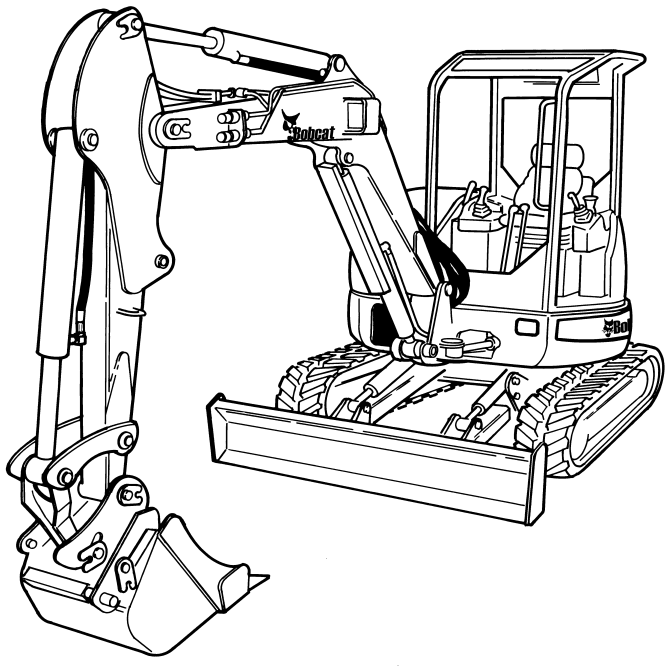
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435

Bobcat®

Service Manual

S/N 562611001 & Above
S/N 562811001 & Above
S/N 563111001 & Above
S/N 563211001 & Above



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MAINTENANCE SAFETY

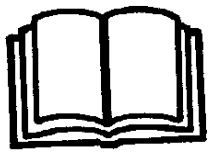
WARNING

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

W-2003-0903

Safety Alert Symbol: This symbol with a warning statement, means: "Warning, be alert! Your safety is involved!" Carefully read the message that follows.

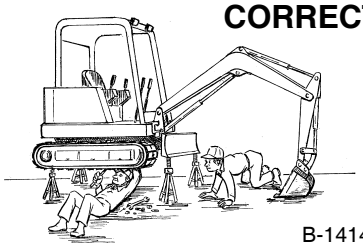
CORRECT



B-10731a

- **Never service the Bobcat Hydraulic Excavator without instructions.**

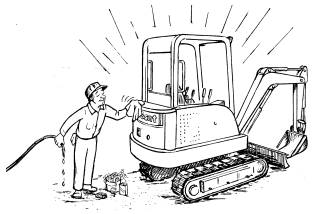
CORRECT



B-14148

- **Use the correct procedure to lift and support the excavator.**
- **Always lift the blade fully before installing jackstands.**

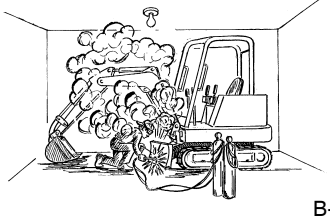
CORRECT



B-14142

- **Cleaning and maintenance are required daily.**

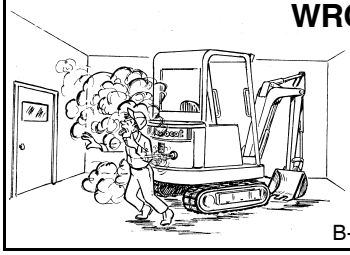
WRONG



B-14147

- **Have good ventilation when welding or grinding painted parts.**
- **Wear dust mask when grinding painted parts. Toxic dust and gas can be produced.**

WRONG



B-14141

- **Vent exhaust to outside when engine must be run for service.**
- **Exhaust system must be tightly sealed. Exhaust Fumes can kill without warning.**

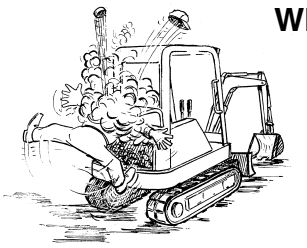
WRONG



B-14145

- **Always lower the bucket and blade to the ground before doing any maintenance.**
- **Never modify equipment or add attachments not approved by Bobcat Company.**

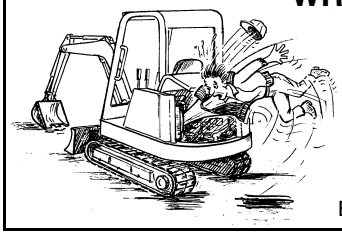
WRONG



B-14146

- **Stop, cool and clean engine of flammable materials before checking fluids.**
- **Never service or adjust machine with the engine running unless instructed to do so in the manual.**
- **Avoid contact with leaking hydraulic fluid or diesel fuel under pressure. It can penetrate the skin or eyes.**
- **Never fill fuel tank with engine running, while smoking or when near open flame.**

WRONG



B-14143

- **Keep body, jewelry and clothing away from moving parts, electrical contact, hot parts and exhaust.**
- **Wear eye protection to guard from battery acid, compressed springs, fluids under pressure and flying debris when engines are running or tools are used. Use eye protection approved for type of welding.**
- **Keep rear door closed except for service. Close and latch door before operating the excavator.**

WRONG



B-6589

- **Lead-acid batteries produce flammable and explosive gases.**
- **Keep arcs, sparks, flames and lighted tobacco away from batteries.**
- **Batteries contain acid which burns eyes or skin on contact. Wear protective clothing. If acid contacts body, flush well with water. For eye contact flush well and get immediate medical attention.**

Maintenance procedures which are given in the Operation & Maintenance Manual can be performed by the owner/operator without any specific technical training. Maintenance procedures which are **not** in the Operation & Maintenance Manual must be performed **ONLY BY QUALIFIED BOBCAT SERVICE PERSONNEL. Always use genuine Bobcat replacement parts.** The Service Safety Training Course is available from your Bobcat dealer.

MSW20-0805

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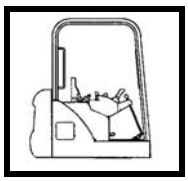
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FOREWORD

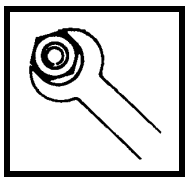
This manual is for the Bobcat Excavator mechanic. It provides necessary servicing and adjustment procedures for the excavator and its component parts and systems. Refer to the Operation & Maintenance Manual for operating instructions, starting procedure, daily checks, etc.

A general inspection of the following items must be made after the excavator has had service or repair:

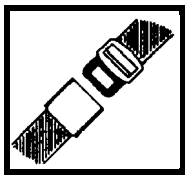
1. Check that the ROPS/TOPS/ FOPS is in good condition and is NOT modified.



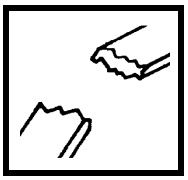
2. Check that ROPS/TOPS mounting hardware is tightened and is Bobcat approved.



3. The seat belt must be correctly installed, functional and in good condition.



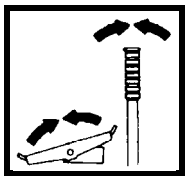
4. Inspect for loose or broken parts or connections.



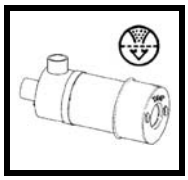
5. Machine signs must be legible and in the correct location.



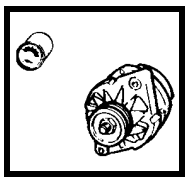
6. Steering levers, control levers and foot pedals must return to neutral. Check that foot pedals lock and control lever locks are in working order.



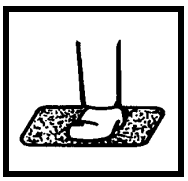
7. Inspect the air cleaner for damage or leaks. Check the condition of the filters.



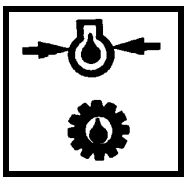
8. Check the electrical charging system.



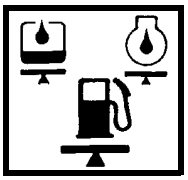
9. Safety treads must be in good condition.



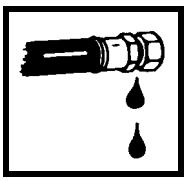
10. Check for correct function of indicator lamps (Optional on some models.



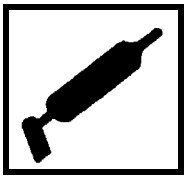
11. Check hydraulic fluid level, engine oil level and fuel supply.



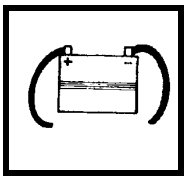
12. Inspect for fuel, oil or hydraulic fluid leaks.



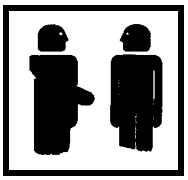
13. Lubricate the excavator.



14. Check the condition of the battery and cables.



Recommend to the owner that all necessary corrections be made before the excavator is returned to service.



CALIFORNIA
PROPOSITION 65 WARNING
Diesel engine exhaust and some of its constituents are know to the state of California to cause cancer, birth defects and other reproductive harm.

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SAFETY INSTRUCTIONS

Safety Alert Symbol

This symbol with a warning statement means: "Warning, be alert! Your safety is involved!" Carefully read the message that follows.

WARNING

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

W-2003-0903

IMPORTANT

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

I-2019-0284

DANGER

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

D-1002-1107

WARNING

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

W-2044-1107

The following publications provide information on the safe use and maintenance of the Bobcat machine and attachments:

- The Delivery Report is used to assure that complete instructions have been given to the new owner and that the machine is in safe operating condition.
- The Operation & Maintenance Manual delivered with the machine or attachment contains operating information as well as routine maintenance and service procedures. It is a part of the machine and can be stored in a container provided on the machine. Replacement Operation & Maintenance Manuals can be ordered from your Bobcat dealer.
- Machine signs (decals) instruct on the safe operation and care of your Bobcat machine or attachment. The signs and their locations are shown in the Operation & Maintenance Manual. Replacement signs are available from your Bobcat dealer.
- An Operator's Handbook fastened to the operator cab. It's brief instructions are convenient to the operator. The handbook is available from your dealer in an English edition or one of many other languages. See your Bobcat dealer for more information on translated versions.
- The AEM Safety Manual delivered with the machine gives general safety information.
- The Service Manual and Parts Manual are available from your dealer for use by mechanics to do shop-type service and repair work.
- The Compact Excavator Operator Training Course is available through your local dealer or at **www.training.bobcat.com** or **www.bobcat.com**. This course is intended to provide rules and practices of correct operation of the Bobcat excavator. The course is available in English and Spanish versions.
- Service Safety Training Courses are available from your Bobcat dealer or at **www.training.bobcat.com** or **www.bobcat.com**. They provide information for safe and correct service procedures.
- The Bobcat compact excavator Safety Video is available from your Bobcat dealer or at **www.training.bobcat.com** or **www.bobcat.com**.

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The dealer and owner / operator review the recommended uses of the product when delivered. If the owner / operator will be using the machine for a different application(s) he or she must ask the dealer for recommendations on the new use.



Call Before You Dig

Dial 811 (USA Only)
1-888-258-0808 (USA & Canada)

When you call, you will be directed to a location in your state / province, or city for information about buried lines (telephone, cable TV, water, sewer, gas, etc.).



Cutting or drilling concrete containing sand or rock containing quartz may result in exposure to silica dust. Do not exceed Permissible Exposure Limits (PEL) to silica dust as determined by OSHA or other job site Rules and Regulations. Use a respirator, water spray or other means to control dust. Silica dust can cause lung disease and is known to the state of California to cause cancer.

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FIRE PREVENTION



Maintenance

The machine and some attachments have components that are at high temperatures under normal operating conditions. The primary source of high temperatures is the engine and exhaust system. The electrical system, if damaged or incorrectly maintained, can be a source of arcs or sparks.

Flammable debris (leaves, straw, etc.) must be removed regularly. If flammable debris is allowed to accumulate, it can cause a fire hazard. Clean often to avoid this accumulation. Flammable debris in the engine compartment is a potential fire hazard.

The operator's area, engine compartment and engine cooling system must be inspected every day and cleaned if necessary to prevent fire hazards and overheating.

All fuels, most lubricants and some coolants mixtures are flammable. Flammable fluids that are leaking or spilled onto hot surfaces or onto electrical components can cause a fire.

Operation

Do not use the machine where exhaust, arcs, sparks or hot components can contact flammable material, explosive dust or gases.

Electrical



Check all electrical wiring and connections for damage. Keep the battery terminals clean and tight. Repair or replace any damaged part or wires that are loose or frayed.

Battery gas can explode and cause serious injury. Use the procedure in the Operation & Maintenance Manual for connecting the battery and for jump starting. Do not jump start or charge a frozen or damaged battery. Keep any open flames or sparks away from batteries. Do not smoke in battery charging area.

Hydraulic System

Check hydraulic tubes, hoses and fittings for damage and leakage. Never use open flame or bare skin to check for leaks. Hydraulic tubes and hoses must be properly routed and have adequate support and secure clamps. Tighten or replace any parts that show leakage.

Always clean fluid spills. Do not use gasoline or diesel fuel for cleaning parts. Use commercial nonflammable solvents.

Fueling



Stop the engine and let it cool before adding fuel. No smoking! Do not refuel a machine near open flames or sparks. Fill the fuel tank outdoors.

Starting

Do not use ether or starting fluids on any engine that has glow plugs. These starting aids can cause explosion and injinjure you or bystanders.

Use the procedure in the Operation & Maintenance Manual for connecting the battery and for jump starting.

Spark Arrestor Exhaust System

The spark arrestor exhaust system is designed to control the emission of hot particles from the engine and exhaust system, but the muffler and the exhaust gases are still hot.

Check the spark arrestor exhaust system regularly to make sure it is maintained and working properly. Use the procedure in the Operation & Maintenance Manual for cleaning the spark arrestor muffler (if equipped).

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FIRE PREVENTION (CONT'D)

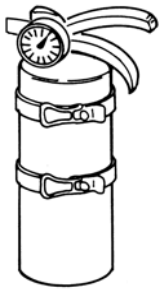
Welding And Grinding

Always clean the machine and attachment, disconnect the battery, and disconnect the wiring from the Bobcat controllers before welding. Cover rubber hoses, battery and all other flammable parts. Keep a fire extinguisher near the machine when welding.

Have good ventilation when grinding or welding painted parts. Wear dust mask when grinding painted parts. Toxic dust or gas can be produced.

Dust generated from repairing nonmetallic parts such as hoods, fenders or covers can be flammable or explosive. Repair such components in a well ventilated area away from open flames or sparks.

Fire Extinguishers



Know where fire extinguishers and first aid kits are located and how to use them. Inspect the fire extinguisher and service the fire extinguisher regularly. Obey the recommendations on the instructions plate.

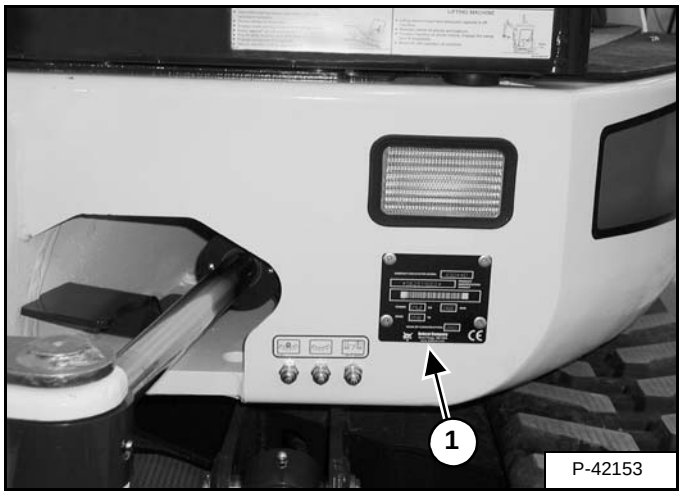
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SERIAL NUMBER LOCATIONS

Always use the serial number of the excavator when requesting service information or when ordering parts. Early or later models (identification made by serial number) may use different parts, or it may be necessary to use a different procedure in doing a specific service operation.

Excavator Serial Number

Figure 1



The excavator serial number plate (Item 1) is located on the frame of the machine in the location shown **[Figure 1]**.

Explanation of Excavator Serial Number:

XXXX XXXXX

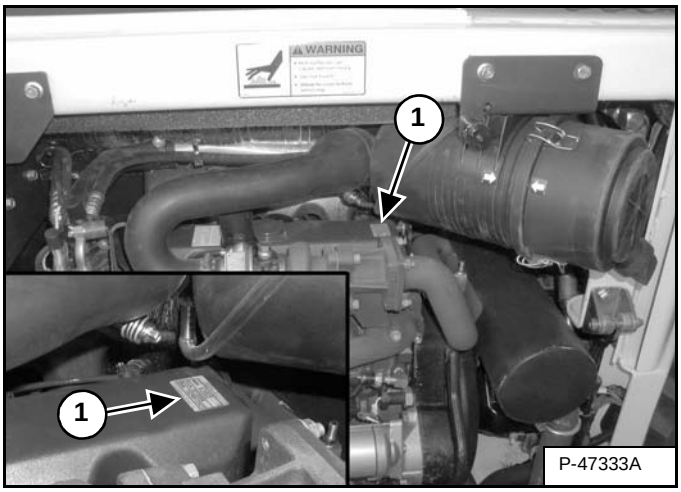
- XXXXX — Module 2. - Production Sequence (Series)
- XXXX — Module 1. - Model / Engine Combination

1. The four digit Model/Engine Combination Module number identifies the model number and engine combination.

2. The five digit Production Sequence Number identifies the order which the excavator is produced.

Engine Serial Number

Figure 2

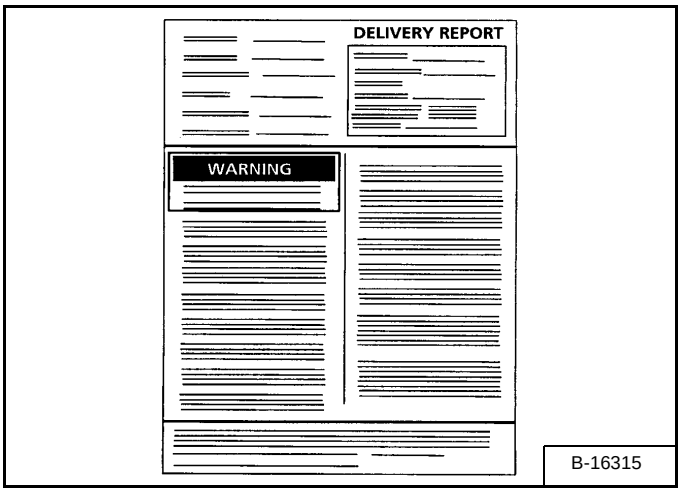


The engine serial number (Item 1) is located on the engine in the location shown **[Figure 2]**.

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DELIVERY REPORT

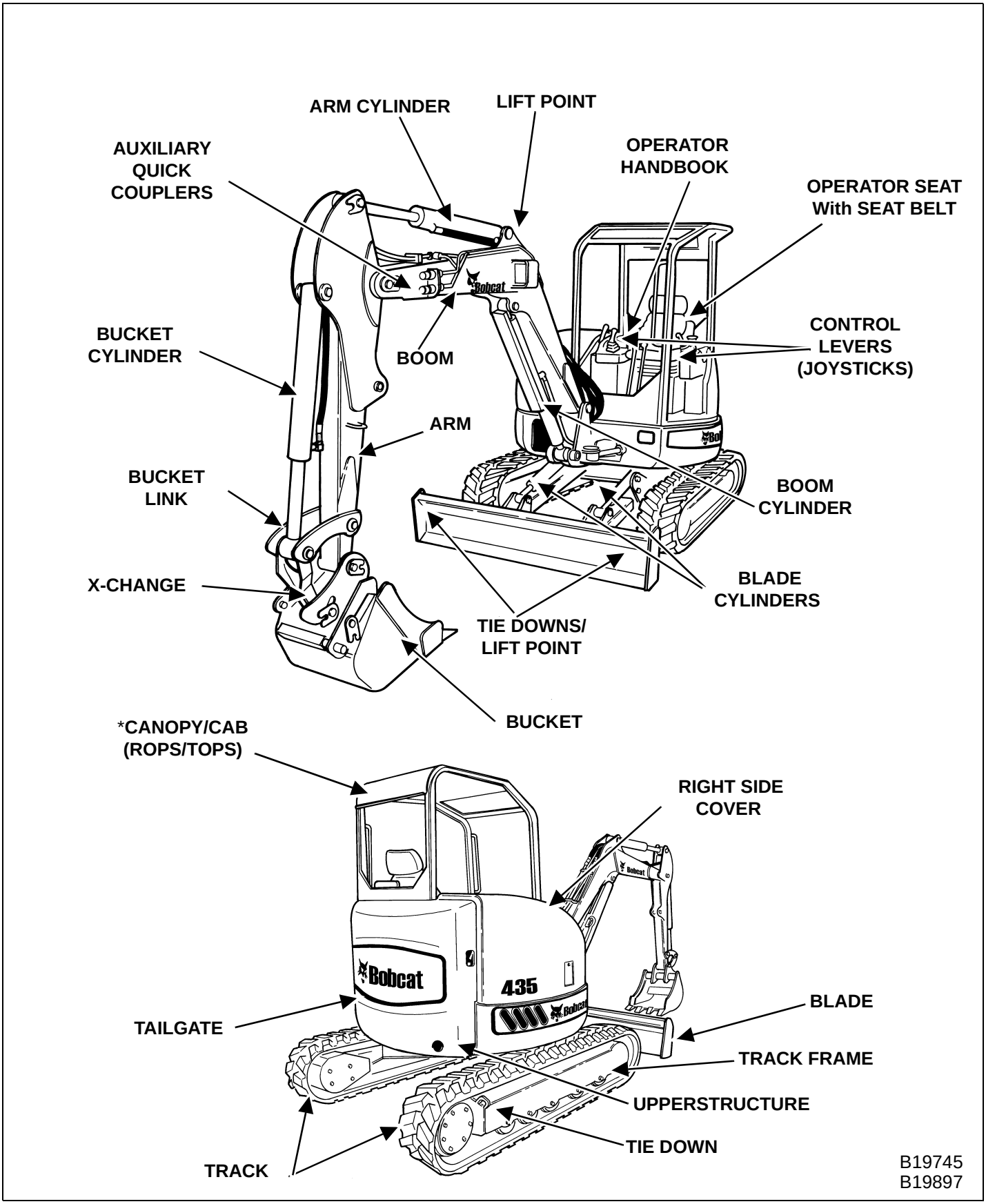
Figure 3



The delivery report must be filled out by the dealer and signed by the owner or operator when the Bobcat Excavator is delivered. An explanation of the form must be given to the owner. Make sure it is filled out completely **[Figure 3]**.

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BOBCAT EXCAVATOR IDENTIFICATION



* FOGS (Falling Object Guards) is available from your Bobcat Excavator dealer.

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Replacing The Filters 10-60-1

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Cleaning The Cooling System 10-70-1
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ENGINE ACCESSORY DRIVE BELT 10-140-1
Belt Adjustment 10-140-1
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Replacing Oil And Filter 10-90-1

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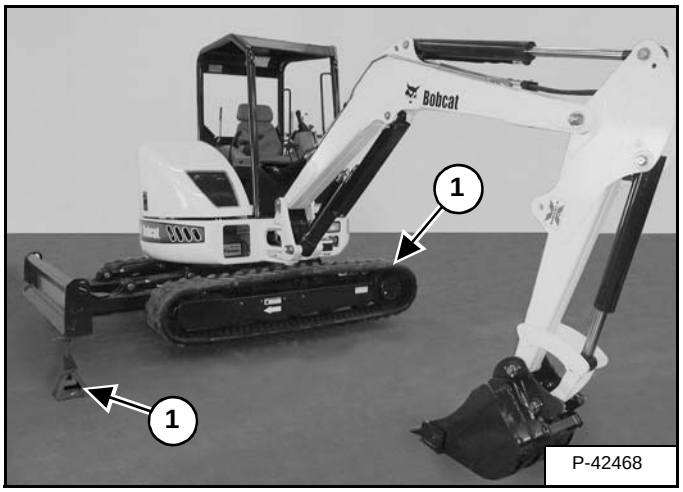
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https://www.pdfmanual4trucks.com/

LIFTING AND BLOCKING THE EXCAVATOR

Procedure

Figure 10-10-1



Raise one side of the machine (approximately four inches) using the boom and arm **[Figure 10-10-1]**.

Raise the blade fully and install jack stands under the blade and track frame (Item 1) **[Figure 10-10-1]**. Lower the boom until all machine weight is on the jack stands.

Repeat the procedure for the other side.

Stop the engine.

⚠ WARNING

AVOID INJURY OR DEATH

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

W-2142-0189

⚠ WARNING

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

W-2218-1195

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UPPERSTRUCTURE SLEW LOCK

Operation

There is not a mechanical upperstructure slew lock to engage or disengage.

This Excavator is equipped with an automatically applied slew brake integrated into the slew motor.

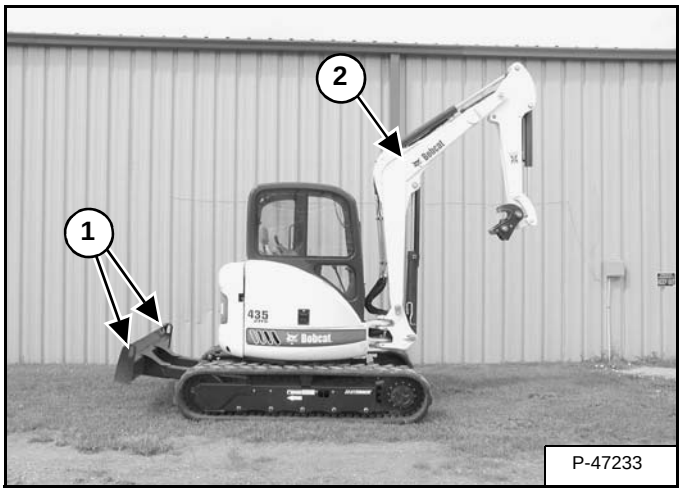
When the upperstructure slew circuit is engaged, hydraulic pressure unlocks the slew motor.

When the upperstructure slew circuit is disengaged, spring pressure applies the internal slew motor brake.

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LIFTING THE EXCAVATOR

Figure 10-12-1



Fully extend the cylinders of the bucket, arm, and boom so that the Excavator is in the position as shown **[Figure 10-12-1]**.

Raise the blade all the way.

Put all the control levers in neutral.

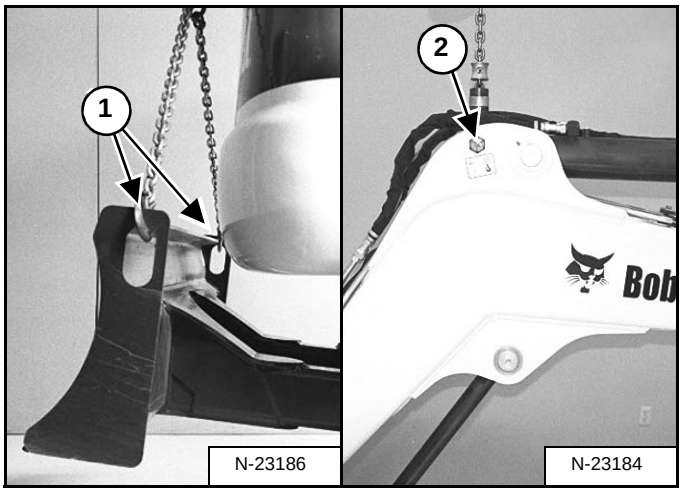
⚠ WARNING

AVOID INJURY OR DEATH

- **Use a lifting fixture with sufficient capacity for the weight of the Excavator plus any added attachments.**
- **Maintain center of gravity and balance when lifting.**
- **Do not swing boom or upperstructure. Engage the swing locking lever.**
- **Never lift with operator on machine.**

W-2202-0595

Figure 10-12-2



Fasten chains to the ends of the blade (Item 1) **[Figure 10-12-1]** and **[Figure 10-12-2]** and up to a lifting fixture above the canopy/cab. The lifting fixture must extend over the sides of the canopy/cab to prevent the chains from hitting the ROPS/TOPS.

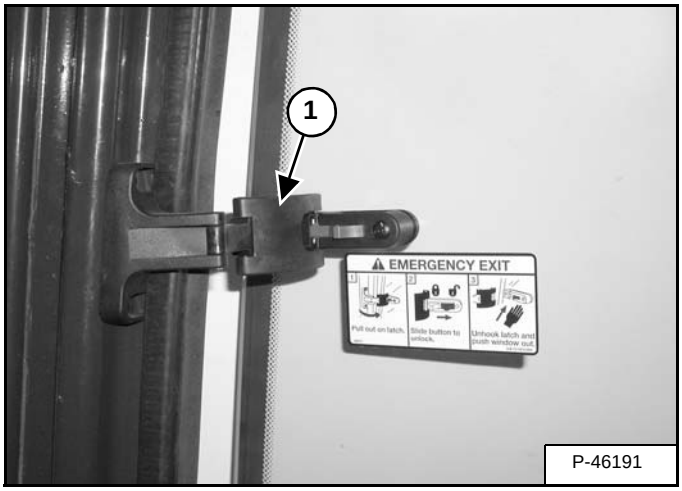
Install a one inch (25 mm) bolt and nut (Grade 5 or 8) through the holes at the boom (Item 2) **[Figure 10-12-1]** and **[Figure 10-12-2]**. Fasten a chain from the bolt to the lift fixture.

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Emergency Exit (Early Models)

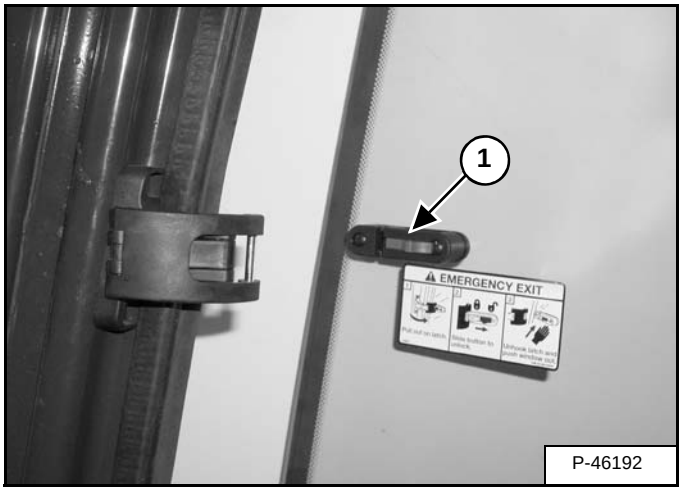
The left door, front window, and right front window provide exits.

Figure 10-20-1



Pull out and fully extend the latch (Item 1) **[Figure 10-20-1]**.

Figure 10-20-2



Slide the button (Item 1) **[Figure 10-20-2]** to unlock the window latch.

Figure 10-20-3



Unhook the latch and push the window all the way open. Exit through the window **[Figure 10-20-3]**.

Figure 10-20-4



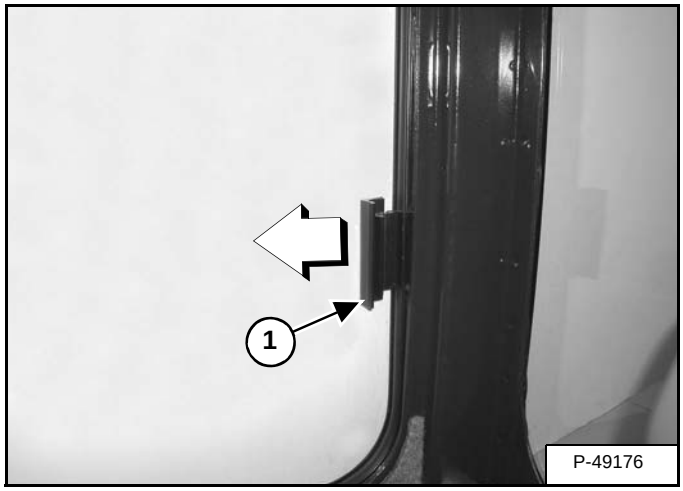
Raise the front window and exit through the window **[Figure 10-20-4]**.

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Emergency Exit (Later Models)

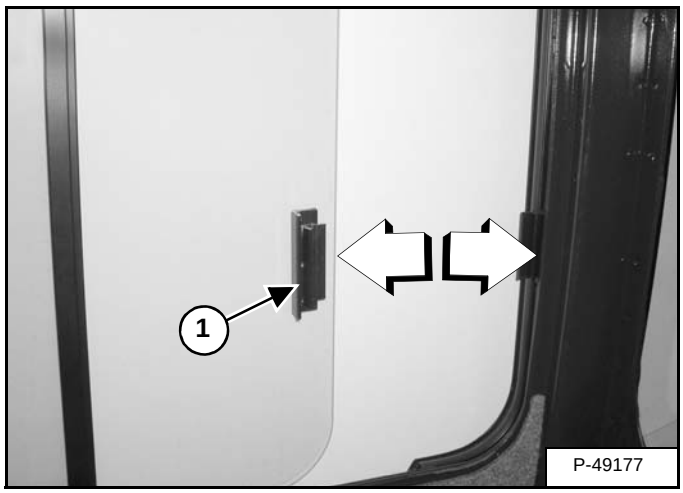
The left door, front window, and right rear window provide exits.

Figure 10-20-5



Pull forward on the latch (Item 1) **[Figure 10-20-5]**.

Figure 10-20-6



Pull the latch/handle (Item 1) **[Figure 10-20-6]** forward to open the window.

Push the handle back to close the window.

Figure 10-20-7



Exit through the window **[Figure 10-20-7]**.

Figure 10-20-8

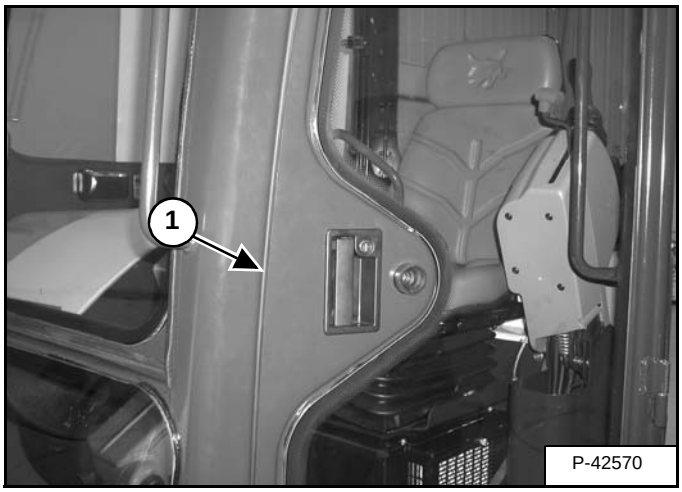


Raise the front window and exit through the window **[Figure 10-20-8]**.

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Cab Door

Figure 10-20-9



The cab door (Item 1) **[Figure 10-20-9]** can be locked with the same key as the starter switch (if equipped).

Push the door all the way open until the latch engages to hold the door in the open position.

Figure 10-20-10

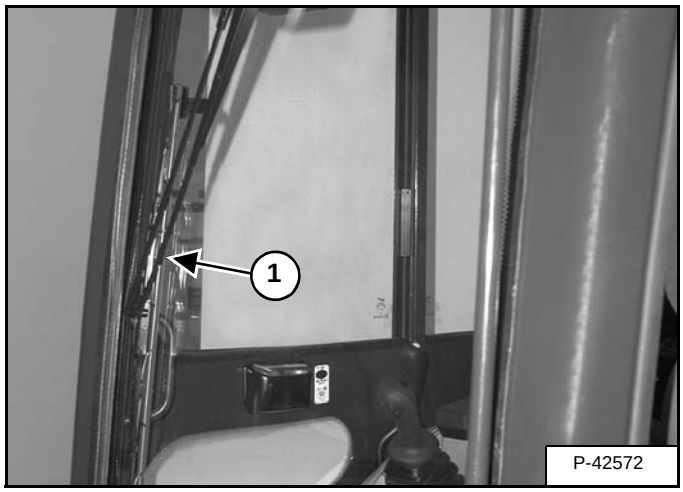


Firmly pull the door away from the cab to disengage the latch and close the door **[Figure 10-20-10]**.

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Front Window

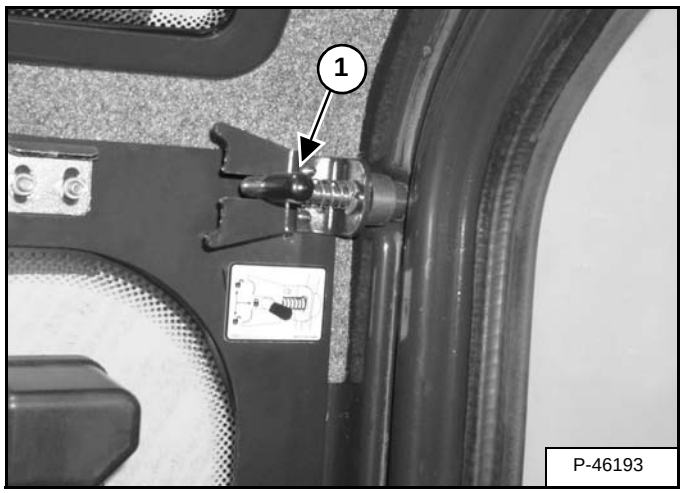
Figure 10-20-11



The front window is equipped with a wiper (Item 1) **[Figure 10-20-11]** and washer.

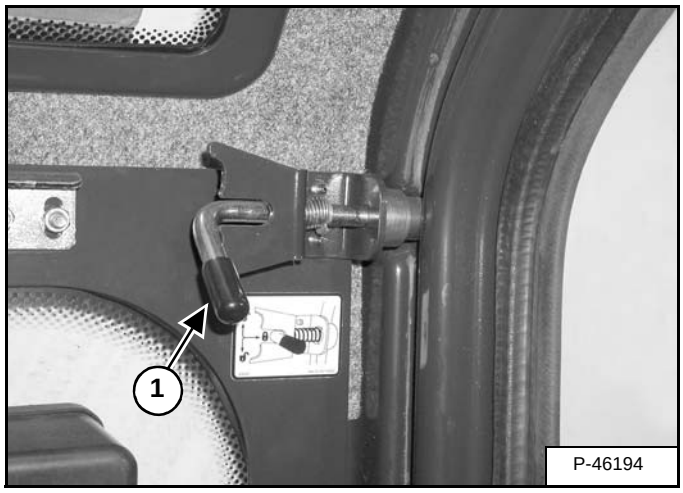
Opening The Front Window

Figure 10-20-12



Retract the two top window latch pins (Item 1) **[Figure 10-20-12]**.

Figure 10-20-13



Turn the two top latches (Item 1) **[Figure 10-20-13]** to the unlocked position.

Figure 10-20-14



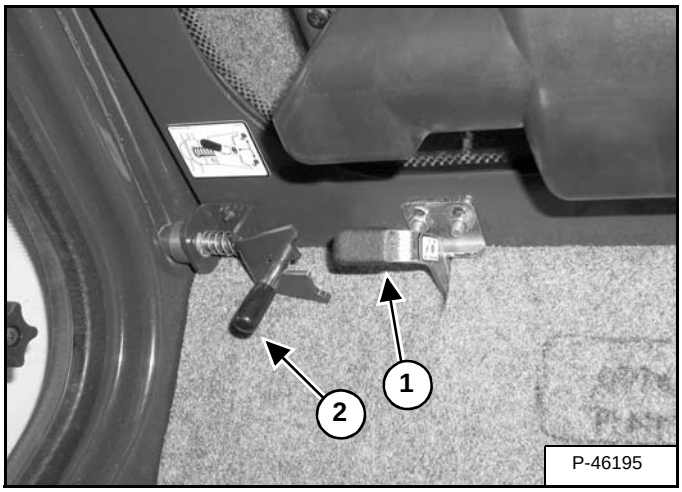
Use both window grab handles to pull the top of the window in **[Figure 10-20-14]**.

Continue moving the window in and up over the operator's head until the window is fully raised.

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Front Window (Cont'd)

Figure 10-20-15



When the window is fully raised, the latch (Item 1) will close on the bracket. Turn the two top latches (Item 2) **[Figure 10-20-15]** to the locked position.

Closing The Front Window

Support the window while releasing both window latch pins and placing the pins in the unlocked position **[Figure 10-20-15]**.

Support the window using the left grab handle and pull down on the latch (Item 1) **[Figure 10-20-15]** to release the window.

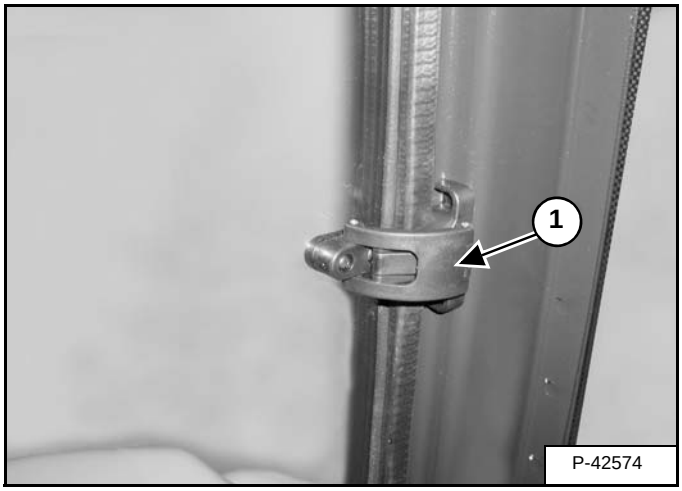
Use both window grab handles to pull the window down **[Figure 10-20-14]**.

Rotate the top latches (Item 1) **[Figure 10-20-13 on Page 4]** to the locked position (Item 1) **[Figure 10-20-12 on Page 4]**.

Right Side Windows (Early Models)

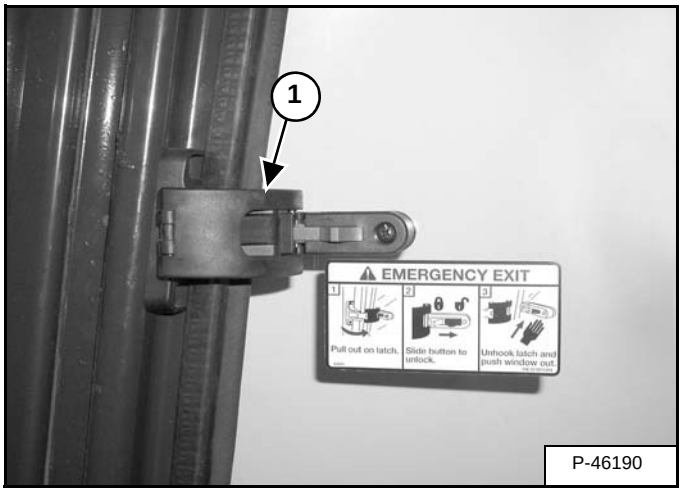
Opening the right rear window

Figure 10-20-16



Pull out on the latch (Item 1) **[Figure 10-20-16]**.

Figure 10-20-17



Push out on the window until the latch (Item 1) **[Figure 10-20-17]** goes over center.

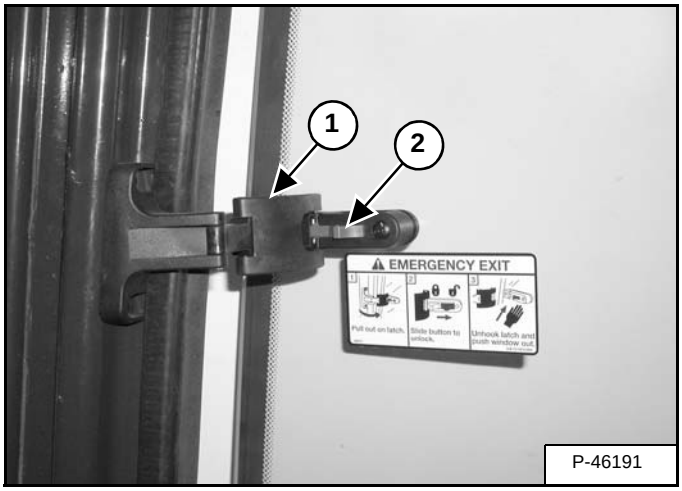
Pull in on the latch to close the window.

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Right Side Windows (Early Models) (Cont'd)

Opening the right front window

Figure 10-20-18

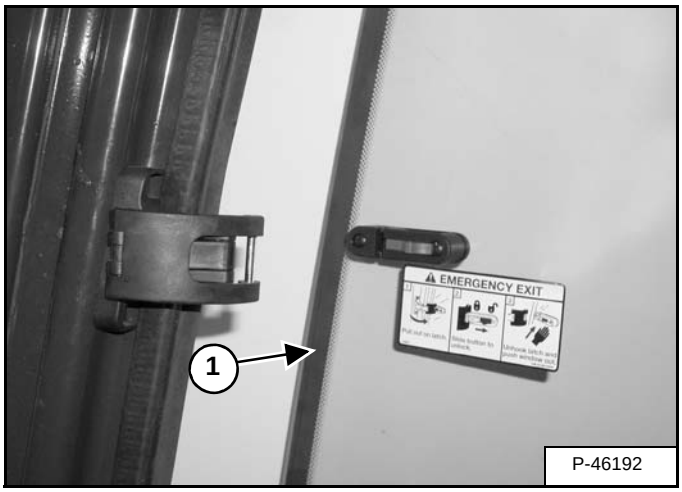


Pull out on the latch (Item 1) **[Figure 10-20-18]**.

Push out on the window until the latch (Item 1) **[Figure 10-20-18]** goes over center.

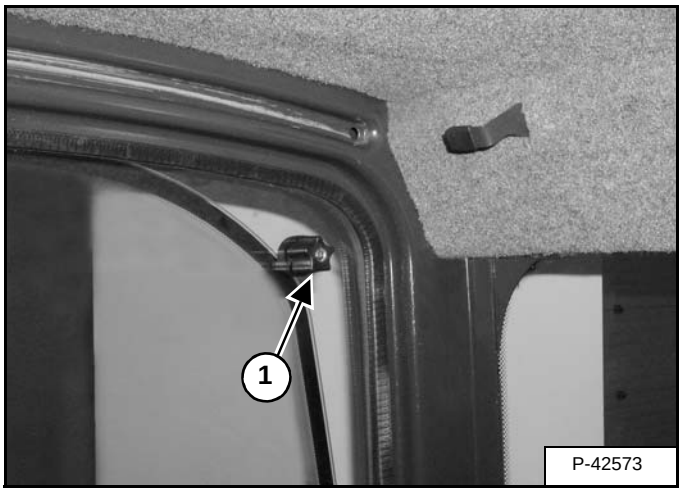
To fully open the right front window, slide the button rearward (Item 2) **[Figure 10-20-18]** to disengage the window latch.

Figure 10-20-19



Push the window (Item 1) **[Figure 10-20-19]** all the way open.

Figure 10-20-20

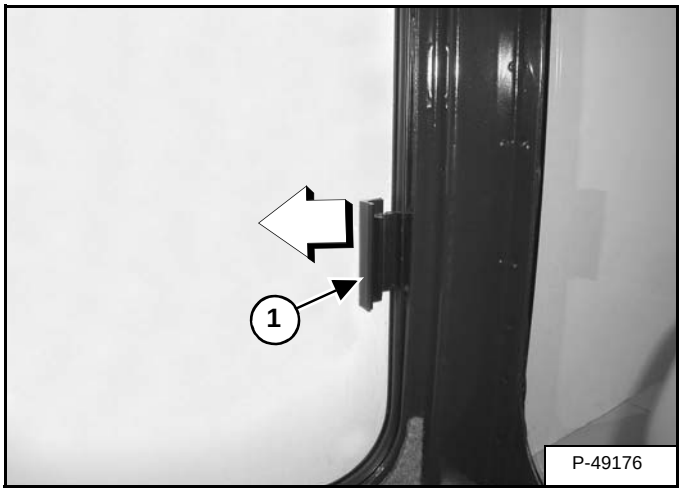


Turn the lock (Item 1) **[Figure 10-20-20]** to lock the window open.

Right Side Windows (Later Models)

Opening the right rear window

Figure 10-20-21

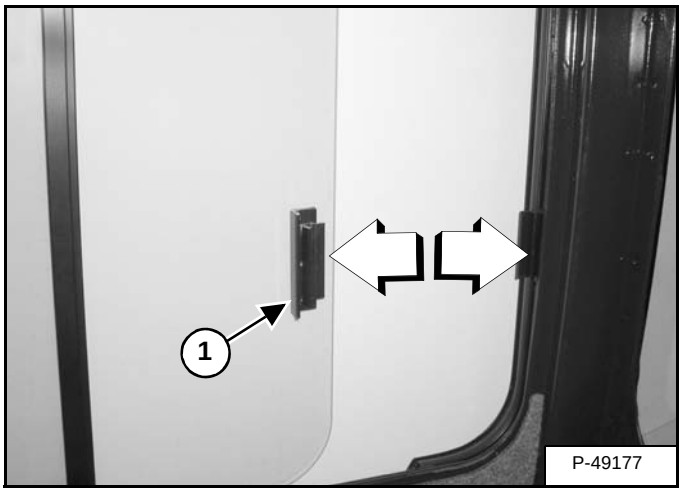


Pull forward on the latch (Item 1) **[Figure 10-20-21]**.

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Right Side Windows (Later Models) (Cont'd)

Figure 10-20-22

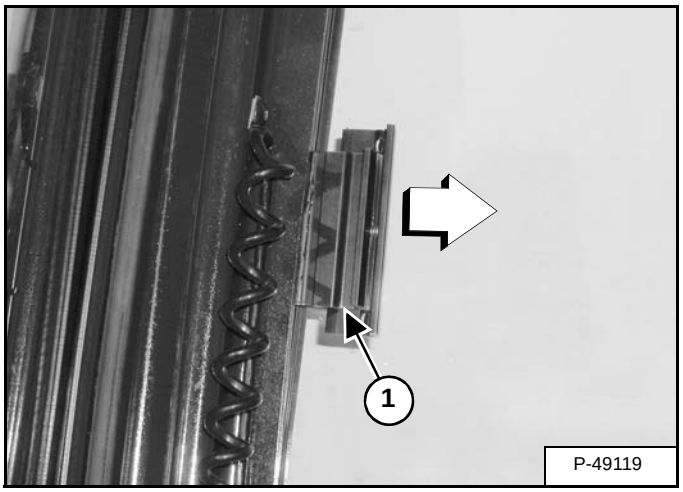


Pull the latch/handle (Item 1) **[Figure 10-20-22]** forward to open the window.

Push the handle back to close the window.

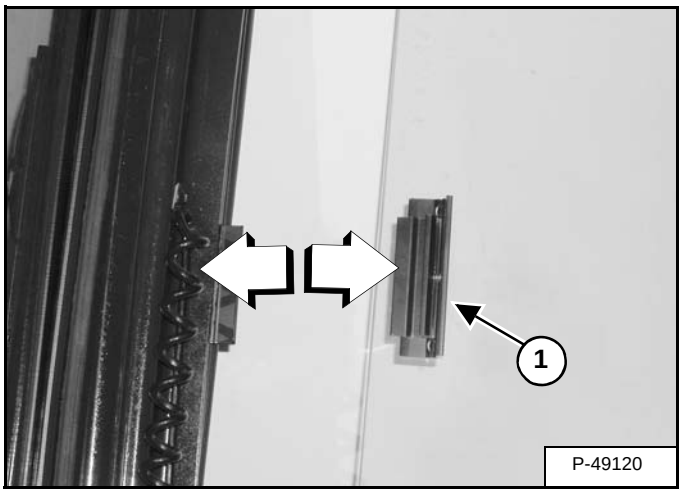
Opening the right front window

Figure 10-20-23



Pull back on the latch (Item 1) **[Figure 10-20-23]**.

Figure 10-20-24



Pull the latch/handle (Item 1) **[Figure 10-20-24]** back to open the window.

Push the handle forward to close the window.

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TRANSPORTING THE EXCAVATOR

Procedure

When transporting the machine, observe the rules, motor vehicle laws, and vehicle limit ordinances. Use a transport and towing vehicle of adequate length and capacity.

Secure the parking brakes and block the wheels of the transport vehicle.

Align the ramps with the center of the transport vehicle. Secure the ramps to the truck bed and be sure ramp angle does not exceed 15 degrees.

Use metal loading ramps with a slip resistant surface.

Use ramps that are the correct length and width and can support the weight of the machine.

The rear of the trailer must be blocked or supported when loading or unloading the Excavator to prevent the front of the transport vehicle from raising.

Determine the direction of the track movement before moving the machine (blade forward).

Engage the slew lock.

Figure 10-30-1



Move the machine forward onto the transport vehicle **[Figure 10-30-1]**.

Do not change direction of the machine while it is on the ramps.

Lower the boom, arm, bucket and blade to the transport vehicle.

Stop the engine and remove the key (if equipped).

Put blocks at the front and rear of the tracks.

Figure 10-30-2

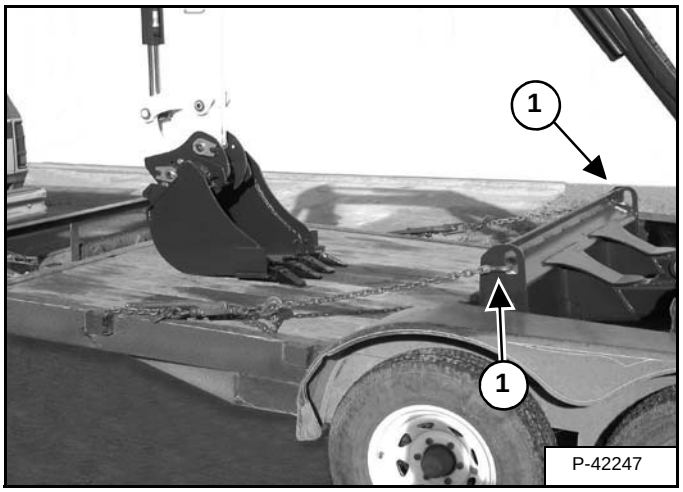
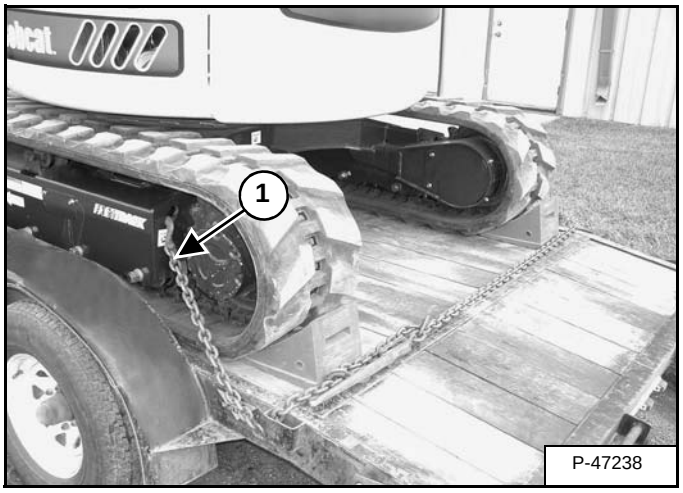


Figure 10-30-3



Fasten chains to the front corners of the blade (Item 1) **[Figure 10-30-2]** and to the tie down loop at the rear (Item 1) **[Figure 10-30-3]** to prevent it from moving when going up or down slopes, or during sudden stops.

Use chain binders to tighten the chains and then safely tie the chain binder levers to prevent loosening.

⚠ WARNING

Adequately designed ramps of sufficient strength are needed to support the weight of the machine when loading onto a transport vehicle. Wood ramps can break and cause personal injury.

W-2058-0494

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TAILGATE

Opening And Closing The Tailgate

WARNING

AVOID INJURY OR DEATH

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

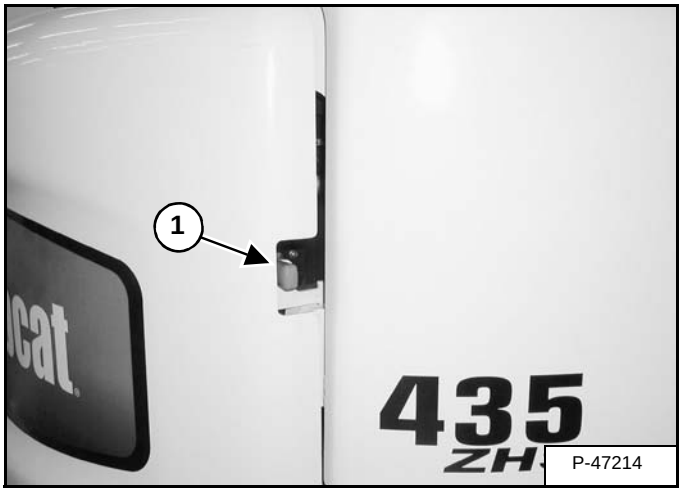
W-2012-0497

WARNING

Keep the rear door closed when operating the machine. Failure to do so could seriously injure a bystander.

W-2020-1285

Figure 10-40-1

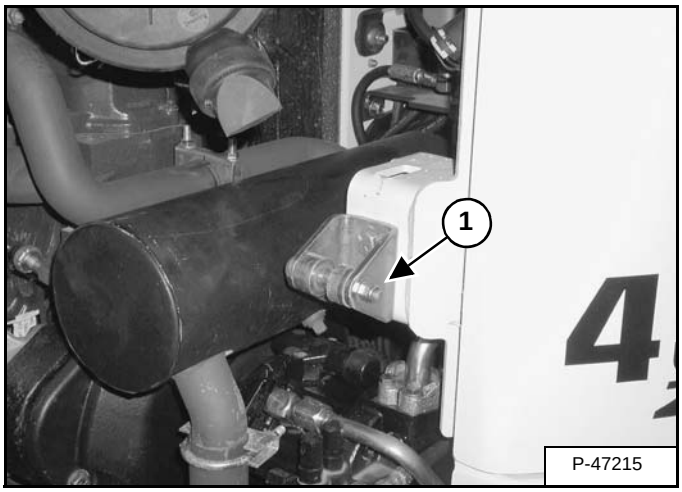


Pull the latch (Item 1) **[Figure 10-40-1]** and pull the tailgate open.

Push firmly to close the tailgate.

Adjusting The Latch

Figure 10-40-2



The door catch (Item 1) **[Figure 10-40-2]** can be adjusted for alignment.

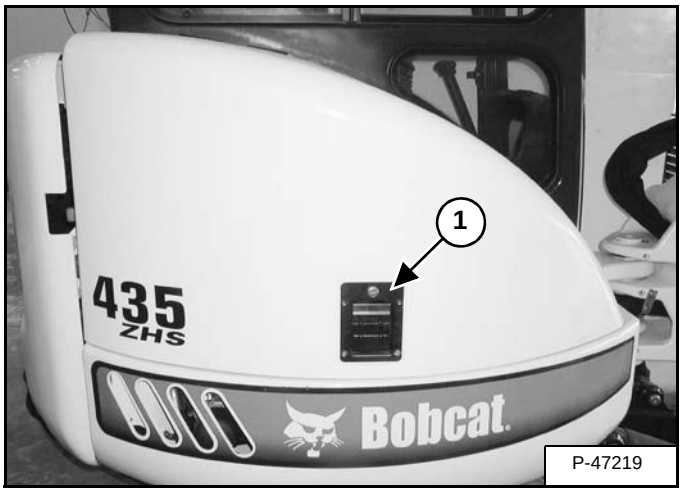
Close the tailgate before operating the Excavator.

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RIGHT SIDE COVER

Opening And Closing The Right Side Cover

Figure 10-41-1



Pull the latch (Item 1) **[Figure 10-41-1]** and raise the right side cover.

NOTE: The right side cover can be locked using the start key.

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SERVICE SCHEDULE

Chart

Maintenance work must be done at regular intervals. Failure to do so will result in excessive wear and early failures. The service schedule is a guide for correct maintenance of the Bobcat Excavator.

⚠ WARNING

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

W-2003-0199

SERVICE SCHEDULE		HOURS					
ITEM	SERVICE REQUIRED	8-10	50	100	250	500	■ 1000
Engine Coolant	Check coolant level. Add premixed coolant as needed.						
Engine Oil	Check the engine oil level and add as needed.						
Hydraulic Fluid, Hoses and Tubelines, Reservoir Breather Cap	Check the hydraulic fluid level and add as needed. Check for damage and leaks. Repair or replace as needed.						
Engine Air Filter and Air System	Check condition indicator and empty dust cup as needed. Check air system for leaks.						
Tracks	Check and adjust track tension as needed.						
Indicators and Lights	Check for correct operation of all indicators and lights.						
Operator Canopy/Cab	Check condition. Check mounting hardware.						
Seat Belt	Check condition. Check mounting hardware.						
Safety Signs and Safety Treads	Check for damaged signs (decals) and safety treads. Replace any signs or safety treads that are damaged or worn.						
Pivot Points	Grease all machinery pivot points.						
Cab Heater Air Filter	Clean the filter as needed.						
Console Lockout	Check console lockout for proper operation.						
X-Change ™	Lubricate and inspect for damage or loose parts.						
Swing Circle and Pinion	Grease two Fittings						
Fuel Tank & Filter	Drain water and sediment from fuel tank and fuel filter.						
Battery	Check battery, cables, connections and electrolyte level. Add distilled water as needed.						
Spark Arrestor Muffler	Clean the spark chamber.						
Travel Motor	Check lubricant level in both travel motors.						
Fuel Filters	Replace fuel filter.						
Inline Fuel Filter	Replace inline fuel filter.						
Accessory Drive Belt	Check condition of belt and adjust as needed.			^			
Drive Belt	Check and adjust as needed			^			
Radiator, Oil Cooler, *A/C	Clean debris from the radiator fins.						
Engine Oil and Filter	Replace oil and filter use CD or better grade oil and Bobcat filter.		●				
Primary Hydraulic Filter	Replace the primary hydraulic filter.			^			
Case Drain Filter	Replace the case drain filter.			^			
Fan Hydraulic Filter	Replace the fan hydraulic filter.			^			
Alternator & Starter	Check the alternator and starter connections.			^			
Engine Valves	Check and adjust the engine valve clearance.						
Engine Cooling System	Drain and flush the cooling system. Replace the coolant.						
Hydraulic System	Replace the hydraulic fluid and filters. Clean the reservoir.						
Travel Motor	Replace the lubricant in both travel motors.			^			

*** If Equipped**
● Also at *first* 50 Hours
^ Also at *first* 100 Hours
■ Or every 6 months.

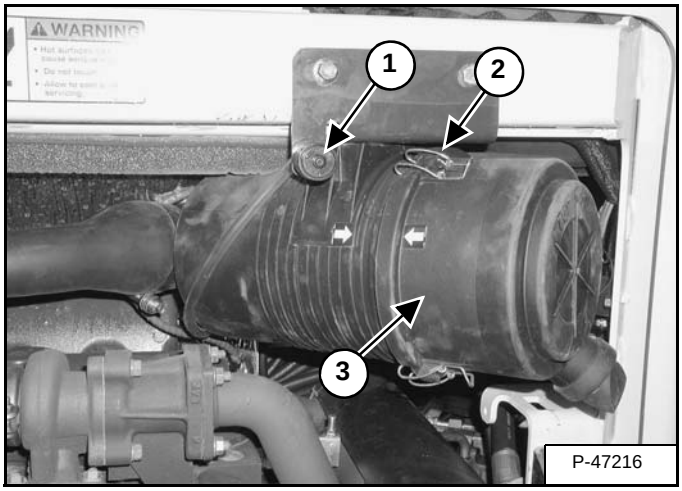
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AIR CLEANER

See the Service Schedule (See Chart on Page 10-50-1) for the correct service interval.

Daily Check

Figure 10-60-1



Check the condition indicator (Item 1) **[Figure 10-60-1]**. If the red ring shows in the condition indicator, the filter needs to be replaced.

Replace the inner filter every third time the outer filter is replaced or as indicated.

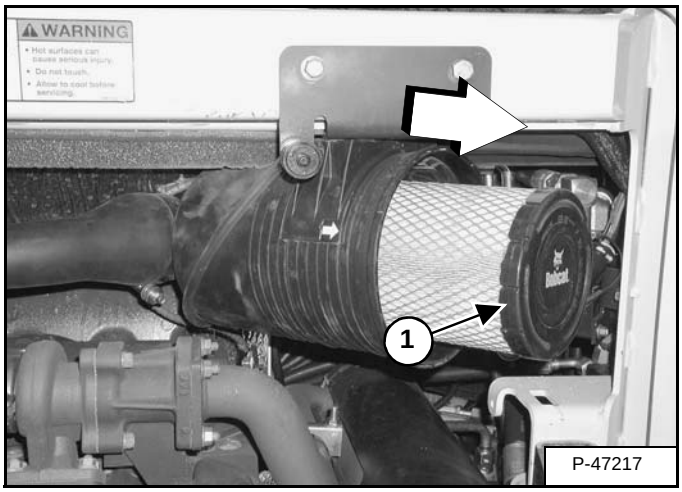
Replacing The Filters

Outer Filter

Release the two fasteners (Item 2) **[Figure 10-60-1]**.

Remove and clean the dust cup (Item 3) **[Figure 10-60-1]**.

Figure 10-60-2



Pull the outer filter (Item 1) **[Figure 10-60-2]** from the air cleaner housing.

Check the housing for damage.

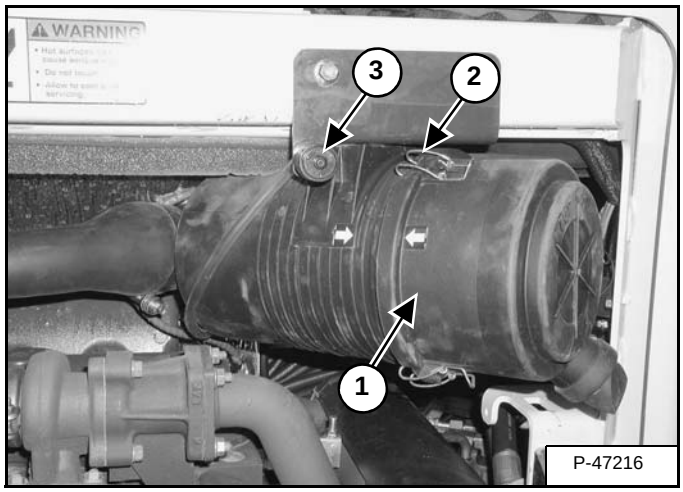
Clean the housing and the seal surface. DO NOT use compressed air.

Install a new filter.

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Replacing The Filters (Cont'd)

Figure 10-60-3



Install the dust cup (Item 1) and engage the fasteners (Item 2) **[Figure 10-60-3]**.

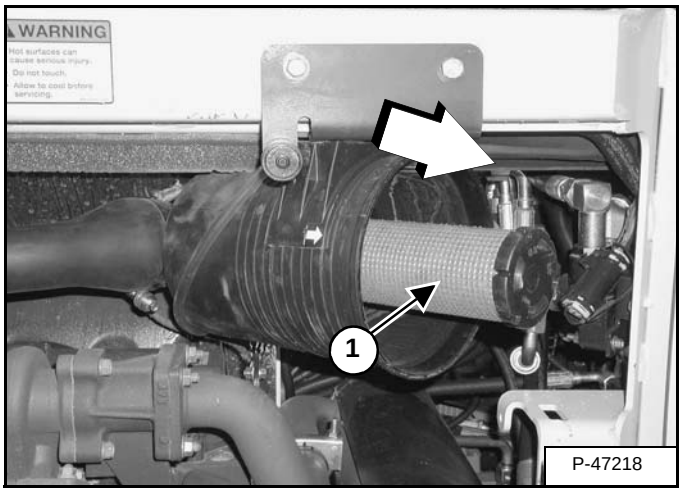
Check the air intake hose and the air cleaner housing for damage. Make sure all connections are tight.

Inner Filter

Only replace the inner filter under the following conditions:

- Replace the inner filter every *third* time the outer filter is replaced.
- After the outer filter has been replaced, press the button (Item 3) **[Figure 10-60-3]** on the top of the condition indicator and start the engine. Run at full RPM, then reduce engine speed and stop the engine. If the red ring shows in the condition indicator, replace the inner filter.

Figure 10-60-4



Remove the dust cup, outer filter and inner filter (Item 1) **[Figure 10-60-4]**.

NOTE: Make sure all sealing surfaces are free of dirt and debris.

Install the new inner filter.

Install the outer filter and the dust cup.

Press the button on the condition indicator to remove the red ring.

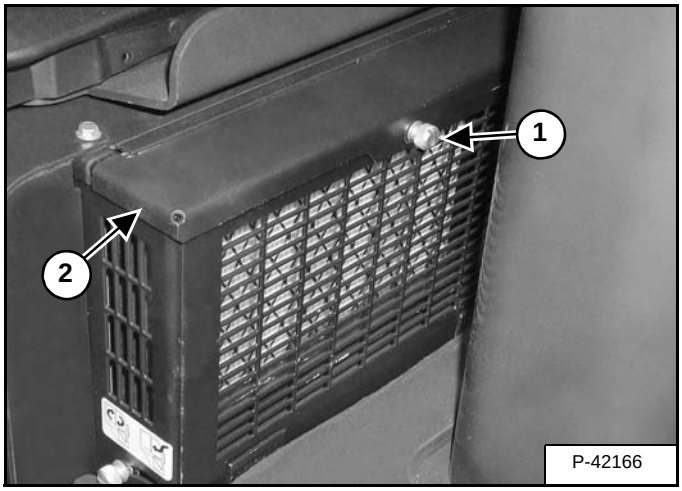
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HEATER AIR FILTER (WITH CAB OPTION ONLY)

Removal And Installation

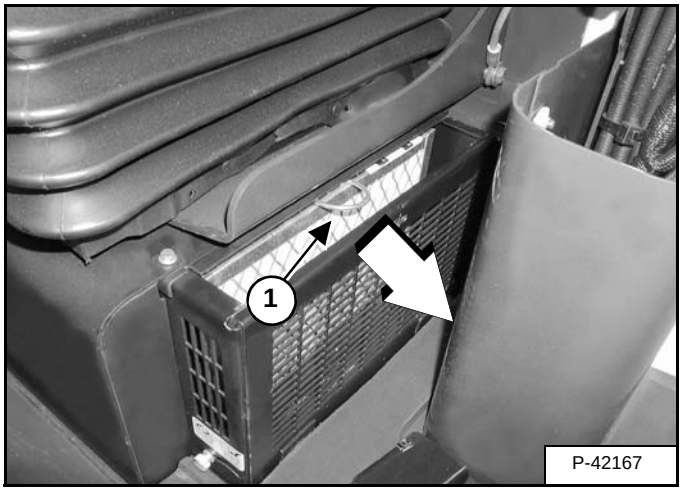
The heater filter must be cleaned regularly. The filter is located at the left of the operator seat.

Figure 10-61-1



Remove the screw (Item 1) and cover (Item 2) **[Figure 10-61-1]**.

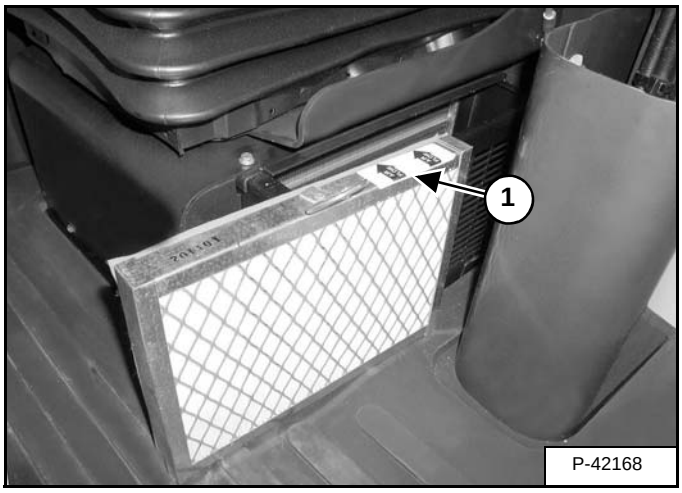
Figure 10-61-2



Pull the filter (Item 1) **[Figure 10-61-2]** away and out of the heater/AC housing.

Use low air pressure to clean the filter. Replace the filter when very dirty.

Figure 10-61-3



Installation: Install the filter with the arrows that indicate air flow direction (Item 1) **[Figure 10-61-3]** pointing towards the heater/AC housing.

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COOLING SYSTEM

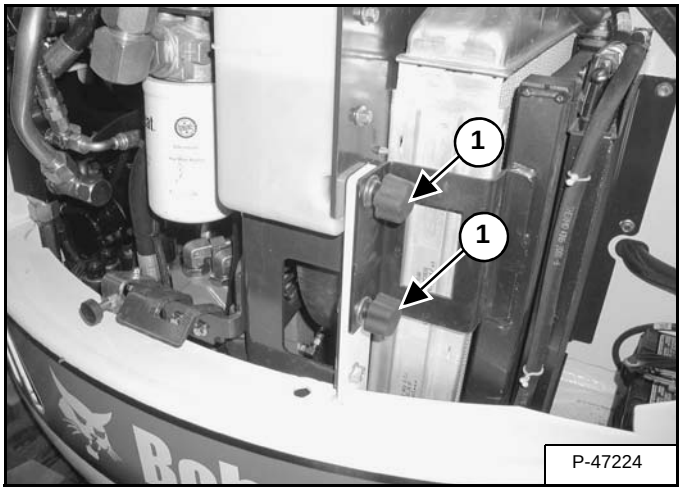
Check the cooling system every day to prevent overheating, loss of performance or engine damage.

Cleaning The Cooling System

NOTE: Allow the cooling system and engine to cool before servicing or cleaning the cooling system.

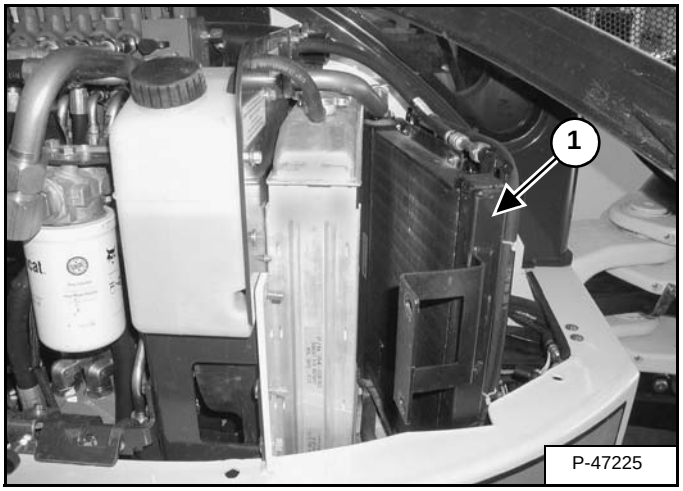
Open the right side cover.

Figure 10-70-1



Remove the two nuts (Item 1) **[Figure 10-70-1]**.

Figure 10-70-2



Pivot the oil cooler (Item 1) **[Figure 10-70-2]** away from the radiator.

Use air pressure or water pressure to clean the radiator and oil cooler. Be careful not to damage fins when cleaning.

Checking Coolant Level

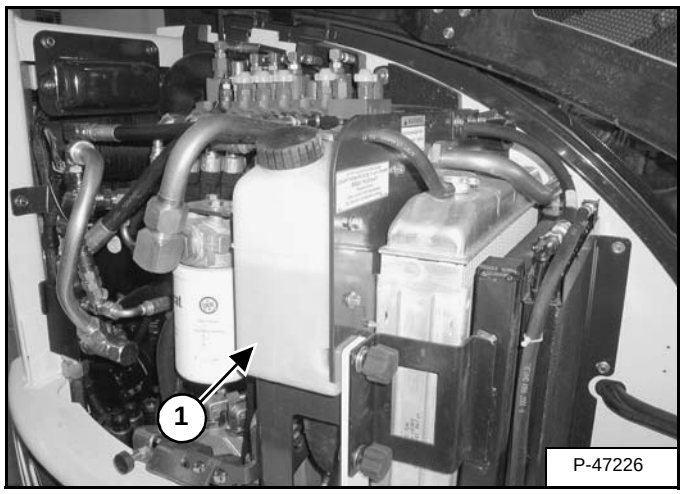
⚠ WARNING

Do not remove radiator cap when the engine is hot. You can be seriously burned.

W-2070-1285

Open the right side cover.

Figure 10-70-3



Check the coolant level in the coolant recovery tank (Item 1) **[Figure 10-70-3]**.

The coolant level must be between the MIN and MAX marks on the coolant recovery tank when the engine is cold.

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

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Checking Coolant Level (Cont'd)

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.

I-2124-0497

WARNING

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.**

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Replacing The Coolant

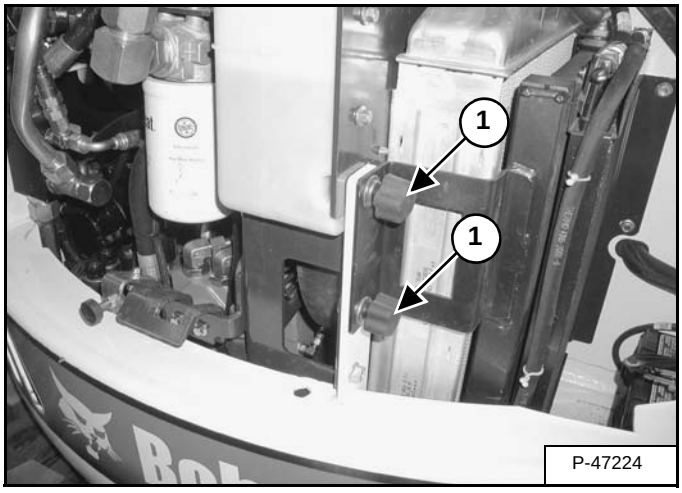
See the SERVICE SCHEDULE (*See Chart on Page 10-50-1)* for correct service intervals.

WARNING

Do not remove radiator cap when the engine is hot. You can be seriously burned.

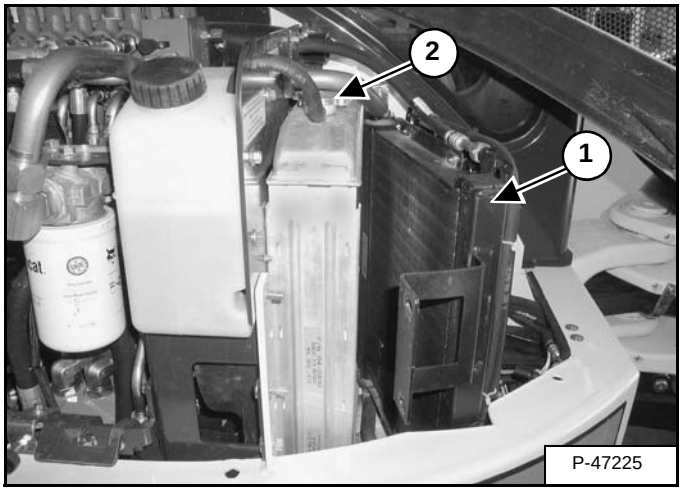
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Figure 10-70-4



Remove the two nuts (Item 1) **[Figure 10-70-4]**.

Figure 10-70-5



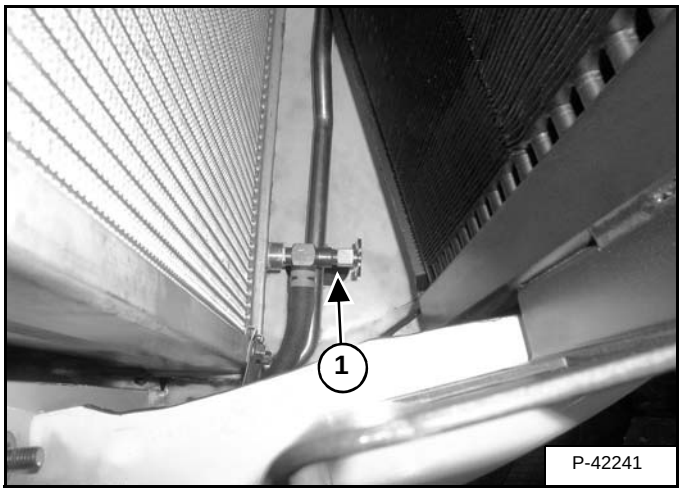
Pivot the oil cooler (Item 1) **[Figure 10-70-5]** away from the radiator.

When the engine is cool, loosen and remove the radiator cap (Item 2) **[Figure 10-70-5]**.

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Replacing The Coolant (Cont'd)

Figure 10-70-6



Put a hose on the drain valve at the bottom of the radiator. Open the drain valve (Item 1) **[Figure 10-70-6]** and drain the coolant into a container.

After all the coolant is removed, close the drain valve.

Recycle or dispose of the used coolant in an environmentally safe manner.

Mix the coolant in a separate container. See *FUEL, COOLANT AND LUBRICANTS Chart for correct capacity. (*See Chart on Page SPEC-60-1)

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

Add premixed coolant; 47% water and 53% propylene glycol to the recovery tank if the coolant level is low.

One gallon and one pint of propylene glycol mixed with one gallon of water is the correct mixture of coolant to provide a -34°F (-37°C) freeze protection.

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.

I-2124-0497

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

Add premixed coolant until the level is correct.

Run the engine until it is at operating temperature. Stop the engine. Check the coolant level and add as needed. Be sure the radiator cap is tight.

Add coolant to the recovery tank as needed.

Close the right side cover.

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FUEL SYSTEM

Fuel Specifications

Use only clean, high quality diesel fuel, Grade No. 2 or Grade No. 1.

The following is a suggested blending guideline which should prevent fuel gelling problems during freezing temperature

Temp. F° (C°)	No. 2	No. 1
Above +15° (-9°)	100%	0%
Down to -20° (-29°)	50%	50%
Below -20° (-29°)	0%	100%

See your fuel supplier for local recommendations.

Filling The Fuel Tank

Figure 10-80-1



Remove the fuel fill cap (Item 1) **[Figure 10-80-1]**.

Use a clean, approved safety container to add fuel. Add fuel only in an area that has a free movement of air and no flames or sparks. **NO SMOKING!**

Install and tighten the fuel fill cap.

Clean up any spilled fuel.

⚠ WARNING

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

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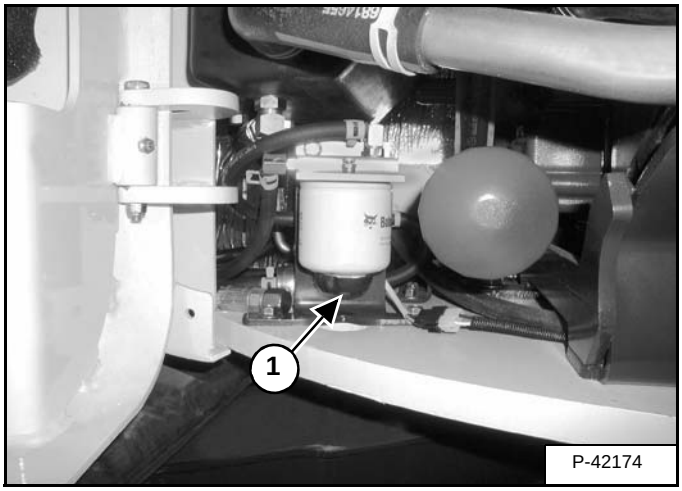
NOTE: The fuel cap can be locked using the start key.

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Removing Water From The Fuel Filter

Open the tailgate.

Figure 10-80-2

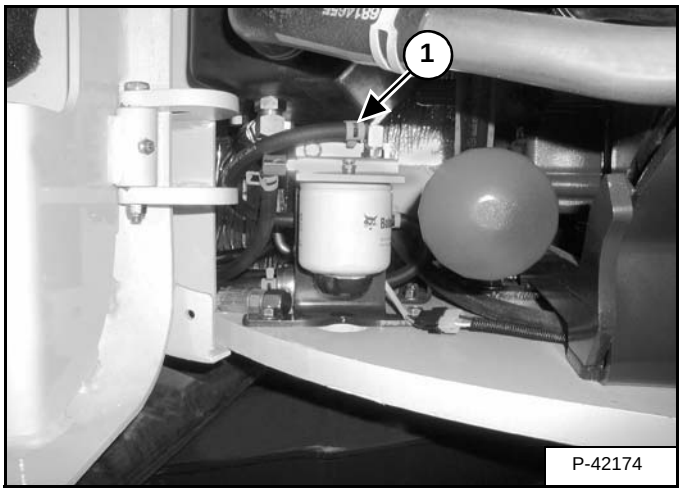


Loosen the drain (Item 1) **[Figure 10-80-2]** at the bottom of the filter to drain water from the filter.

See the SERVICE SCHEDULE for the service interval when to remove the water from the fuel filter. (See Chart on Page 10-50-1)

Draining The Fuel Tank

Figure 10-80-3



See the SERVICE SCHEDULE for the correct service interval. (See Chart on Page 10-50-1)

Remove the hose (Item 1) **[Figure 10-80-3]** from the fuel filter. Route the hose to the bottom of the engine compartment and out the tailgate.

Turn the start key to the ON position.

Drain the fuel into a container.

Turn the start key to the OFF position.

Reuse, recycle or dispose of fuel in an environmentally safe manner.

⚠ WARNING

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

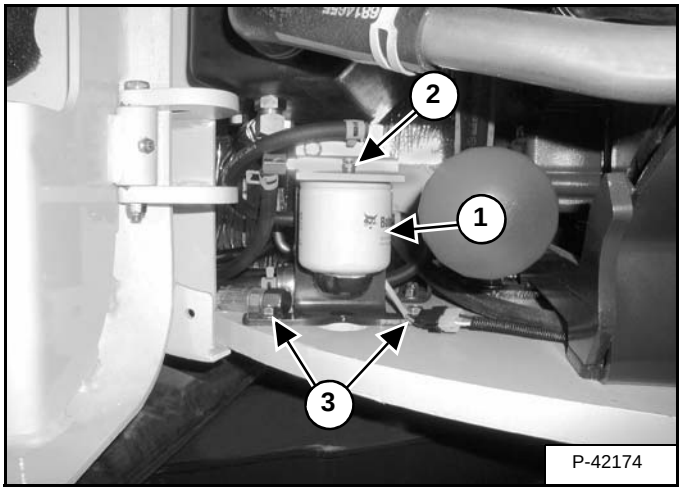
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Spin On Fuel Filter

See the SERVICE SCHEDULE for the service interval when to remove the water from the fuel filter. (See Chart on Page 10-50-1)

Figure 10-80-4



Remove the filter (Item 1) **[Figure 10-80-4]**.

Clean the area around the filter housing.

Put oil on the seal of the new filter.

Install the fuel filter, and hand tighten.

The excavator fuel system is a self bleed system and is purged of air every time the start key is turned to the run position.

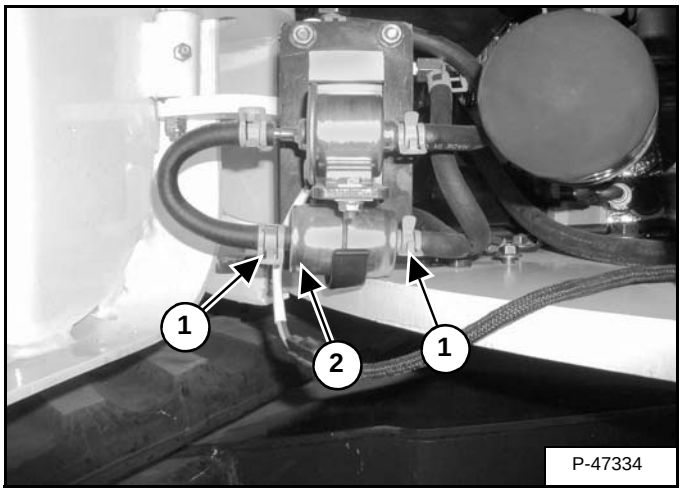
The bleed screw (Item 2) **[Figure 10-80-4]** is not used.

Inline Fuel Filter

See the SERVICE SCHEDULE for the service interval when to remove the water from the fuel filter. (See Chart on Page 10-50-1)

Loosen the two bolts (Item 3) **[Figure 10-80-4]** and position the spin on filter to the side.

Figure 10-80-5



Remove the two clamps (Item 1) and remove the filter (Item 2) **[Figure 10-80-5]**.

The excavator fuel system is a self bleed system and is purged of air every time the start key is turned to the run position.

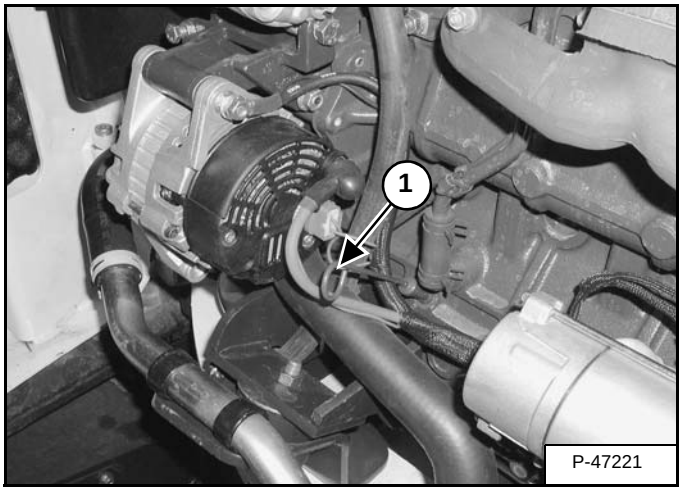
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ENGINE LUBRICATION SYSTEM

Checking Engine Oil

Check the engine oil after every 8-10 hours of operation and before starting the engine.

Figure 10-90-1



Open the tailgate and remove the dipstick (Item 1) **[Figure 10-90-1]**.

Keep the oil level between the marks on the dipstick.

Use a good quality motor oil that meets the correct API Service Classification. See the *FUEL, COOLANT AND LUBRICANTS CHART*. (See Chart on Page SPEC-60-1)

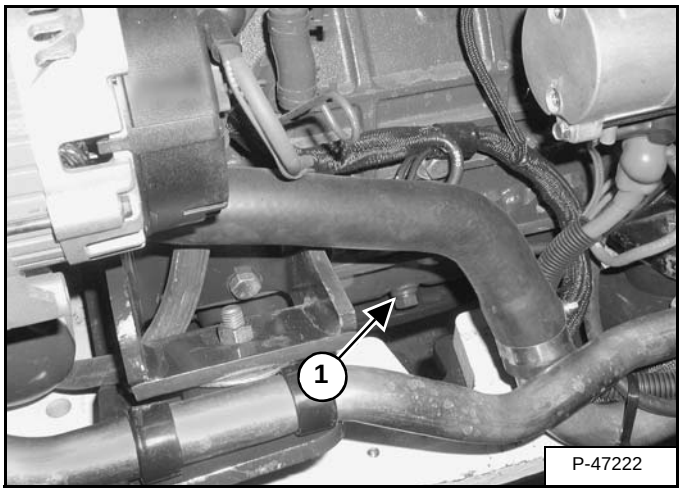
Replacing Oil And Filter

See the *SERVICE SCHEDULE* (See Chart on Page 10-50-1) for the service interval for replacing the engine oil and filter.

Run the engine until it is at operating temperature. Stop the engine.

Open the tailgate.

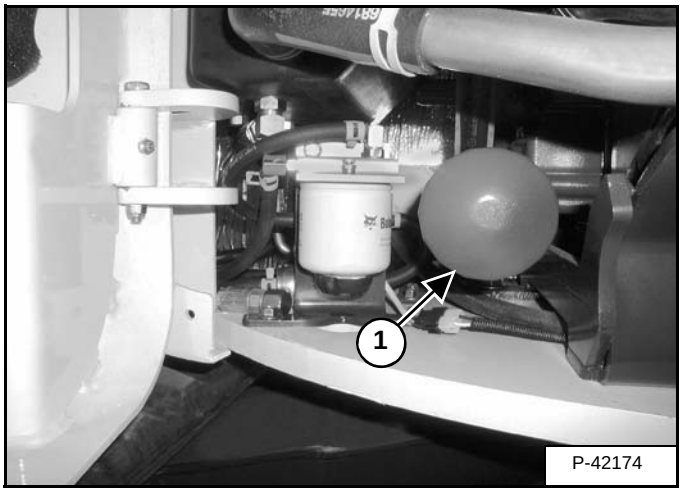
Figure 10-90-2



Remove the plug (Item 1) **[Figure 10-90-2]**. Drain the oil into a container.

Recycle or dispose of used oil in an environmentally safe manner.

Figure 10-90-3



Remove the oil filter (Item 1) **[Figure 10-90-3]** and clean the filter housing surface.

Use a genuine Bobcat replacement filter.

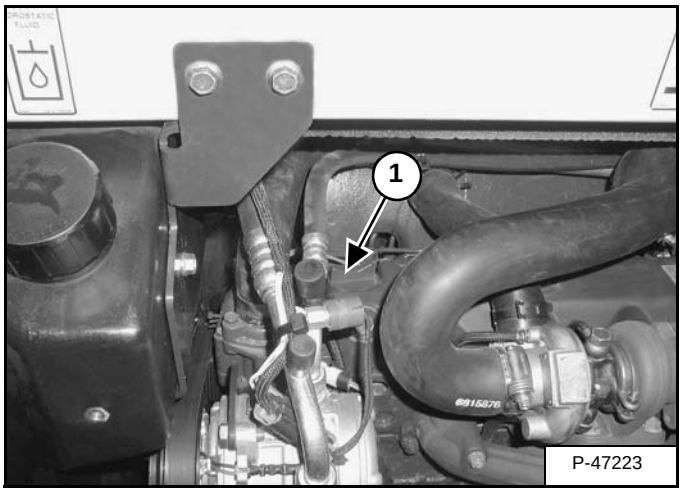
Put clean oil on the filter gasket. Install the filter and hand tighten.

Install and tighten the oil plug.

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Replacing Oil And Filter (Cont'd)

Figure 10-90-4



Remove the fill cap (Item 1) **[Figure 10-90-4]**.

Put oil in the engine. See the *FUEL, COOLANT AND LUBRICANTS CHART*. (See Chart on Page SPEC-60-1)

Install the fill cap.

Start the engine and let it run for several minutes.

Stop the engine. Check for leaks at the oil filter. Check the oil level.

Add oil as needed if it is not at the top mark on the dipstick.

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HYDRAULIC SYSTEM

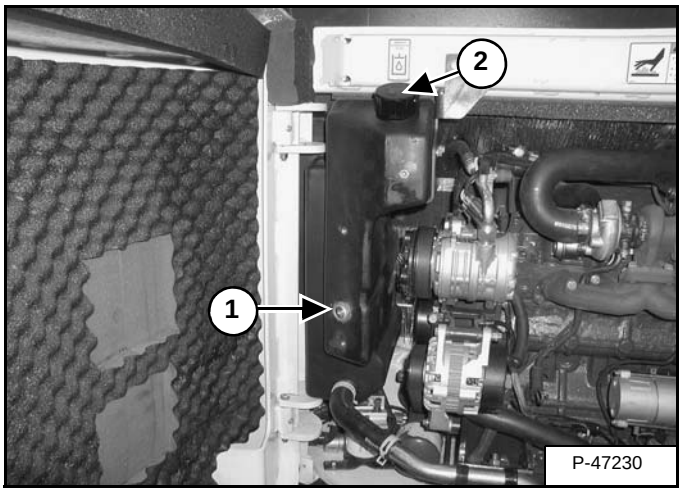
Checking And Adding Hydraulic Oil

Put the machine on a flat level surface.

Retract the arm and bucket cylinders, put the bucket on the ground and lower the blade. Stop the engine.

Open the tailgate.

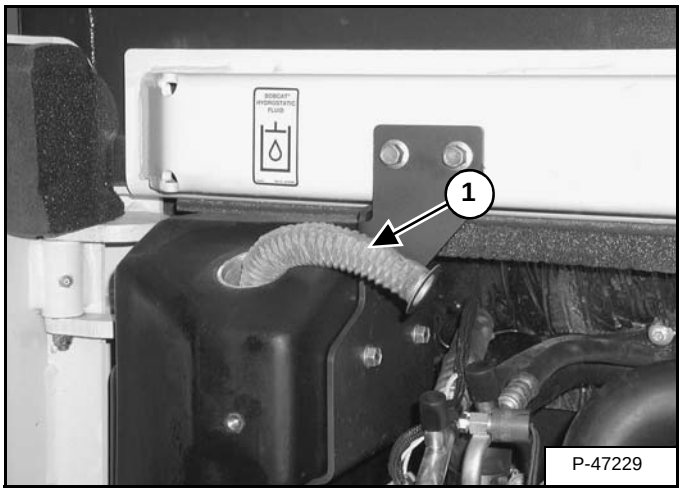
Figure 10-100-1



Check the hydraulic fluid level, it must be visible in the sight gauge (Item 1) **[Figure 10-100-1]**.

Clean the surface around the reservoir (breather) cap and remove the cap from the reservoir (Item 2) **[Figure 10-100-1]**.

Figure 10-100-2



Check the condition of the fill strainer screen (Item 1) **[Figure 10-100-2]**. Clean or replace as necessary.

Be sure the screen is installed before adding fluid.

Add the correct fluid to the reservoir until it is visible in the sight gauge. See *FUEL, COOLANT AND LUBRICANTS Chart.* (See Chart on Page SPEC-60-1)

Check the cap and clean as necessary. Replace the cap if damaged.

Install the cap.

Close the tailgate.

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Replacing The Hydraulic Oil

See the *SERVICE SCHEDULE* for the correct service interval. (See Chart on Page 10-50-1)

⚠ WARNING

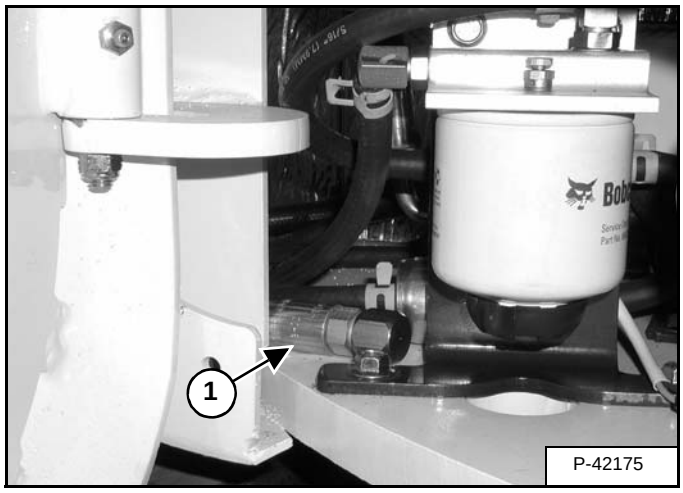
Diesel fuel or hydraulic fluid under pressure can penetrate skin or eyes, causing serious injury or death. Fluid leaks under pressure may not be visible. Use a piece of cardboard or wood to find leaks. Do not use your bare hand. Wear safety goggles. If fluid enters skin or eyes, get immediate medical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

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Retract the arm and bucket cylinders, lower the bucket to the ground. Stop the engine.

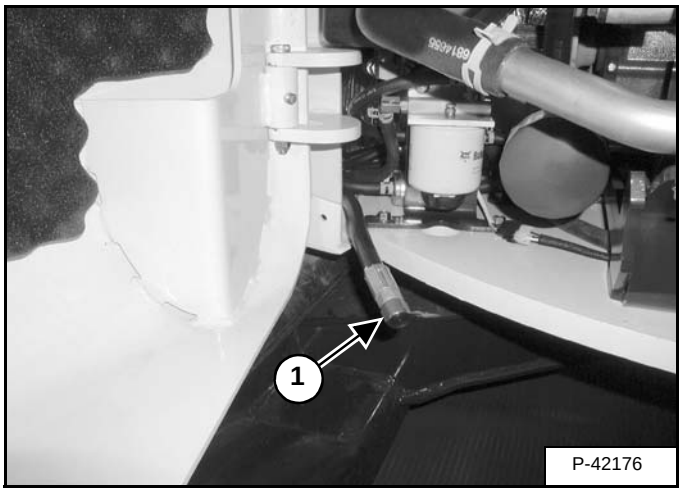
Open the tailgate.

Figure 10-100-3



Pull the hydraulic reservoir drain hose (Item 1) **[Figure 10-100-3]** out of the excavator upperstructure.

Figure 10-100-4



Remove the drain hose cap (Item 1) **[Figure 10-100-4]**.

Drain the fluid into a container.

Recycle or dispose of the fluid in an environmentally safe manner.

Install the drain hose cap (Item 1) **[Figure 10-100-4]**.

Add the correct fluid to the reservoir until it is visible in the sight gauge. See *FUEL, COOLANT AND LUBRICANTS Chart.* (See Chart on Page SPEC-60-1)

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

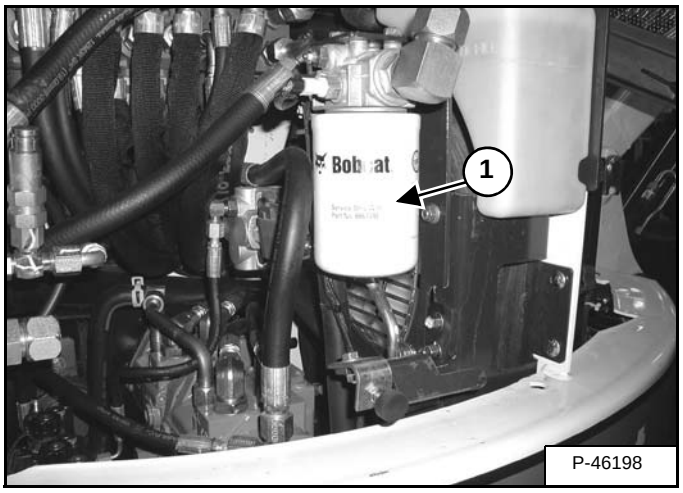
https://www.pdfmanual4trucks.com/

Replacing The Hydraulic Filter

See the *SERVICE SCHEDULE* for the correct service interval. (See Chart on Page 10-50-1)

Open the right side cover.

Figure 10-100-5



Remove the hydraulic filter (Item 1) **[Figure 10-100-5]**.

Clean the housing where the filter gasket makes contact.

Put clean hydraulic fluid on the gasket. Install the new filter and hand tighten only.

⚠ WARNING

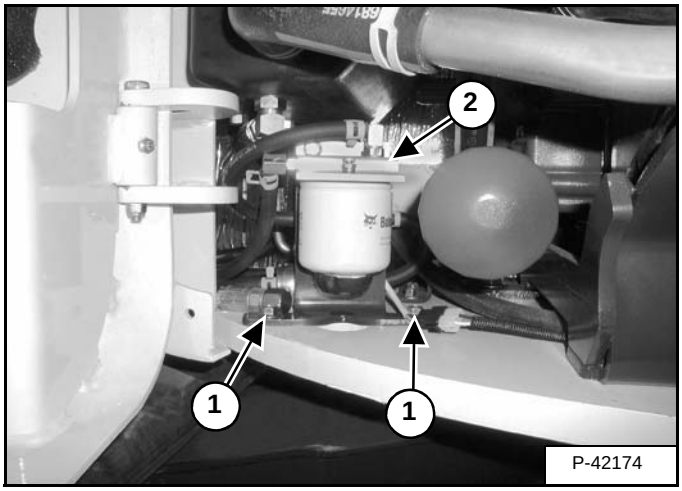
Always clean up spilled fuel or oil. Keep heat, flames, sparks or lighted tobacco away from fuel and oil. Failure to use care around combustibles can cause explosion or fire which can result in injury or death.

W-2103-1285

Replacing The Case Drain Filter

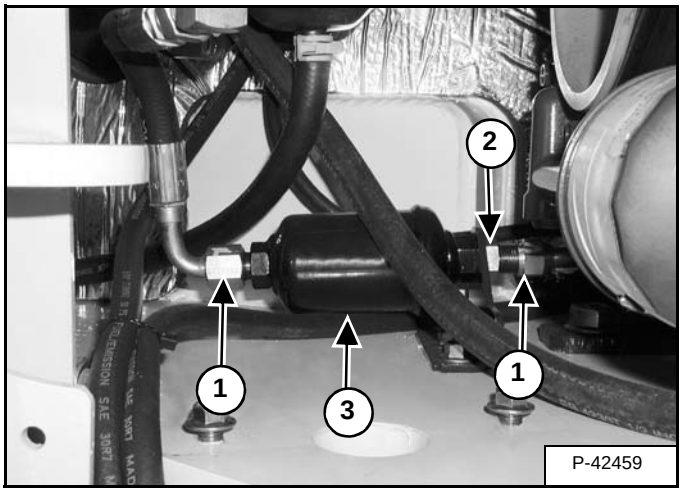
Open the tailgate.

Figure 10-100-6



Loosen the fuel filter mount bolts (Item 1) and reposition the fuel filter/fuel pump (Item 2) **[Figure 10-100-6]**.

Figure 10-100-7



Remove the two hoses (Item 1). Remove the nut (Item 2) and remove the filter (Item 3) **[Figure 10-100-7]**.

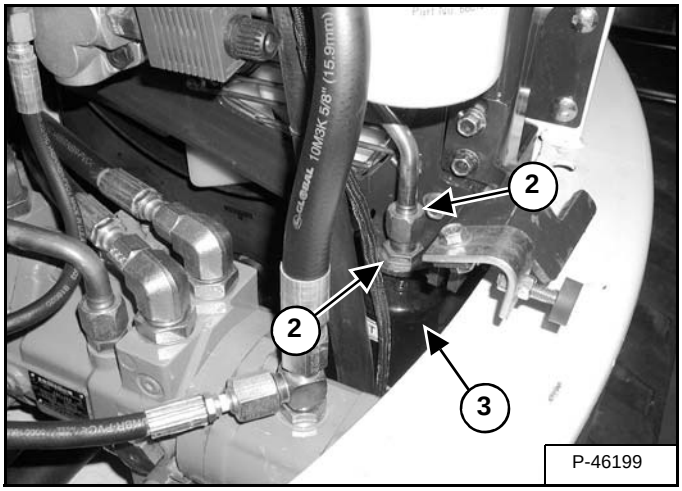
NOTE: Cap hoses immediately as oil will drain out quickly.

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Replacing The Fan Filter

Open the right side cover.

Figure 10-100-8



Loosen the tubeline (Item 1) and remove the hose from the bottom of the filter. Remove the nut (Item 2) and remove the filter (Item 3) **[Figure 10-100-8]**.

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Diagnostic Couplers

Open the right side cover and tailgate.

Figure 10-100-9

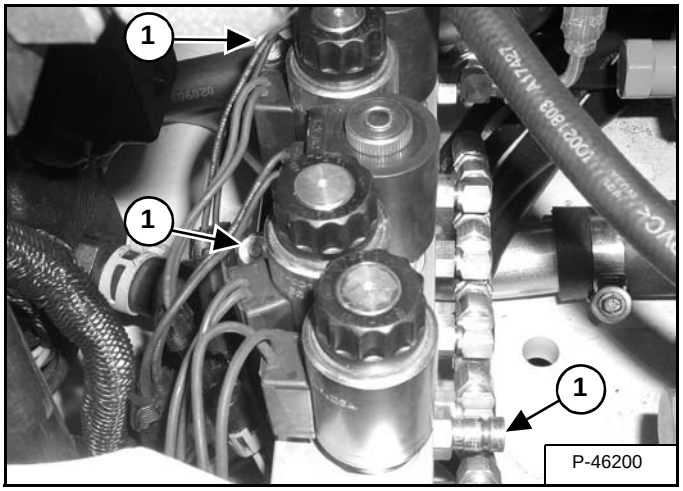


Figure 10-100-10

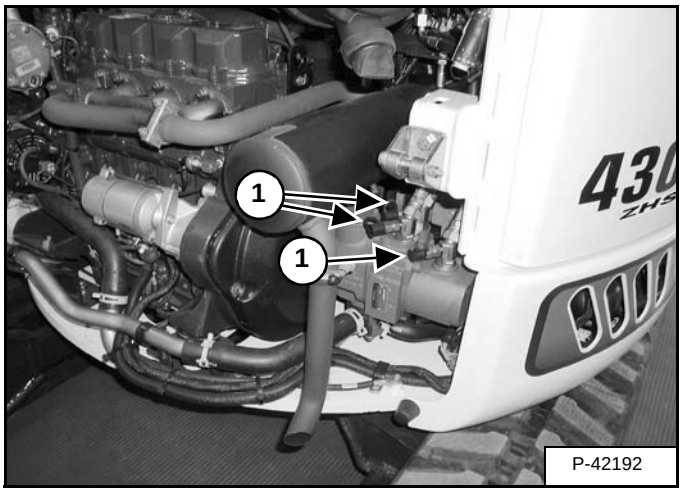
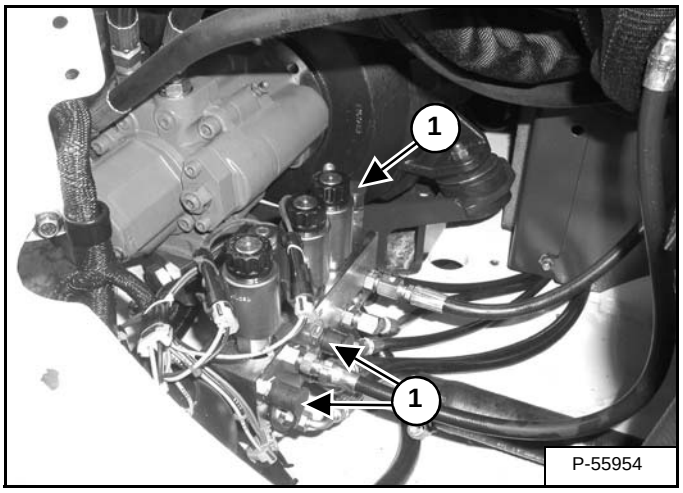


Figure 10-100-11



Diagnostic couplers (S/N 562611001 & Above, 562811001 & Above and 563211001 & Above) (Item 1) **[Figure 10-100-9]** & **[Figure 10-100-10]** (S/N 563111001 & Above) **[Figure 10-100-11]** are located on the hydraulic circuitry.

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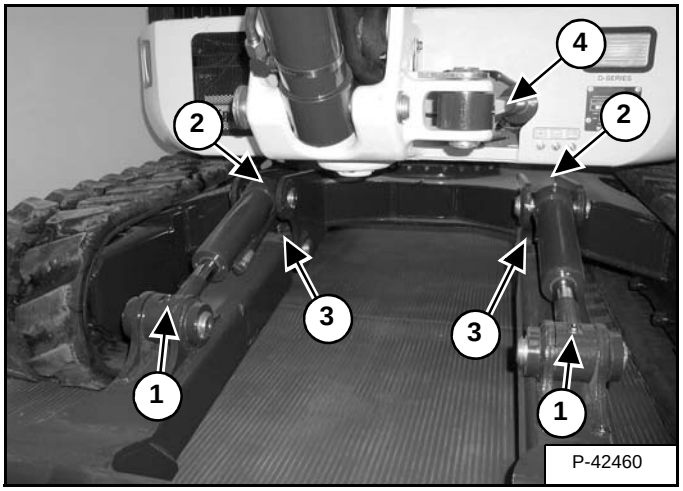
LUBRICATION OF THE HYDRAULIC EXCAVATOR

Lubricate the Hydraulic Excavator as specified in the *SERVICE SCHEDULE* for the best performance of the machine. (See SERVICE SCHEDULE on Page 10-50-1.)

Always use a good quality lithium based multipurpose grease when lubricating the machine. Apply the lubricant until extra grease shows.

Lubricate the following locations on the Hydraulic Excavator EVERY 8-10 HOURS:

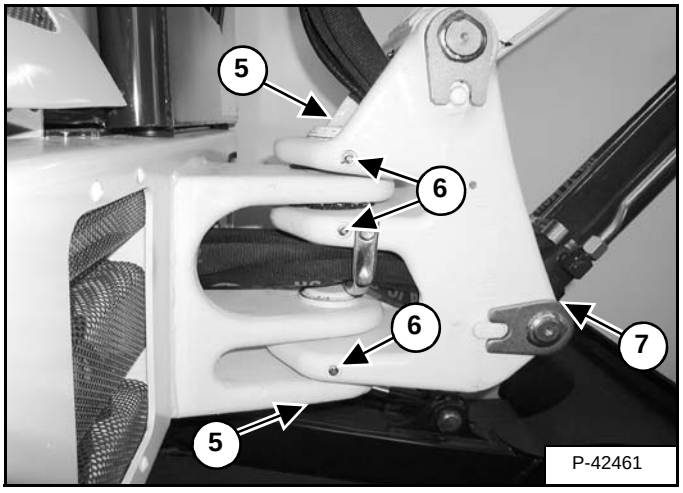
Figure 10-110-1



Ref Description (# of Fittings)

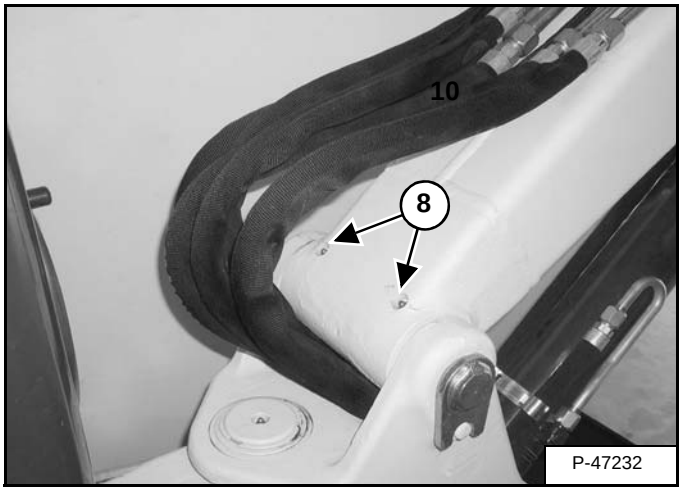
1. Blade Cylinder Rod End (2)
2. Blade Cylinder Base End (2)
3. Blade Pivots (2)
4. Boom Swing Cylinder Rod End (1) **[Figure 10-110-1]**

Figure 10-110-2



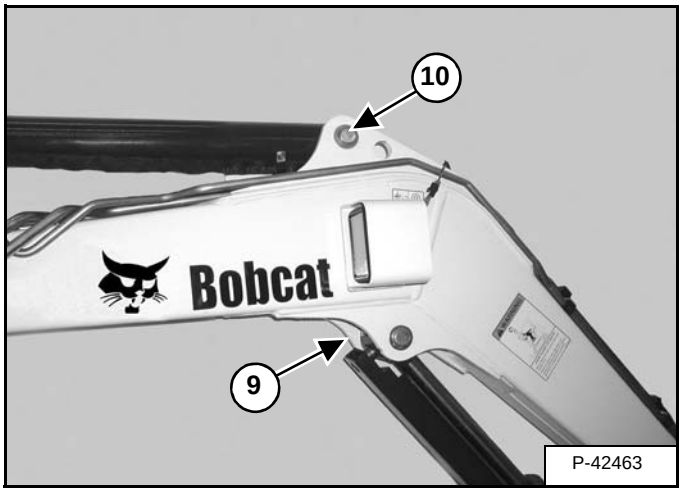
5. Boom Swing Pin (2)
6. Boom Swing Pivot (3)
7. Boom Cylinder Base End (1) **[Figure 10-110-2]**

Figure 10-110-3



8. Boom Pivot (2) **[Figure 10-110-3]**

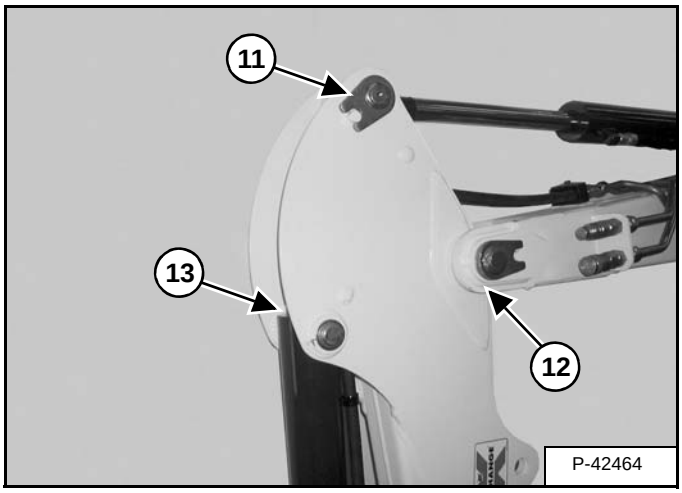
Figure 10-110-4



9. Boom Cylinder Rod End (1)
10. Bucket Cylinder Base End (1) **[Figure 10-110-4]**

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Figure 10-110-5

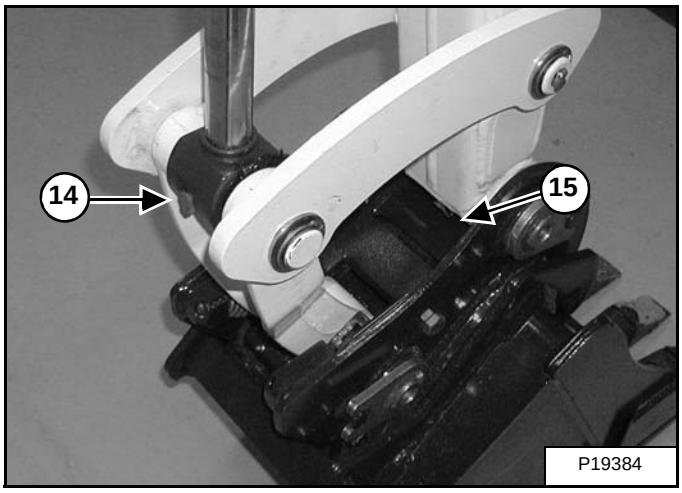


11. Arm Cylinder Rod End (1)

12. Arm Pivot (1)

13. Bucket Cylinder Base End (1) **[Figure 10-110-5]**

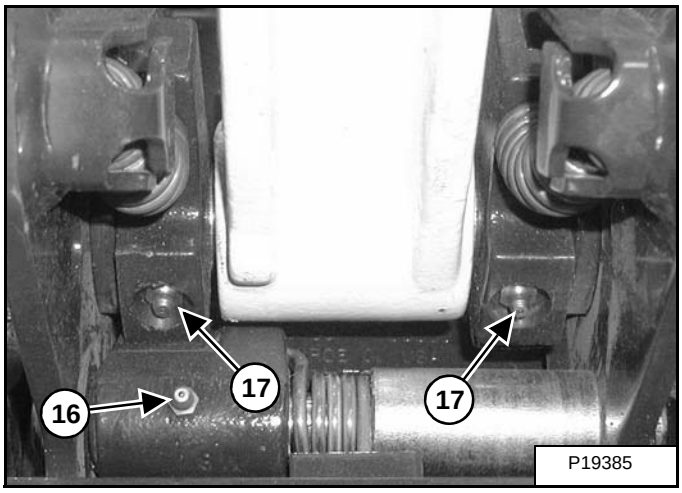
Figure 10-110-6



14. Bucket Cylinder Rod End (1)

15. Bucket Pivot (1) **[Figure 10-110-6]**

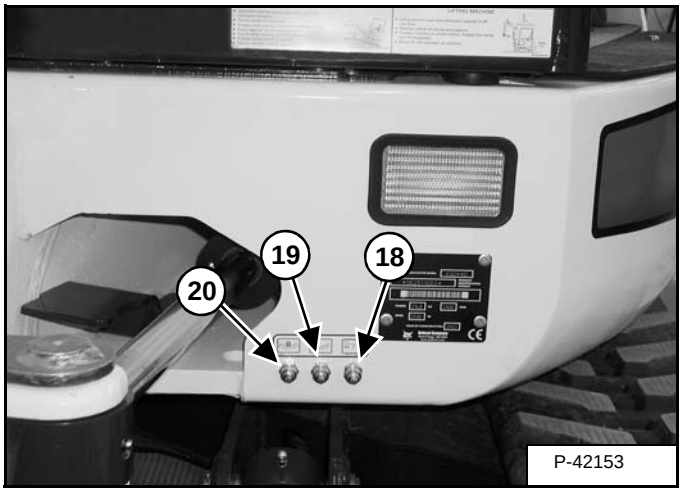
Figure 10-110-7



16. X-Change Latch (1) (If Equipped)

17. X-Change Pivot Pin (2) **[Figure 10-110-7]** (If Equipped)

Figure 10-110-8



18. Boom Swing Cylinder Base End (1) **[Figure 10-110-8]**

Lubricate the following locations on the hydraulic Excavator **EVERY 50 HOURS**:

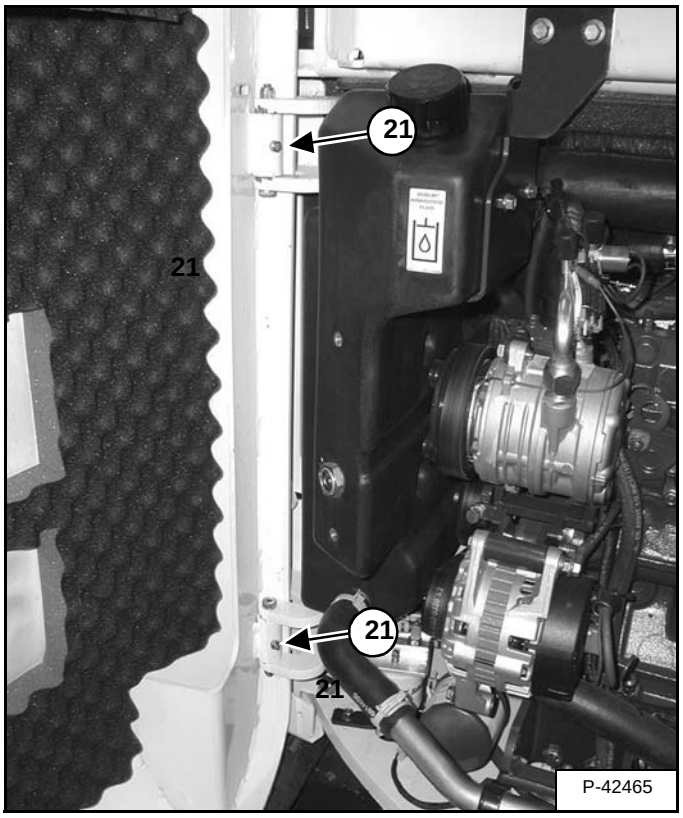
19. Slew Circle (1)

20. Slew Pinion (1) **[Figure 10-110-8]**

(Install 3 to 4 pumps of grease then rotate the upperstructure 90°. Install 3 to 4 pumps of grease and again rotate the upperstructure 90°. Repeat this until the swing pinion has been greased at four positions.)

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Figure 10-110-9



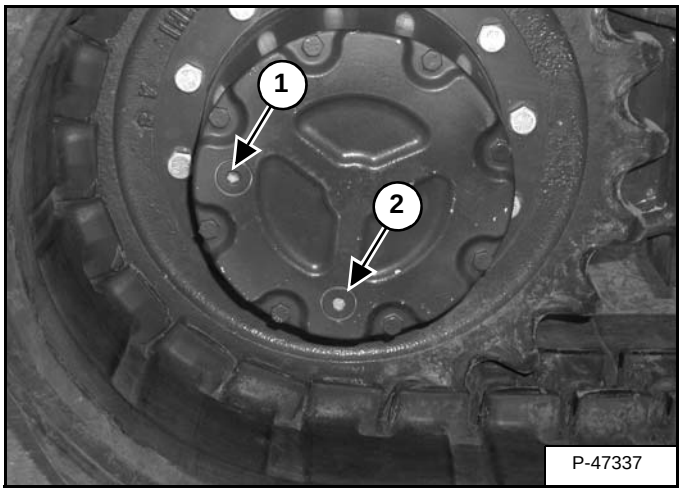
21. Tailgate Hinge (2) **[Figure 10-110-9]**

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TRAVEL MOTOR

Checking Oil Level

Figure 10-120-1



Park the Excavator on a level surface with the plugs (Item 1 & 2) **[Figure 10-120-1]** in the position as shown.

Remove the plug (Item 1) **[Figure 10-120-1]**. The lube level must be at the bottom edge of the hole.

Add lubricant through the hole if the lube level is low. See the *FUEL, COOLANT AND LUBRICANTS Chart* (See Chart on Page SPEC-60-1)

Draining The Travel Motor

See the *SERVICE SCHEDULE* (See Chart on Page 10-50-1) for the correct service interval.

Park the Excavator on a level surface with plugs (Item 1 & 2) **[Figure 10-120-1]** in the position shown. Remove both plugs and drain the lubricant into a container.

⚠ WARNING

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

W-2103-1285

Install the bottom plug (Item 2 **[Figure 10-120-1]**). Add lubricant through the top plug hole until the lube level is at the bottom edge of the hole. See *FUEL, COOLANT AND LUBRICANTS* Chart. (See Chart on Page SPEC-60-1)

Install the plug (Item 1) **[Figure 10-120-1]**.

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SPARK ARRESTOR MUFFLER

See the *SERVICE SCHEDULE* (See Chart on Page 10-50-1) for the correct service interval.

Do not operate the Excavator with a defective exhaust system.

IMPORTANT

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

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

Make reference to local laws and regulations for spark arrestor requirements.

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⚠ WARNING

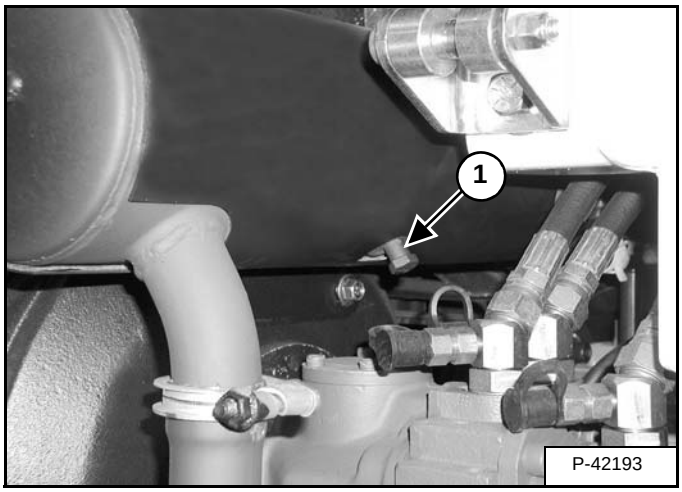
When the engine is running during service, the steering levers must be in neutral.

Failure to do so can cause injury or death.

W-2203-0595

Stop the engine. Open the tailgate.

Figure 10-130-1



Remove the plug (Item 1) **[Figure 10-130-1]** from the bottom of the muffler.

Start the engine and run for about 10 seconds while a second person, wearing safety glasses, holds a piece of wood over the outlet of the muffler. The carbon deposits will be forced out of the muffler plug hole (Item 1) **[Figure 10-130-1]**.

Stop the engine. Install and tighten the plug.

Close the tailgate.

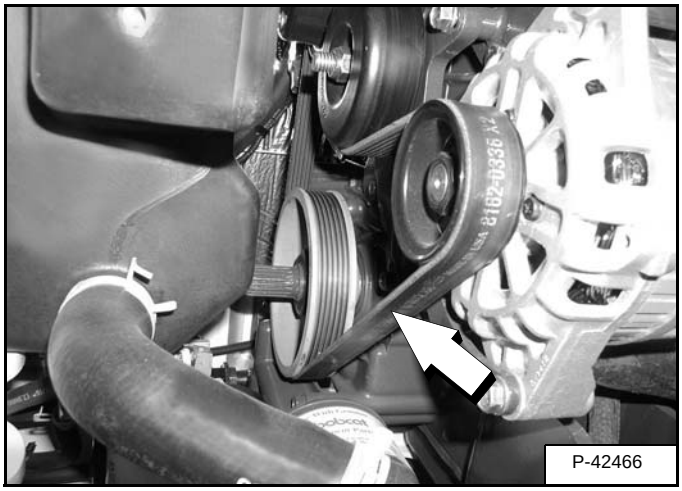
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ENGINE ACCESSORY DRIVE BELT

Belt Tension

Open the tailgate.

Figure 10-140-1



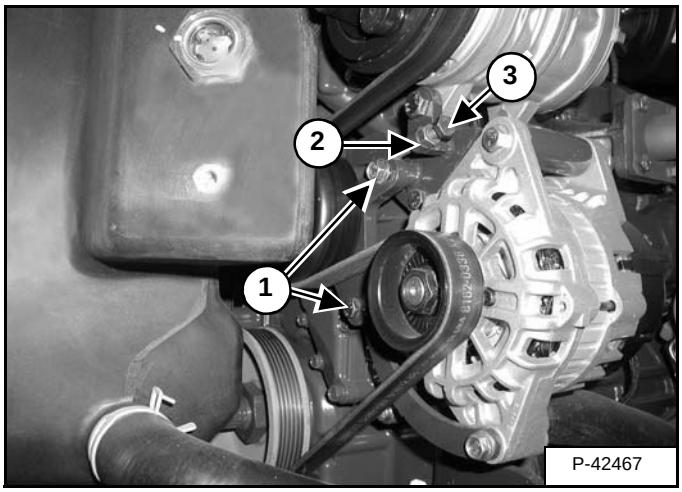
Using a belt tension gauge, measure the belt tension midway between the crankshaft pulley and alternator pulley **[Figure 10-140-1]**.

Belt tension is as follows:

New belt 107-114 ft. lbs (145-155 Nm)
Used belt 92-99 ft. lbs. (125-134 Nm)

Belt Adjustment

Figure 10-140-2



Loosen the two bolts (Item 1). Loosen the nut (Item 2). Tighten the bolt (Item 3) **[Figure 10-140-2]** until the belt tension is correct. Tighten the two bolts and nut.

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435 HYDRAULIC/HYDROSTATIC SCHEMATIC
S/N 562611001 AND ABOVE
S/N 562811001 AND ABOVE

(PRINTED NOVEMBER 2006)
V-0380legend

LEGEND

(1) HYDRAULIC RESERVOIR: Pressurized with Fill Strainer
Reservoir Capacity . .38.8 qt. (29.9 L)

(2) PRESSURIZED BREATHER/FILL CAP with FILTER:
5 PSI (3.4 bar) - Outlet
0.435 PSI (0.3 bar) - Inlet

(3) HYDRAULIC FILTER ELEMENT
15 Micron

(4) FILTER BY-PASS 50 PSI (3.44 bar)

(5) HYDRAULIC FILTER - with By-Pass
Element - 40 Micron
By-Pass - 50 PSI (3.44 bar)

(6) SHUTTLE VALVE - 2 Speed (2)

(7) VALVE - 2 -Speed (2)

(8) SHUTTLE VALVE - 2 Speed (2)

(9) BRAKE - Travel Motor (2)

(10) RELIEF VALVE - FAN MOTOR:
160 degrees F. (71 degrees C.) Fluid
2050 PSI (141 bar)

(11) CHECK VALVE - ANTI CAVITATION

(12) FAN PUMP / CHARGE PUMP
8.70 GPM (32,9 L/min.) at High Engine RPM

(13) RELIEF VALVE - CHARGE:
160 degrees F. (71 degrees C.) Fluid
220 PSI (15.2 bar) at 2500 Engine RPM

(14) RELIEF/REPLENISHING VALVE - HIGH PRESSURE: 4640 PSI (320 bar)

(15) RESTRICTOR - N/A inch (N/A mm)

(16) DISPLACEMENT CONTROL SPOOL

(17) VARIABLE CAPACITY DISPLACEMENT BIDIRECTIONAL HYDROSTATIC PUMP

(18) RESTRICTOR - N/A inch (N/A mm)

(19) HYDRAULIC PISTON PUMP . . . . . .
Maximum Displacement:
29.7 GPM (112.4 L/min.) at 2500 Engine RPM
Minimum Displacement:
5.0 GPM (19 L/min.) at 2500 Engine RPM

(20) SHUTTLE VALVE (3)

(21) VALVE - Travel Motor Brake Release

(22) PRESSURE REDUCING VALVE
435 PSI (30 bar)

(23) SOLENOID ACTIVATED DIRECTIONAL CONTROL VALVE - Work group Lockout

(24) SOLENOID ACTIVATED DIRECTIONAL CONTROL VALVE - Travel Pilot Pressure

(25) SOLENOID ACTIVATED DIRECTIONAL CONTROL VALVE - Two Speed

(26) SOLENOID ACTIVATED DIRECTIONAL CONTROL VALVE - Male Coupler

(27) SOLENOID ACTIVATED DIRECTIONAL CONTROL VALVE - Female Coupler

(28) ACCUMULATOR

(29) TEST PORT - "G1" PORT - Pressure Reducing Valve

(30) TEST PORT - "C1" PORT - Travel Pilot Pressure

(31) SWITCH - Travel Pilot Pressure

(32) TEST PORT - "G" PORT - Fan Pump Output

(33) LOAD SENSE RELIEF VALVE (Main Relief):
3750 PSI (259 bar) when tested at port M (51) at high engine idle

(34) LOAD SENSE BLEED CARTRIDGE:
0.185 GPM (0,70 L/min)

(35) FLUSHING VALVE: 360 PSI (24,8 bar) when tested at port M (51) at low engine idle

(36) COMPENSATOR - Standard (Blade, Bucket, Arm, Boom, Offset & Auxiliary)

(37) COMPENSATOR - With Priority Slots (Slew)

(38) PORT RELIEF VALVE - (Auxiliary Pressure Port: 3000 PSI (207 bar)

(39) PORT RELIEF VALVE (With Anti-Cavitation Valve) - (Auxiliary Return Port: 3000 PSI (207 bar)

(40) LOAD CHECK - (Two per Section - 14 Total - Only 7 Shown)

(41) CROSS PORT RELIEF VALVES - 2 STAGE (2): 2800 PSI (193 bar) at 2500 Engine RPM

(42) RELIEF VALVE - SECOND AUXILIARY (2) - (Optional): 1500 PSI (103 bar)

(43) LOAD CHECK VALVE

(44) PILOT ACTIVATED DIRECTIONAL CONTROL VALVE - Second Auxiliary

(45) SOLENOID ACTIVATED DIRECTIONAL CONTROL VALVE - Second Auxiliary

(46) PILOT ACTIVATED DIRECTIONAL CONTROL VALVE - Second Auxiliary

(47) RESTRICTOR - 0.012 inch (0,3 mm)

(48) FLUSHING ORIFICE - 0.055 inch (1,4 mm)

(49) RESTRICTOR - Brake Activation:
0.029 inch (0,74 mm)

(50) DIAGNOSTIC PORT - Build-Up Valve

(51) DIAGNOSTIC PORT

(52) DIAGNOSTIC PORT - Load Sense

(53) RETURN PORT - Capped

(54) DIAGNOSTIC PORT - Travel Control Servo Pressure

(55) DRIVE MOTOR SHUTTLE - With N/A inch (N/A mm) restrictors (2)

(56) SHUTTLE RELIEF:
N/A PSI (N/A bar) With
N/A inch (N/A mm) restrictors

(57) RESTRICTOR - 0.108 inch (2,7 mm)

(58) RESTRICTOR - 0.083 inch (2,1 mm)

(59) BUILD-UP VALVE: 105 PSI (7,2 bar)

(60) TORQUE LIMITER SUPPLY SPOOL - 290 PSI (20 bar)

(61) PUMP MARGIN SPOOL - 220 PSI (15,2 bar)

(62) TORQUE LIMITER

(63) DESTROKE PISTON

(64) ANTI-CAVITATION VALVE (2)

(65) TWO STAGE PILOT SPOOL:
250 PSI (17,2 bar)

(66) SHUTTLE - Dual Sequence Valve

(67) ORIFICE, Brake - 0.030 inch (0,76 mm)

(68) BRAKE RELEASE SPOOL: 80 PSI (5,5 bar)

(69) PORT RELIEF VALVE (With Anti-Cavitation Valve) - (Boom Cylinder) 4200 PSI (290 bar)

(70) PORT RELIEF VALVE (With Anti-Cavitation Valve) - (Boom Cylinder) 4200 PSI (290 bar)

(71) PORT RELIEF VALVE (With Anti-Cavitation Valve) - (ARM Cylinder) 4200 PSI (290 bar)

(72) PORT RELIEF VALVE (With Anti-Cavitation Valve) - (ARM Cylinder) 4200 PSI (290 bar)

(73) PORT RELIEF VALVE (With Anti-Cavitation Valve) - (BUCKET Cylinder) 4200 PSI (290 bar)

(74) PORT RELIEF VALVE (With Anti-Cavitation Valve) - (BUCKET Cylinder) 4200 PSI (290 bar)

(75) PORT RELIEF VALVE (With Anti-Cavitation Valve) - (BLADE Cylinder) 3770 PSI (260 bar)

(76) MINIMUM PUMP DISPLACEMENT ADJUSTMENT - 5.0 GPM (19 L/min)

(77) SOLENOID ACTIVATED DIRECTIONAL CONTROL VALVE (TWO Coil)

(78) CHECK VALVE 80 PSI (5,5 bar)

(79) CHECK VALVE- Load Sense

(80) ORIFICE 0.025 in. (0,64 mm)

(81) FILTER – Hydraulic X-Change Valve

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

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435 HYDRAULIC/HYDROSTATIC SCHEMATIC
S/N 562611001 AND ABOVE
S/N 562811001 AND ABOVE
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DUAL SEQUENCE VALVE
OIL COOLER
MAIN FILTER WITH BY-PASS
PRESSURIZED BREATHER
RESERVOIR
CASE DRAIN FILTER WITH BY-PASS
CENTER SWIVEL JOINT
LH BLADE CYLINDER
RH BLADE CYLINDER
SLEW MOTOR W/ BRAKE
CROSS PORT BLOCK
SLEW
BLADE
BUCKET
ARM
BOOM
OFFSET
AUXILIARY
BUCKET CYLINDER
ARM CYLINDER
BOOM CYLINDER
DIRECT TO TANK VALVE (OPTIONAL)
MALE (RETURN)
FEMALE (PRESSURE)
OFFSET CYLINDER
LOCKING VALVE
SECOND AUXILIARY (OPTIONAL)
LH JOYSTICK
RH JOYSTICK
ISO/STD CONVERTER (ISO SHOWN)
HYDRAULIC PUMP
HYDROSTATIC PUMP
TRAVEL CONTROLS
FAN PUMP
FAN MOTOR
FAN FILTER WITH BY-PASS
LEFT
RIGHT
TRAVEL MOTOR W/ BRAKE (2)
HYDRAULIC X-CHANGE (OPTIONAL)
PILOT MANIFOLD
ACC

ENCLOSURE
PUMP SUPPLY
WORKING CIRCUITS
PILOT PRESSURE
SYSTEM RETURN LINES
DIRECT TANK RETURN

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435 HYDRAULIC/HYDROSTATIC SCHEMATIC
S/N 563111001 AND ABOVE

(PRINTED NOVEMBER 2007)
V-0630legend

LEGEND

(1) HYDRAULIC RESERVOIR: Pressurized with Fill Strainer
Reservoir Capacity . .38.8 qt. (29.9 L)

(2) PRESSURIZED BREATHER/FILL CAP with FILTER:
5 PSI (3.4 bar) - Outlet
0.435 PSI (0.3 bar) - Inlet

(3) HYDRAULIC FILTER ELEMENT
15 Micron

(4) FILTER BY-PASS 50 PSI (3.44 bar)

(5) HYDRAULIC FILTER - with By-Pass
Element - 40 Micron
By-Pass - 50 PSI (3.44 bar)

(6) SHUTTLE VALVE - 2 Speed (2)

(7) VALVE - 2 -Speed (2)

(8) SHUTTLE VALVE - 2 Speed (2)

(9) RESTRICTOR - N/A inch (N/A mm)

(10) RELIEF VALVE - FAN MOTOR:
160 degrees F. (71 degrees C.) Fluid
2050 PSI (141 bar)

(11) CHECK VALVE - ANTI CAVITATION

(12) FAN PUMP / CHARGE PUMP
9.30 GPM (35,2 L/min.) at High Engine RPM

(13) RESTRICTOR - N/A inch (N/A mm)

(14) TORQUE LIMITER SUPPLY SPOOL -
290 PSI (20 bar)

(15) PUMP MARGIN SPOOL -
220 PSI (15,2 bar)

(16) TORQUE LIMITER

(17) DESTROKE PISTON

(18) MINIMUM PUMP DISPLACEMENT ADJUSTMENT - 5.0 GPM (19 L/min)

(19) HYDRAULIC PISTON PUMP . . . . . .
Maximum Displacement:
29.7 GPM (112.4 L/min.) at High Engine RPM
Minimum Displacement:
5.0 GPM (19 L/min.) at High Engine RPM

(20) DRIVE MOTOR SHUTTLE - With N/A inch (N/A mm) restrictors (2)

(21) SHUTTLE RELIEF:
4060 PSI (280 bar) With
N/A inch (N/A mm) restrictors

(22) PRESSURE REDUCING VALVE
435 PSI (30 bar)

(23) SOLENOID ACTIVATED DIRECTIONAL CONTROL VALVE - Work group Lockout

(24) SOLENOID ACTIVATED DIRECTIONAL CONTROL VALVE - Two Speed

(25) SOLENOID ACTIVATED DIRECTIONAL CONTROL VALVE - Male Coupler

(26) SOLENOID ACTIVATED DIRECTIONAL CONTROL VALVE - Female Coupler

(27) ACCUMULATOR

(28) TEST PORT - "G" PORT - Pressure Reducing Valve

(29) TEST PORT - "B1" PORT - Travel Pilot Pressure

(30) TEST PORT - "P1" PORT - Fan Pump Output

(31) LOAD SENSE RELIEF VALVE (Main Relief)
3625 PSI (250 bar) when tested at port M (62) at high engine idle

(32) LOAD SENSE BLEED CARTRIDGE:
0.185 GPM (0,70 L/min)

(33) FLUSHING VALVE: 360 PSI (24,8 bar) when tested at port M (62) at high engine idle

(34) COMPENSATOR (Slew, Travel, Blade, Bucket, Arm, Boom, Offset & Auxiliary)

(35) PORT RELIEF VALVE - (Auxiliary
Pressure Port: 3000 PSI (207 bar)

(36) PORT RELIEF VALVE (With Anti-Cavitation Valve) - (Auxiliary Return Port:
3000 PSI (207 bar)

(37) PORT RELIEF VALVE (With Anti-Cavitation Valve) - (Boom Cylinder) 4200 PSI (290 bar)

(38) PORT RELIEF VALVE (With Anti-Cavitation Valve) - (Boom Cylinder) 4200 PSI (290 bar)

(39) PORT RELIEF VALVE (With Anti-Cavitation Valve) - (ARM Cylinder) 4200 PSI (290 bar)

(40) PORT RELIEF VALVE (With Anti-Cavitation Valve) - (ARM Cylinder) 4200 PSI (290 bar)

(41) PORT RELIEF VALVE (With Anti-Cavitation Valve) - (BUCKET Cylinder) 4200 PSI (290 bar)

(42) PORT RELIEF VALVE (With Anti-Cavitation Valve) - (BUCKET Cylinder) 4200 PSI (290 bar)

(43) PORT RELIEF VALVE (With Anti-Cavitation Valve) - (BLADE Cylinder) 3770 PSI (260 bar)

(44) LOAD CHECK - (Two per Section - 14 Total - Only 7 Shown)

(45) CROSS PORT RELIEF VALVES - 2 STAGE (2): 2800 PSI (193 bar) at High Engine RPM

(46) ANTI-CAVITATION VALVE (2)

(47) TWO STAGE PILOT SPOOL:
250 PSI (17,2 bar)

(48) SHUTTLE - Dual Sequence Valve

(49) ORIFICE, Brake - 0.030 inch (0,76 mm)

(50) BRAKE RELEASE SPOOL: 80 PSI (5,5 bar)

(51) RELIEF VALVE - SECOND AUXILIARY (2) - (Optional): 1500 PSI (103 bar)

(52) LOAD CHECK VALVE

(53) PILOT ACTIVATED DIRECTIONAL CONTROL VALVE - Second Auxiliary

(54) SOLENOID ACTIVATED DIRECTIONAL CONTROL VALVE - Second Auxiliary

(55) PILOT ACTIVATED DIRECTIONAL CONTROL VALVE - Second Auxiliary

(56) DIAGNOSTIC PORT - Build-Up Valve

(57) DIAGNOSTIC PORT - Load Sense

(58) RETURN PORT - Capped

(59) RESTRICTOR - 0.108 inch (2,7 mm)

(60) RESTRICTOR - 0.083 inch (2,1 mm)

(61) BUILD-UP VALVE: 105 PSI (7,2 bar)

(62) DIAGNOSTIC PORT

(63) SOLENOID ACTIVATED DIRECTIONAL CONTROL VALVE (TWO Coil)

(64) CHECK VALVE 80 PSI (5,5 bar)

(65) CHECK VALVE- Load Sense

(66) ORIFICE 0.025 in. (0,64 mm)

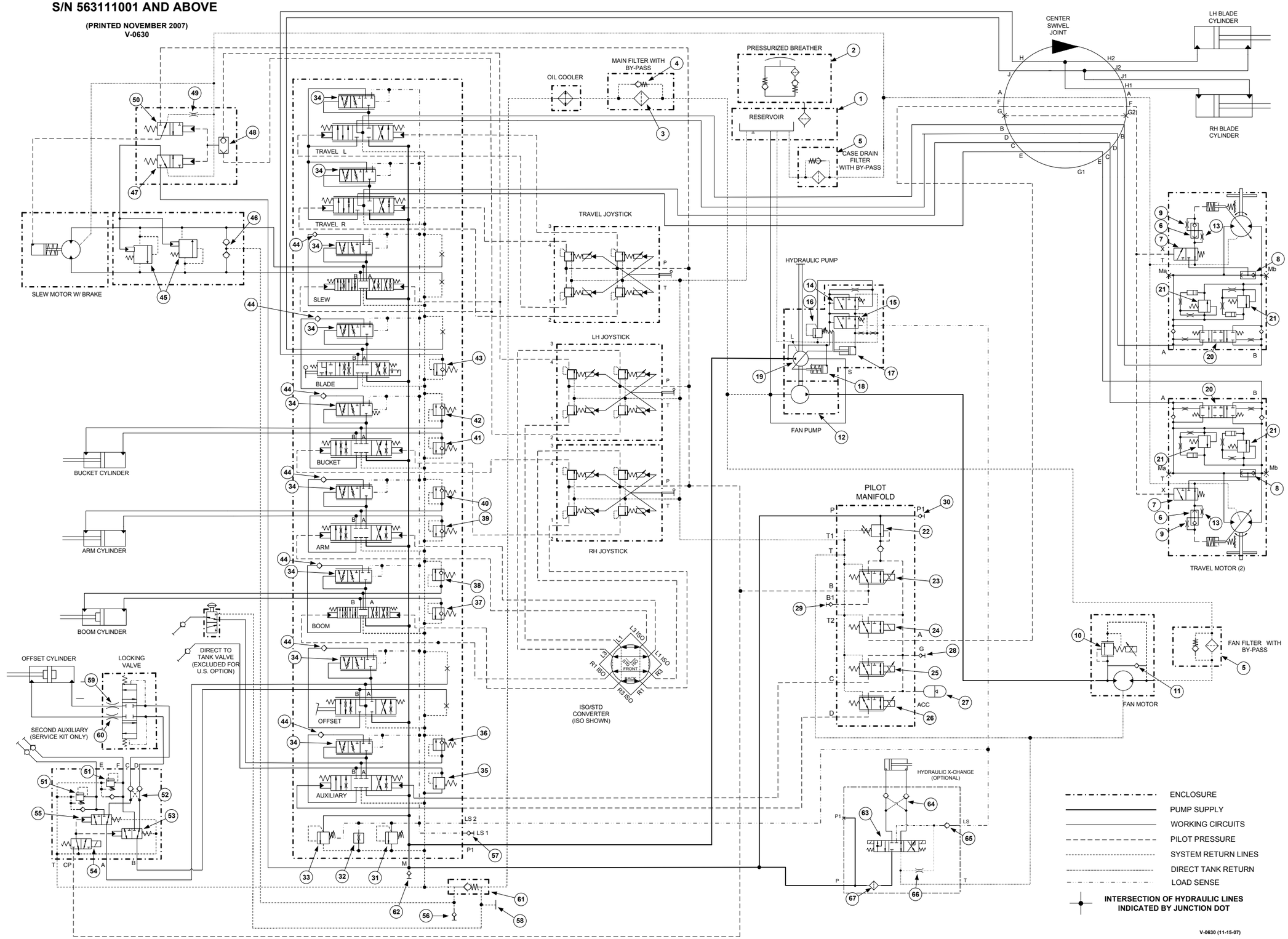
(67) FILTER – Hydraulic X-Change Valve

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

435 HYDRAULIC/HYDROSTATIC SCHEMATIC
S/N 563111001 AND ABOVE

(PRINTED NOVEMBER 2007)
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435 HYDRAULIC/HYDROSTATIC SCHEMATIC
S/N 563211001 AND ABOVE

(PRINTED NOVEMBER 2007)
V-0686legend

LEGEND

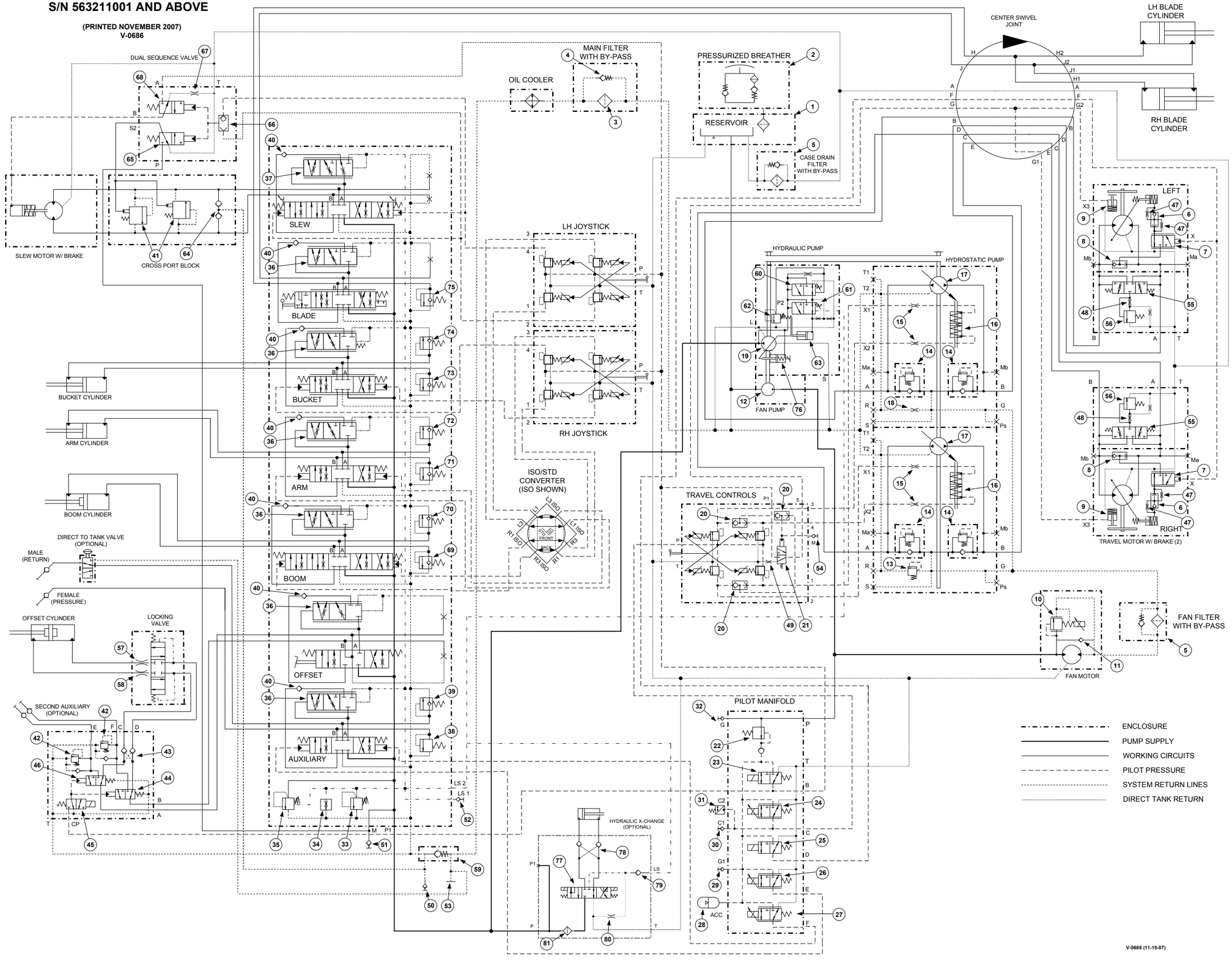
1. HYDRAULIC RESERVOIR: Pressurized with Fill Strainer
   Reservoir Capacity . .38.8 qt. (29.9 L)
2. PRESSURIZED BREATHER/FILL CAP with FILTER:
   5 PSI (3.4 bar) - Outlet
   0.435 PSI (0.3 bar) - Inlet
3. HYDRAULIC FILTER ELEMENT
   15 Micron
4. FILTER BY-PASS 50 PSI (3.44 bar)
5. HYDRAULIC FILTER - with By-Pass
   Element - 40 Micron
   By-Pass - 40 PSI (2.75 bar)
6. SHUTTLE VALVE - 2 Speed (2)
7. VALVE - 2 -Speed (2)
8. SHUTTLE VALVE - 2 Speed (2)
9. BRAKE - Travel Motor (2)
10. RELIEF VALVE - FAN MOTOR:
    160 degrees F. (71 degrees C.) Fluid
    2050 PSI (141 bar)
11. CHECK VALVE - ANTI CAVITATION
12. FAN PUMP / CHARGE PUMP
    8.70 GPM (32,9 L/min.) at High Engine RPM
13. RELIEF VALVE - CHARGE:
    160 degrees F. (71 degrees C.) Fluid
    220 PSI (15.2 bar) at 2500 Engine RPM
14. RELIEF/REPLENISHING VALVE - HIGH PRESSURE: 5076 PSI (350 bar)
15. RESTRICTOR - N/A inch (N/A mm)
16. DISPLACEMENT CONTROL SPOOL
17. VARIABLE CAPACITY DISPLACEMENT BIDIRECTIONAL HYDROSTATIC PUMP
18. RESTRICTOR - N/A inch (N/A mm)
19. HYDRAULIC PISTON PUMP . . . . . .
    Maximum Displacement:
    29.7 GPM (112.4 L/min.) at 2500 Engine RPM
    Minimum Displacement:
    5.0 GPM (19 L/min.) at 2500 Engine RPM
20. SHUTTLE VALVE (3)
21. VALVE - Travel Motor Brake Release
22. PRESSURE REDUCING VALVE
    435 PSI (30 bar)
23. SOLENOID ACTIVATED DIRECTIONAL CONTROL VALVE - Work group Lockout
24. SOLENOID ACTIVATED DIRECTIONAL CONTROL VALVE - Travel Pilot Pressure
25. SOLENOID ACTIVATED DIRECTIONAL CONTROL VALVE - Two Speed
26. SOLENOID ACTIVATED DIRECTIONAL CONTROL VALVE - Male Coupler
27. SOLENOID ACTIVATED DIRECTIONAL CONTROL VALVE - Female Coupler
28. ACCUMULATOR
29. TEST PORT - "G1" PORT - Pressure Reducing Valve
30. TEST PORT - "C1" PORT - Travel Pilot Pressure
31. SWITCH - Travel Pilot Pressure
32. TEST PORT - "G" PORT - Fan Pump Output
33. LOAD SENSE RELIEF VALVE
    3625 PSI (250 bar)
34. LOAD SENSE BLEED CARTRIDGE:
    0.185 GPM (0,70 L/min)
35. FLUSHING VALVE: 360 PSI (24,8 bar)
36. COMPENSATOR - Standard (Blade, Bucket, Arm, Boom, Offset & Auxiliary)
37. COMPENSATOR - With Priority Slots (Slew)
38. PORT RELIEF VALVE - (Auxiliary Pressure Port: 3000 PSI (207 bar)
39. PORT RELIEF VALVE (With Anti-Cavitation Valve) - (Auxiliary Return Port: 3000 PSI (207 bar)
40. LOAD CHECK - (Two per Section - 14 Total - Only 7 Shown)
41. CROSS PORT RELIEF VALVES - 2 STAGE (2): 2800 PSI (193 bar) at 2500 Engine RPM
42. RELIEF VALVE - SECOND AUXILIARY (2) - (Optional): 1500 PSI (103 bar)
43. LOAD CHECK VALVE
44. PILOT ACTIVATED DIRECTIONAL CONTROL VALVE - Second Auxiliary
45. SOLENOID ACTIVATED DIRECTIONAL CONTROL VALVE - Second Auxiliary
46. PILOT ACTIVATED DIRECTIONAL CONTROL VALVE - Second Auxiliary
47. RESTRICTOR - 0.012 inch (0,3 mm)
48. FLUSHING ORIFICE - 0.055 inch (1,4 mm)
49. RESTRICTOR - Brake Activation:
    0.029 inch (0,74 mm)
50. DIAGNOSTIC PORT - Build-Up Valve
51. DIAGNOSTIC PORT
52. DIAGNOSTIC PORT - Load Sense
53. RETURN PORT - Capped
54. DIAGNOSTIC PORT - Travel Control Servo Pressure
55. DRIVE MOTOR SHUTTLE - With N/A inch (N/A mm) restrictors (2)
56. SHUTTLE RELIEF:
    N/A PSI (N/A bar) With
    N/A inch (N/A mm) restrictors
57. RESTRICTOR - 0.108 inch (2,7 mm)
58. RESTRICTOR - 0.083 inch (2,1 mm)
59. BUILD-UP VALVE: 105 PSI (7,2 bar)
60. TORQUE LIMITER SUPPLY SPOOL - 290 PSI (20 bar)
61. PUMP MARGIN SPOOL - 220 PSI (15,2 bar)
62. TORQUE LIMITER
63. DESTROKE PISTON
64. ANTI-CAVITATION VALVE (2)
65. TWO STAGE PILOT SPOOL:
    250 PSI (17,2 bar)
66. SHUTTLE - Dual Sequence Valve
67. ORIFICE, Brake - 0.030 inch (0,76 mm)
68. BRAKE RELEASE SPOOL: 80 PSI (5,5 bar)
69. PORT RELIEF VALVE (With Anti-Cavitation Valve) - (Boom Cylinder) 4200 PSI (290 bar)
70. PORT RELIEF VALVE (With Anti-Cavitation Valve) - (Boom Cylinder) 4200 PSI (290 bar)
71. PORT RELIEF VALVE (With Anti-Cavitation Valve) - (ARM Cylinder) 4200 PSI (290 bar)
72. PORT RELIEF VALVE (With Anti-Cavitation Valve) - (ARM Cylinder) 4200 PSI (290 bar)
73. PORT RELIEF VALVE (With Anti-Cavitation Valve) - (BUCKET Cylinder) 4200 PSI (290 bar)
74. PORT RELIEF VALVE (With Anti-Cavitation Valve) - (BUCKET Cylinder) 4200 PSI (290 bar)
75. PORT RELIEF VALVE (With Anti-Cavitation Valve) - (BLADE Cylinder) 3770 PSI (260 bar)
76. MINIMUM PUMP DISPLACEMENT ADJUSTMENT - 5.0 GPM (19 L/min)
77. SOLENOID ACTIVATED DIRECTIONAL CONTROL VALVE (TWO Coil)
78. CHECK VALVE 80 PSI (5,5 bar)
79. CHECK VALVE- Load Sense
80. ORIFICE 0.025 in. (0,64 mm)
81. FILTER – Hydraulic X-Change Valve

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

435 HYDRAULIC/HYDROSTATIC SCHEMATIC
S/N 563211001 AND ABOVE

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Glossary Of Hydraulic/Hydrostatic Symbols For Excavators

GLOSSARY OF HYDRAULIC/HYDROSTATIC SYMBOLS FOR EXCAVATORS

SYMBOL DESCRIPTION

FLOW LINES and CONNECTIONS

WORKING CIRCUITS – Continuous, Solid Line – Working (Main) Line, Return Line (line conducting fluid from working devices to the reservoir) and Feed Line (main line conductor)

PILOT PRESSURE – Dashed Line – Pilot Line (line which conducts control fluid)

DRAIN CIRCUITS – Dotted Line – Drain Line (drain or bleed line – line conducting fluid from a component housing to the reservoir)

COMPONENTS – Long Chain Line – Enclosure outline for several components assembled in one unit

MECHANICAL CONNECTIONS – Double Line (Shaft, Lever, Piston Rod)

CONNECTED JUNCTION OF OIL LINES (Flow Line Connection)

OIL LINES CROSSING (NOT Connected)

COUPLER – Quick–Acting Coupling (uncoupled, closed by non–return valve)

SYMBOL DESCRIPTION

BASIC and MISCELLANEOUS SYMBOLS

RESTRICTION – Line with Fixed Restriction – Affected by Viscosity (property of resistance to flowing fluid)

VARIABLE ADJUSTMENT RESTRICTION – Regulated or Variable Restriction

TEMPERATURE CONTROL – (indication of temperature)

TEMPERATURE INDICATOR – (temperature measurement – thermometer)

FILTER (strainer or screen) – For fluid conditioning

VENTED AND FILTERED RESERVOIR (reservoir open to atmosphere)

OIL COOLER (heat exchanger) – The arrows in the diamond indicate the extraction of heat (heat dissipation)

PRESSURE SENSOR – Varies electric signal with pressure

DIFFERENTIAL PRESSURE SWITCH – Switch activates when pressure difference reaches specified level

PRESSURE SWITCH – Switch activates when pressure reaches specified level

MUFFLER (silencer) – Reduces noise

MS-1892

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Glossary Of Hydraulic/Hydrostatic Symbols For Excavators (Cont'd)

GLOSSARY OF HYDRAULIC/HYDROSTATIC SYMBOLS FOR EXCAVATORS

SYMBOL DESCRIPTION

CYLINDER: Equipment to convert hydraulic energy into linear energy and in which the fluid pressure operates alternately in both directions (forward and backward strokes)



DOUBLE ACTING HYDRAULIC CYLINDER, UNEQUAL DISPLACEMENT – With single piston rod



DOUBLE ACTING HYDRAULIC CYLINDER, UNEQUAL DISPLACEMENT and CUSHION ON ONE END – With single piston rod

PUMP: To convert mechanical energy into hydraulic energy



FIXED CAPACITY DISPLACEMENT HYDRAULIC PUMP – With one direction of flow



VARIABLE CAPACITY DISPLACEMENT BIDIRECTIONAL HYDRAULIC PUMP – With two directions of flow (bidirectional)

MOTOR: To convert hydraulic energy into rotary mechanical energy



FIXED CAPACITY DISPLACEMENT BIDIRECTIONAL HYDRAULIC MOTOR – With two directions of flow (bidirectional)

SYMBOL DESCRIPTION

CONTROL MECHANISMS



CONTROL VALVE WITH DETENT (Holds Valve in Position) – device for maintaining a given position (mechanical)



CONTROL VALVE ACTIVATED BY A PULL BUTTON (manual)



CONTROL VALVE ACTIVATED BY A PUSH–PULL BUTTON (manual)



CONTROL VALVE ACTIVATED BY A LEVER (manual)



CONTROL VALVE ACTIVATED BY A PEDAL (manual)



CONTROL VALVE WITH SPRING RETURN (mechanical)



CONTROL VALVE ACTIVATED BY AN ELECTRIC SOLENOID (electrical)



CONTROL VALVE ACTIVATED BY PILOT PRESSURE (indirect control, pilot actuated by application of pressure)

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Glossary Of Hydraulic/Hydrostatic Symbols For Excavators (Cont'd)

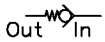
GLOSSARY OF HYDRAULIC/HYDROSTATIC SYMBOLS FOR EXCAVATORS

SYMBOL DESCRIPTION

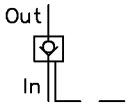
NON–RETURN VALVE, SHUTTLE VALVE: Valve which allows free flow in one direction only



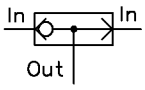
NON–RETURN VALVE (Check Valve) – Used as Replenishing Valve, Load Check Valve or Anticavitation Valve – Opens if the Inlet pressure is higher than the Outlet pressure. Often contains internal spring which has NO significant pressure value



SPRING LOADED VALVE (Bypass Valve) – Opens if the Inlet pressure is greater than the Outlet pressure plus the spring pressure

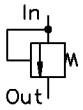


PILOT CONTROLLED NON–RETURN VALVE – It is possible to open the valve by pilot pressure

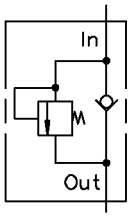


SHUTTLE VALVE – The Inlet port connected to the higher pressure is automatically connected to the Outlet port while the other Inlet port is closed

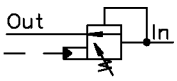
PRESSURE CONTROL VALVE: Valve ensuring the control of pressure



RELIEF VALVE – When the Inlet pressure overcomes the opposing force of the spring, the valve opens permitting flow from the Outlet port.



RELIEF/REPLENISHING VALVE or RELIEF/ANTICAVITATION VALVE – When the Inlet pressure overcomes the opposing force of the spring, the valve opens permitting flow from the Outlet port – Allows free flow in the opposite direction

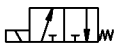


DUAL PRESSURE RELIEF VALVE – When the inlet pressure overcomes the opposing force of the spring, the valve opens permitting flow from the Outlet port. Pilot pressure provides a second pressure value.

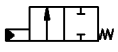
DIRECTIONAL CONTROL VALVE: Valve providing for the opening (fully or restricted) or the closing of one or more flow paths (represented by several squares)



TWO PORTS and CLOSED FLOW PATHS

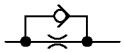


SOLENOID ACTIVATED DIRECTIONAL CONTROL VALVE (Two Position) – controlled by an electric solenoid (with return spring)

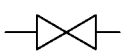


PILOT ACTIVATED DIRECTIONAL CONTROL VALVE (Two Position) – controlled by pressure (with return spring)

FLOW CONTROL VALVE: Valve controlling the flow in one or both directions



ONE WAY RESTRICTOR VALVE (Non–Return Valve with Restriction) – Unit allowing free flow in one direction but restricted flow in the other direction



TOW VALVE – Normally in closed position

MS-1892

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Troubleshooting The Hydraulic Circuit

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. Use correct viscosity oil.
	Engine RPM reduced.	Readjust or replace.
	Control valve linkage defective.	Check, repair or replace.
	Hydraulic pump volume low.	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).	
	Fan belt loose.	Tighten fan belt.

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Troubleshooting The Cylinder Circuit

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

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Troubleshooting The Upperstructure Slew Circuit

TROUBLESHOOTING THE UPPERSTRUCTURE SLEW CIRCUIT		
PROBLEM	**CAUSE**	**CORRECTION**
Swing not operating.	Control console raised.	Lower control console.
	Control console lock out switch incorrectly adjusted or defective.	Readjust or replace.
	Swing lock pin engaged.	Disengage lock pin.
	Joystick manifold pressure reducing valve defective.	Repair or replace.
	Swing motor gear defective.	Repair or replace.
	Joystick internal leakage excessive.	Repair or replace.
	Swing motor defective.	Repair or replace.
Swing force.	Main relief valve set too low.	Readjust or replace.
	Swing motor relief valve pressure too low.	Readjust or replace.
Swing speed too low.	Pump flow low.	Check, repair or replace.
	Blocked or restricted line to swing motor.	Replace.
	Joystick internal leakage excessive.	Repair or replace.
	Control valve internal leakage excessive.	Repair or replace.
	Swing motor internal leakage excessive.	Repair or replace.
Swing over run excessive.	Control valve spool sticking.	Repair or replace.
	Joystick spool sticking.	Repair or replace.
	Swing motor relief valve set too low.	Repair or replace.
	Swing motor internal leakage excessive.	Repair or replace.
Swing motor seal leakage.	Return line filter plugged.	Inspect, clean or replace.

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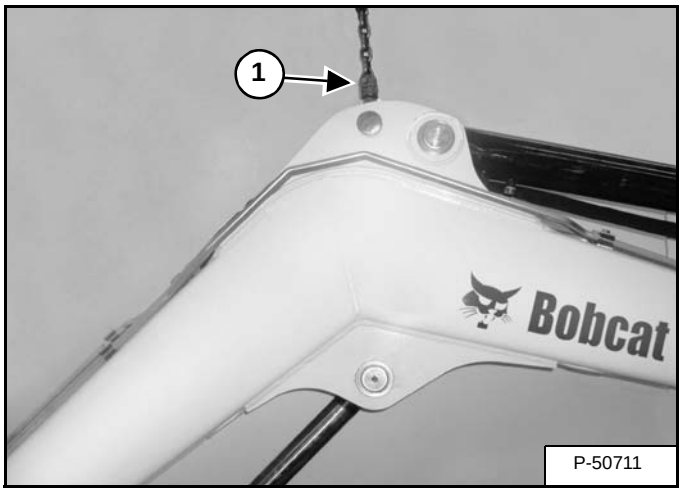
BOOM CYLINDER

Testing

Lower the boom/bucket and blade to the ground.

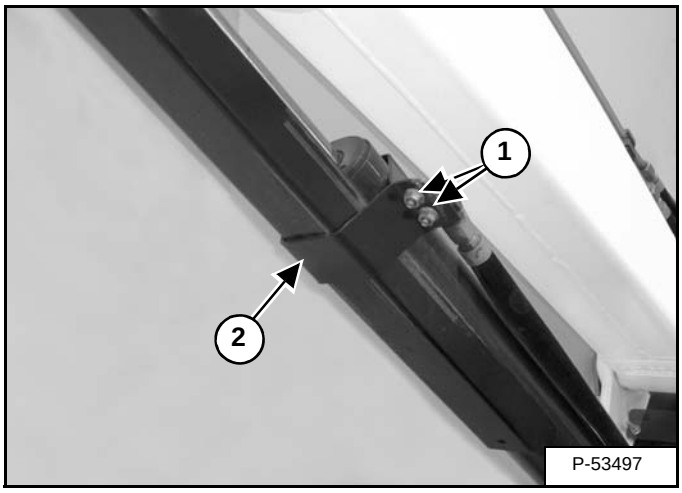
With the engine off, turn the key to the ON position and move both hydraulic control levers to relieve hydraulic pressure.

Figure 20-20-1



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

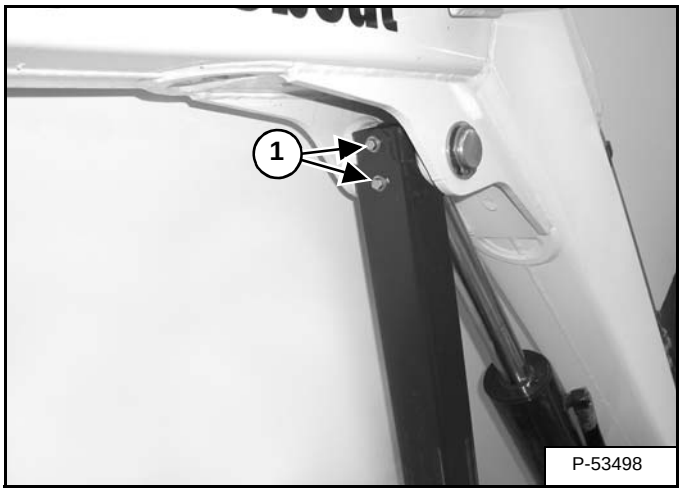
Figure 20-20-2



Remove the bolts (Item 1) from both sides of the cylinder rod guard bracket (Item 2) **[Figure 20-20-2]**.

Remove the brackets.

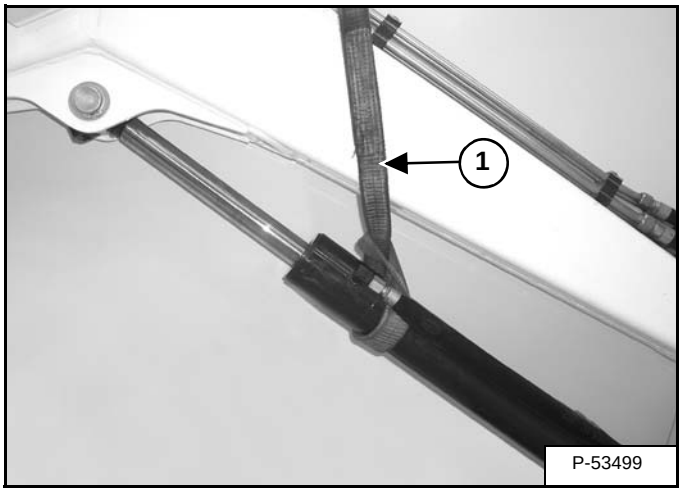
Figure 20-20-3



Remove the bolts (Item 1) **[Figure 20-20-3]** from the guard.

Remove the guard.

Figure 20-20-4

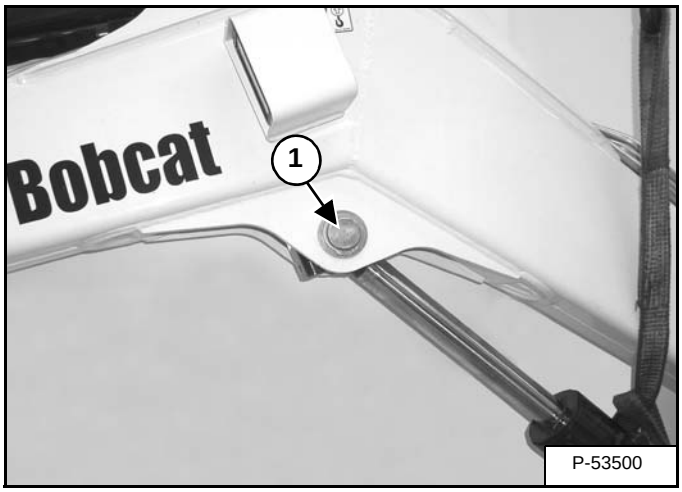


Install a sling (Item 1) **[Figure 20-20-4]** and hoist to the rod end of the boom cylinder. Support the cylinder with the hoist.

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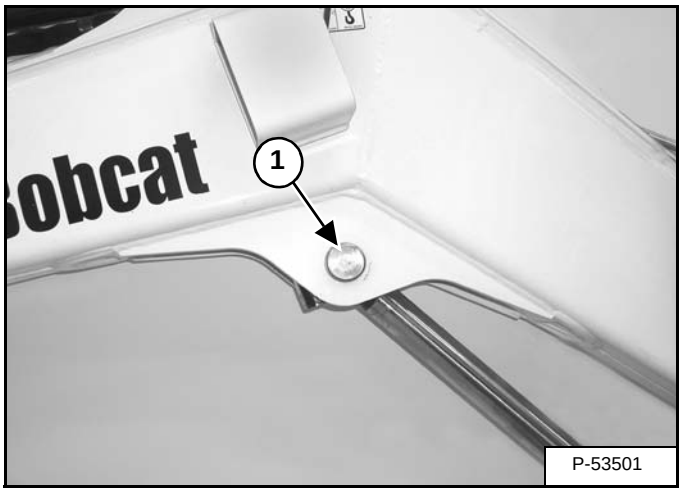
Testing (Cont'd)

Figure 20-20-5



Remove the snap ring (Item 1) **[Figure 20-20-5]** and washer from the cylinder rod end pin.

Figure 20-20-6

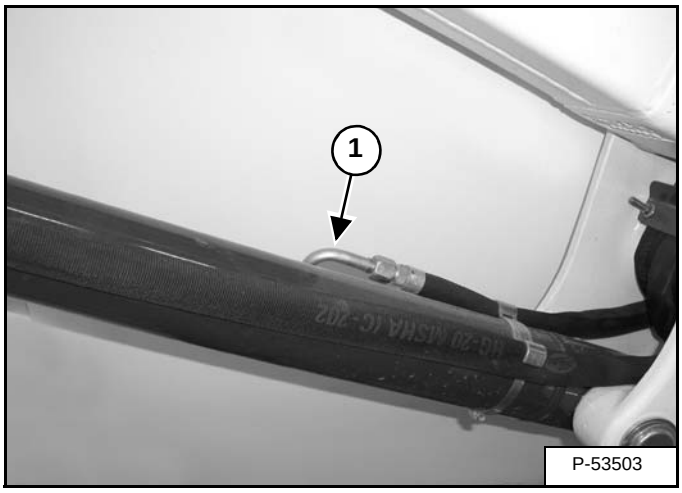


Remove the pin (Item 1) **[Figure 20-20-6]**.

Start the excavator and retract the cylinder.

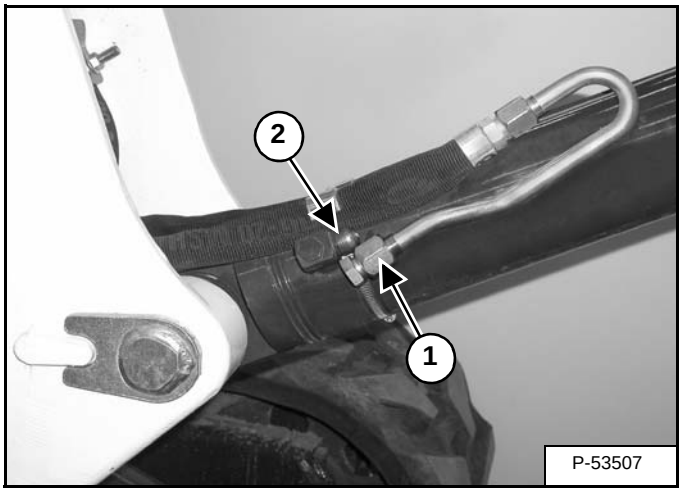
Stop the engine. Relieve hydraulic pressure.

Figure 20-20-7



Remove the tubeline (Item 1) **[Figure 20-20-7]** from the base end of the boom cylinder.

Figure 20-20-8



Plug the tubeline (Item 1) **[Figure 20-20-8]**.

Start the engine and retract the boom cylinder.

If there is any oil leakage from the base end fitting (Item 2) **[Figure 20-20-8]**, remove the cylinder for repair or replacement.

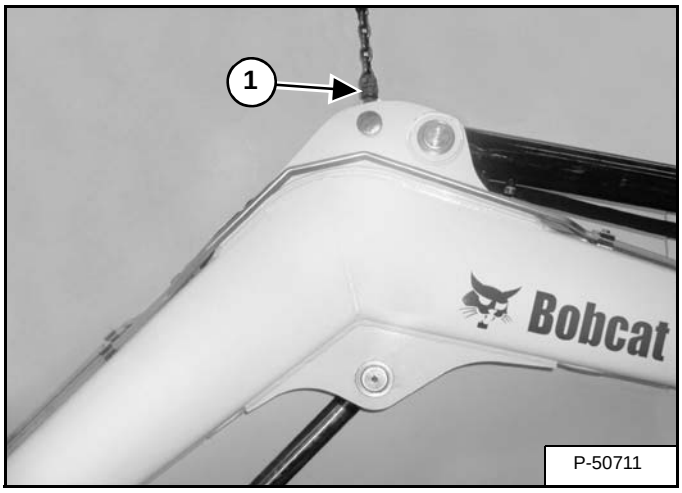
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Removal And Installation

Lower the boom/bucket and blade to the ground.

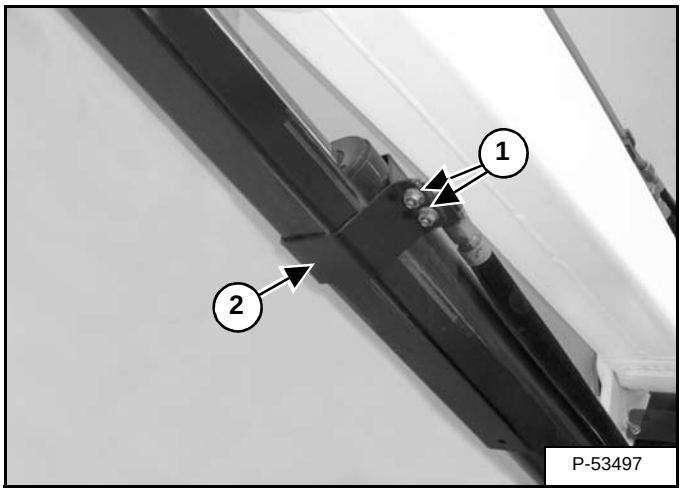
With the engine off, turn the key to the ON position and move both hydraulic control levers to relieve hydraulic pressure.

Figure 20-20-9



Support the boom with a chain hoist (Item 1) **[Figure 20-20-9]**.

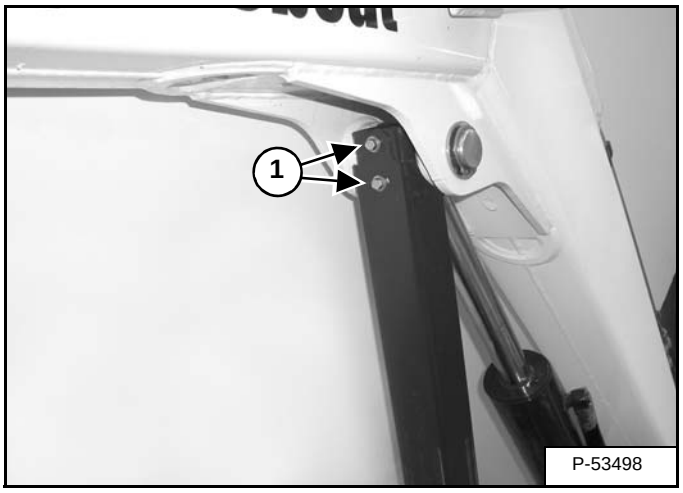
Figure 20-20-10



Remove the bolts (Item 1) from both sides of the cylinder rod guard bracket (Item 2) **[Figure 20-20-10]**.

Remove the brackets.

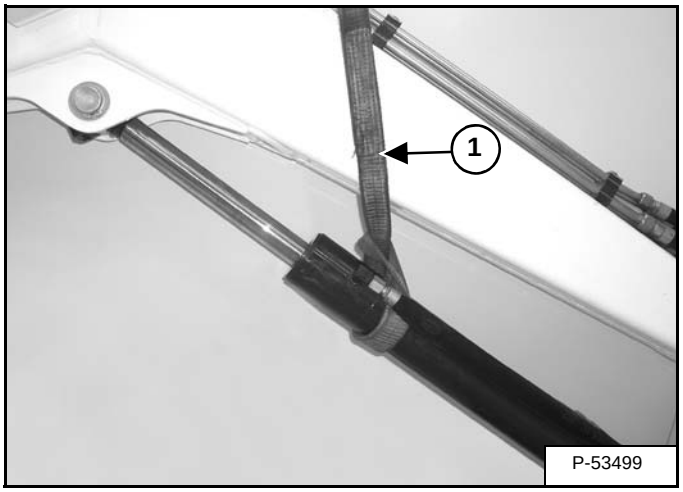
Figure 20-20-11



Remove the bolts (Item 1) **[Figure 20-20-11]** from the guard.

Remove the guard.

Figure 20-20-12

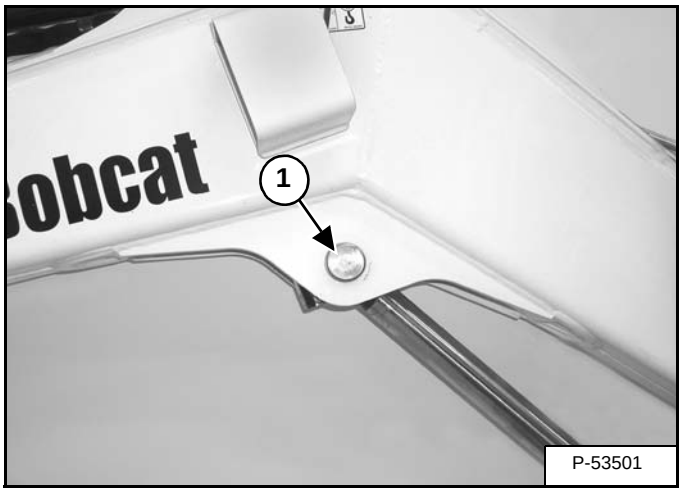


Install a sling (Item 1) **[Figure 20-20-12]** and hoist to the rod end of the boom cylinder. Support the cylinder with the hoist.

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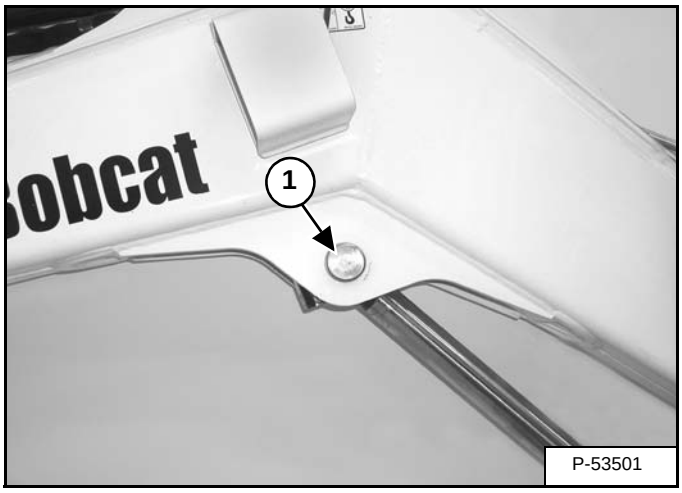
Removal And Installation (Cont'd)

Figure 20-20-13



Remove the snap ring (Item 1) **[Figure 20-20-13]** and washer from the cylinder rod end pin.

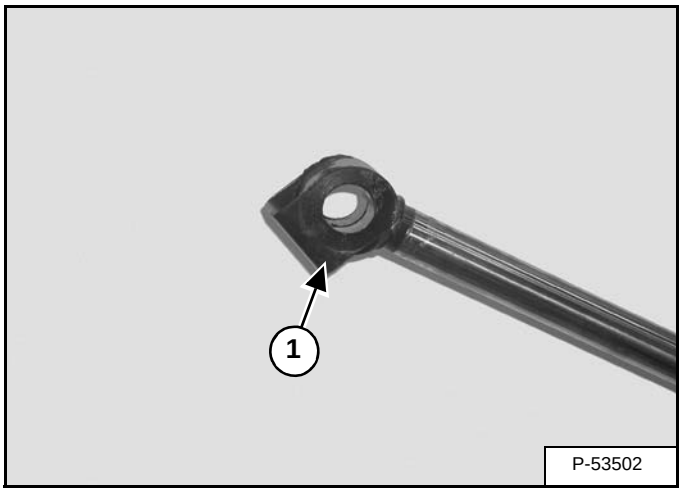
Figure 20-20-14



Remove the pin (Item 1) **[Figure 20-20-14]**.

Lower the hoist.

Figure 20-20-15

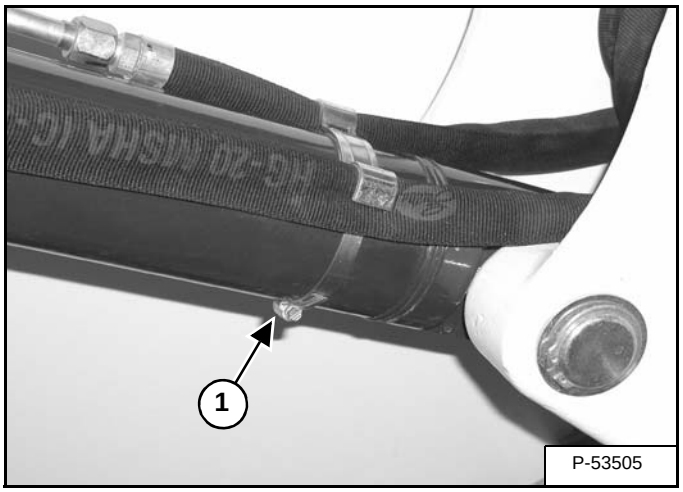


Remove the bracket (Item 1) **[Figure 20-20-15]** from the rod end of the cylinder.

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Removal And Installation (Cont'd)

Figure 20-20-16



Loosen the cylinder hose mount clamp (Item1) **[Figure 20-20-16]**.

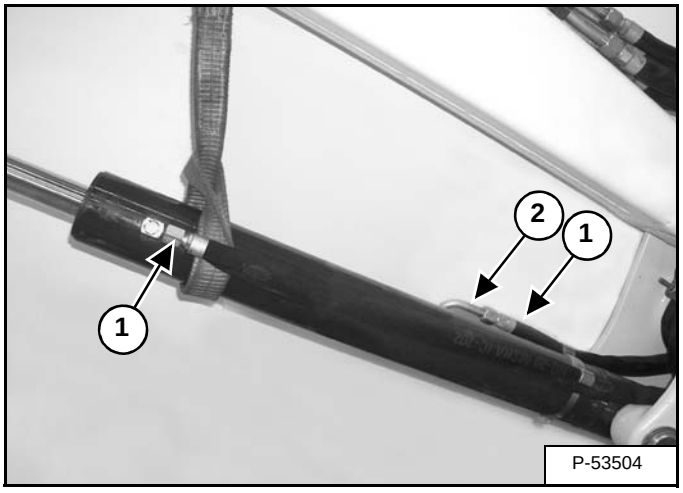
Remove the hoses from the clamp.

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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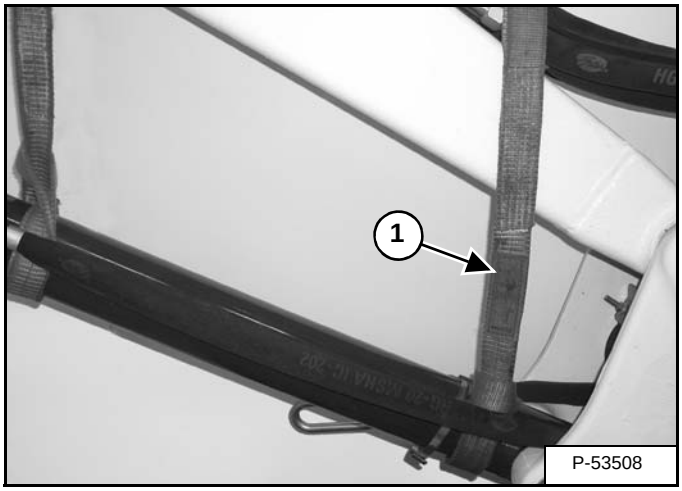
Figure 20-20-17



Remove the hoses (Item 1) and tubeline (Item 2) **[Figure 20-20-17]**.

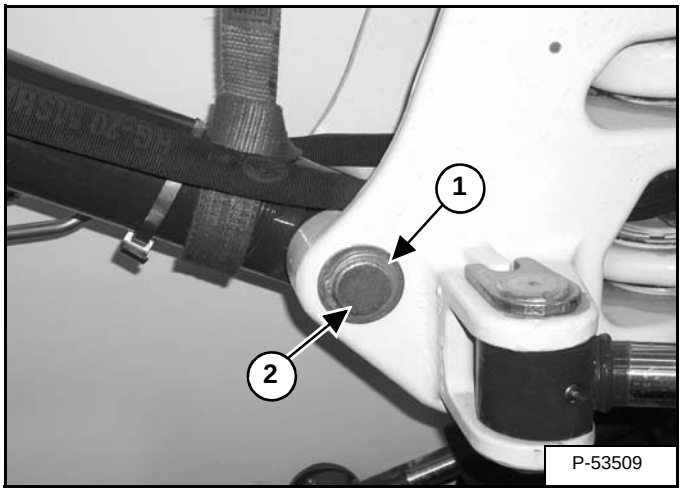
Remove the hoses from the clamp.

Figure 20-20-18



Install a second sling (Item 1) **[Figure 20-20-18]** on the base of the cylinder.

Figure 20-20-19



Remove the snap ring (Item 1) **[Figure 20-20-19]** and washers from the cylinder base end pin.

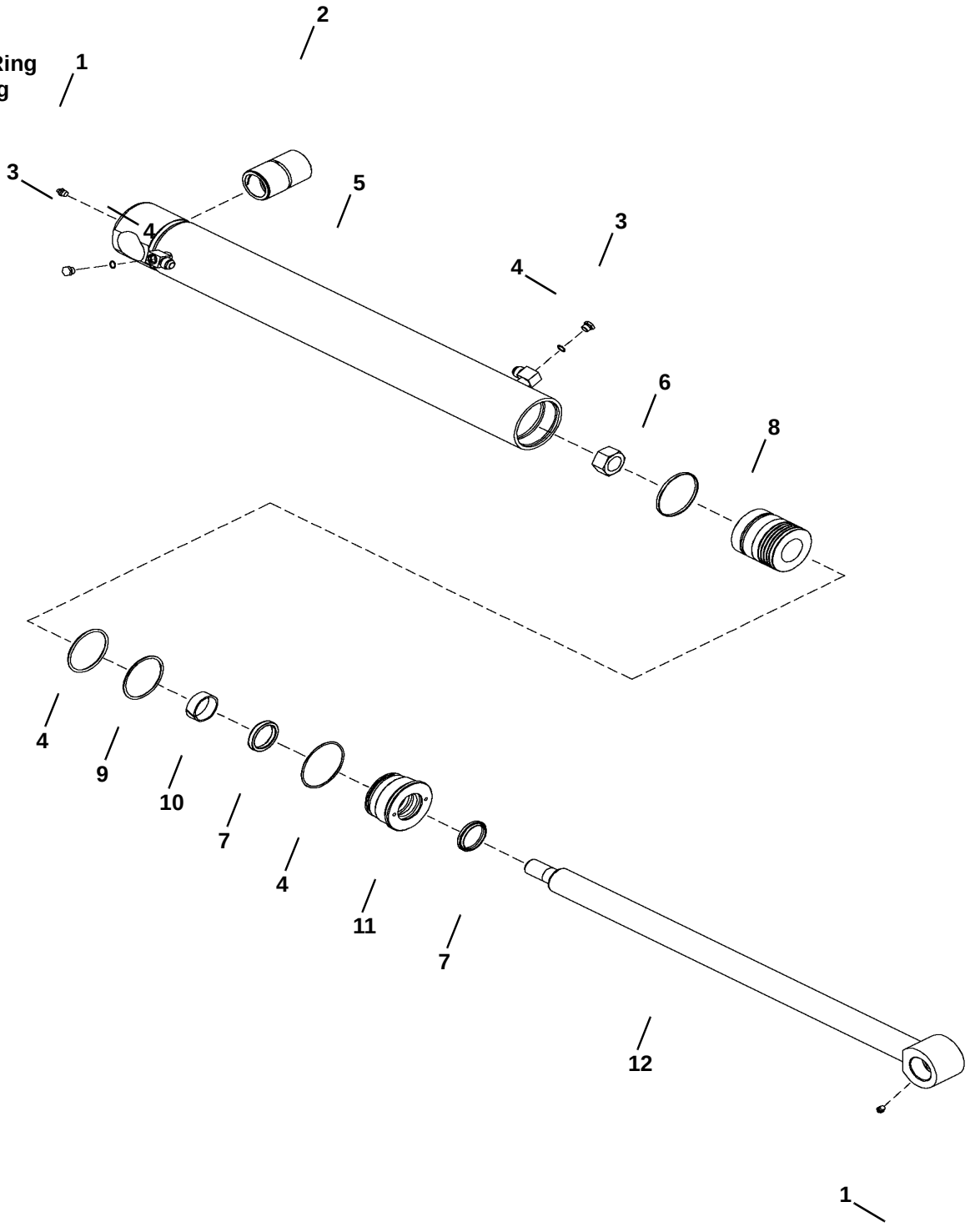
Remove the pin (Item 2) **[Figure 20-20-19]**.

Remove the boom cylinder from the excavator.

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Parts Identification

1. Grease Fitting
2. Bushing
3. Plug
4. O-Ring
5. Housing
6. Nut
7. Seal
8. Head
9. Backup Ring
10. Wear Ring
11. Head
12. Rod



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Disassembly

Clean the outside of the boom cylinder before disassembly.

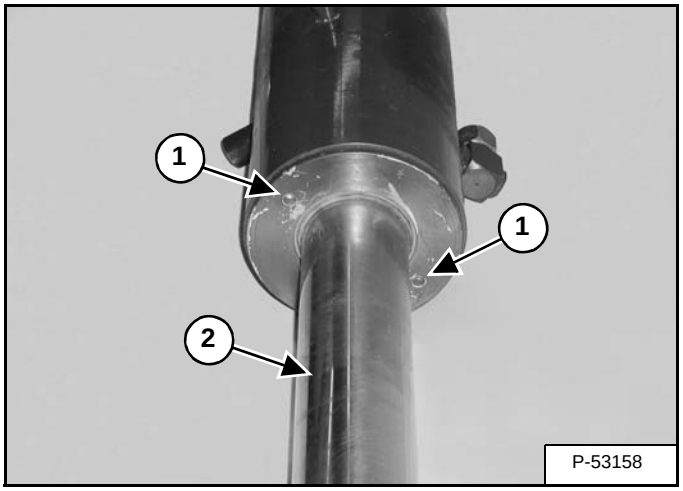
The following tools will be needed to disassemble and assemble the cylinders:

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

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

Put the base end of the cylinder in a vise.

Figure 20-20-20

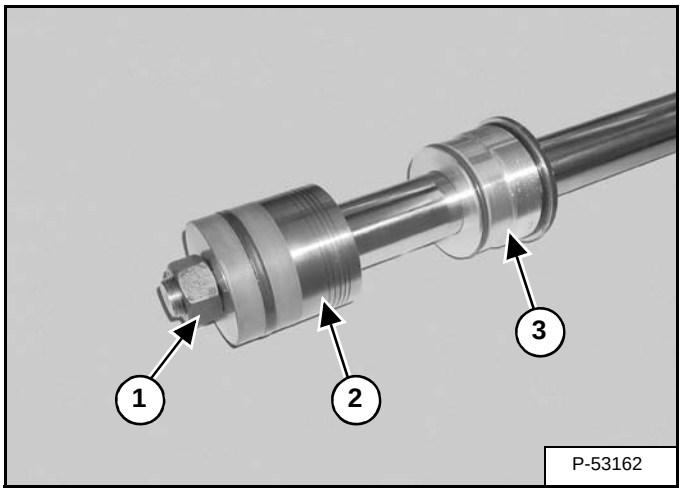


Insert the adjustable gland nut wrench into the holes (Item 1) **[Figure 20-20-20]** to loosen the head.

Remove the head and the rod assembly (Item 2) **[Figure 20-20-20]** from the cylinder.

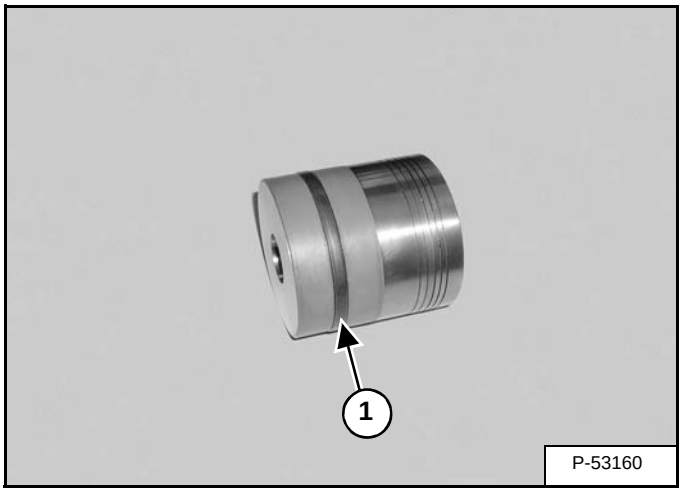
Put the rod end in a vise.

Figure 20-20-21



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

Figure 20-20-22

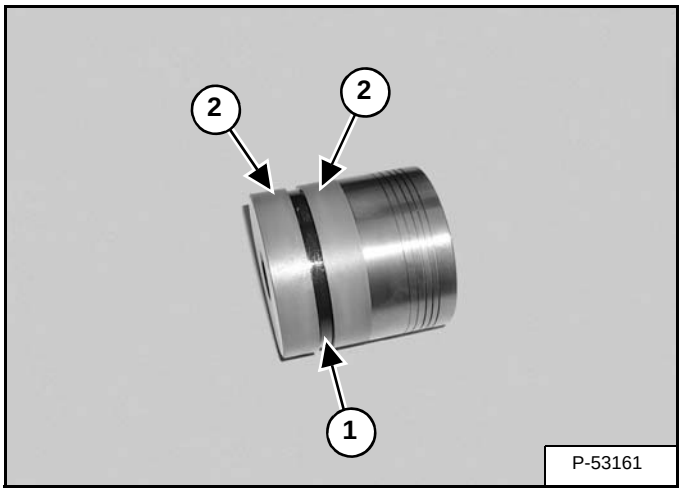


Remove the seal (Item 1) **[Figure 20-20-22]**.

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Disassembly (Cont'd)

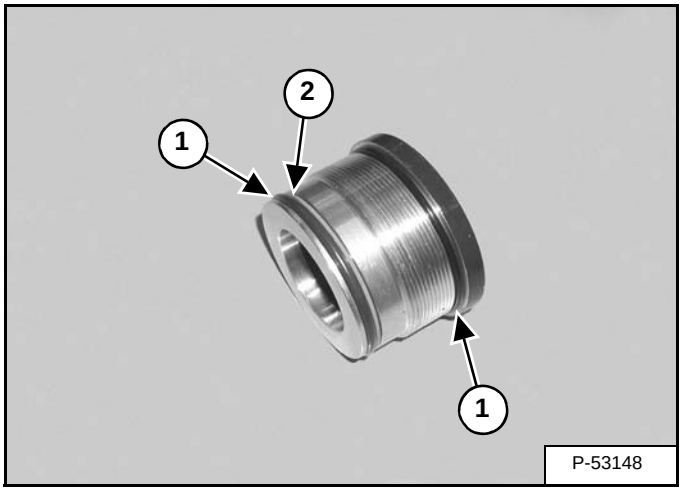
Figure 20-20-23



Remove the backup ring (Item 1) **[Figure 20-20-23]**.

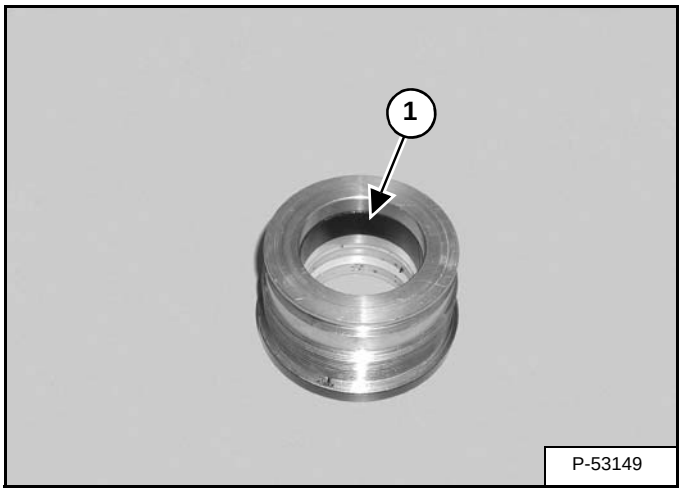
NOTE: If the fiber surface (Item 2) [Figure 20-20-23] on the piston head is damaged, the piston must be replaced.

Figure 20-20-24



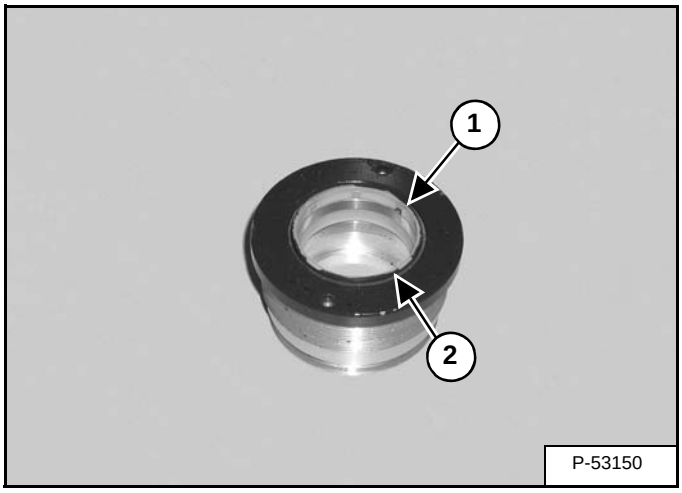
Remove the O-rings (Item 1) and backup ring (Item 2) **[Figure 20-20-24]** from the head.

Figure 20-20-25



Remove the wear ring (Item 1) **[Figure 20-20-25]**.

Figure 20-20-26

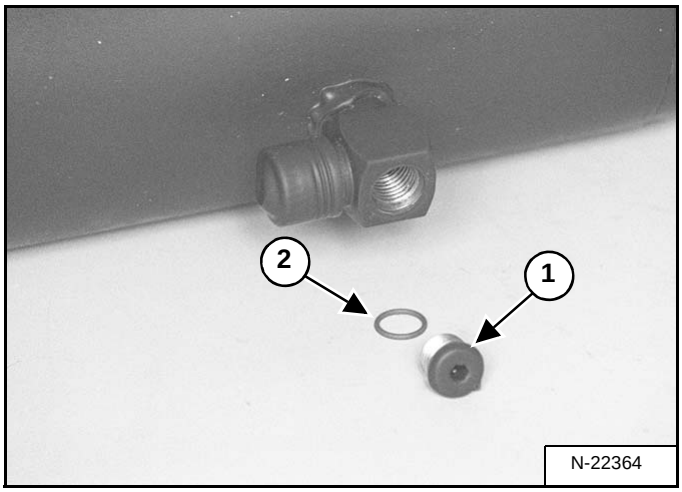


Remove the wiper seal (Item 1) and rod seal (Item 2) **[Figure 20-20-26]** from the inside of the head.

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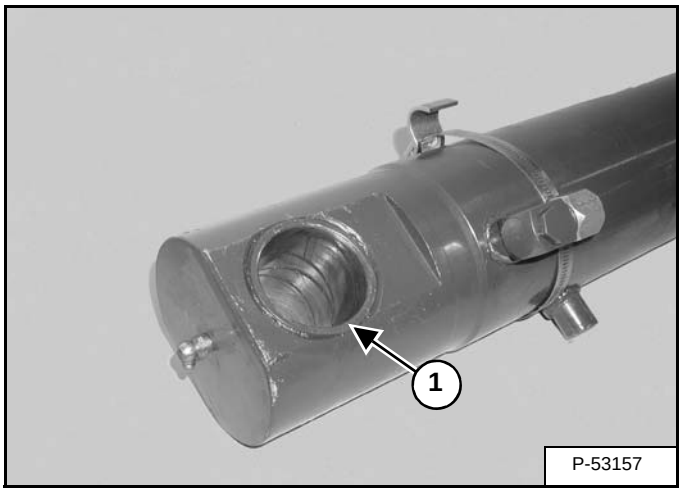
Disassembly (Cont'd)

Figure 20-20-27



Remove the plug (Item 1) and O-ring (Item 2) **[Figure 20-20-27]** from the hose fittings.

Figure 20-20-28



Remove the bushing (Item 1) **[Figure 20-20-28]** from the base end of the cylinder.

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Assembly

Clean all parts in solvent and dry with compressed air.

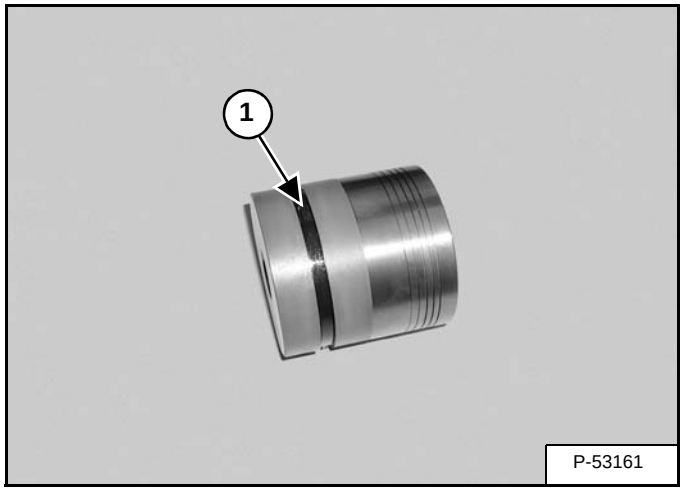
Inspect all parts for wear or damage. Replace any worn or damaged parts.

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

Use the following tools to assemble the cylinder:

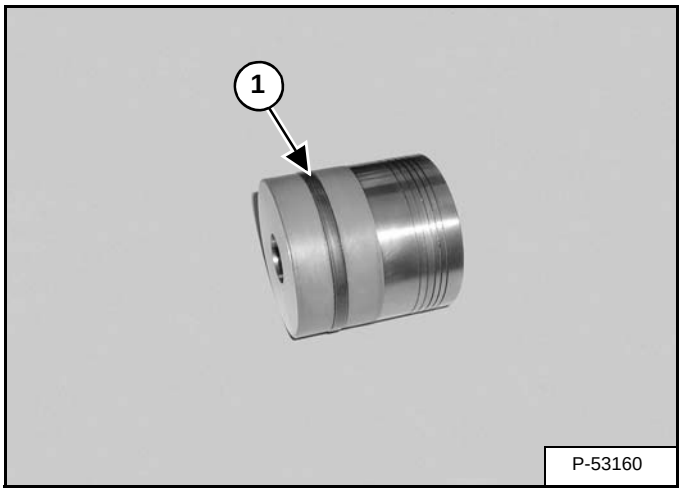
MEL1396 - Universal Seal Expander
Piston Ring Compressor
MEL1075 - Adjustable Gland Nut Wrench
MEL1075-1 - Standard Pins

Figure 20-20-29



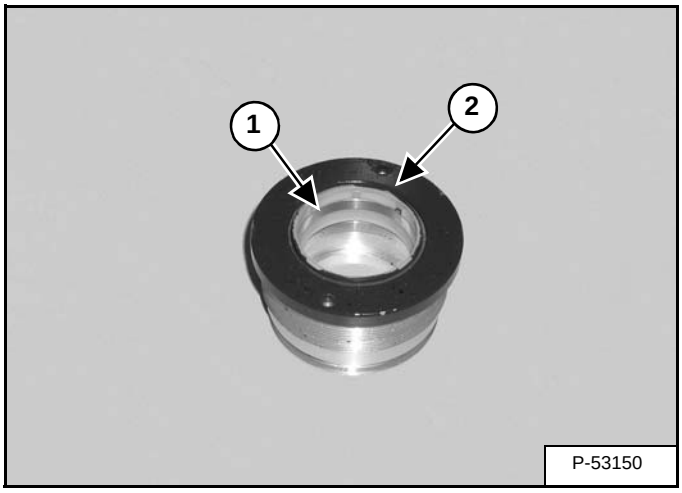
Install the backup ring (Item 1) **[Figure 20-20-29]** on the piston.

Figure 20-20-30



Install the seal (Item 1) **[Figure 20-20-30]** on the piston.

Figure 20-20-31

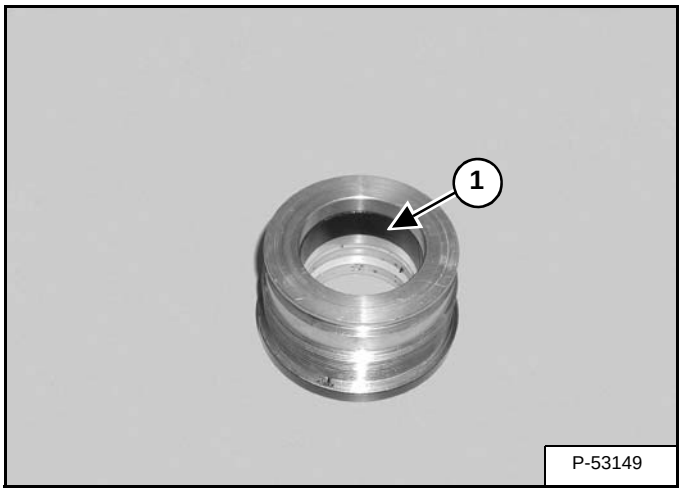


Install the rod seal (Item 1) and wiper (Item 2) **[Figure 20-20-31]** in the head.

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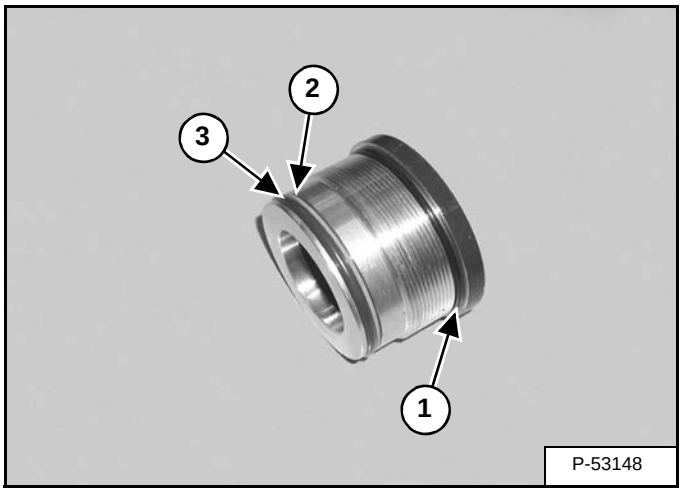
Assembly (Cont'd)

Figure 20-20-32



Install the wear ring (Item 1) **[Figure 20-20-32]** in the head.

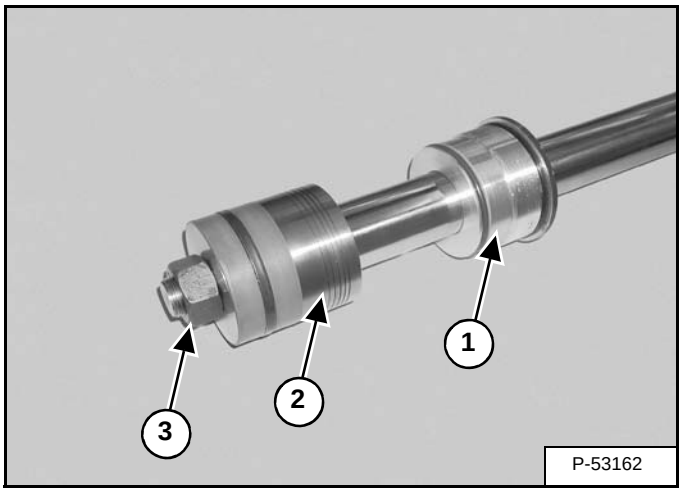
Figure 20-20-33



Install the O-ring (Item 1) **[Figure 20-20-33]**.

Install the backup ring (Item 2) and O-ring (Item 3) **[Figure 20-20-33]**.

Figure 20-20-34



Install the head (Item 1), piston (Item 2) **[Figure 20-20-34]** on the rod as shown.

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

Provide an adequate support for the cylinder before tightening.

Install the nut (Item 3) **[Figure 20-20-34]**.

NOTE: Clean and dry the rod threads. Install a NEW nut with pre-applied LOCTITE.

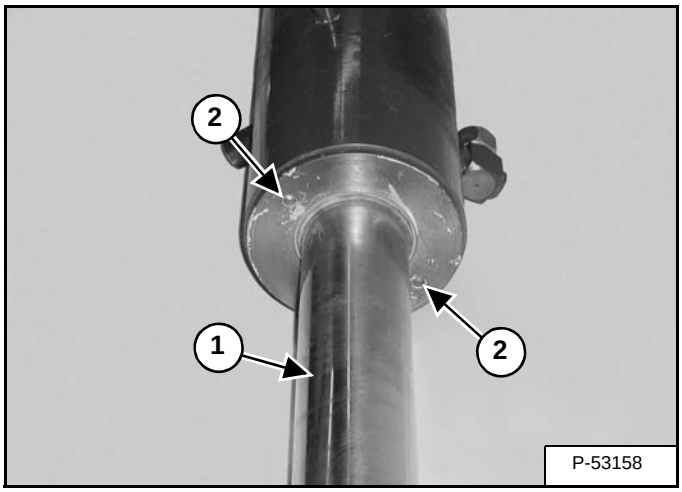
Tighten the nut to 850 ft.-lb. (1153 N•m) torque.

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

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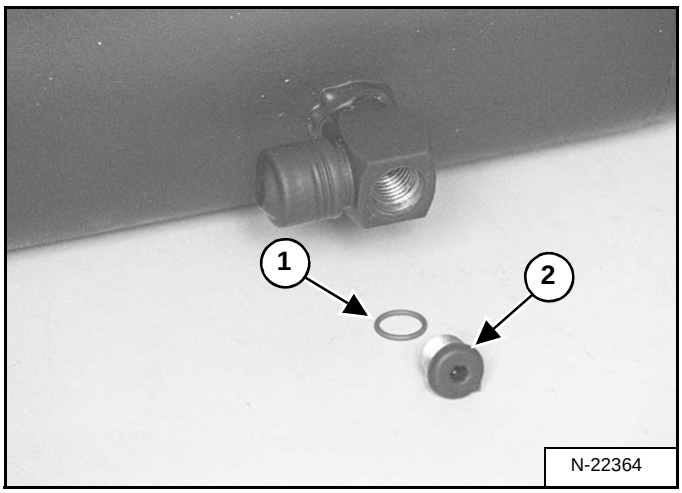
Assembly (Cont'd)

Figure 20-20-35



Install the head and rod assembly (Item 1). Insert the adjustable gland nut wrench into the holes (Item 2) **[Figure 20-20-35]** to tighten the head. Tighten the head until it is flush with the end of the housing.

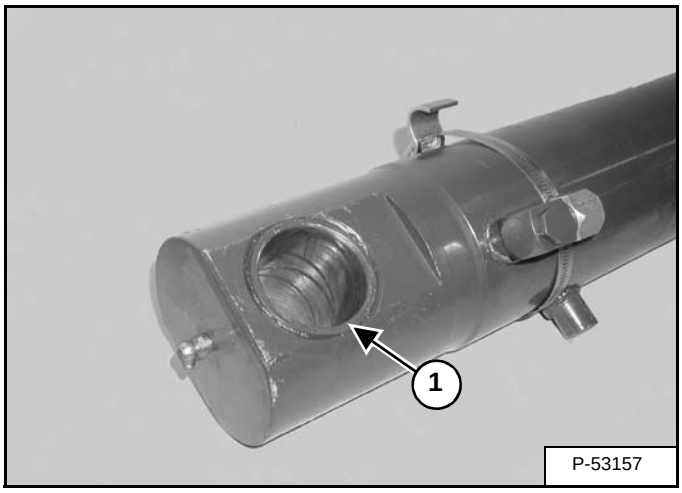
Figure 20-20-36



Install the O-ring (Item 1) and plug (Item 2) **[Figure 20-20-36]** in the hose fittings.

Tighten the plug to 8 ft.-lb. (11 N•m) torque.

Figure 20-20-37



Install the bushing (Item 1) **[Figure 20-20-37]**. The bushing must be aligned with the grease channel in the base end of the cylinder.

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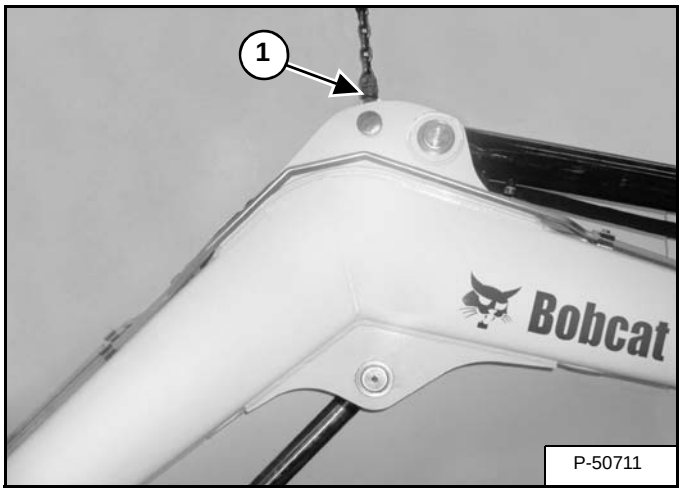
ARM CYLINDER

Testing

Lower the boom/bucket and blade to the ground.

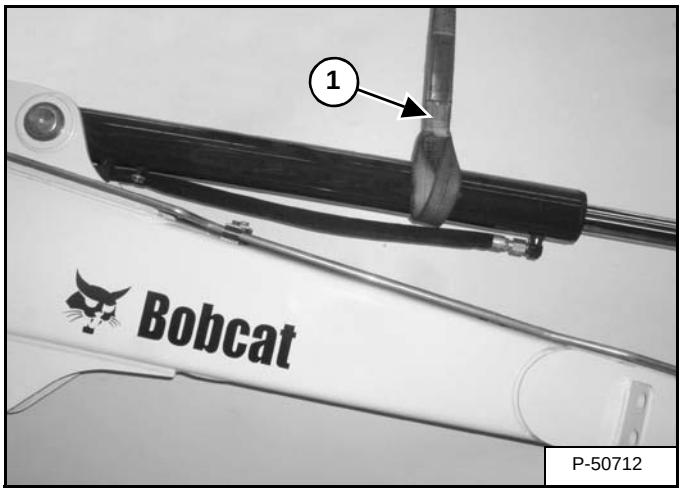
With the engine off, turn the key to the ON position and move both hydraulic control levers to relieve hydraulic pressure.

Figure 20-21-1



Support the boom with a chain hoist (Item 1) **[Figure 20-21-1]** and release the hydraulic pressure on the arm cylinder.

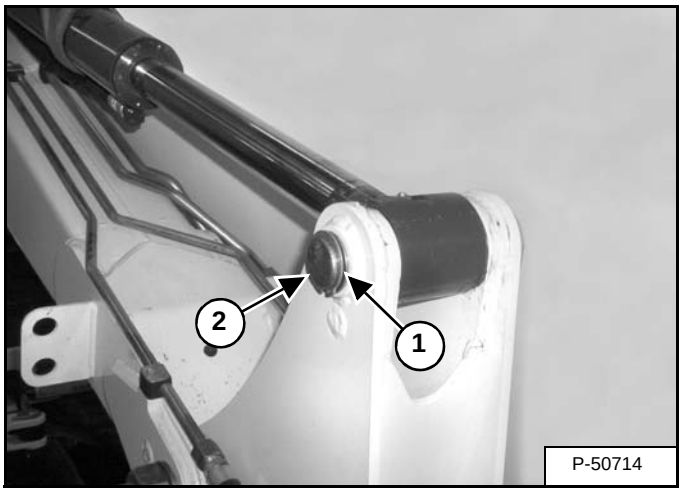
Figure 20-21-2



Install a sling and hoist (Item 1) **[Figure 20-21-2]** on the rod end of the arm cylinder.

Support the cylinder with the hoist.

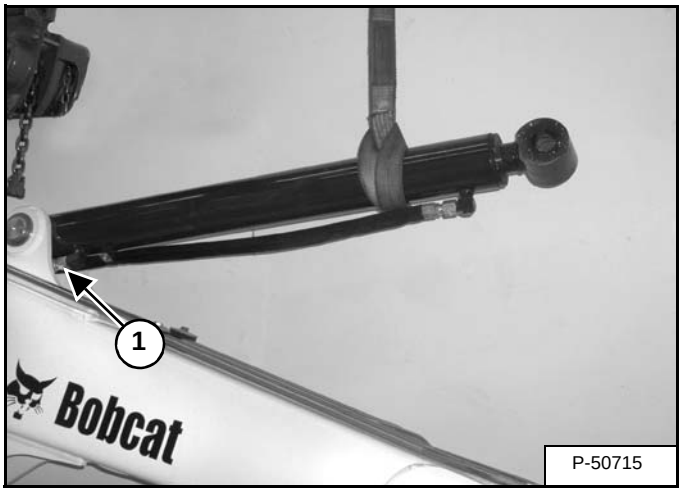
Figure 20-21-3



Remove the snap ring and washers (Item 1) **[Figure 20-21-3]** from the rod end of the arm cylinder.

Remove the pin (Item 2) **[Figure 20-21-3]**.

Figure 20-21-4



Start the Excavator and retract the arm cylinder **[Figure 20-21-4]**.

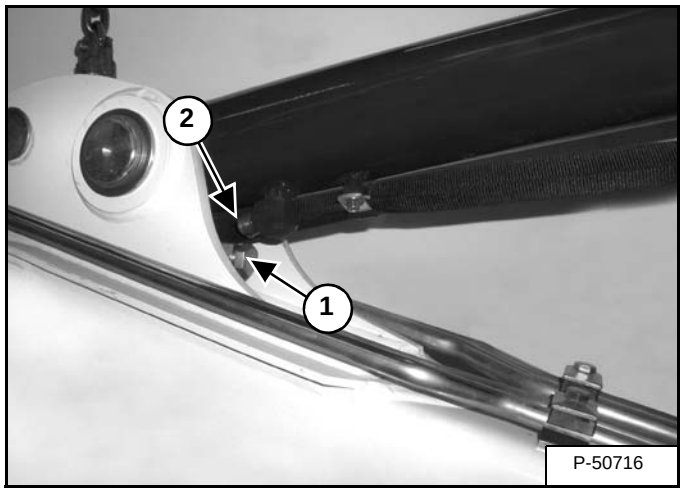
Stop the engine. Relieve hydraulic pressure.

Remove the hose (Item 1) **[Figure 20-21-4]** from the base end of the cylinder.

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Testing (Cont'd)

Figure 20-21-5



Cap the hose (Item 1) **[Figure 20-21-5]**.

Start the Excavator and retract the cylinder.

If there is any oil leakage from the base end fitting (Item 2) **[Figure 20-21-5]** on the arm cylinder, remove the cylinder for repair or replacement.

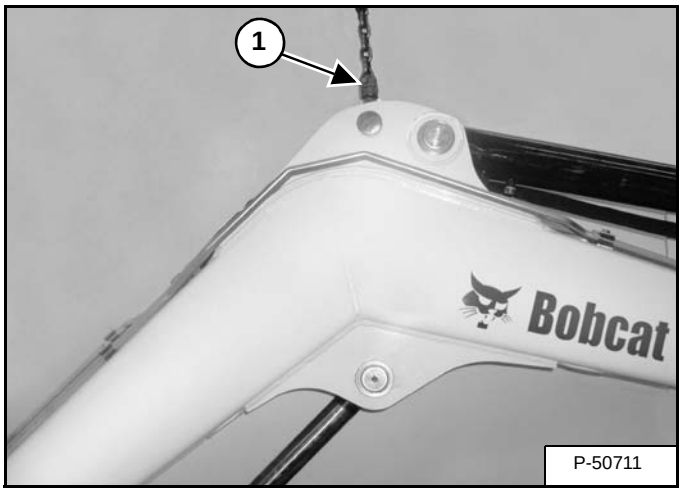
https://www.pdfmanual4trucks.com/

Removal and Installation

Lower the boom/bucket and blade to the ground.

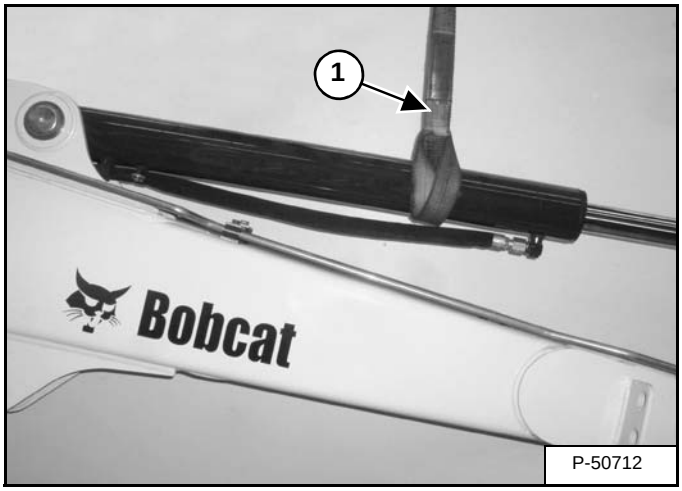
With the engine off, turn the key to the ON position and move both hydraulic control levers to relieve hydraulic pressure.

Figure 20-21-6



Support the boom with a chain hoist **[Figure 20-21-6]**.

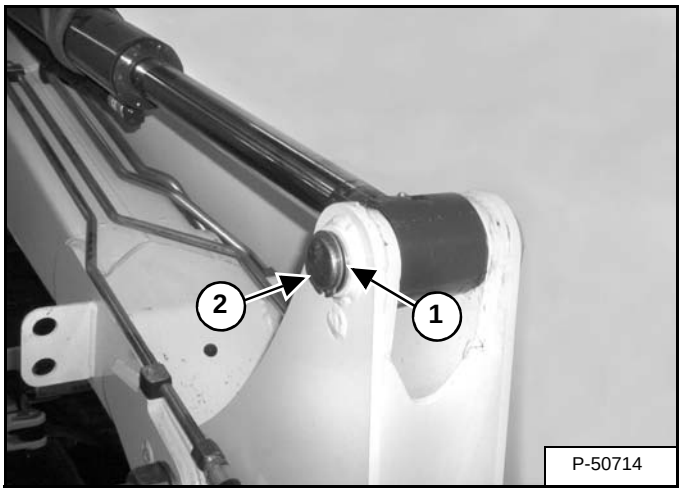
Figure 20-21-7



Install a sling and hoist (Item 1) **[Figure 20-21-7]** on the rod end of the arm cylinder.

Support the cylinder with the hoist.

Figure 20-21-8

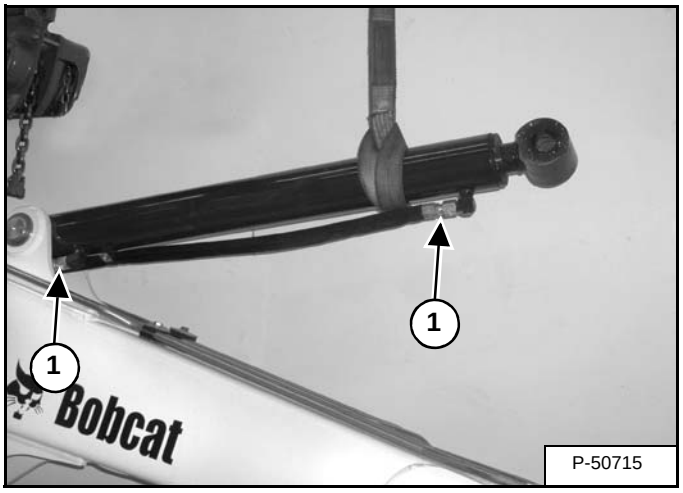


Remove the snap ring and washers (Item 1) **[Figure 20-21-8]** from the rod end of the arm cylinder.

Remove the pin (Item 2) **[Figure 20-21-8]**.

Raise the hoist to access the base end hose.

Figure 20-21-9



Mark and remove the hoses (Item 1) **[Figure 20-21-9]**.

IMPORTANT

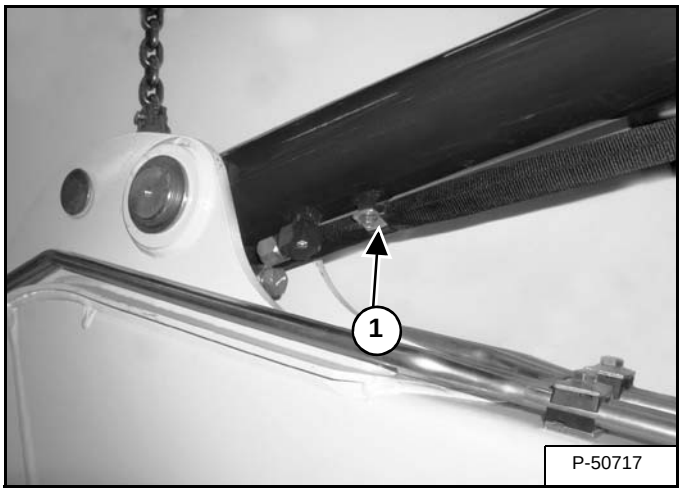
When repairing hydrostatic and hydraulic systems, clean the work area before disassembly and keep all parts clean. Always use caps and plugs on hoses, tubelines and ports to keep dirt out. Dirt can quickly damage the system.

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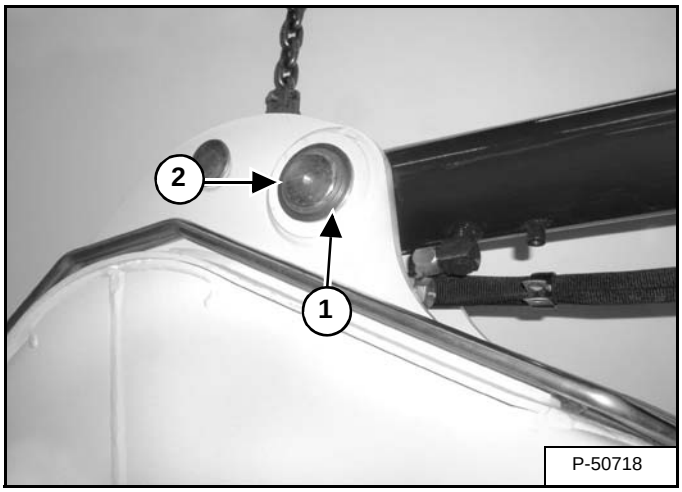
Removal and Installation (Cont'd)

Figure 20-21-10



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

Figure 20-21-11



Remove the snap ring and washers (Item 1) **[Figure 20-21-11]** from the base end cylinder pin.

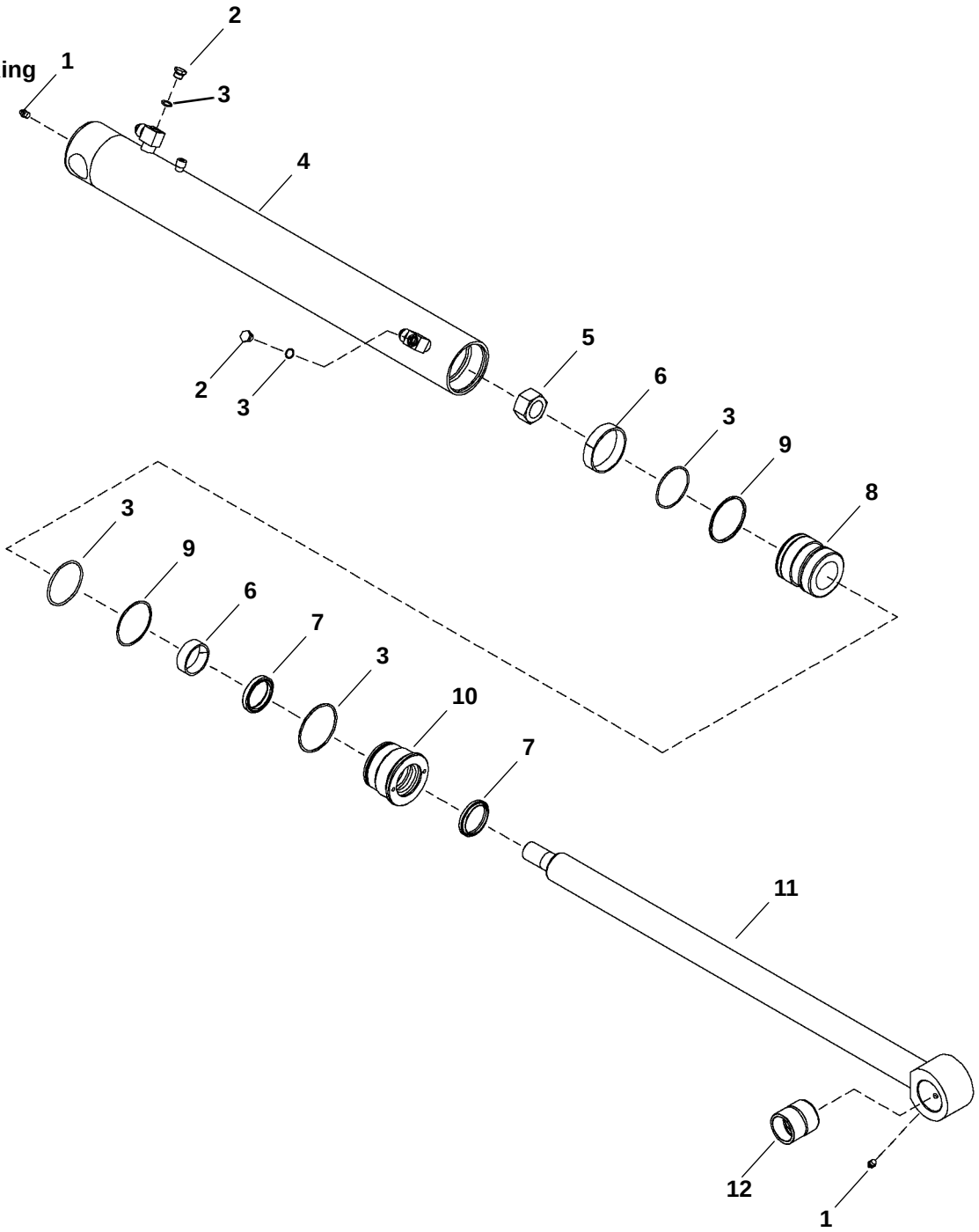
Remove the pin (Item 2) **[Figure 20-21-11]**.

Remove the cylinder from the Excavator.

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Parts Identification

1. Grease Fitting
2. Plug
3. O-Ring
4. Housing
5. Nut
6. Wear Ring
7. Seal
8. Piston
9. Backup Ring
10. Head
11. Rod
12. Bushing



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Disassembly

Clean the outside of the arm cylinder before disassembly.

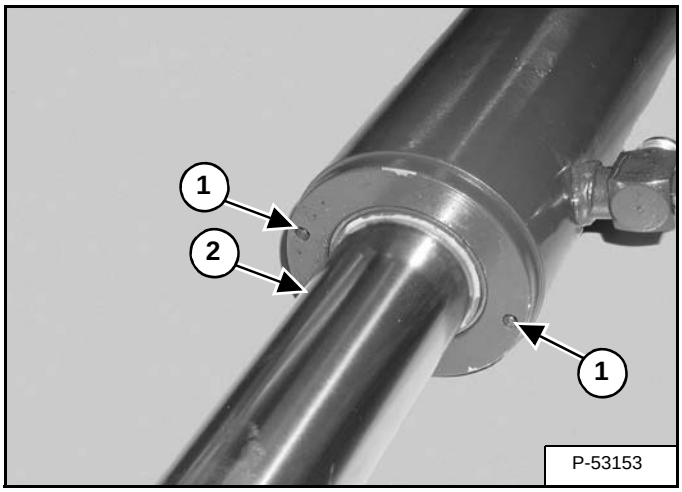
Use the following tools to disassemble the cylinder:

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.

Put the base end of the cylinder in a vise.

Figure 20-21-12

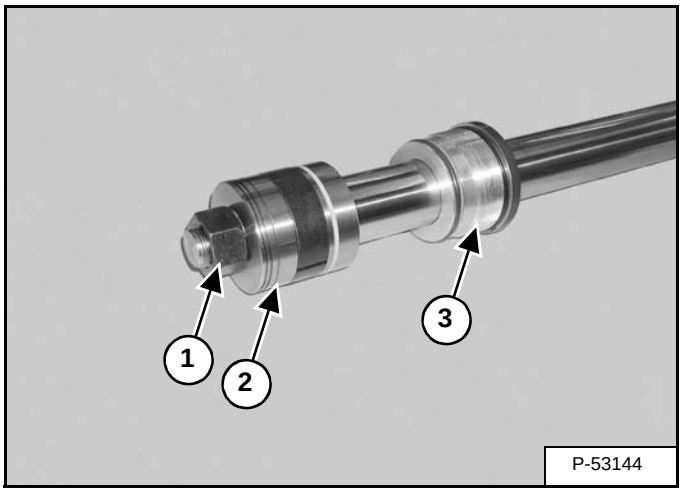


Insert the adjustable gland nut wrench into the holes (Item 1) **[Figure 20-21-12]** to loosen the head.

Remove the head and the rod assembly (Item 2) **[Figure 20-21-12]** from the cylinder.

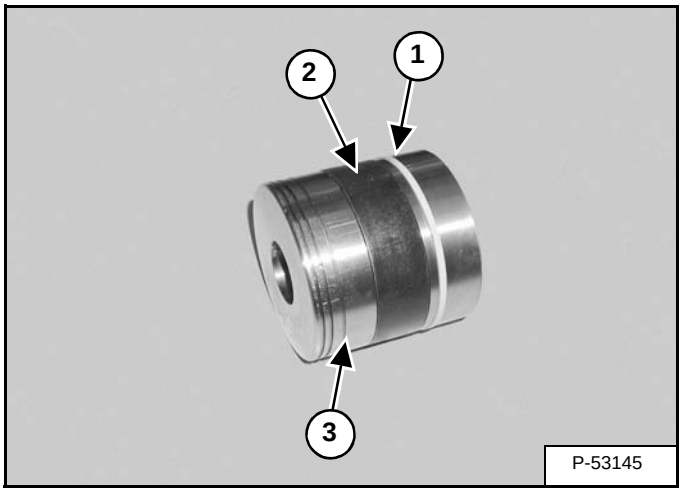
Put the rod end in a vise.

Figure 20-21-13



Remove the nut (Item 1), piston (Item 2), and head (Item 3) **[Figure 20-21-13]**.

Figure 20-21-14

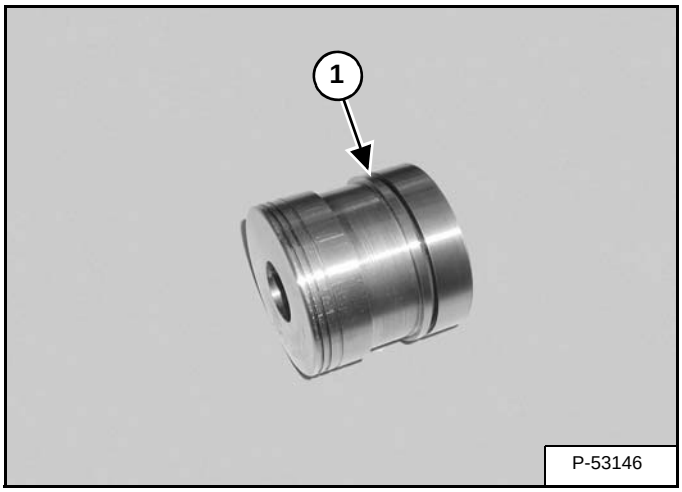


Remove the seal (Item 1) and wear ring (Item 2) from the piston (Item 3) **[Figure 20-21-14]**.

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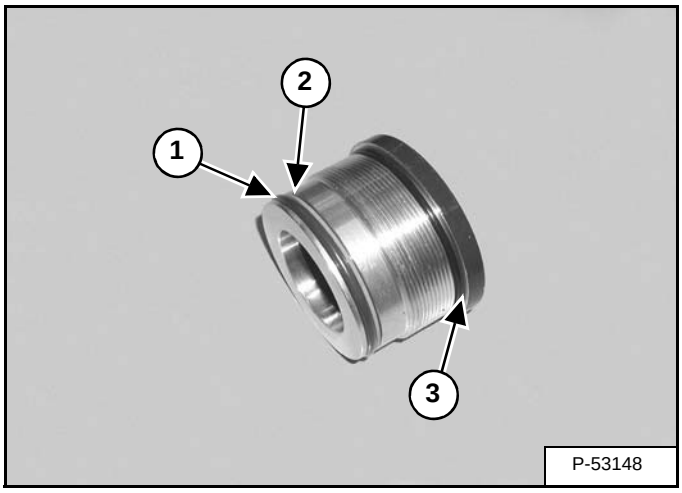
Disassembly (Cont'd)

Figure 20-21-15



Remove the O-ring (Item 1) **[Figure 20-21-15]**.

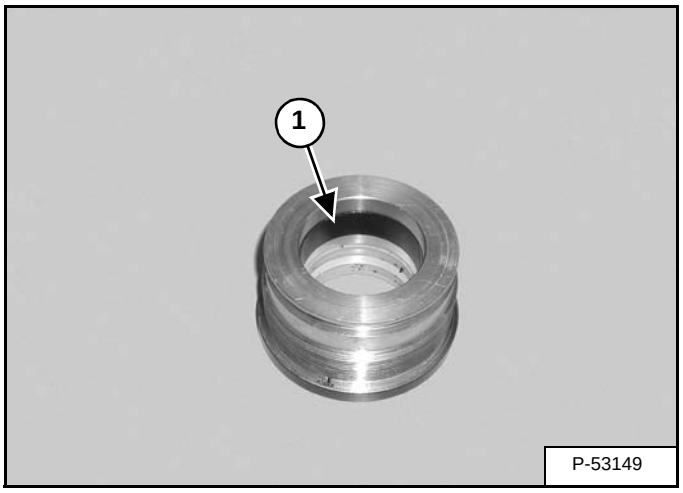
Figure 20-21-16



Remove the O-ring (Item 1) and the back-up ring (Item 2) **[Figure 20-21-16]**.

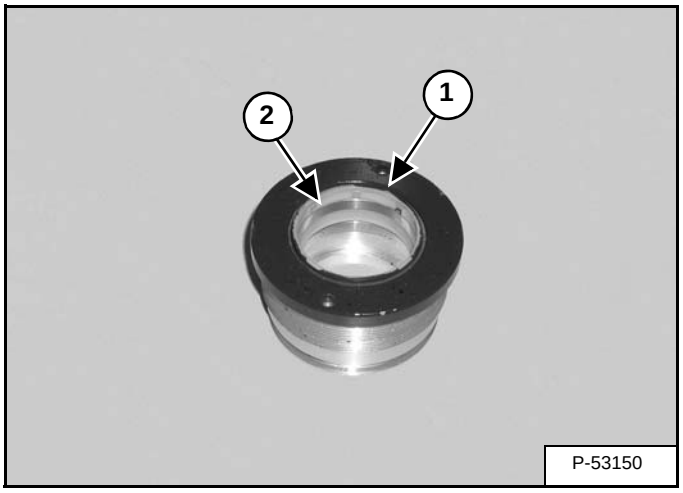
Remove the O-ring (Item 3) **[Figure 20-21-16]**.

Figure 20-21-17



Remove the wear ring (Item 1) **[Figure 20-21-17]**.

Figure 20-21-18

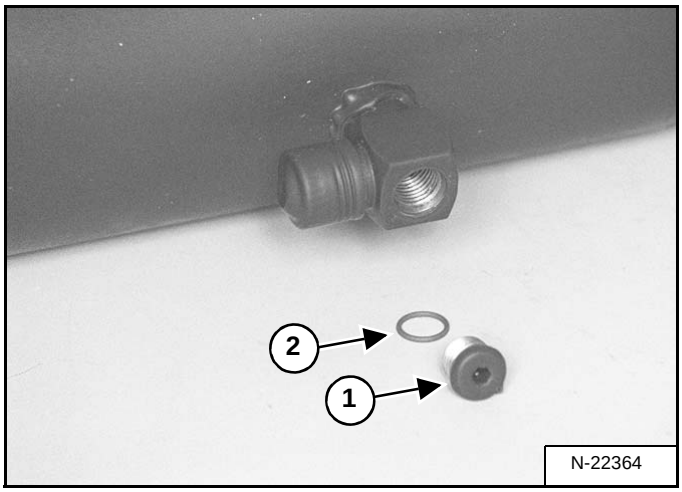


Remove the wiper seal (Item 1) and rod seal (Item 2) from the inside of the head (Item 3) **[Figure 20-21-18]**.

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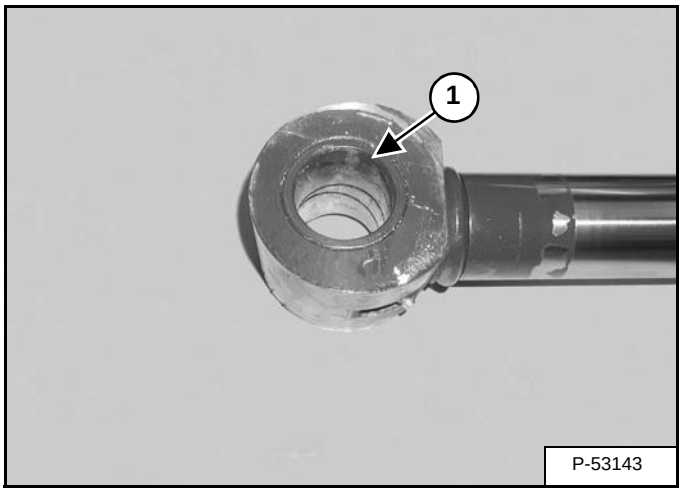
Disassembly (Cont'd)

Figure 20-21-19



Remove the plug (Item 1) and O-ring (Item 2) **[Figure 20-21-19]** from the hose fittings.

Figure 20-21-20



Remove the bushing (Item 1) **[Figure 20-21-20]** from the rod end of the cylinder.

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Assembly

Clean all parts in solvent and dry with compressed air.

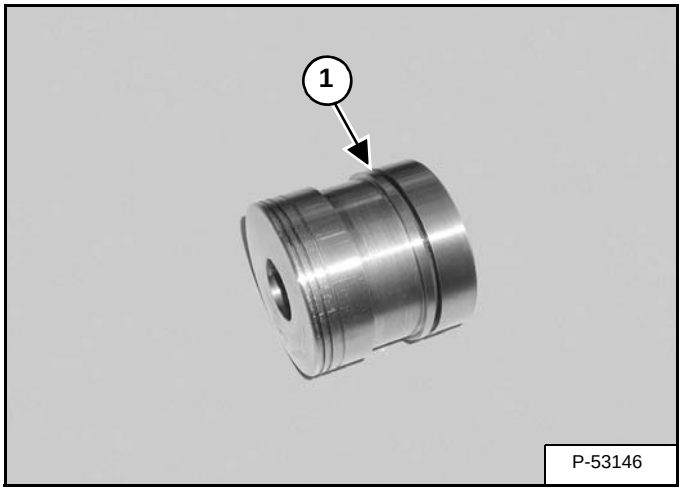
Inspect all parts for wear or damage. Replace any worn or damaged parts.

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

Use the following tools to assemble the cylinder:

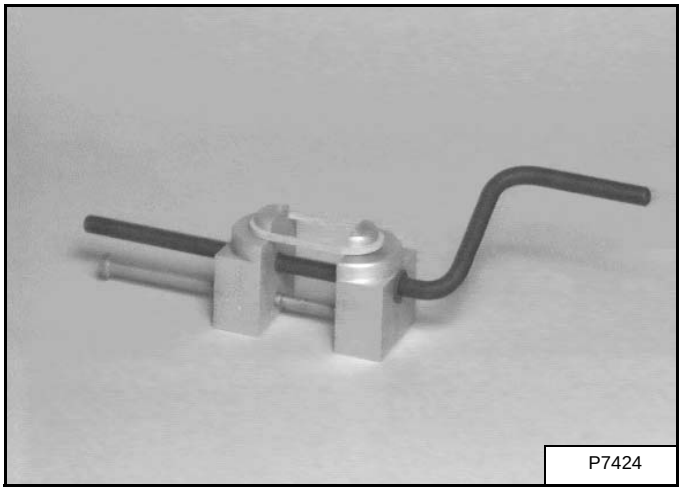
MEL1396 - Universal Seal Expander
Piston Ring Compressor
MEL1075 - Adjustable Gland Nut Wrench
MEL1075-2 - Special Offset Pins

Figure 20-21-21



Install the O-ring on the piston **[Figure 20-21-21]**.

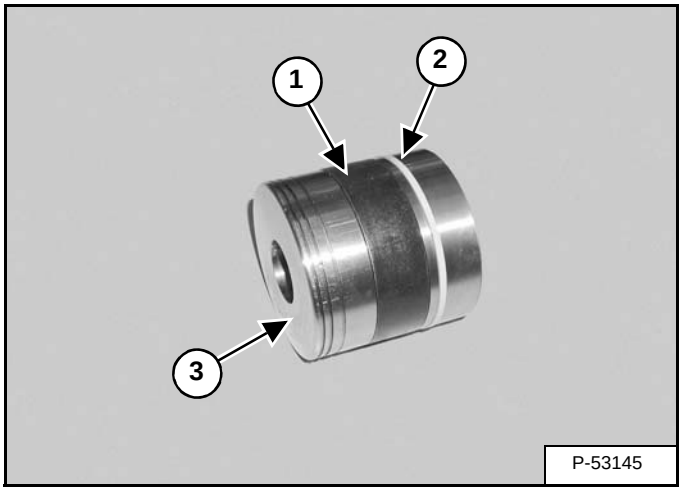
Figure 20-21-22



Install the seal on the tool and stretch it until it fits the piston **[Figure 20-21-22]**.

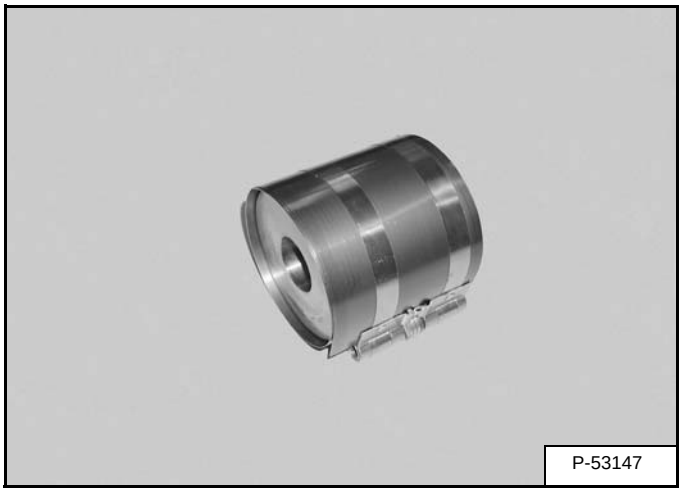
Allow the seal to stretch for 30 seconds before removing it from the tool.

Figure 20-21-23



Install the wear ring (Item 1) and seal (Item 2) on the piston (Item 3) **[Figure 20-21-23]**.

Figure 20-21-24

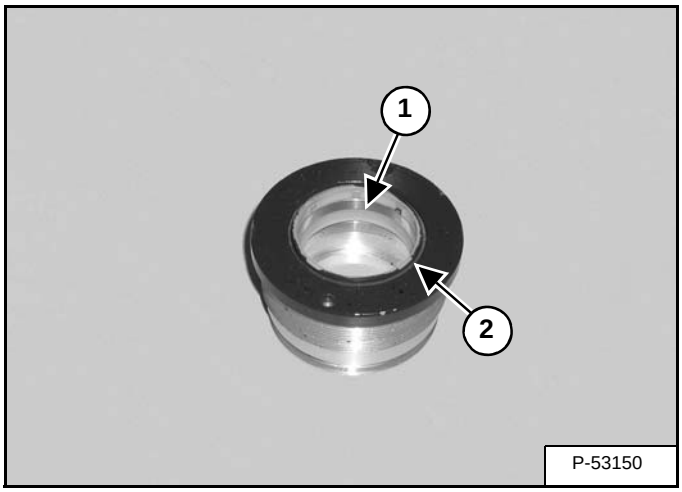


Use a ring compressor to compress the seal to the correct size. Leave the piston in the ring compressor for three minutes **[Figure 20-21-24]**.

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Assembly (Cont'd)

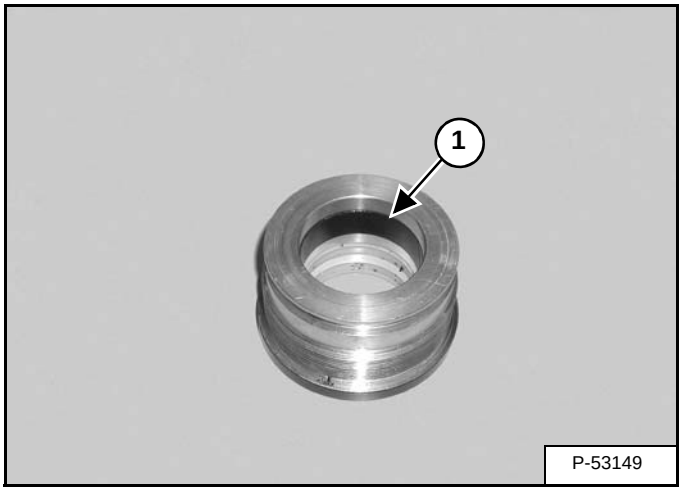
Figure 20-21-25



Install the rod seal in the head (Item 1) **[Figure 20-21-25]**.

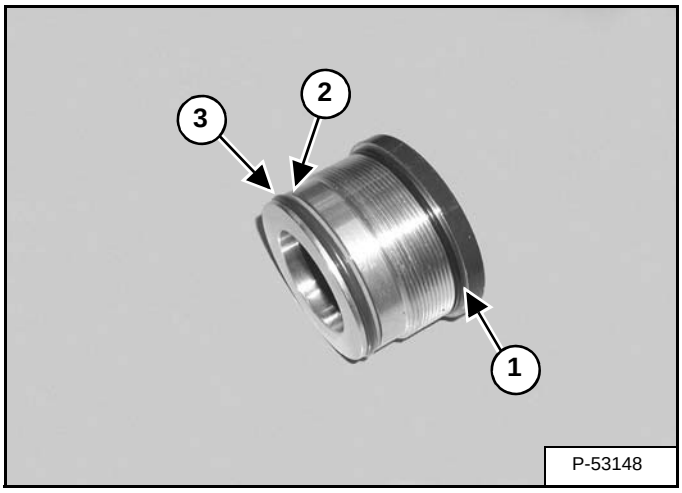
Install the wiper seal (Item 2) **[Figure 20-21-25]** with the wiper toward the outside of the head.

Figure 20-21-26



Install the wear ring (Item 1) **[Figure 20-21-26]**.

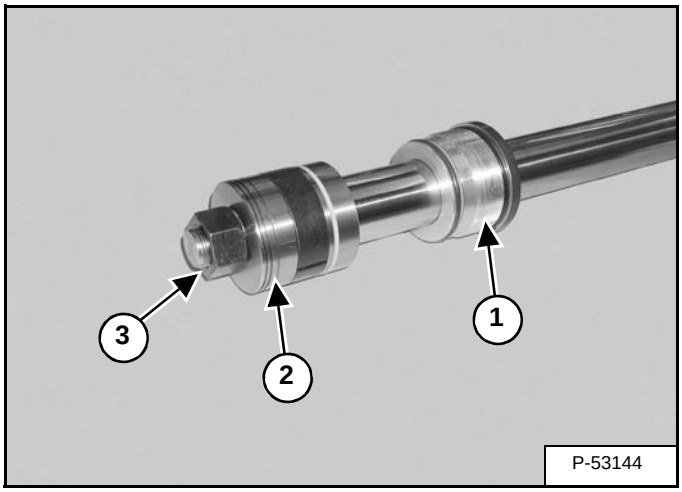
Figure 20-21-27



Install the O-ring (Item 1) **[Figure 20-21-27]**.

Install the back-up ring (Item 2) and O-ring (Item 3) **[Figure 20-21-27]**.

Figure 20-21-28



Install the head (Item 1) and piston (Item 2) **[Figure 20-21-28]** on the rod as shown.

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

Provided an adequate support for the cylinder before tightening.

Install the nut (Item 3) **[Figure 20-21-28]**.

NOTE: Clean and dry the rod threads. Install a NEW NUT with pre-applied Loctite™.

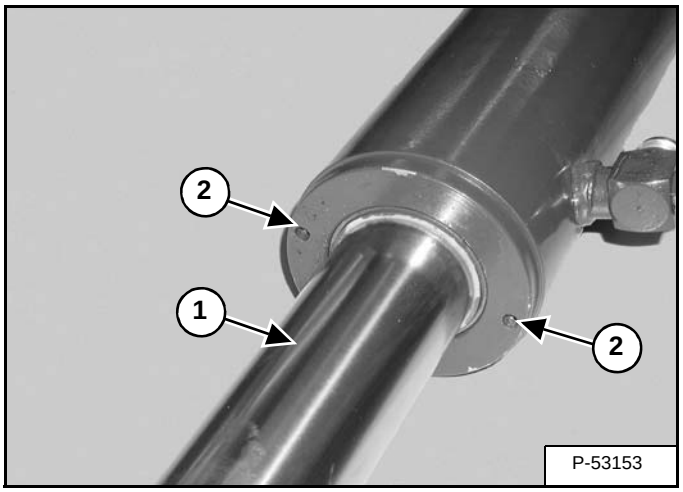
Tighten the nut to 850 ft.-lb. (1152 N•m) torque.

Put the base end of the cylinder in a vise.

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Assembly (Cont'd)

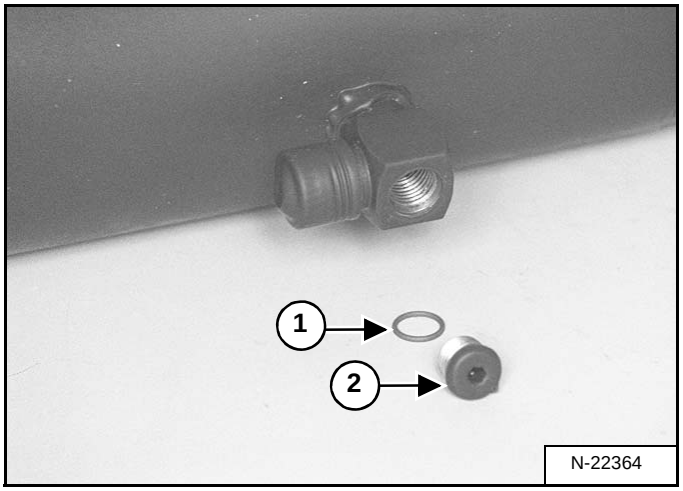
Figure 20-21-29



Install the head and rod assembly (Item 1) **[Figure 20-21-29]** in the housing.

Insert the adjustable gland nut wrench into the holes (Item 2) **[Figure 20-21-29]** to tighten the head. Tighten the head until it is flush with the end of the housing.

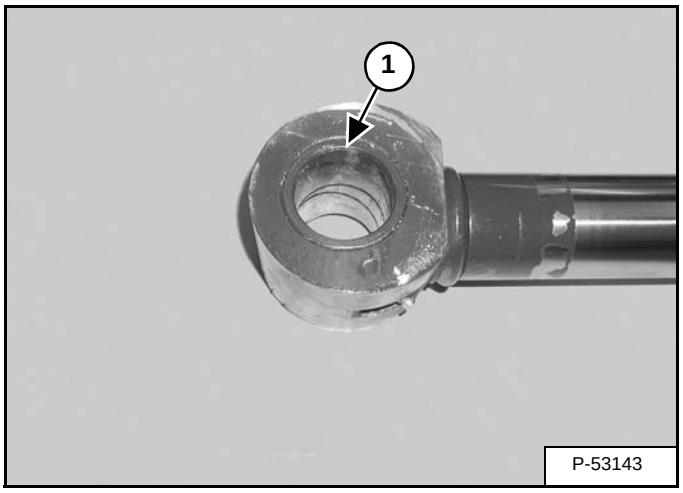
Figure 20-21-30



Install the O-ring (Item 1) and plug (Item 2) **[Figure 20-21-30]** in the hose fittings.

Tighten the plug to 8 ft.-lb. (11 N•m) torque.

Figure 20-21-31



Install the bushing (Item 1) **[Figure 20-21-31]**. The bushing must be aligned with the grease channel in the rod end of the cylinder.

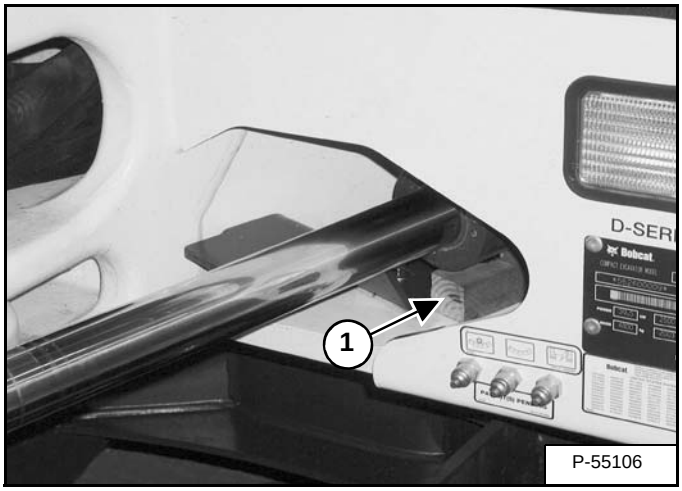
https://www.pdfmanual4trucks.com/

BOOM SWING CYLINDER

Testing

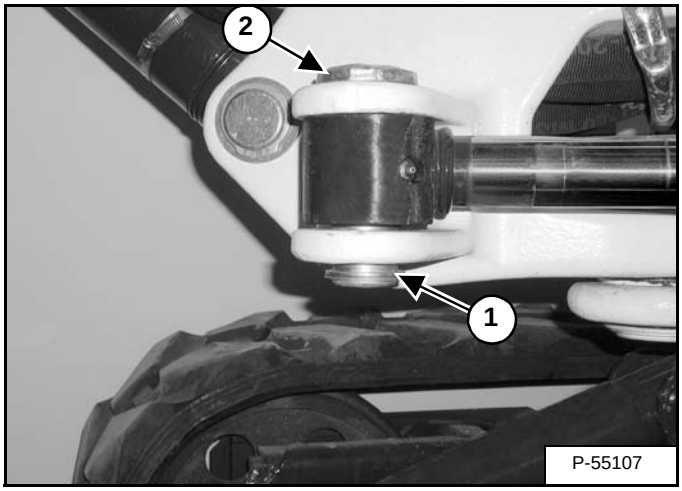
Lower the boom/bucket and blade to the ground.

Figure 20-22-1



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

Figure 20-22-2



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

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

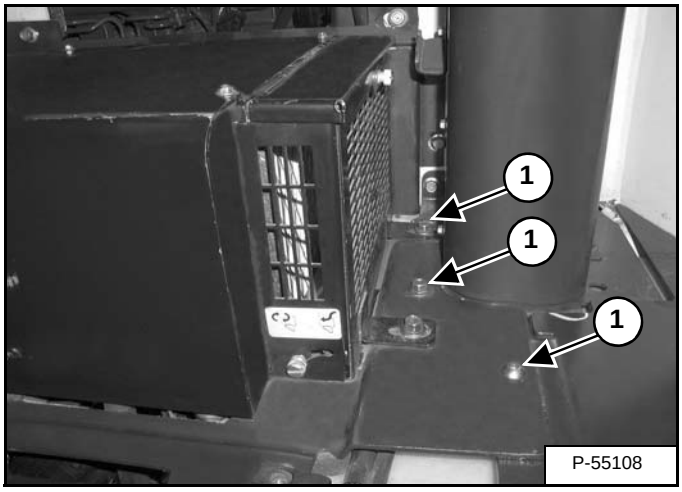
Start the engine and fully retract the cylinder rod **[Figure 20-22-2]**.

Stop the engine.

Remove the floormat and floor plate. (See Removal And Installation on Page 50-120-1)

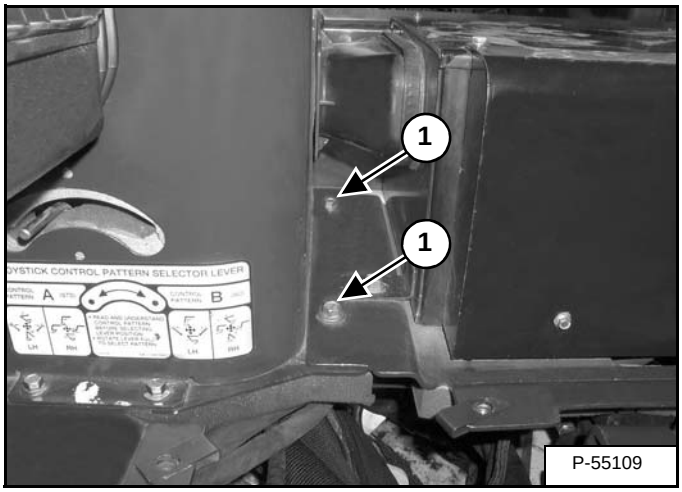
Remove the seat and seat mount. (See Removal And Installation on Page 50-40-1)

Figure 20-22-3



Remove the bolts (Item 1) **[Figure 20-22-3]** from the left side of the rear floor plate.

Figure 20-22-4



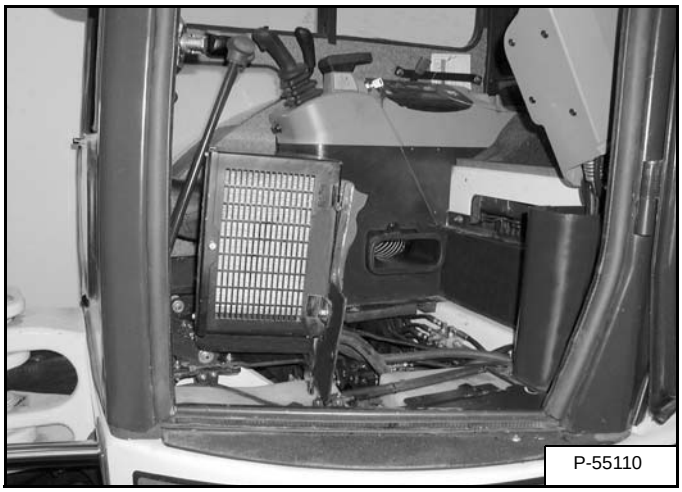
Remove the bolts (Item 1) **[Figure 20-22-4]** from the right side of the rear floor plate.

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BOOM SWING CYLINDER (CONT'D)

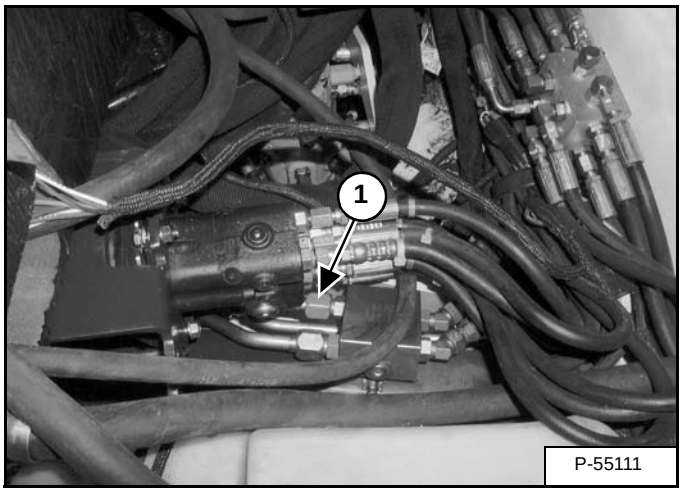
Testing (Cont'd)

Figure 20-22-5



Reposition the evaporator/heater unit as shown (Item 1) **[Figure 20-22-5]**.

Figure 20-22-6



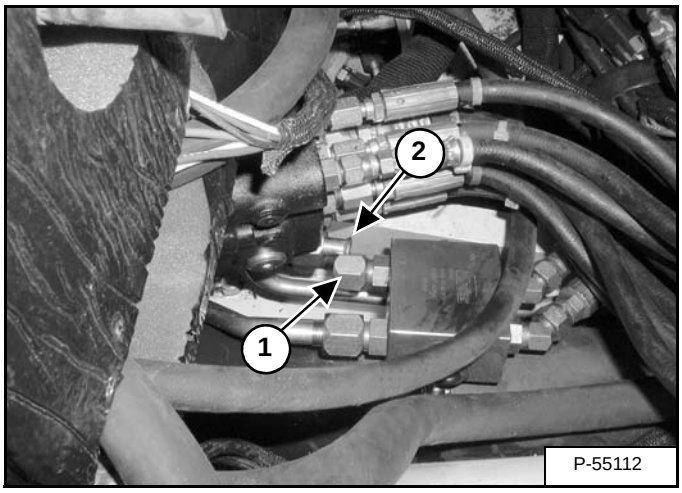
At the boom swing lock valve, on the boom swing cylinder, remove the tubeline (Item 1) **[Figure 20-22-6]** from the lock valve.

⚠ WARNING

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

W-2145-0290

Figure 20-22-7



Cap the fitting (Item 1) **[Figure 20-22-7]** on the swing lock valve.

Start the engine and retract the cylinder.

If there is any oil leakage from the base end fitting (Item 2) **[Figure 20-22-7]** on the boom swing cylinder, remove the cylinder for repair or replacement.

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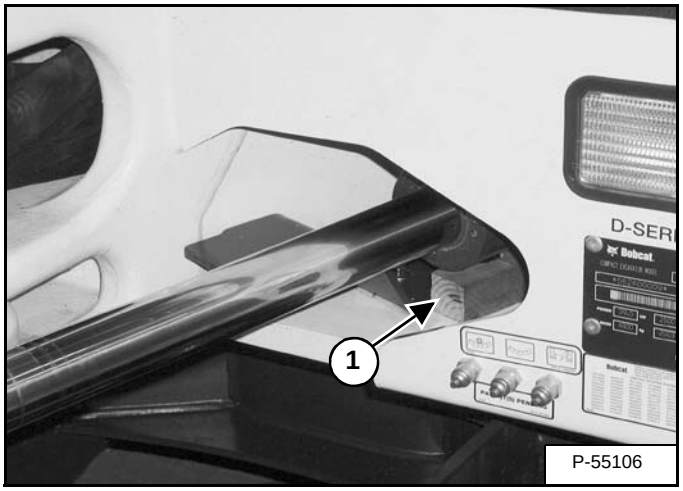
Removal And Installation

Lower the boom/bucket and blade to the ground.

Remove the floormat and floor plate. (See Removal And Installation on Page 50-120-1)

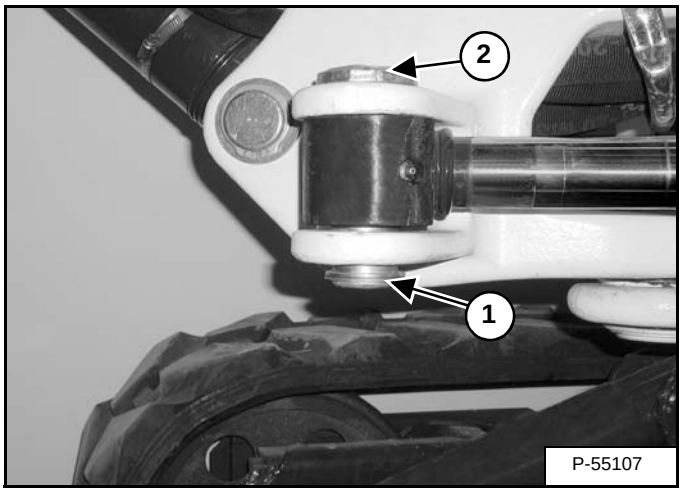
Remove the travel controls. (See Removal And Installation on Page 50-100-1)

Figure 20-22-8



Place a block (Item 1) **[Figure 20-22-8]** under the rod end of the boom swing cylinder.

Figure 20-22-9

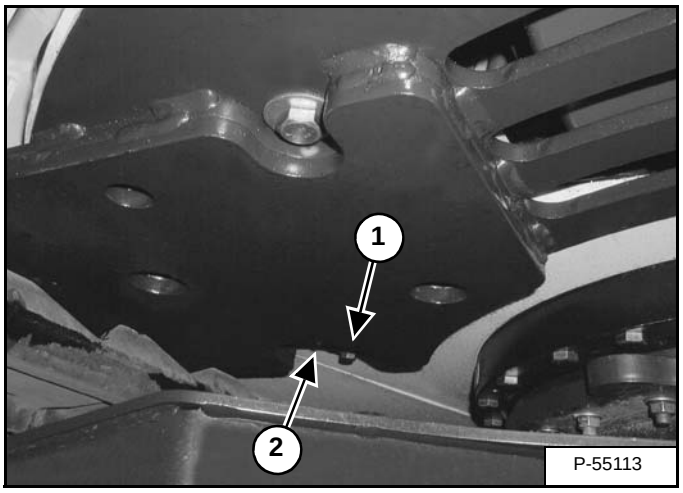


Remove the snap ring and washer (Item 1) **[Figure 20-22-9]** from the rod end pin of the cylinder.

Remove the pin (Item 2) **[Figure 20-22-9]**.

Remove the boom swing lock valve. (See Removal And Installation on Page 20-200-1)

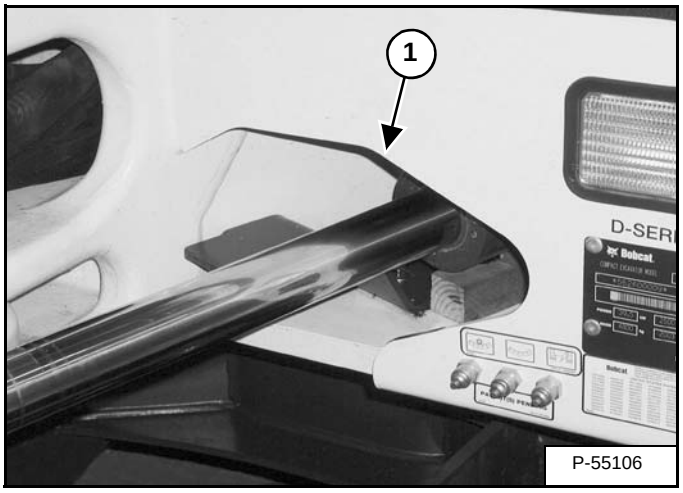
Figure 20-22-10



Remove the bolt (Item 1) **[Figure 20-22-10]** from the cylinder base end pin located under the right side of the upperstructure.

Remove the pin (Item 2) **[Figure 20-22-10]**.

Figure 20-22-11

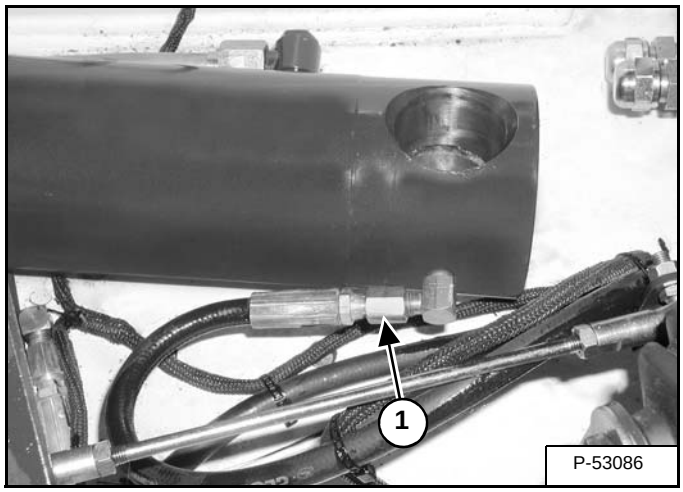


Slide the cylinder forward through the hole (Item 1) **[Figure 20-22-11]** to provide access to the base end of the cylinder.

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Removal And Installation (Cont'd)

Figure 20-22-12



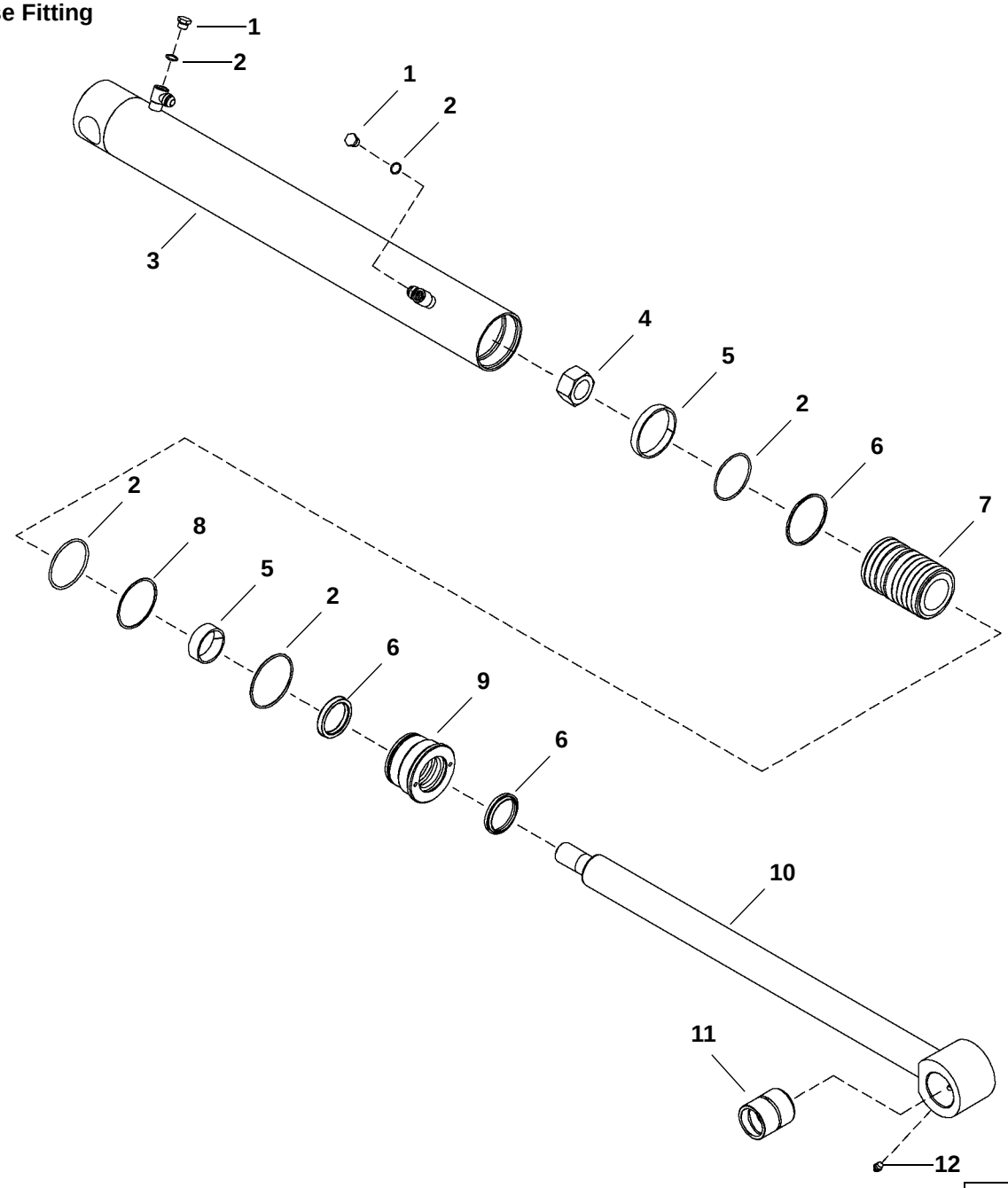
Remove the grease fitting hose (Item 1) **[Figure 20-22-12]**.

Remove the cylinder from the Excavator.

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Parts Identification

1. Plug
2. O-Ring
3. Housing
4. Nut
5. Wear Ring
6. Seal
7. Piston
8. Backup Ring
9. Head
10. Rod
11. Bushing
12. Grease Fitting



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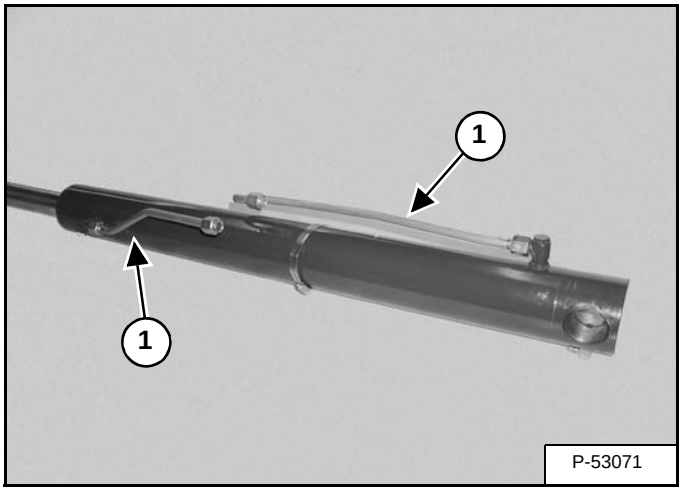
Disassembly

Clean the outside of the boom swing cylinder before disassembly.

The following tools will be needed to disassemble and assemble the cylinders:

1. MEL1075 - Adjustable Gland Nut Wrench
2. MEL1074 - O-Ring Seal Hook
3. MEL1396 - Seal Installation Tool
4. MEL1033 - Rod Seal Installation Tool

Figure 20-22-13

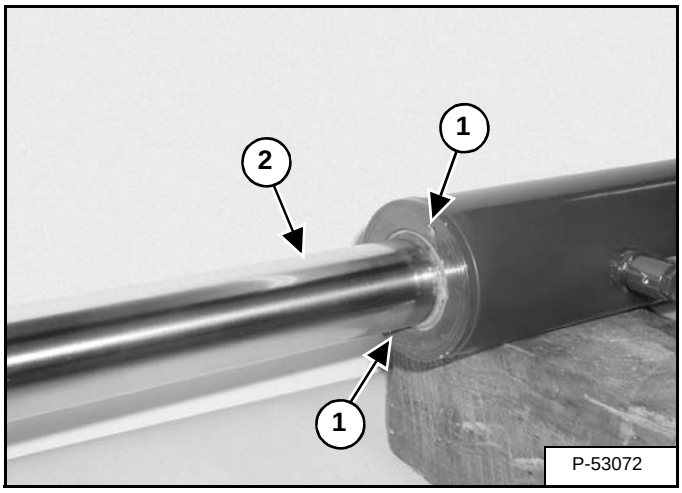


Remove the tubelines (Item 1) **[Figure 20-22-13]**.

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

Put the base end of the cylinder in a vise.

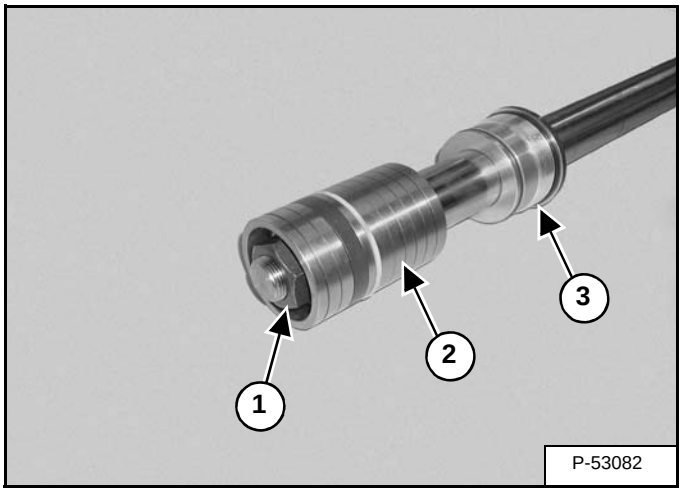
Figure 20-22-14



Insert the adjustable gland nut wrench into the holes **[Figure 20-22-14]** to loosen the head.

Remove the head and rod assembly (Item 2) **[Figure 20-22-14]** from the cylinder housing. Put the rod end in a vise.

Figure 20-22-15

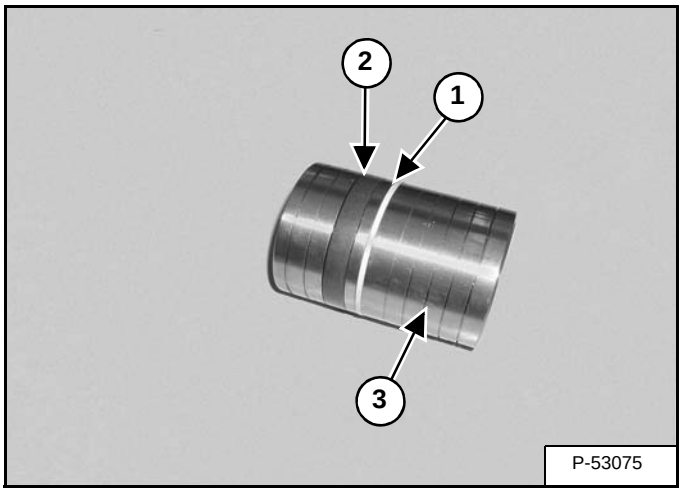


Remove the nut (Item 1), piston (Item 2) and head (Item 3) **[Figure 20-22-15]**.

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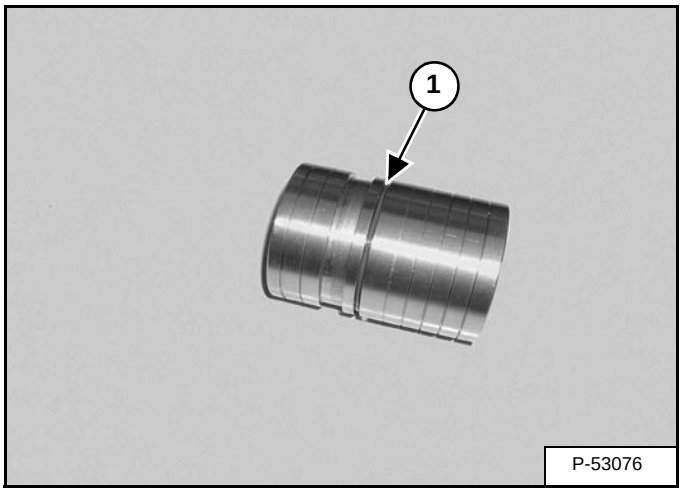
Disassembly (Cont'd)

Figure 20-22-16



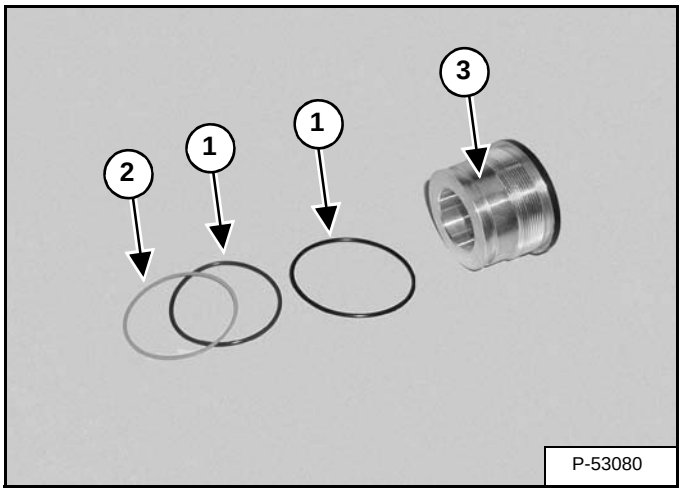
Remove the seal (Item 1) and wear ring (Item 2) from the piston (Item 3) **[Figure 20-22-16]**.

Figure 20-22-17



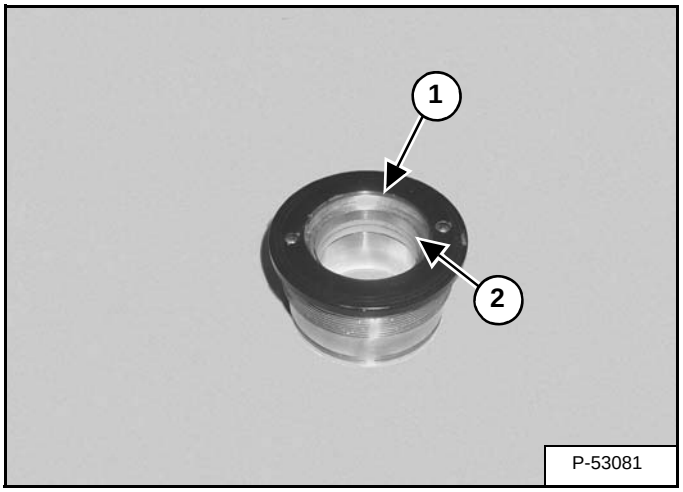
Remove the O-ring (Item 1) **[Figure 20-22-17]**.

Figure 20-22-18



Remove the O-rings (Item 1) and the back-up ring (Item 2) from the head (Item 3) **[Figure 20-22-18]**.

Figure 20-22-19

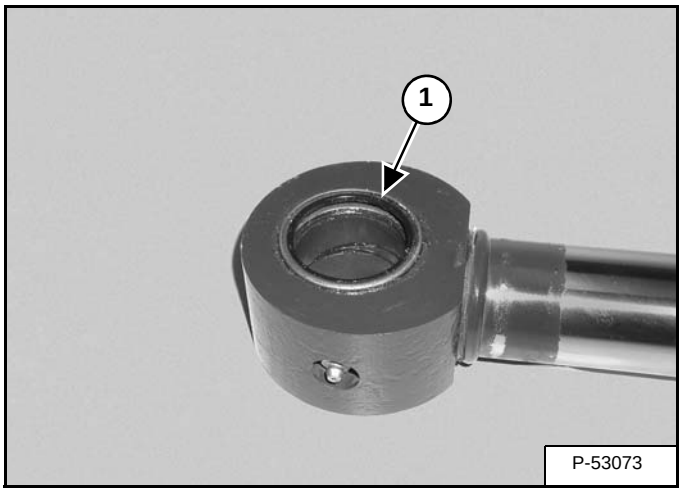


Remove the wiper seal (Item 1) and rod seal (Item 2) **[Figure 20-22-19]** from the inside of the head.

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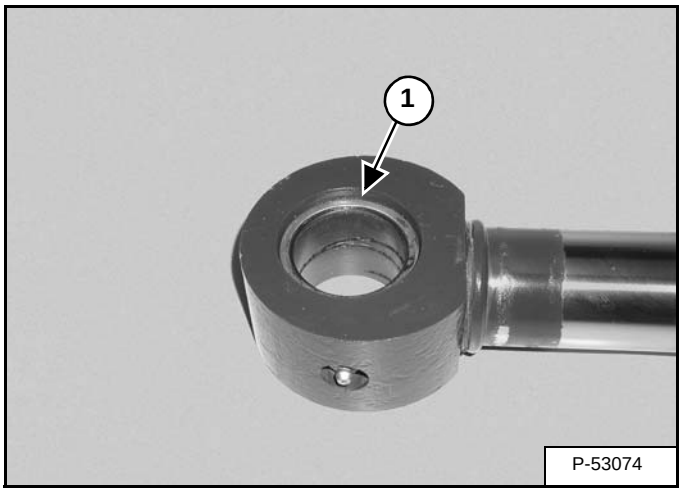
Disassembly (Cont'd)

Figure 20-22-20



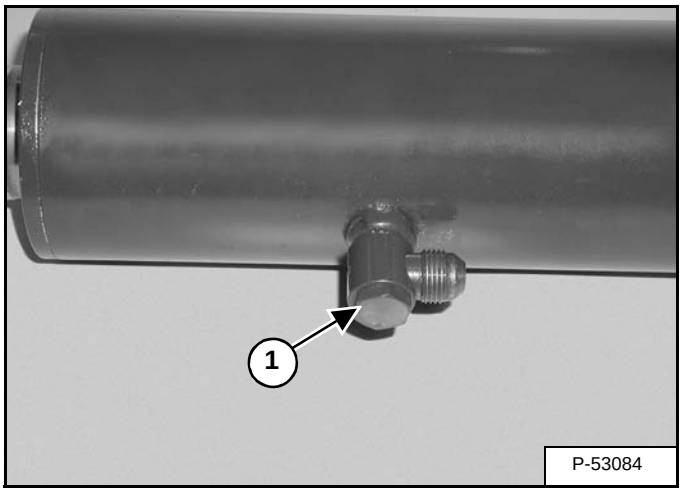
Remove seal (Item 1) **[Figure 20-22-20]**. (Both sides)

Figure 20-22-21



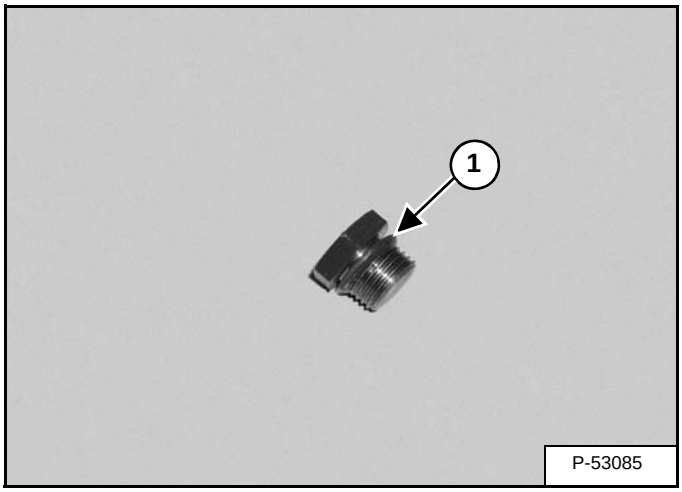
Remove the bushing (Item 1) **[Figure 20-22-21]**.

Figure 20-22-22



Remove the plug (Item 1) **[Figure 20-22-22]** from both hose fittings.

Figure 20-22-23



Remove the O-ring (Item 1) **[Figure 20-22-22]** from the plugs.

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Assembly

Clean all parts in solvent and dry with compressed air.

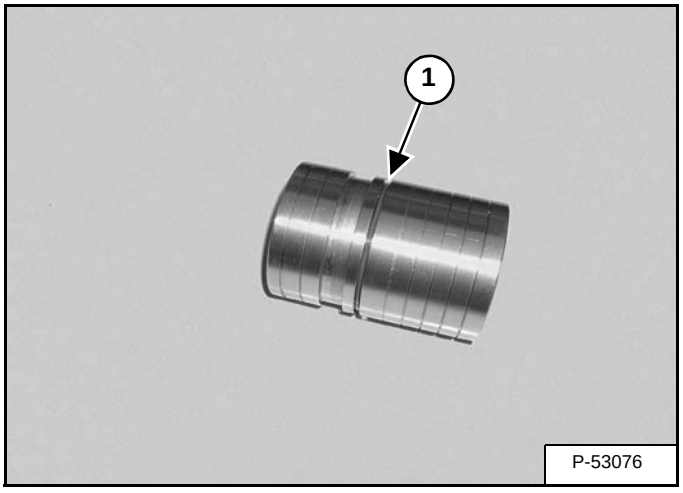
Inspect all parts for wear or damage. Replace any worn or damaged parts.

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

Use the following tools to assemble the cylinder:

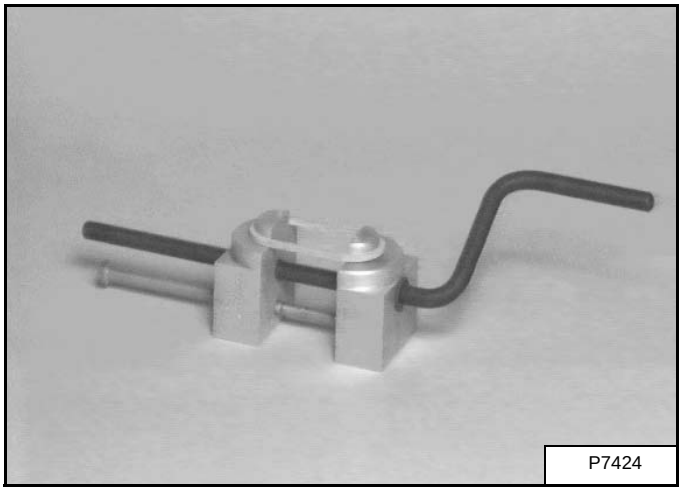
MEL1396 - Universal Seal Expander
Piston Ring Compressor
MEL1075 - Adjustable Gland Nut Wrench
MEL1075-1 - Standard Pins

Figure 20-22-24



Install the O-ring **[Figure 20-22-24]** on the piston.

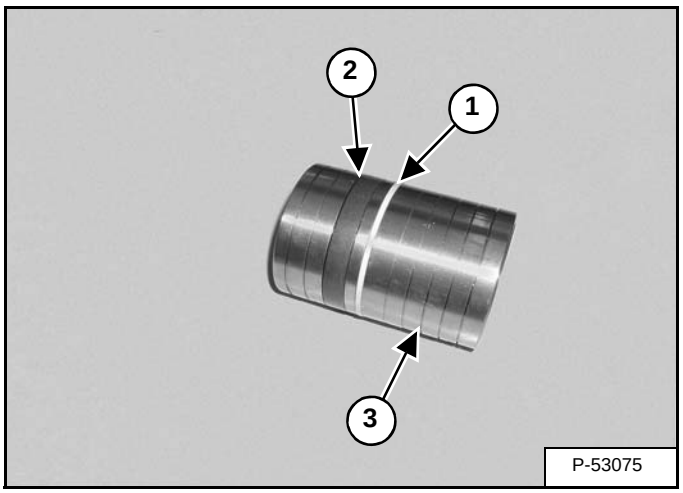
Figure 20-22-25



Install the seal on the tool and stretch it until it fits the piston **[Figure 20-22-25]**.

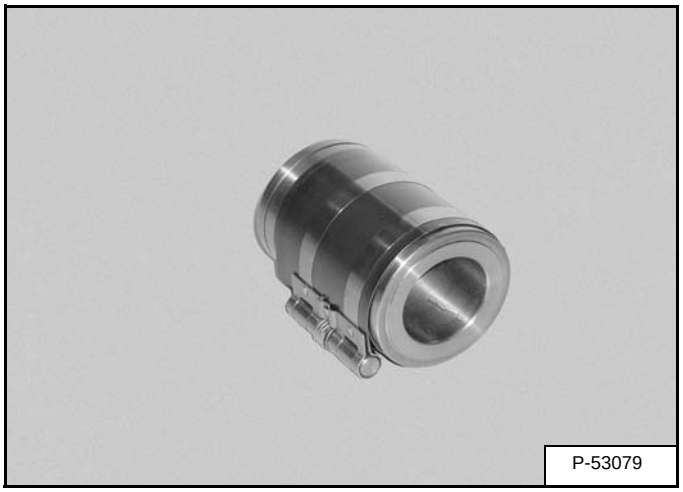
Allow the seal to stretch for 30 seconds before removing it from the tool.

Figure 20-22-26



Install the seal (Item 1) and wear ring (Item 2) on the piston (Item 3) **[Figure 20-22-26]**.

Figure 20-22-27

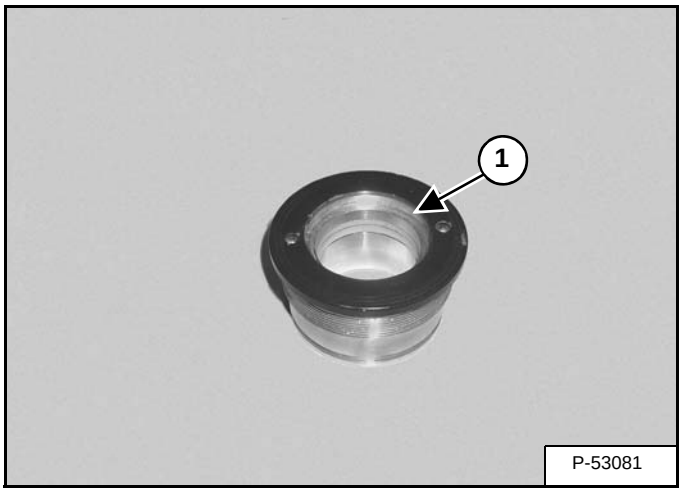


Use a ring compressor to compress the seal to the correct size. Leave the piston in the ring compressor for three minutes **[Figure 20-22-27]**.

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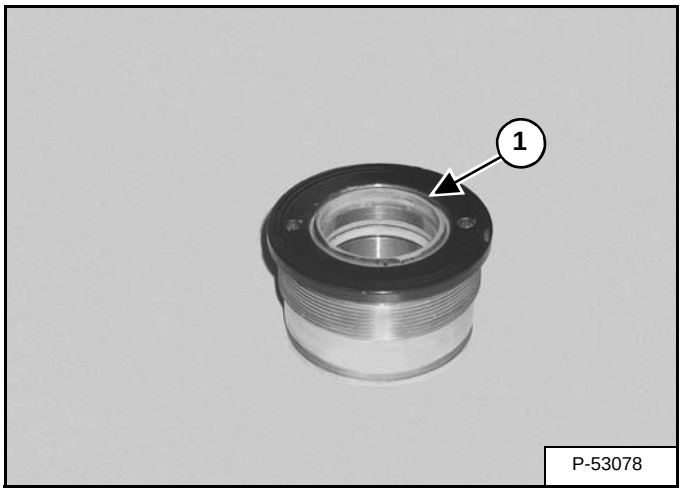
Assembly (Cont'd)

Figure 20-22-28



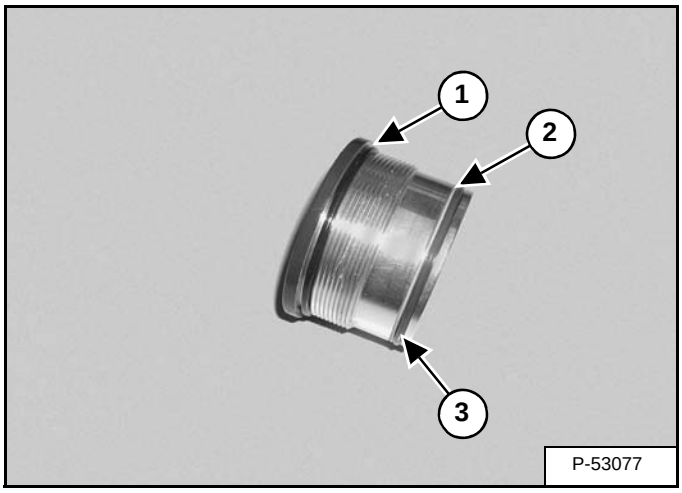
Install the rod seal in the head (Item 1) **[Figure 20-22-28]**.

Figure 20-22-29



Install the wiper seal with the wiper (Item 1) **[Figure 20-22-29]** toward the outside of the head.

Figure 20-22-30



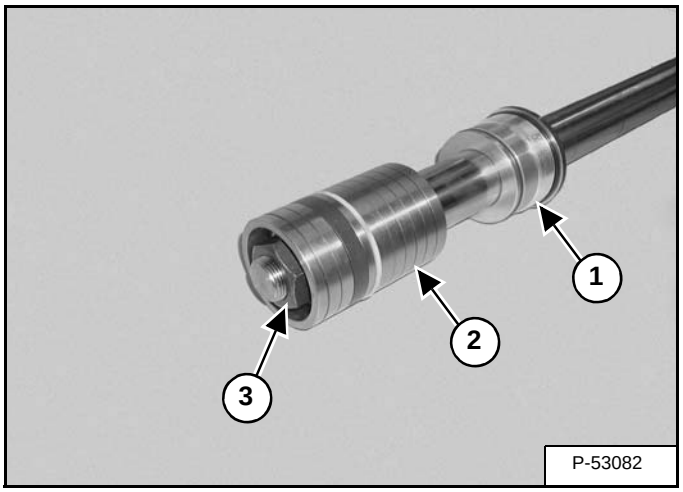
Install the O-ring (Item 1) **[Figure 20-22-30]**.

Install the back-up ring (Item 2) and O-ring (Item 3) **[Figure 20-22-30]** on the head.

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Assembly (Cont'd)

Figure 20-22-31



Install the head (Item 1) and the piston (Item 2) **[Figure 20-22-31]** on the rod as shown.

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

Provide an adequate support for the cylinder before tightening.

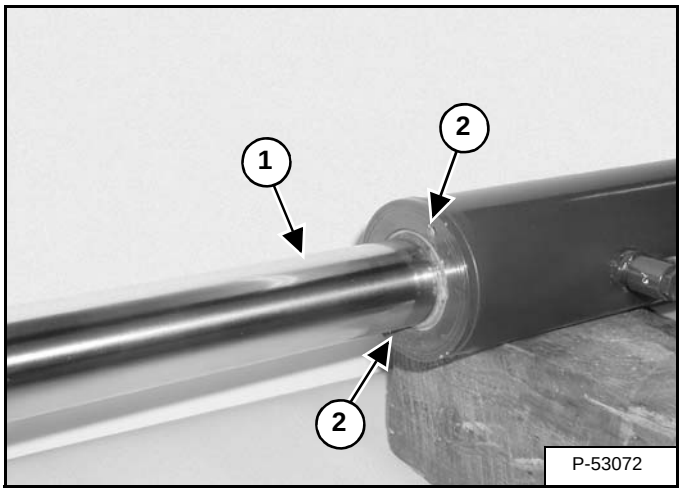
Install the nut (Item 3) **[Figure 20-22-31]**.

NOTE: Clean and dry the rod threads. Install a NEW NUT with pre-applied Loctite™.

Tighten the nut to 850 ft.-lb. (1152,6 N•m) torque.

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

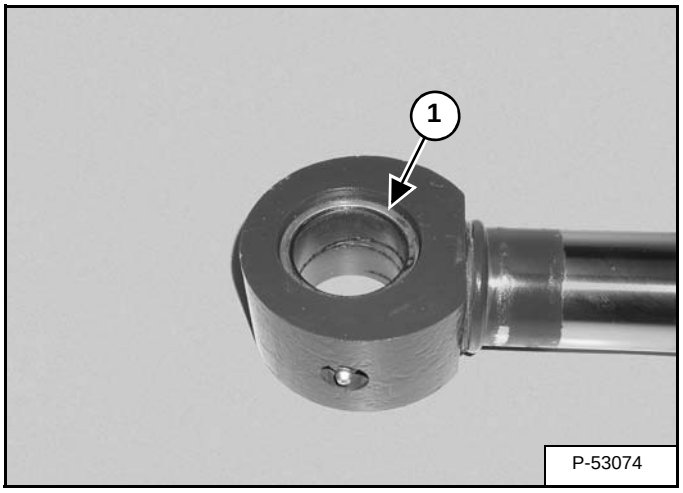
Figure 20-22-32



Install the head and rod assembly (Item 1) **[Figure 20-22-32]** in the housing.

Insert the adjustable gland nut wrench into the holes (Item 2) **[Figure 20-22-32]** to tighten the head. Head to be torqued until flush with the end of the housing.

Figure 20-22-33

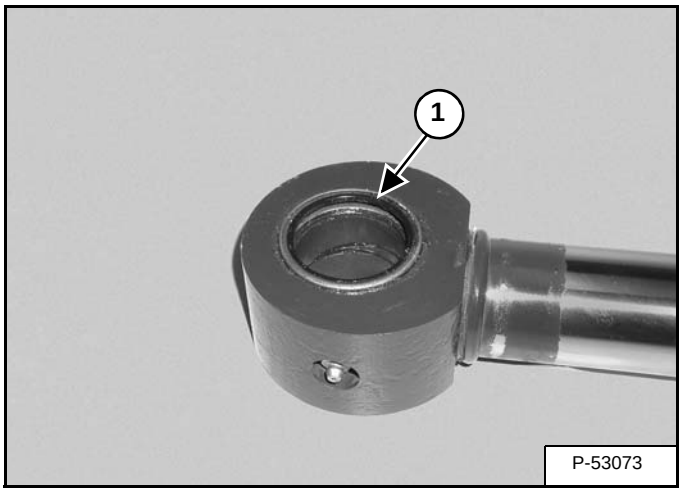


Install the bushing (Item 1) **[Figure 20-22-33]**. The bushing must be aligned with the grease channel in the rod end of the cylinder.

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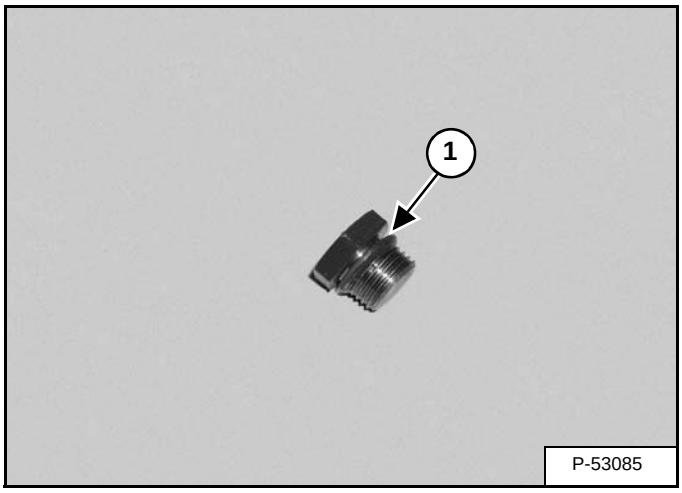
Assembly (Cont'd)

Figure 20-22-34



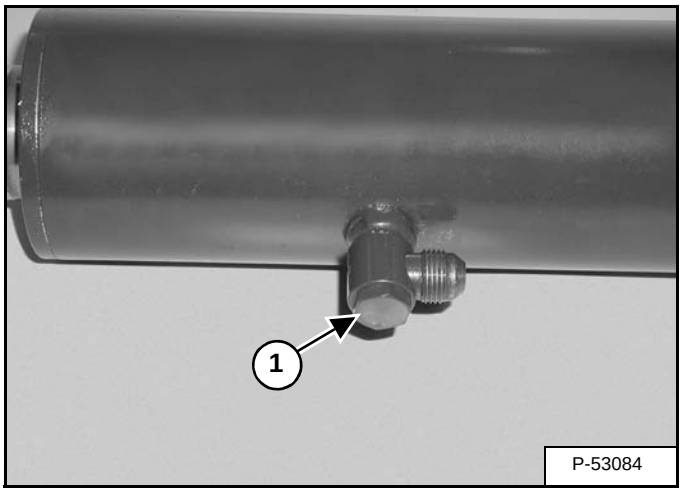
Install the seal (Item 1) **[Figure 20-22-34]**. (Both sides)

Figure 20-22-35



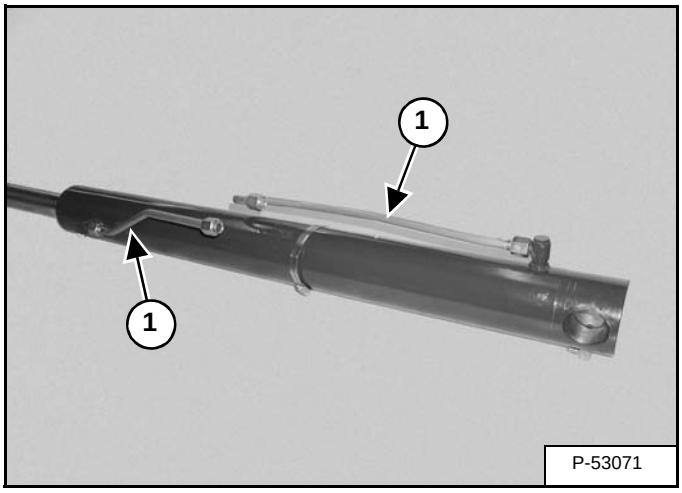
Install the O-ring (Item 1) **[Figure 20-22-35]** on the plugs.

Figure 20-22-36



Install the plug **[Figure 20-22-36]** in both hose fittings.

Figure 20-22-37



Install the tubelines (Item 1) **[Figure 20-22-37]**.

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BUCKET CYLINDER

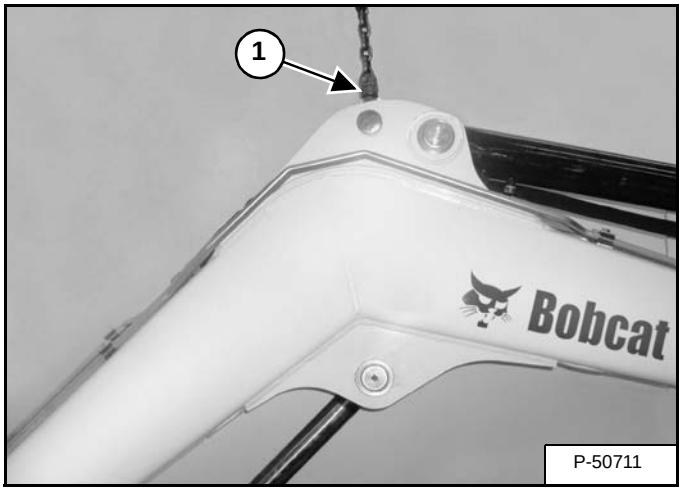
Testing

Lower the boom/bucket and blade to the ground.

Stop the engine.

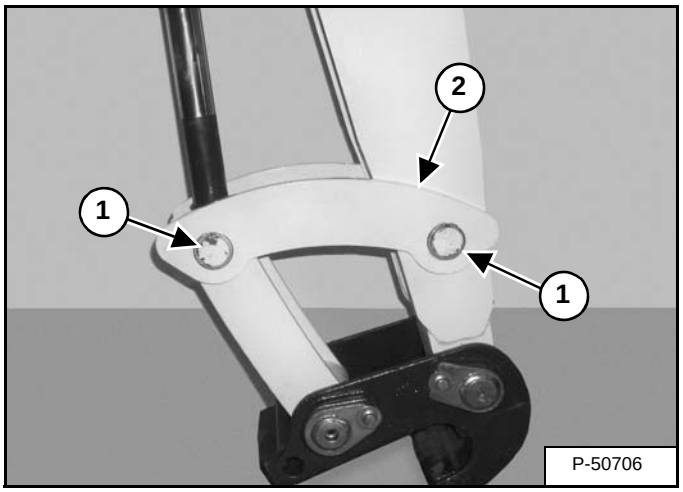
With the engine off, turn the key to the ON position and move both hydraulic control levers to relieve hydraulic pressure.

Figure 20-23-1



Support the boom with a chain hoist (Item 1) **[Figure 20-23-1]**.

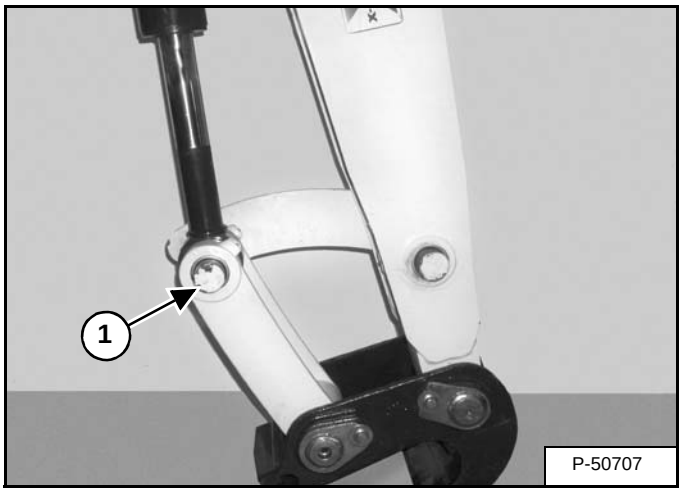
Figure 20-23-2



Remove the snap rings and washers (Item 1) from the cylinder rod end pin link (Item 2) **[Figure 20-23-2]**.

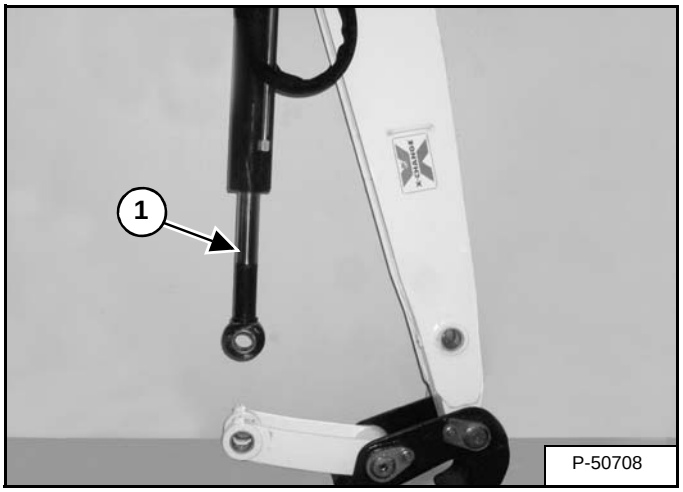
Remove the cylinder rod end pin link (Item 2) **[Figure 20-23-2]**.

Figure 20-23-3



Remove the cylinder rod end pin (Item 1) **[Figure 20-23-3]**.

Figure 20-23-4

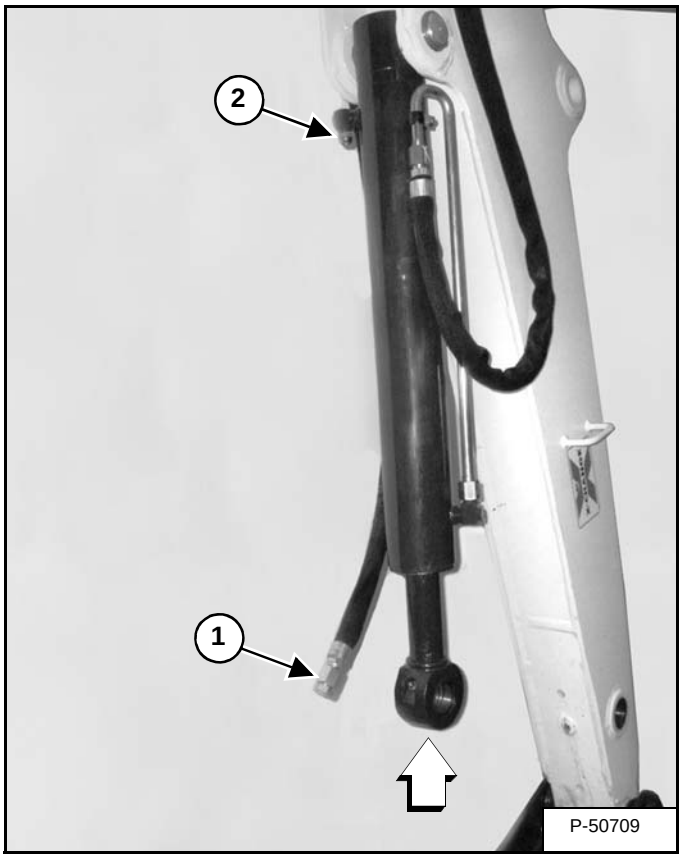


Start the engine and retract the bucket cylinder (Item 1) **[Figure 20-23-4]**.

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Testing (Cont'd)

Figure 20-23-5



Stop the engine. Relieve hydraulic pressure and remove the hose (Item 1) **[Figure 20-23-5]** from the base end of the cylinder.

Cap the hose (Item 1) **[Figure 20-23-5]**.

Start the Excavator and retract the cylinder.

If there is any oil leakage from the base end fitting (Item 2) **[Figure 20-23-5]** on the bucket cylinder, remove the cylinder for repair or replacement.

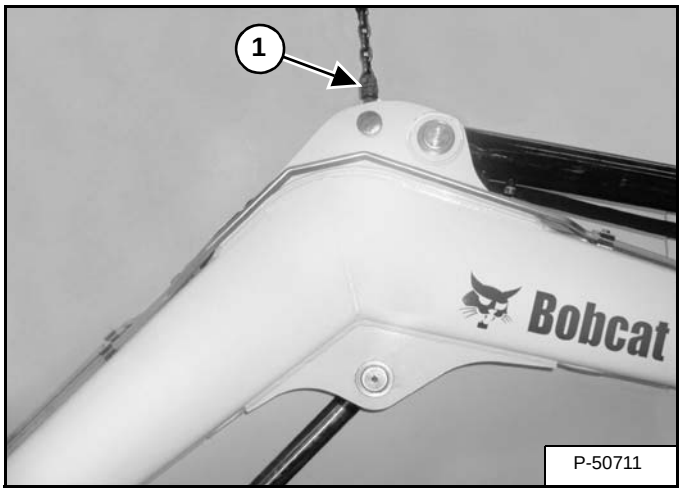
https://www.pdfmanual4trucks.com/

Removal And Installation

Lower the boom/bucket and blade to the ground.

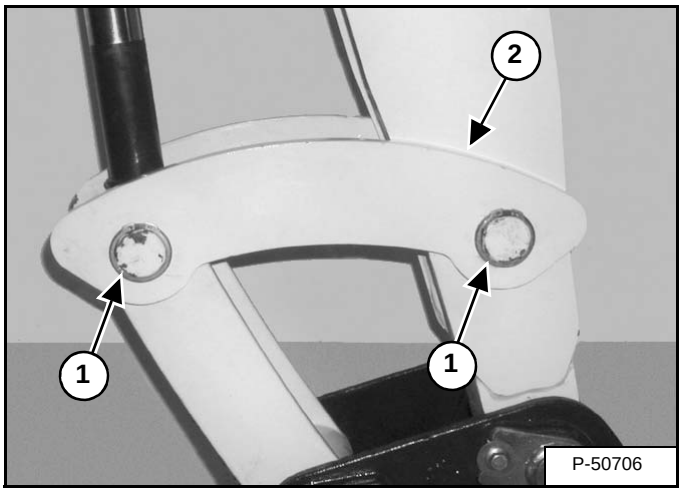
With the engine off, turn the key to the ON position and move both hydraulic control levers to relieve hydraulic pressure.

Figure 20-23-6



Support the boom with a chain hoist (Item 1) **[Figure 20-23-6]**.

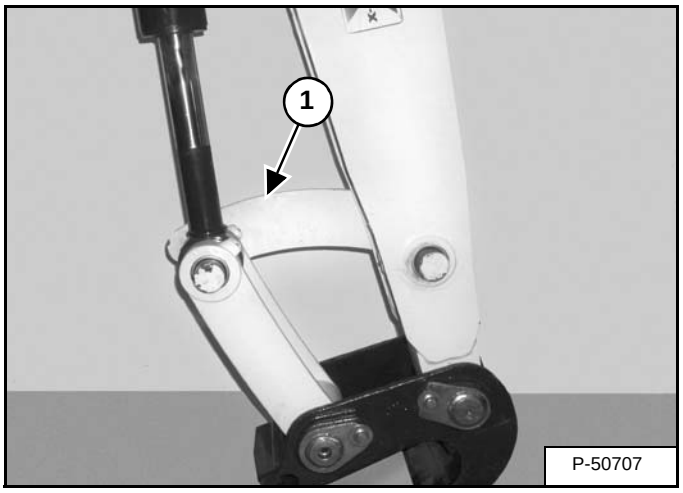
Figure 20-23-7



Remove the snap rings and washers from the cylinder rod end pin link (Item 1) **[Figure 20-23-7]**.

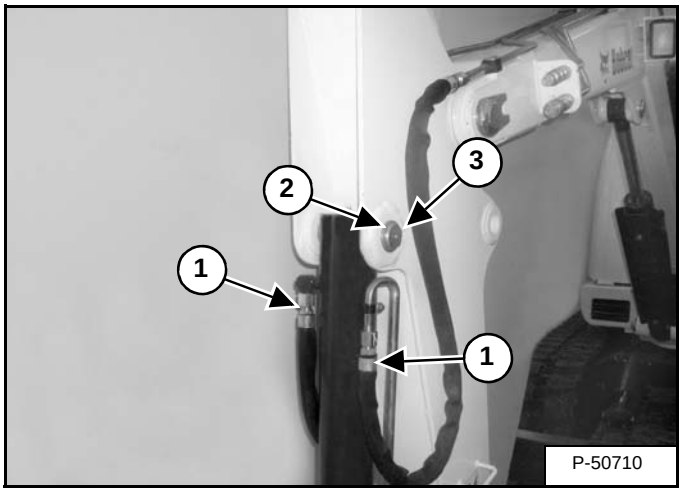
Remove the cylinder rod end pin link (Item 2) **[Figure 20-23-7]**.

Figure 20-23-8



Remove the cylinder rod end pin (Item 1) **[Figure 20-23-8]** from the cylinder and arm.

Figure 20-23-9



Mark and remove the hoses (Item 1) **[Figure 20-23-9]**.

IMPORTANT

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

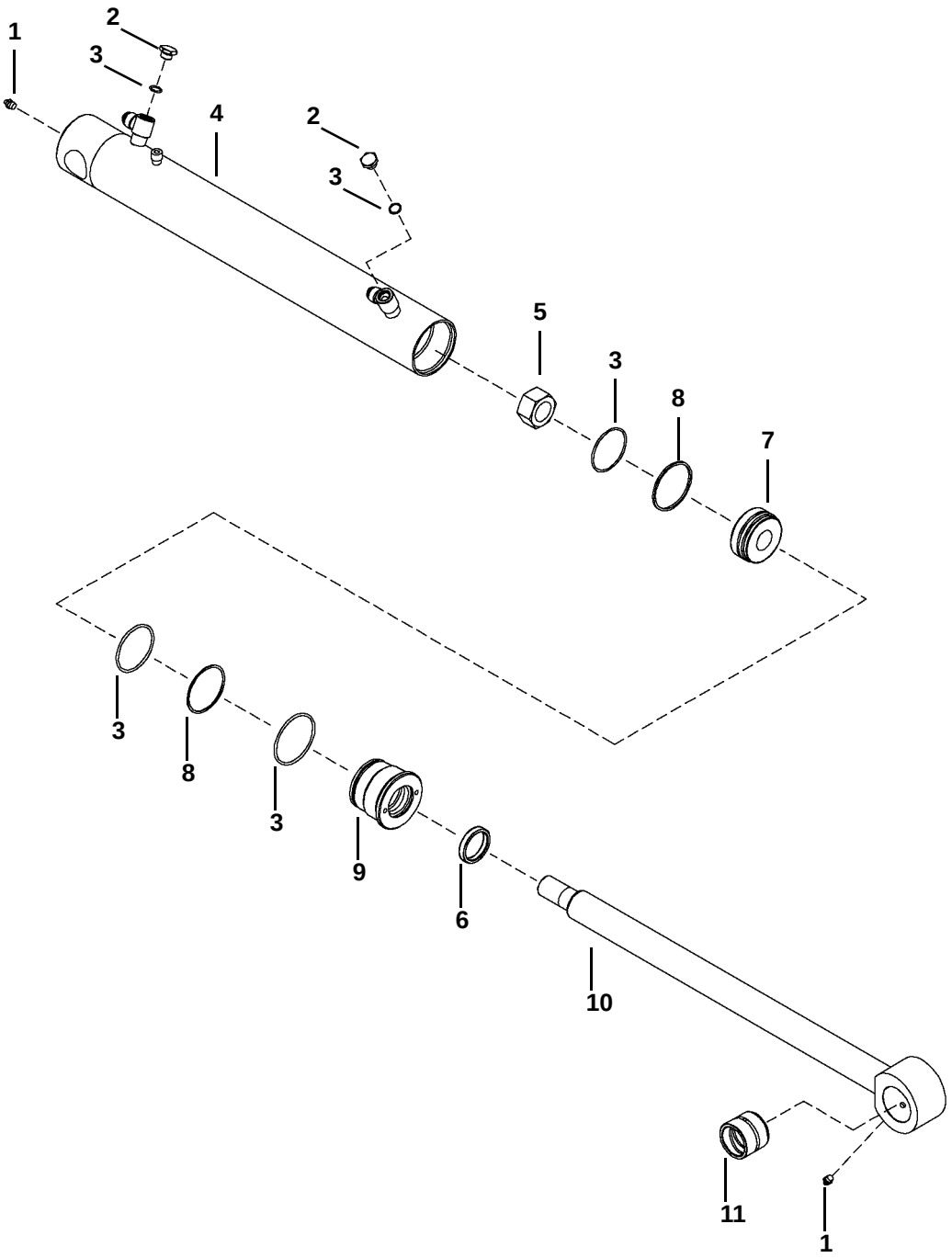
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Remove the snap ring (Item 2) and washer from the cylinder base end pin. Remove the pin (Item 3) **[Figure 20-23-9]**. Remove the bucket cylinder from the Excavator.

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Parts Identification

1. Grease Fitting
2. Plug
3. O-Ring
4. Housing
5. Nut
6. Seal
7. Piston
8. Backup Ring
9. Head
10. Rod
11. Bushing



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Disassembly

Clean the outside of the bucket cylinder before disassembly.

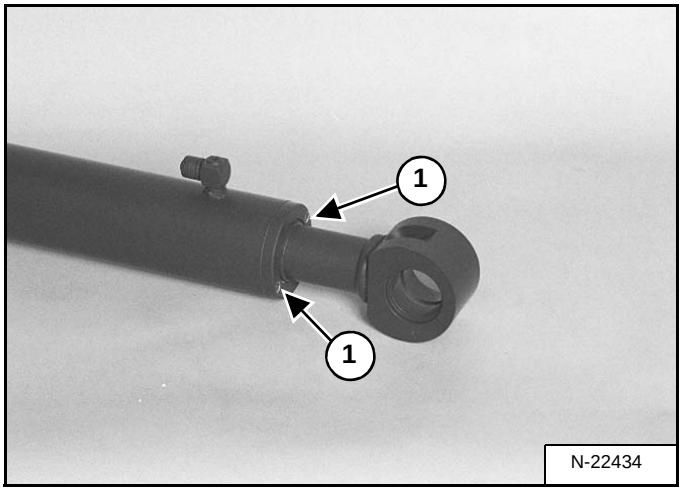
Use the following tools to disassemble the cylinder:

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.

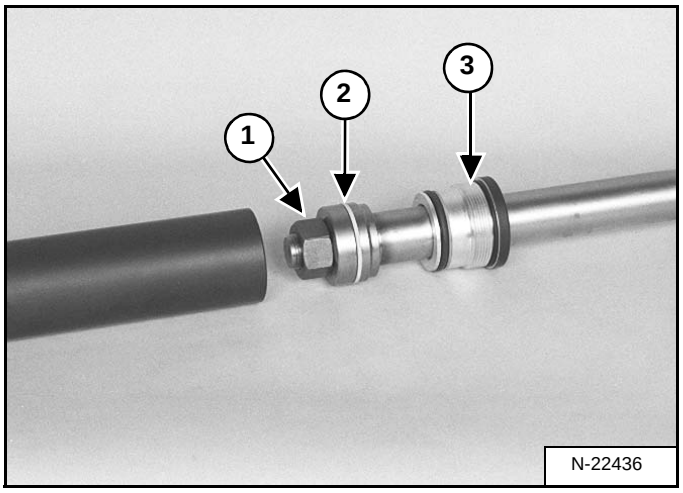
Put the base end of the cylinder in a vise.

Figure 20-23-10



Insert the adjustable gland nut wrench into the holes (Item 1) **[Figure 20-23-10]** to loosen the head.

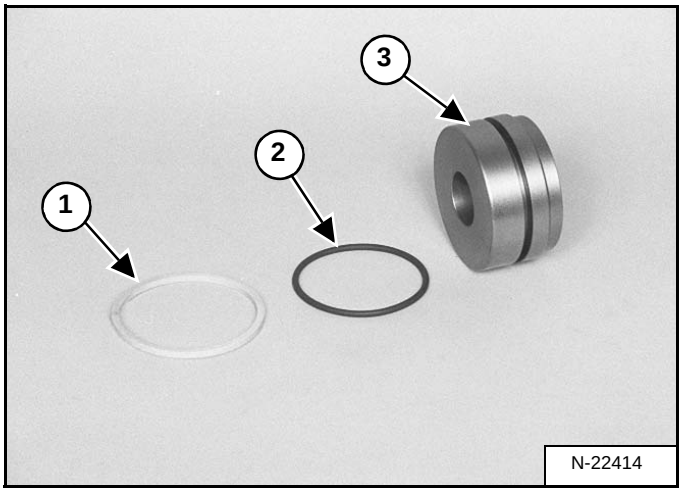
Figure 20-23-11



Remove the head and the rod assembly from the cylinder **[Figure 20-23-11]**. Put the rod end in a vise.

Remove the nut (Item 1), piston (Item 2) and head (Item 3) **[Figure 20-23-11]**.

Figure 20-23-12

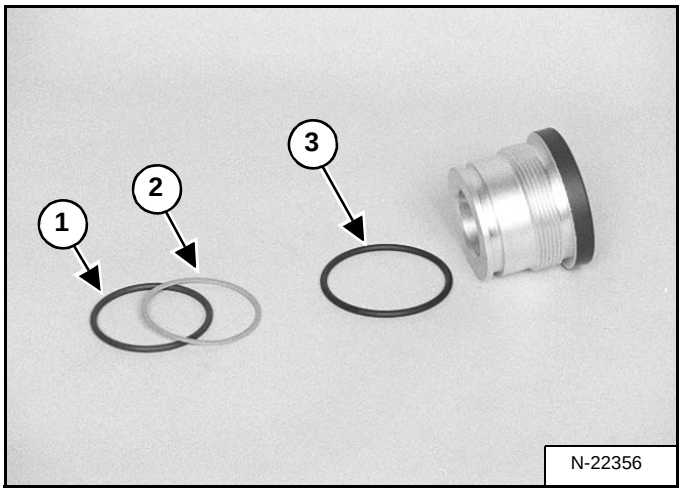


Remove the seal (Item 1) and O-ring (Item 2) from the piston (Item 3) **[Figure 20-23-12]**.

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Disassembly (Cont'd)

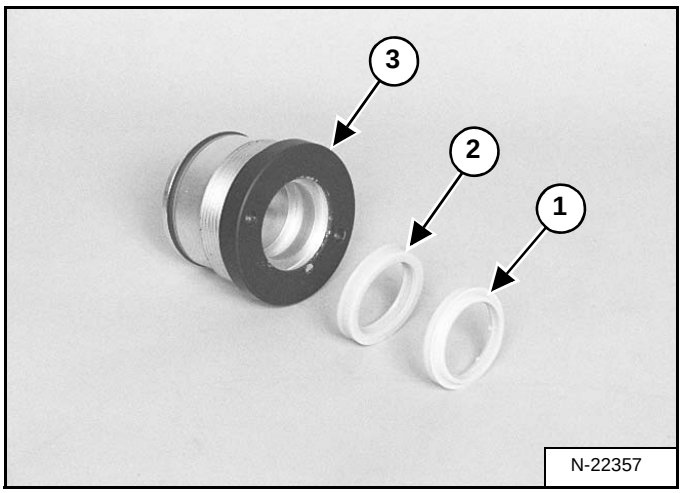
Figure 20-23-13



Remove the O-ring (Item 1) and the back-up ring (Item 2) **[Figure 20-23-13]**.

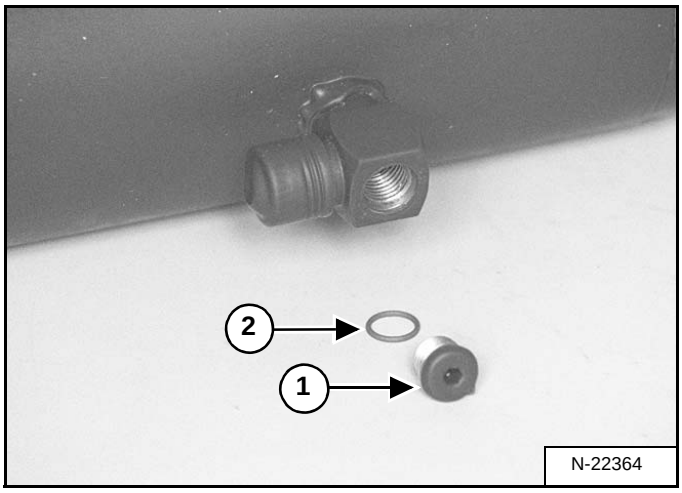
Remove the O-ring (Item 3) **[Figure 20-23-13]**.

Figure 20-23-14



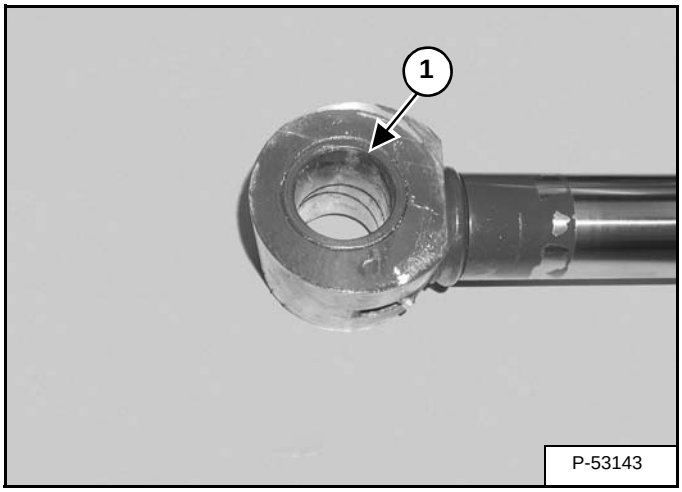
Remove the wiper seal (Item 1) and rod seal (Item 2) from the inside of the head (Item 3) **[Figure 20-23-14]**.

Figure 20-23-15



Remove the plug (Item 1) and O-ring (Item 2) **[Figure 20-23-15]**.

Figure 20-23-16



Remove the bushing (Item 1) **[Figure 20-23-16]**.

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Assembly

Clean all parts in solvent and dry with compressed air.

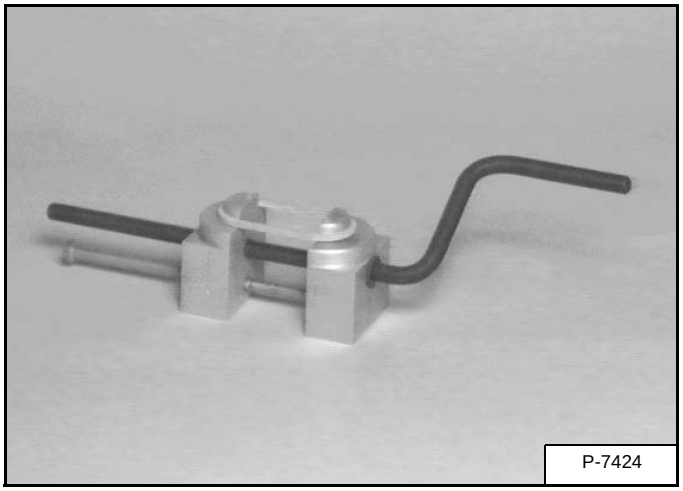
Inspect all parts for wear or damage. Replace any worn or damaged parts.

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

Use the following tools to assemble the cylinder:

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

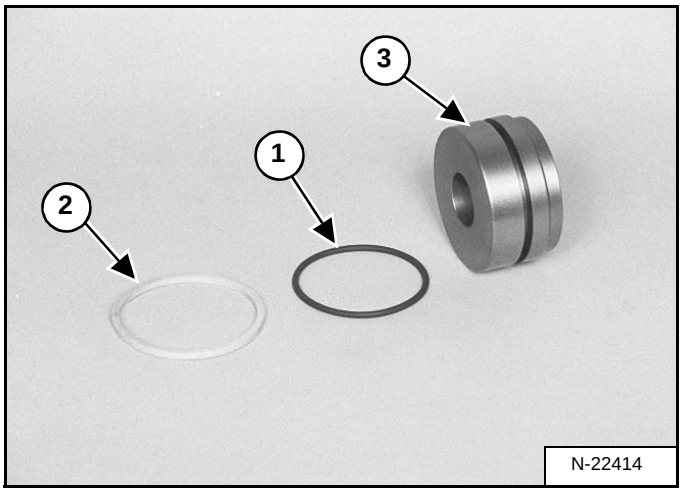
Figure 20-23-17



Install the seal on the tool and slowly stretch it until it fits the piston **[Figure 20-23-17]**.

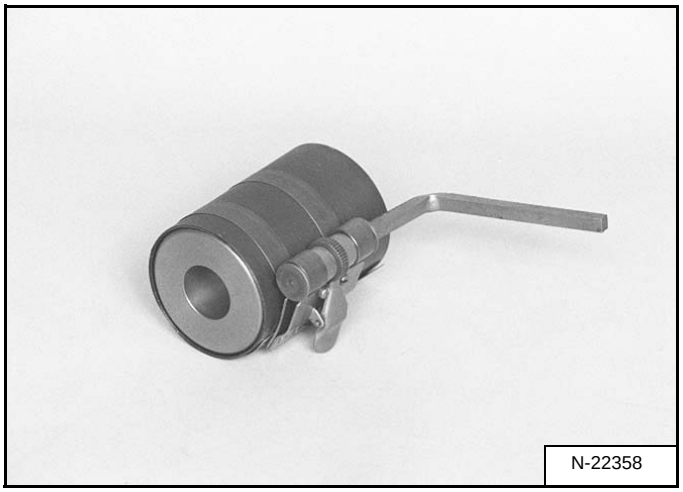
Allow the seal to stretch for 30 seconds before installing it on the piston.

Figure 20-23-18



Install the O-ring (Item 1) and seal (Item 2) on the piston (Item 3) **[Figure 20-23-18]**.

Figure 20-23-19

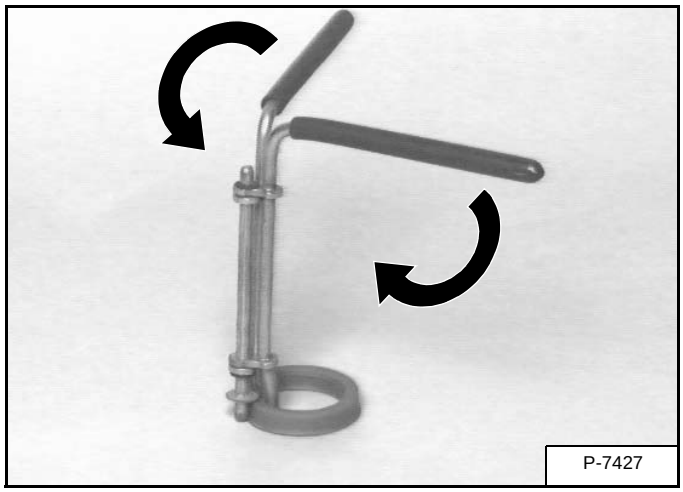


Use a ring compressor to compress the seal to the correct size. Leave the piston in the compressor for about three minutes **[Figure 20-23-19]**.

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Assembly (Cont'd)

Figure 20-23-20

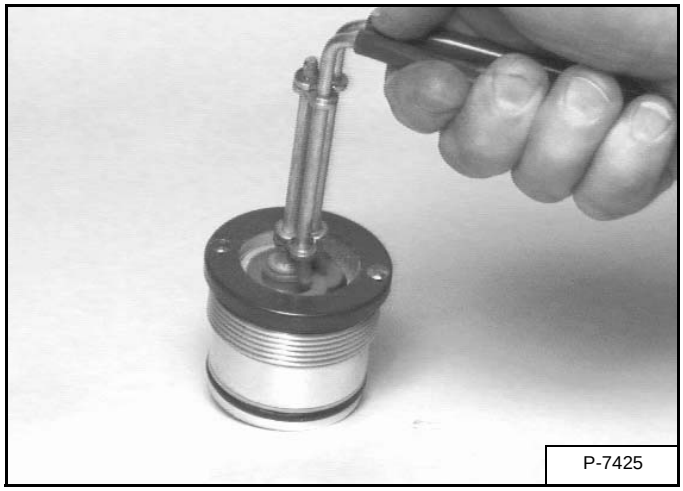


Install the rod seal on the rod seal tool **[Figure 20-23-20]**.

NOTE: During installation the spring side of the seal must be toward the inside of the cylinder.

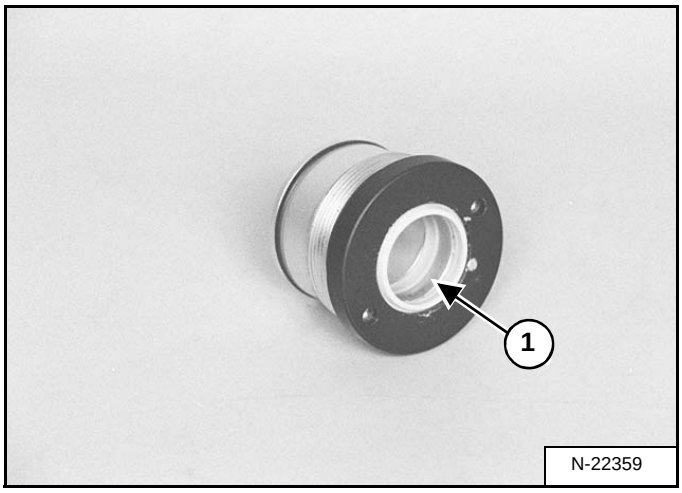
Rotate the handles to collapse the rod seal **[Figure 20-23-20]**.

Figure 20-23-21



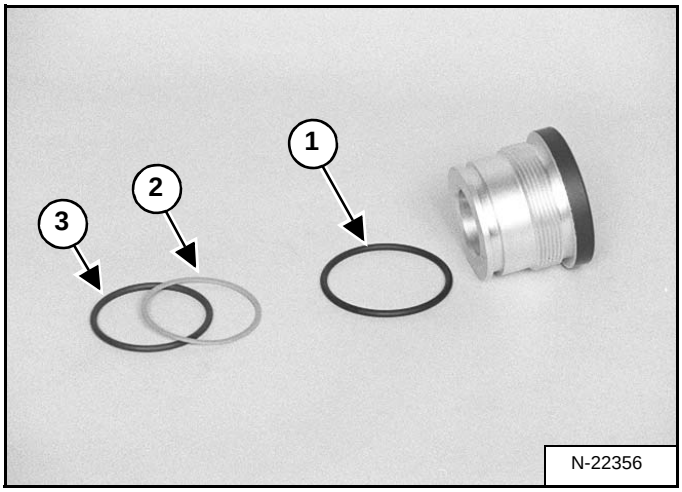
Install the rod seal in the head **[Figure 20-23-21]**.

Figure 20-23-22



Install the wiper seal with the wiper (Item 1) **[Figure 20-23-22]** toward the outside of the head.

Figure 20-23-23



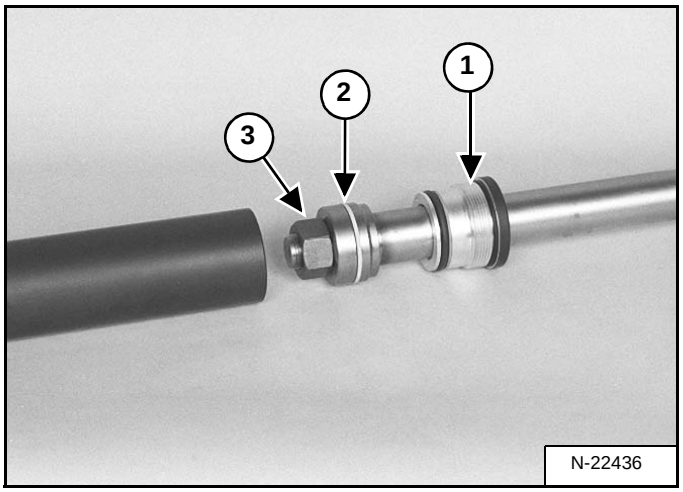
Install the O-ring (Item 1) **[Figure 20-23-23]**.

Install the back-up ring (Item 2) and O-ring (Item 3) **[Figure 20-23-23]**.

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Assembly (Cont'd)

Figure 20-23-24



Install the head (Item 1) and the piston (Item 2) **[Figure 20-23-24]** on the rod as shown.

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

Provide an adequate support for the cylinder before tightening.

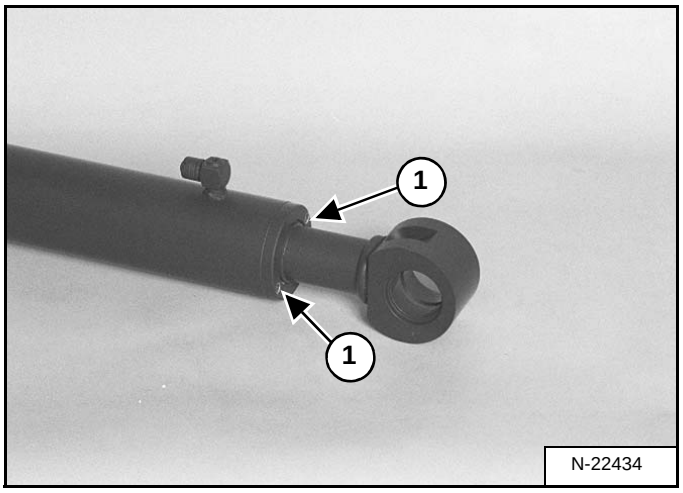
Install the nut (Item 3) **[Figure 20-23-24]**.

NOTE: Clean and dry the rod threads. Install a NEW NUT with pre-applied Loctite™.

Tighten the nut to 850 ft.-lb. (1152 N•m) torque.

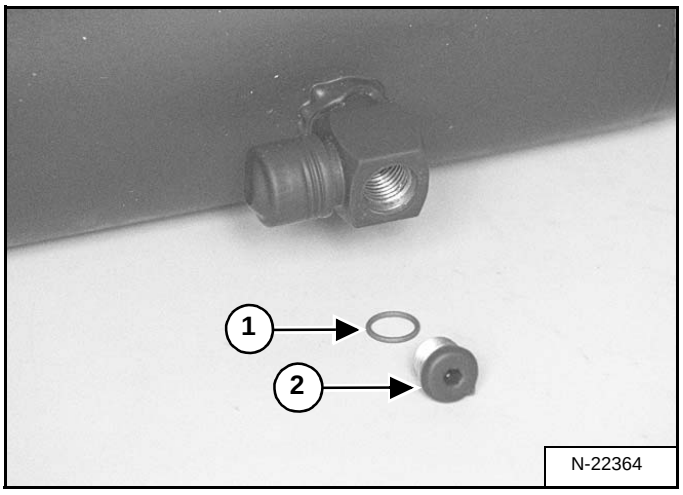
Put the base end of the hydraulic cylinder in a vise.

Figure 20-23-25



Insert the adjustable gland nut wrench into the holes (Item 1) **[Figure 20-23-25]** to tighten the head. Tighten the head until it is flush with the end of the housing.

Figure 20-23-26



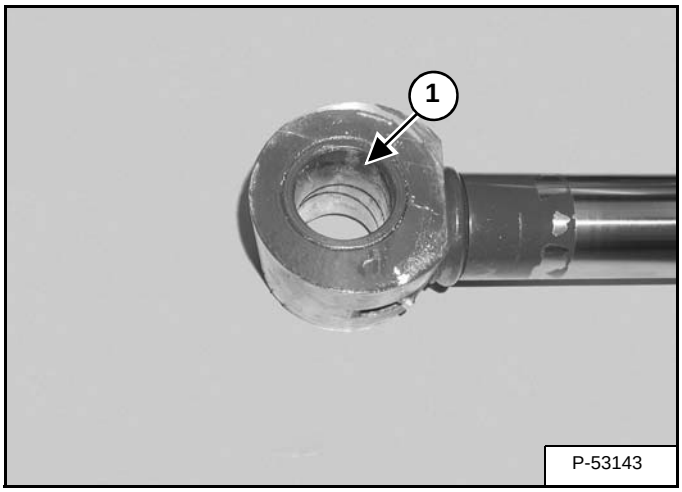
Install the O-ring (Item 1) and plug (Item 2) **[Figure 20-23-26]**.

Tighten the plug to 8 ft.-lb. (11 N•m) torque.

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Assembly (Cont'd)

Figure 20-23-27



Install the bushing (Item 1) **[Figure 20-23-27]**. The bushing must be aligned with the grease channel in the rod end of the cylinder.

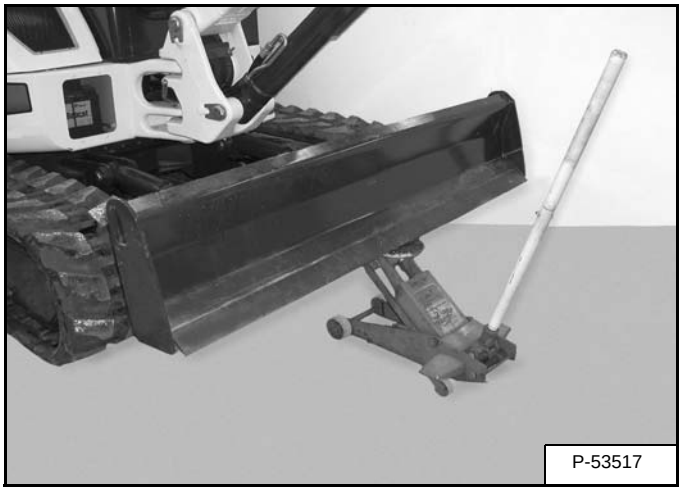
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BLADE CYLINDER

Testing

Lower the boom/bucket to the ground.

Figure 20-24-1

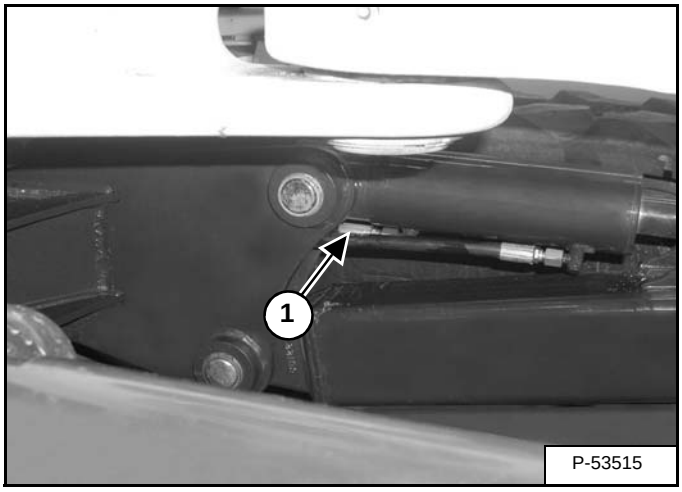


Raise the blade, and support with a jack **[Figure 20-24-1]**.

Stop the engine.

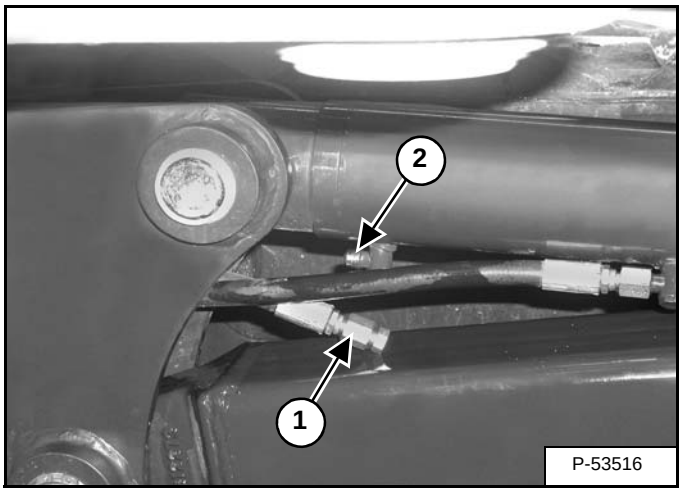
Move the blade lever in both directions to release hydraulic pressure.

Figure 20-24-2



Remove the hose (Item 1) **[Figure 20-24-2]** from the base end of the blade cylinders.

Figure 20-24-3



Cap the hose (Item 1) **[Figure 20-24-3]**.

Start the engine, and retract the blade cylinders.

If there is any oil leakage from the base end fitting (Item 2) **[Figure 20-24-3]** on the blade cylinders, remove the cylinders for repair or replacement.

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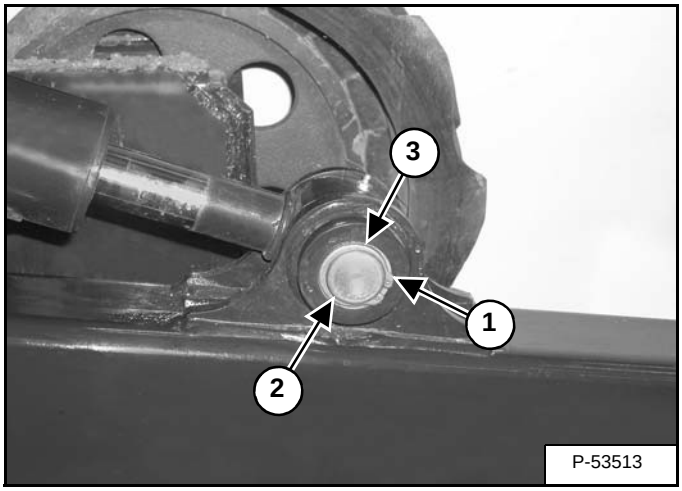
Removal And Installation

Lower the boom/bucket and blade to the ground.

NOTE: The left blade cylinder is shown. The procedure for the right blade cylinder is the same.

Stop the engine. Move the blade control lever both directions to release the hydraulic pressure.

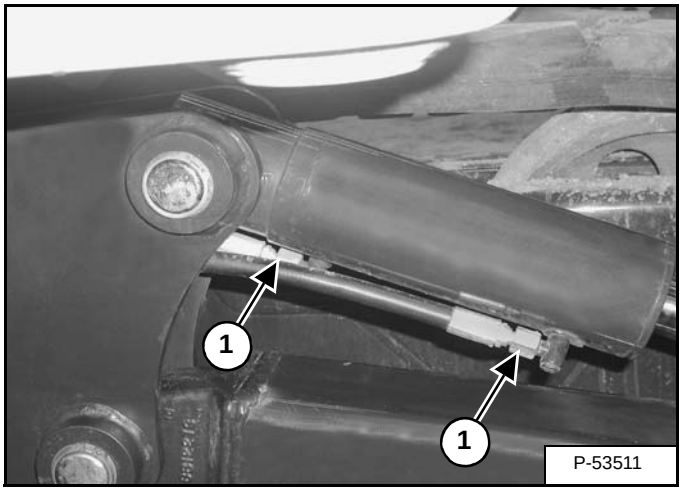
Figure 20-24-4



Remove the snap ring (Item 1) and washer (Item 2) **[Figure 20-24-4]** from the rod end pin.

Remove the pin (Item 3) **[Figure 20-24-4]**.

Figure 20-24-5



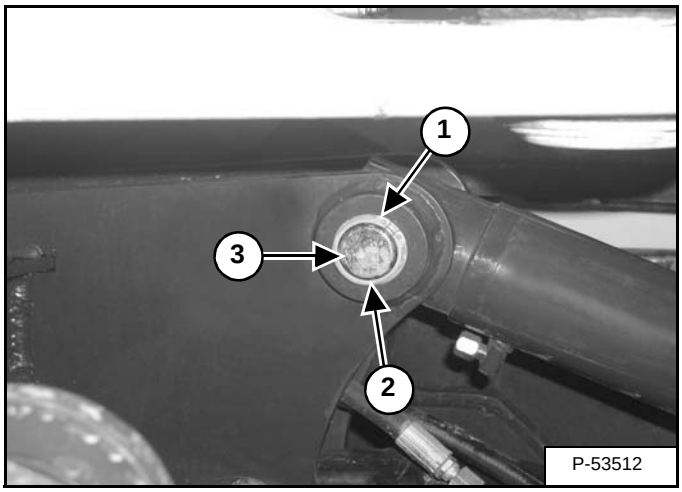
Remove the hoses (Item 1) **[Figure 20-24-5]** from the blade cylinder.

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 20-24-6



Remove the snap ring (Item 1) and washer (Item 2) **[Figure 20-24-6]** from the base end pin.

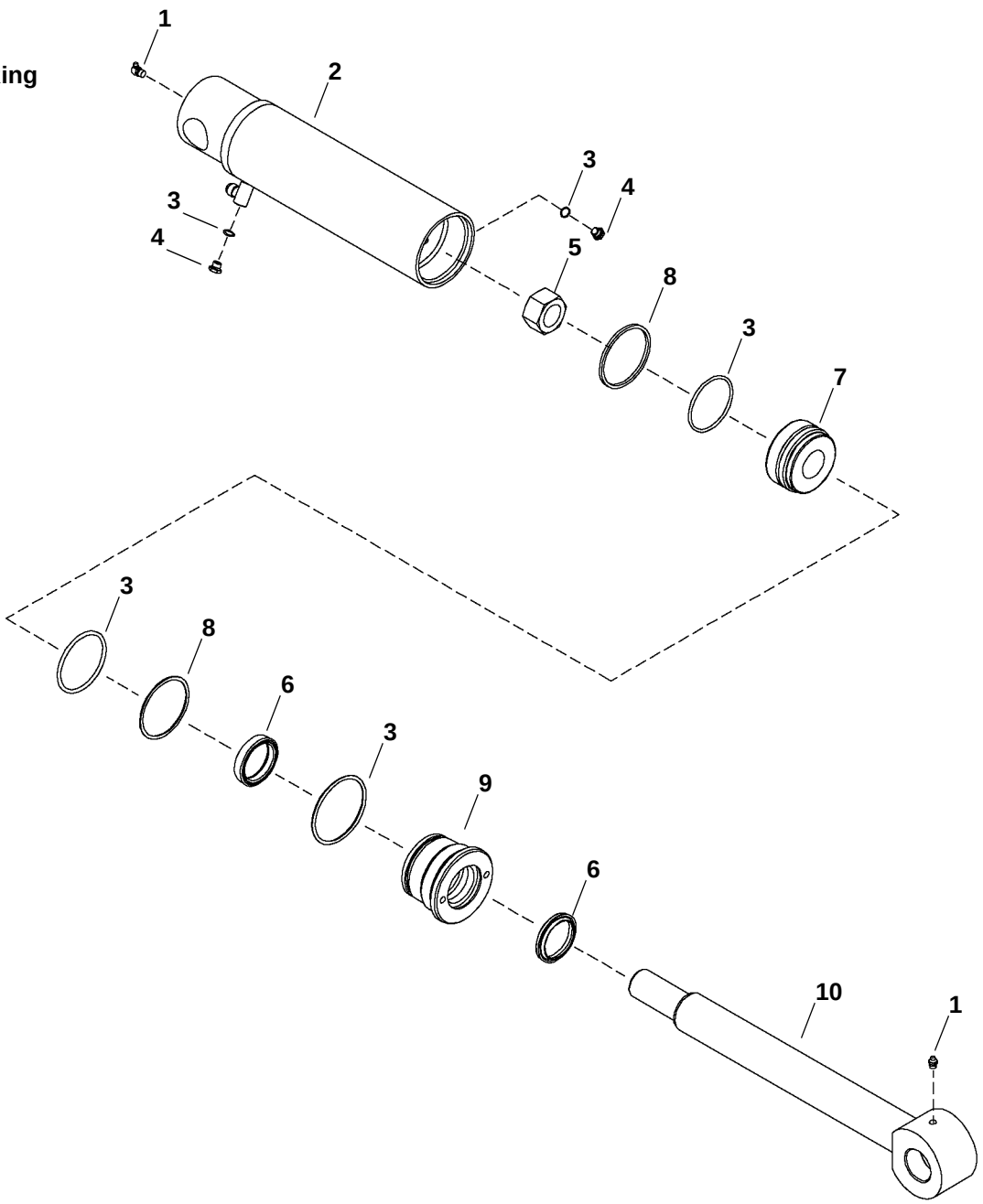
Remove the pin (Item 3) **[Figure 20-24-6]**.

Remove the cylinder.

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Parts Identification

1. Grease Fitting
2. Housing
3. O-Ring
4. Plug
5. Nut
6. Seal
7. Piston
8. Backup Ring
9. Head
10. Rod



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Disassembly

Clean the outside of the blade cylinder before disassembly.

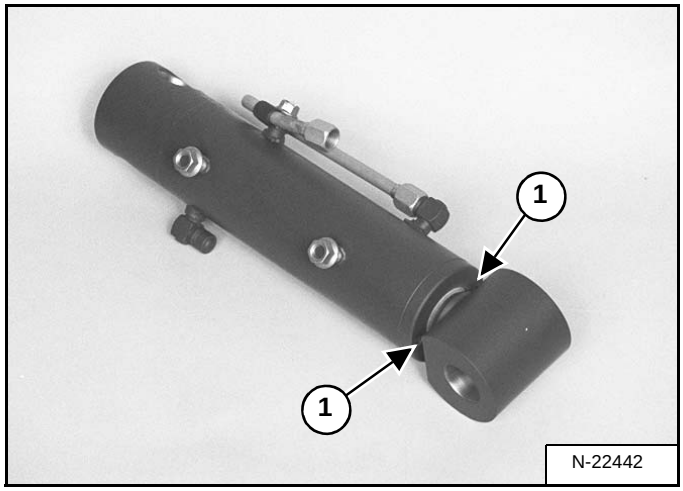
Use the following tools to disassemble the cylinder:

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.

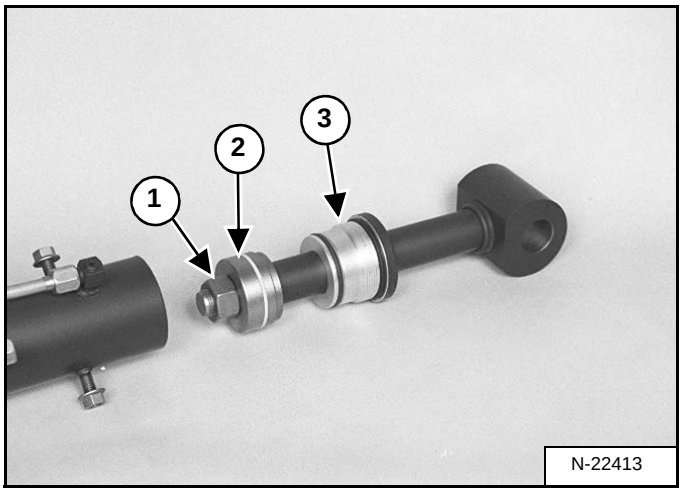
Put the base end of the cylinder in a vise.

Figure 20-24-7



Insert the adjustable gland nut wrench into the holes (Item 1) **[Figure 20-24-7]** to loosen the head.

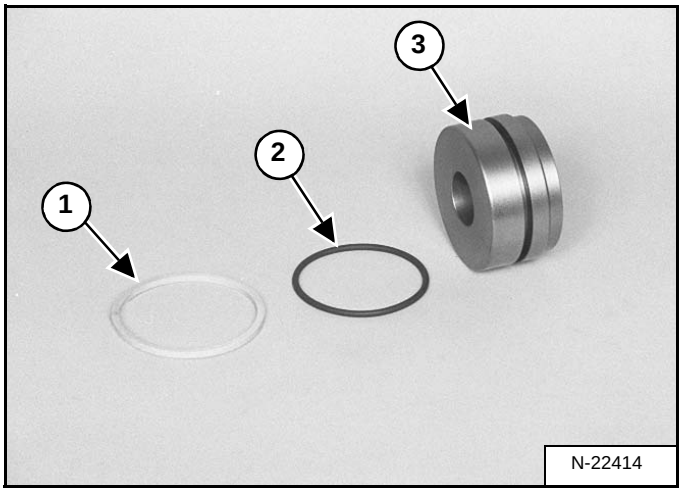
Figure 20-24-8



Remove the head and the rod assembly from the cylinder **[Figure 20-24-8]**. Put the rod end in a vise.

Remove the nut (Item 1), piston (Item 2) and head (Item 3) **[Figure 20-24-8]**.

Figure 20-24-9

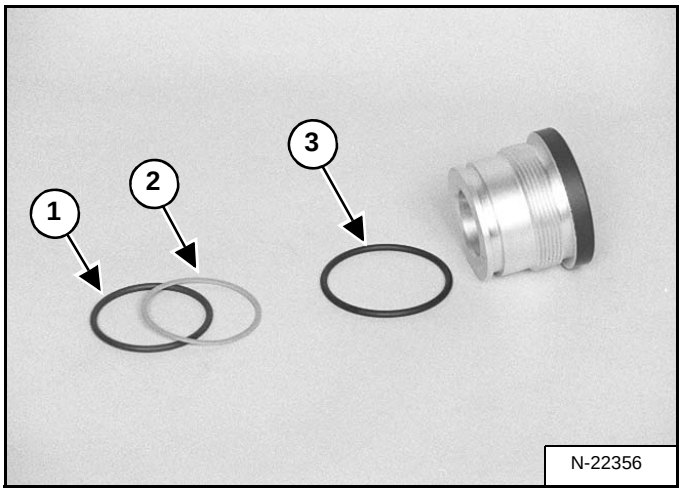


Remove the seal (Item 1) and O-ring (Item 2) from the piston (Item 3) **[Figure 20-24-9]**.

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Disassembly (Cont'd)

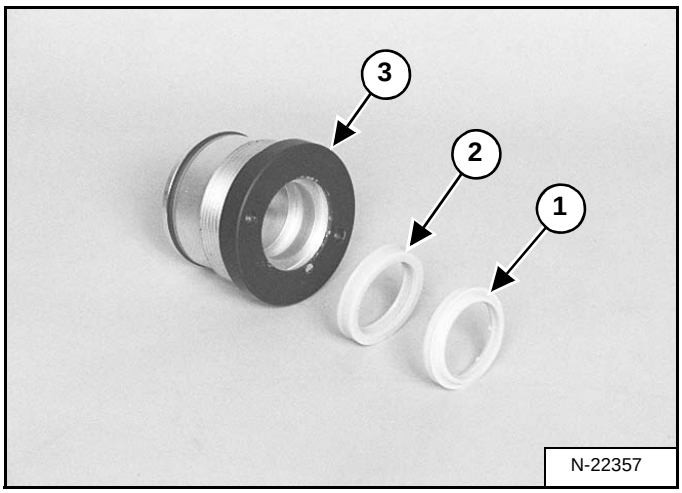
Figure 20-24-10



Remove the O-ring (Item 1) and the back-up ring (Item 2) **[Figure 20-24-10]**.

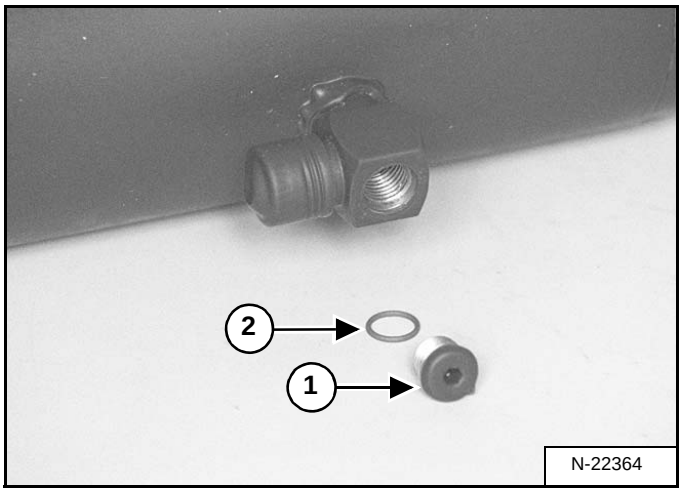
Remove the O-ring (Item 3) **[Figure 20-24-10]**.

Figure 20-24-11



Remove the wiper seal (Item 1) and rod seal (Item 2) from the inside of the head (Item 3) **[Figure 20-24-11]**.

Figure 20-24-12



Remove the plug (Item 1) and O-ring (Item 2) **[Figure 20-24-12]**.

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Assembly

Clean all parts in solvent and dry with compressed air.

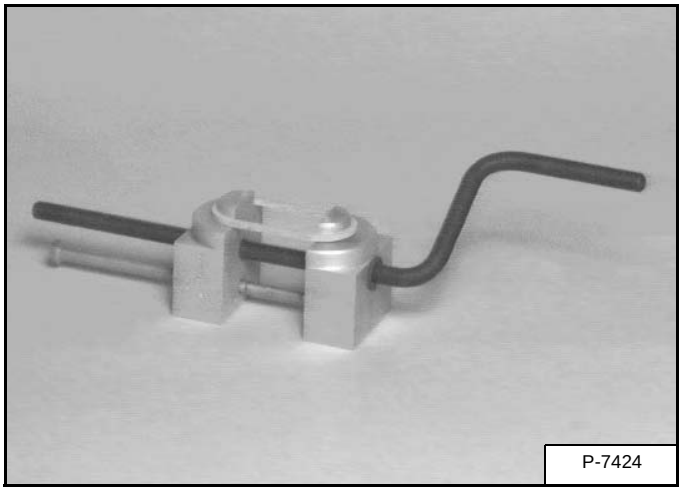
Inspect all parts for wear or damage. Replace any worn or damaged parts.

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

Use the following tools to assemble the cylinder:

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

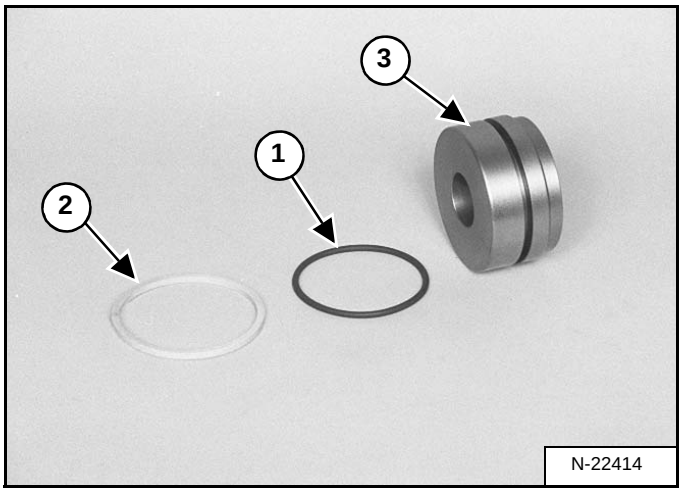
Figure 20-24-13



Install the seal on the tool and slowly stretch it until it fits the piston **[Figure 20-24-13]**.

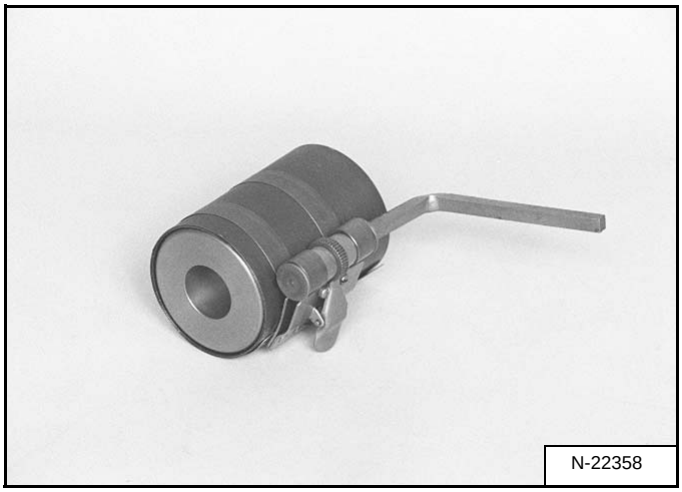
Allow the seal to stretch for 30 seconds before installing it on the piston.

Figure 20-24-14



Install the O-ring (Item 1) and seal (Item 2) on the piston (Item 3) **[Figure 20-24-14]**.

Figure 20-24-15

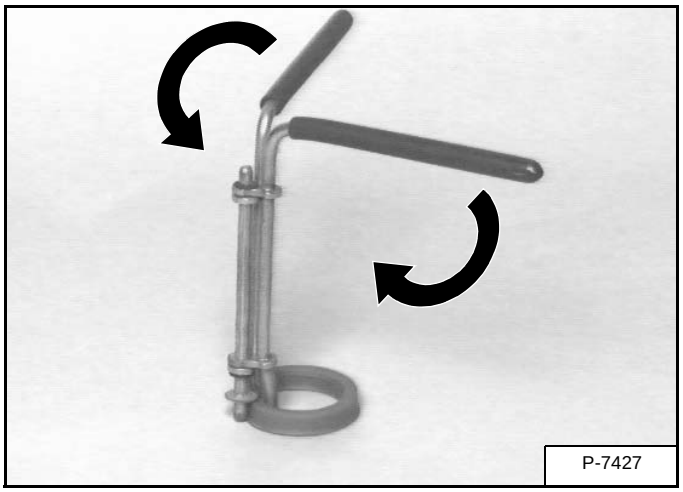


Use a ring compressor to compress the seal to the correct size. Leave the piston in the compressor for about three minutes **[Figure 20-24-15]**.

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Assembly (Cont'd)

Figure 20-24-16

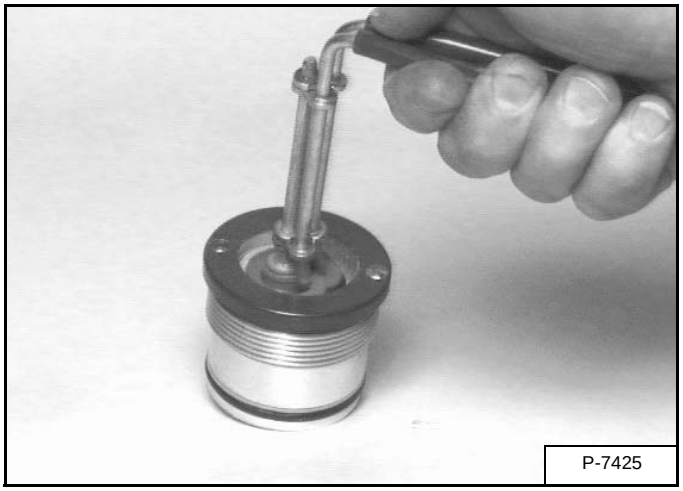


Install the rod seal on the rod seal tool **[Figure 20-24-16]**.

NOTE: During installation the spring side of the seal must be toward the inside of the cylinder.

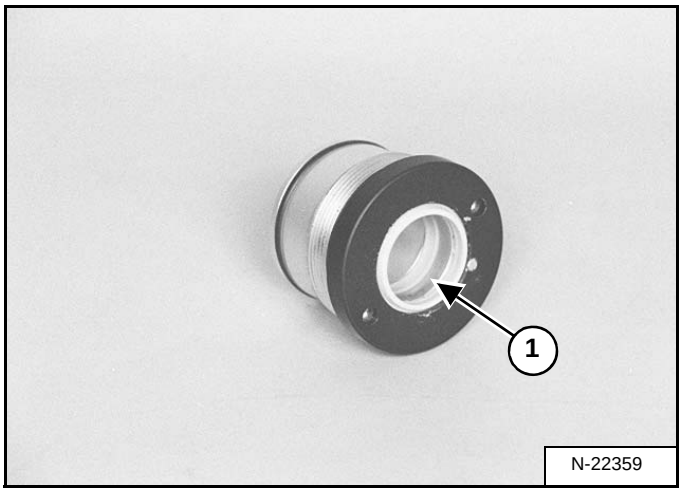
Rotate the handles to collapse the rod seal **[Figure 20-24-16]**.

Figure 20-24-17



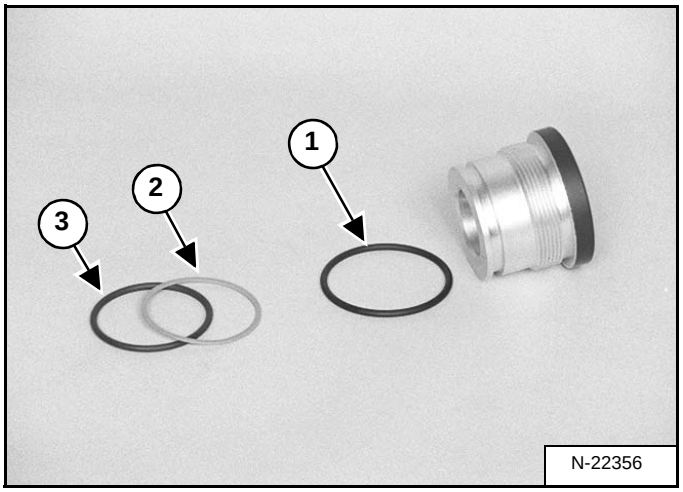
Install the rod seal in the head **[Figure 20-24-17]**.

Figure 20-24-18



Install the wiper seal with the wiper (Item 1) **[Figure 20-24-18]** toward the outside of the head.

Figure 20-24-19



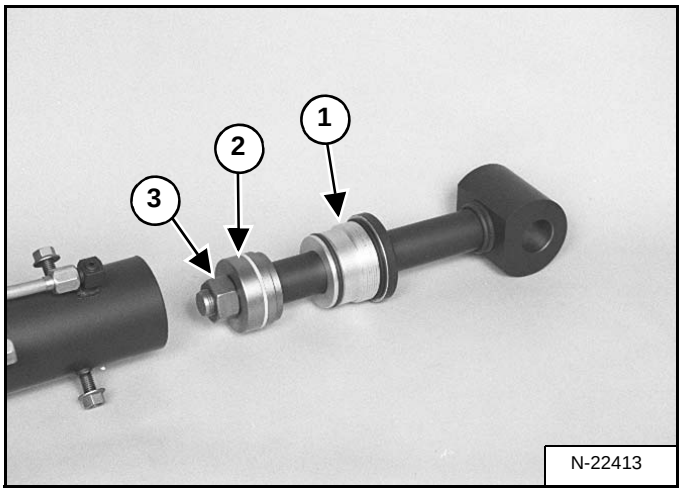
Install the O-ring (Item 1) **[Figure 20-24-19]** on the head.

Install the back-up ring (Item 2) and O-ring (Item 3) **[Figure 20-24-19]**.

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Assembly (Cont'd)

Figure 20-24-20



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

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

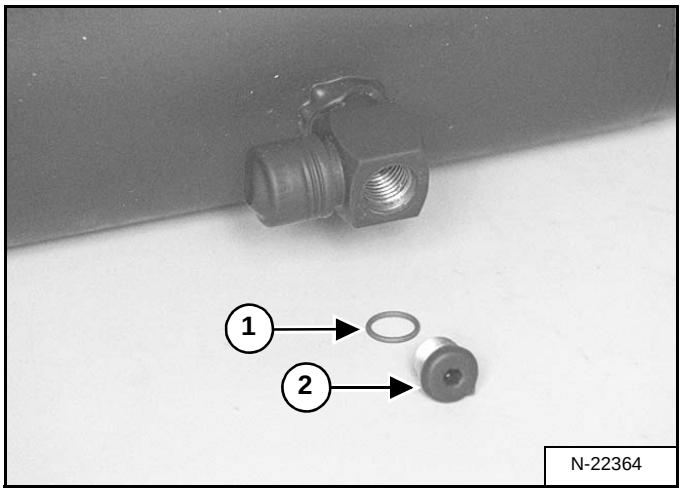
Provide an adequate support for the cylinder before tightening.

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

NOTE: Clean and dry the rod threads. Install a NEW NUT with pre-applied Loctite™.

Tighten the nut to 600 ft.-lb. (814 N•m) torque.

Figure 20-24-21

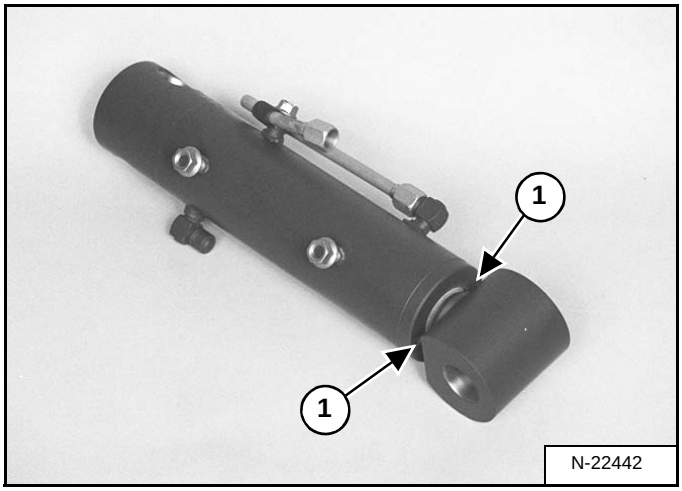


Install the O-ring (Item 1) and plug (Item 2) **[Figure 20-24-21]**.

Tighten the plug to 8 ft.-lb. (11 N•m) torque.

Put the base end of the cylinder in a vise.

Figure 20-24-22



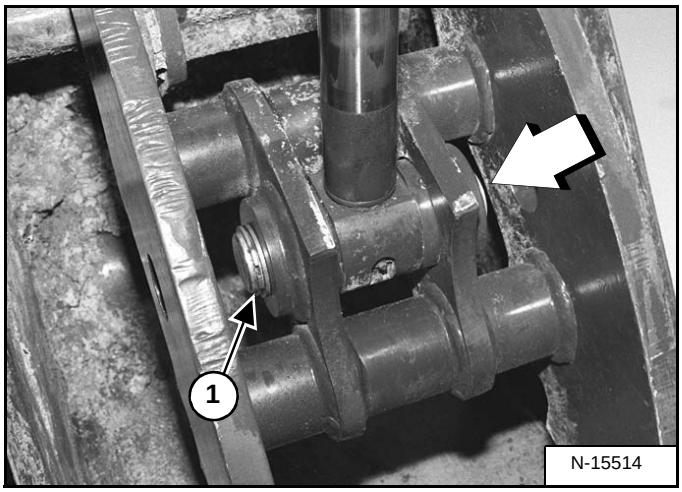
Insert the adjustable gland nut wrench into the holes (Item 1) **[Figure 20-24-22]** to tighten the head. Tighten the head until it is flush with the end of the housing.

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CLAMP CYLINDER

Testing

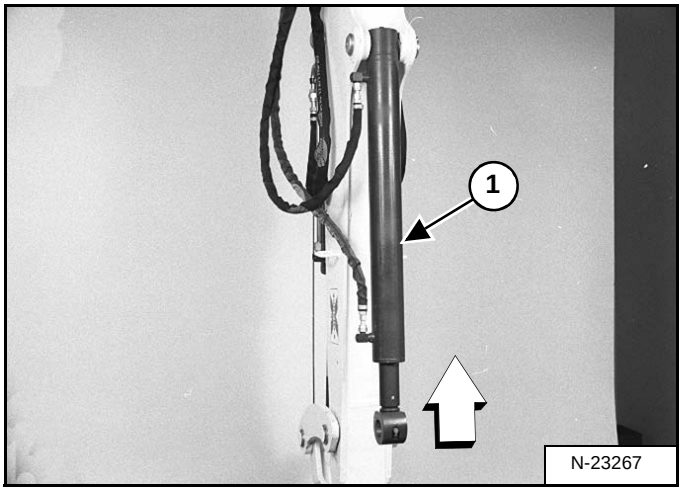
Figure 20-25-1



Remove the snap ring and washer (Item 1) **[Figure 20-25-1]** from the clamp cylinder pin.

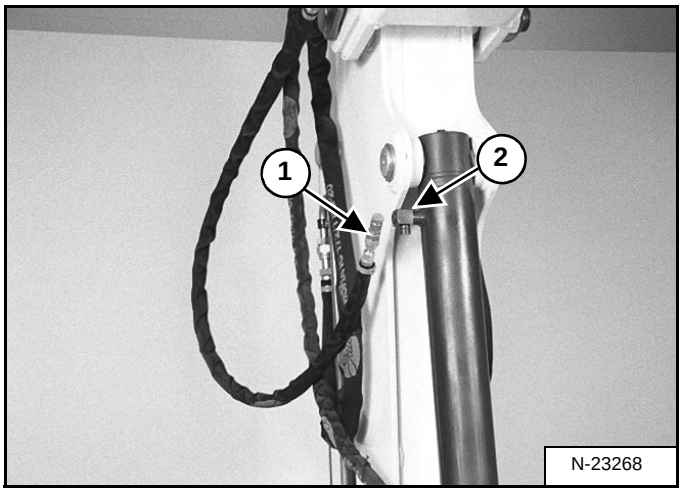
Remove the pin from the rod end of the clamp cylinder **[Figure 20-25-1]**.

Figure 20-25-2



Start the engine and retract the clamp cylinder (Item 1) **[Figure 20-25-2]**.

Figure 20-25-3



Shut OFF the excavator and disconnect the hydraulic hose (Item 1) **[Figure 20-25-3]** from the base end of the cylinder.

Cap the hose (Item 1) **[Figure 20-25-3]**.

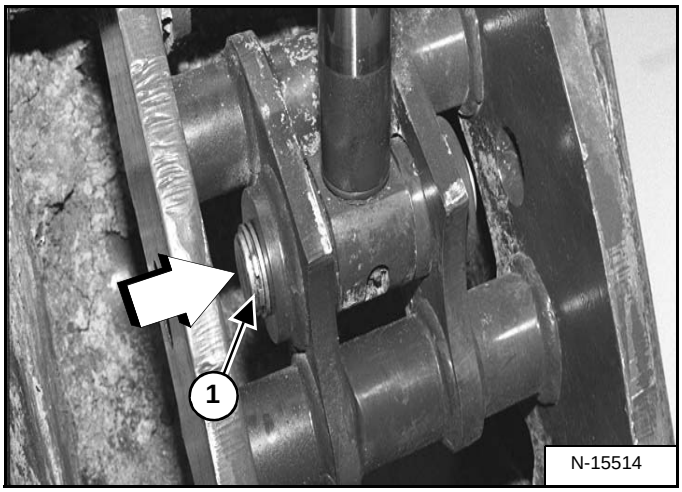
Start the excavator and retract the cylinder.

If there is any oil leakage from the base end fitting (Item 2) **[Figure 20-25-3]** on the clamp cylinder, remove the cylinder for repair or replacement.

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Removal And Installation

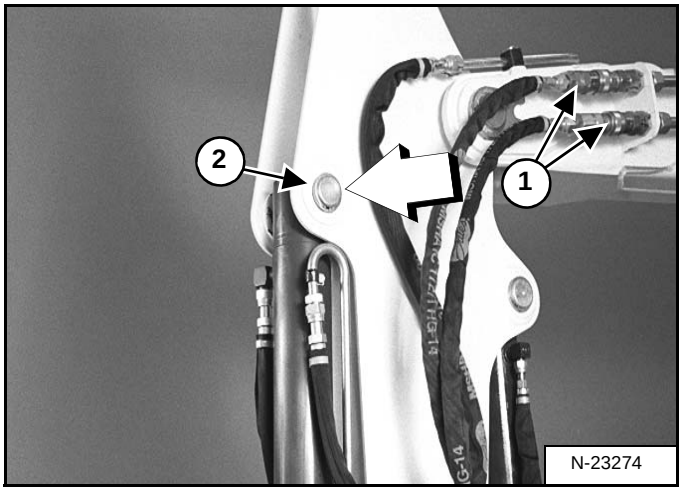
Figure 20-25-4



Remove the snap ring and washer (Item 1) **[Figure 20-25-4]** from the clamp cylinder pin.

Remove the pin from the rod end of the clamp cylinder **[Figure 20-25-4]**.

Figure 20-25-5



Disconnect the quick couplers (Item 1) **[Figure 20-25-5]**.

Remove the snap ring and washer (Item 2) **[Figure 20-25-5]**.

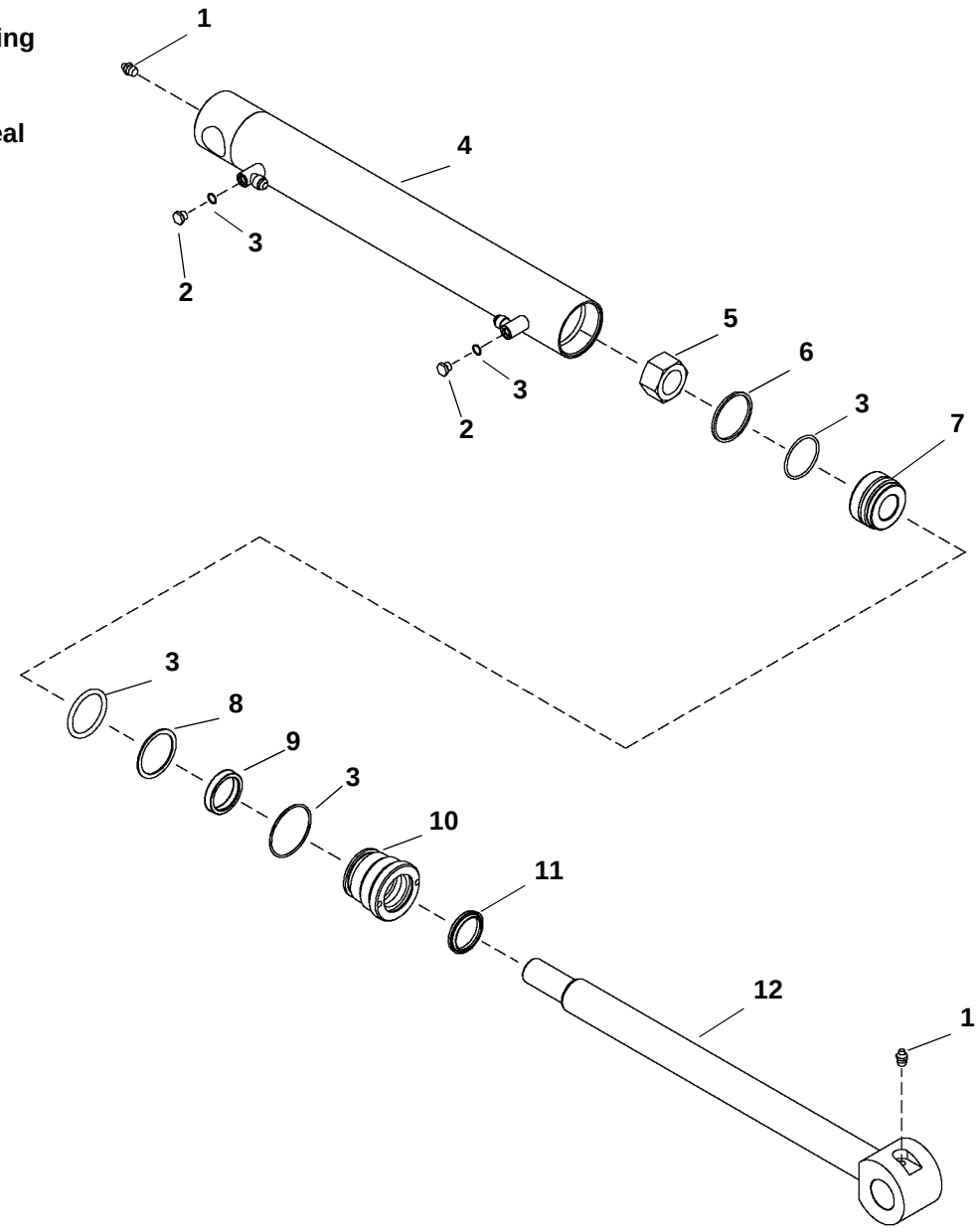
Remove the base end cylinder pin **[Figure 20-25-5]**.

Remove the cylinder.

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Parts Identification

1. Grease fitting
2. Plug
3. O-Ring
4. Housing
5. Nut
6. Seal
7. Piston
8. Backup ring
9. Seal
10. Head
11. Wiper Seal
12. Rod



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Disassembly

NOTE: The drawings may appear different. The procedure is the same.

Clean the outside of the clamp cylinder before disassembly.

The following tools will be needed to disassemble and assemble the cylinders:

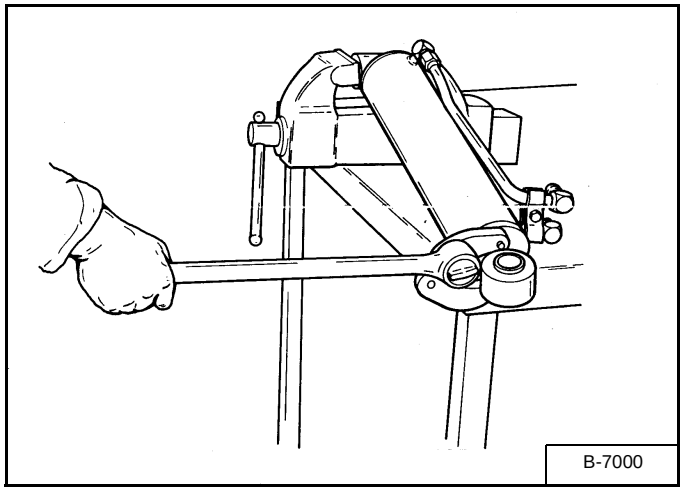
1. MEL1075 - Adjustable Gland Nut Wrench
2. MEL1074 - O-Ring Seal Hook
3. MEL1396 - Seal Installation Tool
4. MEL1033 - Rod Seal Installation Tool

Put the base end of the hydraulic cylinder in a drain pan.

Move the rod in and out to remove the fluid from the cylinder. Move the rod slowly so the fluid will go directly into the drain pan.

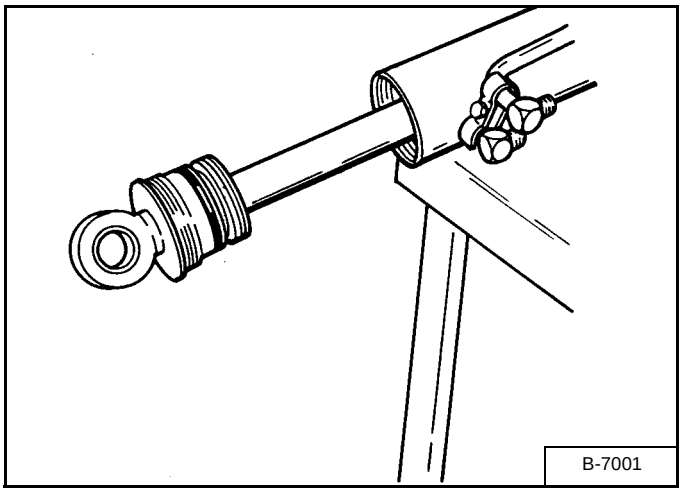
Put the base end of the cylinder in a vise.

Figure 20-25-6



Use the adjustable gland nut wrench to loosen the head **[Figure 20-25-1]**.

Figure 20-25-7

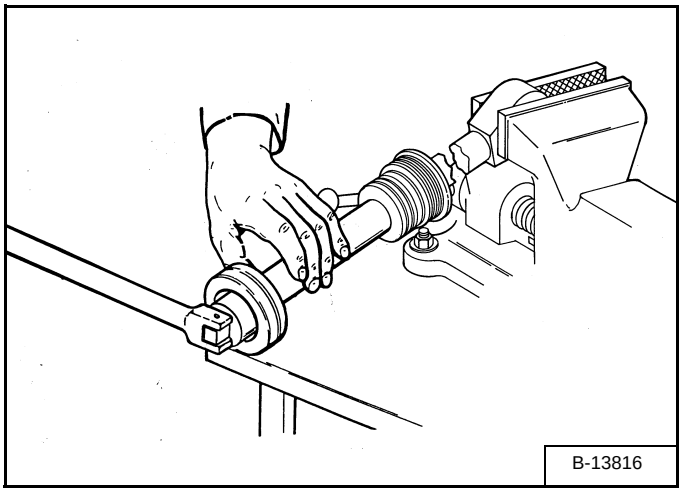


Remove the rod assembly from the cylinder housing **[Figure 20-25-2]**.

Remove the cylinder housing from the vise.

Put the rod end in the vise.

Figure 20-25-8



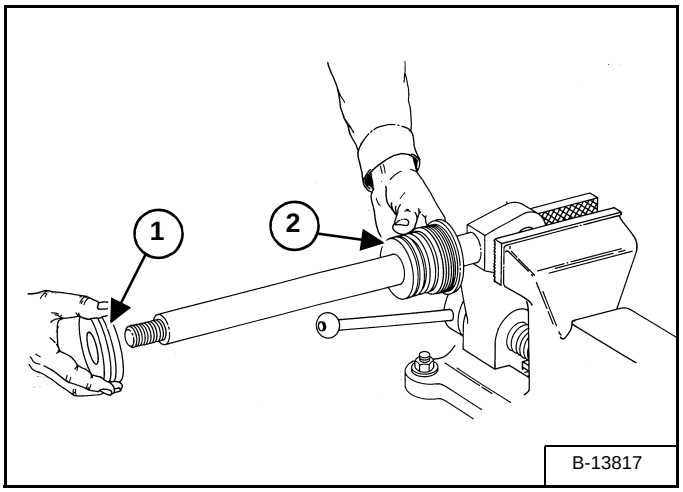
Loosen the nut from the piston end of the rod **[Figure 20-25-8]**.

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CLAMP CYLINDER (CONT'D)

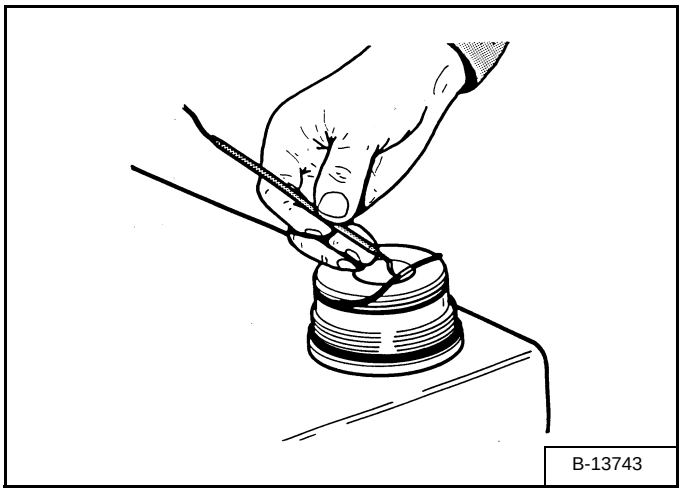
Disassembly (Cont'd)

Figure 20-25-9



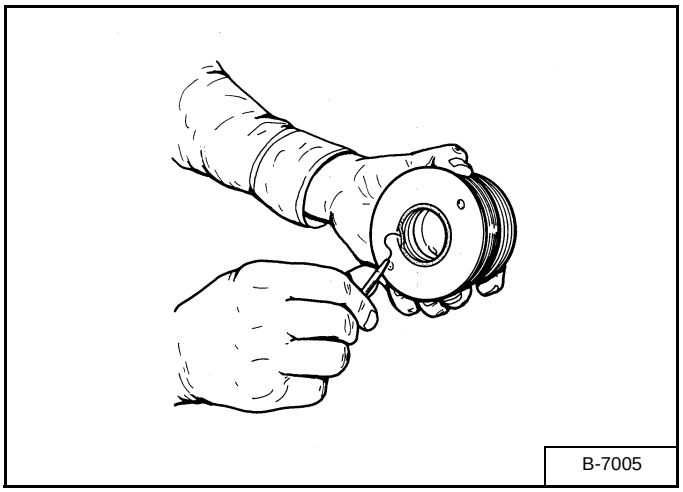
Remove the piston (Item 1) and head (Item 2) **[Figure 20-25-9]**.

Figure 20-25-10



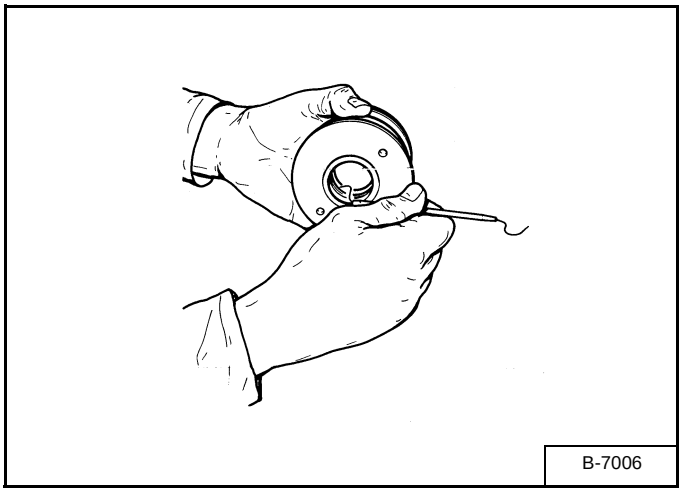
Remove the O-ring and back-up ring from the head with seal hook **[Figure 20-25-10]**.

Figure 20-25-11



Remove the wiper seal **[Figure 20-25-11]**.

Figure 20-25-12

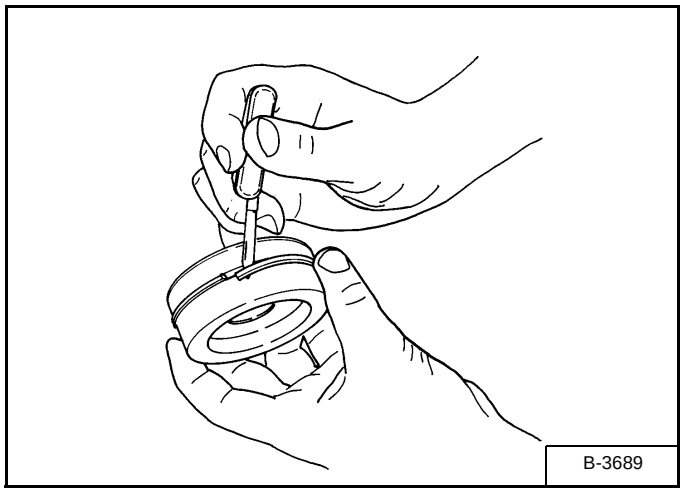


Remove the oil seal from the head **[Figure 20-25-12]**.

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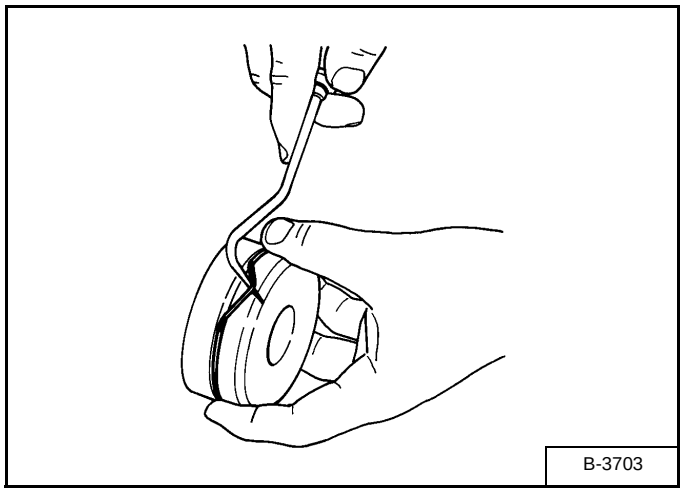
Disassembly (Cont'd)

Figure 20-25-13



Cut the old teflon seal and remove the seal from the piston **[Figure 20-25-13]**.

Figure 20-25-14



Remove the O-ring from the piston **[Figure 20-25-14]**.

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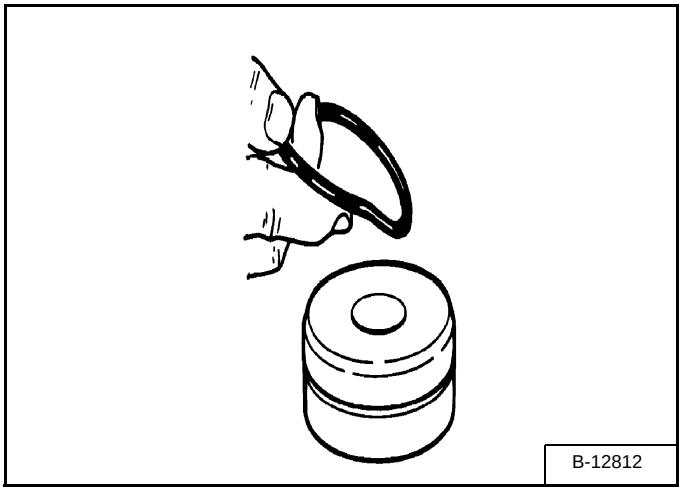
Assembly

Clean all parts in solvent and dry with compressed air.

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

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

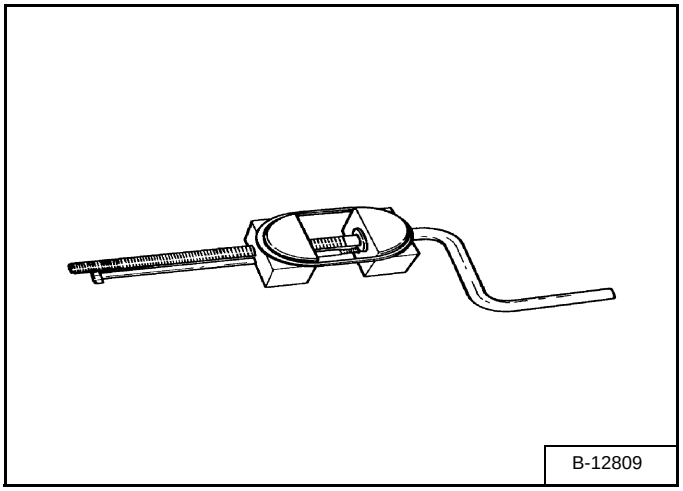
Figure 20-25-15



Install the O-ring on the piston **[Figure 20-25-15]**.

NOTE: Do not overstretch the seal.

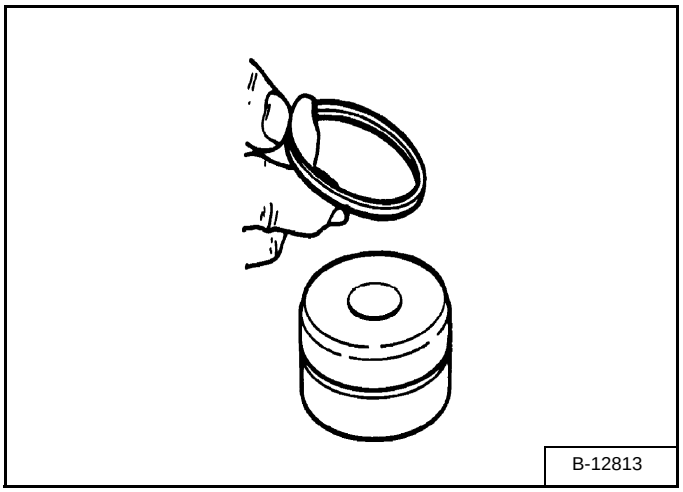
Figure 20-25-16



Install the seal on the tool and stretch it until it fits the piston **[Figure 20-25-16]**.

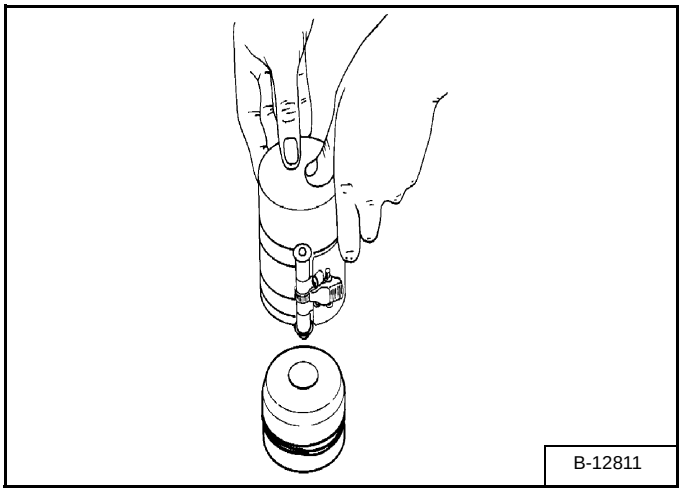
Allow the seal to stretch for 30 seconds before removing it from the tool.

Figure 20-25-17



Install the seal on the piston **[Figure 20-25-17]**.

Figure 20-25-18



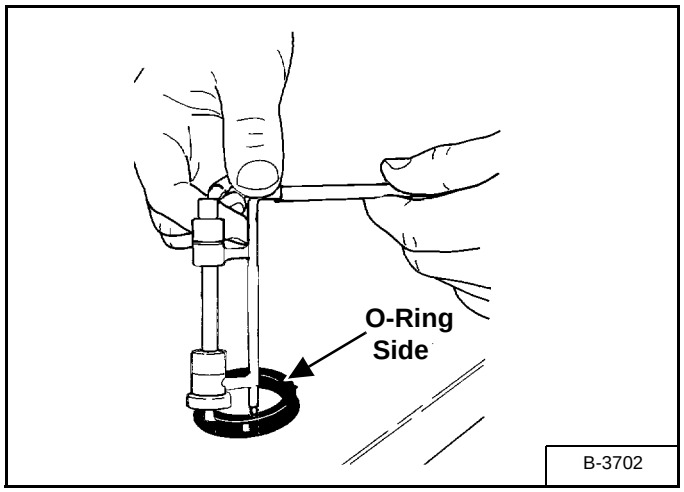
Use a ring compressor to compress the seal to the correct size **[Figure 20-25-18]**.

Leave the piston in the ring compressor for three minutes.

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Assembly (Cont'd)

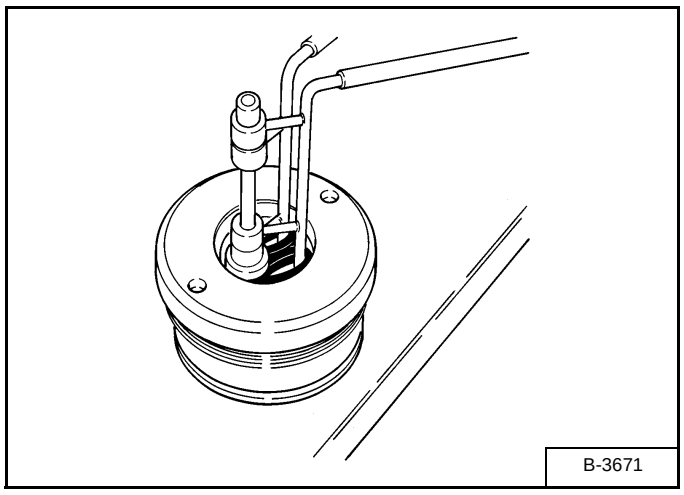
Figure 20-25-19



Install the oil seal on the rod seal tool **[Figure 20-25-19]**.

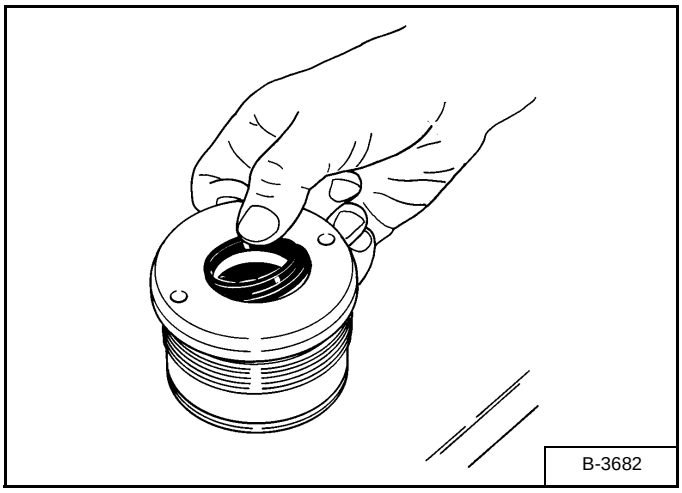
NOTE: The O-ring side of the oil seal goes toward the inside of the cylinder.

Figure 20-25-20



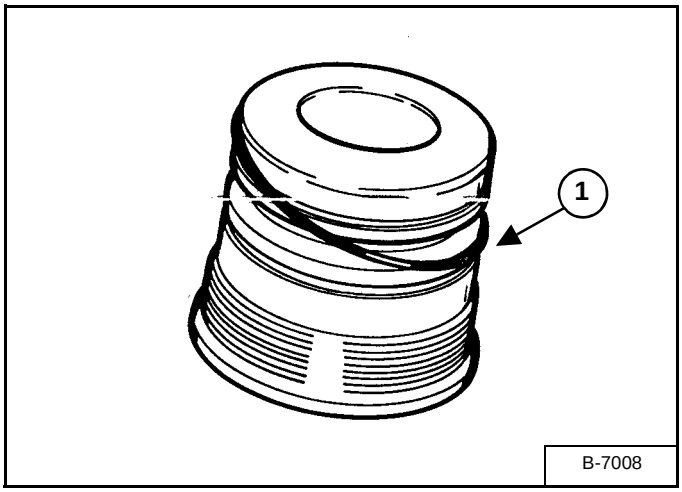
Install the oil seal in the head **[Figure 20-25-20]**.

Figure 20-25-21



Install the wiper seal with the lip toward the outside of the head **[Figure 20-25-21]**.

Figure 20-25-22

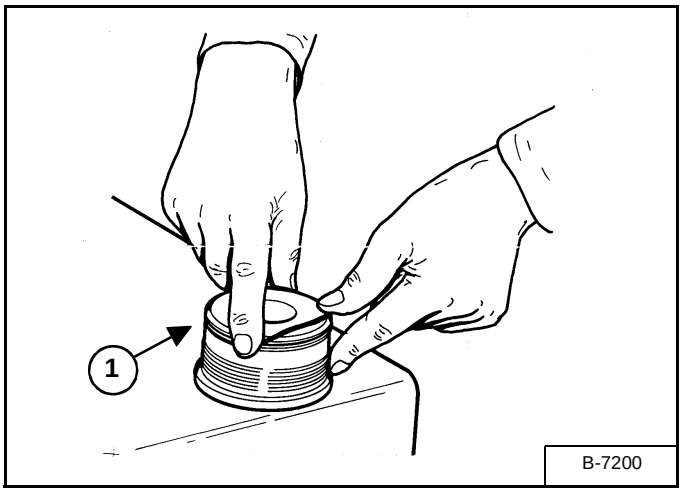


Install the O-ring (Item 1) **[Figure 20-25-22]** on the head.

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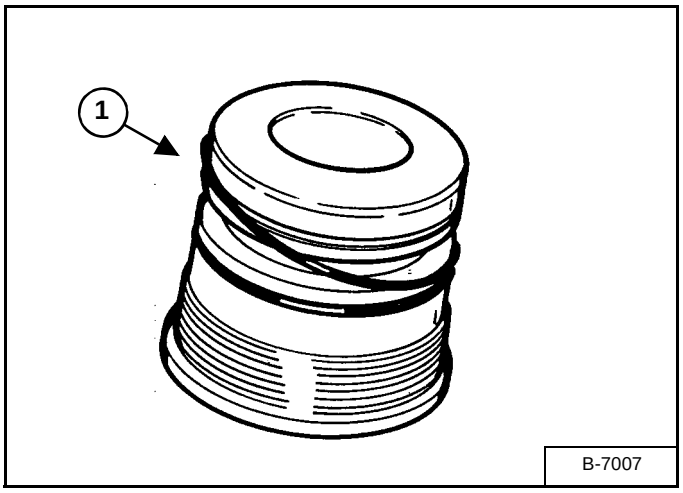
Assembly (Cont'd)

Figure 20-25-23



Install the back-up ring (Item 1) **[Figure 20-25-23]** on the head.

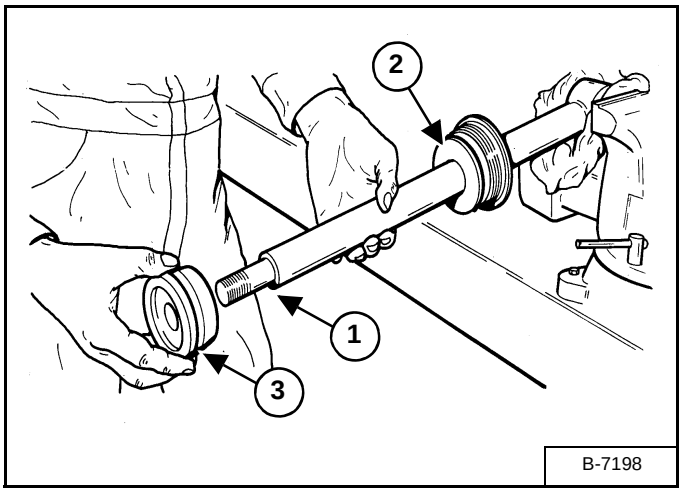
Figure 20-25-24



Install the O-ring (Item 1) **[Figure 20-25-24]** on the head.

Apply grease to the inside of the head and to the lips of the seals.

Figure 20-25-25



Inspect the beveled edge of the rod for nicks or sharp edges (Item 1) **[Figure 20-25-25]**. Remove these with a file prior to installing the head on the rod or damage to the seals may occur.

Install the head (Item 2) **[Figure 20-25-25]** on the rod.

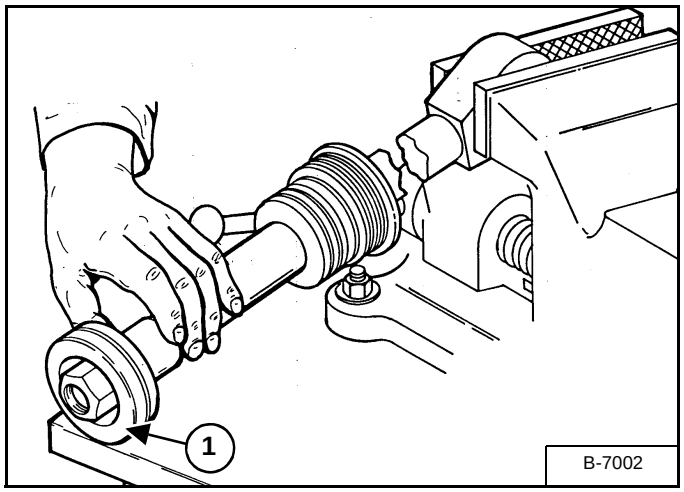
Install the piston (Item 3) **[Figure 20-25-25]** on the rod.

Clean and dry the cylinder rod threads. Grease the shoulder of the cylinder rod.

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Assembly (Cont'd)

Figure 20-25-26



Tighten the nut (Item 1) **[Figure 20-25-26]** to 850 ft.-lb. (1153 N•m) torque.

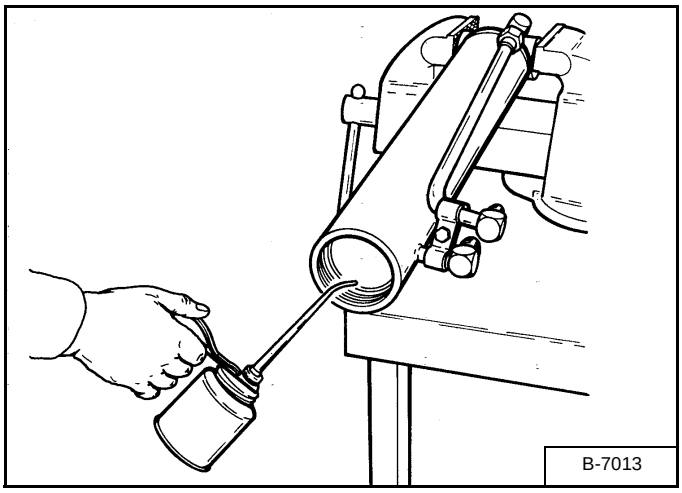
Inspect the inside of the cylinder housing for nicks and scratches. If the cylinder housing has minor scuffing the cylinder housing can be honed. Use a flexible hone and lubricate with oil during the honing process.

The following hones can be ordered from OTC Service Tools:

MEL1418 - 2 in.
OEM6275 - 2-3/4 in - 3 in.
OEM6270 - 3 in. - 3-1/2 in
OEM6271 - 3-1/2 in. - 4 in.

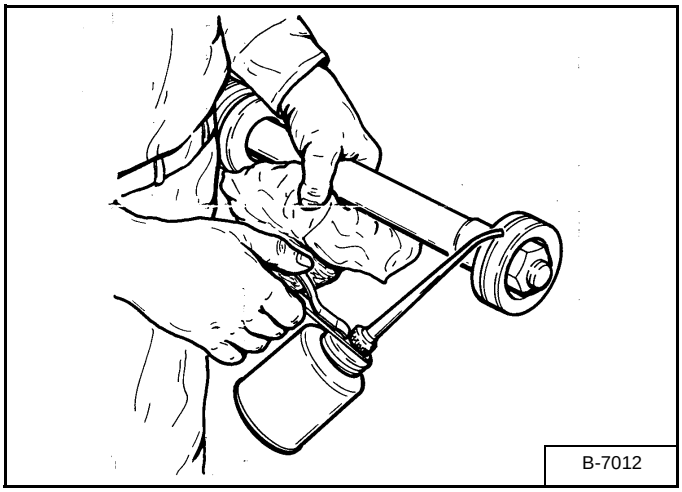
Thoroughly wash the inside of the housing after the honing process.

Figure 20-21-27



Apply oil to the seal surface of the housing **[Figure 20-21-27]**.

Figure 20-25-28



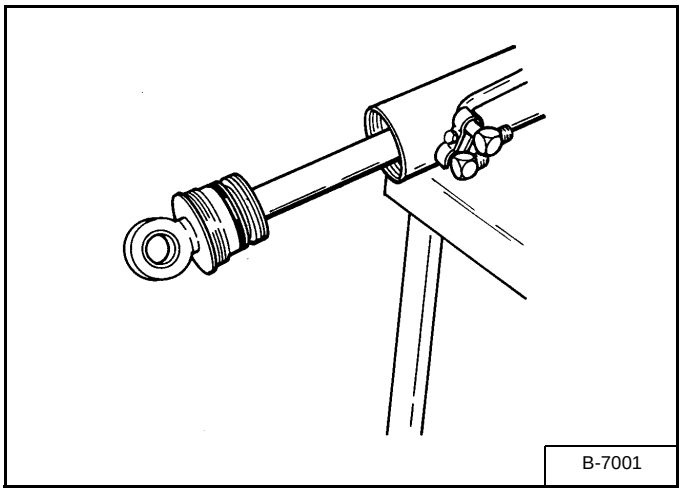
Apply oil to the Teflon seal on the piston **[Figure 20-25-28]**.

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CLAMP CYLINDER (CONT'D)

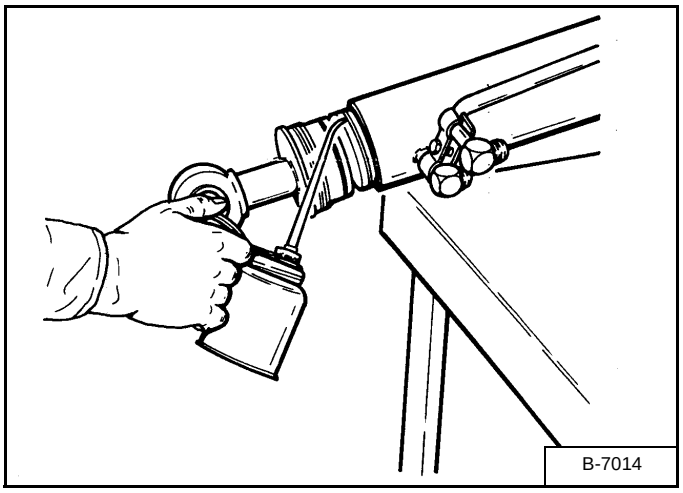
Assembly (Cont'd)

Figure 20-25-29



Install the rod assembly in the housing **[Figure 20-25-29]**.

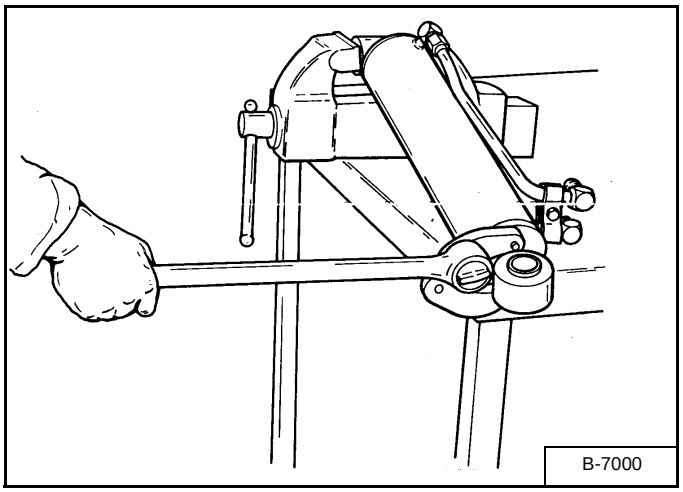
Figure 20-25-30



Apply oil to the seals on the head **[Figure 20-25-30]**.

Apply oil to the threads of the head.

Figure 20-25-31



Use the adjustable gland nut wrench to tighten the head **[Figure 20-25-31]**.

NOTE: Tighten gland until it is flush with the end of the housing.

Move rod in and out of cylinder housing and make sure that it moves freely.

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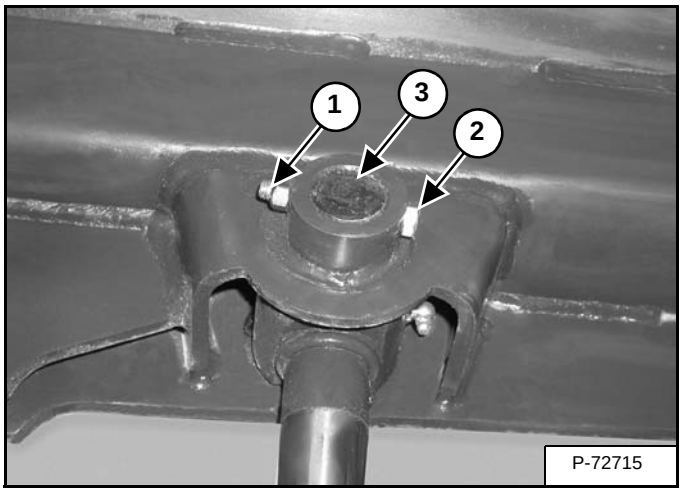
ANGLE BLADE CYLINDER

Testing

Lower the boom/bucket and blade to the ground.

With the engine off, turn the key to the ON position, lower the console and move the blade lever. Press and hold the two speed button to activate angle blade mode, move the lever again to relieve hydraulic pressure.

Figure 20-26-1



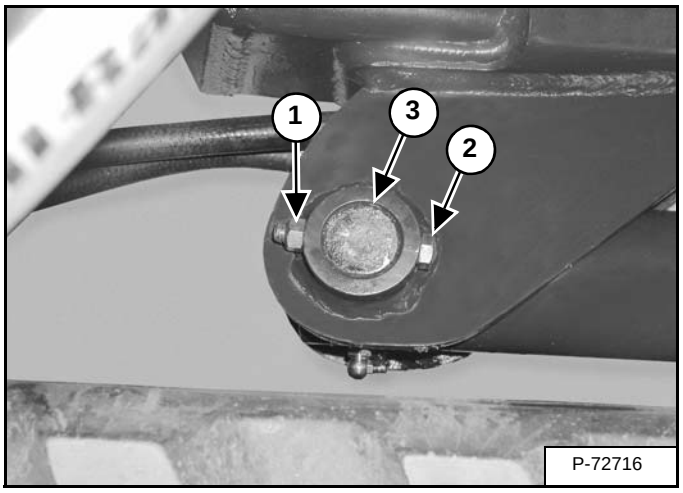
Remove the nut (Item 1), bolt (Item 2) and pin (Item 3) **[Figure 20-26-1]** from the rod end of the angle blade cylinder.

Start the engine and retract the angle blade cylinder.

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

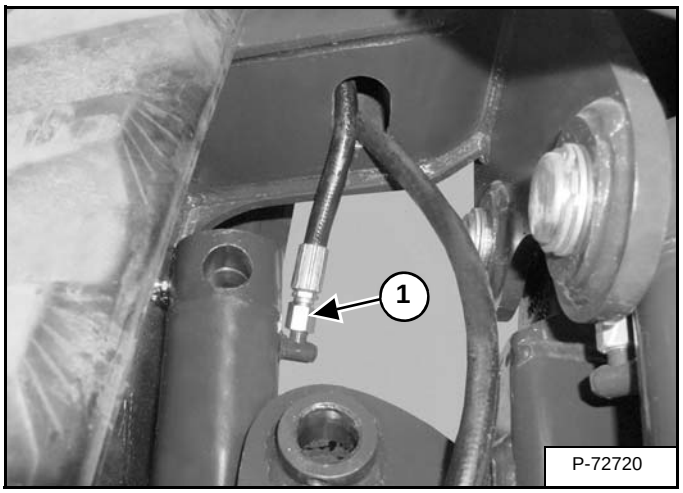
Stop the engine.

Figure 20-26-2



Remove the nut (Item 1), bolt (Item 2) and pin (Item 3) **[Figure 20-26-2]** from the base end of the angle blade cylinder.

Figure 20-26-3



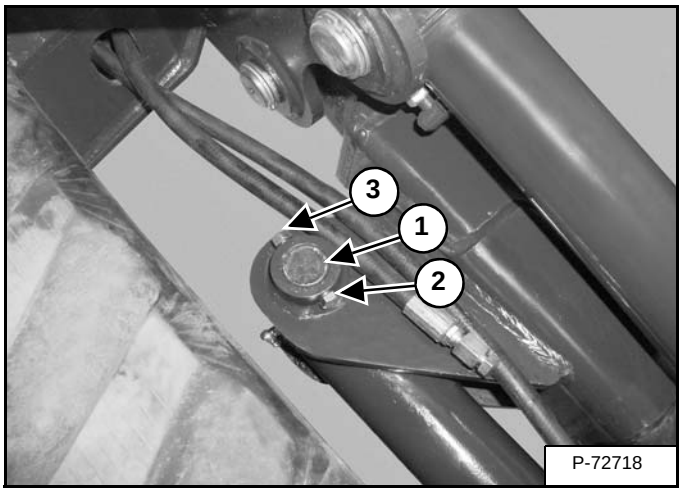
Reposition the cylinder and remove the hose (Item 1) **[Figure 20-26-3]** from the base end of the angle blade cylinder.

Install a plug in the hose.

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Testing (Cont'd)

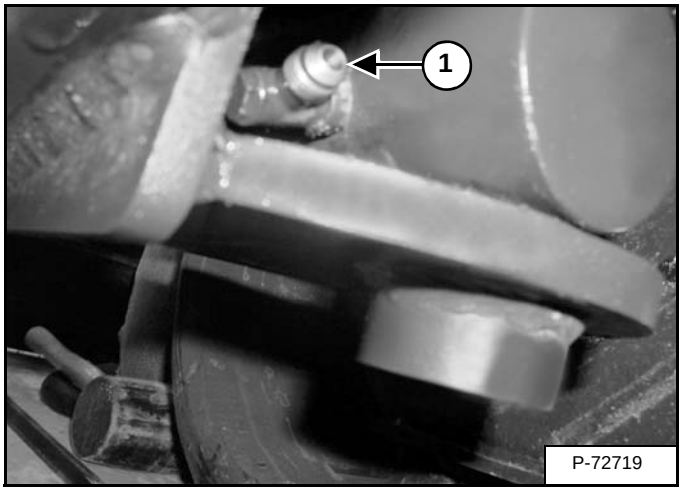
Figure 20-26-4



Temporarily install the pin (Item 1), bolt (Item 2) and nut (Item 3) **[Figure 20-26-4]** into the base end of the angle blade cylinder.

Start the engine, and retract the angle blade cylinder.

Figure 20-26-5



If there is any leakage from the base end fitting (Item 1) **[Figure 20-26-5]**, remove the cylinder for repair or replacement.

Removal And Installation

Lower the bucket and blade to the ground.

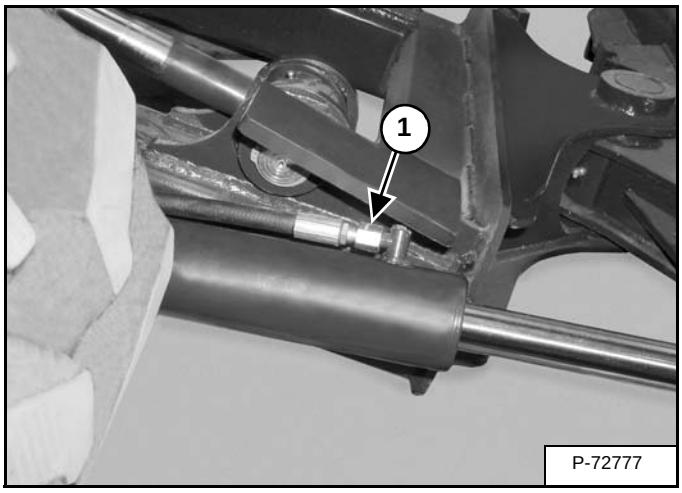
With the engine off, turn the key to the ON position, lower the console and move the blade lever. Press and hold the two speed button to activate angle blade mode, move the lever again to relieve hydraulic pressure.

IMPORTANT

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

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Figure 20-26-6

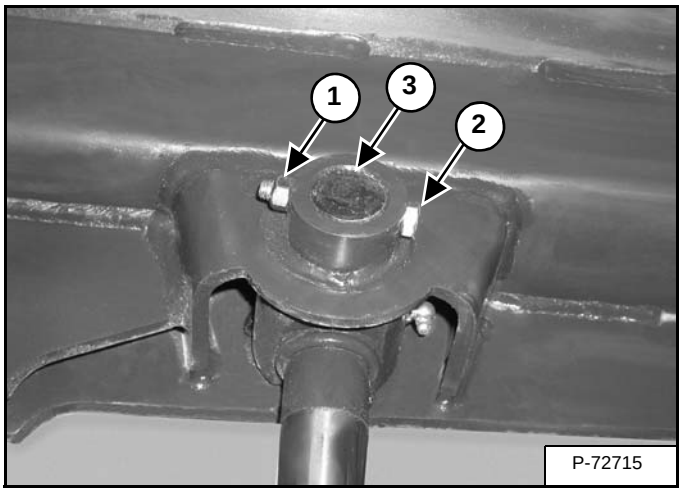


Remove the hose (Item 1) **[Figure 20-26-6]**.

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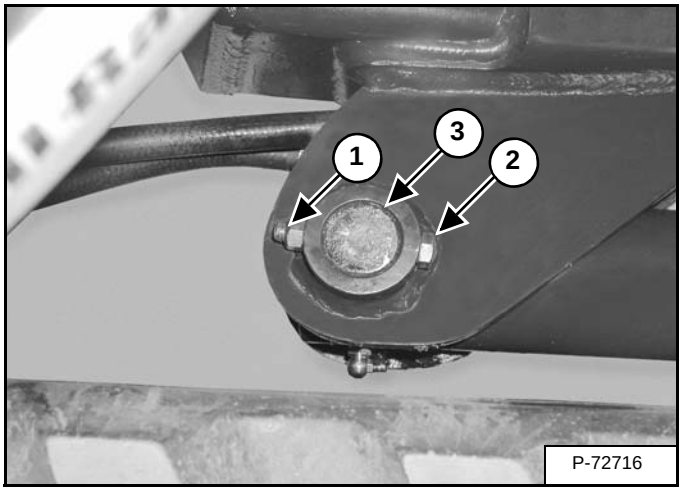
Removal And Installation (Cont'd)

Figure 20-26-7



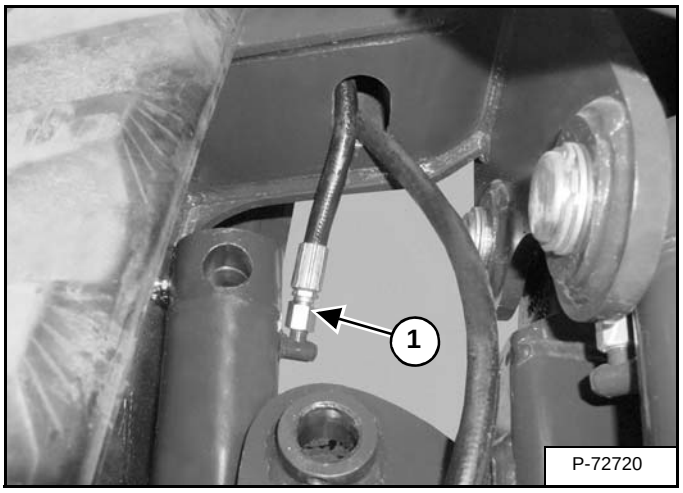
Remove the nut (Item 1), bolt (Item 2) and pin (Item 3) **[Figure 20-26-7]** from the rod end of the angle blade cylinder.

Figure 20-26-8



Remove the nut (Item 1), bolt (Item 2) and pin (Item 3) **[Figure 20-26-8]** from the base end of the angle blade cylinder.

Figure 20-26-9



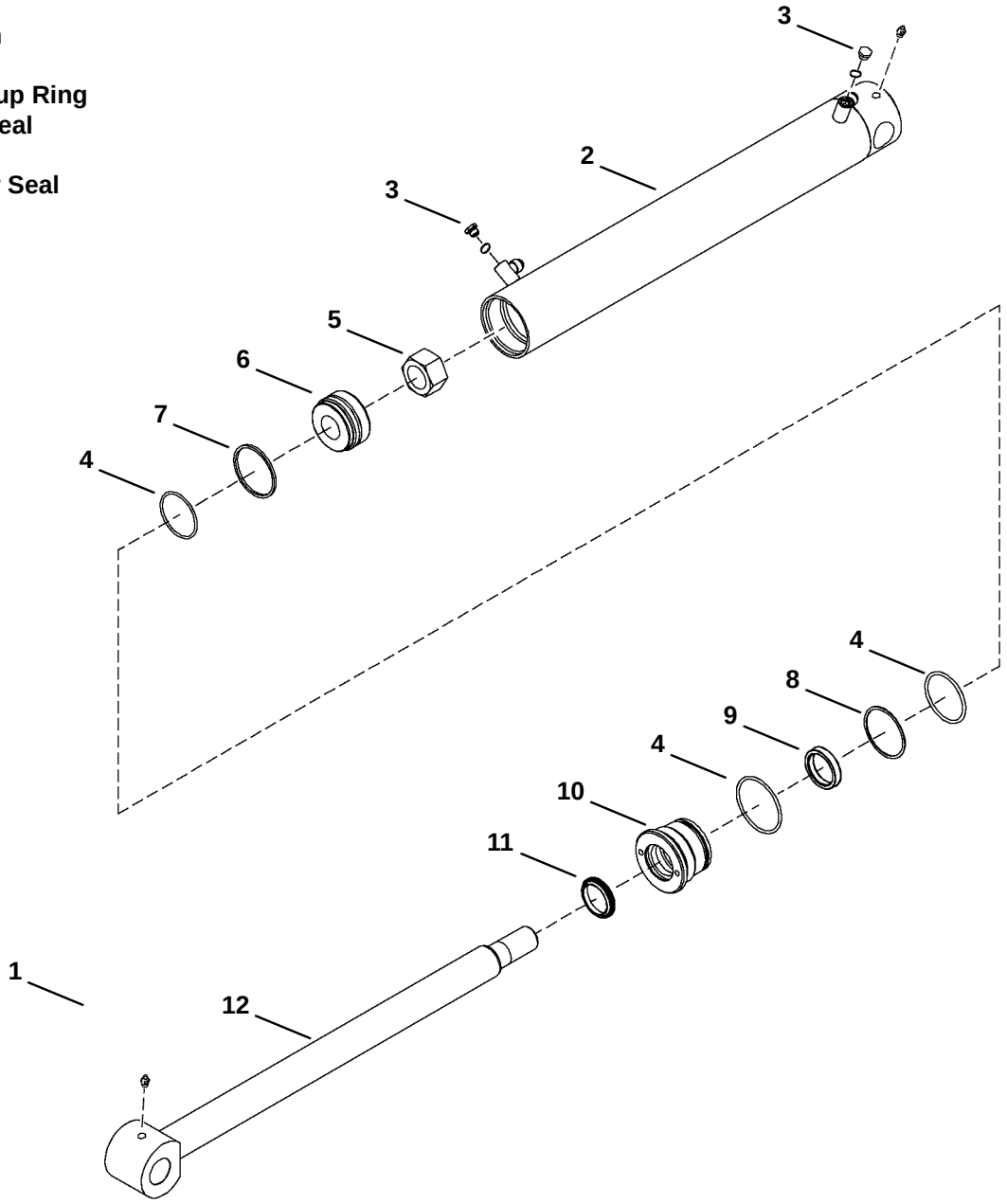
Reposition the cylinder and remove the hose (Item 1), **[Figure 20-26-9]** from the base end of the angle blade cylinder.

Remove the cylinder.

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Parts Identification

1. Grease Fitting
2. Housing
3. Plug
4. O-Ring
5. Nut
6. Piston
7. Seal
8. Back-up Ring
9. Rod Seal
10. Head
11. Wiper Seal
12. Rod



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Disassembly

Clean the outside of the angle blade cylinder before disassembly.

Use the following tools to disassemble the cylinder:

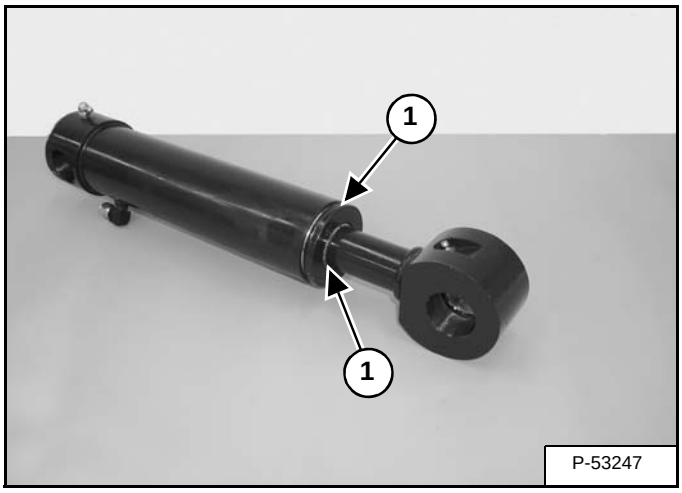
MEL1074 - O-ring Seal Hook
MEL1075 - Adjustable Gland Nut Wrench
MEL1075-2 - Special Offset Pins

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

Put the base end of the cylinder in a vise.

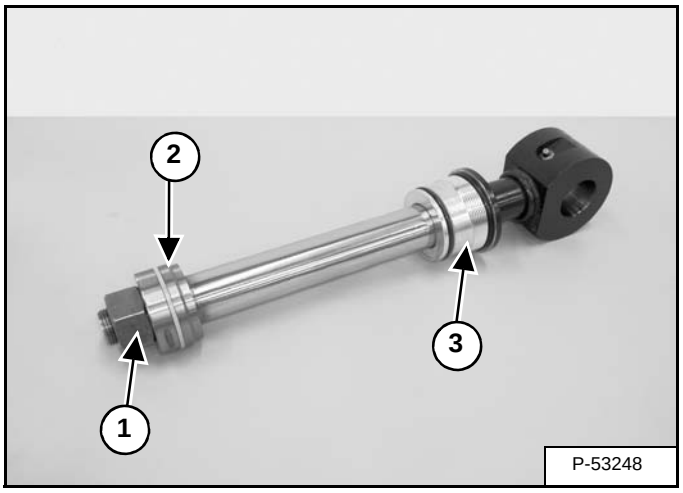
NOTE: Photo's may appear different, but the procedures are the same.

Figure 20-26-10



Insert the adjustable gland nut wrench into the two holes (Item 1) **[Figure 20-26-10]** to loosen the head.

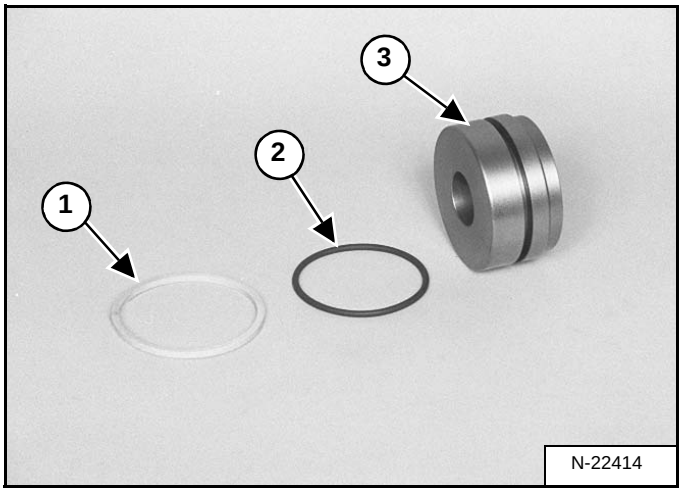
Figure 20-26-11



Remove the head and the rod assembly from the cylinder **[Figure 20-26-11]**. Put the rod end in a vise.

Remove the nut (Item 1), piston (Item 2) and head (Item 3) **[Figure 20-26-11]**.

Figure 20-26-12

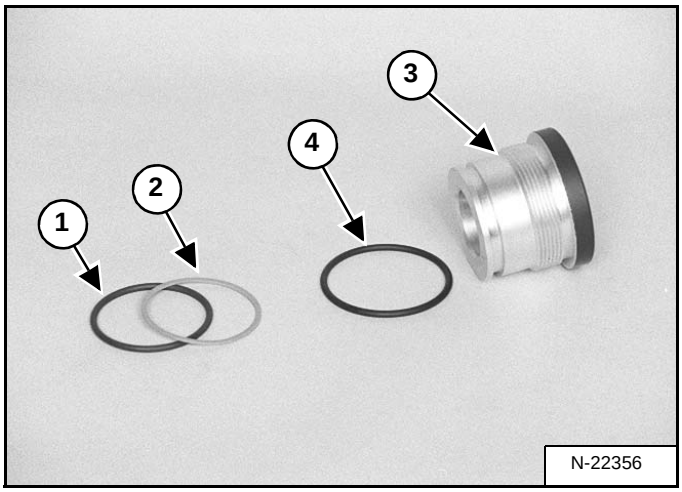


Remove the seal (Item 1) and O-ring (Item 2) from the piston (Item 3) **[Figure 20-26-12]**.

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Disassembly (Cont'd)

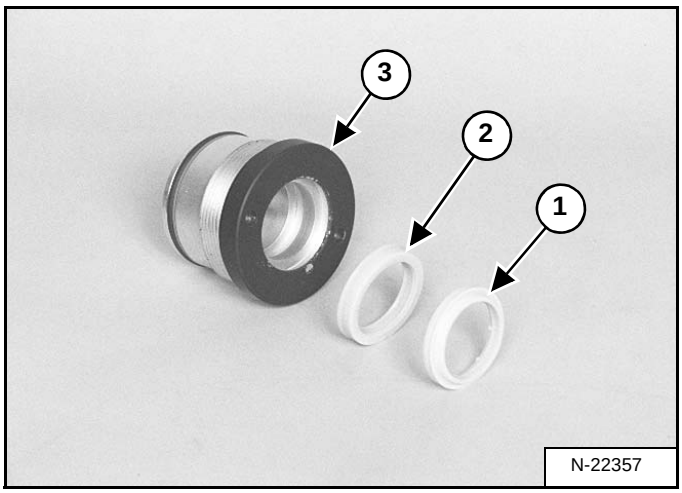
Figure 20-26-13



Remove the O-ring (Item 1) and the back-up ring (Item 2) from the head (Item 3) **[Figure 20-26-13]**.

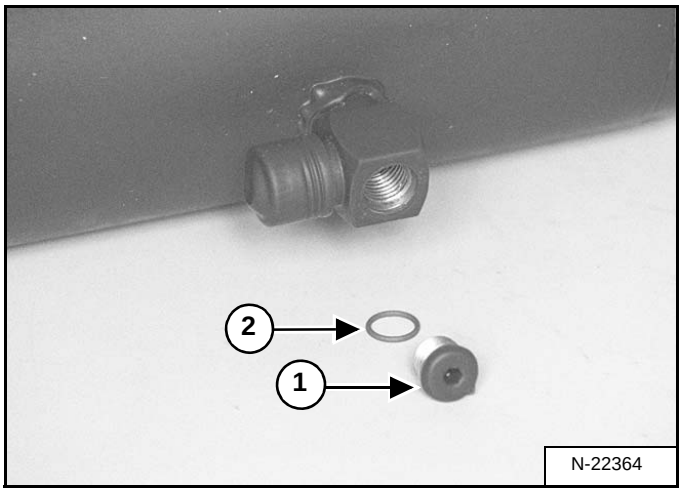
Remove the O-ring (Item 4) **[Figure 20-26-13]**.

Figure 20-26-14



Remove the wiper seal (Item 1) and rod seal (Item 2) from the inside of the head (Item 3) **[Figure 20-26-14]**.

Figure 20-26-15



Remove plug (Item 1) and O-ring (Item 2) **[Figure 20-26-15]** from both fittings.

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Assembly

Clean all parts in solvent and dry with compressed air.

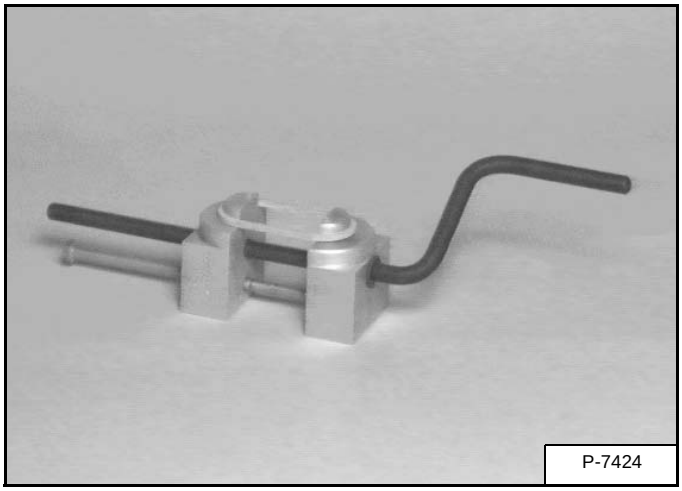
Inspect all parts for wear or damage. Replace any worn or damaged parts.

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

Use the following tools to assemble the cylinder:

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

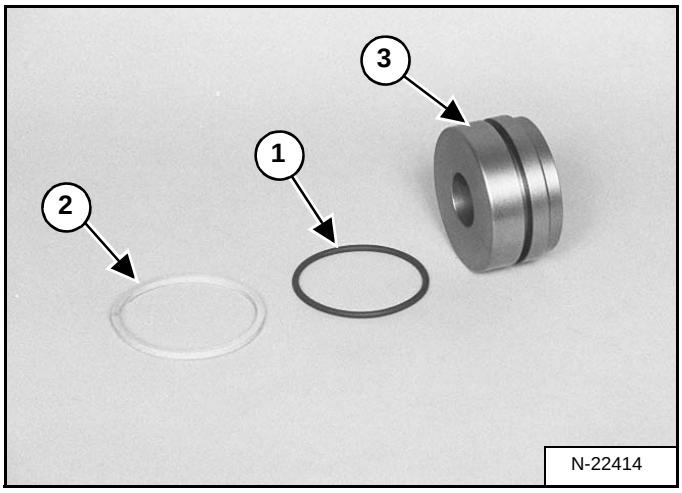
Figure 20-26-16



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

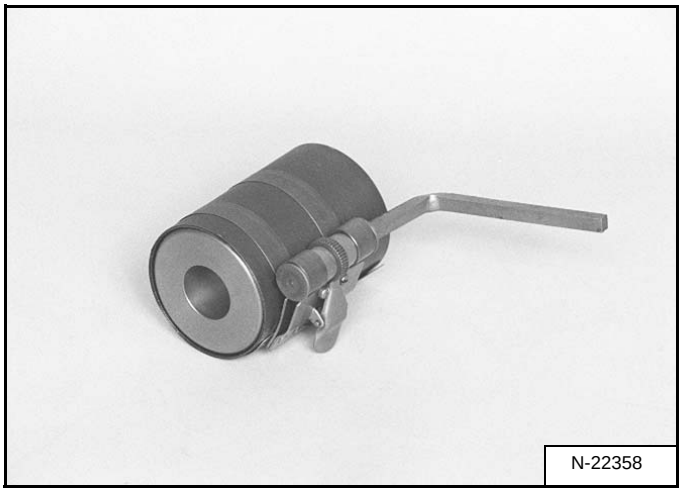
Allow the seal to stretch for 30 seconds before installing it on the piston.

Figure 20-26-17



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

Figure 20-26-18

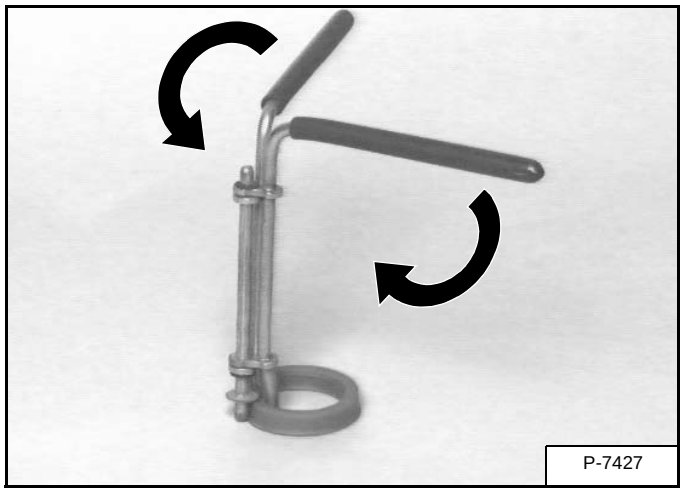


Use a ring compressor to compress the seal to the correct size. Leave the piston in the compressor for about three minutes **[Figure 20-26-18]**.

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Assembly (Cont'd)

Figure 20-26-19

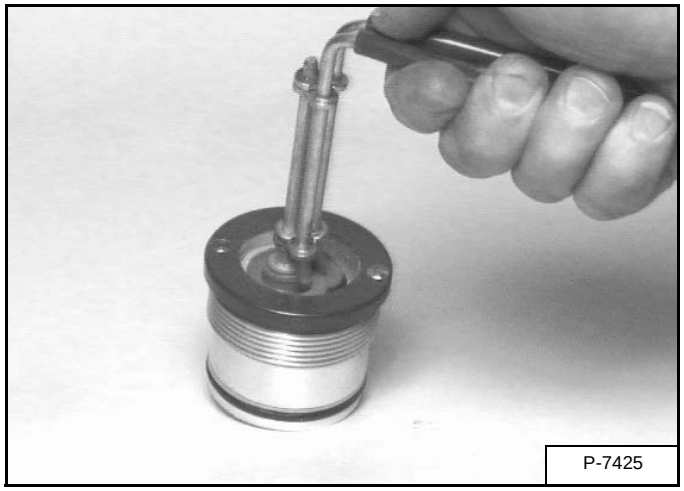


Install the rod seal on the rod seal tool **[Figure 20-26-19]**.

NOTE: During installation the spring side of the seal must be toward the inside of the cylinder.

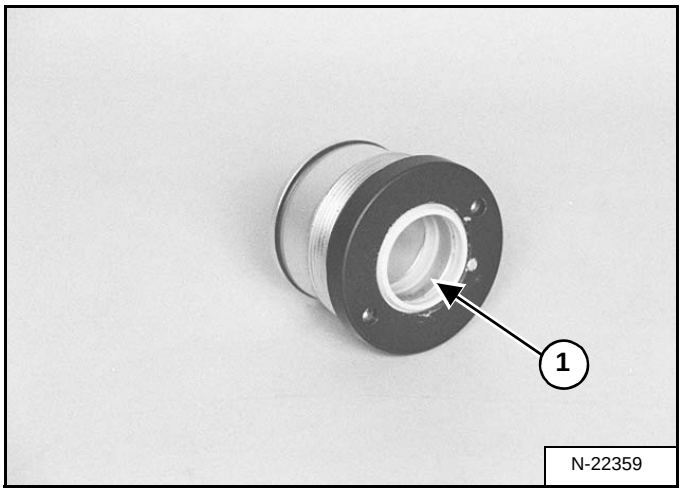
Rotate the handles to collapse the rod seal **[Figure 20-26-19]**.

Figure 20-26-20



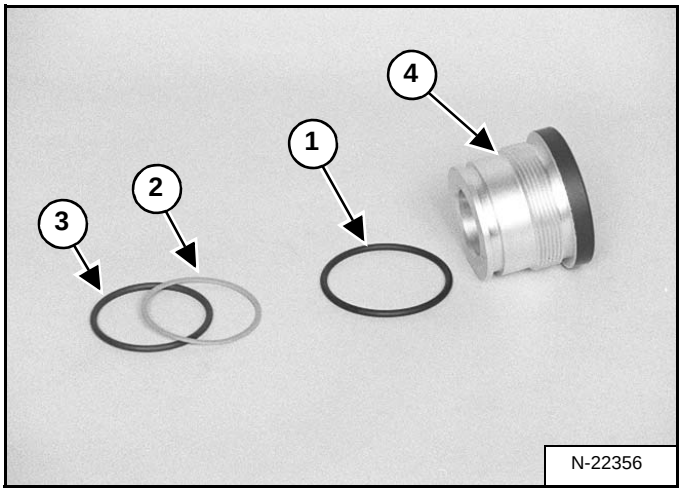
Install the rod seal in the head **[Figure 20-26-20]**.

Figure 20-26-21



Install the wiper seal with the wiper (Item 1) **[Figure 20-26-21]** toward the outside of the head.

Figure 20-26-22



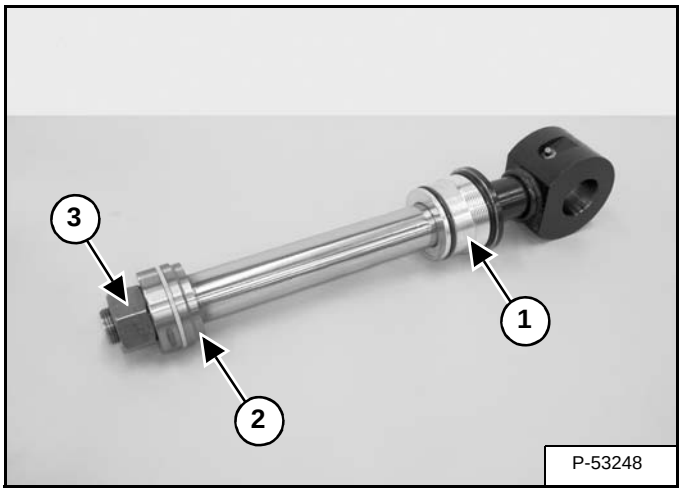
Install the O-ring (Item 1) **[Figure 20-26-22]**.

Install the back-up ring (Item 2) and O-ring (Item 3) into the groove on the head (Item 4) **[Figure 20-26-22]**.

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Assembly (Cont'd)

Figure 20-26-23



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

NOTE: Clean and dry the rod threads. Install a NEW NUT with pre-applied Loctite™.

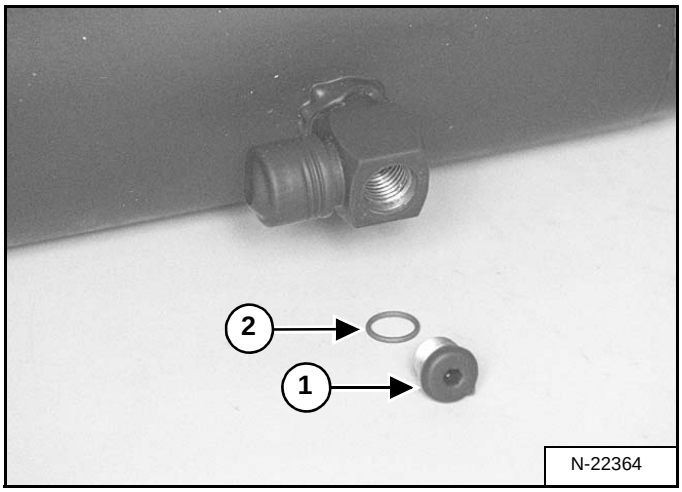
Grease the piston where the nut contacts the piston. Do not get grease on the threads.

Provide an adequate support for the cylinder before tightening.

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

Tighten the nut to 850 ft.-lb. (1153 N•m) torque.

Figure 20-26-24

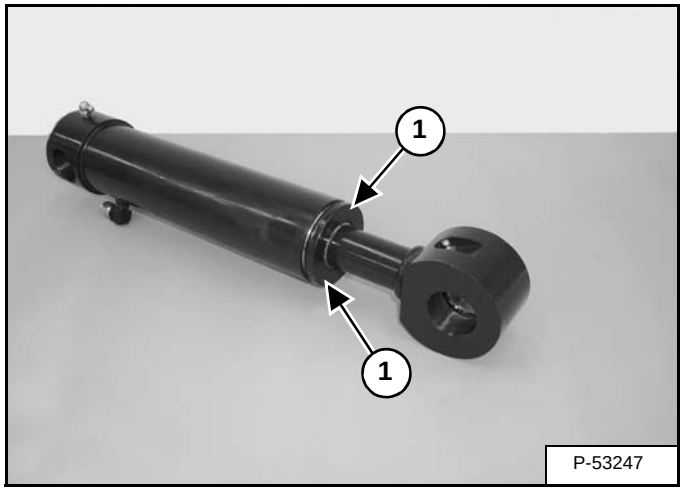


Install plug (Item 1) and O-ring (Item 2) **[Figure 20-26-24]**.

Tighten the plug to 8 ft.-lb. (11 N•m) torque.

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

Figure 20-26-25



Insert the adjustable gland nut wrench into the two holes (Item 1) **[Figure 20-26-25]** to tighten the head. Head to be torqued until flush with end of housing.

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MAIN RELIEF VALVES

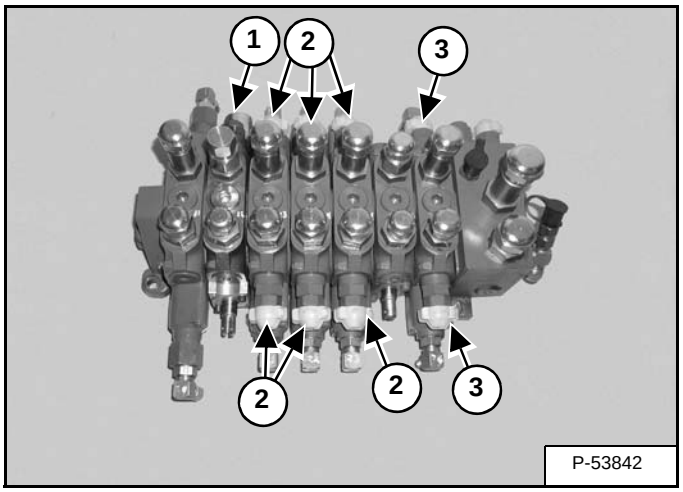
The 435 Excavator does not have a main relief valve, which can be removed or adjusted. The system pressure is regulated by several components within the hydraulic system. For pressure adjustment, go to the Hydraulic Pump. See HYDRAULIC PUMP (See HYDRAULIC PUMP (S/N 562611001 & ABOVE AND 562811001 & ABOVE) on Page 20-50-1 or See HYDRAULIC PUMP (S/N 563111001 & Above AND 563211001 & above) on Page 20-51-1)

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PORT RELIEF VALVES

Port Relief Valve Pressure Setting

Figure 20-31-1



Blade Relief (Item 1) **[Figure 20-31-1]** set at:

Base End	3770 PSI (260 bar)

Bucket, Arm and Boom Relief (Item 2) **[Figure 20-31-1]** set at:

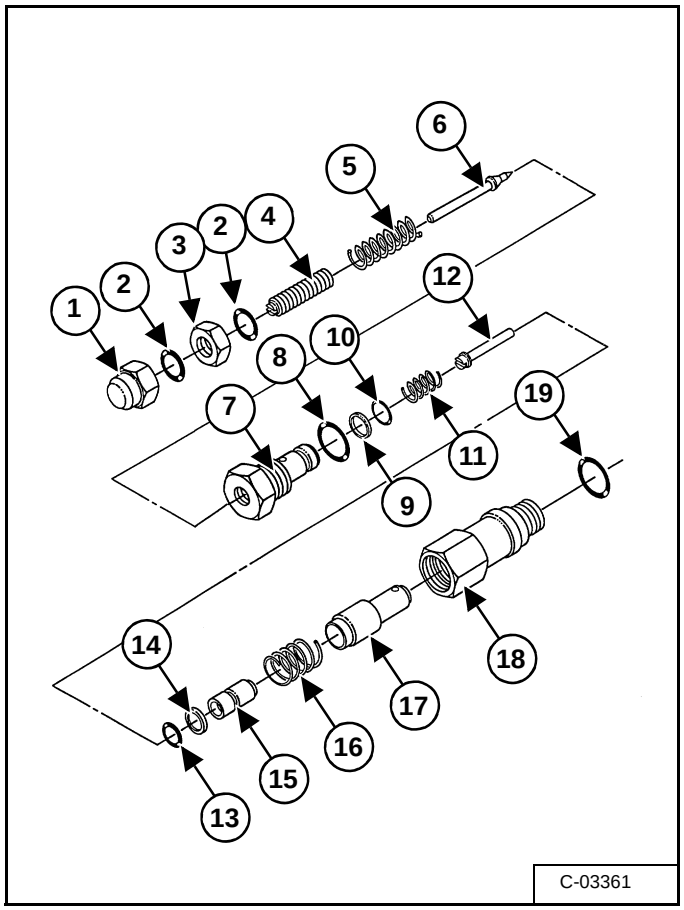
Base End	4206 PSI (290 bar)
Rod End	4206 PSI (290 bar)

Auxiliary Relief (Item 3) **[Figure 20-31-1]** set at:

Female Coupler	3045 PSI (210 bar)
Male Coupler	3045 PSI (210 bar)

Parts Identification

Figure 20-31-2



ITEM	DESCRIPTION
1.	END CAP
2.	O-RING
3.	NUT
4.	ADJUSTING SCREW
5.	SPRING
6.	POPPET
7.	HOUSING
8.	O-RING
9.	BACK-UP RING
10.	O-RING
11.	SPRING
12.	POPPET
13.	O-RING
14.	BACK-UP RING
15.	POPPET
16.	SPRING
17.	SLEEVE
18.	HOUSING
19.	O-RING **[Figure 20-31-2]**

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Adjustment Procedure

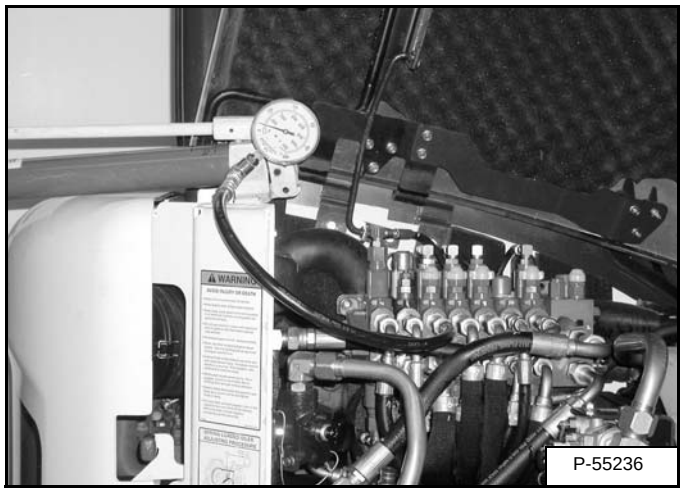
IMPORTANT

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

A portable hydraulic hand pump will be used to test the work port relief valves. The hand pump must have clean hydraulic fluid that is compatible with the Bobcat hydraulic fluid.

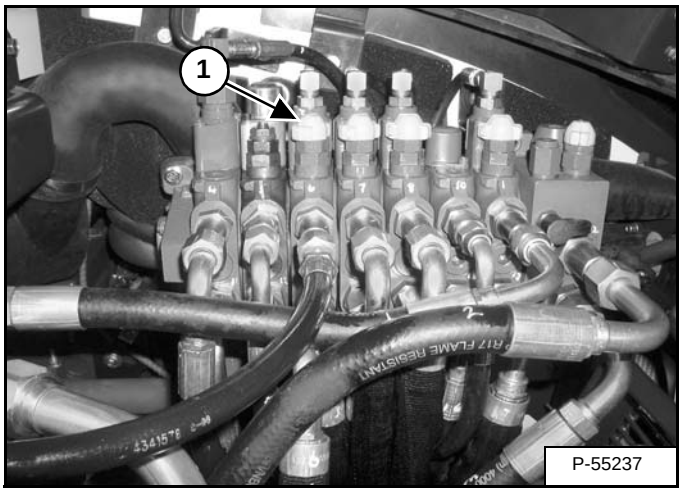
Figure 20-31-3



Install the hand pump hose and a pressure gauge (minimum of 5000 PSI) (345 bar) into the valve section work port in which the port relief valve is located **[Figure 20-31-3]**. Pressurize this section with the hand pump until the port relief valve opens and make a note of the pressure reading.

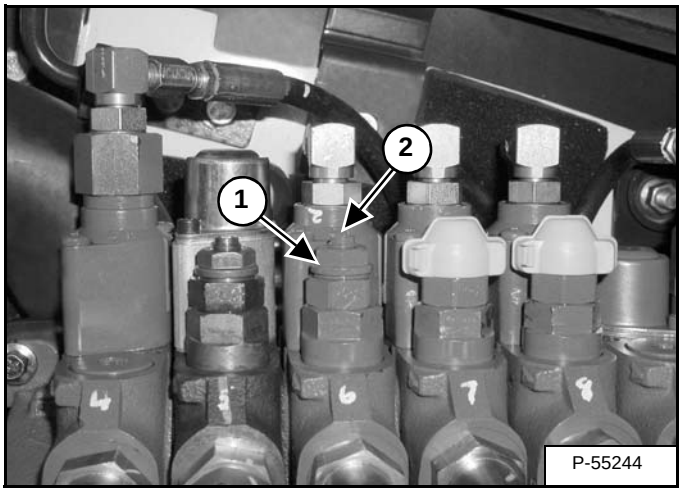
If the port relief pressure setting needs to be adjusted, release the hand pump pressure valve.

Figure 20-31-4



Remove the protective end cap (Item 1) **[Figure 20-31-4]**.

Figure 20-31-5



Loosen the nut (Item 1) **[Figure 20-31-5]**.

Turn the adjusting screw (Item 2) **[Figure 20-31-5]** clockwise to increase the pressure and counterclockwise to reduce the pressure.

NOTE: 1/8 turn is approximately 100 PSI (7 bar) and 1/4 turn is approximately 250 PSI (17 bar) when the correct pressure setting is obtained, tighten the locknut while holding the adjustment screw from turning.

Adjust the port relief valve until the correct setting is obtained.

Install the end cap.

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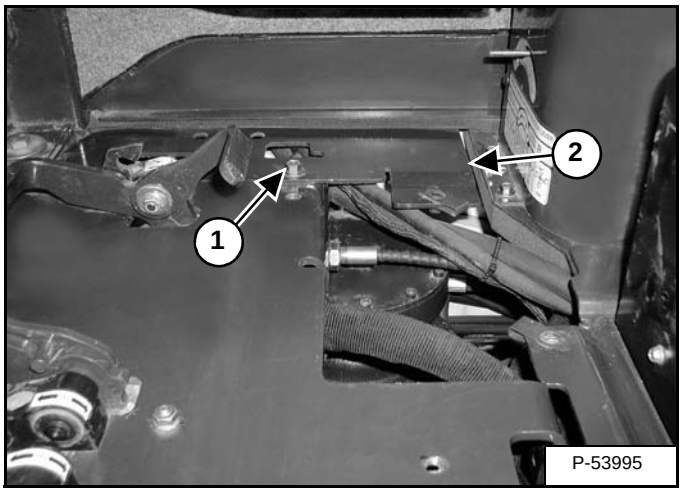
CROSSPORT RELIEF VALVE

Testing And Adjusting The Crossport Relief Valve

Remove the floormat and floorplate. (See Removal And Installation on Page 50-120-1)

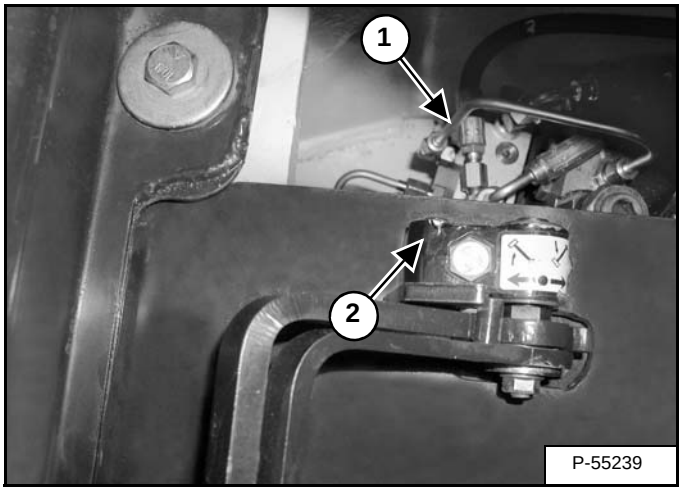
Open the right side cover.

Figure 20-32-1



Remove the bolt (Item 1) and right floorplate (Item 2) **[Figure 20-32-1]**.

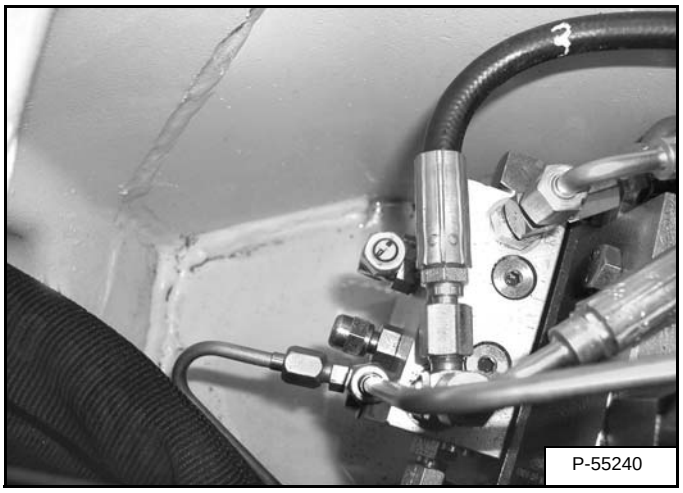
Figure 20-32-2



At the dual sequence valve, remove the tubeline (Item 1) **[Figure 20-32-2]** from the two stage port. (Port 2S.)

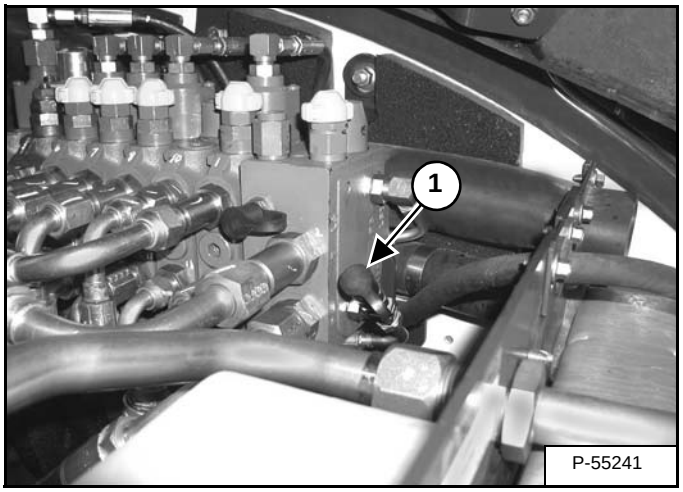
Remove the tubeline (Item 2) **[Figure 20-32-2]** from the brake port. (Port B.)

Figure 20-32-3



Cap and plug both of the hydraulic hoses and both of the hydraulic fittings **[Figure 20-32-3]**.

Figure 20-32-4

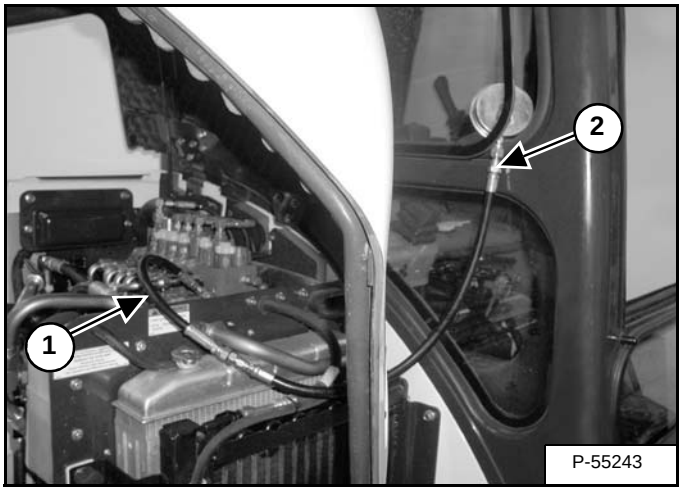


Remove the protective cap from the diagnostic port (Item 1) **[Figure 20-32-4]** on the control valve.

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Testing And Adjusting The Crossport Relief Valve (Cont'd)

Figure 20-32-5



From the hydraulic test kit, attach the hydraulic hose (Item 1) and a 5000 PSI (345 Bar) gauge (Item 2) **[Figure 20-32-5]** to the diagnostic port.

Position the hydraulic gauge so it can be read from inside the operator cab.

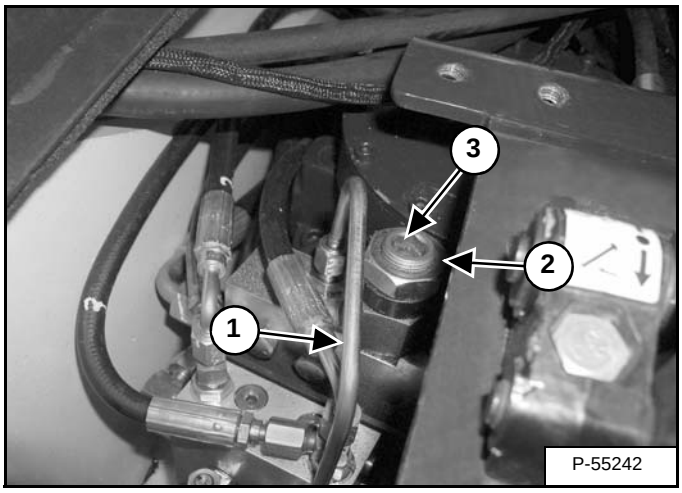
With an operator in the cab, and the left console lowered, start the Excavator and run at high idle.

Operate the left control lever toward the left. Record the pressure at the gauge.

Operate the left control lever toward the right. Record the pressure at the gauge.

The pressure on the gauge should be 3500 PSI ±100 PSI (241 Bar ± 48 Bar), which will give a pressure of 2800 PSI ±100 PSI (193 Bar ± 7 Bar) at the crossport relief.

Figure 20-32-6



The relief valves (Item 1) **[Figure 20-32-6]** can be adjusted, **only with the Excavator shut OFF**.

If the pressure needs to be adjusted when operating toward the right, the upper relief valve (Item 1) **[Figure 20-32-6]**, must be adjusted.

If the pressure needs to be adjusted when operating toward the left, the lower relief valve must be adjusted.

With the Excavator shut **OFF** loosen the nut (Item 2). Adjust the pressure by turning the adjustment screw (Item 3) **[Figure 20-32-6]**.

Turn the adjustment screw clockwise to increase the pressure and counterclockwise to decrease the pressure.

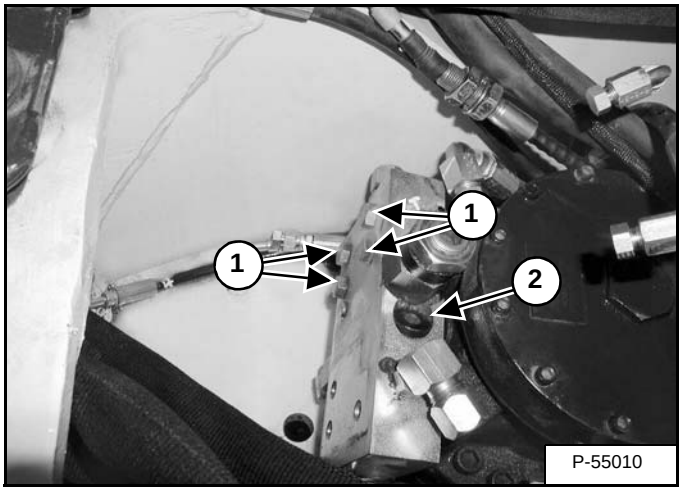
NOTE: 1/4 turn clockwise will increase pressure approximately 100-200 PSI (7-14 Bar)

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Removal And Installation

Remove the Dual Sequence Valve. (See Removal And Installation on Page 20-160-1)

Figure 20-32-7



Remove the four bolts (Item 1) **[Figure 20-32-7]**.

Installation: Tighten the bolts to 45 ft.-lb. (61 N•m) torque.

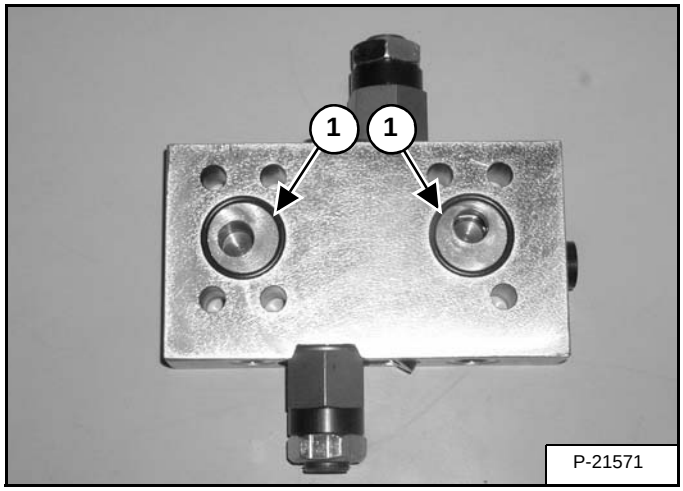
Remove the crossport relief valve block (Item 2) **[Figure 20-32-7]**.

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Disassembly And Assembly

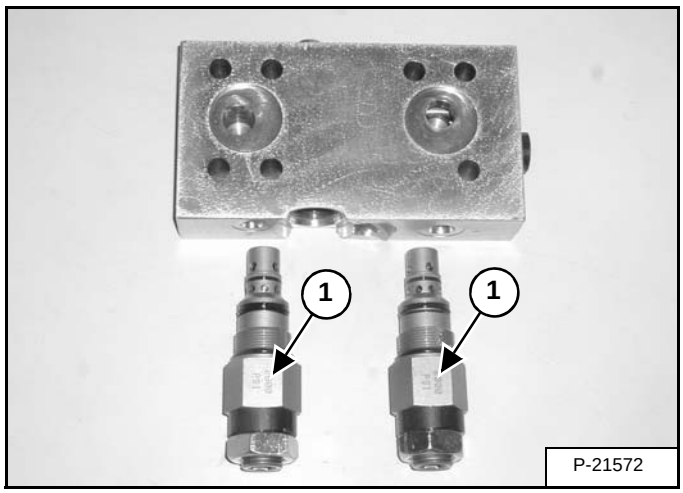
Clean the outside of the crossport relief block valve before disassembly.

Figure 20-32-8



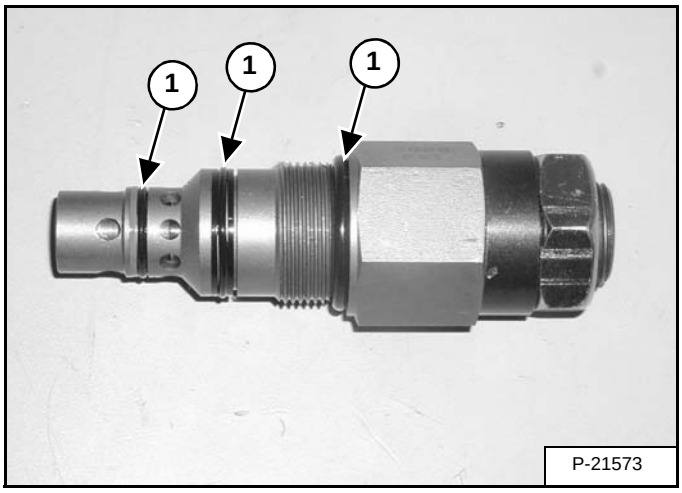
Remove the two O-rings (Item 1) **[Figure 20-32-8]**.

Figure 20-32-9



Remove the relief valves (Item 1) **[Figure 20-32-9]**.

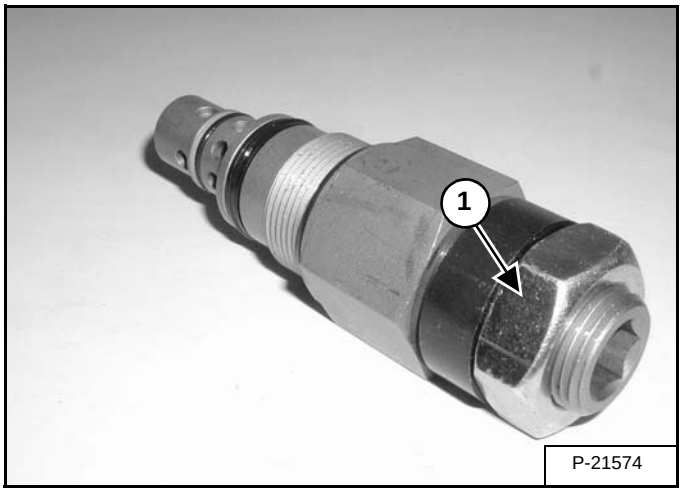
Figure 20-32-10



NOTE: The relief valves (Item 1) [Figure 20-32-9] are interchangeable. The relief valves must be replaced as a complete unit.

Check the O-rings and back-up rings (Item 1) **[Figure 20-32-10]** and replace as needed.

Figure 20-32-11

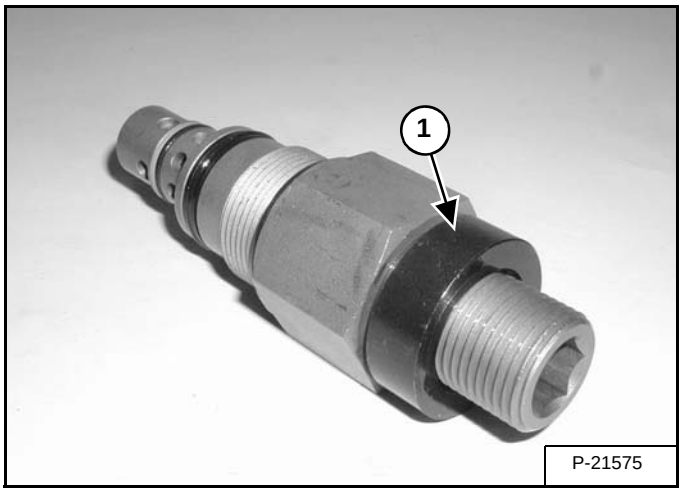


Remove the nut (Item 1) **[Figure 20-32-11]**.

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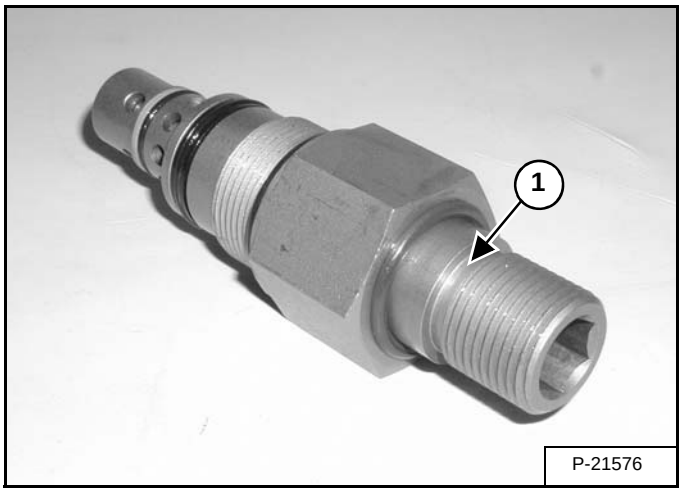
Disassembly And Assembly (Cont'd)

Figure 20-32-12



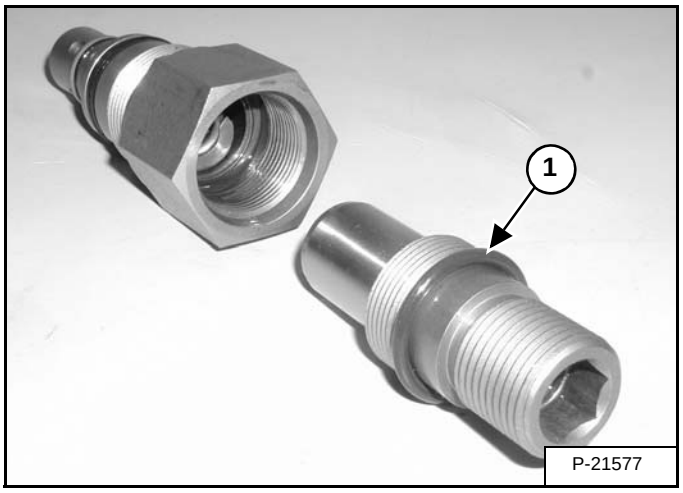
Remove the spacer (Item 1) **[Figure 20-32-12]**.

Figure 20-32-13



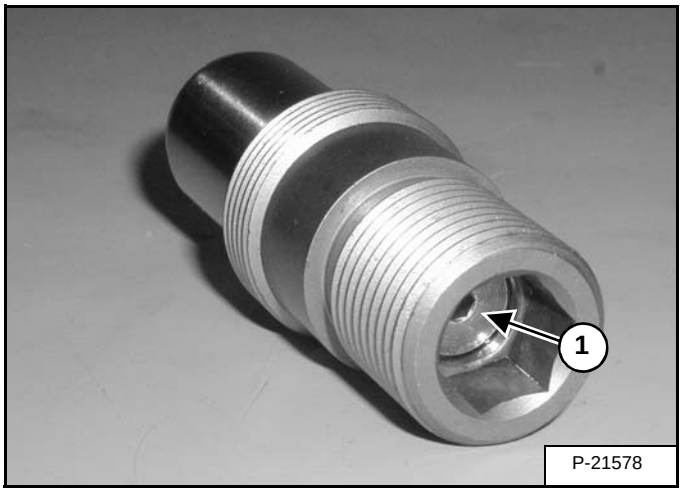
Remove the adjustment screw (Item 1) **[Figure 20-32-13]** and O-ring from the valve.

Figure 20-32-14



Remove the O-ring (Item 1) **[Figure 20-32-14]**.

Figure 20-32-15

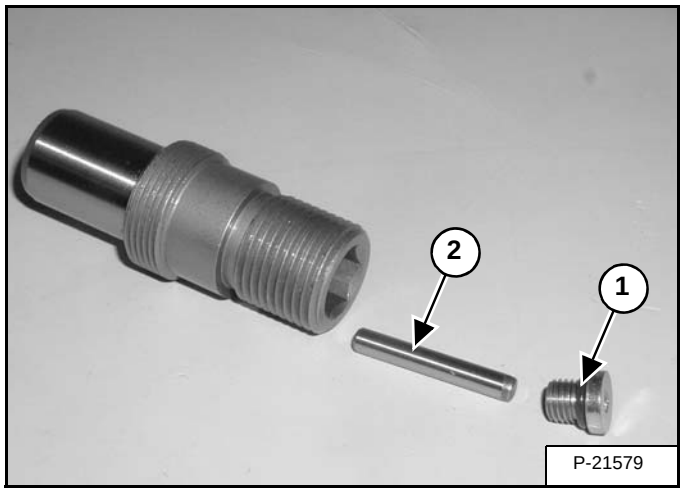


Remove the plug (Item 1) **[Figure 20-32-15]**.

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Disassembly And Assembly (Cont'd)

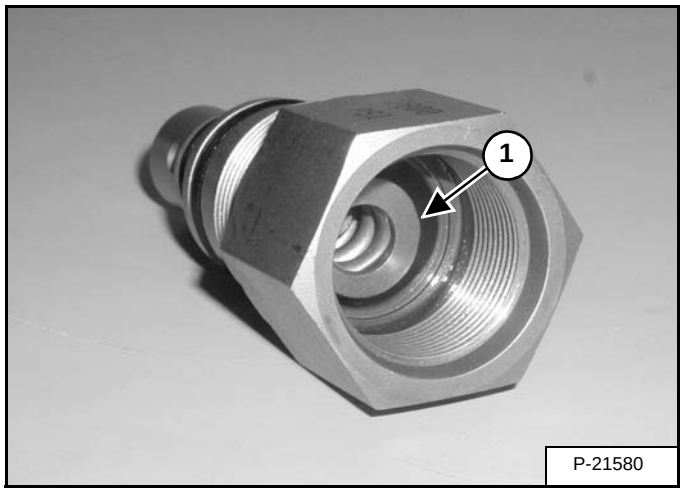
Figure 20-32-16



Remove the O-ring (Item 1) **[Figure 20-32-16]**.

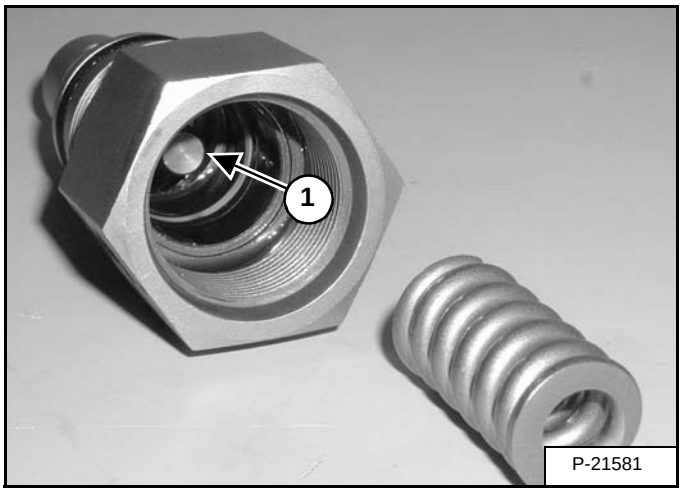
Remove the plunger (Item 2) **[Figure 20-32-16]**.

Figure 20-32-17



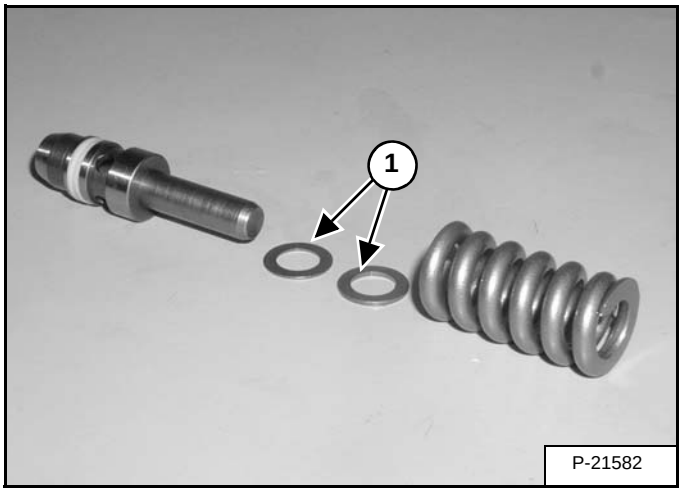
Remove the spring (Item 1) **[Figure 20-32-17]**.

Figure 20-32-18



Remove the poppet (Item 1) **[Figure 20-32-18]**.

Figure 20-32-19

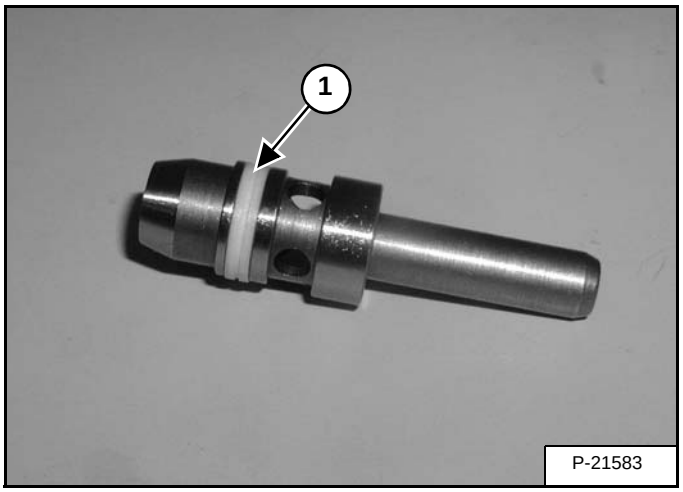


Remove the shims (Item 1) **[Figure 20-32-19]** from the poppet.

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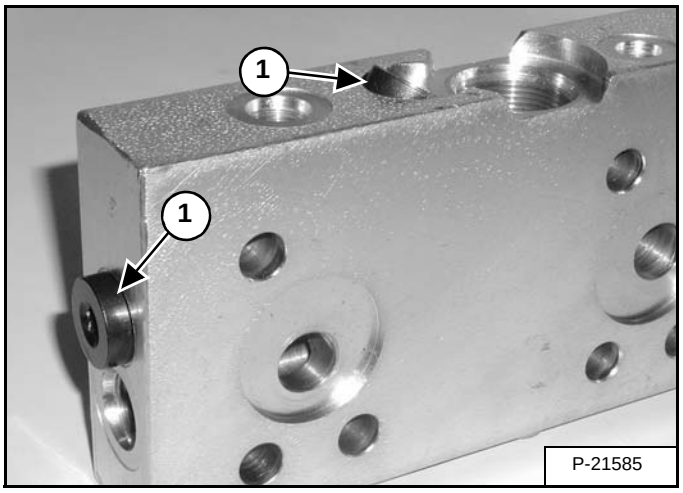
Disassembly And Assembly (Cont'd)

Figure 20-32-20



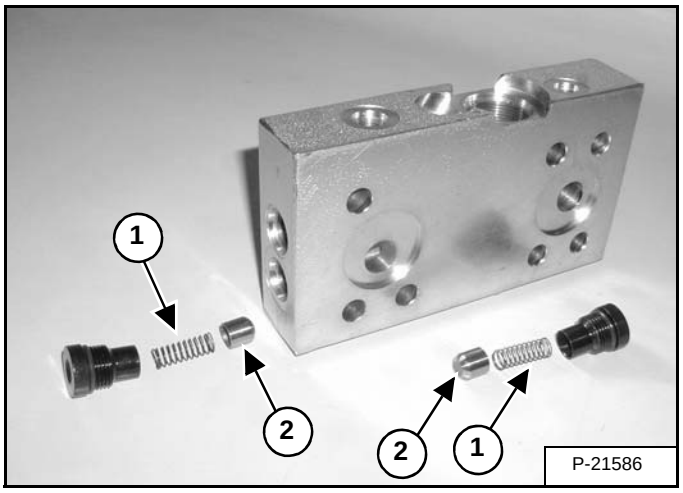
Remove the seal (Item 1) **[Figure 20-32-20]**.

Figure 20-32-21



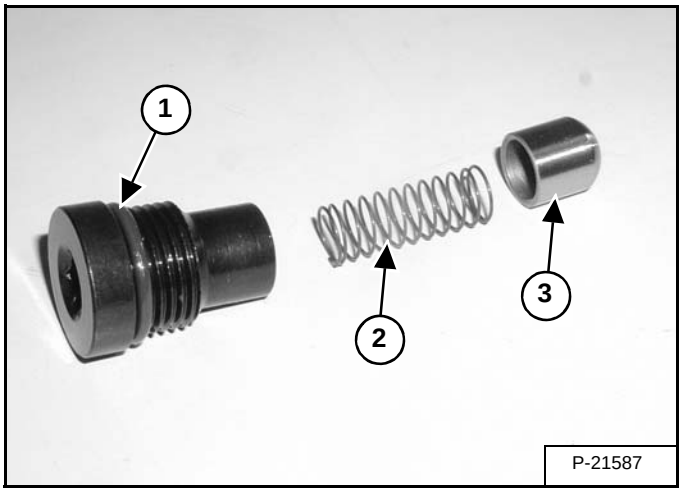
Remove the plugs (Item 1) **[Figure 20-32-21]** from the valve.

Figure 20-32-22



Remove the springs (Item 1) and poppets (Item 2) **[Figure 20-32-22]**, from the valve.

Figure 20-32-23

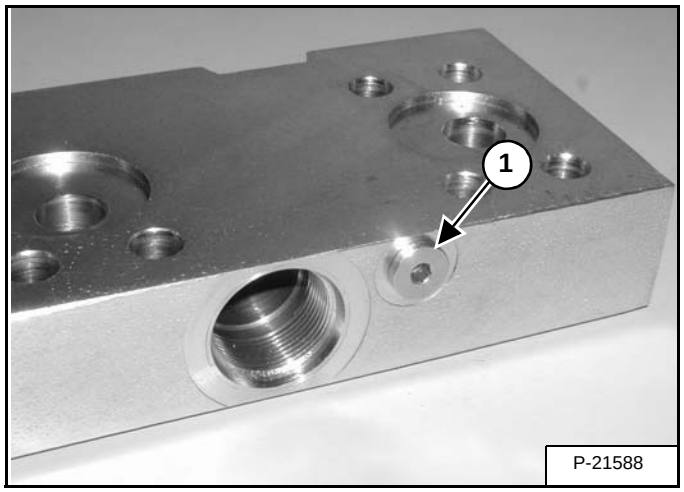


Remove the O-ring (Item 1), spring (Item 2) and poppet (Item 3) **[Figure 20-32-23]**.

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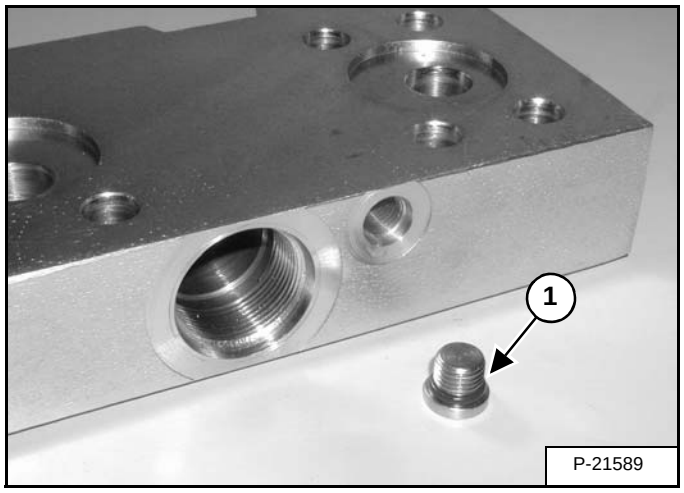
Disassembly And Assembly (Cont'd)

Figure 20-32-24



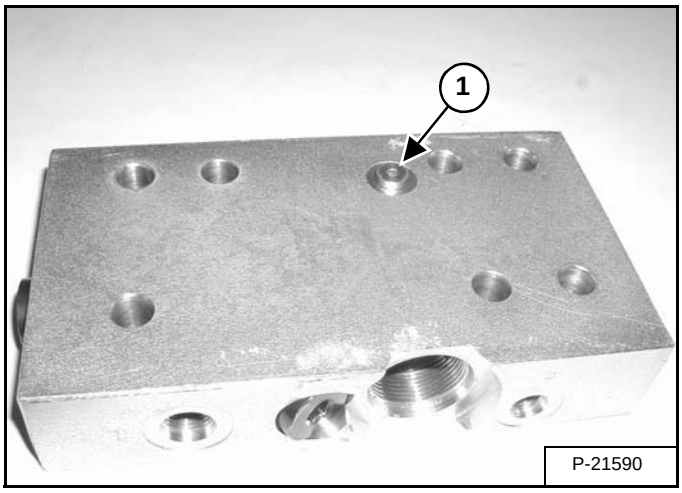
Remove the plug (Item 1) **[Figure 20-32-24]**.

Figure 20-32-25



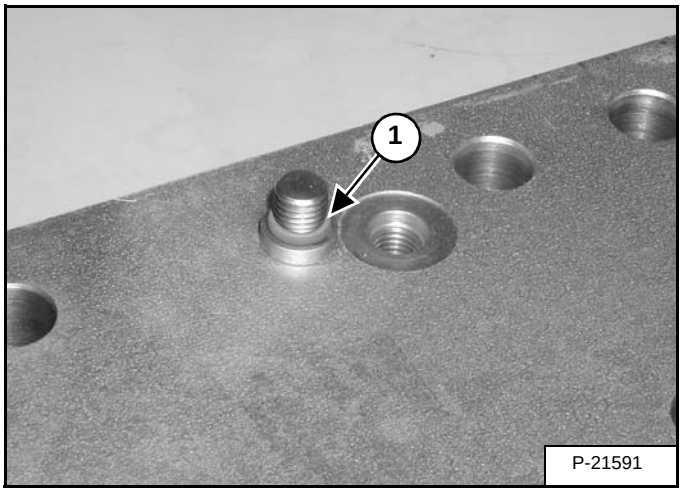
Remove the O-ring (Item 1) **[Figure 20-32-25]**.

Figure 20-32-26



Remove the plug (Item 1) **[Figure 20-32-26]**.

Figure 20-32-27



Remove the O-ring (Item 1) **[Figure 20-32-27]**.

Clean all parts in solvent and dry with compressed air.

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

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

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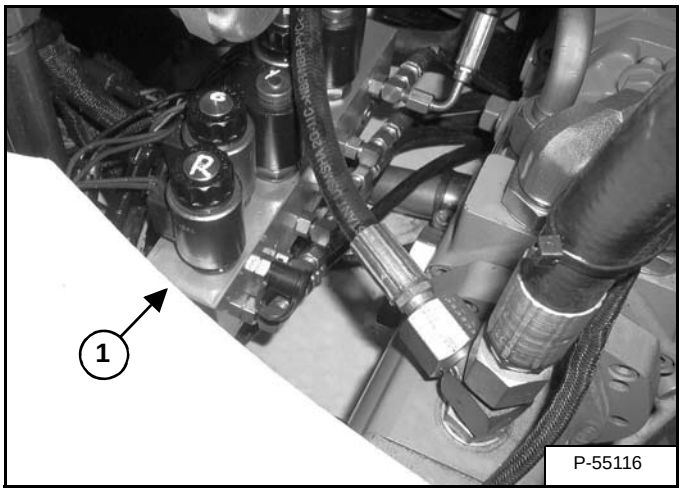
PRESSURE REDUCING VALVE

Description

The pressure reducing valve is part of the manifold assembly, and provides pilot pressure for the hydraulic system.

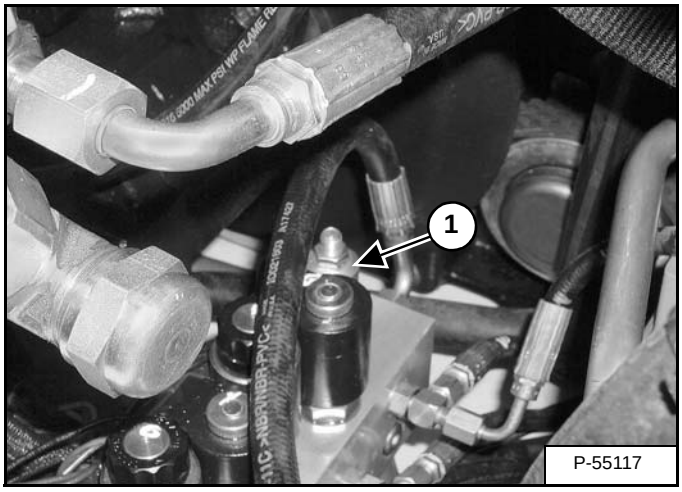
Open the right side cover.

Figure 20-33-1



Locate the manifold assembly (Item 1) **[Figure 20-33-1]**.

Figure 20-33-2



The pressure reducing valve (Item 1) **[Figure 20-33-2]** is located on the back side of the manifold assembly.

To test or adjust the pressure reducing valve, see Manifold Assembly/Accumulator (See MANIFOLD ASSEMBLY/ACCUMULATOR (S/N 562611001 & ABOVE, 562811001 & ABOVE, AND 563211001 - 563213999) on Page 20-60-1 or See MANIFOLD ASSEMBLY/ACCUMULATOR (S/N 563214000 & ABOVE) on Page 20-60-1)

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ANGLE BLADE VALVE

Description

The angle blade valve is only on machines equipped with an angle blade option.

The angle blade valve uses pilot pressure to select two speed travel function and the angle blade function.

The angle blade valve uses 2-speed pilot pressure to divert main valve blade oil to the lift or angle cylinders.

Testing And Adjusting Port Relief Valves

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

IMPORTANT

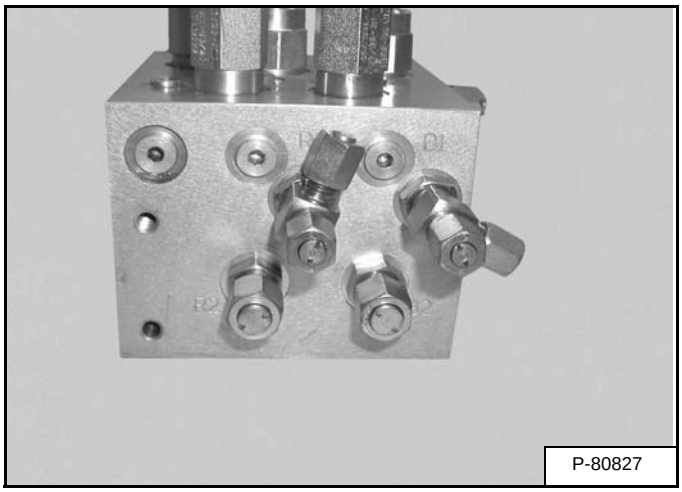
When repairing hydrostatic and hydraulic systems, clean the work area before disassembly and keep all parts clean. Always use caps and plugs on hoses, tubelines and ports to keep dirt out. Dirt can quickly damage the system.

I-2003-0888

A portable hydraulic hand pump will be used to test the work port relief valves. The hand pump must have clean hydraulic fluid that is compatible with the Bobcat hydraulic fluid.

NOTE: The valve is shown removed from the excavator for photo clarity.

Figure 20-34-1

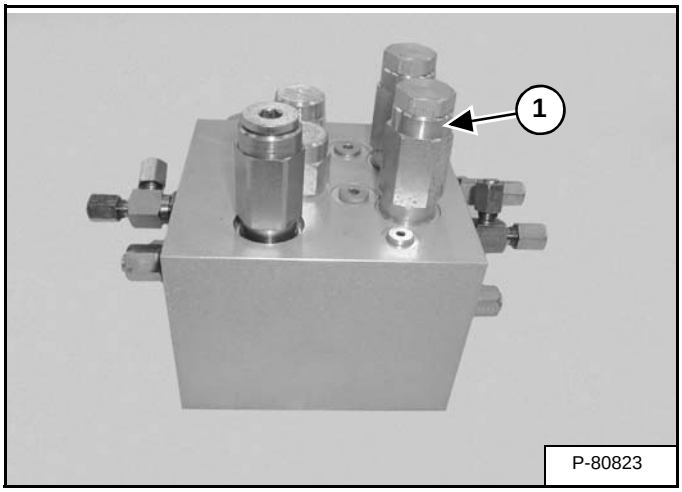


Install the hand pump and pressure gauge (minimum 5000 PSI) (345 bar) into the work port to be tested (B2 or R2) **[Figure 20-34-1]**.

Pressurize this section with the hand pump until the port relief valve opens and make a note of the pressure reading.

If the port relief pressure setting needs to be adjusted, release the hand pump pressure valve.

Figure 20-34-2

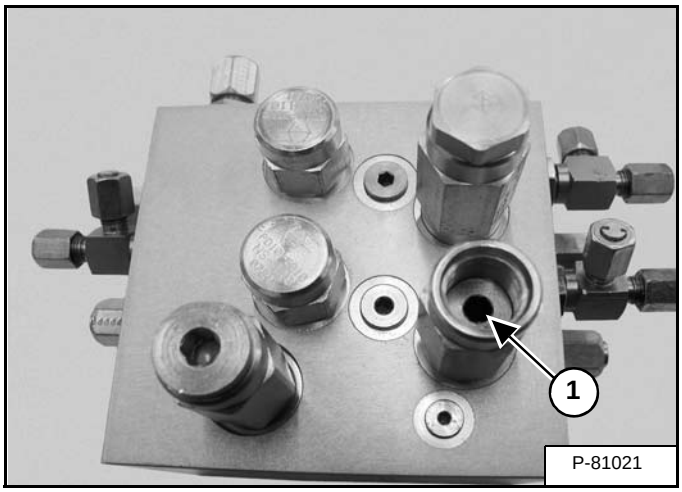


Remove the cap (Item 1) **[Figure 20-34-2]**.

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Testing And Adjusting Port Relief Valves (Cont'd)

Figure 20-34-3



Turn the adjustment screw (Item 1) **[Figure 20-34-3]** clockwise to increase pressure or counter- clockwise to reduce the pressure.

Install the cap.

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Testing And Adjusting Sequence Valve

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

IMPORTANT

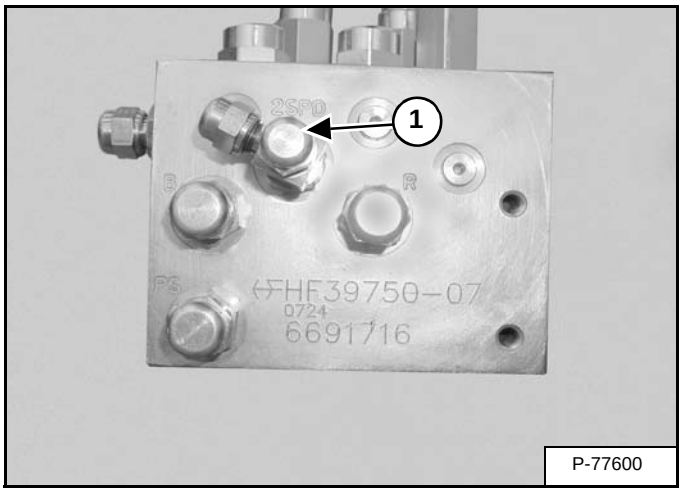
When repairing hydrostatic and hydraulic systems, clean the work area before disassembly and keep all parts clean. Always use caps and plugs on hoses, tubelines and ports to keep dirt out. Dirt can quickly damage the system.

I-2003-0888

A portable hydraulic hand pump will be used to test the work port relief valves. The hand pump must have clean hydraulic fluid that is compatible with the Bobcat hydraulic fluid.

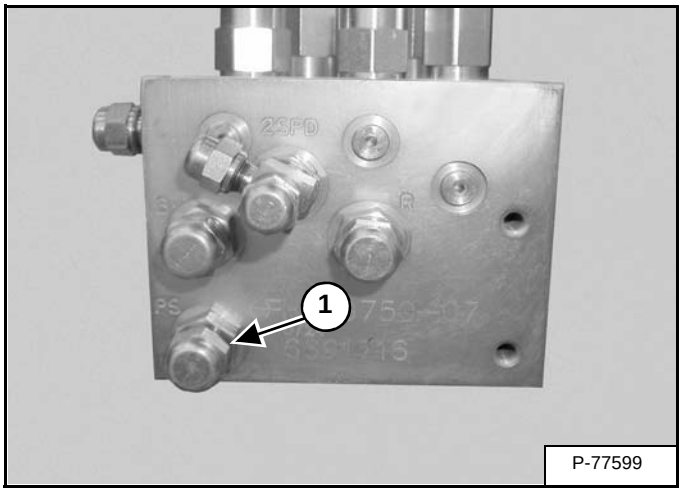
NOTE: The valve is shown removed from the excavator for photo clarity.

Figure 20-34-4



Remove both hoses from the fitting in the 2-speed port (Item 1) **[Figure 20-34-4]**.

Figure 20-192-5



Install the hand pump and pressure gauge in the PS port (Item 1) **[Figure 20-192-5]**.

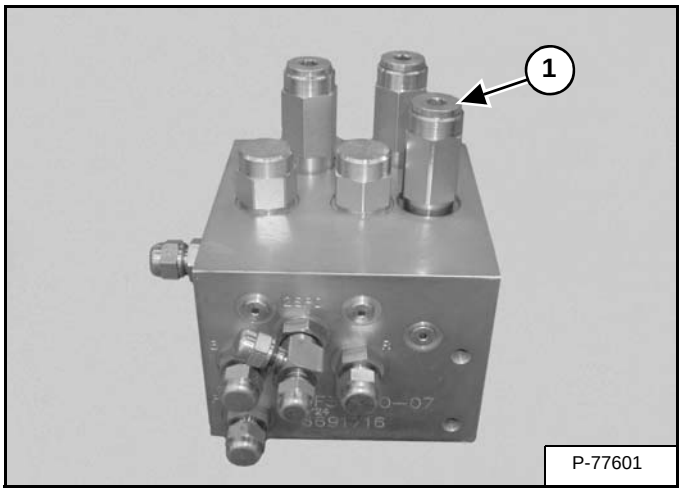
Pressurize with the hand pump until fluid comes out of the 2-speed port. Make note of the pressure reading.

If the sequence valve pressure setting needs to be adjusted, release the hand pump pressure valve.

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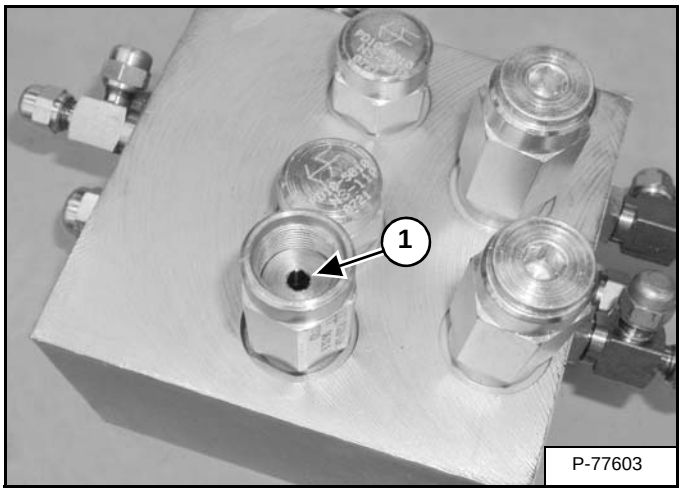
Testing And Adjusting Sequence Valve (Cont'd)

Figure 20-34-6



Remove the plug (Item 1) **[Figure 20-34-6]**.

Figure 20-34-7



Turn the adjustment screw (Item 1) **[Figure 20-34-7]** clockwise to increase pressure or counterclockwise to reduce the pressure.

Install the plug.

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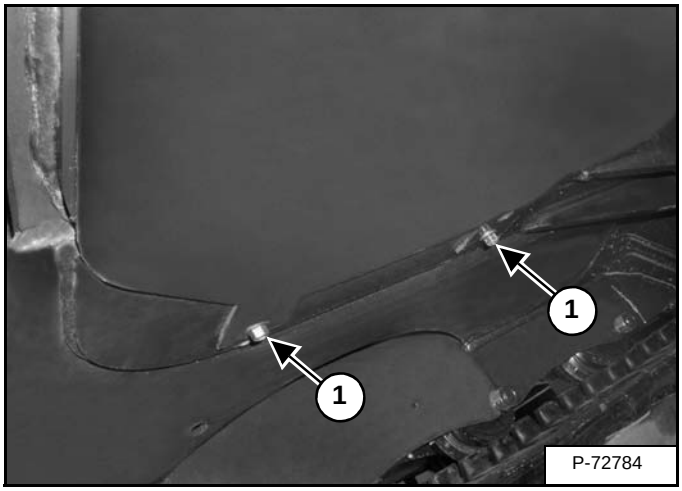
Removal And Installation

Lower the boom/bucket and blade to the ground.

Lift and block the excavator. (See LIFTING AND BLOCKING THE EXCAVATOR on Page 10-10-1.)

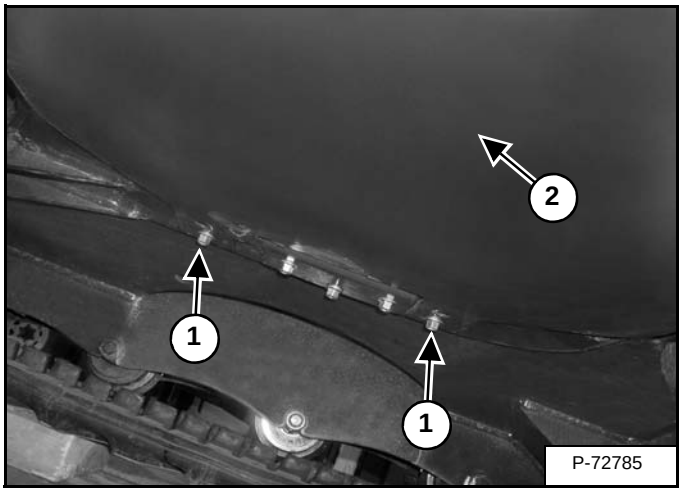
With the engine off, turn the key to the ON position, lower the console and move the blade lever. Press and hold the two speed button to activate angle blade mode, move the lever again to relieve hydraulic pressure.

Figure 20-34-8



Loosen the two bolts (Item 1) **[Figure 20-34-8]** from the undercarriage bottom cover.

Figure 20-34-9



While supporting the bottom cover, remove the two bolts (Item 1) and remove the cover (Item 2) **[Figure 20-34-9]**.

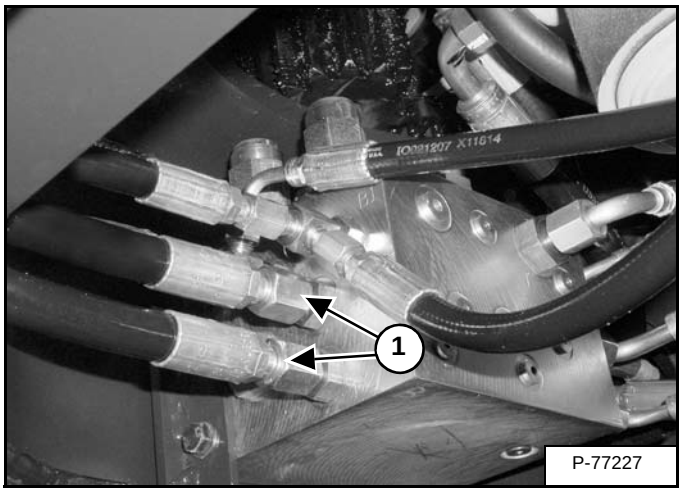
IMPORTANT

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

I-2003-0888

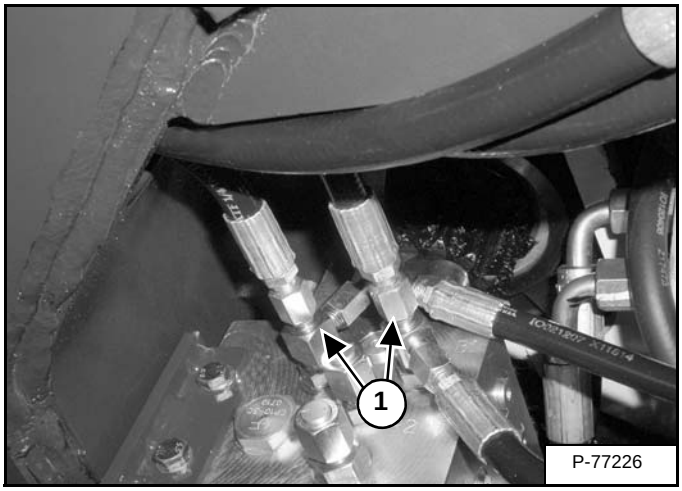
Mark all hoses for ease of assembly.

Figure 20-34-10



Remove the two hoses (Item 1) **[Figure 20-34-10]** from the R2 and B2 ports.

Figure 20-34-11



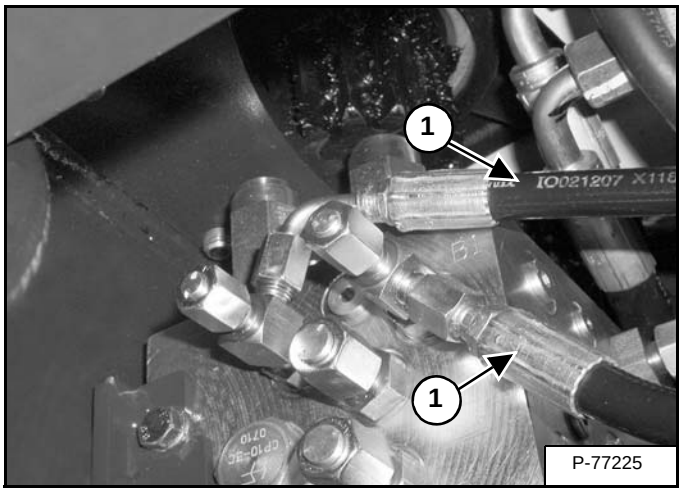
Remove the two hoses (Item 1) **[Figure 20-34-11]** from the R1 and B1 ports.

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ANGLE BLADE VALVE (CONT'D)

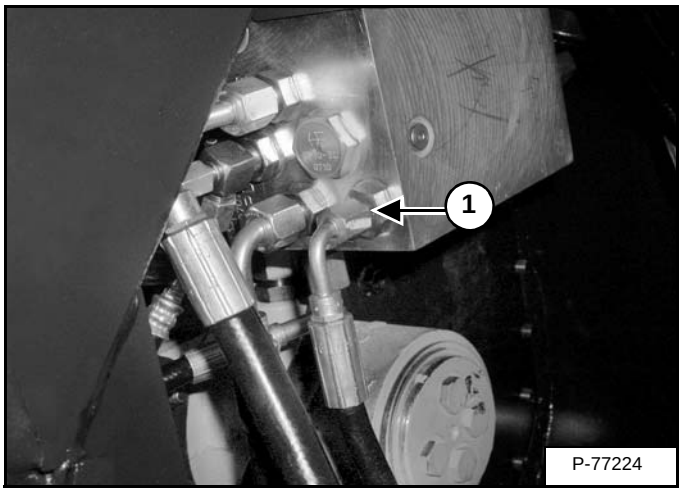
Removal And Installation (Cont'd)

Figure 20-34-12



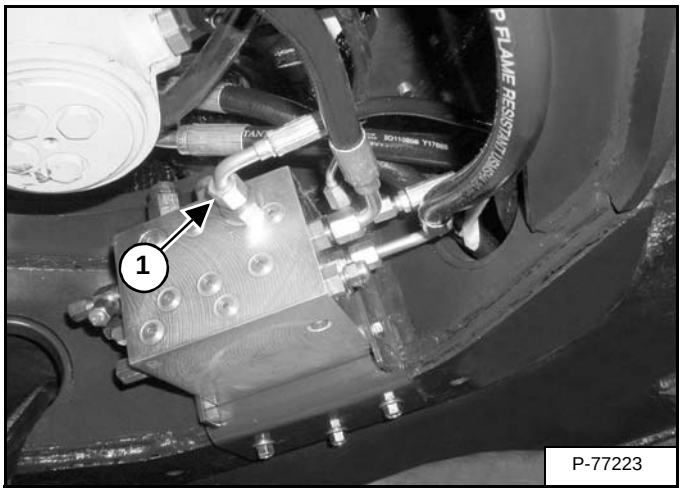
Remove the two hoses (Item 1) **[Figure 20-34-12]** from the R1 and B1 ports.

Figure 20-34-13



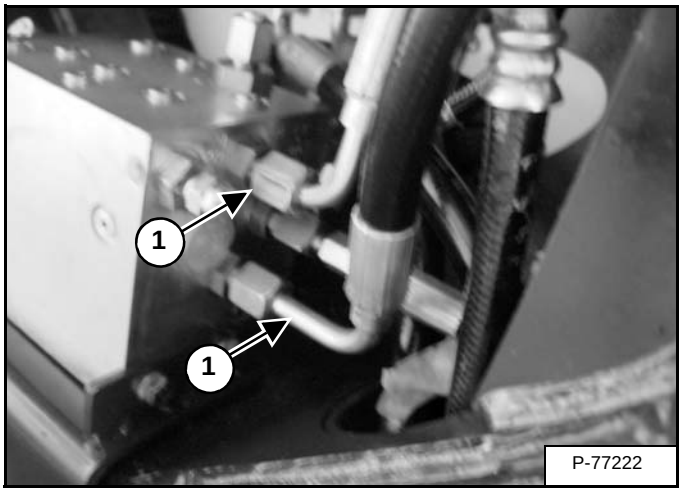
Remove the hose (Item 1) **[Figure 20-34-13]** from the PS port.

Figure 20-34-14



Remove the hose (Item 1) **[Figure 20-34-14]** from the T port

Figure 20-34-15

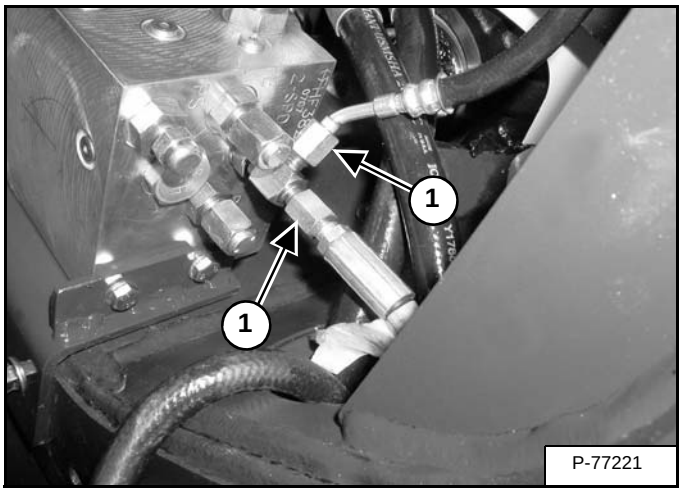


Remove the two hoses (Item 1) **[Figure 20-34-15]** from the R and B ports.

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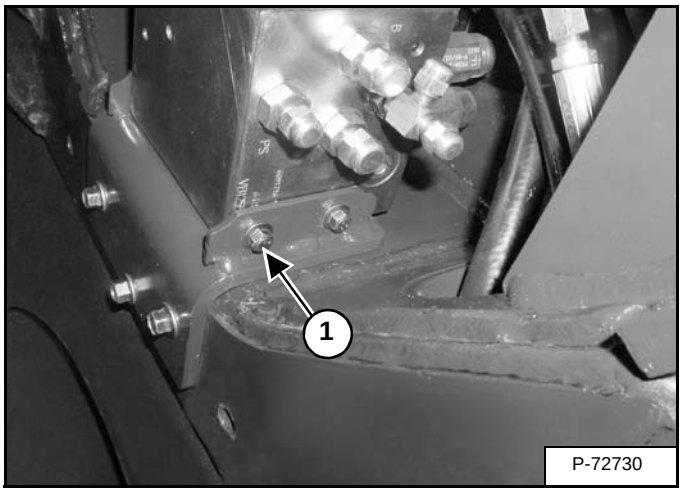
Removal And Installation (Cont'd)

Figure 20-34-16



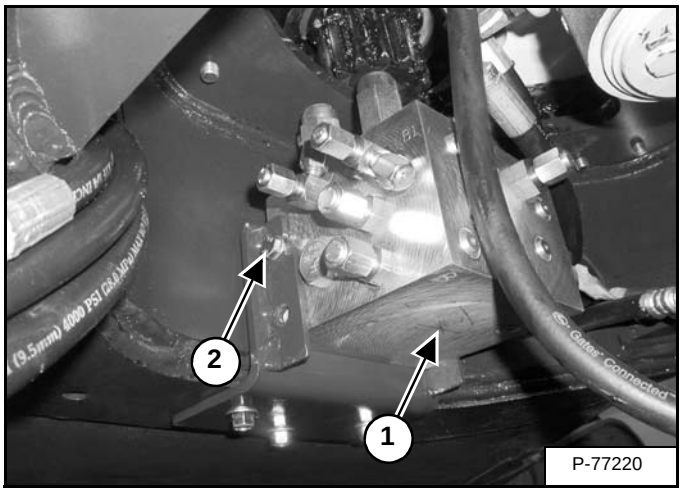
Remove the two hoses (Item 1) **[Figure 20-34-16]** from the T fitting in the 2-speed port.

Figure 20-34-17



Remove the bolt (Item 1) **[Figure 20-34-17]** (both sides).

Figure 20-34-18



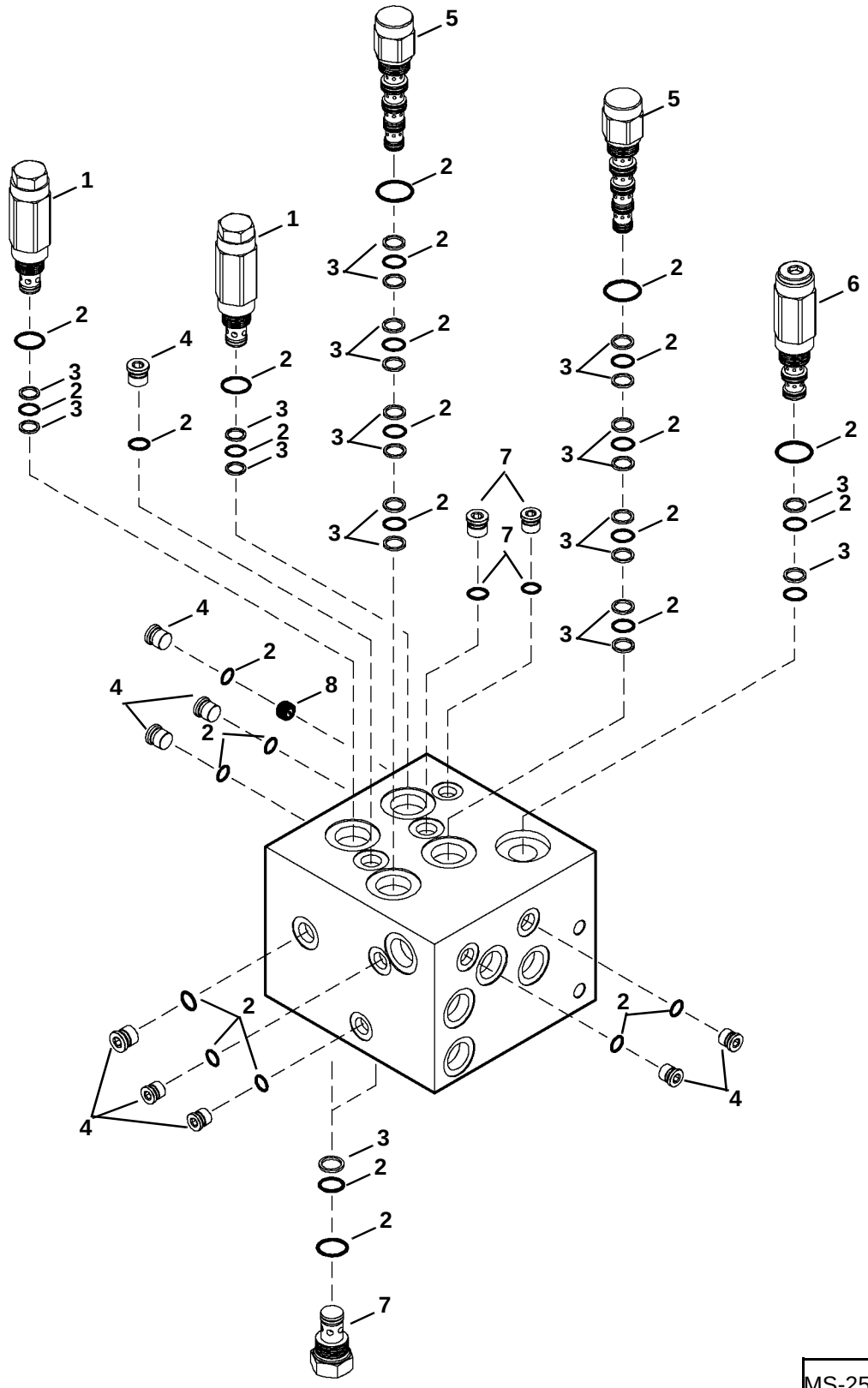
While supporting the diverter valve (Item 1) loosen the two remaining mounting bolts (Item 2) and remove the diverter valve (Item 1) **[Figure 20-34-18]**.

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ANGLE BLADE VALVE (CONT'D)

Parts Identification

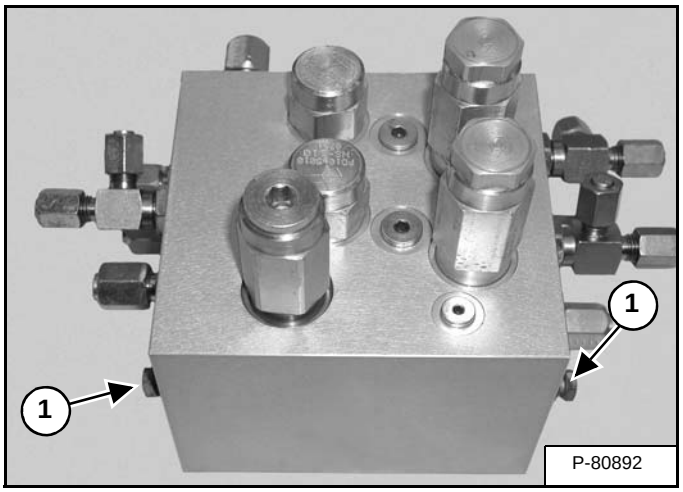
1. Relief Valve
2. O-Ring
3. Back-up Ring
4. Plug
5. Directional Valve
6. Sequence Valve
7. Check Valve
8. Orifice



https://www.pdfmanual4trucks.com/

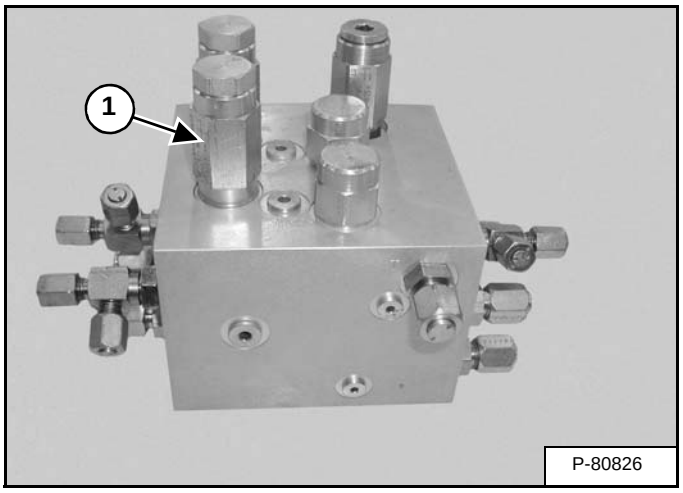
Disassembly

Figure 20-34-19



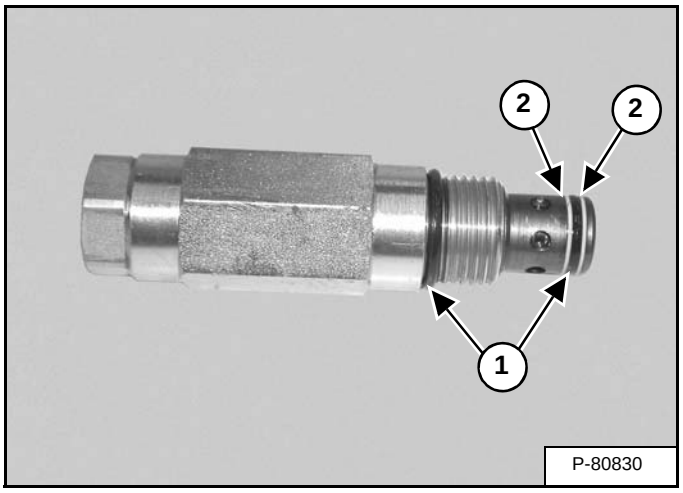
Remove the two bolts (Item 1) **[Figure 20-34-19]** from the angle blade valve.

Figure 20-34-20



Remove the relief valve (Item 1) **[Figure 20-34-20]** from the angle blade valve.

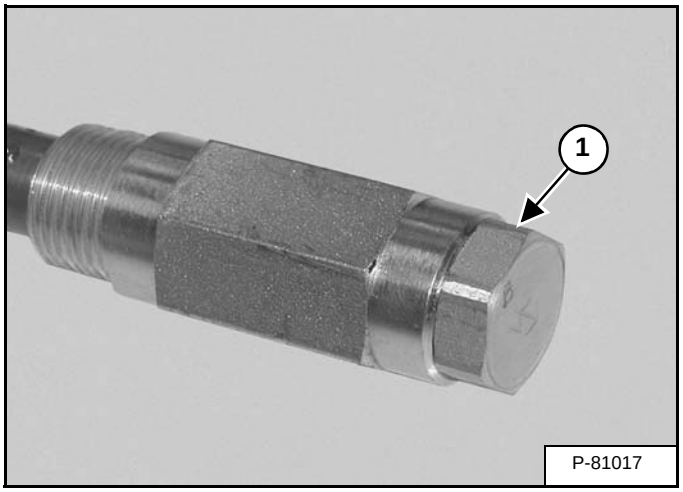
Figure 20-34-21



Remove the O-rings (Item 1) and back-up rings (Item 2) **[Figure 20-34-21]** from the relief valve.

Discard the O-rings and back-up rings.

Figure 20-34-22

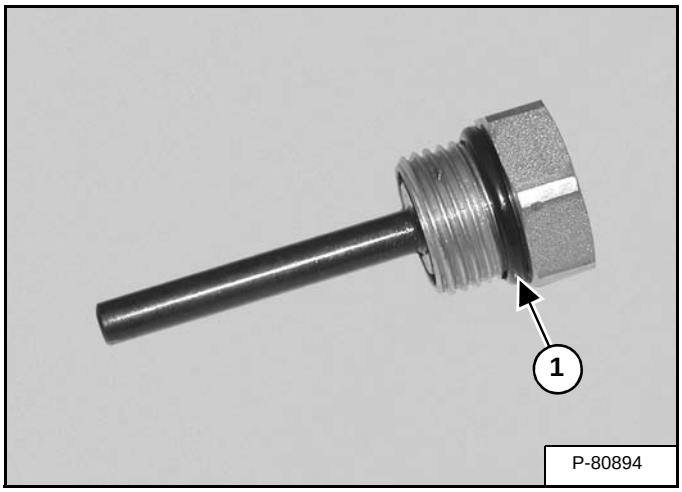


Remove the plug (Item 1) **[Figure 20-34-22]** from the end of the relief valve.

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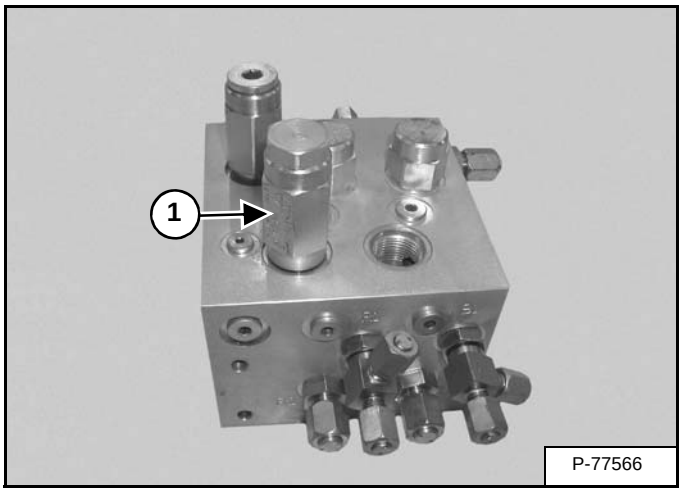
Disassembly (Cont'd)

Figure 20-34-23



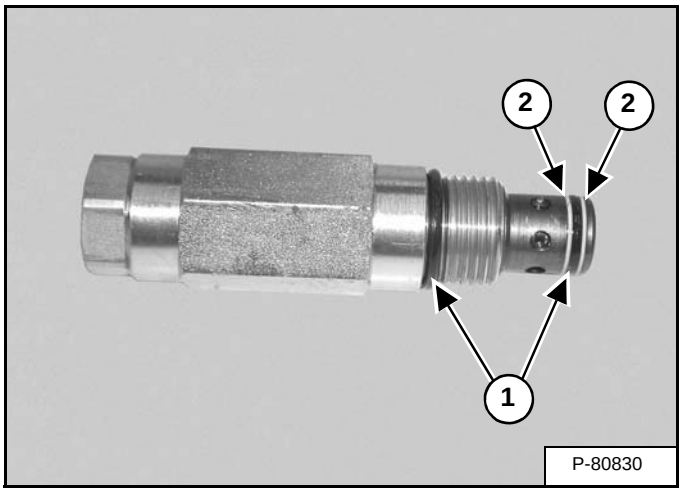
Remove the O-ring (Item 1) **[Figure 20-34-23]** from the plug and discard.

Figure 20-34-24



Remove the relief valve (Item 1) **[Figure 20-34-24]** from the angle blade valve.

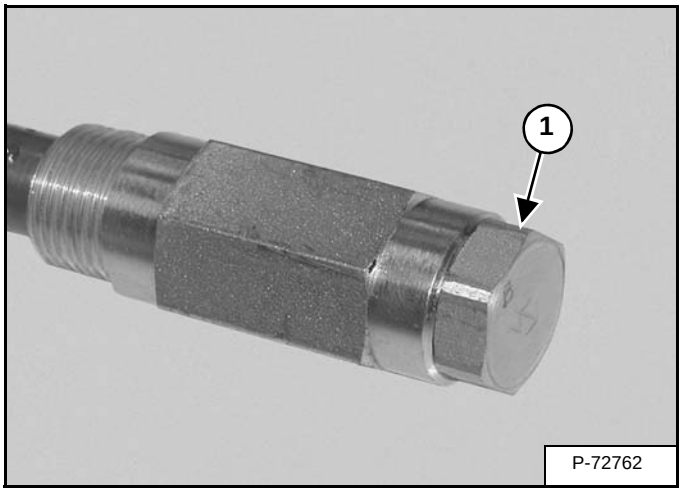
Figure 20-34-25



Remove the O-rings (Item 1) and back-up ring (Item 2) **[Figure 20-34-25]** from the relief valve.

Discard the O-rings and back-up rings.

Figure 20-34-26

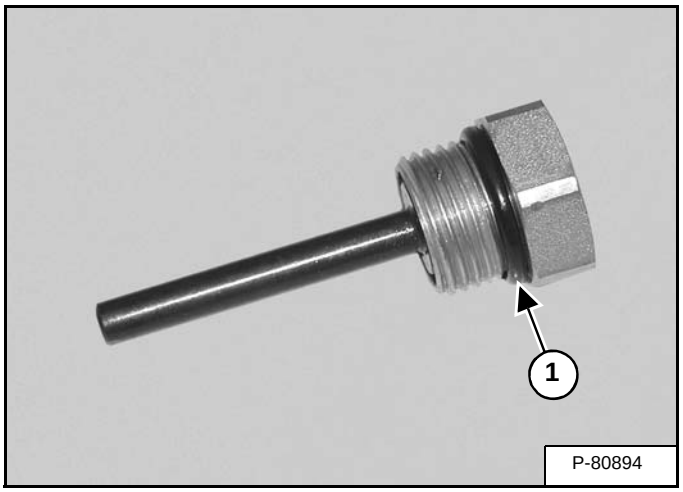


Remove the plug (Item 1) **[Figure 20-34-26]** from the end of the relief valve.

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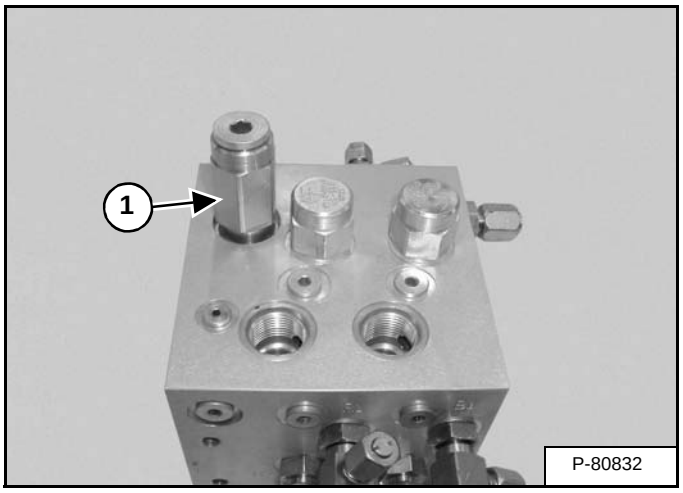
Disassembly (Cont'd)

Figure 20-34-27



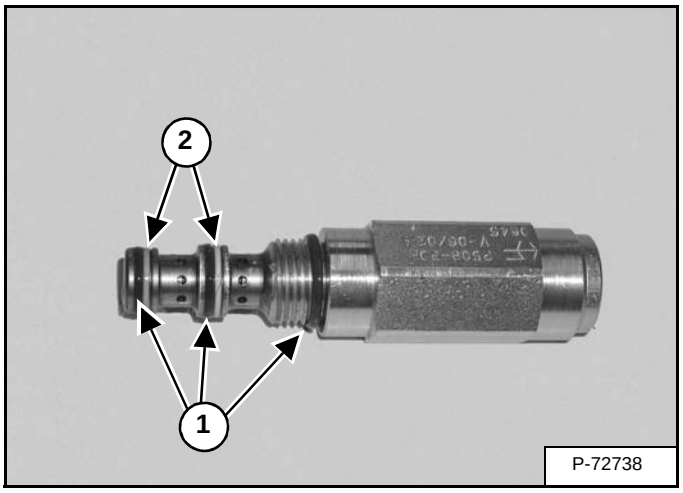
Remove the O-ring (Item 1) **[Figure 20-34-27]** from the plug and discard.

Figure 20-34-28



Remove the sequence valve (Item 1) **[Figure 20-34-28]** from the angle blade valve.

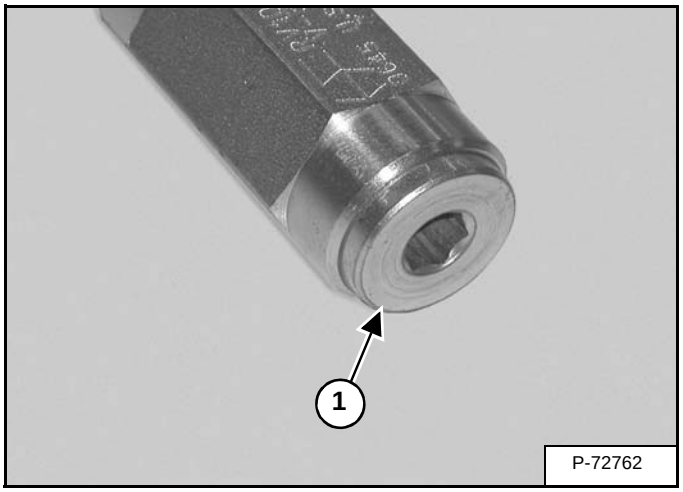
Figure 20-34-29



Remove the O-rings (Item 1) and back-up rings (Item 2) **[Figure 20-34-29]** from the sequence valve.

Discard the O-rings and back-up rings.

Figure 20-34-30

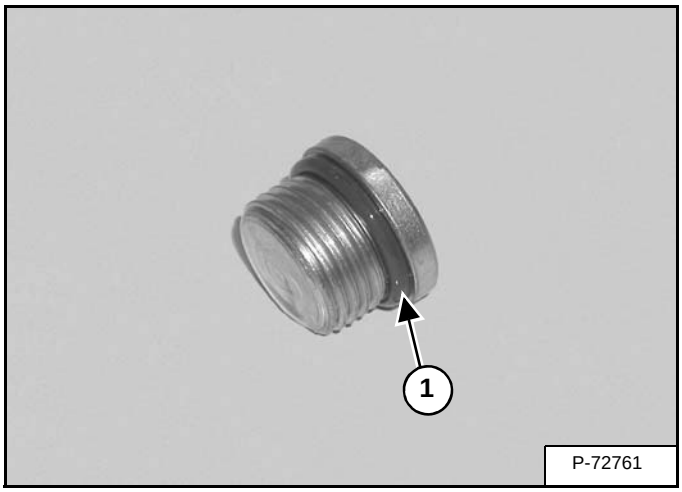


Remove the plug (Item 1) **[Figure 20-34-30]** from the end of the sequence valve.

https://www.pdfmanual4trucks.com/

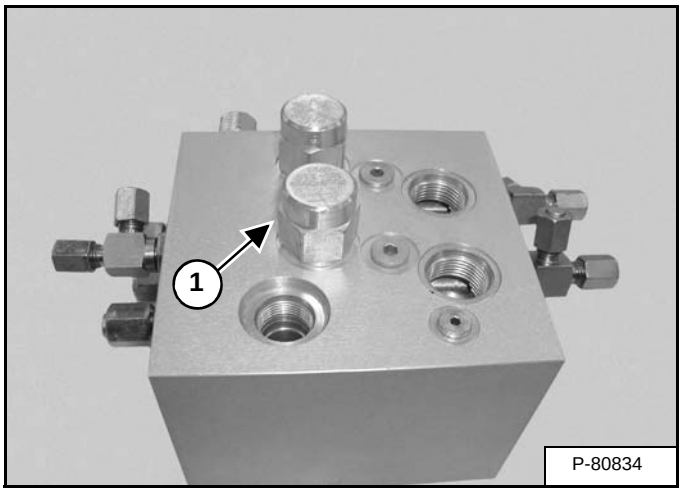
Disassembly (Cont'd)

Figure 20-34-31



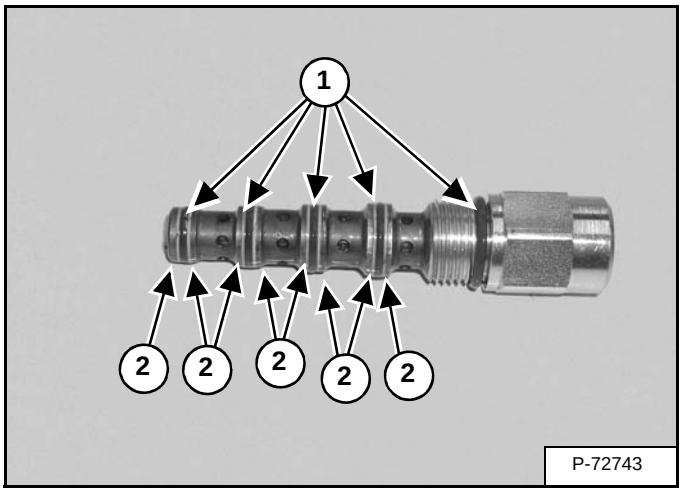
Remove the O-ring (Item 1) **[Figure 20-34-31]** from the plug and discard.

Figure 20-34-32



Remove the directional valve (Item 1) **[Figure 20-34-32]** from the angle blade valve.

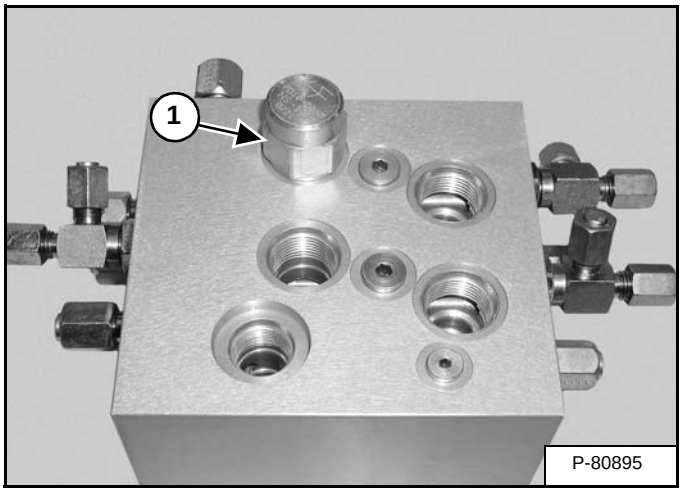
Figure 20-34-33



Remove the O-rings (Item 1) and back-up rings (Item 2) **[Figure 20-34-33]** from the directional valve.

Discard the O-rings and back-up rings.

Figure 20-34-34

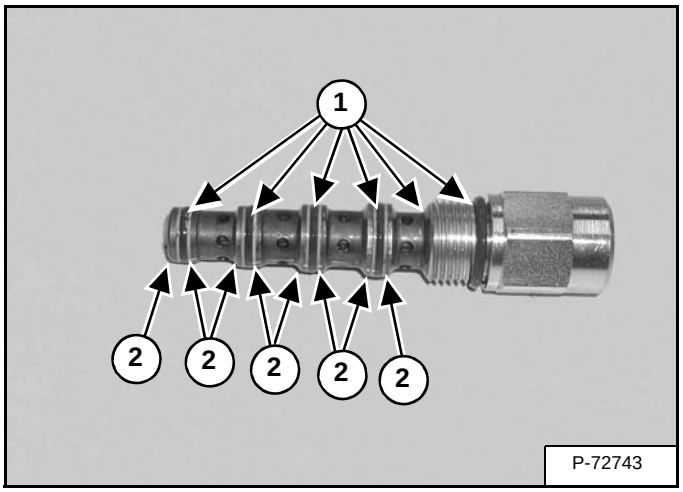


Remove the directional valve (Item 1) **[Figure 20-34-34]** from the angle blade valve.

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Disassembly (Cont'd)

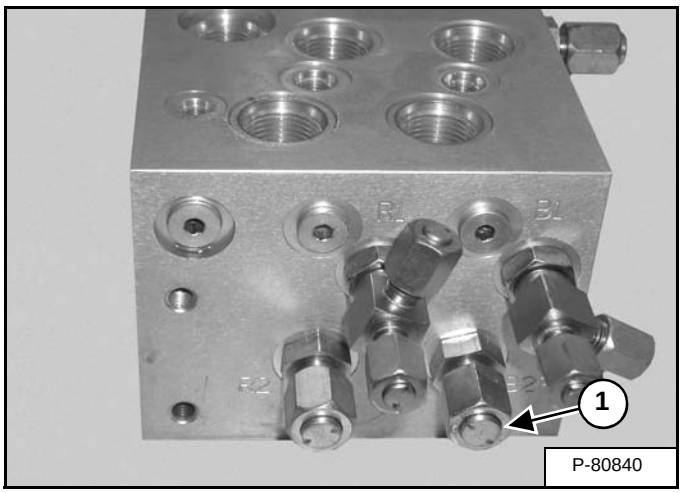
Figure 20-34-35



Remove the O-rings (Item 1) and back-up rings (Item 2) **[Figure 20-34-35]**.

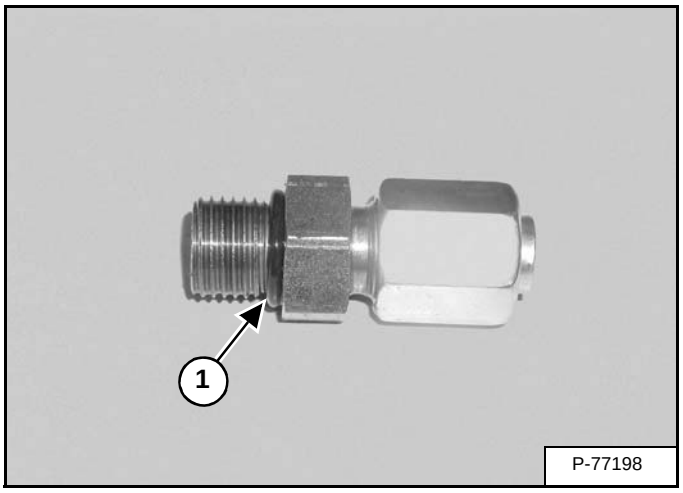
Discard the O-rings and back-up rings.

Figure 20-34-36



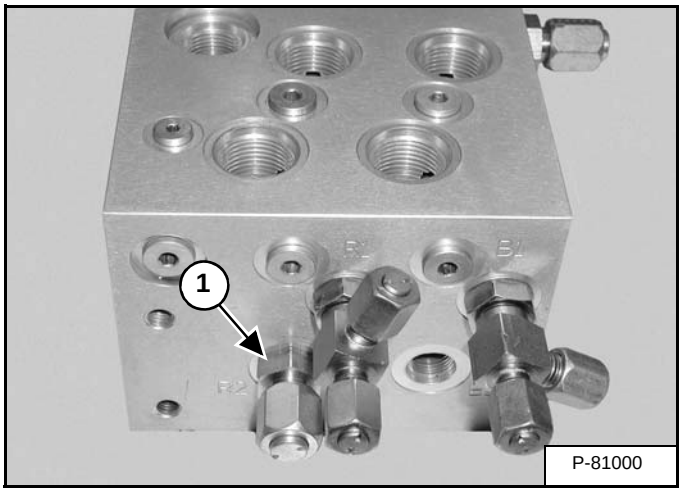
Remove the fitting (Item 1) **[Figure 20-34-36]** from the B2 port of the angle blade valve.

Figure 20-34-37



Remove the O-ring (Item 1) **[Figure 20-34-37]** from the fitting and discard.

Figure 20-34-38

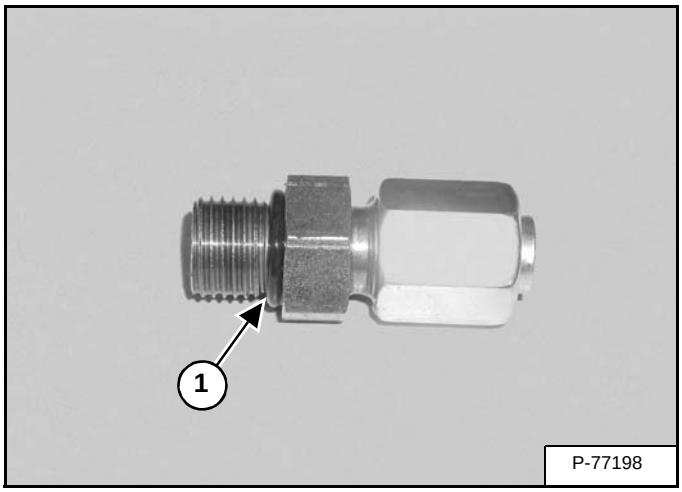


Remove the fitting (Item 1) **[Figure 20-34-38]** from the R2 port of the angle blade valve.

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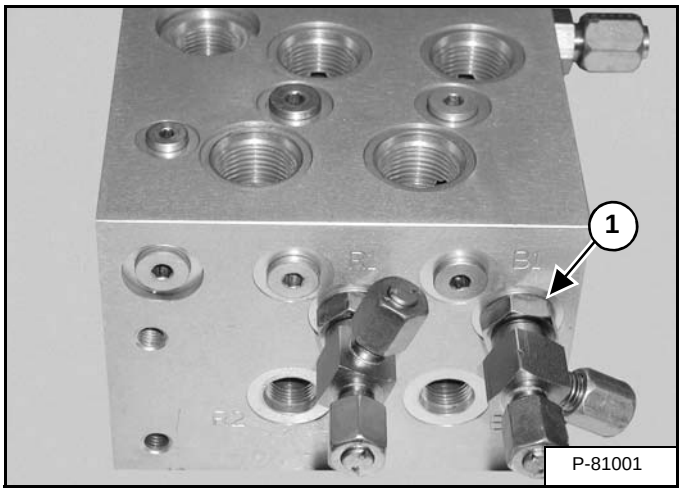
Disassembly (Cont'd)

Figure 20-34-39



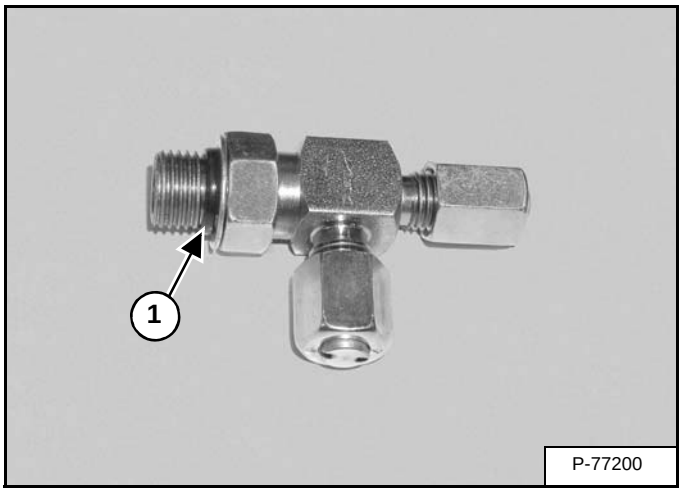
Remove the O-ring (Item 1) **[Figure 20-34-39]** from the fitting and discard.

Figure 20-34-40



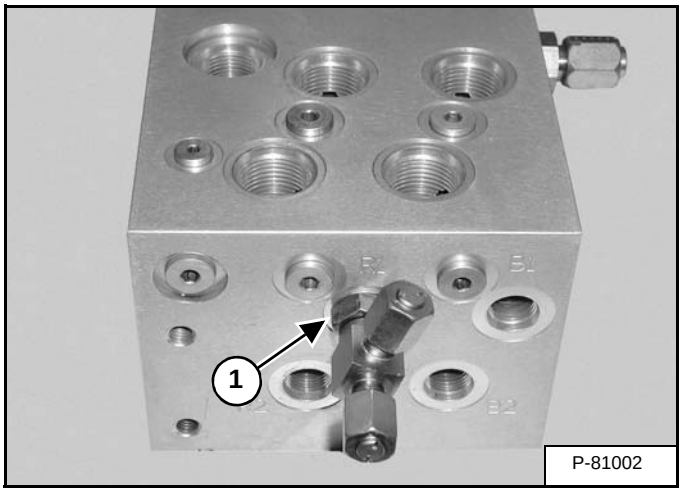
Remove the fitting (Item 1) **[Figure 20-34-40]** from the B1 port of the angle blade valve.

Figure 20-34-41



Remove the O-ring (Item 1) **[Figure 20-34-41]** from the fitting and discard.

Figure 20-34-42

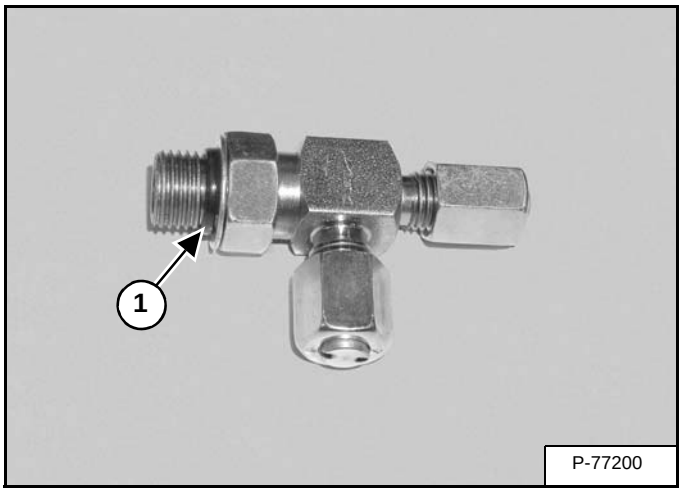


Remove the fitting (Item 1) **[Figure 20-34-42]** from the R1 port of the angle blade valve.

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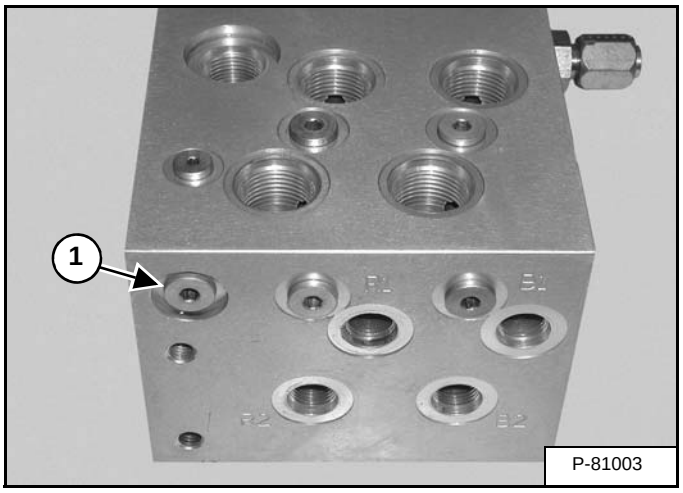
Disassembly (Cont'd)

Figure 20-34-43



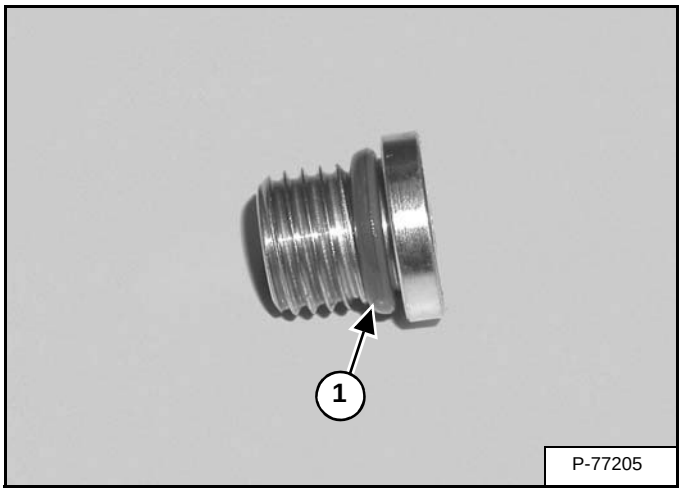
Remove the O-ring (Item 1) **[Figure 20-34-43]** from the fitting and discard.

Figure 20-34-44



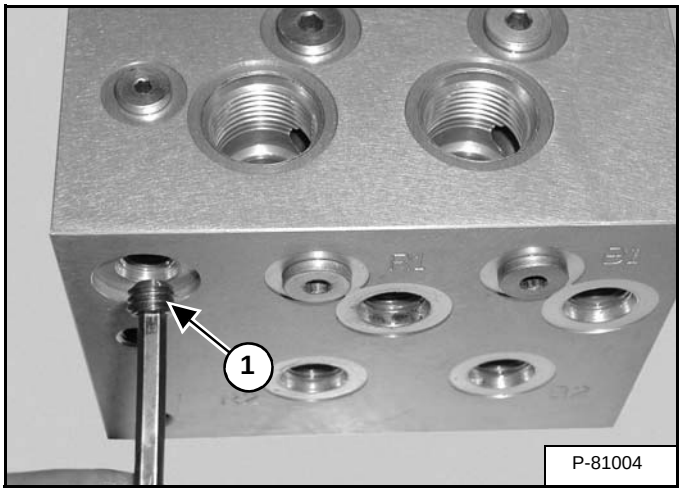
Remove the plug (Item 1) **[Figure 20-34-44]** from the angle blade valve.

Figure 20-34-45



Remove the O-ring (Item 1) **[Figure 20-34-45]** from the plug and discard.

Figure 20-34-46

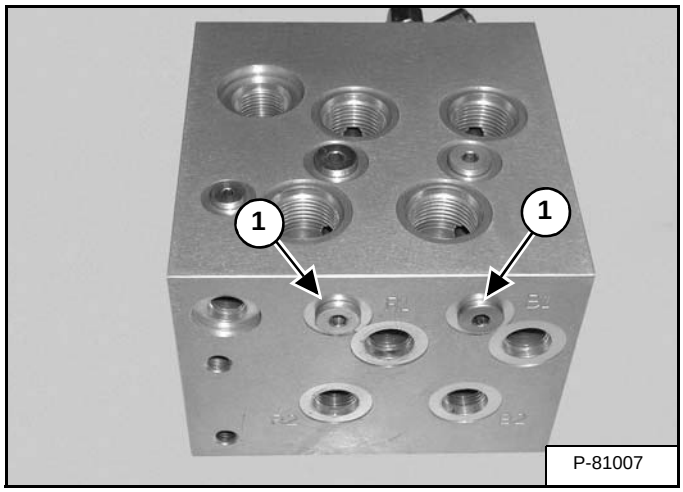


Remove the orifice (Item 1) **[Figure 20-34-46]** from the angle blade valve.

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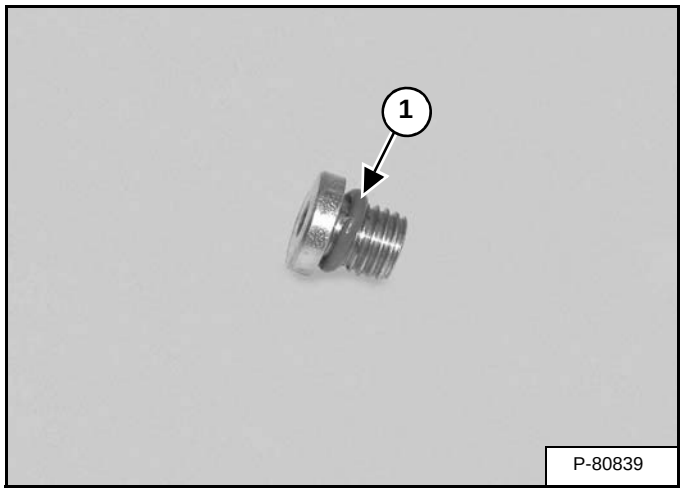
Disassembly (Cont'd)

Figure 20-34-47



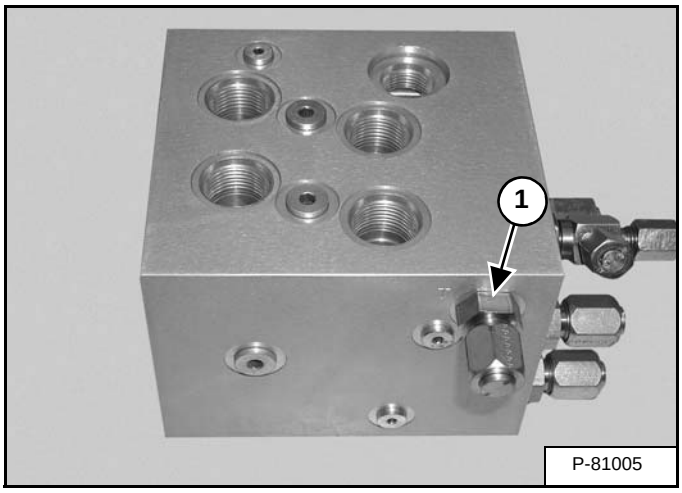
Remove the two plugs (Item 1) **[Figure 20-34-49]** from the angle blade valve.

Figure 20-34-48



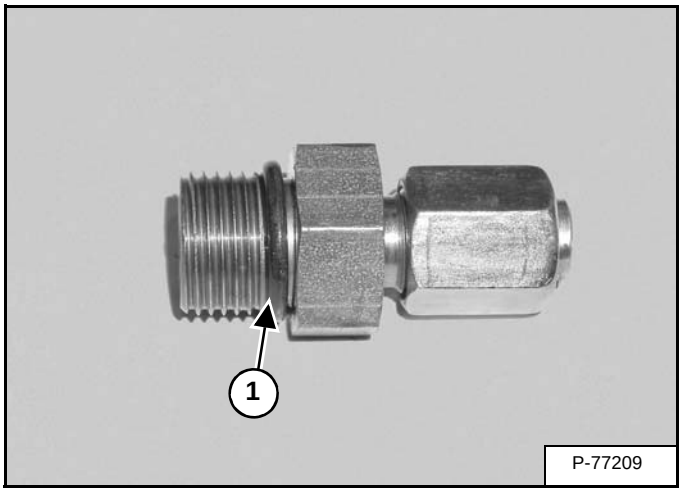
Remove the O-ring (Item 1) **[Figure 20-34-49]** from the plugs and discard.

Figure 20-34-49



Remove the fitting (Item 1) **[Figure 20-34-49]** from the T port of the angle blade valve.

Figure 20-34-50

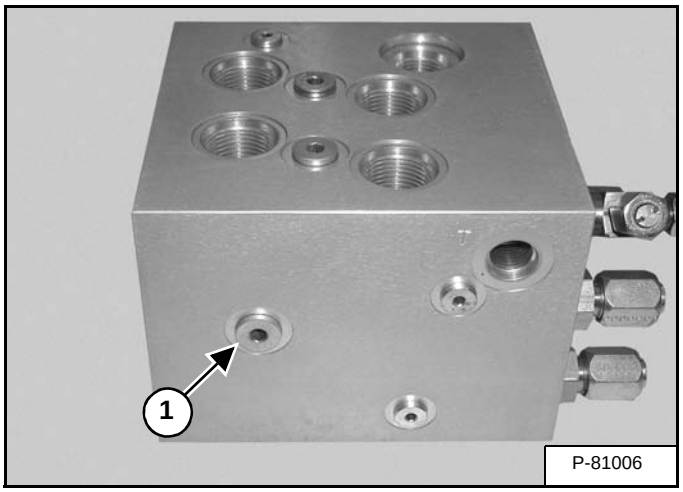


Remove the O-ring (Item 1) **[Figure 20-34-50]** from the fitting and discard.

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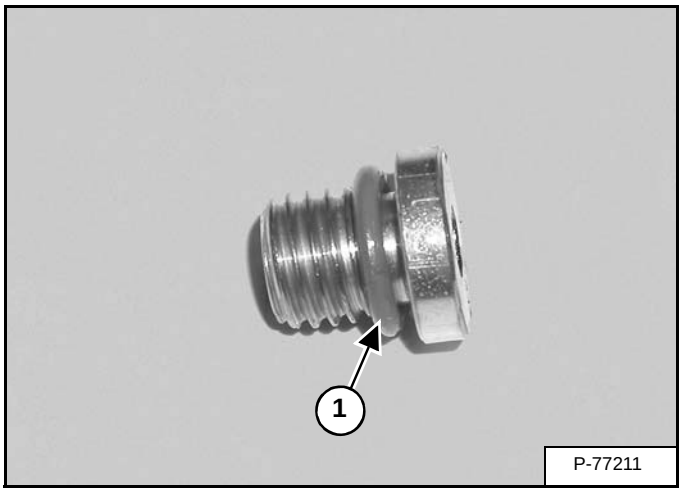
Disassembly (Cont'd)

Figure 20-34-51



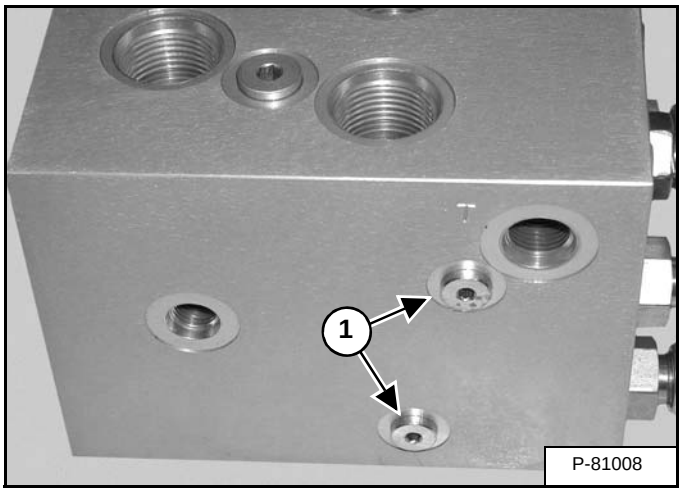
Remove the plug (Item 1) **[Figure 20-34-51]** from the angle blade valve.

Figure 20-34-52



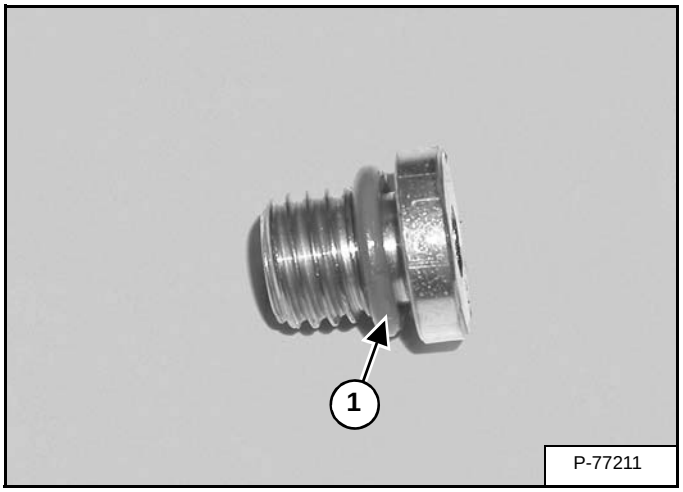
Remove the O-ring (Item 1) **[Figure 20-34-52]** from the plug and discard.

Figure 20-34-53



Remove the two plugs (Item 1) **[Figure 20-34-53]** from the angle blade valve.

Figure 20-34-54

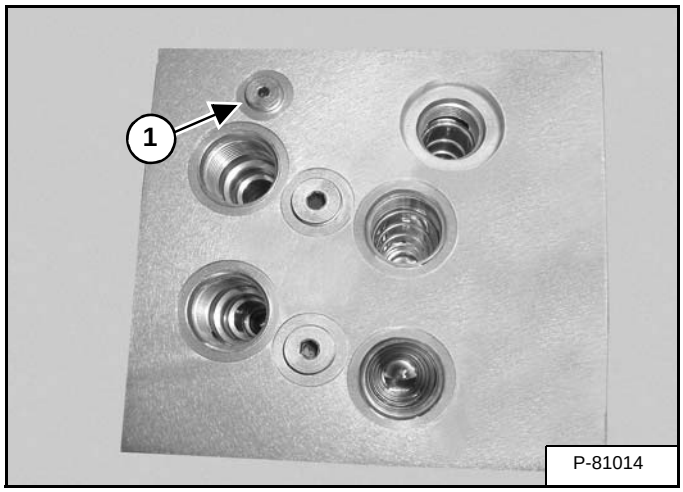


Remove the O-ring (Item 1) **[Figure 20-34-54]** from the plugs and discard.

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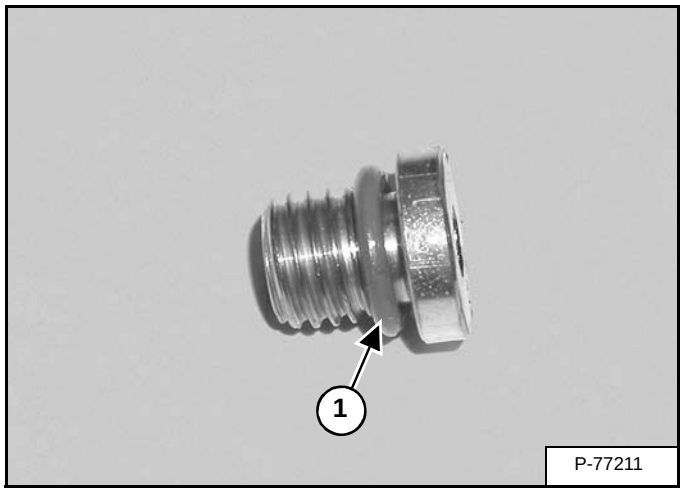
Disassembly (Cont'd)

Figure 20-34-55



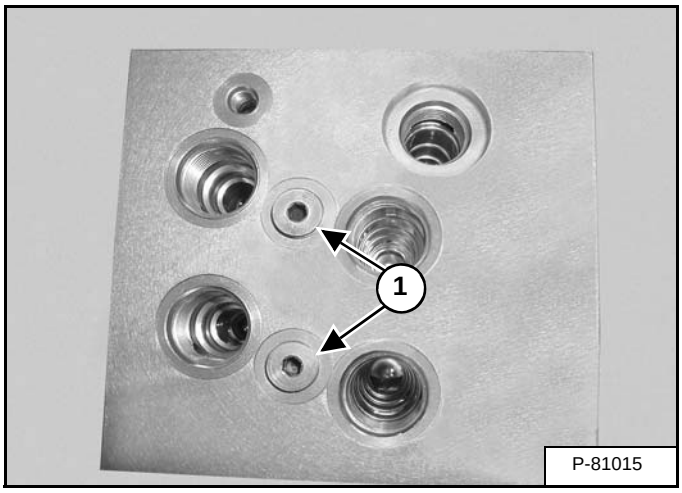
Remove the plug (Item 1) **[Figure 20-34-55]** from the angle blade valve.

Figure 20-34-56



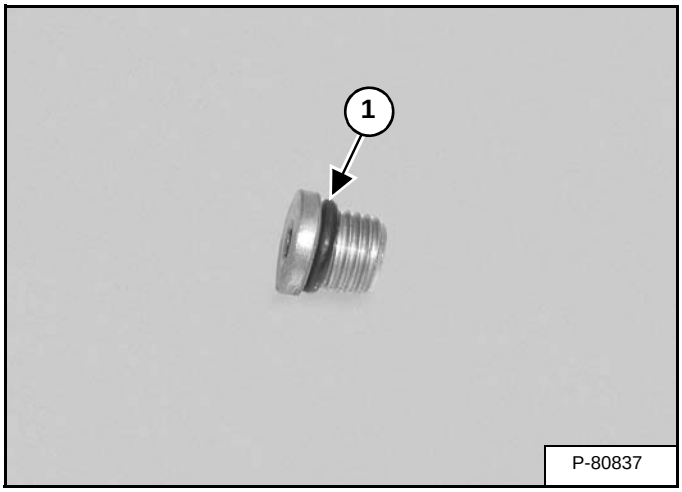
Remove the O-ring (Item 1) **[Figure 20-34-56]** from the plug and discard.

Figure 20-34-57



Remove the two plugs (Item 1) **[Figure 20-34-57]** from the angle blade valve.

Figure 20-34-58

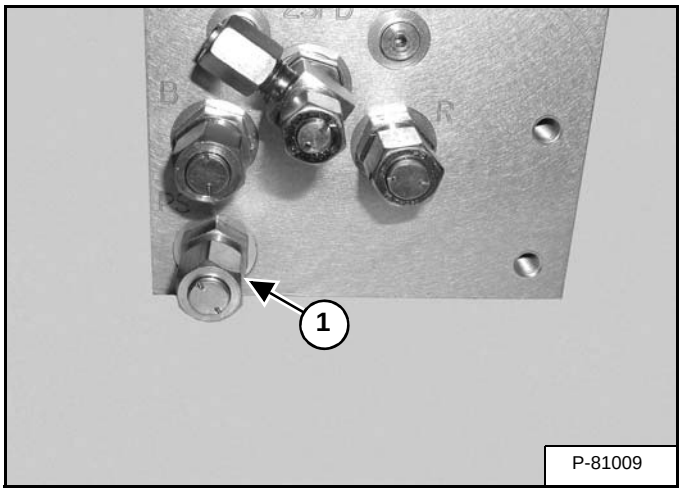


Remove the O-ring (Item 1) **[Figure 20-34-58]** from the plugs and discard.

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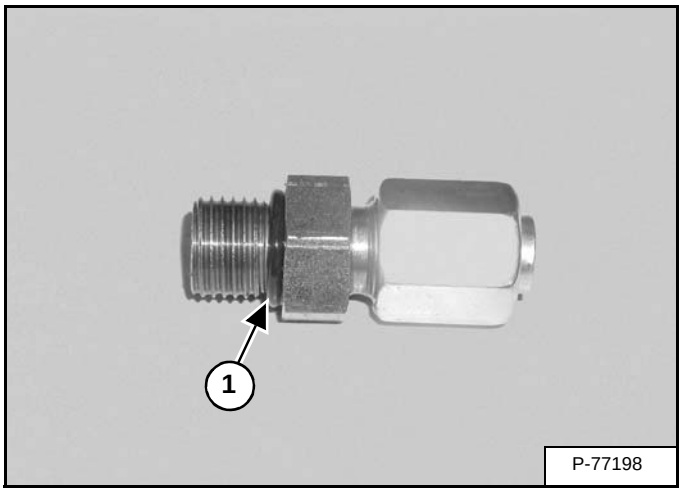
Disassembly (Cont'd)

Figure 20-34-59



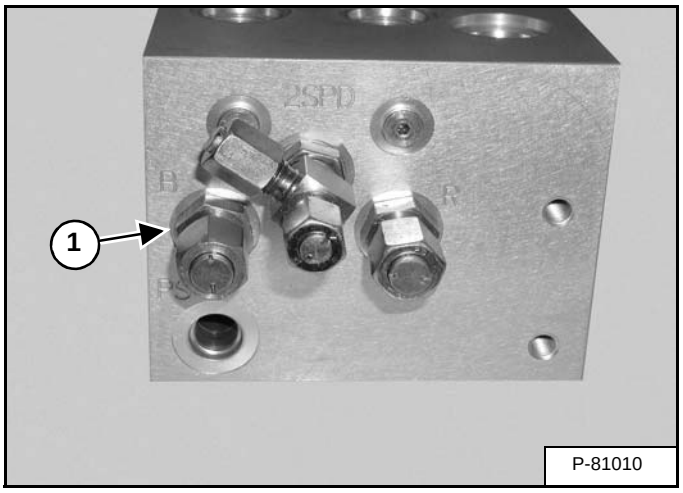
Remove the fitting (Item 1) **[Figure 20-34-57]** from the PS port of the angle blade valve.

Figure 20-34-60



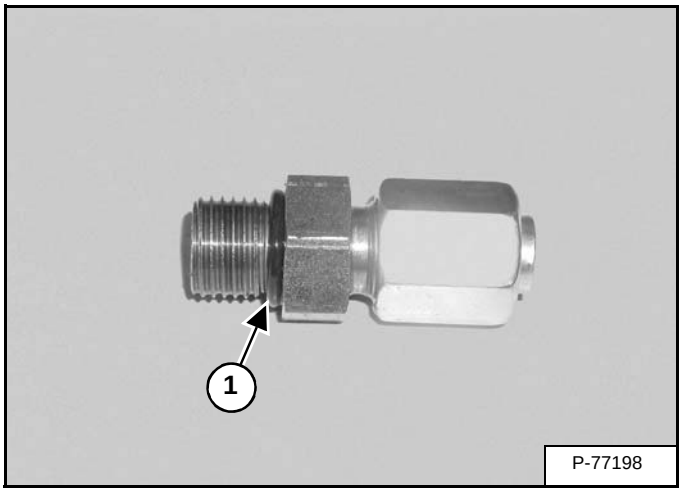
Remove the O-ring (Item 1) **[Figure 20-34-58]** from the fitting and discard.

Figure 20-34-61



Remove the fitting (Item 1) **[Figure 20-34-61]** from the B port of the angle blade valve.

Figure 20-34-62

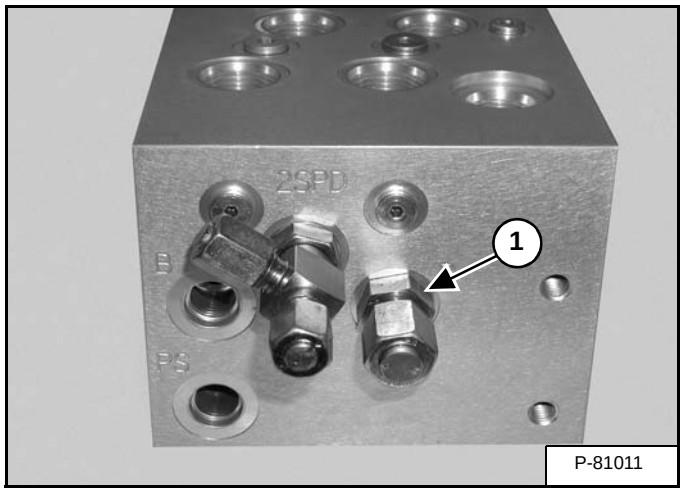


Remove the O-ring (Item 1) **[Figure 20-34-62]** from the fitting and discard.

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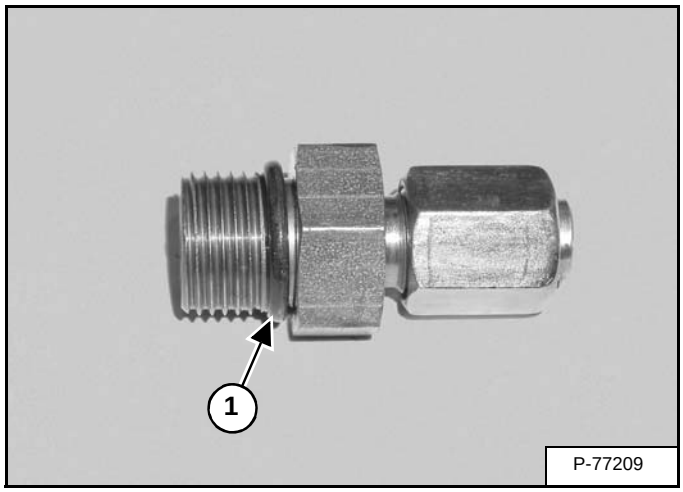
Disassembly (Cont'd)

Figure 20-34-63



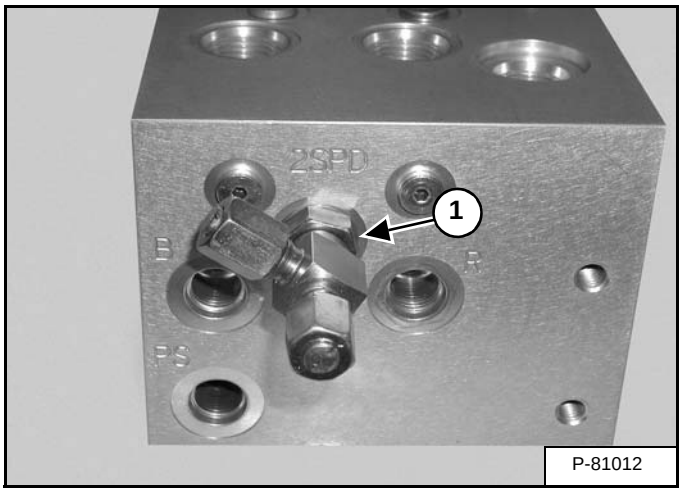
Remove the fitting (Item 1) **[Figure 20-34-63]** from the R port of the angle blade valve.

Figure 20-34-64



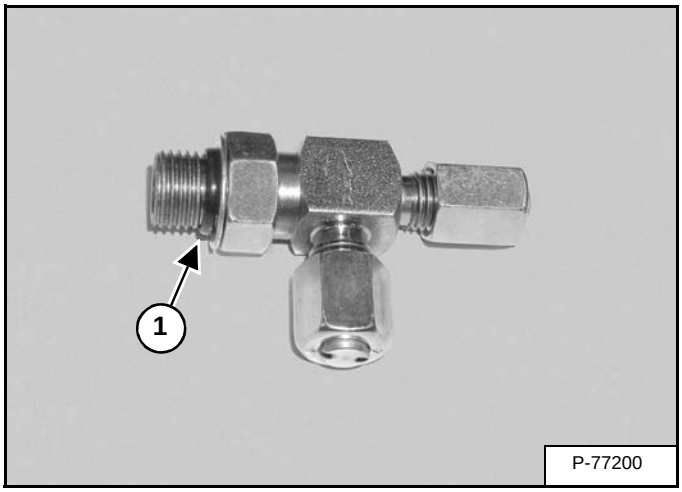
Remove the O-ring (Item 1) **[Figure 20-34-64]** from the fitting and discard.

Figure 20-34-65



Remove the fitting (Item 1) **[Figure 20-34-65]** from the 2-speed port of the angle blade valve.

Figure 20-34-66

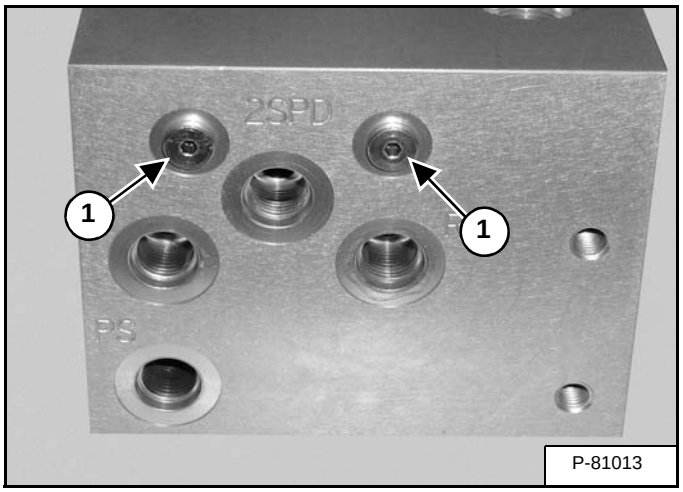


Remove the O-ring (Item 1) **[Figure 20-34-66]** from the fitting and discard.

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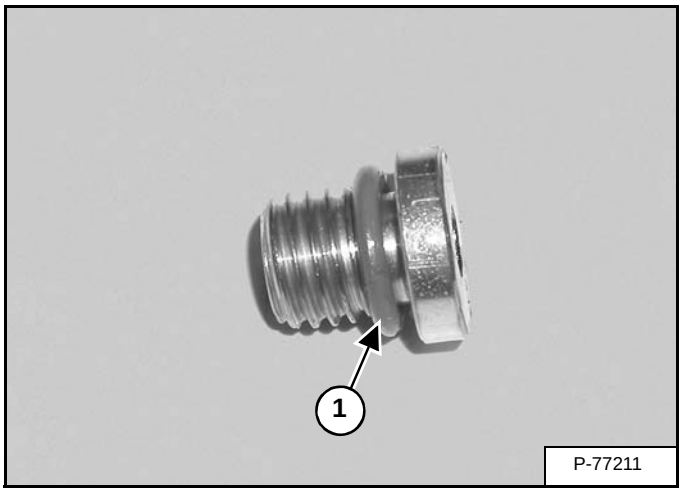
Disassembly (Cont'd)

Figure 20-34-67



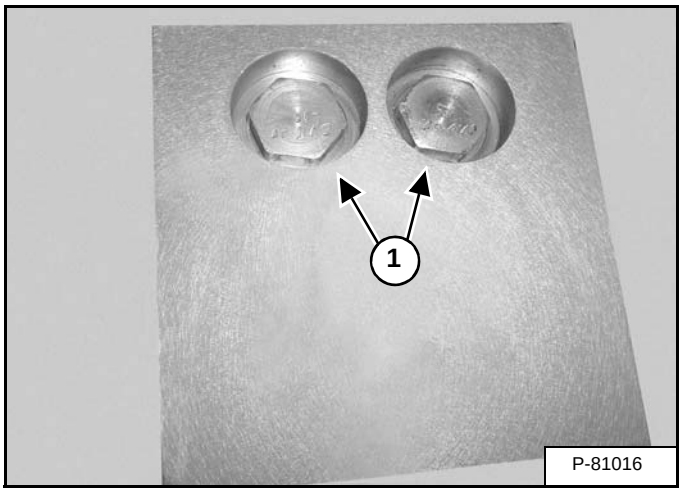
Remove the two plugs (Item 1) **[Figure 20-34-67]** from the angle blade valve.

Figure 20-34-68



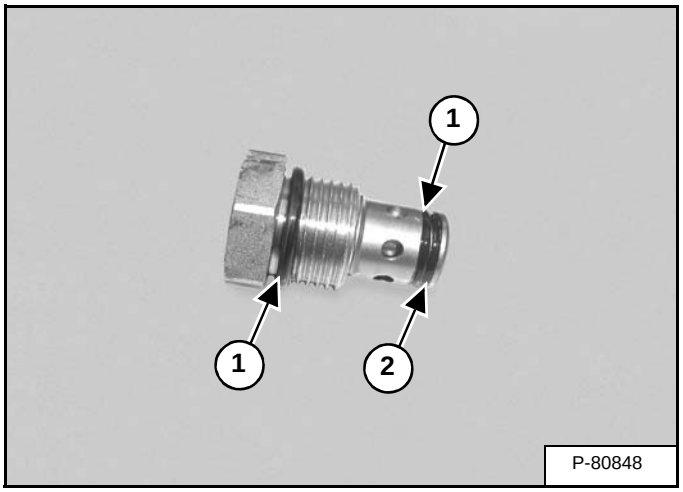
Remove the O-ring (Item 1) **[Figure 20-34-68]** from the plugs and discard.

Figure 20-34-69



Remove the two check valves (Item 1) **[Figure 20-34-69]** from the angle blade valve.

Figure 20-34-70



Remove the O-rings (Item 1) and back-up ring (Item 2) **[Figure 20-34-70]** from the check valves. Discard the O-rings and back-up rings.

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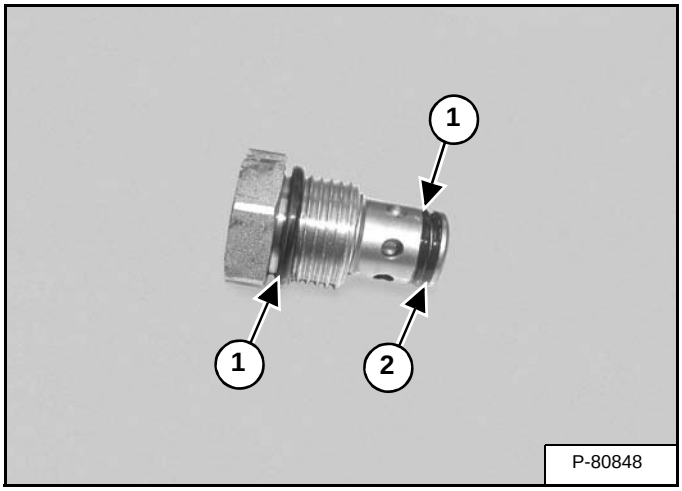
Assembly

Clean all parts in solvent and dry with compressed air.

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

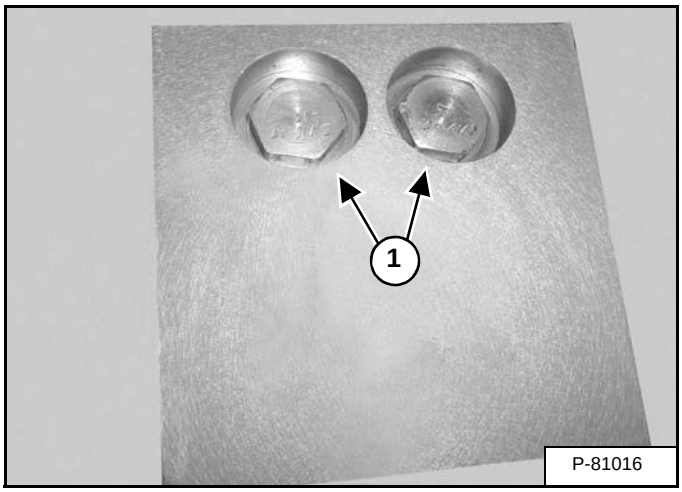
Always install new O-rings. Lubricate the O-rings with clean hydraulic fluid before installation.

Figure 20-34-71



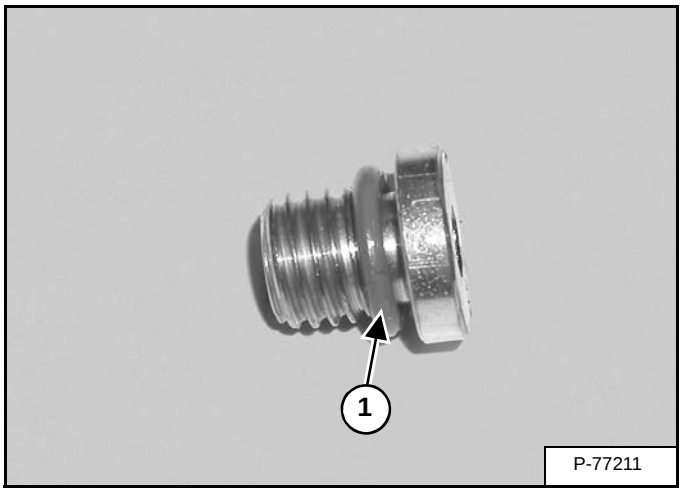
Install the O-rings (Item 1) and back-up ring (Item 2) **[Figure 20-34-71]** onto the check valves.

Figure 20-34-72



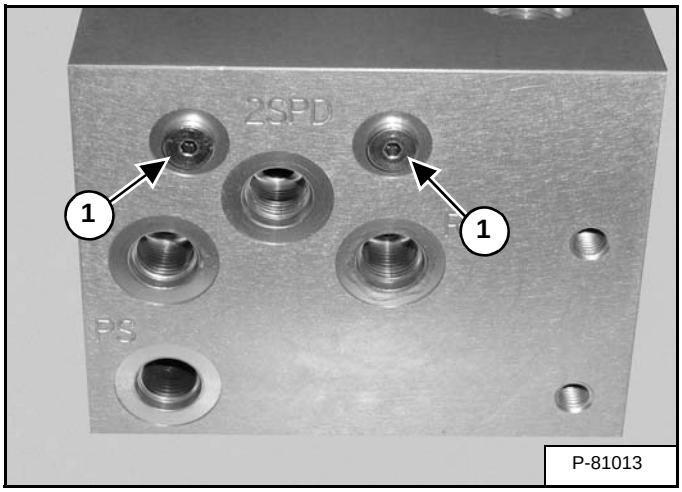
Install the two check valves (Item 1) **[Figure 20-34-72]** into the angle blade valve.

Figure 20-34-73



Install the O-ring (Item 1) **[Figure 20-34-73]** onto the two plugs.

Figure 20-34-74

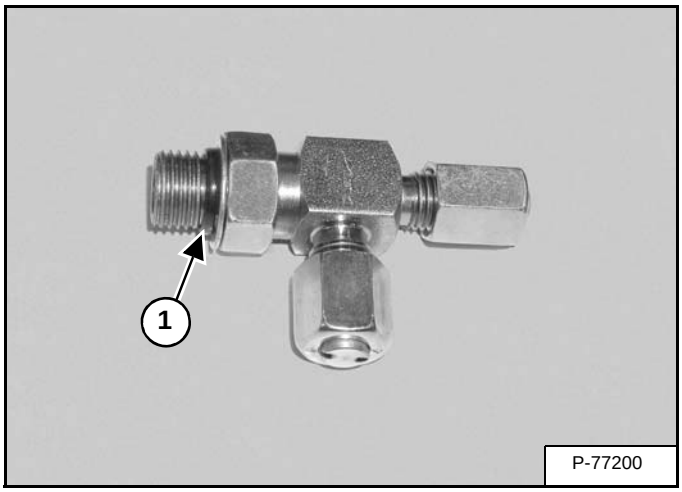


Install the two plugs (Item 1) **[Figure 20-34-74]** into the angle blade valve.

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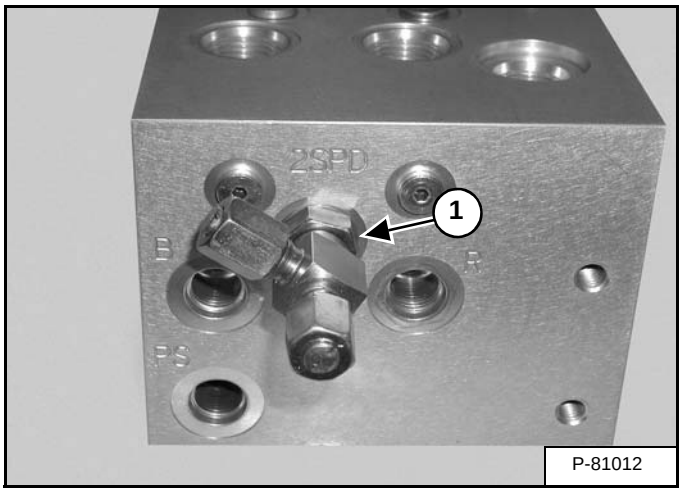
Assembly (Cont'd)

Figure 20-34-75



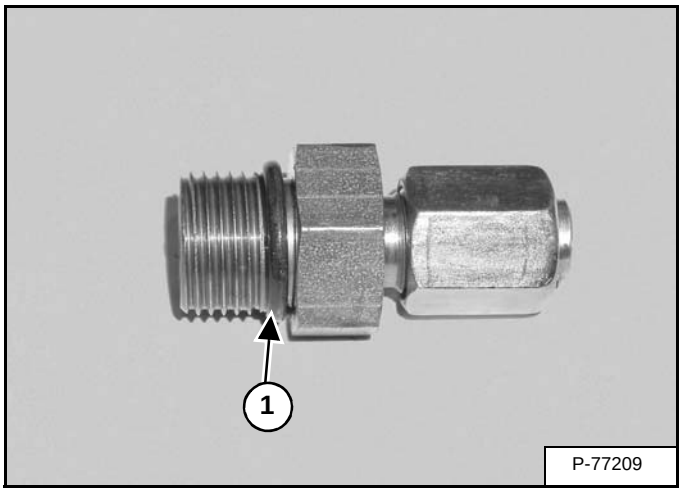
Install the O-ring (Item 1) **[Figure 20-34-75]** onto the fitting.

Figure 20-34-76



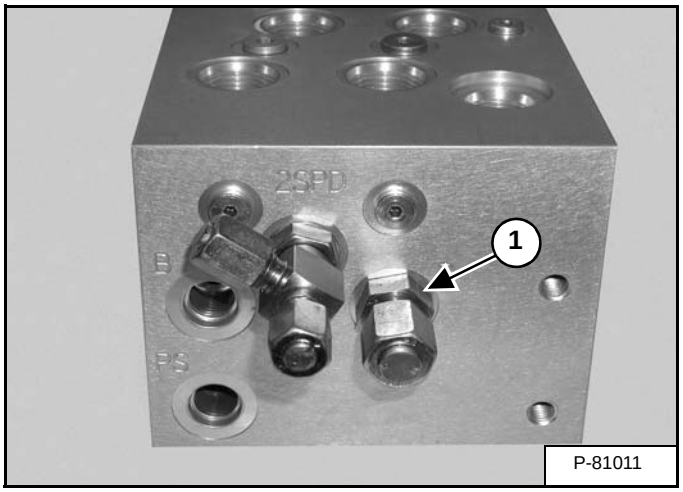
Install the fitting (Item 1) **[Figure 20-34-76]** into the 2-speed port of the angle blade valve.

Figure 20-34-77



Install the O-ring (Item 1) **[Figure 20-34-77]** onto the fitting.

Figure 20-34-78

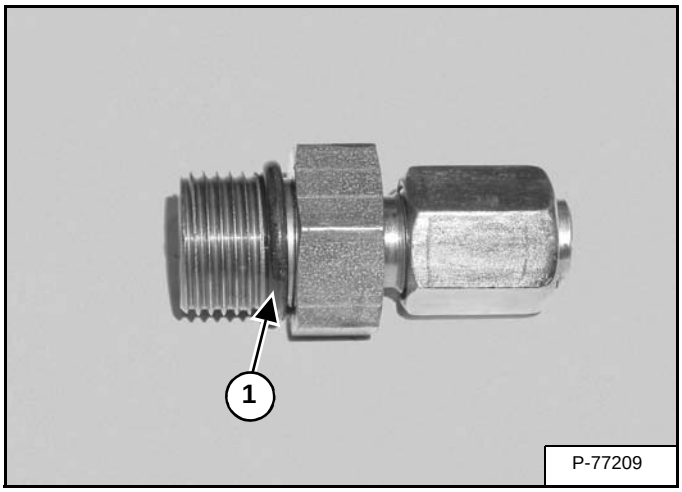


Install the fitting (Item 1) **[Figure 20-34-78]** into the R port of the angle blade valve.

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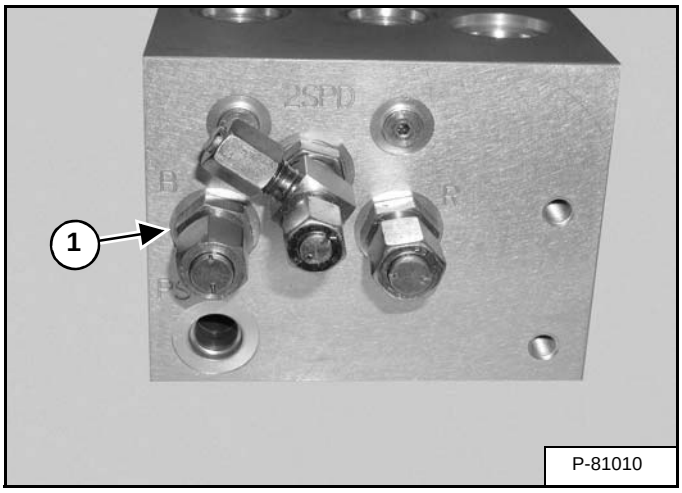
Assembly (Cont'd)

Figure 20-34-79



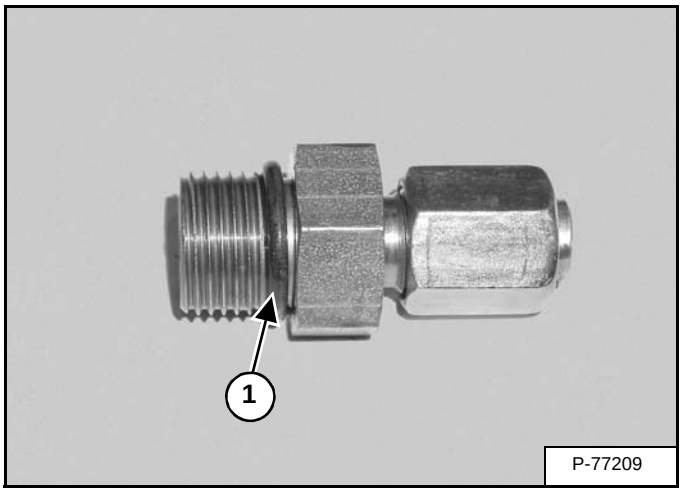
Install the O-ring (Item 1) **[Figure 20-34-79]** onto the fitting.

Figure 20-34-80



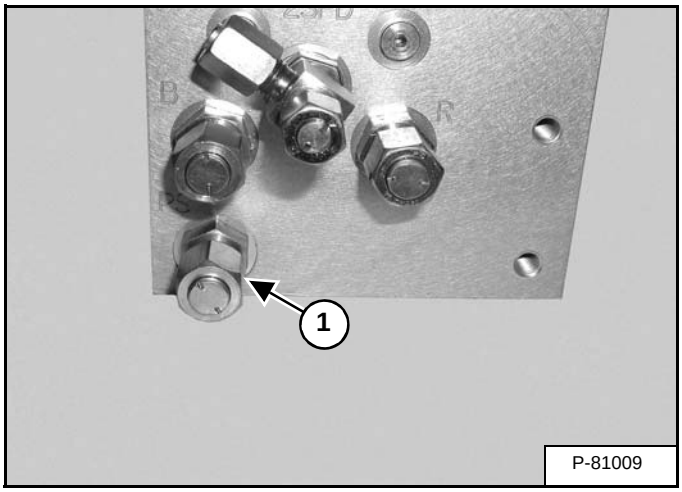
Install the fitting (Item 1) **[Figure 20-34-80]** into the B port of the angle blade valve.

Figure 20-34-81



Install the O-ring (Item 1) **[Figure 20-34-81]** onto the plug.

Figure 20-34-82

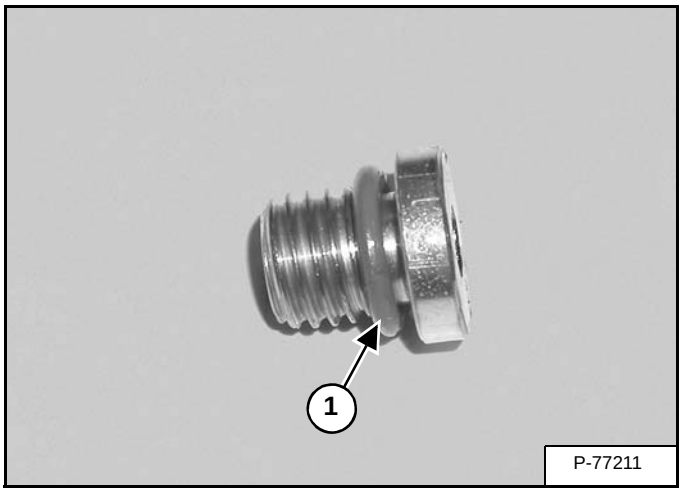


Install the fitting (Item 1) **[Figure 20-34-82]** into the PS port of the angle blade valve.

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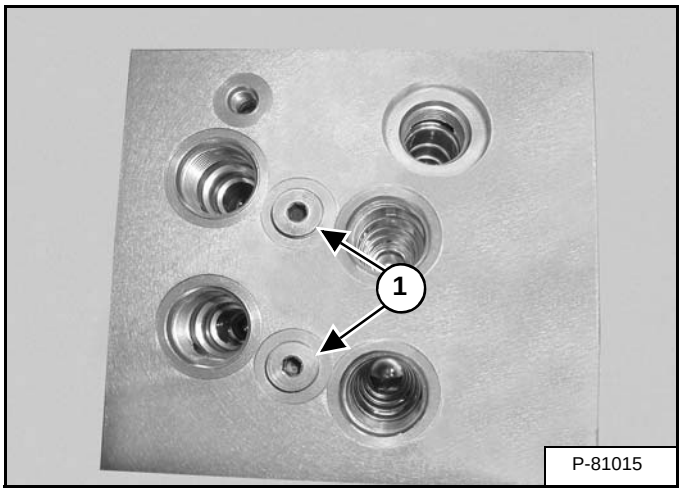
Assembly (Cont'd)

Figure 20-34-83



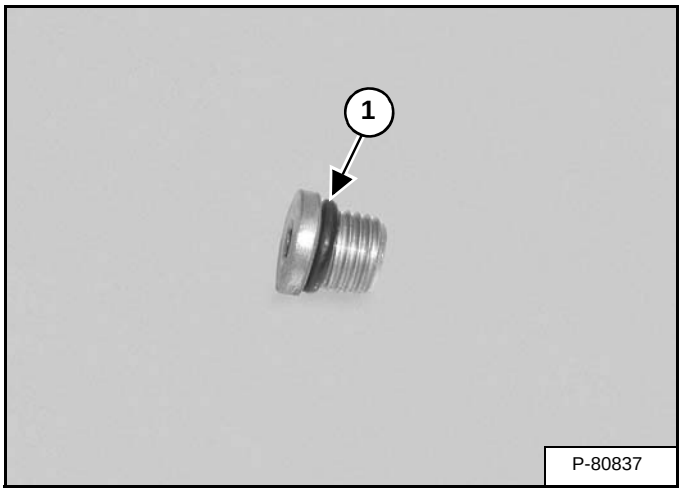
Install the O-ring (Item 1) **[Figure 20-34-83]** onto the plugs.

Figure 20-34-84



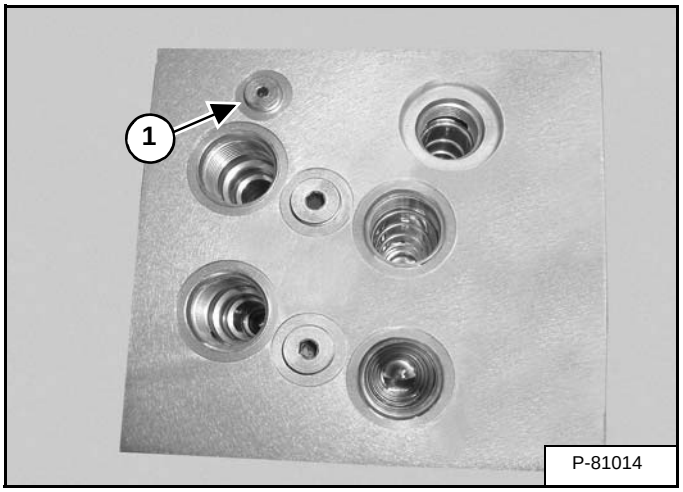
Install the two plugs (Item 1) **[Figure 20-34-84]** into the angle blade valve.

Figure 20-34-85



Install the O-ring (Item 1) **[Figure 20-34-85]** onto the plug.

Figure 20-34-86

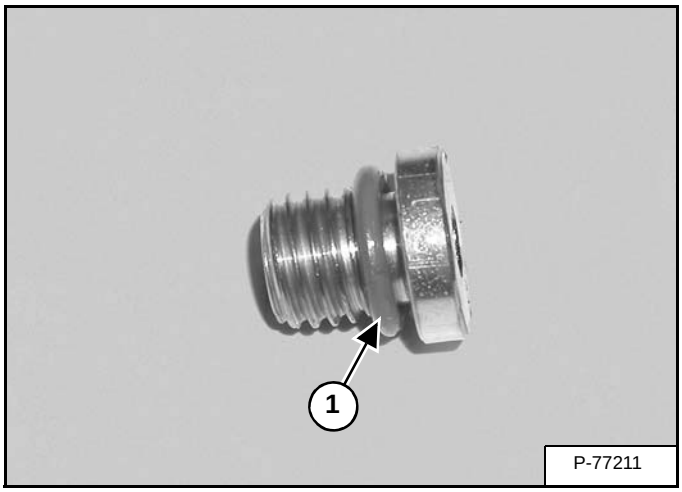


Install the plug (Item 1) **[Figure 20-34-84]** into the angle blade valve.

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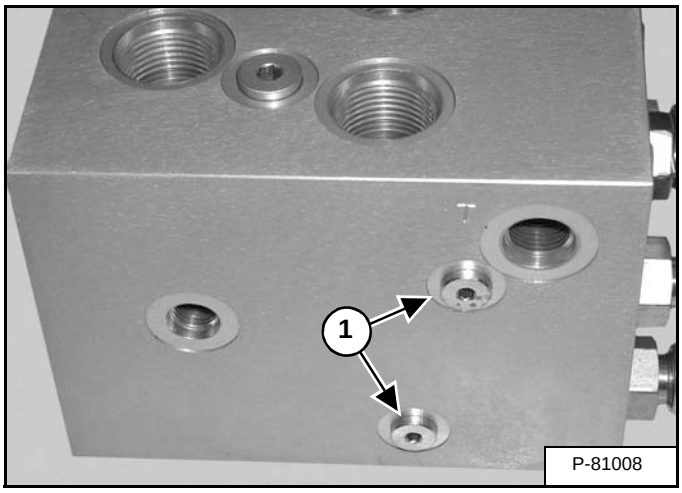
Assembly (Cont'd)

Figure 20-34-87



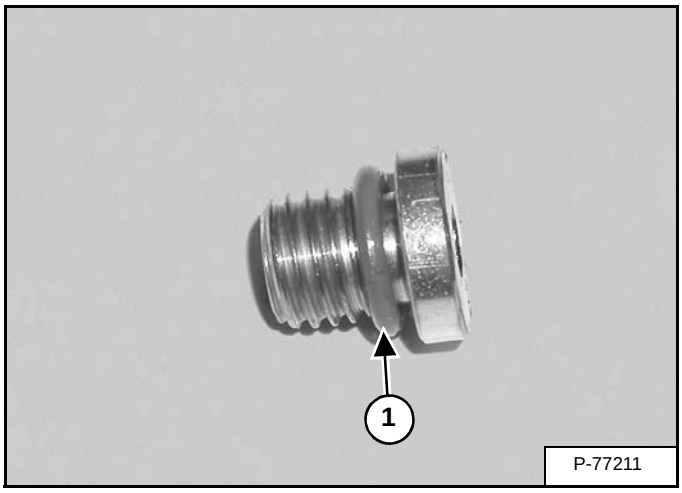
Install the O-ring (Item 1) **[Figure 20-34-87]** onto the two plugs.

Figure 20-34-88



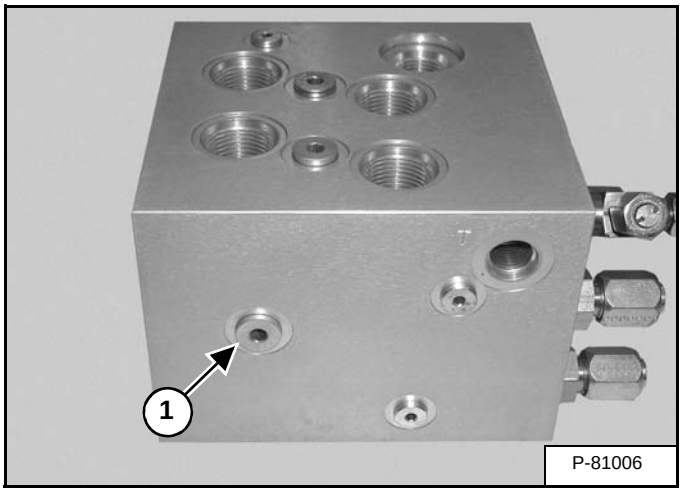
Install the two plugs (Item 1) **[Figure 20-34-88]** into the angle blade valve.

Figure 20-34-89



Install the O-ring (Item 1) **[Figure 20-34-89]** onto the plug.

Figure 20-34-90

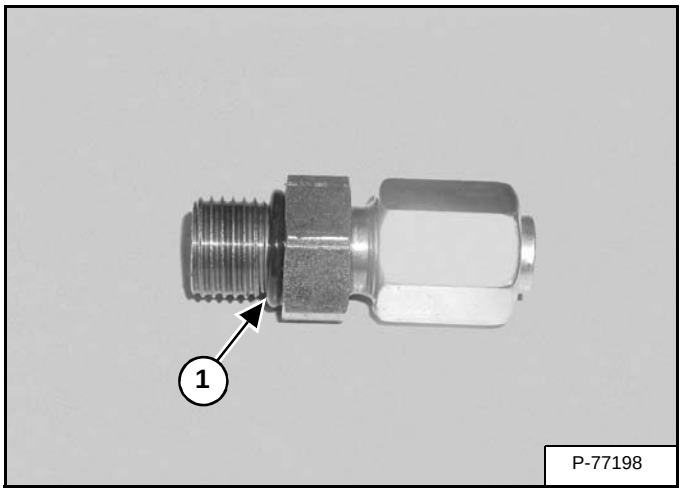


Install the plug (Item 1) **[Figure 20-34-90]** in the angle blade valve.

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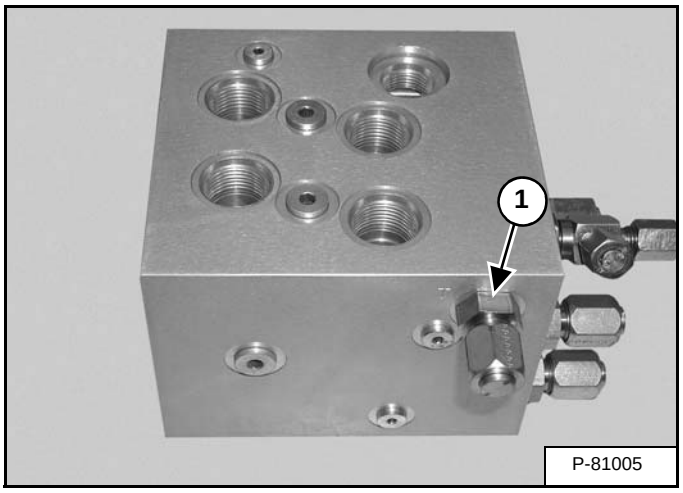
Assembly (Cont'd)

Figure 20-34-91



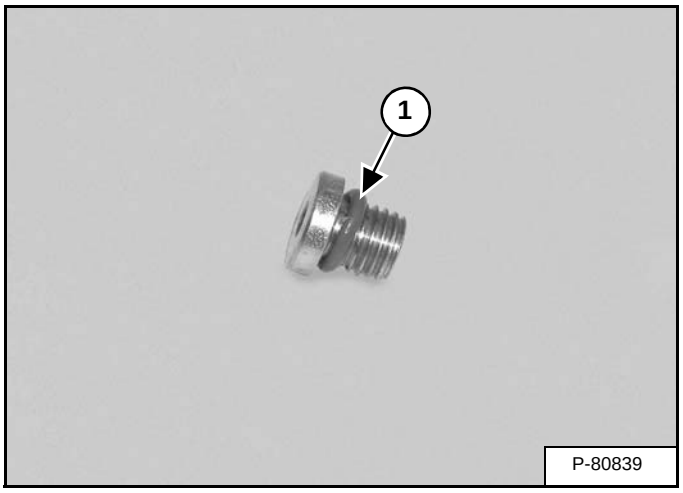
Install the O-ring (Item 1) **[Figure 20-34-91]** onto the fitting.

Figure 20-34-92



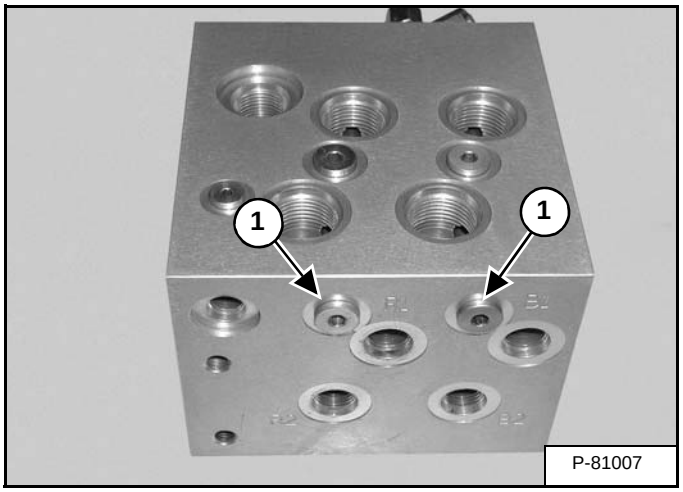
Install the fitting (Item 1) **[Figure 20-34-92]** into the T port of the angle blade valve.

Figure 20-34-93



Install the O-ring (Item 1) **[Figure 20-34-93]** onto the plug.

Figure 20-34-94

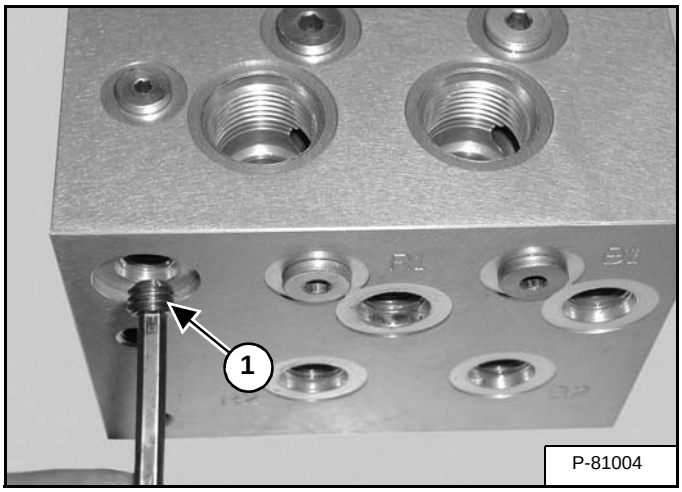


Install the plugs (Item 1) **[Figure 20-34-94]** into the angle blade valve.

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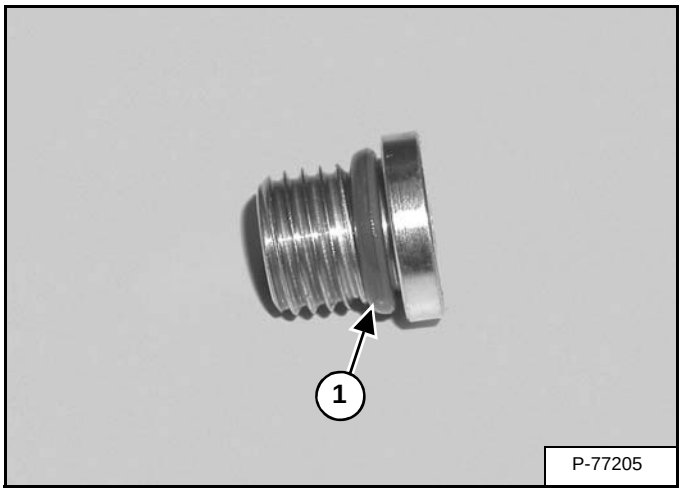
Assembly (Cont'd)

Figure 20-34-95



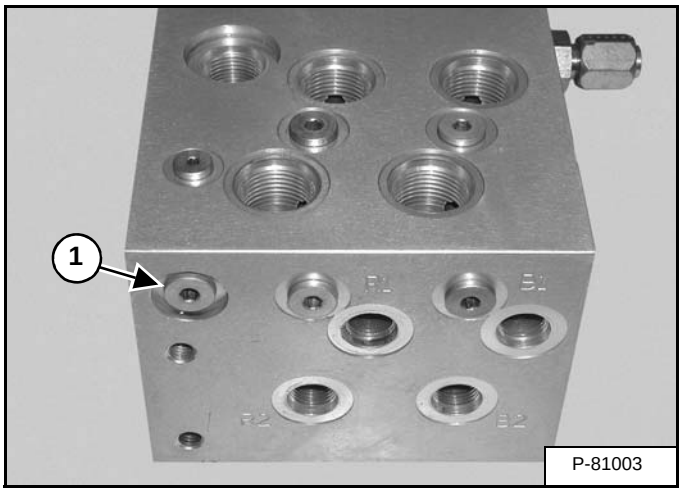
Install the orifice (Item 1) **[Figure 20-34-95]** into the angle blade valve.

Figure 20-34-96



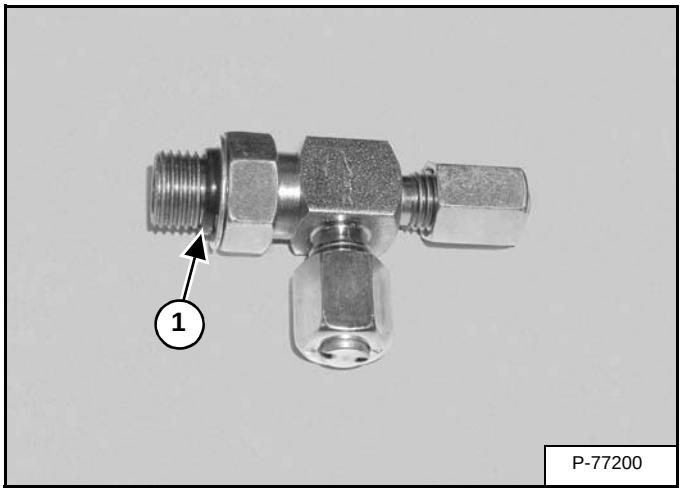
Install the O-ring (Item 1) **[Figure 20-34-96]** onto the plug.

Figure 20-34-97



Install the plug (Item 1) **[Figure 20-34-97]** into the angle blade valve.

Figure 20-34-98

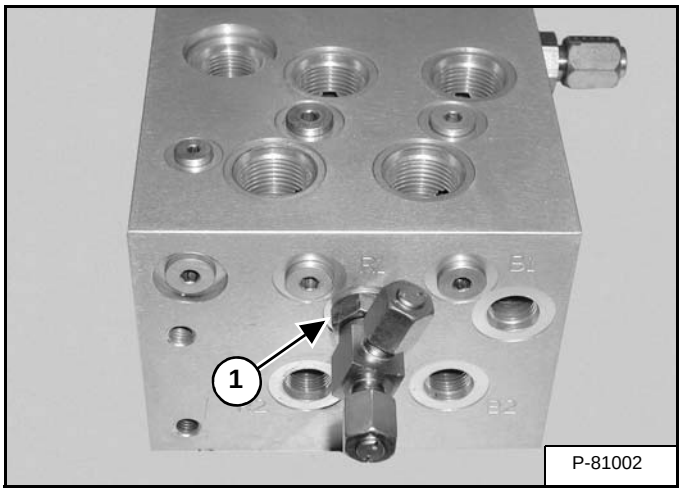


Install the O-ring (Item 1) **[Figure 20-34-98]** onto the fitting.

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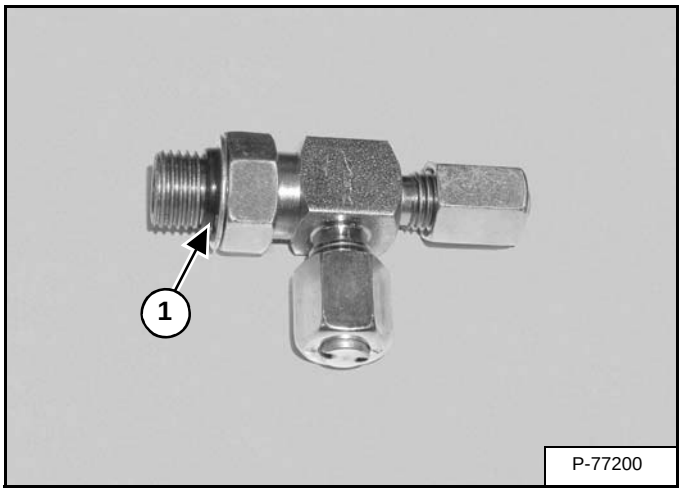
Assembly (Cont'd)

Figure 20-34-99



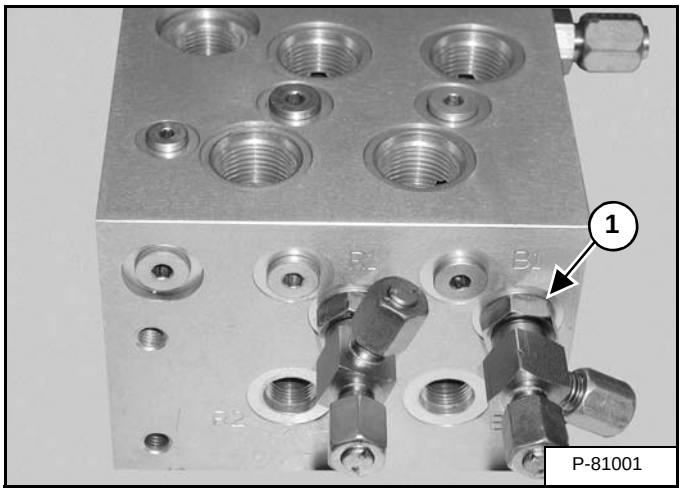
Install the fitting (Item 1) **[Figure 20-34-99]** into the R1 port of the angle blade valve.

Figure 20-34-100



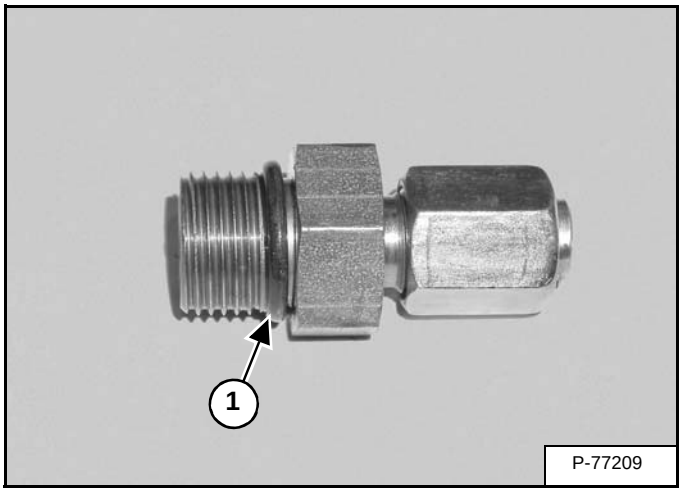
Install the O-ring (Item 1) **[Figure 20-34-100]** onto the fitting.

Figure 20-34-101



Install the fitting (Item 1) **[Figure 20-34-101]** into the B1 port of the angle blade valve.

Figure 20-34-102

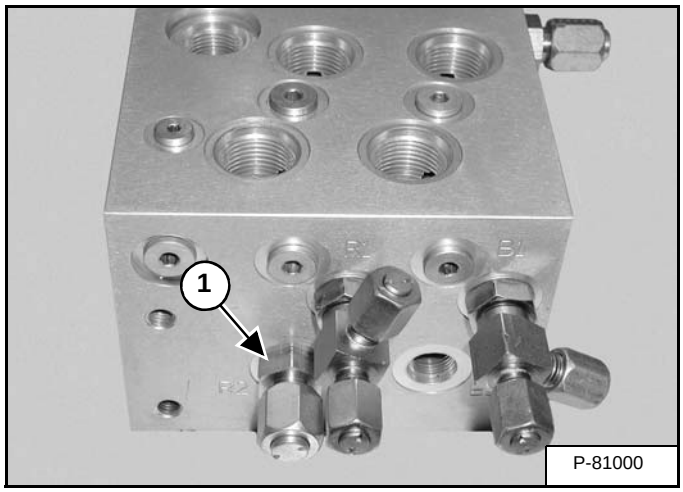


Install the O-ring (Item 1) **[Figure 20-34-102]** onto the fitting.

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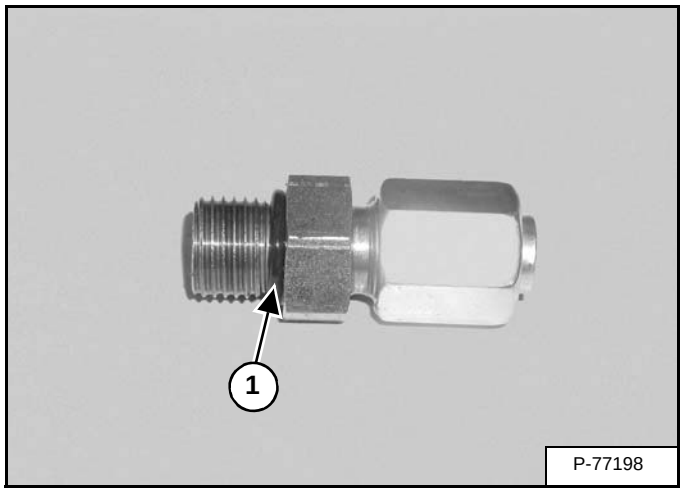
Assembly (Cont'd)

Figure 20-34-103



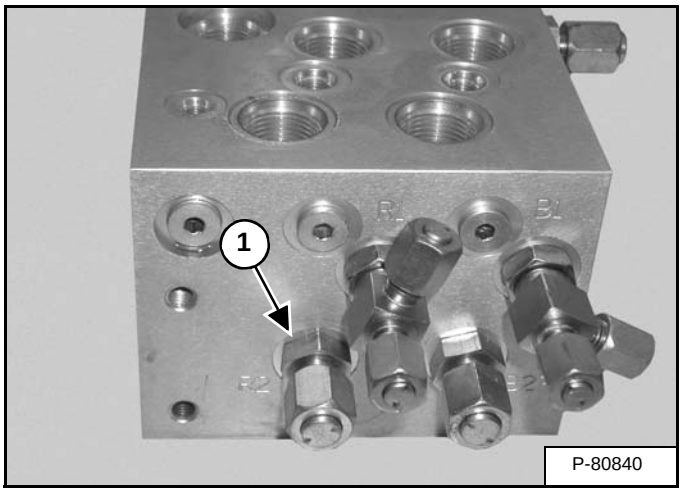
Install the fitting (Item 1) **[Figure 20-34-103]** into the R2 port of the angle blade valve.

Figure 20-34-104



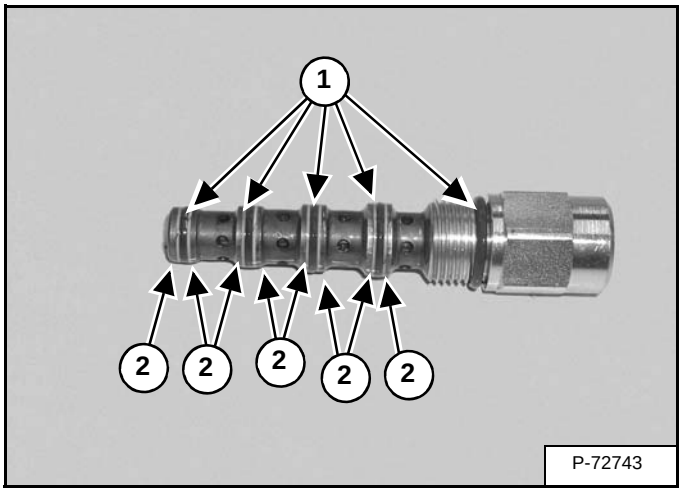
Install the O-ring (Item 1) **[Figure 20-34-104]** onto the fitting.

Figure 20-34-105



Install the fitting (Item 1) **[Figure 20-34-105]** into the B2 port of the angle blade valve.

Figure 20-34-106

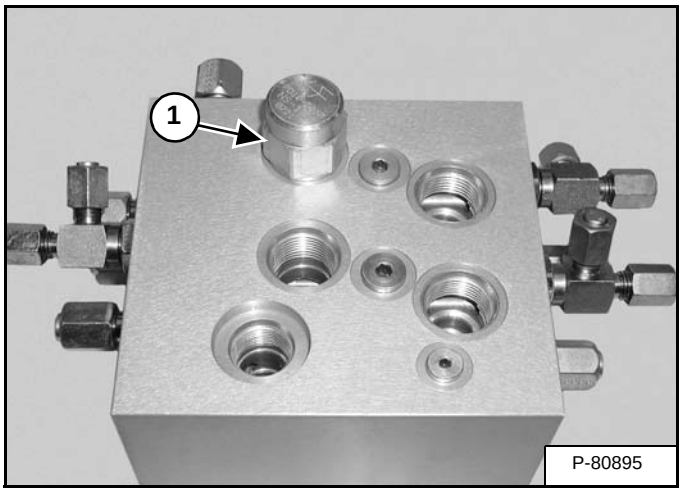


Install the O-rings (Item 1) and back-up rings (Item 2) **[Figure 20-34-106]** onto the directional valve.

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Assembly (Cont'd)

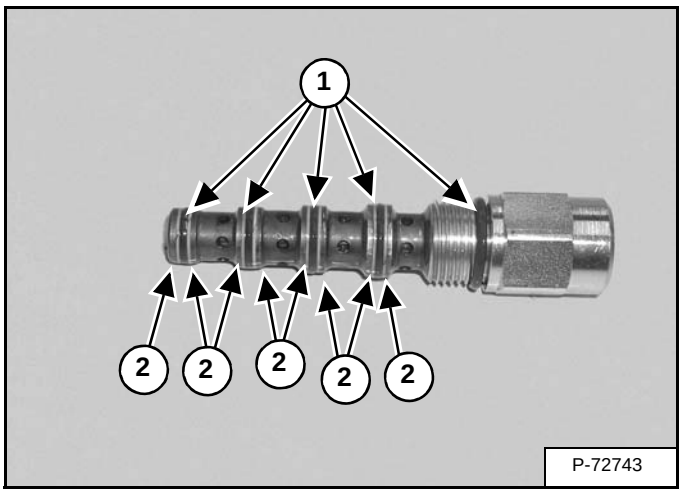
Figure 20-34-107



Install the directional valve (Item 1) **[Figure 20-34-107]** into the angle blade valve.

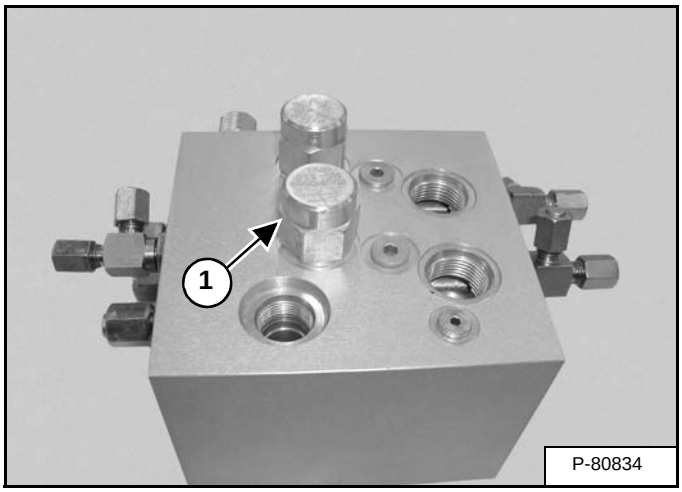
Tighten the directional valve to 25 ft.-lb. (34 N•m) torque.

Figure 20-34-108



Install the O-rings (Item 1) and back-up rings (Item 2) **[Figure 20-34-108]** onto the directional valve.

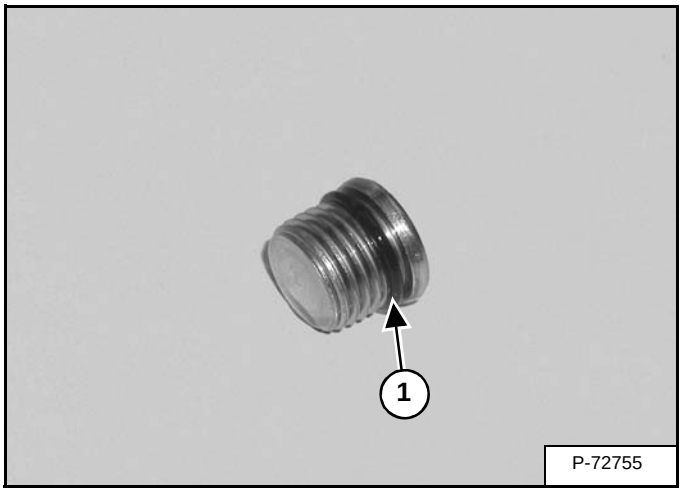
Figure 20-34-109



Install the directional valve (Item 1) **[Figure 20-34-109]** into the angle blade valve.

Tighten the directional valve to 25 ft.-lb. (34 N•m) torque.

Figure 20-34-110

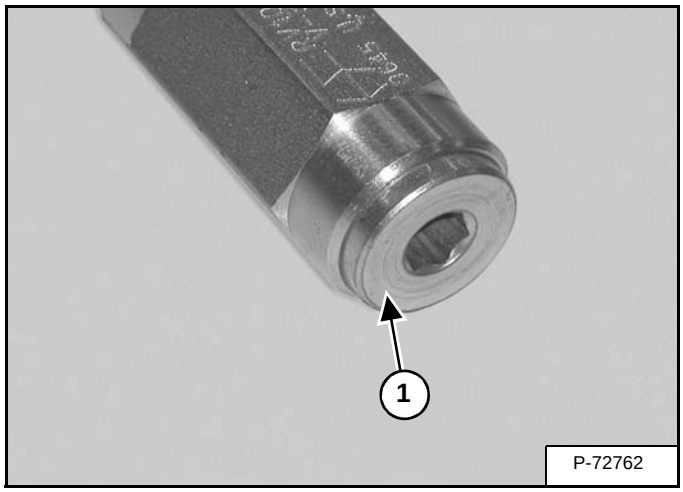


Install the O-ring (Item 1) **[Figure 20-34-110]** onto the plug.

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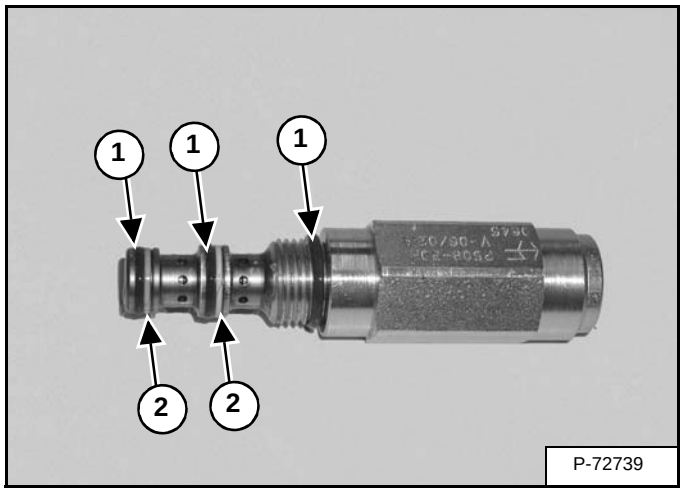
Assembly (Cont'd)

Figure 20-34-111



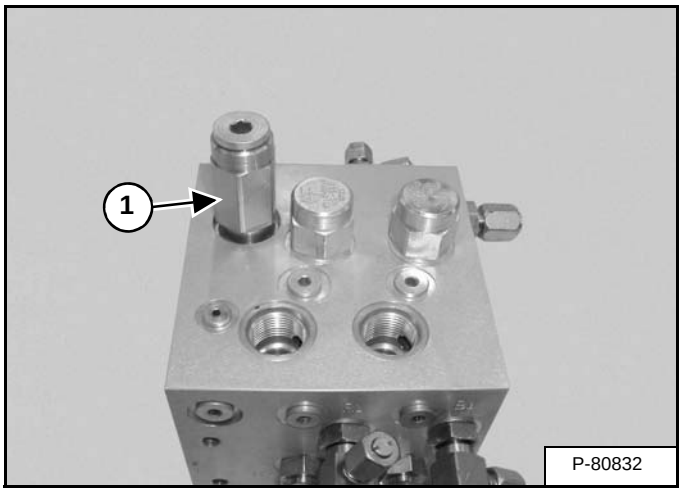
Install the plug (Item 1) **[Figure 20-34-111]** into the end of the sequence valve.

Figure 20-34-112



Install the O-rings (Item 1) and back-up rings (Item 2) **[Figure 20-34-112]** onto the sequence valve.

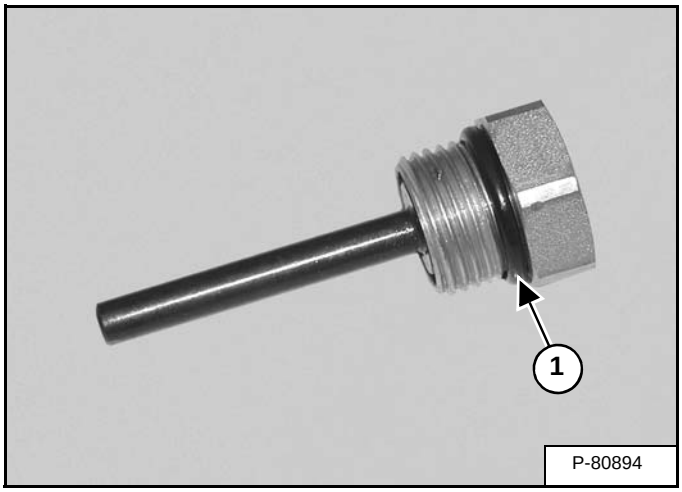
Figure 20-34-113



Install the sequence valve (Item 1) **[Figure 20-34-113]** into the angle blade valve.

Tighten the sequence element to 20 ft.-lb. (27 N•m) torque.

Figure 20-34-114

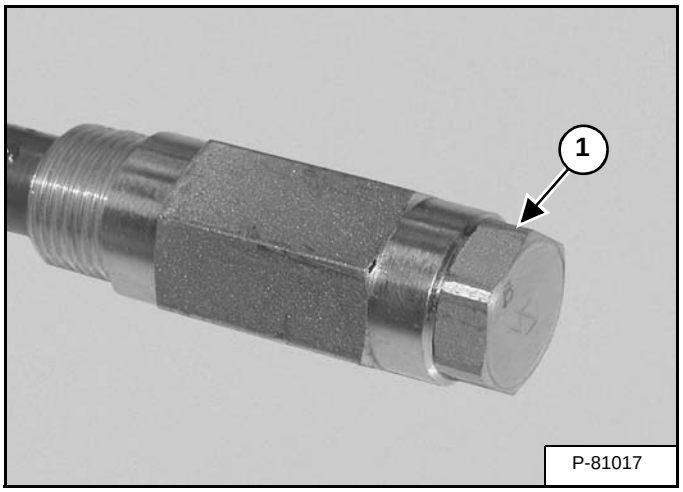


Install the O-ring (Item 1) **[Figure 20-34-114]** onto the plug.

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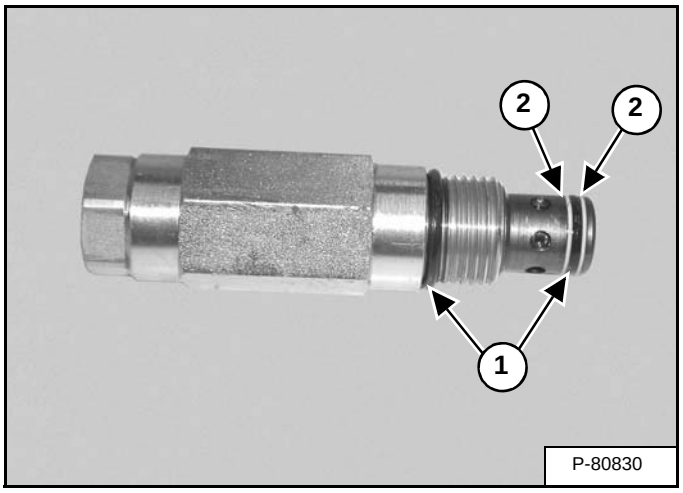
Assembly (Cont'd)

Figure 20-34-115



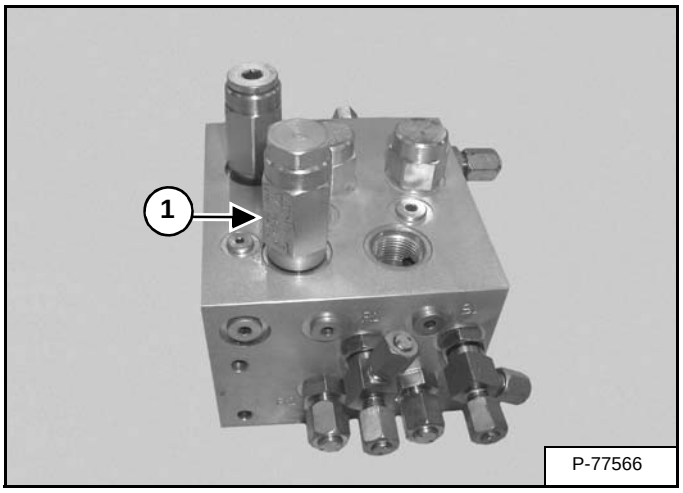
Install the plug (Item 1) **[Figure 20-34-115]** into the end of the relief valve.

Figure 20-34-116



Install the O-rings (Item 1) and back-up rings (Item 2) **[Figure 20-34-116]** onto the relief valve.

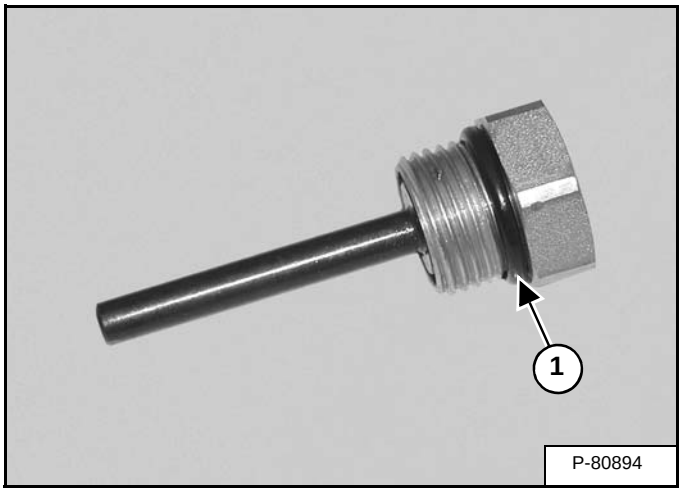
Figure 20-34-117



Install the relief valve (Item 1) **[Figure 20-34-117]** into the angle blade valve.

Tighten the relief valve to 25 ft.-lb. (34 N•m) torque.

Figure 20-34-118

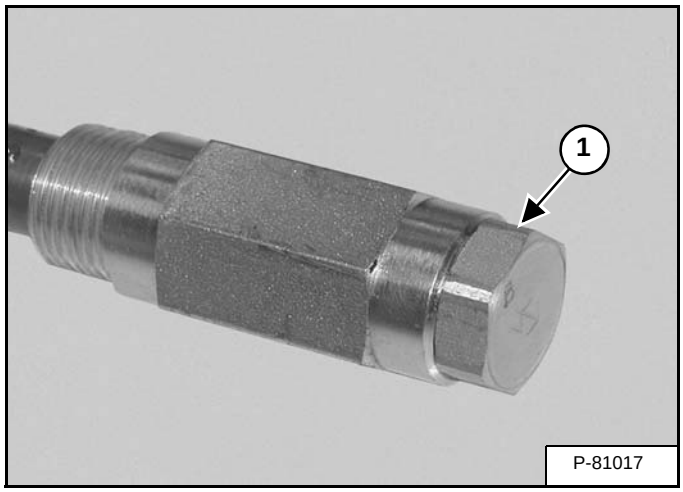


Install the O-ring (Item 1) **[Figure 20-34-118]** onto the plug.

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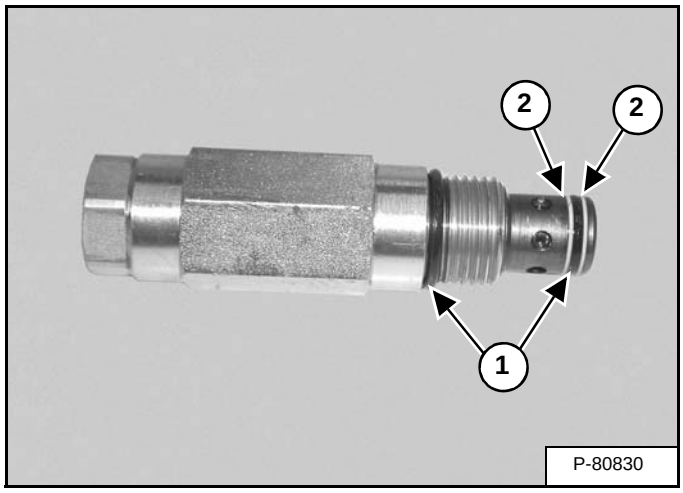
Assembly (Cont'd)

Figure 20-34-119



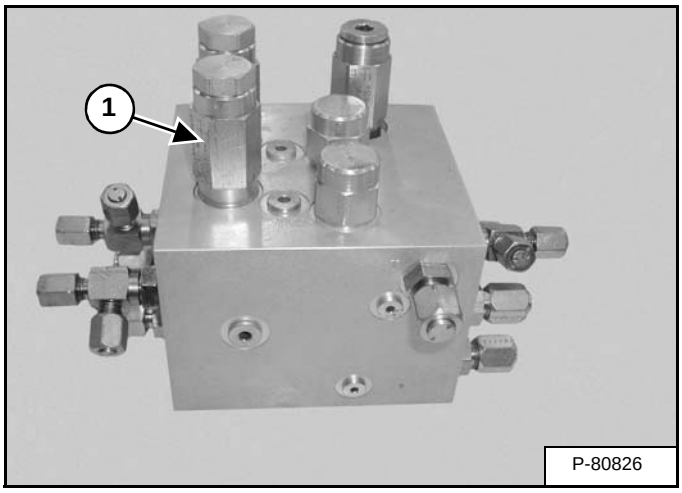
Install the plug (Item 1) **[Figure 20-34-119]** into the end of the relief valve.

Figure 20-34-120



Install the O-rings (Item 1) and back-up ring (Item 2) **[Figure 20-34-120]** onto the relief valve.

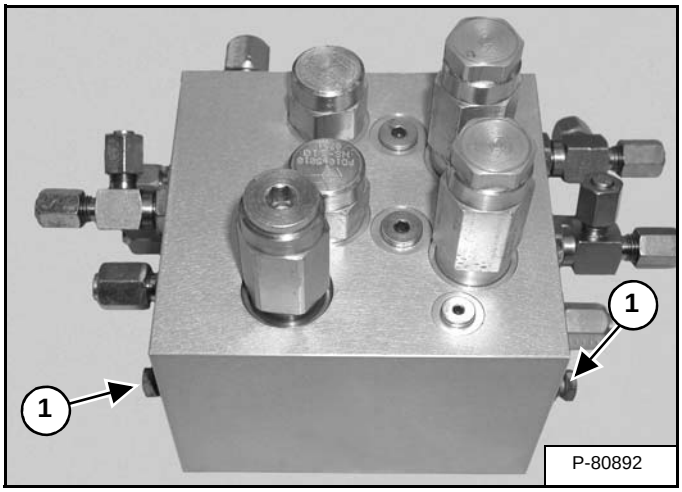
Figure 20-34-121



Install the relief valve (Item 1) **[Figure 20-34-121]** into the angle blade valve.

Tighten the relief valve to 25 ft.-lb. (34 N•m) torque.

Figure 20-34-122



Partially install the two bolts (Item 1) **[Figure 20-34-122]** into the angle blade valve.

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HYDRAULIC CONTROL VALVE (S/N 562611001 & ABOVE, 562811001 & ABOVE AND 563211001 & ABOVE)

Removal And Installation

Lower the boom/bucket and blade to the ground.

Stop the engine.

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

IMPORTANT

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

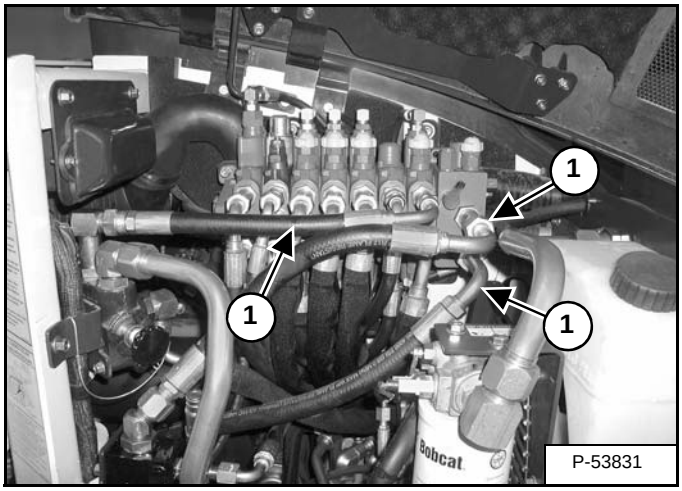
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Drain the hydraulic reservoir. (See Replacing The Hydraulic Oil on Page 10-100-2.)

Open the right side cover.

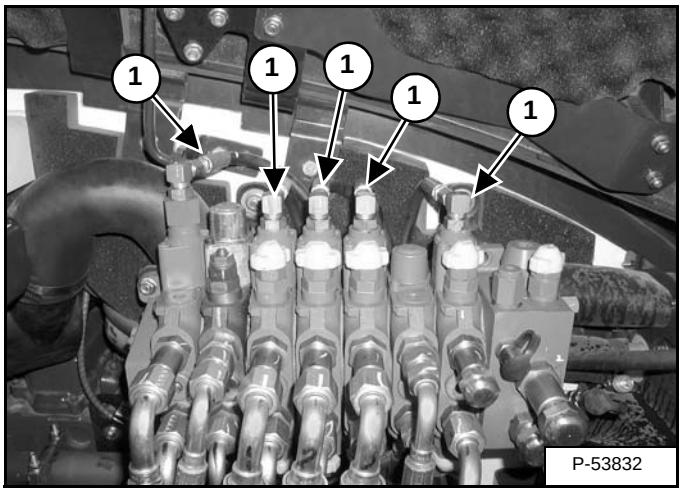
Mark all tubelines and hoses for proper installation.

Figure 20-40-1



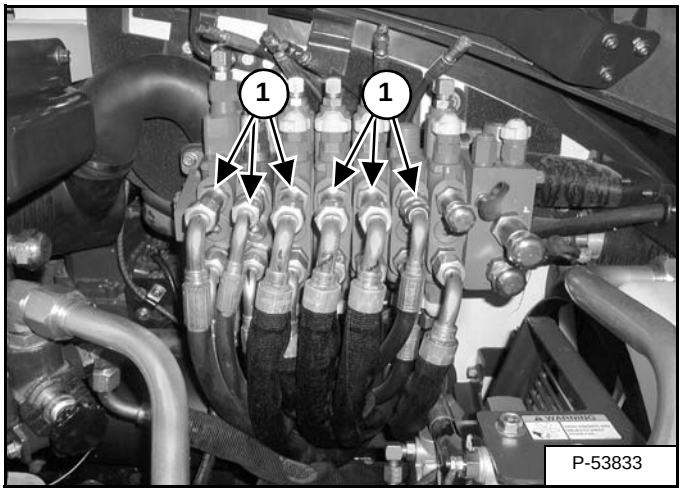
Remove the hoses (Item 1) **[Figure 20-40-1]**.

Figure 20-40-2



Remove the hoses (Item 1) **[Figure 20-40-2]**.

Figure 20-40-3

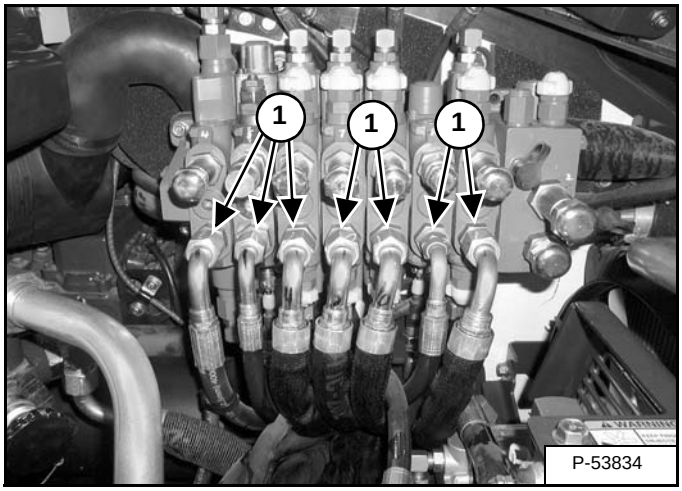


Remove the hoses (Item 1) **[Figure 20-40-3]**.

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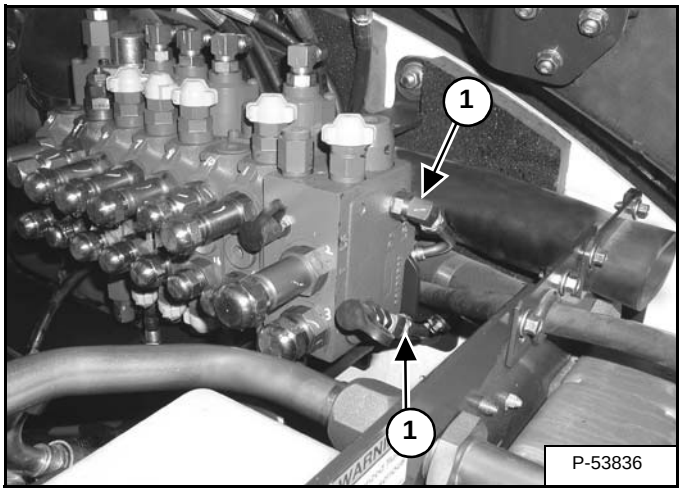
Removal And Installation (Cont'd)

Figure 20-40-4



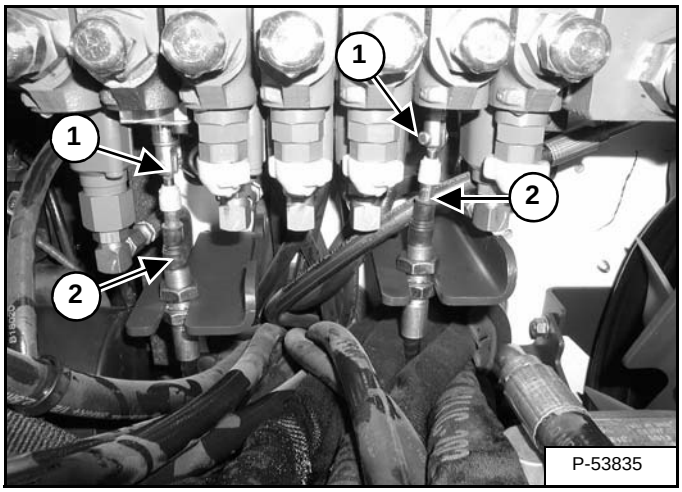
Remove the hoses (Item 1) **[Figure 20-40-4]**.

Figure 20-40-5



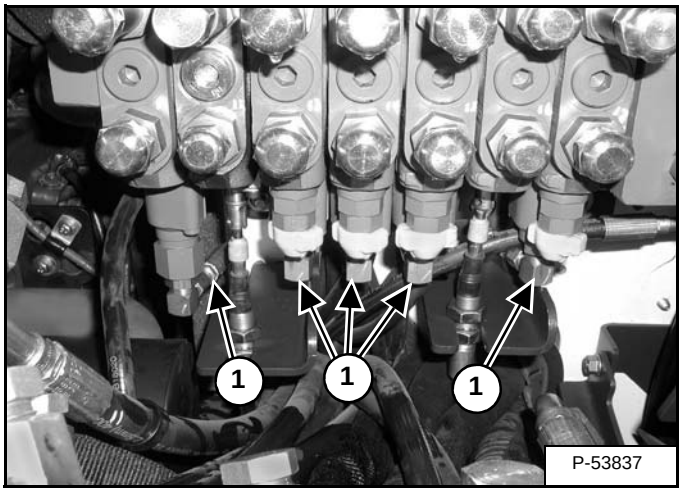
Remove the hoses (Item 1) **[Figure 20-40-5]**.

Figure 20-40-6



Remove the cotter pins and clevis pins (Item 1) from the swing and blade linkages (Item 2) **[Figure 20-40-6]**.

Figure 20-40-7



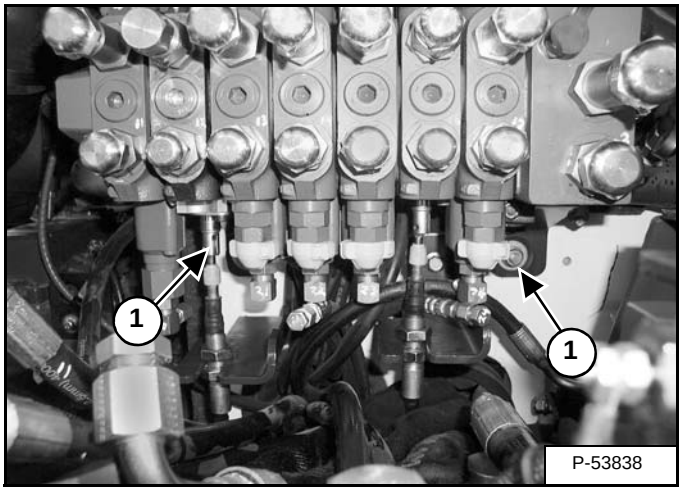
Remove the hoses (Item 1) **[Figure 20-40-7]**.

NOTE: If pilot pressure hose replacement is required, see Hoses for hose routing diagrams. (See HOSES on Page 20-114-1.)

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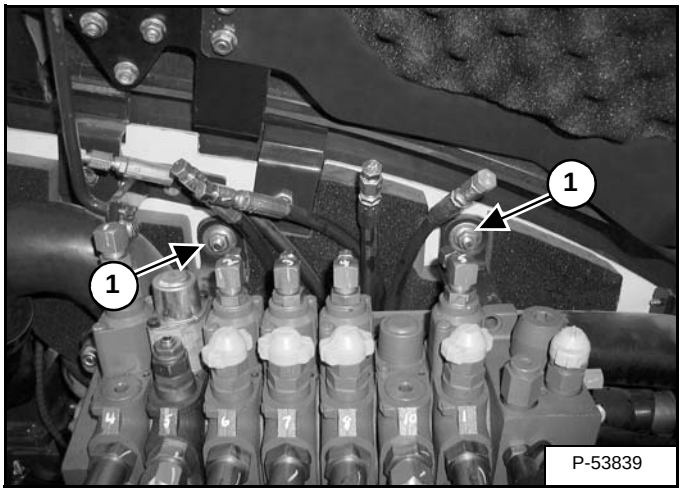
Removal And Installation (Cont'd)

Figure 20-40-8



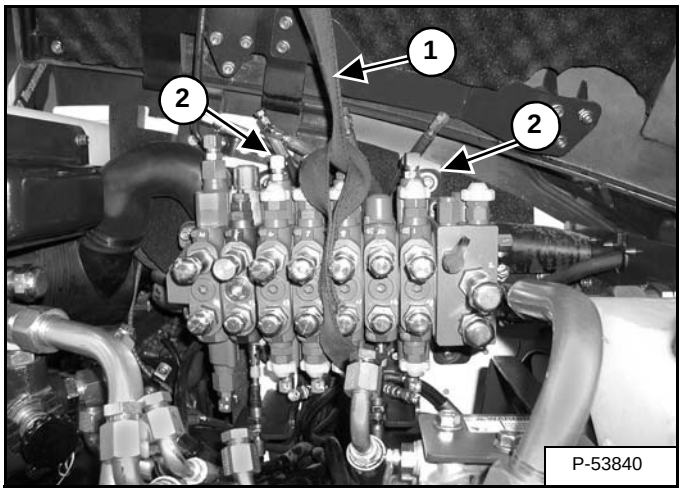
Remove the two nuts (Item 1) **[Figure 20-40-8]** and washers.

Figure 20-40-9



Loosen the two nuts (Item 1) **[Figure 20-40-9]**.

Figure 20-40-10



Install a sling (Item 1) **[Figure 20-40-10]** around the control valve and connect to a hoist.

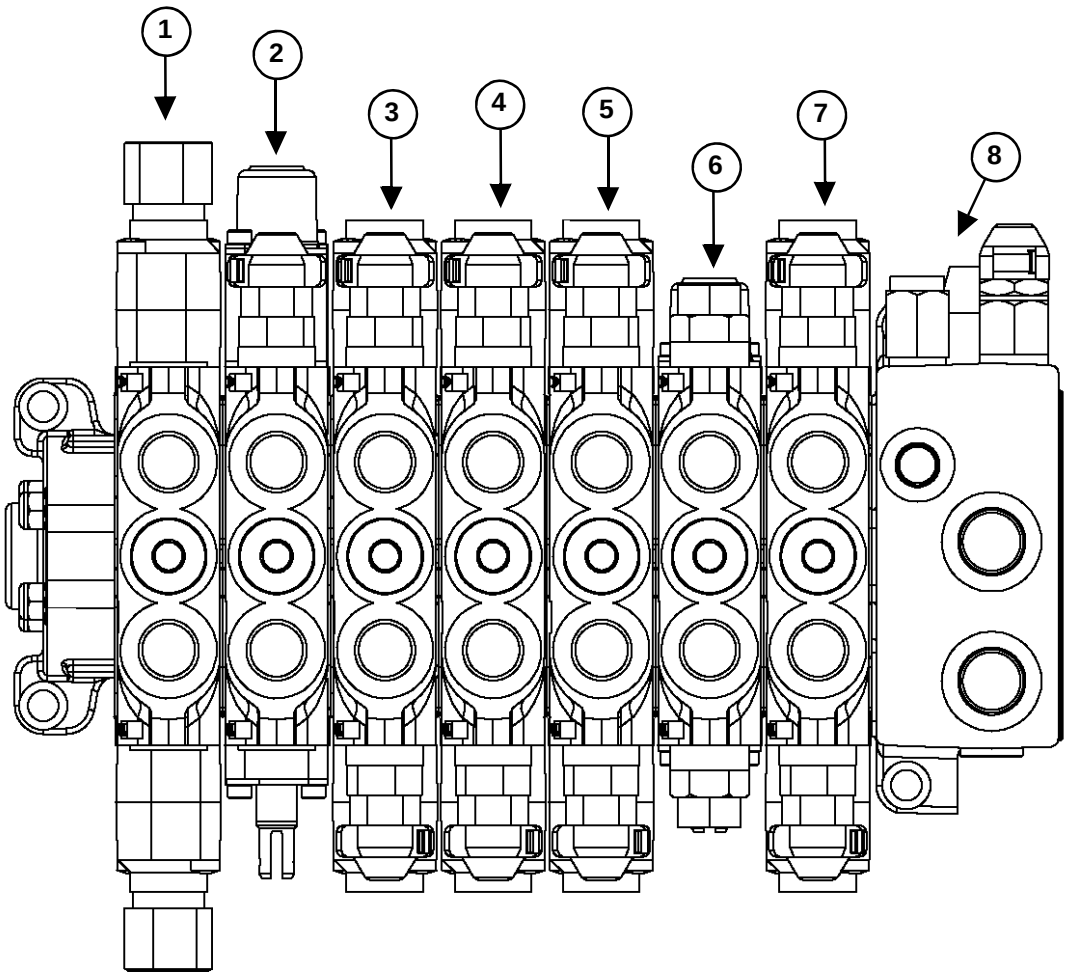
Remove the two nuts (Item 2) **[Figure 20-40-10]** and washers.

Remove the control valve from the excavator.

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Parts Identification

1. Upperstructure Slew Section
2. Blade Section
3. Bucket Section
4. Arm Section
5. Boom Section
6. Boom Swing Section
7. Auxiliary Hydraulic Section
8. Inlet/Outlet Section



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Disassembly

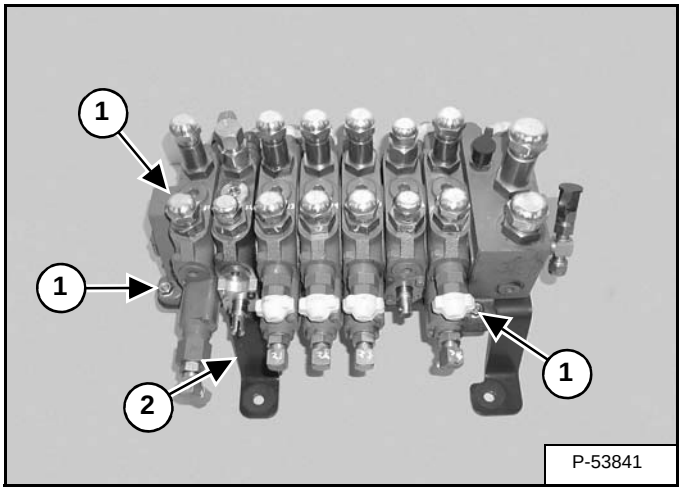
Clean the outside of the control valve before disassembly.

IMPORTANT

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

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Figure 20-40-11

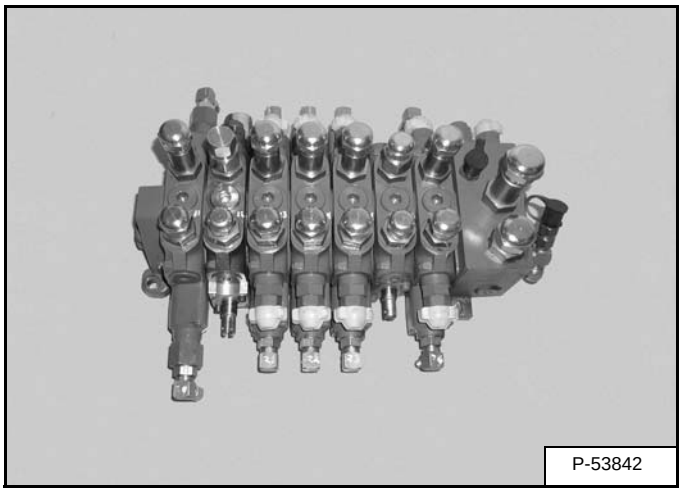


Remove the three bolts (Item 1) from the mount plate (Item 2) **[Figure 20-40-11]**.

Remove the mount plate from the control valve.

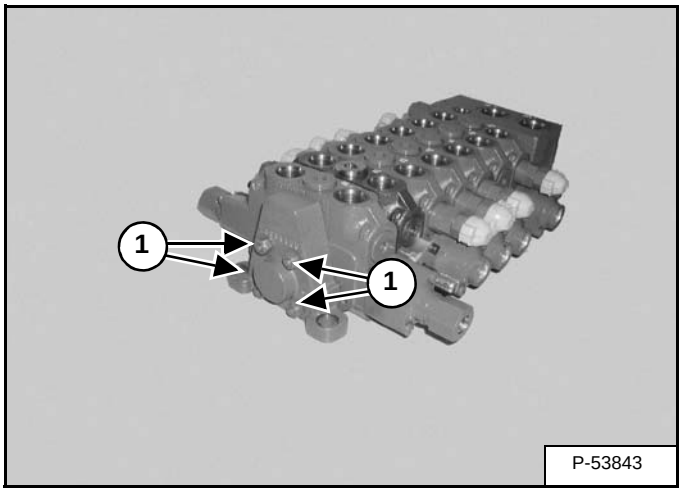
Mark all of the sections of the control valve for proper installation.

Figure 20-40-12



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

Figure 20-40-13

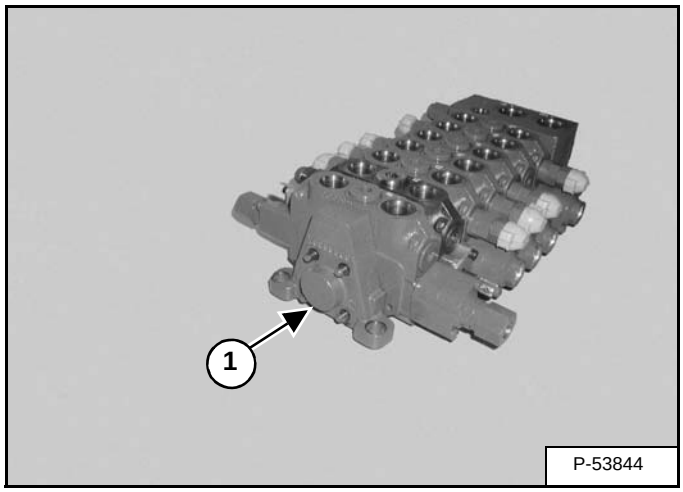


Remove the nuts (Item 1) **[Figure 20-40-13]** and washers.

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Disassembly (Cont'd)

Figure 20-40-14

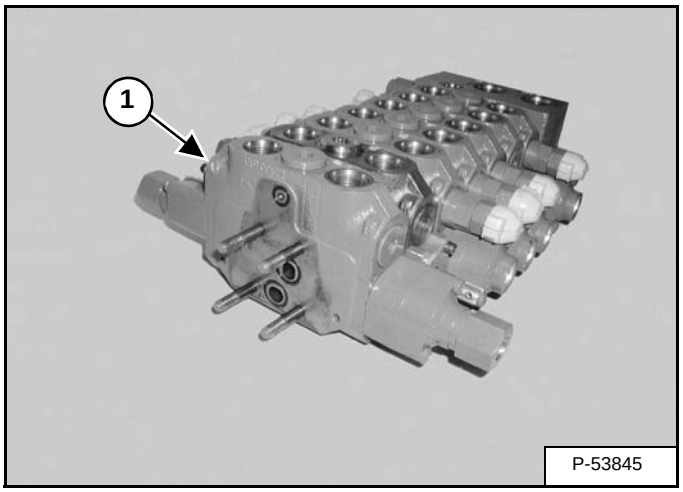


Remove the end cap (Item 1) **[Figure 20-40-14]** from the control valve.

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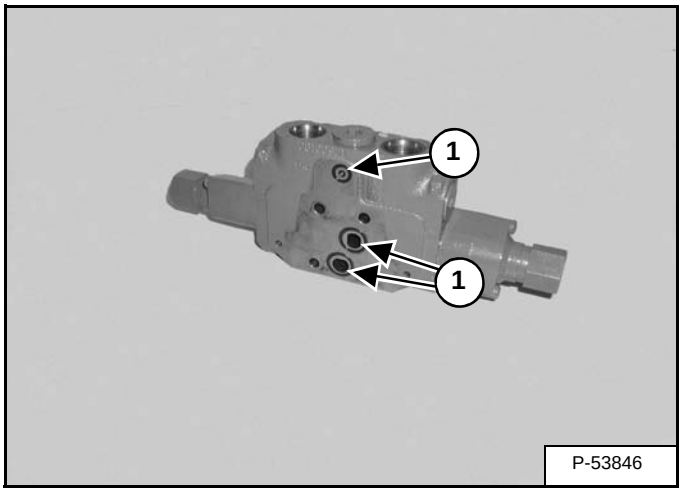
Slew Valve Section Disassembly And Assembly

Figure 20-40-15



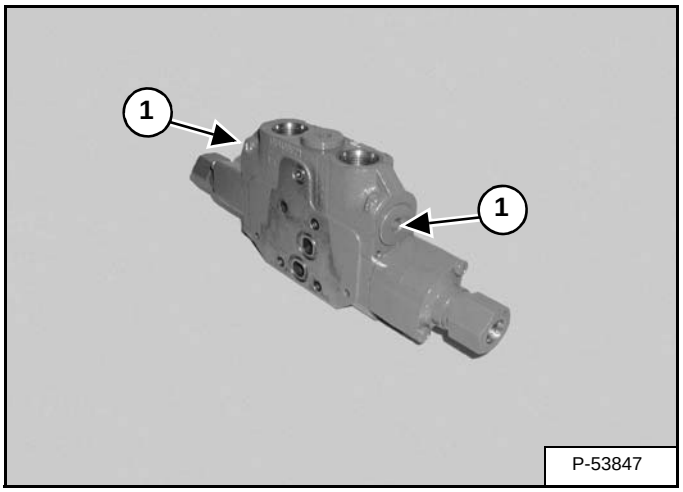
Remove the slew valve section (Item 1) **[Figure 20-40-15]** from the control valve.

Figure 20-40-16



Remove the O-rings (Item 1) **[Figure 20-40-16]** from the valve section.

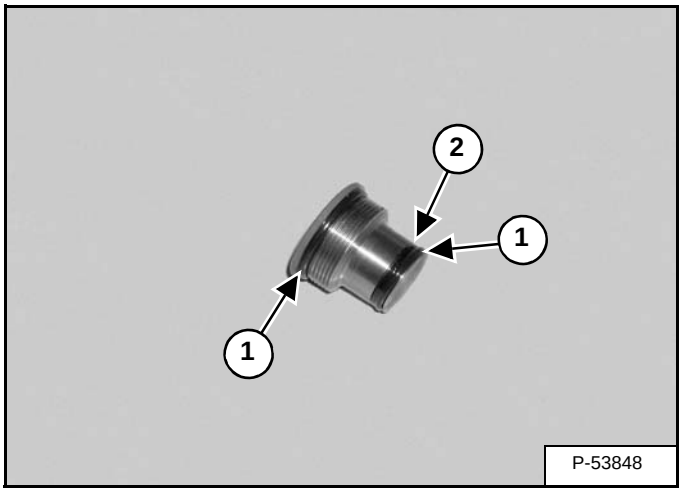
Figure 20-40-17



Remove the plug (Item 1) **[Figure 20-40-17]** from both ends of the valve section.

Assembly: Tighten the plug to 46 - 57 ft.-lb. (63 - 77 N•m) torque.

Figure 20-40-18

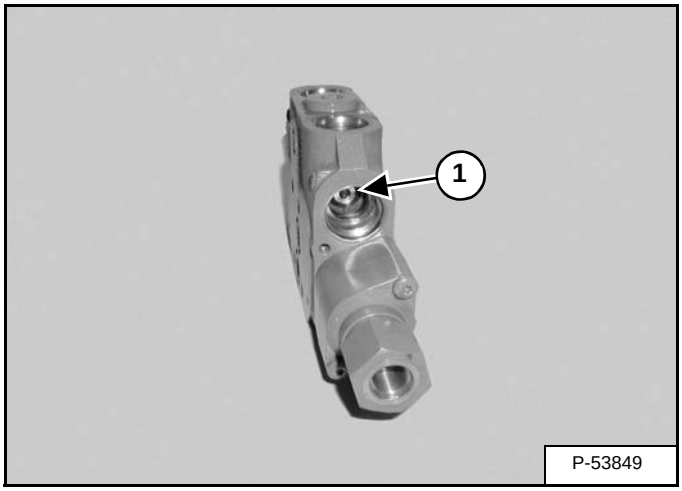


Remove the O-rings (Item 1) and backup ring (Item 2) **[Figure 20-40-18]** from the plug.

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Slew Valve Section Disassembly And Assembly (Cont'd)

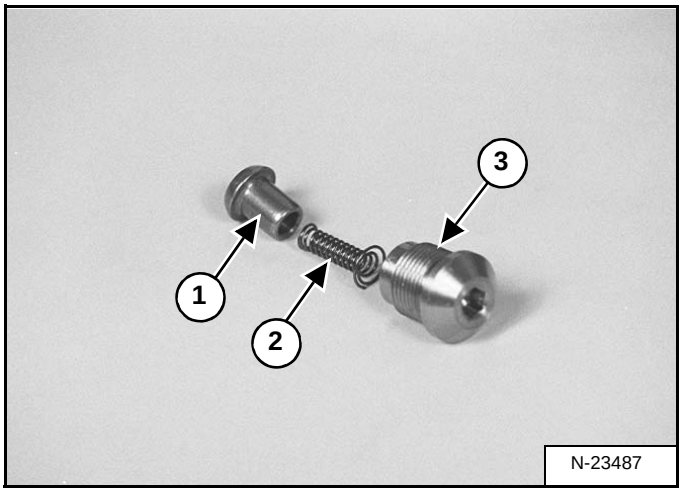
Figure 20-40-19



Remove the load check valve assembly (Item 1) **[Figure 20-40-19]** from both ends of the valve section.

Assembly: Tighten the load check valve assemblies to 80 - 97 in.-lb. (9 - 11 N•m) torque.

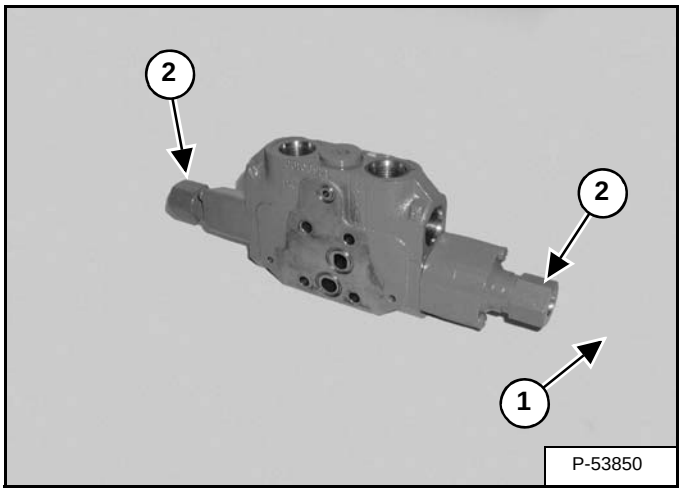
Figure 20-40-20



Remove the seat (Item 1) and spring (Item 2) from the load check valve bodies (Item 3) **[Figure 20-40-20]**.

NOTE: The load check valves must be replaced as a complete assembly.

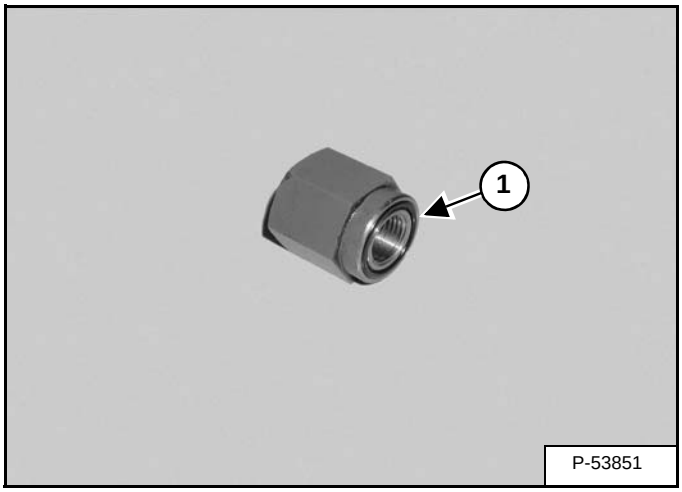
Figure 20-40-21



Install a hex wrench (Item 1) **[Figure 20-40-21]** to hold the spool limiter (both ends).

Remove the nut (Item 2) **[Figure 20-40-21]** from both ends of the valve section.

Figure 20-40-22

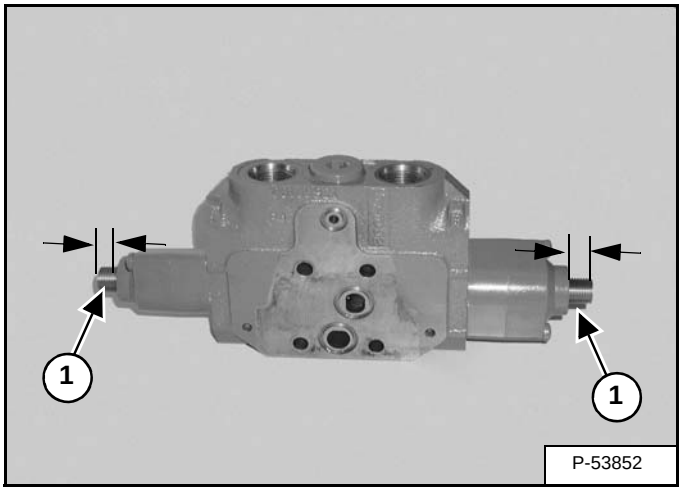


Remove the O-ring (Item 1) **[Figure 20-40-22]** from the nut.

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Slew Valve Section Disassembly And Assembly (Cont'd)

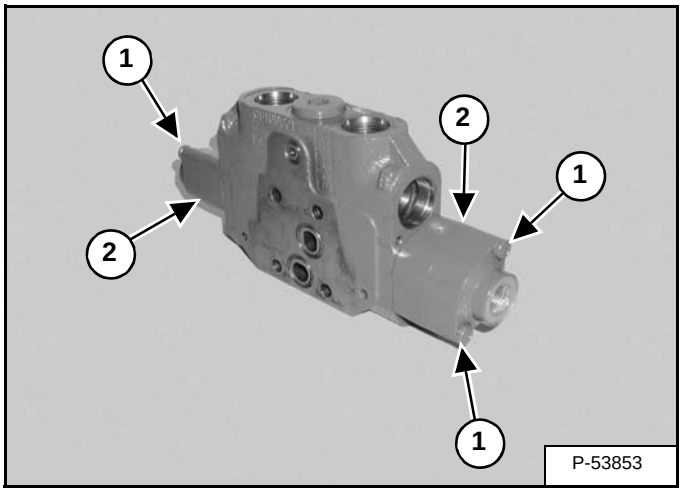
Figure 20-40-23



Measure and record the length of the spool limiter (Item 1) **[Figure 20-40-23]** on both ends of the valve section.

Remove the spool limiters.

Figure 20-40-24

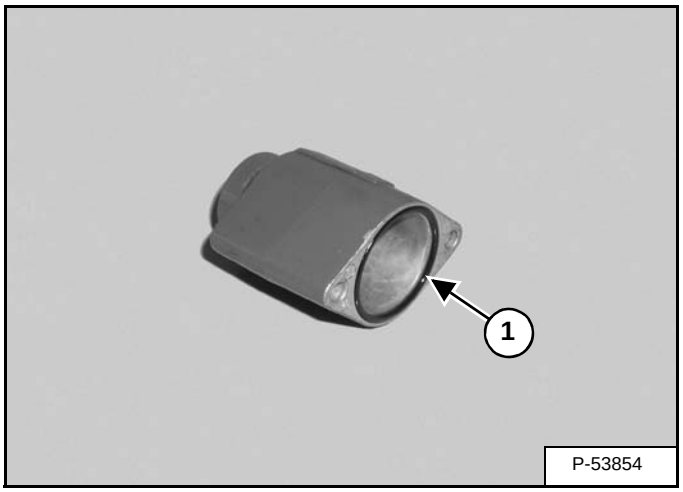


Remove the two screws (Item 1) from both valve section end caps (Item 2) **[Figure 20-40-24]**.

Assembly: Tighten the screws to 48 - 58 in.-lb. (5,4 - 6,6 N•m) torque.

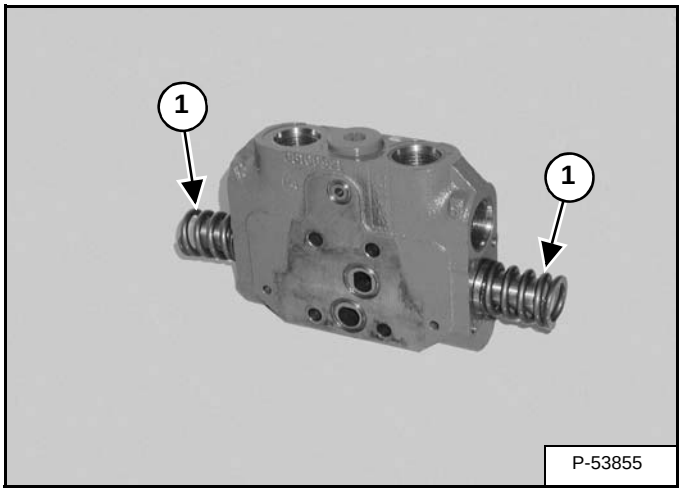
Remove the end caps from the valve section.

Figure 20-40-25



Remove the O-ring (Item 1) **[Figure 20-40-25]** from the end caps.

Figure 20-40-26

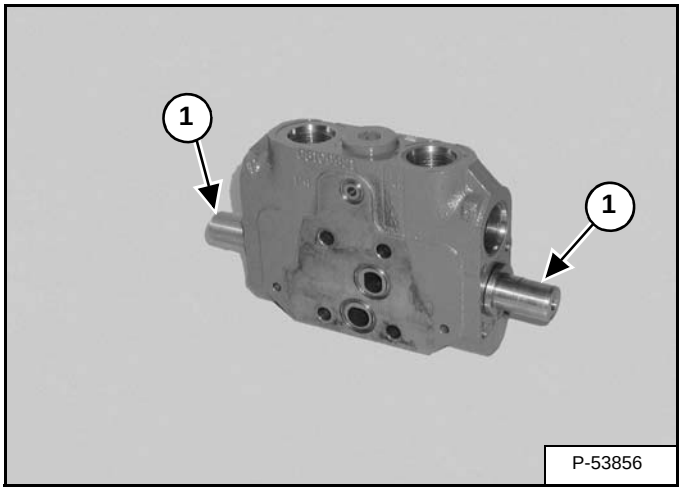


Remove the centering springs (Item 1) **[Figure 20-40-26]** from the spring guides.

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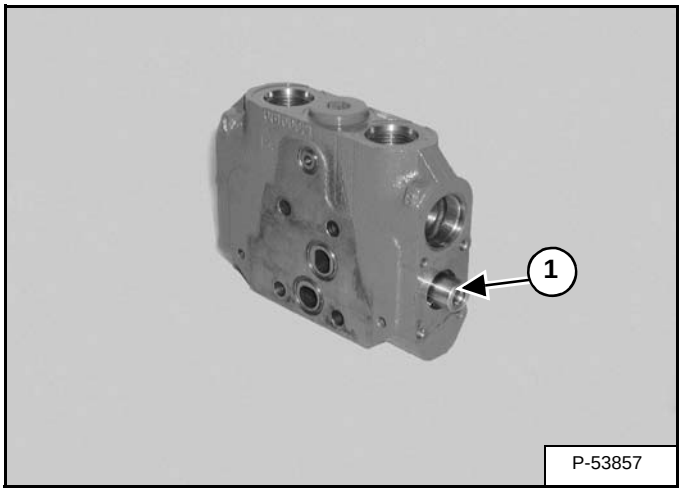
Slew Valve Section Disassembly And Assembly (Cont'd)

Figure 20-40-27



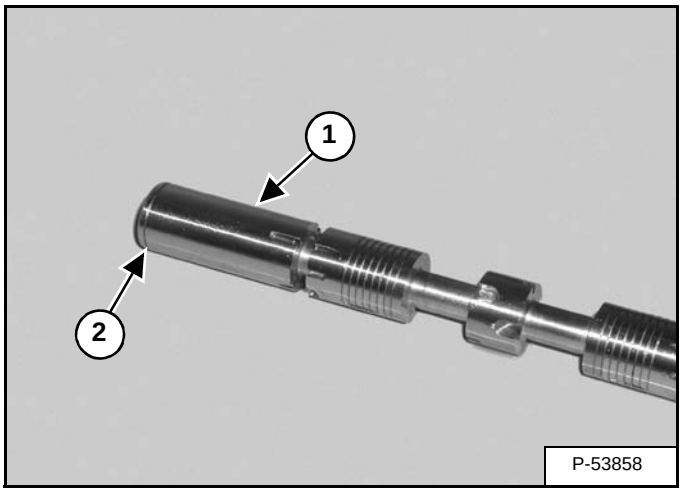
Remove the spring guides (Item 1) **[Figure 20-40-27]** from both ends of the valve spool.

Figure 20-40-28



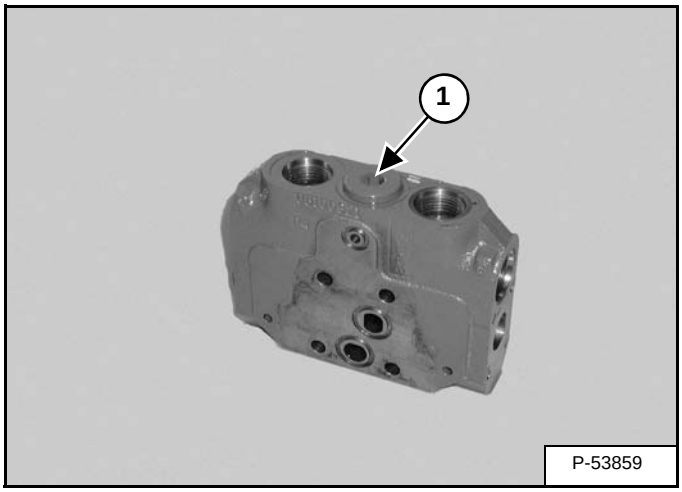
Remove the spool (Item 1) **[Figure 20-40-28]** from the valve section.

Figure 20-40-29



Assembly: The spool (Item 1) is symmetrical, and can be installed in the valve section with the spool groove (Item 2) **[Figure 20-40-29]** either toward the top, or the bottom of the valve section.

Figure 20-40-30



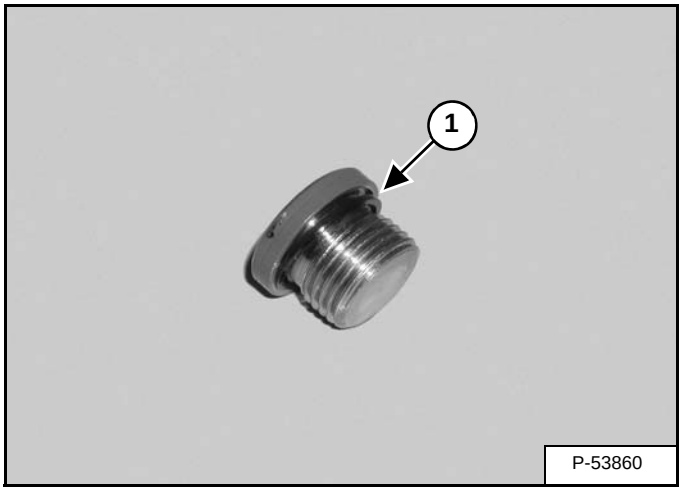
Remove the plug (Item 1) **[Figure 20-40-30]** from the top of the valve section.

Assembly: Tighten the plug to 46 - 57 ft.-lb. (63 - 77 N•m) torque.

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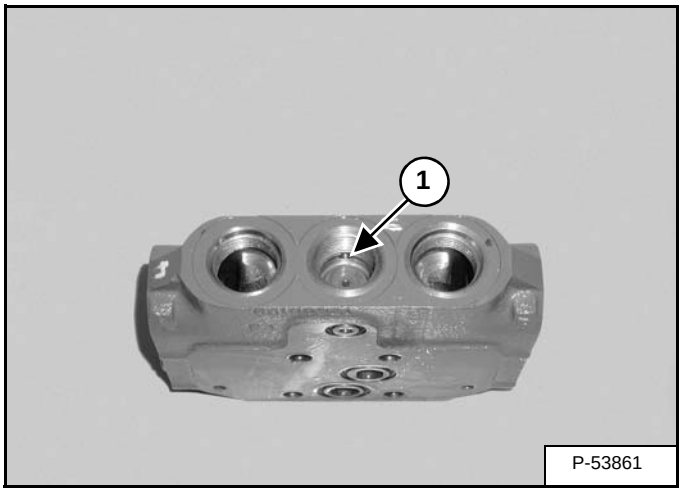
Slew Valve Section Disassembly And Assembly (Cont'd)

Figure 20-40-31



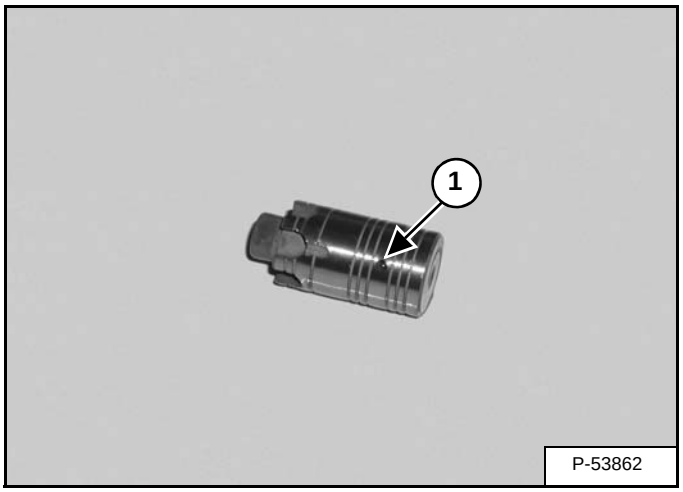
Remove the O-ring (Item 1) **[Figure 20-40-31]** from the plug.

Figure 20-40-32



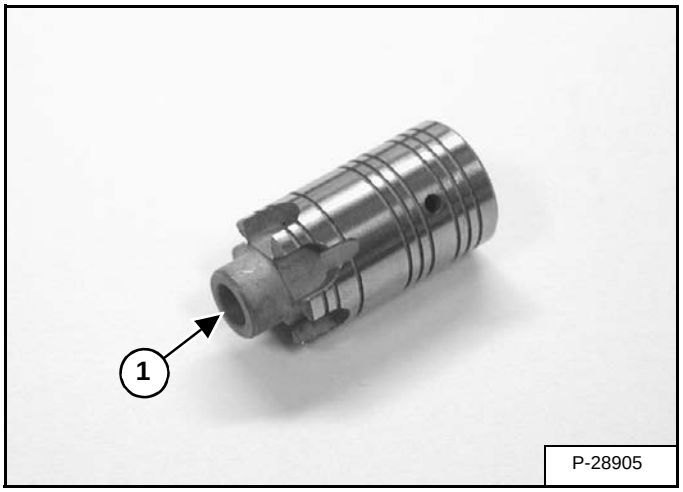
Remove the compensator (Item 1) **[Figure 20-40-32]** from the valve section.

Figure 20-40-33



Check the crossport hole (Item 1) **[Figure 20-40-33]** in the compensator, to be sure it is not plugged.

Figure 20-40-34

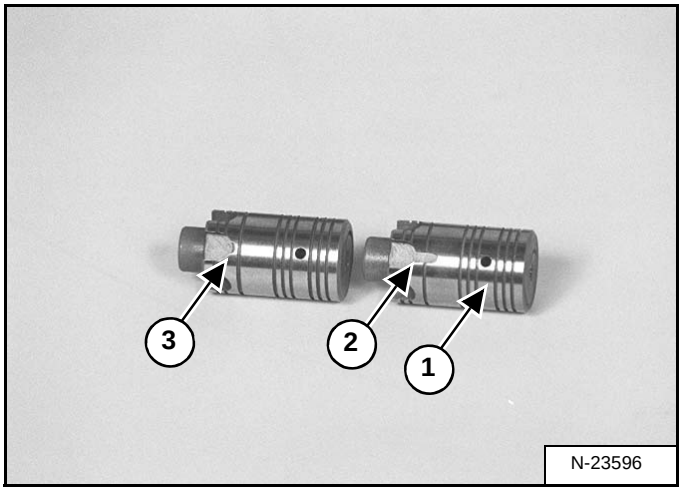


Check the orifice (Item 1) **[Figure 20-40-34]** to be sure it is not plugged.

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Slew Valve Section Disassembly And Assembly (Cont'd)

Figure 20-40-35

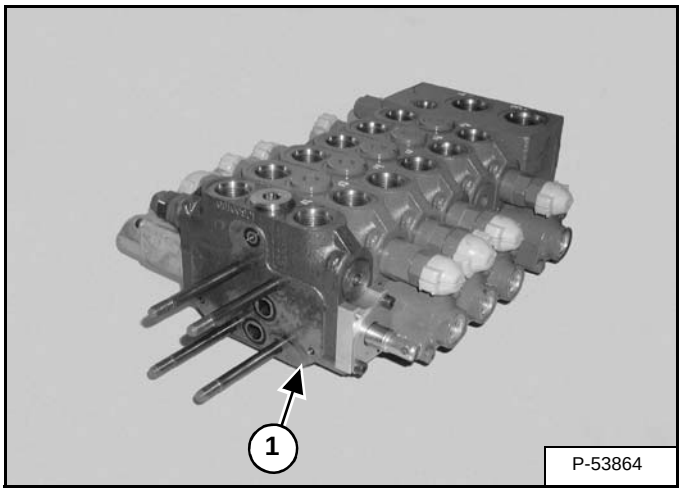


NOTE: The compensator (Item 1), in the slew valve section, is a Priority Compensator and can be determined by the extended groove (Item 2) as compared to a normal compensator (Item 3) [Figure 20-40-35]. These compensators must not be interchanged with each other.

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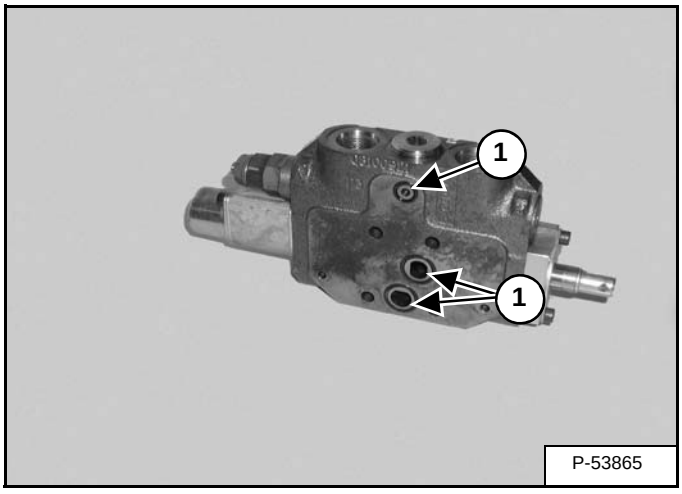
Blade Valve Section Disassembly And Assembly

Figure 20-40-36



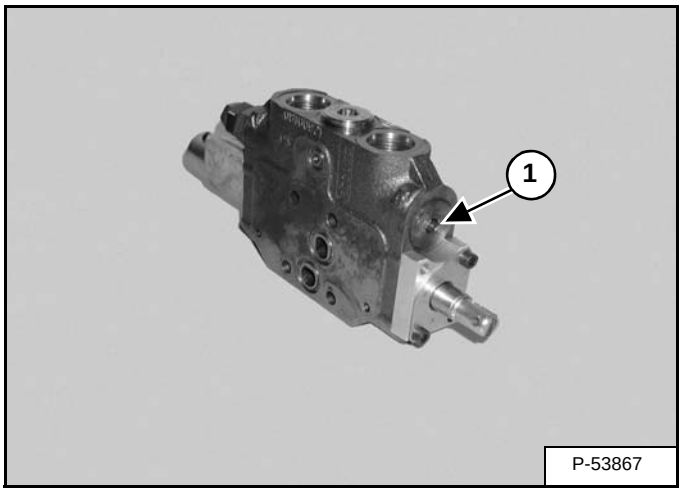
Remove the blade valve section (Item 1) **[Figure 20-40-36]** from the control valve.

Figure 20-40-37



Remove the O-rings (Item 1) **[Figure 20-40-37]** from the valve section.

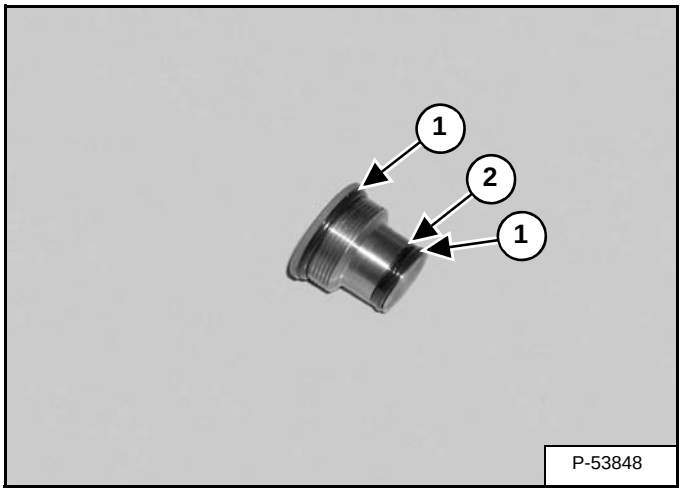
Figure 20-40-38



Remove the plug (Item 1) **[Figure 20-40-38]** from the valve section.

Assembly: Tighten the plug to 46 - 57 ft.-lb. (63 - 77 N•m) torque.

Figure 20-40-39

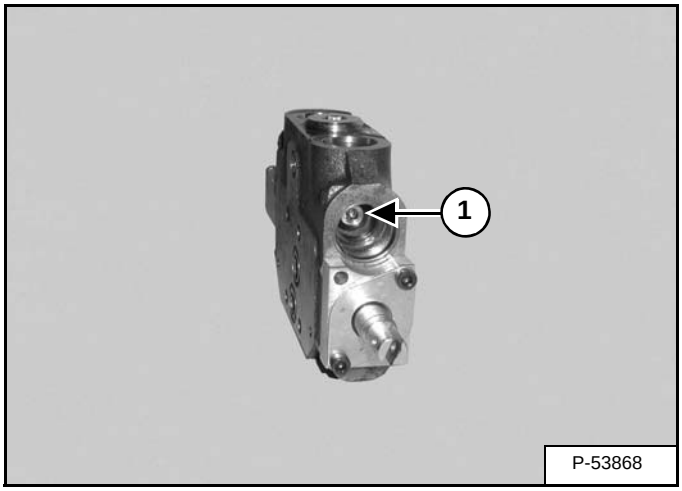


Remove the O-rings (Item 1) and backup ring (Item 2) **[Figure 20-40-39]** from the plug.

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Blade Valve Section Disassembly And Assembly (Cont'd)

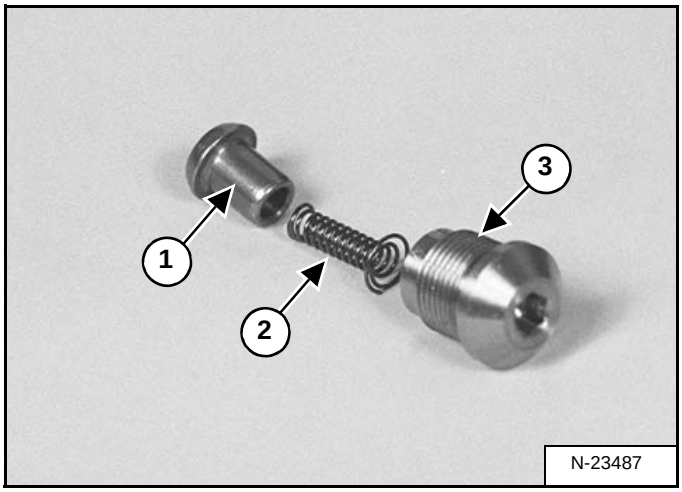
Figure 20-40-40



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

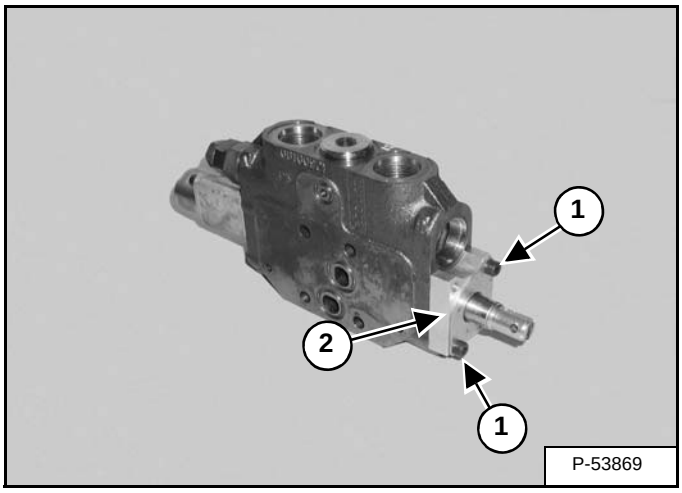
Assembly: Tighten the load check valve to 80 - 97 in.-lb. (9 - 11 N•m) torque.

Figure 20-40-41



Remove the seat (Item 1) and spring (Item 2) from the load check valve (Item 3) **[Figure 20-40-41]**.

Figure 20-40-42

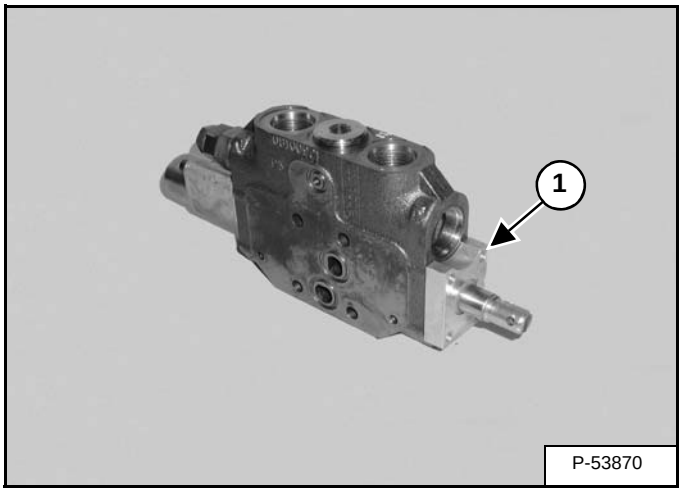


Remove the screws (Item 1) from the valve spool retainer (Item 2) **[Figure 20-40-42]**.

Remove the retainer.

Assembly: Tighten the screws to 48 - 58 in.-lb. (5,4 - 6,6 N•m) torque.

Figure 20-40-43

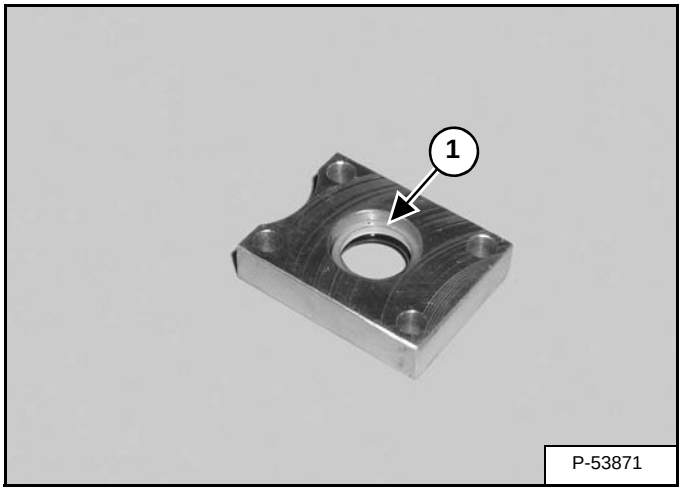


Remove the seal carrier (Item 1) **[Figure 20-40-43]**.

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Blade Valve Section Disassembly And Assembly (Cont'd)

Figure 20-40-44

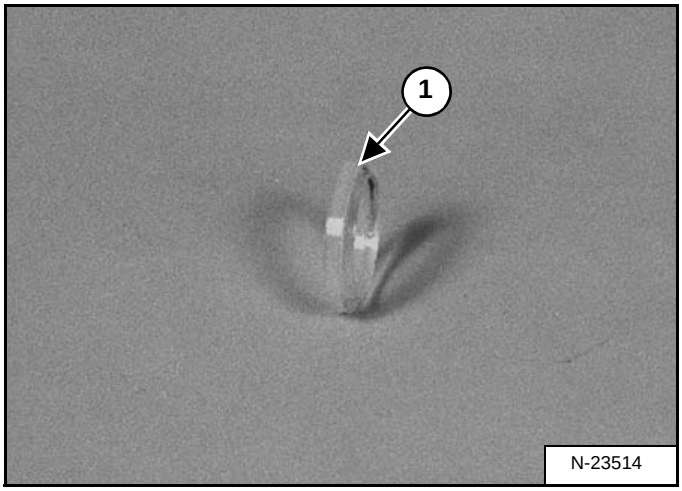


Remove the seal (Item 1) **[Figure 20-40-44]** from the seal carrier.

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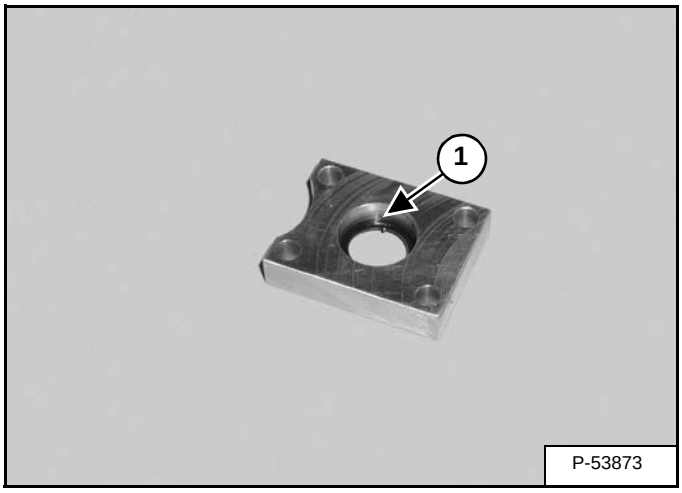
Blade Valve Section Disassembly And Assembly (Cont'd)

Figure 20-40-45



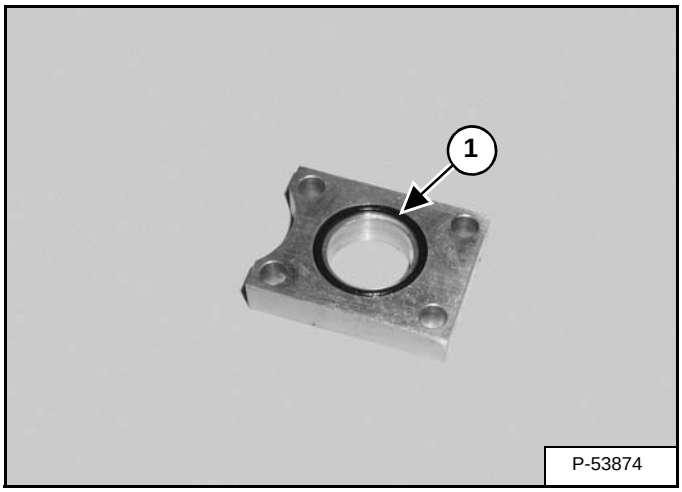
Assembly: Install the seal on the spool with the flange (Item 1) **[Figure 20-40-45]** toward the outside of the valve section.

Figure 20-40-46



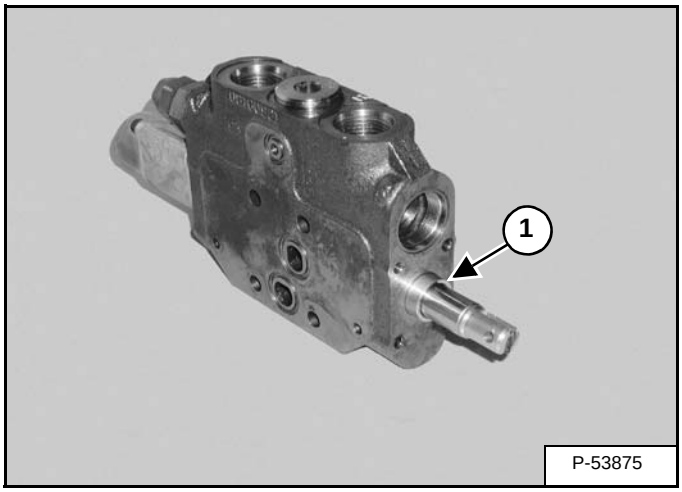
Remove the O-ring (Item 1) **[Figure 20-40-46]**.

Figure 20-40-47



Turn the seal carrier over and remove the O-ring (Item 1) **[Figure 20-40-47]**.

Figure 20-40-48

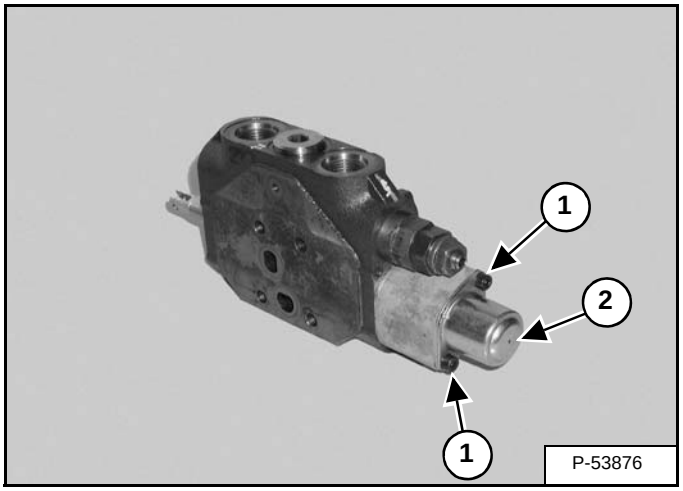


Remove the sleeve (Item 1) **[Figure 20-40-48]**.

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Blade Valve Section Disassembly And Assembly (Cont'd)

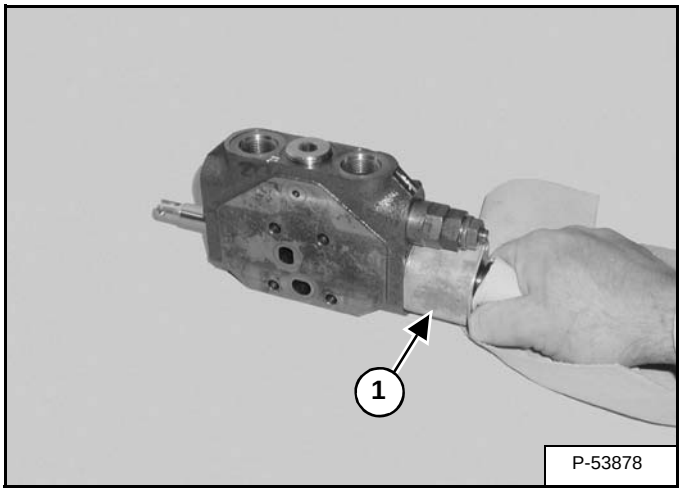
Figure 20-40-49



Remove the screws (Item 1) from the valve section end cap (Item 2) **[Figure 20-40-49]**. Remove the end cap.

Assembly: Tighten the screws to 48 - 58 in.-lb. (5,4 - 6,6 N•m) torque.

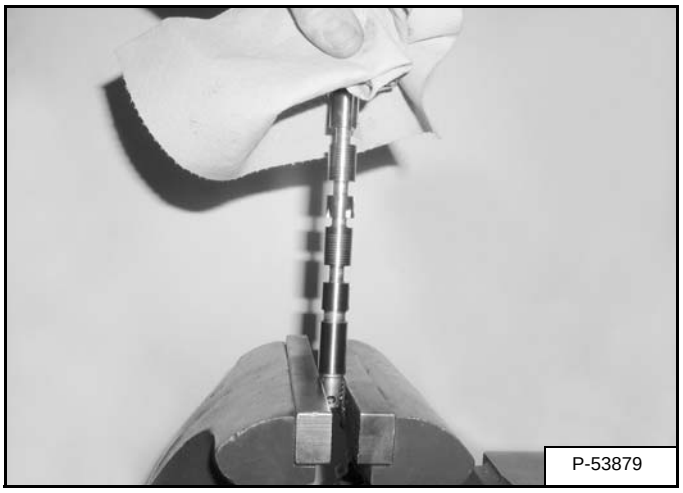
Figure 20-40-50



Put a rag around the detent sleeve. Remove the spool assembly (Item 1) **[Figure 20-40-50]**.

NOTE: Do not remove the detent sleeve from the spool.

Figure 20-40-51



Put the linkage end of the spool in a vise **[Figure 20-40-51]**.

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Blade Valve Section Disassembly And Assembly (Cont'd)

Figure 20-40-52

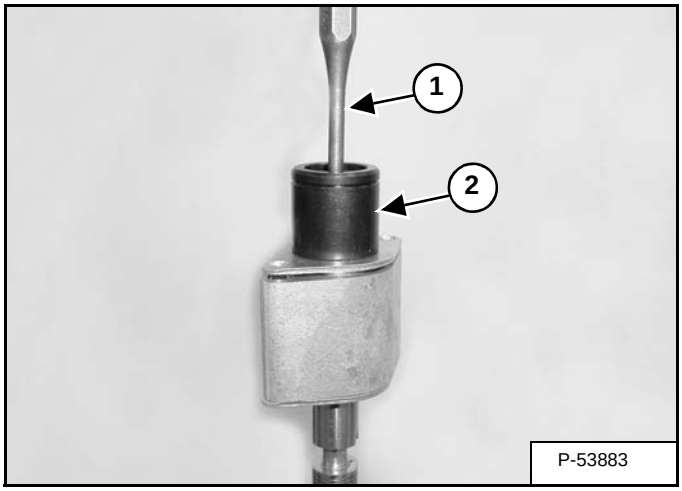
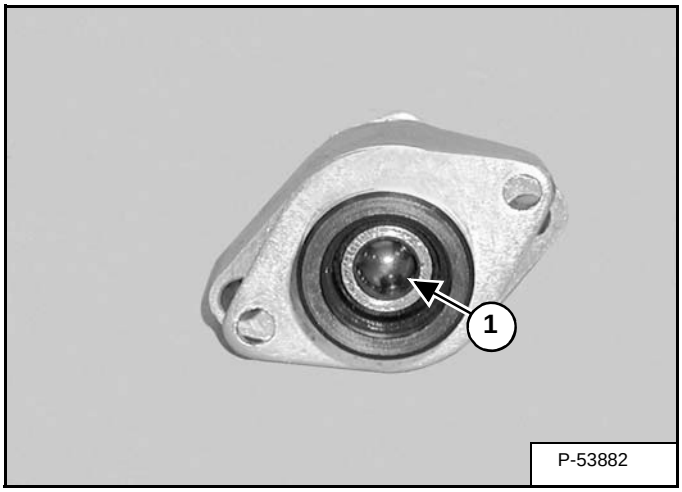


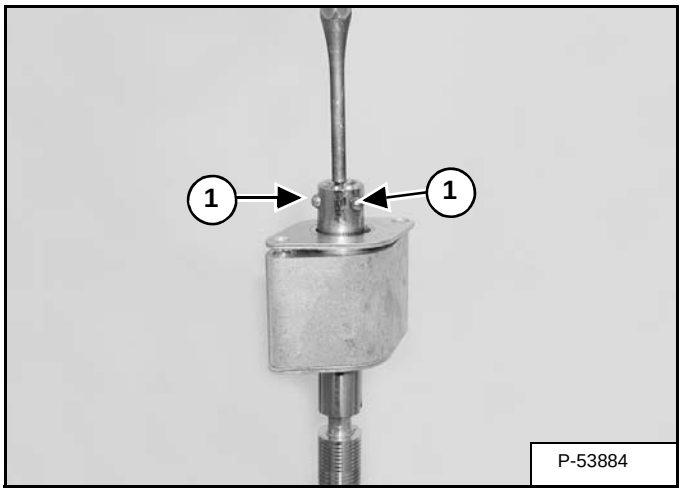
Figure 20-40-53



Using a brass drift (Item 1) **[Figure 20-40-52]** press down on the center ball (Item 1) **[Figure 20-40-53]**.

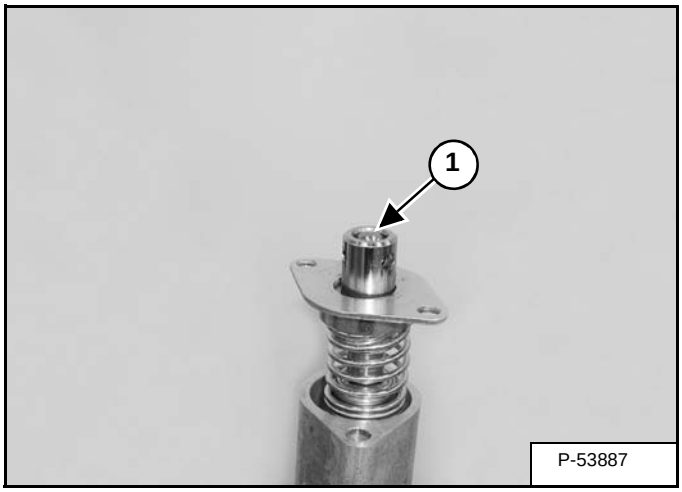
Continue to press down on the ball and remove the detent sleeve (Item 2) **[Figure 20-40-52]**.

Figure 20-40-54



Press down on the center ball and remove the three detent balls (Item 1) **[Figure 20-40-54]**.

Figure 20-40-55

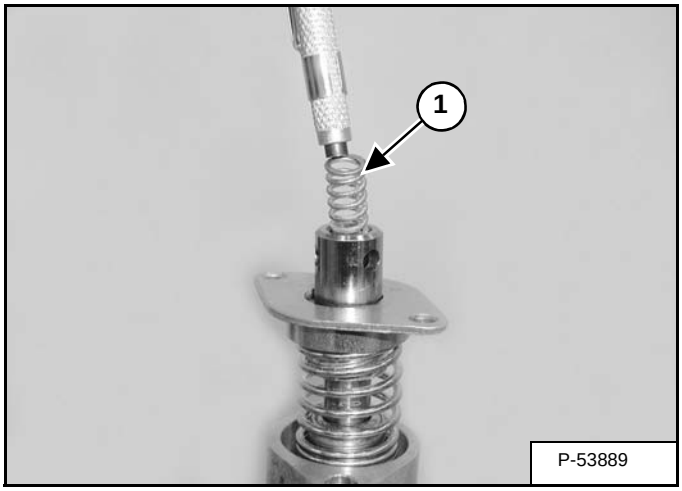


Remove the center ball (Item 1) **[Figure 20-40-55]**.

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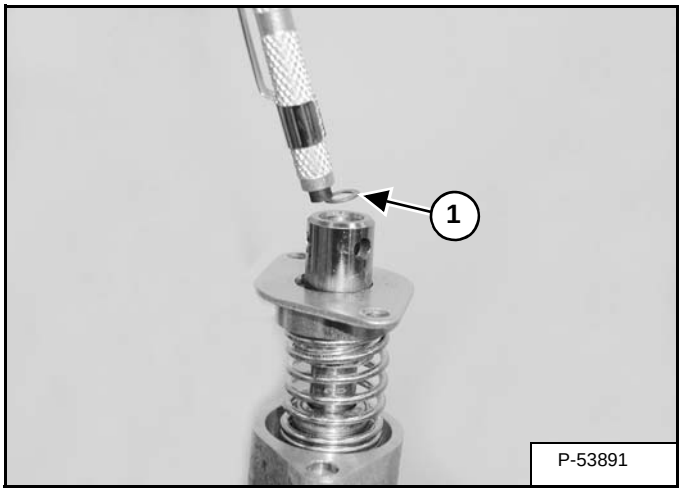
Blade Valve Section Disassembly And Assembly (Cont'd)

Figure 20-40-56



Remove the spring (Item 1) **[Figure 20-40-56]**.

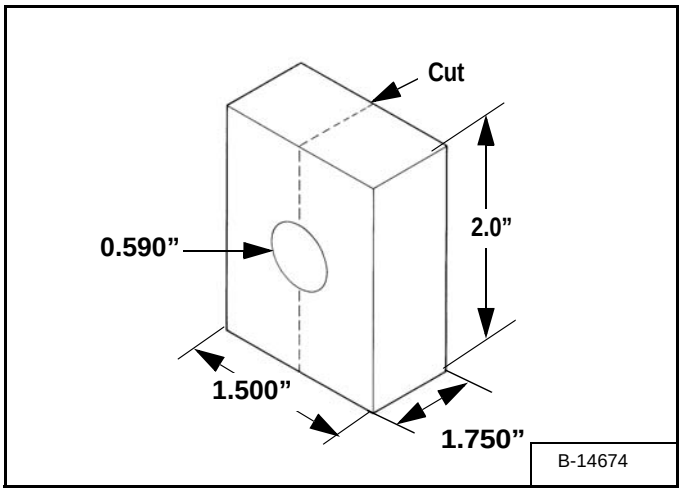
Figure 20-40-57



Remove the shims (Item 2) **[Figure 20-40-57]**.

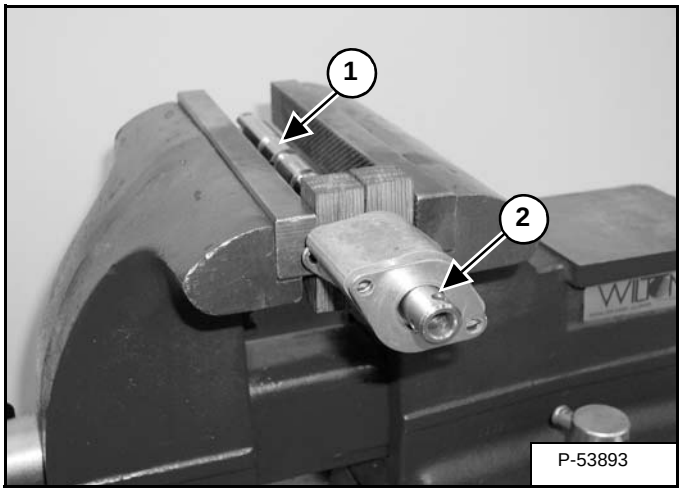
Remove the spool from the vise.

Figure 20-40-58



To remove the spring assembly from the spool a holding fixture will have to be made from a.750 in. thick x 1.500 in. wide x 2.0 in. long (19 mm thick x 38 mm wide x 51 mm long) piece of hardwood. Drill a 0.590 in. (15 mm) hole in the center of the hardwood block. Cut the block lengthwise **[Figure 20-40-58]**.

Figure 20-40-59



Using the wood blocks clamp the spool (Item 1) **[Figure 20-40-59]** in a vise.

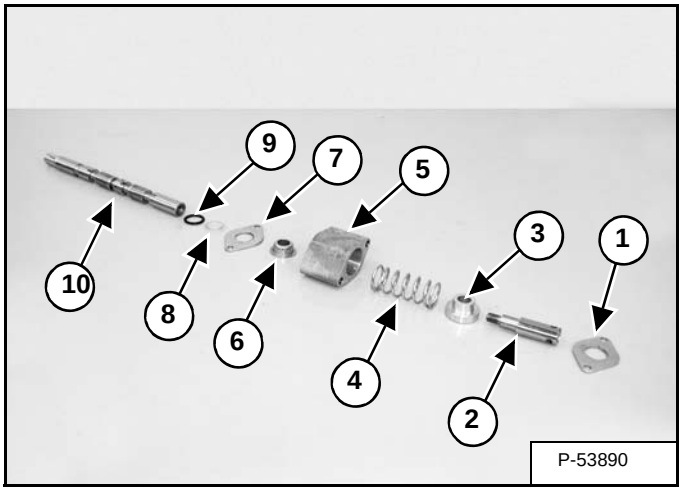
NOTE: Do not use anything other than hardwood blocks to grip the spool, or the spool will be damaged.

Loosen the detent ball retainer (Item 2) **[Figure 20-40-59]**.

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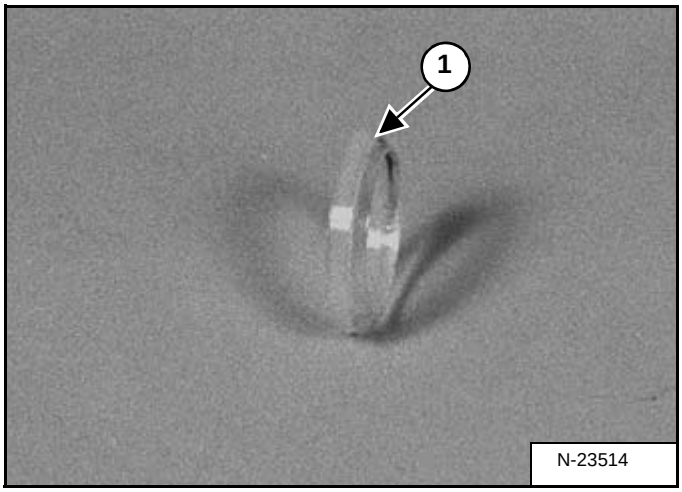
Blade Valve Section Disassembly And Assembly (Cont'd)

Figure 20-40-60



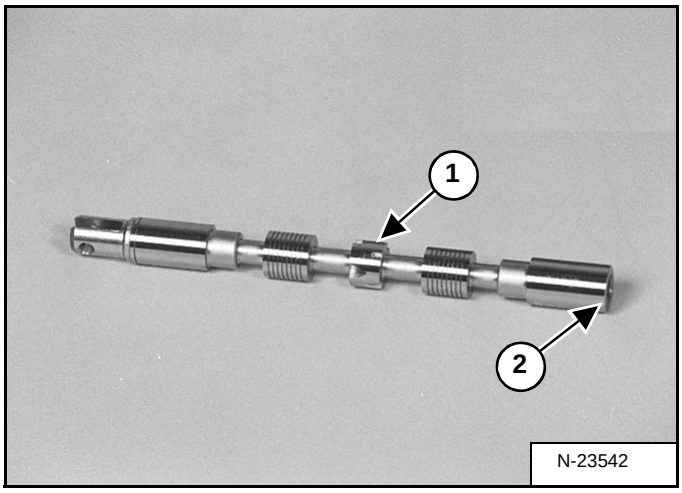
Remove the retainer (Item 1), detent ball retainer (Item 2), spring retainer (Item 3), spring (Item 4), housing (Item 5), spring retainer (Item 6), retainer (Item 7), seal (Item 8) and O-ring (Item 9) from the spool (Item 10) **[Figure 20-40-60]**.

Figure 20-40-61



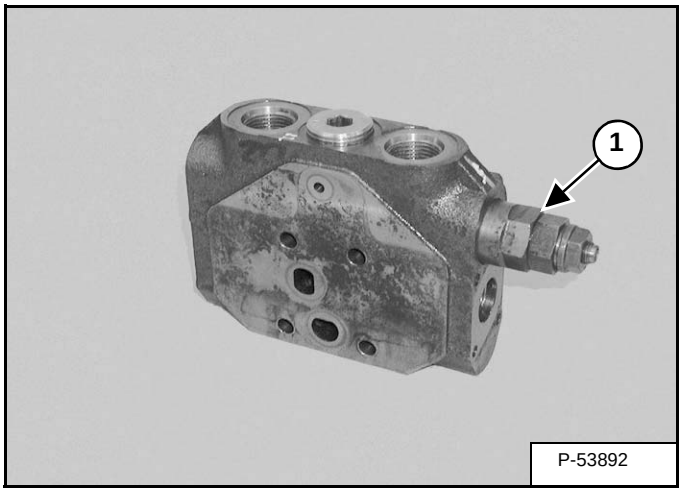
Assembly: Install the seal on the spool with the flange (Item 1) **[Figure 20-40-61]** toward the outside of the valve section.

Figure 20-40-62



Assembly: The spool (Item 1) can only be installed in the valve section with the spool groove (Item 2) **[Figure 20-40-62]** toward the top of the valve section, on the A port.

Figure 20-40-63



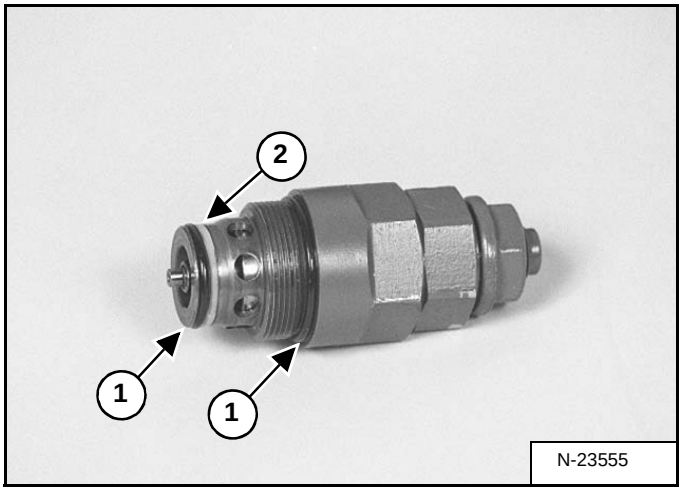
Remove the port relief/anti-cav valve (Item 1) **[Figure 20-40-63]** from the valve section.

Assembly: Tighten the port relief/anti-cav valve to 46 - 57 ft.-lb. (63 - 77 N•m) torque.

https://www.pdfmanual4trucks.com/

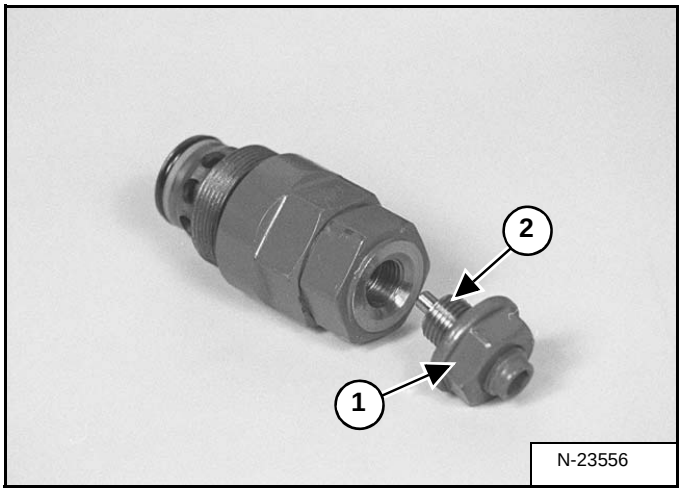
Blade Valve Section Disassembly And Assembly (Cont'd)

Figure 20-40-64



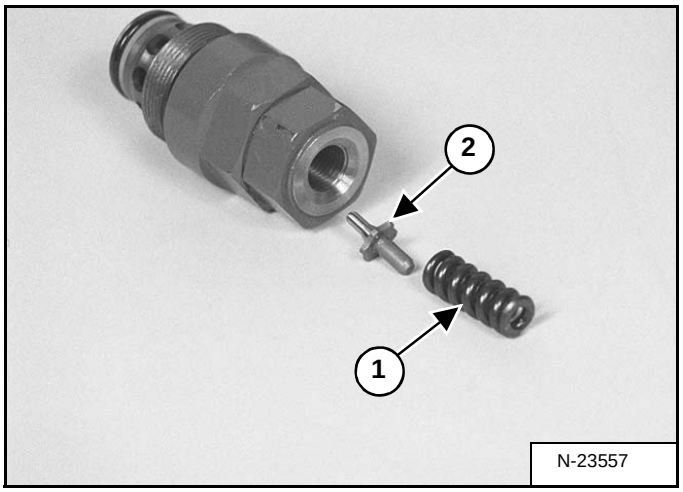
Remove the O-rings (Item 1) and back-up ring (Item 2) **[Figure 20-40-64]** from the port relief/anti-cav valve.

Figure 20-40-65



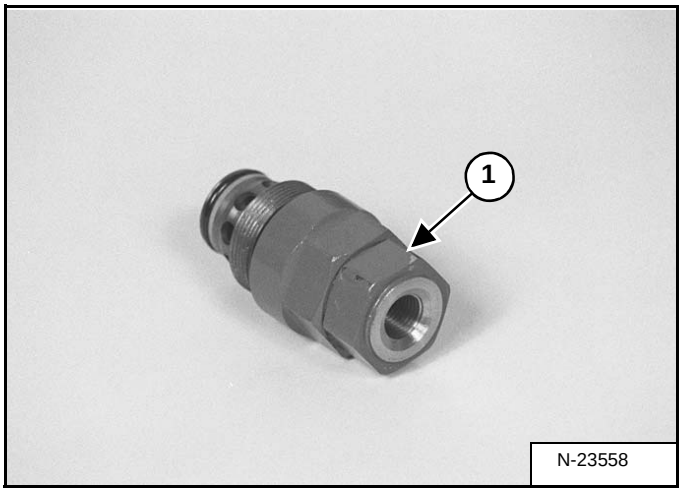
Remove the nut (Item 1) and adjustment screw (Item 2) **[Figure 20-40-65]** from the port relief/anti-cav valve.

Figure 20-40-66



Remove the spring (Item 1) and poppet (Item 2) **[Figure 20-40-66]** from the port relief/anti-cav valve.

Figure 20-40-67

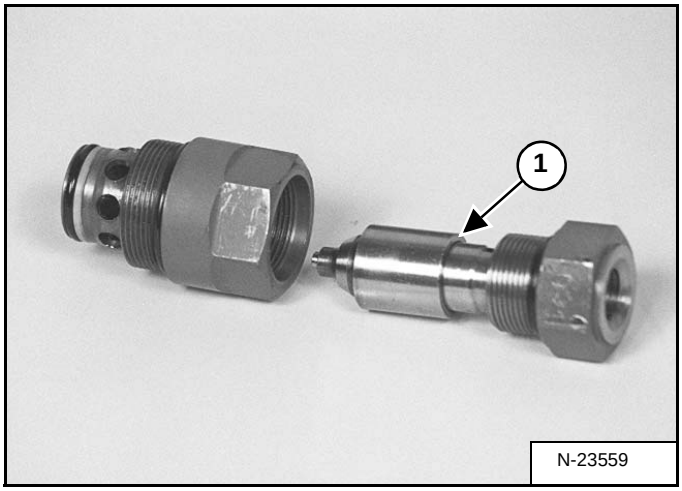


Remove the nut (Item 1) **[Figure 20-40-67]** from the front housing of the port relief/anti-cav valve.

https://www.pdfmanual4trucks.com/

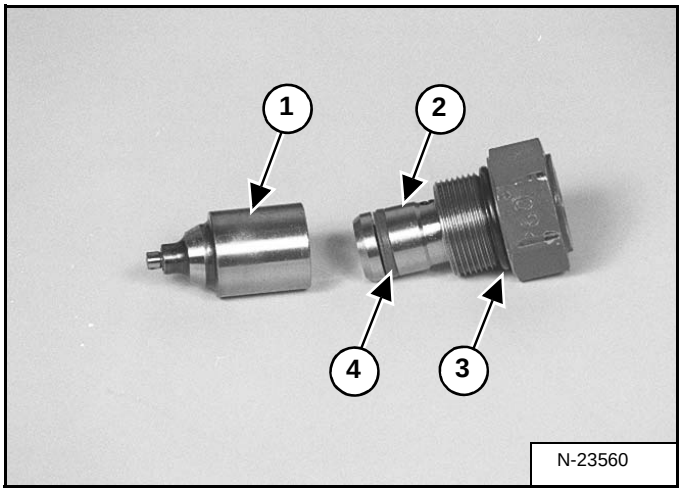
Blade Valve Section Disassembly And Assembly (Cont'd)

Figure 20-40-68



Remove the relief valve assembly (Item 1) **[Figure 20-40-68]** from the housing.

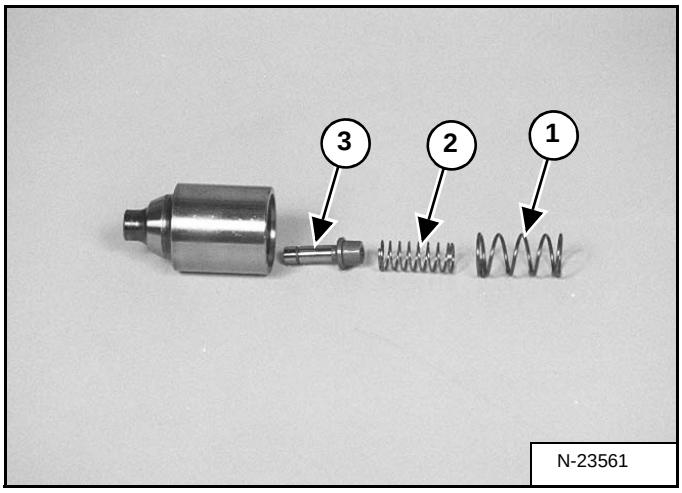
Figure 20-40-69



Remove the front section (Item 1) from the relief valve (Item 2) **[Figure 20-40-69]**.

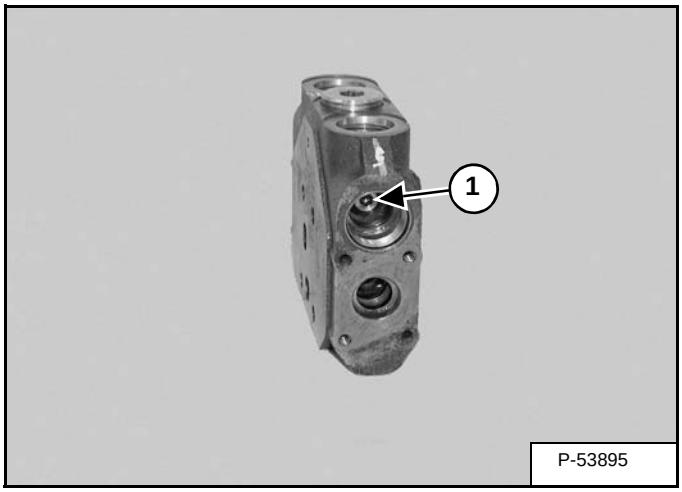
Remove the O-ring (Item 3) and seal (Item 4) **[Figure 20-40-69]**.

Figure 20-40-70



Remove the spring (Item 1), spring (Item 2) and poppet (Item 3) **[Figure 20-40-70]**.

Figure 20-40-71



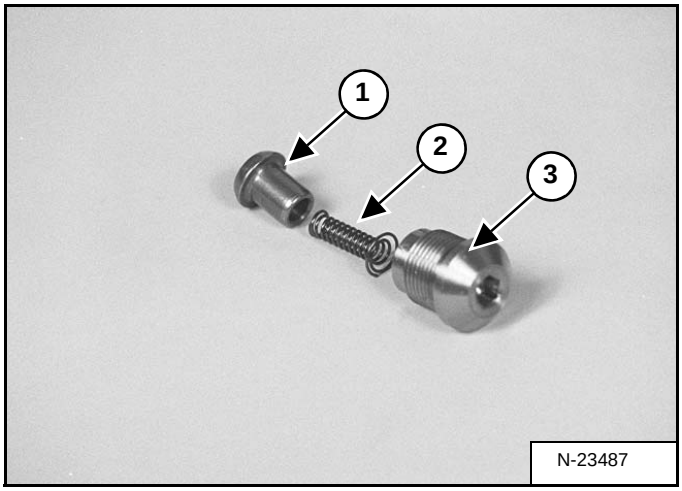
Remove the load check valve (Item 1) **[Figure 20-40-71]** from the valve section.

Assembly: Tighten the load check valve to 80 - 97 in.-lb. (9 - 11 N•m) torque.

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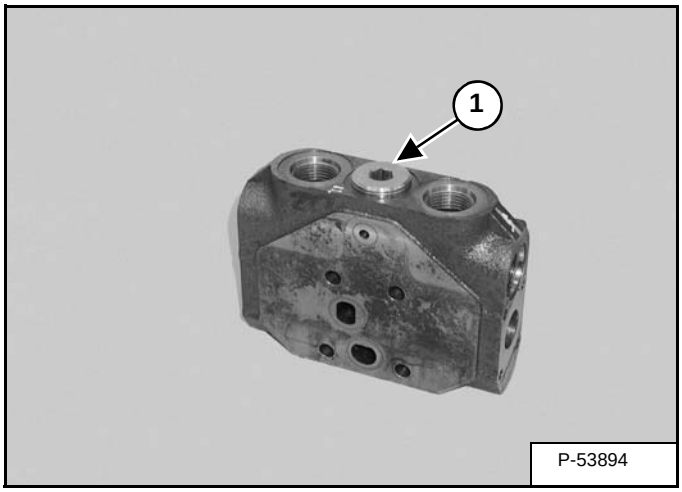
Blade Valve Section Disassembly And Assembly (Cont'd)

Figure 20-40-72



Remove the seat (Item 1) and spring (Item 2) from the load check valve (Item 3) **[Figure 20-40-72]**.

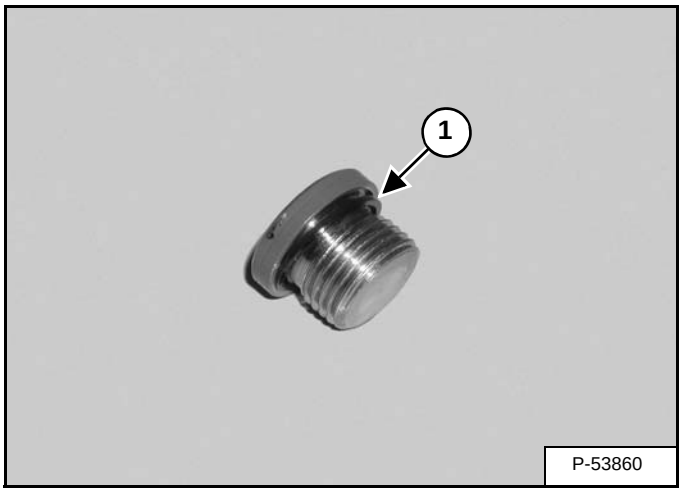
Figure 20-40-73



Remove the plug (Item 1) **[Figure 20-40-73]** from the top of the valve section.

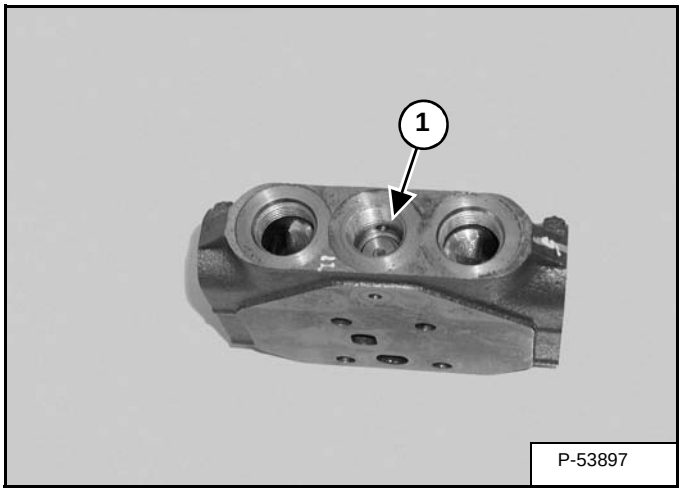
Assembly: Tighten the plug to 46 - 57 ft.-lb. (63 - 77 N•m) torque.

Figure 20-40-74



Remove the O-ring (Item 1) **[Figure 20-40-74]** from the plug.

Figure 20-40-75

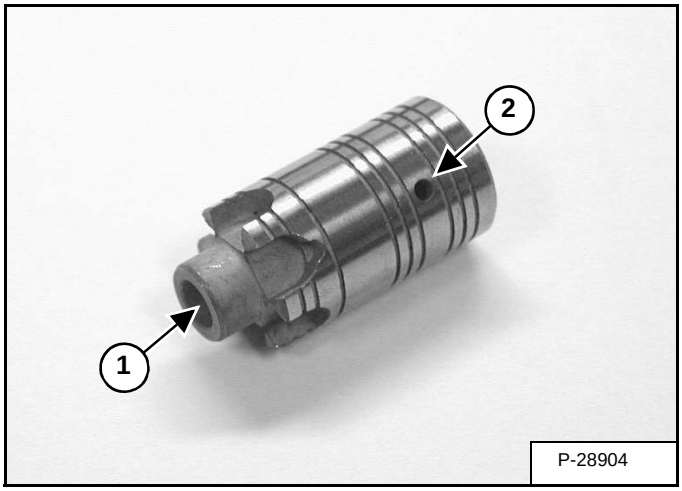


Remove the compensator (Item 1) **[Figure 20-40-75]** from the valve section.

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Blade Valve Section Disassembly And Assembly (Cont'd)

Figure 20-40-76



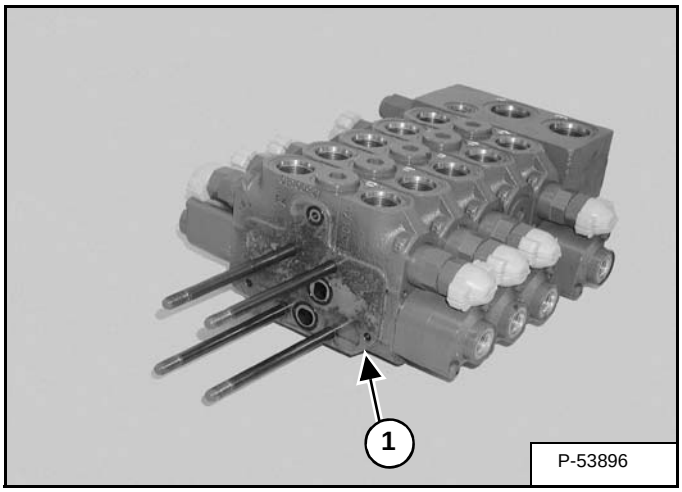
Check the orifice (Item 1) **[Figure 20-40-76]** in the compensator to be sure it is not plugged.

Check the crossport hole (Item 2) **[Figure 20-40-76]** to be sure it is not plugged.

https://www.pdfmanual4trucks.com/

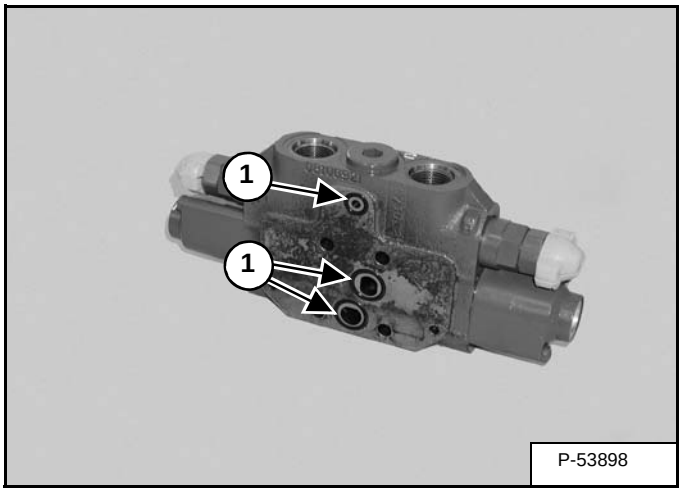
Bucket Valve Section Disassembly And Assembly

Figure 20-40-77



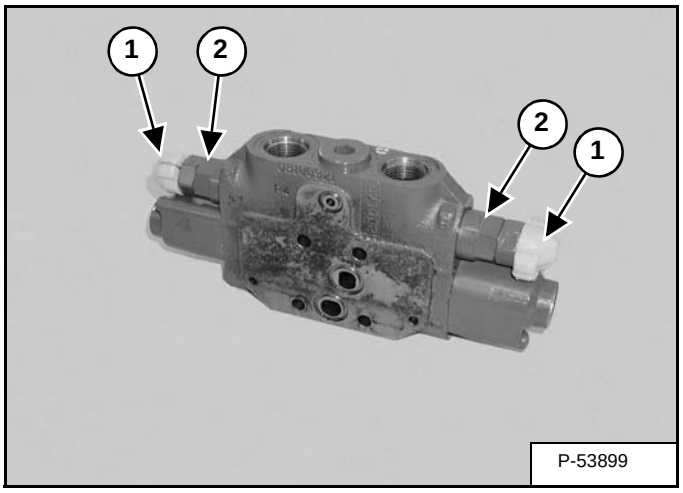
Remove the bucket valve section (Item 1) **[Figure 20-40-77]** from the control valve.

Figure 20-40-78



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

Figure 20-40-79

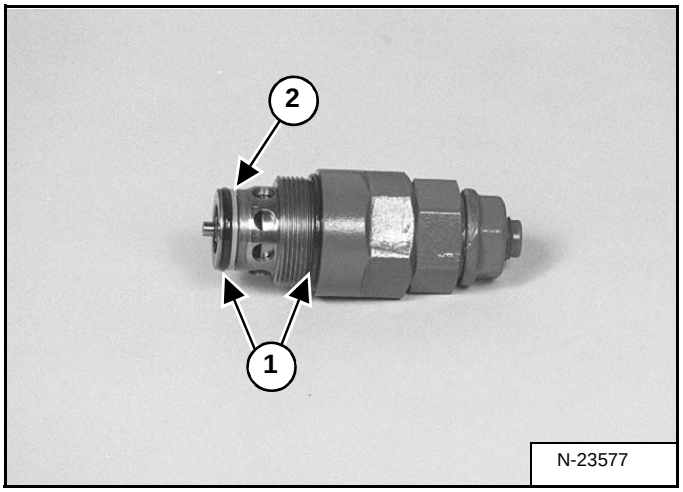


Remove the protective covers (Item 1) **[Figure 20-40-79]** from the valve section port relief/anti-cav valves.

Remove the port relief/anti-cav valves (Item 2) **[Figure 20-40-79]** from the valve section.

Assembly: Tighten the port relief/anti-cav valve to 46 - 57 ft.-lb. (63 - 77 N•m) torque.

Figure 20-40-80

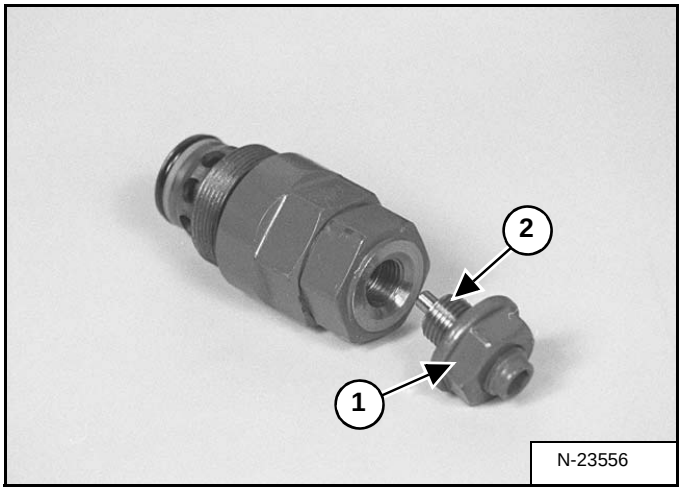


Remove the O-rings (Item 1) and back-up ring (Item 2) **[Figure 20-40-80]** from the port relief/anti-cav valves.

https://www.pdfmanual4trucks.com/

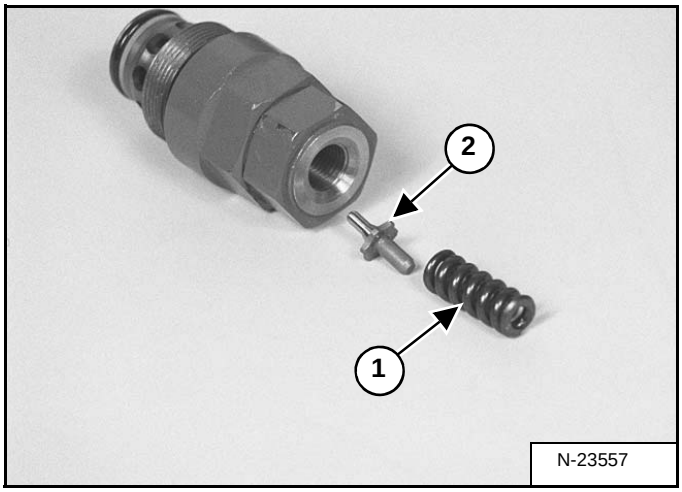
Bucket Valve Section Disassembly And Assembly (Cont'd)

Figure 20-40-81



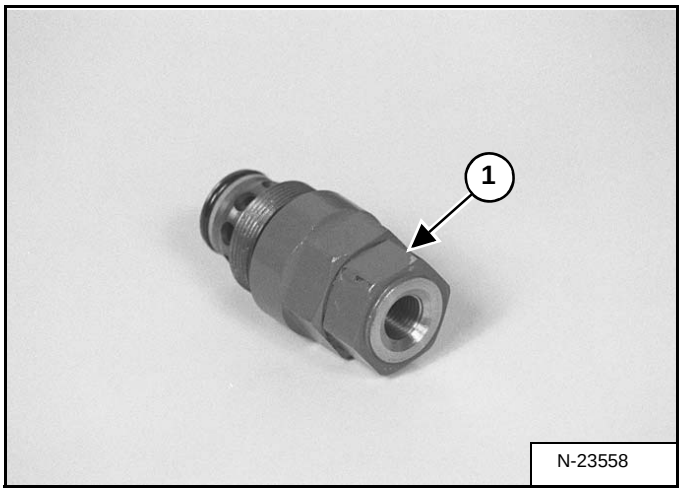
Remove the nut (Item 1) and adjustment screw (Item 2) **[Figure 20-40-81]** from the port relief/anti-cav valve.

Figure 20-40-82



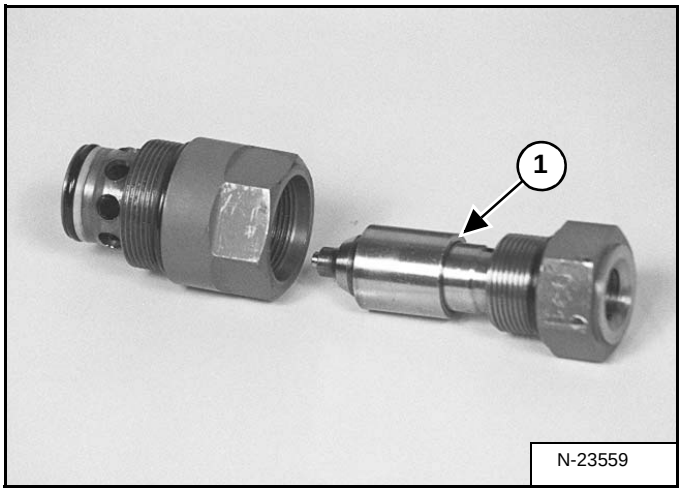
Remove the spring (Item 1) and poppet (Item 2) **[Figure 20-40-82]** from the port relief/anti-cav body.

Figure 20-40-83



Remove the nut (Item 1) **[Figure 20-40-83]** from the port relief/anti-cav valve.

Figure 20-40-84

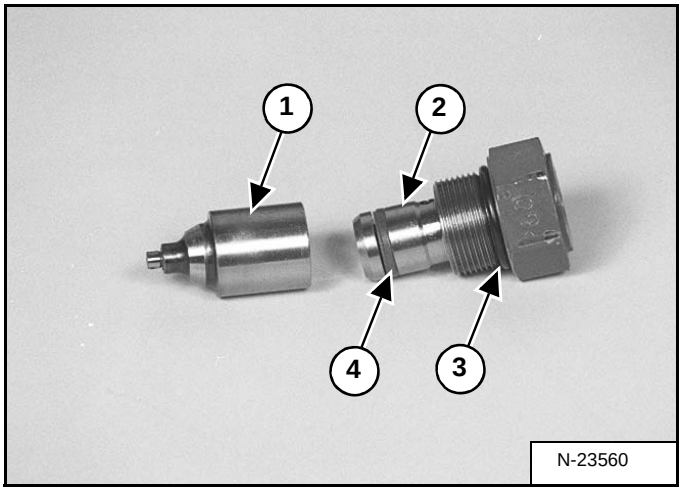


Remove the relief valve assembly (Item 1) **[Figure 20-40-84]** from the valve.

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Bucket Valve Section Disassembly And Assembly (Cont'd)

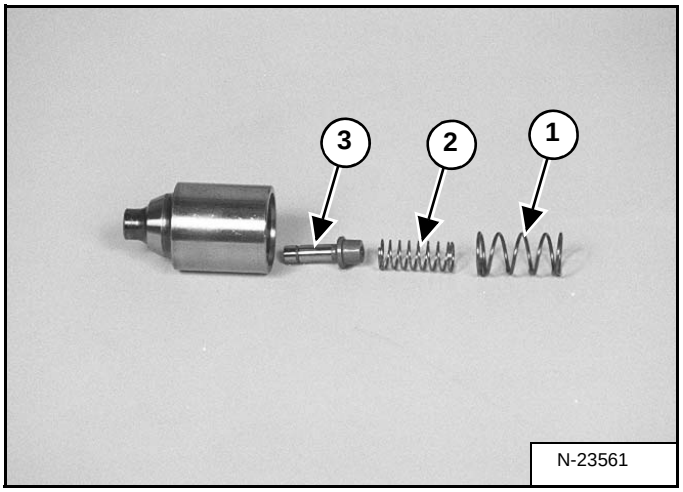
Figure 20-40-85



Remove the front section (Item 1) from the relief valve (Item 2) **[Figure 20-40-85]**.

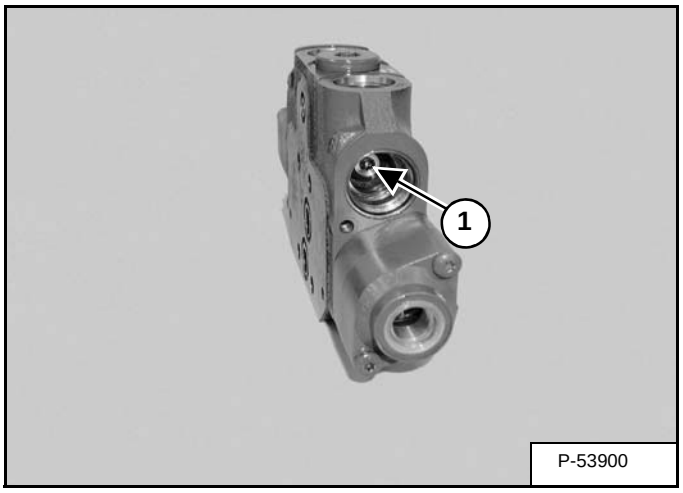
Remove the O-ring (Item 3) and seal (Item 4) **[Figure 20-40-85]**.

Figure 20-40-86



Remove the spring (Item 1), spring (Item 2) and poppet (Item 3) **[Figure 20-40-86]**.

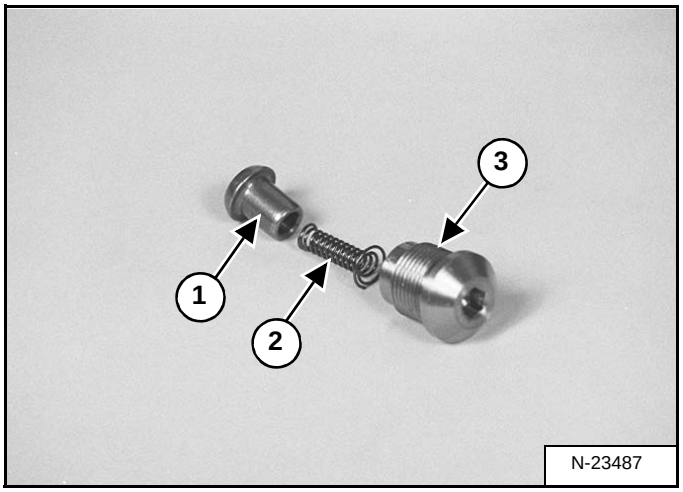
Figure 20-40-87



Remove the load check valve assembly (Item 1) **[Figure 20-40-87]** from both ends of the valve section.

Assembly: Tighten the load check valves to 80 - 97 in.-lb. (9 - 11 N•m) torque.

Figure 20-40-88

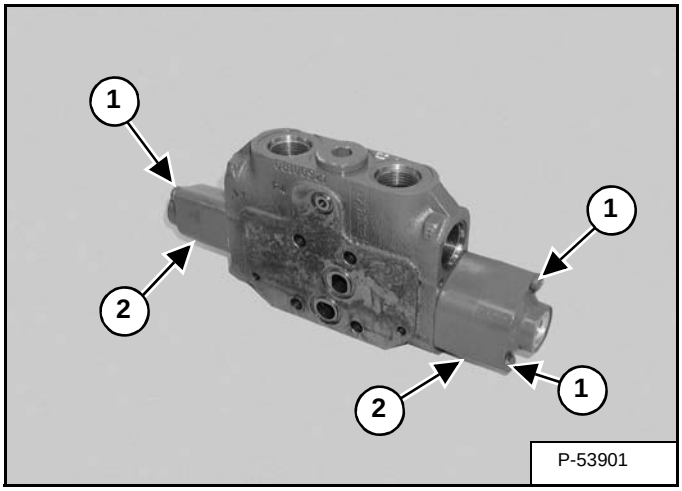


Remove the seat (Item 1) and spring (Item 2) from the load check valve body (Item 3) **[Figure 20-40-88]**.

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Bucket Valve Section Disassembly And Assembly (Cont'd)

Figure 20-40-89

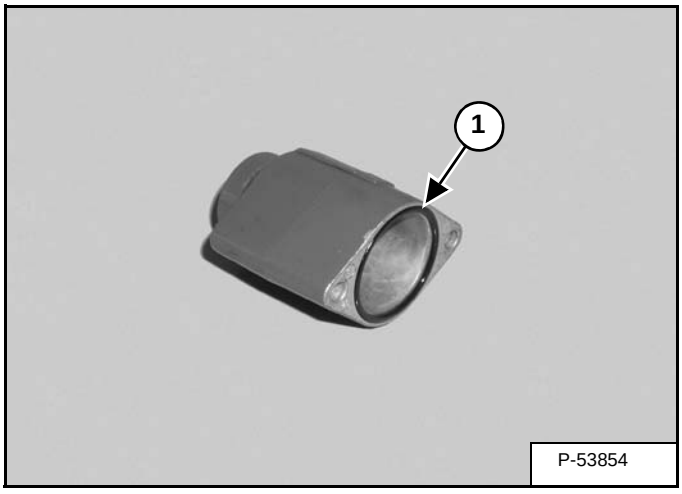


Remove the screws (Item 1) from both valve section end caps (Item 2) **[Figure 20-40-89]**.

Assembly: Tighten the screws to 48 - 58 in.-lb. (5,4 - 6,6 N•m) torque.

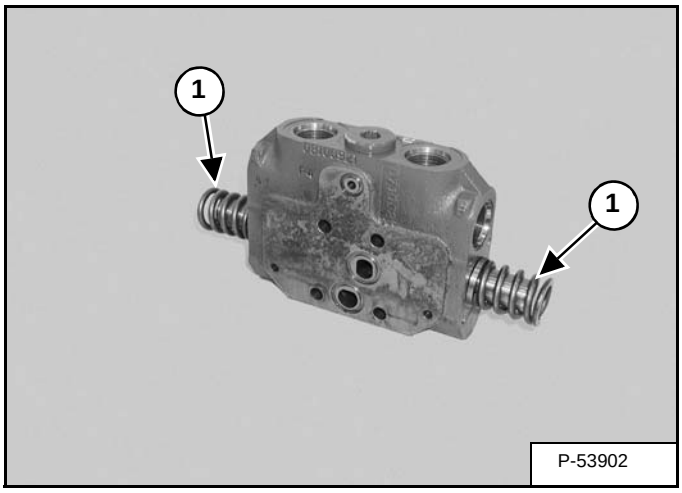
Remove the end caps.

Figure 20-40-90



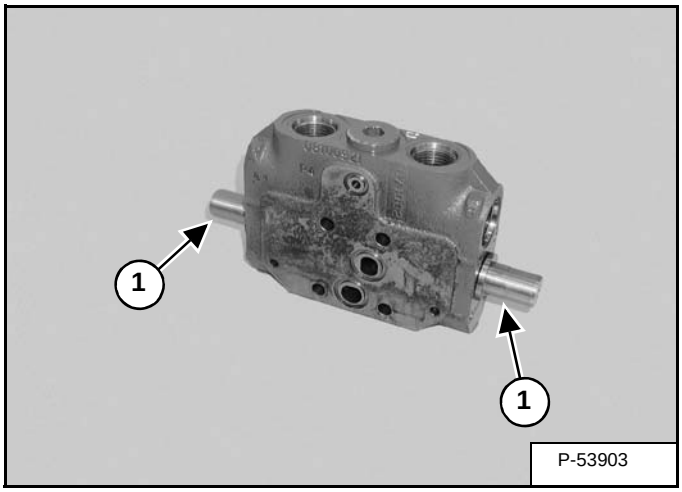
Remove the O-ring (Item 1) **[Figure 20-40-90]** from the end cap.

Figure 20-40-91



Remove the centering springs (Item 1) **[Figure 20-40-91]** from both ends of the valve spool.

Figure 20-40-92

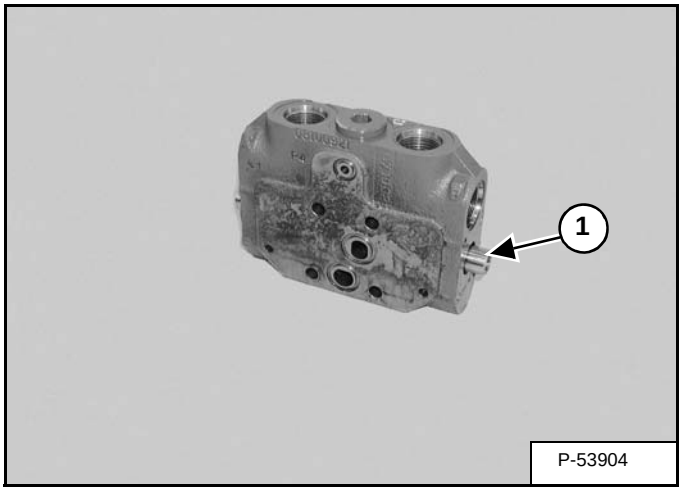


Remove the spring guides (Item 1) **[Figure 20-40-92]** from both ends of the valve spool.

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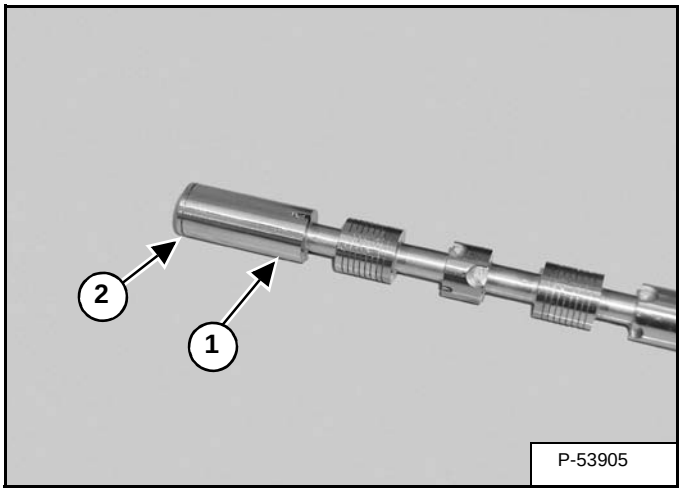
Bucket Valve Section Disassembly And Assembly (Cont'd)

Figure 20-40-93



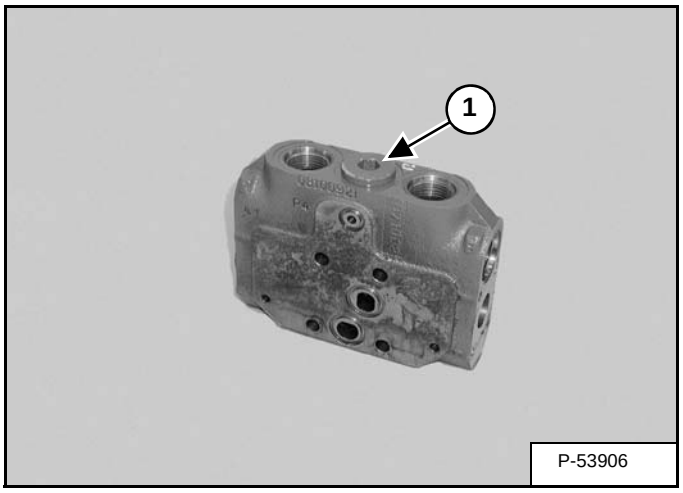
Remove the spool (Item 1) **[Figure 20-40-93]** from the valve section.

Figure 20-40-94



Assembly: The spool (Item 1) can only be installed in the valve section with the spool groove (Item 2) **[Figure 20-40-94]** toward the top of the valve section, on the A port.

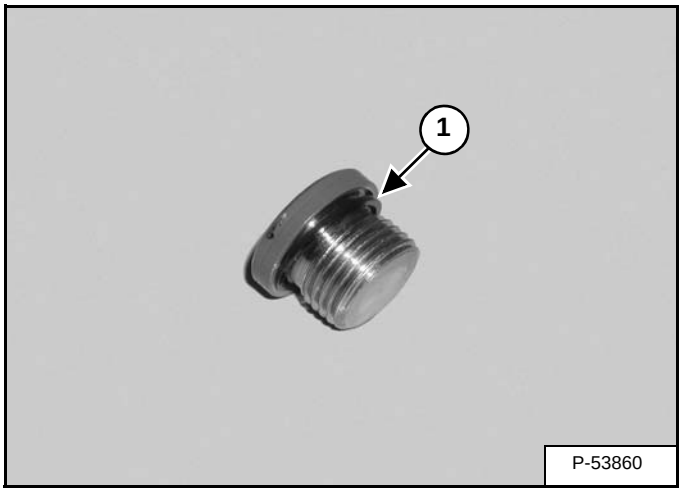
Figure 20-40-95



Remove the plug (Item 1) **[Figure 20-40-95]** from the top of the valve section.

Assembly: Tighten the plug to 46 - 57 ft.-lb. (63 - 77 N•m) torque.

Figure 20-40-96

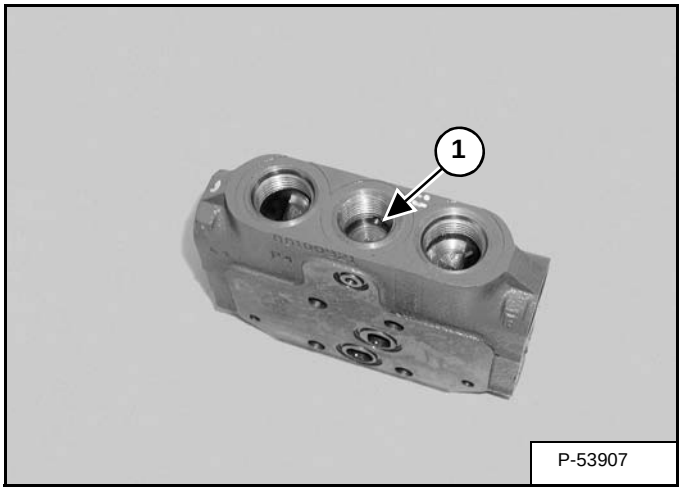


Remove the O-ring (Item 1) **[Figure 20-40-96]** from the plug.

https://www.pdfmanual4trucks.com/

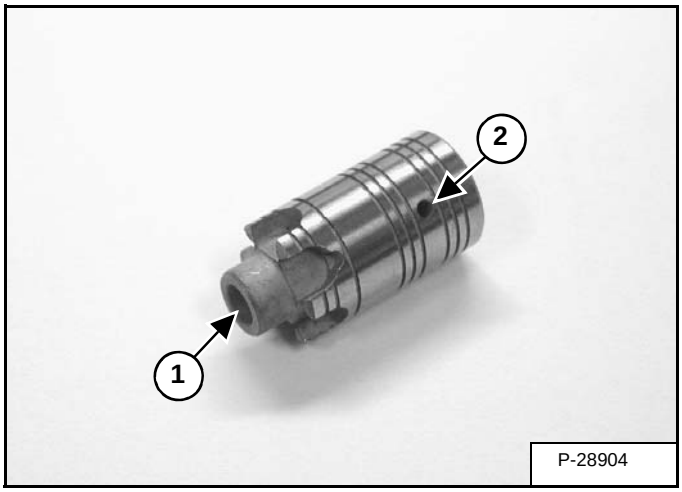
Bucket Valve Section Disassembly And Assembly (Cont'd)

Figure 20-40-97



Remove the compensator (Item 1) **[Figure 20-40-97]** from the valve section.

Figure 20-40-98



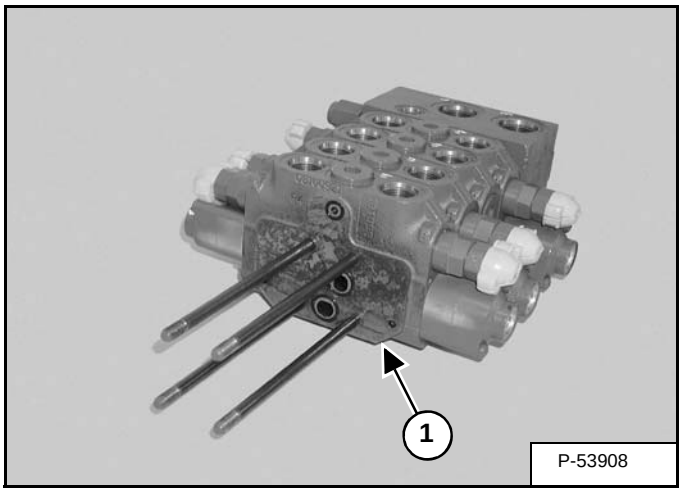
Check the orifice (Item 1) **[Figure 20-40-98]** in the compensator to be sure it is not plugged.

Check the crossport hole (Item 2) **[Figure 20-40-98]** to be sure it is not plugged.

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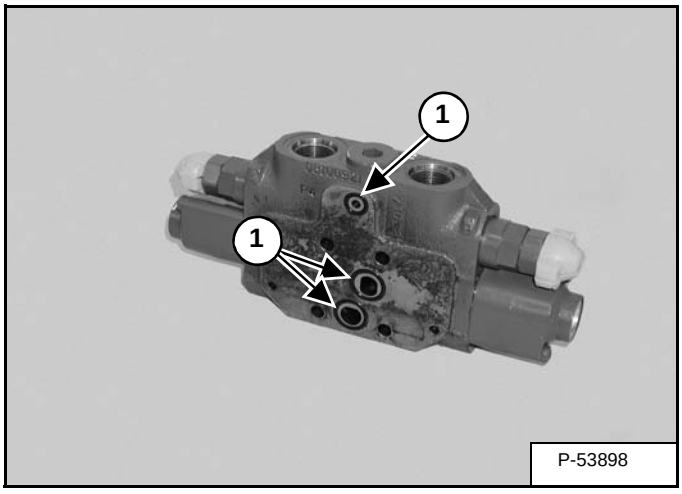
Arm Valve Section Disassembly And Assembly

Figure 20-40-99



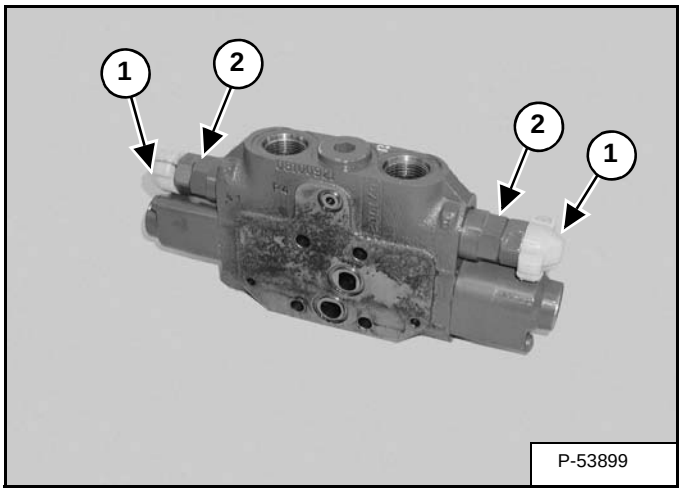
Remove the arm valve section (Item 1) **[Figure 20-40-99]** from the control valve.

Figure 20-40-100



Remove the O-rings (Item 1) **[Figure 20-40-100]** from the valve section.

Figure 20-40-101

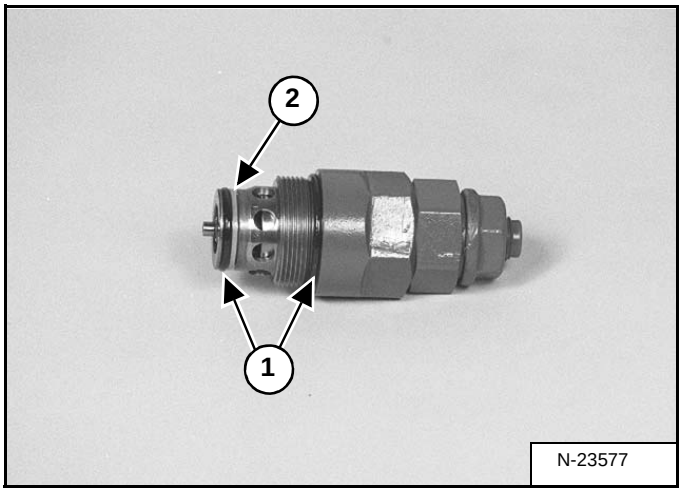


Remove the protective covers (Item 1) **[Figure 20-40-101]** from the valve section port relief/anti-cav valves.

Remove the port relief/anti-cav valves (Item 2) **[Figure 20-40-101]** from the valve section.

Assembly: Tighten the port relief/anti-cav valves to 46 - 57 ft.-lb. (63 - 77 N•m) torque.

Figure 20-40-102

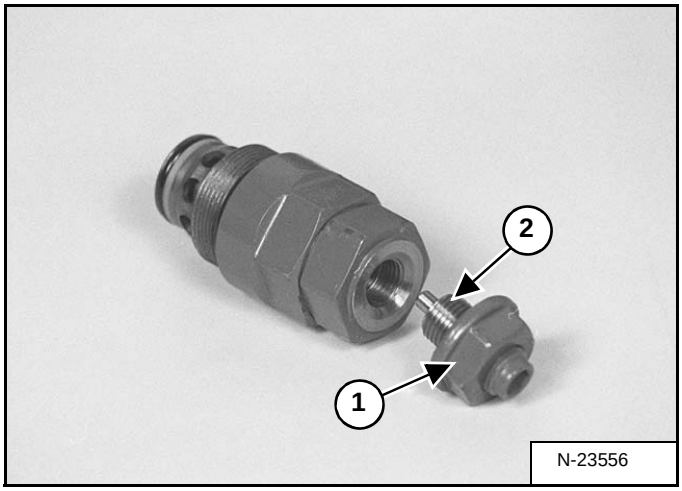


Remove the O-rings (Item 1) and back-up ring (Item 2) **[Figure 20-40-102]** from the port relief/anti-cav valve.

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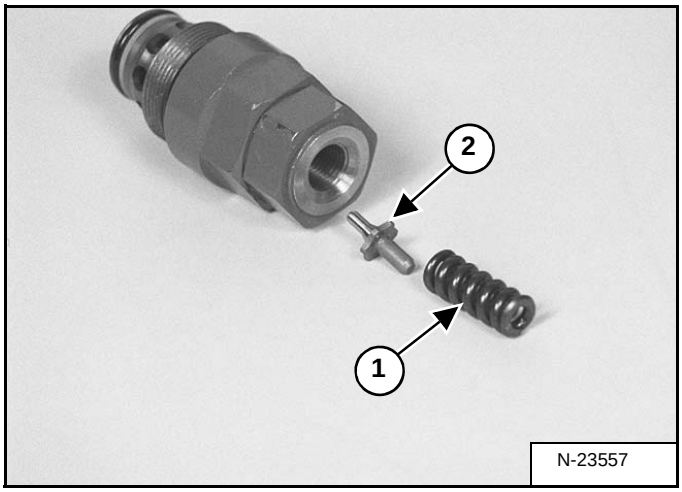
Arm Valve Section Disassembly And Assembly (Cont'd)

Figure 20-40-103



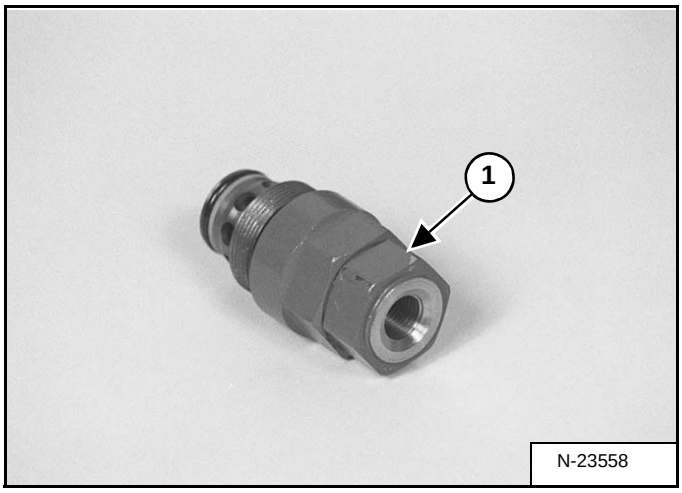
Remove the nut (Item 1) and adjustment screw (Item 2) **[Figure 20-40-103]** from the port relief/anti-cav valve.

Figure 20-40-104



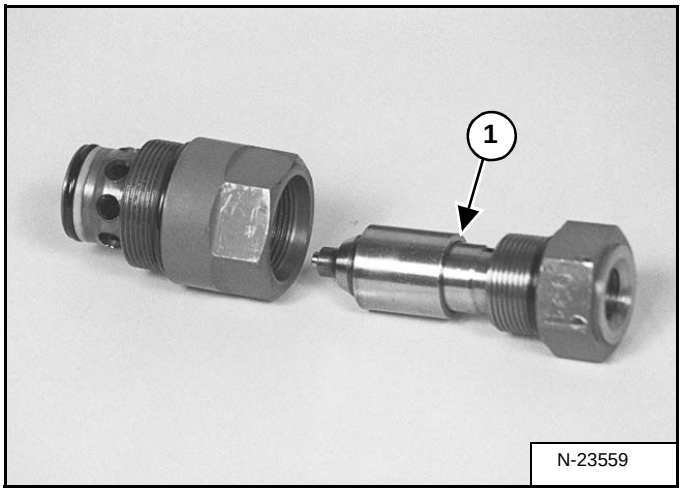
Remove the spring (Item 1) and poppet (Item 2) **[Figure 20-40-104]** from the port relief/anti-cav valve.

Figure 20-40-105



Remove the nut (Item 1) **[Figure 20-40-105]** from port relief/anti-cav valve.

Figure 20-40-106

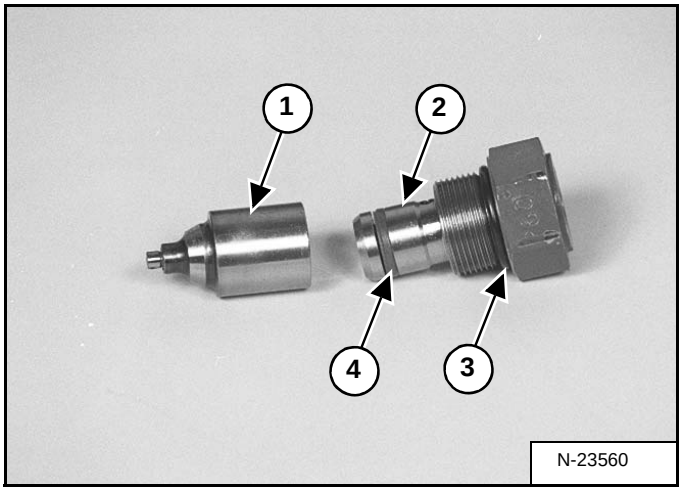


Remove the relief valve assembly (Item 1) **[Figure 20-40-106]** from the valve.

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Arm Valve Section Disassembly And Assembly (Cont'd)

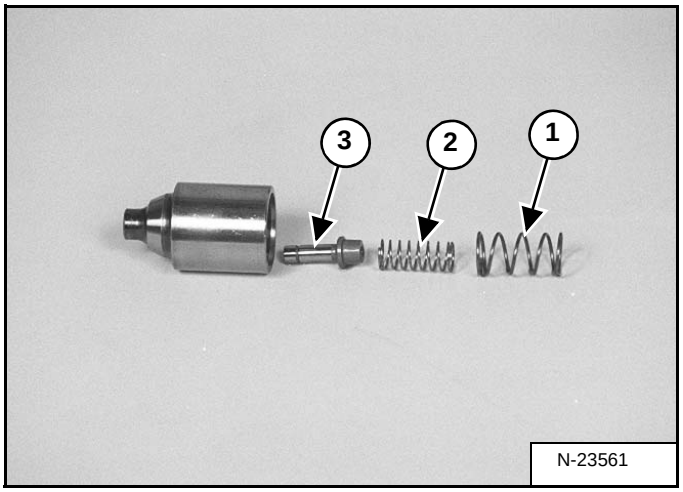
Figure 20-40-107



Remove the front section (Item 1) from the relief valve (Item 2) **[Figure 20-40-107]**.

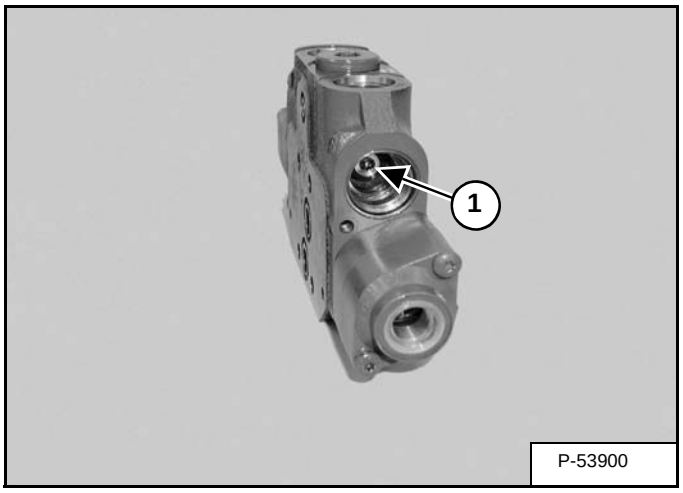
Remove the O-ring (Item 3) and seal (Item 4) **[Figure 20-40-107]**.

Figure 20-40-108



Remove the spring (Item 1), spring (Item 2) and poppet (Item 3) **[Figure 20-40-108]**.

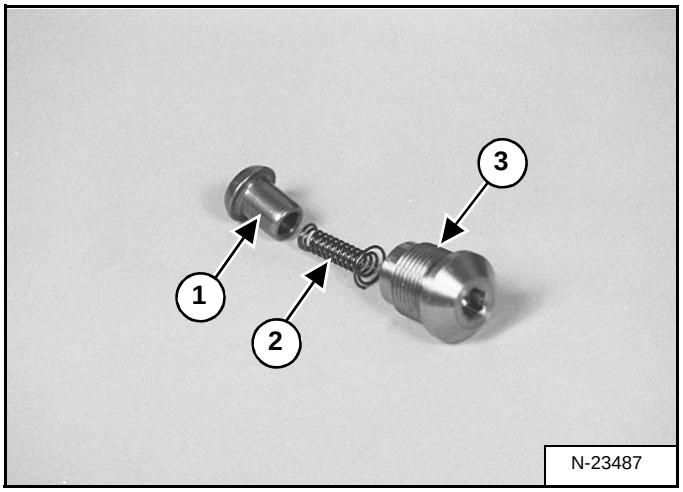
Figure 20-40-109



Remove the load check valve assembly (Item 1) **[Figure 20-40-109]** from both ends of the valve section.

Assembly: Tighten the load check valves to 80 - 97 in.-lb. (9 - 11 N•m) torque.

Figure 20-40-110

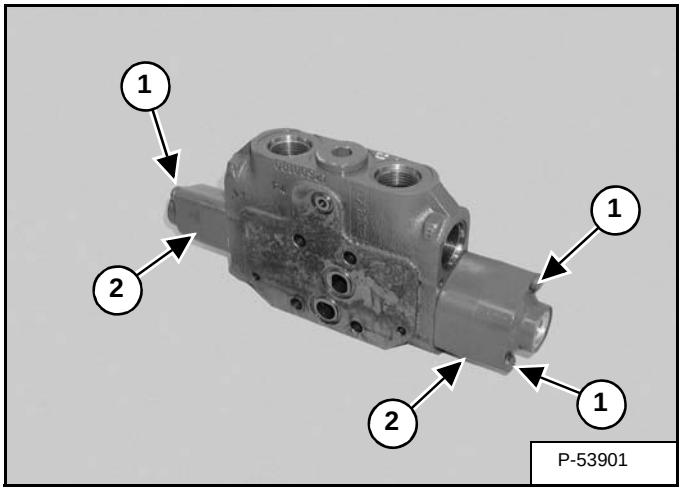


Remove the seat (Item 1) and spring (Item 2) from the load check valve body (Item 3) **[Figure 20-40-110]**.

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Arm Valve Section Disassembly And Assembly (Cont'd)

Figure 20-40-111

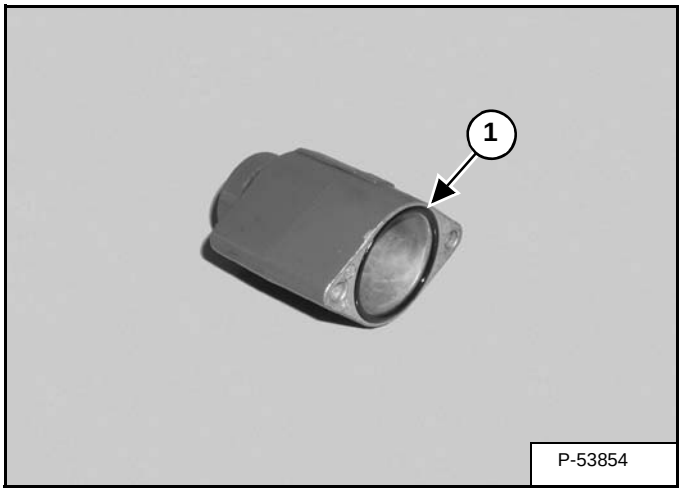


Remove the screws (Item 1) from both valve section end caps (Item 2) **[Figure 20-40-111]**.

Assembly: Tighten the screws to 48 - 58 in.-lb. (5,4 - 6,6 N•m).

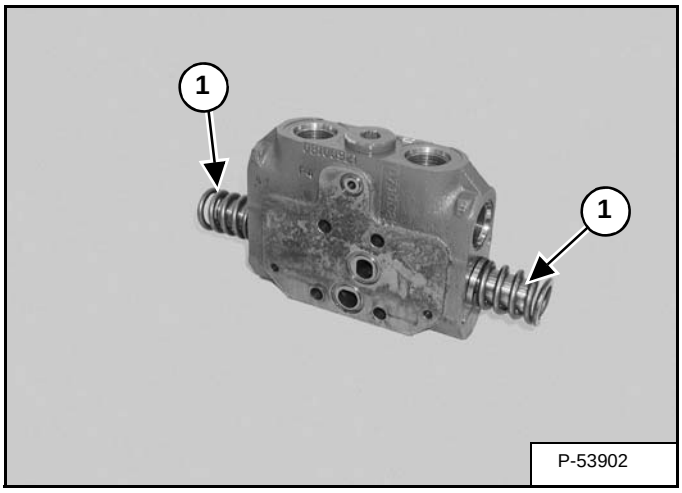
Remove the end caps.

Figure 20-40-112



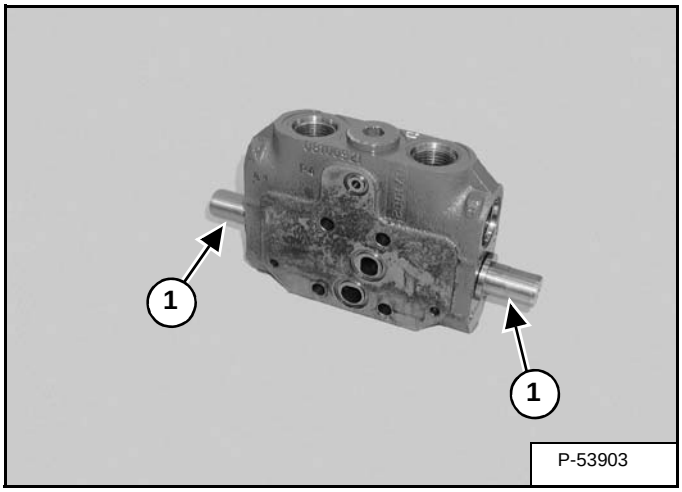
Remove the O-ring (Item 1) **[Figure 20-40-112]** from the end caps.

Figure 20-40-113



Remove the centering spring (Item 1) **[Figure 20-40-113]** from both ends of the valve spool.

Figure 20-40-114

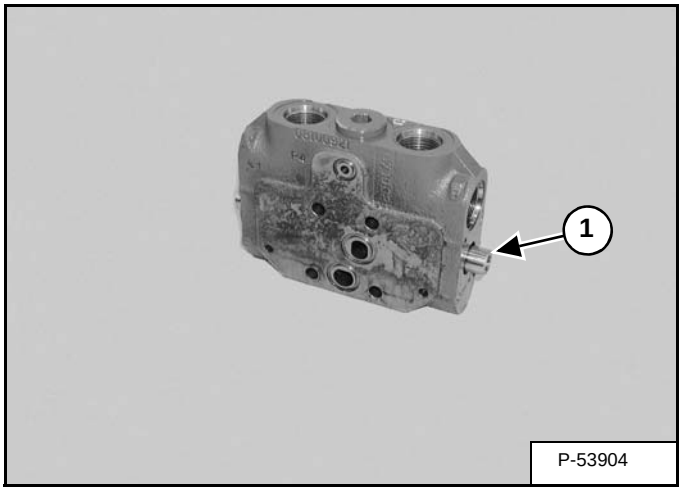


Remove the spring guides (Item 1) **[Figure 20-40-114]** from both ends of the valve spool.

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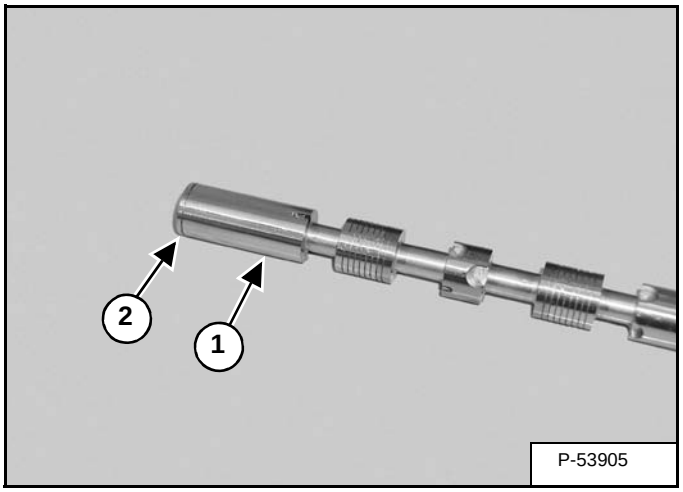
Arm Valve Section Disassembly And Assembly (Cont'd)

Figure 20-40-115



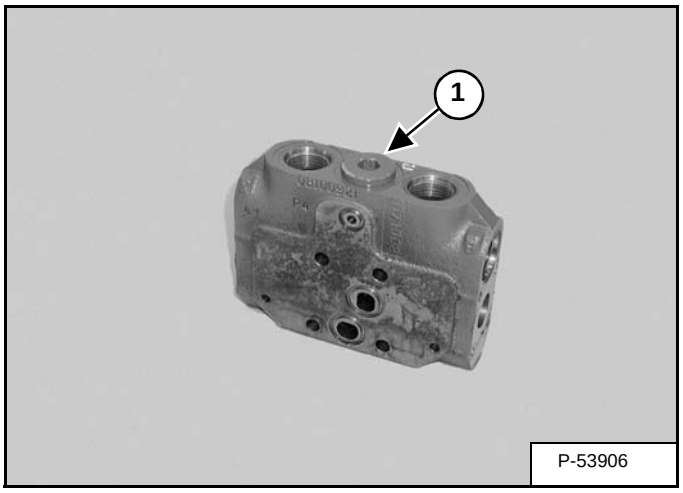
Remove the spool (Item 1) **[Figure 20-40-115]** from the valve section.

Figure 20-40-116



Assembly: The spool (Item 1) can only be installed in the valve section with the spool groove (Item 2) **[Figure 20-40-116]** toward the bottom of the valve section, on the B port.

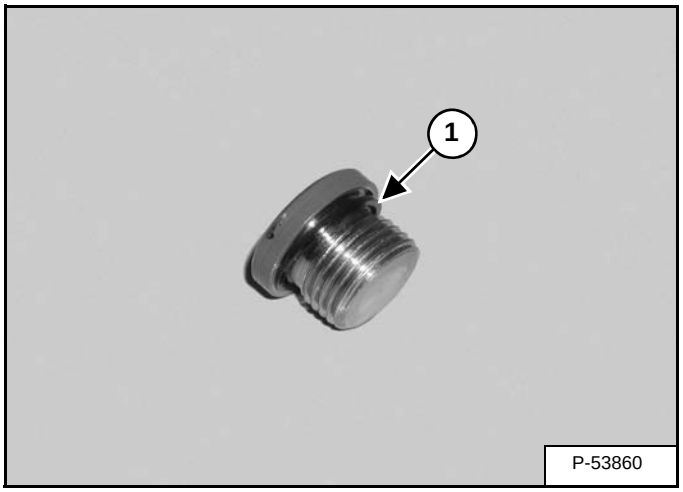
Figure 20-40-117



Remove the plug (Item 1) **[Figure 20-40-117]** from the top of the valve section.

Assembly: Tighten the plug to 46 - 57 ft.-lb. (63 - 77 N•m) torque.

Figure 20-40-118

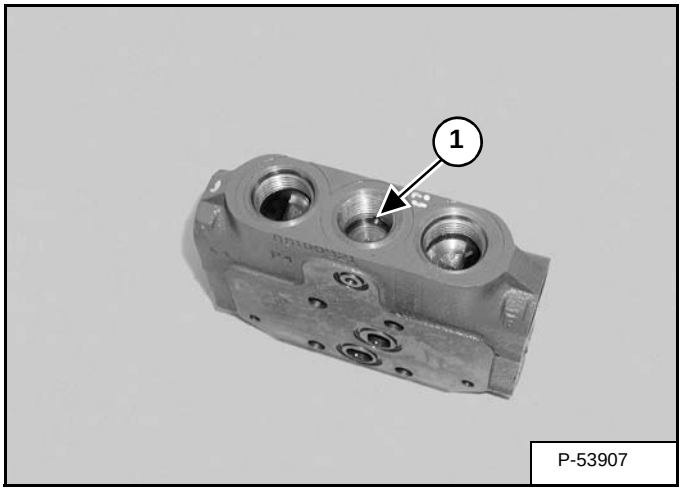


Remove the O-ring (Item 1) **[Figure 20-40-118]** from the plug.

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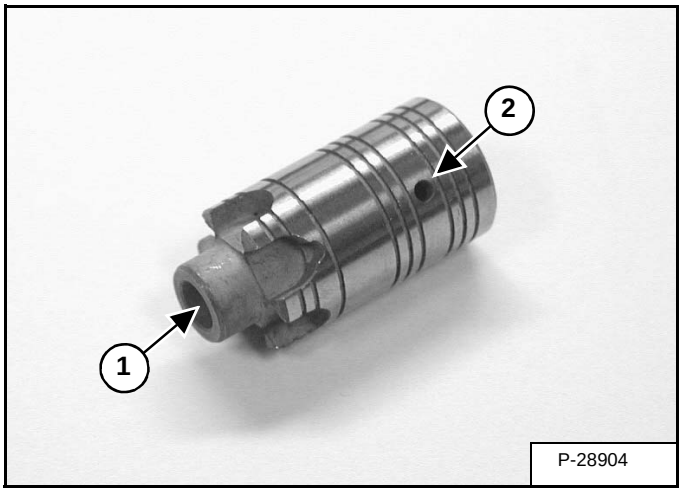
Arm Valve Section Disassembly And Assembly (Cont'd)

Figure 20-40-119



Remove the compensator (Item 1) **[Figure 20-40-119]** from the valve section.

Figure 20-40-120



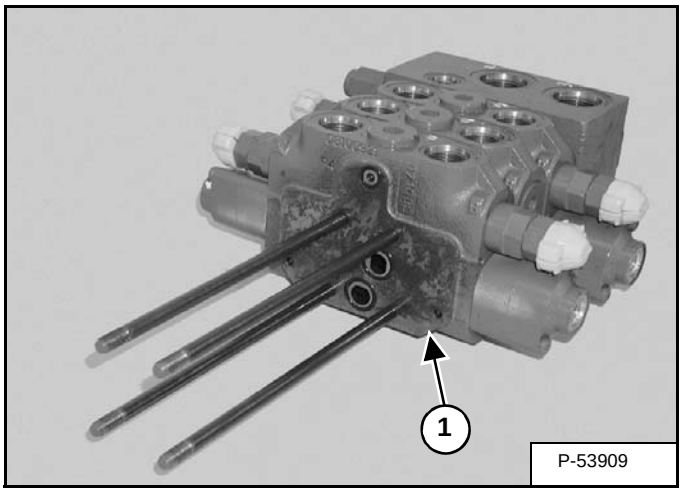
Check the orifice (Item 1) **[Figure 20-40-120]** in the compensator to be sure it is not plugged.

Check the crossport hole (Item 2) **[Figure 20-40-120]** to be sure it is not plugged.

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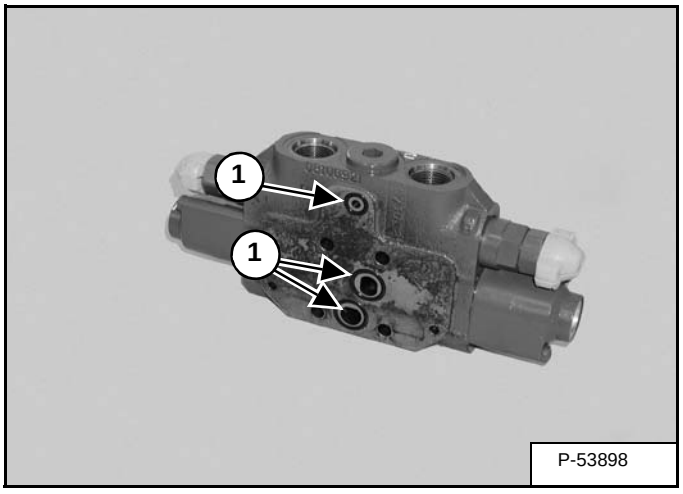
Boom Valve Section Disassembly And Assembly

Figure 20-40-121



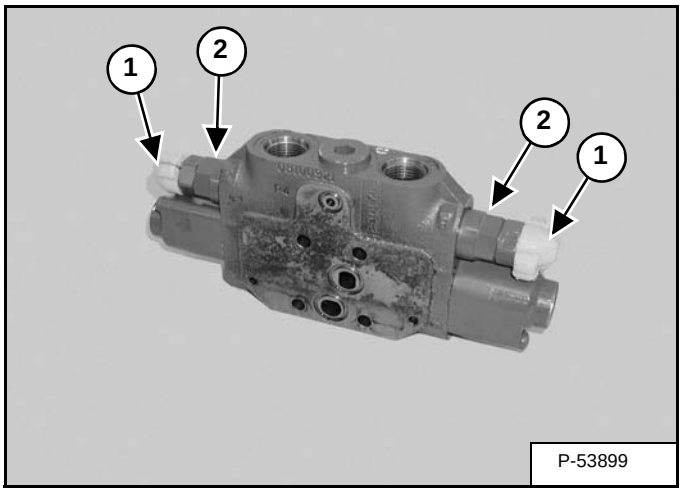
Remove the boom valve section (Item 1) **[Figure 20-40-121]** from the control valve.

Figure 20-40-122



Remove the O-rings (Item 1) **[Figure 20-40-122]** from the valve section.

Figure 20-40-123

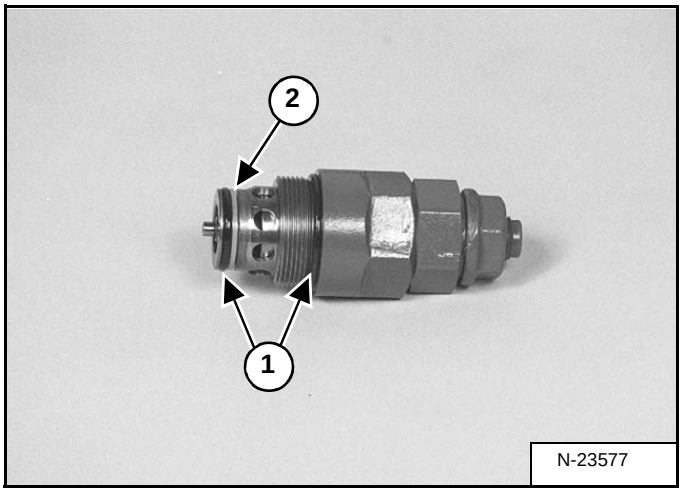


Remove the protective covers (Item 1) **[Figure 20-40-123]** from the valve section port relief/anti-cav valves.

Remove the port relief/anti-cav valves (Item 2) **[Figure 20-40-123]** from both ends of the valve section.

Assembly: Tighten the port relief/anti-cav valve to 46 - 57 ft.-lb. (63 - 77 N•m) torque.

Figure 20-40-124

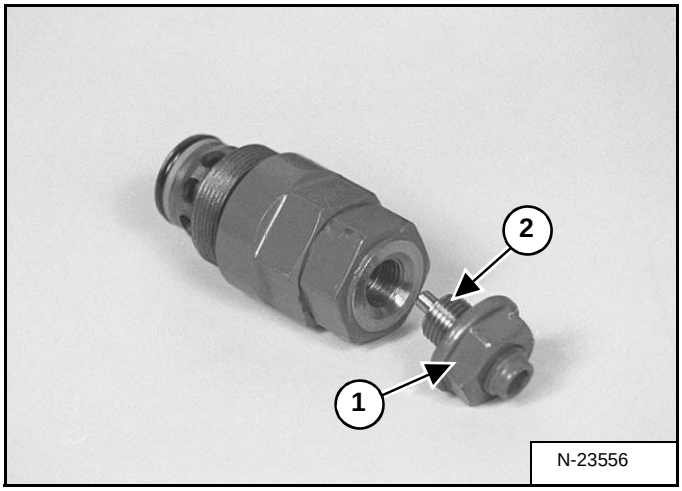


Remove the O-rings (Item 1) and back-up ring (Item 2) **[Figure 20-40-124]** from the port relief/anti-cav valve.

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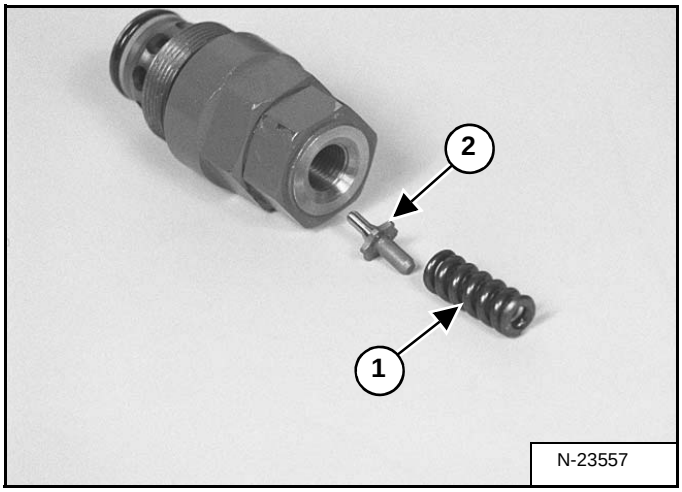
Boom Valve Section Disassembly And Assembly (Cont'd)

Figure 20-40-125



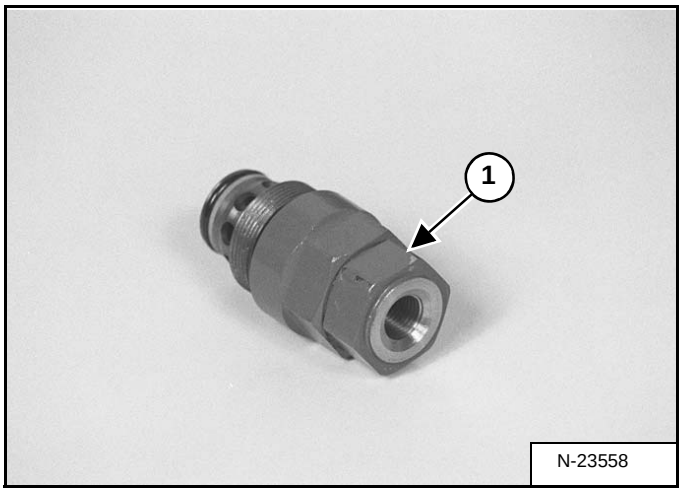
Remove the nut (Item 1) and adjustment screw (Item 2) **[Figure 20-40-125]** from the port relief/anti-cav valve.

Figure 20-40-126



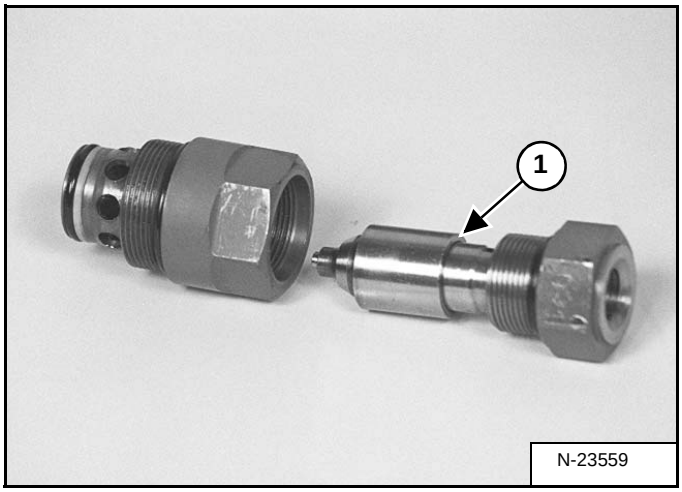
Remove the spring (Item 1) and poppet (Item 2) **[Figure 20-40-126]** from the port relief/anti-cav valve.

Figure 20-40-127



Remove the nut (Item 1) **[Figure 20-40-127]** from the port relief/anti-cav valve.

Figure 20-40-128

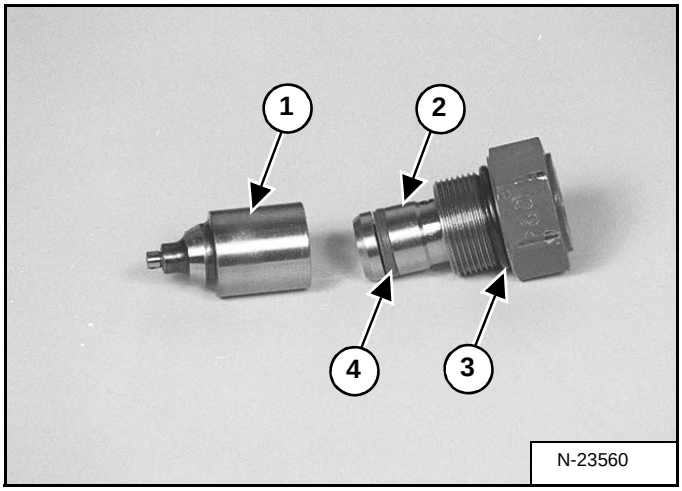


Remove the relief valve assembly (Item 1) **[Figure 20-40-128]** from the valve.

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Boom Valve Section Disassembly And Assembly (Cont'd)

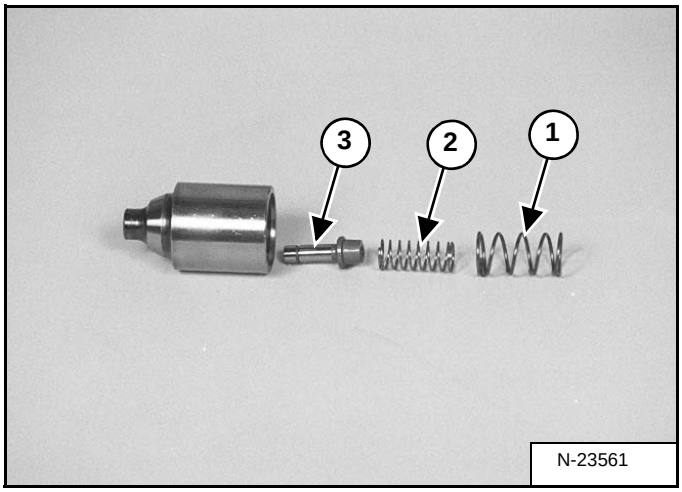
Figure 20-40-129



Remove the front section (Item 1) from the relief valve (Item 2) **[Figure 20-40-129]**.

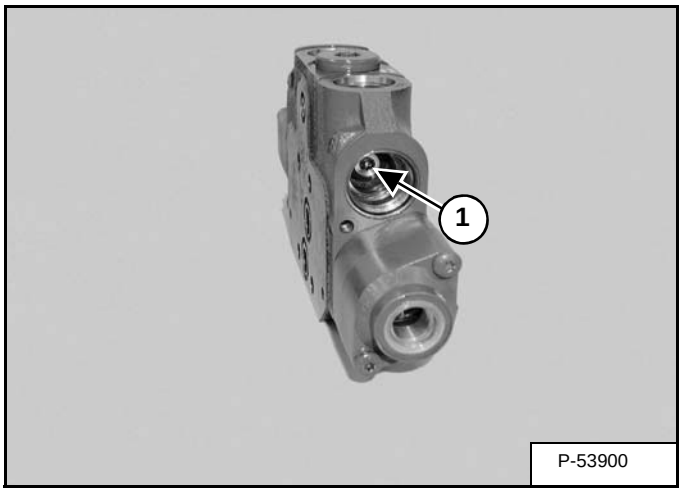
Remove the O-ring (Item 3) and seal (Item 4) **[Figure 20-40-129]**

Figure 20-40-130



Remove the spring (Item 1), spring (Item 2) and poppet (Item 3) **[Figure 20-40-130]** from the front section of the relief valve assembly.

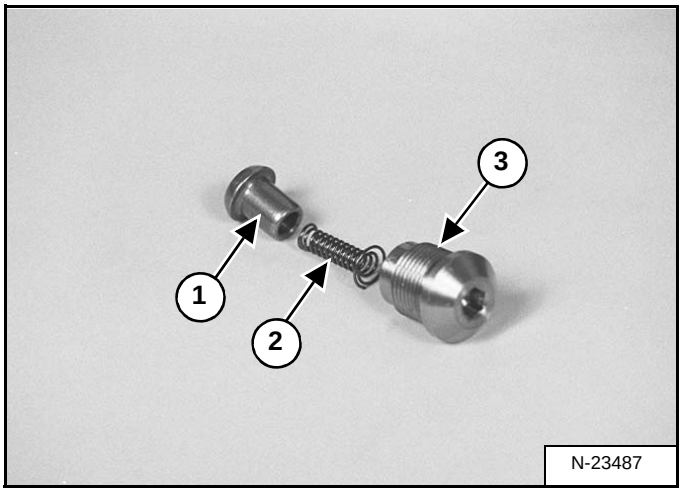
Figure 20-40-131



Remove the load check valve assembly (Item 1) **[Figure 20-40-131]** from both ends of the valve section.

Assembly: Tighten the load check valves to 80 - 97 in.-lb. (9 - 11 N•m) torque.

Figure 20-40-132

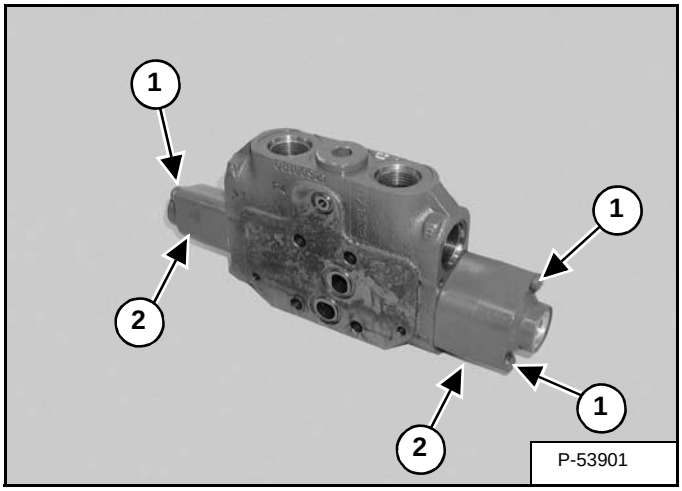


Remove the seat (Item 1) and spring (Item 2) from the load check valve body (Item 3) **[Figure 20-40-132]**.

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Boom Valve Section Disassembly And Assembly (Cont'd)

Figure 20-40-133

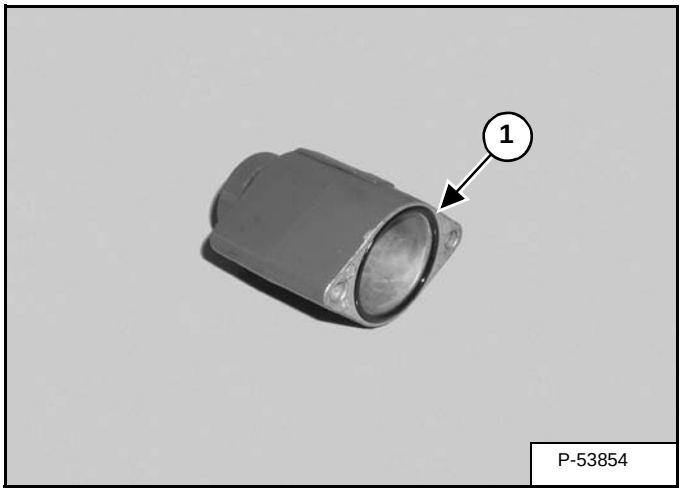


Remove the screws (Item 1) from both valve section end caps (Item 2) **[Figure 20-40-133]**.

Assembly: Tighten the screws to 48 - 58 in.-lb. (5,4 - 6,6 N•m)

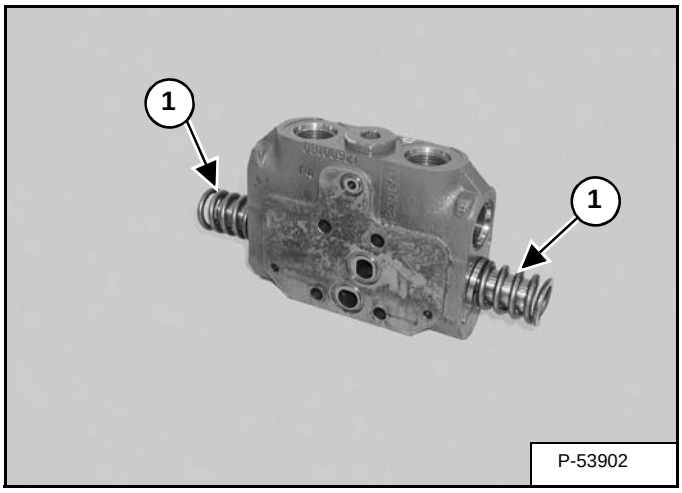
Remove the end caps.

Figure 20-40-134



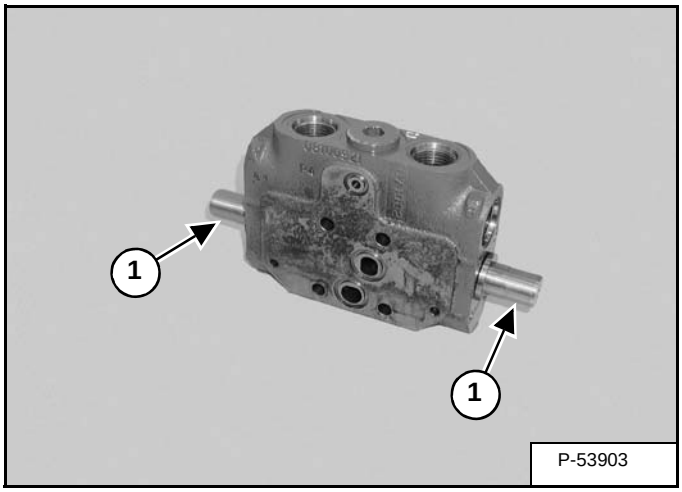
Remove the O-ring (Item 1) **[Figure 20-40-134]** from the end cap.

Figure 20-40-135



Remove the centering spring (Item 1) **[Figure 20-40-135]** from both ends of the valve spool.

Figure 20-40-136

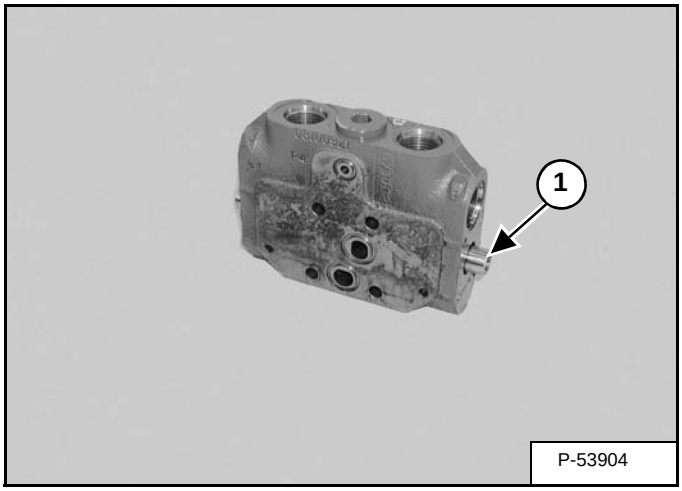


Remove the spring guides (Item 1) **[Figure 20-40-136]** from both ends of the valve spool.

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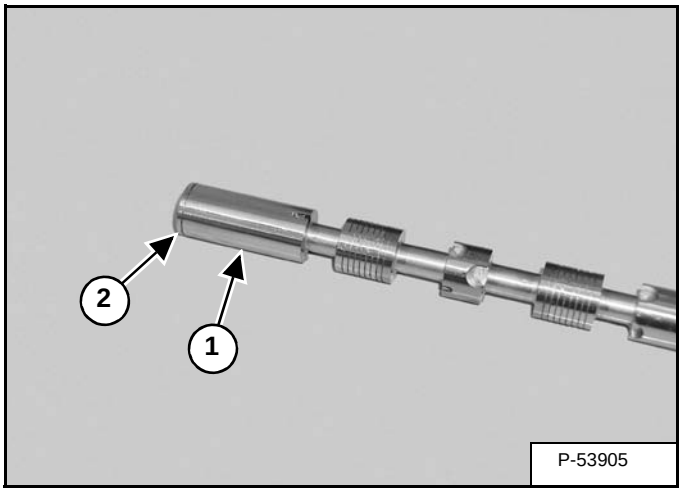
Boom Valve Section Disassembly And Assembly (Cont'd)

Figure 20-40-137



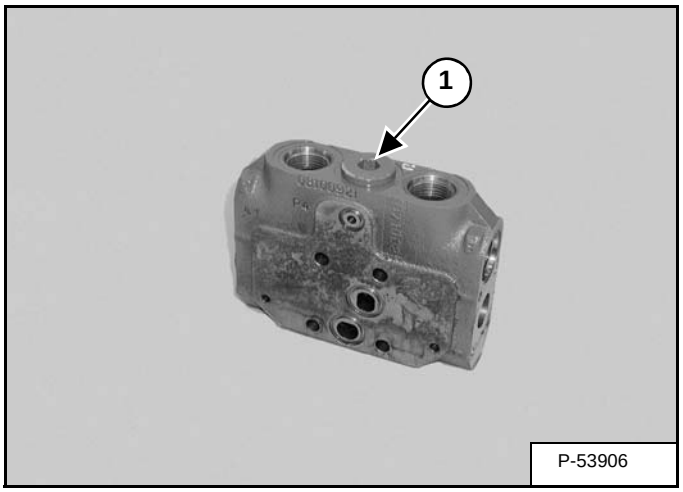
Remove the spool (Item 1) **[Figure 20-40-137]** from the valve section.

Figure 20-40-138



Assembly: The spool (Item 1) can only be installed in the valve section with the spool groove (Item 2) **[Figure 20-40-138]** toward the top of the valve section, on the A port.

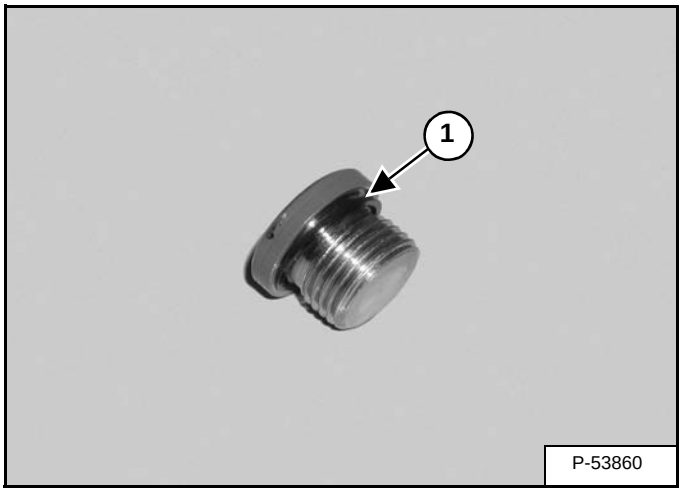
Figure 20-40-139



Remove the plug (Item 1) **[Figure 20-40-139]** from the top of the valve section.

Assembly: Tighten the plug to 46 - 57 ft.-lb. (63 - 77 N•m) torque.

Figure 20-40-140

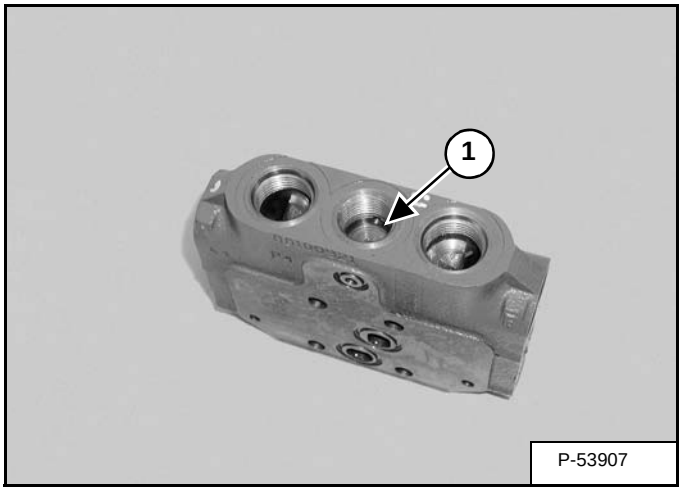


Remove the O-ring (Item 1) **[Figure 20-40-140]** from the plug.

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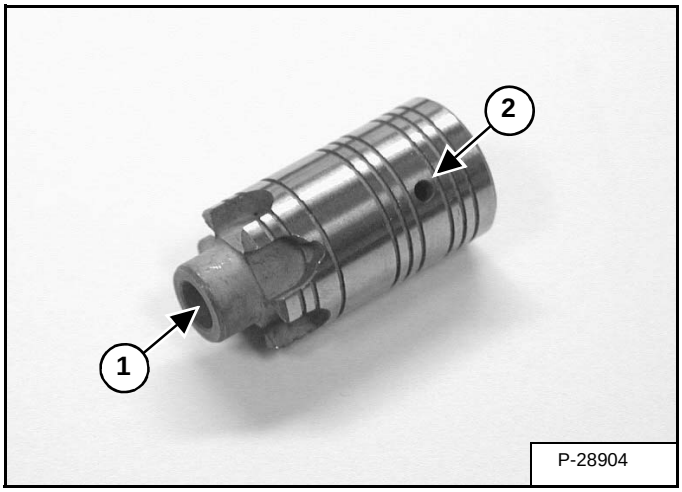
Boom Valve Section Disassembly And Assembly (Cont'd)

Figure 20-40-141



Remove the compensator (Item 1) **[Figure 20-40-141]** from the valve section.

Figure 20-40-142



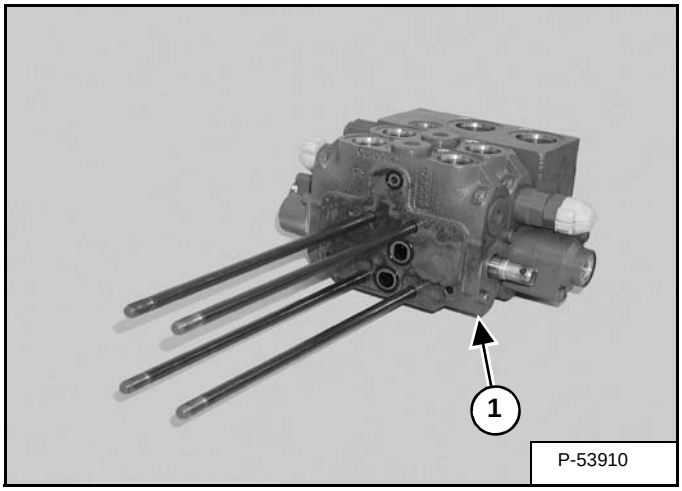
Check the orifice (Item 1) **[Figure 20-40-142]** in the compensator to be sure it is not plugged.

Check the crossport hole (Item 2) **[Figure 20-40-142]** to be sure it is not plugged.

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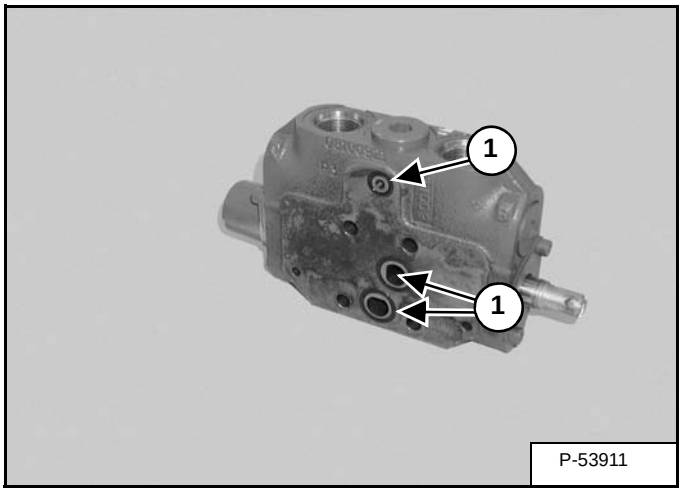
Boom Swing Valve Section Disassembly And Assembly

Figure 20-40-143



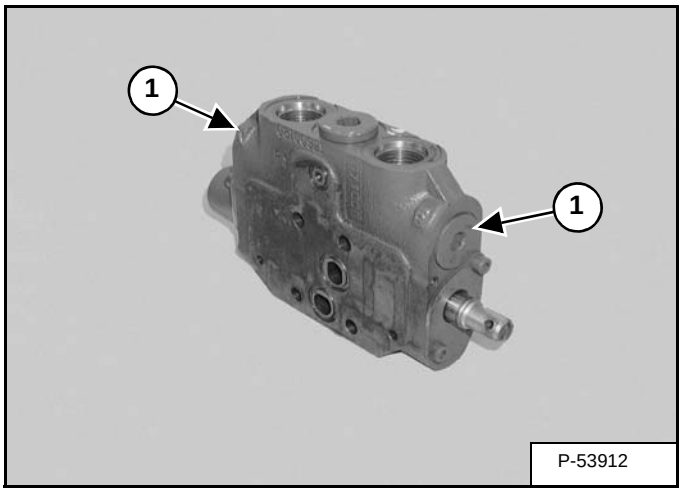
Remove the boom swing valve section (Item 1) **[Figure 20-40-143]** from the control valve.

Figure 20-40-144



Remove the O-rings (Item 1) **[Figure 20-40-144]** from the valve section.

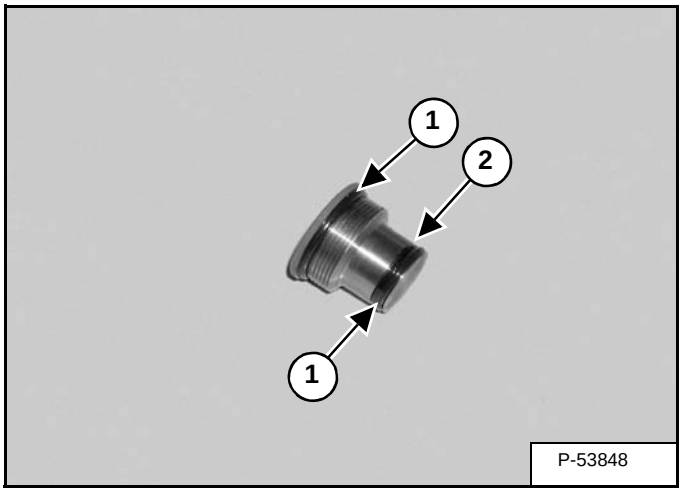
Figure 20-40-145



Remove the plug (Item 1) **[Figure 20-40-145]** from both ends of the valve section.

Assembly: Tighten the plug to 46 - 57 ft.-lb. (63 - 77 N•m) torque.

Figure 20-40-146

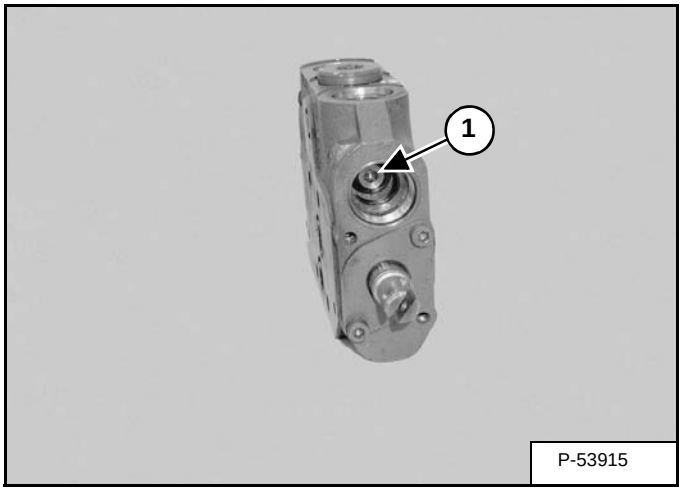


Remove the O-rings (Item 1) and backup ring (Item 2) **[Figure 20-40-146]** from the plugs.

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Boom Swing Valve Section Disassembly And Assembly (Cont'd)

Figure 20-40-147



Remove the load check valve assembly (Item 1) **[Figure 20-40-147]** from both ends of the valve section.

Assembly: Tighten the load check valves to 80 - 97 in.-lb. (9 - 11 N•m) torque.

Figure 20-40-148

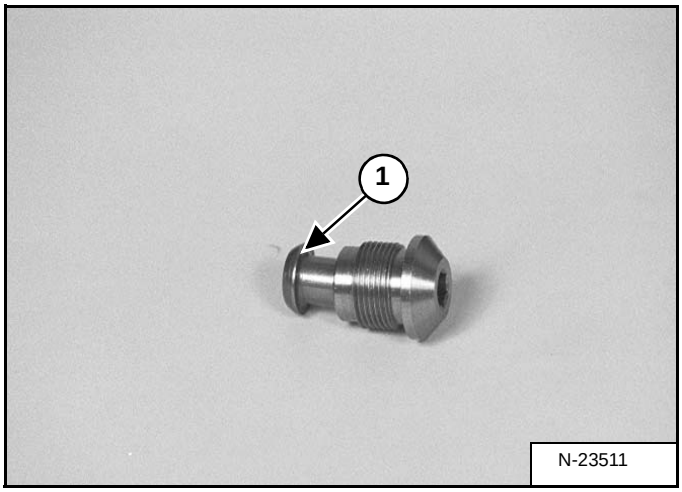
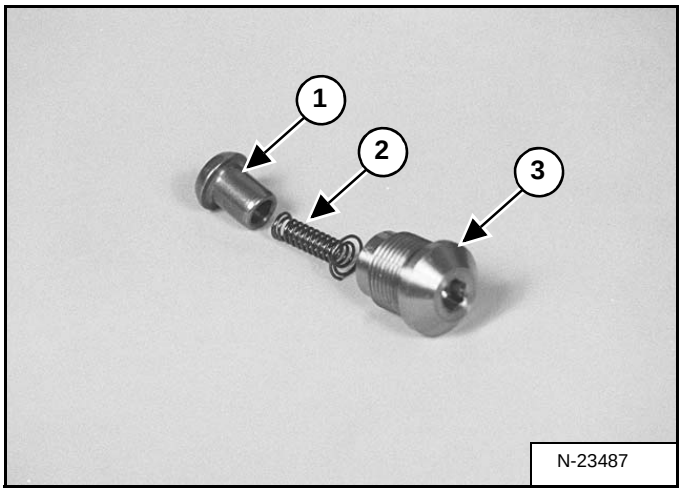
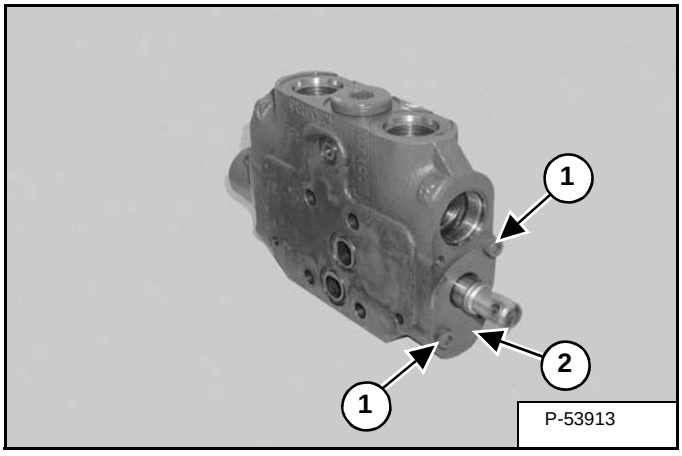


Figure 20-40-149



Remove the seat (Item 1) **[Figure 20-40-148]** & **[Figure 20-40-149]** and spring (Item 2) from the load check valve body (Item 3) **[Figure 20-40-149]**.

Figure 20-40-150



Remove the screws (Item 1) from the valve spool retainer (Item 2) **[Figure 20-40-150]**.

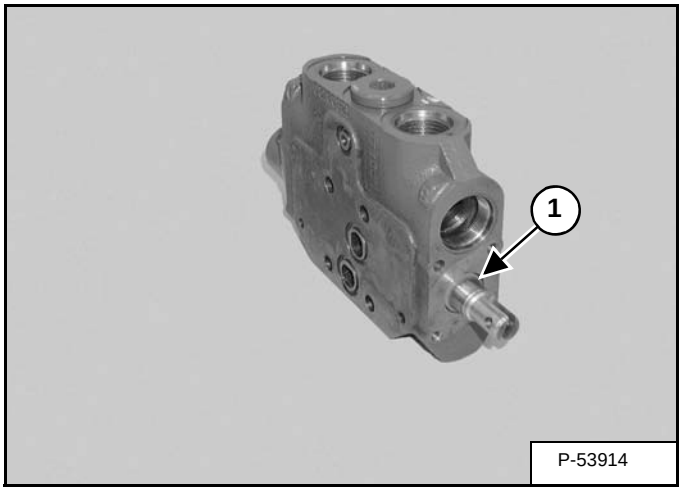
Installation: Tighten the screws to 48 - 58 in.-lb. (5,4 - 6,6 N•m) torque.

Remove the retainer.

https://www.pdfmanual4trucks.com/

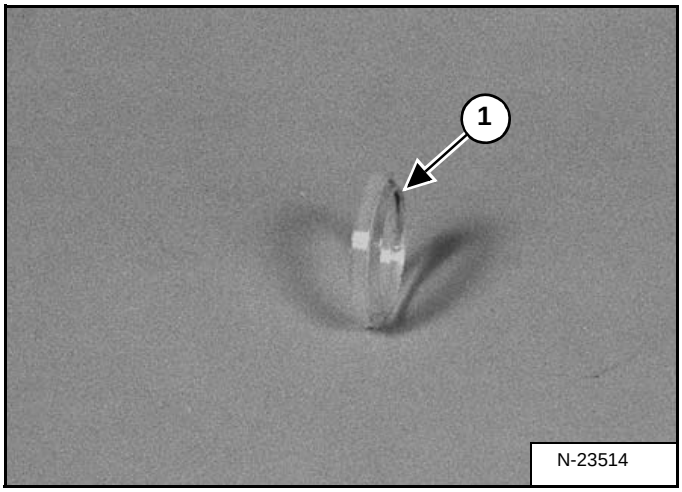
Boom Swing Valve Section Disassembly And Assembly (Cont'd)

Figure 20-40-151



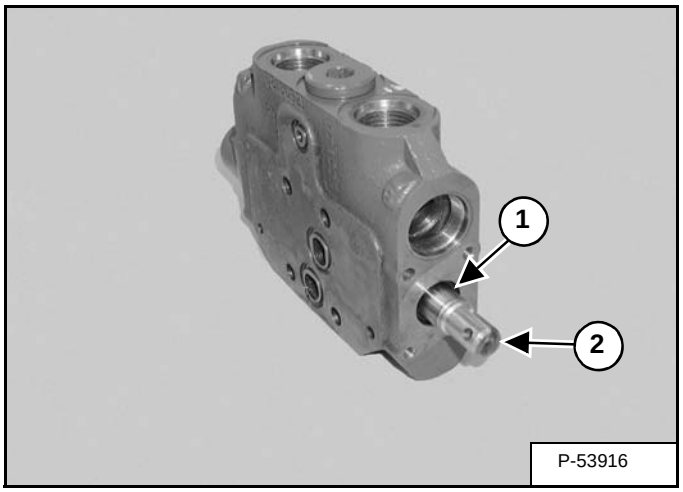
Remove the seal (Item 1) **[Figure 20-40-151]** from the spool.

Figure 20-40-152



Assembly: Install the seal on the spool with the flange (Item 1) **[Figure 20-40-152]** toward the outside of the valve section.

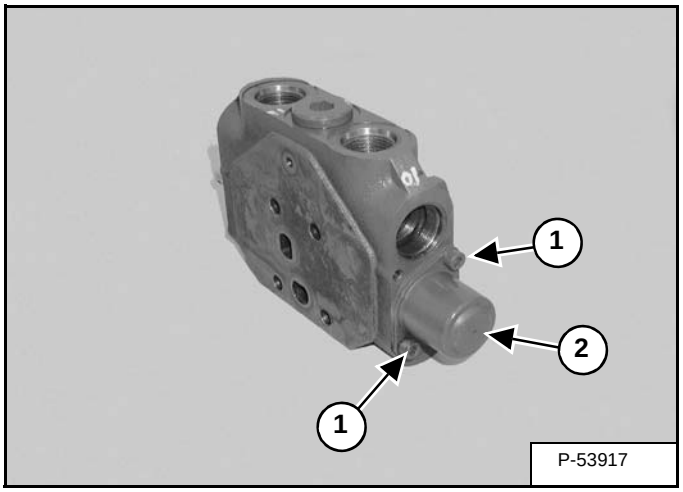
Figure 20-40-153



Remove the O-ring (Item 1) **[Figure 20-40-153]** from the valve spool.

NOTE: The valve spool (Item 2) [Figure 20-40-153] can only be removed from the valve section from the spring end of the valve section.

Figure 20-40-154



Remove the screws (Item 1) from the valve section end cap (Item 2) **[Figure 20-40-154]**.

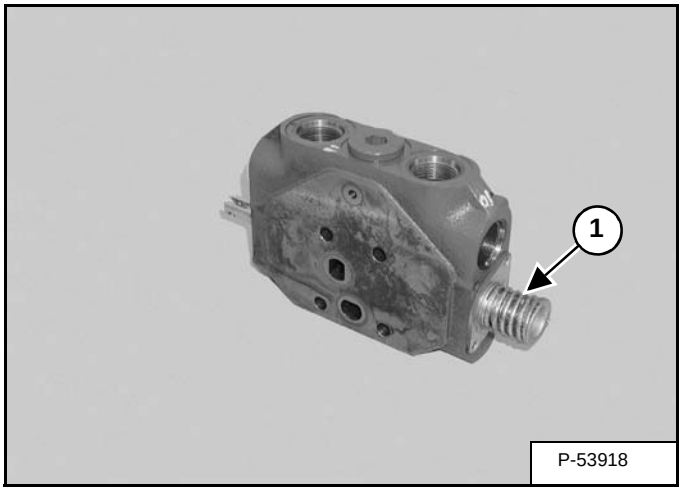
Assembly: Tighten the screws to 48 - 58 in.-lb. (5,4 - 6,6 N•m) torque.

Remove the end cap.

https://www.pdfmanual4trucks.com/

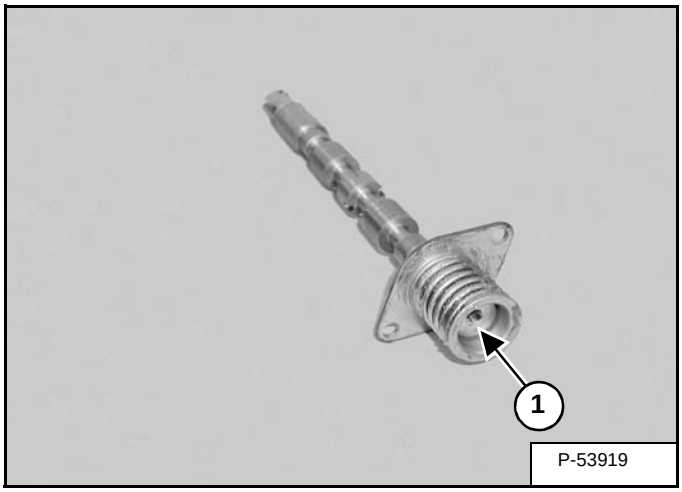
Boom Swing Valve Section Disassembly And Assembly (Cont'd)

Figure 20-40-155



Remove the spool assembly (Item 1) **[Figure 20-40-155]**.

Figure 20-40-156

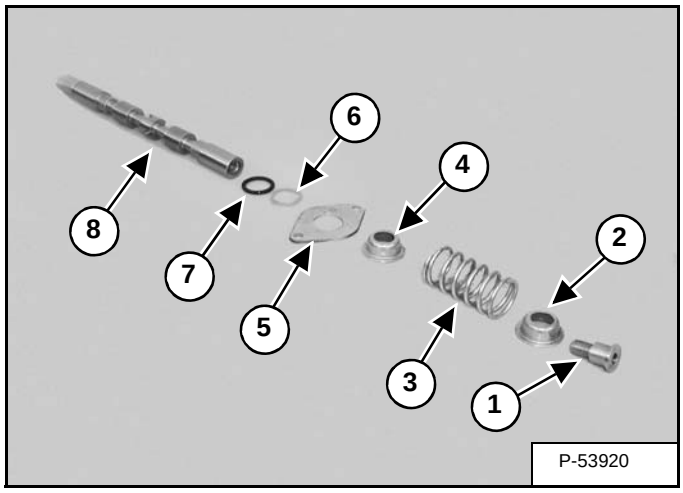


Loosen the bolt (Item 1) **[Figure 20-40-156]**.

Assembly: Tighten the bolt to 80 - 97 in.-lb. (9 - 1 N•m) torque.

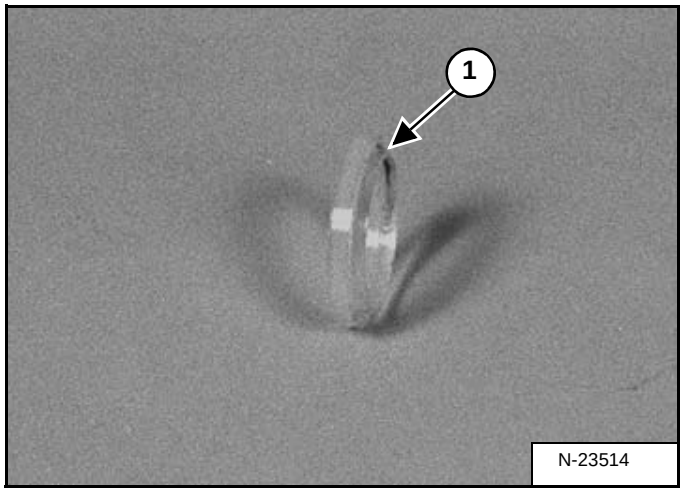
NOTE: To remove the bolt, the spool must be held on the linkage end, to keep the spool from rotating.

Figure 20-40-157



Remove the bolt (Item 1), spring retainer (Item 2), spring (Item 3), spring retainer (Item 4), retainer (Item 5), seal (Item 6) and O-ring (Item 7) from the spool (Item 8) **[Figure 20-40-157]**.

Figure 20-40-158

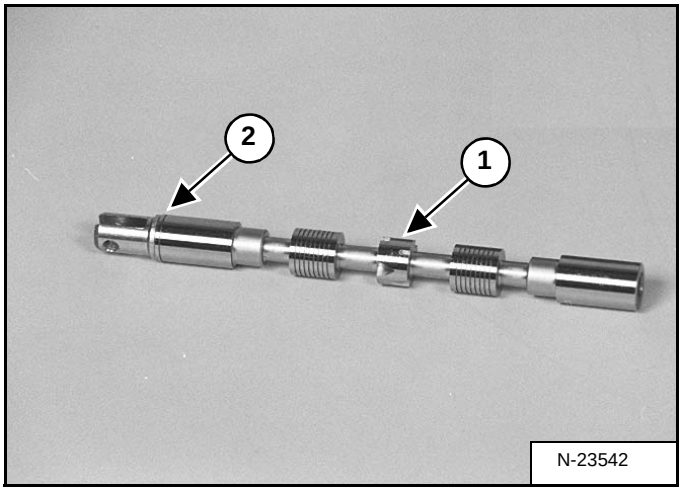


Assembly: Install the seal on the spool with the flange (Item 1) **[Figure 20-40-158]** toward the outside of the valve section.

https://www.pdfmanual4trucks.com/

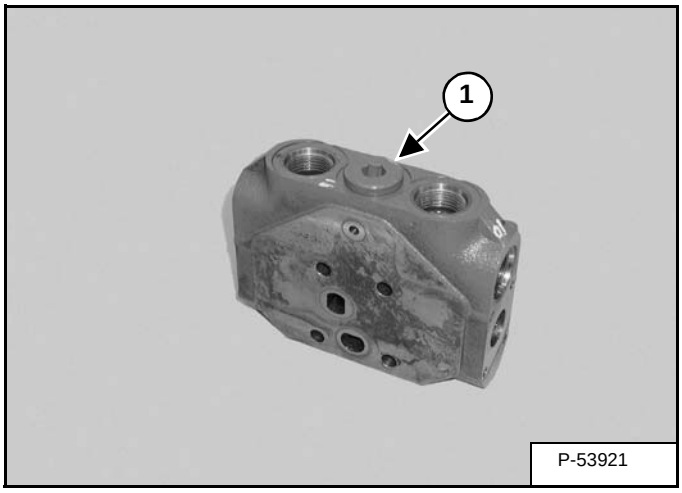
Boom Swing Valve Section Disassembly And Assembly (Cont'd)

Figure 20-40-159



Assembly: The spool (Item 1) can only be installed in the valve section with the spool groove (Item 2) **[Figure 20-40-159]** toward the bottom of the valve section, on the B port.

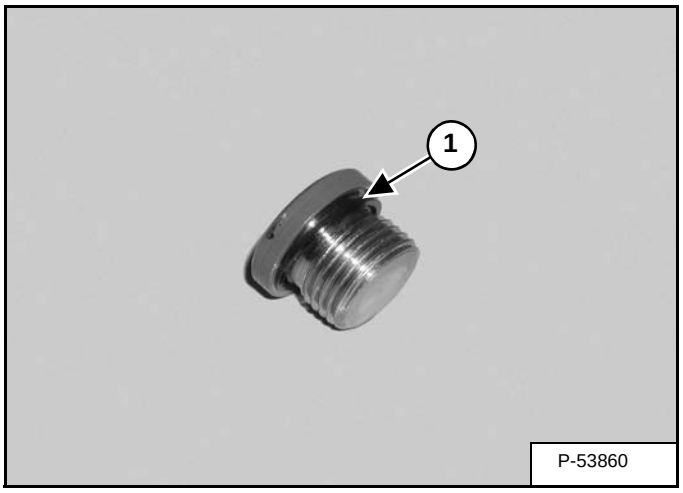
Figure 20-40-160



Remove the plug (Item 1) **[Figure 20-40-160]** from the top of the valve section.

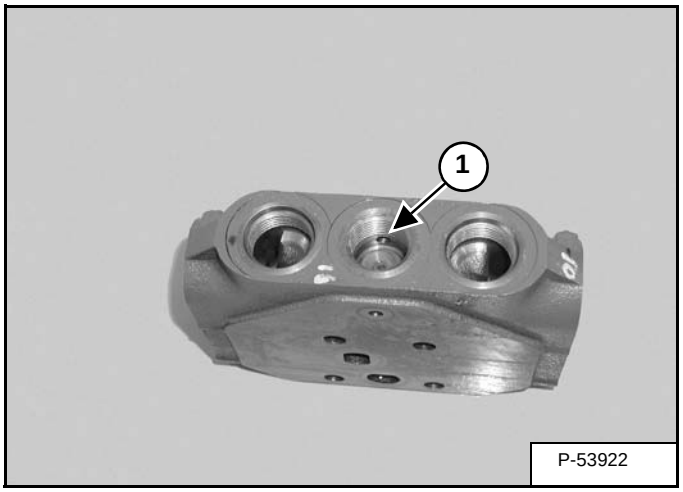
Assembly: Tighten the plug to 46 - 57 ft.-lb. (63 - 77 N•m) torque.

Figure 20-40-161



Remove the O-ring (Item 1) **[Figure 20-40-161]** from the plug.

Figure 20-40-162

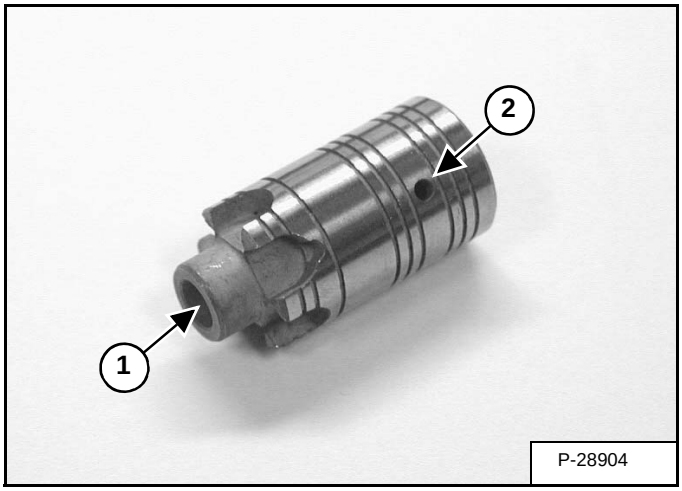


Remove the compensator (Item 1) **[Figure 20-40-162]** from the valve section.

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Boom Swing Valve Section Disassembly And Assembly (Cont'd)

Figure 20-40-163



Check the orifice (Item 1) **[Figure 20-40-163]** in the compensator to be sure it is not plugged.

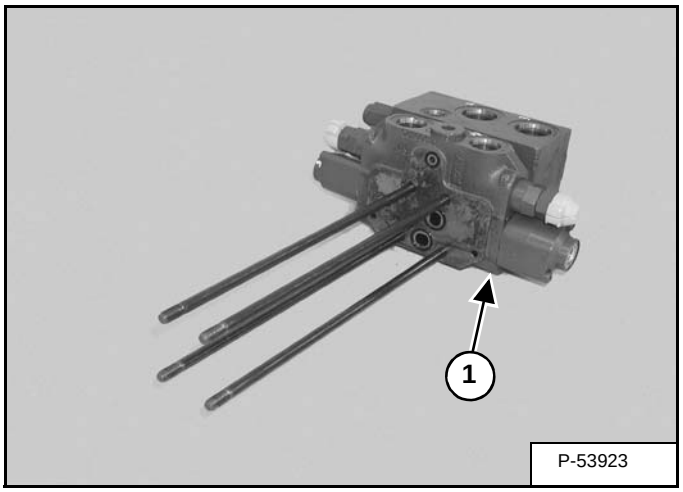
Check the crossport hole (Item 2) **[Figure 20-40-163]** to be sure it is not plugged.

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HYDRAULIC CONTROL VALVE (S/N 562611001 & ABOVE, 562811001 & ABOVE AND 563211001 & ABOVE) (CONT'D)

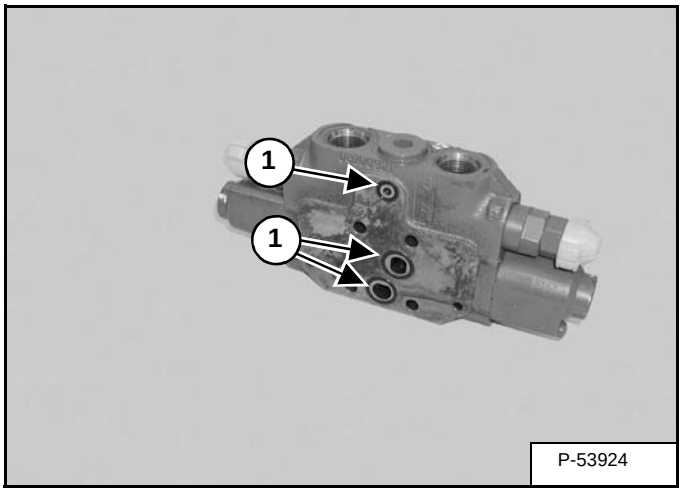
Auxiliary Valve Section Disassembly And Assembly

Figure 20-40-164



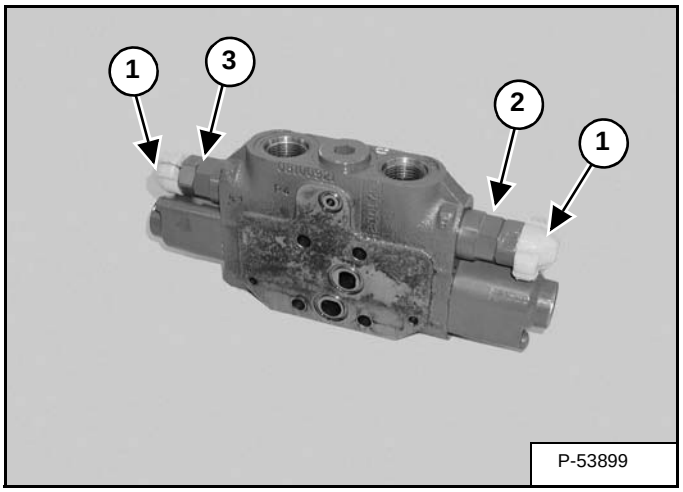
Remove the auxiliary valve section (Item 1) **[Figure 20-40-164]** from the control valve.

Figure 20-40-165



Remove the O-rings (Item 1) **[Figure 20-40-165]** from the valve section.

Figure 20-40-166



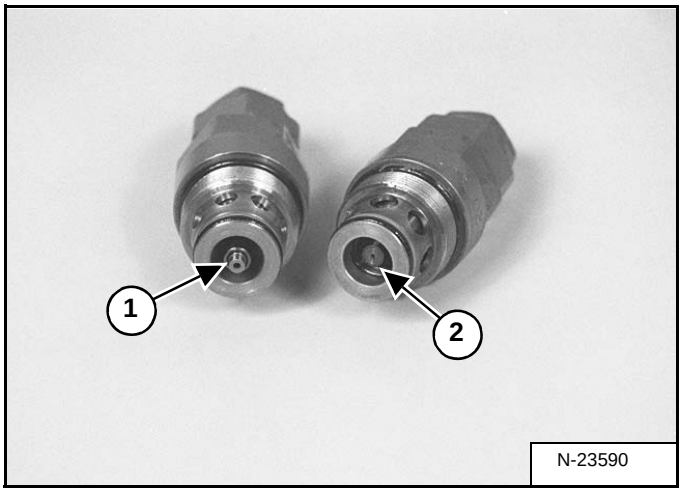
Remove the protective covers (Item 1) **[Figure 20-40-166]** from the valve section.

Remove the port relief valve (Item 2) **[Figure 20-40-166]** from the valve section.

Remove the port relief/anti-cav valve (Item 3) **[Figure 20-40-166]** from the valve section.

Assembly: Tighten the valves to 46 - 57 ft.lb. (63 - 77 N•m) torque.

Figure 20-40-167



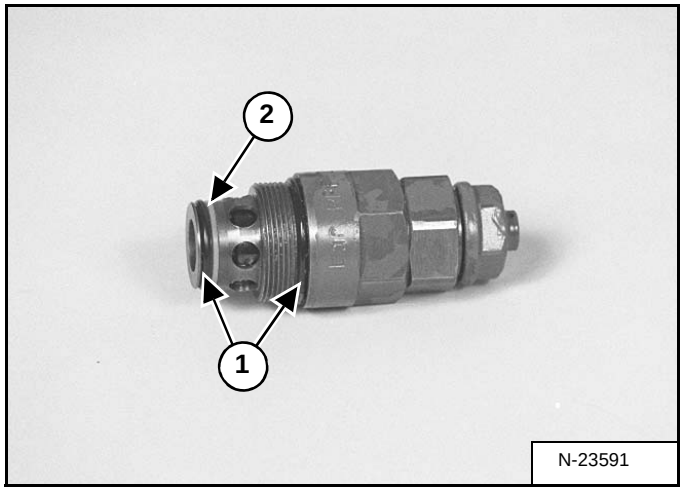
NOTE: The auxiliary valve section has one port relief/ anti-cav valve (Item 1), and one port relief valve (Item 2) [Figure 20-40-167].

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Auxiliary Valve Section Disassembly And Assembly (Cont'd)

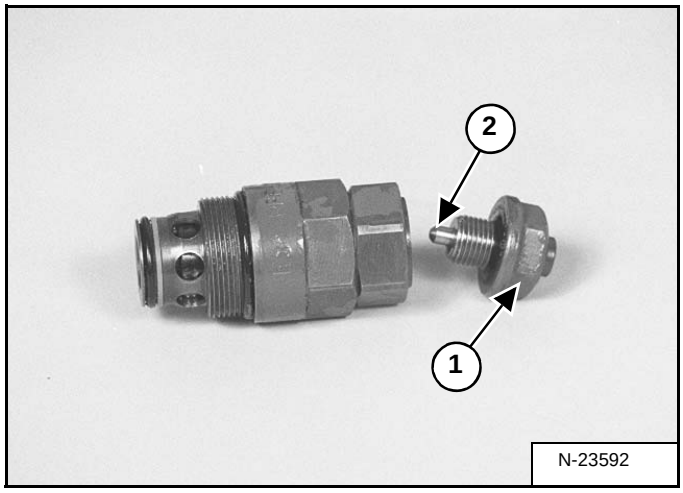
Port Relief

Figure 20-40-168



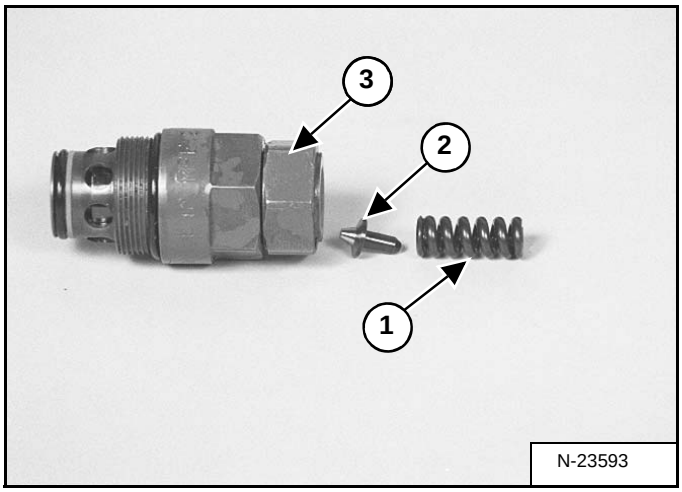
Remove the O-rings (Item 1) and back-up ring (Item 2) **[Figure 20-40-168]** from the port relief valve.

Figure 20-40-169



Remove the nut (Item 1) and adjustment screw (Item 2) **[Figure 20-40-169]** from the port relief valve.

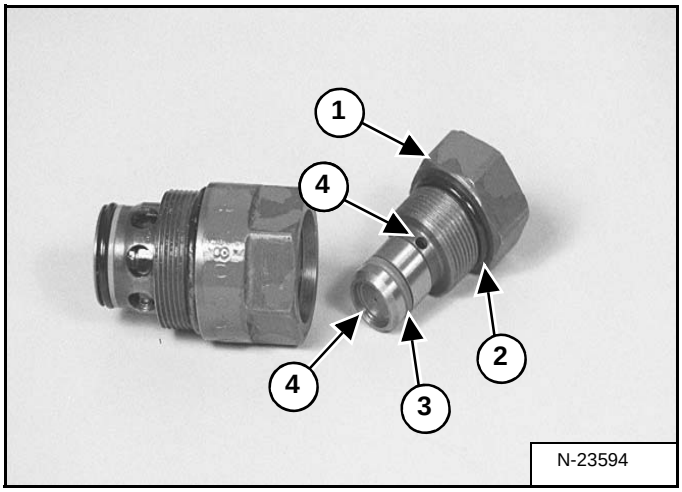
Figure 20-40-170



Remove the spring (Item 1) and poppet (Item 2) **[Figure 20-40-170]** from the port relief valve body.

Remove the nut (Item 3) **[Figure 20-40-170]** from the port relief valve.

Figure 20-40-171



Remove the relief valve assembly (Item 1) **[Figure 20-40-171]**.

Remove the O-ring (Item 2) and seal (Item 3) **[Figure 20-40-171]**.

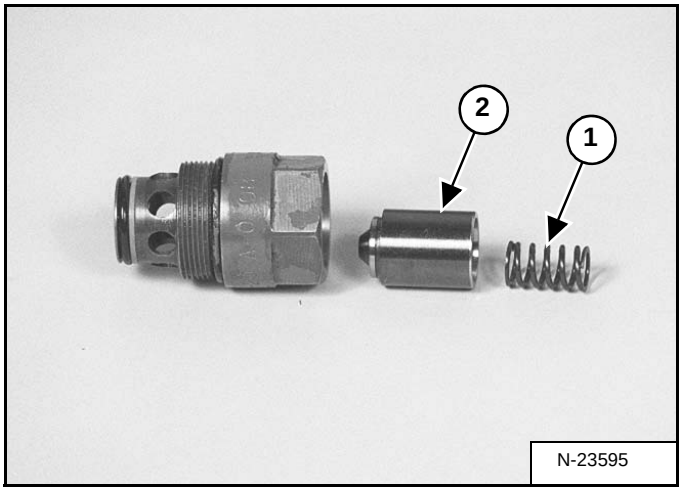
Check the orifice (Item 4) **[Figure 20-40-171]** to be sure it is not plugged.

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Auxiliary Valve Section Disassembly And Assembly (Cont'd)

Port Relief (Cont'd)

Figure 20-40-172



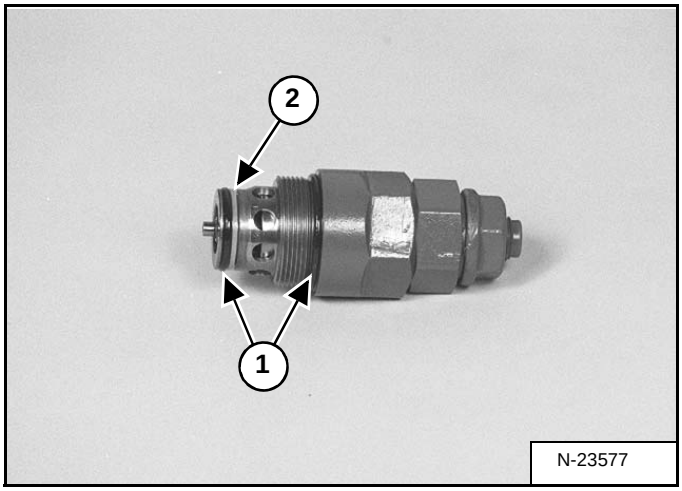
Remove the spring (Item 1) and poppet (Item 2) **[Figure 20-40-172]**.

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Auxiliary Valve Section Disassembly And Assembly (Cont'd)

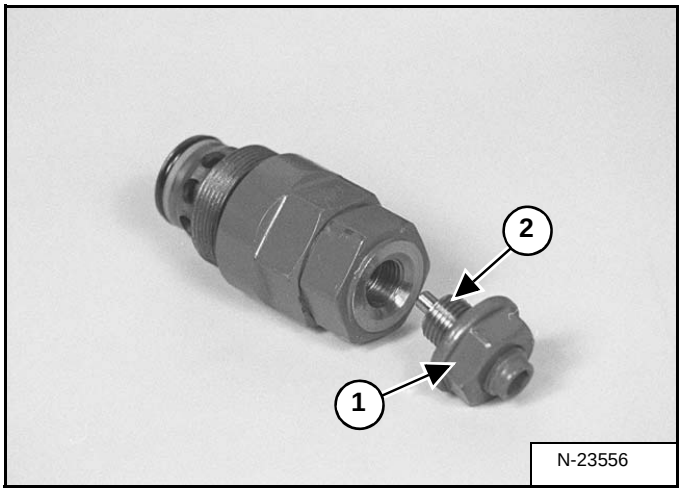
Port Relief/Anti-Cav

Figure 20-40-173



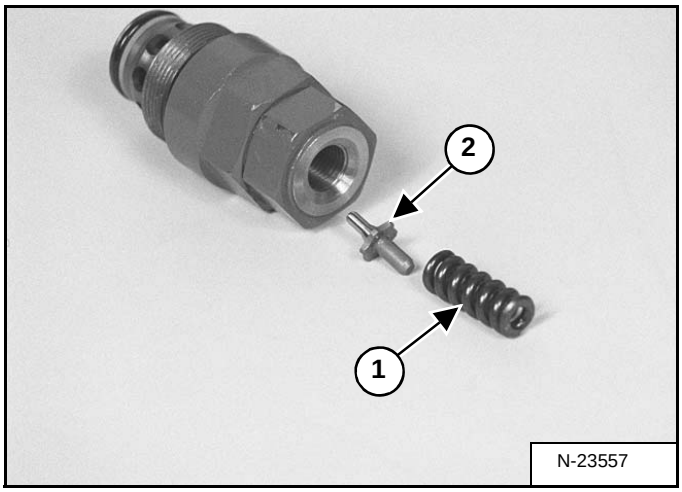
Remove the O-rings (Item 1) and back-up ring (Item 2) **[Figure 20-40-173]** from the port relief/anti-cav valve.

Figure 20-40-174



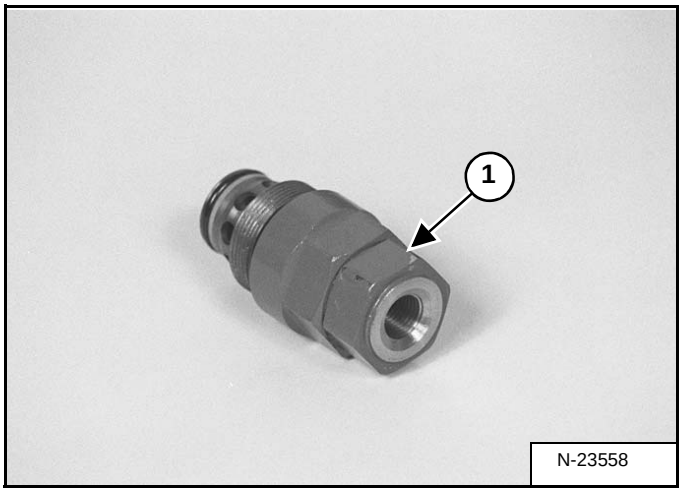
Remove the nut (Item 1) and adjustment screw (Item 2) **[Figure 20-40-174]** from the port relief/anti-cav valve.

Figure 20-40-175



Remove the spring (Item 1) and poppet (Item 2) **[Figure 20-40-175]** from the port relief/anti-cav valve.

Figure 20-40-176



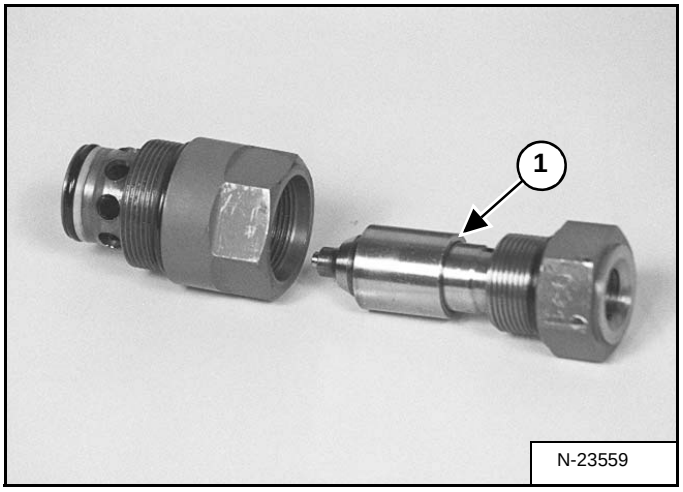
Remove the nut (Item 1) **[Figure 20-40-176]** the port relief/anti-cav valve.

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Auxiliary Valve Section Disassembly And Assembly (Cont'd)

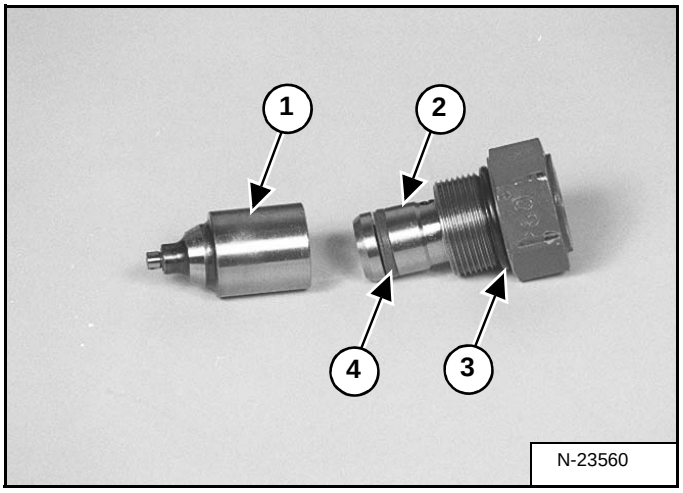
Port Relief/Anti-Cav (Cont'd)

Figure 20-40-177



Remove the relief valve assembly (Item 1) **[Figure 20-40-177]**.

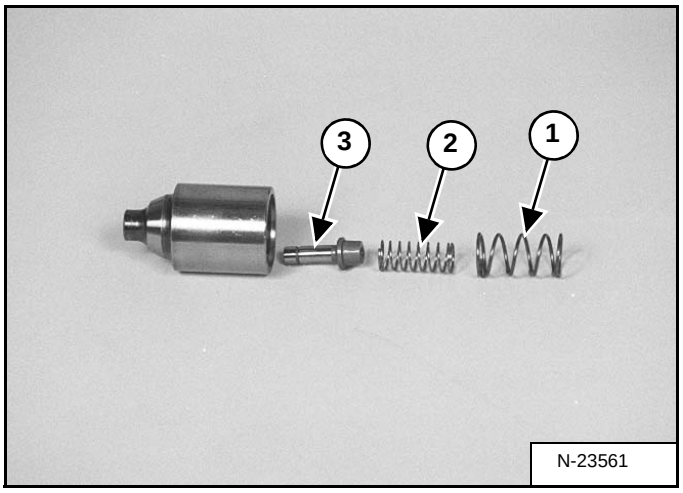
Figure 20-40-178



Remove the front section (Item 1) from the relief valve (Item 2) **[Figure 20-40-178]**.

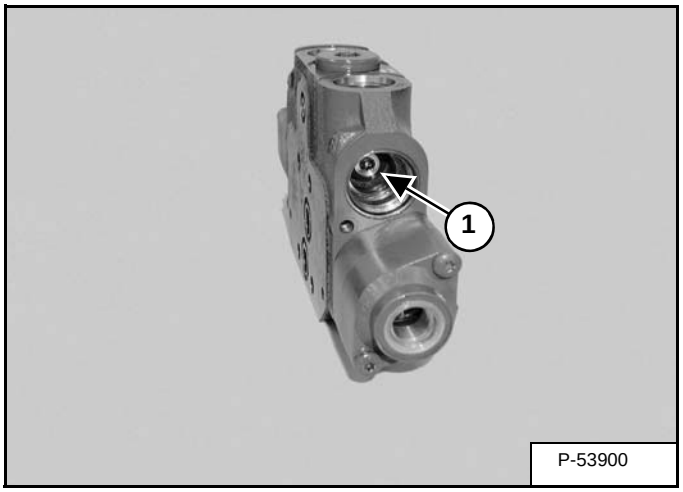
Remove the O-ring (Item 3) and seal (Item 4) **[Figure 20-40-178]**

Figure 20-40-179



Remove the spring (Item 1), spring (Item 2) and poppet (Item 3) **[Figure 20-40-179]**.

Figure 20-40-180



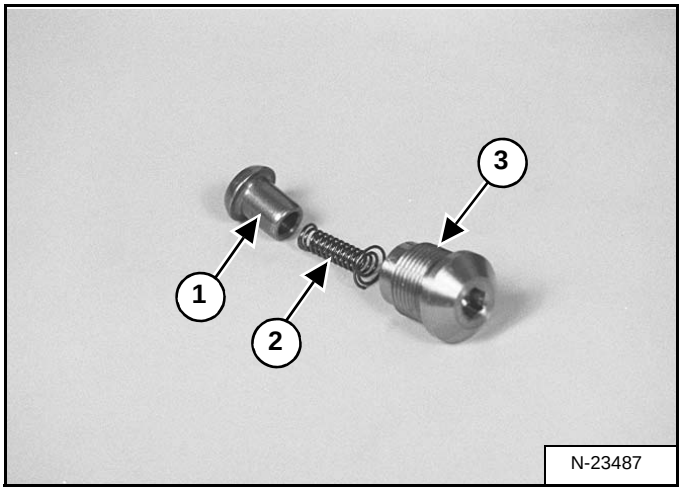
Remove the load check valve assembly (Item 1) **[Figure 20-40-180]** from both ends of the valve section.

Assembly: Tighten the load check valves to 80 - 97 in.-lb. (9 - 11 N•m) torque.

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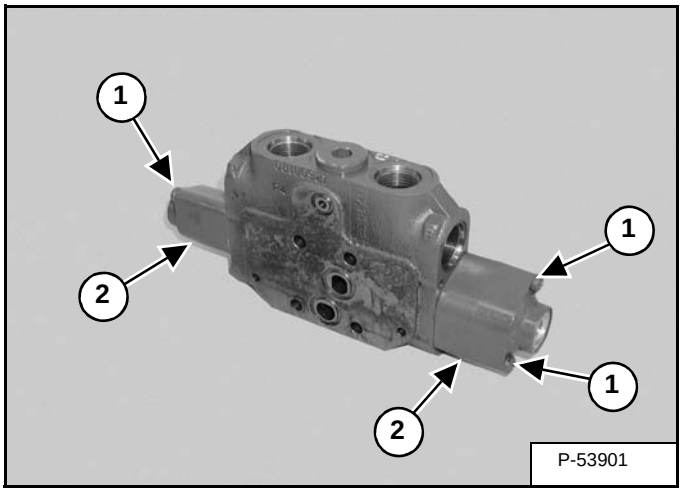
Auxiliary Valve Section Disassembly And Assembly (Cont'd)

Figure 20-40-181



Remove the seat (Item 1) and spring (Item 2) from the load check valve body (Item 3) **[Figure 20-40-181]**.

Figure 20-40-182

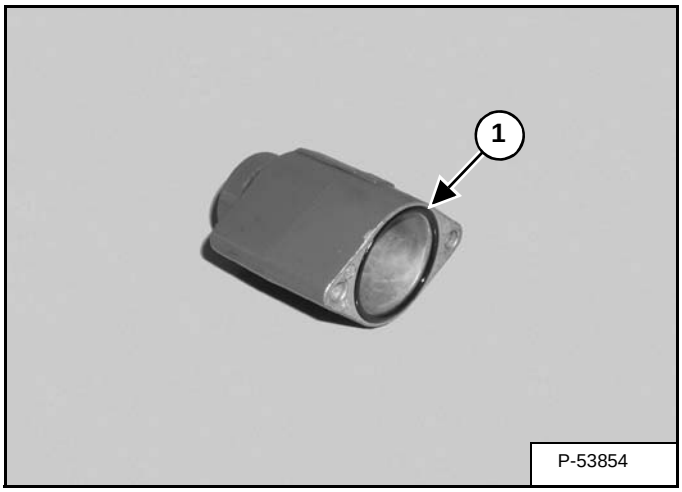


Remove the screws (Item 1) **[Figure 20-40-182]** from both valve section end caps.

Assembly: Tighten the screws to 48 - 58 in.-lb. (5,4 - 6,6 N•m)

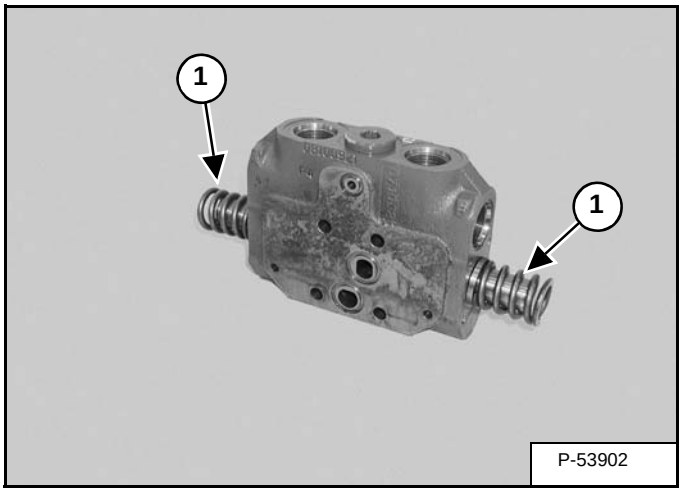
Remove the end cap (Item 2) **[Figure 20-40-182]** from both ends of the valve section.

Figure 20-40-183



Remove the O-ring (Item 1) **[Figure 20-40-183]** from both end caps.

Figure 20-40-184

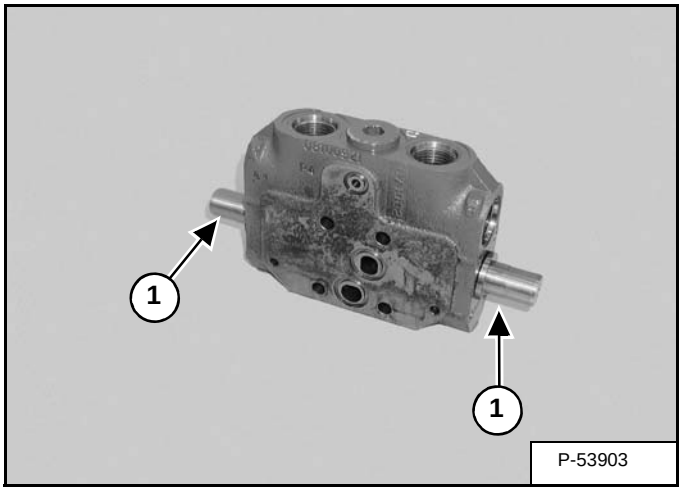


Remove the centering springs (Item 1) **[Figure 20-40-184]** from both ends of the valve spool.

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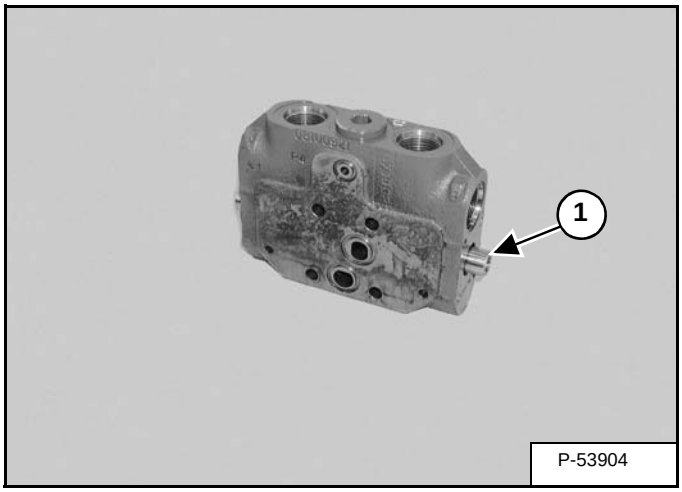
Auxiliary Valve Section Disassembly And Assembly (Cont'd)

Figure 20-40-185



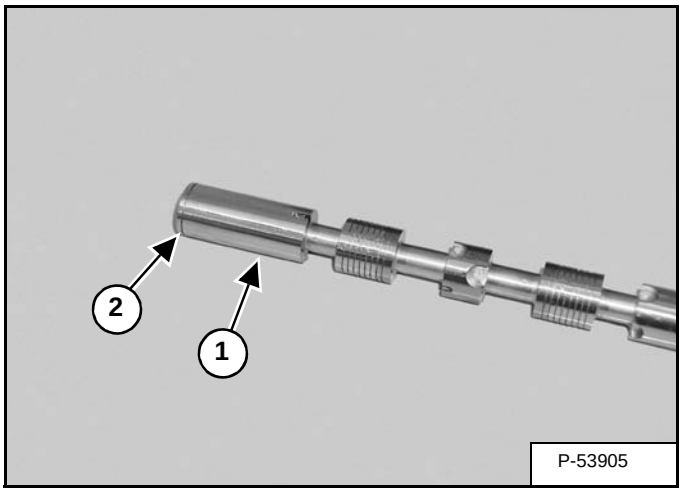
Remove the spring guides (Item 1) **[Figure 20-40-186]** from both ends of the valve spool.

Figure 20-40-186



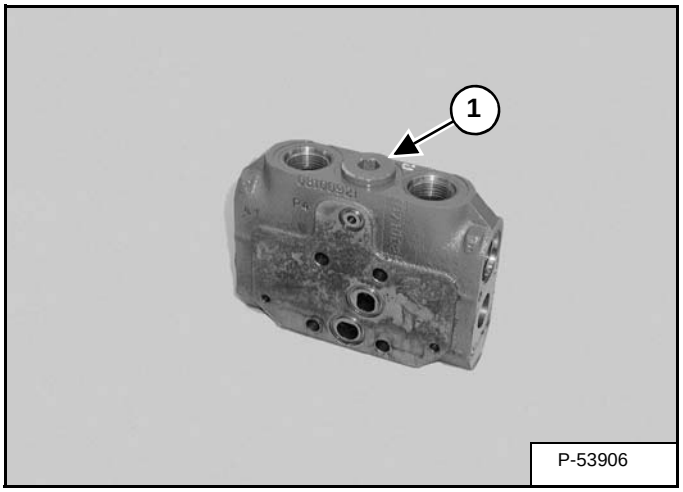
Remove the spool (Item 1) **[Figure 20-40-186]** from the valve section.

Figure 20-40-187



Assembly: The spool (Item 1) is symmetrical, and can be installed in the valve section with the spool groove (Item 2) **[Figure 20-40-187]** either toward the top, or the bottom of the valve section.

Figure 20-40-188



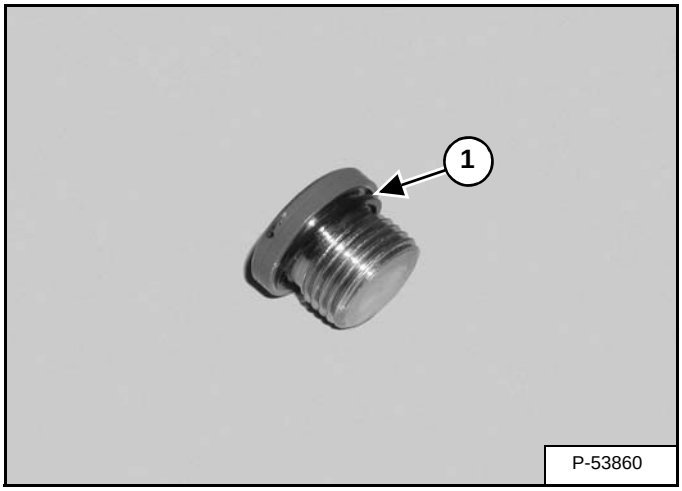
Remove the plug (Item 1) **[Figure 20-40-188]** from the top of the valve section.

Assembly: Tighten the plug to 46 - 57 ft.-lb. (63 - 77 N•m) torque.

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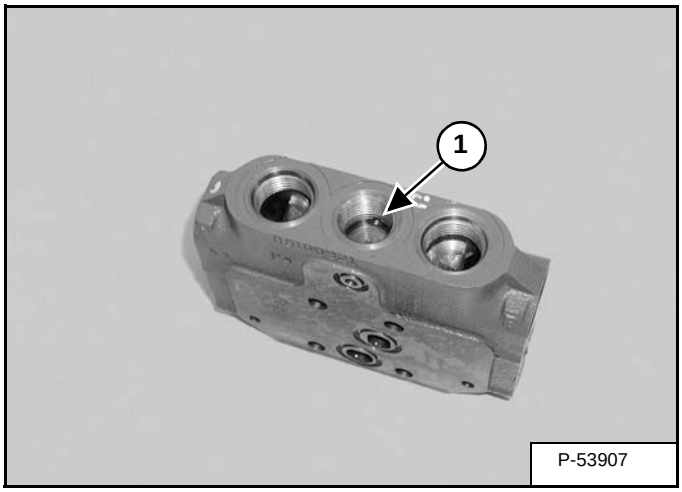
Auxiliary Valve Section Disassembly And Assembly (Cont'd)

Figure 20-40-189



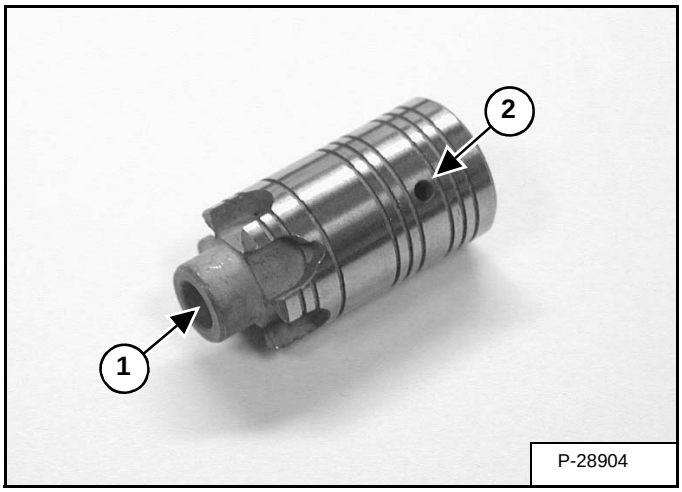
Remove the O-ring (Item 1) **[Figure 20-40-189]** from the plug.

Figure 20-40-190



Remove the compensator (Item 1) **[Figure 20-40-190]** from the valve section.

Figure 20-40-191



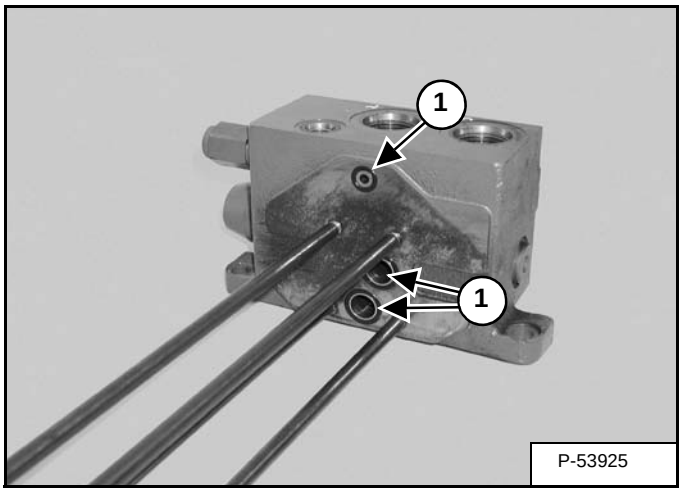
Check the orifice (Item 1) **[Figure 20-40-191]** in the compensator to be sure it is not plugged.

Check the crossport hole (Item 2) **[Figure 20-40-191]** to be sure it is not plugged.

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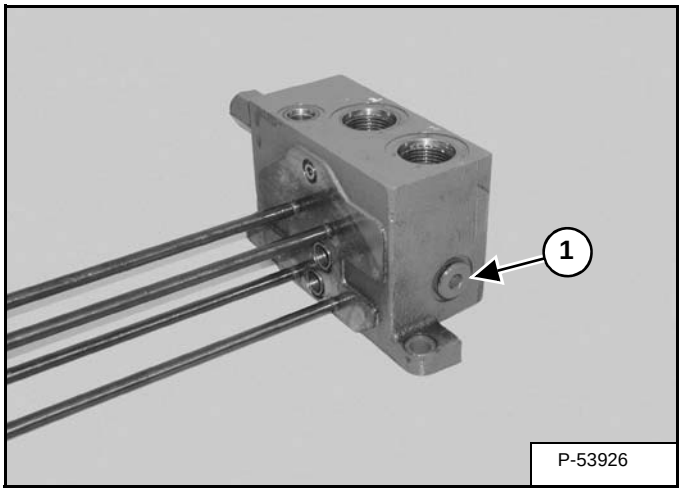
Inlet Section Disassembly And Assembly

Figure 20-40-192



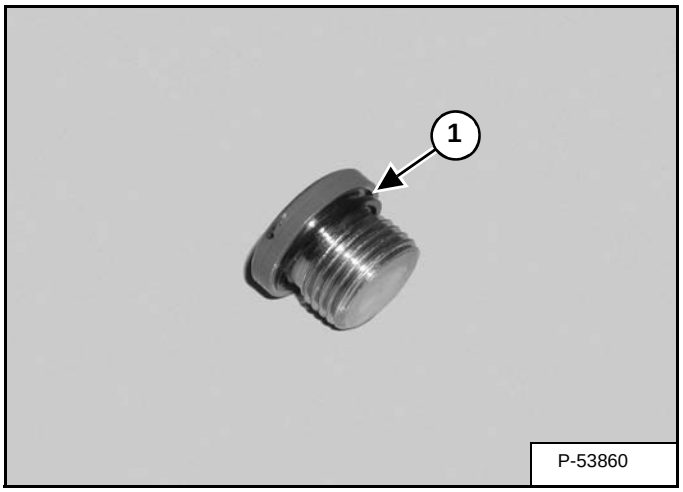
Remove the O-rings (Item 1) **[Figure 20-40-192]** from the inlet section.

Figure 20-40-193



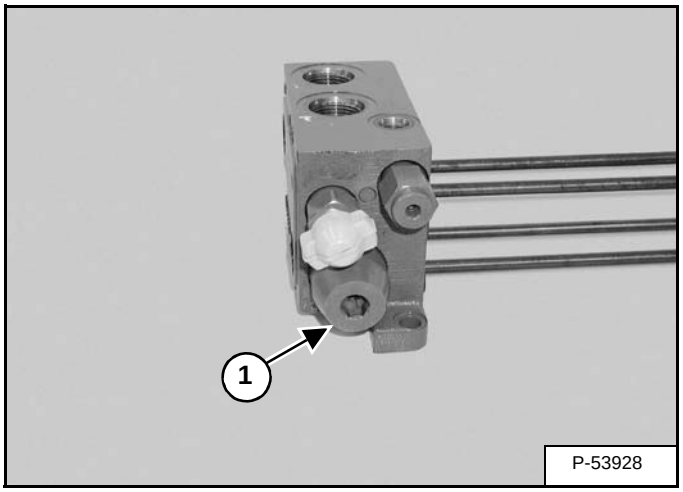
Remove the plug (Item 1) **[Figure 20-40-193]** that retains the flushing spool.

Figure 20-40-194



Remove the O-ring (Item 1) **[Figure 20-40-194]** from the plug.

Figure 20-40-195



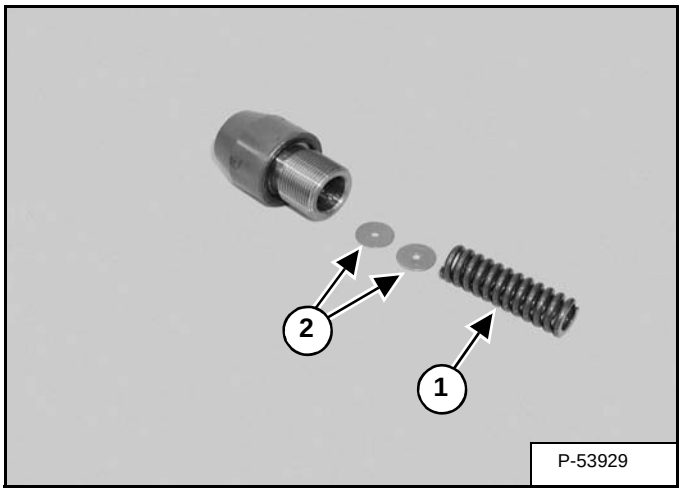
Remove the plug (Item 1) **[Figure 20-40-195]** from the valve section.

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HYDRAULIC CONTROL VALVE (S/N 562611001 & ABOVE, 562811001 & ABOVE AND 563211001 & ABOVE) (CONT'D)

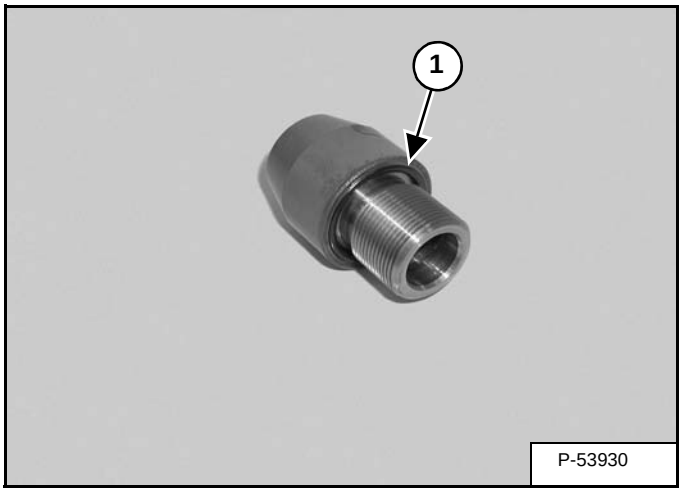
Inlet Section Disassembly And Assembly (Cont'd)

Figure 20-40-196



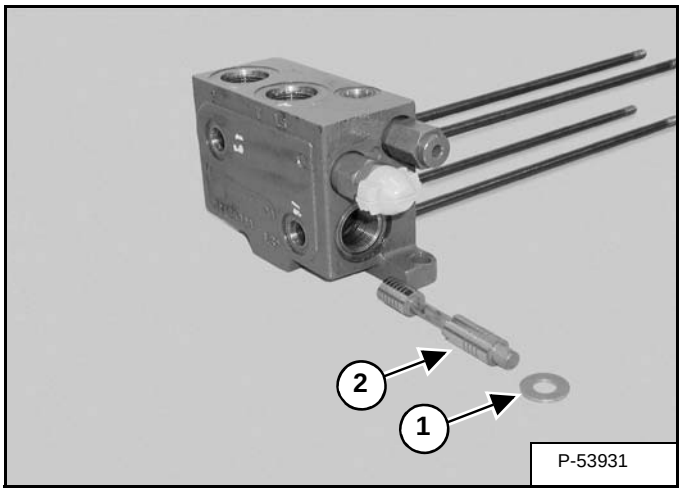
Remove the spring (Item 1) and shims (Item 2) **[Figure 20-40-196]** from the plug.

Figure 20-40-197



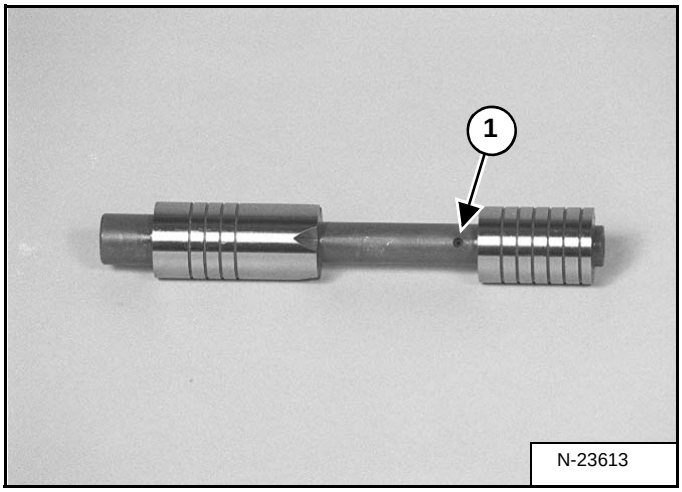
Remove the O-ring (Item 1) **[Figure 20-40-197]**.

Figure 20-40-198



Remove the washer (Item 1) and flushing spool (Item 2) **[Figure 20-40-198]** from the inlet section.

Figure 20-40-199

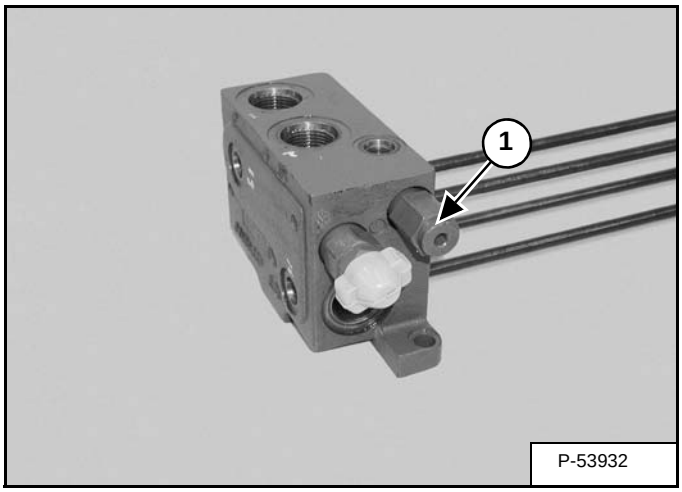


Check the orifice (Item 1) **[Figure 20-40-199]** to be sure it is not plugged.

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Inlet Section Disassembly And Assembly (Cont'd)

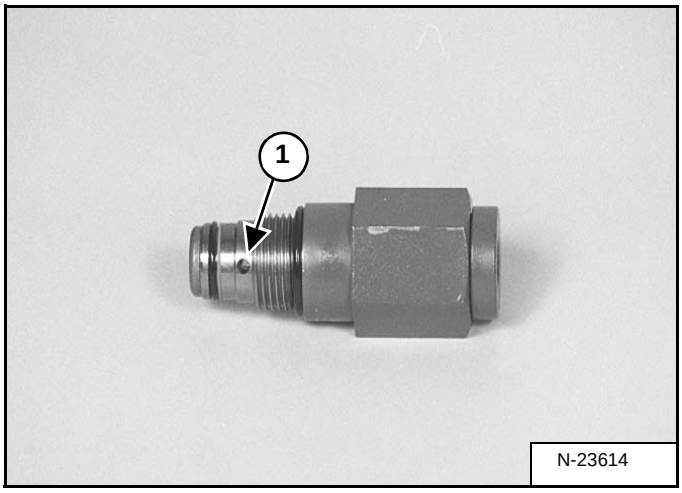
Figure 20-40-200



Remove the load sense bleed valve (Item 1) **[Figure 20-40-200]** from the inlet section.

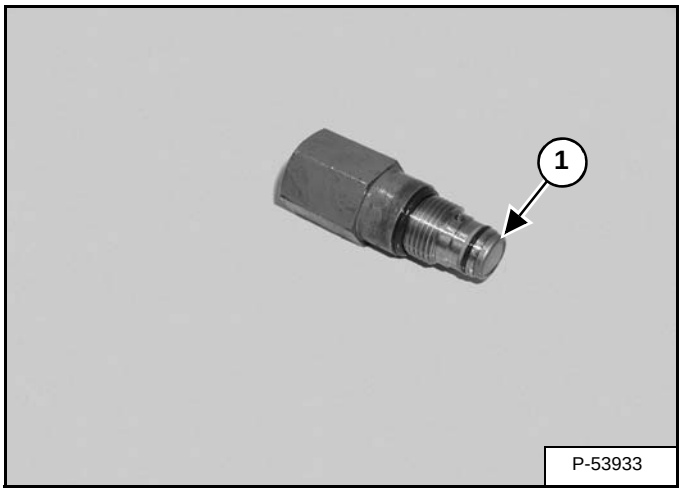
Assembly: Tighten the valve to 13 - 16 ft.-lb. (18 - 22 N•m) torque.

Figure 20-40-201



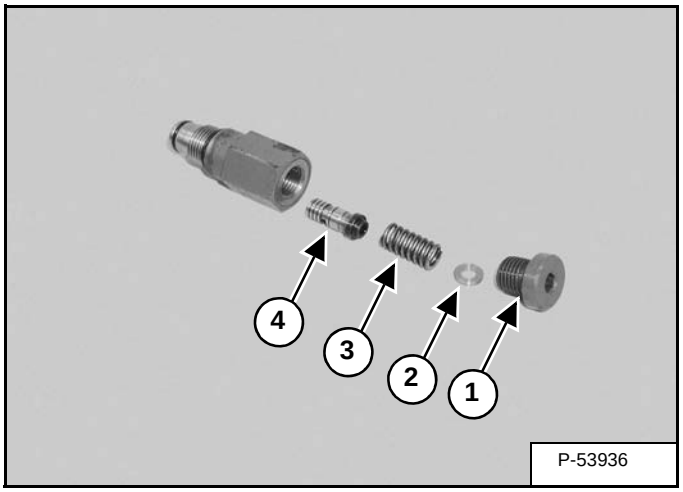
Check the port (Item 1) **[Figure 20-40-201]** in the load sense bleed valve to be sure it is not plugged.

Figure 20-40-202



Remove the filter (Item 1) **[Figure 20-40-202]** from the end of the load sense bleed valve.

Figure 20-40-203

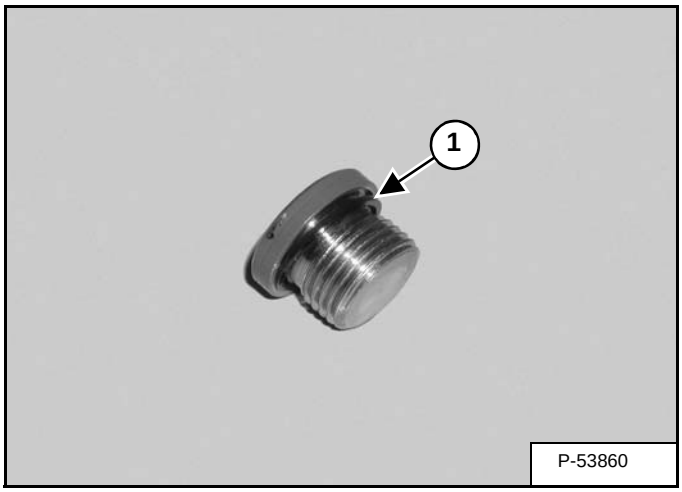


Remove the plug (Item 1), shims (Item 2), spring (Item 3) and spool (Item 4) **[Figure 20-40-203]**.

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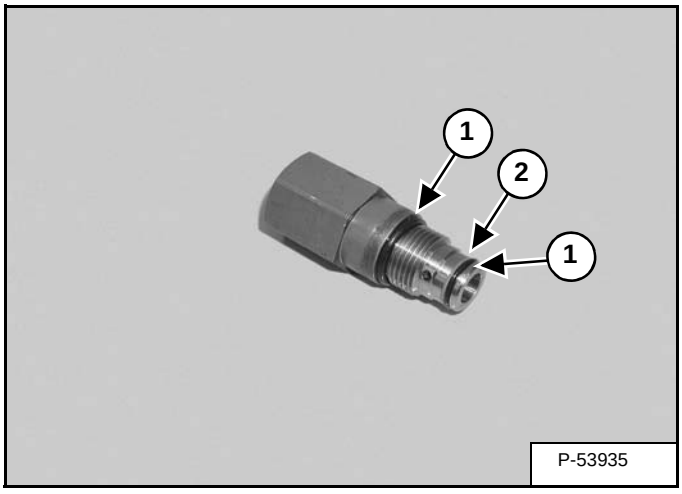
Inlet Section Disassembly And Assembly (Cont'd)

Figure 20-40-204



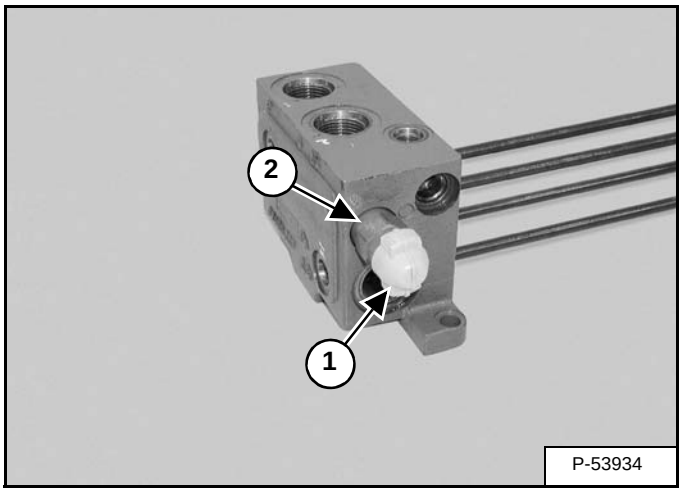
Remove the O-ring (Item 1) **[Figure 20-40-204]** from the plug.

Figure 20-40-205



Remove the O-rings (Item 1) and back-up ring (Item 2) **[Figure 20-40-205]**.

Figure 20-40-206

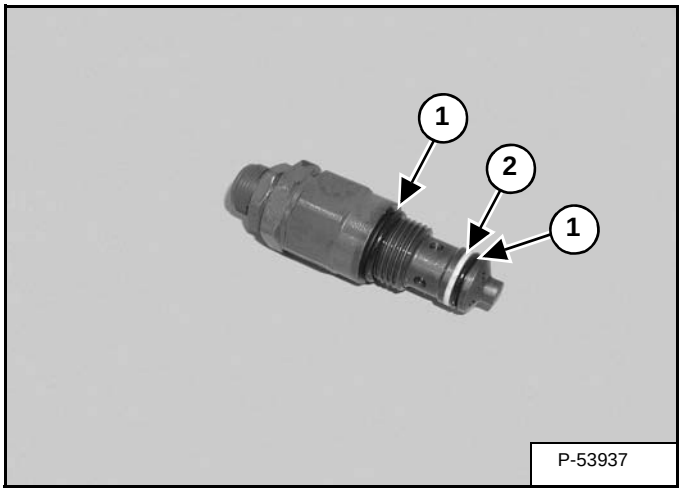


Remove the protective cover (Item 1) from the load sense relief valve (Item 2) **[Figure 20-40-206]**.

Remove the load sense relief valve from the inlet section.

Assembly: Tighten the load sense relief valve to 17 - 20 ft.-lb. (23 - 27 N•m) torque.

Figure 20-40-207

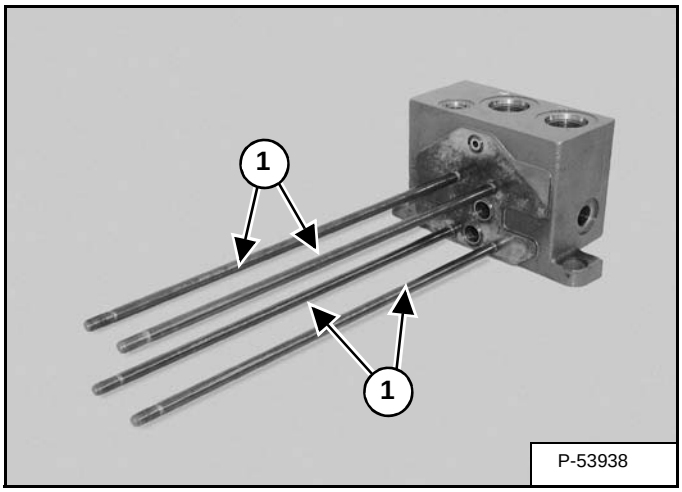


Remove the O-rings (Item 1), back-up ring (Item 2) **[Figure 20-40-207]** from the relief valve.

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Inlet Section Disassembly And Assembly (Cont'd)

Figure 20-40-208



Remove the tie rods (Item 1) **[Figure 20-40-208]** from the inlet section.

Assembly: Tighten the tie rods to 16 - 19 ft.-lb. (22 - 26 N•m) torque.

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Assembly

IMPORTANT

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

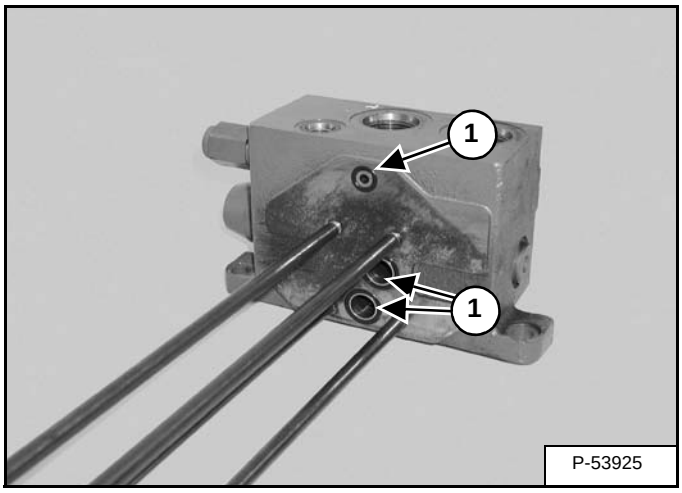
I-2003-0888

Clean all parts in solvent and dry with compressed air.

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

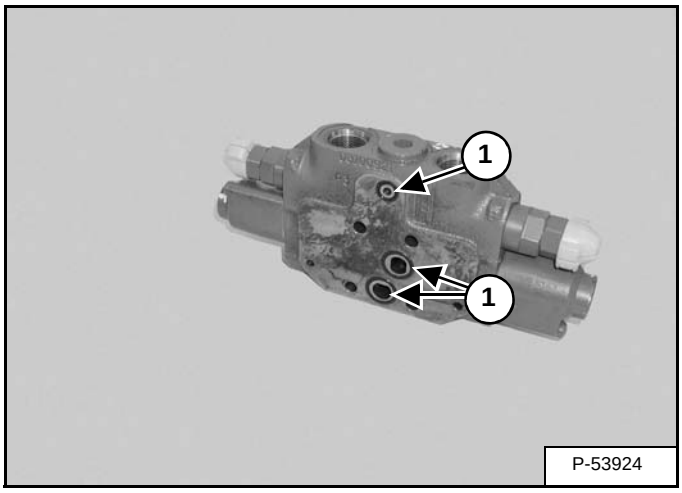
Always install new seals and O-rings. Lubricate all seals and O-rings with clean hydraulic fluid before installation.

Figure 20-40-209



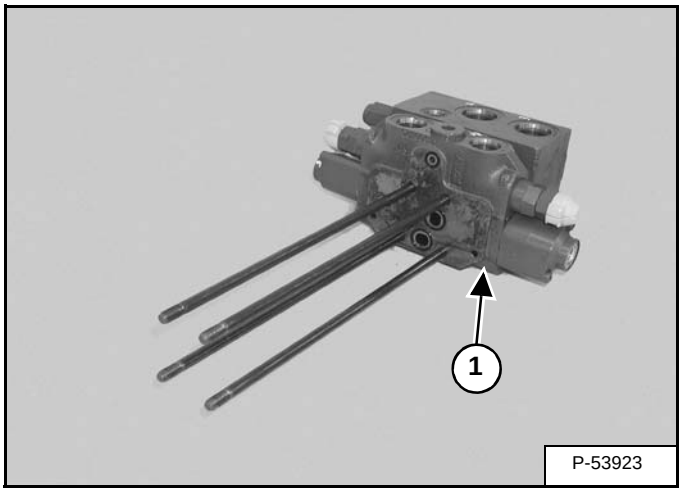
Install the O-rings (Item 1) **[Figure 20-40-209]** on the inlet section.

Figure 20-40-210



Install the O-rings (Item 1) **[Figure 20-40-210]** on the auxiliary valve section.

Figure 20-40-211

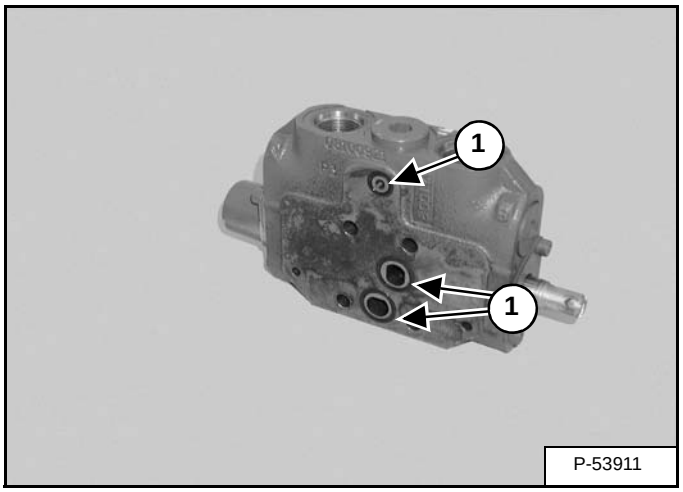


Install the auxiliary valve section (Item 1) **[Figure 20-40-211]** on the tie rods.

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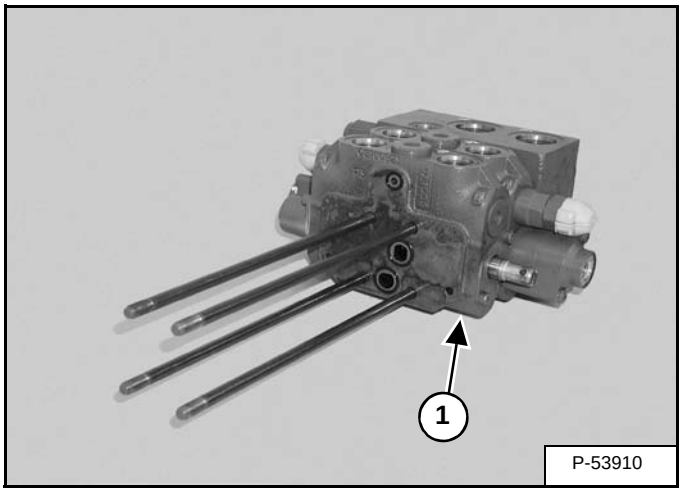
Assembly (Cont'd)

Figure 20-40-212



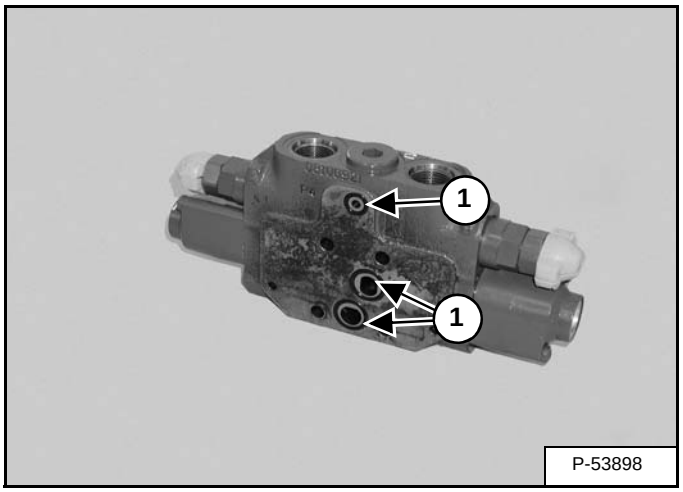
Install the O-rings (Item 1) **[Figure 20-40-212]** on the boom swing valve section.

Figure 20-40-213



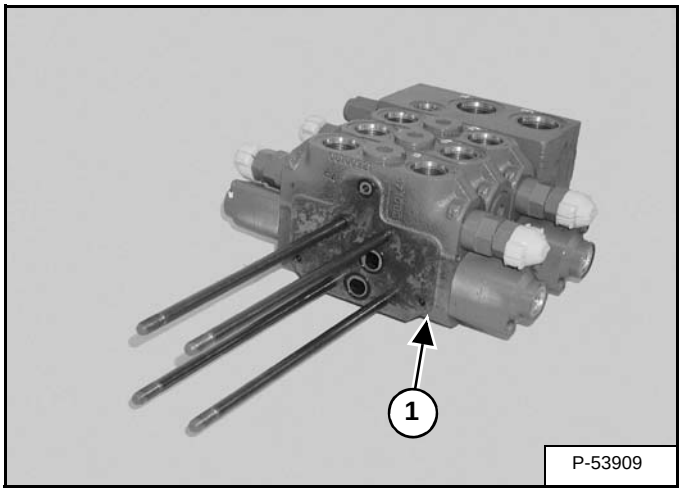
Install the boom swing section (Item 1) **[Figure 20-40-213]** on the tie rods.

Figure 20-40-214



Install the O-rings (Item 1) **[Figure 20-40-214]** on the boom valve.

Figure 20-40-215



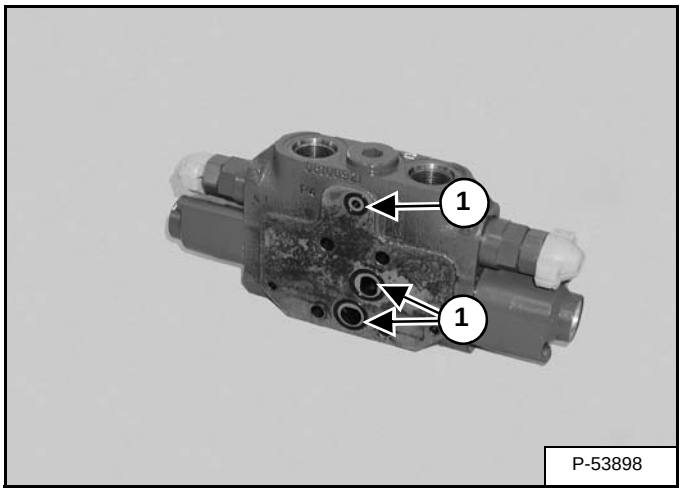
Install the boom valve section (Item 1) **[Figure 20-40-215]** on the tie rods.

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HYDRAULIC CONTROL VALVE (S/N 562611001 & ABOVE, 562811001 & ABOVE AND 563211001 & ABOVE) (CONT'D)

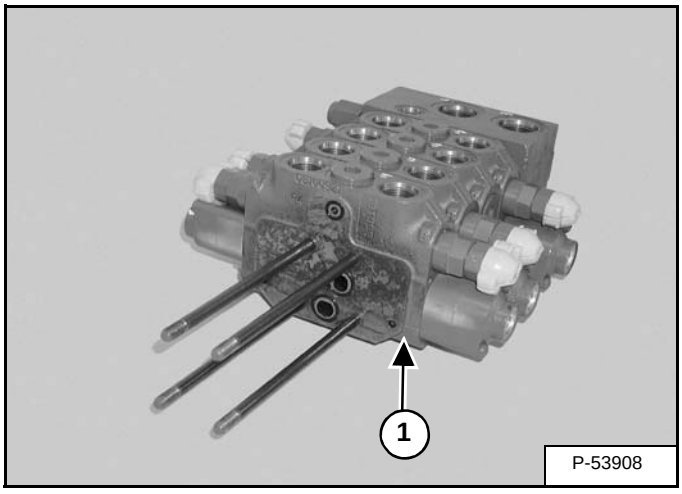
Assembly (Cont'd)

Figure 20-40-216



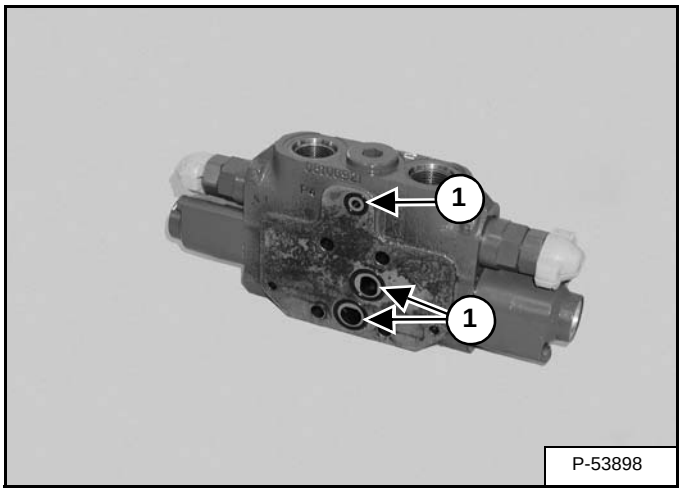
Install the O-rings (Item 1) **[Figure 20-40-216]** on the arm valve section.

Figure 20-40-217



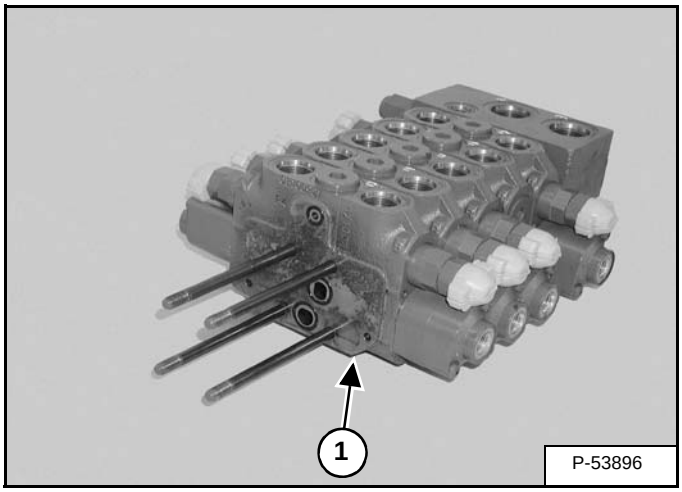
Install the arm valve section (Item 1) **[Figure 20-40-217]** on the tie rods.

Figure 20-40-218



Install the O-rings (Item 1) **[Figure 20-40-218]** on the bucket valve section.

Figure 20-40-219

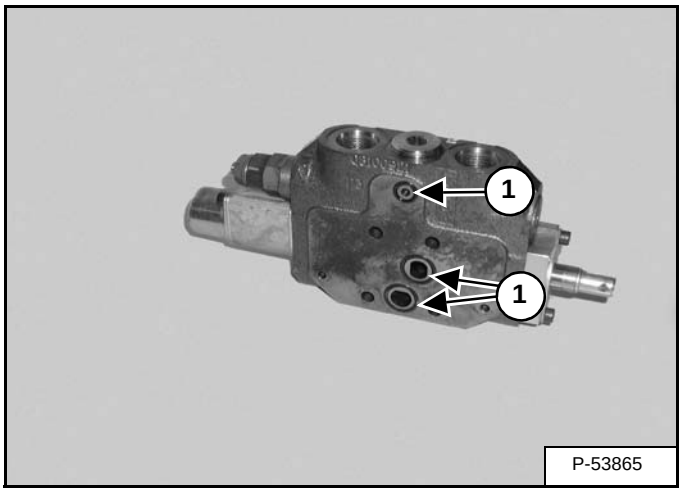


Install the bucket valve section (Item 1) **[Figure 20-40-219]** on the tie rods.

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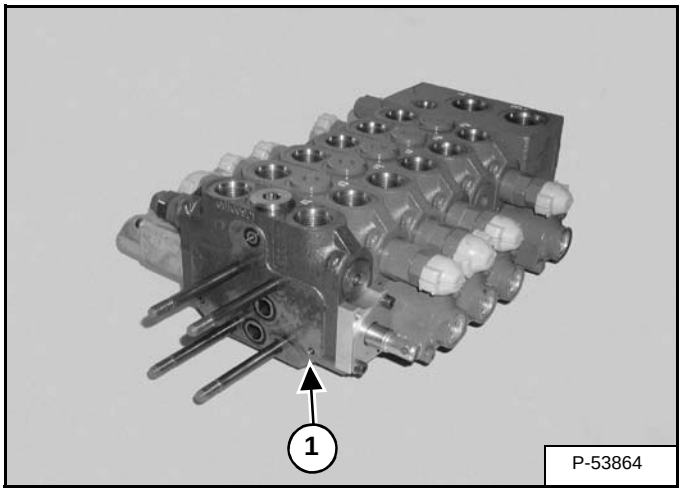
Assembly (Cont'd)

Figure 20-40-220



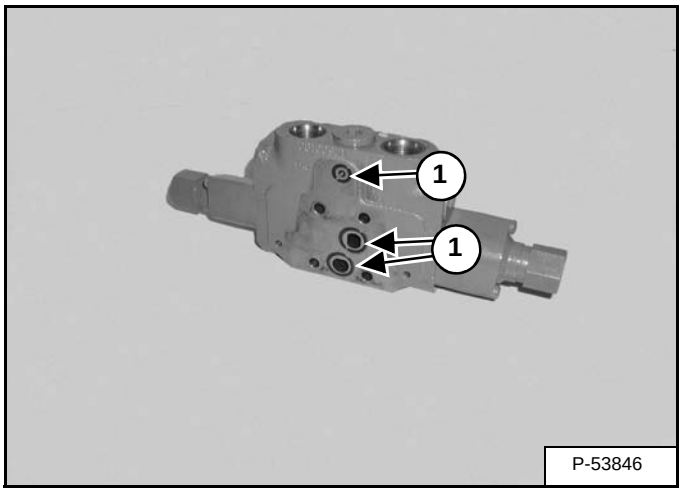
Install the O-rings (Item 1) **[Figure 20-40-220]** on the blade valve section.

Figure 20-40-221



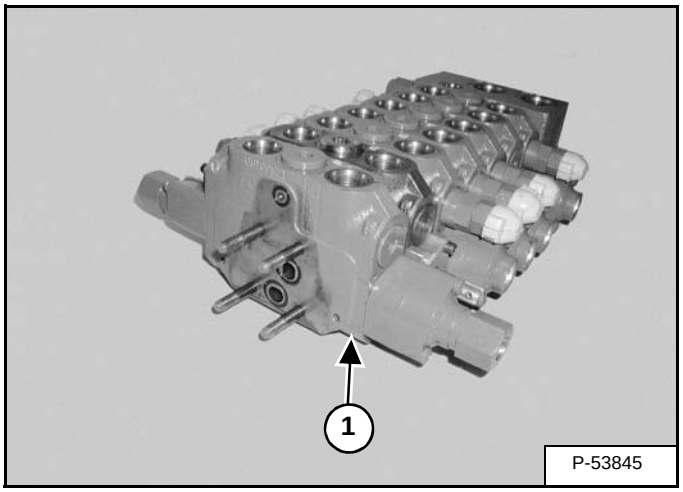
Install the blade valve section (Item 1) **[Figure 20-40-221]** on the tie rods.

Figure 20-40-222



Install the O-rings (Item 1) **[Figure 20-40-222]** on the slew valve section.

Figure 20-40-223

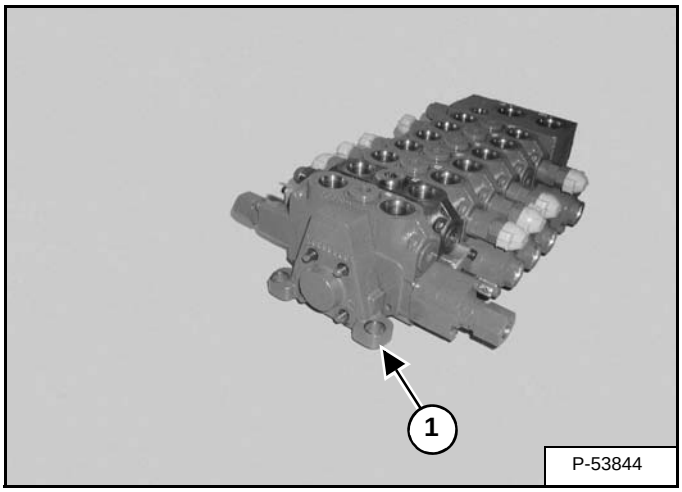


Install the slew valve section (Item 1) **[Figure 20-40-223]** on the tie rods.

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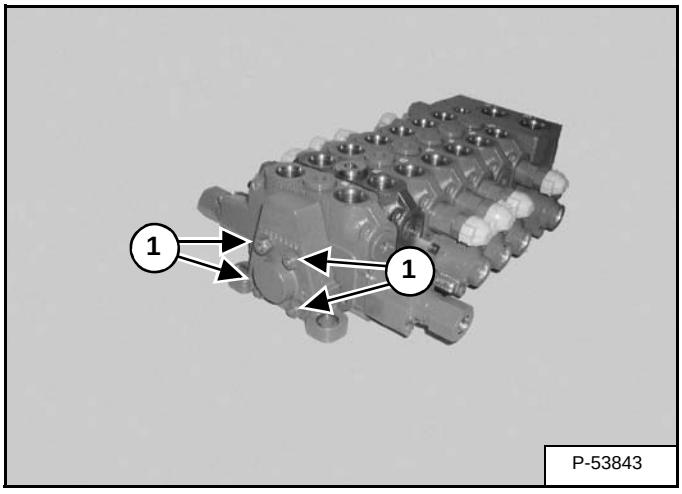
Assembly (Cont'd)

Figure 20-40-224



Install the end cap (Item 1) **[Figure 20-40-224]** on the tie rods.

Figure 20-40-225



Install the four nuts (Item 1) **[Figure 20-40-225]** on the tie rods, finger tight.

Be sure the valve assembly does not rock on a flat surface.

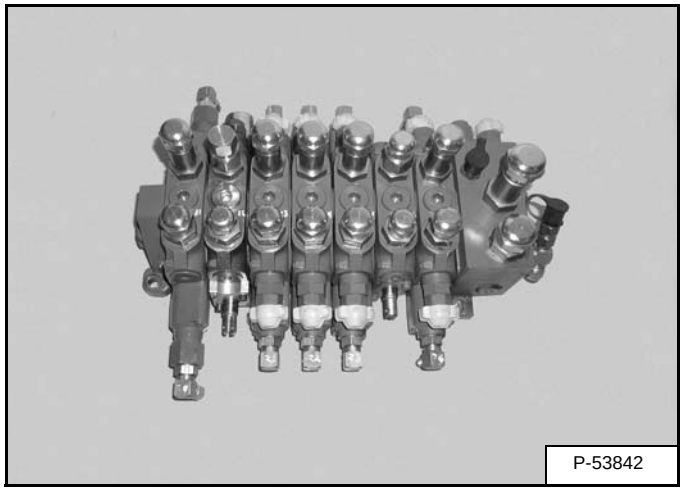
Initially tighten the tie rod nuts (Item 1) to 10 ft.-lb. (13 N•m) torque in a crisscross manner. Final tighten the tie rod nuts (Item 1) **[Figure 20-40-225]** to 16 - 19 ft.-lb. (22 - 26 N•m) torque.

The valve assembly must not have any spacing between the valve sections and the spools must be free when pushed in and released.

The spools must not stick, if the spools stick, loosen the tie rod nuts and tighten per above information.

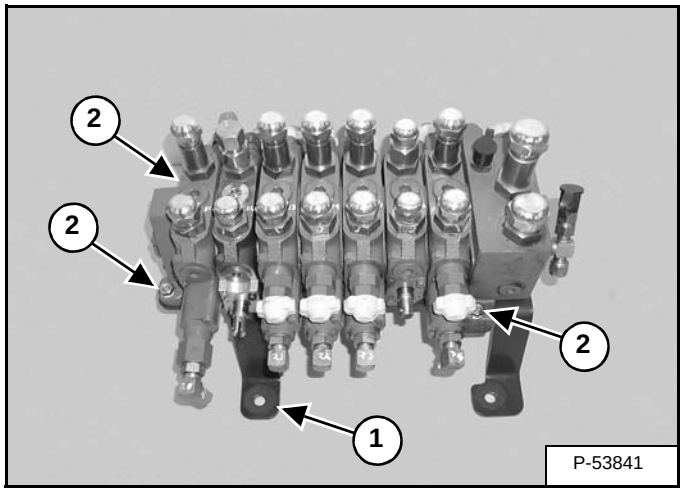
Recheck the control valve assembly for level settings.

Figure 20-40-226



Install the fittings **[Figure 20-40-226]**.

Figure 20-40-227



Install the mount plate (Item 1) with three bolts and nuts (Item 2) **[Figure 20-40-227]**.

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HYDRAULIC CONTROL VALVE (S/N 563111001 & ABOVE)

Removal And Installation

Lower the boom/bucket and blade to the ground.

Stop the engine.

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

IMPORTANT

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

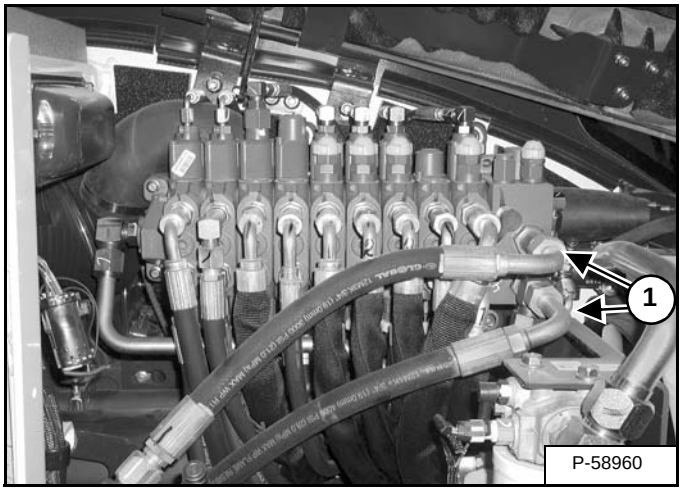
I-2003-0888

Drain the hydraulic reservoir. (See Replacing The Hydraulic Oil on Page 10-100-2.)

Open the right side cover.

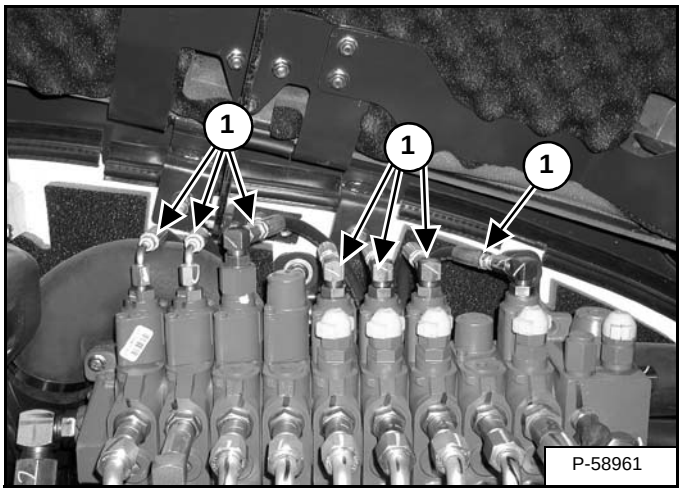
Mark all tubelines and hoses for proper installation.

Figure 20-41-1



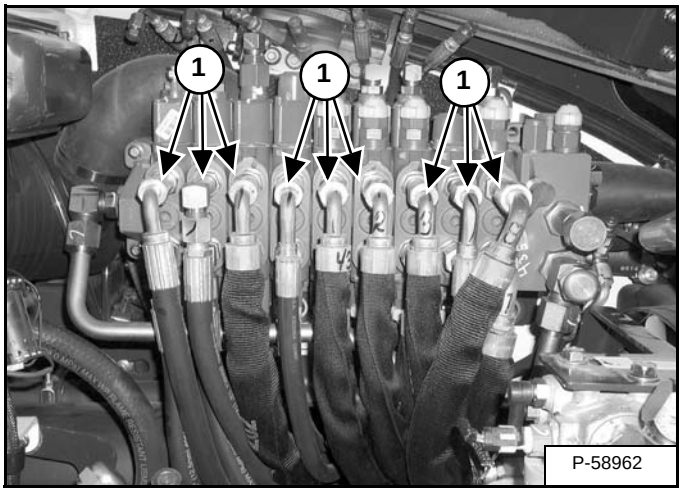
Remove the hoses (Item 1) **[Figure 20-41-1]**.

Figure 20-41-2



Remove the hoses (Item 1) **[Figure 20-41-2]**.

Figure 20-41-3

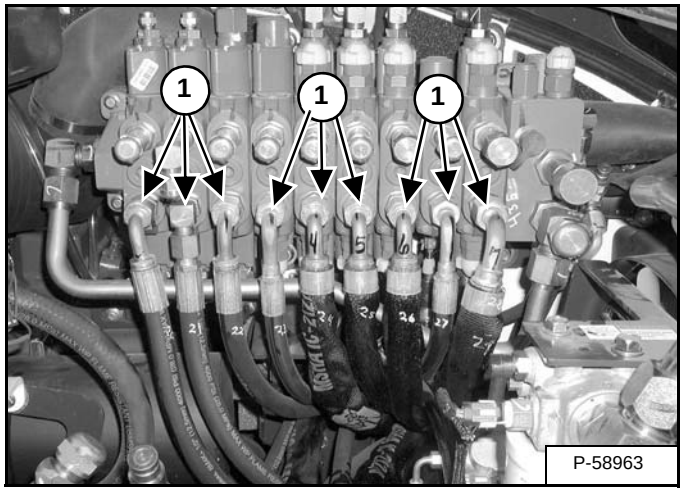


Remove the hoses (Item 1) **[Figure 20-41-3]**.

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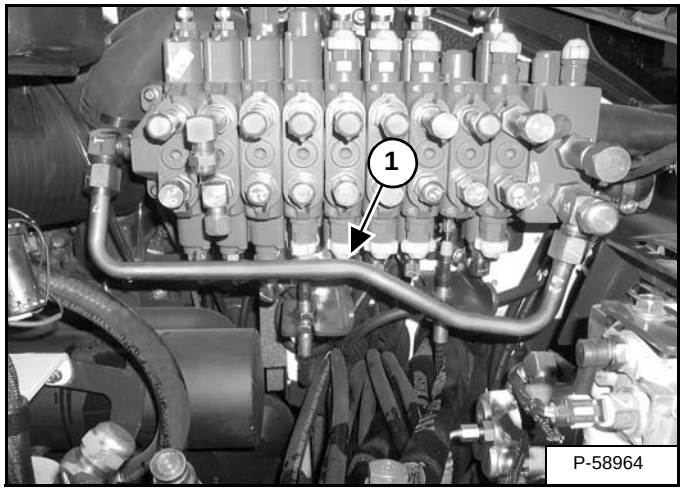
Removal And Installation (Cont'd)

Figure 20-41-4



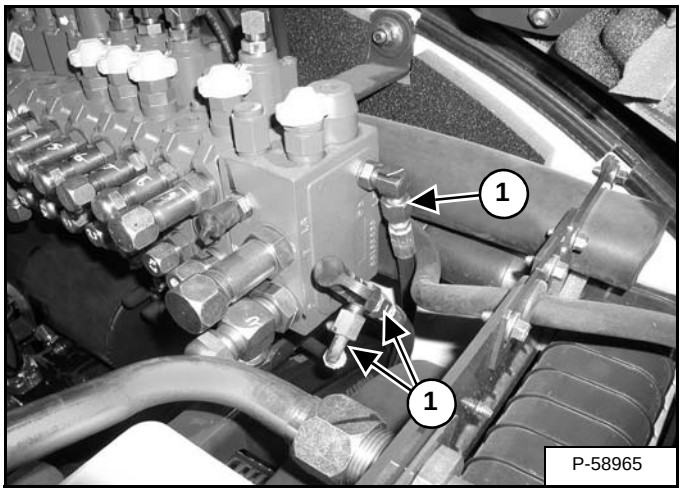
Remove the hoses (Item 1) **[Figure 20-41-4]**.

Figure 20-41-5



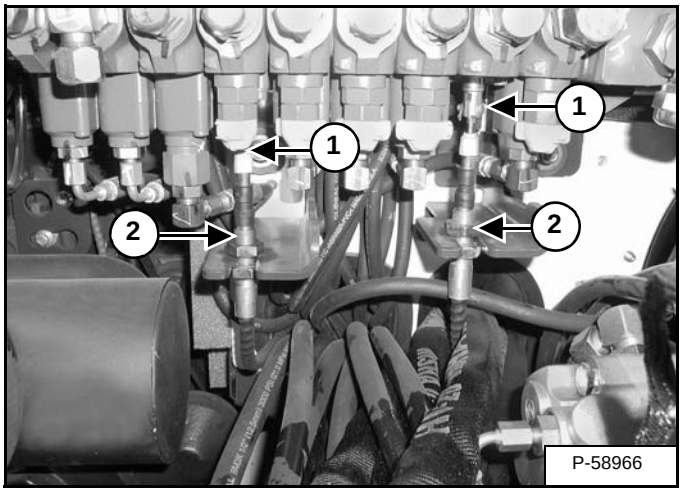
Remove the tubeline (Item 1) **[Figure 20-41-5]**.

Figure 20-41-6



Remove the hoses (Item 1) **[Figure 20-41-6]**.

Figure 20-41-7

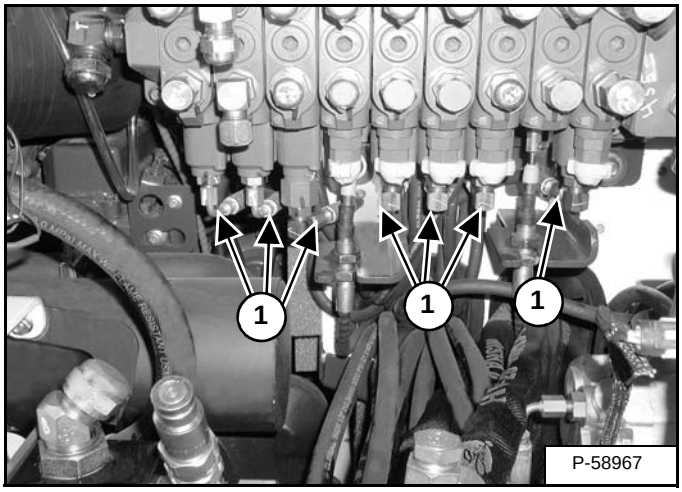


Remove the cotter pins and clevis pins (Item 1) from the swing and blade linkages (Item 2) **[Figure 20-41-7]**.

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Removal And Installation (Cont'd)

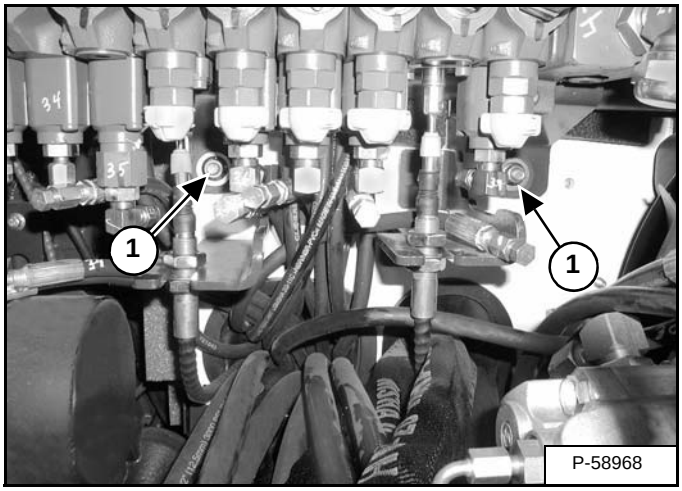
Figure 20-41-8



Remove the hoses (Item 1) **[Figure 20-41-8]**.

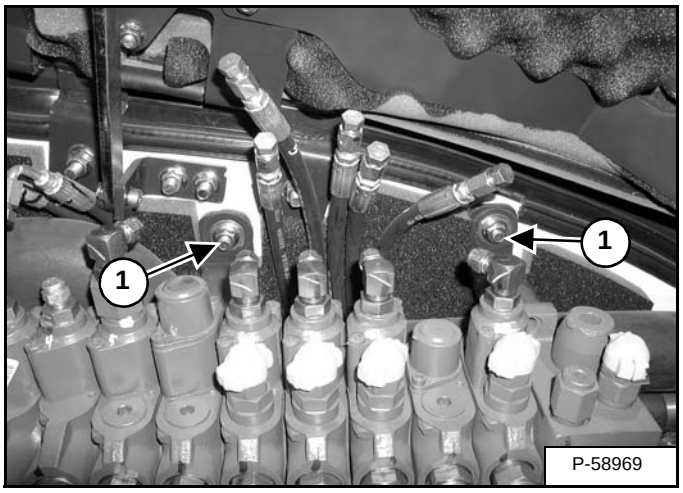
NOTE: If pilot pressure hose replacement is required, see Hoses for hose routing diagrams. (See HOSES on Page 20-114-1.)

Figure 20-41-9



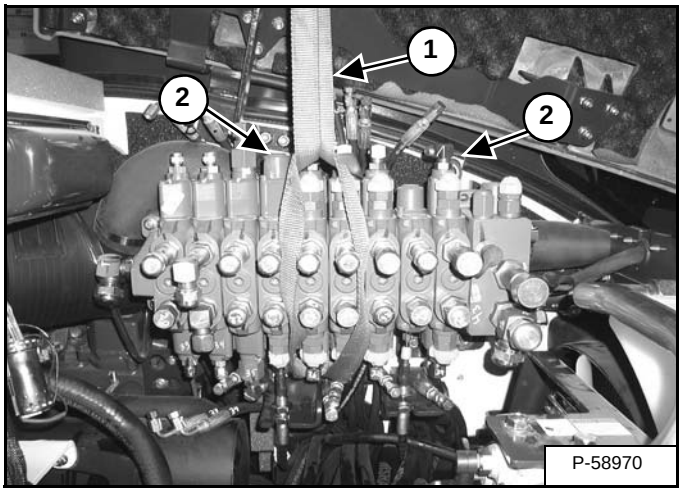
Remove the two nuts (Item 1) **[Figure 20-41-9]** and washers.

Figure 20-41-10



Loosen the two nuts (Item 1) **[Figure 20-41-10]**.

Figure 20-41-11



Install a sling (Item 1) **[Figure 20-41-11]** around the control valve and connect to a hoist.

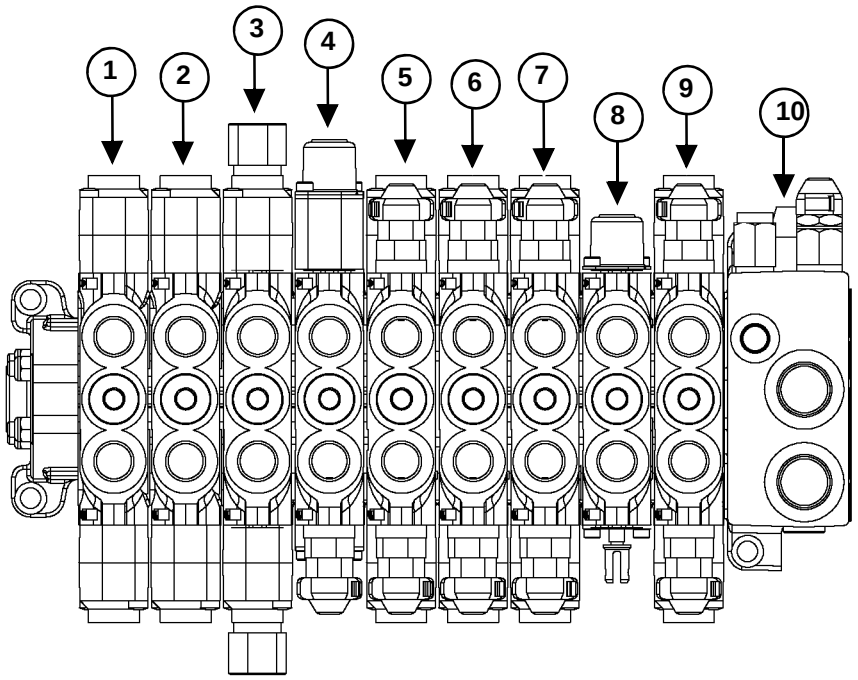
Remove the two nuts (Item 2) **[Figure 20-41-11]** and washers.

Remove the control valve from the excavator.

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Parts Identification

1. Right Travel Section
2. Left Travel Section
3. Upperstructure Slew Section
4. Blade Section
5. Bucket Section
6. Arm Section
7. Boom Section
8. Boom Swing Section
9. Auxiliary Hydraulic Section
10. Inlet/Outlet Section



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Disassembly

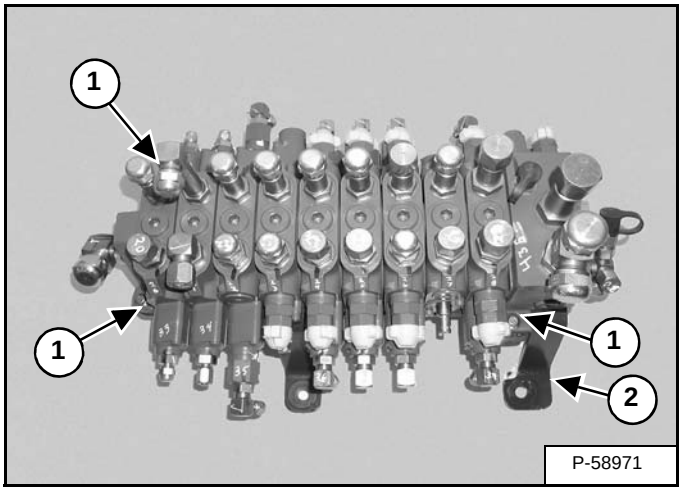
Clean the outside of the control valve before disassembly.

IMPORTANT

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

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Figure 20-41-12

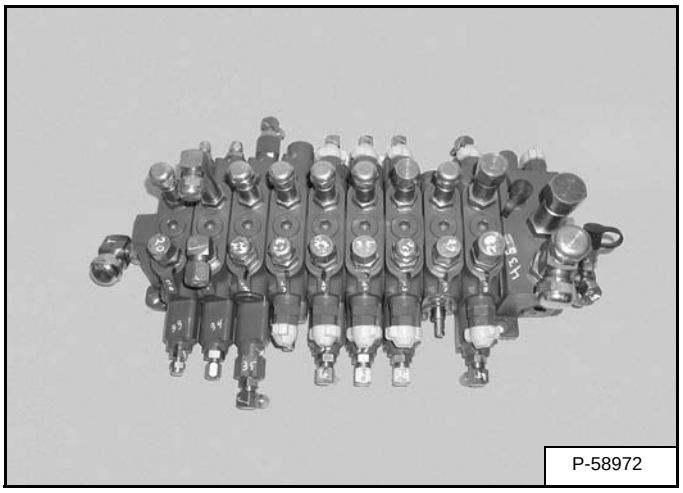


Remove the three bolts (Item 1) from the mount plate (Item 2) **[Figure 20-41-12]**.

Remove the mount plate from the control valve.

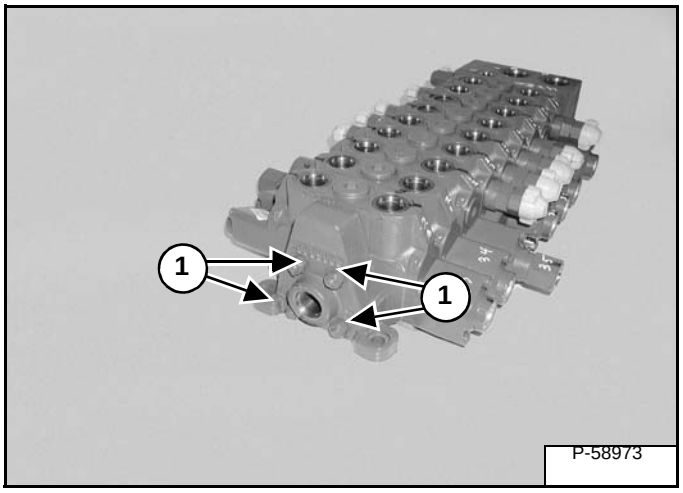
Mark all of the sections of the control valve for proper installation.

Figure 20-41-13



Remove the fittings **[Figure 20-41-13]**.

Figure 20-41-14

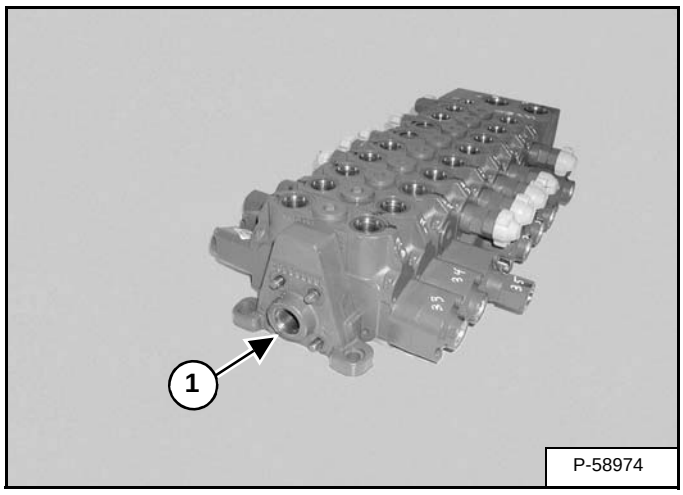


Remove the nuts (Item 1) **[Figure 20-41-14]** and washers.

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Disassembly (Cont'd)

Figure 20-41-15

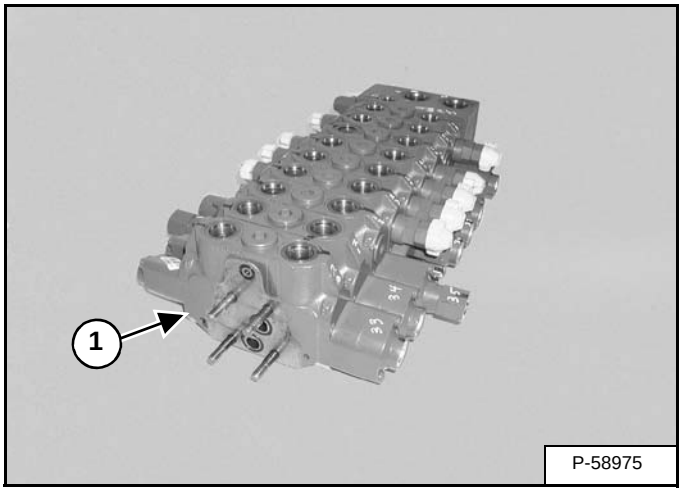


Remove the end cap (Item 1) **[Figure 20-41-15]** from the control valve.

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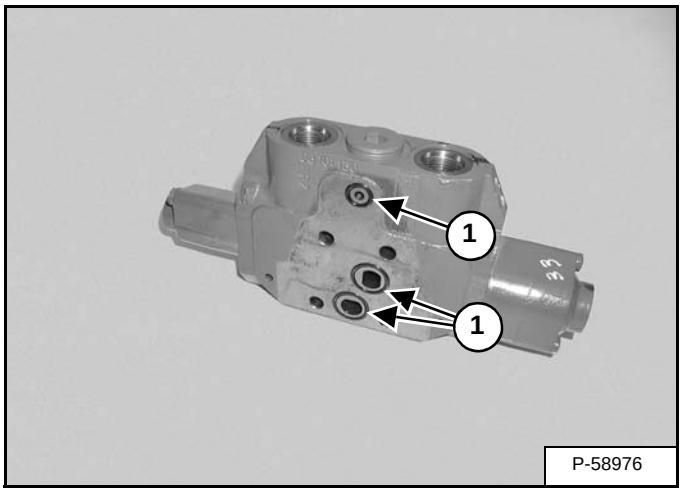
Right Travel Valve Section Disassembly And Assembly

Figure 20-41-16



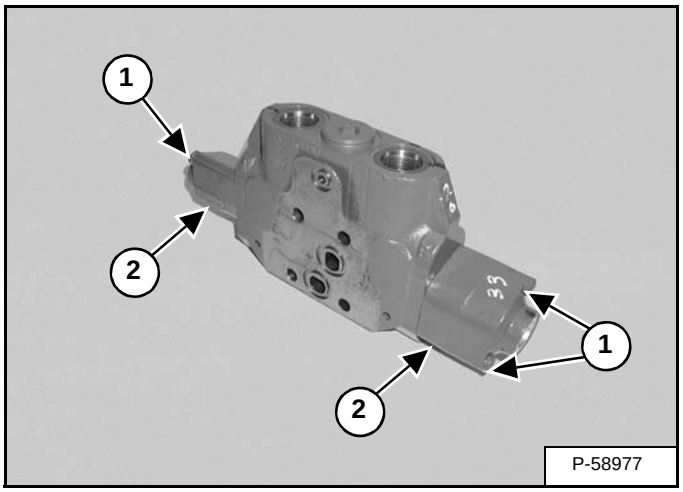
Remove the right travel valve section (Item 1) **[Figure 20-41-16]** from the control valve.

Figure 20-41-17



Remove the O-rings (Item 1) **[Figure 20-41-17]** from the valve section.

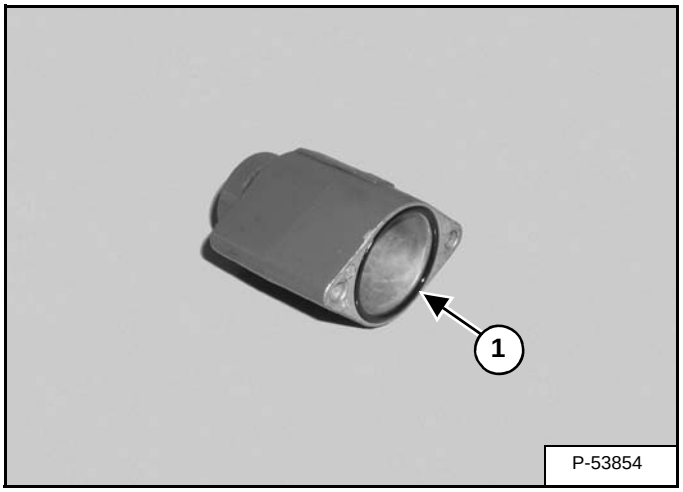
Figure 20-41-18



Remove the screws (Item 1) from both end caps (Item 2) **[Figure 20-41-18]**.

Remove the end caps from the valve section.

Figure 20-41-19

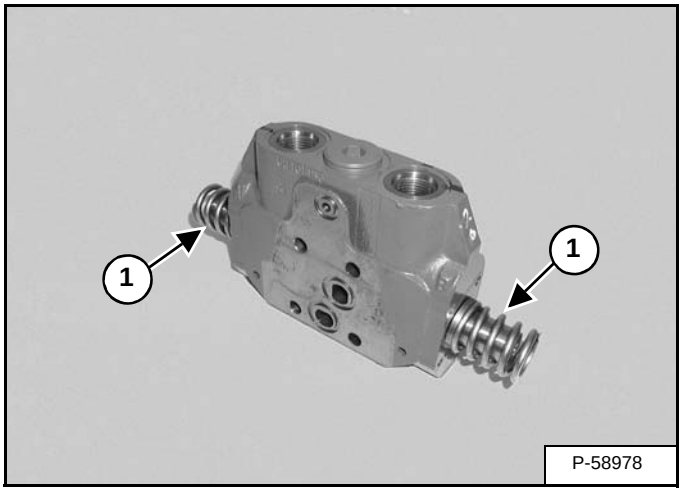


Remove the O-ring (Item 1) **[Figure 20-41-19]** from the end caps.

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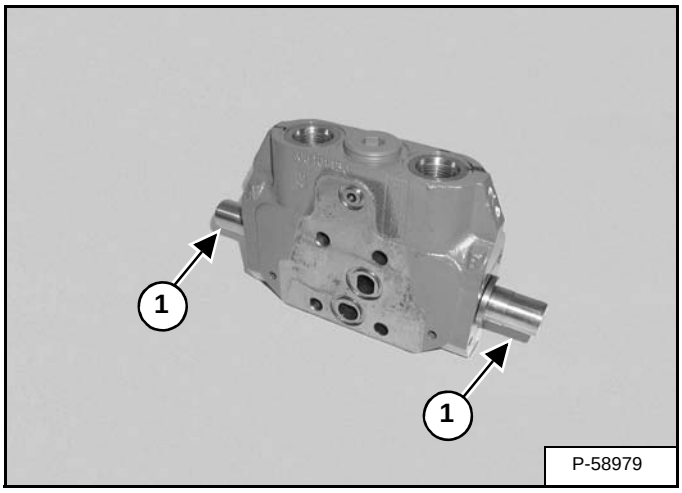
Right Travel Valve Section Disassembly And Assembly (Cont'd)

Figure 20-41-20



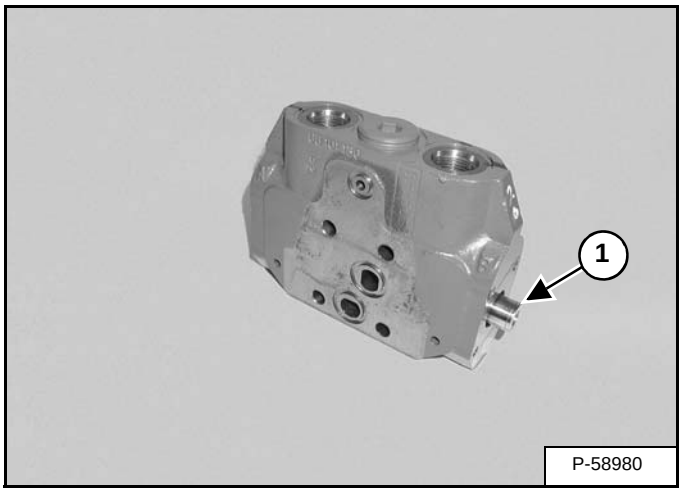
Remove the centering springs (Item 1) **[Figure 20-41-20]** from the spring guides.

Figure 20-41-21



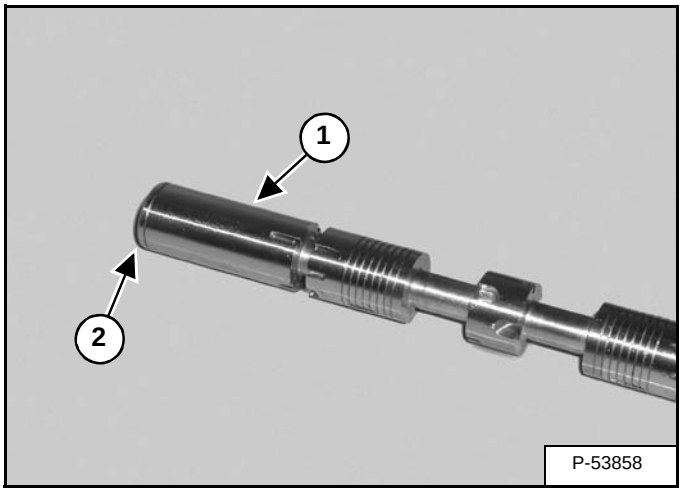
Remove the spring guides (Item 1) **[Figure 20-41-21]** from both ends of the valve spool.

Figure 20-41-22



Remove the spool (Item 1) **[Figure 20-41-22]** from the valve section.

Figure 20-41-23

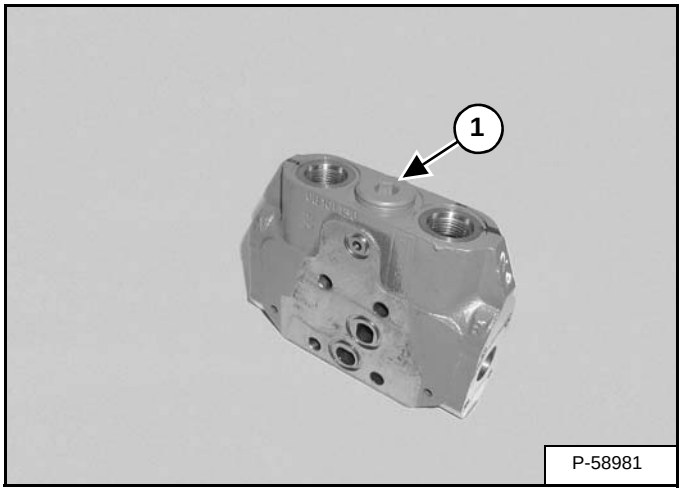


Assembly: The spool (Item 1) is symmetrical, and can be installed in the valve section with the spool groove (Item 2) **[Figure 20-41-23]** either toward the top, or the bottom of the valve section.

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

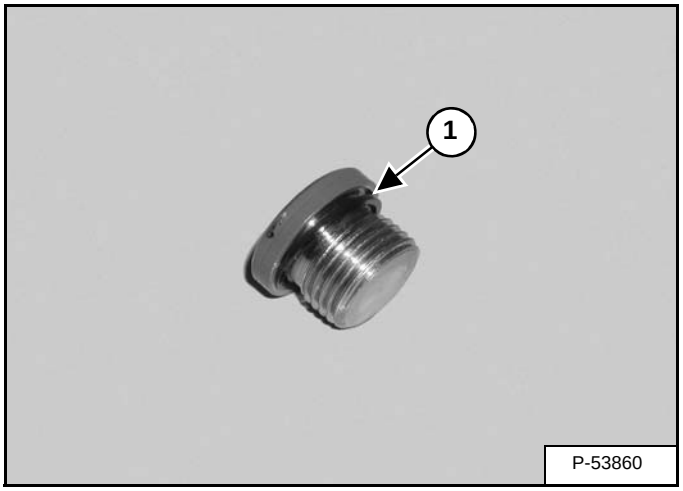
Figure 20-41-24



Remove the plug (Item 1) **[Figure 20-41-24]** from the top of the valve section.

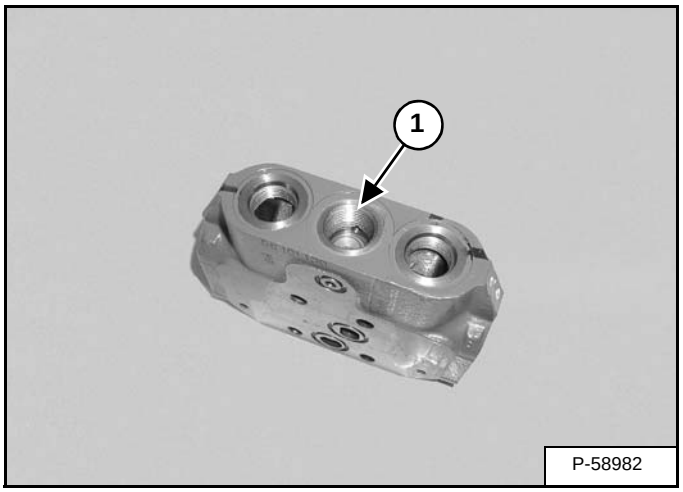
Assembly: Tighten the plug to 46 - 57 ft.-lb. (63 - 77 N•m) torque.

Figure 20-41-25



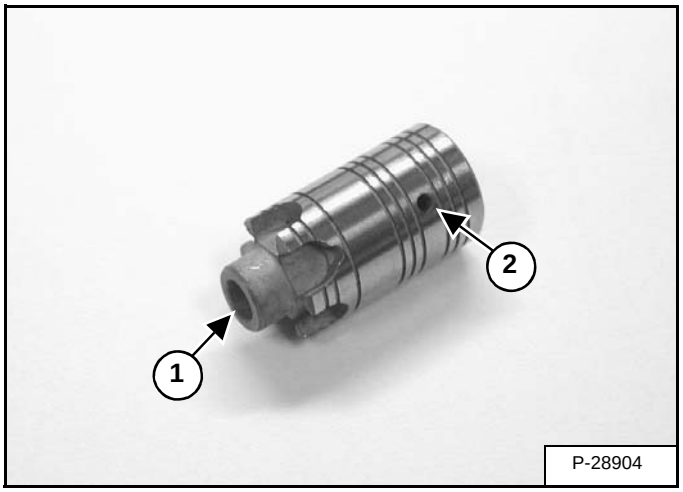
Remove the O-ring (Item 1) **[Figure 20-41-25]** from the plug.

Figure 20-41-26



Remove the compensator (Item 1) **[Figure 20-41-26]** from the valve section.

Figure 20-41-27



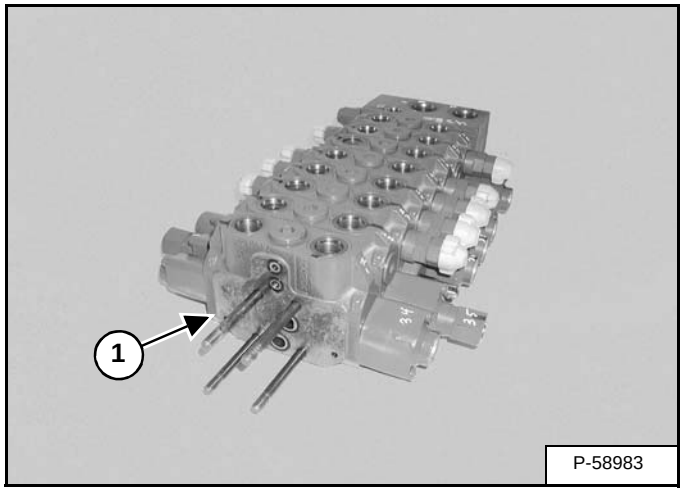
Check the orifice (Item 1) **[Figure 20-41-27]** in the compensator to be sure it is not plugged.

Check the crossport hole (Item 2) **[Figure 20-41-27]** to be sure it is not plugged.

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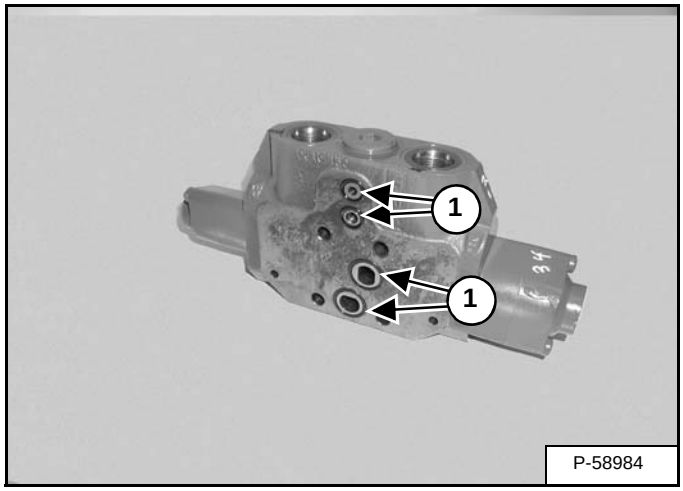
Left Travel Valve Section Disassembly And Assembly

Figure 20-41-28



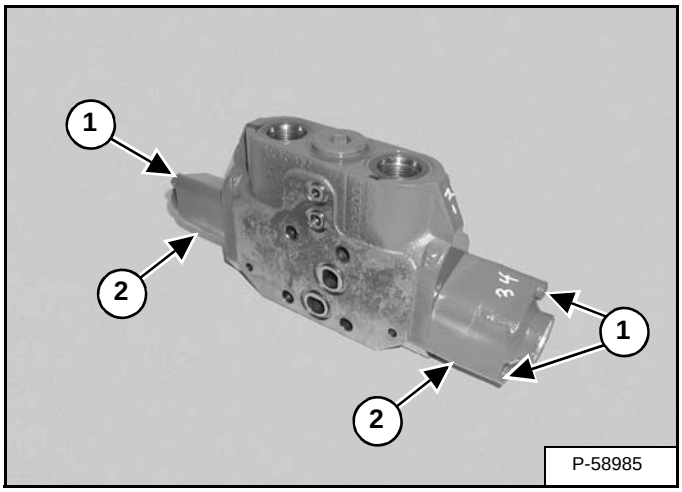
Remove the left travel valve section (Item 1) **[Figure 20-41-28]** from the control valve.

Figure 20-41-29



Remove the O-rings (Item 1) **[Figure 20-41-29]** from the valve section.

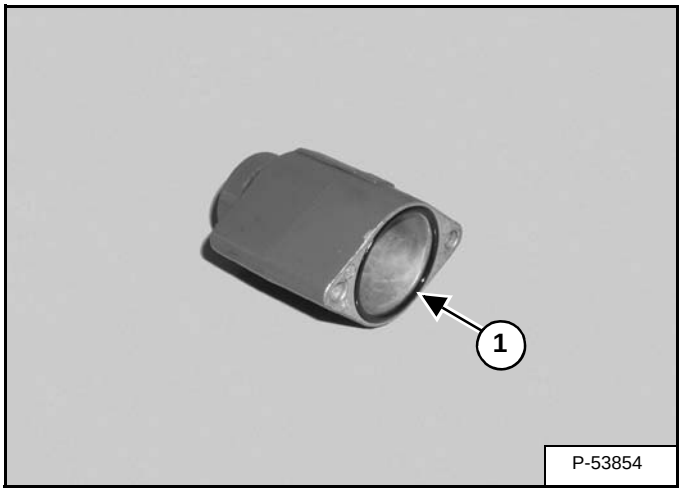
Figure 20-41-30



Remove the screws (Item 1) from both end caps (Item 2) **[Figure 20-41-30]**.

Remove the end caps from the valve section.

Figure 20-41-31

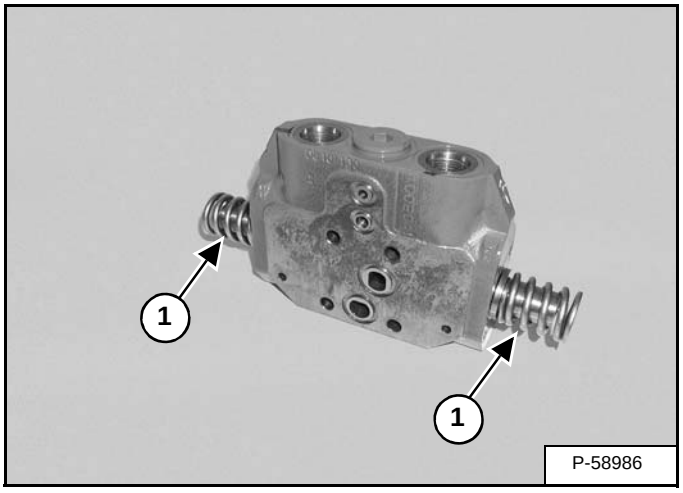


Remove the O-ring (Item 1) **[Figure 20-41-31]** from the end caps.

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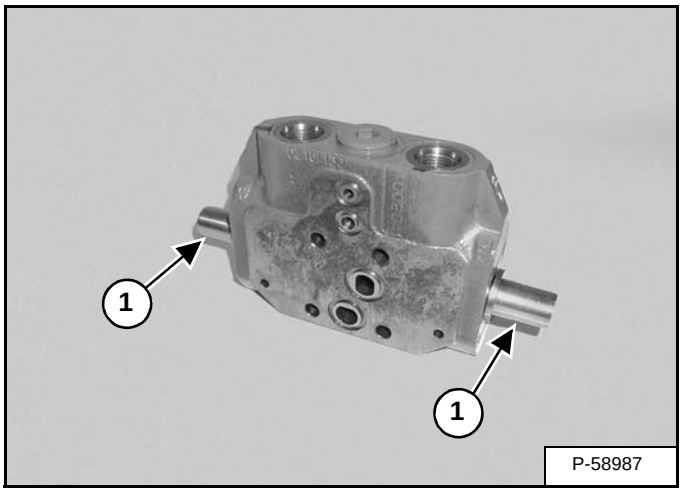
Left Travel Valve Section Disassembly And Assembly (Cont'd)

Figure 20-41-32



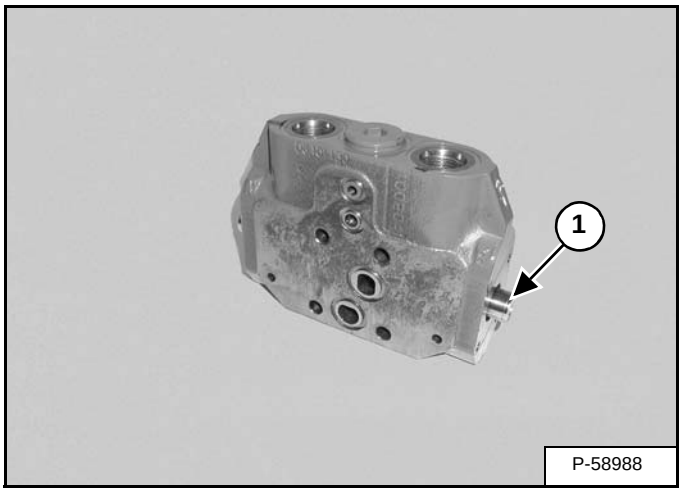
Remove the centering springs (Item 1) **[Figure 20-41-32]** from the spring guides.

Figure 20-41-33



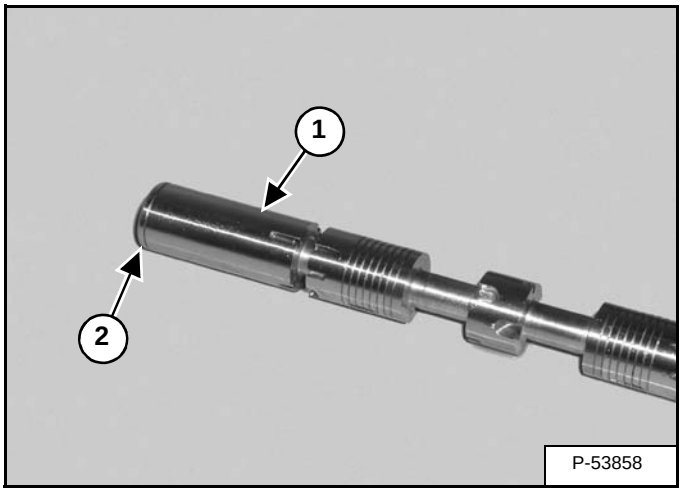
Remove the spring guides (Item 1) **[Figure 20-41-33]** from both ends of the valve spool.

Figure 20-41-34



Remove the spool (Item 1) **[Figure 20-41-34]** from the valve section.

Figure 20-41-35

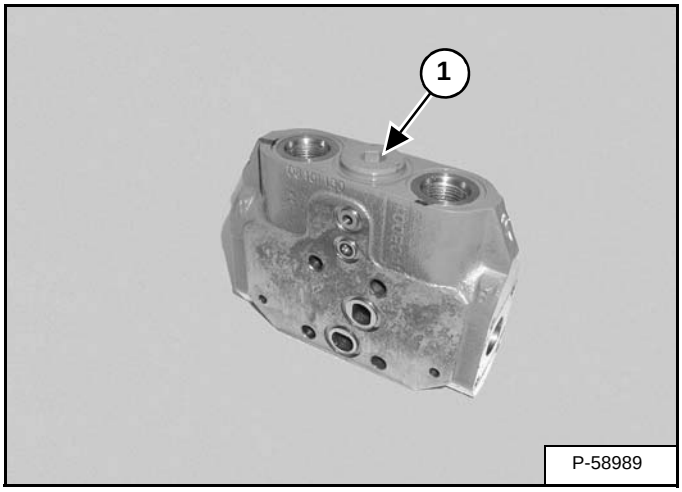


Assembly: The spool (Item 1) is symmetrical, and can be installed in the valve section with the spool groove (Item 2) **[Figure 20-41-35]** either toward the top, or the bottom of the valve section.

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

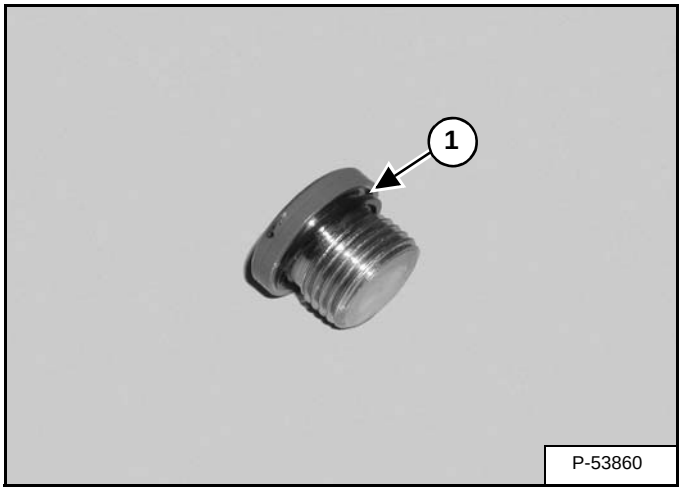
Figure 20-41-36



Remove the plug (Item 1) **[Figure 20-41-36]** from the top of the valve section.

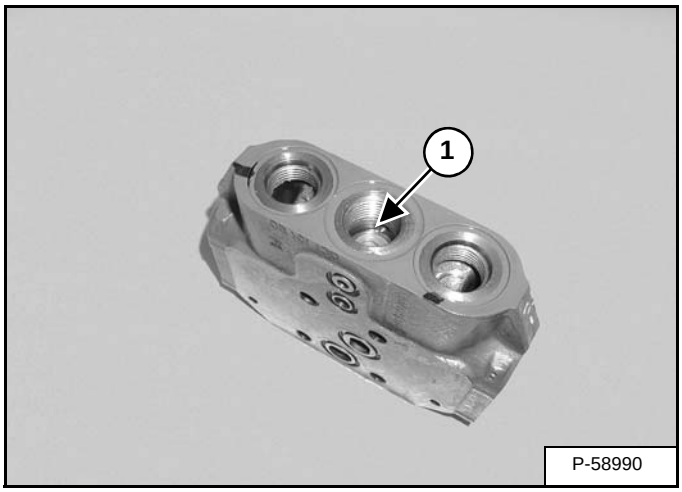
Assembly: Tighten the plug to 46 - 57 ft.-lb. (63 - 77 N•m) torque.

Figure 20-41-37



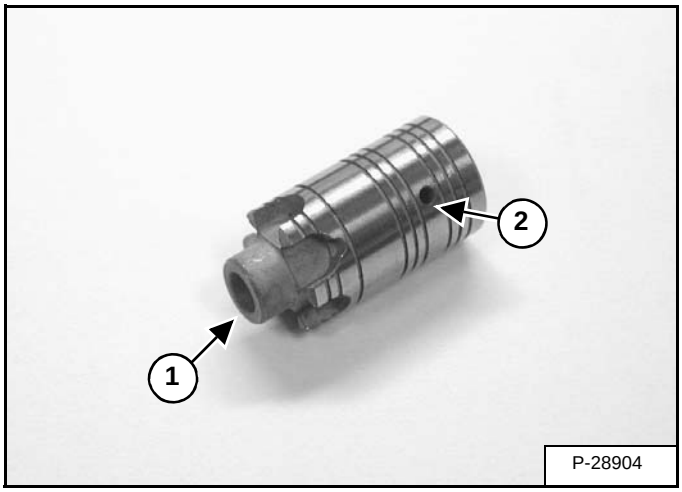
Remove the O-ring (Item 1) **[Figure 20-41-37]** from the plug.

Figure 20-41-38



Remove the compensator (Item 1) **[Figure 20-41-38]** from the valve section.

Figure 20-41-39



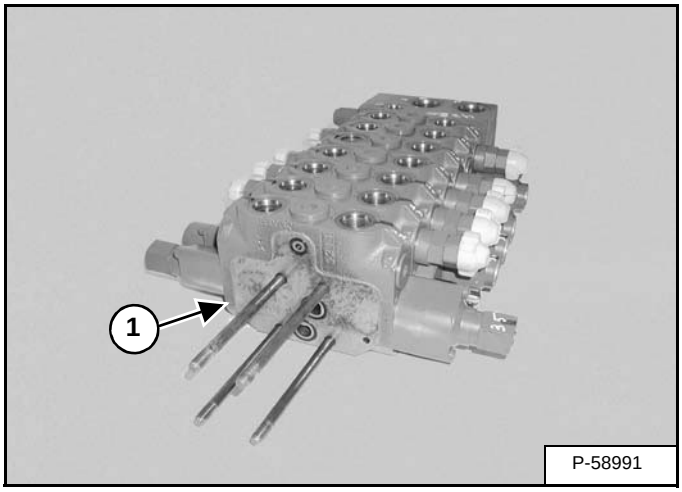
Check the orifice (Item 1) **[Figure 20-41-39]** in the compensator to be sure it is not plugged.

Check the crossport hole (Item 2) **[Figure 20-41-39]** to be sure it is not plugged.

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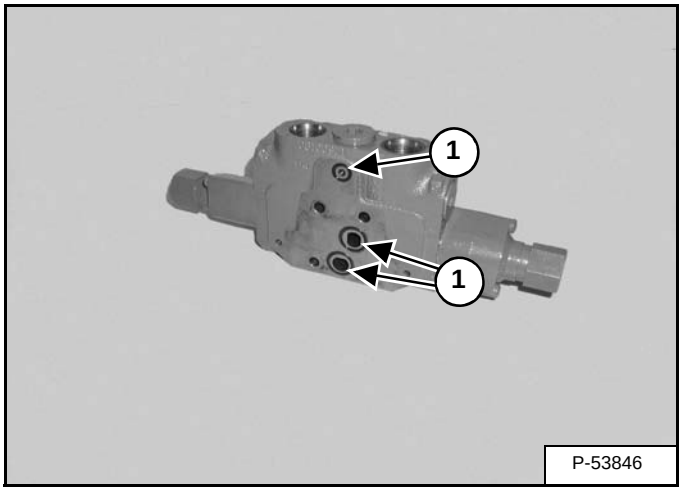
Slew Valve Section Disassembly And Assembly

Figure 20-41-40



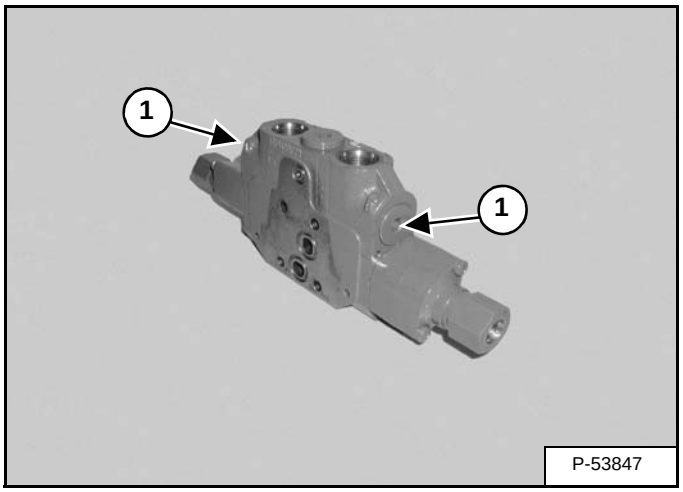
Remove the slew valve section (Item 1) **[Figure 20-41-40]**. from the control valve.

Figure 20-41-41



Remove the O-rings (Item 1) **[Figure 20-41-41]** from the valve section.

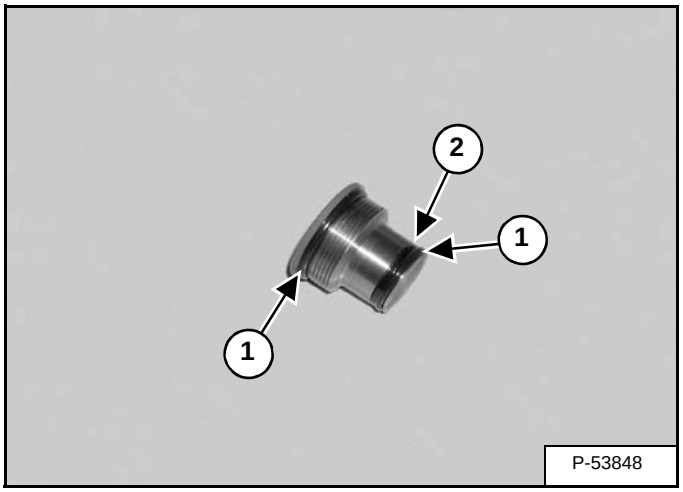
Figure 20-41-42



Remove the plug (Item 1) **[Figure 20-41-42]** from both ends of the valve section.

Assembly: Tighten the plug to 46 - 57 ft.-lb. (63 - 77 N•m) torque.

Figure 20-41-43

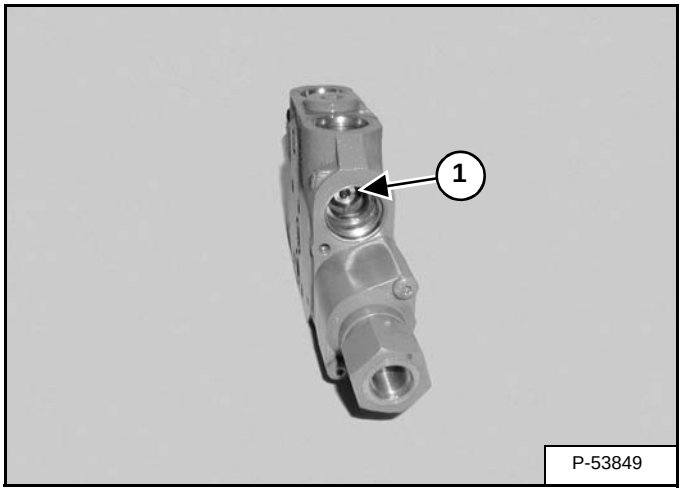


Remove the O-rings (Item 1) and backup ring (Item 2) **[Figure 20-41-43]** from the plug.

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Slew Valve Section Disassembly And Assembly (Cont'd)

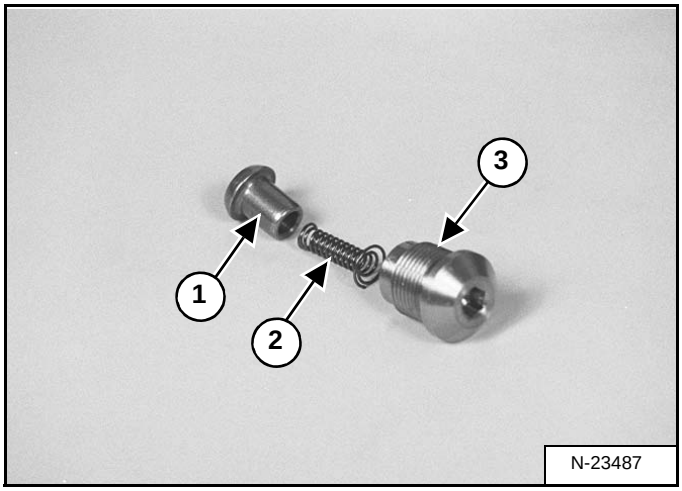
Figure 20-41-44



Remove the load check valve assembly (Item 1) **[Figure 20-41-44]** from both ends of the valve section.

Assembly: Tighten the load check valve assemblies to 80 - 97 in.-lb. (9 - 11 N•m) torque.

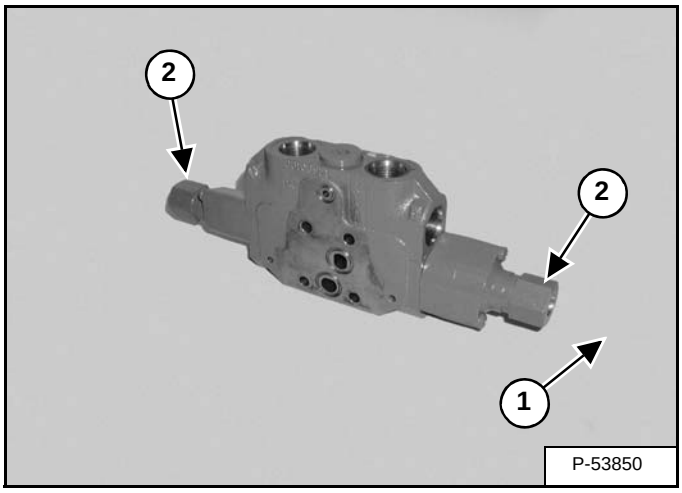
Figure 20-41-45



Remove the seat (Item 1) and spring (Item 2) from the load check valve bodies (Item 3) **[Figure 20-41-45]**.

NOTE: The load check valves must be replaced as a complete assembly.

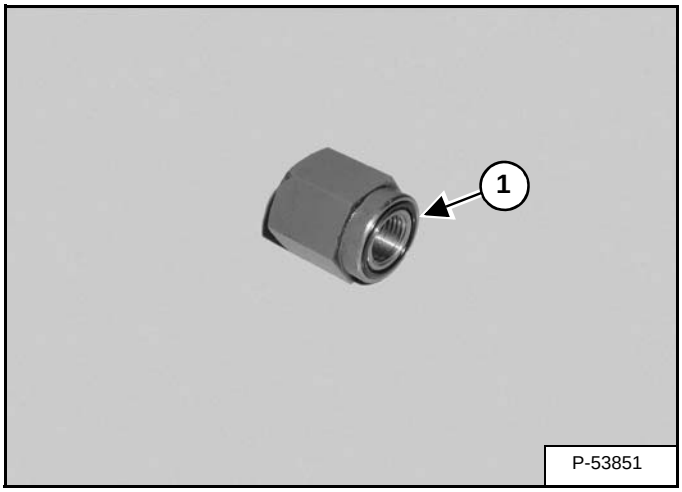
Figure 20-41-46



Install a hex wrench (Item 1) **[Figure 20-41-46]** to hold the spool limiter (both ends.)

Remove the nut (Item 2) **[Figure 20-41-46]** from both ends of the valve section.

Figure 20-41-47

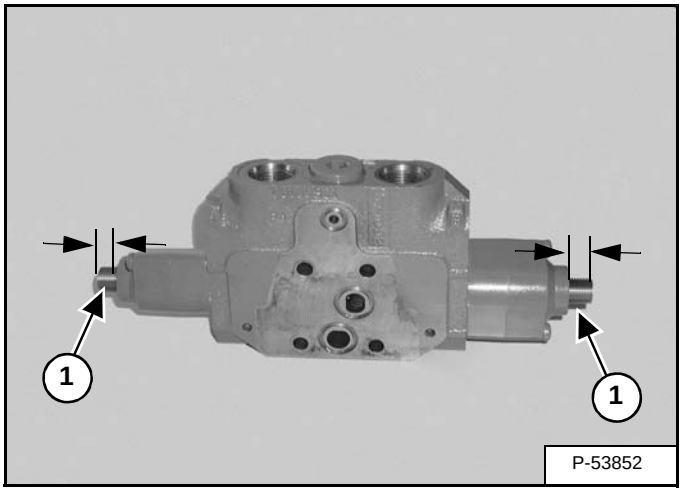


Remove the O-ring (Item 1) **[Figure 20-41-47]** from the nut.

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Slew Valve Section Disassembly And Assembly (Cont'd)

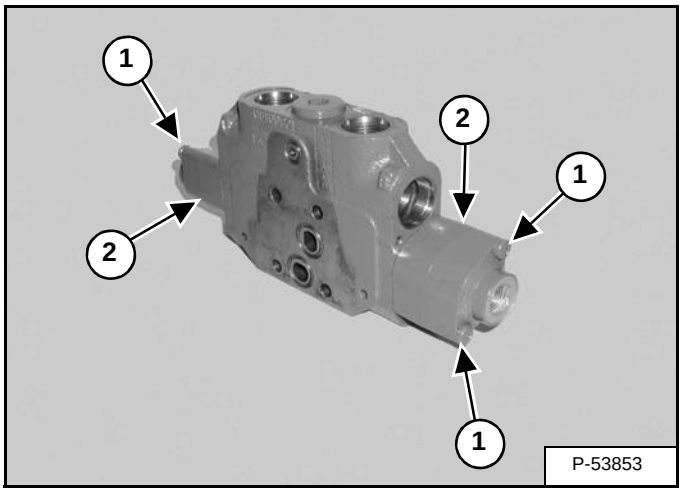
Figure 20-41-48



Measure and record the length of the spool limiter (Item 1) **[Figure 20-41-48]** on both ends of the valve section.

Remove the spool limiters.

Figure 20-41-49

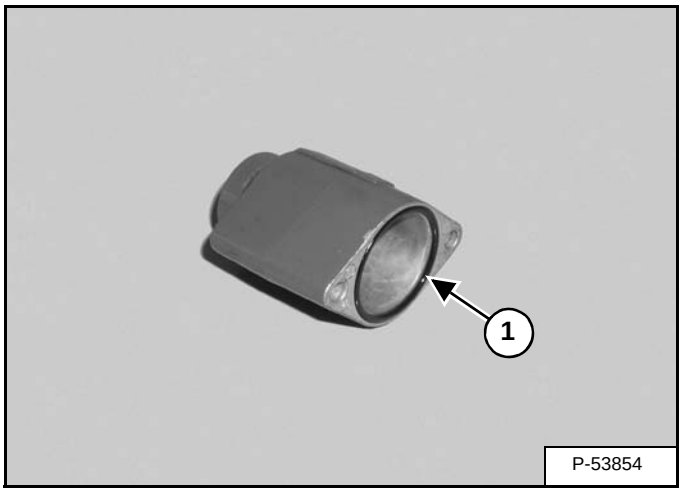


Remove the screws (Item 1) from both valve section end caps (Item 2) **[Figure 20-41-49]**.

Assembly: Tighten the screws to 48 - 58 in.-lb. (5,4 - 6,6 N•m) torque.

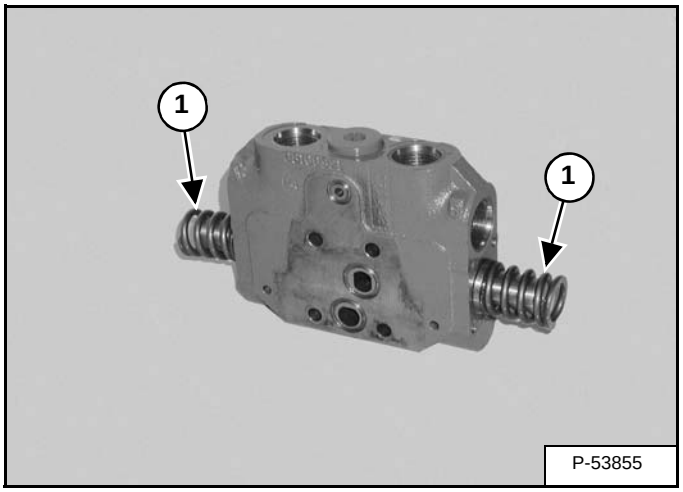
Remove the end caps from the valve section.

Figure 20-41-50



Remove the O-ring (Item 1) **[Figure 20-41-50]** from the end caps.

Figure 20-41-51

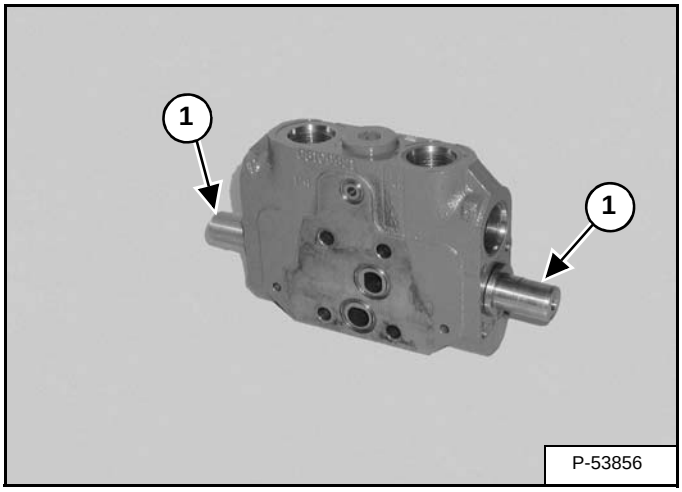


Remove the centering springs (Item 1) **[Figure 20-41-51]** from the spring guides.

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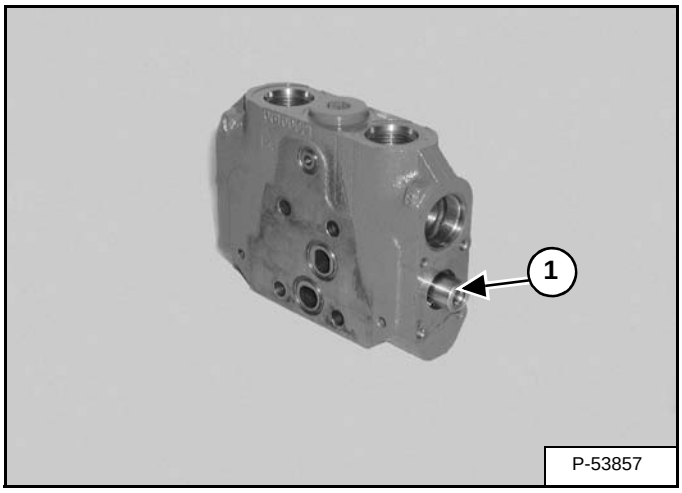
Slew Valve Section Disassembly And Assembly (Cont'd)

Figure 20-41-52



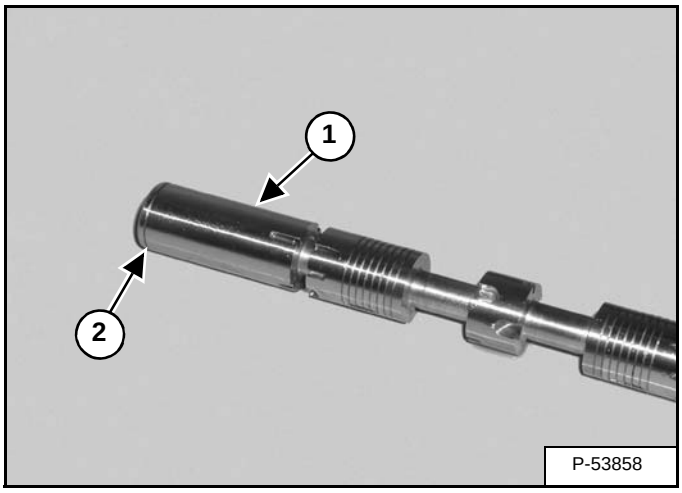
Remove the spring guides (Item 1) **[Figure 20-41-52]** from both ends of the valve spool.

Figure 20-41-53



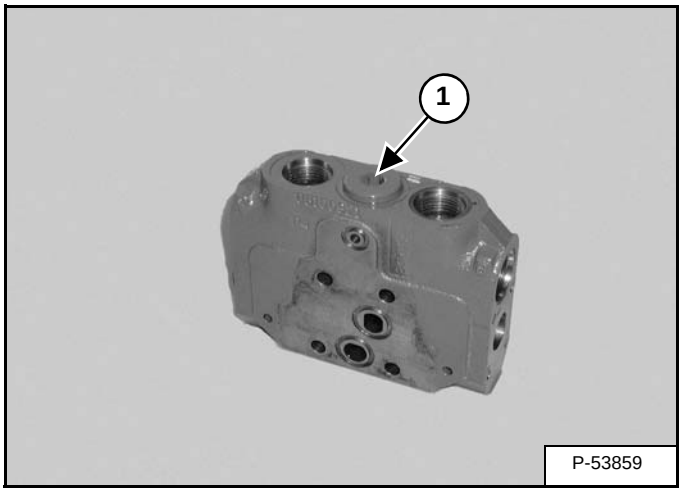
Remove the spool (Item 1) **[Figure 20-41-53]** from the valve section.

Figure 20-41-54



Assembly: The spool (Item 1) is symmetrical, and can be installed in the valve section with the spool groove (Item 2) **[Figure 20-41-54]** either toward the top, or the bottom of the valve section.

Figure 20-41-55



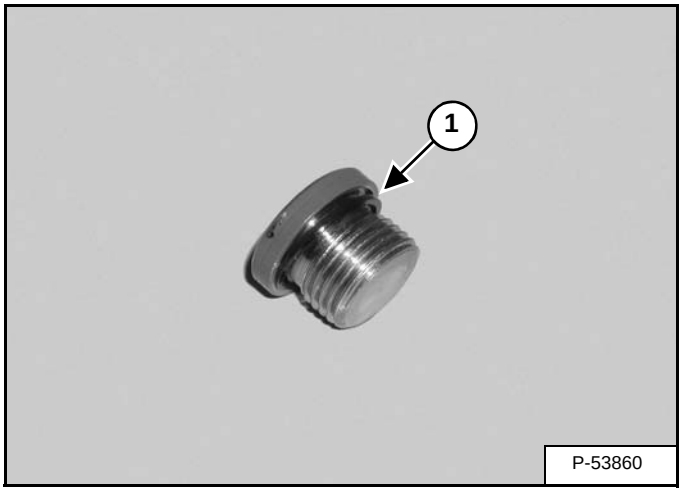
Remove the plug (Item 1) **[Figure 20-41-55]** from the top of the valve section.

Assembly: Tighten the plug to 46 - 57 ft.-lb. (63 - 77 N•m) torque.

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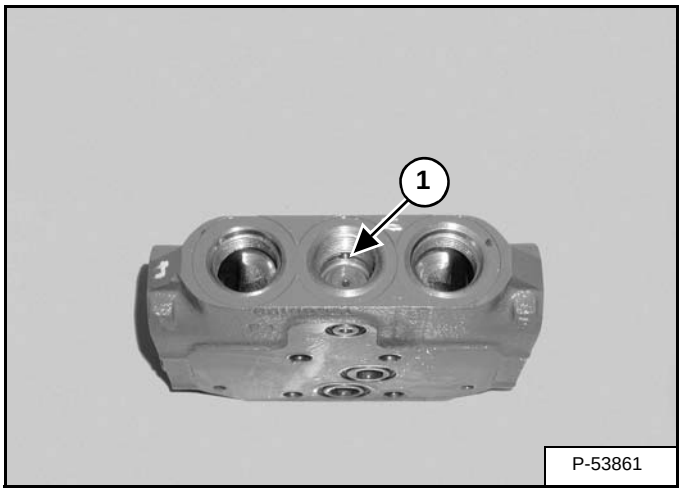
Slew Valve Section Disassembly And Assembly (Cont'd)

Figure 20-41-56



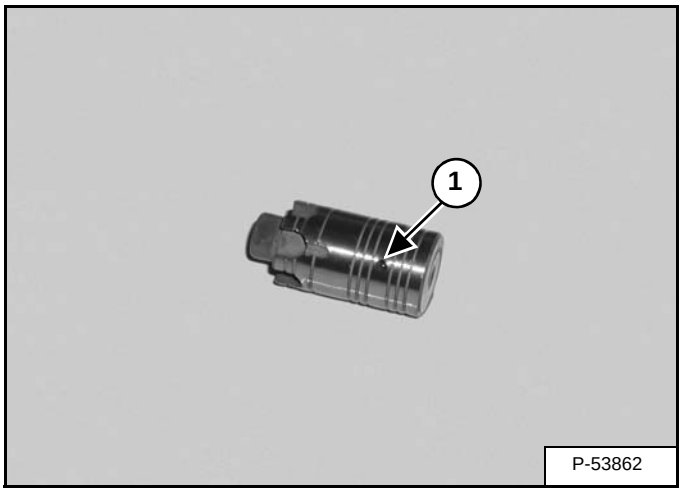
Remove the O-ring (Item 1) **[Figure 20-41-56]** from the plug.

Figure 20-41-57



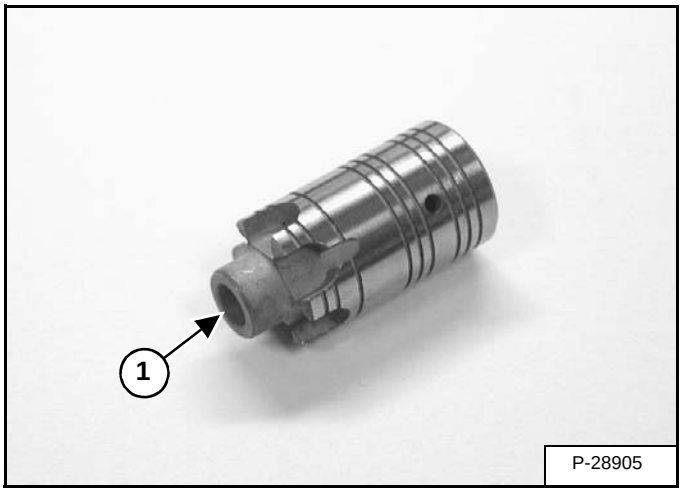
Remove the compensator (Item 1) **[Figure 20-41-57]** from the valve section.

Figure 20-41-58



Check the crossport hole (Item 1) **[Figure 20-41-58]** in the compensator, to be sure it is not plugged.

Figure 20-41-59

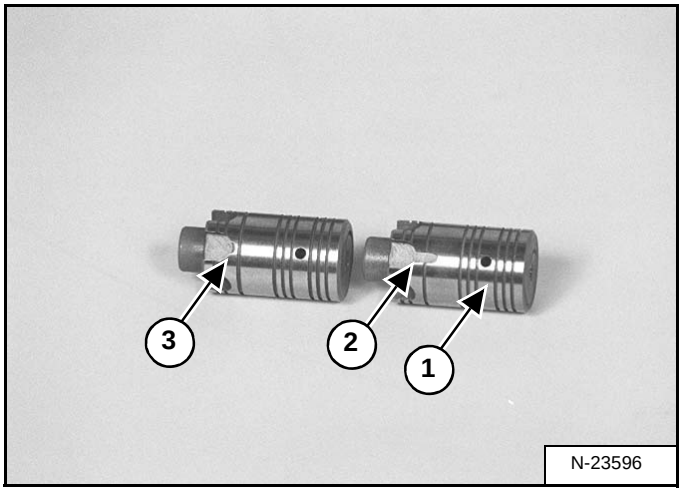


Check the orifice (Item 1) **[Figure 20-41-59]** to be sure it is not plugged.

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Slew Valve Section Disassembly And Assembly (Cont'd)

Figure 20-41-60

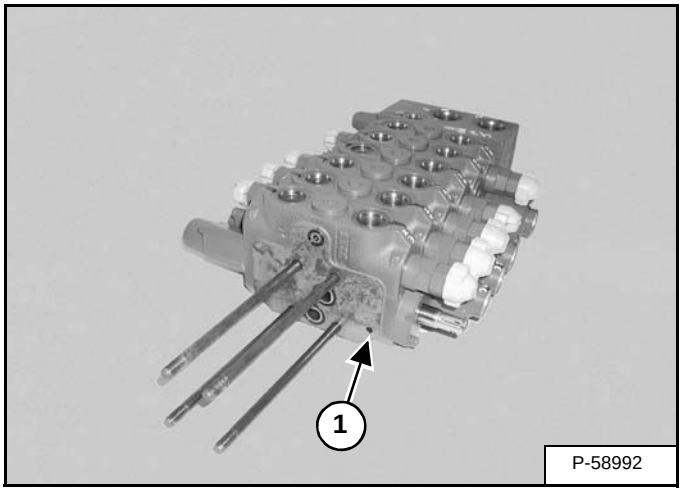


NOTE: The compensator (Item 1), in the slew valve section, is a Priority Compensator and can be determined by the extended groove (Item 2) as compared to a normal compensator (Item 3) [Figure 20-41-60]. These compensators must not be interchanged with each other.

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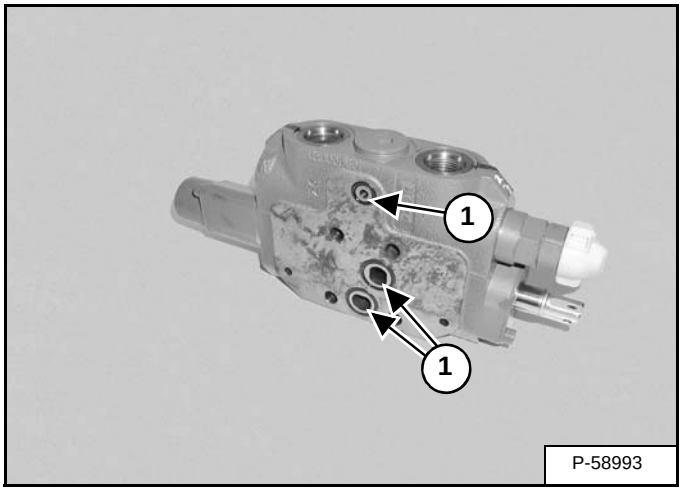
Blade Valve Section Disassembly And Assembly

Figure 20-41-61



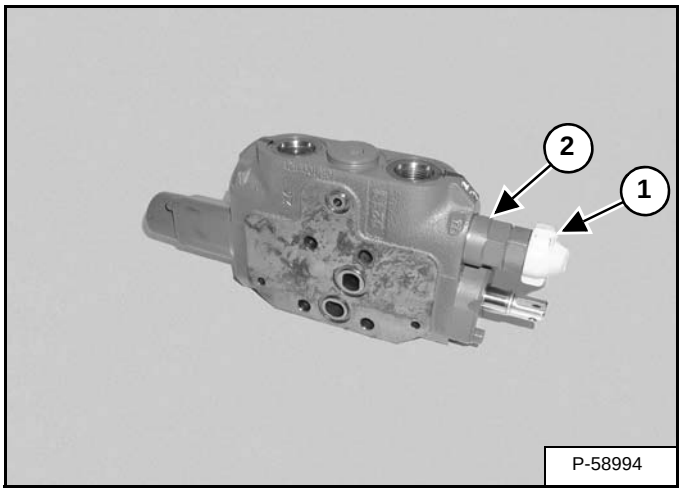
Remove the blade valve section (Item 1) **[Figure 20-41-61]** from the control valve.

Figure 20-41-62



Remove the O-rings (Item 1) **[Figure 20-41-62]** from the valve section.

Figure 20-41-63

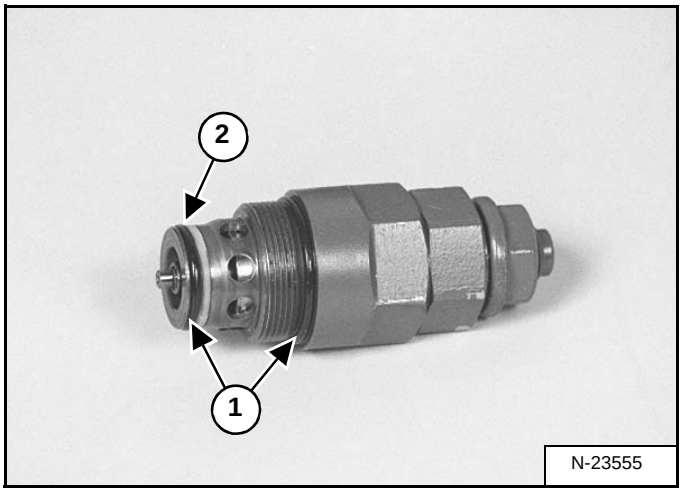


Remove the protective cover (Item 1) **[Figure 20-41-63]**.

Remove the port relief/anti-cav valve (Item 2) **[Figure 20-41-63]** from the valve section.

Assembly: Tighten the port relief/anti-cav valve to 46 - 57 ft.-lb. (63 - 77 N•m) torque.

Figure 20-41-64



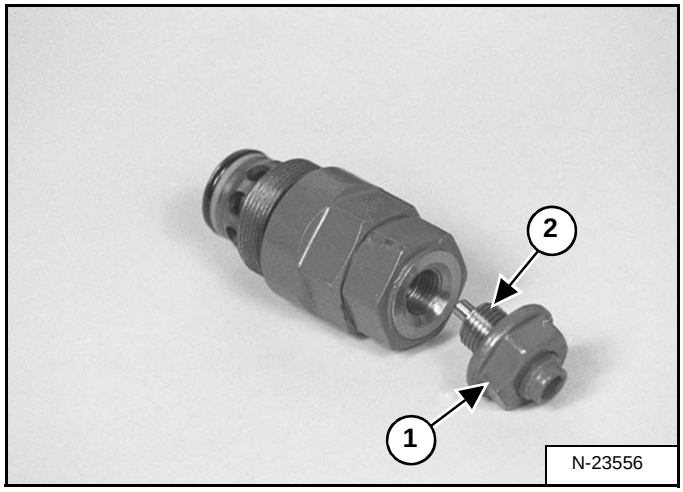
Remove the O-rings (Item 1) and backup ring (Item 2) **[Figure 20-41-64]** from the port relief/anti-cav valve.

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HYDRAULIC CONTROL VALVE (S/N 563111001 & ABOVE) (CONT'D)

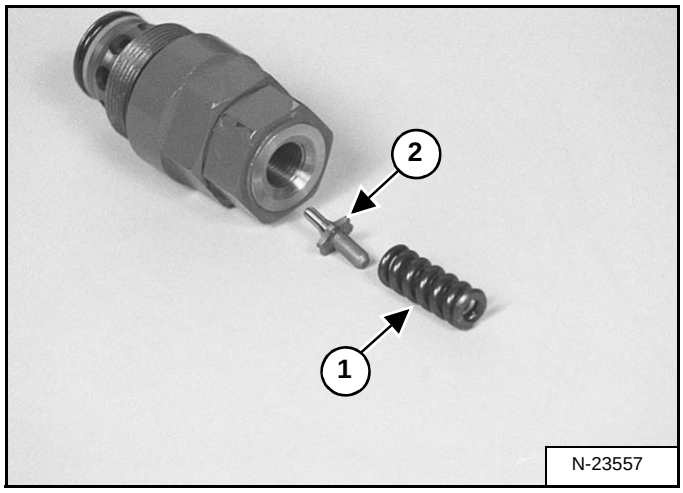
Blade Valve Section Disassembly And Assembly (Cont'd)

Figure 20-41-65



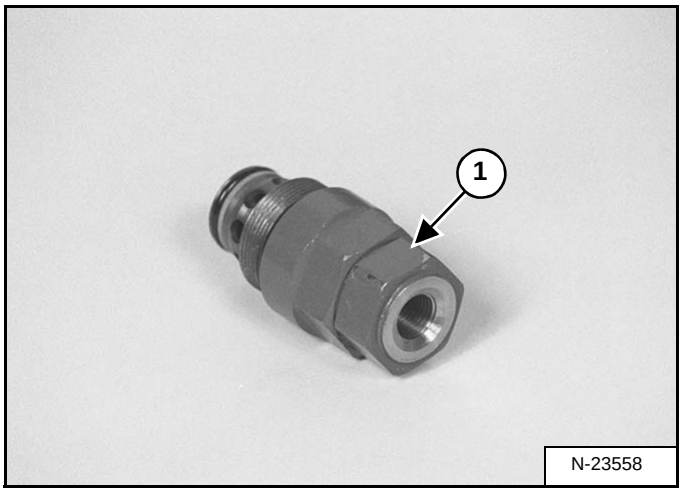
Remove the nut (Item 1) and adjustment screw (Item 2) **[Figure 20-41-65]** from the port relief/anti-cav valve.

Figure 20-41-66



Remove the spring (Item 1) and poppet (Item 2) **[Figure 20-41-66]** from the port relief/anti-cav valve.

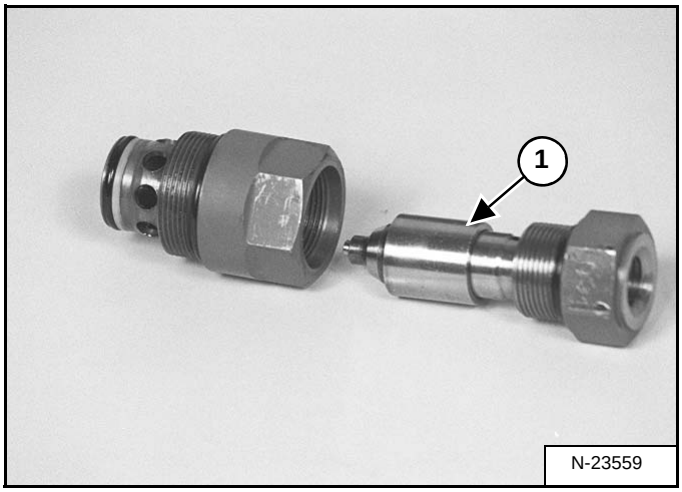
Figure 20-41-67



Remove the nut (Item 1) **[Figure 20-41-67]** from the front housing of the port relief/anti-cav valve.

Remove the retainer.

Figure 20-41-68



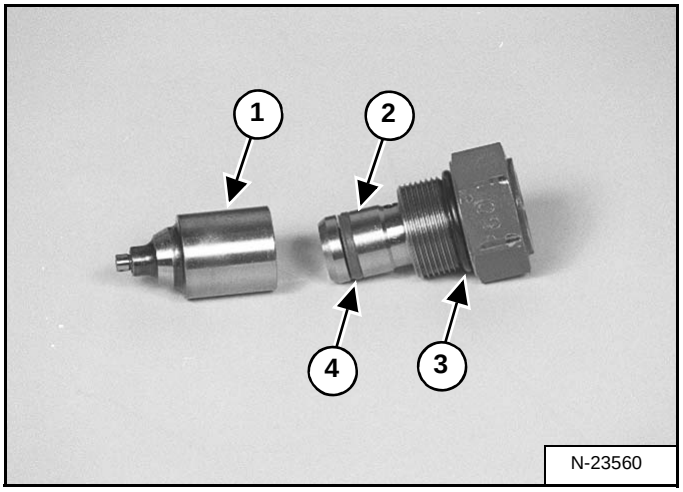
Remove the relief valve assembly (Item 1) **[Figure 20-41-68]** from the housing.

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HYDRAULIC CONTROL VALVE (S/N 563111001 & ABOVE) (CONT'D)

Blade Valve Section Disassembly And Assembly (Cont'd)

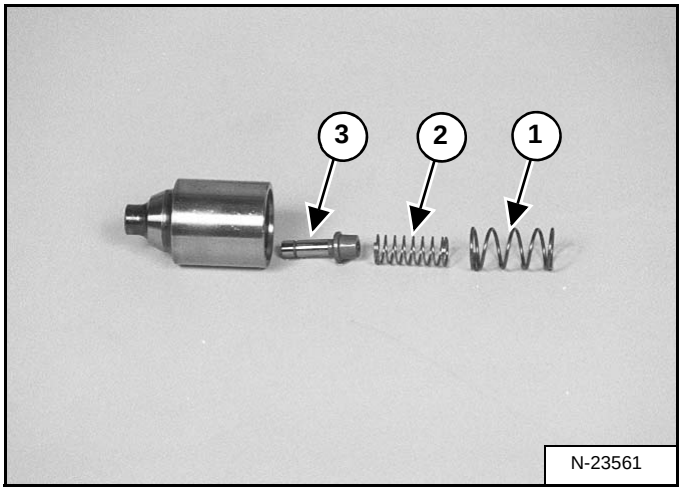
Figure 20-41-69



Remove the front section (Item 1) from the relief valve (Item 2) **[Figure 20-41-69]**.

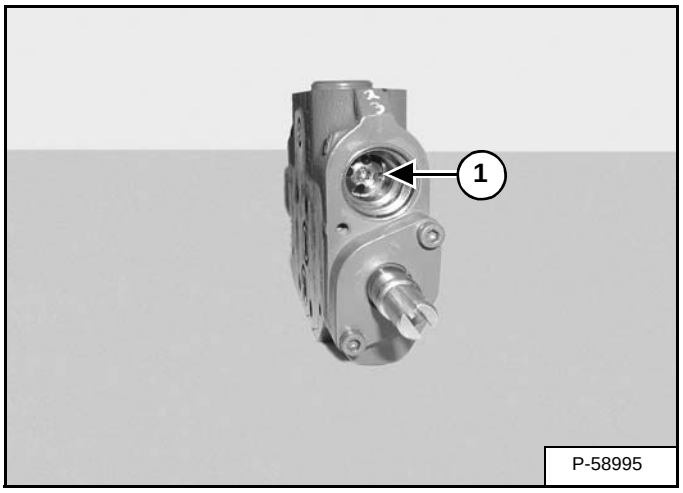
Remove the O-ring (Item 3) and seal (Item 4) **[Figure 20-41-69]**.

Figure 20-41-70



Remove the spring (Item 1), spring (Item 2) and poppet (Item 3) **[Figure 20-41-70]**.

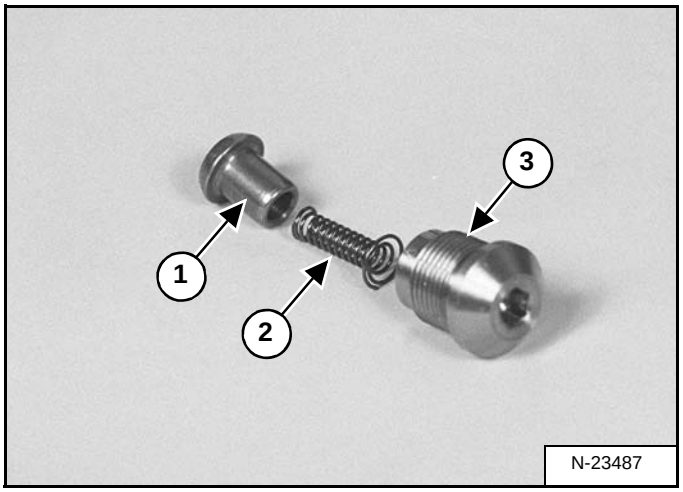
Figure 20-41-71



Remove the load check valve (Item 1) **[Figure 20-41-71]** from the valve section.

Assembly: Tighten the load check valve to 80 - 97 in.-lb. (9 - 11 N•m) torque.

Figure 20-41-72

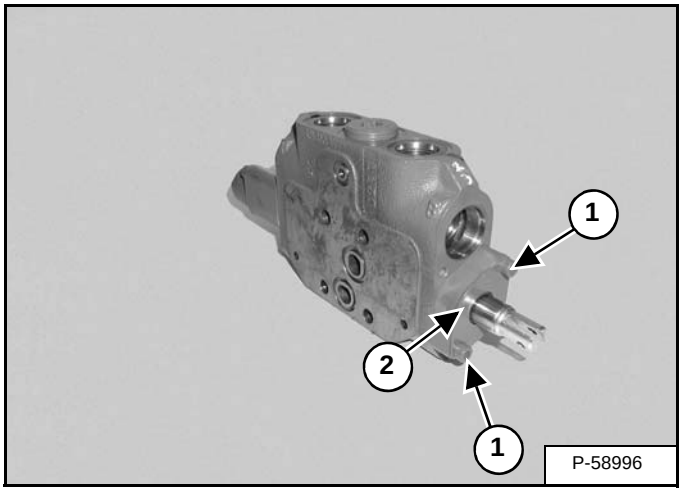


Remove the seat (Item 1) and spring (Item 2) from the load check valve (Item 3) **[Figure 20-41-72]**.

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Blade Valve Section Disassembly And Assembly (Cont'd)

Figure 20-41-73

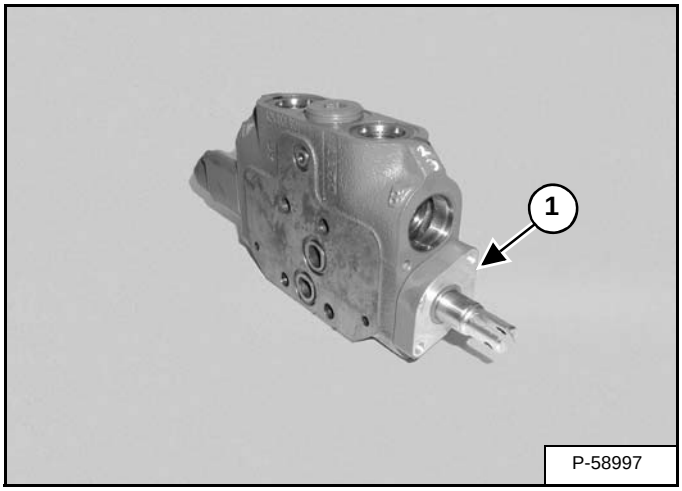


Remove the screws (Item 1) from the valve spool retainer (Item 2) **[Figure 20-41-73]**.

Remove the retainer.

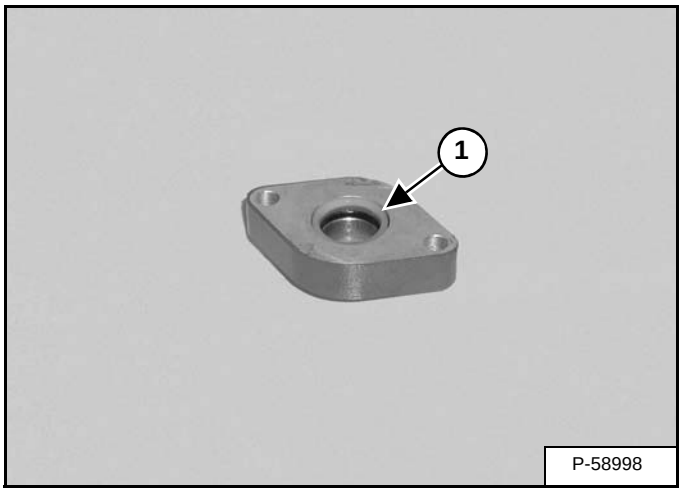
Assembly: Tighten the screws to 48 - 58 in.-lb. (5,4 - 6,6 N•m) torque.

Figure 20-41-74



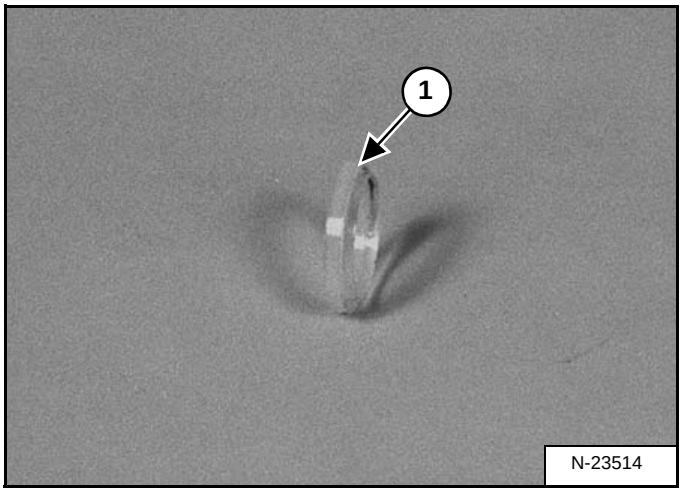
Remove the seal carrier (Item 1) **[Figure 20-41-74]**.

Figure 20-41-75



Remove the seal (Item 1) **[Figure 20-41-75]** from the seal carrier.

Figure 20-41-76

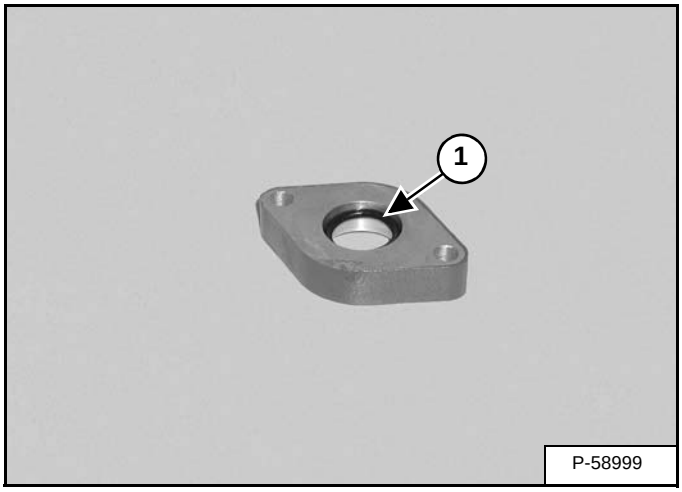


Assembly: Install the seal on the spool with the flange (Item 1) **[Figure 20-41-76]** toward the outside of the valve section.

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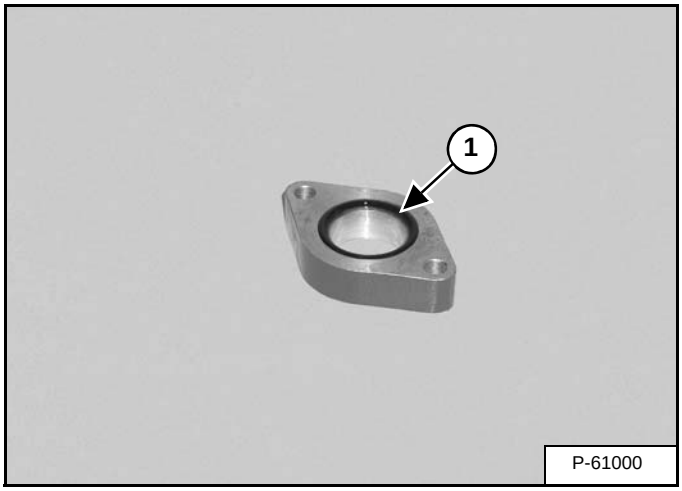
Blade Valve Section Disassembly And Assembly (Cont'd)

Figure 20-41-77



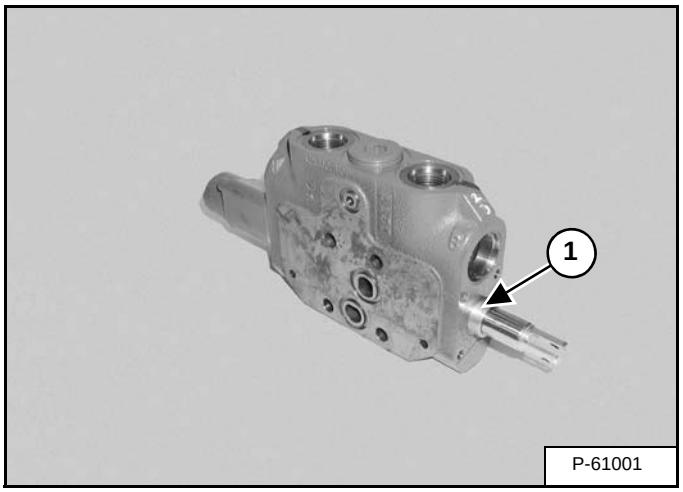
Remove the O-ring (Item 1) **[Figure 20-41-77]**.

Figure 20-41-78



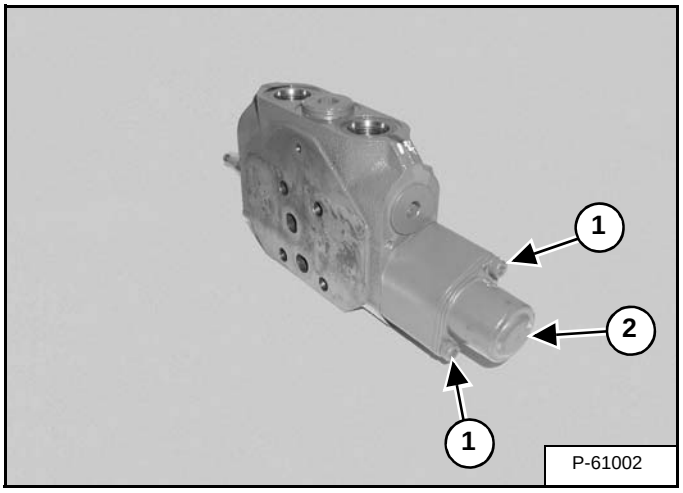
Turn the seal carrier over and remove the O-ring (Item 1) **[Figure 20-41-78]**.

Figure 20-41-79



Remove the sleeve (Item 1) **[Figure 20-41-79]**.

Figure 20-41-80



Remove the screws (Item 1) from the valve section end cap (Item 2) **[Figure 20-41-80]**.

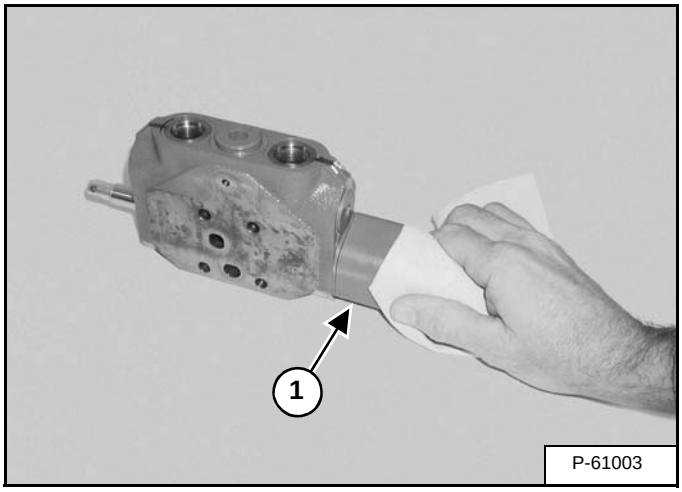
Assembly: Tighten the screws to 48 - 58 in.-lb. (5,4 - 6,6 N•m) torque.

Remove the end cap.

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Blade Valve Section Disassembly And Assembly (Cont'd)

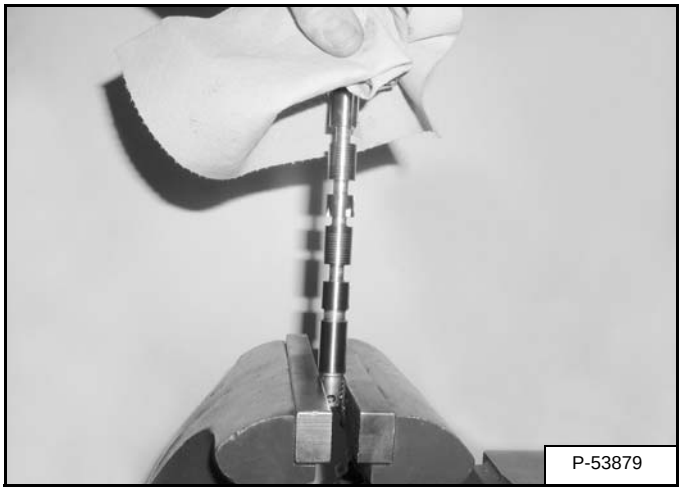
Figure 20-41-81



Put a rag around the detent sleeve. Remove the spool assembly (Item 1) **[Figure 20-41-81]**.

NOTE: Do not remove the detent sleeve from the spool.

Figure 20-41-82



Put the linkage end of the spool in a vise **[Figure 20-41-82]**.

Figure 20-41-83

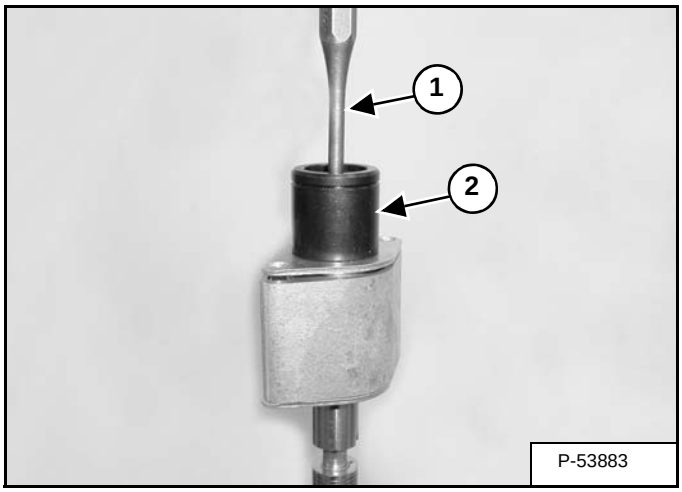
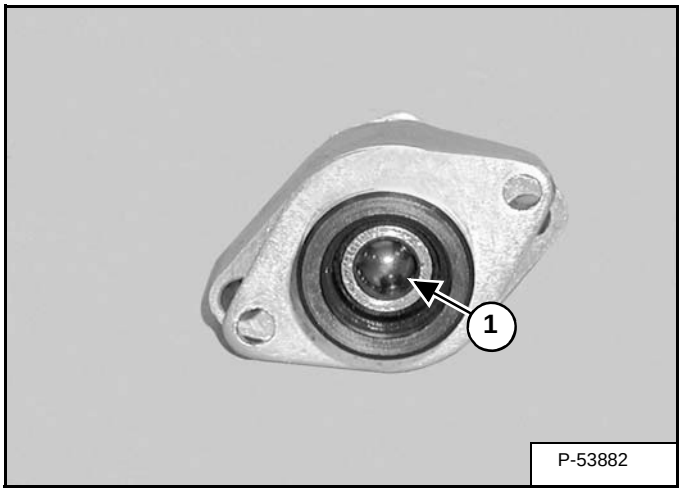


Figure 20-41-84



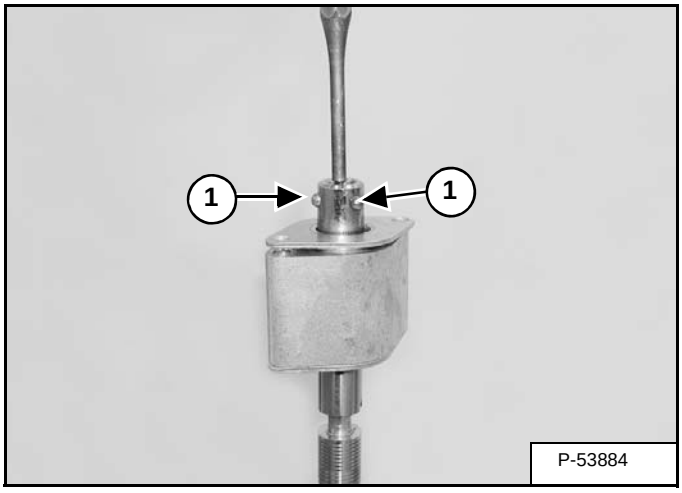
Using a brass drift (Item 1) **[Figure 20-41-83]** press down on the center ball (Item 1) **[Figure 20-41-84]**.

Continue to press down on the ball and remove the detent sleeve (Item 2) **[Figure 20-41-83]**.

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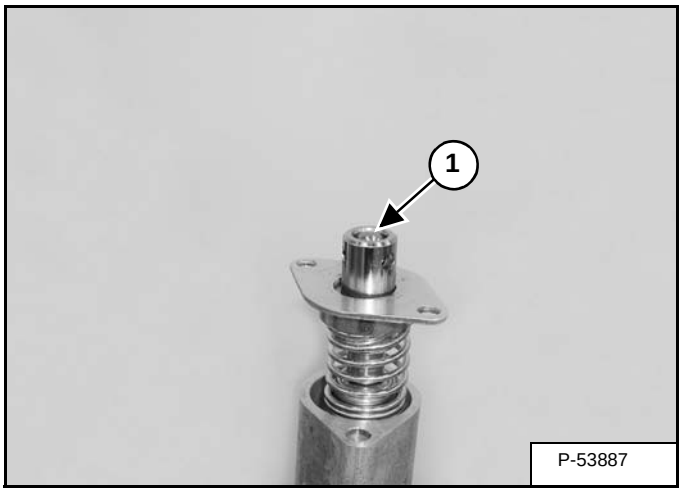
Blade Valve Section Disassembly And Assembly (Cont'd)

Figure 20-41-85



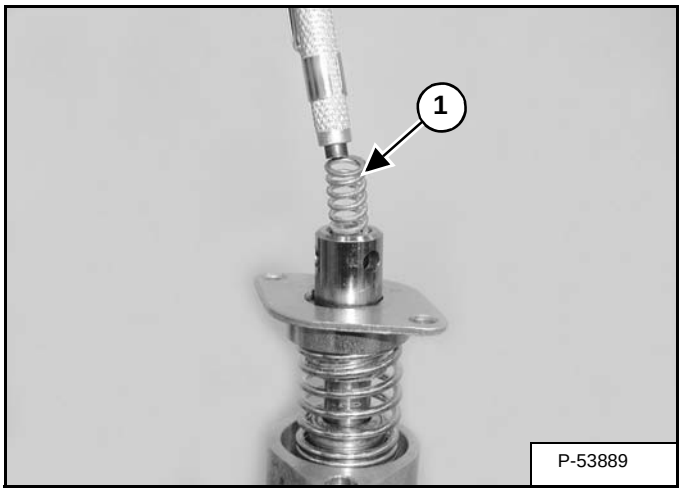
Press down on the center ball and remove the three detent balls (Item 1) **[Figure 20-41-85]**.

Figure 20-41-86



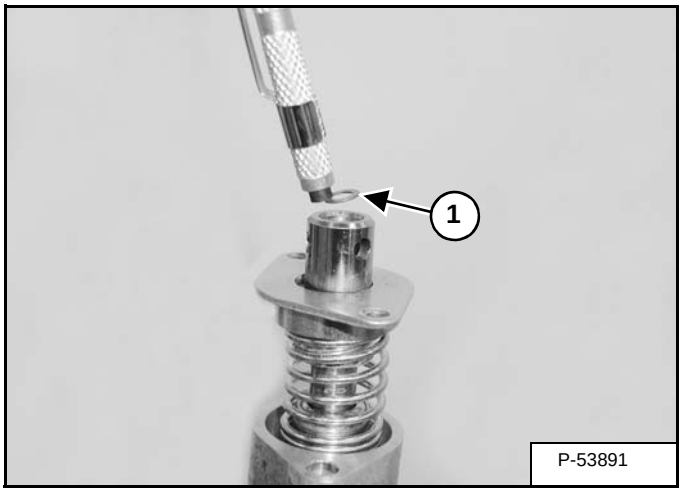
Remove the center ball (Item 1) **[Figure 20-41-86]**.

Figure 20-41-87



Remove the spring (Item 1) **[Figure 20-41-87]**.

Figure 20-41-88



Remove the shims (Item 2) **[Figure 20-41-88]**.

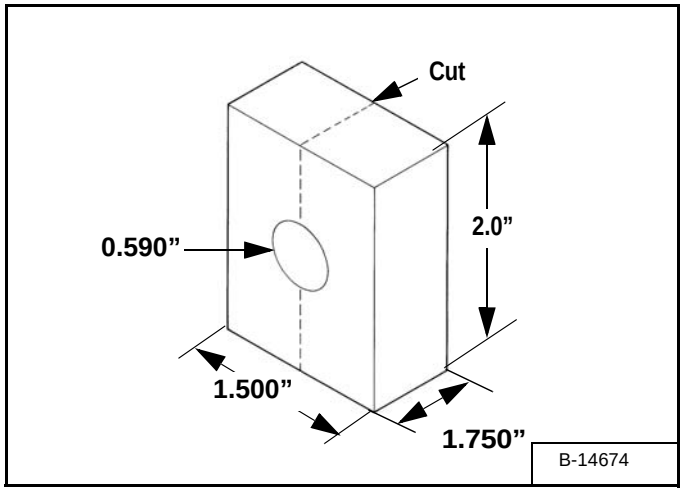
Remove the spool from the vise.

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HYDRAULIC CONTROL VALVE (S/N 563111001 & ABOVE) (CONT'D)

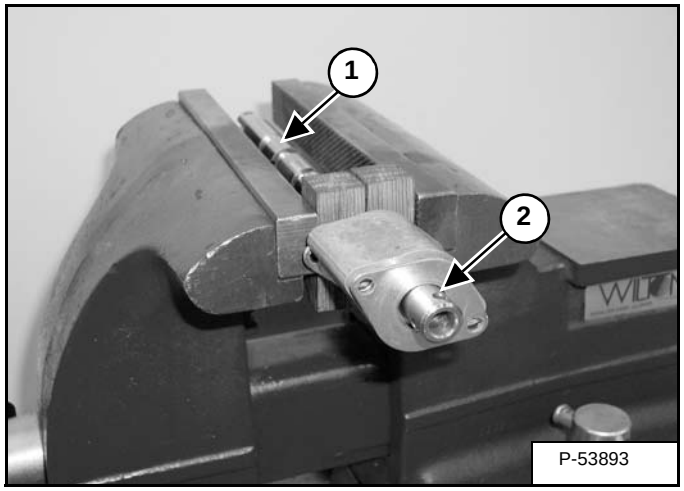
Blade Valve Section Disassembly And Assembly (Cont'd)

Figure 20-41-89



To remove the spring assembly from the spool a holding fixture will have to be made from a 0.750 in. thick x 1.500 in. wide x 2.0 in. long (19 mm thick x 38 mm wide x 51 mm long) piece of hardwood. Drill a 0.590 in. (15 mm) hole in the center of the hardwood block. Cut the block lengthwise **[Figure 20-41-89]**.

Figure 20-41-90

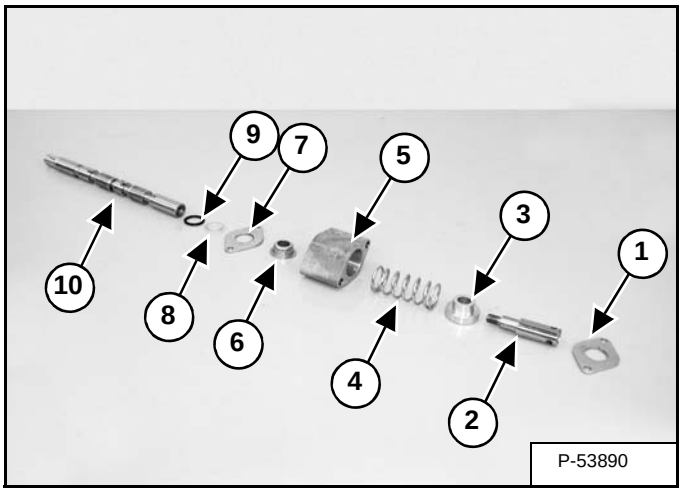


Using the wood blocks clamp the spool (Item 1) **[Figure 20-41-90]** in a vise.

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

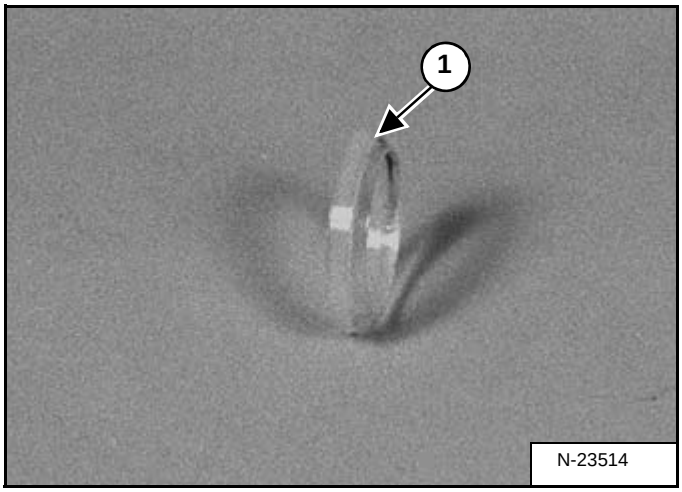
Loosen the detent ball retainer (Item 2) **[Figure 20-41-90]**.

Figure 20-41-91



Remove the retainer (Item 1), detent ball retainer (Item 2), spring retainer (Item 3), spring (Item 4), housing (Item 5), spring retainer (Item 6), retainer (Item 7), seal (Item 8) and O-ring (Item 9) from the spool (Item 10) **[Figure 20-41-91]**.

Figure 20-41-92

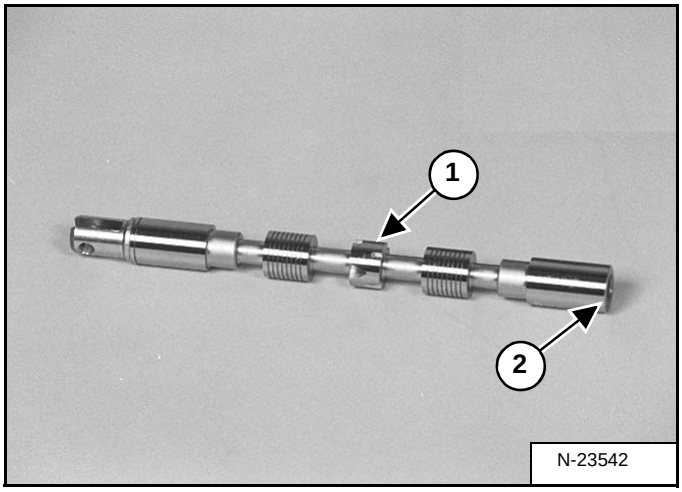


Assembly: Install the seal on the spool with the flange (Item 1) **[Figure 20-41-92]** toward the outside of the valve section.

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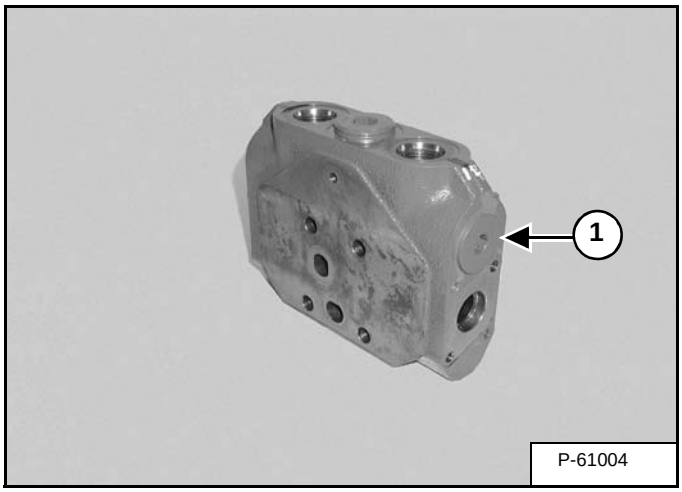
Blade Valve Section Disassembly And Assembly (Cont'd)

Figure 20-41-93



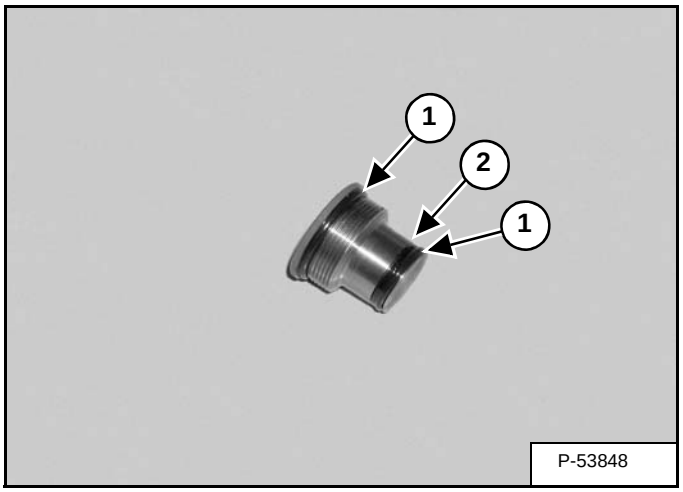
Assembly: The spool (Item 1) can only be installed in the valve section with the spool groove (Item 2) **[Figure 20-41-93]** toward the top of the valve section, on the A port.

Figure 20-41-94



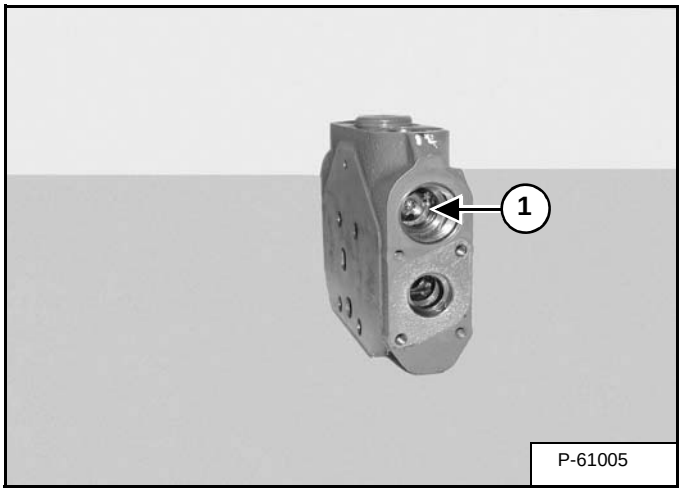
Remove the plug (Item 1) **[Figure 20-41-94]** from the valve section.

Figure 20-41-95



Remove the O-rings (Item 1) and back-up ring (Item 2) **[Figure 20-41-95]** from the plug.

Figure 20-41-96



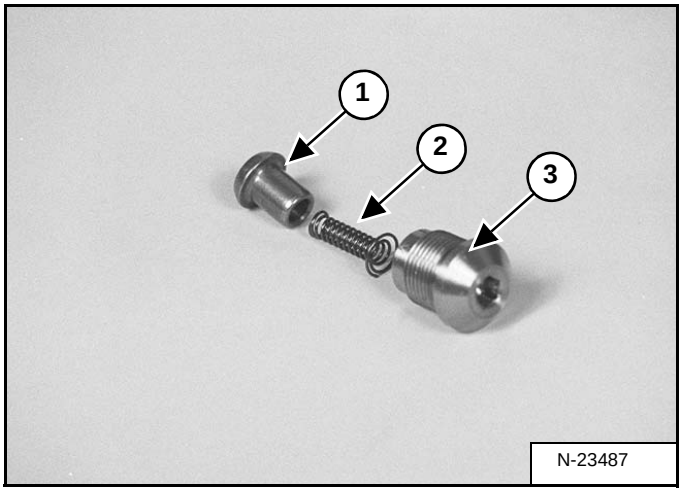
Remove the load check valve (Item 1) **[Figure 20-41-96]** from the valve section.

Assembly: Tighten the load check valve to 80 - 97 in.-lb. (9 - 11 N•m) torque.

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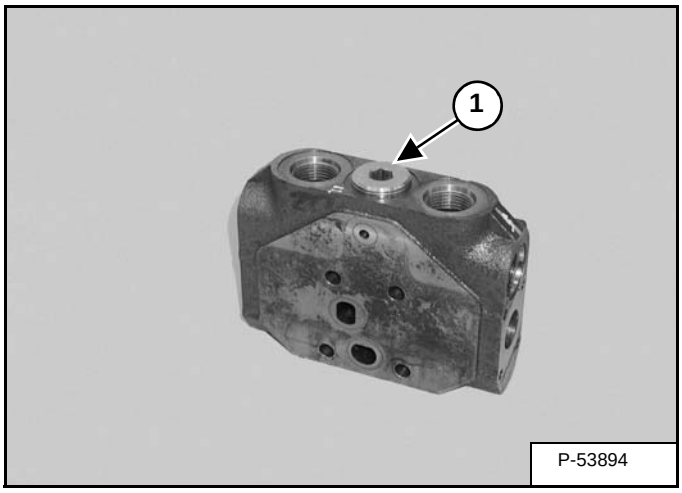
Blade Valve Section Disassembly And Assembly (Cont'd)

Figure 20-41-97



Remove the seat (Item 1) and spring (Item 2) from the load check valve (Item 3) **[Figure 20-41-97]**.

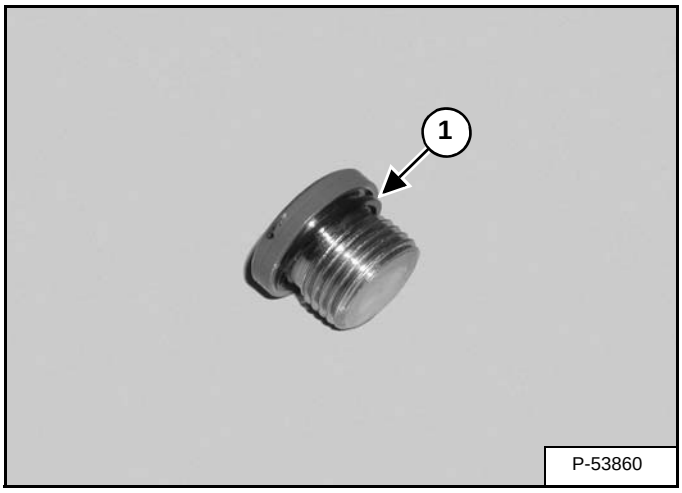
Figure 20-41-98



Remove the plug (Item 1) **[Figure 20-41-98]** from the top of the valve section.

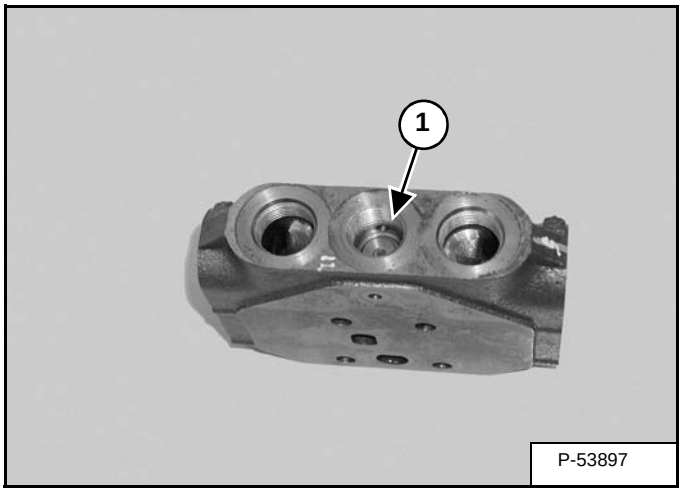
Assembly: Tighten the plug to 46 - 57 ft.-lb. (63 - 77 N•m) torque.

Figure 20-41-99



Remove the O-ring (Item 1) **[Figure 20-41-99]** from the plug.

Figure 20-41-100

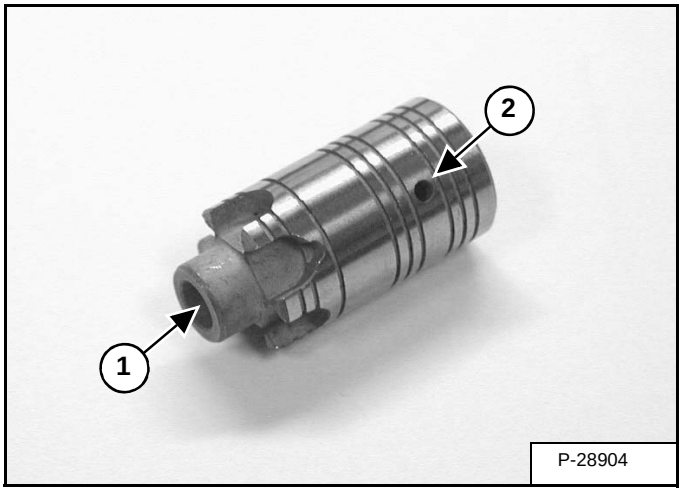


Remove the compensator (Item 1) **[Figure 20-41-100]** from the valve section.

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Blade Valve Section Disassembly And Assembly (Cont'd)

Figure 20-41-101



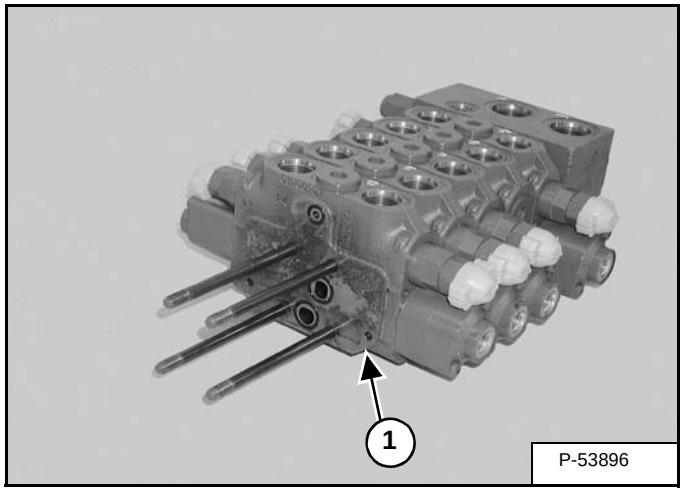
Check the orifice (Item 1) **[Figure 20-41-101]** in the compensator to be sure it is not plugged.

Check the crossport hole (Item 2) **[Figure 20-41-101]** to be sure it is not plugged.

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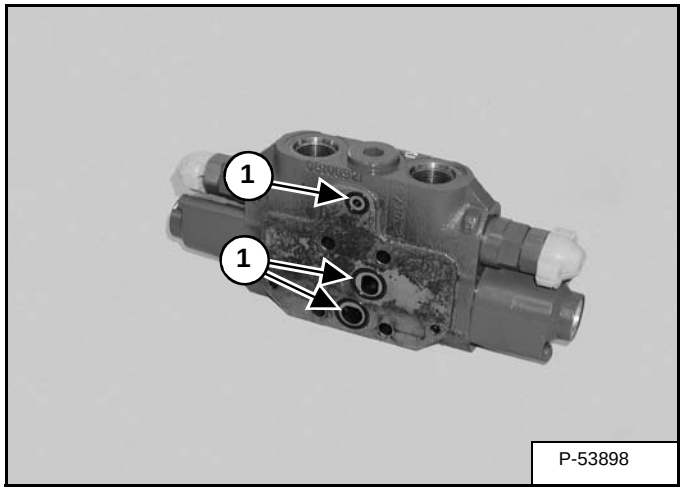
Bucket Valve Section Disassembly And Assembly

Figure 20-41-102



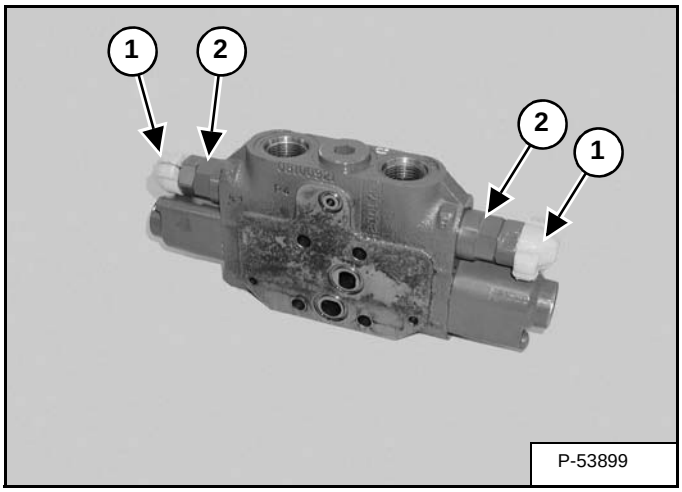
Remove the bucket valve section (Item 1) **[Figure 20-41-102]** from the control valve.

Figure 20-41-103



Remove the O-rings (Item 1) **[Figure 20-41-103]** from the valve section.

Figure 20-41-104

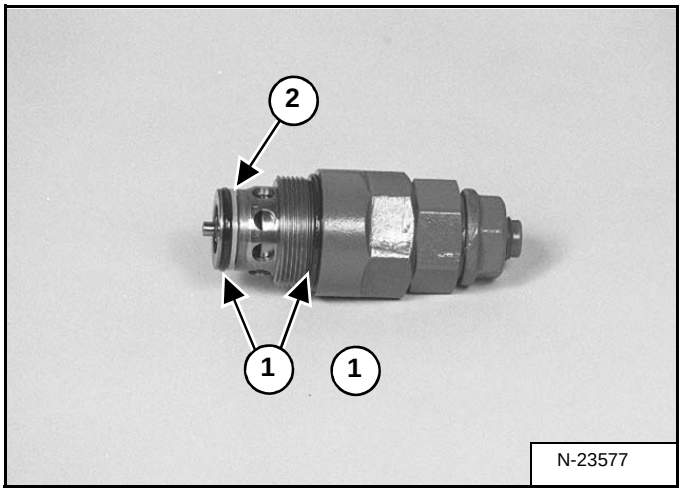


Remove the protective covers (Item 1) **[Figure 20-41-104]** from the valve section port relief/anti-cav valves.

Remove the port relief/anti-cav valves (Item 2) **[Figure 20-41-104]** from the valve section.

Assembly: Tighten the port relief/anti-cav valve to 46 - 57 ft.-lb (63 - 77 N•m) torque.

Figure 20-41-105

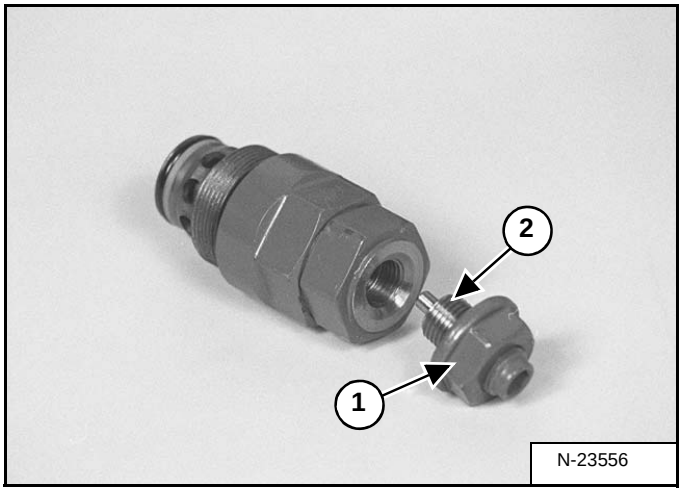


Remove the O-rings (Item 1) and back-up ring (Item 2) **[Figure 20-41-105]** from the port relief/anti-cav valves.

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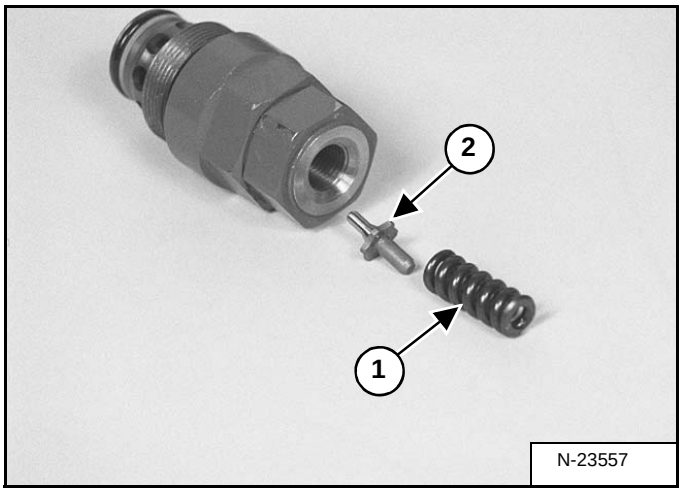
Bucket Valve Section Disassembly And Assembly (Cont'd)

Figure 20-41-106



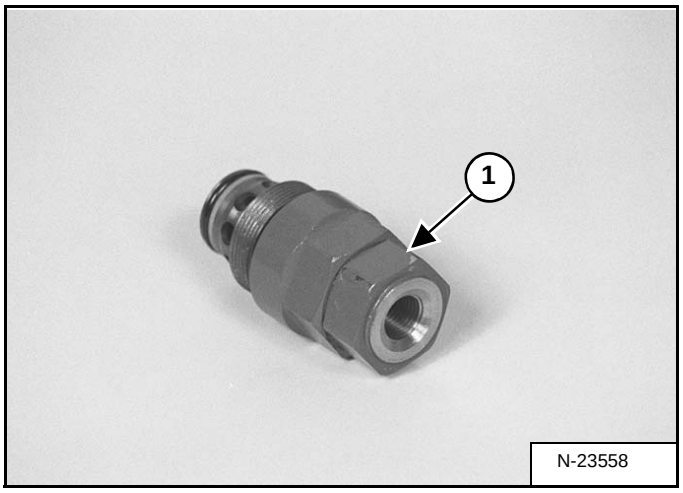
Remove the nut (Item 1) and adjustment screw (Item 2) **[Figure 20-41-106]** from the port relief/anti-cav valve.

Figure 20-41-107



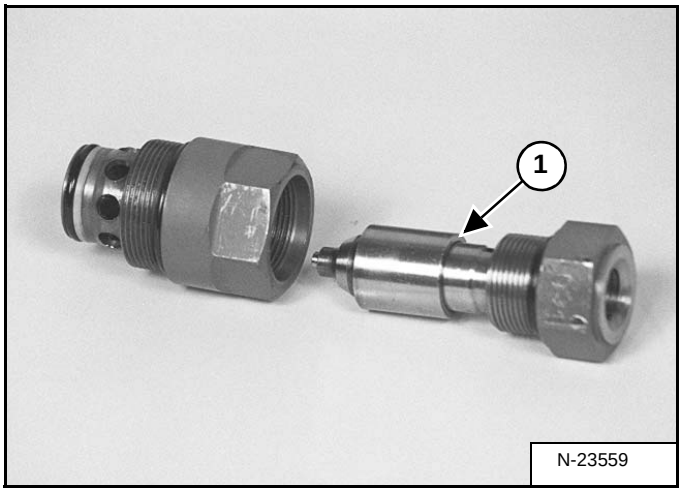
Remove the spring (Item 1) and poppet (Item 2) **[Figure 20-41-107]** from the port relief/anti-cav body.

Figure 20-41-108



Remove the nut (Item 1) **[Figure 20-41-108]** from the port relief/anti-cav valve.

Figure 20-41-109

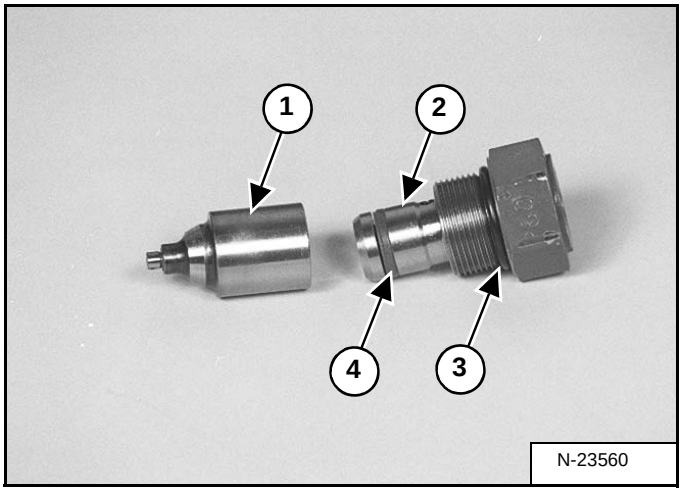


Remove the relief valve assembly (Item 1) **[Figure 20-41-109]** from the valve.

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Bucket Valve Section Disassembly And Assembly (Cont'd)

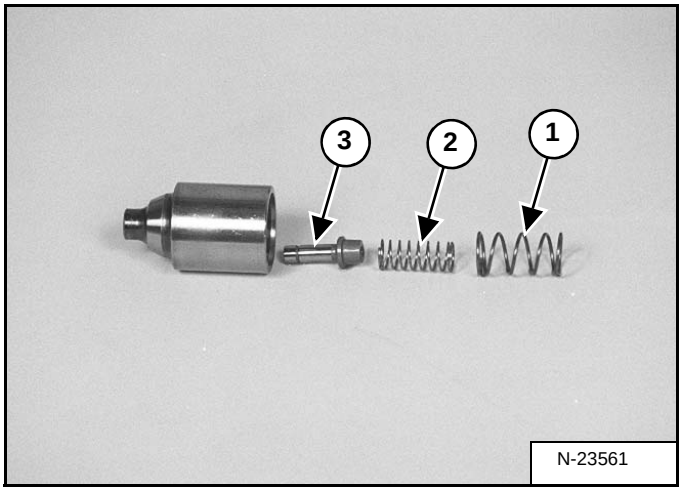
Figure 20-41-110



Remove the front section (Item 1) from the relief valve (Item 2) **[Figure 20-41-110]**.

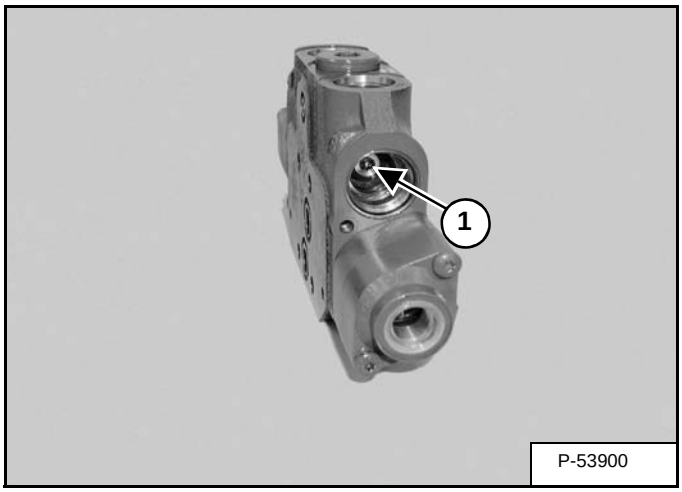
Remove the O-ring (Item 3) and seal (Item 4) **[Figure 20-41-110]**.

Figure 20-41-111



Remove the spring (Item 1), spring (Item 2) and poppet (Item 3) **[Figure 20-41-111]**.

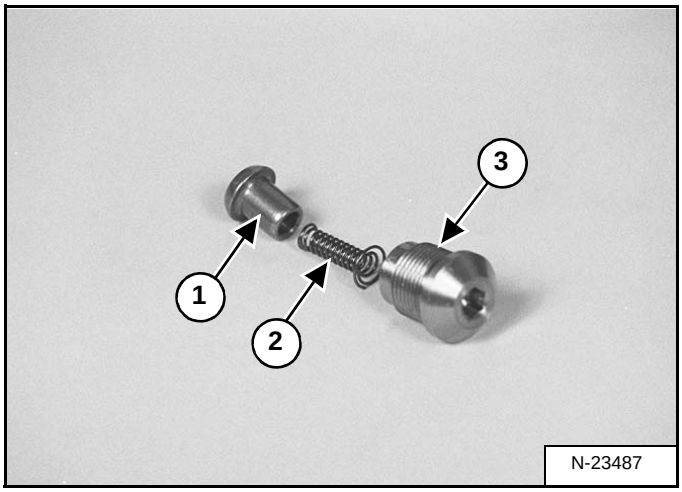
Figure 20-41-112



Remove the load check valve assembly (Item 1) **[Figure 20-41-112]** from both ends of the valve section.

Assembly: Tighten the load check valves to 80 - 97 in.-lb. (9 - 11 N•m) torque.

Figure 20-41-113

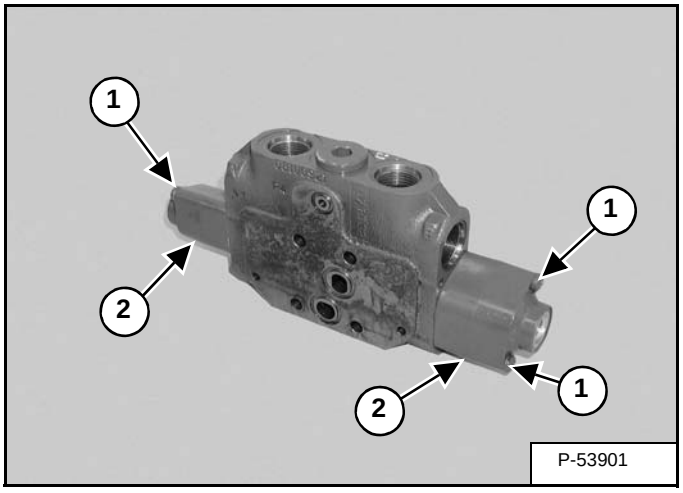


Remove the seat (Item 1) and spring (Item 2) from the load check valve body (Item 3) **[Figure 20-41-113]**.

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Bucket Valve Section Disassembly And Assembly (Cont'd)

Figure 20-41-114

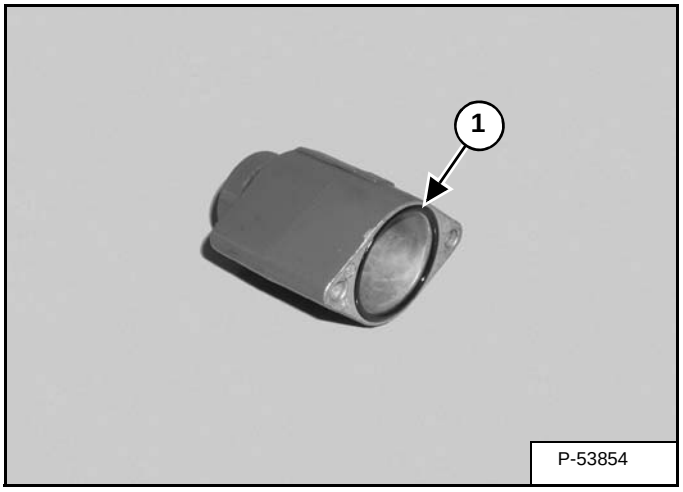


Remove the screws (Item 1) from both valve section end caps (Item 2) **[Figure 20-41-114]**.

Assembly: Tighten the screws to 48 - 58 in.-lb. (5,4 - 6,6 N•m) torque.

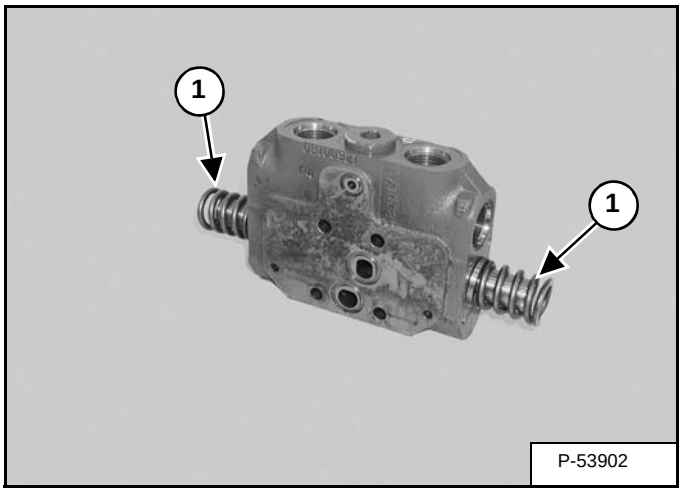
Remove the end caps.

Figure 20-41-115



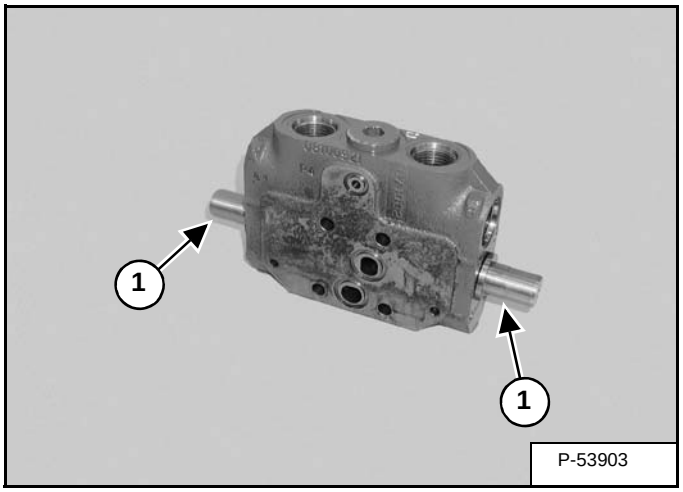
Remove the O-ring (Item 1) **[Figure 20-41-115]** from the end cap.

Figure 20-41-116



Remove the centering springs (Item 1) **[Figure 20-41-116]** from both ends of the valve spool.

Figure 20-41-117



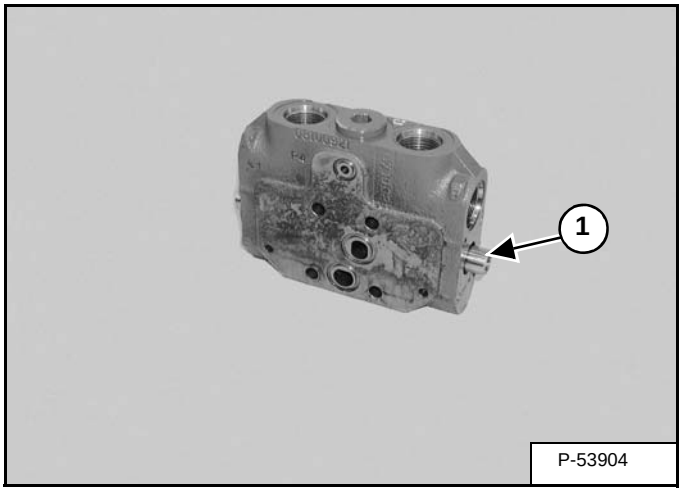
Remove the spring guides (Item 1) **[Figure 20-41-117]** from both ends of the valve spool.

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HYDRAULIC CONTROL VALVE (S/N 563111001 & ABOVE) (CONT'D)

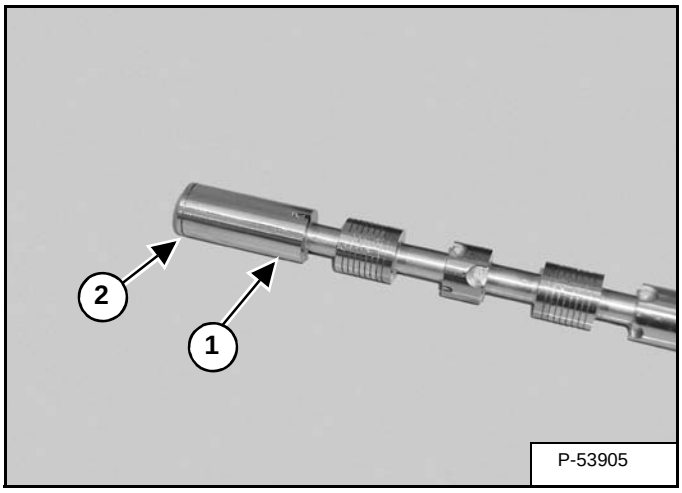
Bucket Valve Section Disassembly And Assembly (Cont'd)

Figure 20-41-118



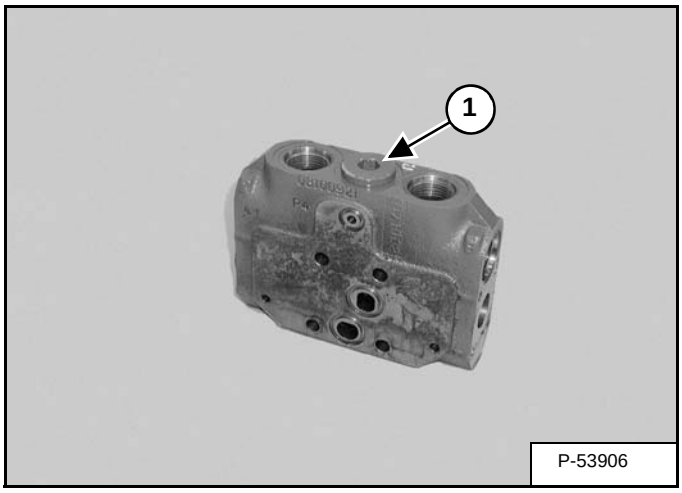
Remove the spool (Item 1) **[Figure 20-41-118]** from the valve section.

Figure 20-41-119



Assembly: The spool (Item 1) can only be installed in the valve section with the spool groove (Item 2) **[Figure 20-41-119]** toward the top of the valve section, on the A port.

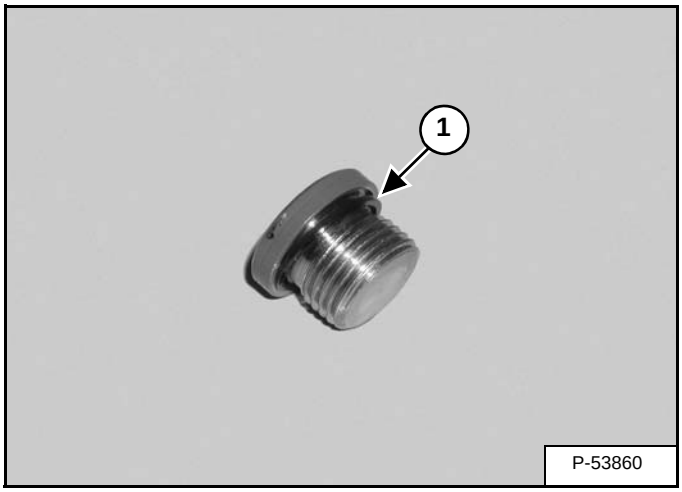
Figure 20-41-120



Remove the plug (Item 1) **[Figure 20-41-120]** from the top of the valve section.

Assembly: Tighten the plug to 46 - 57 ft.-lb. (63 - 77 N•m) torque.

Figure 20-41-121

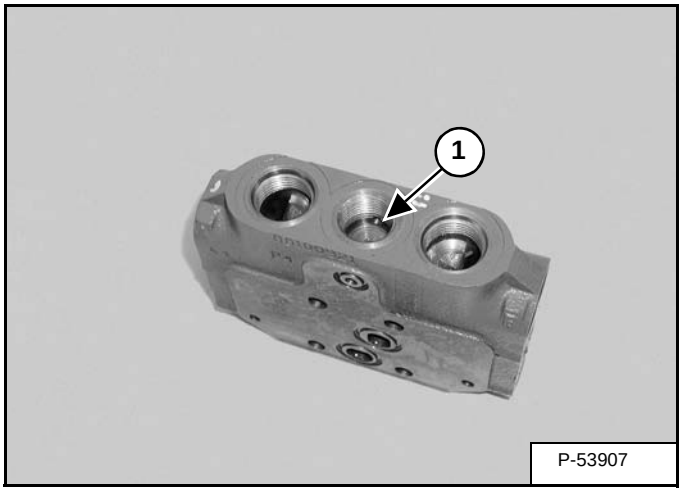


Remove the O-ring (Item 1) **[Figure 20-41-121]** from the plug.

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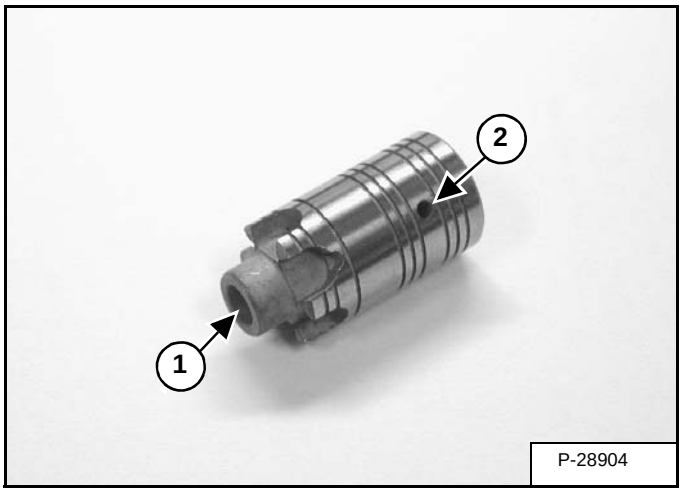
Bucket Valve Section Disassembly And Assembly (Cont'd)

Figure 20-41-122



Remove the compensator (Item 1) **[Figure 20-41-122]** from the valve section.

Figure 20-41-123



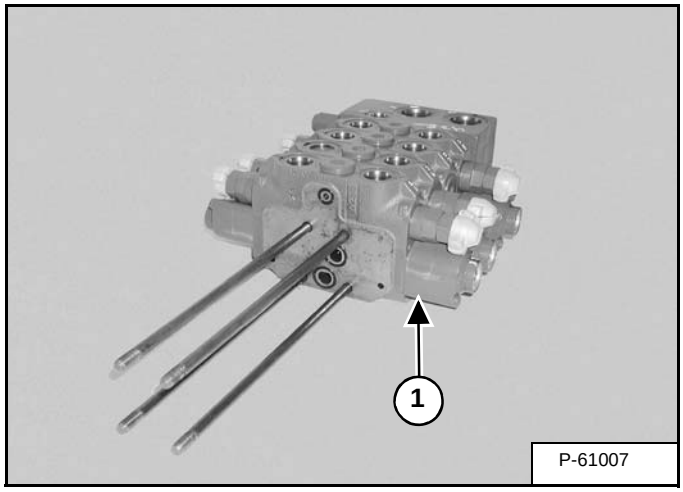
Check the orifice (Item 1) **[Figure 20-41-123]** in the compensator to be sure it is not plugged.

Check the crossport hole (Item 2) **[Figure 20-41-123]** to be sure it is not plugged.

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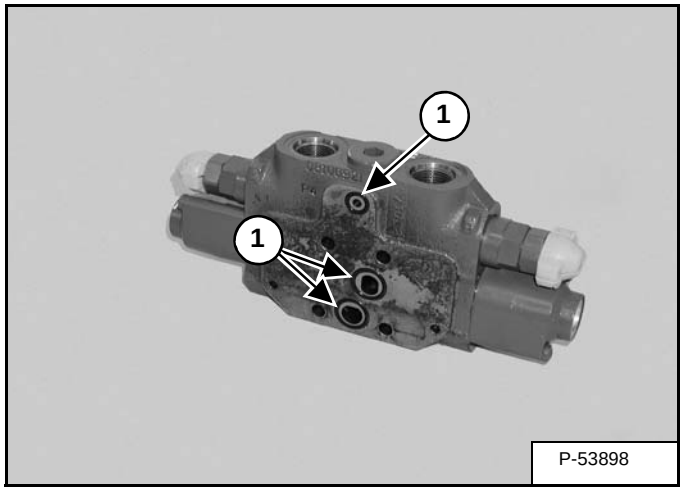
Arm Valve Section Disassembly And Assembly

Figure 20-41-124



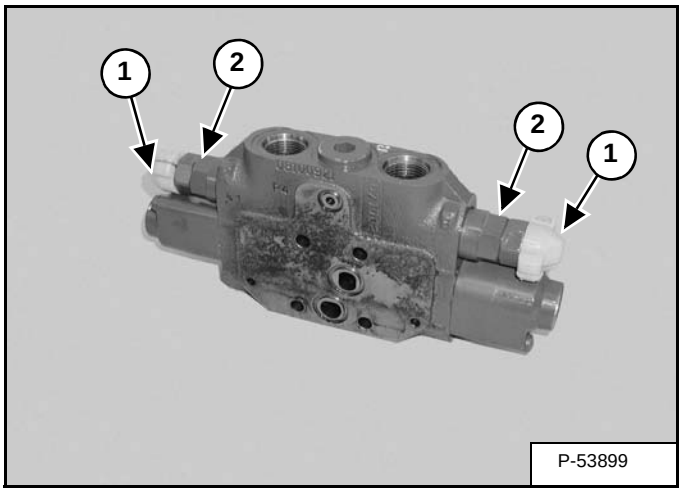
Remove the arm valve section (Item 1) **[Figure 20-41-124]** from the control valve.

Figure 20-41-125



Remove the O-rings (Item 1) **[Figure 20-41-125]** from the valve section.

Figure 20-41-126

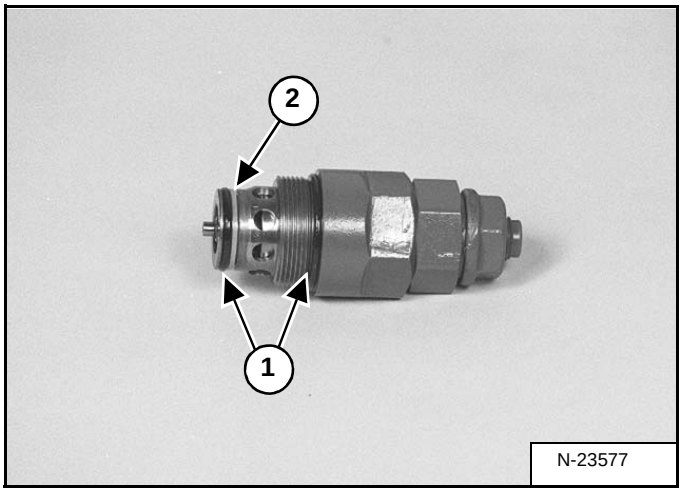


Remove the protective covers (Item 1) **[Figure 20-41-126]** from the valve section port relief/anti-cav valves.

Remove the port relief/anti-cav valves (Item 2) **[Figure 20-41-126]** from the valve section.

Assembly: Tighten the port relief/anti-cav valves to 46 - 57 ft.-lb. (63 - 77 N•m) torque.

Figure 20-41-127

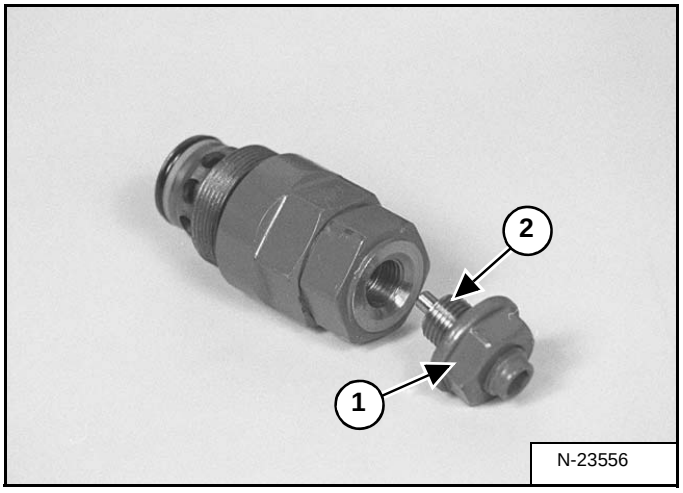


Remove the O-rings (Item 1) and back-up ring (Item 2) **[Figure 20-41-127]** from the port relief/anti-cav valve.

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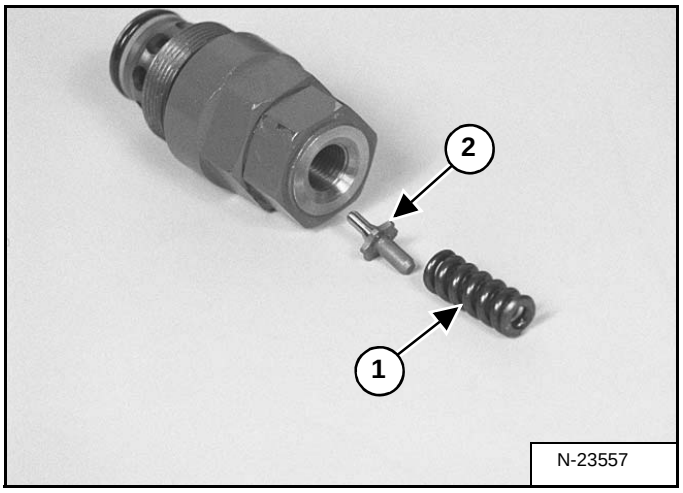
Arm Valve Section Disassembly And Assembly (Cont'd)

Figure 20-41-128



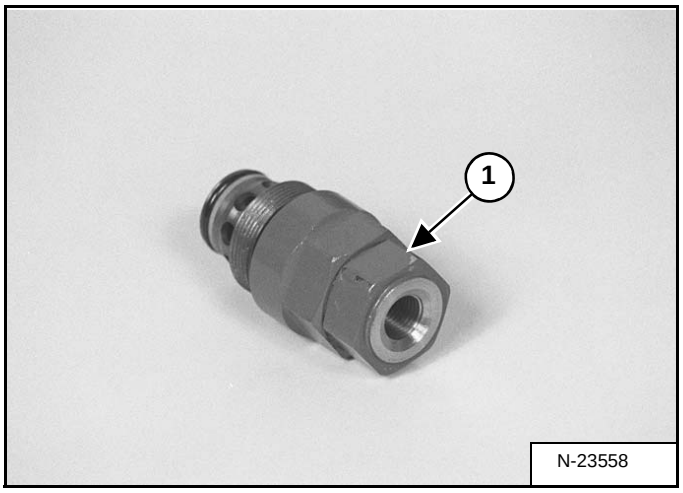
Remove the nut (Item 1) and adjustment screw (Item 2) **[Figure 20-41-128]** from the port relief/anti-cav valve.

Figure 20-41-129



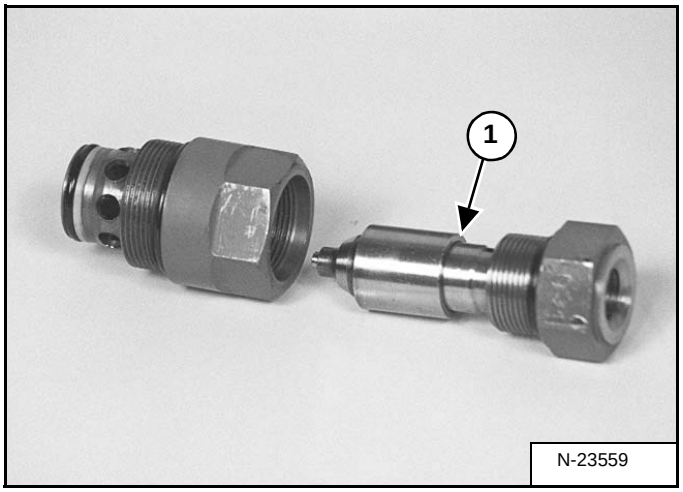
Remove the spring (Item 1) and poppet (Item 2) **[Figure 20-41-129]** from the port relief/anti-cav valve.

Figure 20-41-130



Remove the nut (Item 1) **[Figure 20-41-130]** from port relief/anti-cav valve.

Figure 20-41-131

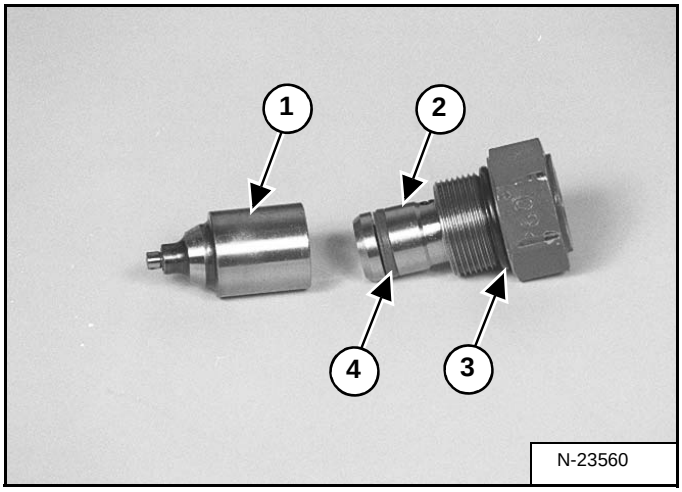


Remove the relief valve assembly (Item 1) **[Figure 20-41-131]** from the valve.

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Arm Valve Section Disassembly And Assembly (Cont'd)

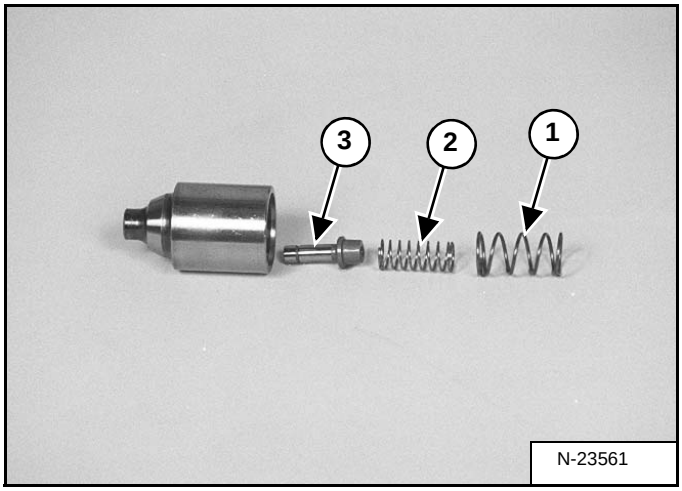
Figure 20-41-132



Remove the front section (Item 1) from the relief valve (Item 2) **[Figure 20-41-132]**.

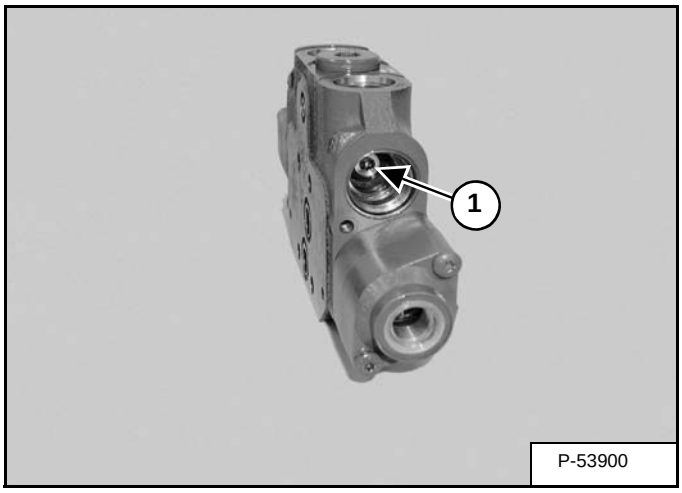
Remove the O-ring (Item 3) and seal (Item 4) **[Figure 20-41-132]**.

Figure 20-41-133



Remove the spring (Item 1), spring (Item 2) and poppet (Item 3) **[Figure 20-41-133]**.

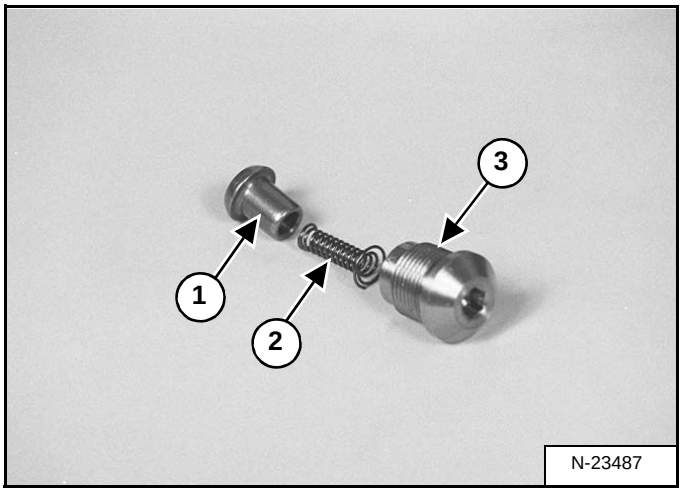
Figure 20-41-134



Remove the load check valve assembly (Item 1) **[Figure 20-41-134]** from both ends of the valve section.

Assembly: Tighten the load check valves to 80 - 97 in.-lb. (9 - 11 N•m) torque.

Figure 20-41-135

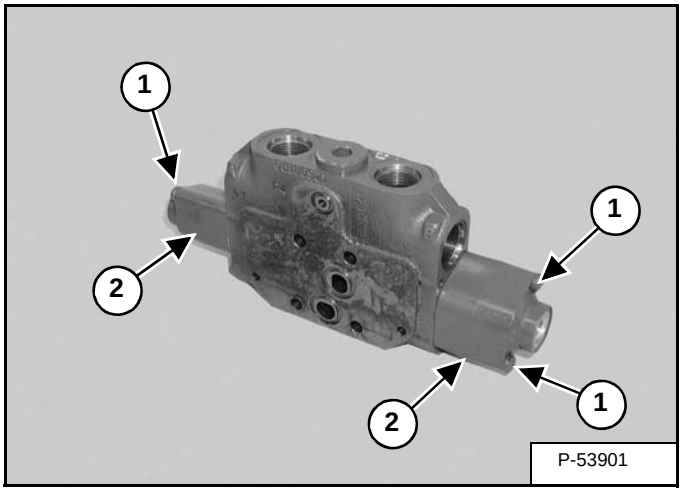


Remove the seat (Item 1) and spring (Item 2) from the load check valve body (Item 3) **[Figure 20-41-135]**.

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Arm Valve Section Disassembly And Assembly (Cont'd)

Figure 20-41-136

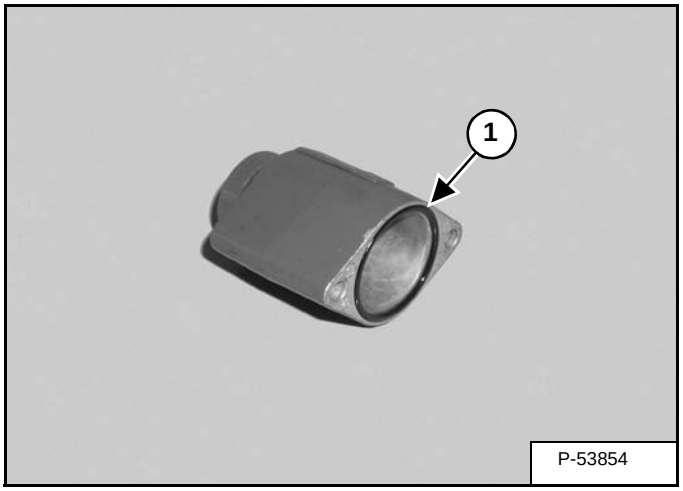


Remove the screws (Item 1) from both valve section end caps (Item 2) **[Figure 20-41-136]**.

Assembly: Tighten the screws to 48 - 58 in.-lb. (5,4 - 6,6 N•m).

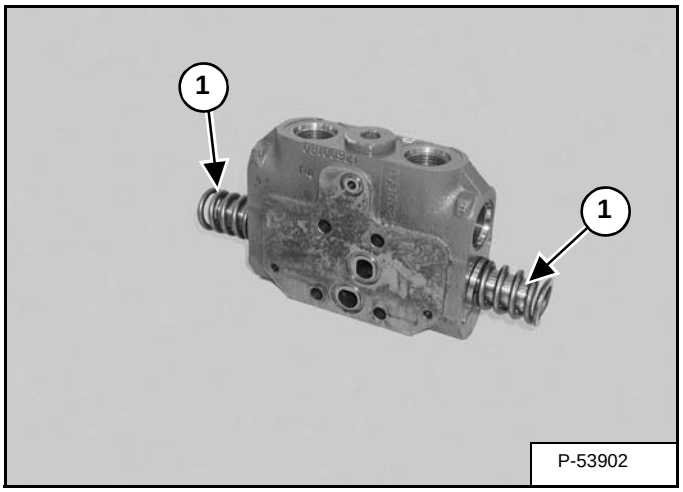
Remove the end caps.

Figure 20-41-137



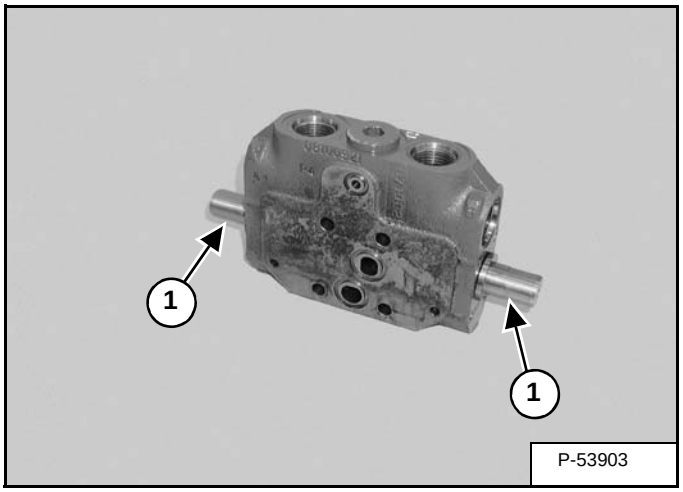
Remove the O-ring (Item 1) **[Figure 20-41-137]** from the end caps.

Figure 20-41-138



Remove the centering spring (Item 1) **[Figure 20-41-138]** from both ends of the valve spool.

Figure 20-41-139



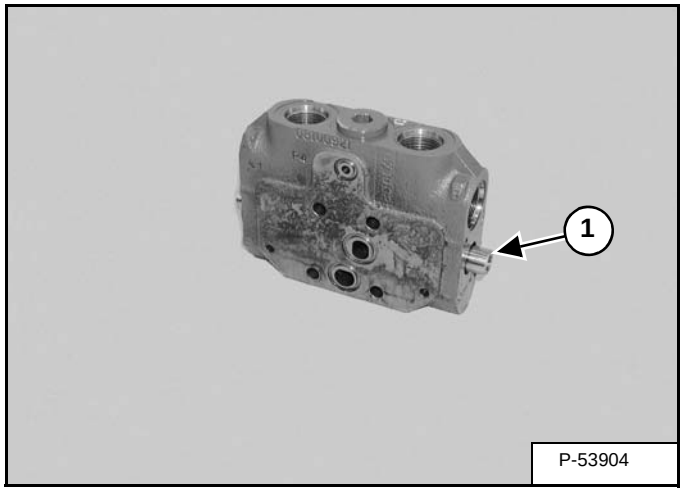
Remove the spring guides (Item 1) **[Figure 20-41-139]** from both ends of the valve spool.

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HYDRAULIC CONTROL VALVE (S/N 563111001 & ABOVE) (CONT'D)

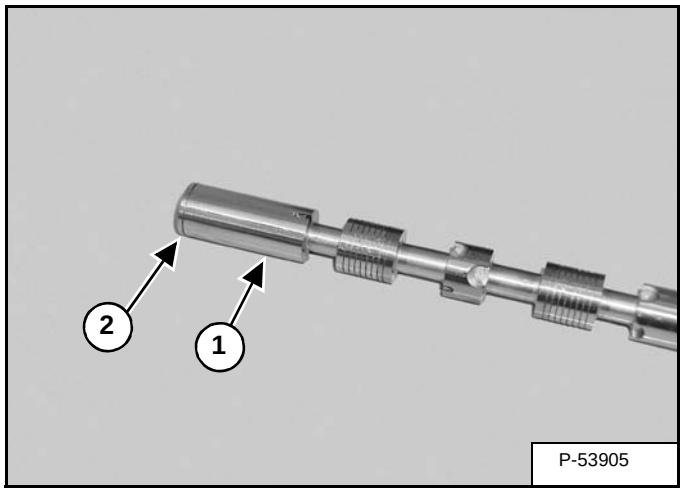
Arm Valve Section Disassembly And Assembly (Cont'd)

Figure 20-41-140



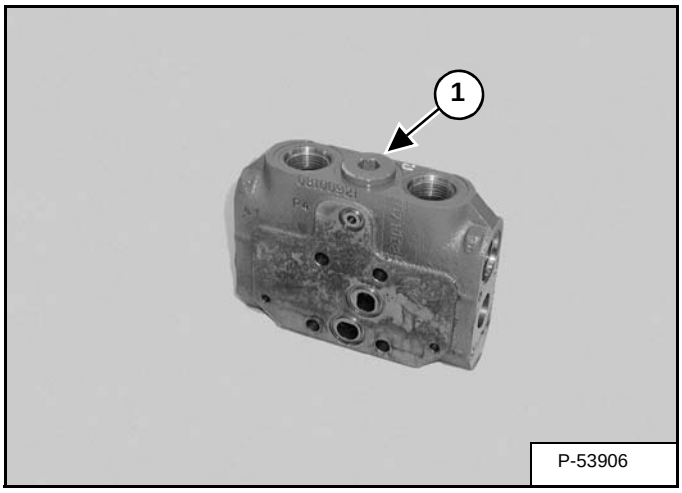
Remove the spool (Item 1) **[Figure 20-41-140]** from the valve section.

Figure 20-41-141



Assembly: The spool (Item 1) can only be installed in the valve section with the spool groove (Item 2) **[Figure 20-41-141]** toward the bottom of the valve section, on the B port.

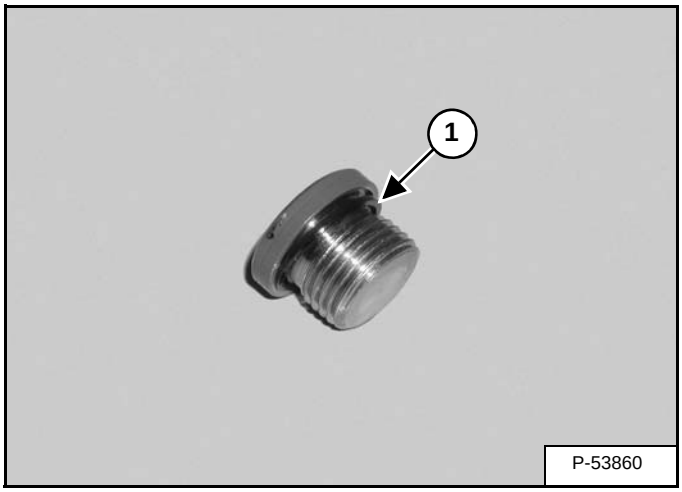
Figure 20-41-142



Remove the plug (Item 1) **[Figure 20-41-142]** from the top of the valve section.

Assembly: Tighten the plug to 46 - 57 ft.-lb. (63 - 77 N•m) torque.

Figure 20-41-143

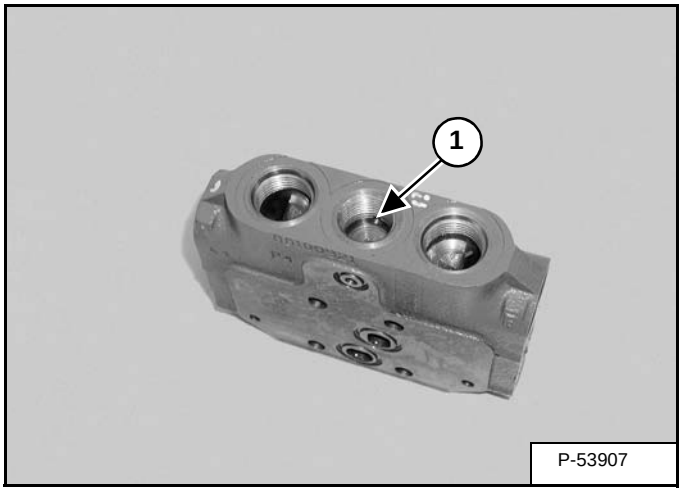


Remove the O-ring (Item 1) **[Figure 20-41-143]** from the plug.

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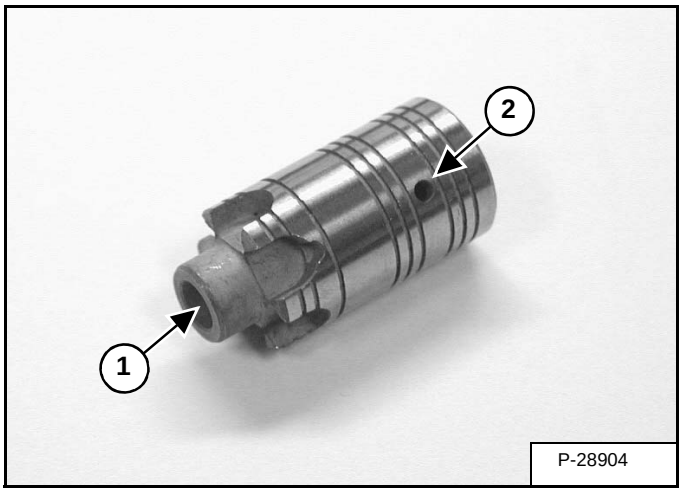
Arm Valve Section Disassembly And Assembly (Cont'd)

Figure 20-41-144



Remove the compensator (Item 1) **[Figure 20-41-144]** from the valve section.

Figure 20-41-145



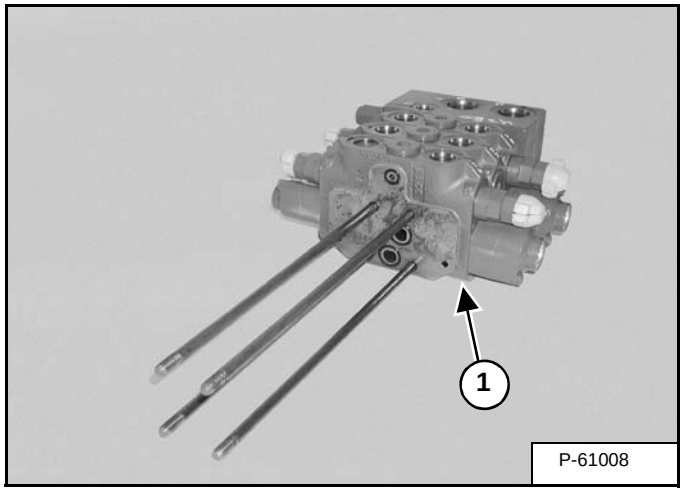
Check the orifice (Item 1) **[Figure 20-41-145]** in the compensator to be sure it is not plugged.

Check the crossport hole (Item 2) **[Figure 20-41-145]** to be sure it is not plugged.

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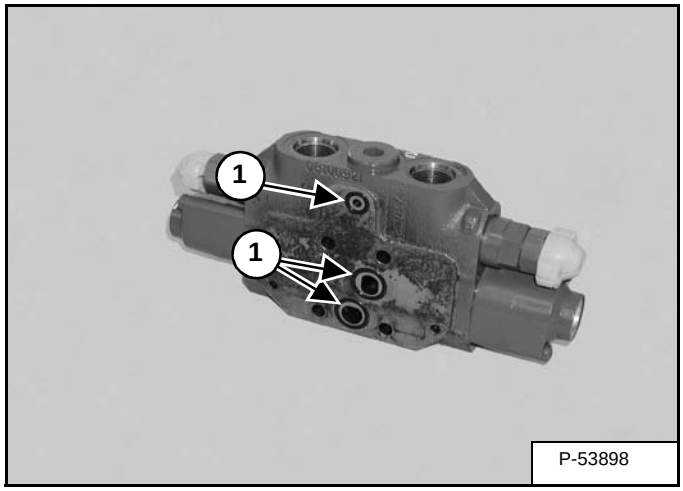
Boom Valve Section Disassembly And Assembly

Figure 20-41-146



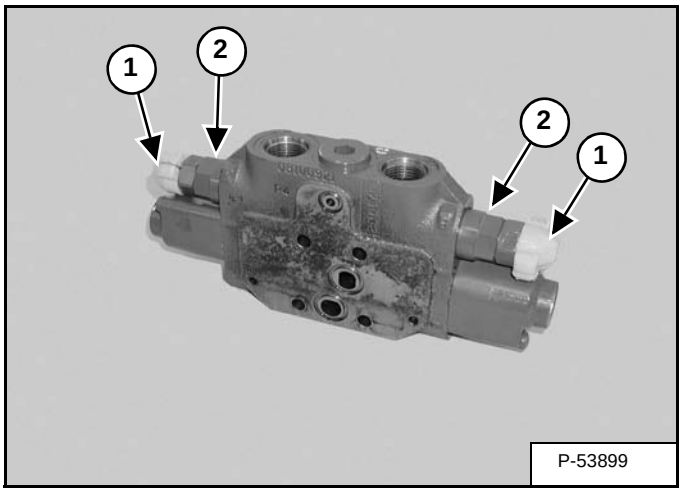
Remove the boom valve section (Item 1) **[Figure 20-41-146]** from the control valve.

Figure 20-41-147



Remove the O-rings (Item 1) **[Figure 20-41-147]** from the valve section.

Figure 20-41-148

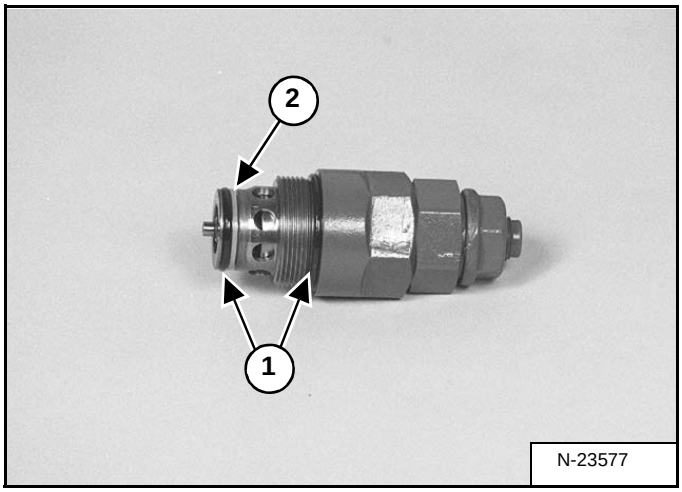


Remove the protective covers (Item 1) **[Figure 20-41-148]** from the valve section port relief/anti-cav valves.

Remove the port relief/anti-cav valves (Item 2) **[Figure 20-41-148]** from both ends of the valve section.

Assembly: Tighten the port relief/anti-cav valve to 46 - 57 ft.-lb. (63 - 77 N•m) torque.

Figure 20-41-149

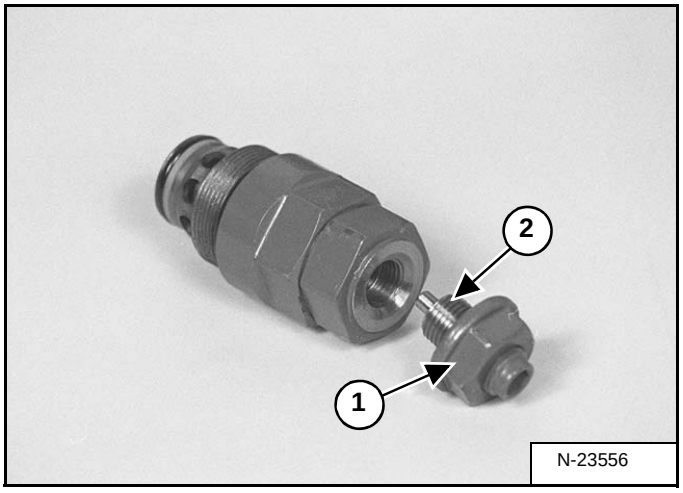


Remove the O-rings (Item 1) and back-up ring (Item 2) **[Figure 20-41-149]** from the port relief/anti-cav valve.

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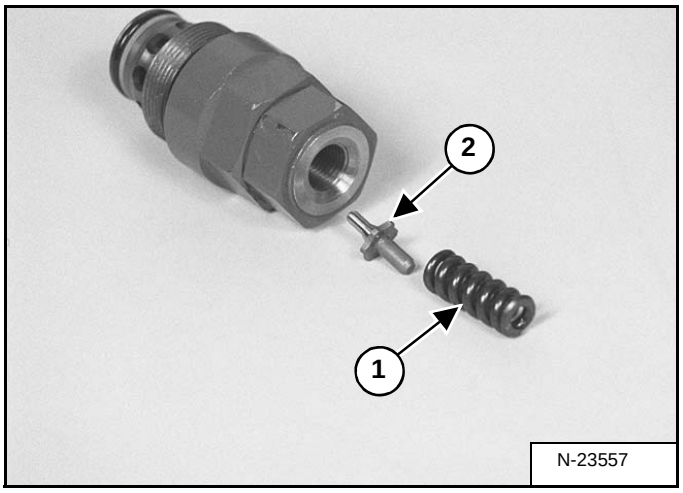
Boom Valve Section Disassembly And Assembly (Cont'd)

Figure 20-41-150



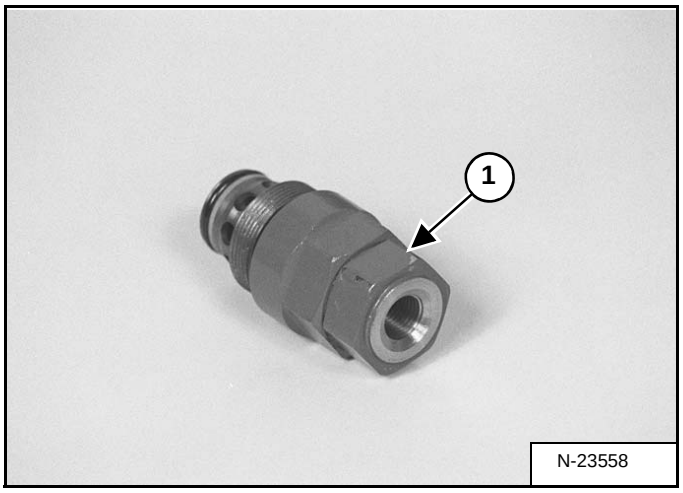
Remove the nut (Item 1) and adjustment screw (Item 2) **[Figure 20-41-150]** from the port relief/anti-cav valve.

Figure 20-41-151



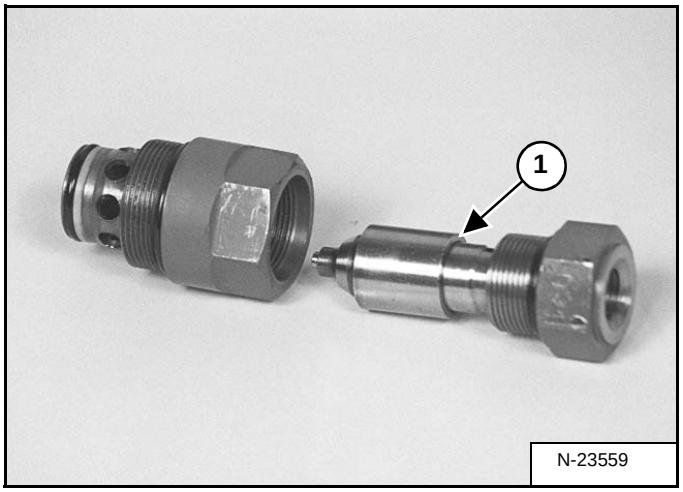
Remove the spring (Item 1) and poppet (Item 2) **[Figure 20-41-151]** from the port relief/anti-cav valve.

Figure 20-41-152



Remove the nut (Item 1) **[Figure 20-41-152]** from the port relief/anti-cav valve.

Figure 20-41-153

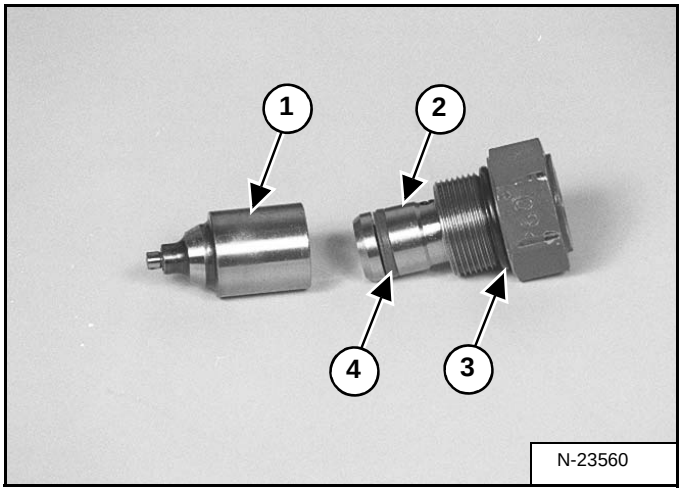


Remove the relief valve assembly (Item 1) **[Figure 20-41-153]** from the valve.

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Boom Valve Section Disassembly And Assembly (Cont'd)

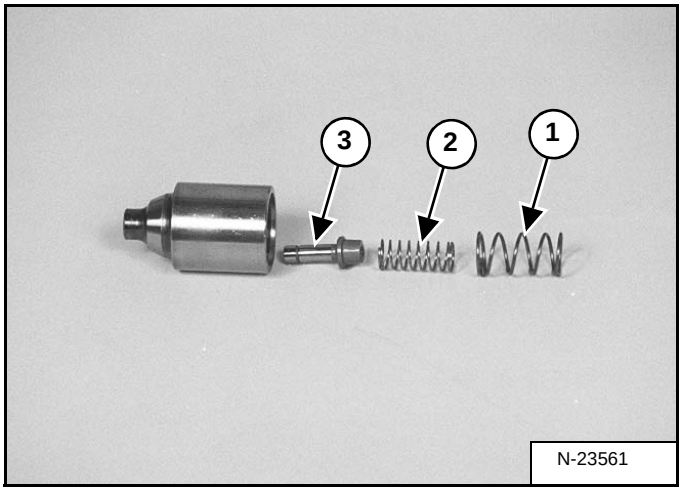
Figure 20-41-154



Remove the front section (Item 1) from the relief valve (Item 2) **[Figure 20-41-154]**.

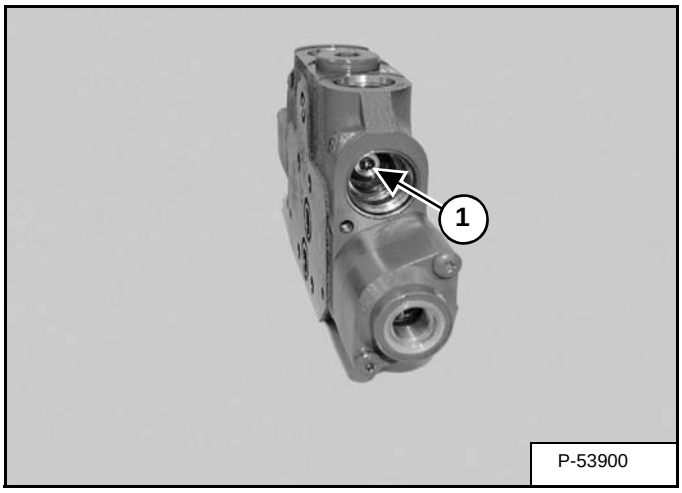
Remove the O-ring (Item 3) and seal (Item 4) **[Figure 20-41-154]**

Figure 20-41-155



Remove the spring (Item 1), spring (Item 2) and poppet (Item 3) **[Figure 20-41-155]** from the front section of the relief valve assembly.

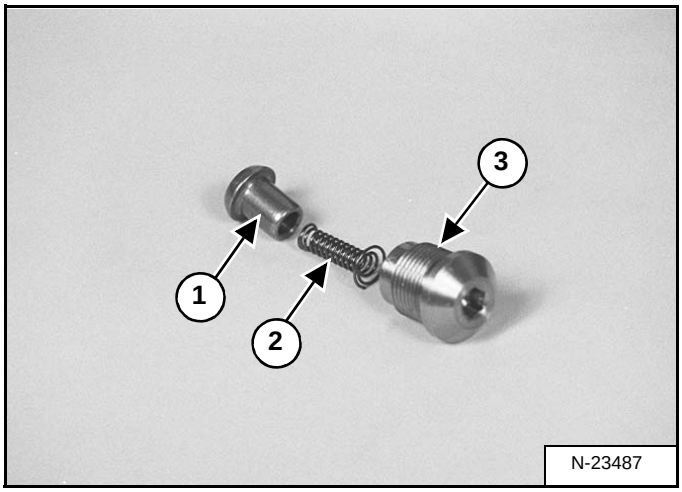
Figure 20-41-156



Remove the load check valve assembly (Item 1) **[Figure 20-41-156]** from both ends of the valve section.

Assembly: Tighten the load check valves to 80 - 97 in.-lb. (9 - 11 N•m) torque.

Figure 20-41-157

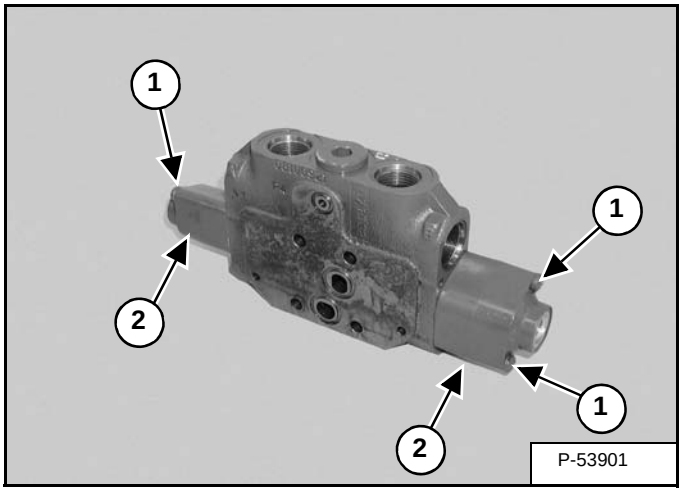


Remove the seat (Item 1) and spring (Item 2) from the load check valve body (Item 3) **[Figure 20-41-157]**.

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Boom Valve Section Disassembly And Assembly (Cont'd)

Figure 20-41-158

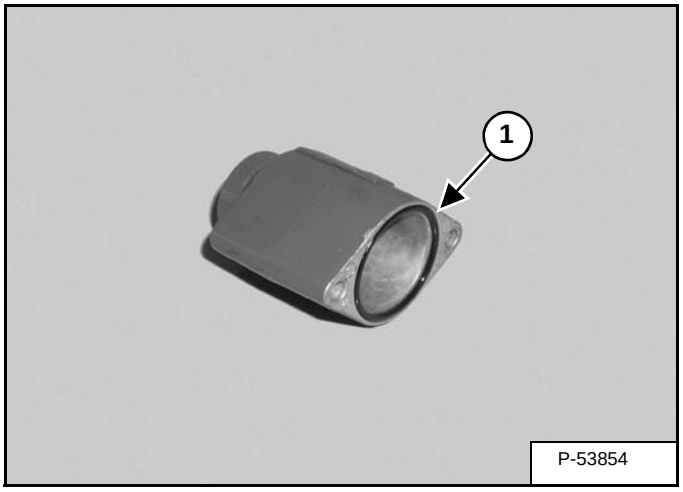


Remove the screws (Item 1) from both valve section end caps (Item 2) **[Figure 20-41-158]**.

Assembly: Tighten the screws to 48 - 58 in.-lb. (5,4 - 6,6 N•m)

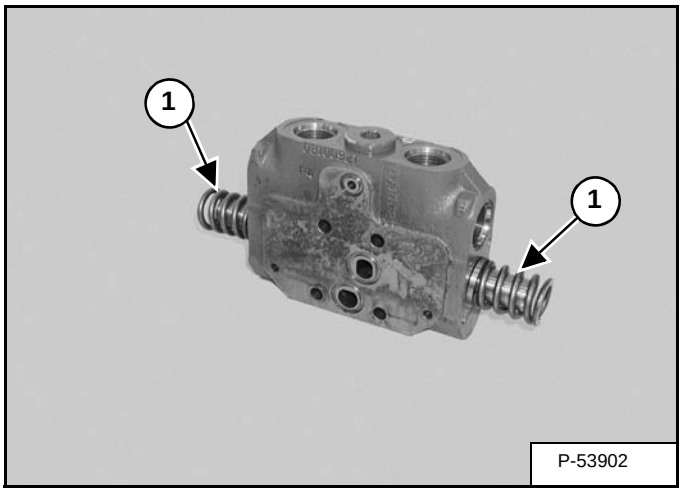
Remove the end caps.

Figure 20-41-159



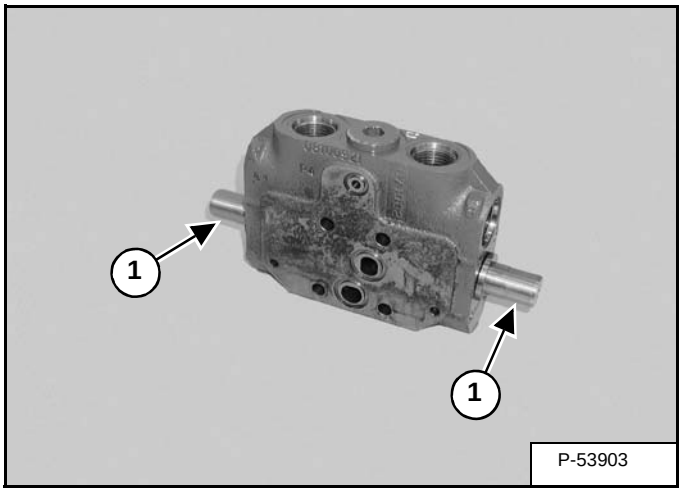
Remove the O-ring (Item 1) **[Figure 20-41-159]** from the end caps.

Figure 20-41-160



Remove the centering spring (Item 1) **[Figure 20-41-160]** from both ends of the valve spool.

Figure 20-41-161

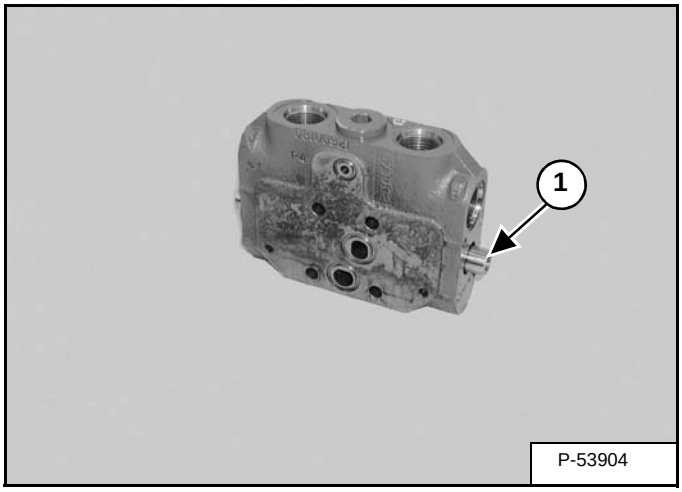


Remove the spring guides (Item 1) **[Figure 20-41-161]** from both ends of the valve spool.

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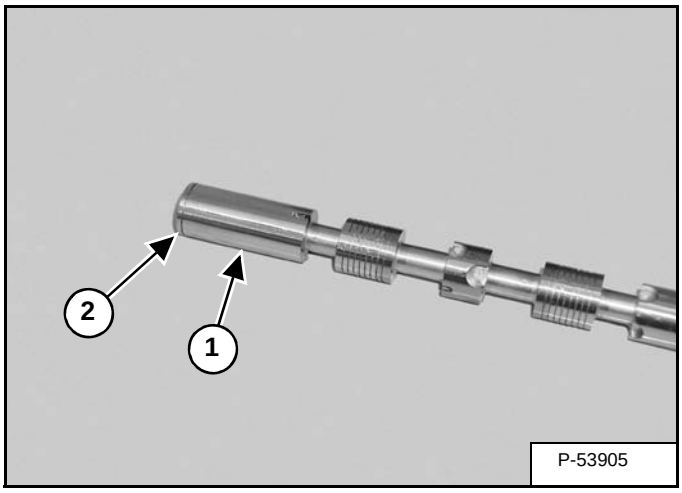
Boom Valve Section Disassembly And Assembly (Cont'd)

Figure 20-41-162



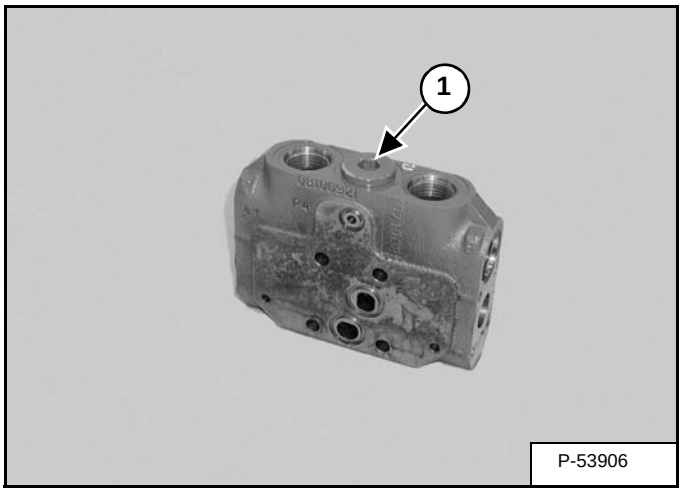
Remove the spool (Item 1) **[Figure 20-41-162]** from the valve section.

Figure 20-41-163



Assembly: The spool (Item 1) can only be installed in the valve section with the spool groove (Item 2) **[Figure 20-41-163]** toward the top of the valve section, on the A port.

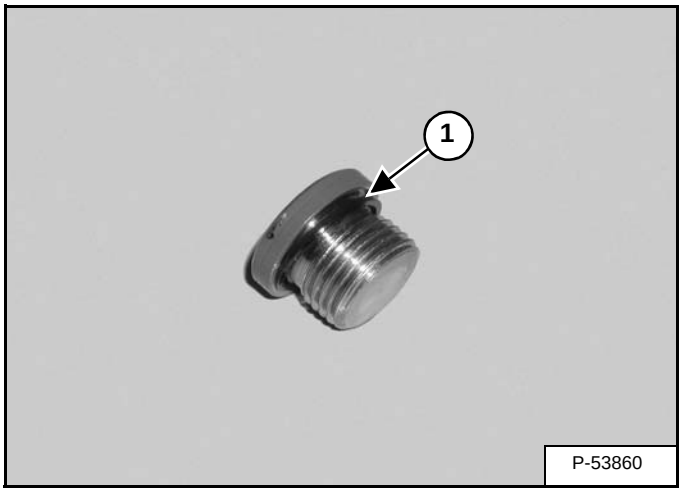
Figure 20-41-164



Remove the plug (Item 1) **[Figure 20-41-164]** from the top of the valve section.

Assembly: Tighten the plug to 46 - 57 ft.-lb. (63 - 77 N•m) torque.

Figure 20-41-165

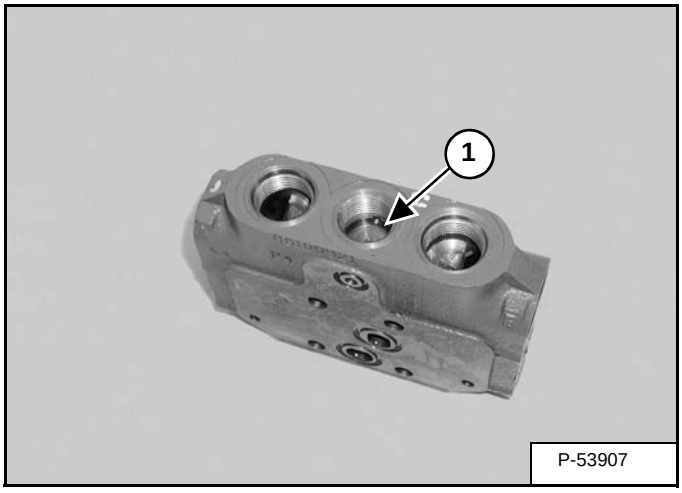


Remove the O-ring (Item 1) **[Figure 20-41-165]** from the plug.

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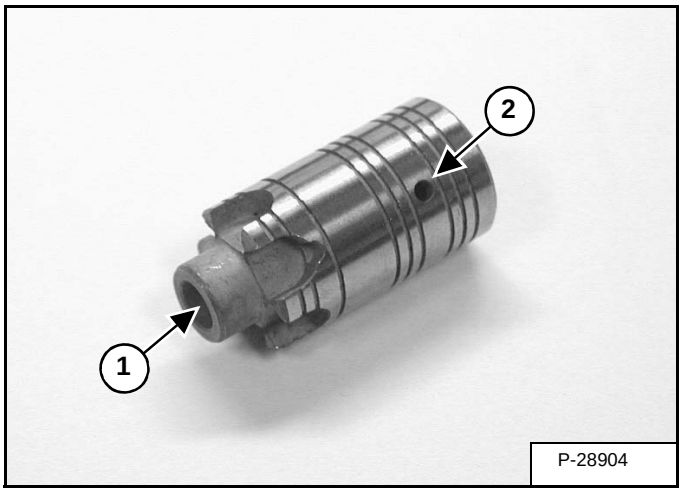
Boom Valve Section Disassembly And Assembly (Cont'd)

Figure 20-41-166



Remove the compensator (Item 1) **[Figure 20-41-166]** from the valve section.

Figure 20-41-167



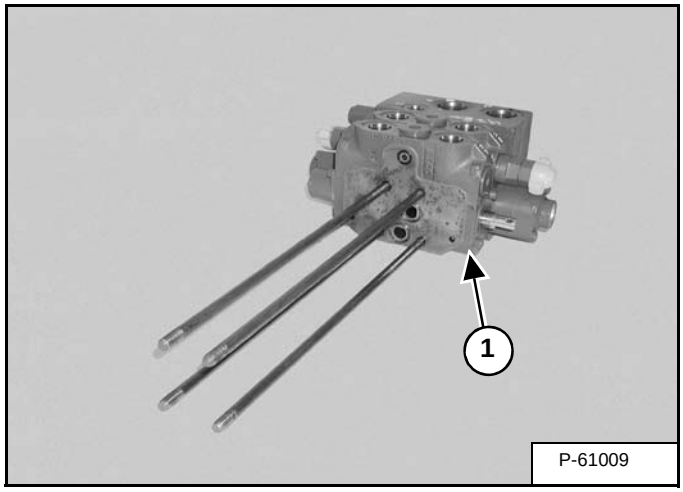
Check the orifice (Item 1) **[Figure 20-41-167]** in the compensator to be sure it is not plugged.

Check the crossport hole (Item 2) **[Figure 20-41-167]** to be sure it is not plugged.

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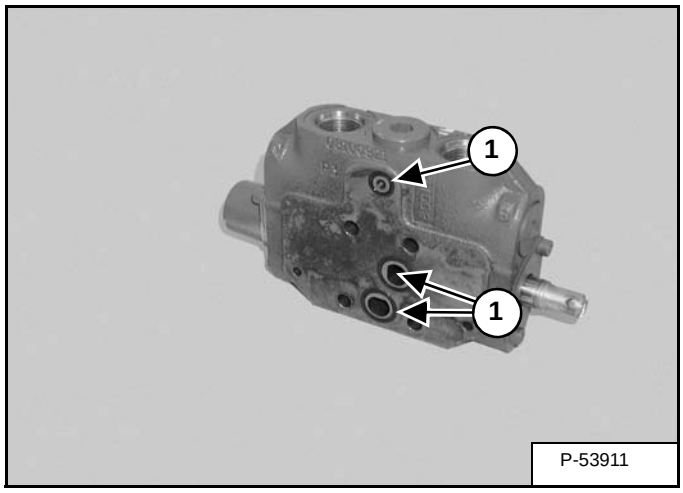
Boom Swing Valve Section Disassembly And Assembly

Figure 20-41-168



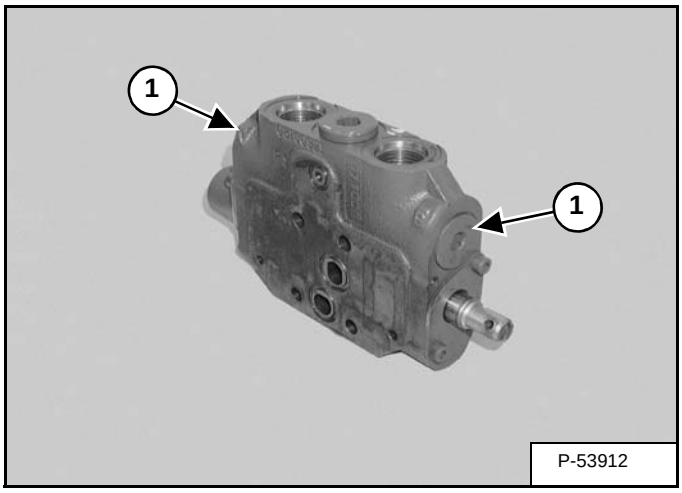
Remove the boom swing valve section (Item 1) **[Figure 20-41-168]** from the control valve.

Figure 20-41-169



Remove the O-rings (Item 1) **[Figure 20-41-169]** from the valve section.

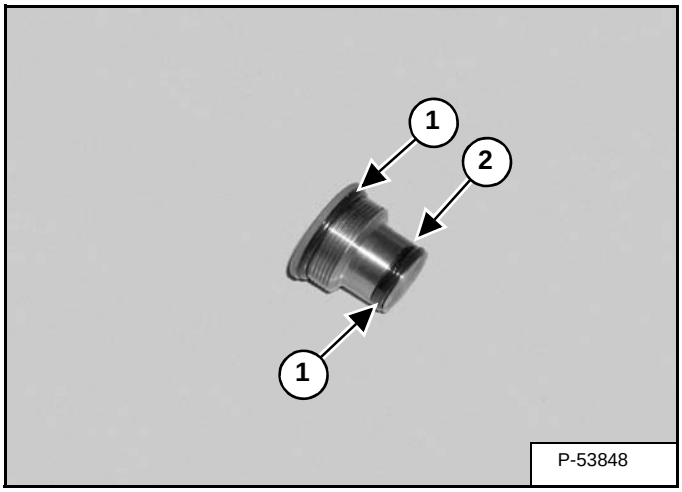
Figure 20-41-170



Remove the plug (Item 1) **[Figure 20-41-170]** from both ends of the valve section.

Assembly: Tighten the plug to 46 - 57 ft.-lb. (63 - 77 N•m) torque.

Figure 20-41-171

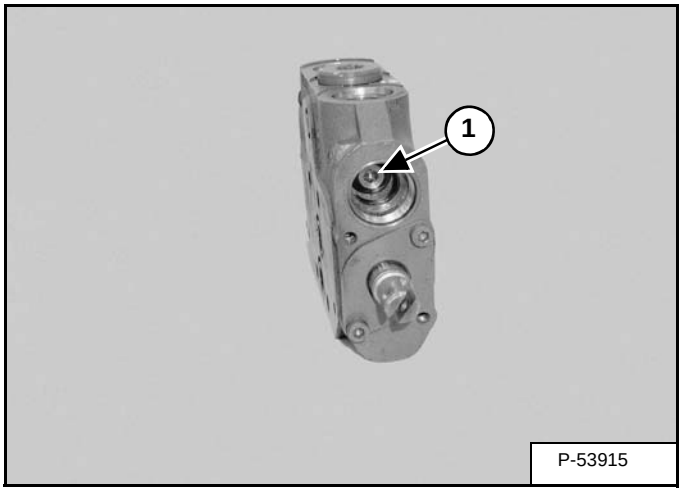


Remove the O-rings (Item 1) and backup ring (Item 2) **[Figure 20-41-171]** from the plugs.

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Boom Swing Valve Section Disassembly And Assembly (Cont'd)

Figure 20-41-172



Remove the load check valve assembly (Item 1) **[Figure 20-41-172]** from both ends of the valve section.

Assembly: Tighten the load check valves to 80 - 97 in.-lb. (9 - 11 N•m) torque.

Figure 20-41-173

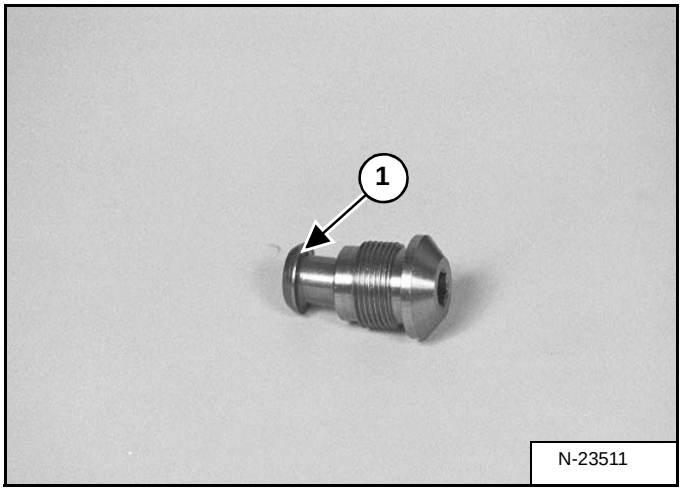
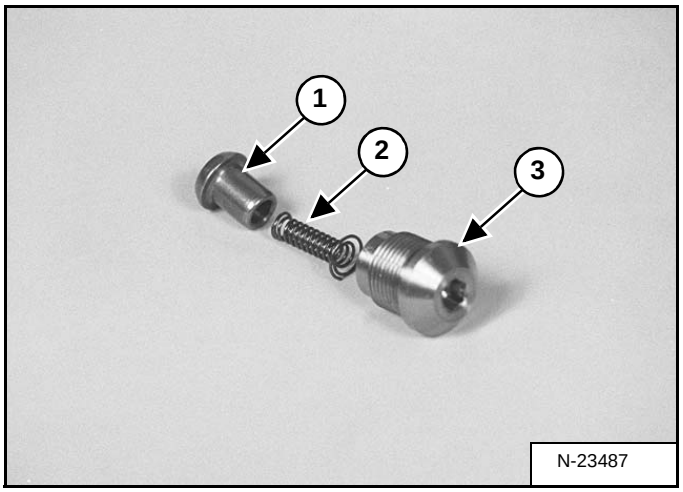
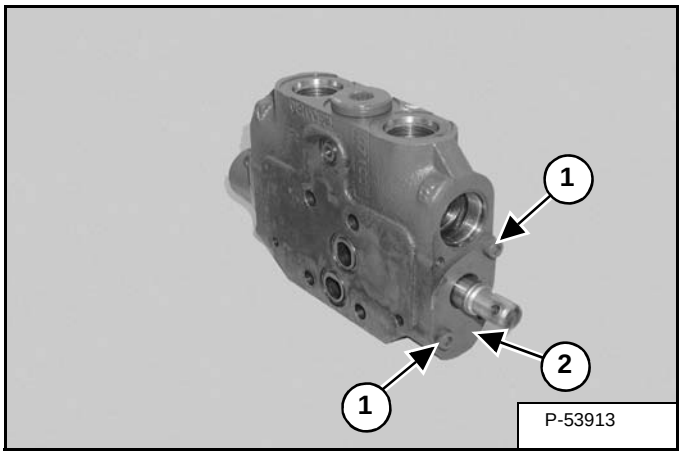


Figure 20-41-174



Remove the seat (Item 1) **[Figure 20-41-173]** & **[Figure 20-41-174]** and spring (Item 2) from the load check valve body (Item 3) **[Figure 20-41-174]**.

Figure 20-41-175



Remove the screws (Item 1) from the valve spool retainer (Item 2) **[Figure 20-41-175]**.

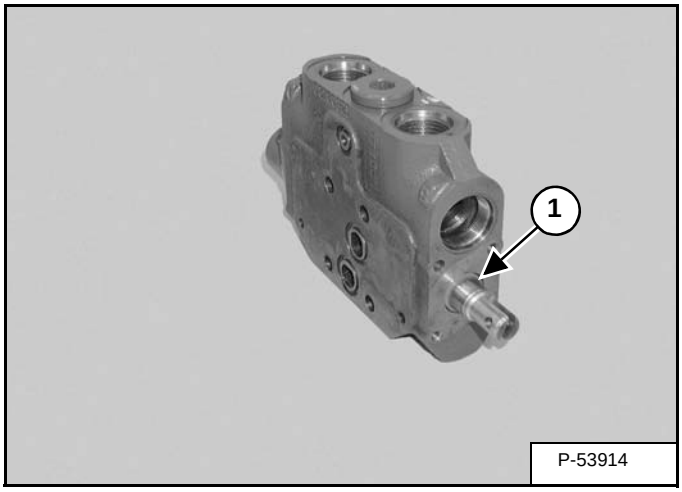
Installation: Tighten the screws to 48 - 58 in.-lb. (5,4 - 6,6 N•m) torque.

Remove the retainer.

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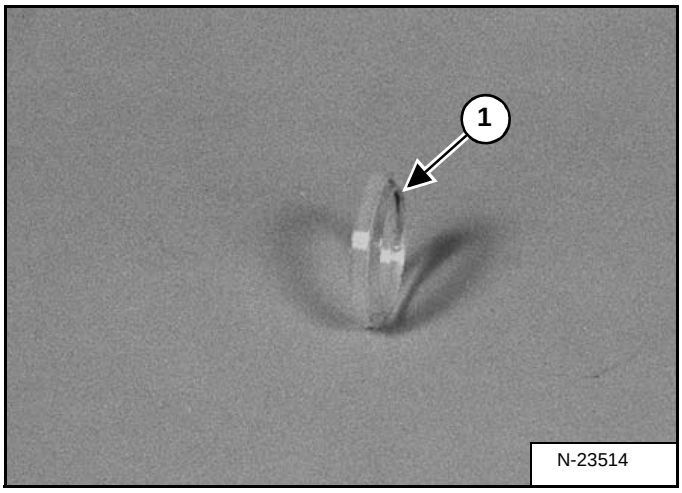
Boom Swing Valve Section Disassembly And Assembly (Cont'd)

Figure 20-41-176



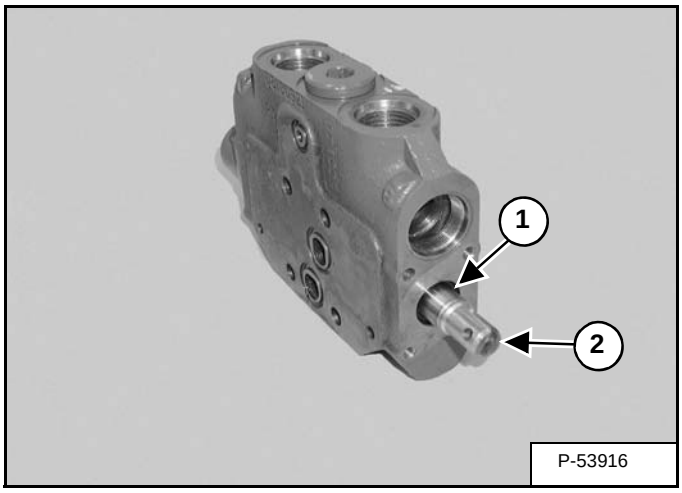
Remove the seal (Item 1) **[Figure 20-41-176]** from the spool.

Figure 20-41-177



Assembly: Install the seal on the spool with the flange (Item 1) **[Figure 20-41-177]** toward the outside of the valve section.

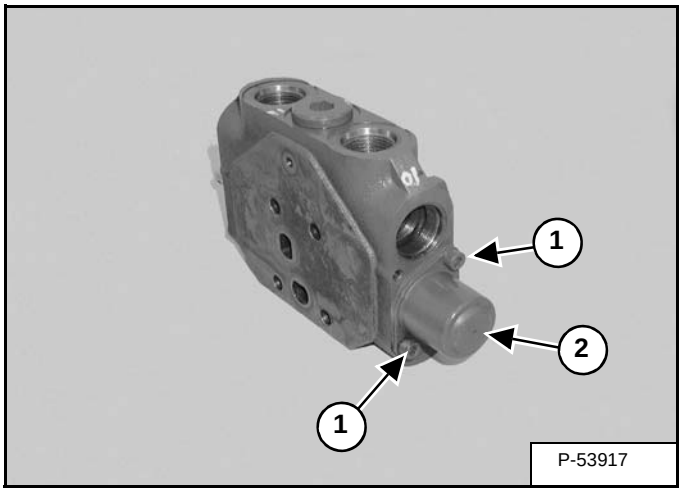
Figure 20-41-178



Remove the O-ring (Item 1) **[Figure 20-41-178]** from the valve spool.

NOTE: The valve spool (Item 2) [Figure 20-41-178] can only be removed from the valve section from the spring end of the valve section.

Figure 20-41-179



Remove the screws (Item 1) from the valve section end cap (Item 2) **[Figure 20-41-179]**.

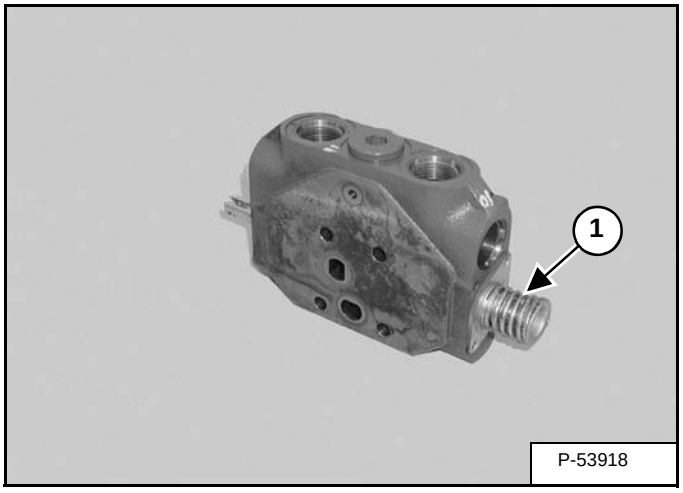
Assembly: Tighten the screws to 48 - 58 in.-lb. (5,4 - 6,6 N•m) torque.

Remove the end cap.

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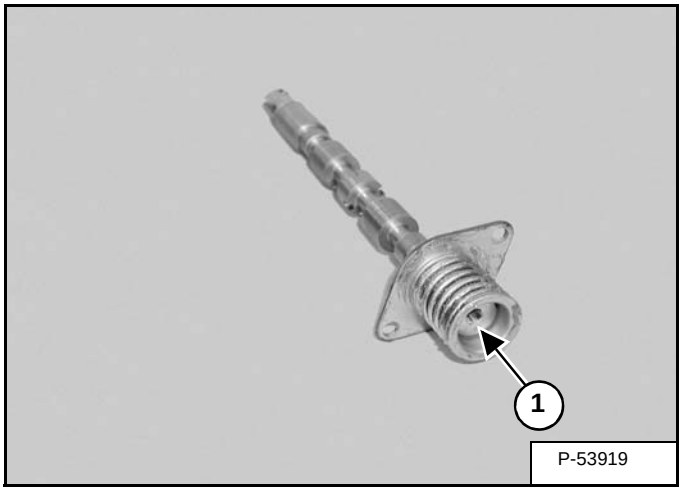
Boom Swing Valve Section Disassembly And Assembly (Cont'd)

Figure 20-41-180



Remove the spool assembly (Item 1) **[Figure 20-41-180]**.

Figure 20-41-181

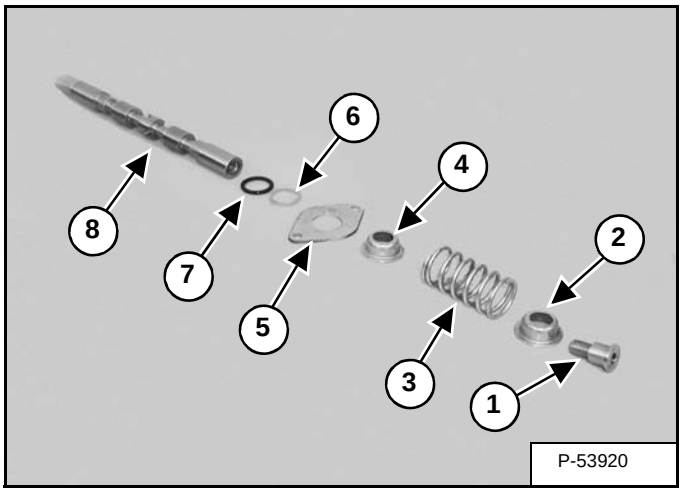


Loosen the bolt (Item 1) **[Figure 20-41-181]**.

Assembly: Tighten the bolt to 80 - 97 in.-lb. (9 - 1 N•m) torque.

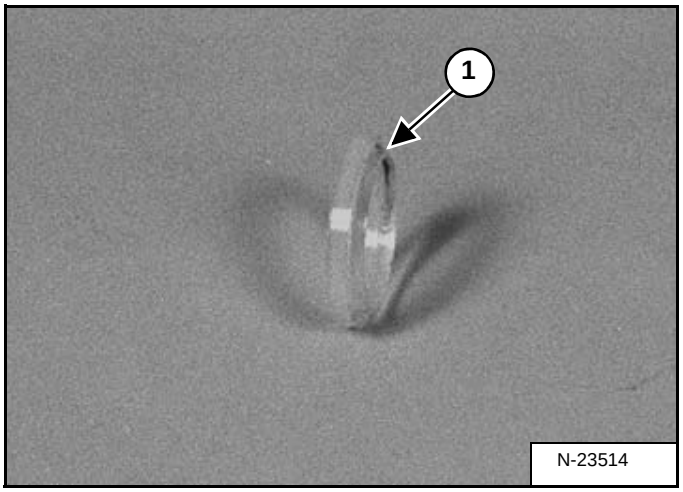
NOTE: To remove the bolt, the spool must be held on the linkage end, to keep the spool from rotating.

Figure 20-41-182



Remove the bolt (Item 1), spring retainer (Item 2), spring (Item 3), spring retainer (Item 4), retainer (Item 5), seal (Item 6) and O-ring (Item 7) from the spool (Item 8) **[Figure 20-41-182]**.

Figure 20-41-183

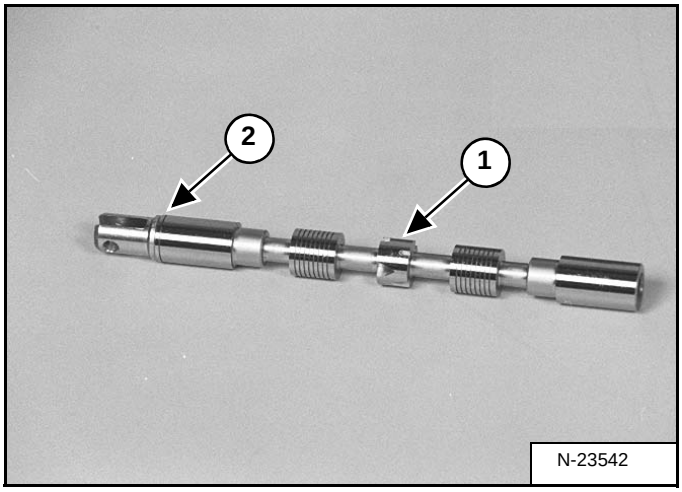


Assembly: Install the seal on the spool with the flange (Item 1) **[Figure 20-41-183]** toward the outside of the valve section.

https://www.pdfmanual4trucks.com/

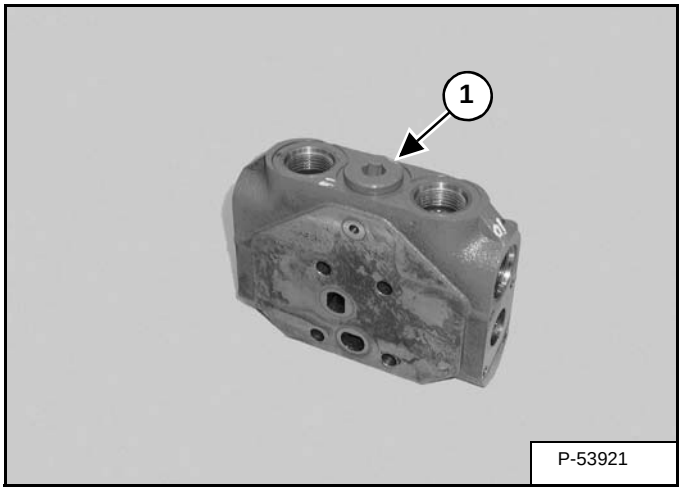
Boom Swing Valve Section Disassembly And Assembly (Cont'd)

Figure 20-41-184



Assembly: The spool (Item 1) can only be installed in the valve section with the spool groove (Item 2) **[Figure 20-41-184]** toward the bottom of the valve section, on the B port.

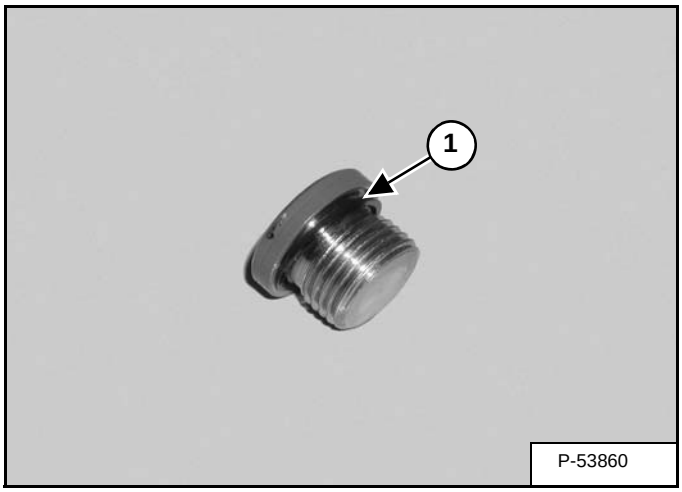
Figure 20-41-185



Remove the plug (Item 1) **[Figure 20-41-185]** from the top of the valve section.

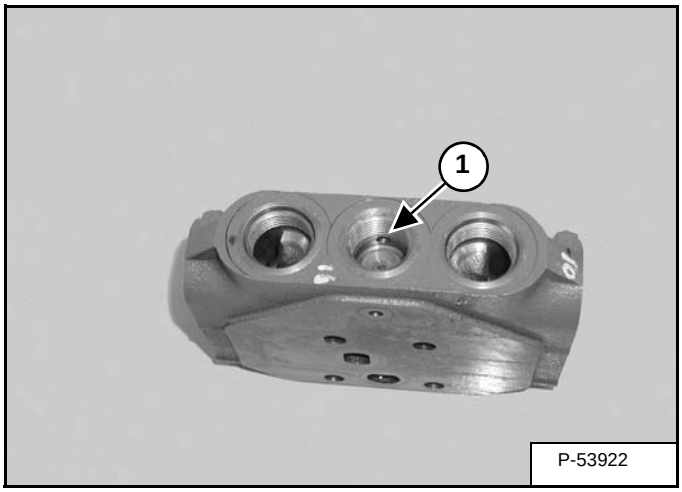
Assembly: Tighten the plug to 46 - 57 ft.-lb. (63 - 77 N•m) torque.

Figure 20-41-186



Remove the O-ring (Item 1) **[Figure 20-41-186]** from the plug.

Figure 20-41-187

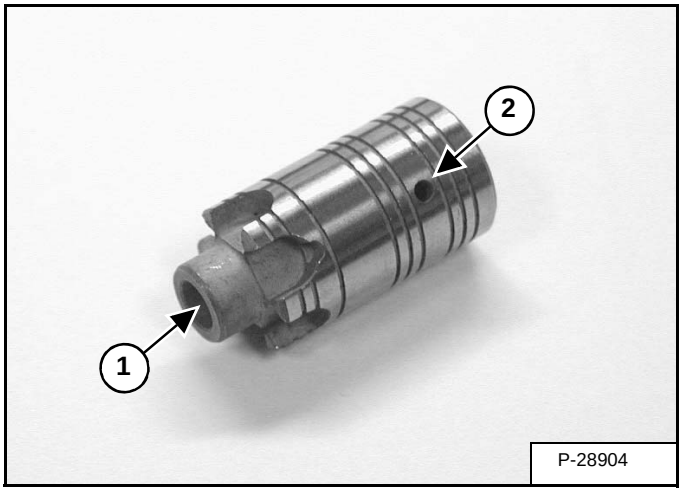


Remove the compensator (Item 1) **[Figure 20-41-187]** from the valve section.

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Boom Swing Valve Section Disassembly And Assembly (Cont'd)

Figure 20-41-188



Check the orifice (Item 1) **[Figure 20-41-188]** in the compensator to be sure it is not plugged.

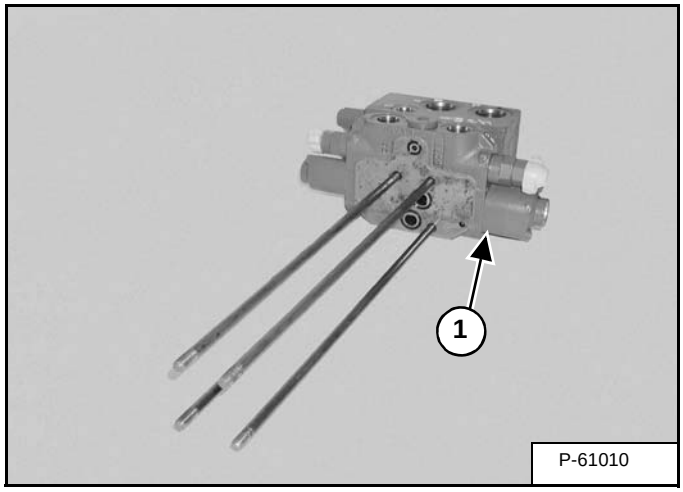
Check the crossport hole (Item 2) **[Figure 20-41-188]** to be sure it is not plugged.

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HYDRAULIC CONTROL VALVE (S/N 563111001 & ABOVE) (CONT'D)

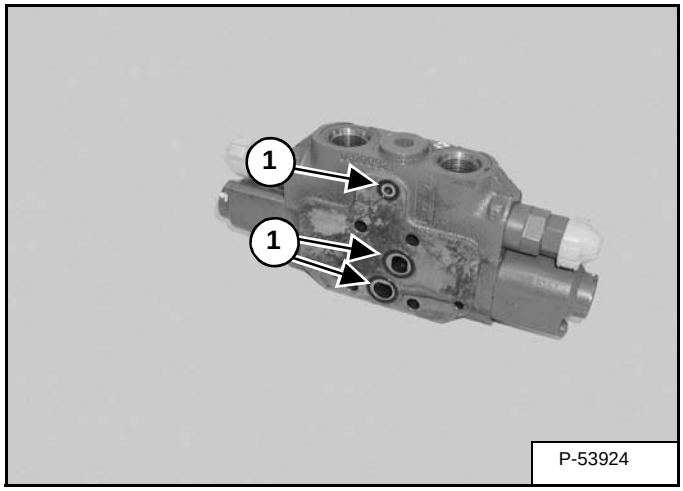
Auxiliary Valve Section Disassembly And Assembly

Figure 20-41-189



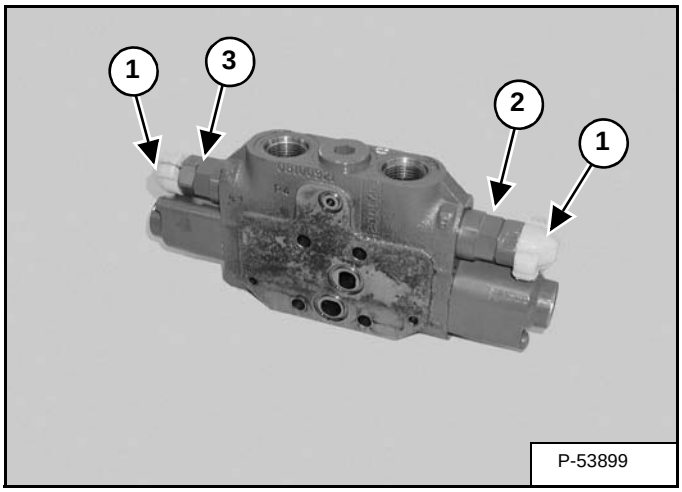
Remove the auxiliary valve section (Item 1) **[Figure 20-41-189]** from the control valve.

Figure 20-41-190



Remove the O-rings (Item 1) **[Figure 20-41-190]** from the valve section.

Figure 20-41-191



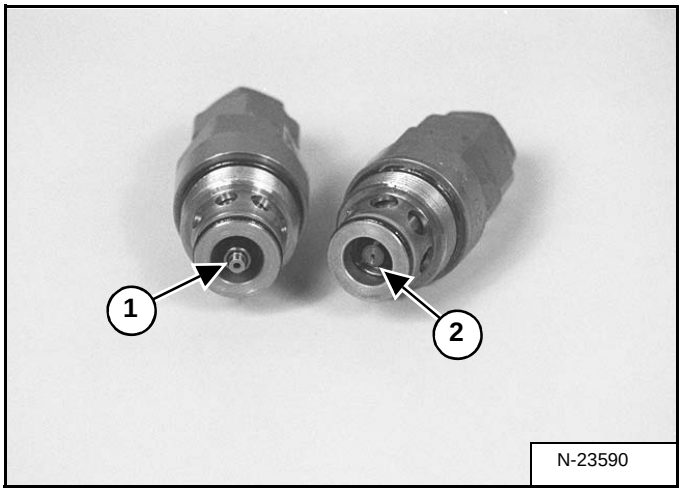
Remove the protective covers (Item 1) **[Figure 20-41-191]** from the valve section.

Remove the port relief valve (Item 2) **[Figure 20-41-191]** from the valve section.

Remove the port relief/anti-cav valve (Item 3) **[Figure 20-41-191]** from the valve section.

Assembly: Tighten the valves to 46 - 57 ft.lb. (63 - 77 N•m) torque.

Figure 20-41-192



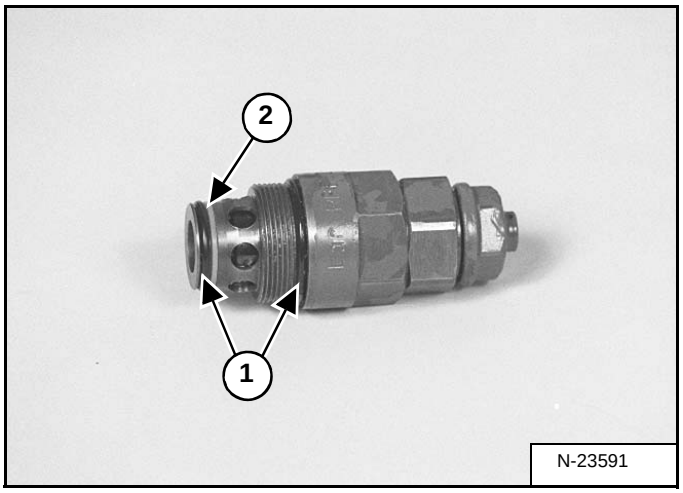
NOTE: The auxiliary valve section has one port relief/ anti-cav valve (Item 1), and one port relief valve (Item 2) [Figure 20-41-192].

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Auxiliary Valve Section Disassembly And Assembly (Cont'd)

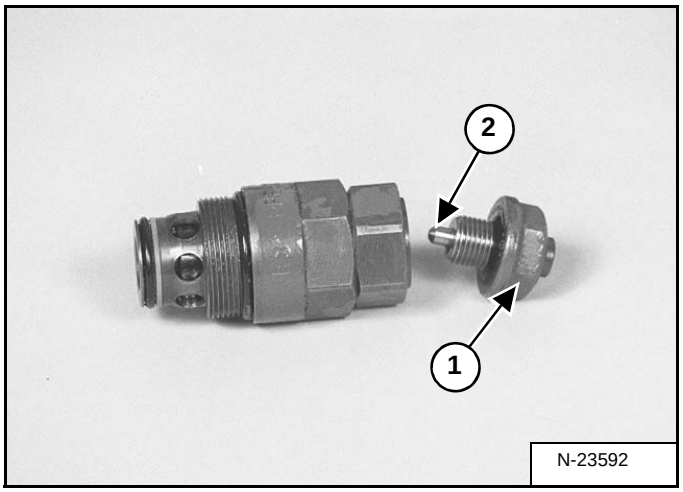
Port Relief

Figure 20-41-193



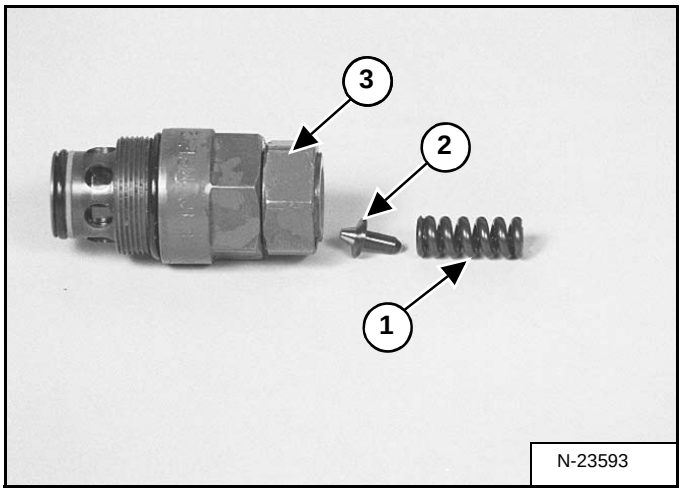
Remove the O-rings (Item 1) and back-up ring (Item 2) **[Figure 20-41-193]** from the port relief valve.

Figure 20-41-194



Remove the nut (Item 1) and adjustment screw (Item 2) **[Figure 20-41-194]** from the port relief valve.

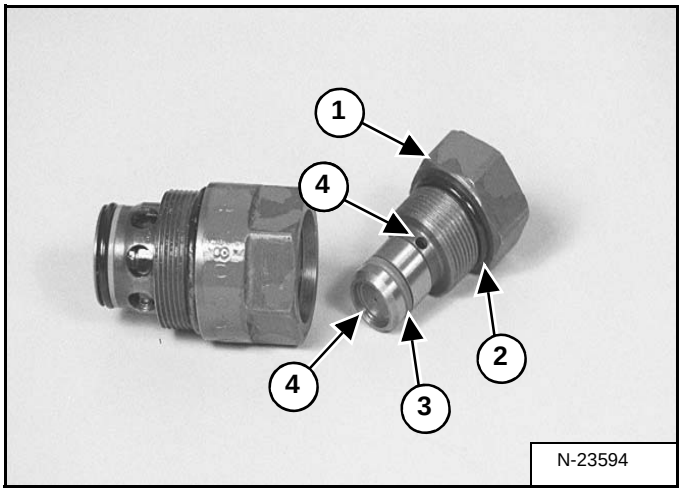
Figure 20-41-195



Remove the spring (Item 1) and poppet (Item 2) **[Figure 20-41-195]** from the port relief valve body.

Remove the nut (Item 3) **[Figure 20-41-195]** from the port relief valve.

Figure 20-41-196



Remove the relief valve assembly (Item 1) **[Figure 20-41-196]**.

Remove the O-ring (Item 2) and seal (Item 3) **[Figure 20-41-196]**.

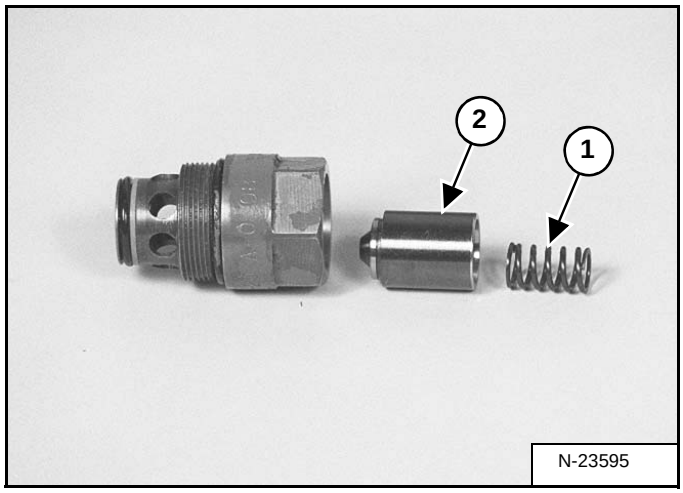
Check the orifice (Item 4) **[Figure 20-41-196]** to be sure it is not plugged.

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Auxiliary Valve Section Disassembly And Assembly (Cont'd)

Port Relief (Cont'd)

Figure 20-41-197



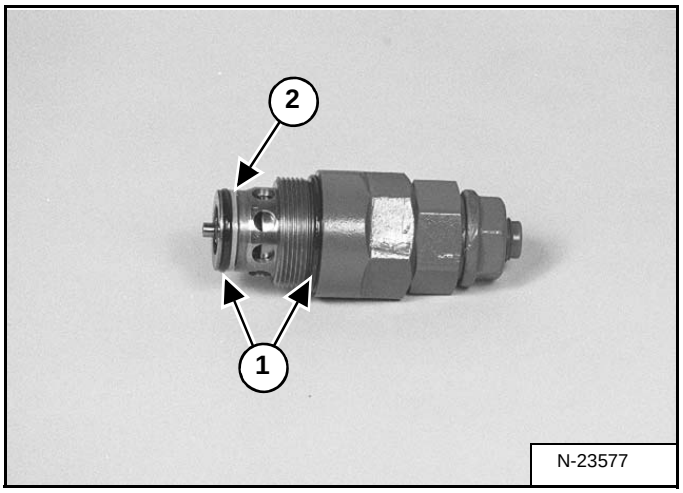
Remove the spring (Item 1) and poppet (Item 2) **[Figure 20-41-197]**.

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Auxiliary Valve Section Disassembly And Assembly (Cont'd)

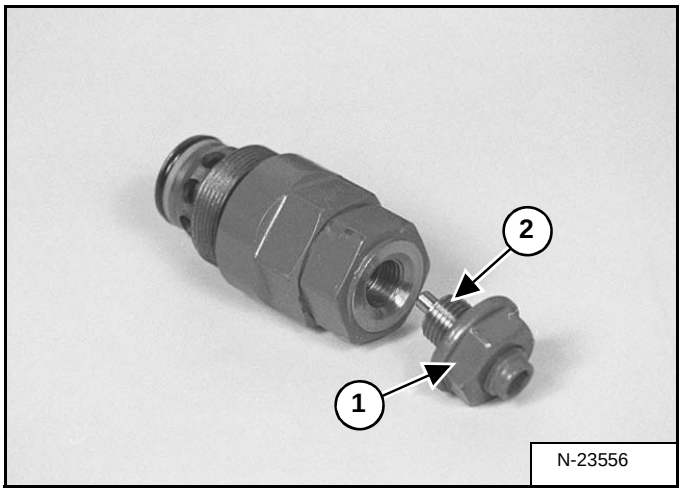
Port Relief/Anti-Cav

Figure 20-41-198



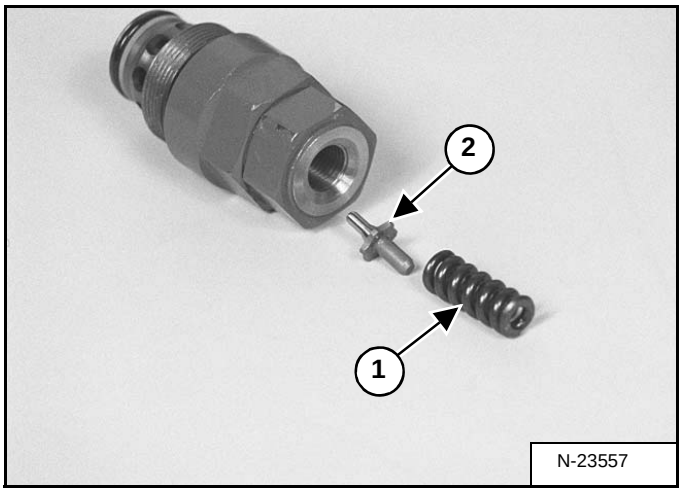
Remove the O-rings (Item 1) and back-up ring (Item 2) **[Figure 20-41-198]** from the port relief/anti-cav valve.

Figure 20-41-199



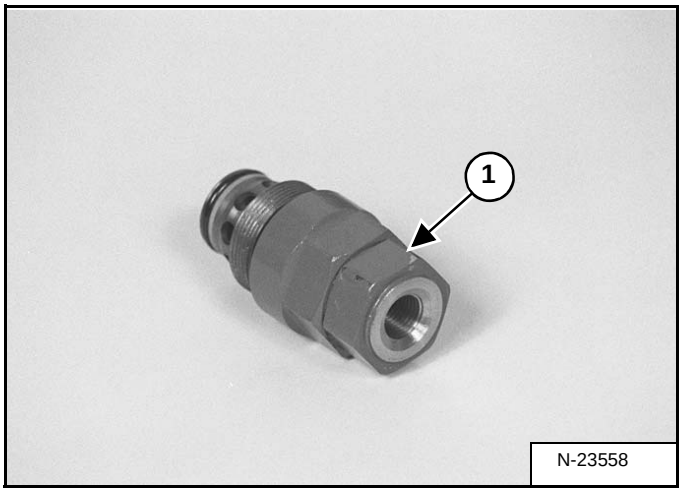
Remove the nut (Item 1) and adjustment screw (Item 2) **[Figure 20-41-199]** from the port relief/anti-cav valve.

Figure 20-41-200



Remove the spring (Item 1) and poppet (Item 2) **[Figure 20-41-200]** from the port relief/anti-cav valve.

Figure 20-41-201



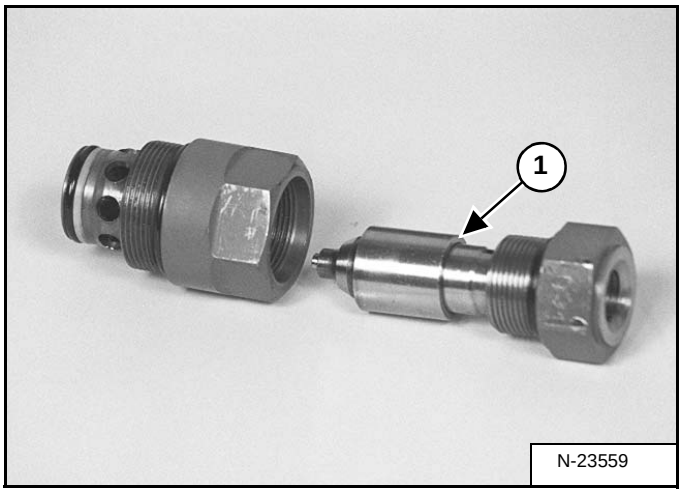
Remove the nut (Item 1) **[Figure 20-41-201]** the port relief/anti-cav valve.

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Auxiliary Valve Section Disassembly And Assembly (Cont'd)

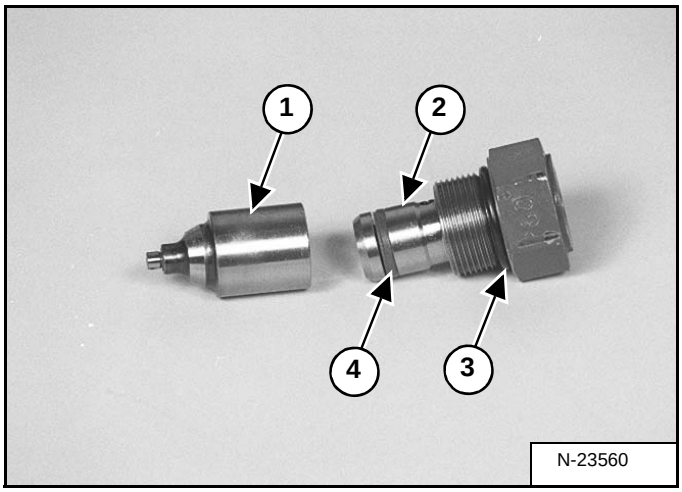
Port Relief/Anti-Cav (Cont'd)

Figure 20-41-202



Remove the relief valve assembly (Item 1) **[Figure 20-41-202]**.

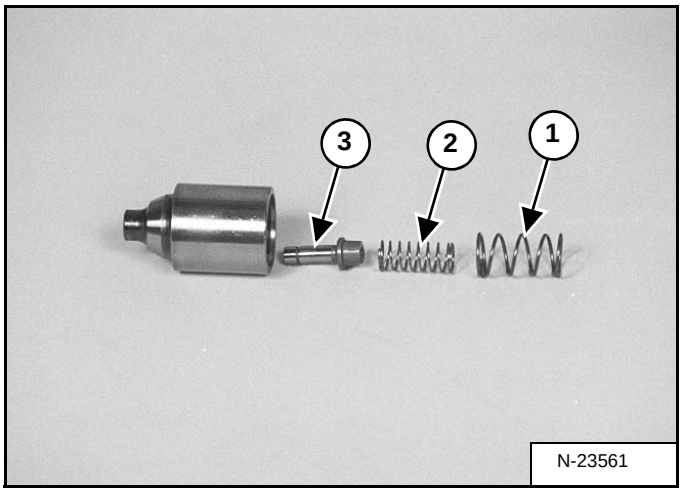
Figure 20-41-203



Remove the front section (Item 1) from the relief valve (Item 2) **[Figure 20-41-203]**.

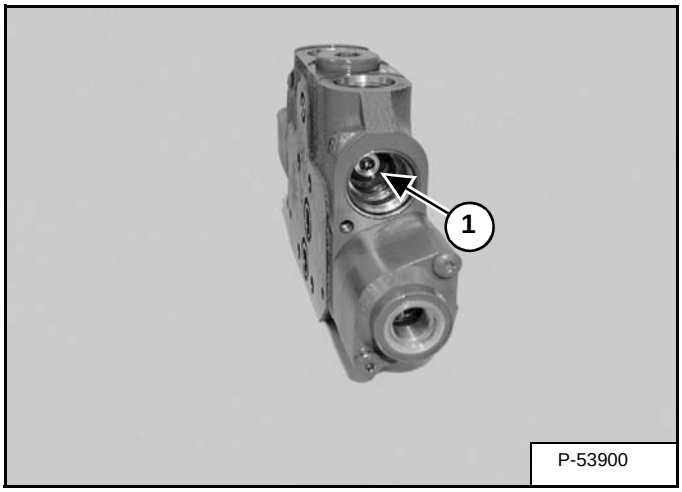
Remove the O-ring (Item 3) and seal (Item 4) **[Figure 20-41-203]**.

Figure 20-41-204



Remove the spring (Item 1), spring (Item 2) and poppet (Item 3) **[Figure 20-41-204]**.

Figure 20-41-205



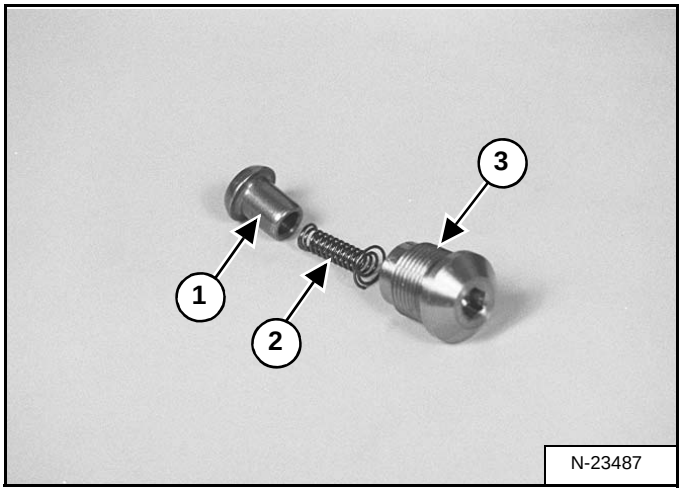
Remove the load check valve assembly (Item 1) **[Figure 20-41-205]** from both ends of the valve section.

Assembly: Tighten the load check valves to 80 - 97 in.-lb. (9 - 11 N•m) torque.

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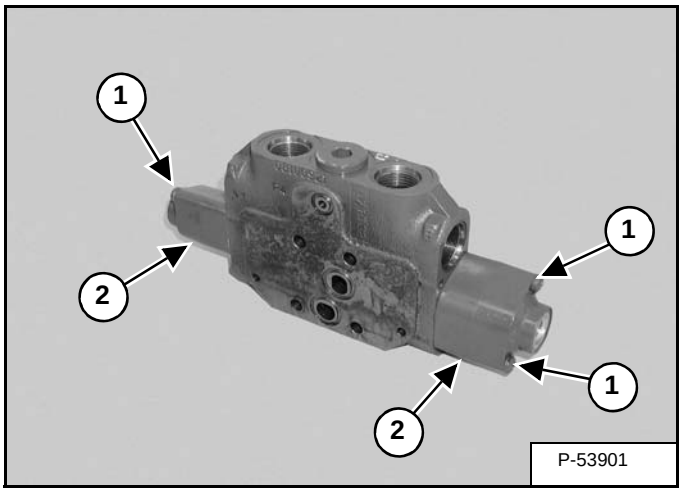
Auxiliary Valve Section Disassembly And Assembly (Cont'd)

Figure 20-41-206



Remove the seat (Item 1) and spring (Item 2) from the load check valve body (Item 3) **[Figure 20-41-206]**.

Figure 20-41-207

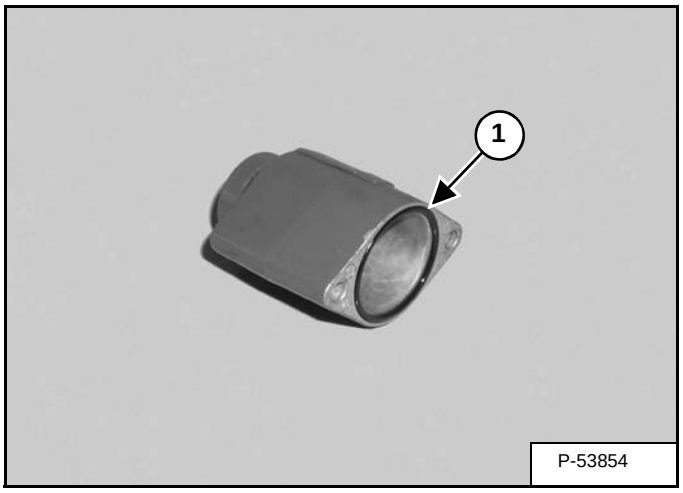


Remove the screws (Item 1) **[Figure 20-41-207]** from both valve section end caps.

Assembly: Tighten the screws to 48 - 58 in.-lb. (5,4 - 6,6 N•m)

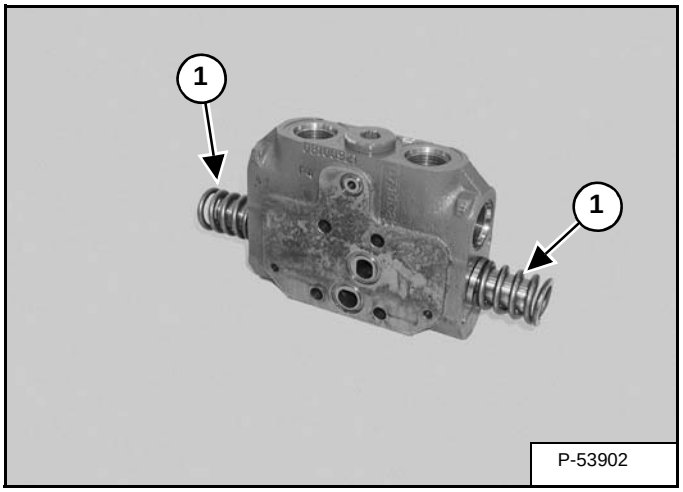
Remove the end cap (Item 2) **[Figure 20-41-207]** from both ends of the valve section.

Figure 20-41-208



Remove the O-ring (Item 1) **[Figure 20-41-208]** from both end caps.

Figure 20-41-209

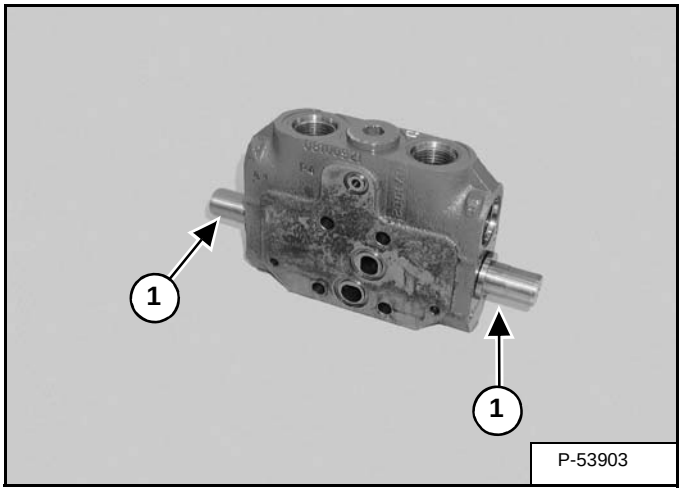


Remove the centering springs (Item 1) **[Figure 20-41-209]** from both ends of the valve spool.

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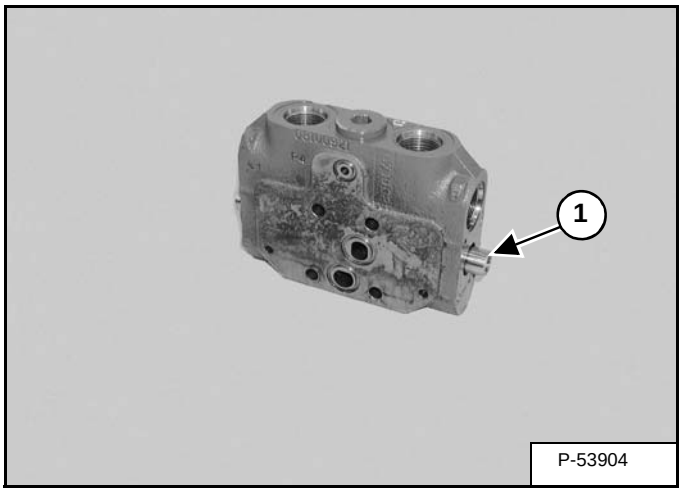
Auxiliary Valve Section Disassembly And Assembly (Cont'd)

Figure 20-41-210



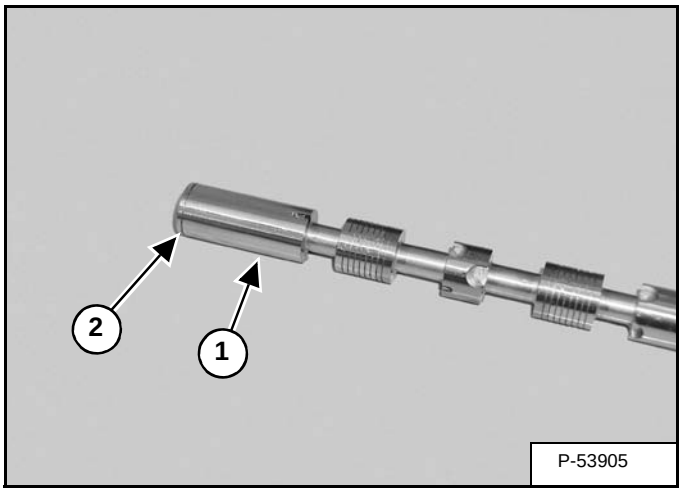
Remove the spring guides (Item 1) **[Figure 20-41-210]** from both ends of the valve spool.

Figure 20-41-211



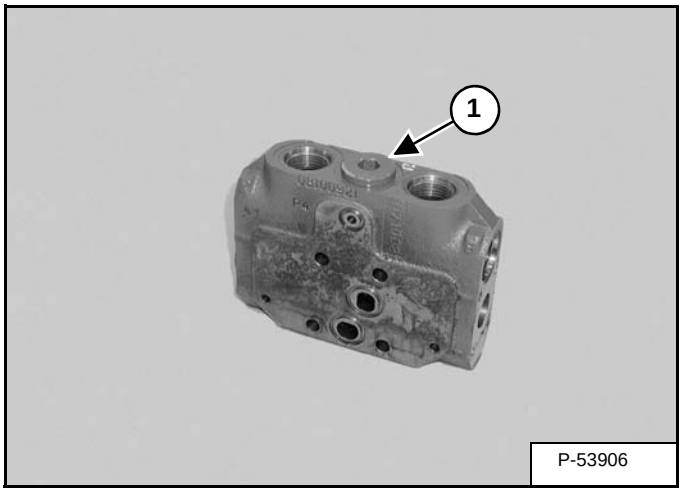
Remove the spool (Item 1) **[Figure 20-41-211]** from the valve section.

Figure 20-41-212



Assembly: The spool (Item 1) is symmetrical, and can be installed in the valve section with the spool groove (Item 2) **[Figure 20-41-212]** either toward the top, or the bottom of the valve section.

Figure 20-41-213



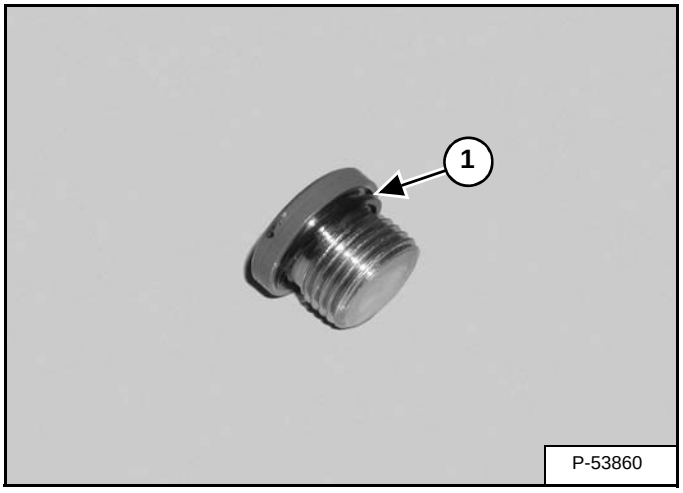
Remove the plug (Item 1) **[Figure 20-41-213]** from the top of the valve section.

Assembly: Tighten the plug to 46 - 57 ft.-lb. (63 - 77 N•m) torque.

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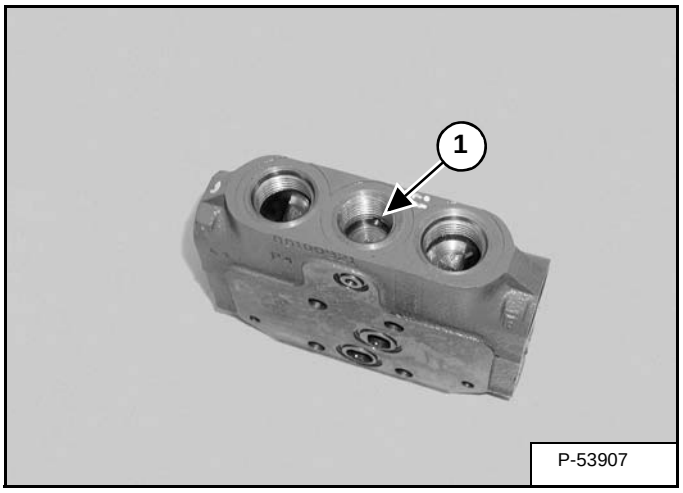
Auxiliary Valve Section Disassembly And Assembly (Cont'd)

Figure 20-41-214



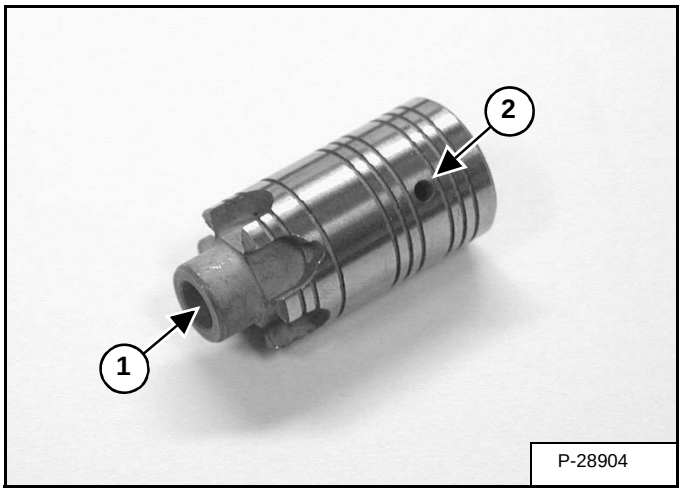
Remove the O-ring (Item 1) **[Figure 20-41-214]** from the plug.

Figure 20-41-215



Remove the compensator (Item 1) **[Figure 20-41-215]** from the valve section.

Figure 20-41-216



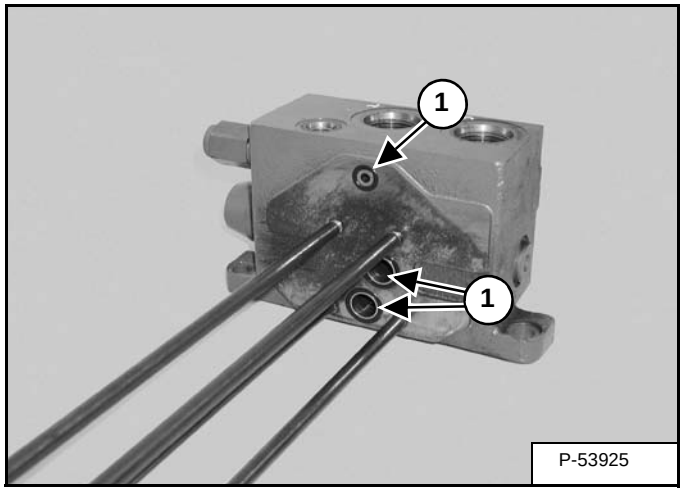
Check the orifice (Item 1) **[Figure 20-41-216]** in the compensator to be sure it is not plugged.

Check the crossport hole (Item 2) **[Figure 20-41-216]** to be sure it is not plugged.

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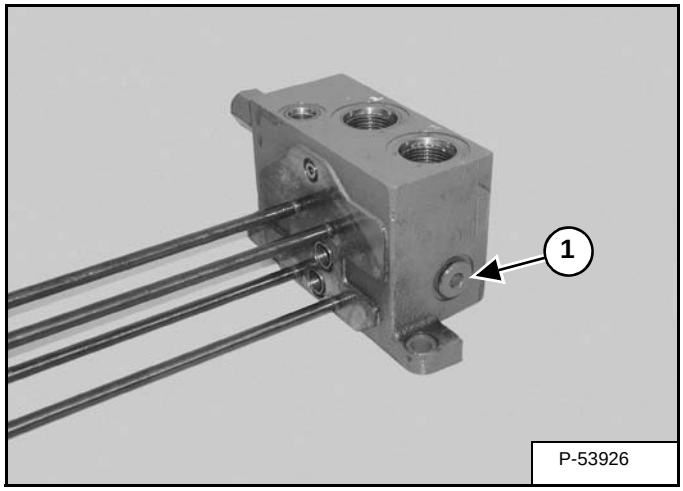
Inlet Section Disassembly And Assembly

Figure 20-41-217



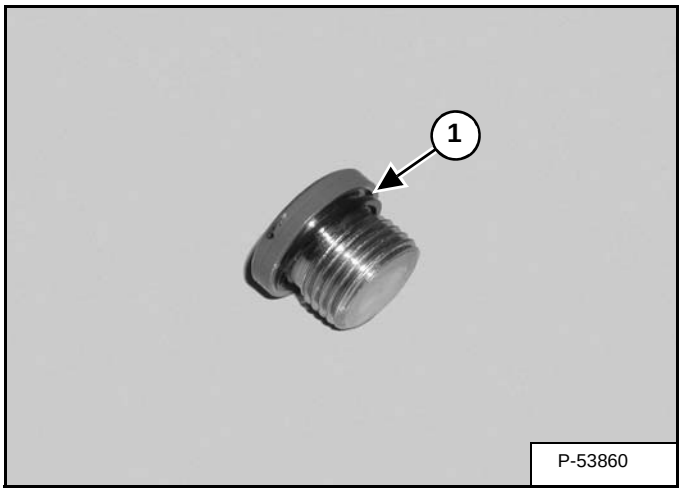
Remove the O-rings (Item 1) **[Figure 20-41-217]** from the inlet section.

Figure 20-41-218



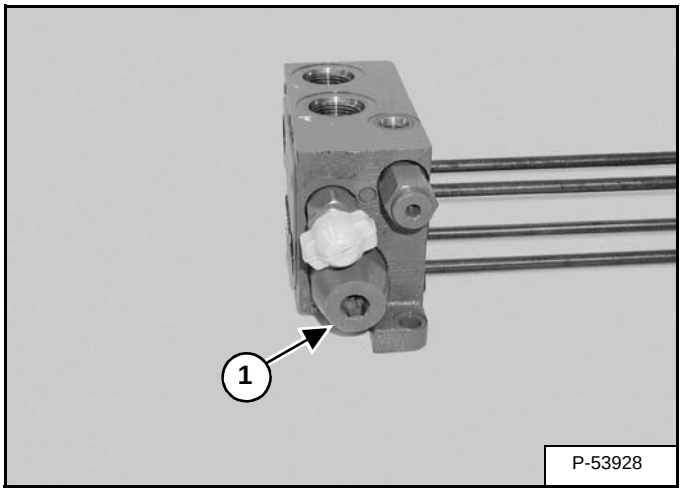
Remove the plug (Item 1) **[Figure 20-41-218]** that retains the flushing spool.

Figure 20-41-219



Remove the O-ring (Item 1) **[Figure 20-41-219]** from the plug.

Figure 20-41-220

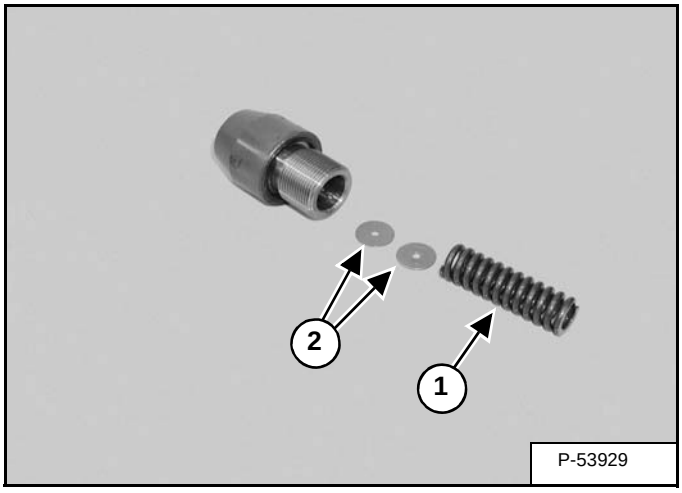


Remove the plug (Item 1) **[Figure 20-41-220]** from the valve section.

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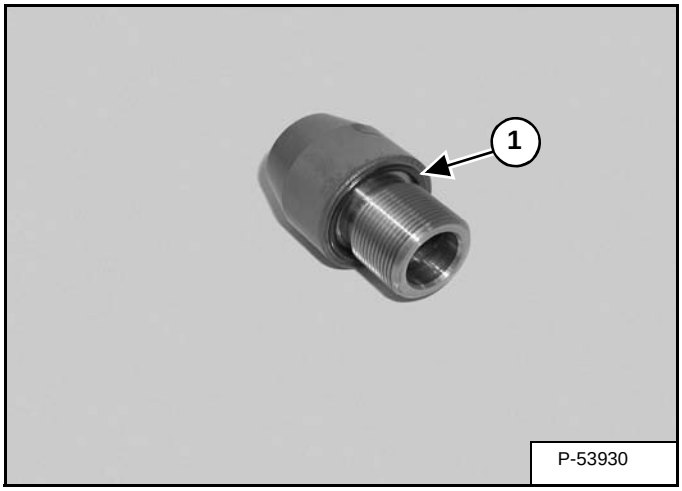
Inlet Section Disassembly And Assembly (Cont'd)

Figure 20-41-221



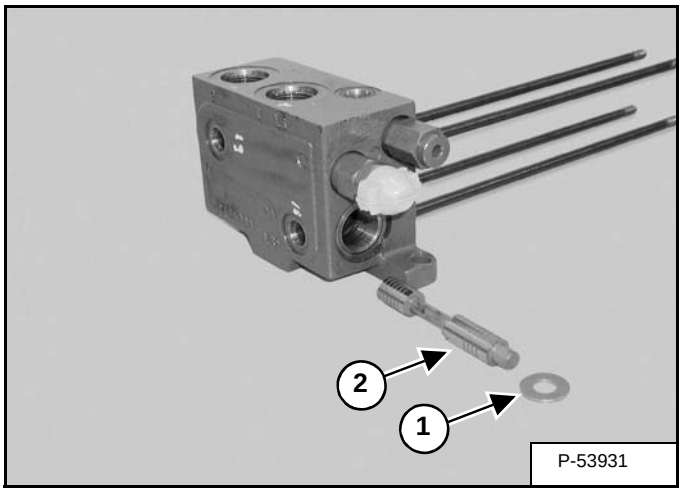
Remove the spring (Item 1) and shims (Item 2) **[Figure 20-41-221]** from the plug.

Figure 20-41-222



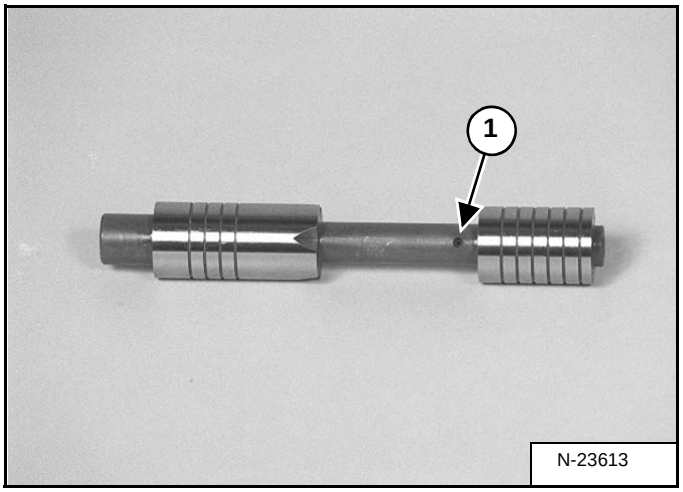
Remove the O-ring (Item 1) **[Figure 20-41-222]**.

Figure 20-41-223



Remove the washer (Item 1) and flushing spool (Item 2) **[Figure 20-41-223]** from the inlet section.

Figure 20-41-224

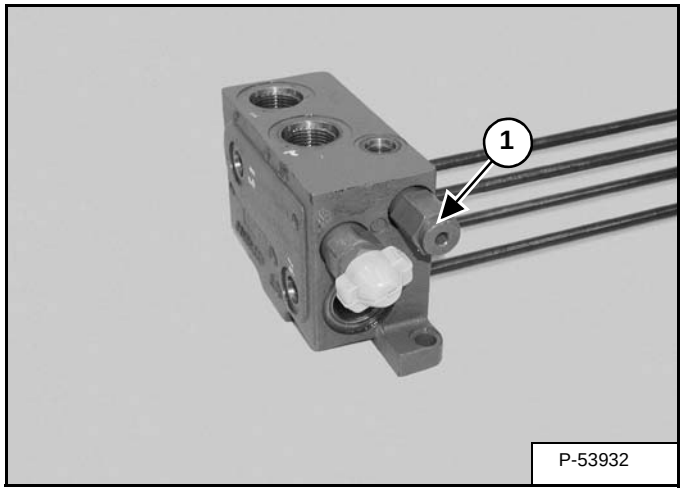


Check the orifice (Item 1) **[Figure 20-41-224]** to be sure it is not plugged.

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Inlet Section Disassembly And Assembly (Cont'd)

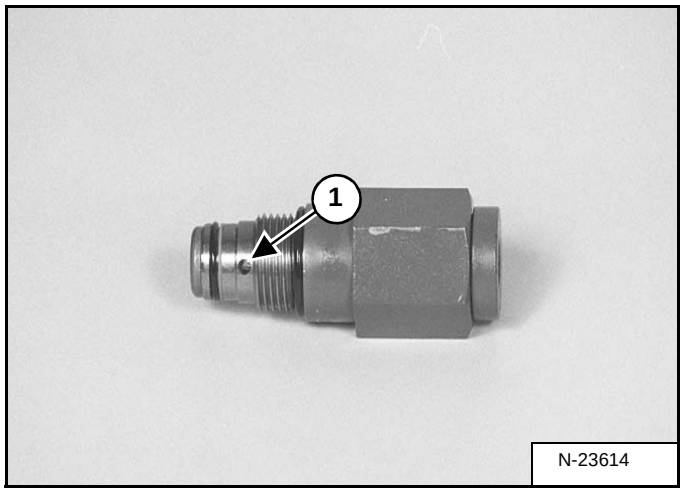
Figure 20-41-225



Remove the load sense bleed valve (Item 1) **[Figure 20-41-225]** from the inlet section.

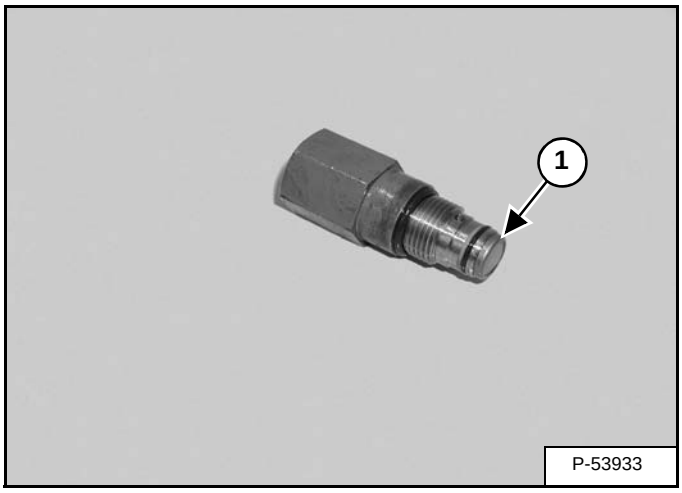
Assembly: Tighten the valve to 13 - 16 ft.-lb. (18 - 22 N•m) torque.

Figure 20-41-226



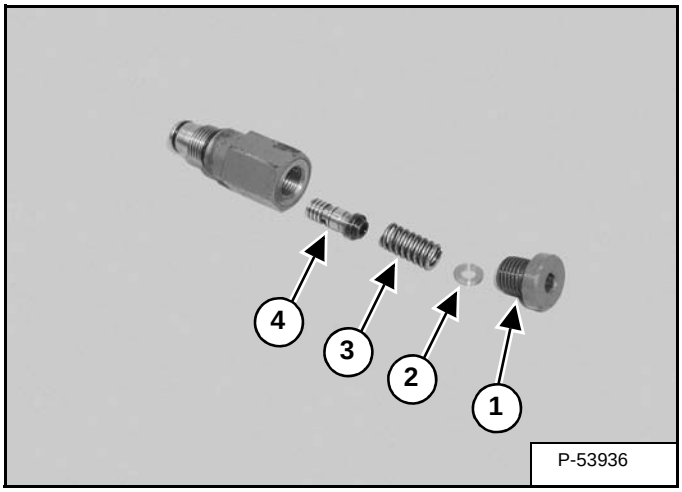
Check the port (Item 1) **[Figure 20-41-226]** in the load sense bleed valve to be sure it is not plugged.

Figure 20-41-227



Remove the filter (Item 1) **[Figure 20-41-227]** from the end of the load sense bleed valve.

Figure 20-41-228

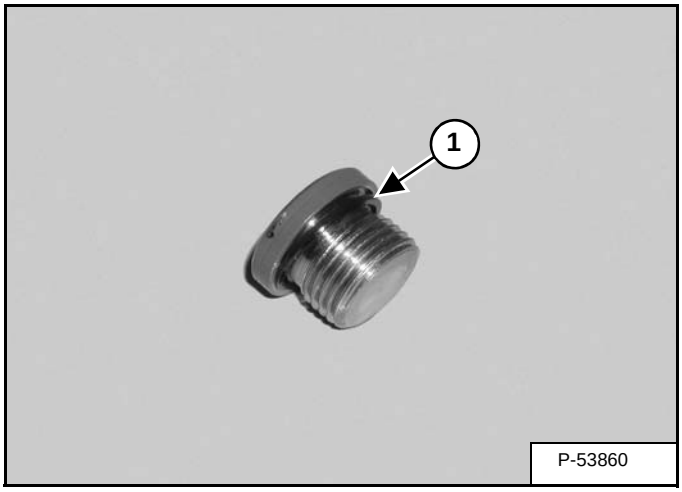


Remove the plug (Item 1), shims (Item 2), spring (Item 3) and spool (Item 4) **[Figure 20-41-228]**.

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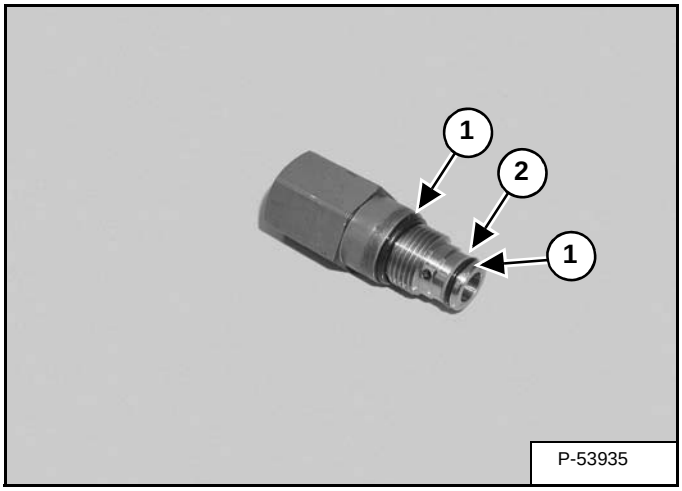
Inlet Section Disassembly And Assembly (Cont'd)

Figure 20-41-229



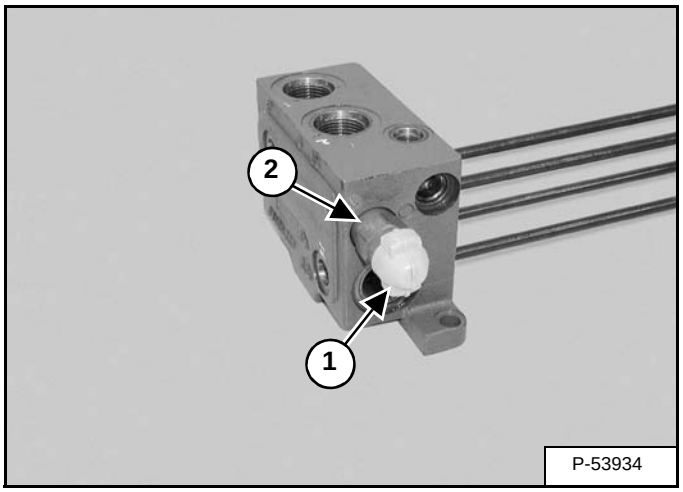
Remove the O-ring (Item 1) **[Figure 20-41-229]** from the plug.

Figure 20-41-230



Remove the O-rings (Item 1) and back-up ring (Item 2) **[Figure 20-41-230]**.

Figure 20-41-231

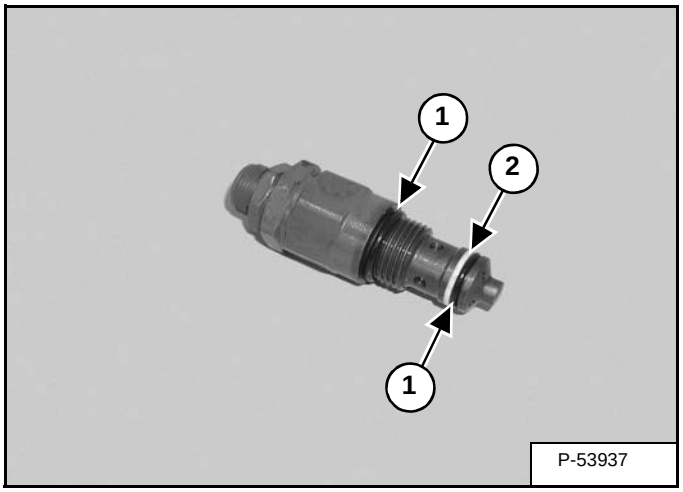


Remove the protective cover (Item 1) from the load sense relief valve (Item 2) **[Figure 20-41-231]**.

Remove the load sense relief valve from the inlet section.

Assembly: Tighten the load sense relief valve to 17 - 20 ft.-lb. (23 - 27 N•m) torque.

Figure 20-41-232

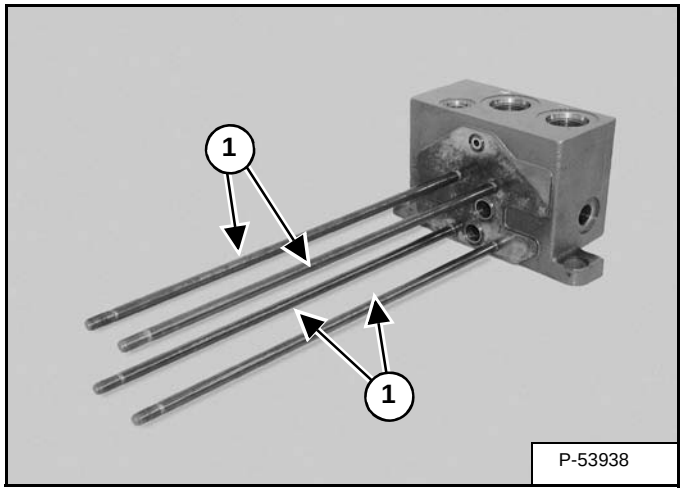


Remove the O-rings (Item 1), back-up ring (Item 2) **[Figure 20-41-232]** from the relief valve.

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Inlet Section Disassembly And Assembly (Cont'd)

Figure 20-41-233



Remove the tie rods (Item 1) **[Figure 20-41-233]** from the inlet section.

Assembly: Tighten the tie rods to 16 - 19 ft.-lb. (22 - 26 N•m) torque.

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Assembly

IMPORTANT

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

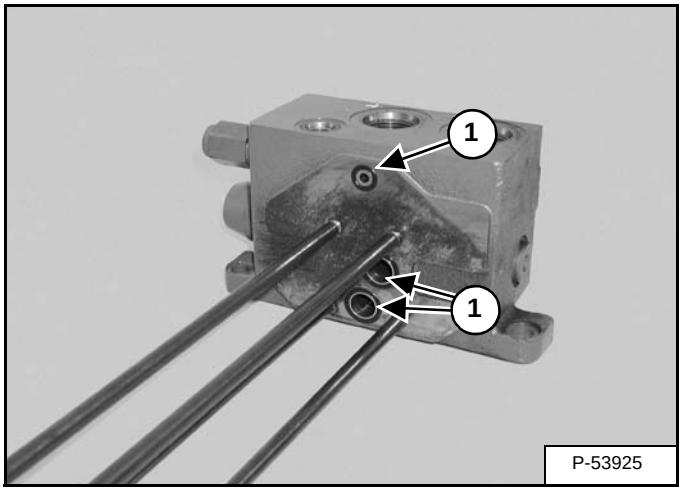
I-2003-0888

Clean all parts in solvent and dry with compressed air.

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

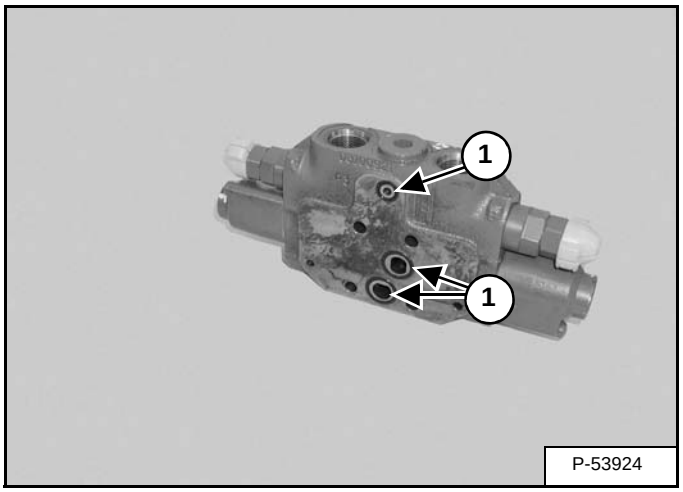
Always install new seals and O-rings. Lubricate all seals and O-rings with clean hydraulic fluid before installation.

Figure 20-41-234



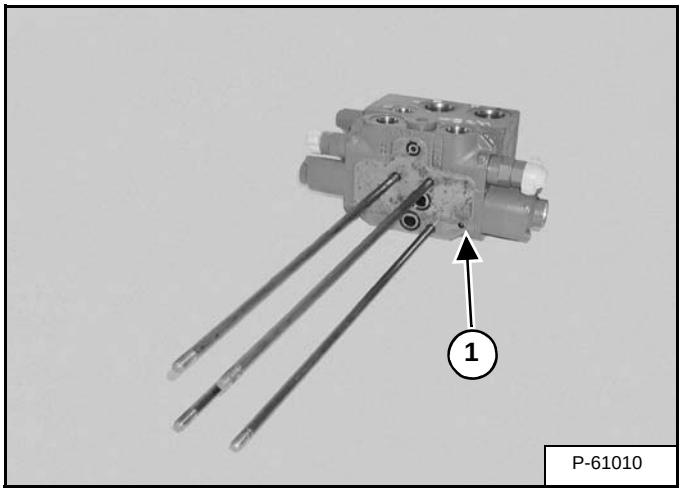
Install the O-rings (Item 1) **[Figure 20-41-234]** on the inlet section.

Figure 20-41-235



Install the O-rings (Item 1) **[Figure 20-41-235]** on the auxiliary valve section.

Figure 20-41-236

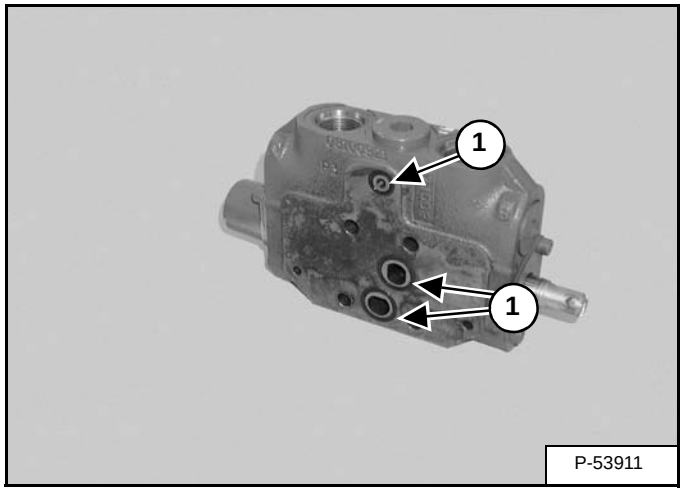


Install the auxiliary valve section (Item 1) **[Figure 20-41-236]** on the tie rods.

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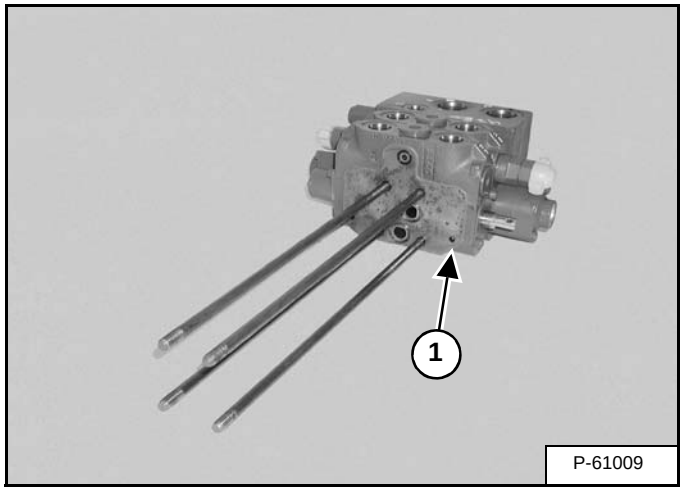
Assembly (Cont'd)

Figure 20-41-237



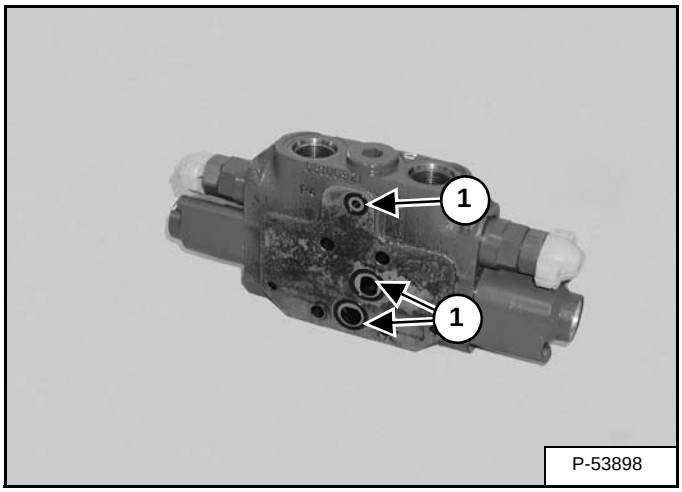
Install the O-rings (Item 1) **[Figure 20-41-237]** on the boom swing valve section.

Figure 20-41-238



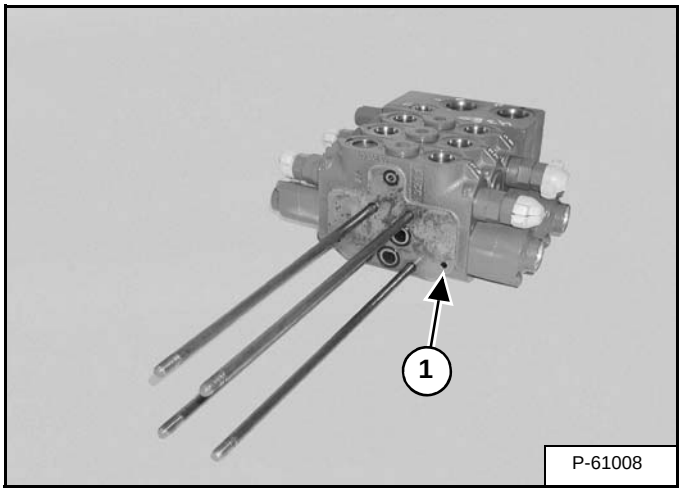
Install the boom swing section (Item 1) **[Figure 20-41-238]** on the tie rods.

Figure 20-41-239



Install the O-rings (Item 1) **[Figure 20-41-239]** on the boom valve.

Figure 20-41-240

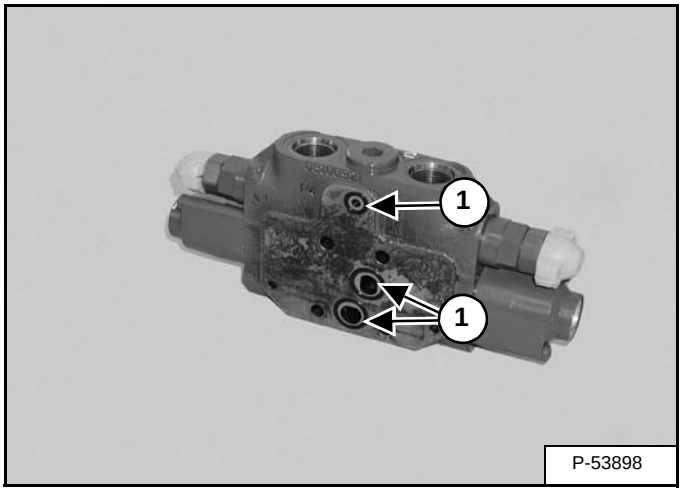


Install the boom valve section (Item 1) **[Figure 20-41-240]** on the tie rods.

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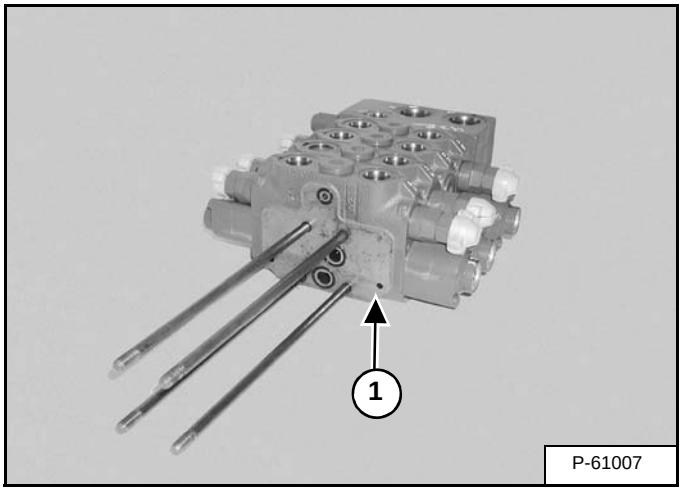
Assembly (Cont'd)

Figure 20-41-241



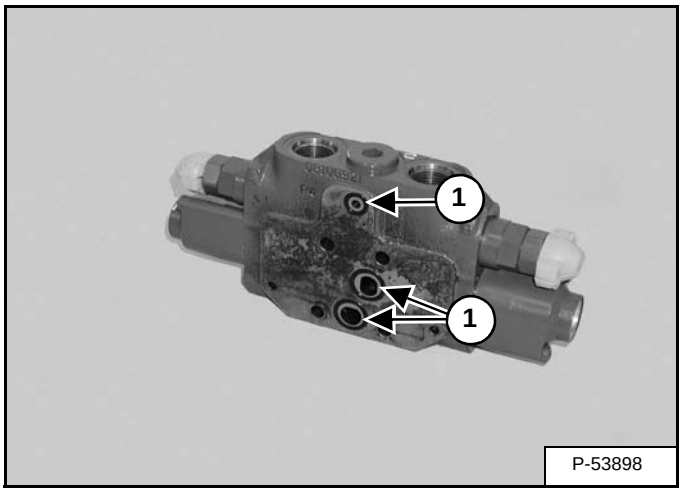
Install the O-rings (Item 1) **[Figure 20-41-241]** on the arm valve section.

Figure 20-41-242



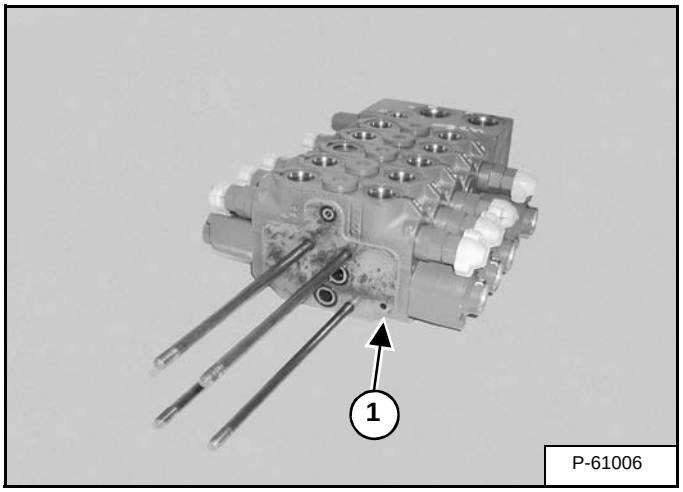
Install the arm valve section (Item 1) **[Figure 20-41-242]** on the tie rods.

Figure 20-41-243



Install the O-rings (Item 1) **[Figure 20-41-243]** on the bucket valve section.

Figure 20-41-244



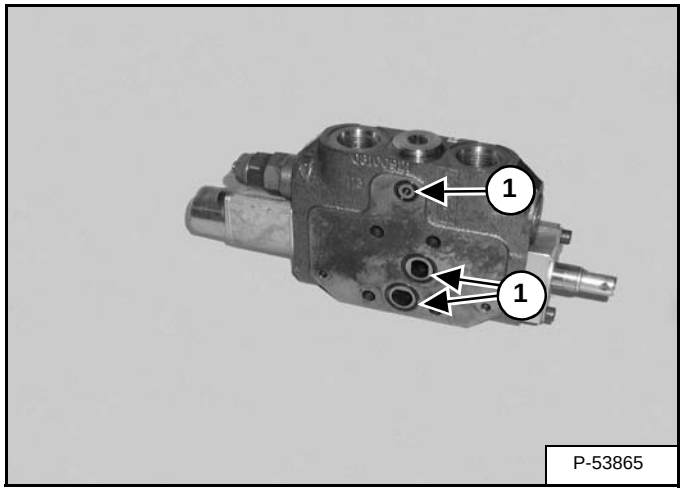
Install the bucket valve section (Item 1) **[Figure 20-41-244]** on the tie rods.

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HYDRAULIC CONTROL VALVE (S/N 563111001 & ABOVE) (CONT'D)

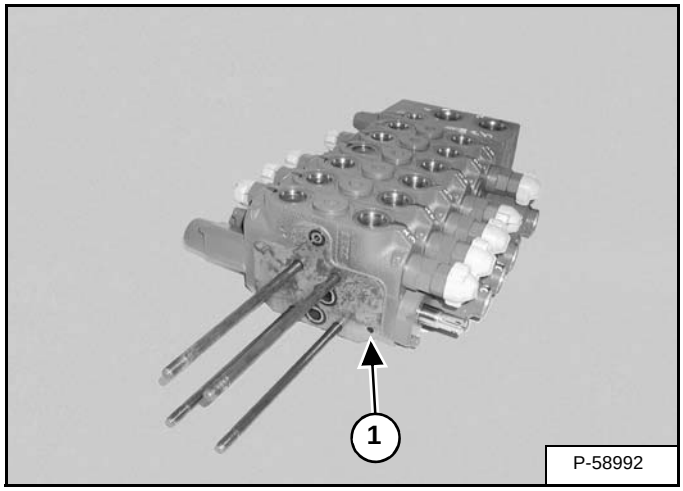
Assembly (Cont'd)

Figure 20-41-245



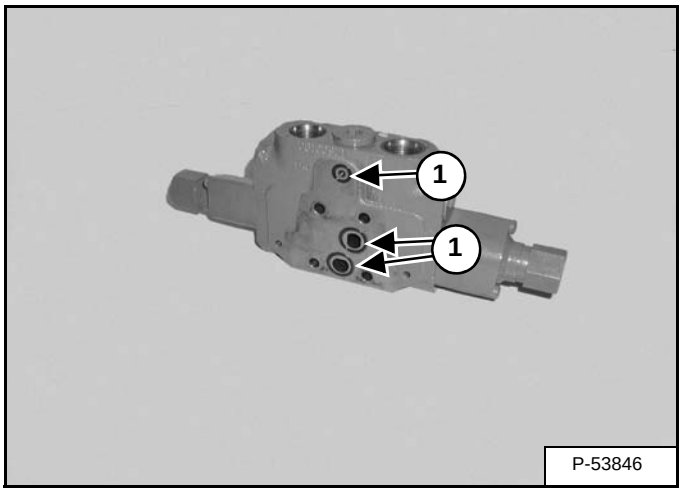
Install the O-rings (Item 1) **[Figure 20-41-245]** on the blade valve section.

Figure 20-41-246



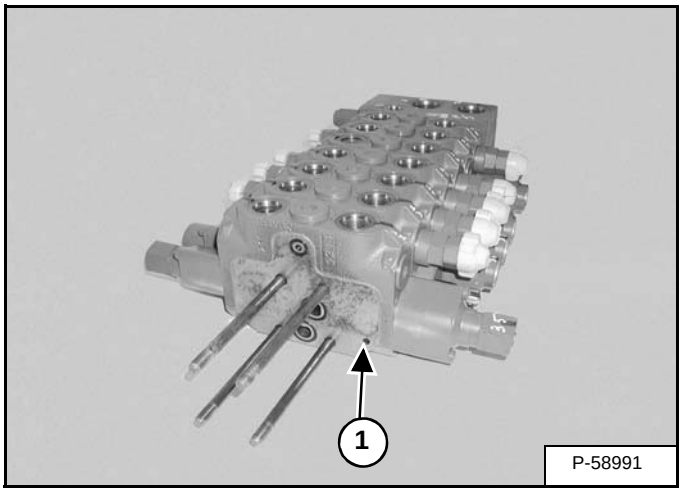
Install the blade valve section (Item 1) **[Figure 20-41-246]** on the tie rods.

Figure 20-41-247



Install the O-rings (Item 1) **[Figure 20-41-247]** on the slew valve section.

Figure 20-41-248

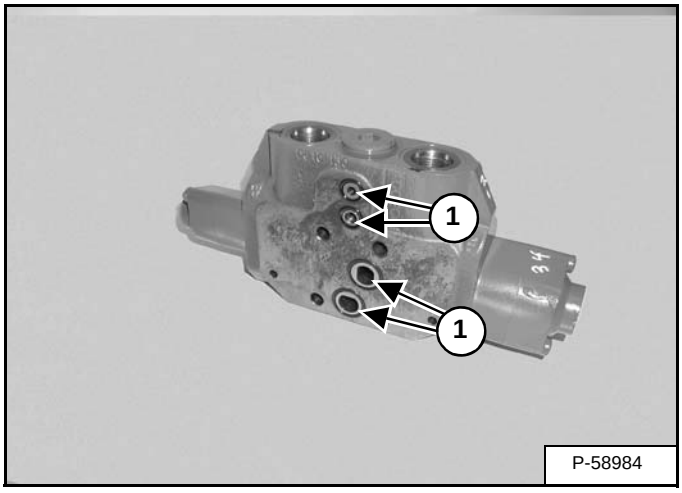


Install the slew valve section (Item 1) **[Figure 20-41-248]** on the tie rods.

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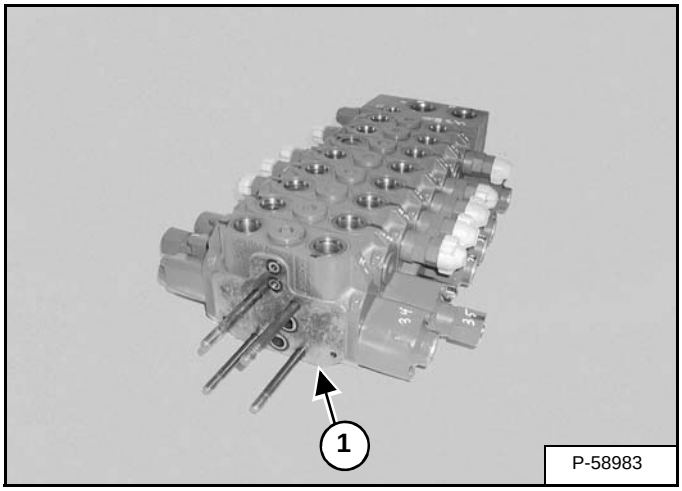
Assembly (Cont'd)

Figure 20-41-249



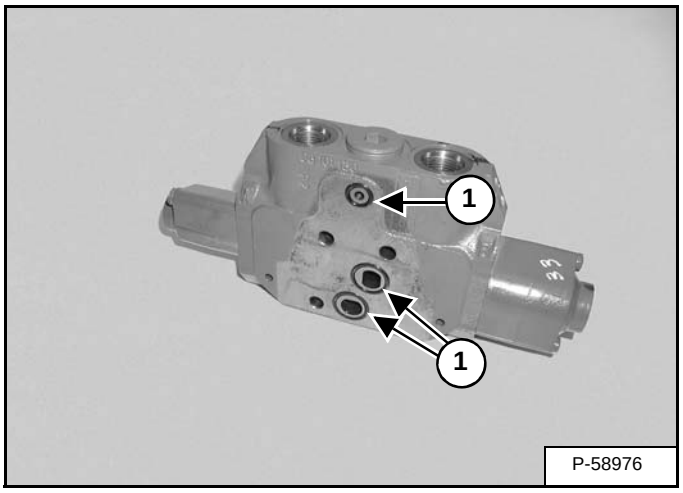
Install the O-rings (Item 1) **[Figure 20-41-249]** on the left travel valve section.

Figure 20-41-250



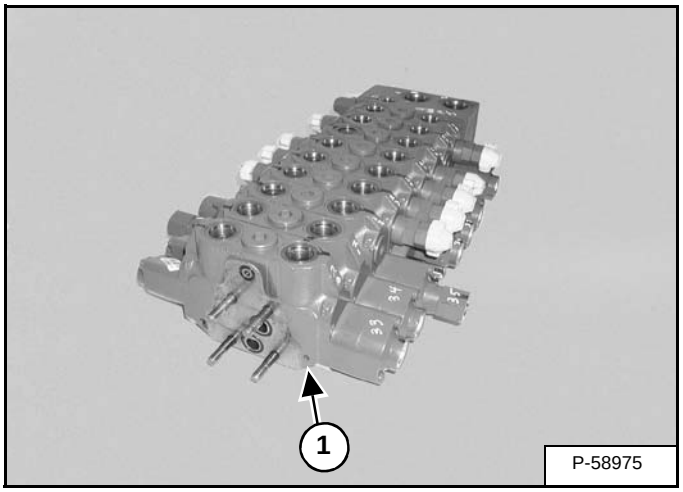
Install the left travel valve section (Item 1) **[Figure 20-41-250]** on the tie rods.

Figure 20-41-251



Install the O-rings (Item 1) **[Figure 20-41-251]** on the right travel valve section.

Figure 20-41-252



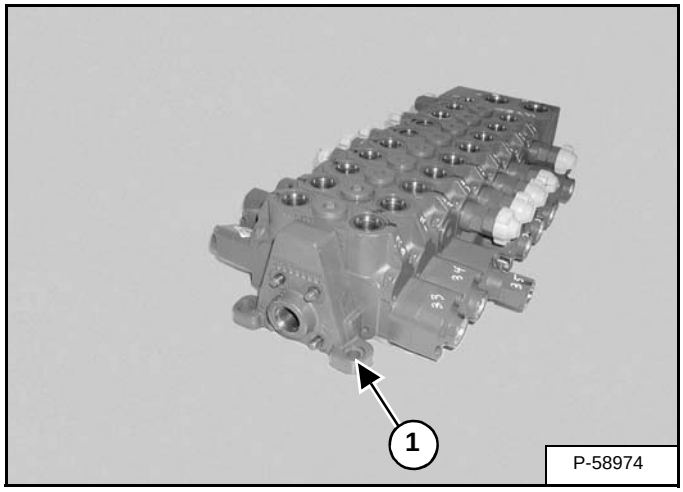
Install the right travel valve section (Item 1) **[Figure 20-41-252]** on the tie rods.

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HYDRAULIC CONTROL VALVE (S/N 563111001 & ABOVE) (CONT'D)

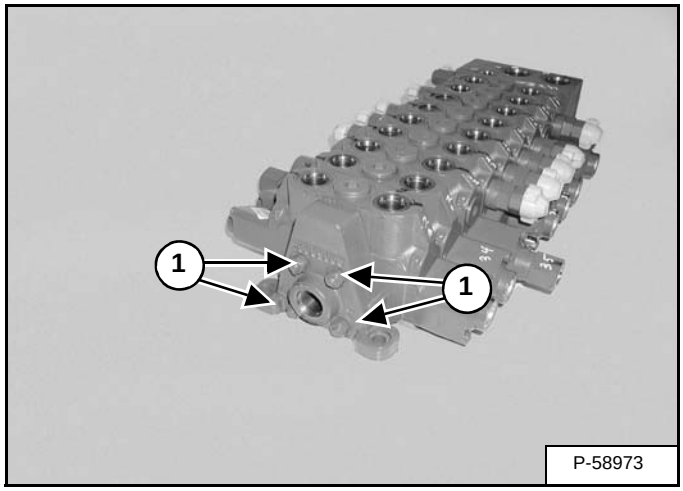
Assembly (Cont'd)

Figure 20-41-253



Install the end cap (Item 1) **[Figure 20-41-253]** on the tie rods.

Figure 20-41-254



Install the nuts (Item 1) **[Figure 20-41-254]** on the tie rods, finger tight.

Be sure the valve assembly does not rock on a flat surface.

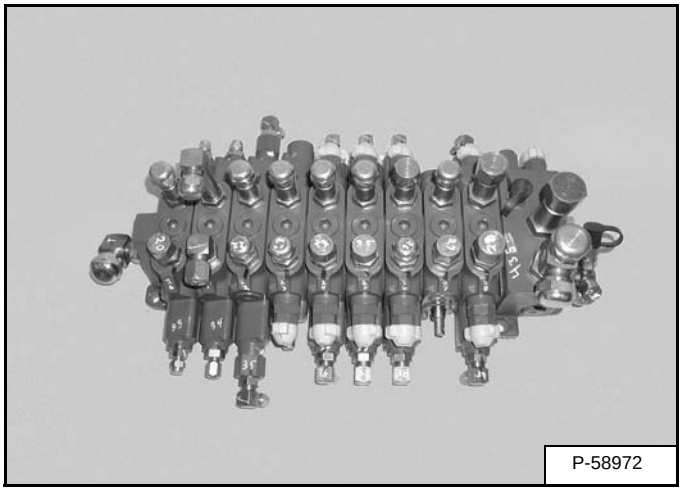
Initially tighten the tie rod nuts (Item 1) to 10 ft.-lb. (13 N•m) torque in a crisscross manner. Final tighten the tie rod nuts (Item 1) **[Figure 20-41-254]** to 16 - 19 ft.-lb. (22-26 N•m) torque.

The valve assembly must not have any spacing between the valve sections and the spools must be free when pushed in and released.

The spools must not stick, if the spools stick, loosen the tie rod nuts and tighten per above information.

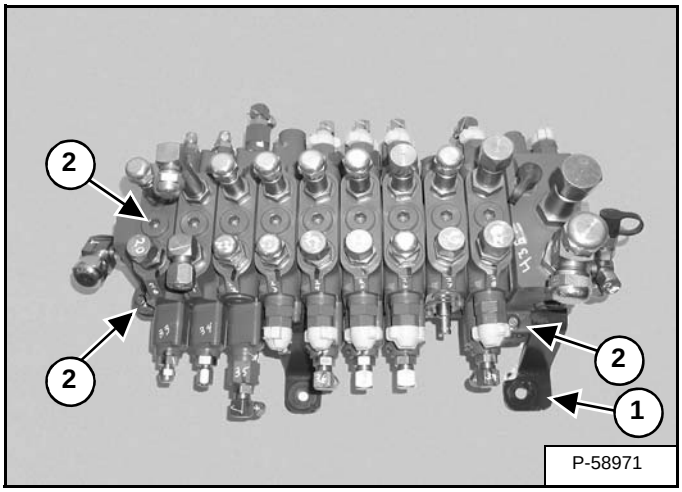
Recheck the control valve assembly for level settings.

Figure 20-41-255



Install the fittings **[Figure 20-41-255]**.

Figure 20-41-256



Install the mount plate (Item 1) with three bolts and nuts (Item 2) **[Figure 20-41-256]**.

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HYDRAULIC PUMP (S/N 562611001 & ABOVE AND 562811001 & ABOVE)

Hydraulic Pump Work Sheet

(Please review pump procedure as illustrated in “Pump Testing”. (See Pump Testing on Page 20-50-4.)

The outline listed below, gives the five adjustments for setting the hydraulic pump. The adjustments are listed in the order in which they ***MUST*** be performed. Below each adjustment is a list of the steps. Behind each adjustment is the page location within the Service Manual for the complete adjustment procedure.

1. Run Engine at High Idle, (2560 - 2770 RPM) Record NO Load Engine RPM.

_____ **ENGINE RPM**

2. Adjust Engine RPM (If Necessary.)

3. Connect Hydraulic Tester to the test fittings

4. Record the Flow.

_____ **FLOW**

I. Minimum Displacement Adjustment (See Minimum Displacement Adjustment on Page 20-50-6)

5. Disconnect the Load Sense Hose at the Pump. Plug the Hose and Cap the Fitting.

6. Install Jumper Hose with a Test Port, Between the Pump Diagnostic Port and the Load Sense Diagnostic Port at the Control Valve

7. Install a **5000 PSI (345 bar) gauge** to the tee fitting test port installed on the hydraulic hose.

8. Run Engine at High Idle.

9. Adjust hydraulic tester to 2400 - 2500 PSI (165 - 172 bar), pump flow should be 5 - 5.5 GPM (19 - 21 L/min)

10. Record the Flow.

_____ **FLOW**

II. Torque Limiter Supply Pressure Adjustment (See Torque Limiter Supply Pressure Adjustment on Page 20-50-8)

11. Bottom Out Pump Margin Spool (Approximately Six Turns In.)

12. Connect Torque Limiter Supply Spool to the Reservoir.

13. Install a **500 PSI (35 bar) gauge** to the diagnostic test port on the control valve.

14. Run Engine at High Idle

15. Adjust as Necessary to get 290 ± 20 PSI (20 ± 1,37 bar) at 8 GPM (30 L/min)

16. Record Pressure

_____ **TLS PRESSURE**

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Hydraulic Pump Work Sheet (Cont'd)

17. Remove the Hose and Fitting from the Torque Limiter Supply Spool and Plug the Port
18. Reset Pump Margin Spool (Approximately Six Turns Out.)

III. Pump Margin Pressure Adjustment. (See Pump Margin Pressure Adjustment on Page 20-50-10)

19. Connect Pump Margin Spool to the Reservoir.
20. Run Engine at High Idle
21. Adjust as Necessary to get 220 ± 10 PSI (15 ± 0,69 bar) at 8 GPM (30 L/min)
22. Record Pressure

_____ **PM PRESSURE**

23. Remove the Hose and Fitting from the Pump Margin Spool and Plug Port.
24. Remove the **500 PSI (35 bar) gauge** from the Pump Diagnostic Port at the Control Valve

IV. Pump Pressure Adjustment (See Pump Pressure Adjustment on Page 20-50-12)

25. Install **5000 (345 bar) PSI Gauge**, On Pump Diagnostic Coupler at the Control Valve.
26. Readjust the hydraulic flow tester by turning the knob clockwise, all the way in (closed position)
27. Run Engine at High Idle, Raise Dozer Blade and Dead-Head in Up Position
28. Adjust Load Sense Relief Valve as Necessary to get 3625 ± 75 PSI (250 ± 5,2 bar).
29. Record Pressure
30. Readjust the hydraulic flow tester by turning the knob counterclockwise, all the way in (open position)

_____ **PUMP PRESSURE**

31. Remove the **5000 PSI (345 bar) Gauge**, from the Pump Diagnostic Coupler at the Control Valve.

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Hydraulic Pump Work Sheet (Cont'd)

V. Torque Limiter Adjustment (See Torque Limiter Adjustment on Page 20-50-13)

32. Install Jumper Hose with a Test Port, Between the Pump Diagnostic Port and the Load Sense Diagnostic Port at the Control Valve

33. Install a **5000 PSI (345 bar) gauge** to the test port on the hydraulic test hose.

34. Adjust the Hydraulic Tester to 1450 PSI (100 bar).

35. Adjust the Torque Limiter to obtain 27 - 32 GPM (102 - 121 L/min)

36. Record Flow and Engine RPM.

_____ **FLOW**

_____ **ENGINE RPM**

37. Adjust the Hydraulic Tester to 3300 PSI (228 bar).

38. Adjust the Torque Limiter to obtain 14 - 18 GPM (53 - 68 L/min)

39. Record Flow and Engine RPM.

_____ **FLOW**

_____ **ENGINE RPM**

ALL PUMP ADJUSTMENTS ARE NOW COMPLETED

40. Remove the Jumper Hose

41. Remove the Hydraulic Tester

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Pump Testing

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

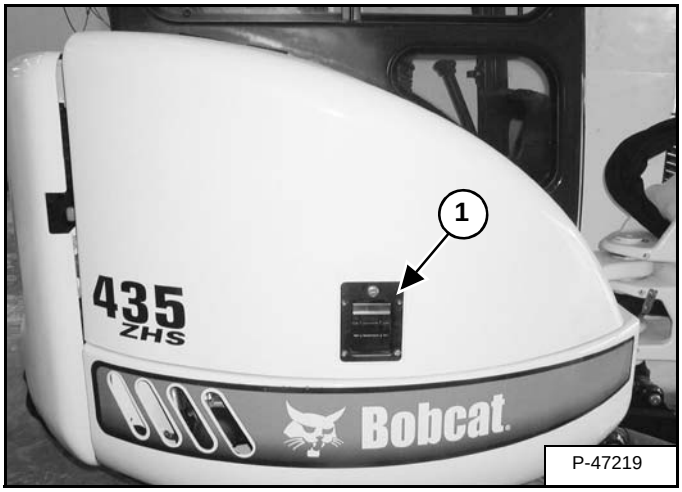
Minimum Displacement Adjustment
Torque Limiter Supply Pressure
Pump Margin Pressure
Pump Pressure
Torque Limiter

Test Fitting Installation

The following tools will be needed to do the procedure:

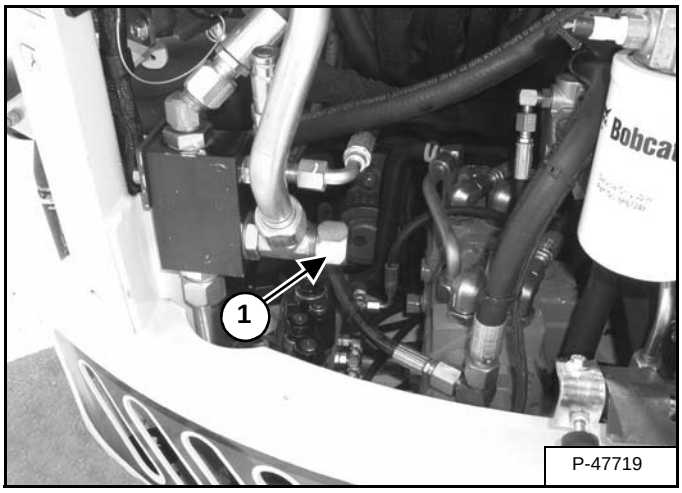
MEL10003 - Hydraulic Tester
MEL1355 - Hydraulic Test Kit
MEL1548 - Hydraulic Fitting Kit
MEL1598 - Hydraulic Fitting Kit

Figure 20-50-1



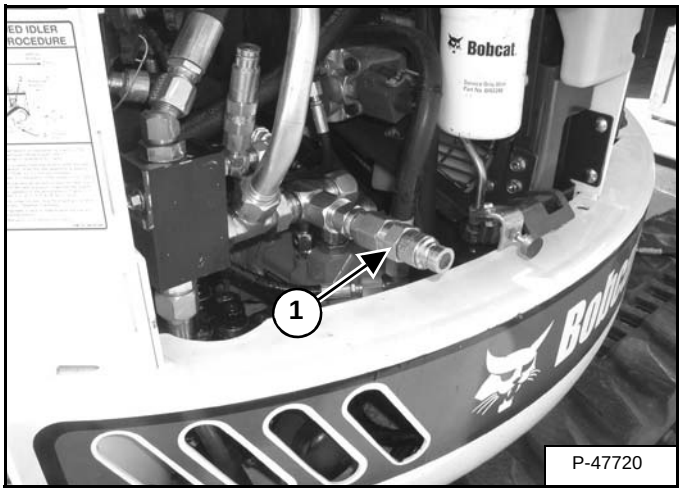
Open the right side cover (Item 1) **[Figure 20-50-1]**.

Figure 20-50-2



Remove the cap (Item 1) **[Figure 20-50-2]** from the build up valve.

Figure 20-50-3

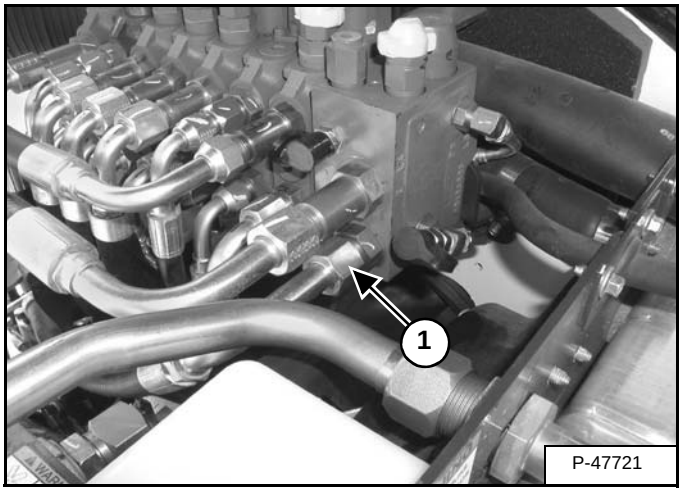


Install a male hydraulic coupler (Item 1) **[Figure 20-50-3]** on the fitting.

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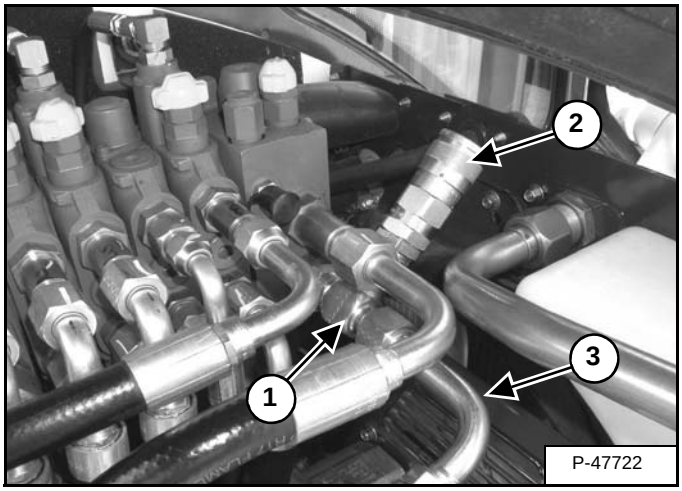
Pump Testing (Cont'd)

Figure 20-50-4



Remove the inlet hose (Item 1) **[Figure 20-50-4]** from the control valve.

Figure 20-50-5



Install a T fitting (Item 1), and female quick coupler (Item 2) **[Figure 20-50-5]** on the hydraulic control valve.

Reinstall the inlet hose (Item 3) **[Figure 20-50-5]** on the T fitting.

Figure 20-50-6



Connect the **Inlet** hose of the hydraulic tester to the coupler (Item 1) **[Figure 20-50-6]** at the control valve.

Connect the **Outlet** hose of the hydraulic tester to the coupler (Item 2) **[Figure 20-50-6]** at the build up valve.

Test Fittings are Now Installed.

The values read at the Hydraulic Tester (MEL10003) are based on the use of 3/4 in. (19.05 mm) hoses on the tester. Different size hoses will cause variation in the readings.

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

The No Load Engine RPM should be **2560 - 2770 RPM**.

Stop the engine and adjust the engine RPM if necessary.

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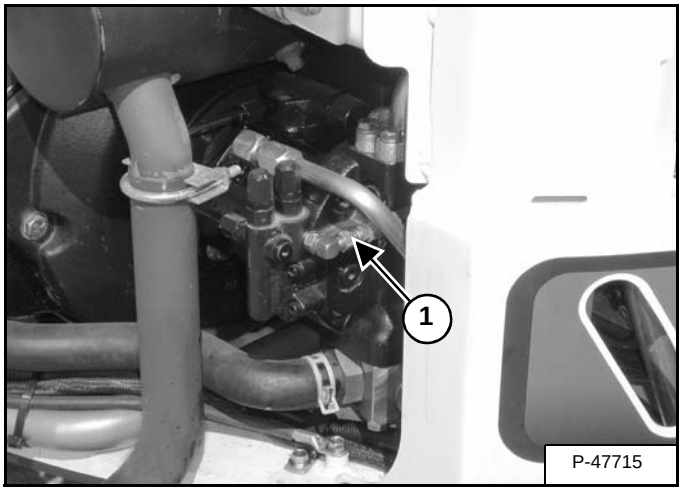
Pump Testing (Cont'd)

Minimum Displacement Adjustment

The hydraulic pump has an adjustable minimum displacement feature. This is set to approximately **5 - 5.5 GPM (21 L/min) @ High Idle**.

The minimum displacement ensures that some volume of oil is available from the pump at all times to the work group anti-cav valves and the slew motor cross port anti-cav valves.

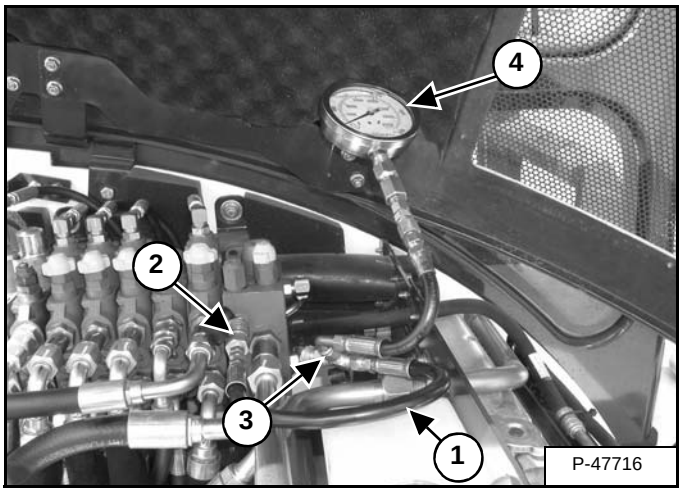
Figure 20-50-7



At the hydraulic pump, disconnect the load sense hose (Item 1) **[Figure 20-50-7]**.

Plug the hose and cap the fitting.

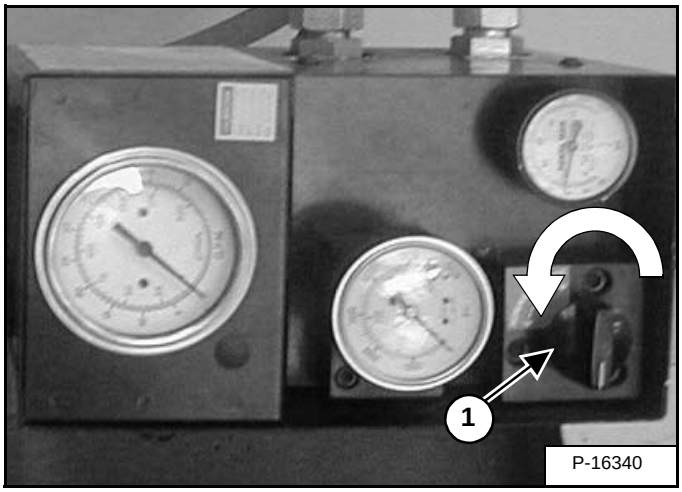
Figure 20-50-8



With a 5000 PSI (345 bar), 1/4 in. hose (Item 1) and 2 female hydraulic couplers from the kit, connect the pump diagnostic port (Item 2) to the Load Sense diagnostic port (Item 3) **[Figure 20-50-8]** on the control valve.

Install a 5000 PSI (345 bar) gauge (Item 4) **[Figure 20-50-8]** to the test port on the test hose.

Figure 20-50-9



Connect the hydraulic tester to the test fittings. Turn the hydraulic tester flow control (Item 1) **[Figure 20-50-9]** counterclockwise until all restriction is removed.

With another person in the operator cab, start the engine and run at high idle.

Start the engine and warm the hydraulic oil to a minimum of 140° F (60° C).

At high idle, activate the auxiliary hydraulic flow.

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Pump Testing (Cont'd)

Figure 20-50-10

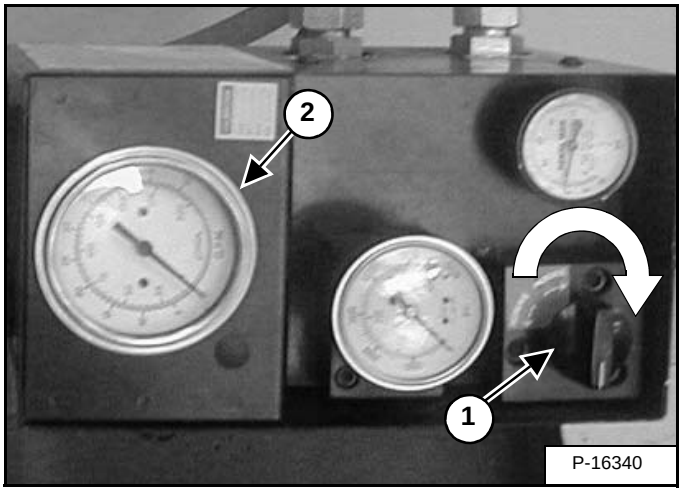
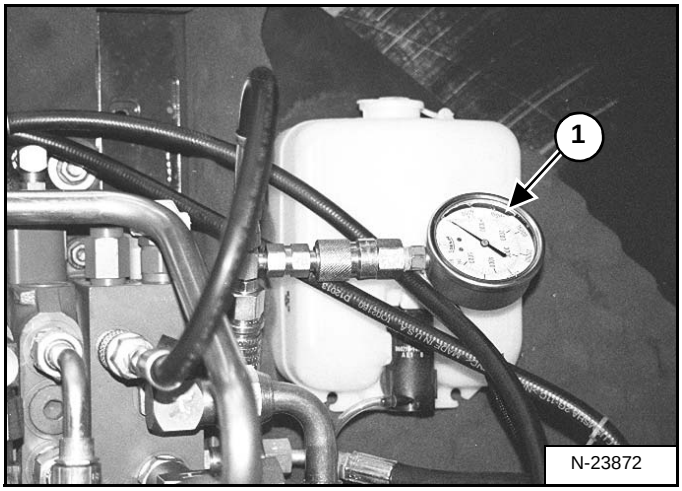


Figure 20-50-11



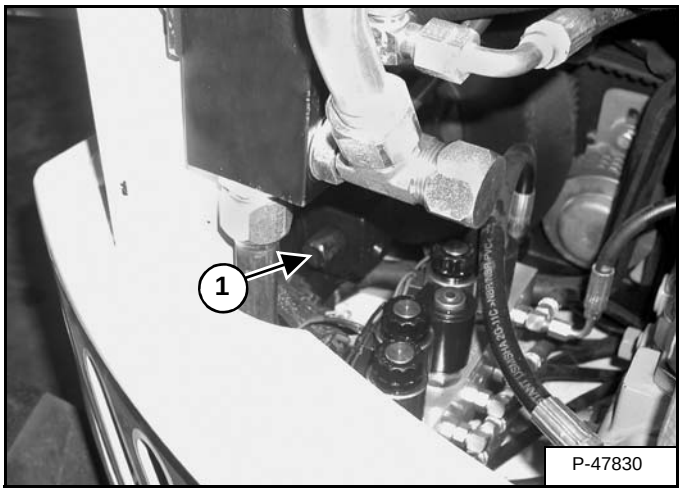
Turn the hydraulic tester flow control (Item 1) **[Figure 20-50-10]** clockwise until the test gauge (Item 1) **[Figure 20-50-11]** at the control valve, reads **2400 - 2500 PSI (165 - 172 bar)**.

Record the pressure at the gauge (Item 1) **[Figure 20-50-11]**.

Record the amount of flow at the tester gauge (Item 2) **[Figure 20-50-10]**.

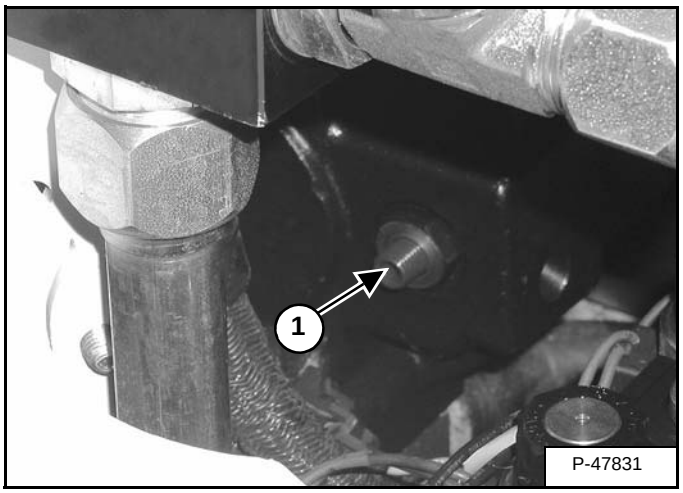
The flow should be **5 - 5.5 GPM (19 - 21 L/min)**.

Figure 20-50-12



To adjust the flow, go to the hydraulic pump, remove the cap (Item 1) **[Figure 20-50-12]** from the pump minimum displacement screw.

Figure 20-50-13



With an Allen wrench adjust the flow adjustment screw (Item 1) **[Figure 20-50-13]** by turning ***clockwise to increase*** the flow and ***counterclockwise to decrease*** the flow.

At the hydraulic pump, reconnect the load sense hose.

At the control valve, disconnect the hose from the pump diagnostic port to the Load Sense diagnostic port.

Minimum Displacement Adjustment is now completed.

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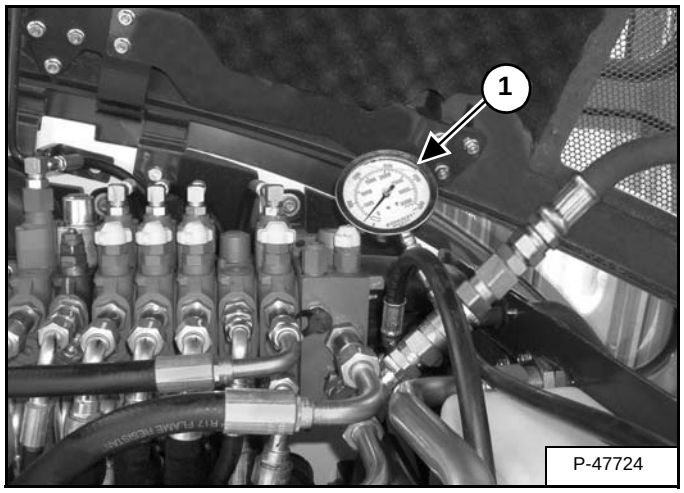
HYDRAULIC PUMP (S/N 562611001 & ABOVE AND 562811001 & ABOVE) (CONT'D)

Pump Testing (Cont'd)

Torque Limiter Supply Pressure Adjustment

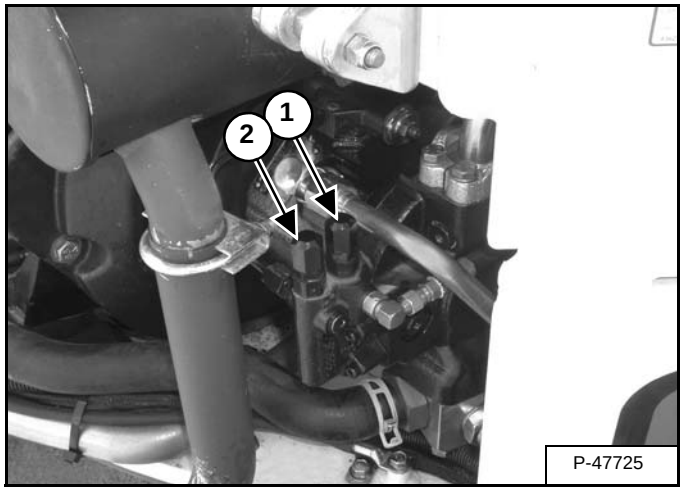
NOTE: This circuit is capable of high pressure.

Figure 20-50-14



Connect a **500 PSI (35 bar) pressure gauge** (Item 1) **[Figure 20-50-14]** to the pump diagnostic coupler at the control valve.

Figure 20-50-15



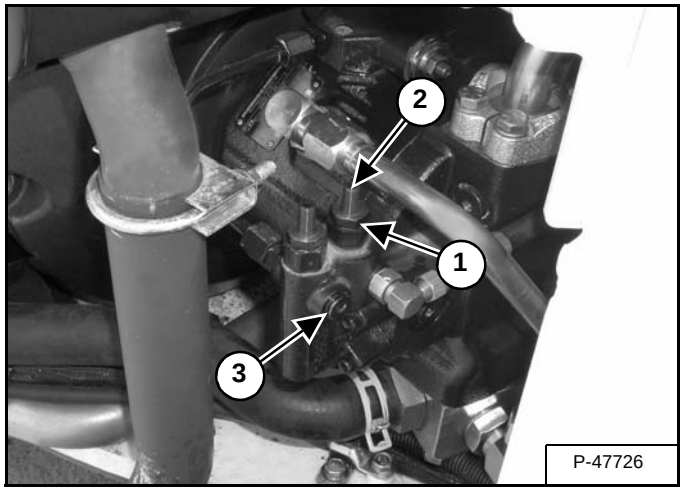
At the hydraulic pump, remove the cap (Item 1) **[Figure 20-50-15]** from the pump margin spool adjustment. (Rear cap.)

Remove the cap (Item 2) **[Figure 20-50-15]** from the pump torque limiter supply spool adjustment. (Front cap)

NOTE: The adjustment caps contain a sealing washer that can be easily lost when caps are removed.

NOTE: To adjust the Torque Limiter Supply Pressure, the Pump Margin Spool must be temporarily bottomed out.

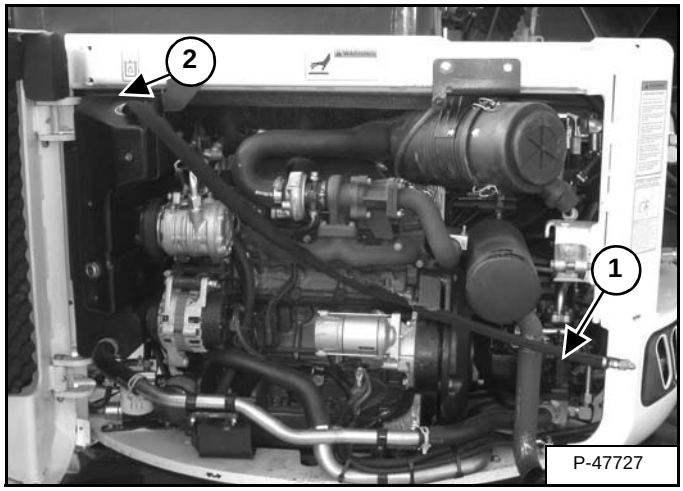
Figure 20-50-16



Loosen the nut (Item 1) on the pump margin spool. (Rear Spool.) With an Allen wrench turn the pump margin spool adjustment (Item 2) **[Figure 20-50-16]** all the way in (approximately 6 turns).

Remove the side plug (Item 3) **[Figure 20-50-16]** from the torque limiter supply spool and install a 15KN-3 fitting.

Figure 20-50-17



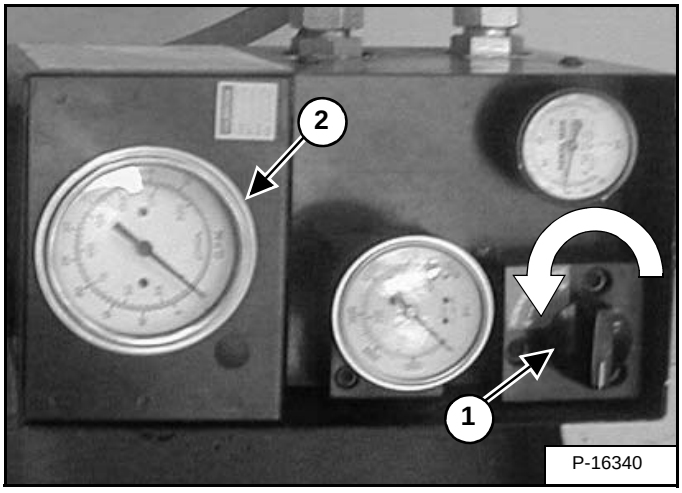
Connect a 1/4 in. hydraulic hose, with a 90° end (Item 1) **[Figure 20-50-17]**, to the fitting.

Remove the cap from the hydraulic reservoir and route the hydraulic hose into the reservoir (Item 2) **[Figure 20-50-17]**.

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Pump Testing (Cont'd)

Figure 20-50-18



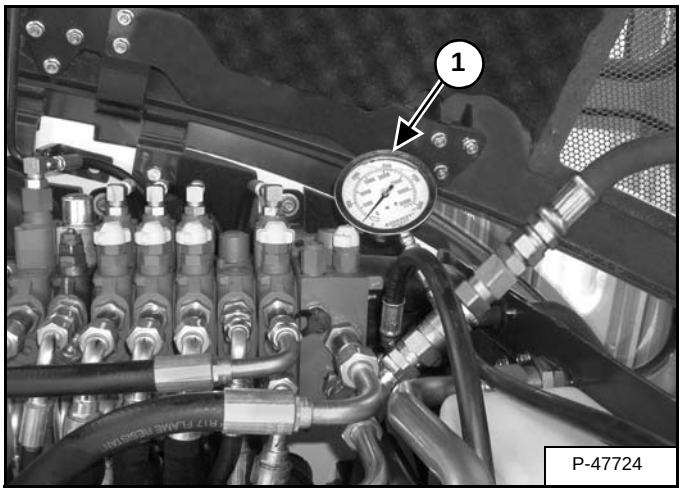
Turn the hydraulic tester flow control (Item 1) **[Figure 20-50-18]** counterclockwise so there is no restriction on the hydraulic system.

Start the engine and and allow the hydraulic fluid to warm to 140° F (60° C).

NOTE: Do not engage any hydraulic functions at this time, hydraulic pressure will damage the hydraulic test gauge (Item 1) [Figure 20-50-19].

With the engine at high idle, turn the hydraulic tester flow control (Item 1) clockwise until **8 GPM (30 L/min**) flow is shown at the hydraulic tester gauge (Item 2) **[Figure 20-50-18]**.

Figure 20-50-19

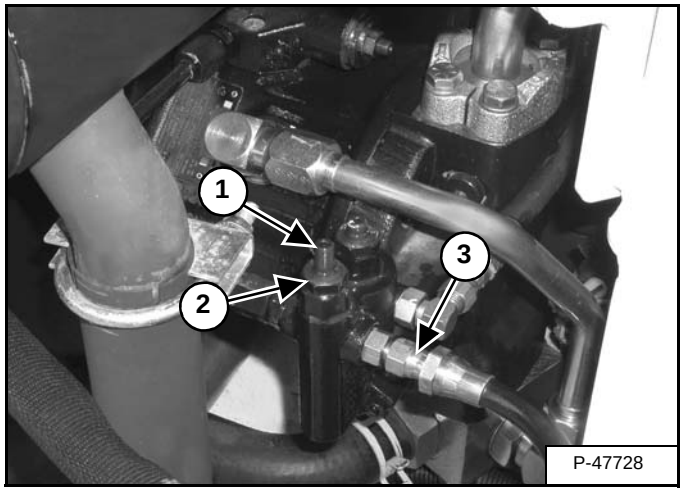


Check the torque limiter supply pressure at the gauge (Item 1) **[Figure 20-50-19]**.

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Pump Testing (Cont'd)

Figure 20-50-20



If the torque limiter supply pressure is not **290 ± 20 PSI (20 ± 1,37 bar)**, turn the torque limiter supply spool (Item 1) **[Figure 20-50-20]** (Front Spool) clockwise to increase the pressure, and counterclockwise to decrease the pressure. (Approximately 1/4 turn per 50 PSI.)

NOTE: Changing the Torque Limiter Supply Adjustment Screw, will affect the pressure and flow. The Hydraulic Tester must be reset to 8 GPM.

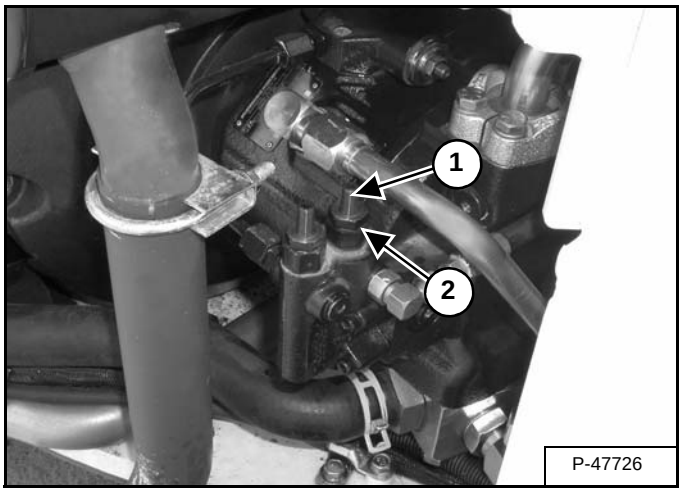
Repeat the procedure listed above until the pressure is set.

If correct pressure cannot be obtained, disassemble and clean the torque limit supply pressure spool.

When the correct pressure is obtained, tighten the nut (Item 2) and remove the hose and fitting (Item 3) **[Figure 20-50-20]** from the torque limiter spool. Replace the plug in the torque limiter spool (Front Spool) and tighten.

Replace and tighten the cap on the torque limiter supply spool adjustment.

Figure 20-50-21



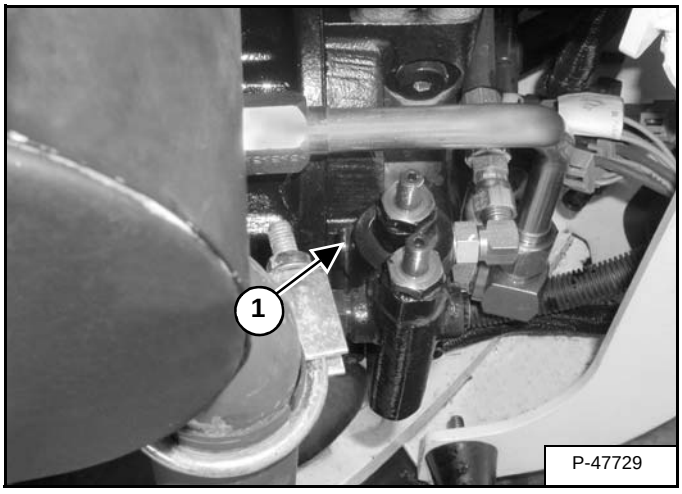
With an Allen wrench turn the pump margin spool (Rear Spool) adjustment (Item 1) **[Figure 20-50-21]** ***back out, (approximately six turns)***.

Tighten the nut (Item 2) **[Figure 20-50-21]** on the pump margin spool.

Torque Limiter Supply Pressure Adjustment is now completed.

Pump Margin Pressure Adjustment

Figure 20-50-22

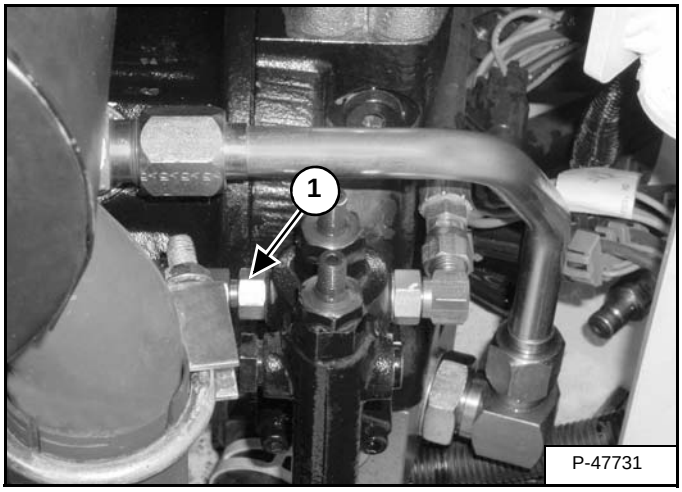


At the pump margin spool remove the front plug (Item 1) **[Figure 20-50-22]**.

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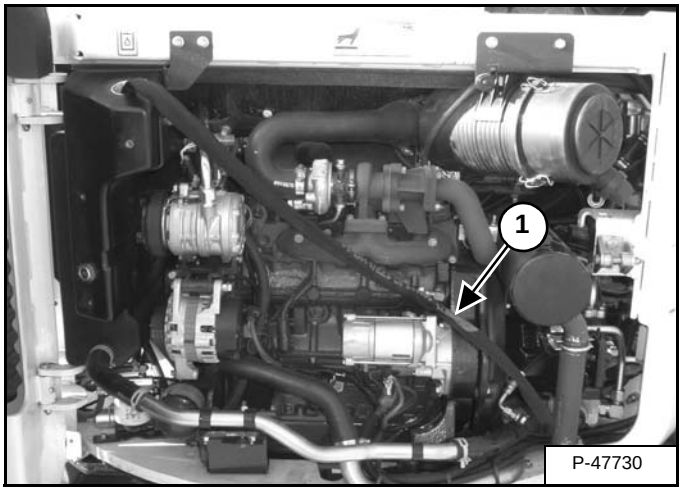
Pump Testing (Cont'd)

Figure 20-50-23



Install a 15KN-3 (Item 1) **[Figure 20-50-23]** fitting and 1/4 in. hydraulic hose with a 90° end to the fitting.

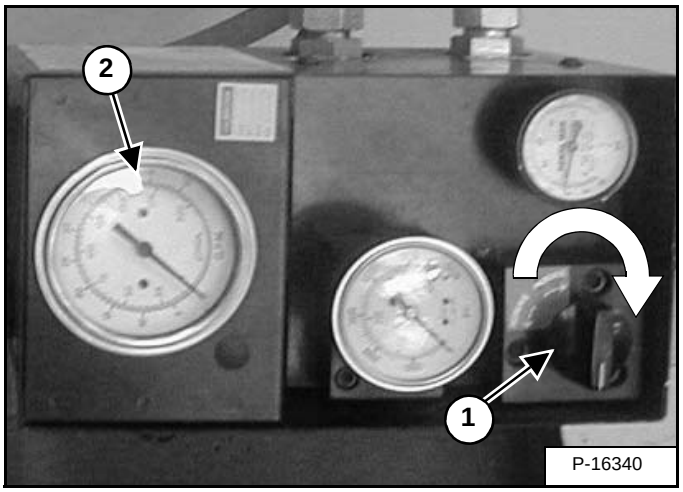
Figure 20-50-24



Route the hose (Item 1) **[Figure 20-50-24]** from the pump margin spool to the hydraulic reservoir.

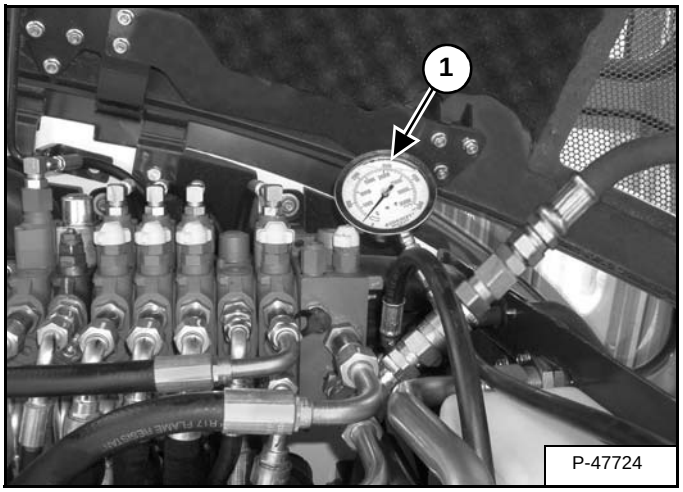
Start the engine and and allow the hydraulic fluid to warm to 140° F (60° C).

Figure 20-50-25



With the engine at high idle, turn the hydraulic tester flow control (Item 1) clockwise until **8 GPM (30 L/min**) flow is shown at the hydraulic tester gauge (Item 2) **[Figure 20-50-25]**.

Figure 20-50-26

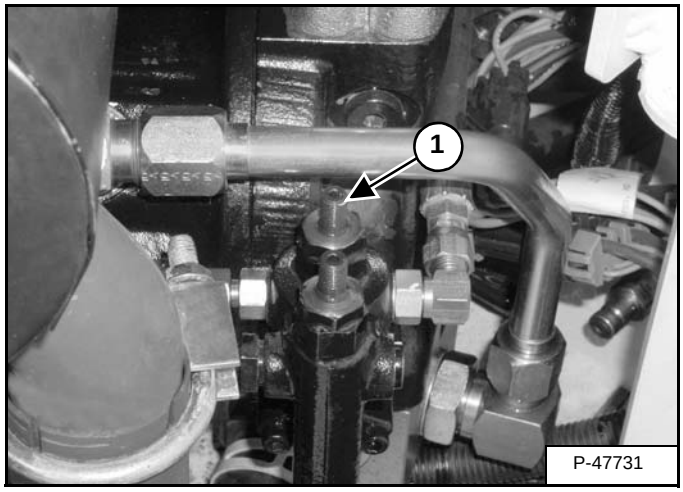


Check the pump margin pressure at the gauge (Item 1) **[Figure 20-50-26]**.

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Pump Testing (Cont'd)

Figure 20-50-27



If the pump margin pressure is not **220 ± 10 PSI (15 ± 1,37 bar)**, turn the pump margin pressure adjustment screw (Item 1) **[Figure 20-50-27]** (Front Spool) clockwise to increase the pressure, and counter clockwise to decrease the pressure. (Approximately 1/4 turn per 50 PSI [3,4 bar])

NOTE: Changing the Pump Margin Pressure Adjustment Screw, will effect the pressure and flow. The Hydraulic Tester must be reset to 8 GPM.

Repeat the procedure listed above until the pressure is set.

If correct pressure cannot be obtained, disassemble and clean the pump margin spool.

When the correct pressure is obtained, tighten the nut and remove the hose and fitting from the pump margin spool. Replace the plug in the pump margin spool (Rear Spool) and tighten.

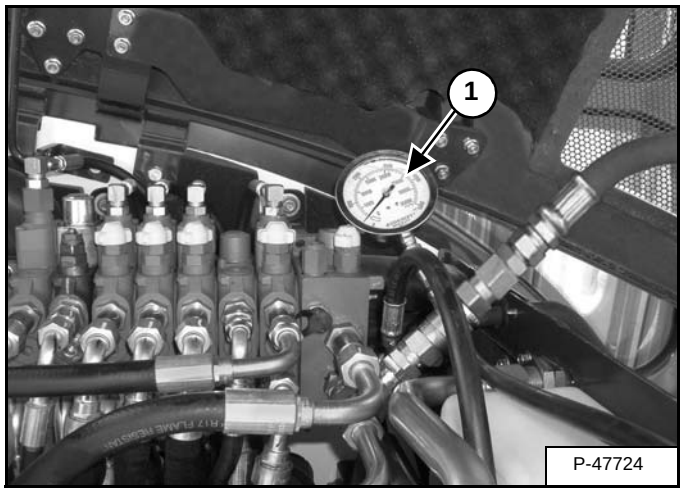
Replace and tighten the cap on the the pump margin pressure adjustment screw.

Remove the 500 PSI (35 bar) test gauge from the pump diagnostic port on the control valve.

The Pump Margin Pressure Adjustment is now completed.

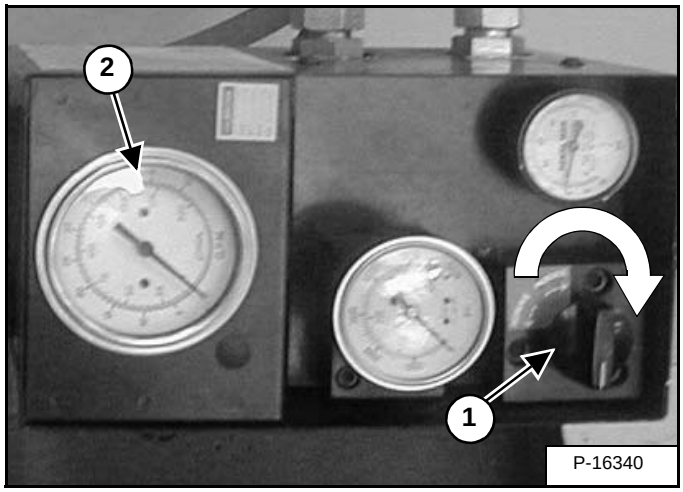
Pump Pressure Adjustment

Figure 20-50-28



Install a **5000 PSI (345 bar) gauge** (Item 1) **[Figure 20-50-28]** to the pump diagnostic port on the control valve.

Figure 20-50-29



Turn the hydraulic tester flow control (Item 1) **[Figure 20-50-29]** clockwise until maximum restriction.

Start the engine and run at high idle.

Raise the blade and deadhead the blade in the up position.

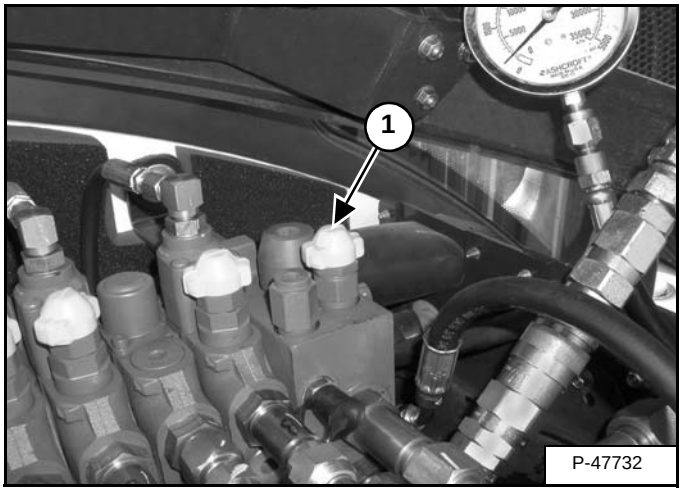
Have another person check the pressure gauge (Item 1) **[Figure 20-50-28]** and record the pump pressure.

The pump pressure should be **3625 ± 75 PSI (250 ± 5,2 bar)**.

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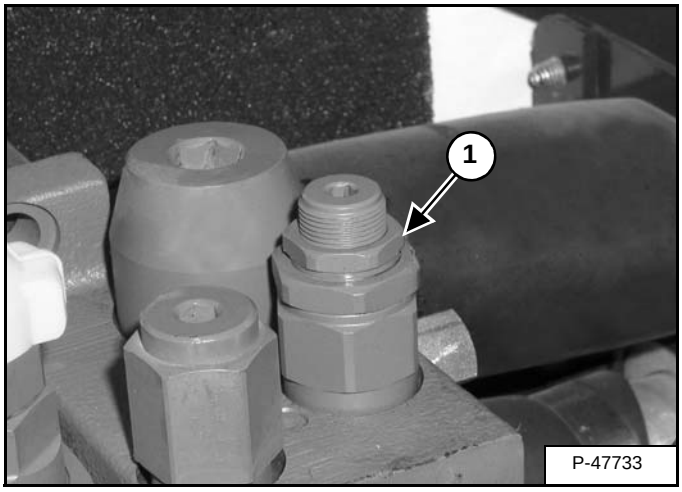
Pump Testing (Cont'd)

Figure 20-50-30



Remove the protective cap (Item 1) **[Figure 20-50-30]** from the top of the Load Sense Relief Valve.

Figure 20-50-31



Loosen the nut (Item 1) **[Figure 20-50-31]** and with an Allen wrench adjust the pressure to **3625 ± 75 PSI (250 ± 5,2 bar)**.

If pump pressure cannot be obtained, disassemble and clean the load sense relief valve.

When pump pressure is set, tighten the nut (Item 1) **[Figure 20-50-31]**.

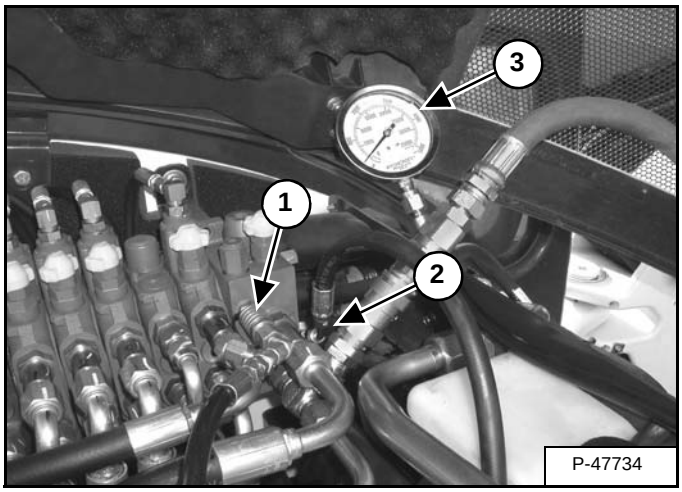
Remove the 5000 PSI (345 bar) gauge from the pump diagnostic port on the control valve.

Pump Pressure Adjustment is now completed.

Torque Limiter Adjustment

NOTE: For a pump that has been tampered with or one that is so far out of adjustment that the correct settings cannot be obtained. (See Initial Torque Limiter Valve Setting on Page 20-50-29.).

Figure 20-50-32



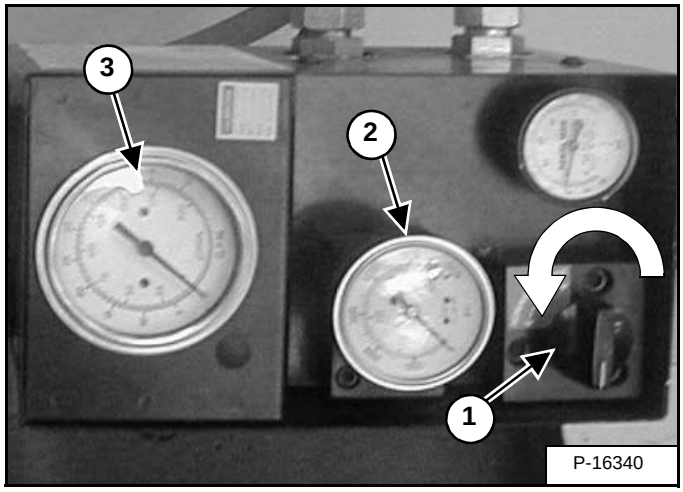
Use a 5000 PSI (345 bar) gauge, 1/4 in. hose and two female hydraulic couplers from the kit, connect the pump diagnostic port (Item 1) to the Load Sense diagnostic port (Item 2) **[Figure 20-50-32]** on the control valve.

Install a **5000 PSI (345 bar) gauge** (Item 3) **[Figure 20-50-32]** to the test port on the hydraulic test hose.

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Pump Testing (Cont'd)

Figure 20-50-33



Turn the hydraulic tester flow control (Item 1) **[Figure 20-50-33]** counterclockwise so there is no restriction on the hydraulic system.

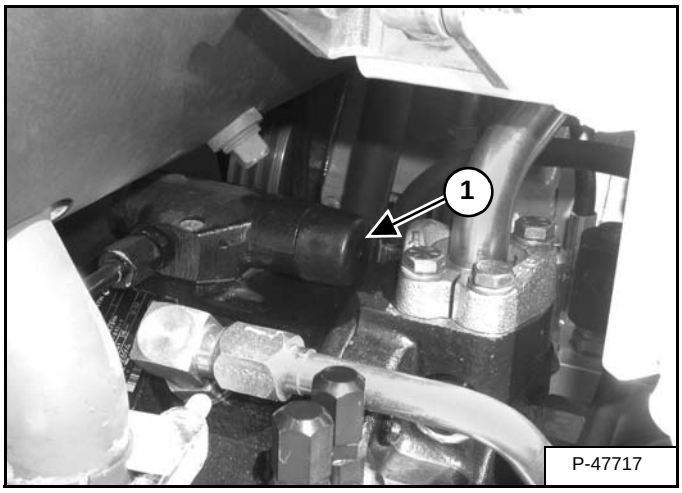
Start the engine and run at high idle.

Turn the hydraulic tester flow control (Item 1) clockwise until the gauge (Item 2) **[Figure 20-50-32 on Page 20-50-13]** reads **1450 PSI (100 bar)**.

Record the amount of flow at the tester gauge (Item 3) **[Figure 20-50-33]**, which is the *flow at low pressure*.

The flow should be approximately **27 - 32 GPM (102 - 121 L/min)**.

Figure 20-50-34

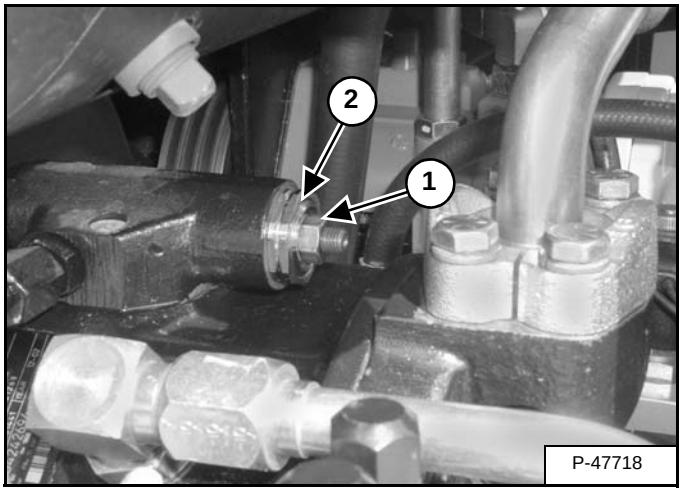


If the pump torque limiter must be adjusted, stop the engine and remove the protective cap (Item 1) **[Figure 20-50-34]** from the hydraulic pump torque limiter.

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Pump Testing (Cont'd)

Figure 20-50-35



Check the small nut (Item 1) **[Figure 20-50-35]** to be sure it is locked in place.

Adjust the flow at the hydraulic pump torque limiter loosening the large nut (Item 2) **[Figure 20-50-35]**. With an Allen wrench adjust the *flow at low pressure*.

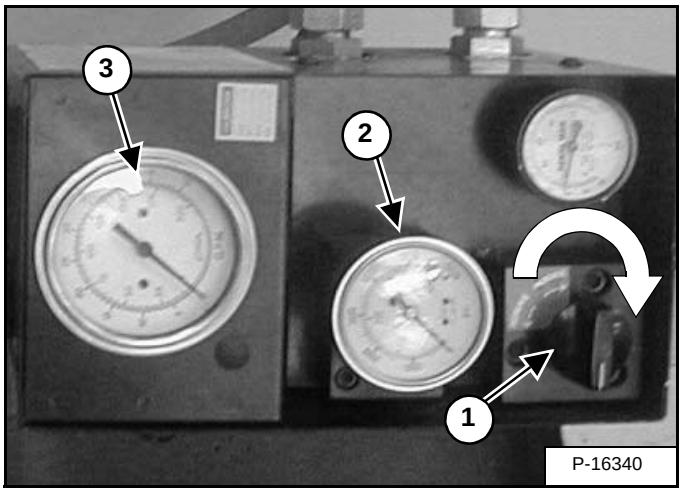
When the proper flow is obtained, **27 - 32 GPM (102 - 121 L/min) at 1450 PSI (100 bar)**, tighten the large nut (Item 2) **[Figure 20-50-35]**.

NOTE: When adjusting the flow at low pressure [Figure 20-50-35], the engine RPM must not fall below 2100 RPM.

NOTE: Changing the flow at low pressure (Item 2), (large nut) will affect flow at high pressure (Item 1) [Figure 20-50-35] (small nut).

If this flow at low pressure cannot be obtained, disassemble and clean the torque limiter spool.

Figure 20-50-36



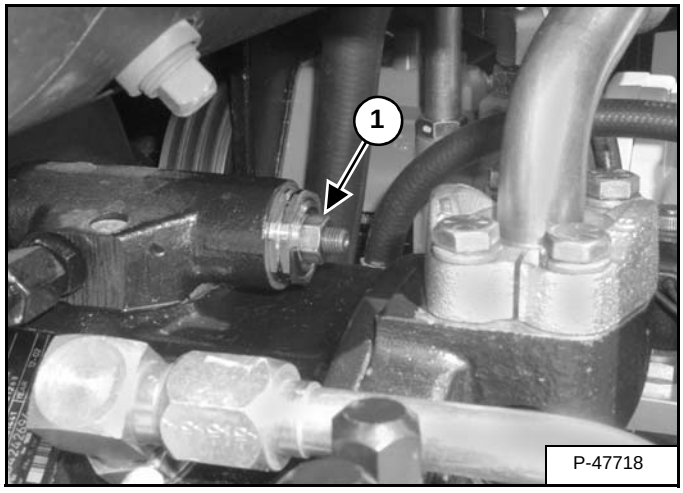
Turn the hydraulic tester flow control (Item 1) clockwise until the gauge (Item 2) reads **3300 PSI (228 bar)**. Record the amount of flow at the tester gauge (Item 3) **[Figure 20-50-36]**, which is the *flow at high pressure*.

The flow should be approximately **14 - 18 GPM (53 - 68 L/min)**.

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Pump Testing (Cont'd)

Figure 20-50-37



Adjust the flow at the hydraulic pump torque limiter. Stop the engine and loosen the small nut (Item 1) **[Figure 20-50-37]** and with an Allen wrench adjust the *flow at high pressure*.

If this flow at high pressure cannot be obtained, disassemble and clean the torque limiter spool.

When the proper flow is obtained, **14 - 18 GPM (53 - 68 L/min) at 3300 PSI (228 bar)**, lock the small nut (Item 1) **[Figure 20-50-37]**.

NOTE: When adjusting the flow at high pressure, the engine RPM must not fall below 2100 RPM.

NOTE: If adjustments were made to *flow at high pressure* verify the *flow at low pressure*. (See Torque Limiter Adjustment on Page 20-50-13)

Install the protective cap on the hydraulic pump torque limiter.

Torque Limiter Adjustment is now completed.

ALL PUMP ADJUSTMENTS ARE NOW COMPLETED

Remove the hydraulic tester and all test fittings from the excavator.

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Removal And Installation

IMPORTANT

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

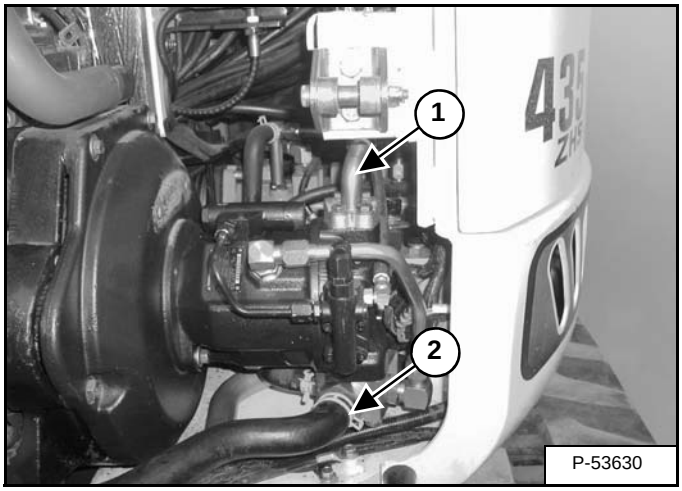
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Open the tailgate.

Drain the hydraulic reservoir. (See Replacing The Hydraulic Oil on Page 10-100-2)

Remove the muffler. (See Removal And Installation on Page 70-20-1)

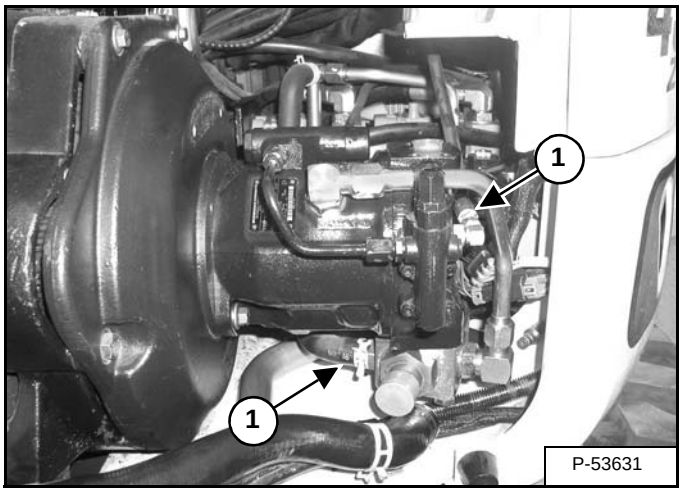
Figure 20-50-38



Remove the hose (Item 1) **[Figure 20-50-38]** that goes from the pump to the control valve.

Remove the hose (Item 2) **[Figure 20-50-38]** that goes from the reservoir to the pump.

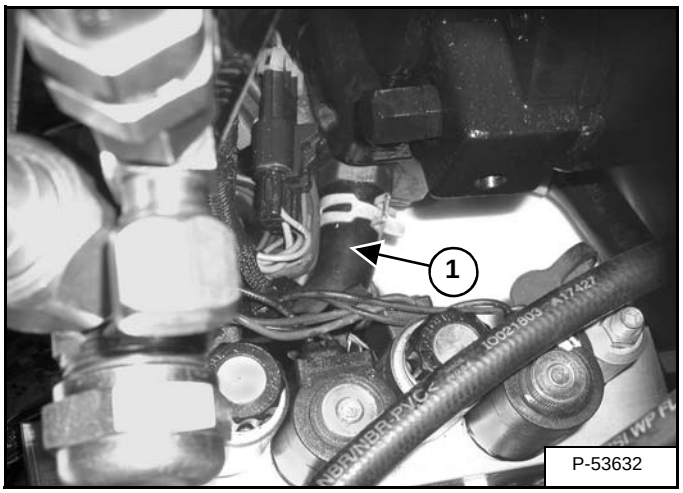
Figure 20-50-39



Remove the hoses (Item 1) **[Figure 20-50-39]**.

Open the right side cover.

Figure 20-50-40

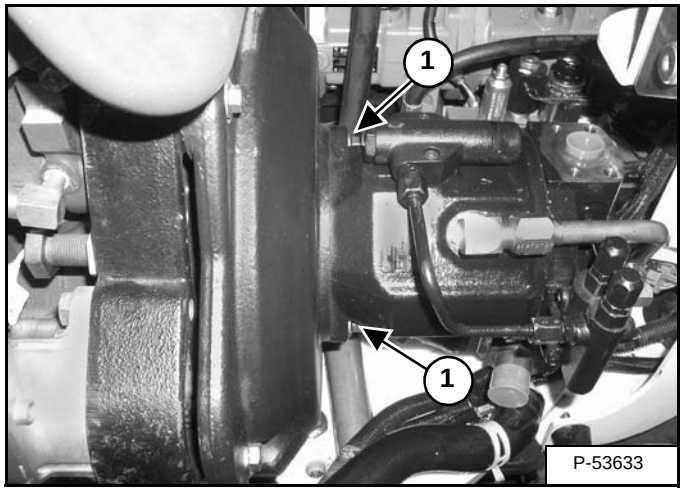


Remove the hose (Item 1) **[Figure 20-50-40]**.

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Removal And Installation (Cont'd)

Figure 20-50-41



Remove the bolts (Item 1) **[Figure 20-50-41]**.

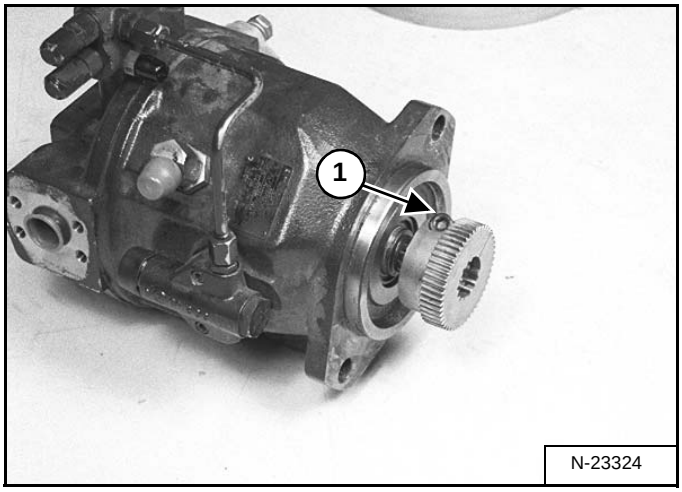
Separate the pump from the engine.

Remove the pump from the excavator.

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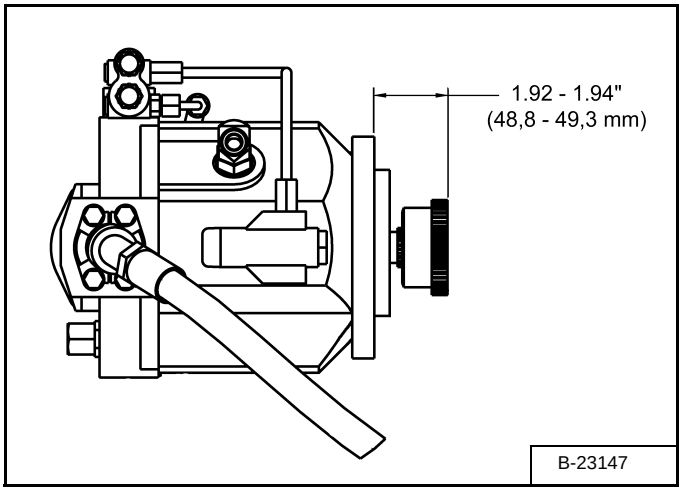
Coupler Removal And Installation

Figure 20-50-42



Remove the bolt (Item 1) **[Figure 20-50-42]** from the coupler. Slide the coupler off the pump shaft.

Figure 20-50-43

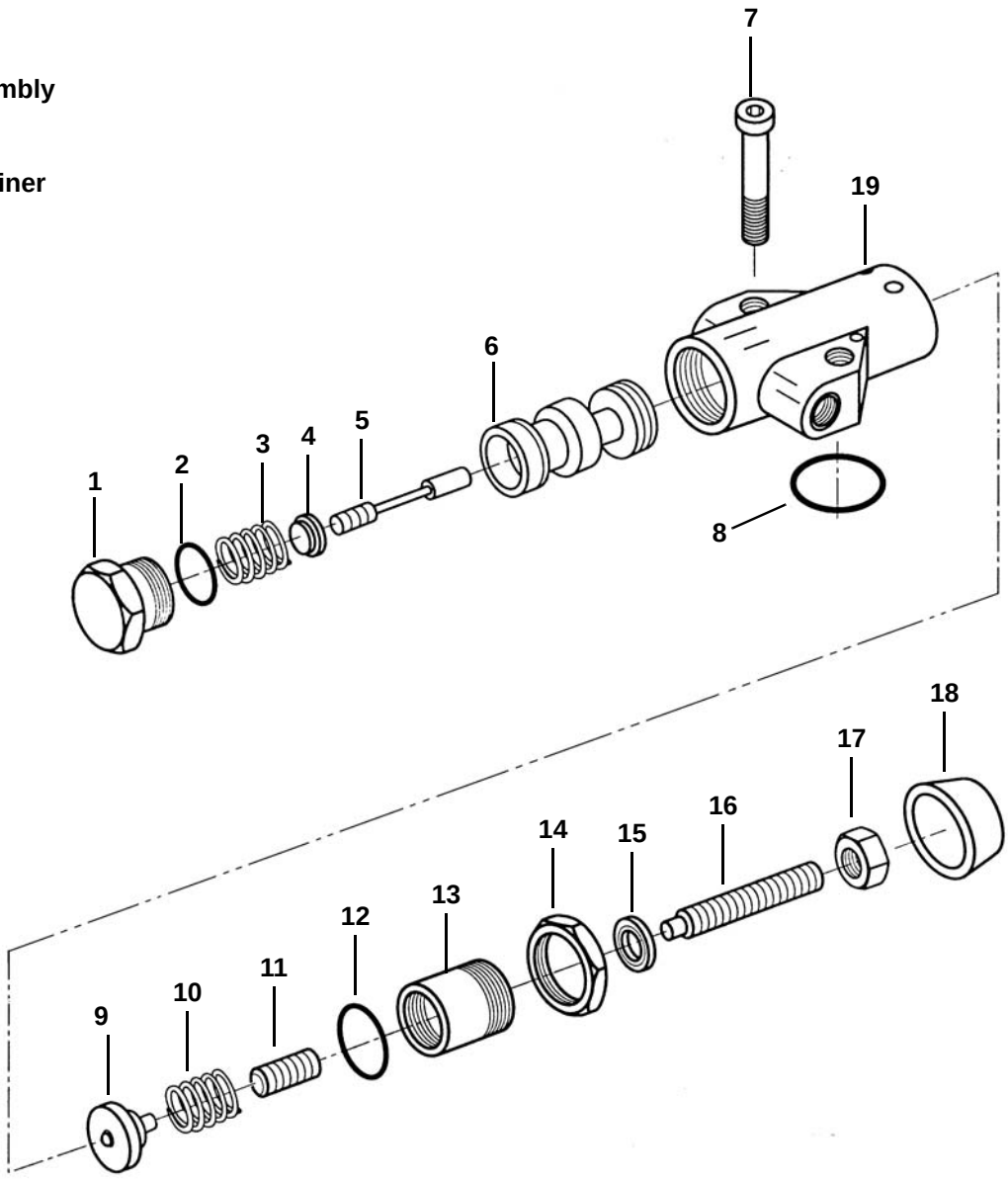


Installation: When installing the coupler, maintain a 1.92 - 1.94 in. (48,8 - 49,3 mm) gap from the pump mount flange to the coupler **[Figure 20-50-43]**.

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Torque Limiter Valve Parts Identification

1. Plug
2. O-Ring
3. Spring
4. Spring Seat
5. Spool
6. Spool Assembly
7. Bolt
8. O-Ring
9. Spring Retainer
10. Spring
11. Spring
12. O-Ring
13. Body
14. Locknut
15. Washer
16. Screw
17. Nut
18. Cap
19. Housing



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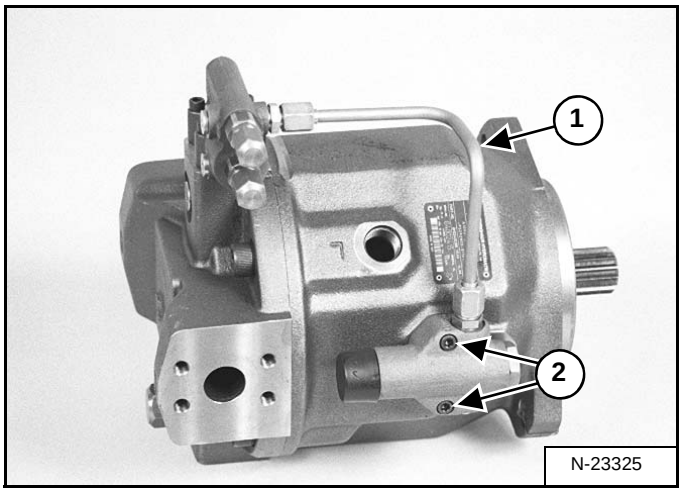
Torque Limiter Valve Removal

IMPORTANT

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

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Figure 20-50-44



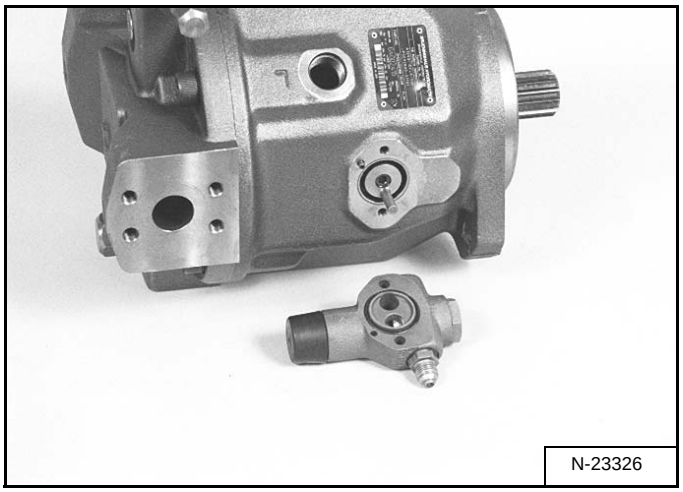
Remove the tubeline (Item 1) **[Figure 20-50-44]** from the pump control and torque limiter valve.

NOTE: Mark the tubeline for correct installation.

Remove the bolts (Item 2) **[Figure 20-50-44]** from the torque limiter valve.

Installation: Tighten the bolts to 7 - 8 ft.-lb. (9,5 - 10,5 N•m) torque.

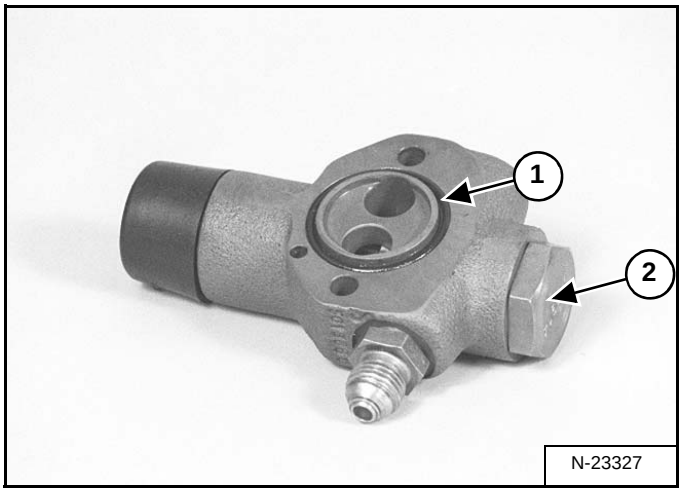
Figure 20-50-45



Using a screwdriver gently pry up on the torque limiter valve and remove it from the pump **[Figure 20-50-45]**.

Torque Limiter Valve Disassembly

Figure 20-50-46



Remove the O-ring (Item 1) **[Figure 20-50-46]** from the torque limiter valve.

NOTE: Care should be taken not to scratch or damage the mounting surface on the valve body.

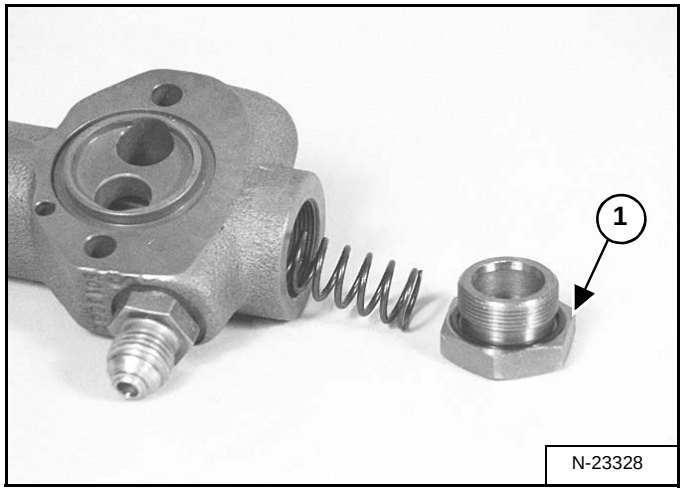
NOTE: The plug (Item 2) [Figure 20-50-46] is under spring pressure.

Remove the plug (Item 2) **[Figure 20-50-46]** from the torque limiter valve to relieve pressure on the torque limiter valve spool.

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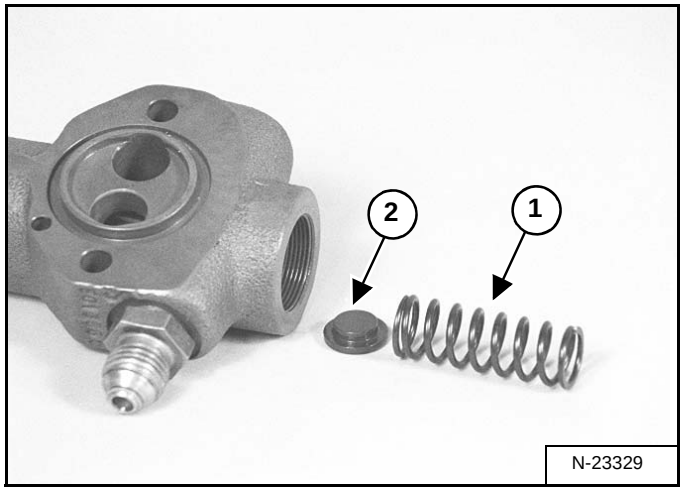
Torque Limiter Valve Disassembly (Cont'd)

Figure 20-50-47



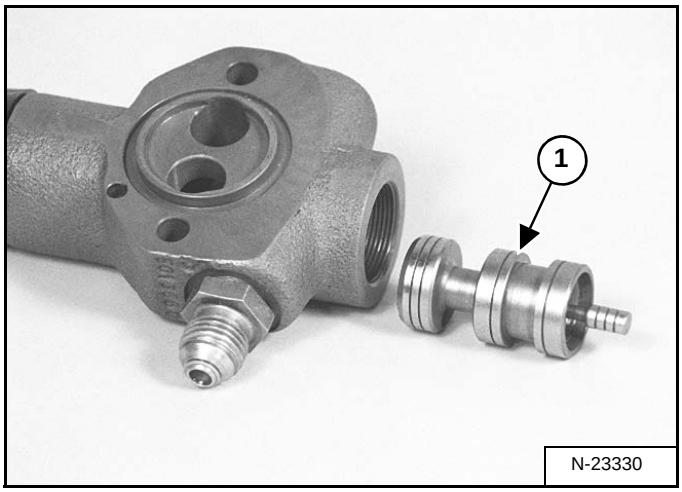
Remove the O-ring (Item 1) **[Figure 20-50-47]**.

Figure 20-50-48



Remove the spring (Item 1) and spring seat (Item 2) **[Figure 20-50-48]**.

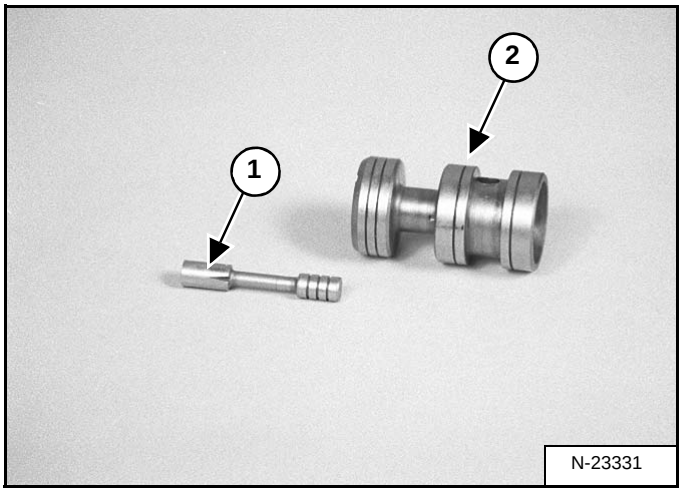
Figure 20-50-49



Remove the control spool assembly (Item 1) **[Figure 20-50-49]**.

NOTE: Use care not to scratch or damage the spool. Scratches in the spool can cause internal leakage.

Figure 20-50-50

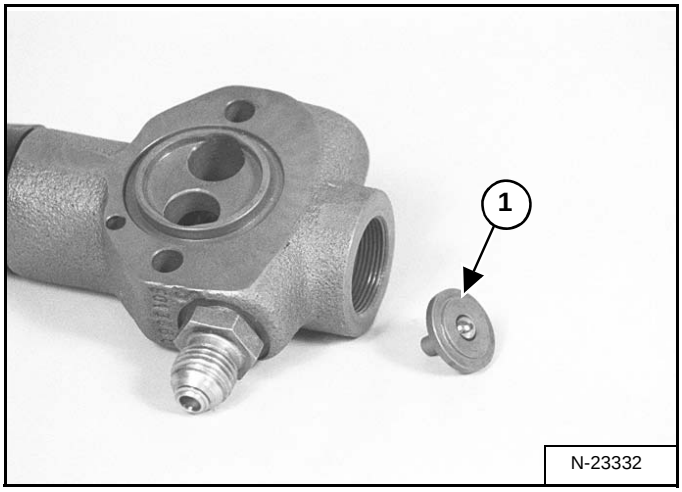


Remove the metering spool (Item 1) from the control spool (Item 2) **[Figure 20-50-50]**.

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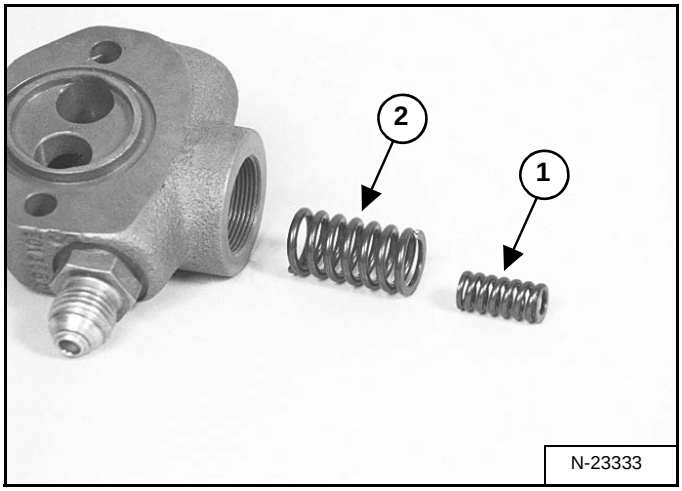
Torque Limiter Valve Disassembly (Cont'd)

Figure 20-50-51



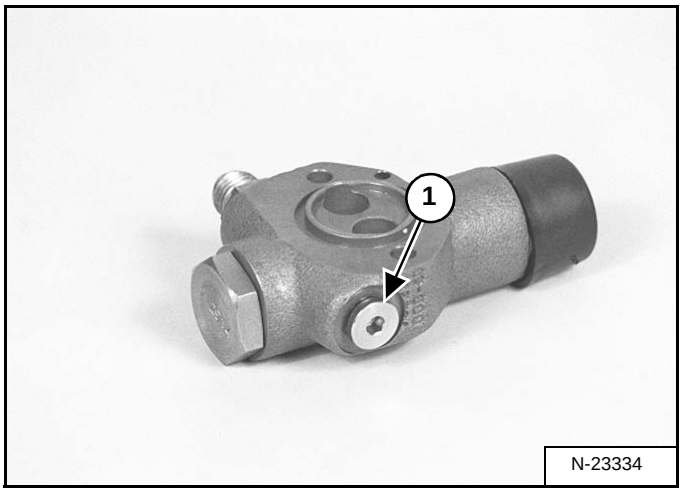
Remove the spring retainer (Item 1) **[Figure 20-50-51]** from the torque limiter valve.

Figure 20-50-52



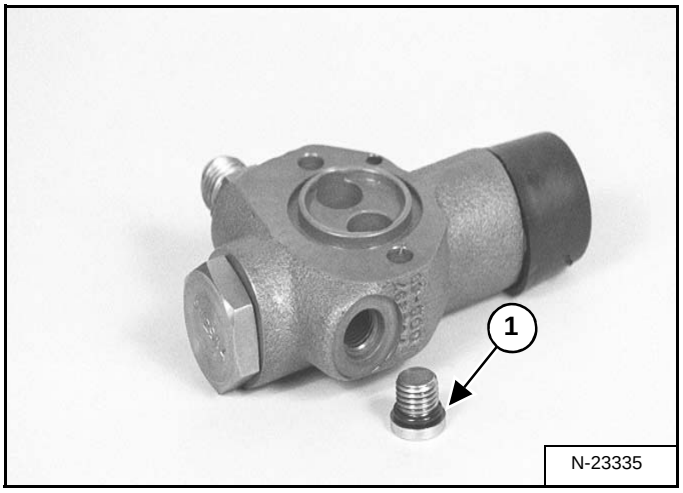
Remove the two springs (Items 1 & 2) **[Figure 20-50-52]**.

Figure 20-50-53



Remove the plug (Item 1) **[Figure 20-50-53]**.

Figure 20-50-54



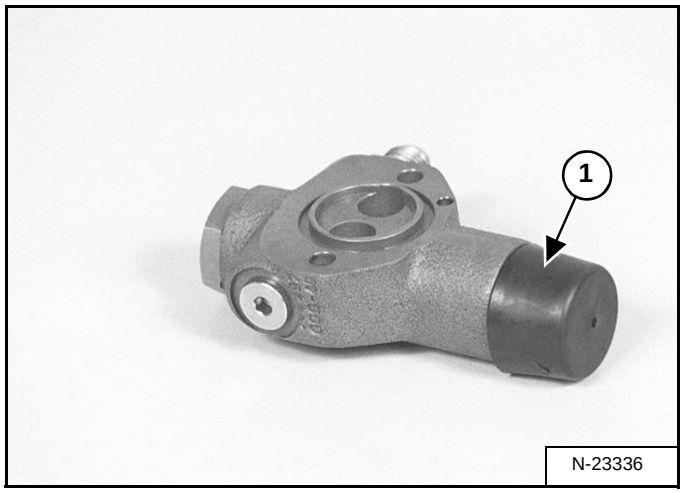
Remove the O-ring (Item 1) **[Figure 20-50-54]**.

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Torque Limiter Valve Disassembly (Cont'd)

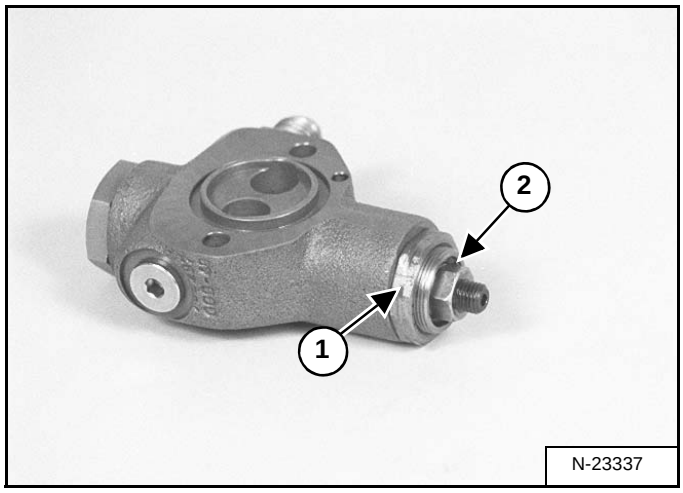
The following procedures are only used if the adjustment assembly is removed.

Figure 20-50-55



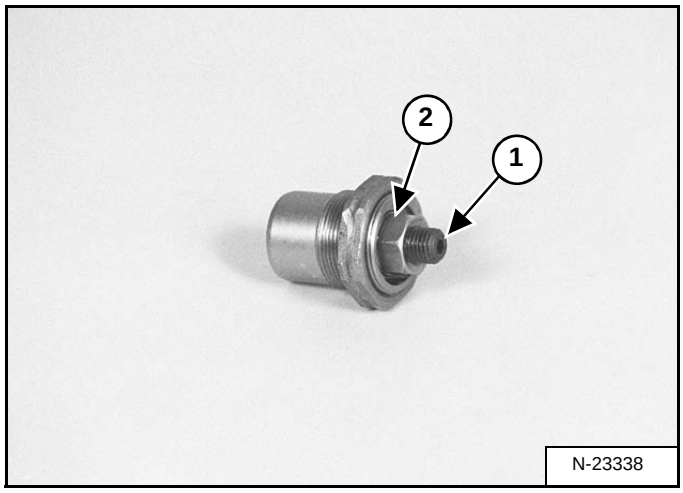
Remove the dust cap (Item 1) **[Figure 20-50-55]**.

Figure 20-50-56



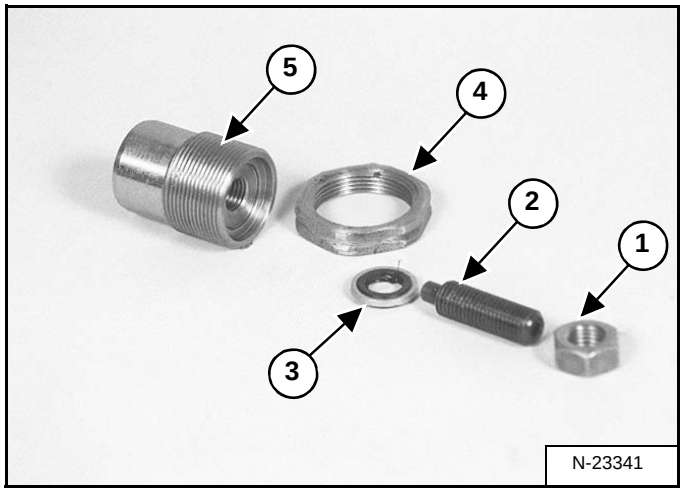
Loosen the large nut (Item 1). With a 13 mm wrench on the small nut (Item 2) **[Figure 20-50-56]** remove the adjustment body from the valve body.

Figure 20-50-57



With an Allen wrench hold the adjustment bolt (Item 1) and loosen the nut (Item 2) **[Figure 20-50-57]**.

Figure 20-50-58

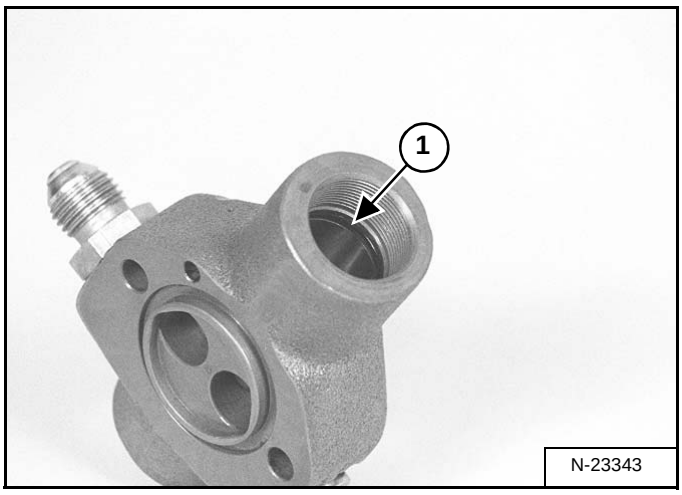


Remove the nut (Item 1) adjustment bolt (Item 2) O-ring washer (Item 3) and large nut (Item 4) from the adjustment body (Item 5) **[Figure 20-50-58]**.

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Torque Limiter Valve Disassembly (Cont'd)

Figure 20-50-59



Remove the O-ring (Item 1) **[Figure 20-50-59]** from the housing.

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Torque Limiter Valve Assembly

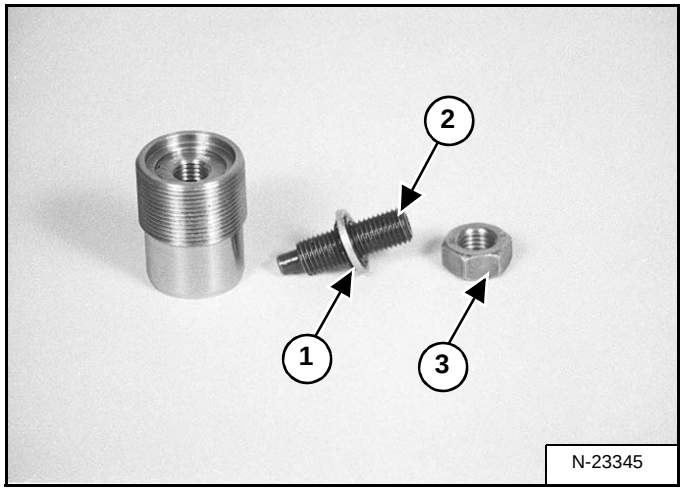
Clean all the parts in solvent and dry with compressed air.

Inspect seats and spools for wear.

Apply clean oil to new O-rings.

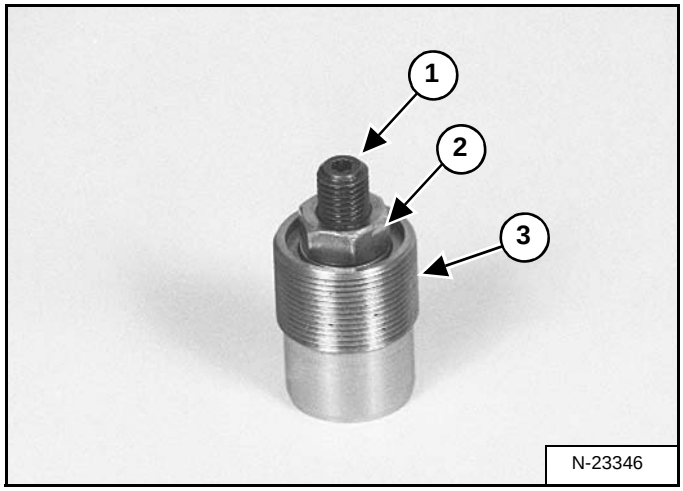
The following procedures are only used if the adjustment assembly is removed.

Figure 20-50-60



Install the O-ring washer (Item 1) on the adjustment screw (Item 2). Install the nut (Item 3) **[Figure 20-50-60]** on the adjustment screw.

Figure 20-50-61

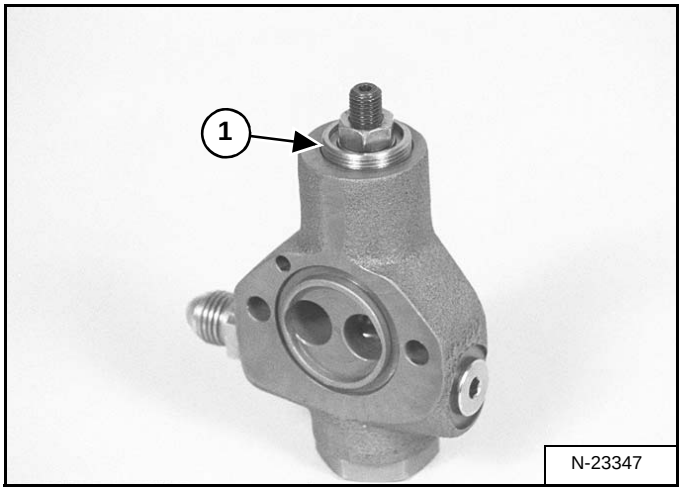


Install the adjustment bolt (Item 1) and nut (Item 2) into the adjustment body (Item 3) **[Figure 20-50-61]**.

NOTE: Turn the adjustment screw into the valve body approximately six complete turns.

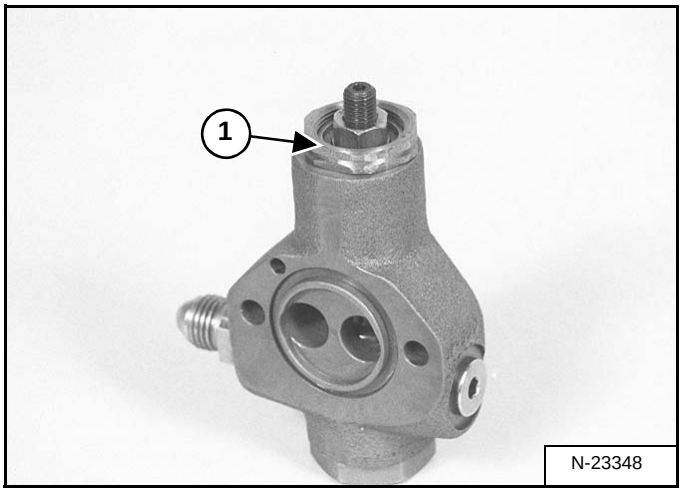
Hold the adjustment screw with an Allen wrench and tighten the nut (Item 2) **[Figure 20-50-61]**.

Figure 20-50-62



Install the adjustment body (Item 1) **[Figure 20-50-62]** and nut into the housing.

Figure 20-50-63

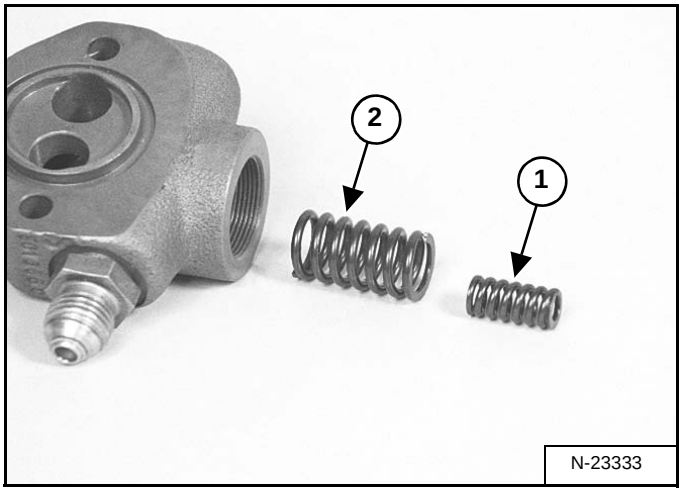


Install the large nut (Item 1) **[Figure 20-50-63]** and finger tighten.

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Torque Limiter Valve Assembly (Cont'd)

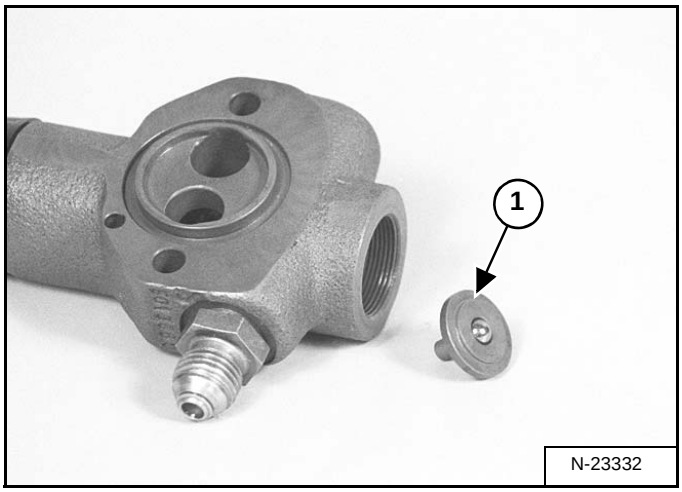
Figure 20-50-64



Install the two springs (Items 1 & 2) **[Figure 20-50-64]** in the valve body.

NOTE: Install the big spring first and the small spring second.

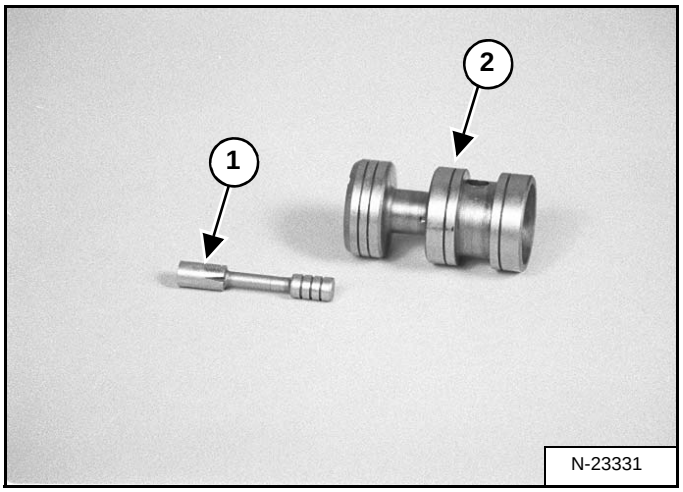
Figure 20-50-65



Install the spring retainer (Item 1) **[Figure 20-50-65]** in the valve body with the ball side facing toward the control spool.

The opposite side of the spring retainer will fit inside the springs (Items 1 & 2) **[Figure 20-50-64]**.

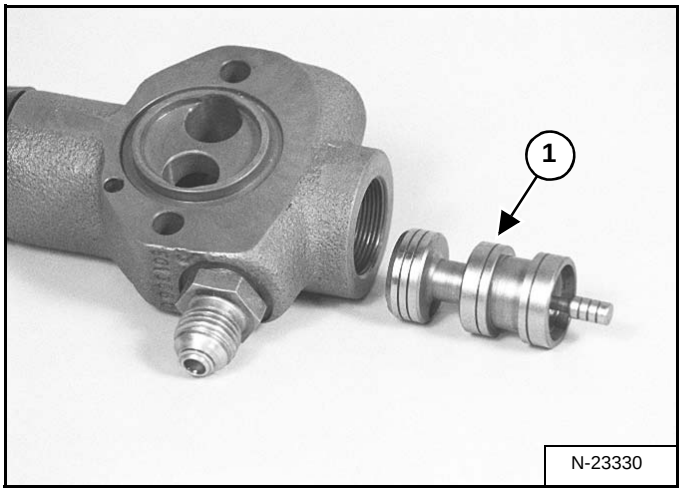
Figure 20-50-66



Put oil on the metering spool (Item 1) and install in the control spool (Item 2) **[Figure 20-50-66]**.

NOTE: The end of the metering spool with the 3 rings enters the control spool first.

Figure 20-50-67



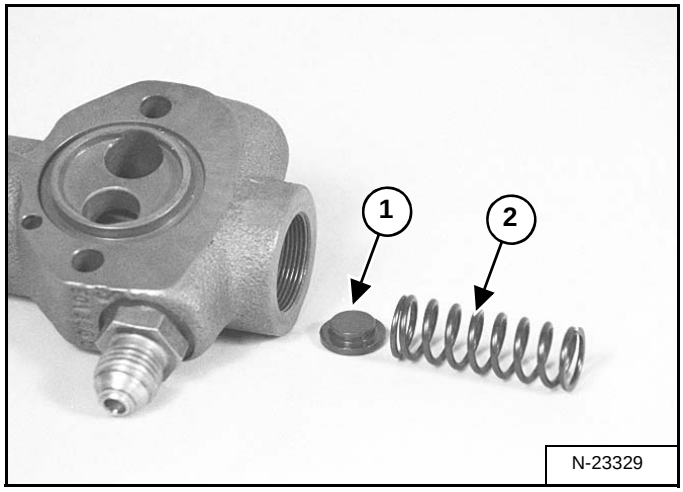
Put oil on the control spool assembly (Item 1) **[Figure 20-50-67]** and install it in the housing.

NOTE: Use care not to scratch or damage the spool (Item 1) [Figure 20-50-67]. Scratches in the spool can cause internal leakage.

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Torque Limiter Valve Assembly (Cont'd)

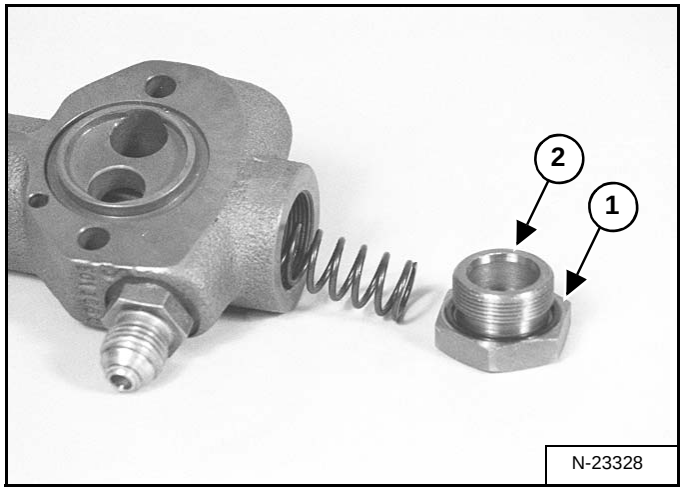
Figure 20-50-68



Install the spring guide (Item 1) **[Figure 20-50-68]** in the valve body, with the smaller diameter end toward the spring.

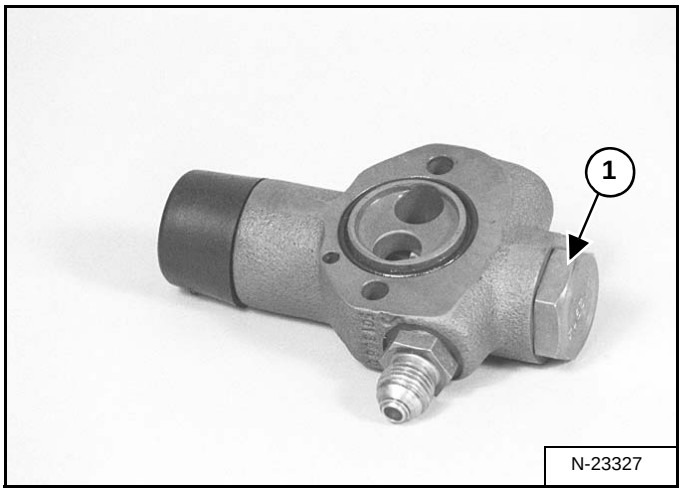
Install the spring (Item 2) **[Figure 20-50-68]** in the housing.

Figure 20-50-69



Install the O-ring (Item 1) on the plug (Item 2) **[Figure 20-50-69]**.

Figure 20-50-70



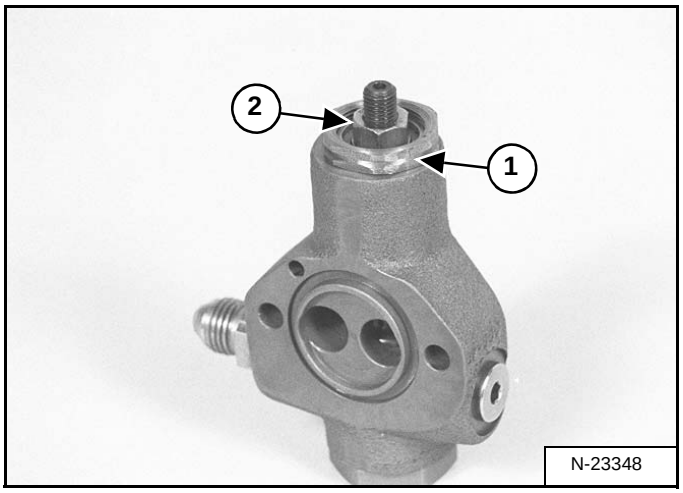
Install the plug (Item 1) **[Figure 20-50-70]** on the torque limiter valve.

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Initial Torque Limiter Valve Setting

Use the following procedure to set the torque limiter valve after being disassembled and assembled.

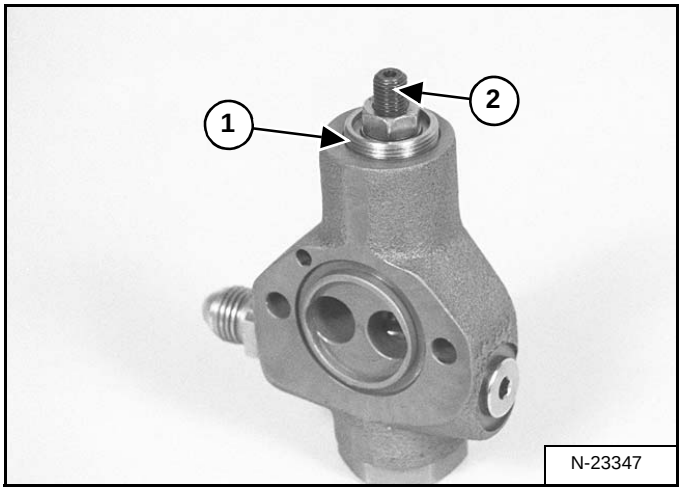
Figure 20-50-71



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

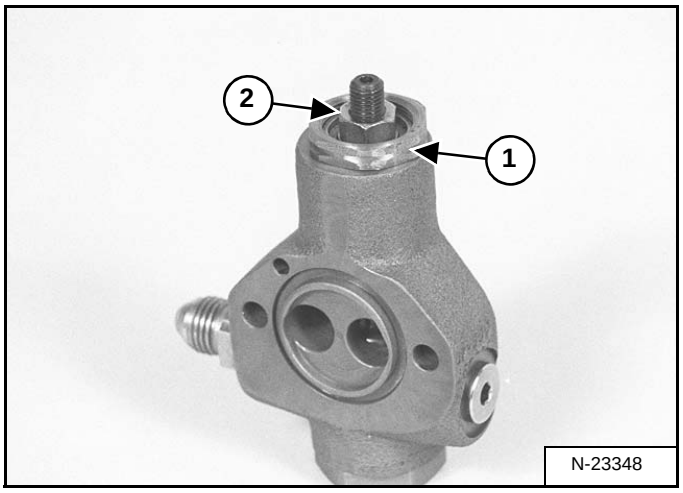
Lock the small nut (Item 2) **[Figure 20-50-71]**.

Figure 20-50-72



Both the large (Item 1) and small (Item 2) adjusting screws must be lightly bottomed out in the valve. The large adjustment screw (Item 1) **[Figure 20-50-72]** must be bottomed out (just touching) first, make sure the small adjustment screw is turned out a small amount so it will not hit first.

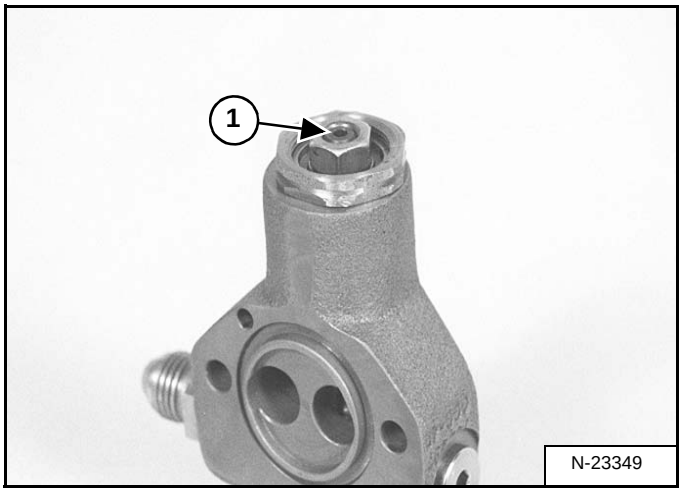
Figure 20-50-73



After the large adjustment screw is just seated, tighten the large nut (Item 1) **[Figure 20-50-73]**.

Loosen the small nut (Item 2) **[Figure 20-50-73]**.

Figure 20-50-74

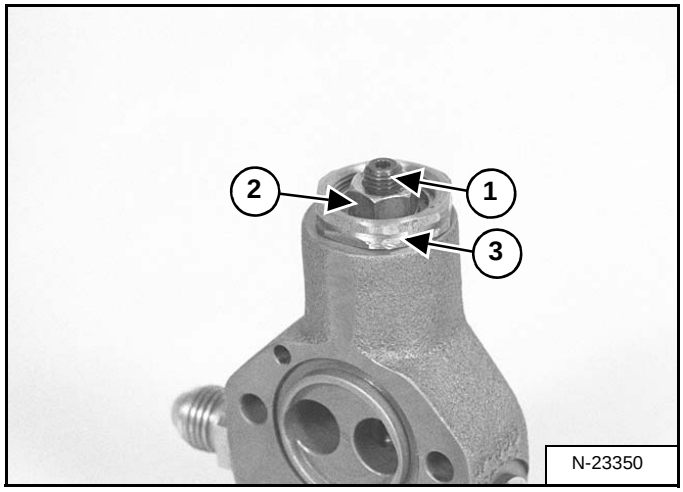


Turn the small adjustment screw (Item 1) **[Figure 20-50-74]** in until it bottoms in the valve.

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Initial Torque Limiter Valve Setting (Cont'd)

Figure 20-50-75

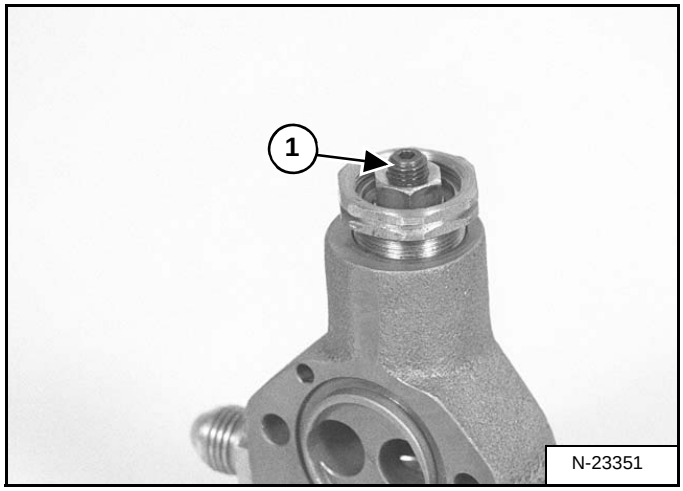


Back out the small adjustment screw (Item 1) **[Figure 20-50-75]** 10-1/4 turns.

Tighten the small nut (Item 2) **[Figure 20-50-75]**.

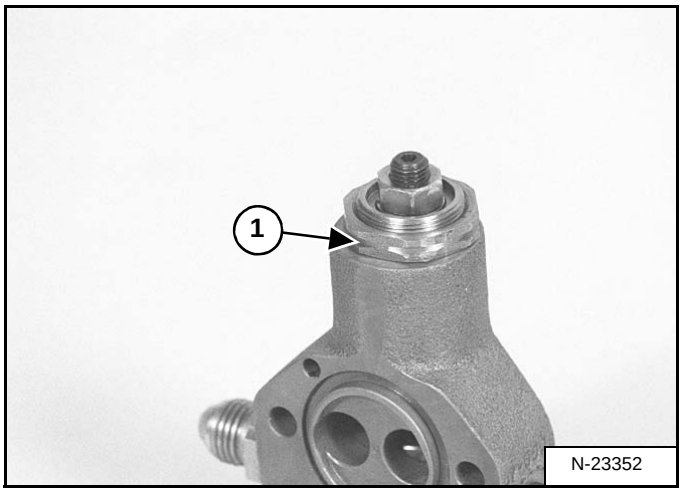
Loosen the large nut (Item 3) **[Figure 20-50-75]**.

Figure 20-50-76



With an Allen wrench in the small adjustment screw (Item 1) **[Figure 20-50-76]** back out the large adjustment screw 5-3/4 turns.

Figure 20-50-77



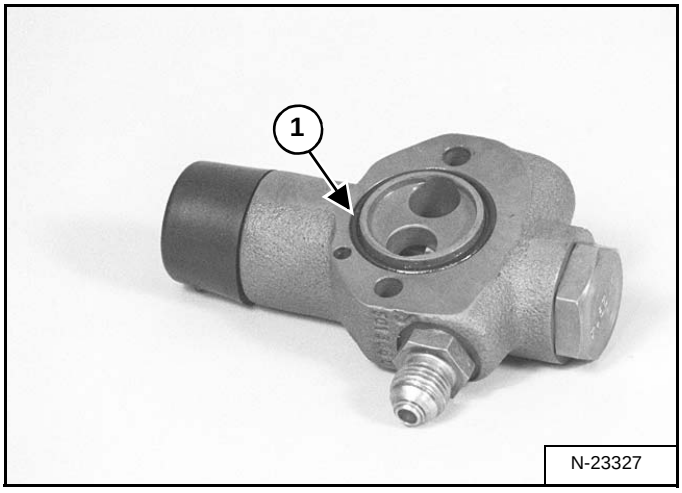
Tighten the large nut (Item 1) **[Figure 20-50-77]**.

This is the initial adjustment to the torque limiter valve. For the final adjustment see Pump Testing. (See Pump Testing on Page 20-50-4)

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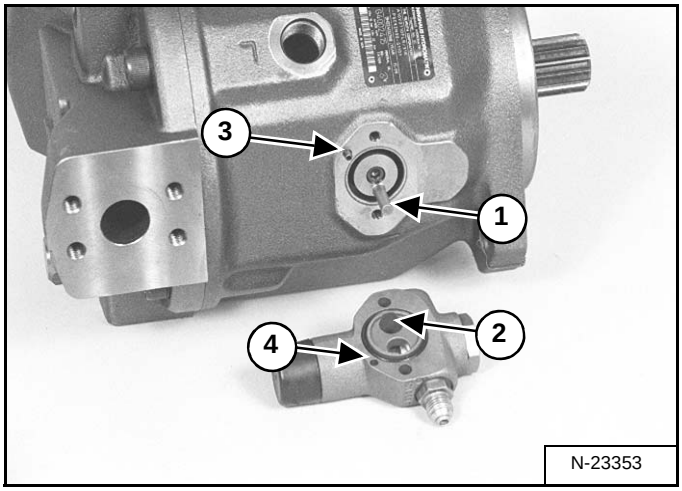
Torque Limiter Valve Installation

Figure 20-50-78



Install the O-ring (Item 1) **[Figure 20-50-78]** on the torque limiter valve.

Figure 20-50-79



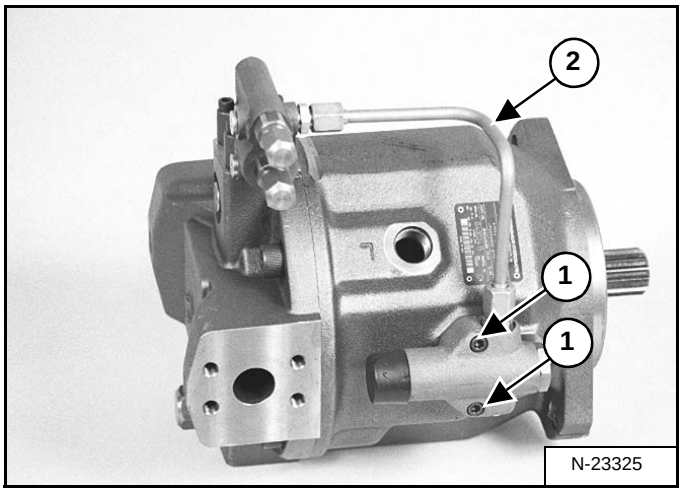
Align the linkage pin (Item 1) on the hydraulic piston pump into the hole (Item 2) **[Figure 20-50-79]** in the torque limiter valve.

Turn the valve slightly to align the dowel pin (Item 3) on the hydraulic piston pump into the hole (Item 4) **[Figure 20-50-79]** in the torque limiter valve. Apply pressure to the valve to compress the spring.

NOTE: Care should be taken not to scratch or damage the valve spool.

NOTE: Before tightening the bolts, make sure the dowel pin is aligned with the housing.

Figure 20-50-80



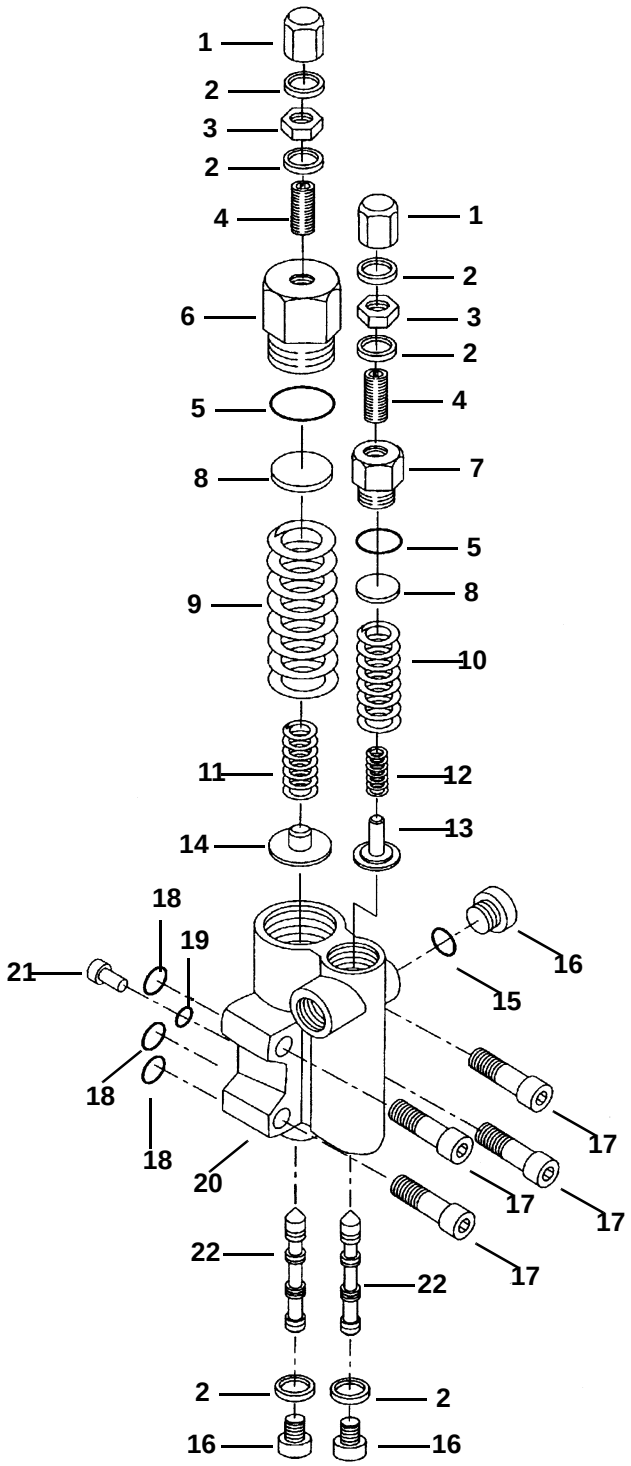
Tighten the bolts (Item 1) **[Figure 20-50-80]** to 7 - 8 ft. lb. (9,5 - 10,5 N•m) torque.

Install the tubeline (Item 2) **[Figure 20-50-80]**.

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Pump Control Parts Identification

1. Cap
2. O-Ring Washer
3. Jam Nut
4. Adjusting Screw
5. O-Ring
6. Adjustment Assembly
7. Adjustment Assembly
8. Disc
9. Spring
10. Spring
11. Spring
12. Spring
13. Spring Retainers
14. Spring Retainers
15. O-Ring
16. Plug
17. Bolt
18. O-Ring
19. O-Ring
20. Housing
21. Orifice
22. Spool

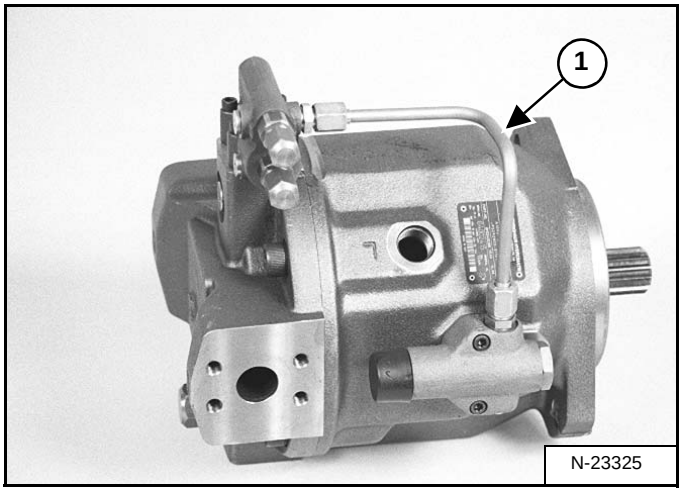


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Pump Control Removal And Installation

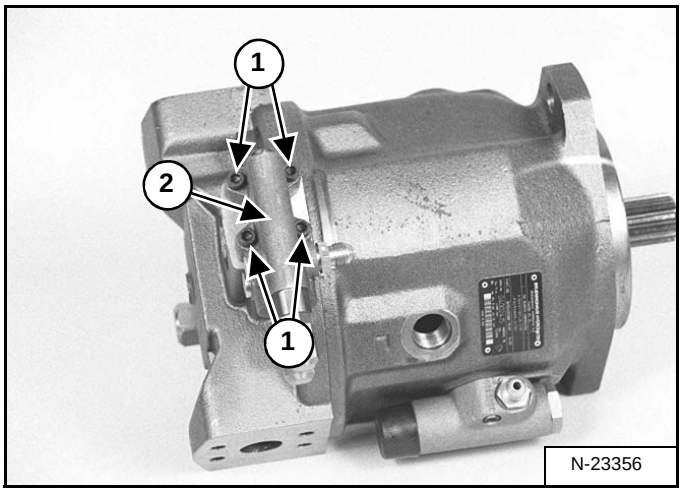
Figure 20-50-81



Mark the tubeline (Item 1) **[Figure 20-50-81]** for correct assembly.

Remove the tubeline (Item 1) **[Figure 20-50-81]** from the pump control and torque limiter valve.

Figure 20-50-82

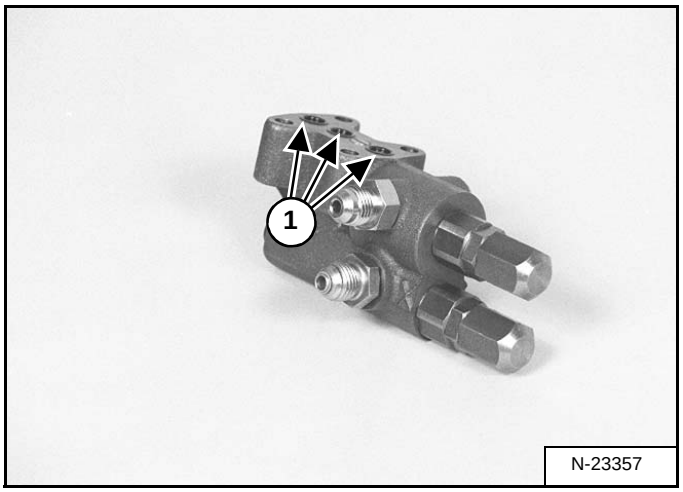


Remove the bolts (Item 1) and remove the pump control (Item 2) **[Figure 20-50-82]** from the hydraulic piston pump.

Installation: Tighten the bolts to 10 ft.-lb. (13 N•m) torque.

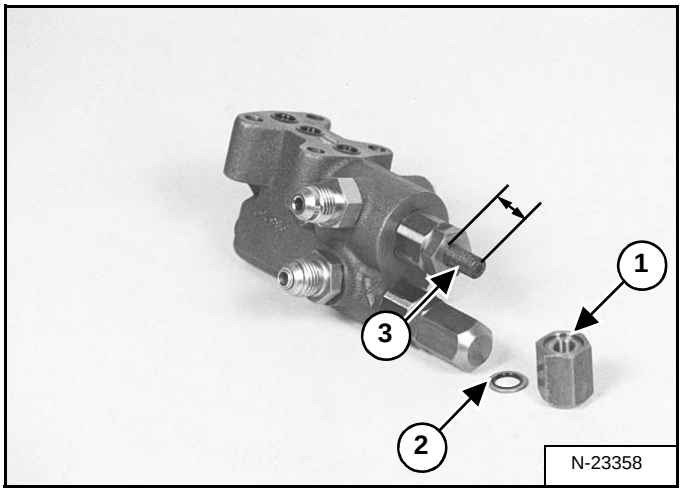
Pump Control Disassembly And Assembly

Figure 20-50-83



Remove the O-rings (Item 1) **[Figure 20-50-83]** from the valve.

Figure 20-50-84



Pump Margin Control

Before disassembling the pump margin control, remove the cap (Item 1) and O-ring washer (Item 2) **[Figure 20-50-84]** from the adjustment assembly.

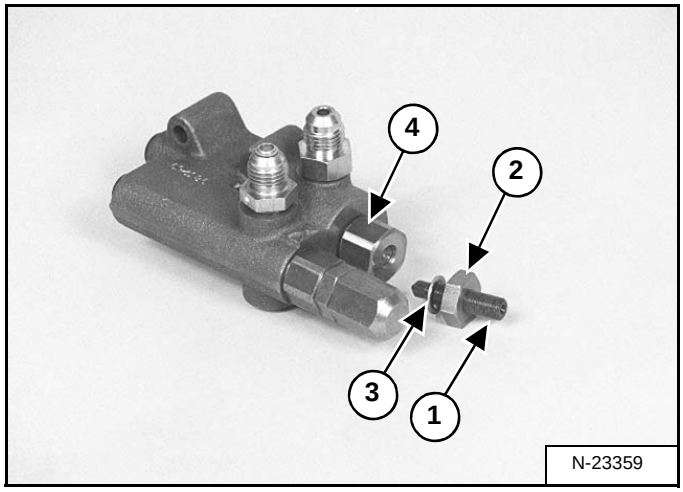
Measure the adjustment screw (Item 3) **[Figure 20-50-84]**, thread length for the correct initial adjustment.

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Pump Control Disassembly And Assembly (Cont'd)

Pump Margin Control (Cont'd)

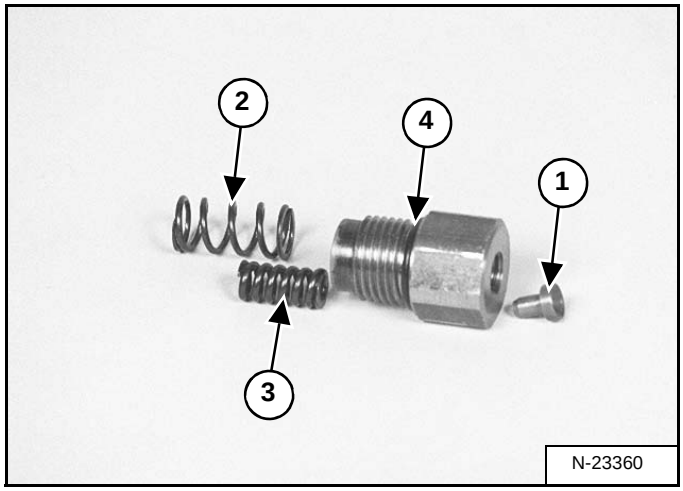
Figure 20-50-85



Remove the adjustment screw (Item 1) nut (Item 2), and O-ring washer (Item 3) from the adjustment assembly (Item 4) **[Figure 20-50-85]**.

Remove the adjustment assembly (Item 4) **[Figure 20-50-85]** from the pump control assembly.

Figure 20-50-86

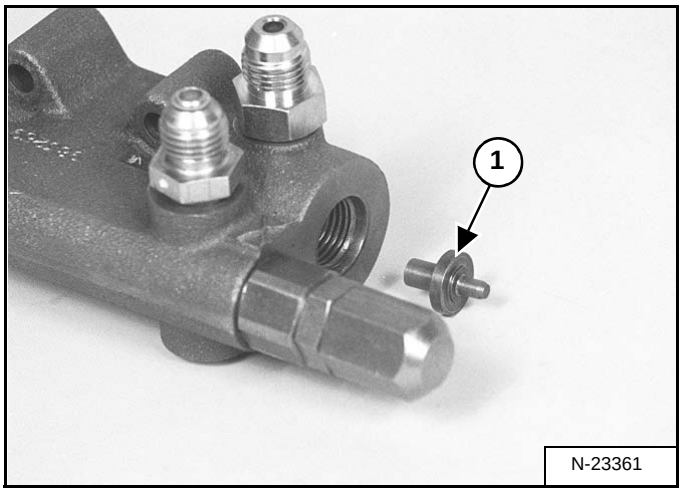


Remove the adjustment seat (Item 1) **[Figure 20-50-86]** from the adjustment assembly.

Remove the large spring (Item 2) and the small spring (Item 3) **[Figure 20-50-86]** from the adjustment assembly.

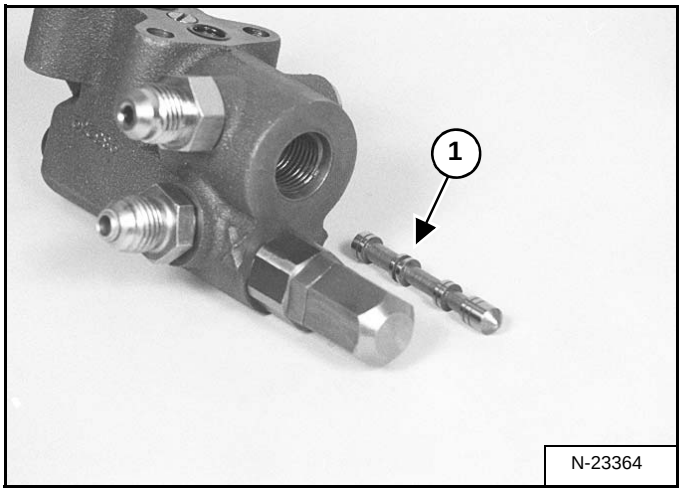
Remove the O-ring (Item 4) **[Figure 20-50-86]**.

Figure 20-50-87



Remove the spring guide (Item 1) **[Figure 20-50-87]** from the pump control assembly.

Figure 20-50-88



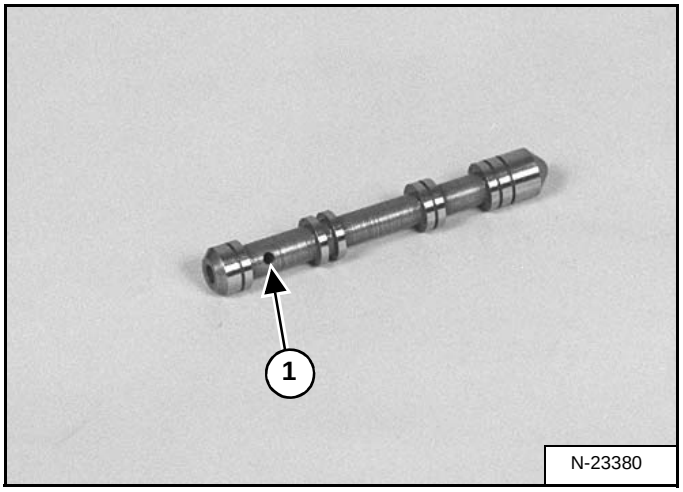
Remove the spool (Item 1) **[Figure 20-50-88]** from the pump control assembly.

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Pump Control Disassembly And Assembly (Cont'd)

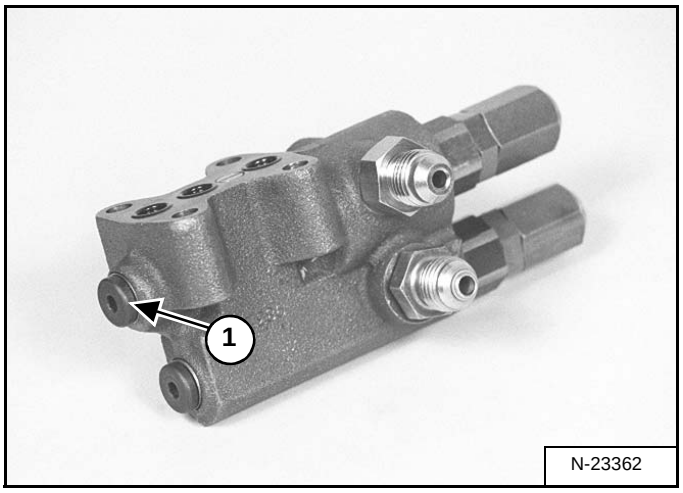
Pump Margin Control (Cont'd)

Figure 20-50-89



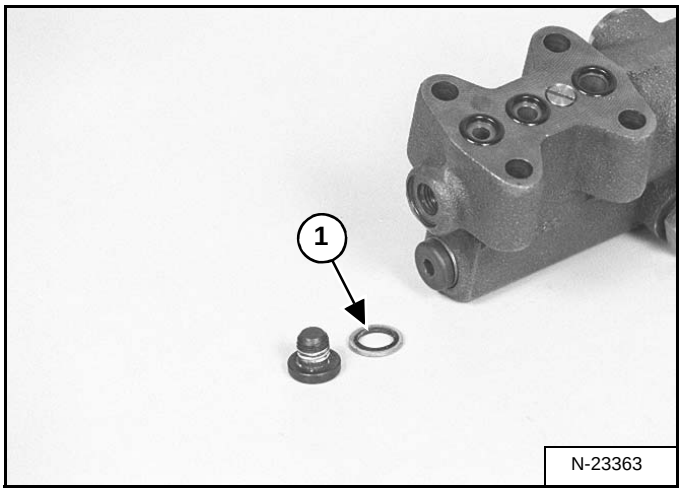
Check the spool for scratches and be sure the orifice (Item 1) **[Figure 20-50-89]** is not plugged.

Figure 20-50-90



Remove the plug (Item 1) **[Figure 20-50-90]** from the pump control.

Figure 20-50-91



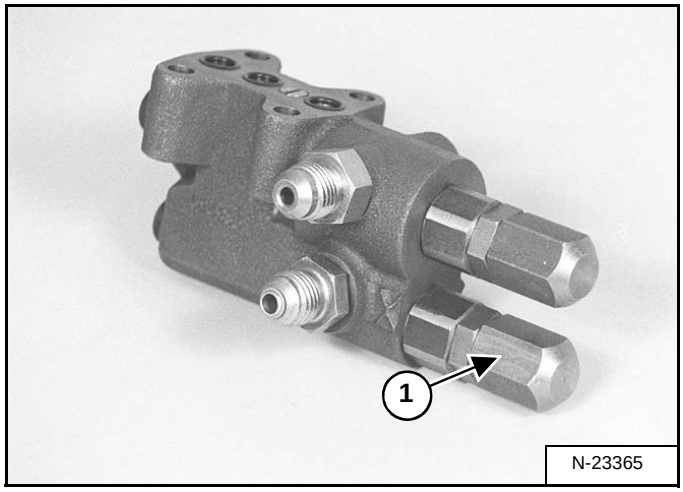
Remove the O-ring washer (Item 1) **[Figure 20-50-91]**.

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Pump Control Disassembly And Assembly (Cont'd)

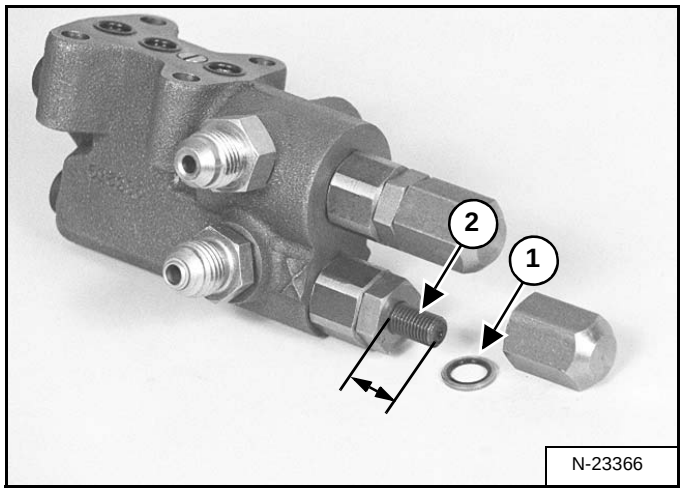
Torque Limiter Supply Control

Figure 20-50-92



Remove the cap (Item 1) **[Figure 20-50-92]**.

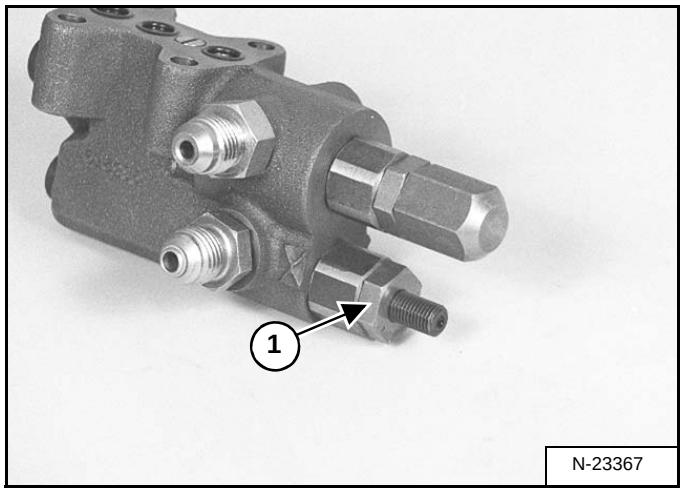
Figure 20-50-93



Before disassembling the torque limiter supply control, remove the O-ring washer (Item 1) **[Figure 20-50-93]** from the adjustment assembly.

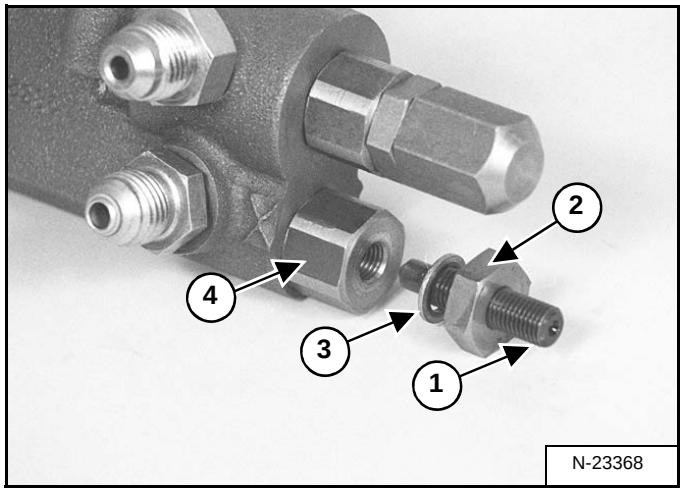
Measure the adjustment screw (Item 2) **[Figure 20-50-93]**, thread length for the correct initial adjustment.

Figure 20-50-94



Loosen the jam nut (Item 1) **[Figure 20-50-94]**.

Figure 20-50-95



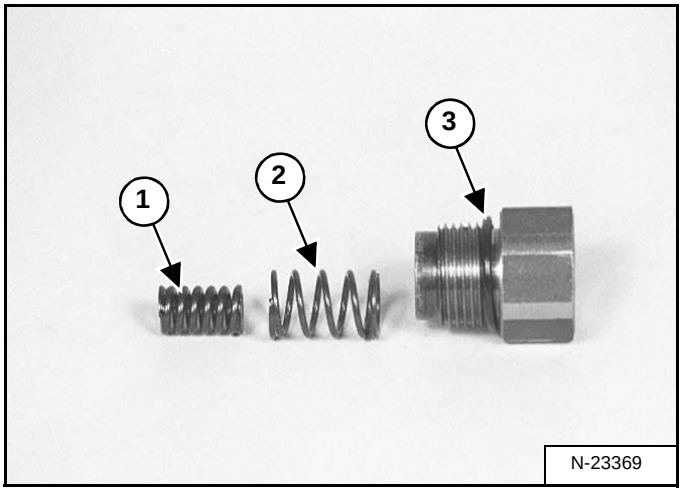
Remove the adjustment screw (Item 1), nut (Item 2), and O-ring washer (Item 3) from the adjustment assembly (Item 4) **[Figure 20-50-95]**.

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Pump Control Disassembly And Assembly (Cont'd)

Torque Limiter Supply Control (Cont'd)

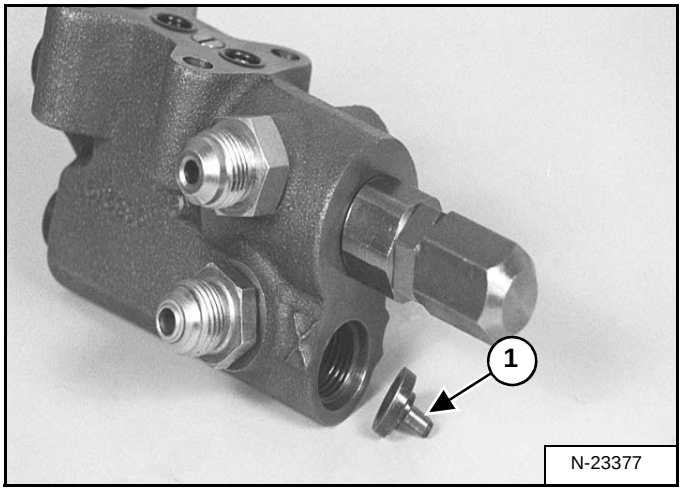
Figure 20-50-96



Remove the small spring (Item 1) and the large spring (Item 2) **[Figure 20-50-96]** from the adjustment assembly.

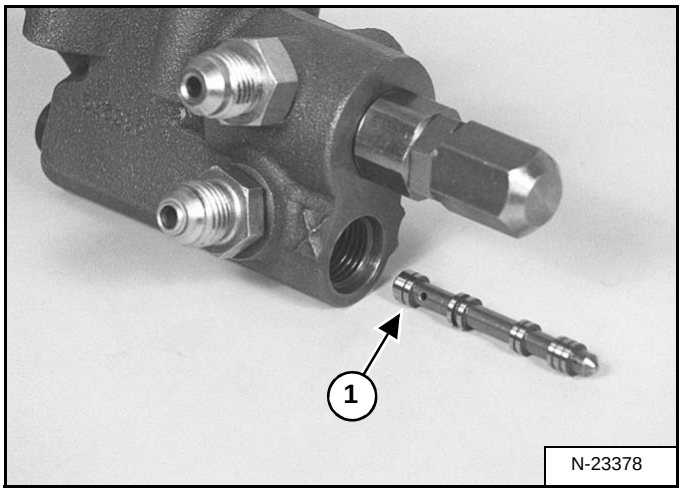
Remove the O-ring (Item 3) **[Figure 20-50-96]**.

Figure 20-50-97



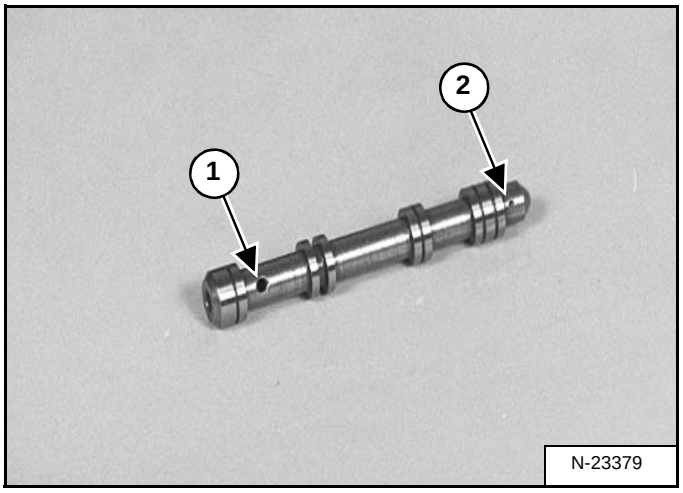
Remove the spring guide (Item 1) **[Figure 20-50-97]**.

Figure 20-50-98



Remove the spool (Item 1) **[Figure 20-50-98]**.

Figure 20-50-99



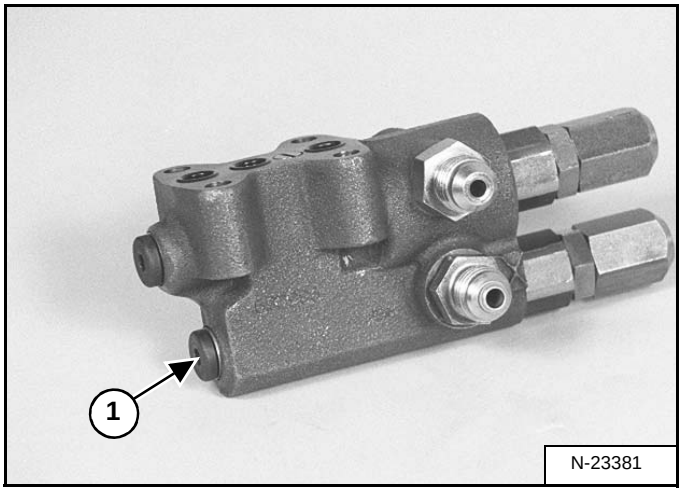
Check the spool for scratches and be sure the orifice (Items 1 & 2) **[Figure 20-50-99]** are not plugged.

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Pump Control Disassembly And Assembly (Cont'd)

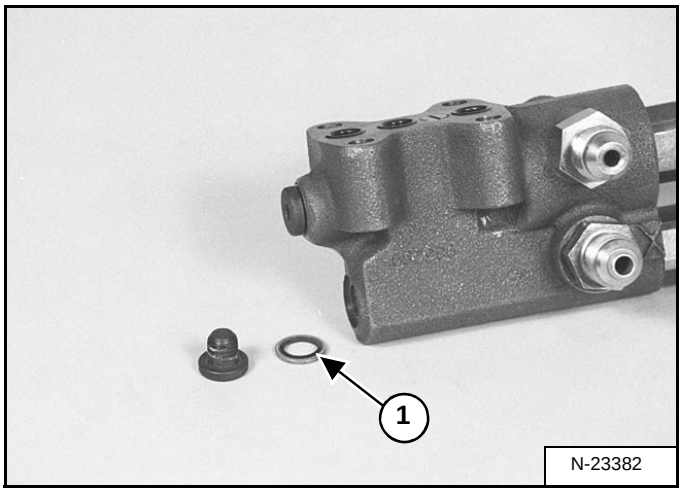
Torque Limiter Supply Control (Cont'd)

Figure 20-50-100



Remove the plug (Item 1) **[Figure 20-50-100]** from the pump control.

Figure 20-50-101

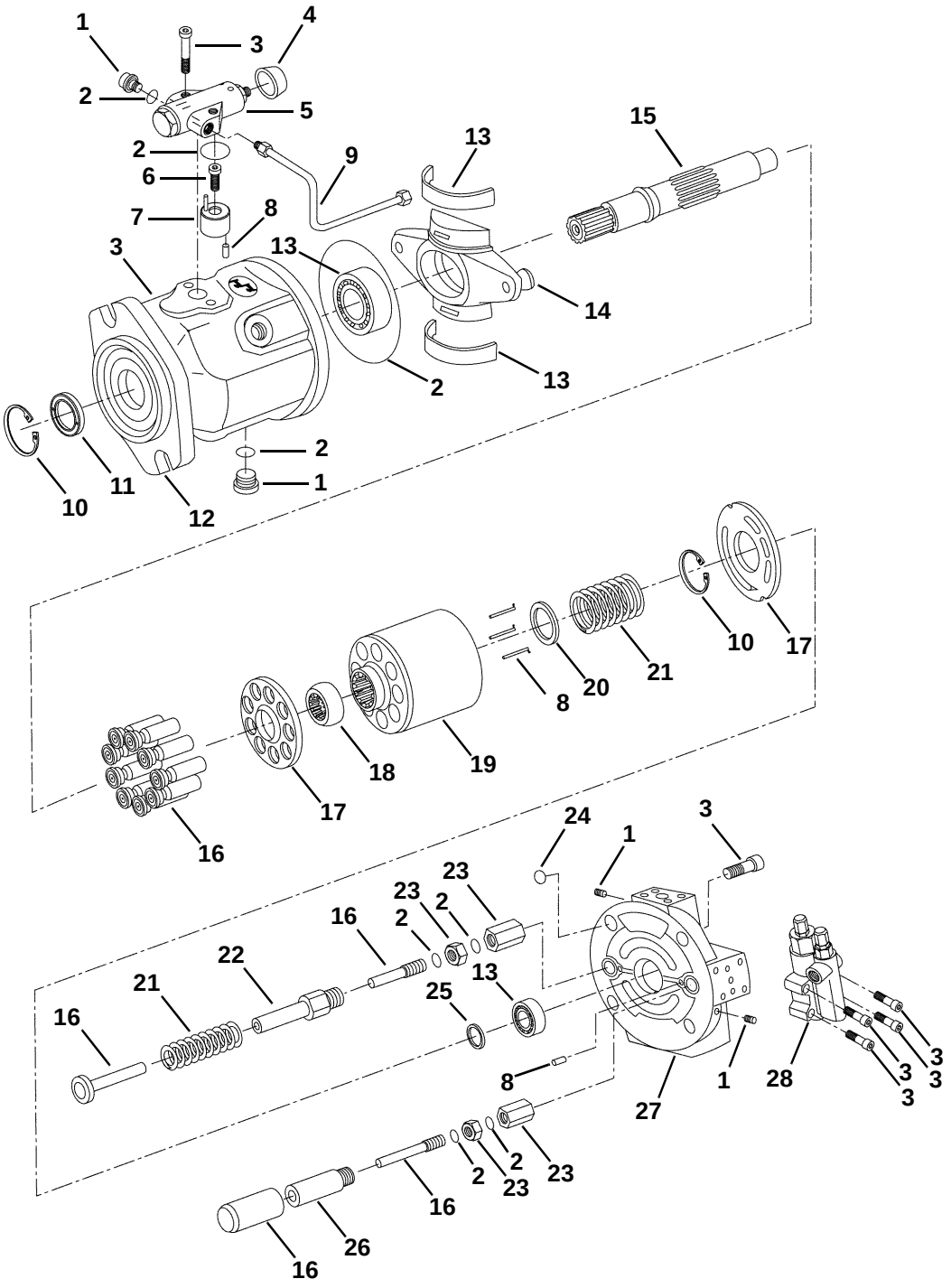


Remove the O-ring washer (Item 1) **[Figure 20-50-101]**.

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Parts Identification

1. Plug
2. O-Ring
3. Bolt
4. Dust Cap
5. Torque Limiter
6. Screw
7. Pin Assembly
8. Pin
9. Tubeline
10. Snap Ring
11. Seal
12. Housing
13. Bearing
14. Swash Plate
15. Shaft
16. Piston
17. Plate
18. Retaining Ball
19. Cylinder Block
20. Washer
21. Spring
22. Spring Guide
23. Nut
24. Ball
25. Shim
26. Piston Guide
27. Port Block
28. Pump Control



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Disassembly

IMPORTANT

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

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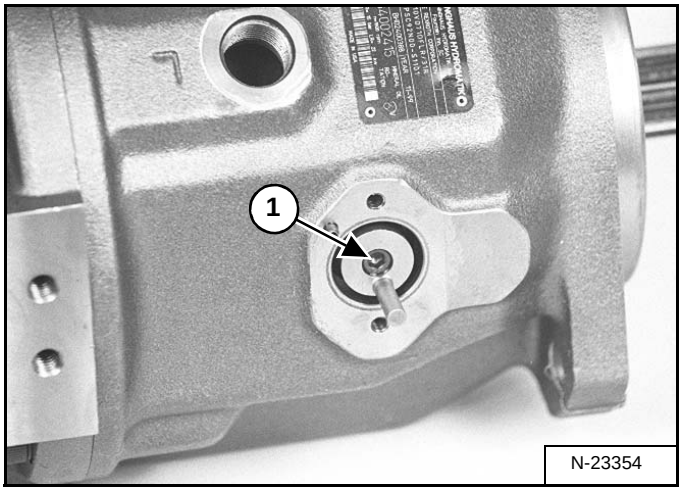
Remove the hydraulic piston pump from the machine. (See Removal And Installation on Page 20-50-17.)

Clean the outside of the hydraulic piston pump.

Remove the torque limiter valve. (See Torque Limiter Valve Removal on Page 20-50-21.)

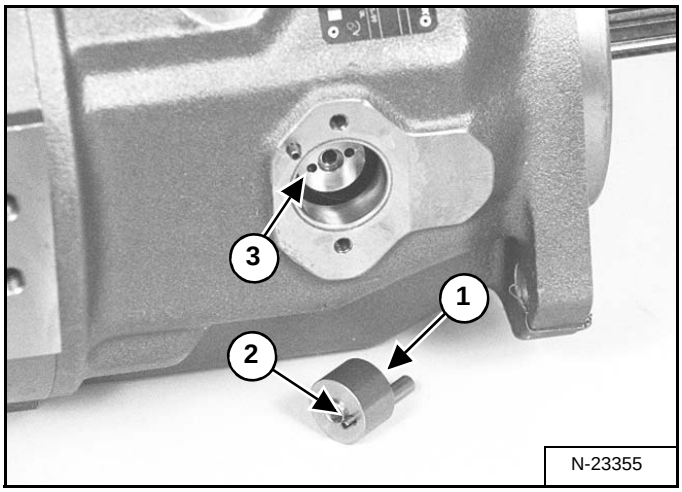
Remove the pump control assembly. (See Pump Control Removal And Installation on Page 20-50-33.)

Figure 20-50-102



Remove the screw (Item 1) **[Figure 20-50-102]** from the pin assembly.

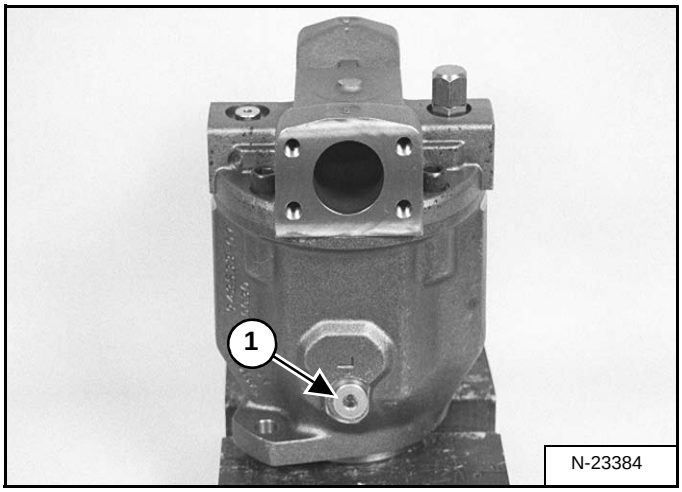
Figure 20-50-103



Remove the pin assembly (Item 1) **[Figure 20-50-103]**.

NOTE: Note the position of the dowel pin (Item 2) on the pin assembly, with the locating hole on the swash plate cradle (Item 3) [Figure 20-50-103].

Figure 20-50-104



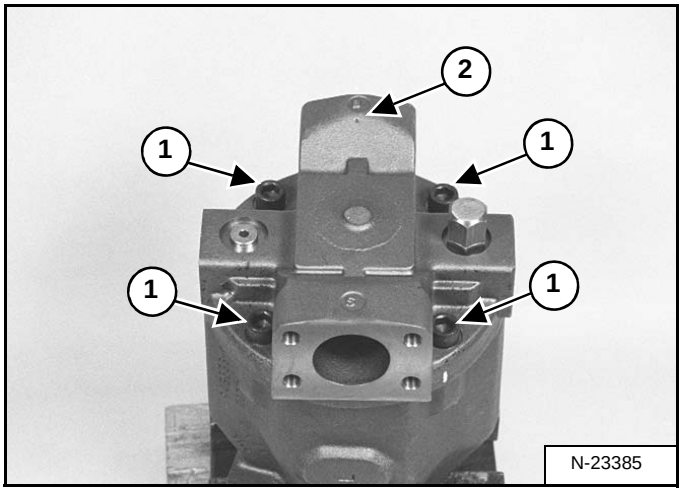
Remove the plug (Item 1) **[Figure 20-50-104]** from the pump housing and drain the oil.

Mark the pump housing for proper installation.

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Disassembly (Cont'd)

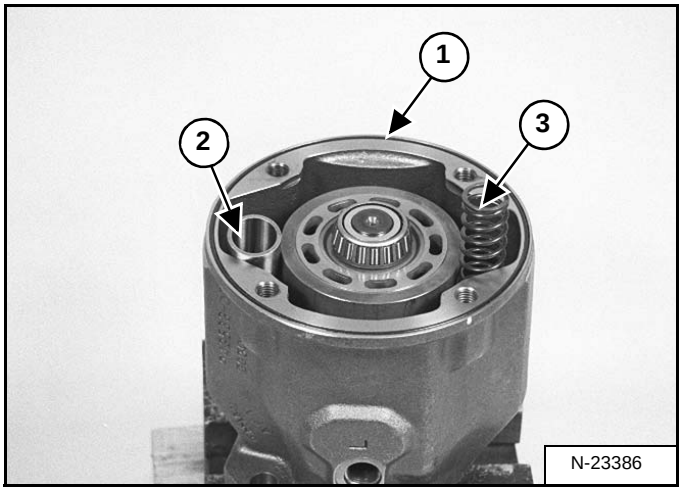
Figure 20-50-105



Remove the bolts (Item 1) **[Figure 20-50-105]**.

Remove the port block assembly (Item 2) **[Figure 20-50-105]** from the pump.

Figure 20-50-106

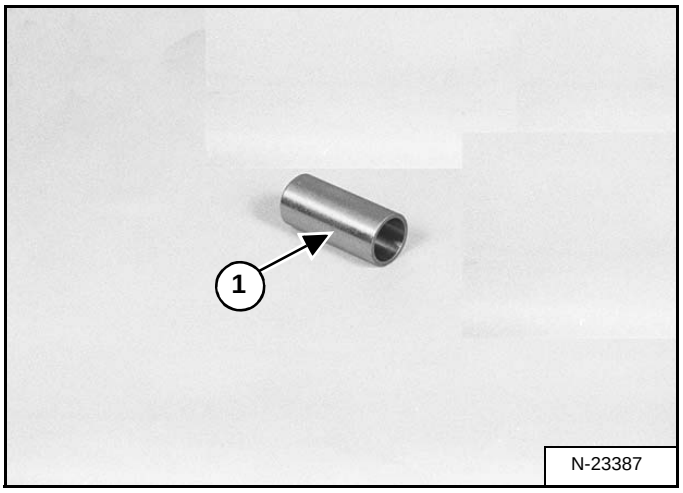


Remove the O-ring (Item 1) **[Figure 20-50-106]**.

Remove the destroking piston (Item 2) **[Figure 20-50-106]**.

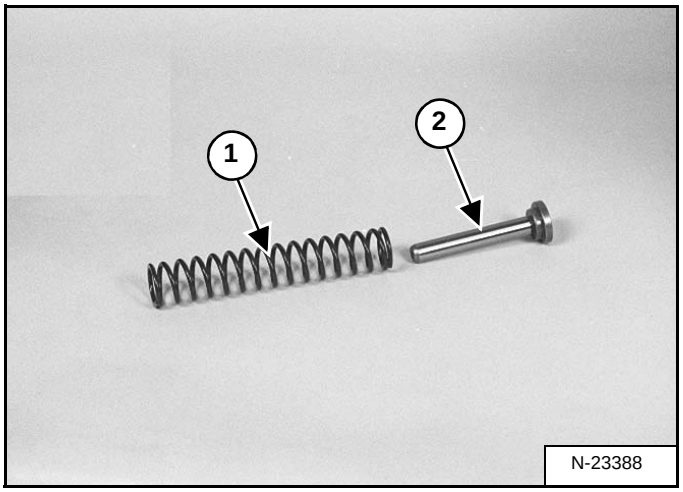
Remove the stroking piston/spring assembly (Item 3) **[Figure 20-50-106]**.

Figure 20-50-107



Inspect the destroking piston (Item 1) **[Figure 20-50-107]** for scratches and replace as needed.

Figure 20-50-108

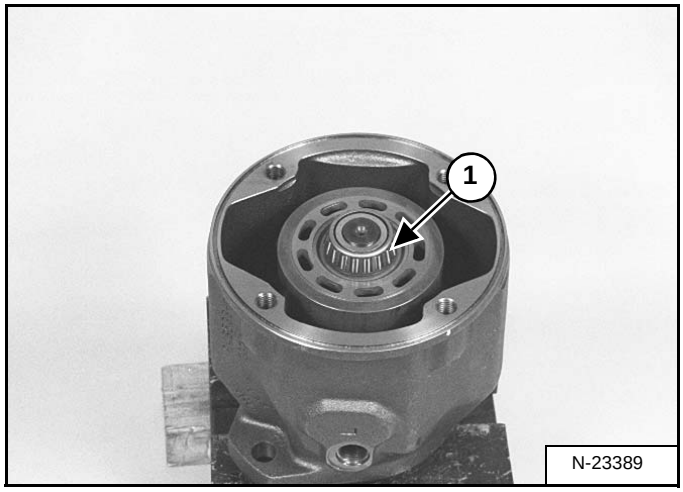


Remove the spring (Item 1) from the stroking piston (Item 2) **[Figure 20-50-108]**, inspect all parts and replace as needed.

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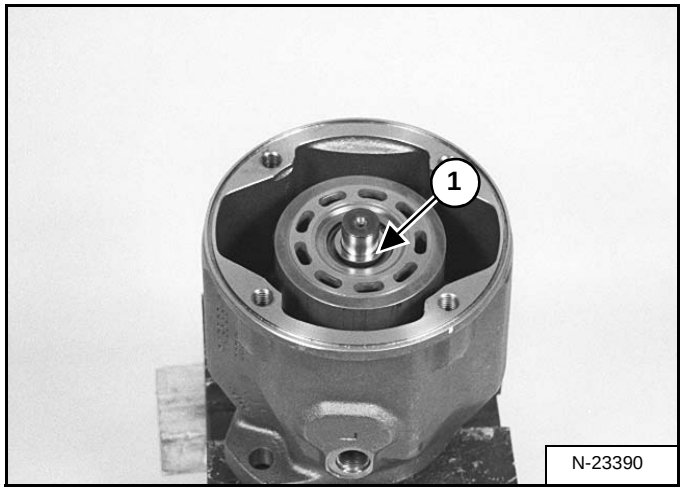
Disassembly (Cont'd)

Figure 20-50-109



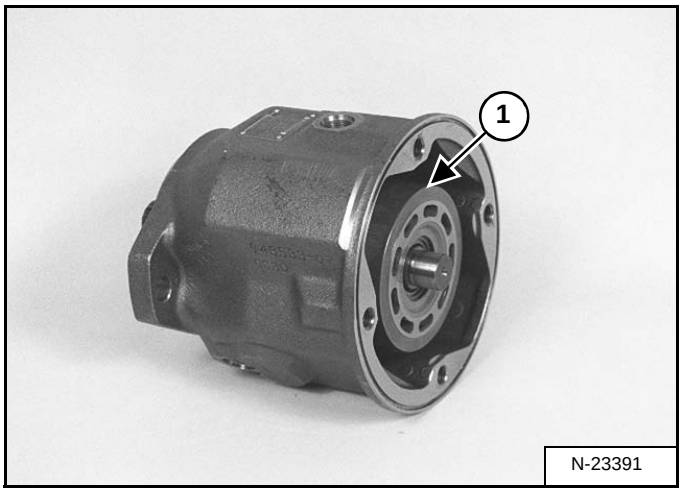
Remove the bearing (Item 1) **[Figure 20-50-109]**

Figure 20-50-110



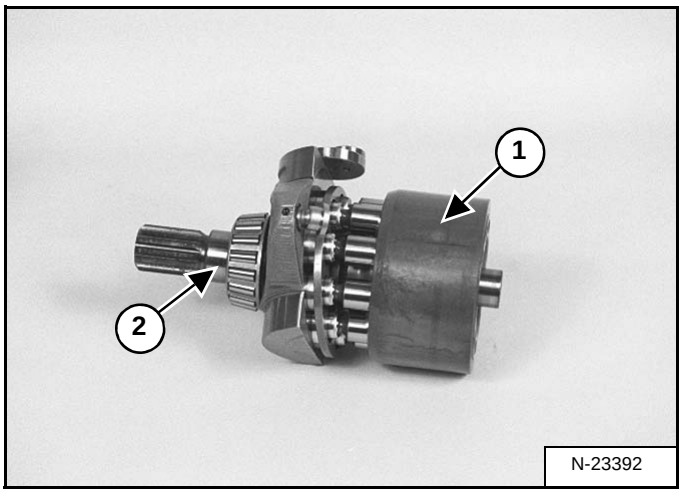
Remove the adjustment spacer(s) (Item 1) **[Figure 20-50-110]** from the pump shaft.

Figure 20-50-111



Lay the pump assembly on its side and remove the rotary group, cradle, and shaft (Item 1) **[Figure 20-50-111]** from the housing.

Figure 20-50-112



Slide the rotary group (Item 1) from the shaft assembly (Item 2) **[Figure 20-50-112]**.

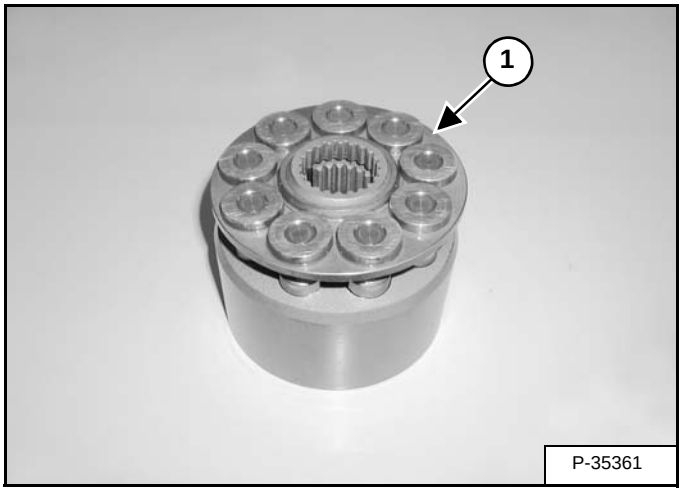
NOTE: It is NOT important that the pistons are installed in their original positions.

NOTE: Check that there are no scratches or metal deposits on the sliding surface (pistons must be replaced in sets).

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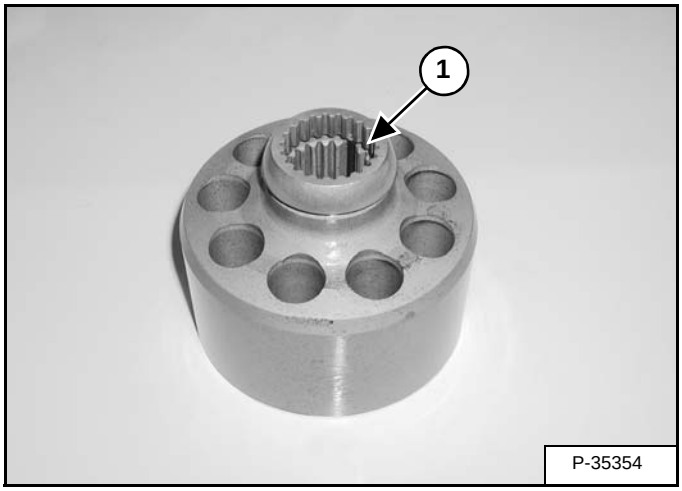
Disassembly (Cont'd)

Figure 20-50-113



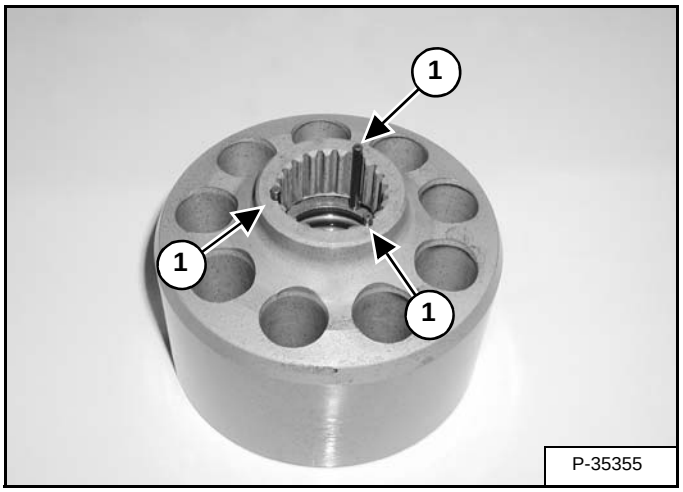
Remove the retainer plate and pistons (Item 1) **[Figure 20-50-113]** from the cylinder block.

Figure 20-50-114



Remove the retaining ball (Item 1) **[Figure 20-50-114]**.

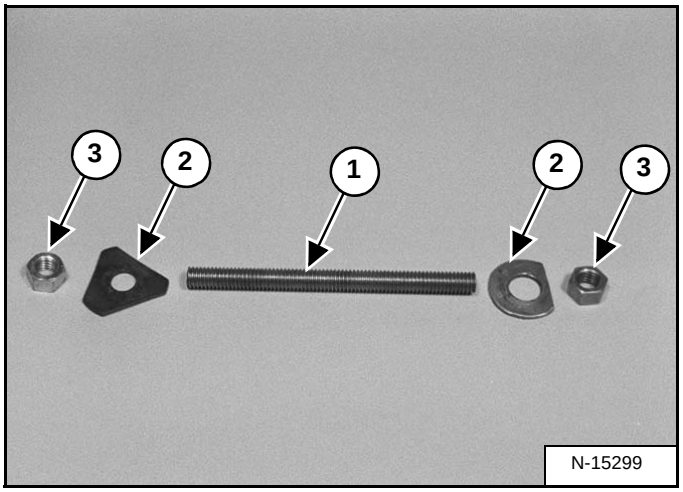
Figure 20-50-115



Inspect the three pins (Item 1) **[Figure 20-50-115]** for wear and/or damage.

NOTE: The following procedure shown is to disassemble the rotating group for inspection only. The rotating group parts can not be ordered separately and must be ordered as an assembly.

Figure 20-50-116

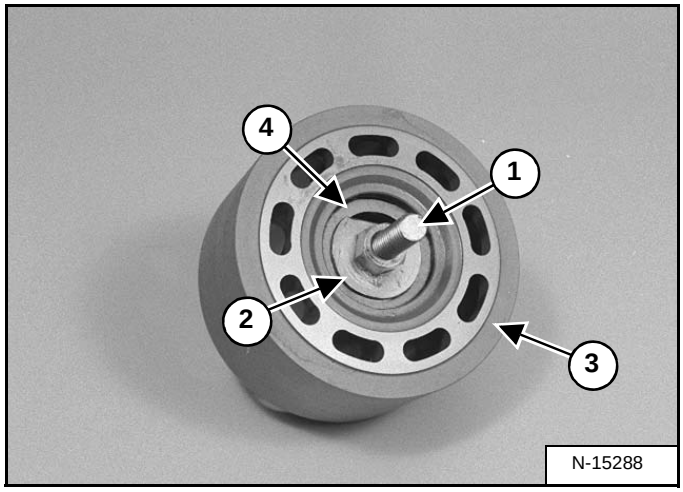


To remove the spring from inside the cylinder block, use a threaded rod (or bolt) (Item 1) two trimmed washers (Item 2) and two nuts (Item 3) **[Figure 20-50-116]**.

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Disassembly (Cont'd)

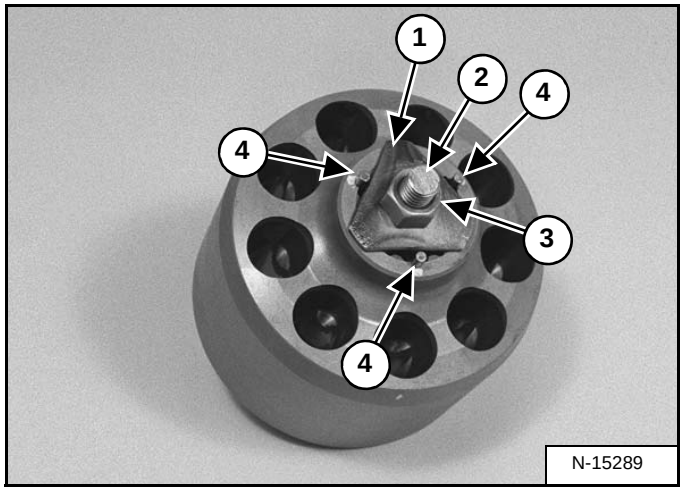
Figure 20-50-117



Install the threaded rod and nut (Item 1) through the trimmed washer (Item 2) and through the block assembly (Item 3) **[Figure 20-50-117]**.

NOTE: The modified washer (Item 2) must fit over the spring but must also fit inside the snap ring (Item 4) [Figure 20-50-117].

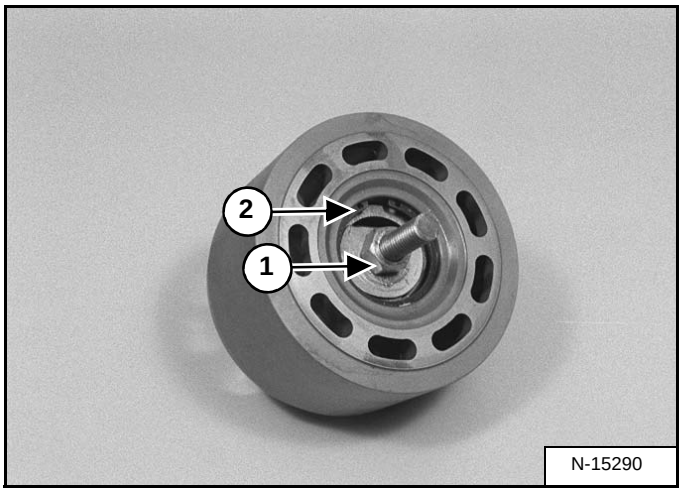
Figure 20-50-118



Install the second trimmed washer (Item 1) over the threaded rod (Item 2) install the nut (Item 3) **[Figure 20-50-118]**.

NOTE: The modified washer (Item 1) must fit between the three pins (Item 4) [Figure 20-50-118].

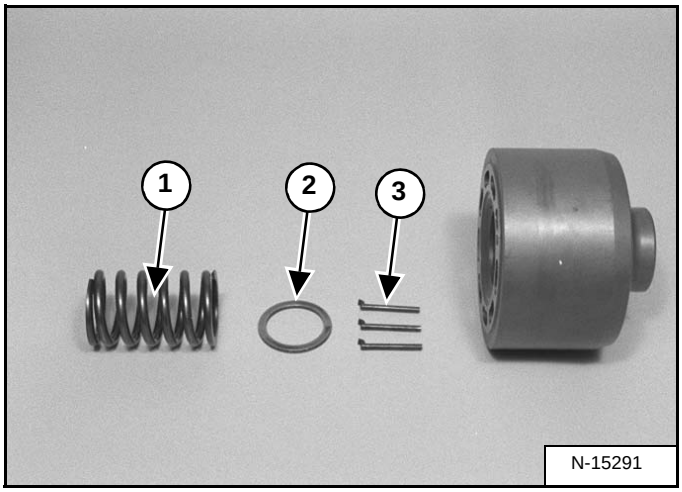
Figure 20-50-119



Tighten the nut (Item 1) until the spring is compressed enough to remove the snap ring (Item 2) **[Figure 20-50-119]**.

Loosen the nut to release the tension on the spring and remove the bolts and washers.

Figure 20-50-120

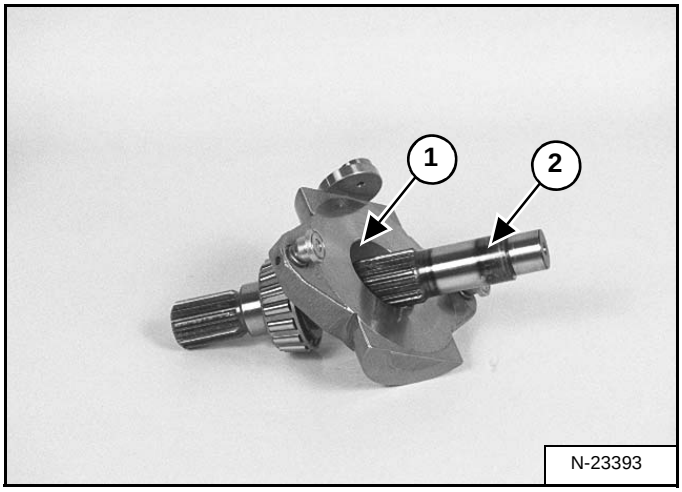


Remove the spring (Item 1) the washer (Item 2) and the three pins (Item 3) **[Figure 20-50-120]** from the cylinder block.

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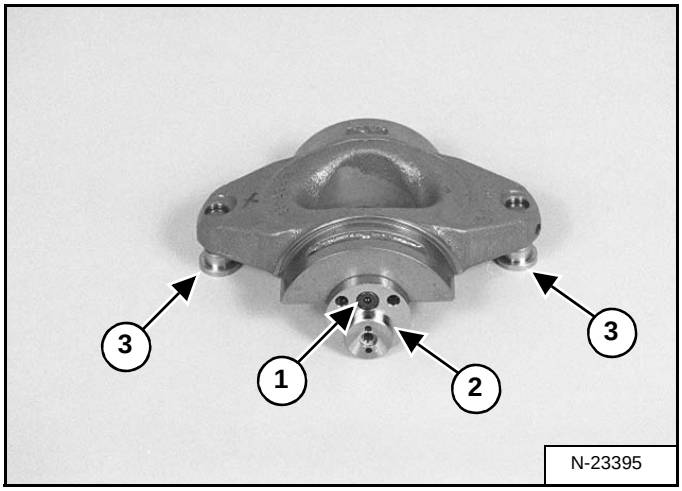
Disassembly (Cont'd)

Figure 20-50-121



Remove the cradle (Item 1) from the shaft (Item 2) **[Figure 20-50-121]**.

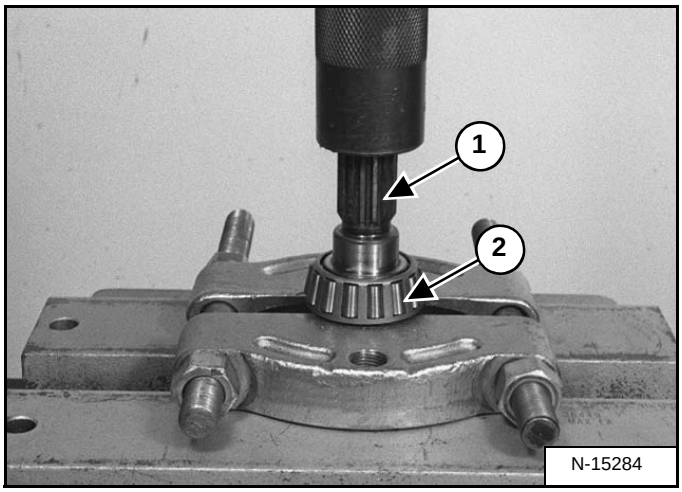
Figure 20-50-122



Loosen and remove the bolt (Item 1) and remove the torque limiter plate (Item 2) **[Figure 20-50-122]**.

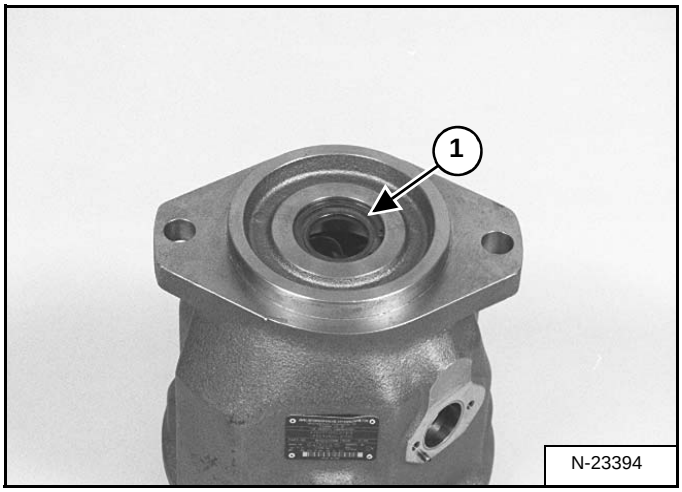
NOTE: The caps (Item 3) [Figure 20-50-122] cannot be replaced, a new cradle must be ordered.

Figure 20-50-123



Press the shaft (Item 1) from the bearing (Item 2) **[Figure 20-50-123]**.

Figure 20-50-124

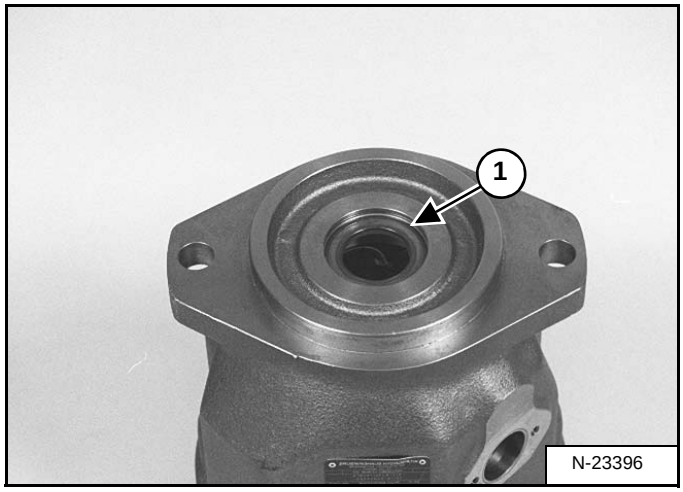


Remove the snap ring (Item 1) **[Figure 20-50-124]** from the housing.

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Disassembly (Cont'd)

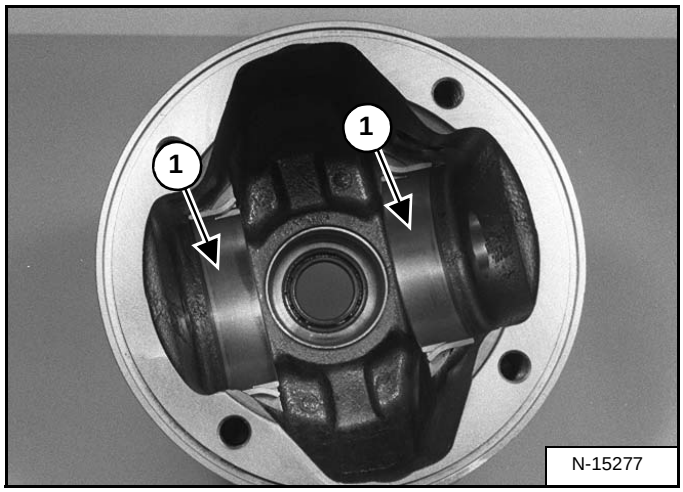
Figure 20-50-125



Remove the seal (Item 1) **[Figure 20-50-125]** from the housing.

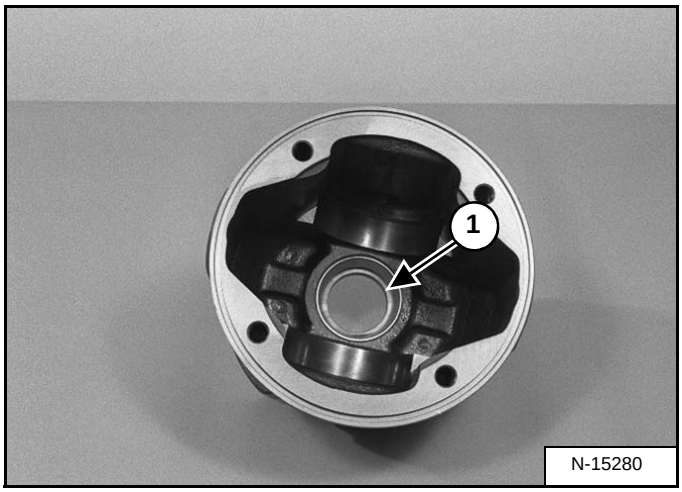
NOTE: The shaft seal can be removed without removing the shaft.

Figure 20-50-126



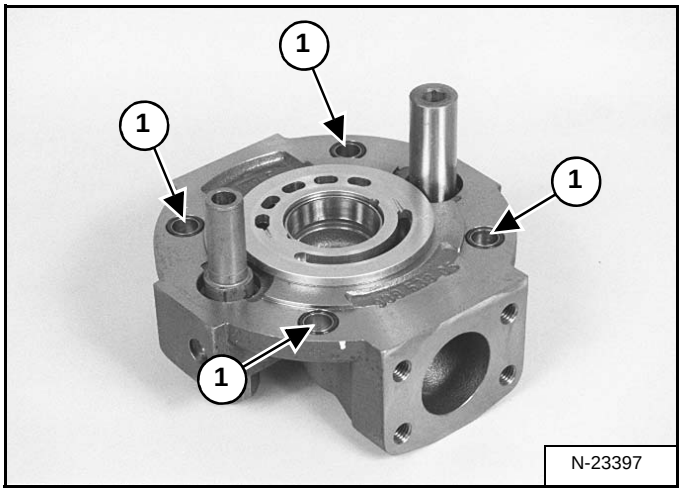
Remove the two brass bearings (Item 1) **[Figure 20-50-126]** from the housing.

Figure 20-50-127



Remove the race (Item 1) **[Figure 20-50-127]** from the housing.

Figure 20-50-128

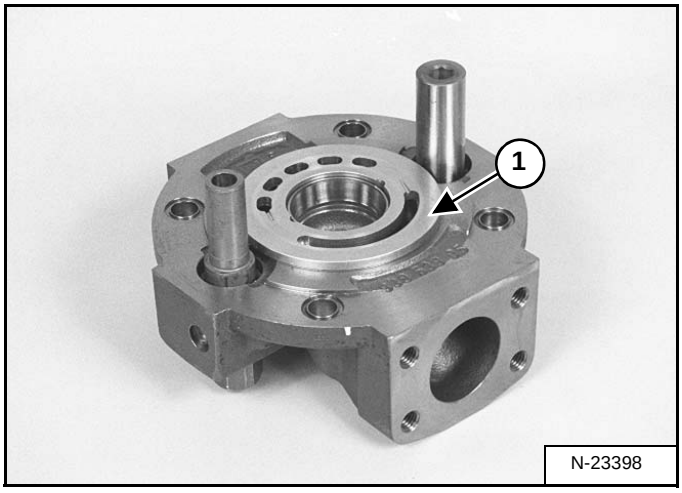


Remove the O-rings (Item 1) **[Figure 20-50-128]**.

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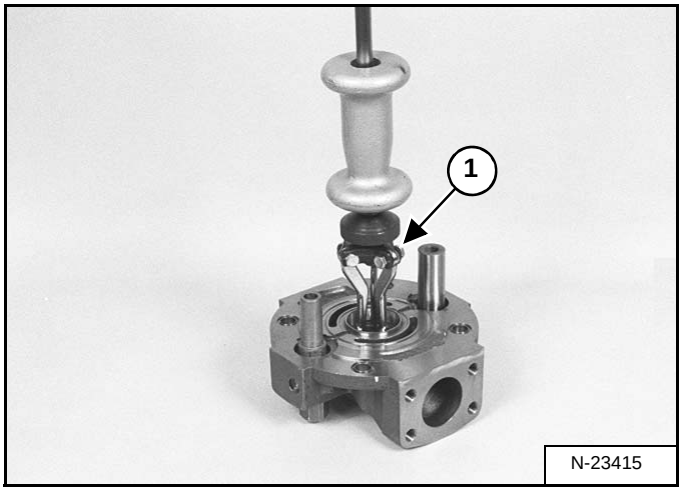
Disassembly (Cont'd)

Figure 20-50-129



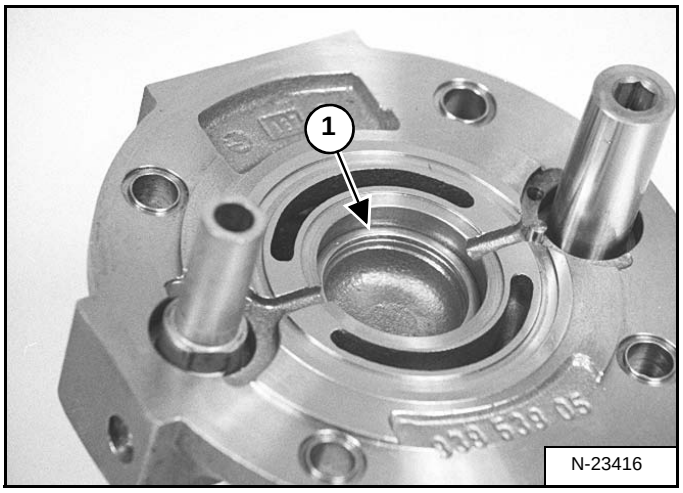
Remove the valve plate (Item 1) **[Figure 20-50-129]** from the port block assembly.

Figure 20-50-130



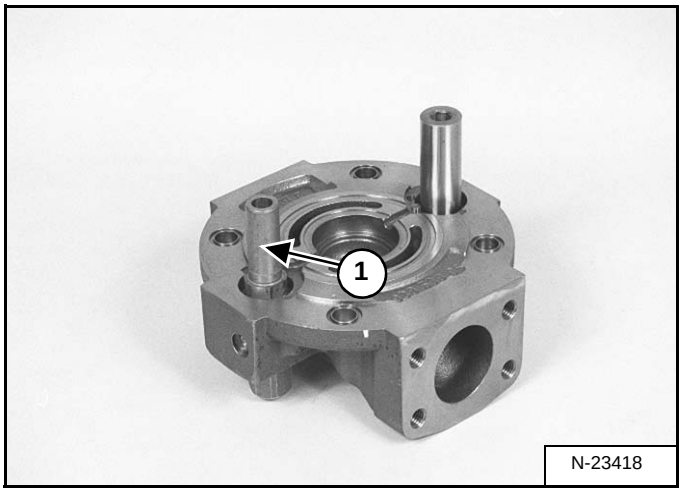
With a bearing puller (Item 1) **[Figure 20-50-130]** remove the bearing race from the port block assembly.

Figure 20-50-131



Remove the spacer (Item 1) **[Figure 20-50-131]** from the port block assembly.

Figure 20-50-132

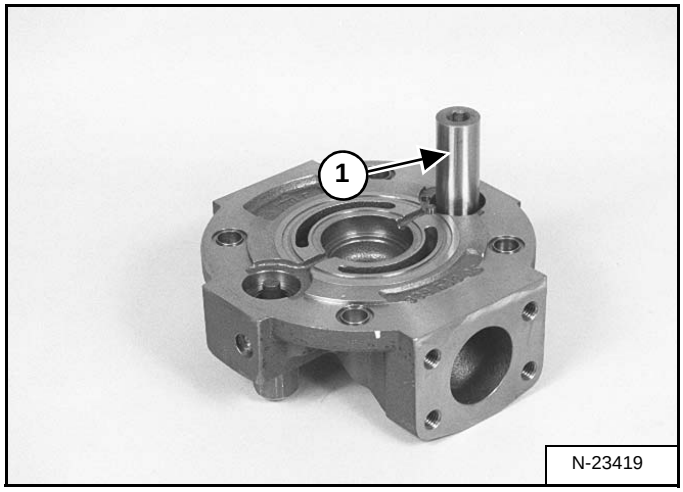


Remove the stroking piston (Item 1) **[Figure 20-50-132]** (spring side).

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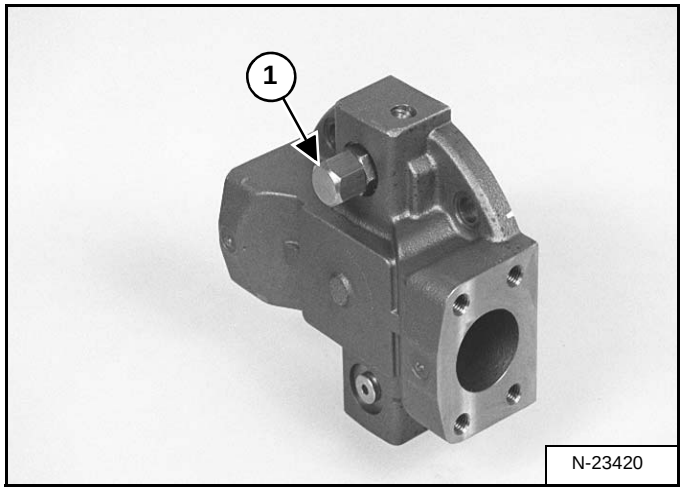
Disassembly (Cont'd)

Figure 20-50-133



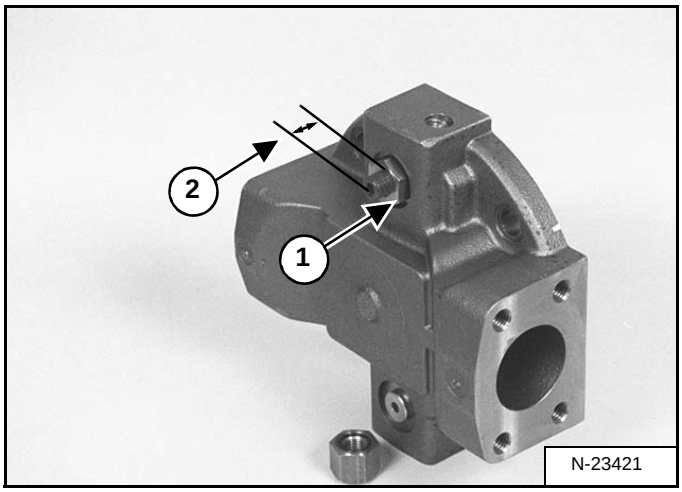
Remove the destroking piston (Item 1) **[Figure 20-50-133]**.

Figure 20-50-134



Remove the cap (Item 1) **[Figure 20-50-134]** from the stroking piston adjustment.

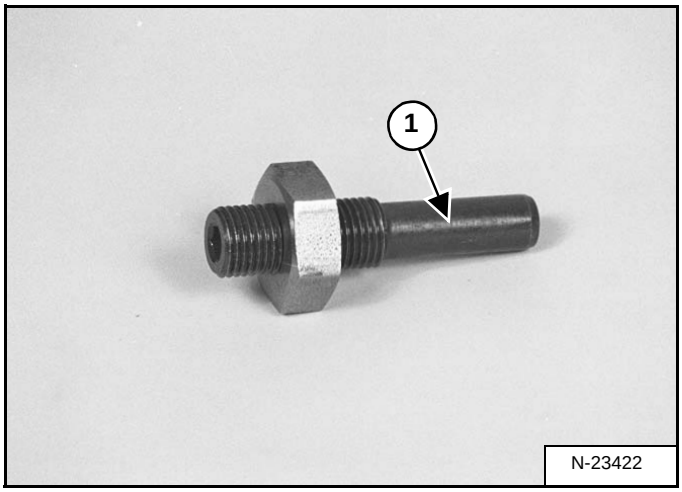
Figure 20-50-135



Before loosening the nut (Item 1) measure the distance (Item 2) **[Figure 20-50-135]** of the stroking piston adjustment screw to the nut.

Loosen the adjustment nut.

Figure 20-50-136



Remove the adjustment screw and nut (Item 1) **[Figure 20-50-136]** from the housing.

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Assembly

IMPORTANT

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

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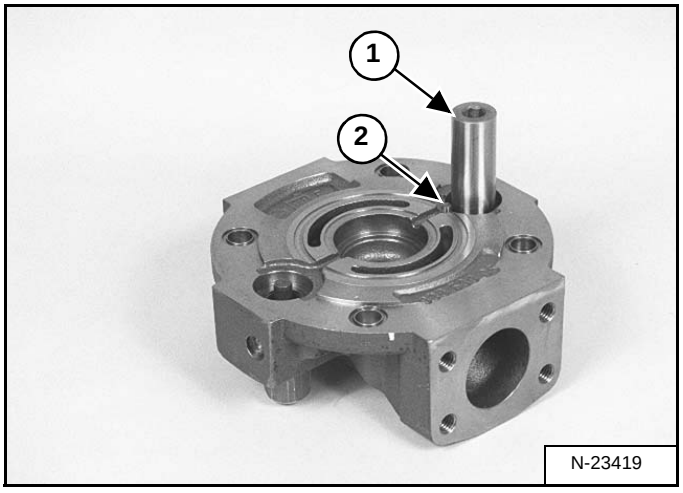
Clean parts in solvent and dry with compressed air.

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

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

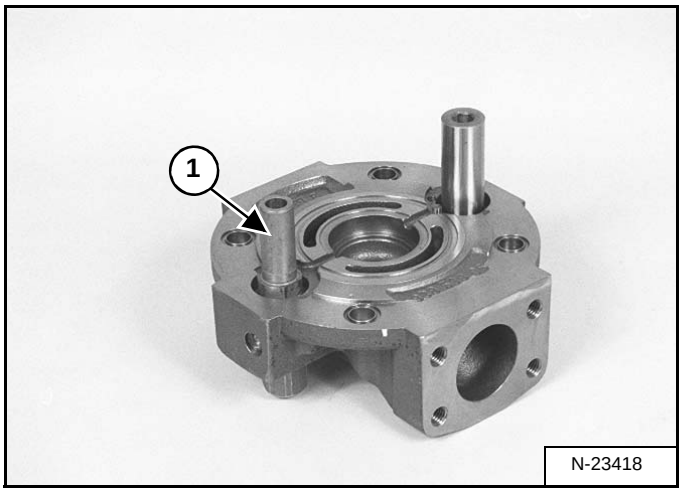
Apply assembly lube on the bearings before assembly.

Figure 20-50-137



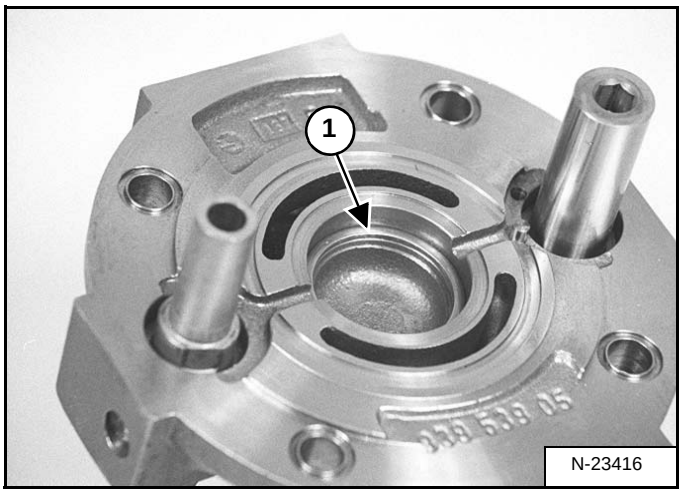
Apply Loctite™ 241 on the threads and install the destroking piston (Item 1) in the hole next to the alignment pin (Item 2) **[Figure 20-50-137]** and tighten.

Figure 20-50-138



Apply Loctite™ 241 on the threads and install the stroking piston (Item 1) **[Figure 20-50-138]** in the hole and tighten.

Figure 20-50-139

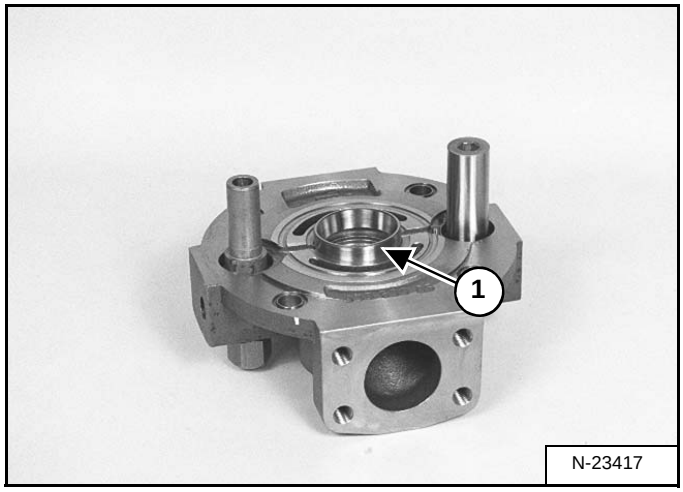


Install the spacer (Item 1) **[Figure 20-50-139]** in the port block assembly.

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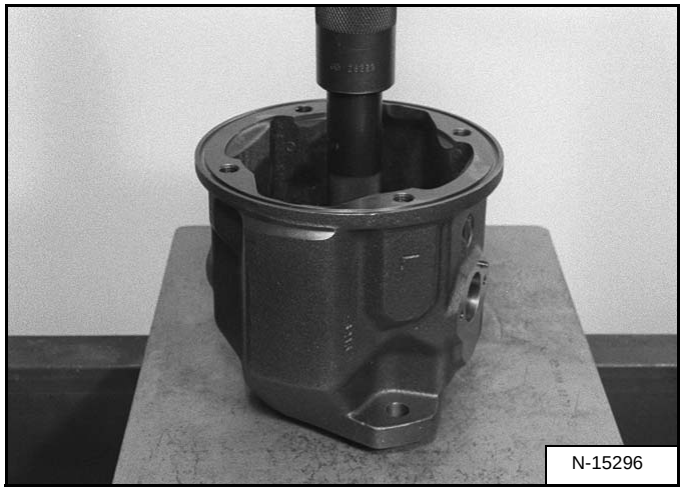
Assembly (Cont'd)

Figure 20-50-140



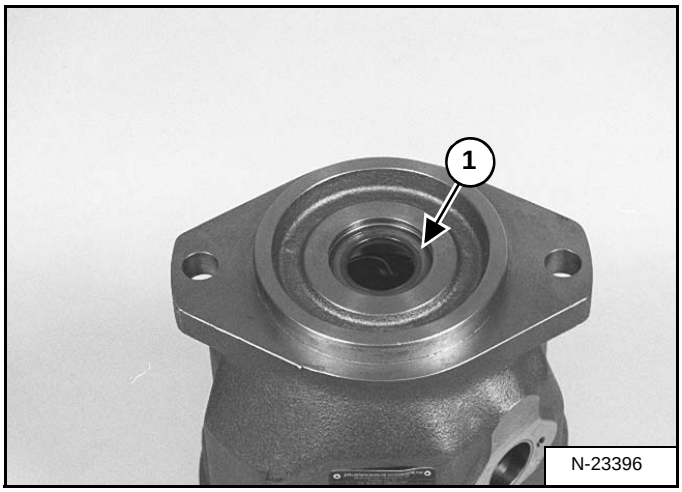
Install the bearing race (Item 1) **[Figure 20-50-140]** in the port block assembly.

Figure 20-50-141



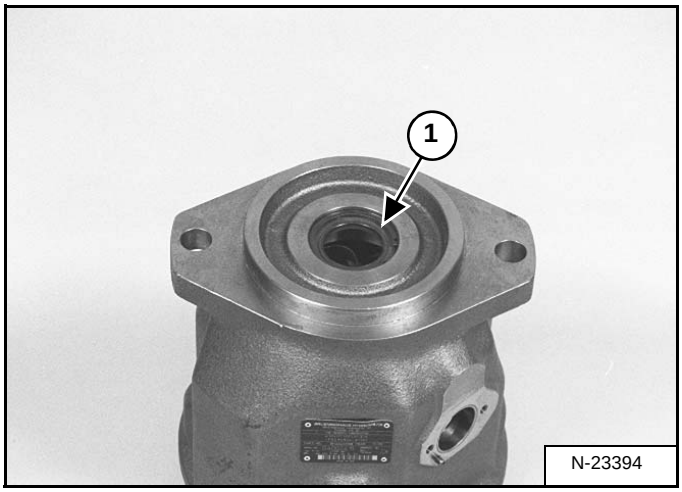
Press the race into the housing **[Figure 20-50-141]**.

Figure 20-50-142



Install the shaft seal (Item 1) **[Figure 20-50-142]** in the housing.

Figure 20-50-143

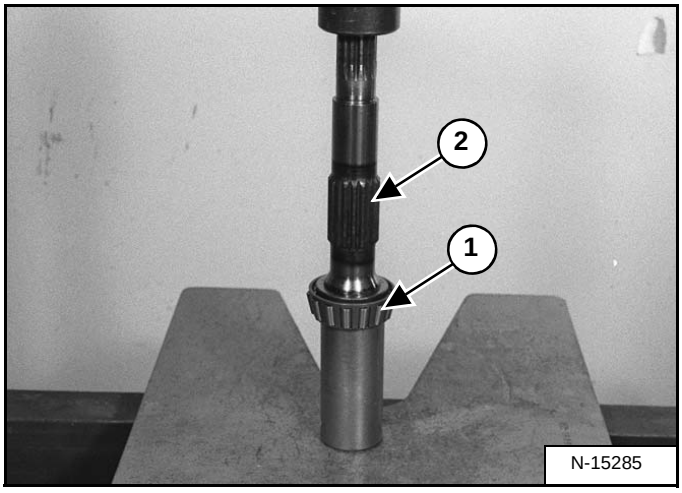


Install the snap ring (Item 1) **[Figure 20-50-143]**.

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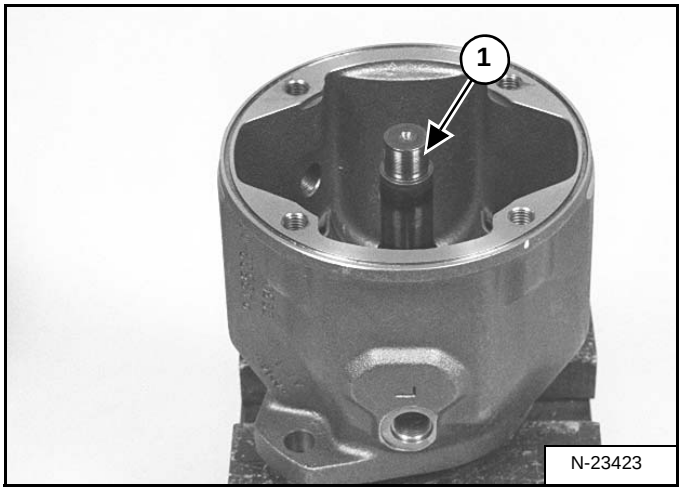
Assembly (Cont'd)

Figure 20-50-144



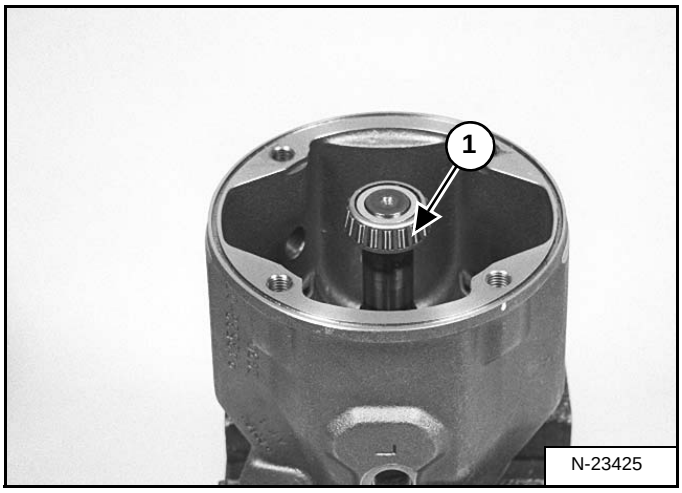
Press the bearing (Item 1) onto the shaft (Item 2) **[Figure 20-50-144]**.

Figure 20-50-145



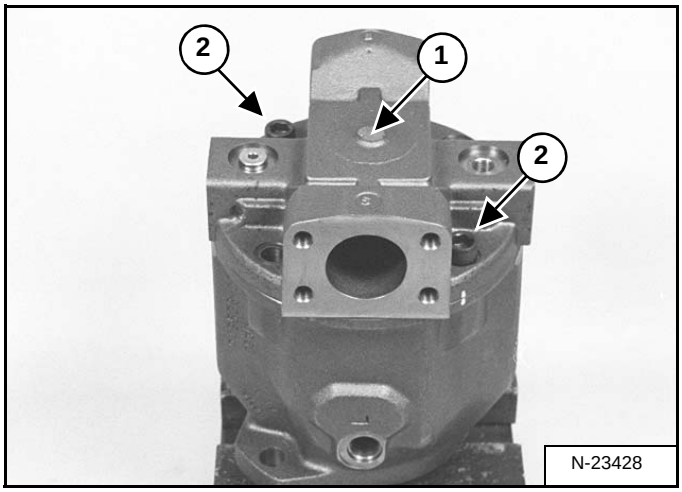
To find the correct shim washer thickness for bearing end play, the shaft/bearing assembly (Item 1) **[Figure 20-50-145]** must be installed in the housing.

Figure 20-50-146



Install the bearing (Item 1) **[Figure 20-50-146]** on the shaft.

Figure 20-50-147

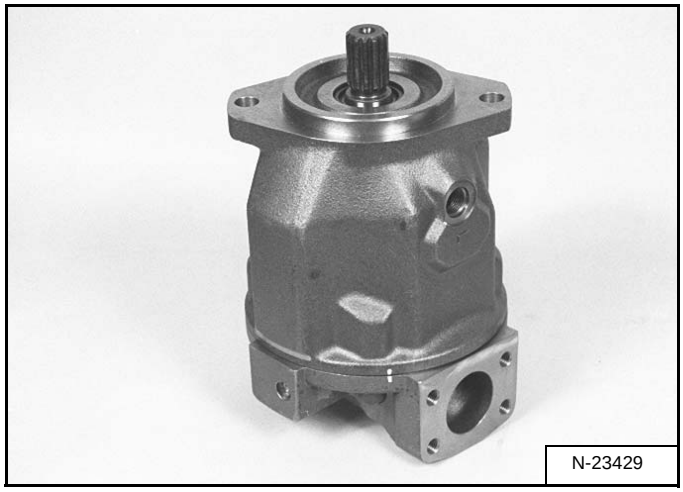


Install the port block assembly (Item 1) on the housing with two bolts (Item 2) **[Figure 20-50-147]** and tighten.

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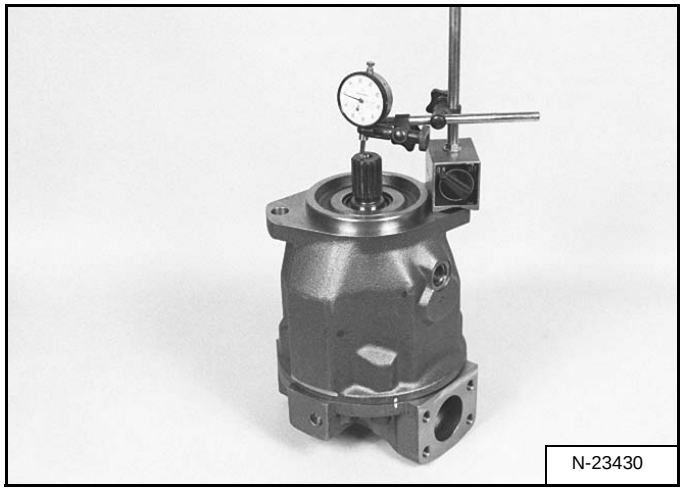
Assembly (Cont'd)

Figure 20-50-148



Turn the housing over **[Figure 20-50-148]**.

Figure 20-50-149



Install a dial indicator on the housing as shown **[Figure 20-50-149]** and set it to zero.

Pull the shaft up as far as it will go and record the reading on the dial indicator. Repeat the procedure several times. The reading must be the same each time.

Add the nominal pre-load of 0.001 in. (0,025 mm), the actual pre-load is 0.000 in. (0,000 mm) to 0.002 in. (0,050 mm) to the reading found on the dial indicator **[Figure 20-50-149]**.

Example: (In inches):

0.150 Measure movement of shaft

0.001 Nominal Pre-load

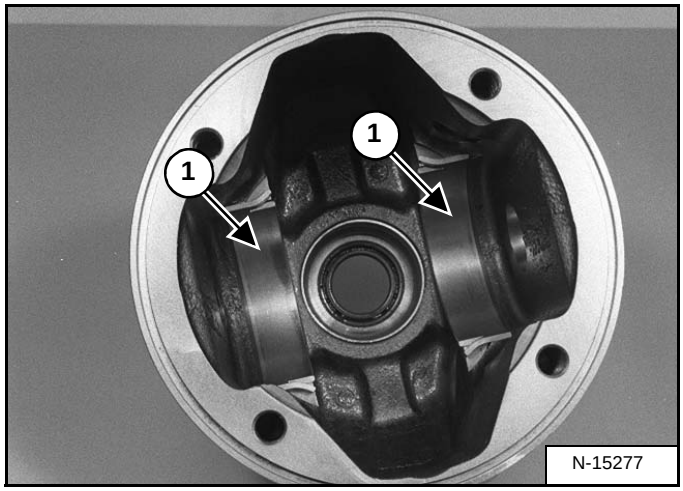
=0.151 ± thickness of the spacer needed.

When the proper thickness of shim washer is determined, remove the dial indicator from the pump housing.

Remove the two port block assembly mounting bolts from the pump.

Remove the shaft/bearing assembly from the pump housing.

Figure 20-50-150

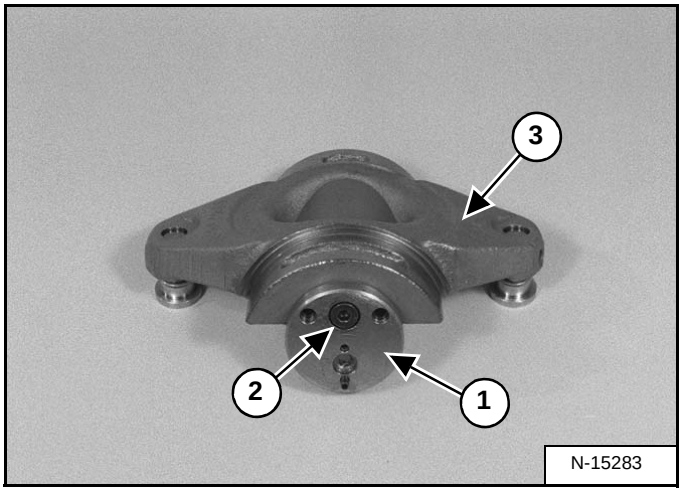


Install the two brass bearings (Item 1) **[Figure 20-50-150]** into the pump housing.

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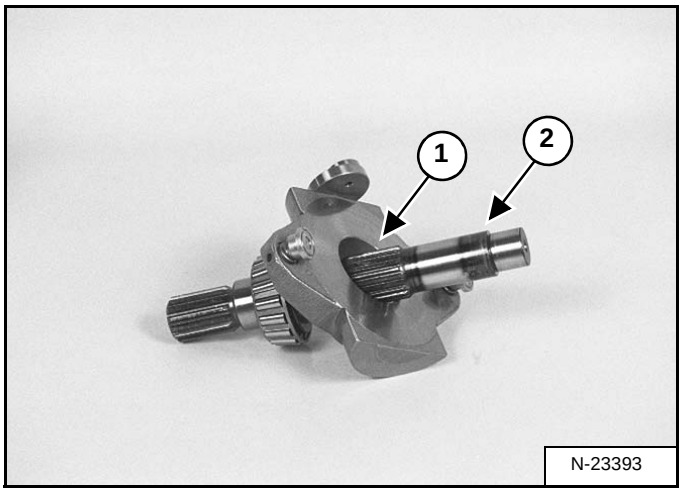
Assembly (Cont'd)

Figure 20-50-151



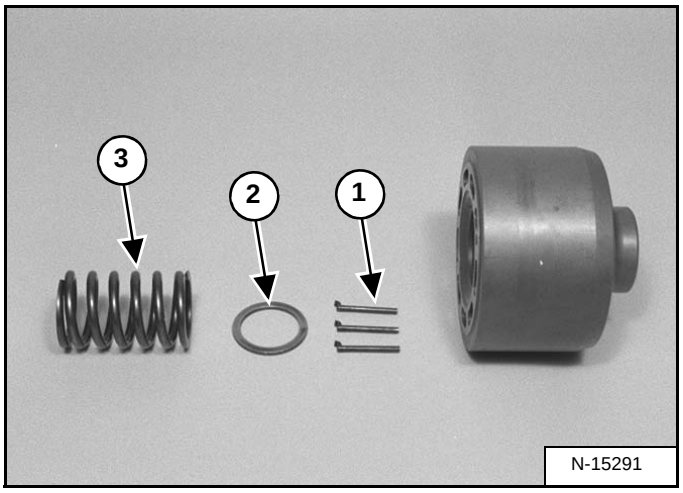
Apply Loctite™ 241 and install the torque limiter plate (Item 1) and bolt (Item 2) on the swash plate (Item 3) **[Figure 20-50-151]**.

Figure 20-50-152



Install the cradle (Item 1) on the shaft (Item 2) **[Figure 20-50-152]**.

Figure 20-50-153

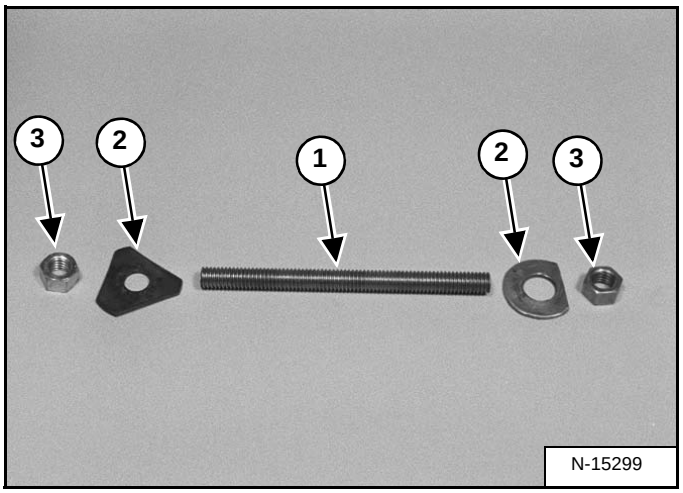


Apply clean grease to the three pins (Item 1) **[Figure 20-50-153]** and install them in the appropriate groove.

Install the washer (Item 2) and the spring (Item 3) **[Figure 20-50-153]**.

NOTE: If the rotating group is damaged, the parts can not be ordered separately and must be order as an assembly.

Figure 20-50-154

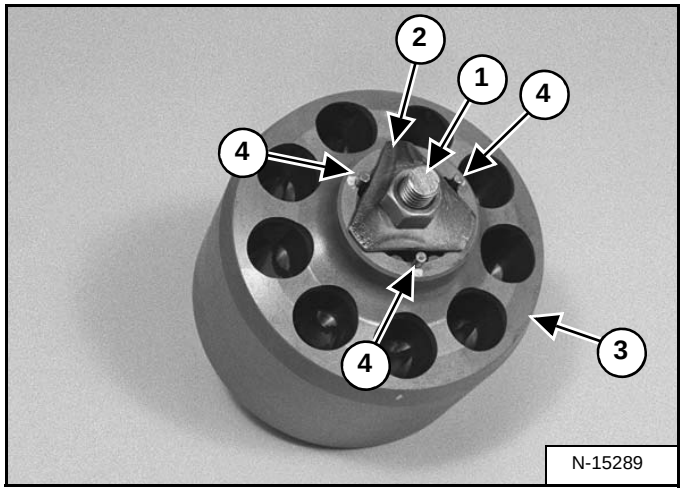


To compress the spring inside the cylinder block, use a threaded rod (or bolt) (Item 1), two trimmed washers (Item 2) and two nuts (Item 3) **[Figure 20-50-154]**.

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Assembly (Cont'd)

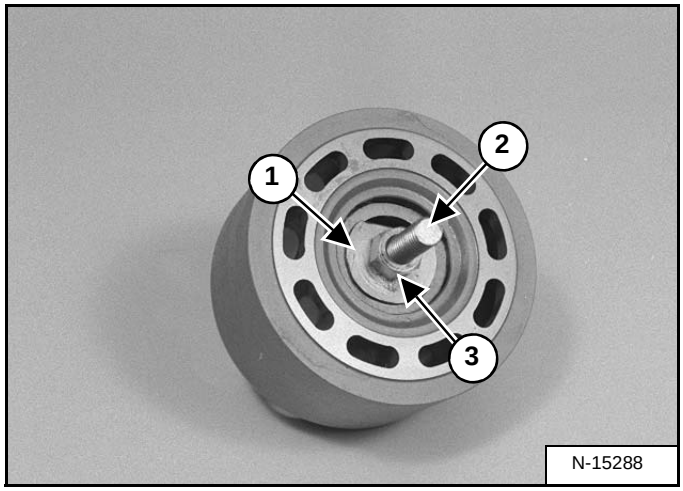
Figure 20-50-155



Install the threaded rod and nut (Item 1) through the modified washer (Item 2) and the block assembly (Item 3) **[Figure 20-50-155]**.

NOTE: The modified washer (Item 2) must fit between the three pins (Item 4) [Figure 20-50-155].

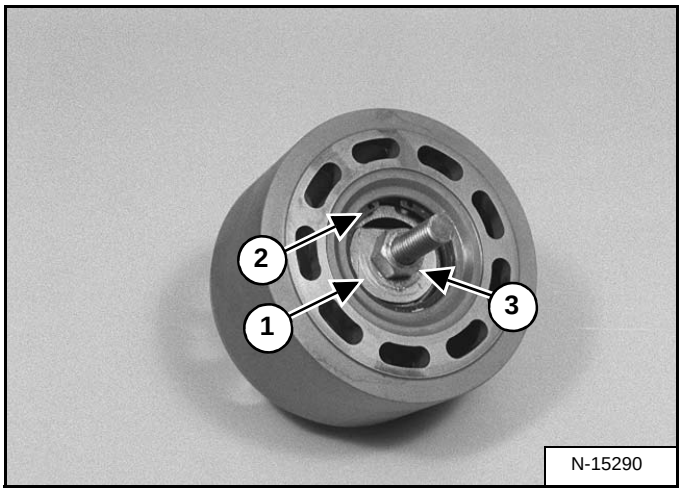
Figure 20-50-156



Install the second modified washer (Item 1) over the threaded rod (Item 2) **[Figure 20-50-156]**.

Install the nut (Item 3) **[Figure 20-50-156]** on the threaded rod.

Figure 20-50-157

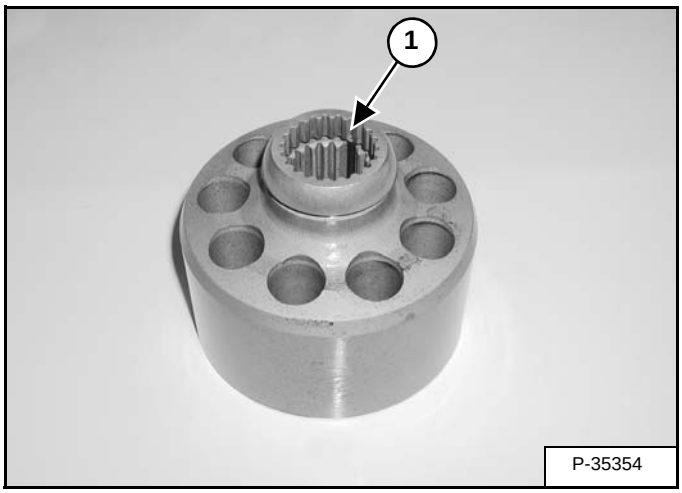


NOTE: The modified washer (Item 1) must fit over the spring, but must also fit inside the snap ring (Item 2) [Figure 20-50-157].

Tighten the nut (Item 3) until the spring is compressed enough to install the snap ring (Item 2) **[Figure 20-50-157]**.

Remove the threaded rod/washer assembly.

Figure 20-50-158

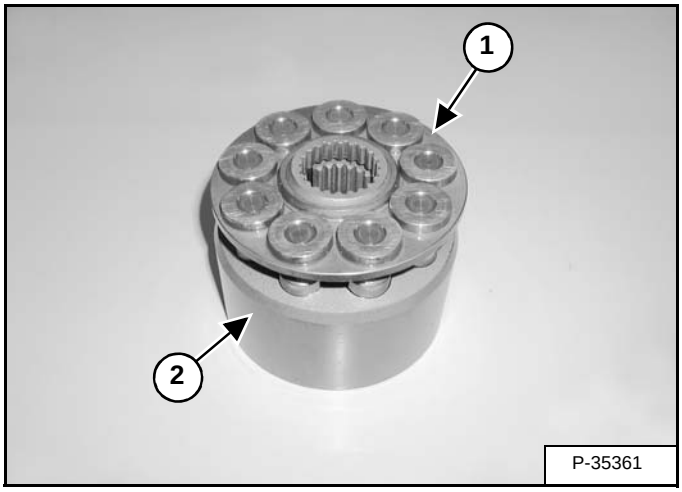


Install the retaining ball (Item 1) **[Figure 20-50-158]**.

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Assembly (Cont'd)

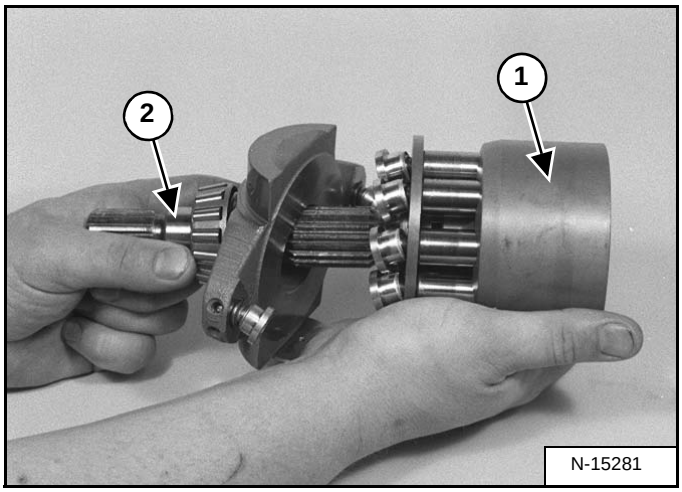
Figure 20-50-159



Install the retainer and piston assembly (Item 1) in the cylinder block (Item 2) **[Figure 20-50-159]**.

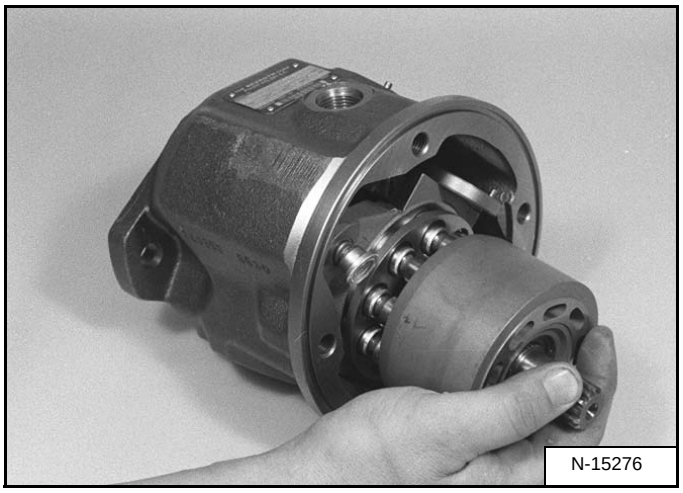
NOTE: It is NOT important that the pistons are installed in their original positions.

Figure 20-50-160



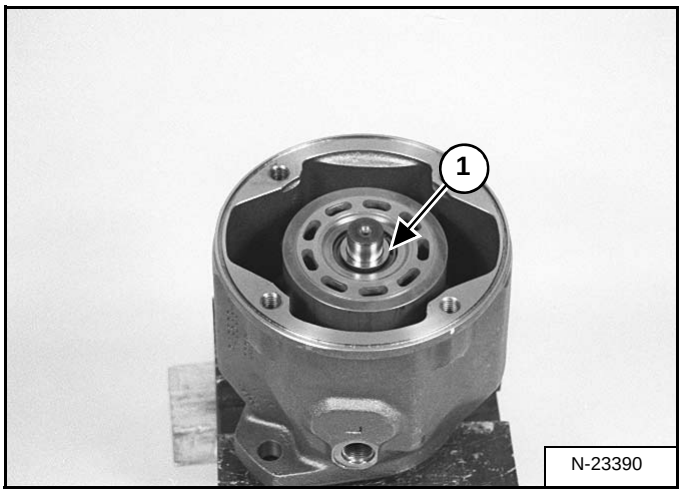
Slide the rotary group assembly (Item 1) on the shaft (Item 2) **[Figure 20-50-160]**.

Figure 20-50-161



Lay the pump housing on its side and install the rotary group assembly, swash plate, and shaft in the housing **[Figure 20-50-161]**.

Figure 20-50-162



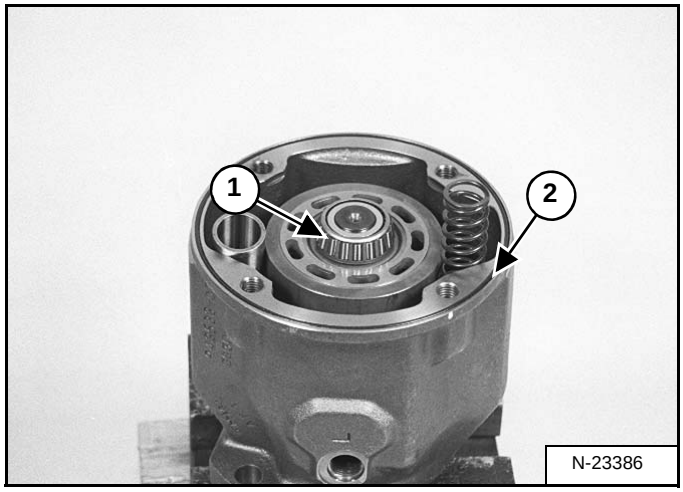
Set the pump housing in the up-right position **[Figure 20-50-162]**.

Install the shim washer (Item 1) **[Figure 20-50-162]**.

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Assembly (Cont'd)

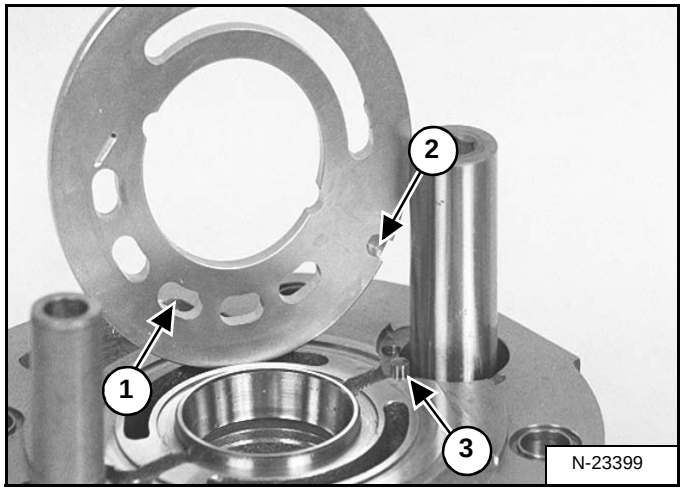
Figure 20-50-163



Install the bearing (Item 1) **[Figure 20-50-163]** on the shaft.

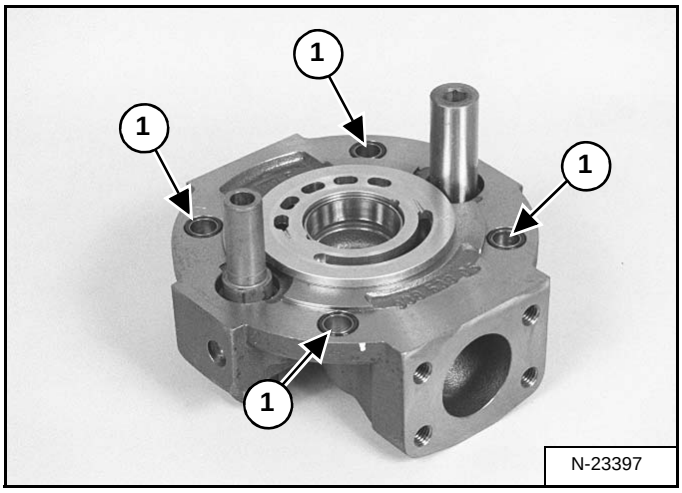
Install the O-ring (Item 2) **[Figure 20-50-163]**.

Figure 20-50-164



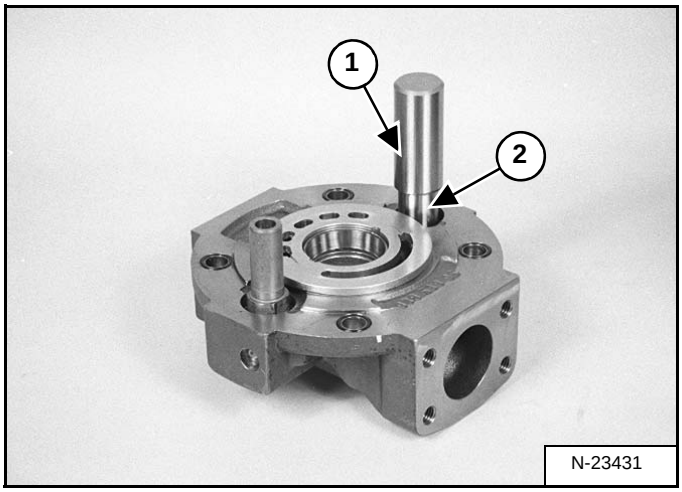
Install the valve plate (Item 1) on the back port assembly. The valve plate can only be installed one way by aligning the groove (Item 2) with the pin (Item 3) **[Figure 20-50-164]**.

Figure 20-50-165



Install the O-rings (Item 1) **[Figure 20-50-165]** on the back port assembly.

Figure 20-50-166



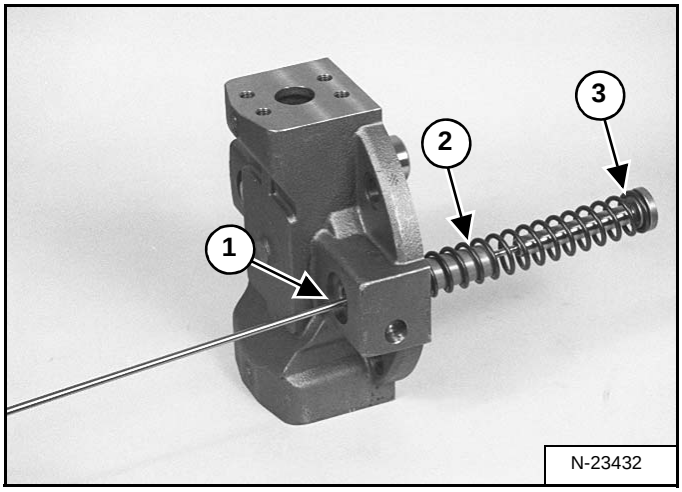
Grease the inside of the control piston (Item 1) **[Figure 20-50-166]**.

Slide it over the control piston shaft (Item 2) **[Figure 20-50-166]**.

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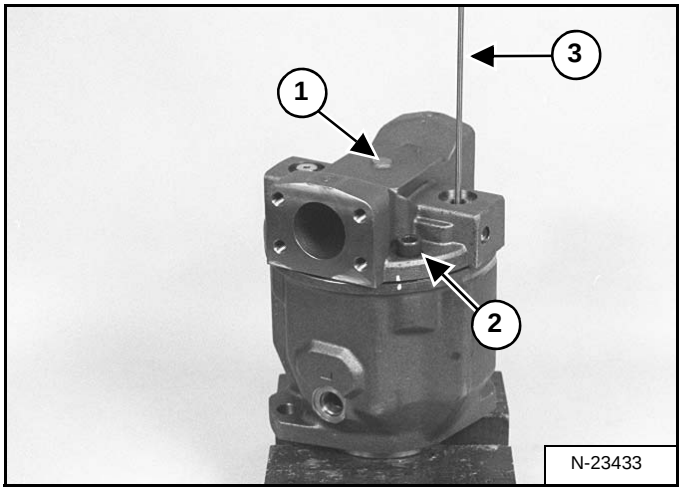
Assembly (Cont'd)

Figure 20-50-167



Insert a 0.1875 in. (4,76 mm) rod through the stroking piston adjustment screw hole (Item 1) and through the spring (Item 2) and into the shaft of the stroking piston (Item 3) **[Figure 20-50-167]**.

Figure 20-50-168

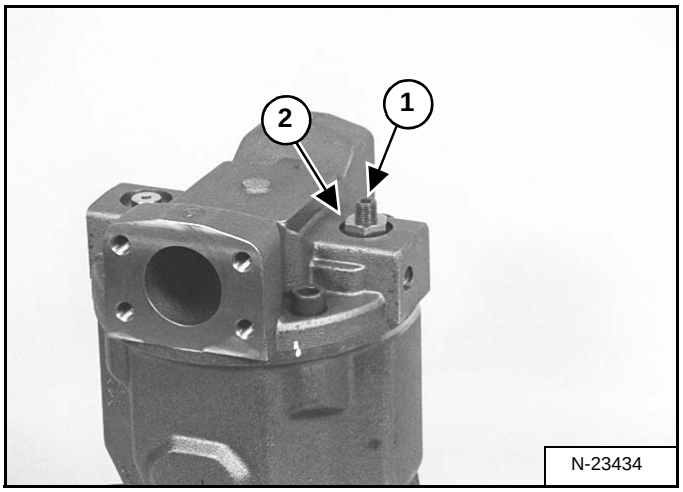


Align the marks and install the back port assembly (Item 1) **[Figure 20-50-168]** on the pump housing.

Install the four mounting bolts (Item 2) **[Figure 20-50-168]** and tighten to 88 ft.-lb. (119 N•m) torque.

Remove the aligning rod (Item 3) **[Figure 20-50-168]** from the pump housing.

Figure 20-50-169

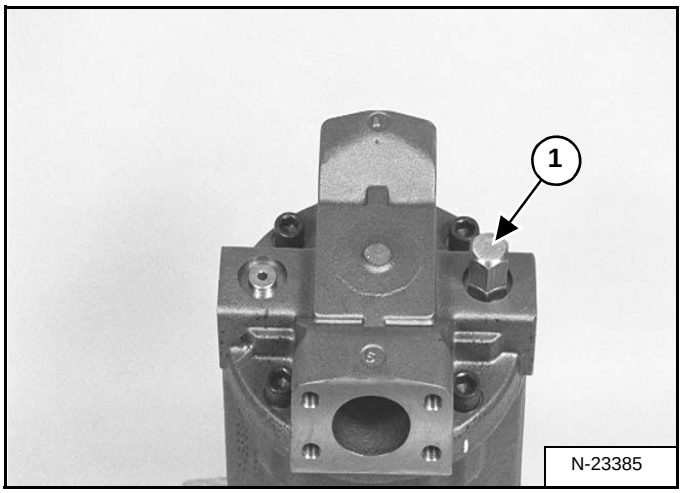


Install the stroking piston adjustment screw (Item 1) **[Figure 20-50-169]**, and adjust the screw to the measurement taken in the disassembly procedure.

Tighten the nut (Item 2) **[Figure 20-50-169]**.

NOTE: The final adjustment on the pump must be done on the excavator. (See Pump Testing on Page 20-50-4.)

Figure 20-50-170

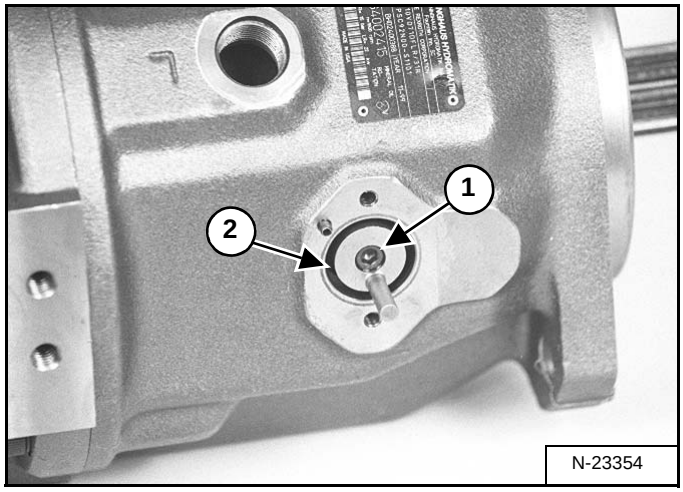


Install the cap (Item 1) **[Figure 20-50-170]**, and tighten.

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Assembly (Cont'd)

Figure 20-50-171



Apply Loctite™ 241 on the bolt (Item 1) and install the load sensing assembly (Item 2) **[Figure 20-50-171]**. Tighten to 10 ft.-lb. (13 N•m) torque.

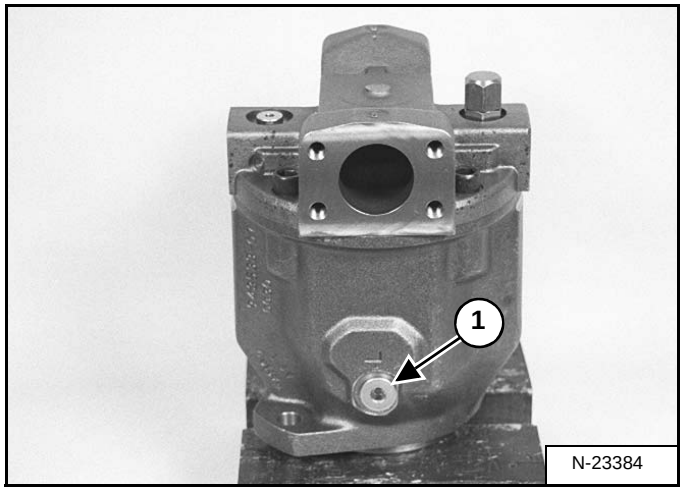
Install the torque limiter valve. (See Torque Limiter Valve Installation on Page 20-50-31)

Install the pump control assembly. (See Pump Control Removal And Installation on Page 20-50-33.)

Place the hydraulic piston pump on its side and fill approximately half full.

Install a new O-ring on the plug.

Figure 20-50-172



Install the plug (Item 1) **[Figure 20-50-172]** in the pump and tighten.

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HYDRAULIC PUMP (S/N 563111001 & ABOVE AND 563211001 & ABOVE)

Piston Pump Work Sheet

(Please review pump procedure as illustrated in “Piston Pump Testing”. (See Piston Pump Testing on Page 20-51-4)

The outline listed below, gives the five adjustments for setting the piston pump. The adjustments are listed in the order in which they ***MUST*** be performed. Below each adjustment is a list of the steps. Behind each adjustment is the page location within the Service Manual for the complete adjustment procedure.

1. Run Engine at High Idle (2560 - 2770 RPM). Record NO Load Engine RPM.

_____ **ENGINE RPM**

2. Adjust Engine RPM (If necessary)
3. Connect Hydraulic Tester to the test fittings
4. Record the Flow.

_____ **FLOW**

I. Torque Limiter Supply Pressure Adjustment (See Torque Limiter Supply Pressure Adjustment on Page 20-51-6)

5. Bottom Out Pump Margin Spool (Approximately Six Turns In.)
6. Connect Torque Limiter Supply Spool to the Reservoir.
7. Install a **500 PSI (35 bar) gauge** to the diagnostic test port on the control valve.
8. Run Engine at High Idle
9. Adjust as Necessary to get 290 ± 20 PSI (20 ± 1,37 bar) at 8 GPM (30 L/min)
10. Record Pressure

_____ **TLS PRESSURE**

11. Remove the Hose and Fitting from the Torque Limiter Supply Spool and Plug the Port
12. Reset Pump Margin Spool (Approximately Six Turns Out.)

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Piston Pump Work Sheet (Cont'd)

II. Pump Margin Pressure Adjustment. (See Pump Margin Pressure Adjustment on Page 20-51-8)

13. Connect Pump Margin Spool to the Reservoir.
14. Run Engine at High Idle
15. Adjust as Necessary to get 220 ± 10 PSI (15 ± 0,69 bar) at 8 GPM (30 L/min)
16. Record Pressure

_____ **PM PRESSURE**

17. Remove the Hose and Fitting from the Pump Margin Spool and Plug Port.
18. Remove the **500 PSI (35 bar) gauge** from the Pump Diagnostic Port at the Control Valve

III. Pump Pressure Adjustment (See Pump Pressure Adjustment on Page 20-51-10)

19. Install **5000 PSI (345 bar) gauge**, On Pump Diagnostic Coupler at the Control Valve.
20. Readjust the hydraulic flow tester by turning the knob clockwise, all the way in (closed position)
21. Run Engine at High Idle, Raise Dozer Blade and Dead-Head in Up Position
22. Adjust Load Sense Relief Valve as Necessary to get 3485 ± 75 PSI (240,3 ± 5,2 bar).
23. Record Pressure
24. Readjust the hydraulic flow tester by turning the knob counterclockwise, all the way in (open position)

_____ **PUMP PRESSURE**

25. Remove the **500 PSI (345 bar) gauge**, from the Pump Diagnostic Coupler at the Control Valve.

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Piston Pump Work Sheet (Cont'd)

IV. Torque Limiter Adjustment (See Torque Limiter Adjustment on Page 20-51-11)

26. Install Jumper Hose with a Test Port, Between the Pump Diagnostic Port and the Load Sense Diagnostic Port at the Control Valve

27. Install a **500 PSI (345 bar) gauge** to the test port on the hydraulic test hose.

28. Adjust the Hydraulic Tester to 1450 PSI (100 bar).

29. Adjust the Torque Limiter to obtain 27 - 32 GPM (102 - 121 L/min)

30. Record Flow and Engine RPM.

_____ **FLOW**

_____ **ENGINE RPM**

31. Adjust the Hydraulic Tester to 3300 PSI (228 bar).

32. Adjust the Torque Limiter to obtain 14 - 18 GPM (53 - 68 L/min)

33. Record Flow and Engine RPM.

_____ **FLOW**

_____ **ENGINE RPM**

ALL PISTON PUMP ADJUSTMENTS ARE NOW COMPLETED

34. Remove the Jumper Hose

35. Remove the Hydraulic Tester

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Piston Pump Testing

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

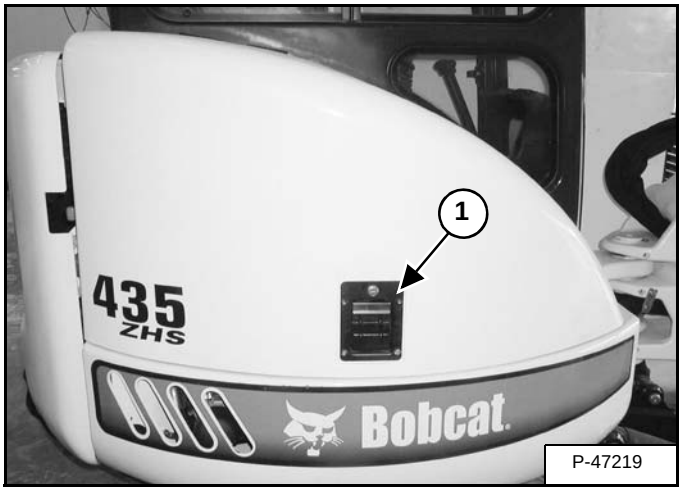
Torque Limiter Supply Pressure
Pump Margin Pressure
Pump Pressure
Torque Limiter

Test Fitting Installation

The following tools will be needed to do the procedure:

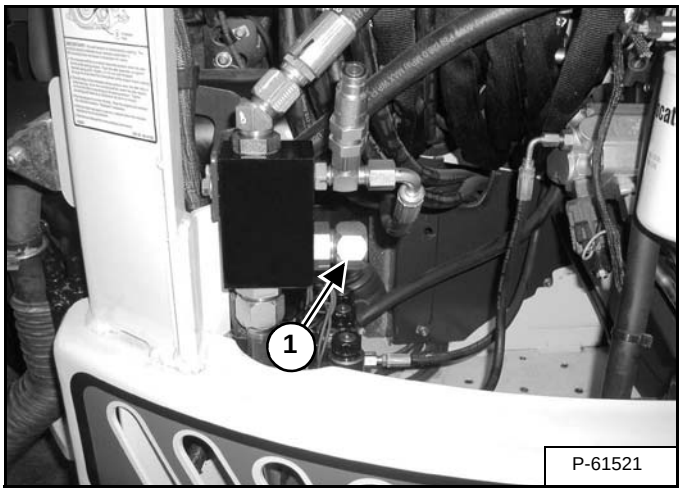
MEL10003 - Hydraulic Tester
MEL1355 - Hydraulic Test Kit
MEL1548 - Hydraulic Fitting Kit
MEL1598 - Hydraulic Fitting Kit

Figure 20-51-1



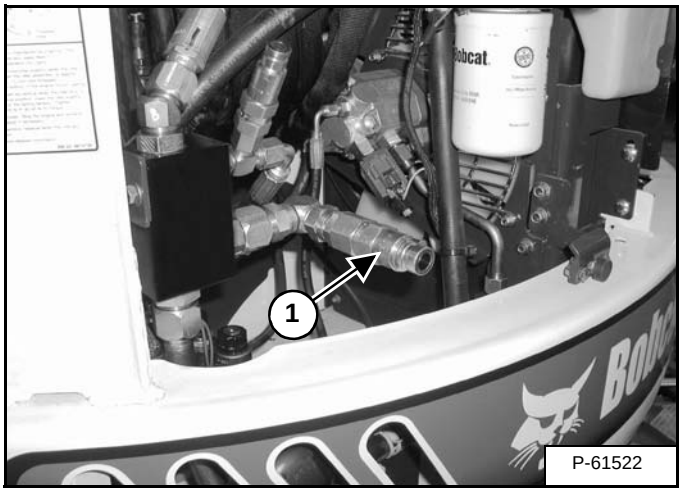
Open the right side cover (Item 1) **[Figure 20-51-1]**.

Figure 20-51-2



Remove the cap (Item 2) **[Figure 20-51-2]** from the build up valve.

Figure 20-51-3

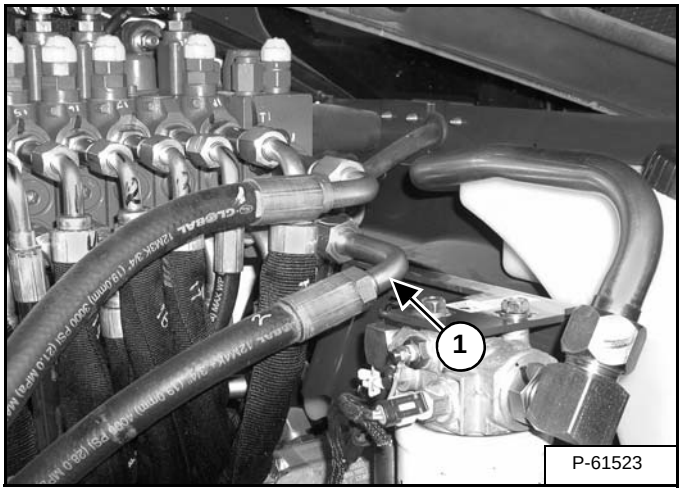


Install a male hydraulic coupler (Item 1) **[Figure 20-51-3]** to the fitting.

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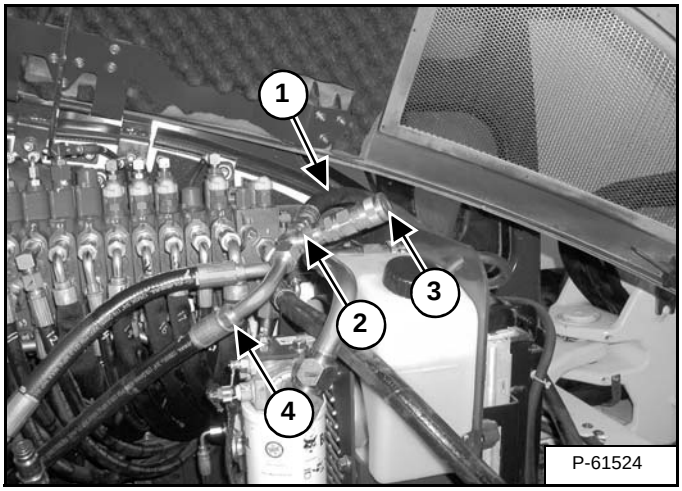
Piston Pump Testing (Cont'd)

Figure 20-51-4



Remove the inlet hose (Item 1) **[Figure 20-51-4]** from the control valve.

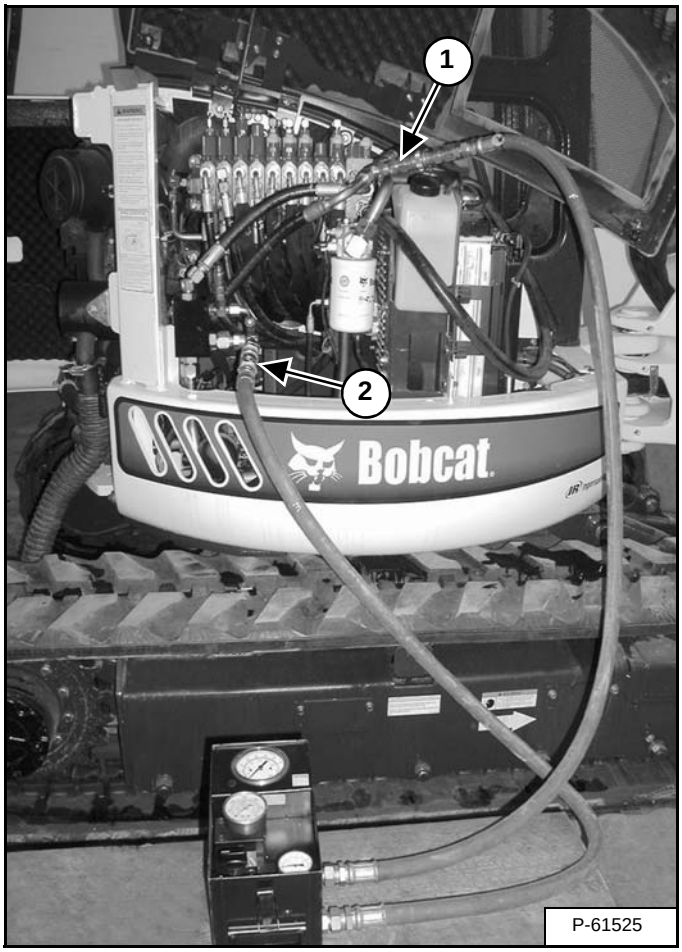
Figure 20-51-5



Install a short hose (Item 1), T fitting (Item 2), and female quick coupler (Item 3) **[Figure 20-51-5]** on the hydraulic control valve.

Reinstall the inlet hose (Item 4) **[Figure 20-51-5]** on the T fitting.

Figure 20-51-6



Connect the **Inlet** hose of the hydraulic tester to the coupler (Item 1) **[Figure 20-51-6]** at the control valve.

Connect the **Outlet** hose of the hydraulic tester to the coupler (Item 2) **[Figure 20-51-6]** at the build up valve.

Test Fittings are Now Installed.

The values read at the Hydraulic Tester (MEL10003) are based on the use of 3/4 in. (19,05 mm) hoses on the tester. Different size hoses will cause variation in the readings.

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

The No Load Engine RPM should be **2560 - 2770 RPM**.

Stop the engine and adjust the engine RPM if necessary.

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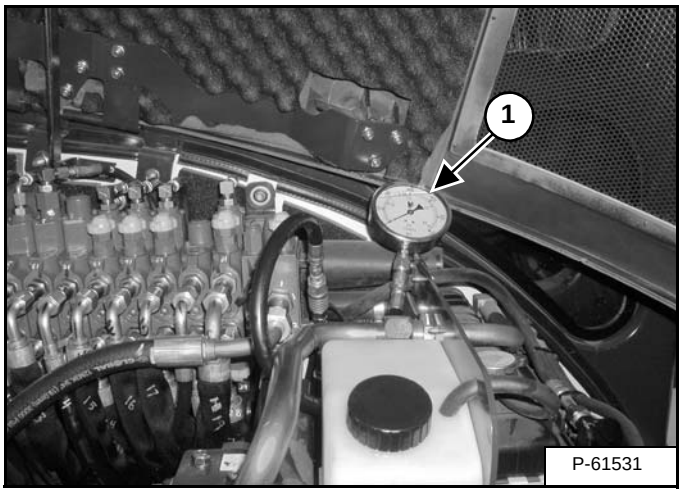
HYDRAULIC PUMP (S/N 563111001 & ABOVE AND 563211001 & ABOVE) (CONT'D)

Piston Pump Testing (Cont'd)

Torque Limiter Supply Pressure Adjustment

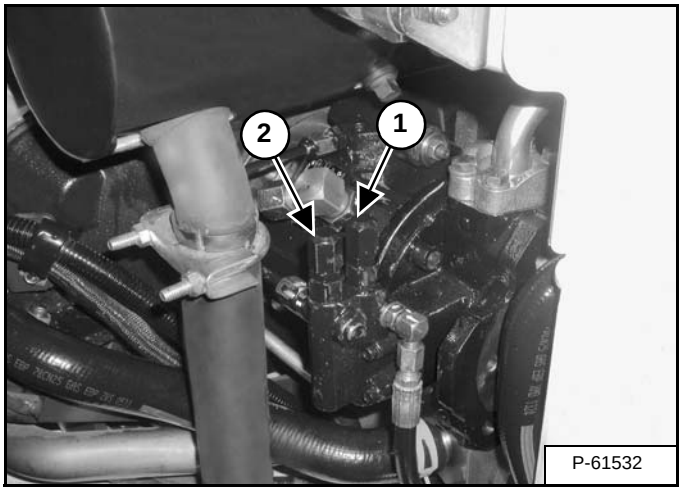
NOTE: This circuit is capable of high pressure.

Figure 20-51-7



Connect a **500 PSI (35 bar) pressure gauge** (Item 1) **[Figure 20-51-7]** to the pump diagnostic coupler at the control valve.

Figure 20-51-8



At the hydraulic pump, remove the cap (Item 1) **[Figure 20-51-8]** from the pump margin spool adjustment. (Front cap)

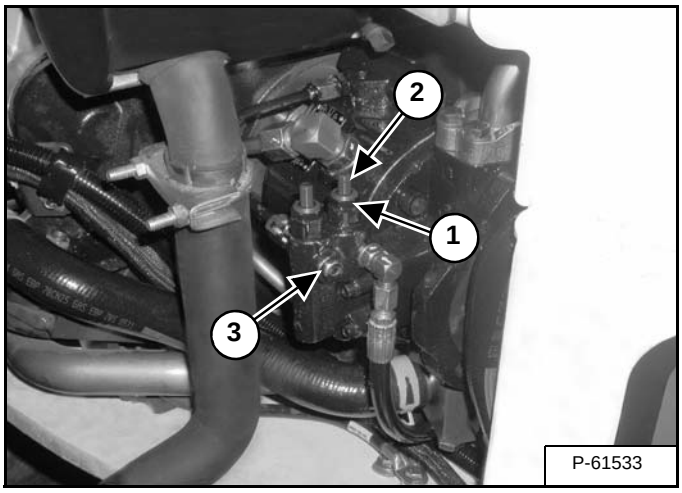
Remove the cap (Item 2) **[Figure 20-51-8]** from the pump torque limiter supply spool adjustment. (Rear Cap)

NOTE: The adjustment caps contain a sealing washer that can be easily lost when caps are removed.

NOTE: Early model shown. Later models do not have the caps and washers.

NOTE: To adjust the Torque Limiter Supply Pressure, the Pump Margin Spool must be temporarily bottomed out.

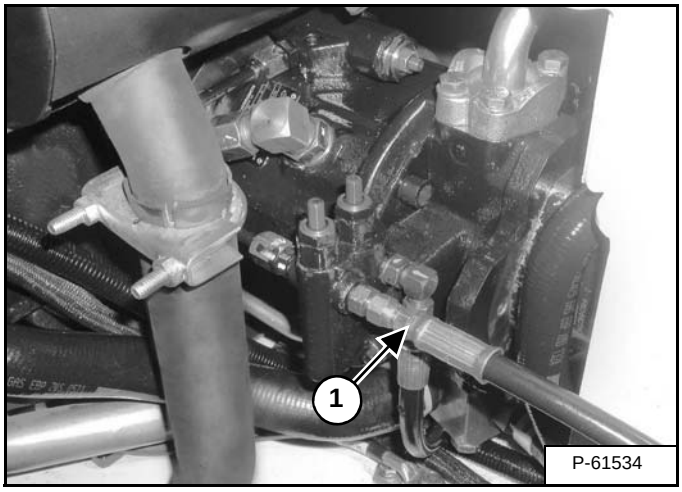
Figure 20-51-9



Loosen the nut (Item 1) on the pump margin spool. (Front spool) With an Allen wrench turn the pump margin spool adjustment (Item 2) **[Figure 20-51-9]** all the way in. (Approximately six turns)

Remove the plug (Item 3) **[Figure 20-51-9]** from the torque limiter supply spool and install a 15KN-3 fitting.

Figure 20-51-10



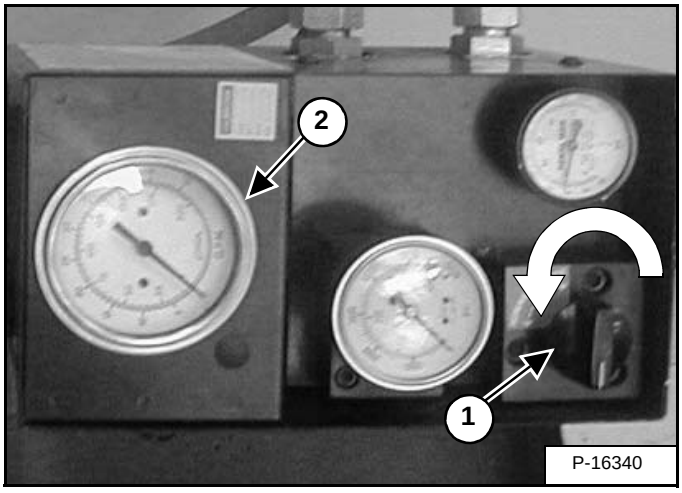
Connect a 1/4 in. (6,35 mm) hydraulic hose, with a 90° end (Item 1) **[Figure 20-51-10]**, to the fitting.

Remove the cap from the hydraulic reservoir and route the hydraulic hose into the reservoir.

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Piston Pump Testing (Cont'd)

Figure 20-51-11

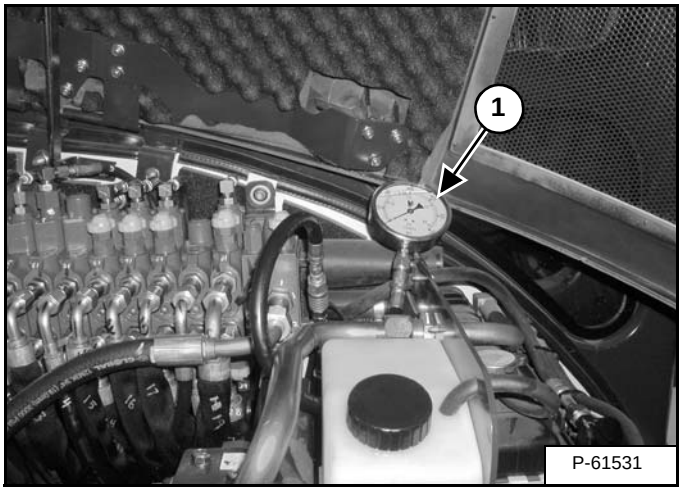


Turn the hydraulic tester flow control (Item 1) **[Figure 20-51-11]** counterclockwise so there is no restriction on the hydraulic system.

Start the engine and allow the hydraulic fluid to warm to 140° F (60° C).

With the engine at high idle, turn the hydraulic tester flow control (Item 1) clockwise until **8 GPM (30 L/min)** flow is shown at the hydraulic tester gauge (Item 2) **[Figure 20-51-11]**.

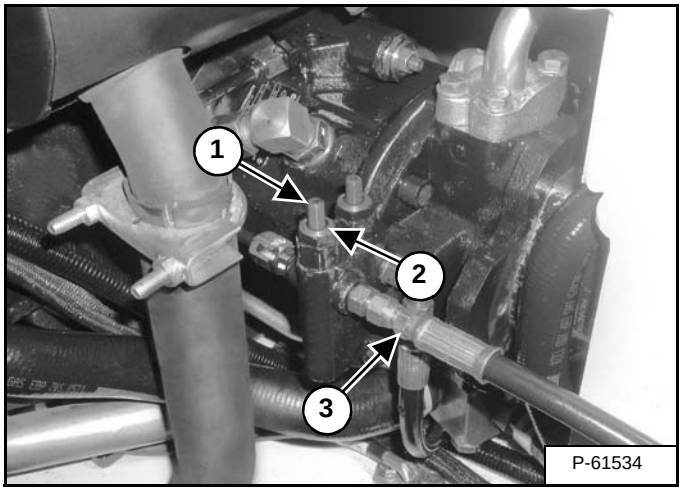
Figure 20-51-12



Check the torque limiter supply pressure at the gauge (Item 1) **[Figure 20-51-12]**.

NOTE: Do not engage any hydraulic functions at this time, hydraulic pressure will damage the hydraulic test gauge (Item 1) [Figure 20-51-12].

Figure 20-51-13



If the torque limiter supply pressure is not **290 ± 20 PSI (20 ± 1,37 bar)**, turn the torque limiter supply spool (Item 1) **[Figure 20-51-13]** (Rear spool) clockwise to increase the pressure, and counterclockwise to decrease the pressure. (Approximately 1/4 turn per 50 PSI (3,4 bar))

NOTE: Changing the Torque Limiter Supply Adjustment Screw, will affect the pressure and flow. The Hydraulic Tester must be reset to 8 GPM (30 L/min).

Repeat the procedure listed above until the pressure is set.

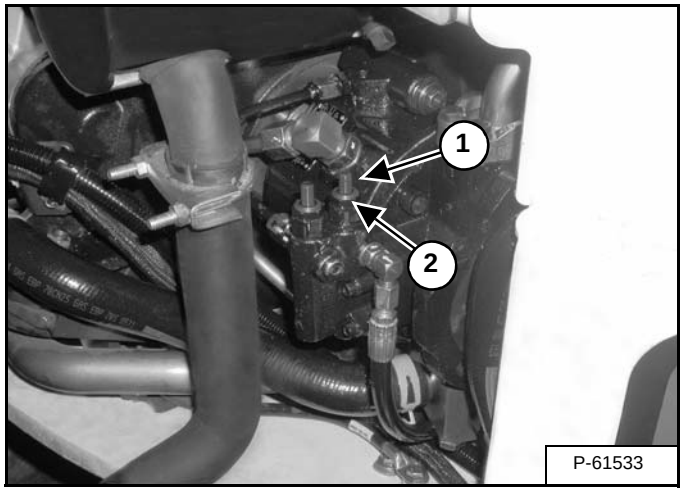
If correct pressure cannot be obtained, disassemble and clean the torque limiter supply pressure spool.

When the correct pressure is obtained, tighten the nut (Item 2) and remove the hose and fitting (Item 3) **[Figure 20-51-13]** from the torque limiter spool. Replace the plug in the torque limiter spool (Rear spool) and tighten.

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Piston Pump Testing (Cont'd)

Figure 20-51-14



With an Allen wrench turn the pump margin spool (Front spool) adjustment (Item 1) **[Figure 20-51-14]** ***back out. (Approximately six turns)***

Tighten the nut (Item 2) **[Figure 20-51-14]** on the pump margin spool.

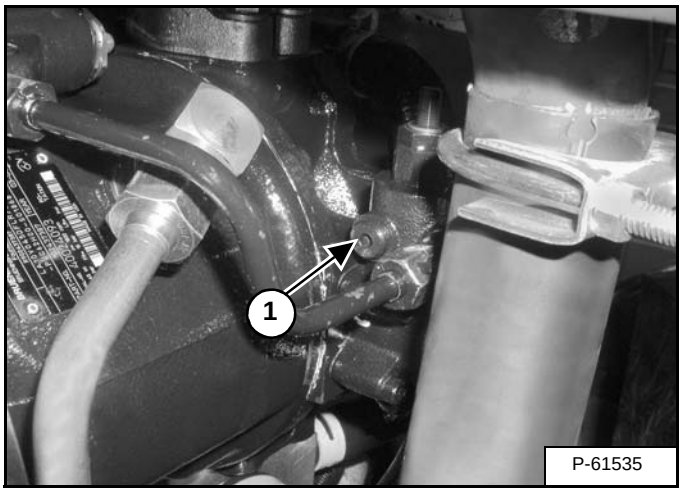
Replace and tighten the cap on the torque limiter supply spool adjustment.

NOTE: Early model shown. Later models do not have the caps and washers.

Torque Limiter Supply Pressure Adjustment is now completed.

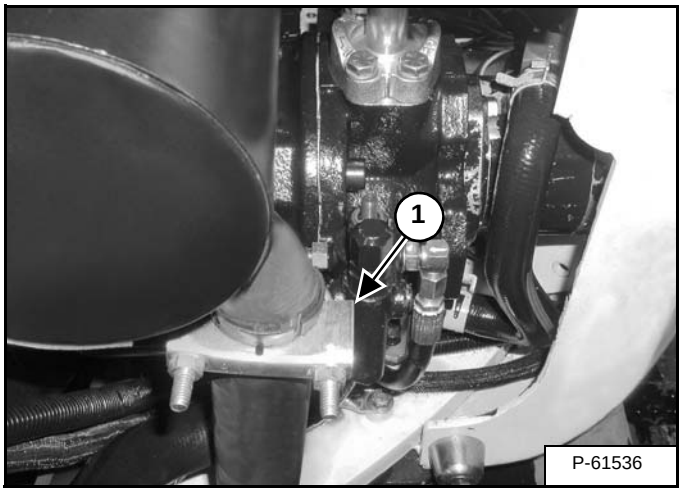
Pump Margin Pressure Adjustment

Figure 20-51-15



At the pump margin spool remove the front plug (Item 1) **[Figure 20-51-15]**.

Figure 20-51-16

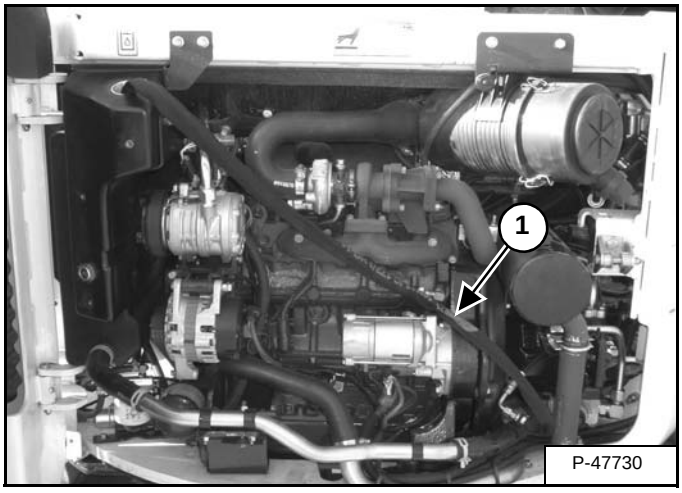


Install a 15KN-3 (Item 1) **[Figure 20-51-16]** fitting and 1/4 in. (6,35 mm) hydraulic hose with a 90° end to the fitting.

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Piston Pump Testing (Cont'd)

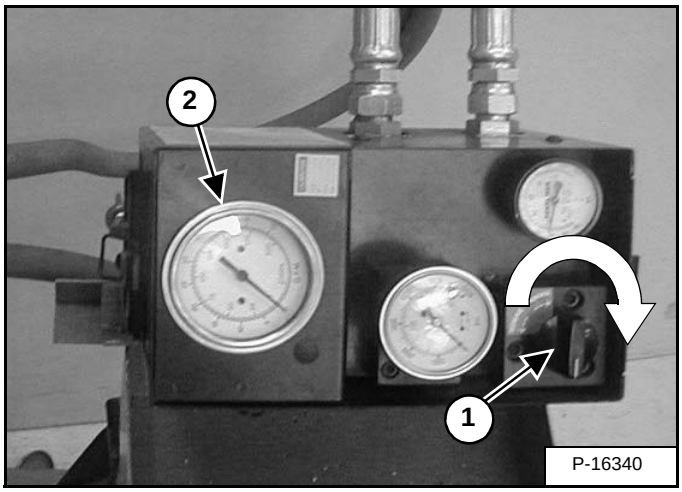
Figure 20-51-17



Route the hose (Item 1) **[Figure 20-51-17]** from the pump margin spool to the hydraulic reservoir.

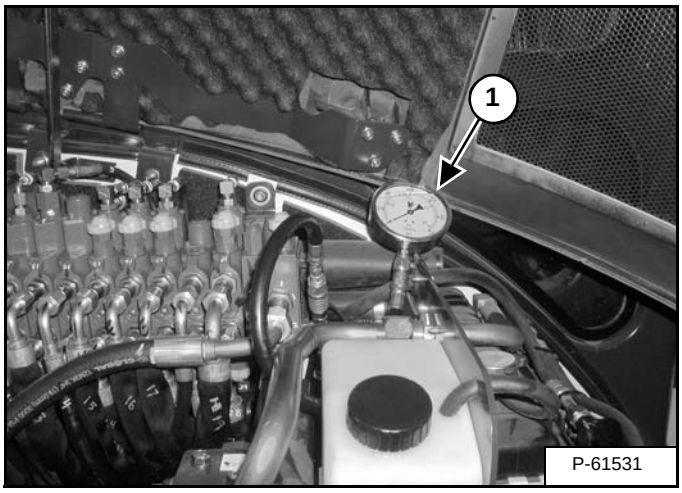
Start the engine and allow the hydraulic fluid to warm to 140° F (60° C).

Figure 20-51-18



With the engine at high idle, turn the hydraulic tester flow control (Item 1) clockwise until **8 GPM (30 L/min**) flow is shown at the hydraulic tester gauge (Item 2) **[Figure 20-51-18]**.

Figure 20-51-19

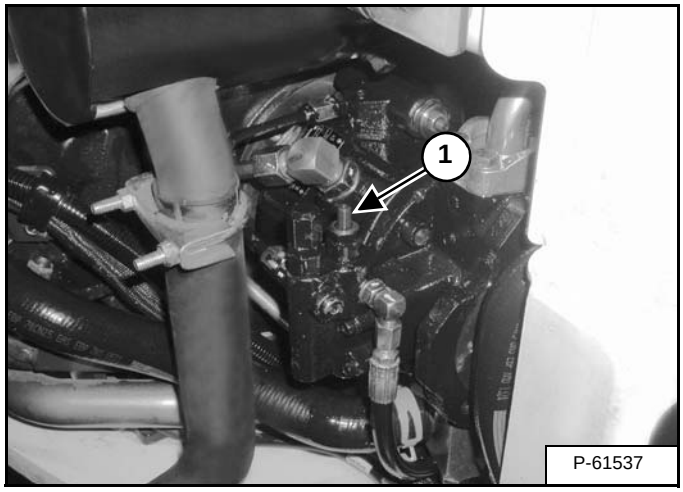


Check the pump margin pressure at the gauge (Item 1) **[Figure 20-51-19]**.

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Piston Pump Testing (Cont'd)

Figure 20-51-20



If the pump margin pressure is not **220 ± 10 PSI (15 ± 1,37 bar)**, turn the pump margin pressure adjustment screw (Item 1) **[Figure 20-51-20]** (Front Spool) clockwise to increase the pressure, and counter clockwise to decrease the pressure. (Approximately 1/4 turn per 50 PSI [3,4 bar])

NOTE: Changing the Pump Margin Pressure Adjustment Screw, will affect the pressure and flow. The Hydraulic Tester must be reset to 8 GPM (30 L/min).

Repeat the procedure listed above until the pressure is set.

If correct pressure cannot be obtained, disassemble and clean the pump margin spool.

When the correct pressure is obtained, tighten the nut and remove the hose and fitting from the pump margin spool. Replace the plug in the pump margin spool (Rear Spool) and tighten.

Replace and tighten the cap on the pump margin pressure adjustment screw.

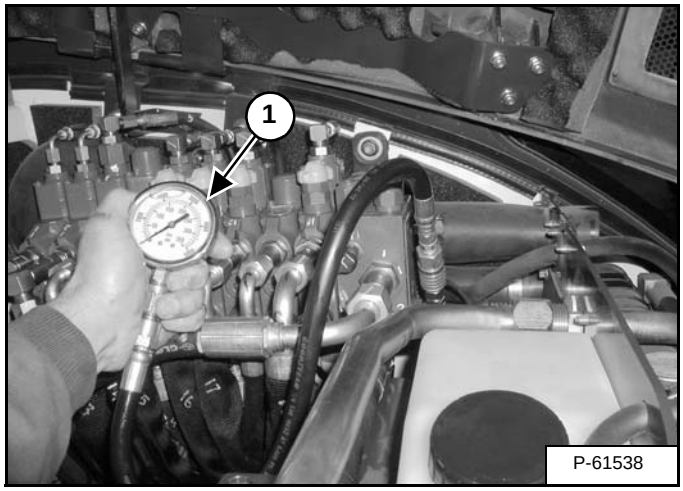
NOTE: Early model shown. Later models do not have the caps and washers.

Remove the 500 PSI (35 bar) test gauge from the pump diagnostic port on the control valve.

The Pump Margin Pressure Adjustment is now completed.

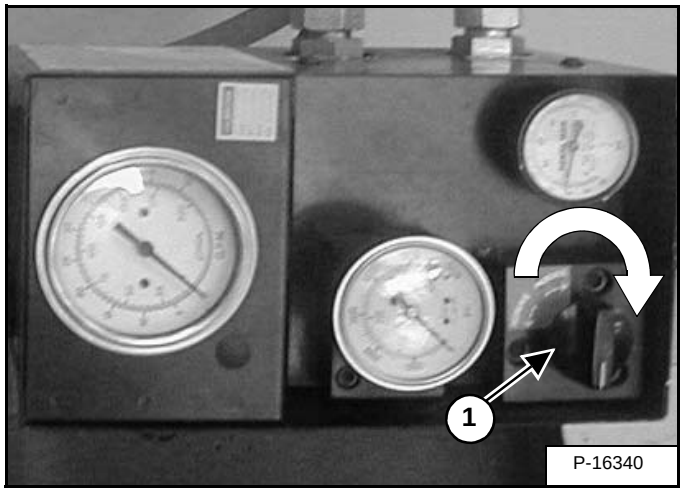
Pump Pressure Adjustment

Figure 20-51-21



Install a **5000 PSI (345 bar) gauge** (Item 1) **[Figure 20-51-21]** to the pump diagnostic port on the control valve.

Figure 20-51-22



Turn the hydraulic tester flow control (Item 1) **[Figure 20-51-22]** clockwise until maximum restriction.

Start the engine and run at high idle.

Raise the blade and deadhead the blade in the up position.

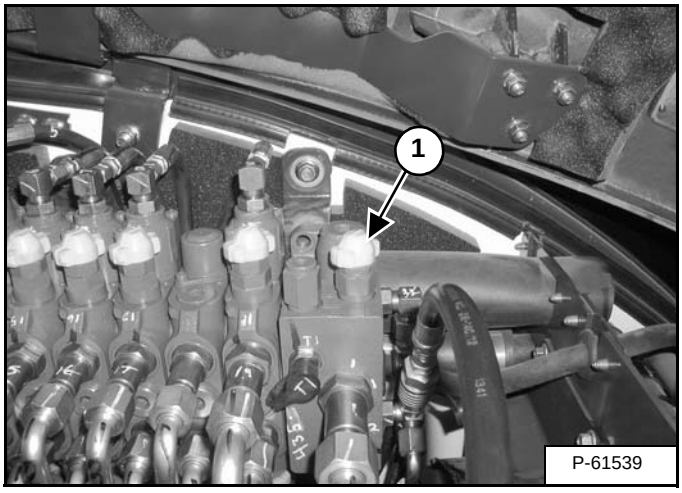
Have another person check the pressure gauge (Item 1) **[Figure 20-51-21]** and record the pump pressure.

The pump pressure should be **3485 ± 75 PSI (250 ± 5,2 bar)**.

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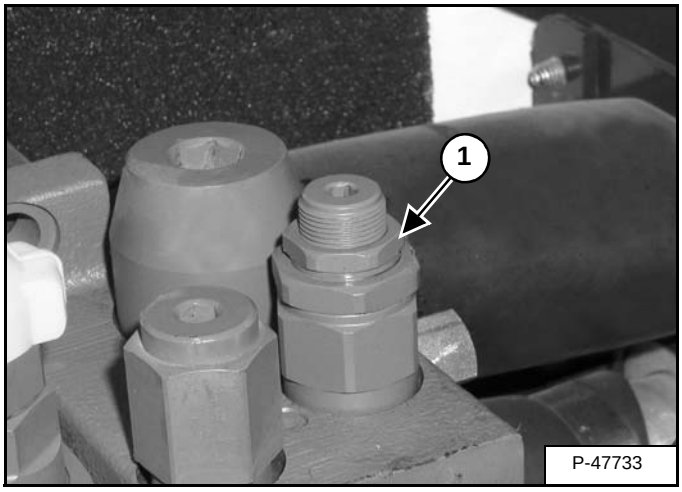
Piston Pump Testing (Cont'd)

Figure 20-51-23



Remove the protective cap (Item 1) **[Figure 20-51-23]** from the top of the Load Sense Relief Valve.

Figure 20-51-24



Loosen the nut (Item 1) **[Figure 20-51-24]** and with an Allen wrench adjust the pressure to **3485 ± 75 PSI (240,3 ± 5,2 bar)**.

If pump pressure cannot be obtained, disassemble and clean the load sense relief valve.

When pump pressure is set, tighten the nut (Item 1) **[Figure 20-51-24]**.

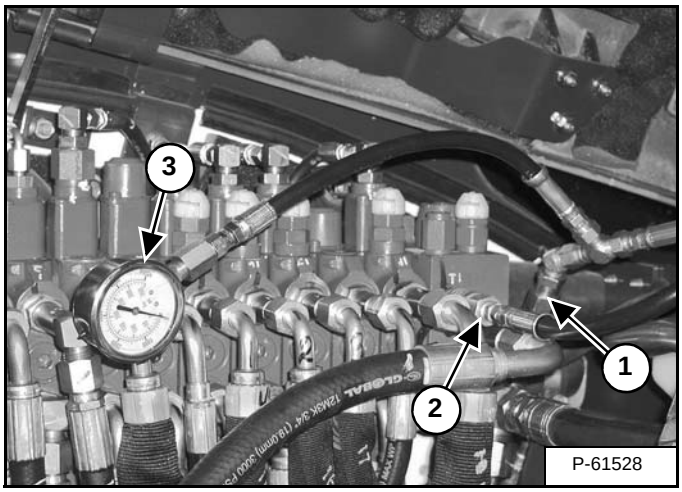
Remove the 5000 PSI (345 bar) gauge from the pump diagnostic port on the control valve.

Pump Pressure Adjustment is now completed.

Torque Limiter Adjustment

NOTE: For a pump that has been tampered with or one that is so far out of adjustment that the correct settings cannot be obtained. (See Initial Torque Limiter Valve Setting on Page 20-51-29).

Figure 20-51-25



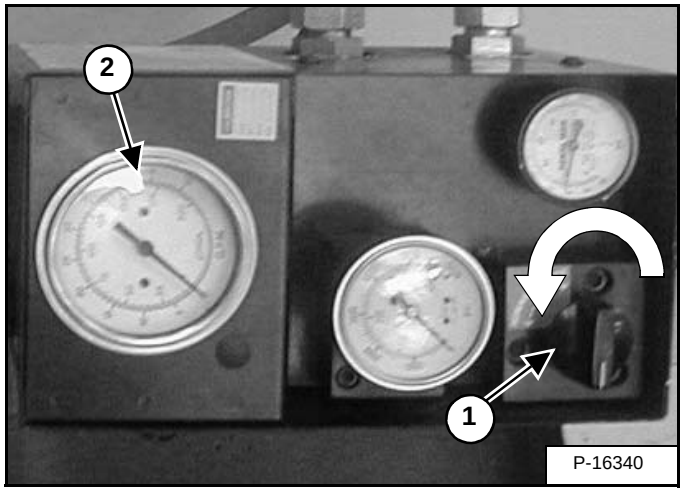
Install a 5000 PSI (345 bar), 1/4 in. (6,35 mm) hose and two female hydraulic couplers from the kit, connect the pump diagnostic port (Item 1) to the Load Sense diagnostic port (Item 2) **[Figure 20-51-25]** on the control valve.

Install a **5000 PSI (345 bar) gauge** (Item 3) **[Figure 20-51-25]** to the test port on the hydraulic test hose.

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Piston Pump Testing (Cont'd)

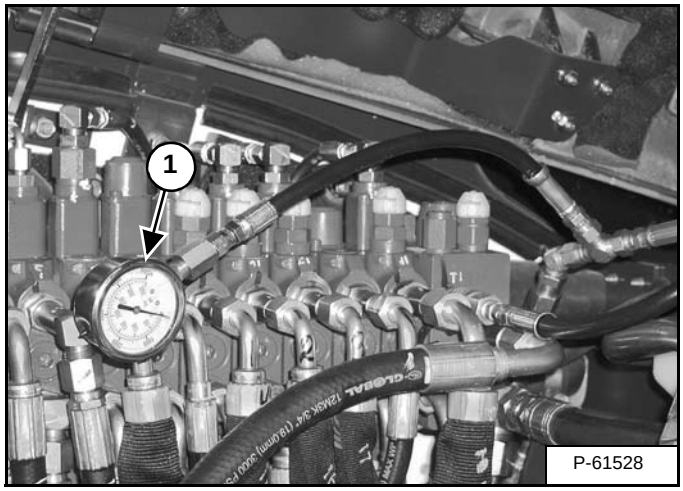
Figure 20-51-26



Turn the hydraulic tester flow control (Item 1) **[Figure 20-51-26]** counterclockwise so there is no restriction on the hydraulic system.

Start the engine and run at high idle. If equipped with air conditioning, turn air conditioning ON and turn temperature switch to lowest setting.

Figure 20-51-27

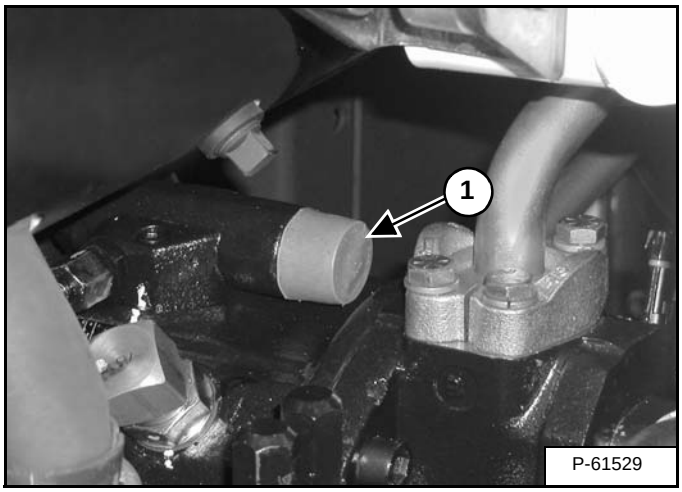


Turn the hydraulic tester flow control (Item 1) **[Figure 20-51-26]** clockwise until the gauge (Item 1) **[Figure 20-51-27]** reads **1450 PSI (100 bar)**.

Record the amount of flow at the tester gauge (Item 2) **[Figure 20-51-26]**, which is the *flow at low pressure*.

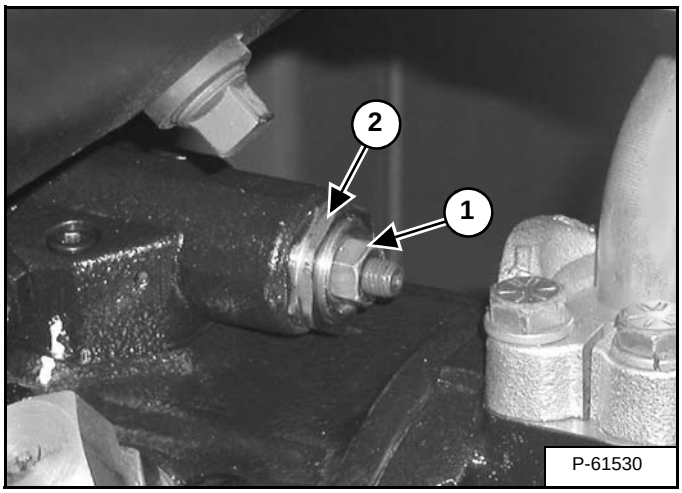
The flow should be **27 - 32 GPM (102 - 121 L/min)**.

Figure 20-51-28



If the pump torque limiter must be adjusted, stop the engine and remove the protective cap (Item 1) **[Figure 20-51-28]** from the hydraulic pump torque limiter.

Figure 20-51-29



Check the small nut (Item 1) **[Figure 20-51-29]** to be sure it is locked in place.

Adjust the flow at the hydraulic pump torque limiter loosening the large nut (Item 2) **[Figure 20-51-29]**. With an Allen wrench adjust the *flow at low pressure*.

When the proper flow is obtained, **27 - 32 GPM (102 - 121 L/min) at 1450 PSI (100 bar)**, tighten the large nut (Item 2) **[Figure 20-51-29]**.

NOTE: When adjusting the flow at low pressure [Figure 20-51-29], the engine RPM must not fall below 2100 RPM.

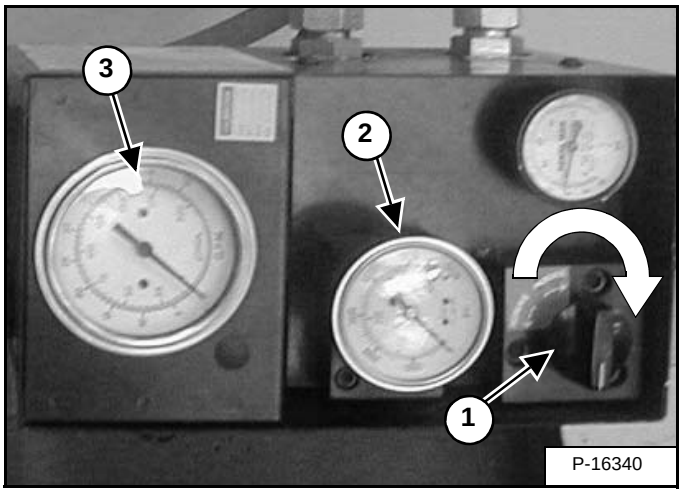
NOTE: Changing the flow at low pressure (Item 2), (large nut) will affect flow at high pressure (Item 1) [Figure 20-51-29] (small nut).

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Piston Pump Testing (Cont'd)

If this flow at low pressure cannot be obtained, disassemble and clean the torque limiter spool.

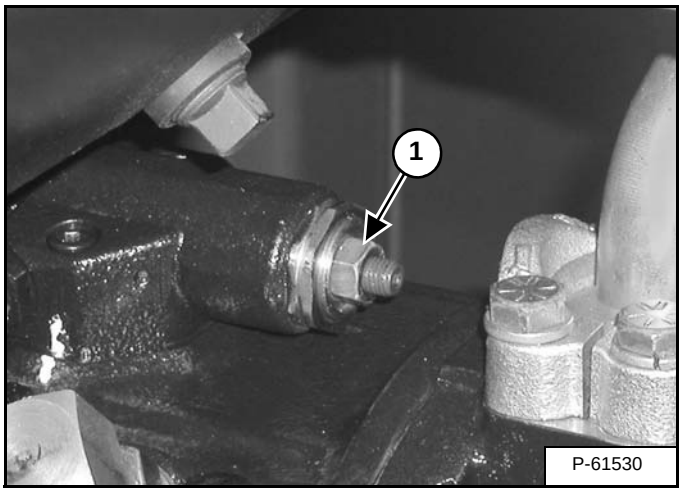
Figure 20-51-30



Turn the hydraulic tester flow control (Item 1) clockwise until the gauge (Item 2) reads **3300 PSI (228 bar)**. Record the amount of flow at the tester gauge (Item 3) **[Figure 20-51-30]**, which is the *flow at high pressure*.

The flow should be **14 - 18 GPM (53 - 68 L/min)**.

Figure 20-51-31



Adjust the flow at the hydraulic pump torque limiter. Stop the engine and loosen the small nut (Item 1) **[Figure 20-51-31]** and with an Allen wrench adjust the *flow at high pressure*.

If this flow at high pressure cannot be obtained, disassemble and clean the torque limiter spool.

When the proper flow is obtained, **14 - 18 GPM (53 - 68 L/min) at 3300 PSI (228 bar)**, lock the small nut (Item 1) **[Figure 20-51-31]**.

NOTE: When adjusting the flow at high pressure, the engine RPM must not fall below 2100 RPM.

NOTE: If adjustments were made to *flow at high pressure* verify the *flow at low pressure*. (See Torque Limiter Adjustment on Page 20-51-11)

Install the protective cap on the hydraulic pump torque limiter.

Torque Limiter Adjustment is now completed.

ALL PUMP ADJUSTMENTS ARE NOW COMPLETED

Remove the hydraulic tester and all test fittings from the excavator.

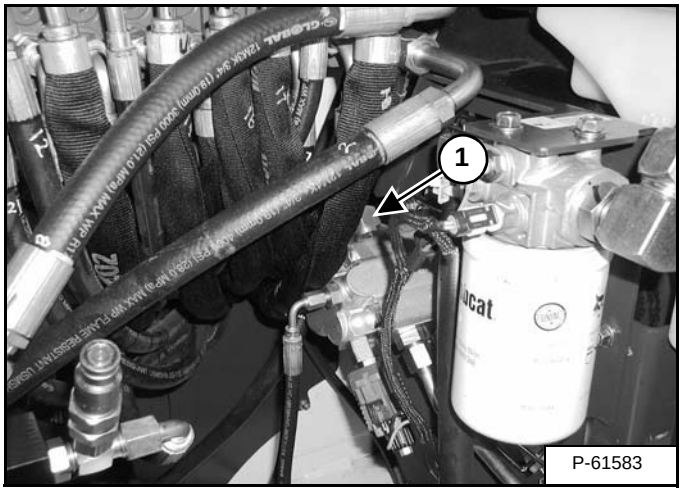
https://www.pdfmanual4trucks.com/

Description

The fan/charge pump supplies hydraulic fluid to the manifold and cooling fan motor.

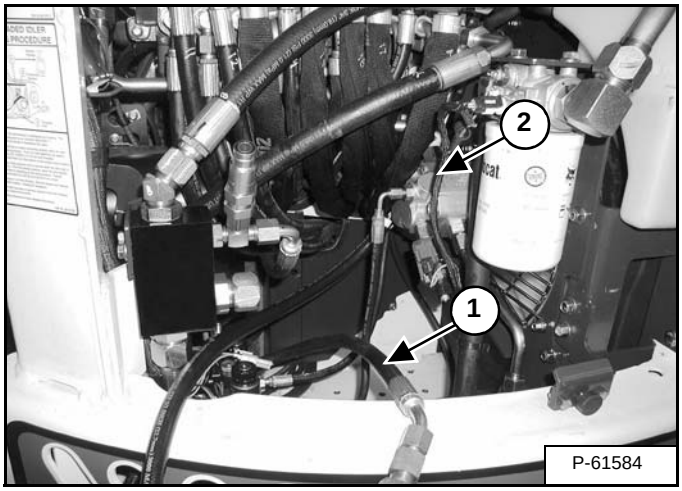
Gear Pump Testing

Figure 20-51-32



Remove the hose (Item 1) **[Figure 20-51-32]** from the fan motor.

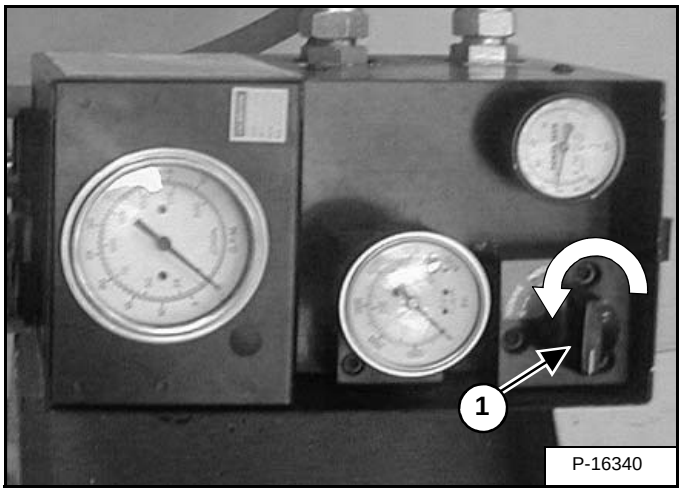
Figure 20-51-33



Connect the hydraulic tester inlet side (Item 1) **[Figure 20-51-33]** to the hose removed from the fan motor.

Install a short hose (Item 2) **[Figure 20-51-33]** on the fan motor. Connect the hose to the hydraulic tester outlet side.

Figure 20-51-34



Turn the hydraulic tester flow control (Item 1) **[Figure 20-51-34]** counterclockwise until all restriction is removed.

Start the engine and run at low RPM. Make sure the tester is connected correctly. If no flow is indicated at the tester, the hoses are connected wrong.

Increase the engine speed to full RPM. Warm the hydraulic fluid to a minimum temperature of 140° F (60° C) by turning the restrictor valve until the gauge reads about 1000 PSI (69 bar).

After the temperature is correct, open the restrictor valve fully.

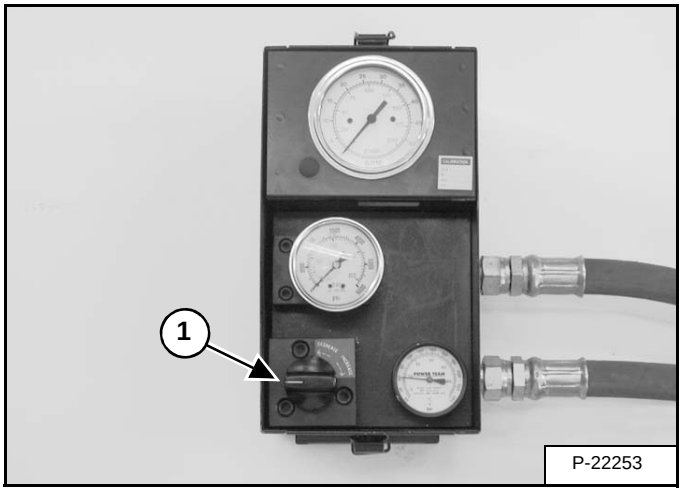
Record the pump free flow GPM (L/min).

Pump flow on a new pump is 9.3 GPM (35,2 L/min) at 2500 engine rpm.

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Gear Pump Testing (Cont'd)

Figure 20-51-35



Close the flow control knob (Item 1) **[Figure 20-51-35]** slowly to 1950 PSI (134 bar).

Record the pump high pressure flow GPM (L/min).

NOTE: The high pressure flow must be at least 80% of free flow.

$$\%= \frac{\text{HIGH PRESSURE FLOW (GPM)}}{\text{FREE FLOW (GPM)}} \times 100$$

If the high pressure flow is less than 80% of free flow, remove the pump for repair or replacement.

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Removal And Installation

IMPORTANT

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

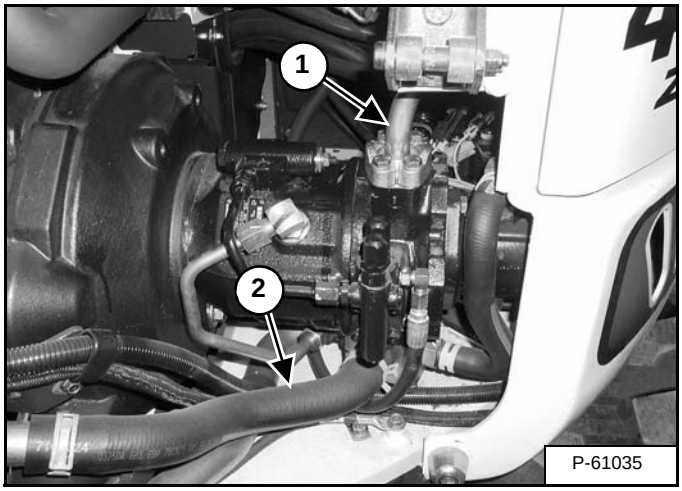
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Open the tailgate.

Drain the hydraulic reservoir. (See Replacing The Hydraulic Oil on Page 10-100-2)

Remove the muffler. (See Removal And Installation on Page 70-20-1)

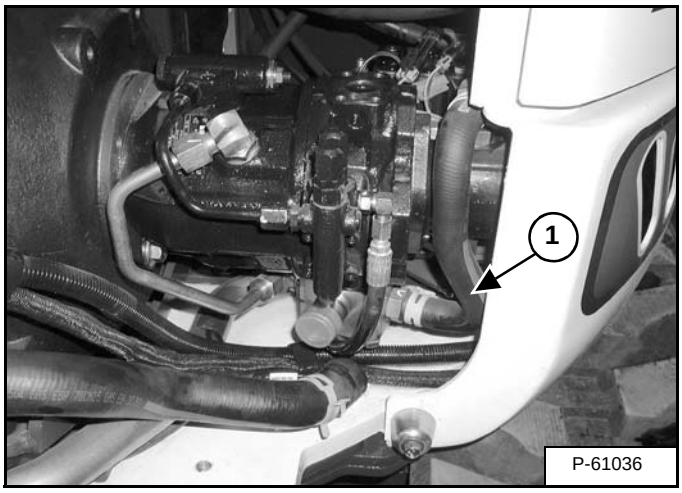
Figure 20-51-36



Remove the hose (Item 1) **[Figure 20-51-36]** that goes from the pump to the control valve.

Remove the hose (Item 2) **[Figure 20-51-36]** that goes from the reservoir to the pump.

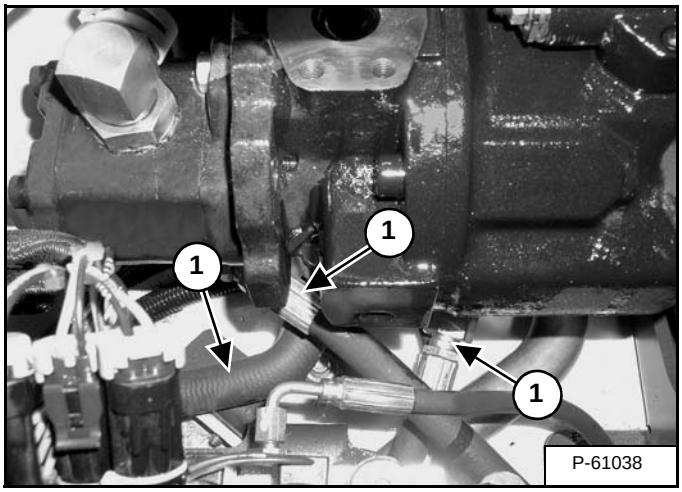
Figure 20-51-37



Remove the hoses (Item 1) **[Figure 20-51-37]**.

Open the right side cover.

Figure 20-51-38

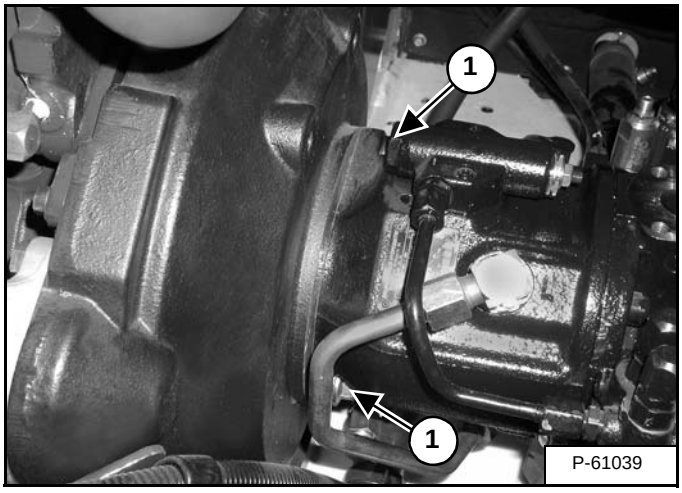


Remove the hoses (Item 1) **[Figure 20-51-38]**.

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Removal And Installation (Cont'd)

Figure 20-51-39



Remove the bolts (Item 1) **[Figure 20-51-39]**.

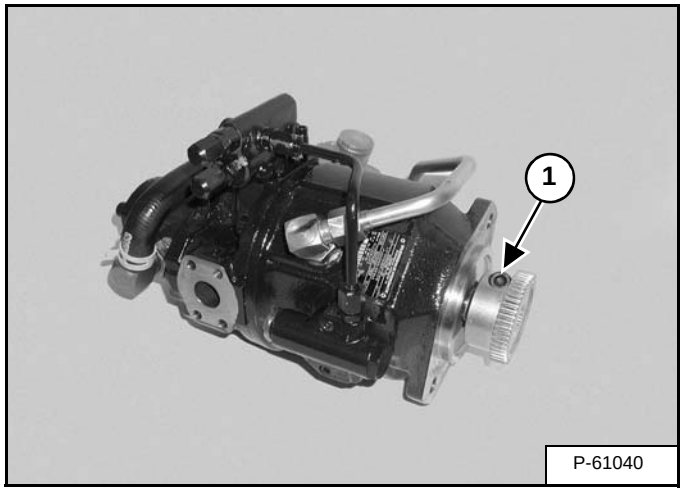
Separate the pump from the engine.

Remove the pump from the excavator.

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Coupler Removal And Installation

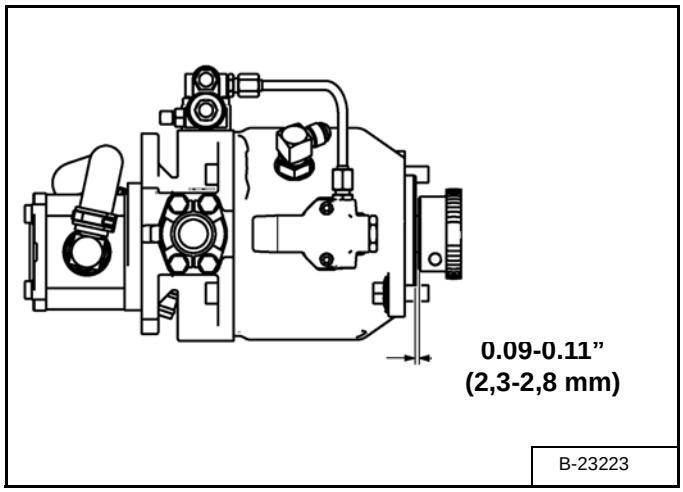
Figure 20-51-40



Remove the bolt (Item 1) **[Figure 20-51-40]** from the coupler. Slide the coupler off the pump shaft.

Installation: Tighten the bolt to 36 - 44 ft.-lb. (49 - 60 N•m) torque.

Figure 20-51-41



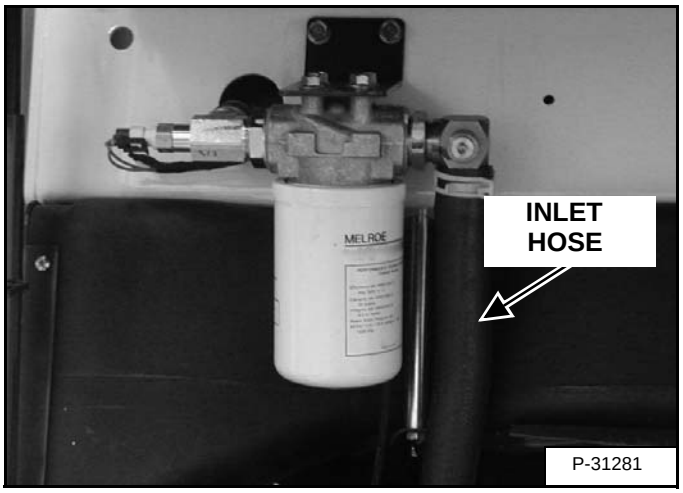
Installation: When installing the coupler, maintain a 0.09 - 0.11 in. (2,3 - 2,8 mm) gap from the pump mount flange to the coupler **[Figure 20-51-41]**.

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Hydraulic Pump Start Up

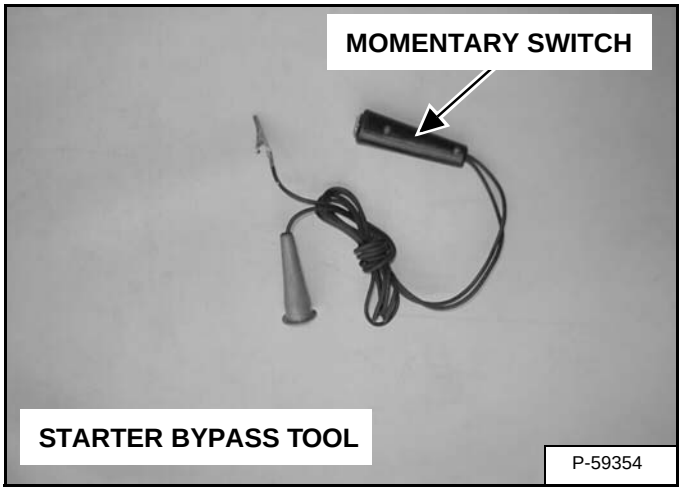
NOTE: This procedure is to prevent a dry start up of the hydraulic pump.

Figure 20-51-42



Disconnect the pump inlet hose connection at the filter head. Fill the pump inlet and hose completely with hydraulic fluid. Reconnect the hose **[Figure 20-51-42]**.

Figure 20-51-43



To crank the engine without starting, the machine key switch can be bypassed. Obtain a starter bypass tool from a local source which can be used as a universal connection to remotely crank the engine without starting **[Figure 20-51-43]**.

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

Figure 20-51-44

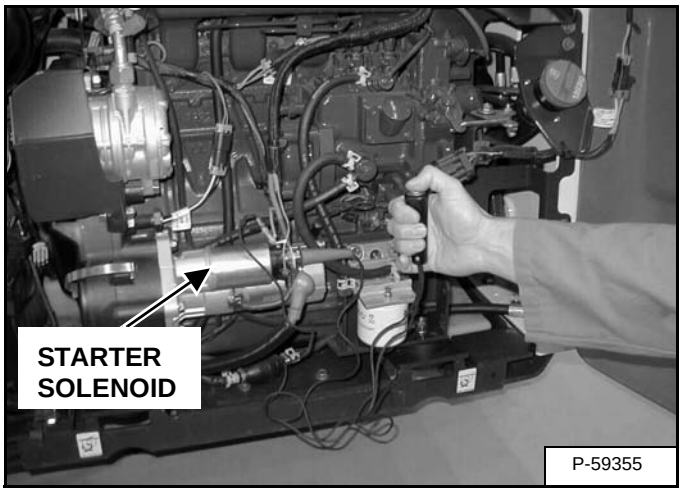
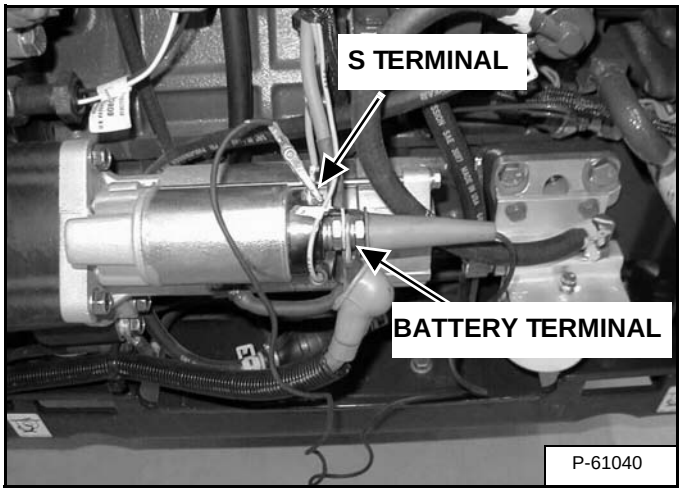


Figure 20-51-45



Connect the starter bypass tool to the starter solenoid battery terminal and S terminal. Crank the engine for 15 seconds, then stop for at least 30 seconds. Again, crank the engine for 15 seconds. Remove the starter bypass tool **[Figure 20-51-44]** & **[Figure 20-51-45]**.

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

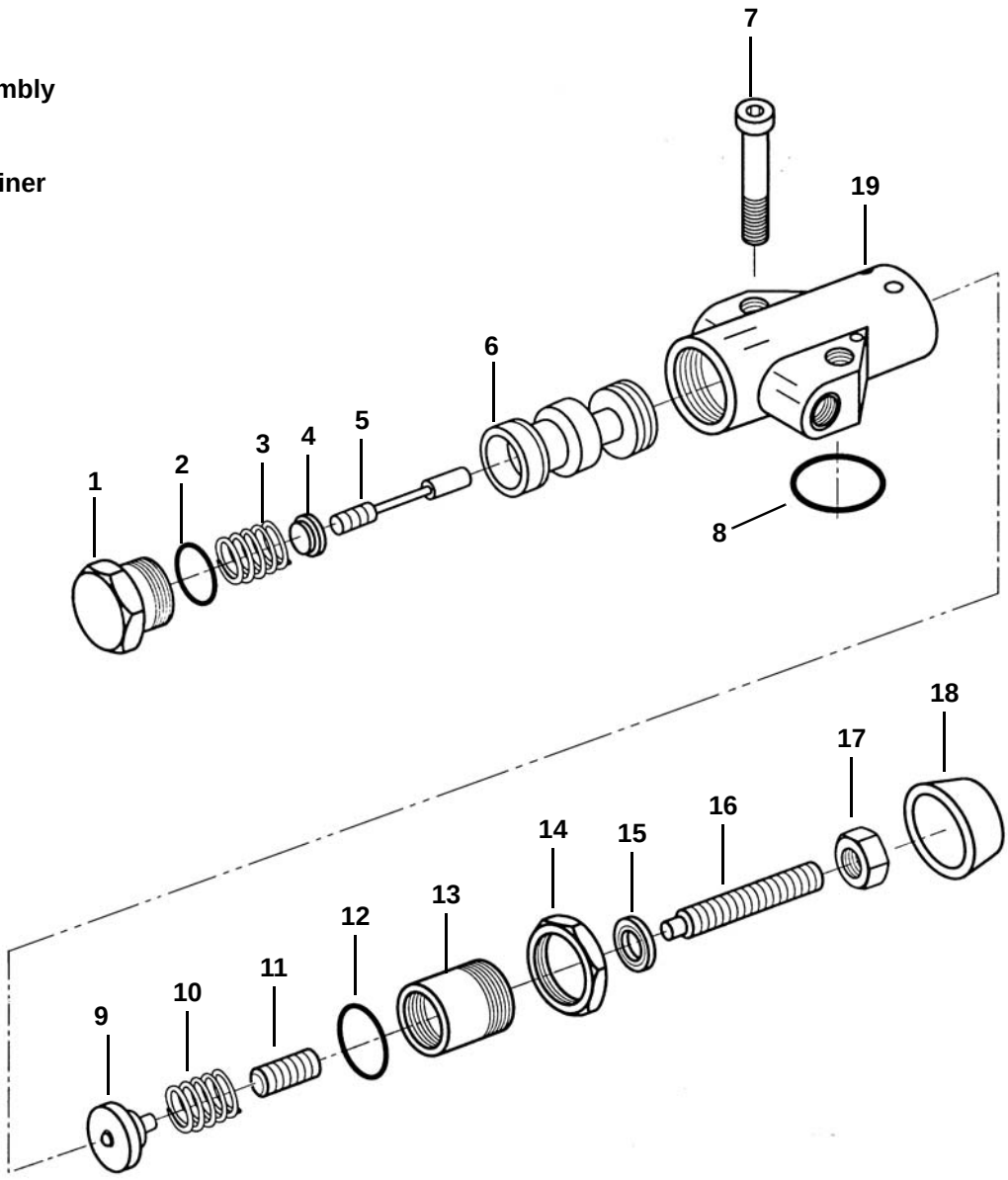
After operating the engine at low idle, operate the hydraulic systems several times or until air is purged from the system. **Avoid running over the relief valve setting at the end of cylinder stroke.**

With the excavator parked on a level surface and lift arms down, check and fill the hydraulic reservoir as required. Check for hydraulic leaks.

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Torque Limiter Valve Parts Identification

1. Plug
2. O-Ring
3. Spring
4. Spring Seat
5. Spool
6. Spool Assembly
7. Bolt
8. O-Ring
9. Spring Retainer
10. Spring
11. Spring
12. O-Ring
13. Body
14. Locknut
15. Washer
16. Screw
17. Nut
18. Cap
19. Housing



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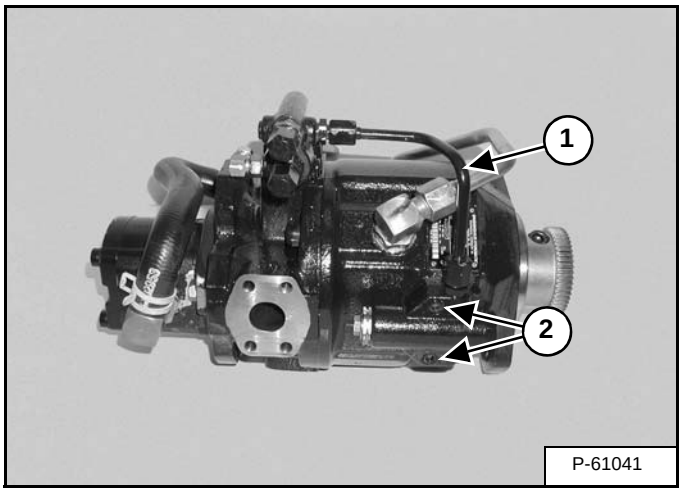
Torque Limiter Valve Removal

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 20-51-46



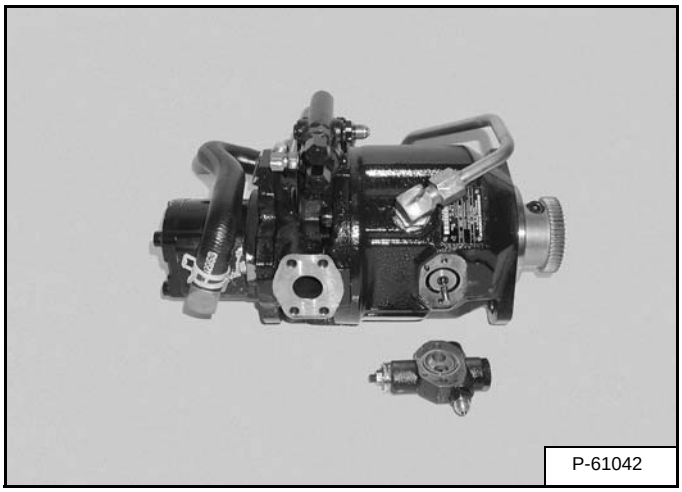
Remove the tubeline (Item 1) **[Figure 20-51-46]** from the pump control and torque limiter valve.

NOTE: Mark the tubeline for correct installation.

Remove the bolts (Item 2) **[Figure 20-51-46]** from the torque limiter valve.

Installation: Tighten the bolts to 7.0 - 7.5 ft.-lb. (9,5 - 10,5 N•m) torque.

Figure 20-51-47

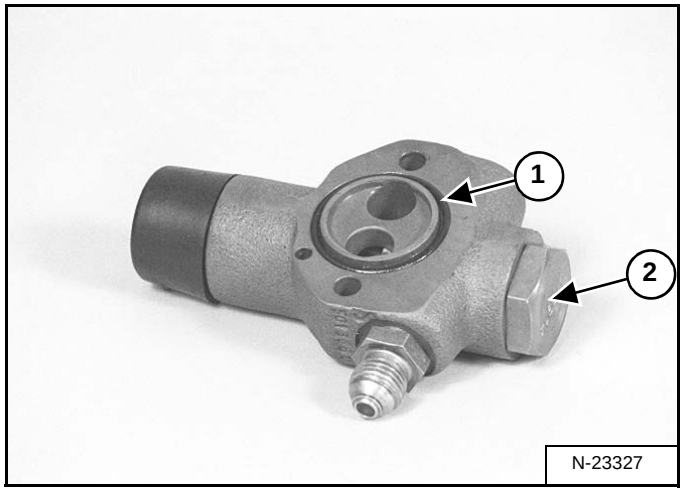


Using a screwdriver gently pry up on the torque limiter valve and remove it from the pump **[Figure 20-51-47]**.

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Torque Limiter Valve Disassembly

Figure 20-51-48



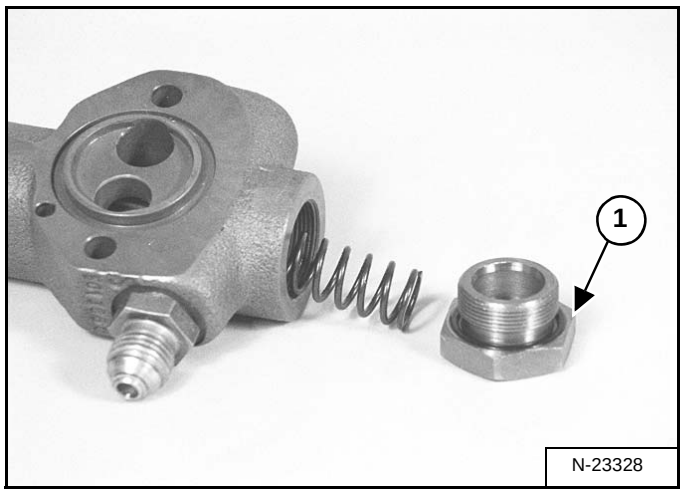
Remove the O-ring (Item 1) **[Figure 20-51-48]** from the torque limiter valve.

NOTE: Care should be taken not to scratch or damage the mounting surface on the housing.

NOTE: The plug (Item 2) [Figure 20-51-48] is under spring pressure.

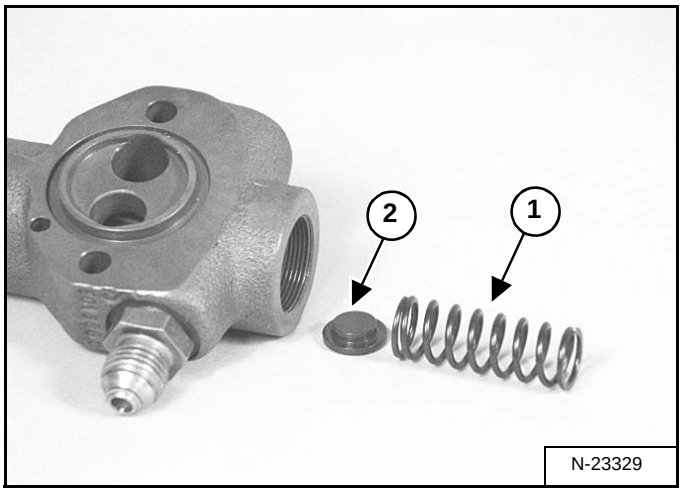
Remove the plug (Item 2) **[Figure 20-51-48]** from the torque limiter valve to relieve pressure on the torque limiter valve spool.

Figure 20-51-49



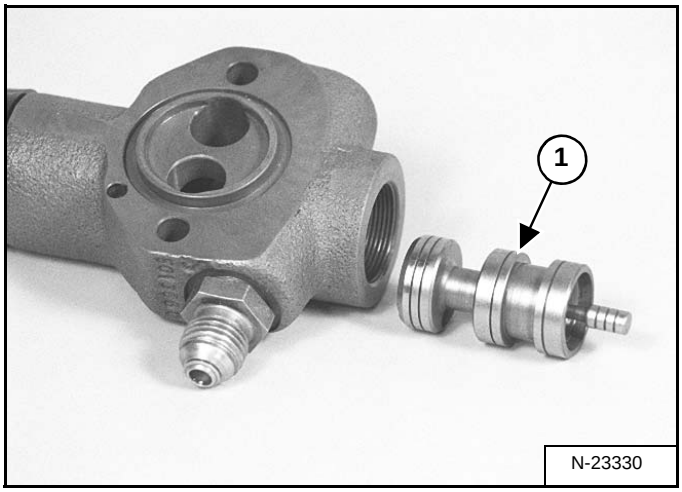
Remove the O-ring (Item 1) **[Figure 20-51-49]**.

Figure 20-51-50



Remove the spring (Item 1) and spring seat (Item 2) **[Figure 20-51-50]**.

Figure 20-51-51



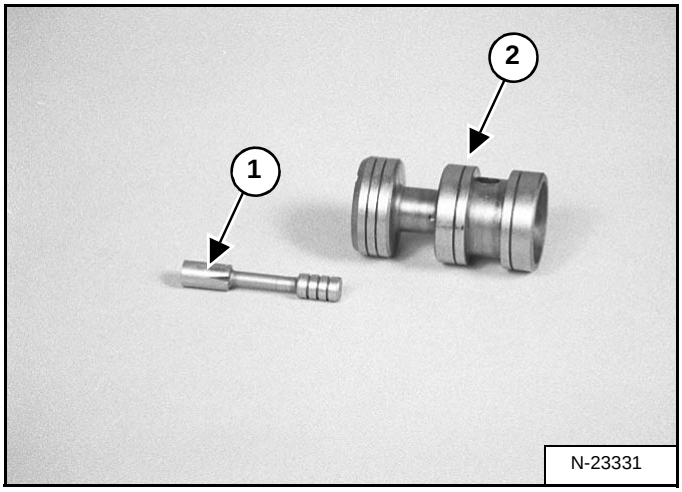
Remove the control spool assembly (Item 1) **[Figure 20-51-51]**.

NOTE: Use care not to scratch or damage the spool. Scratches in the spool can cause internal leakage.

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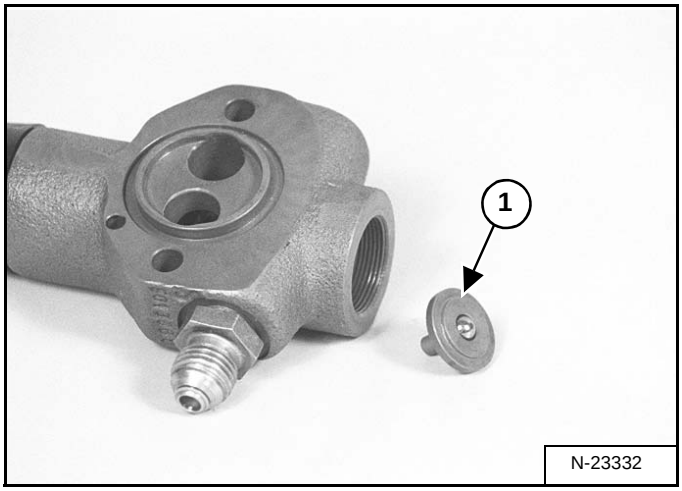
Torque Limiter Valve Disassembly (Cont'd)

Figure 20-51-52



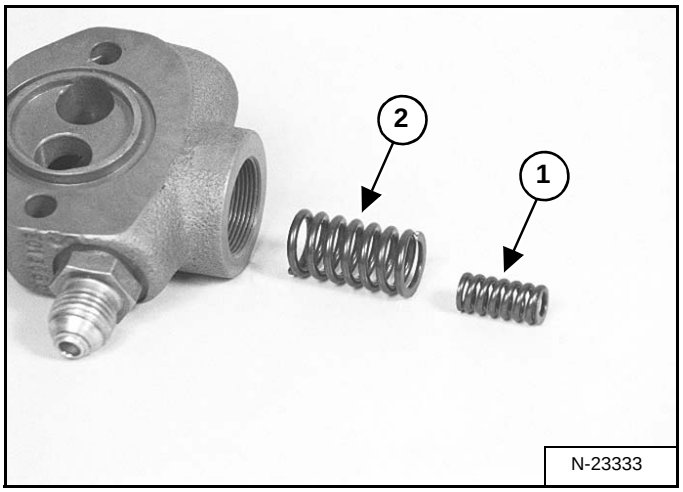
Remove the metering spool (Item 1) from the control spool (Item 2) **[Figure 20-51-52]**.

Figure 20-51-53



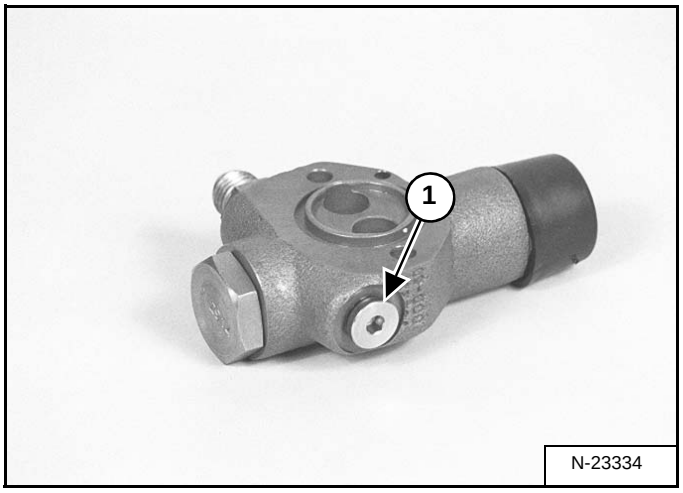
Remove the spring retainer (Item 1) **[Figure 20-51-53]** from the housing.

Figure 20-51-54



Remove the two springs (Items 1 & 2) **[Figure 20-51-54]**.

Figure 20-51-55

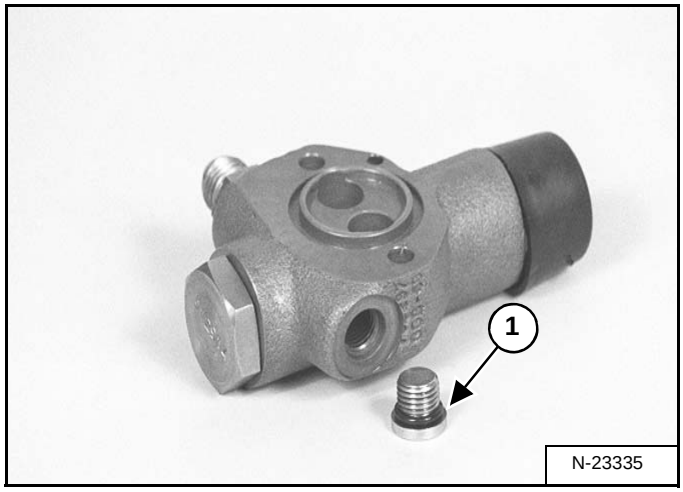


Remove the plug (Item 1) **[Figure 20-51-55]**.

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Torque Limiter Valve Disassembly (Cont'd)

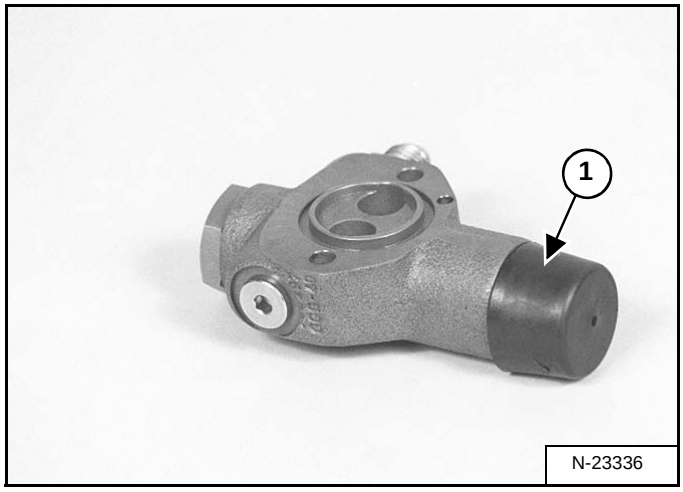
Figure 20-51-56



Remove the O-ring (Item 1) **[Figure 20-51-56]**.

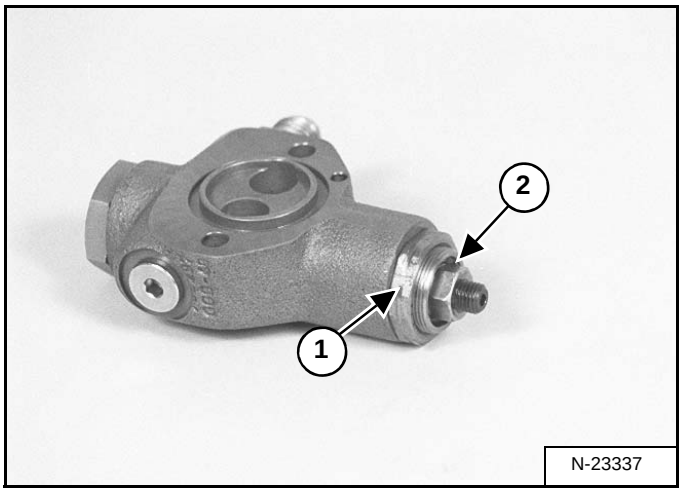
The following procedures are only used if the adjustment assembly is removed.

Figure 20-51-57



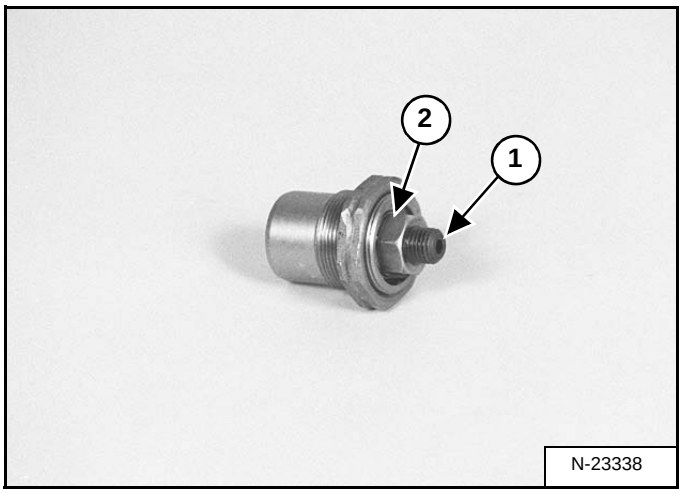
Remove the dust cap (Item 1) **[Figure 20-51-57]**. (If equipped)

Figure 20-51-58



Loosen the large nut (Item 1). With a 13 mm wrench on the small nut (Item 2) **[Figure 20-51-58]** remove the adjustment body from the housing.

Figure 20-51-59

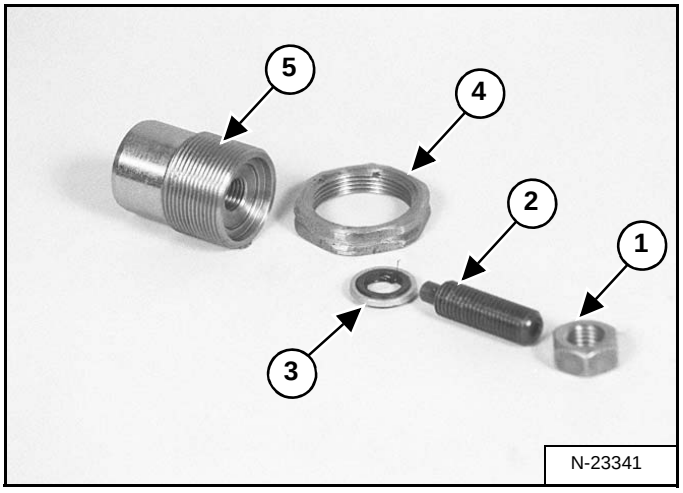


With an Allen wrench hold the adjustment bolt (Item 1) and loosen the nut (Item 2) **[Figure 20-51-59]**.

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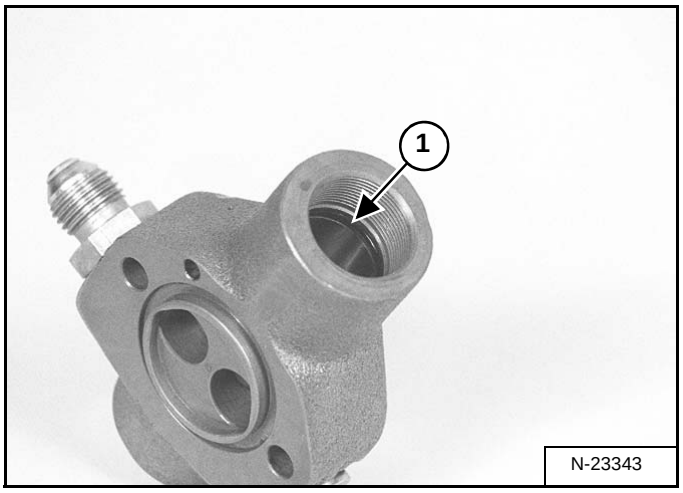
Torque Limiter Valve Disassembly (Cont'd)

Figure 20-51-60



Remove the nut (Item 1) adjustment bolt (Item 2) O-ring washer (Item 3) and large nut (Item 4) from the adjustment body (Item 5) **[Figure 20-51-60]**.

Figure 20-51-61



Remove the O-ring (Item 1) **[Figure 20-51-61]** from the housing.

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Torque Limiter Valve Assembly

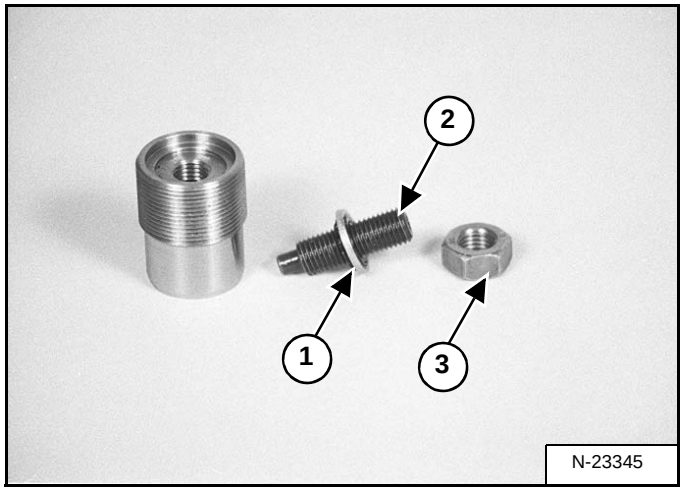
Clean all the parts in solvent and dry with compressed air.

Inspect seats and spools for wear.

Apply clean oil to new O-rings.

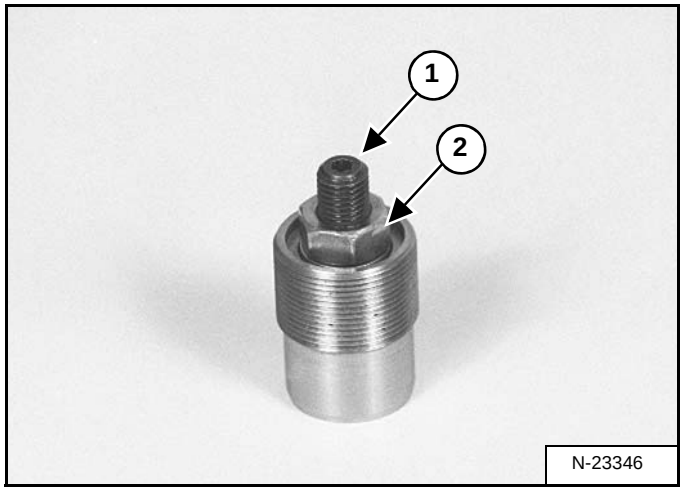
The following procedures are only used if the adjustment assembly is removed.

Figure 20-51-62



Install the O-ring washer (Item 1) on the adjustment screw (Item 2). Install the nut (Item 3) **[Figure 20-51-62]** on the adjustment screw.

Figure 20-51-63

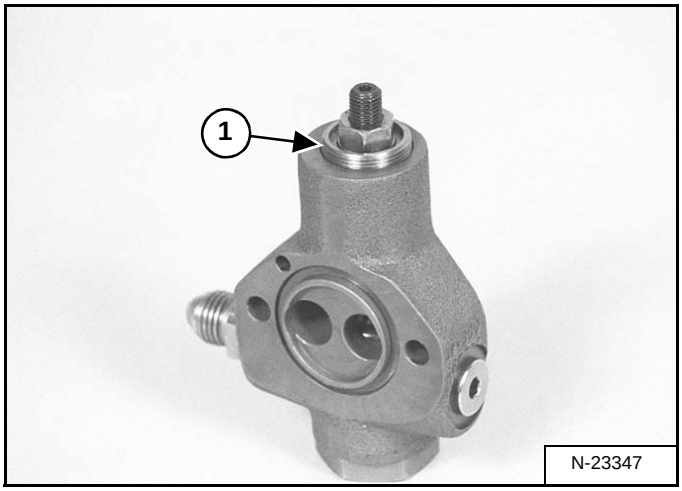


Install the adjustment screw (Item 1) and nut (Item 2) **[Figure 20-51-63]** into the adjustment body.

NOTE: Turn the adjustment screw into the adjustment body approximately six complete turns.

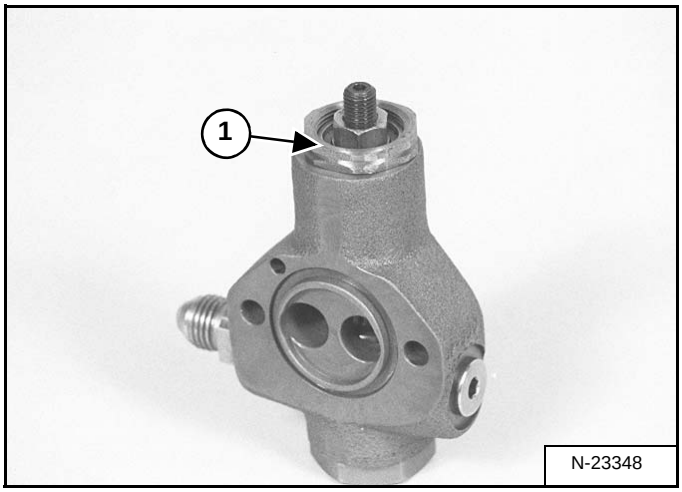
Hold the adjustment screw with an Allen wrench and tighten the nut (Item 2) **[Figure 20-51-63]**.

Figure 20-51-64



Install the adjustment body (Item 1) **[Figure 20-51-64]** and nut into the housing.

Figure 20-51-65

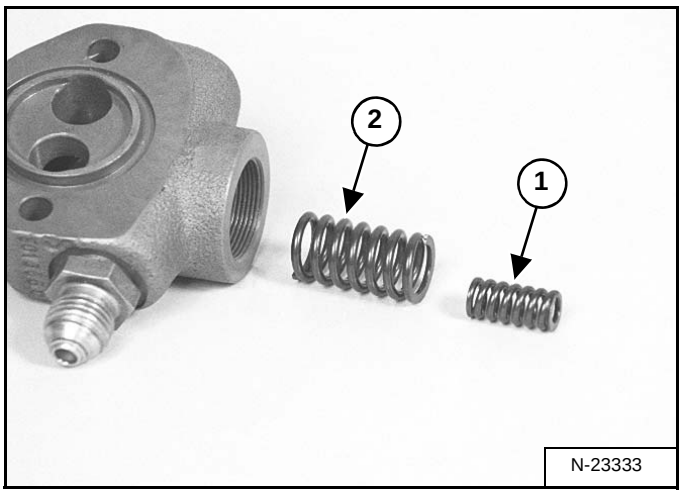


Install the large nut (Item 1) **[Figure 20-51-65]** and finger tighten.

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Torque Limiter Valve Assembly (Cont'd)

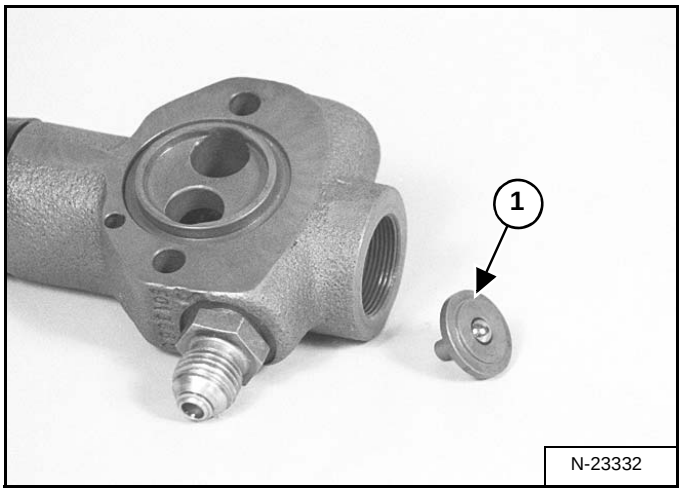
Figure 20-51-66



Install the two springs (Items 1 & 2) **[Figure 20-51-66]** in the housing.

NOTE: Install the big spring first and the small spring second.

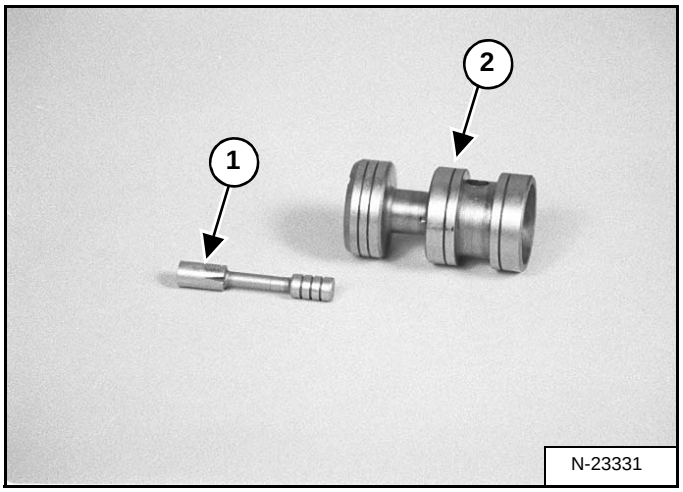
Figure 20-51-67



Install the spring retainer (Item 1) **[Figure 20-51-67]** in the housing with the ball side facing toward the control spool.

The opposite side of the spring retainer will fit inside the springs (Items 1 & 2) **[Figure 20-51-66]**.

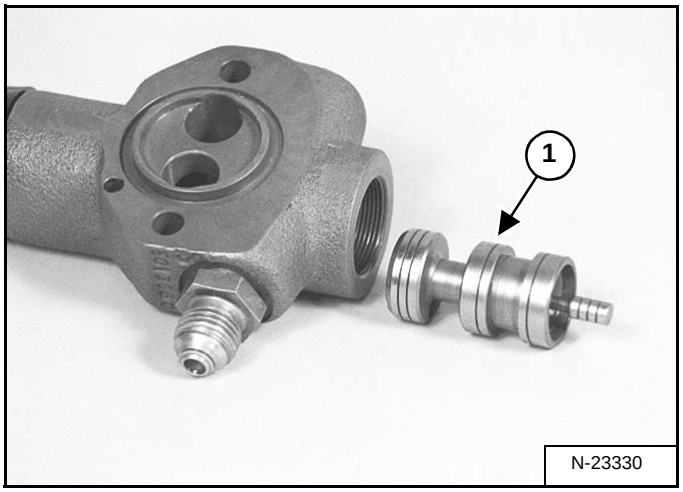
Figure 20-51-68



Put oil on the metering spool (Item 1) and install in the control spool (Item 2) **[Figure 20-51-68]**.

NOTE: The end of the metering spool with the three rings enters the control spool first.

Figure 20-51-69



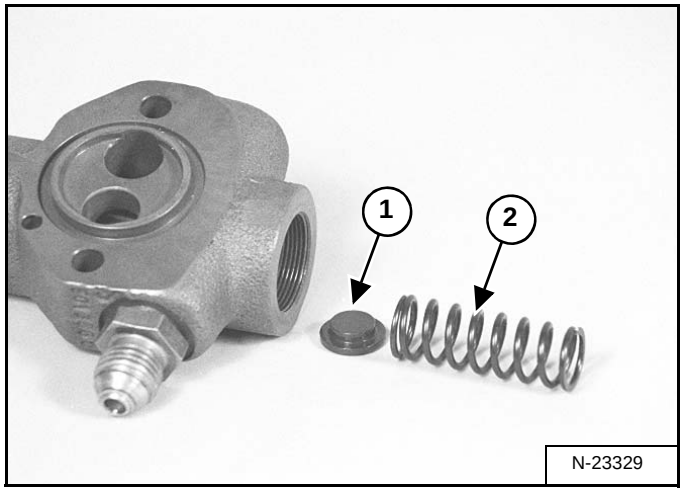
Put oil on the control spool assembly (Item 1) **[Figure 20-51-69]** and install it in the housing.

NOTE: Use care not to scratch or damage the spool (Item 1) [Figure 20-51-69]. Scratches in the spool can cause internal leakage.

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Torque Limiter Valve Assembly (Cont'd)

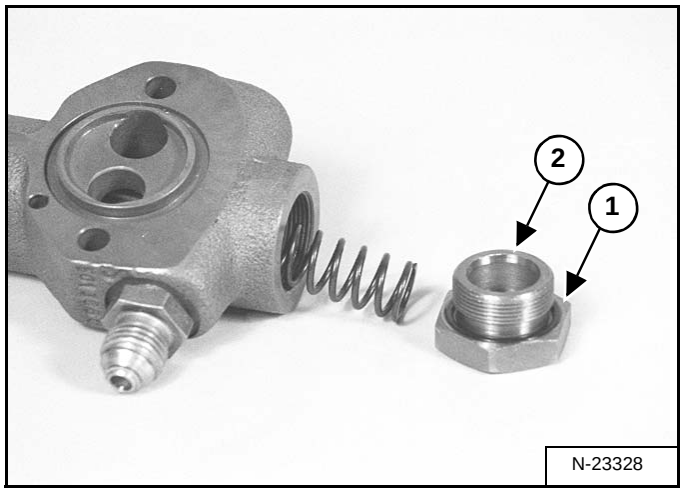
Figure 20-51-70



Install the spring guide (Item 1) **[Figure 20-51-70]** in the housing, with the smaller diameter end toward the spring.

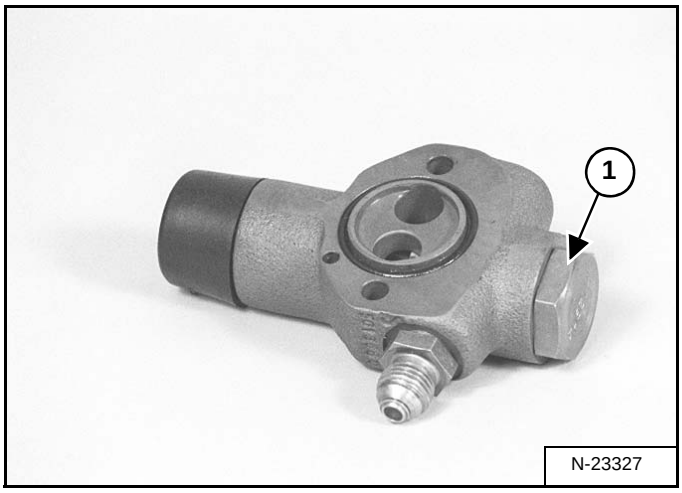
Install the spring (Item 2) **[Figure 20-51-70]** in the housing.

Figure 20-51-71



Install the O-ring (Item 1) on the plug (Item 2) **[Figure 20-51-71]**.

Figure 20-51-72



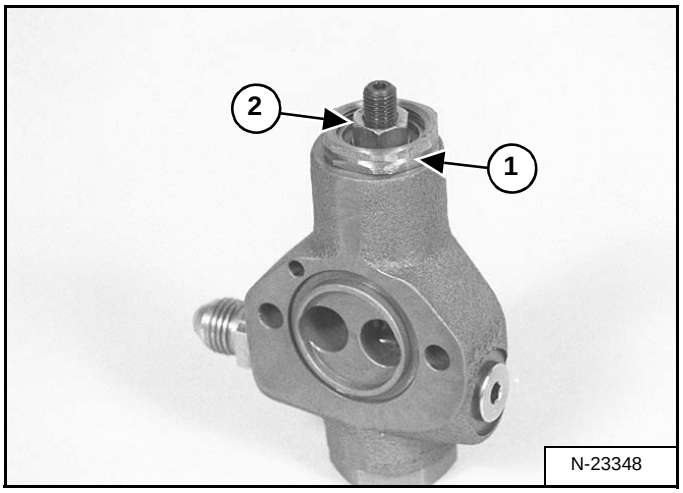
Install the plug (Item 1) **[Figure 20-51-72]**.

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Initial Torque Limiter Valve Setting

Use the following procedure to set the torque limiter valve after being disassembled and assembled.

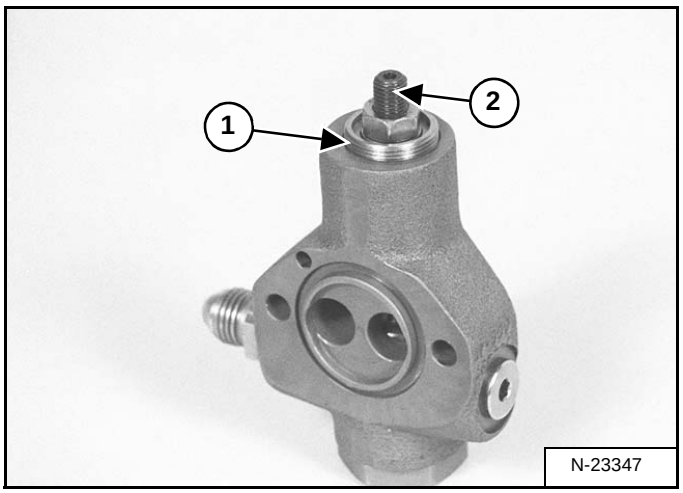
Figure 20-51-73



Remove the large nut (Item 1) **[Figure 20-51-73]**.

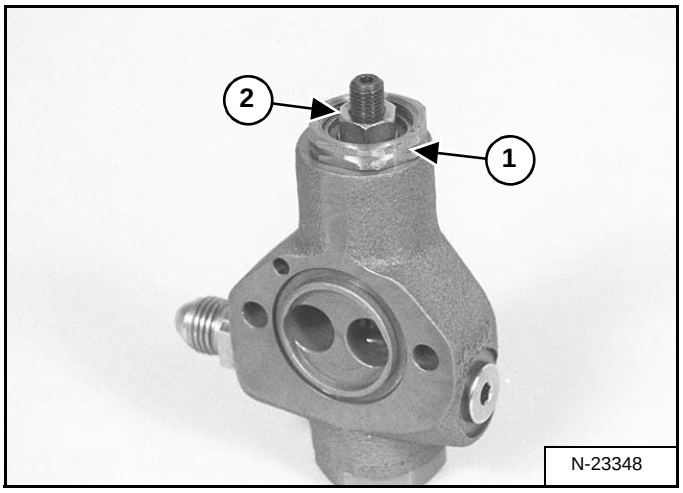
Lock the small nut (Item 2) **[Figure 20-51-73]**.

Figure 20-51-74



Both the large (Item 1) and small (Item 2) adjusting screws must be lightly bottomed out in the valve. The large adjustment screw (Item 1) **[Figure 20-51-74]** must be bottomed out (just touching) first, make sure the small adjustment screw is turned out a small amount so it will not hit first.

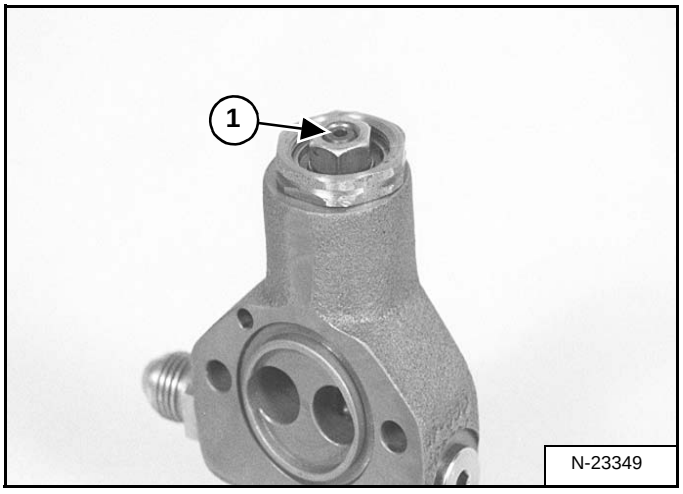
Figure 20-51-75



After the large adjustment screw is just seated, tighten the large nut (Item 1) **[Figure 20-51-75]**.

Loosen the small nut (Item 2) **[Figure 20-51-75]**.

Figure 20-51-76



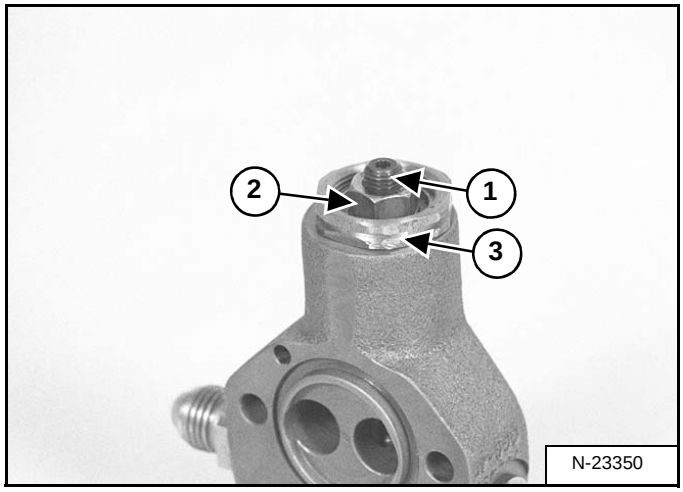
Turn the small adjustment screw (Item 1) **[Figure 20-51-76]** in until it bottoms in the valve.

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HYDRAULIC PUMP (S/N 563111001 & ABOVE AND 563211001 & ABOVE) (CONT'D)

Initial Torque Limiter Valve Setting (Cont'd)

Figure 20-51-77

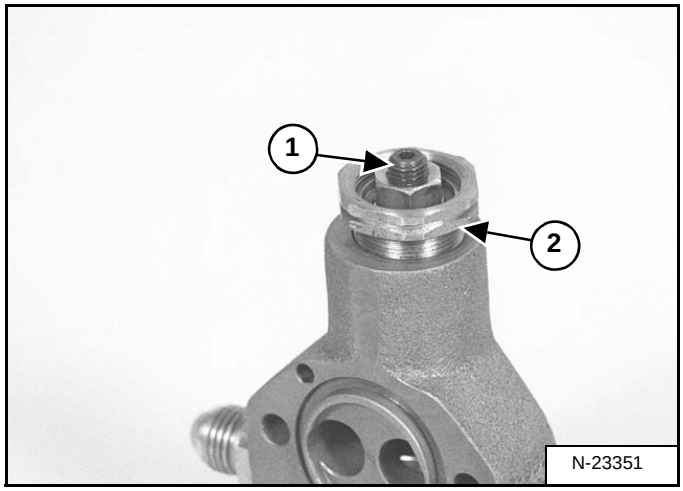


Back out the small adjustment screw (Item 1) **[Figure 20-51-77]** 10-1/4 turns.

Tighten the small nut (Item 2) **[Figure 20-51-77]**.

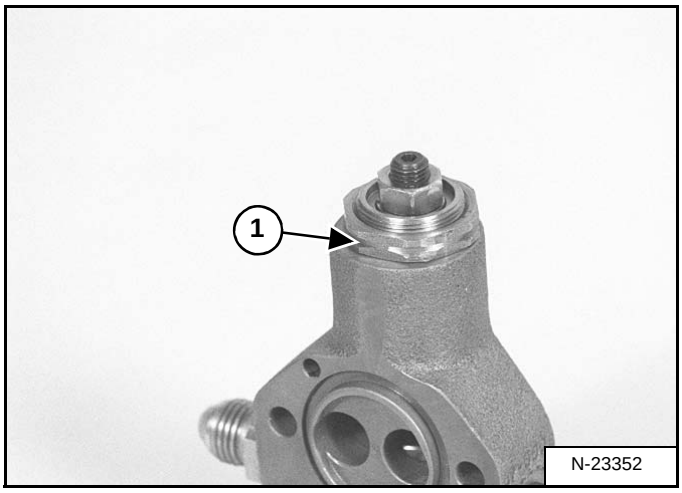
Loosen the large nut (Item 3) **[Figure 20-51-77]**.

Figure 20-51-78



With an Allen wrench in the small adjustment screw (Item 1) back out the large adjustment screw (Item 2) **[Figure 20-51-78]** 5-3/4 turns.

Figure 20-51-79



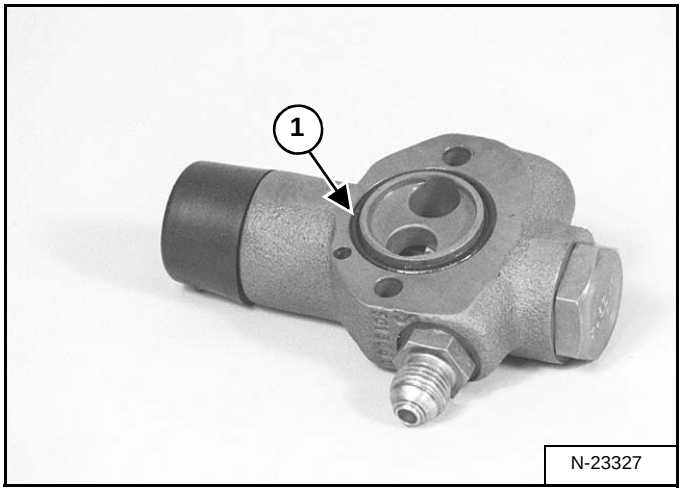
Tighten the large nut (Item 1) **[Figure 20-51-79]**.

This is the initial adjustment to the torque limiter valve.

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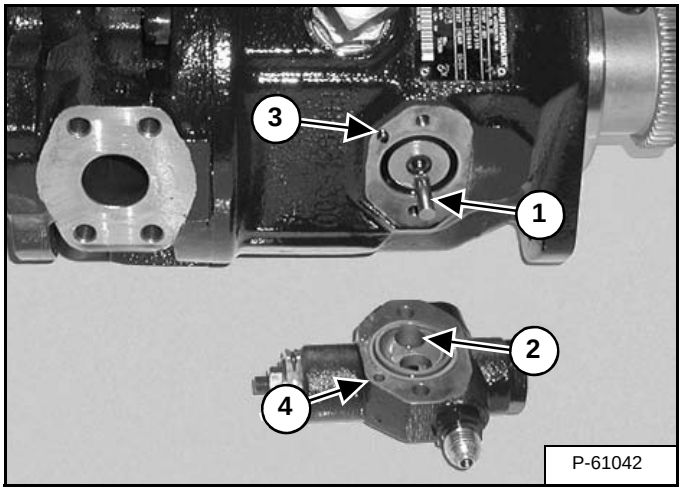
Torque Limiter Valve Installation

Figure 20-51-80



Install the O-ring (Item 1) **[Figure 20-51-80]** on the torque limiter valve.

Figure 20-51-81



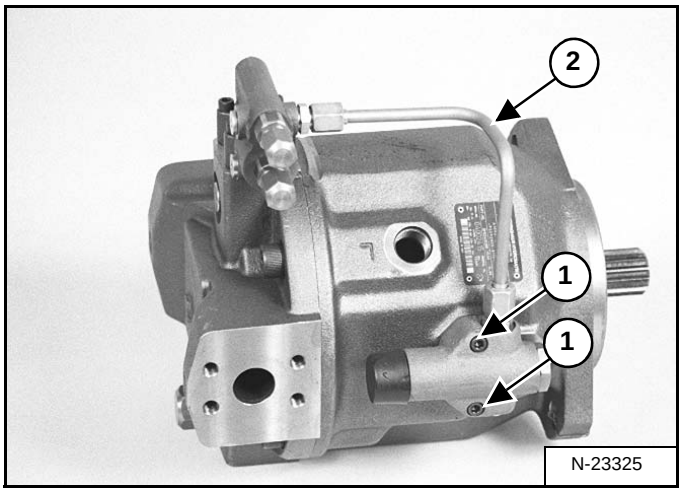
Align the linkage pin (Item 1) on the hydraulic piston pump into the hole (Item 2) **[Figure 20-51-81]** in the torque limiter valve.

Turn the valve slightly to align the dowel pin (Item 3) on the hydraulic piston pump into the hole (Item 4) **[Figure 20-51-81]** in the torque limiter valve. Apply pressure to the valve to compress the spring.

NOTE: Care should be taken not to scratch or damage the valve spool.

NOTE: Before tightening the bolts, make sure the dowel pin is aligned with the housing.

Figure 20-51-82



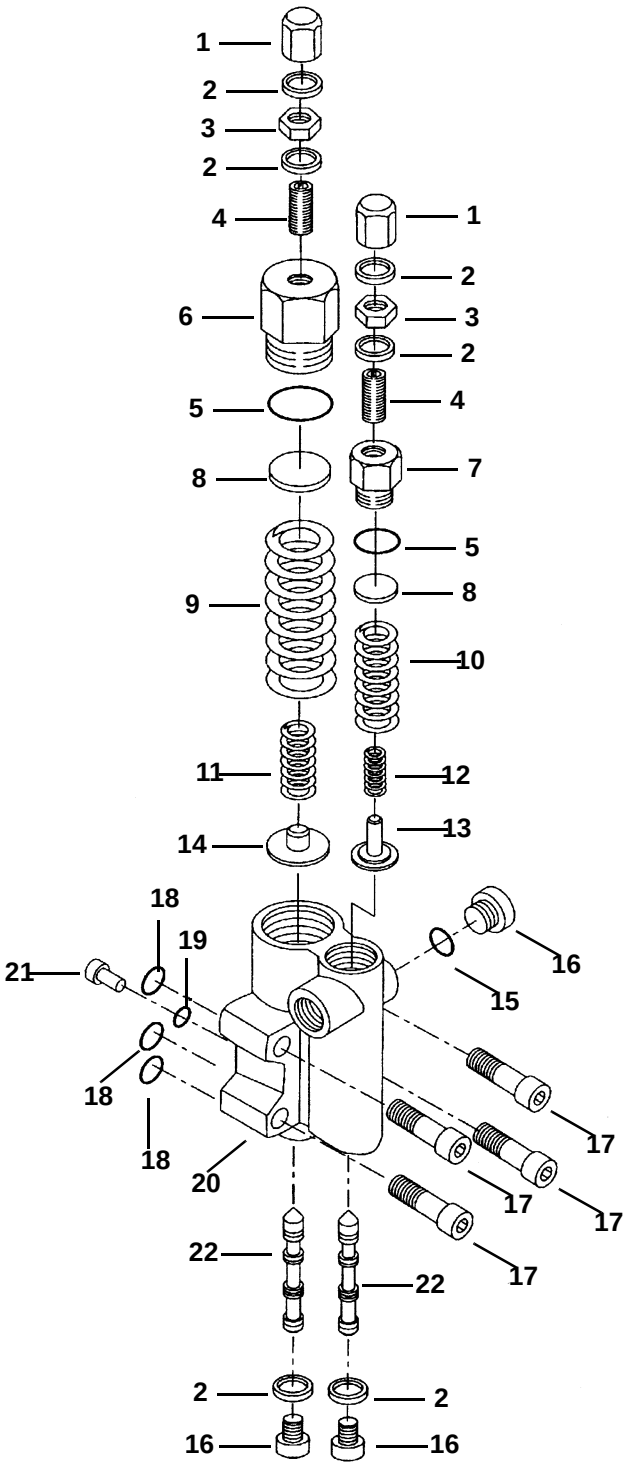
Install and tighten the bolts (Item 1) **[Figure 20-51-82]** to 7.0 - 7.5 ft. lb. (9,5 - 10,5 N•m) torque.

Install the tubeline (Item 2) **[Figure 20-51-82]**.

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Pump Control Parts Identification

1. Cap (Early Models Only)
2. O-Ring Washer (Early Models Only)
3. Jam Nut
4. Adjusting Screw
5. O-Ring
6. Adjustment Assembly
7. Adjustment Assembly
8. Disc
9. Spring
10. Spring
11. Spring
12. Spring
13. Spring Retainers
14. Spring Retainers
15. O-Ring
16. Plug
17. Bolt
18. O-Ring
19. O-Ring
20. Housing
21. Orifice
22. Spool

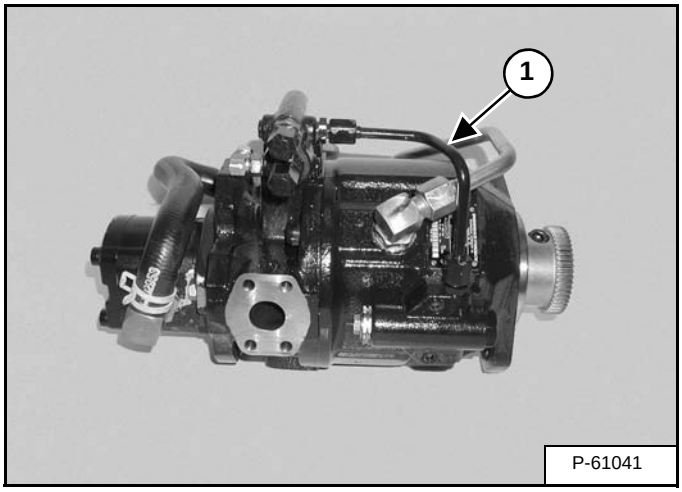


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Pump Control Removal And Installation

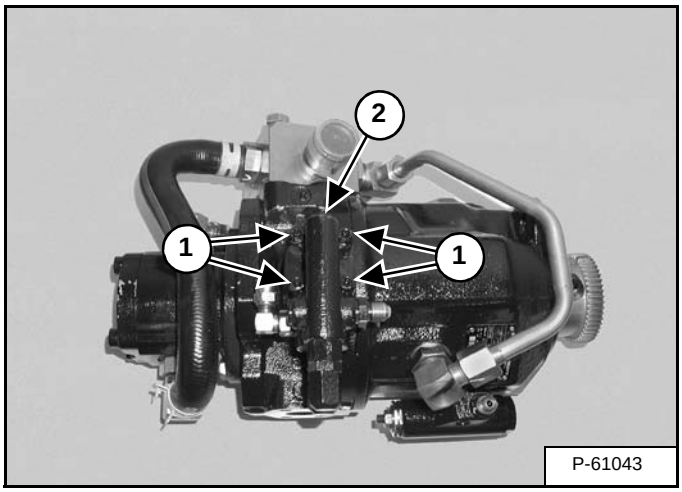
Figure 20-51-83



Mark the tubeline (Item 1) **[Figure 20-51-83]** for correct assembly.

Remove the tubeline (Item 1) **[Figure 20-51-83]** from the pump control and torque limiter valve.

Figure 20-51-84

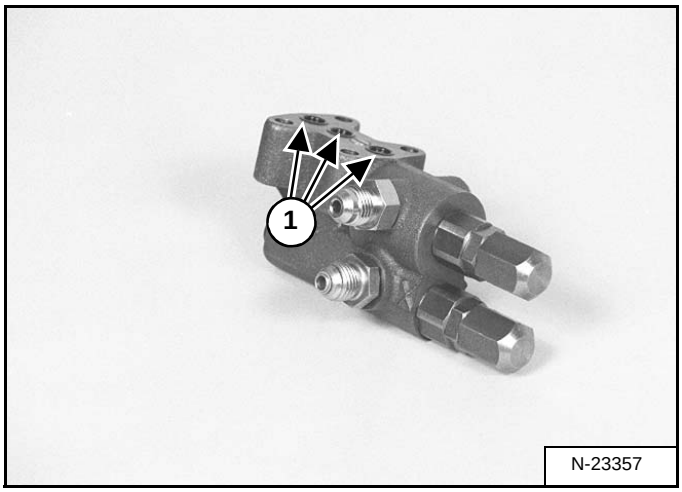


Remove the bolts (Item 1) and pump control (Item 2) **[Figure 20-51-84]** from the hydraulic piston pump.

Installation: Tighten the bolts to 10 ft.-lb. (13 N•m) torque.

Pump Control Disassembly And Assembly

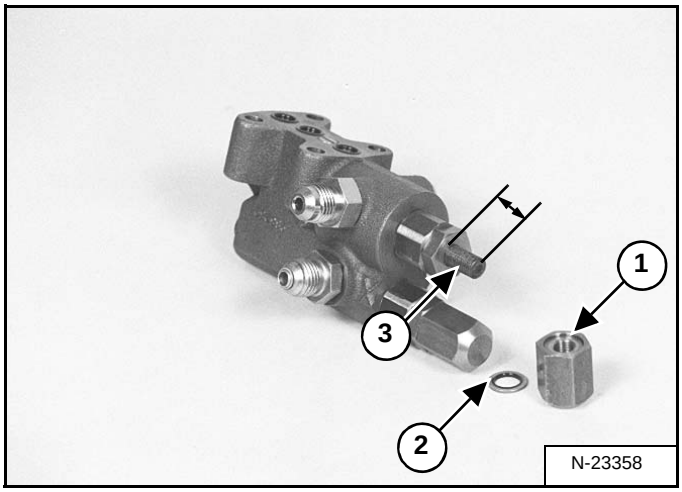
Figure 20-51-85



Remove the O-rings (Item 1) **[Figure 20-51-85]** from the valve.

Pump Margin Control

Figure 20-51-86



Before disassembling the pump margin control, remove the cap (Item 1) and O-ring washer (Item 2) **[Figure 20-51-86]** from the adjustment assembly.

NOTE: Early model shown. Later models do not have the caps and washers.

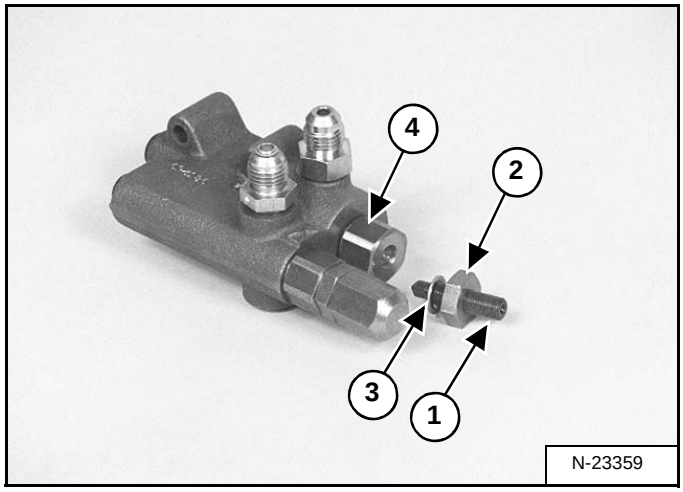
Measure the adjustment screw (Item 3) **[Figure 20-51-86]**, thread length for the correct initial adjustment.

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Pump Control Disassembly And Assembly (Cont'd)

Pump Margin Control (Cont'd)

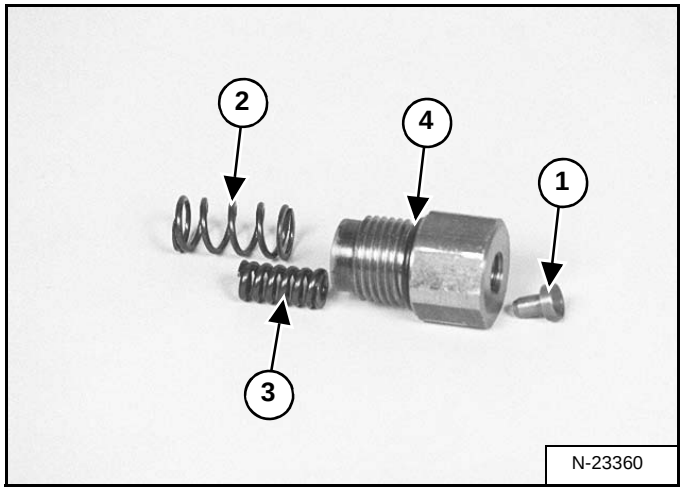
Figure 20-51-87



Remove the adjustment screw (Item 1) nut (Item 2), and O-ring washer (Item 3) from the adjustment assembly (Item 4) **[Figure 20-51-87]**.

Remove the adjustment assembly (Item 4) **[Figure 20-51-87]** from the housing.

Figure 20-51-88

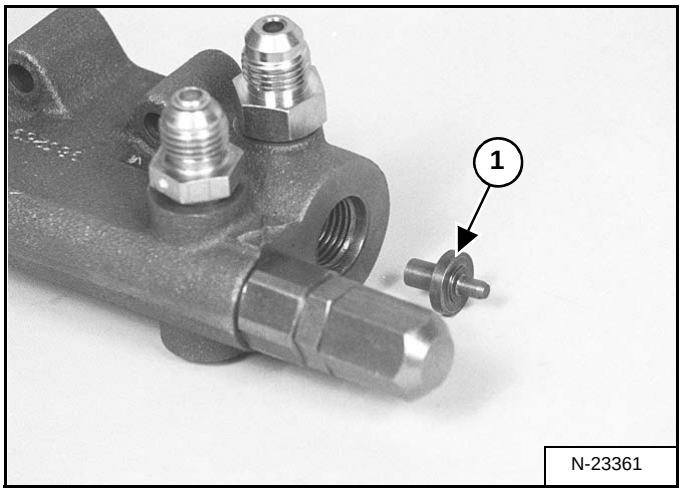


Remove the adjustment seat (Item 1) **[Figure 20-51-88]** from the adjustment assembly.

Remove the large spring (Item 2) and the small spring (Item 3) **[Figure 20-51-88]** from the adjustment assembly.

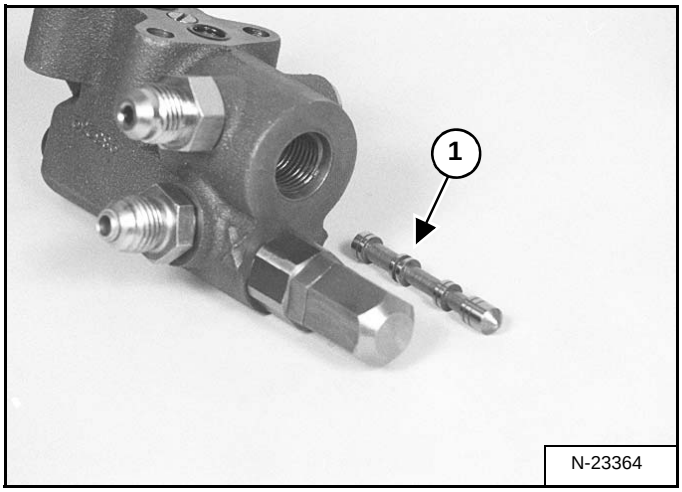
Remove the O-ring (Item 4) **[Figure 20-51-88]**.

Figure 20-51-89



Remove the spring guide (Item 1) **[Figure 20-51-89]** from the housing.

Figure 20-51-90



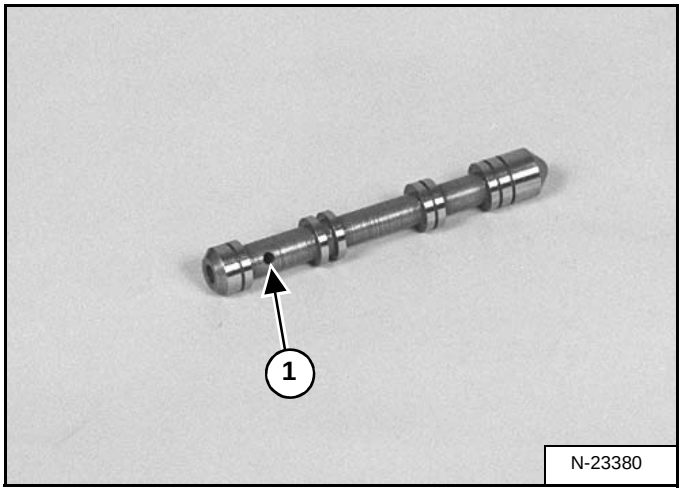
Remove the spool (Item 1) **[Figure 20-51-90]** from the pump control assembly.

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Pump Control Disassembly And Assembly (Cont'd)

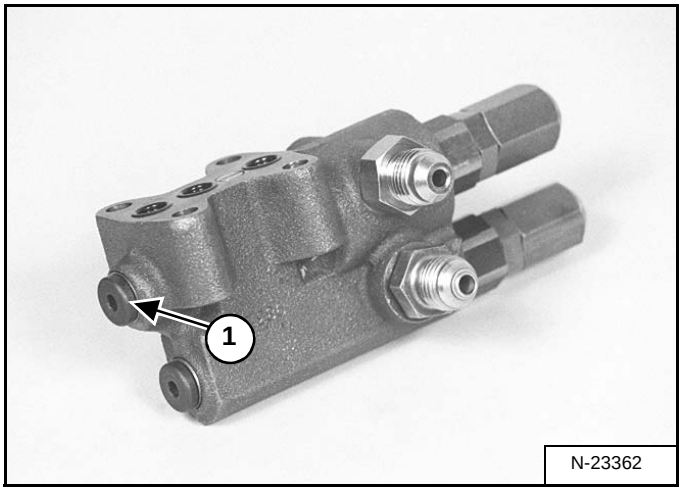
Pump Margin Control (Cont'd)

Figure 20-51-91



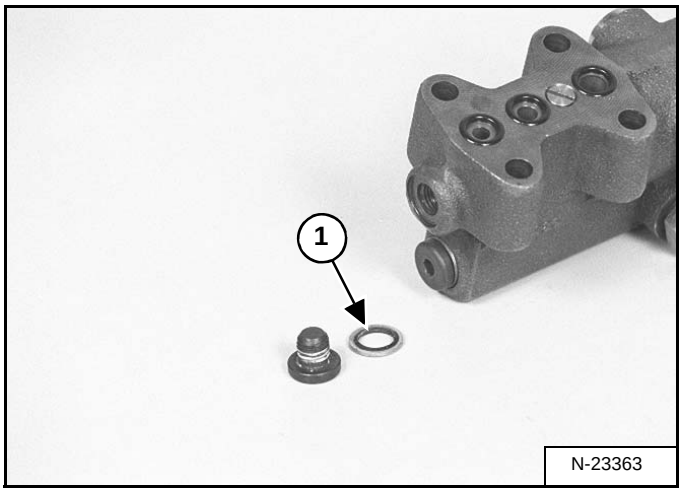
Check the spool for scratches and be sure the orifice (Item 1) **[Figure 20-51-91]** is not plugged.

Figure 20-51-92



Remove the plug (Item 1) **[Figure 20-51-92]**.

Figure 20-51-93



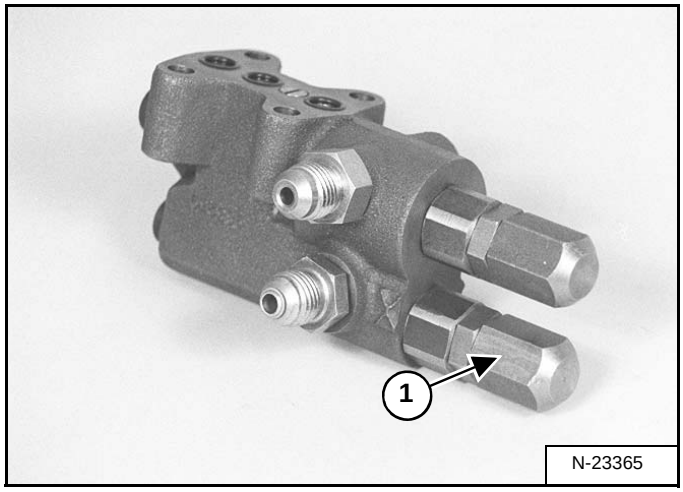
Remove the O-ring washer (Item 1) **[Figure 20-51-93]**.

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Pump Control Disassembly And Assembly (Cont'd)

Torque Limiter Supply Control

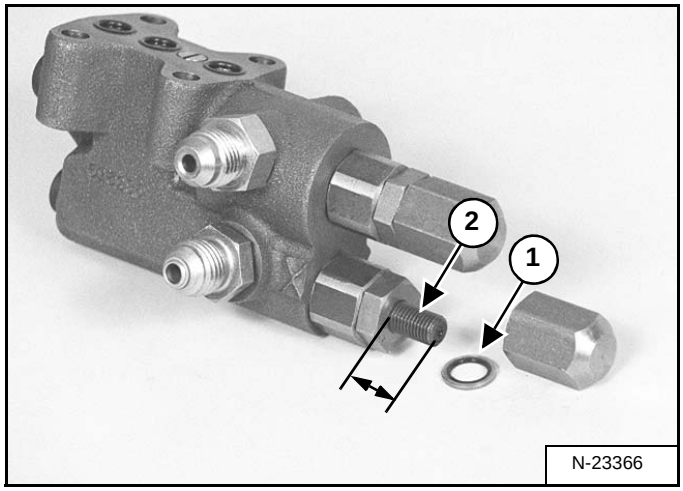
Figure 20-51-94



Remove the cap (Item 1) **[Figure 20-51-94]**.

NOTE: Early model shown. Later models do not have the caps and washers.

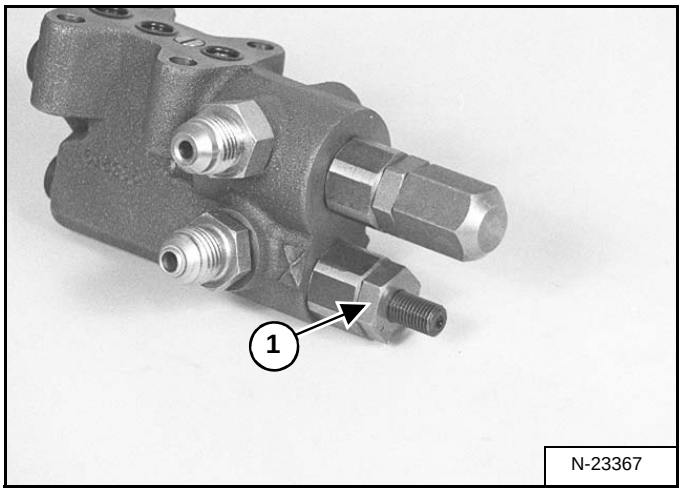
Figure 20-51-95



Before disassembling the torque limiter supply control, remove the O-ring washer (Item 1) **[Figure 20-51-95]** from the adjustment assembly.

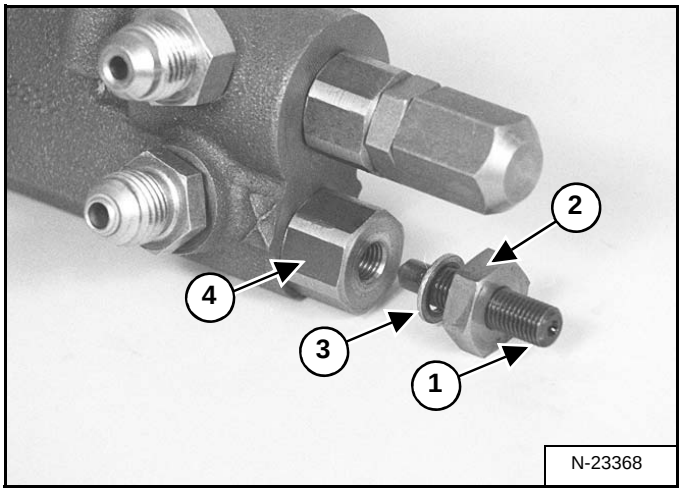
Measure the adjustment screw (Item 2) **[Figure 20-51-95]**, thread length for the correct initial adjustment.

Figure 20-51-96



Loosen the nut (Item 1) **[Figure 20-51-96]**.

Figure 20-51-97



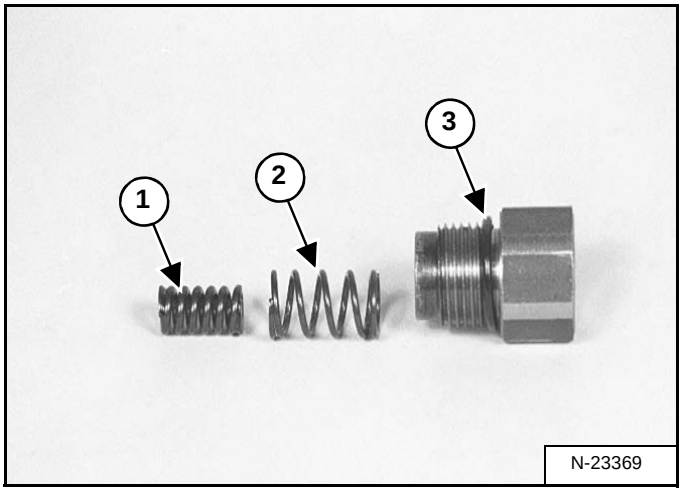
Remove the adjustment screw (Item 1), nut (Item 2), and O-ring washer (Item 3) from the adjustment assembly (Item 4) **[Figure 20-51-97]**.

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Pump Control Disassembly And Assembly (Cont'd)

Torque Limiter Supply Control (Cont'd)

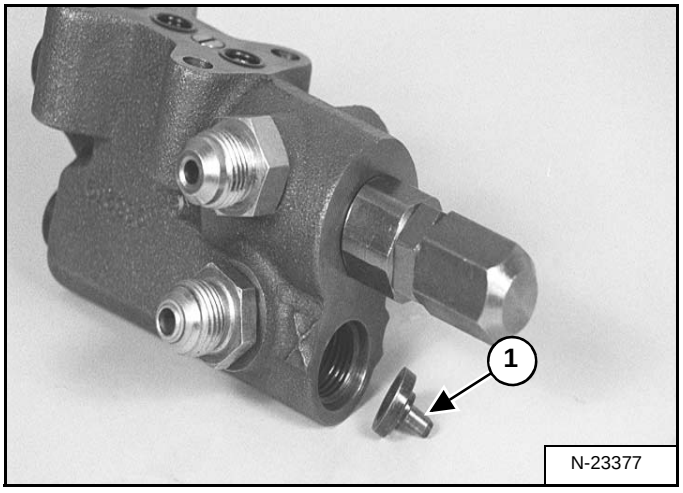
Figure 20-51-98



Remove the small spring (Item 1) and the large spring (Item 2) **[Figure 20-51-98]** from the adjustment assembly.

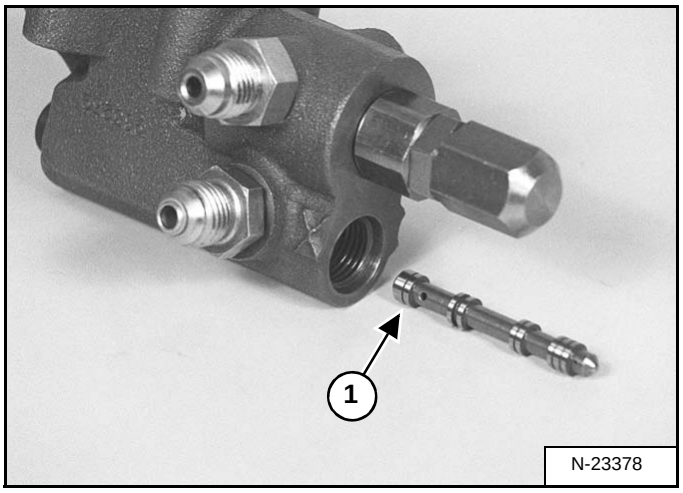
Remove the O-ring (Item 3) **[Figure 20-51-98]**.

Figure 20-51-99



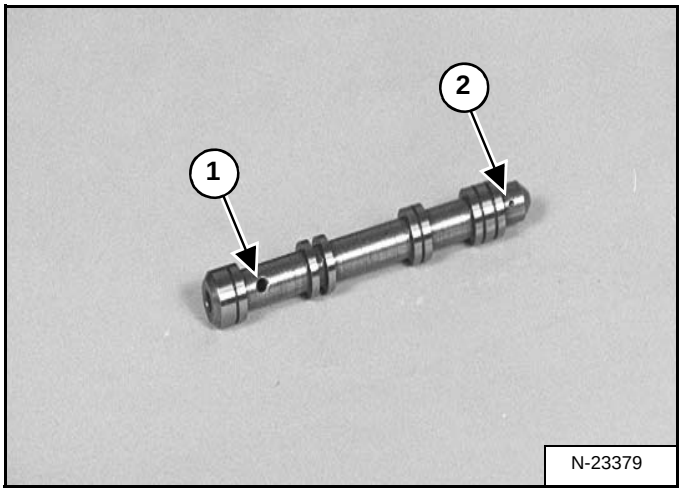
Remove the spring guide (Item 1) **[Figure 20-51-99]**.

Figure 20-51-100



Remove the spool (Item 1) **[Figure 20-51-100]**.

Figure 20-51-101



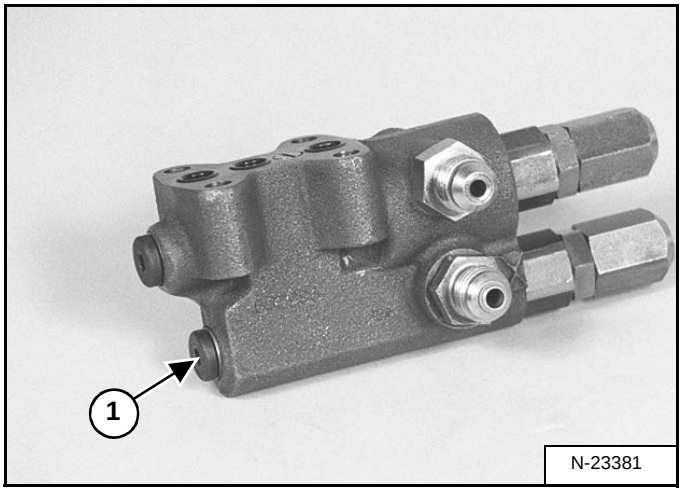
Check the spool for scratches and be sure the orifice (Items 1 & 2) **[Figure 20-51-101]** are not plugged.

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Pump Control Disassembly And Assembly (Cont'd)

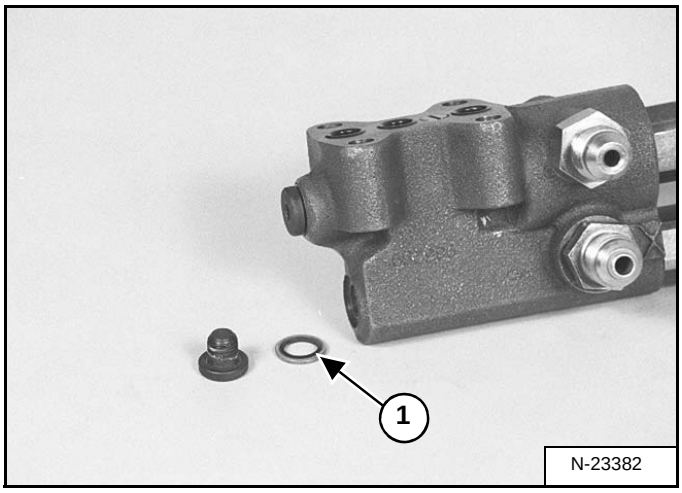
Torque Limiter Supply Control (Cont'd)

Figure 20-51-102



Remove the plug (Item 1) **[Figure 20-51-102]**.

Figure 20-51-103

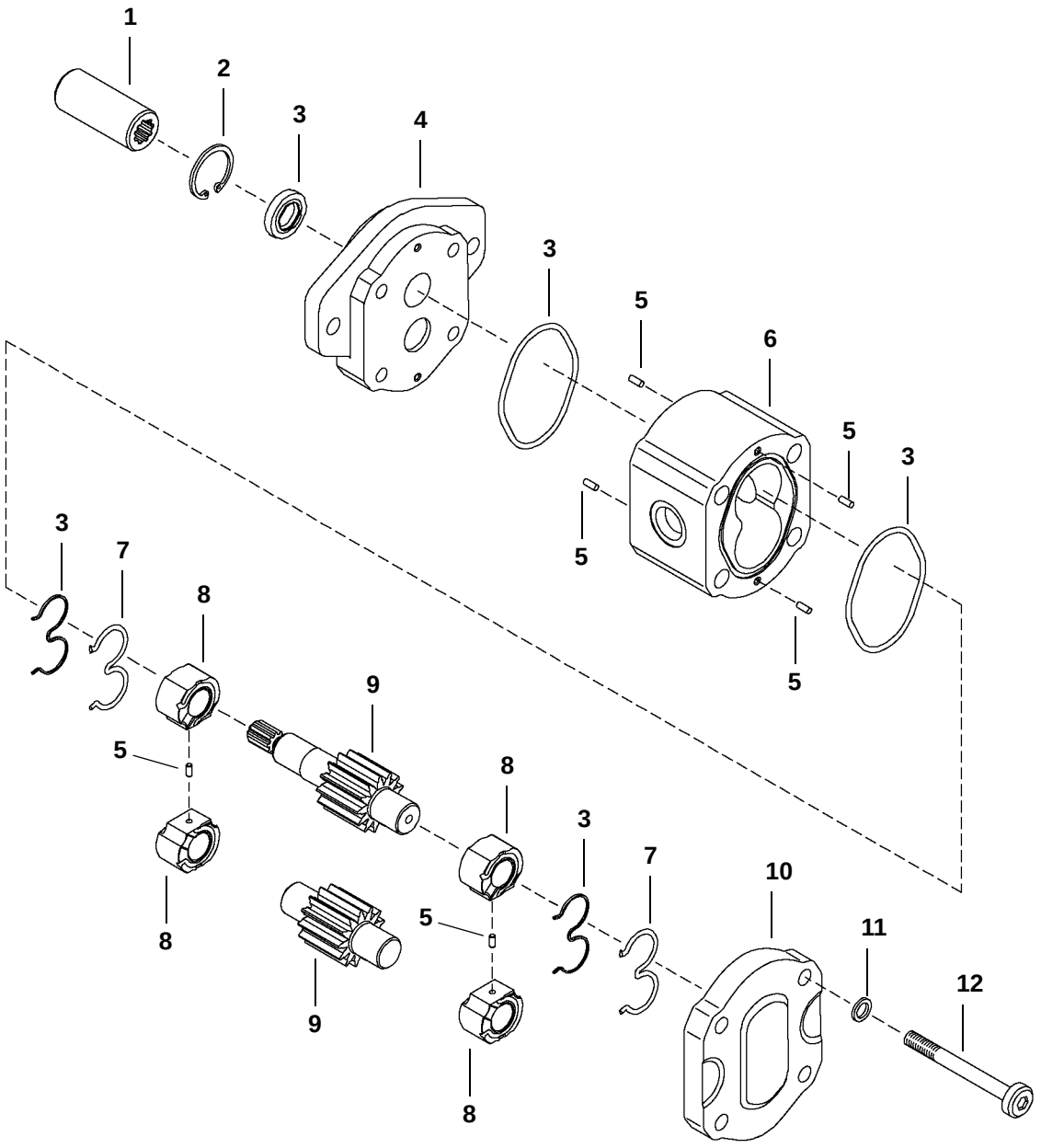


Remove the O-ring washer (Item 1) **[Figure 20-51-103]**.

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Parts Identification

1. Coupler
2. Snap Ring
3. Seal
4. Mount Flange
5. Dowel Pin
6. Housing
7. Back-up Ring
8. Bearing
9. Gear
10. End Cap
11. Washer
12. Bolt

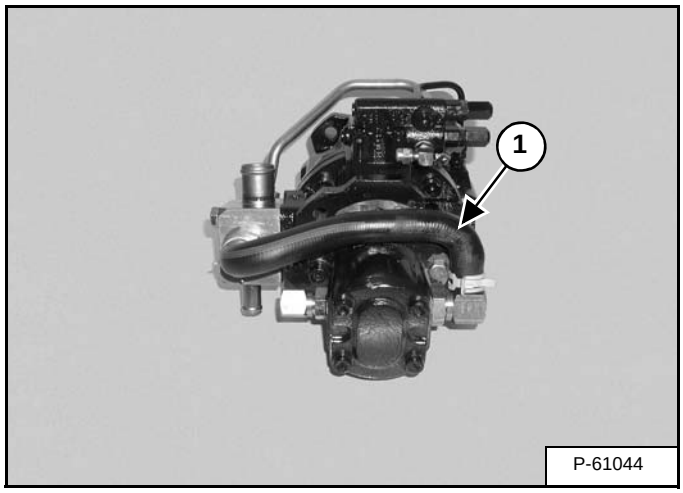


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Gear Pump Removal And Installation

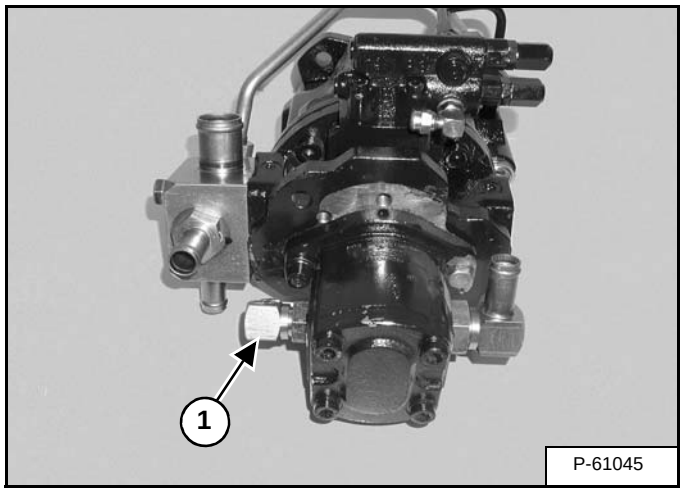
Remove the hydraulic pump from the excavator. (See Removal And Installation on Page 20-51-16)

Figure 20-51-104



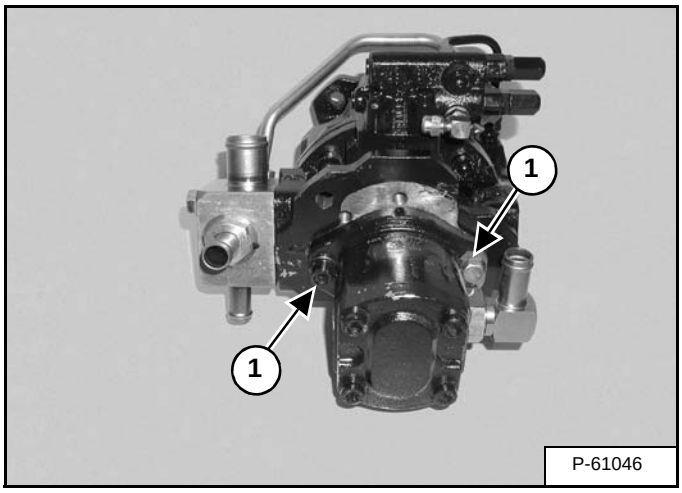
Remove the hose (Item 1) **[Figure 20-51-104]**.

Figure 20-51-105



Remove the fitting (Item 1) **[Figure 20-51-105]**.

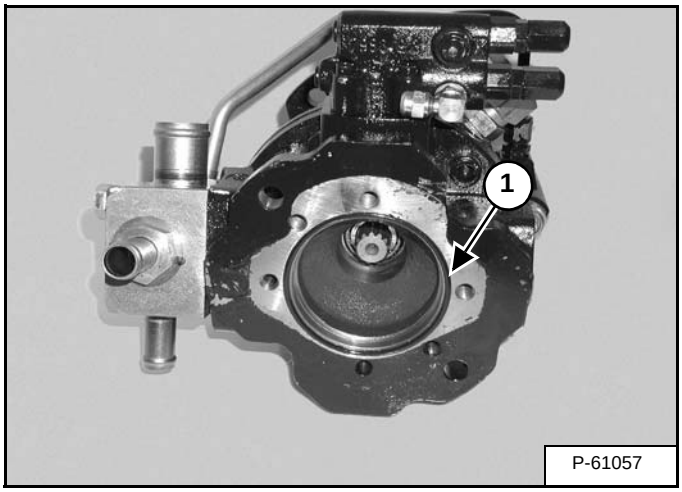
Figure 20-51-106



Remove the bolts (Item 1) **[Figure 20-51-106]**.

Installation: Tighten the bolts to 25 - 28 ft.-lb. (34 - 38 N•m) torque.

Figure 20-51-107



Remove the O-ring (Item 1) **[Figure 20-51-107]**.

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Gear Pump Disassembly And Assembly

Clean the outside of the gear pump before disassembly.

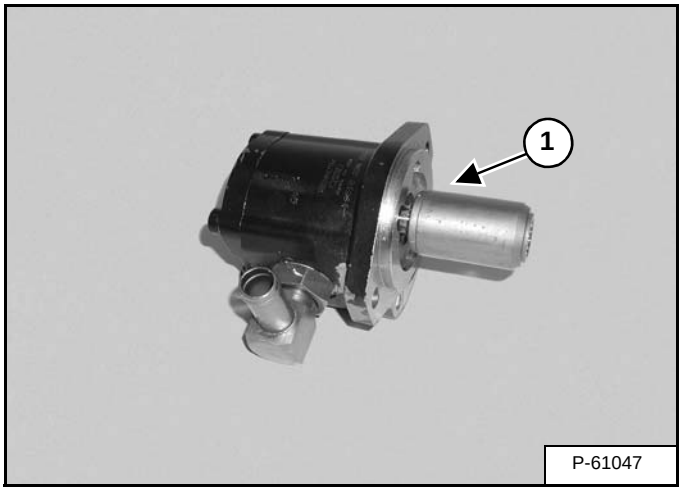
Mark the outside of the gear pump before disassembly.

IMPORTANT

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

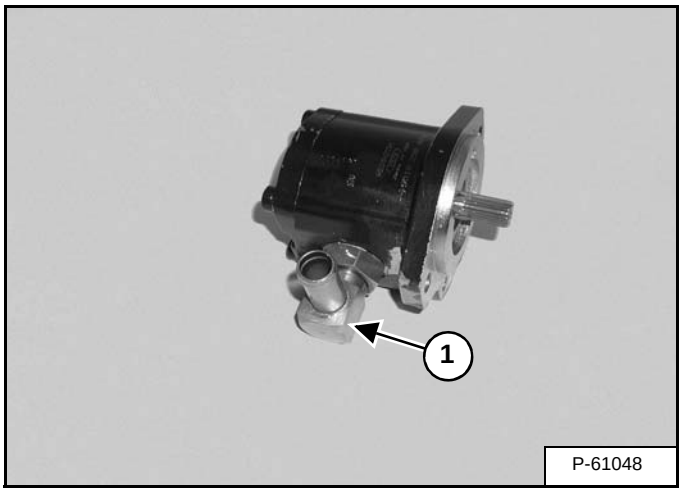
I-2003-0888

Figure 20-51-108



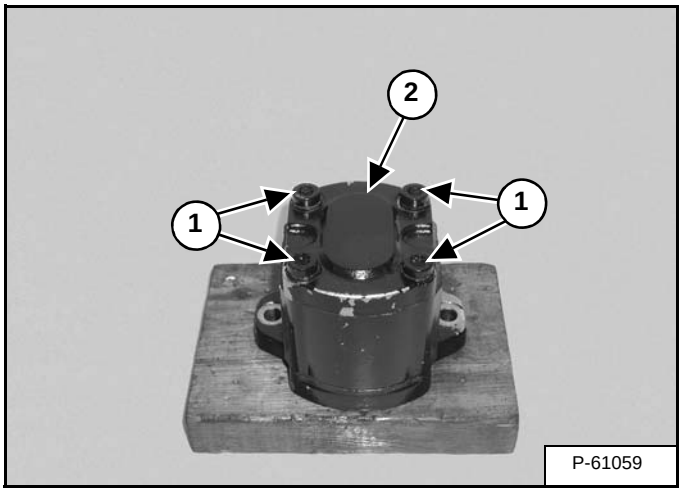
Remove the coupler (Item 1) **[Figure 20-51-108]**.

Figure 20-51-109



Remove the fitting (Item 1) **[Figure 20-51-109]**.

Figure 20-51-110

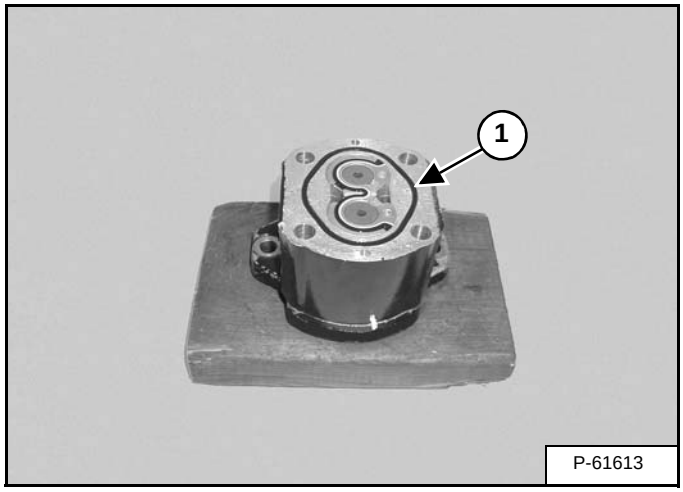


Remove the bolts (Item 1) and end cap (Item 2) **[Figure 20-51-110]**.

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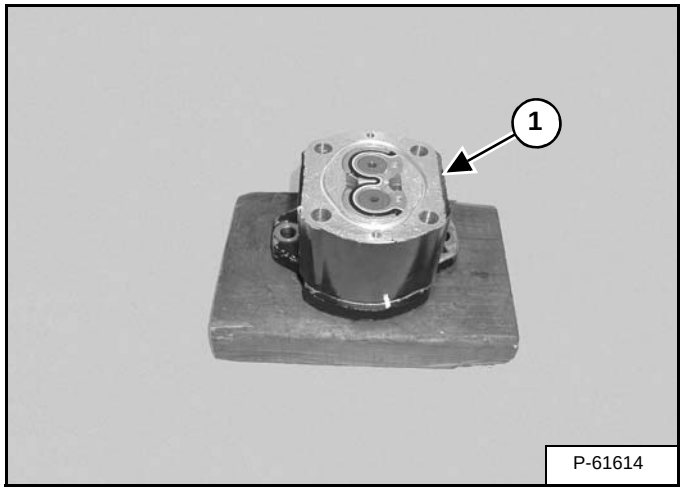
Gear Pump Disassembly And Assembly (Cont'd)

Figure 20-51-111



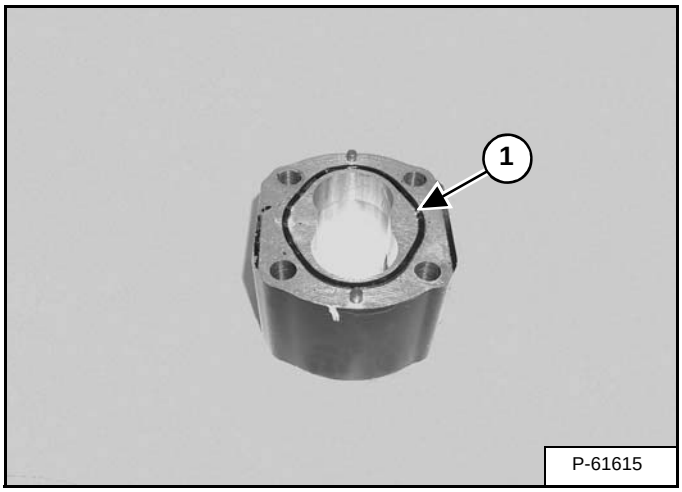
Remove the seal (Item 1) **[Figure 20-51-111]**.

Figure 20-51-112



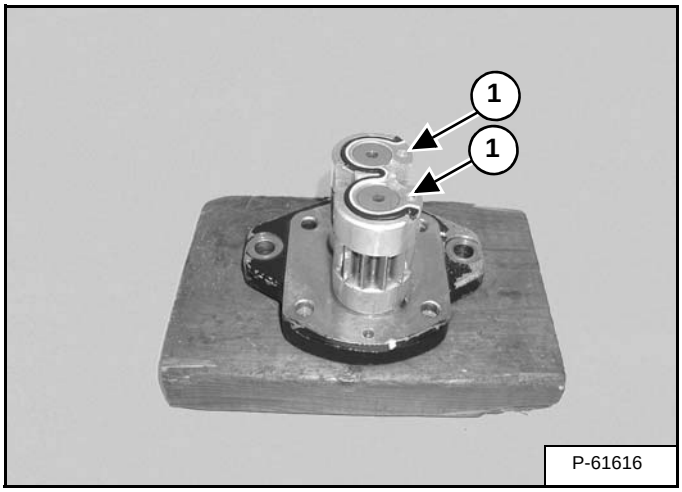
Remove the housing (Item 1) **[Figure 20-51-112]**.

Figure 20-51-113



Turn the housing over and remove the seal (Item 1) **[Figure 20-51-113]**.

Figure 20-51-114

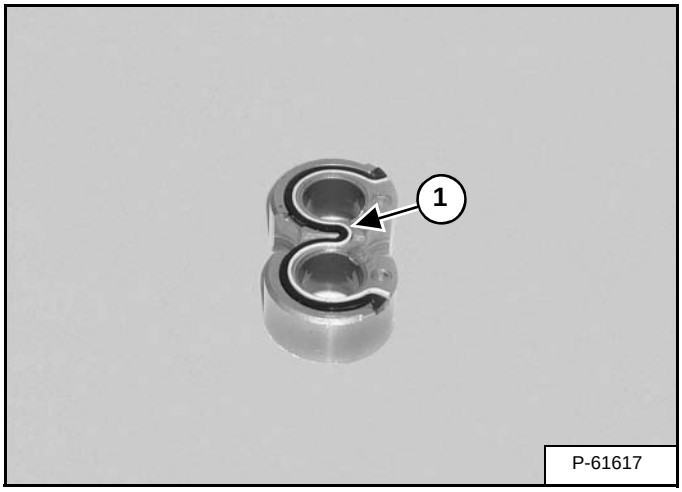


Record the orientation of the bearings and remove the bearing/seal assemblies (Item 1) **[Figure 20-51-114]**.

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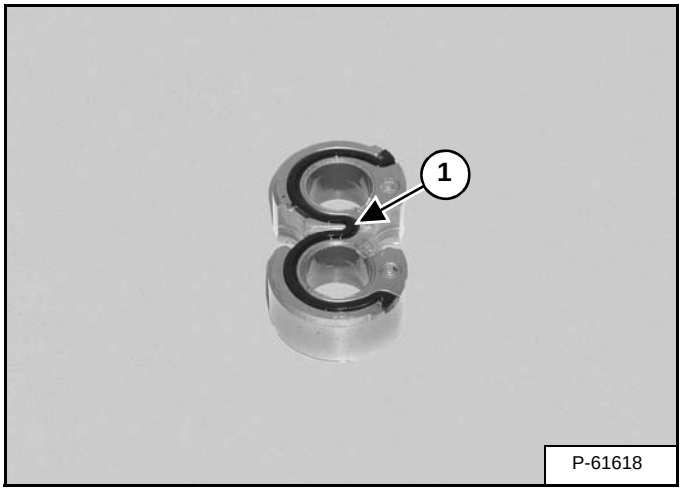
Gear Pump Disassembly And Assembly (Cont'd)

Figure 20-51-115



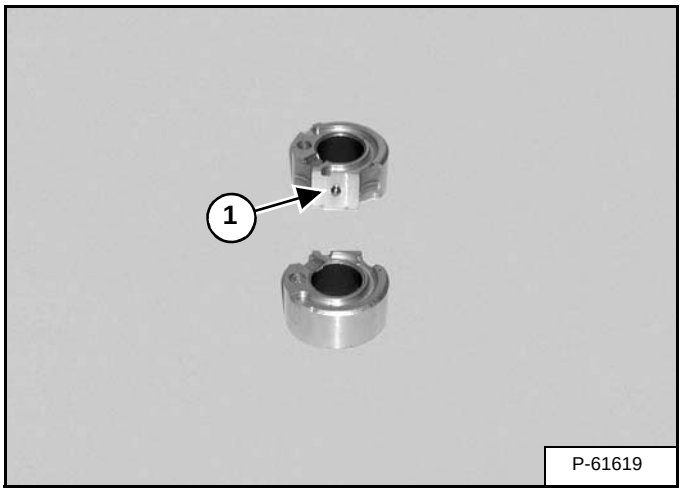
Remove the back-up ring (Item 1) **[Figure 20-51-115]**.

Figure 20-51-116



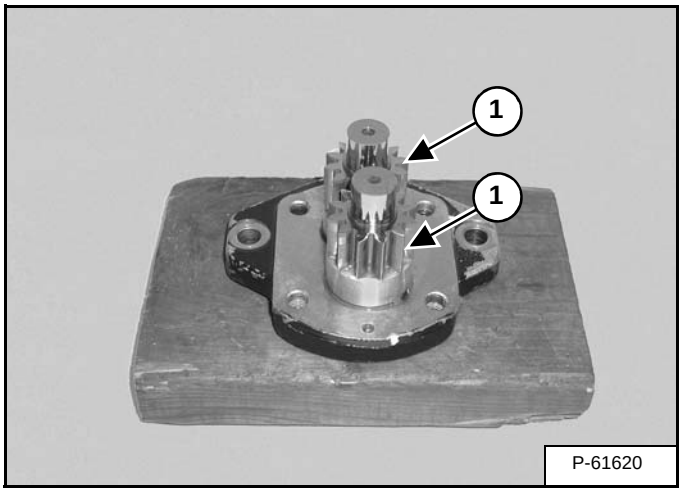
Remove the seal (Item 1) **[Figure 20-51-116]**.

Figure 20-51-117



Separate the bearings and remove the dowel pin (Item 1) **[Figure 20-51-117]**.

Figure 20-51-118

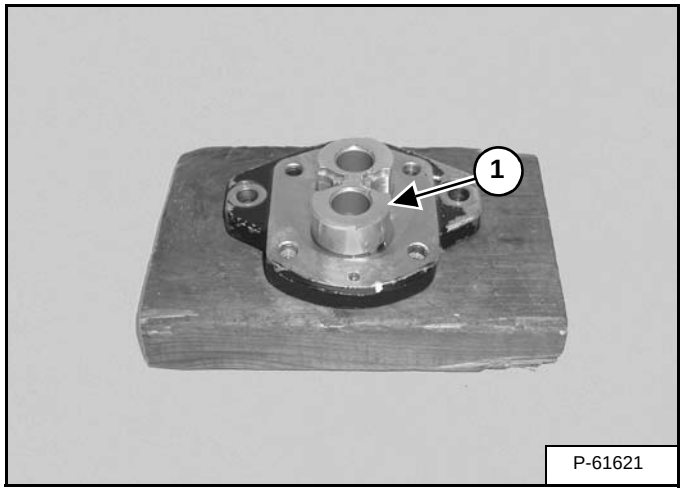


Remove the gears (Item 1) **[Figure 20-51-118]**.

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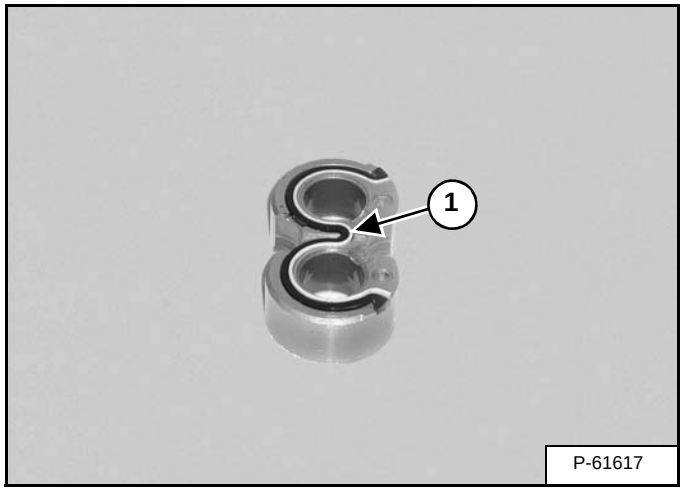
Gear Pump Disassembly And Assembly (Cont'd)

Figure 20-51-119



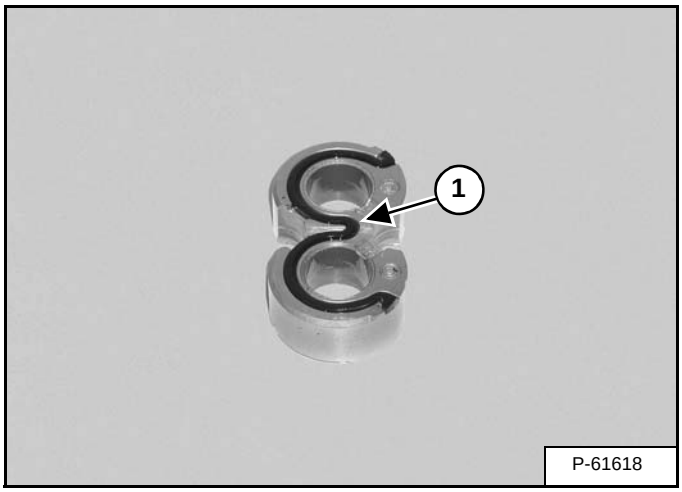
Remove the bearings (Item 1) **[Figure 20-51-119]**.

Figure 20-51-120



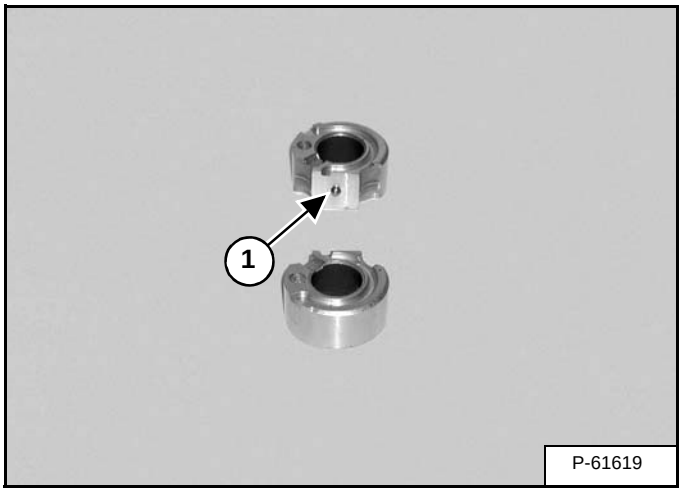
Remove the back-up ring (Item 1) **[Figure 20-51-120]**.

Figure 20-51-121



Remove the seal (Item 1) **[Figure 20-51-121]**.

Figure 20-51-122

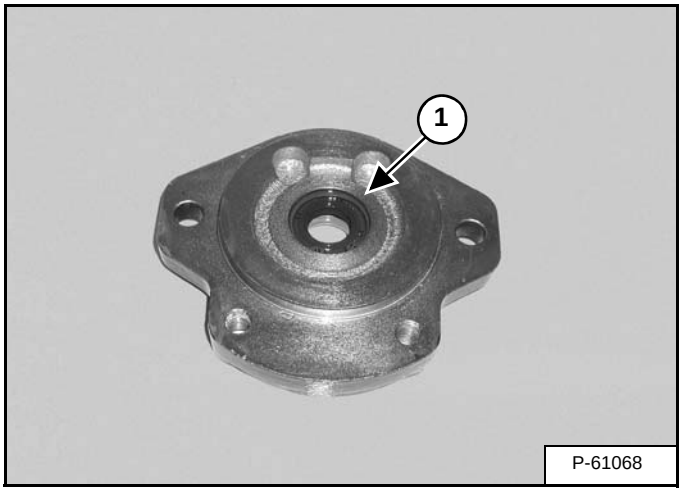


Separate the bearings and remove the dowel pin (Item 1) **[Figure 20-51-122]**.

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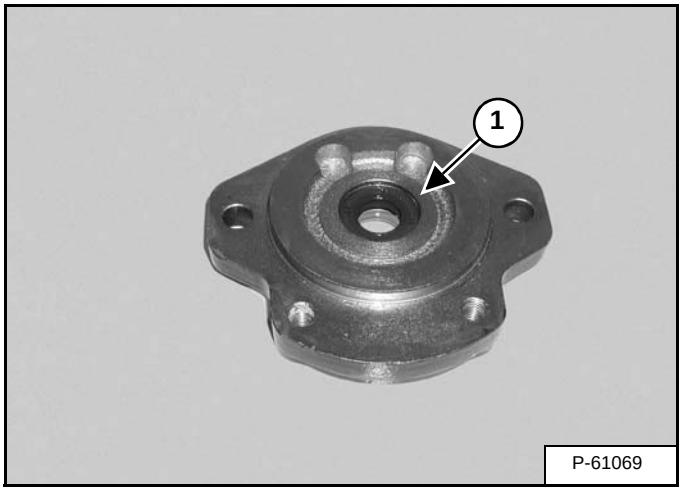
Gear Pump Disassembly And Assembly (Cont'd)

Figure 20-51-123



Remove the snap ring (Item 1) **[Figure 20-51-123]**

Figure 20-51-124



Remove the seal (Item 1) **[Figure 20-51-124]**.

Assembly:

Clean all parts in solvent and dry with compressed air.

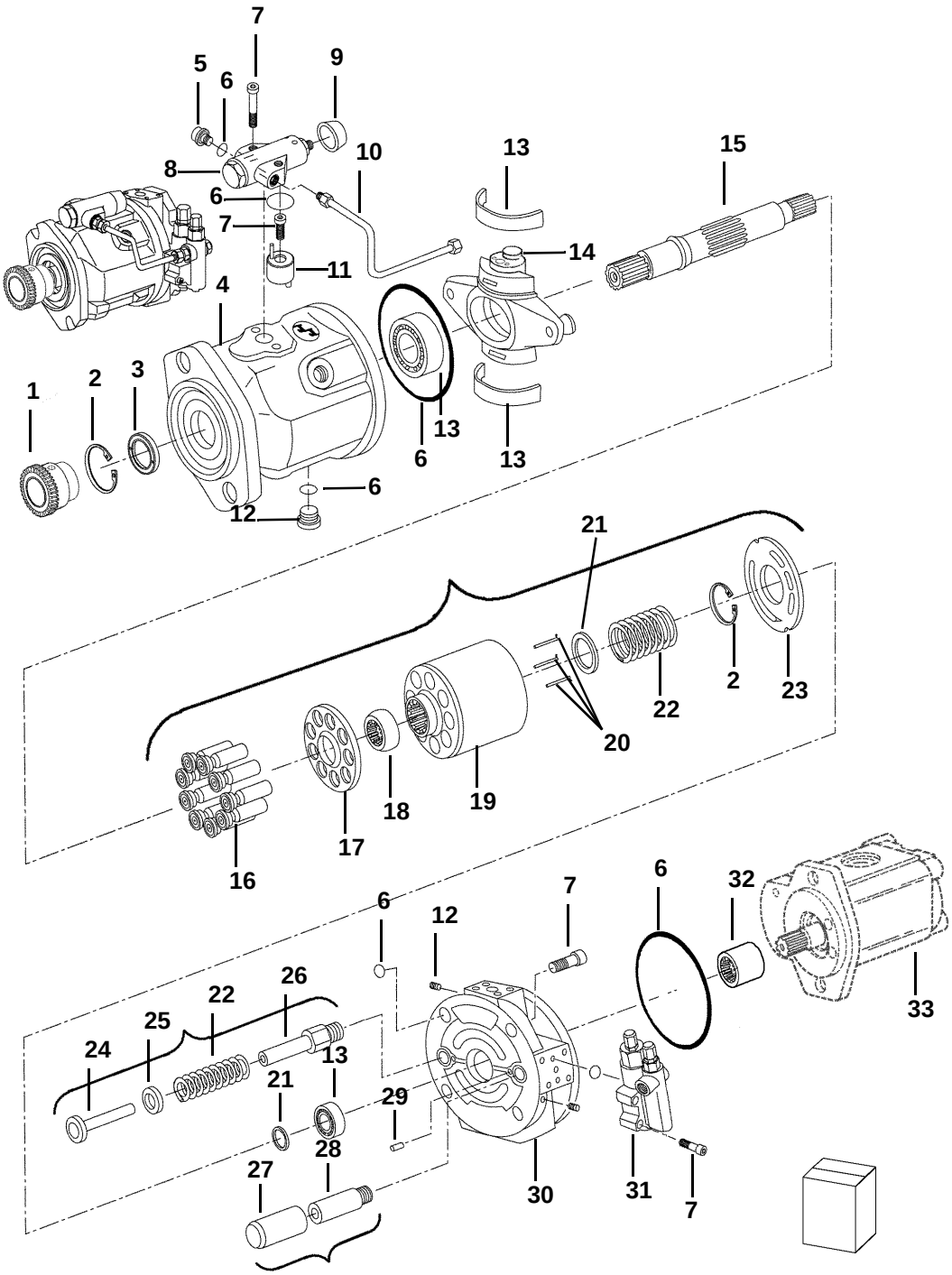
Inspect all parts for wear or damage. Replace any worn or damaged parts.

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

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Piston Pump Parts Identification

1. Coupler
2. Snap Ring
3. Seal
4. Housing
5. Fitting
6. O-Ring
7. Bolt
8. Torque Limiter
9. Dust Cap
10. Tubeline
11. Pin Assembly
12. Plug
13. Bearing
14. Cradle
15. Shaft
16. Pistons
17. Retainer Plate
18. Retaining Ball
19. Cylinder Block
20. Pin
21. Spacer
22. Spring
23. Valve Plate
24. Stroking Piston
25. Bushing
26. Stroking Piston Shaft
27. Destroking Piston
28. Destroking Piston Shaft
29. Dowel Pin
30. Back Port Assembly
31. Pump Control
32. Coupler
33. Gear Pump



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Piston Pump Disassembly

IMPORTANT

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

I-2003-0888

Remove the hydraulic pump from the machine. (See Removal And Installation on Page 20-51-16)

Remove the gear pump. (See Gear Pump Removal And Installation on Page 20-51-40)

Remove the coupler. (See Coupler Removal And Installation on Page 20-51-18)

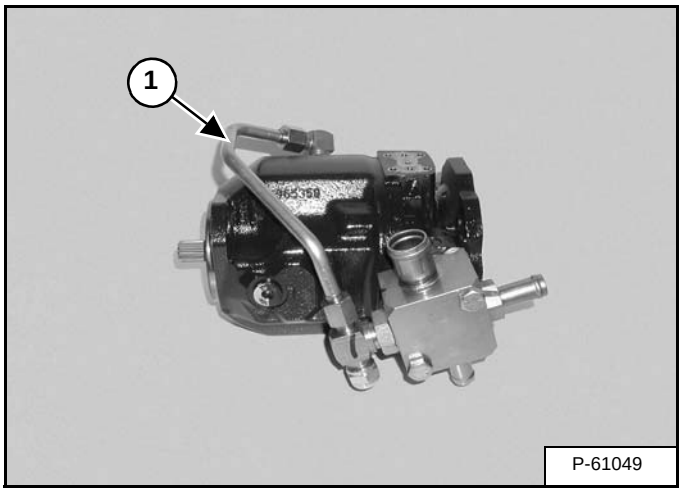
Remove the torque limiter valve. (See Torque Limiter Valve Removal on Page 20-51-21)

Remove the pump control assembly. (See Pump Control Removal And Installation on Page 20-51-33)

Clean the outside of the piston pump before disassembly.

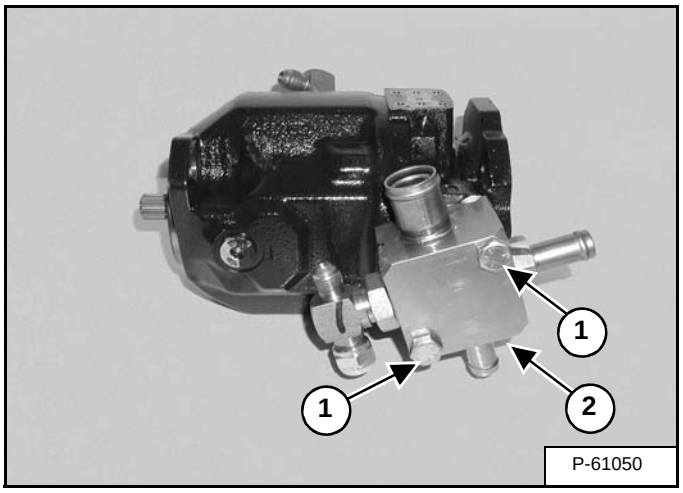
Mark the outside of the piston pump for ease of assembly.

Figure 20-51-125



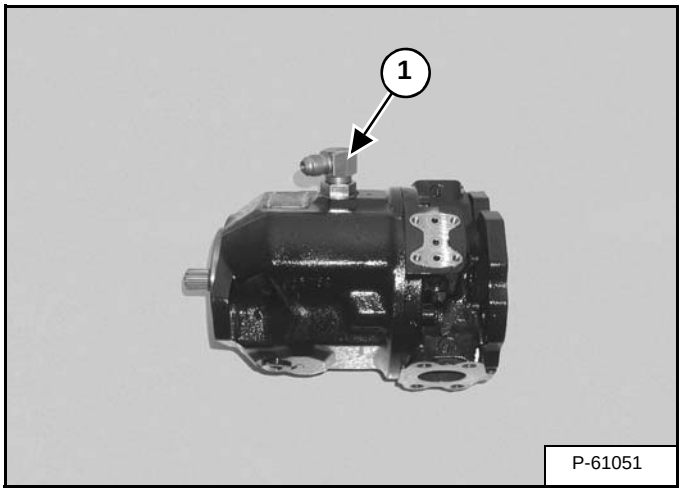
Remove the tubeline (Item 1) **[Figure 20-51-125]**.

Figure 20-51-126



Remove the bolts (Item 1) and block (Item 2) **[Figure 20-51-126]**.

Figure 20-51-127

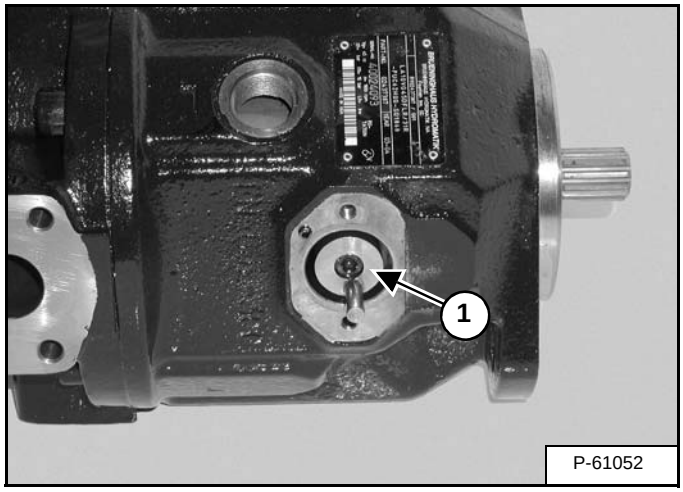


Remove the fitting (Item 1) **[Figure 20-51-127]**.

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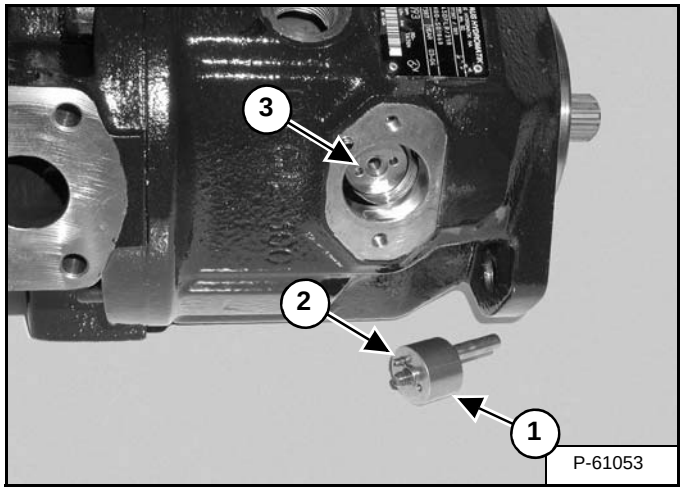
Piston Pump Disassembly (Cont'd)

Figure 20-51-128



Remove the screw (Item 1) **[Figure 20-51-128]** from the pin assembly.

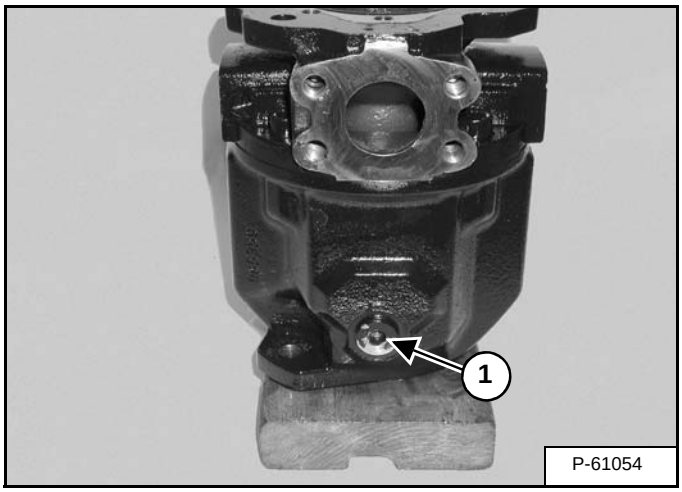
Figure 20-51-129



Remove the pin assembly (Item 1) **[Figure 20-51-129]**.

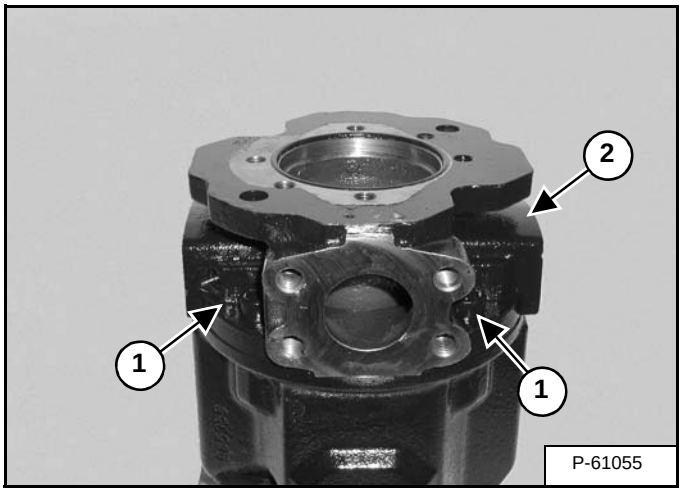
NOTE: Note the position of the dowel pin (Item 2) on the pin assembly, with the locating hole on the swash plate cradle (Item 3) [Figure 20-51-129].

Figure 20-51-130



Remove the plug (Item 1) **[Figure 20-51-130]** from the pump housing and drain the oil.

Figure 20-51-131



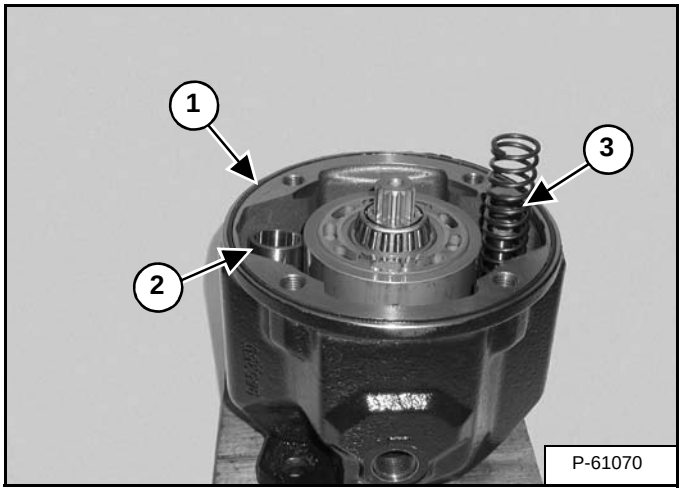
Remove the four bolts (Item 1) **[Figure 20-51-131]**.

Remove the back port assembly (Item 2) **[Figure 20-51-131]**.

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Piston Pump Disassembly (Cont'd)

Figure 20-51-132

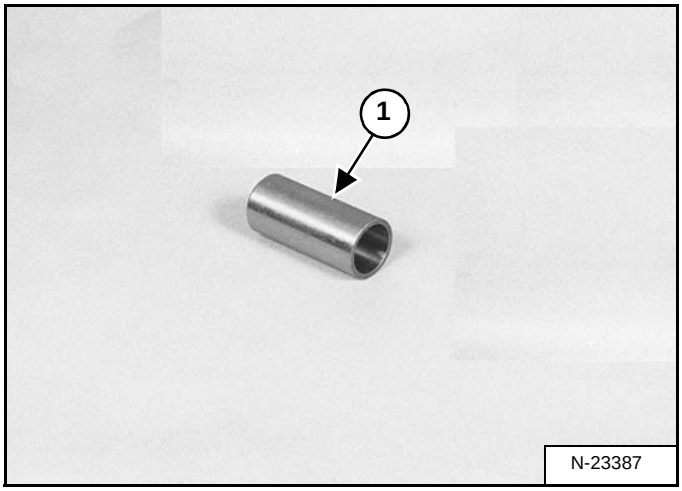


Remove the O-ring (Item 1) **[Figure 20-51-132]**.

Remove the destroking piston (Item 2) **[Figure 20-51-132]**.

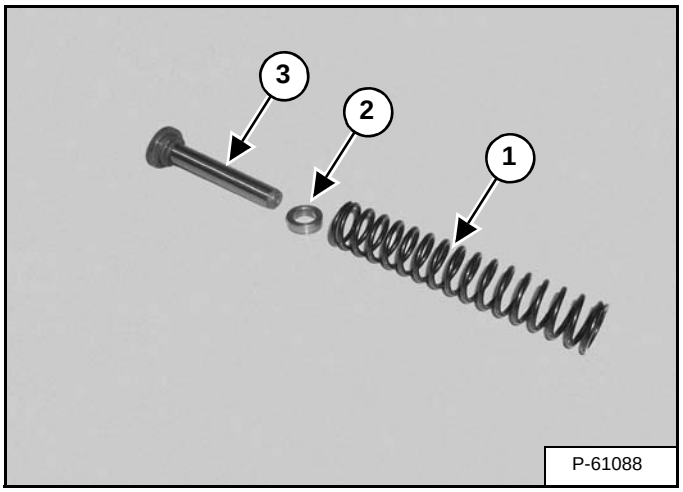
Remove the stroking piston/spring assembly (Item 3) **[Figure 20-51-132]**.

Figure 20-51-133



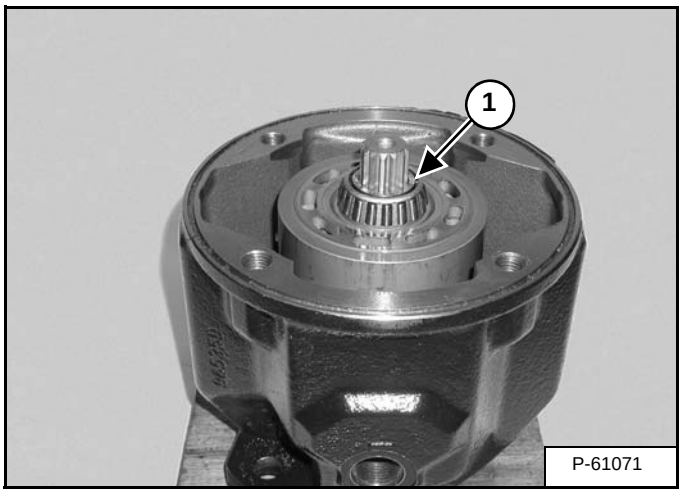
Inspect the destroking piston (Item 1) **[Figure 20-51-133]**.

Figure 20-51-134



Remove the spring (Item 1) and bushing (Item 2) from the stroking piston (Item 3) **[Figure 20-51-134]**. Inspect all parts and replace as needed.

Figure 20-51-135

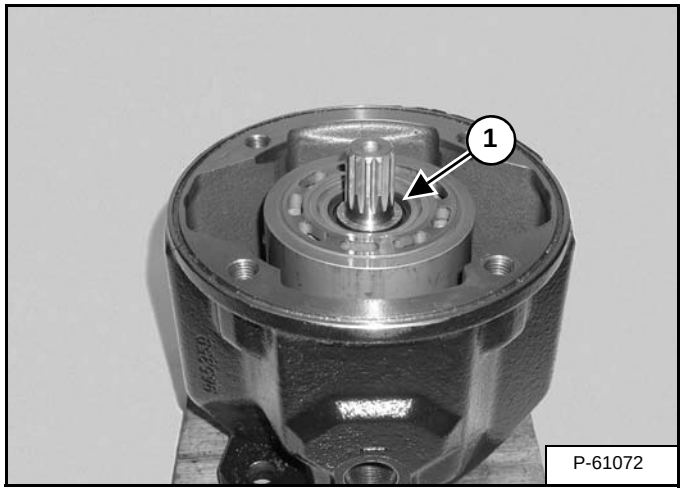


Remove the bearing (Item 1) **[Figure 20-51-135]**.

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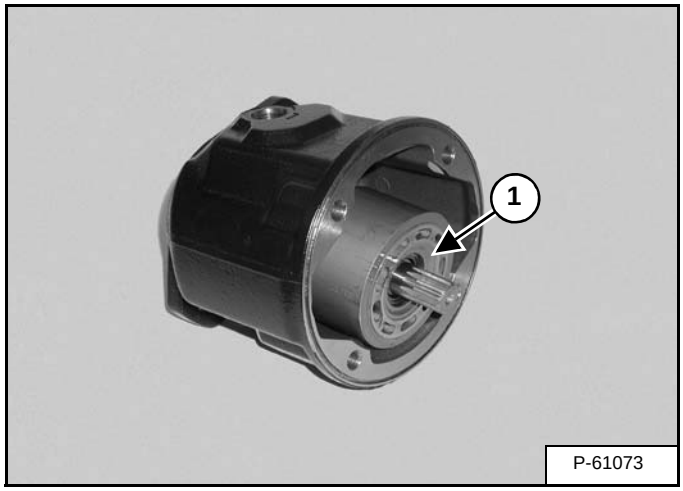
Piston Pump Disassembly (Cont'd)

Figure 20-51-136



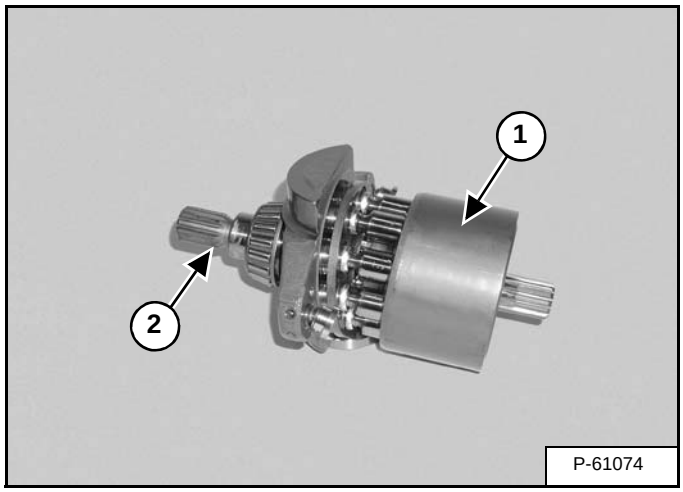
Remove the adjustment spacer(s) (Item 1) **[Figure 20-51-136]** from the pump shaft.

Figure 20-51-137



Lay the pump assembly on its side and remove the rotary group, cradle, and shaft (Item 1) **[Figure 20-51-137]** from the housing.

Figure 20-51-138

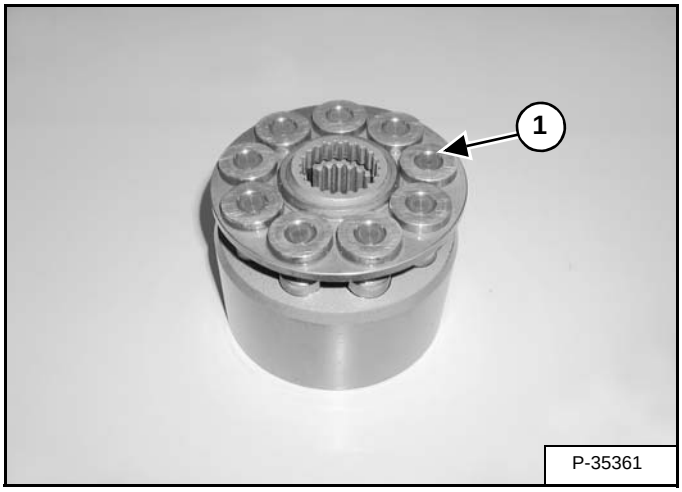


Slide the rotary group (Item 1) from the shaft assembly (Item 2) **[Figure 20-51-138]**.

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Piston Pump Disassembly (Cont'd)

Figure 20-51-139

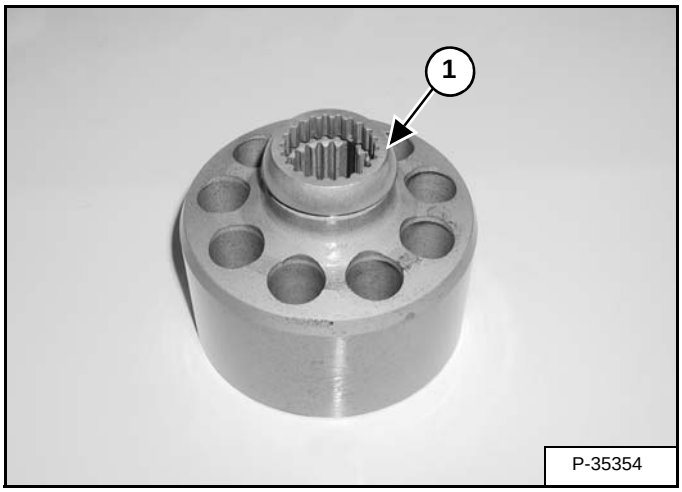


Remove the retainer plate and pistons (Item 1) **[Figure 20-51-139]** from the cylinder block.

NOTE: It is NOT important that the pistons are installed in their original positions.

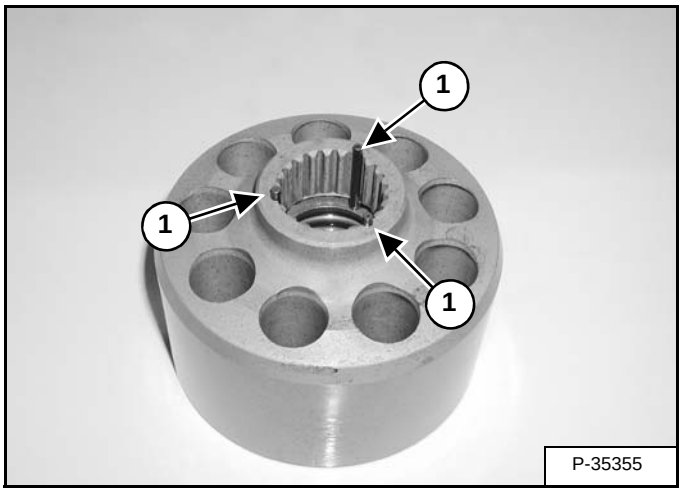
NOTE: Check that there are no scratches or metal deposits on the sliding surface. (Pistons must be replaced in sets)

Figure 20-51-140



Remove the retaining ball (Item 1) **[Figure 20-51-140]**.

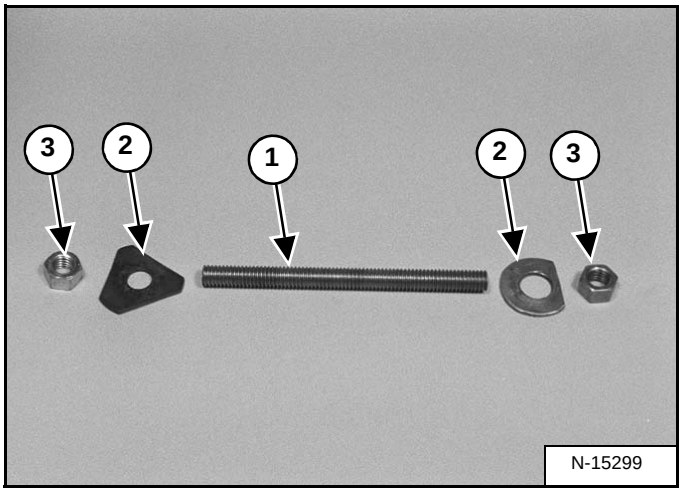
Figure 20-51-141



Inspect the three pins (Item 1) **[Figure 20-51-141]** for wear and/or damage.

NOTE: The following procedure shown is to disassemble the rotating group for inspection only. The rotating group parts can not be ordered separately and must be ordered as an assembly.

Figure 20-51-142

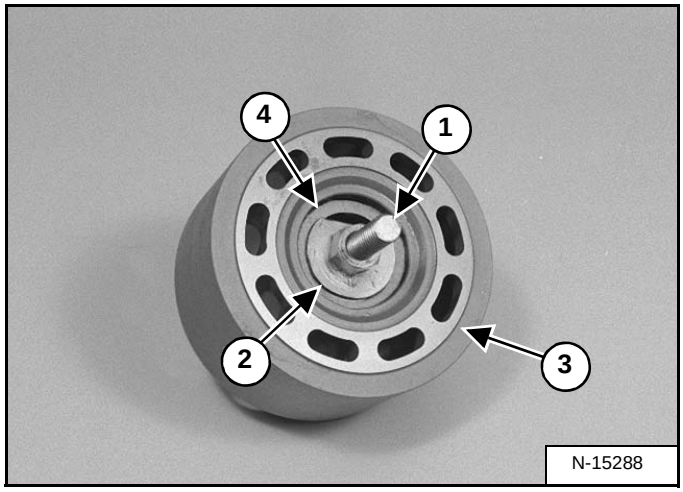


To remove the spring from inside the cylinder block, use a threaded rod (or bolt) (Item 1), two trimmed washers (Item 2) and two nuts (Item 3) **[Figure 20-51-142]**.

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Piston Pump Disassembly (Cont'd)

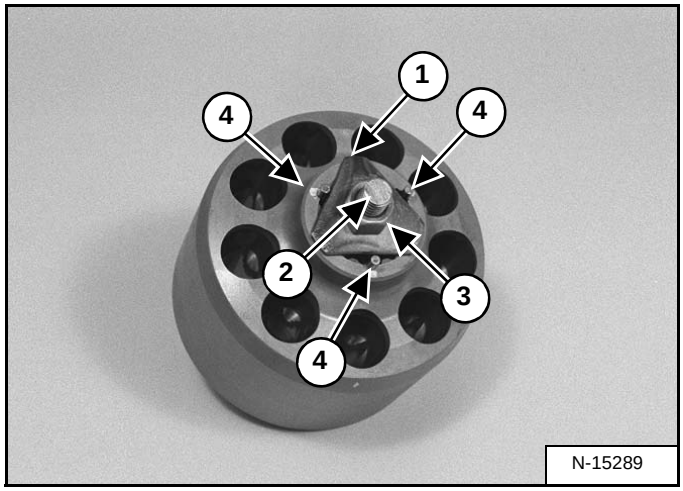
Figure 20-51-143



Install the threaded rod and nut (Item 1) through the modified washer (Item 2) and the block assembly (Item 3) **[Figure 20-51-143]**.

NOTE: The modified washer (Item 2) must fit inside the snap ring (Item 4) [Figure 20-51-143].

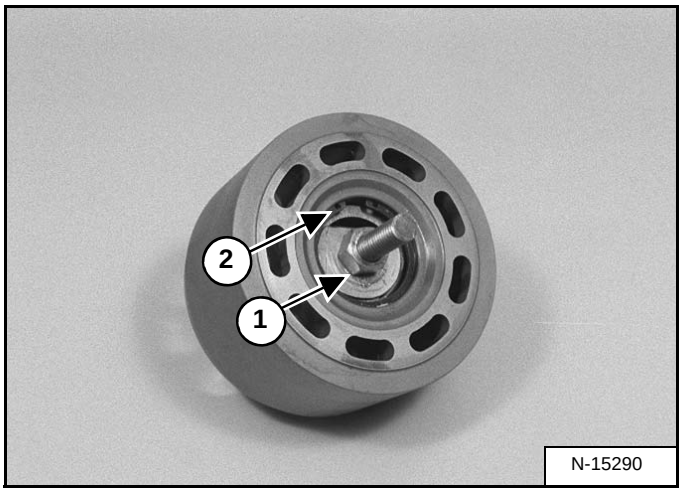
Figure 20-51-144



Install the second trimmed washer (Item 1) over the threaded rod (Item 2) and install the nut (Item 3) **[Figure 20-51-144]**.

NOTE: The modified washer (Item 1) must fit between the three pins (Item 4) [Figure 20-51-144].

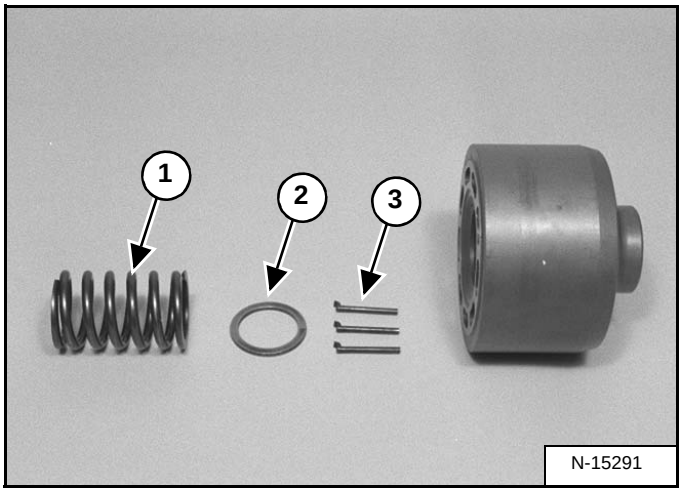
Figure 20-51-145



Tighten the nut (Item 1) until the spring is compressed enough to install the snap ring (Item 2) **[Figure 20-51-145]**.

Loosen the nut to release the tension on the spring and remove the bolts and washers.

Figure 20-51-146

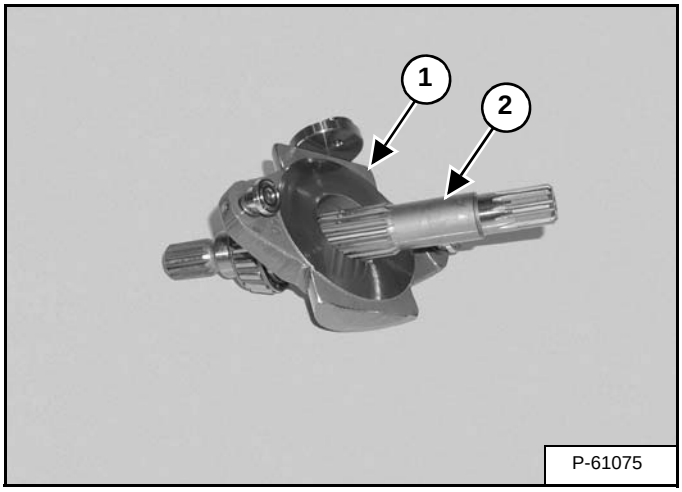


Remove the spring (Item 1), the washer (Item 2), and the three pins (Item 3) **[Figure 20-51-146]** from the cylinder block.

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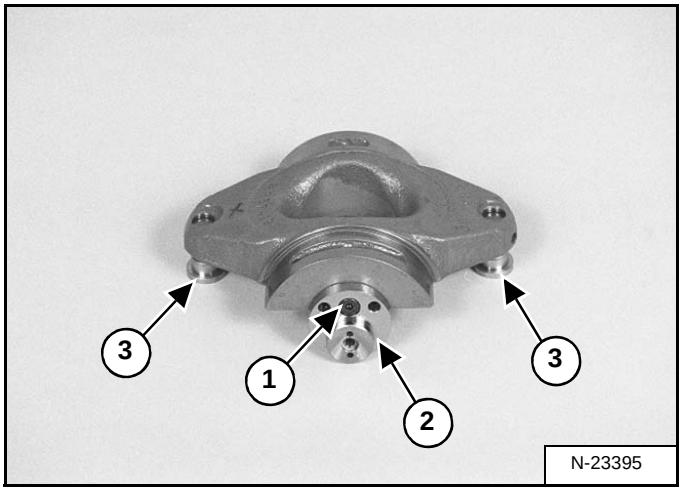
Piston Pump Disassembly (Cont'd)

Figure 20-51-147



Remove the cradle (Item 1) from the shaft (Item 2) **[Figure 20-51-147]**.

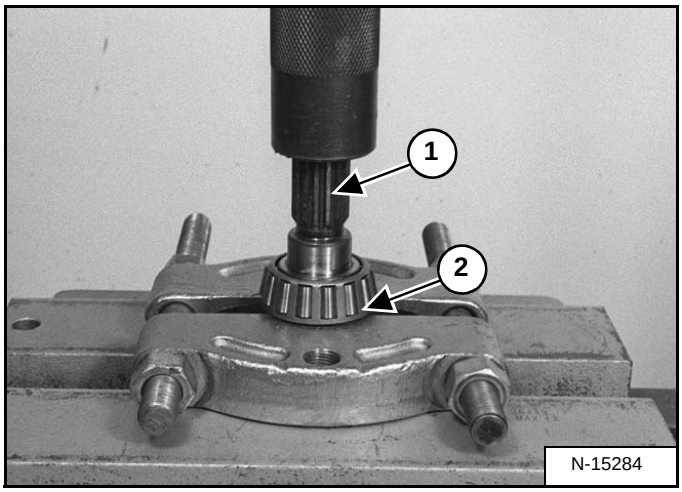
Figure 20-51-148



Remove the bolt (Item 1) and the torque limiter plate (Item 2) **[Figure 20-51-148]**.

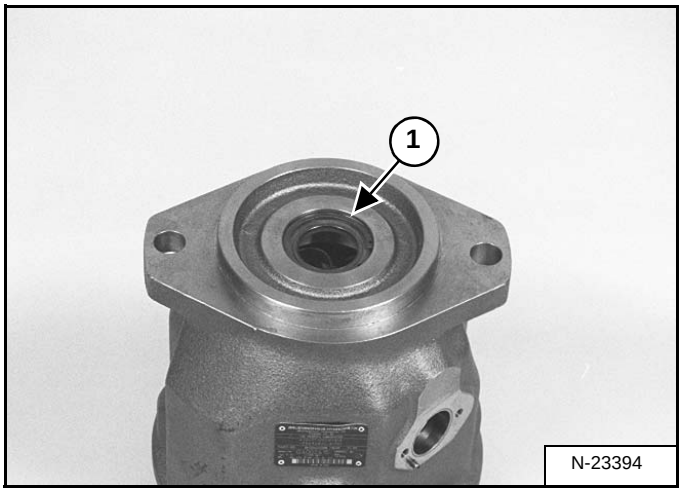
NOTE: The caps (Item 3) [Figure 20-51-148] cannot be replaced, a new cradle must be ordered.

Figure 20-51-149



Press the shaft (Item 1) from the bearing (Item 2) **[Figure 20-51-149]**.

Figure 20-51-150

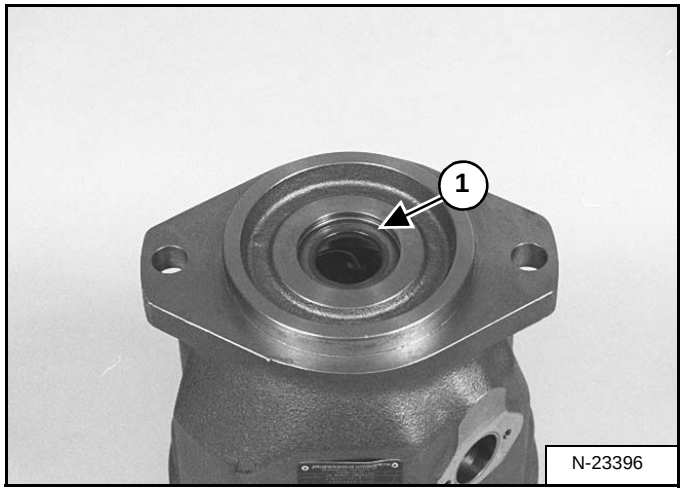


Remove the snap ring (Item 1) **[Figure 20-51-150]** from the housing.

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Piston Pump Disassembly (Cont'd)

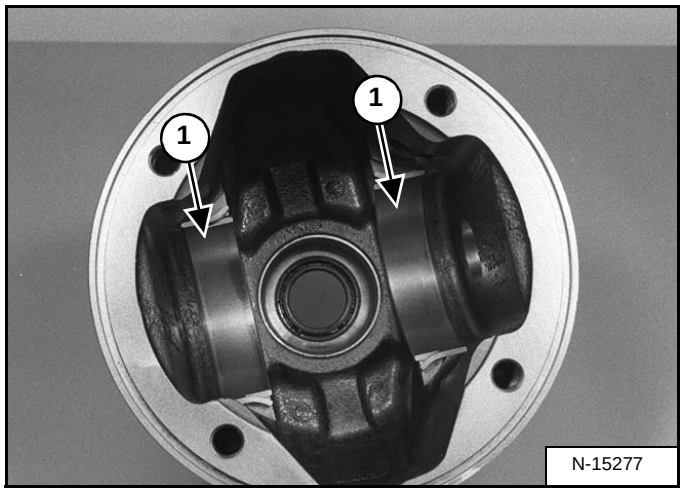
Figure 20-51-151



Remove the seal (Item 1) **[Figure 20-51-151]** from the housing.

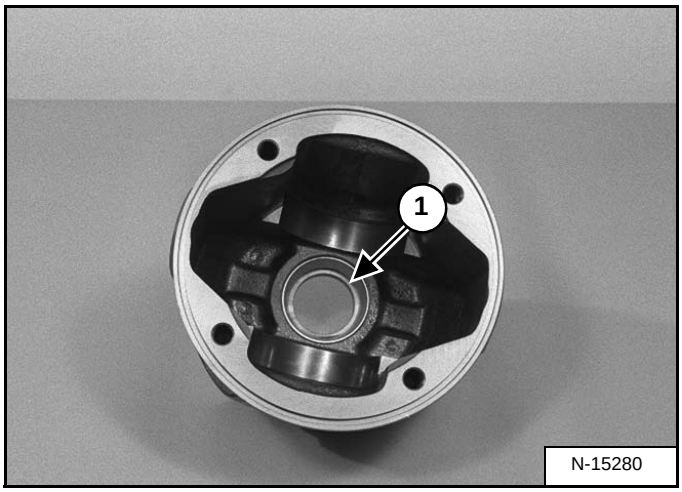
NOTE: The shaft seal can be removed without removing the shaft.

Figure 20-51-152



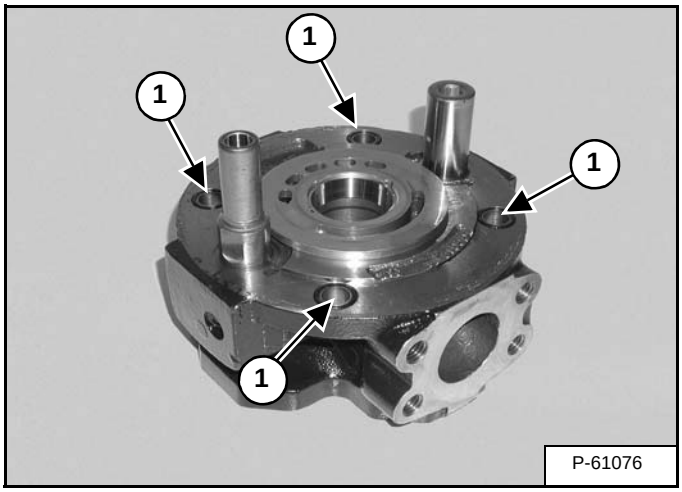
Remove the two brass bearings (Item 1) **[Figure 20-51-152]** from the housing.

Figure 20-51-153



Remove the race (Item 1) **[Figure 20-51-153]** from the housing.

Figure 20-51-154

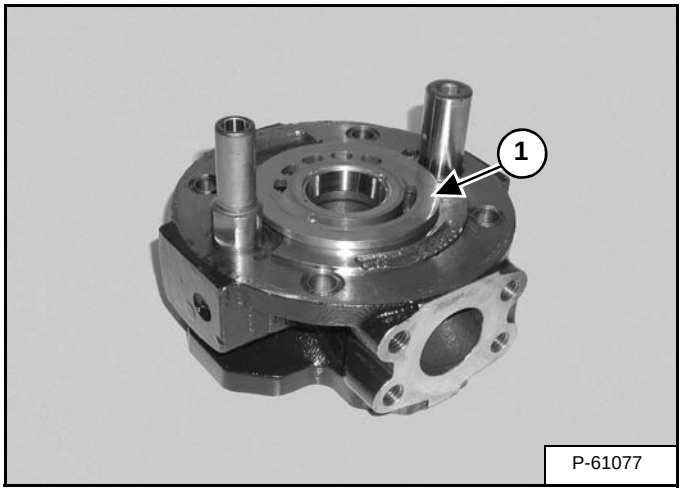


Remove the O-rings (Item 1) **[Figure 20-51-154]**.

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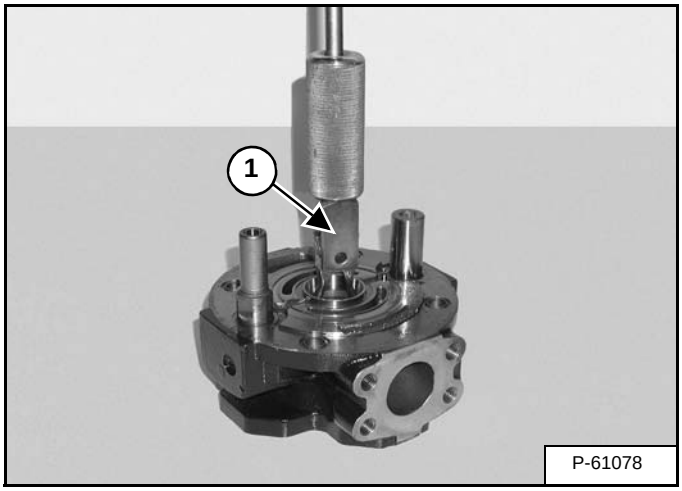
Piston Pump Disassembly (Cont'd)

Figure 20-51-155



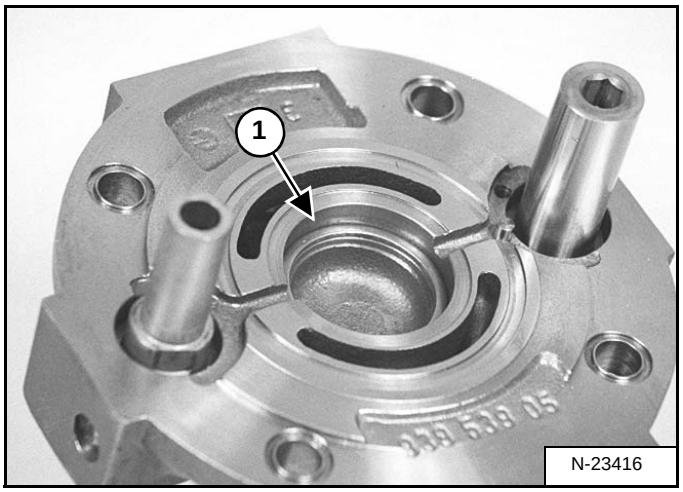
Remove the valve plate (Item 1) **[Figure 20-51-155]** from the back port assembly.

Figure 20-51-156



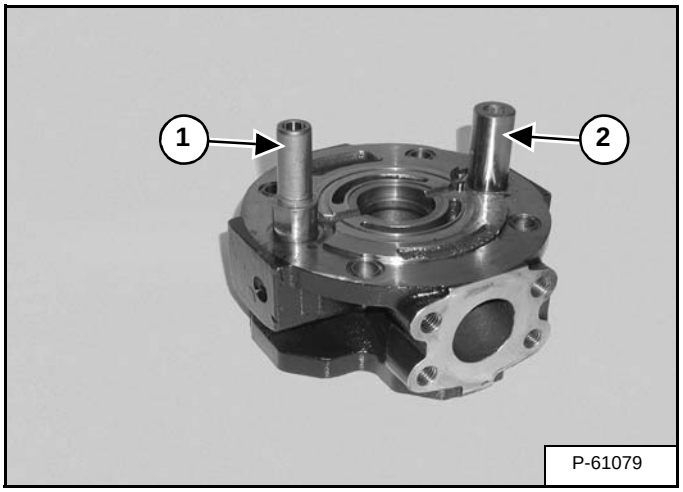
With a bearing puller (Item 1) **[Figure 20-51-156]** remove the bearing race from the back port assembly.

Figure 20-51-157



Remove the spacer (Item 1) **[Figure 20-51-157]** from the back port assembly. (If equipped)

Figure 20-51-158



Remove the stroking piston (Item 1) **[Figure 20-51-158]**. (Spring side)

Remove the destroking piston (Item 2) **[Figure 20-51-158]**.

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Piston Pump Assembly

IMPORTANT

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

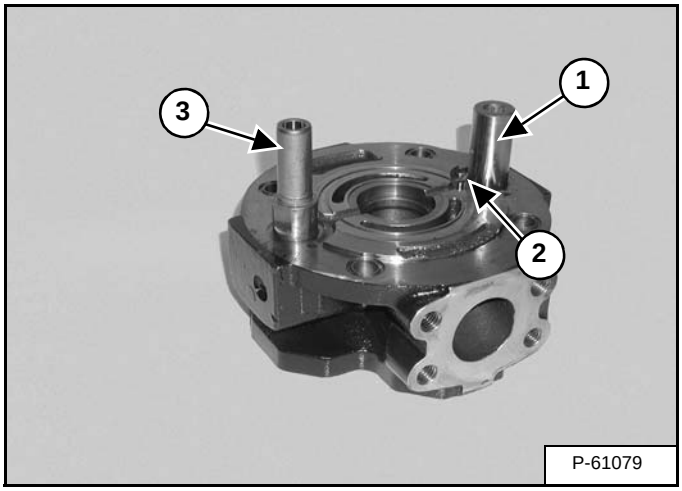
I-2003-0888

Clean parts in solvent and dry with compressed air.

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

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

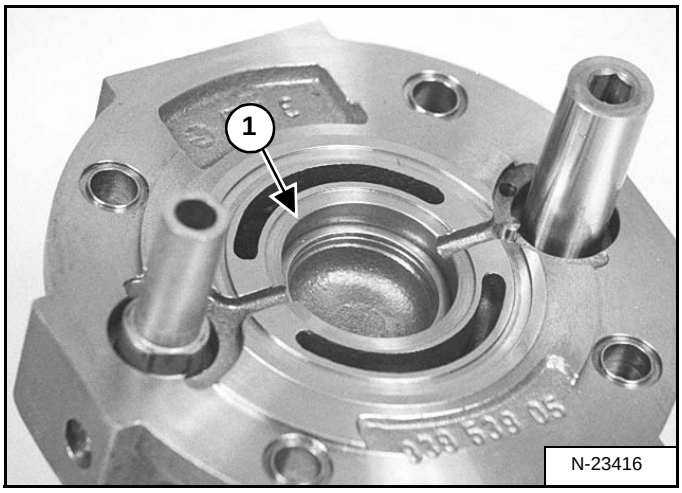
Figure 20-51-159



Apply Loctite™ 241 on the threads and install the destroking piston (Item 1) in the hole next to the alignment pin (Item 2) **[Figure 20-51-159]**.

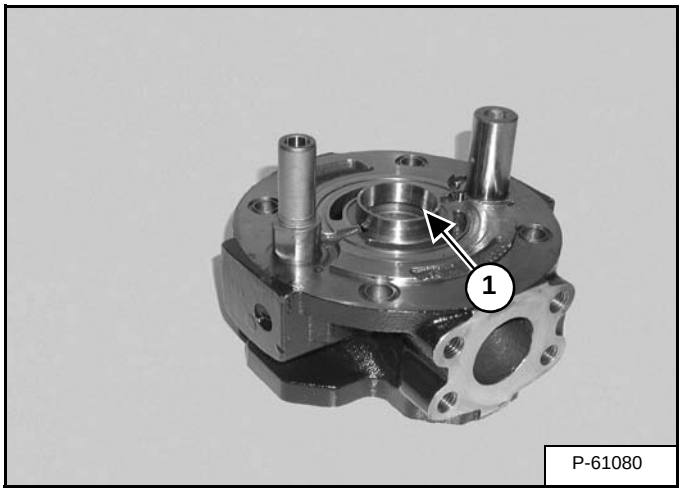
Apply Loctite™ 241 on the threads and install the stroking piston (Item 3) **[Figure 20-51-159]** in the hole.

Figure 20-51-160



Install the spacer (Item 1) **[Figure 20-51-160]** in the back port assembly. (If equipped)

Figure 20-51-161

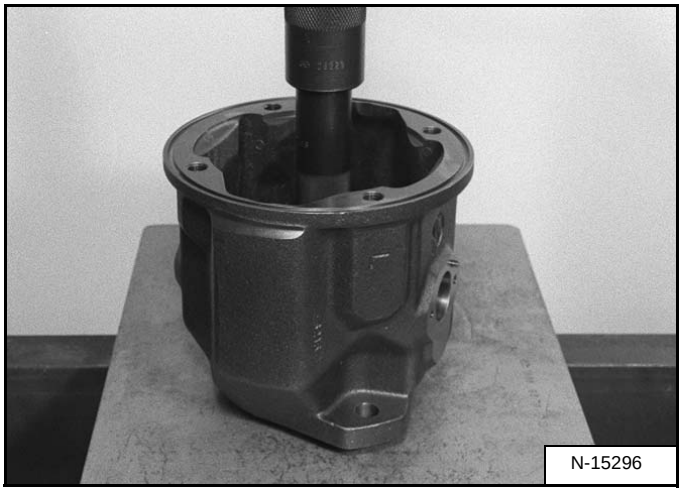


Install the bearing race (Item 1) **[Figure 20-51-161]**. in the back port assembly.

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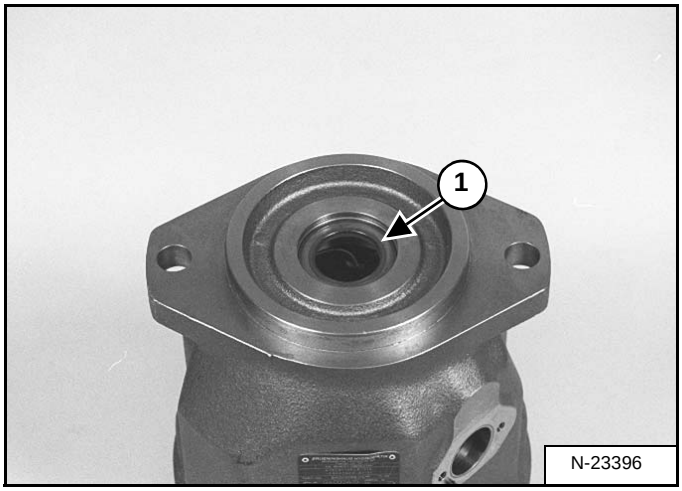
Piston Pump Assembly (Cont'd)

Figure 20-51-162



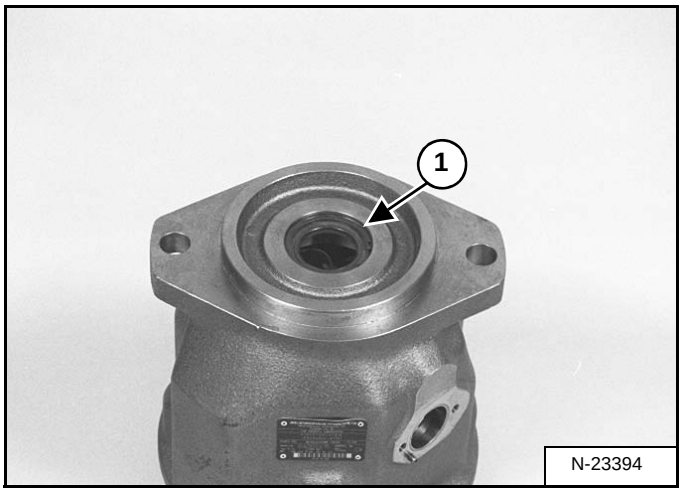
Press the race into the housing **[Figure 20-51-162]**.

Figure 20-51-163



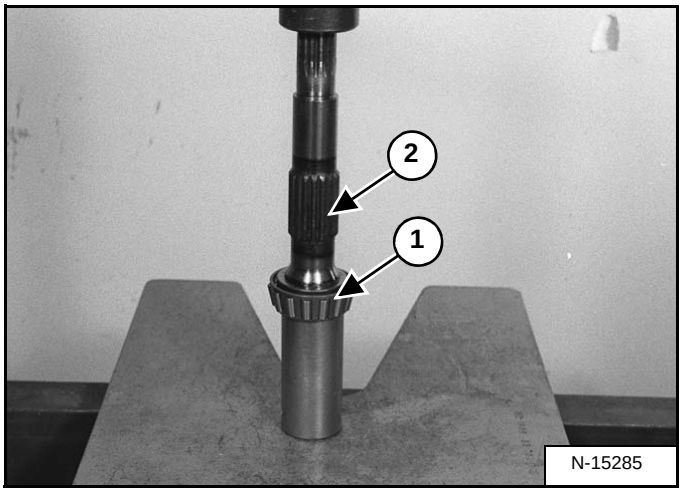
Install the shaft seal (Item 1) **[Figure 20-51-163]** in the housing.

Figure 20-51-164



Install the snap ring (Item 1) **[Figure 20-51-164]**.

Figure 20-51-165

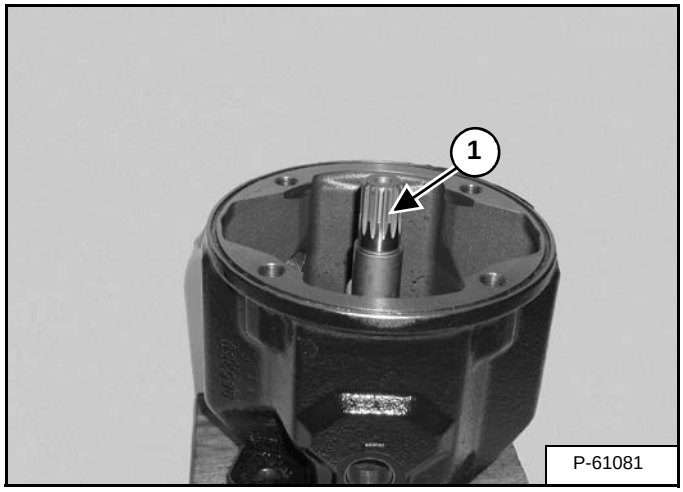


Press the bearing (Item 1) onto the shaft (Item 2) **[Figure 20-51-165]**.

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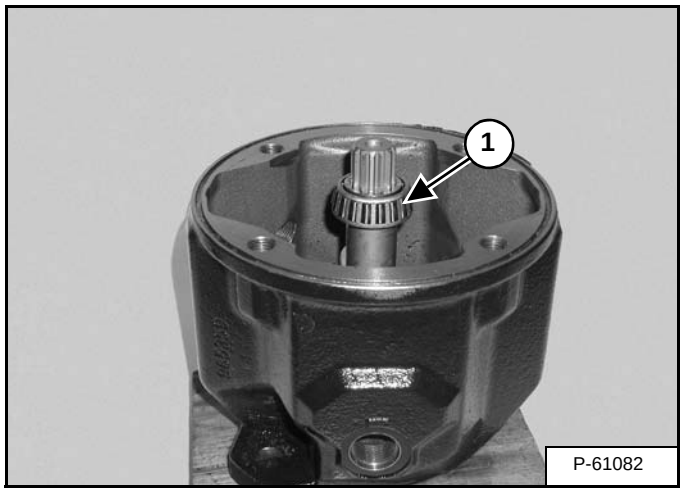
Piston Pump Assembly (Cont'd)

Figure 20-51-166



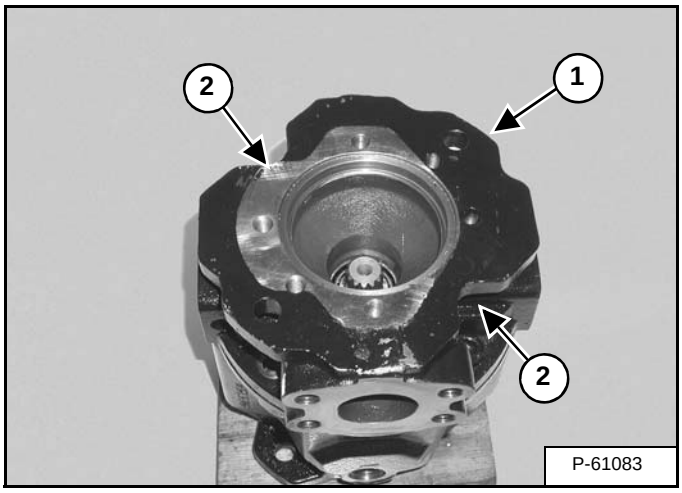
To find the correct shim washer thickness for bearing end play, the shaft/bering assembly (Item 1) **[Figure 20-51-166]** must be installed in the housing.

Figure 20-51-167



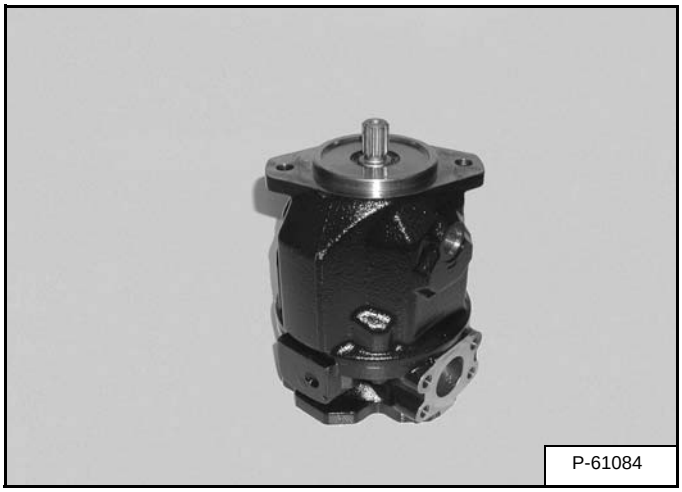
Install the bearing (Item 1) **[Figure 20-51-167]** on the shaft.

Figure 20-51-168



Install the back port assembly (Item 1) on the housing with two bolts (Item 2) **[Figure 20-51-168]**.

Figure 20-51-169

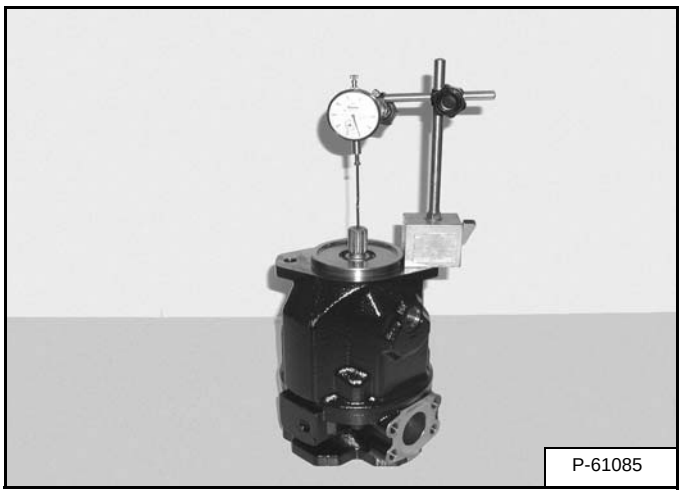


Turn the housing over **[Figure 20-51-169]**.

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Piston Pump Assembly (Cont'd)

Figure 20-51-170



Install a dial indicator on the housing as shown **[Figure 20-51-170]** and set it to zero.

Pull the shaft up as far as it will go and record the reading on the dial indicator. Repeat the procedure several times. The reading must be the same each time.

Add the nominal pre-load of 0.001 in. (0,025 mm), the actual pre-load is 0.000 in. (0,000 mm) to 0.002 in. (0,050 mm) to the reading found on the dial indicator **[Figure 20-51-170]**.

Example: (In Inches):

0.150 Measure movement of shaft

0.001 Nominal Pre-load

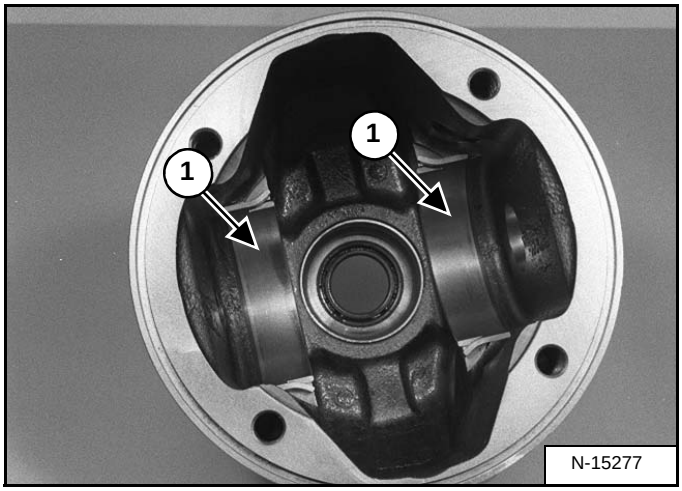
=0.151 ± thickness of the spacer needed.

When the proper thickness of shim washer is determined, remove the dial indicator from the pump housing.

Remove the two back port assembly mounting bolts from the pump.

Remove the shaft/bearing assembly from the pump housing.

Figure 20-51-171

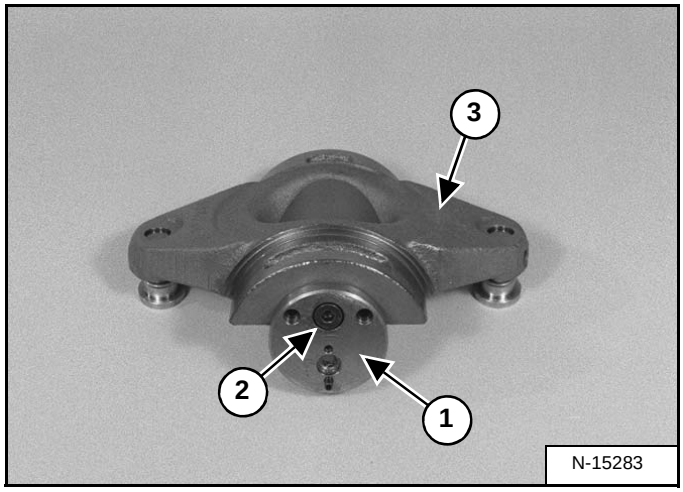


Install the two brass bearings (Item 1) **[Figure 20-51-171]** into the pump housing.

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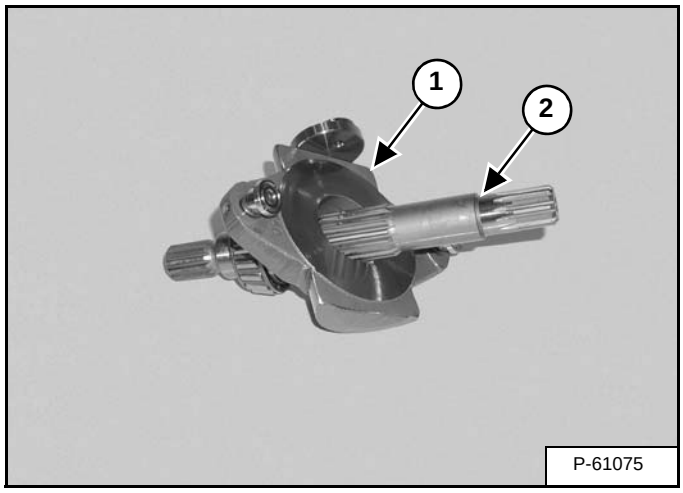
Piston Pump Assembly (Cont'd)

Figure 20-51-172



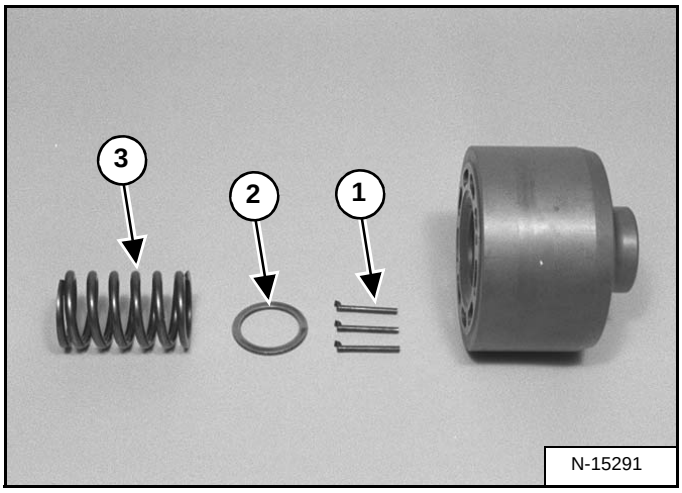
Apply Loctite™ 241 and install the torque limiter plate (Item 1) and bolt (Item 2) on the swash plate (Item 3) **[Figure 20-51-172]**.

Figure 20-51-173



Install the cradle (Item 1) on the shaft (Item 2) **[Figure 20-51-173]**.

Figure 20-51-174

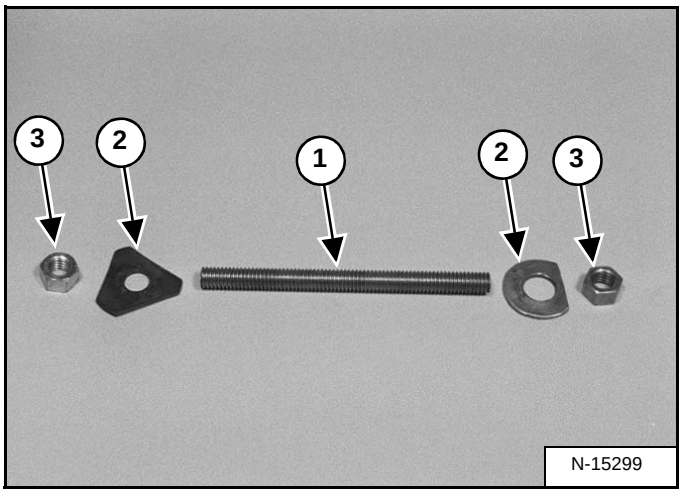


Apply clean grease to the three pins (Item 1) **[Figure 20-51-174]** and install the pins in the appropriate groove.

Install the washer (Item 2) and the spring (Item 3) **[Figure 20-51-174]**.

NOTE: If the rotating group is damaged, the parts can not be ordered separately and must be order as an assembly.

Figure 20-51-175

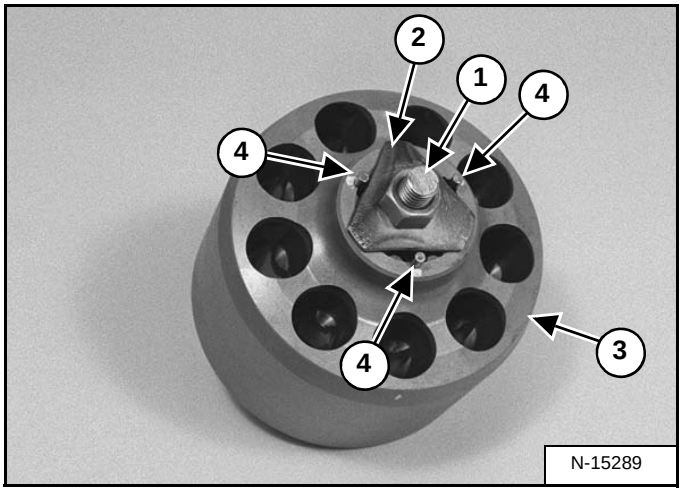


To compress the spring inside the cylinder block, use a threaded rod (or bolt) (Item 1), two trimmed washers (Item 2) and two nuts (Item 3) **[Figure 20-51-175]**.

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Piston Pump Assembly (Cont'd)

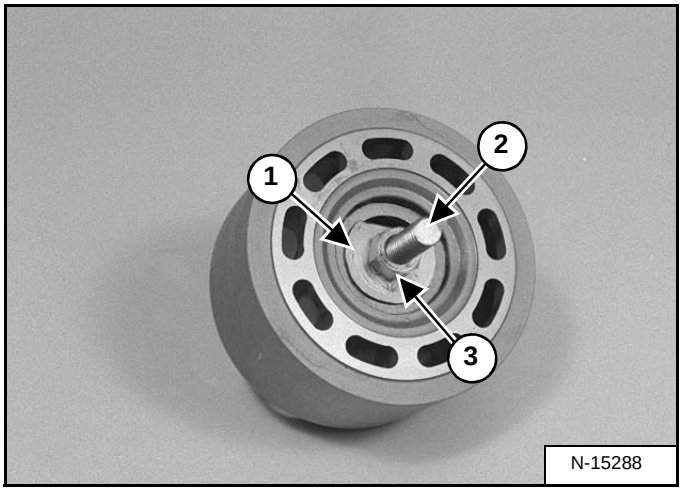
Figure 20-51-176



Install the threaded rod and nut (Item 1) through the modified washer (Item 2) and the block assembly (Item 3) **[Figure 20-51-176]**.

NOTE: The modified washer (Item 2) must fit between the three pins (Item 4) [Figure 20-51-176].

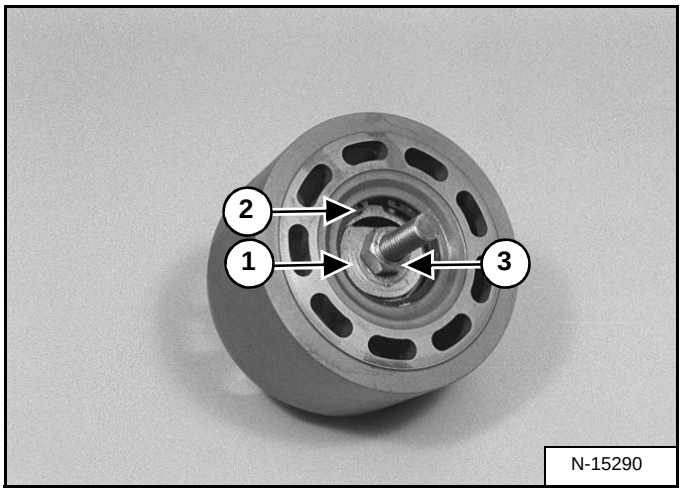
Figure 20-51-177



Install the second modified washer (Item 1) over the threaded rod (Item 2) **[Figure 20-51-177]**.

Install the nut (Item 3) **[Figure 20-51-177]** on the threaded rod.

Figure 20-51-178

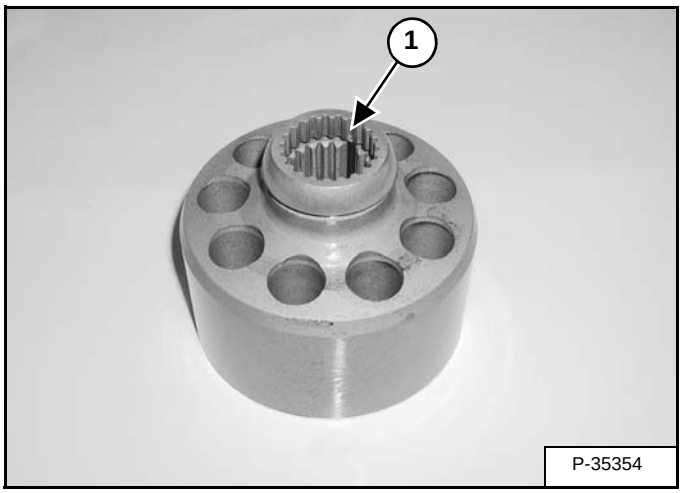


NOTE: The modified washer (Item 1) must fit over the spring, but must also fit inside the snap ring (Item 2) [Figure 20-51-178].

Tighten the nut (Item 3) until the spring is compressed enough to install the snap ring (Item 2) **[Figure 20-51-178]**.

Remove the threaded rod/washer assembly.

Figure 20-51-179

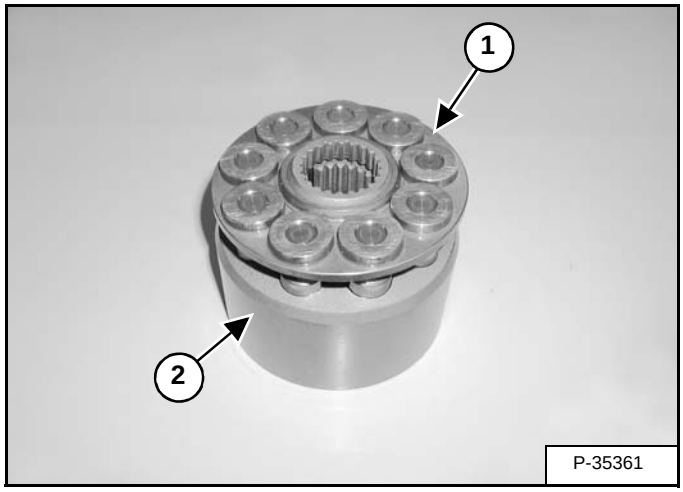


Install the retaining ball (Item 1) **[Figure 20-51-179]** on the three pins.

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Piston Pump Assembly (Cont'd)

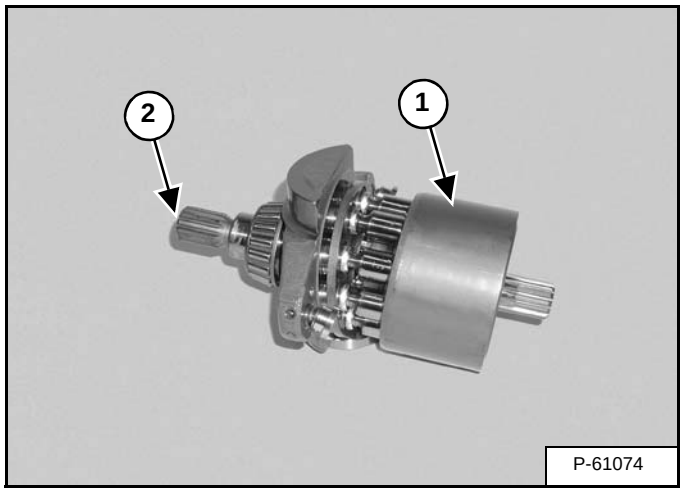
Figure 20-51-180



Install the retainer and piston assembly (Item 1) in the cylinder block (Item 2) **[Figure 20-51-180]**.

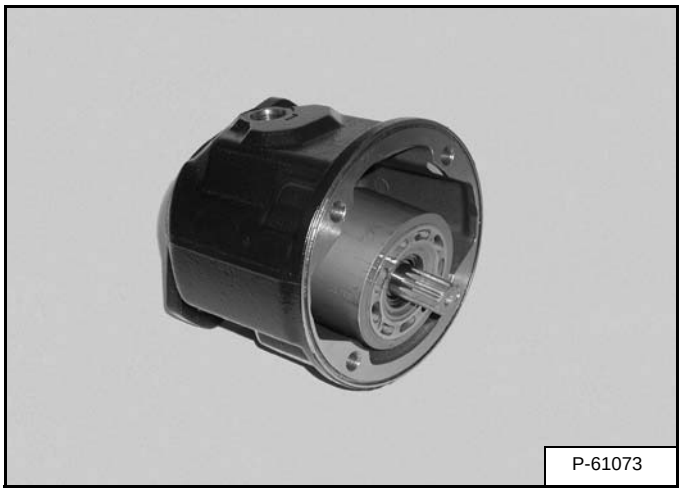
NOTE: It is NOT important that the pistons are installed in their original positions.

Figure 20-51-181



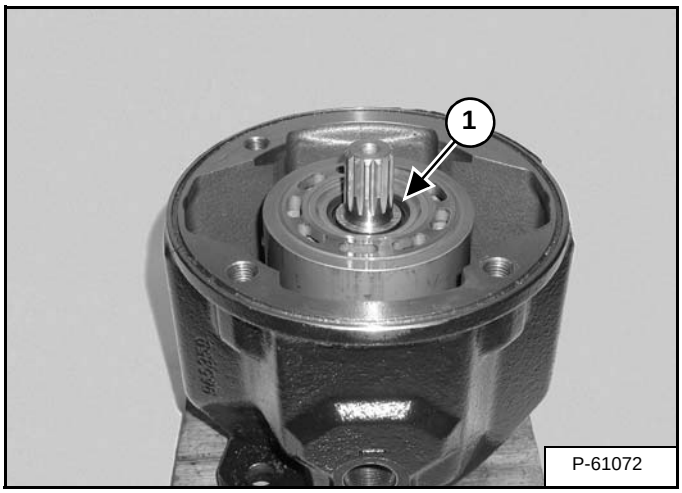
Slide the rotary group assembly (Item 1) on the shaft (Item 2) **[Figure 20-51-181]**.

Figure 20-51-182



Lay the pump housing on its side and install the rotary group assembly, swash plate, and shaft in the housing **[Figure 20-51-182]**.

Figure 20-51-183



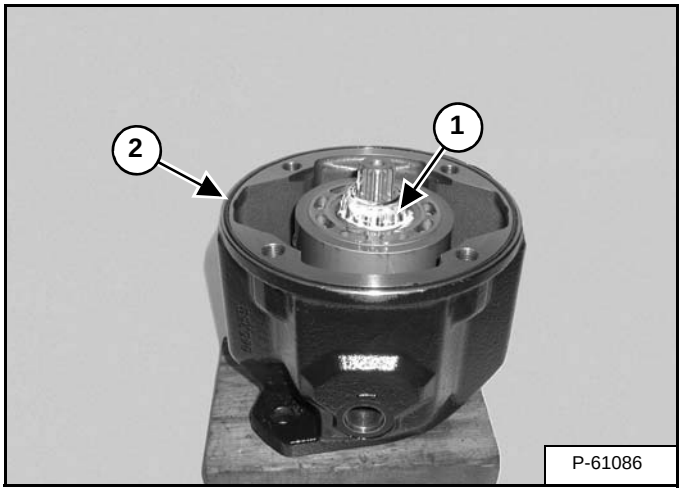
Set the pump housing in the up-right position **[Figure 20-51-183]**.

Install the shim washer (Item 1) **[Figure 20-51-183]**.

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Piston Pump Assembly (Cont'd)

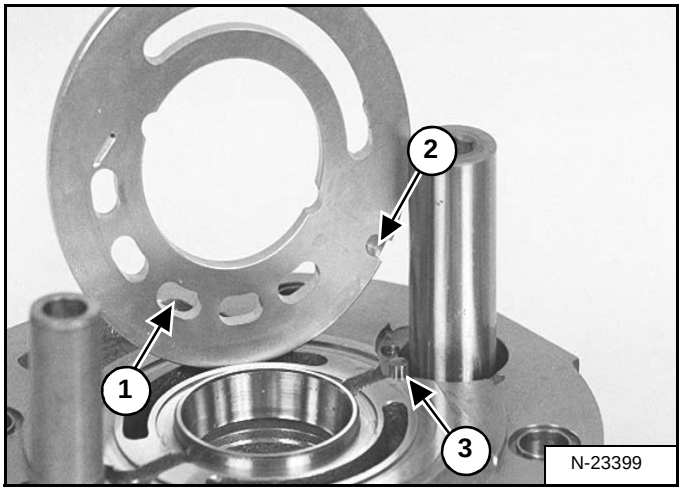
Figure 20-51-184



Install the bearing (Item 1) **[Figure 20-51-184]** on the shaft.

Install the O-ring (Item 2) **[Figure 20-51-184]**.

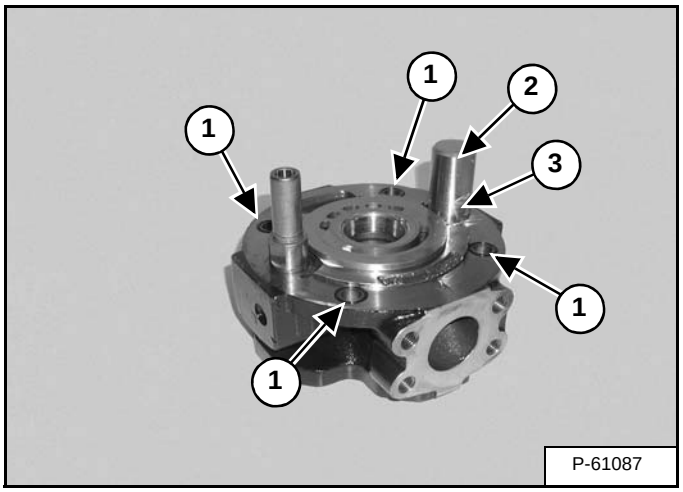
Figure 20-51-185



Install the valve plate (Item 1) on the back port assembly. The valve plate can only be installed one way by aligning the groove (Item 2) with the pin (Item 3) **[Figure 20-51-185]**.

NOTE: Apply assembly lube to the back of the valve plate.

Figure 20-51-186

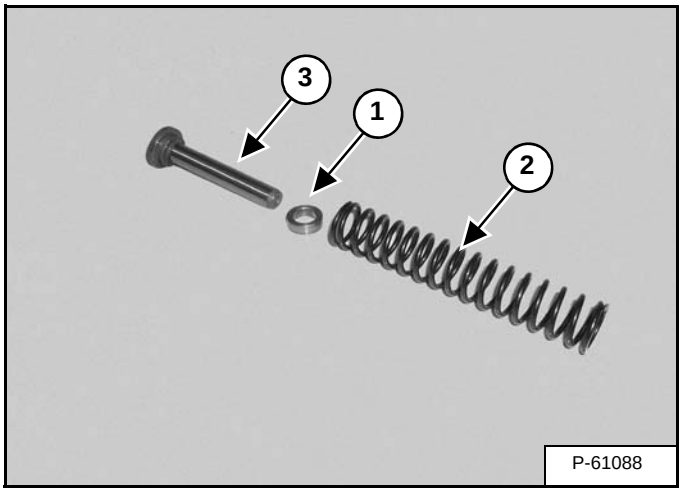


Install the O-rings (Item 1) **[Figure 20-51-186]** on the back port assembly.

Grease the inside of the control piston (Item 2) **[Figure 20-51-186]**.

Slide it over the control piston shaft (Item 3) **[Figure 20-51-186]**.

Figure 20-51-187

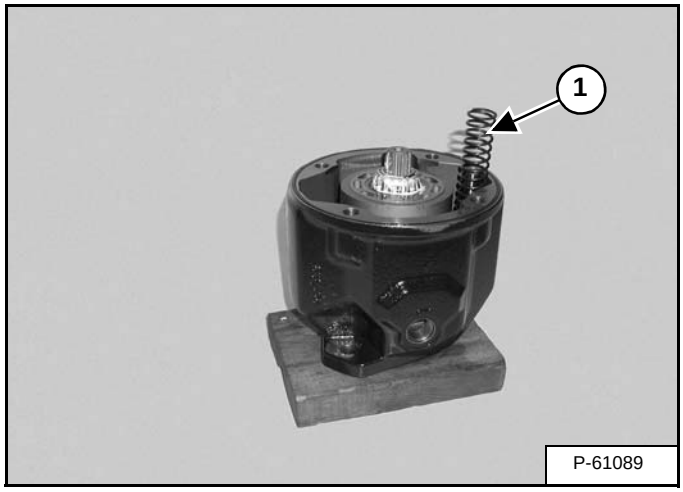


Install the bushing (Item 1) and spring (Item 2) on the stroking piston (Item 3) **[Figure 20-51-187]**.

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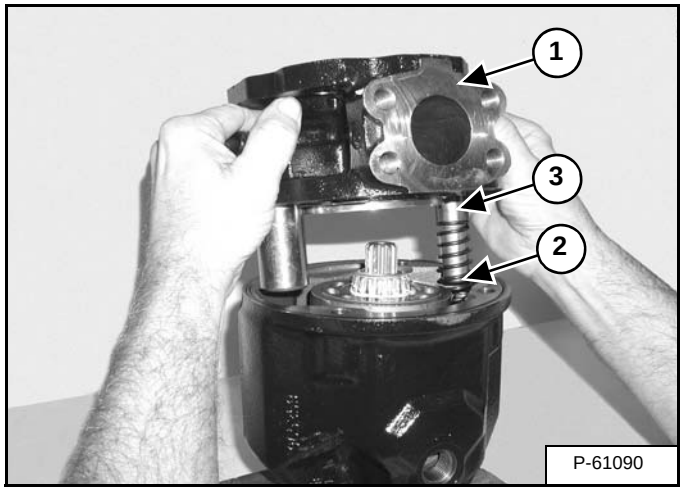
Piston Pump Assembly (Cont'd)

Figure 20-51-188



Install the stroking piston assembly (Item 1) **[Figure 20-51-188]** in the housing.

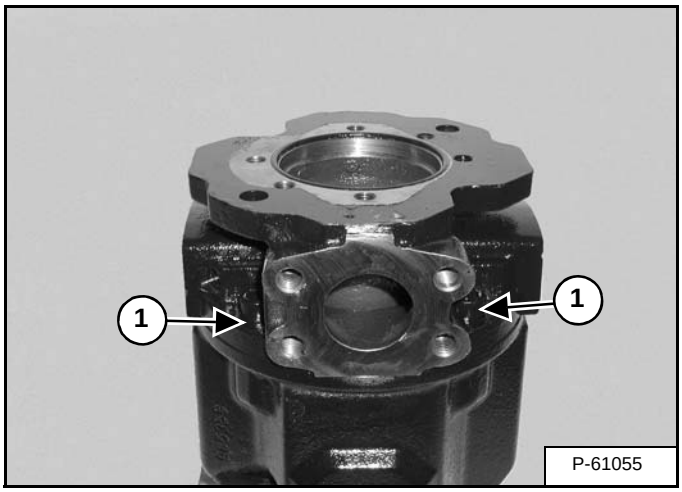
Figure 20-51-189



Install the back port assembly (Item 1) **[Figure 20-51-189]**

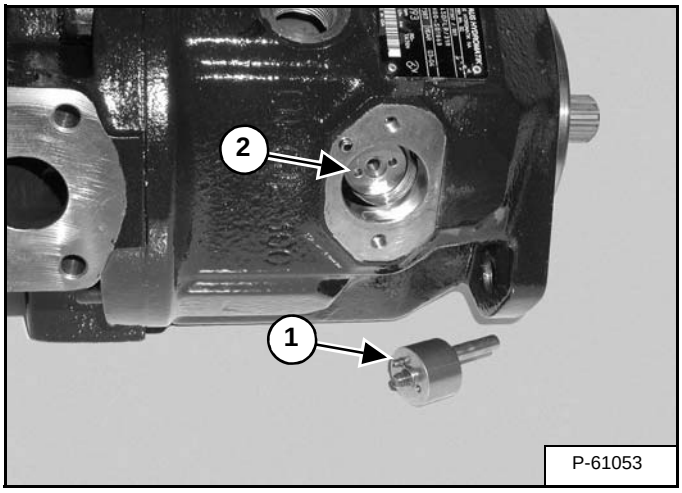
NOTE: Align the stroking piston assembly (Item 2) with the shaft (Item 3) [Figure 20-51-189].

Figure 20-51-190



Install the four bolts (Item 1) **[Figure 20-51-190]**.

Figure 20-51-191

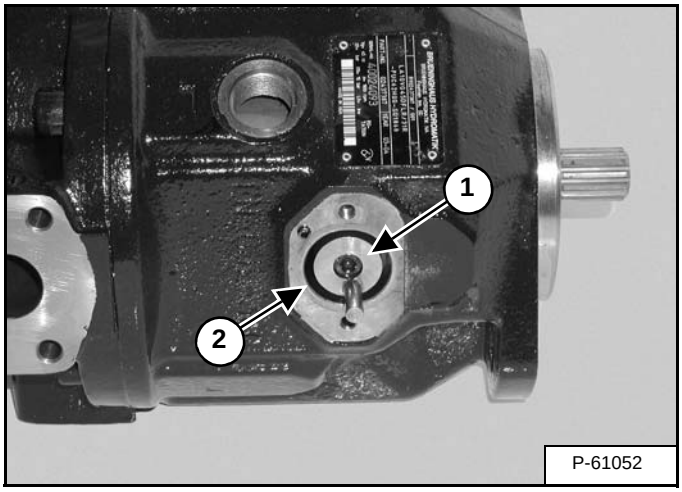


Align the dowel pin (Item 1) with the hole in the swash plate (Item 2) **[Figure 20-51-191]**.

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Piston Pump Assembly (Cont'd)

Figure 20-51-192



Apply Loctite™ 241 on the bolt (Item 1) and install the load sensing assembly (Item 2) **[Figure 20-51-192]**. Tighten to 10 ft.-lb. (13 N•m) torque.

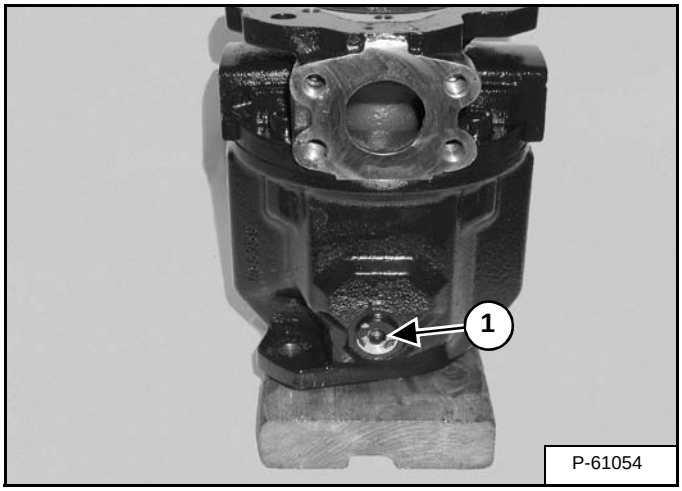
Install the torque limiter valve. (See Torque Limiter Valve Installation on Page 20-51-31)

Install the pump control assembly. (See Pump Control Removal And Installation on Page 20-51-33)

Place the hydraulic piston pump on its side and fill approximately half full.

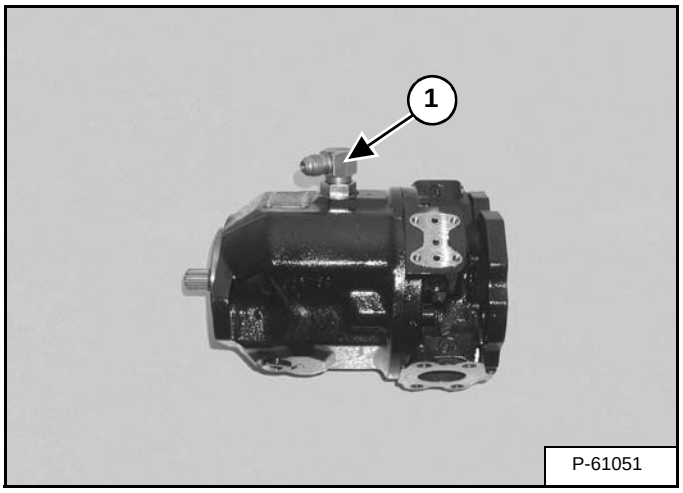
Install an O-ring on the plug.

Figure 20-51-193



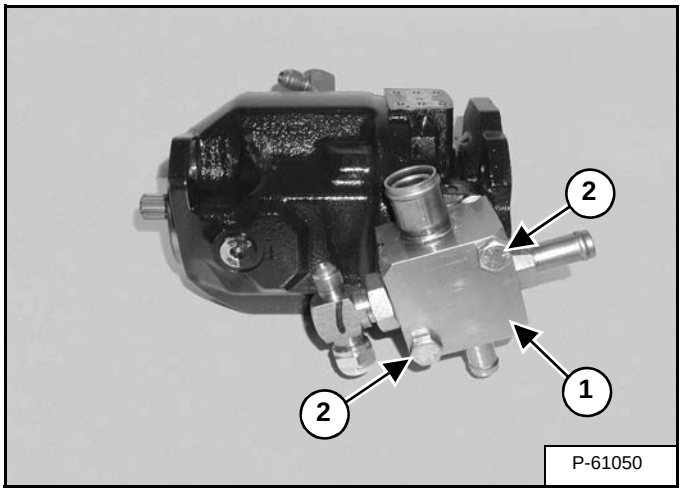
Install the plug (Item 1) **[Figure 20-51-193]** and tighten.

Figure 20-51-194



Install the fitting (Item 1) **[Figure 20-51-194]**.

Figure 20-51-195

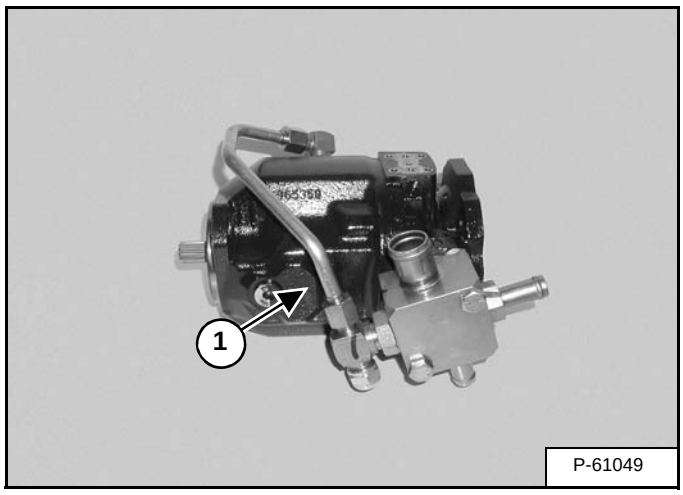


Install the block (Item 1) with the bolts (Item 2) **[Figure 20-51-195]**.

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Piston Pump Assembly (Cont'd)

Figure 20-51-196



Install the tubeline (Item 1) **[Figure 20-51-196]**.

Install the gear pump. (See Gear Pump Removal And Installation on Page 20-51-40)

Install the coupler. (See Coupler Removal And Installation on Page 20-51-18)

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HYDRAULIC PUMP (S/N 563112526 & ABOVE AND 563212618 & ABOVE)

Hydraulic Pump Work Sheet

(Please review pump procedure as illustrated in “Pump Testing”. (See Piston Pump Testing on Page 20-50-4.)

The outline listed below, gives the five adjustments for setting the hydraulic pump. The adjustments are listed in the order in which they ***MUST*** be performed. Below each adjustment is a list of the steps. Behind each adjustment is the page location within the Service Manual for the complete adjustment procedure.

1. Run Engine at High Idle, (2560 to 2770 RPM) Record NO Load Engine RPM.

_____ **ENGINE RPM**

2. Adjust Engine RPM (If Necessary.)

3. Connect Hydraulic Tester to the test fittings

4. Record the Flow.

_____ **FLOW**

I. Minimum Displacement Adjustment (See Minimum Displacement Adjustment on Page 20-52-6)

5. Disconnect the Load Sense Hose at the Pump. Plug the Hose and Cap the Fitting.

6. Install Jumper Hose with a Test Port, Between the Pump Diagnostic Port and the Load Sense Diagnostic Port at the Control Valve

7. Install a **5000 PSI (345 bar) gauge** to the tee fitting test port installed on the hydraulic hose.

8. Run Engine at High Idle.

9. Adjust hydraulic tester to 2400 to 2500 PSI (165 to 172 bar), pump flow should be 5 to 5.5 GPM (19 to 21 L/min)

10. Record the Flow.

_____ **FLOW**

II. Pump Margin Pressure Adjustment (See Pump Pressure Adjustment on Page 20-52-12)

11. Connect Pump Margin Spool to the Reservoir.

12. Run Engine at High Idle.

13. Adjust as Necessary to get 220 ± 10 PSI (15 ± 0,69 bar) at 8 GPM (30 L/min).

14. Record Pressure.

_____ **PM PRESSURE**

15. Remove the Hose and Fitting from the Pump Margin Spool and Plug Port.

16. Remove the **500 PSI (35 bar) gauge** from the Pump Diagnostic Port at the Control Valve.

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Hydraulic Pump Work Sheet (Cont'd)

III. Back-up Relief Valve Pressure Adjustment. (See Pump Margin Pressure Adjustment on Page 20-52-8)

17. Install **5000 PSI (345 bar) Gauge** on Pump Diagnostic Coupler at the Control Valve.
18. Turn the load sense relief valve in 3/4 turn.
19. Run Engine at High Idle, Raise Dozer Blade and Dead-Head in Up Position.
20. Adjust Load Sense Relief Valve as Necessary to get 3750 PSI ± 50 PSI (259 ± 3,4 bar).
21. Record Pressure

_____ **BR PRESSURE**

IV. Pump Pressure Adjustment (See Pump Pressure Adjustment on Page 20-52-12)

22. Install **5000 (345 bar) PSI Gauge**, On Pump Diagnostic Coupler at the Control Valve.
23. Readjust the hydraulic flow tester by turning the knob clockwise, all the way in (closed position)
24. Run Engine at High Idle, Raise Dozer Blade and Dead-Head in Up Position
25. Adjust Load Sense Relief Valve as Necessary to get 3625 ± 75 PSI (250 ± 5,2 bar).
26. Record Pressure
27. Readjust the hydraulic flow tester by turning the knob counterclockwise, all the way in (open position)

_____ **PUMP PRESSURE**

28. Remove the **5000 PSI (345 bar) Gauge**, from the Pump Diagnostic Coupler at the Control Valve.

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Hydraulic Pump Work Sheet (Cont'd)

V. Torque Limiter Adjustment (See Torque Limiter Adjustment on Page 20-52-13)

29. Install Jumper Hose with a Test Port, Between the Pump Diagnostic Port and the Load Sense Diagnostic Port at the Control Valve

30. Install a **5000 PSI (345 bar) gauge** to the test port on the hydraulic test hose.

31. Adjust the Hydraulic Tester to 1450 PSI (100 bar).

32. Adjust the Torque Limiter to obtain 27 to 32 GPM (102 to 121 L/min)

33. Record Flow and Engine RPM.

_____ **FLOW**

_____ **ENGINE RPM**

34. Adjust the Hydraulic Tester to 3300 PSI (228 bar).

35. Adjust the Torque Limiter to obtain 14 to 18 GPM (53 to 68 L/min)

36. Record Flow and Engine RPM.

_____ **FLOW**

_____ **ENGINE RPM**

ALL PUMP ADJUSTMENTS ARE NOW COMPLETED

37. Remove the Jumper Hose

38. Remove the Hydraulic Tester

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Piston Pump Testing

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

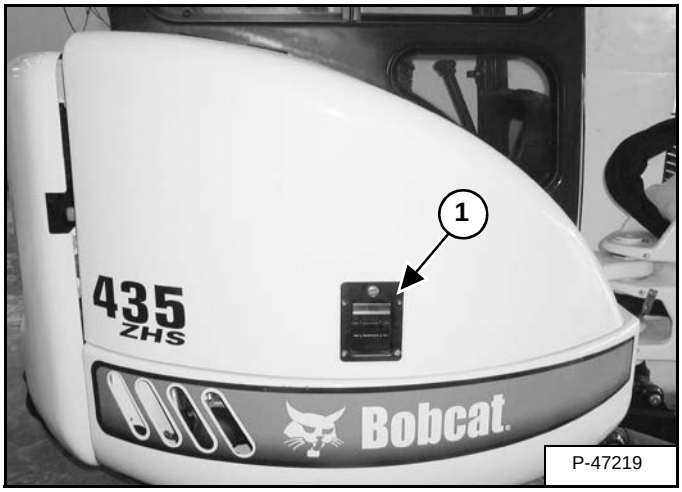
Minimum Displacement Adjustment
Pump Margin Pressure
Back-up Relief Valve Adjustment
Pump Pressure
Torque Limiter

Test Fitting Installation

The following tools will be needed to do the procedure:

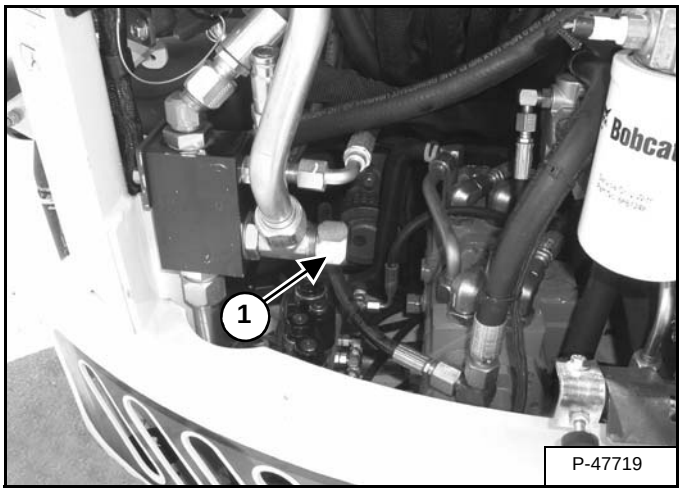
MEL10003 - Hydraulic Tester
MEL1355 - Hydraulic Test Kit
MEL1548 - Hydraulic Fitting Kit
MEL1598 - Hydraulic Fitting Kit

Figure 20-52-1



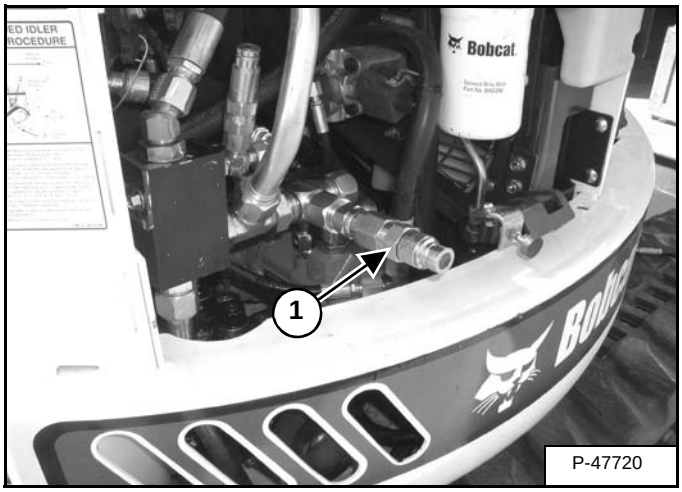
Open the right side cover (Item 1) **[Figure 20-52-1]**.

Figure 20-52-2



Remove the cap (Item 1) **[Figure 20-52-2]** from the build up valve.

Figure 20-52-3

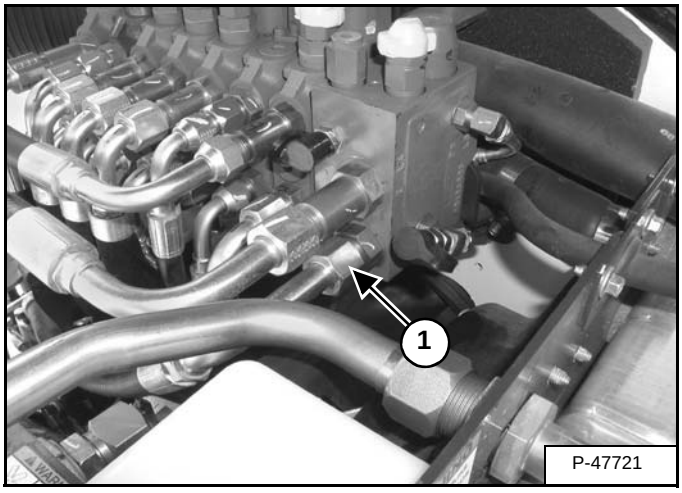


Install a male hydraulic coupler (Item 1) **[Figure 20-52-3]** on the fitting.

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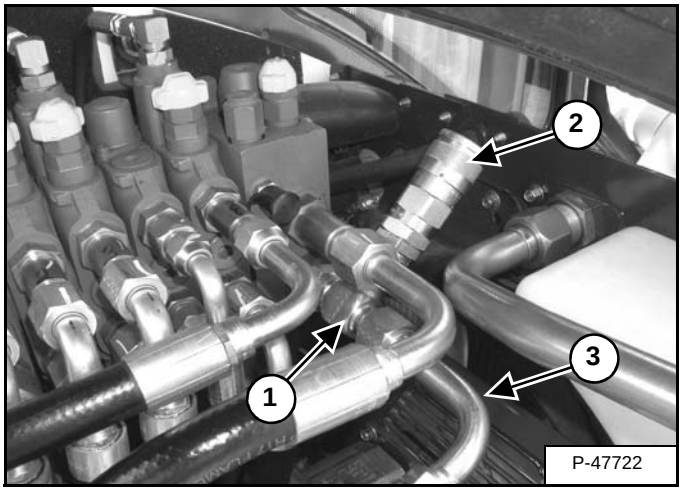
Piston Pump Testing (Cont'd)

Figure 20-52-4



Remove the inlet hose (Item 1) **[Figure 20-52-4]** from the control valve.

Figure 20-52-5



Install a T fitting (Item 1), and female quick coupler (Item 2) **[Figure 20-52-5]** on the hydraulic control valve.

Reinstall the inlet hose (Item 3) **[Figure 20-52-5]** on the T fitting.

Figure 20-52-6



Connect the **Inlet** hose of the hydraulic tester to the coupler (Item 1) **[Figure 20-52-6]** at the control valve.

Connect the **Outlet** hose of the hydraulic tester to the coupler (Item 2) **[Figure 20-52-6]** at the build up valve.

Test Fittings are Now Installed.

The values read at the Hydraulic Tester (MEL10003) are based on the use of 3/4 in. (19.05 mm) hoses on the tester. Different size hoses will cause variation in the readings.

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

The No Load Engine RPM should be **2560 to 2770 RPM**.

Stop the engine and adjust the engine RPM if necessary.

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HYDRAULIC PUMP (S/N 562611001 & ABOVE AND 562811001 & ABOVE) (CONT'D)

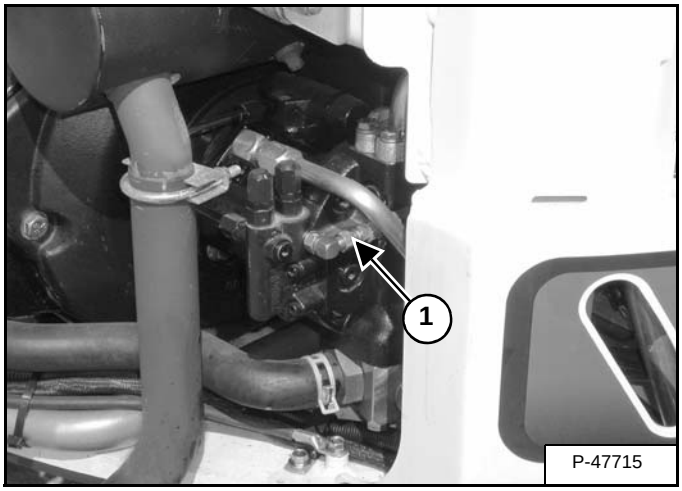
Pump Testing (Cont'd)

Minimum Displacement Adjustment

The hydraulic pump has an adjustable minimum displacement feature. This is set to approximately **5 to 5.5 GPM (21 L/min) @ High Idle**.

The minimum displacement ensures that some volume of oil is available from the pump at all times to the work group anti-cav valves and the slew motor cross port anti-cav valves.

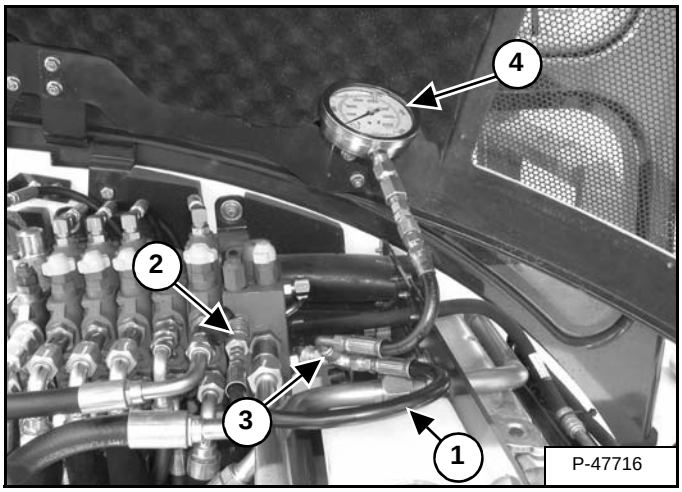
Figure 20-52-7



At the hydraulic pump, disconnect the load sense hose (Item 1) **[Figure 20-52-7]**.

Plug the hose and cap the fitting.

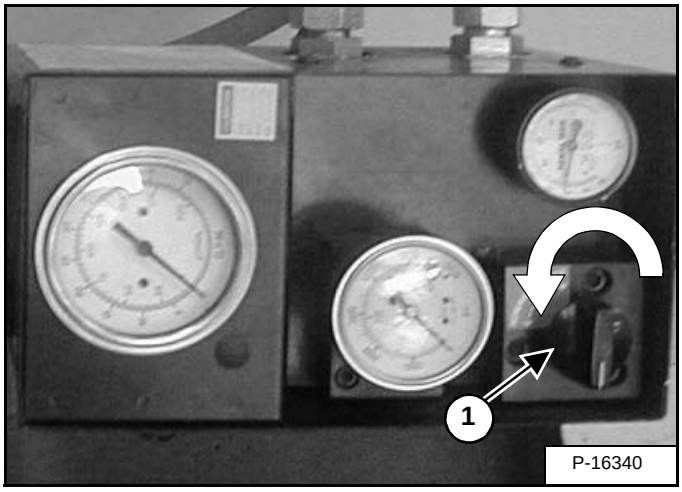
Figure 20-52-8



With a 5000 PSI (345 bar), 1/4 in. hose (Item 1) and 2 female hydraulic couplers from the kit, connect the pump diagnostic port (Item 2) to the Load Sense diagnostic port (Item 3) **[Figure 20-52-8]** on the control valve.

Install a 5000 PSI (345 bar) gauge (Item 4) **[Figure 20-52-8]** to the test port on the test hose.

Figure 20-52-9



Connect the hydraulic tester to the test fittings. Turn the hydraulic tester flow control (Item 1) **[Figure 20-52-9]** counterclockwise until all restriction is removed.

With another person in the operator cab, start the engine and run at high idle.

Start the engine and warm the hydraulic oil to a minimum of 140° F (60° C).

At high idle, activate the auxiliary hydraulic flow.

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Piston Pump Testing (Cont'd)

Figure 20-52-10

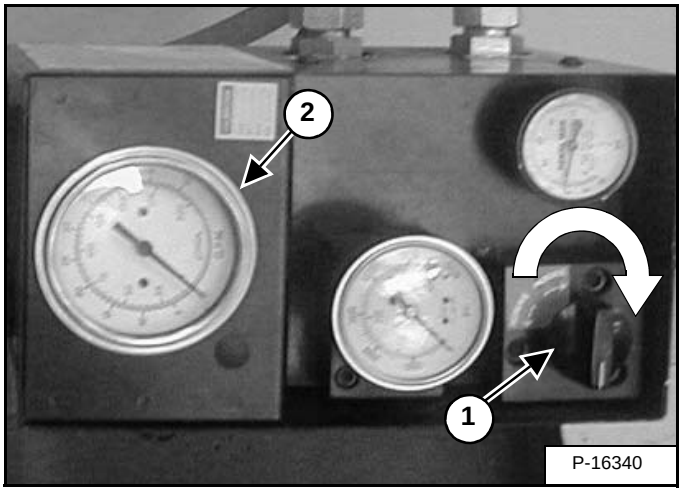
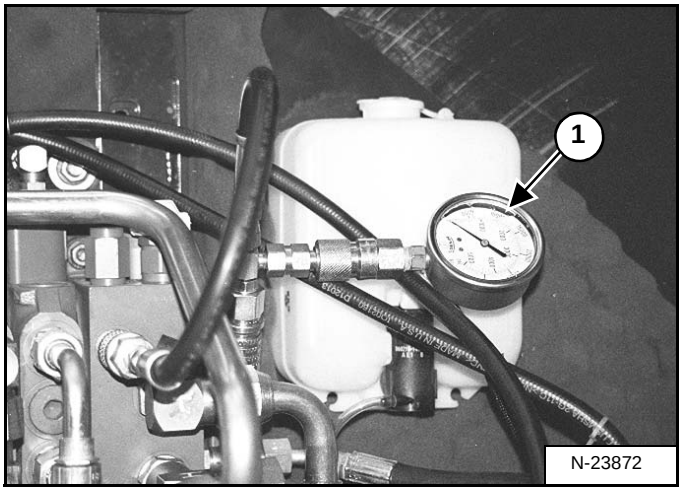


Figure 20-52-11



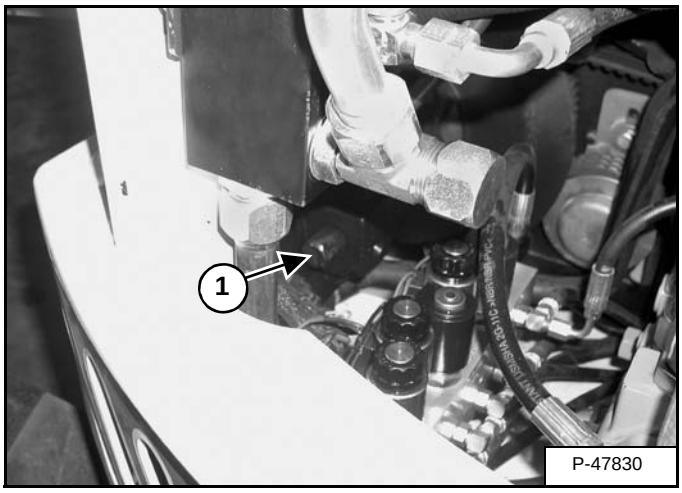
Turn the hydraulic tester flow control (Item 1) **[Figure 20-52-10]** clockwise until the test gauge (Item 1) **[Figure 20-52-11]** at the control valve, reads **2400 to 2500 PSI (165 to 172 bar)**.

Record the pressure at the gauge (Item 1) **[Figure 20-52-11]**.

Record the amount of flow at the tester gauge (Item 2) **[Figure 20-52-10]**.

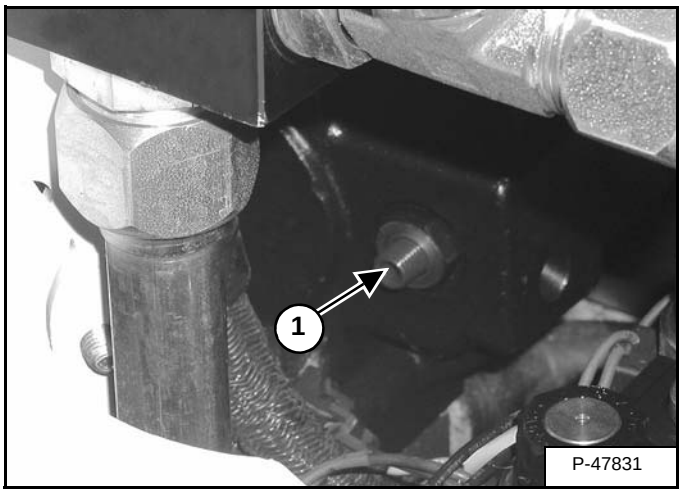
The flow should be **5 to 5.5 GPM (19 to 21 L/min)**.

Figure 20-52-12



To adjust the flow, go to the hydraulic pump, remove the cap (Item 1) **[Figure 20-52-12]** from the pump minimum displacement screw.

Figure 20-52-13



With an Allen wrench adjust the flow adjustment screw (Item 1) **[Figure 20-52-13]** by turning ***clockwise to increase*** the flow and ***counterclockwise to decrease*** the flow.

At the hydraulic pump, reconnect the load sense hose.

At the control valve, disconnect the hose from the pump diagnostic port to the Load Sense diagnostic port.

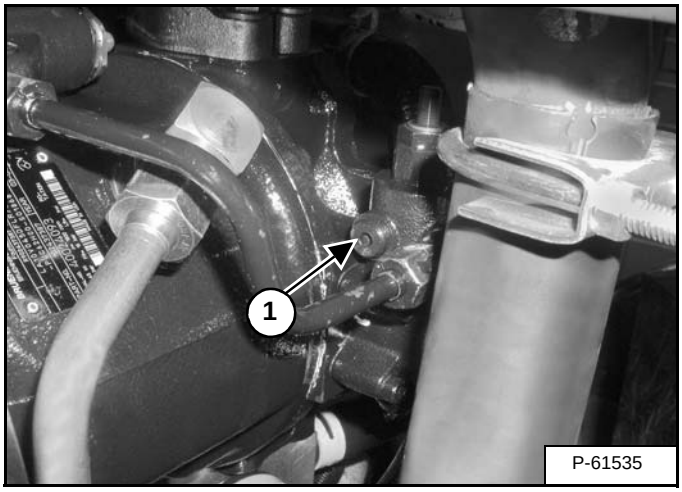
Minimum Displacement Adjustment is now completed.

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Piston Pump Testing (Cont'd)

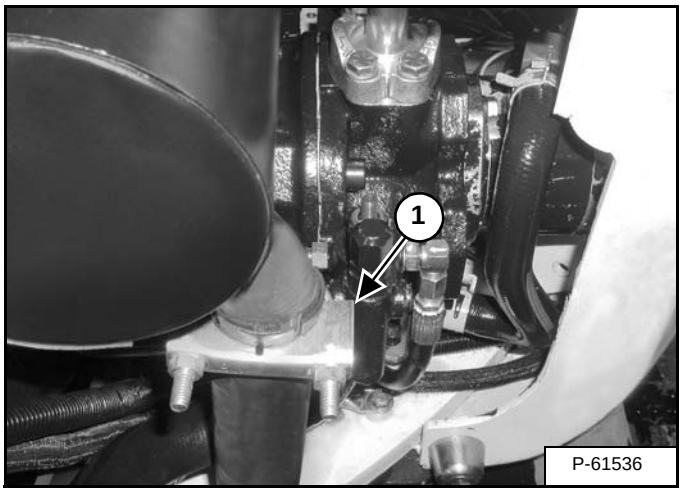
Pump Margin Pressure Adjustment

Figure 20-52-14



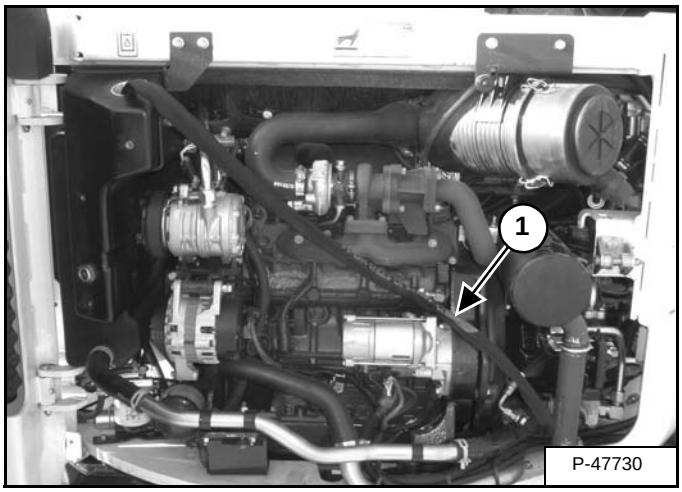
At the pump margin spool remove the front plug (Item 1) **[Figure 20-52-14]**.

Figure 20-52-15



Install a 15KN-3 (Item 1) **[Figure 20-52-15]** fitting and 1/4 in. (6,35 mm) hydraulic hose with a 90° end to the fitting.

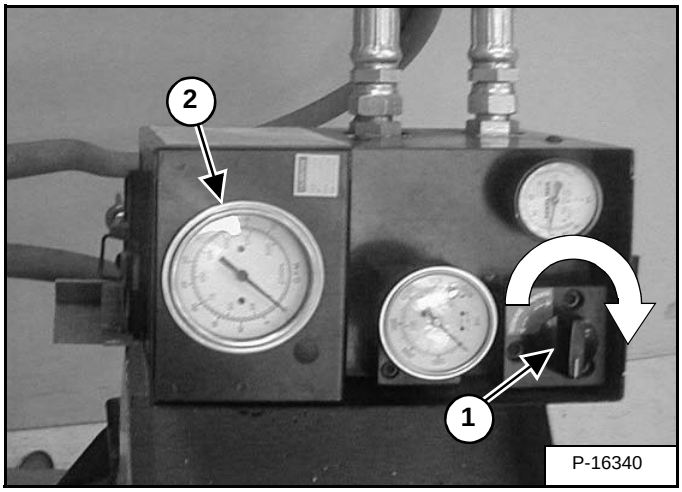
Figure 20-52-16



Route the hose (Item 1) **[Figure 20-52-16]** from the pump margin spool to the hydraulic reservoir.

Start the engine and allow the hydraulic fluid to warm to 140° F (60° C).

Figure 20-52-17

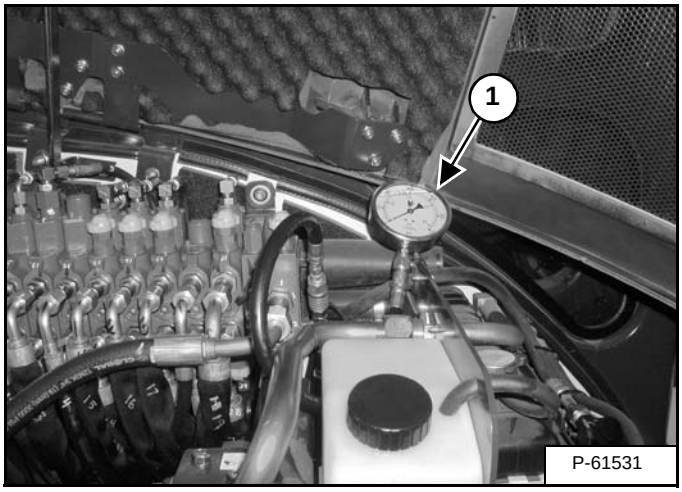


With the engine at high idle, turn the hydraulic tester flow control (Item 1) clockwise until **8 GPM (30 L/min**) flow is shown at the hydraulic tester gauge (Item 2) **[Figure 20-52-17]**.

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Piston Pump Testing (Cont'd)

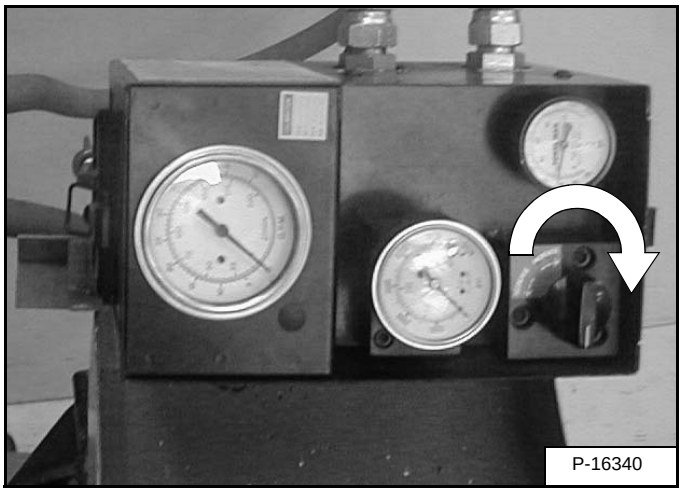
Figure 20-52-18



Check the pump margin pressure at the gauge (Item 1) **[Figure 20-52-18]**.

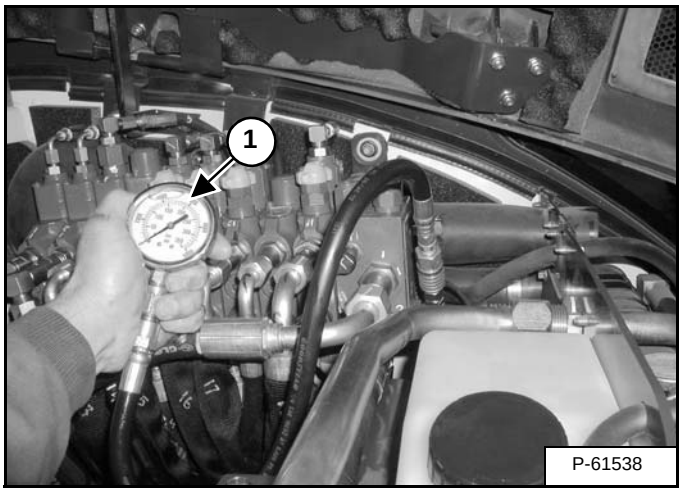
Back-up Relief Valve Adjustment

Figure 20-52-19



Turn the hydraulic tester flow control (Item 1) **[Figure 20-52-19]** clockwise until maximum restriction.

Figure 20-52-20



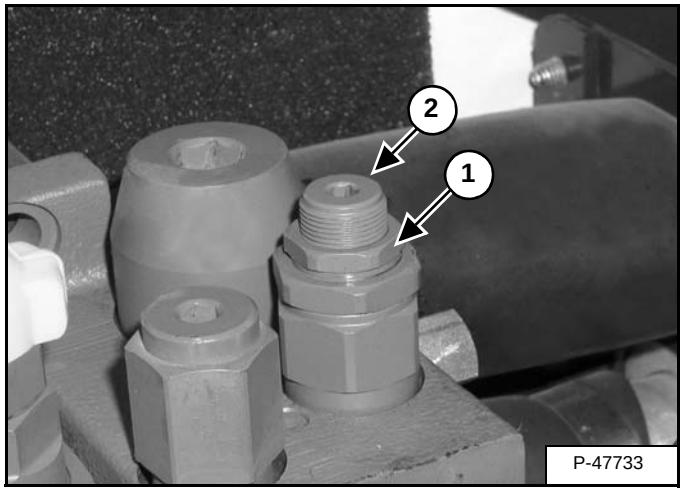
Install a 5000 PSi (345 bar) gauge on the test coupler (Item 1) **[Figure 20-52-20]**.

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HYDRAULIC PUMP (S/N 563112526 & ABOVE AND 563212618 & ABOVE) (CONT'D)

Back-up Relief Valve Adjustment (Cont'd)

Figure 20-52-21



Loosen the lock nut (Item 1) **[Figure 20-52-21]**.

Turn the load sense relief adjustment screw (Item 2) **[Figure 20-52-21]** in 3/4 of a turn, increasing the relief pressure approximately 250 PSI (17 bar) to 4000 PSI (276 bar). The main relief is now set to a higher pressure than the back-up relief on the hydraulic pump.

Tighten the lock nut (Item 1) **[Figure 20-52-21]**.

Start the excavator and warm the hydraulic oil to operating temperature.

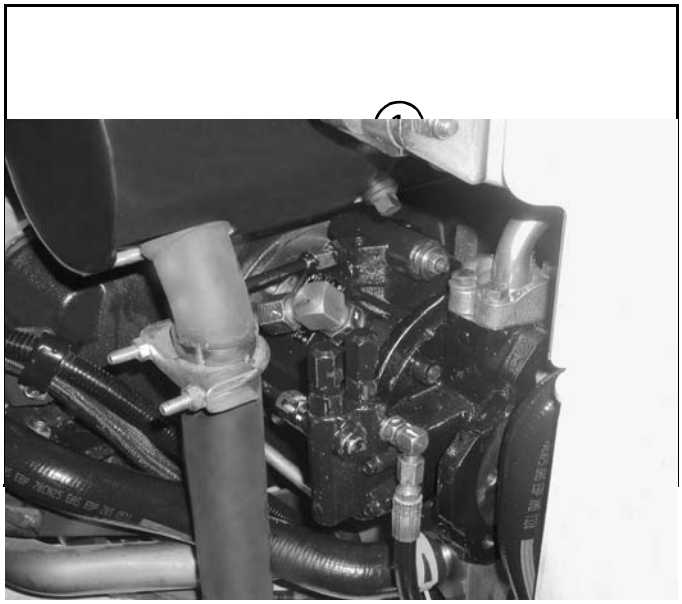
Move the engine speed control to the high speed position.

Raise the blade until the blade cylinder is fully retracted and the relief valve opens.

Have another person check the pressure gauge and record the back-up relief valve pressure.

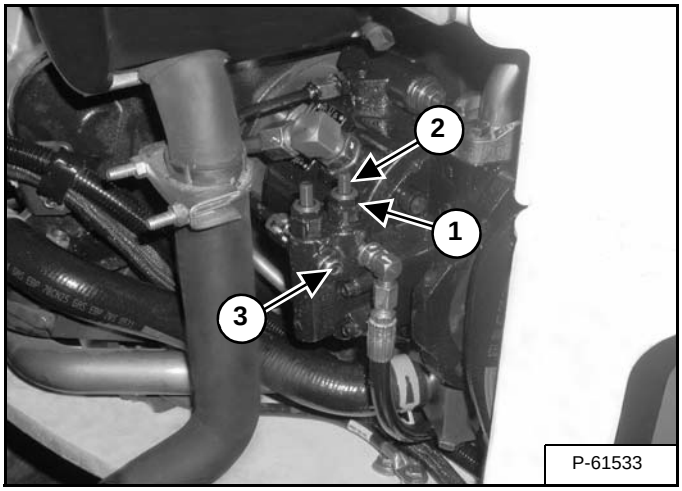
The pressure at the gauge (Item 1) **[Figure 20-52-20]** should be 3916 PSI (270 bar) ± 43.5 PSI (3 bar).

Figure 20-52-22



Remove the cap (Item 1) **[Figure 20-52-22]** from the back-up relief valve.

Figure 20-52-23



Loosen the lock nut (Item 1) **[Figure 20-52-23]**.

Turn the adjustment screw (Item 2) **[Figure 20-52-23]** in to increase pressure and out to decrease pressure.

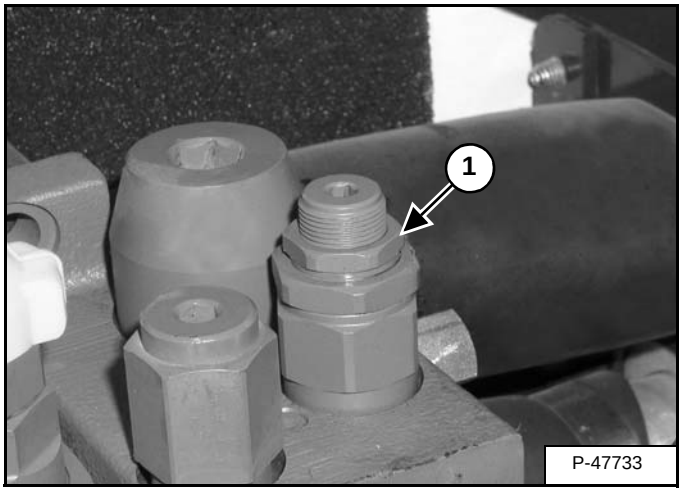
NOTE: One quarter turn is approximately 200 PSI (13,8 bar).

When back-up relief valve pressure is set, tighten the lock nut (Item 1) **[Figure 20-52-23]**.

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Back-up Relief Valve Adjustment (Cont'd)

Figure 20-52-24



Reset the Load Sense Relief Valve by loosening the lock nut (Item 1) and turning the load sense relief adjustment screw (Item 2) **[Figure 20-52-24]** out 3/4 of a turn, decreasing the relief pressure **approximately 250 PSi (17 bar) to 3750 PSI (259 bar)**. Tighten the lock nut.

The Backup Relief Valve Adjustment is now completed.

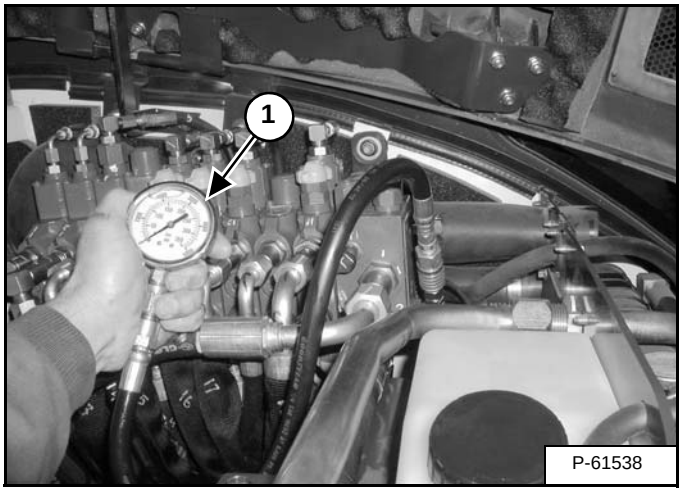
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HYDRAULIC PUMP (S/N 563112526 & ABOVE AND 563212618 & ABOVE) (CONT'D)

Piston Pump Testing (Cont'd)

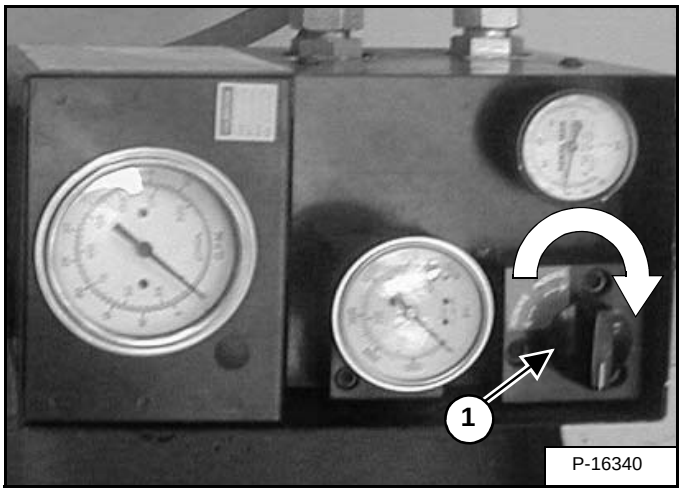
Pump Pressure Adjustment

Figure 20-52-25



Install a **5000 PSI (345 bar) gauge** (Item 1) **[Figure 20-52-25]** to the pump diagnostic port on the control valve.

Figure 20-52-26



Turn the hydraulic tester flow control (Item 1) **[Figure 20-52-26]** clockwise until maximum restriction.

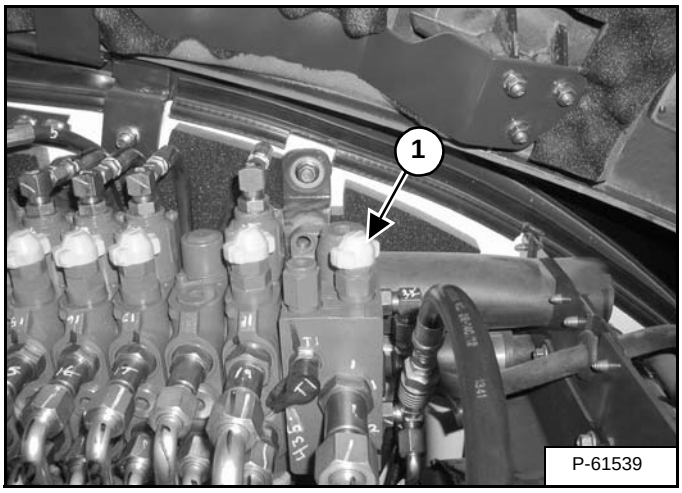
Start the engine and run at high idle.

Raise the blade and deadhead the blade in the up position.

Have another person check the pressure gauge (Item 1) **[Figure 20-52-25]** and record the pump pressure.

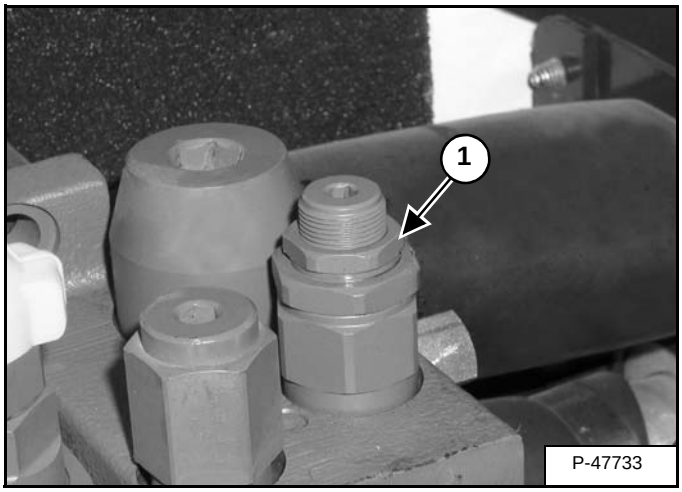
The pump pressure should be **3625 ± 75 PSI (250 ± 5,2 bar)**.

Figure 20-52-27



Remove the protective cap (Item 1) **[Figure 20-52-27]** from the top of the Load Sense Relief Valve.

Figure 20-52-28



Loosen the nut (Item 1) **[Figure 20-52-28]** and with an Allen wrench adjust the pressure to **3625 ± 75 PSI (250 ± 5,2 bar)**.

If pump pressure cannot be obtained, disassemble and clean the load sense relief valve.

When pump pressure is set, tighten the nut (Item 1) **[Figure 20-52-28]**.

Remove the 5000 PSI (345 bar) gauge from the pump diagnostic port on the control valve.

Pump Pressure Adjustment is now completed.

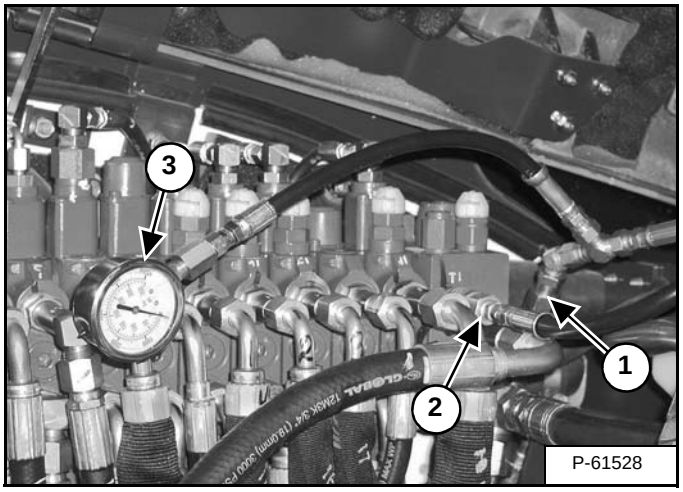
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Piston Pump Testing (Cont'd)

Torque Limiter Adjustment

NOTE: For a pump that has been tampered with or one that is so far out of adjustment that the correct settings cannot be obtained. (See Initial Torque Limiter Valve Setting on Page 20-52-30).

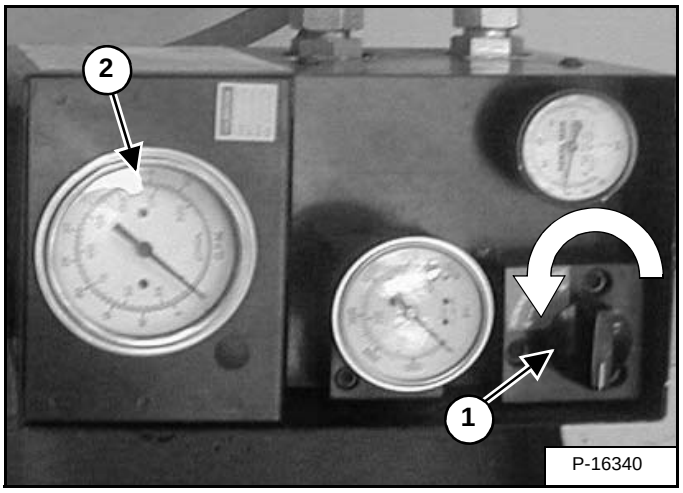
Figure 20-52-29



Install a 5000 PSI (345 bar), 1/4 in. (6,35 mm) hose and 2 female hydraulic couplers from the kit, connect the pump diagnostic port (Item 1) to the Load Sense diagnostic port (Item 2) **[Figure 20-52-29]** on the control valve.

Install a **5000 PSI (345 bar) gauge** (Item 3) **[Figure 20-52-29]** to the test port on the hydraulic test hose.

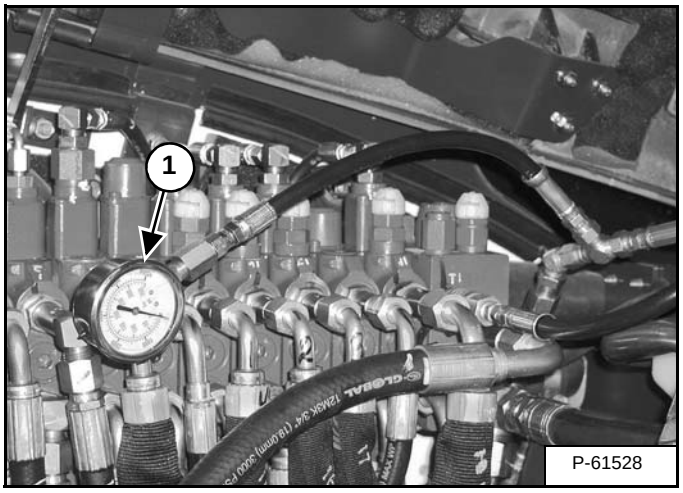
Figure 20-52-30



Turn the hydraulic tester flow control (Item 1) **[Figure 20-52-30]** counterclockwise so there is no restriction on the hydraulic system.

Start the engine and run at high idle.

Figure 20-52-31



Turn the hydraulic tester flow control (Item 1) **[Figure 20-52-31]** clockwise until the gauge (Item 1) **[Figure 20-52-31]** reads **1450 PSI (100 bar)**.

Record the amount of flow at the tester gauge (Item 2) **[Figure 20-52-30]**, which is the *flow at low pressure*.

The flow should be **27 to 32 GPM (102 to 121 L/min)**.

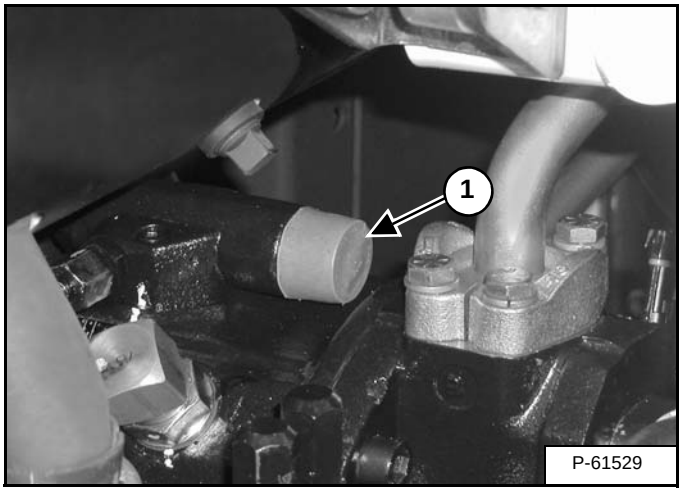
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HYDRAULIC PUMP (S/N 563112526 & ABOVE AND 563212618 & ABOVE) (CONT'D)

Piston Pump Testing (Cont'd)

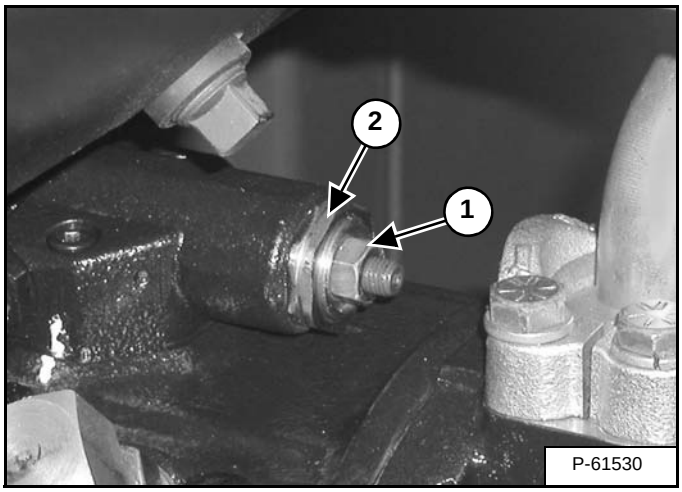
Torque Limiter Adjustment

Figure 20-52-32



If the pump torque limiter must be adjusted, stop the engine and remove the protective cap (Item 1) **[Figure 20-52-32]** from the hydraulic pump torque limiter.

Figure 20-52-33



Check the small nut (Item 1) **[Figure 20-52-33]** to be sure it is locked in place.

Adjust the flow at the hydraulic pump torque limiter loosening the large nut (Item 2) **[Figure 20-52-33]**. With an Allen wrench adjust the *flow at low pressure*.

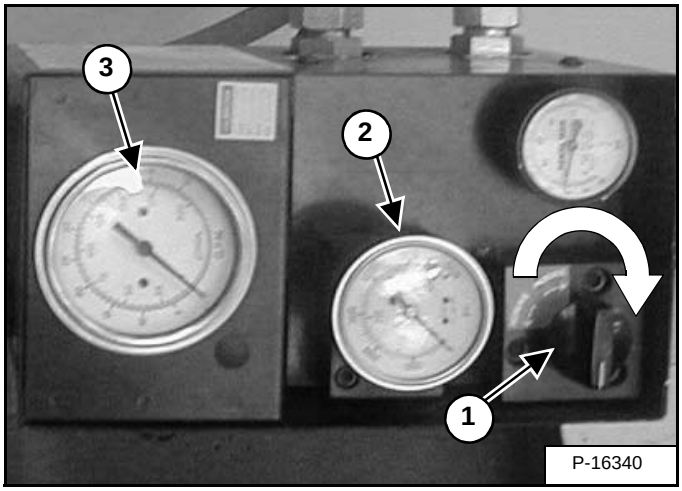
When the proper flow is obtained, **27 to 32 GPM (102 to 121 L/min) at 1450 PSI (100 bar)**, tighten the large nut (Item 2) **[Figure 20-52-33]**.

NOTE: When adjusting the flow at low pressure [Figure 20-52-33], the engine RPM must not fall below 2100 RPM.

NOTE: Changing the flow at low pressure (Item 2), (large nut) will affect flow at high pressure (Item 1) [Figure 20-52-33] (small nut).

If this flow at low pressure cannot be obtained, disassemble and clean the torque limiter spool.

Figure 20-52-34



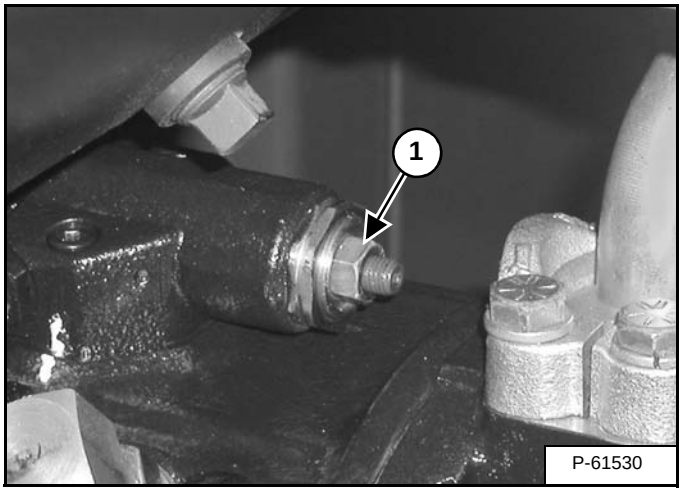
Turn the hydraulic tester flow control (Item 1) clockwise until the gauge (Item 2) reads **3300 PSI (228 bar)**. Record the amount of flow at the tester gauge (Item 3) **[Figure 20-52-34]**, which is the *flow at high pressure*.

The flow should be **14 to 18 GPM (53 to 68 L/min)**.

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Piston Pump Testing (Cont'd)

Figure 20-52-35



Adjust the flow at the hydraulic pump torque limiter. Stop the engine and loosen the small nut (Item 1) **[Figure 20-52-35]** and with an Allen wrench adjust the *flow at high pressure*.

If this flow at high pressure cannot be obtained, disassemble and clean the torque limiter spool.

When the proper flow is obtained, **14 to 18 GPM (53 to 68 L/min) at 3300 PSI (228 bar)**, lock the small nut (Item 1) **[Figure 20-52-35]**.

NOTE: When adjusting the flow at high pressure, the engine RPM must not fall below 2100 RPM.

NOTE: If adjustments were made to *flow at high pressure* verify the *flow at low pressure*. (See Torque Limiter Adjustment on Page 20-52-13)

Install the protective cap on the hydraulic pump torque limiter.

Torque Limiter Adjustment is now completed.

ALL PUMP ADJUSTMENTS ARE NOW COMPLETED

Remove the hydraulic tester and all test fittings from the excavator.

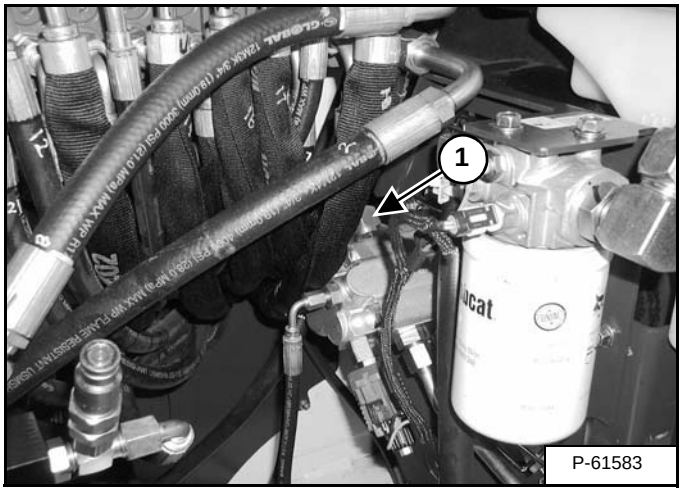
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Description

The fan/charge pump supplies hydraulic fluid to the manifold and cooling fan motor.

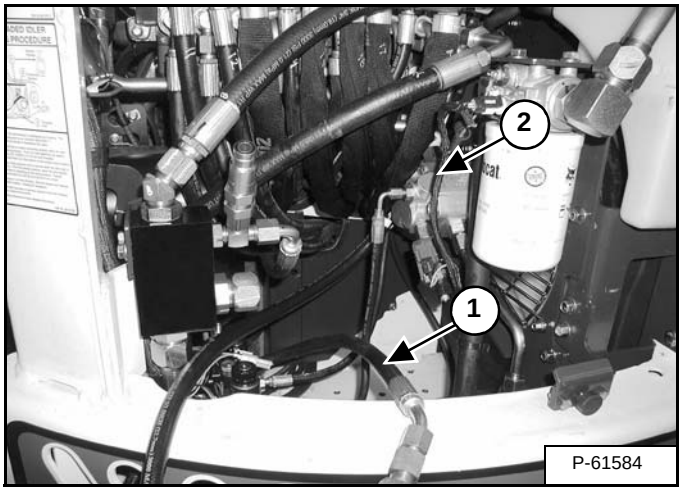
Gear Pump Testing

Figure 20-52-36



Remove the hose (Item 1) **[Figure 20-52-36]** from the fan motor.

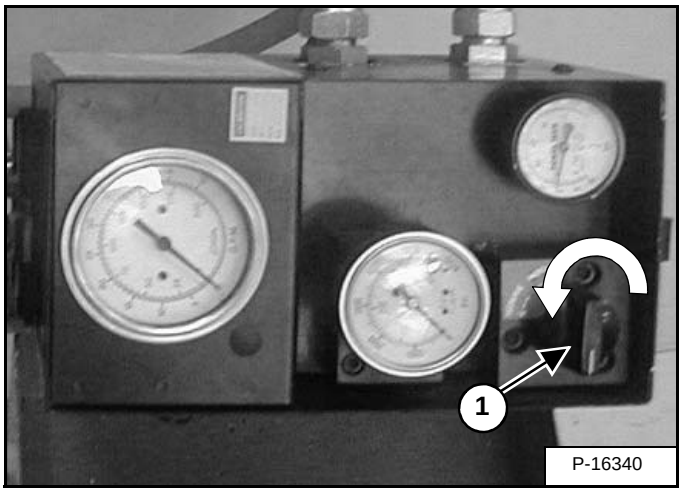
Figure 20-52-37



Connect the hydraulic tester inlet side (Item 1) **[Figure 20-52-37]** to the hose removed from the fan motor.

Install a short hose (Item 2) **[Figure 20-52-37]** on the fan motor. Connect the hose to the hydraulic tester outlet side.

Figure 20-52-38



Turn the hydraulic tester flow control (Item 1) **[Figure 20-52-38]** counterclockwise until all restriction is removed.

Start the engine and run at low RPM. Make sure the tester is connected correctly. If no flow is indicated at the tester, the hoses are connected wrong.

Increase the engine speed to full RPM. Warm the hydraulic fluid to a minimum temperature of 140° F (60° C) by turning the restrictor valve until the gauge reads about 1000 PSI (69 bar).

After the temperature is correct, open the restrictor valve fully.

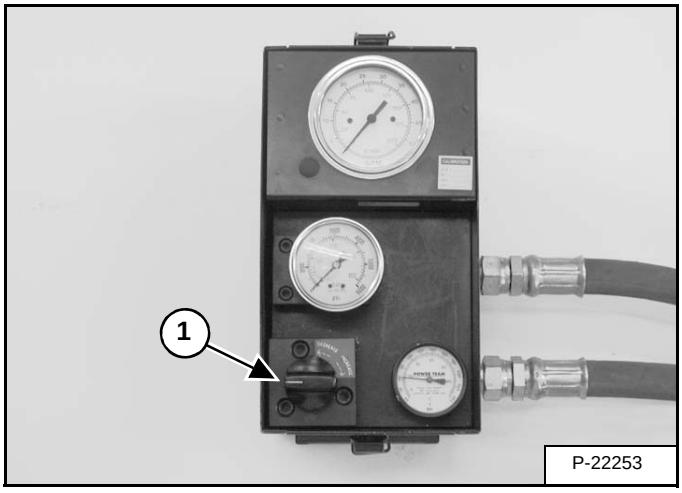
Record the pump free flow GPM (L/min).

Pump flow on a new pump is 9.3 GPM (35,2 L/min) at 2500 engine rpm.

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Gear Pump Testing (Cont'd)

Figure 20-52-39



Close the flow control knob (Item 1) **[Figure 20-52-39]** slowly to 1950 PSI (134 bar).

Record the pump high pressure flow GPM (L/min).

NOTE: The high pressure flow must be at least 80% of free flow.

$$\%= \frac{\text{HIGH PRESSURE FLOW (GPM)}}{\text{FREE FLOW (GPM)}} \times 100$$

If the high pressure flow is less than 80% of free flow, remove the pump for repair or replacement.

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Removal And Installation

IMPORTANT

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

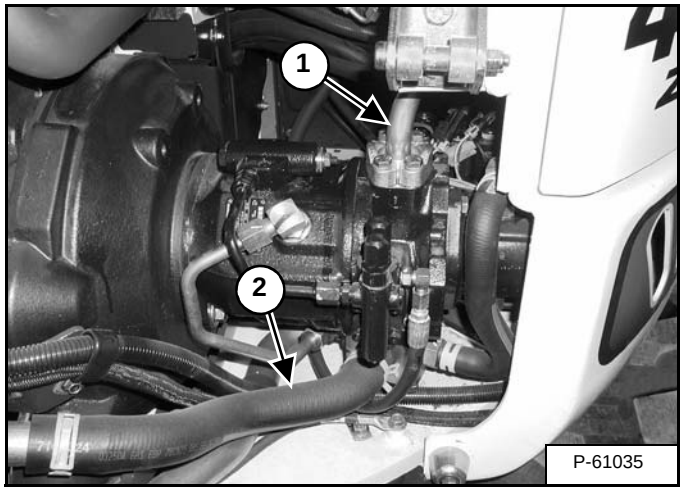
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Open the tailgate.

Drain the hydraulic reservoir. (See Replacing The Hydraulic Oil on Page 10-100-2)

Remove the muffler. (See Removal And Installation on Page 70-20-1)

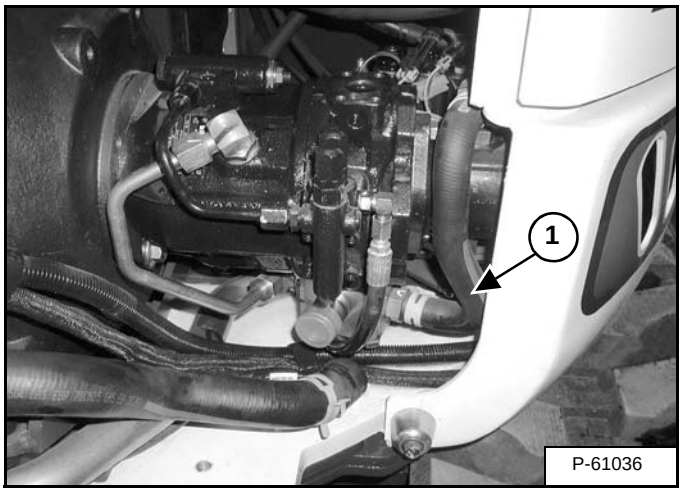
Figure 20-52-40



Remove the hose (Item 1) **[Figure 20-52-40]** that goes from the pump to the control valve.

Remove the hose (Item 2) **[Figure 20-52-40]** that goes from the reservoir to the pump.

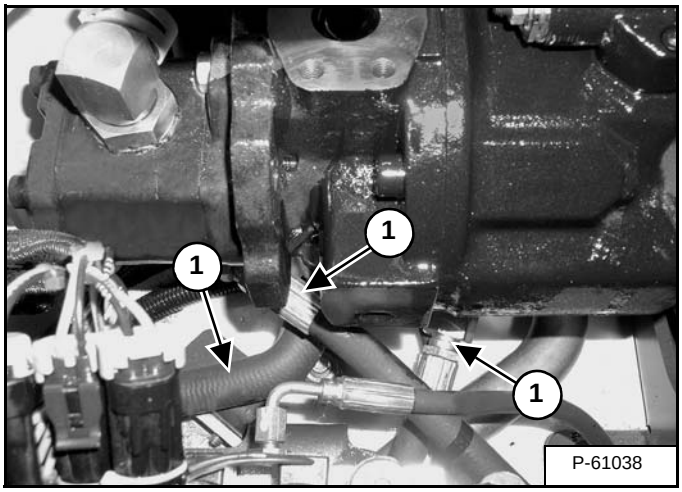
Figure 20-52-41



Remove the hoses (Item 1) **[Figure 20-52-41]**.

Open the right side cover.

Figure 20-52-42

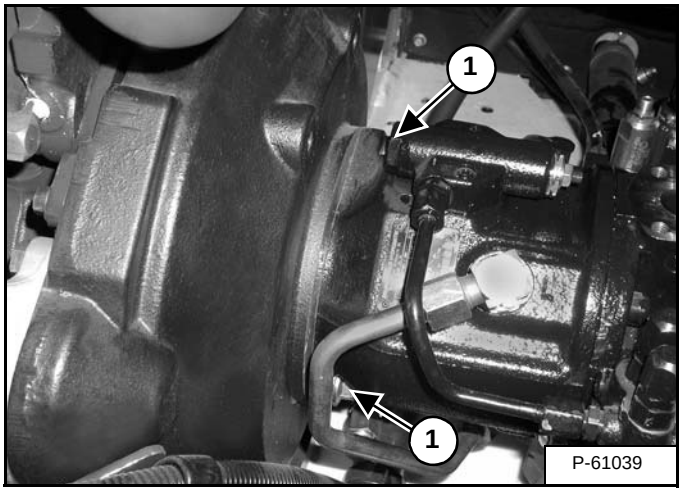


Remove the hoses (Item 1) **[Figure 20-52-42]**.

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Removal And Installation (Cont'd)

Figure 20-52-43



Remove the bolts (Item 1) **[Figure 20-52-43]**.

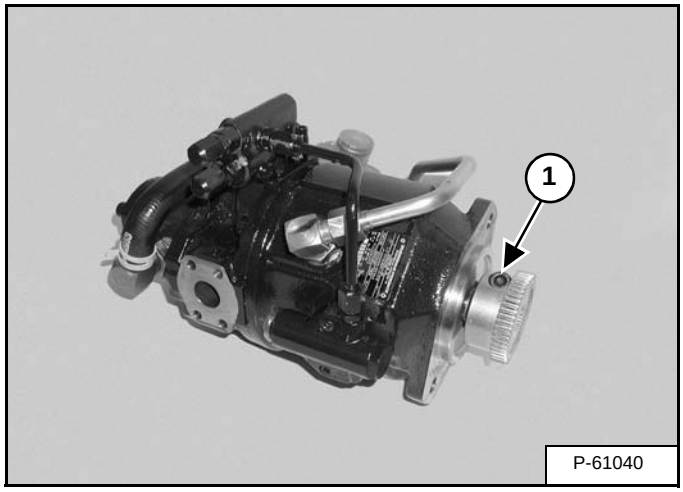
Separate the pump from the engine.

Remove the pump from the excavator.

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Coupler Removal And Installation

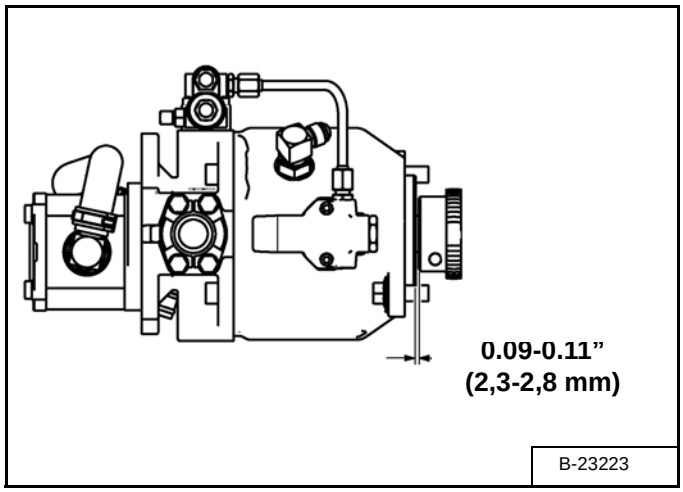
Figure 20-52-44



Remove the bolt (Item 1) **[Figure 20-52-44]** from the coupler. Slide the coupler off the pump shaft.

Installation: Tighten the bolt to 36 to 40 ft.-lb. (49 to 54 N•m) torque.

Figure 20-52-45

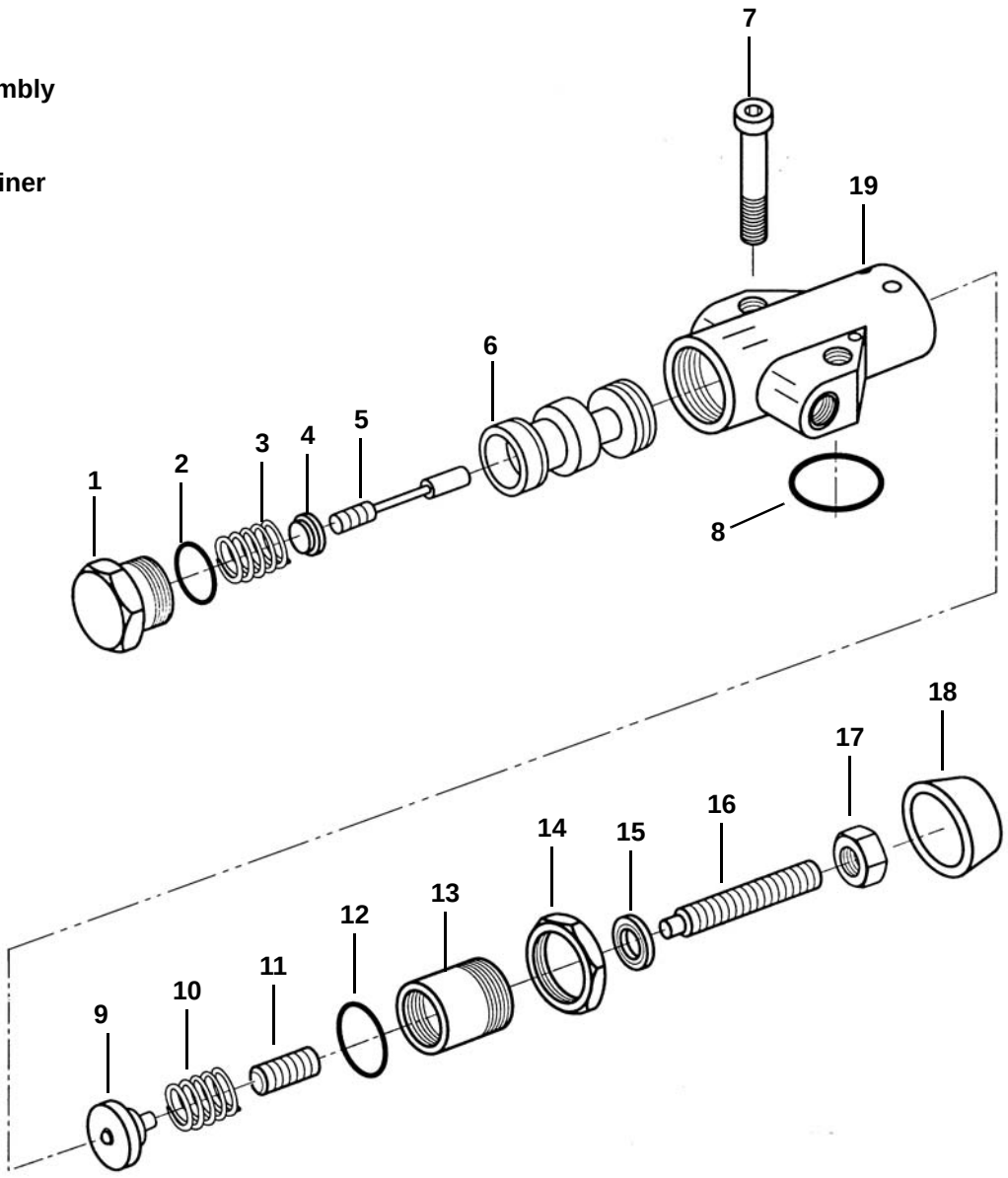


Installation: When installing the coupler, maintain a 0.09 to 0.11 in. (2,3 to 2,8 mm) gap from the pump mount flange to the coupler **[Figure 20-52-45]**.

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Torque Limiter Valve Parts Identification

1. Plug
2. O-Ring
3. Spring
4. Spring Seat
5. Spool
6. Spool Assembly
7. Bolt
8. O-Ring
9. Spring Retainer
10. Spring
11. Spring
12. O-Ring
13. Body
14. Locknut
15. Washer
16. Screw
17. Nut
18. Cap
19. Housing



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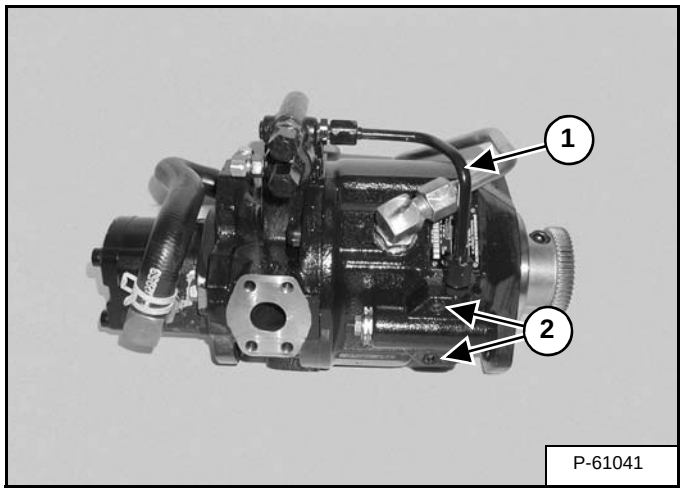
Torque Limiter Valve Removal

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 20-52-46



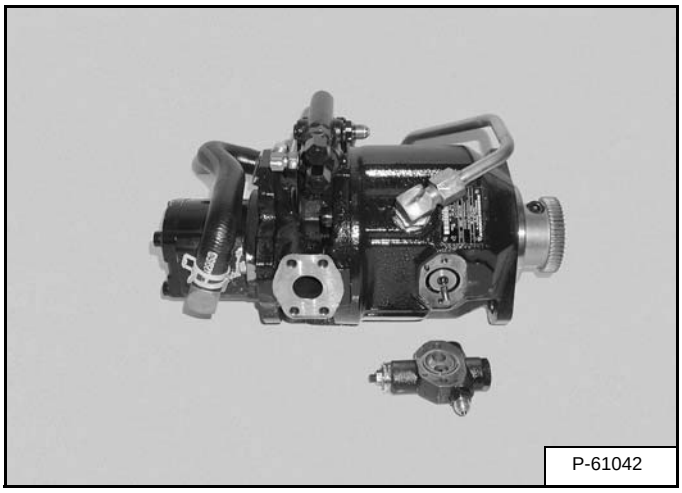
Remove the tubeline (Item 1) **[Figure 20-52-46]** from the pump control and torque limiter valve.

NOTE: Mark the tubeline for correct installation.

Remove the bolts (Item 2) **[Figure 20-52-46]** from the torque limiter valve.

Installation: Tighten the bolts to 7.0 to 7.5 ft.-lb. (9,5 to 10,5 N•m) torque.

Figure 20-52-47

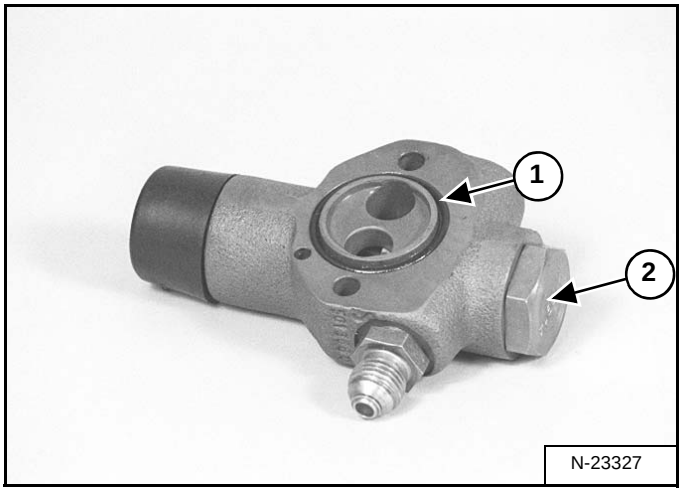


Using a screwdriver gently pry up on the torque limiter valve and remove it from the pump **[Figure 20-52-47]**.

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Torque Limiter Valve Disassembly

Figure 20-52-48



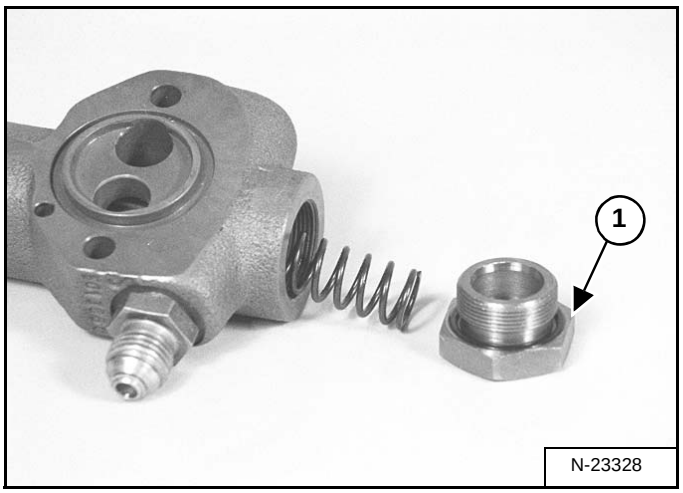
Remove the O-ring (Item 1) **[Figure 20-52-48]** from the torque limiter valve.

NOTE: Care should be taken not to scratch or damage the mounting surface on the housing.

NOTE: The plug (Item 2) [Figure 20-52-48] is under spring pressure.

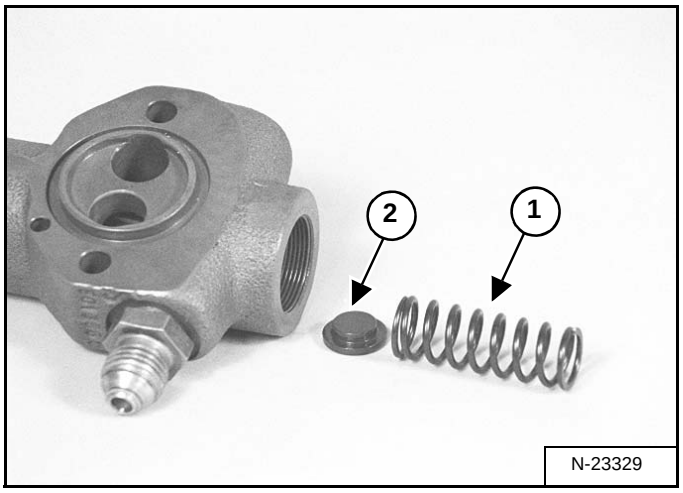
Remove the plug (Item 2) **[Figure 20-52-48]** from the torque limiter valve to relieve pressure on the torque limiter valve spool.

Figure 20-52-49



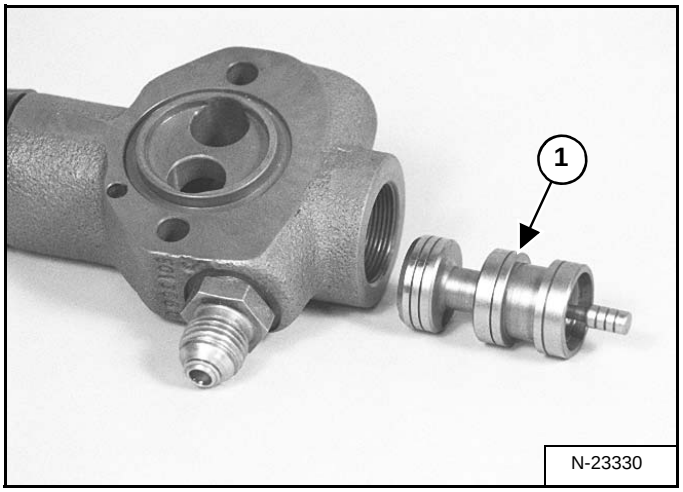
Remove the O-ring (Item 1) **[Figure 20-52-49]**.

Figure 20-52-50



Remove the spring (Item 1) and spring seat (Item 2) **[Figure 20-52-50]**.

Figure 20-52-51



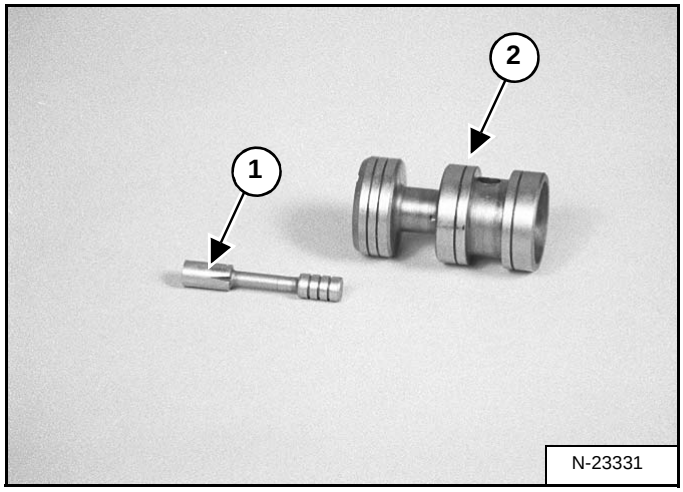
Remove the control spool assembly (Item 1) **[Figure 20-52-51]**.

NOTE: Use care not to scratch or damage the spool. Scratches in the spool can cause internal leakage.

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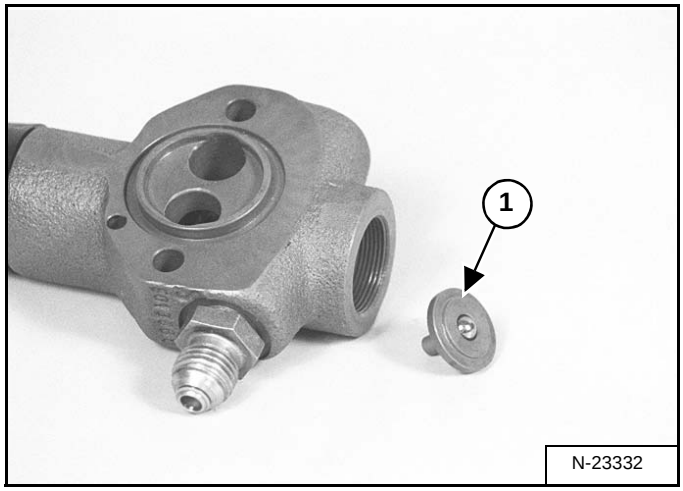
Torque Limiter Valve Disassembly (Cont'd)

Figure 20-52-52



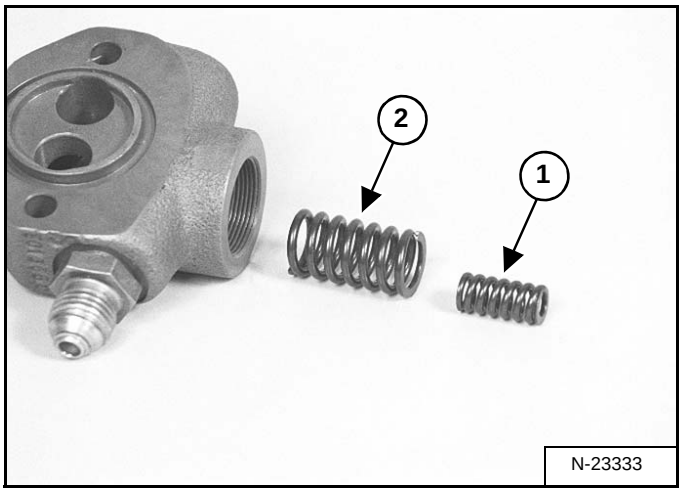
Remove the metering spool (Item 1) from the control spool (Item 2) **[Figure 20-52-52]**.

Figure 20-52-53



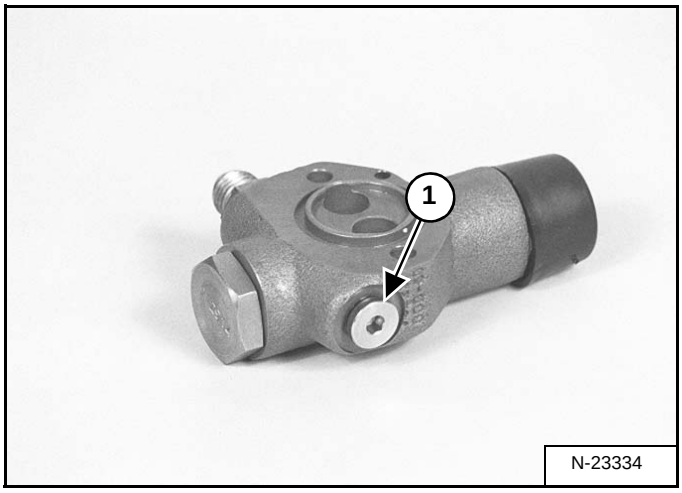
Remove the spring retainer (Item 1) **[Figure 20-52-53]** from the housing.

Figure 20-52-54



Remove the 2 springs (Items 1 & 2) **[Figure 20-52-54]**.

Figure 20-52-55

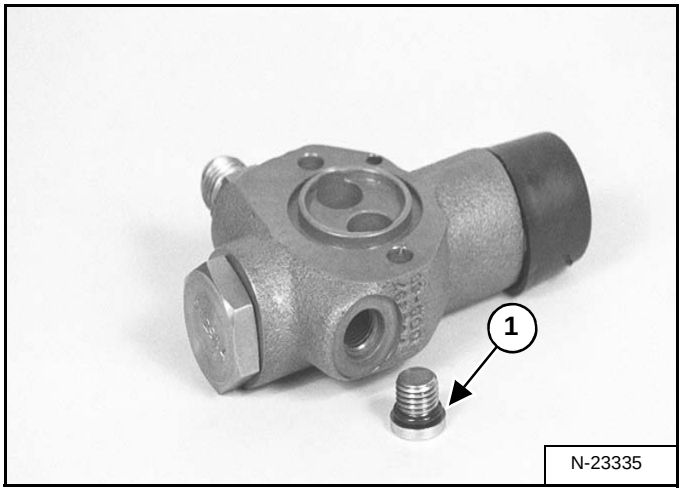


Remove the plug (Item 1) **[Figure 20-52-55]**.

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Torque Limiter Valve Disassembly (Cont'd)

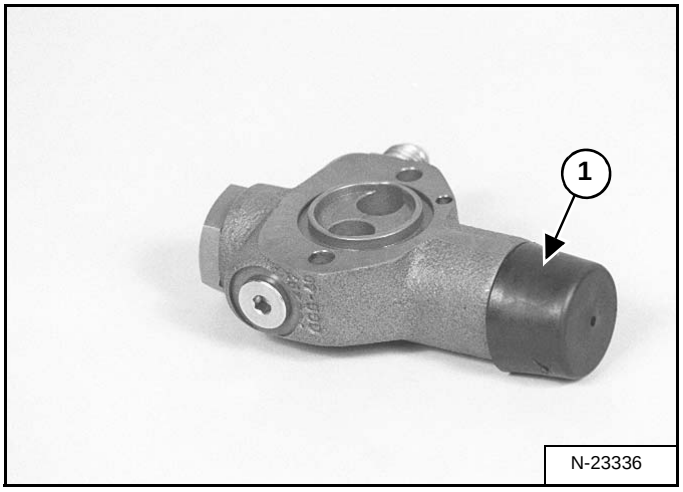
Figure 20-52-56



Remove the O-ring (Item 1) **[Figure 20-52-56]**.

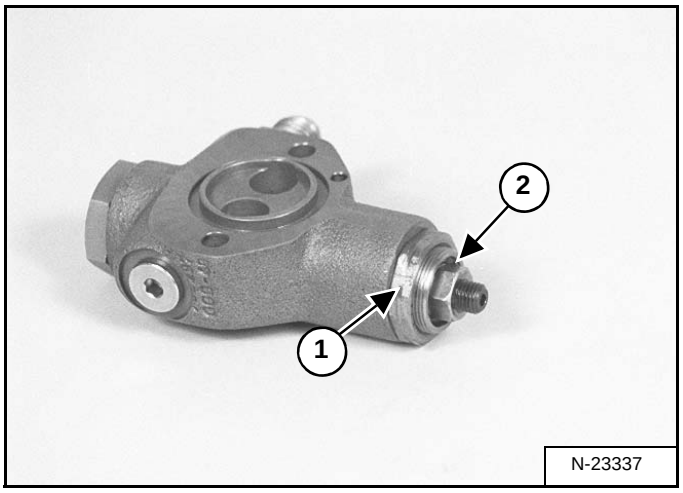
The following procedures are only used if the adjustment assembly is removed.

Figure 20-52-57



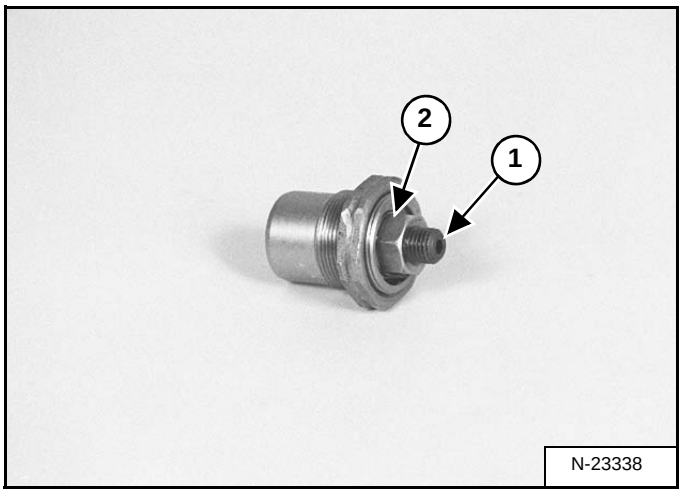
Remove the dust cap (Item 1) **[Figure 20-52-57]**. (If equipped)

Figure 20-52-58



Loosen the large nut (Item 1). With a 13 mm wrench on the small nut (Item 2) **[Figure 20-52-58]** remove the adjustment body from the housing.

Figure 20-52-59

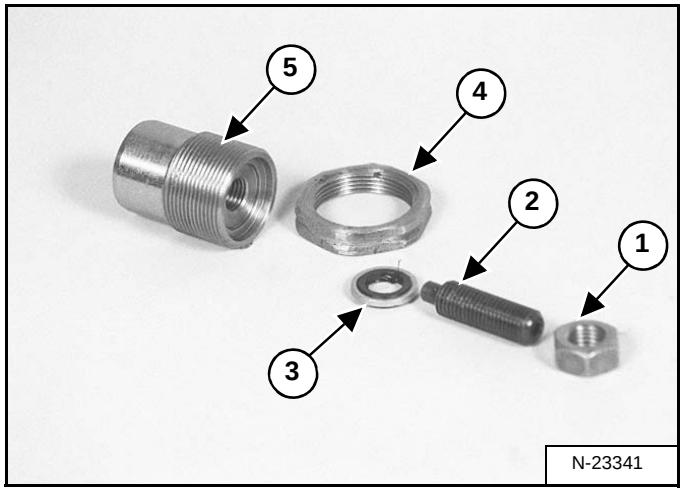


With an Allen wrench hold the adjustment bolt (Item 1) and loosen the nut (Item 2) **[Figure 20-52-59]**.

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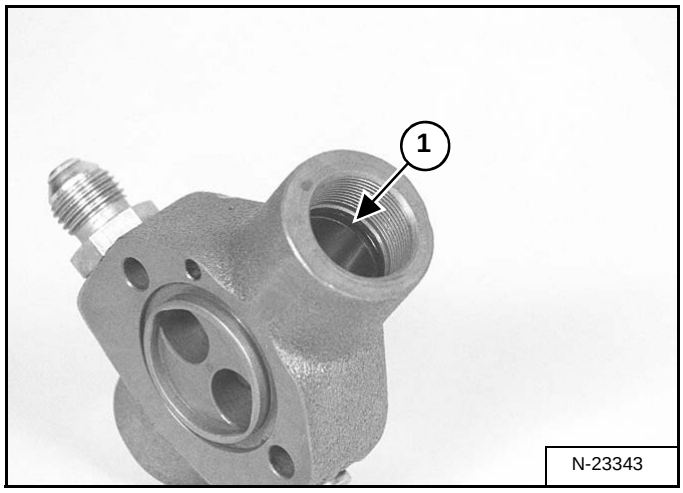
Torque Limiter Valve Disassembly (Cont'd)

Figure 20-52-60



Remove the nut (Item 1) adjustment bolt (Item 2) O-ring washer (Item 3) and large nut (Item 4) from the adjustment body (Item 5) **[Figure 20-52-60]**.

Figure 20-52-61



Remove the O-ring (Item 1) **[Figure 20-52-61]** from the housing.

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HYDRAULIC PUMP (S/N 563112526 & ABOVE AND 563212618 & ABOVE) (CONT'D)

Torque Limiter Valve Assembly

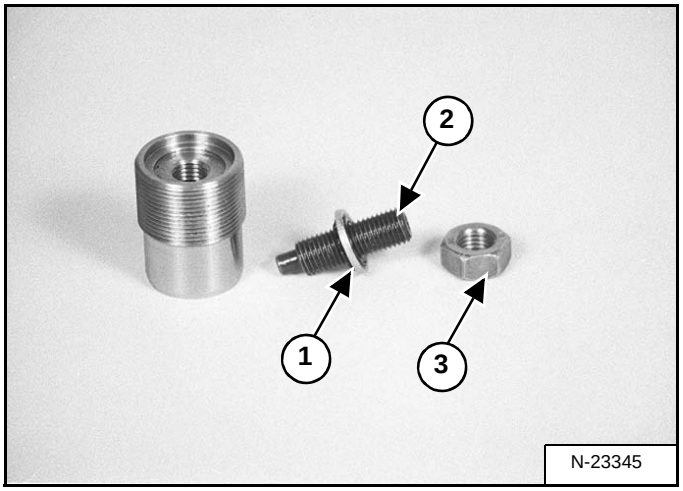
Clean all the parts in solvent and dry with compressed air.

Inspect seats and spools for wear.

Apply clean oil to new O-rings.

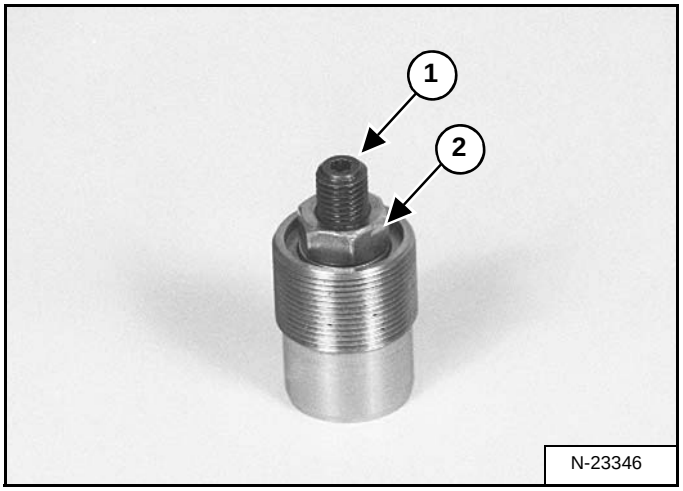
The following procedures are only used if the adjustment assembly is removed.

Figure 20-52-62



Install the O-ring washer (Item 1) on the adjustment screw (Item 2). Install the nut (Item 3) **[Figure 20-52-62]** on the adjustment screw.

Figure 20-52-63

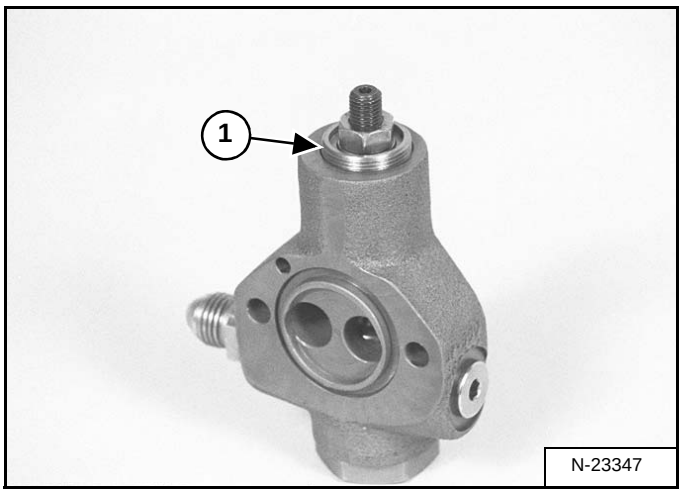


Install the adjustment screw (Item 1) and nut (Item 2) **[Figure 20-52-63]** into the adjustment body.

NOTE: Turn the adjustment screw into the adjustment body approximately 6 complete turns.

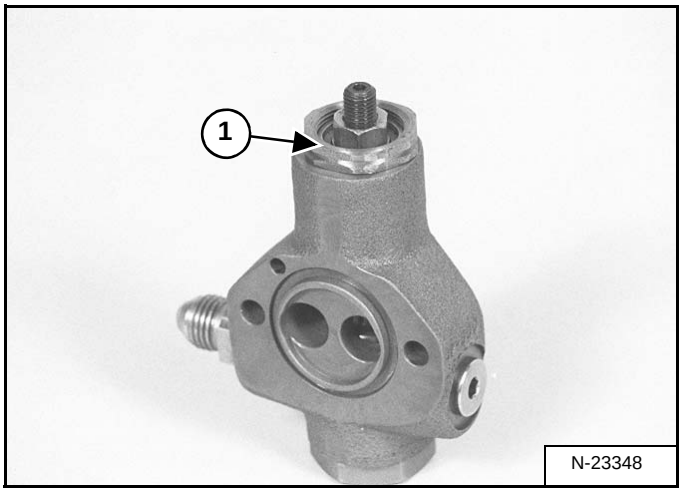
Hold the adjustment screw with an Allen wrench and tighten the nut (Item 2) **[Figure 20-52-63]**.

Figure 20-52-64



Install the adjustment body (Item 1) **[Figure 20-52-64]** and nut into the housing.

Figure 20-52-65

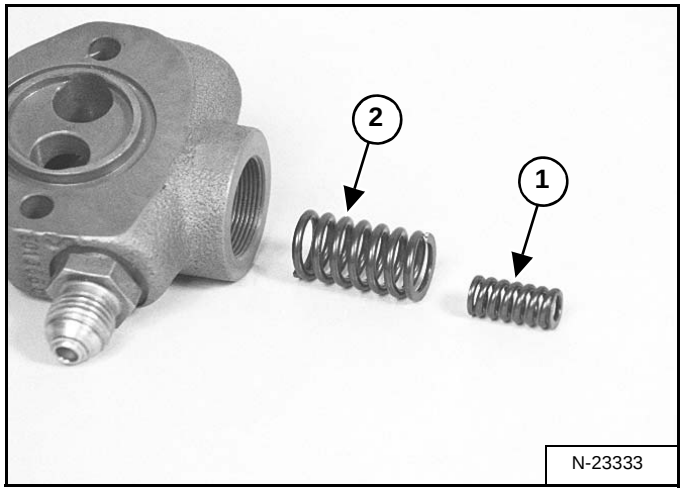


Install the large nut (Item 1) **[Figure 20-52-65]** and finger tighten.

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Torque Limiter Valve Assembly (Cont'd)

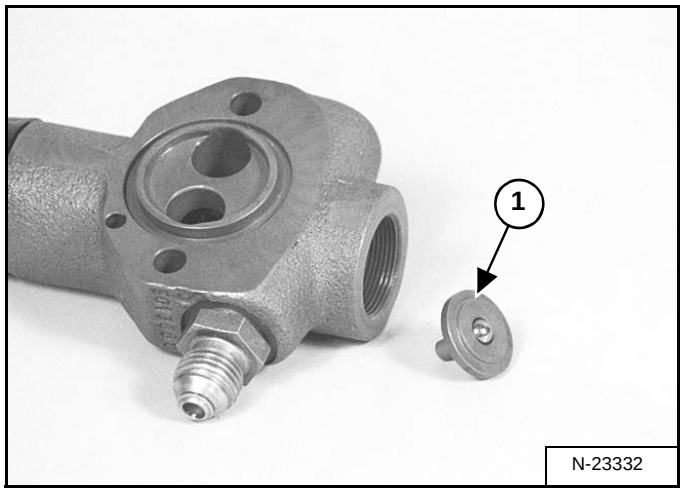
Figure 20-52-66



Install the 2 springs (Items 1 & 2) **[Figure 20-52-66]** in the housing.

NOTE: Install the big spring first and the small spring second.

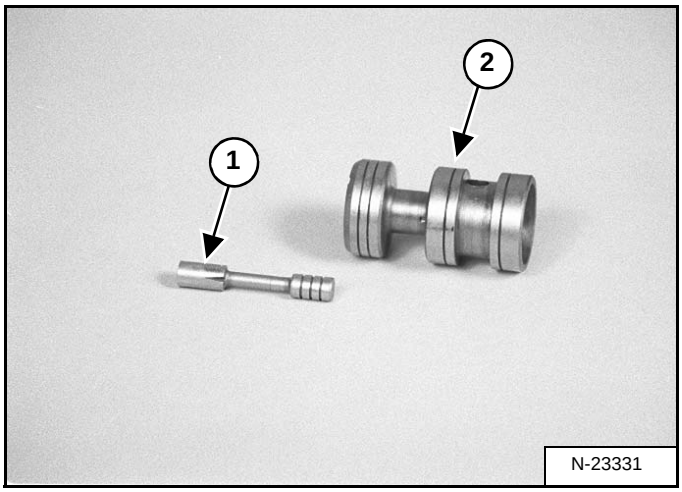
Figure 20-52-67



Install the spring retainer (Item 1) **[Figure 20-52-67]** in the housing with the ball side facing toward the control spool.

The opposite side of the spring retainer will fit inside the springs (Items 1 & 2) **[Figure 20-52-66]**.

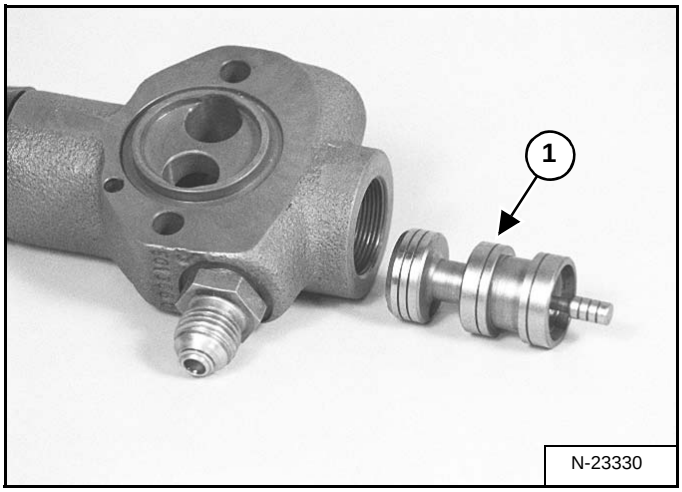
Figure 20-52-68



Put oil on the metering spool (Item 1) and install in the control spool (Item 2) **[Figure 20-52-68]**.

NOTE: The end of the metering spool with the 3 rings enters the control spool first.

Figure 20-52-69



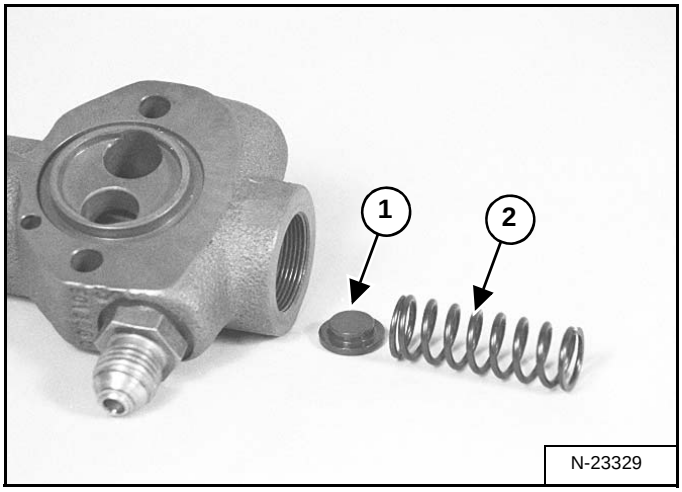
Put oil on the control spool assembly (Item 1) **[Figure 20-52-69]** and install it in the housing.

NOTE: Use care not to scratch or damage the spool (Item 1) [Figure 20-52-69]. Scratches in the spool can cause internal leakage.

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Torque Limiter Valve Assembly (Cont'd)

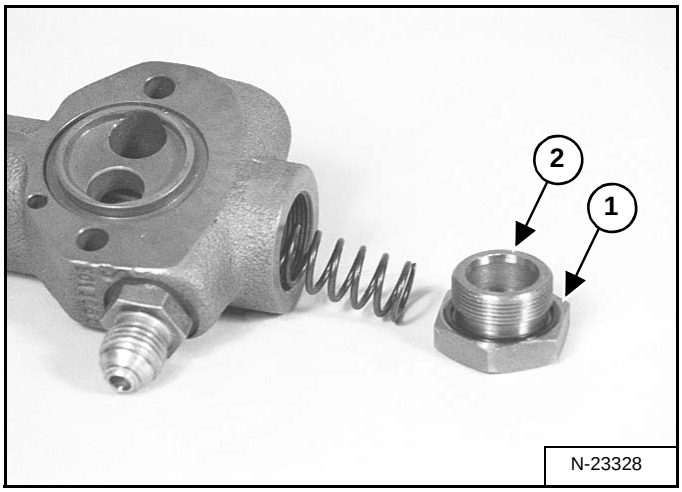
Figure 20-52-70



Install the spring guide (Item 1) **[Figure 20-52-70]** in the housing, with the smaller diameter end toward the spring.

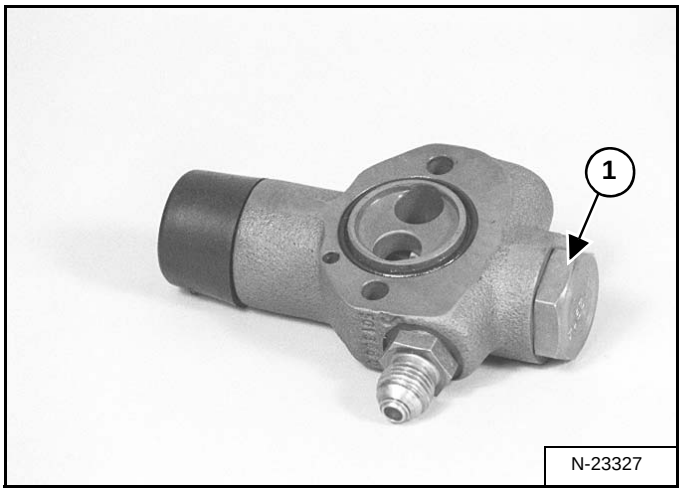
Install the spring (Item 2) **[Figure 20-52-70]** in the housing.

Figure 20-52-71



Install the O-ring (Item 1) on the plug (Item 2) **[Figure 20-52-71]**.

Figure 20-52-72



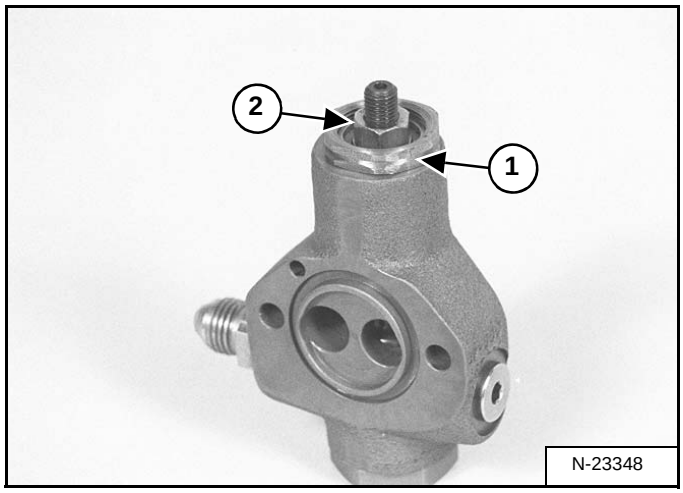
Install the plug (Item 1) **[Figure 20-52-72]**.

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Initial Torque Limiter Valve Setting

Use the following procedure to set the torque limiter valve after being disassembled and assembled.

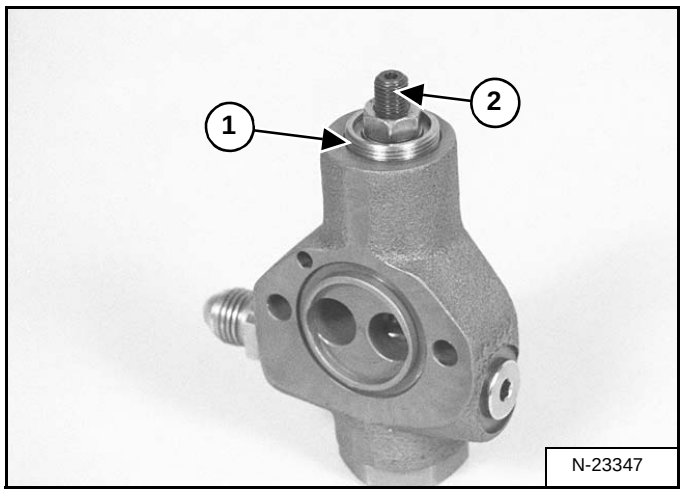
Figure 20-52-73



Remove the large nut (Item 1) **[Figure 20-52-73]**.

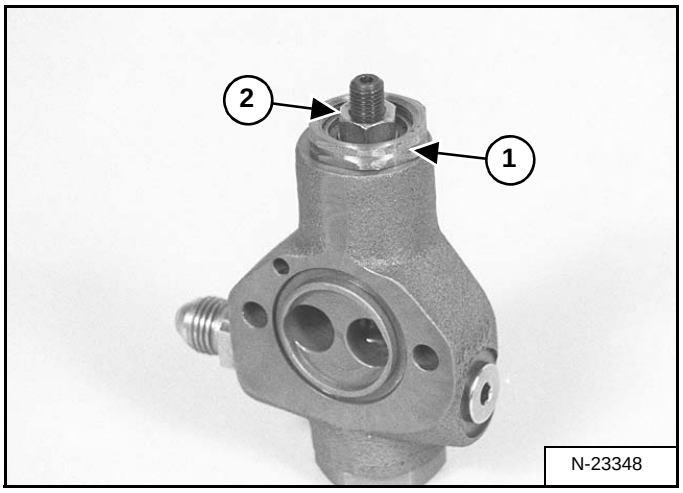
Lock the small nut (Item 2) **[Figure 20-52-73]**.

Figure 20-52-74



Both the large (Item 1) and small (Item 2) adjusting screws must be lightly bottomed out in the valve. The large adjustment screw (Item 1) **[Figure 20-52-74]** must be bottomed out (just touching) first, make sure the small adjustment screw is turned out a small amount so it will not hit first.

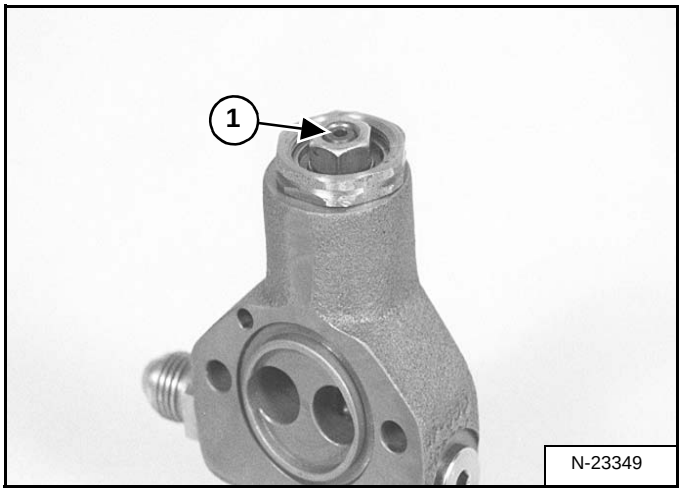
Figure 20-52-75



After the large adjustment screw is just seated, tighten the large nut (Item 1) **[Figure 20-52-75]**.

Loosen the small nut (Item 2) **[Figure 20-52-75]**.

Figure 20-52-76

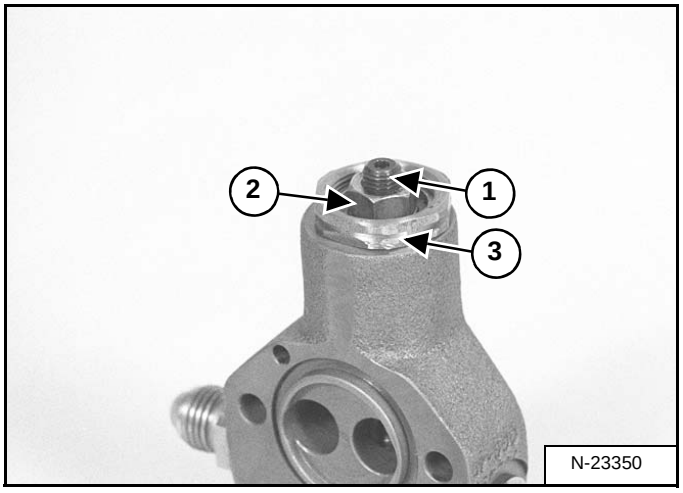


Turn the small adjustment screw (Item 1) **[Figure 20-52-76]** in until it bottoms in the valve.

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Initial Torque Limiter Valve Setting (Cont'd)

Figure 20-52-77

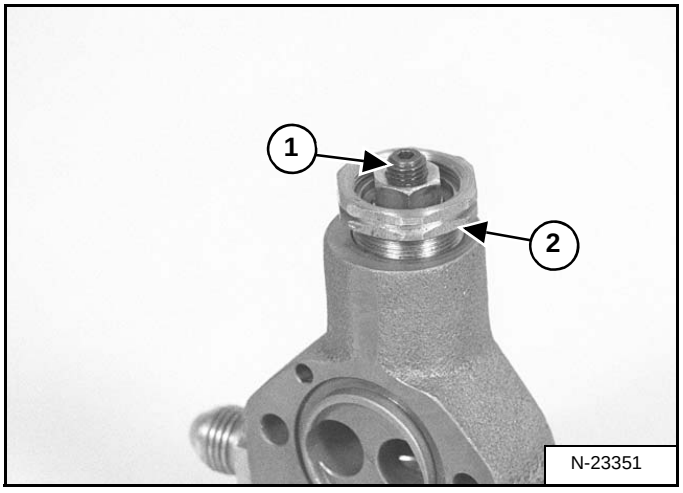


Back out the small adjustment screw (Item 1) **[Figure 20-52-77]** 10-1/4 turns.

Tighten the small nut (Item 2) **[Figure 20-52-77]**.

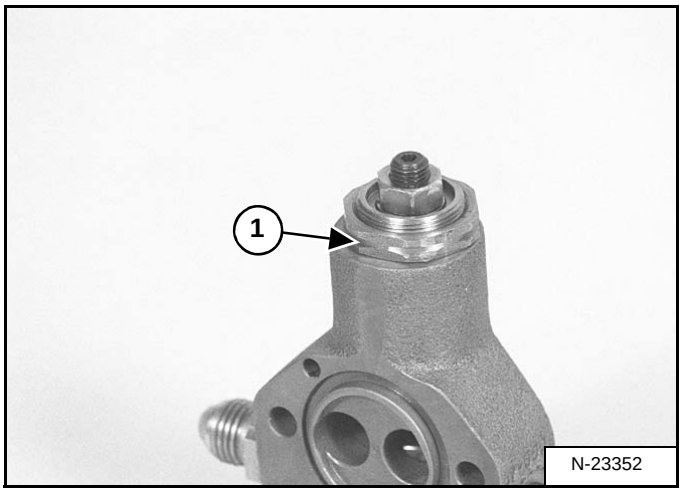
Loosen the large nut (Item 3) **[Figure 20-52-77]**.

Figure 20-52-78



With an Allen wrench in the small adjustment screw (Item 1) back out the large adjustment screw (Item 2) **[Figure 20-52-78]** 5-3/4 turns.

Figure 20-52-79



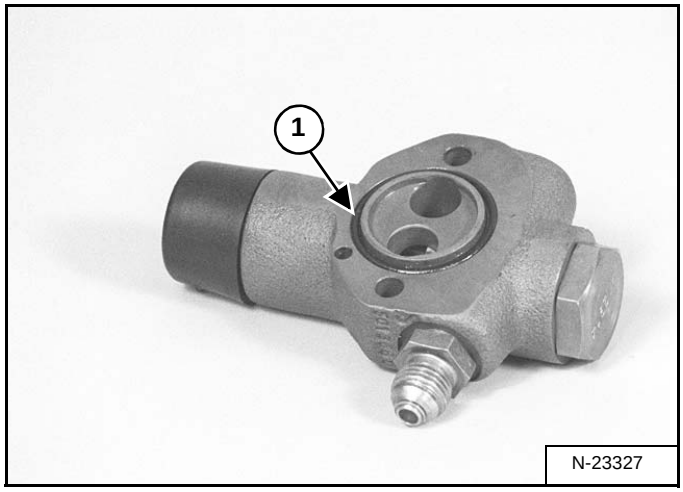
Tighten the large nut (Item 1) **[Figure 20-52-79]**.

This is the initial adjustment to the torque limiter valve.

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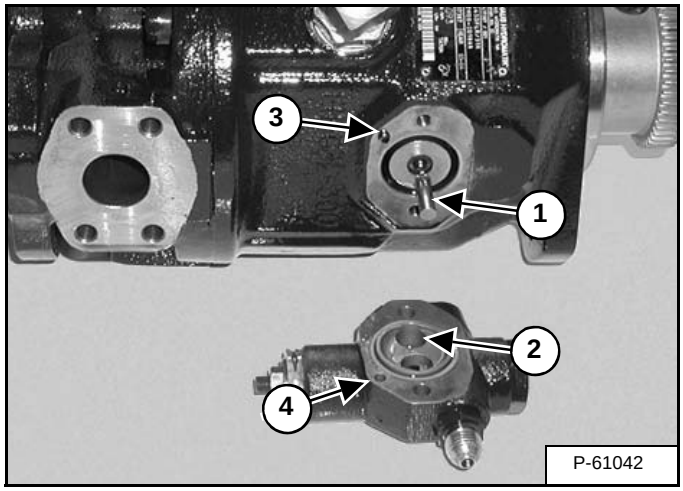
Torque Limiter Valve Installation

Figure 20-52-80



Install the O-ring (Item 1) **[Figure 20-52-80]** on the torque limiter valve.

Figure 20-52-81



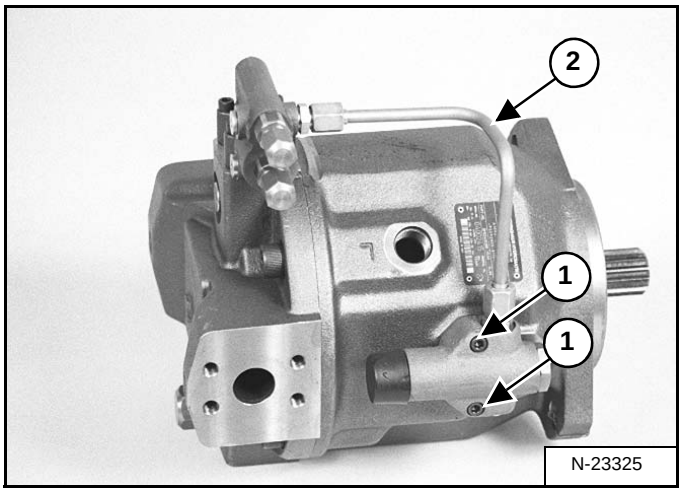
Align the linkage pin (Item 1) on the hydraulic piston pump into the hole (Item 2) **[Figure 20-52-81]** in the torque limiter valve.

Turn the valve slightly to align the dowel pin (Item 3) on the hydraulic piston pump into the hole (Item 4) **[Figure 20-52-81]** in the torque limiter valve. Apply pressure to the valve to compress the spring.

NOTE: Care should be taken not to scratch or damage the valve spool.

NOTE: Before tightening the bolts, make sure the dowel pin is aligned with the housing.

Figure 20-52-82



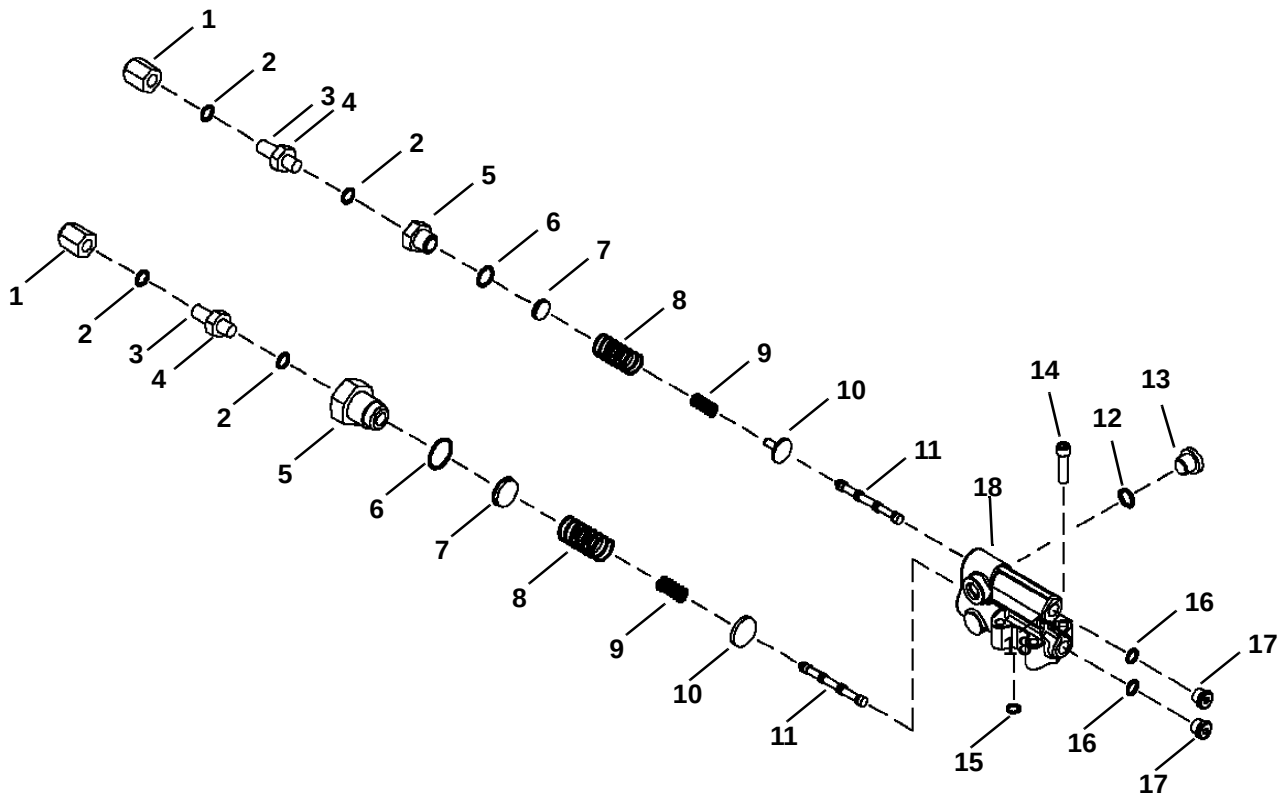
Install and tighten the bolts (Item 1) **[Figure 20-52-82]** to 7.0 to 7.5 ft. lb. (9,5 to 10,5 N•m) torque.

Install the tubeline (Item 2) **[Figure 20-52-82]**.

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Pump Control Parts Identification

1. Cap
2. O-ring Washer
3. Adjusting Screw
4. Jam Nut
5. Adjustment Assembly
6. O-ring
7. Disc
8. Spring
9. Spring
10. Spring Retainer
11. Spool
12. O-ring
13. Plug
14. Bolt
15. O-ring
16. O-ring
17. Plug
18. Housing

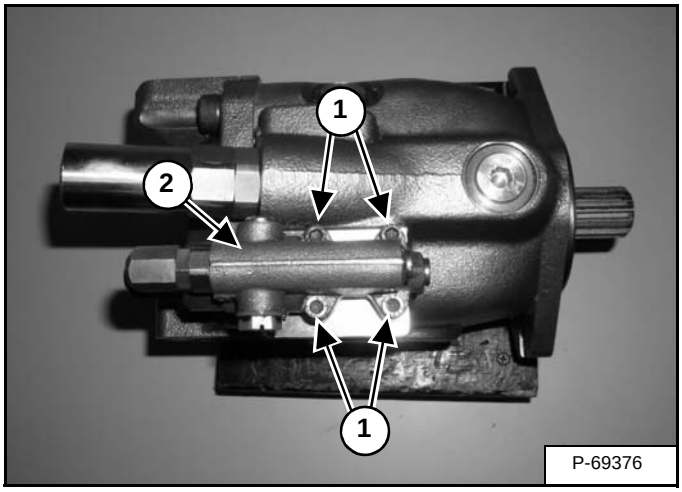


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Pump Control Removal And Installation

Figure 20-52-83

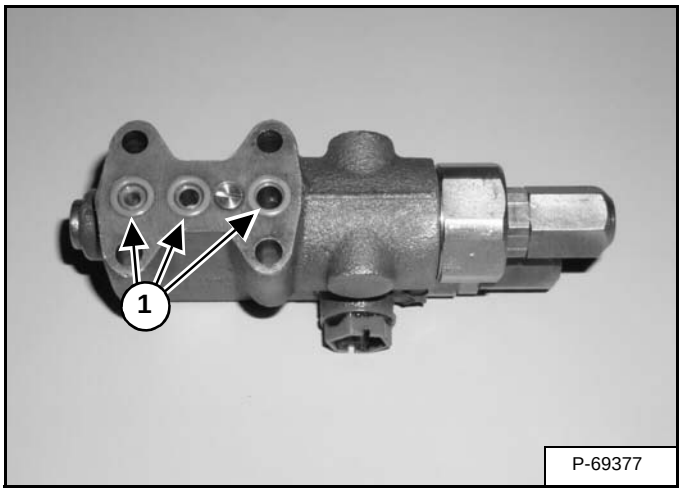


Remove the four bolts (Item 1) and pump control (Item 2) **[Figure 20-52-83]** from the hydraulic piston pump.

Installation: Tighten to 10 ft.-lb. and (13 N•m) torque.

Pump Control Disassembly And Assembly

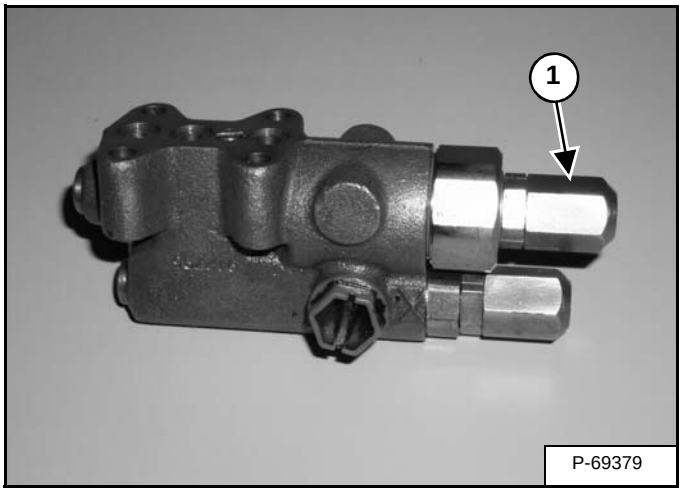
Figure 20-52-84



Remove the three O-rings (Item 1) **[Figure 20-52-84]** from the valve.

Back-up Relief Valve

Figure 20-52-85



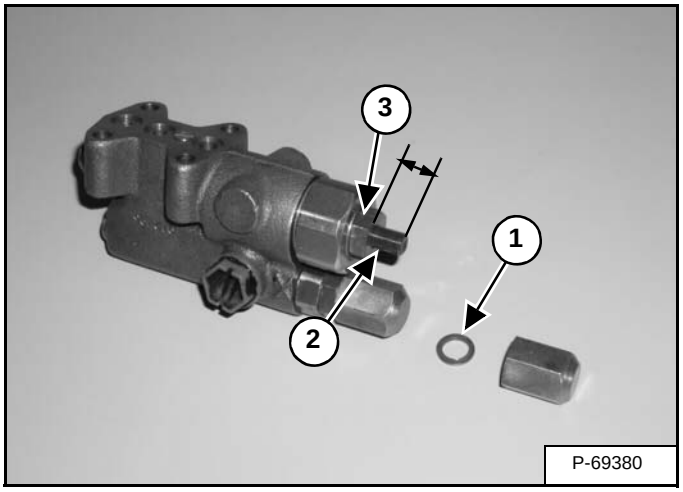
Remove the cap (Item 1) **[Figure 20-52-85]** from the back-up relief valve.

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Pump Control Disassembly And Assembly (Cont'd)

Back-up Relief Valve (Cont'd)

Figure 20-52-86

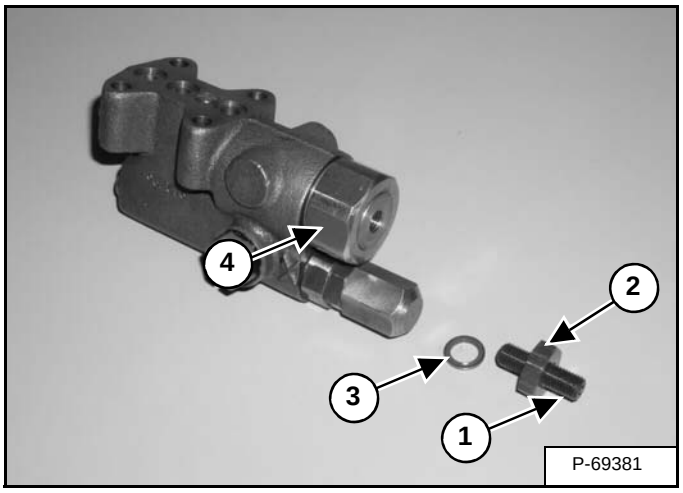


Before disassembling the back-up relief valve, remove the O-ring washer (Item 1) **[Figure 20-52-86]** from the adjustment assembly.

Measure the adjustment screw (Item 2) **[Figure 20-52-86]**, thread length for the correct initial adjustment.

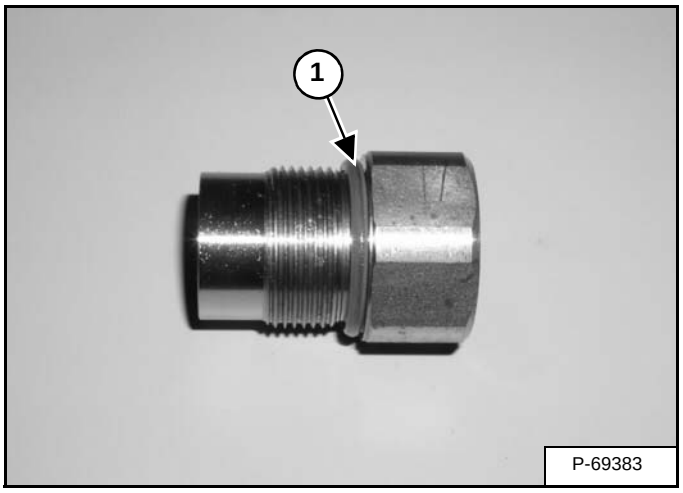
Loosen the nut (Item 3) **[Figure 20-52-86]**.

Figure 20-52-87



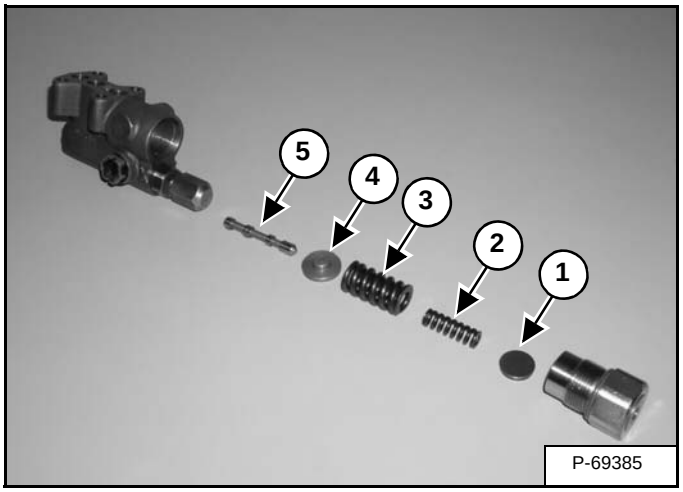
Remove the adjustment screw (Item 1), nut (Item 2), and O-ring washer (Item 3) from the adjustment assembly (Item 4) **[Figure 20-52-87]**.

Figure 20-52-88



Replace the O-ring (Item 1) **[Figure 20-52-88]** before installation.

Figure 20-52-89



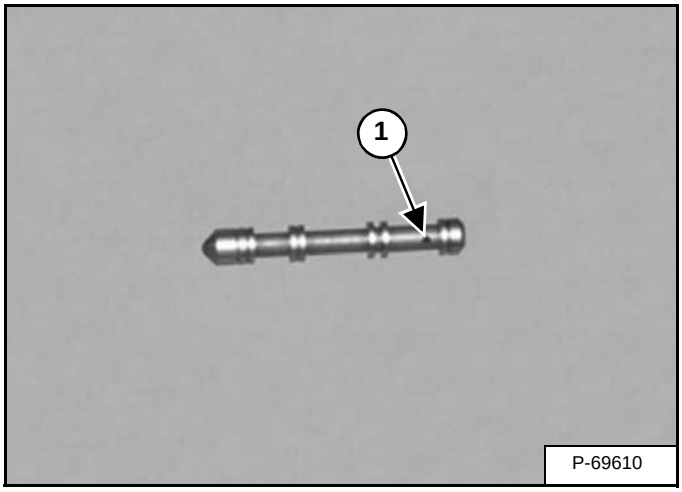
Remove the disc (Item 1), small spring (Item 2), large spring (Item 3), spring retainer (Item 4) and spool (Item 5) **[Figure 20-52-89]** from the pump control.

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Pump Control Disassembly And Assembly (Cont'd)

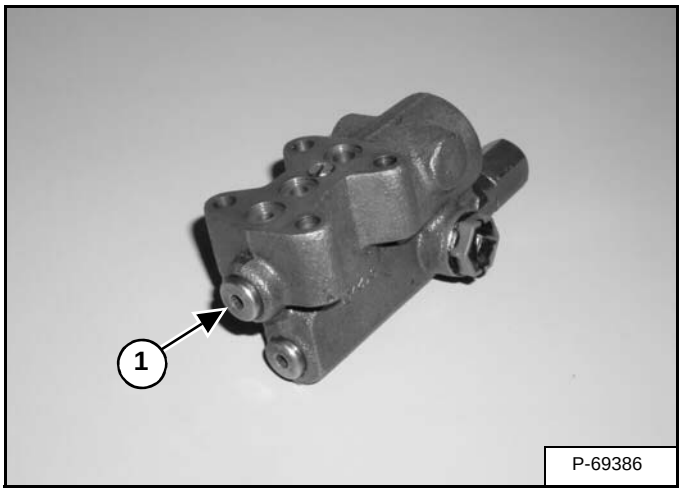
Back-up Relief Valve (Cont'd)

Figure 20-52-90



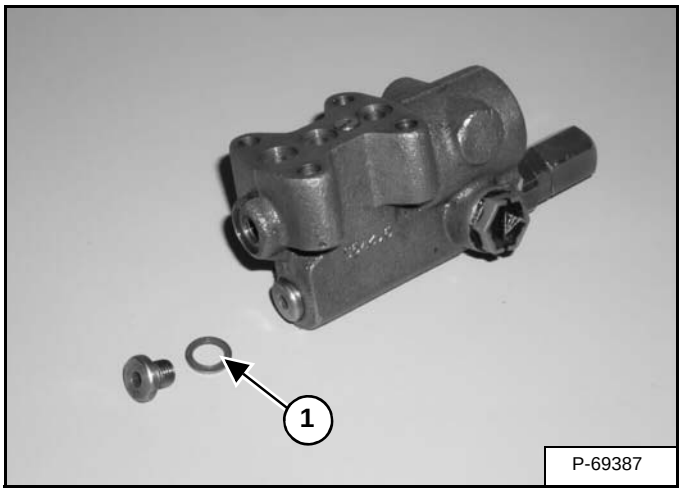
Check the spool for scratches. Make sure the orifice (Items 1) **[Figure 20-52-90]** are not plugged.

Figure 20-52-91



Remove the plug (Item 1) **[Figure 20-52-91]** from the back-up relief valve on the pump control.

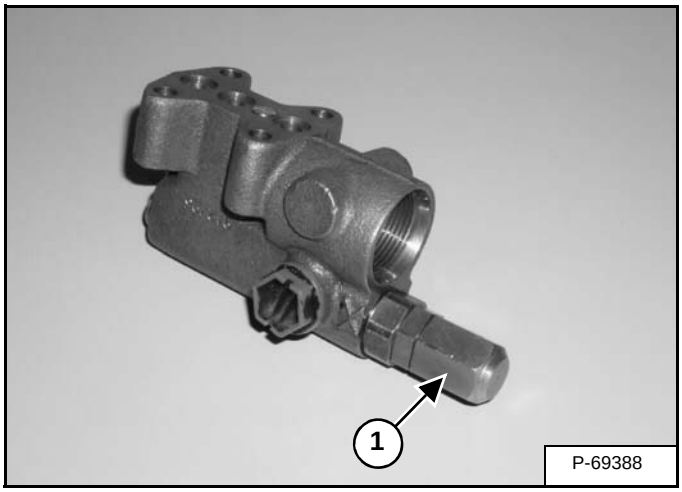
Figure 20-52-92



Check the O-ring washer (Item 1) **[Figure 20-52-92]** and replace as needed.

Pump Margin Control

Figure 20-52-93



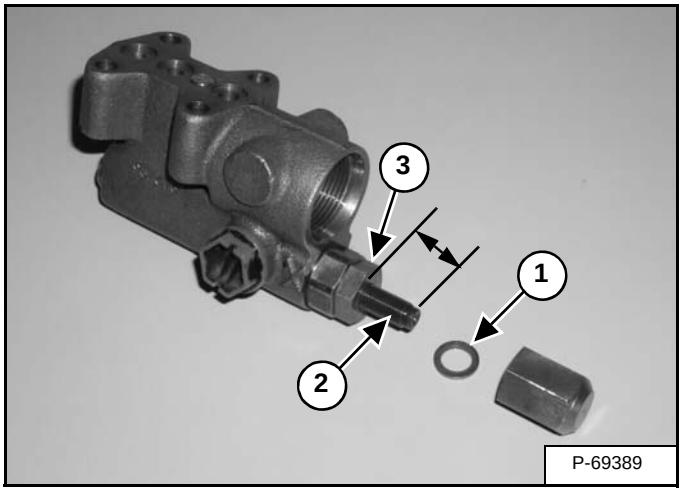
Remove the cap (Item 1) **[Figure 20-52-93]** from the back-up relief valve.

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Pump Control Disassembly And Assembly (Cont'd)

Pump Margin Control (Cont'd)

Figure 20-52-94

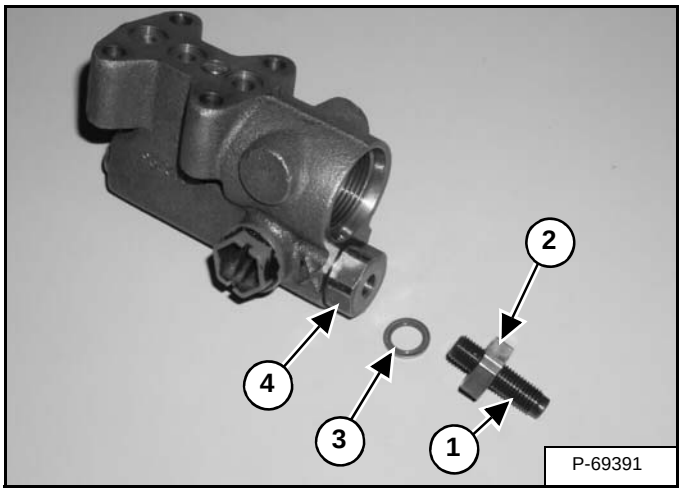


Before disassembling the pump margin control, remove the O-ring washer (Item 1) **[Figure 20-52-94]** from the adjustment assembly.

Measure the adjustment screw (Item 2) **[Figure 20-52-94]**, thread length for the correct initial adjustment.

Loosen the nut (Item 3) **[Figure 20-52-94]**.

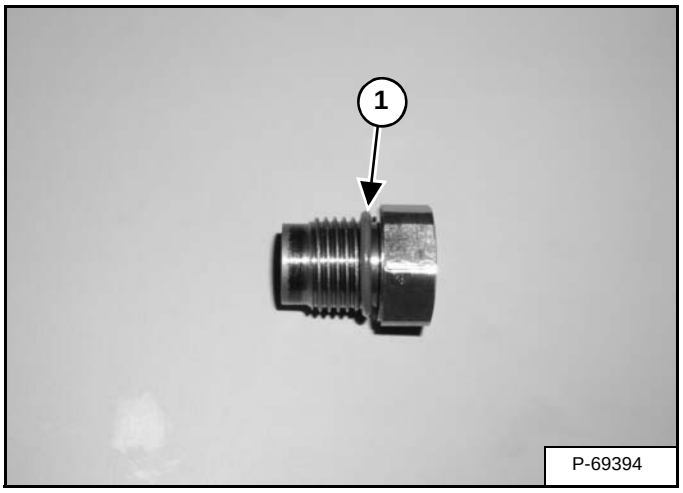
Figure 20-52-95



Remove the adjustment screw (Item 1), nut (Item 2), and O-ring washer (Item 3) from the adjustment assembly (Item 4) **[Figure 20-52-95]**.

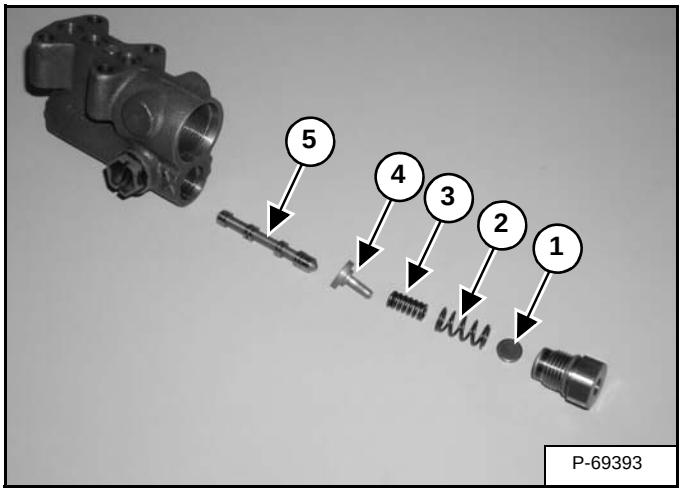
Remove the adjustment assembly (Item 4) **[Figure 20-52-95]** from the pump control assembly.

Figure 20-52-96



Replace the O-ring (Item 1) **[Figure 20-52-96]** before installation.

Figure 20-52-97



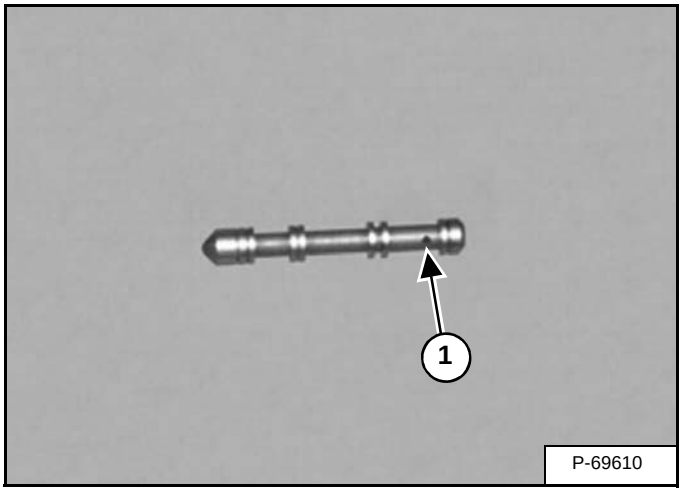
Remove the disc (Item 1), large spring (Item 2), small spring (Item 3), spring retainer (Item 4) and spool (Item 5) **[Figure 20-52-97]** from the pump control.

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Pump Control Disassembly And Assembly (Cont'd)

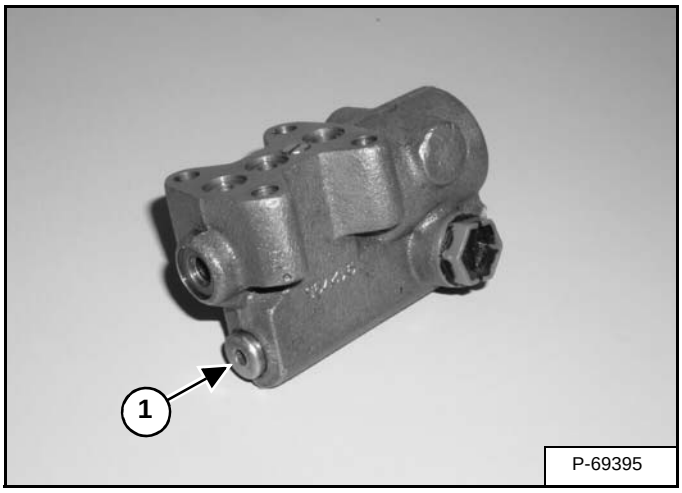
Pump Margin Control (Cont'd)

Figure 20-52-98



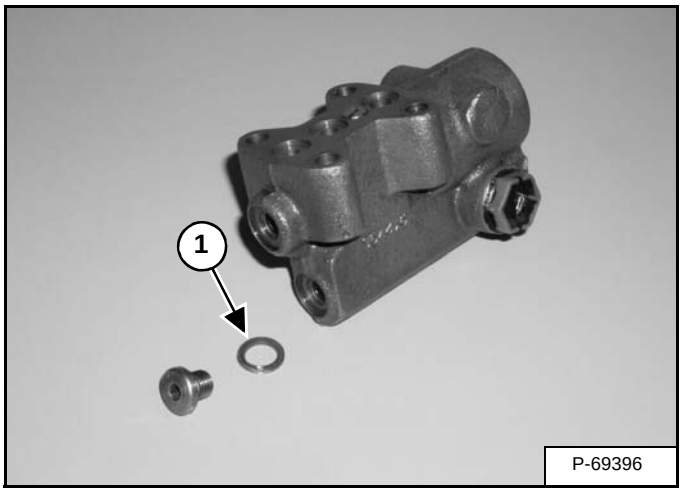
Check the spool for scratches. Make sure the orifice (Item 1) **[Figure 20-52-98]** is not plugged.

Figure 20-52-99



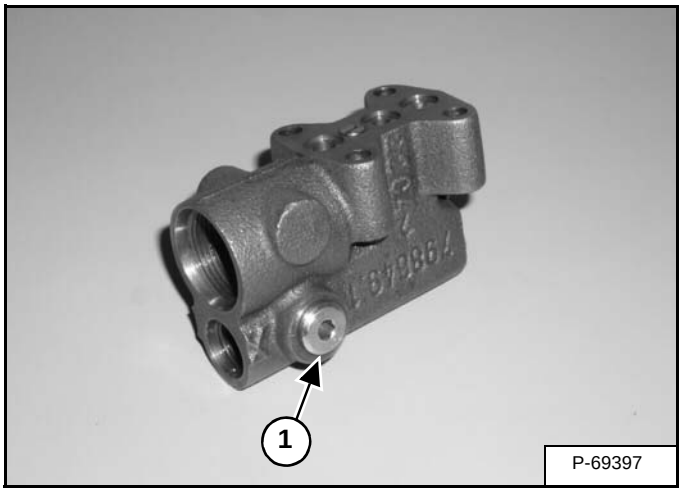
Remove the plug (Item 1) **[Figure 20-52-99]** from the pump control.

Figure 20-52-100



Check the O-ring washer (Item 1) **[Figure 20-52-100]** and replace as needed.

Figure 20-52-101



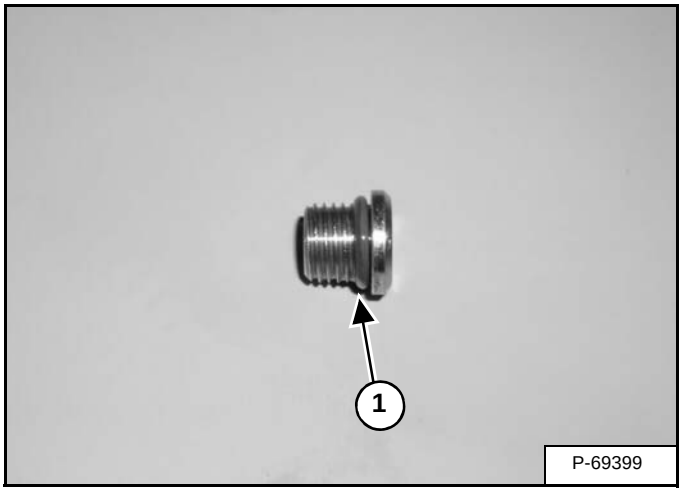
Remove the plug (Item 1) **[Figure 20-52-101]** from the pump control.

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Pump Control Disassembly And Assembly (Cont'd)

Pump Margin Control (Cont'd)

Figure 20-52-102

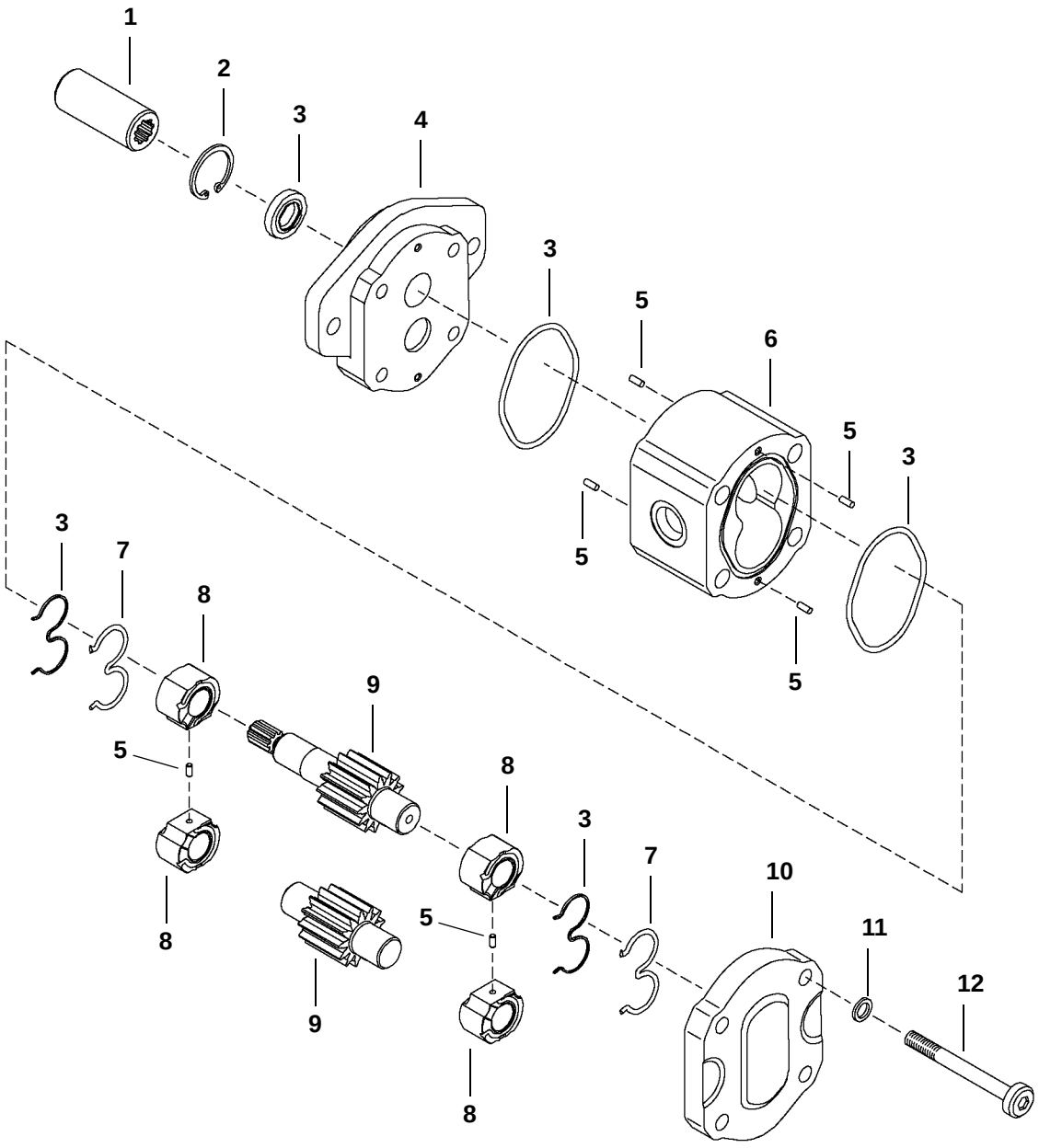


Remove the O-ring (Item 1) **[Figure 20-52-102]** from the plug.

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Parts Identification

1. Coupler
2. Snap Ring
3. Seal
4. Mount Flange
5. Dowel Pin
6. Housing
7. Back-up Ring
8. Bearing
9. Gear
10. End Cap
11. Washer
12. Bolt

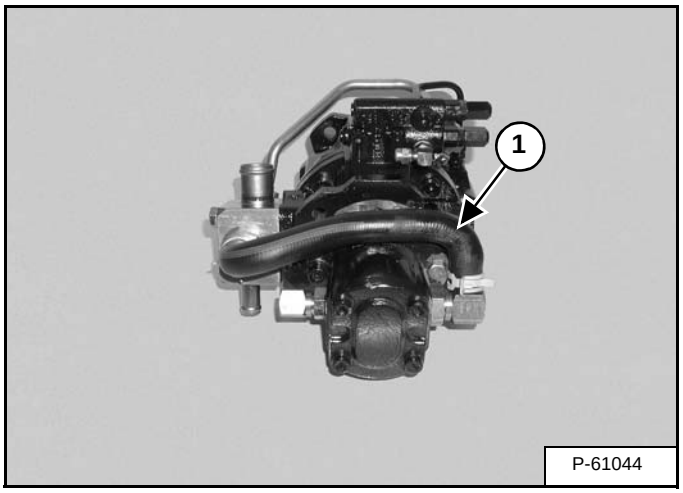


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Gear Pump Removal And Installation

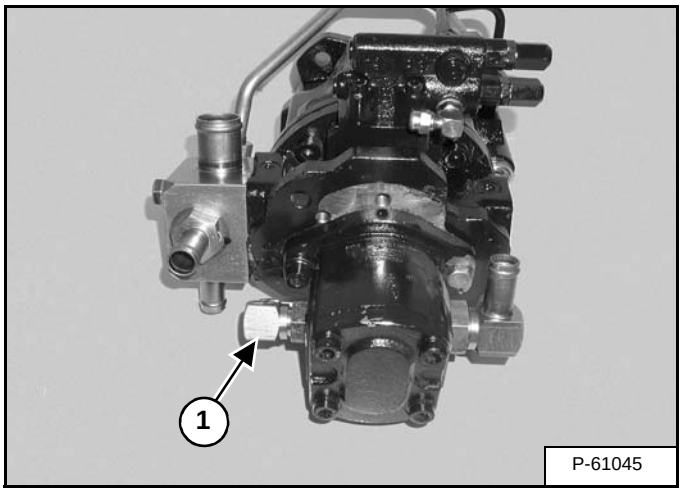
Remove the hydraulic pump from the excavator. (See Removal And Installation on Page 20-50-18.)

Figure 20-52-103



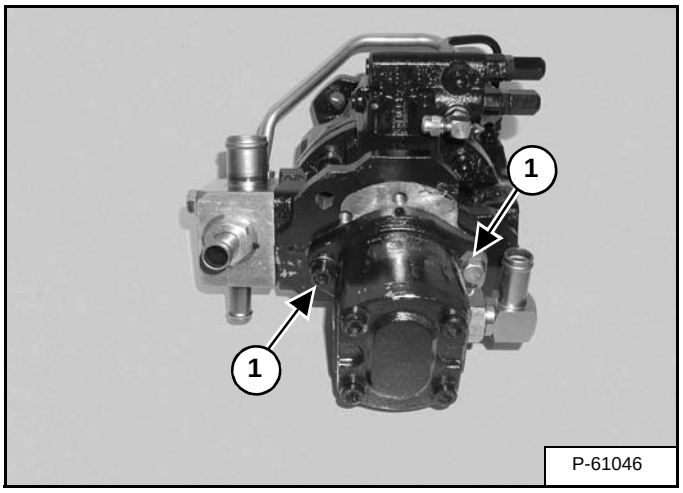
Remove the hose (Item 1) **[Figure 20-52-103]**.

Figure 20-52-104



Remove the fitting (Item 1) **[Figure 20-52-104]**.

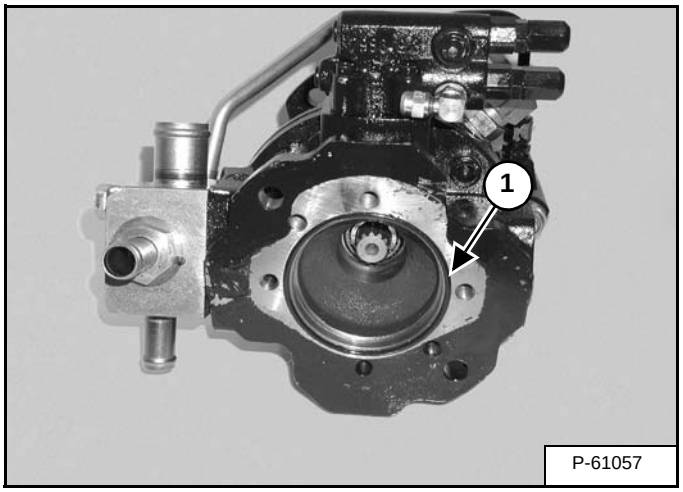
Figure 20-52-105



Remove the bolts (Item 1) **[Figure 20-52-105]**.

Installation: Tighten the bolts to 25 to 28 ft.-lb. (34 to 38 N•m) torque.

Figure 20-52-106



Remove the O-ring (Item 1) **[Figure 20-52-106]**.

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Gear Pump Disassembly And Assembly

Clean the outside of the gear pump before disassembly.

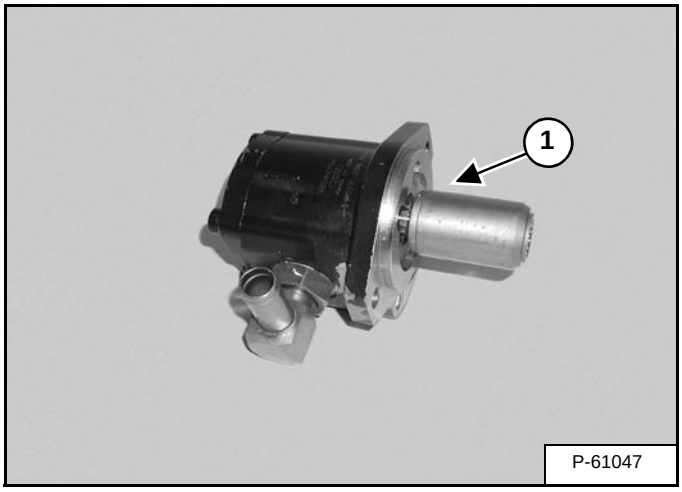
Mark the outside of the gear pump before disassembly.

IMPORTANT

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

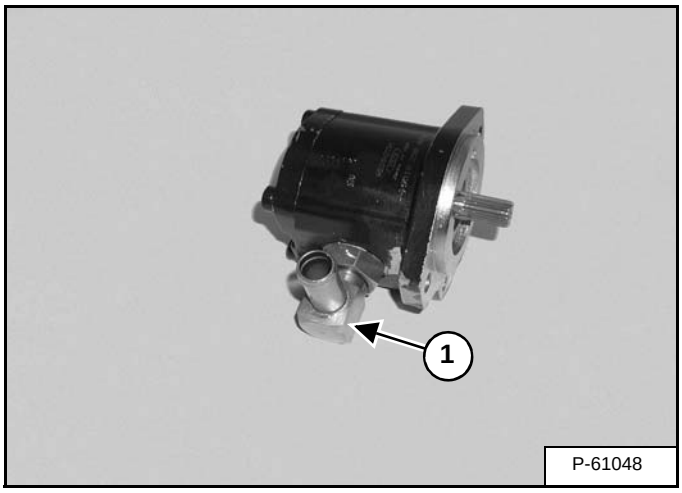
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Figure 20-52-107



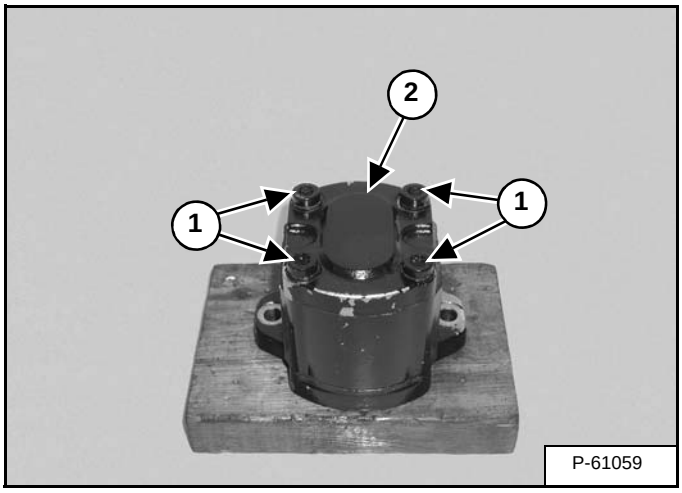
Remove the coupler (Item 1) **[Figure 20-52-107]**.

Figure 20-52-108



Remove the fitting (Item 1) **[Figure 20-52-108]**.

Figure 20-52-109

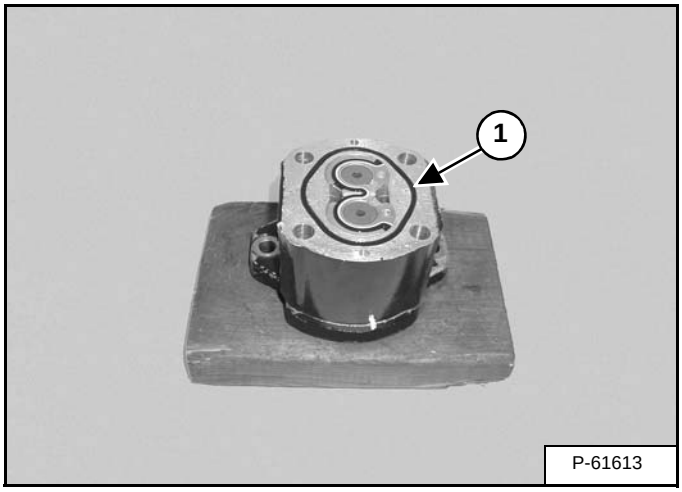


Remove the bolts (Item 1) and end cap (Item 2) **[Figure 20-52-109]**.

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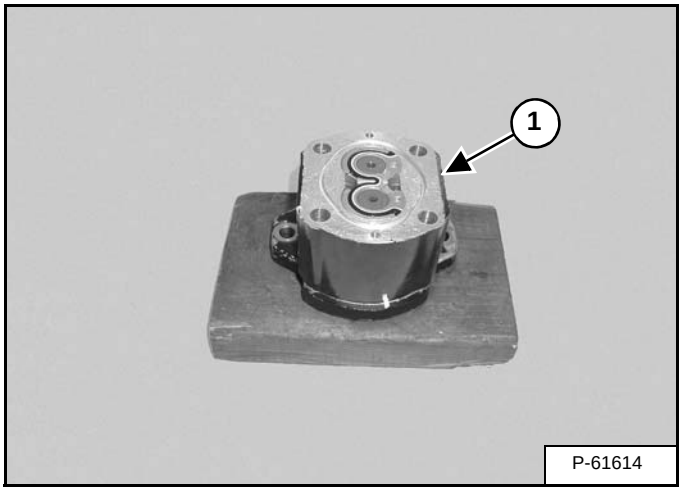
Gear Pump Disassembly And Assembly (Cont'd)

Figure 20-52-110



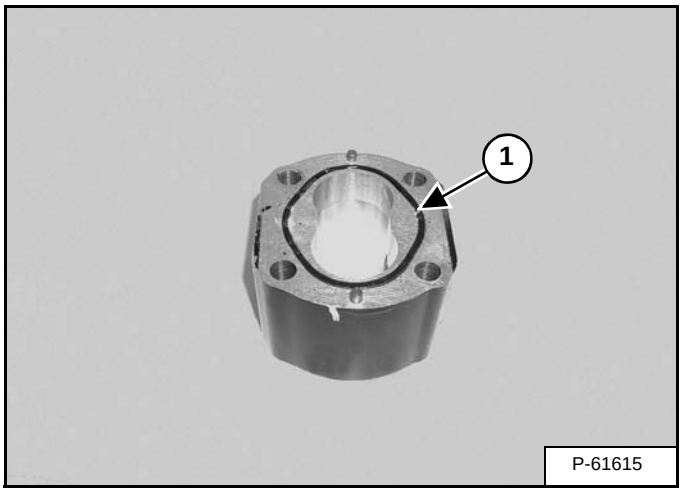
Remove the seal (Item 1) **[Figure 20-52-110]**.

Figure 20-52-111



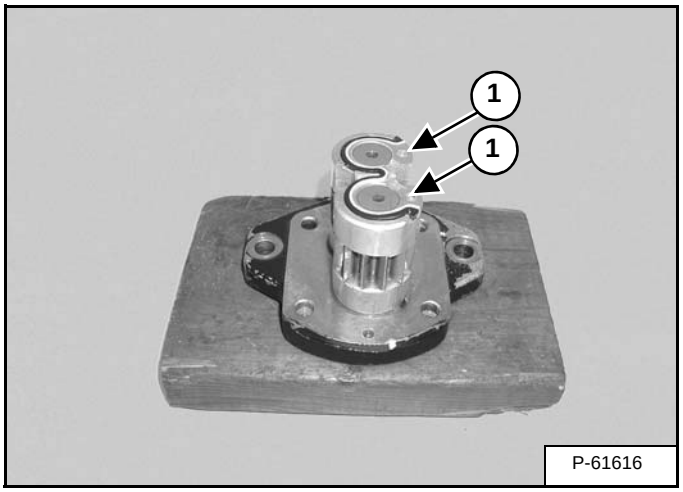
Remove the housing (Item 1) **[Figure 20-52-111]**.

Figure 20-52-112



Turn the housing over and remove the seal (Item 1) **[Figure 20-52-112]**.

Figure 20-52-113

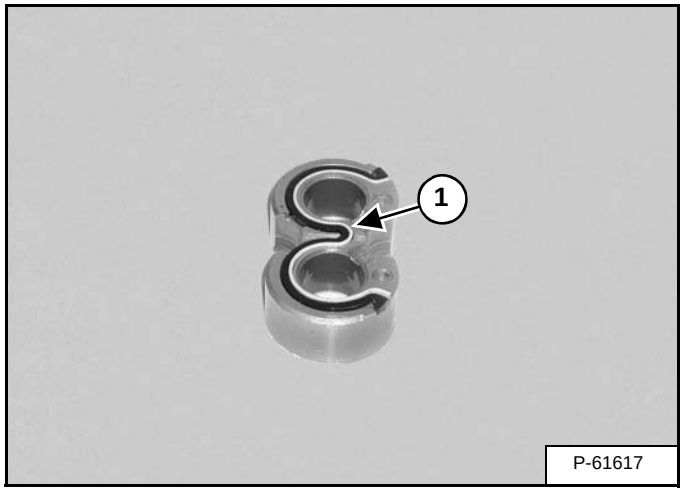


Record the orientation of the bearings and remove the bearing/seal assemblies (Item 1) **[Figure 20-52-113]**.

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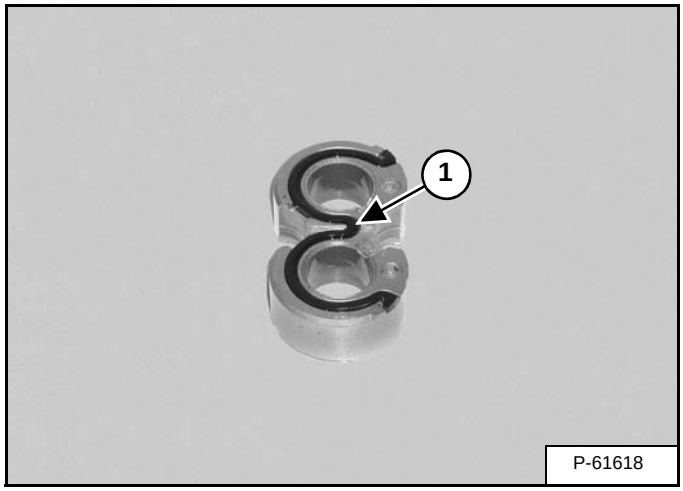
Gear Pump Disassembly And Assembly (Cont'd)

Figure 20-52-114



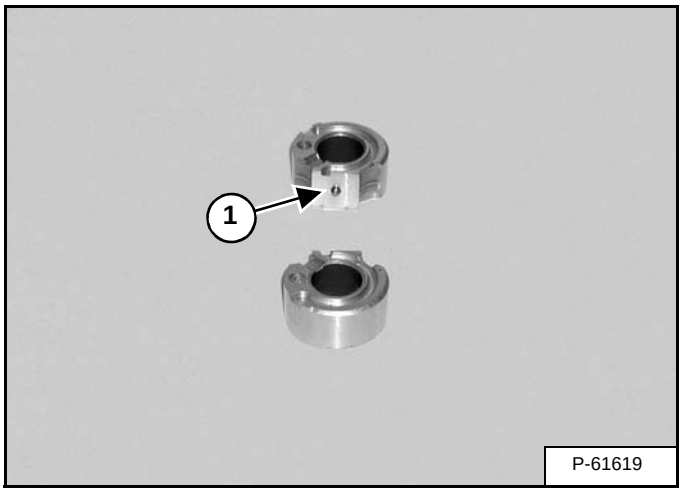
Remove the back-up ring (Item 1) **[Figure 20-52-114]**.

Figure 20-52-115



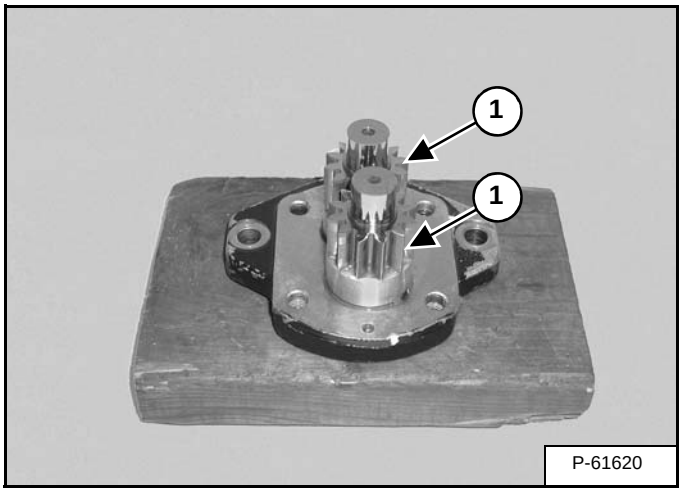
Remove the seal (Item 1) **[Figure 20-52-115]**.

Figure 20-52-116



Separate the bearings and remove the dowel pin (Item 1) **[Figure 20-52-116]**.

Figure 20-52-117

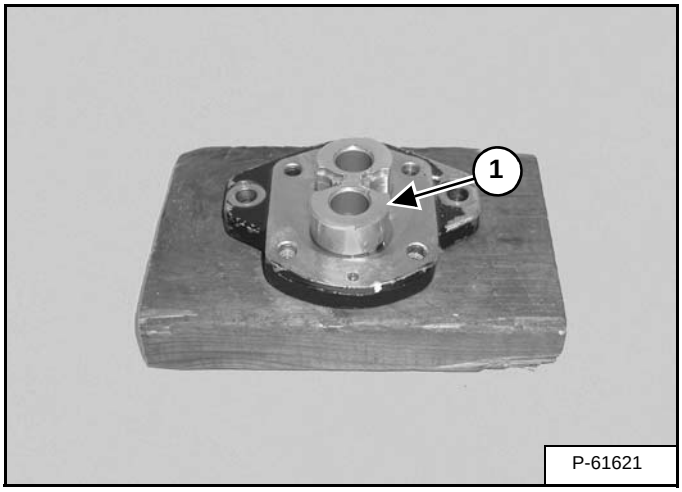


Remove the gears (Item 1) **[Figure 20-52-117]**.

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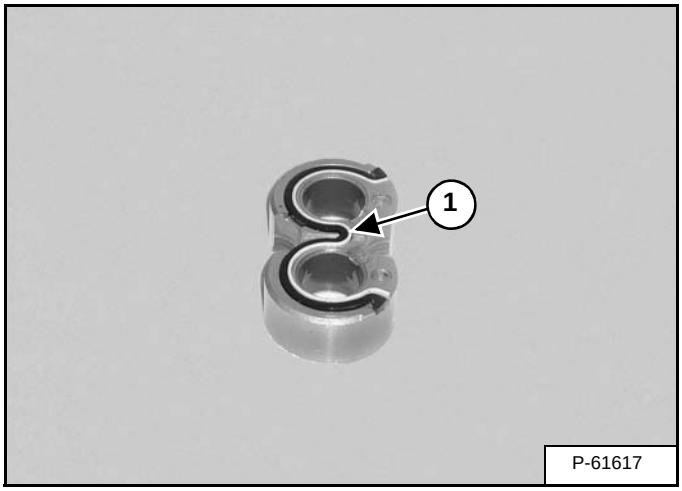
Gear Pump Disassembly And Assembly (Cont'd)

Figure 20-52-118



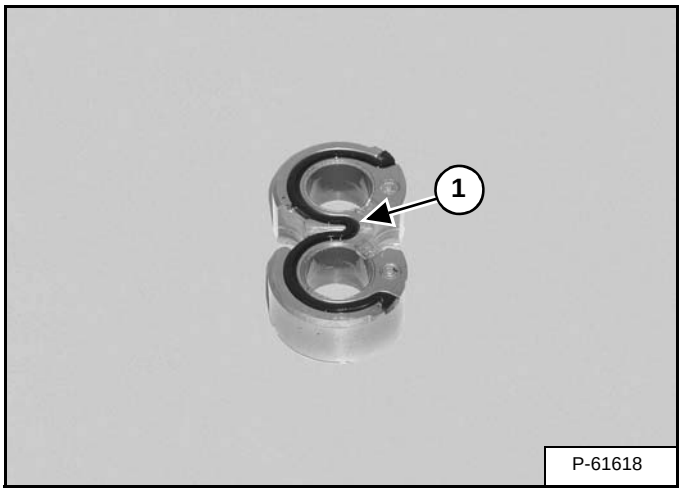
Remove the bearings (Item 1) **[Figure 20-52-118]**.

Figure 20-52-119



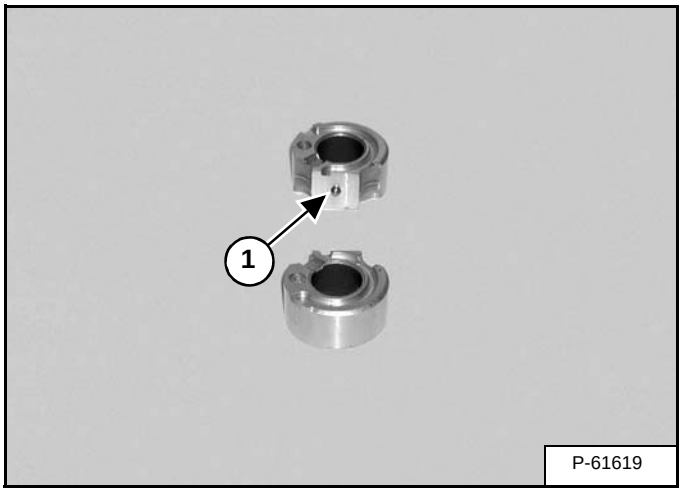
Remove the back-up ring (Item 1) **[Figure 20-52-119]**.

Figure 20-52-120



Remove the seal (Item 1) **[Figure 20-52-120]**.

Figure 20-52-121

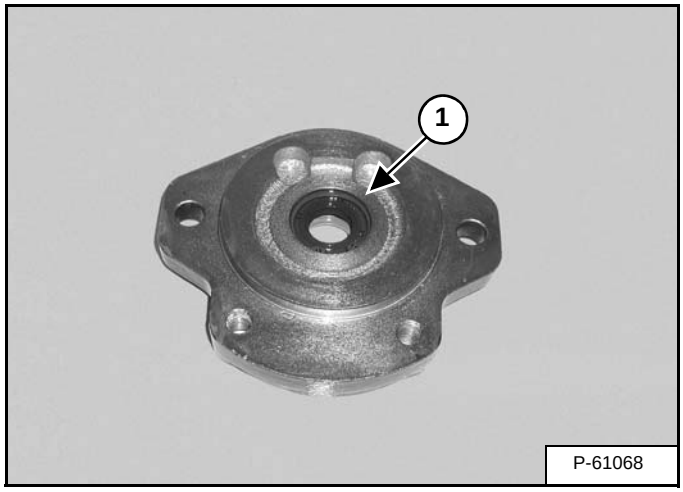


Separate the bearings and remove the dowel pin (Item 1) **[Figure 20-52-121]**.

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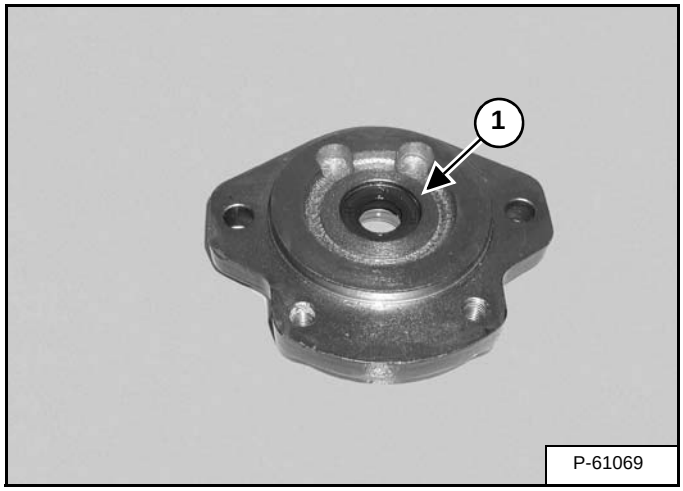
Gear Pump Disassembly And Assembly (Cont'd)

Figure 20-52-122



Remove the snap ring (Item 1) **[Figure 20-52-122]**

Figure 20-52-123



Remove the seal (Item 1) **[Figure 20-52-123]**.

Assembly:

Clean all parts in solvent and dry with compressed air.

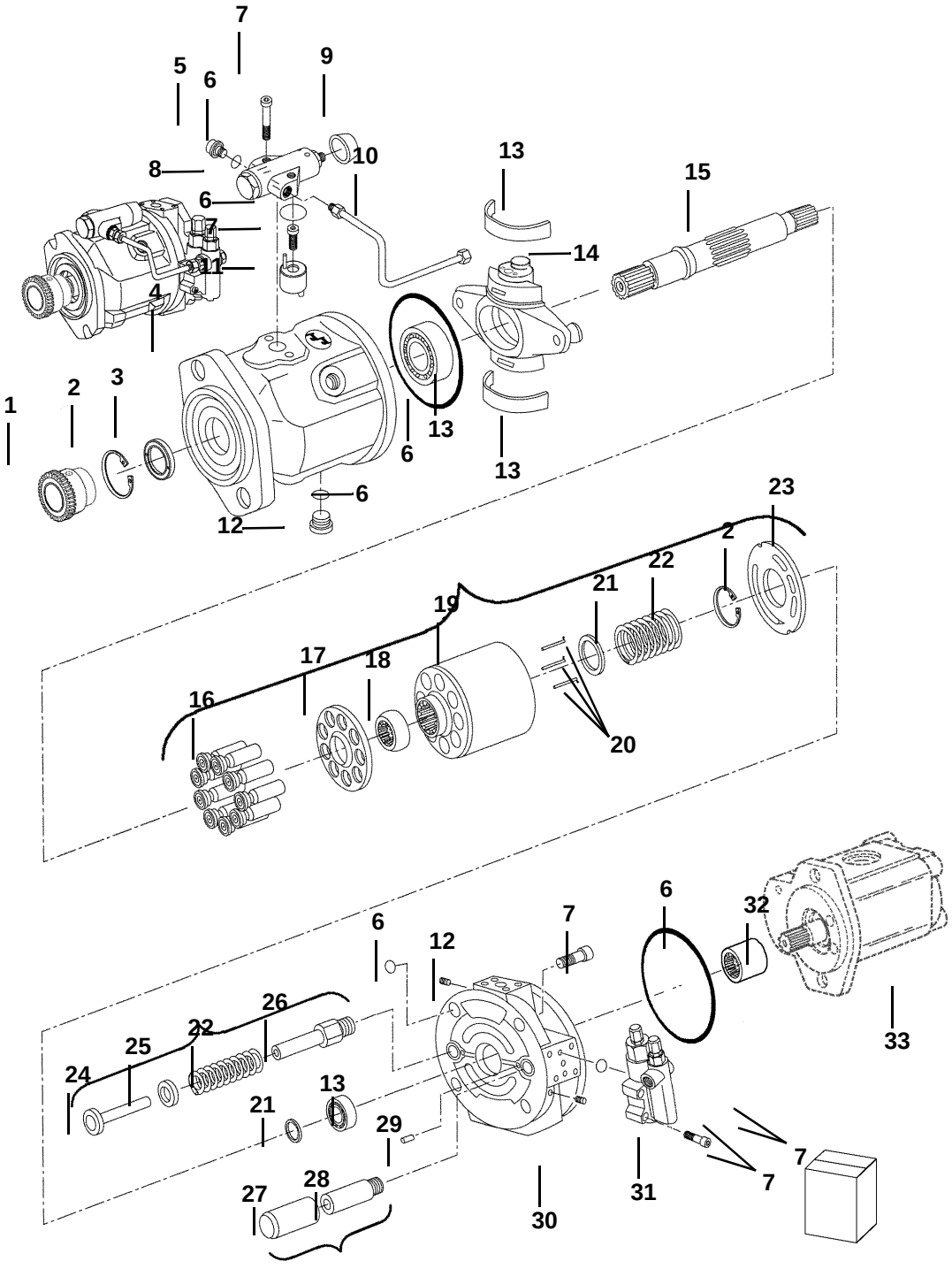
Inspect all parts for wear or damage. Replace any worn or damaged parts.

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

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Piston Pump Parts Identification

1. Coupler
2. Snap Ring
3. Seal
4. Housing
5. Fitting
6. O-Ring
7. Bolt
8. Torque Limiter
9. Dust Cap
10. Tubeline
11. Pin Assembly
12. Plug
13. Bearing
14. Cradle
15. Shaft
16. Pistons
17. Retainer Plate
18. Retaining Ball
19. Cylinder Block
20. Pin
21. Spacer
22. Spring
23. Valve Plate
24. Stroking Piston
25. Bushing
26. Stroking Piston Shaft
27. Destroking Piston
28. Destroking Piston Shaft
29. Dowel Pin
30. Back Port Assembly
31. Pump Control
32. Coupler
33. Gear Pump



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Piston Pump Disassembly

IMPORTANT

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

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Remove the hydraulic pump from the machine. (See Removal And Installation on Page 20-52-18)

Remove the gear pump. (See Gear Pump Removal And Installation on Page 20-52-41)

Remove the coupler. (See Coupler Removal And Installation on Page 20-52-20)

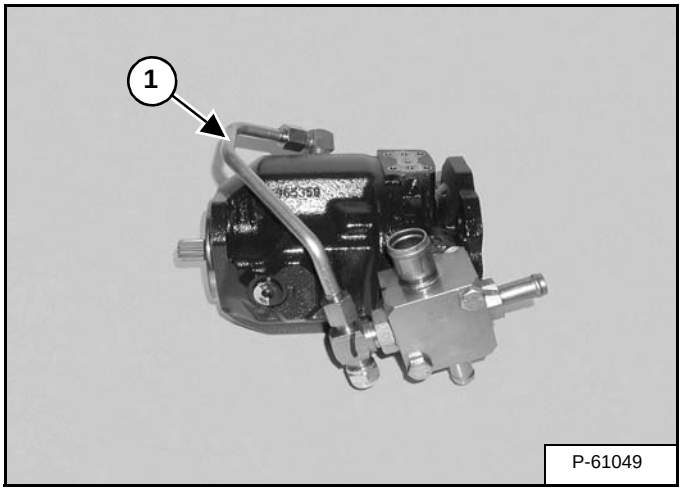
Remove the torque limiter valve. (See Torque Limiter Valve Removal on Page 20-52-22)

Remove the pump control assembly. (See Pump Control Removal And Installation on Page 20-52-34)

Clean the outside of the piston pump before disassembly.

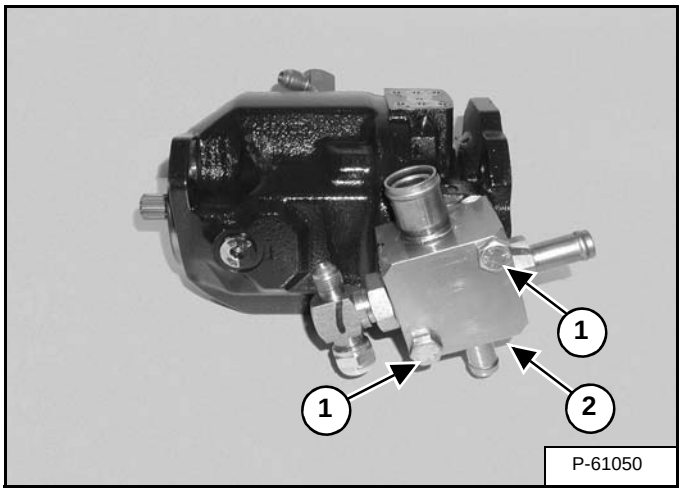
Mark the outside of the piston pump for ease of assembly.

Figure 20-52-124



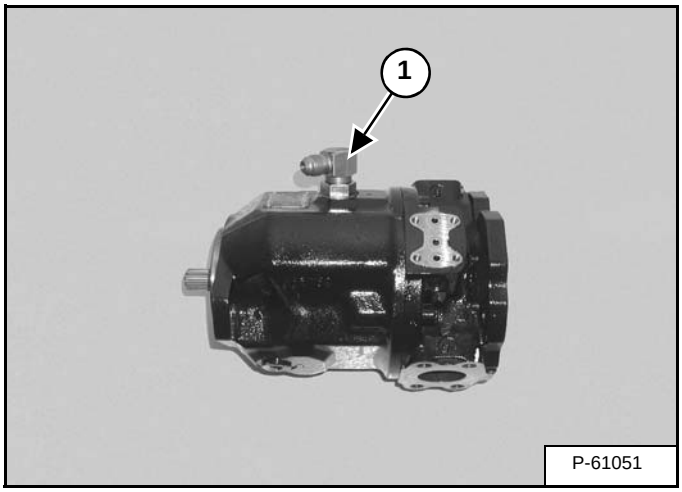
Remove the tubeline (Item 1) **[Figure 20-52-124]**.

Figure 20-52-125



Remove the bolts (Item 1) and block (Item 2) **[Figure 20-52-125]**.

Figure 20-52-126

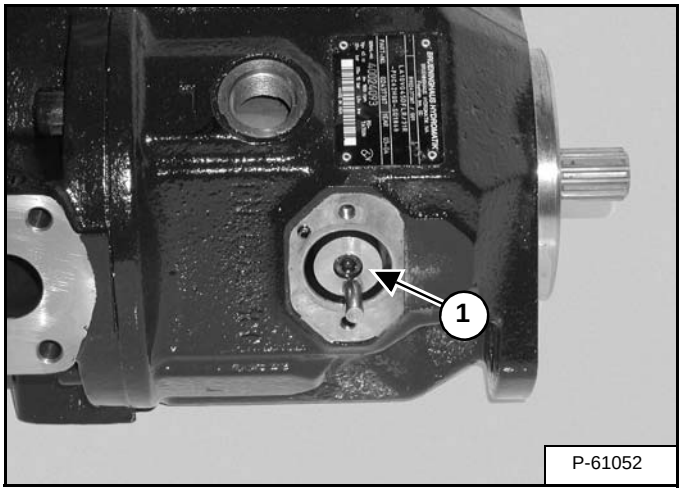


Remove the fitting (Item 1) **[Figure 20-52-126]**.

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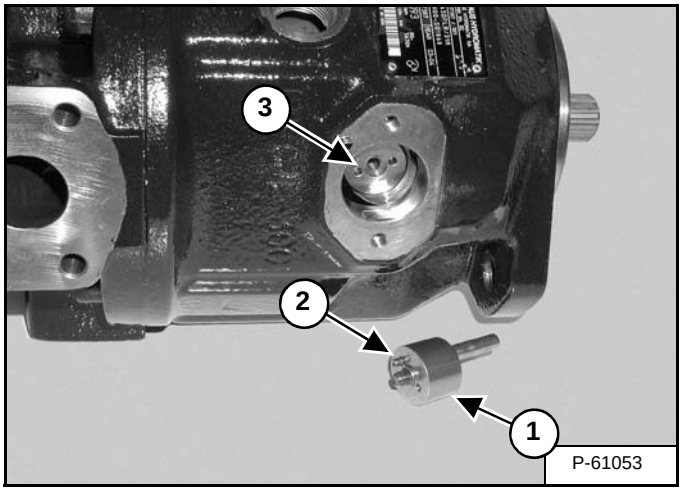
Piston Pump Disassembly (Cont'd)

Figure 20-52-127



Remove the screw (Item 1) **[Figure 20-52-127]** from the pin assembly.

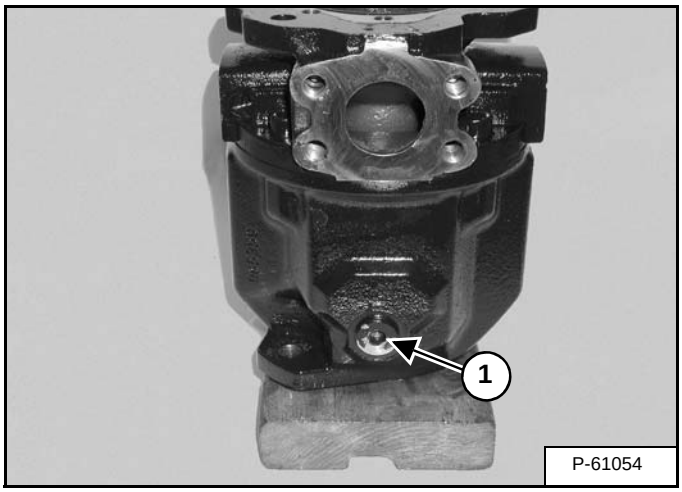
Figure 20-52-128



Remove the pin assembly (Item 1) **[Figure 20-52-128]**.

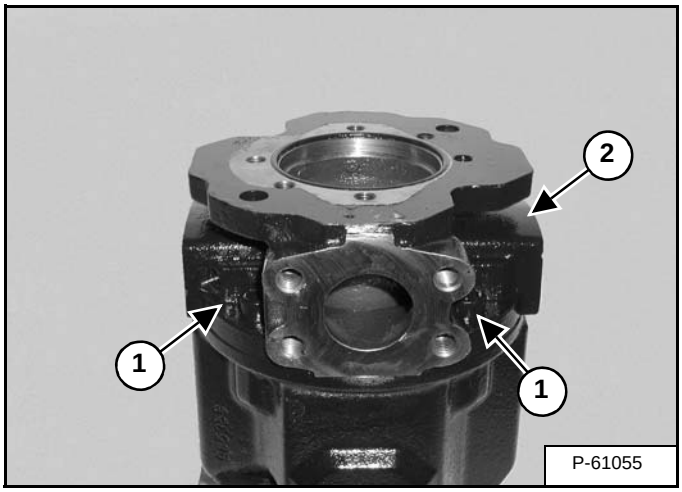
NOTE: Note the position of the dowel pin (Item 2) on the pin assembly, with the locating hole on the swash plate cradle (Item 3) [Figure 20-52-128].

Figure 20-52-129



Remove the plug (Item 1) **[Figure 20-52-129]** from the pump housing and drain the oil.

Figure 20-52-130



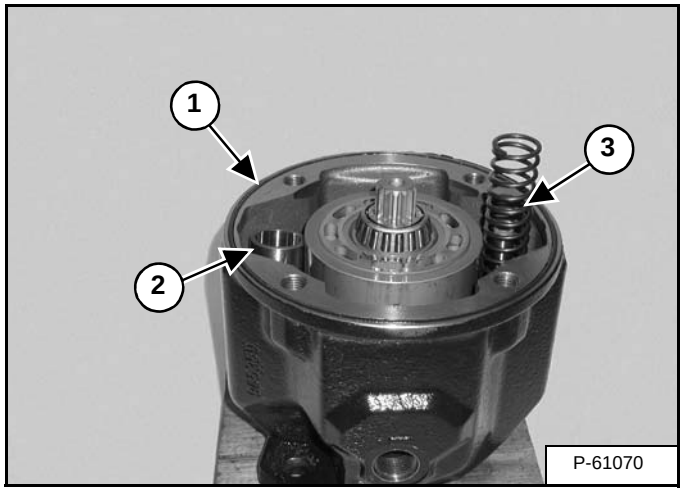
Remove the 4 bolts (Item 1) **[Figure 20-52-130]**.

Remove the back port assembly (Item 2) **[Figure 20-52-130]**.

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Piston Pump Disassembly (Cont'd)

Figure 20-52-131

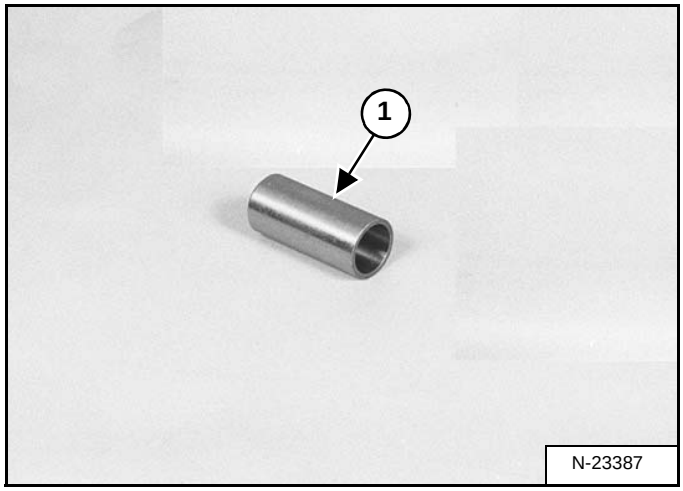


Remove the O-ring (Item 1) **[Figure 20-52-131]**.

Remove the destroking piston (Item 2) **[Figure 20-52-131]**.

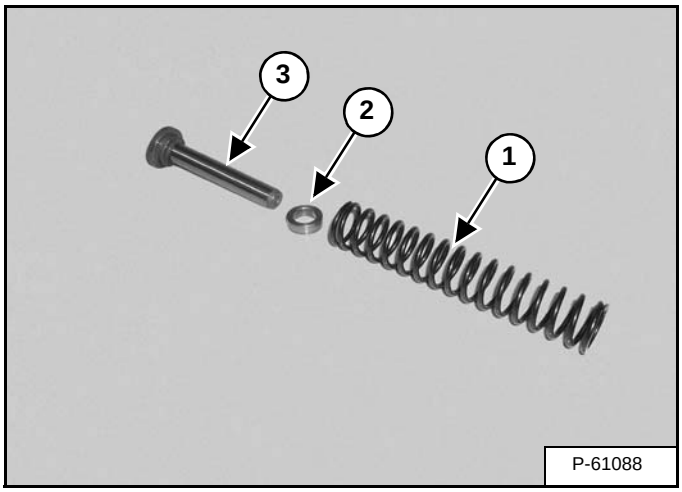
Remove the stroking piston/spring assembly (Item 3) **[Figure 20-52-131]**.

Figure 20-52-132



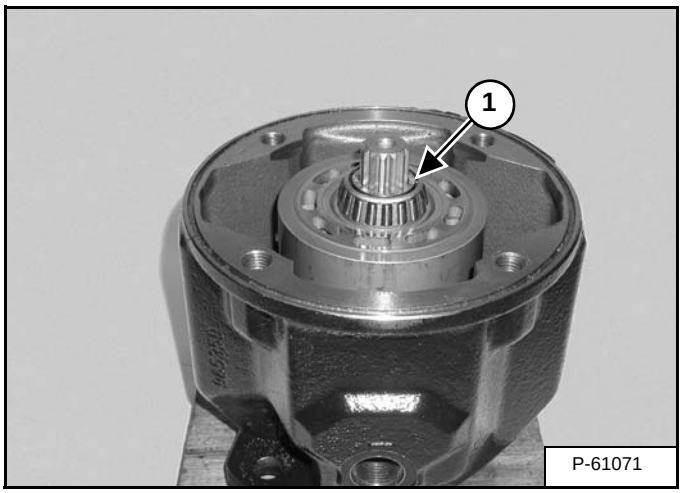
Inspect the destroking piston (Item 1) **[Figure 20-52-132]**.

Figure 20-52-133



Remove the spring (Item 1) and bushing (Item 2) from the stroking piston (Item 3) **[Figure 20-52-133]**. Inspect all parts and replace as needed.

Figure 20-52-134

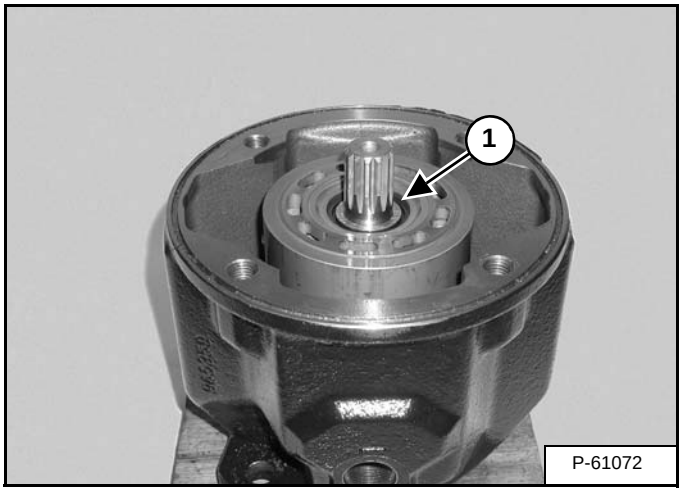


Remove the bearing (Item 1) **[Figure 20-52-134]**.

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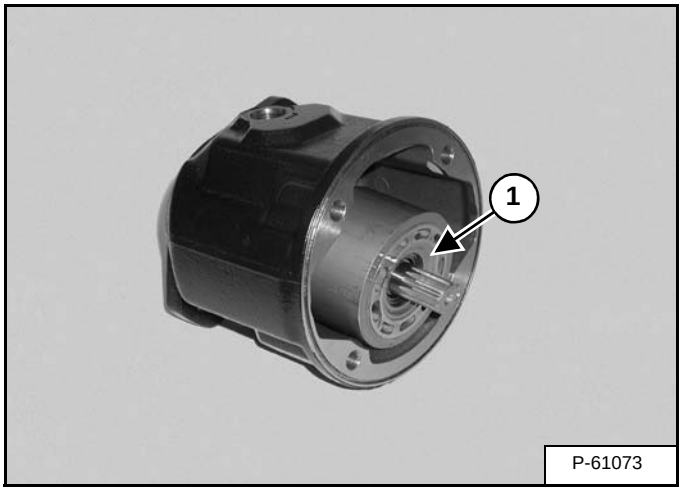
Piston Pump Disassembly (Cont'd)

Figure 20-52-135



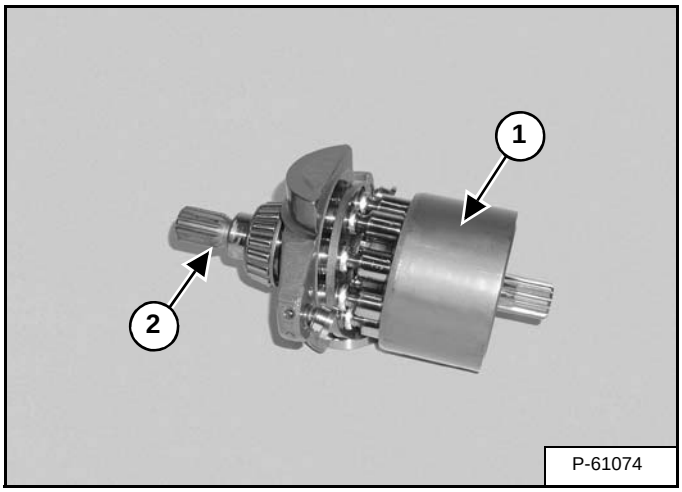
Remove the adjustment spacer(s) (Item 1) **[Figure 20-52-135]** from the pump shaft.

Figure 20-52-136



Lay the pump assembly on its side and remove the rotary group, cradle, and shaft (Item 1) **[Figure 20-52-136]** from the housing.

Figure 20-52-137

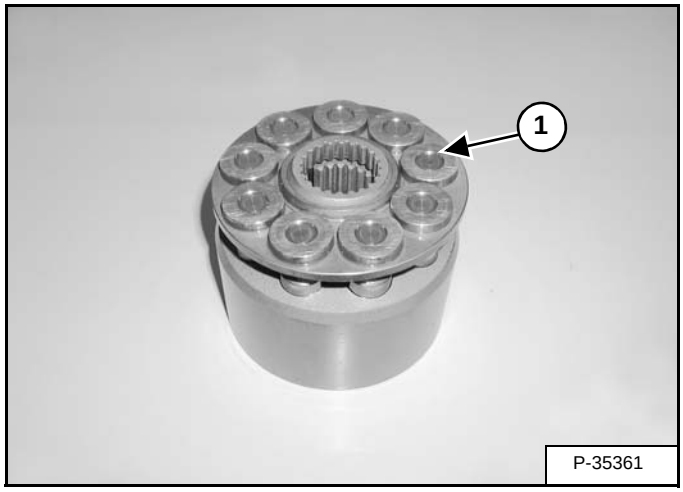


Slide the rotary group (Item 1) from the shaft assembly (Item 2) **[Figure 20-52-137]**.

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Piston Pump Disassembly (Cont'd)

Figure 20-52-138

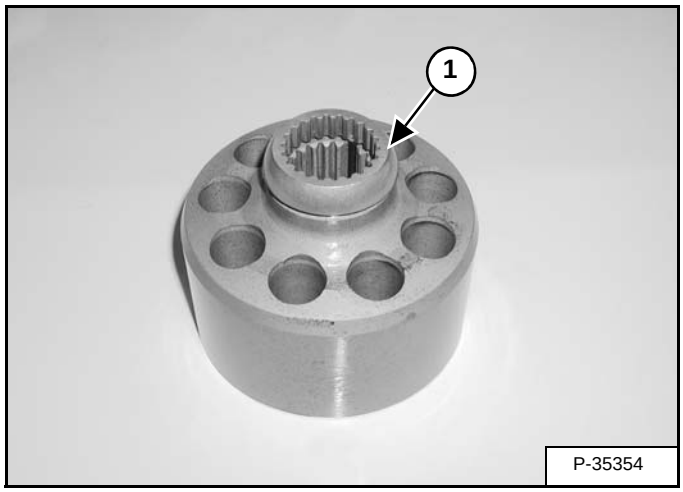


Remove the retainer plate and pistons (Item 1) **[Figure 20-52-138]** from the cylinder block.

NOTE: It is NOT important that the pistons are installed in their original positions.

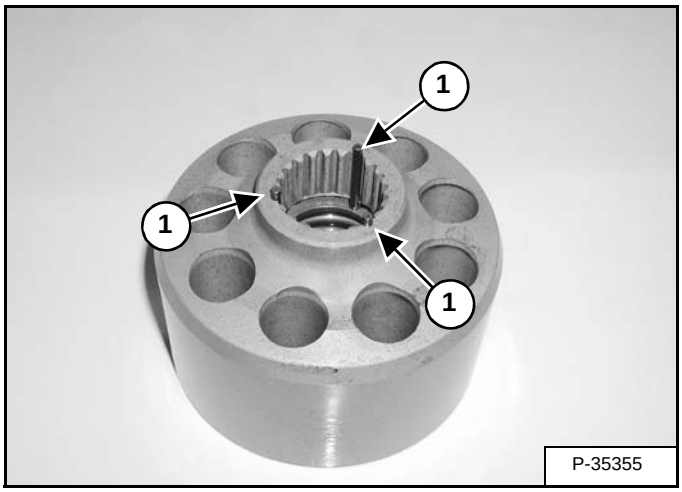
NOTE: Check that there are no scratches or metal deposits on the sliding surface. (Pistons must be replaced in sets)

Figure 20-52-139



Remove the retaining ball (Item 1) **[Figure 20-52-139]**.

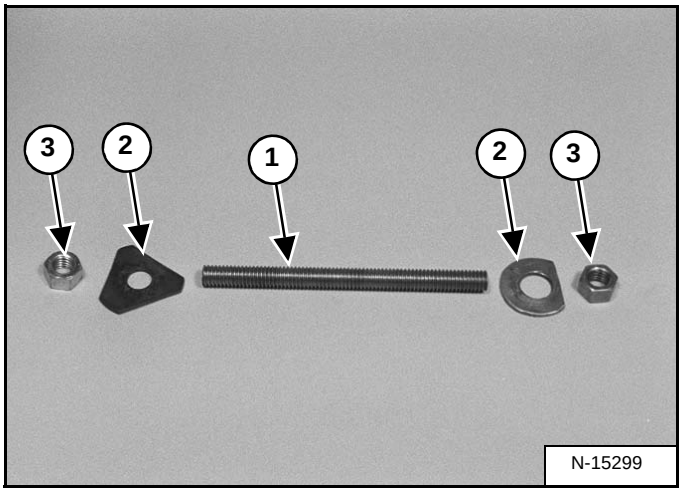
Figure 20-52-140



Inspect the 3 pins (Item 1) **[Figure 20-52-140]** for wear and/or damage.

NOTE: The following procedure shown is to disassemble the rotating group for inspection only. The rotating group parts can not be ordered separately and must be ordered as an assembly.

Figure 20-52-141

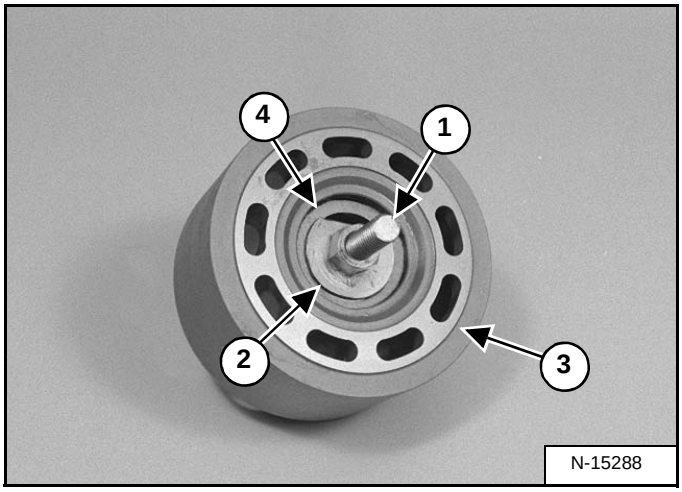


To remove the spring from inside the cylinder block, use a threaded rod (or bolt) (Item 1), 2 trimmed washers (Item 2) and 2 nuts (Item 3) **[Figure 20-52-141]**.

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Piston Pump Disassembly (Cont'd)

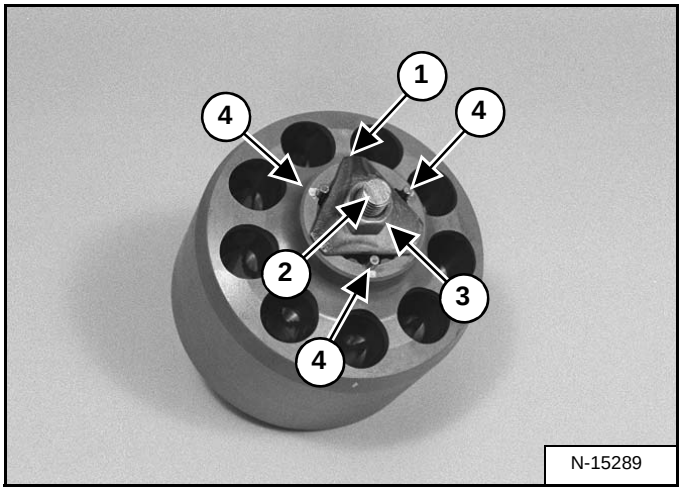
Figure 20-52-142



Install the threaded rod and nut (Item 1) through the modified washer (Item 2) and the block assembly (Item 3) **[Figure 20-52-142]**.

NOTE: The modified washer (Item 2) must fit inside the snap ring (Item 4) [Figure 20-52-142].

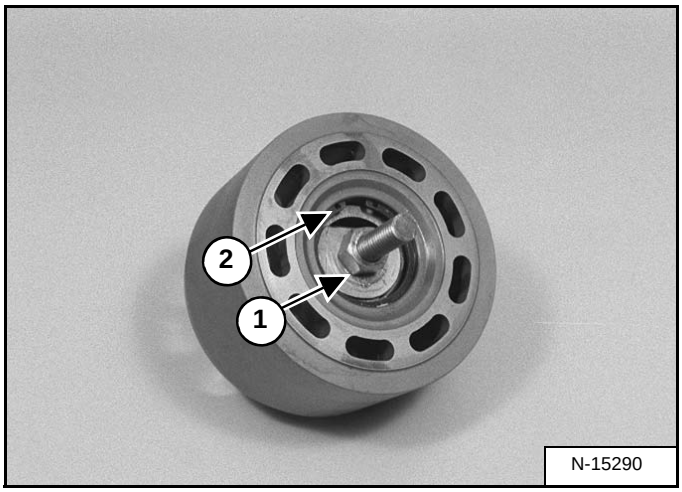
Figure 20-52-143



Install the second trimmed washer (Item 1) over the threaded rod (Item 2) and install the nut (Item 3) **[Figure 20-52-143]**.

NOTE: The modified washer (Item 1) must fit between the 3 pins (Item 4) [Figure 20-52-143].

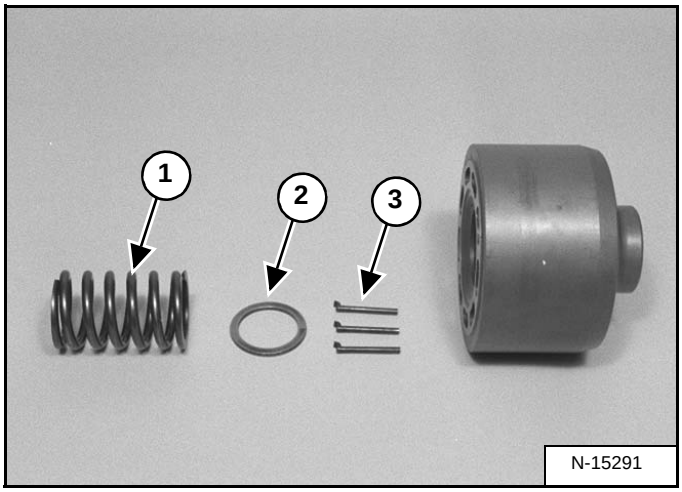
Figure 20-52-144



Tighten the nut (Item 1) until the spring is compressed enough to install the snap ring (Item 2) **[Figure 20-52-144]**.

Loosen the nut to release the tension on the spring and remove the bolts and washers.

Figure 20-52-145

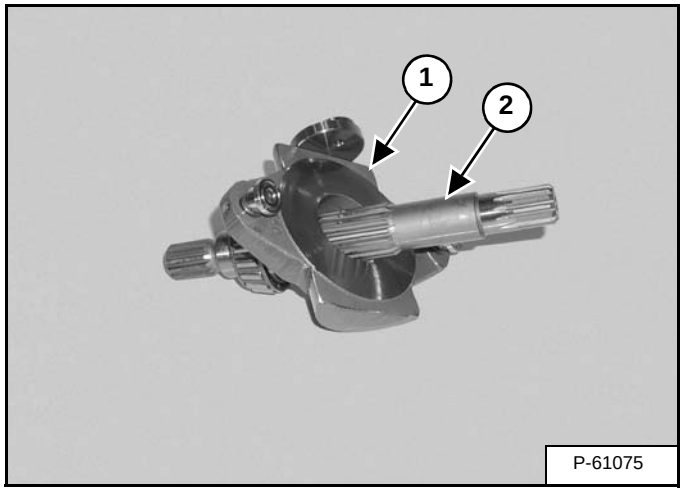


Remove the spring (Item 1), the washer (Item 2), and the 3 pins (Item 3) **[Figure 20-52-145]** from the cylinder block.

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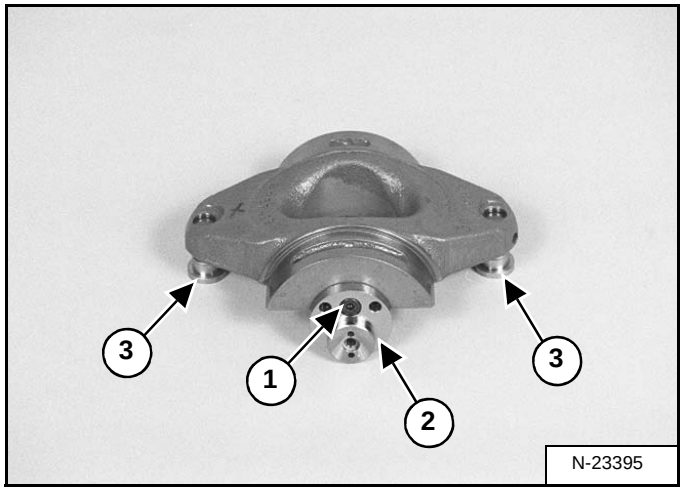
Piston Pump Disassembly (Cont'd)

Figure 20-52-146



Remove the cradle (Item 1) from the shaft (Item 2) **[Figure 20-52-146]**.

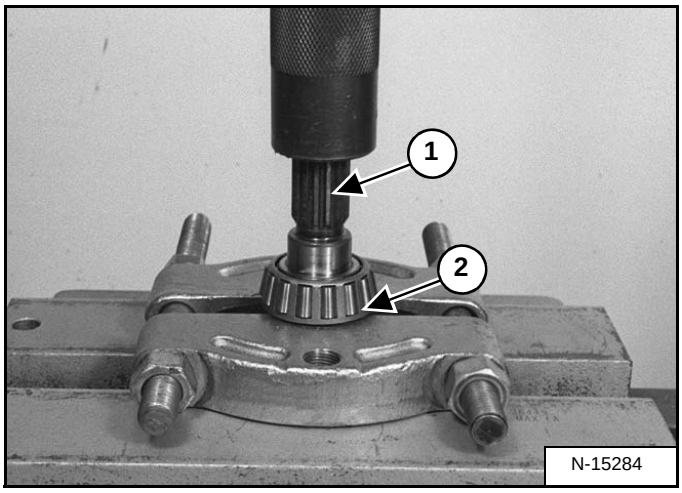
Figure 20-52-147



Remove the bolt (Item 1) and the torque limiter plate (Item 2) **[Figure 20-52-147]**.

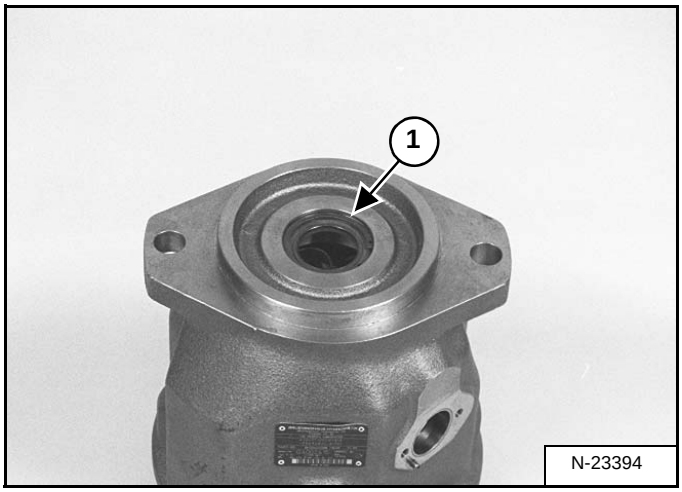
NOTE: The caps (Item 3) [Figure 20-52-147] cannot be replaced, a new cradle must be ordered.

Figure 20-52-148



Press the shaft (Item 1) from the bearing (Item 2) **[Figure 20-52-148]**.

Figure 20-52-149

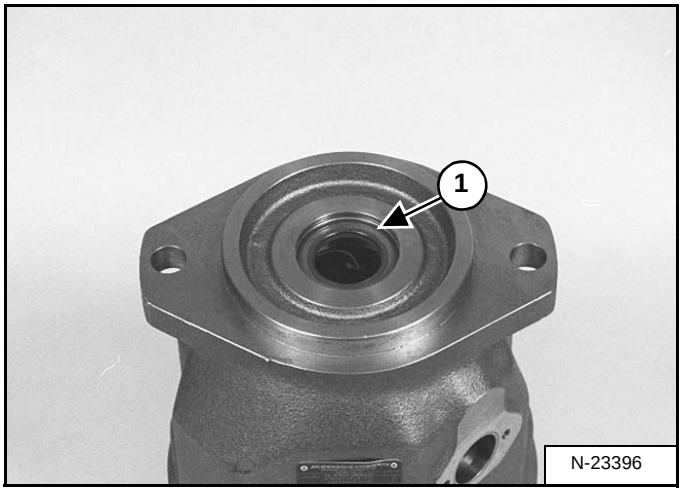


Remove the snap ring (Item 1) **[Figure 20-52-149]** from the housing.

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Piston Pump Disassembly (Cont'd)

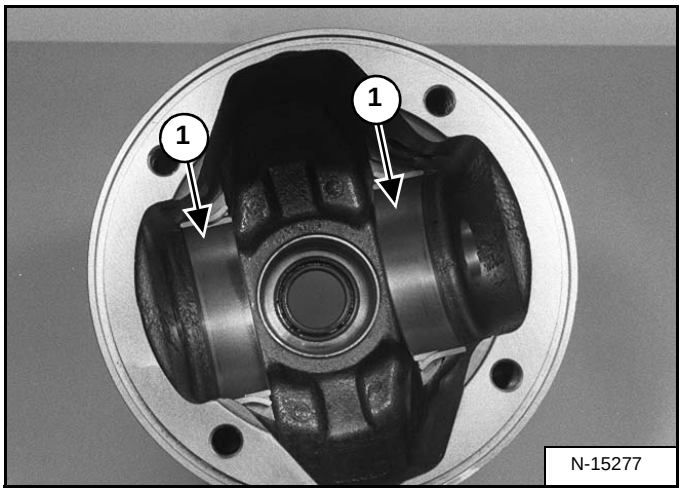
Figure 20-52-150



Remove the seal (Item 1) **[Figure 20-52-150]** from the housing.

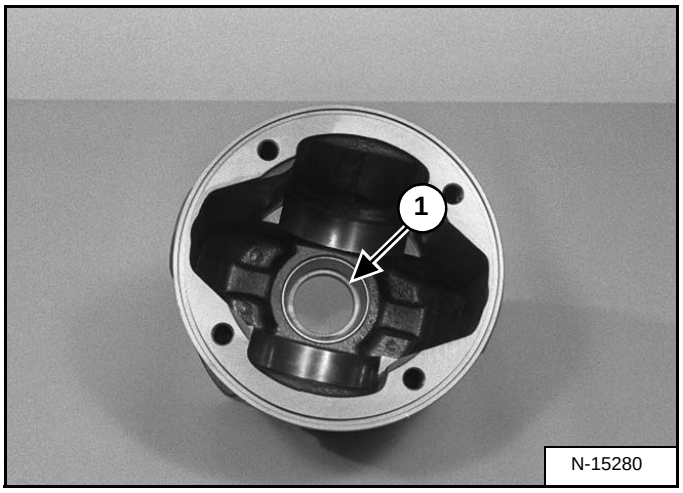
NOTE: The shaft seal can be removed without removing the shaft.

Figure 20-52-151



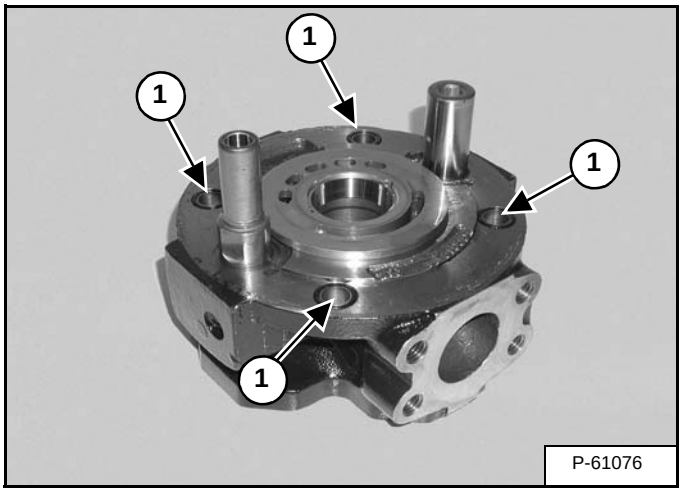
Remove the 2 brass bearings (Item 1) **[Figure 20-52-151]** from the housing.

Figure 20-52-152



Remove the race (Item 1) **[Figure 20-52-152]** from the housing.

Figure 20-52-153

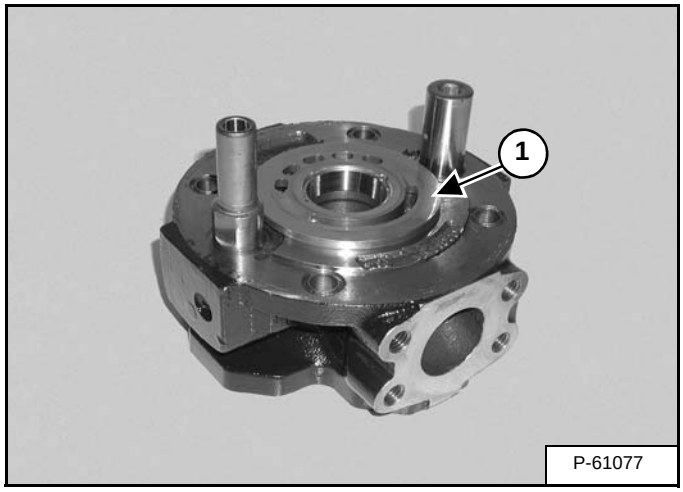


Remove the O-rings (Item 1) **[Figure 20-52-153]**.

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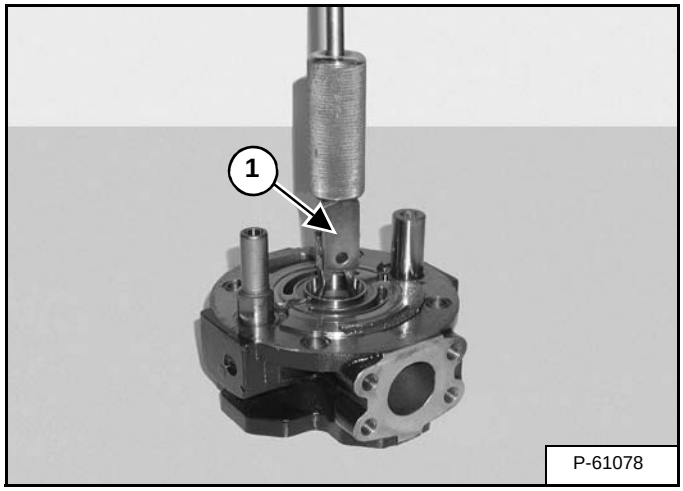
Piston Pump Disassembly (Cont'd)

Figure 20-52-154



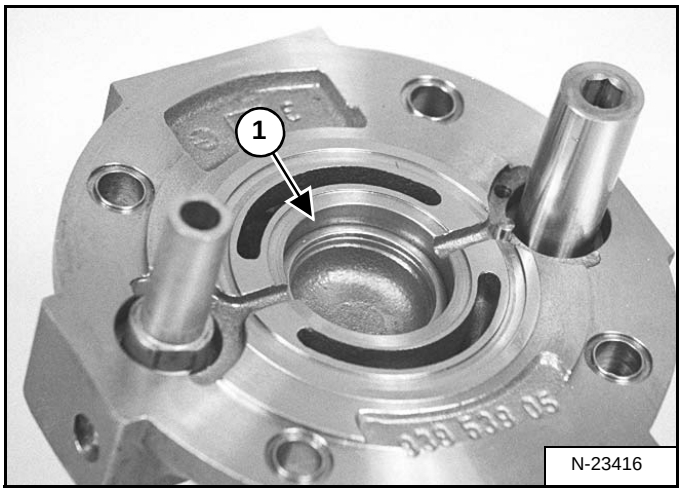
Remove the valve plate (Item 1) **[Figure 20-52-154]** from the back port assembly.

Figure 20-52-155



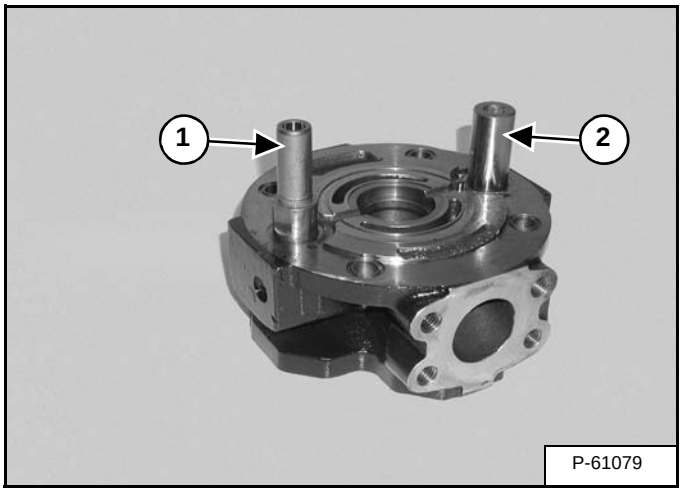
With a bearing puller (Item 1) **[Figure 20-52-155]** remove the bearing race from the back port assembly.

Figure 20-52-156



Remove the spacer (Item 1) **[Figure 20-52-156]** from the back port assembly. (If equipped)

Figure 20-52-157



Remove the stroking piston (Item 1) **[Figure 20-52-157]**. (Spring side)

Remove the destroking piston (Item 2) **[Figure 20-52-157]**.

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Piston Pump Assembly

IMPORTANT

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

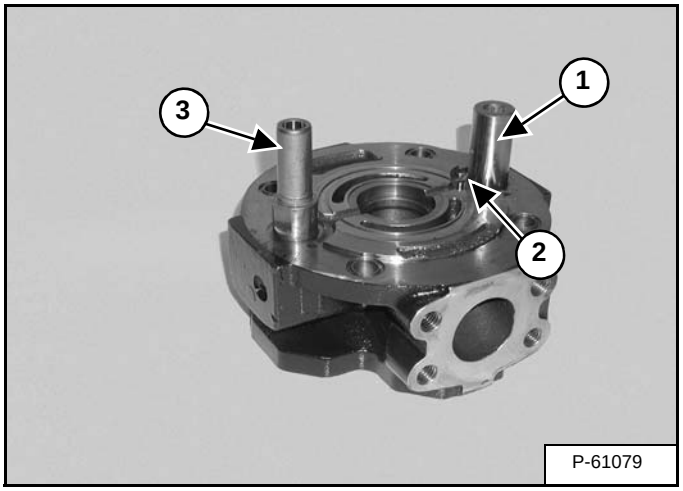
I-2003-0888

Clean parts in solvent and dry with compressed air.

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

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

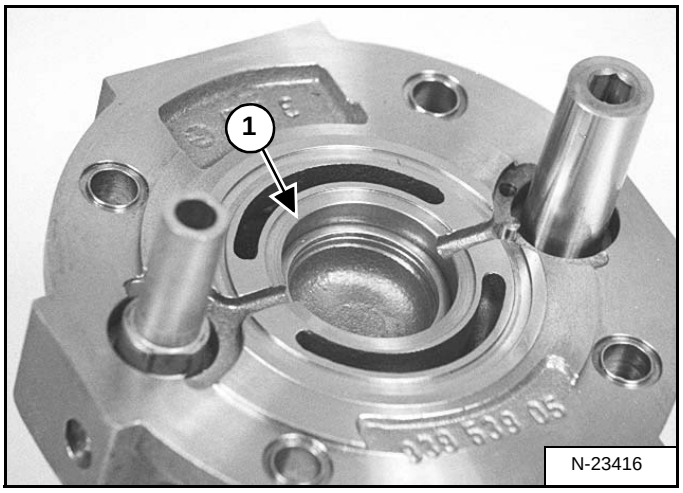
Figure 20-52-158



Apply Loctite™ 241 on the threads and install the destroking piston (Item 1) in the hole next to the alignment pin (Item 2) **[Figure 20-52-158]**.

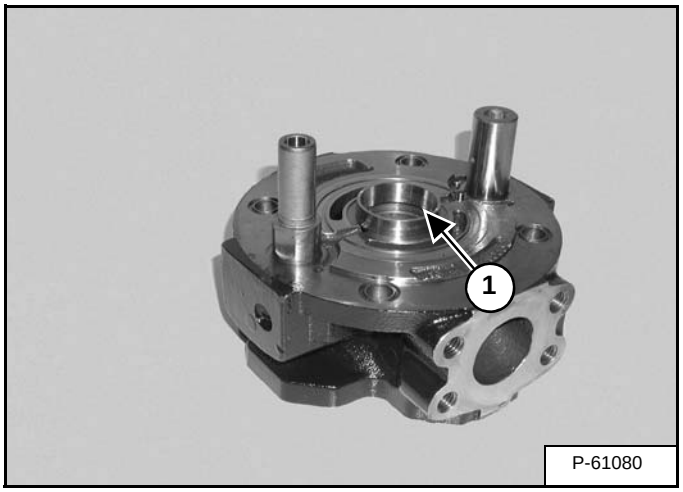
Apply Loctite™ 241 on the threads and install the stroking piston (Item 3) **[Figure 20-52-158]** in the hole.

Figure 20-52-159



Install the spacer (Item 1) **[Figure 20-52-159]** in the back port assembly. (If equipped)

Figure 20-52-160

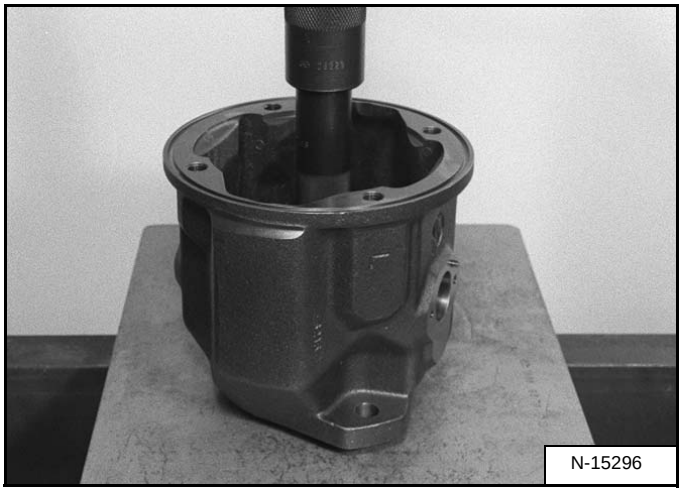


Install the bearing race (Item 1) **[Figure 20-52-160]**. in the back port assembly.

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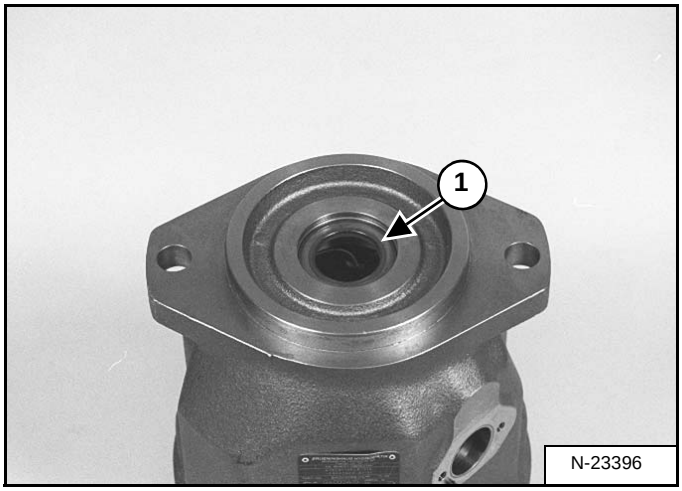
Piston Pump Assembly (Cont'd)

Figure 20-52-161



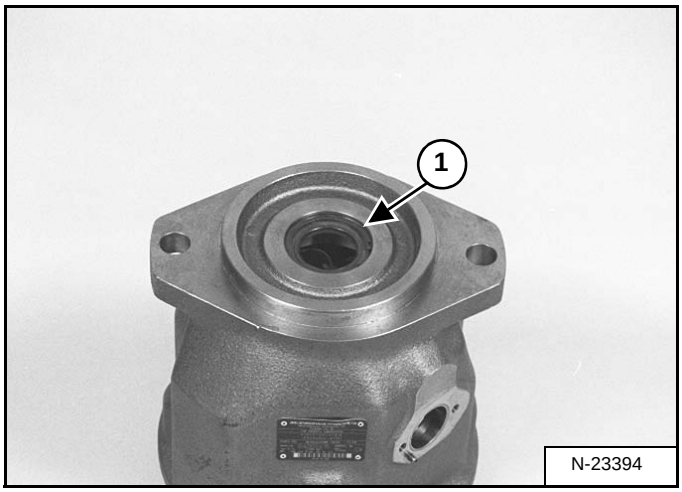
Press the race into the housing **[Figure 20-52-161]**.

Figure 20-52-162



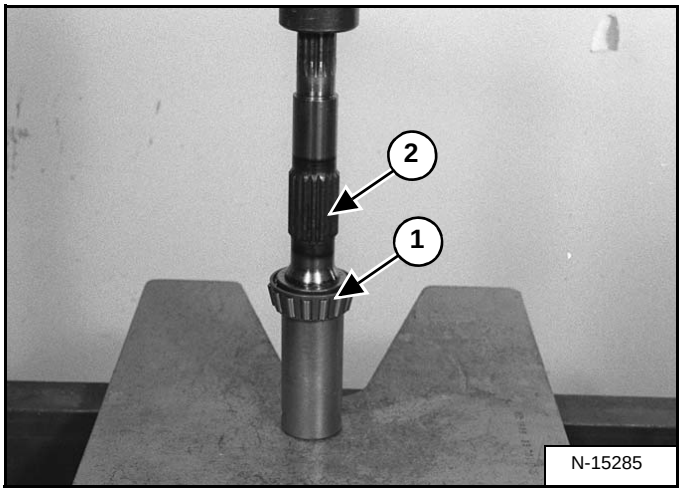
Install the shaft seal (Item 1) **[Figure 20-52-162]** in the housing.

Figure 20-52-163



Install the snap ring (Item 1) **[Figure 20-52-163]**.

Figure 20-52-164

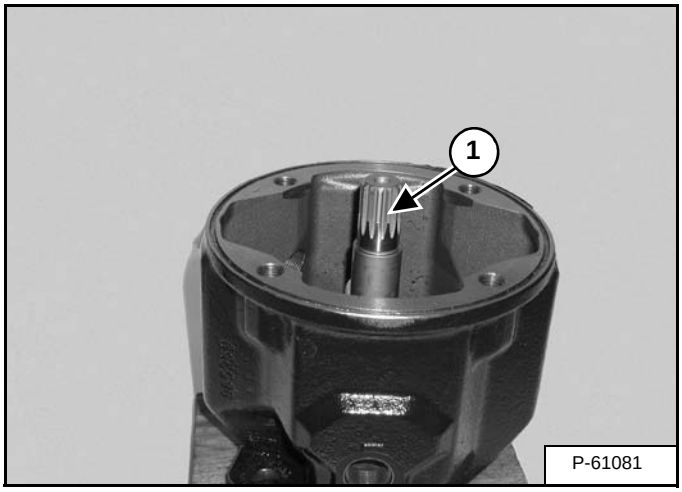


Press the bearing (Item 1) onto the shaft (Item 2) **[Figure 20-52-164]**.

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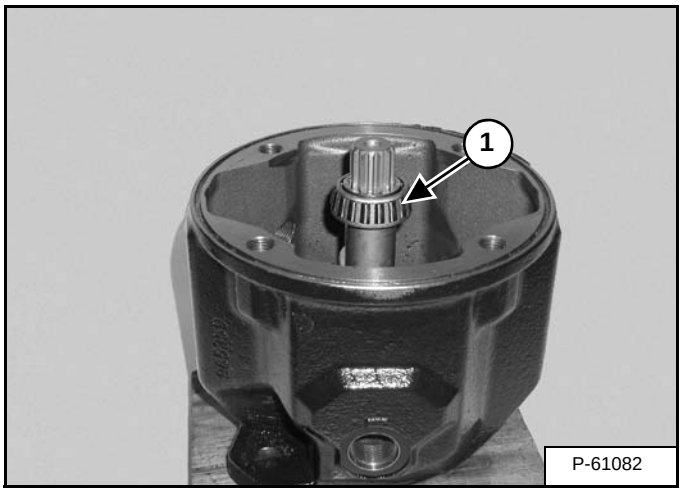
Piston Pump Assembly (Cont'd)

Figure 20-52-165



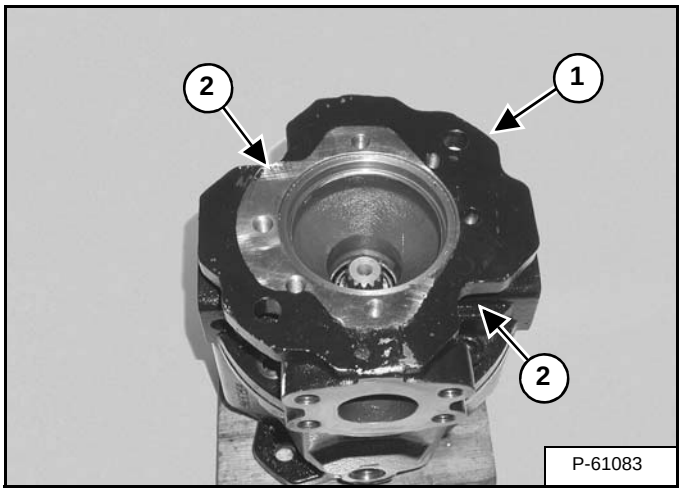
To find the correct shim washer thickness for bearing end play, the shaft/bering assembly (Item 1) **[Figure 20-52-165]** must be installed in the housing.

Figure 20-52-166



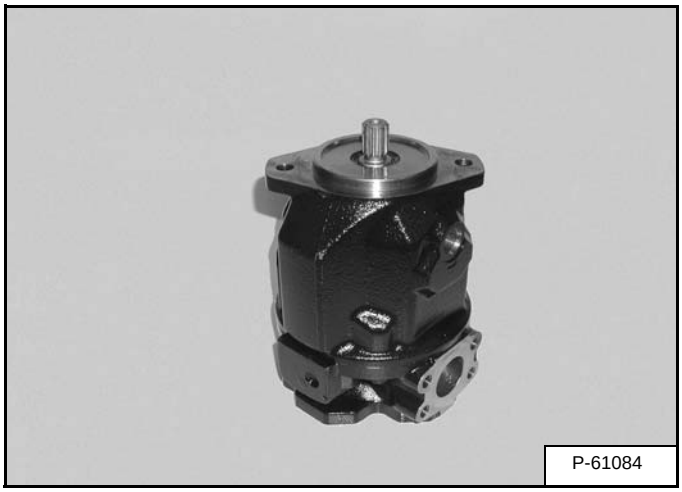
Install the bearing (Item 1) **[Figure 20-52-166]** on the shaft.

Figure 20-52-167



Install the back port assembly (Item 1) on the housing with 2 bolts (Item 2) **[Figure 20-52-167]**.

Figure 20-52-168

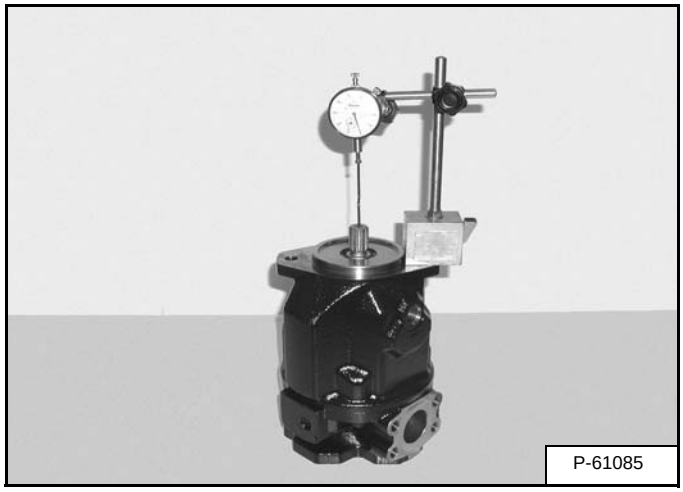


Turn the housing over **[Figure 20-52-168]**.

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Piston Pump Assembly (Cont'd)

Figure 20-52-169



Install a dial indicator on the housing as shown **[Figure 20-52-169]** and set it to zero.

Pull the shaft up as far as it will go and record the reading on the dial indicator. Repeat the procedure several times. The reading must be the same each time.

Add the nominal pre-load of 0.001 in. (0,025 mm), the actual pre-load is 0.000 in. (0,000 mm) to 0.002 in. (0,050 mm) to the reading found on the dial indicator **[Figure 20-52-169]**.

Example: (In Inches):

0.150 Measure movement of shaft

0.001 Nominal Pre-load

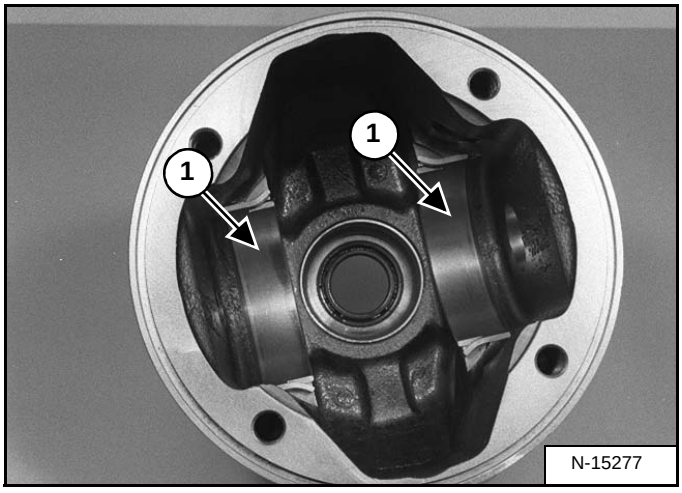
=0.151 ± thickness of the spacer needed.

When the proper thickness of shim washer is determined, remove the dial indicator from the pump housing.

Remove the 2 back port assembly mounting bolts from the pump.

Remove the shaft/bearing assembly from the pump housing.

Figure 20-52-170

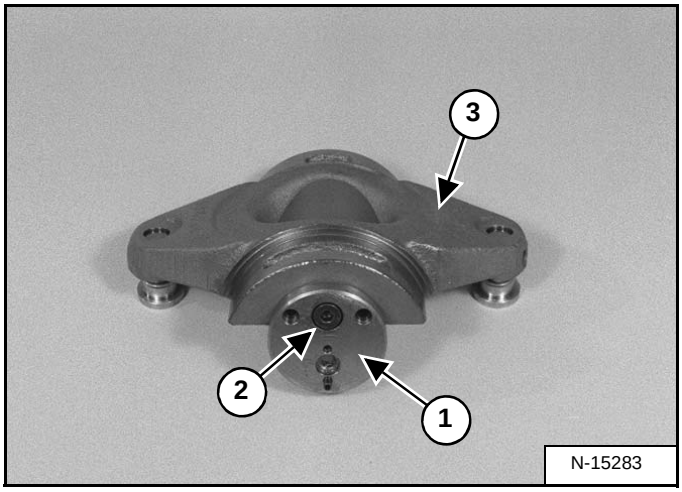


Install the 2 brass bearings (Item 1) **[Figure 20-52-170]** into the pump housing.

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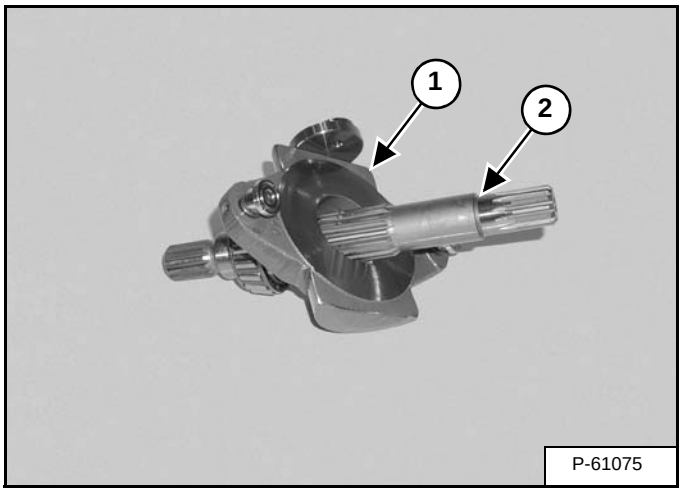
Piston Pump Assembly (Cont'd)

Figure 20-52-171



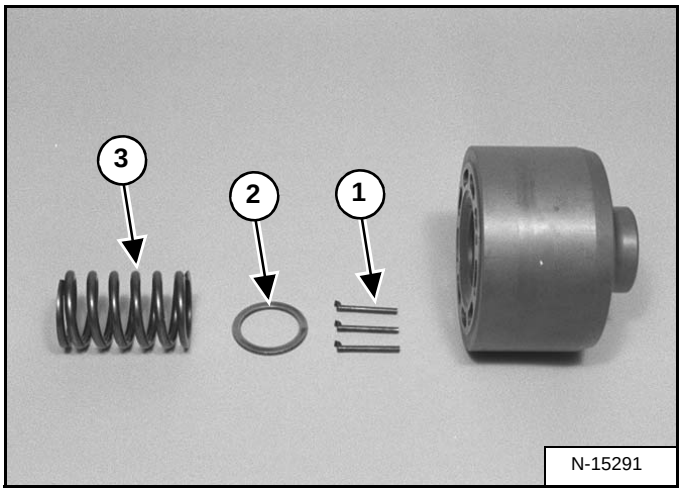
Apply Loctite™ 241 and install the torque limiter plate (Item 1) and bolt (Item 2) on the swash plate (Item 3) **[Figure 20-52-171]**.

Figure 20-52-172



Install the cradle (Item 1) on the shaft (Item 2) **[Figure 20-52-172]**.

Figure 20-52-173

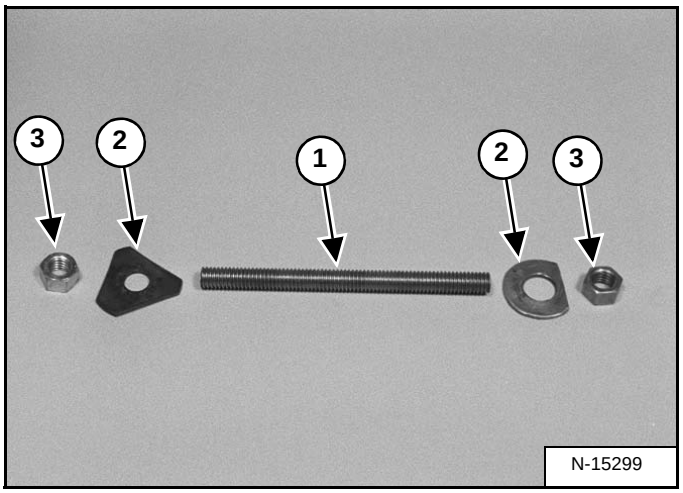


Apply clean grease to the 3 pins (Item 1) **[Figure 20-52-173]** and install the pins in the appropriate groove.

Install the washer (Item 2) and the spring (Item 3) **[Figure 20-52-173]**.

NOTE: If the rotating group is damaged, the parts can not be ordered separately and must be order as an assembly.

Figure 20-52-174

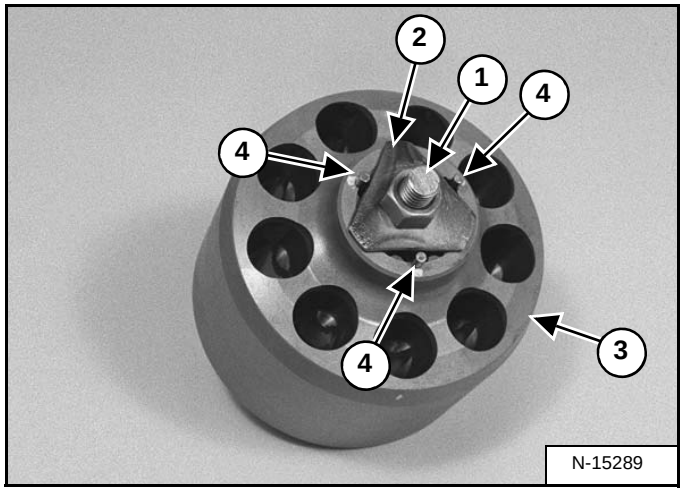


To compress the spring inside the cylinder block, use a threaded rod (or bolt) (Item 1), 2 trimmed washers (Item 2) and 2 nuts (Item 3) **[Figure 20-52-174]**.

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Piston Pump Assembly (Cont'd)

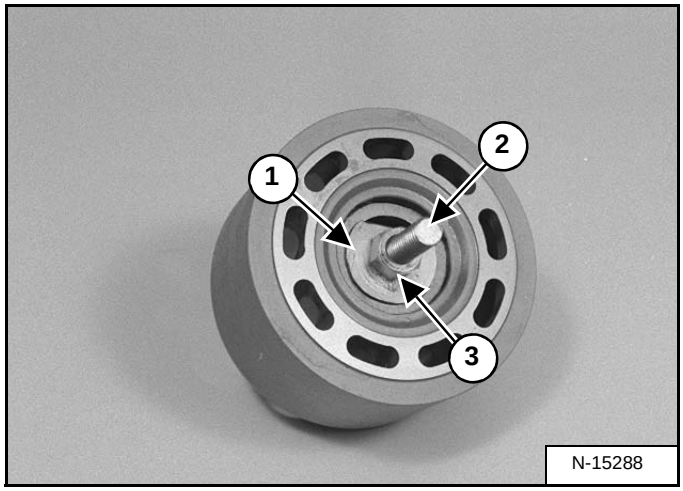
Figure 20-52-175



Install the threaded rod and nut (Item 1) through the modified washer (Item 2) and the block assembly (Item 3) **[Figure 20-52-175]**.

NOTE: The modified washer (Item 2) must fit between the 3 pins (Item 4) [Figure 20-52-175].

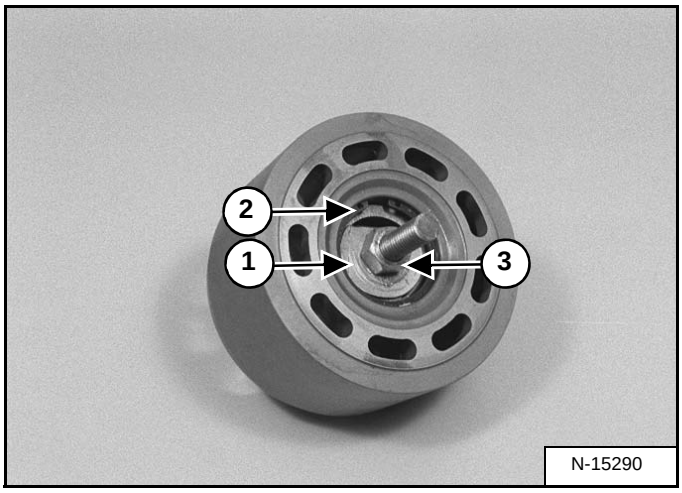
Figure 20-52-176



Install the second modified washer (Item 1) over the threaded rod (Item 2) **[Figure 20-52-176]**.

Install the nut (Item 3) **[Figure 20-52-176]** on the threaded rod.

Figure 20-52-177

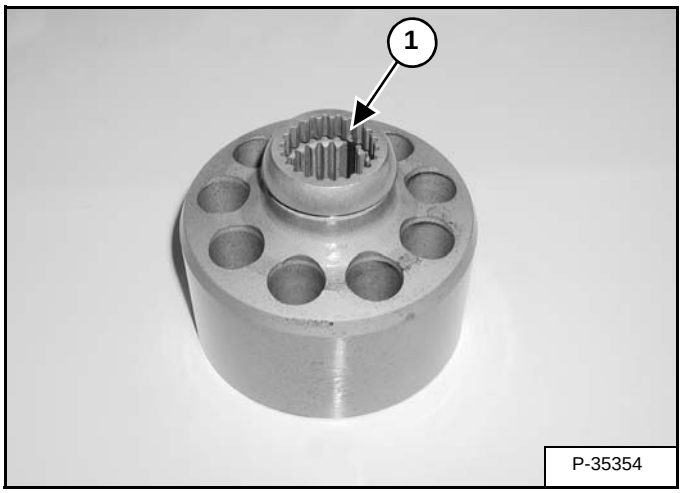


NOTE: The modified washer (Item 1) must fit over the spring, but must also fit inside the snap ring (Item 2) [Figure 20-52-177].

Tighten the nut (Item 3) until the spring is compressed enough to install the snap ring (Item 2) **[Figure 20-52-177]**.

Remove the threaded rod/washer assembly.

Figure 20-52-178

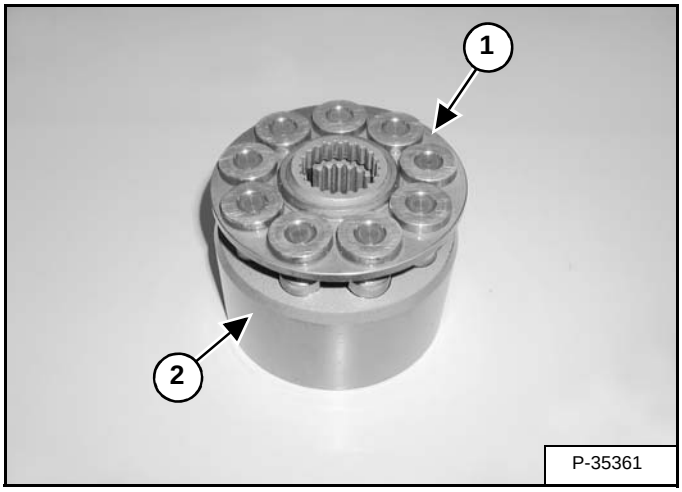


Install the retaining ball (Item 1) **[Figure 20-52-178]** on the 3 pins.

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Piston Pump Assembly (Cont'd)

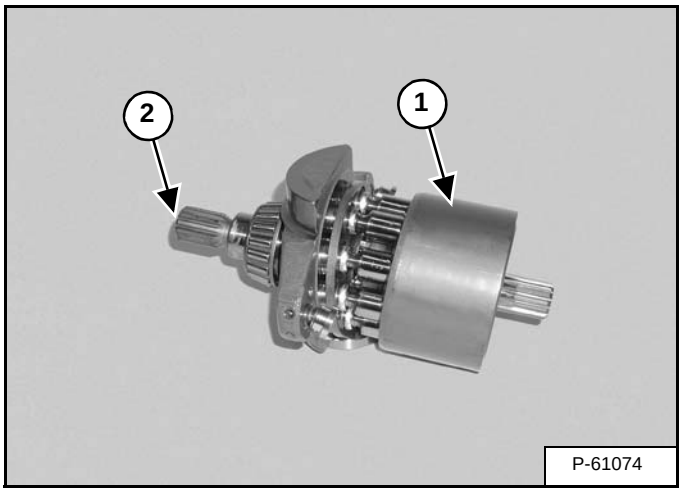
Figure 20-52-179



Install the retainer and piston assembly (Item 1) in the cylinder block (Item 2) **[Figure 20-52-179]**.

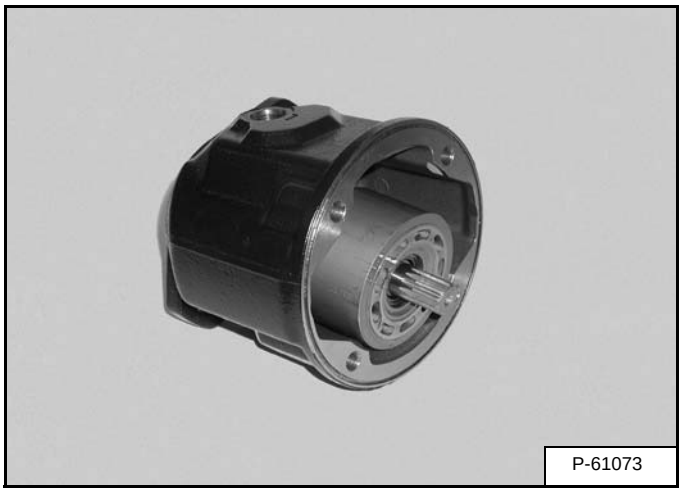
NOTE: It is NOT important that the pistons are installed in their original positions.

Figure 20-52-180



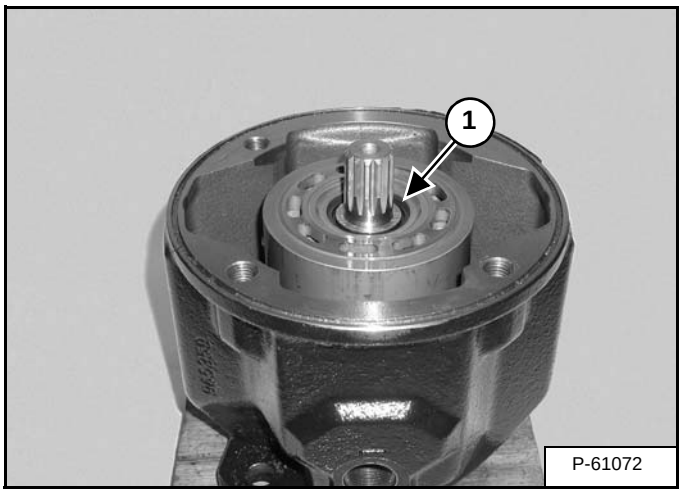
Slide the rotary group assembly (Item 1) on the shaft (Item 2) **[Figure 20-52-180]**.

Figure 20-52-181



Lay the pump housing on its side and install the rotary group assembly, swash plate, and shaft in the housing **[Figure 20-52-181]**.

Figure 20-52-182



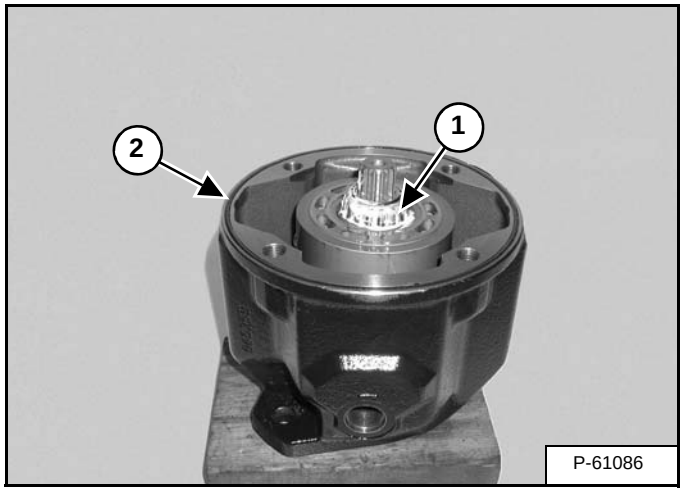
Set the pump housing in the up-right position **[Figure 20-52-182]**.

Install the shim washer (Item 1) **[Figure 20-52-182]**.

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Piston Pump Assembly (Cont'd)

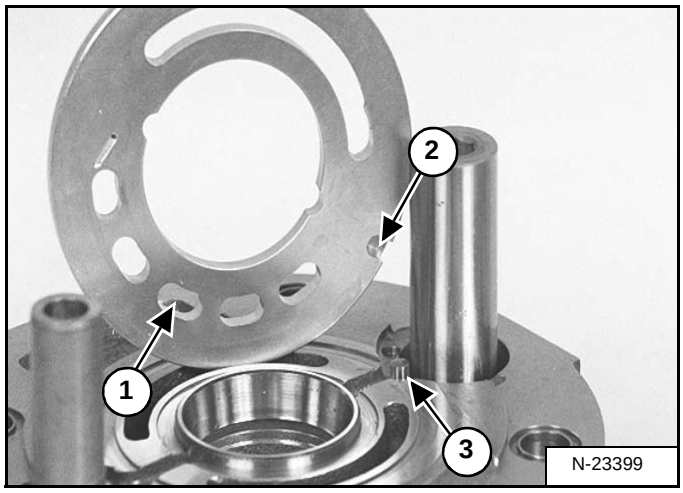
Figure 20-52-183



Install the bearing (Item 1) **[Figure 20-52-183]** on the shaft.

Install the O-ring (Item 2) **[Figure 20-52-183]**.

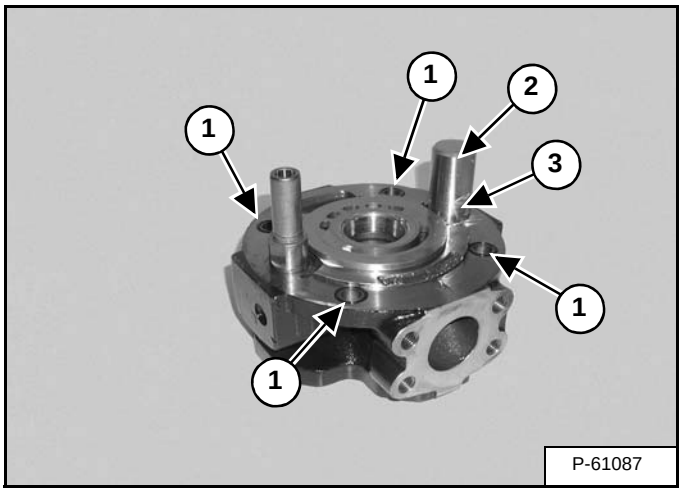
Figure 20-52-184



Install the valve plate (Item 1) on the back port assembly. The valve plate can only be installed one way by aligning the groove (Item 2) with the pin (Item 3) **[Figure 20-52-184]**.

NOTE: Apply assembly lube to the back of the valve plate.

Figure 20-52-185

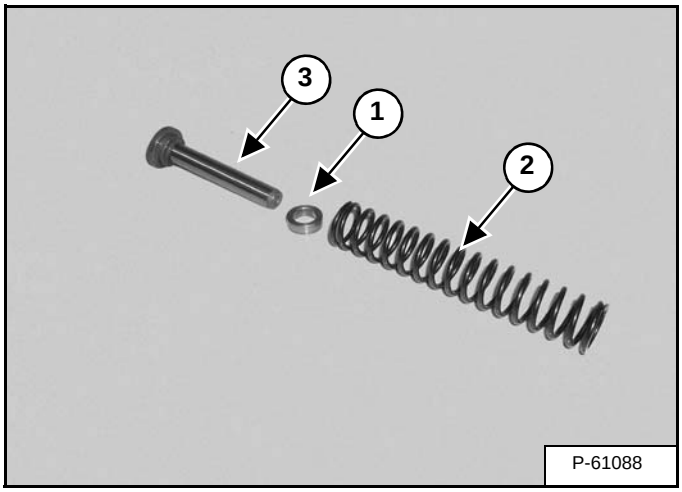


Install the O-rings (Item 1) **[Figure 20-52-185]** on the back port assembly.

Grease the inside of the control piston (Item 2) **[Figure 20-52-185]**.

Slide it over the control piston shaft (Item 3) **[Figure 20-52-185]**.

Figure 20-52-186

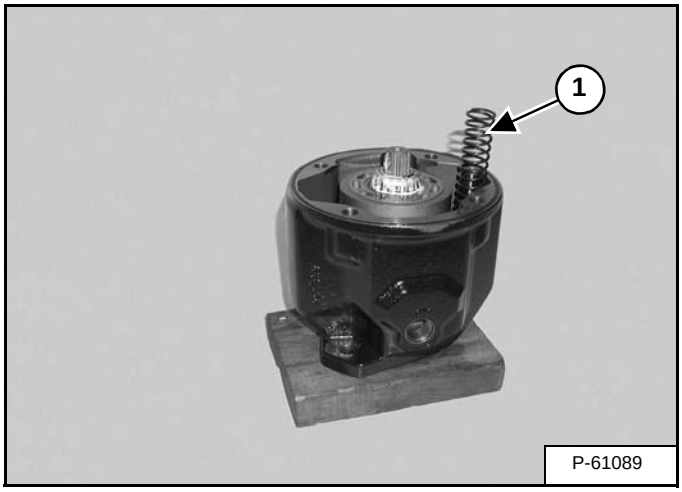


Install the bushing (Item 1) and spring (Item 2) on the stroking piston (Item 3) **[Figure 20-52-186]**.

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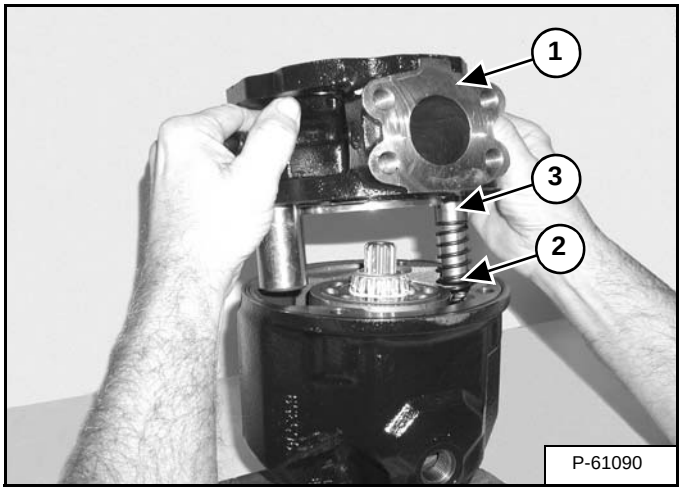
Piston Pump Assembly (Cont'd)

Figure 20-52-187



Install the stroking piston assembly (Item 1) **[Figure 20-52-187]** in the housing.

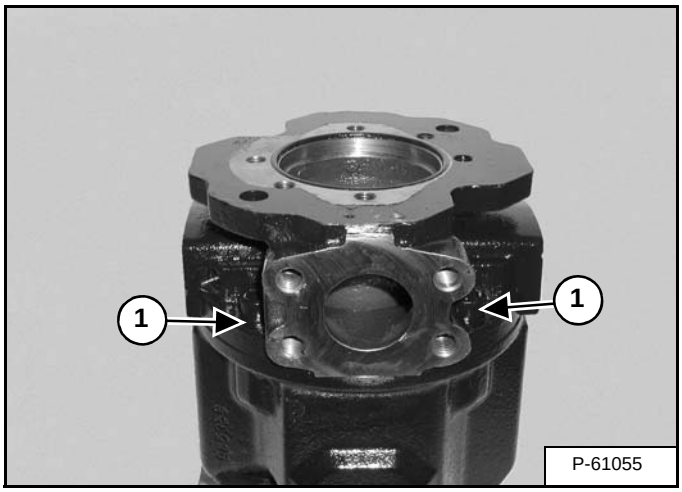
Figure 20-52-188



Install the back port assembly (Item 1) **[Figure 20-52-188]**

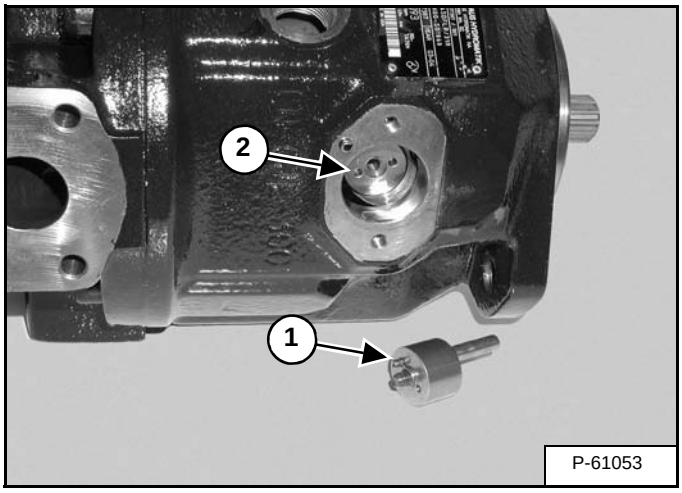
NOTE: Align the stroking piston assembly (Item 2) with the shaft (Item 3) [Figure 20-52-188].

Figure 20-52-189



Install the 4 bolts (Item 1) **[Figure 20-52-189]**.

Figure 20-52-190

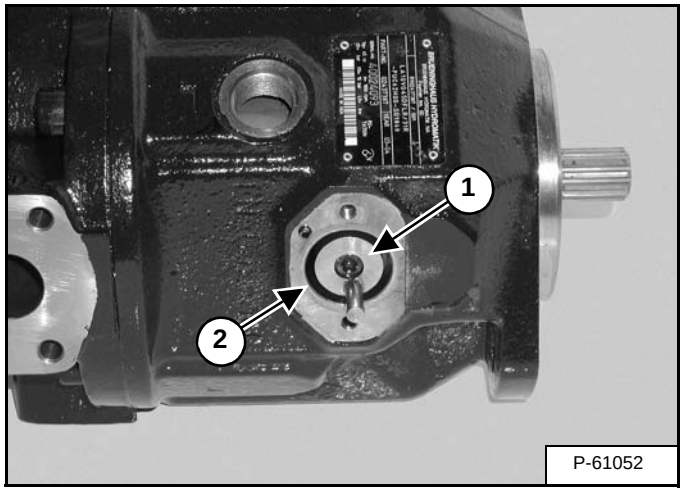


Align the dowel pin (Item 1) with the hole in the swash plate (Item 2) **[Figure 20-52-190]**.

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Piston Pump Assembly (Cont'd)

Figure 20-52-191



Apply Loctite™ 241 on the bolt (Item 1) and install the load sensing assembly (Item 2) **[Figure 20-52-191]**. Tighten to 10 ft.-lb. (13 N•m) torque.

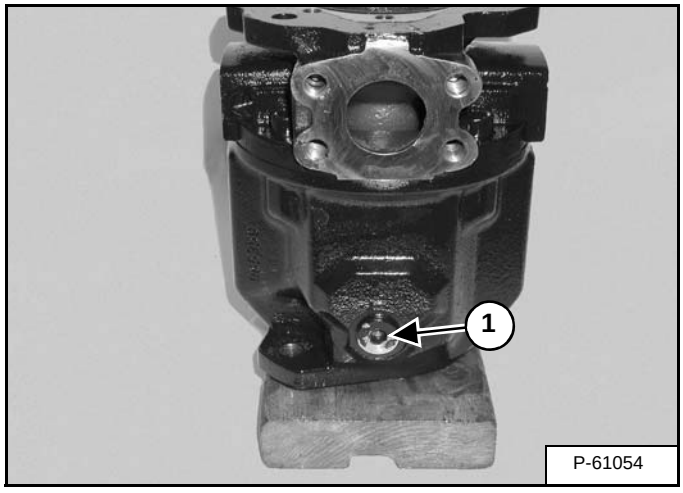
Install the torque limiter valve. (See Torque Limiter Valve Installation on Page 20-52-32)

Install the pump control assembly. (See Pump Control Removal And Installation on Page 20-52-34)

Place the hydraulic piston pump on its side and fill approximately half full.

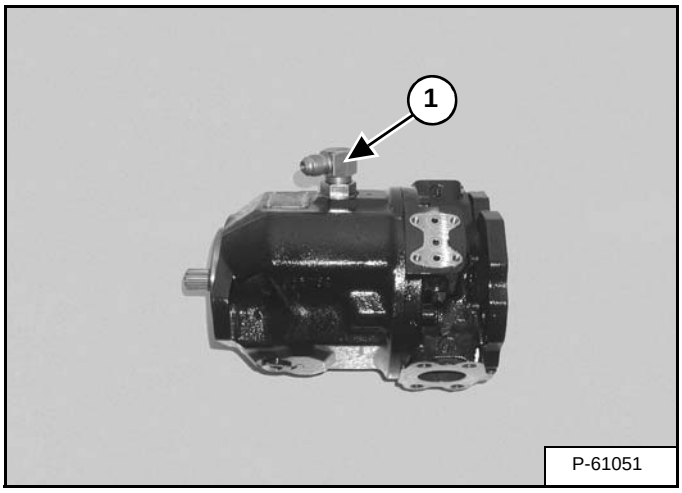
Install an O-ring on the plug.

Figure 20-52-192



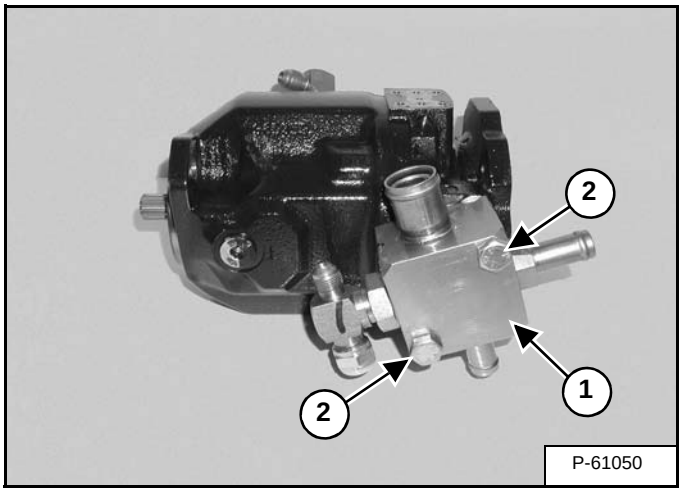
Install the plug (Item 1) **[Figure 20-52-192]** and tighten.

Figure 20-52-193



Install the fitting (Item 1) **[Figure 20-52-193]**.

Figure 20-52-194

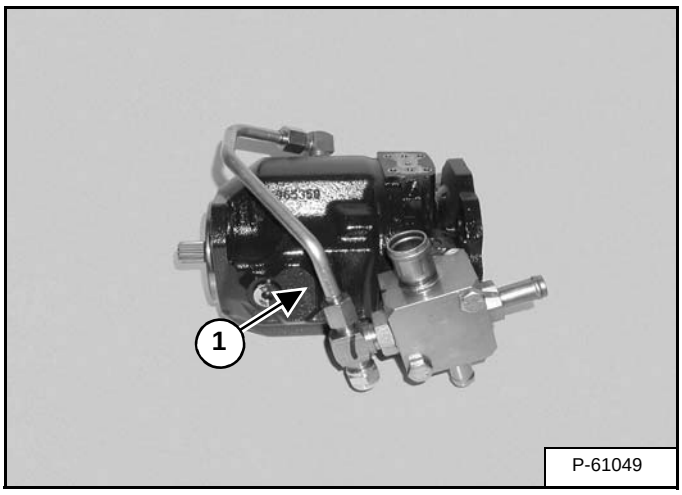


Install the block (Item 1) with the bolts (Item 2) **[Figure 20-52-194]**.

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Piston Pump Assembly (Cont'd)

Figure 20-52-195



Install the tubeline (Item 1) **[Figure 20-52-195]**.

Install the gear pump. (See Gear Pump Removal And Installation on Page 20-52-41)

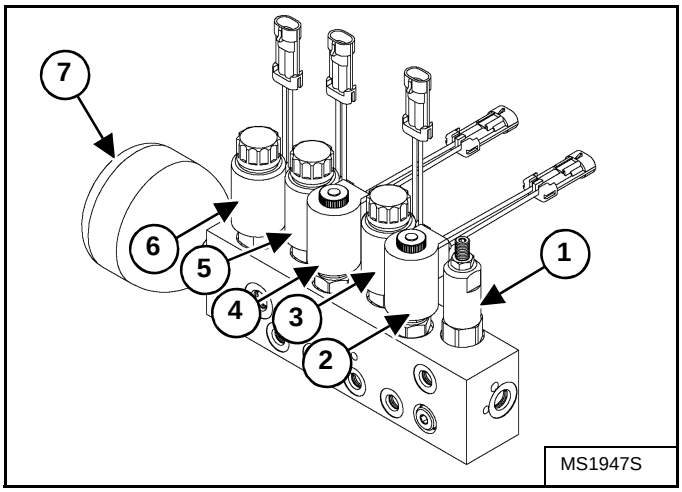
Install the coupler. (See Coupler Removal And Installation on Page 20-52-20)

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MANIFOLD ASSEMBLY/ACCUMULATOR (S/N 562611001 & ABOVE, 562811001 & ABOVE, AND 563211001 - 563213999)

Description

Figure 20-60-1



The manifold assembly contains the following:

Pressure reducing valve (Item 1) **[Figure 20-60-1]**.

Work group lockout solenoid (Item 2) **[Figure 20-60-1]**.

Travel pilot pressure solenoid (Item 3) **[Figure 20-60-1]**.

Two speed solenoid (Item 4) **[Figure 20-60-1]**.

Directional control valve solenoid (male coupler) (Item 5) **[Figure 20-60-1]**.

Directional control valve solenoid (female coupler) (Item 6) **[Figure 20-60-1]**.

Accumulator (Item 7) **[Figure 20-60-1]**.

The manifold supplies 406-450 PSI (28-31 bar) for joystick operation.

The accumulator provides short term reserve pressure for joystick function with engine off and the key in the ON position.

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MANIFOLD ASSEMBLY/ACCUMULATOR (S/N 562611001 & ABOVE, 562811001 & ABOVE, AND 563211001 - 563213999) (CONT'D)

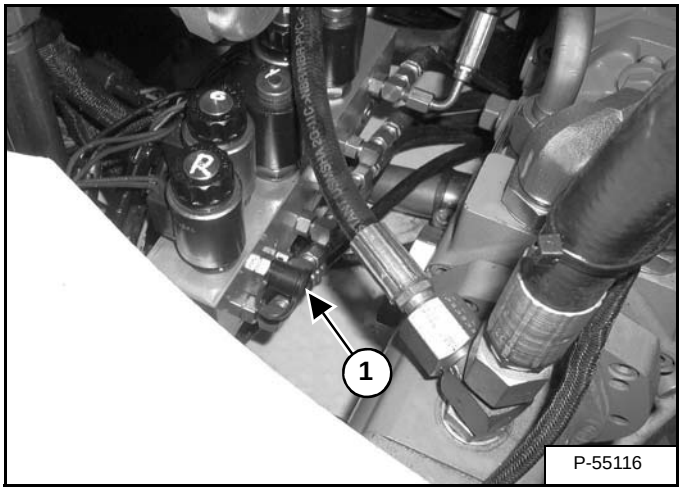
Testing Pilot Pressure

The following tools will be needed to do the procedure:
MEL1355 - Hydraulic Test Kit

Stop the engine.

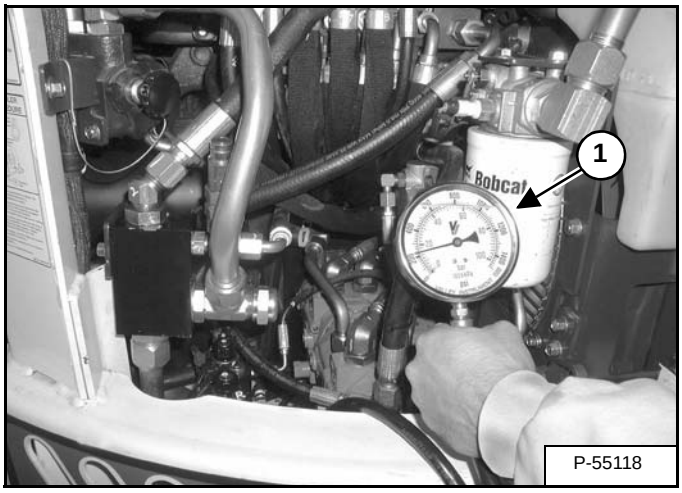
Lower the boom/bucket and blade to the ground. Open the right side cover.

Figure 20-60-2



Remove the protective cap (Item 1) **[Figure 20-60-2]** from the G1 diagnostic port located on the manifold assembly.

Figure 20-60-3



From the test kit, connect a 500 PSI (35 bar) gauge (Item 1) **[Figure 20-60-3]** on the diagnostic port.

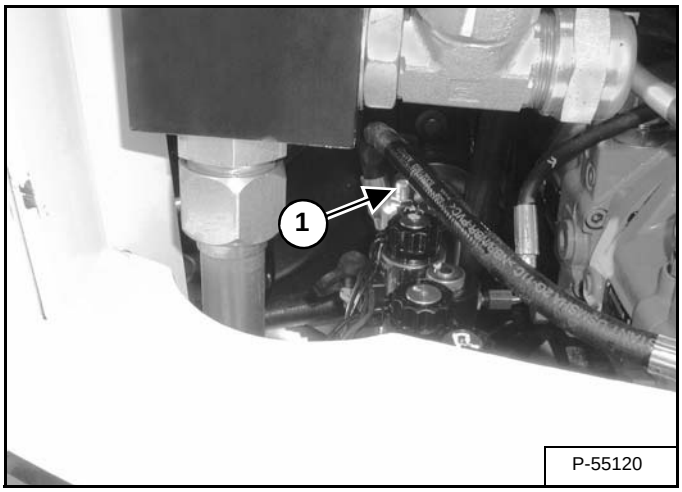
With an operator in the seat and the left console in the raised position, start the excavator and run at low idle.

Lower the left console and increase the engine speed to high idle.

Check the pressure at the gauge (Item 1) **[Figure 20-60-3]** the pressure should be as follows:

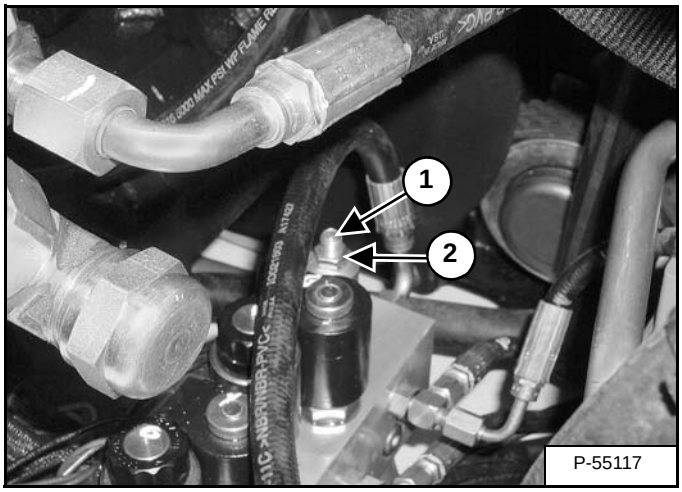
A target pressure of 428 PI (29 bar) with an acceptable range of 406-450 PSI (28-31 bar).

Figure 20-60-4



If adjustment is needed, loosen the nut (Item 1) **[Figure 20-60-4]**.

Figure 20-60-5



Turn the adjustment screw (Item 1) **[Figure 20-60-5]** clockwise to increase the pressure or counter clockwise to decrease the pressure.

NOTE: 1/4 turn clockwise will increase pressure approximately 20 PSI (1.4 bar).

Tighten the nut (Item 2) **[Figure 20-60-5]**.

Retest the valve after adjustment.

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Removal And Installation

IMPORTANT

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

I-2003-0888

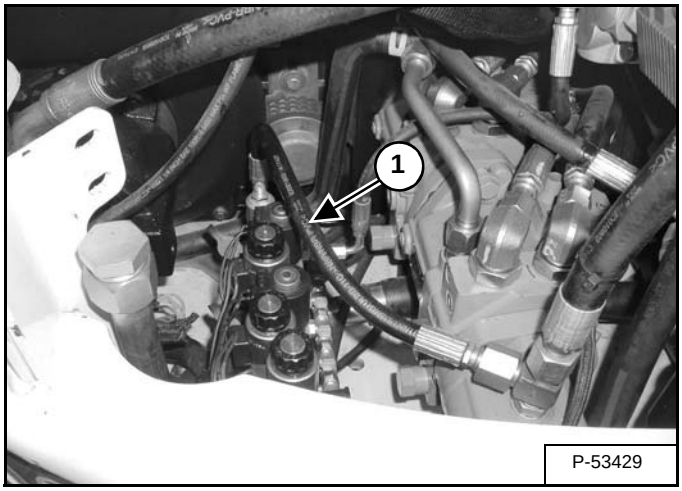
Open the right side cover.

Open the tailgate.

Mark all tubelines and hoses for proper installation.

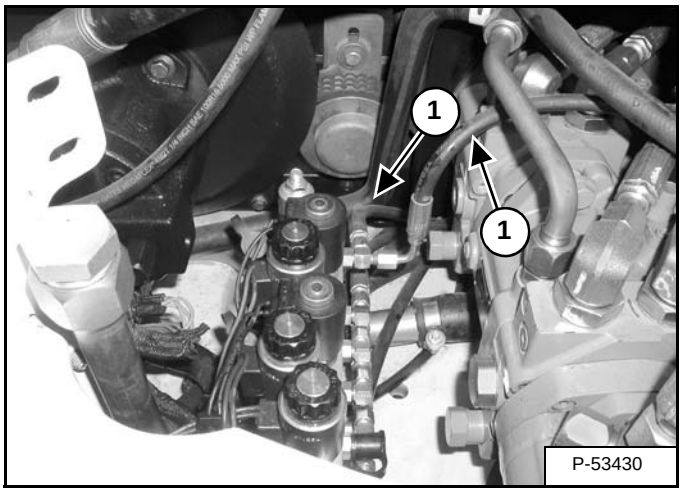
NOTE: The build up valve has been removed for photo clarity.

Figure 20-60-6



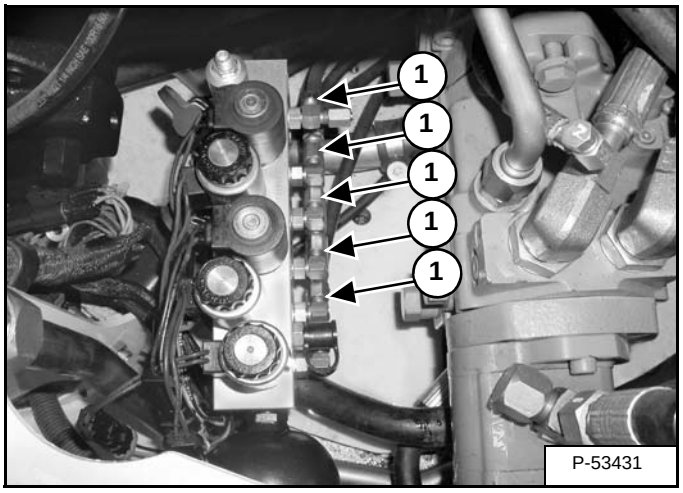
Remove the hose (Item 1) **[Figure 20-60-6]**.

Figure 20-60-7



Remove the hoses (Item 1) **[Figure 20-60-7]**.

Figure 20-60-8



Remove the hoses (Item 1) **[Figure 20-60-8]**.

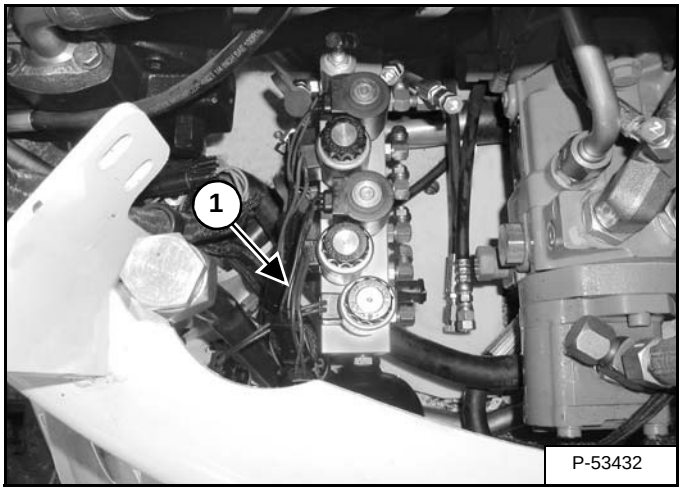
NOTE: If pilot pressure hose replacement is required, see Hoses for hose routing diagrams. (See Hose Guide Location on Page 20-114-1.)

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MANIFOLD ASSEMBLY/ACCUMULATOR (S/N 562611001 & ABOVE, 562811001 & ABOVE, AND 563211001 - 563213999) (CONT'D)

Removal And Installation (Cont'd)

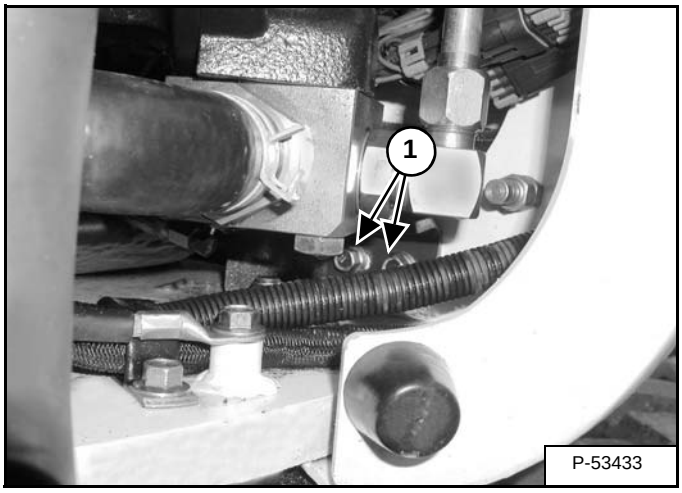
Figure 20-60-9



Disconnect the five wire harnesses (Item 1) **[Figure 20-60-9]** from the manifold assembly solenoids.

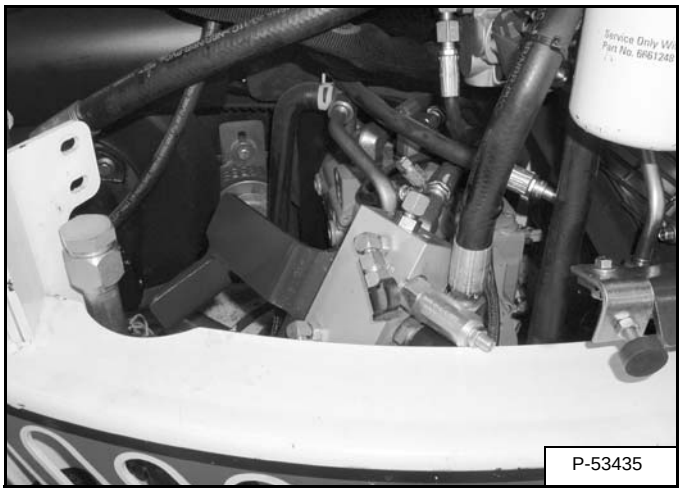
NOTE: The electrical connectors have colored cable ties for proper installation.

Figure 20-60-10



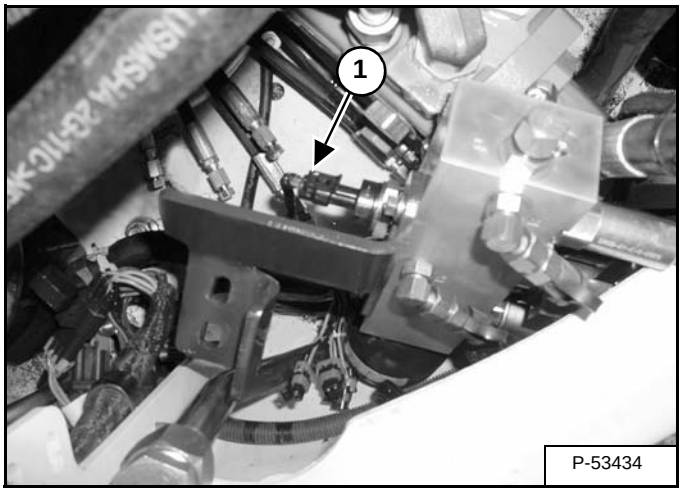
Remove the bolts (Item 1) **[Figure 20-60-10]**.

Figure 20-60-11



Relocate the manifold assembly/accumulator as shown **[Figure 20-60-11]**.

Figure 20-60-12



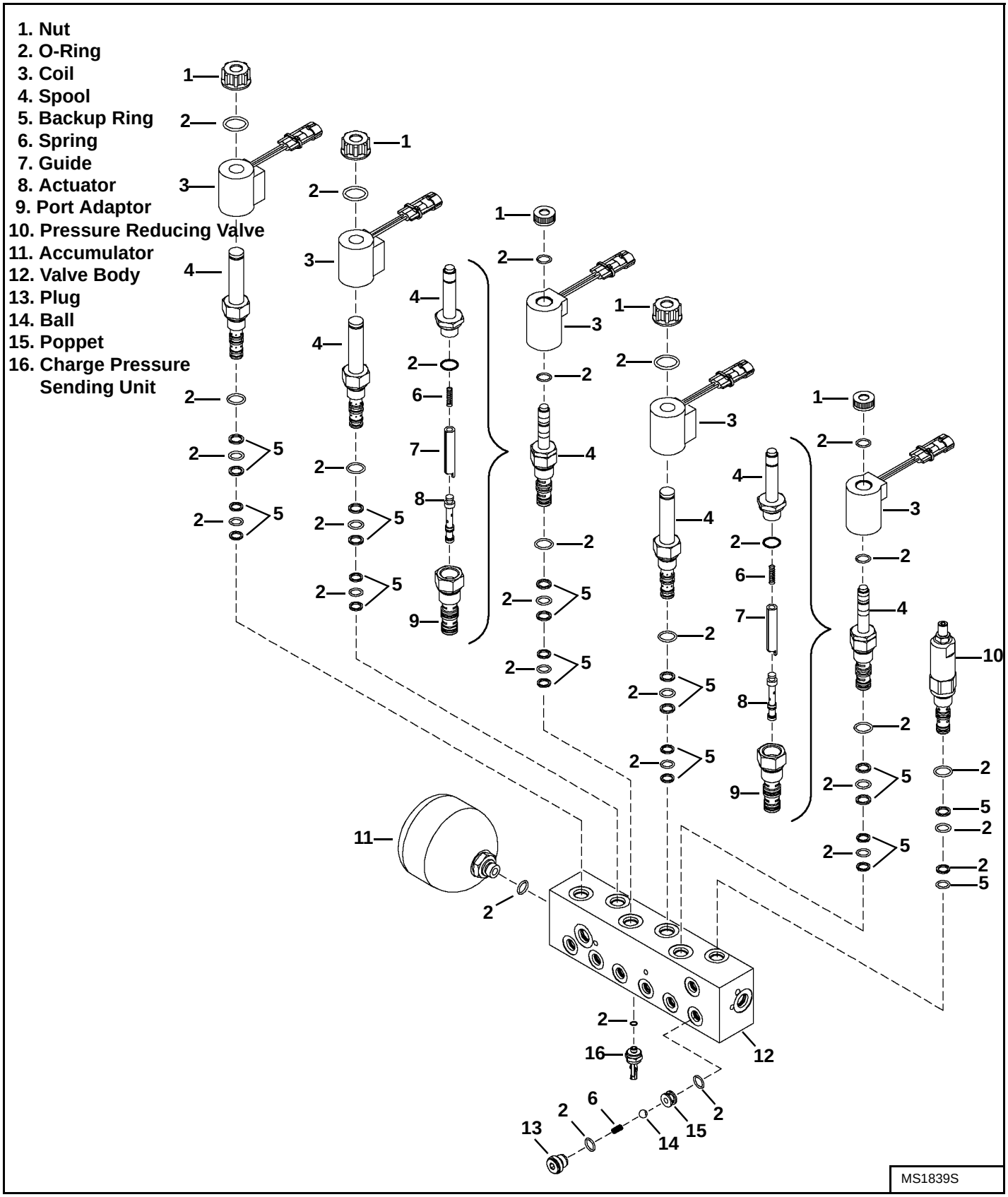
Disconnect the wire harness (Item 1) **[Figure 20-60-12]**.

Remove the manifold assembly from the excavator.

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Parts Identification

1. Nut
2. O-Ring
3. Coil
4. Spool
5. Backup Ring
6. Spring
7. Guide
8. Actuator
9. Port Adaptor
10. Pressure Reducing Valve
11. Accumulator
12. Valve Body
13. Plug
14. Ball
15. Poppet
16. Charge Pressure Sending Unit

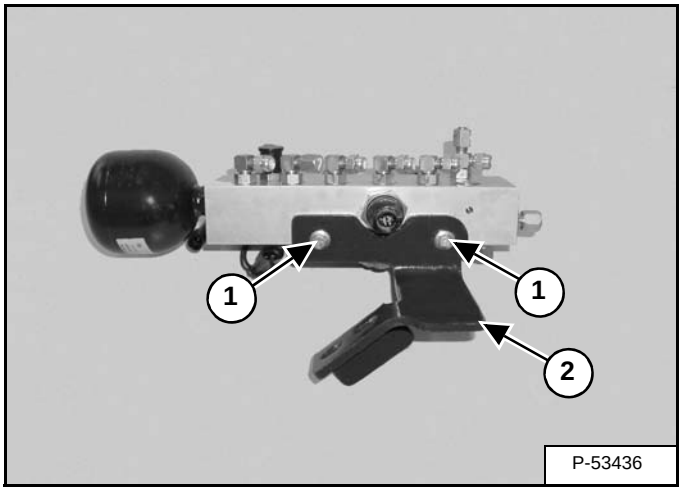


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Disassembly

Clean the outside of the manifold assembly/accumulator before disassembly.

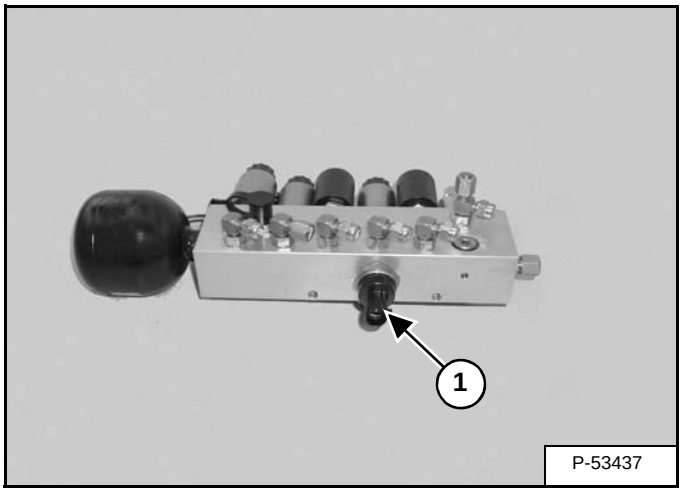
Figure 20-60-13



Remove the bolts (Item 1) **[Figure 20-60-13]** from the mount.

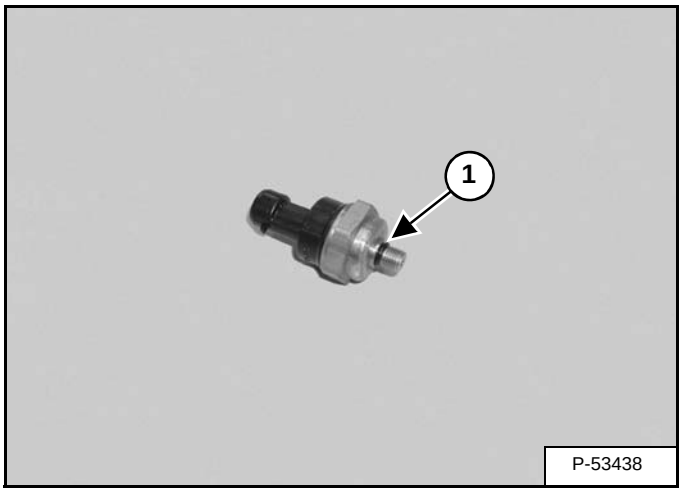
Remove the mount bracket (Item 2) **[Figure 20-60-13]**.

Figure 20-60-14



Remove the charge pressure sending unit (Item 1) **[Figure 20-60-14]**.

Figure 20-60-15



Remove the O-ring (Item 1) **[Figure 20-60-15]**.

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MANIFOLD ASSEMBLY/ACCUMULATOR (S/N 562611001 & ABOVE, 562811001 & ABOVE, AND 563211001 - 563213999) (CONT'D)

Disassembly (Cont'd)

Figure 20-60-16

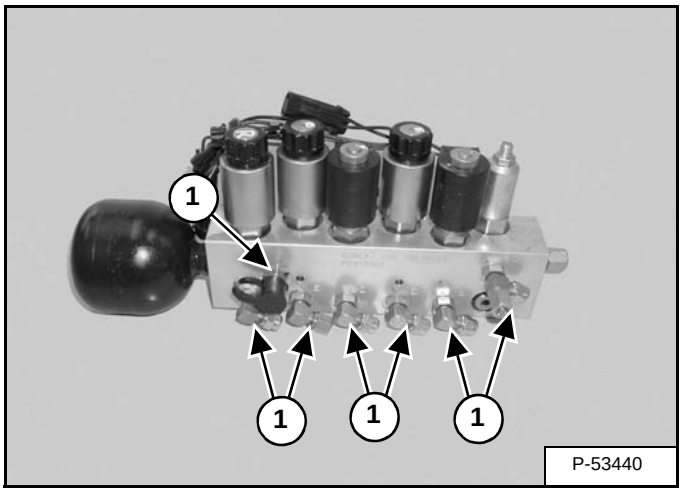
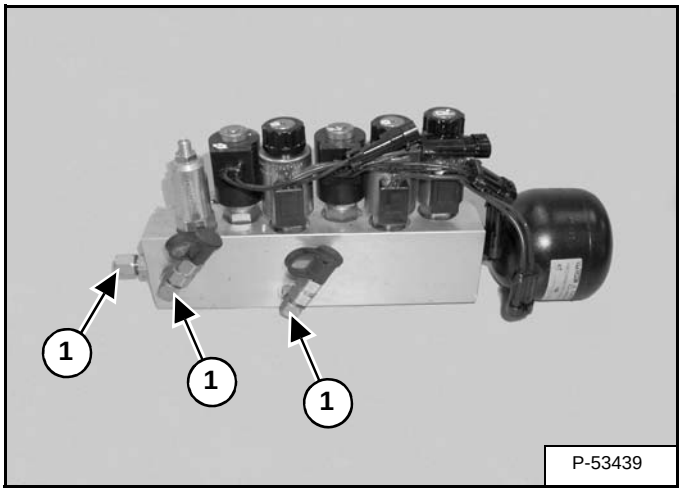
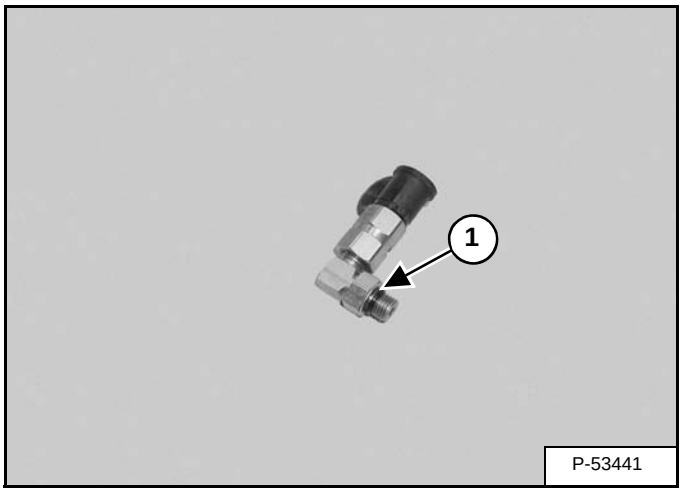


Figure 20-60-17



Remove the fittings (Item 1) **[Figure 20-60-16]** & **[Figure 20-60-17]**.

Figure 20-60-18

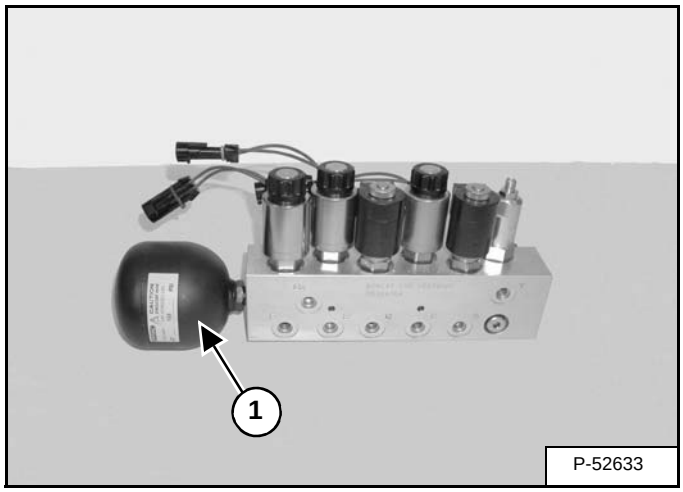


Remove the O-ring (Item 1) **[Figure 20-60-18]** from the fittings. (Test fitting shown)

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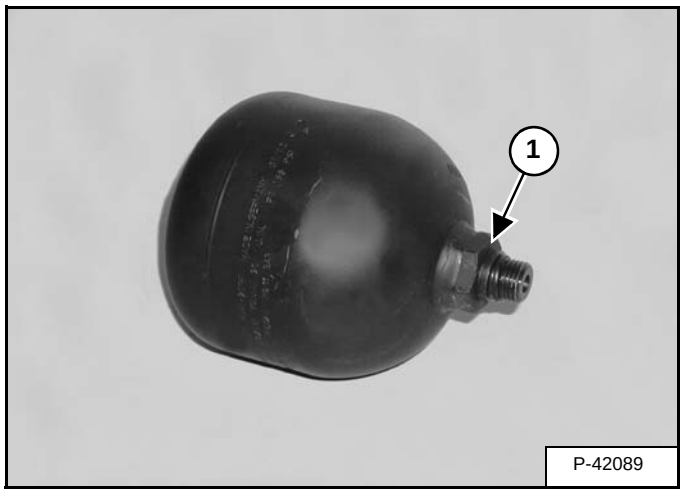
Disassembly (Cont'd)

Figure 20-60-19



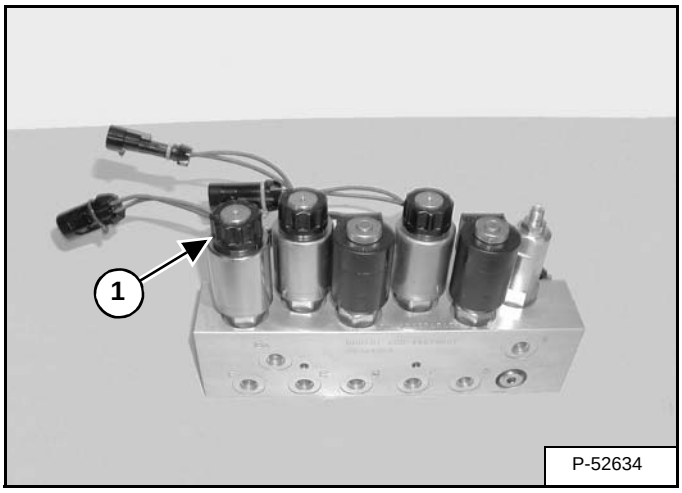
Remove the accumulator (Item 1) **[Figure 20-60-19]**.

Figure 20-60-20



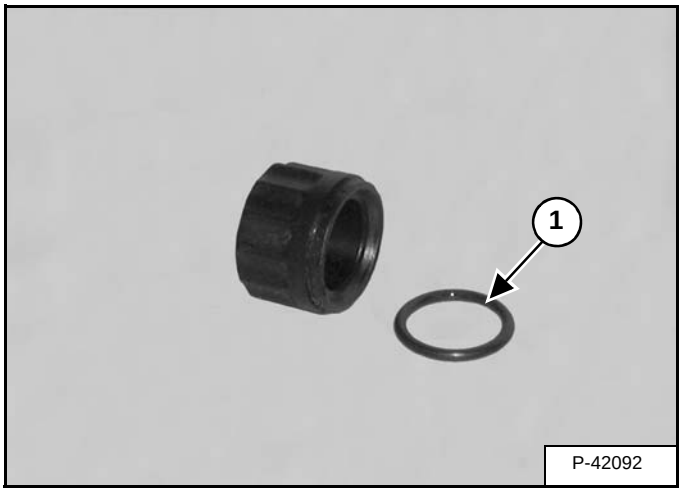
Remove the O-ring (Item 1) **[Figure 20-60-20]**.

Figure 20-60-21



Remove the nut (Item 1) **[Figure 20-60-21]** from the spool.

Figure 20-60-22

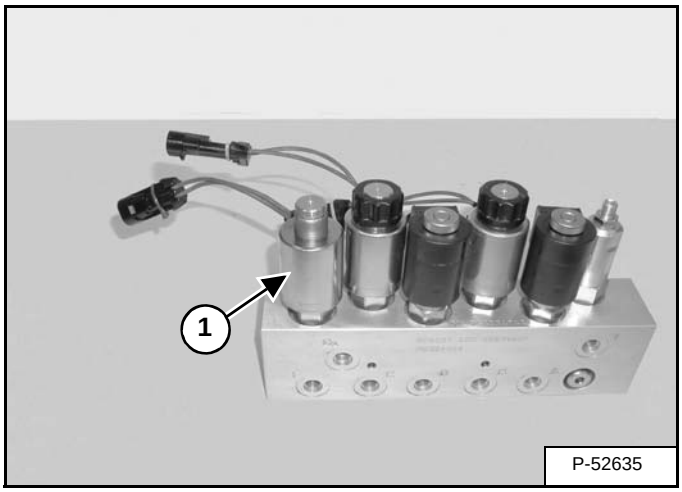


Remove the O-ring (Item 1) **[Figure 20-60-22]** from the nut.

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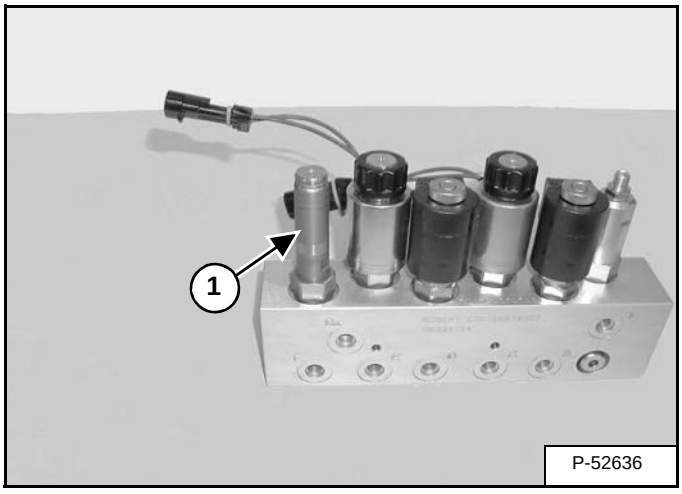
Disassembly (Cont'd)

Figure 20-60-23



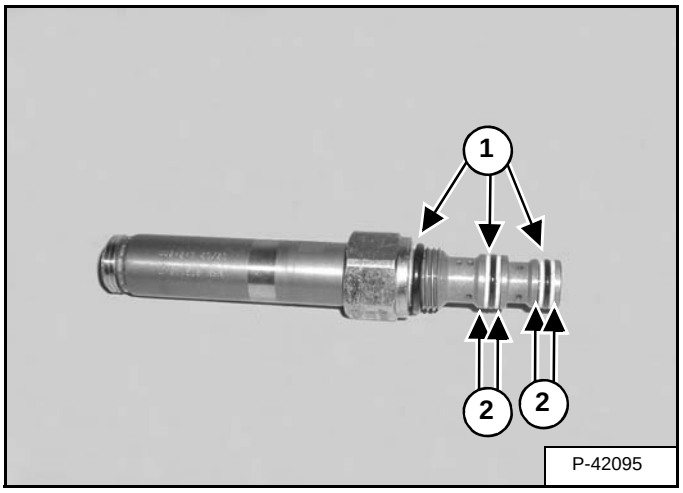
Remove the coil (Item 1) **[Figure 20-60-23]** with the red cable tie.

Figure 20-60-24



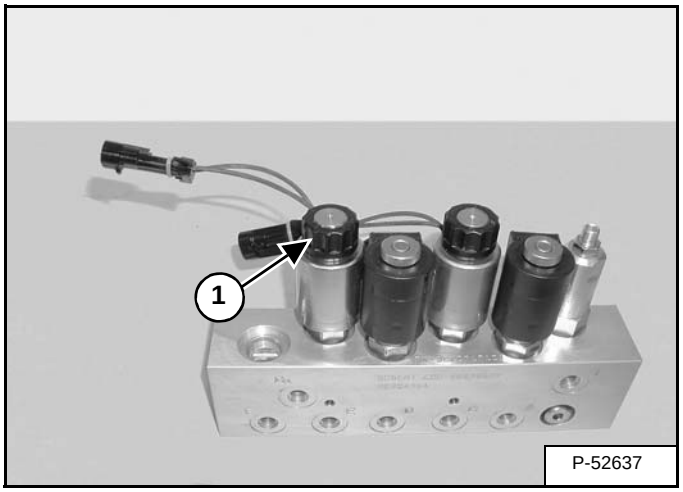
Remove the spool (Item 1) **[Figure 20-60-24]**.

Figure 20-60-25



Remove the O-rings (Item 1) and backup rings (Item 2) **[Figure 20-60-25]** from the spool.

Figure 20-60-26

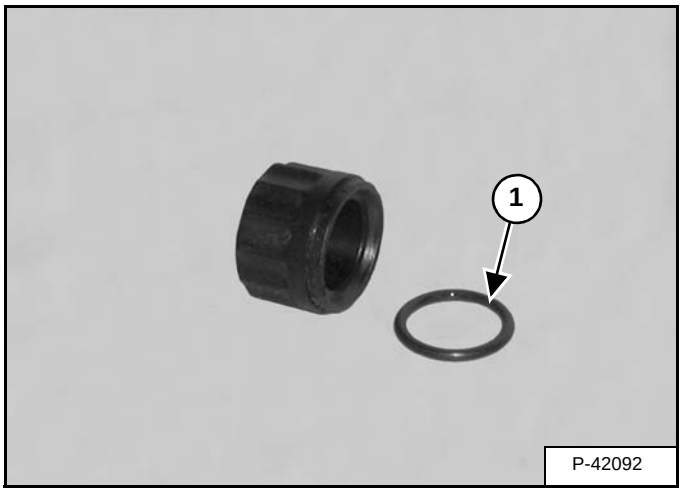


Remove the nut (Item 1) **[Figure 20-60-26]** from the spool.

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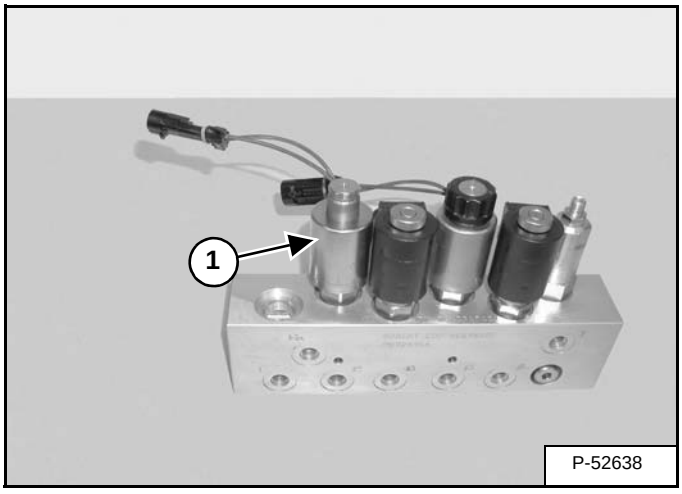
Disassembly (Cont'd)

Figure 20-60-27



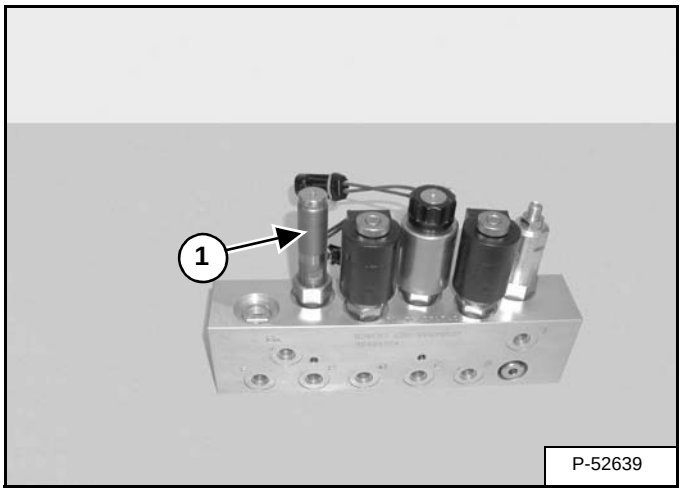
Remove the O-ring (Item 1) **[Figure 20-60-27]** from the nut.

Figure 20-60-28



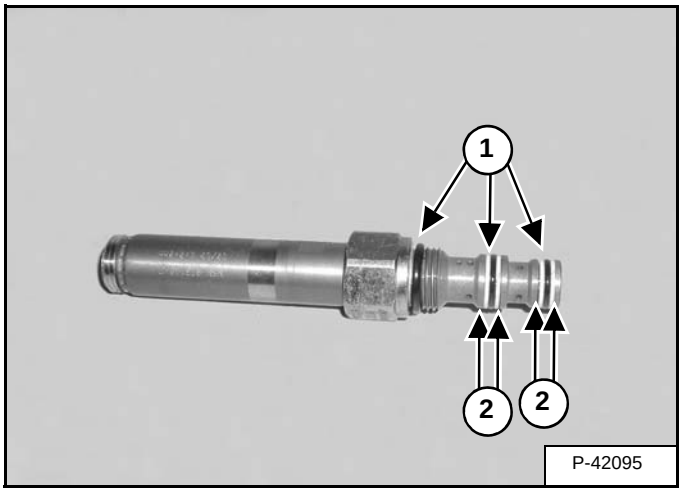
Remove the coil (Item 1) **[Figure 20-60-28]** with the blue cable tie.

Figure 20-60-29



Remove the spool (Item 1) **[Figure 20-60-29]**.

Figure 20-60-30

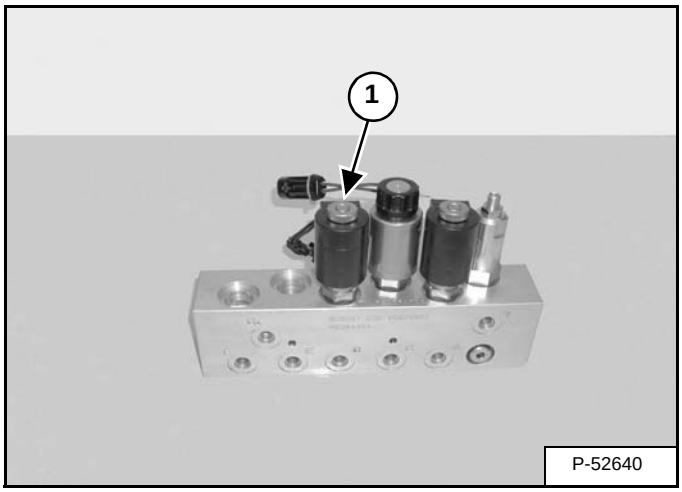


Remove the O-rings (Item 1) and backup rings (Item 2) **[Figure 20-60-30]** from the spool.

https://www.pdfmanual4trucks.com/

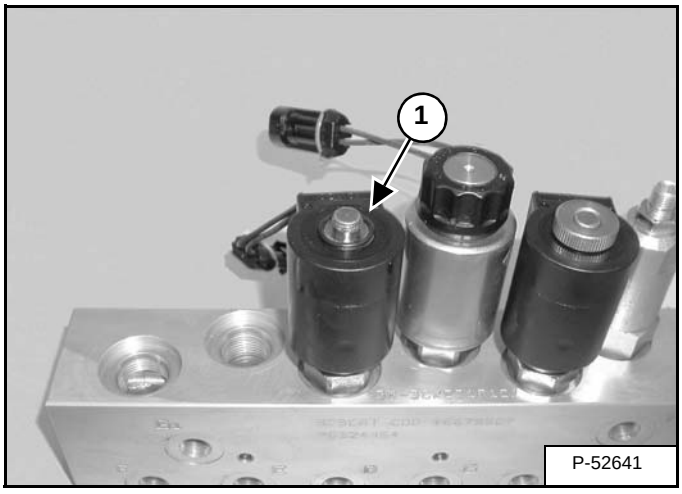
Disassembly (Cont'd)

Figure 20-60-31



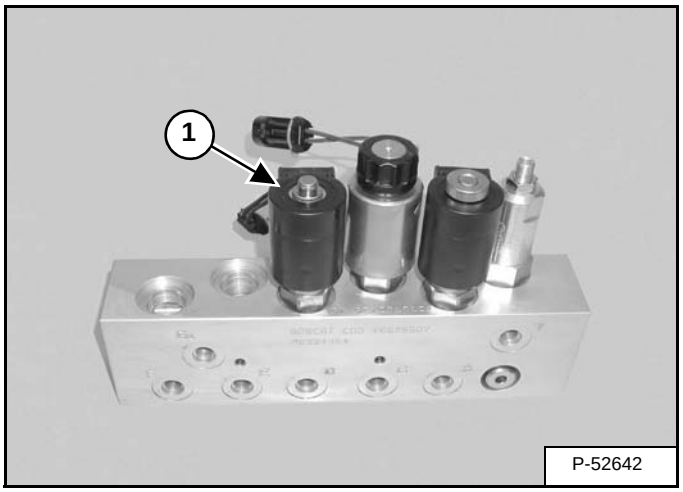
Remove the nut (Item 1) **[Figure 20-60-31]** from the spool.

Figure 20-60-32



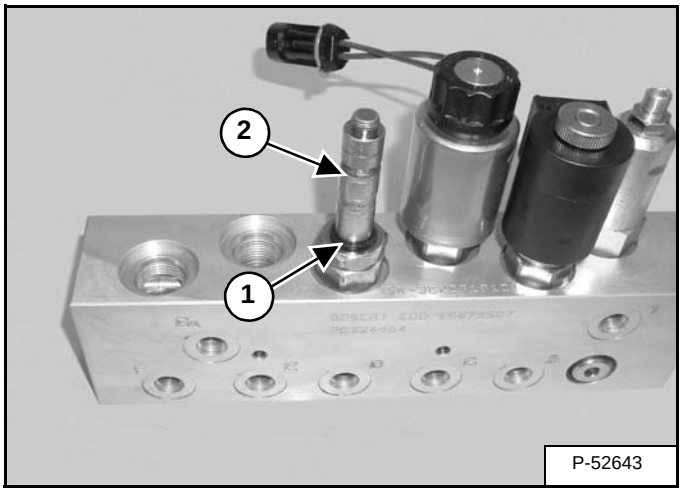
Remove the O-ring (Item 1) **[Figure 20-60-32]**.

Figure 20-60-33



Remove the coil (Item 1) **[Figure 20-60-33]** with the yellow cable tie.

Figure 20-60-34

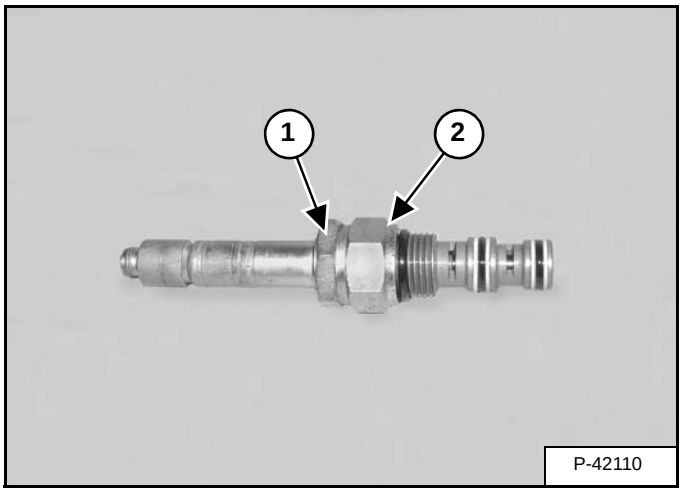


Remove the O-ring (Item 1) and spool (Item 2) **[Figure 20-60-34]**.

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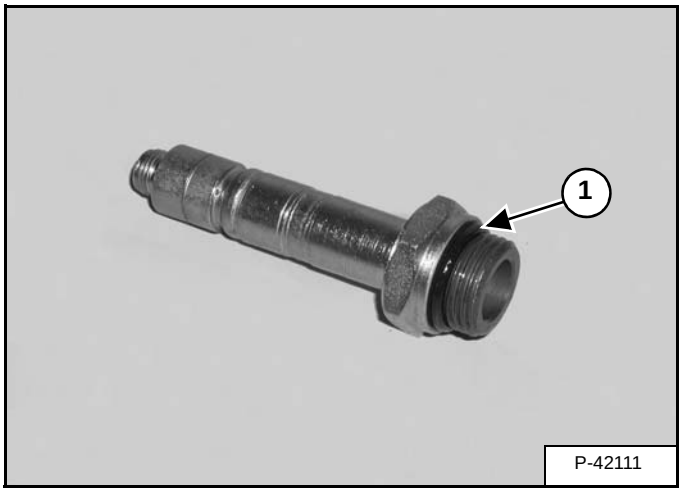
Disassembly (Cont'd)

Figure 20-60-35



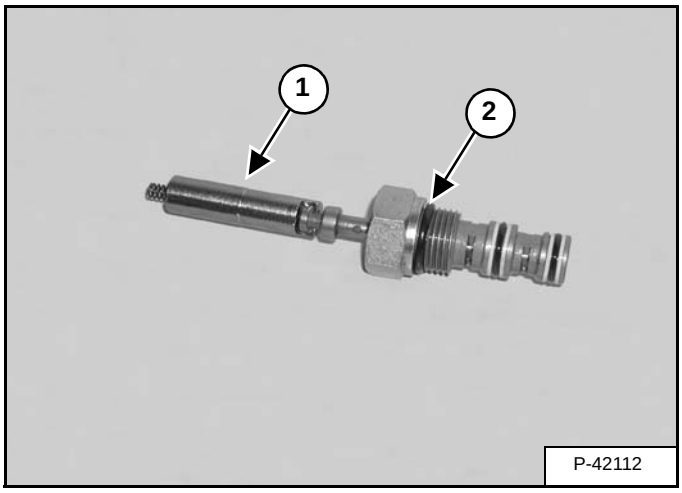
Remove the spool (Item 1) from the port adapter (Item 2) **[Figure 20-60-35]**.

Figure 20-60-36



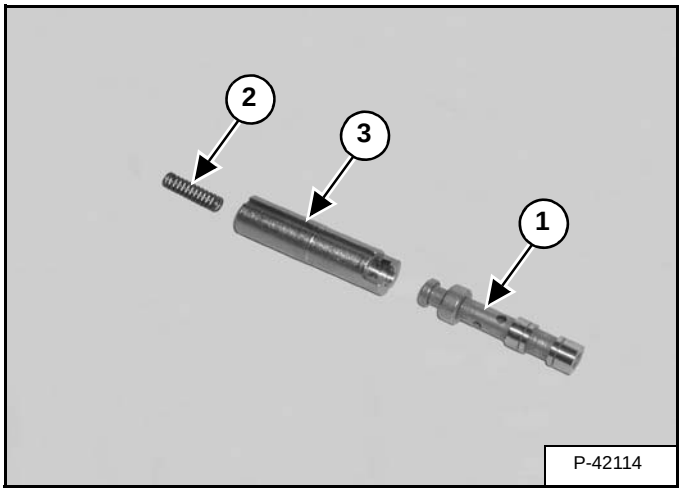
Remove the O-ring (Item 1) **[Figure 20-60-36]** from the spool.

Figure 20-60-37



Remove the actuator assembly (Item 1) from the port adapter (Item 2) **[Figure 20-60-37]**.

Figure 20-60-38

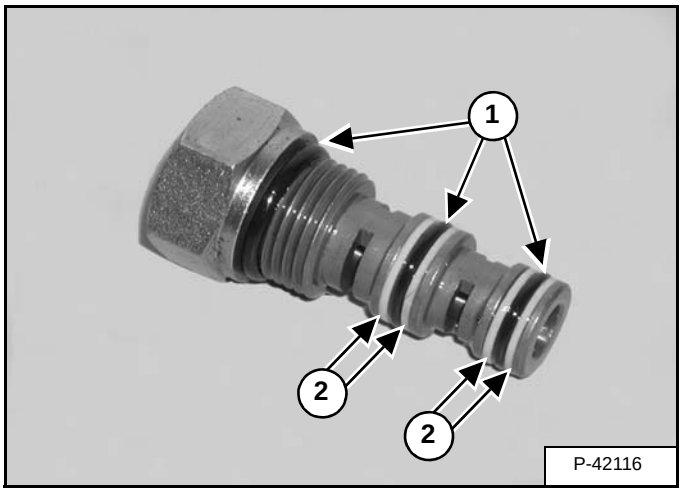


Remove the actuator (Item 1) and spring (Item 2) from the guide (Item 3) **[Figure 20-60-38]**.

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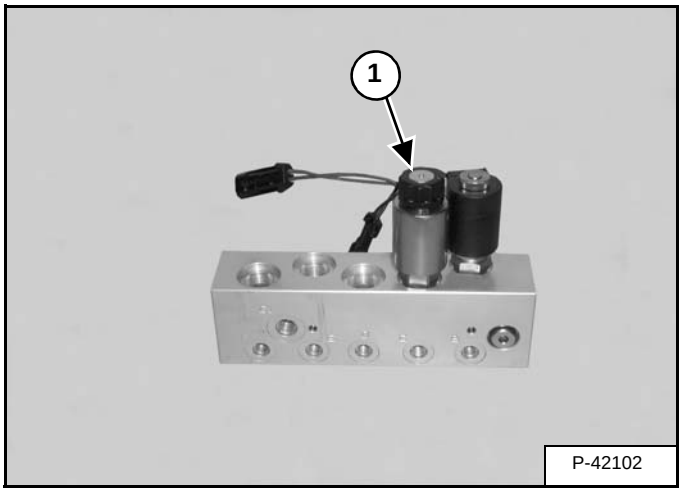
Disassembly (Cont'd)

Figure 20-60-39



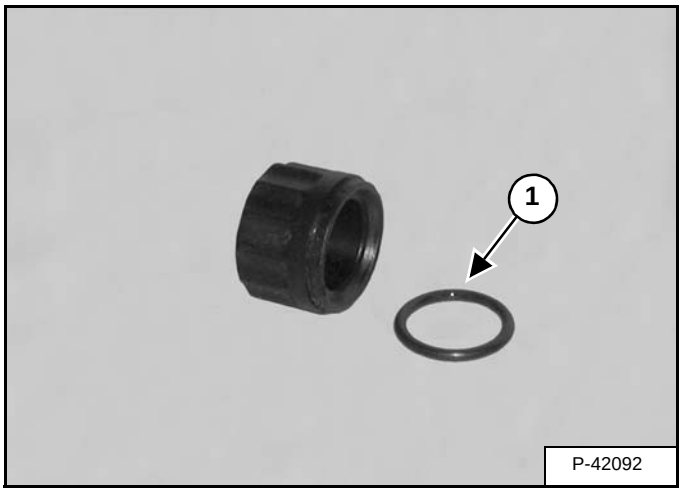
Remove the O-rings (Item 1) and backup rings (Item 2) **[Figure 20-60-39]**.

Figure 20-60-40



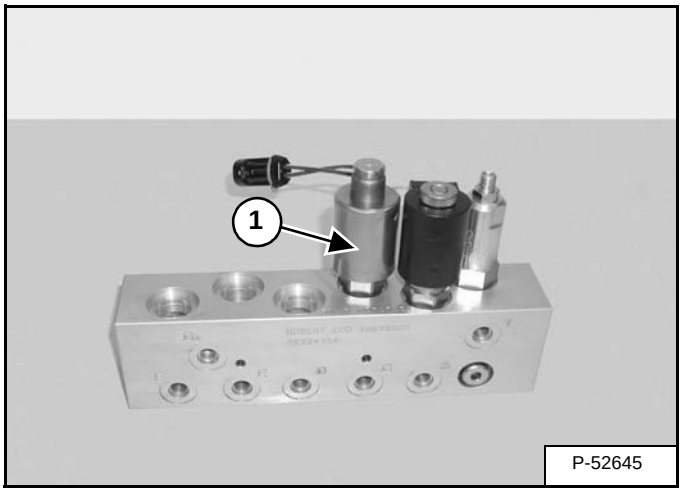
Remove the nut (Item 1) **[Figure 20-60-40]** from the spool.

Figure 20-60-41



Remove the O-ring (Item 1) **[Figure 20-60-41]** from the nut.

Figure 20-60-42

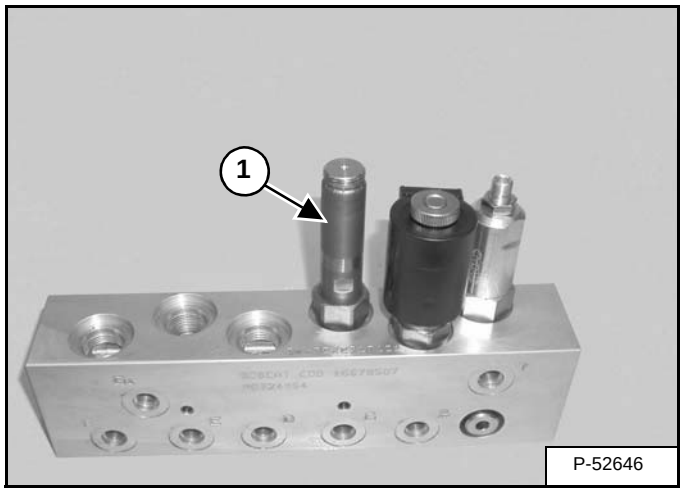


Remove the coil (Item 1) **[Figure 20-60-42]** with the orange cable tie.

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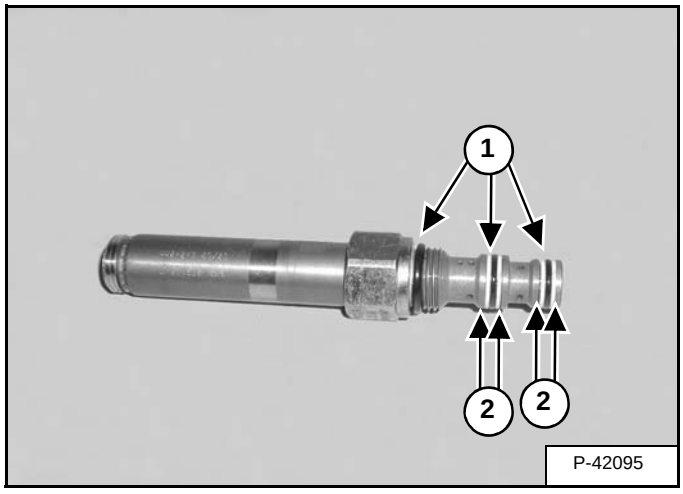
Disassembly (Cont'd)

Figure 20-60-43



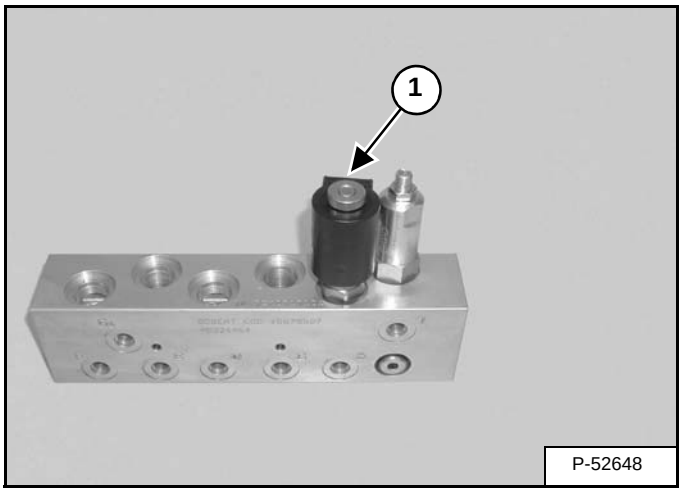
Remove the spool (Item 1) **[Figure 20-60-43]**.

Figure 20-60-44



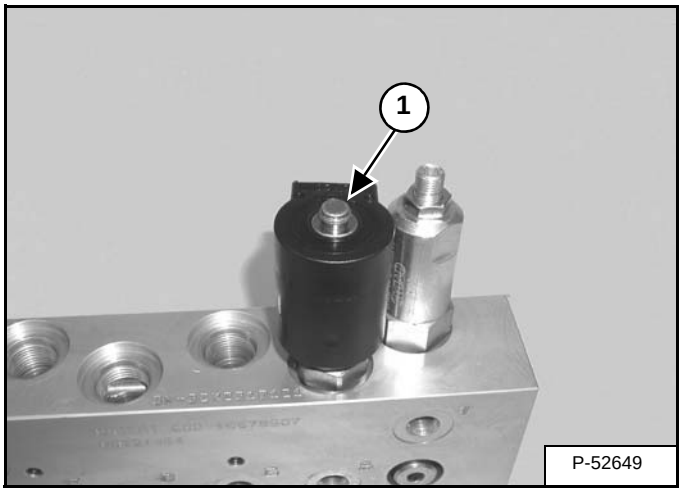
Remove the O-rings (Item 1) and backup rings (Item 2) **[Figure 20-60-44]** from the spool assembly.

Figure 20-60-45



Remove the nut (Item 1) **[Figure 20-60-45]** from the spool assembly.

Figure 20-60-46

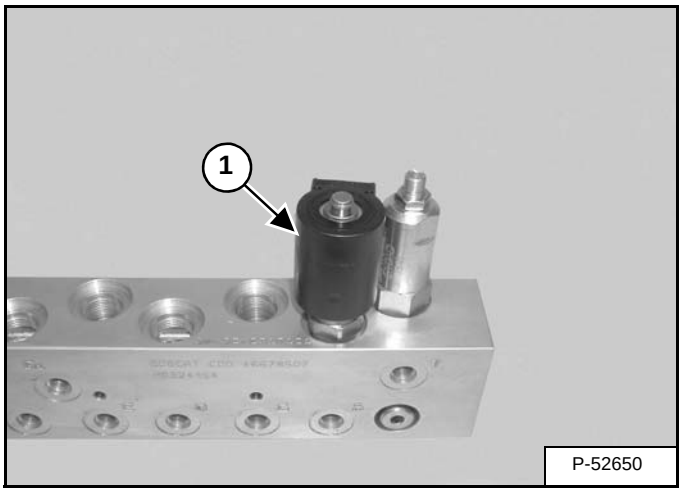


Remove the O-ring (Item 1) **[Figure 20-60-46]**.

https://www.pdfmanual4trucks.com/

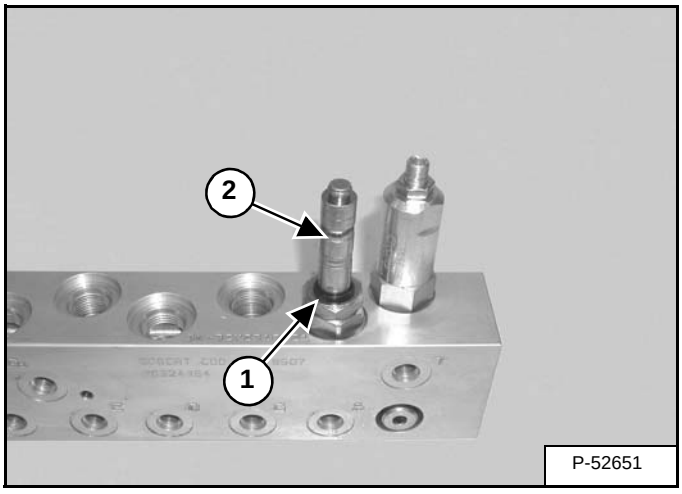
Disassembly (Cont'd)

Figure 20-60-47



Remove the coil (Item 1) **[Figure 20-60-47]** with the green cable tie.

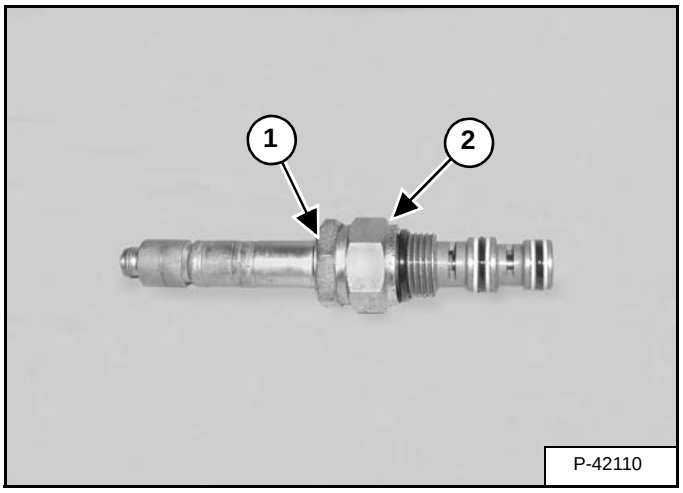
Figure 20-60-48



Remove the O-ring (Item 1) **[Figure 20-60-48]**.

Remove the spool (Item 2) **[Figure 20-60-48]**.

Figure 20-60-49



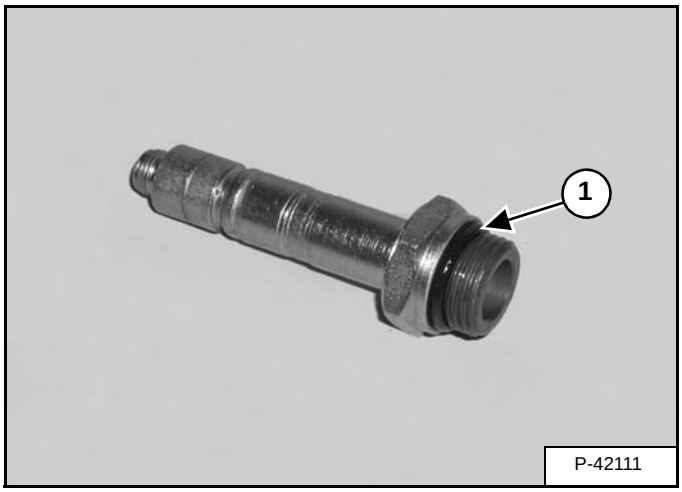
Remove the spool (Item 1) from the port adapter (Item 2) **[Figure 20-60-49]**.

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MANIFOLD ASSEMBLY/ACCUMULATOR (S/N 562611001 & ABOVE, 562811001 & ABOVE, AND 563211001 - 563213999) (CONT'D)

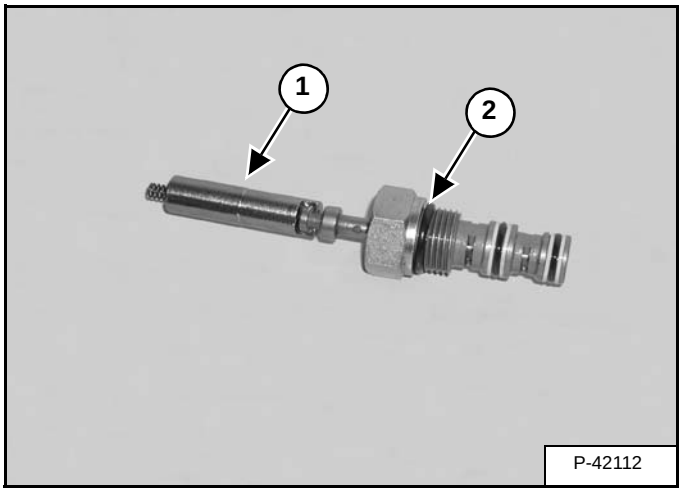
Disassembly (Cont'd)

Figure 20-60-50



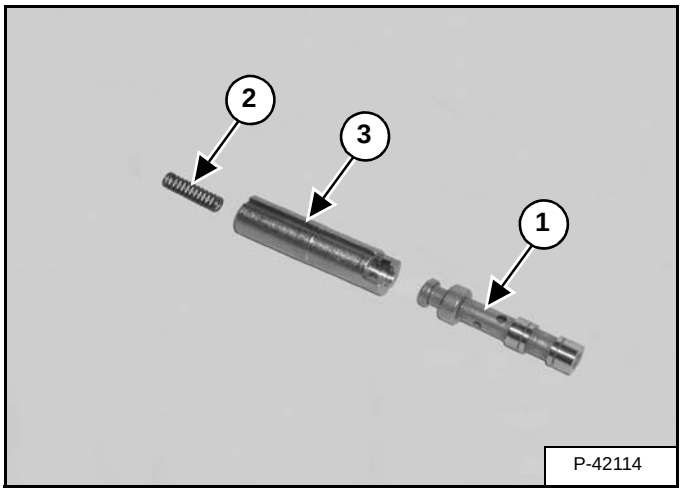
Remove the O-ring (Item 1) **[Figure 20-60-50]** from the spool.

Figure 20-60-51



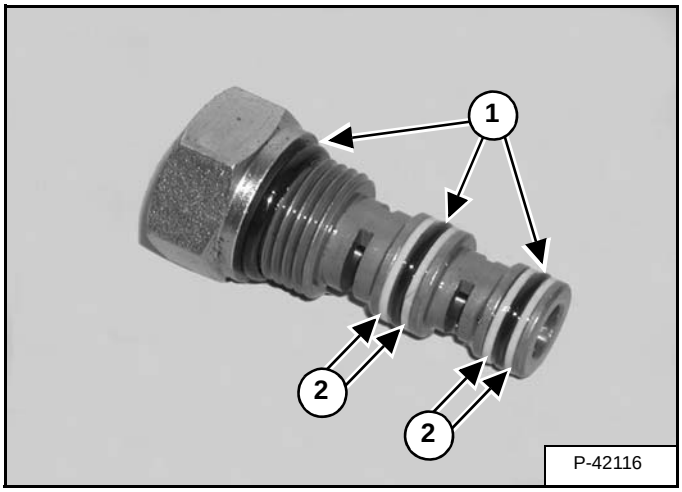
Remove the actuator assembly (Item 1) from the port adapter (Item 2) **[Figure 20-60-51]**.

Figure 20-60-52



Remove the actuator (Item 1) and spring (Item 2) from the guide (Item 3) **[Figure 20-60-52]**.

Figure 20-60-53

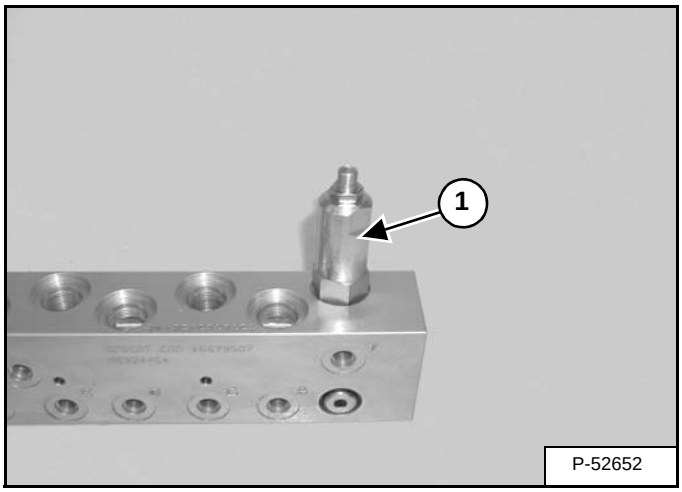


Remove the O-rings (Item 1) and backup rings (Item 2) **[Figure 20-60-53]**.

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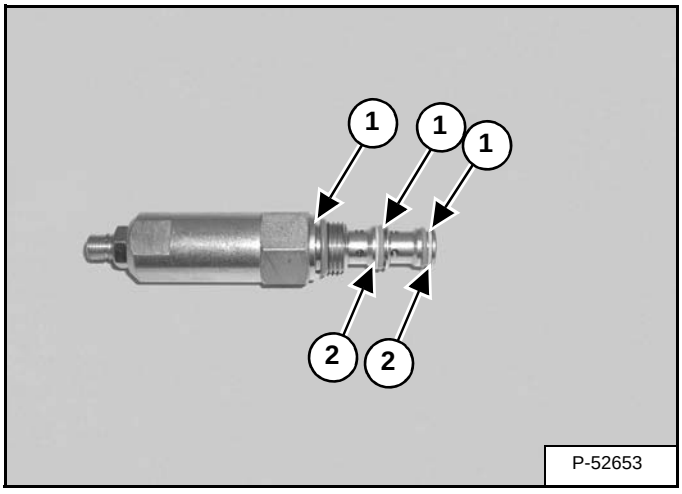
Disassembly (Cont'd)

Figure 20-60-54



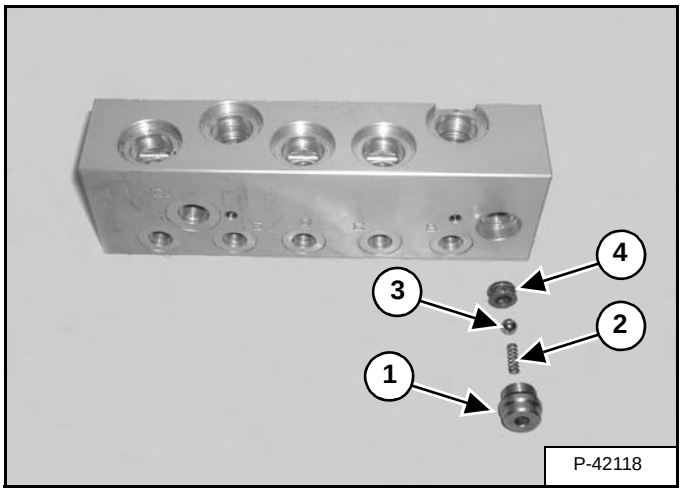
Remove the pressure reducing valve (Item 1) **[Figure 20-60-54]**.

Figure 20-60-55



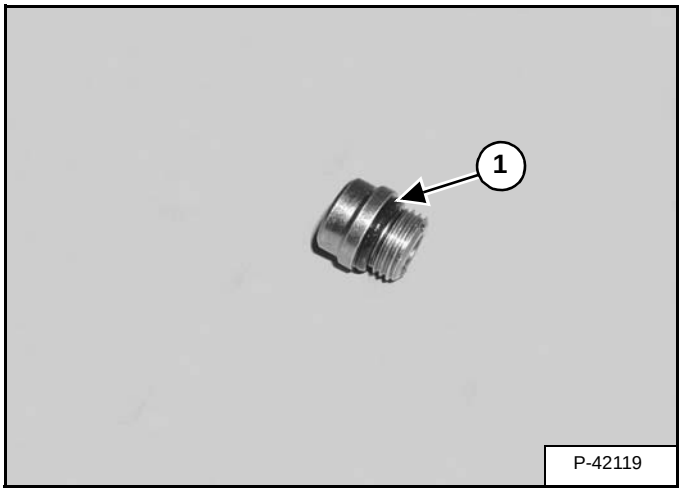
Remove the O-rings (Item 1) and back up rings (Item 2) **[Figure 20-60-55]**.

Figure 20-60-56



Remove the plug (Item 1), spring (Item 2), ball (Item 3) and poppet (Item 4) **[Figure 20-60-56]**.

Figure 20-60-57

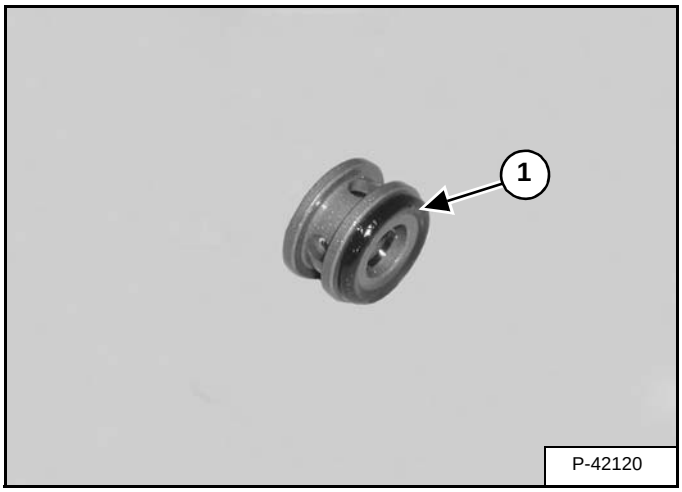


Remove the O-ring (Item 1) **[Figure 20-60-57]** from the plug.

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Disassembly (Cont'd)

Figure 20-60-58



Remove the O-ring (Item 1) **[Figure 20-60-58]** from the poppet.

https://www.pdfmanual4trucks.com/

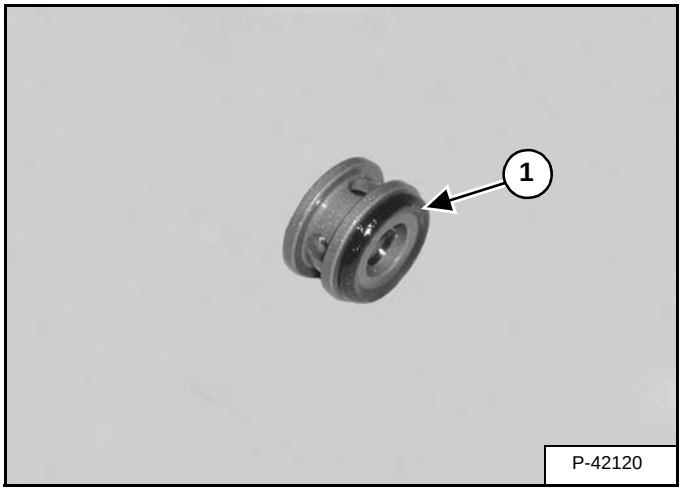
Assembly

Clean all parts in solvent and dry with compressed air.

Replace any worn or damaged parts. Always use new O-rings and backup rings.

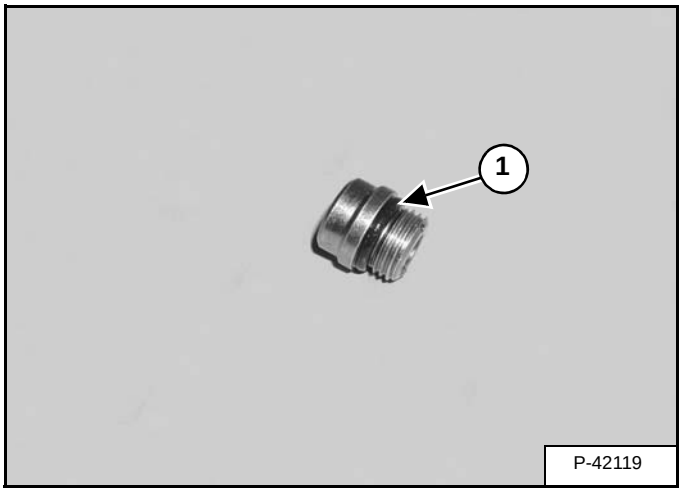
Apply clean hydraulic fluid to the O-rings and backup rings during installation.

Figure 20-60-59



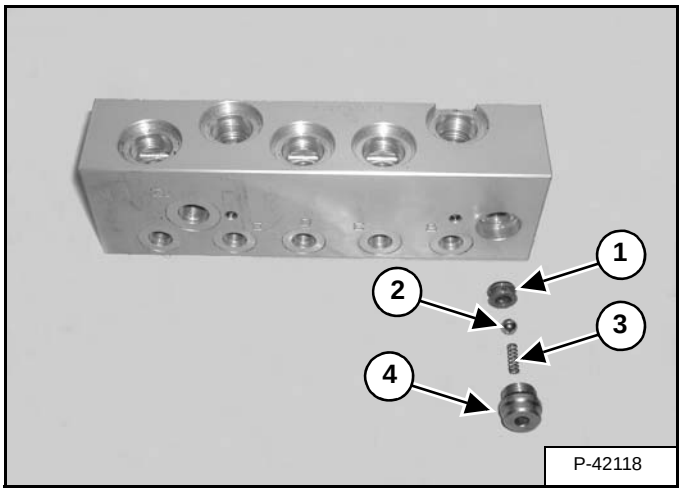
Install the O-ring (Item 1) **[Figure 20-60-59]** on the poppet.

Figure 20-60-60



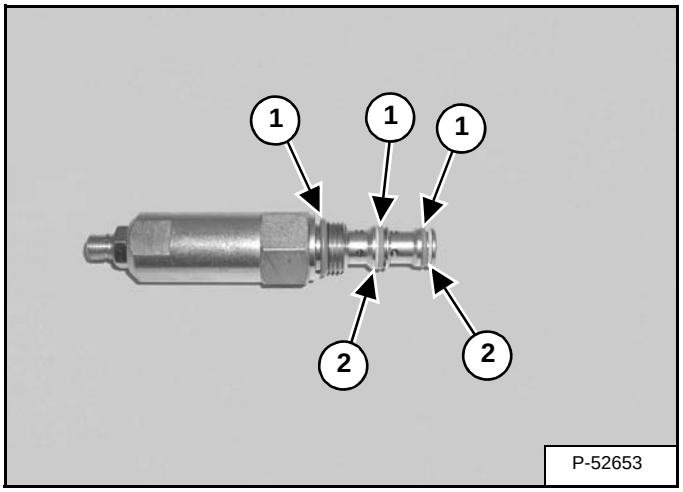
Install the O-ring (Item 1) **[Figure 20-60-60]** on the plug.

Figure 20-60-61



Install the poppet (Item 1), ball (Item 2), spring (Item 3), and plug (Item 4) **[Figure 20-60-61]** in the housing.

Figure 20-60-62

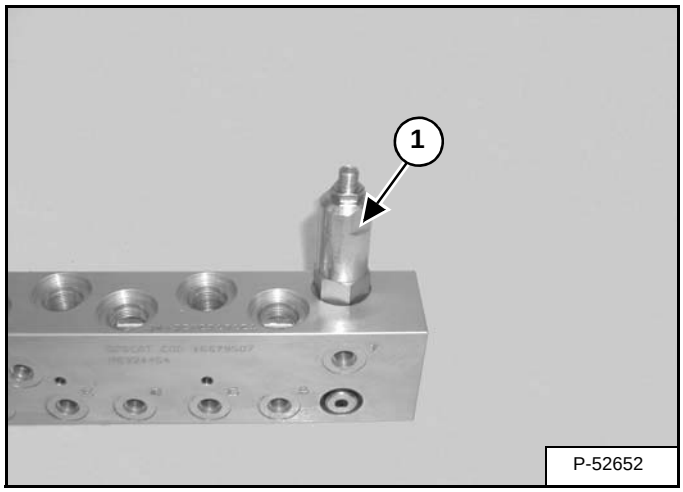


Install the O-rings (Item 1) and back up rings (Item 2) **[Figure 20-60-62]** on the pressure reducing valve.

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Assembly (Cont'd)

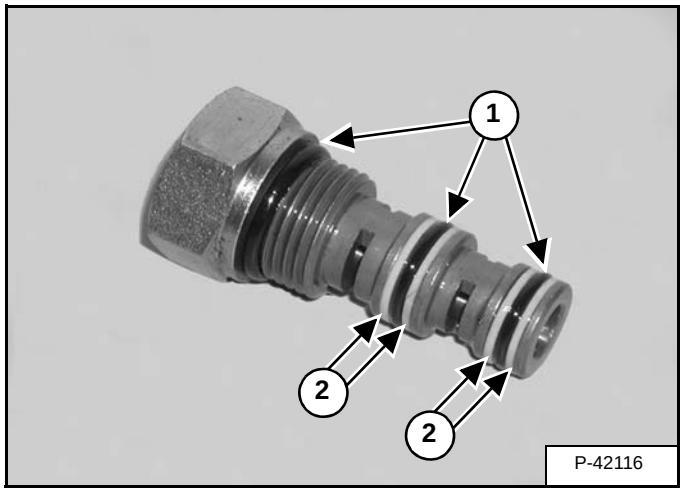
Figure 20-60-63



Install the pressure reducing valve (Item 1) **[Figure 20-60-63]**.

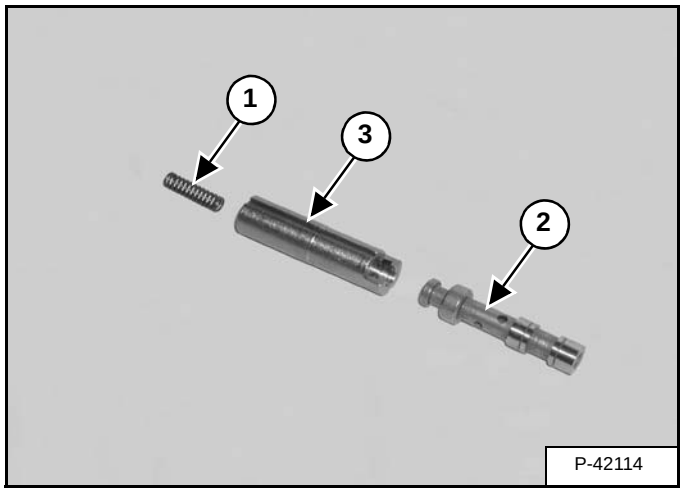
Tighten the pressure reducing valve to 22 ft.-lb. (30 N•m) torque.

Figure 20-60-64



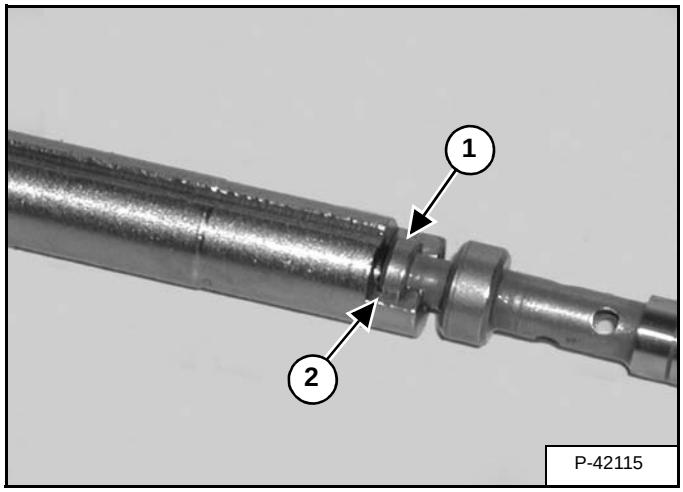
Install the O-rings (Item 1) and backup rings (Item 2) **[Figure 20-60-64]** on the port adapter.

Figure 20-60-65



Install the spring (Item 1) and actuator (Item 2) in the guide (Item 3) **[Figure 20-60-65]**.

Figure 20-60-66



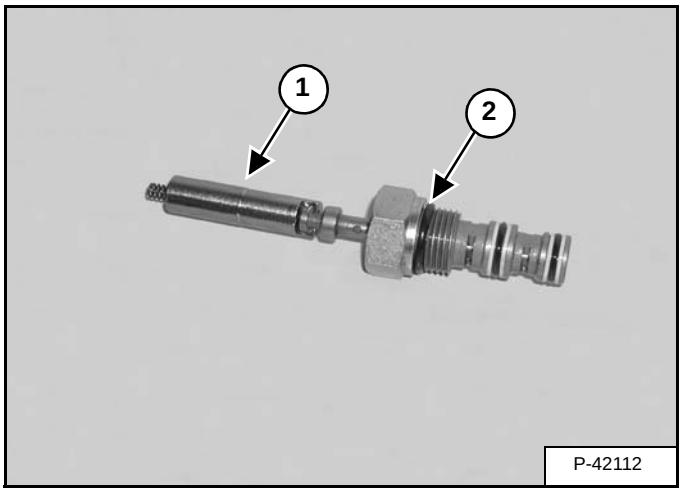
Install the end of the actuator (Item 1) into the groove in the guide (Item 2) **[Figure 20-60-66]**.

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MANIFOLD ASSEMBLY/ACCUMULATOR (S/N 562611001 & ABOVE, 562811001 & ABOVE, AND 563211001 - 563213999) (CONT'D)

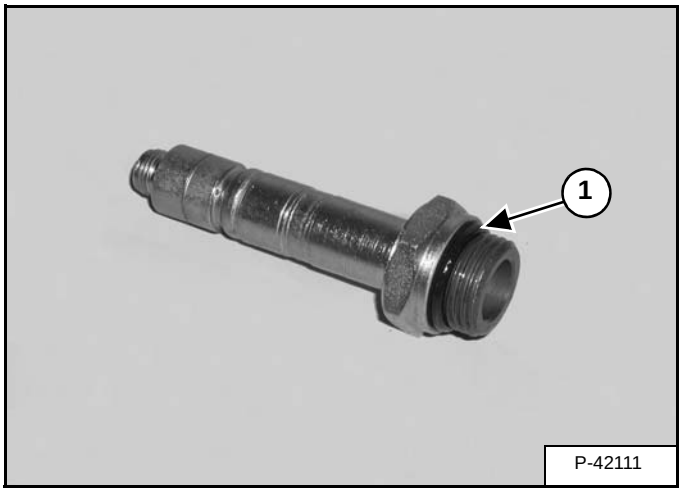
Assembly (Cont'd)

Figure 20-60-67



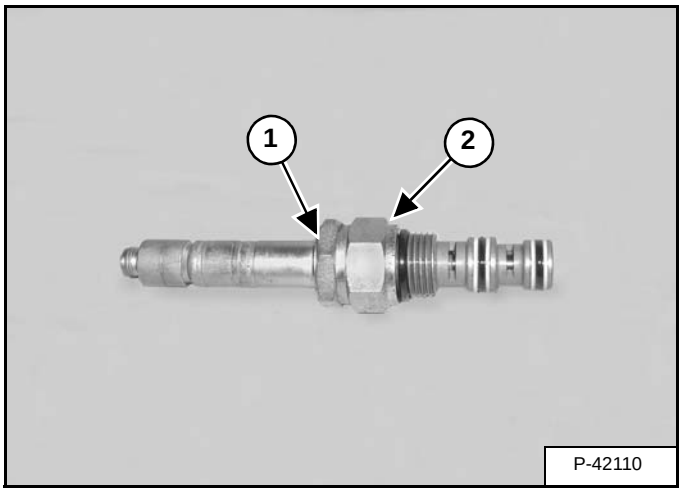
Install the actuator assembly (Item 1) into the port adapter (Item 2) **[Figure 20-60-67]**.

Figure 20-60-68



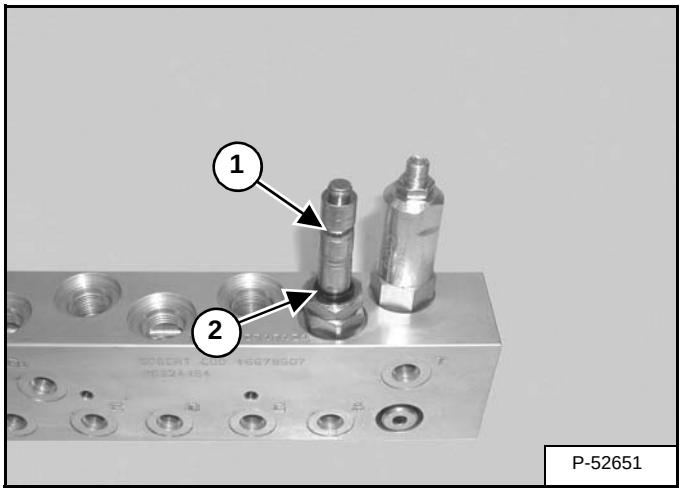
Install the O-ring (Item 1) **[Figure 20-60-68]**.

Figure 20-60-69



Install the spool (Item 1) in the port adapter (Item 2) **[Figure 20-60-69]**.

Figure 20-60-70



Install the spool assembly (Item 1) **[Figure 20-60-70]**.

Tighten the spool to 22 ft.-lb. (30 N•m) torque.

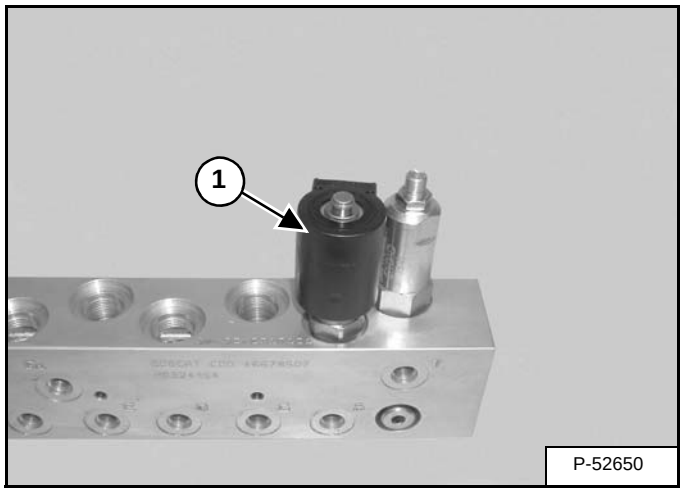
Install the O-ring (Item 2) **[Figure 20-60-70]**.

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MANIFOLD ASSEMBLY/ACCUMULATOR (S/N 562611001 & ABOVE, 562811001 & ABOVE, AND 563211001 - 563213999) (CONT'D)

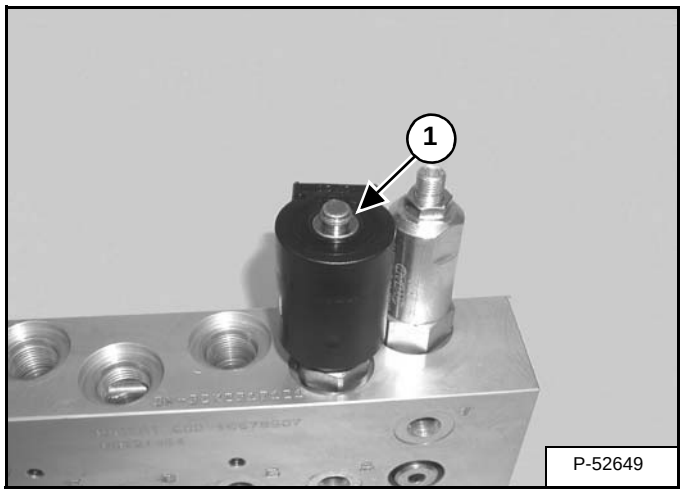
Assembly (Cont'd)

Figure 20-60-71



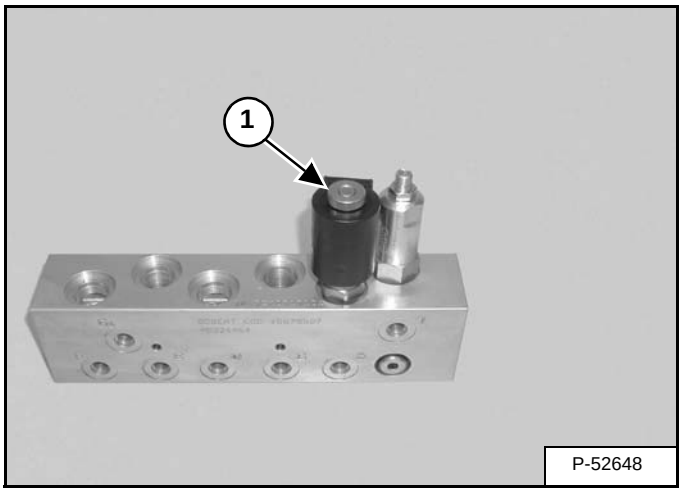
Install the coil with the green cable tie (Item 1) **[Figure 20-60-71]**.

Figure 20-60-72



Install the O-ring (Item 1) **[Figure 20-60-72]**.

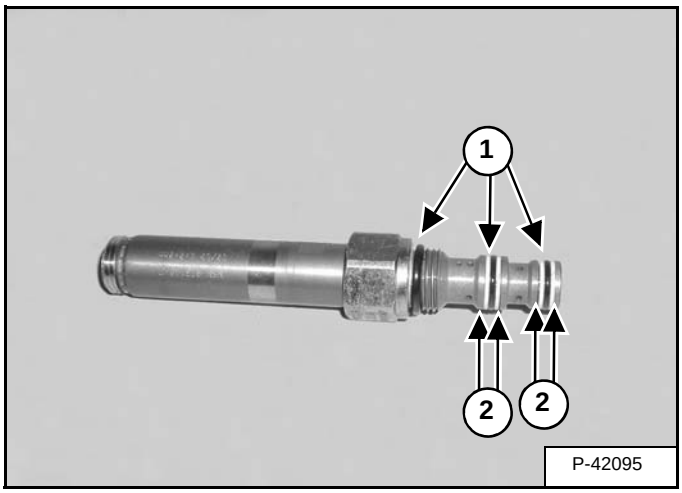
Figure 20-60-73



Install the nut (Item 1) **[Figure 20-60-73]**.

Tighten the nut to 53 in.-lb. (6 N•m) torque.

Figure 20-60-74

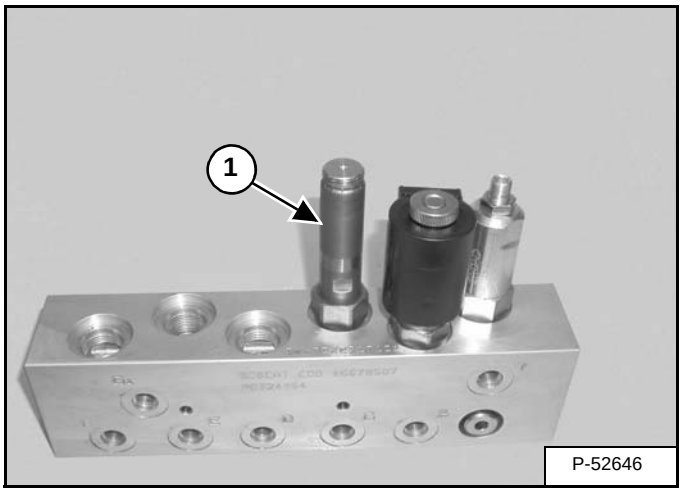


Install the O-rings (Item 1) and backup rings (Item 2) **[Figure 20-60-74]** on the spool.

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Assembly (Cont'd)

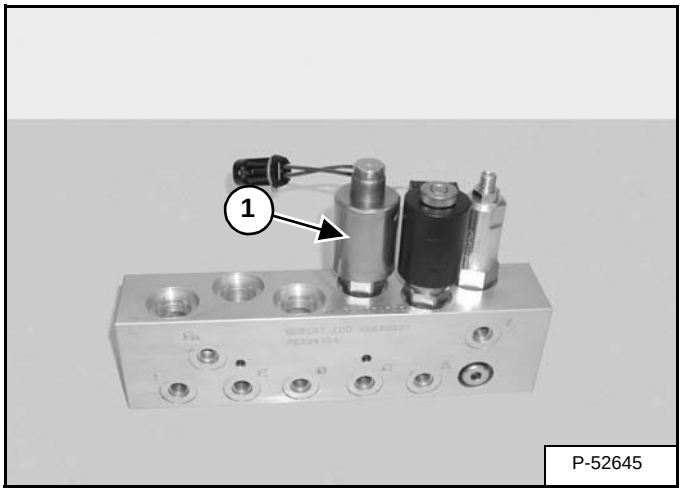
Figure 20-60-75



Install the spool (Item 1) **[Figure 20-60-75]**.

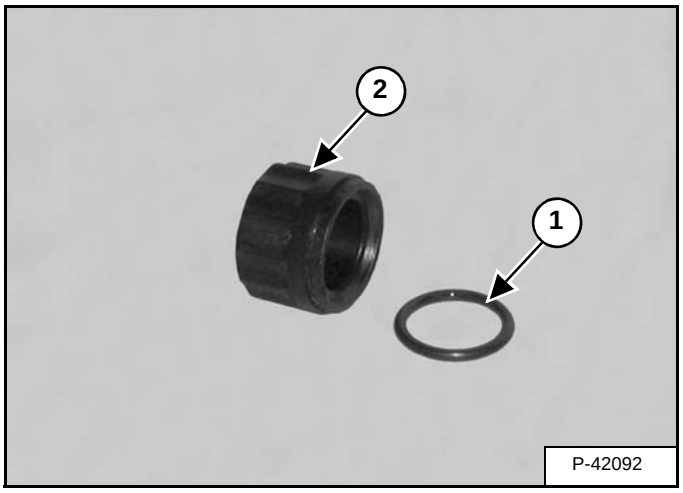
Tighten the spool to 22 ft.-lb. (30 N•m) torque.

Figure 20-60-76



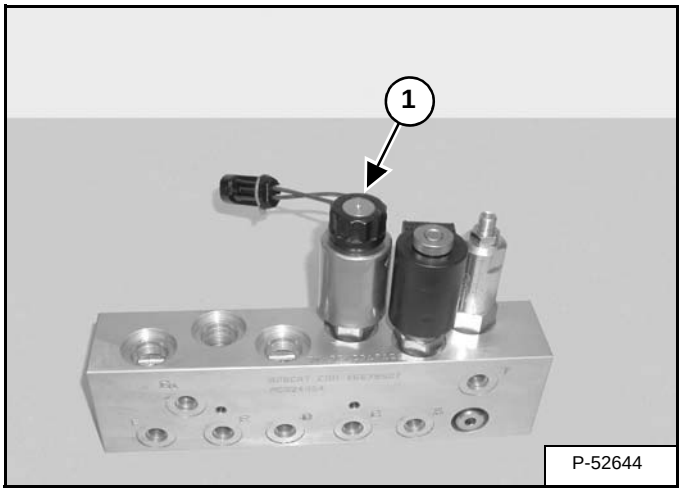
Install the coil with the orange cable tie (Item 1) **[Figure 20-60-76]**.

Figure 20-60-77



Install the O-ring (Item 1) on the nut (Item 2) **[Figure 20-60-77]**.

Figure 20-60-78



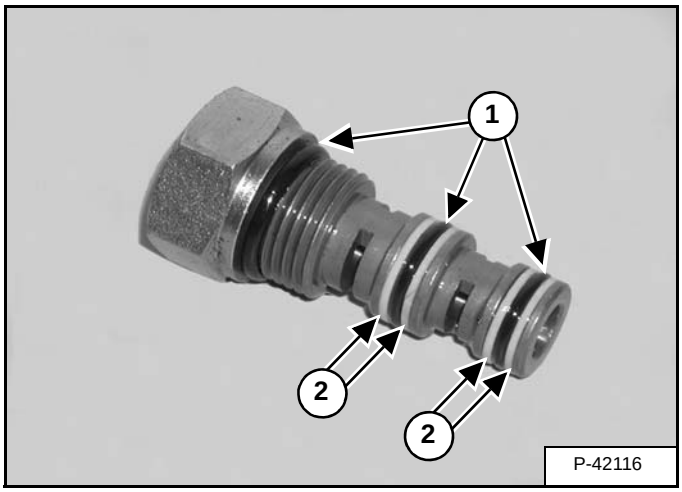
Install the nut (Item 1) **[Figure 20-60-78]** on the spool.

Tighten the nut to 53 in.-lb. (6 N•m) torque.

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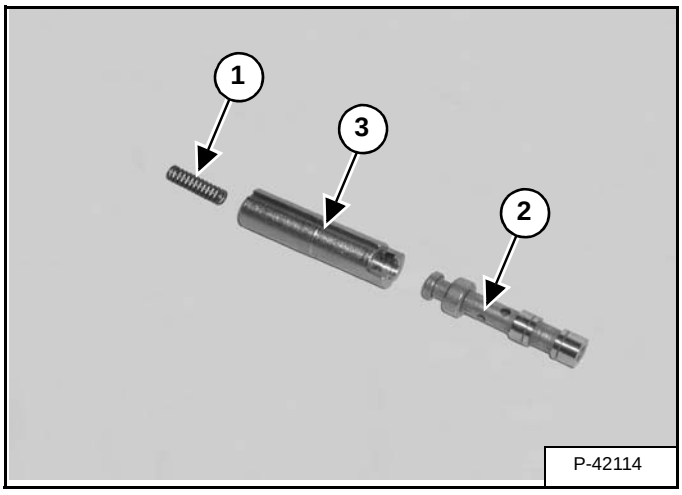
Assembly (Cont'd)

Figure 20-60-79



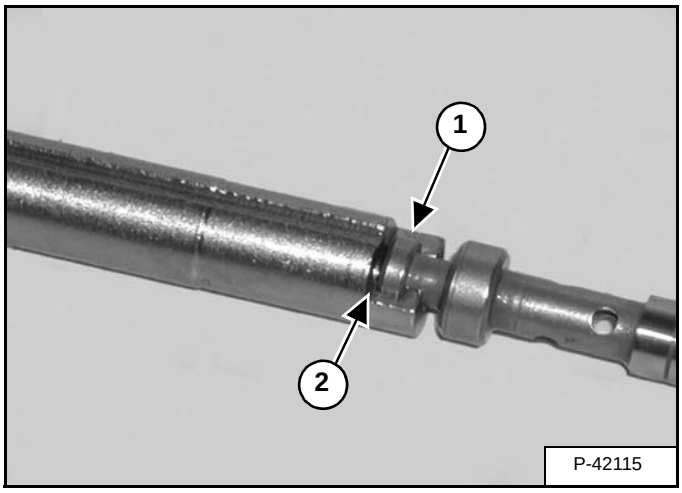
Install the O-rings (Item 1) and backup rings (Item 2) **[Figure 20-60-79]** on the port adapter.

Figure 20-60-80



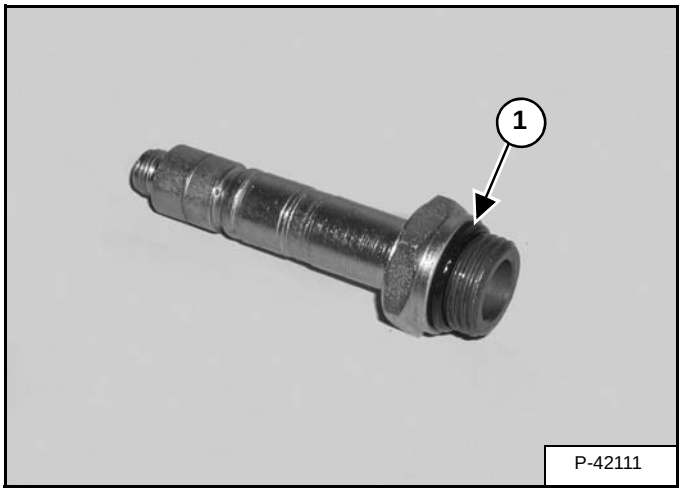
Install the spring (Item 1) and actuator (Item 2) in the guide (Item 3) **[Figure 20-60-80]**.

Figure 20-60-81



Install the end of the actuator (Item 1) into the groove in the guide (Item 2) **[Figure 20-60-81]** on the port adapter.

Figure 20-60-82

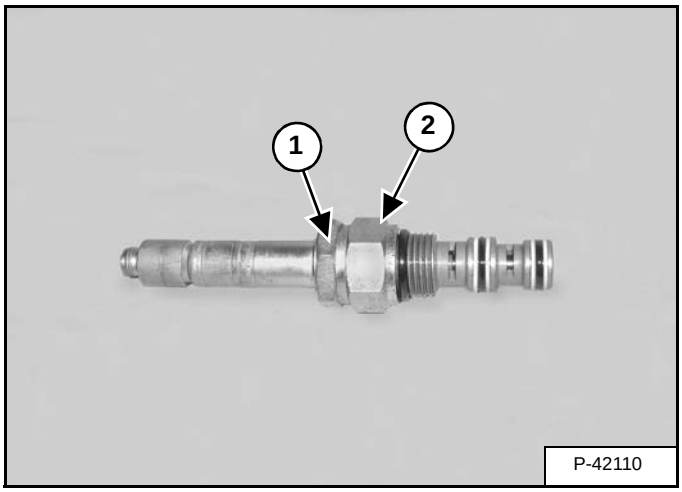


Install the O-ring (Item 1) **[Figure 20-60-82]** on the spool.

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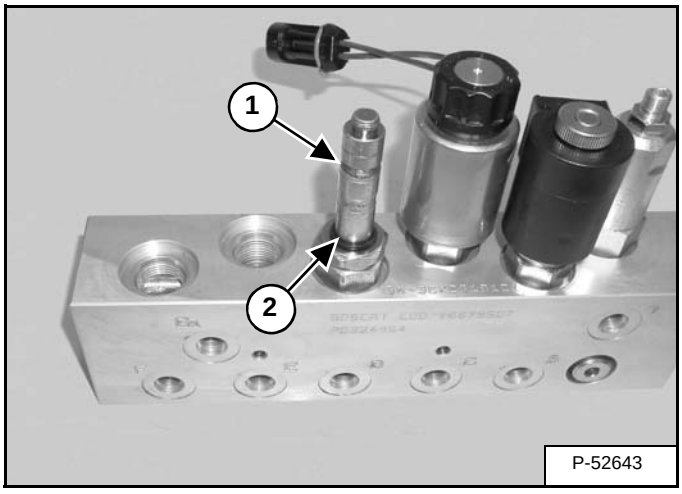
Assembly (Cont'd)

Figure 20-60-83



Install the spool (Item 1) in the port adapter (Item 2) **[Figure 20-60-83]**.

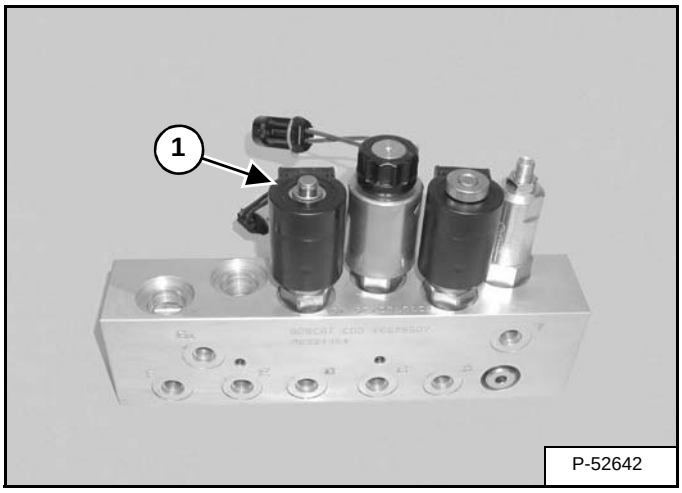
Figure 20-60-84



Install the spool (Item 1) and O-ring (Item 2) **[Figure 20-60-84]**.

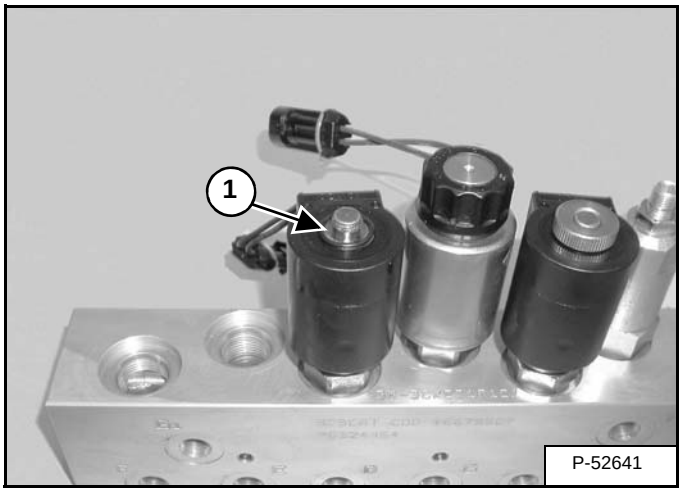
Tighten the spool to 22 ft.-lb. (30 N•m) torque.

Figure 20-60-85



Install the coil with the yellow cable tie (Item 1) **[Figure 20-60-85]**.

Figure 20-60-86



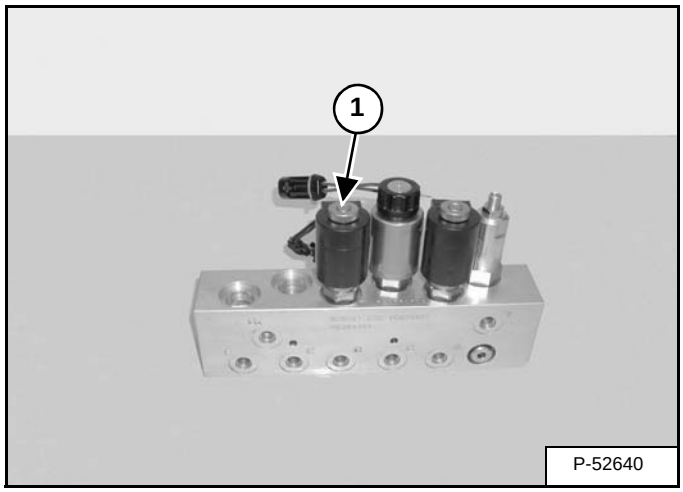
Install the O-ring (Item 1) **[Figure 20-60-86]**.

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MANIFOLD ASSEMBLY/ACCUMULATOR (S/N 562611001 & ABOVE, 562811001 & ABOVE, AND 563211001 - 563213999) (CONT'D)

Assembly (Cont'd)

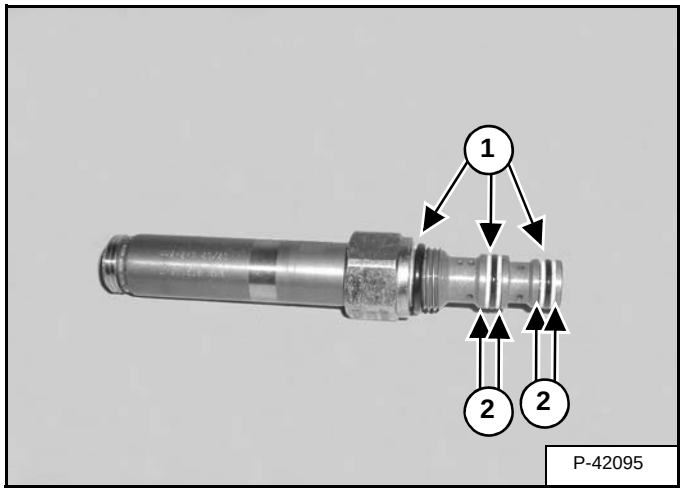
Figure 20-60-87



Install the nut (Item 1) **[Figure 20-60-87]** on the spool.

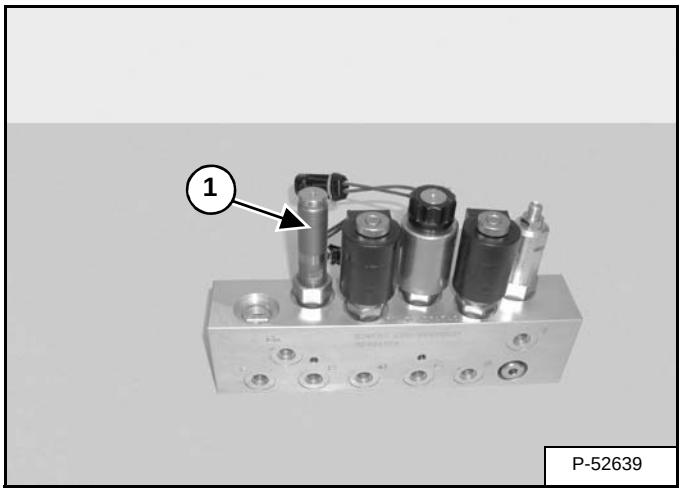
Tighten the nut to 53 in.-lb. (6 N•m) torque.

Figure 20-60-88



Install the O-rings (Item 1) and backup rings (Item 2) **[Figure 20-60-88]** on the spool.

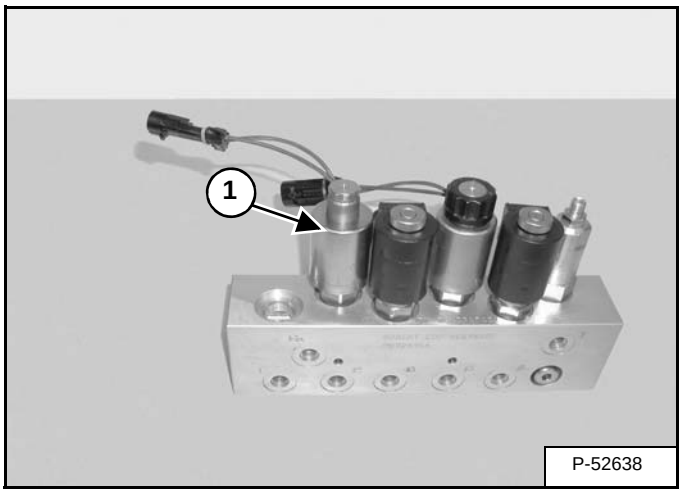
Figure 20-60-89



Install the spool (Item 1) **[Figure 20-60-89]**.

Tighten the spool to 22 ft.-lb. (30 N•m) torque.

Figure 20-60-90

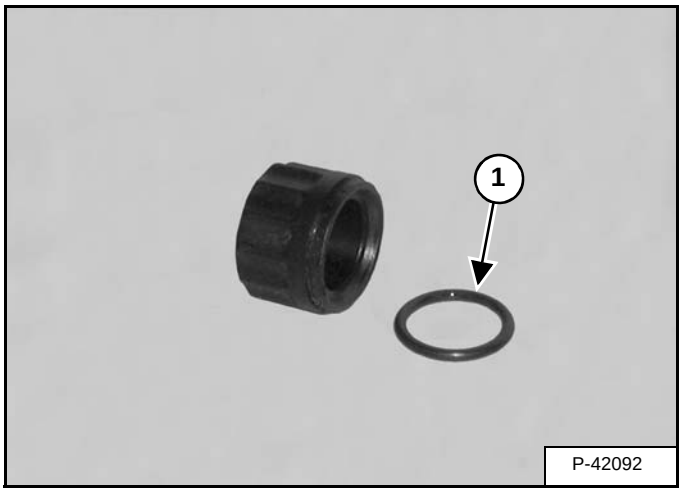


Install the coil with the blue cable tie (Item 1) **[Figure 20-60-90]** on the spool.

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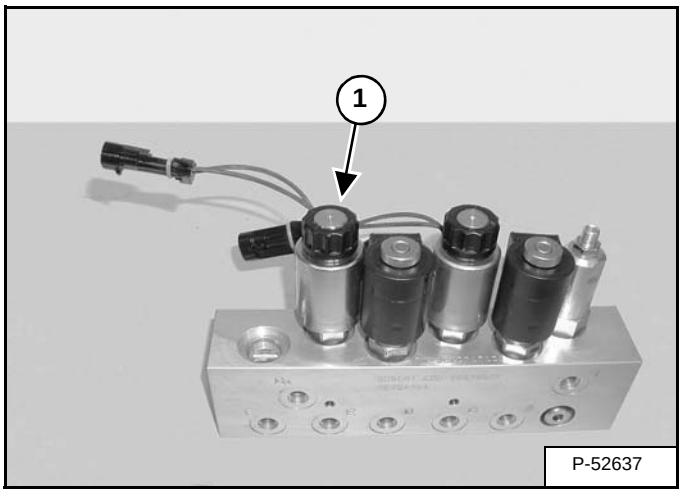
Assembly (Cont'd)

Figure 20-60-91



Install the O-ring (Item 1) **[Figure 20-60-91]** on the nut.

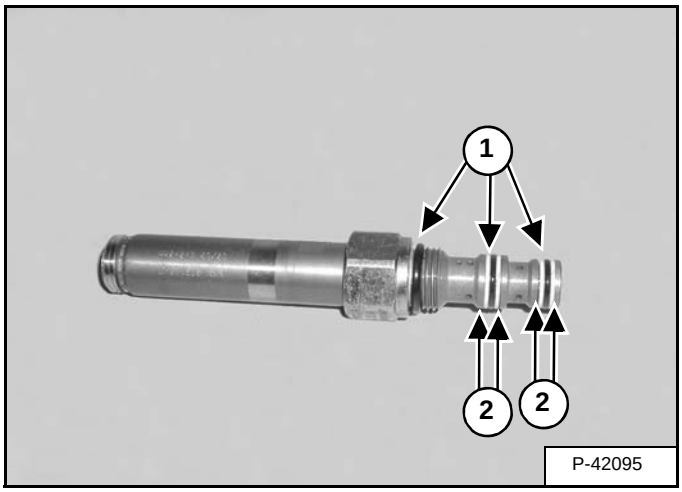
Figure 20-60-92



Install the nut **[Figure 20-60-92]** on the spool.

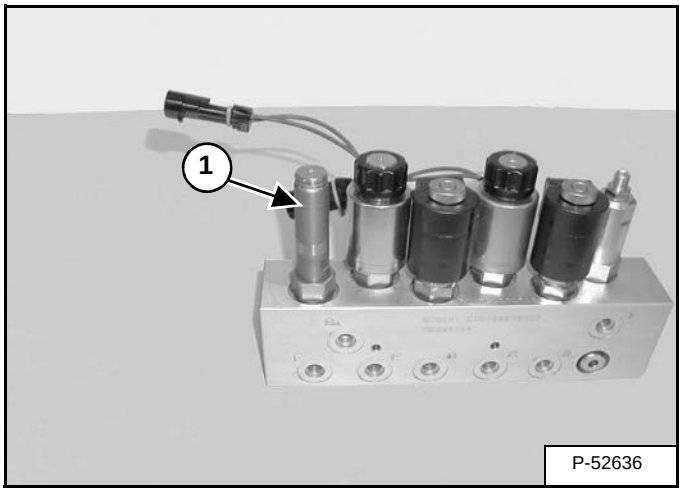
Tighten the nut to 53 in.-lb. (6 N•m) torque.

Figure 20-60-93



Install the O-rings (Item 1) and backup rings (Item 2) **[Figure 20-60-93]** on the spool.

Figure 20-60-94



Install the spool (Item 1) **[Figure 20-60-94]**.

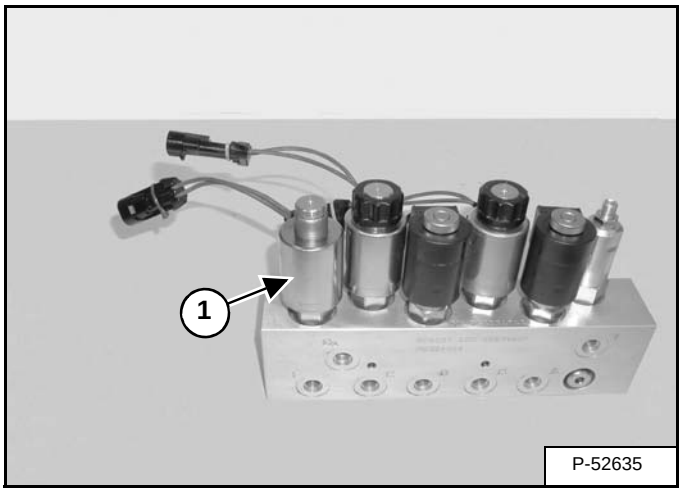
Tighten the spool to 22 ft.-lb. (30 N•m) torque.

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MANIFOLD ASSEMBLY/ACCUMULATOR (S/N 562611001 & ABOVE, 562811001 & ABOVE, AND 563211001 - 563213999) (CONT'D)

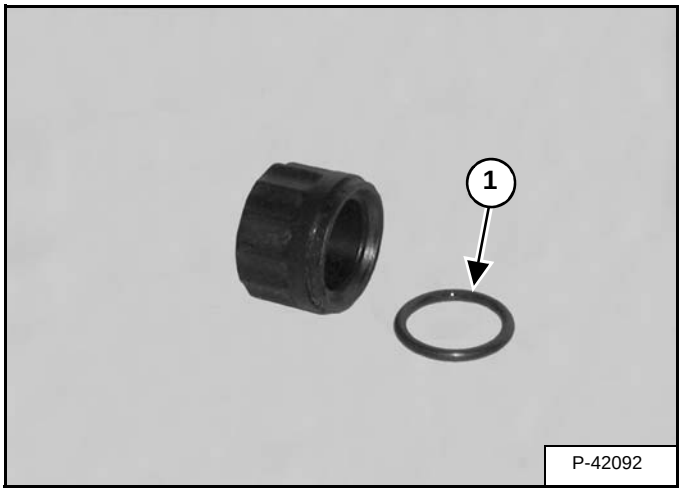
Assembly (Cont'd)

Figure 20-60-95



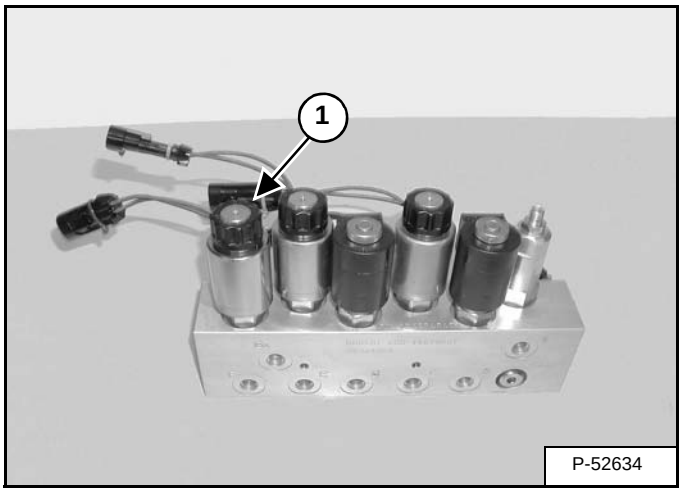
Install the coil with the red cable tie (Item 1) **[Figure 20-60-95]** on the spool.

Figure 20-60-96



Install the O-ring **[Figure 20-60-96]** on the nut.

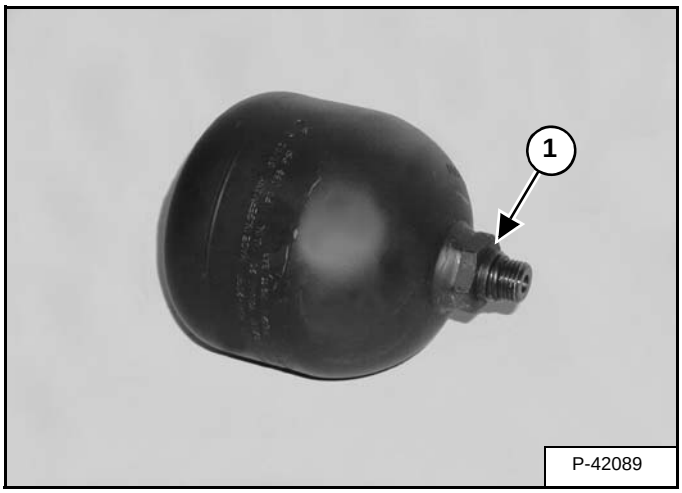
Figure 20-60-97



Install the nut (Item 1) **[Figure 20-60-97]** on the spool.

Tighten the nut to 53 in.-lb. (6 N•m) torque.

Figure 20-60-98

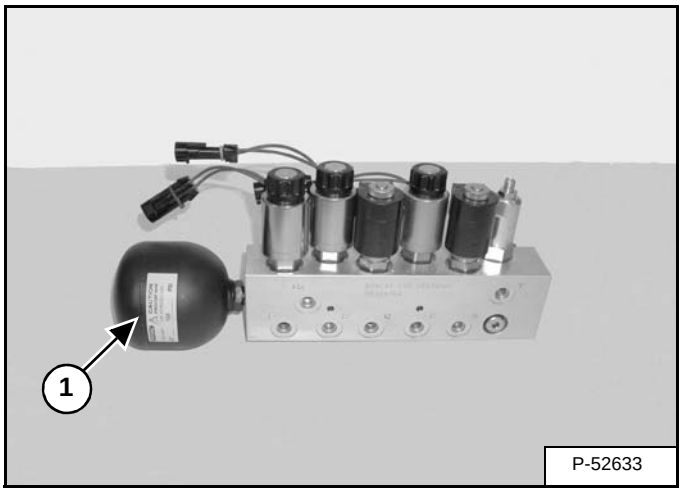


Install the O-ring (Item 1) **[Figure 20-60-98]** on the accumulator.

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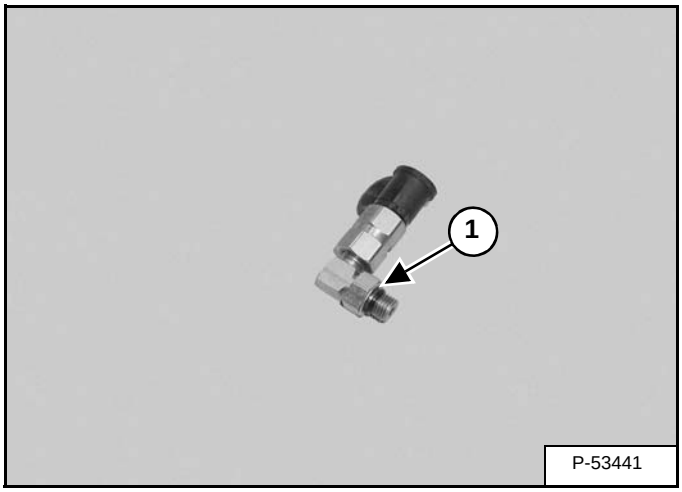
Assembly (Cont'd)

Figure 20-60-99



Install the accumulator (Item 1) **[Figure 20-60-99]**.

Figure 20-60-100



Install the O-ring (Item 1) **[Figure 20-60-100]** on the fittings. (Test fitting shown)

Figure 20-60-101

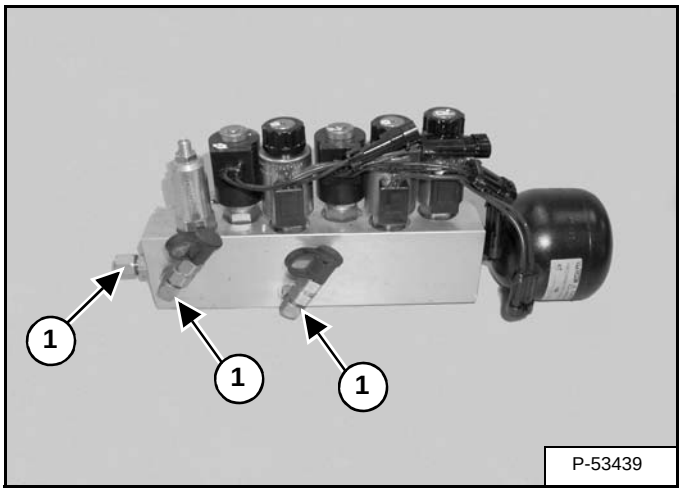
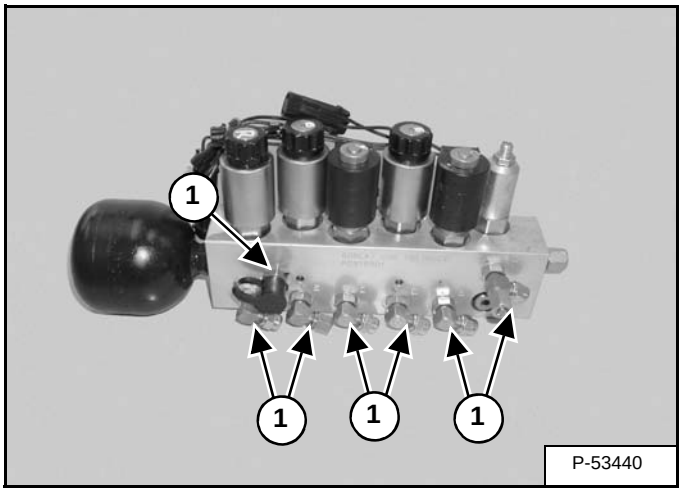


Figure 20-60-102



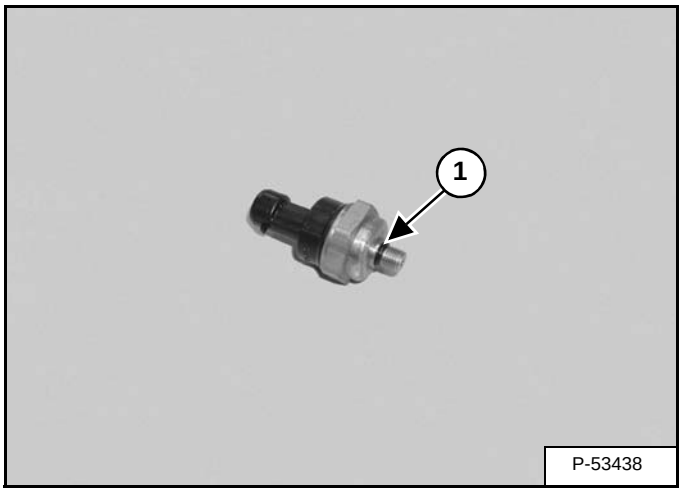
Install the fittings (Item 1) **[Figure 20-60-101]** & **[Figure 20-60-102]**.

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MANIFOLD ASSEMBLY/ACCUMULATOR (S/N 562611001 & ABOVE, 562811001 & ABOVE, AND 563211001 - 563213999) (CONT'D)

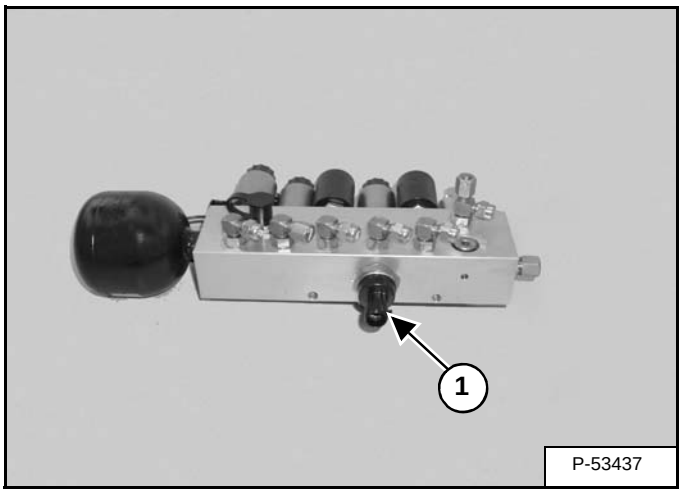
Assembly (Cont'd)

Figure 20-60-103



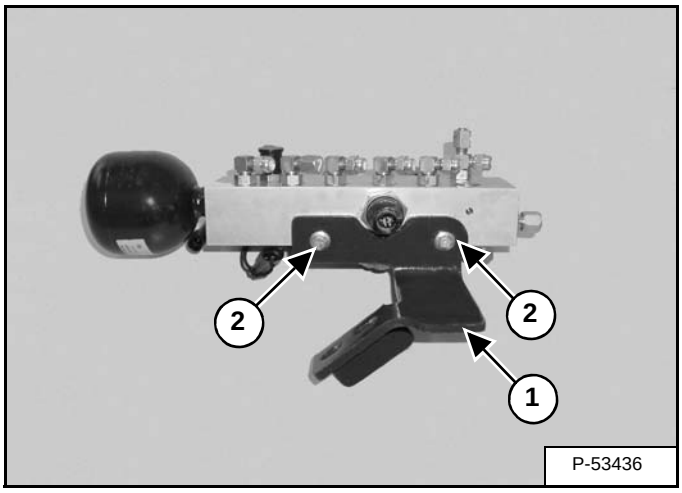
Install the O-ring (Item 1) **[Figure 20-60-103]** on the charge pressure sending unit.

Figure 20-60-104



Install the charge pressure sending unit (Item 1) **[Figure 20-60-104]**.

Figure 20-60-105



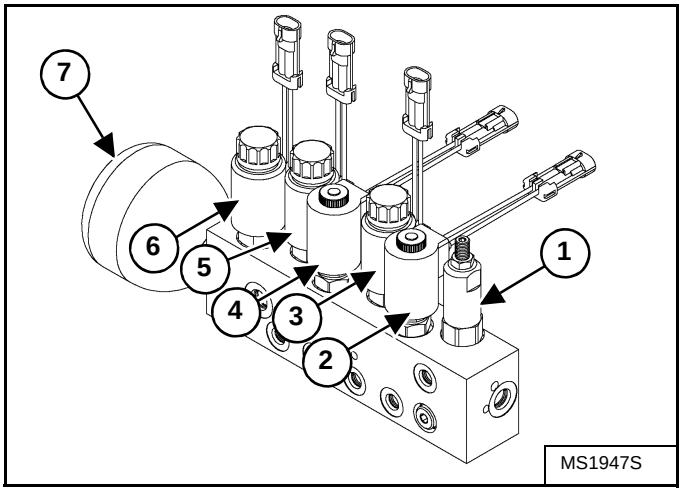
Install the mount bracket (Item 1) with the bolts (Item 2) **[Figure 20-60-105]**.

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MANIFOLD ASSEMBLY/ACCUMULATOR (S/N 563214000 & ABOVE)

Description

Figure 20-61-1



The manifold assembly contains the following:

Pressure reducing valve (Item 1) **[Figure 20-61-1]**.

Work group lockout solenoid (Item 2) **[Figure 20-61-1]**.

Travel pilot pressure solenoid (Item 3) **[Figure 20-61-1]**.

Two speed solenoid (Item 4) **[Figure 20-61-1]**.

Directional control valve solenoid (male coupler) (Item 5) **[Figure 20-61-1]**.

Directional control valve solenoid (female coupler) (Item 6) **[Figure 20-61-1]**.

Accumulator (Item 7) **[Figure 20-61-1]**.

The manifold supplies 406 - 450 PSI (28 - 31 bar) for joystick operation.

The accumulator provides short term reserve pressure for joystick function with engine off and the key in the ON position.

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MANIFOLD ASSEMBLY/ACCUMULATOR (S/N 563214000 & ABOVE) (CONT'D)

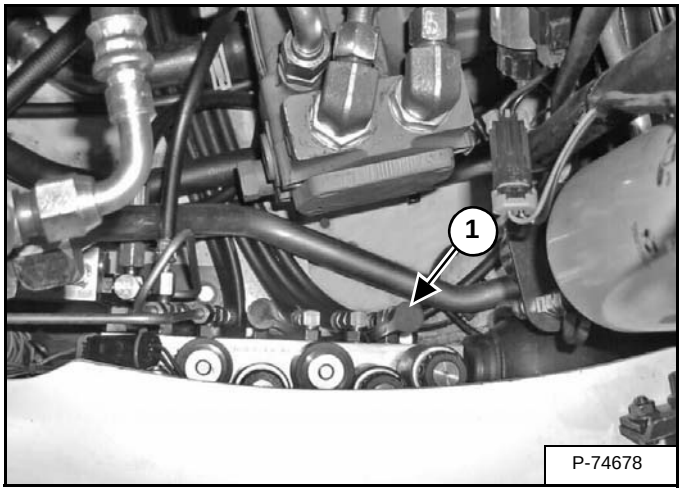
Testing Pilot Pressure

The following tools will be needed to do the procedure:
MEL1355 - Hydraulic Test Kit

Stop the engine.

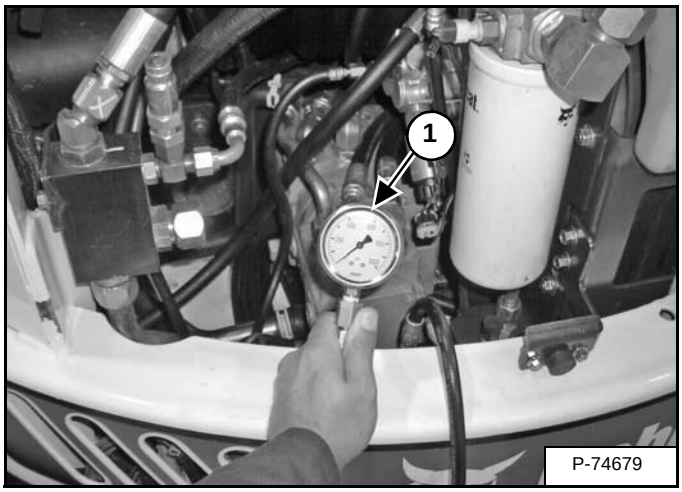
Lower the boom/bucket and blade to the ground. Open the right side cover.

Figure 20-61-2



Remove the protective cap (Item 1) **[Figure 20-61-2]** from the G1 diagnostic port located on the manifold assembly.

Figure 20-61-3



From the test kit, connect a 500 PSI (35 bar) gauge (Item 1) **[Figure 20-61-3]** on the diagnostic port.

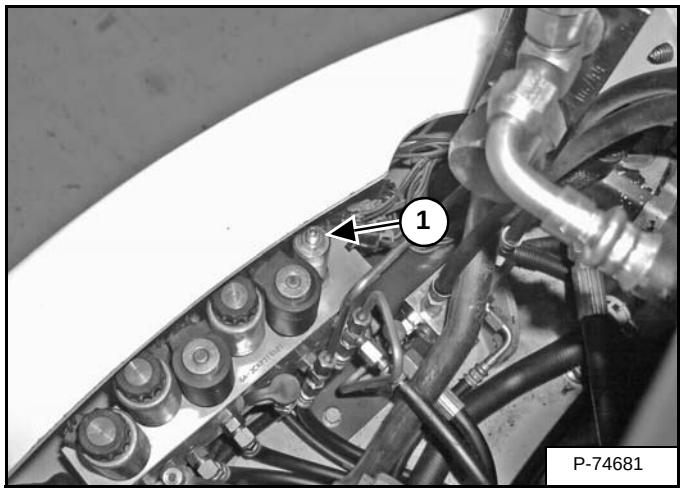
With an operator in the seat and the left console in the raised position, start the excavator and run at low idle.

Lower the left console and increase the engine speed to high idle.

Check the pressure at the gauge (Item 1) **[Figure 20-61-3]** the pressure should be as follows:

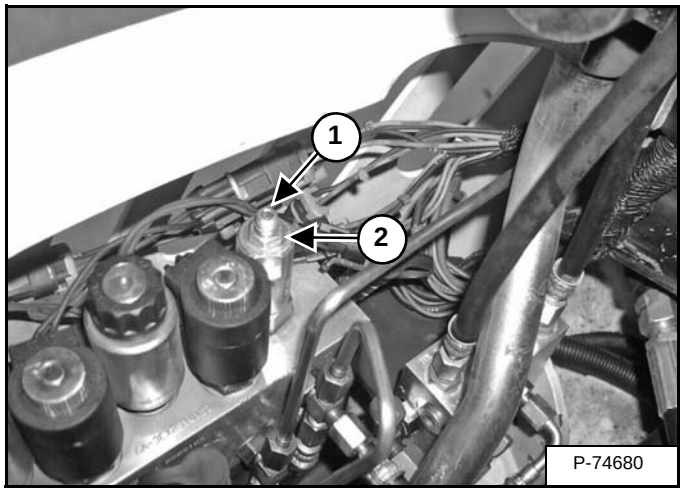
A target pressure of 428 PI (29 bar) with an acceptable range of 406 - 450 PSI (28 - 31 bar).

Figure 20-61-4



If adjustment is needed, loosen the nut (Item 1) **[Figure 20-61-4]**.

Figure 20-61-5



Turn the adjustment screw (Item 1) **[Figure 20-61-5]** clockwise to increase the pressure or counter clockwise to decrease the pressure.

NOTE: 1/4 turn clockwise will increase pressure approximately 20 PSI (1.4 bar).

Tighten the nut (Item 2) **[Figure 20-61-5]**.

Retest the valve after adjustment.

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Removal And Installation

IMPORTANT

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

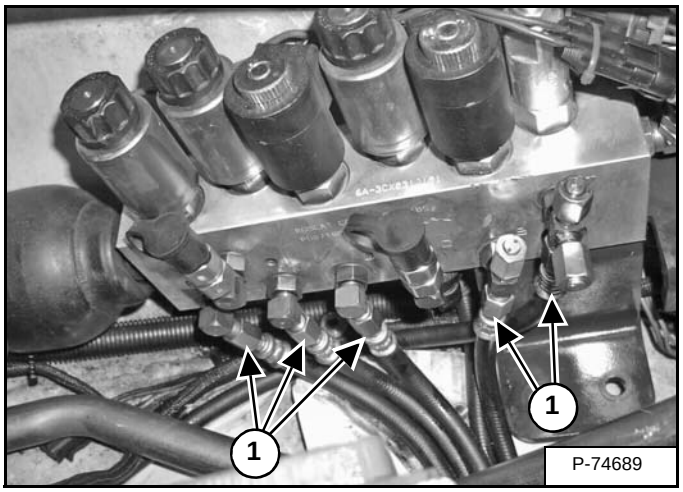
I-2003-0888

Open the right side cover.

Mark all tubelines and hoses for proper installation.

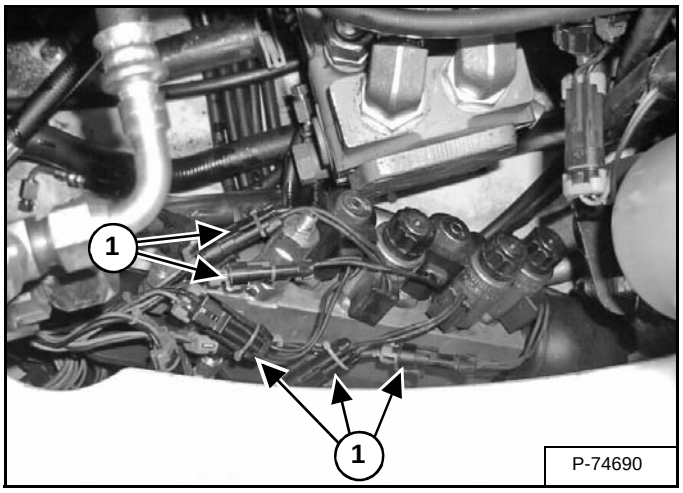
Remove the dual sequence valve. (See Removal And Installation on Page 20-160-1.)

Figure 20-61-6



Remove the five hoses (Item 1) **[Figure 20-61-6]**.

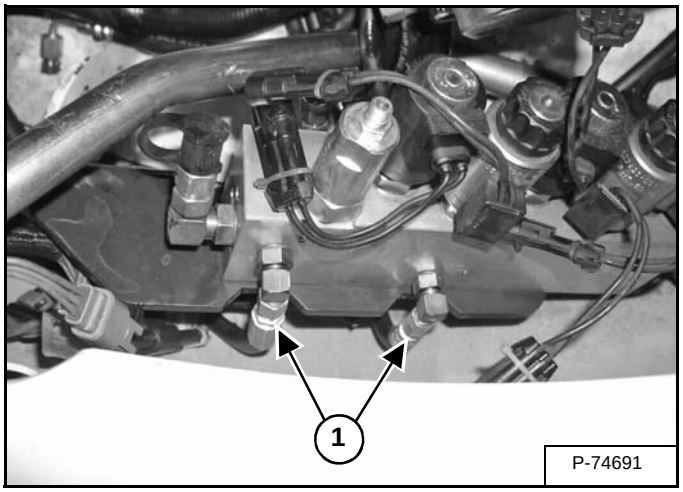
Figure 20-61-7



Disconnect the five wire harnesses (Item 1) **[Figure 20-61-7]** from the manifold assembly solenoids.

NOTE: The electrical connectors have colored cable ties for proper installation.

Figure 20-61-8



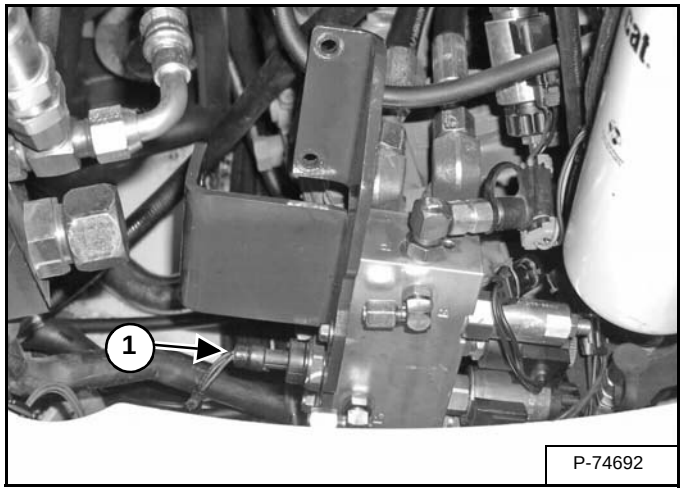
Remove the hoses (Item 1) **[Figure 20-61-8]**.

NOTE: If pilot pressure hose replacement is required, see Hoses for hose routing diagrams. (See HOSES on Page 20-114-1.)

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Removal And Installation (Cont'd)

Figure 20-61-9



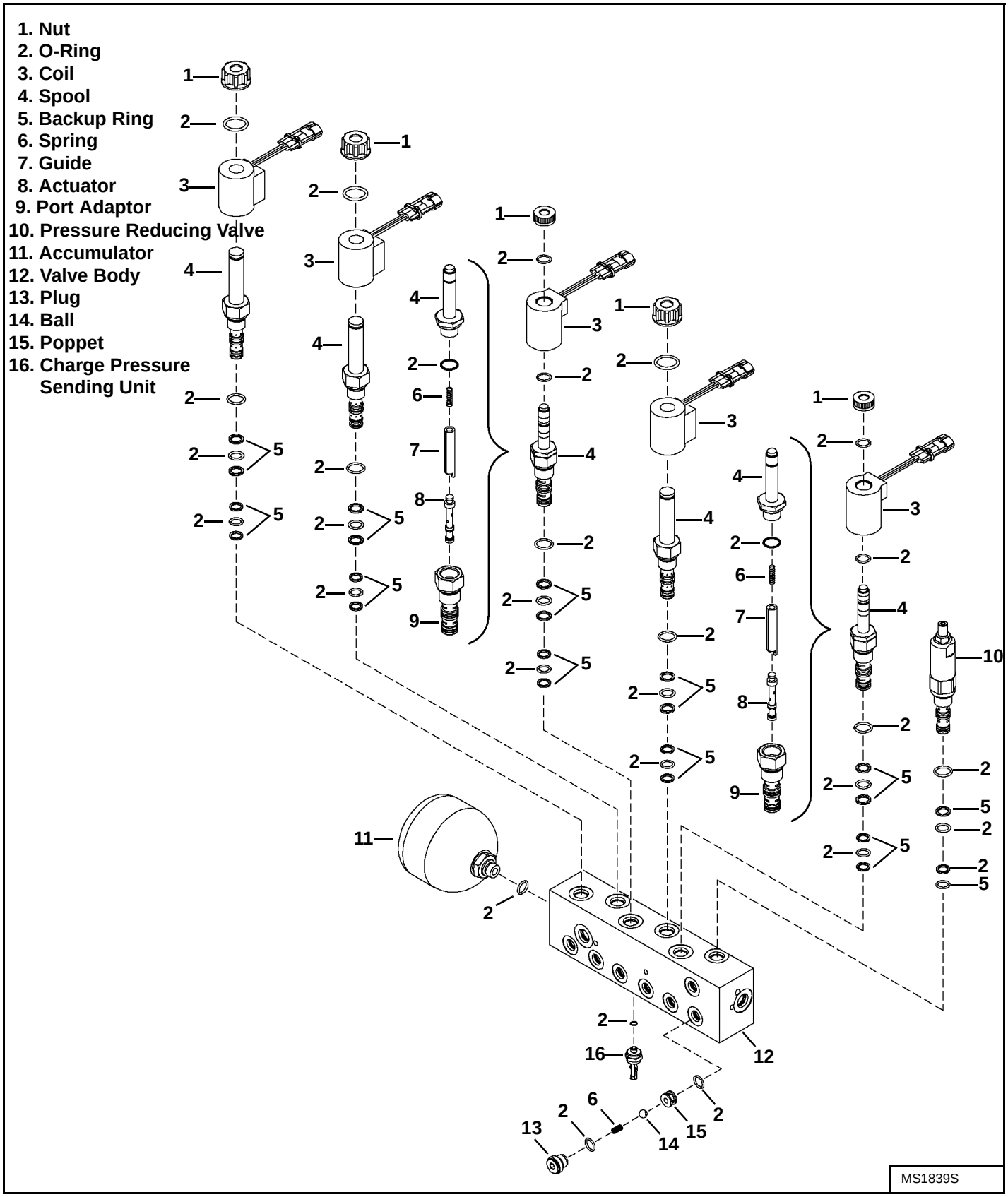
Relocate the manifold assembly/accumulator as shown. Disconnect the wire harness (Item 1) **[Figure 20-61-9]**.

Remove the manifold assembly from the excavator.

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Parts Identification

1. Nut
2. O-Ring
3. Coil
4. Spool
5. Backup Ring
6. Spring
7. Guide
8. Actuator
9. Port Adaptor
10. Pressure Reducing Valve
11. Accumulator
12. Valve Body
13. Plug
14. Ball
15. Poppet
16. Charge Pressure Sending Unit



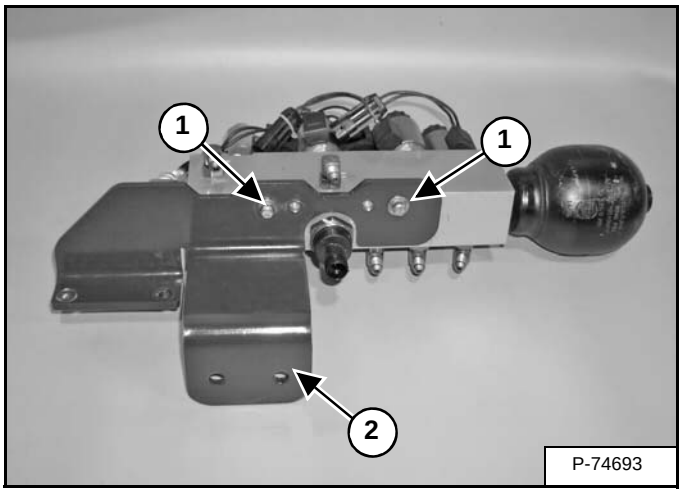
https://www.pdfmanual4trucks.com/

MANIFOLD ASSEMBLY/ACCUMULATOR (S/N 563214000 & ABOVE) (CONT'D)

Disassembly

Clean the outside of the manifold assembly/accumulator before disassembly.

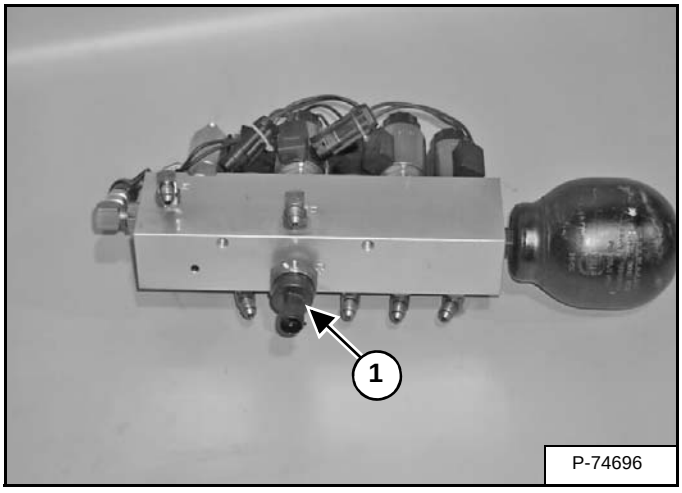
Figure 20-61-10



Remove the bolts (Item 1) **[Figure 20-61-10]** from the mount.

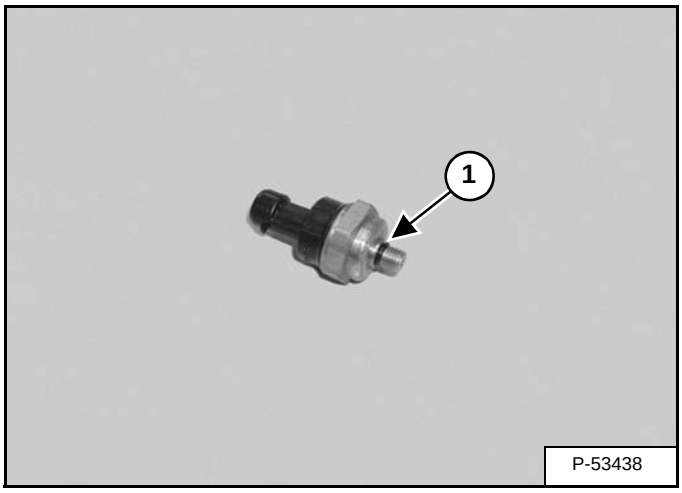
Remove the mount bracket (Item 2) **[Figure 20-61-10]**.

Figure 20-61-11



Remove the charge pressure sending unit (Item 1) **[Figure 20-61-11]**.

Figure 20-61-12



Remove the O-ring (Item 1) **[Figure 20-61-12]**.

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Disassembly (Cont'd)

Figure 20-61-13

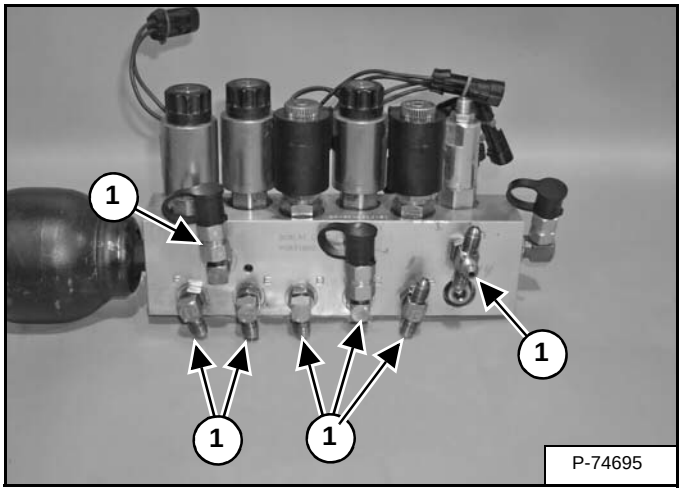
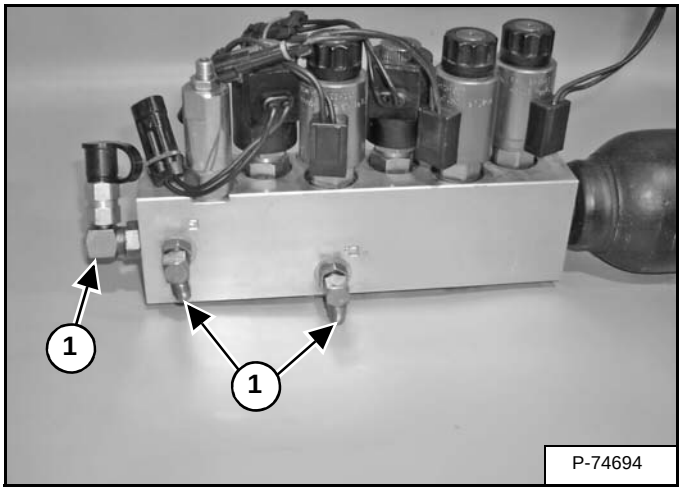
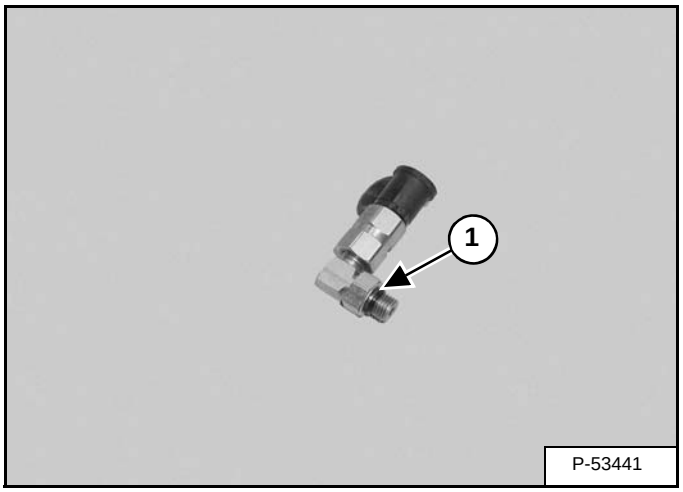


Figure 20-61-14



Remove the fittings (Item 1) **[Figure 20-61-13]** & **[Figure 20-61-14]**.

Figure 20-61-15



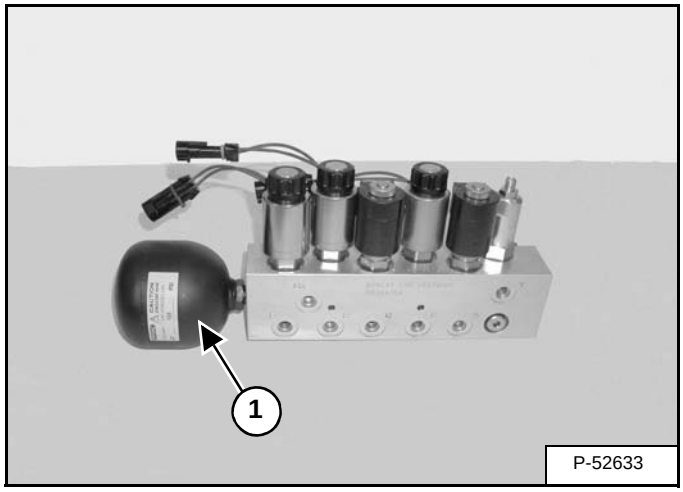
Remove the O-ring (Item 1) **[Figure 20-61-15]** from the fittings. (Test fitting shown)

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MANIFOLD ASSEMBLY/ACCUMULATOR (S/N 563214000 & ABOVE) (CONT'D)

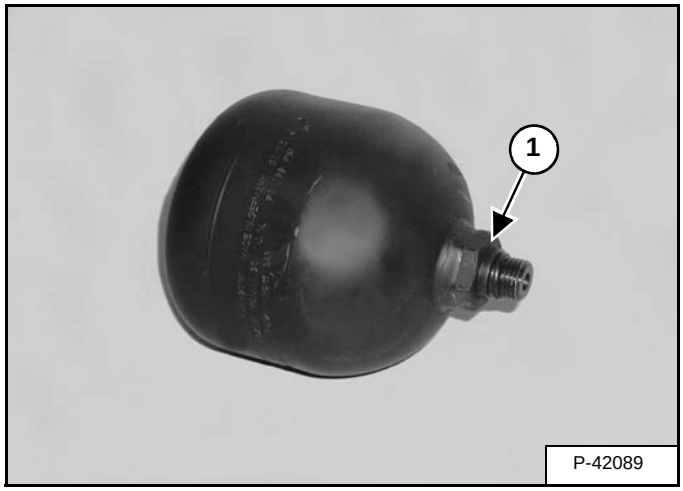
Disassembly (Cont'd)

Figure 20-61-16



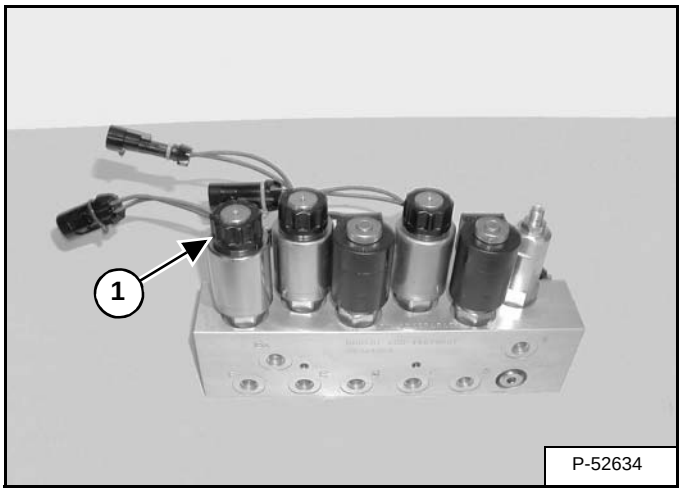
Remove the accumulator (Item 1) **[Figure 20-61-16]**.

Figure 20-61-17



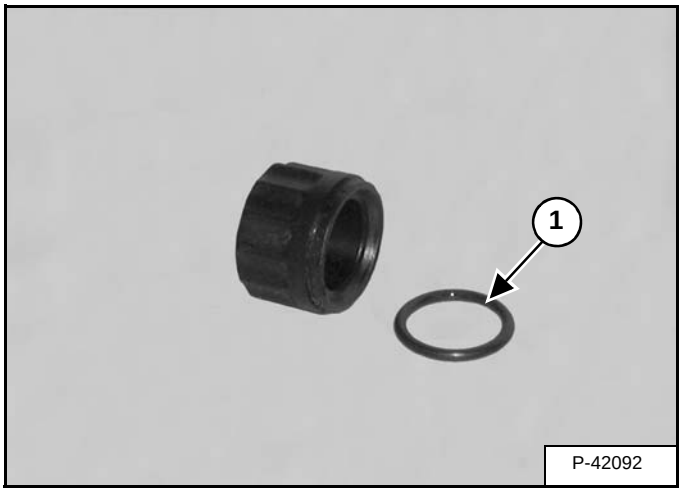
Remove the O-ring (Item 1) **[Figure 20-61-17]**.

Figure 20-61-18



Remove the nut (Item 1) **[Figure 20-61-18]** from the spool.

Figure 20-61-19

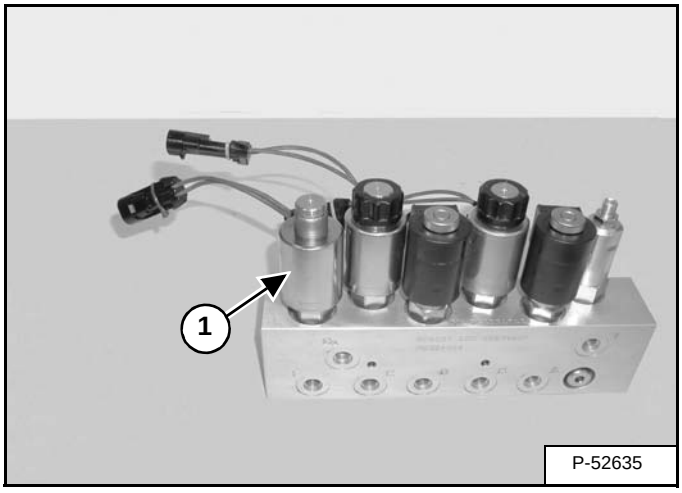


Remove the O-ring (Item 1) **[Figure 20-61-19]** from the nut.

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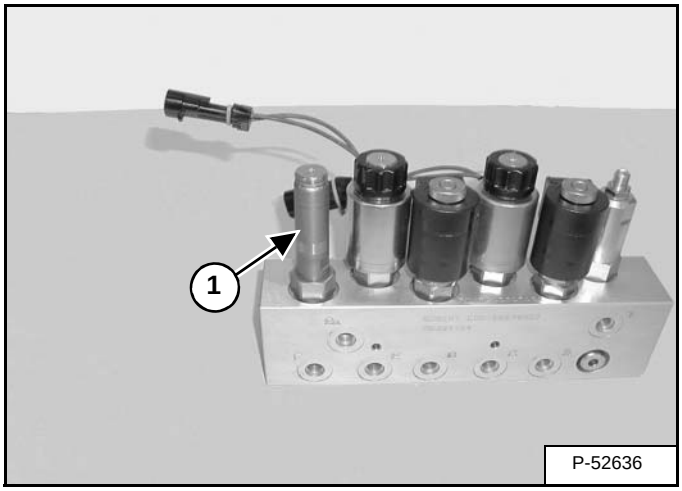
Disassembly (Cont'd)

Figure 20-61-20



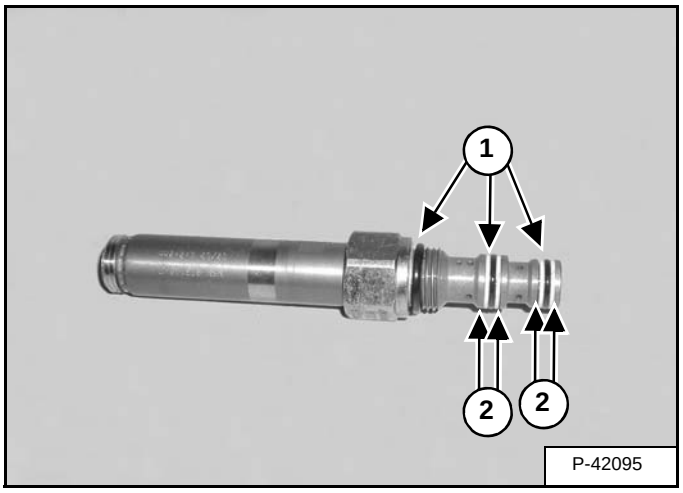
Remove the coil (Item 1) **[Figure 20-61-20]** with the red cable tie.

Figure 20-61-21



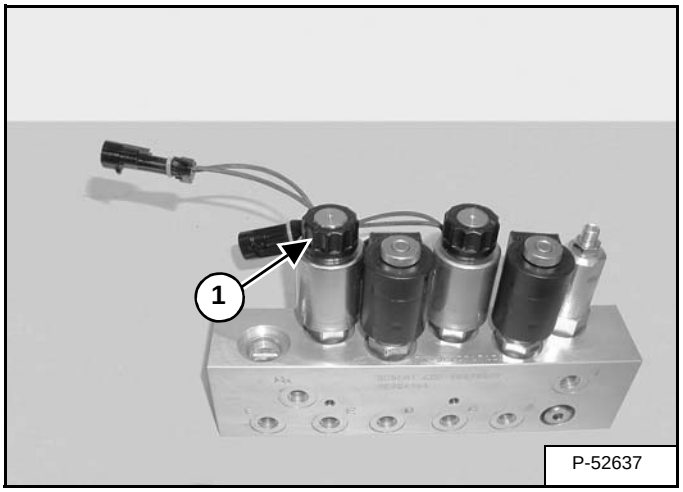
Remove the spool (Item 1) **[Figure 20-61-21]**.

Figure 20-61-22



Remove the O-rings (Item 1) and backup rings (Item 2) **[Figure 20-61-22]** from the spool.

Figure 20-61-23

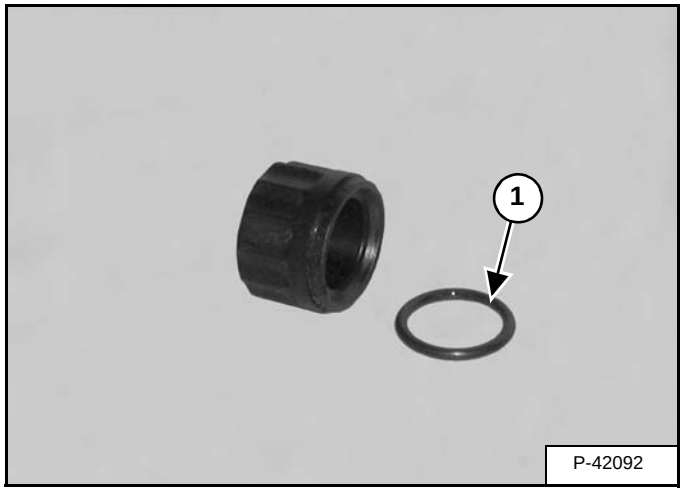


Remove the nut (Item 1) **[Figure 20-61-23]** from the spool.

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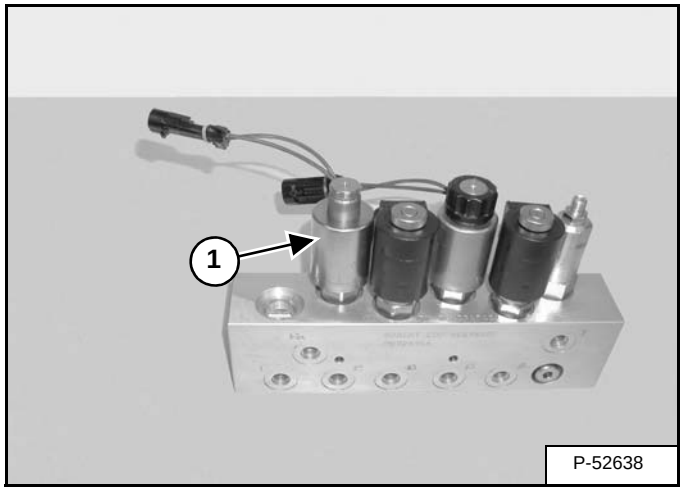
Disassembly (Cont'd)

Figure 20-61-24



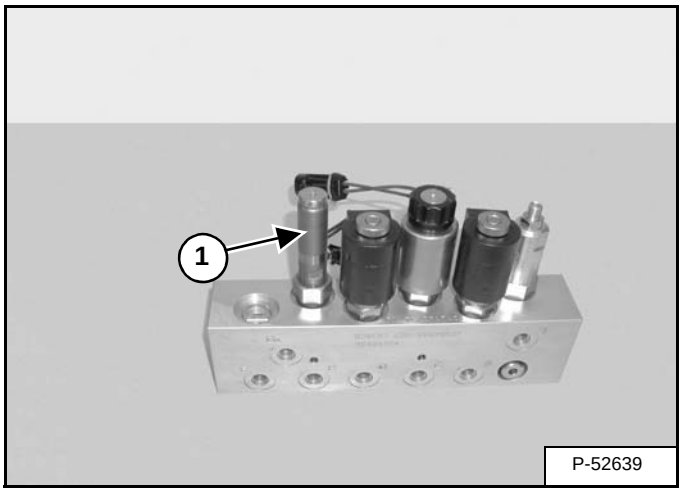
Remove the O-ring (Item 1) **[Figure 20-61-24]** from the nut.

Figure 20-61-25



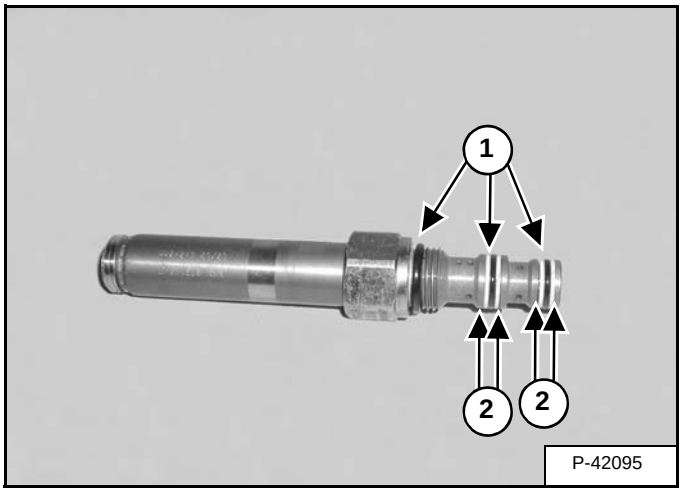
Remove the coil (Item 1) **[Figure 20-61-25]** with the blue cable tie.

Figure 20-61-26



Remove the spool (Item 1) **[Figure 20-61-26]**.

Figure 20-61-27

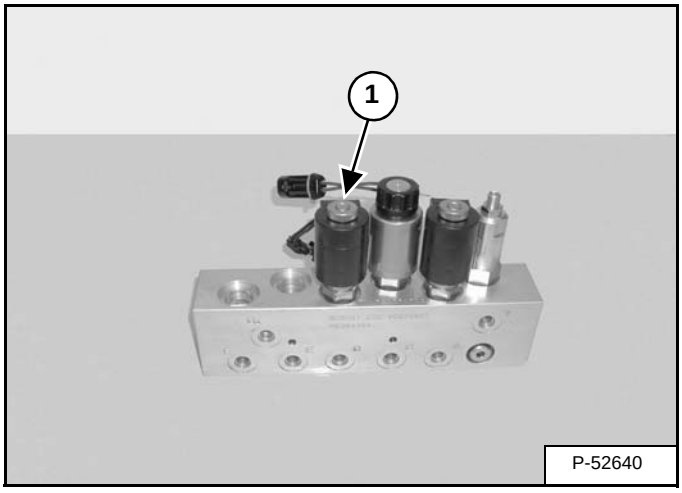


Remove the O-rings (Item 1) and backup rings (Item 2) **[Figure 20-61-27]** from the spool.

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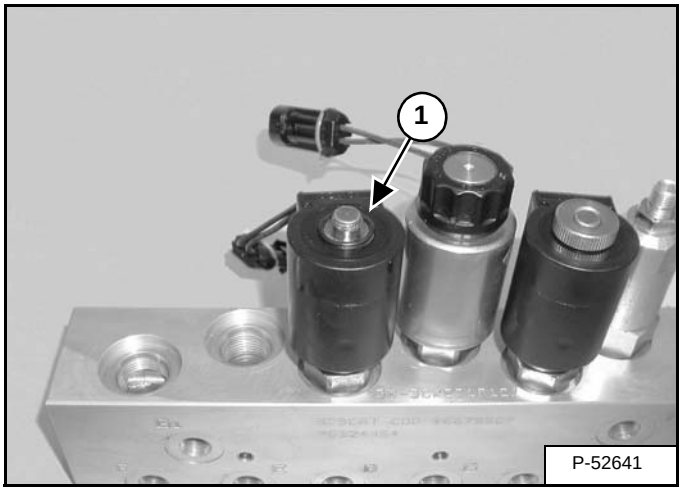
Disassembly (Cont'd)

Figure 20-61-28



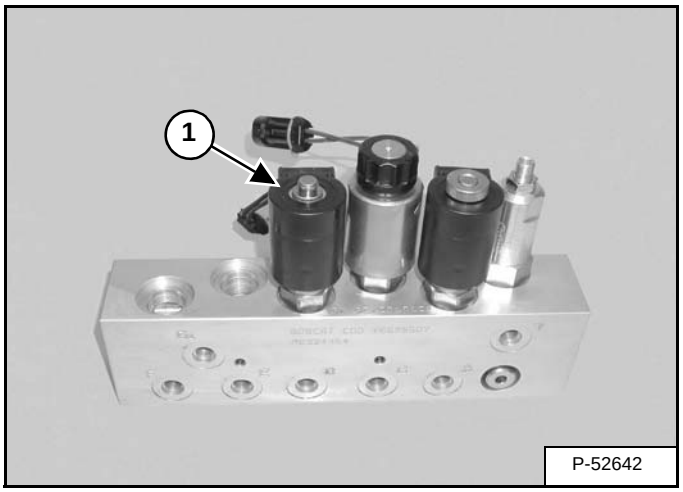
Remove the nut (Item 1) **[Figure 20-61-28]** from the spool.

Figure 20-61-29



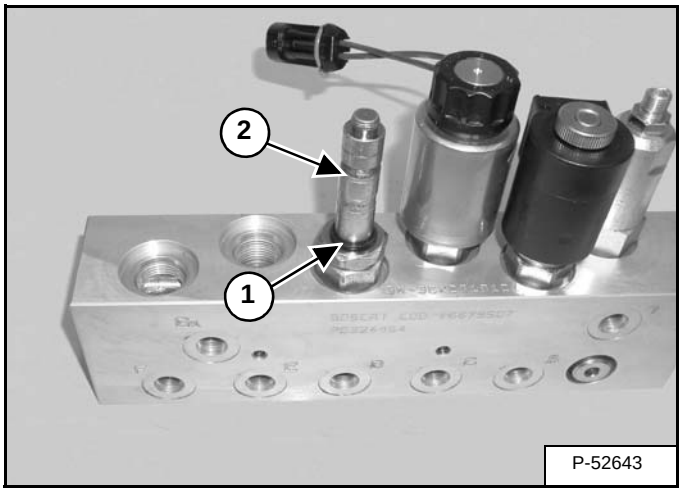
Remove the O-ring (Item 1) **[Figure 20-61-29]**.

Figure 20-61-30



Remove the coil (Item 1) **[Figure 20-61-30]** with the yellow cable tie.

Figure 20-61-31

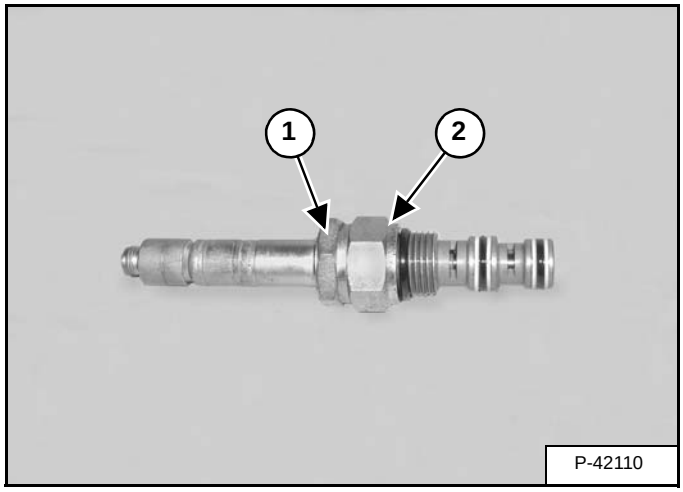


Remove the O-ring (Item 1) and spool (Item 2) **[Figure 20-61-31]**.

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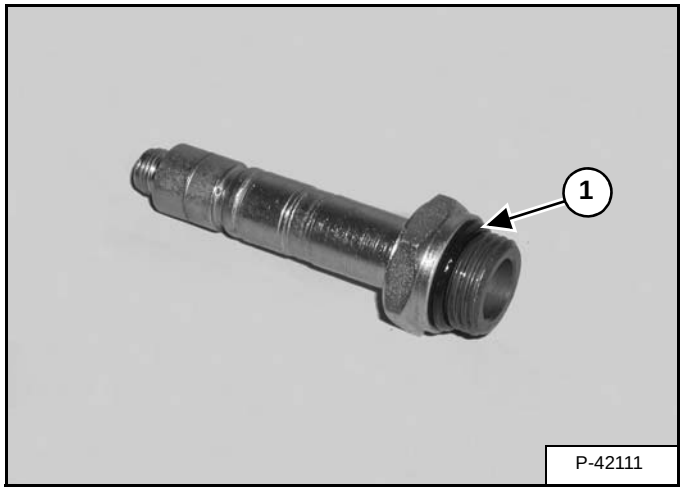
Disassembly (Cont'd)

Figure 20-61-32



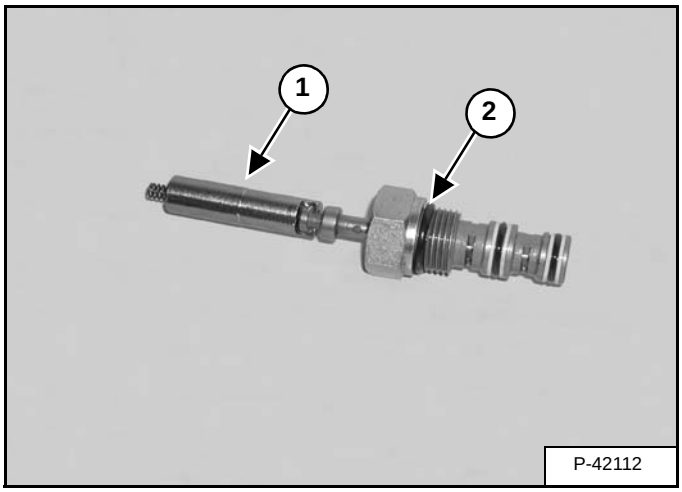
Remove the spool (Item 1) from the port adapter (Item 2) **[Figure 20-61-32]**.

Figure 20-61-33



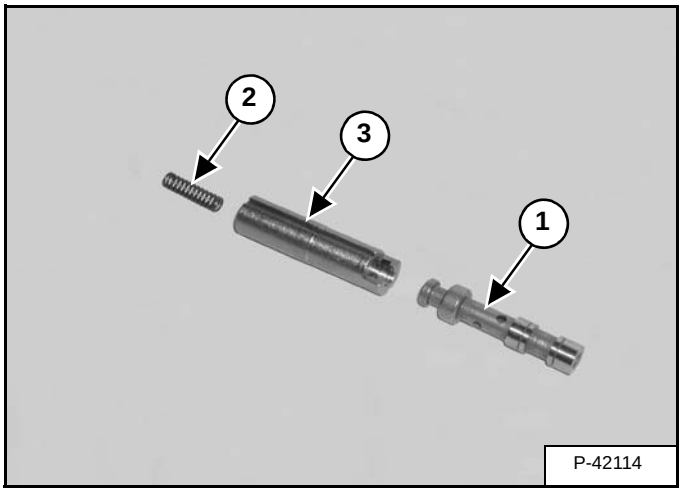
Remove the O-ring (Item 1) **[Figure 20-61-33]** from the spool.

Figure 20-61-34



Remove the actuator assembly (Item 1) from the port adapter (Item 2) **[Figure 20-61-34]**.

Figure 20-61-35

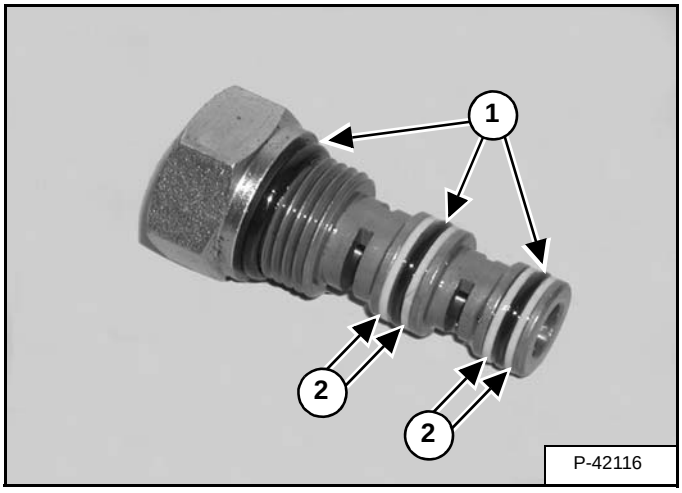


Remove the actuator (Item 1) and spring (Item 2) from the guide (Item 3) **[Figure 20-61-35]**.

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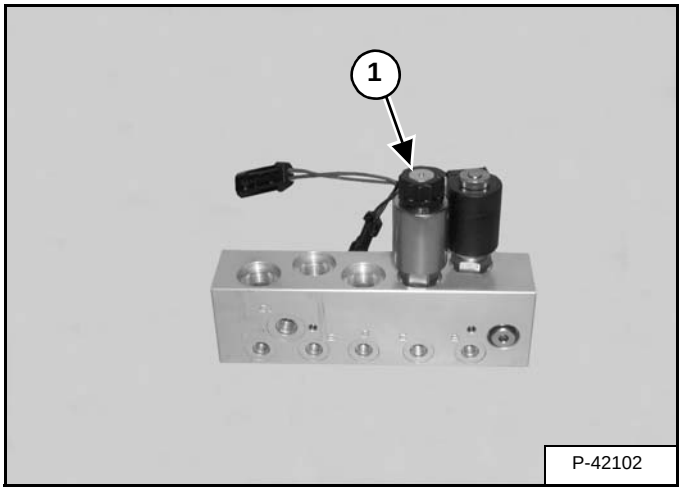
Disassembly (Cont'd)

Figure 20-61-36



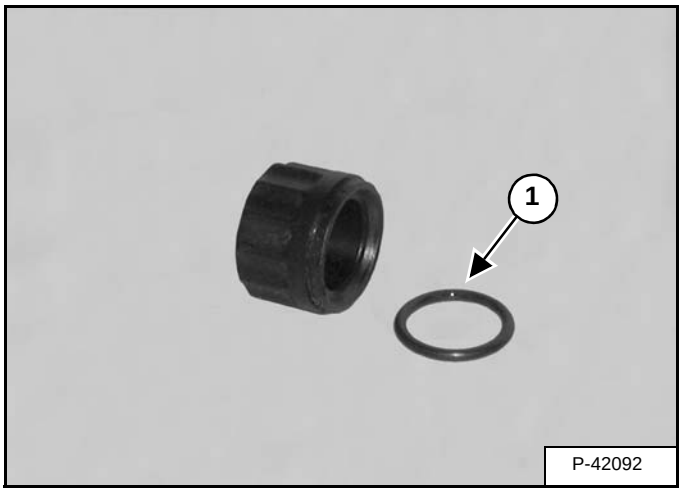
Remove the O-rings (Item 1) and backup rings (Item 2) **[Figure 20-61-36]**.

Figure 20-61-37



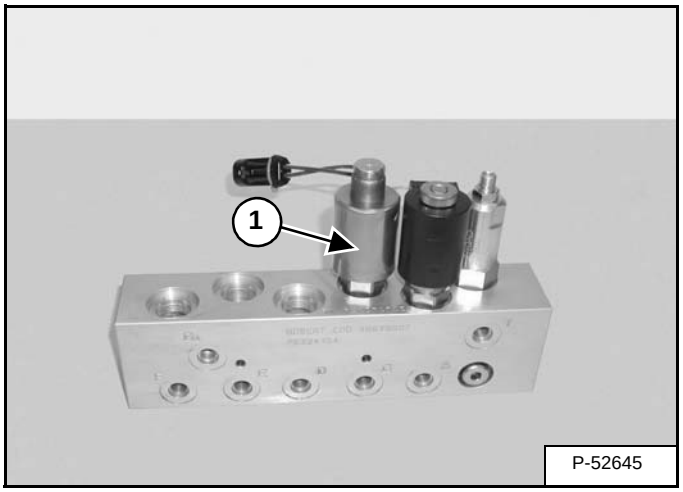
Remove the nut (Item 1) **[Figure 20-61-37]** from the spool.

Figure 20-61-38



Remove the O-ring (Item 1) **[Figure 20-61-38]** from the nut.

Figure 20-61-39

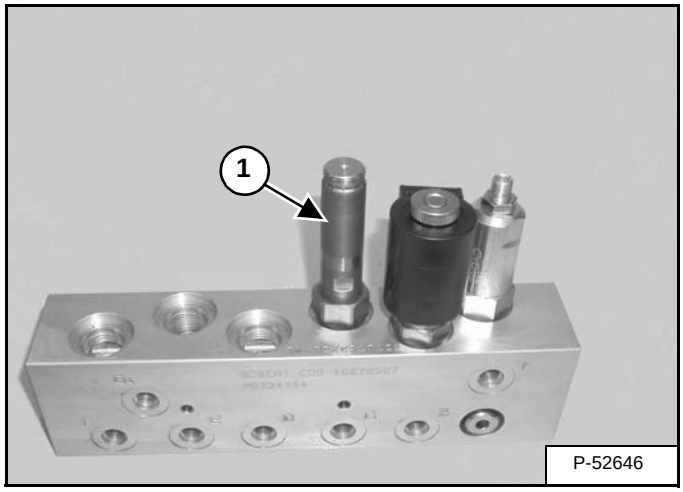


Remove the coil (Item 1) **[Figure 20-61-39]** with the orange cable tie.

https://www.pdfmanual4trucks.com/

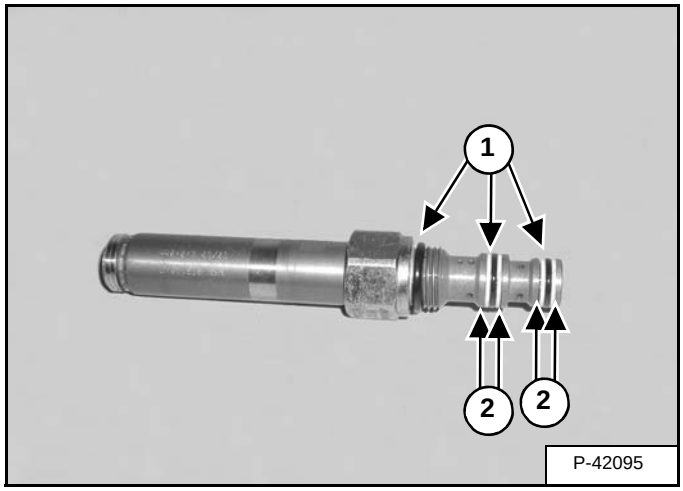
Disassembly (Cont'd)

Figure 20-61-40



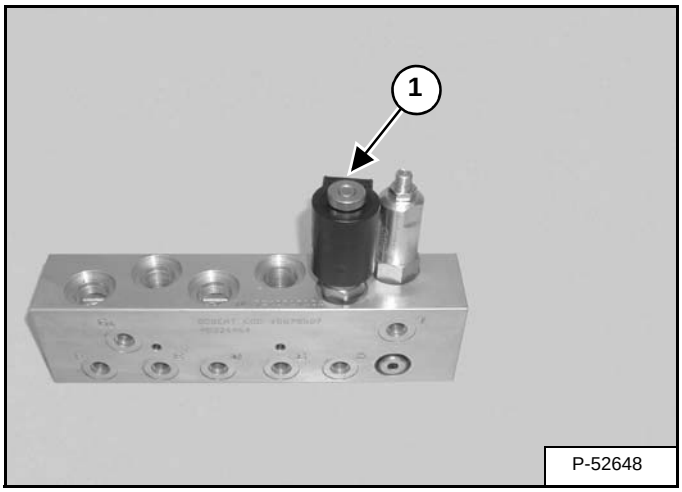
Remove the spool (Item 1) **[Figure 20-61-40]**.

Figure 20-61-41



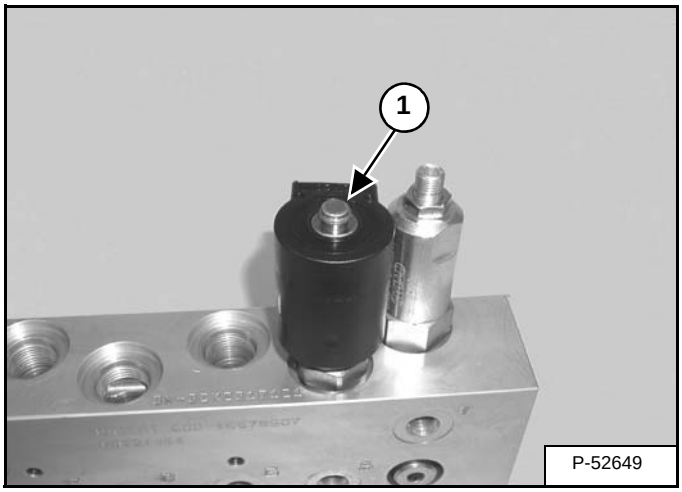
Remove the O-rings (Item 1) and backup rings (Item 2) **[Figure 20-61-41]** from the spool assembly.

Figure 20-61-42



Remove the nut (Item 1) **[Figure 20-61-42]** from the spool assembly.

Figure 20-61-43

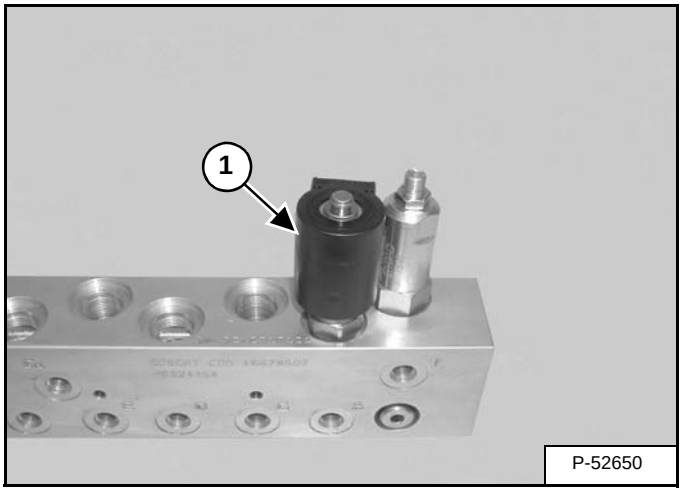


Remove the O-ring (Item 1) **[Figure 20-61-43]**.

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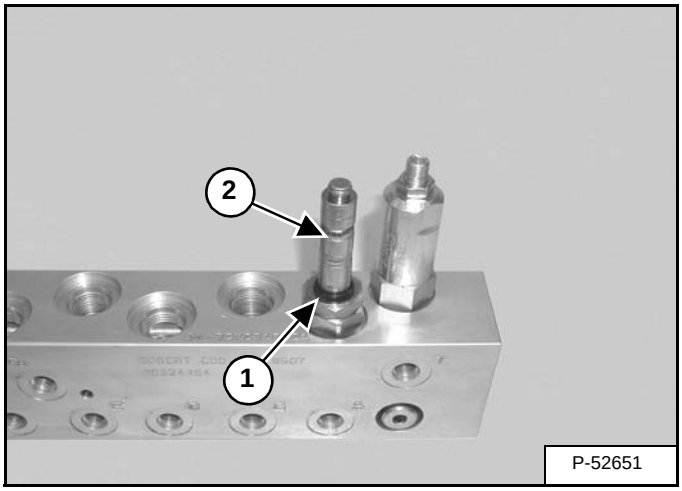
Disassembly (Cont'd)

Figure 20-61-44



Remove the coil (Item 1) **[Figure 20-61-44]** with the green cable tie.

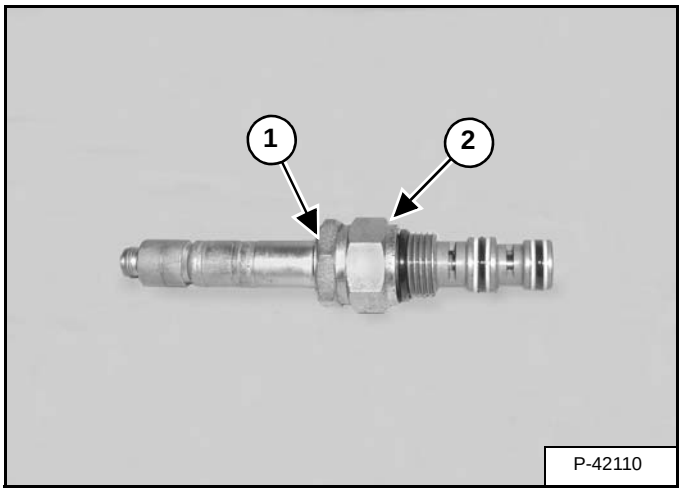
Figure 20-61-45



Remove the O-ring (Item 1) **[Figure 20-61-45]**.

Remove the spool (Item 2) **[Figure 20-61-45]**.

Figure 20-61-46

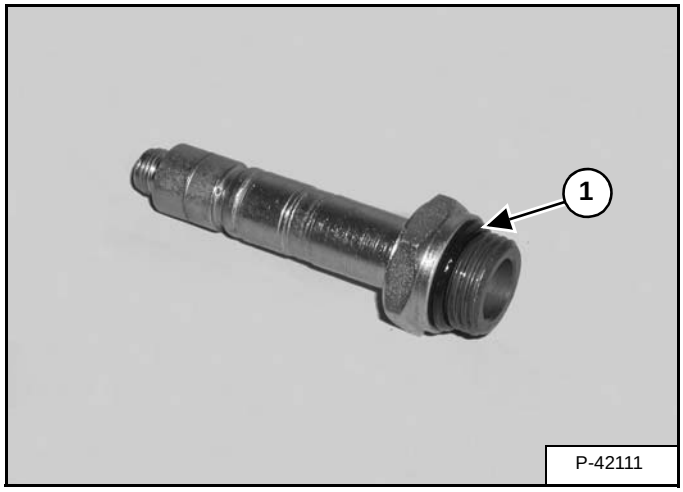


Remove the spool (Item 1) from the port adapter (Item 2) **[Figure 20-61-46]**.

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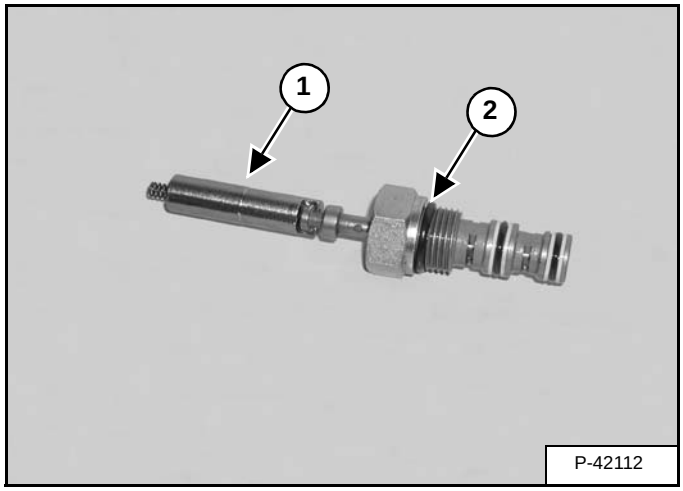
Disassembly (Cont'd)

Figure 20-61-47



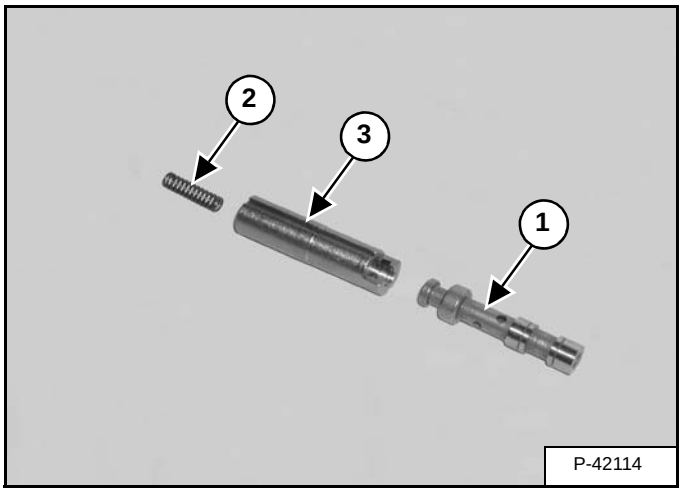
Remove the O-ring (Item 1) **[Figure 20-61-47]** from the spool.

Figure 20-61-48



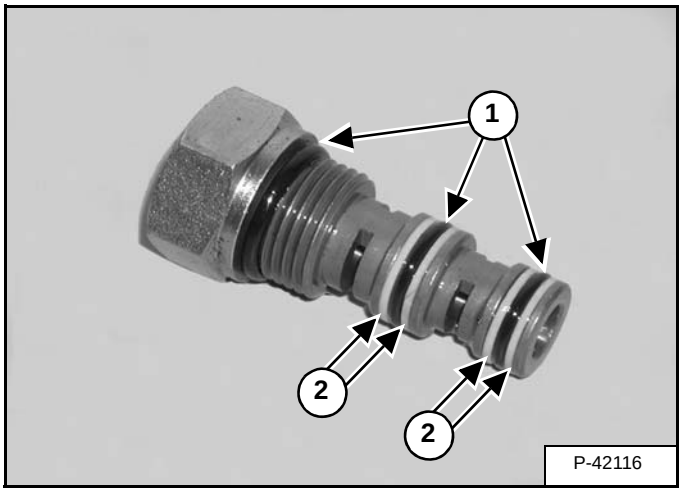
Remove the actuator assembly (Item 1) from the port adapter (Item 2) **[Figure 20-61-48]**.

Figure 20-61-49



Remove the actuator (Item 1) and spring (Item 2) from the guide (Item 3) **[Figure 20-61-49]**.

Figure 20-61-50

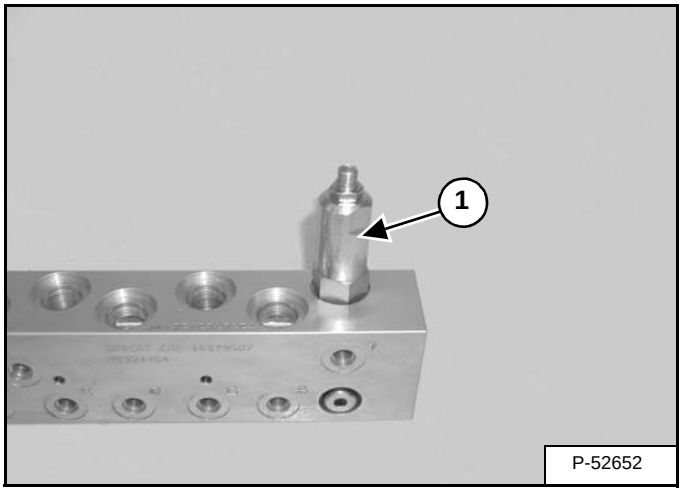


Remove the O-rings (Item 1) and backup rings (Item 2) **[Figure 20-61-50]**.

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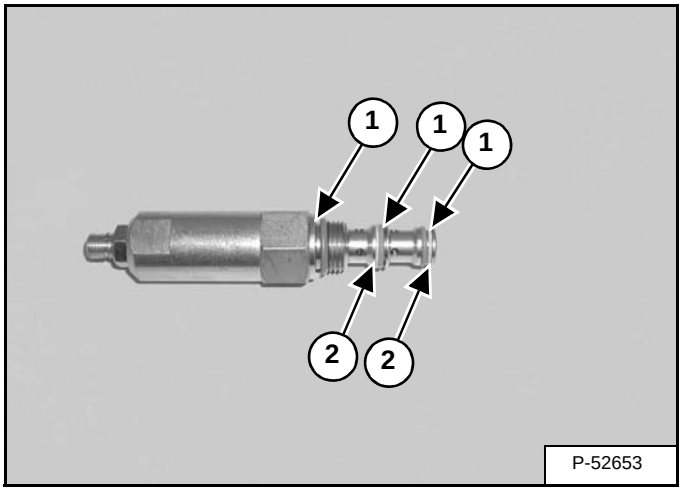
Disassembly (Cont'd)

Figure 20-61-51



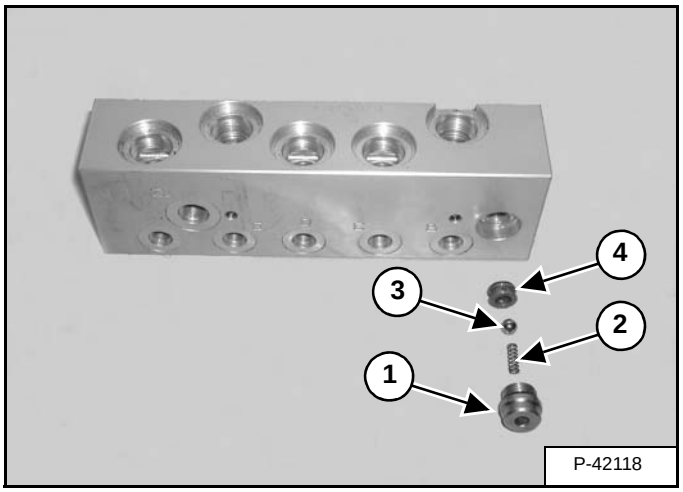
Remove the pressure reducing valve (Item 1) **[Figure 20-61-51]**.

Figure 20-61-52



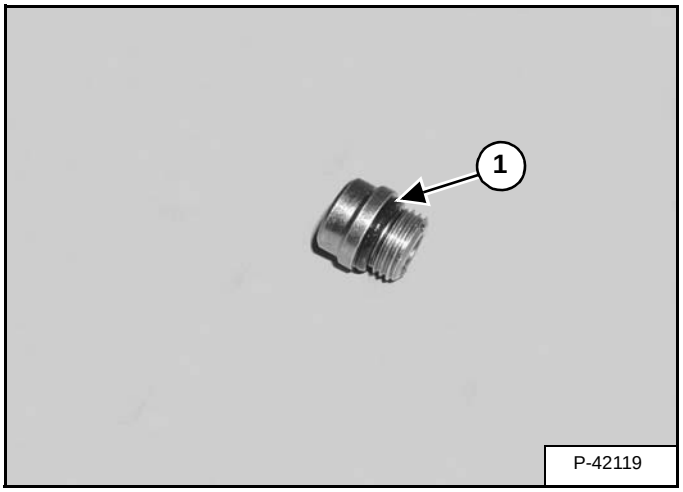
Remove the O-rings (Item 1) and back up rings (Item 2) **[Figure 20-61-52]**.

Figure 20-61-53



Remove the plug (Item 1), spring (Item 2), ball (Item 3) and poppet (Item 4) **[Figure 20-61-53]**.

Figure 20-61-54

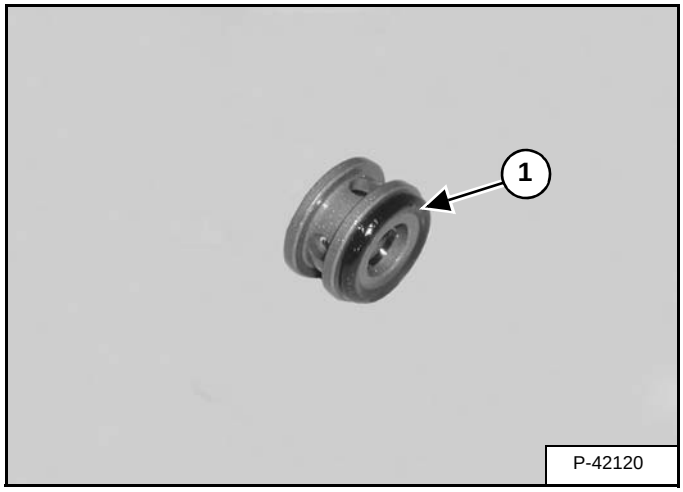


Remove the O-ring (Item 1) **[Figure 20-61-54]** from the plug.

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Disassembly (Cont'd)

Figure 20-61-55



Remove the O-ring (Item 1) **[Figure 20-61-55]** from the poppet.

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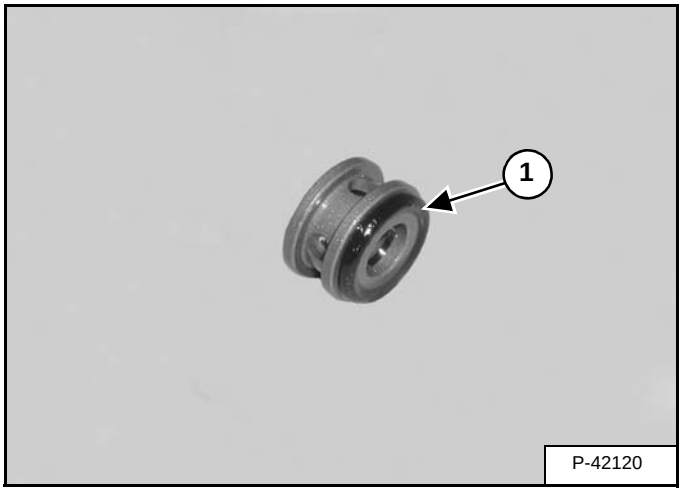
Assembly

Clean all parts in solvent and dry with compressed air.

Replace any worn or damaged parts. Always use new O-rings and backup rings.

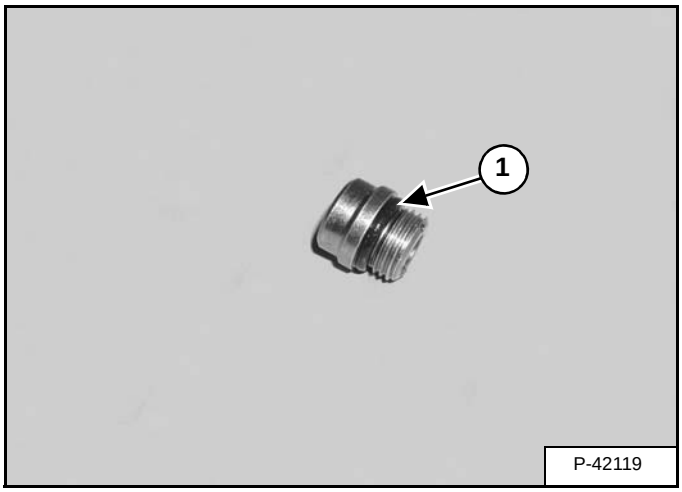
Apply clean hydraulic fluid to the O-rings and backup rings during installation.

Figure 20-61-56



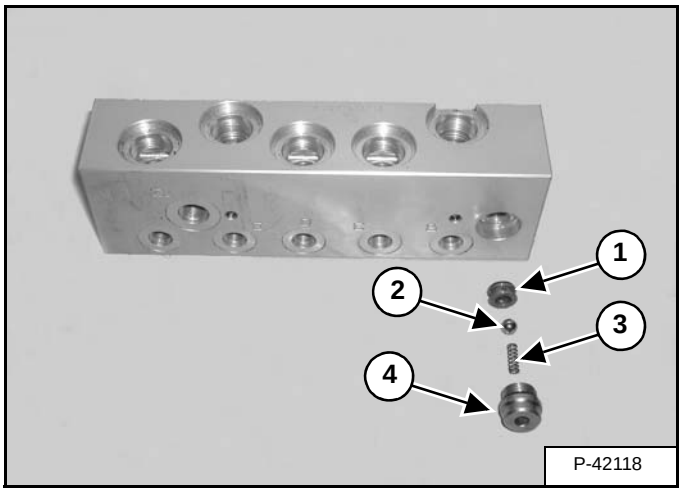
Install the O-ring (Item 1) **[Figure 20-61-56]** on the poppet.

Figure 20-61-57



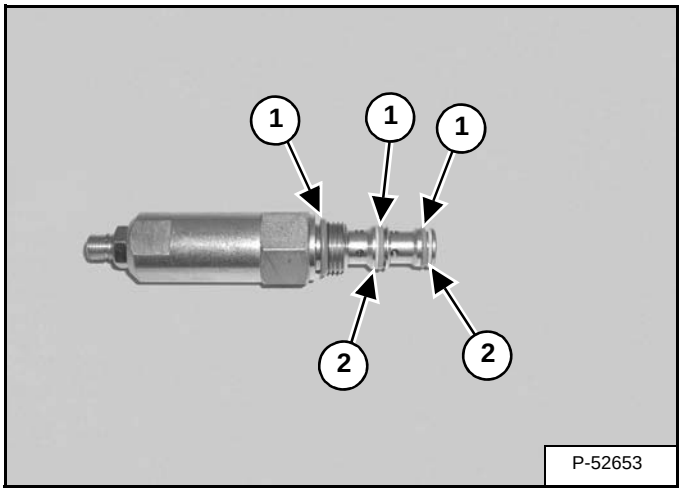
Install the O-ring (Item 1) **[Figure 20-61-57]** on the plug.

Figure 20-61-58



Install the poppet (Item 1), ball (Item 2), spring (Item 3), and plug (Item 4) **[Figure 20-61-58]** in the housing.

Figure 20-61-59

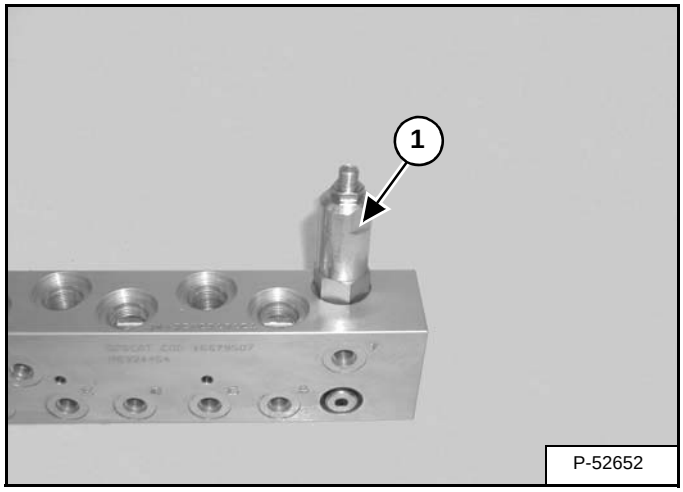


Install the O-rings (Item 1) and back up rings (Item 2) **[Figure 20-61-59]** on the pressure reducing valve.

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Assembly (Cont'd)

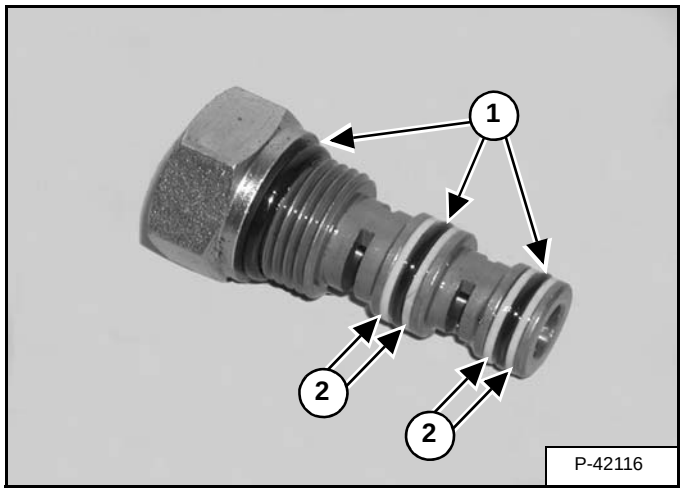
Figure 20-61-60



Install the pressure reducing valve (Item 1) **[Figure 20-61-60]**.

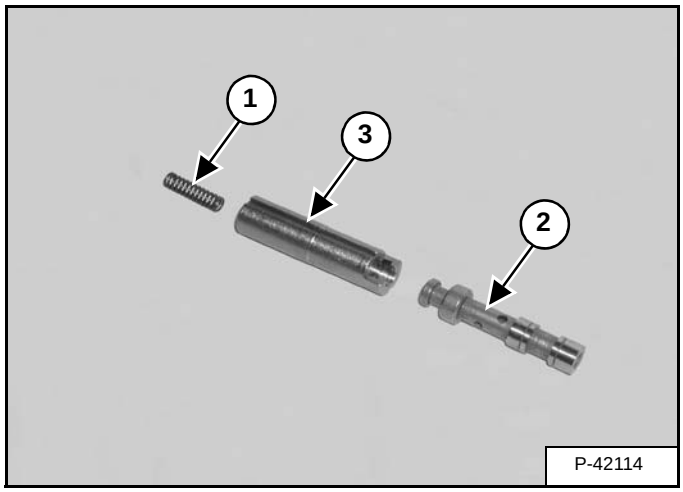
Tighten the pressure reducing valve to 22 ft.-lb. (30 N•m) torque.

Figure 20-61-61



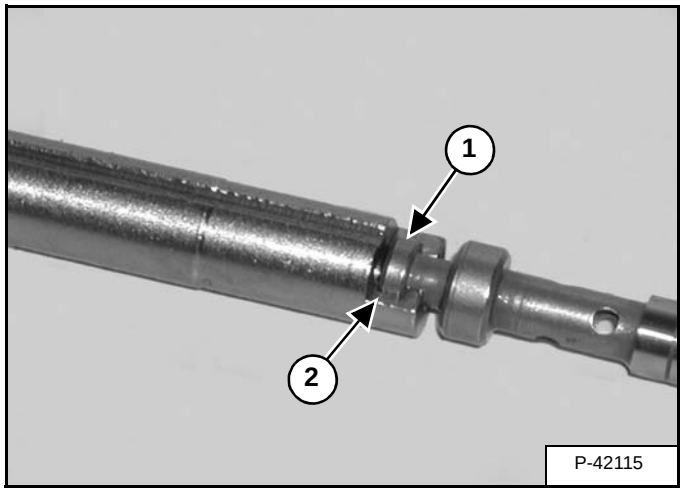
Install the O-rings (Item 1) and backup rings (Item 2) **[Figure 20-61-61]** on the port adapter.

Figure 20-61-62



Install the spring (Item 1) and actuator (Item 2) in the guide (Item 3) **[Figure 20-61-62]**.

Figure 20-61-63

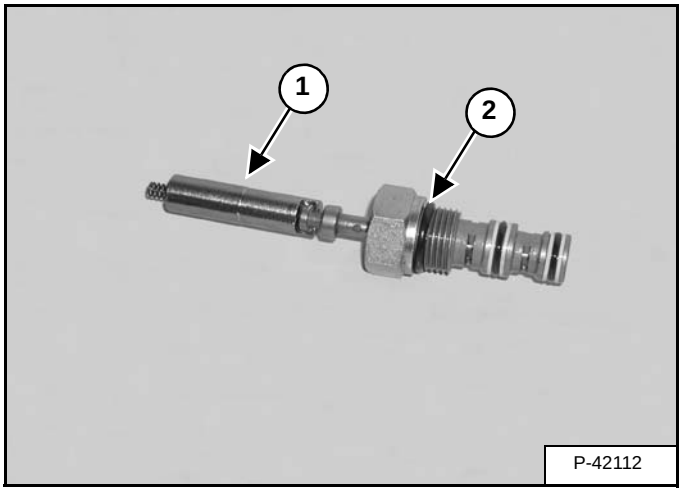


Install the end of the actuator (Item 1) into the groove in the guide (Item 2) **[Figure 20-61-63]**.

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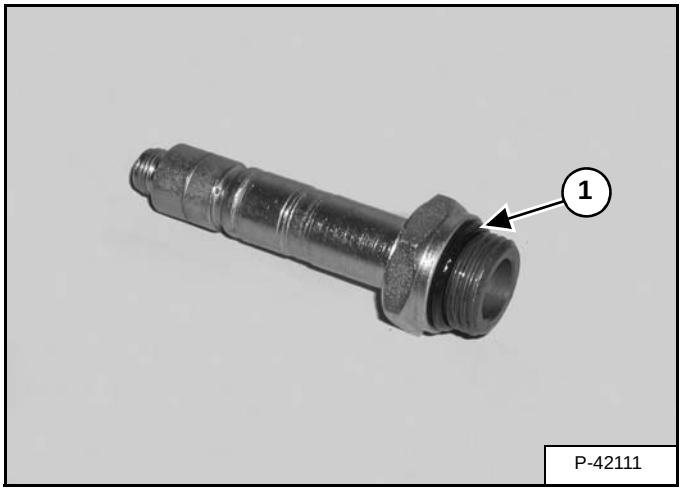
Assembly (Cont'd)

Figure 20-61-64



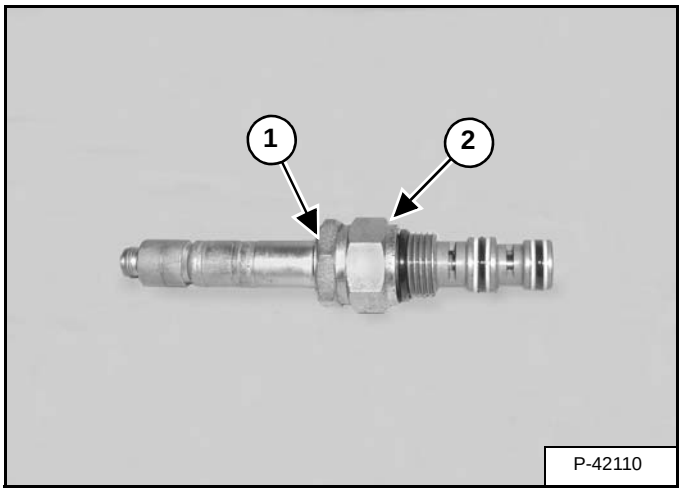
Install the actuator assembly (Item 1) into the port adapter (Item 2) **[Figure 20-61-64]**.

Figure 20-61-65



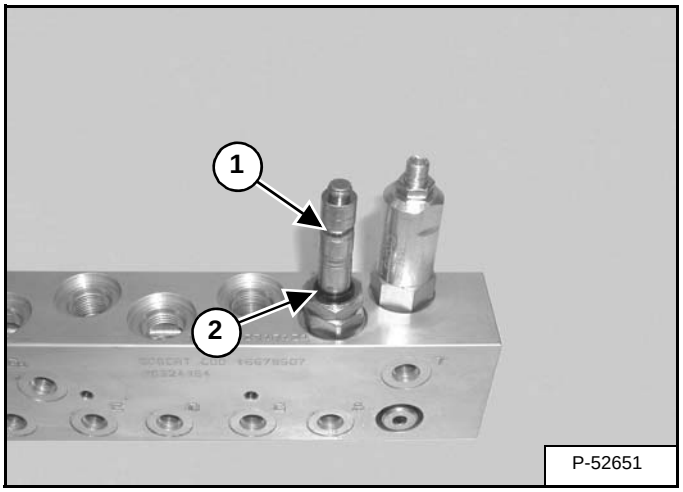
Install the O-ring (Item 1) **[Figure 20-61-65]**.

Figure 20-61-66



Install the spool (Item 1) in the port adapter (Item 2) **[Figure 20-61-66]**.

Figure 20-61-67



Install the spool assembly (Item 1) **[Figure 20-61-67]**.

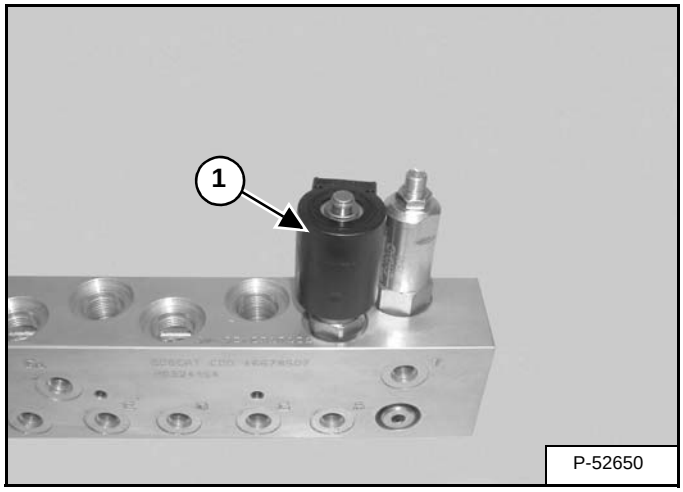
Tighten the spool to 22 ft.-lb. (30 N•m) torque.

Install the O-ring (Item 2) **[Figure 20-61-67]**.

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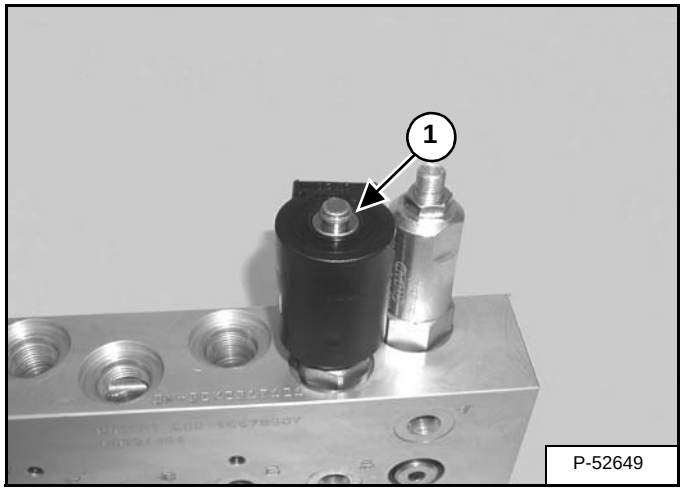
Assembly (Cont'd)

Figure 20-61-68



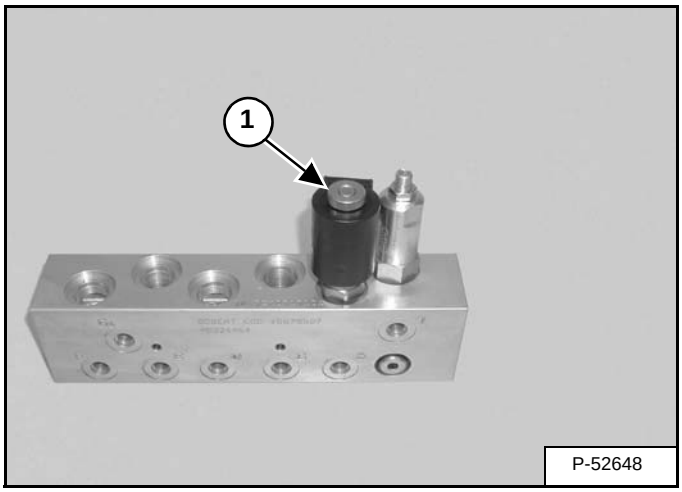
Install the coil with the green cable tie (Item 1) **[Figure 20-61-68]**.

Figure 20-61-69



Install the O-ring (Item 1) **[Figure 20-61-69]**.

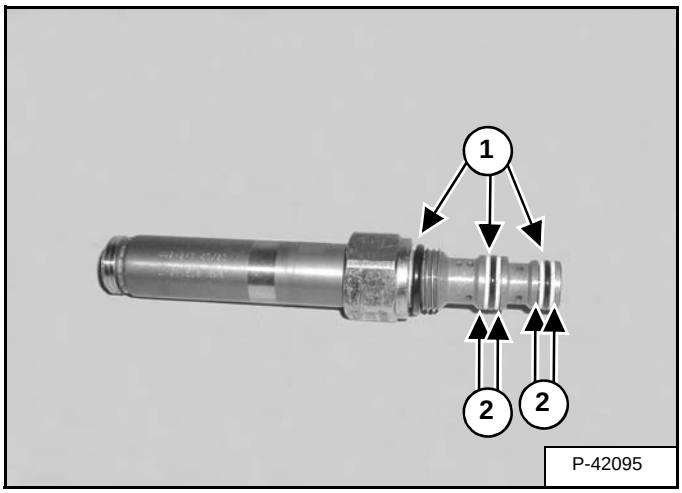
Figure 20-61-70



Install the nut (Item 1) **[Figure 20-61-70]**.

Tighten the nut to 53 in.-lb. (6 N•m) torque.

Figure 20-61-71

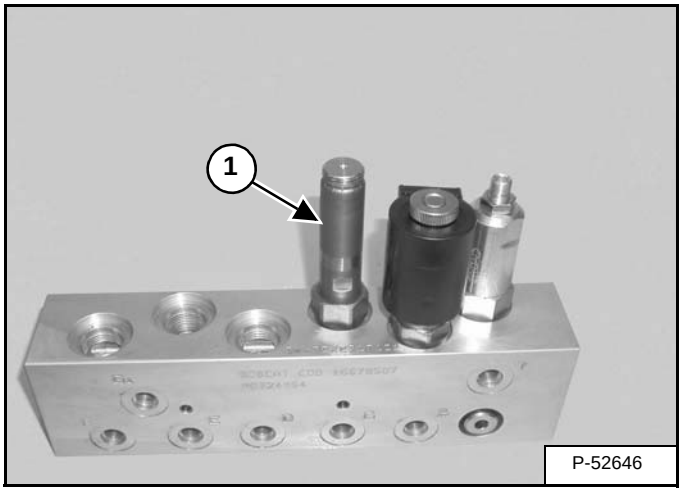


Install the O-rings (Item 1) and backup rings (Item 2) **[Figure 20-61-71]** on the spool.

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Assembly (Cont'd)

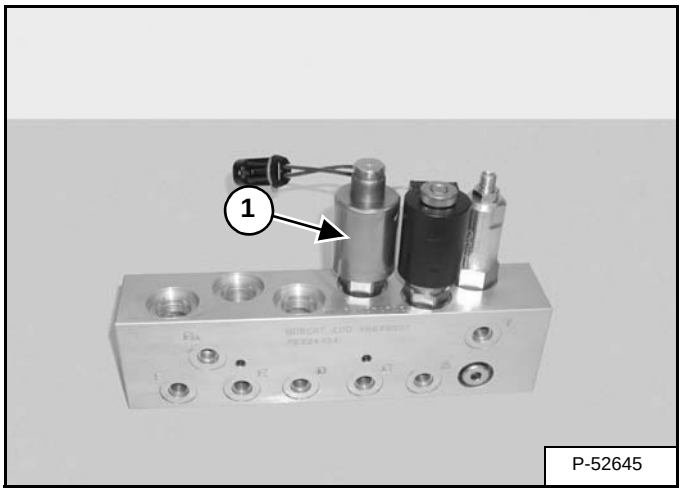
Figure 20-61-72



Install the spool (Item 1) **[Figure 20-61-72]**.

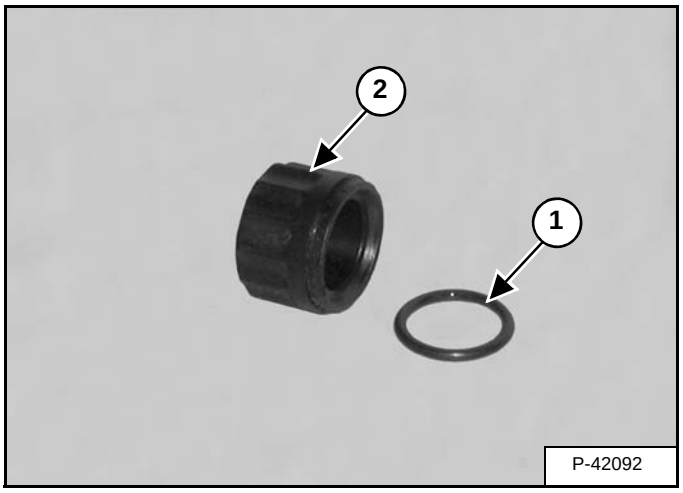
Tighten the spool to 22 ft.-lb. (30 N•m) torque.

Figure 20-61-73



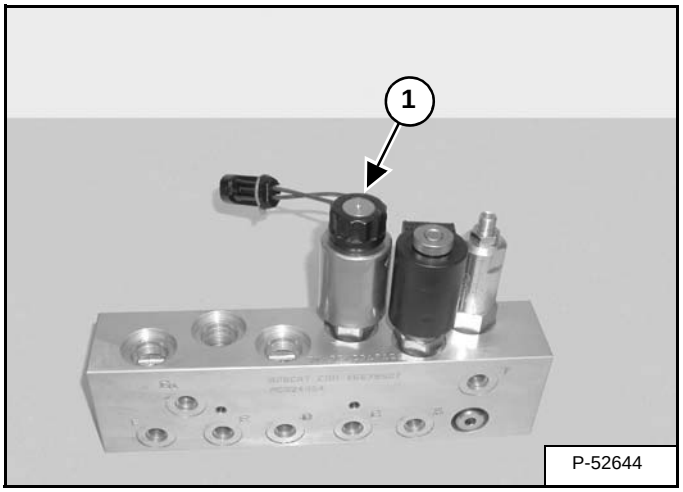
Install the coil with the orange cable tie (Item 1) **[Figure 20-61-73]**.

Figure 20-61-74



Install the O-ring (Item 1) on the nut (Item 2) **[Figure 20-61-74]**.

Figure 20-61-75



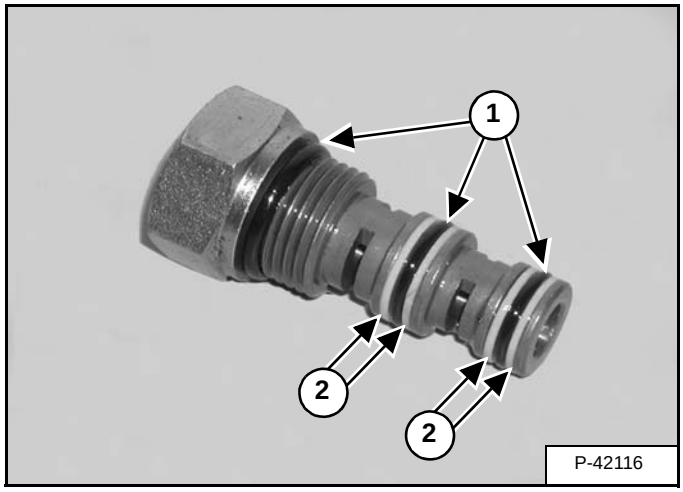
Install the nut (Item 1) **[Figure 20-61-75]** on the spool.

Tighten the nut to 53 in.-lb. (6 N•m) torque.

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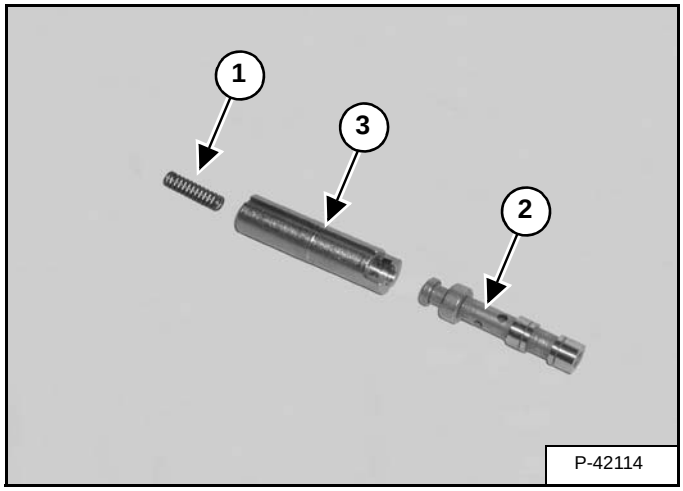
Assembly (Cont'd)

Figure 20-61-76



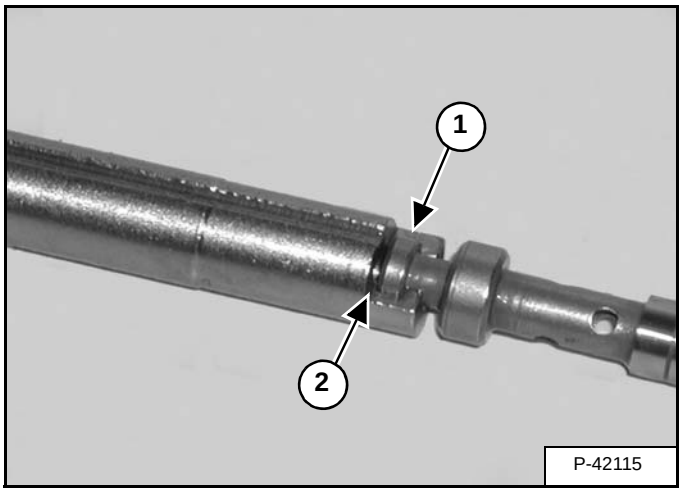
Install the O-rings (Item 1) and backup rings (Item 2) **[Figure 20-61-76]** on the port adapter.

Figure 20-61-77



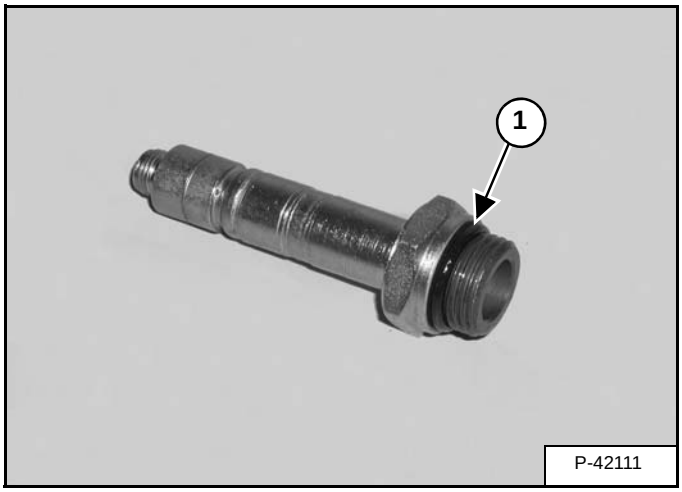
Install the spring (Item 1) and actuator (Item 2) in the guide (Item 3) **[Figure 20-61-77]**.

Figure 20-61-78



Install the end of the actuator (Item 1) into the groove in the guide (Item 2) **[Figure 20-61-78]** on the port adapter.

Figure 20-61-79



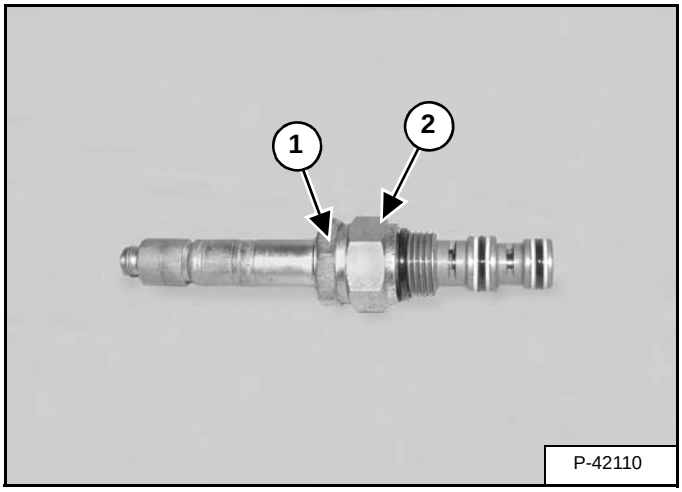
Install the O-ring (Item 1) **[Figure 20-61-79]** on the spool.

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MANIFOLD ASSEMBLY/ACCUMULATOR (S/N 563214000 & ABOVE) (CONT'D)

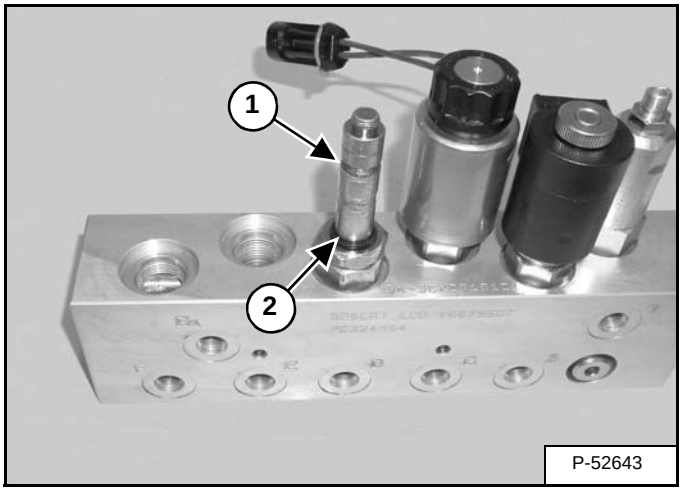
Assembly (Cont'd)

Figure 20-61-80



Install the spool (Item 1) in the port adapter (Item 2) **[Figure 20-61-80]**.

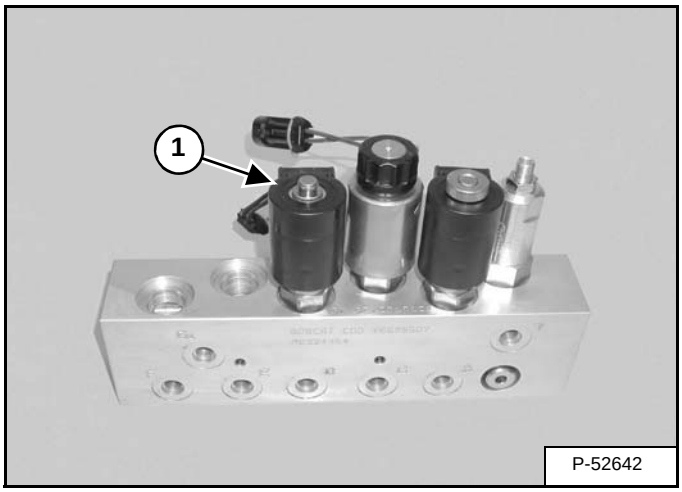
Figure 20-61-81



Install the spool (Item 1) and O-ring (Item 2) **[Figure 20-61-81]**.

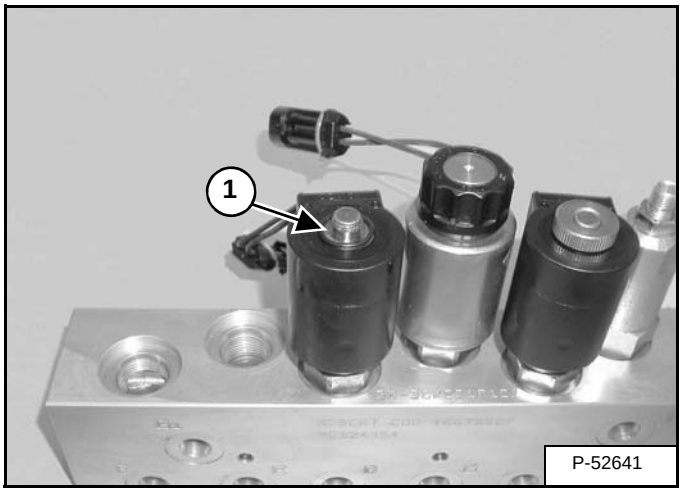
Tighten the spool to 22 ft.-lb. (30 N•m) torque.

Figure 20-61-82



Install the coil with the yellow cable tie (Item 1) **[Figure 20-61-82]**.

Figure 20-61-83



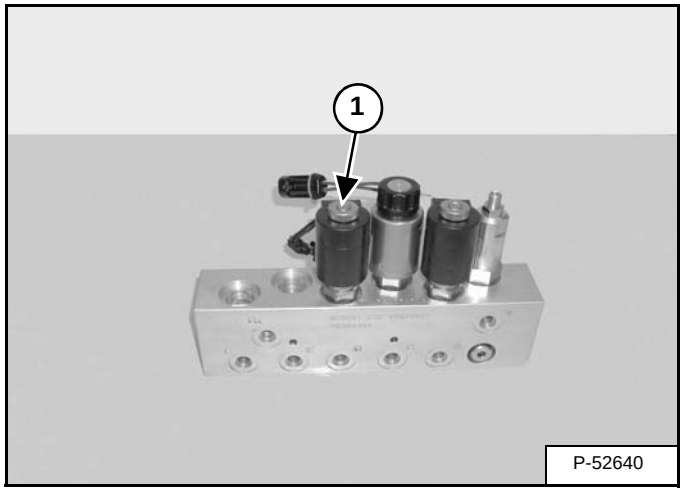
Install the O-ring (Item 1) **[Figure 20-61-83]**.

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MANIFOLD ASSEMBLY/ACCUMULATOR (S/N 563214000 & ABOVE) (CONT'D)

Assembly (Cont'd)

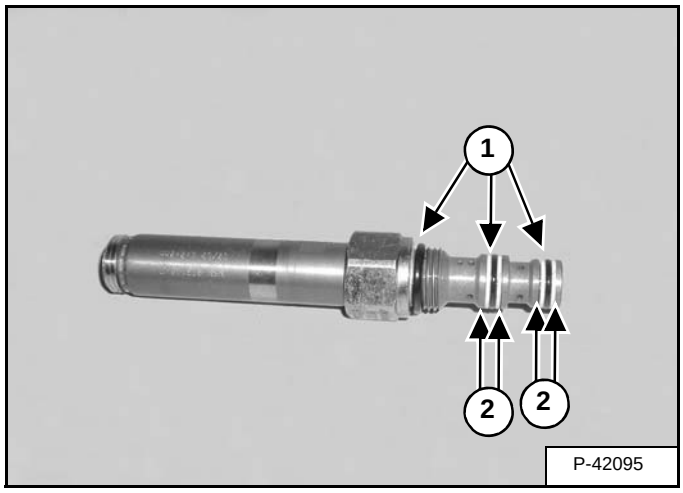
Figure 20-61-84



Install the nut (Item 1) **[Figure 20-61-84]** on the spool.

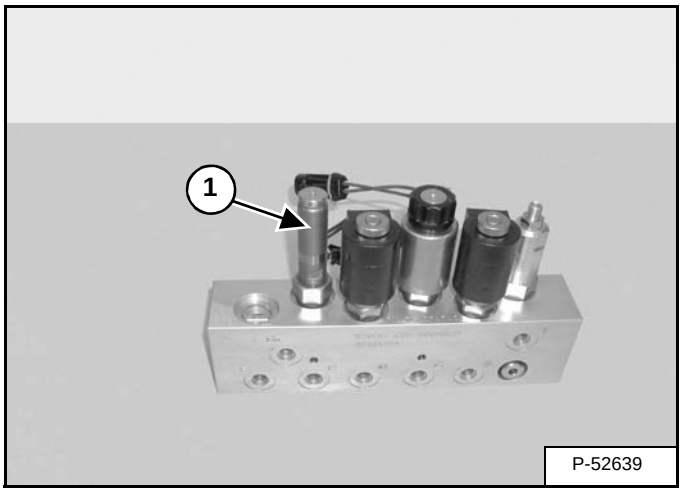
Tighten the nut to 53 in.-lb. (6 N•m) torque.

Figure 20-61-85



Install the O-rings (Item 1) and backup rings (Item 2) **[Figure 20-61-85]** on the spool.

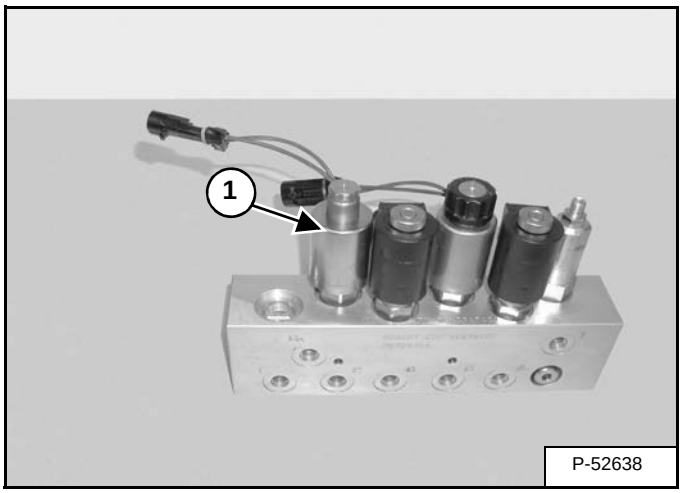
Figure 20-61-86



Install the spool (Item 1) **[Figure 20-61-86]**.

Tighten the spool to 22 ft.-lb. (30 N•m) torque.

Figure 20-61-87

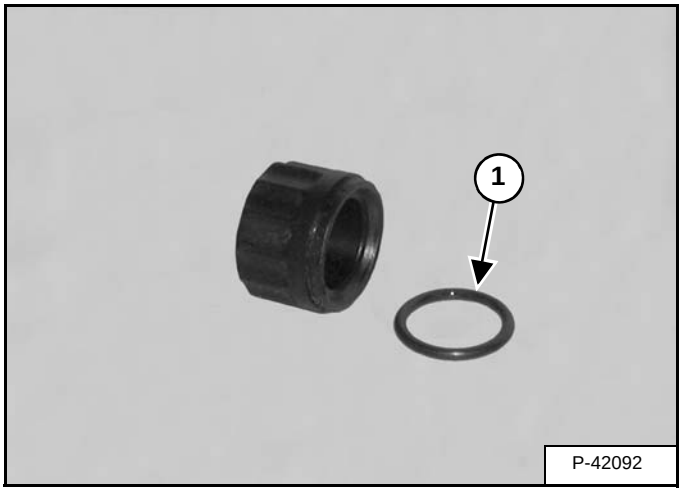


Install the coil with the blue cable tie (Item 1) **[Figure 20-61-87]** on the spool.

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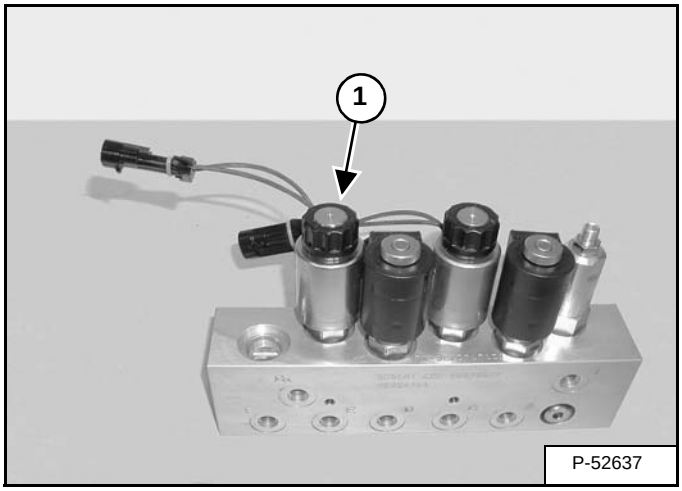
Assembly (Cont'd)

Figure 20-61-88



Install the O-ring (Item 1) **[Figure 20-61-88]** on the nut.

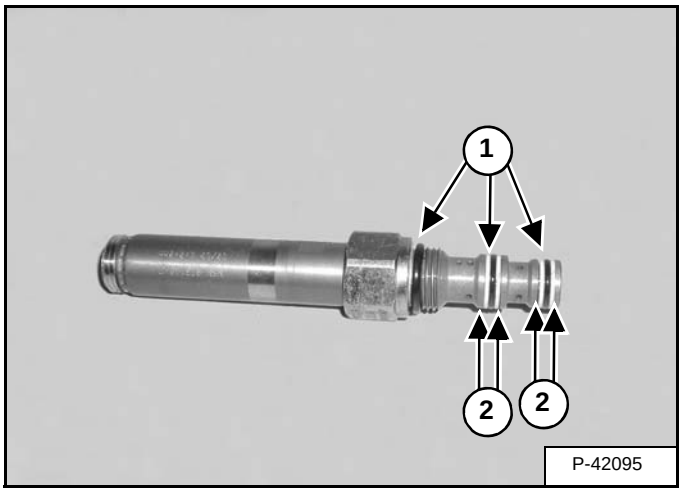
Figure 20-61-89



Install the nut **[Figure 20-61-89]** on the spool.

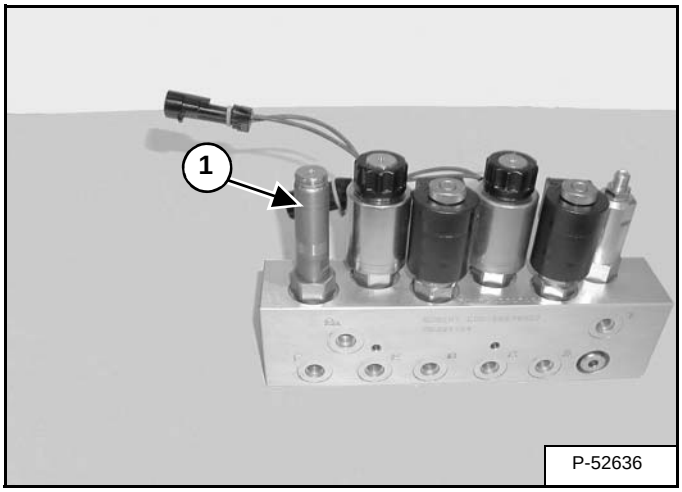
Tighten the nut to 53 in.-lb. (6 N•m) torque.

Figure 20-61-90



Install the O-rings (Item 1) and backup rings (Item 2) **[Figure 20-61-90]** on the spool.

Figure 20-61-91



Install the spool (Item 1) **[Figure 20-61-91]**.

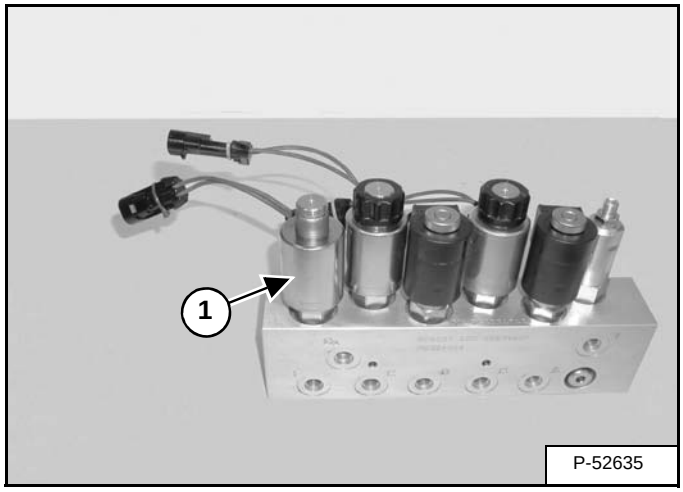
Tighten the spool to 22 ft.-lb. (30 N•m) torque.

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MANIFOLD ASSEMBLY/ACCUMULATOR (S/N 563214000 & ABOVE) (CONT'D)

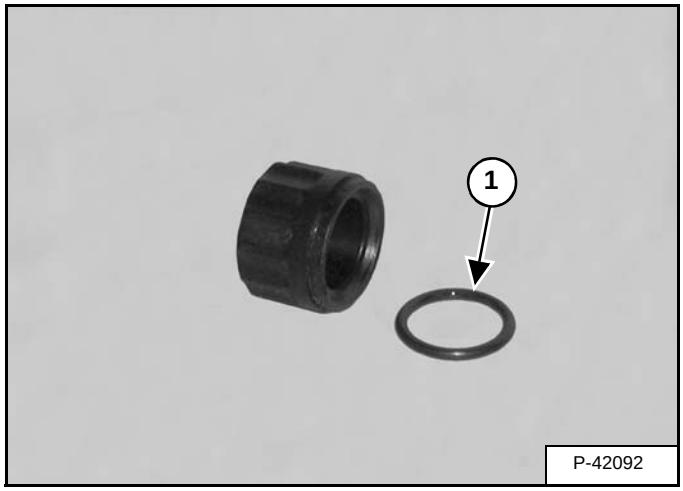
Assembly (Cont'd)

Figure 20-61-92



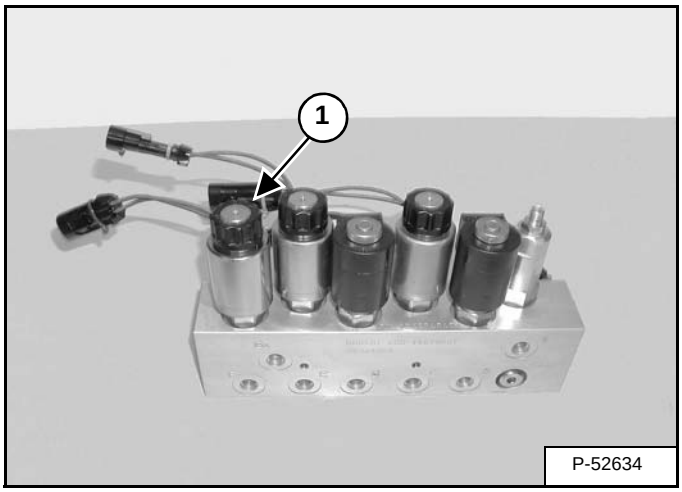
Install the coil with the red cable tie (Item 1) **[Figure 20-61-92]** on the spool.

Figure 20-61-93



Install the O-ring **[Figure 20-61-93]** on the nut.

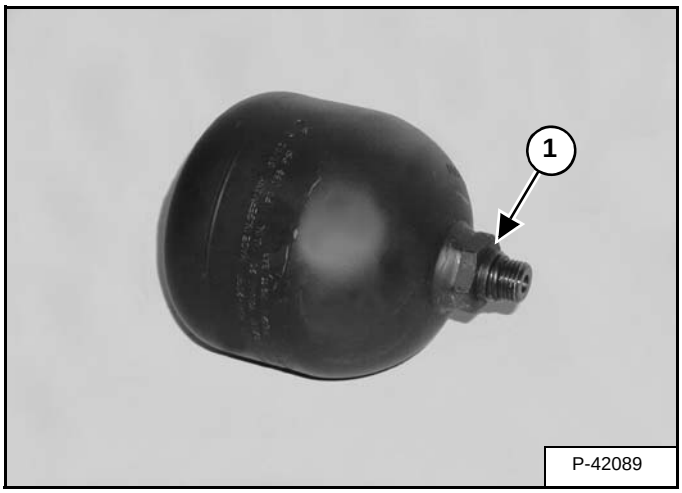
Figure 20-61-94



Install the nut (Item 1) **[Figure 20-61-94]** on the spool.

Tighten the nut to 53 in.-lb. (6 N•m) torque.

Figure 20-61-95

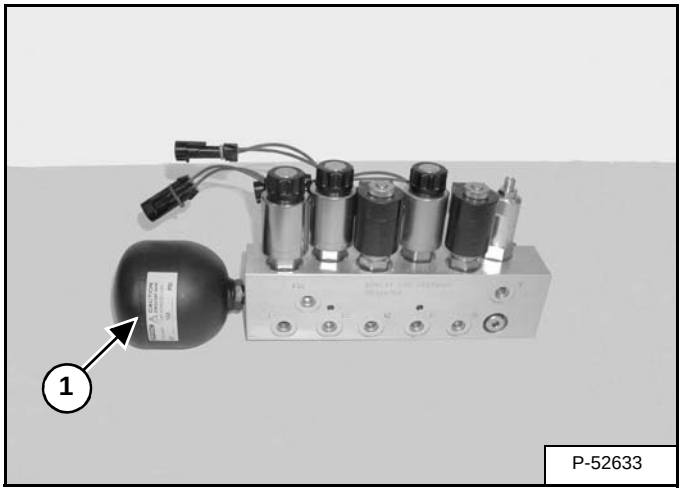


Install the O-ring (Item 1) **[Figure 20-61-95]** on the accumulator.

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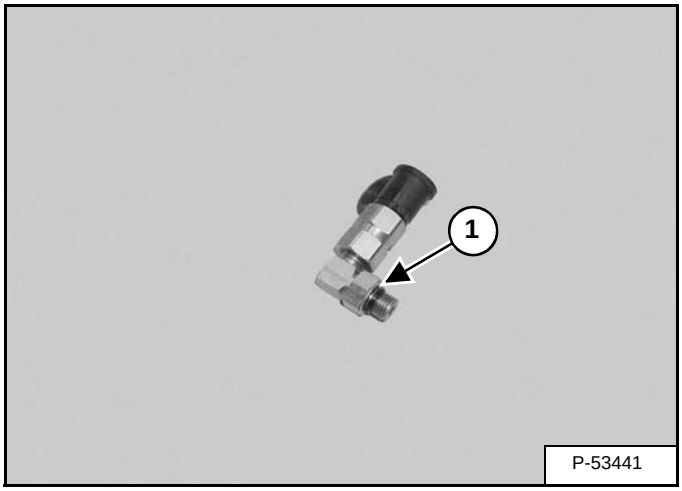
Assembly (Cont'd)

Figure 20-61-96



Install the accumulator (Item 1) **[Figure 20-61-96]**.

Figure 20-61-97



Install the O-ring (Item 1) **[Figure 20-61-97]** on the fittings (test fitting shown).

Figure 20-61-98

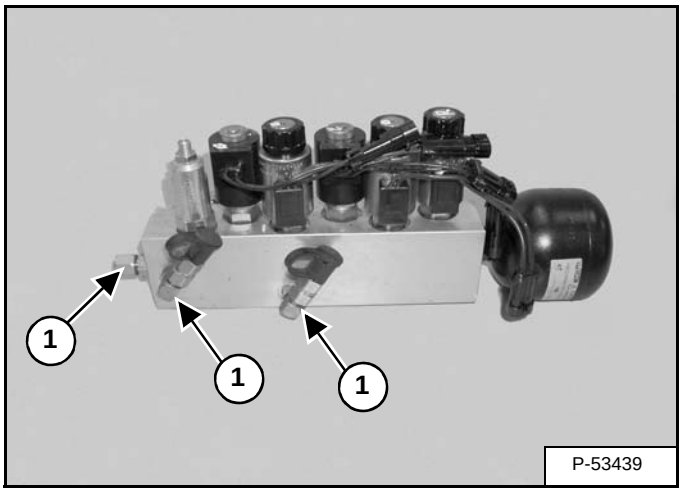
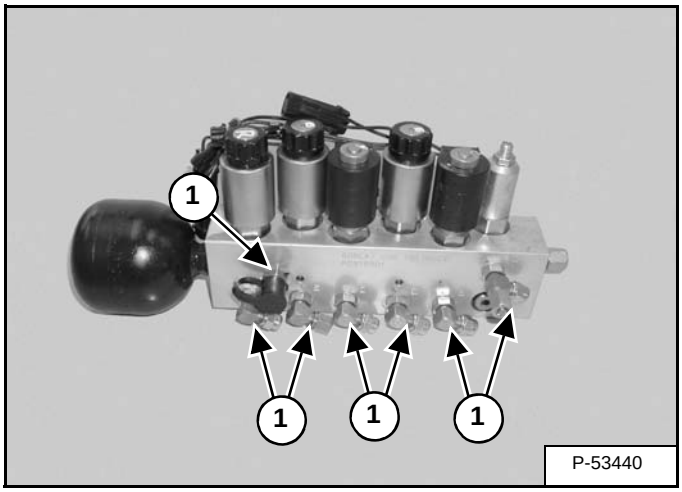


Figure 20-61-99



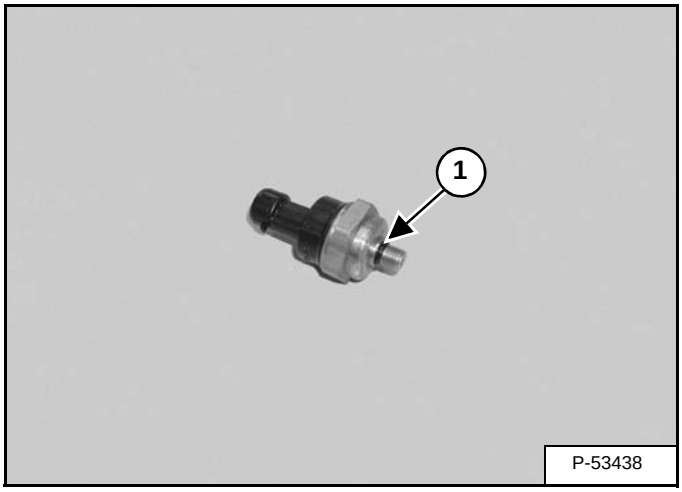
Install the fittings (Item 1) **[Figure 20-61-98]** & **[Figure 20-61-99]**.

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MANIFOLD ASSEMBLY/ACCUMULATOR (S/N 563214000 & ABOVE) (CONT'D)

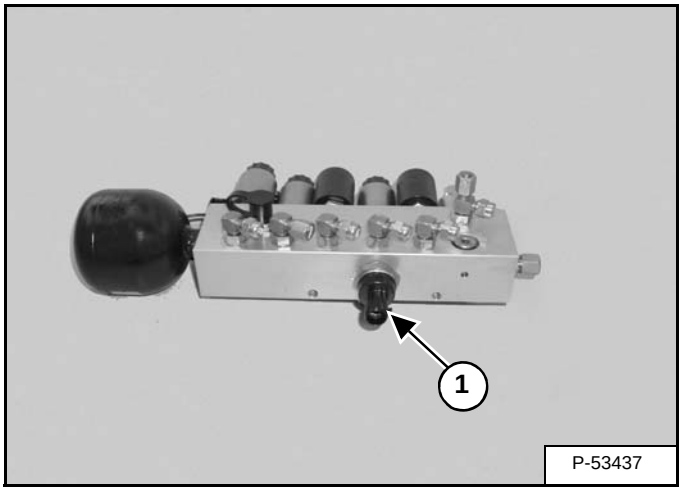
Assembly (Cont'd)

Figure 20-61-100



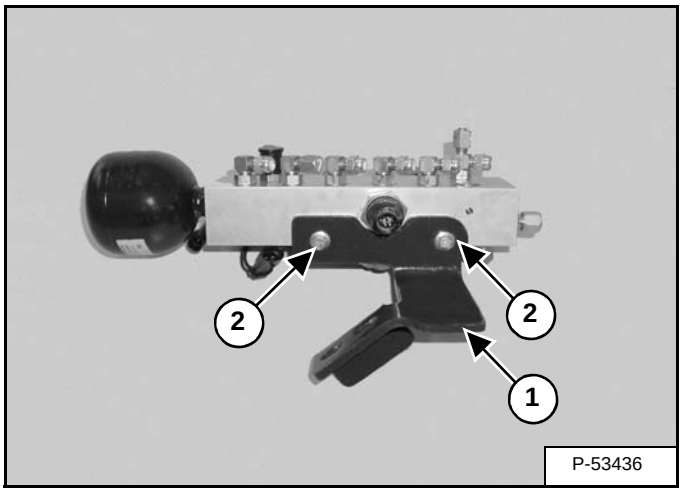
Install the O-ring (Item 1) **[Figure 20-61-100]** on the charge pressure sending unit.

Figure 20-61-101



Install the charge pressure sending unit (Item 1) **[Figure 20-61-101]**.

Figure 20-61-102



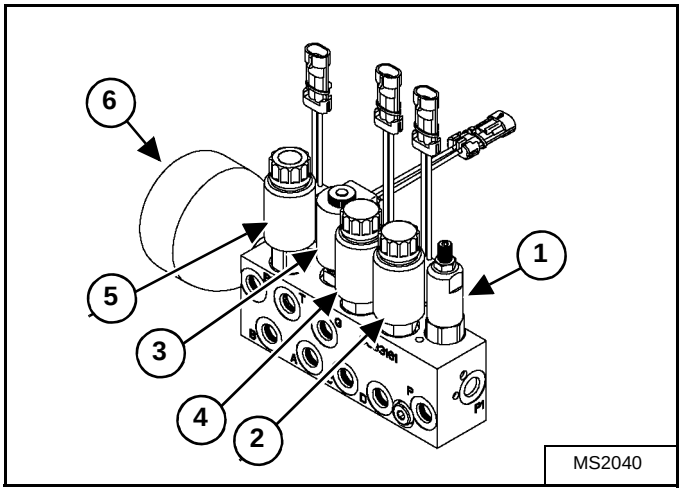
Install the mount bracket (Item 1) with the bolts (Item 2) **[Figure 20-61-102]**.

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MANIFOLD ASSEMBLY/ACCUMULATOR (S/N 563111001 - 563113999)

Description

Figure 20-62-1



The manifold assembly contains the following:

Pressure reducing valve (Item 1) **[Figure 20-62-1]**.

Work group lockout solenoid (Item 2) **[Figure 20-62-1]**.

Two speed solenoid (Item 3) **[Figure 20-62-1]**.

Directional control valve solenoid (male coupler) (Item 4) **[Figure 20-62-1]**.

Directional control valve solenoid (female coupler) (Item 5) **[Figure 20-62-1]**.

Accumulator (Item 6) **[Figure 20-62-1]**.

The manifold supplies 406 - 450 PSI (28 - 31 bar) for joystick operation.

The accumulator provides short term reserve pressure for joystick function with engine off and the key in the ON position.

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MANIFOLD ASSEMBLY/ACCUMULATOR (S/N 563111001 - 563113999) (CONT'D)

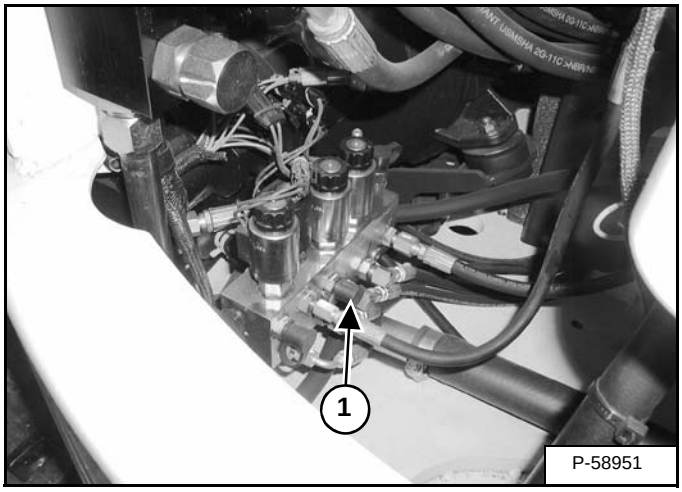
Testing Pilot Pressure

The following tools will be needed to do the procedure:
MEL 1355 - Hydraulic Test Kit

Stop the engine.

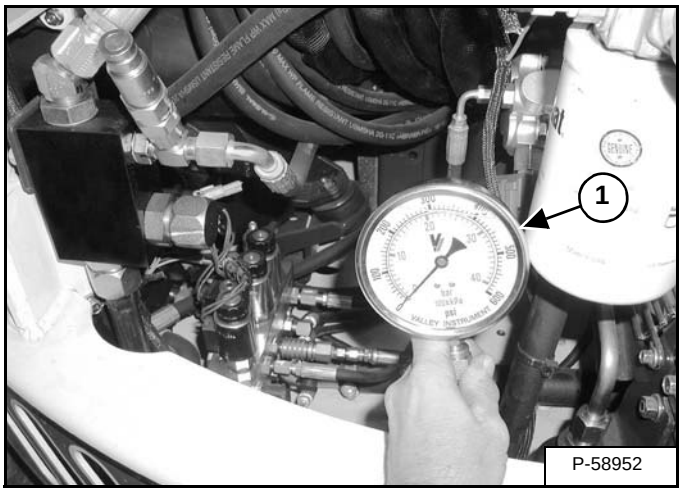
Lower the boom/bucket and blade to the ground. Open the right side cover.

Figure 20-62-2



Remove the protective cap (Item 1) **[Figure 20-62-2]** from the G diagnostic port located on the manifold assembly.

Figure 20-62-3



From the test kit, connect a 500 PSI (35 bar) gauge (Item 1) **[Figure 20-62-3]** on the diagnostic port.

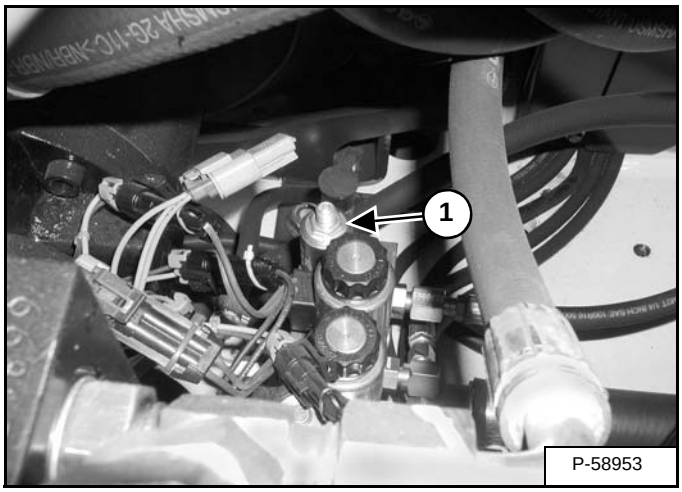
With an operator in the seat and the left console in the raised position, start the excavator and run at low idle.

Lower the left console and increase the engine speed to high idle.

Check the pressure at the gauge (Item 1) **[Figure 20-62-3]** the pressure should be as follows:

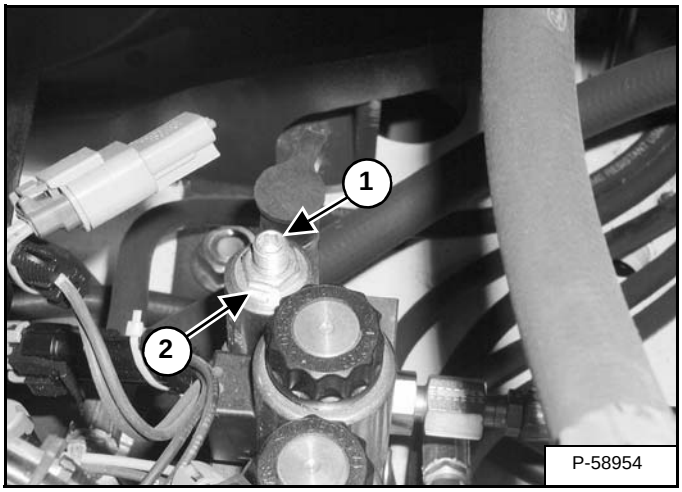
A target pressure of 435 PSI (30 bar) with an acceptable range of 406 to 450 PSI (28 to 31 bar).

Figure 20-62-4



If adjustment is needed, loosen the nut (Item 1) **[Figure 20-62-4]**.

Figure 20-62-5



Turn the adjustment screw (Item 1) **[Figure 20-62-5]** clockwise to increase the pressure or counterclockwise to decrease the pressure.

NOTE: 1/4 turn clockwise will increase pressure approximately 20 PSI (1,4 bar).

Tighten the nut (Item 2) **[Figure 20-62-5]**.

Retest the valve after adjustment.

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Removal And Installation

IMPORTANT

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

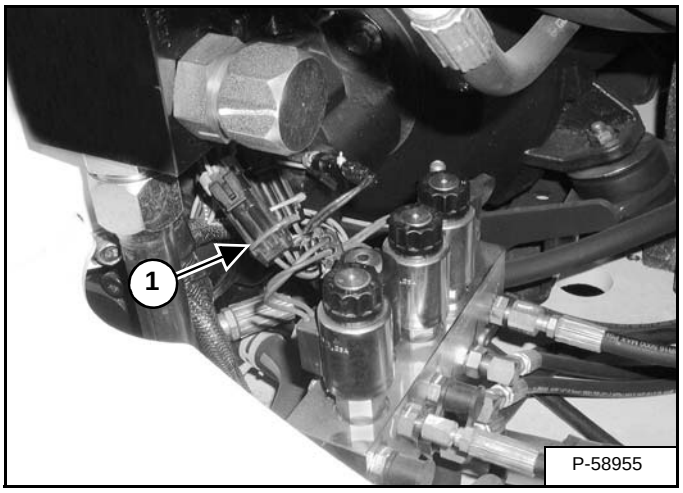
I-2003-0888

Open the right side cover.

Open the tailgate.

Mark all tubelines and hoses for proper installation.

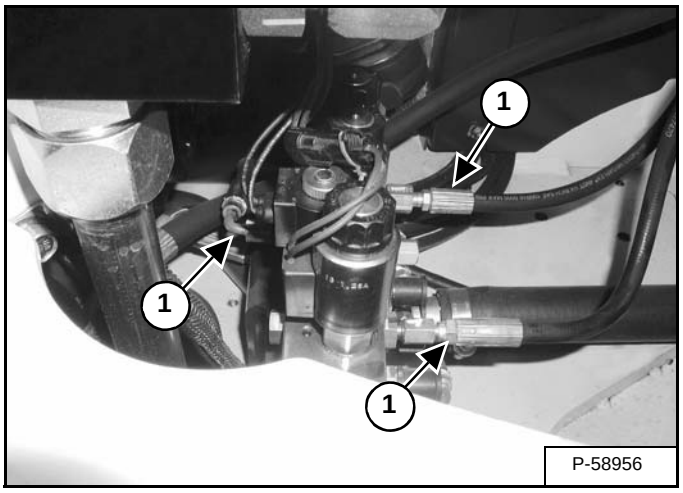
Figure 20-62-6



Disconnect the four wire harnesses (Item 1) **[Figure 20-62-6]** from the manifold assembly solenoids.

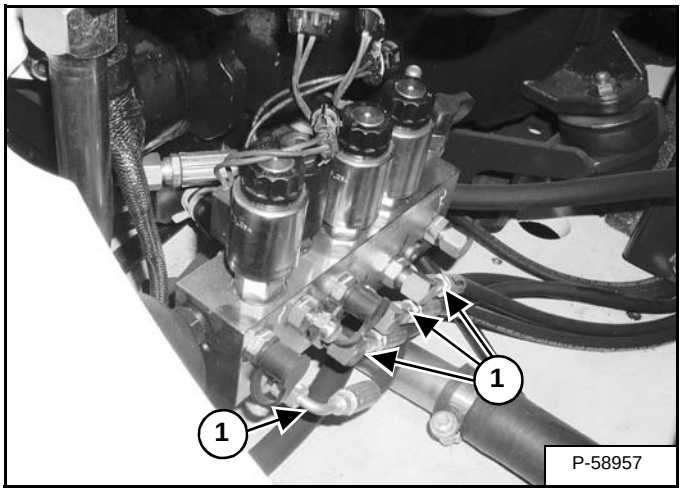
NOTE: The electrical connectors have colored cable ties for proper installation.

Figure 20-62-7



Remove the hoses (Item 1) **[Figure 20-62-7]**.

Figure 20-62-8

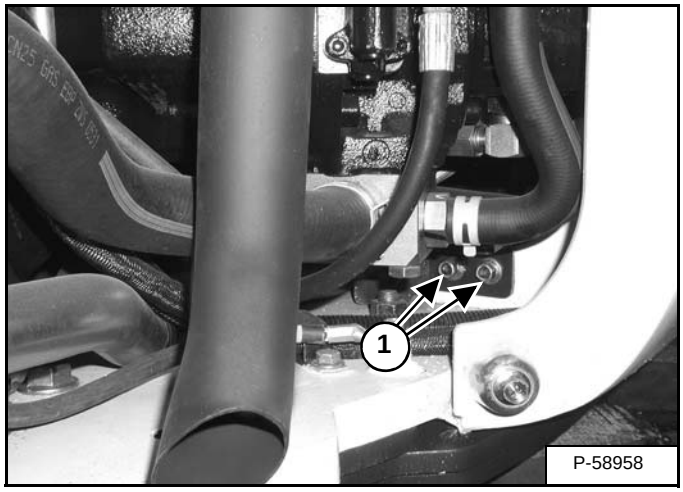


Remove the hoses (Item 1) **[Figure 20-62-8]**.

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Removal And Installation (Cont'd)

Figure 20-62-9

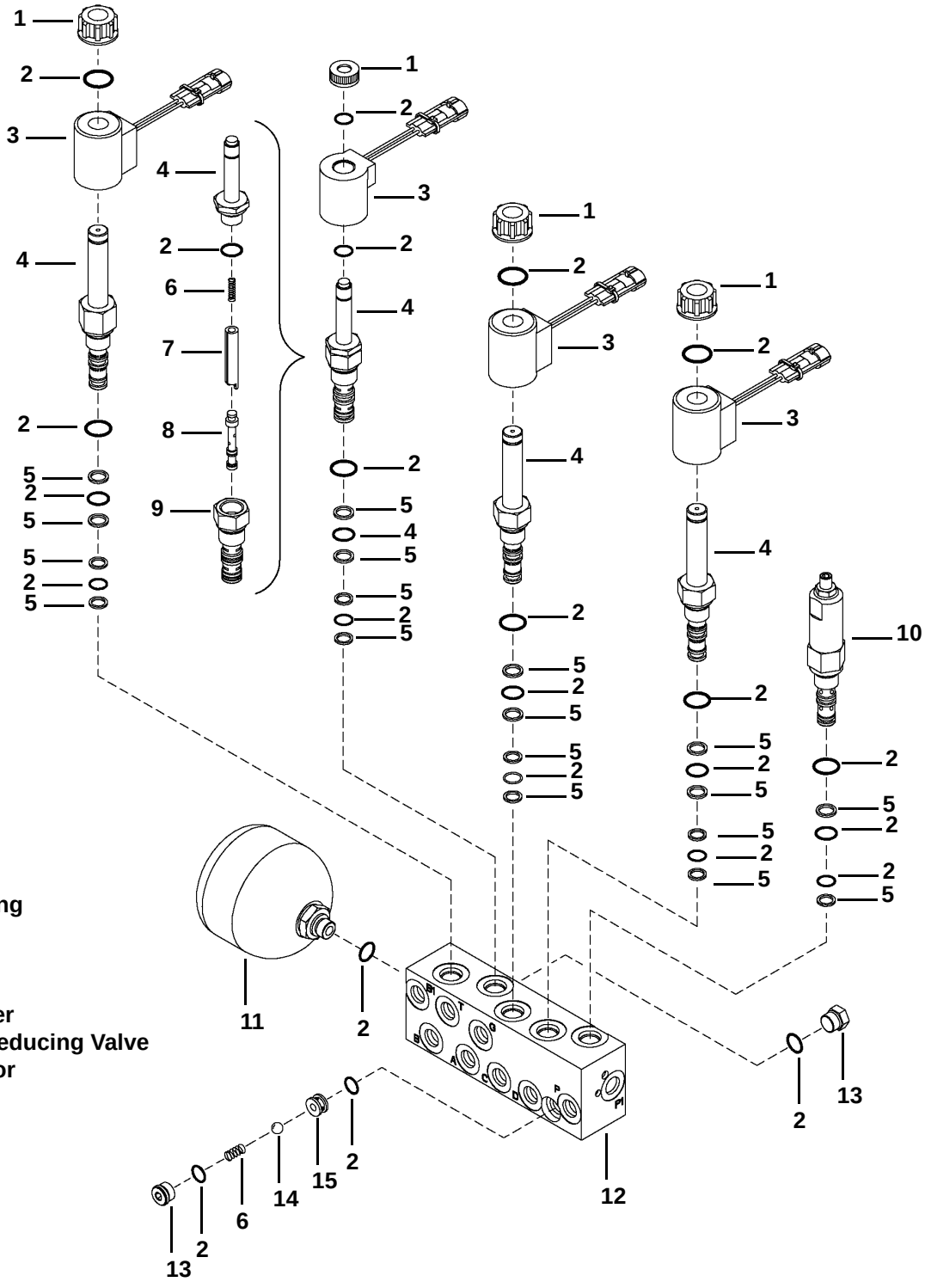


Remove the bolts (Item 1) **[Figure 20-62-9]**.

Remove the manifold assembly from the excavator.

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Parts Identification



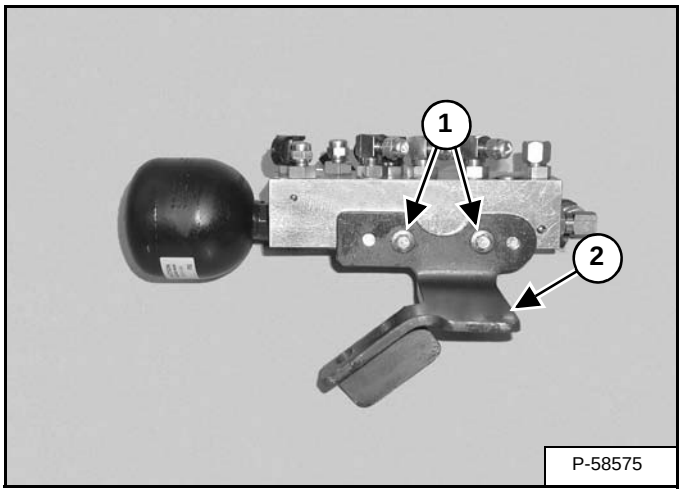
1. Nut
2. O-Ring
3. Coil
4. Spool
5. Back-up Ring
6. Spring
7. Guide
8. Actuator
9. Port Adapter
10. Pressure Reducing Valve
11. Accumulator
12. Housing
13. Plug
14. Ball
15. Poppet

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Disassembly

Clean the outside of the manifold assembly/accumulator before disassembly.

Figure 20-62-10



Remove the bolts (Item 1) **[Figure 20-62-10]** from the mount.

Remove the mount bracket (Item 2) **[Figure 20-62-10]**.

Figure 20-62-11

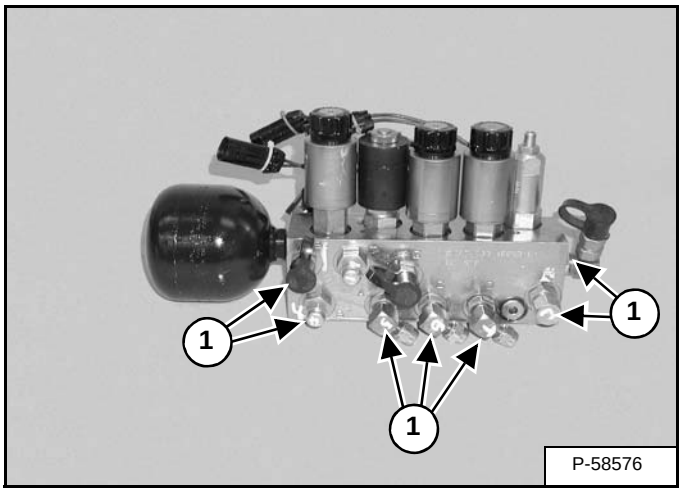
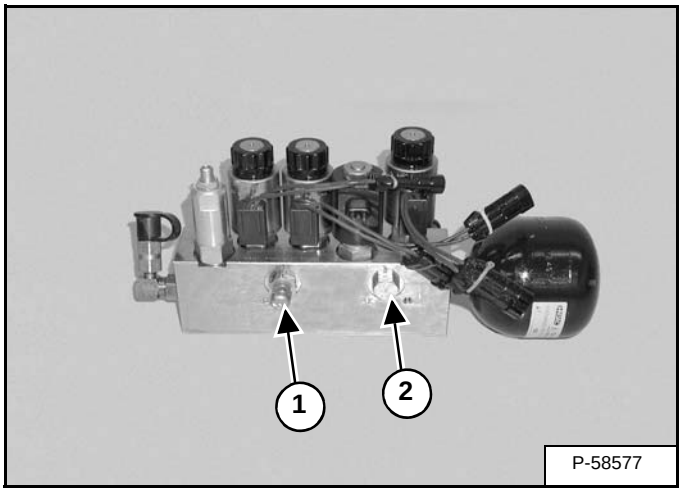


Figure 20-62-12

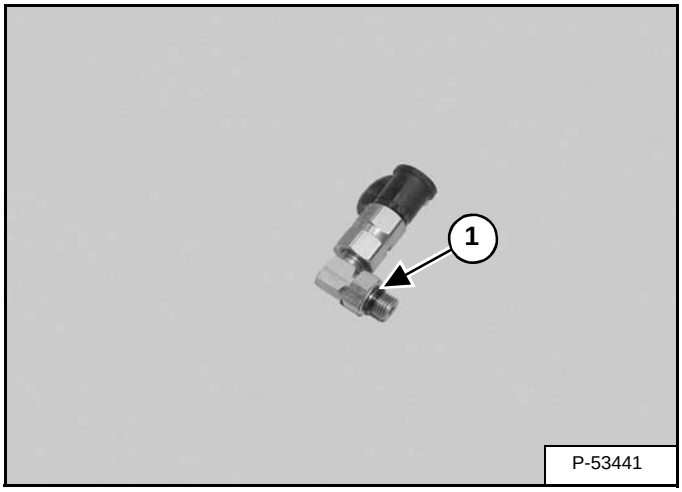


Remove the fittings (Item 1) and plug (Item 2) **[Figure 20-62-11]** & **[Figure 20-62-12]**.

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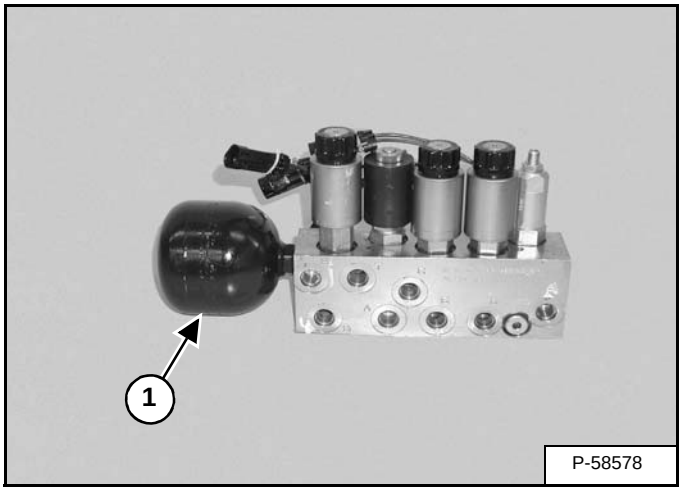
Disassembly (Cont'd)

Figure 20-62-13



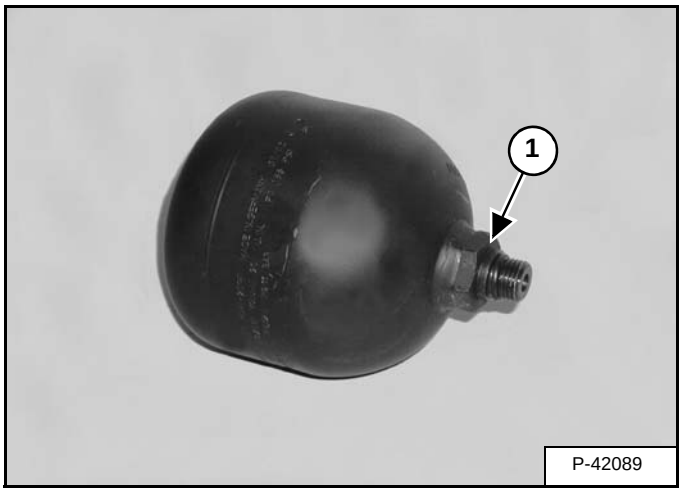
Remove the O-ring (Item 1) **[Figure 20-62-13]** from the fittings and plug. (Test fitting shown)

Figure 20-62-14



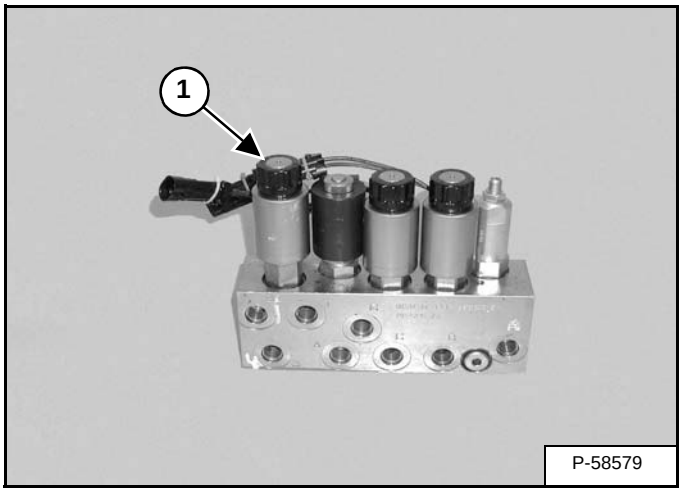
Remove the accumulator (Item 1) **[Figure 20-62-14]**.

Figure 20-62-15



Remove the O-ring (Item 1) **[Figure 20-62-15]**.

Figure 20-62-16

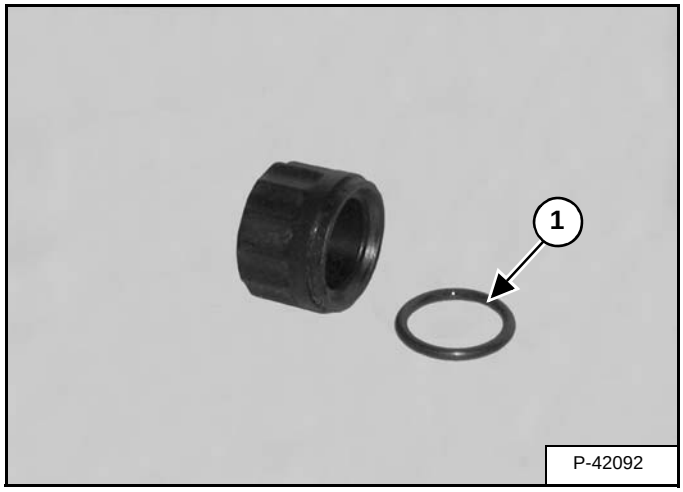


Remove the nut (Item 1) **[Figure 20-62-16]** from the spool.

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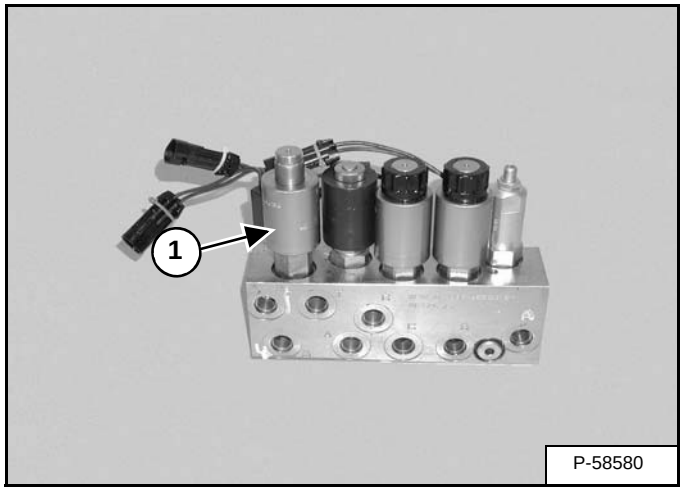
Disassembly (Cont'd)

Figure 20-62-17



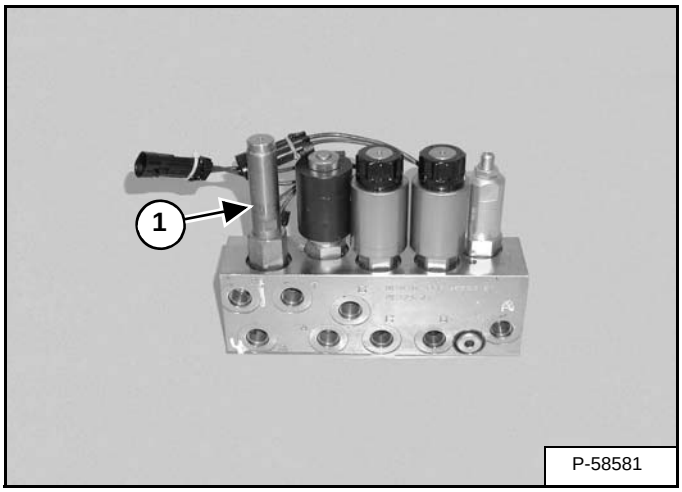
Remove the O-ring (Item 1) **[Figure 20-62-17]** from the nut.

Figure 20-62-18



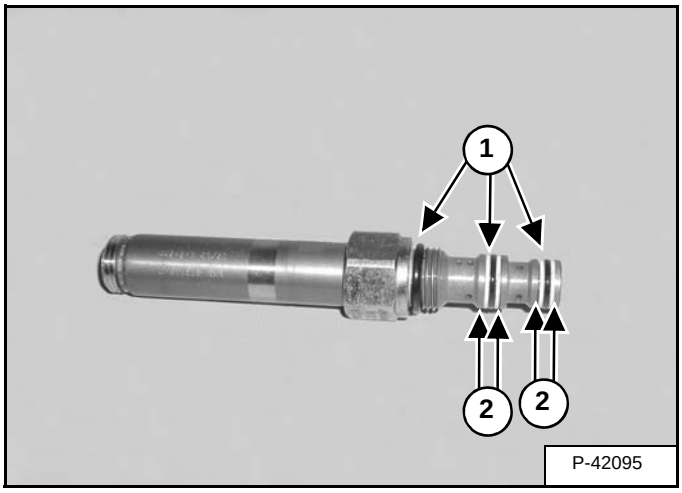
Remove the coil (Item 1) **[Figure 20-62-18]** with the green tie strap.

Figure 20-62-19



Remove the spool (Item 1) **[Figure 20-62-19]**.

Figure 20-62-20

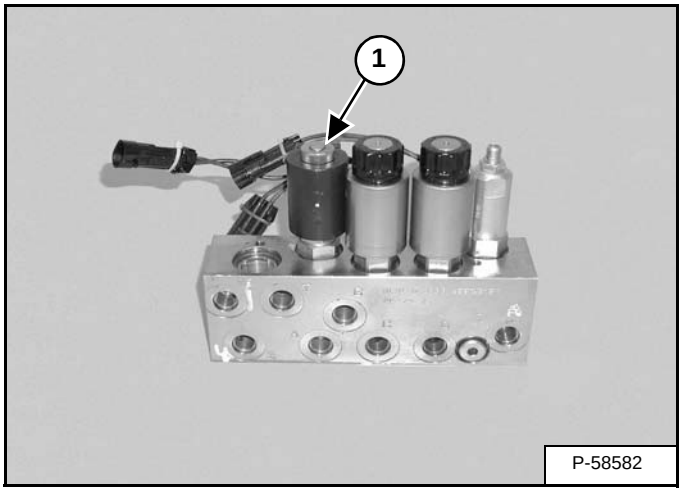


Remove the O-rings (Item 1) and back-up rings (Item 2) **[Figure 20-62-20]** from the spool.

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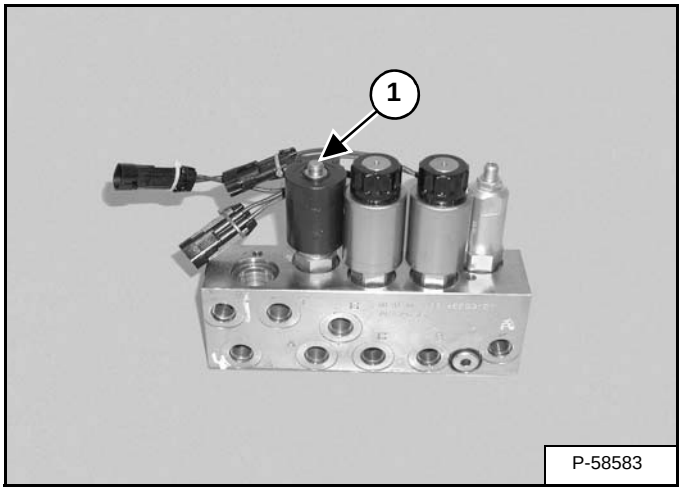
Disassembly (Cont'd)

Figure 20-62-21



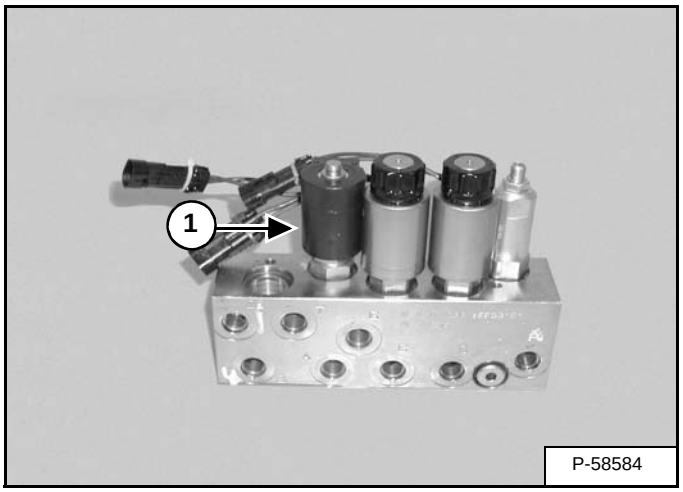
Remove the nut (Item 1) **[Figure 20-62-21]** from the spool.

Figure 20-62-22



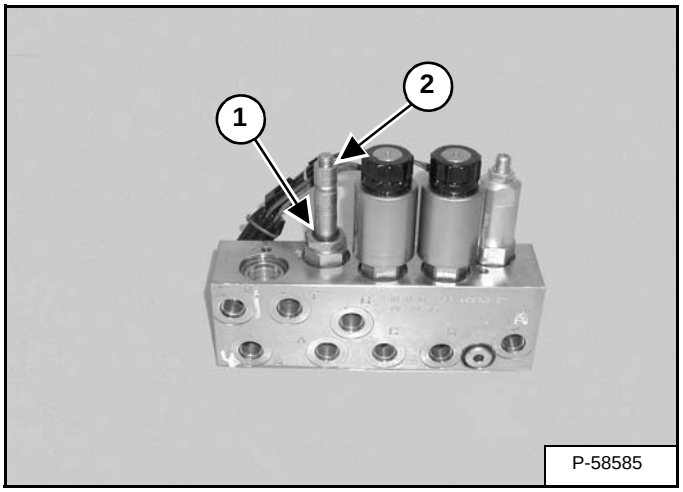
Remove the O-ring (Item 1) **[Figure 20-62-22]** from the spool.

Figure 20-62-23



Remove the coil (Item 1) **[Figure 20-62-23]** with the yellow tie strap.

Figure 20-62-24

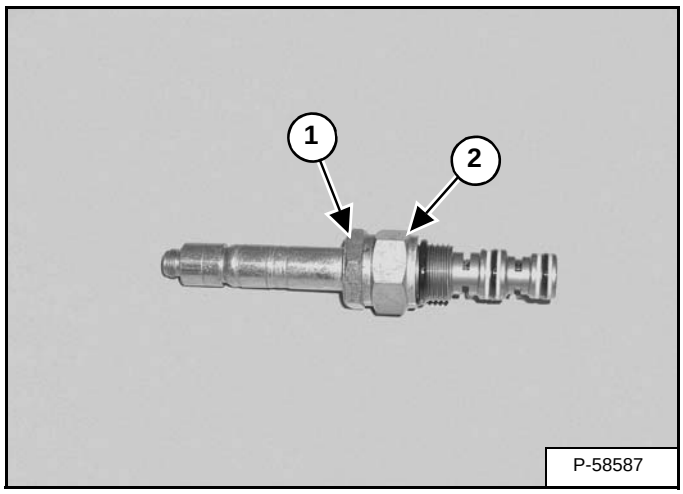


Remove the O-ring (Item 1) and spool (Item 2) **[Figure 20-62-24]**.

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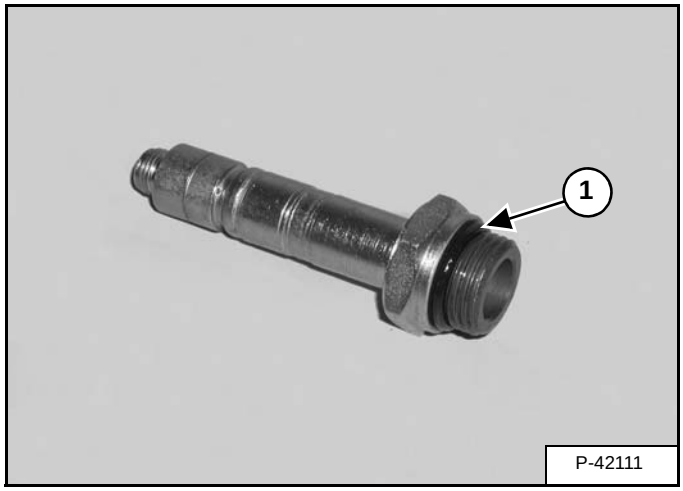
Disassembly (Cont'd)

Figure 20-62-25



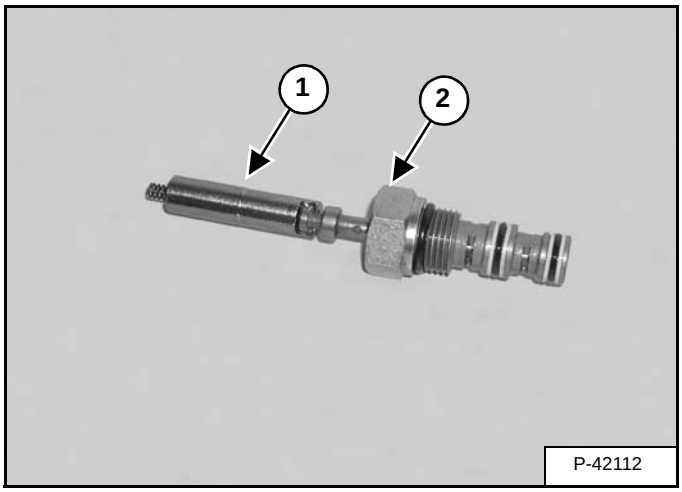
Remove the spool (Item 1) from the port adapter (Item 2) **[Figure 20-62-25]** from the spool.

Figure 20-62-26



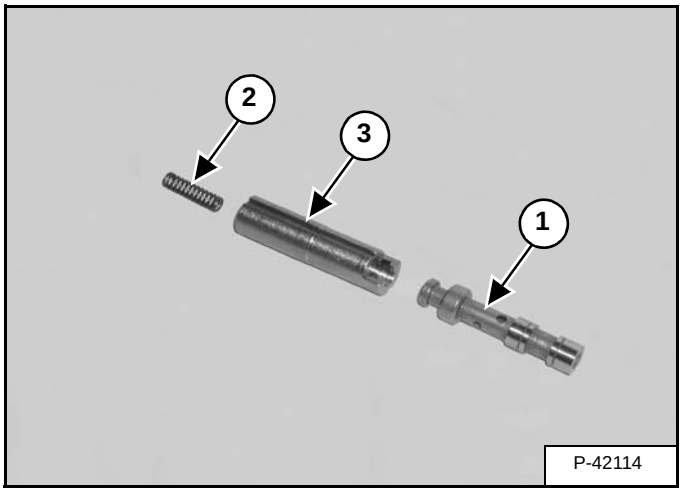
Remove the O-ring (Item 1) **[Figure 20-62-26]** from the spool.

Figure 20-62-27



Remove the actuator assembly (Item 1) from the port adapter (Item 2) **[Figure 20-62-27]**.

Figure 20-62-28

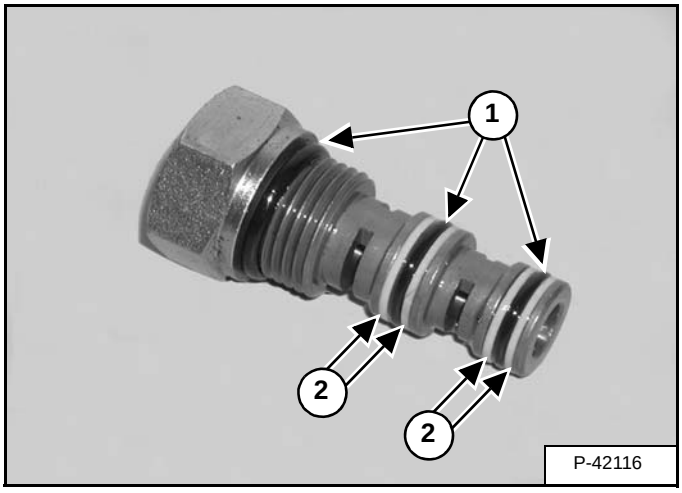


Remove the actuator (Item 1) and spring (Item 2) from the guide (Item 3) **[Figure 20-62-28]**.

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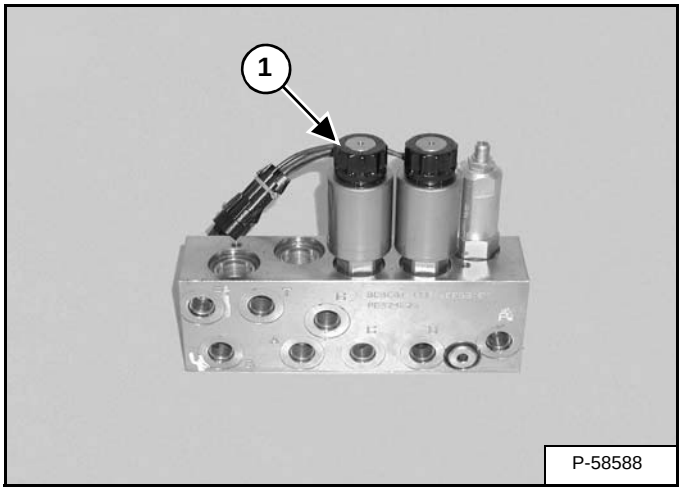
Disassembly (Cont'd)

Figure 20-62-29



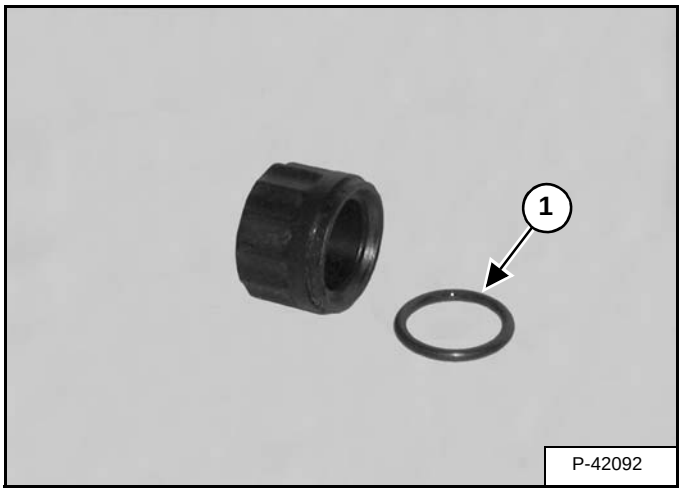
Remove the O-rings (Item 1) and back-up rings (Item 2) **[Figure 20-62-29]**.

Figure 20-62-30



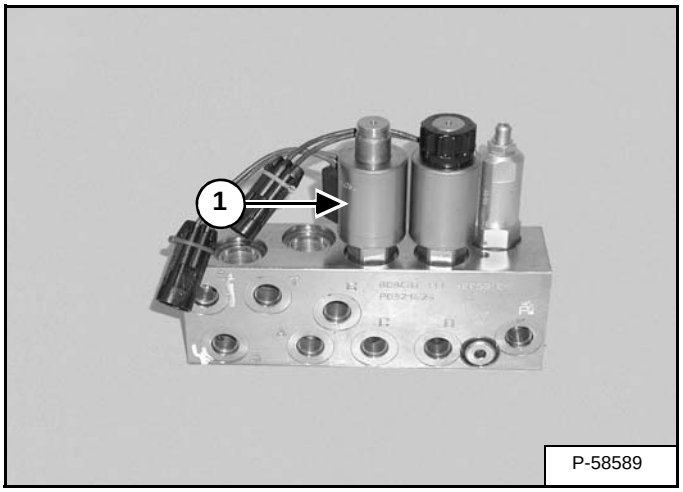
Remove the nut (Item 1) **[Figure 20-62-30]** from the spool.

Figure 20-62-31



Remove the O-ring (Item 1) **[Figure 20-62-31]** from the nut.

Figure 20-62-32



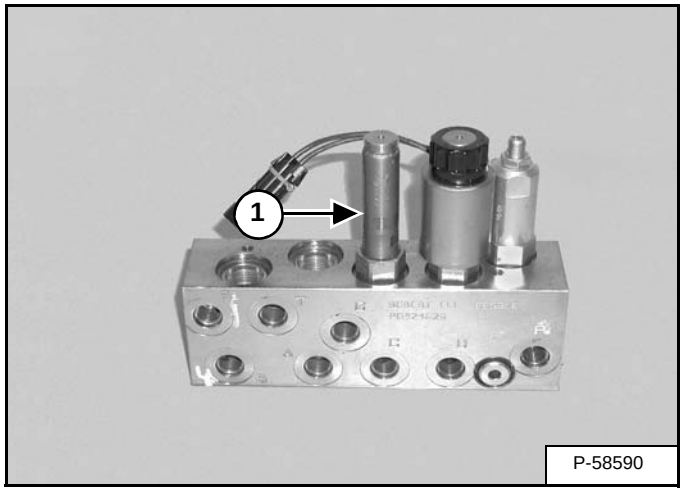
Remove the coil (Item 1) **[Figure 20-62-32]** with the red tie strap.

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MANIFOLD ASSEMBLY/ACCUMULATOR (S/N 563111001 - 563113999) (CONT'D)

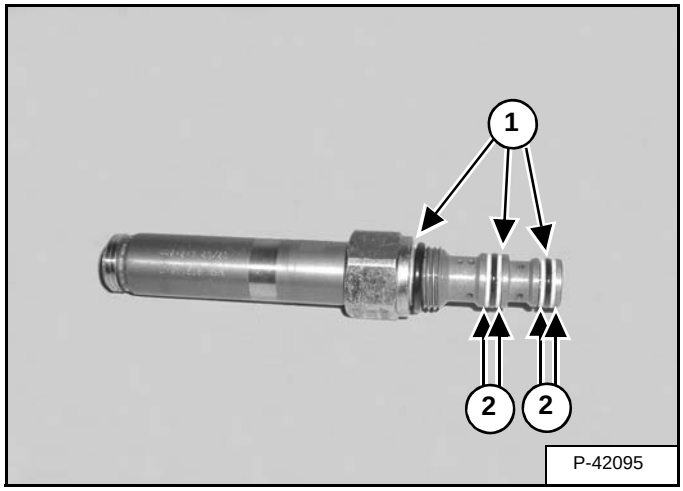
Disassembly (Cont'd)

Figure 20-62-33



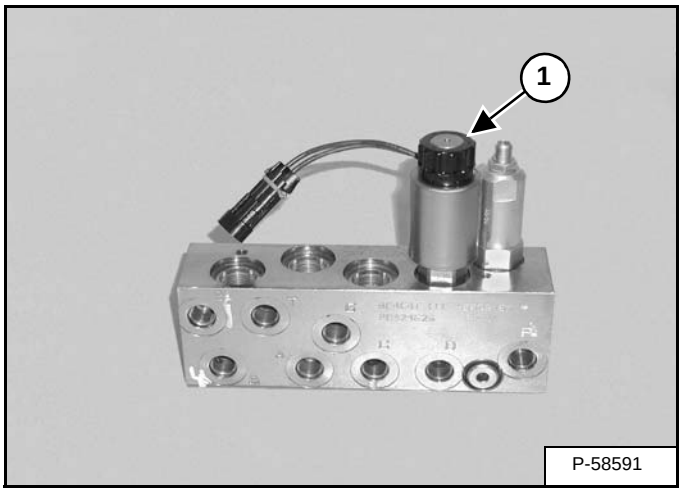
Remove the spool (Item 1) **[Figure 20-62-33]**.

Figure 20-62-34



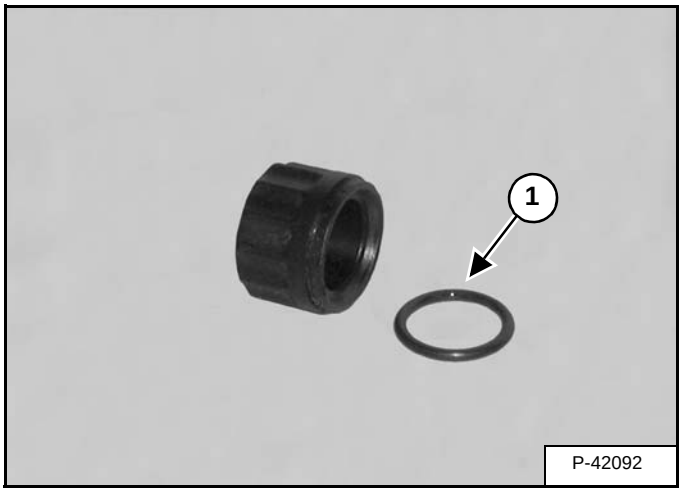
Remove the O-rings (Item 1) and back-up rings (Item 2) **[Figure 20-62-34]**.

Figure 20-62-35



Remove the nut (Item 1) **[Figure 20-62-35]** from the spool.

Figure 20-62-36

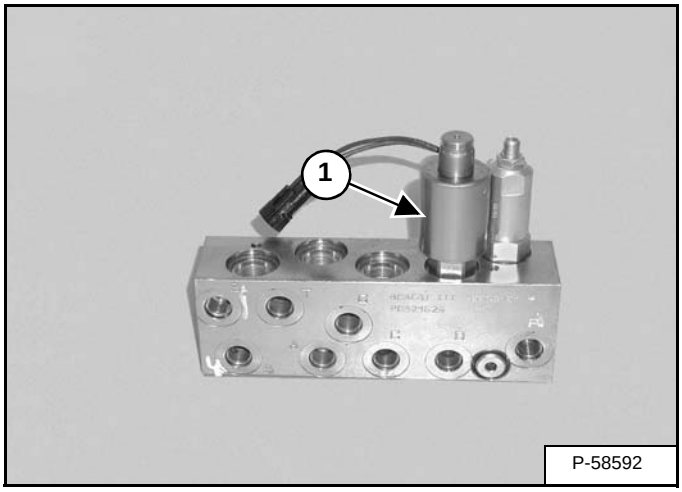


Remove the O-ring (Item 1) **[Figure 20-62-36]** from the nut.

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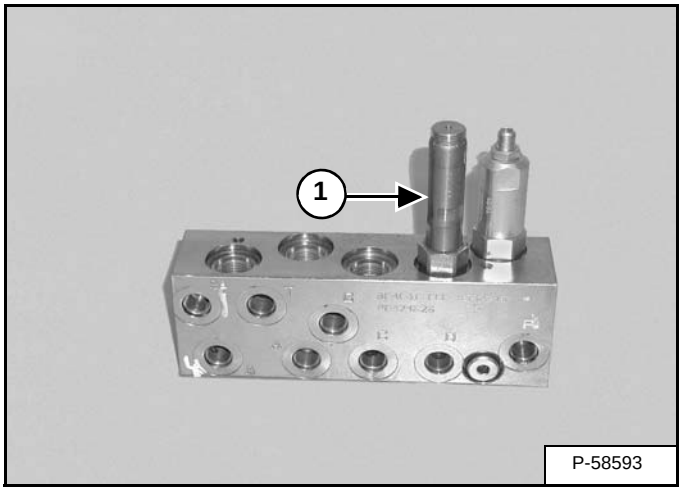
Disassembly (Cont'd)

Figure 20-62-37



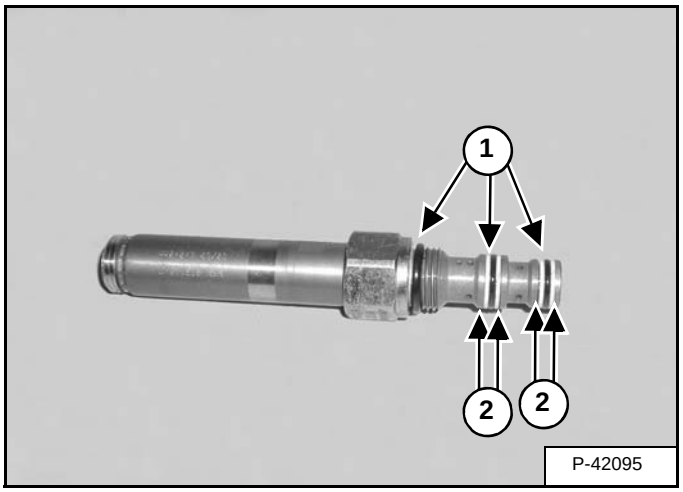
Remove the coil (Item 1) **[Figure 20-62-37]** with the blue tie strap.

Figure 20-62-38



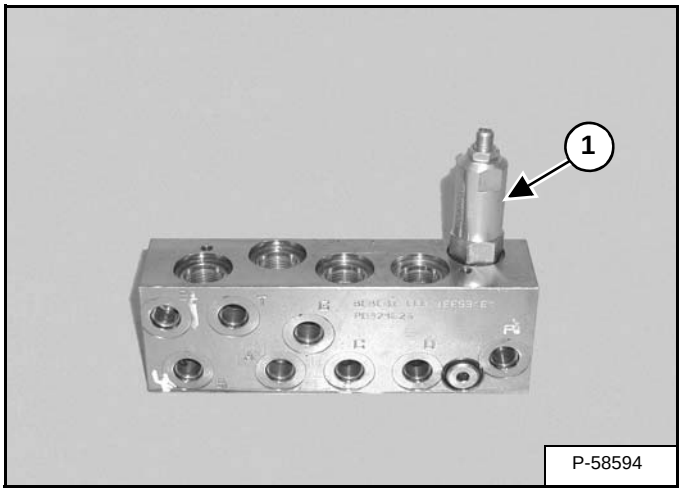
Remove the spool (Item 1) **[Figure 20-62-38]**.

Figure 20-62-39



Remove the O-rings (Item 1) and back-up rings (Item 2) **[Figure 20-62-39]** from the spool assembly.

Figure 20-62-40

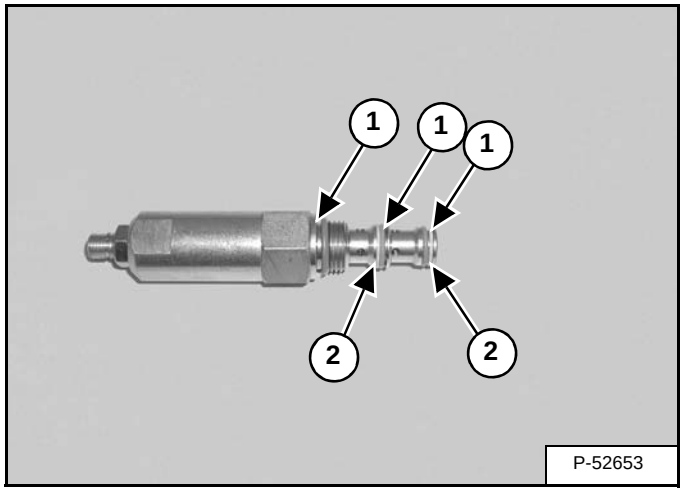


Remove the pressure reducing valve (Item 1) **[Figure 20-62-40]**.

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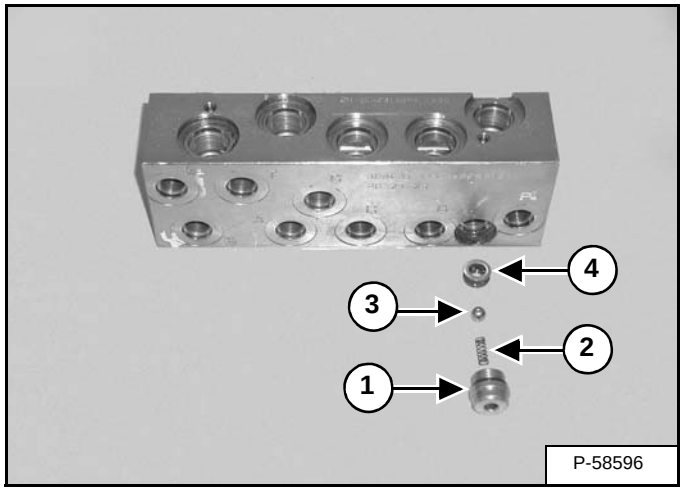
Disassembly (Cont'd)

Figure 20-62-41



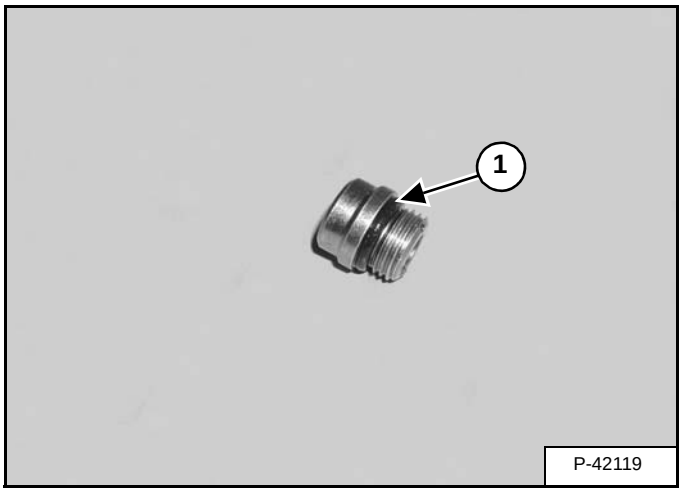
Remove the O-rings (Item 1) and back-up rings (Item 2) **[Figure 20-62-41]**.

Figure 20-62-42



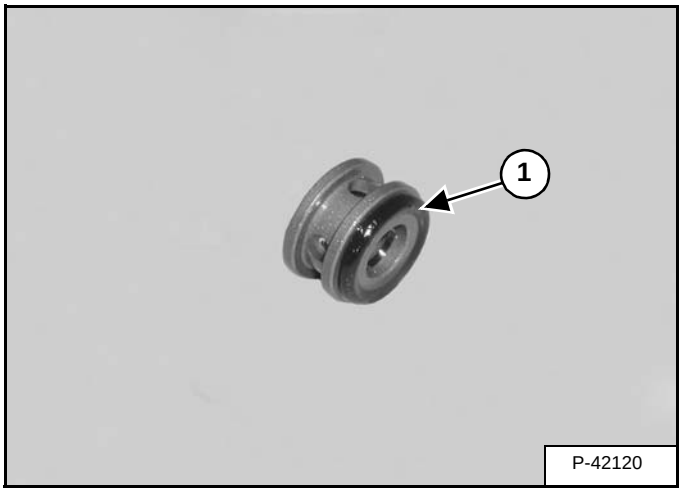
Remove the plug (Item 1), spring (Item 2), ball (Item 3) and poppet (Item 4) **[Figure 20-62-42]**.

Figure 20-62-43



Remove the O-ring (Item 1) **[Figure 20-62-43]** from the plug.

Figure 20-62-44



Remove the O-ring (Item 1) **[Figure 20-62-44]** from the poppet.

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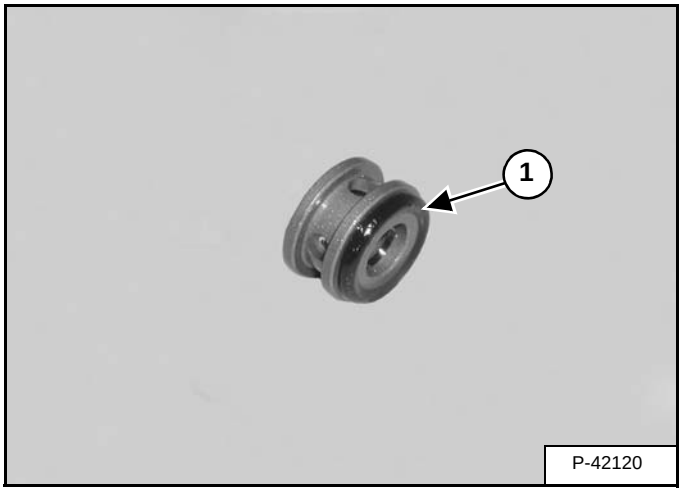
Assembly

Clean all parts in solvent and dry with compressed air.

Replace any worn or damaged parts. Always use new O-rings and back-up rings.

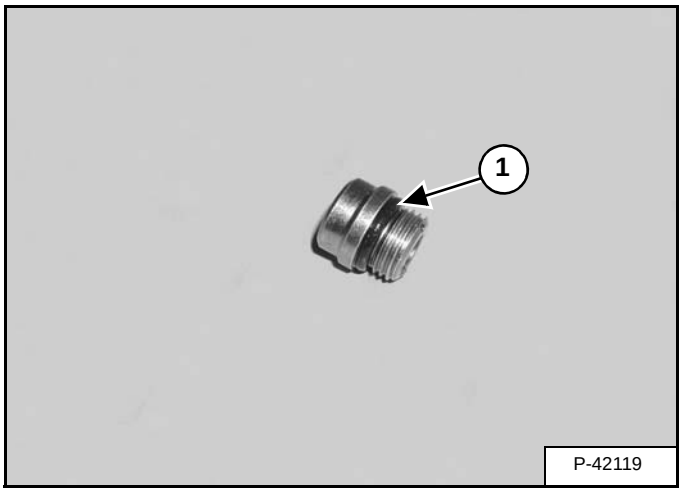
Apply clean hydraulic fluid to the O-rings and back-up rings during installation.

Figure 20-62-45



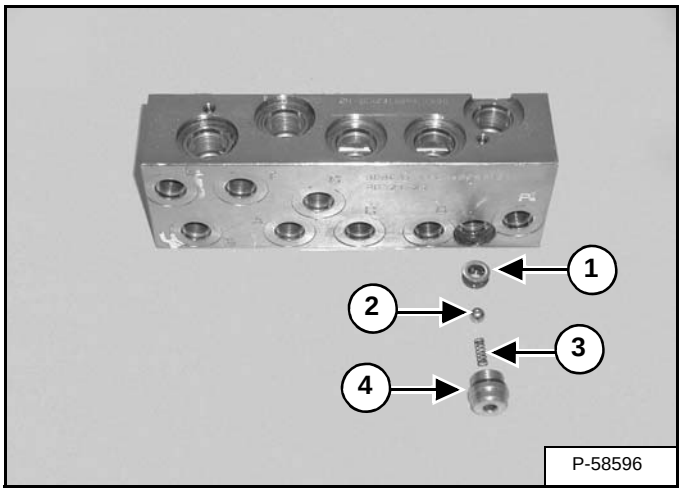
Install the O-ring (Item 1) **[Figure 20-62-45]** on the poppet.

Figure 20-62-46



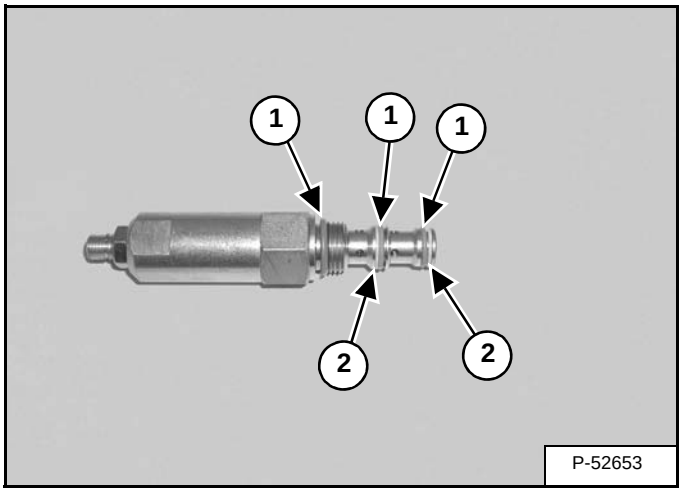
Install the O-ring (Item 1) **[Figure 20-62-46]** on the plug.

Figure 20-62-47



Install the poppet (Item 1), ball (Item 2), spring (Item 3), and plug (Item 4) **[Figure 20-62-47]** in the housing.

Figure 20-62-48



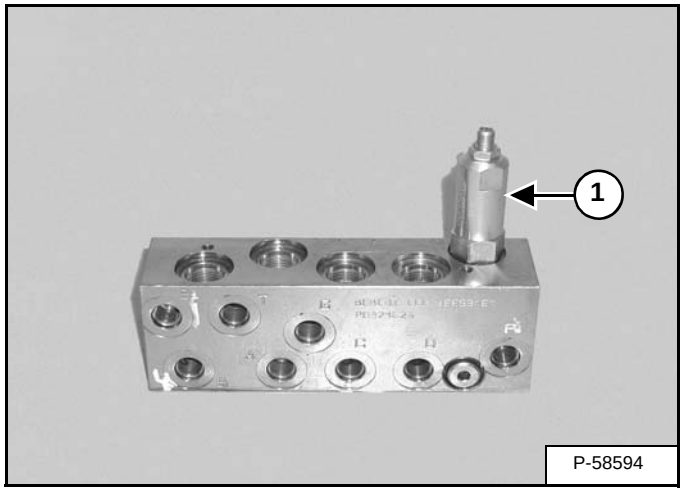
Install the O-rings (Item 1) and back-up rings (Item 2) **[Figure 20-62-48]** on the pressure reducing valve.

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MANIFOLD ASSEMBLY/ACCUMULATOR (S/N 563111001 - 563113999) (CONT'D)

Assembly (Cont'd)

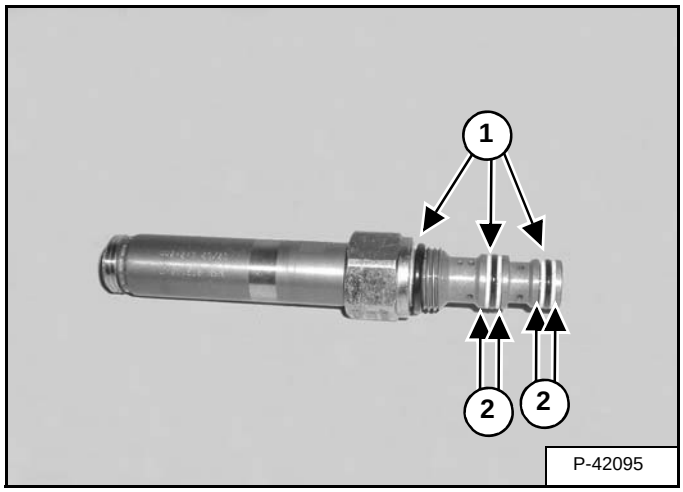
Figure 20-62-49



Install the pressure reducing valve (Item 1) **[Figure 20-62-49]**.

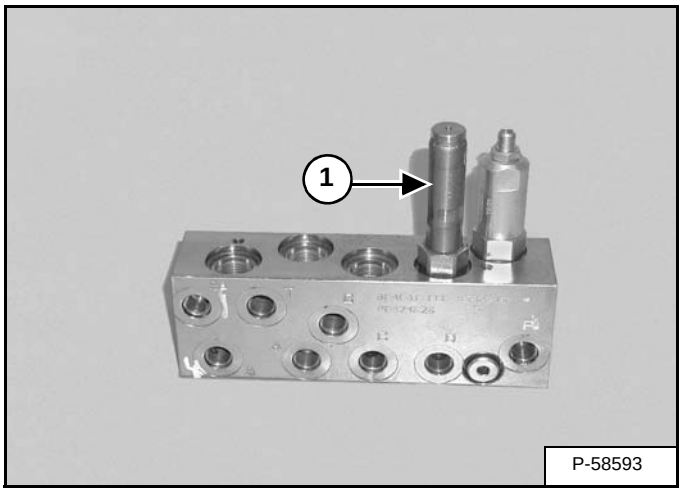
Tighten the pressure reducing valve to 22 ft.-lb. (30 N•m) torque.

Figure 20-62-50



Install the O-rings (Item 1) and back-up rings (Item 2) **[Figure 20-62-50]** on the spool.

Figure 20-62-51



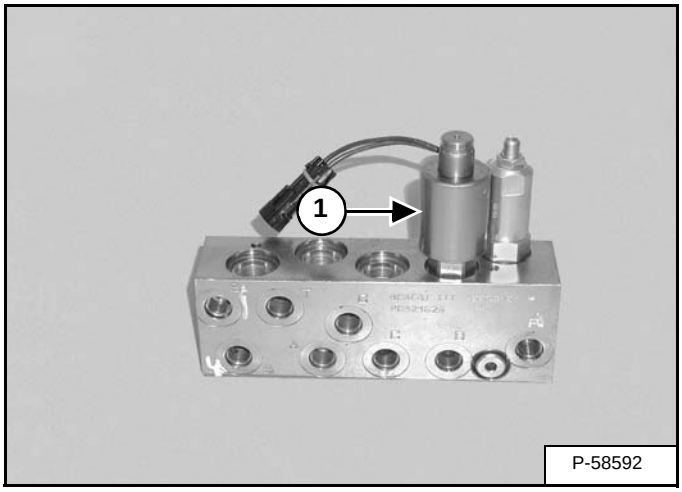
Install the spool (Item 1) **[Figure 20-62-51]**.

Tighten the spool to 22 ft.-lb. (30 N•m) torque.

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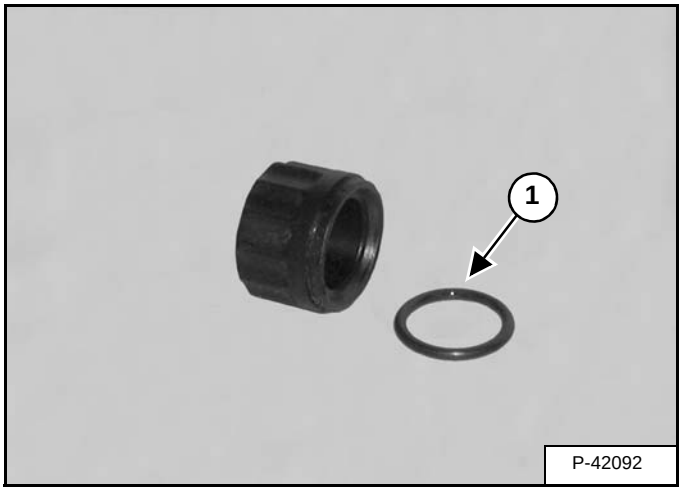
Assembly (Cont'd)

Figure 20-62-52



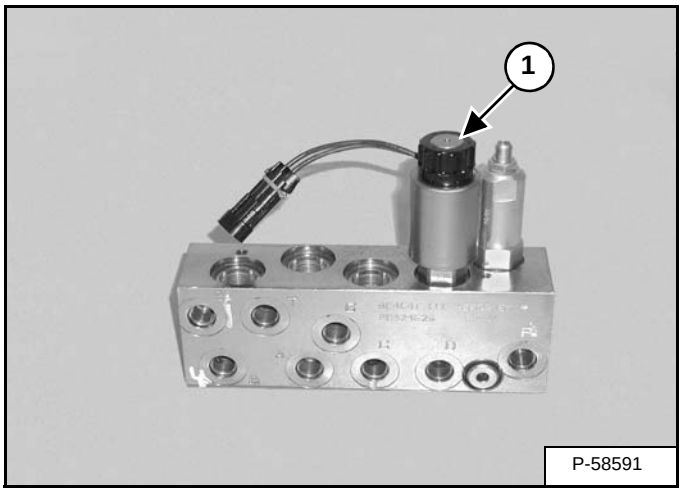
Install the coil with the blue tie strap (Item 1) **[Figure 20-62-52]**.

Figure 20-62-53



Install the O-ring (Item 1) **[Figure 20-62-53]** in the nut.

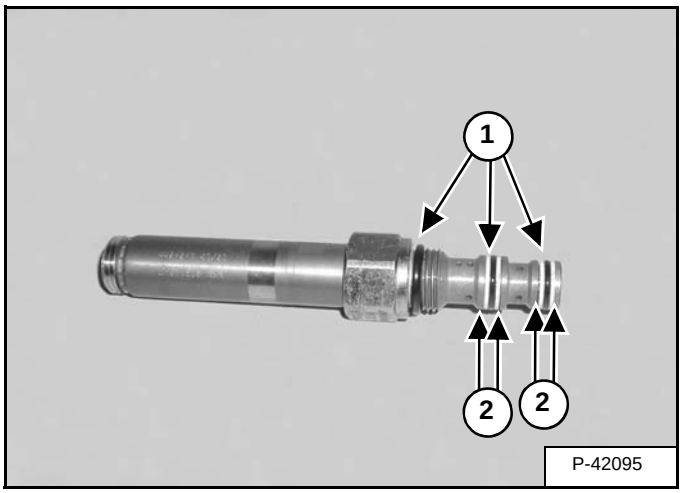
Figure 20-62-54



Install the nut (Item 1) **[Figure 20-62-54]**.

Tighten the nut to 53 in.-lb. (6 N•m) torque.

Figure 20-62-55



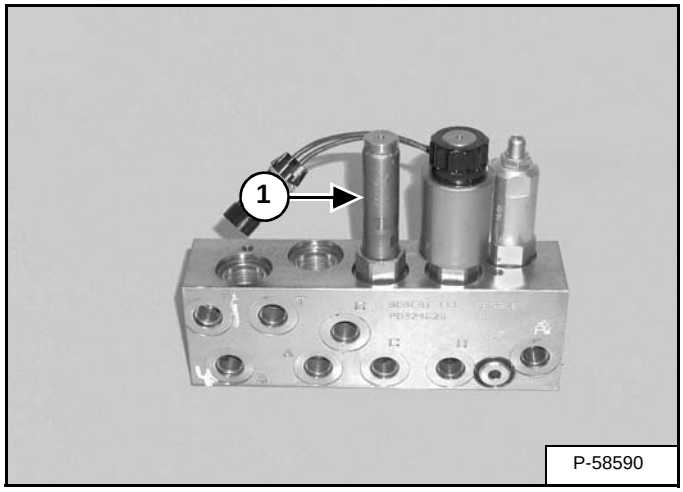
Install the O-rings (Item 1) and back-up rings (Item 2) **[Figure 20-62-55]** on the spool.

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MANIFOLD ASSEMBLY/ACCUMULATOR (S/N 563111001 - 563113999) (CONT'D)

Assembly (Cont'd)

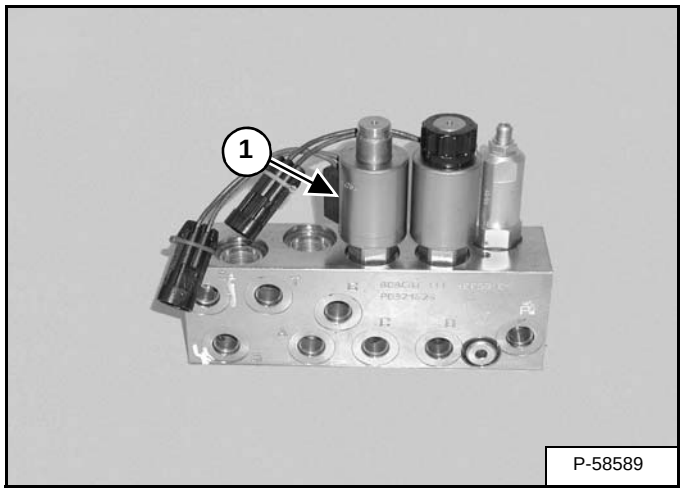
Figure 20-62-56



Install the spool (Item 1) **[Figure 20-62-56]**.

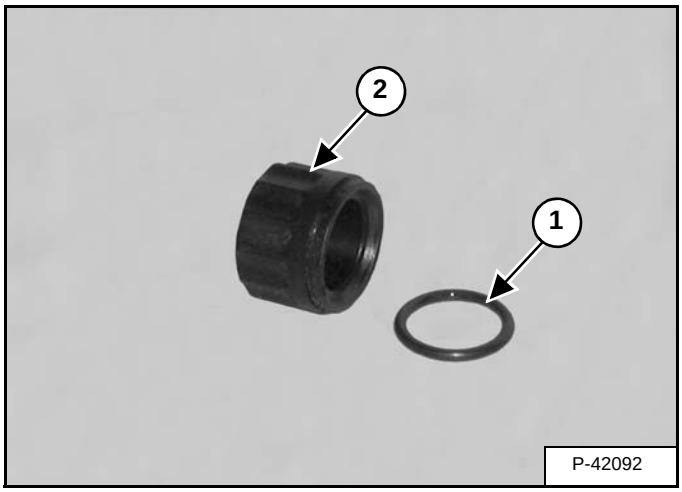
Tighten the spool to 22 ft.-lb. (30 N•m) torque.

Figure 20-62-57



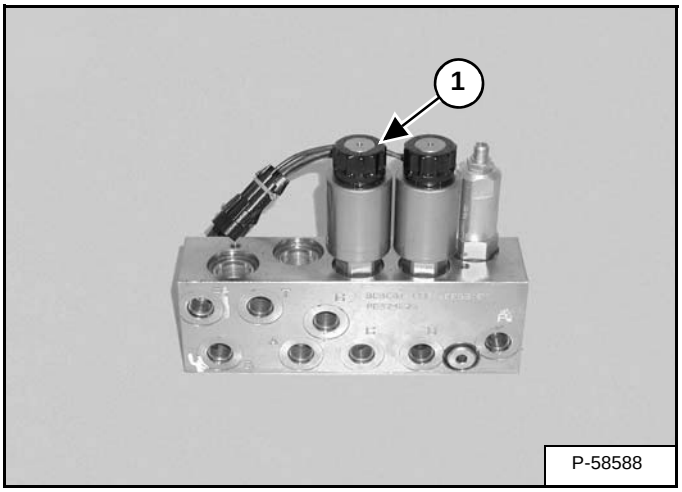
Install the coil with the red tie strap (Item 1) **[Figure 20-62-57]**.

Figure 20-62-58



Install the O-ring (Item 1) on the nut (Item 2) **[Figure 20-62-58]**.

Figure 20-62-59



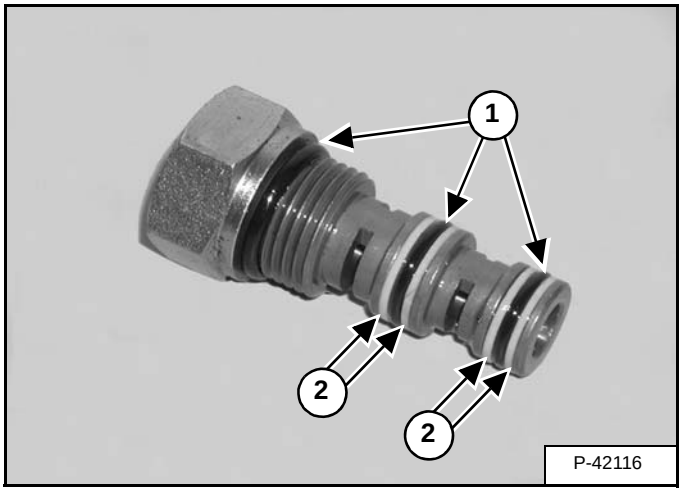
Install the nut (Item 1) **[Figure 20-62-59]** on the spool.

Tighten the nut to 53 in.-lb. (6 N•m) torque.

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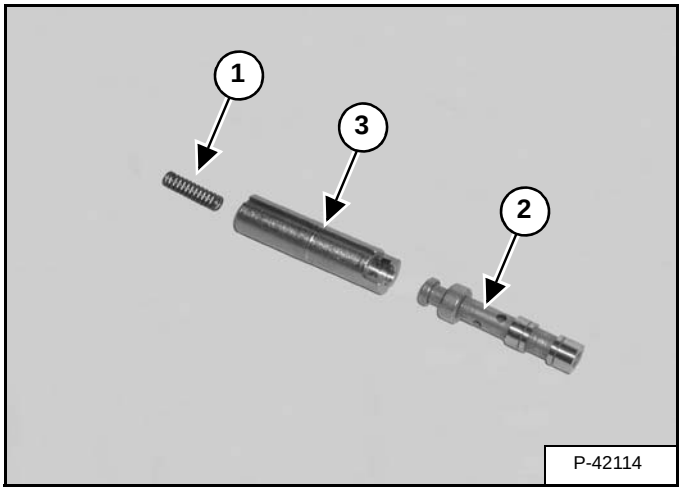
Assembly (Cont'd)

Figure 20-62-60



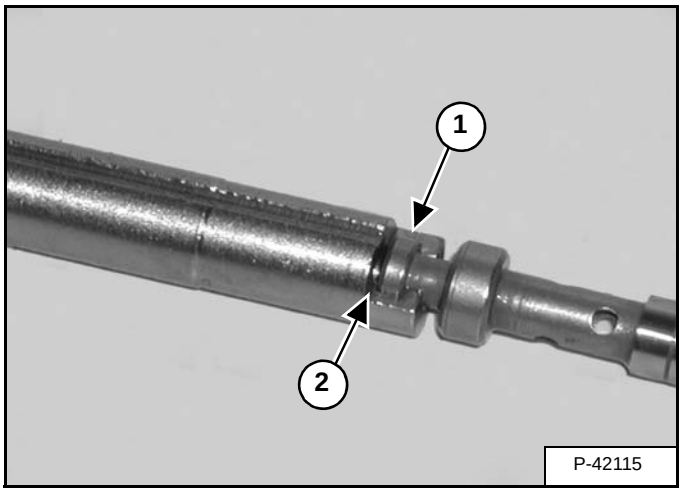
Install the O-rings (Item 1) and back-up rings (Item 2) **[Figure 20-62-60]** on the port adapter.

Figure 20-62-61



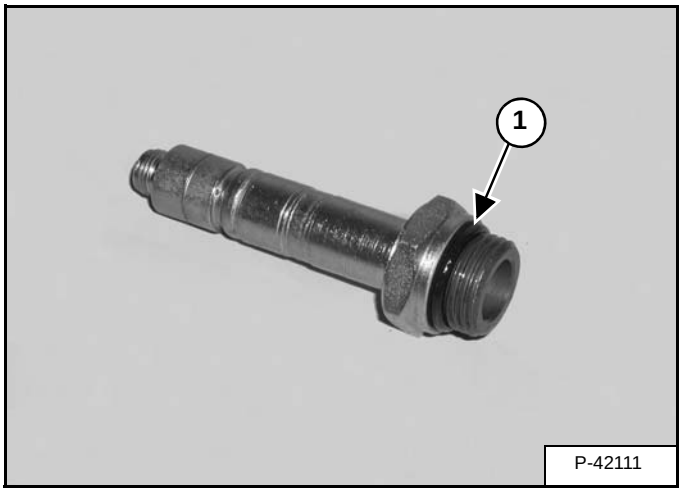
Install the spring (Item 1) and actuator (Item 2) in the guide (Item 3) **[Figure 20-62-61]**.

Figure 20-62-62



Install the end of the actuator (Item 1) into the groove in the guide (Item 2) **[Figure 20-62-62]** on the port adapter.

Figure 20-62-63

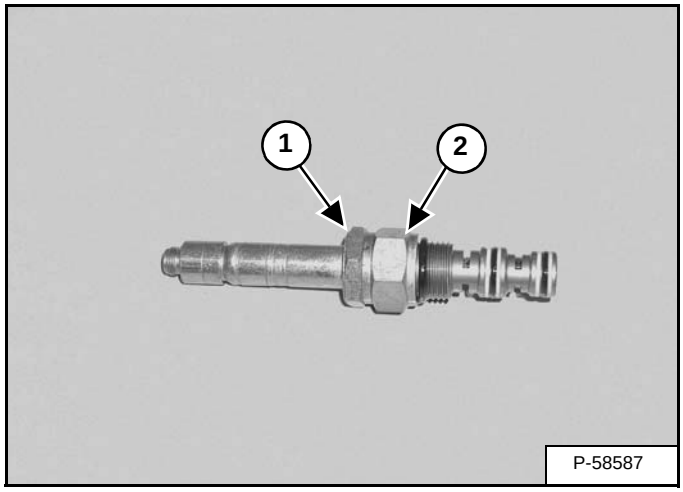


Install the O-ring (Item 1) **[Figure 20-62-63]** on the spool.

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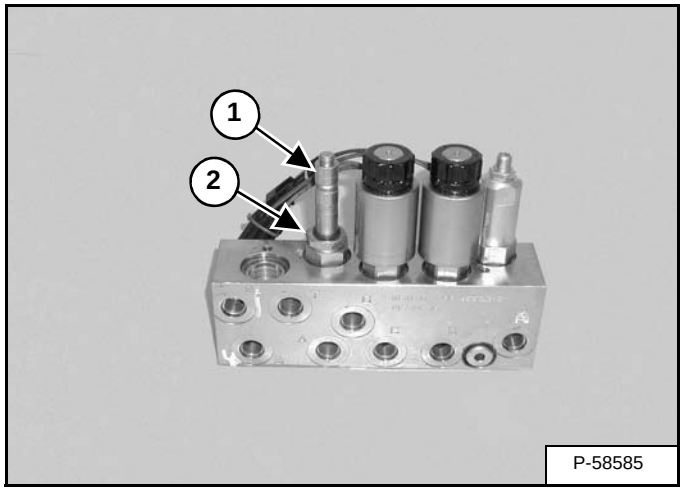
Assembly (Cont'd)

Figure 20-62-64



Install the spool (Item 1) in the port adapter (Item 2) **[Figure 20-62-64]**.

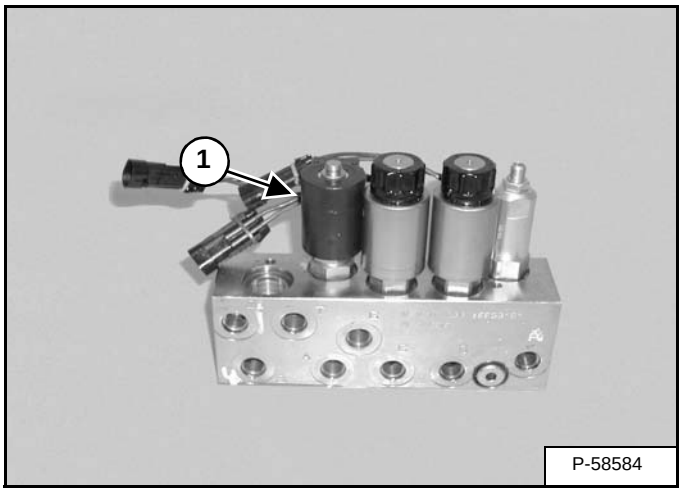
Figure 20-62-65



Install the spool (Item 1) and O-ring (Item 2) **[Figure 20-62-65]**.

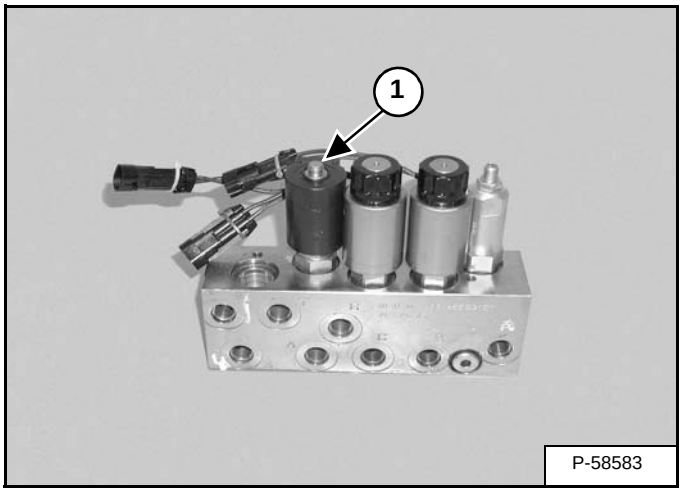
Tighten the spool to 22 ft.-lb. (30 N•m) torque.

Figure 20-62-66



Install the coil with the yellow tie strap (Item 1) **[Figure 20-62-66]**.

Figure 20-62-67

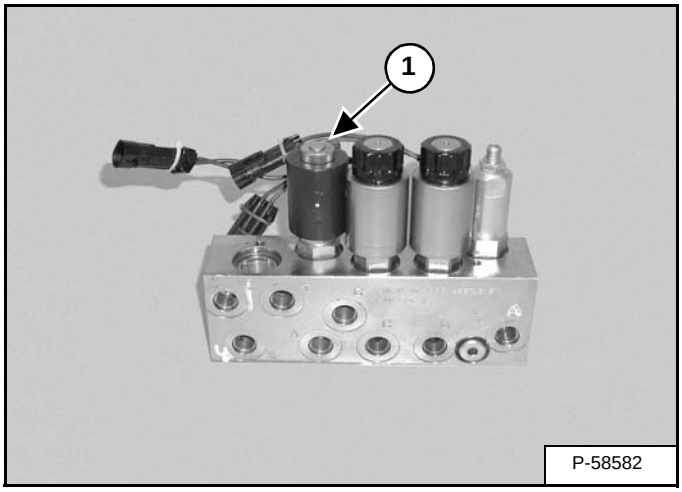


Install the O-ring (Item 1) **[Figure 20-62-67]**.

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Assembly (Cont'd)

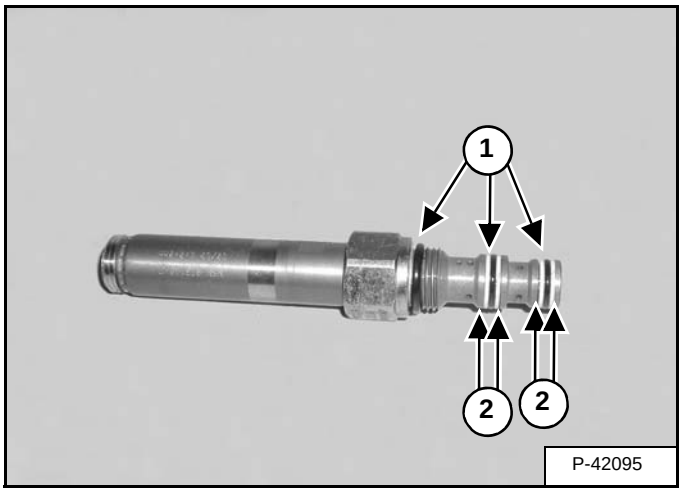
Figure 20-62-68



Install the nut (Item 1) **[Figure 20-62-68]** on the spool.

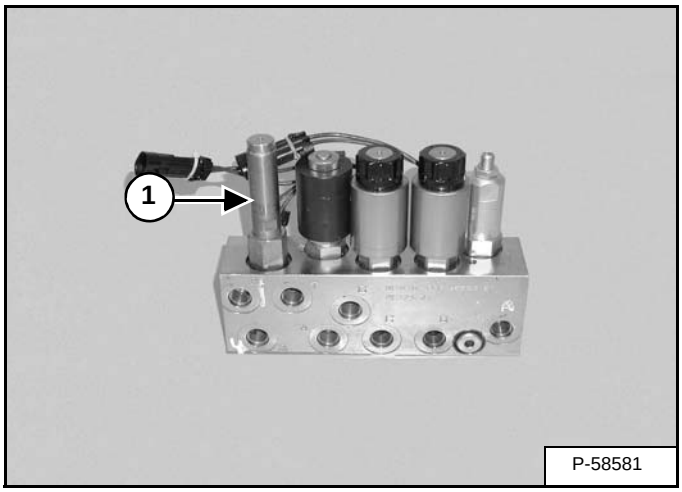
Tighten the nut to 53 in.-lb. (6 N•m) torque.

Figure 20-62-69



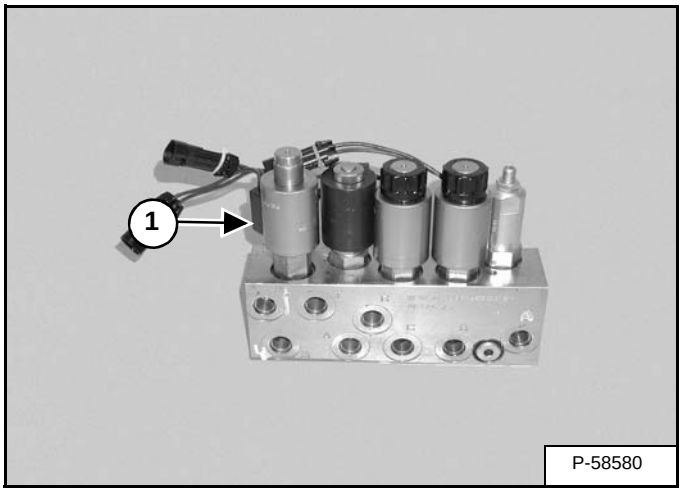
Install the O-rings (Item 1) and back-up rings (Item 2) **[Figure 20-62-69]** on the spool.

Figure 20-62-70



Install the spool (Item 1) **[Figure 20-62-70]**.

Figure 20-62-71

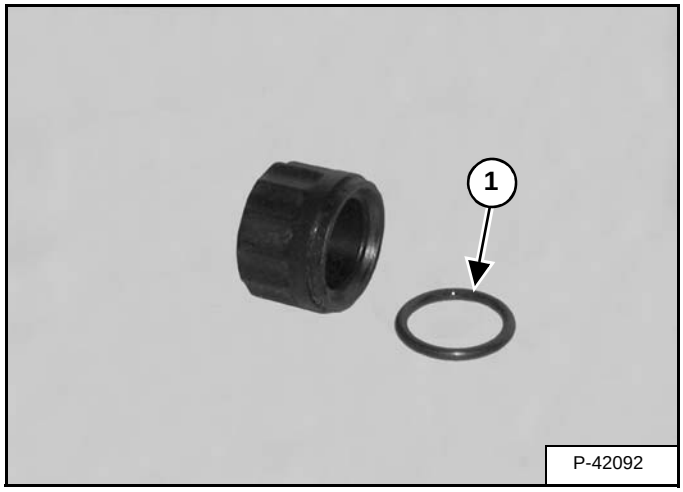


Install the coil with the green tie strap (Item 1) **[Figure 20-62-71]** on the spool.

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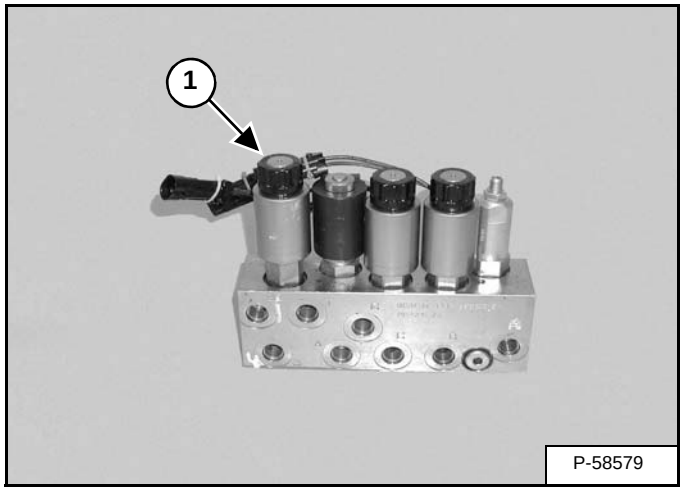
Assembly (Cont'd)

Figure 20-62-72



Install the O-ring (Item 1) **[Figure 20-62-72]** on the nut.

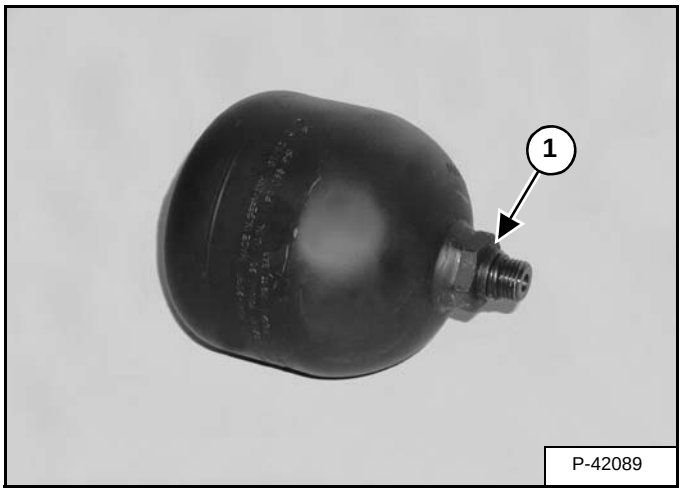
Figure 20-62-73



Install the nut (Item 1) **[Figure 20-62-73]** on the spool.

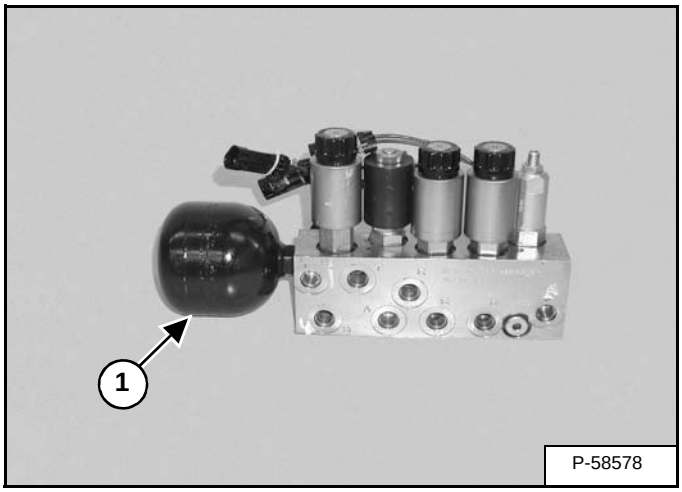
Tighten the nut to 53 in.-lb. (6 N•m) torque.

Figure 20-62-74



Install the O-ring (Item 1) **[Figure 20-62-74]** on the accumulator.

Figure 20-62-75



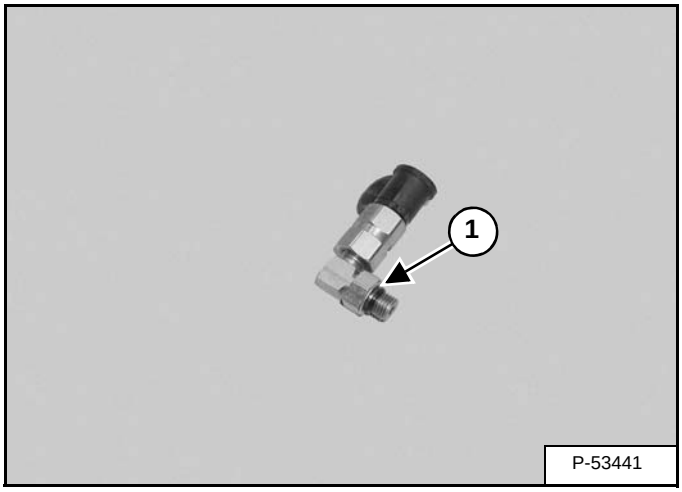
Install the accumulator (Item 1) **[Figure 20-62-75]**.

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MANIFOLD ASSEMBLY/ACCUMULATOR (S/N 563111001 - 563113999) (CONT'D)

Assembly (Cont'd)

Figure 20-62-76



Install the O-ring (Item 1) **[Figure 20-62-76]** on the fittings and plug. (Test fitting shown)

Figure 20-62-77

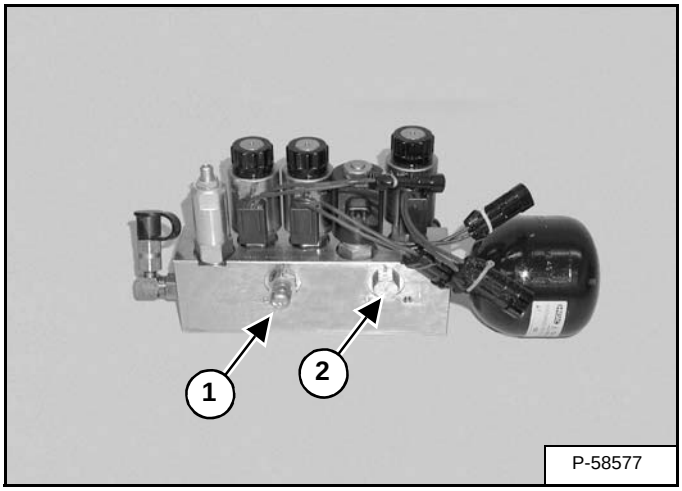
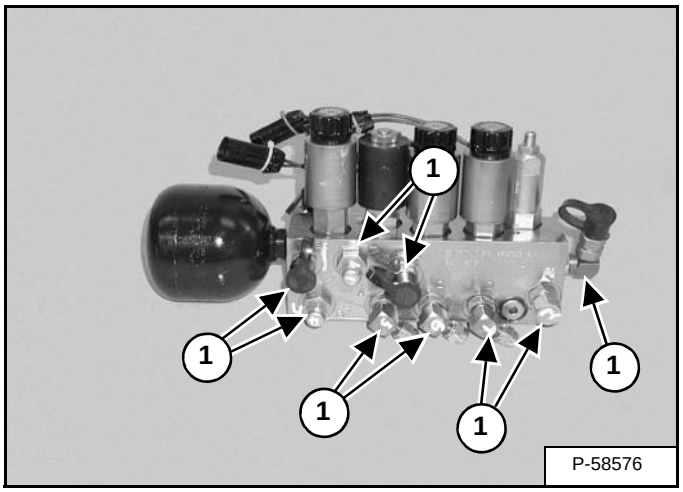
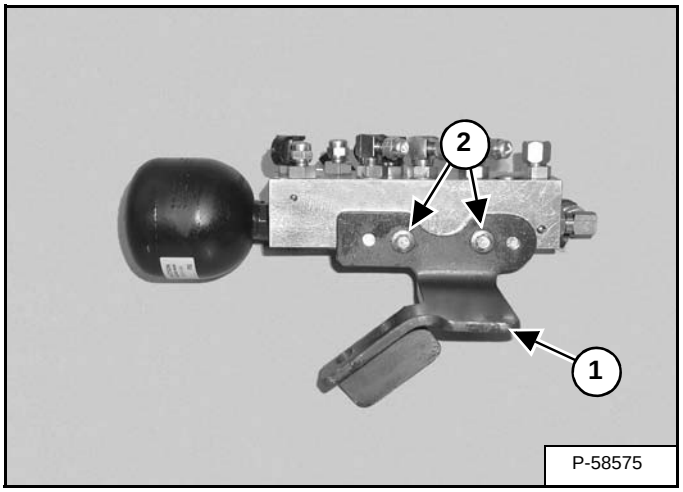


Figure 20-62-78



Install the fittings (Item 1) and plug (Item 2) **[Figure 20-62-77]** & **[Figure 20-62-78]**.

Figure 20-62-79



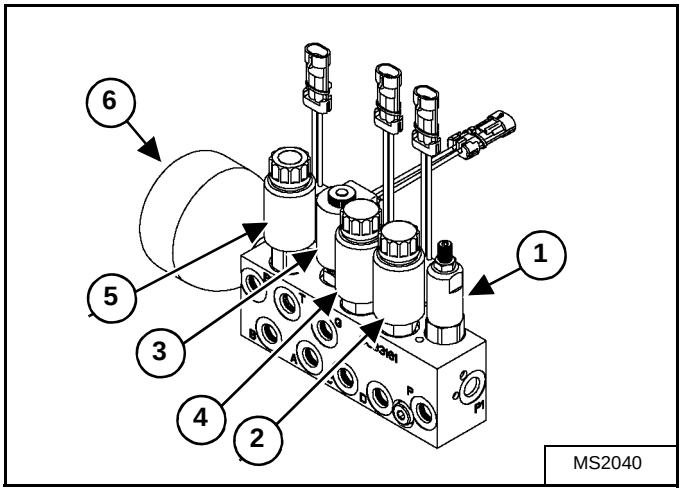
Install the mount bracket (Item 1) with the bolts (Item 2) **[Figure 20-62-79]**.

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MANIFOLD ASSEMBLY/ACCUMULATOR (S/N 563114000 & ABOVE)

Description

Figure 20-63-1



The manifold assembly contains the following:

Pressure reducing valve (Item 1) **[Figure 20-63-1]**.

Work group lockout solenoid (Item 2) **[Figure 20-63-1]**.

Two speed solenoid (Item 3) **[Figure 20-63-1]**.

Directional control valve solenoid (male coupler) (Item 4) **[Figure 20-63-1]**.

Directional control valve solenoid (female coupler) (Item 5) **[Figure 20-63-1]**.

Accumulator (Item 6) **[Figure 20-63-1]**.

The manifold supplies 406 - 450 PSI (28 - 31 bar) for joystick operation.

The accumulator provides short term reserve pressure for joystick function with engine off and the key in the ON position.

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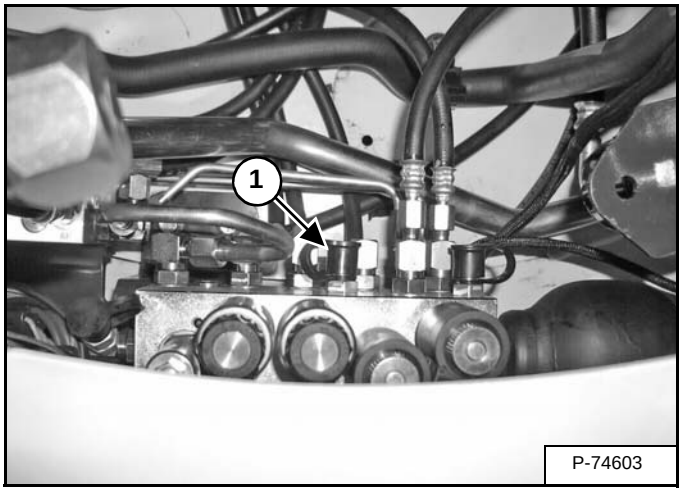
Testing Pilot Pressure

The following tools will be needed to do the procedure:
MEL 1355 - Hydraulic Test Kit

Stop the engine.

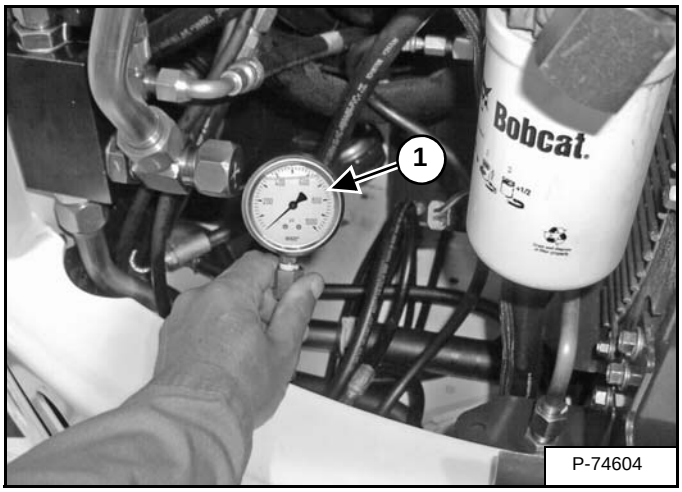
Lower the boom/bucket and blade to the ground. Open the right side cover.

Figure 20-63-2



Remove the protective cap (Item 1) **[Figure 20-63-2]** from the G diagnostic port located on the manifold assembly.

Figure 20-63-3



From the test kit, connect a 500 PSI (35 bar) gauge (Item 1) **[Figure 20-63-3]** on the diagnostic port.

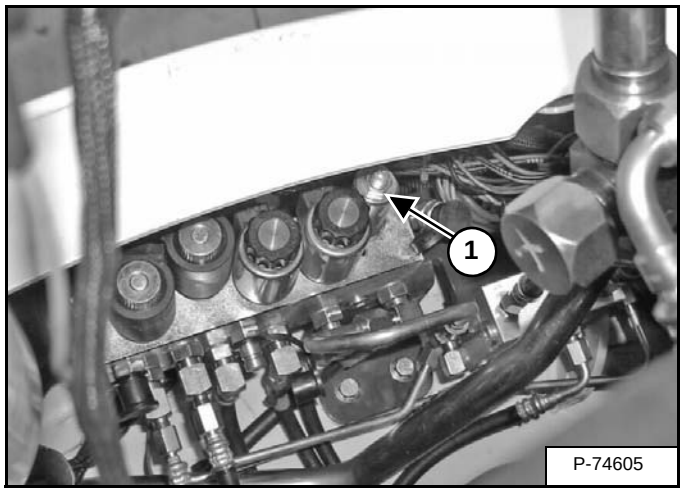
With an operator in the seat and the left console in the raised position, start the excavator and run at low idle.

Lower the left console and increase the engine speed to high idle.

Check the pressure at the gauge (Item 1) **[Figure 20-63-3]** the pressure should be as follows:

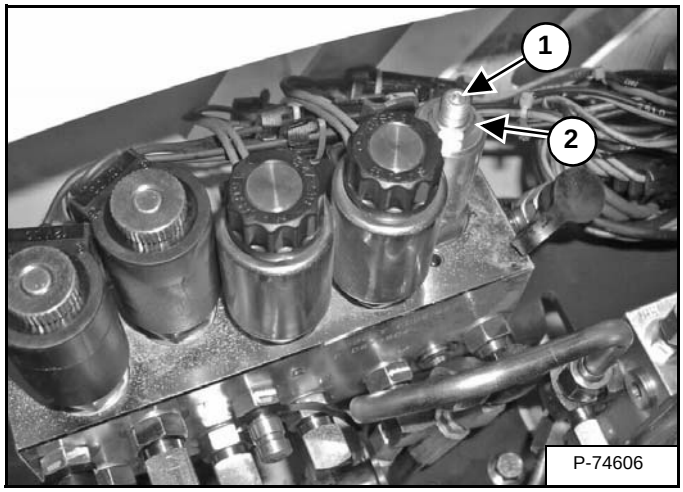
A target pressure of 435 PSI (30 bar) with an acceptable range of 406 - 450 PSI (28 - 31 bar).

Figure 20-63-4



If adjustment is needed, loosen the nut (Item 1) **[Figure 20-63-4]**.

Figure 20-63-5



Turn the adjustment screw (Item 1) **[Figure 20-63-5]** clockwise to increase the pressure or counterclockwise to decrease the pressure.

NOTE: 1/4 turn clockwise will increase pressure approximately 20 PSI (1,4 bar).

Tighten the nut (Item 2) **[Figure 20-63-5]**.

Retest the valve after adjustment.

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Removal And Installation

IMPORTANT

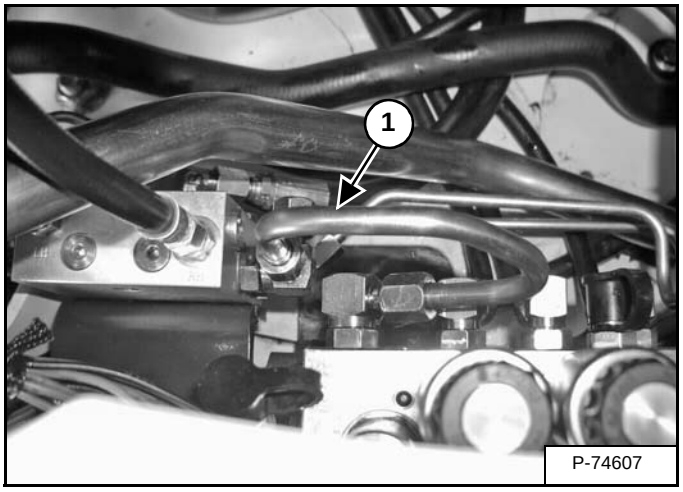
When repairing hydrostatic and hydraulic systems, clean the work area before disassembly and keep all parts clean. Always use caps and plugs on hoses, tubelines and ports to keep dirt out. Dirt can quickly damage the system.

I-2003-0888

Open the right side cover.

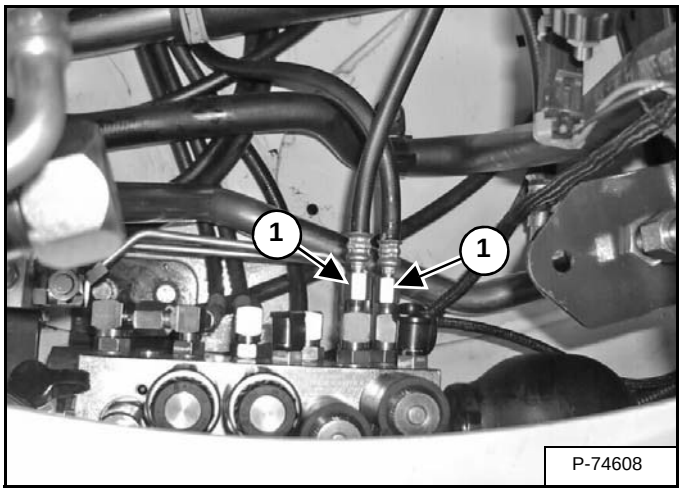
Mark all tubelines and hoses for proper installation.

Figure 20-63-6



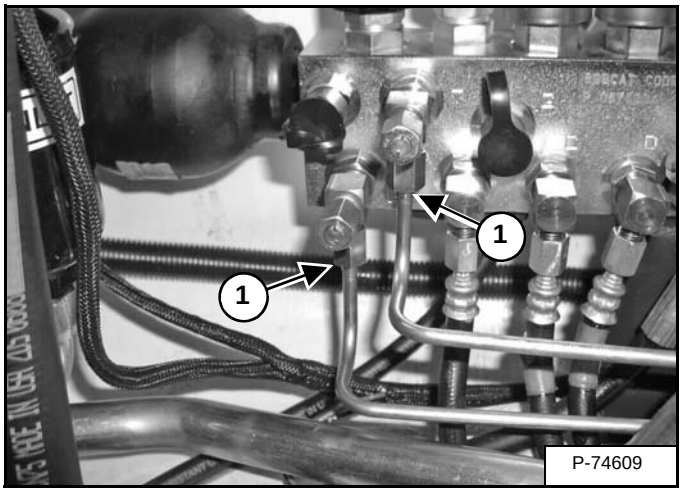
Remove the tubeline (Item 1) **[Figure 20-63-6]**.

Figure 20-63-7



Remove the hoses (Item 1) **[Figure 20-63-7]**.

Figure 20-63-8



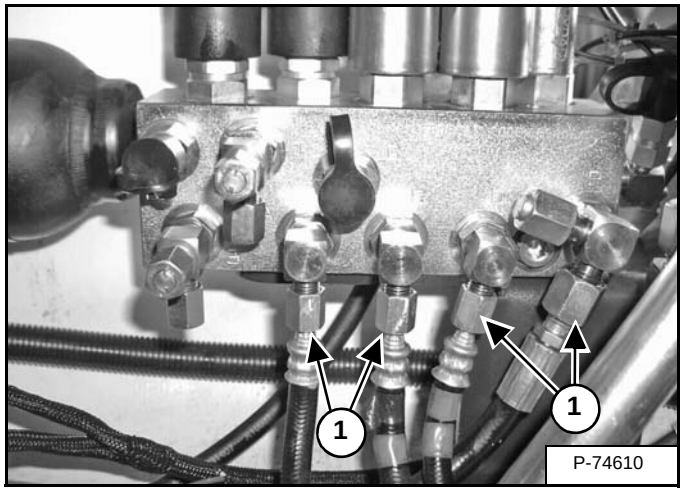
Remove the tubelines (Item 1) **[Figure 20-63-8]**.

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MANIFOLD ASSEMBLY/ACCUMULATOR (S/N 563114000 & ABOVE) (CONT'D)

Removal And Installation (Cont'd)

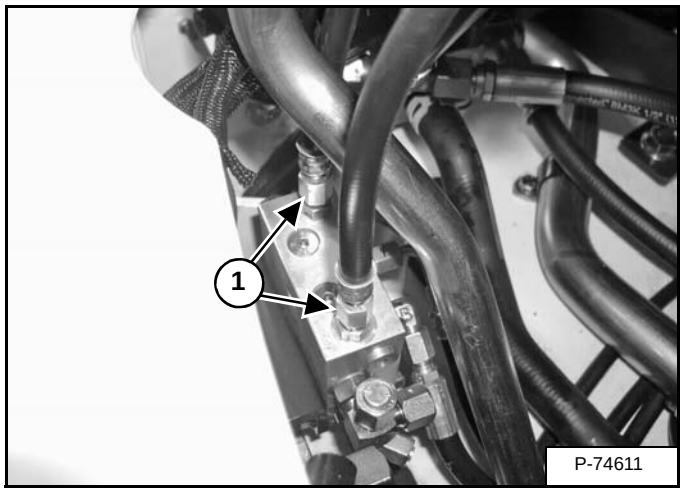
Figure 20-63-9



Remove the hoses (Item 1) **[Figure 20-63-9]**.

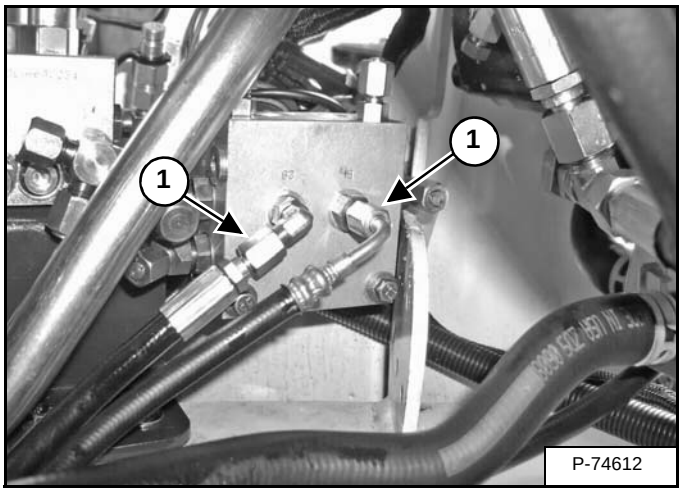
NOTE: If pilot pressure hose replacement is required, see Hoses for hose routing diagrams. (See HOSES on Page 20-114-1.)

Figure 20-63-10



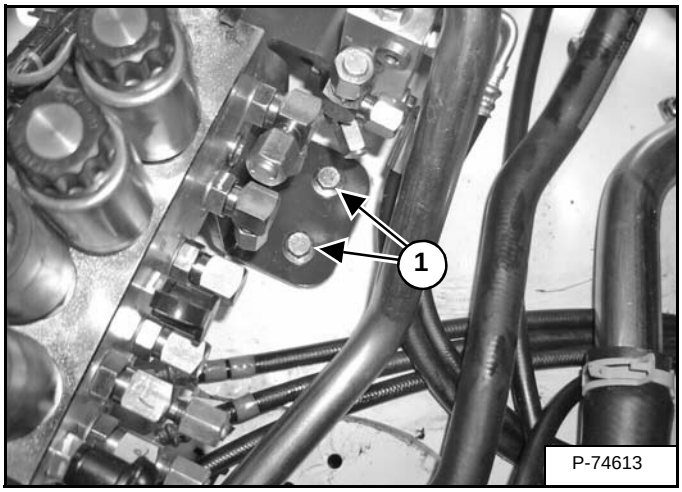
Remove the hoses (Item 1) **[Figure 20-63-10]** from the dual sequence valve.

Figure 20-63-11



Remove the hoses (Item 1) **[Figure 20-63-11]** from the dual sequence valve.

Figure 20-63-12



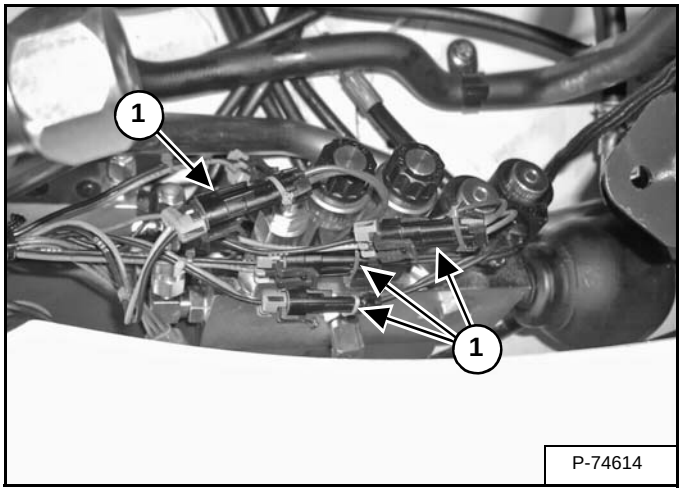
Remove the bolts (Item 2) **[Figure 20-63-12]**.

Installation: Tighten the bolts to 43 - 47 ft.lb. (58 - 64 N•m) torque.

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Removal And Installation (Cont'd)

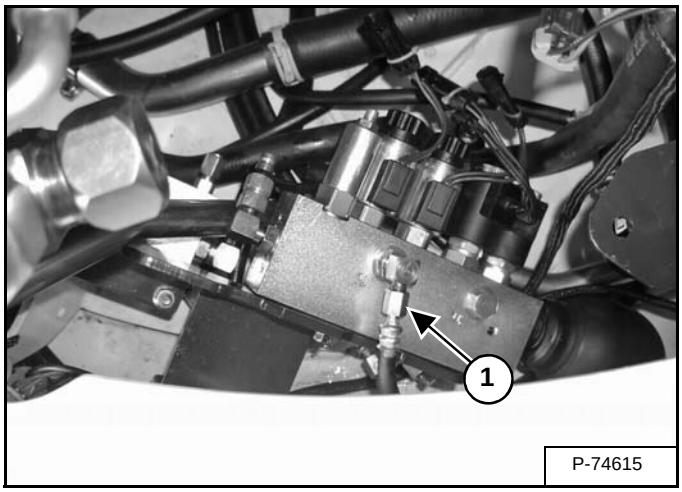
Figure 20-63-13



Disconnect the four wire harnesses (Item 1) **[Figure 20-63-13]** from the manifold assembly solenoids.

NOTE: The electrical connectors have colored cable ties for proper installation.

Figure 20-63-14



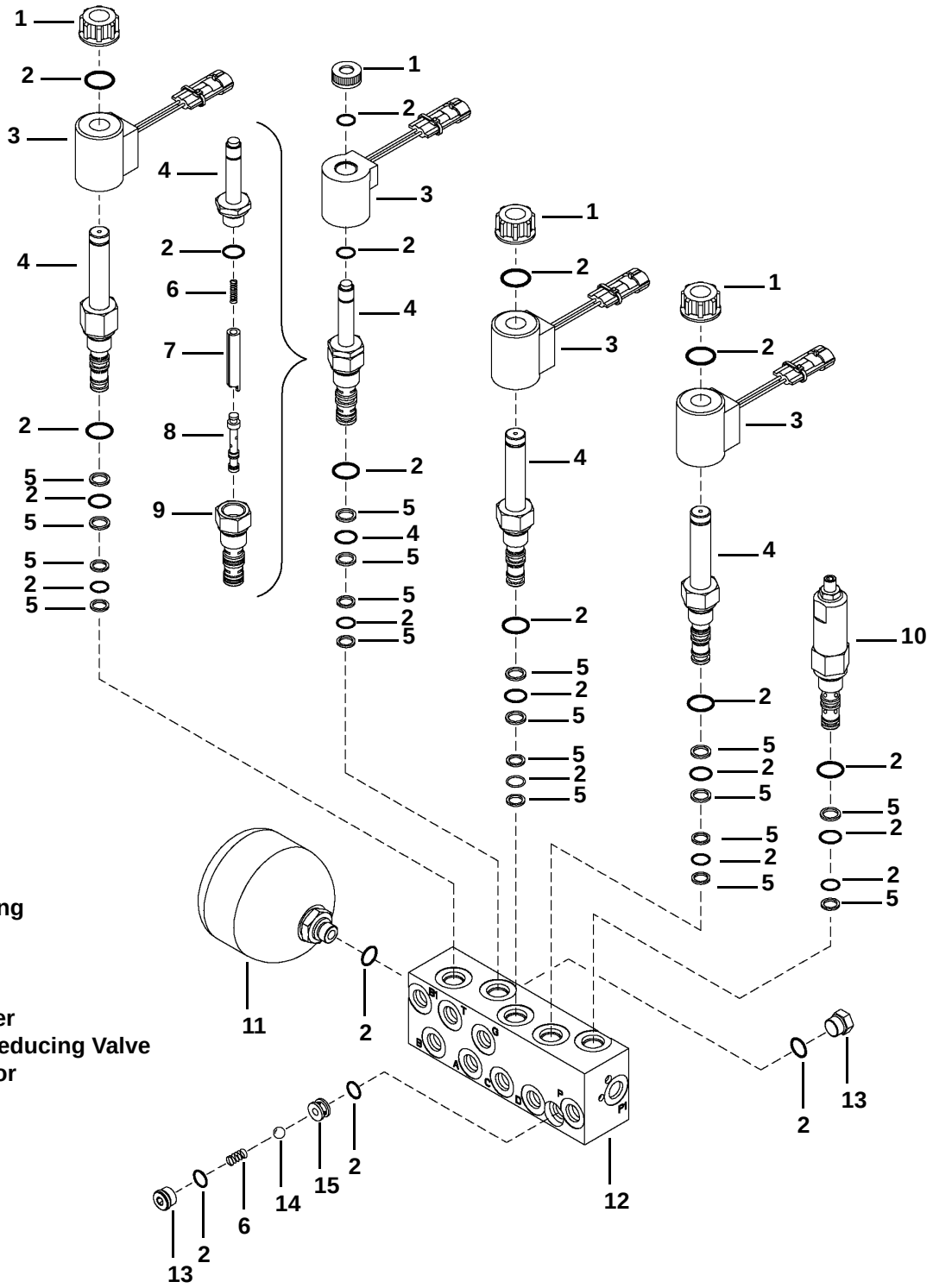
Reposition the manifold assembly.

Disconnect the hose (Item 1) **[Figure 20-63-14]** from the back of the manifold.

Remove the manifold and bracket assembly from the excavator.

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Parts Identification



1. Nut
2. O-Ring
3. Coil
4. Spool
5. Back-up Ring
6. Spring
7. Guide
8. Actuator
9. Port Adapter
10. Pressure Reducing Valve
11. Accumulator
12. Housing
13. Plug
14. Ball
15. Poppet

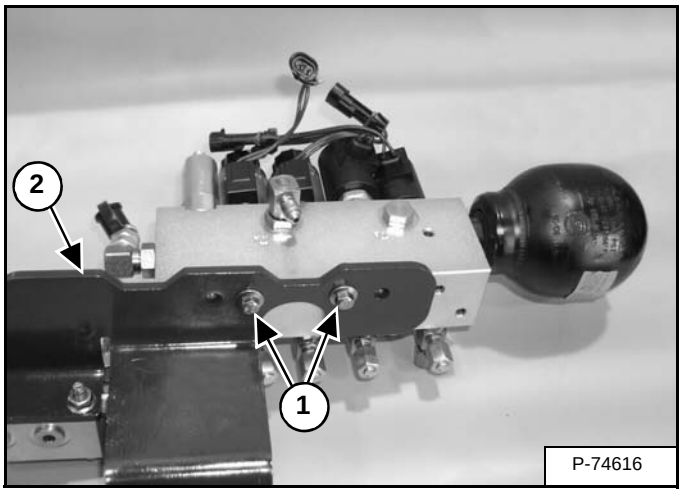
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Disassembly

Clean the outside of the manifold assembly/accumulator before disassembly.

Figure 20-63-15



Remove the bolts (Item 1) **[Figure 20-63-15]** from the mount.

Remove the mount bracket (Item 2) **[Figure 20-63-15]**.

Figure 20-63-16

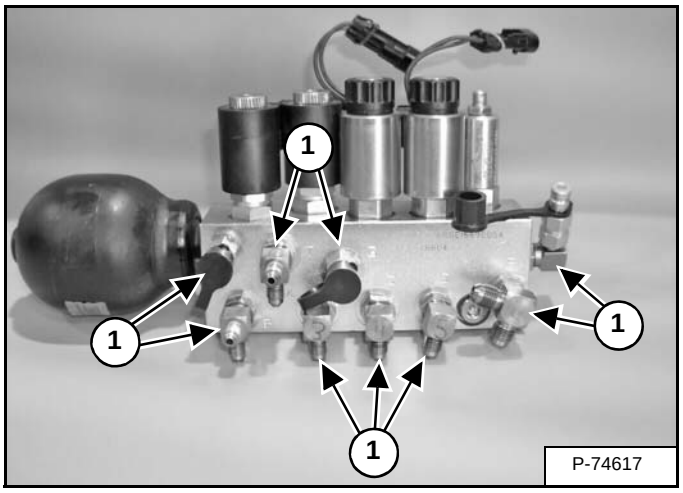
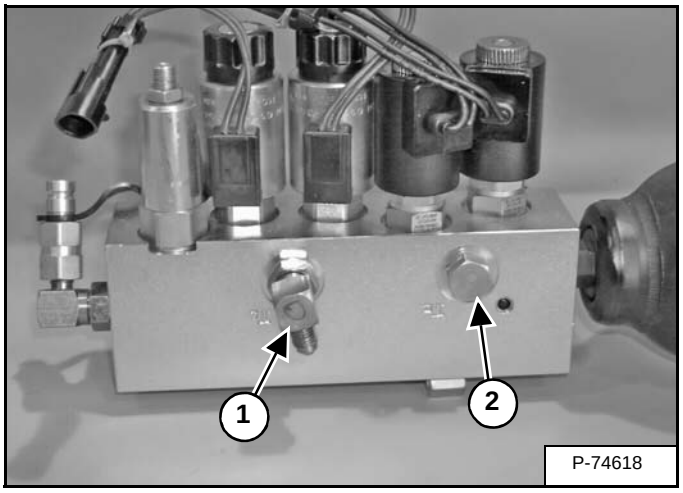


Figure 20-63-17

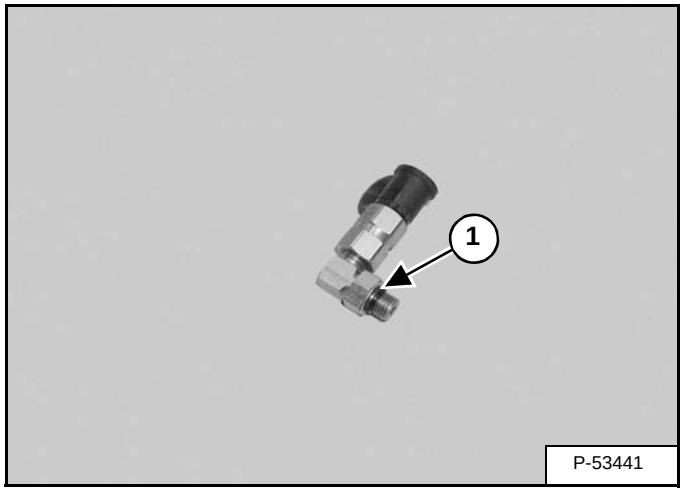


Remove the fittings (Item 1) and plug (Item 2) **[Figure 20-63-16]** & **[Figure 20-63-17]**.

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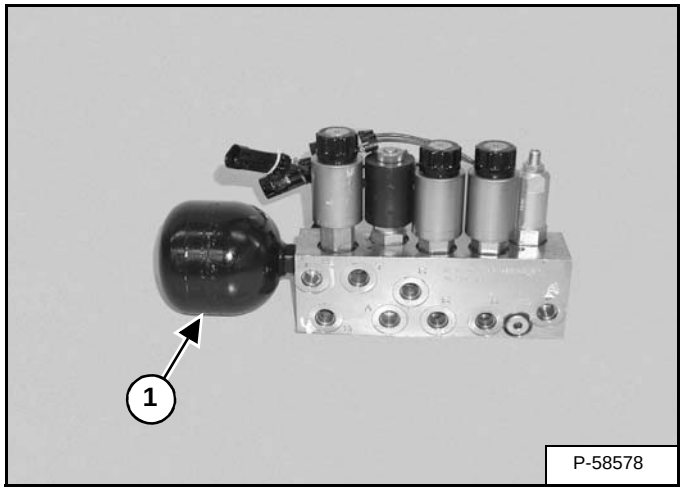
Disassembly (Cont'd)

Figure 20-63-18



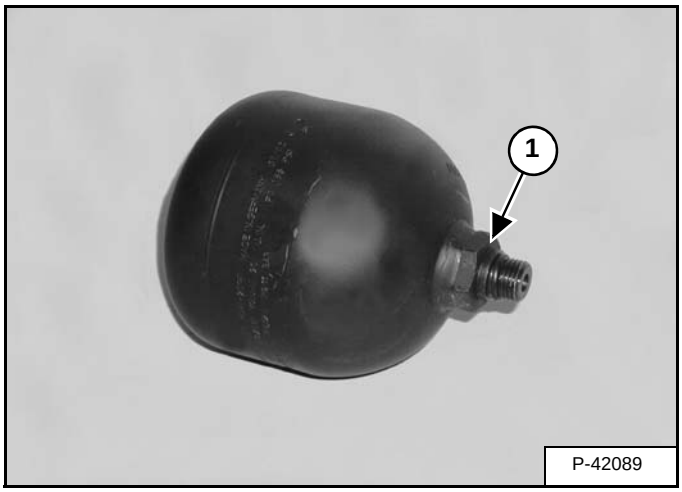
Remove the O-ring (Item 1) **[Figure 20-63-18]** from the fittings and plug (test fitting shown).

Figure 20-63-19



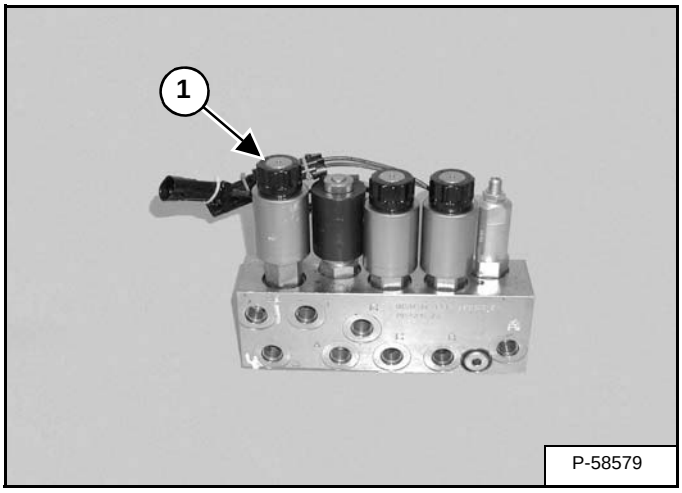
Remove the accumulator (Item 1) **[Figure 20-63-19]**.

Figure 20-63-20



Remove the O-ring (Item 1) **[Figure 20-63-20]**.

Figure 20-63-21

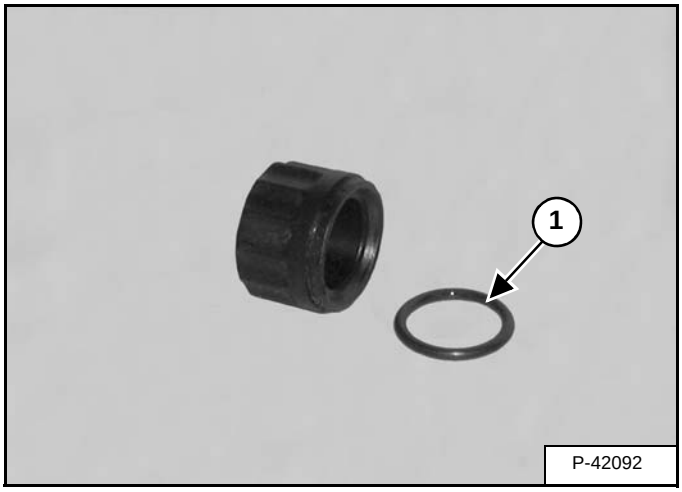


Remove the nut (Item 1) **[Figure 20-63-21]** from the spool.

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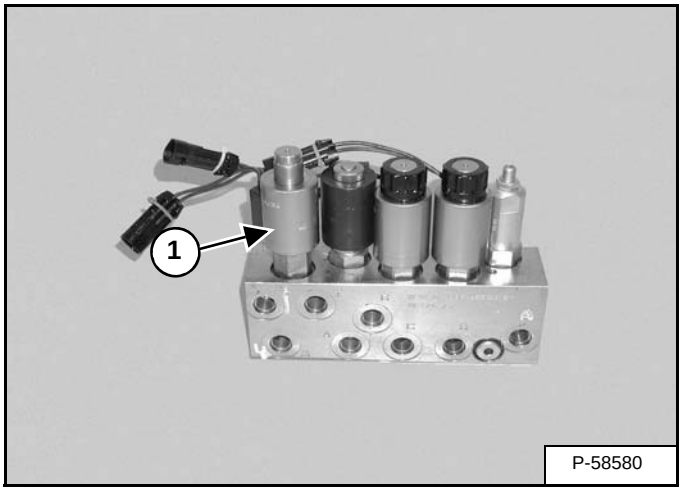
Disassembly (Cont'd)

Figure 20-63-22



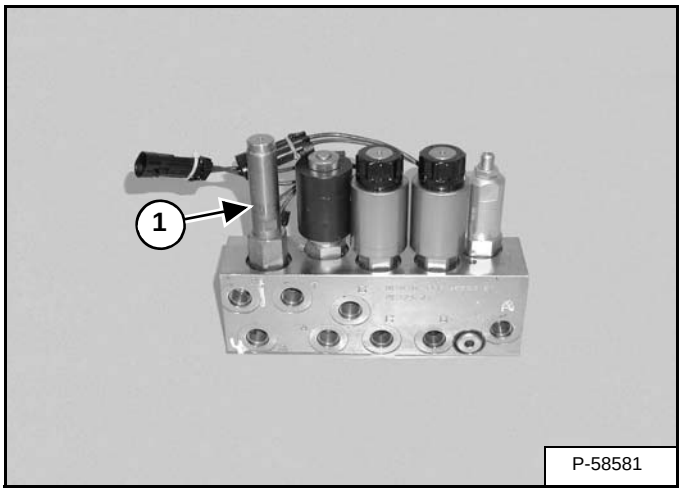
Remove the O-ring (Item 1) **[Figure 20-63-22]** from the nut.

Figure 20-63-23



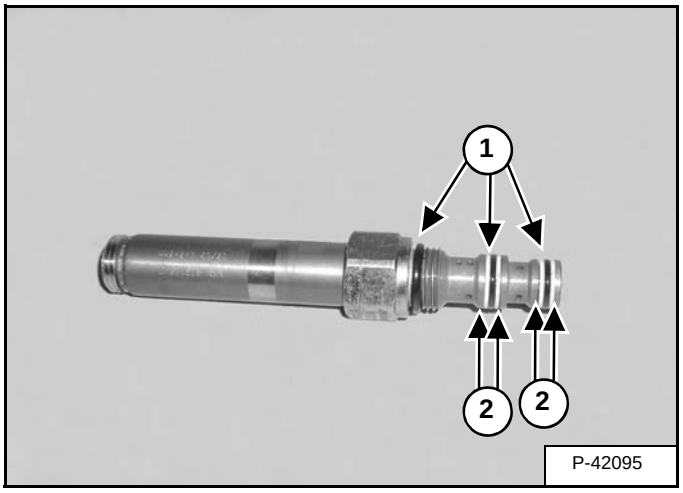
Remove the coil (Item 1) **[Figure 20-63-23]** with the green tie strap.

Figure 20-63-24



Remove the spool (Item 1) **[Figure 20-63-24]**.

Figure 20-63-25

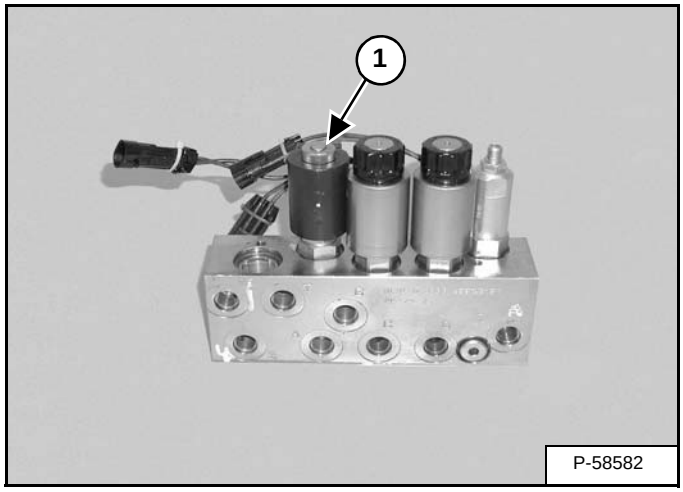


Remove the O-rings (Item 1) and back-up rings (Item 2) **[Figure 20-63-25]** from the spool.

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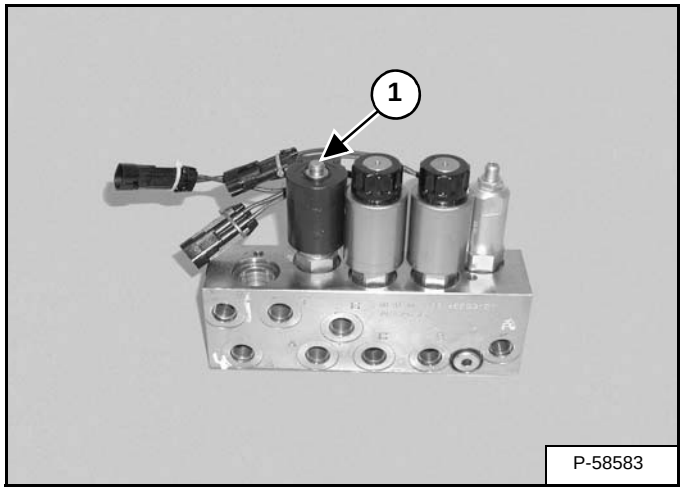
Disassembly (Cont'd)

Figure 20-63-26



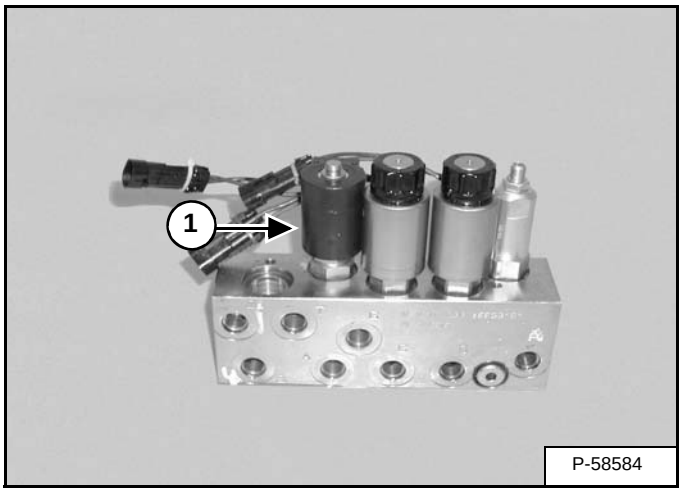
Remove the nut (Item 1) **[Figure 20-63-26]** from the spool.

Figure 20-63-27



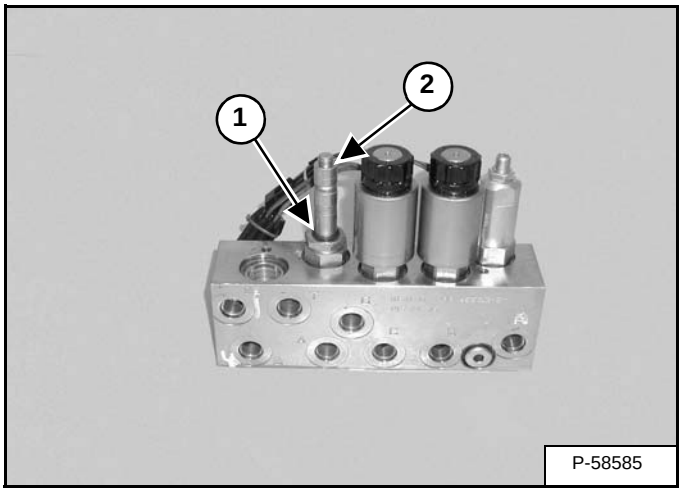
Remove the O-ring (Item 1) **[Figure 20-63-27]** from the spool.

Figure 20-63-28



Remove the coil (Item 1) **[Figure 20-63-28]** with the yellow tie strap.

Figure 20-63-29

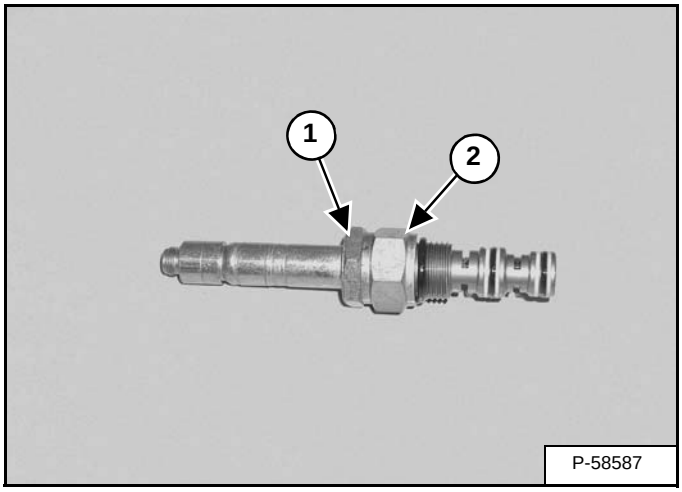


Remove the O-ring (Item 1) and spool (Item 2) **[Figure 20-63-29]**.

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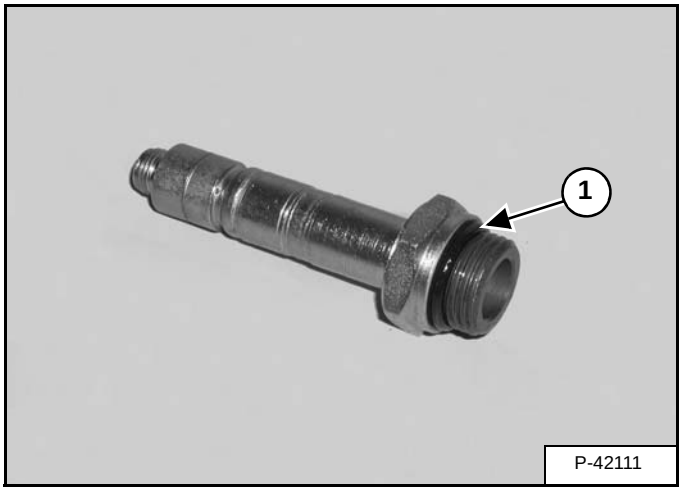
Disassembly (Cont'd)

Figure 20-63-30



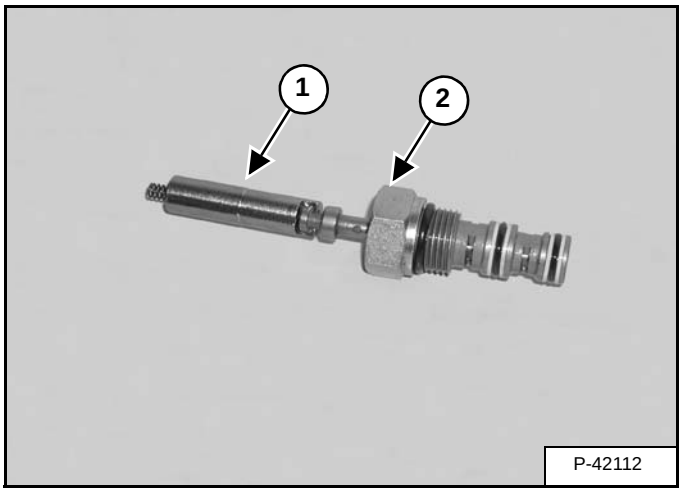
Remove the spool (Item 1) from the port adapter (Item 2) **[Figure 20-63-30]**.

Figure 20-63-31



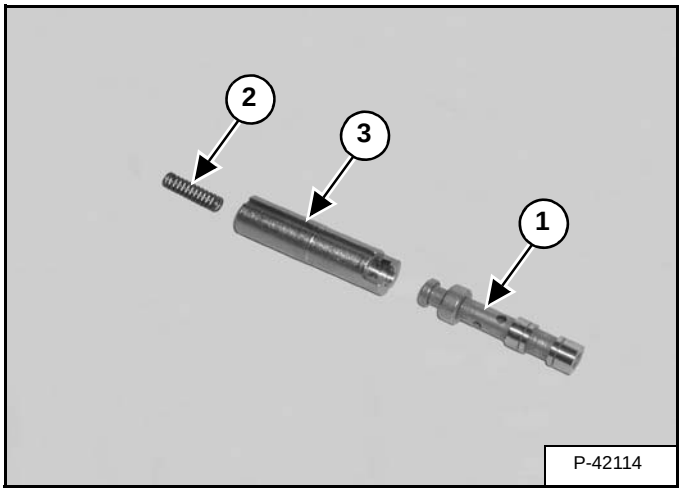
Remove the O-ring (Item 1) **[Figure 20-63-31]** from the spool.

Figure 20-63-32



Remove the actuator assembly (Item 1) from the port adapter (Item 2) **[Figure 20-63-32]**.

Figure 20-63-33

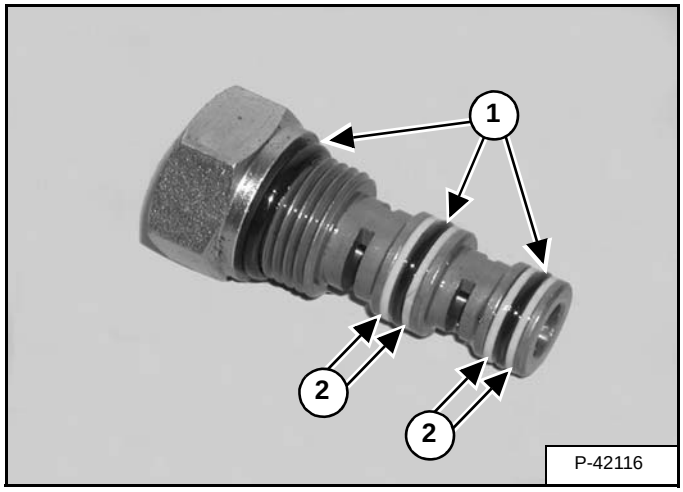


Remove the actuator (Item 1) and spring (Item 2) from the guide (Item 3) **[Figure 20-63-33]**.

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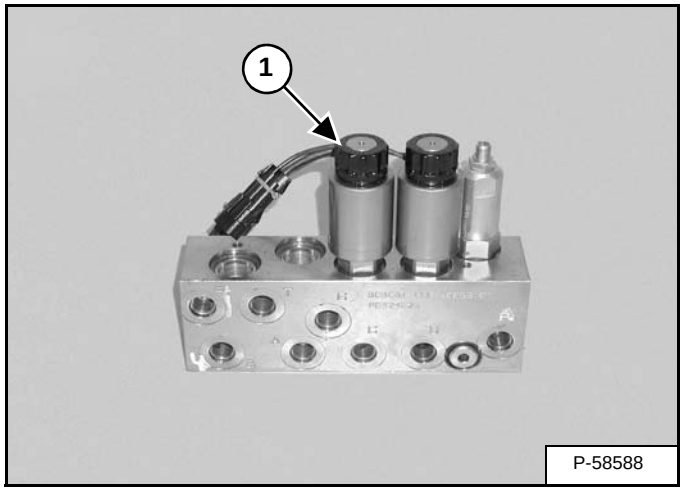
Disassembly (Cont'd)

Figure 20-63-34



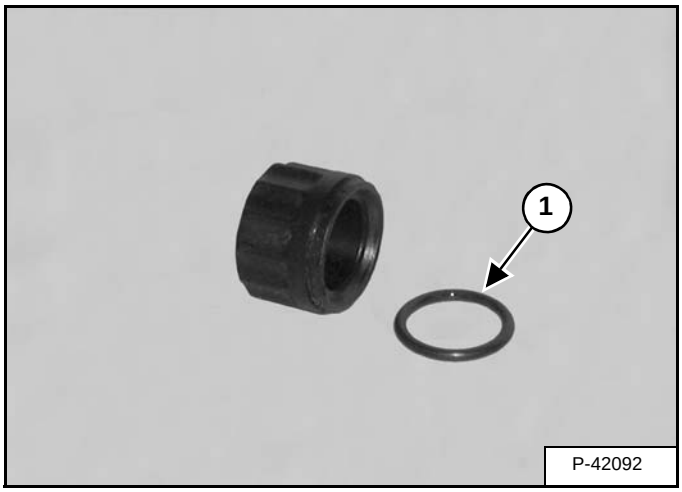
Remove the O-rings (Item 1) and back-up rings (Item 2) **[Figure 20-63-34]**.

Figure 20-63-35



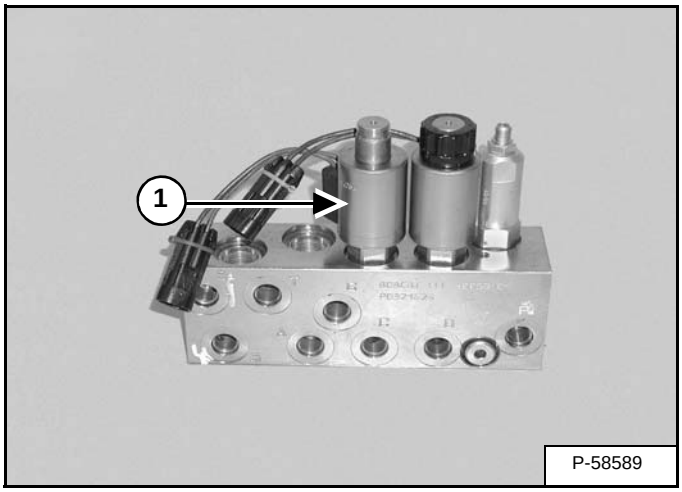
Remove the nut (Item 1) **[Figure 20-63-35]** from the spool.

Figure 20-63-36



Remove the O-ring (Item 1) **[Figure 20-63-36]** from the nut.

Figure 20-63-37

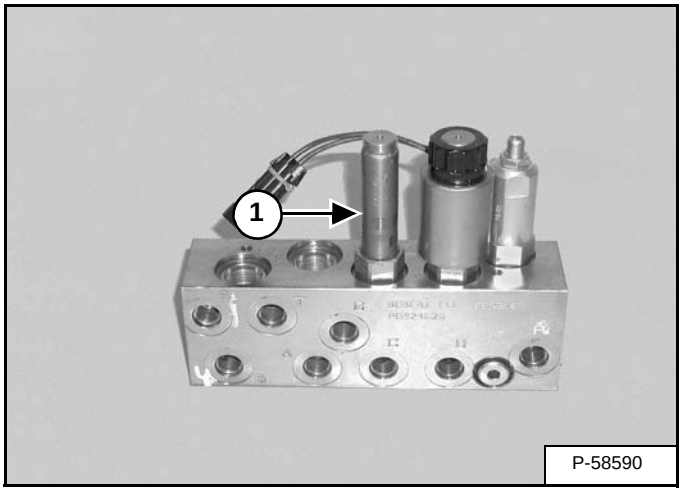


Remove the coil (Item 1) **[Figure 20-63-37]** with the red tie strap.

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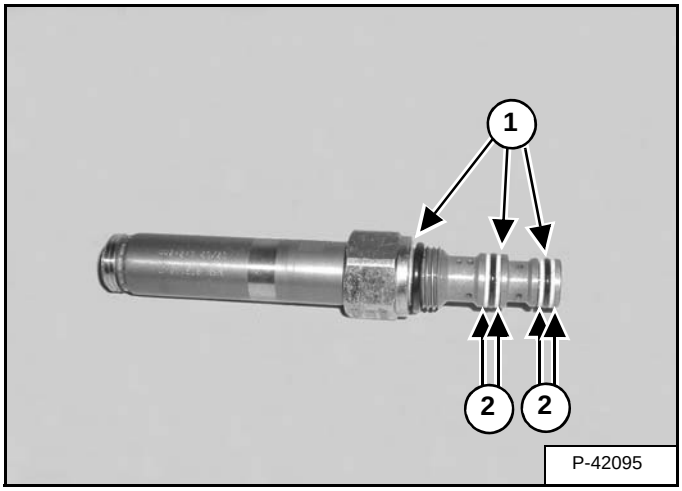
Disassembly (Cont'd)

Figure 20-63-38



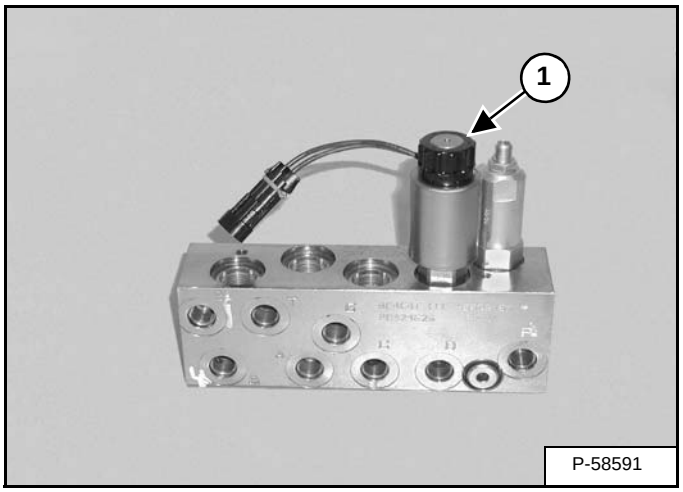
Remove the spool (Item 1) **[Figure 20-63-38]**.

Figure 20-63-39



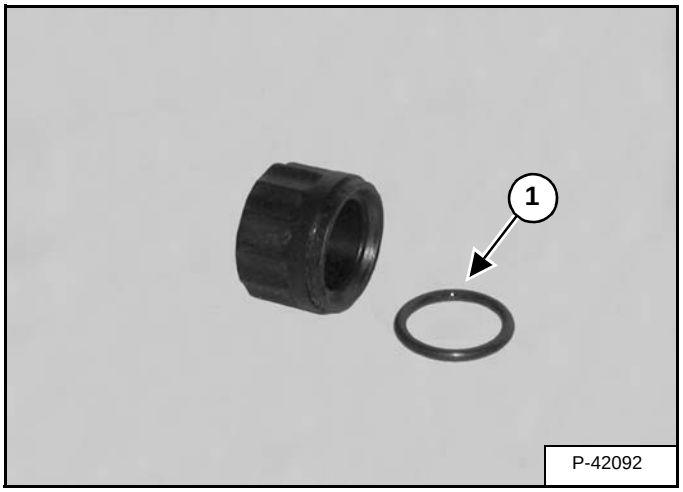
Remove the O-rings (Item 1) and back-up rings (Item 2) **[Figure 20-63-39]**.

Figure 20-63-40



Remove the nut (Item 1) **[Figure 20-63-40]** from the spool.

Figure 20-63-41

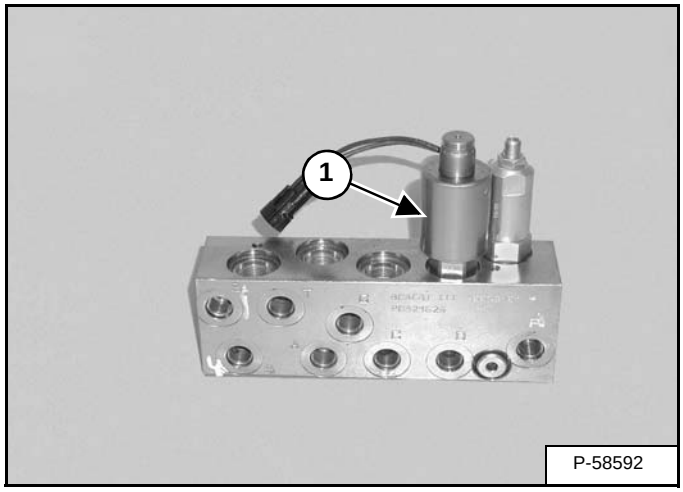


Remove the O-ring (Item 1) **[Figure 20-63-41]** from the nut.

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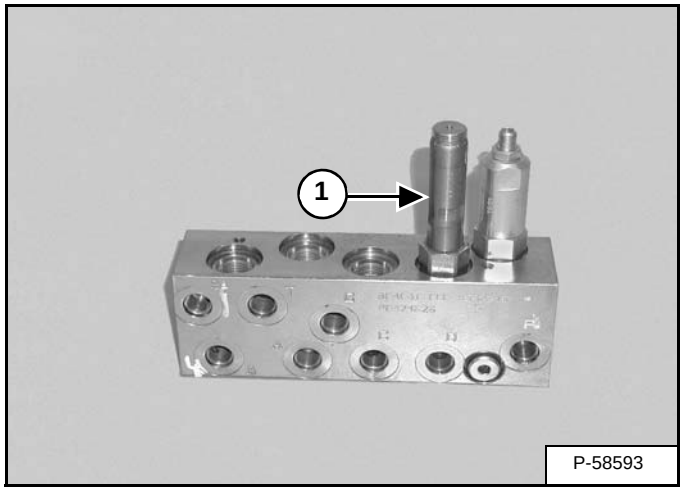
Disassembly (Cont'd)

Figure 20-63-42



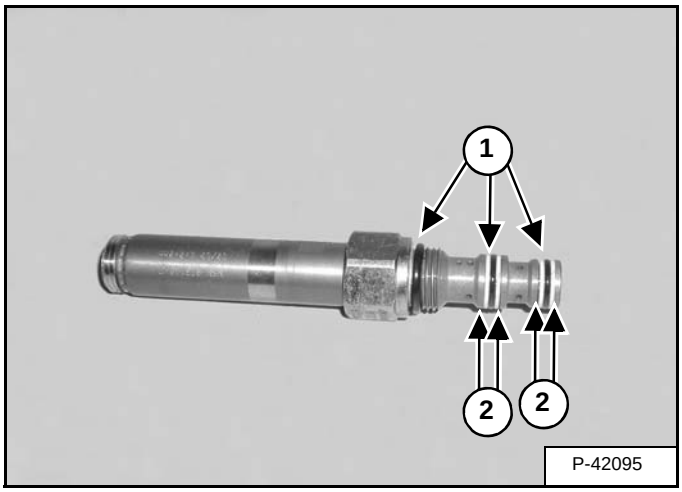
Remove the coil (Item 1) **[Figure 20-63-42]** with the blue tie strap.

Figure 20-63-43



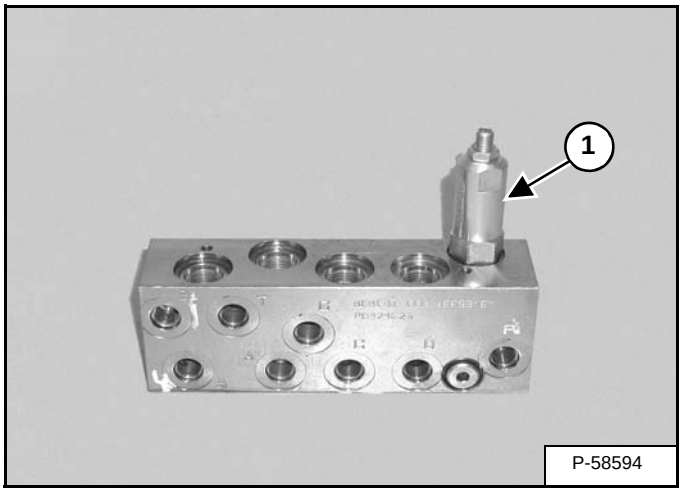
Remove the spool (Item 1) **[Figure 20-63-43]**.

Figure 20-63-44



Remove the O-rings (Item 1) and back-up rings (Item 2) **[Figure 20-63-44]** from the spool assembly.

Figure 20-63-45

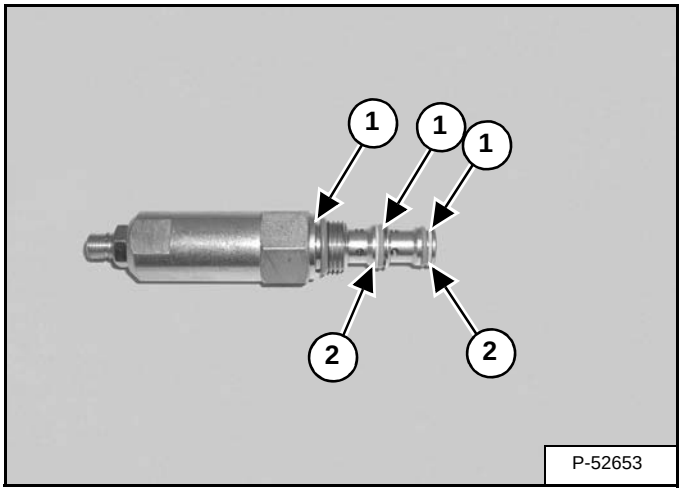


Remove the pressure reducing valve (Item 1) **[Figure 20-63-45]**.

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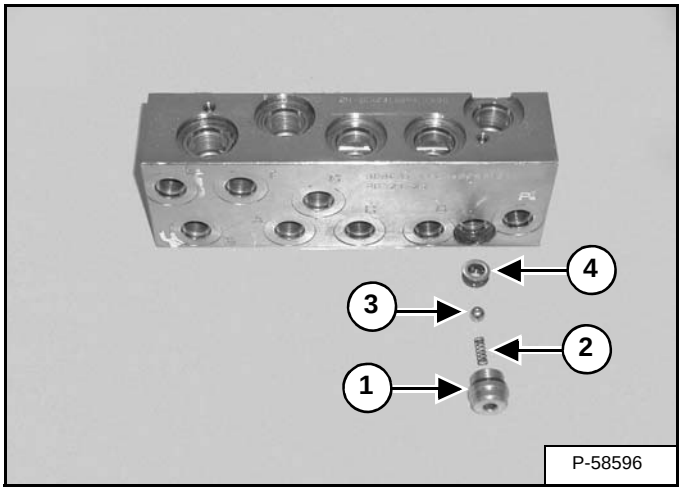
Disassembly (Cont'd)

Figure 20-63-46



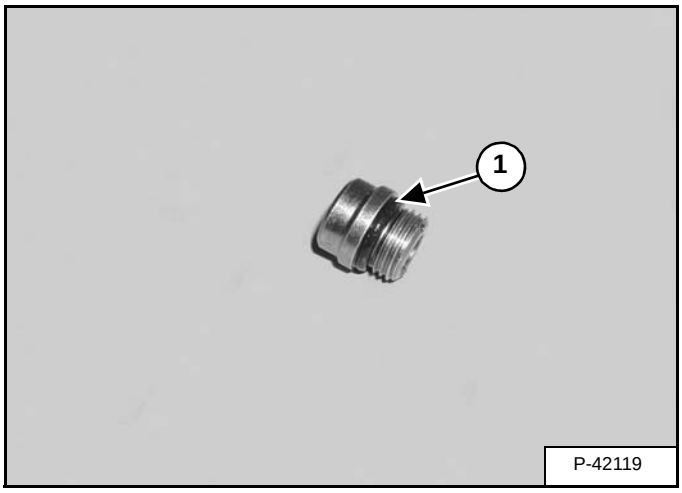
Remove the O-rings (Item 1) and back-up rings (Item 2) **[Figure 20-63-46]**.

Figure 20-63-47



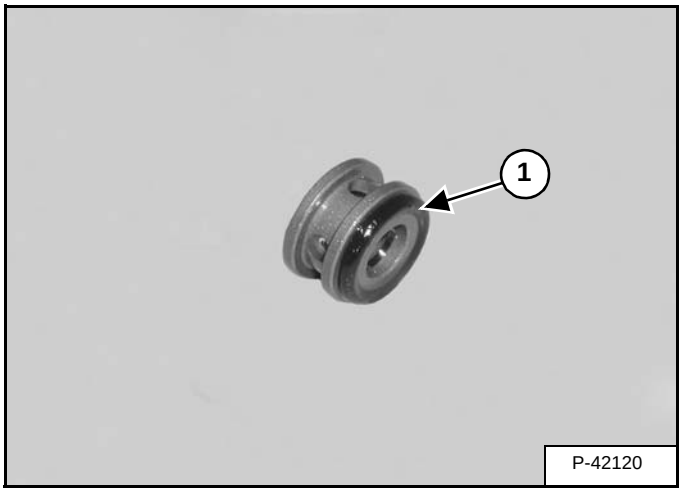
Remove the plug (Item 1), spring (Item 2), ball (Item 3) and poppet (Item 4) **[Figure 20-63-47]**.

Figure 20-63-48



Remove the O-ring (Item 1) **[Figure 20-63-48]** from the plug.

Figure 20-63-49



Remove the O-ring (Item 1) **[Figure 20-63-49]** from the poppet.

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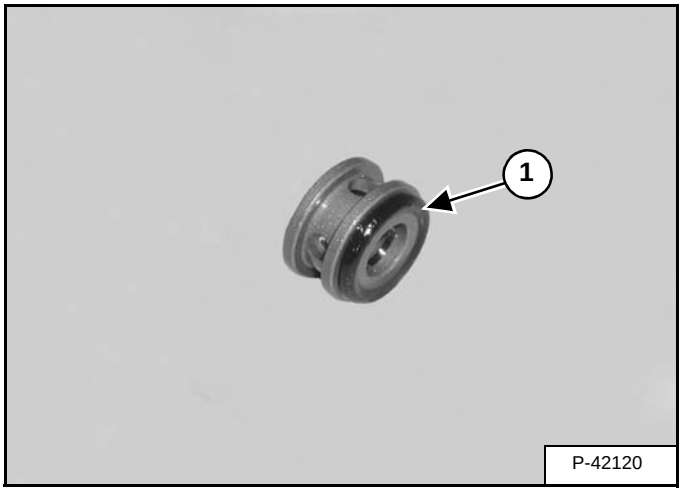
Assembly

Clean all parts in solvent and dry with compressed air.

Replace any worn or damaged parts. Always use new O-rings and back-up rings.

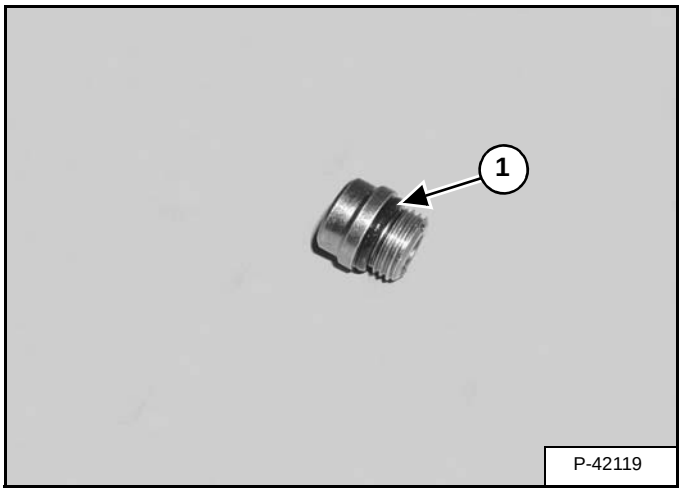
Apply clean hydraulic fluid to the O-rings and back-up rings during installation.

Figure 20-63-50



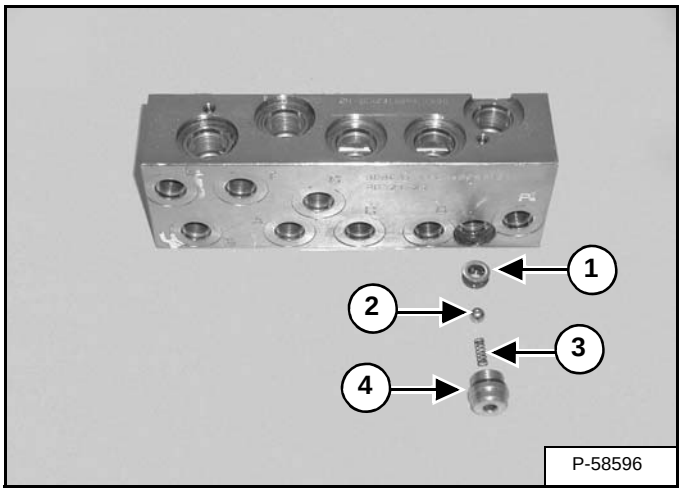
Install the O-ring (Item 1) **[Figure 20-63-50]** on the poppet.

Figure 20-63-51



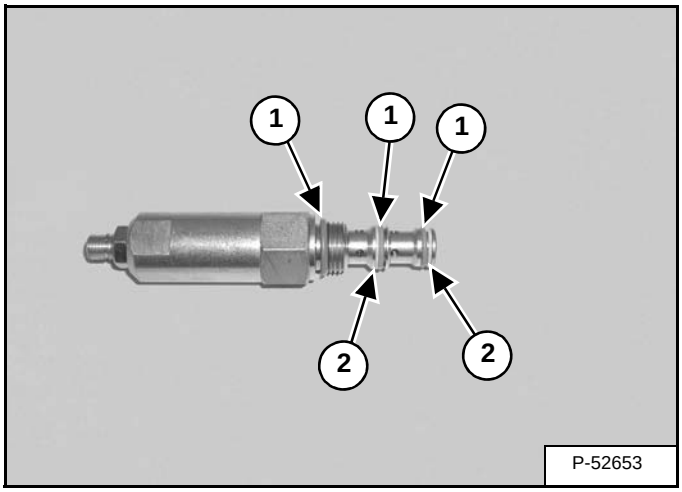
Install the O-ring (Item 1) **[Figure 20-63-51]** on the plug.

Figure 20-63-52



Install the poppet (Item 1), ball (Item 2), spring (Item 3), and plug (Item 4) **[Figure 20-63-52]** in the housing.

Figure 20-63-53

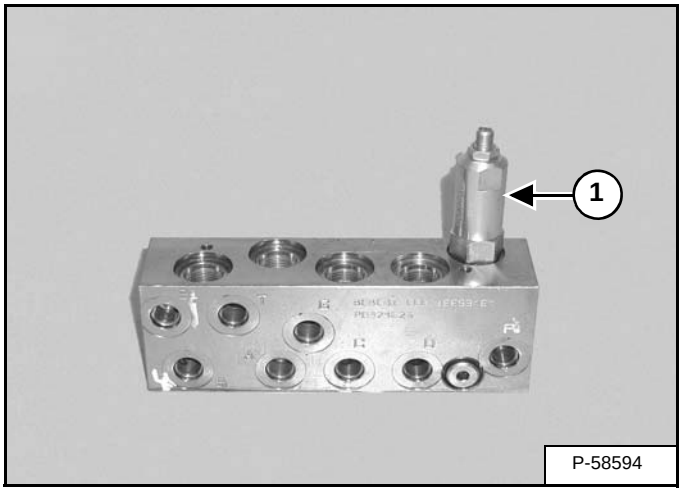


Install the O-rings (Item 1) and back-up rings (Item 2) **[Figure 20-63-53]** on the pressure reducing valve.

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Assembly (Cont'd)

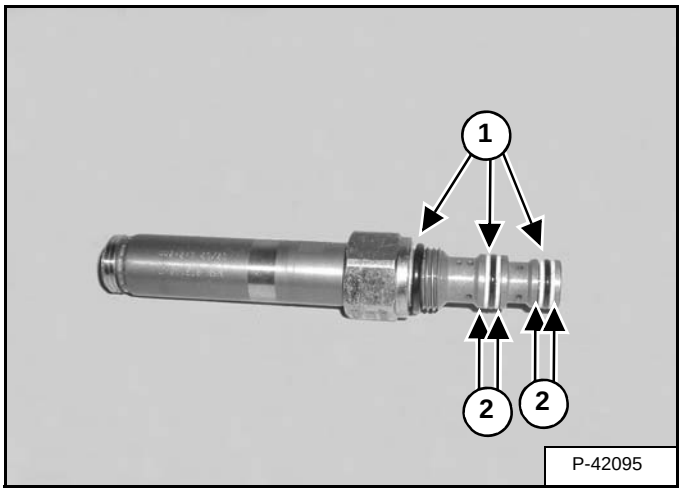
Figure 20-63-54



Install the pressure reducing valve (Item 1) **[Figure 20-63-54]**.

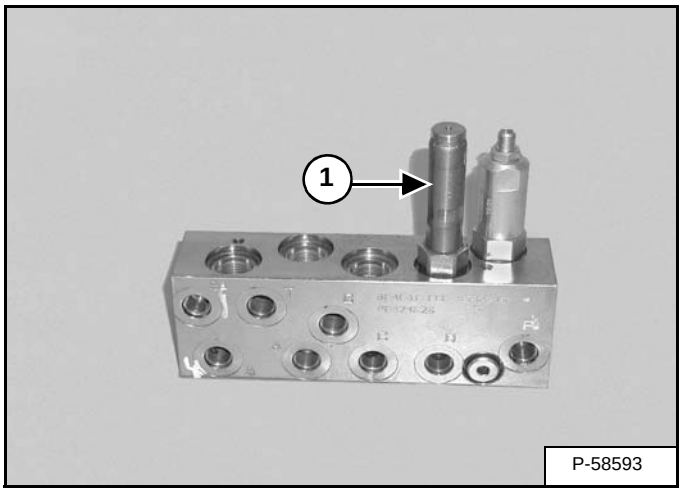
Tighten the pressure reducing valve to 22 ft.-lb. (30 N•m) torque.

Figure 20-63-55



Install the O-rings (Item 1) and back-up rings (Item 2) **[Figure 20-63-55]** on the spool.

Figure 20-63-56



Install the spool (Item 1) **[Figure 20-63-56]**.

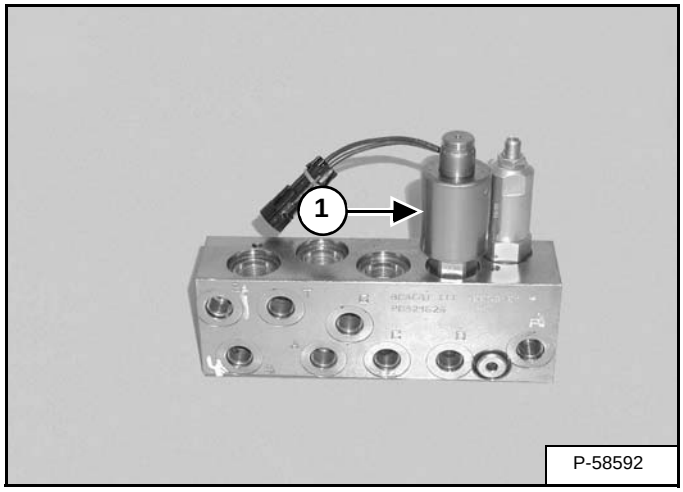
Tighten the spool to 22 ft.-lb. (30 N•m) torque.

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MANIFOLD ASSEMBLY/ACCUMULATOR (S/N 563114000 & ABOVE) (CONT'D)

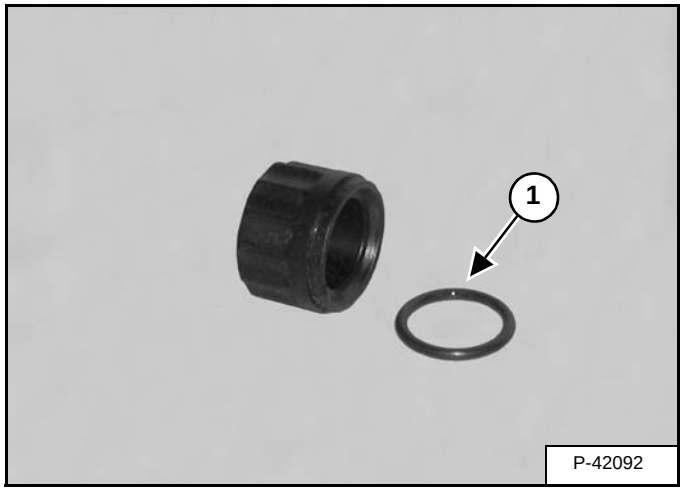
Assembly (Cont'd)

Figure 20-63-57



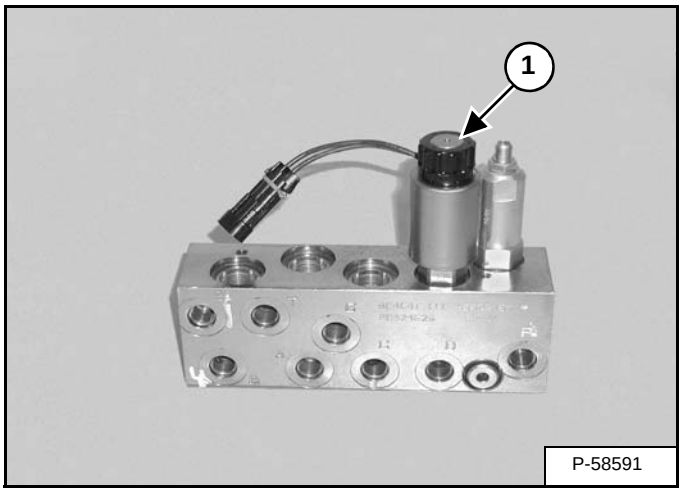
Install the coil with the blue tie strap (Item 1) **[Figure 20-63-57]**.

Figure 20-63-58



Install the O-ring (Item 1) **[Figure 20-63-58]** in the nut.

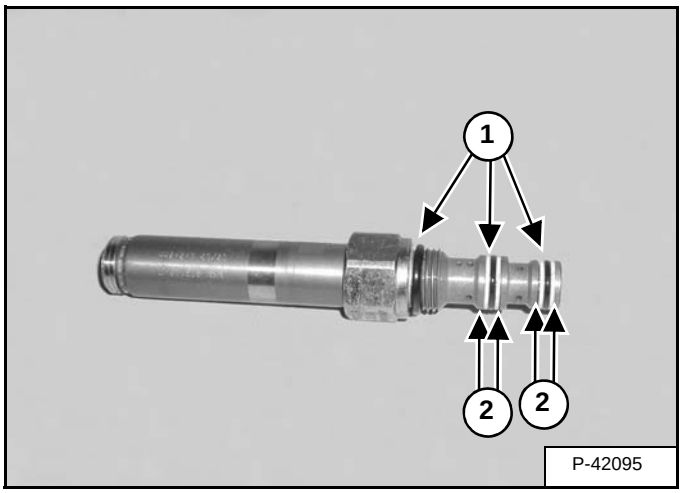
Figure 20-63-59



Install the nut (Item 1) **[Figure 20-63-59]**.

Tighten the nut to 53 in.-lb. (6 N•m) torque.

Figure 20-63-60



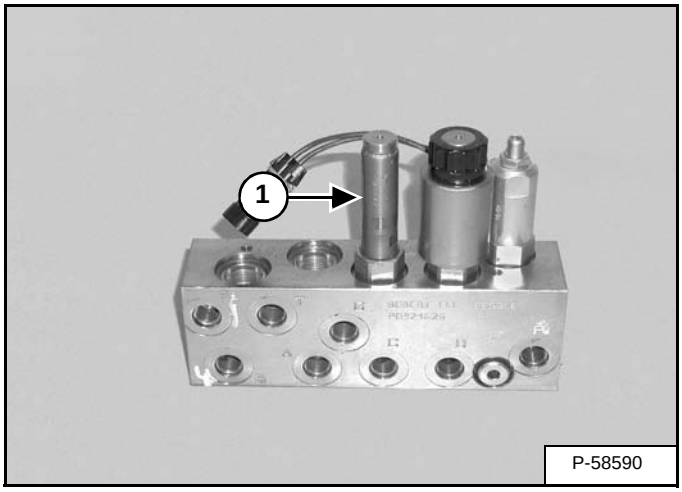
Install the O-rings (Item 1) and back-up rings (Item 2) **[Figure 20-63-60]** on the spool.

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MANIFOLD ASSEMBLY/ACCUMULATOR (S/N 563114000 & ABOVE) (CONT'D)

Assembly (Cont'd)

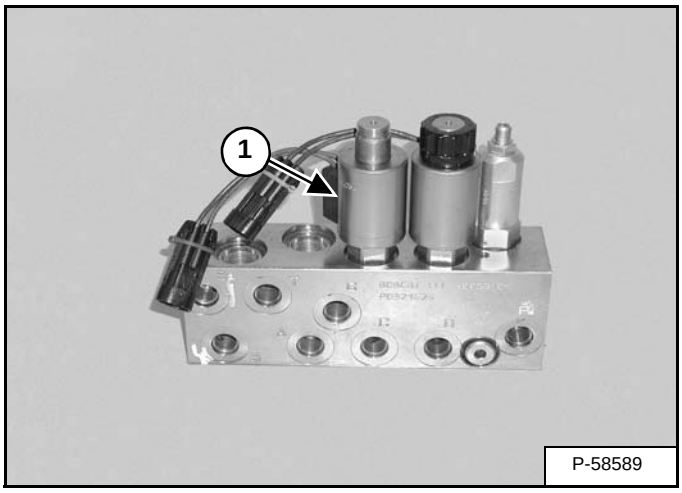
Figure 20-63-61



Install the spool (Item 1) **[Figure 20-63-61]**.

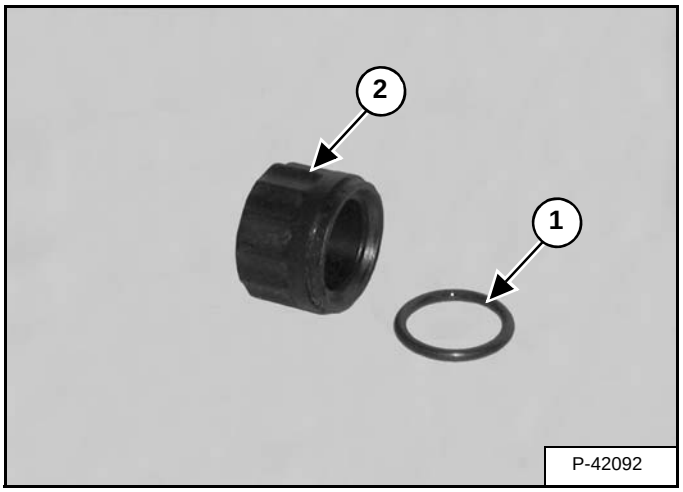
Tighten the spool to 22 ft.-lb. (30 N•m) torque.

Figure 20-63-62



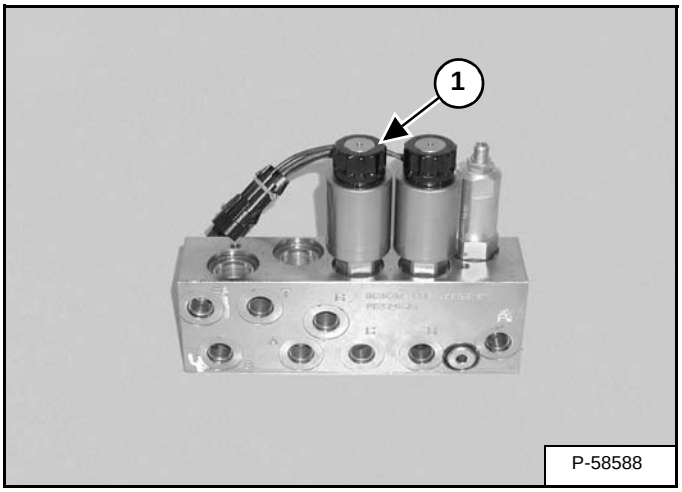
Install the coil with the red tie strap (Item 1) **[Figure 20-63-62]**.

Figure 20-63-63



Install the O-ring (Item 1) on the nut (Item 2) **[Figure 20-63-63]**.

Figure 20-63-64



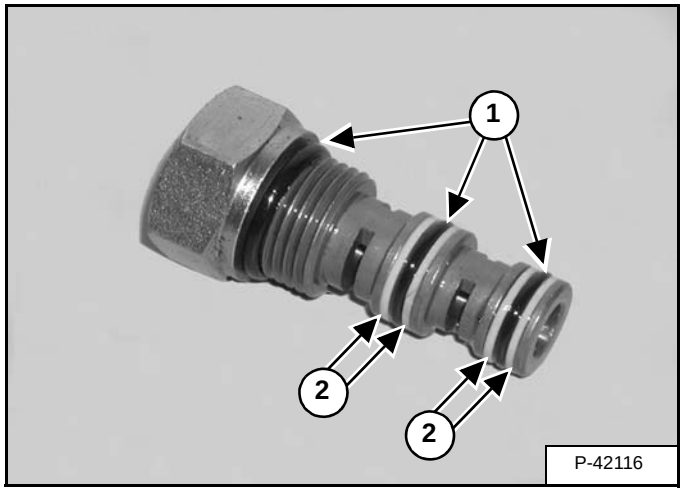
Install the nut (Item 1) **[Figure 20-63-64]** on the spool.

Tighten the nut to 53 in.-lb. (6 N•m) torque.

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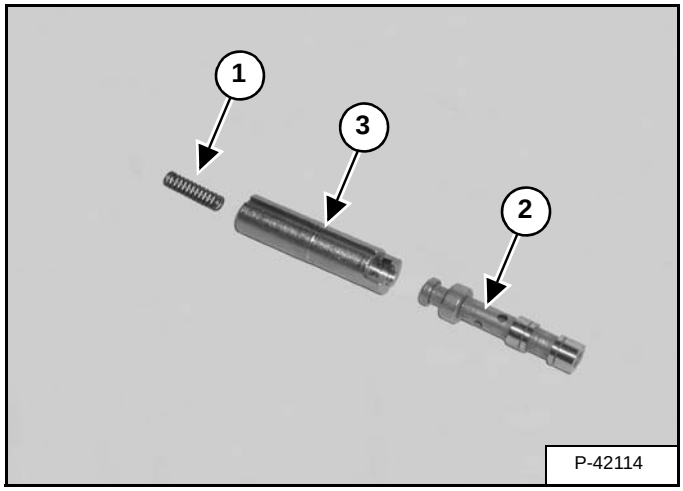
Assembly (Cont'd)

Figure 20-63-65



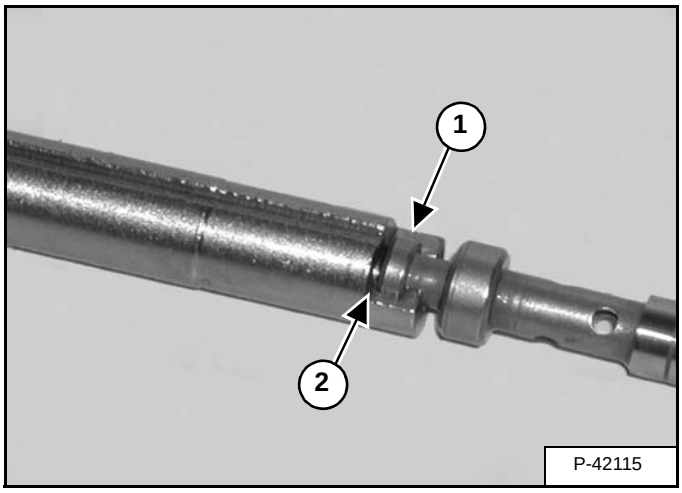
Install the O-rings (Item 1) and back-up rings (Item 2) **[Figure 20-63-65]** on the port adapter.

Figure 20-63-66



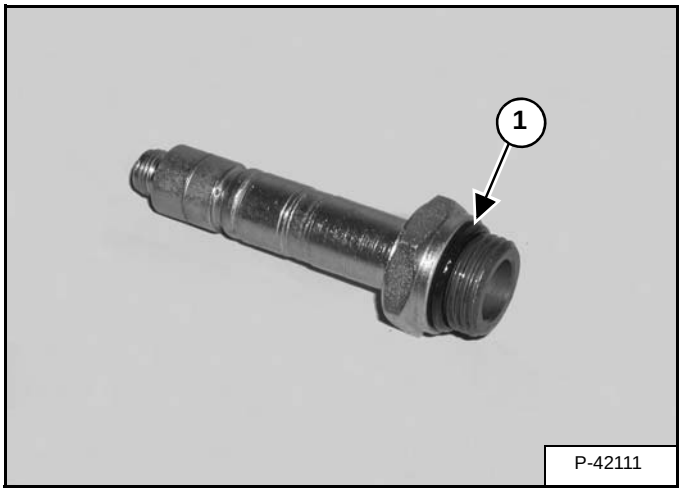
Install the spring (Item 1) and actuator (Item 2) in the guide (Item 3) **[Figure 20-63-66]**.

Figure 20-63-67



Install the end of the actuator (Item 1) into the groove in the guide (Item 2) **[Figure 20-63-67]** on the port adapter.

Figure 20-63-68

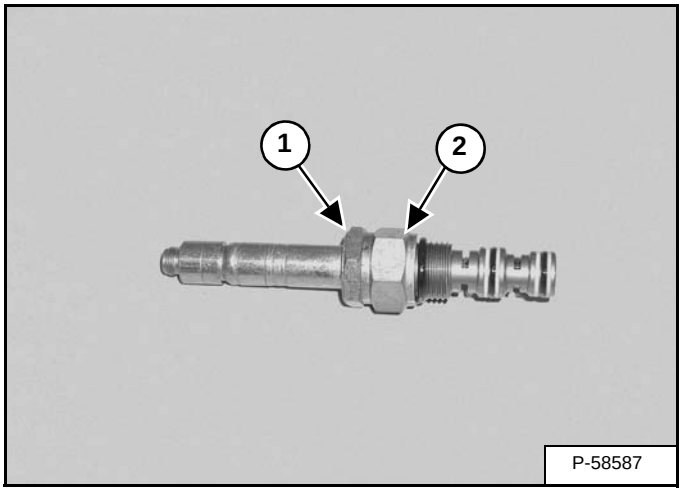


Install the O-ring (Item 1) **[Figure 20-63-68]** on the spool.

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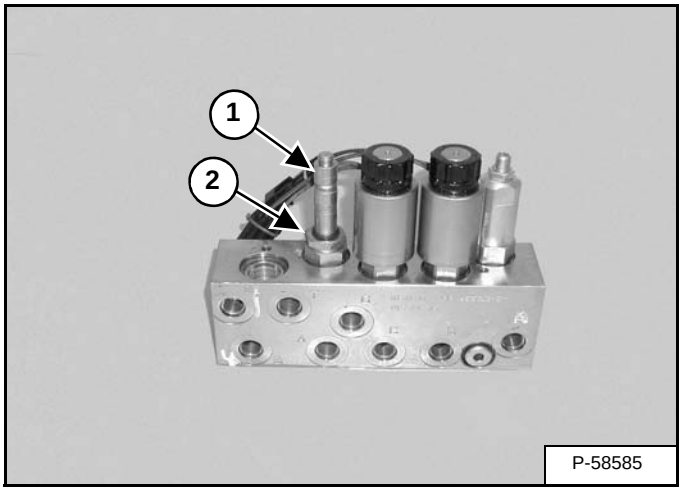
Assembly (Cont'd)

Figure 20-63-69



Install the spool (Item 1) in the port adapter (Item 2) **[Figure 20-63-69]**.

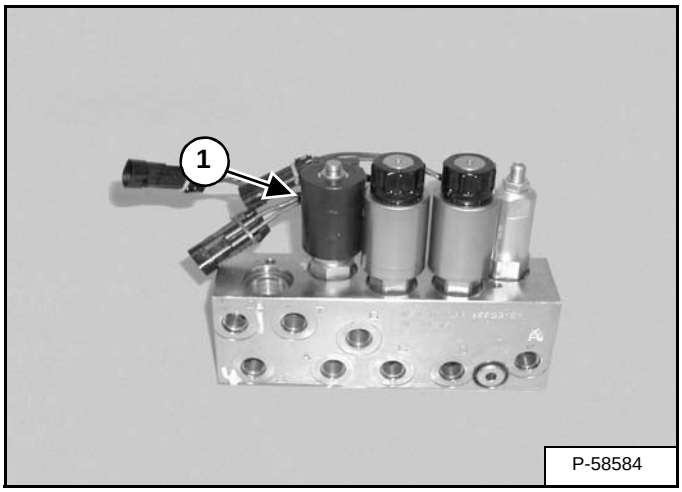
Figure 20-63-70



Install the spool (Item 1) and O-ring (Item 2) **[Figure 20-63-70]**.

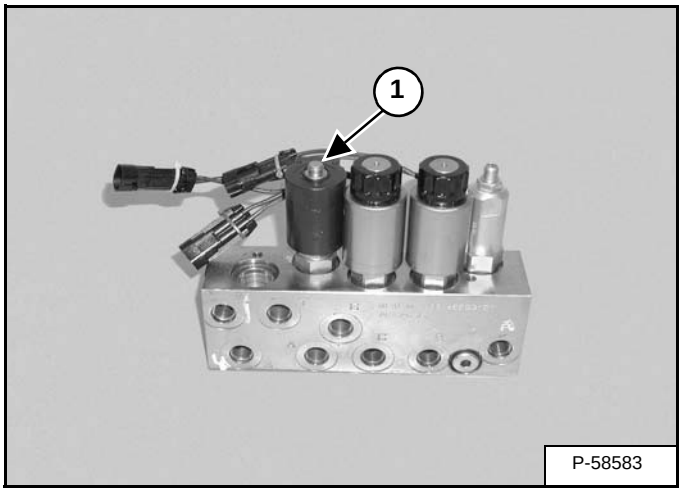
Tighten the spool to 22 ft.-lb. (30 N•m) torque.

Figure 20-63-71



Install the coil with the yellow tie strap (Item 1) **[Figure 20-63-71]**.

Figure 20-63-72

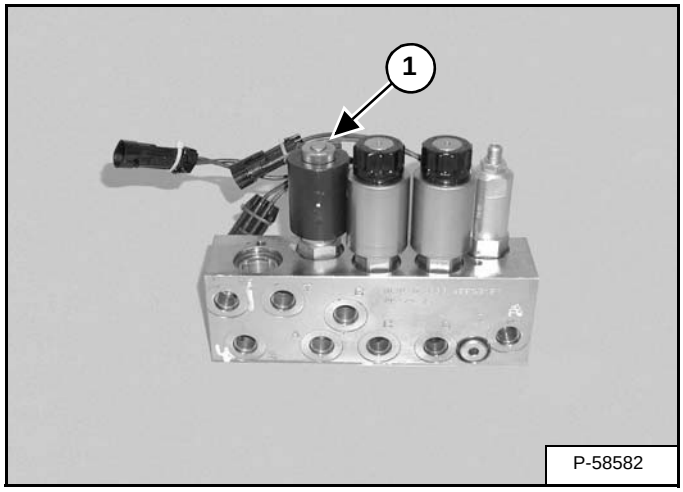


Install the O-ring (Item 1) **[Figure 20-63-72]**.

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Assembly (Cont'd)

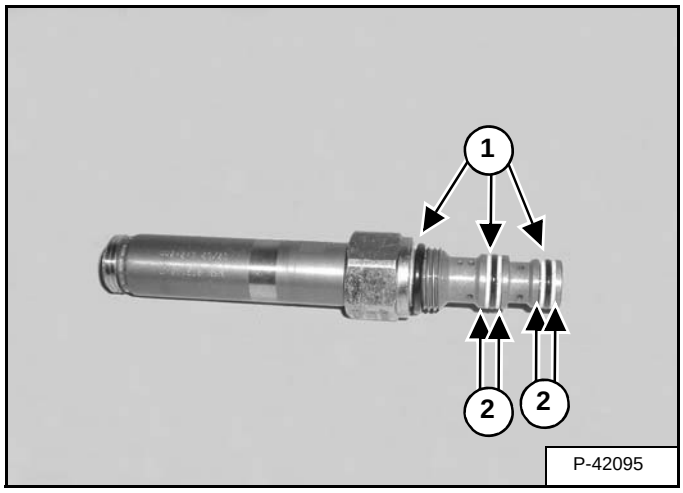
Figure 20-63-73



Install the nut (Item 1) **[Figure 20-63-73]** on the spool.

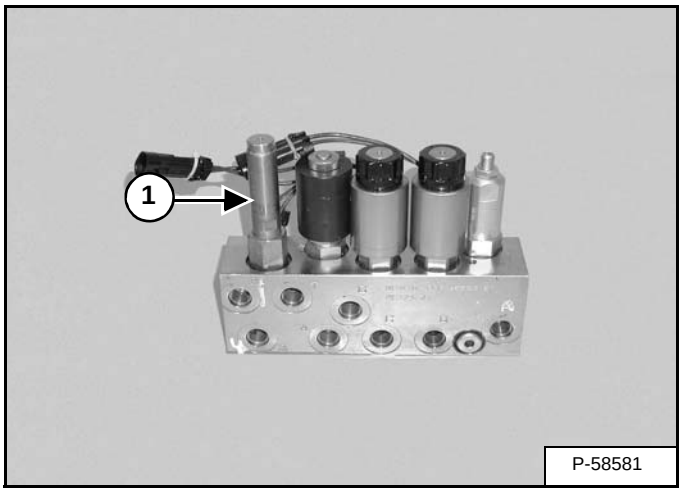
Tighten the nut to 53 in.-lb. (6 N•m) torque.

Figure 20-63-74



Install the O-rings (Item 1) and back-up rings (Item 2) **[Figure 20-63-74]** on the spool.

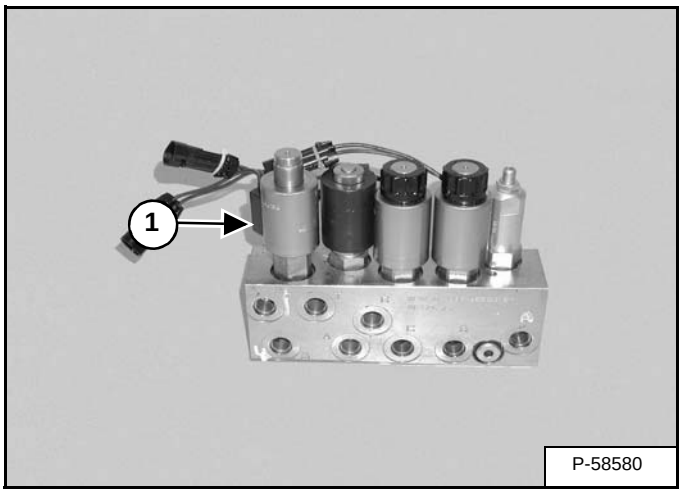
Figure 20-63-75



Install the spool (Item 1) **[Figure 20-63-75]**.

Tighten the spool to 22 ft.-lb. (30 N•m) torque.

Figure 20-63-76

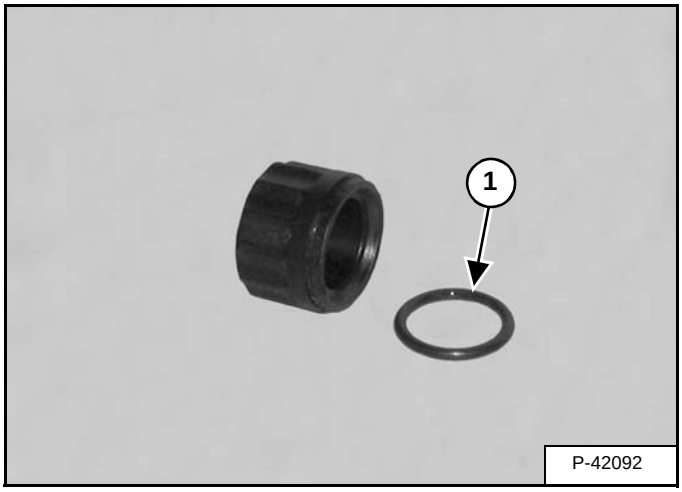


Install the coil with the green tie strap (Item 1) **[Figure 20-63-76]** on the spool.

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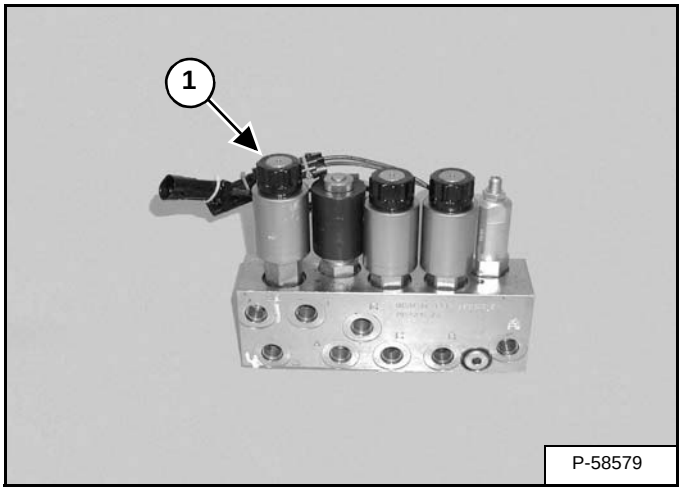
Assembly (Cont'd)

Figure 20-63-77



Install the O-ring (Item 1) **[Figure 20-63-77]** on the nut.

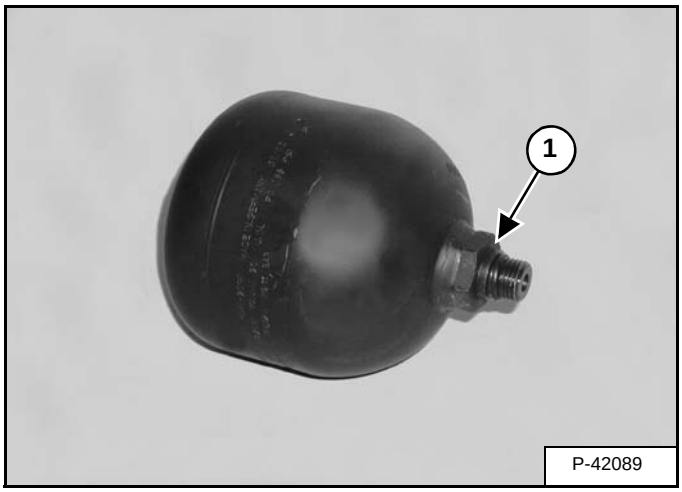
Figure 20-63-78



Install the nut (Item 1) **[Figure 20-63-78]** on the spool.

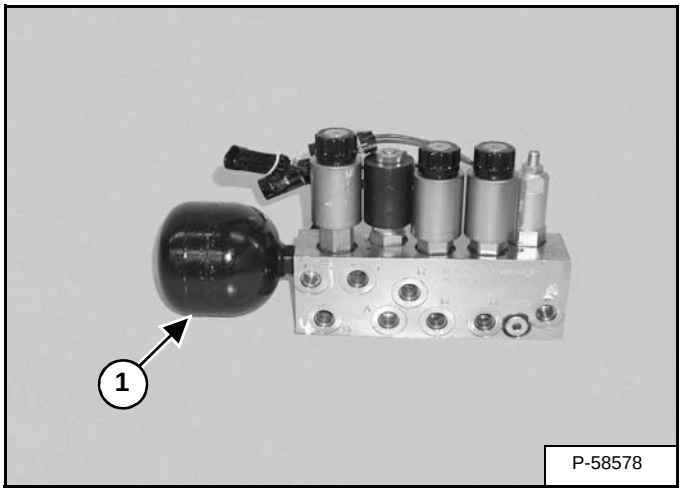
Tighten the nut to 53 in.-lb. (6 N•m) torque.

Figure 20-63-79



Install the O-ring (Item 1) **[Figure 20-63-79]** on the accumulator.

Figure 20-63-80



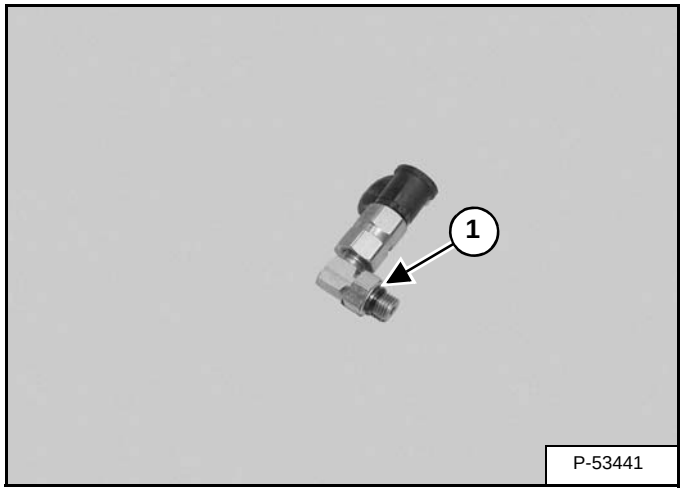
Install the accumulator (Item 1) **[Figure 20-63-80]**.

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MANIFOLD ASSEMBLY/ACCUMULATOR (S/N 563114000 & ABOVE) (CONT'D)

Assembly (Cont'd)

Figure 20-63-81



Install the O-ring (Item 1) **[Figure 20-63-81]** on the fittings and plug (test fitting shown).

Figure 20-63-82

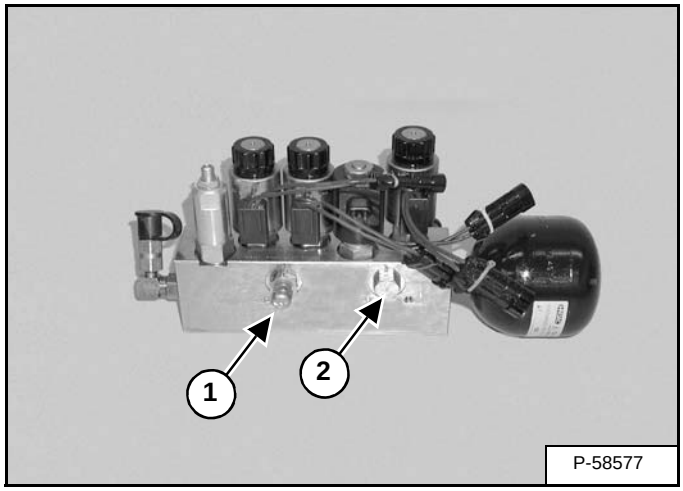
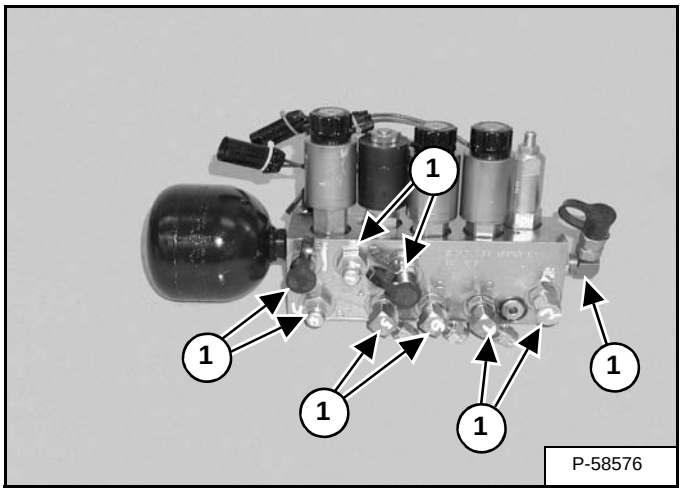
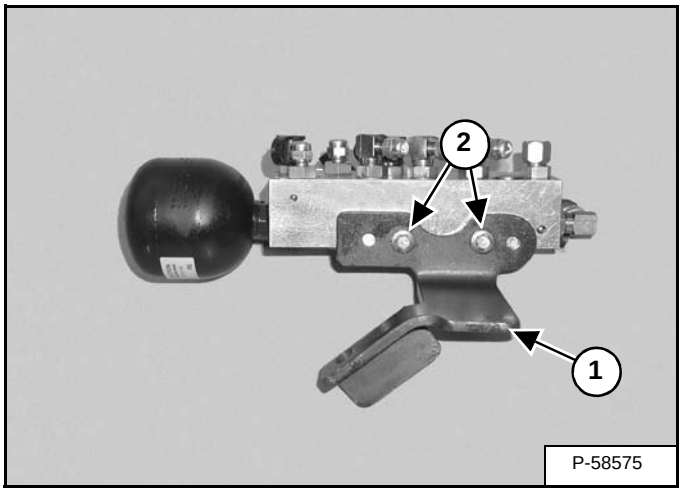


Figure 20-63-83



Install the fittings (Item 1) and plug (Item 2) **[Figure 20-63-82]** & **[Figure 20-63-83]**.

Figure 20-63-84



Install the mount bracket (Item 1) with the bolts (Item 2) **[Figure 20-63-84]**.

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TRAVEL MOTOR (S/N 562611001 & ABOVE, 562811001 & ABOVE, AND 563211001 & ABOVE)

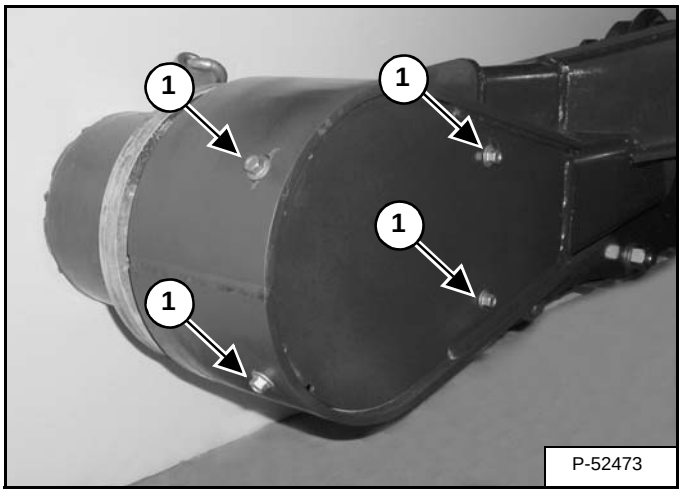
Removal And Installation

Lift and block the side of the track frame where the travel motor will be removed.

Release the track tension and remove the track. (See Rubber Track Removal And Installation on Page 40-20-4 or See Steel Track Removal And Installation on Page 40-20-7)

Remove the drive sprocket. See Track Frame. (See TRACK FRAME on Page 40-30-1)

Figure 20-70-1



Remove the bolts (Item 1) **[Figure 20-70-1]** from the track frame cover.

Installation: Tighten the bolts to 20 to 25 ft.-lb. (27 to 34 N•m) torque.

Remove the cover.

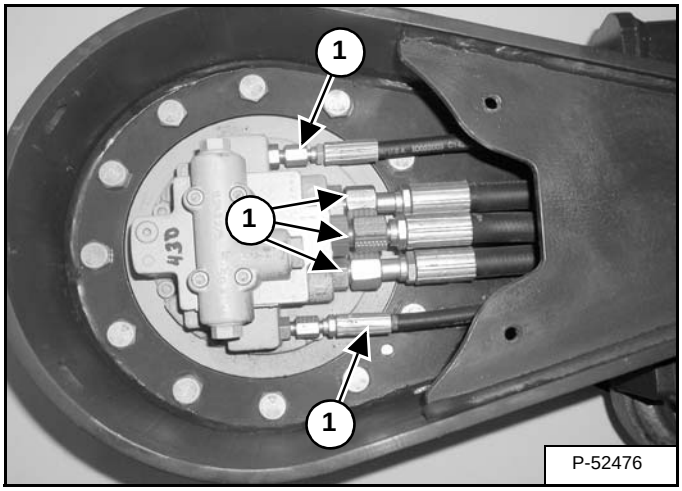
IMPORTANT

When making repairs on 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-2003-0284

Mark the hoses for correct installation.

Figure 20-70-2

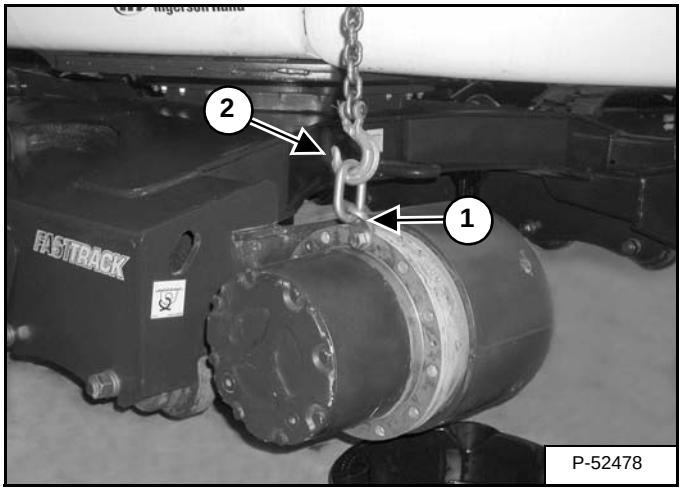


Remove the hoses (Item 1) **[Figure 20-70-2]** from the travel motor.

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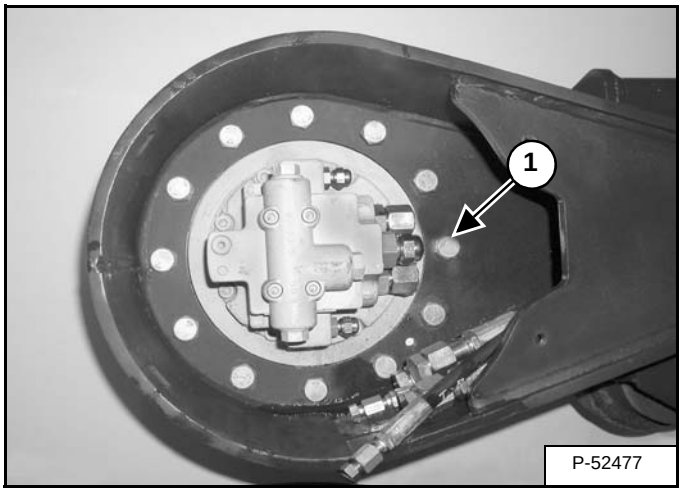
Removal And Installation (Cont'd)

Figure 20-70-3



Install a lifting bracket (Item 1) and hoist (Item 2) **[Figure 20-70-3]** on the motor.

Figure 20-70-4



Remove the bolts from the travel motor **[Figure 20-70-4]**.

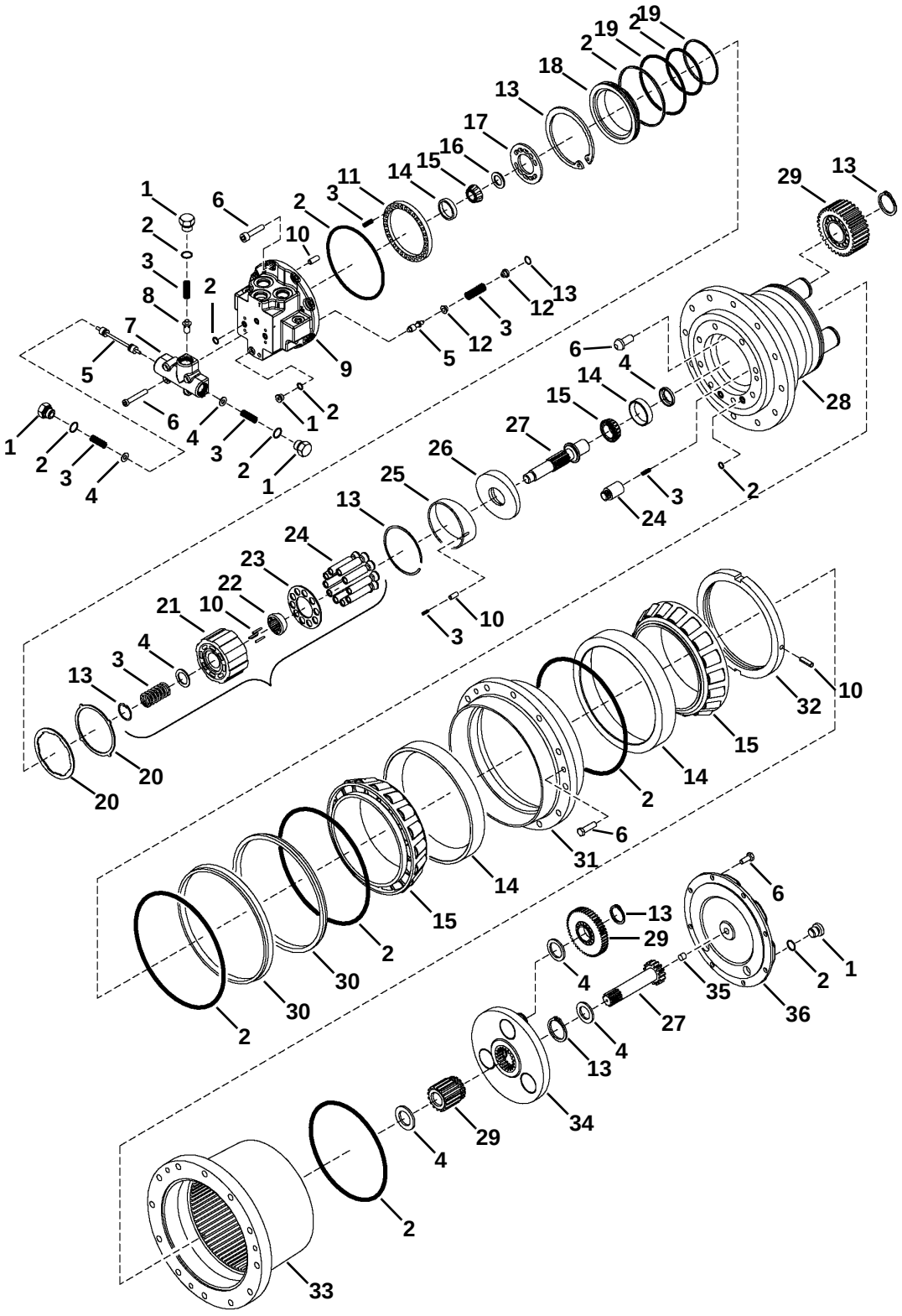
Installation: Apply thread lock adhesive (Loctite™ 242) to the bolts and tighten to 118 to 133 ft.-lb. (160 to 180 N•m) torque.

Remove the travel motor from the track frame.

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Parts Identification

1. Plug
2. O-Ring
3. Spring
4. Washer
5. Spool
6. Bolt
7. Shuttle Valve Housing
8. Poppet
9. Housing
10. Pin
11. Spring Housing
12. Spring Seat
13. Snap Ring
14. Bearing Race
15. Bearing
16. Seal
17. Valve Plate
18. Brake Plunger
19. Back-up Ring
20. Brake Disc
21. Cylinder Block
22. Piston Plate Pivot
23. Piston Plate
24. Piston
25. Brake Disc Stop
26. Swash Plate
27. Shaft
28. Hub
29. Gear
30. Seal Ring
31. Seal Carrier
32. Nut
33. Housing
34. Planetary Carrier
35. Bushing
36. Cover



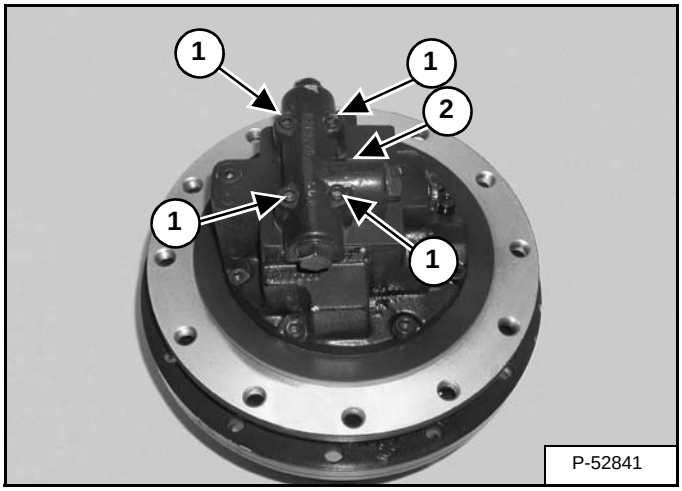
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Disassembly

Drain the travel motor oil. (See Draining The Travel Motor on Page 10-120-1)

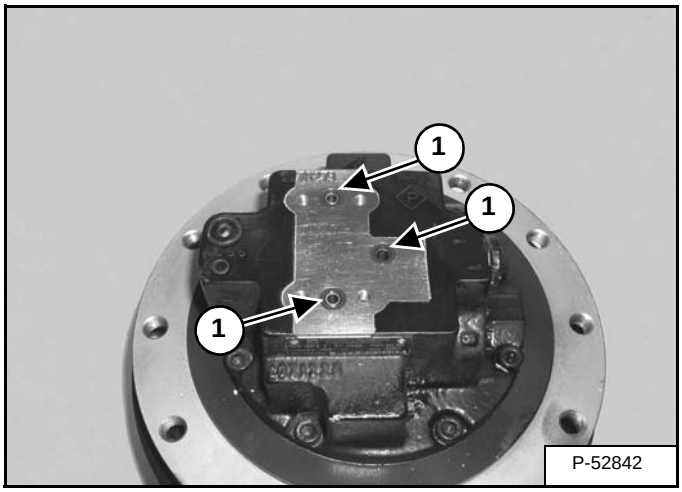
Figure 20-70-5



Remove the bolts (Item 1) **[Figure 20-70-5]**.

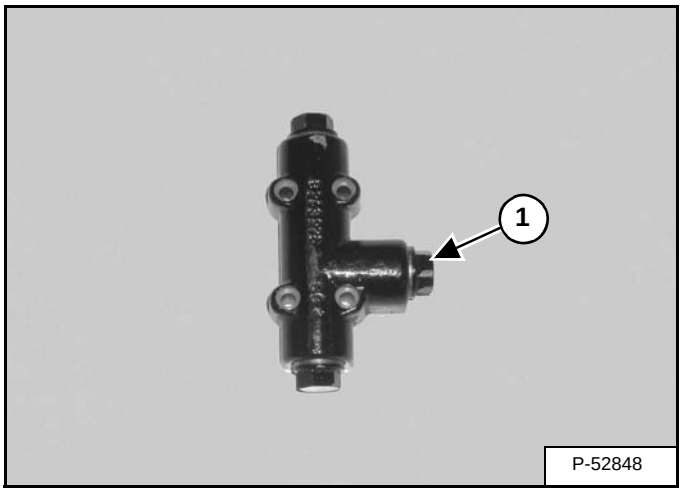
Remove the shuttle valve (Item 2) **[Figure 20-70-5]**.

Figure 20-70-6



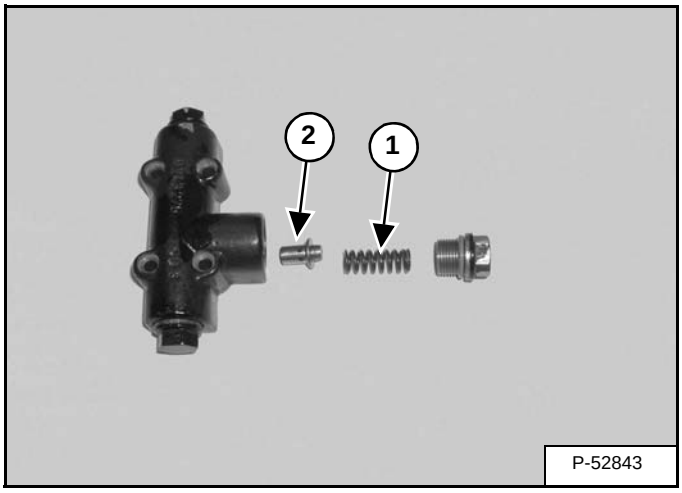
Remove the O-rings (Item 1) **[Figure 20-70-6]**.

Figure 20-70-7



Remove the plug (Item 1) **[Figure 20-70-7]**.

Figure 20-70-8

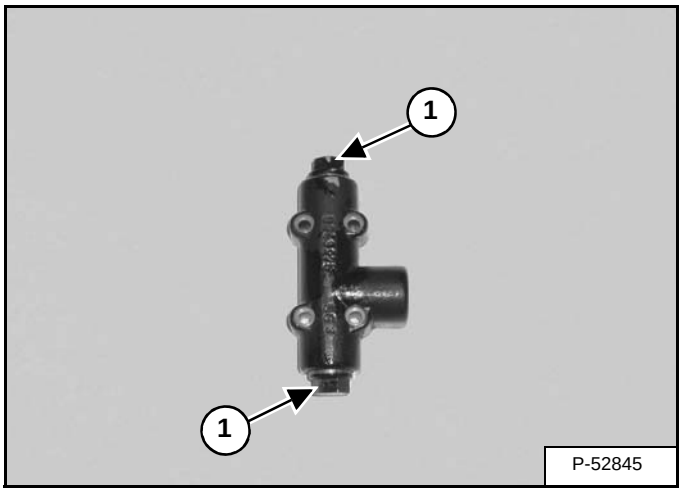


Remove the spring (Item 1) and poppet (Item 2) **[Figure 20-70-8]**.

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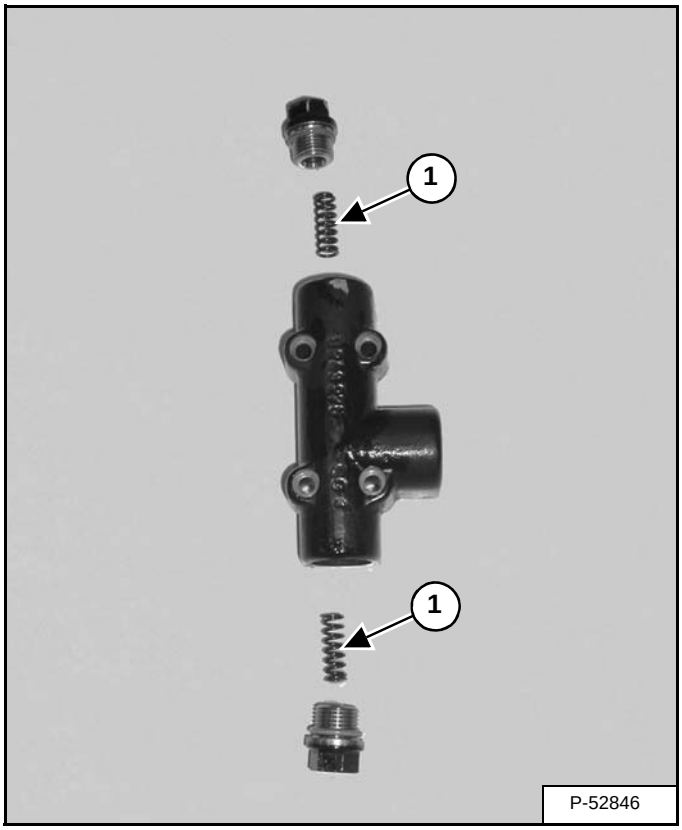
Disassembly (Cont'd)

Figure 20-70-9



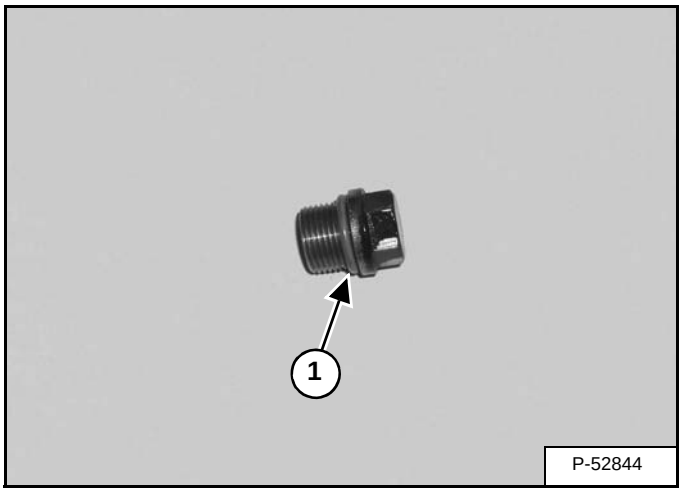
Remove the plugs (Item 1) **[Figure 20-70-9]**.

Figure 20-70-10



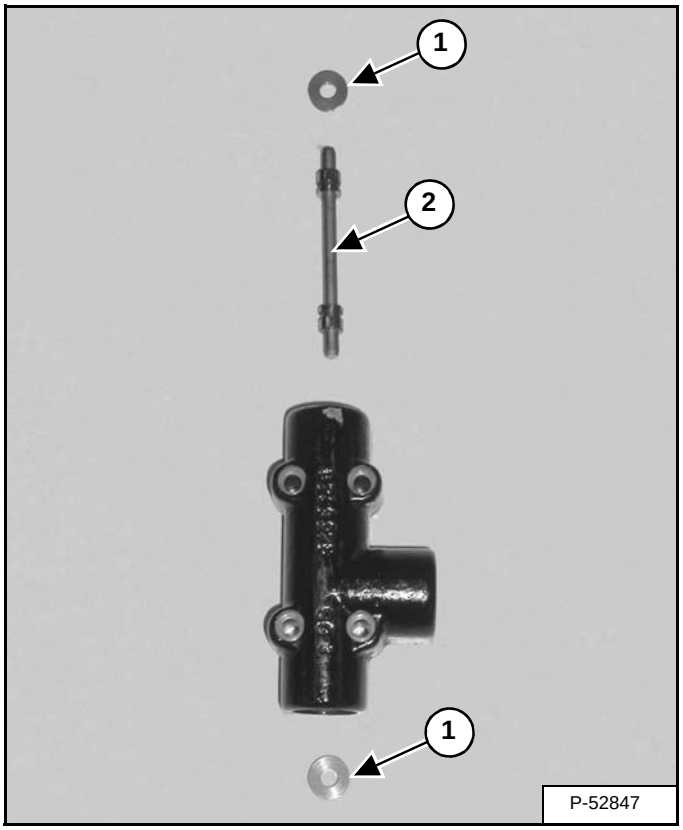
Remove the springs (Item 1) **[Figure 20-70-10]**.

Figure 20-70-11



Remove the O-ring (Item 1) **[Figure 20-70-11]** from the plugs.

Figure 20-70-12

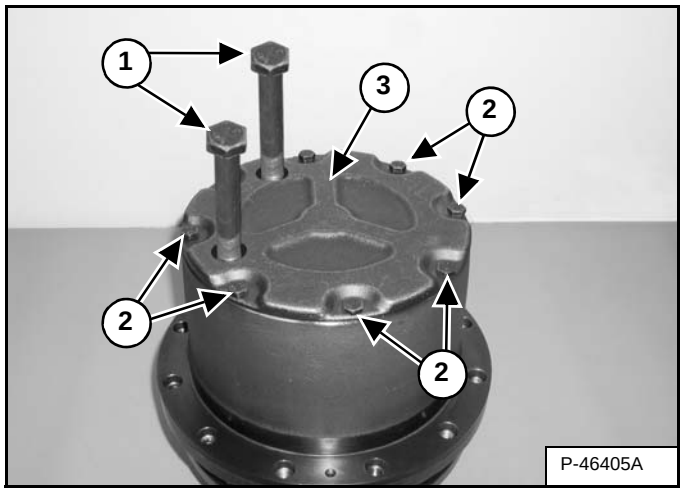


Remove the washers (Item 1) and spool (Item 2) **[Figure 20-70-12]**.

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Disassembly (Cont'd)

Figure 20-70-13

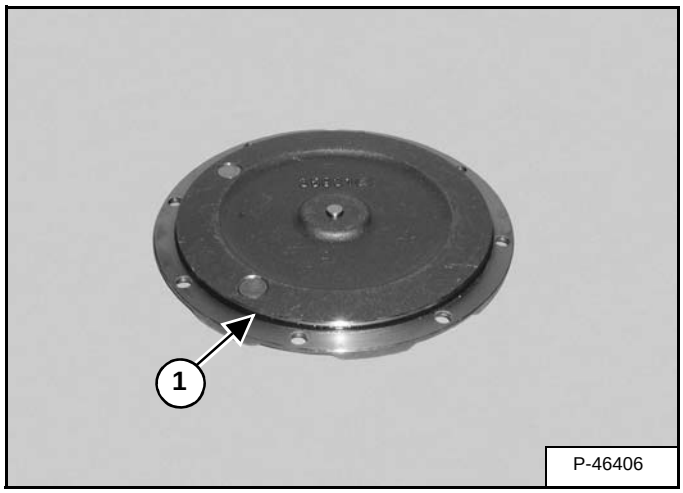


Remove the bolts (Item 2) and cover (Item 3) **[Figure 20-70-13]**.

Install two M18 x 1.5 bolts (Item 1) **[Figure 20-70-13]** into the cover.

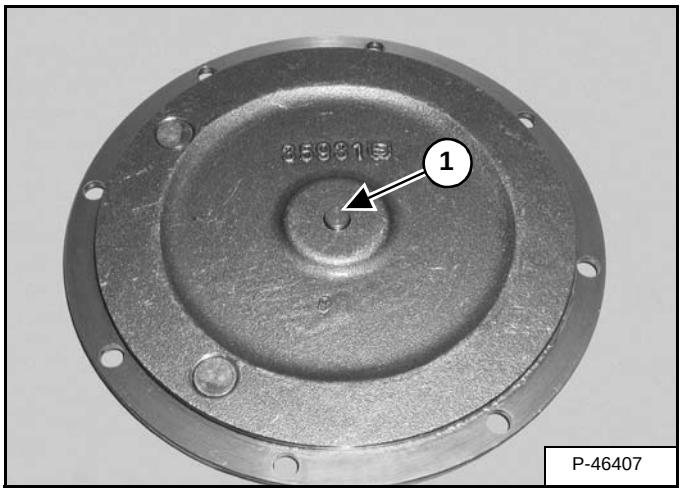
NOTE: The two bolts will be used to remove the cover.

Figure 20-70-14



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

Figure 20-70-15

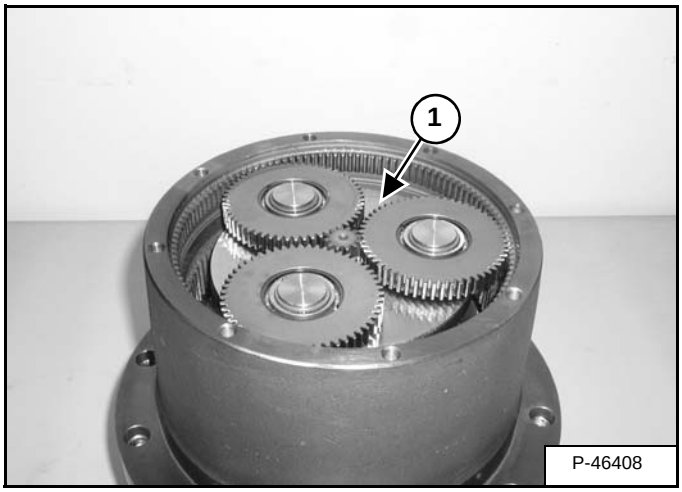


Drill a hole in the center of the bushing (Item 1) **[Figure 20-70-15]** using a number 3 drill bit.

Thread the hole using a 1/4 x 28 in. N.F. tap.

Install a 1/4 x 28 in. bolt in the bushing, and pull the bushing out.

Figure 20-70-16

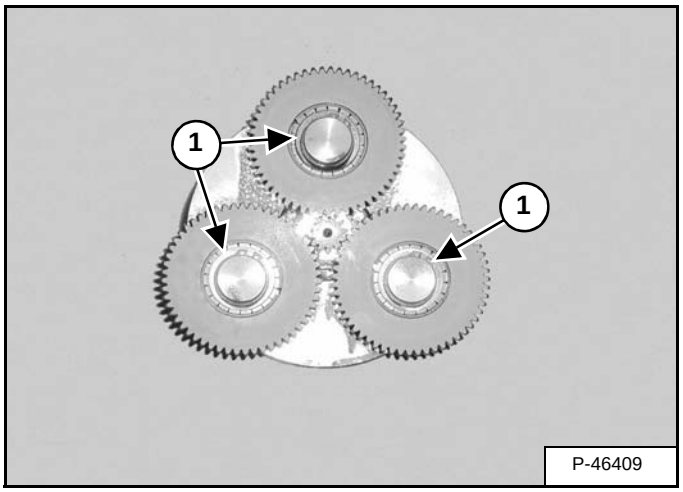


Remove the planetary carrier (Item 1) **[Figure 20-70-16]**.

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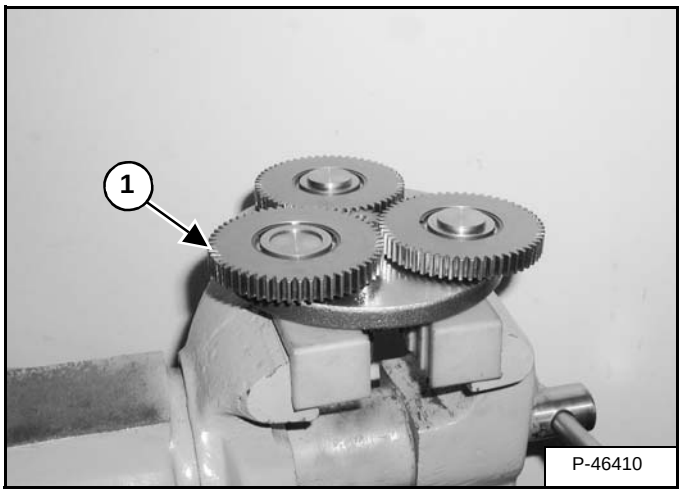
Disassembly (Cont'd)

Figure 20-70-17



Remove the snap rings (Item 1) **[Figure 20-70-17]**.

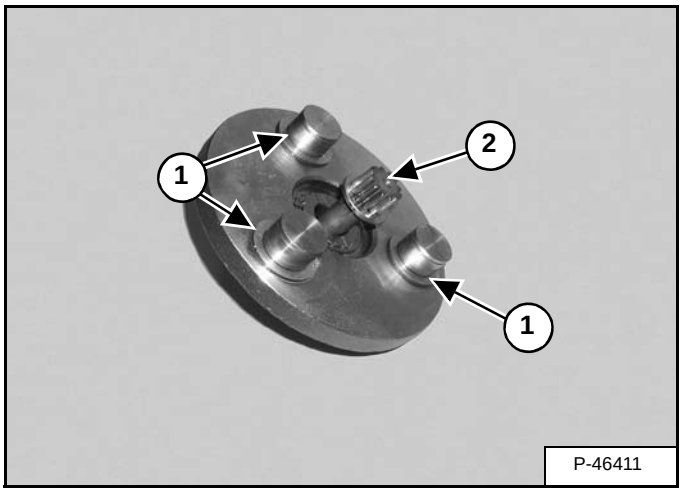
Figure 20-70-18



Place the carrier in a vice equipped with padded jaws. Pry the planetary gears (Item 1) **[Figure 20-70-18]** off of the carrier.

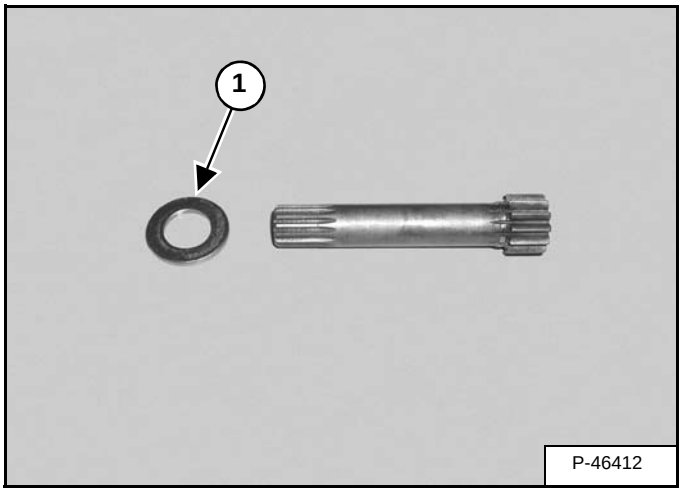
Record the orientation of the gear/bearing assembly. The gear/bearing assembly can only be installed in 1 direction.

Figure 20-70-19



Remove the washers (Item 1). Remove the drive shaft (Item 2) **[Figure 20-70-19]**.

Figure 20-70-20

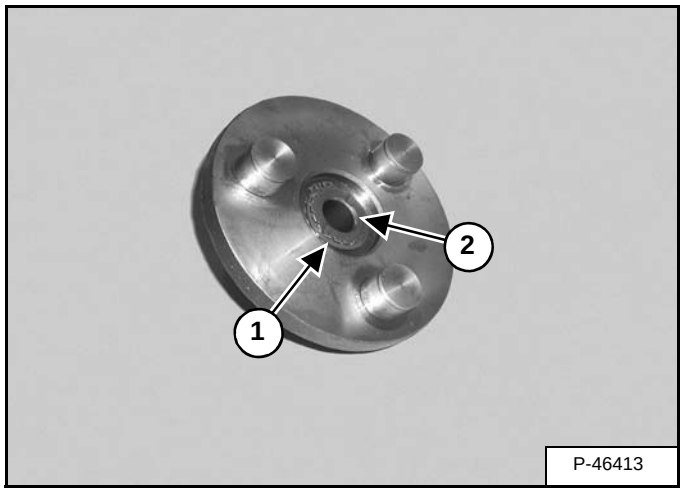


Remove the washer (Item 1) **[Figure 20-70-20]** from the drive shaft.

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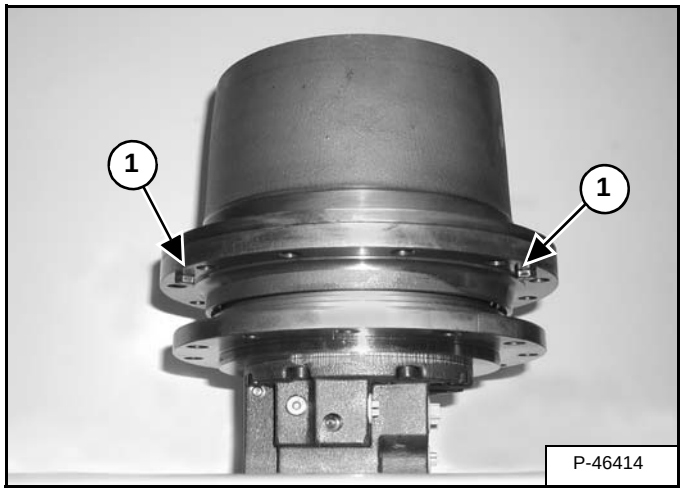
Disassembly (Cont'd)

Figure 20-70-21



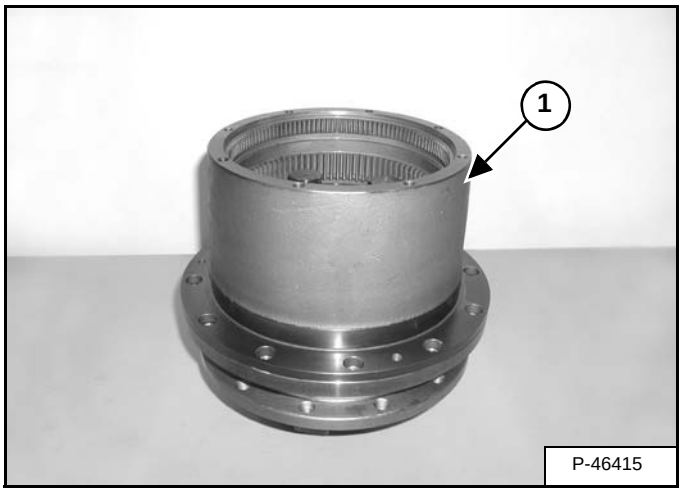
Remove the snap ring (Item 1). Remove the sun gear (Item 2) **[Figure 20-70-21]**.

Figure 20-70-22



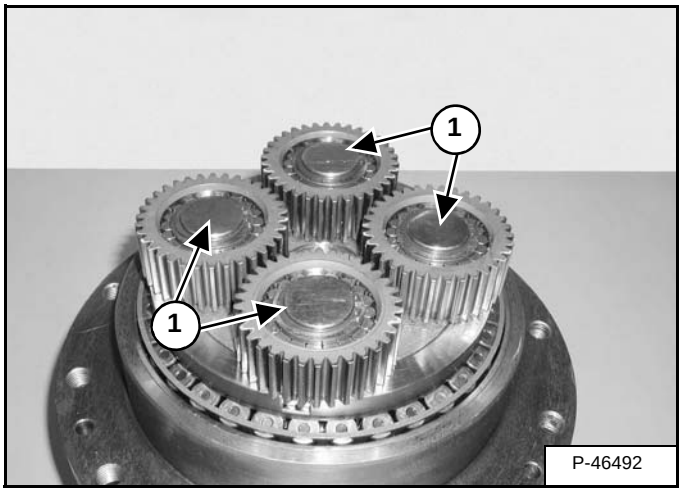
Remove the 3 bolts (Item 1) **[Figure 20-70-22]**.

Figure 20-70-23



Pull up on and remove the ring gear (Item 1) **[Figure 20-70-23]** from the hub assembly.

Figure 20-70-24

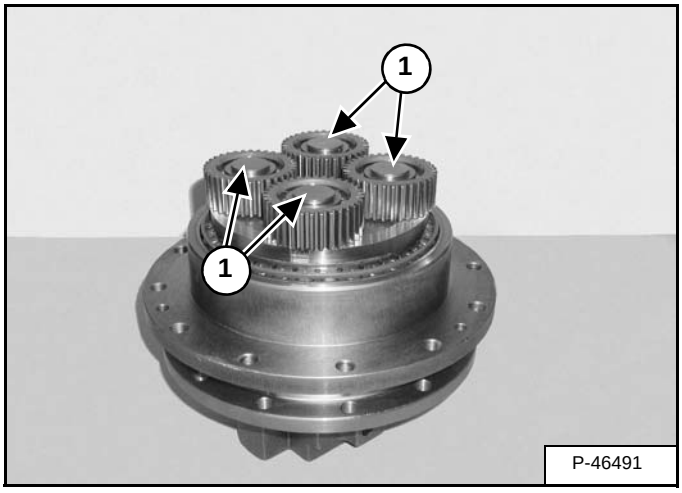


Remove the snap rings (Item 1) **[Figure 20-70-24]**.

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Disassembly (Cont'd)

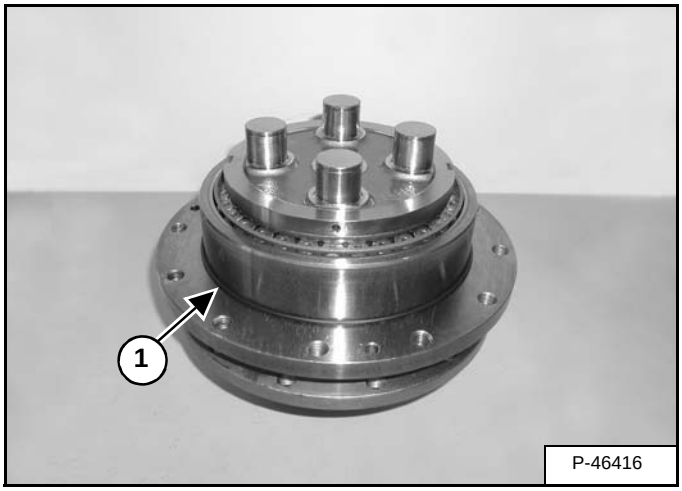
Figure 20-70-25



Pry the gear/bearing assembly (Item 1) **[Figure 20-70-25]** off of the hub. Record the orientation of the gear/bearing assembly.

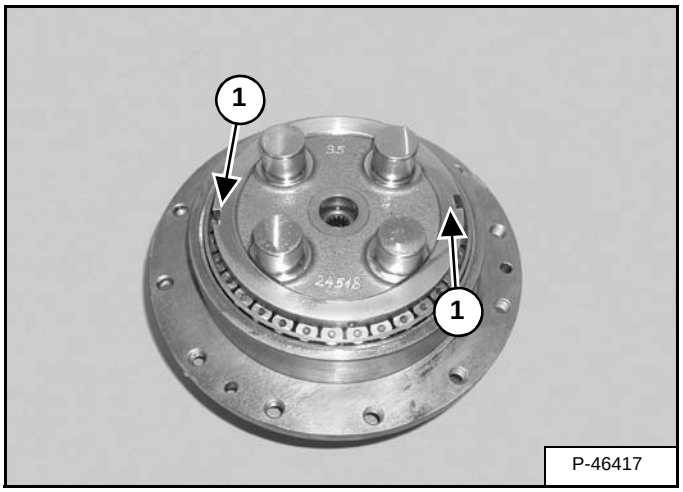
The gear/bearing assembly can only be installed in 1 direction.

Figure 20-70-26



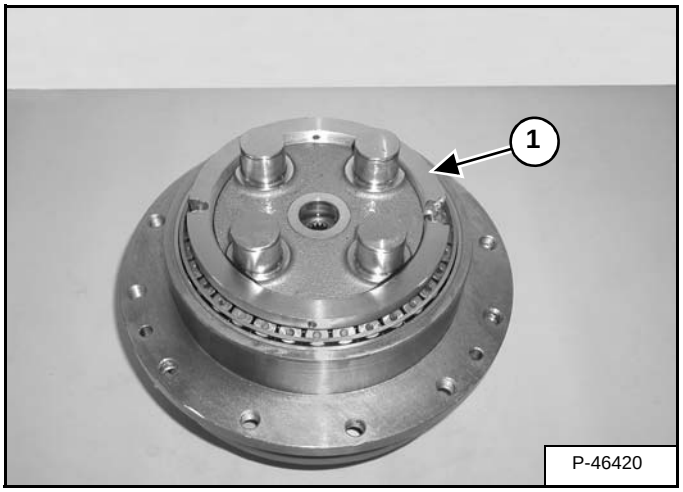
Remove the O-ring (Item 1) **[Figure 20-70-26]**.

Figure 20-70-27



Center punch and drill the nut where shown (Item 1) **[Figure 20-70-27]**.

Figure 20-70-28



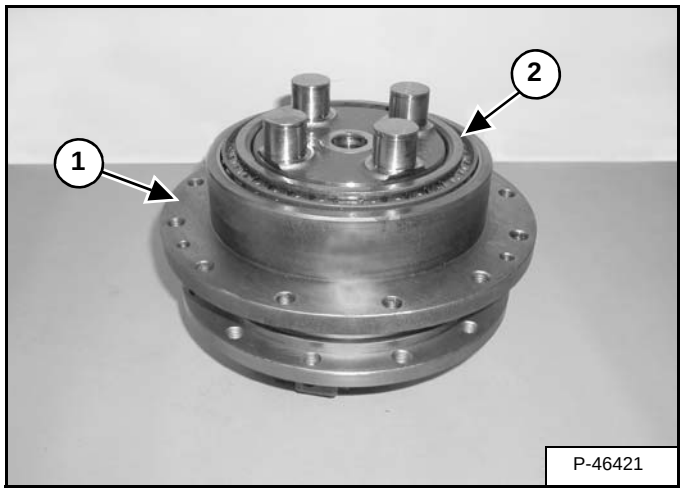
Split and remove the nut (Item 1) **[Figure 20-70-28]**.

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TRAVEL MOTOR (S/N 562611001 & ABOVE, 562811001 & ABOVE, AND 563211001 & ABOVE) (CONT'D)

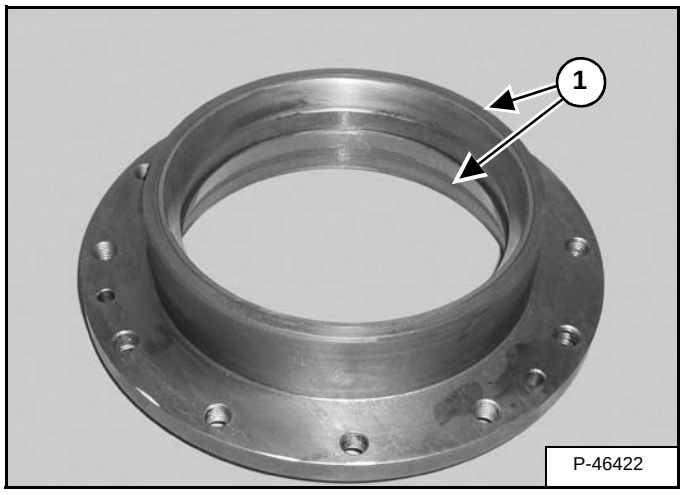
Disassembly (Cont'd)

Figure 20-70-29



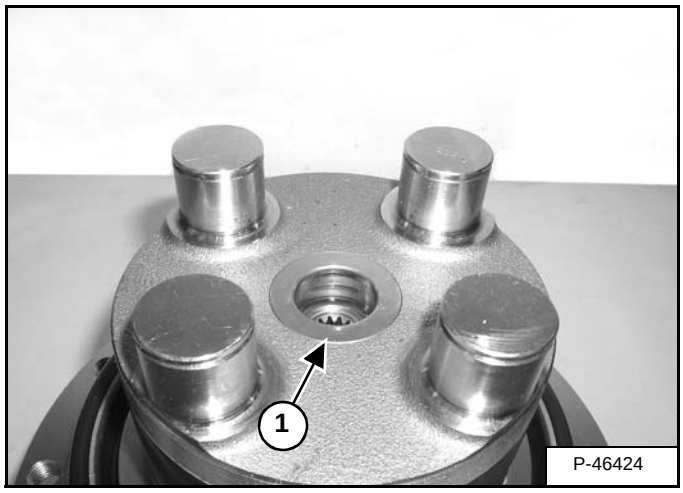
Pull up on and remove the bearing carrier (Item 1) and top bearing (Item 2) **[Figure 20-70-29]**.

Figure 20-70-30



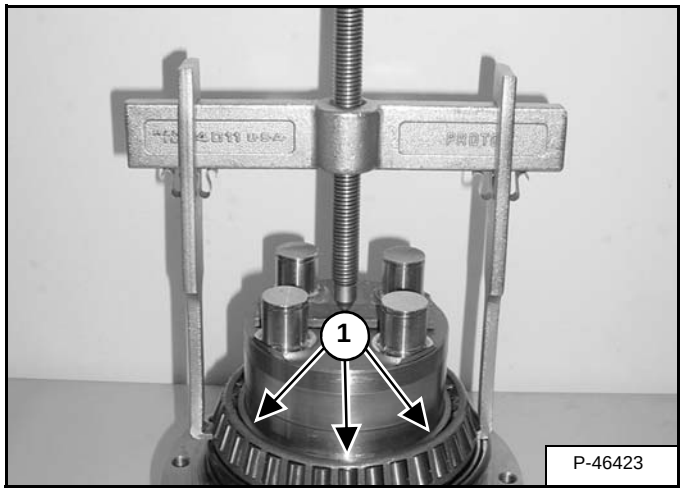
Remove the top and bottom bearing race (Item 1) **[Figure 20-70-30]** from the bearing carrier.

Figure 20-70-31



Remove the washer (Item 1) **[Figure 20-70-31]**.

Figure 20-70-32



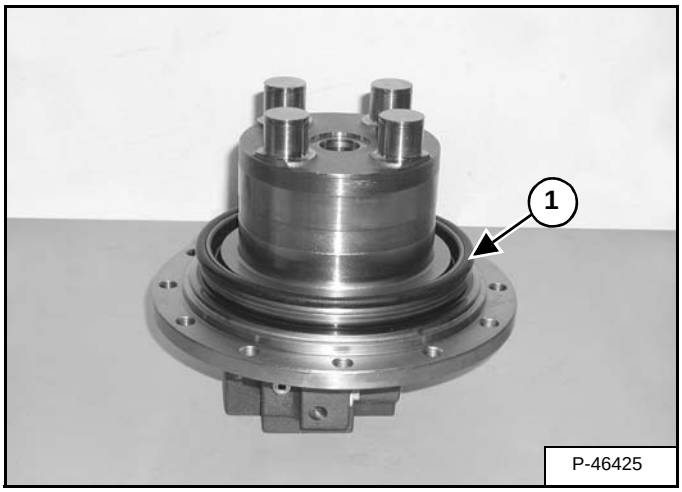
Install a puller on the hub bearing. Heat the inside diameter (Item 1) **[Figure 20-70-32]** of the bearing.

Remove the bearing.

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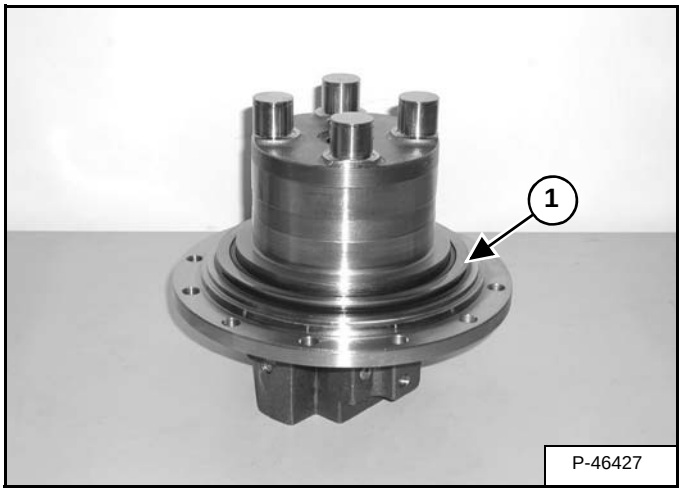
Disassembly (Cont'd)

Figure 20-70-33



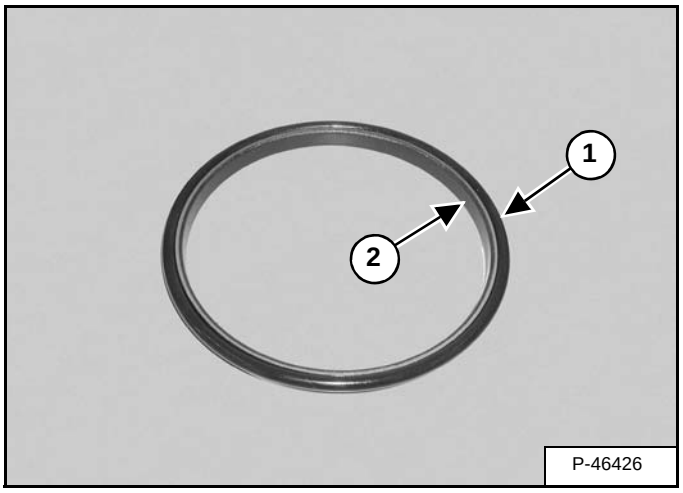
Remove the bearing carrier seal ring assembly (Item 1) **[Figure 20-70-33]**.

Figure 20-70-34



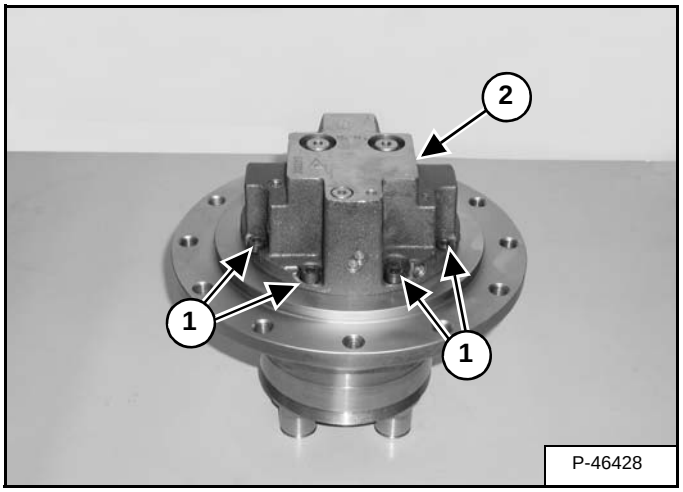
Remove the hub seal ring assembly (Item 1) **[Figure 20-70-34]**.

Figure 20-70-35



Remove the O-ring (Item 1) from both seal rings (Item 2) **[Figure 20-70-35]**.

Figure 20-70-36



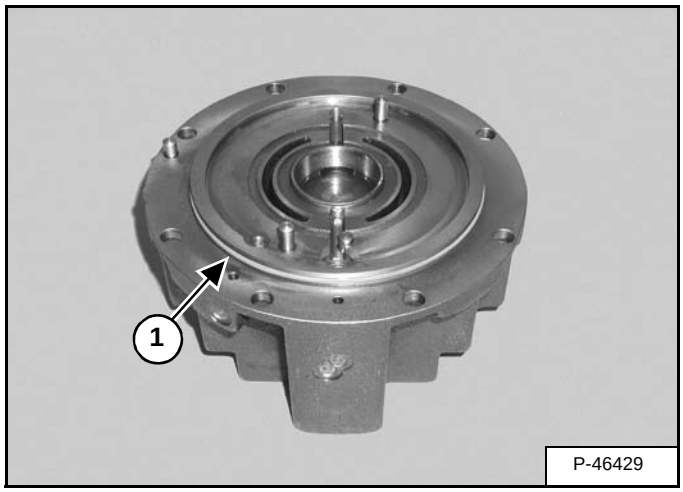
Turn the hub over and remove the 8 bolts (Item 1) **[Figure 20-70-36]**.

Remove the valve block (Item 2) **[Figure 20-70-36]**.

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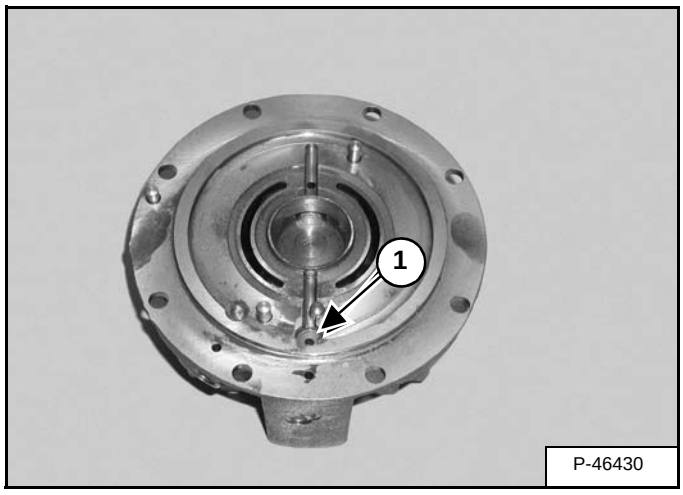
Disassembly (Cont'd)

Figure 20-70-37



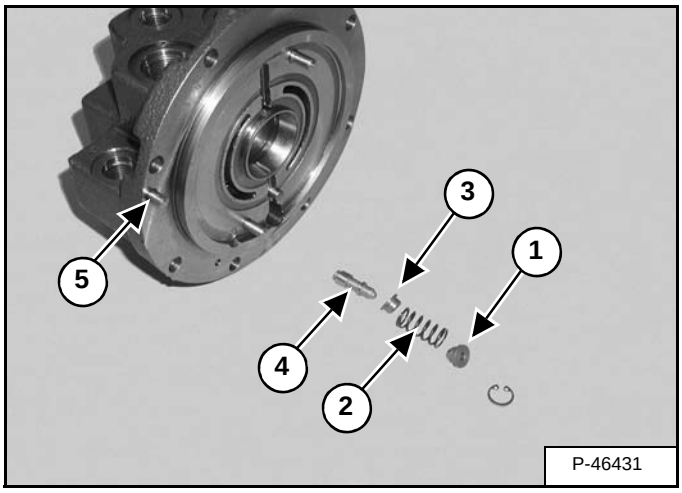
Turn the valve block over and remove the O-ring (Item 1) **[Figure 20-70-37]**.

Figure 20-70-38



Remove the snap ring (Item 1) **[Figure 20-70-38]**.

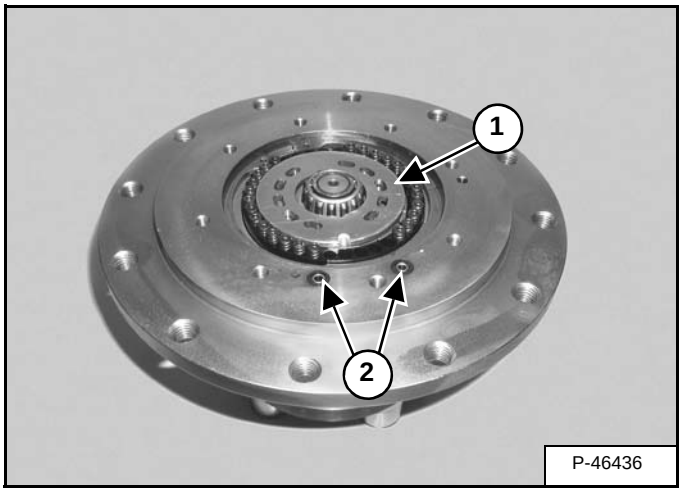
Figure 20-70-39



Remove the spring seat (Item 1), spring (Item 2), spring seat (Item 3), and spool (Item 4) **[Figure 20-70-39]**.

Remove the alignment pin (Item 5) **[Figure 20-70-39]**.

Figure 20-70-40

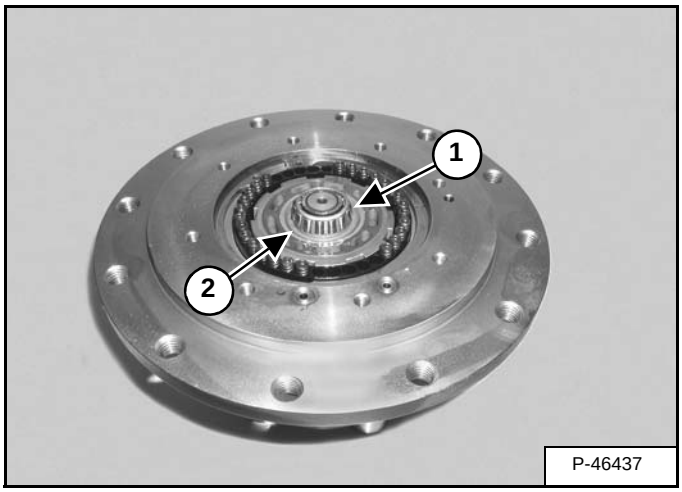


Remove the valve plate (Item 1) and O-rings (Item 2) **[Figure 20-70-40]**.

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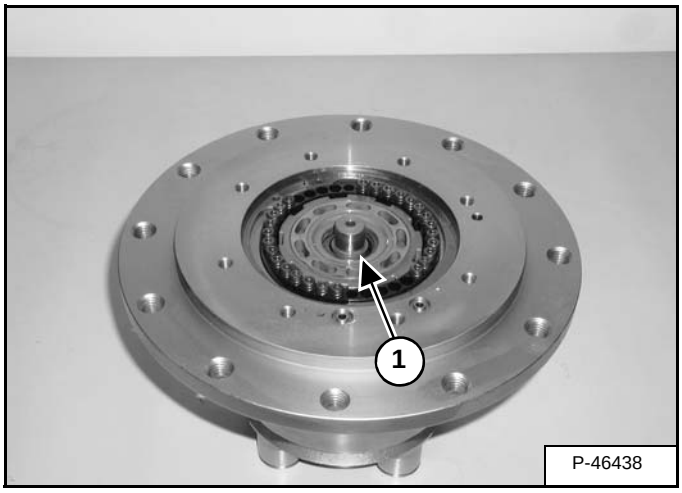
Disassembly (Cont'd)

Figure 20-70-41



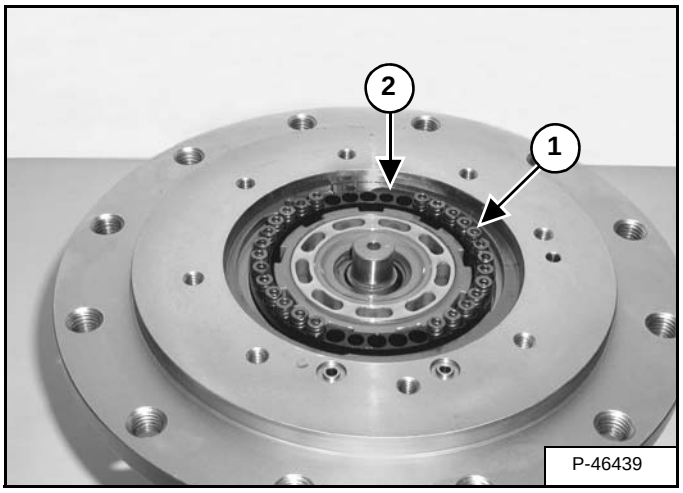
Remove the bearing (Item 1) and washer (Item 2) **[Figure 20-70-41]**. Record the position of the washer, as it can only be installed in 1 direction.

Figure 20-70-42



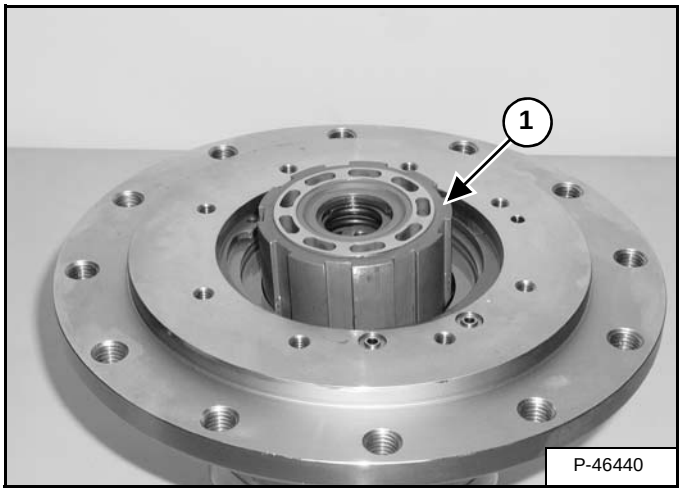
Remove the washer (Item 1) **[Figure 20-70-42]**.

Figure 20-70-43



Remove the 26 springs (Item 1) and spring retainer (Item 2) **[Figure 20-70-43]**.

Figure 20-70-44

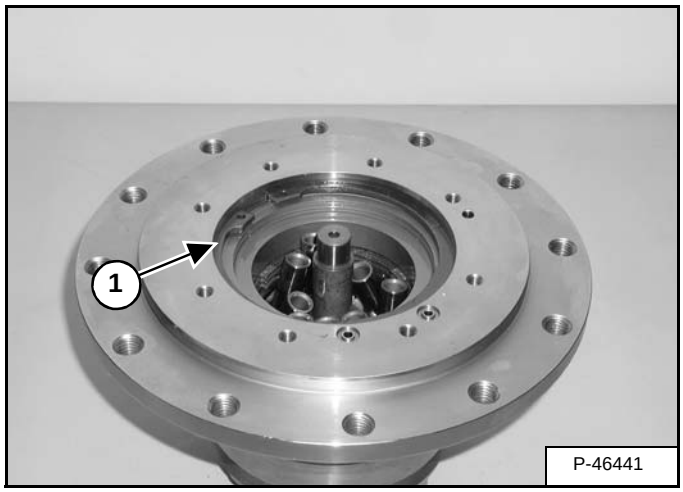


Remove the cylinder block (Item 1) **[Figure 20-70-44]**.

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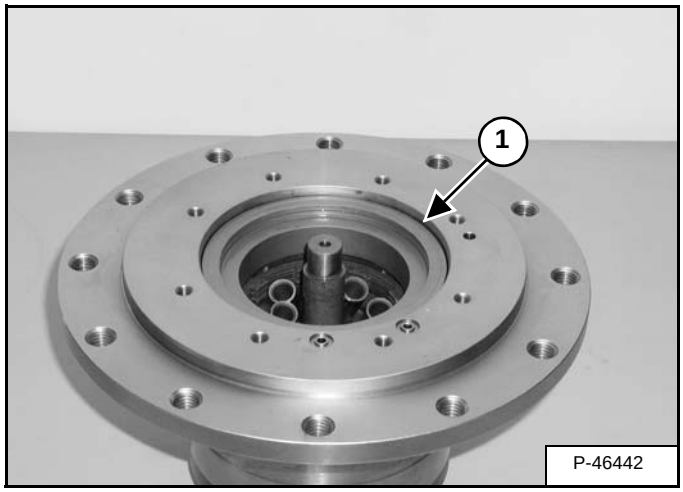
Disassembly (Cont'd)

Figure 20-70-45



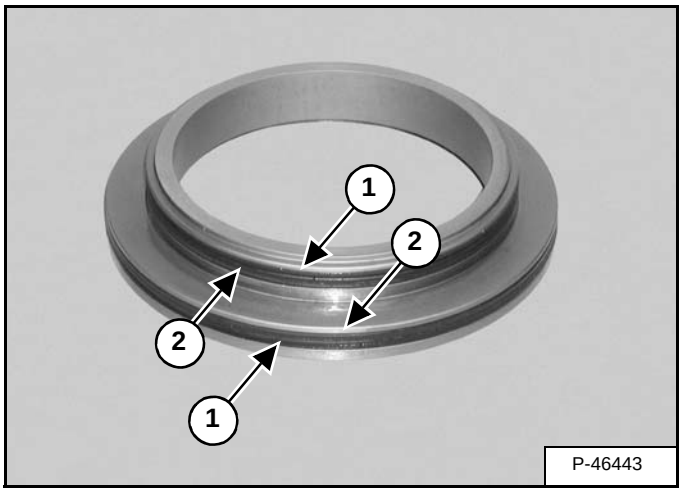
Remove the snap ring (Item 1) **[Figure 20-70-45]**.

Figure 20-70-46



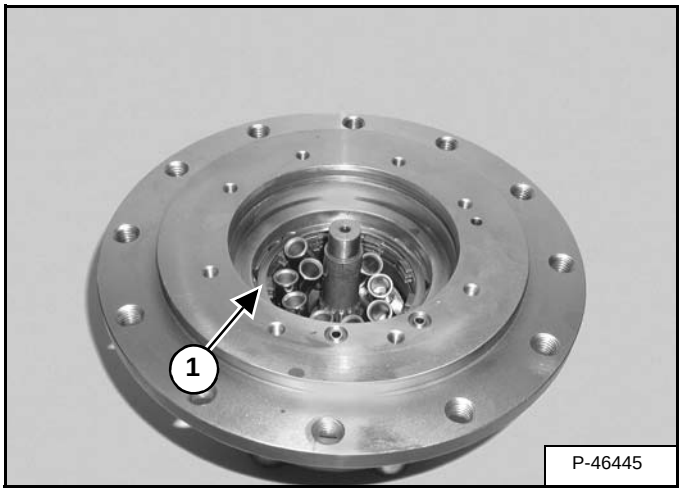
Pry up on and remove the brake piston (Item 1) **[Figure 20-70-46]**.

Figure 20-70-47



Remove the back-up rings (Item 1) and seals (Item 2) **[Figure 20-70-47]** from the brake piston.

Figure 20-70-48

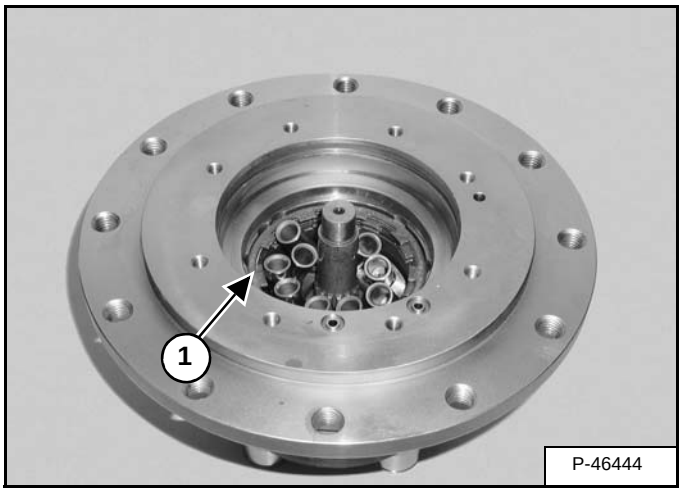


Remove the external brake disc (Item 1) **[Figure 20-70-48]**.

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Disassembly (Cont'd)

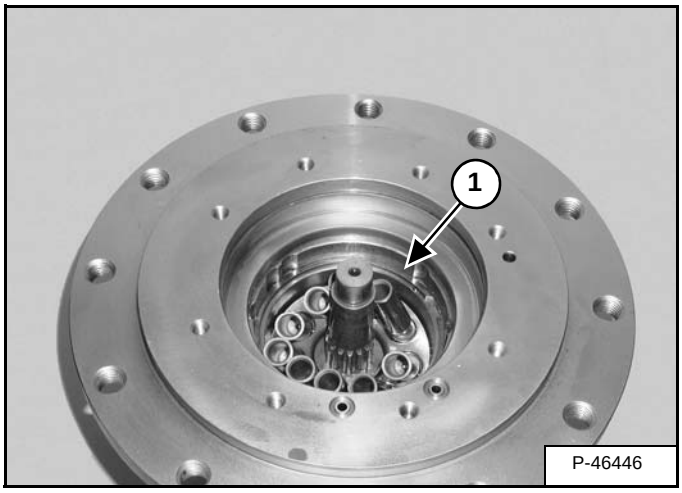
Figure 20-70-49



Remove the internal brake disc (Item 1) **[Figure 20-70-49]**.

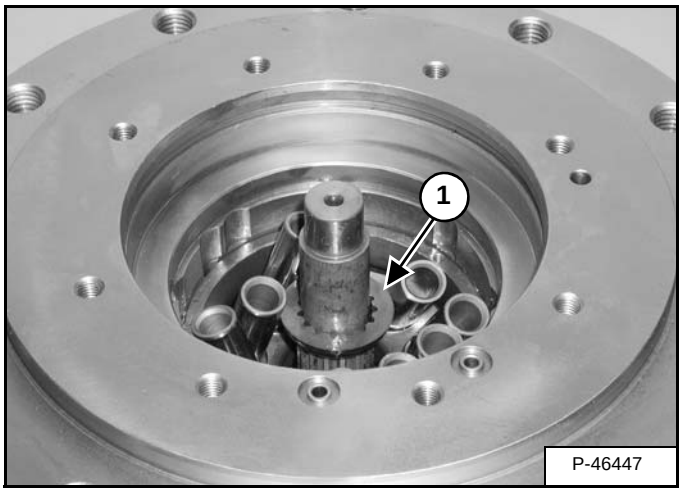
Continue removing the external and internal brake discs.

Figure 20-70-50



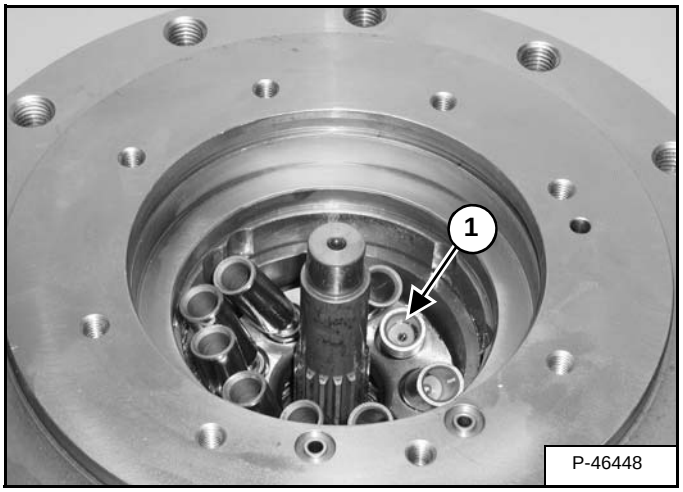
Remove the snap ring (Item 1) **[Figure 20-70-50]**.

Figure 20-70-51



Remove the piston plate pivot (Item 1) **[Figure 20-70-51]**.

Figure 20-70-52

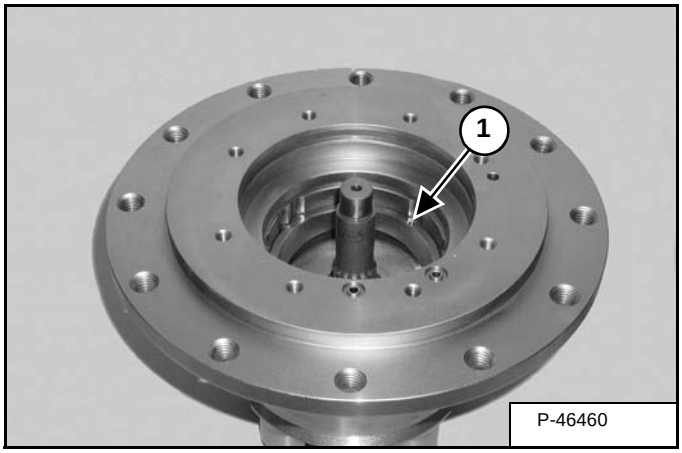


Remove the piston plate and pistons (Item 1) **[Figure 20-70-52]**.

https://www.pdfmanual4trucks.com/

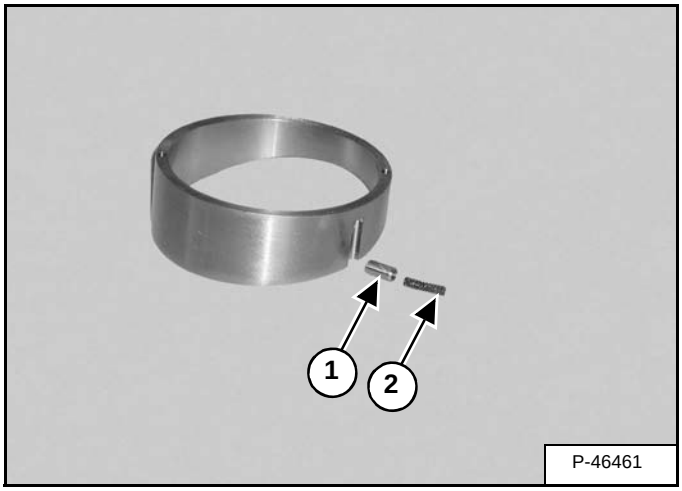
Disassembly (Cont'd)

Figure 20-70-53



Remove the brake disc stop (Item 1) **[Figure 20-70-53]**.

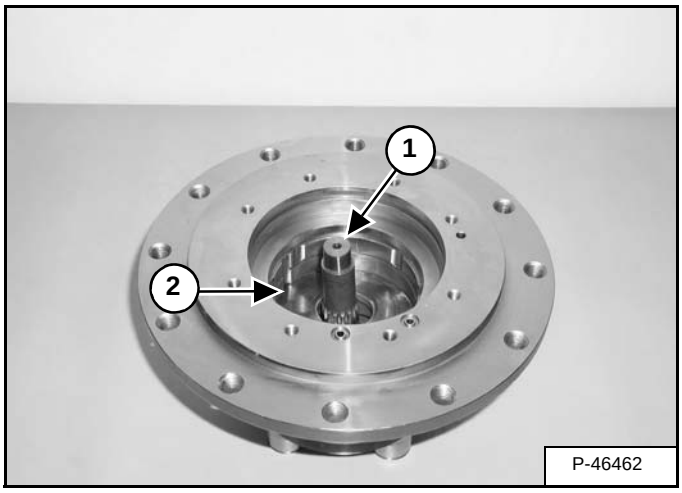
Figure 20-70-54



Remove the pin (Item 1) and spring (Item 2) **[Figure 20-70-54]** from both sides of the stop.

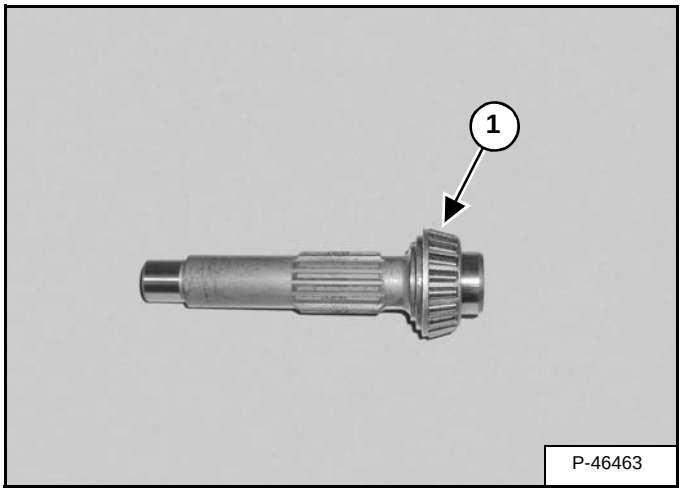
NOTE: Later models are equipped with a plastic stop and springs (Item 2) [Figure 20-70-54].

Figure 20-70-55



Remove the shaft (Item 1) and swash plate (Item 2) **[Figure 20-70-55]**.

Figure 20-70-56

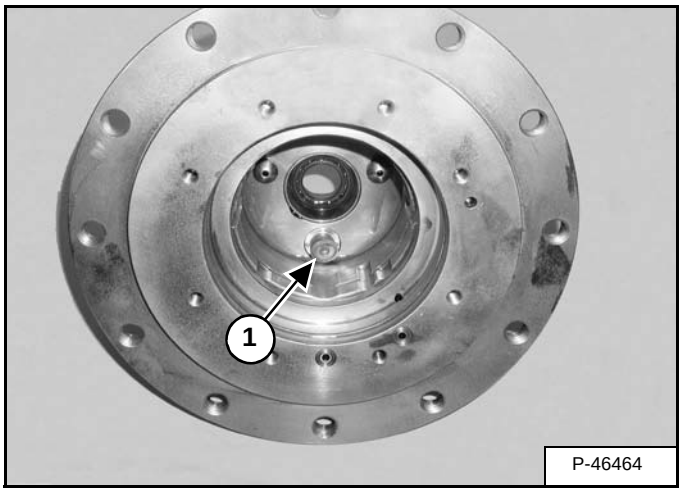


Remove the bearing (Item 1) **[Figure 20-70-56]** from the shaft.

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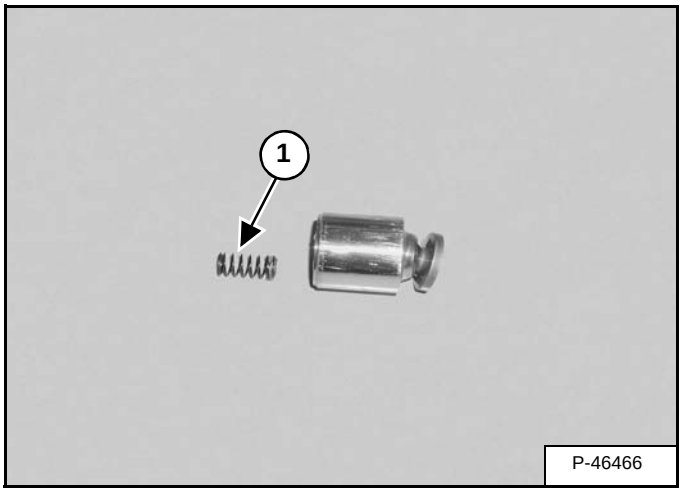
Disassembly (Cont'd)

Figure 20-70-57



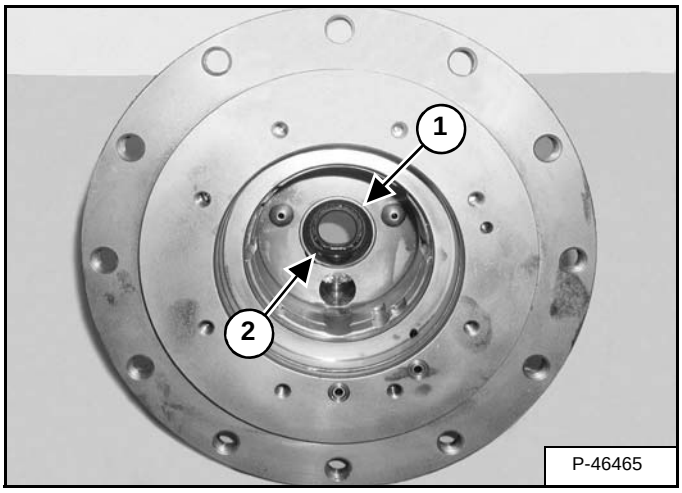
Remove the piston assembly (Item 1) **[Figure 20-70-57]**.

Figure 20-70-58



Remove the spring (Item 1) **[Figure 20-70-58]**.

Figure 20-70-59



Remove the bearing race (Item 1) and seal (Item 2) **[Figure 20-70-59]**.

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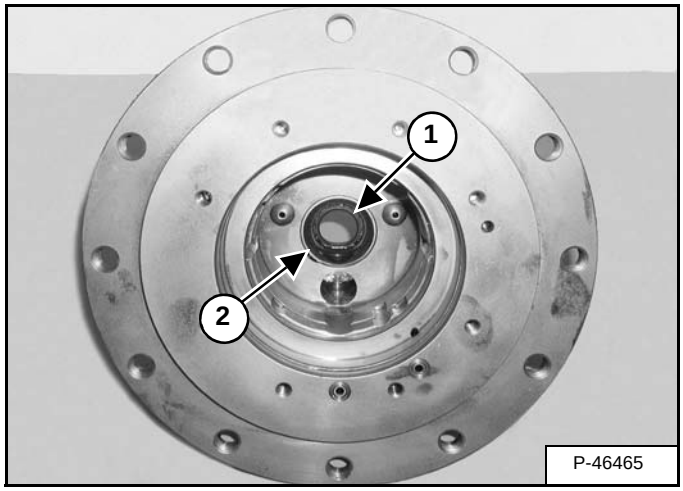
Assembly

The tools listed will be needed to assemble the travel motor:

MEL **XXXX** Spanner Wrench.

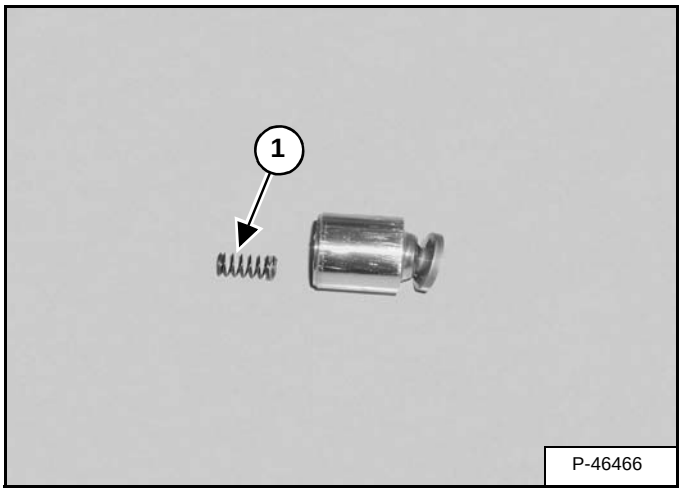
Clean all parts in solvent and dry with compressed air. Inspect all parts and replace any that are damaged. If any of the planetary gears are damaged, replace all the planetary gears and sun gear from the planetary assembly that is damaged. one damaged gear can cause a microscopic fatigue crack in mating teeth and cause premature failure after servicing. Apply oil to all O-rings (as noted) and assembly lube to the bearings before installation.

Figure 20-70-60



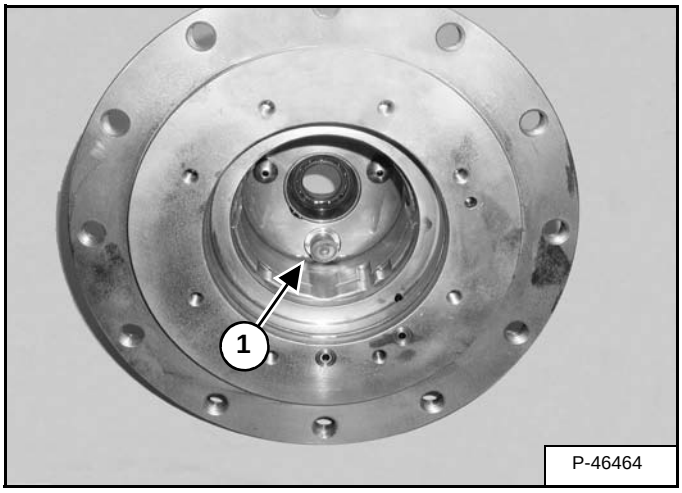
Install the seal (Item 1). Install the bearing race (Item 2) **[Figure 20-70-60]**.

Figure 20-70-61



Install the spring (Item 1) **[Figure 20-70-61]** in the piston.

Figure 20-70-62

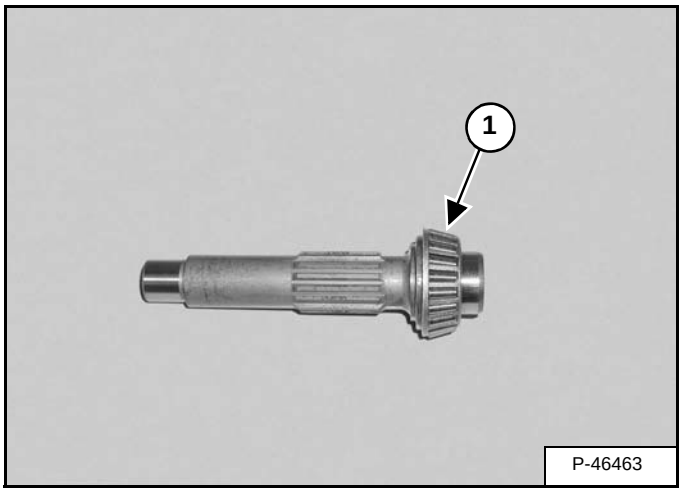


Install the piston assembly (Item 1) **[Figure 20-70-62]**.

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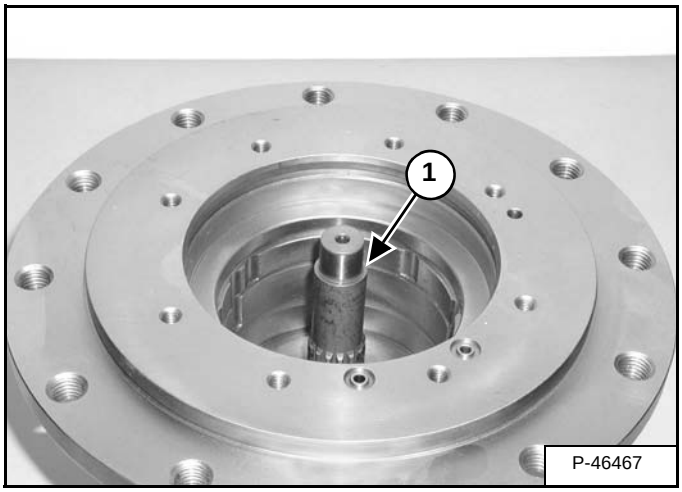
Assembly (Cont'd)

Figure 20-70-63



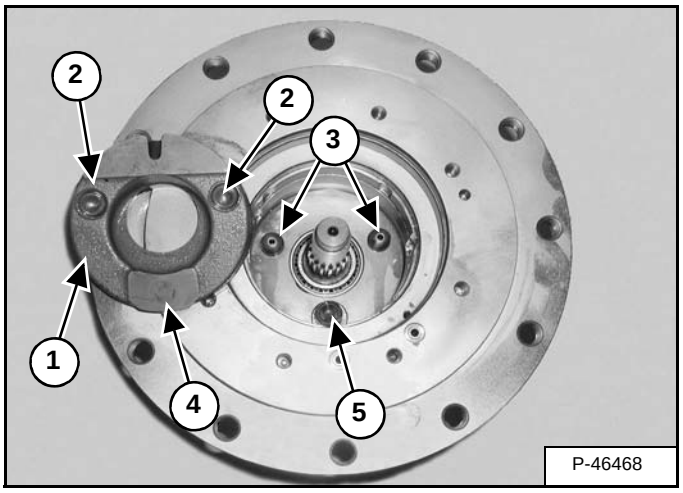
Install the bearing (Item 1) **[Figure 20-70-63]**.

Figure 20-70-64



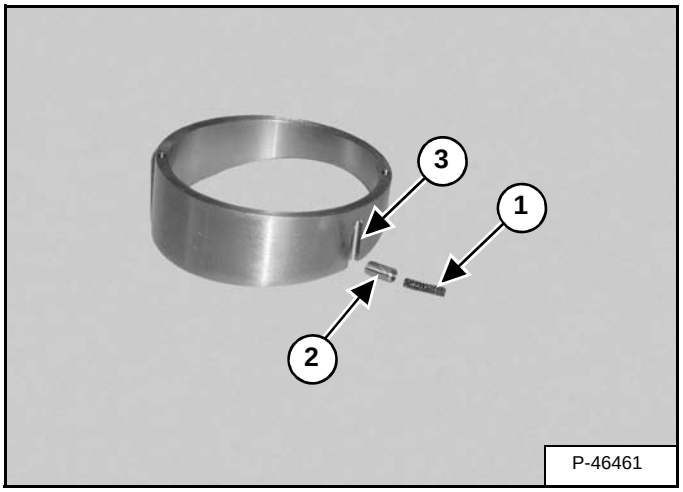
Install the shaft/bearing assembly (Item 1) **[Figure 20-70-64]**.

Figure 20-70-65



Install the swash plate (Item 1) with the sockets (Item 2) of the plate engaging the studs (Item 3) of the hub, and the flat surface (Item 4) of the plate resting on the piston assembly (Item 5) **[Figure 20-70-65]**.

Figure 20-70-66



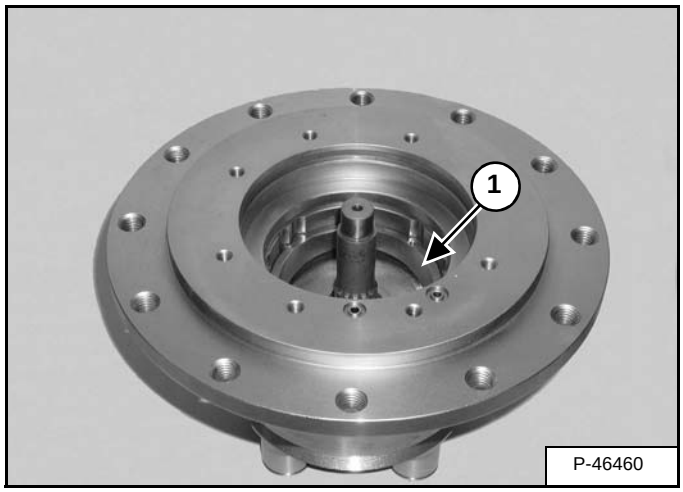
Apply assembly lube to the springs (Item 1) and install the springs in the pins (Item 2). Apply assembly lube to the pins and install the spring/pin assemblies in the groove of the brake disc stop (Item 3) **[Figure 20-70-66]**.

NOTE: Later models are equipped with a plastic stop and springs (Item 1) [Figure 20-70-66].

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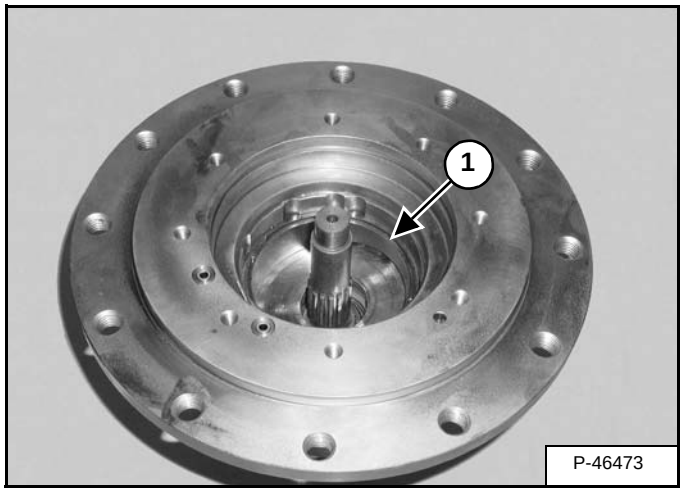
Assembly (Cont'd)

Figure 20-70-67



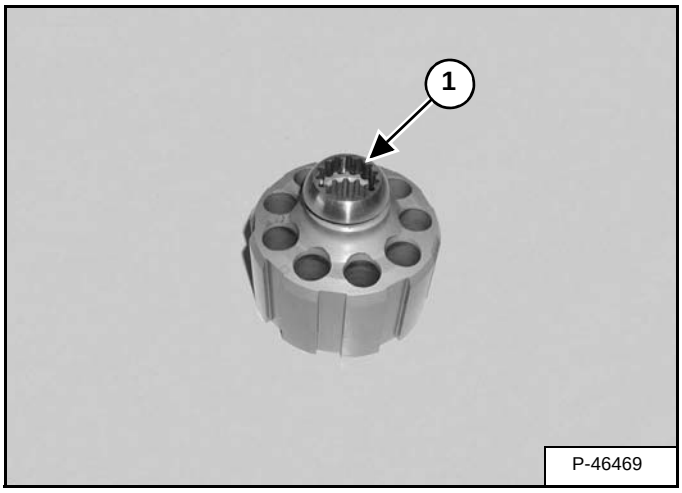
Align the pins in the stop with the grooves in the hub and install the stop (Item 1) **[Figure 20-70-67]**.

Figure 20-70-68



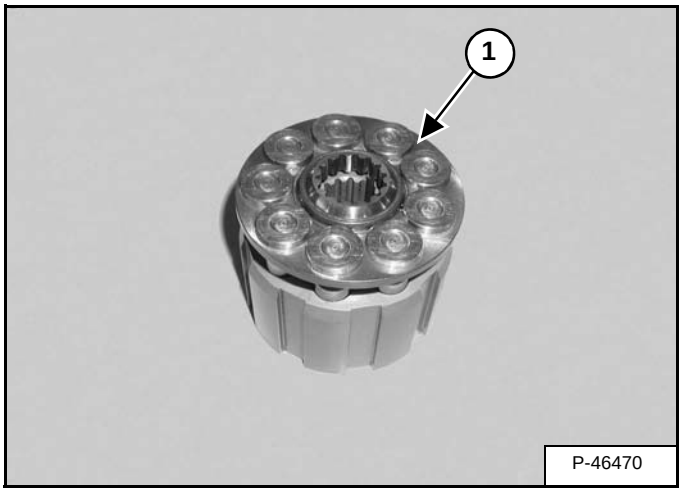
Install the snap ring (Item 1) **[Figure 20-70-68]**.

Figure 20-70-69



Install the piston plate pivot (Item 1) **[Figure 20-70-69]** on the cylinder block.

Figure 20-70-70

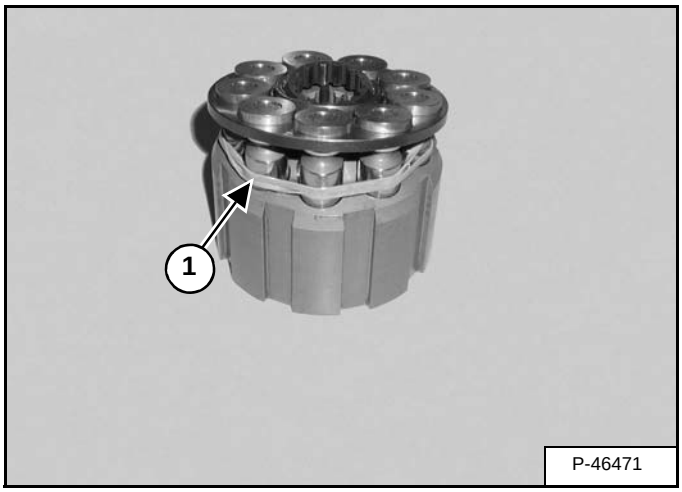


Install the piston plate and pistons (Item 1) **[Figure 20-70-70]** in the cylinder block.

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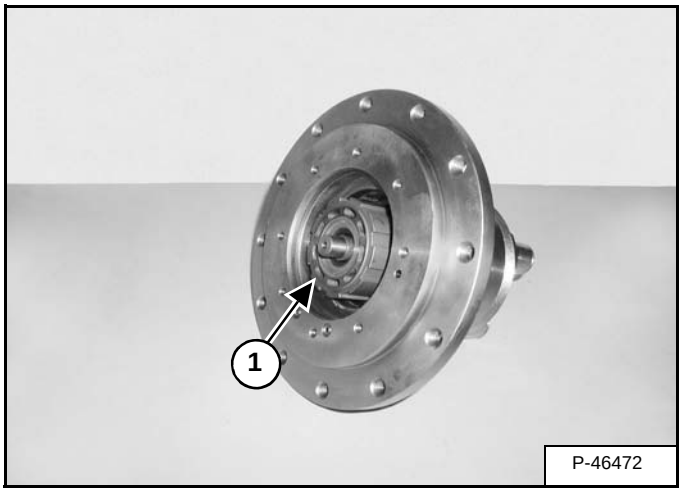
Assembly (Cont'd)

Figure 20-70-71



Install a rubber band (Item 1) **[Figure 20-70-71]** around the pistons.

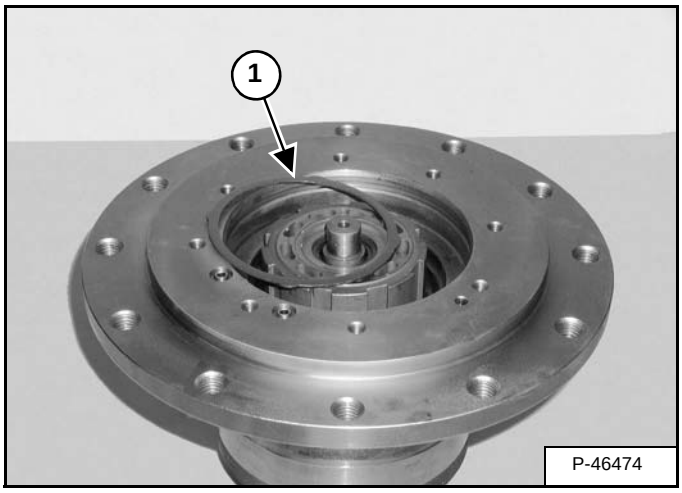
Figure 20-70-72



Tip the hub on its side, and install the cylinder block assembly (Item 1) **[Figure 20-70-72]**.

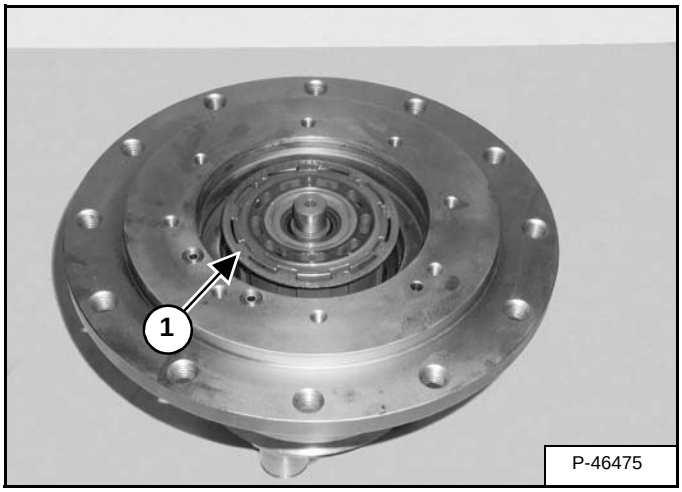
Remove the rubber band from the pistons.

Figure 20-70-73



Tip the hub up and install the external brake disc (Item 1) **[Figure 20-70-73]**.

Figure 20-70-74



Install the internal brake disc (Item 1) **[Figure 20-70-74]**.

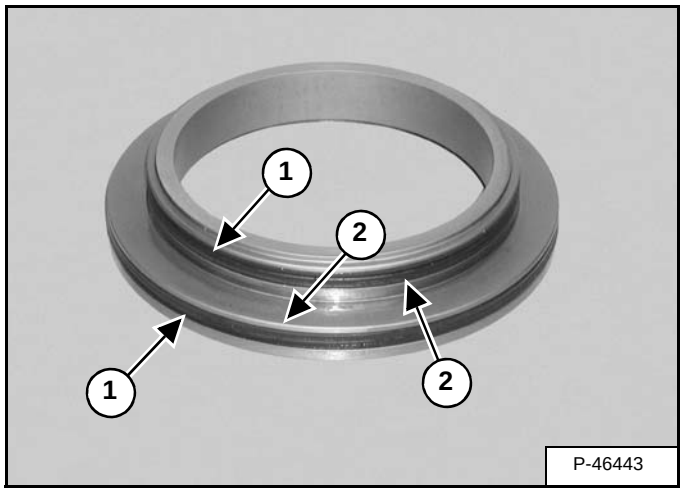
Continue to install the external and internal brake discs.

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TRAVEL MOTOR (S/N 562611001 & ABOVE, 562811001 & ABOVE, AND 563211001 & ABOVE) (CONT'D)

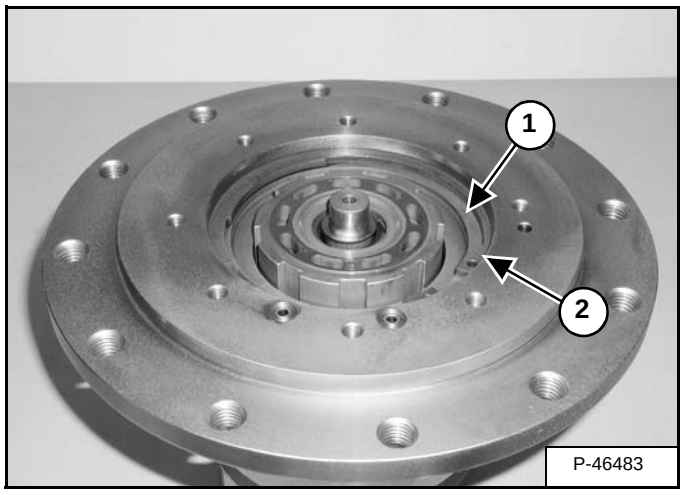
Assembly (Cont'd)

Figure 20-70-75



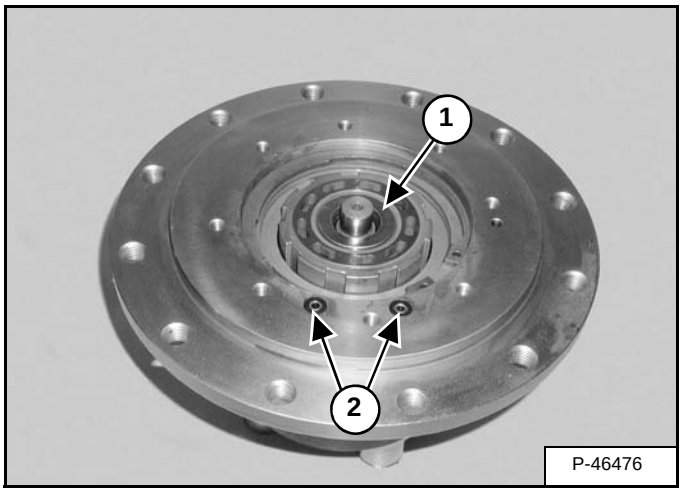
Install the back-up rings (Item 1) and seals (Item 2) **[Figure 20-70-75]** in the brake piston.

Figure 20-70-76



Install the brake piston (Item 1) and snap ring (Item 2) **[Figure 20-70-76]**.

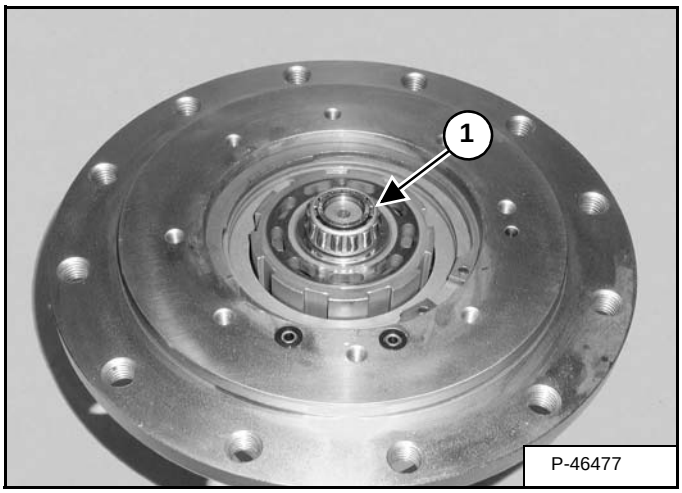
Figure 20-70-77



Install the washer (Item 1) **[Figure 20-70-77]**.

Install the O-rings (Item 2) **[Figure 20-70-77]**.

Figure 20-70-78

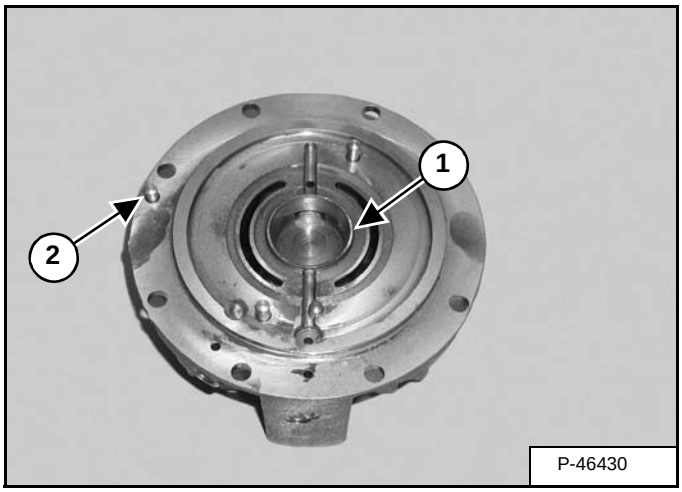


Install the bearing (Item 1) **[Figure 20-70-78]**.

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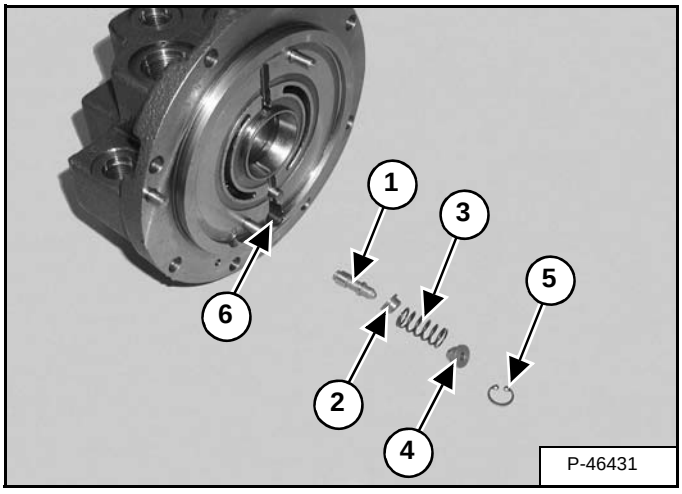
Assembly (Cont'd)

Figure 20-70-79



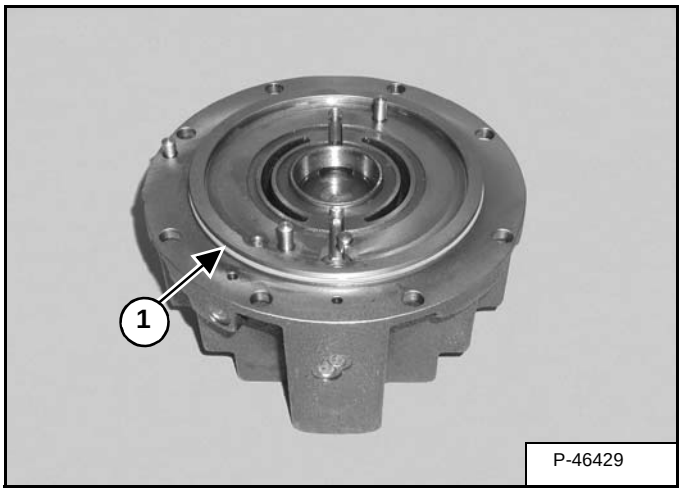
Install the bearing race (Item 1) and alignment pin (Item 2) **[Figure 20-70-79]**.

Figure 20-70-80



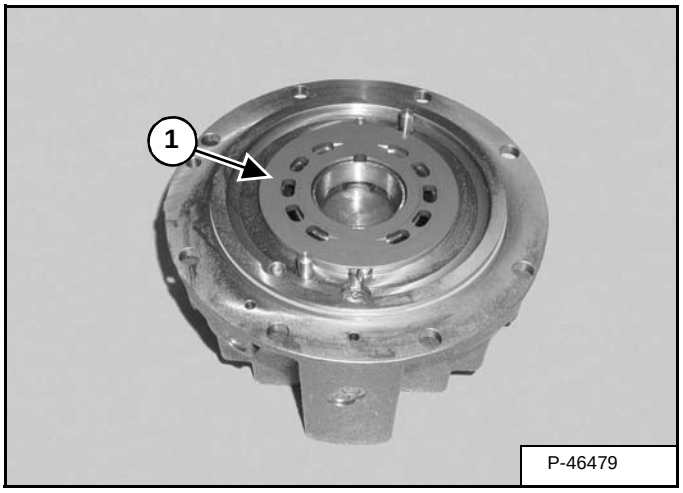
Install the spool (Item 1), spring seat (Item 2), spring (Item 3), spring seat (Item 4), and snap ring (Item 5) in the port (Item 6) **[Figure 20-70-80]**.

Figure 20-70-81



Install the O-ring (Item 1) **[Figure 20-70-81]**.

Figure 20-70-82



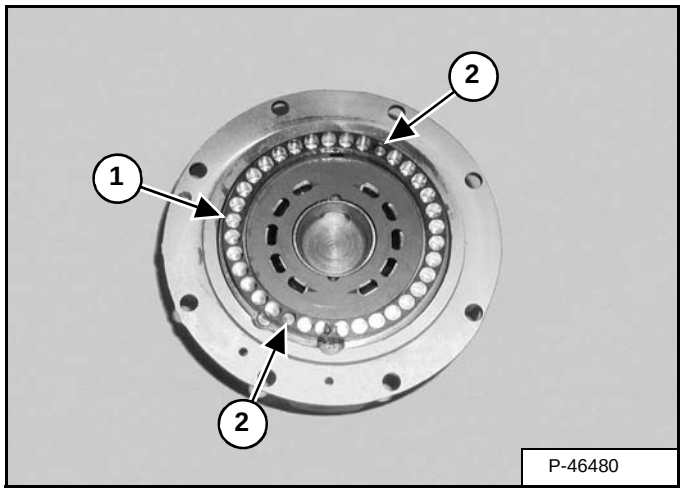
Install the valve plate (Item 1) **[Figure 20-70-82]**.

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TRAVEL MOTOR (S/N 562611001 & ABOVE, 562811001 & ABOVE, AND 563211001 & ABOVE) (CONT'D)

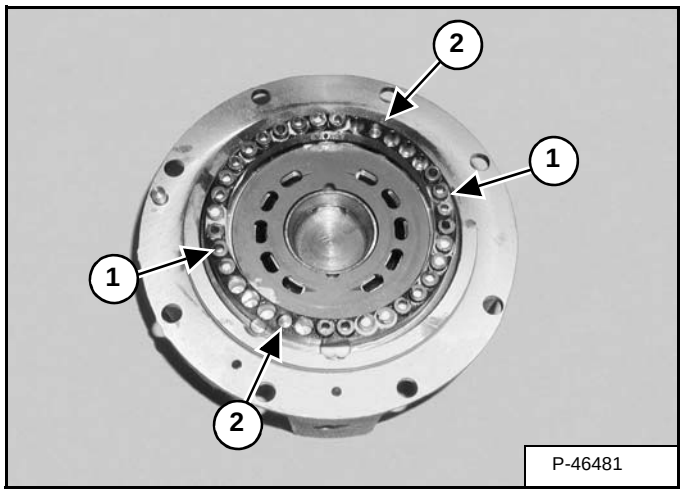
Assembly (Cont'd)

Figure 20-70-83



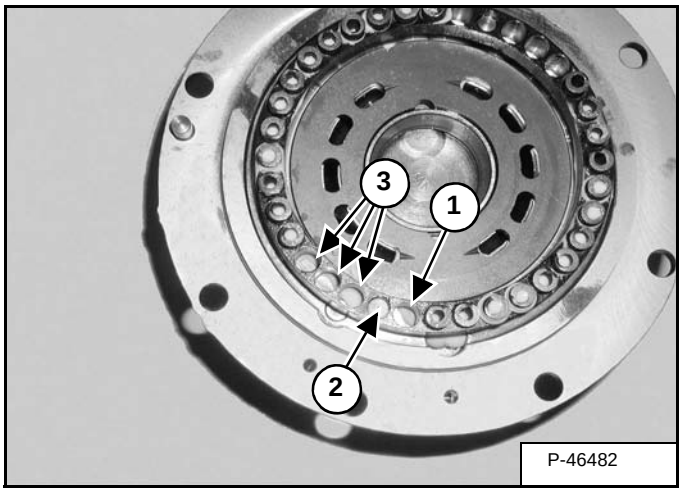
Apply assembly lube to the bottom of the spring retainer and install the retainer (Item 1) over the 2 alignment pins (Item 2) **[Figure 20-70-83]**.

Figure 20-70-84



Apply assembly lube to the springs, and install the springs (Item 1) equally on either side of the alignment pins (Item 2) **[Figure 20-70-84]**.

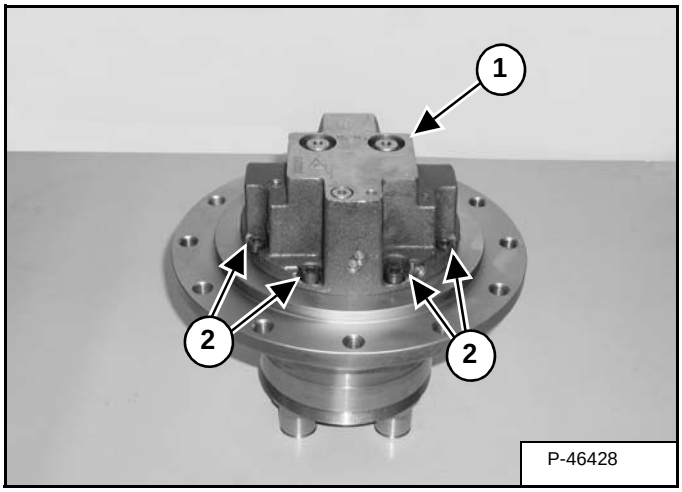
Figure 20-70-85



Install the springs with 1 open spring slot (Item 1) on 1 side of the alignment pin (Item 2) and 3 open spring slots (Item 3) **[Figure 20-70-85]** on the other side of the alignment pin.

NOTE: The springs must be installed equally on either side of the alignment pins.

Figure 20-70-86

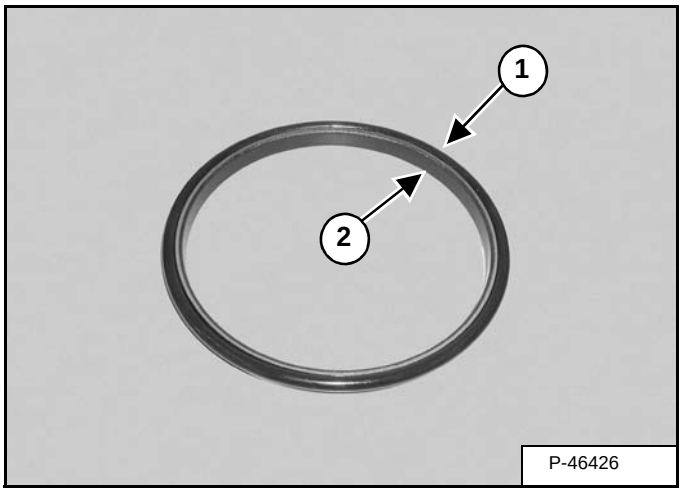


Install the valve block (Item 1) and 8 bolts (Item 2) **[Figure 20-70-86]**. Tighten the bolts to 22 to 26 ft.-lb. (30 to 35 N•m) torque.

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Assembly (Cont'd)

Figure 20-70-87



Install the O-ring (Item 1) on both seal rings (Item 2) **[Figure 20-70-87]**.

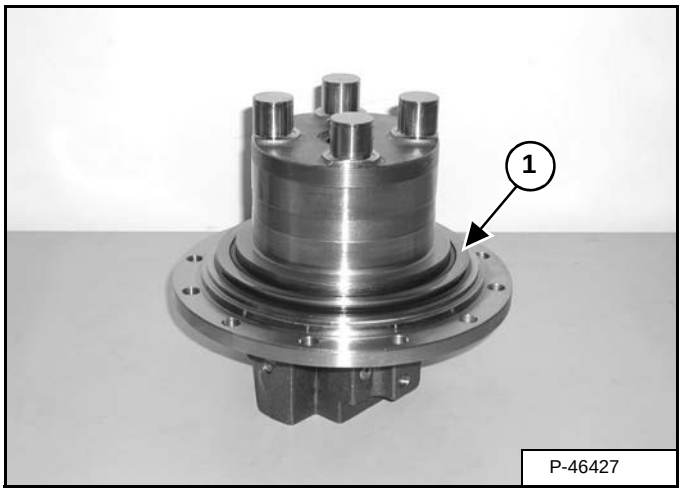
NOTE: Inspect the seal ring for burrs before installing the O-ring. Install the O-ring making sure it is not twisted. To remove any twists, gently pull a section of the O-ring and let it snap back.

The O-ring, seal ring, hub assembly, and bearing carrier must be clean and fee of any dust, oil film, or foreign matter.

The O-ring and seal ring assembly has to be lubricated with alcohol, so the O-ring will slip past the housing retaining ring and seal uniformly in the housing radius.

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

Figure 20-70-88



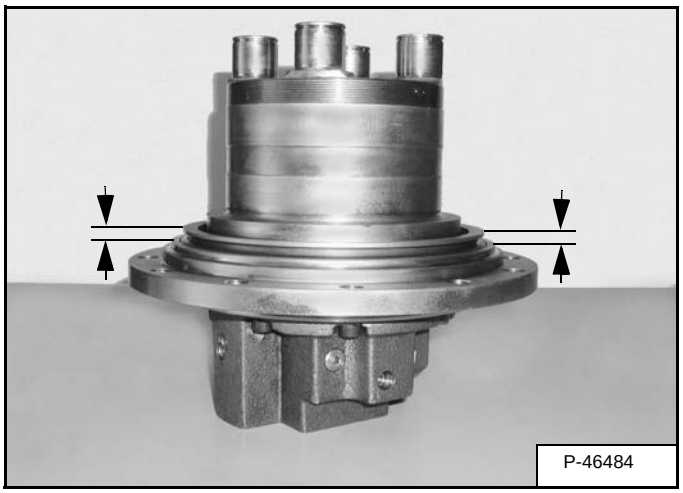
Shake off the excess alcohol and install the seal ring assembly (Item 1) **[Figure 20-70-88]** on the hub.

Use firm even pressure to *pop* the O-ring into the housing.

Apply a light film of oil to the metal seal ring.

NOTE: Do not get any oil on the rubber O-ring.

Figure 20-70-89

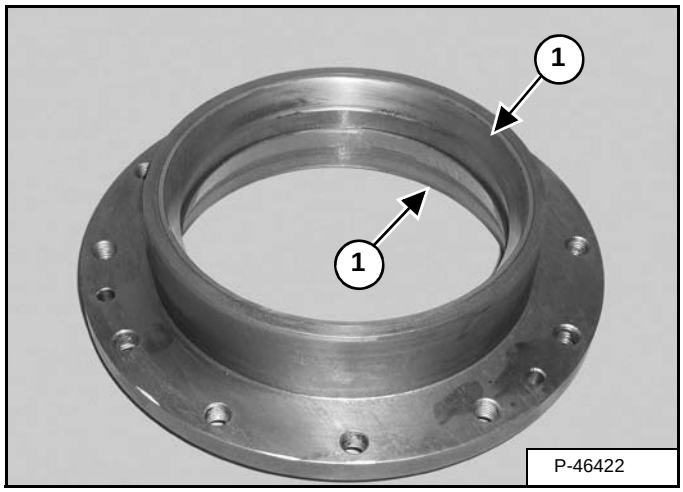


Check the seal stand off height. The stand off height must be uniform with no twists in the O-ring **[Figure 20-70-89]**.

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Assembly (Cont'd)

Figure 20-70-90

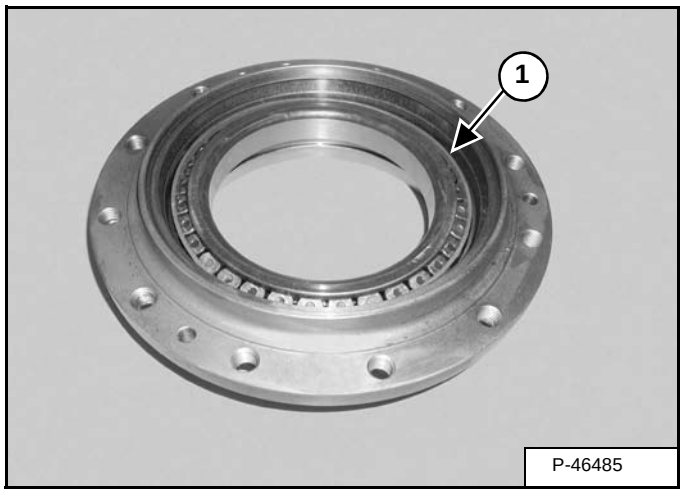


Install the bearing races (Item 1) **[Figure 20-70-90]** in the bearing carrier.

Turn the bearing carrier over.

Heat the bearing in clean hydraulic oil to 225° F (107° C) for 30 minutes.

Figure 20-70-91

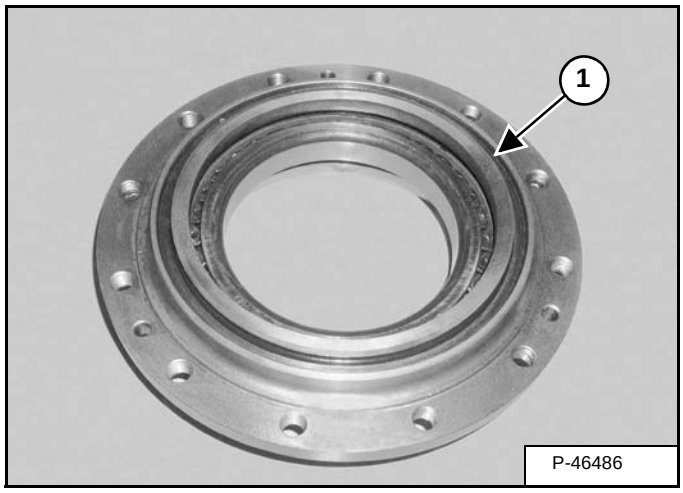


Install the bearing (Item 1) **[Figure 20-70-91]** in the bearing carrier.

The O-ring and seal ring assembly has to be lubricated with alcohol, so the O-ring will slip past the bearing carrier retaining ring and seal uniformly in the carrier radius.

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

Figure 20-70-92



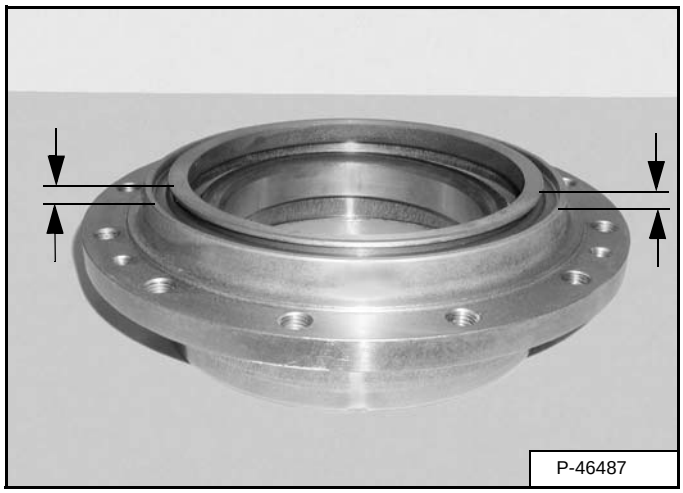
Shake off the excess alcohol and install the seal ring assembly (Item 1) **[Figure 20-70-92]** on the bearing carrier.

Use firm even pressure to *pop* the O-ring into the housing.

Apply a light film of oil to the metal seal ring.

NOTE: Do not get any oil on the rubber O-ring.

Figure 20-70-93

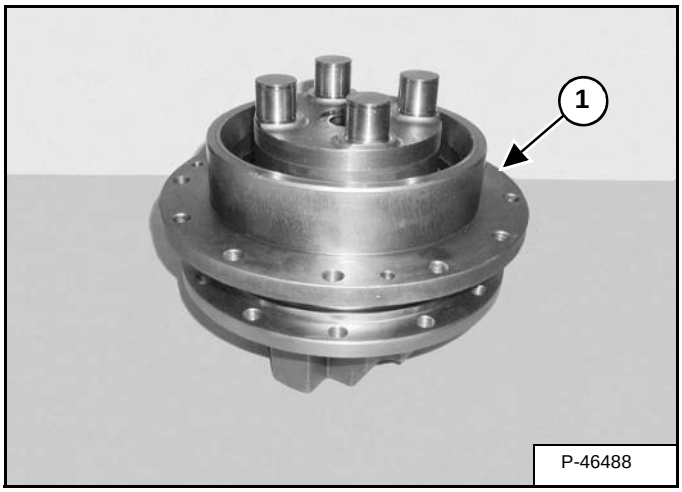


Check the seal stand off height. The stand off height must be uniform with no twists in the O-ring **[Figure 20-70-93]**.

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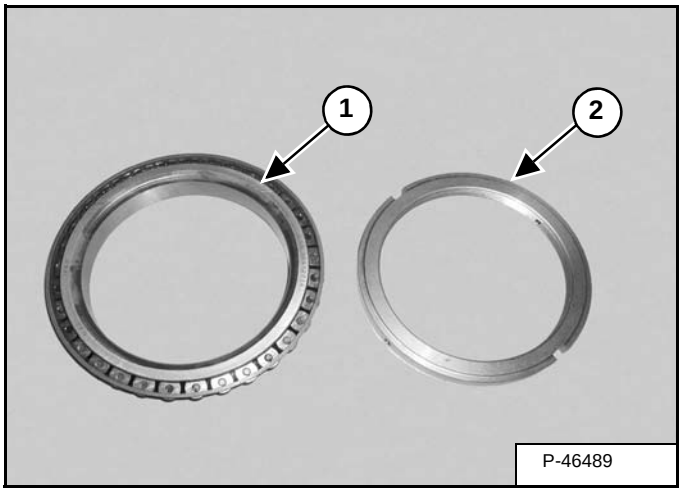
Assembly (Cont'd)

Figure 20-70-94



Turn the bearing carrier over and install the carrier (Item 1) **[Figure 20-70-94]** on the hub.

Figure 20-70-95

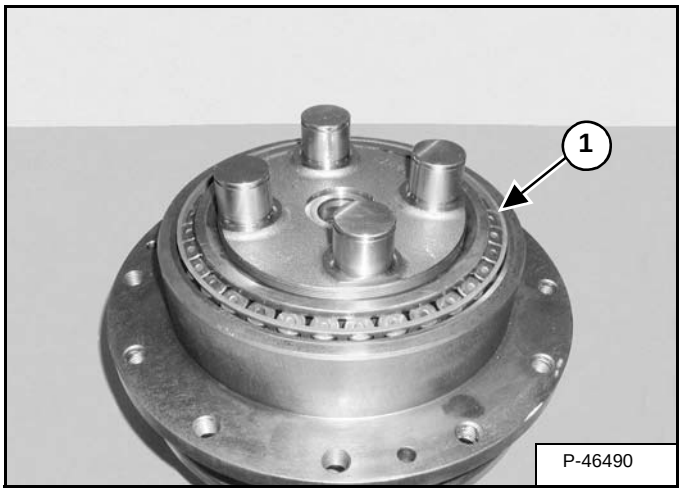


The top bearing (Item 1) must be lapped to the bottom (stepped side) of the new nut (Item 2) **[Figure 20-70-95]**.

Clean the bearing and nut.

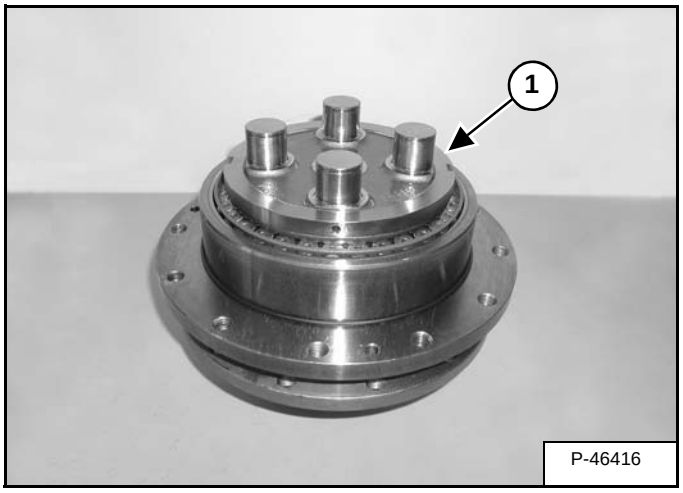
After the bearing has been lapped to the nut, heat the bearing in clean hydraulic oil to 225° F (107° C) for 30 minutes.

Figure 20-70-96



Install the bearing (Item 1) **[Figure 20-70-96]**.

Figure 20-70-97

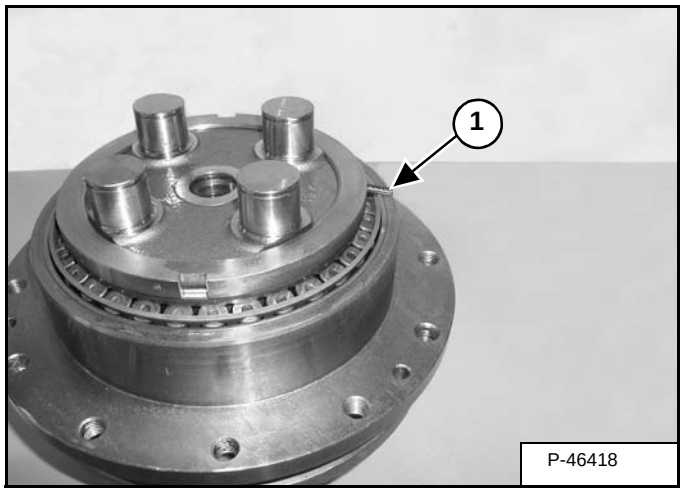


Install the nut (Item 1) **[Figure 20-70-97]**. Tighten the nut to 620 ft.-lb. (840 N•m) while rotating the bearing carrier.

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Assembly (Cont'd)

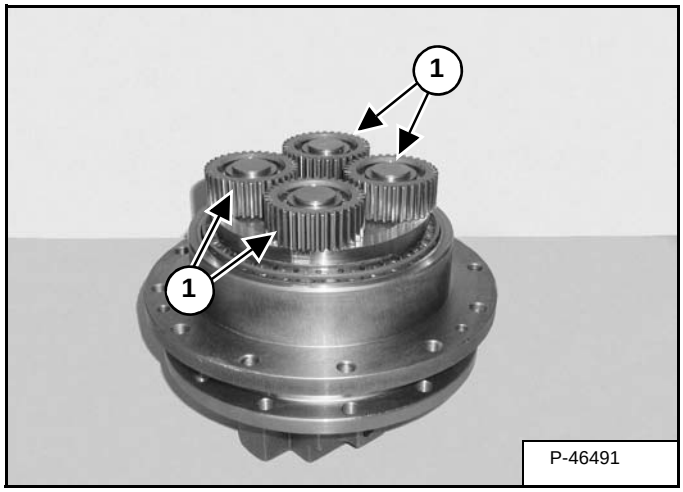
Figure 20-70-98



Install the 2 pins (Item 1) **[Figure 20-70-98]** in the nut. Drive the pins in until the pins are against the threads of the hub.

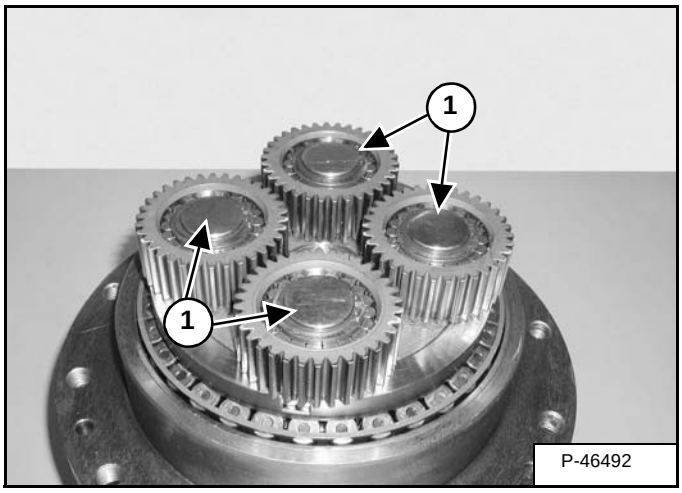
Heat the planetary gear/bearing assemblies in clean hydraulic oil to 225° F (107° C) for 30 minutes.

Figure 20-70-99



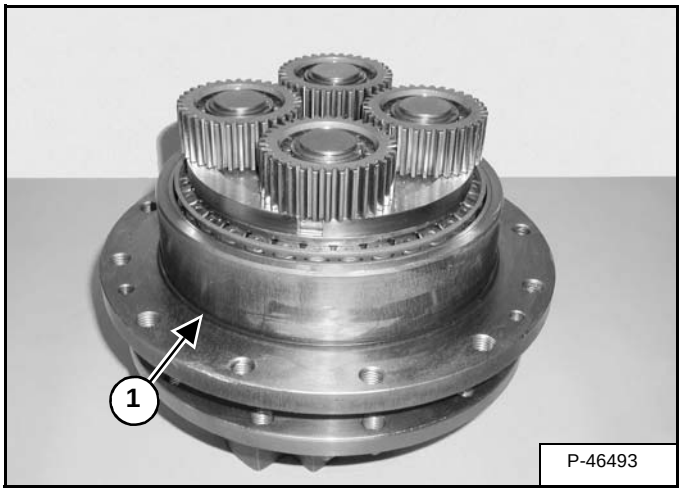
Install the planetary gears (Item 1) **[Figure 20-70-99]**.

Figure 20-70-100



Install the snap rings (Item 1) **[Figure 20-70-100]**.

Figure 20-70-101

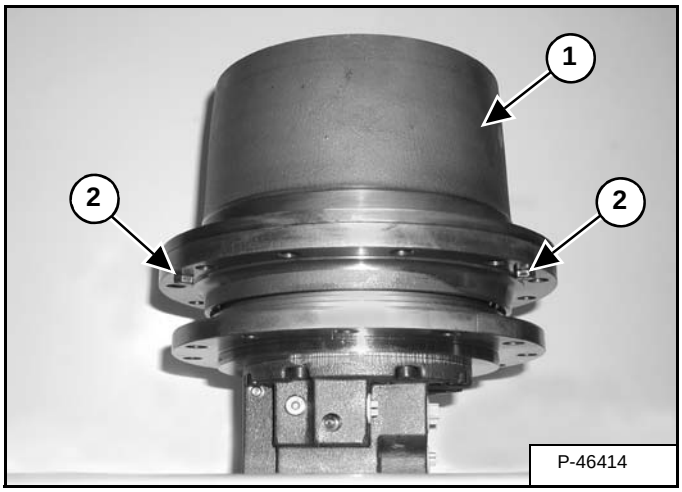


Install the O-ring (Item 1) **[Figure 20-70-101]**.

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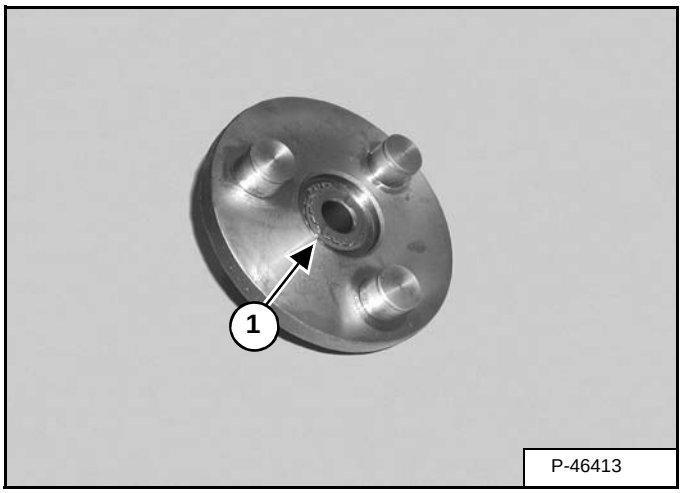
Assembly (Cont'd)

Figure 20-70-102



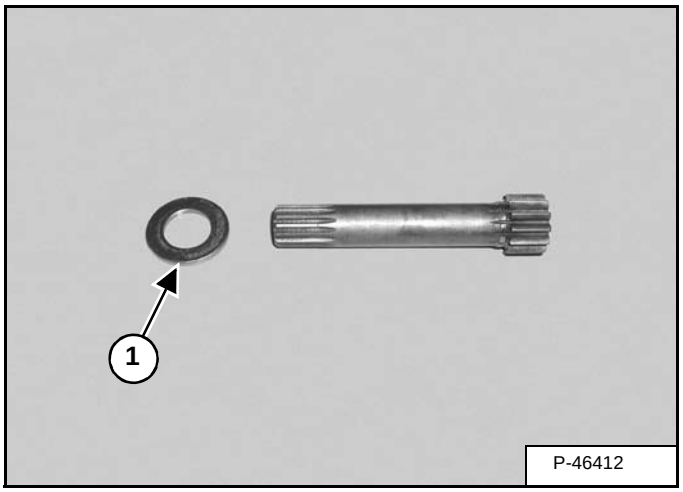
Install the housing (Item 1) and 3 bolts (Item 2) **[Figure 20-70-102]**. Tighten the bolts to 15 to 18 ft.-lb. (20 to 25 N•m) torque.

Figure 20-70-103



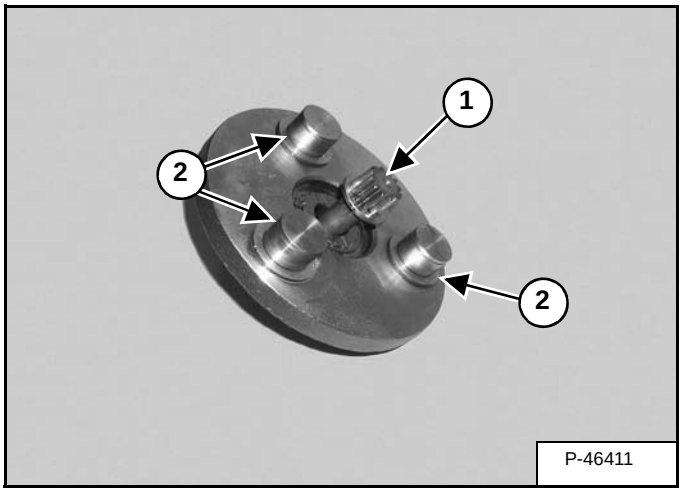
Install the sun gear and snap ring (Item 1) **[Figure 20-70-103]** on the gear carrier.

Figure 20-70-104



Install the washer (Item 1) **[Figure 20-70-104]** on the drive shaft.

Figure 20-70-105



Install the drive shaft (Item 1) and washers (Item 2) **[Figure 20-70-105]**.

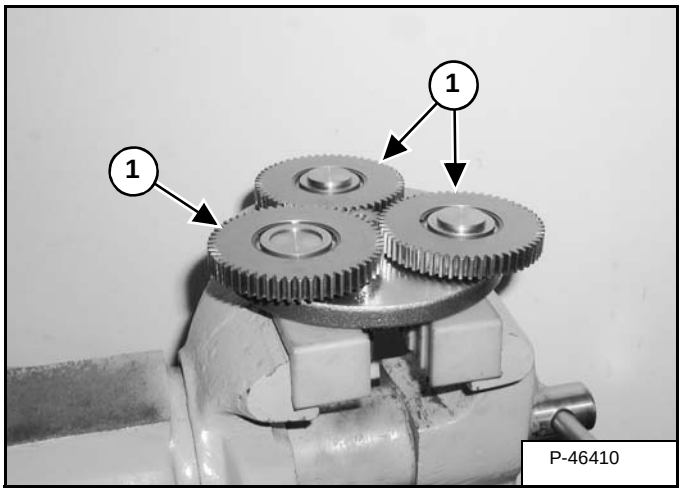
Place the gear carrier in a vise equipped with padded jaws. Heat the planetary gear/bearing assemblies in clean hydraulic oil to 225° F (107° C) for 30 minutes.

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TRAVEL MOTOR (S/N 562611001 & ABOVE, 562811001 & ABOVE, AND 563211001 & ABOVE) (CONT'D)

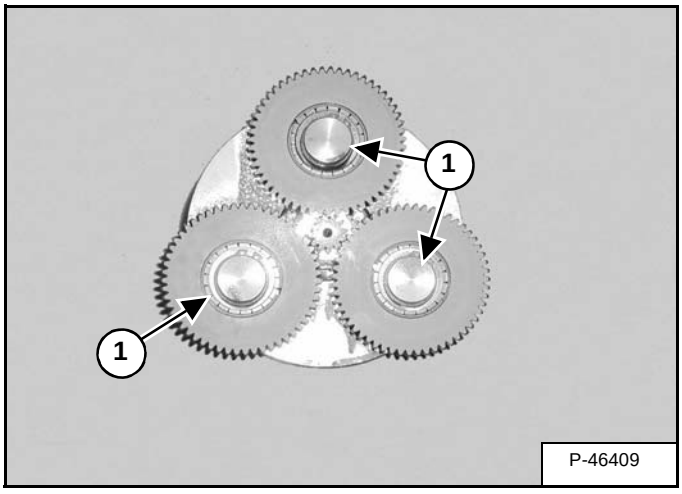
Assembly (Cont'd)

Figure 20-70-106



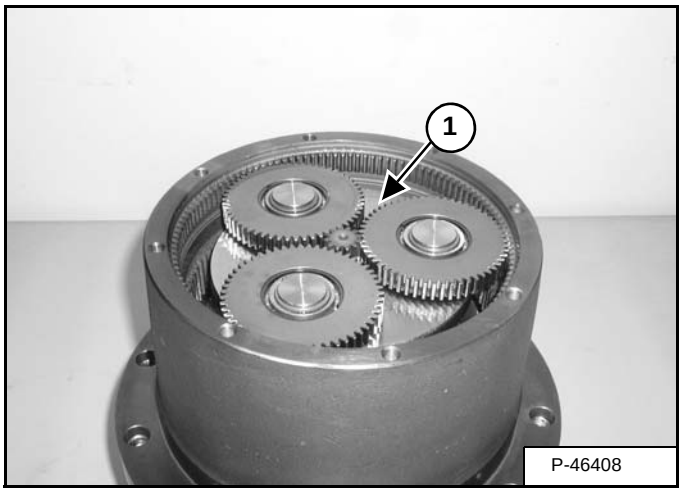
Install the planetary gears (Item 1) **[Figure 20-70-106]**.

Figure 20-70-107



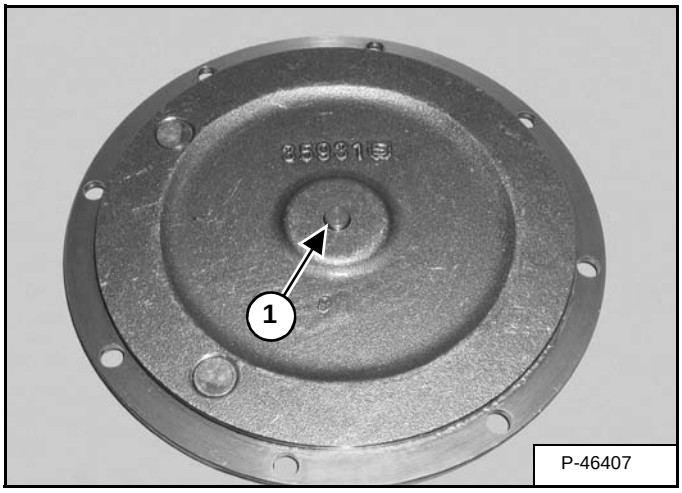
Remove the carrier from the vise and install the snap rings (Item 1) **[Figure 20-70-107]**.

Figure 20-70-108



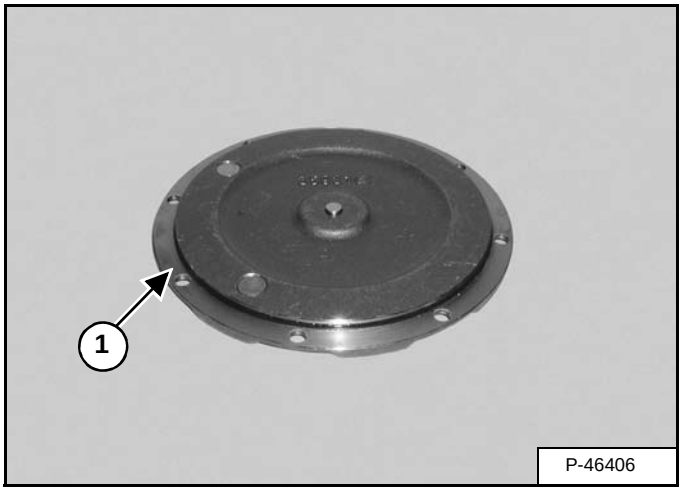
Install the planetary carrier (Item 1) **[Figure 20-70-108]**.

Figure 20-70-109



Install the bushing (Item 1) **[Figure 20-70-109]**.

Figure 20-70-110

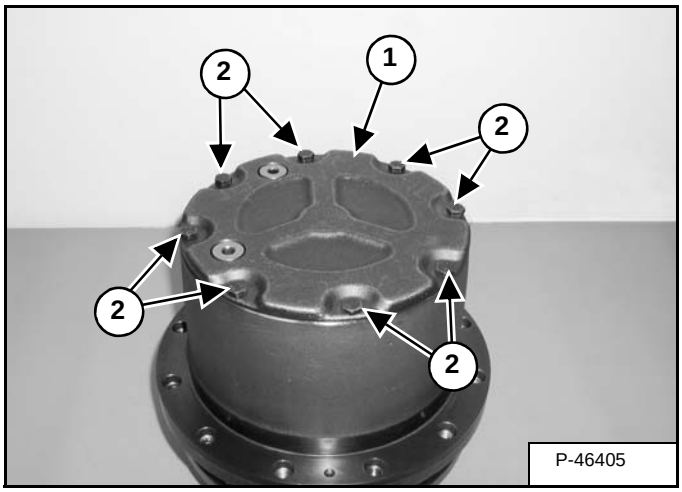


Install the O-ring (Item 1) **[Figure 20-70-110]**.

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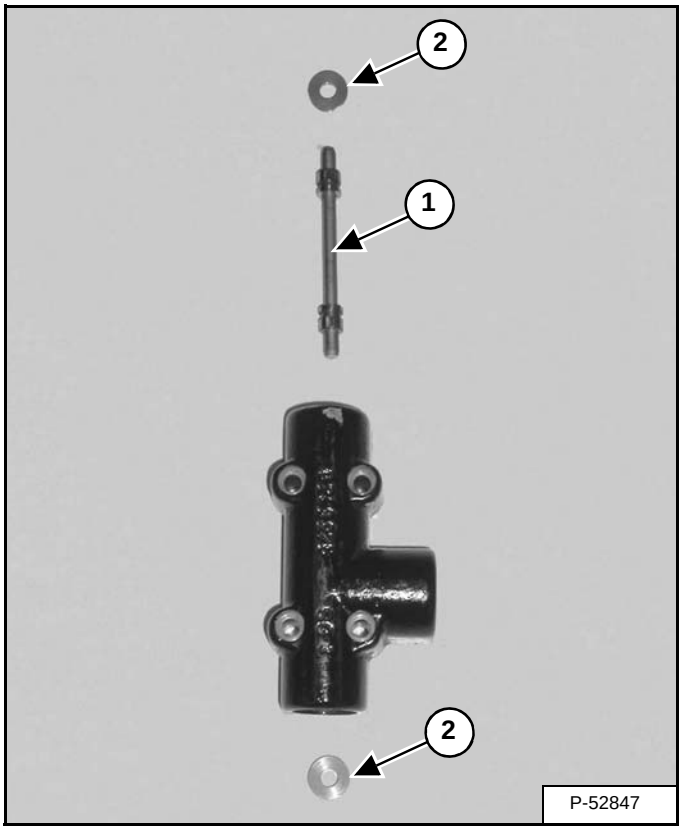
Assembly (Cont'd)

Figure 20-70-111



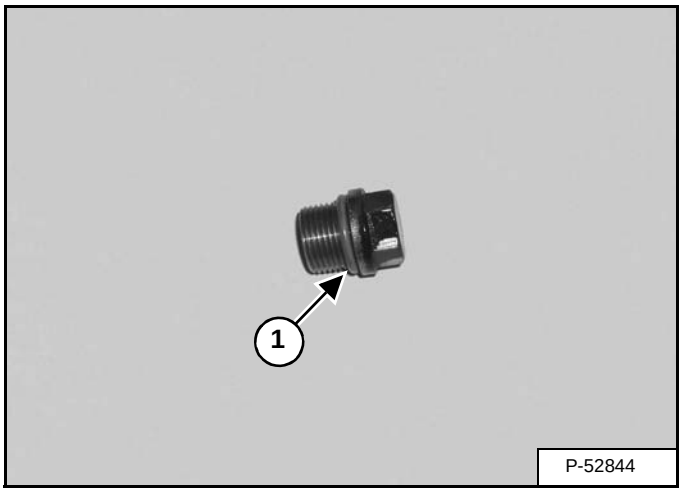
Install the cover (Item 1) and bolts (Item 2) **[Figure 20-70-111]**. Tighten the bolts to 15 to 18 ft.-lb. (20 to 25 N•m) torque.

Figure 20-70-112



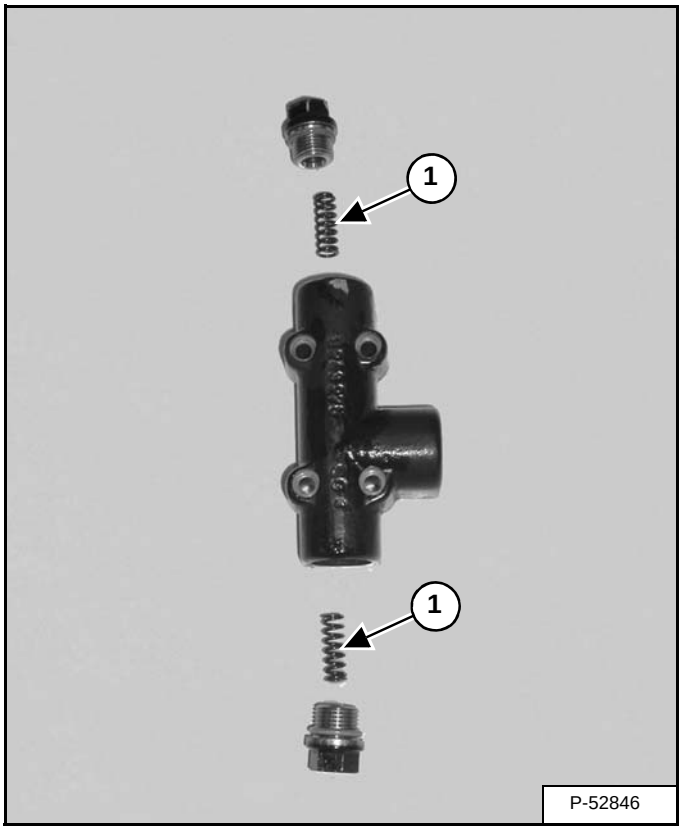
Install the spool (Item 1) and washers (Item 2) **[Figure 20-70-112]**.

Figure 20-70-113



Install the O-ring (Item 1) **[Figure 20-70-113]** on the plugs.

Figure 20-70-114



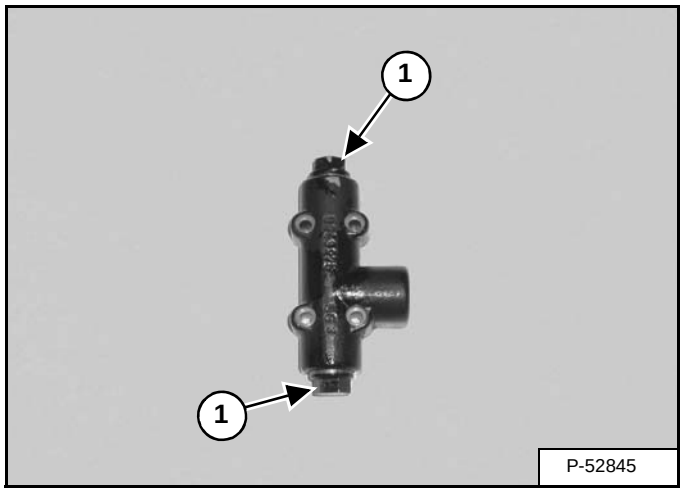
Install the springs (Item 1) **[Figure 20-70-114]**.

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TRAVEL MOTOR (S/N 562611001 & ABOVE, 562811001 & ABOVE, AND 563211001 & ABOVE) (CONT'D)

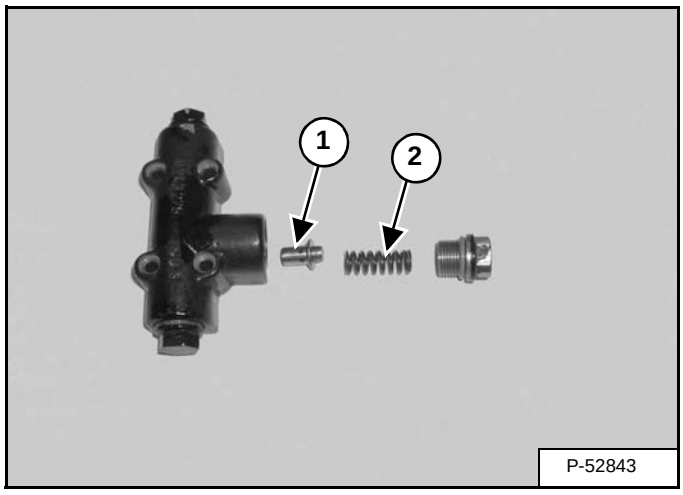
Assembly (Cont'd)

Figure 20-70-115



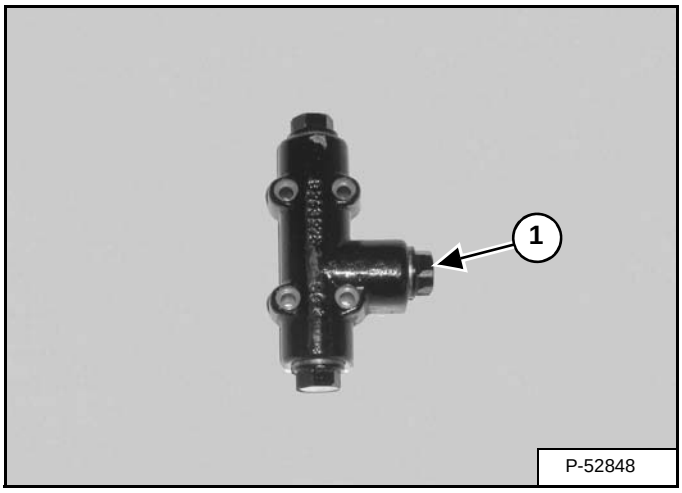
Install the plugs (Item 1) **[Figure 20-70-115]**.

Figure 20-70-116



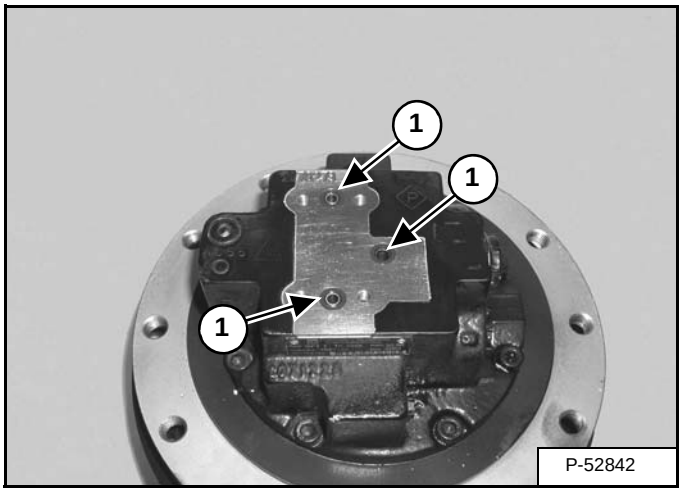
Install the poppet (Item 1) and spring (Item 2) **[Figure 20-70-116]**.

Figure 20-70-117



Install the plug (Item 1) **[Figure 20-70-117]**.

Figure 20-70-118

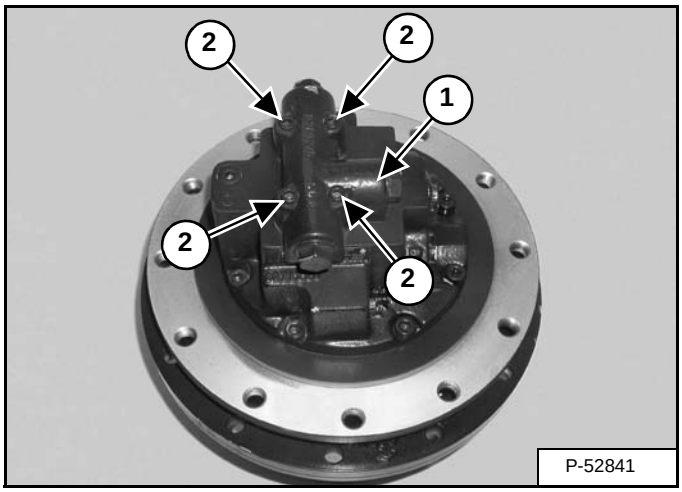


Install the O-rings (Item 1) **[Figure 20-70-118]**.

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Assembly (Cont'd)

Figure 20-70-119



Install the shuttle valve (Item 1) and bolts (Item 2) **[Figure 20-70-119]**.

Tighten the bolts to 6 to 7 ft.-lb. (8 to 10 N•m) torque.

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TRAVEL MOTOR (S/N 563111001 & ABOVE) (EARLY MODELS)

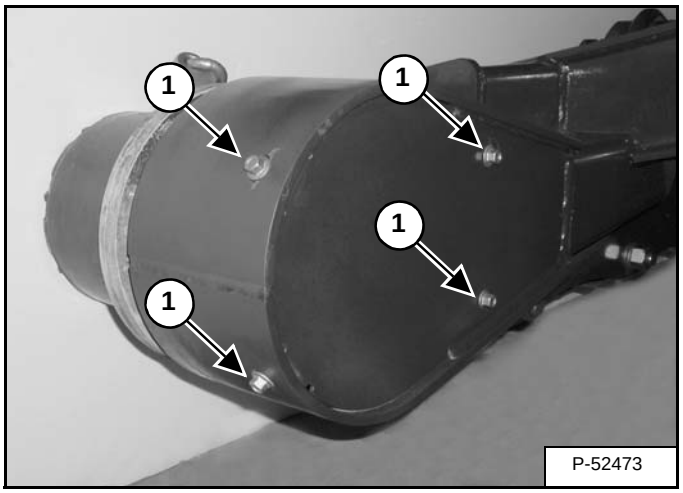
Removal And Installation

Lift and block the side of the track frame where the travel motor will be removed.

Release the track tension and remove the track. (See Rubber Track Removal And Installation on Page 40-20-4 or See Steel Track Removal And Installation on Page 40-20-7)

Remove the drive sprocket. See Track Frame. (See TRACK FRAME on Page 40-30-1)

Figure 20-71-1



Remove the bolts (Item 1) **[Figure 20-71-1]** from the track frame cover.

Installation: Tighten the bolts to 20 - 25 ft.-lb. (27 - 34 N•m) torque.

Remove the cover.

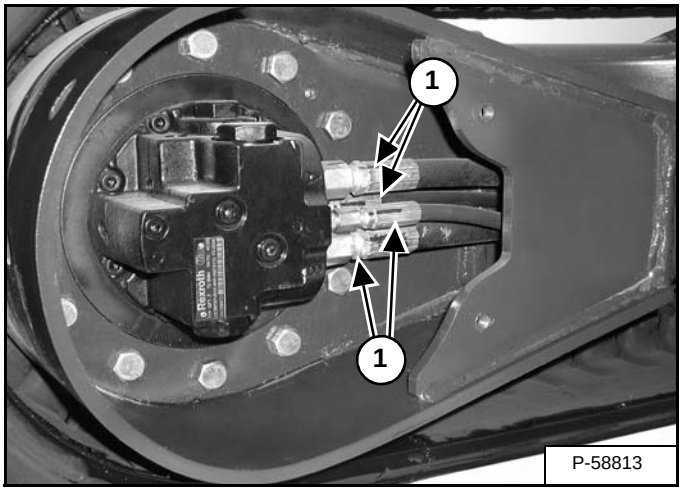
IMPORTANT

When making repairs on 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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Mark the hoses for correct installation.

Figure 20-71-2

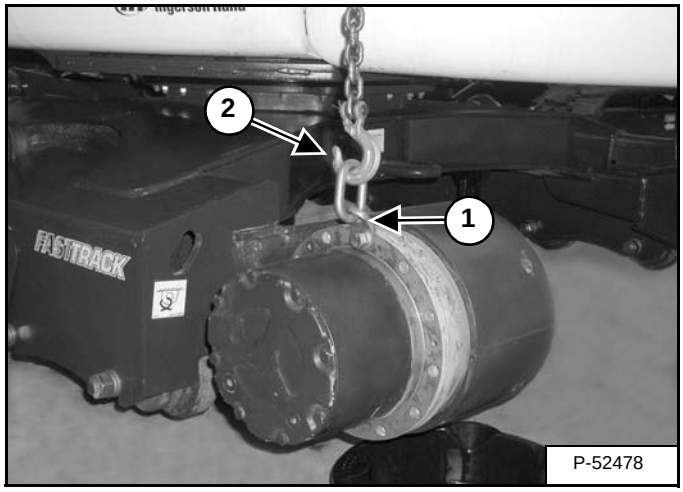


Remove the hoses (Item 1) **[Figure 20-71-2]** from the travel motor.

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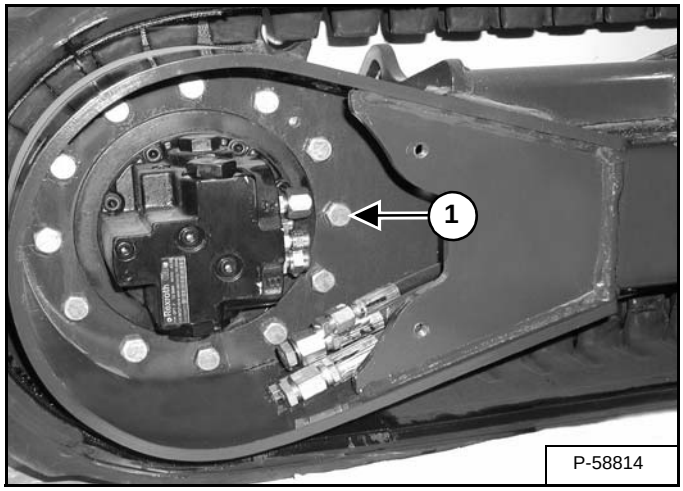
Removal And Installation (Cont'd)

Figure 20-71-3



Install a lifting bracket (Item 1) and hoist (Item 2) **[Figure 20-71-3]** on the motor.

Figure 20-71-4



Remove the bolts (Item 1) **[Figure 20-71-4]** from the travel motor.

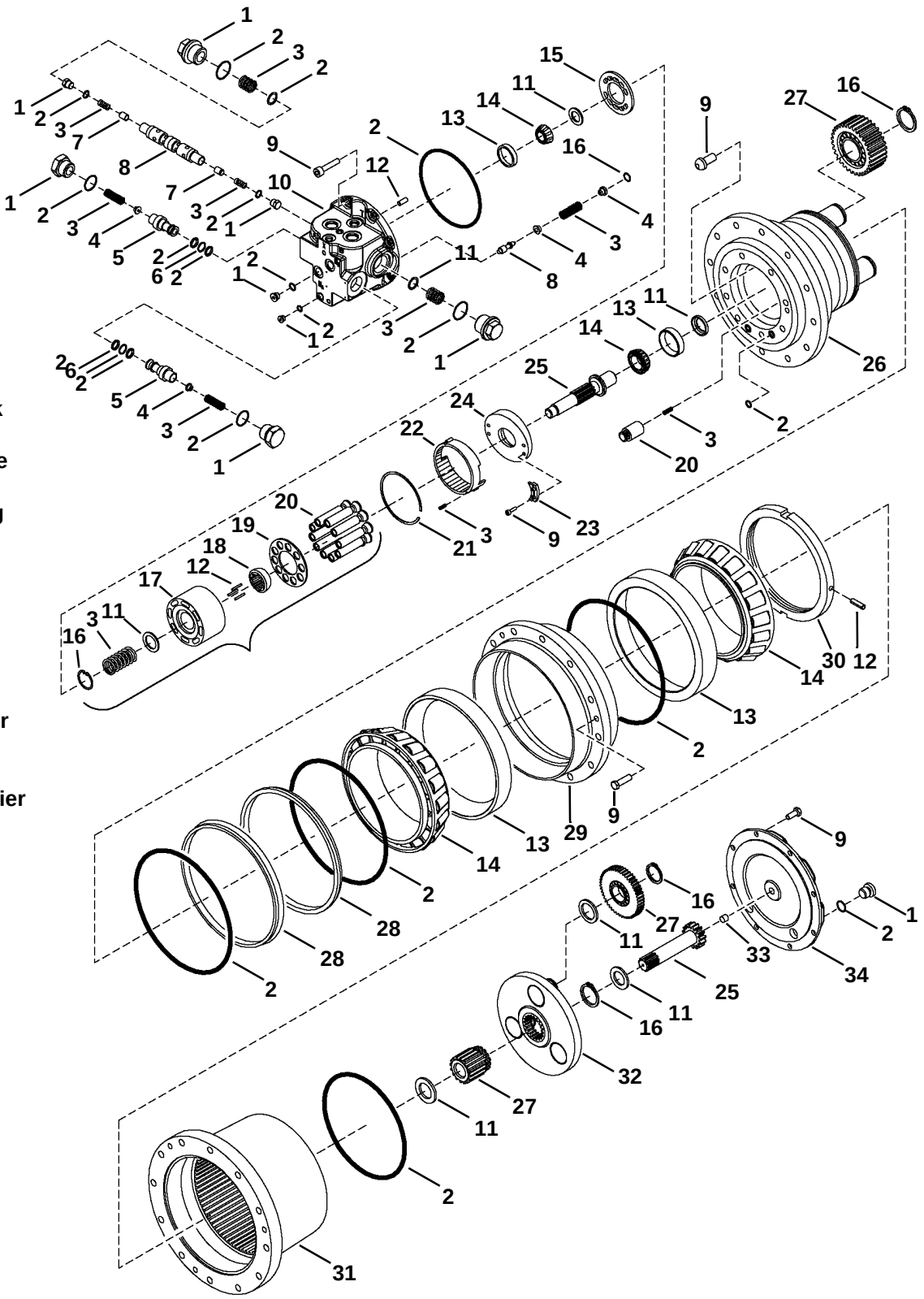
Installation: Apply thread lock adhesive (Loctite™ 242) to the bolts and tighten to 111 - 129 ft.-lb. (150 - 175 N•m) torque.

Remove the travel motor from the track frame.

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Parts Identification

1. Plug
2. O-Ring
3. Spring
4. Spring Seat
5. Cartridge
6. Back-up Ring
7. Poppet
8. Spool
9. Bolt
10. Valve Block
11. Washer
12. Pin
13. Bearing Race
14. Bearing
15. Port Plate
16. Snap Ring
17. Cylinder Block
18. Piston Plate
19. Retaining Plate
20. Piston
21. Retaining Ring
22. Stop
23. Plate
24. Swash Plate
25. Shaft
26. Hub
27. Gear
28. Seal Ring
29. Bearing Carrier
30. Nut
31. Housing
32. Planetary Carrier
33. Bushing
34. Cover



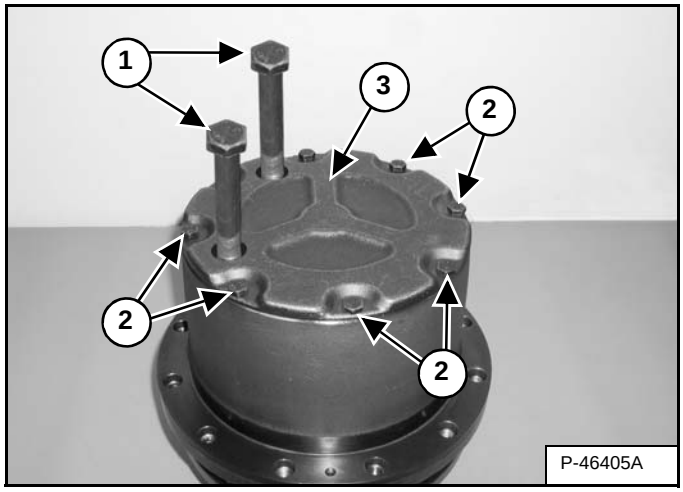
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TRAVEL MOTOR (S/N 563111001 & ABOVE) (EARLY MODELS) (CONT'D)

Disassembly

Figure 20-71-5

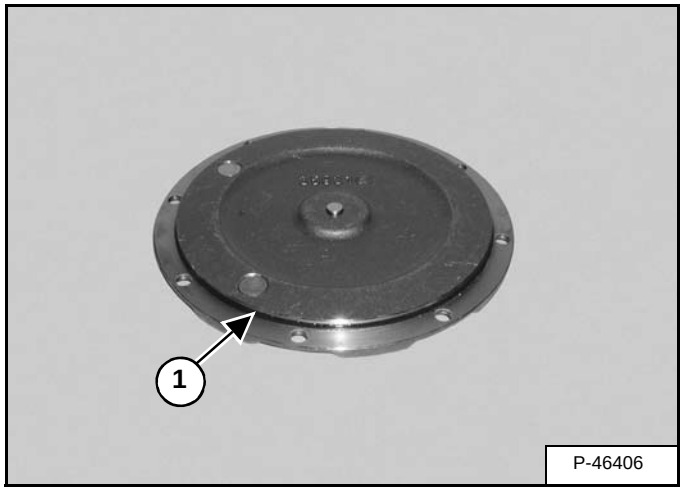


Remove the bolts (Item 2) and cover (Item 3) **[Figure 20-71-5]**.

Install two M18 x 1.5 bolts (Item 1) **[Figure 20-71-5]** into the cover.

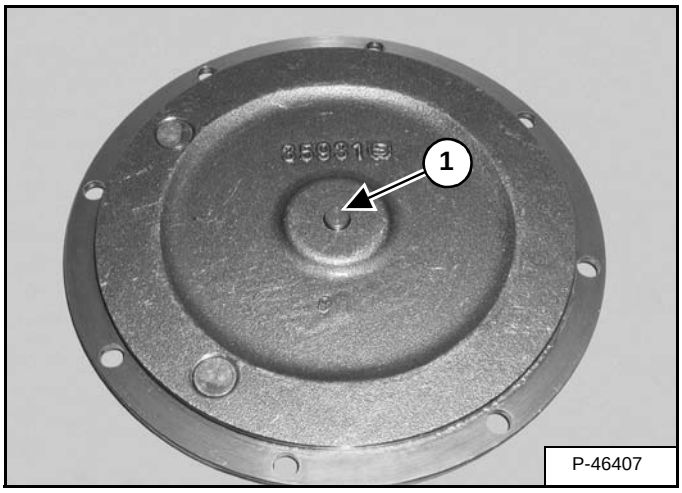
NOTE: The two bolts will be used to remove the cover.

Figure 20-71-6



Remove the O-ring (Item 1) **[Figure 20-71-6]**.

Figure 20-71-7

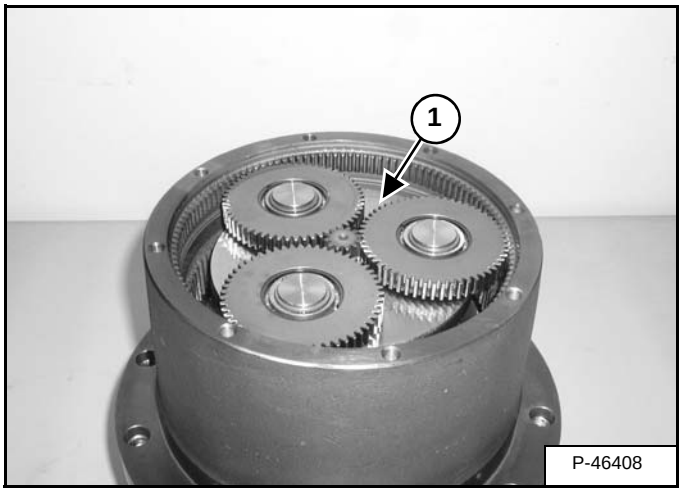


Drill a hole in the center of the bushing (Item 1) **[Figure 20-71-7]** using a number 3 drill bit.

Thread the hole using a 1/4 x 28 in. N.F. tap.

Install a 1/4 x 28 in. bolt in the bushing, and pull the bushing out.

Figure 20-71-8

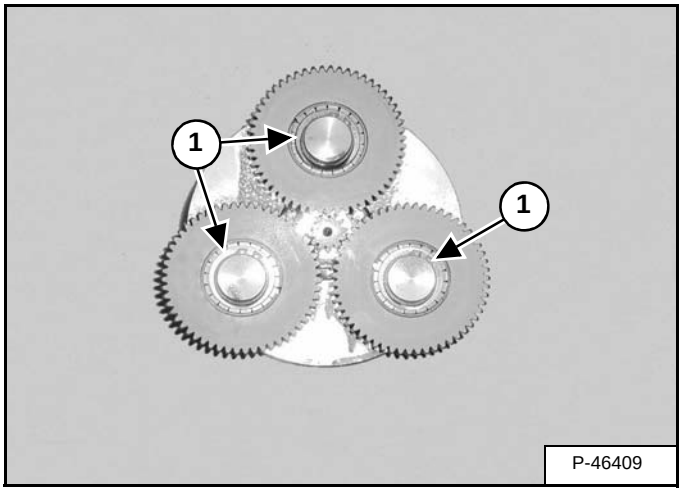


Remove the planetary carrier (Item 1) **[Figure 20-71-8]**.

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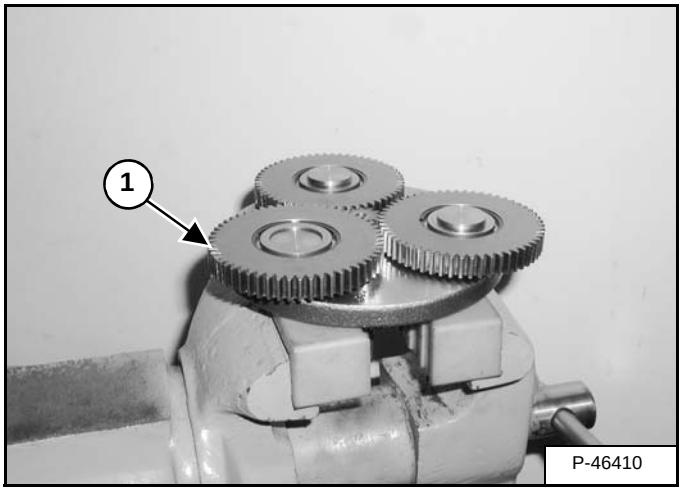
Disassembly (Cont'd)

Figure 20-71-9



Remove the snap rings (Item 1) **[Figure 20-71-9]**.

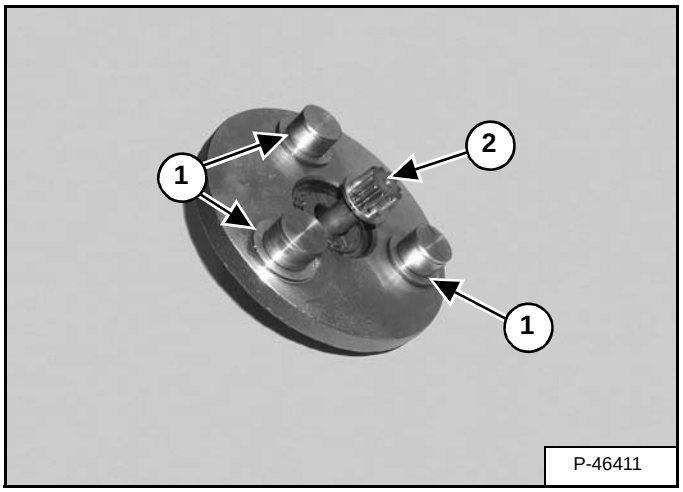
Figure 20-71-10



Place the carrier in a vice equipped with padded jaws. Pry the planetary gears (Item 1) **[Figure 20-71-10]** off of the carrier.

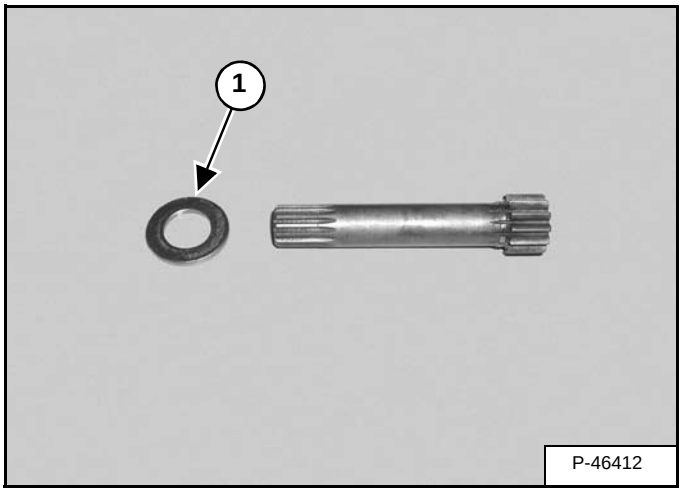
Record the orientation of the gear/bearing assembly. The gear/bearing assembly can only be installed in one direction.

Figure 20-71-11



Remove the washers (Item 1). Remove the drive shaft (Item 2) **[Figure 20-71-11]**.

Figure 20-71-12

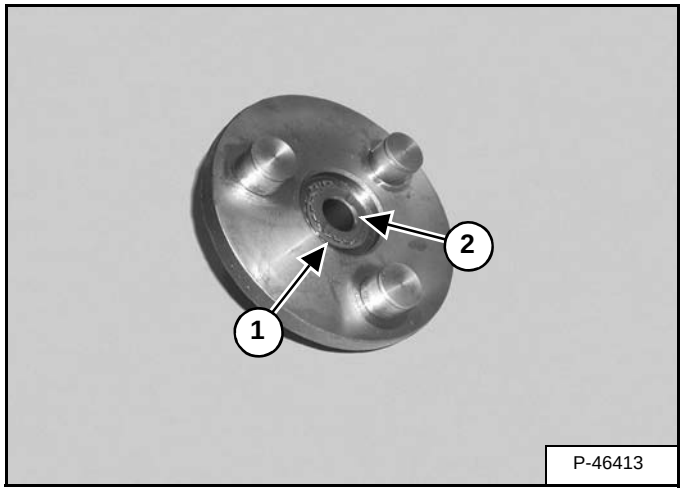


Remove the washer (Item 1) **[Figure 20-71-12]** from the drive shaft.

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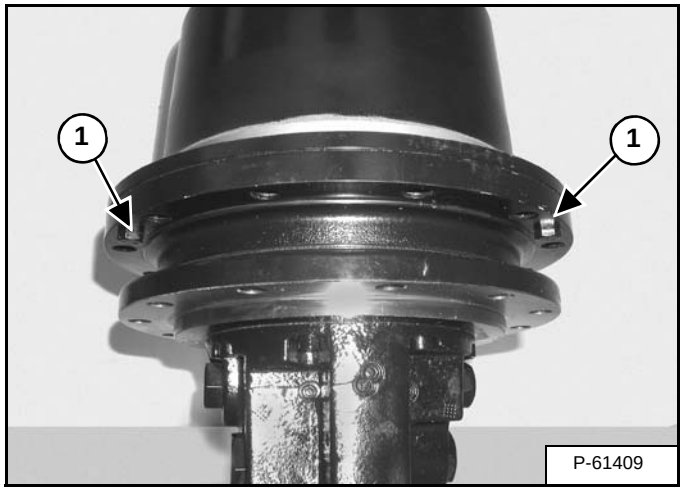
Disassembly (Cont'd)

Figure 20-71-13



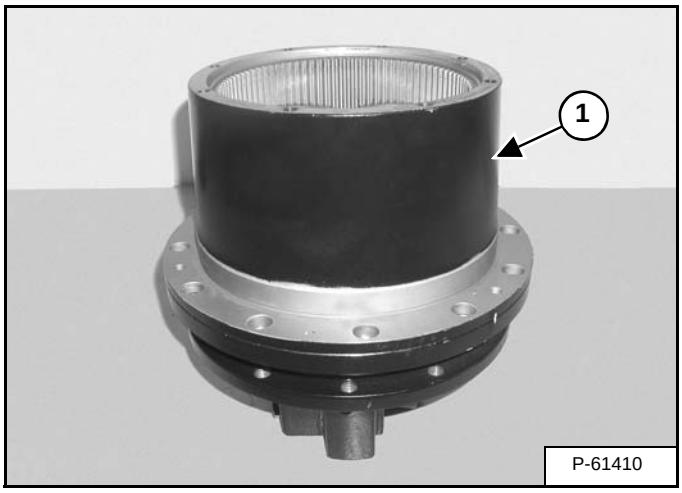
Remove the snap ring (Item 1). Remove the sun gear (Item 2) **[Figure 20-71-13]**.

Figure 20-71-14



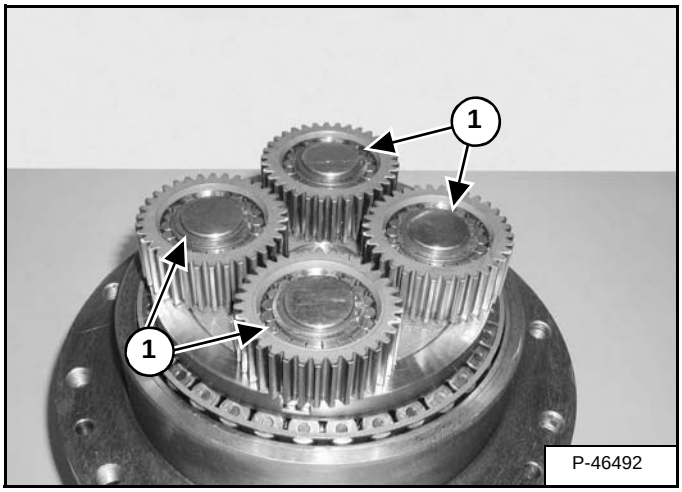
Remove the three bolts (Item 1) **[Figure 20-71-14]**.

Figure 20-71-15



Pull up on and remove the ring gear (Item 1) **[Figure 20-71-15]** from the hub assembly.

Figure 20-71-16

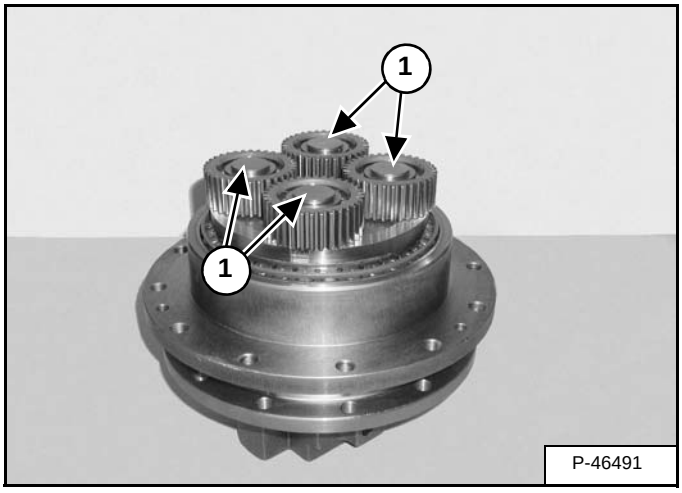


Remove the snap rings (Item 1) **[Figure 20-71-16]**.

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Disassembly (Cont'd)

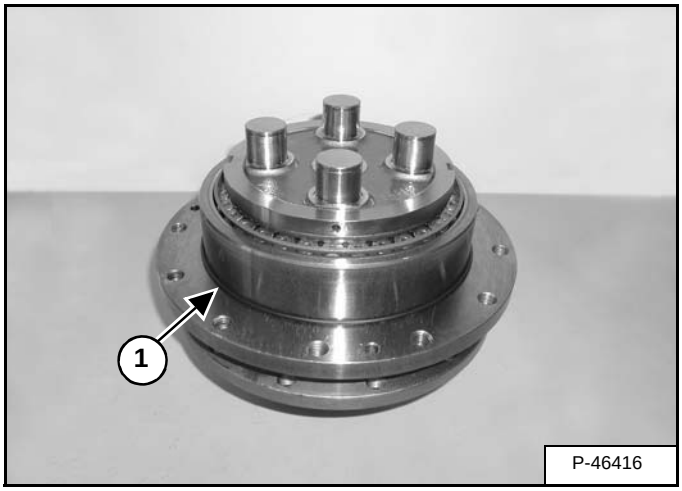
Figure 20-71-17



Pry the gear/bearing assembly (Item 1) **[Figure 20-71-17]** off of the hub. Record the orientation of the gear/bearing assembly.

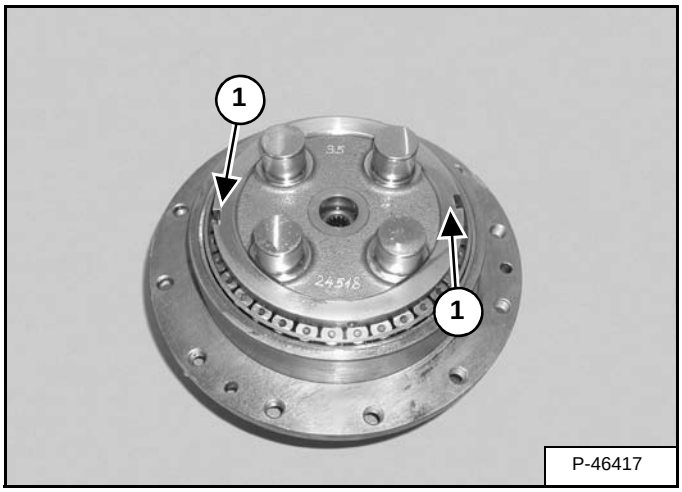
The gear/bearing assembly can only be installed in one direction.

Figure 20-71-18



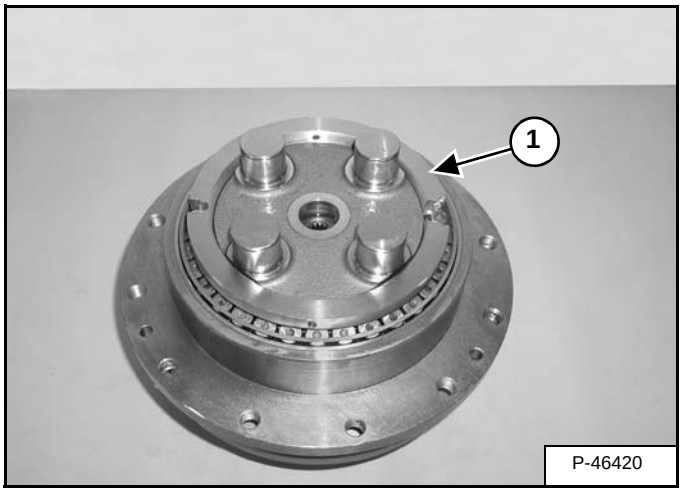
Remove the O-ring (Item 1) **[Figure 20-71-18]**.

Figure 20-71-19



Center punch and drill the nut where shown (Item 1) **[Figure 20-71-19]**.

Figure 20-71-20

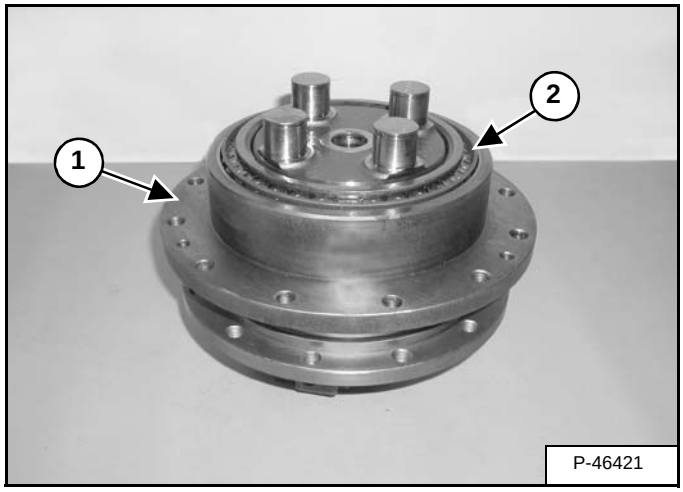


Split and remove the nut (Item 1) **[Figure 20-71-20]**.

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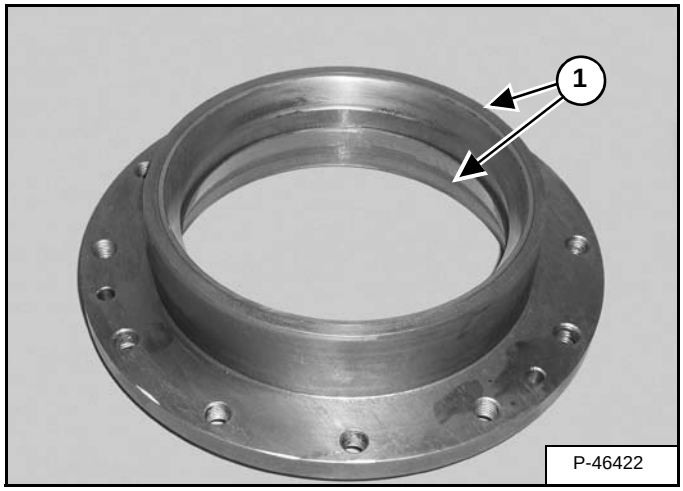
Disassembly (Cont'd)

Figure 20-71-21



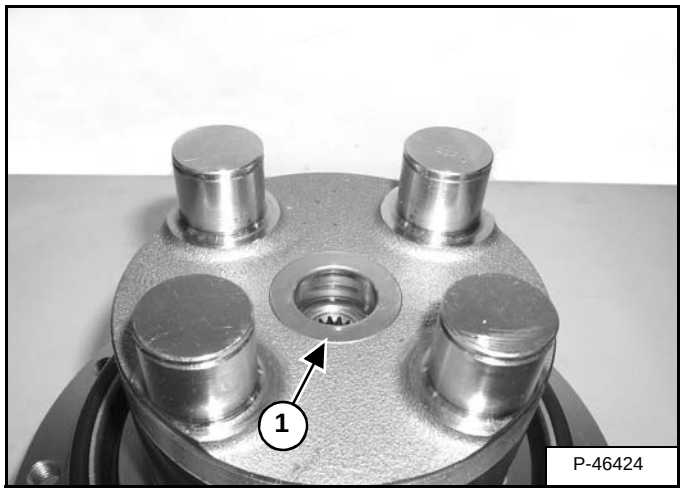
Pull up on and remove the bearing carrier (Item 1) and top bearing (Item 2) **[Figure 20-71-21]**.

Figure 20-71-22



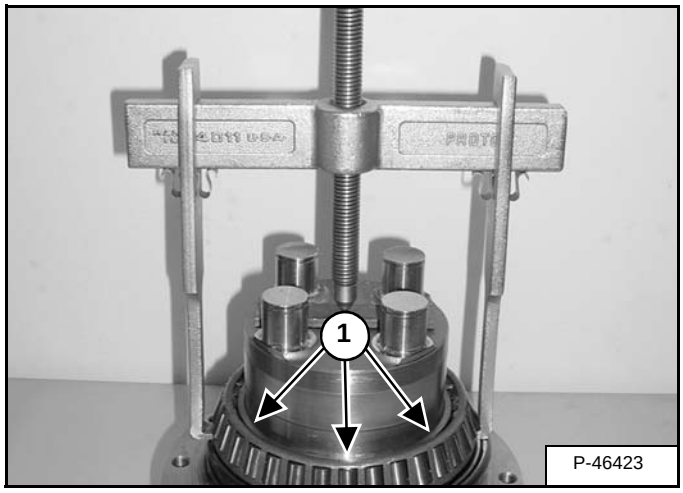
Remove the top and bottom bearing race (Item 1) **[Figure 20-71-22]** from the bearing carrier.

Figure 20-71-23



Remove the washer (Item 1) **[Figure 20-71-23]**.

Figure 20-71-24



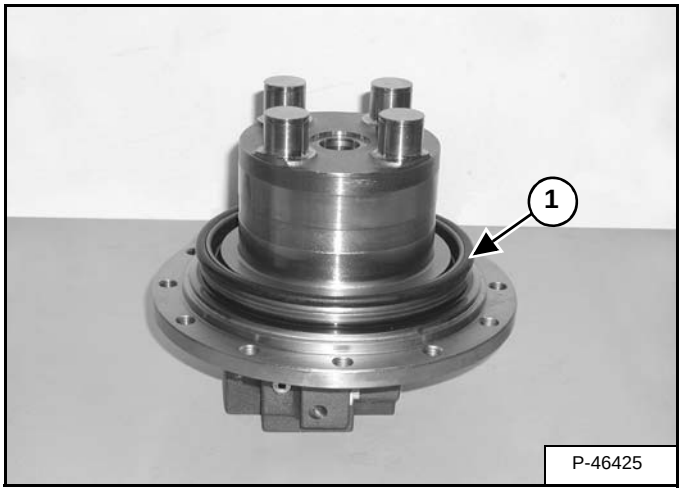
Install a puller on the hub bearing. Apply moderate heat to the inside diameter (Item 1) **[Figure 20-71-24]** of the bearing.

Remove the bearing.

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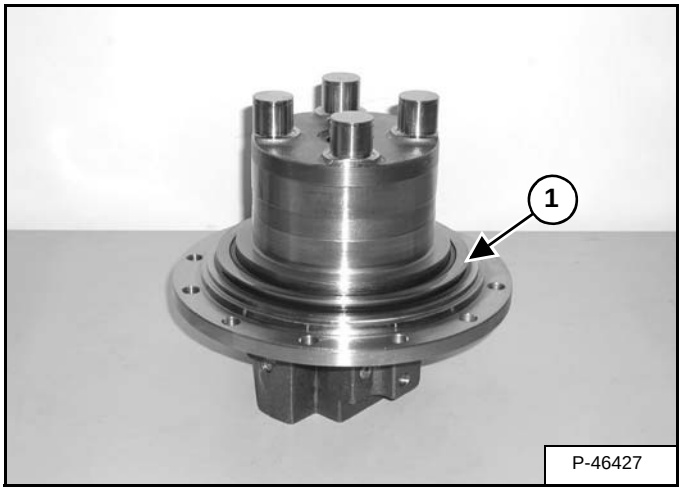
Disassembly (Cont'd)

Figure 20-71-25



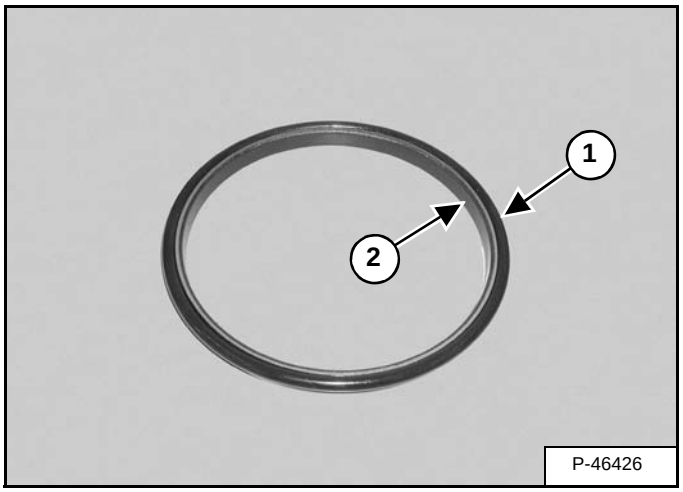
Remove the bearing carrier seal ring assembly (Item 1) **[Figure 20-71-25]**.

Figure 20-71-26



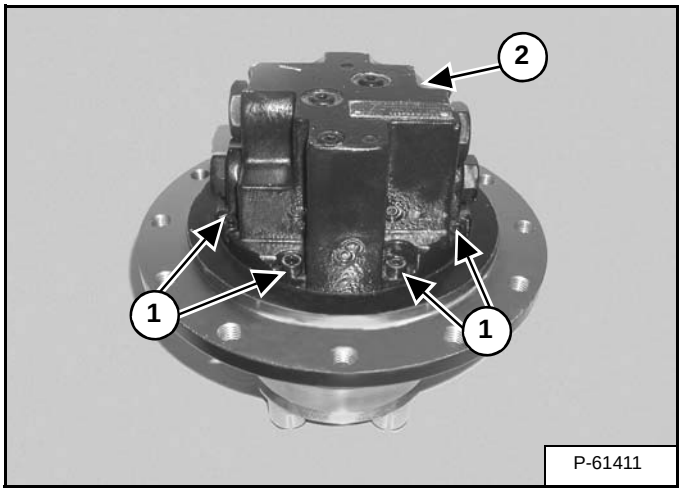
Remove the hub seal ring assembly (Item 1) **[Figure 20-71-26]**.

Figure 20-71-27



Remove the O-ring (Item 1) from both seal rings (Item 2) **[Figure 20-71-27]**.

Figure 20-71-28



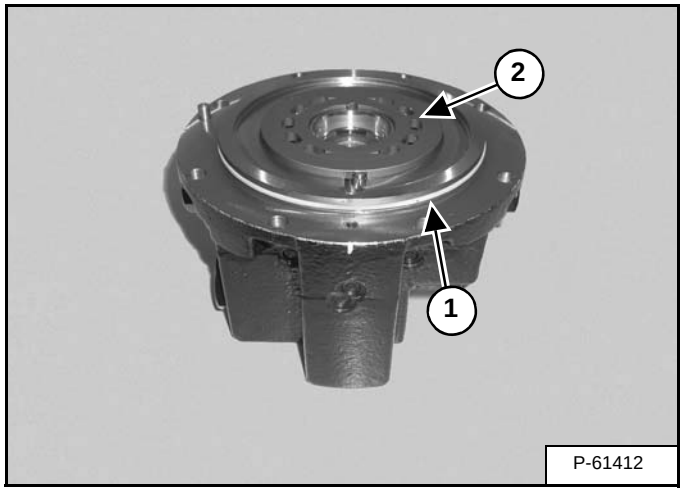
Turn the hub over and remove the eight bolts (Item 1) **[Figure 20-71-28]**.

Remove the valve block (Item 2) **[Figure 20-71-28]**.

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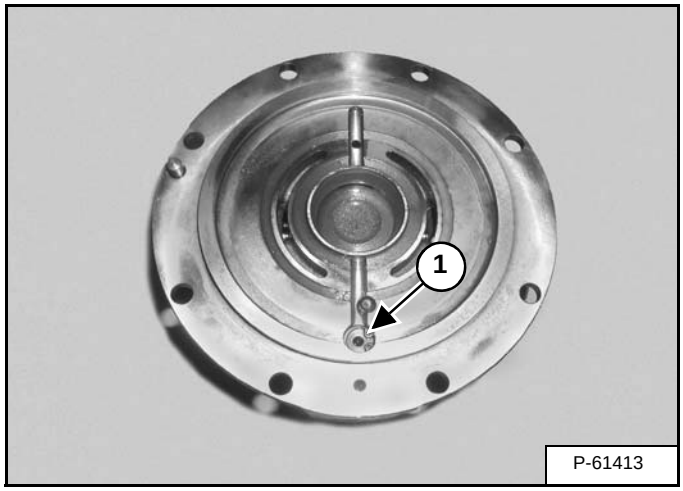
Disassembly (Cont'd)

Figure 20-71-29



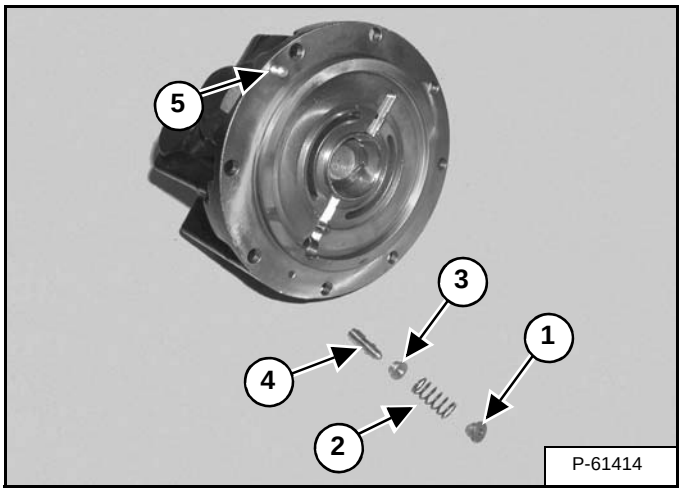
Turn the valve block over and remove the O-ring (Item 1) and valve plate (Item 2) **[Figure 20-71-29]**.

Figure 20-71-30



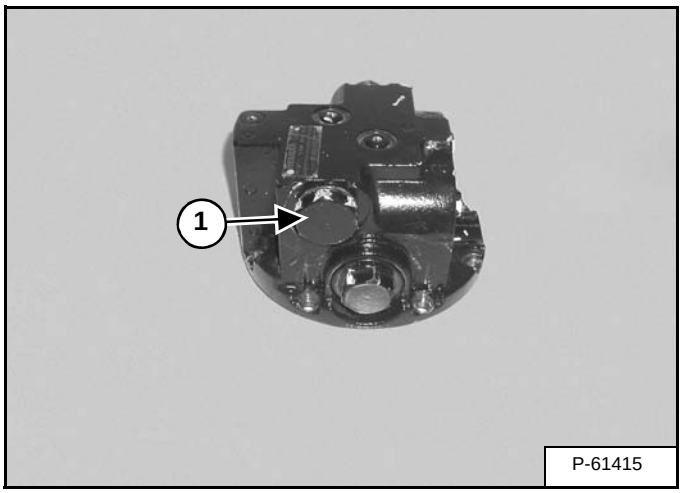
Remove the snap ring (Item 1) **[Figure 20-71-30]**.

Figure 20-71-31



Remove the spring seat (Item 1), spring (Item 2), spring seat (Item 3), spool (Item 4) and alignment pin (Item 5) **[Figure 20-71-31]**.

Figure 20-71-32

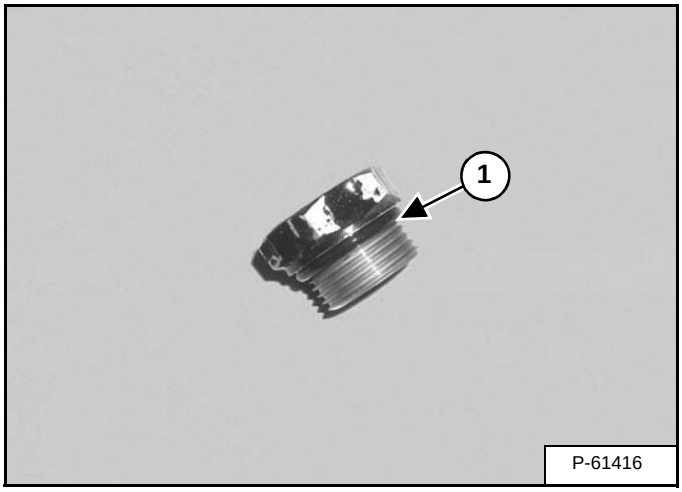


Remove the plug (Item 1) **[Figure 20-71-32]**.

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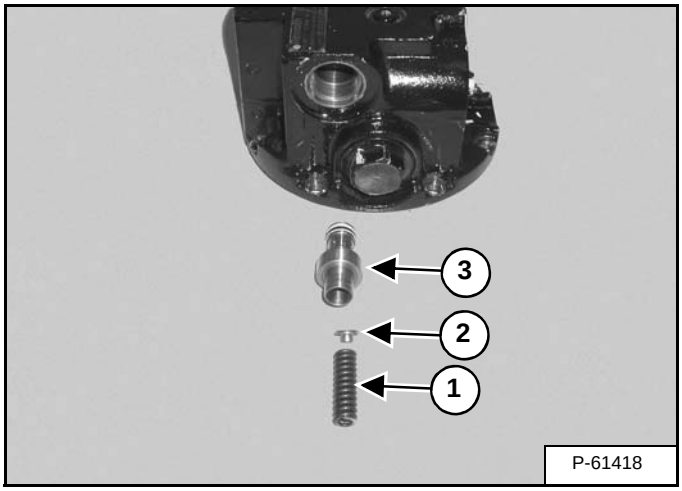
Disassembly (Cont'd)

Figure 20-71-33



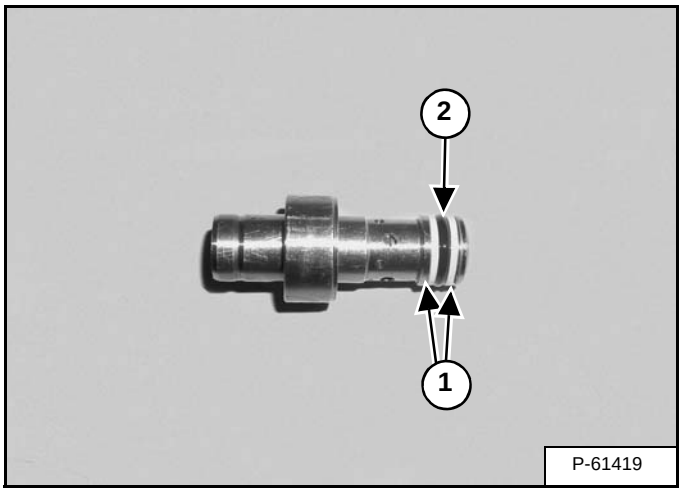
Remove the O-ring (Item 1) **[Figure 20-71-33]**.

Figure 20-71-34



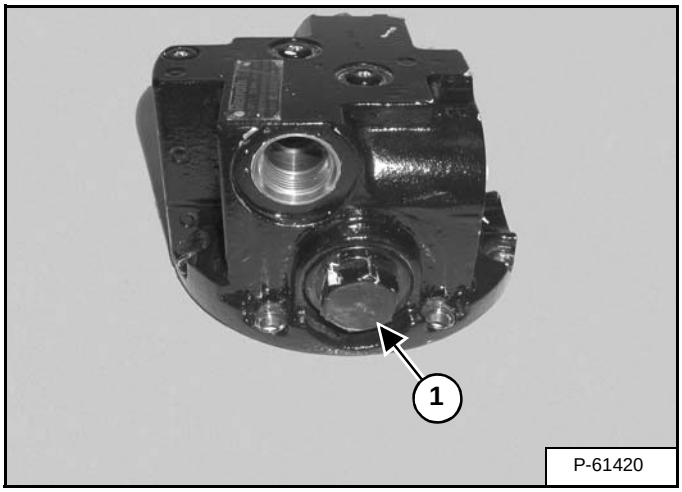
Remove the spring (Item 1), spring seat (Item 2) and cartridge (Item 3) **[Figure 20-71-34]**.

Figure 20-71-35



Remove the back-up rings (Item 1) and O-ring (Item 2) **[Figure 20-71-35]**.

Figure 20-71-36

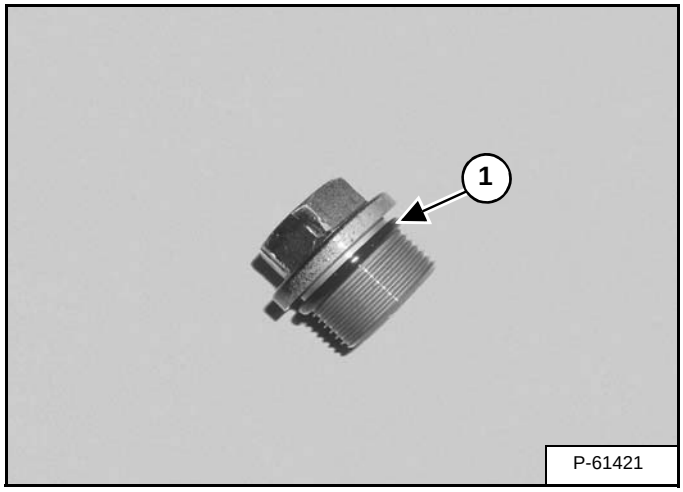


Remove the plug (Item 1) **[Figure 20-71-36]**.

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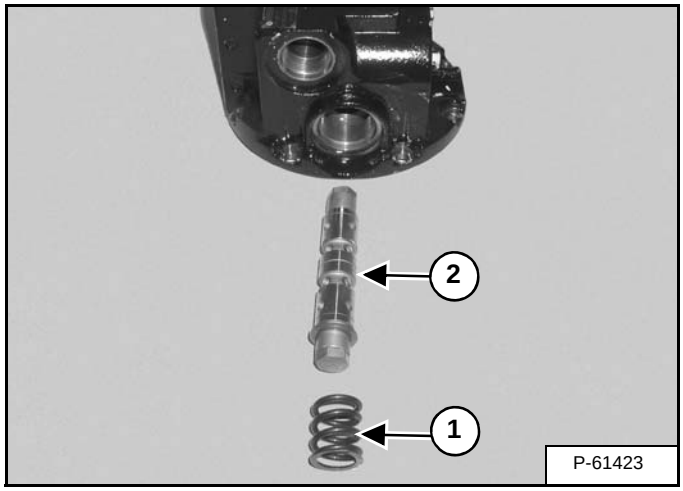
Disassembly (Cont'd)

Figure 20-71-37



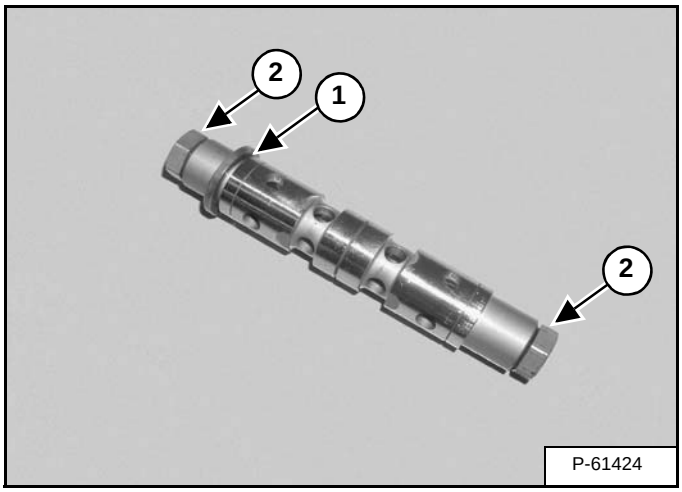
Remove the O-ring (Item 1) **[Figure 20-71-37]**.

Figure 20-71-38



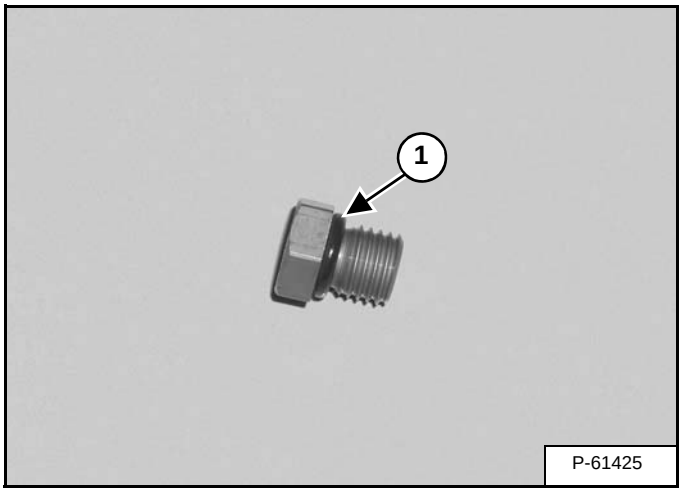
Remove the spring (Item 1) and spool (Item 2) **[Figure 20-71-38]**.

Figure 20-71-39



Remove the washer (Item 1) and plugs (Item 2) **[Figure 20-71-39]** from the spool.

Figure 20-71-40

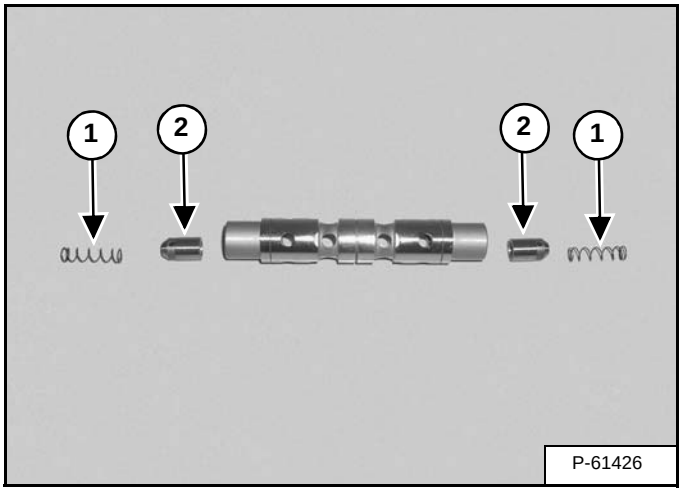


Remove the O-ring (Item 1) **[Figure 20-71-40]** from both plugs.

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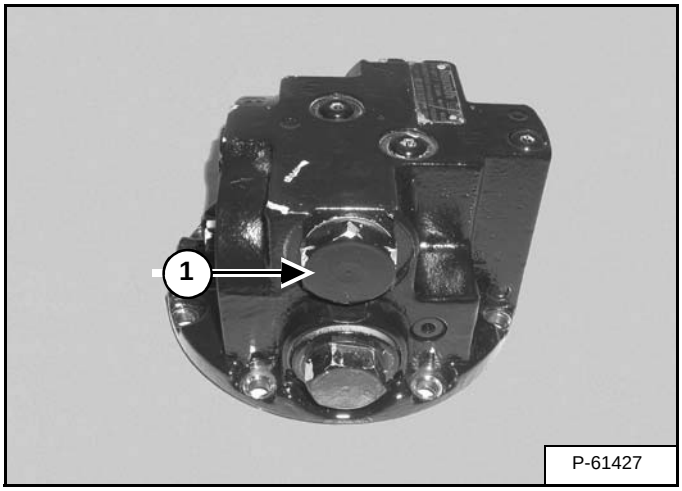
Disassembly (Cont'd)

Figure 20-71-41



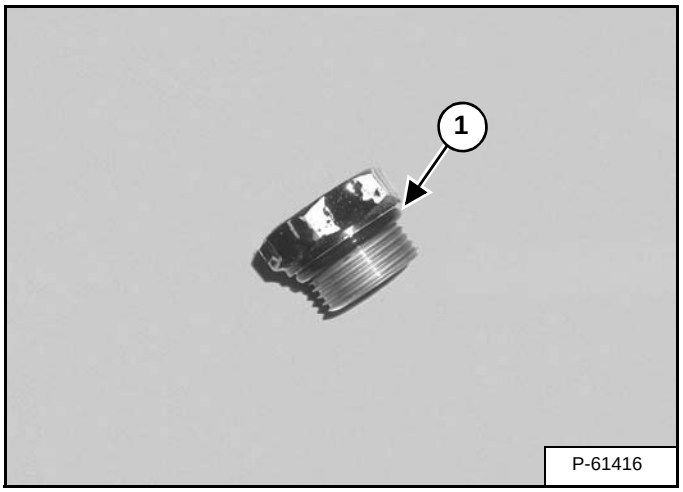
Remove the springs (Item 1) and poppets (Item 2) **[Figure 20-71-41]**.

Figure 20-71-42



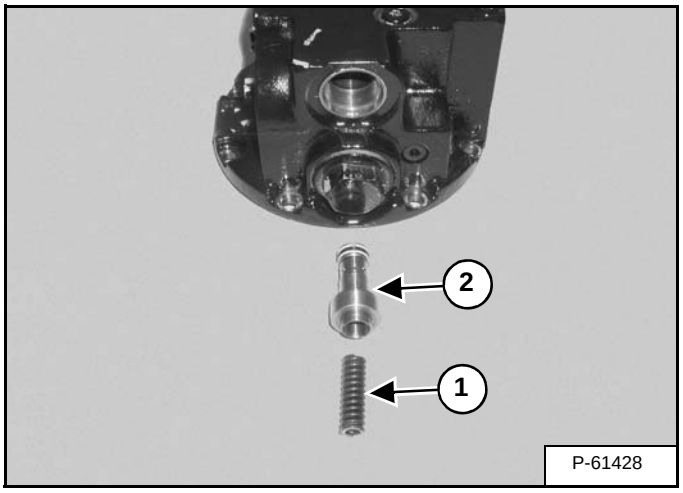
Remove the plug (Item 1) **[Figure 20-71-42]**.

Figure 20-71-43



Remove the O-ring (Item 1) **[Figure 20-71-43]**.

Figure 20-71-44

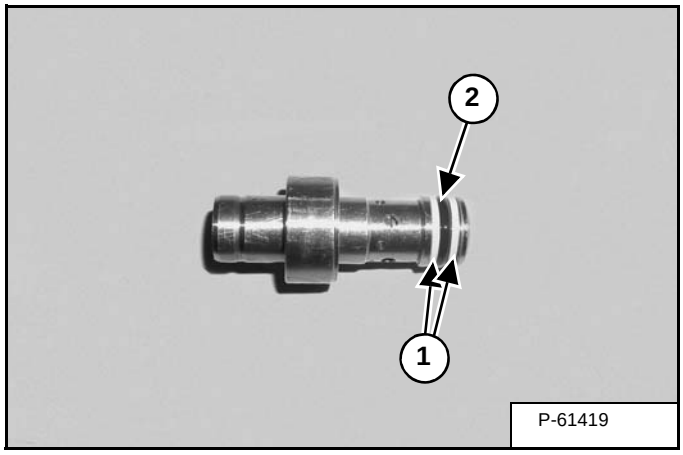


Remove the spring (Item 1), and cartridge (Item 2) **[Figure 20-71-44]**.

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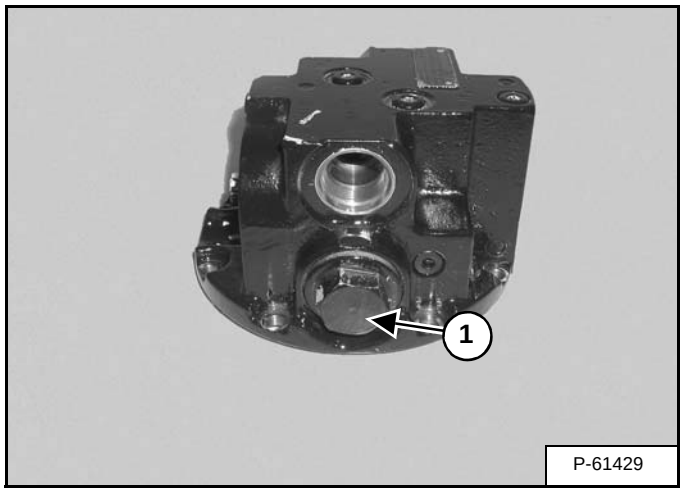
Disassembly (Cont'd)

Figure 20-71-45



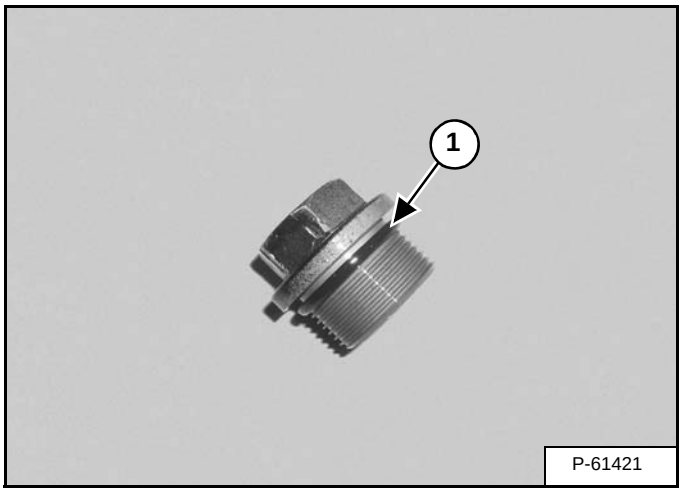
Remove the back-up rings (Item 1) and O-ring (Item 2) **[Figure 20-71-45]**.

Figure 20-71-46



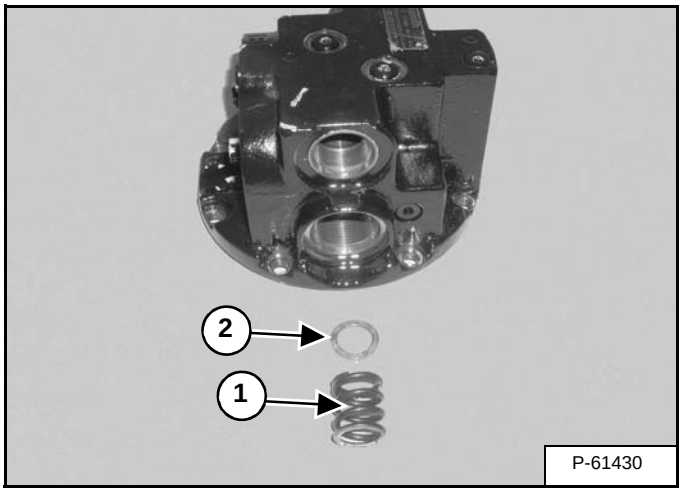
Remove the plug (Item 1) **[Figure 20-71-46]**.

Figure 20-71-47



Remove the O-ring (Item 1) **[Figure 20-71-47]**.

Figure 20-71-48

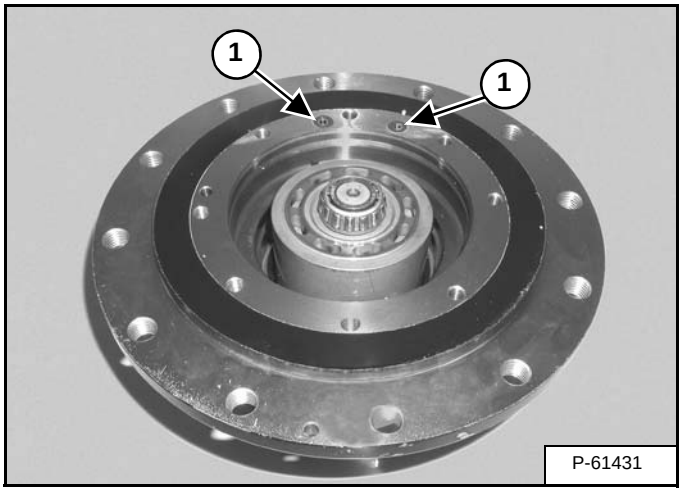


Remove the spring (Item 1) and washer (Item 2) **[Figure 20-71-48]**.

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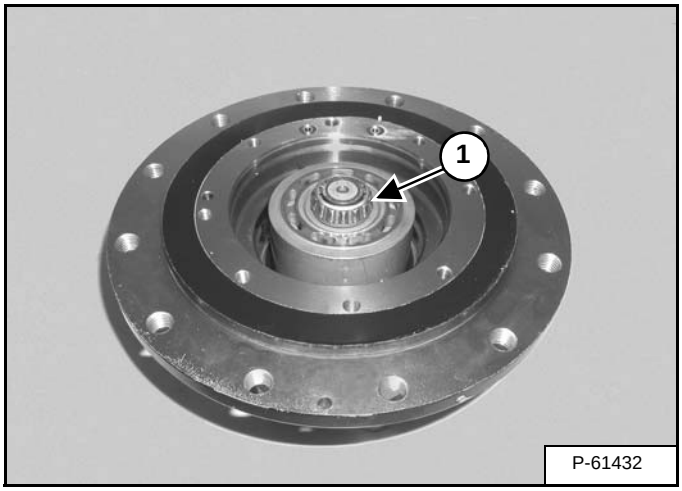
Disassembly (Cont'd)

Figure 20-71-49



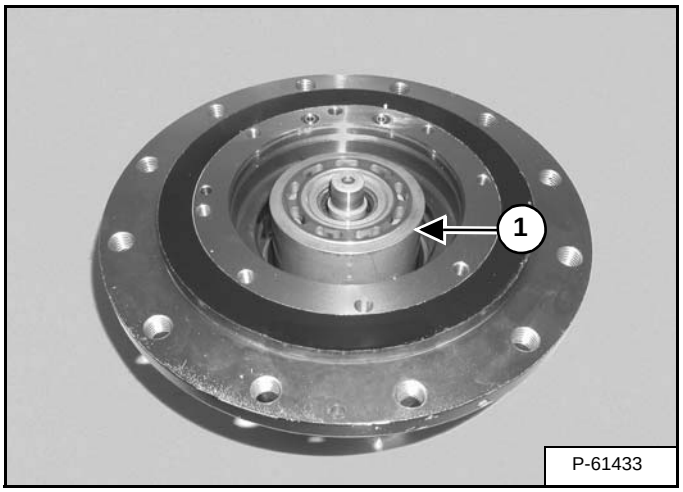
Remove the O-rings (Item 1) **[Figure 20-71-49]**.

Figure 20-71-50



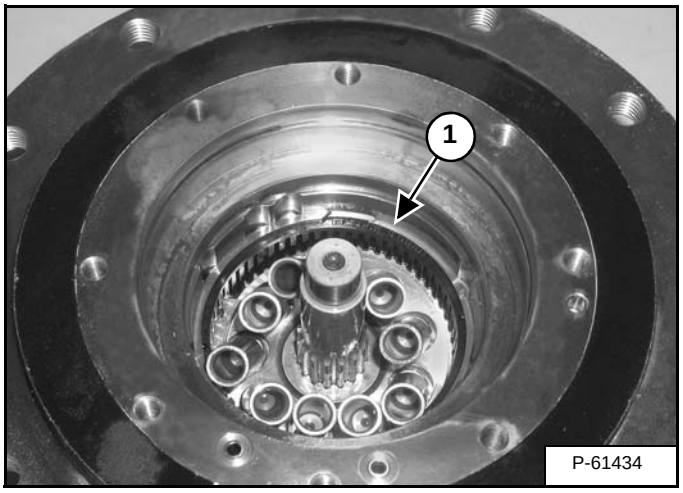
Remove the bearing and washer (Item 1) **[Figure 20-71-50]**.

Figure 20-71-51



Remove the cylinder block (Item 1) **[Figure 20-71-51]**.

Figure 20-71-52

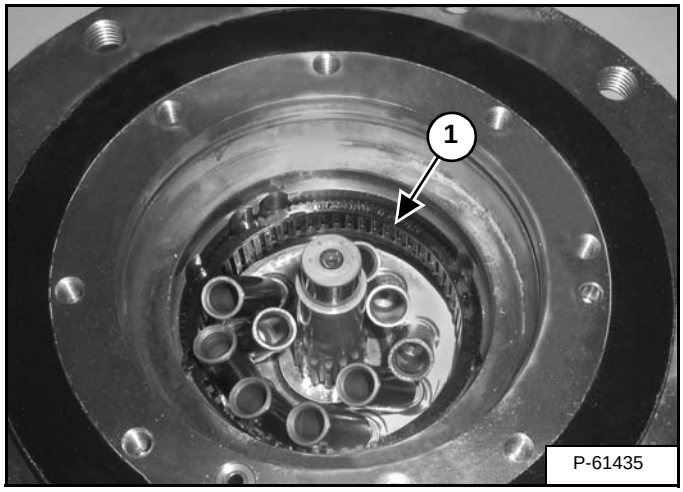


Remove the retaining ring (Item 1) **[Figure 20-71-52]**.

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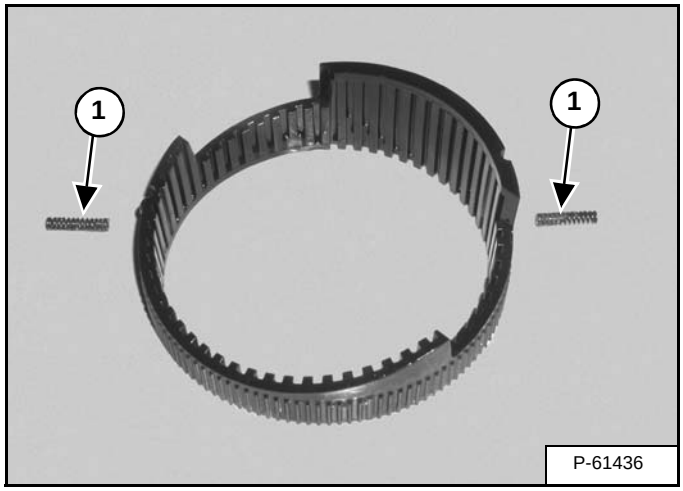
Disassembly (Cont'd)

Figure 20-71-53



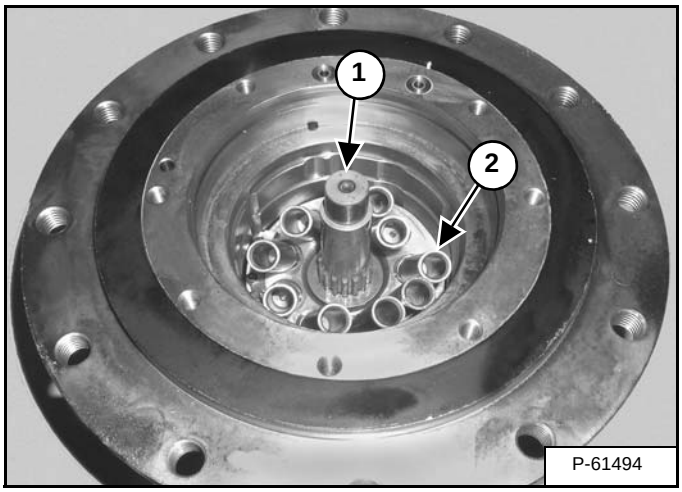
Remove the stop (Item 1) **[Figure 20-71-53]**.

Figure 20-71-54



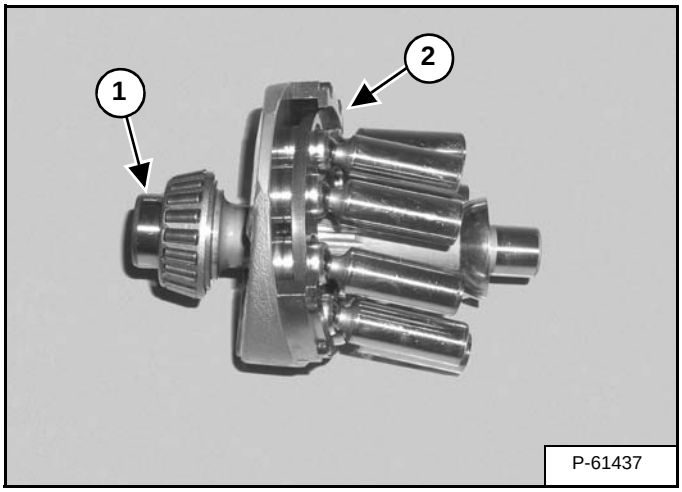
Remove the springs (Item 1) **[Figure 20-71-54]** from both sides of the stop.

Figure 20-71-55



Remove the shaft (Item 1) and piston/swash plate assemblies (Item 2) **[Figure 20-71-55]**.

Figure 20-71-56

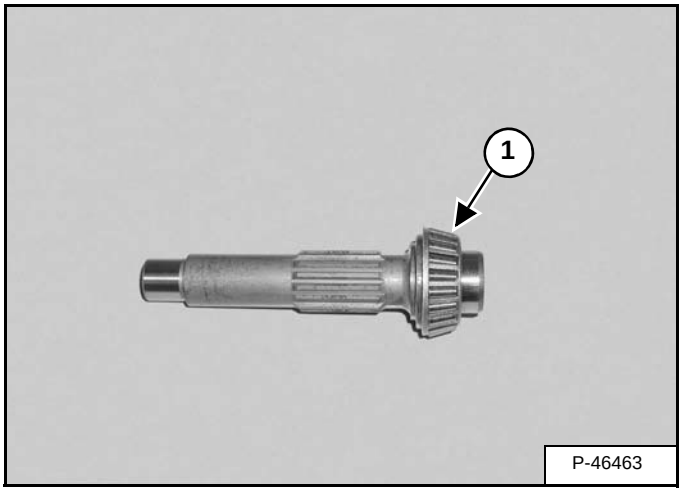


Remove the shaft (Item 1) and piston pivot plate (Item 2) **[Figure 20-71-56]**.

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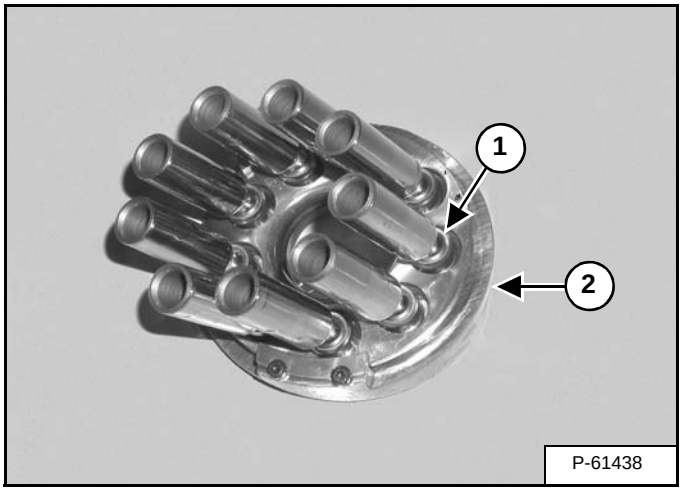
Disassembly (Cont'd)

Figure 20-71-57



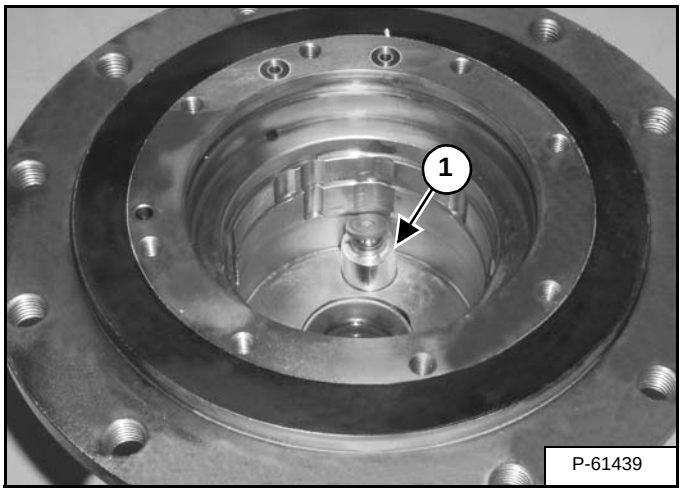
Remove the bearing (Item 1) **[Figure 20-71-57]** from the shaft.

Figure 20-71-58



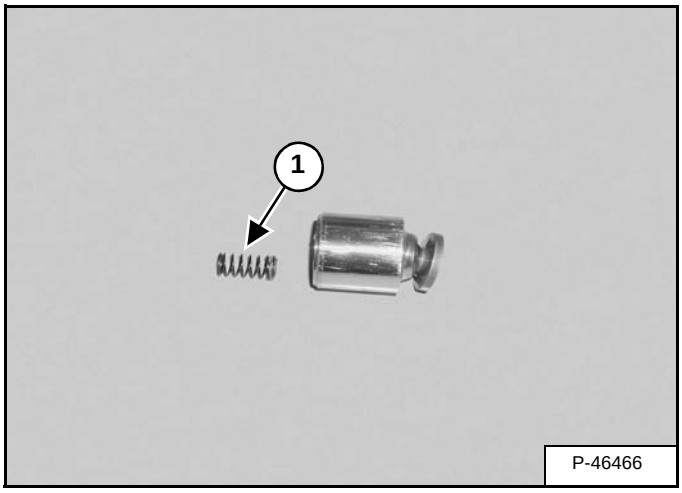
Remove the piston and retaining ring assembly (1) from the swash plate (Item 2) **[Figure 20-71-58]**.

Figure 20-71-59



Remove the piston (Item 1) **[Figure 20-71-59]**.

Figure 20-71-60

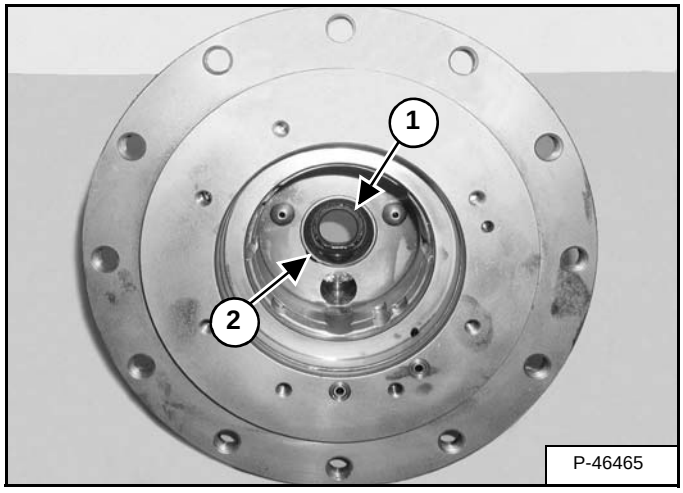


Remove the spring (Item 1) **[Figure 20-71-60]**.

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Disassembly (Cont'd)

Figure 20-71-61



Remove the bearing race (Item 1) and seal (Item 2) **[Figure 20-71-61]**.

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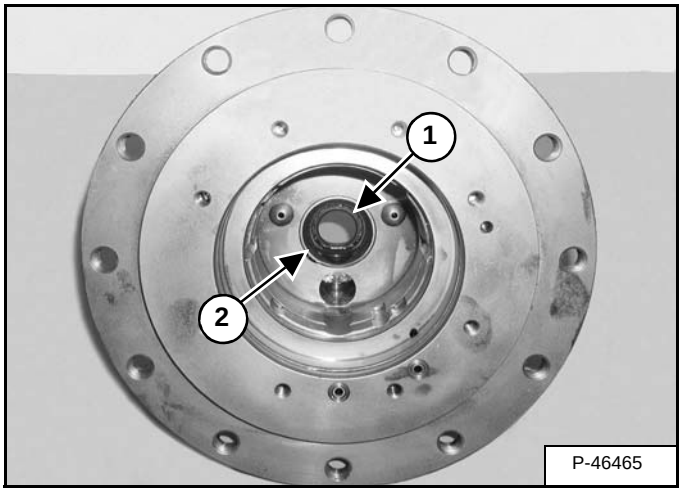
Assembly

The tools listed will be needed to assemble the travel motor:

MEL **XXXX** Spanner Wrench.

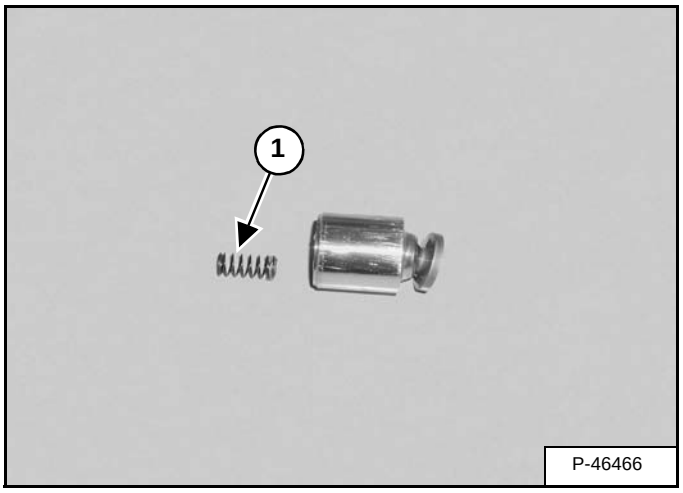
Clean all parts in solvent and dry with compressed air. Inspect all parts and replace any that are damaged. If any of the planetary gears are damaged, replace all the planetary gears and sun gear from the planetary assembly that is damaged. one damaged gear can cause a microscopic fatigue crack in mating teeth and cause premature failure after servicing. Apply oil to all O-rings (as noted) and assembly lube to the bearings before installation.

Figure 20-71-62



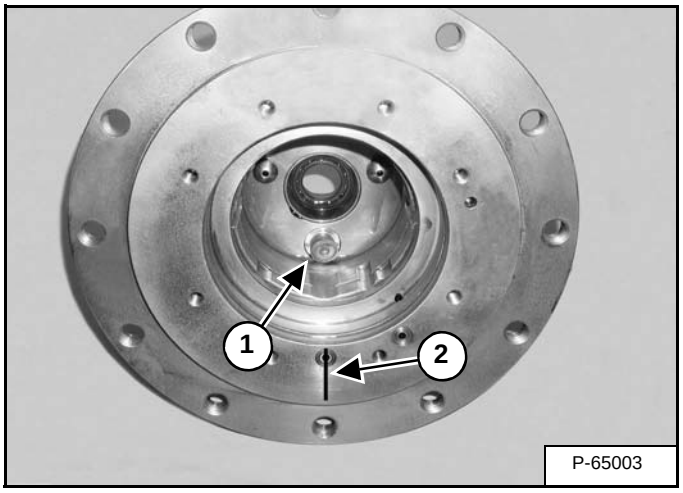
Install the seal (Item 1). Install the bearing race (Item 2) **[Figure 20-71-62]**.

Figure 20-71-63



Install the spring (Item 1) **[Figure 20-71-63]** in the piston.

Figure 20-71-64



Install the piston assembly (Item 1) **[Figure 20-71-64]**.

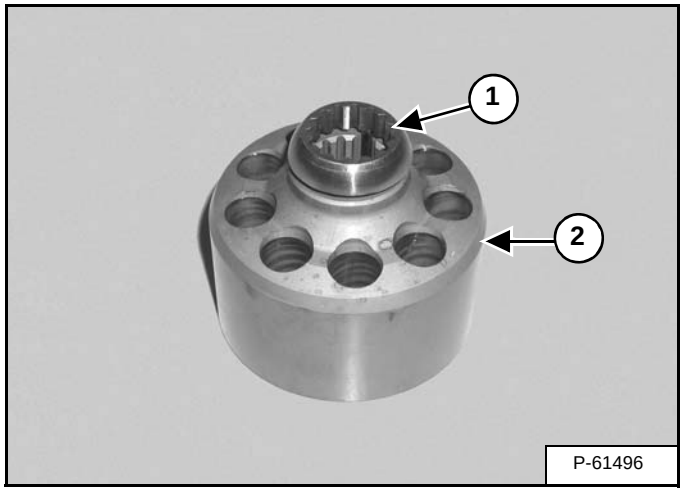
NOTE: Mark the location of the piston (Item 2) [Figure 20-71-64] for proper retaining ring installation.

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TRAVEL MOTOR (S/N 563111001 & ABOVE) (EARLY MODELS) (CONT'D)

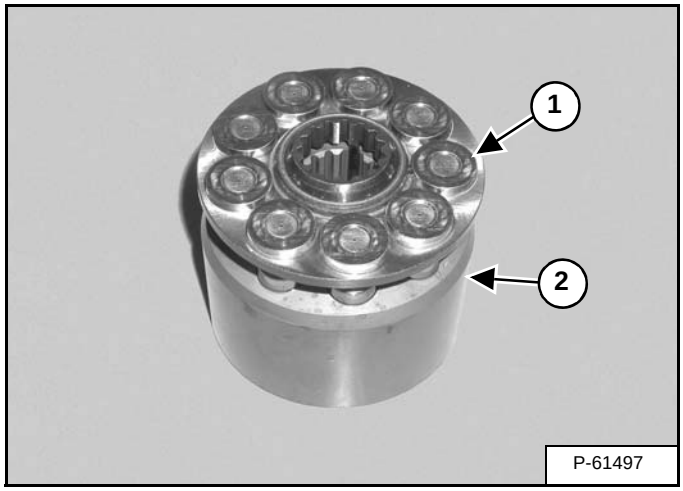
Assembly (Cont'd)

Figure 20-71-65



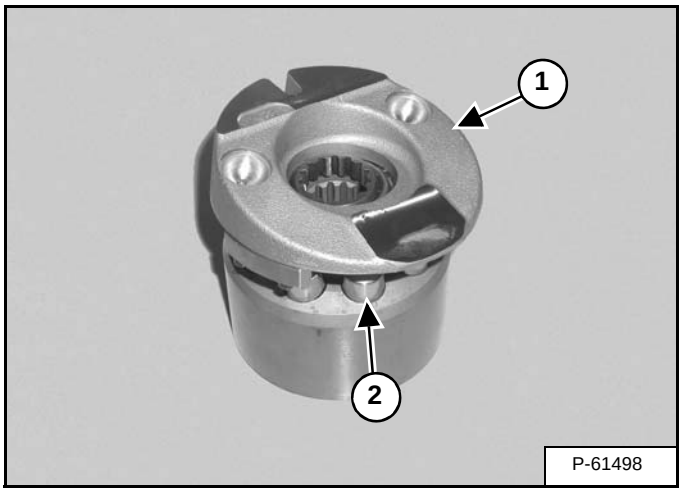
Install the piston plate pivot (Item 1) onto the cylinder block (Item 2) **[Figure 20-71-65]**.

Figure 20-71-66



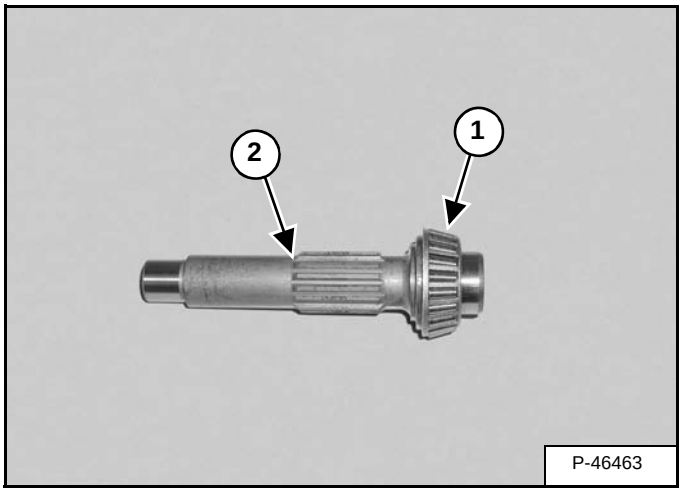
Install the piston assembly (Item 1) into the cylinder block (Item 2) **[Figure 20-71-66]**.

Figure 20-71-67



Install the swash plate (Item 1) on the piston assembly (Item 2) **[Figure 20-71-67]**.

Figure 20-71-68

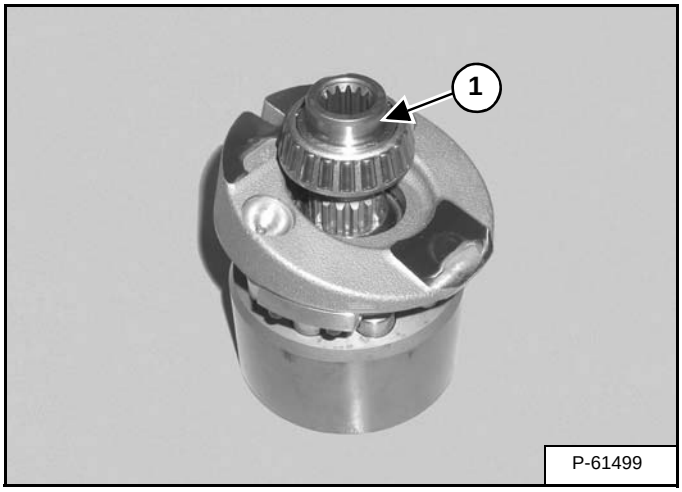


Install the bearing (Item 1) on the shaft (Item 2) **[Figure 20-71-68]**.

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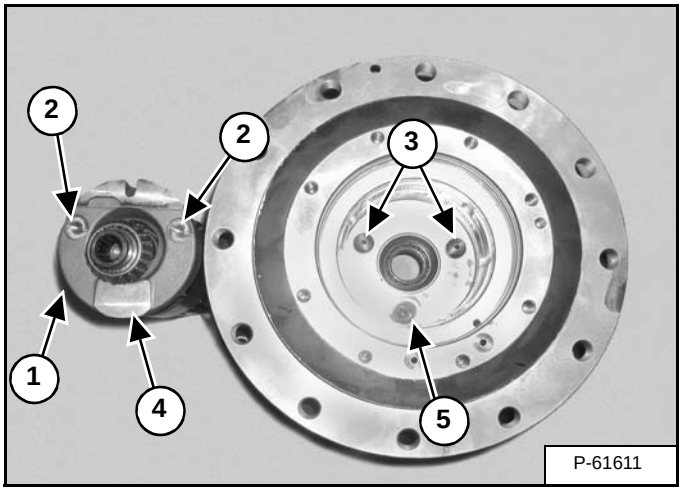
Assembly (Cont'd)

Figure 20-71-69



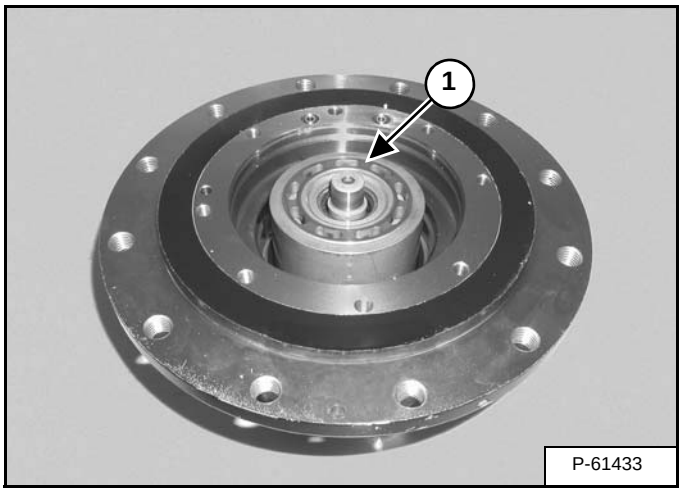
Install the shaft (Item 1) **[Figure 20-71-69]**.

Figure 20-71-70



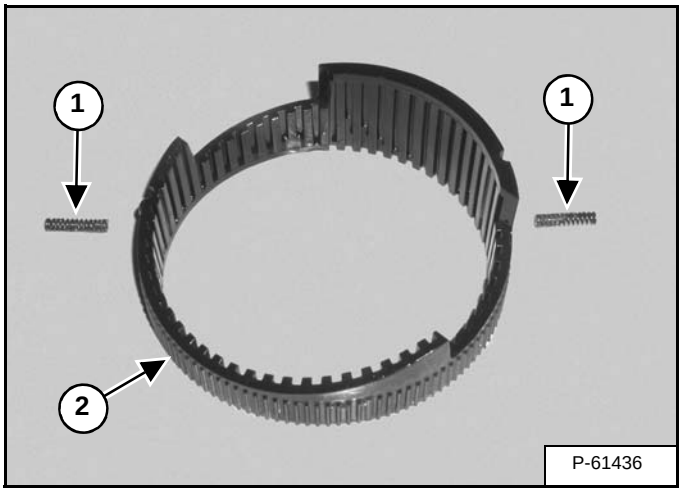
Install the swash plate (Item 1) with the sockets (Item 2) of the plate engaging the studs (Item 3) of the hub, and the flat surface (Item 4) of the plate resting on the piston assembly (Item 5) **[Figure 20-71-70]**.

Figure 20-71-71



Install the shaft / rotating group (Item 1) **[Figure 20-71-71]** into the hub.

Figure 20-71-72



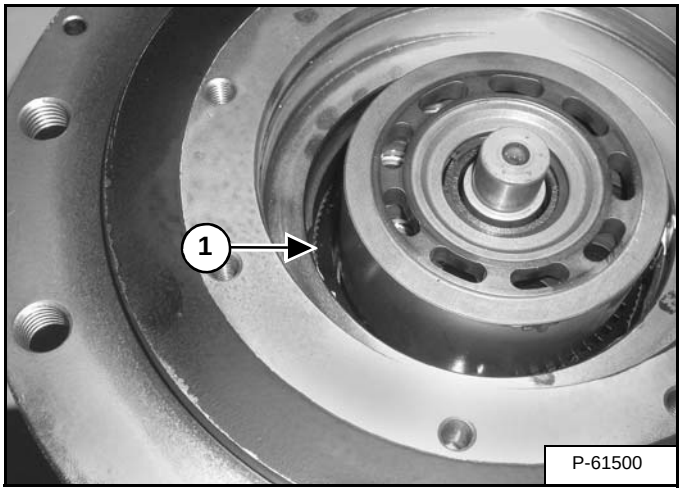
Apply assembly lube to the springs (Item 1) and install into the stop (Item 2) **[Figure 20-71-72]**.

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TRAVEL MOTOR (S/N 563111001 & ABOVE) (EARLY MODELS) (CONT'D)

Assembly (Cont'd)

Figure 20-71-73



Install the stop (Item 1) **[Figure 20-71-73]** into the hub.

Figure 20-71-74

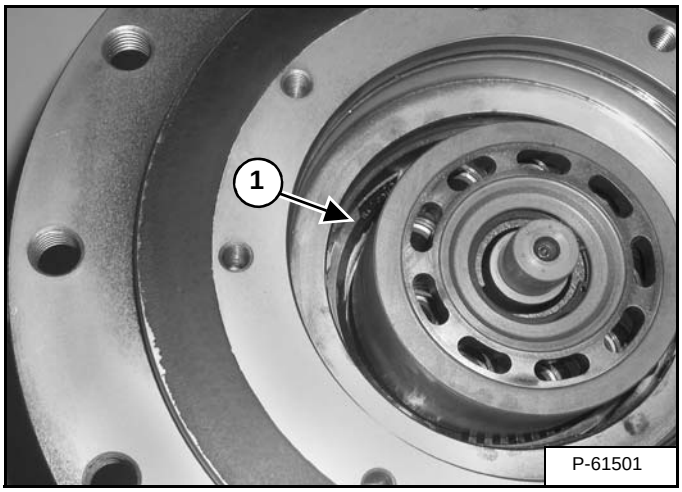
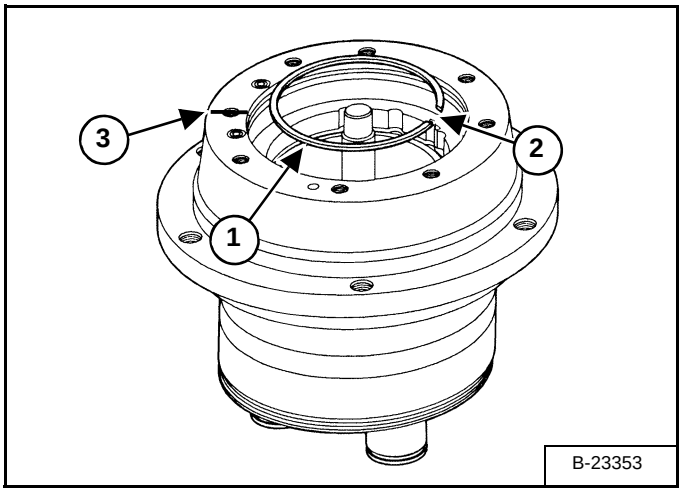


Figure 20-71-75



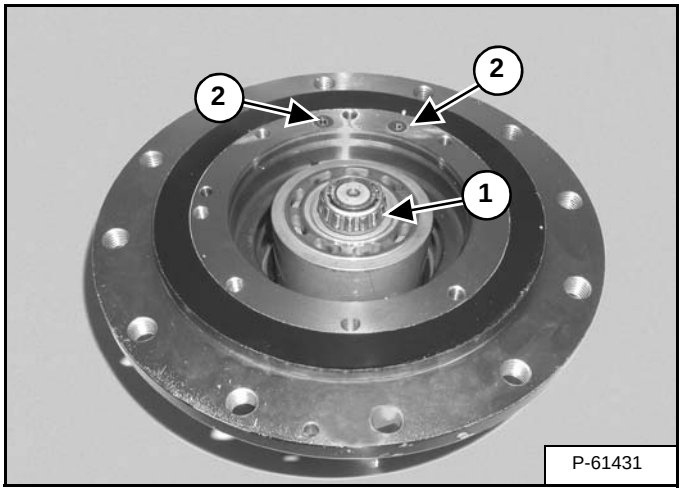
Install the retaining ring (Item 1) **[Figure 20-71-74]** and **[Figure 20-71-75]**.

NOTE: The opening in the retaining ring (Item 2) must be installed in the housing on the opposite side of the piston (marked earlier) (Item 3) [Figure 20-71-75].

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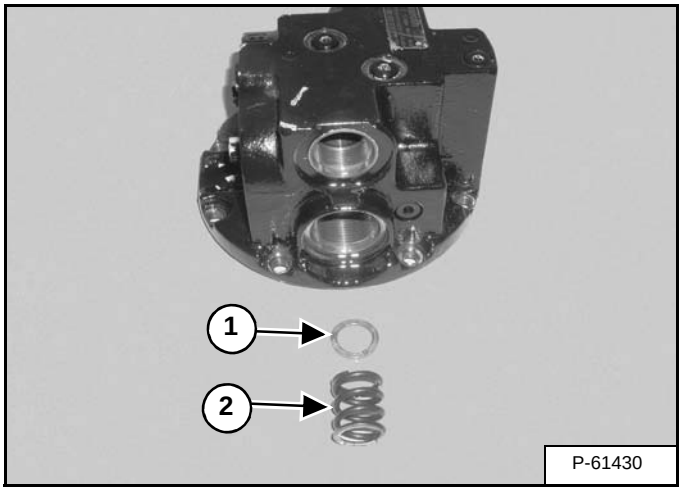
Assembly (Cont'd)

Figure 20-71-76



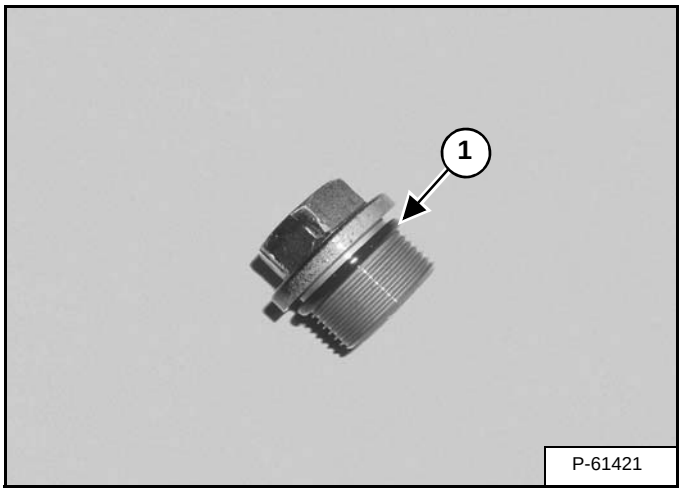
Install the bearing and washer (Item 1) and O-rings (Item 2) **[Figure 20-71-76]**.

Figure 20-71-77



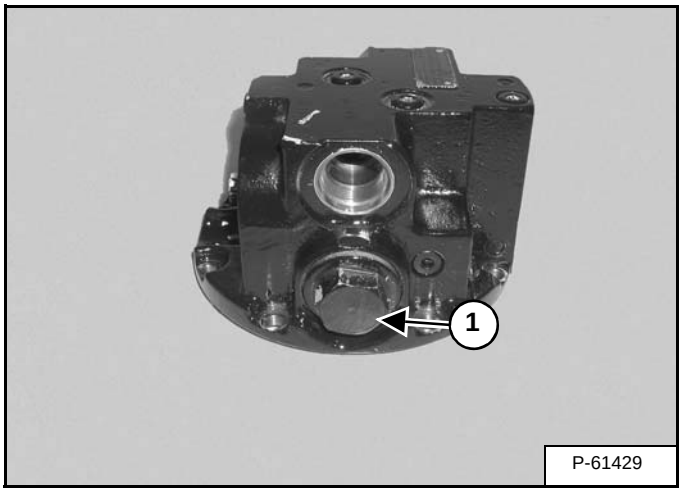
Install the washer (Item 1) and spring (Item 2) **[Figure 20-71-77]**.

Figure 20-71-78



Install the O-ring (Item 1) **[Figure 20-71-78]**.

Figure 20-71-79

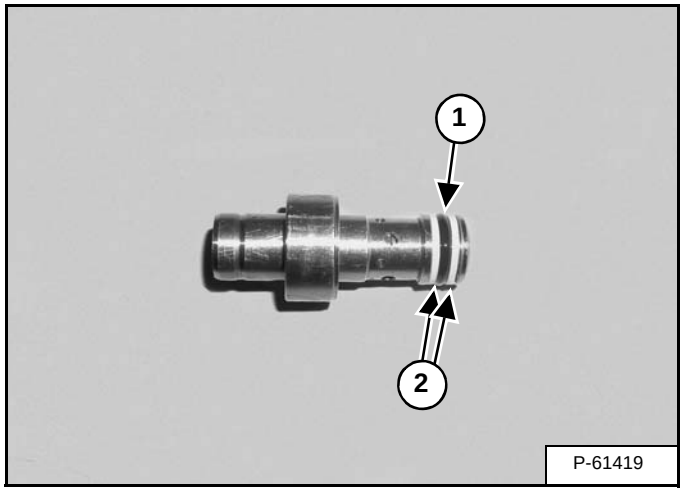


Install the plug (Item 1) **[Figure 20-71-79]**.

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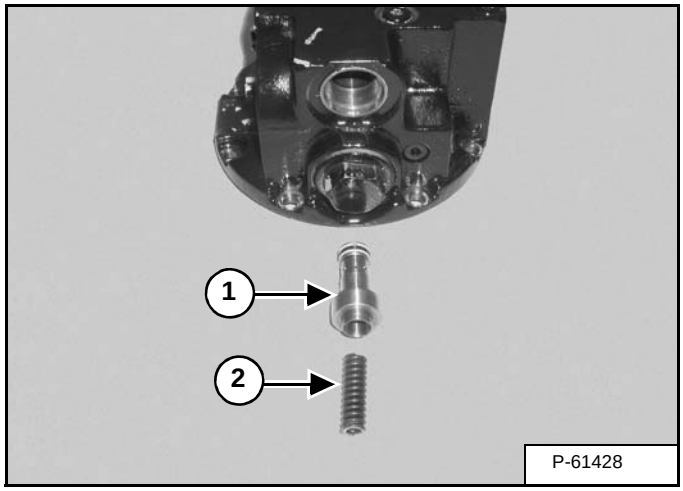
Assembly (Cont'd)

Figure 20-71-80



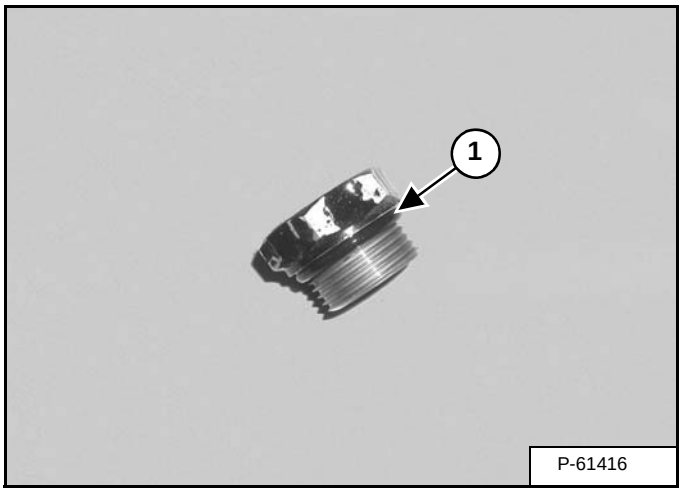
Install the O-ring (Item 1) and back-up rings (Item 2) **[Figure 20-71-80]**.

Figure 20-71-81



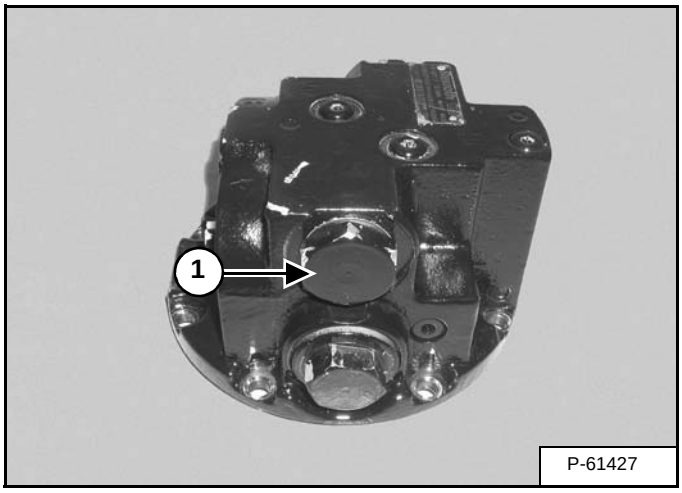
Install the cartridge (Item 1) and spring (Item 2) **[Figure 20-71-81]**.

Figure 20-71-82



Install the O-ring (Item 1) **[Figure 20-71-82]**.

Figure 20-71-83

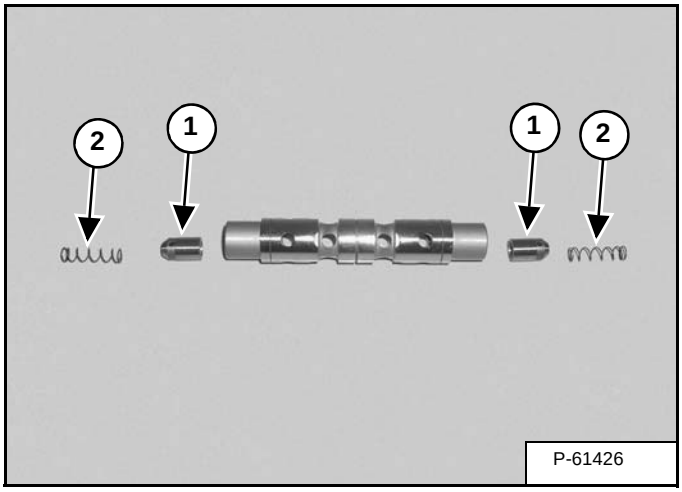


Install the plug (Item 1) **[Figure 20-71-83]**.

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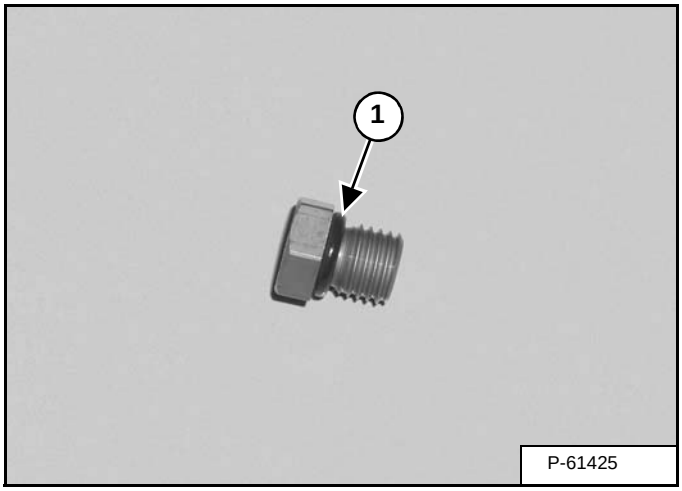
Assembly (Cont'd)

Figure 20-71-84



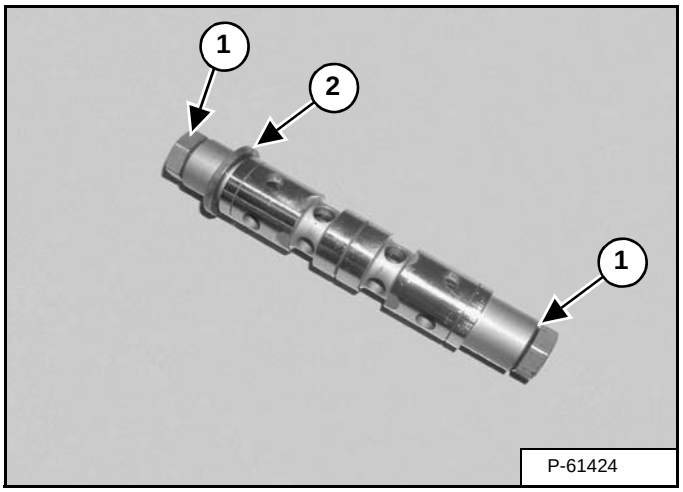
Install the poppets (Item 1) and springs (Item 2) **[Figure 20-71-84]**.

Figure 20-71-85



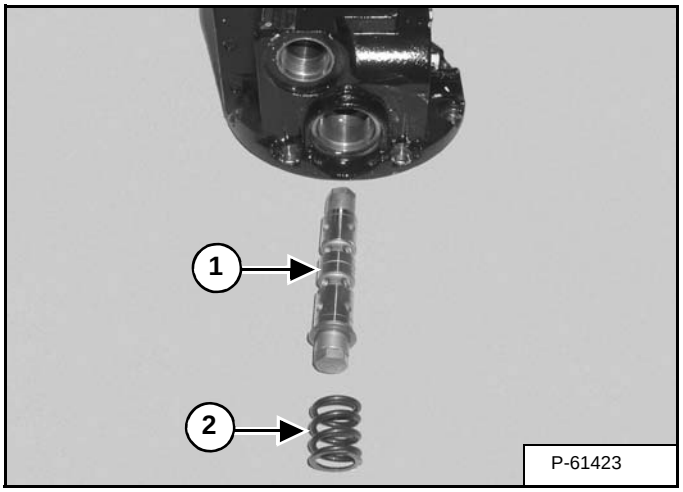
Install the O-ring (Item 1) **[Figure 20-71-85]** on both plugs.

Figure 20-71-86



Install the plugs (Item 1) and washer (Item 2) **[Figure 20-71-86]**.

Figure 20-71-87

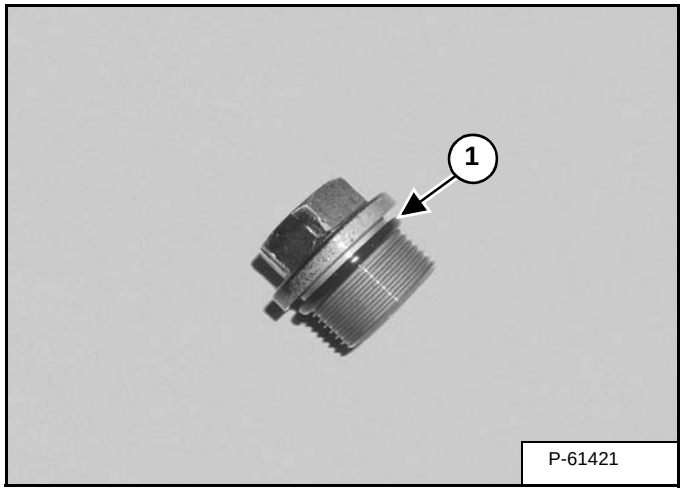


Install the spool (Item 1) and spring (Item 2) **[Figure 20-71-87]**.

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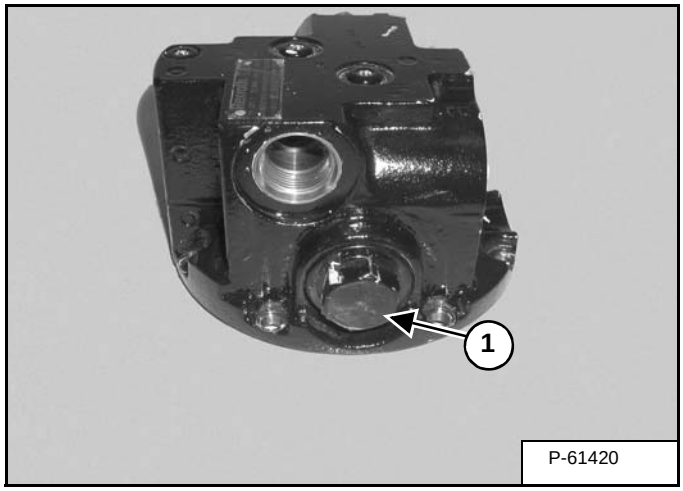
Assembly (Cont'd)

Figure 20-71-88



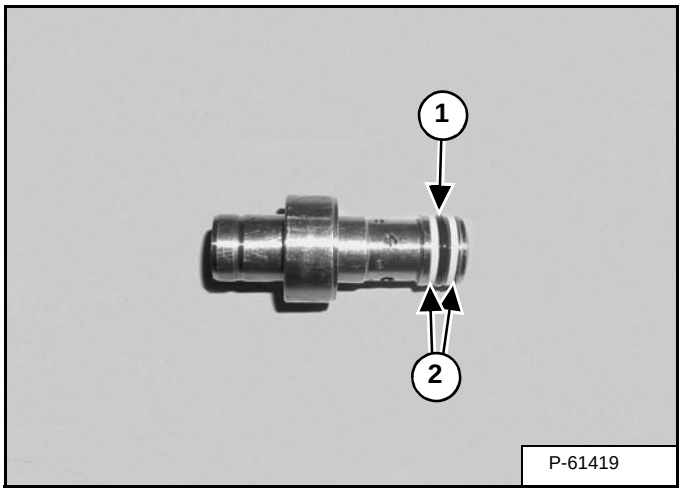
Install the O-ring (Item 1) **[Figure 20-71-88]**.

Figure 20-71-89



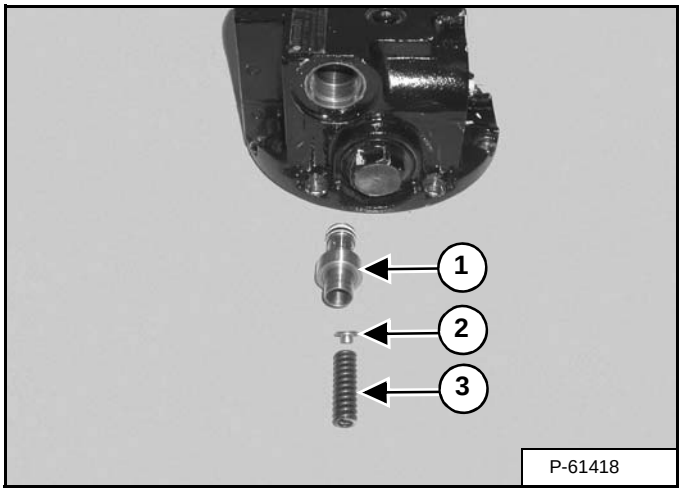
Install the plug (Item 1) **[Figure 20-71-89]**.

Figure 20-71-90



Install the O-ring (Item 1) and back-up rings (Item 2) **[Figure 20-71-90]**.

Figure 20-71-91

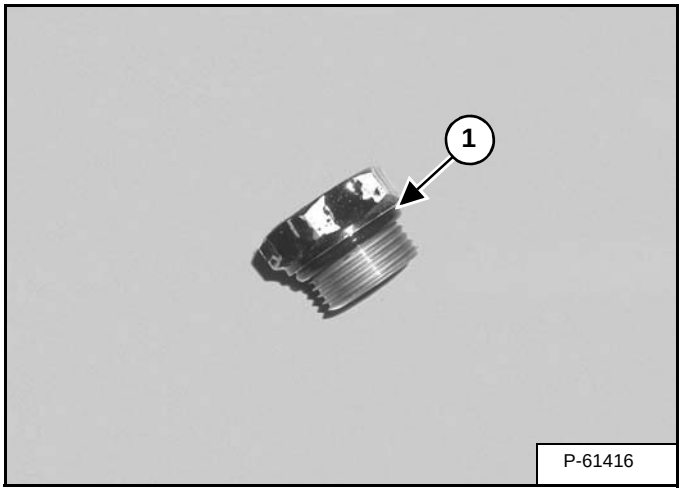


Install the cartridge (Item 1), spring seat (Item 2) and spring (Item 3) **[Figure 20-71-91]**.

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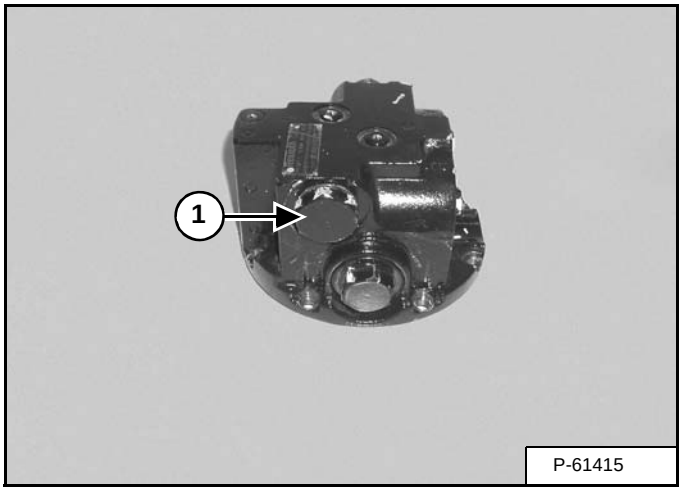
Assembly (Cont'd)

Figure 20-71-92



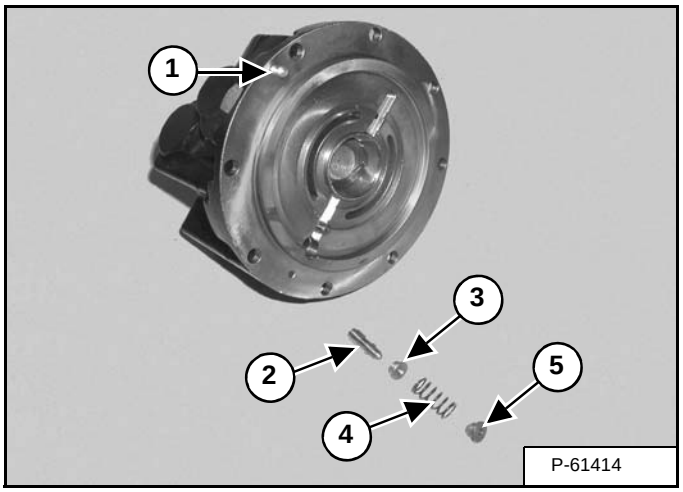
Install the O-ring (Item 1) **[Figure 20-71-92]**.

Figure 20-71-93



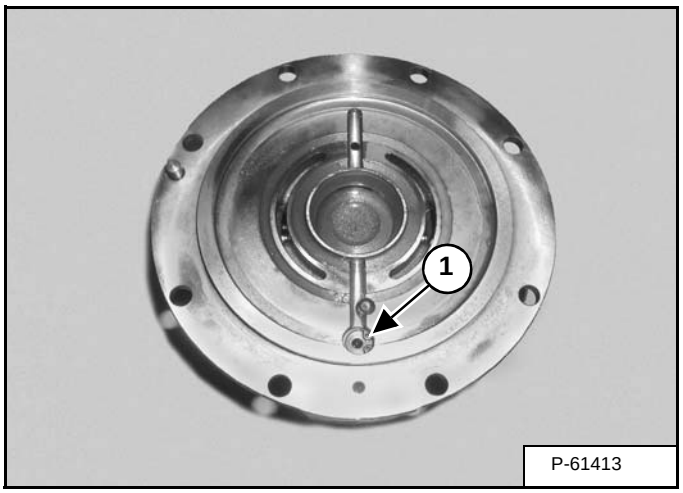
Install the plug (Item 1) **[Figure 20-71-93]**.

Figure 20-71-94



Tip the valve block on its side and install the alignment pin (Item 1), spool (Item 2), spring seat (Item 3), spring (Item 4) and spring seat (Item 5) **[Figure 20-71-94]**.

Figure 20-71-95



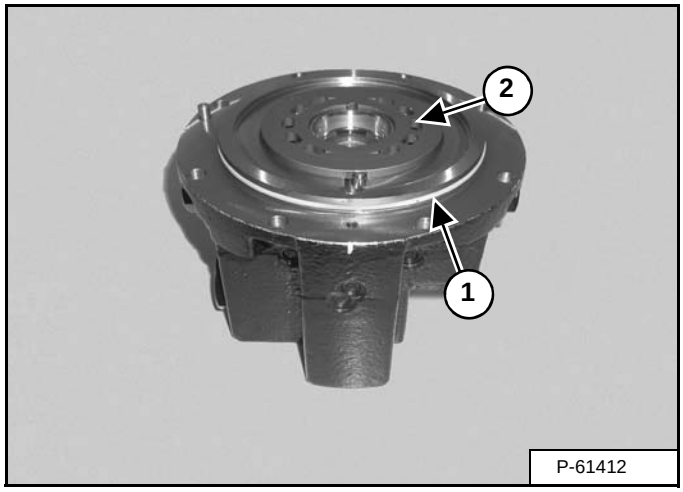
Stand the valve block up and install the snap ring (Item 1) **[Figure 20-71-95]**.

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TRAVEL MOTOR (S/N 563111001 & ABOVE) (EARLY MODELS) (CONT'D)

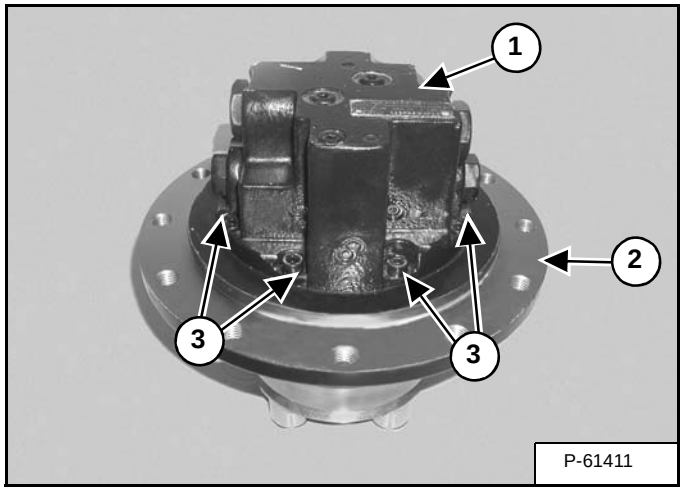
Assembly (Cont'd)

Figure 20-71-96



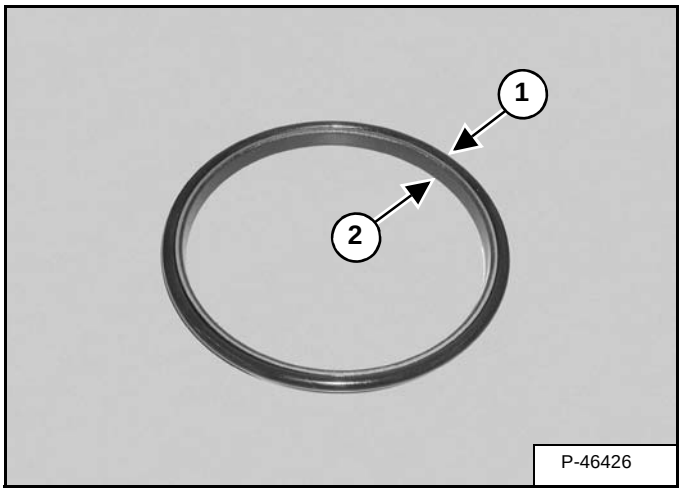
Install the O-ring (Item 1) and valve plate (Item 2) **[Figure 20-71-96]**.

Figure 20-71-97



Install the valve block (Item 1) onto the hub (Item 2). Install the eight bolts (Item 3) **[Figure 20-71-97]**. Tighten the bolts to 22 - 26 ft.-lb. (30 - 35 N•m) torque.

Figure 20-71-98



Install the O-ring (Item 1) on both seal rings (Item 2) **[Figure 20-71-98]**.

NOTE: Inspect the seal ring for burrs before installing the O-ring. Install the O-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, hub assembly, and bearing carrier must be clean and free of any dust, oil film, or foreign matter.

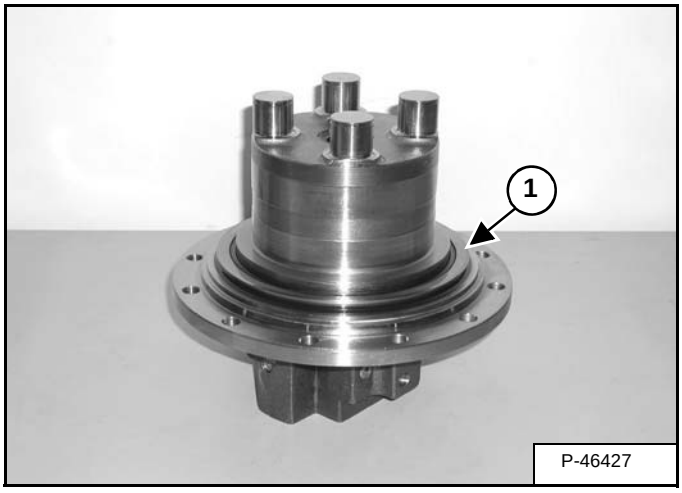
The O-ring and seal ring assembly has to be lubricated with rubbing alcohol, so the O-ring will slip past the housing retaining ring and seal uniformly in the housing radius.

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

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Assembly (Cont'd)

Figure 20-71-99



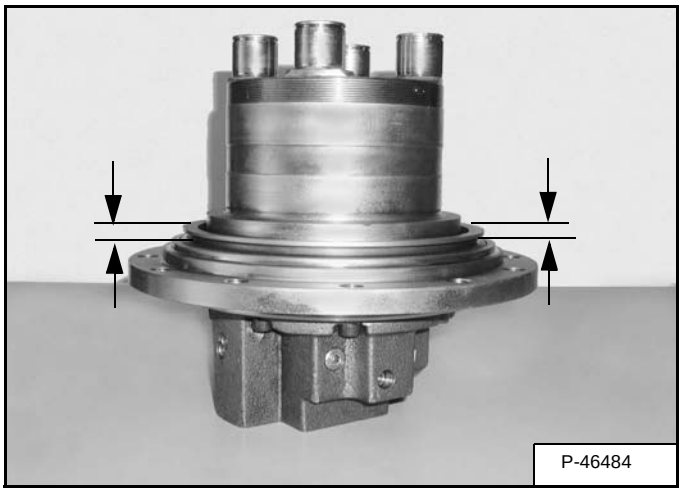
Shake off the excess alcohol and install the seal ring assembly (Item 1) **[Figure 20-71-99]** on the hub.

Use firm even pressure to *pop* the O-ring into the housing.

Apply a light film of oil to the metal seal ring.

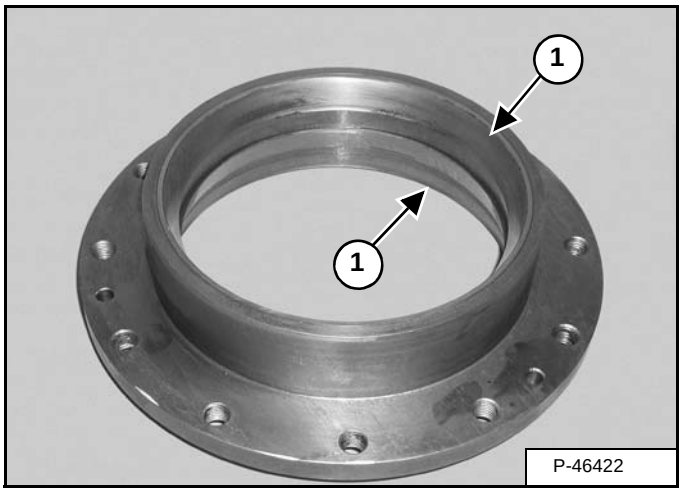
NOTE: Do not get any oil on the rubber O-ring.

Figure 20-71-100



Check the seal stand off height. The stand off height must be uniform with no twists in the O-ring **[Figure 20-71-100]**.

Figure 20-71-101

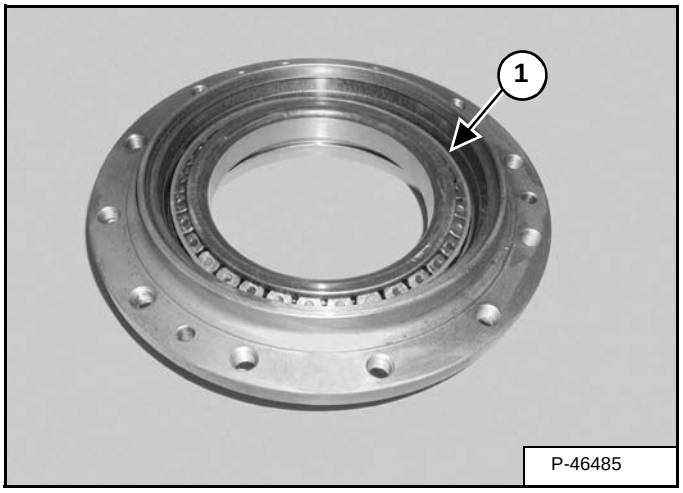


Install the bearing races (Item 1) **[Figure 20-71-101]** in the bearing carrier.

Turn the bearing carrier over.

Heat the bearing in clean hydraulic oil to 225° F (107° C) for 30 minutes.

Figure 20-71-102



Install the bearing (Item 1) **[Figure 20-71-102]** in the bearing carrier.

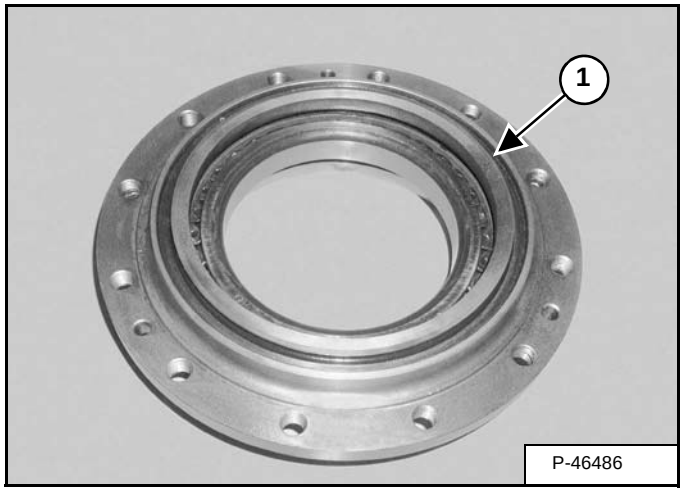
The O-ring and seal ring assembly has to be lubricated with alcohol, so the O-ring will slip past the bearing carrier retaining ring and seal uniformly in the carrier radius.

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

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Assembly (Cont'd)

Figure 20-71-103



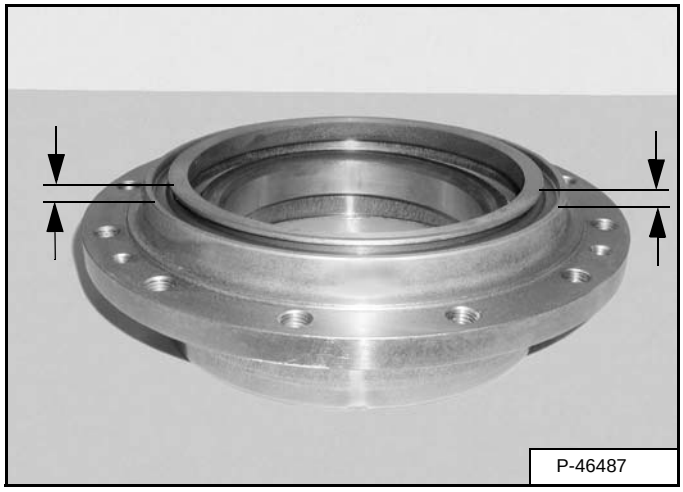
Shake off the excess alcohol and install the seal ring assembly (Item 1) **[Figure 20-71-103]** on the bearing carrier.

Use firm even pressure to *pop* the O-ring into the bearing carrier.

Apply a light film of oil to the metal seal ring.

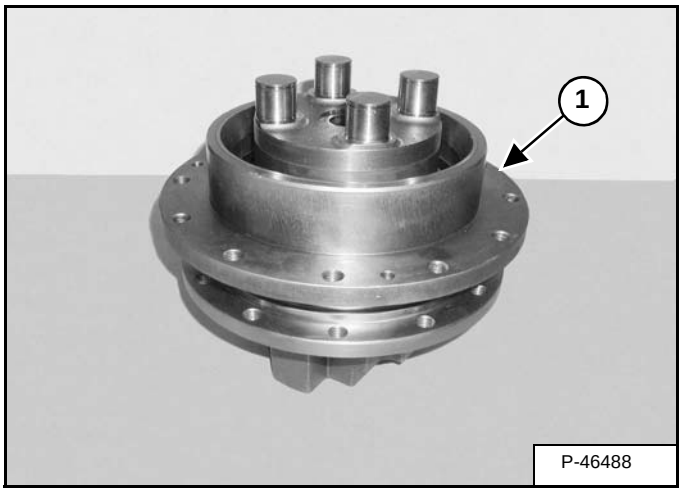
NOTE: Do not get any oil on the rubber O-ring.

Figure 20-71-104



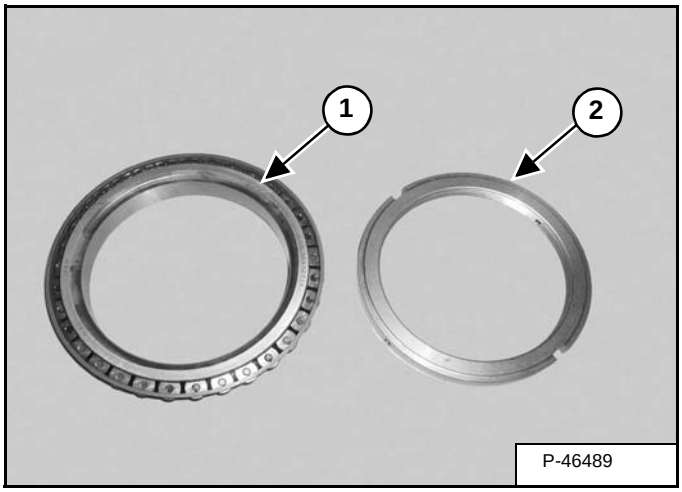
Check the seal stand off height. The standoff height must be uniform with no twists in the O-ring **[Figure 20-71-104]**.

Figure 20-71-105



Turn the bearing carrier over and install the carrier (Item 1) **[Figure 20-71-105]** on the hub.

Figure 20-71-106



The top bearing (Item 1) must be lapped to the bottom (stepped side) of the new nut (Item 2) **[Figure 20-71-106]**.

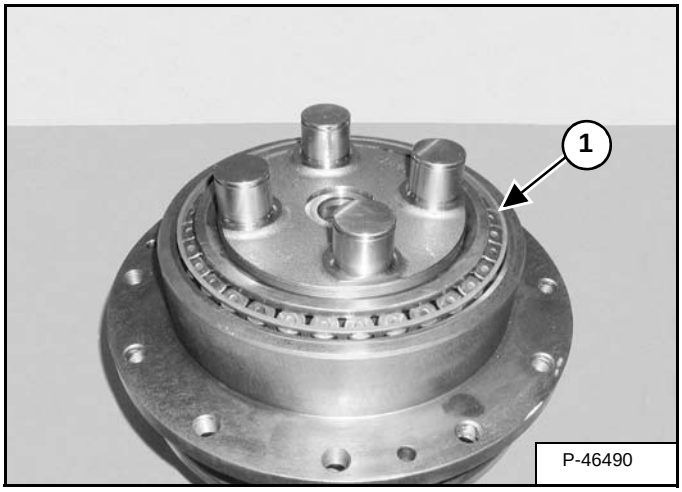
Clean the bearing and nut.

After the bearing has been lapped to the nut, heat the bearing in clean hydraulic oil to 225° F (107° C) for 30 minutes.

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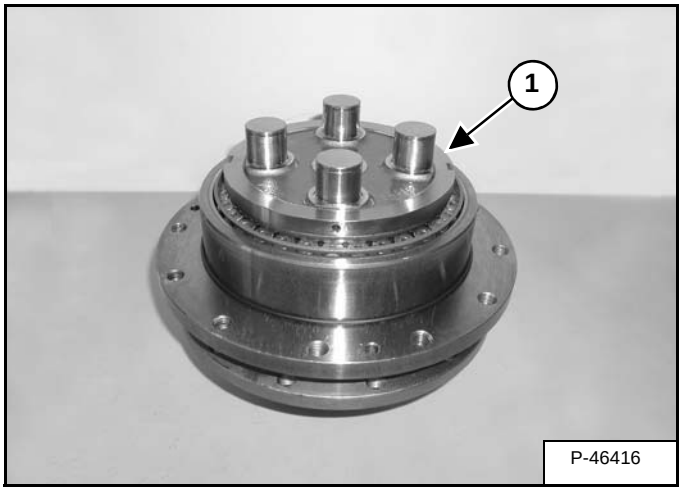
Assembly (Cont'd)

Figure 20-71-107



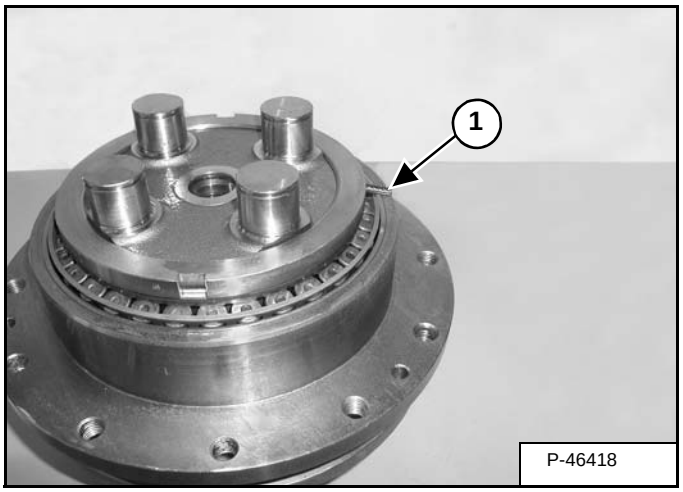
Install the bearing (Item 1) **[Figure 20-71-107]**.

Figure 20-71-108



Install the nut (Item 1) **[Figure 20-71-108]**. Tighten the nut to 620 ft.-lb. (840 N•m) while rotating the bearing carrier.

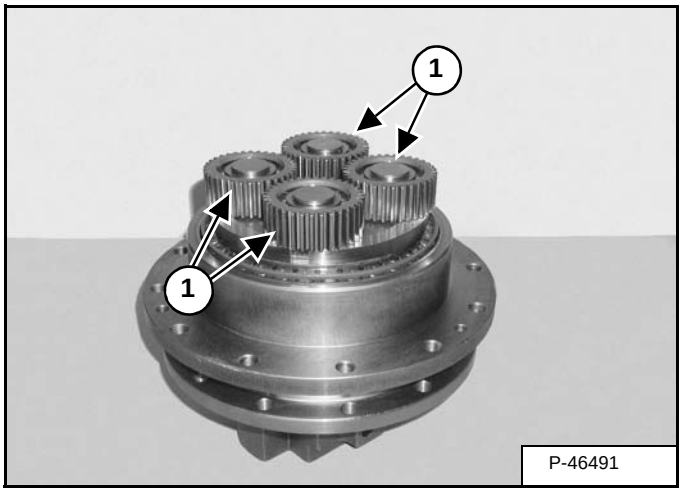
Figure 20-71-109



Install the two pins (Item 1) **[Figure 20-71-109]** in the nut. Drive the pins in until the pins are against the threads of the hub.

Heat the planetary gear / bearing assemblies in clean hydraulic oil to 225° F (107° C) for 30 minutes.

Figure 20-71-110

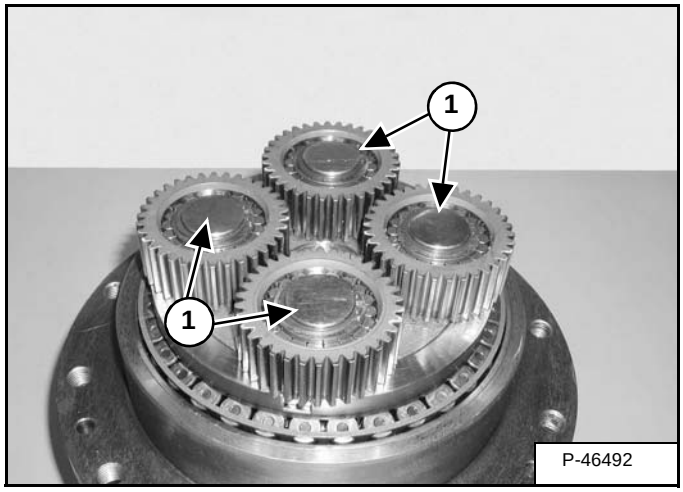


Install the planetary gears (Item 1) **[Figure 20-71-110]**.

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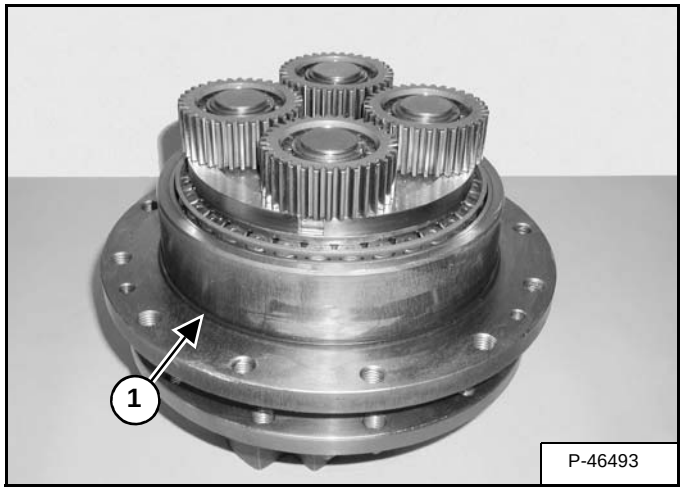
Assembly (Cont'd)

Figure 20-71-111



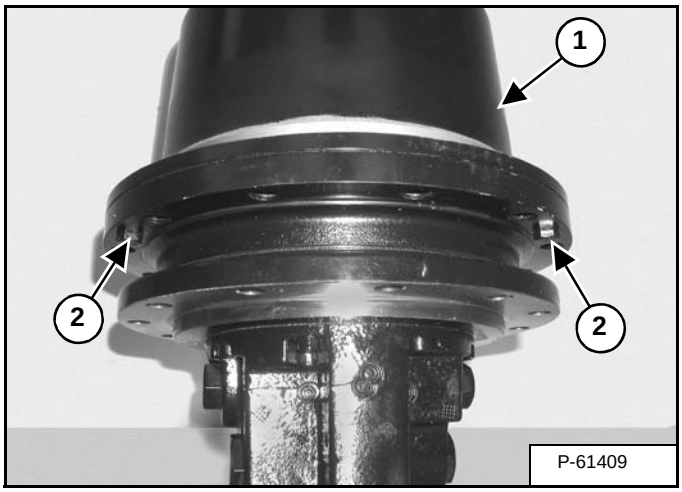
Install the snap rings (Item 1) **[Figure 20-71-111]**.

Figure 20-71-112



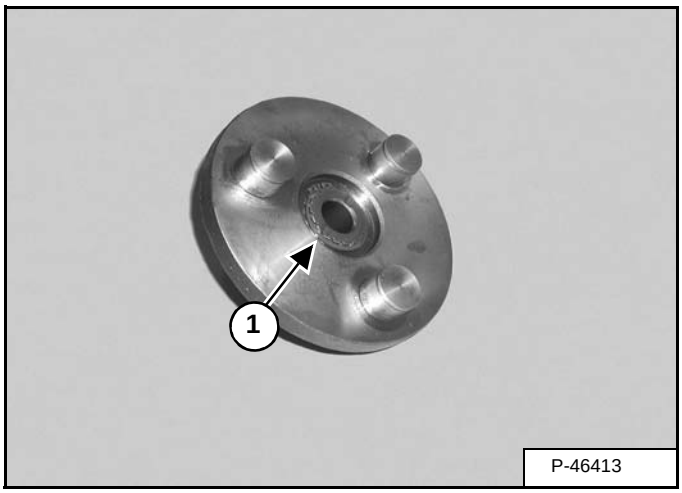
Install the O-ring (Item 1) **[Figure 20-71-112]**.

Figure 20-71-113



Install the ring gear (Item 1) and three bolts (Item 2) **[Figure 20-71-113]**. Tighten the bolts to 15 - 18 ft.-lb. (20 - 25 N•m) torque.

Figure 20-71-114

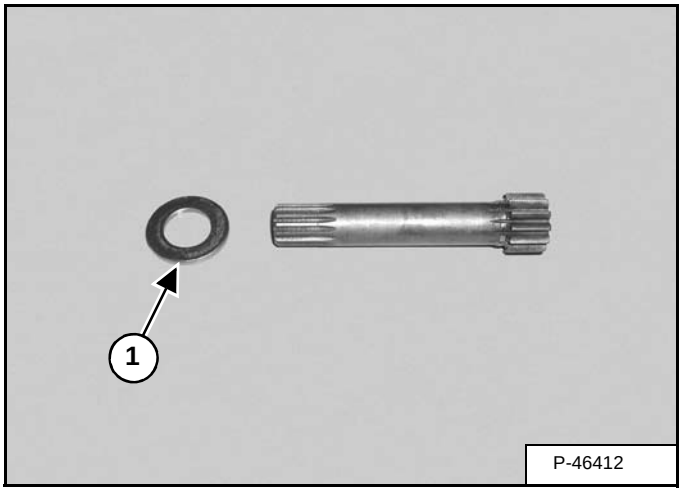


Install the sun gear and snap ring (Item 1) **[Figure 20-71-114]** on the gear carrier.

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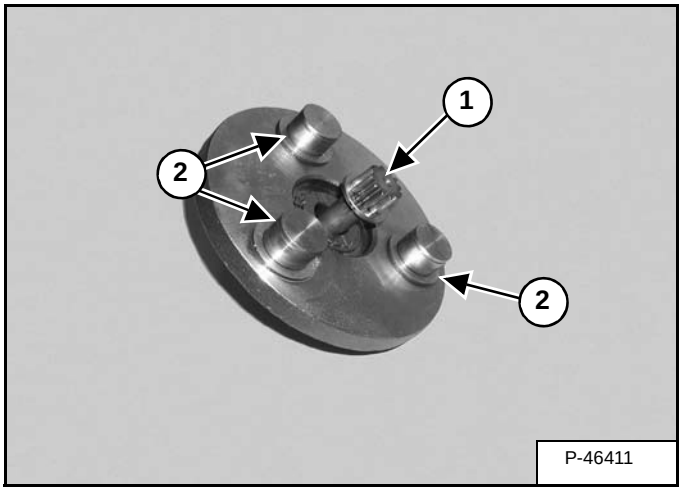
Assembly (Cont'd)

Figure 20-71-115



Install the washer (Item 1) **[Figure 20-71-115]** on the drive shaft.

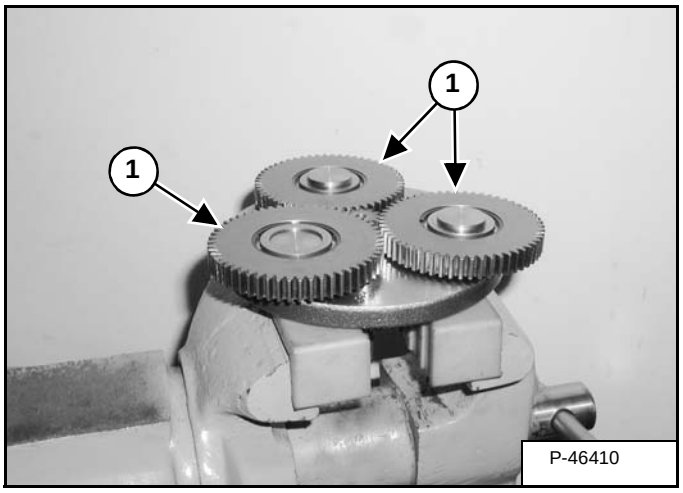
Figure 20-71-116



Install the drive shaft (Item 1) and washers (Item 2) **[Figure 20-71-116]**.

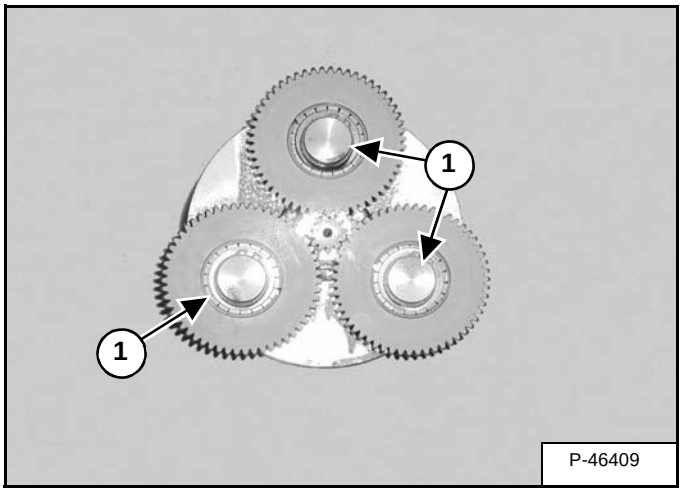
Place the gear carrier in a vise equipped with padded jaws. Heat the planetary gear / bearing assemblies in clean hydraulic oil to 225° F (107° C) for 30 minutes.

Figure 20-71-117



Install the planetary gears (Item 1) **[Figure 20-71-117]**.

Figure 20-71-118

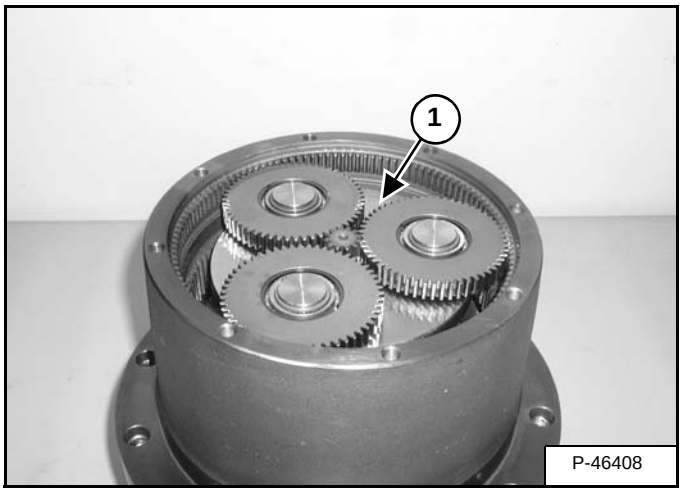


Remove the carrier from the vise and install the snap rings (Item 1) **[Figure 20-71-118]**.

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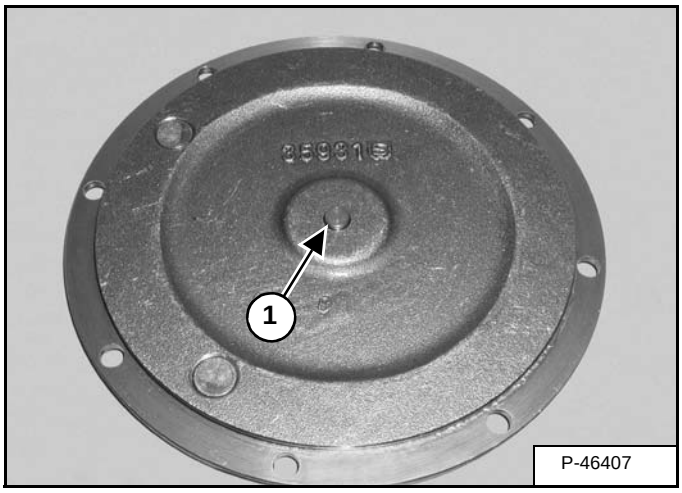
Assembly (Cont'd)

Figure 20-71-119



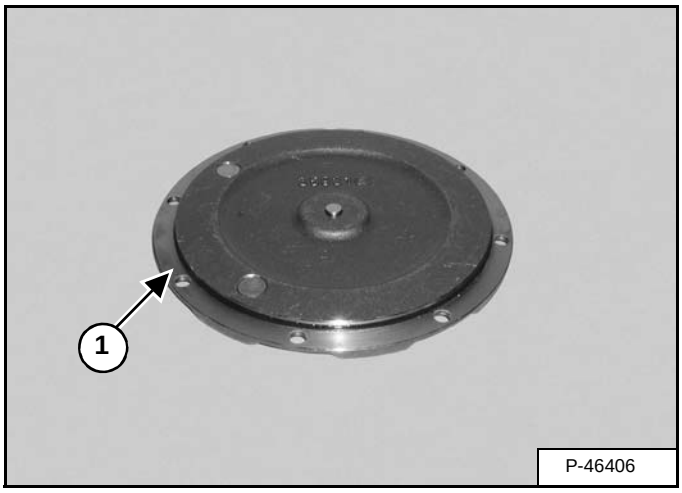
Install the planetary carrier (Item 1) **[Figure 20-71-119]**.

Figure 20-71-120



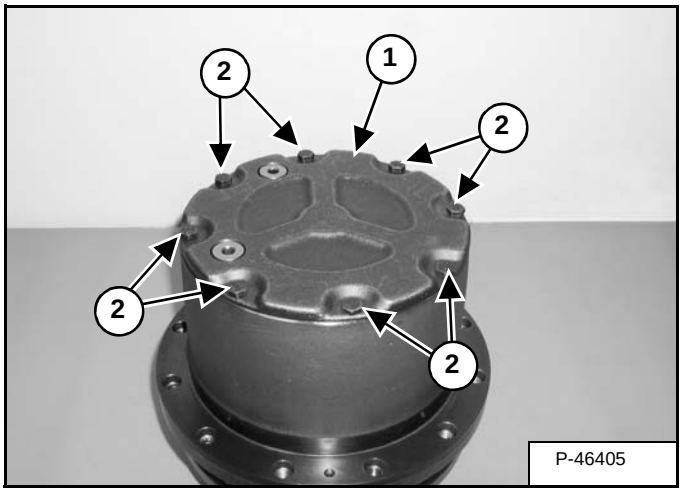
Install the bushing (Item 1) **[Figure 20-71-120]**.

Figure 20-71-121



Install the O-ring (Item 1) **[Figure 20-71-121]**.

Figure 20-71-122



Install the cover (Item 1) and eight bolts (Item 2) **[Figure 20-71-122]**. Tighten the bolts to 15 - 18 ft.-lb. (20 - 25 N•m) torque.

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TRAVEL MOTOR (S/N 563111001 & ABOVE) (LATER MODELS)

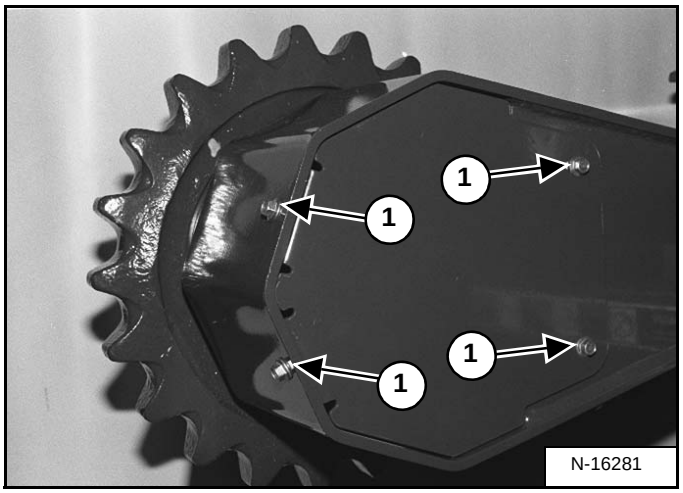
Removal And Installation

Lift and block the side of the track frame where the travel motor will be removed.

Release the rubber track tension and remove the track. (See Rubber Track Removal And Installation on Page 40-20-4.) (If equipped)

Release the steel track tension and remove the track. (See Steel Track Removal And Installation on Page 40-20-7.) (If equipped)

Figure 20-72-1



Remove the four bolts (Item 1) **[Figure 20-72-1]** from the track frame cover.

Installation: Tighten the bolts to 20 - 25 ft.-lb. (27 - 34 N•m) torque.

Remove the cover.

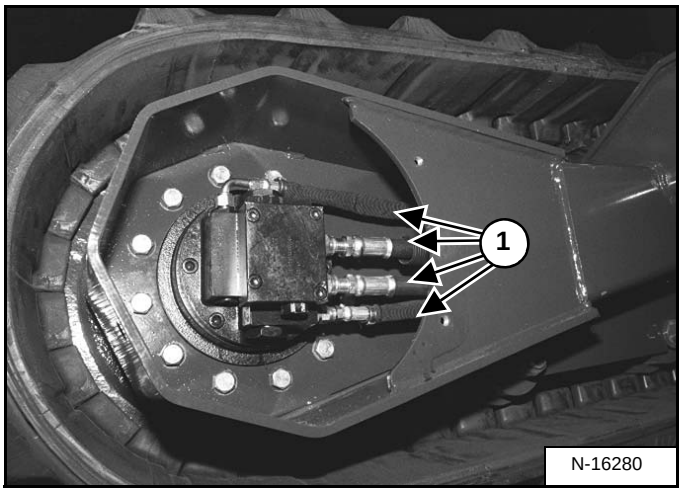
IMPORTANT

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

I-2003-0888

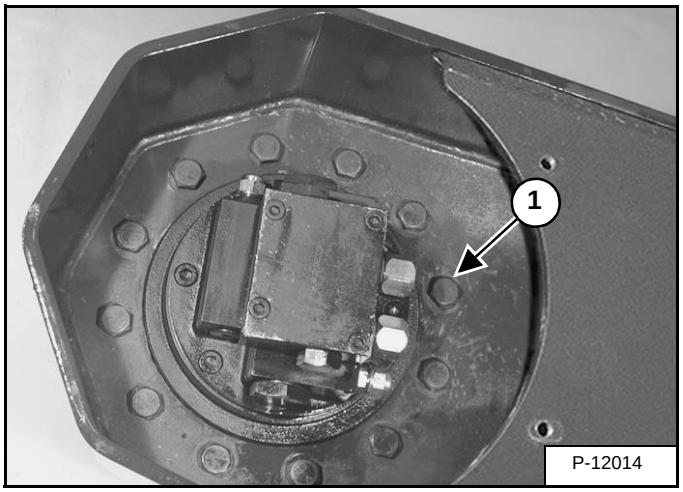
Mark the hoses for correct installation.

Figure 20-72-2



Remove the hoses (Item 1) **[Figure 20-72-2]** from the travel motor.

Figure 20-72-3



Remove the bolts (Item 1) **[Figure 20-72-3]** from the travel motor.

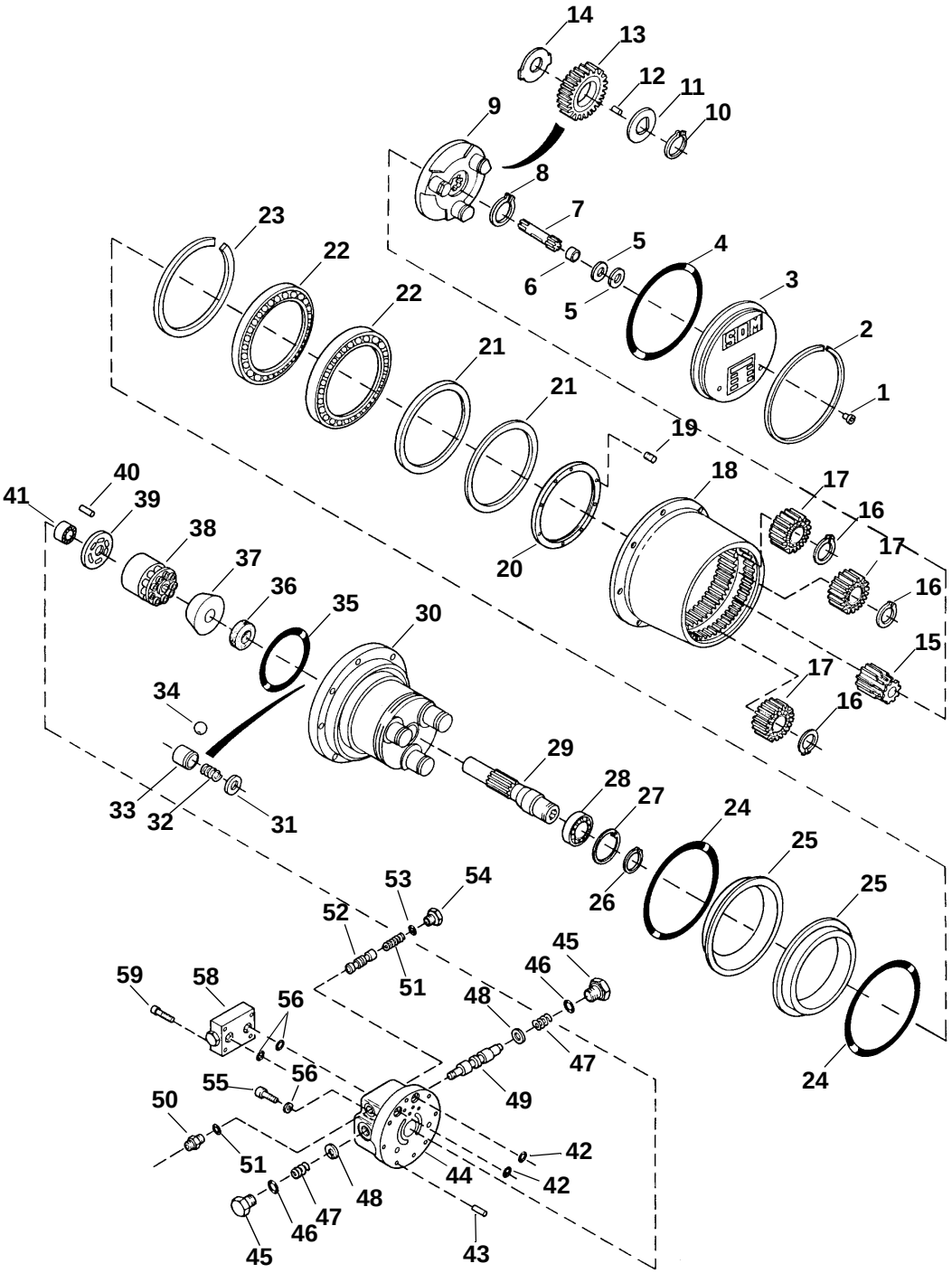
Installation: Apply thread lock adhesive Loctite™ 242 to the bolts and tighten to 118 - 133 ft.-lb. (160 - 180 N•m) torque.

Remove the travel motor from the track frame.

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Parts Identification

1. Plug
2. Snap Ring
3. Cover
4. O-Ring
5. Shims
6. Bushing
7. Sun Gear
8. Snap Ring
9. Planetary Carrier
10. Snap Ring
11. Anti-Rotation Washer
12. Bearing
13. Planetary Gear
14. Thrust Washer
15. Sun Gear
16. Snap Ring
17. Planetary Gear
18. Housing
19. Screw
20 Ring Nut
21. Shim
22. Bearing
23. Snap Ring
24. O-Ring
25. Seal Ring
26. Snap Ring
27. Snap Ring
28. Bearing
29. Drive Shaft
30. Hub
31. Washer
32. Spring
33. Piston
34. Bail
35. O-Ring
36. Seal
37. Swash Plate
38. Rotating Block
39. Motor Plate
40. Pin
41. Bearing
42. O-Ring
43. Pin
44. Motor Cover
45. Plug
46. O-Ring
47. Spring
48. Washer
49. Spool
50. Fitting
51. O-Ring
52. Spool
53. Spring
54. Plug
55. Bolt
56. Washer
57. O-Ring
58. Relief Valve
59. Bolt



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Disassembly

Clean the outside of the travel motor before disassembly.

IMPORTANT

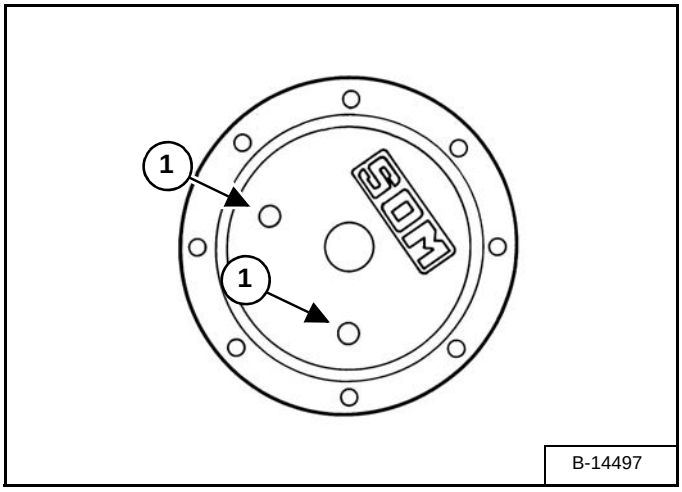
When repairing hydrostatic and hydraulic systems, clean the work area before disassembly and keep all parts clean. Always use caps and plugs on hoses, tubelines and ports to keep dirt out. Dirt can quickly damage the system.

I-2003-0888

The tools listed will be needed to disassemble the travel motor:

MEL1553 Tool Kit
MEL1553-1 Motor Seal Installing Tool
MEL1553-2 Motor Seal Installing Tool
MEL1553-3 Motor Seal Installing Tool
MEL1553-4 Spanner Wrench

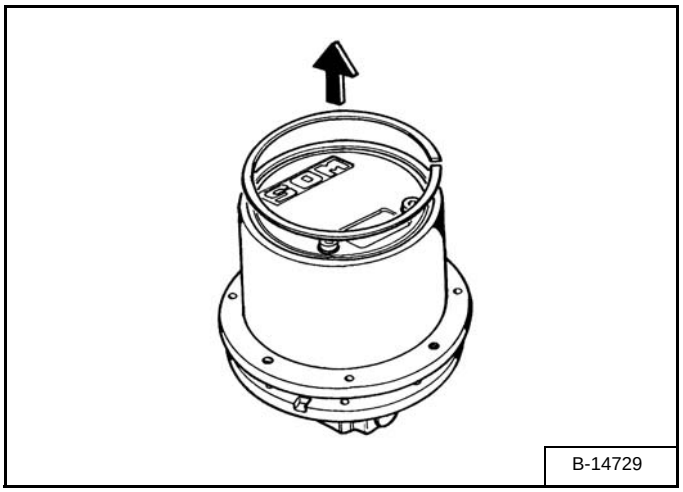
Figure 20-72-4



Remove the drain plugs (Item 1) **[Figure 20-72-4]** from the end cover.

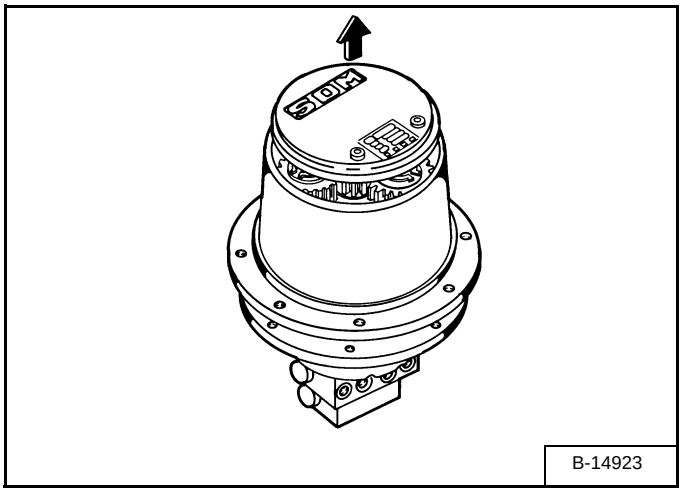
Drain the oil into a container.

Figure 20-72-5



Remove the internal snap ring from the travel motor housing **[Figure 20-72-5]**.

Figure 20-72-6



Use two screw drivers to pry the cover out of the housing **[Figure 20-72-6]**.

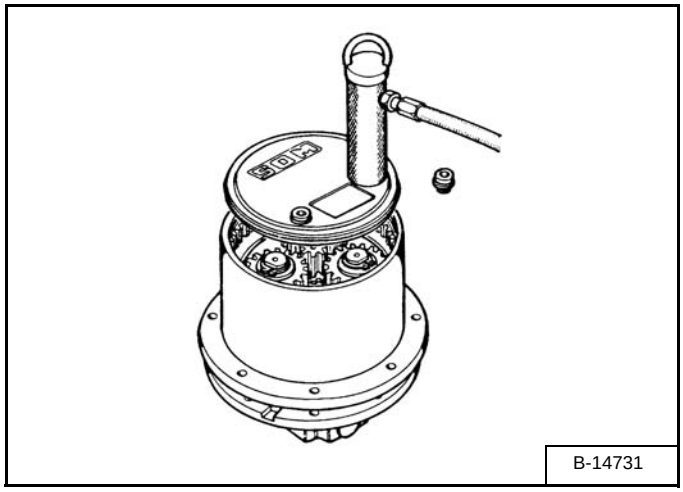
Air pressure may also be used to remove the cover.

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TRAVEL MOTOR (S/N 563111001 & ABOVE) (LATER MODELS) (CONT'D)

Disassembly (Cont'd)

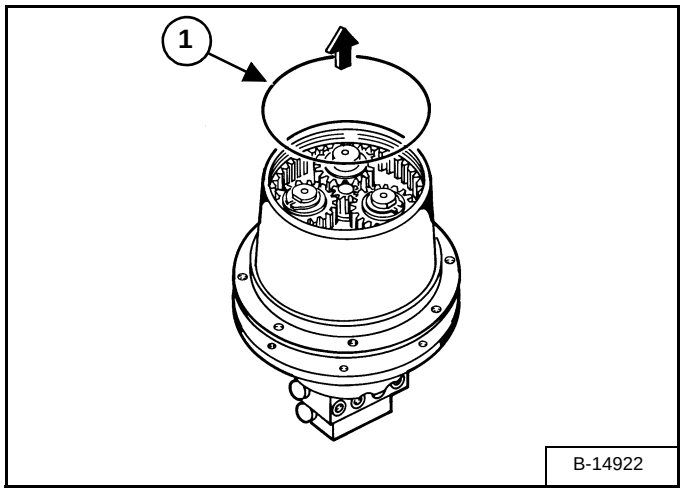
Figure 20-72-7



Screw the adapter in a drain hole and apply 8 - 11 PSI (0,55 - 0,75 bar) **[Figure 20-72-7]**.

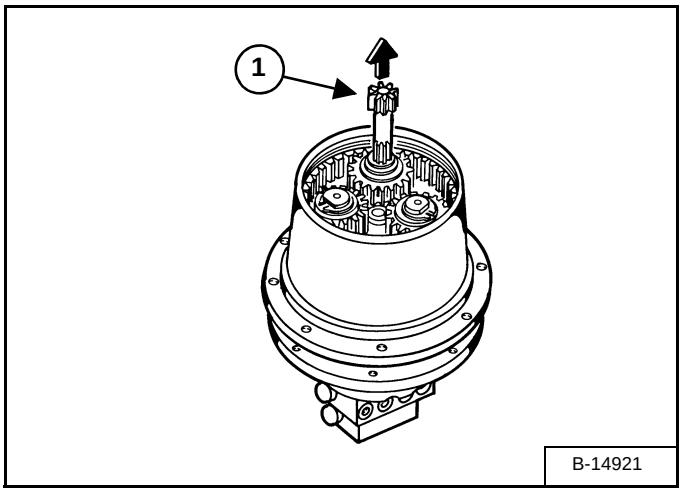
NOTE: Do not use excess pressure or seal damage may result.

Figure 20-72-8



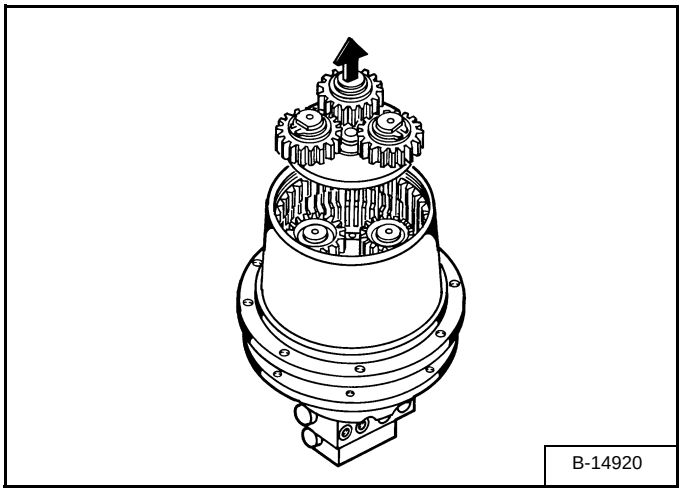
Remove the O-ring (Item 1) **[Figure 20-72-8]**.

Figure 20-72-9



Remove the sun gear (Item 1) **[Figure 20-72-9]** from the carrier.

Figure 20-72-10

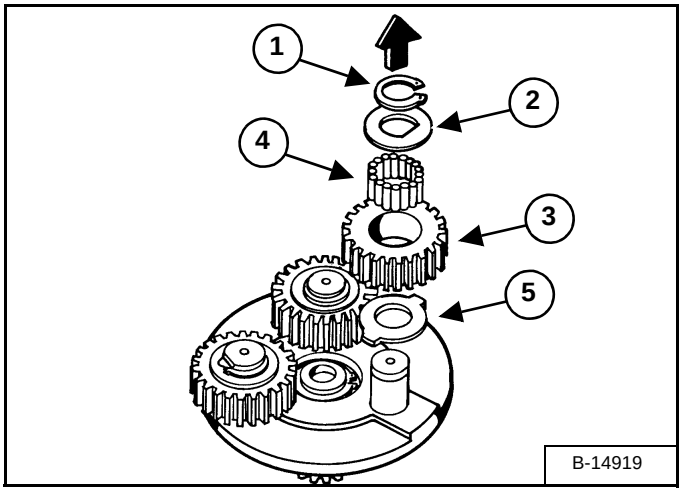


Remove the planetary carrier **[Figure 20-72-10]**.

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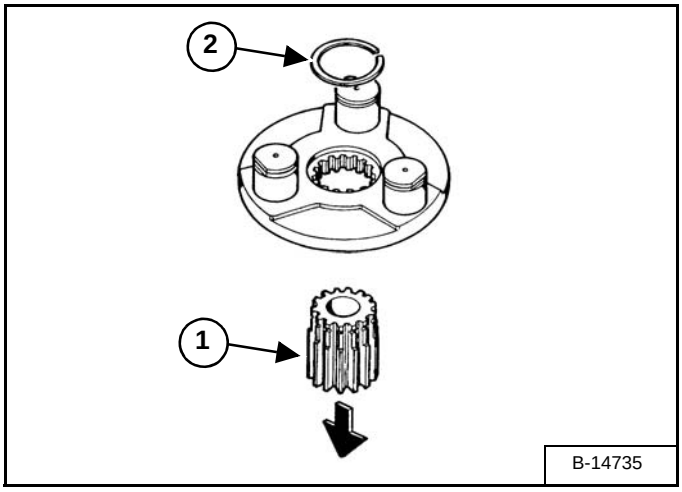
Disassembly (Cont'd)

Figure 20-72-11



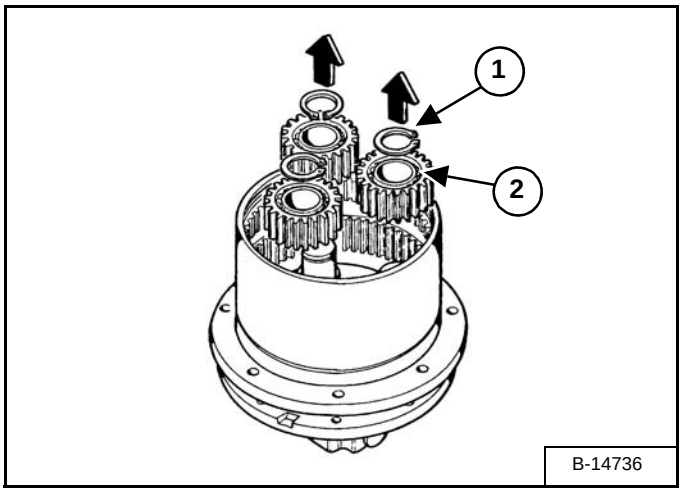
Remove the snap rings (Item 1), anti-rotation washers (Item 2), gears (Item 3), bearings (Item 4) and the bottom thrust washers (Item 5) **[Figure 20-72-11]** from the planetary carrier assembly.

Figure 20-72-12



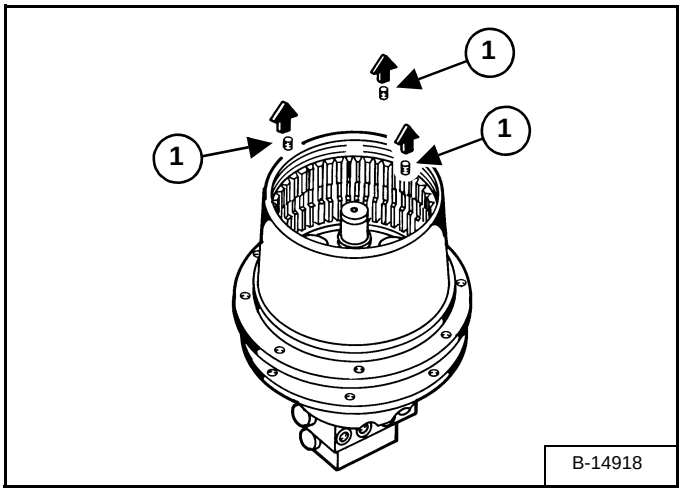
Remove the sun gear (Item 1), from the planetary carrier, by removing the snap ring (Item 2) **[Figure 20-72-12]** and pushing the sun gear out of the carrier.

Figure 20-72-13



Remove the snap rings (Item 1) and gears/bearings (Item 2) **[Figure 20-72-13]**.

Figure 20-72-14



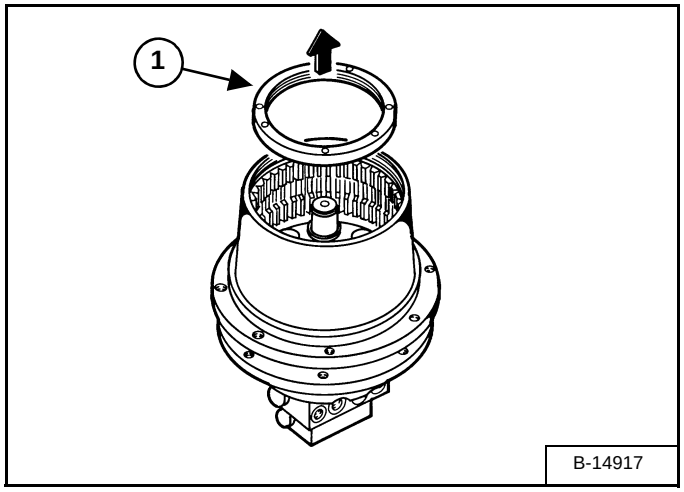
Remove the three screws (Item 1) **[Figure 20-72-14]** from the ring nut.

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TRAVEL MOTOR (S/N 563111001 & ABOVE) (LATER MODELS) (CONT'D)

Disassembly (Cont'd)

Figure 20-72-15



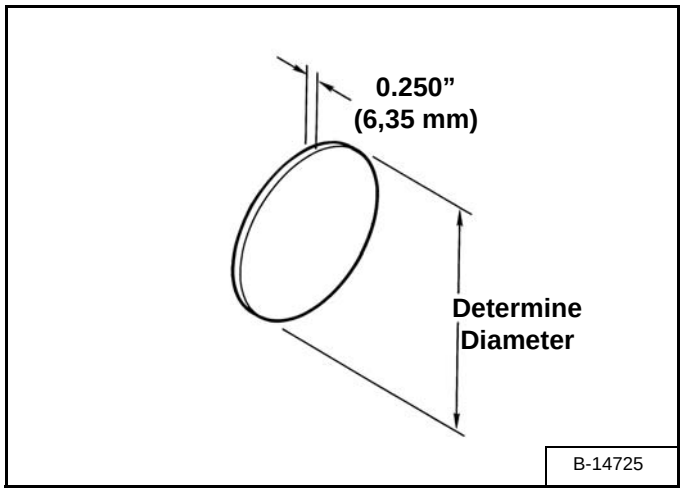
Use the spanner wrench to remove the ring nut (Item 1) **[Figure 20-72-15]**.

Remove the shim(s) (if equipped) from the hub.

Before the housing can be pulled from the hub, a plate must be placed on the three pins of the planetary carrier.

The plate will provide support for the three jaw puller.

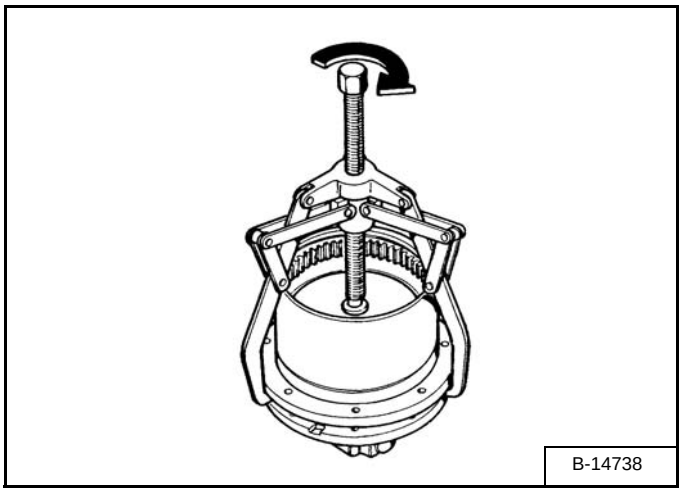
Figure 20-72-16



Fabricate or obtain the plate locally **[Figure 20-72-16]**.

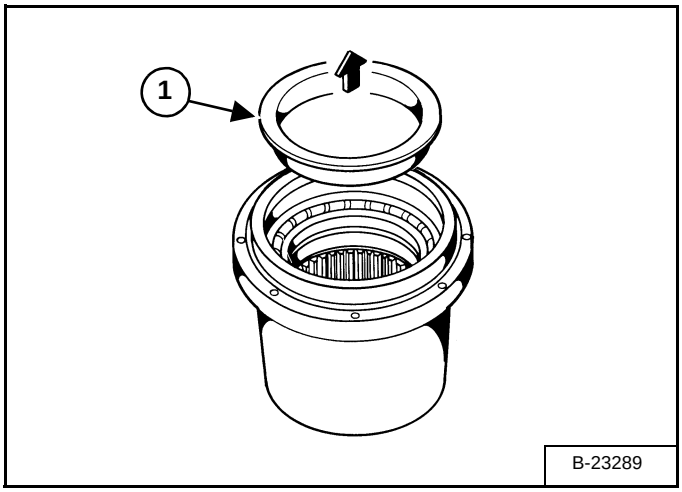
Select a plate that fits over the outer edges of the three pins.

Figure 20-72-17



Using a three jaw puller, separate the hub and housing **[Figure 20-72-17]**.

Figure 20-72-18

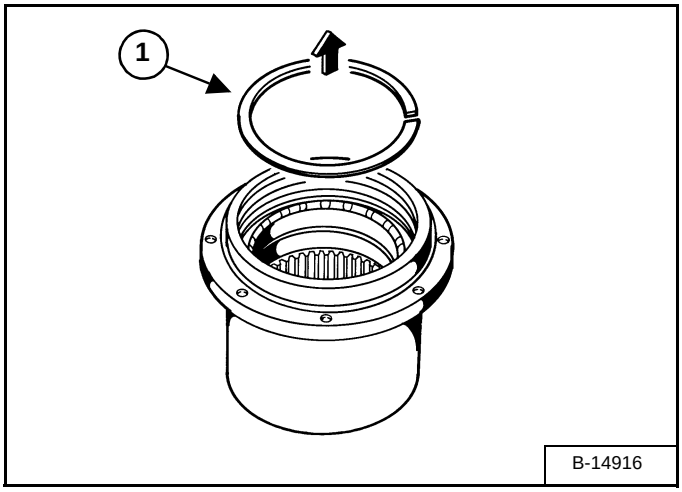


Remove the seal ring (Item 1) **[Figure 20-72-18]** from the housing.

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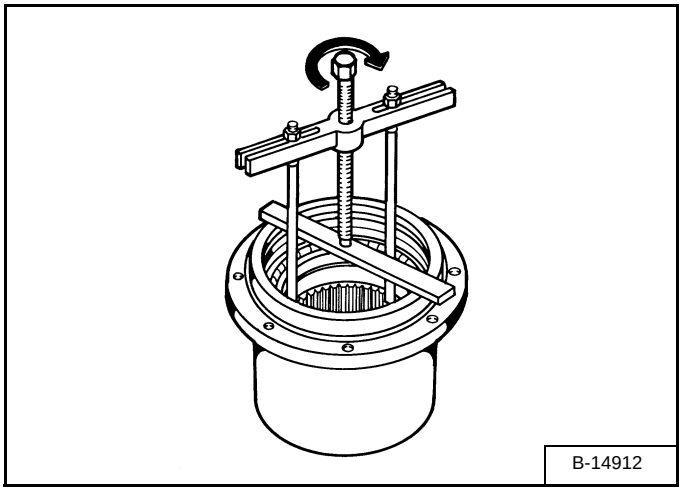
Disassembly (Cont'd)

Figure 20-72-19



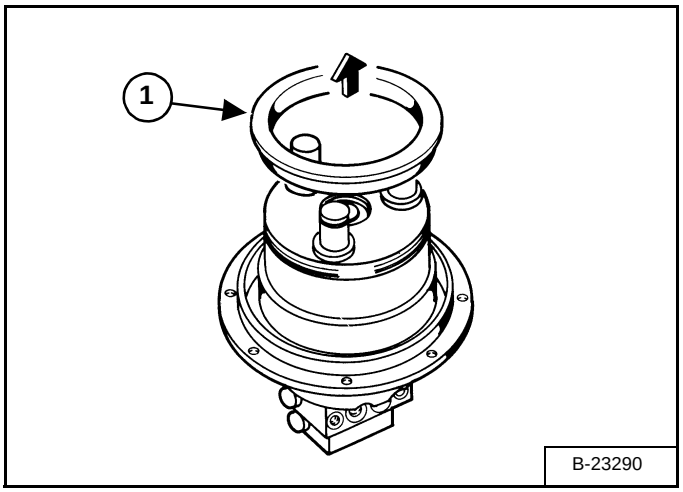
Remove the snap ring (Item 1) **[Figure 20-72-19]** from the housing.

Figure 20-72-20



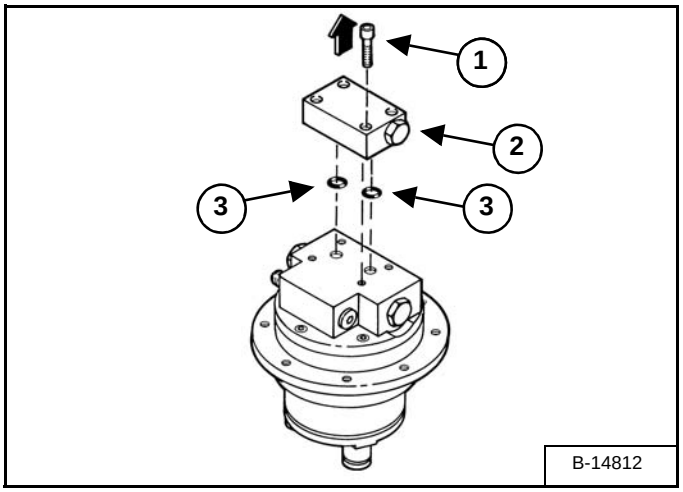
Remove the two ball bearings from the ring gear **[Figure 20-72-20]**.

Figure 20-72-21



Remove the front seal ring (Item 1) **[Figure 20-72-21]** from the motor hub.

Figure 20-72-22



Remove the four screws (Item 1) from the relief valve block (Item 2) **[Figure 20-72-22]**.

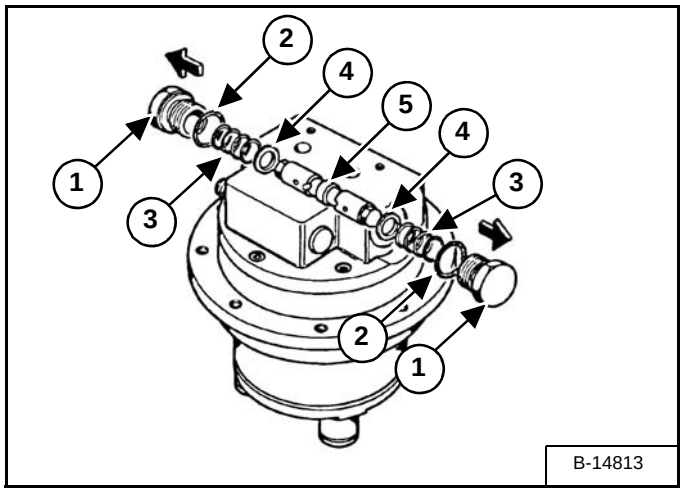
Remove the two O-rings (Item 3) **[Figure 20-72-22]**.

NOTE: Relief valve block components are not serviced separately. If any parts are needed, order a complete relief valve block assembly from Bobcat Parts.

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Disassembly (Cont'd)

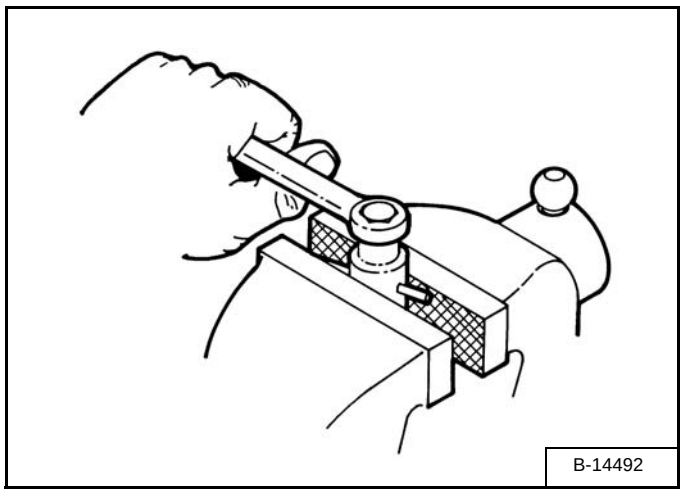
Figure 20-72-23



Remove the two plugs (Item 1), O-rings (Item 2), springs (Item 3) and washers (Item 4) **[Figure 20-72-23]**.

Remove the spool (Item 5) **[Figure 20-72-23]**.

Figure 20-72-24

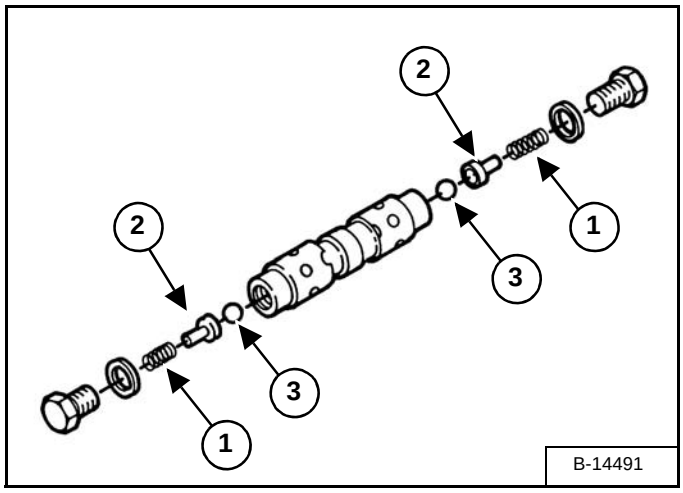


To disassemble the spool, insert a hardened pin through the hole in the spool and use a vise with protective jaws to hold the spool **[Figure 20-72-24]**.

NOTE: Do not use any type of tool to grip the spool or damage to the spool will result.

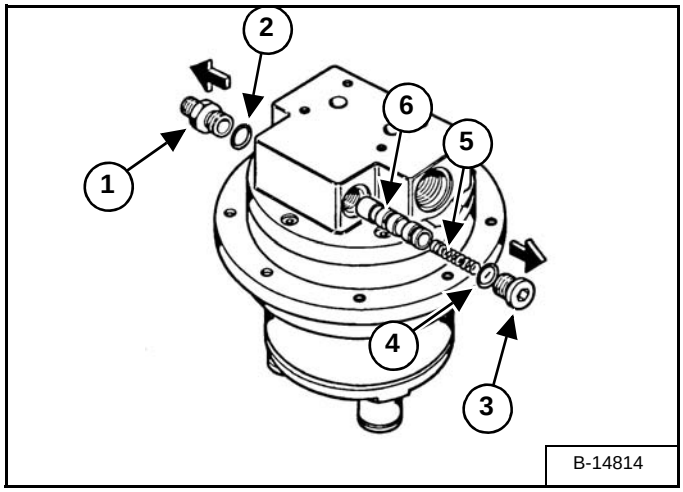
Remove the plug from both ends of the spool.

Figure 20-72-25



Remove the springs (Item 1), poppets (Item 2) and check balls (Item 3) **[Figure 20-72-25]**.

Figure 20-72-26

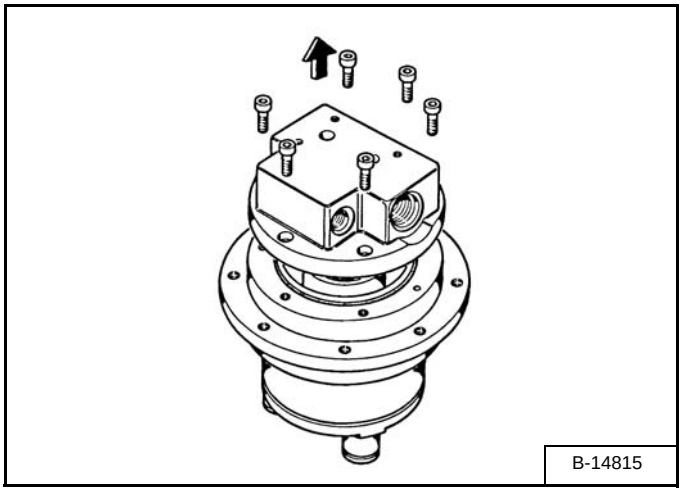


Remove the fitting (Item 1) and O-ring (Item 2). Remove the plug (Item 3), O-ring (Item 4), spring (Item 5) and 2 speed spool (Item 6) **[Figure 20-72-26]**.

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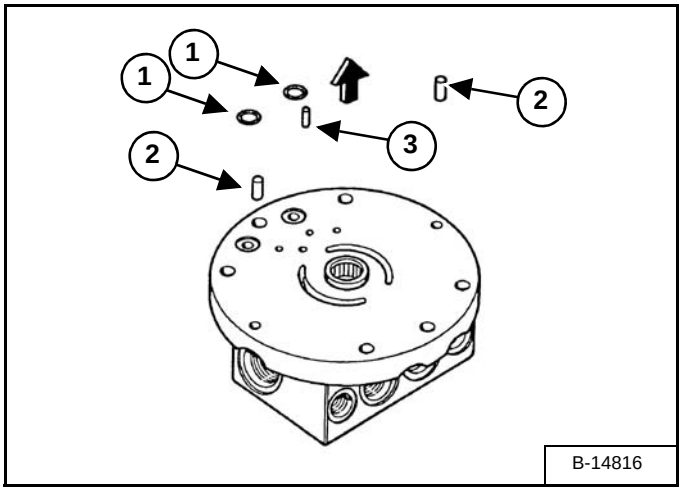
Disassembly (Cont'd)

Figure 20-72-27



Remove the six screws and motor cover **[Figure 20-72-27]**.

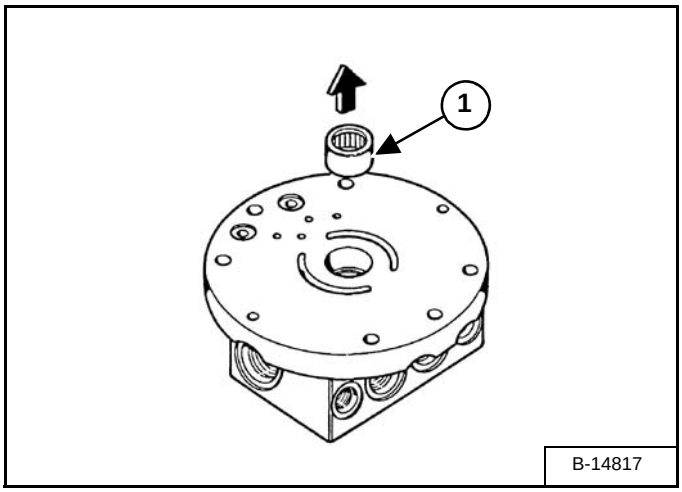
Figure 20-72-28



Remove the two O-rings (Item 1) and two dowel pins (Item 2) **[Figure 20-72-28]**.

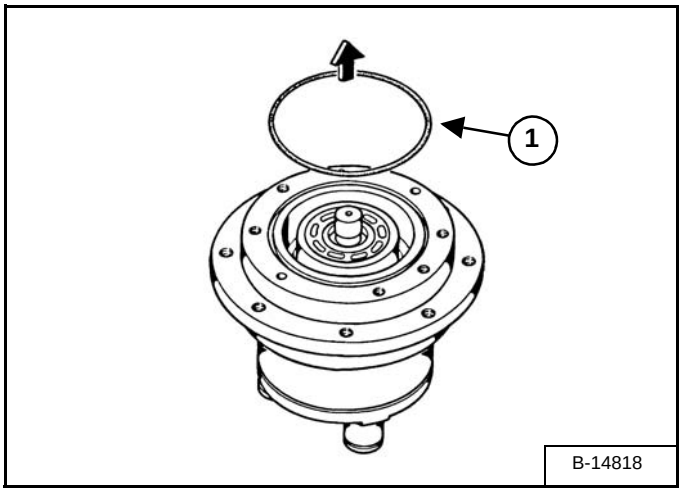
Remove the alignment pin (Item 3) **[Figure 20-72-28]**.

Figure 20-72-29



Remove the bearing (Item 1) **[Figure 20-72-29]** with a bearing puller.

Figure 20-72-30



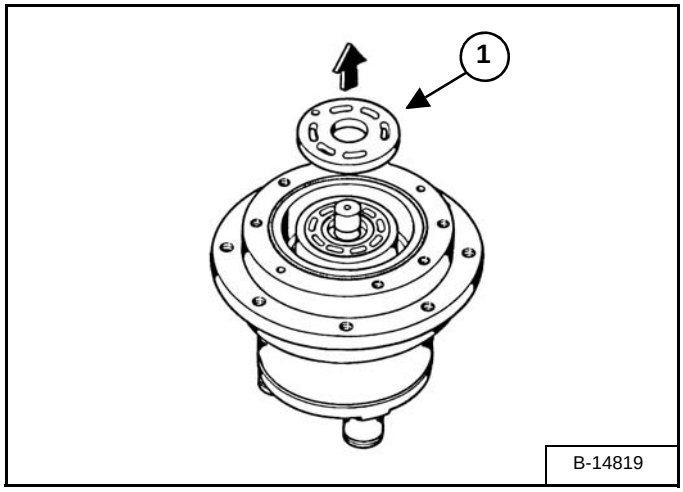
Remove the O-ring (Item 1) **[Figure 20-72-30]** from the hub.

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TRAVEL MOTOR (S/N 563111001 & ABOVE) (LATER MODELS) (CONT'D)

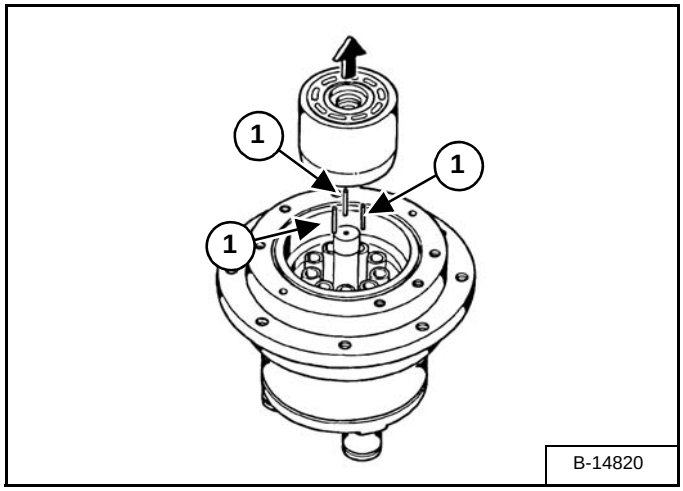
Disassembly (Cont'd)

Figure 20-72-31



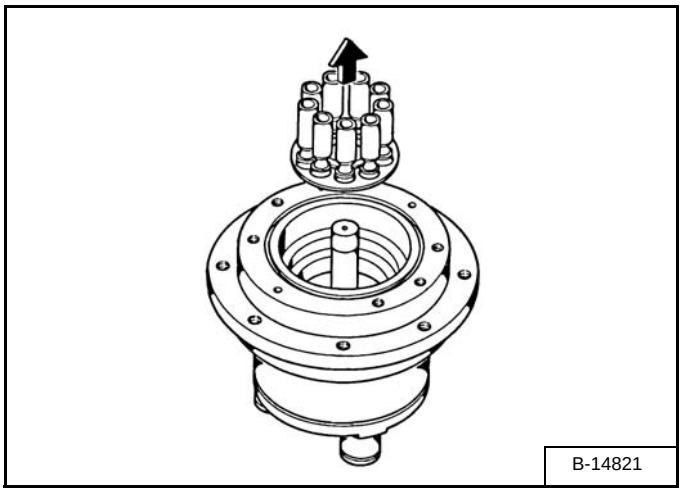
Remove the bronze motor plate (Item 1) **[Figure 20-72-31]**.

Figure 20-72-32



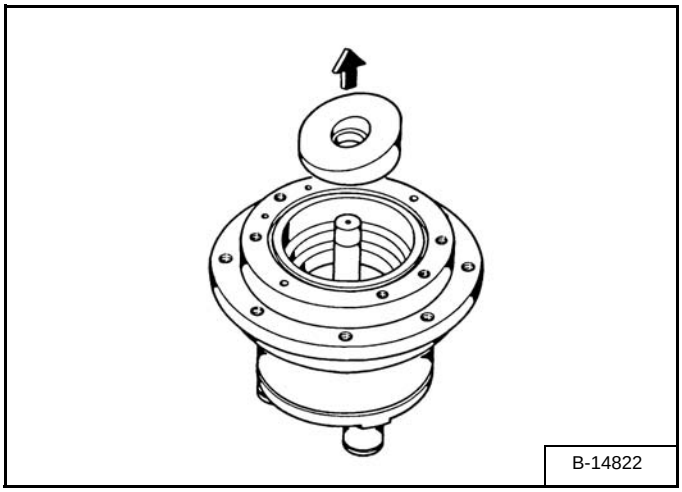
Remove the rotating block and three pins (Item 1) **[Figure 20-72-32]**.

Figure 20-72-33



Remove the piston assembly **[Figure 20-72-33]**.

Figure 20-72-34

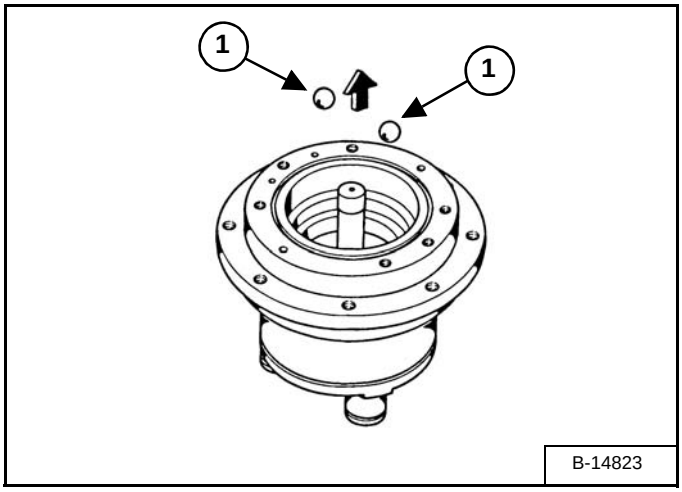


Remove the swash plate **[Figure 20-72-34]**.

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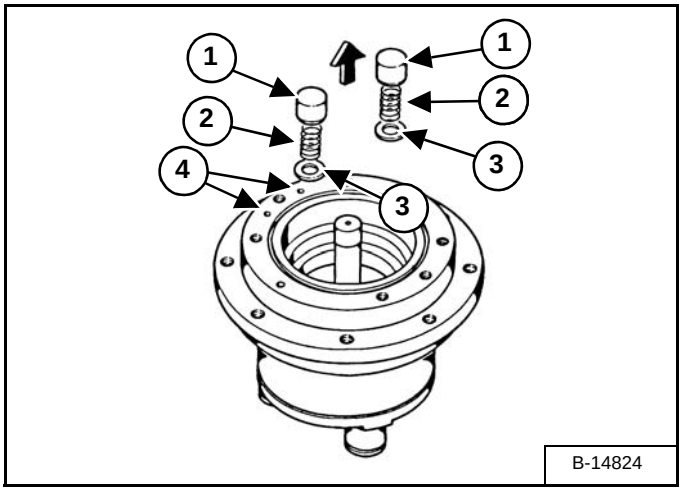
Disassembly (Cont'd)

Figure 20-72-35



Remove the two balls (Item 1) **[Figure 20-72-35]**.

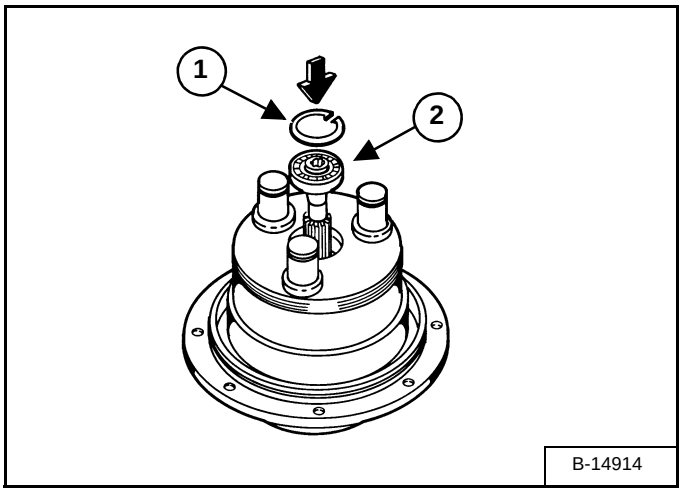
Figure 20-72-36



Remove the two displacement control pistons (Item 1), springs (Item 2) and washers (Item 3) **[Figure 20-72-36]**.

NOTE: To ease removal of the pistons, apply low air pressure to the oil hole (Item 4) [Figure 20-72-36].

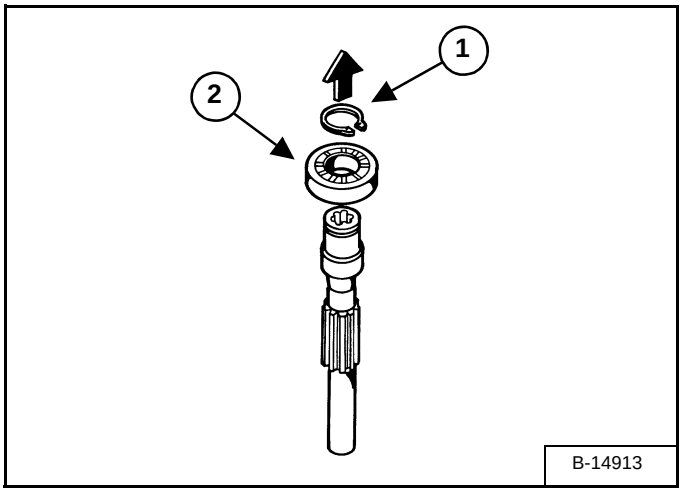
Figure 20-72-37



Remove the internal snap ring (Item 1) **[Figure 20-72-37]** retaining the bearing/drive shaft to the hub.

Push the drive shaft (Item 2) **[Figure 20-72-37]** from the bottom to remove the shaft from the hub.

Figure 20-72-38

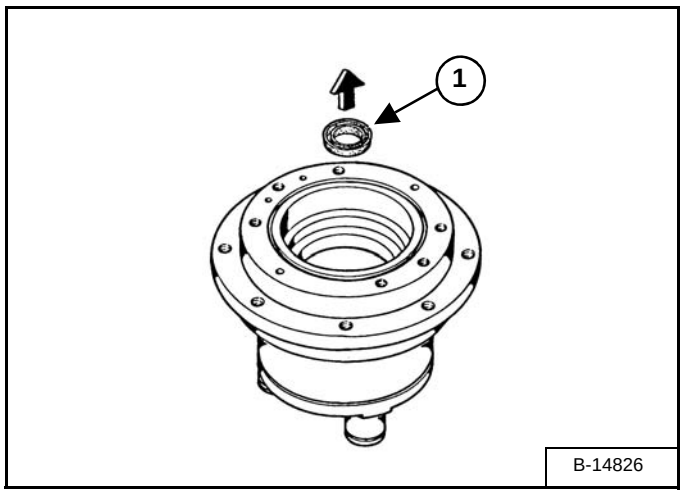


Remove the snap ring (Item 1) and bearing (Item 2) **[Figure 20-72-38]** from the drive shaft.

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Disassembly (Cont'd)

Figure 20-72-39



Remove the seal (Item 1) **[Figure 20-72-39]** from the hub.

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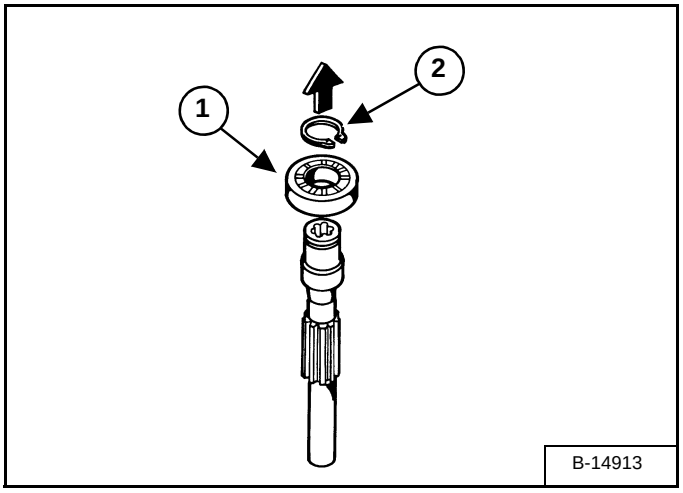
Assembly

The tools listed will be needed to assemble the travel motor:

MEL1553 - Tool Kit
MEL1553-1 Motor Seal Installing Tool
MEL1553-2 Motor Seal Installing Tool
MEL1553-3 Motor Seal Installing Tool
MEL1553-4 Spanner Wrench

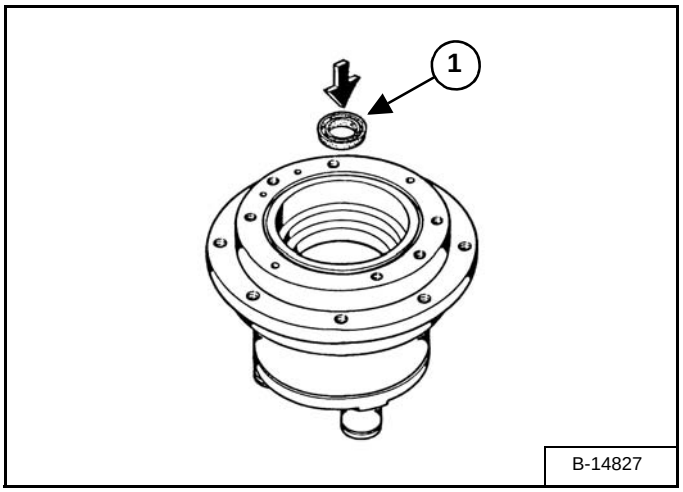
Clean all parts in solvent and dry with compressed air. Inspect all parts and replace any that are damaged. If any of the planetary gears are damaged, replace all the planetary gears and sun gear from the planetary assembly that is damaged. One damaged gear can cause a microscopic fatigue crack in mating teeth and cause premature failure after servicing. Apply oil to all O-rings (as noted) and light grease to the ball and roller bearings before installation.

Figure 20-72-40



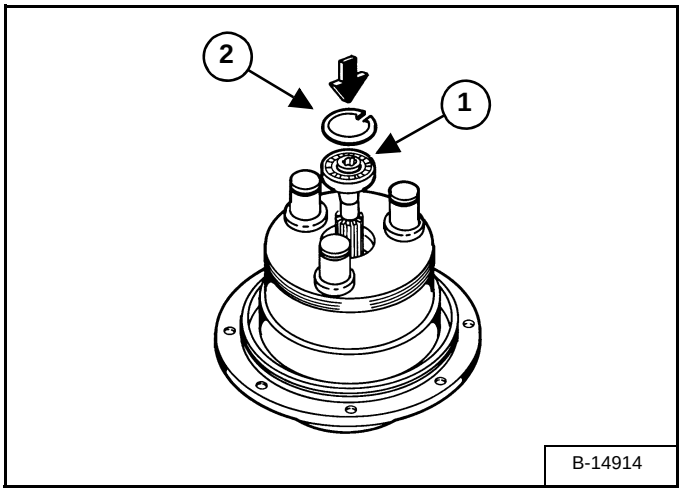
Install the bearing (Item 1) and snap ring (Item 2) **[Figure 20-72-40]** on the drive shaft.

Figure 20-72-41



Apply oil to the inside diameter of the oil seal and install the oil seal (Item 1) **[Figure 20-72-41]** in the hub.

Figure 20-72-42



Install the drive shaft (Item 1) **[Figure 20-72-42]** in the hub.

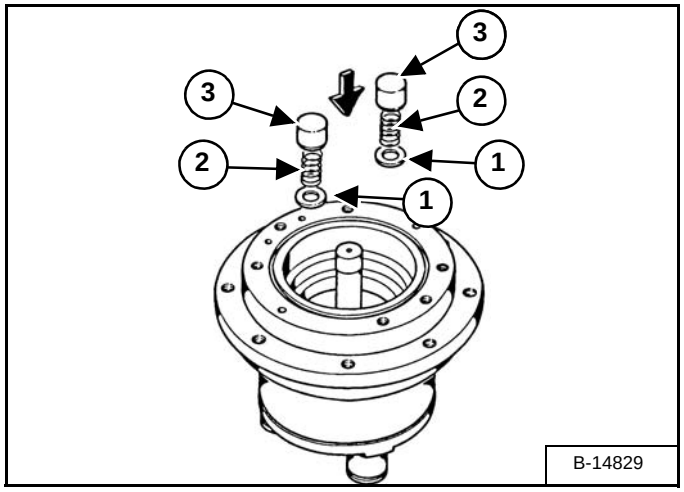
NOTE: Make sure the bearing is seated in the hub.

Install the internal snap ring (Item 2) **[Figure 20-72-42]**.

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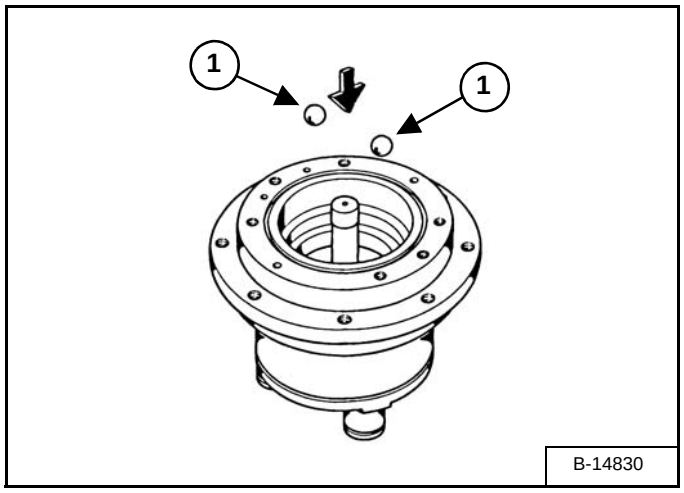
Assembly (Cont'd)

Figure 20-72-43



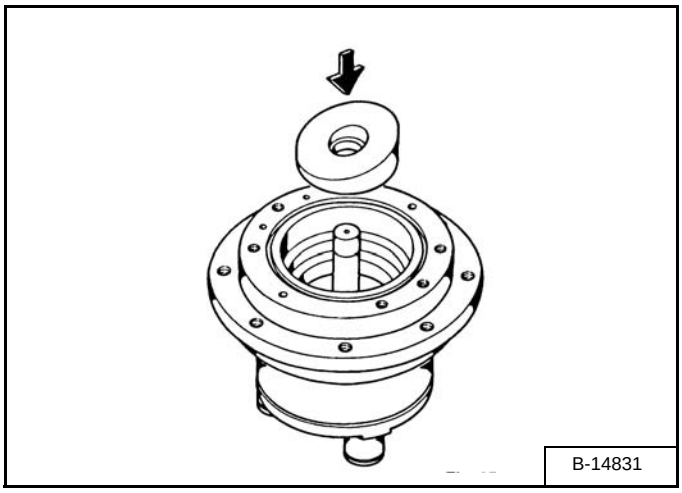
Install the two washers (Item 1) and springs (Item 2). Apply oil on the displacement control pistons (Item 3) **[Figure 20-72-43]** and install the pistons in the piston bore.

Figure 20-72-44



Install the two balls (Item 1) **[Figure 20-72-44]** in the hub.

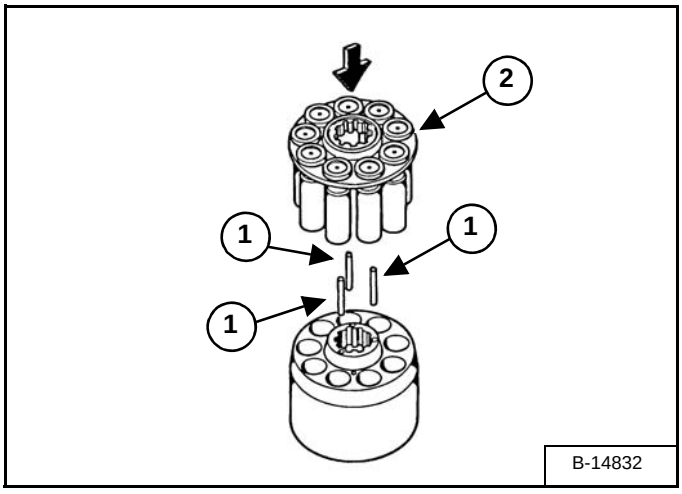
Figure 20-72-45



Install the swash plate in the hub **[Figure 20-72-45]**.

Make sure the swash plate aligns with the two balls.

Figure 20-72-46



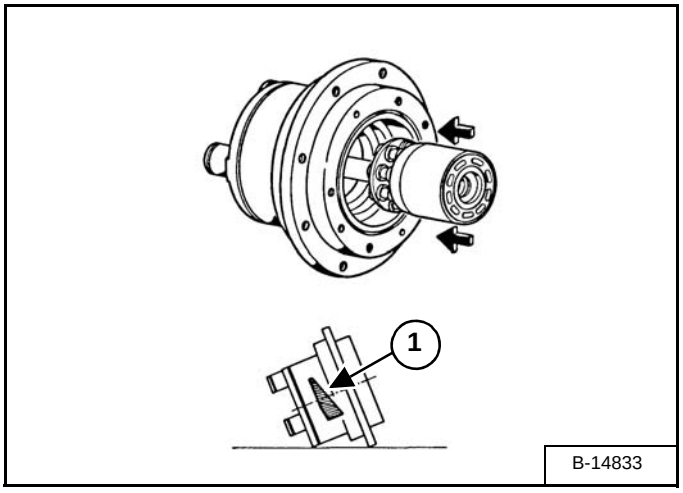
Install the three dowel pins (Item 1) **[Figure 20-72-46]** in the rotating block.

Apply oil to the piston assembly (Item 2) **[Figure 20-72-46]** and install the piston assembly in the rotating block.

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Assembly (Cont'd)

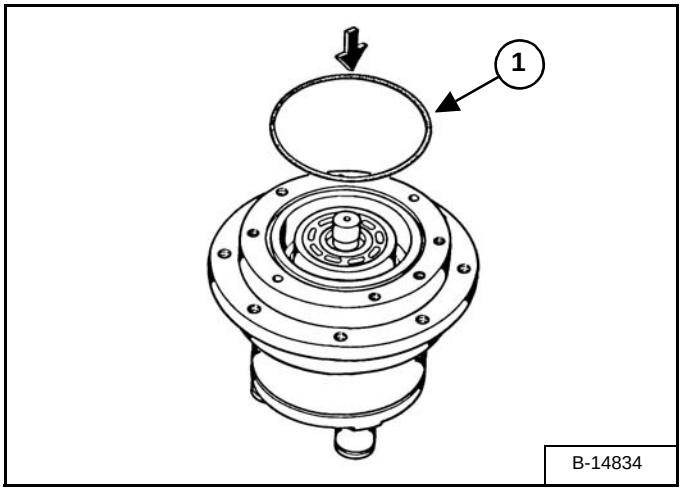
Figure 20-72-47



Tip the motor housing on its side. Make sure the thick side of the swash plate (Item 1) **[Figure 20-72-47]** is to the bottom.

Install the rotating block assembly in the hub **[Figure 20-72-47]**.

Figure 20-72-48



Apply oil to and install the O-ring (Item 1) **[Figure 20-72-48]** on the hub.

Figure 20-72-49

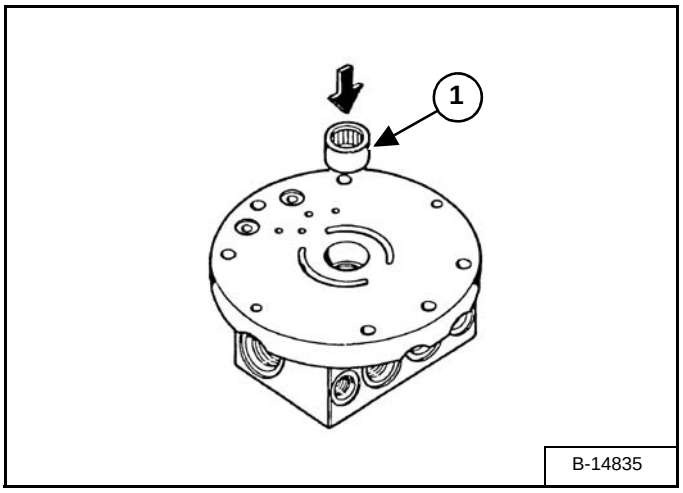
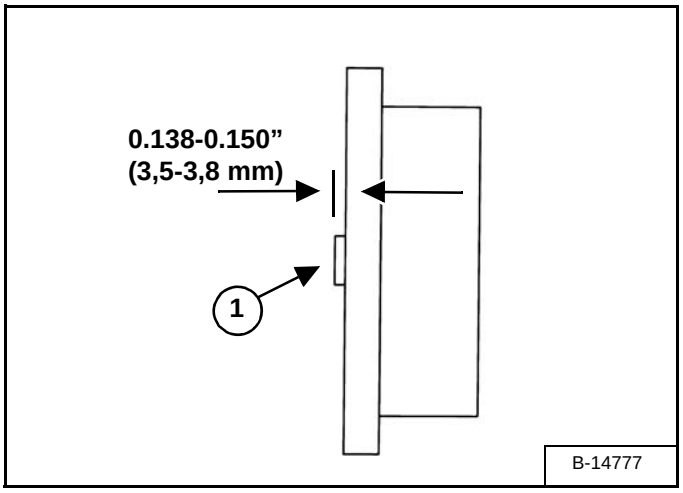


Figure 20-72-50



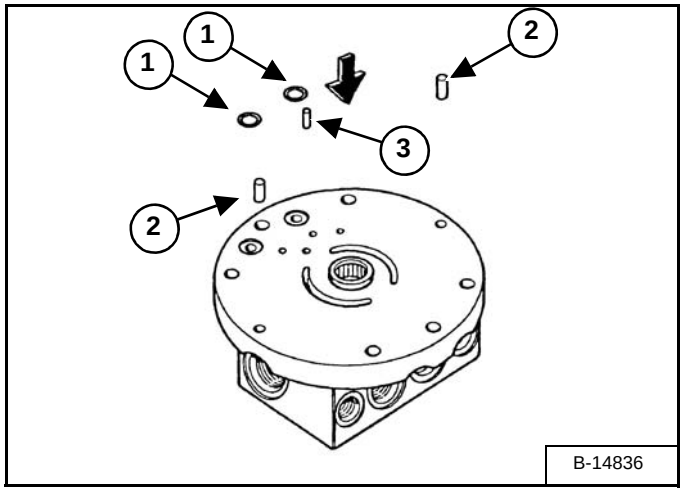
Press the bearing (Item 1) **[Figure 20-72-49]** & **[Figure 20-72-50]** in the motor cover.

The bearing (Item 1) **[Figure 20-72-50]** must extend from the face of the motor cover 0.138 - 0.150 in. (3, 5 - 3,8 mm).

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Assembly (Cont'd)

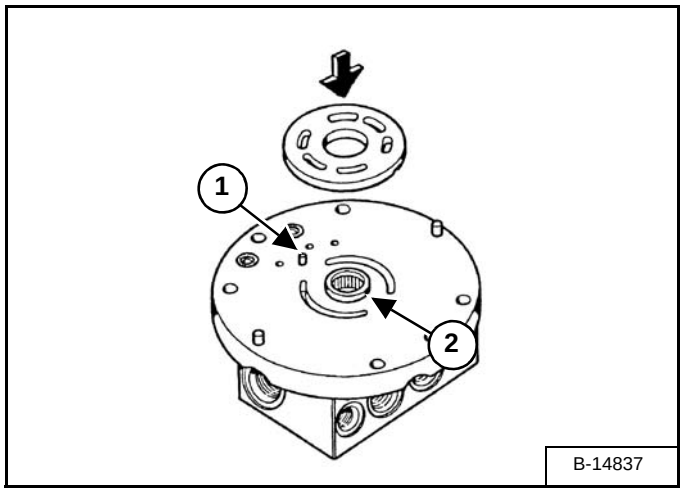
Figure 20-72-51



Apply oil to the two O-rings (Item 1) **[Figure 20-72-51]** and install the O-rings on the motor cover.

Install the two dowel pins (Item 2) and the alignment pin (Item 3) **[Figure 20-72-51]** in the motor cover.

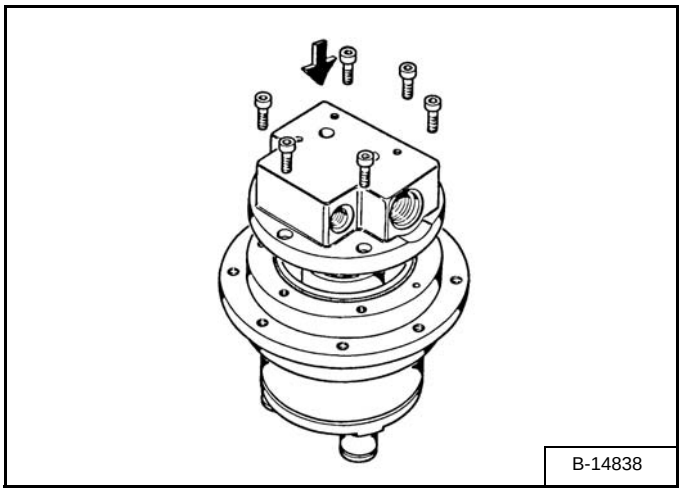
Figure 20-72-52



Apply light grease to the motor plate. Install the motor plate in on the motor cover, over the alignment pin (Item 1) **[Figure 20-72-52]**.

Lubricate the bearing (Item 2) **[Figure 20-72-52]** with oil.

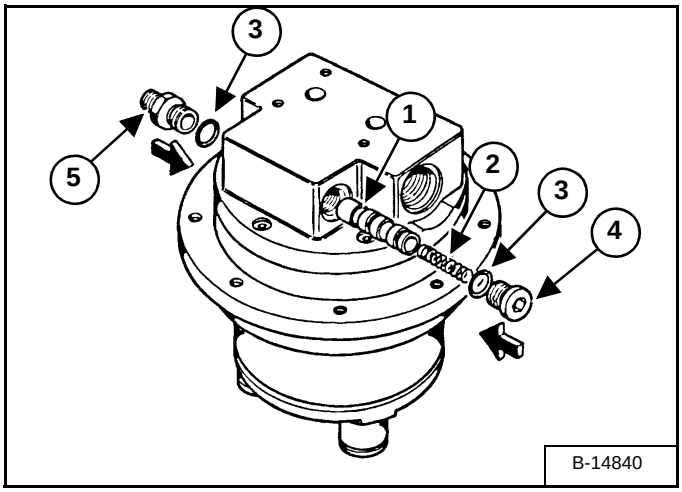
Figure 20-72-53



Install the motor cover on the hub with six screws **[Figure 20-72-53]**.

Tighten the screws in a crisscross manner to 18 - 22 ft.-lb. (25 - 30 N•m) torque.

Figure 20-72-54



Apply oil to and install the two speed spool (Item 1) and spring (Item 2) **[Figure 20-72-54]**.

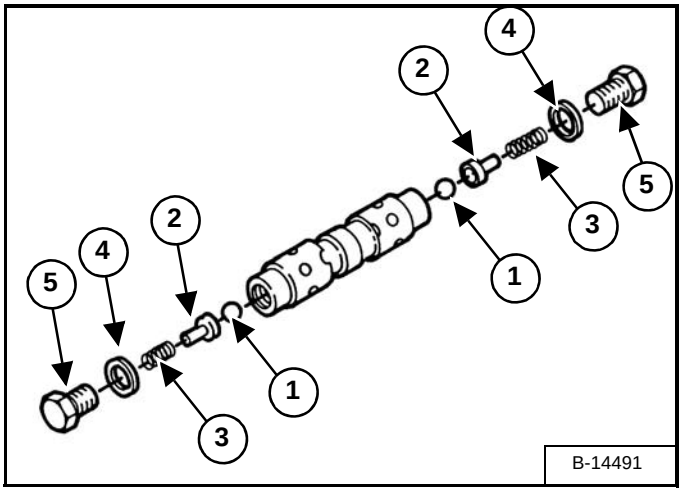
Apply oil to and install the O-rings (Item 3) on the plug (Item 4) and fitting (Item 5) **[Figure 20-72-54]**. Install the plug and fitting.

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TRAVEL MOTOR (S/N 563111001 & ABOVE) (LATER MODELS) (CONT'D)

Assembly (Cont'd)

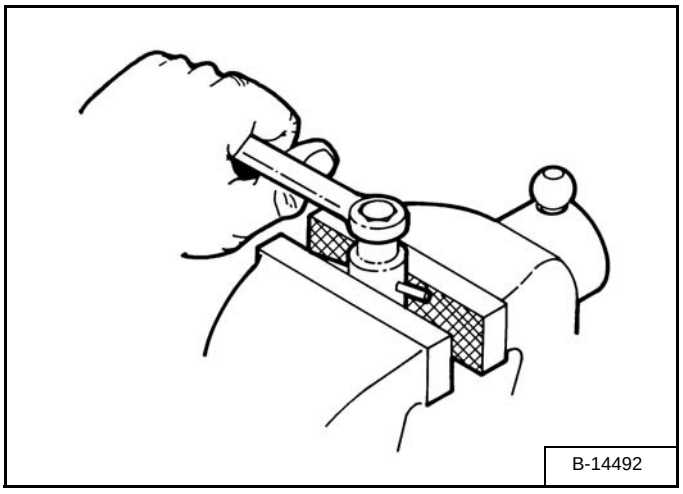
Figure 20-72-55



Install the check ball (Item 1), poppet (Item 2) and spring (Item 3) **[Figure 20-72-55]** in both ends of the spool.

Apply oil to and install the new O-rings (Item 4) on the plugs (Item 5) **[Figure 20-72-55]**.

Figure 20-72-56



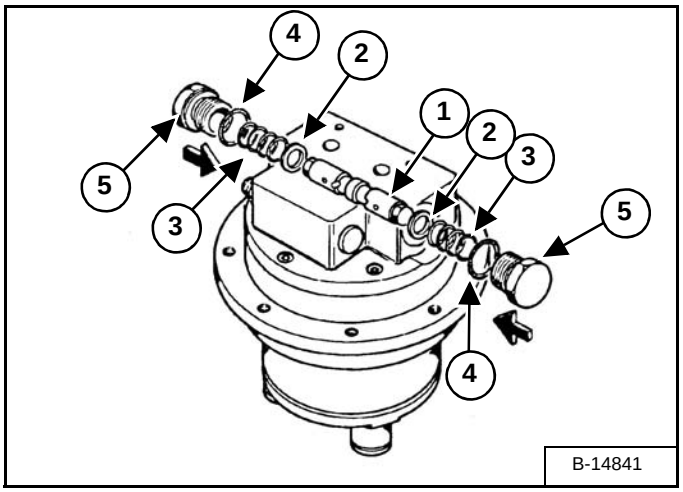
To assemble the spool, insert a hardened pin through the hole in the spool and use a vise with protective jaws to hold the spool **[Figure 20-72-56]**.

NOTE: Do not use any type of tool to grip the spool or damage to the spool will result.

Install the plug in both ends of the spool **[Figure 20-72-56]**.

Tighten the plugs to 18 - 22 ft.-lb. (25 - 30 N•m) torque.

Figure 20-72-57



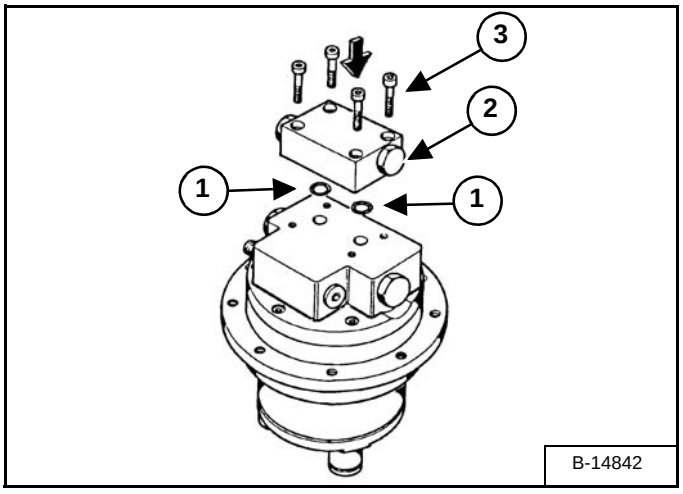
Apply oil to and install the spool (Item 1) **[Figure 20-72-57]** in the motor cover.

Install the washers (Item 2) and springs (Item 3) on both ends of the spool (Item 1) **[Figure 20-72-57]**.

Apply oil to and install new O-rings (Item 4) on the plugs (Item 5) **[Figure 20-72-57]**.

Install the plugs (Item 5) **[Figure 20-72-57]** in the motor cover.

Figure 20-72-58



Apply oil to and install the two O-rings (Item 1) **[Figure 20-72-58]**.

Install the relief valve (Item 2) and the four screws (Item 3) **[Figure 20-72-58]**. Tighten the screws to 18 - 21 ft.-lb. (25 - 28 N•m) torque.

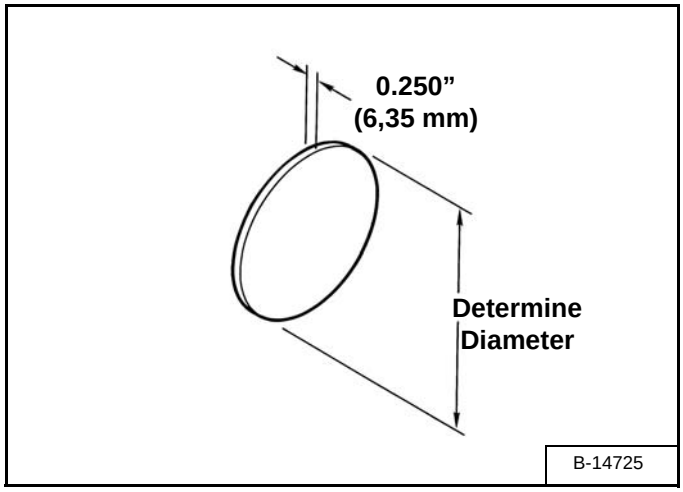
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Assembly (Cont'd)

To install the bearings, a bearing installation tool will be needed.

This tool is placed on the top of the bearing inner and outer race and a press is used to seat the bearings.

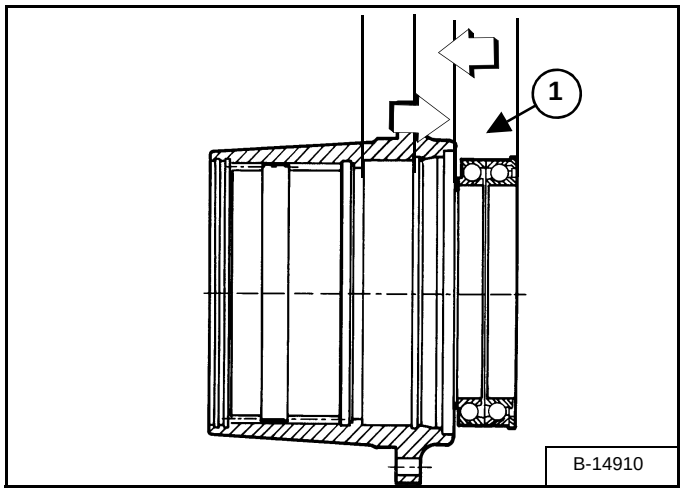
Figure 20-72-59



Fabricate or obtain the tool locally **[Figure 20-72-59]**.

Select a plate that fits over the outer edges of the three pins.

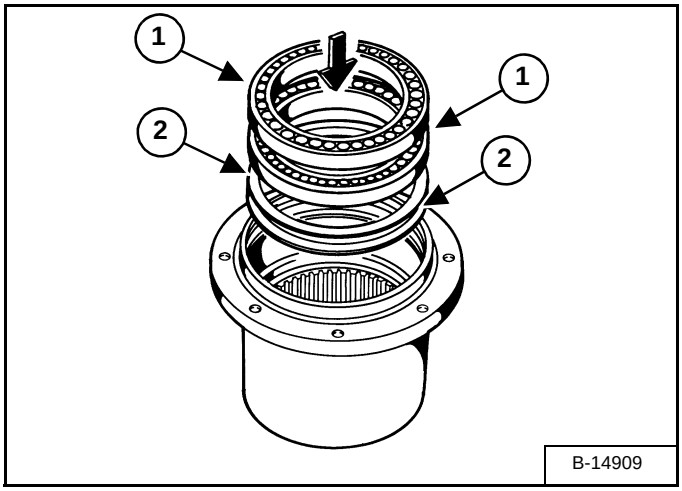
Figure 20-72-60



If either of the bearings or the housing has been replaced, before assembly, measure the bearing area of the hub (Item 1) **[Figure 20-72-60]** and the two bearings. Subtract the bearing measurement from hub measurement. The difference must be between 0.000 - 0.012 in. (0,0 - 0,3 mm). If the difference is greater install shims in the hub.

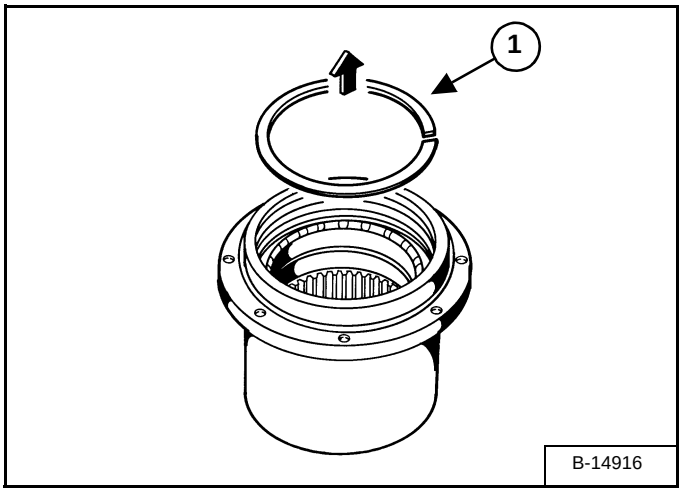
If shims are needed, order the shim kit (P/N 6671939) from Bobcat parts:

Figure 20-72-61



Install the two bearings (Item 1) and shims (Item 2) **[Figure 20-72-61]** (as required) in the housing.

Figure 20-72-62



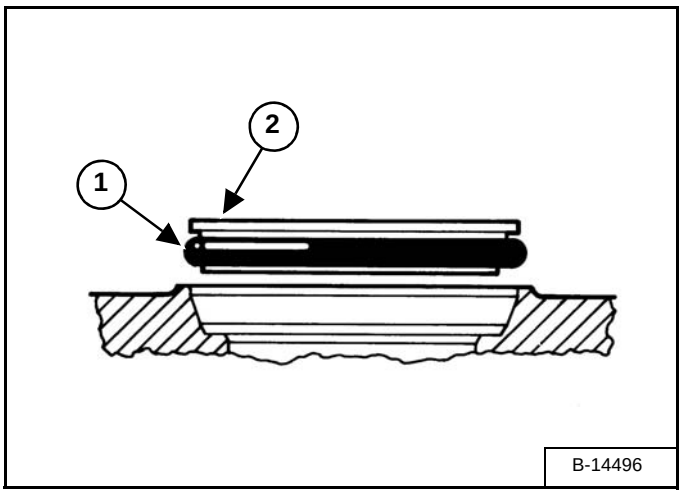
Install the snap ring (Item 1) **[Figure 20-72-62]** in the housing.

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TRAVEL MOTOR (S/N 563111001 & ABOVE) (LATER MODELS) (CONT'D)

Assembly (Cont'd)

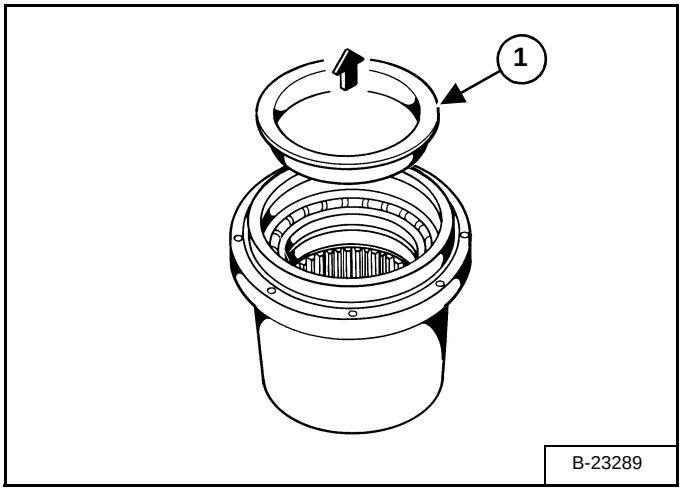
Figure 20-72-63



Install the O-ring (Item 1) on the seal ring (Item 2) **[Figure 20-72-63]**.

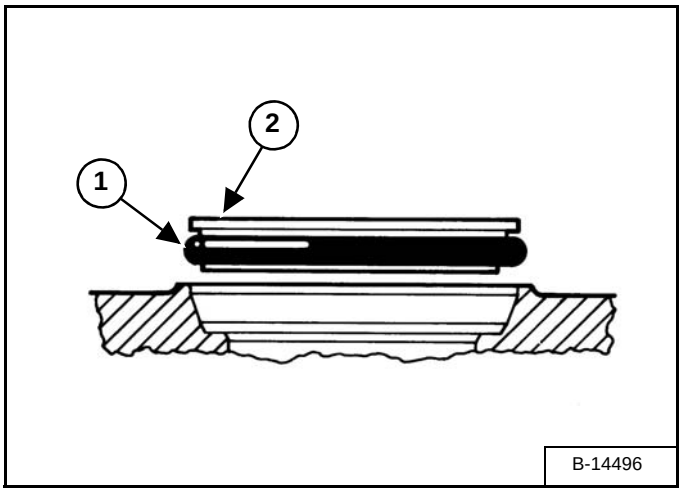
NOTE: Inspect the seal ring for burrs before installing the O-ring. Install the O-ring making sure it is not twisted. To remove any twists, gently pull a section of the O-ring and let it snap back.

Figure 20-72-64



Install the seal ring (Item 1) **[Figure 20-72-64]** in the hub.

Figure 20-72-65

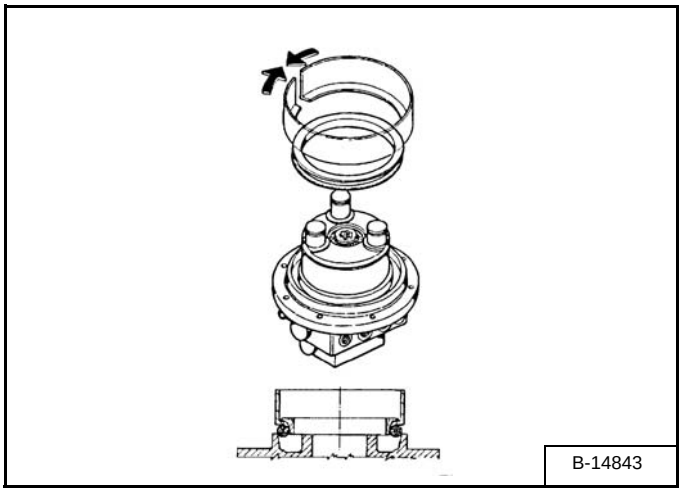


Install the O-ring (Item 1) on the seal ring (Item 2) **[Figure 20-72-65]**.

NOTE: Inspect the seal ring for burrs before installing the O-ring. Install the O-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 motor assembly must be clean and free of any dust, oil film or foreign matter.

Figure 20-72-66



Install the seal installation tool on the seal ring and O-ring assembly **[Figure 20-72-66]**.

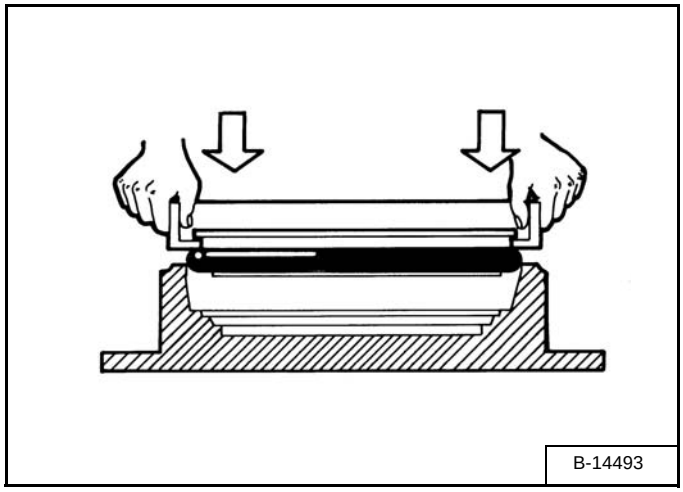
The O-ring and seal ring assembly has to be lubricated with alcohol, so the O-ring will slip past the housing retaining ring and seal uniformly in the motor housing radius **[Figure 20-72-66]**.

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

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Assembly (Cont'd)

Figure 20-72-67



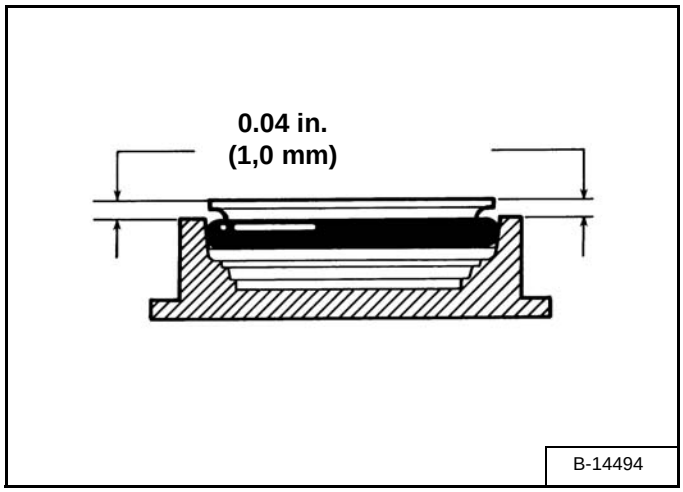
Shake off the excess alcohol and install the seal ring assembly on the motor **[Figure 20-72-67]**.

Use firm even pressure on the installation tool to *pop* the O-ring into the motor housing.

Apply a light film of oil to both metal seal rings.

NOTE: Do not get any oil on the rubber O-ring.

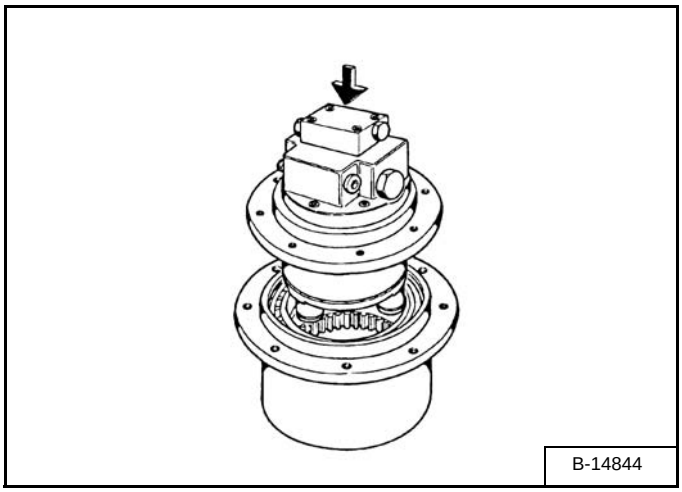
Figure 20-72-68



Remove the seal installation tool. Measure the assembled height at four places 90° apart. The assembled height should be 0.04 in. (1,0 mm) **[Figure 20-72-68]**.

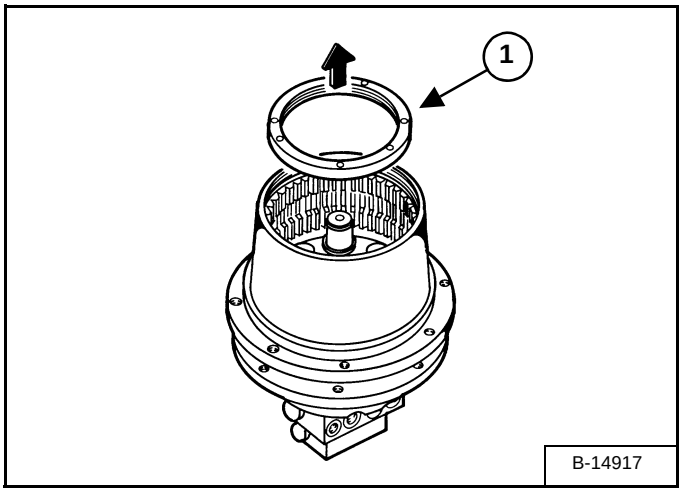
If the assembled height is incorrect, check the O-ring for twists.

Figure 20-72-69



Press the reduction unit and motor assembly in the bearings **[Figure 20-72-69]**.

Figure 20-72-70



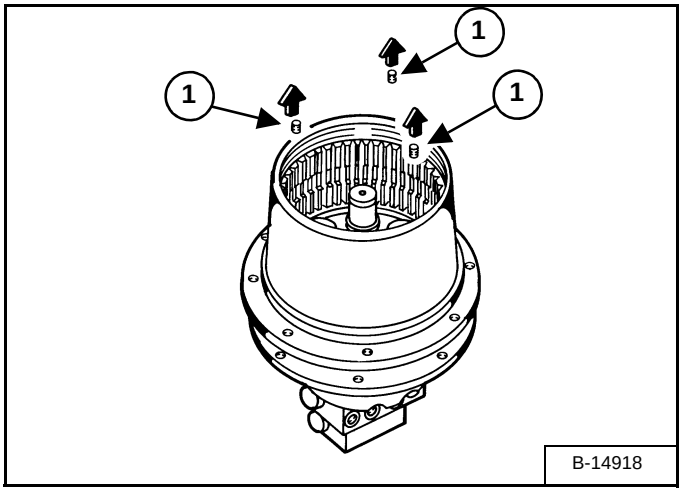
Install the ring nut (Item 1) **[Figure 20-72-70]** on the motor hub. Use the spanner wrench to tighten the ring nut until all backlash between the motor hub and housing is removed. Do not over tighten

NOTE: Install the ring nut with the chamfered side to the bearings.

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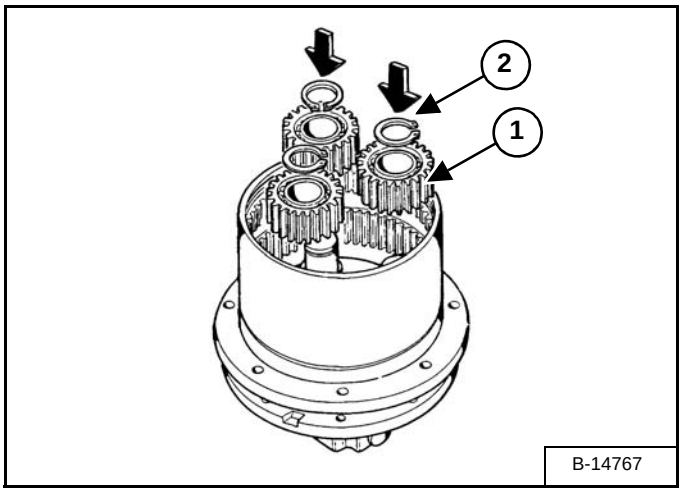
Assembly (Cont'd)

Figure 20-72-71



Apply thread lock adhesive Loctite™ 242 to the ring nut retaining screws (Item 1) **[Figure 20-72-71]**. Install the screws.

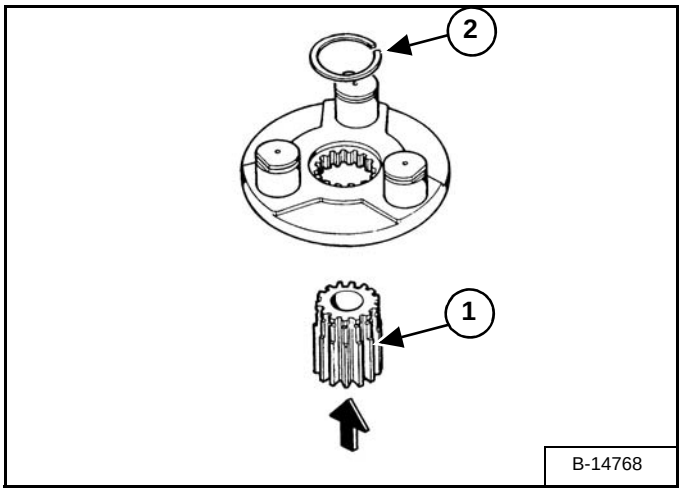
Figure 20-72-72



Install the planetary gears/bearings (Item 1) and snap rings (Item 2) **[Figure 20-72-72]**.

NOTE: The second stage planetary gears/bearings must be installed with the bearing race flare facing down to match the shoulder on the pins.

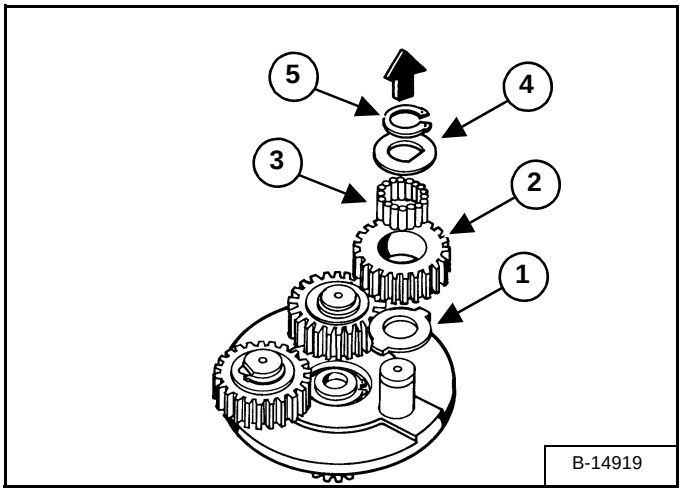
Figure 20-72-73



Install the sun gear (Item 1) **[Figure 20-72-73]** into the outer planetary carrier.

Install the snap ring (Item 2) on the sun gear (Item 1) **[Figure 20-72-73]**.

Figure 20-72-74



Install the thrust washers (Item 1), planetary gears (Item 2), bearings (Item 3), anti-rotation washers (Item 4) and external snap rings (Item 5) **[Figure 20-72-74]**.

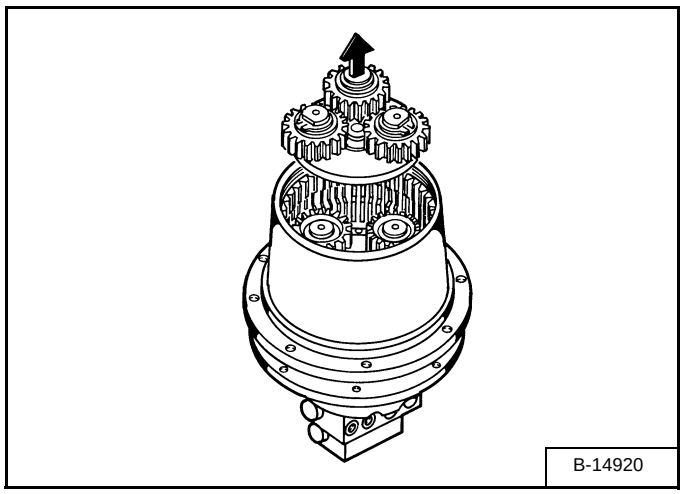
Install the snap rings (Item 5) **[Figure 20-72-74]** so the opening of the snap ring is towards the outside.

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TRAVEL MOTOR (S/N 563111001 & ABOVE) (LATER MODELS) (CONT'D)

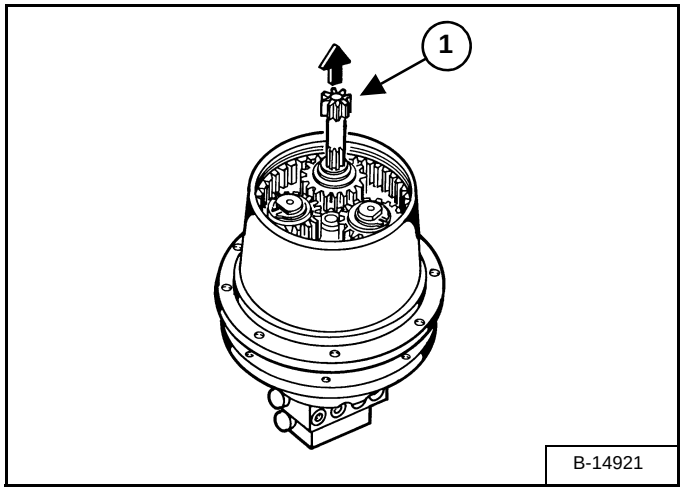
Assembly (Cont'd)

Figure 20-72-75



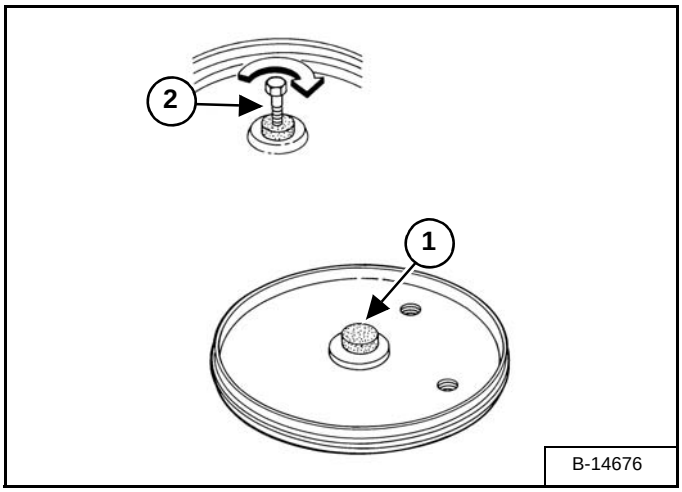
Install the planetary assembly in the housing **[Figure 20-72-75]**.

Figure 20-72-76



Install the sun gear (Item 1) **[Figure 20-72-76]** in the planetary assembly.

Figure 20-72-77



Inspect the cover bushing (Item 1) **[Figure 20-72-77]** for wear.

If the bushing (Item 1) **[Figure 20-72-77]** needs to be replaced, drill a hole in the center of the bushing using a number 3 drill bit.

Thread the hole with a 1/4 x 28 in. N.F. tap.

Install a 1/4 x 28 in. bolt (Item 2) **[Figure 20-72-77]** in the bushing and pull the bushing out of the cover.

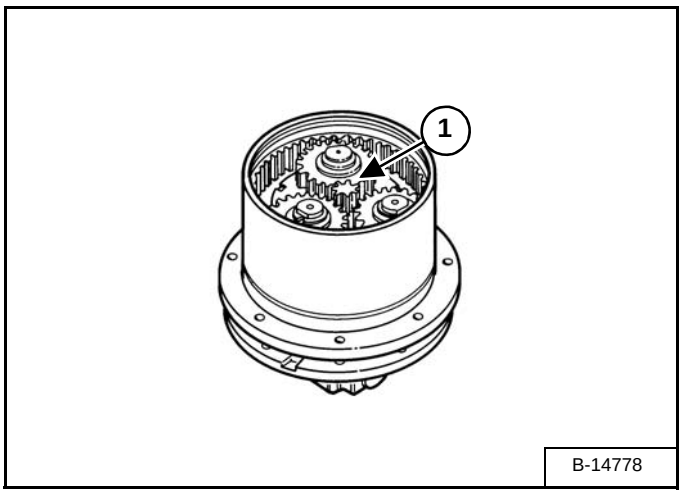
Install the new bushing in the cover with the bevel down.

The clearance between the cover bushing and the sun gear must be 0.016 - 0.031 in. (0,4 - 0,8 mm).

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Assembly (Cont'd)

Figure 20-72-78



Place a 0.500 in. (13 mm) long piece of 0.063 in. (1,5 mm) solder on the end of the sun gear (Item 1) **[Figure 20-72-78]**.

Seat the cover in the hub.

Remove the cover and measure the solder.

If the clearance between the sun gear and cover bushing does not meet specifications, order the bushing shim kit from Bobcat Parts.

P/N 6669597	0.020 in. (0,5 mm)
P/N 6669598	0.030 in. (0,76 mm)
P/N 6669599	0.060 in. (1,27 mm)

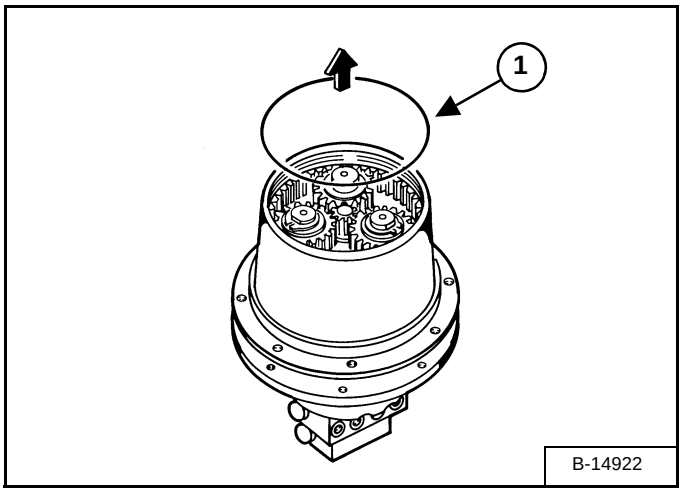
Remove the bushing.

Install the correct shim under the bushing and install the bushing.

NOTE: Make sure there are no burrs on the bushing face from bushing removal.

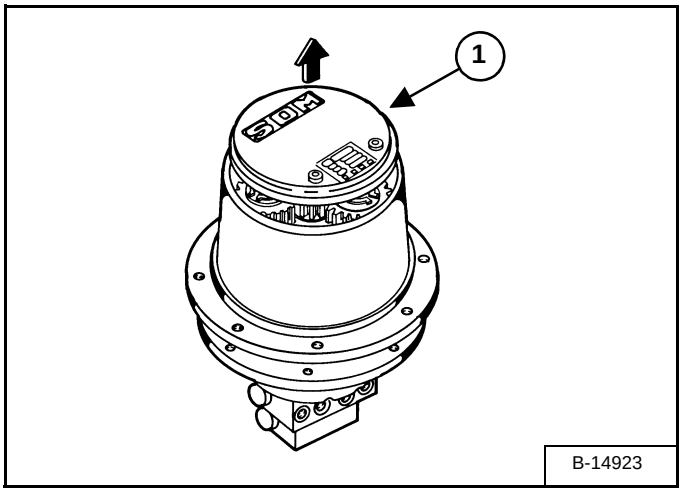
Repeat the procedure for checking clearance between the sun gear and cover bushing.

Figure 20-72-79



Apply oil to and install the O-ring (Item 1) **[Figure 20-72-79]** in the housing.

Figure 20-72-80

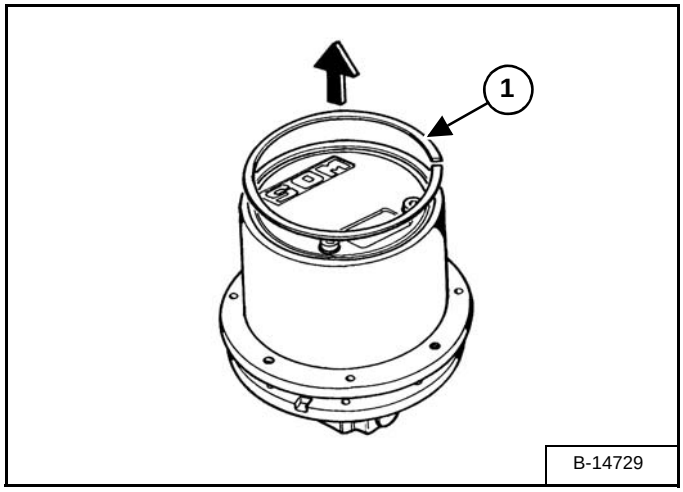


Install the cover (Item 1) **[Figure 20-72-80]** on the housing.

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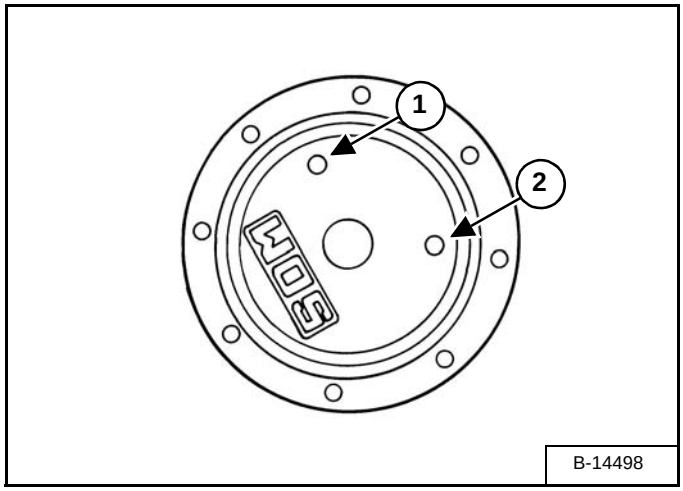
Assembly (Cont'd)

Figure 20-72-81



Install the snap ring (Item 1) **[Figure 20-72-81]** securing the cover to the motor housing.

Figure 20-72-82



Add 1.7 qt. (1,6 L) of gear lube 90W into the top plug hole (Item 1) until the gear lube is at the bottom of the plug hole (Item 2) **[Figure 20-72-82]**.

Install and tighten the two plugs.

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SWIVEL JOINT

Removal And Installation

IMPORTANT

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

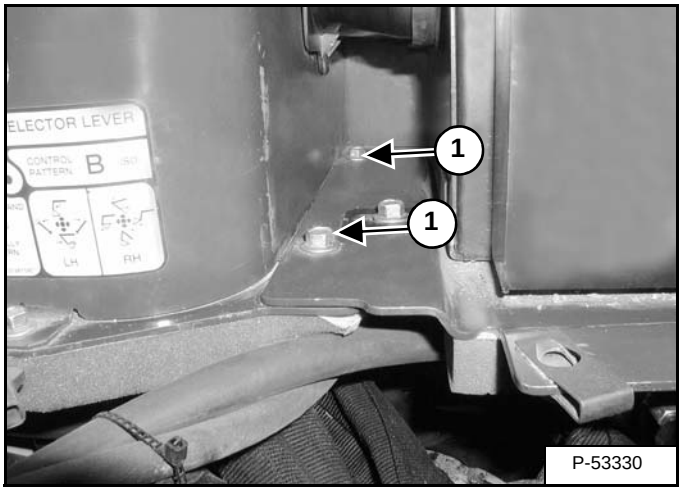
I-2003-0888

Remove the seat and seat mount. (See Removal And Installation on Page 50-40-1)

Remove the floormat and floor plate. (See Removal And Installation on Page 50-120-1)

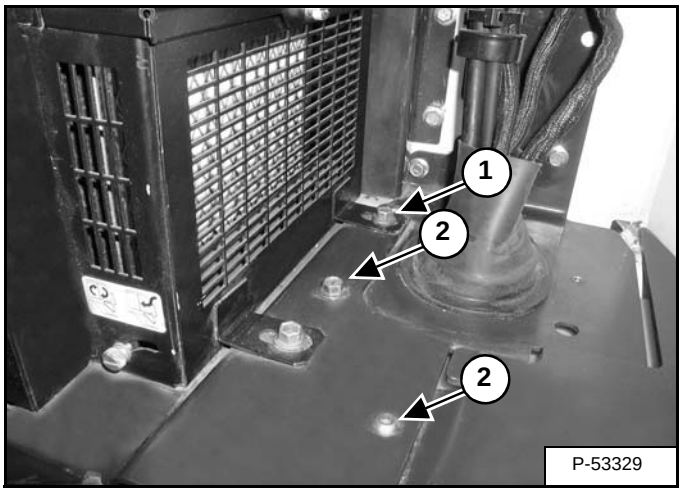
Remove the left console base. (See Console Base Removal And Installation on Page 50-60-16)

Figure 20-80-1



Remove the bolts (Item 1) **[Figure 20-80-1]** from the right side of the rear floor plate.

Figure 20-80-2



Remove the bolt (Item 1) **[Figure 20-80-2]** from the left side of the evaporator/heater unit.

Remove the bolts (Item 2) **[Figure 20-80-2]** from the rear floor plate.

Figure 20-80-3



Reposition the evaporator/heater unit as shown **[Figure 20-80-3]**.

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Removal And Installation (Cont'd)

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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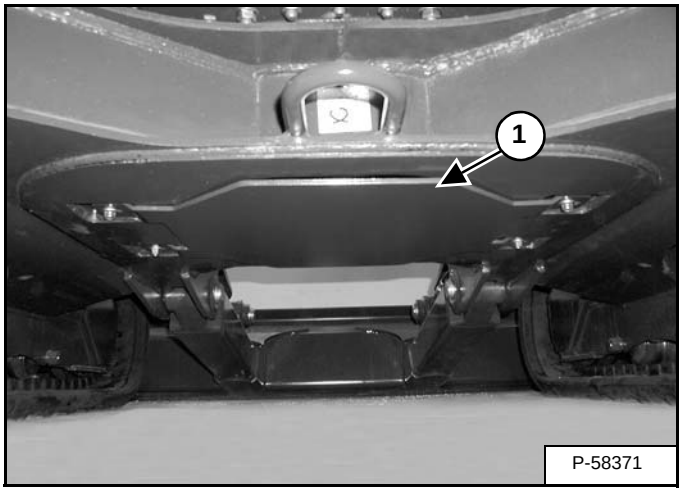
Mark the hoses for ease of installation.

Figure 20-80-4



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

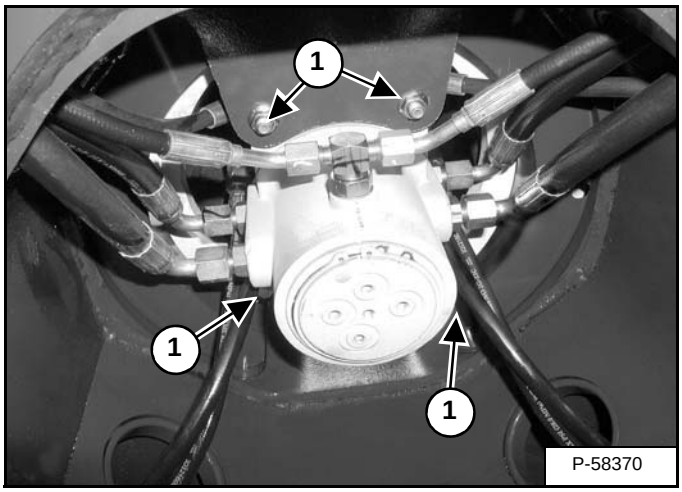
Figure 20-80-5



Remove the access plate (Item 1) **[Figure 20-80-5]** from the bottom of the undercarriage.

Mark the hoses for ease of installation.

Figure 20-80-6



Disconnect the hoses from the lower end of the swivel joint **[Figure 20-80-6]**.

Remove the four mount bolts (Item 1) **[Figure 20-80-6]** from the swivel joint.

Support the swivel joint with a jack.

Rotate the swivel joint 90° to allow clearance between the swivel joint and the mount brackets.

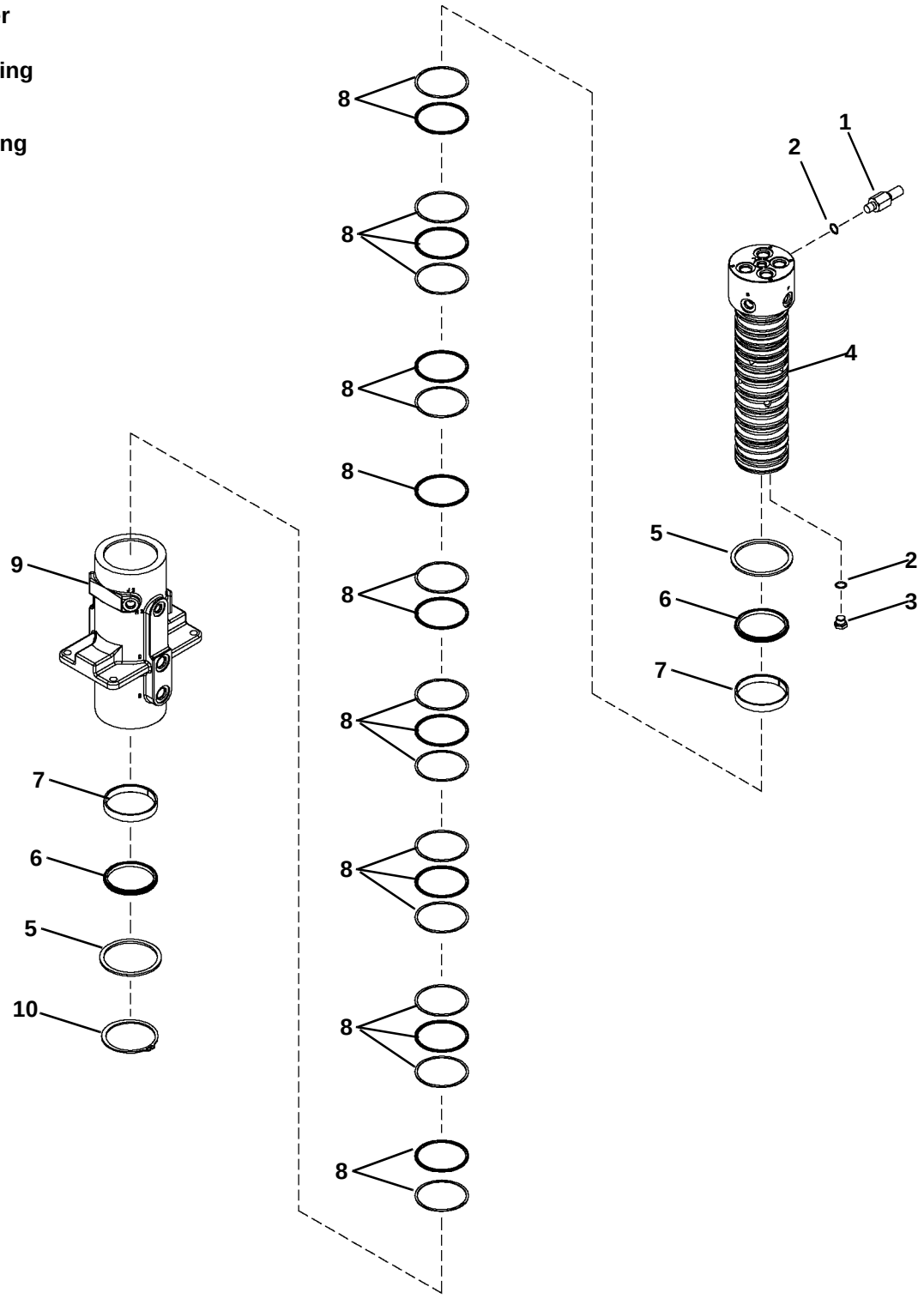
Installation: Apply thread adhesive (Loctite 242) to the bolts before installation.

Lower and remove the swivel joint through the bottom of the undercarriage.

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Parts Identification

1. Bolt
2. O-Ring
3. Plug
4. Rotor
5. Washer
6. Seal
7. Wear ring
8. Seal
9. Body
10. Snapring



PE1906S

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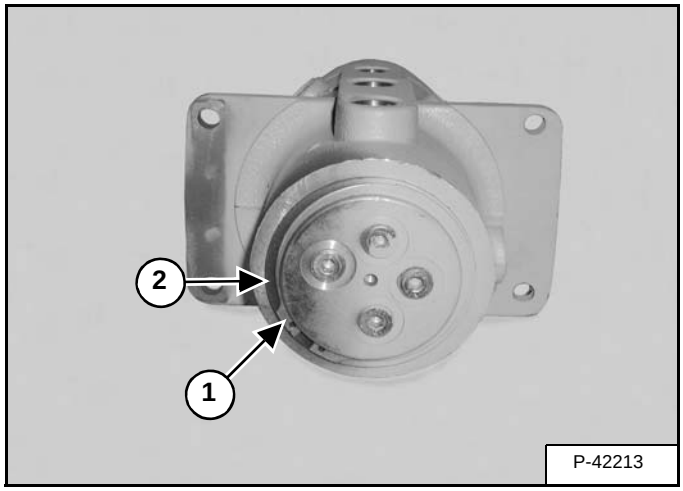
Description

The swivel joint is a rotary hydraulic swivel which diverts hydraulic oil, under pressure, to the travel motors and the blade cylinder.

Disassembly

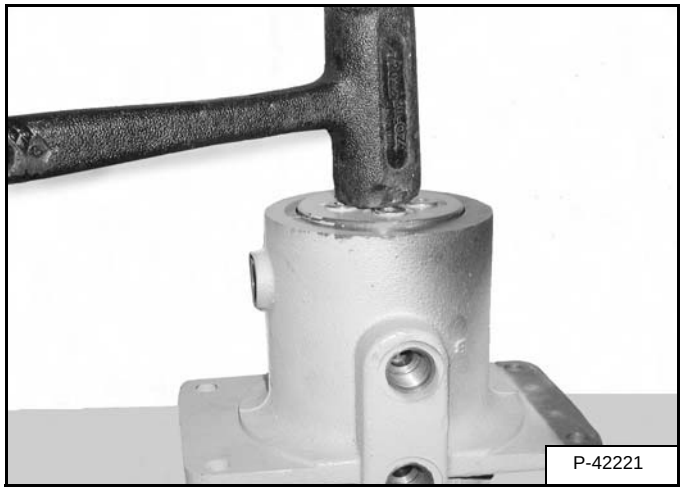
Mark the cover and body for ease of assembly.

Figure 20-80-7



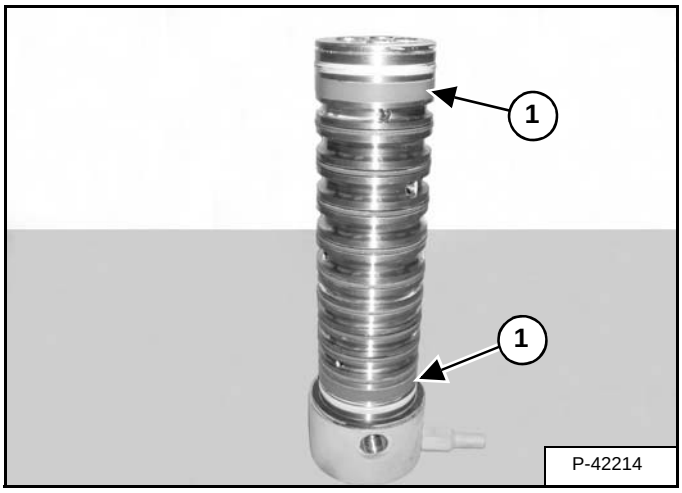
Remove the snap ring (Item 1) and washer (Item 2) **[Figure 20-80-7]**.

Figure 20-80-8



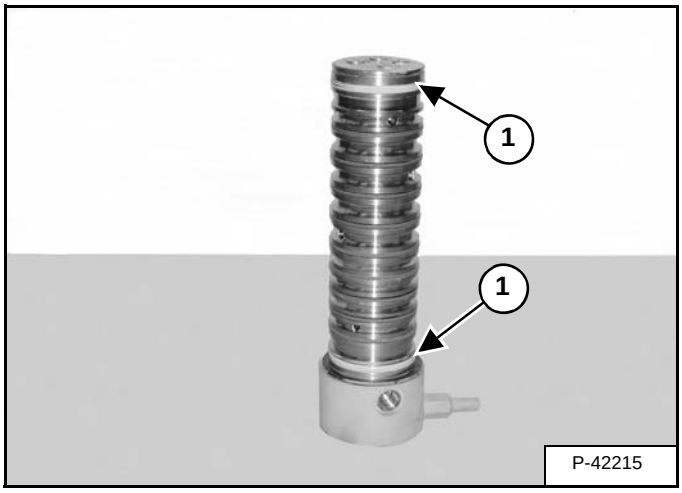
Clamp the swivel joint, base end down in a vise, and drive the rotor out of the body with a soft faced hammer **[Figure 20-80-8]**.

Figure 20-80-9



Remove the two wear rings (Item 1) **[Figure 20-80-9]**.

Figure 20-80-10

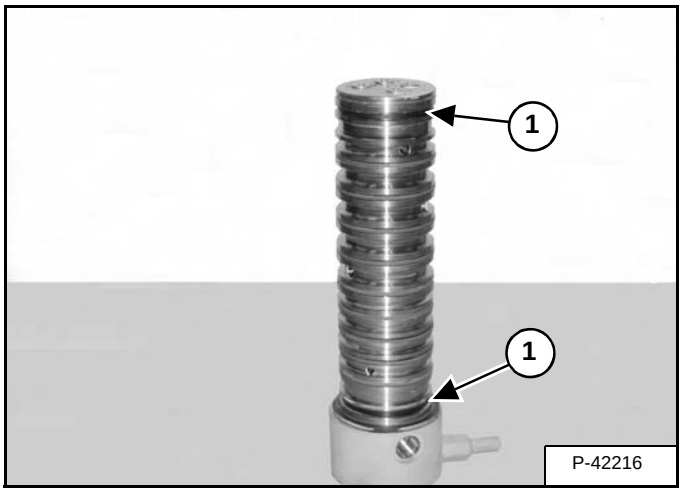


Remove the two seals (Item 1) **[Figure 20-80-10]**.

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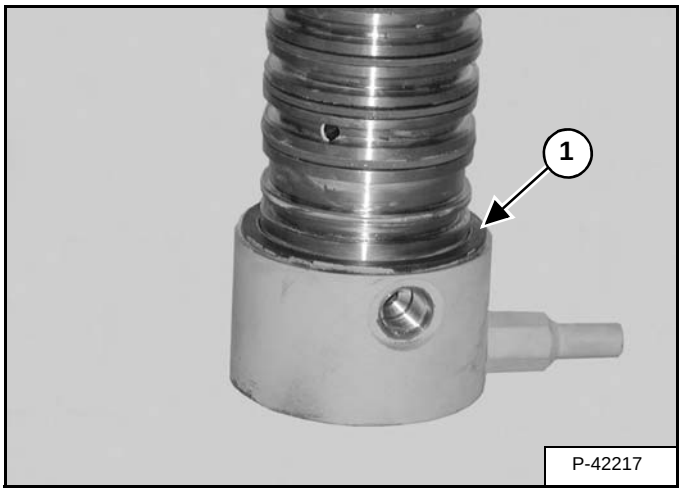
Disassembly (Cont'd)

Figure 20-80-11



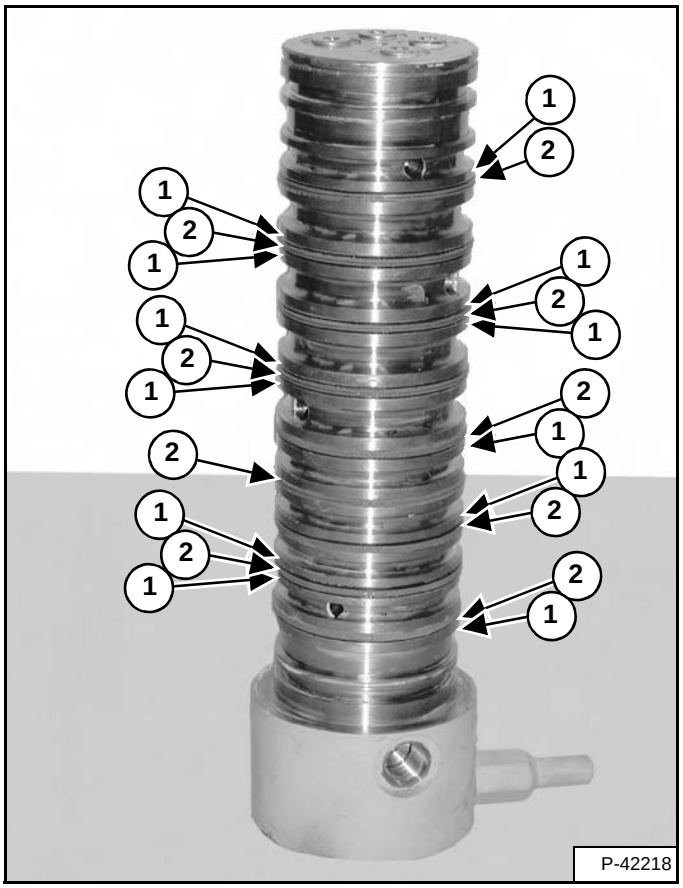
Remove the two backup rings (Item 1) **[Figure 20-80-11]**.

Figure 20-80-12



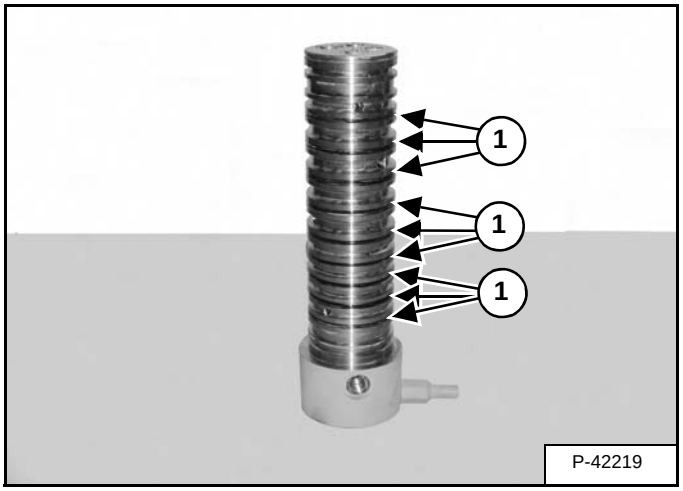
Remove the seal (Item 1) **[Figure 20-80-12]**.

Figure 20-80-13



Remove the twelve back up rings (Item 1) and nine glid rings (Item 2) **[Figure 20-80-13]**.

Figure 20-80-14

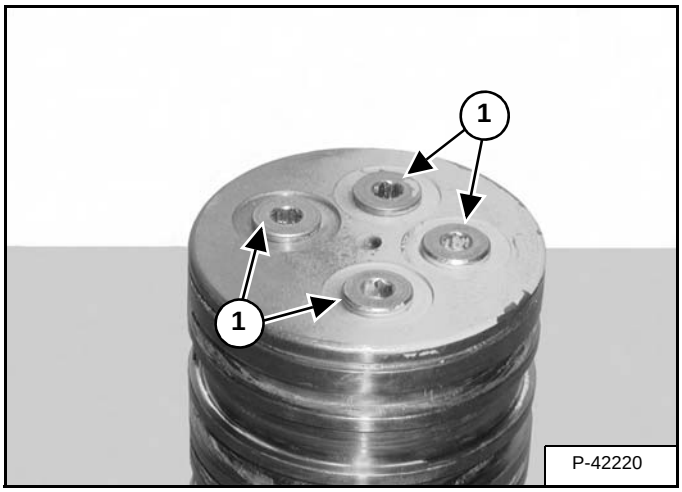


Remove the nine O-rings (Item 1) **[Figure 20-80-14]**.

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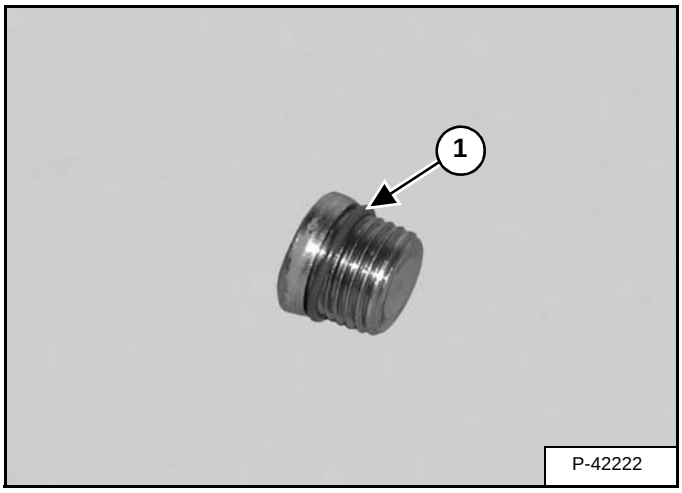
Disassembly (Cont'd)

Figure 20-80-15



Remove the four plugs (Item 1) **[Figure 20-80-15]**.

Figure 20-80-16



Remove the O-ring (Item 1) **[Figure 20-80-16]** from the plugs.

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Assembly

Clean all components in solvent and dry with compressed air.

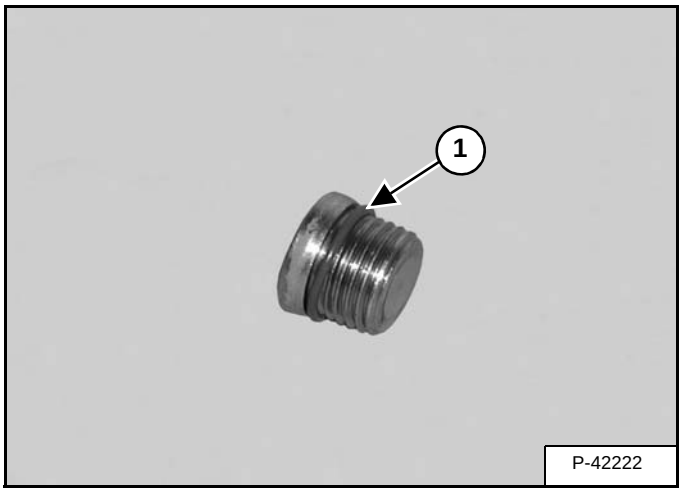
NOTE: Use care not to scratch the rotor surface as damage to the finished surface could cause internal leakage.

Check the components for wear or damage.

Always use new seals, O-rings and glid rings.

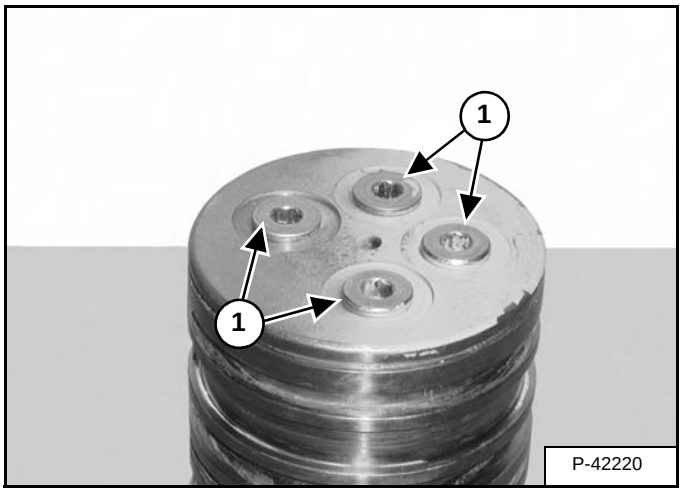
Apply clean hydraulic oil to the components during installation.

Figure 20-80-17



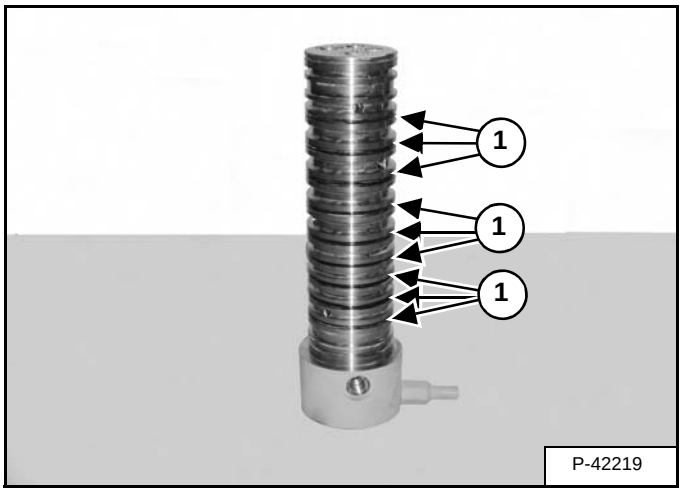
Install O-rings (Item 1) **[Figure 20-80-17]** on the plugs.

Figure 20-80-18



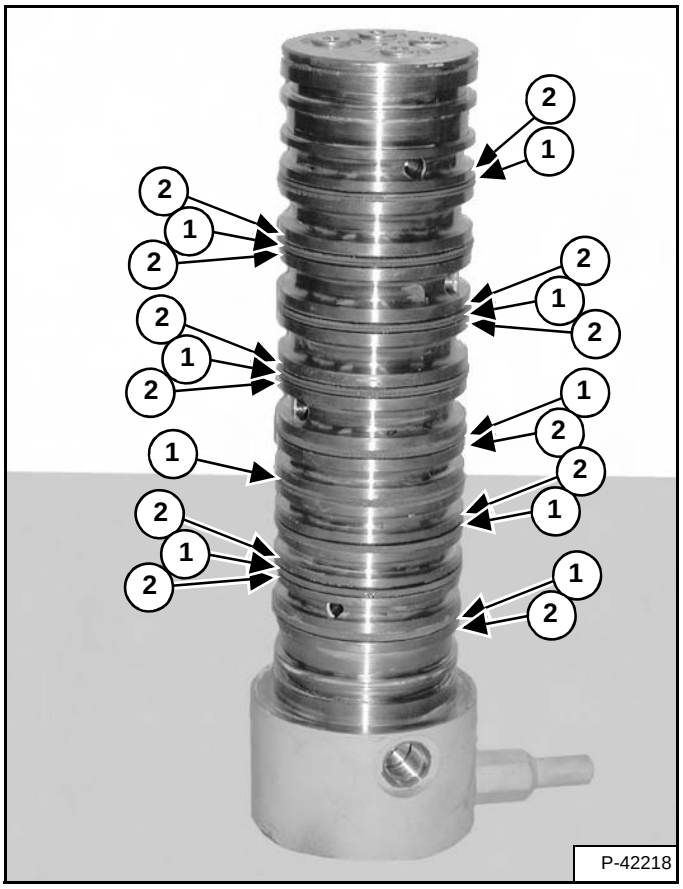
Install the four plugs (Item 1) **[Figure 20-80-18]** in the rotor.

Figure 20-80-19



Install the nine O-rings (Item 1) **[Figure 20-80-19]** on the rotor.

Figure 20-80-20



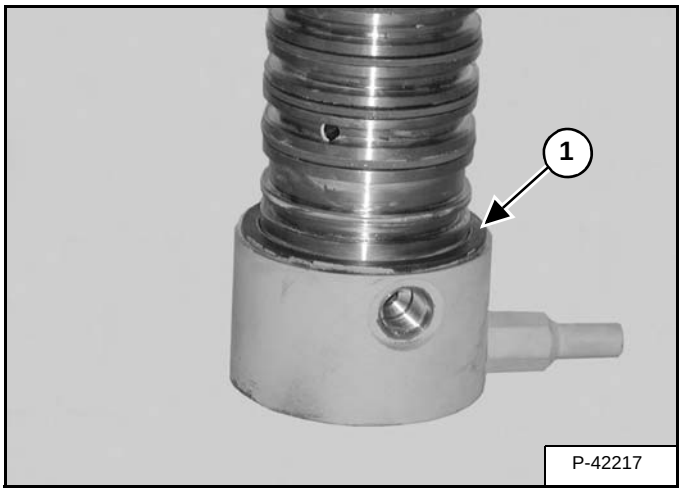
Heat the glid rings in hydraulic oil for three minutes at 130° F (54° C).

Install the nine glid rings (Item 1) and twelve backup rings (Item 2) **[Figure 20-80-20]** on the rotor.

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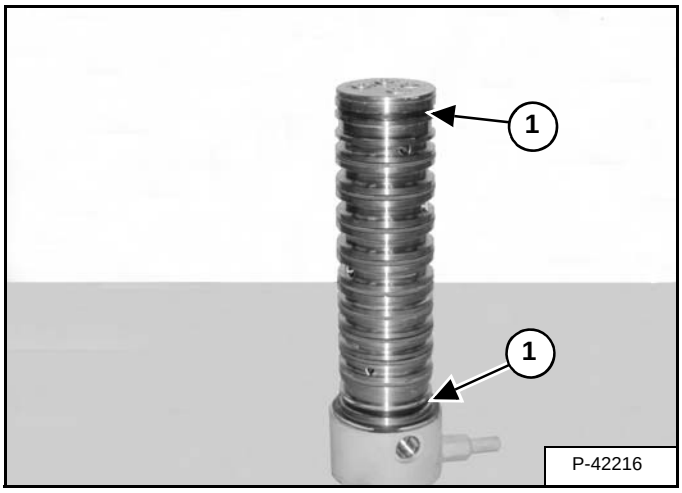
Assembly (Cont'd)

Figure 20-80-21



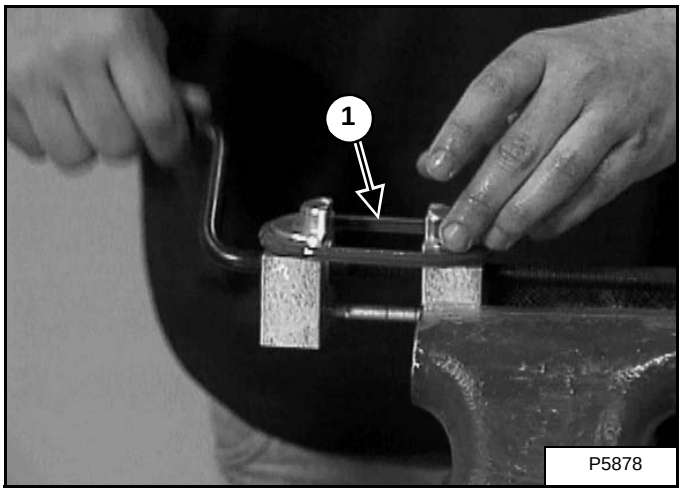
Install the seal (Item 1) **[Figure 20-80-21]**.

Figure 20-80-22



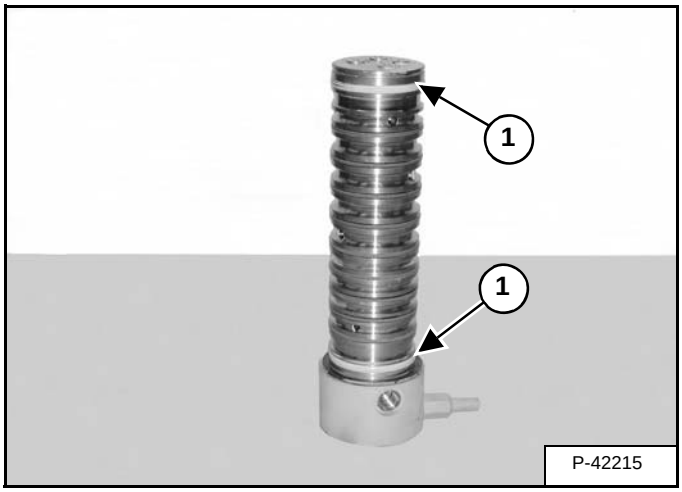
Install the two backup rings (Item 1) **[Figure 20-80-22]**.

Figure 20-80-23



Stretch the seals (Item 1) **[Figure 20-80-23]** until they fit over the rotor.

Figure 20-80-24

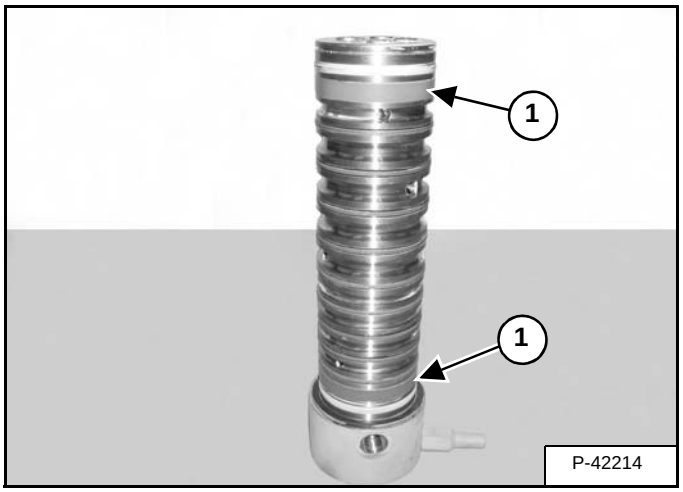


Install the seals (Item 1) **[Figure 20-80-24]**.

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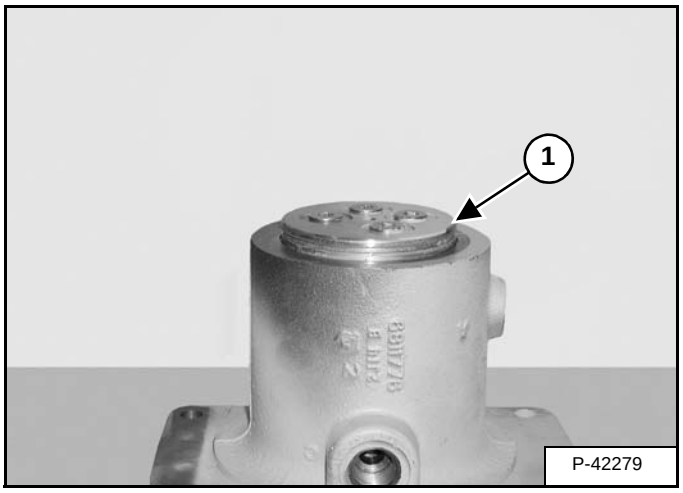
Assembly (Cont'd)

Figure 20-80-25



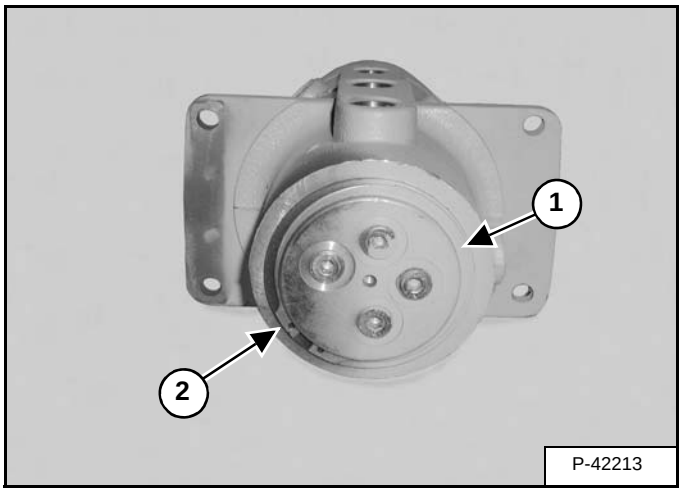
Install the wear rings (Item 1) **[Figure 20-80-25]**.

Figure 20-80-26



Seat the rotor (Item 1) **[Figure 20-80-26]**. Using a soft faced hammer.

Figure 20-80-27



Install the washer (Item 1) and snap ring (Item 2) **[Figure 20-80-27]**.

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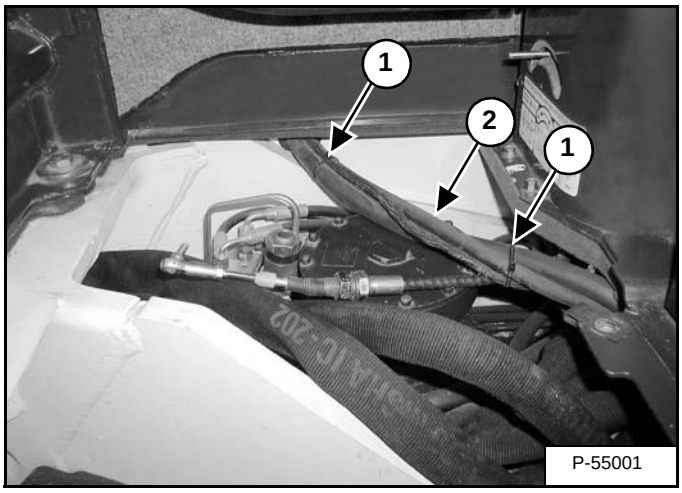
SWING MOTOR

Removal And Installation

Remove the floor mat and floor plate. (See Removal And Installation on Page 50-120-1)

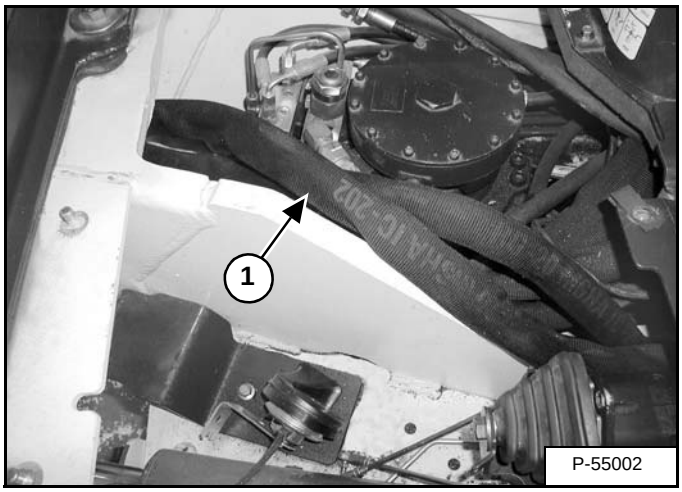
Remove the travel controls. (See Removal And Installation on Page 50-100-1)

Figure 20-90-1



Remove the tie straps (Item 1). Relocate the right pedal linkage, wire harness and A/C hoses (Item 2) **[Figure 20-90-1]**.

Figure 20-90-2



Relocate the hoses (Item 1) **[Figure 20-90-2]**.

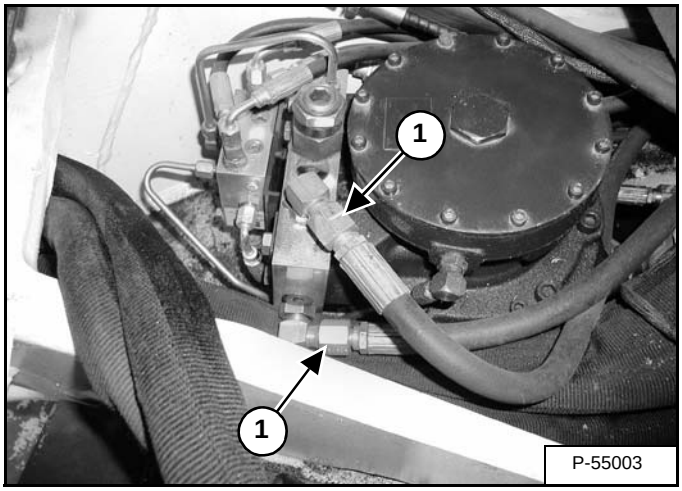
IMPORTANT

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.

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Mark all hoses for correct installation.

Figure 20-90-3

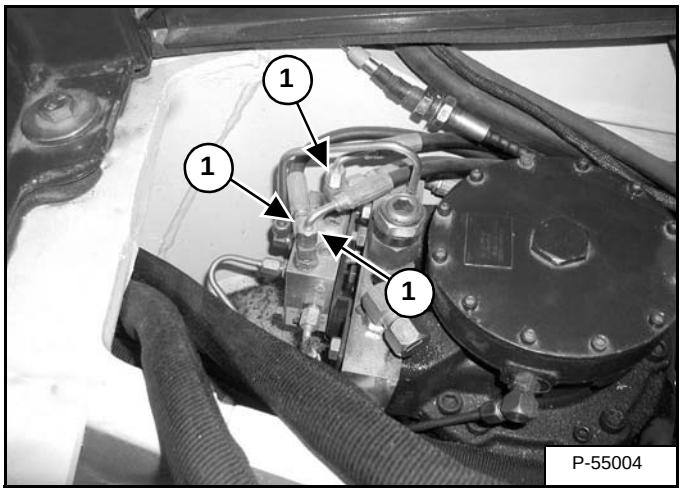


Remove the hoses (Item 1) **[Figure 20-90-3]**.

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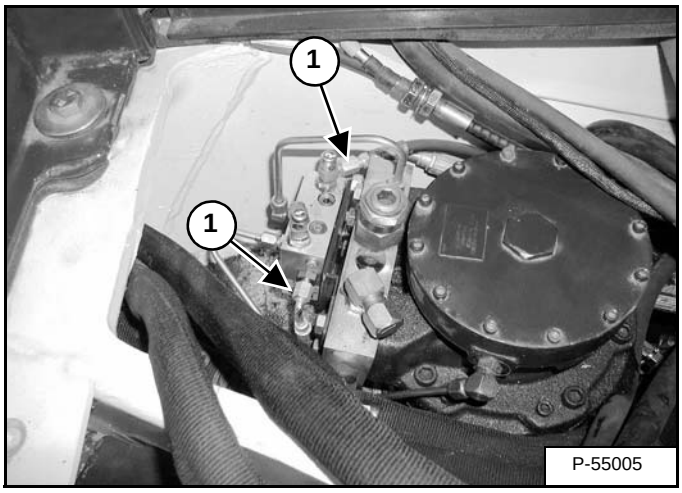
Removal And Installation (Cont'd)

Figure 20-90-4



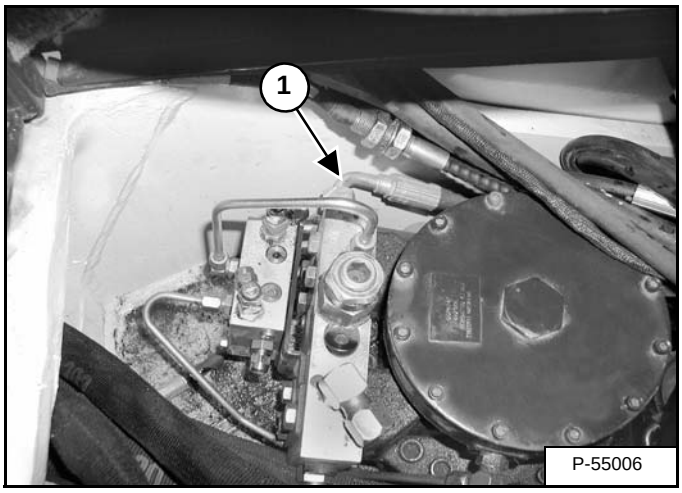
Remove the hoses (Item 1) **[Figure 20-90-4]**.

Figure 20-90-5



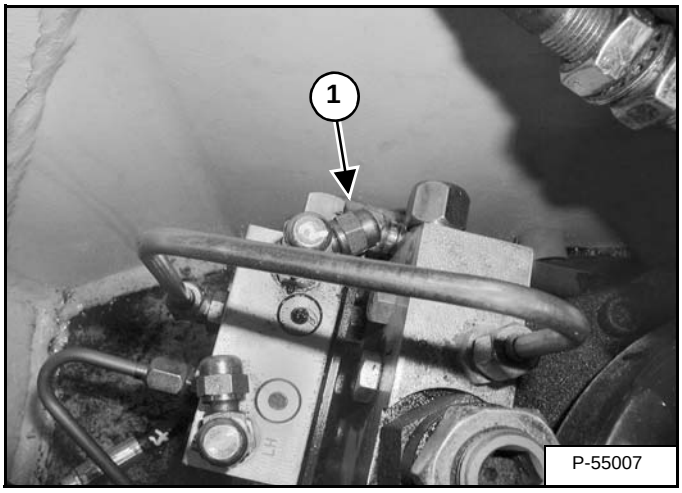
Remove the hoses (Item 1) **[Figure 20-90-5]**.

Figure 20-90-6



Remove the hose (Item 1) **[Figure 20-90-6]**.

Figure 20-90-7

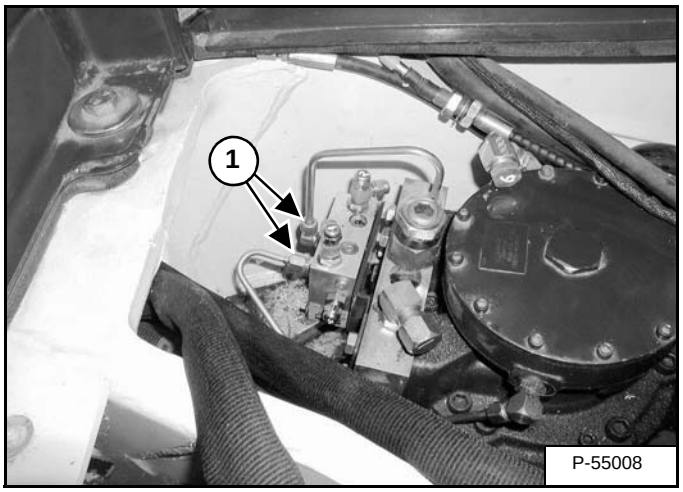


Remove the 2 hoses (Item 1) **[Figure 20-90-7]**.

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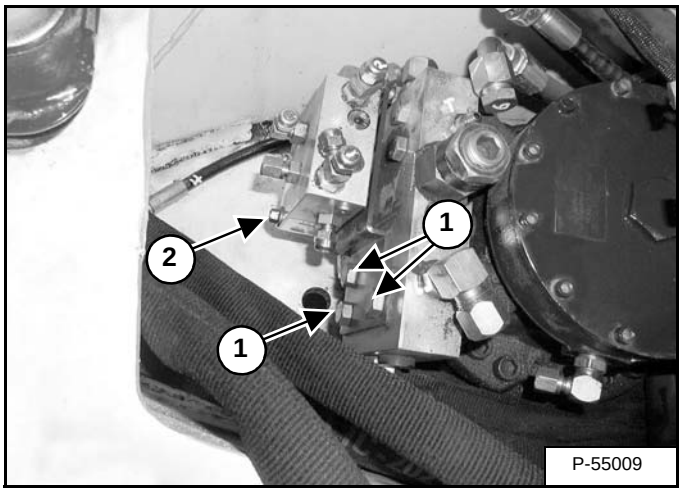
Removal And Installation (Cont'd)

Figure 20-90-8



Remove the tubelines (Item 1) **[Figure 20-90-8]**.

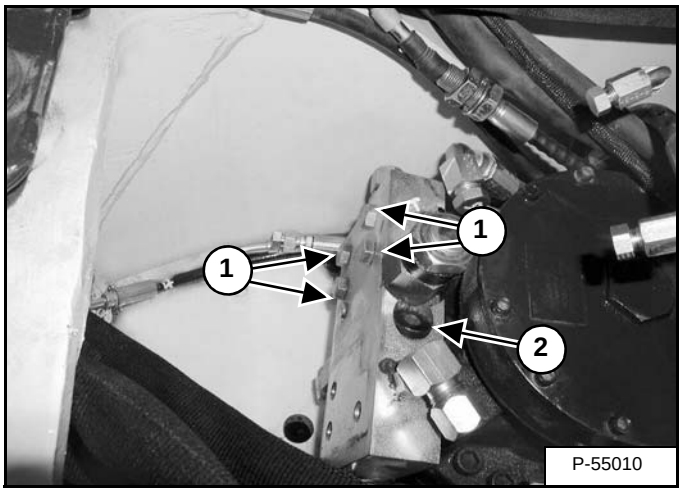
Figure 20-90-9



Remove the bolts (Item 1). Remove the dual sequence valve (Item 2) **[Figure 20-90-9]**.

Installation: Tighten all of the bolts snug. Then tighten to 45 ft.-lb. (61 N•m) torque.

Figure 20-90-10

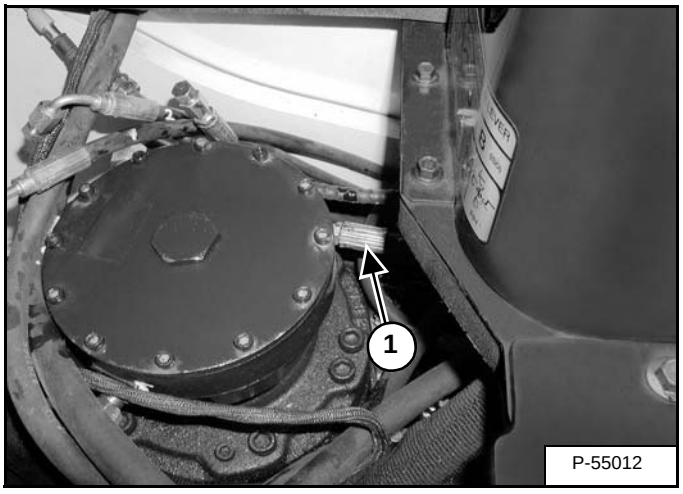


Remove the bolts (Item 1) and crossport relief valve (Item 2) **[Figure 20-90-10]**.

NOTE: The brake can be replaced without removing the swing motor from the excavator. Follow the brake replacement procedure listed in the swing motor disassembly section. (See "Disassembly" on Page 20-90-7.)

Installation: Tighten the bolts to 45 ft.-lb. (61 N•m) torque.

Figure 20-90-11

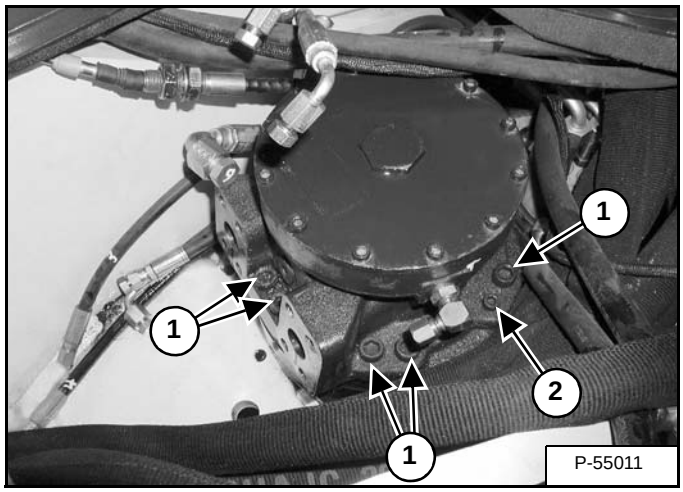


Remove the hose (Item 1) **[Figure 20-90-11]**.

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Removal And Installation (Cont'd)

Figure 20-90-12

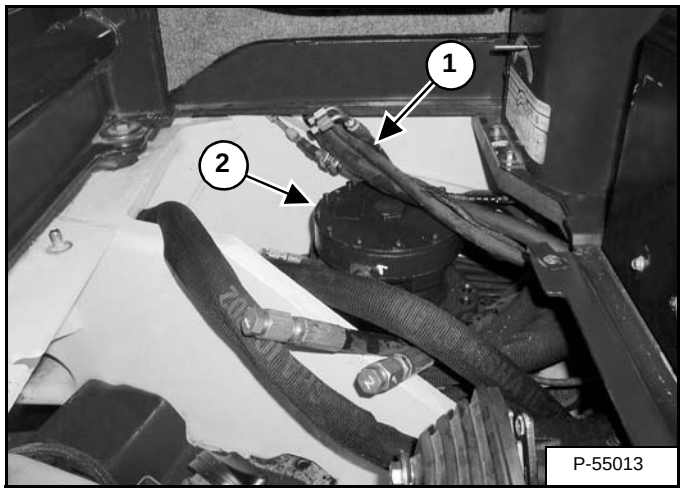


Remove the 10 bolts (Item 1) **[Figure 20-90-12]**.

Installation: Apply thread lock adhesive (Loctite™ 242) to the bolt threads. Tighten the bolts to 110 ft.-lb. (149 N•m) torque.

NOTE: The bolts (Item 2) [Figure 20-90-12] are 6 mm and fasten the motor cam ring to the motor housing. Do Not remove these bolts when removing the swing motor bolts.

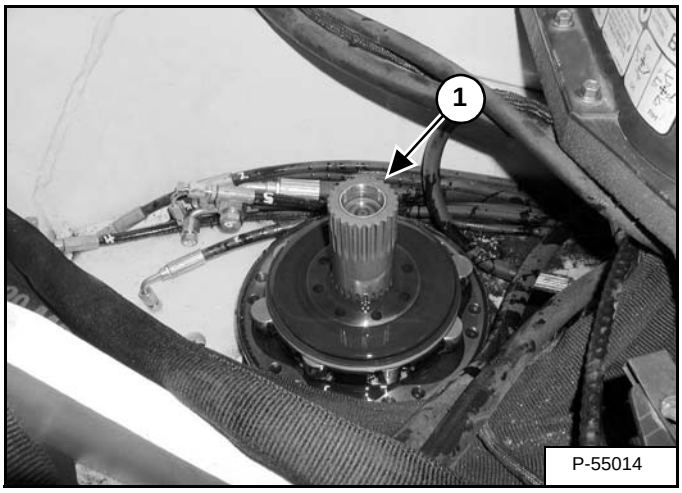
Figure 20-90-13



Reposition the hoses, right pedal linkage and wire harness (Item 1) **[Figure 20-90-13]**.

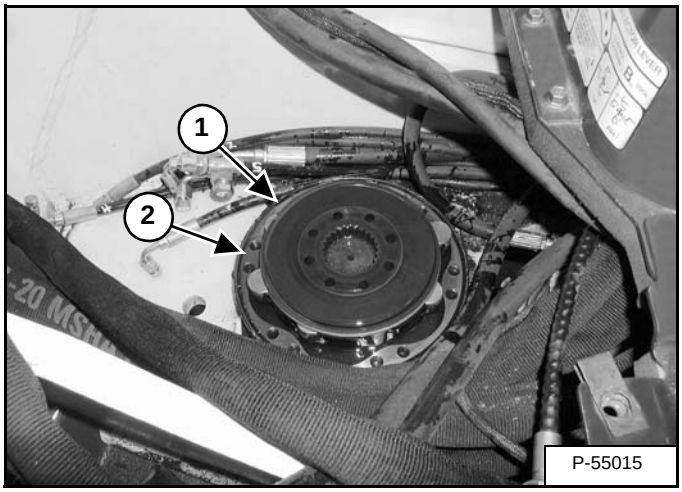
Remove the swing motor (Item 2) **[Figure 20-90-13]**.

Figure 20-90-14



Remove the motor shaft (Item 1) **[Figure 20-90-14]** from the motor rotating group.

Figure 20-90-15



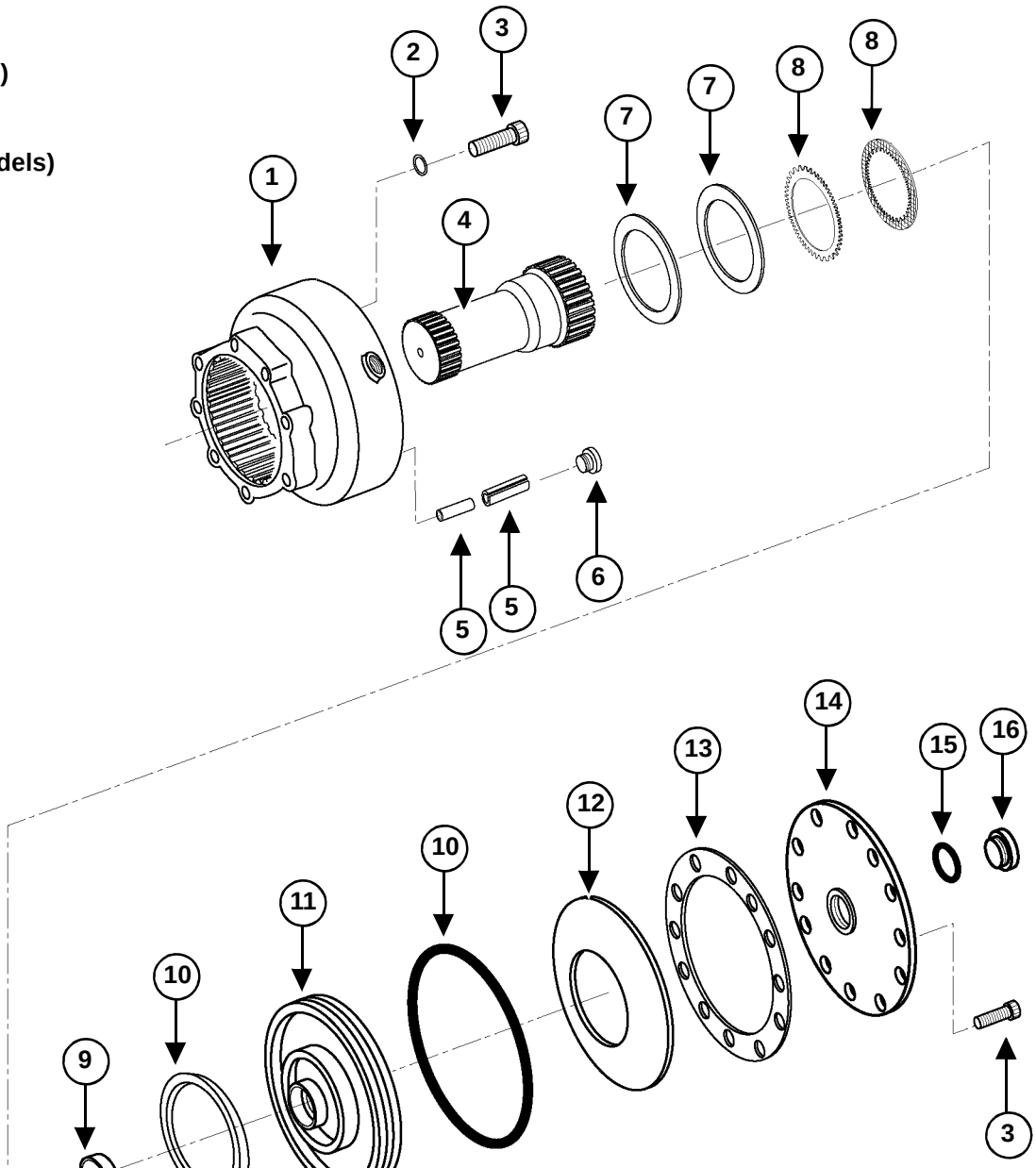
Remove the rotating group (Item 1) **[Figure 20-90-15]** from the motor carrier shaft.

Remove the O-ring (Item 2) **[Figure 20-90-15]** from the motor carrier.

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Parts Identification

1. Housing
2. Washer
3. Bolt
4. Shaft
5. Pin (Later Models)
6. Plug (Later Models)
7. Shim
8. Brake Disc
9. Bushing (Later Models)
10. Seal
11. Piston
12. Spring
13. Gasket
14. Cover
15. O-Ring
16. Plug

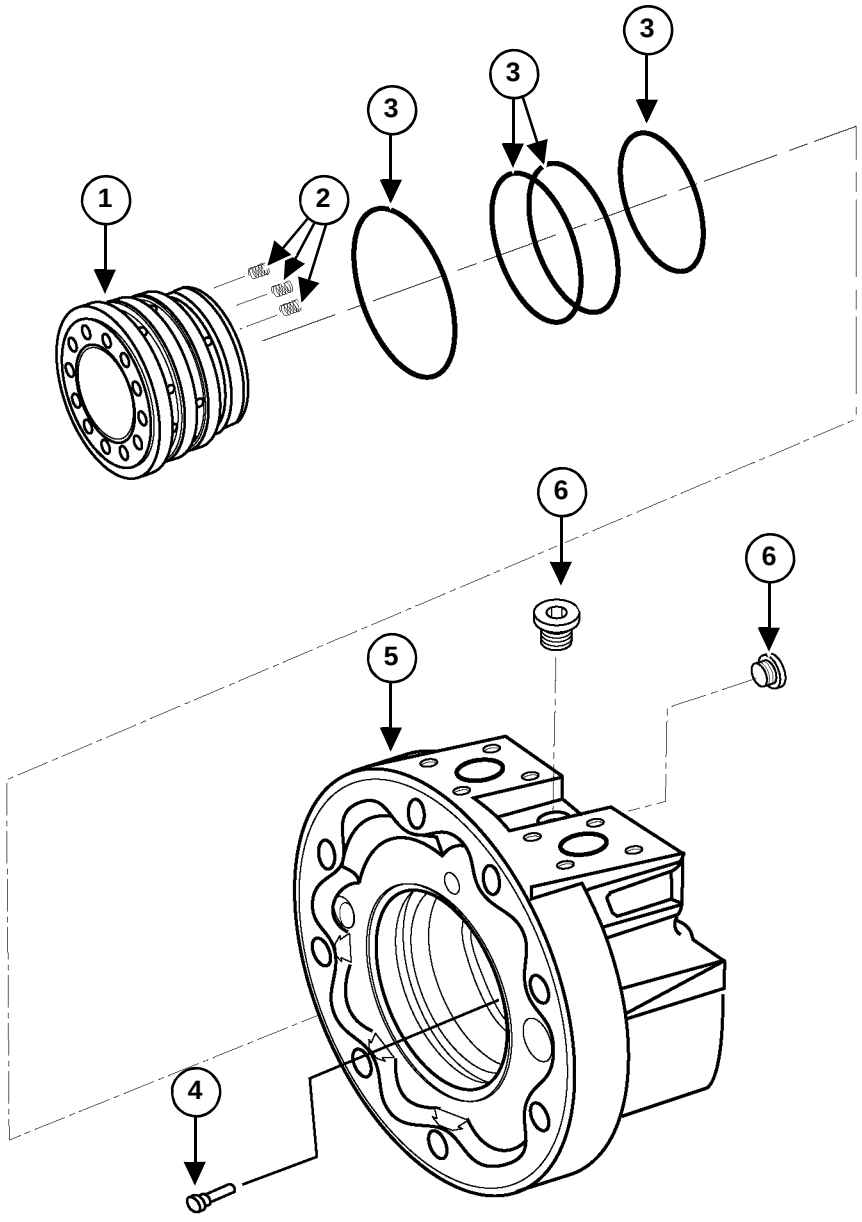


B-19910

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Parts Identification (Cont'd)

1. Distributor
2. Spring
3. Seal
4. Pin
5. Housing
6. Plug



B-19909

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Disassembly

Clean the outside of the swing motor before disassembly.

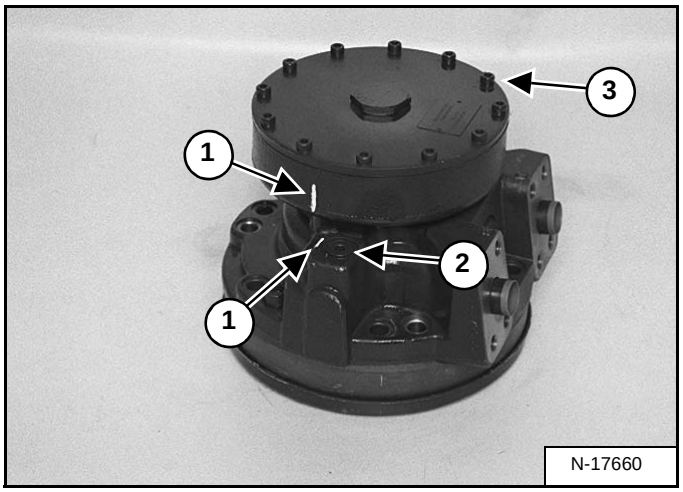
Mark the outside of the swing motor for ease of assembly.

IMPORTANT

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

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Figure 20-90-16



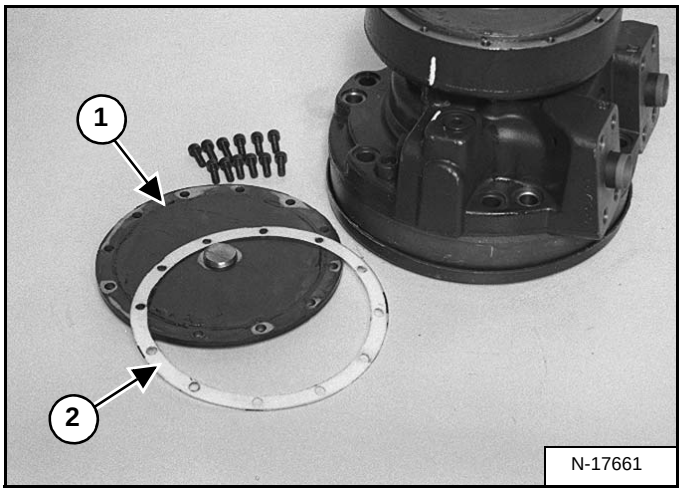
Put a mark (Item 1) **[Figure 20-90-16]** on the brake and motor housing for correct assembly procedure.

Remove the plug (Item 2) **[Figure 20-90-16]** and drain the oil into a container.

Remove the bolts from the cover plate (Item 3) **[Figure 20-90-16]**.

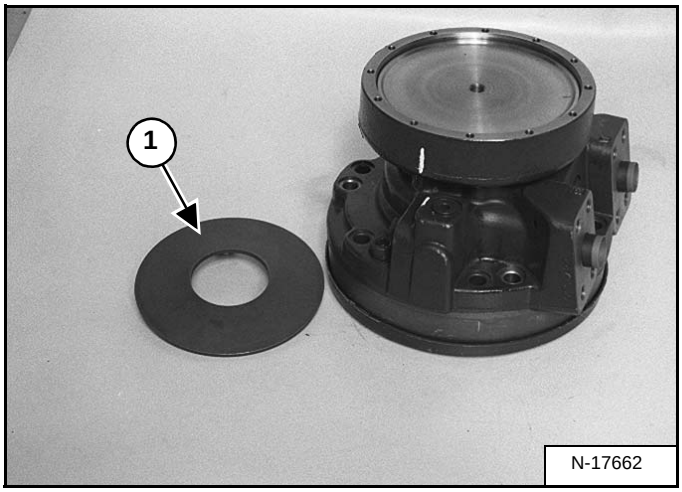
NOTE: Loosen the bolts alternately, 1 turn at a time until the disc spring is released.

Figure 20-90-17



Remove the cover plate (Item 1) and gasket (Item 2) **[Figure 20-90-17]**.

Figure 20-90-18

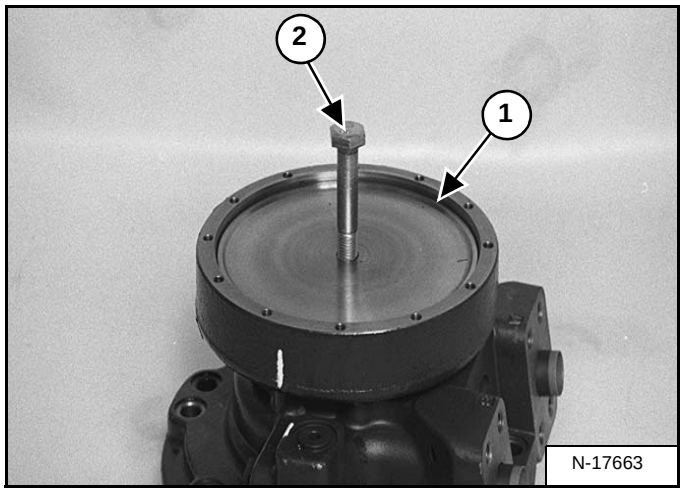


Remove the disc spring (Item 1) **[Figure 20-90-18]** from the brake housing.

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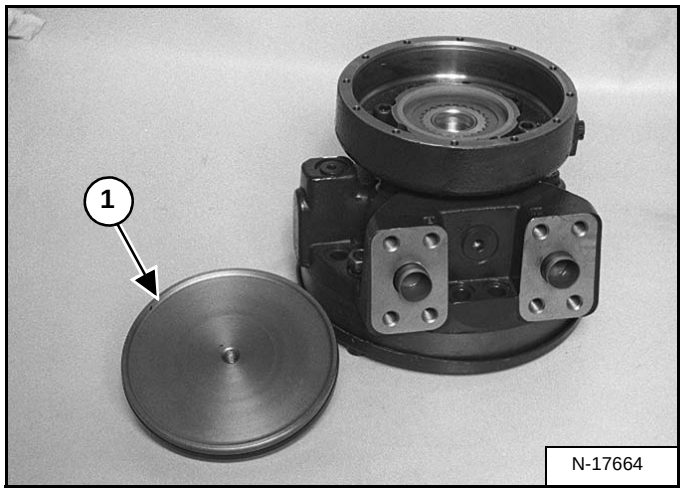
Disassembly (Cont'd)

Figure 20-90-19



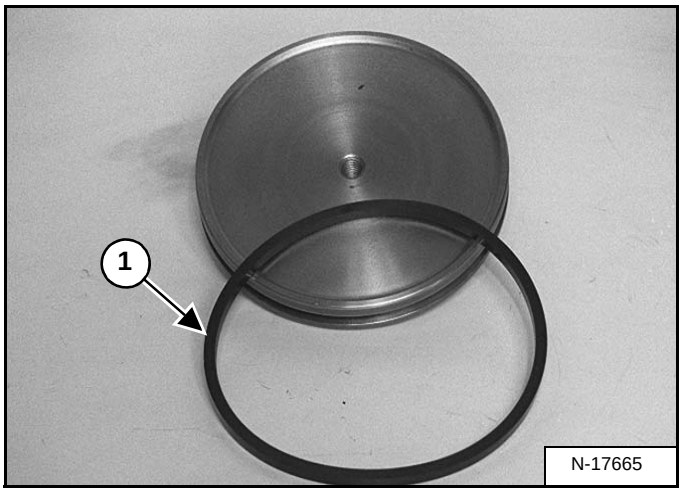
The piston (Item 1) can be removed by installing a bolt (Item 2) **[Figure 20-90-19]** in the tapped hole and using a slide hammer.

Figure 20-90-20



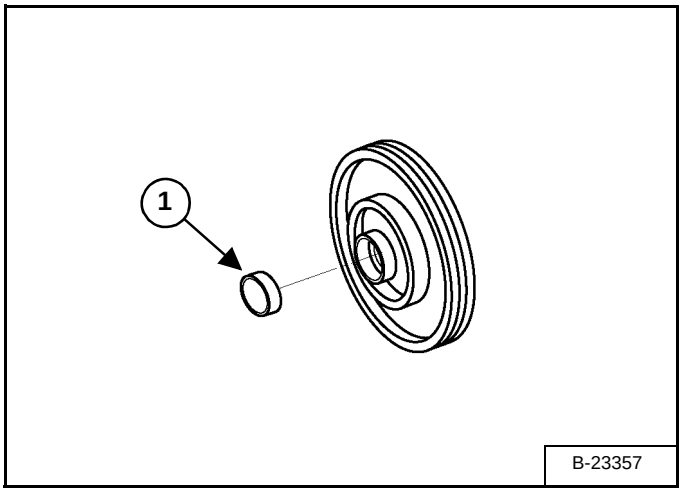
Remove the piston (Item 1) **[Figure 20-90-20]** from the housing.

Figure 20-90-21



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

Figure 20-90-22

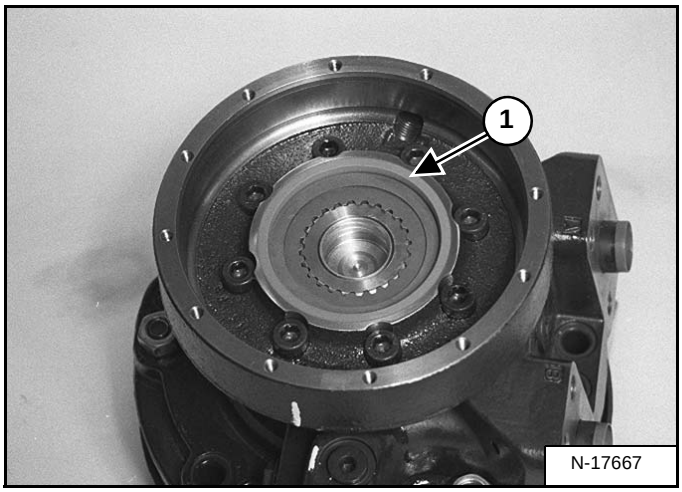


Remove the bushing (Item 1) **[Figure 20-90-22]** from the piston (Later Models).

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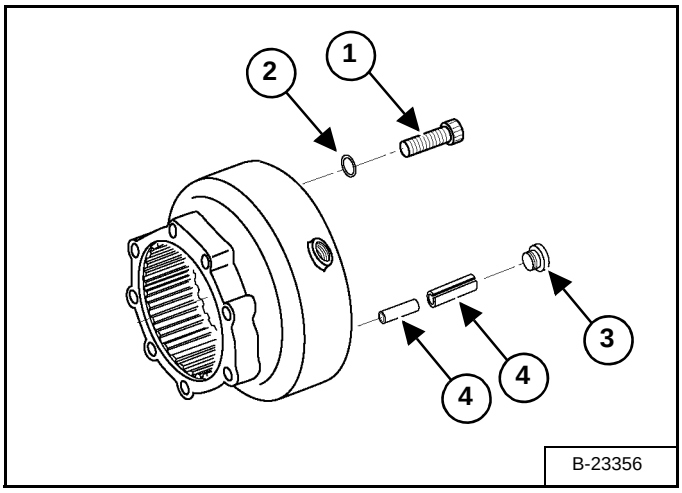
Disassembly (Cont'd)

Figure 20-90-23



Remove the inner piston seal (Item 1) **[Figure 20-90-23]** from the housing.

Figure 20-90-24

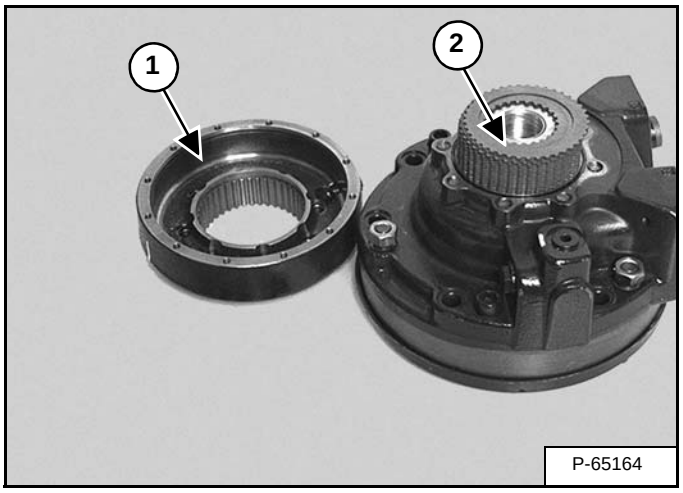


Remove the 8 bolts (Item 1) **[Figure 20-90-24]** and washers from the housing (Early Models).

Later Models: Remove the 6 bolts (Item 1) washers (Item 2), 2 plugs (Item 3) and 4 roll pins (Item 4) from the housing **[Figure 20-90-24]**.

NOTE: The small roll pins are installed inside the large rollpins.

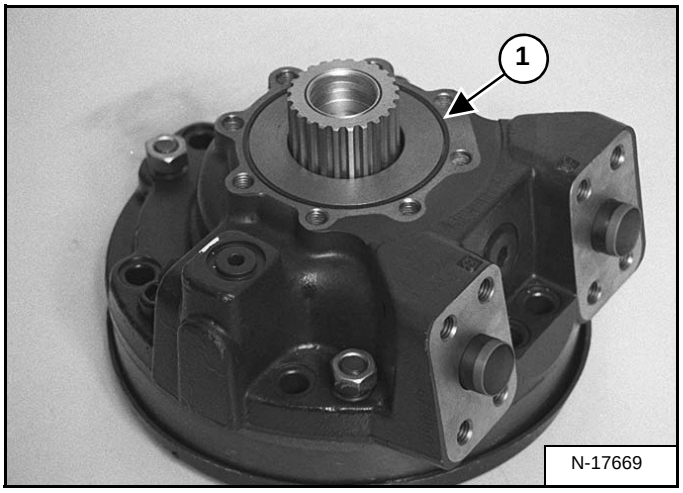
Figure 20-90-25



Remove the brake housing (Item 1) **[Figure 20-90-25]** from the motor housing.

Remove the brake discs pack (Item 2) **[Figure 20-90-25]** from the drive motor shaft.

Figure 20-90-26

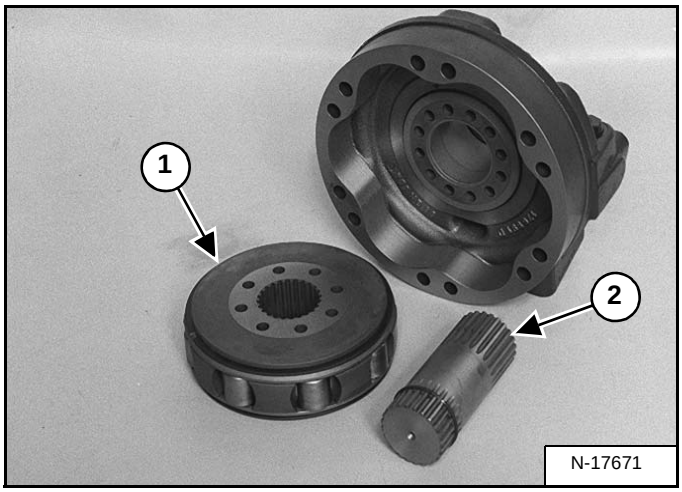


Remove the O-ring (Item 1) **[Figure 20-90-26]** from the housing.

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Disassembly (Cont'd)

Figure 20-90-27



Remove the rotating group (Item 1) **[Figure 20-90-27]** from the cam ring.

Remove the drive shaft (Item 2) **[Figure 20-90-27]** from the motor housing.

Figure 20-90-28

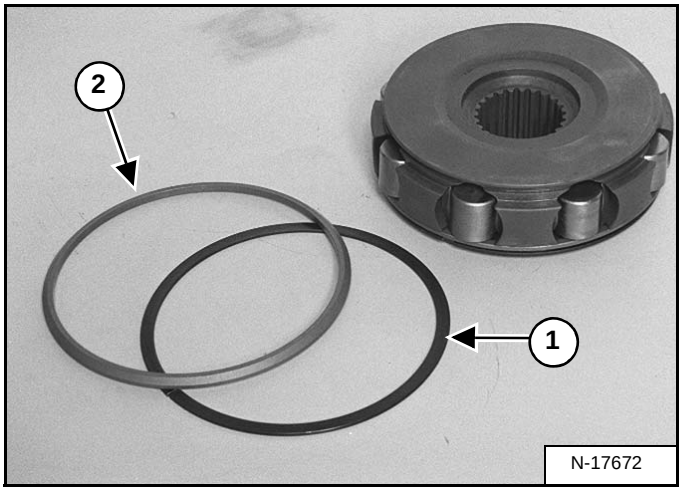
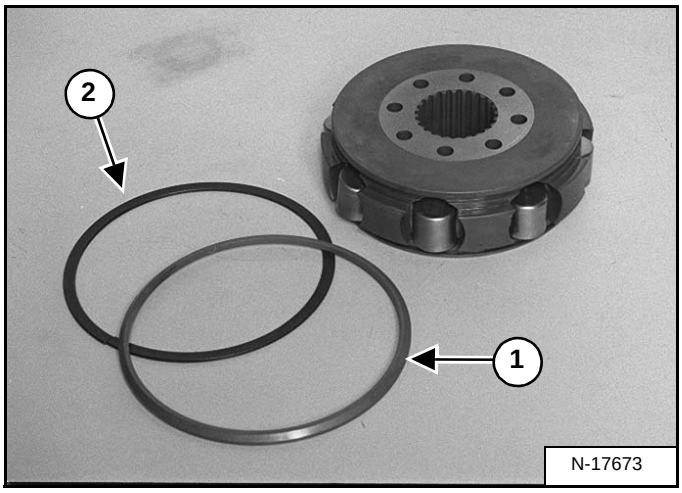


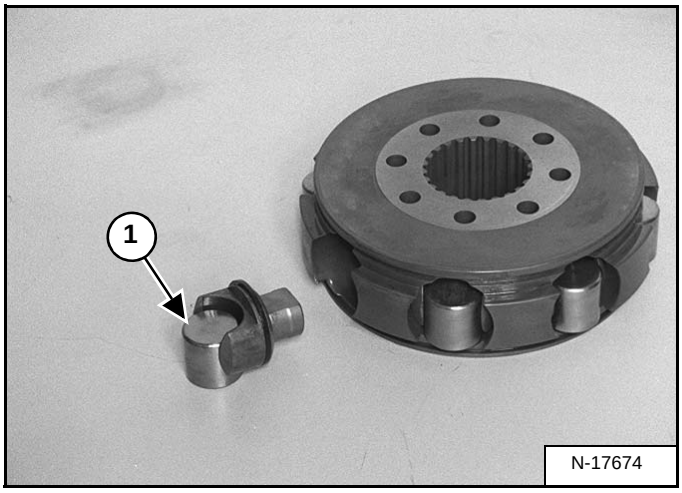
Figure 20-90-29



Remove the snap ring (Item 1) **[Figure 20-90-28]** & **[Figure 20-90-29]** from the rotating group.

Remove the retainer ring (Item 2) **[Figure 20-90-28]** & **[Figure 20-90-29]** from the rotating group.

Figure 20-90-30



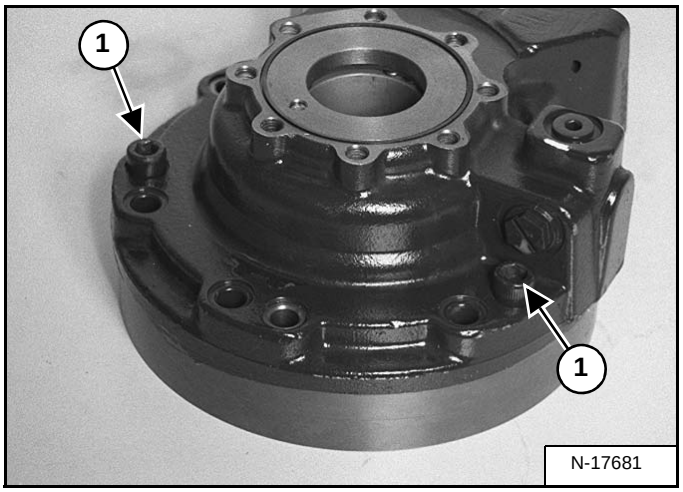
Use low air pressure to remove the roller/piston assembly (Item 1) **[Figure 20-90-30]** from the cylinder block.

NOTE: Put all the roller/piston assemblies back in their original bore.

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Disassembly (Cont'd)

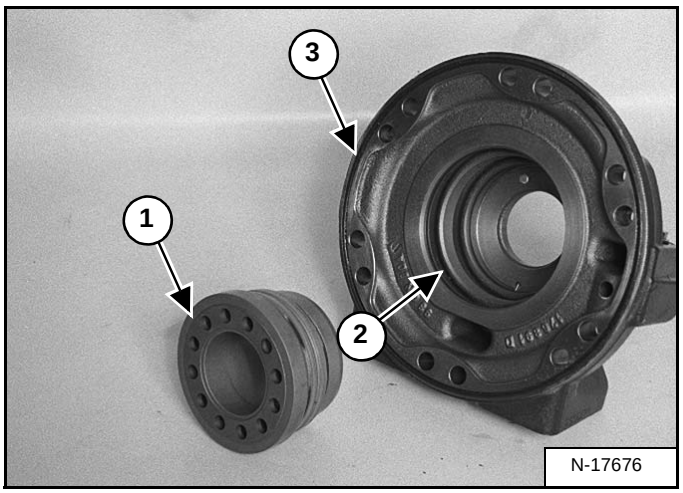
Figure 20-90-31



Remove the cam ring bolts (Item 1) **[Figure 20-90-31]** from the housing.

Remove the cam ring.

Figure 20-90-32



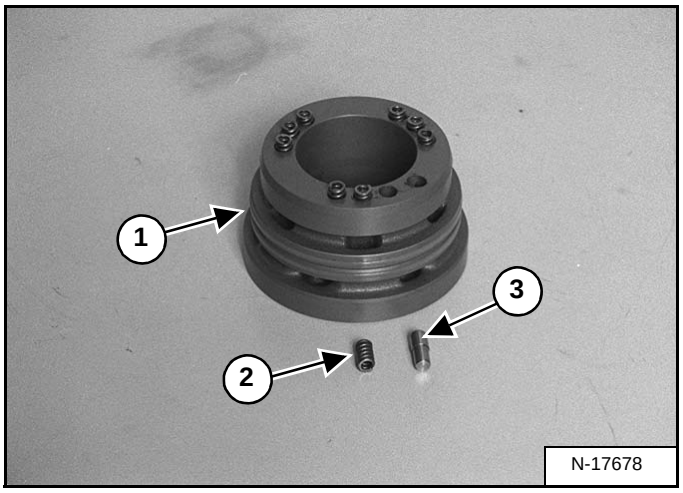
Use a brass drift and hammer to remove the distributor (Item 1) **[Figure 20-90-32]** from the housing.

Remove the seals and O-rings (Item 2) **[Figure 20-90-32]** from inside the housing.

Remove the large outer O-ring (Item 3) **[Figure 20-90-32]** from the housing.

NOTE: Make a note of the position of the back-up rings and seal before removing them for correct assembly.

Figure 20-90-33



Remove the seal and back-up rings (Item 1) **[Figure 20-90-33]** from the distributor.

Remove the 9 springs (Item 2) **[Figure 20-90-33]**.

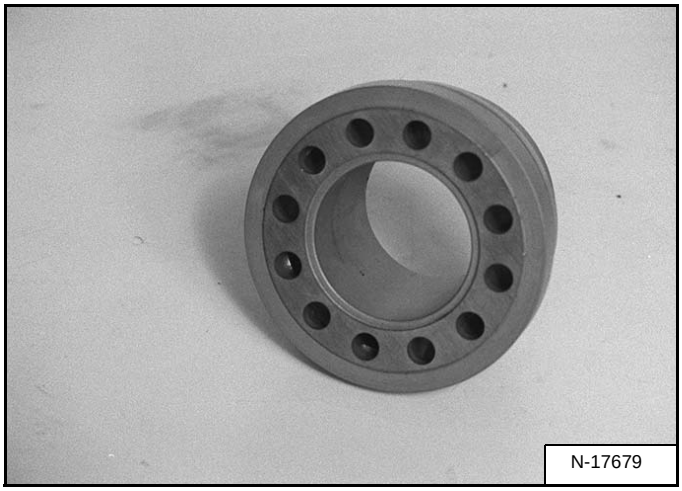
Remove the alignment pin (Item 3) **[Figure 20-90-33]**.

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Inspection

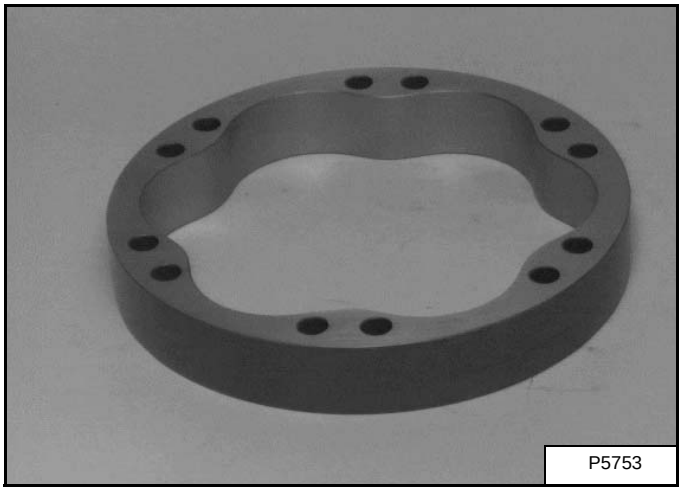
Clean all parts in clean solvent and dry with compressed air. Do Not use cloth or paper because small pieces of material can get into the system and cause damage.

Figure 20-90-34



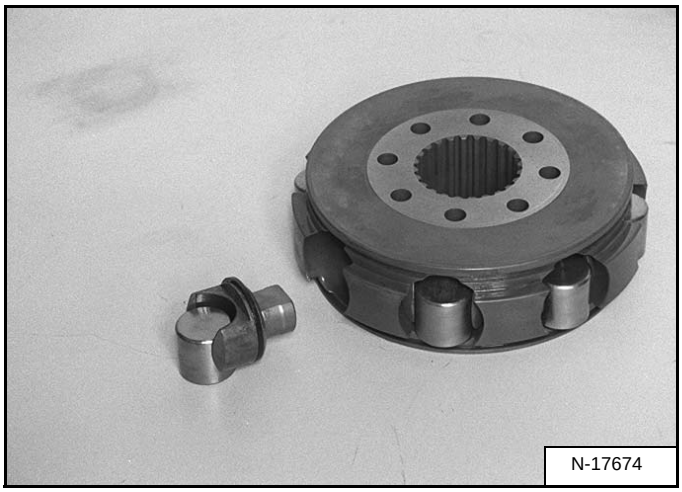
Check the distributor surface for scratches **[Figure 20-90-34]**.

Figure 20-90-35



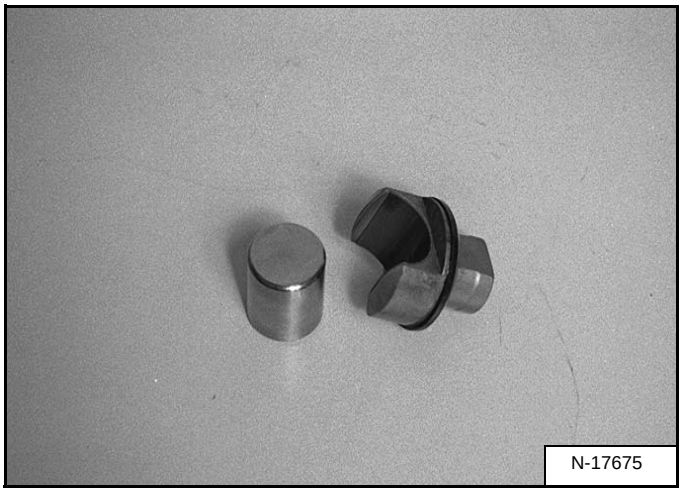
Check the cam ring inside surface for wear or scratches **[Figure 20-90-35]**.

Figure 20-90-36



Check the cylinder block surface for wear or scratches **[Figure 20-90-36]**.

Figure 20-90-37



Check all the roller/piston assemblies for scratches or wear **[Figure 20-90-37]**.

Replace the parts as needed.

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Assembly

IMPORTANT

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

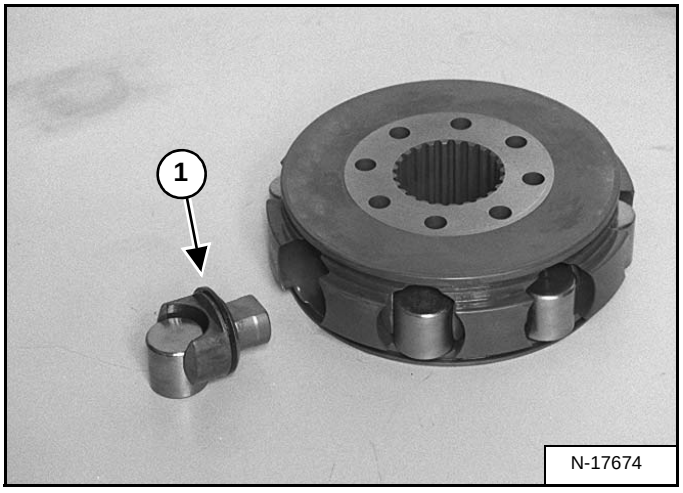
I-2003-0888

Clean all parts in solvent and dry with compressed air.

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

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

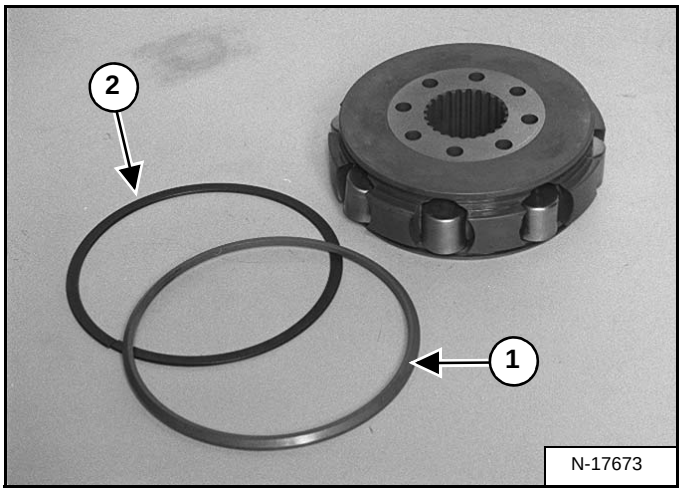
Figure 20-90-38



Dip the roller/piston assembly into oil. Install the roller/piston assembly (Item 1) **[Figure 20-90-38]** back in their original bore.

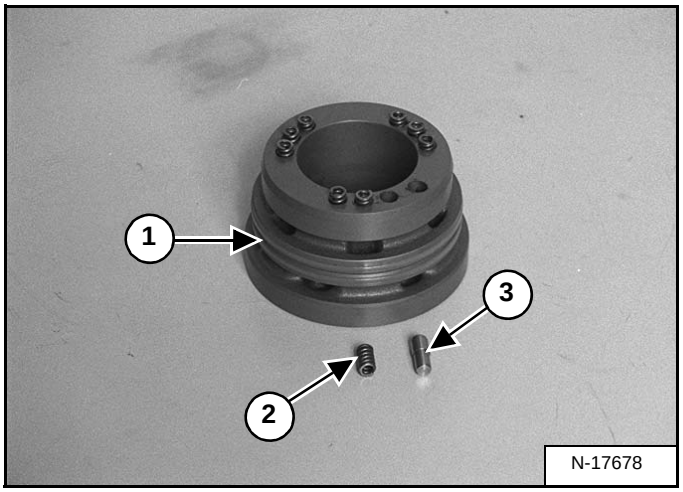
Repeat the procedure for each roller/piston assembly.

Figure 20-90-39



Install the retainer ring (Item 1) and snap ring (Item 2) **[Figure 20-90-39]** on the cylinder block (both sides).

Figure 20-90-40



Install the new seals (Item 1) **[Figure 20-90-40]** and back-up rings on the distributor valve.

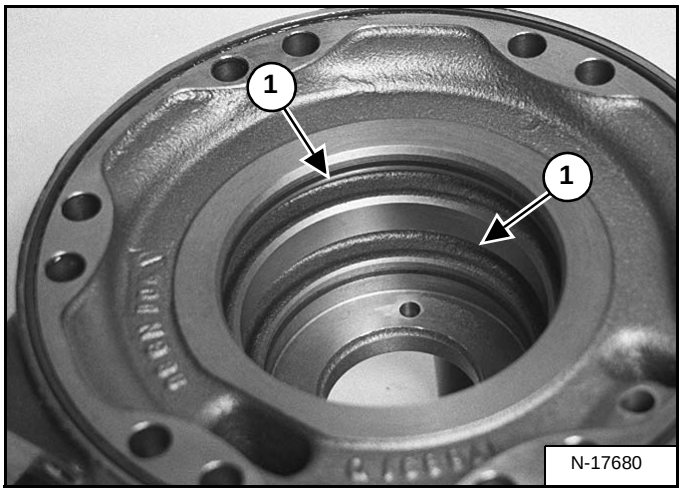
Apply a light coat of assembly lube to the seals.

Install the 9 springs (Item 2) and alignment pin (Item 3) **[Figure 20-90-40]** into the distributor valve.

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Assembly (Cont'd)

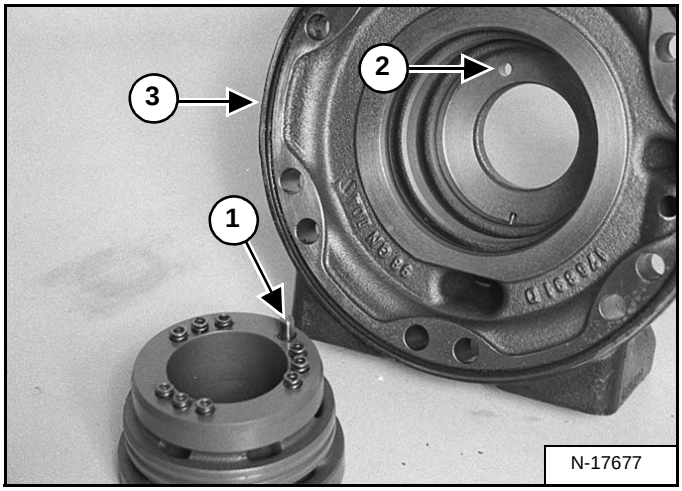
Figure 20-90-41



Install the O-rings and seals (Item 1) **[Figure 20-90-41]** into the housing with minimum distortion.

Apply a light coat of assembly lube to the seals and O-rings.

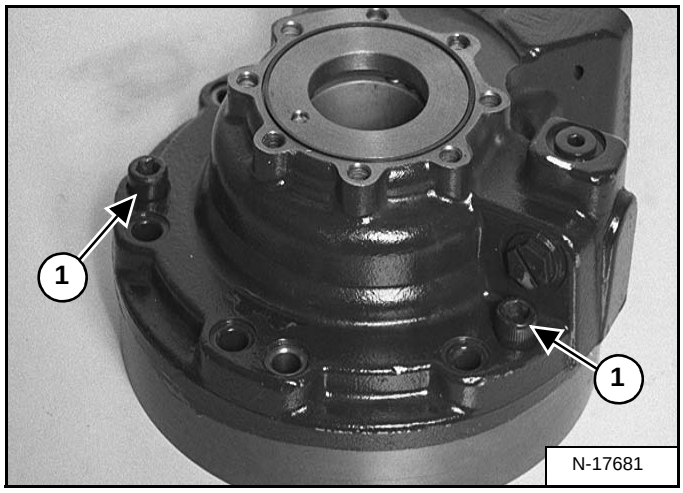
Figure 20-90-42



Align the pin (Item 1) in the hole (Item 2) **[Figure 20-90-42]** in the housing. When the distributor is aligned correctly, the distributor can be depressed slightly.

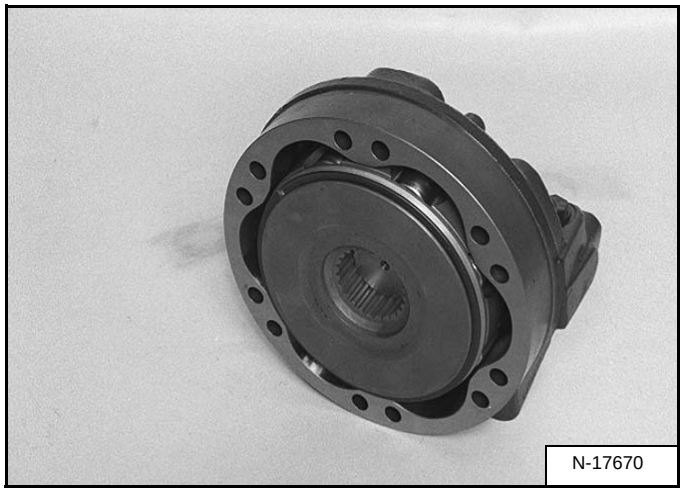
Install the O-ring (Item 3) **[Figure 20-90-42]** on the housing.

Figure 20-90-43



Install the cam ring and tighten the bolts (Item 1) **[Figure 20-90-43]**. For M8 bolts, 25 to 29 ft.-lb. (35 to 40 N•m) torque. For M12 bolts, 85 to 96 ft.-lb. (115 to 130 N•m) torque.

Figure 20-90-44

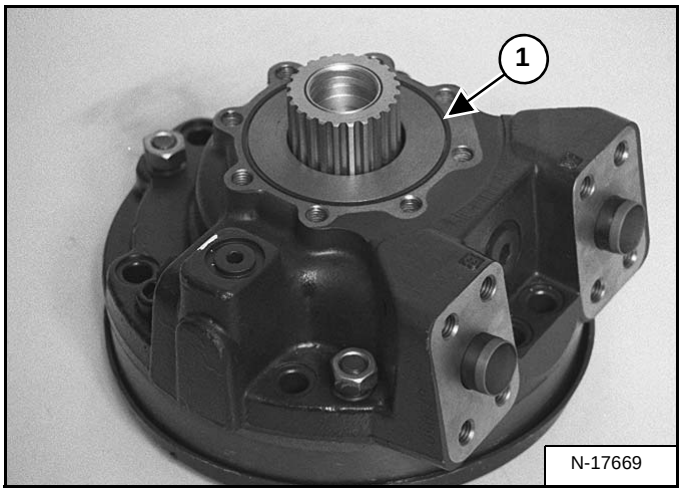


Install the drive shaft and rotating group into the housing **[Figure 20-90-44]**.

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Assembly (Cont'd)

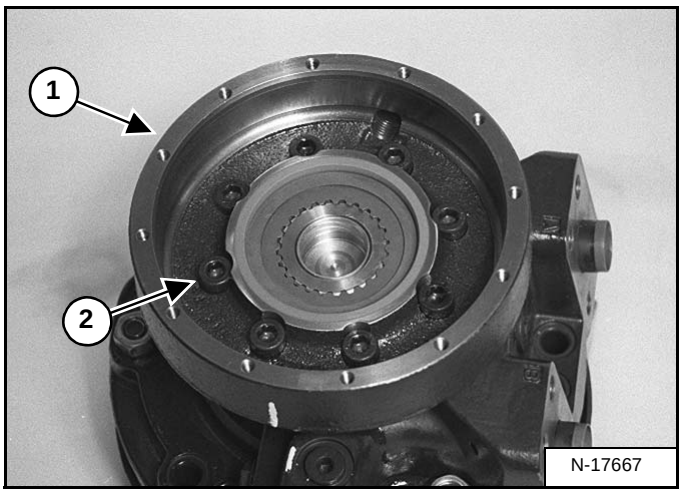
Figure 20-90-45



Install the O-ring (Item 1) **[Figure 20-90-45]** on the housing.

Early Models

Figure 20-90-46



Align the marks and install the brake housing (Item 1) **[Figure 20-90-46]**.

Put Loctite™ 243 on the bolts. Install the 8 bolts (Item 2) **[Figure 20-90-46]** and washers and tighten to 52 to 57 ft.-lb. (70 to 77 N•m) torque.

Later Models

Figure 20-90-47

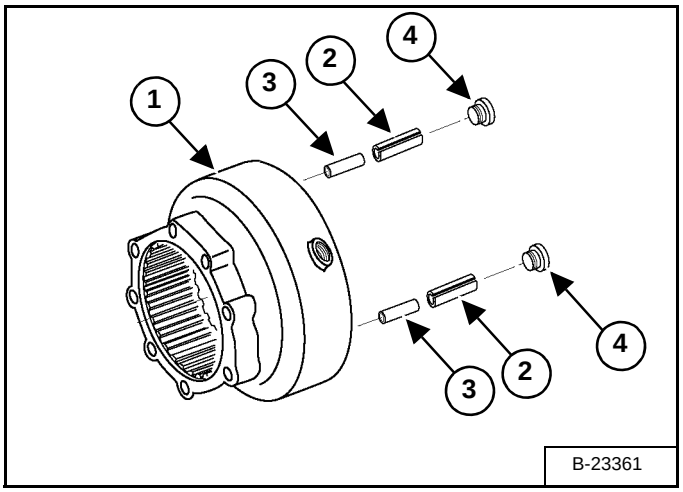
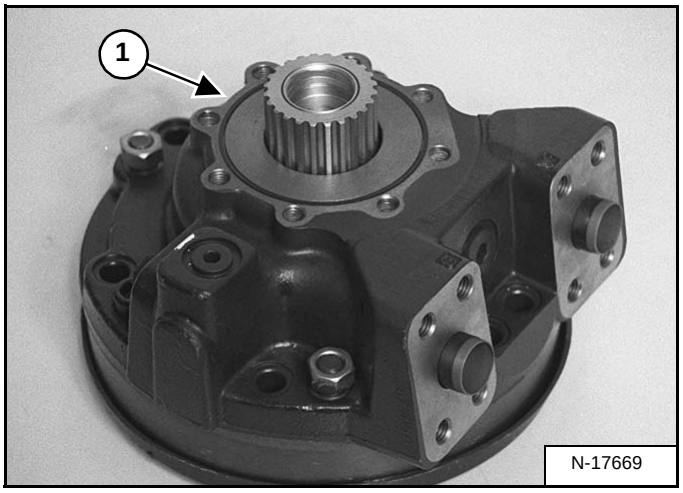


Figure 20-90-48



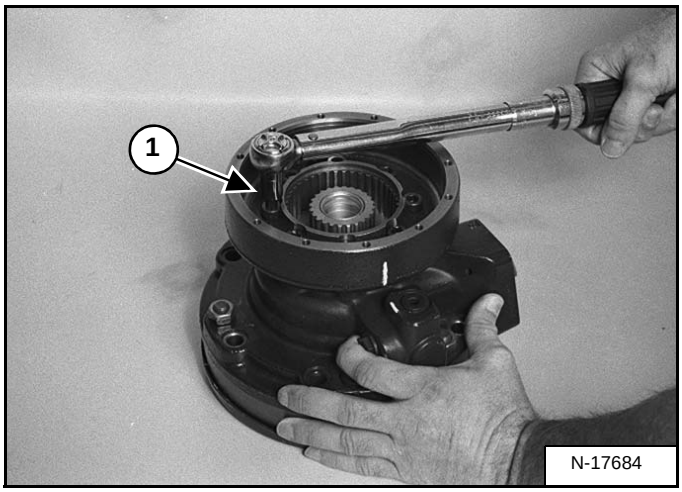
Align the marks and install the brake housing (Item 1) **[Figure 20-90-47]** on the housing (Item 1) **[Figure 20-90-48]**.

Install the large roll pins (Item 2) and small roll pins (Item 3) **[Figure 20-90-47]** through the brake housing into the housing (Item 1) **[Figure 20-90-48]**. Install the plugs (Item 4) **[Figure 20-90-47]**.

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Assembly (Cont'd)

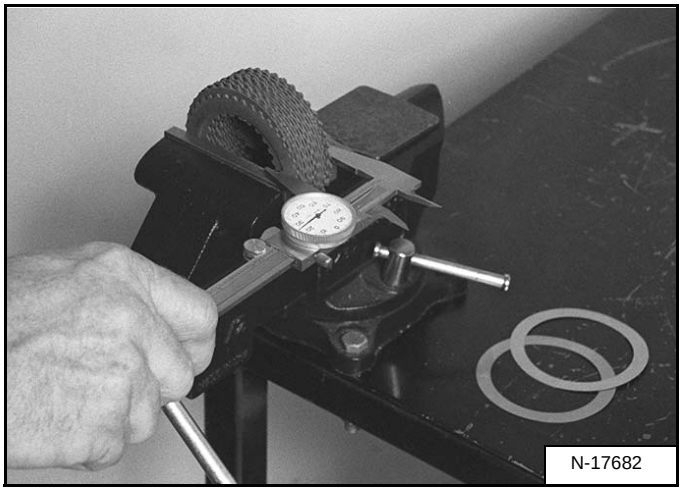
Figure 20-90-49



Put Loctite™ 243 on the bolts. Install the 6 bolts (Item 1) **[Figure 20-90-49]** and washers. Tighten the bolts to 52 to 57 ft.-lb. (70 to 77 N•m) torque.

All Models

Figure 20-90-50



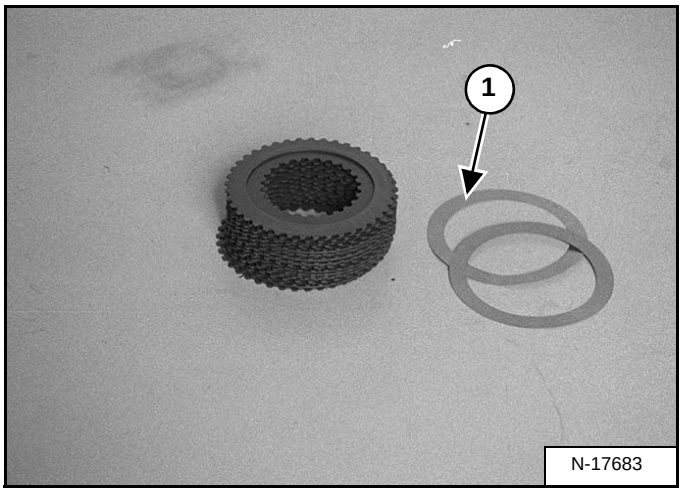
Assemble the brake discs into a pack. Clamp the disc pack in a vise **[Figure 20-90-50]**.

Make sure the inner discs, alternate with the outer disc and an outer disc is placed at each end of the disc pack.

Check the disc pack height **[Figure 20-90-50]**.

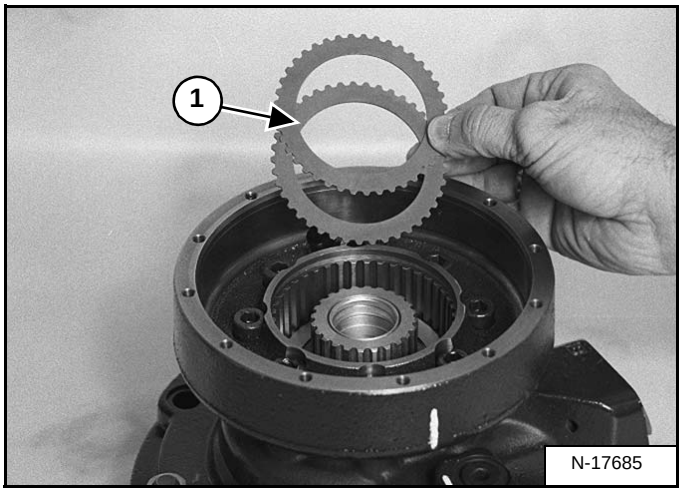
The correct disc pack height specification is 1.13 ± 0.004 inch (28,9 ± 0,1 mm).

Figure 20-90-51



An extra outer disc is preferred to reduce the number of required shims. Shims (Item 1) **[Figure 20-90-51]** should be placed at the end of the disc pack in contact with the motor housing.

Figure 20-90-52

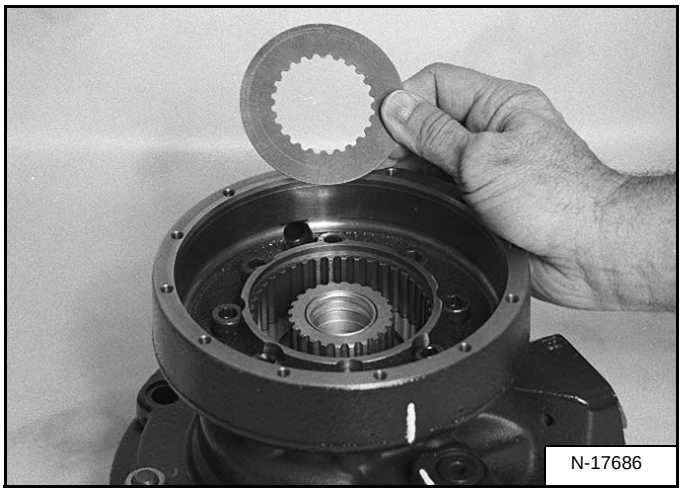


Install the shims as needed. Install the outer discs (Item 1) **[Figure 20-90-52]**.

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Assembly (Cont'd)

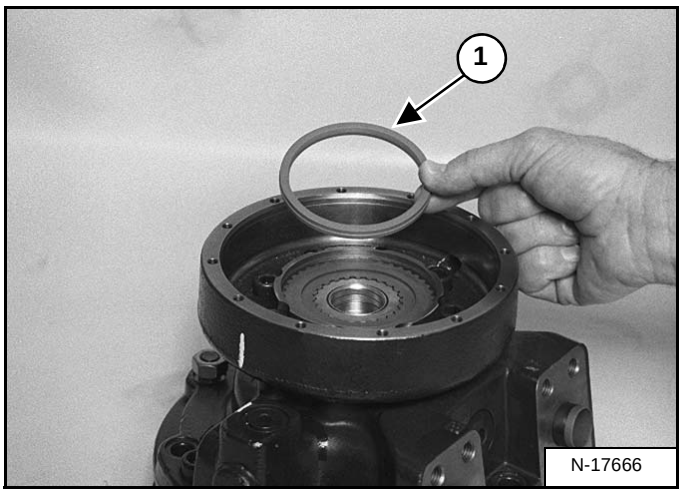
Figure 20-90-53



Install the inner disc plate into the brake housing over the drive shaft **[Figure 20-90-53]**.

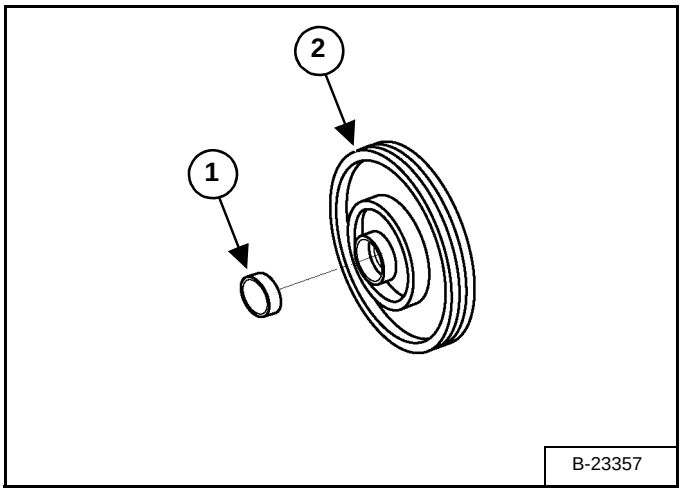
Alternate the brake plate discs until they are all installed.

Figure 20-90-54



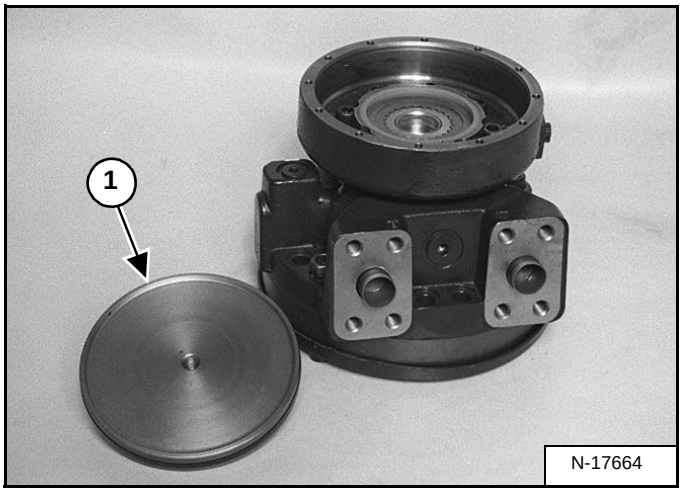
Install the inner piston seal (Item 1) **[Figure 20-90-54]**.

Figure 20-90-55



Install the bushing (Item 1) in the piston (Item 2) **[Figure 20-90-55]** (Later Models).

Figure 20-90-56



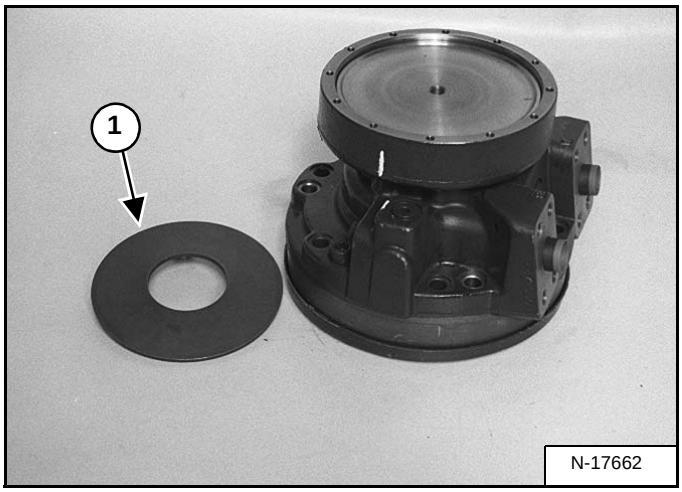
Install the piston seal on the piston (Item 1) **[Figure 20-90-56]**.

Install the piston into the brake housing.

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Assembly (Cont'd)

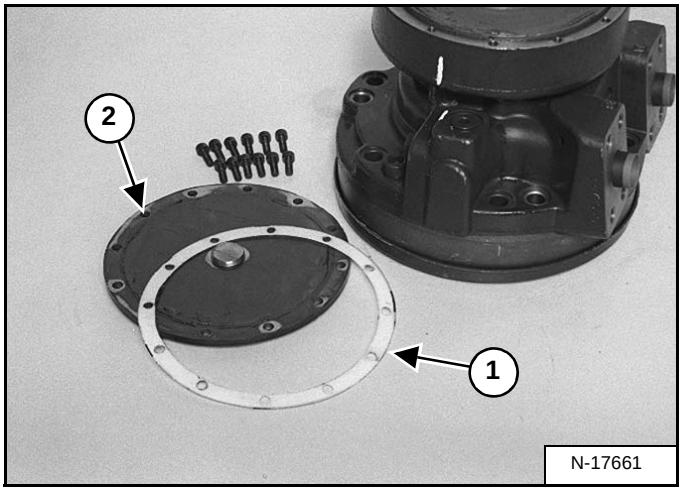
Figure 20-90-57



Install the disc spring (Item 1) **[Figure 20-90-57]** on top of the piston.

Put multi-purpose moly grease on the surface of the disc spring where it contacts the piston.

Figure 20-90-58

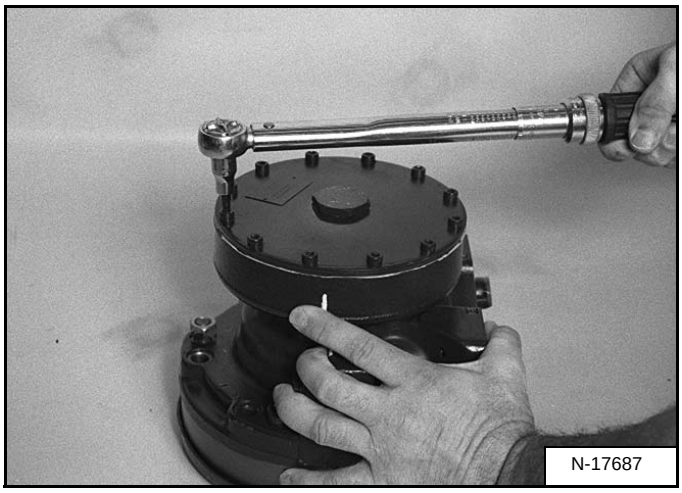


Install a new gasket (Item 1). Install the end cover (Item 2) **[Figure 20-90-58]**.

Install the bolts into the end cover and finger tighten only.

NOTE: Tighten the bolts alternately 1 turn at a time until the end cover is fully seated.

Figure 20-90-59



Tighten the bolts to 10 to 12 ft.-lb. (14 to 16 N•m) torque **[Figure 20-90-59]**.

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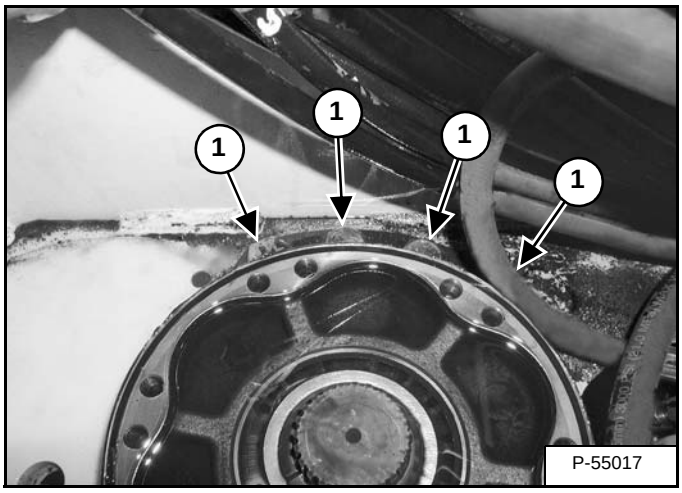
SWING MOTOR DRIVE CARRIER

Removal And Installation

Remove the swing motor. (See Removal And Installation on Page 20-90-1)

Using a suction pump, remove as much hydraulic oil as possible from the motor drive carrier.

Figure 20-91-1

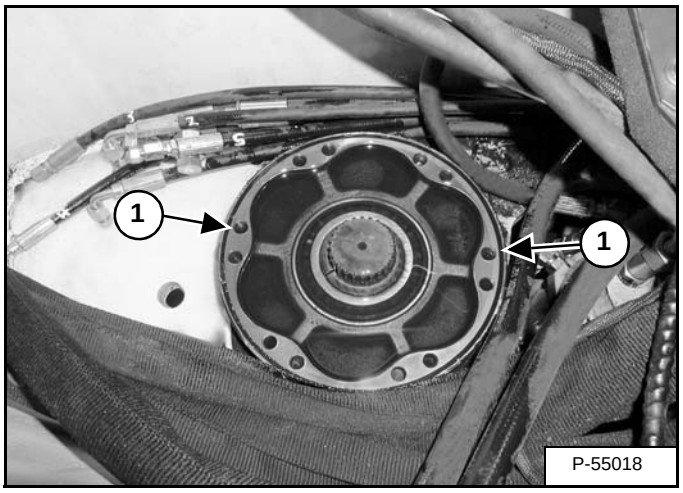


Remove the bolts (Item 1) **[Figure 20-91-1]** from both sides of the drive carrier.

Installation: Clean and dry the threads. Apply thread lock adhesive (Loctite™ 242) to the bolt threads. Tighten all of the bolts to snug. Then tighten the bolts (Item 1) to 190 - 210 ft.-lb. (257,6 - 284,8 N•m) torque. **[Figure 20-91-1]**.

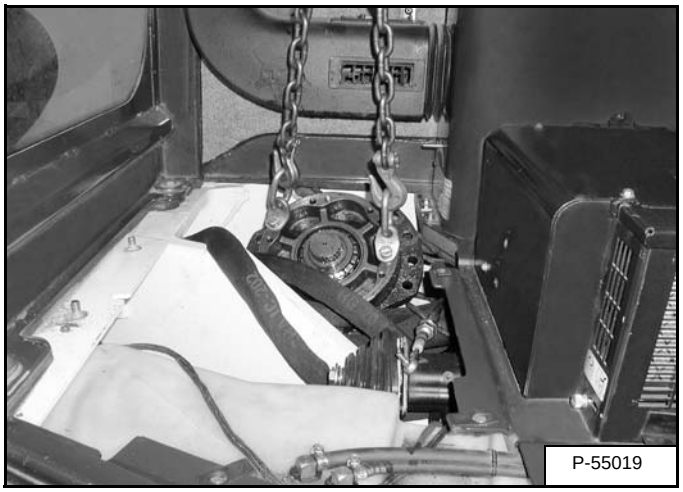
Reposition the hoses, right pedal linkage, and wire harness.

Figure 20-91-2



Attach a chain hoist and lift brackets to the bolt holes (Item 1) **[Figure 20-91-2]** of the carrier.

Figure 20-91-3

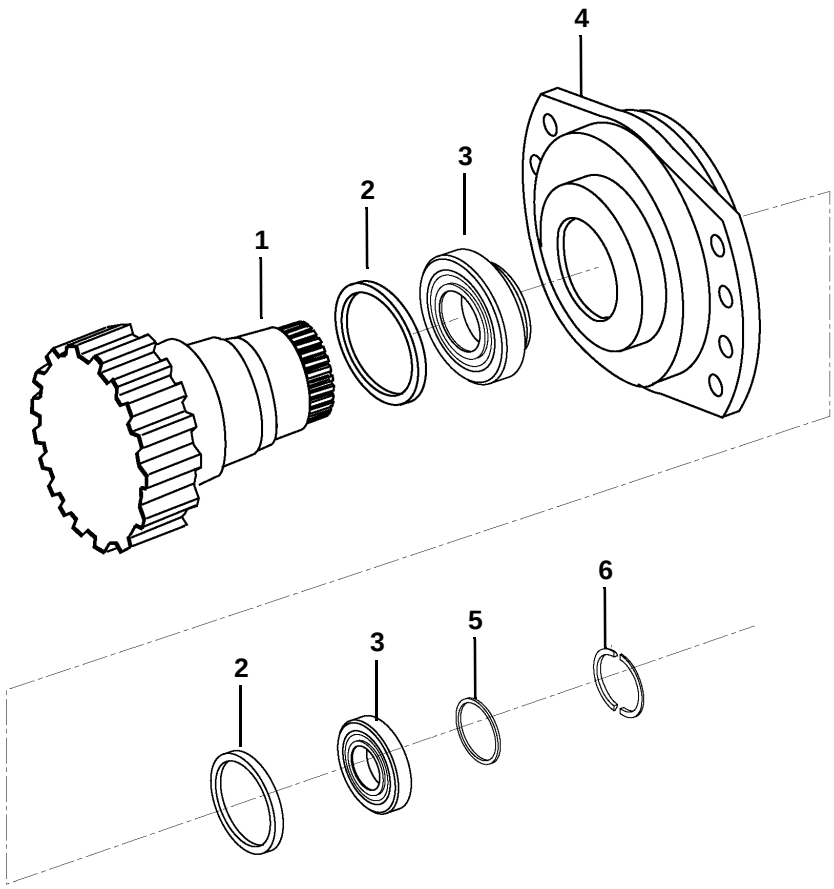


Raise the hoist. Remove the swing motor drive carrier from the excavator **[Figure 20-91-3]**.

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Parts Identification

1. Shaft
2. Seal
3. Bearing
4. Housing
5. Washer
6. Ring

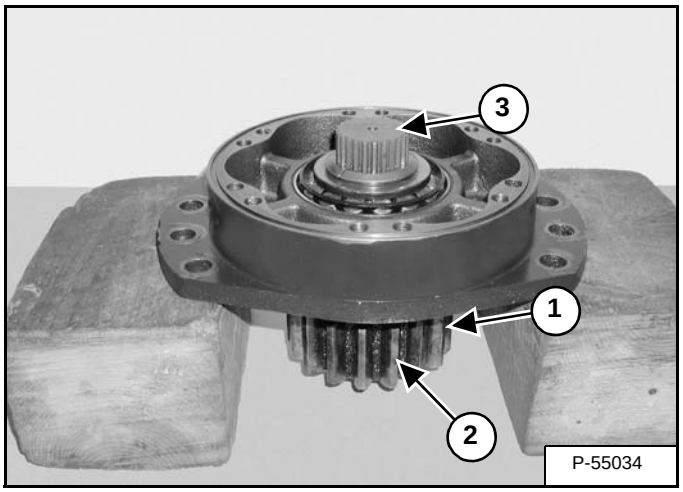


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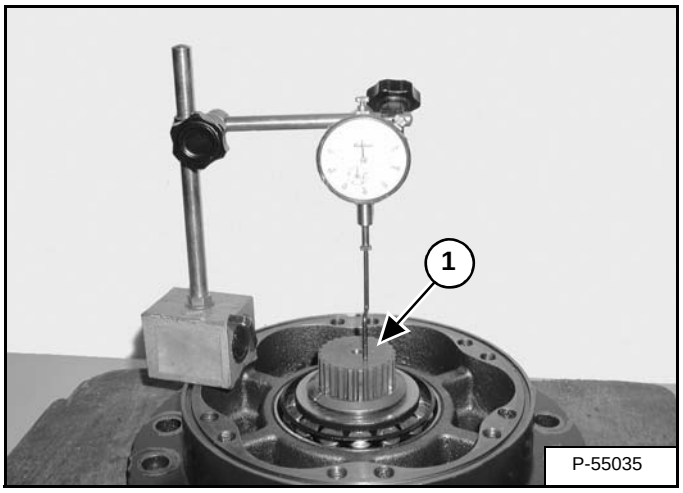
Checking The Drive Carrier Shaft End Play

Figure 20-91-4



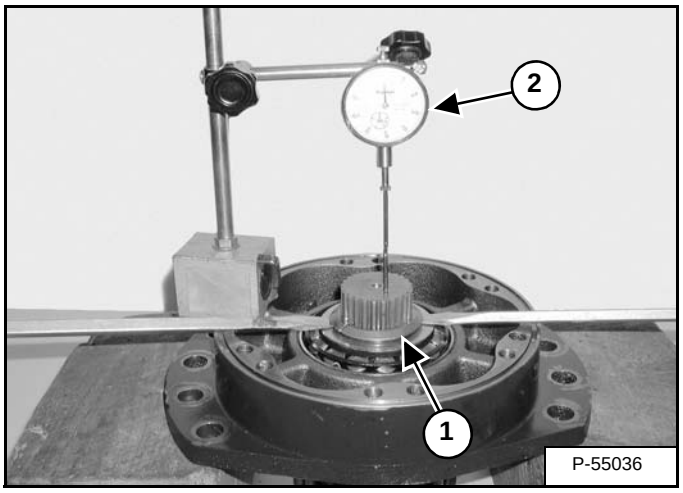
Before disassembling the drive carrier, check the shaft for end play. Place the drive motor carrier housing on support blocks with the large gear (Item 1) pointing down. There must be some space between the bottom of the gear (Item 2) and the top of the bench. With a soft face dead blow hammer, hit the splined end of the shaft (Item 3) **[Figure 20-91-4]** several times to seat the upper bearing.

Figure 20-91-5



Mount a dial indicator onto the carrier housing and position the dial over the end of the splined drive shaft (Item 1) **[Figure 20-91-5]**. Turn the dial to zero.

Figure 20-91-6



With two pry bars placed under the retainer (Item 1), pry the drive shaft up. While applying pressure on the pry bars, take a reading on the dial indicator (Item 2) **[Figure 20-91-6]**.

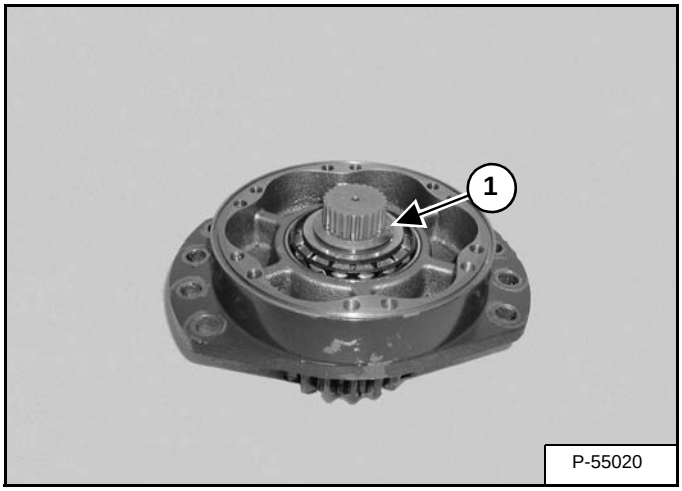
If the end play is more than 0.007 inches (.178 mm) the shim must be replaced with a different size when reassembling the drive carrier. After taking the end play reading, proceed with the disassembly of the drive carrier.

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Disassembly

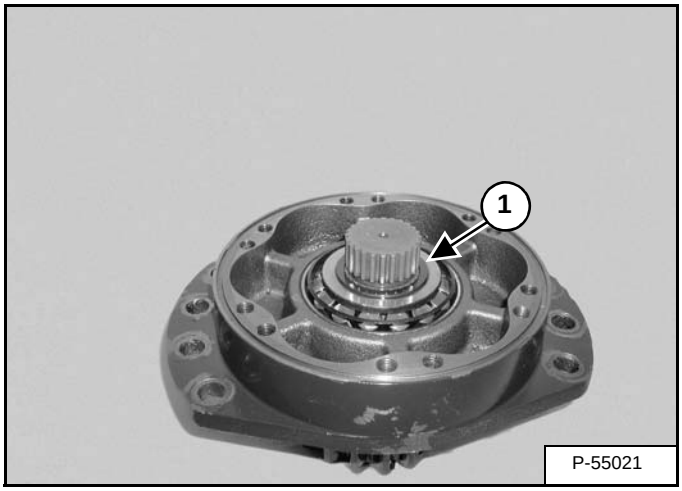
Clean the outside of the swing motor drive carrier before disassembly.

Figure 20-91-7



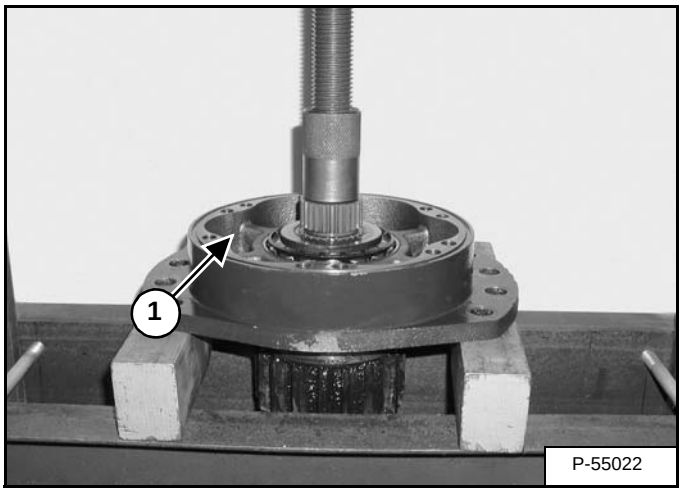
Remove the two piece retainer (Item 1) **[Figure 20-91-7]** from the drive shaft.

Figure 20-91-8



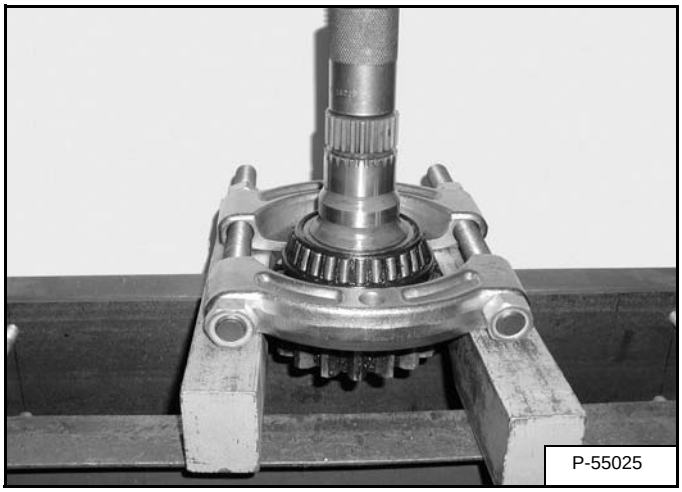
Remove the shim (Item 1) **[Figure 20-91-8]** from the drive shaft. Some carriers may not have shims.

Figure 20-91-9



Press the drive shaft out of the carrier housing to remove the top bearing (Item 1) **[Figure 20-91-9]**.

Figure 20-91-10



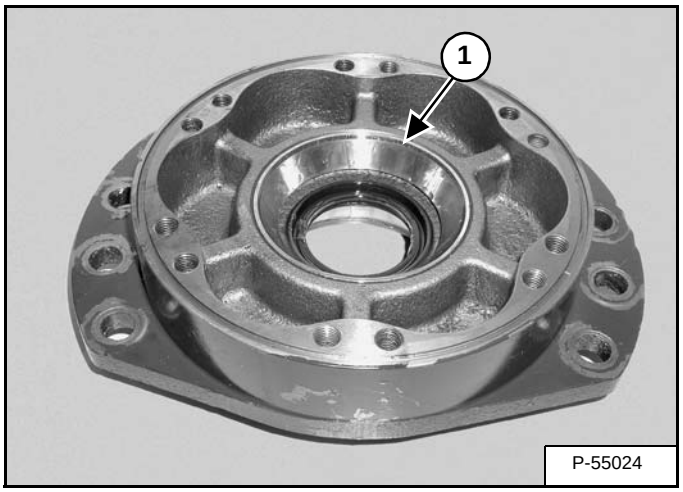
Remove the bottom bearing by supporting the bearing and pressing the drive shaft through it **[Figure 20-91-10]**.

Remove the seal from the drive shaft.

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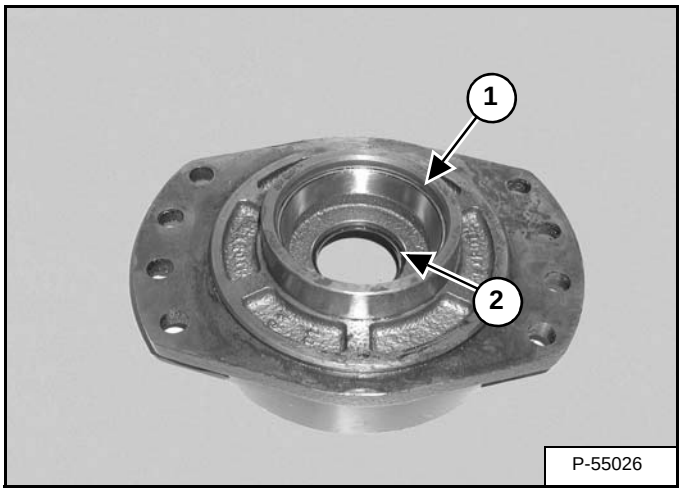
Disassembly (Cont'd)

Figure 20-91-11



Remove the race (Item 1) **[Figure 20-91-11]**.

Figure 20-91-12



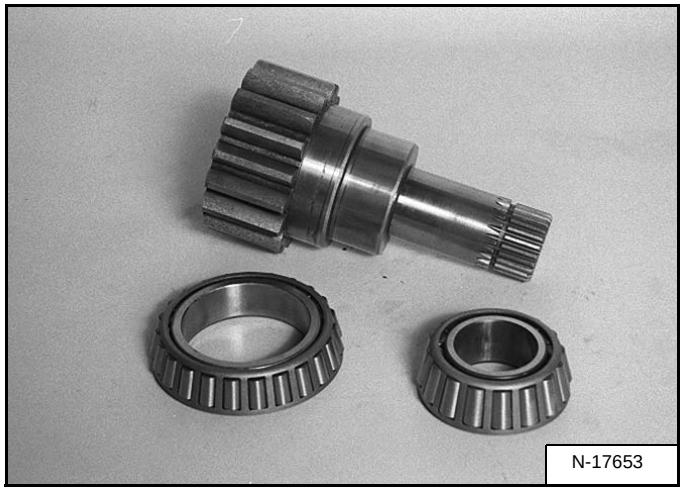
Turn the carrier over and remove the race (Item 1) and seal (Item 2) **[Figure 20-91-12]**.

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Inspection

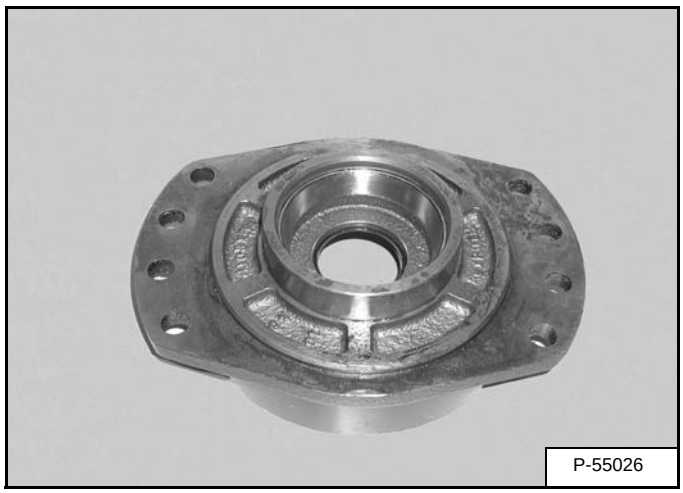
Clean all parts in solvent and dry with compressed air.

Figure 20-91-13



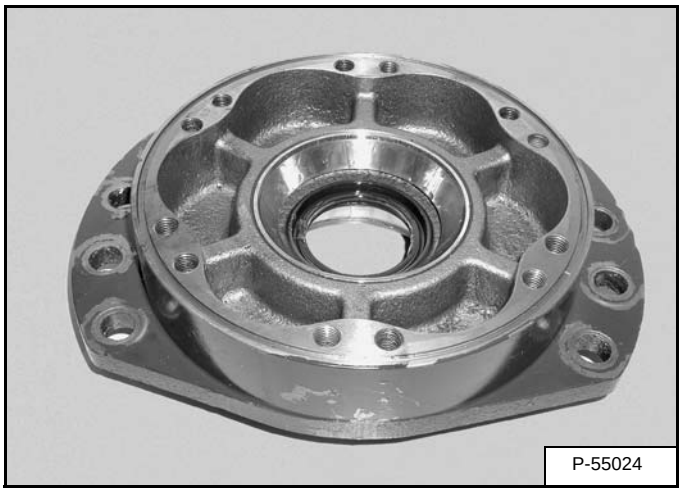
Check the drive shaft and bearings for wear **[Figure 20-91-13]**.

Figure 20-91-14



Check the small bearing race in the housing for wear or damage **[Figure 20-91-14]**.

Figure 20-91-15



Check the large bearing race in the housing for wear or damage **[Figure 20-91-15]**.

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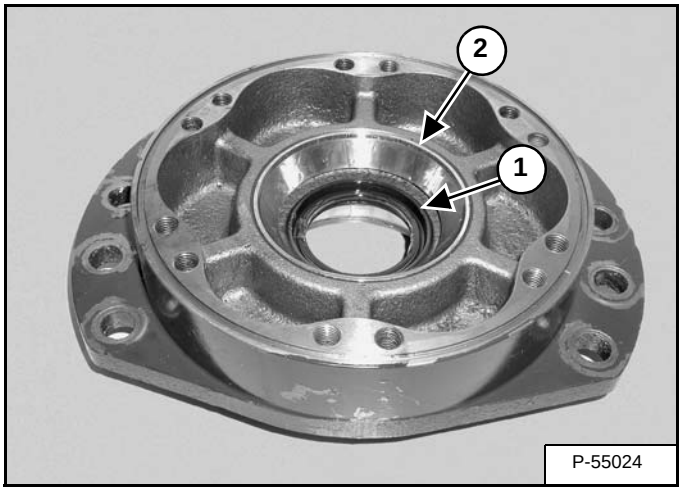
Assembly

Clean all parts in solvent and dry with compressed air.

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

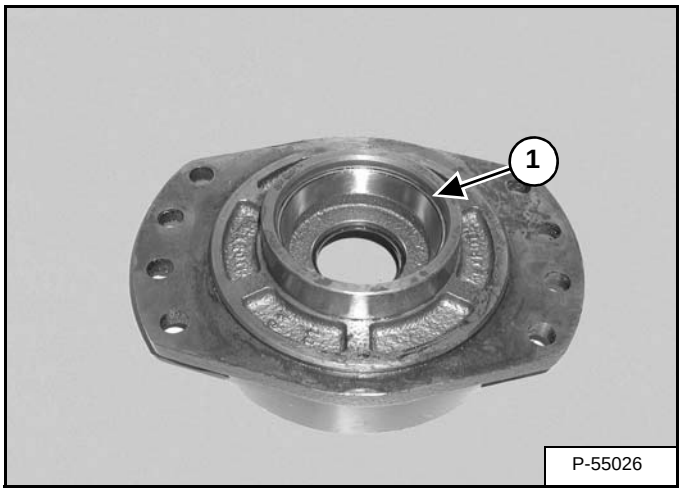
Always install new seals and O-rings. Lubricate all seals and O-rings with clean hydraulic fluid before installation.

Figure 20-91-16



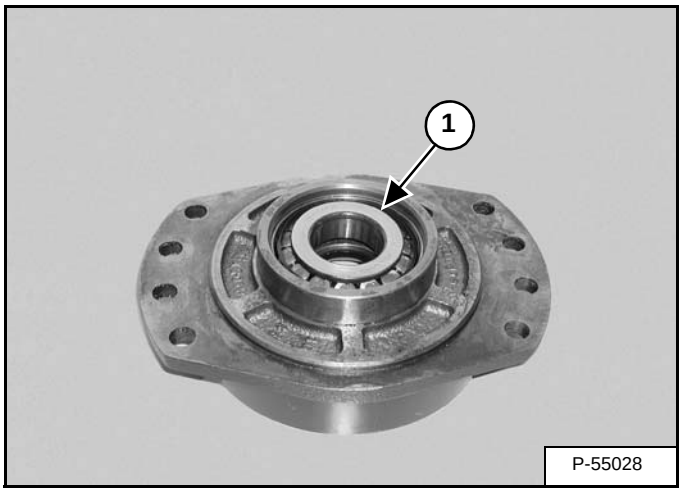
Install the seal (Item 1) and race (Item 2) **[Figure 20-91-16]**.

Figure 20-91-17



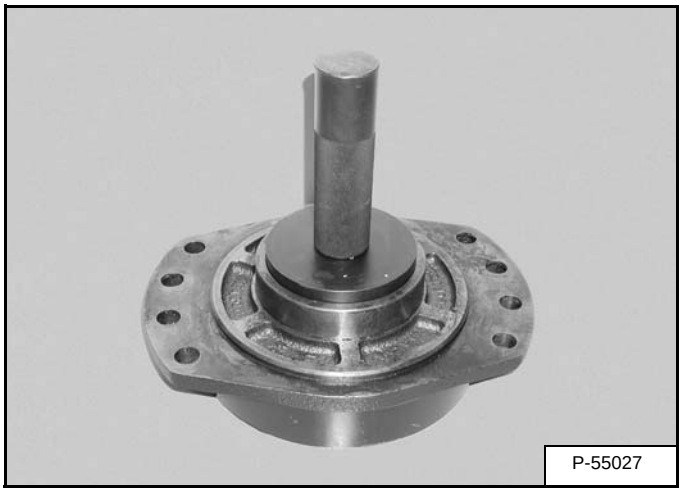
Install the bearing race (Item 1) **[Figure 20-91-17]**.

Figure 20-91-18



Install the bearing **[Figure 20-91-18]**.

Figure 20-91-19

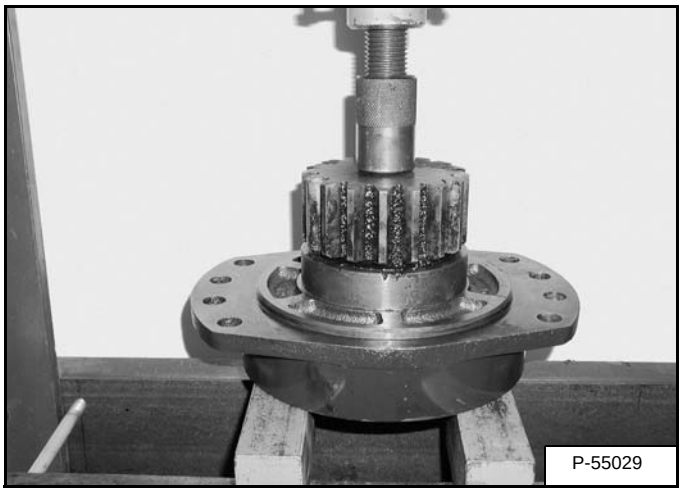


Install the drive shaft seal into the housing **[Figure 20-91-19]**.

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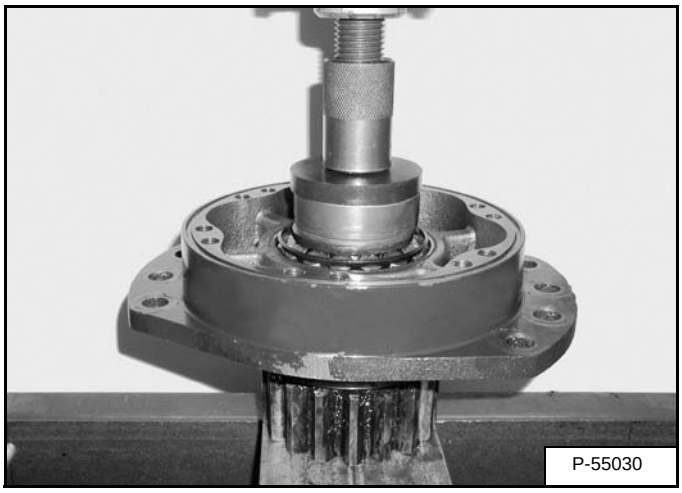
Assembly (Cont'd)

Figure 20-91-20



Install the drive shaft through the seal and bearing. Press the drive shaft into the bearing **[Figure 20-91-20]**.

Figure 20-91-21

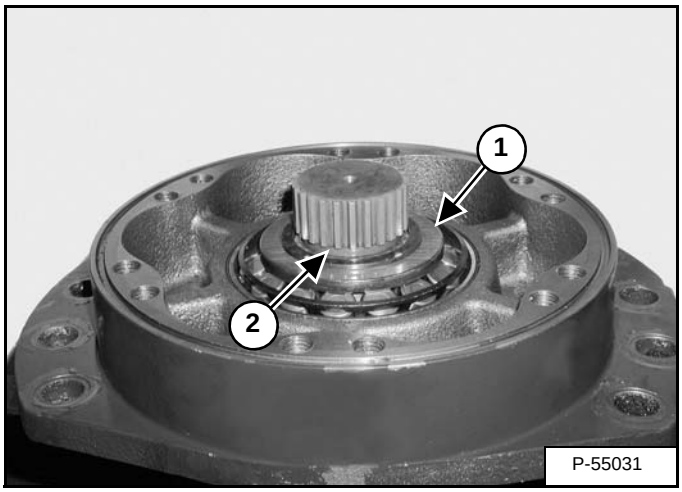


Press the top bearing on the drive shaft, using a bearing driver tool **[Figure 20-91-21]**.

NOTE: Only press on the inner race of the bearing.

Remove the carrier housing from the press. Check to see if the bearings are properly seated by rotating the shaft by hand. If the shaft can not be rotated by hand, there is excessive preload on the bearings. The excessive preload must be relieved before proceeding with the assembly of the drive carrier. The bearings are properly seated when there is no shaft end play and the shaft can be rotated by hand.

Figure 20-91-22

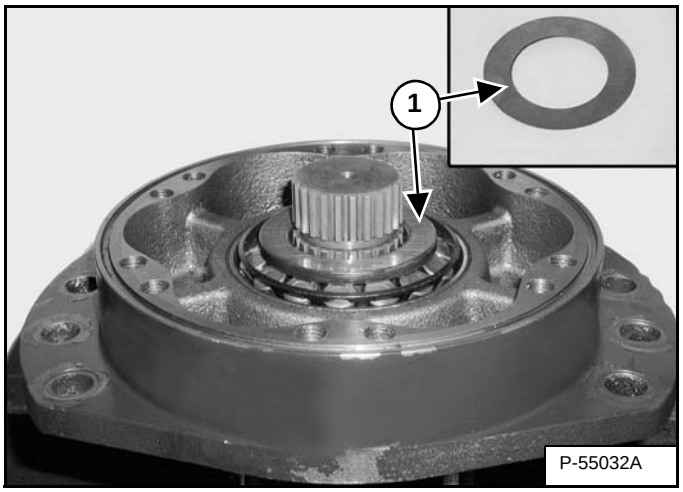


When new parts are used in the assembly of the drive carrier, use a ***go/no-go*** method for selecting the correct number of shims. To find the number of shims needed to bring the shaft end play into specification, install the shim on the shaft (Item 1). Try to slide the edge of the retainer into the groove (Item 2) **[Figure 20-91-22]**.

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Assembly (Cont'd)

Figure 20-91-23



If the edge of the retainer slides into the groove easily ***(go)***, remove the shim and install a thicker shim (Item 1) **[Figure 20-91-23]**. Try sliding the retainer into the groove again.

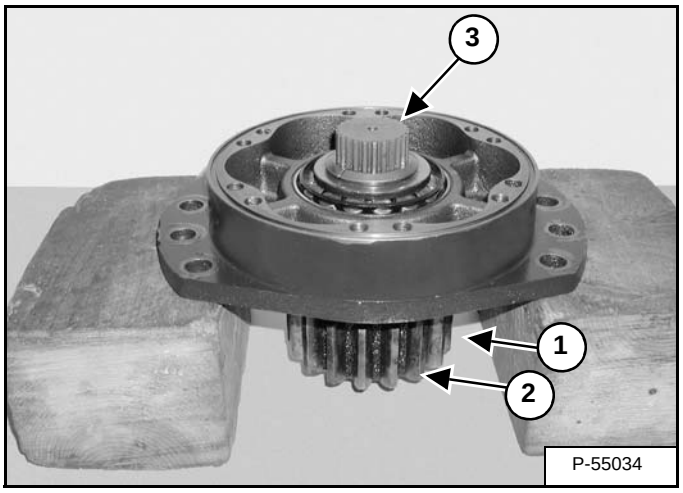
Continue the procedure using thicker shims and trying the retainer until the retainer will no longer slide into the groove ***(no-go)***.Use the next thinner shim and install the retainer (Items 1) **[Figure 20-91-27 on Page 20-91-10]**).

When assembling the drive carrier using the original parts, refer to the dial indicator reading taken earlier. (See Checking The Drive Carrier Shaft End Play on Page 20-91-3)

Shims are available in five sizes: 0.08” (2.05 mm), 0.089” (2.25 mm), 0.093” (2.35 mm), 0.097” (2.35 mm) and 0.104” (2.65 mm).

Install the shim required to get the end play as close to zero as possible.

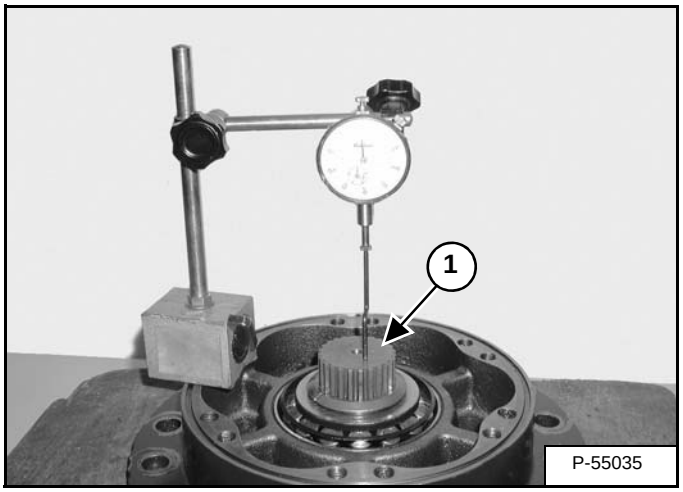
Figure 20-91-24



As a final check of the shaft end play, place the carrier housing on support blocks with the large gear pointing down (Item 1). There must be space between the bottom of the gear (Item 2) **[Figure 20-91-24]** and the bench.

With a soft faced dead blow hammer, hit the splined end of the shaft (Item 3) **[Figure 20-91-24]** several times to be sure the shim is tight against the bearing.

Figure 20-91-25

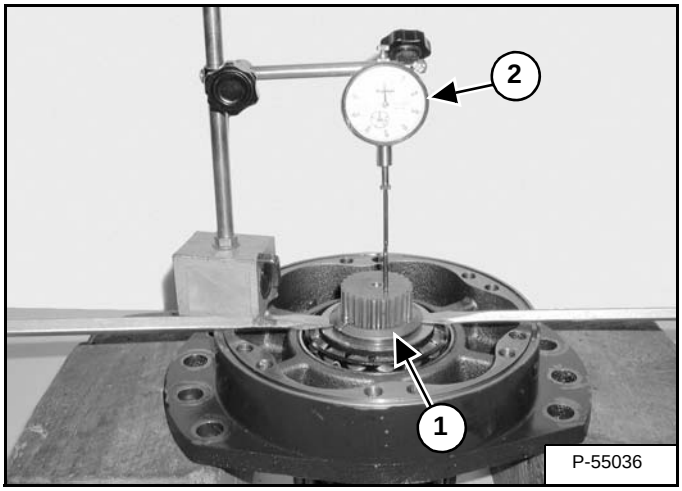


Mount a dial indicator onto the carrier housing and position the dial over the end of the splined drive shaft (Item 1) **[Figure 20-91-25]**. Turn the dial to zero.

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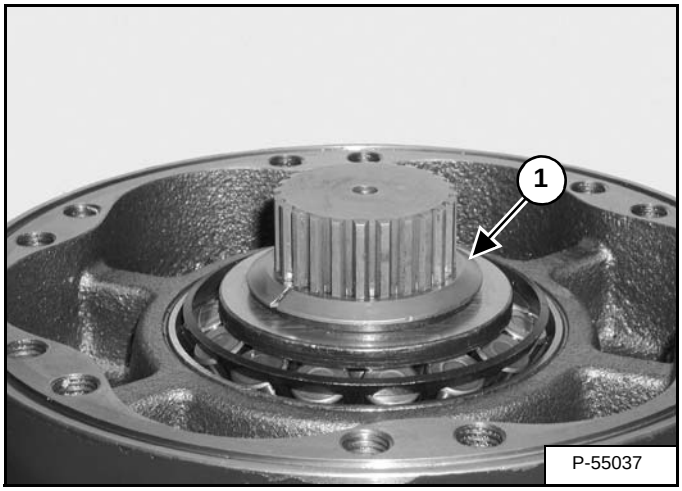
Assembly (Cont'd)

Figure 20-91-26



With two pry bars placed under the retainer (Item 1), pry the drive shaft up. While applying pressure on the pry bars, take a reading on the dial indicator (Item 2) **[Figure 20-91-26]**. If the end play is more than 0.007 inches (.178 mm) the shim must be replaced with a thicker shim.

Figure 20-91-27

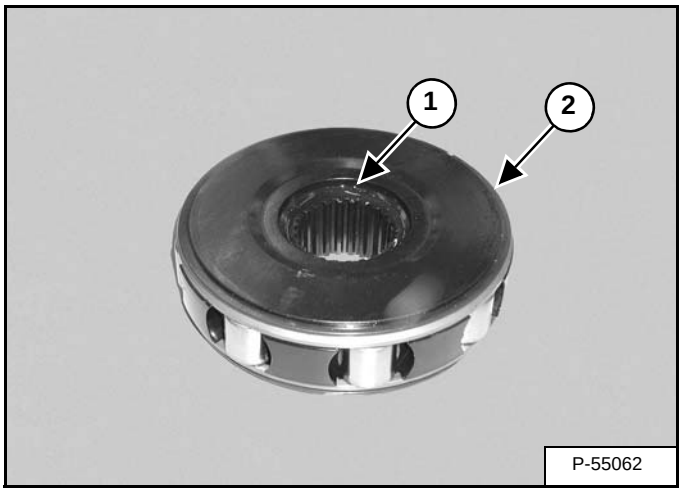


With the correct shim in place, install the retainer (Item 1) **[Figure 20-91-27]**.

The retainer must be fully seated.

NOTE: After completing the assembly, rotate the shaft by hand. This will make sure that the bearings are free to turn.

Figure 20-91-28



The recess (Item 1) in the rotating group (Item 2) **[Figure 20-91-28]** must fit over the retainer (Item 1) **[Figure 20-91-27]**.

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CONTROL PATTERN SELECTOR VALVE

Removal And Installation

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

Remove the right console base. (See Console Base Removal And Installation on Page 50-50-2)

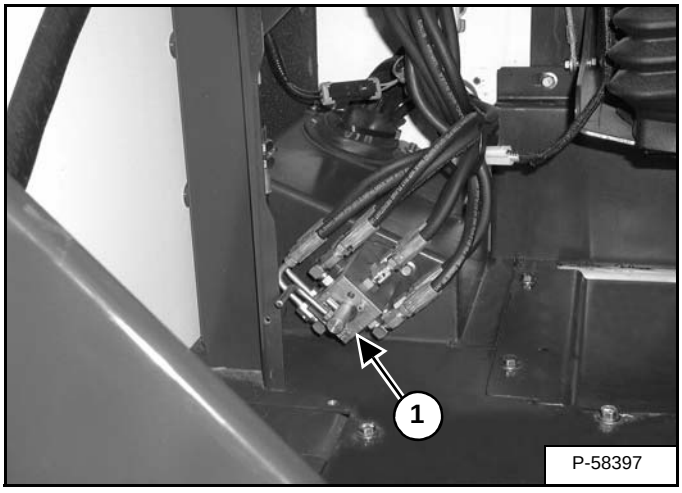
Mark all hydraulic hoses for proper installation.

IMPORTANT

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

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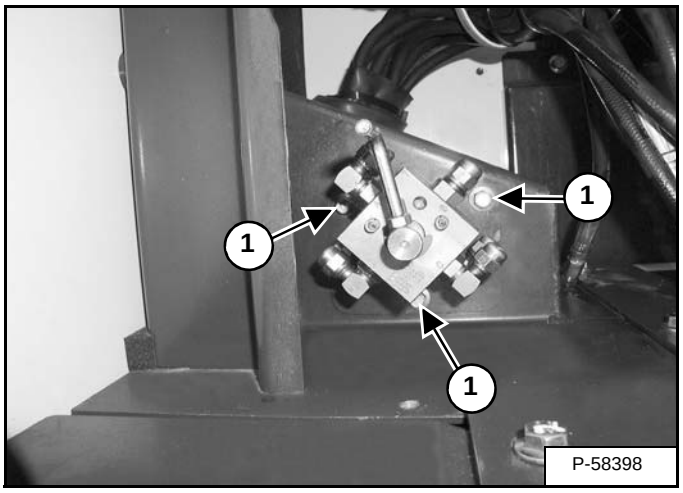
Figure 20-100-1



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

NOTE: If pilot pressure hose replacement is required, see Hoses for hose routing diagrams. See HOSES on Page 20-114-1

Figure 20-100-2



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

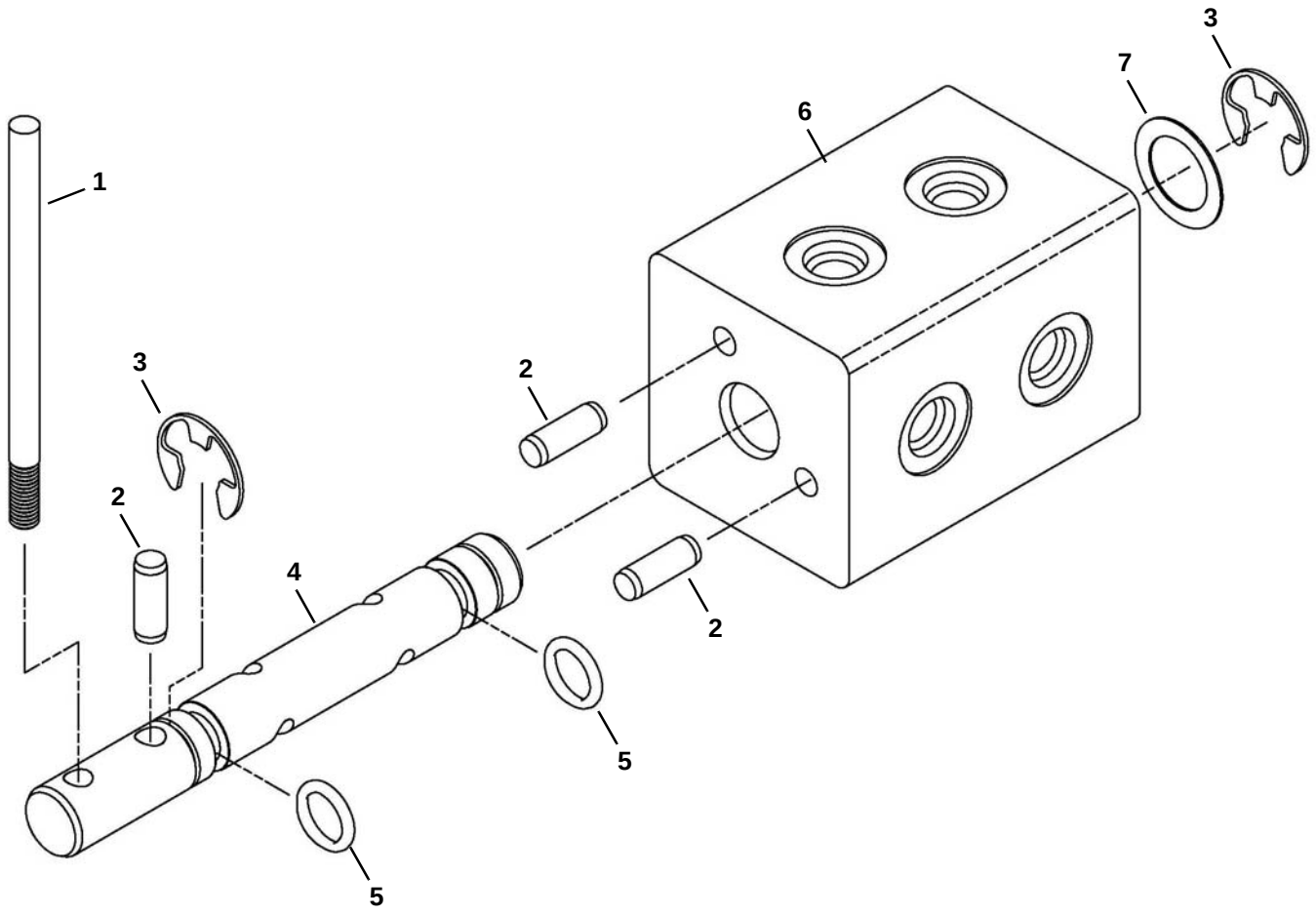
Remove the control pattern selector valve from the excavator.

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CONTROL PATTERN SELECTOR VALVE (CONT'D)

Parts Identification

1. Handle
2. Roll Pin
3. Snap Ring
4. Spool
5. O-Ring
6. Valve Block
7. Washer

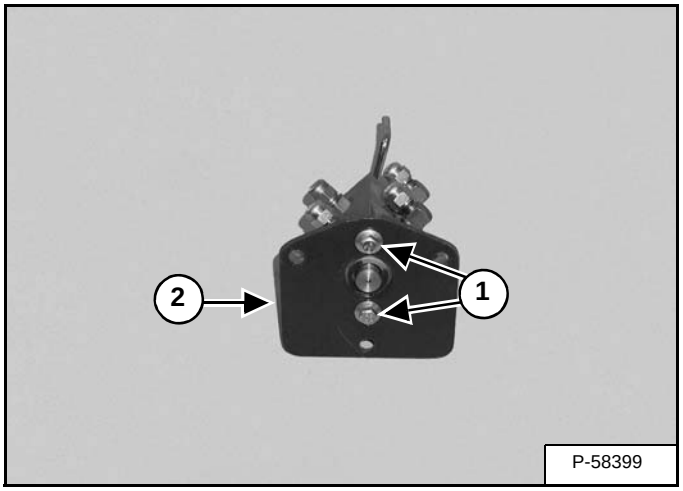


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Disassembly

Clean the outside of the control pattern selector valve before disassembly

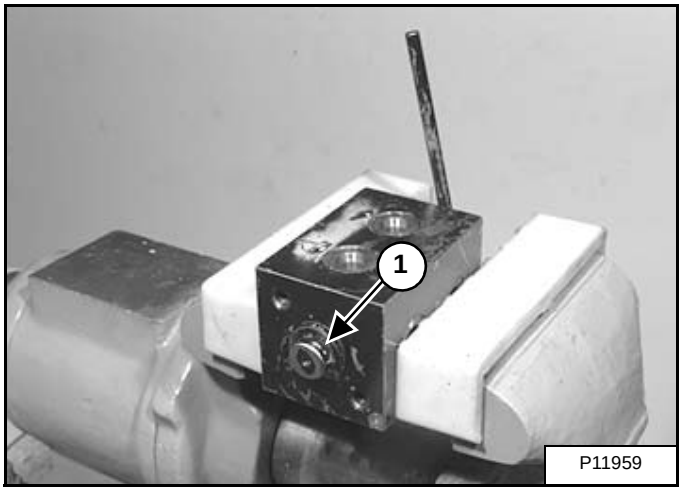
Figure 20-100-3



Remove the bolts (Item 1) and bracket (Item 2) **[Figure 20-100-3]**

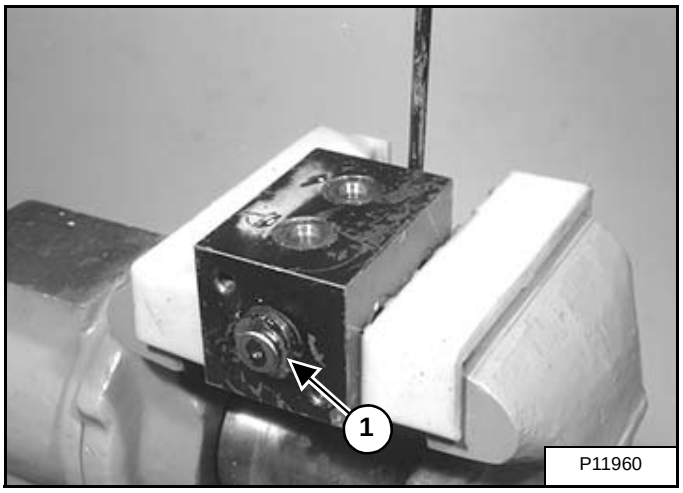
Clamp the valve in a vise equipped with padded jaws.

Figure 20-100-4



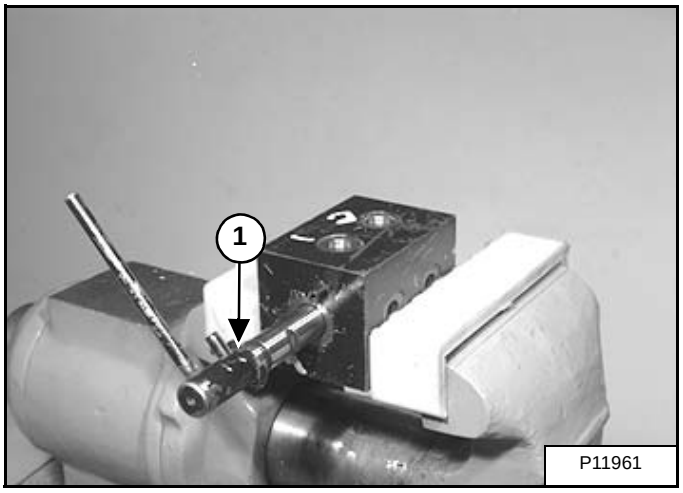
Remove the snap ring (Item 1) **[Figure 20-100-4]**.

Figure 20-100-5



Remove the wave washer (Item 1) **[Figure 20-100-5]**.

Figure 20-100-6

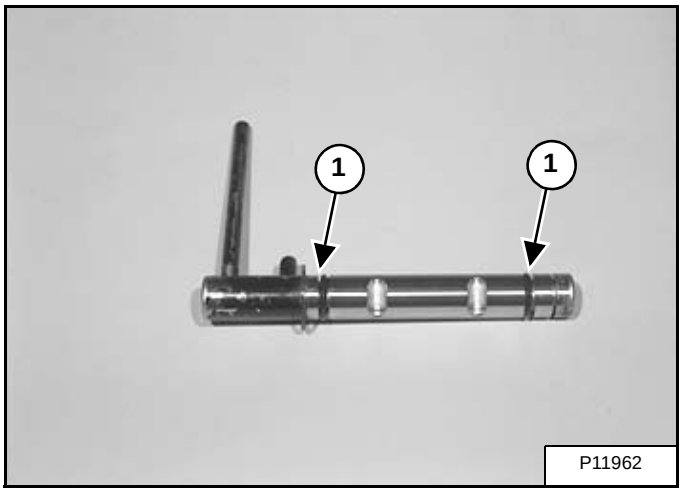


Pull the spool (Item 1) **[Figure 20-100-6]** out of the valve.

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Disassembly (Cont'd)

Figure 20-100-7



Remove the O-rings (Item 1) **[Figure 20-100-7]** from the spool.

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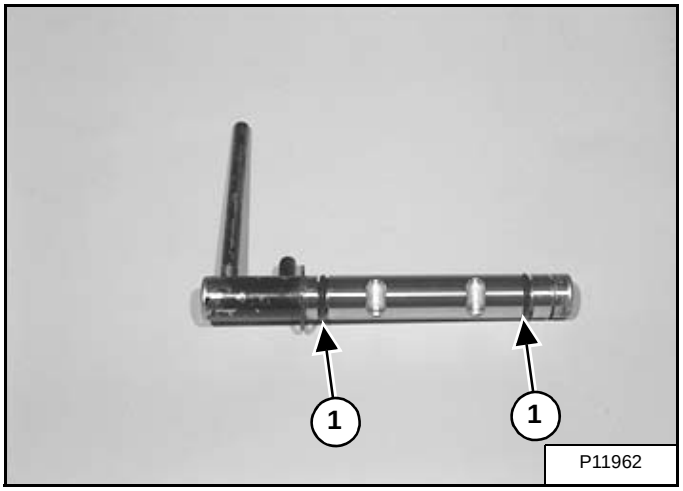
Assembly

Clean all parts in solvent and dry with compressed air.

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

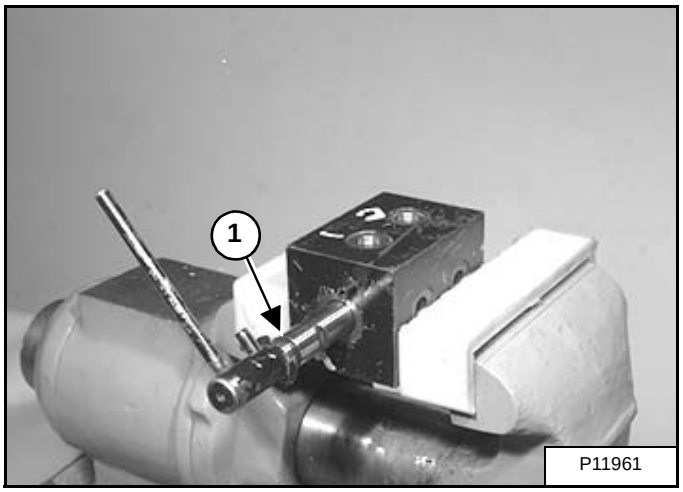
Always install new seals and O-rings. Lubricate all seals and O-rings with clean hydraulic fluid before installation.

Figure 20-100-8



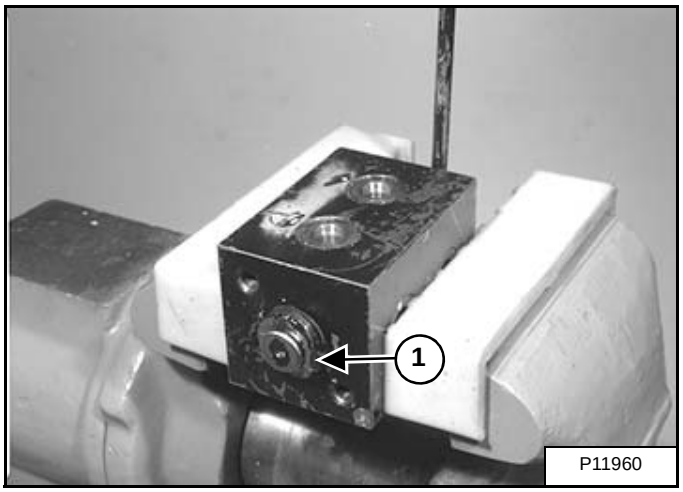
Install the O-rings (Item 1) **[Figure 20-100-8]** on the spool.

Figure 20-100-9



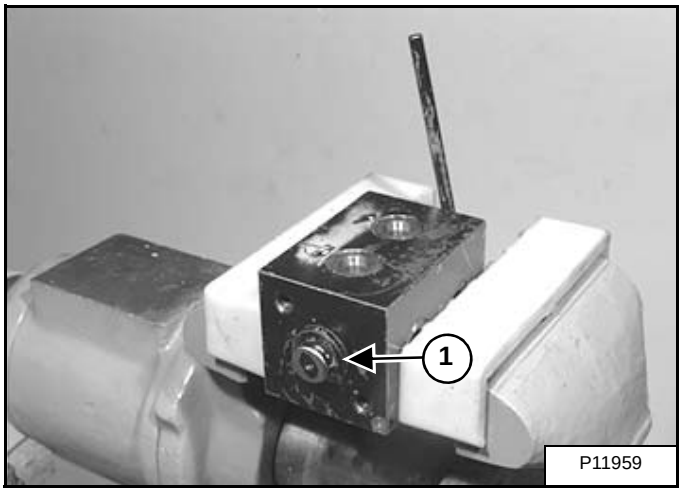
Install the spool (Item 1) **[Figure 20-100-9]** in the valve block.

Figure 20-100-10



Install the wave washer (Item 1) **[Figure 20-100-10]** on the end of the spool.

Figure 20-100-11

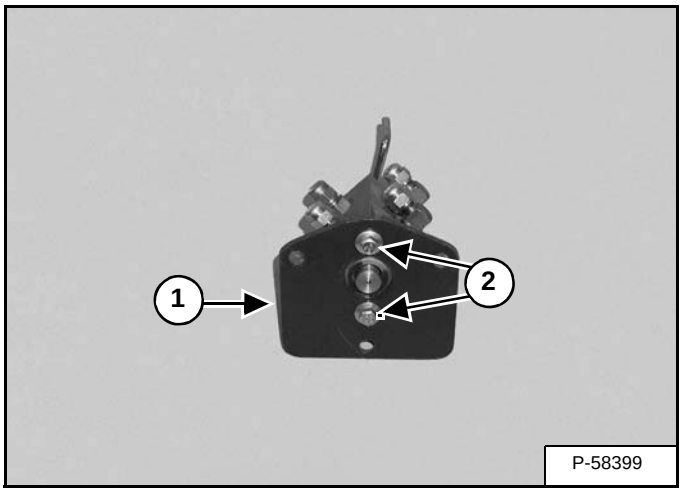


Install the snap ring (Item 1) **[Figure 20-100-11]** on the spool.

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Assembly (Cont'd)

Figure 20-100-12



Install the bracket (Item 1) and bolts (Item 2) **[Figure 20-100-12]**

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RIGHT CONTROL LEVER (JOYSTICK)

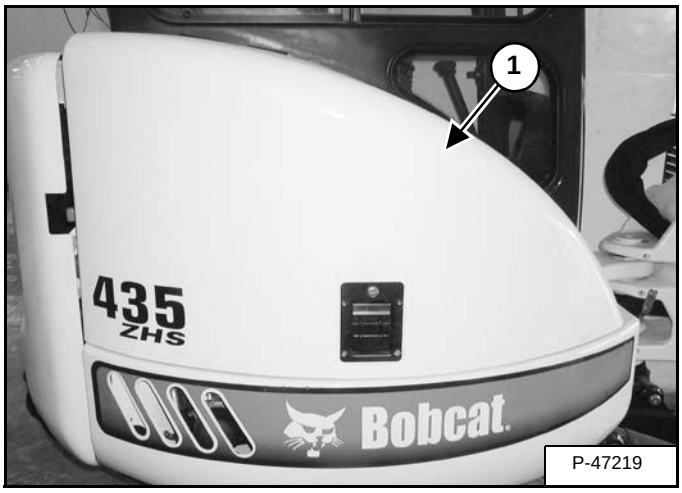
Testing

The following tools will be needed to do the procedure:

MEL1355 - Hydraulic Test Kit

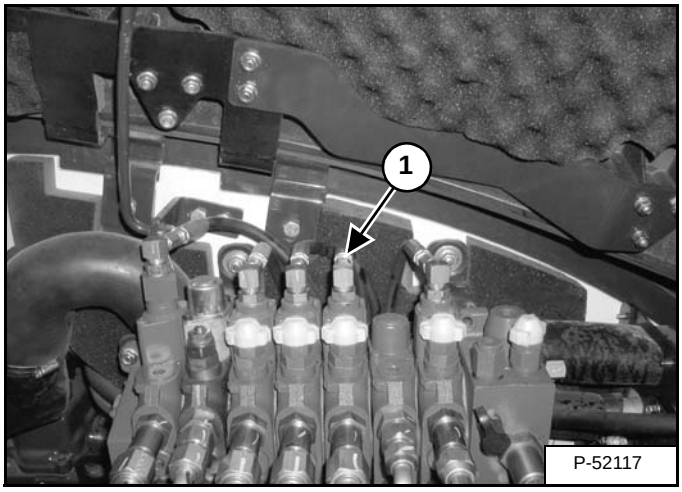
Stop the engine.

Figure 20-110-1



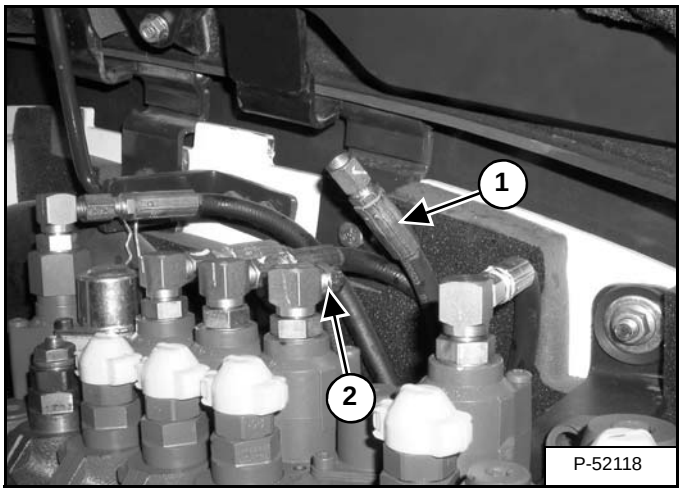
Open the right side cover (Item 1) **[Figure 20-110-1]**.

Figure 20-110-2



At the control valve assembly, find the pilot line (Item 1) **[Figure 20-110-2]** of the control lever (joystick) that is to be checked. (Boom, Arm, Upperstructure Slew, Bucket.)

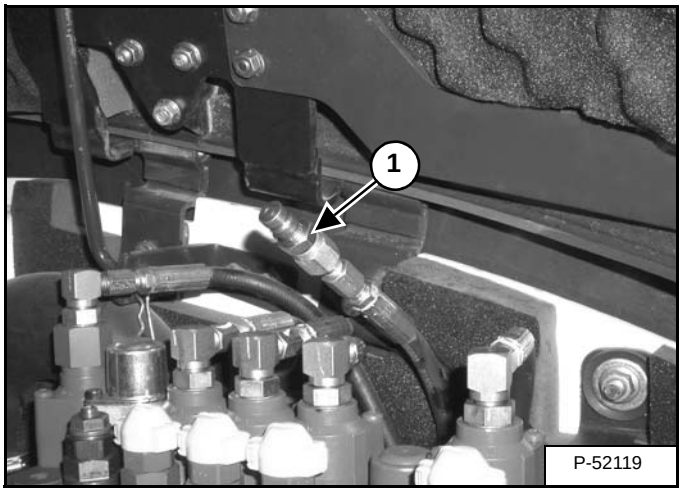
Figure 20-110-3



Disconnect the hydraulic hose (Item 1) **[Figure 20-110-3]** from the control valve.

Install a cap (Item 2) **[Figure 20-110-3]** on the control valve.

Figure 20-110-4

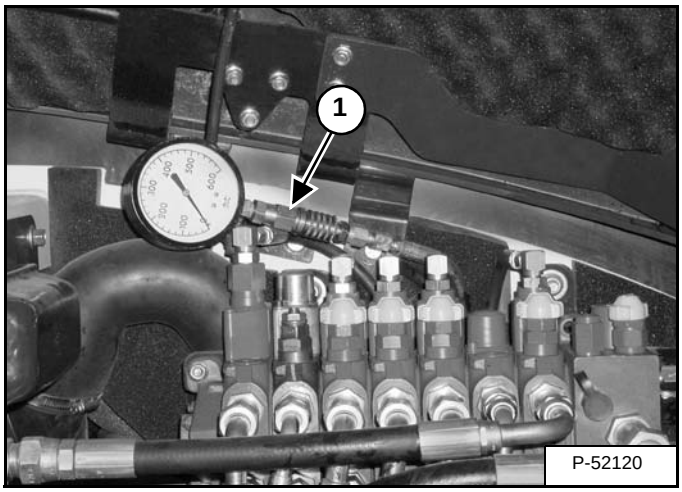


From the test kit, install a hydraulic fitting and test port (Item 1) **[Figure 20-110-4]** to the control valve hydraulic hose.

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Testing (Cont'd)

Figure 20-110-5



From the test kit Install a 500 PSI (35 Bar) gauge and female quick coupler (Item 1) **[Figure 20-110-5]** on the test port.

Start the excavator, and warm the hydraulic oil to operating temperature.

Engage the circuit to be tested and record the operating pressure.

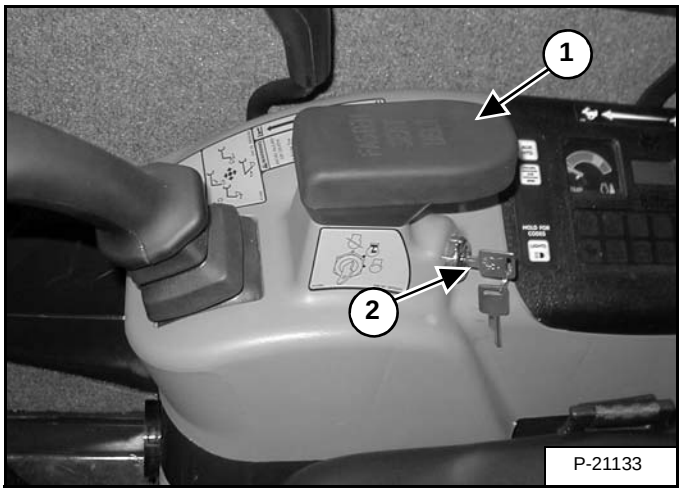
The operating pressure should be approximately 350 PSI (24.1 Bar).

If the operating pressure is correct, check the valve section spool for proper operation. If the operating pressure is incorrect, remove the pressure reducing valve, clean, install and retest. ((See PRESSURE REDUCING VALVE on Page 20-33-1.))

If the pressure is still incorrect replace the pressure reducing valve. ((See PRESSURE REDUCING VALVE on Page 20-33-1.))

Handle Removal And Installation

Figure 20-110-6



In the operator cab, at the right side operator console, remove the cover (Item 1) **[Figure 20-110-6]** from the arm rest.

Lift up on the rear of the cover and slide the cover ahead to remove it.

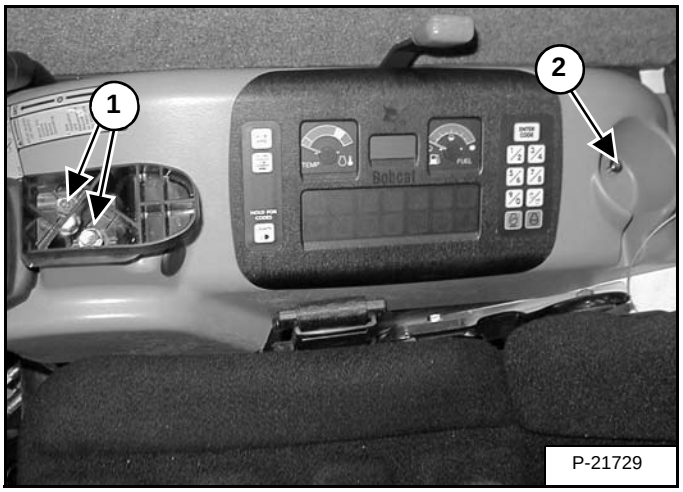
Remove the key and nut from the key switch (Item 2) **[Figure 20-110-6]** (if equipped). Allow the switch to drop inside the console.

NOTE: The key switch must be removed to remove and install the console cover.

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Handle Removal And Installation (Cont'd)

Figure 20-110-7



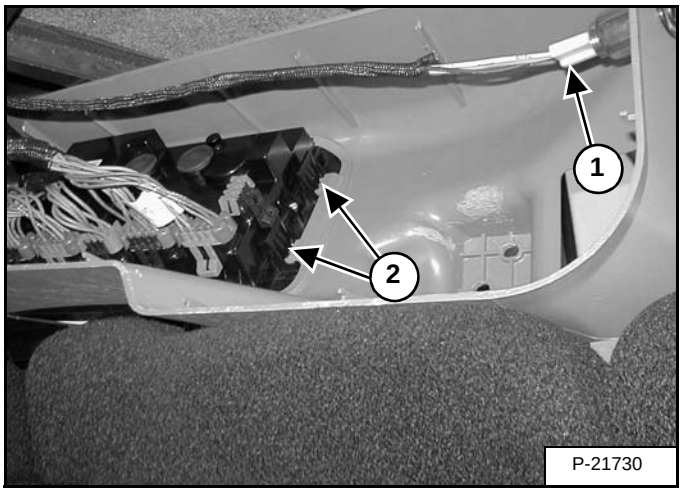
Remove the two bolts (Item 1) **[Figure 20-110-7]** from the arm rest.

Remove the arm rest.

Remove the screw (Item 2) **[Figure 20-110-7]** from the cup holder.

Lift the console cover up and over the joystick.

Figure 20-110-8

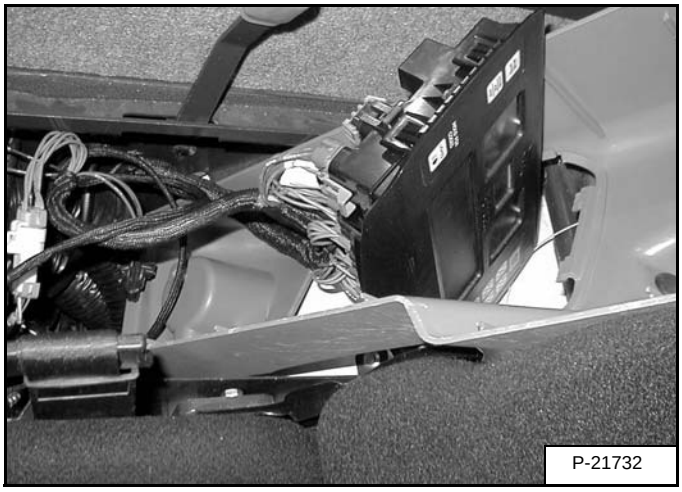


Disconnect the accessory outlet electrical connector (Item 1) **[Figure 20-110-8]**.

Remove the controller from the console cover by pressing the mounting tabs (Item 2) **[Figure 20-110-8]**.

NOTE: The controller must be removed from the console only to allow access to re-install the key switch (if so equipped). Controller removal is not necessary on keyless machines.

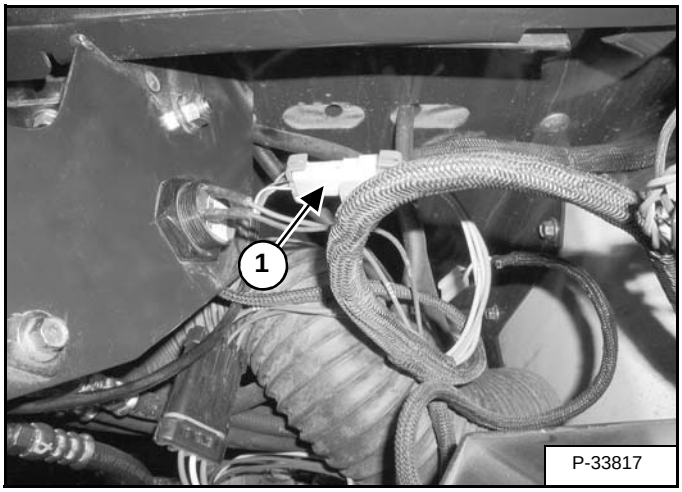
Figure 20-110-9



Turn the controller to allow it to pass through the console cover **[Figure 20-110-9]**.

Remove the console cover.

Figure 20-110-10

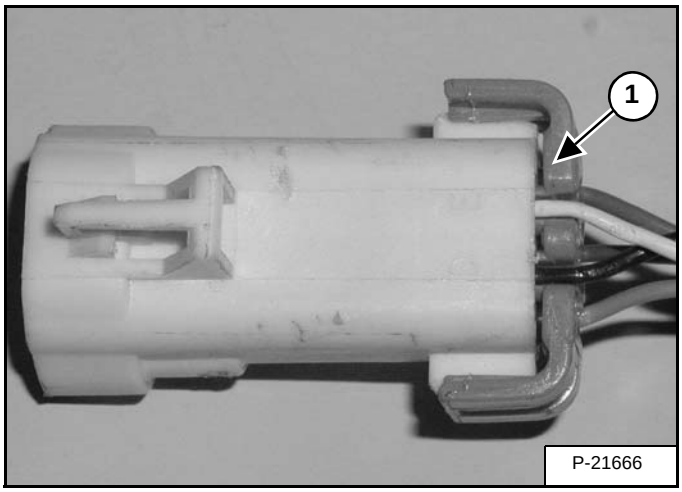


Disconnect the electrical connector (Item 1) **[Figure 20-110-10]** from the excavator wiring harness.

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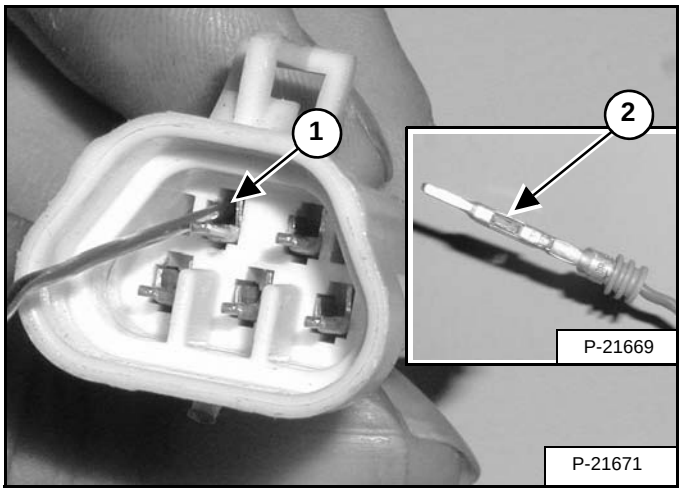
Handle Removal And Installation (Cont'd)

Figure 20-110-11



Remove the lock (Item 1) **[Figure 20-110-11]** from the electrical connector.

Figure 20-110-12

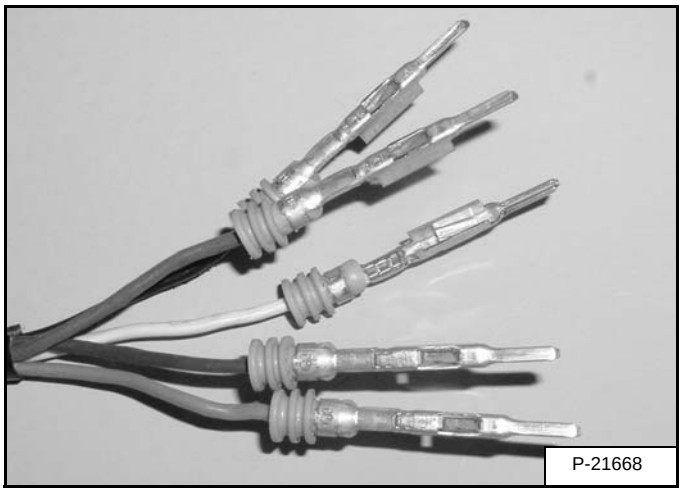


With a small piece of wire, depress the wire terminal tabs (Item 1) **[Figure 20-110-12]**.

Remove the individual wires from the back of the electrical connector.

Installation: Use a small piece of wire and re-bend the tab (Item 2) **[Figure 20-110-12]** on each wire before installing the electrical connector.

Figure 20-110-13

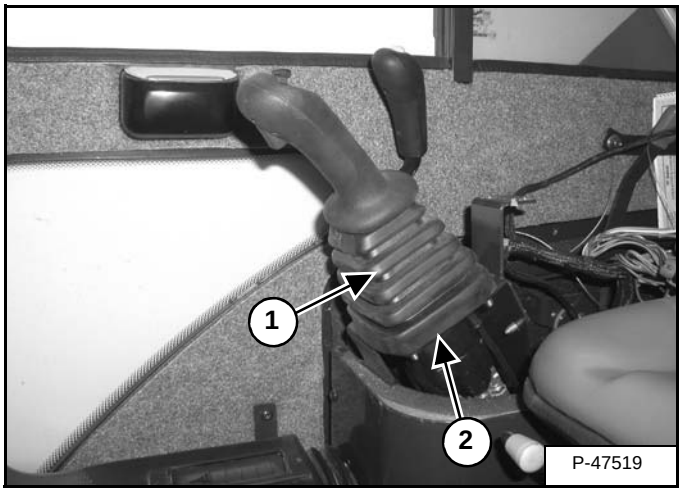


Installation: The wires **[Figure 20-110-13]** must be installed in the proper locations in the wire connector, listed below.

A Green
B Brown
C Red
D Black
E White

Check each wire to be certain the tab locks into position.

Figure 20-110-14



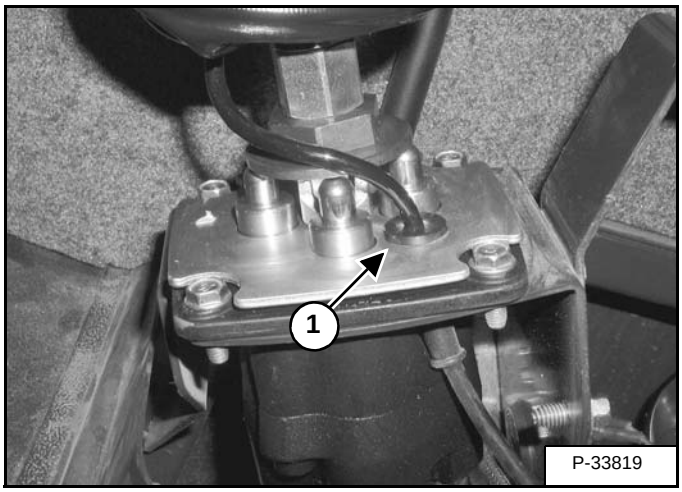
Pull the boot (Item 1) **[Figure 20-110-14]** up.

Installation: The bottom of the boot is molded to fit over the flange of the joystick. It has tabs that fit between the joystick flange (Item 2) **[Figure 20-110-14]** and the mounting plate. Position the boot properly before installing the console cover.

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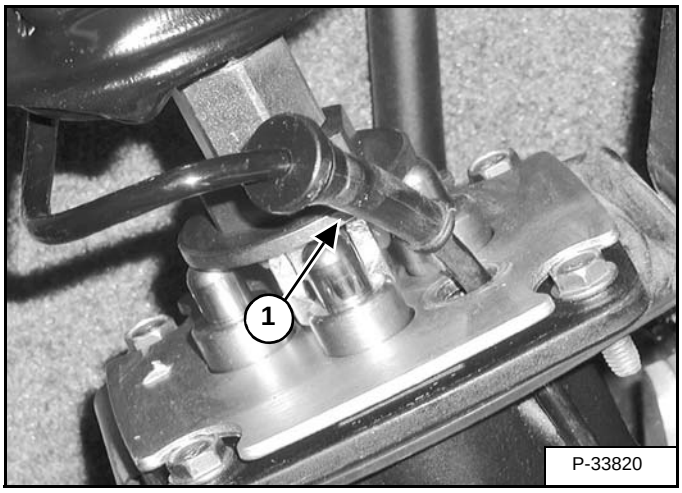
Handle Removal And Installation (Cont'd)

Figure 20-110-15



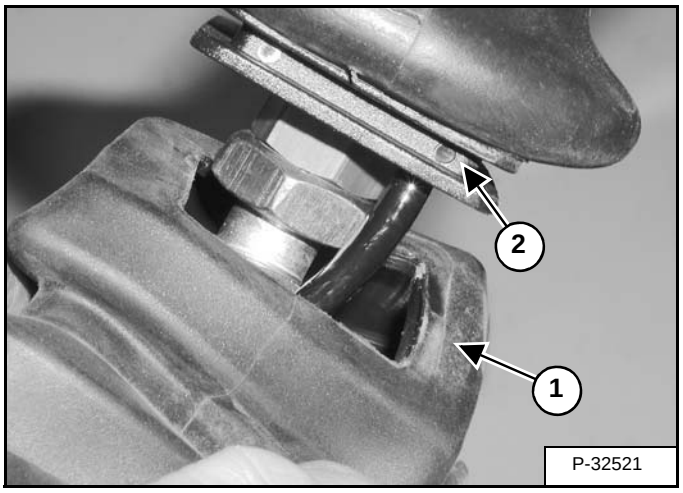
Lift the grommet (Item 1) **[Figure 20-110-15]** from the mount plate.

Figure 20-110-16



Remove the wire and grommet (Item 1) **[Figure 20-110-16]**.

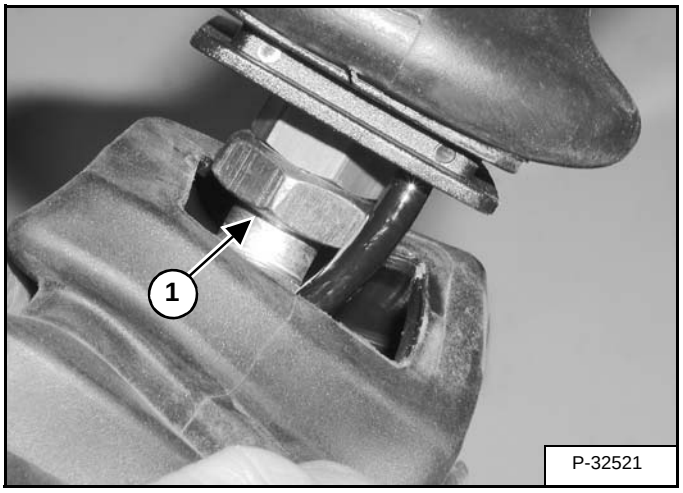
Figure 20-110-17



Pull the boot (Item 1) **[Figure 20-110-17]** down.

Installation: The top of the boot is molded to fit over the flange of the joystick. It has tabs that fit between the handle and joystick flange (Item 2) **[Figure 20-110-17]**. Position the boot properly before reinstalling the console cover.

Figure 20-110-18



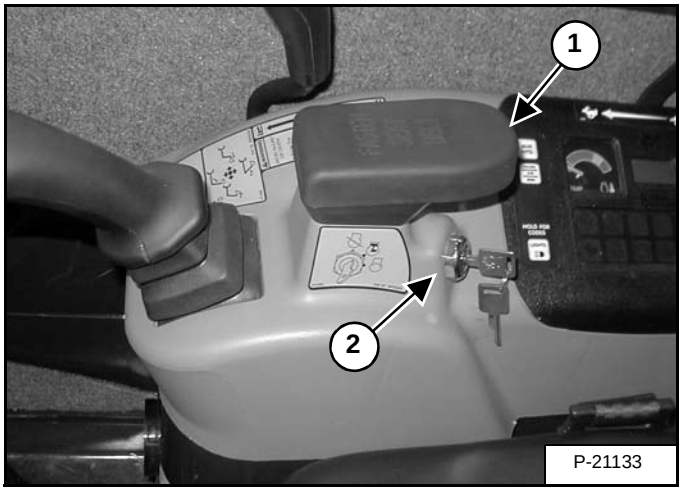
Loosen the nut (Item 1) **[Figure 20-110-18]**.

Remove the handle.

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Joystick Assembly Removal And Installation

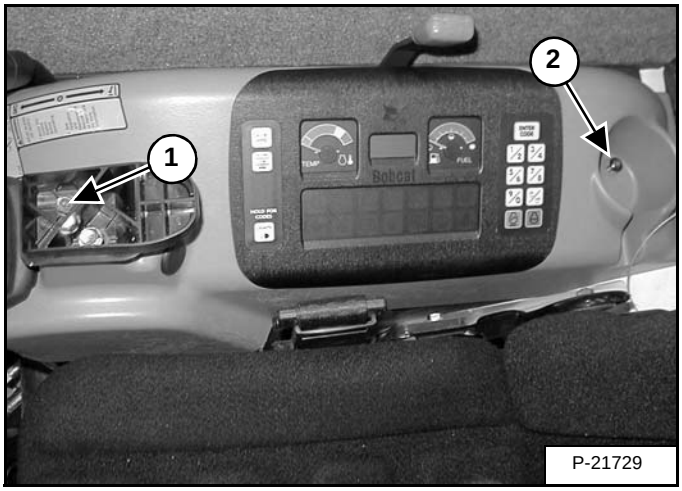
Figure 20-110-19



Lift up on the rear of the cover (Item 1) **[Figure 20-110-19]** and slide the cover ahead to remove it.

Remove the key and nut from the key switch (Item 2) **[Figure 20-110-19]** (if equipped). Allow the switch to drop inside the console.

Figure 20-110-20

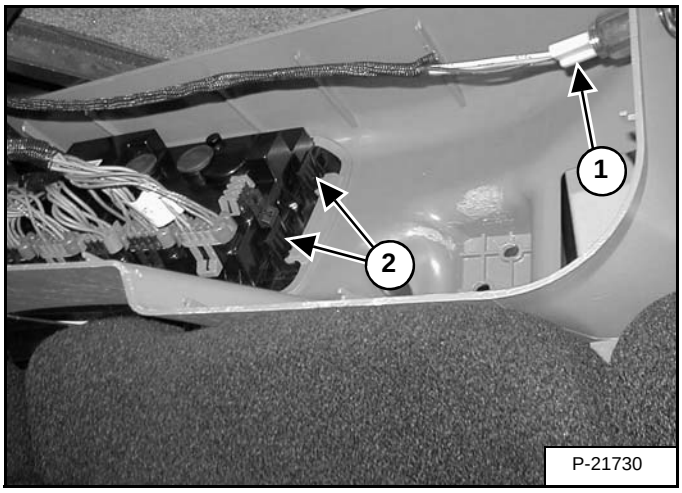


Remove the two bolts (Item 1) **[Figure 20-110-20]** from the arm rest.

Remove the arm rest.

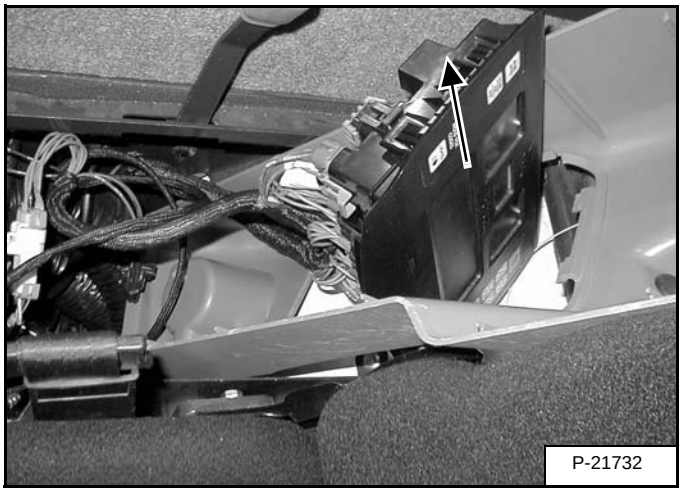
Remove the screw (Item 2) **[Figure 20-110-20]** from the console cover. Lift the console cover up and over the joystick lever.

Figure 20-110-21



Disconnect the accessory outlet electrical connector (Item 1) **[Figure 20-110-21]**.

Figure 20-110-22



Remove the controller from the console cover by pressing the mounting tabs (Item 2) **[Figure 20-110-22]**.

NOTE: The controller must be removed from the console only to allow access to re-install the key switch (if so equipped). Controller removal is not necessary on keyless machines.

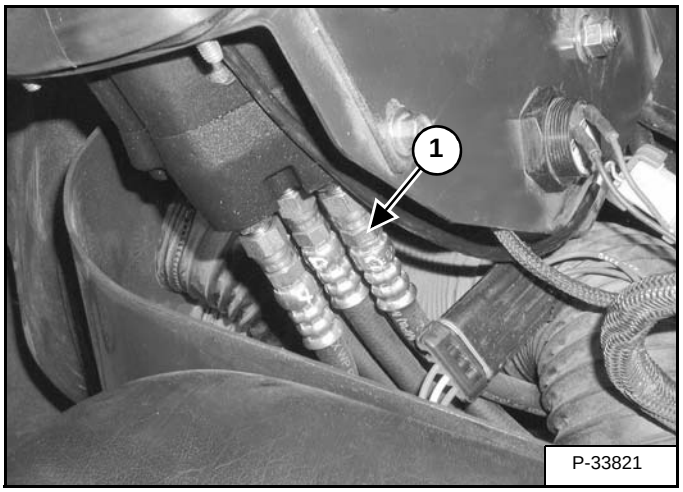
Turn the controller to allow it to pass through the console cover **[Figure 20-110-22]**.

Remove the console cover.

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Joystick Assembly Removal And Installation (Cont'd)

Figure 20-110-23



Mark the hoses for correct installation. Remove the six hoses (Item 1) **[Figure 20-110-23]**.

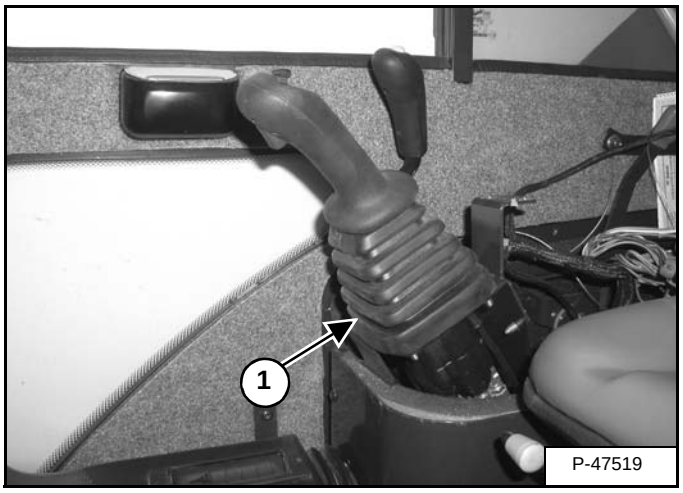
NOTE: If pilot pressure hose replacement is required, see Hoses for hose routing diagrams. (See HOSES on Page 20-114-1.)

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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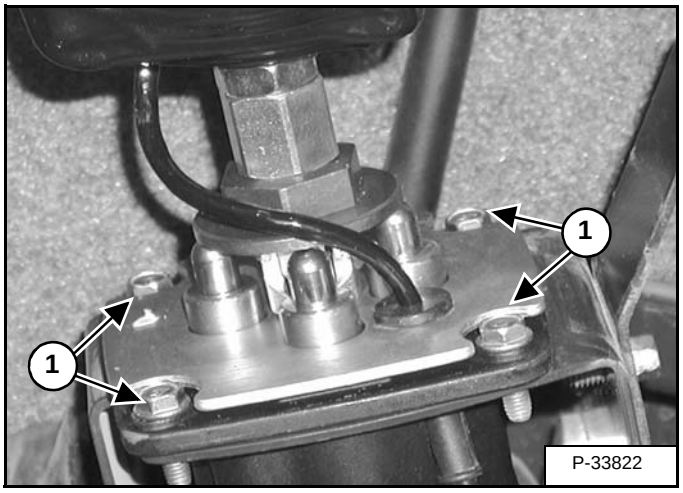
Figure 20-110-24



Pull the boot (Item 1) **[Figure 20-110-24]** up.

Installation: The bottom of the boot is molded to fit over the flange of the joystick. It has tabs that fit between the joystick flange (Item 2) **[Figure 20-110-24]** and the mounting plate. Position the boot properly before installing the console cover.

Figure 20-110-25

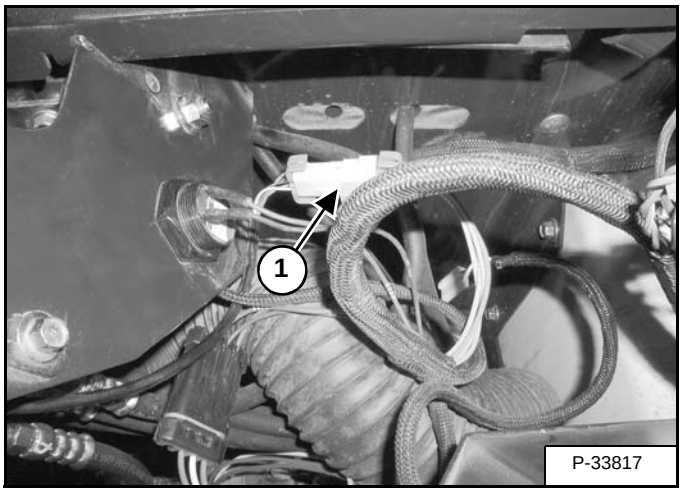


Remove the four mount bolts (Item 1) **[Figure 20-110-25]** from the housing.

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Joystick Assembly Removal And Installation (Cont'd)

Figure 20-110-26



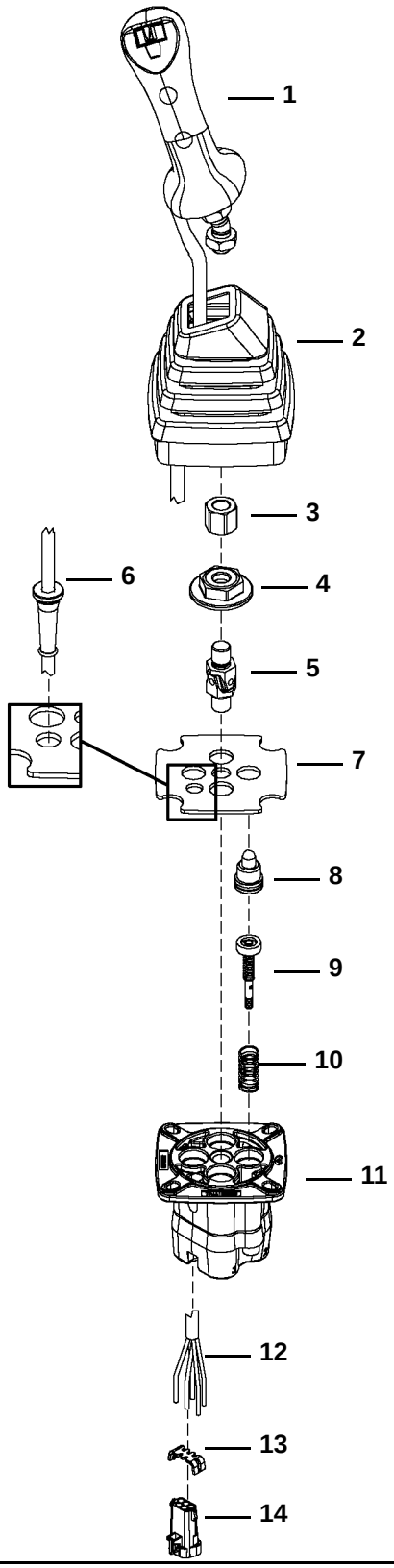
Disconnect the electrical connector (Item 1) **[Figure 20-110-26]**, from the excavator wiring harness.

Remove the joystick assembly.

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Parts Identification

1. Handle
2. Boot
3. Coupler Control
4. Control Plate
5. U-Joint
6. Grommet
7. Plate
8. Plunger Assembly
9. Spool
10. Spring
11. Housing
12. Wire Harness
13. Lock
14. Connector



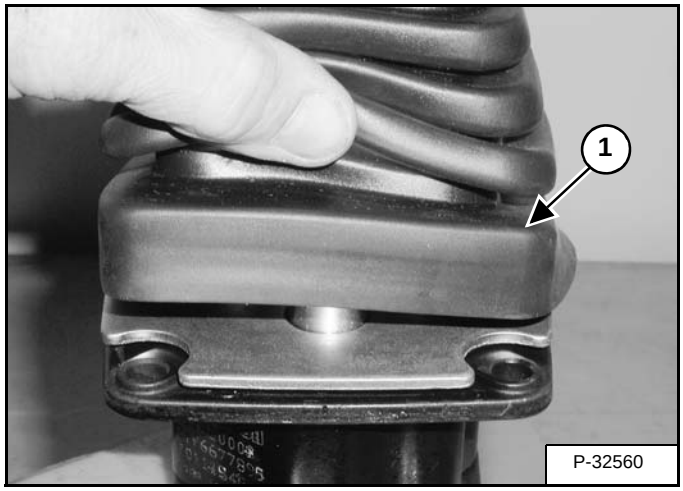
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Disassembly

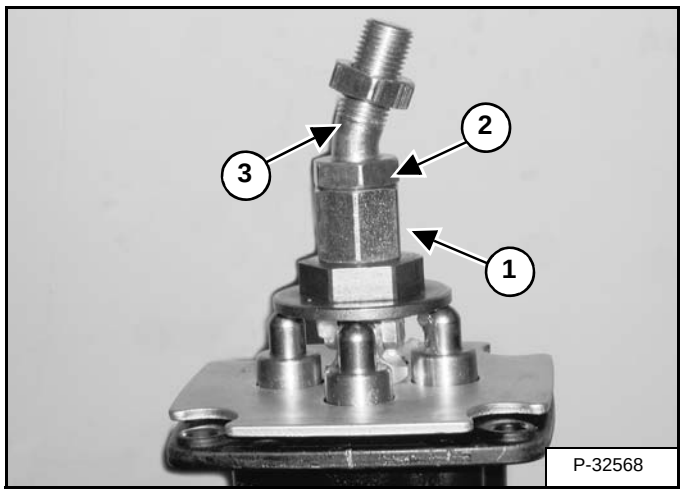
Remove the right handle (See Handle Removal And Installation on Page 20-110-2.)

Figure 20-110-27



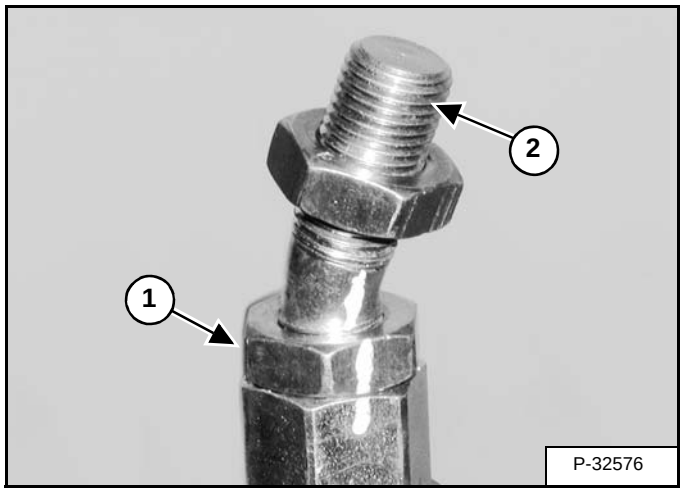
Remove the boot (Item 1) **[Figure 20-110-27]**.

Figure 20-110-28



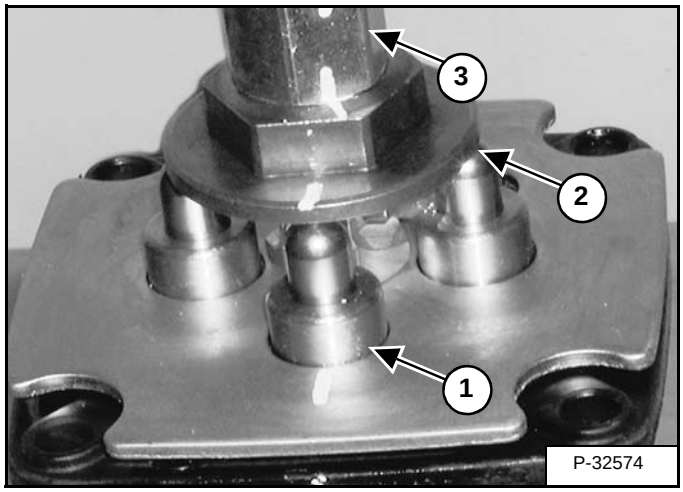
Mark the coupler (Item 1) nut (Item 2), and connector (Item 3) **[Figure 20-110-28]**.

Figure 20-110-29



Loosen the nut (Item 1) and remove the connector (Item 2) **[Figure 20-110-29]**.

Figure 20-110-30

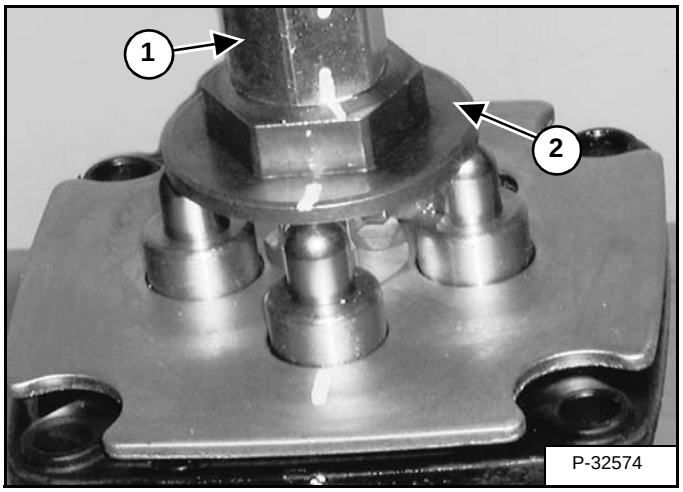


Mark the coupler (Item 1), control plate (Item 2), and plunger (Item 3) **[Figure 20-110-30]** for ease of assembly.

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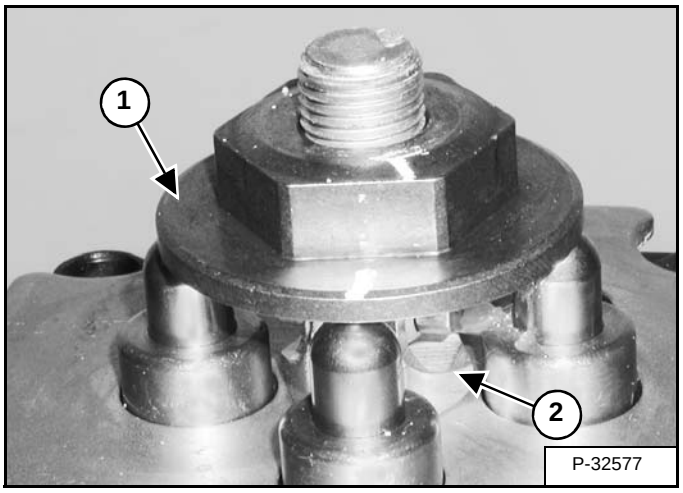
Disassembly (Cont'd)

Figure 20-110-31



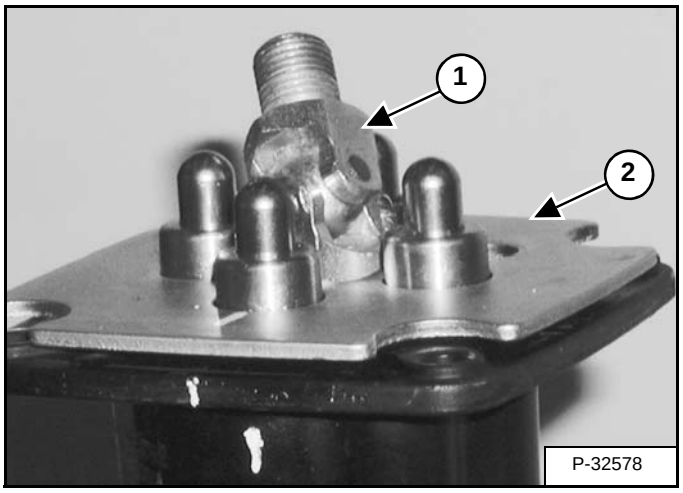
Remove the coupler (Item 1) from the control plate (Item 2) **[Figure 20-110-31]**.

Figure 20-110-32



Remove the control plate (Item 1) from the U-Joint (Item 2) **[Figure 20-110-32]**.

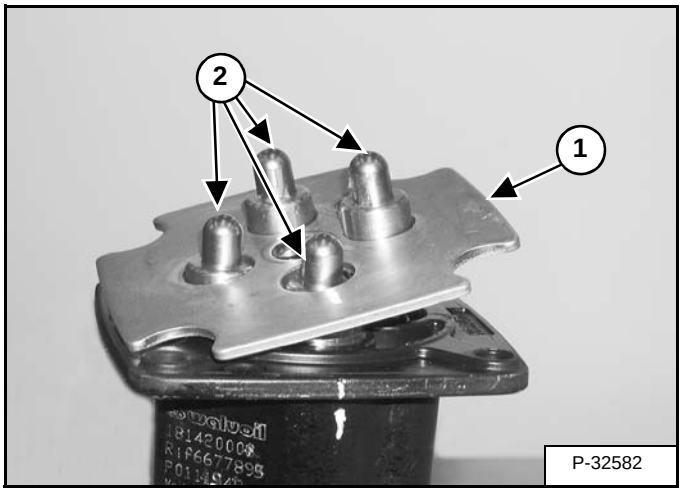
Figure 20-110-33



Mark the plate and housing for correct installation. Remove the U-joint (Item 1) **[Figure 20-110-33]**.

NOTE: The plate (Item 2) [Figure 20-110-33] is spring loaded and will come up as the U-joint is removed.

Figure 20-110-34



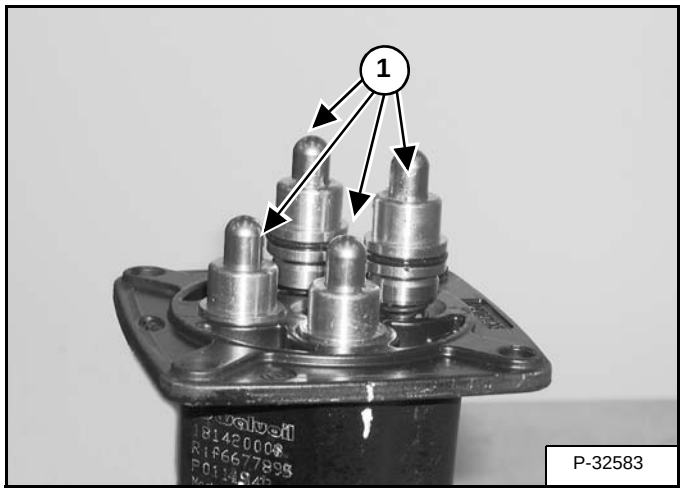
Remove the plate (Item 1) **[Figure 20-110-34]**.

NOTE: Use care while removing the plate. The plungers (Item 2) [Figure 20-110-34] are spring loaded.

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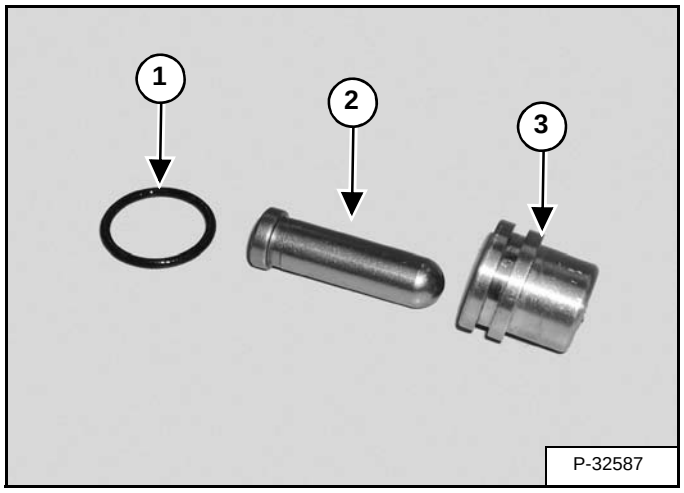
Disassembly (Cont'd)

Figure 20-110-35



Remove the four plunger assemblies (Item 1) **[Figure 20-110-35]**.

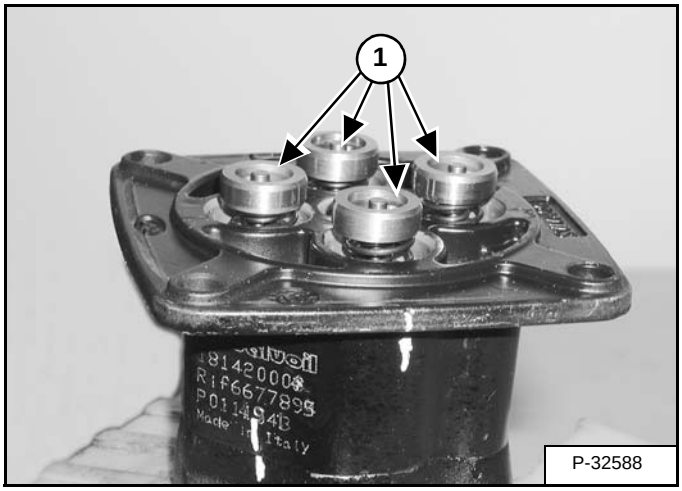
Figure 20-110-36



Remove the O-ring (Item 1) and plunger (Item 2) from the bushing (Item 3) **[Figure 20-110-36]**.

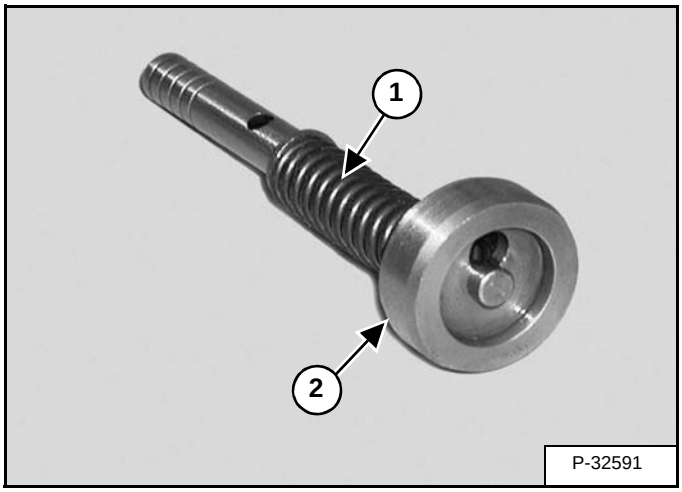
Mark the spool assemblies for installation in their original location.

Figure 20-110-37



Remove the four spool assemblies (Item 1) **[Figure 20-110-37]**.

Figure 20-110-38

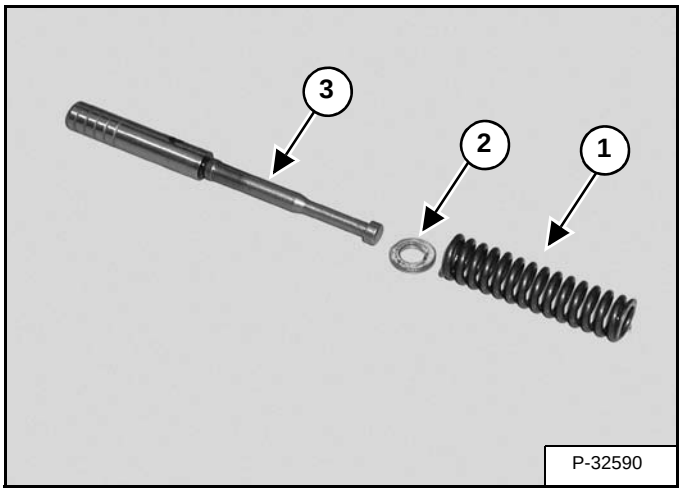


Compress the spring (Item 1) and remove the seat (Item 2) **[Figure 20-110-38]**.

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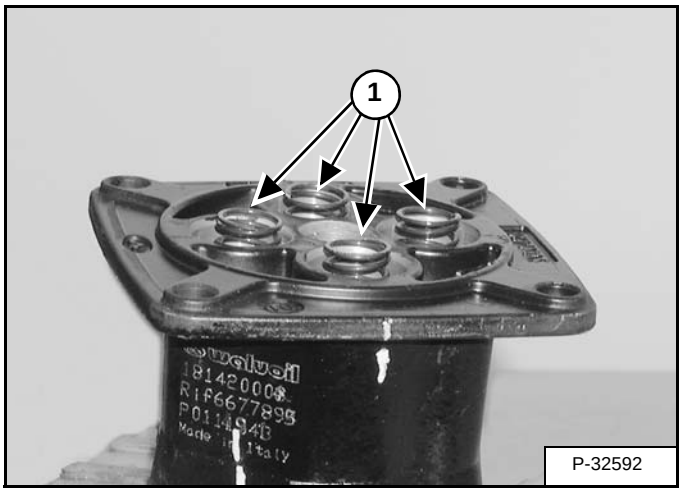
Disassembly (Cont'd)

Figure 20-110-39



Remove the spring (Item 1) and shim (Item 2) from the spool (Item 3) **[Figure 20-110-39]**.

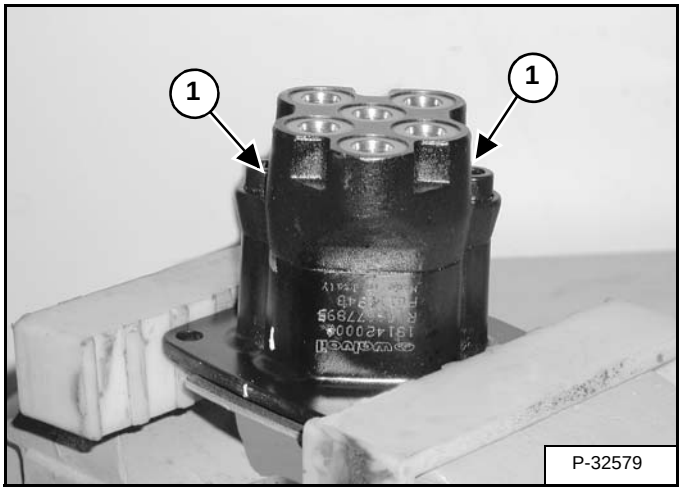
Figure 20-110-40



Remove the four springs (Item 1) **[Figure 20-110-40]** from the housing.

Clamp the housing in a vise that is equipped with padded jaws.

Figure 20-110-41

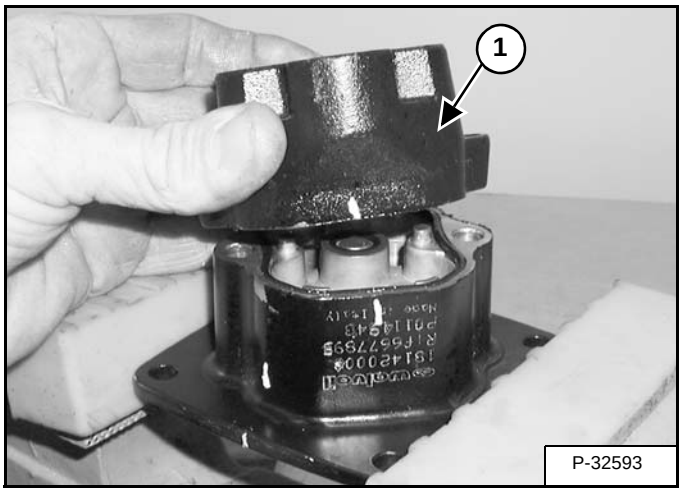


Remove the two bolts (Item 1) **[Figure 20-110-41]**.

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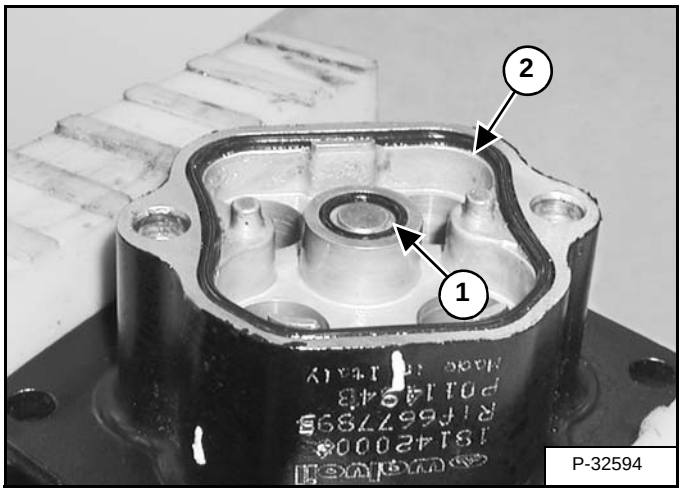
Disassembly (Cont'd)

Figure 20-110-42



Remove the end cap (Item 1) **[Figure 20-110-42]**.

Figure 20-110-43



Remove the O-ring (Item 1) and seal (Item 2) **[Figure 20-110-43]**.

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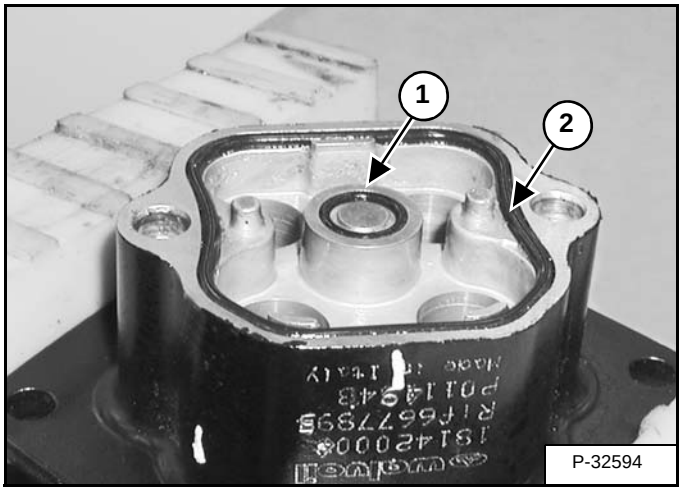
Assembly

Clean all parts in solvent and dry with compressed air.

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

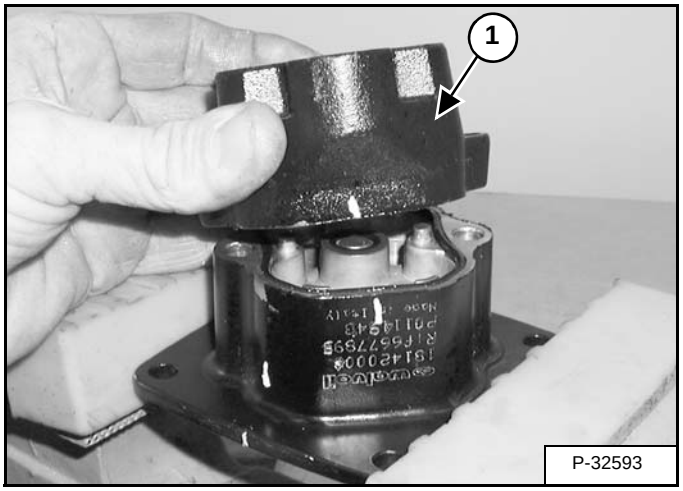
Always install new seals and O-rings. Lubricate all seals and O-rings with clean hydraulic fluid before installation

Figure 20-110-44



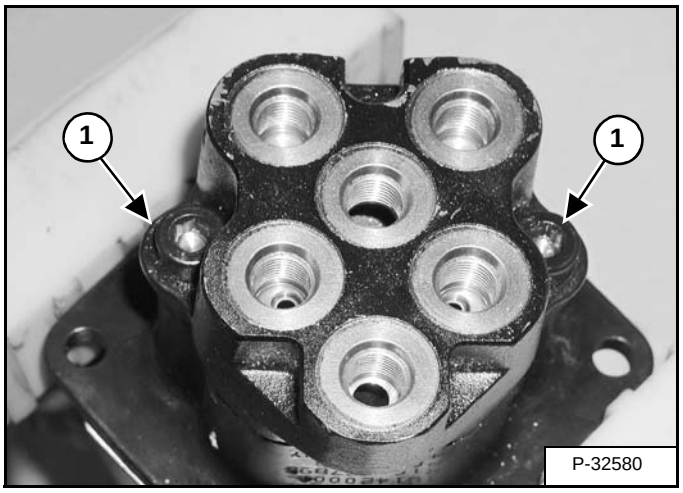
Clamp the housing in a vise equipped with padded jaws. Install the O-ring (Item 1) and seal (Item 2) **[Figure 20-110-44]**.

Figure 20-110-45



Install the end cap (Item 1) **[Figure 20-110-45]**.

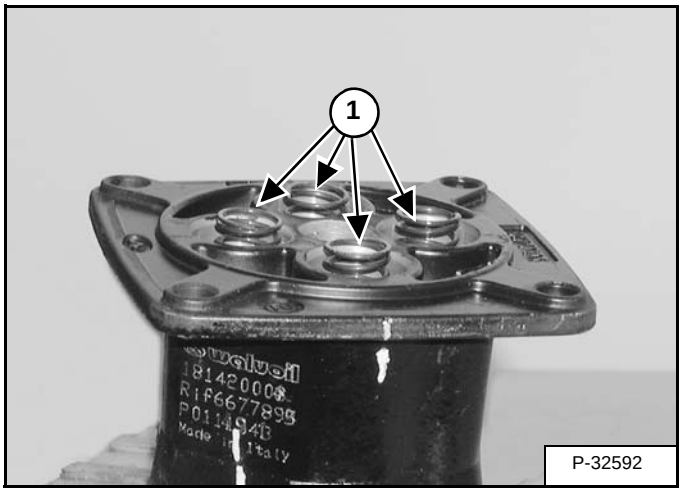
Figure 20-110-46



Install the two bolts (Item 1) **[Figure 20-110-46]**.

Turn the housing over.

Figure 20-110-47

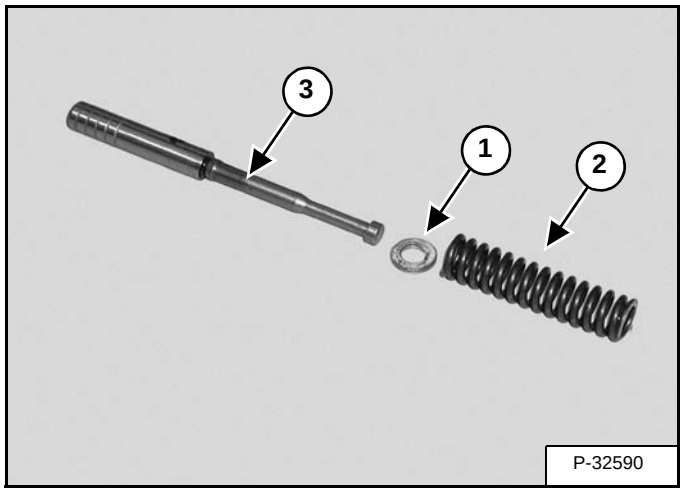


Install the four springs (Item 1) **[Figure 20-110-47]**.

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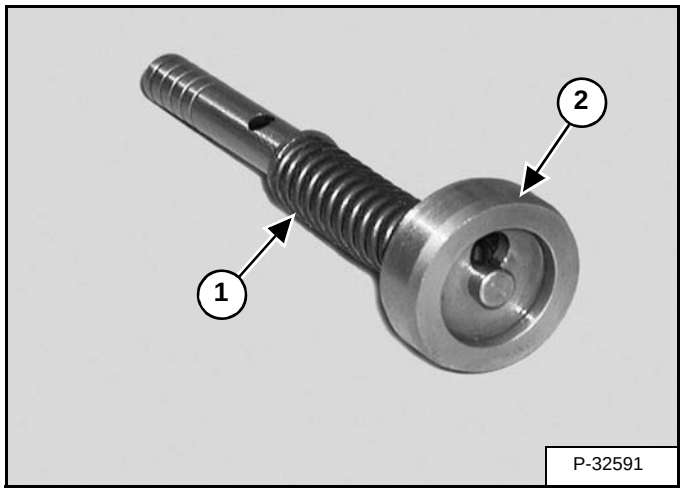
Assembly (Cont'd)

Figure 20-110-48



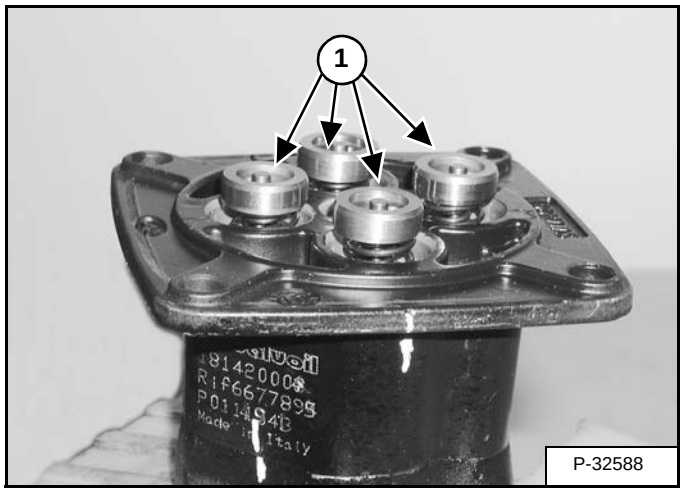
Install the shim (Item 1) and spring (Item 2) on the spool (Item 3) **[Figure 20-110-48]**.

Figure 20-110-49



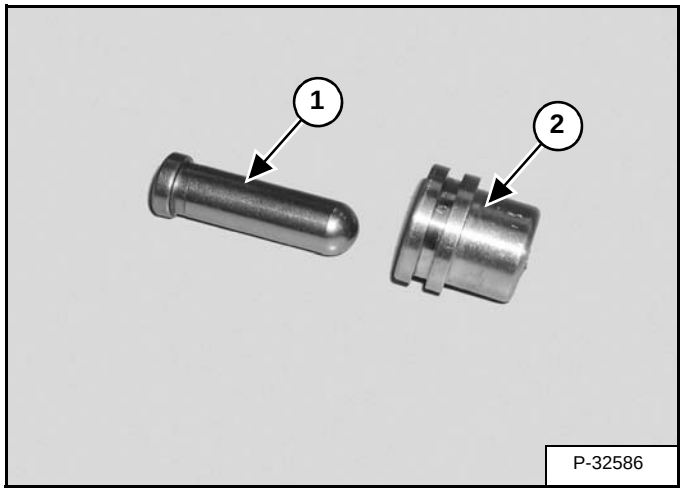
Compress the spring (Item 1) and install the spring seat (Item 2) **[Figure 20-110-49]**.

Figure 20-110-50



Install the four spool assemblies (Item 1) **[Figure 20-110-50]** in the housing.

Figure 20-110-51

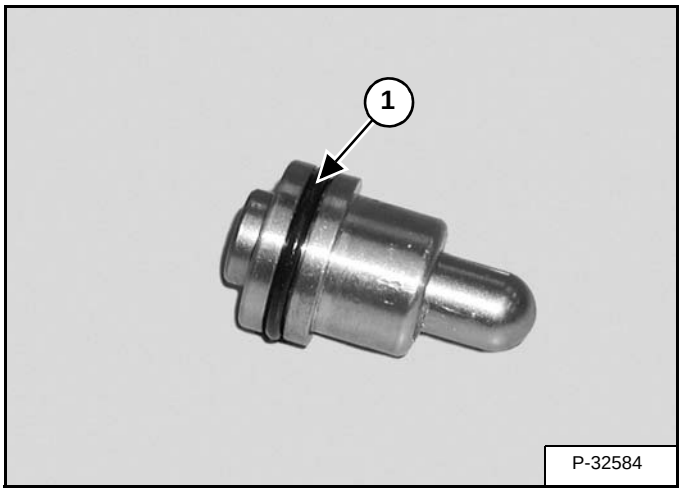


Install the plunger (Item 1) in the bushing (Item 2) **[Figure 20-110-51]**.

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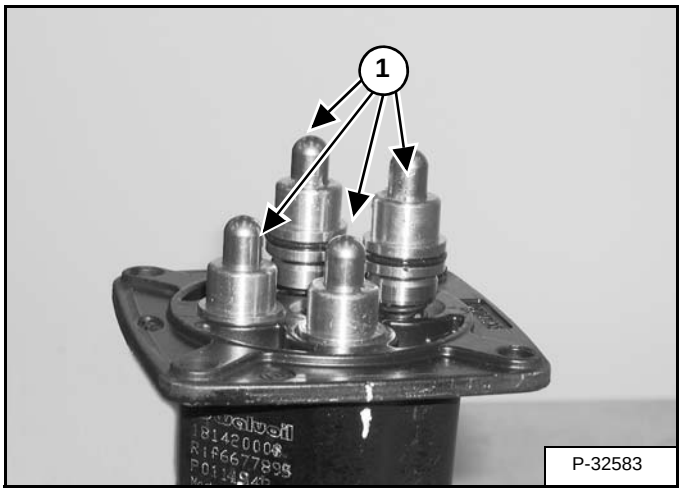
Assembly (Cont'd)

Figure 20-110-52



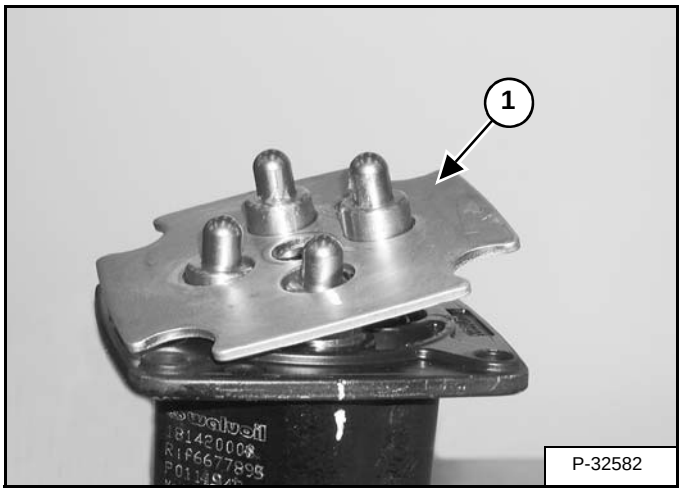
Install the O-ring (Item 1) **[Figure 20-110-52]** on the bushing.

Figure 20-110-53



Install the four plunger assemblies (Item 1) **[Figure 20-110-53]** in the housing.

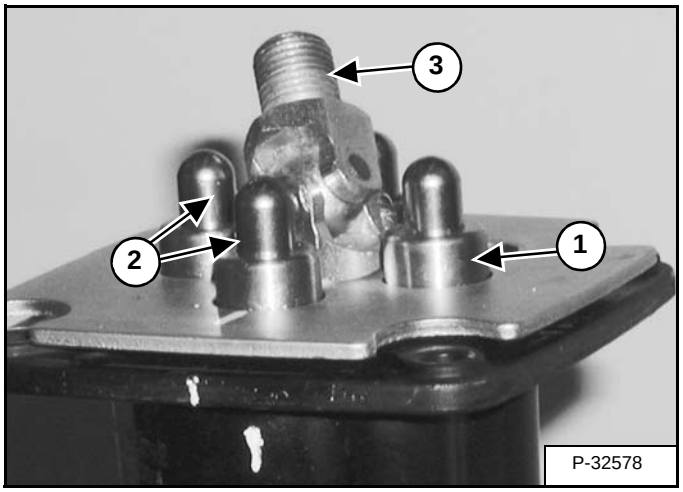
Figure 20-110-54



Install the plate (Item 1) **[Figure 20-110-54]**.

NOTE: Spring pressure can dislodge the plunger assemblies until the plate is secured in place.

Figure 20-110-55

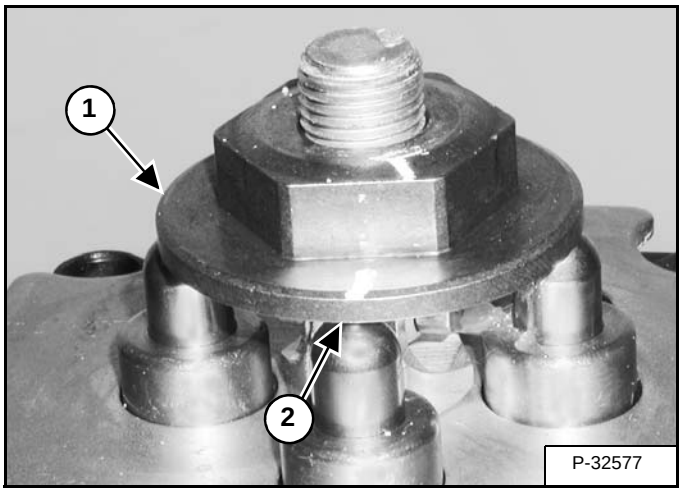


Press down on the plate (Item 1) keeping the plunger assemblies (Item 2) fully seated and install the U-joint (Item 3) **[Figure 20-110-54]**.

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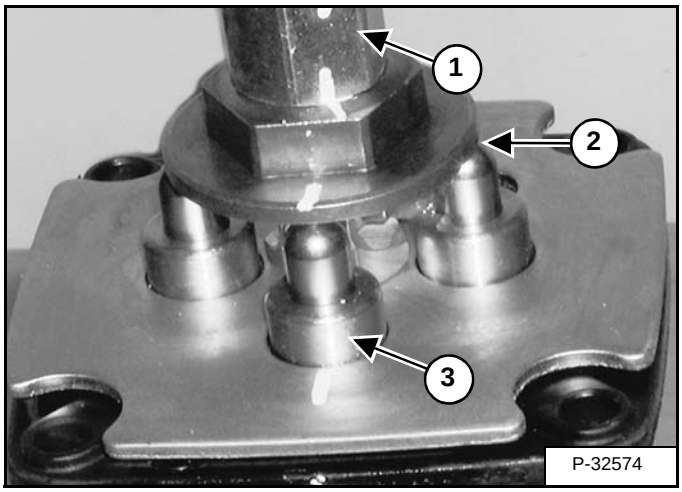
Assembly (Cont'd)

Figure 20-110-56



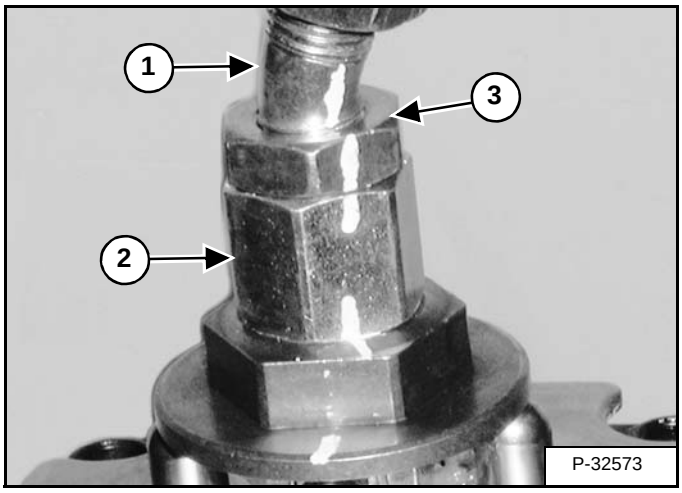
Install the control plate (Item 1) until the plate makes light contact with all four plungers (Item 2) **[Figure 20-110-56]**.

Figure 20-110-57



Align the coupler (Item 1) with the control plate (Item 2) and plunger (Item 3) **[Figure 20-110-57]**. Tighten the coupler.

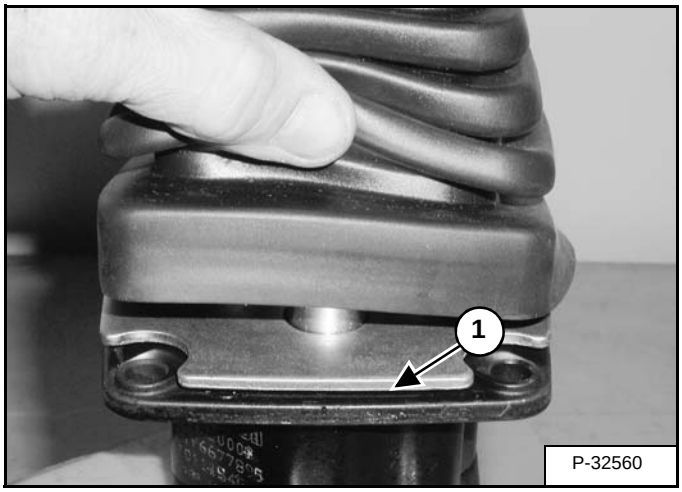
Figure 20-110-58



Install the connector (Item 1) **[Figure 20-110-58]**.

Align the connector with the coupler (Item 2) and tighten the nut (Item 3) **[Figure 20-110-58]**.

Figure 20-110-59



Install the tabs of the boot in between the joystick flange and mounting plate (Item 1) **[Figure 20-110-59]**.

Install the right handle (See Handle Removal And Installation on Page 20-110-2.)

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LEFT CONTROL LEVER (JOYSTICK)

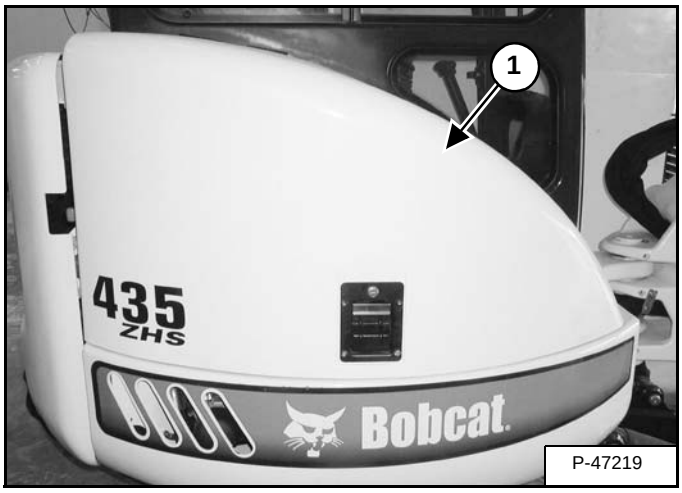
Testing

The following tools will be needed to do the procedure:

MEL1355 - Hydraulic Test Kit

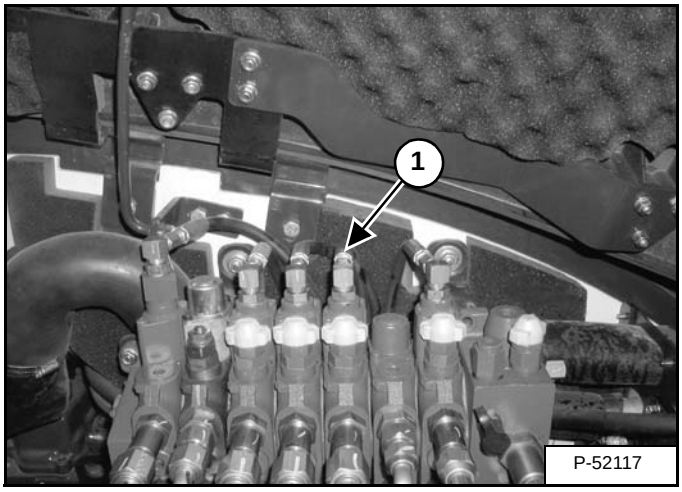
Stop the engine.

Figure 20-111-1



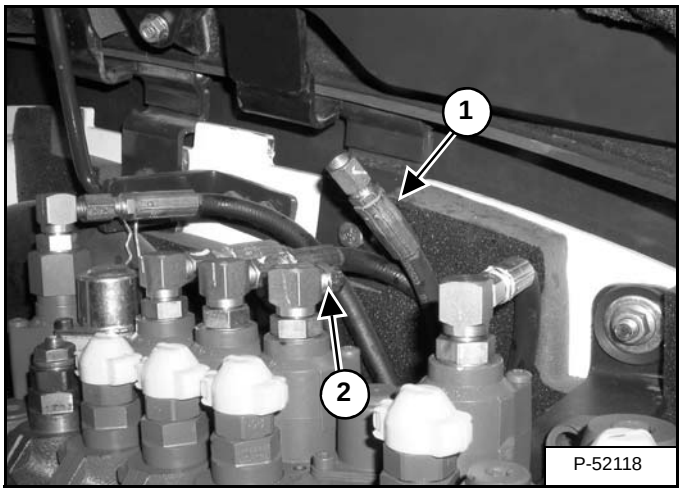
Open the right side cover (Item 1) **[Figure 20-111-1]**.

Figure 20-111-2



At the control valve assembly, find the pilot line (Item 1) **[Figure 20-111-2]** of the control lever (joystick) that is to be checked. (Boom, Arm, Upperstructure Slew, Bucket.)

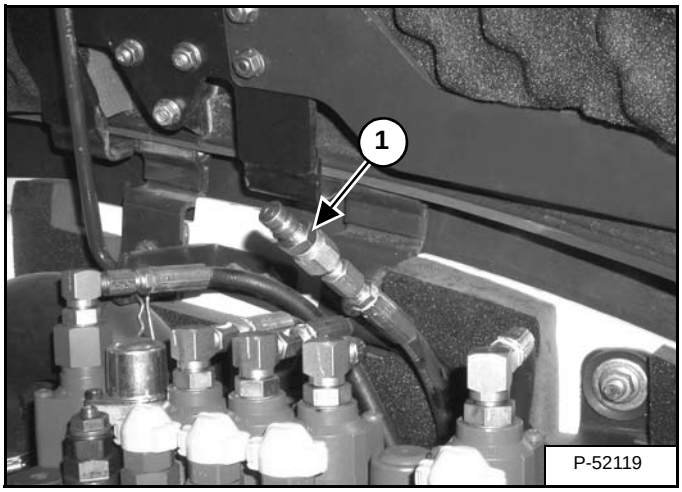
Figure 20-111-3



Disconnect the hydraulic hose (Item 1) **[Figure 20-111-3]** from the control valve.

Install a cap (Item 1) **[Figure 20-111-3]** on the control valve.

Figure 20-111-4

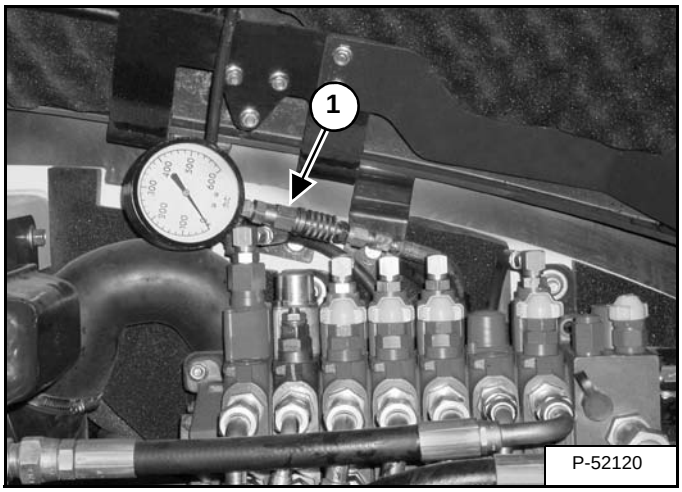


From the test kit, install a hydraulic fitting and test port (Item 1) **[Figure 20-111-4]** to the control valve hydraulic hose.

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Testing (Cont'd)

Figure 20-111-5



From the test kit Install a 500 PSI (35 Bar) gauge and female quick coupler (Item 1) **[Figure 20-111-5]** on the test port.

Start the excavator and warm the hydraulic oil to operating temperature.

Engage the circuit to be tested and record the operating pressure.

The operating pressure should be approximately 350 PSI (24.1 Bar).

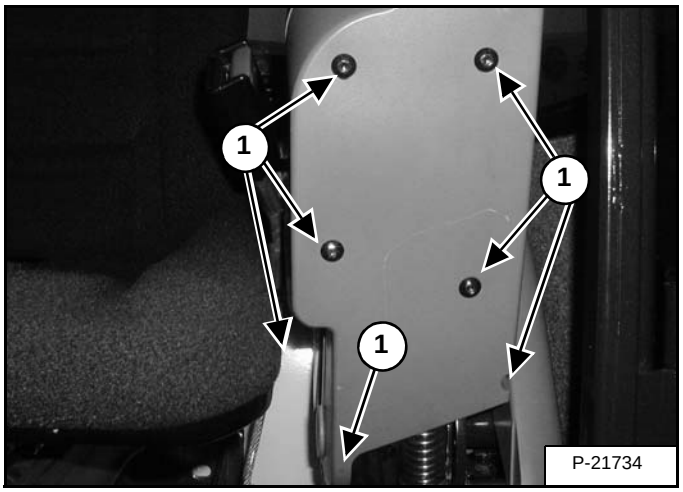
If the operating pressure is correct, check the valve section spool for proper operation. If the operating pressure is incorrect, remove the pressure reducing valve, clean, install and retest. ((See PRESSURE REDUCING VALVE on Page 20-33-1.))

If the pressure is still incorrect replace the pressure reducing valve. ((See PRESSURE REDUCING VALVE on Page 20-33-1.))

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Handle Removal And Installation

Figure 20-111-6

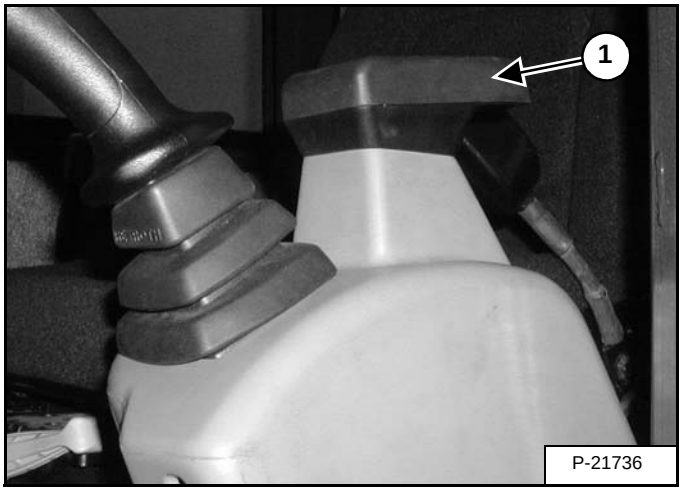


Remove the seven bolts (Item 1) **[Figure 20-111-6]** from the bottom of the console cover.

Remove the bottom of the console cover.

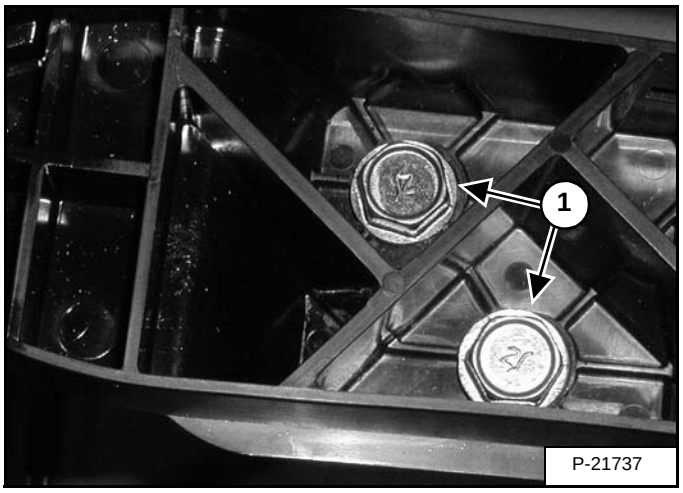
Lower the console.

Figure 20-111-7



Remove the cover (Item 1) **[Figure 20-111-7]** from the arm rest.

Figure 20-111-8

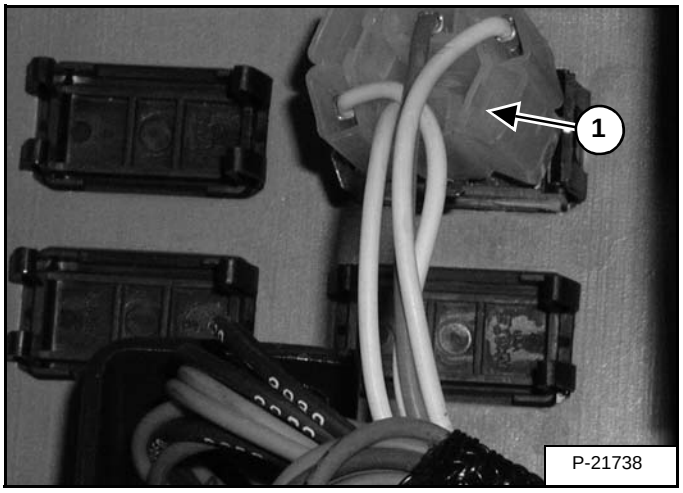


Remove the two mount bolts (Item 1) **[Figure 20-111-8]** from the arm rest.

Remove the arm rest.

Raise the top console cover.

Figure 20-111-9



Disconnect the wire harness (Item 1) **[Figure 20-111-9]**.

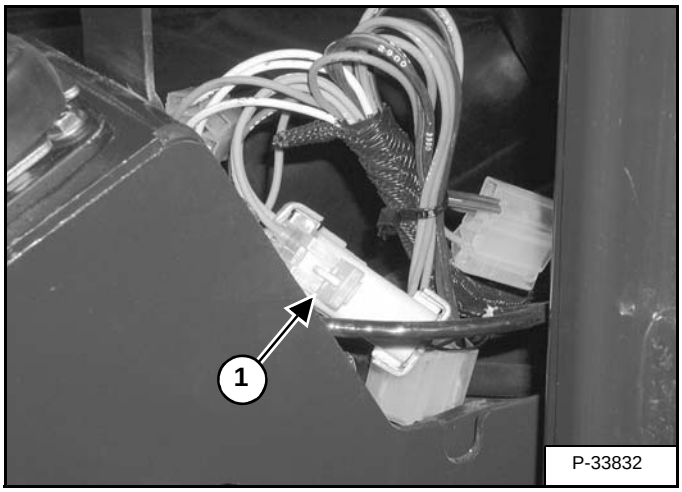
NOTE: These connectors are keyed so they can be plugged in only one way.

Remove the console cover.

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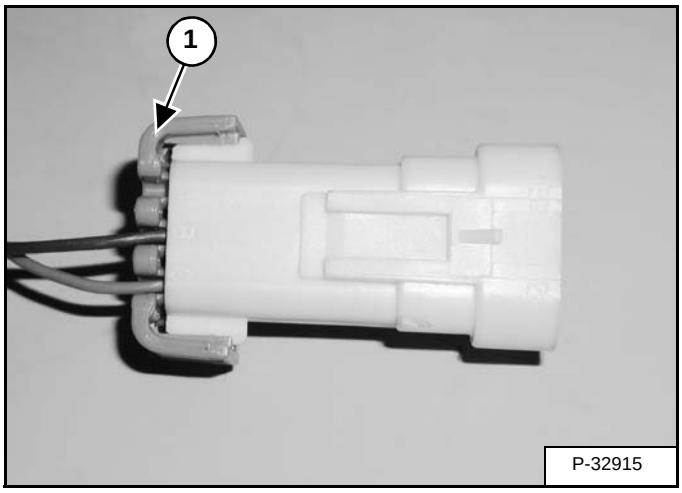
Handle Removal And Installation (Cont'd)

Figure 20-111-10



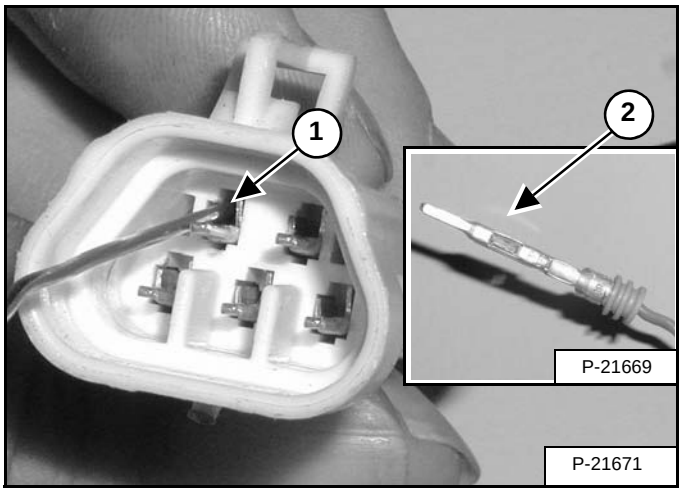
Disconnect the wire harness (Item 1) **[Figure 20-111-10]**.

Figure 20-111-11



Remove the lock (Item 1) **[Figure 20-111-11]** from the electrical connector.

Figure 20-111-12

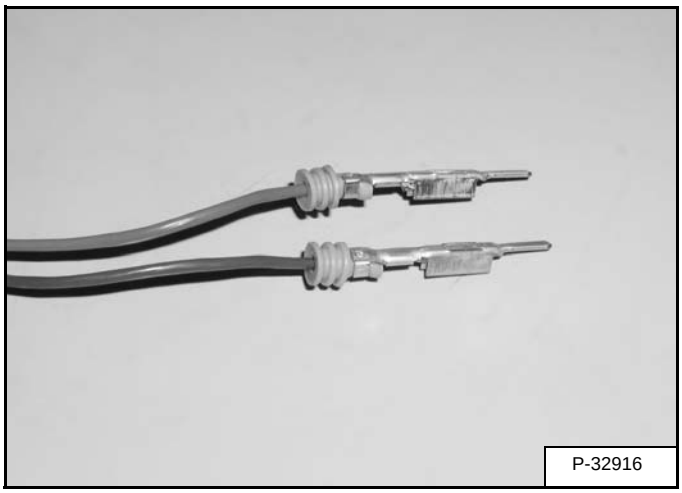


Using a small piece of wire, depress the wire terminal tabs (Item 1) **[Figure 20-111-12]**.

Remove the individual wires from the back of the electrical connector.

Installation: Use a small piece of wire and rebend the tab (Item 2) **[Figure 20-111-12]** on each wire before installing in the electrical connector.

Figure 20-111-13



Installation: The wires **[Figure 20-111-13]** must be installed in the proper locations in the wire connector, listed below.

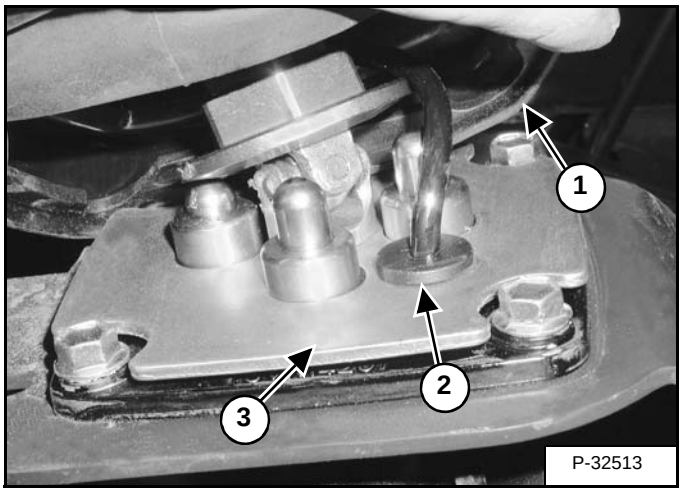
C Red
D Black

Check each wire to be certain the tab locks into position.

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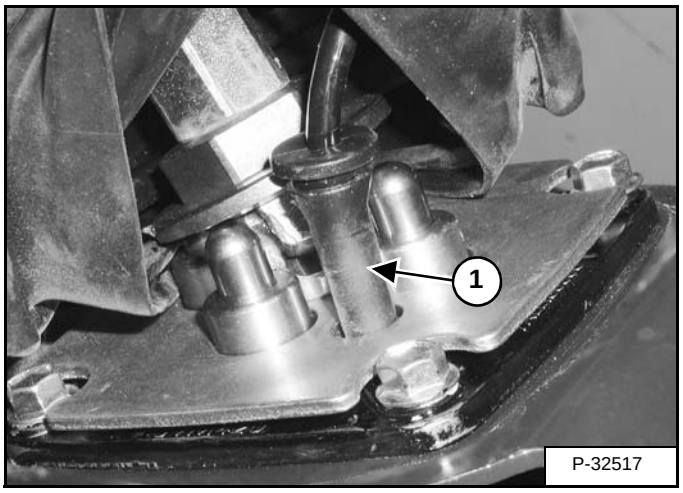
Handle Removal And Installation (Cont'd)

Figure 20-111-14



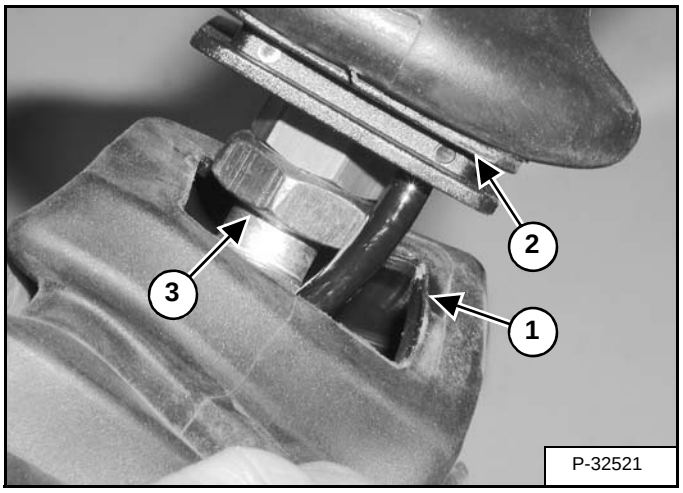
Raise the boot (Item 1) and pull the grommet (Item 2) up out of the mount plate (Item 3) **[Figure 20-111-14]**.

Figure 20-111-15



Remove the grommet and wire (Item 1) **[Figure 20-111-15]** from the mount plate.

Figure 20-111-16



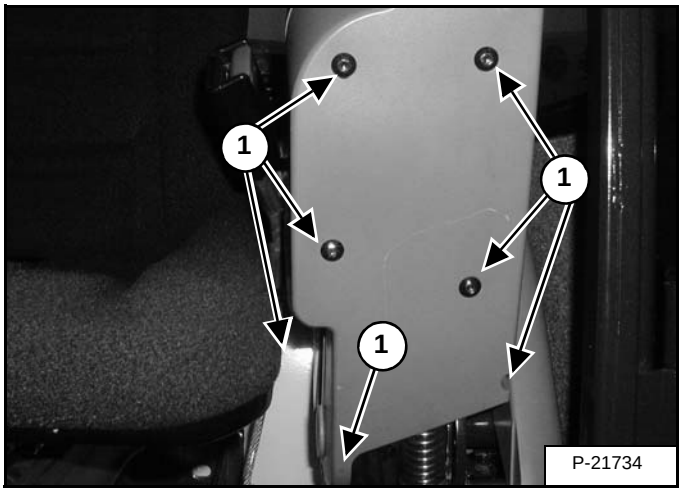
Remove the boot (Item 1) **[Figure 20-111-16]** from the joystick handle.

Installation: Align the top of the boot (Item 1) with the groove (Item 2) **[Figure 20-111-16]**.

Hold the boot down and loosen the nut (Item 3) **[Figure 20-111-16]**.

Remove the handle.

Figure 20-111-17



Remove the seven bolts (Item 1) **[Figure 20-111-17]** from the bottom console cover.

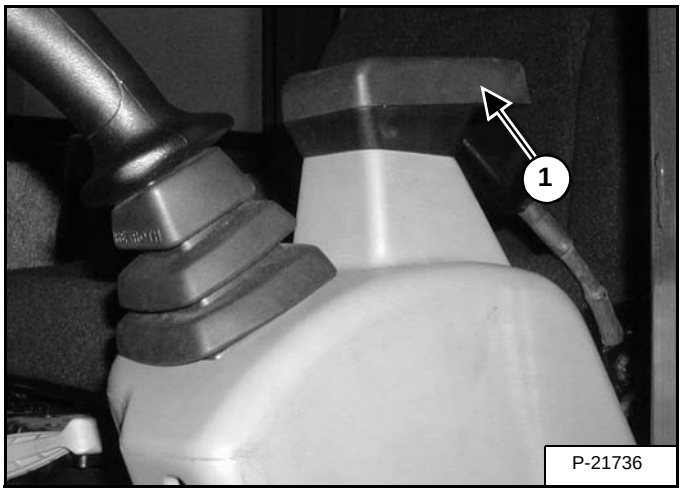
Remove the bottom console cover.

Lower the console.

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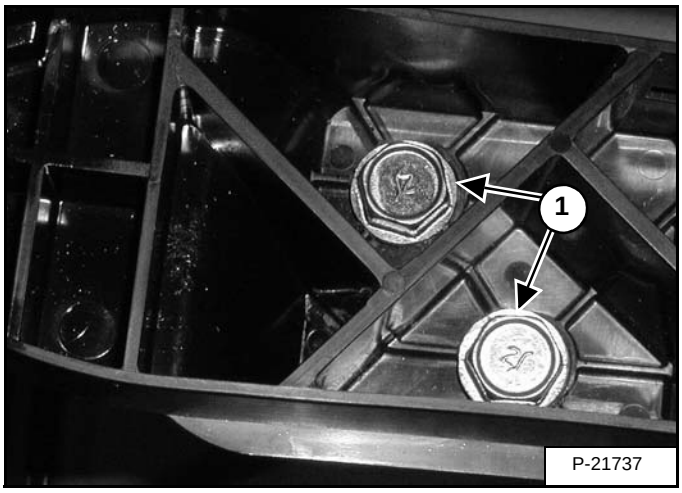
Joystick Assembly Removal And Installation

Figure 20-111-18



Remove the cover (Item 1) **[Figure 20-111-18]** from the arm rest.

Figure 20-111-19

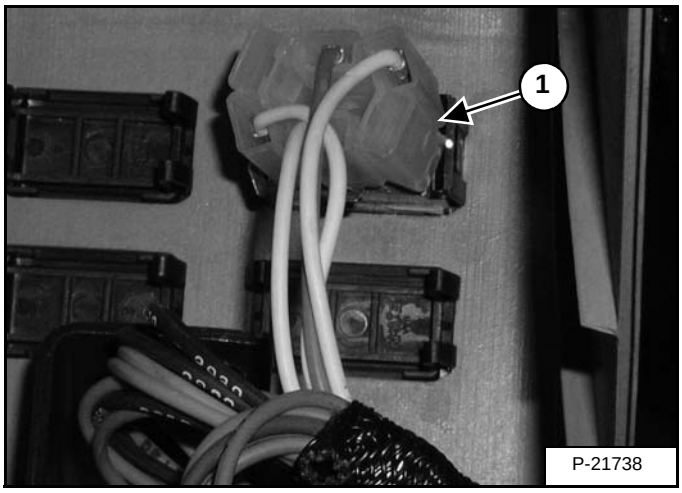


Remove the two mount bolts (Item 1) **[Figure 20-111-19]** from the arm rest.

Remove the arm rest.

Raise the upper half of the console cover.

Figure 20-111-20

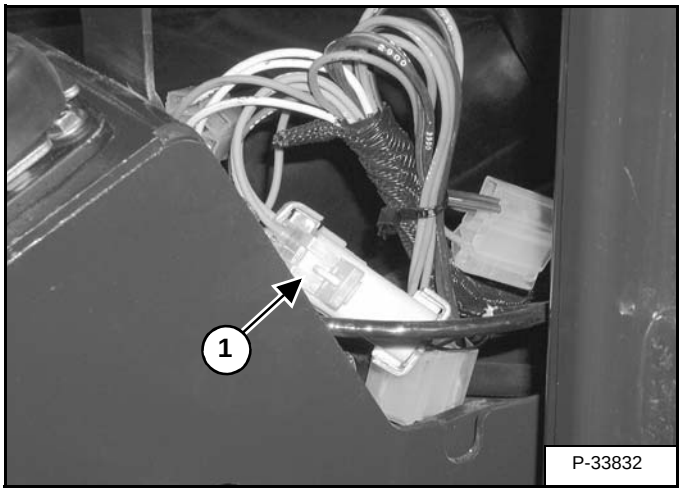


Disconnect the wire harness (Item 1) **[Figure 20-111-20]**.

NOTE: These connectors are keyed so they can be plugged in only one way.

Remove the console cover.

Figure 20-111-21

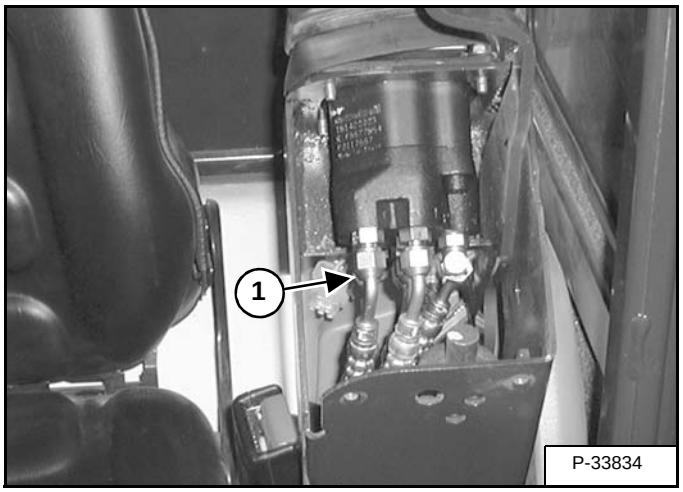


Disconnect the wire harness (Item 1) **[Figure 20-111-21]**.

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Joystick Assembly Removal And Installation (Cont'd)

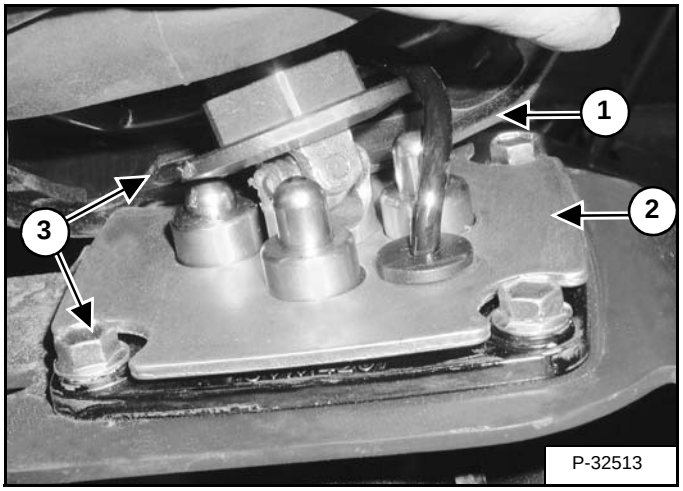
Figure 20-111-22



Mark the hoses for correct installation. Remove the six hoses (Item 1) **[Figure 20-111-22]**.

NOTE: If pilot pressure hose replacement is required, see Hoses for hose routing diagrams. (See HOSES on Page 20-114-1.)

Figure 20-111-23



Pull the boot (Item 1) **[Figure 20-111-23]** up.

Remove the four bolts (Item 2) **[Figure 20-111-23]** from the mounting plate.

Remove the joystick assembly.

IMPORTANT

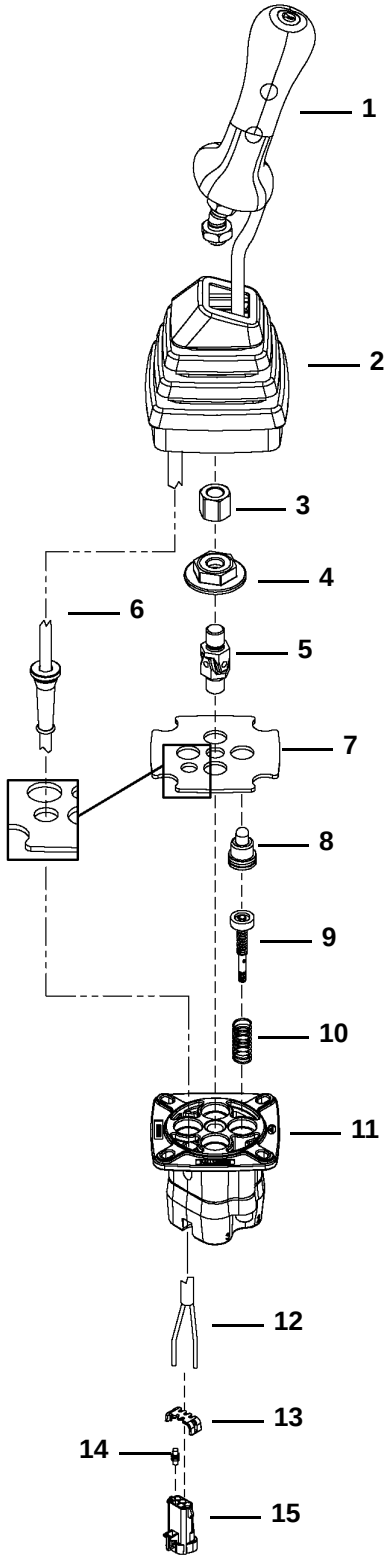
When repairing hydrostatic and hydraulic systems, clean the work area before disassembly and keep all parts clean. Always use caps and plugs on hoses, tubelines and ports to keep dirt out. Dirt can quickly damage the system.

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Parts Identification

1. Handle
2. Boot
3. Coupler
4. Control Plate
5. U-Joint
6. Grommet
7. Plate
8. Plunger Assembly
9. Spool
10. Spring
11. Housing
12. Wire Harness
13. Lock
14. Pin
15. Connector



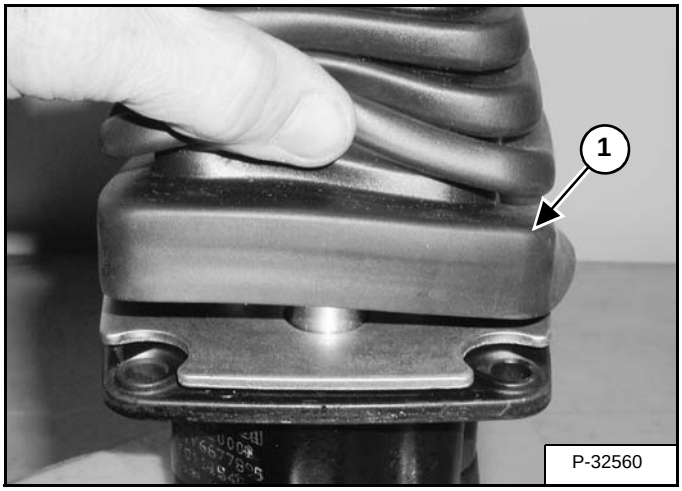
MS1354

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Disassembly

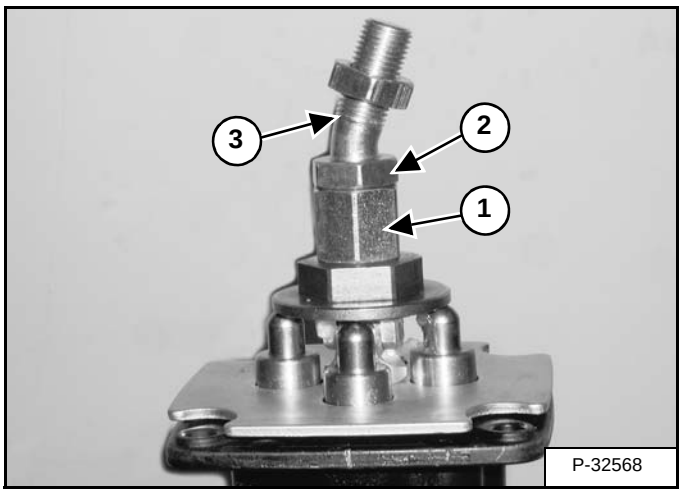
Remove the left handle. (See Handle Removal And Installation on Page 20-111-3.)

Figure 20-111-24



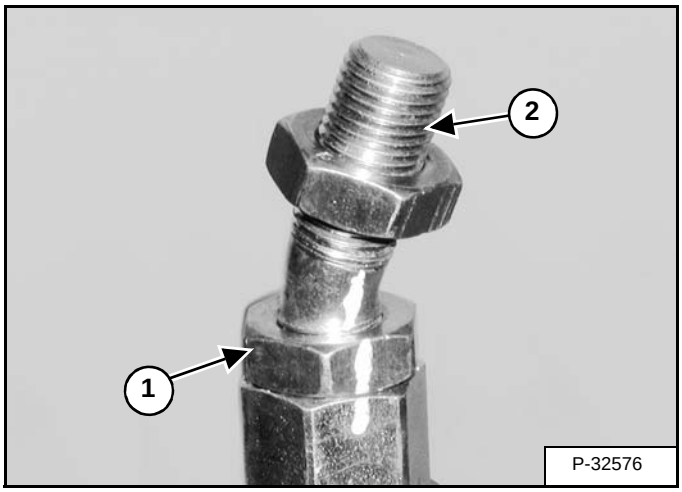
Remove the boot (Item 1) **[Figure 20-111-24]**.

Figure 20-111-25



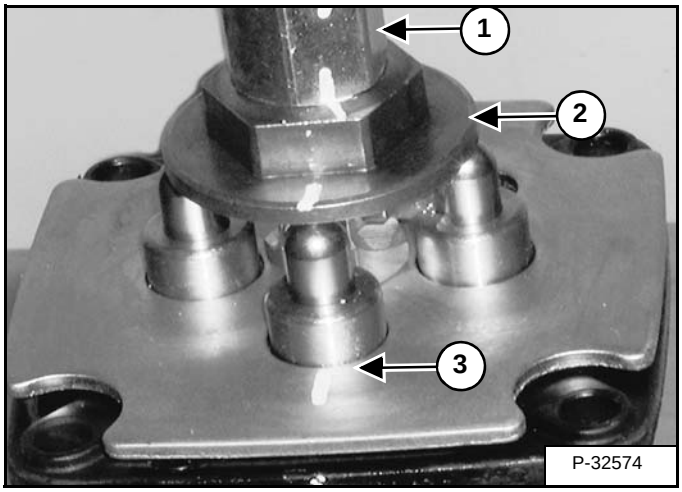
Mark the coupler (Item 1), nut (Item 2), and connector (Item 3) **[Figure 20-111-25]** for ease of assembly.

Figure 20-111-26



Loosen the nut (Item 1) and remove the connector (Item 2) **[Figure 20-111-26]**.

Figure 20-111-27

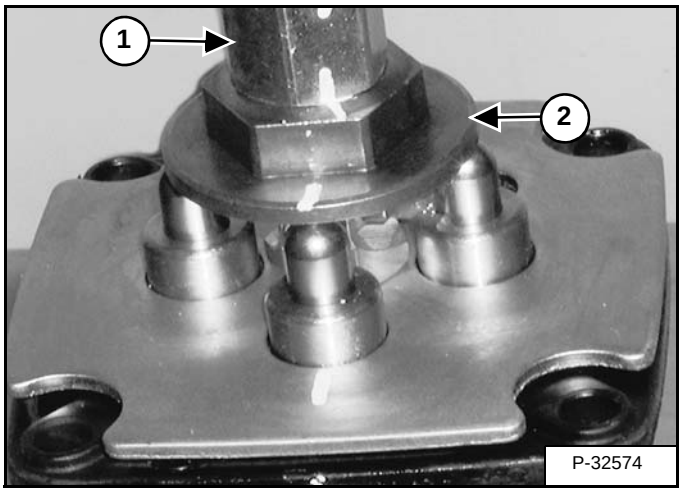


Mark the coupler (Item 1), control plate (Item 2), and plunger (Item 3) **[Figure 20-111-27]** for ease of assembly.

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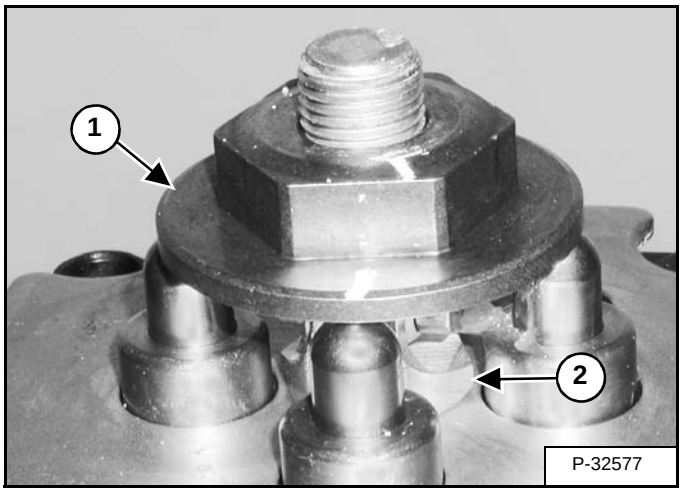
Disassembly (Cont'd)

Figure 20-111-28



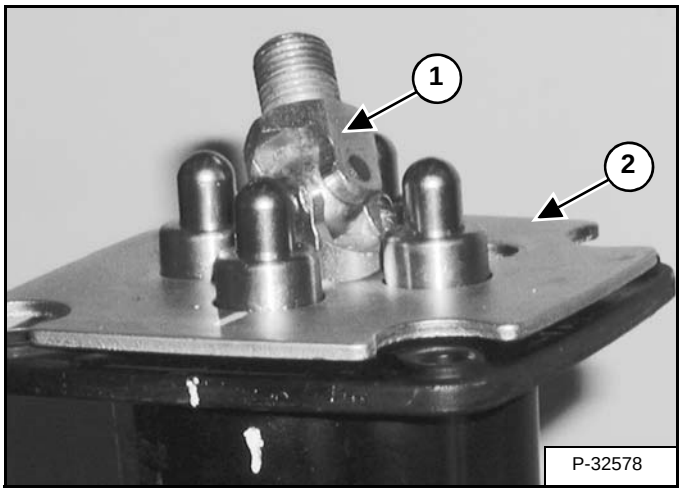
Remove the coupler (Item 1) from the control plate (Item 2) **[Figure 20-111-28]**.

Figure 20-111-29



Remove the control plate (Item 1) from the U-joint (Item 2) **[Figure 20-111-29]**.

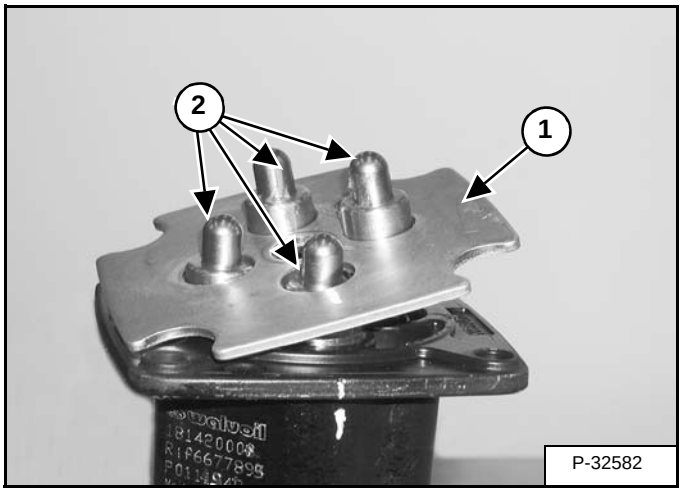
Figure 20-111-30



Mark the plate and housing for correct installation. Remove the U-joint (Item 1) **[Figure 20-111-30]**.

NOTE: The plate (Item 2) [Figure 20-111-30] is spring loaded and will come up as the U-joint is removed.

Figure 20-111-31



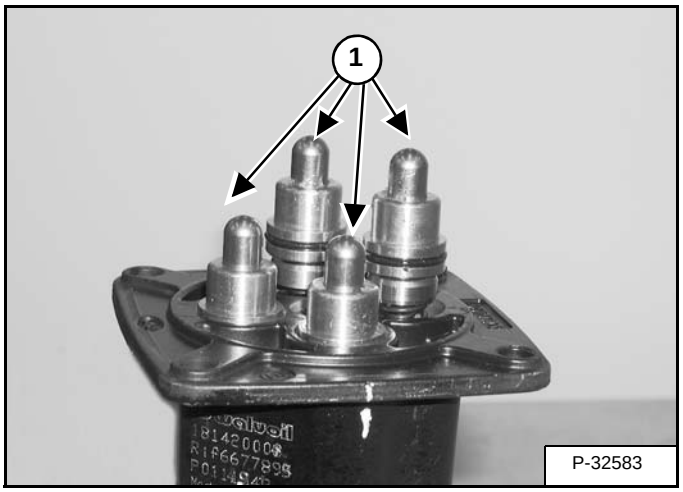
Remove the plate (Item 1) **[Figure 20-111-31]**.

NOTE: Use care while removing the plate. The plungers (Item 2) [Figure 20-111-31] are spring loaded.

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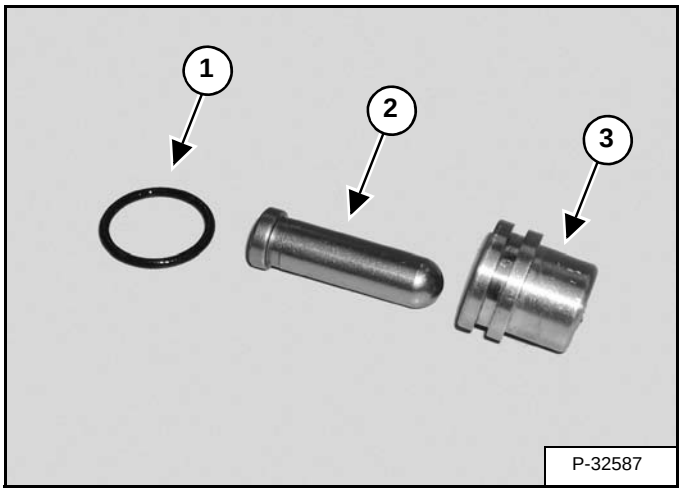
Disassembly (Cont'd)

Figure 20-111-32



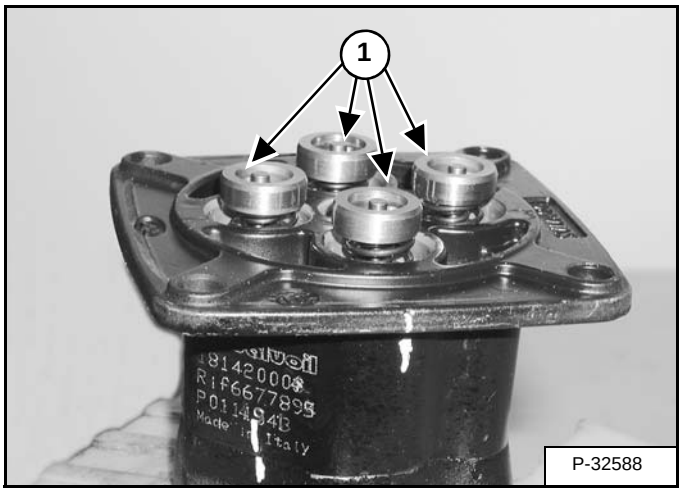
Remove the four plunger assemblies (Item 1) **[Figure 20-111-32]**.

Figure 20-111-33



Remove the O-ring (Item 1) and plunger (Item 2) from the bushing (Item 3) **[Figure 20-111-33]**.

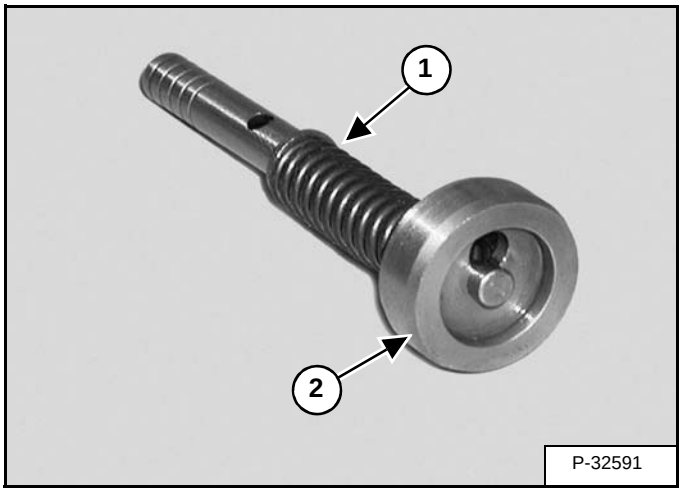
Figure 20-111-34



Mark the spool assemblies for installation in their original location.

Remove the four spool assemblies (Item 1) **[Figure 20-111-34]**.

Figure 20-111-35

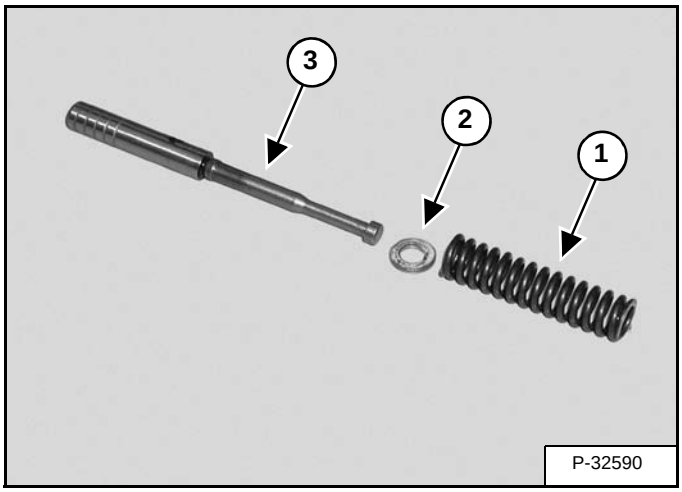


Compress the spring (Item 1) and remove the seat (Item 2) **[Figure 20-111-35]**.

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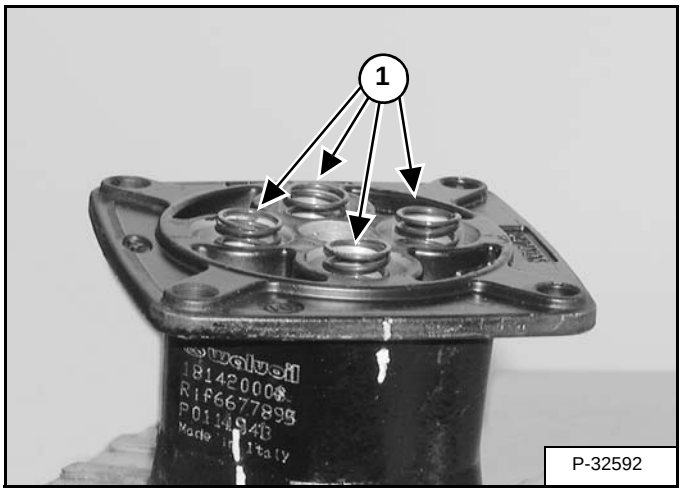
Disassembly (Cont'd)

Figure 20-111-36



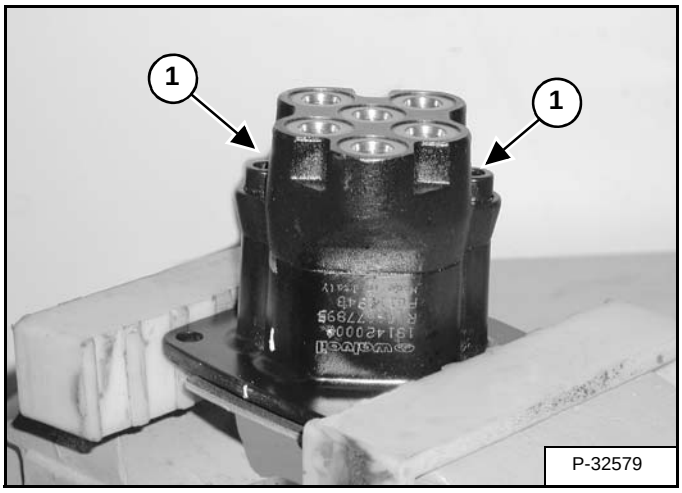
Remove the spring (Item 1) and shim (Item 2) from the spool (Item 3) **[Figure 20-111-36]**.

Figure 20-111-37



Remove the four springs (Item 1) **[Figure 20-111-37]** from the housing.

Figure 20-111-38



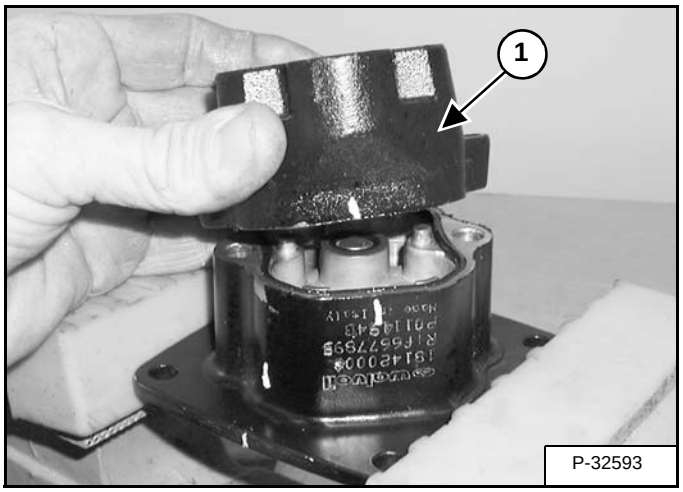
Clamp the housing in a vise that is equipped with padded jaws **[Figure 20-111-38]**.

Remove the two bolts (Item 1) **[Figure 20-111-38]**.

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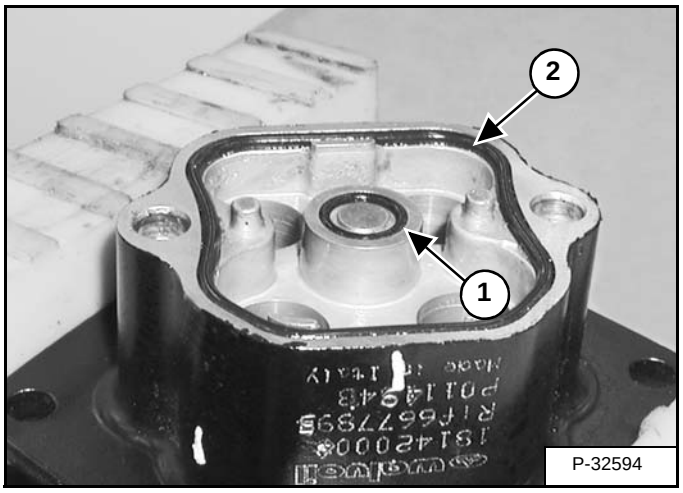
Disassembly (Cont'd)

Figure 20-111-39



Remove the end cap (Item 1) **[Figure 20-111-39]**

Figure 20-111-40



Remove the O-ring (Item 1) and seal (Item 2) **[Figure 20-111-40]**.

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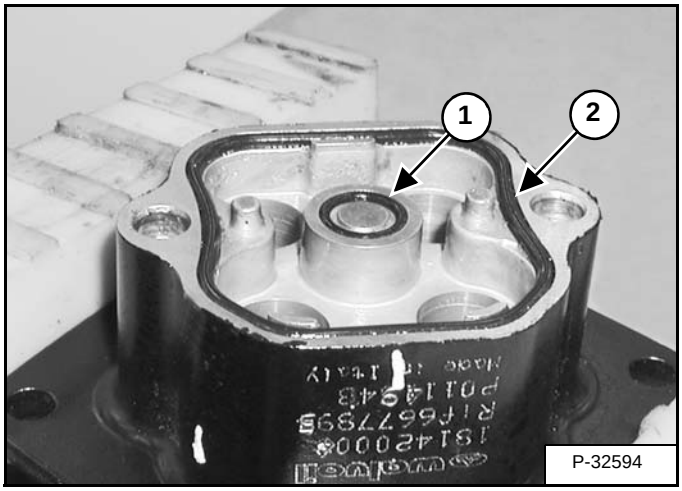
Assembly

Clean all parts in solvent and dry with compressed air.

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

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

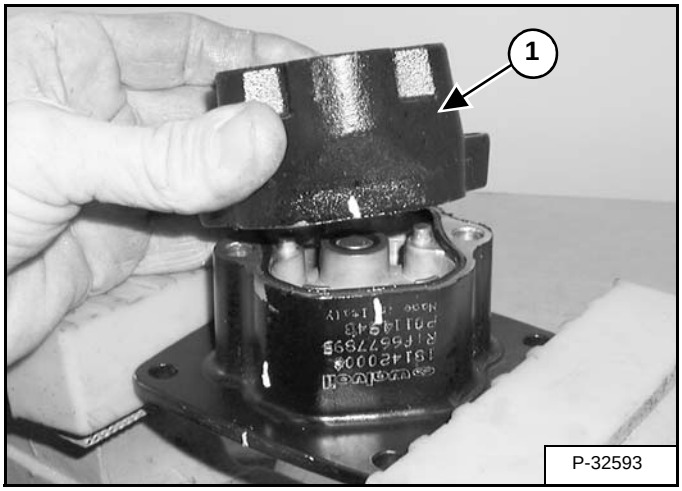
Figure 20-111-41



Clamp the housing in a vise. Install the O-ring (Item 1) and seal (Item 2) **[Figure 20-111-41]**.

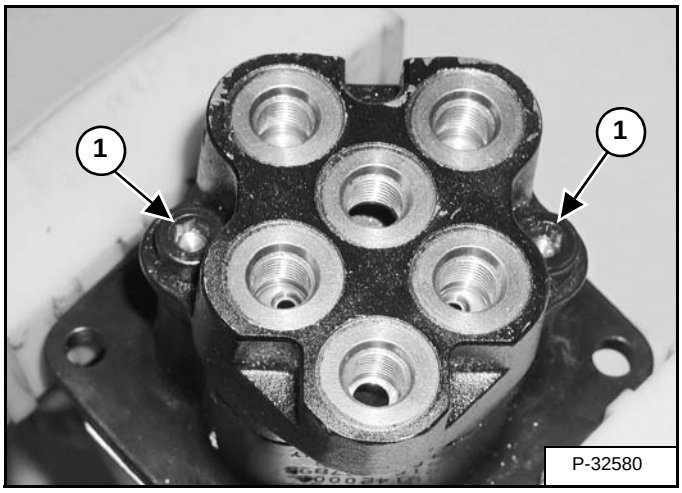
NOTE: Use care not to damage the housing.

Figure 20-111-42



Install the end cap (Item 1) **[Figure 20-111-42]**.

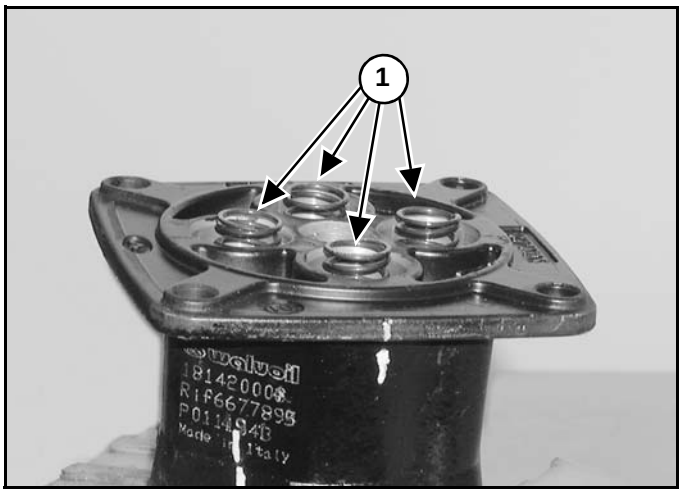
Figure 20-111-43



Install the two bolts (Item 1) **[Figure 20-111-43]**.

Turn the housing over.

Figure 20-111-44

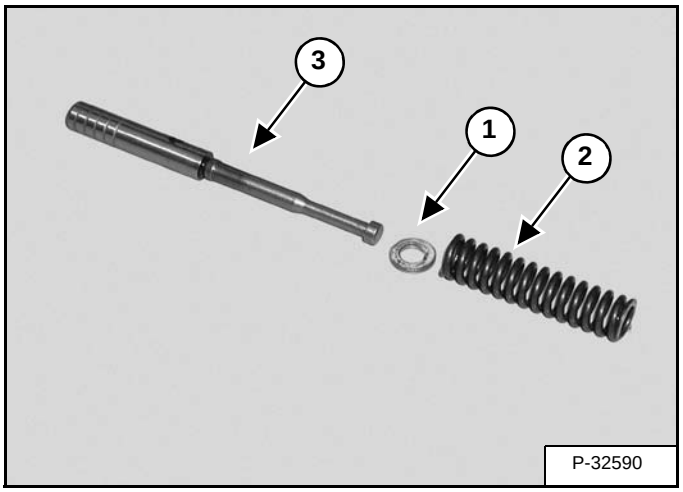


Install the four springs (Item 1) **[Figure 20-111-44]**.

https://www.pdfmanual4trucks.com/

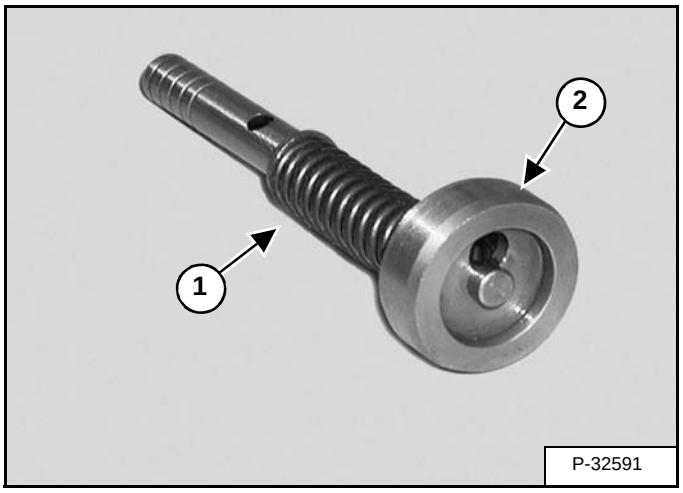
Assembly (Cont'd)

Figure 20-111-45



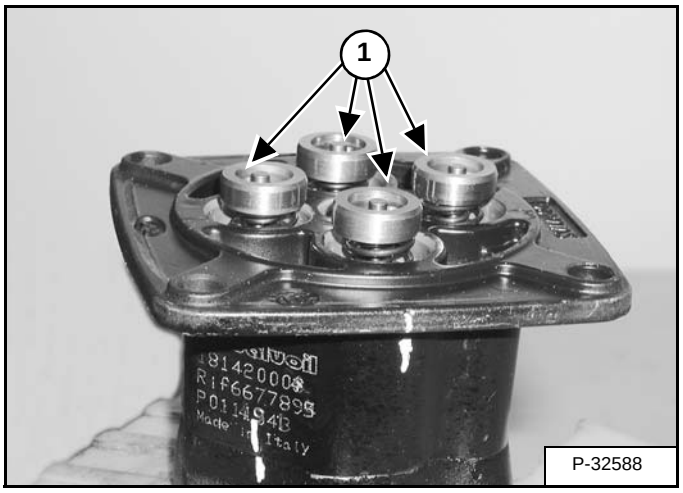
Install the shim (Item 1) and spring (Item 2) on the spool (Item 3) **[Figure 20-111-45]**.

Figure 20-111-46



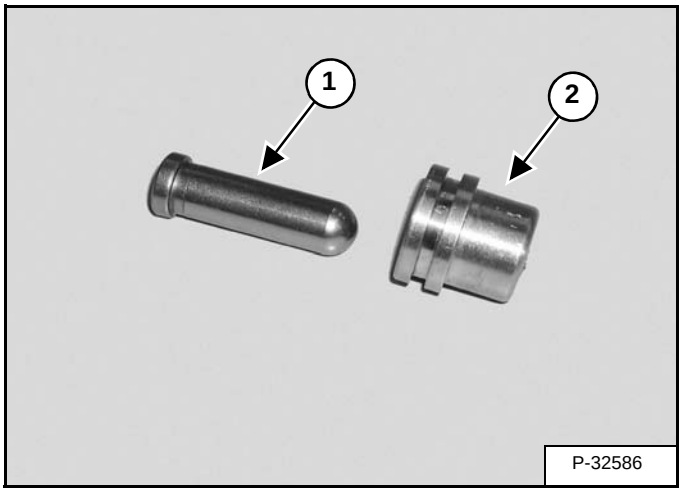
Compress the spring (Item 1) and install the spring seat (Item 2) **[Figure 20-111-46]**

Figure 20-111-47



Install the four spool assemblies (Item 1) **[Figure 20-111-47]** in the housing.

Figure 20-111-48

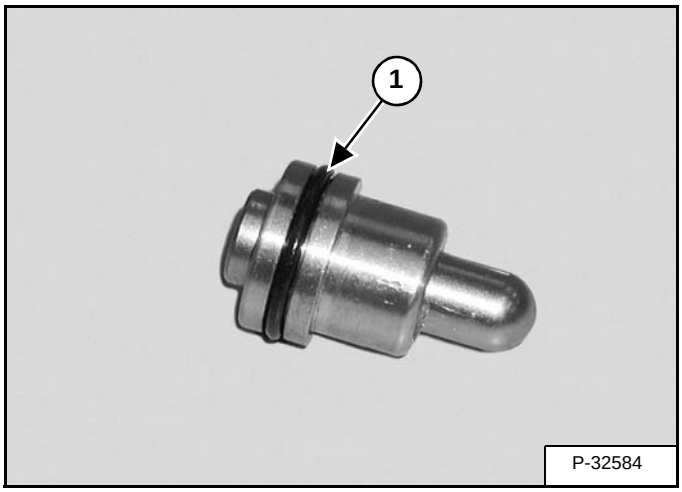


Install the plunger (Item 1) in the bushing (Item 2) **[Figure 20-111-48]**.

https://www.pdfmanual4trucks.com/

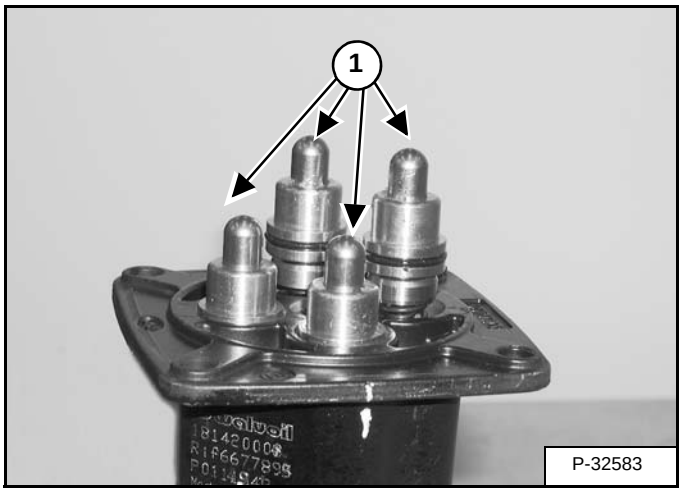
Assembly (Cont'd)

Figure 20-111-49



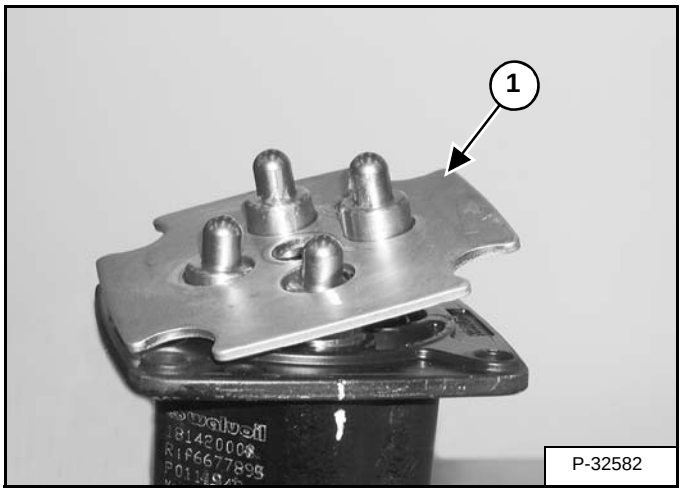
Install the O-ring (Item 1) **[Figure 20-111-49]** on the bushing.

Figure 20-111-50



Install the four plunger assemblies (Item 1) **[Figure 20-111-50]** in the housing.

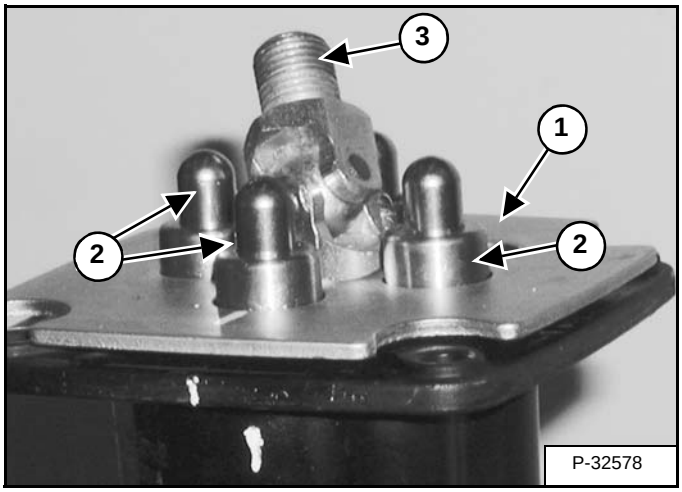
Figure 20-111-51



Install the plate (Item 1) **[Figure 20-111-51]**.

NOTE: Spring pressure can dislodge the plunger assemblies until the plate is secured in place.

Figure 20-111-52

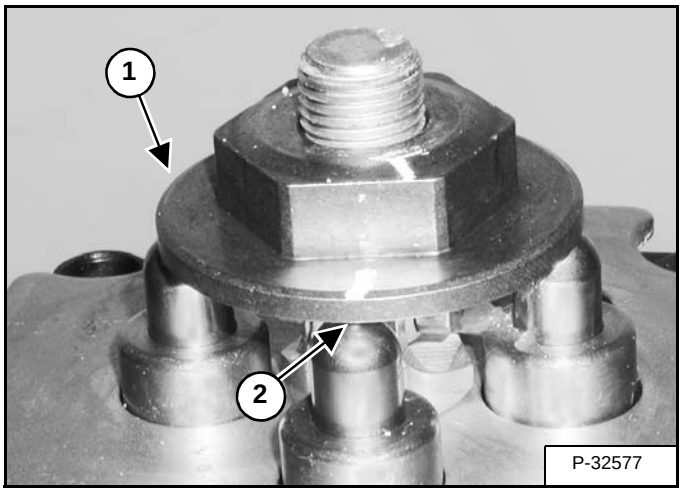


Press down on the plate (Item 1) keeping the plunger assemblies (Item 2) fully seated and install the U-joint (Item 3) **[Figure 20-111-52]**.

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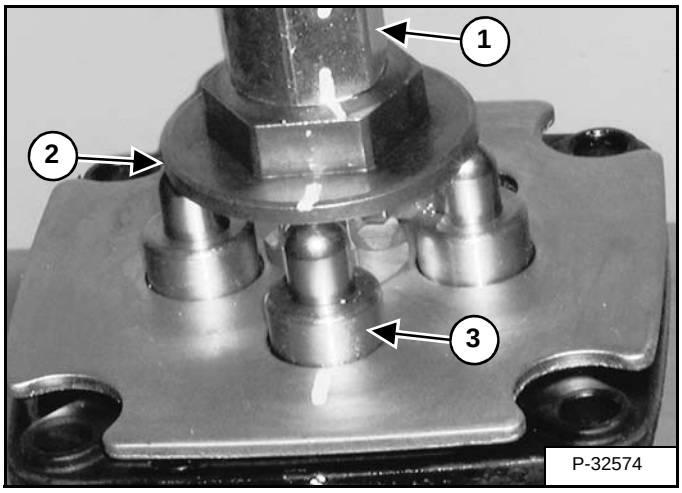
Assembly (Cont'd)

Figure 20-111-53



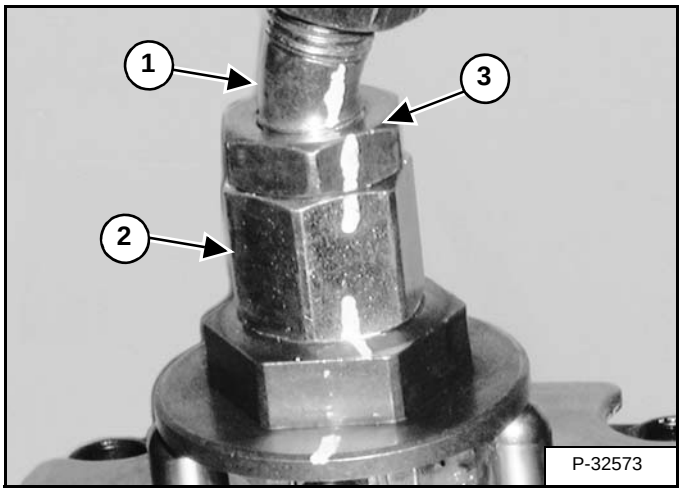
Install the control plate (Item 1) until the plate makes light contact with all four plungers (Item 2) **[Figure 20-111-53]**.

Figure 20-111-54



Align the coupler (Item 1) with the control plate (Item 2) and plunger (Item 3) **[Figure 20-111-54]**. Tighten the coupler.

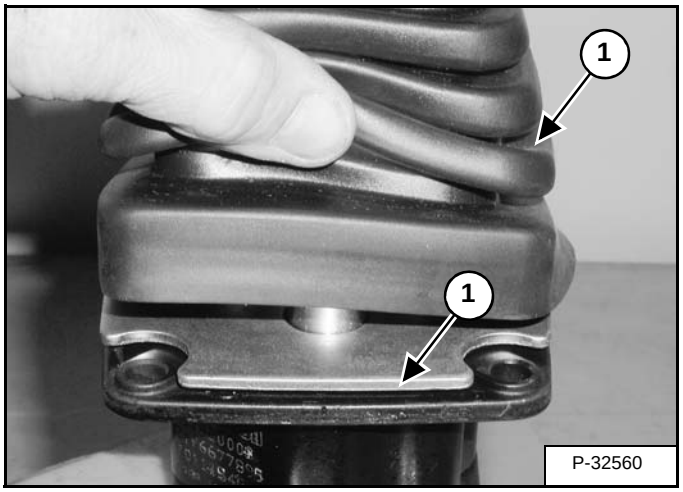
Figure 20-111-55



Install the connector **[Figure 20-111-55]**.

Align the connector with the coupler (Item 2) and tighten the nut (Item 3) **[Figure 20-111-55]**.

Figure 20-111-56



Install the tabs of the boot in between the joystick flange and mounting plate (Item 1) **[Figure 20-111-56]**.

Install the left handle. (See Handle Removal And Installation on Page 20-111-3.)

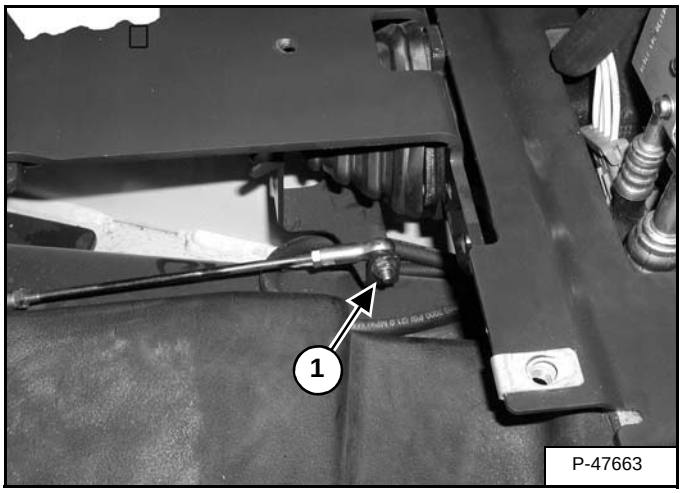
https://www.pdfmanual4trucks.com/

TRAVEL CONTROL VALVE (S/N 562611001 & ABOVE, 562811001 & ABOVE AND 563211001 & ABOVE)

Removal and Installation

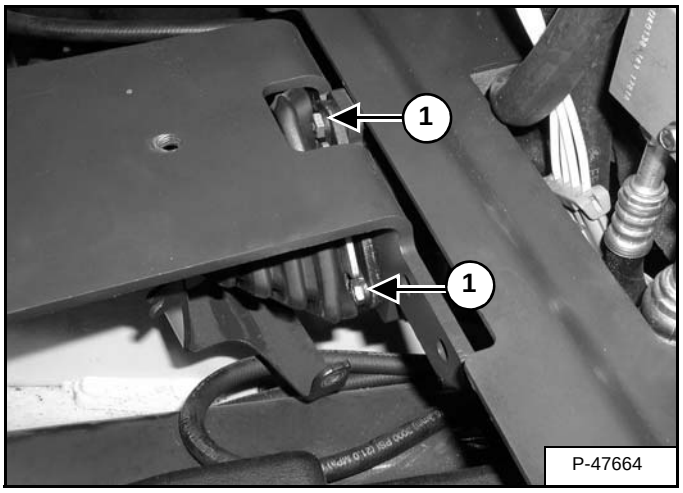
Remove the floor mat and floor plates. (See Removal And Installation on Page 50-120-1.)

Figure 20-112-1



Remove the two linkage nuts (Item 1) **[Figure 20-112-1]**.

Figure 20-112-2

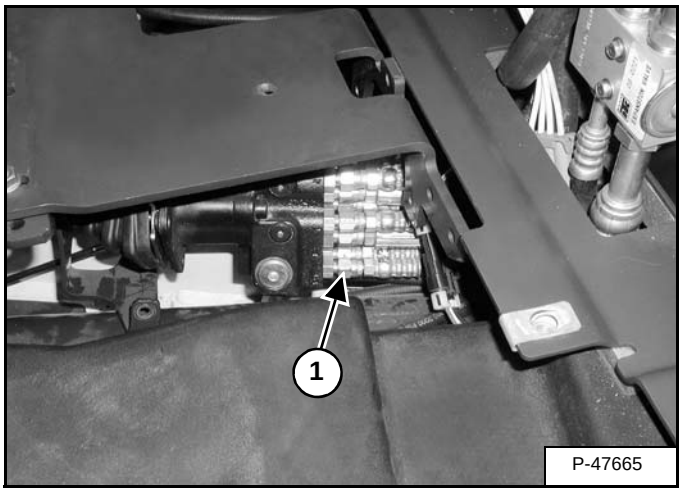


Remove the three bolts and nuts from the control valve (Item 1) **[Figure 20-112-2]**.

Lower the valve.

Mark the hydraulic hoses for proper installation.

Figure 20-112-3



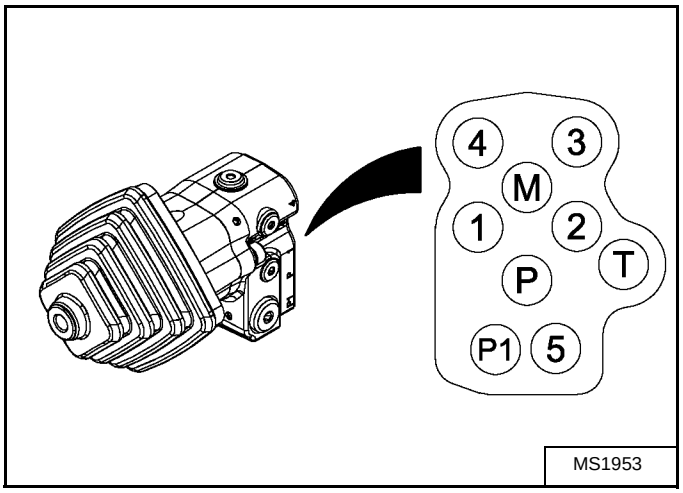
Remove the nine hydraulic hoses (Item 1) **[Figure 20-112-3]** from the control valve.

IMPORTANT

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

I-2003-0888

Figure 20-112-4



Installation: Install the hoses on the correct port **[Figure 20-112-4]**.

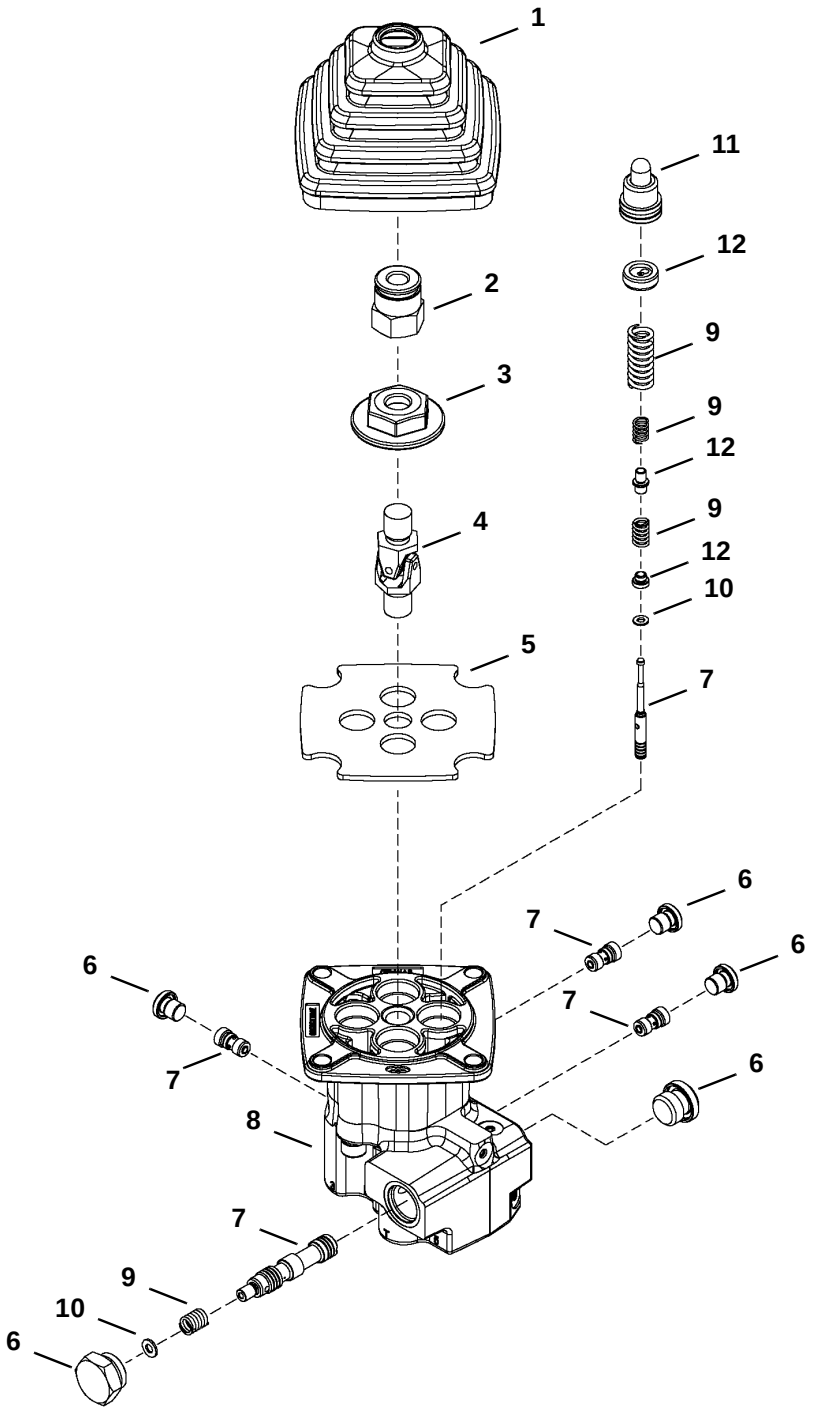
Remove the control valve from the excavator.

NOTE: If pilot pressure hose replacement is required, see Hoses for hose routing diagrams. (See HOSES on Page 20-114-1.)

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Parts Identification

1. Dust Boot
2. Coupler
3. Control Plate
4. Swivel
5. Plate
6. Plug
7. Spool
8. Housing
9. Spring
10. Washer
11. Plunger Assembly
12. Spring Seat



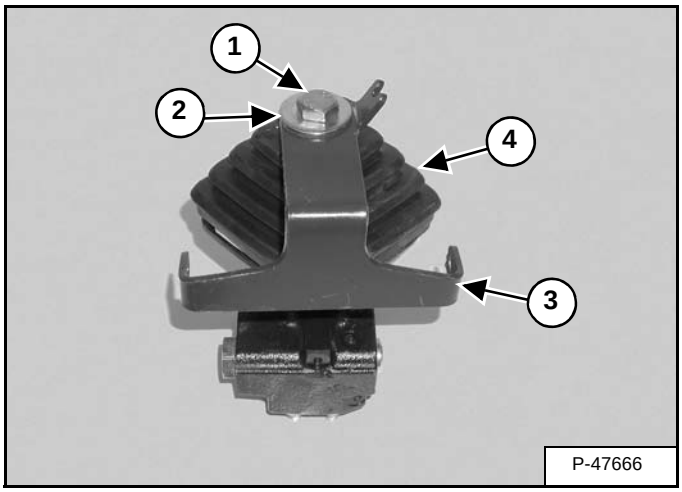
MS1957S

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TRAVEL CONTROL VALVE (S/N 562611001 & ABOVE, 562811001 & ABOVE AND 563211001 & ABOVE) (CONT'D)

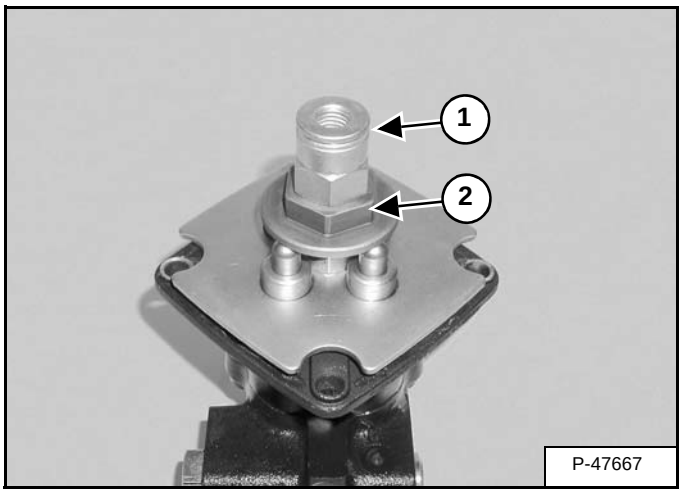
Disassembly And Assembly

Figure 20-112-5



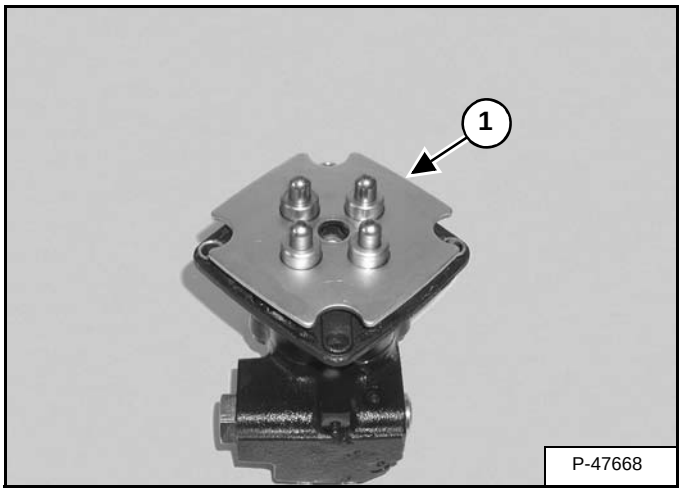
Remove the bolt (Item 1), washer (Item 2), bracket (Item 3) and boot (Item 4) **[Figure 20-112-5]**.

Figure 20-112-6



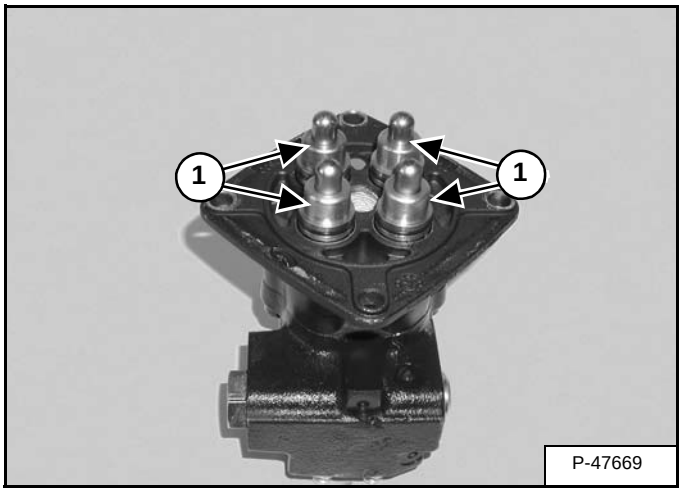
Remove the coupler (Item 1) and swivel joint (Item 2) **[Figure 20-112-6]**.

Figure 20-112-7



Remove the plate (Item 1) **[Figure 20-112-7]**.

Figure 20-112-8



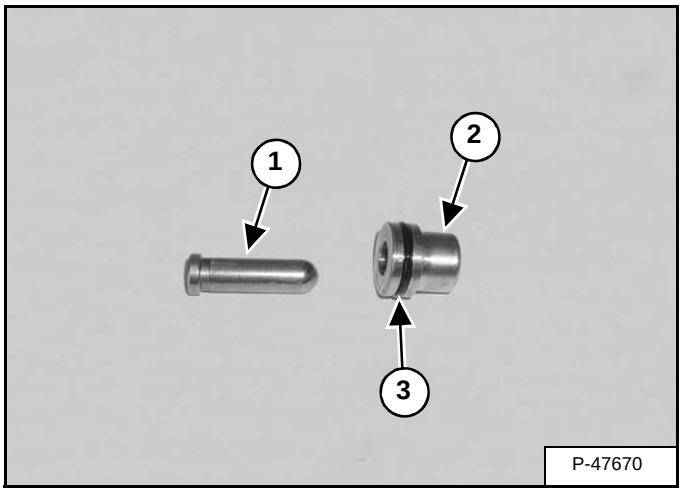
Remove the plunger assemblies (Item 1) **[Figure 20-112-8]**.

NOTE: Install the plunger assemblies in the same bore from which they are removed.

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Disassembly And Assembly (Cont'd)

Figure 20-112-9



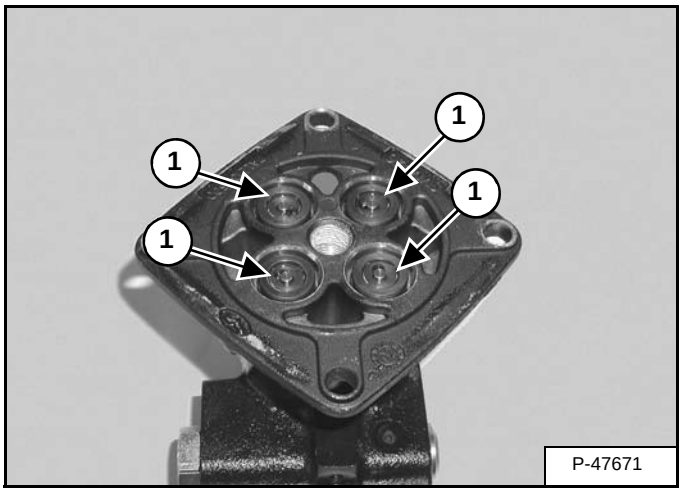
Remove the plunger (Item 1) from the plunger body (Item 2) **[Figure 20-112-9]**.

Remove the O-ring (Item 3) **[Figure 20-112-9]** from the plunger body.

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Disassembly And Assembly (Cont'd)

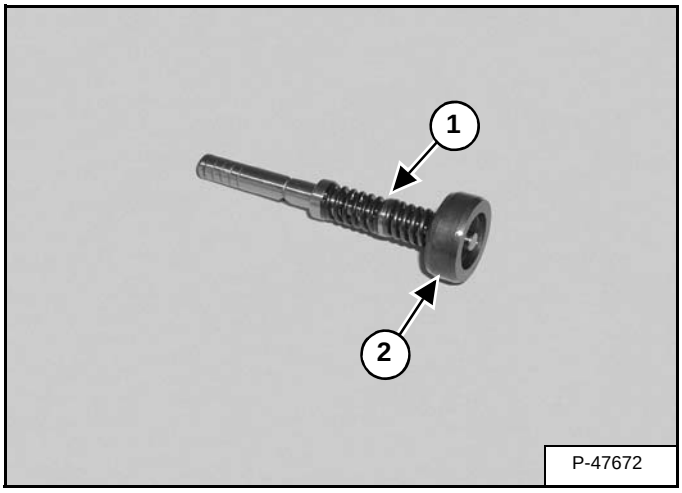
Figure 20-112-10



Remove the spool assemblies (Item 1) **[Figure 20-112-10]**.

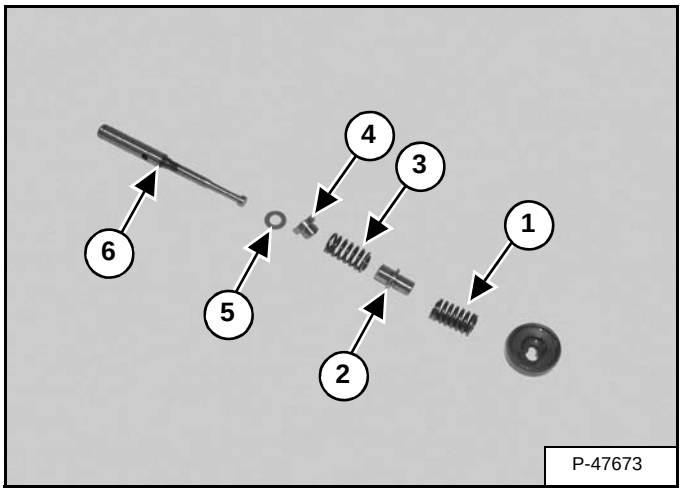
NOTE: Install the spool assembly in the same bore from which they are removed.

Figure 20-112-11



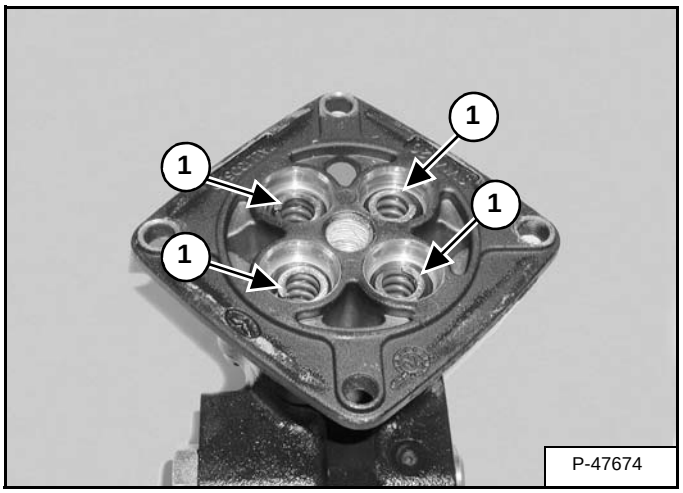
Compress the spring (Item 1) and remove the spring seat (Item 2) **[Figure 20-112-11]**.

Figure 20-112-12



Remove the spring (Item 1), spring seat (Item 2), spring (Item 3), spring seat (Item 4) and washer (Item 5) from the spool (Item 6) **[Figure 20-112-12]**.

Figure 20-112-13

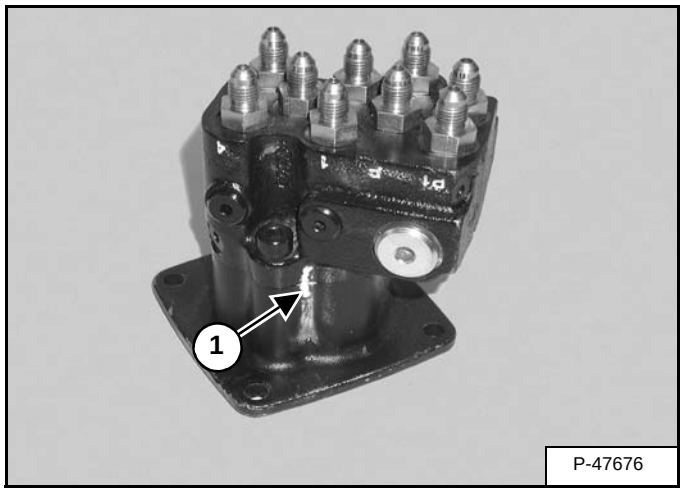


Remove the springs (Item 1) **[Figure 20-112-13]** from the body.

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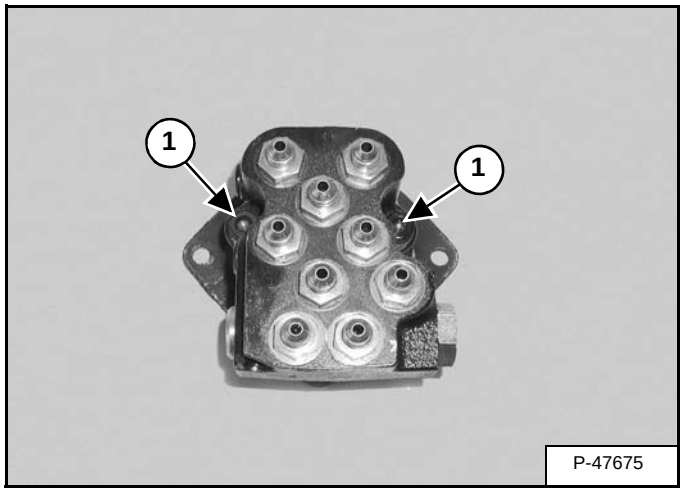
Disassembly And Assembly (Cont'd)

Figure 20-112-14



Mark the housing (Item 1) **[Figure 20-112-14]** for ease of assembly.

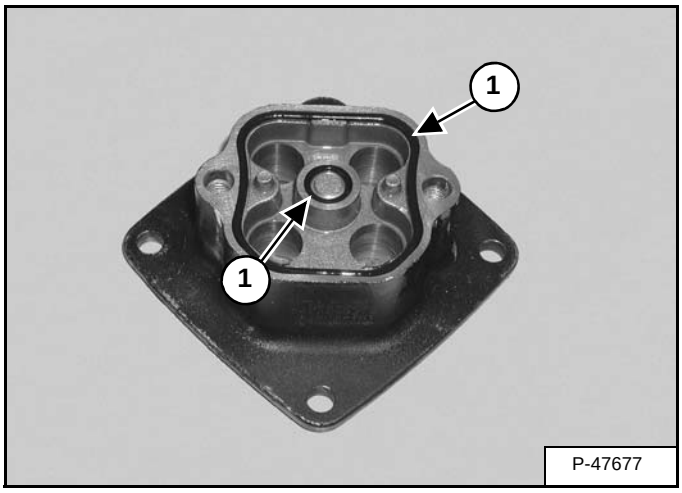
Figure 20-112-15



Remove the two bolts (Item 1) **[Figure 20-112-15]**.

Separate the housing sections.

Figure 20-112-16



Remove the O-rings (Item 1) **[Figure 20-112-16]**.

Figure 20-112-17

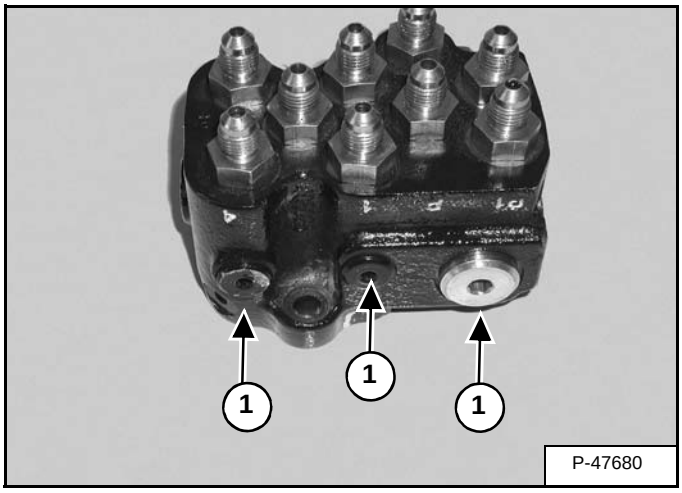
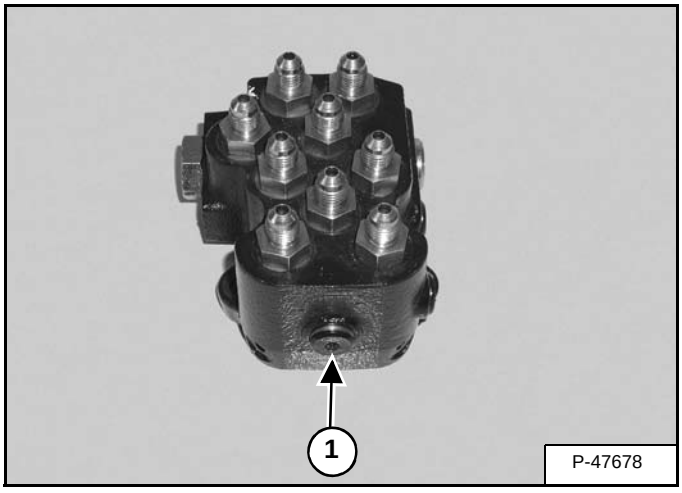


Figure 20-112-18

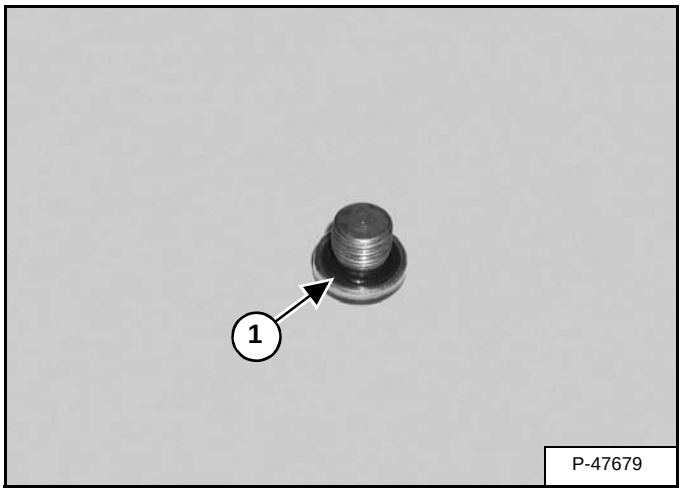


Remove the plugs (Item 1) **[Figure 20-112-17]** & **[Figure 20-112-18]**.

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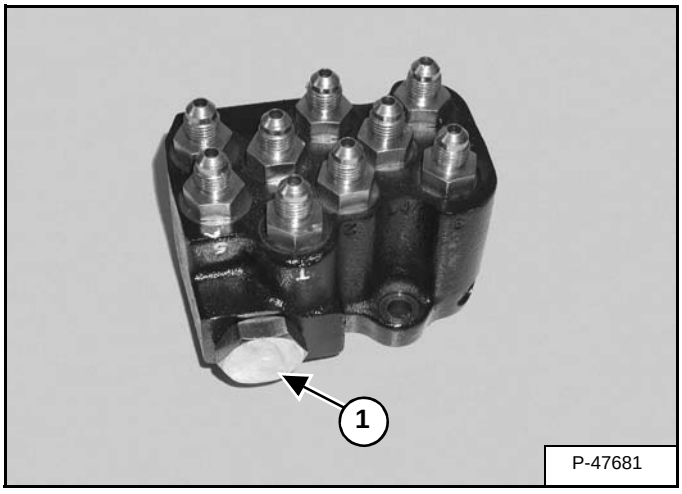
Disassembly And Assembly (Cont'd)

Figure 20-112-19



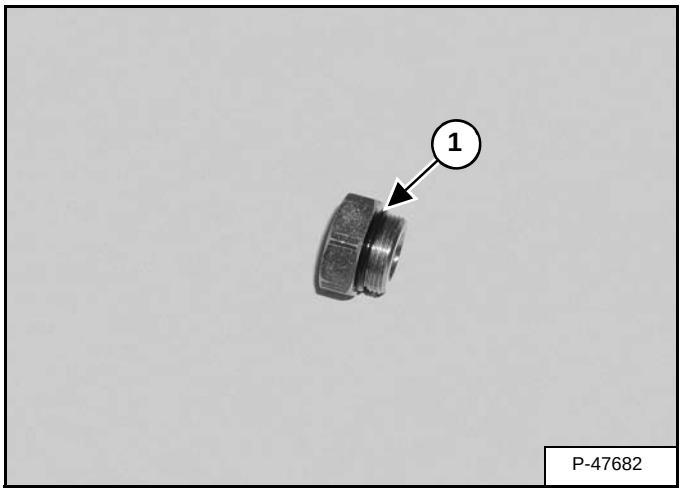
Remove the O-ring (Item 1) **[Figure 20-112-19]** from the plugs.

Figure 20-112-20



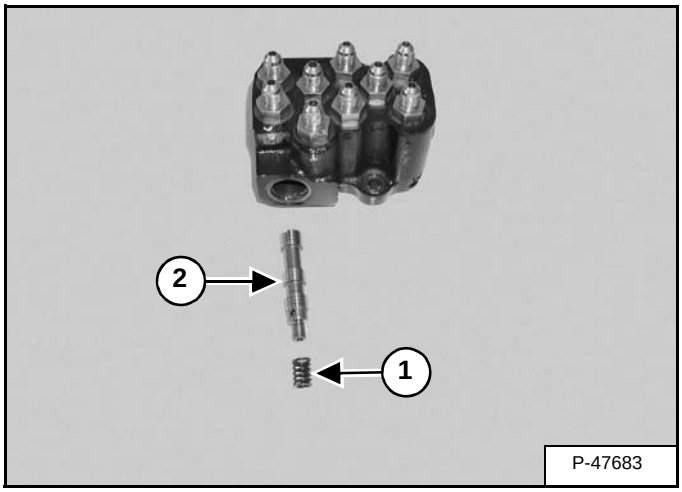
Remove the plug (Item 1) **[Figure 20-112-20]**.

Figure 20-112-21



Remove the O-ring (Item 1) **[Figure 20-112-21]** from the plug.

Figure 20-112-22



Remove the spring (Item 1) and spool (Item 2) **[Figure 20-112-22]**.

Assembly

Clean all parts in solvent and dry with compressed air.

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

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

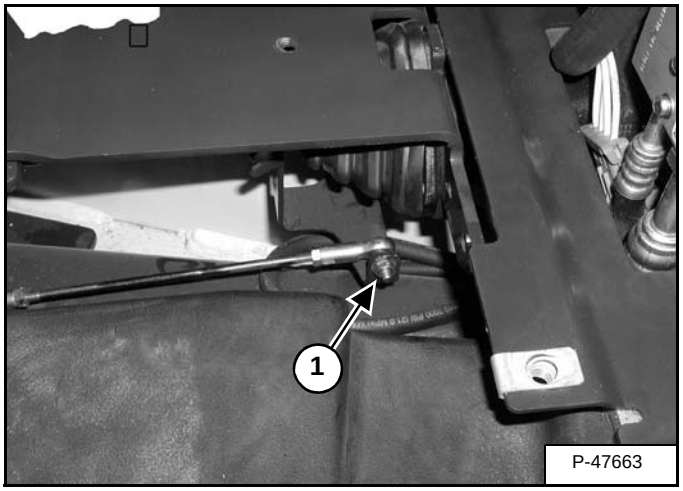
https://www.pdfmanual4trucks.com/

TRAVEL CONTROL VALVE (S/N 563111001 & ABOVE)

Removal and Installation

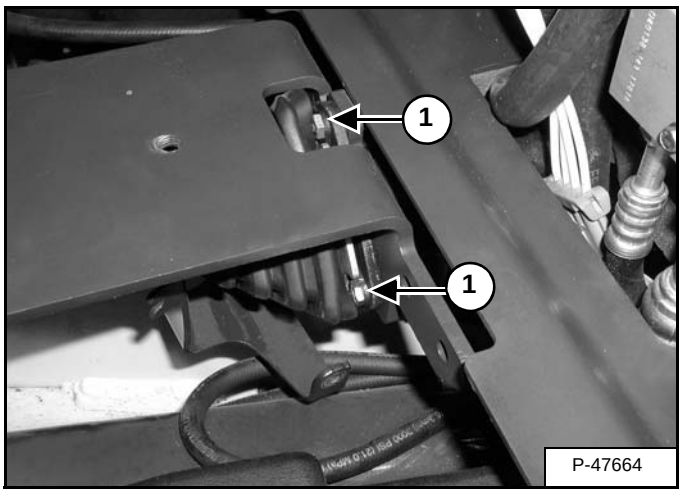
Remove the floor mat and floor plates. (See Removal And Installation on Page 50-120-1.)

Figure 20-113-1



Remove the two linkage nuts (Item 1) **[Figure 20-113-1]**.

Figure 20-113-2

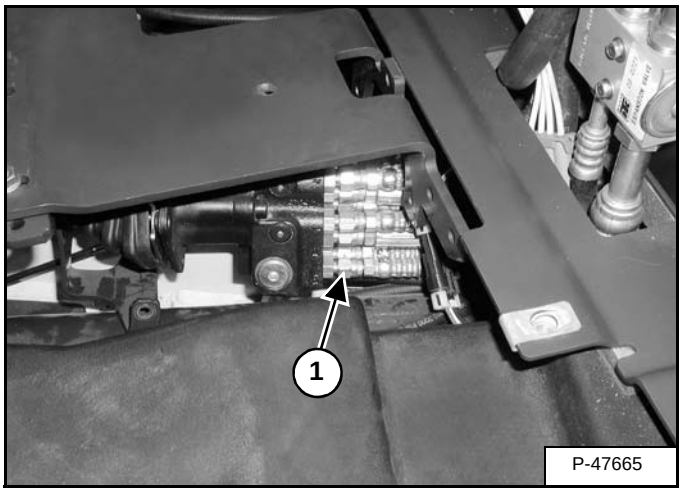


Remove the three bolts and nuts from the control valve (Item 1) **[Figure 20-113-2]**.

Lower the valve.

Mark the hydraulic hoses for proper installation.

Figure 20-113-3



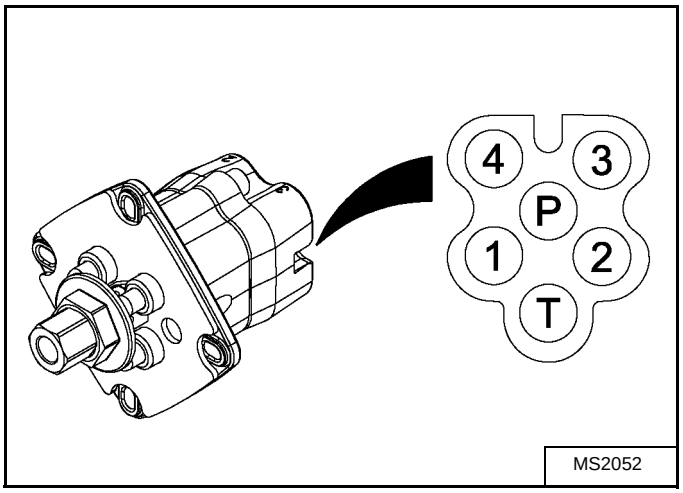
Remove the six hydraulic hoses (Item 1) **[Figure 20-113-3]** from the control valve.

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 20-113-4



Installation: Install the hoses on the correct port **[Figure 20-113-4]**.

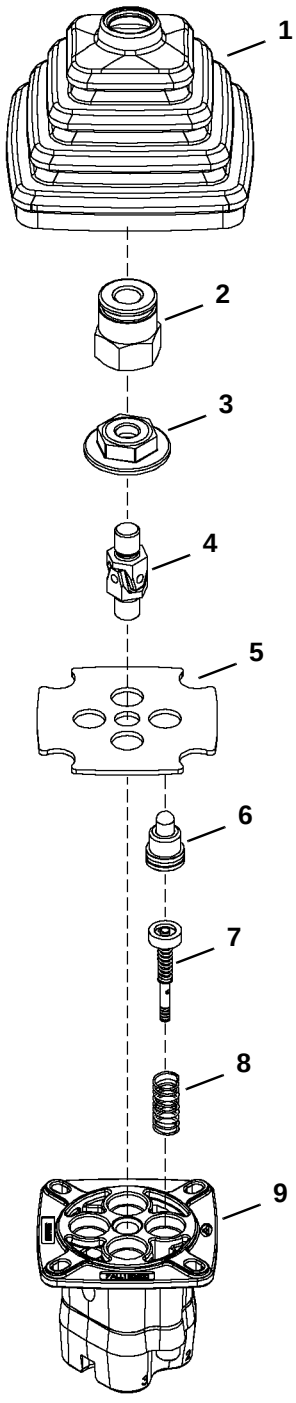
Remove the control valve from the excavator.

NOTE: If pilot pressure hose replacement is required, see Hoses for hose routing diagrams. (See HOSES on Page 20-114-1.)

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Parts Identification

1. Dust Boot
2. Coupler
3. Control Plate
4. Swivel Joint
5. Plate
6. Plunger Assembly
7. Spool Assembly
8. Spring
9. Housing



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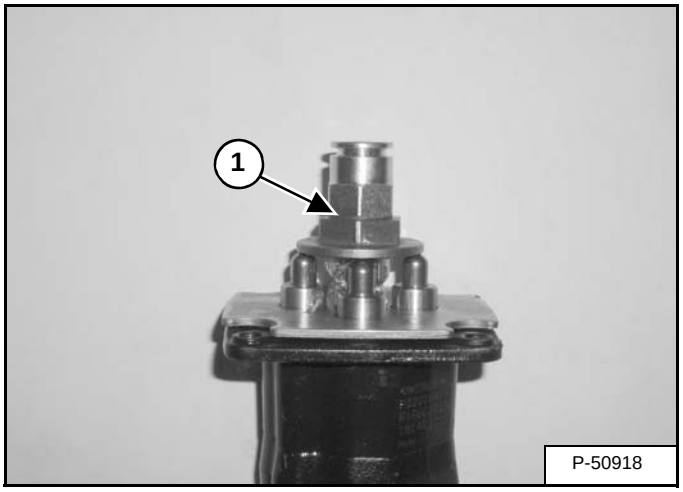
https://www.pdfmanual4trucks.com/

Disassembly And Assembly

Clean the outside of the travel control valve before disassembly.

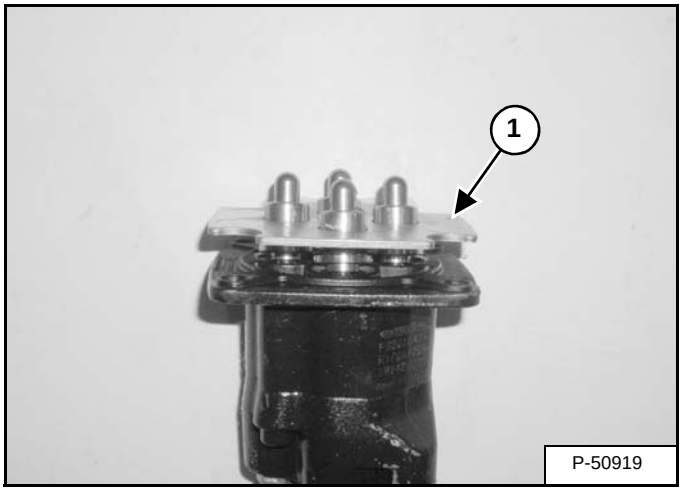
Mark the outside of the travel control valve for ease of assembly.

Figure 20-113-5



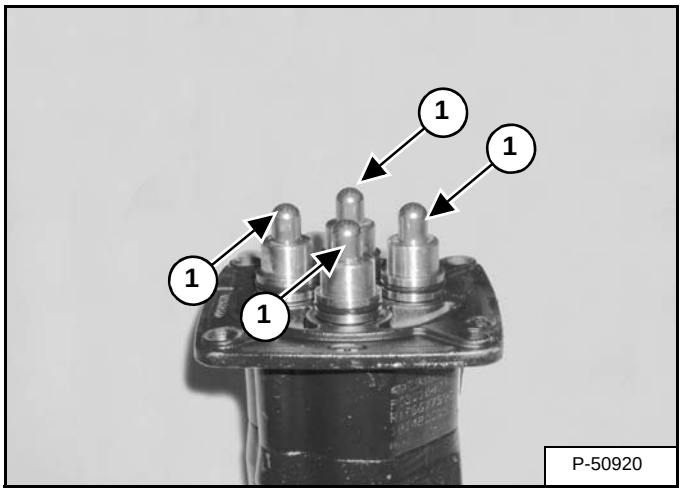
Remove the swivel joint (Item 1) **[Figure 20-113-5]**.

Figure 20-113-6



Remove the plate (Item 1) **[Figure 20-113-6]**.

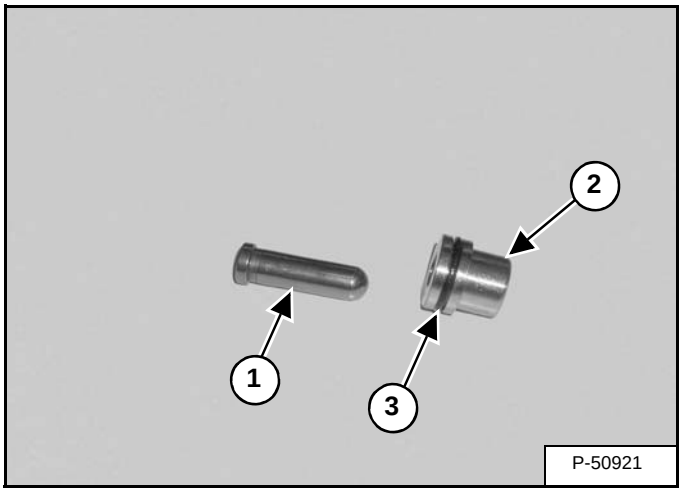
Figure 20-113-7



Remove the plunger assemblies (Item 1) **[Figure 20-113-7]** from the valve body.

NOTE: Install the plunger assemblies in the same bore from which they are removed.

Figure 20-113-8



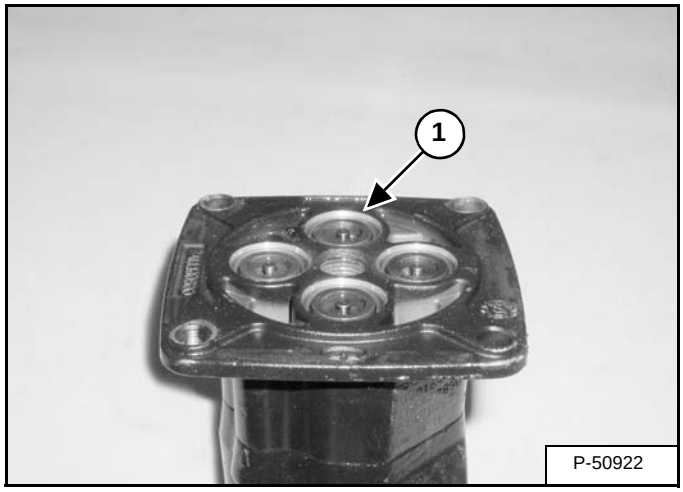
Remove the plunger (Item 1) from the plunger body (Item 2) **[Figure 20-113-8]**.

Remove the O-ring (Item 3) **[Figure 20-113-8]**.

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Disassembly And Assembly (Cont'd)

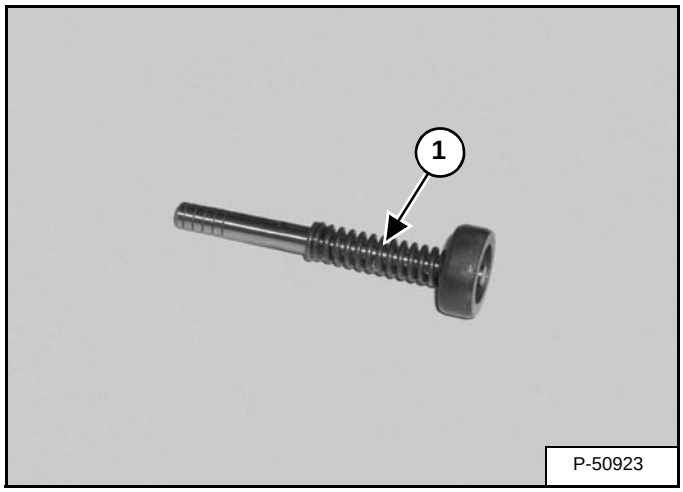
Figure 20-113-9



Remove the spool assemblies (Item 1) **[Figure 20-113-9]**.

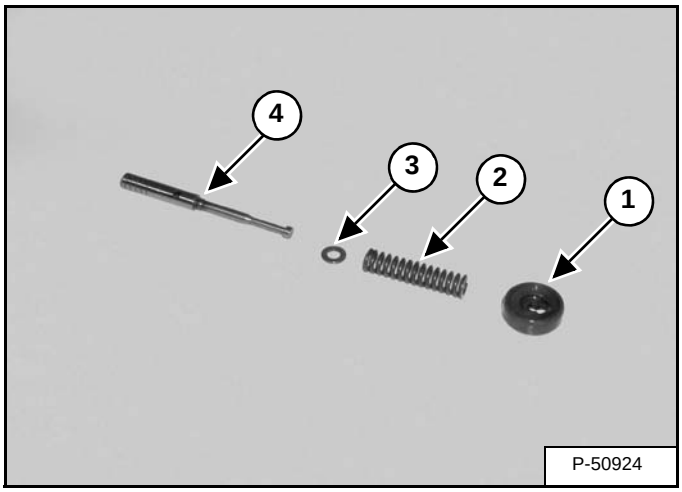
NOTE: Install the spool assemblies in the same bore from which they are removed.

Figure 20-113-10



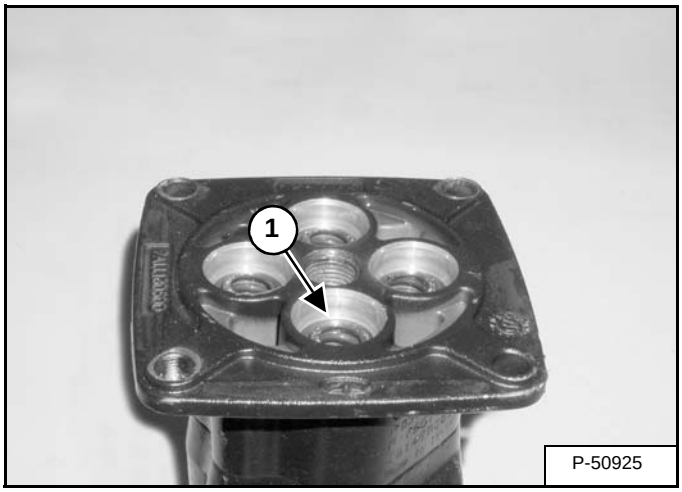
Compress the spring (Item 1) **[Figure 20-113-10]**.

Figure 20-113-11



Remove the piston (Item 1), spring (Item 2) and washer (Item 3) from the spool (Item 4) **[Figure 20-113-11]**.

Figure 20-113-12

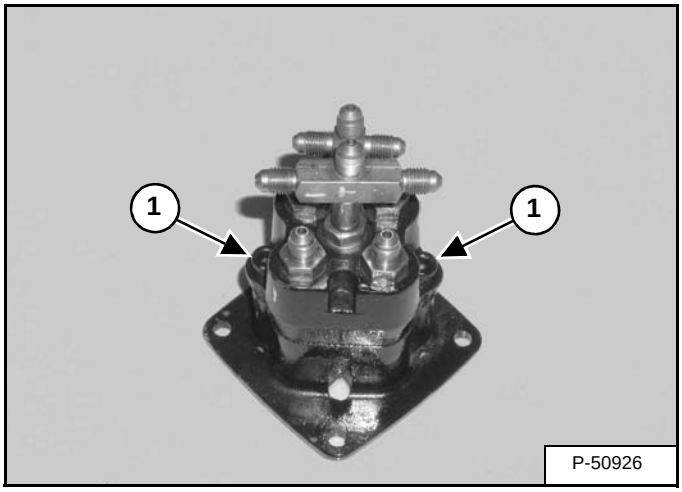


Remove the four centering springs (Item 1) **[Figure 20-113-12]**.

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Disassembly And Assembly (Cont'd)

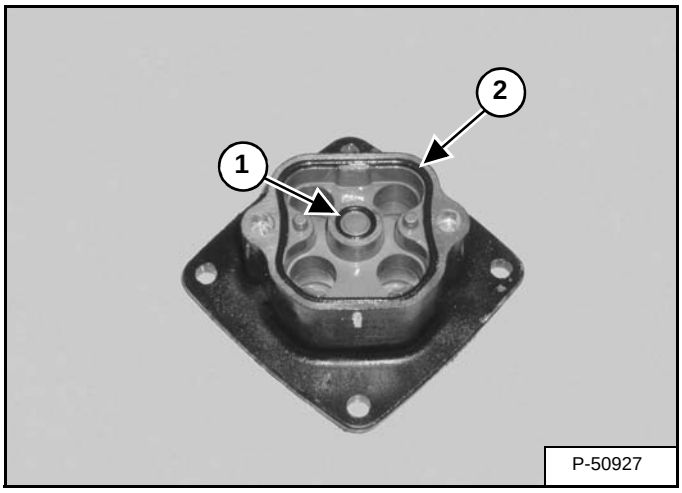
Figure 20-113-13



Remove the bolts (Item 1) **[Figure 20-113-13]**.

Separate the housing sections.

Figure 20-113-14



Remove the O-ring (Item 1) and seal (Item 2) **[Figure 20-113-14]** from the housing.

Assembly

Clean all parts in solvent and dry with compressed air.

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

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

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HOSES

Hose Guide Location

Figure 20-114-1

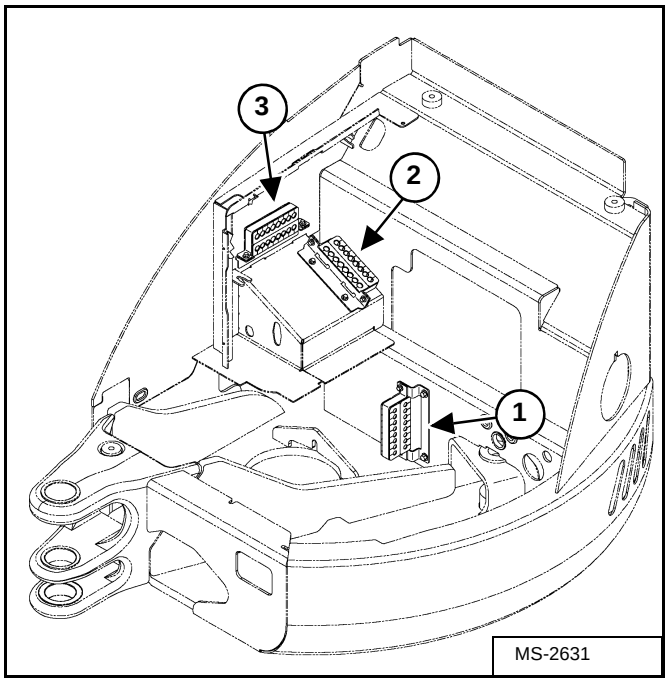


Figure 20-114-2

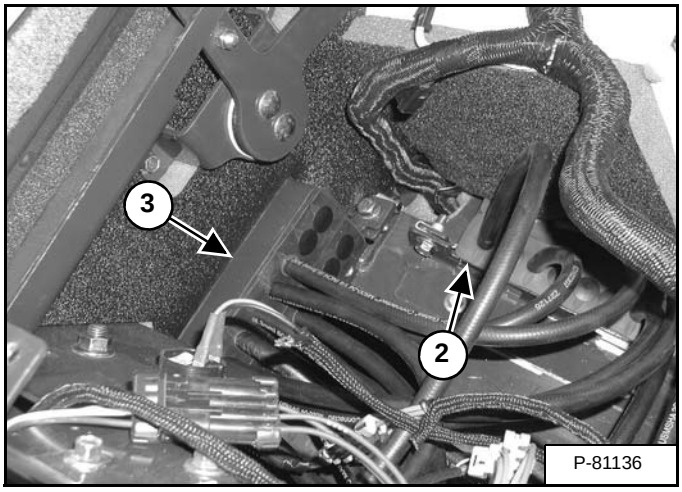
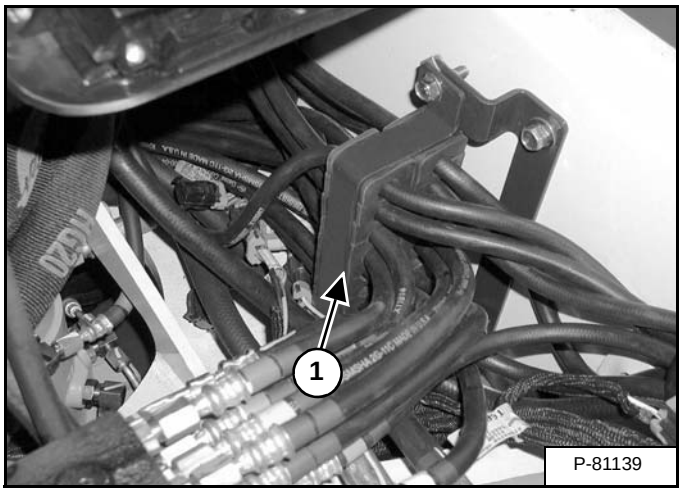


Figure 20-114-3

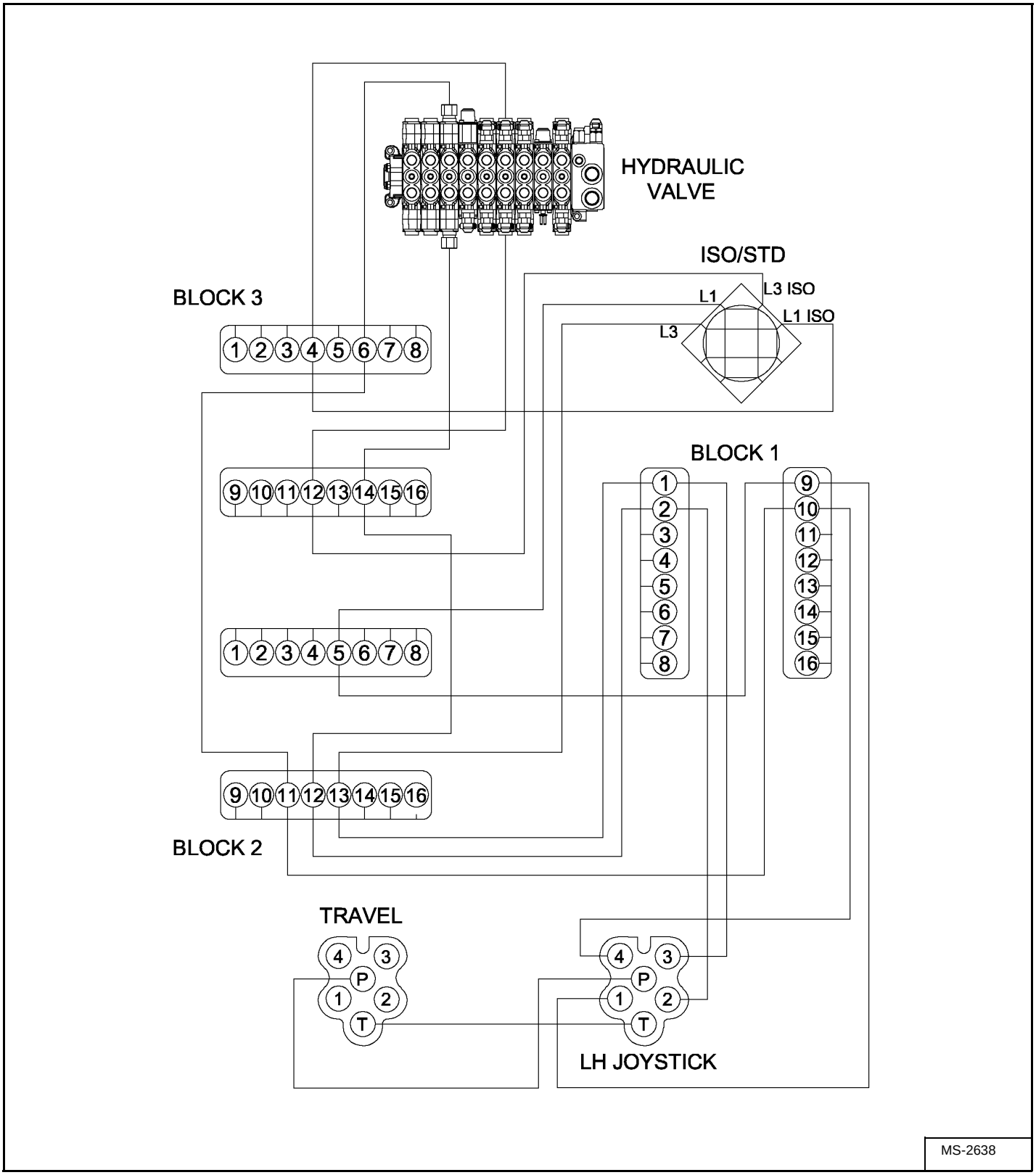


There are three hose guides mounted in the upperstructure to provide proper routing and prevent chaffing of pilot pressure hoses. The floormat and floor plates, operators seat and evaporator/heater unit must be removed to access guide #1 (Item 1) **[Figure 20-114-1]** & **[Figure 20-114-3]**. The right console cover and right console base must be removed to access guide #2 (Item 2) and guide #3 (Item 3) **[Figure 20-114-1]** & **[Figure 20-114-2]**.

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HOSES (CONT'D)

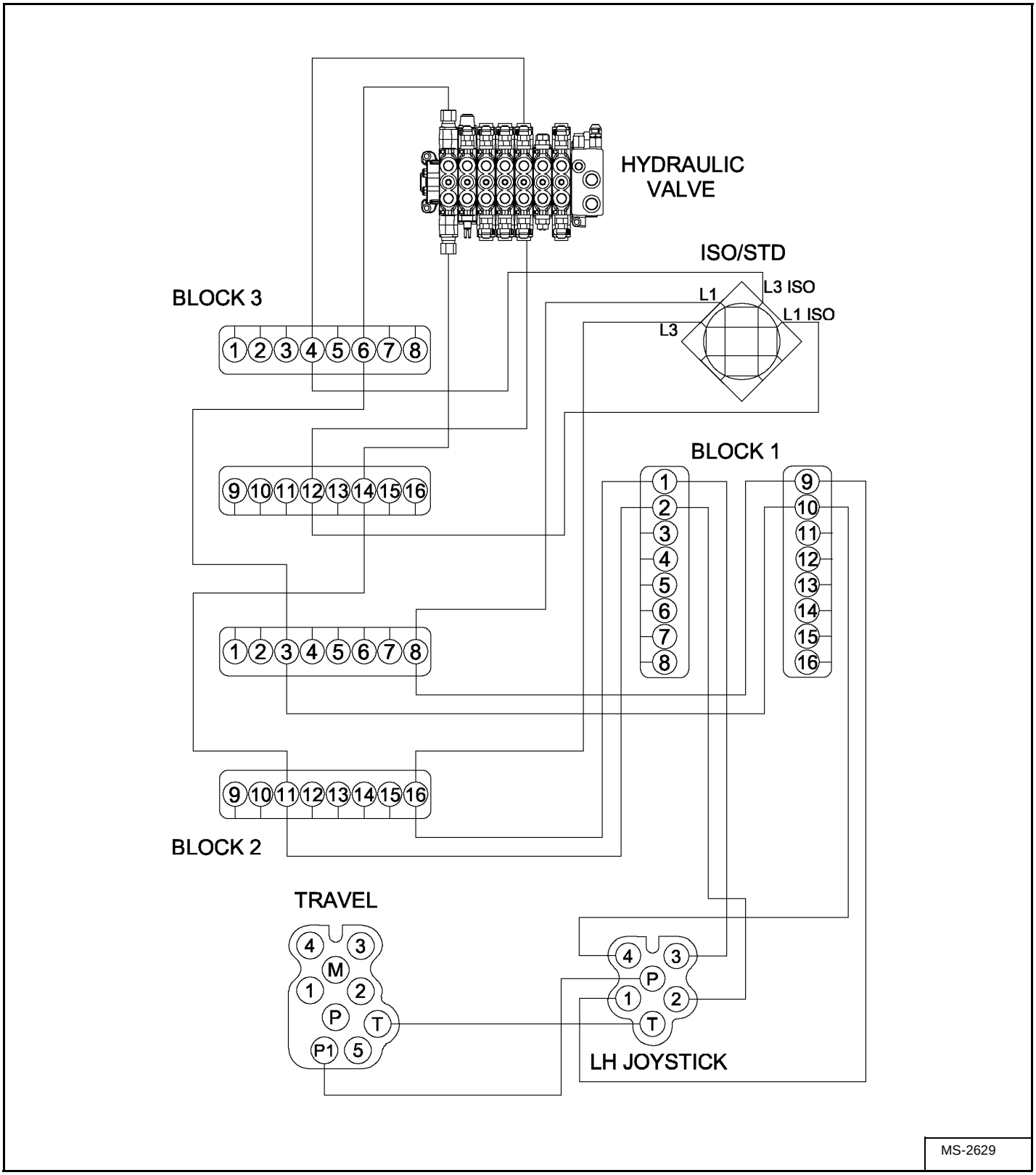
Left Control Lever (Joystick) (S/N 563114000-563114006 AND 563115000 & Above)



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HOSES (CONT'D)

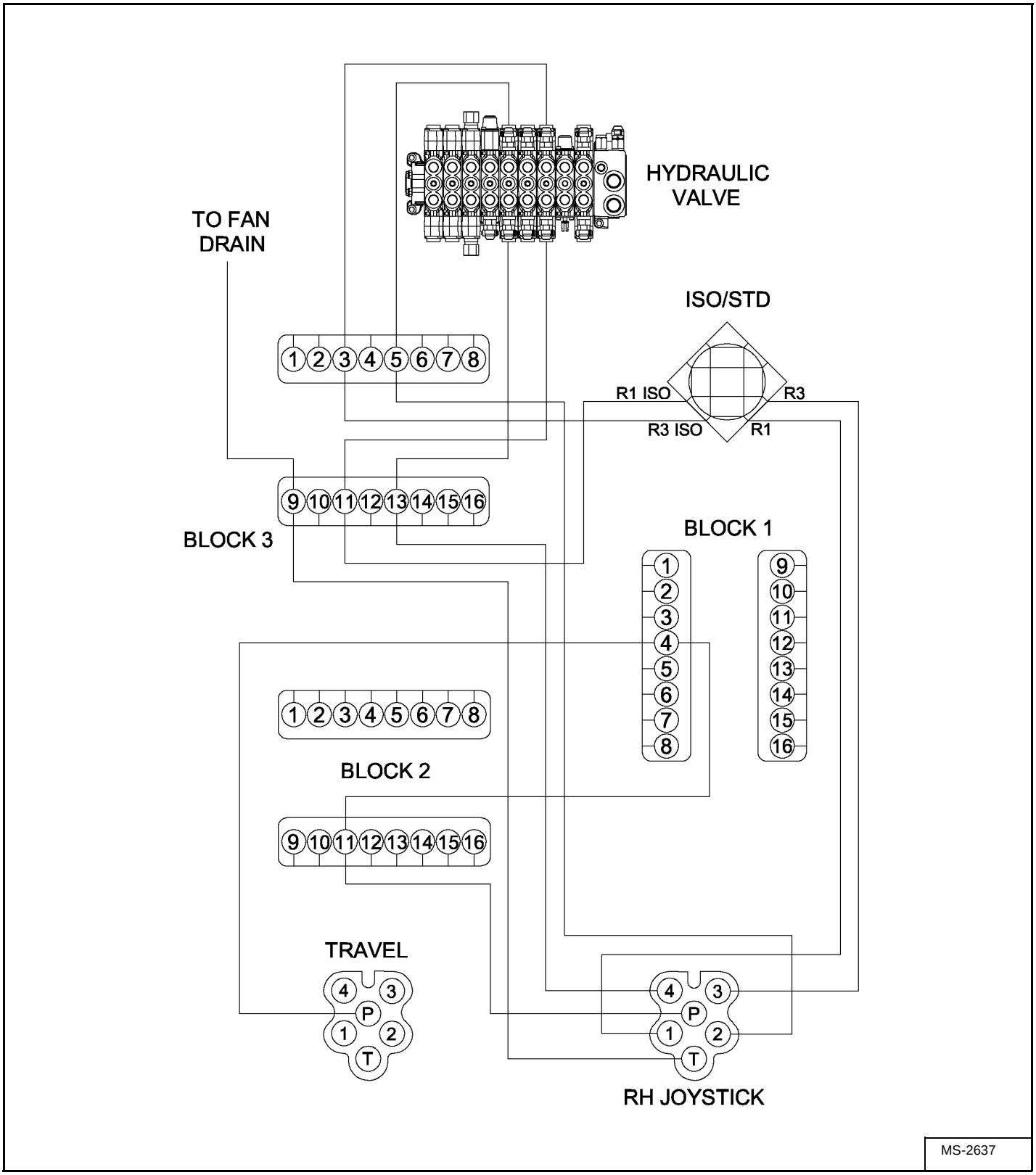
Left Control Lever (Joystick) (S/N 563214000 - 563214007 AND 563215000 & Above)



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HOSES (CONT'D)

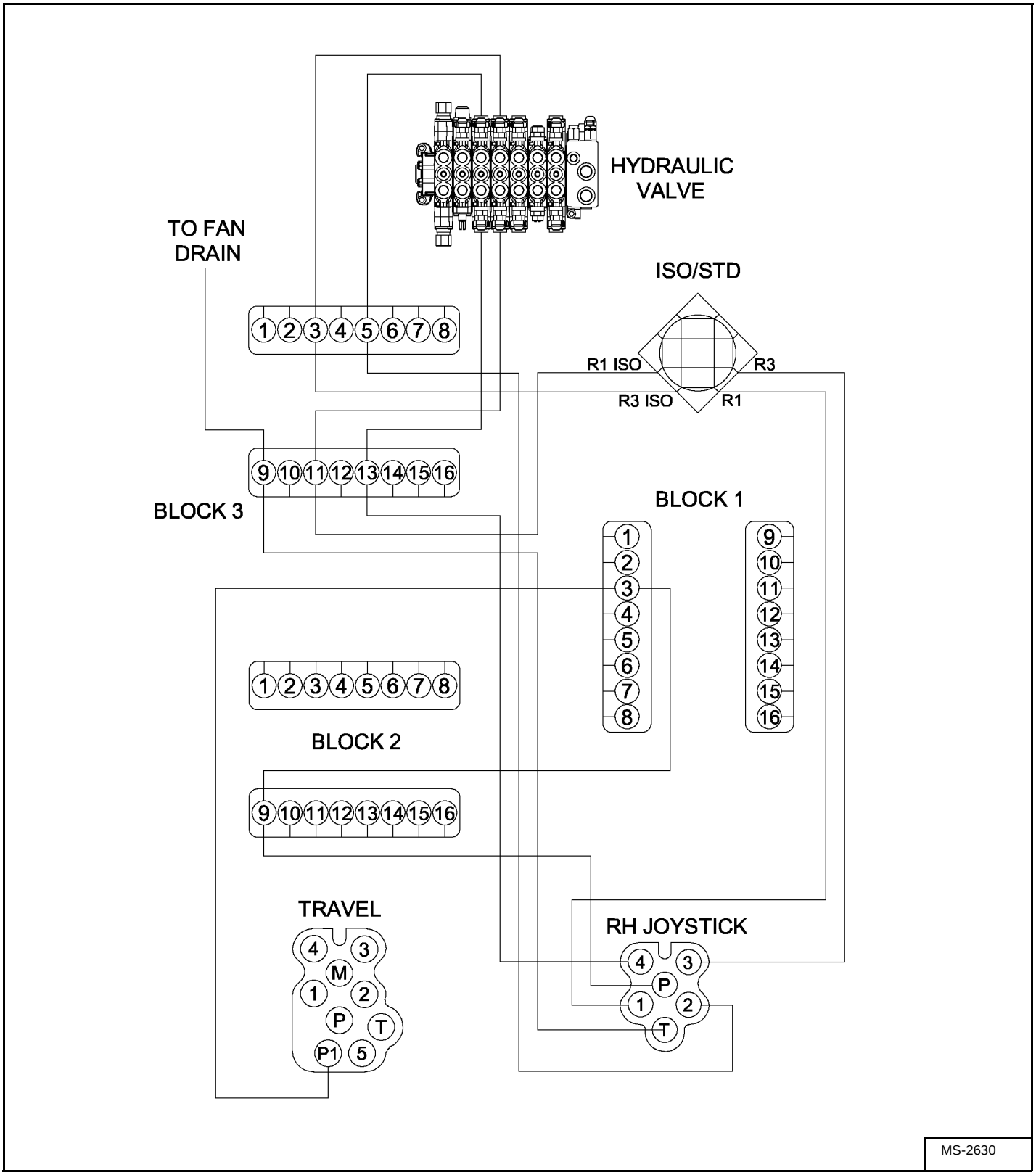
Right Control Lever (Joystick) (S/N 563114000 - 563114006 AND 563115000 & Above)



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HOSES (CONT'D)

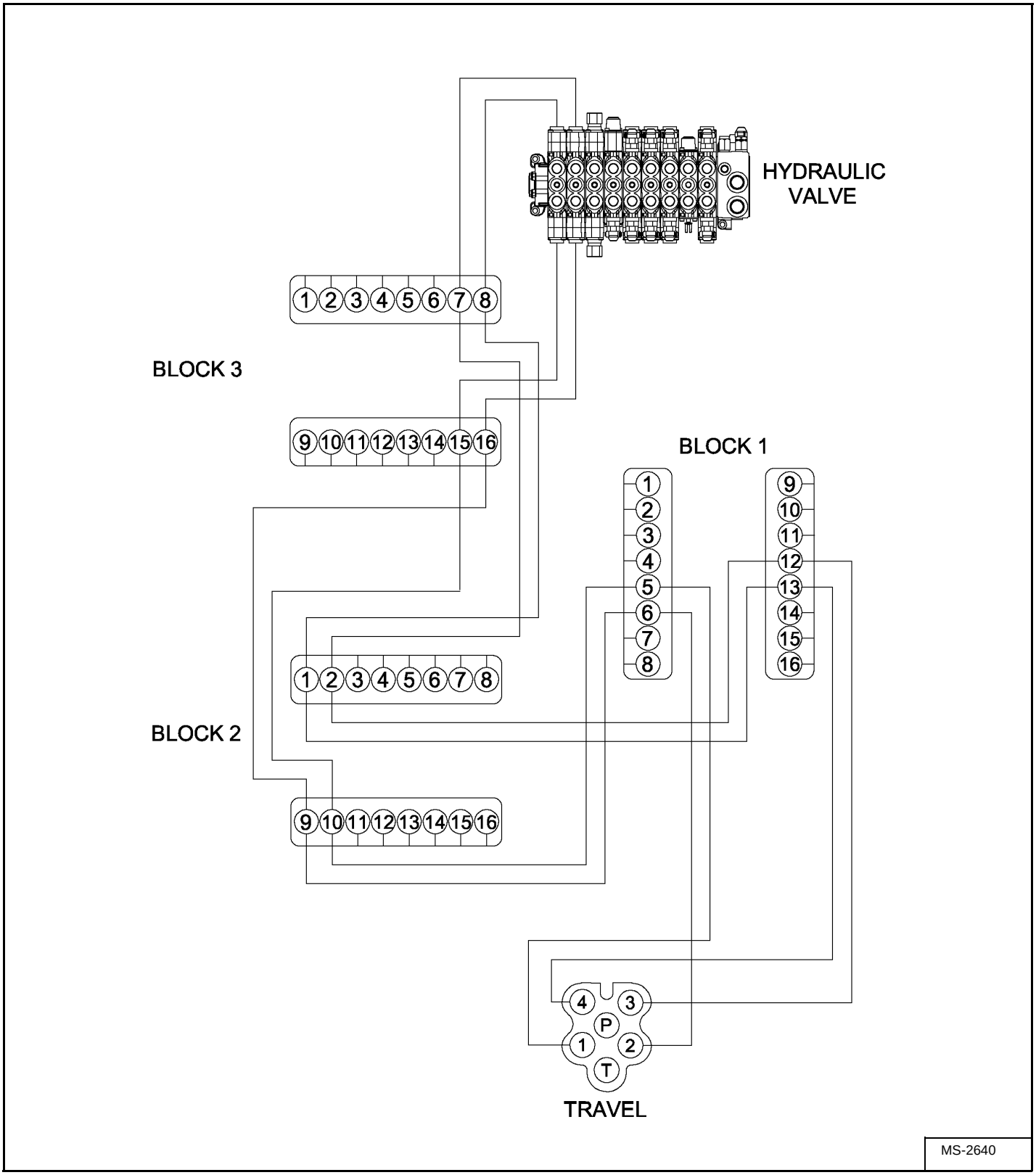
Right Control Lever (Joystick) (S/N 563214000 - 563214007 AND 563215000 & Above)



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HOSES (CONT'D)

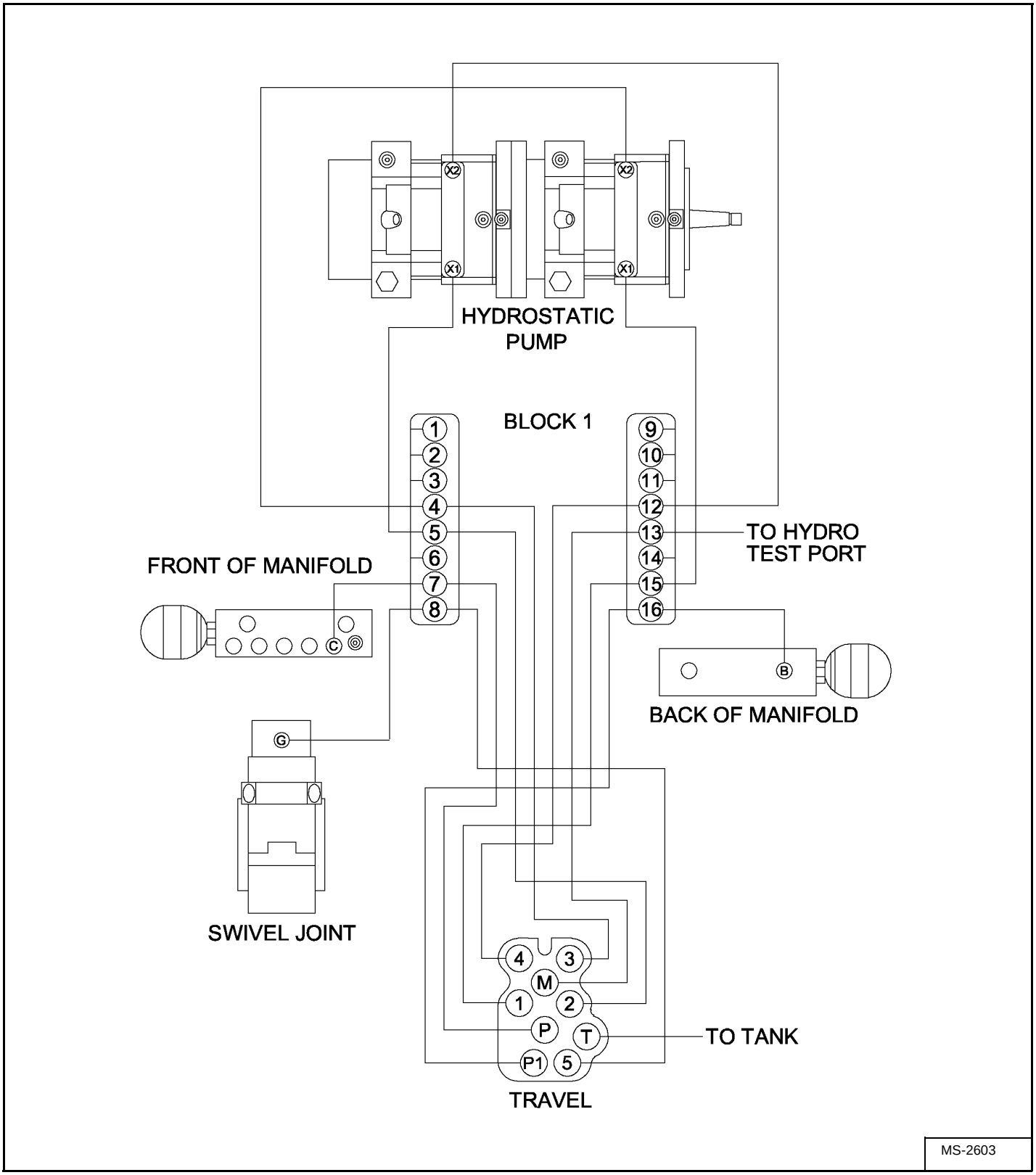
Travel Control Valve (S/N 563114000-563114006 AND 563115000 & Above)



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HOSES (CONT'D)

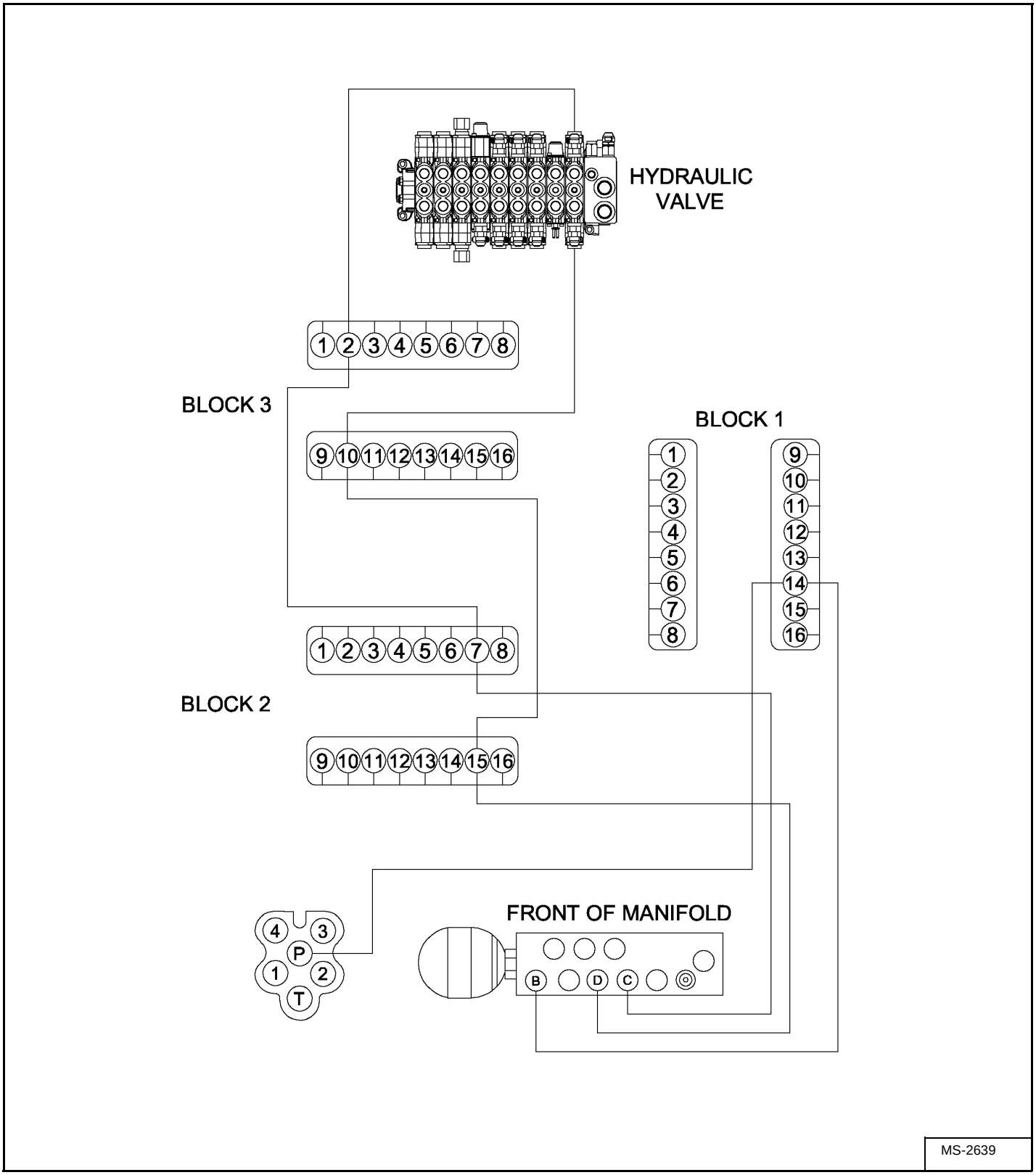
Travel Control Valve (S/N 563214000 - 563214007 AND 563215000 & Above)



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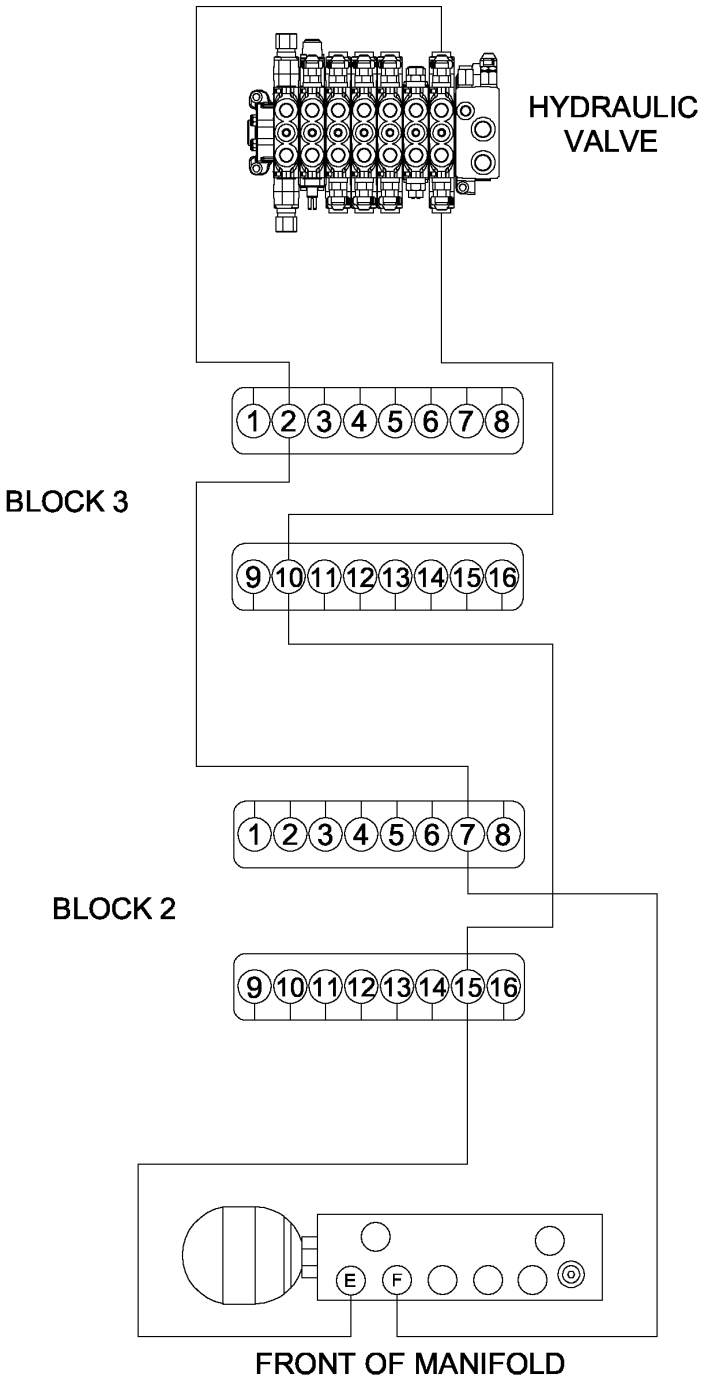
HOSES (CONT'D)

Manifold Assembly / Accumulator (S/N 563114000 - 563114006 AND 563115000 & Above)



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Manifold Assembly / Accumulator (S/N 563214000 - 563214007 AND 563215000 & Above)



MS-2604

https://www.pdfmanual4trucks.com/

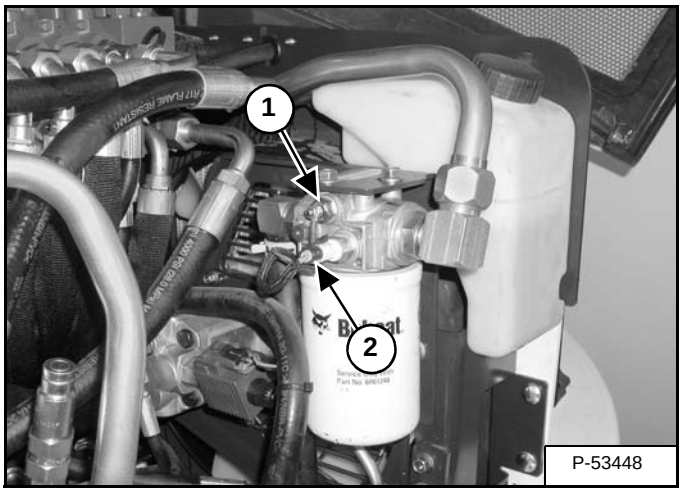
HYDRAULIC FILTER MOUNT

Removal And Installation

Drain the hydraulic reservoir. (See Replacing The Hydraulic Oil on Page 10-100-2)

Open the right side cover.

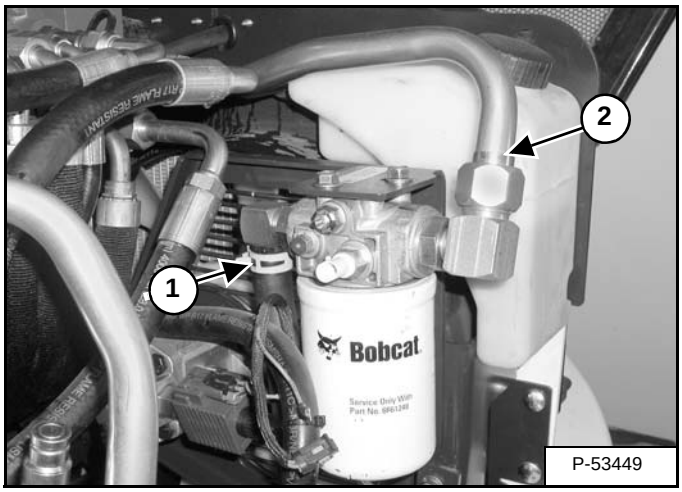
Figure 20-120-1



Loosen the nut and remove the wire harness (Item 1) **[Figure 20-120-1]**.

Disconnect the wire harness (Item 2) **[Figure 20-120-1]**.

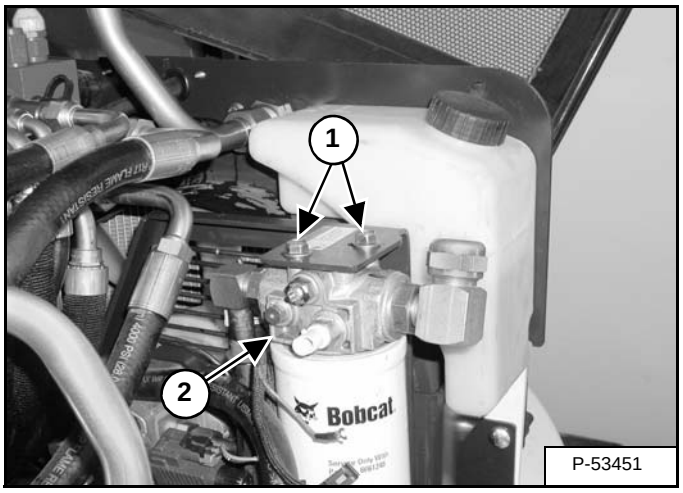
Figure 20-120-2



Remove the clamp and hose (Item 1) **[Figure 20-120-2]**.

Remove the tubeline (Item 2) **[Figure 20-120-2]**.

Figure 20-120-3



Remove the bolts (Item 1) and remove the filter mount (Item 2) **[Figure 20-120-3]**.

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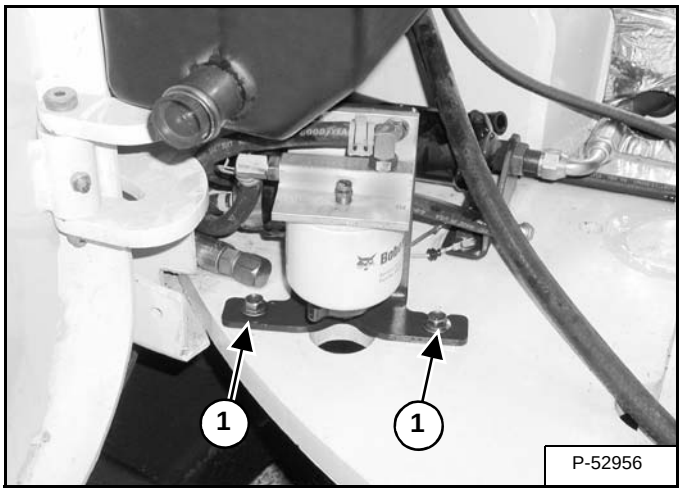
HYDRAULIC RESERVOIR

Removal And Installation

Drain the reservoir. (See Replacing The Hydraulic Oil on Page 10-100-2)

Remove the engine. (See Removal And Installation on Page 70-60-1.)

Figure 20-130-1



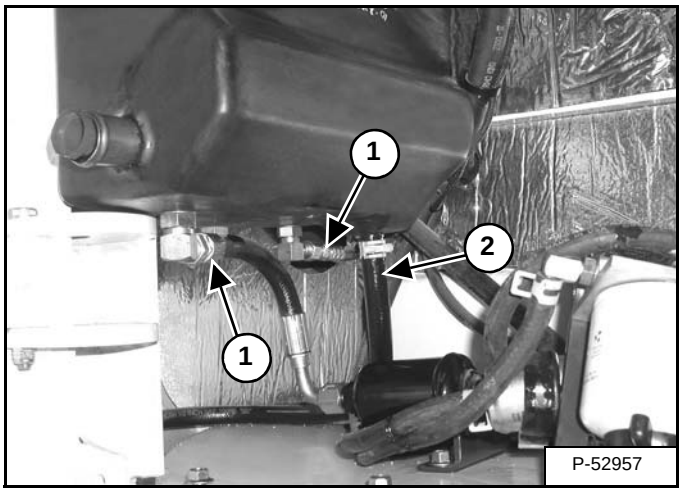
Loosen the bolts (Item 1) **[Figure 20-130-1]** and reposition the fuel filter/pump assembly.

IMPORTANT

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

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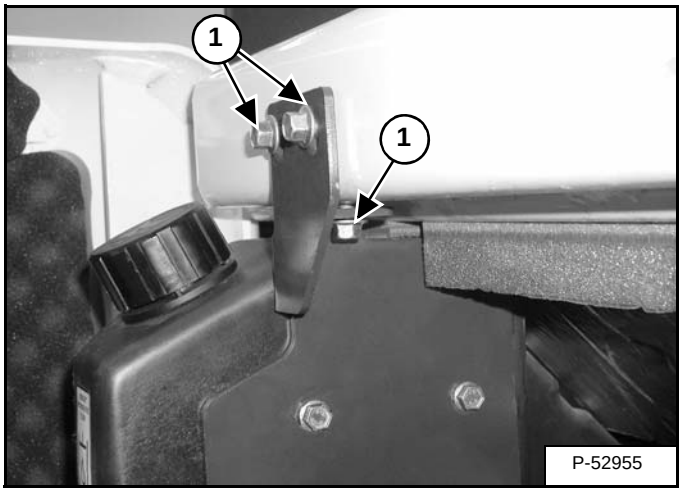
Figure 20-130-2



Remove the hoses (Item 1) **[Figure 20-130-2]**.

Remove the clamp and remove the hose (Item 2) **[Figure 20-130-2]**.

Figure 20-130-3



Remove the bolts (Item 1) **[Figure 20-130-3]**.

Remove the reservoir from the Excavator.

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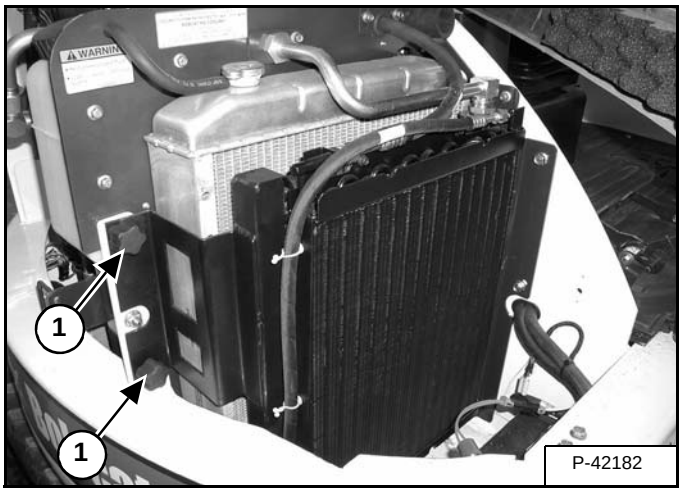
OIL COOLER

Removal And Installation

Remove the battery. (See Removing And Installing The Battery on Page 60-20-2)

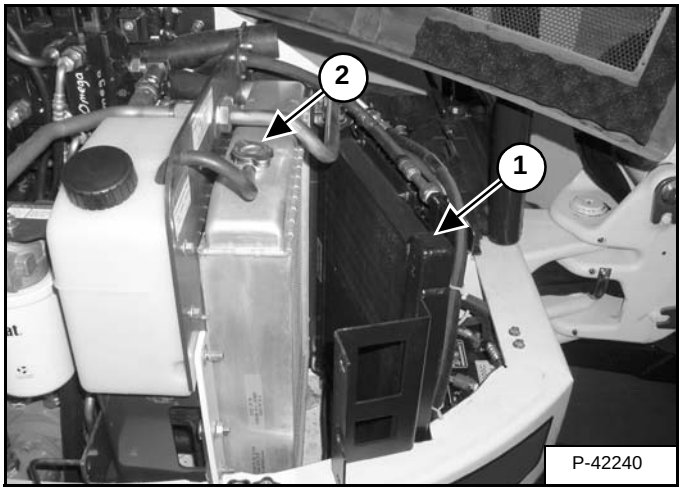
Drain the hydraulic reservoir. (See Replacing The Hydraulic Oil on Page 10-100-2)

Figure 20-140-1



Remove the two nuts (Item 1) **[Figure 20-140-1]**.

Figure 20-140-2



Pivot the oil cooler (Item 1) **[Figure 20-140-2]** away from the radiator.

Figure 20-140-3

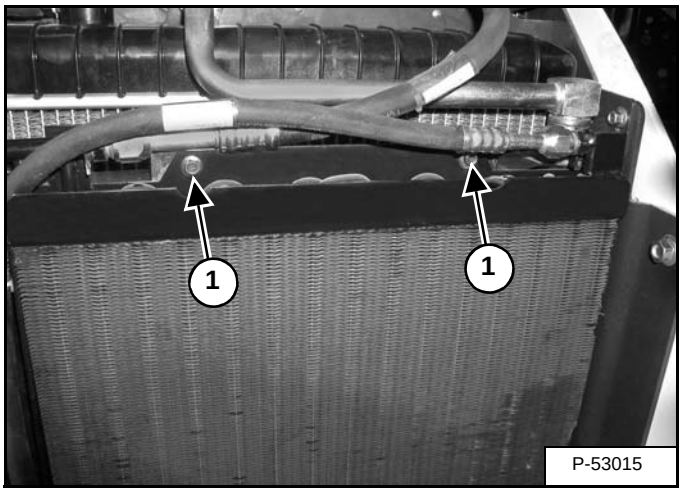
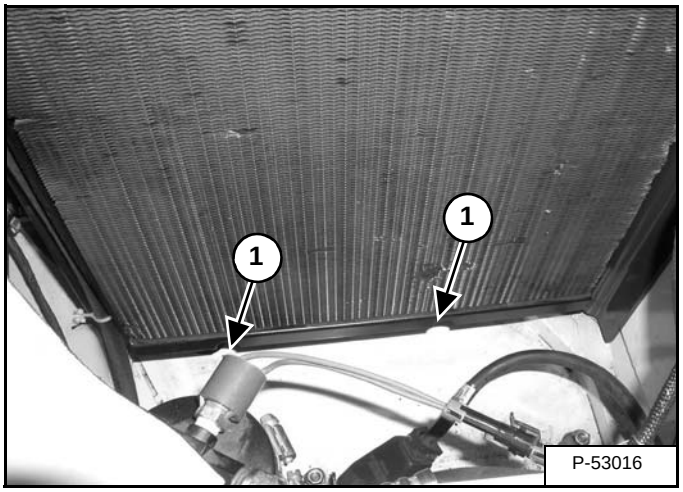


Figure 20-140-4

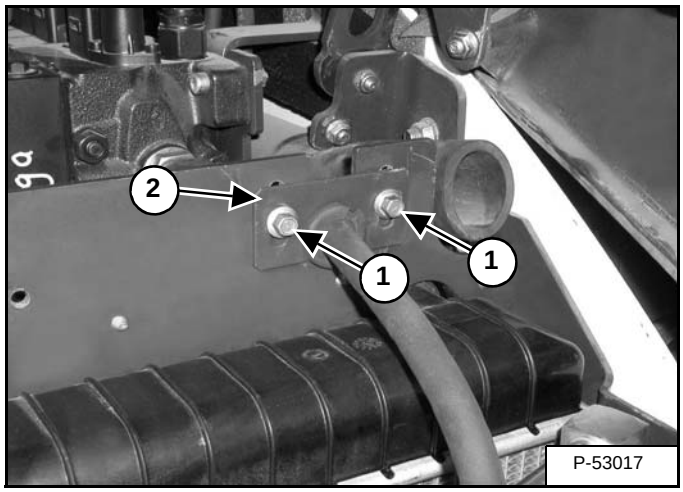


Remove the screws (Item 1) **[Figure 20-140-3]** & **[Figure 20-140-4]** and reposition the A/C condenser.

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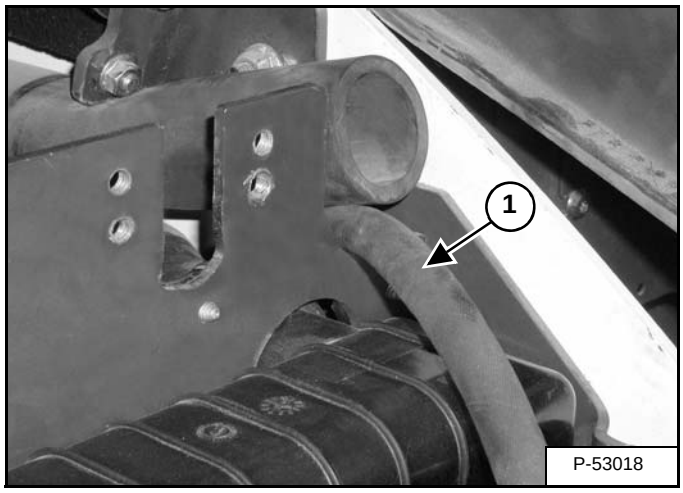
Removal And Installation (Cont'd)

Figure 20-140-5



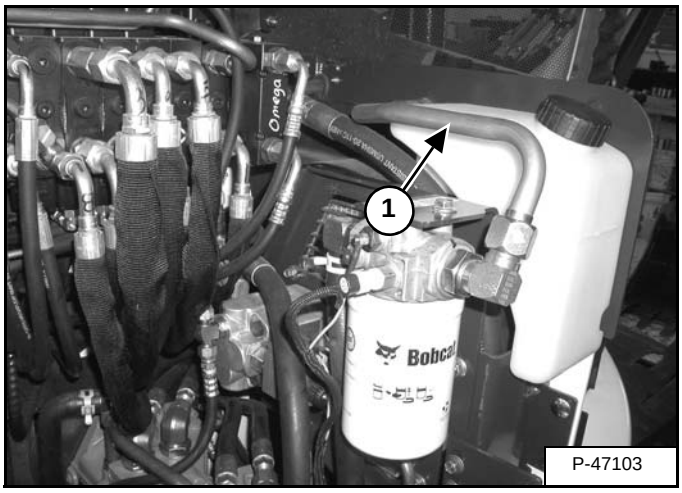
Remove the bolts (Item 1) and bracket (Item 2) **[Figure 20-140-5]**.

Figure 20-140-6



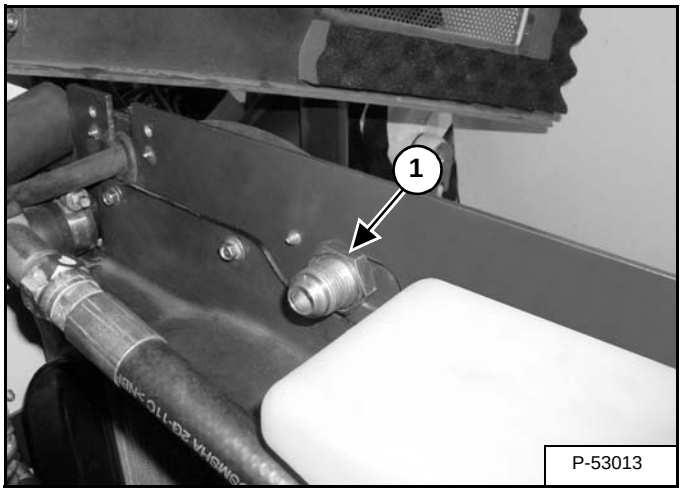
Relocate the A/C hose (Item 1) **[Figure 20-140-6]** as shown.

Figure 20-140-7



Remove the tubeline (Item 1) **[Figure 20-140-7]**.

Figure 20-140-8

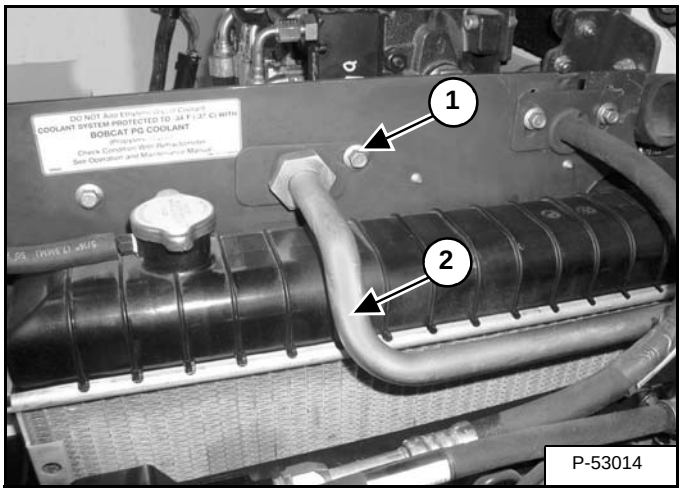


Remove the nut (Item 1) **[Figure 20-140-8]**.

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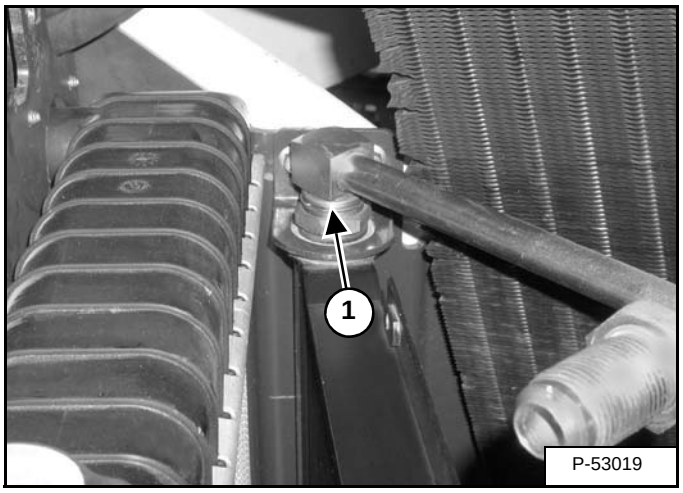
Removal And Installation (Cont'd)

Figure 20-140-9



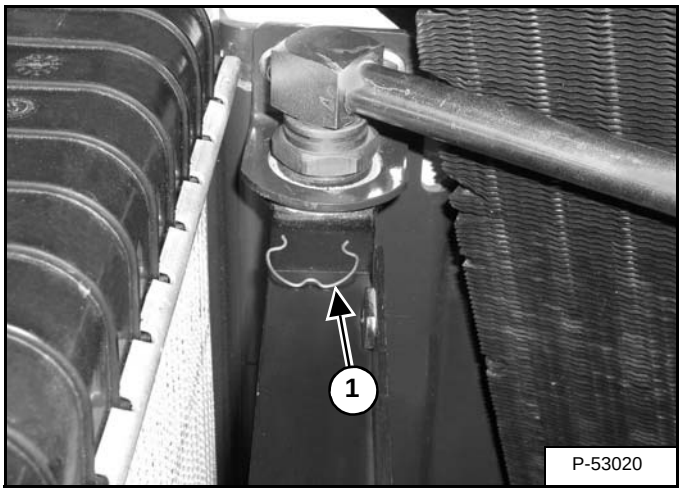
Remove the bolt (Item 1) and pivot the tubeline (Item 2) **[Figure 20-140-9]** away from the radiator.

Figure 20-140-10



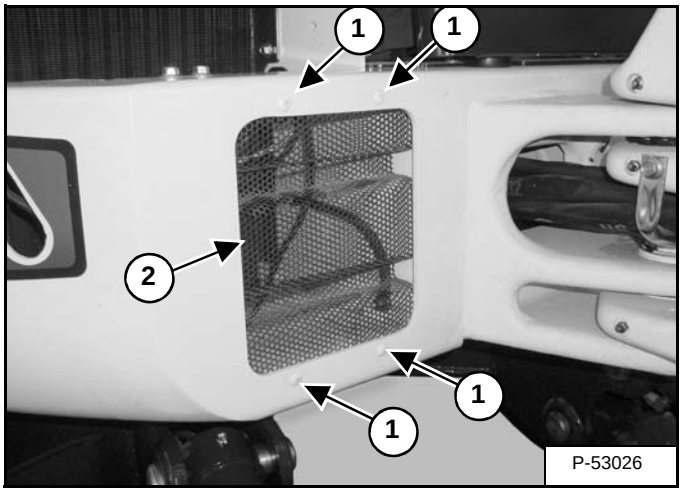
Remove the retainer (Item 1) **[Figure 20-140-10]** & **[Figure 20-140-11]**.

Figure 20-140-11



Pull up on and remove the tubeline (Item 2) **[Figure 20-140-11]**.

Figure 20-140-12



Remove the bolts (Item 1) and screen (Item 2) **[Figure 20-140-12]**.

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Removal And Installation (Cont'd)

Figure 20-140-13

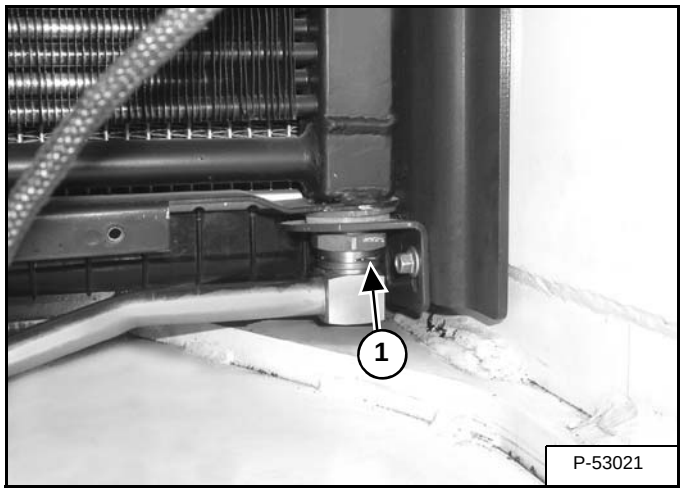
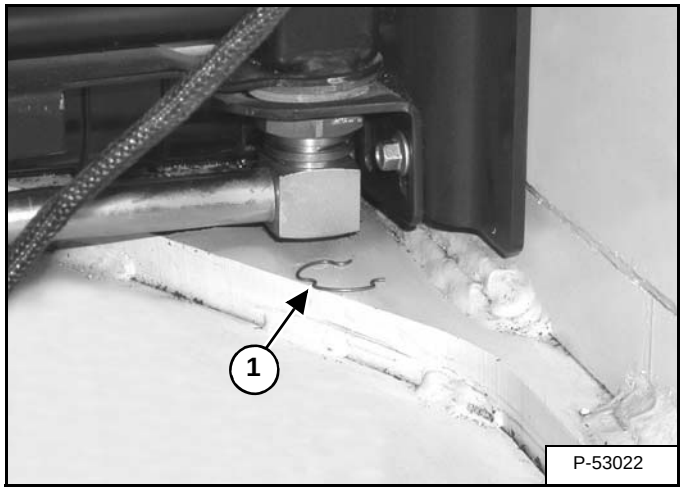
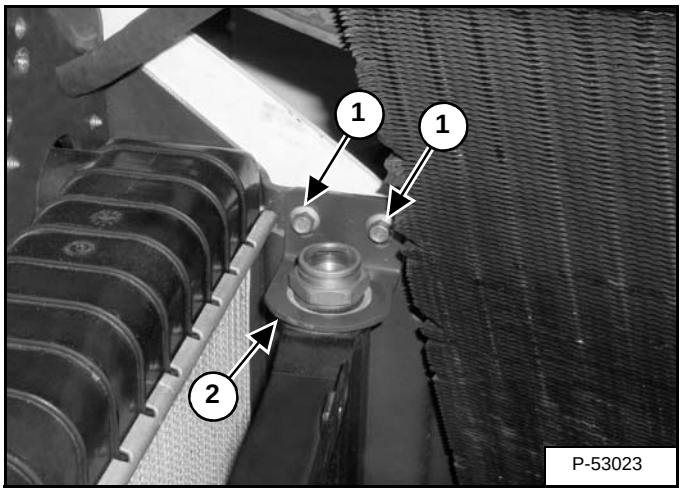


Figure 20-140-14



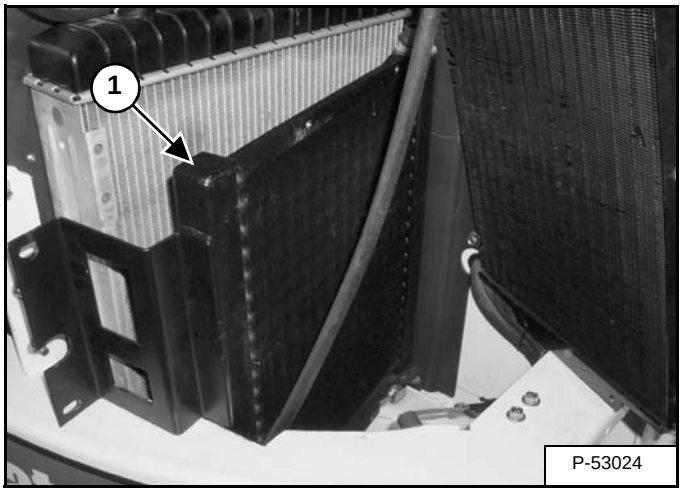
Remove the retainer (Item 1) **[Figure 20-140-13]** & **[Figure 20-140-14]**.

Figure 20-140-15



Remove the bolts (Item 1). Remove the bracket (Item 2) **[Figure 20-140-15]**.

Figure 20-140-16



Pull up on and remove the oil cooler (Item 1) **[Figure 20-140-16]**.

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DIRECT TO TANK VALVE (IF EQUIPPED)

Removal And Installation

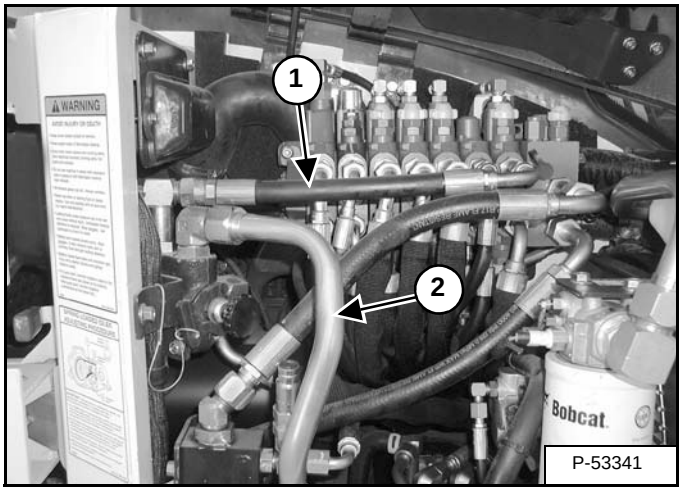
Open the right side cover.

IMPORTANT

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

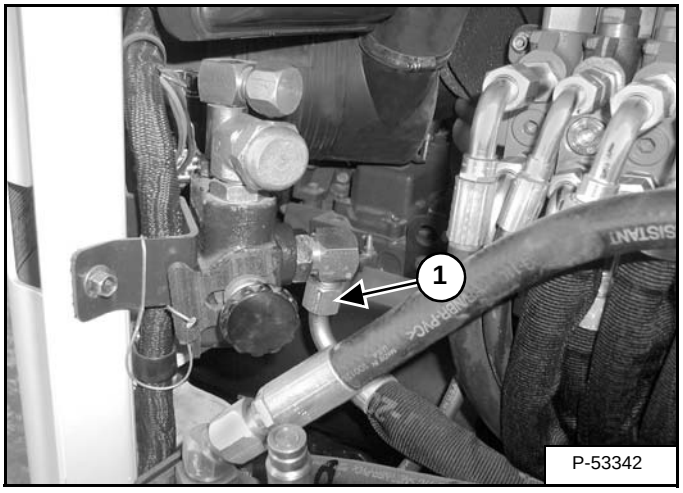
I-2003-0888

Figure 20-150-1



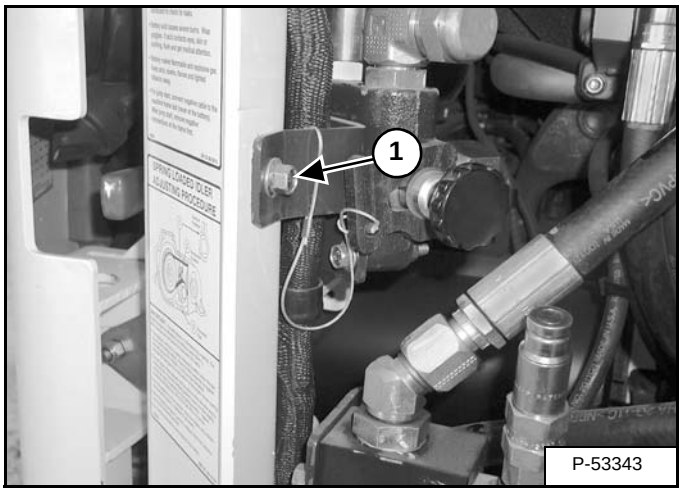
Remove the hose (Item 1) and tubeline (Item 2) **[Figure 20-150-1]**.

Figure 20-150-2



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

Figure 20-150-3



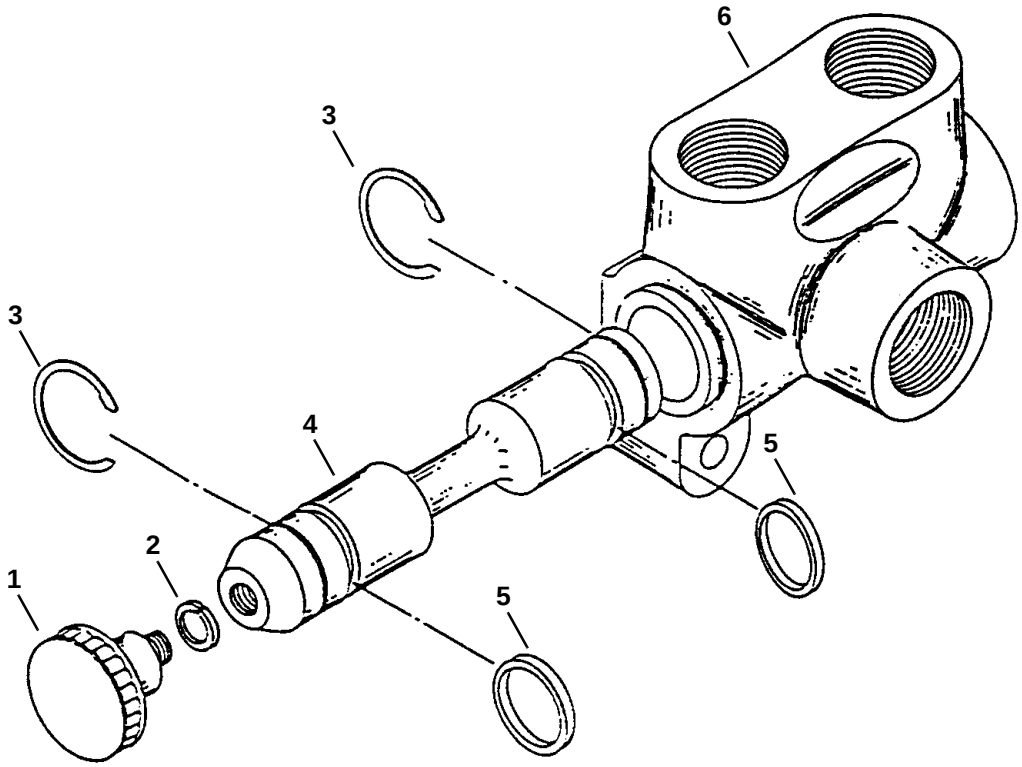
Remove the 2 bolts (Item 1) **[Figure 20-150-3]**.

Remove the direct to tank valve from the excavator.

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Parts Identification

1. Control Knob
2. Washer
3. Snap Ring
4. Spool
5. O-Ring
6. Housing



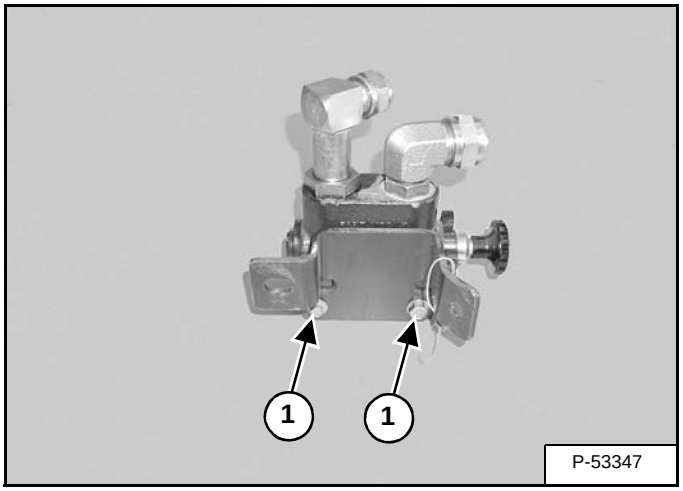
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Disassembly And Assembly

Clean the outside of the direct to tank valve before disassembly.

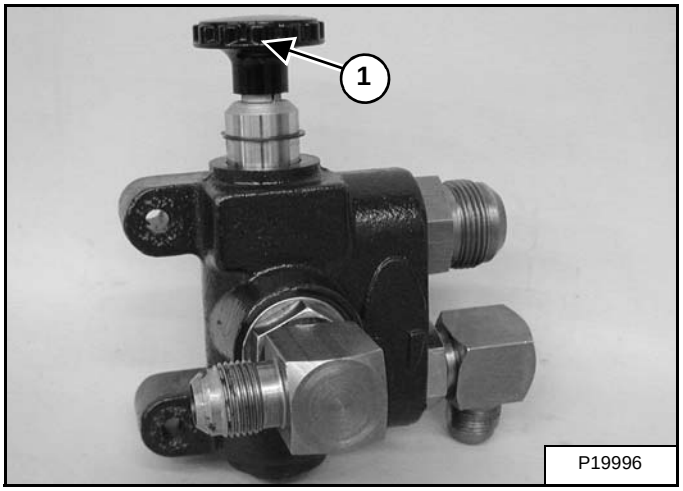
Figure 20-150-4



Remove the mount bracket bolts (Item 1) **[Figure 20-150-4]**.

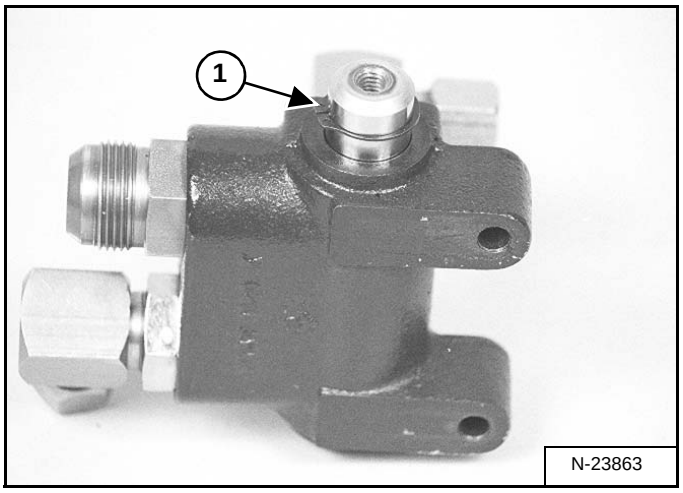
Remove the mount bracket from the valve.

Figure 20-150-5



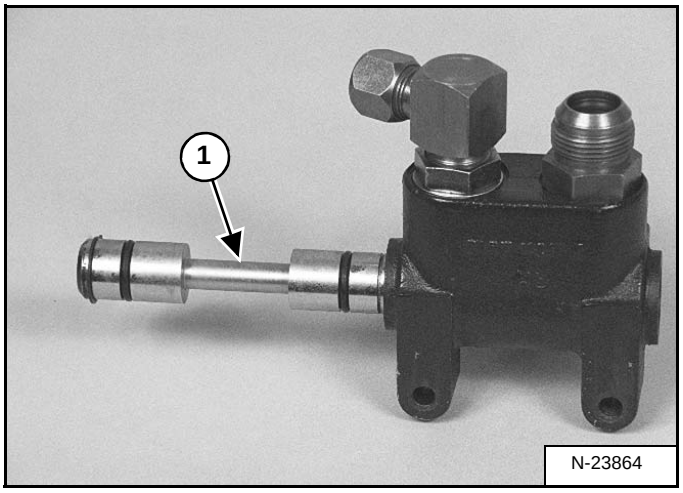
Remove the control knob (Item 1) **[Figure 20-150-5]** from the valve spool.

Figure 20-150-6



Remove the snap ring (Item 1) **[Figure 20-150-6]**.

Figure 20-150-7

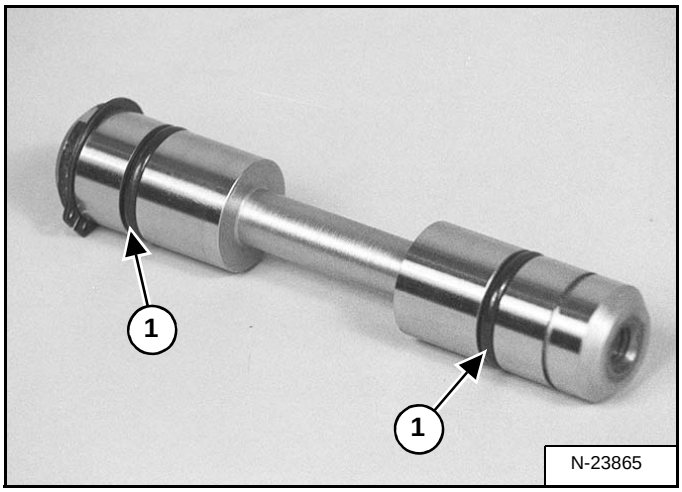


Remove the spool (Item 1) **[Figure 20-150-7]** from the valve.

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Disassembly And Assembly (Cont'd)

Figure 20-150-8



Remove the O-rings (Item 1) **[Figure 20-150-8]**.

Clean all parts in solvent and dry with compressed air.

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

Always install new O-rings. Lubricate the spool, valve spool bore and O-rings with clean hydraulic fluid before installation.

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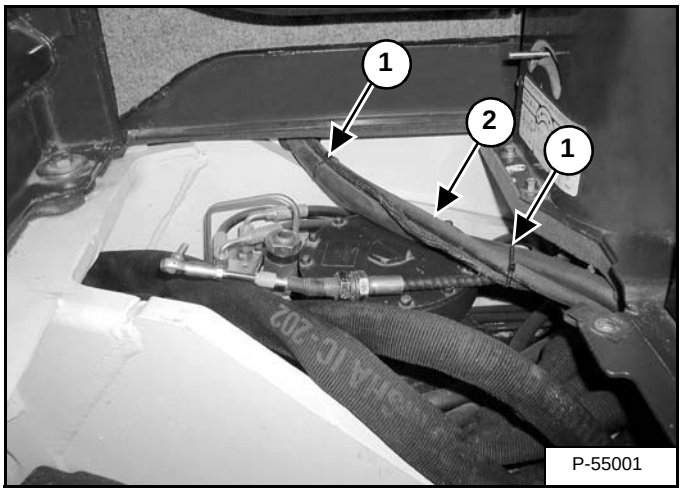
DUAL SEQUENCE VALVE (S/N 562611001 & ABOVE, 562811001 & ABOVE, 563111001 - 563113999 563211001 - 563213999)

Removal And Installation

Remove the floor mat and floor plate. (See Removal And Installation on Page 50-120-1)

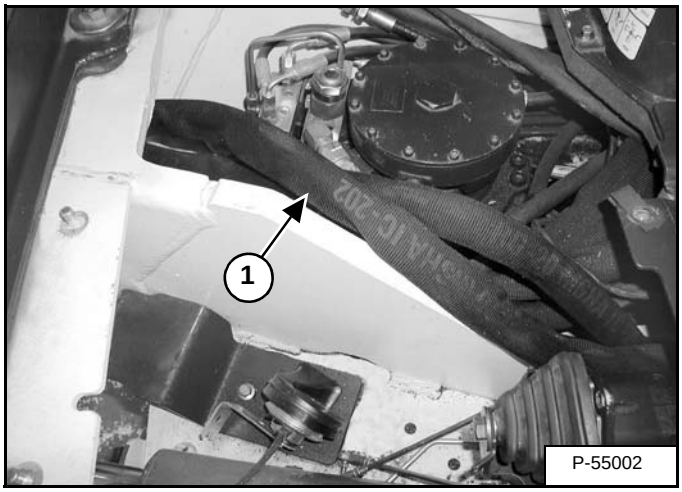
Remove the travel controls. (See Removal And Installation on Page 50-100-1)

Figure 20-160-1



Cut the tie straps (Item 1). Relocate the right pedal linkage, wire harness and A/C hoses (Item 2) **[Figure 20-160-1]**.

Figure 20-160-2



Relocate the hoses (Item 1) **[Figure 20-160-2]**.

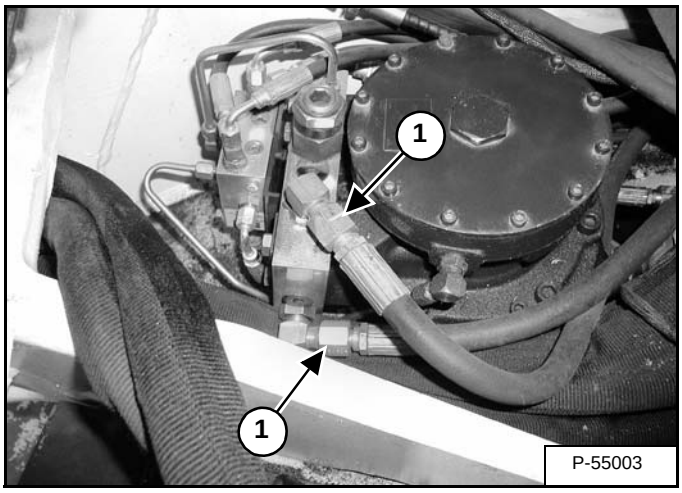
IMPORTANT

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.

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Mark all hoses for correct installation.

Figure 20-160-3



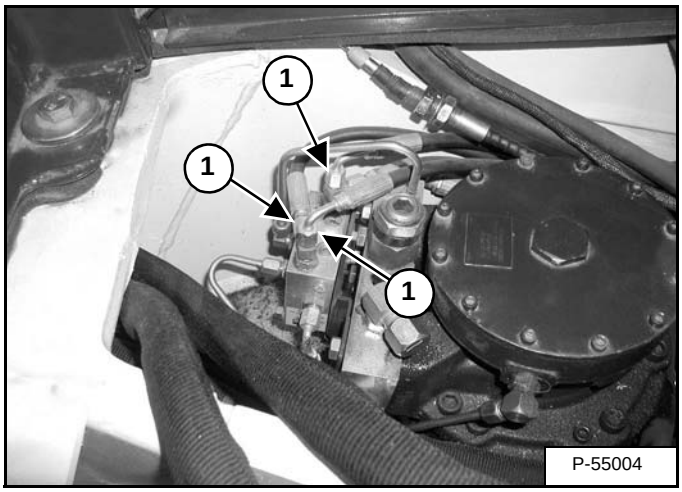
Remove the hoses (Item 1) **[Figure 20-160-3]**.

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DUAL SEQUENCE VALVE (S/N 562611001 & ABOVE, 562811001 & ABOVE, 563111001 - 563113999 563211001 - 563213999) (CONT'D)

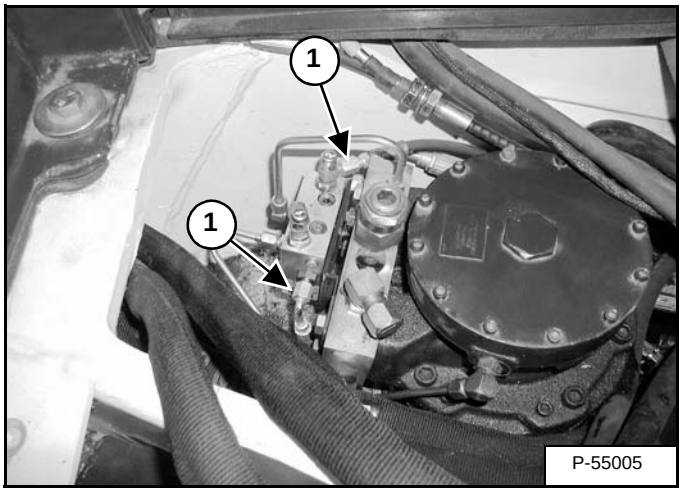
Removal And Installation (Cont'd)

Figure 20-160-4



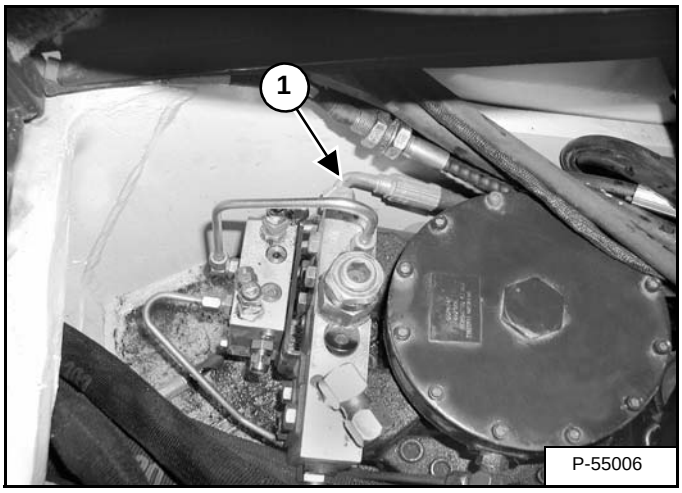
Remove the hoses (Item 1) **[Figure 20-160-4]**.

Figure 20-160-5



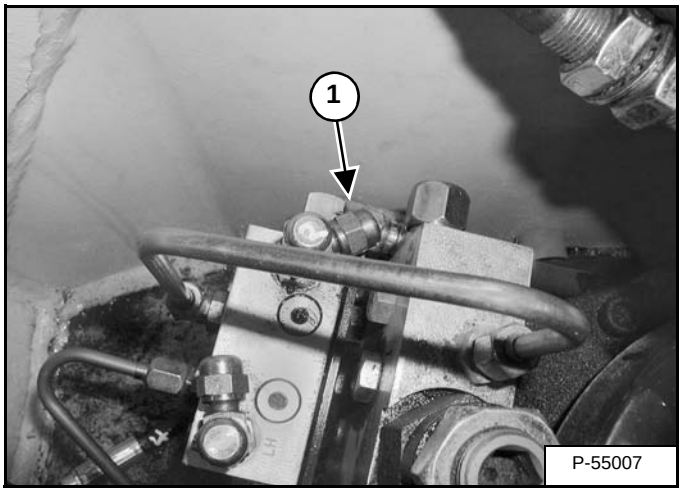
Remove the hoses (Item 1) **[Figure 20-160-5]**.

Figure 20-160-6



Remove the hose (Item 1) **[Figure 20-160-6]**.

Figure 20-160-7

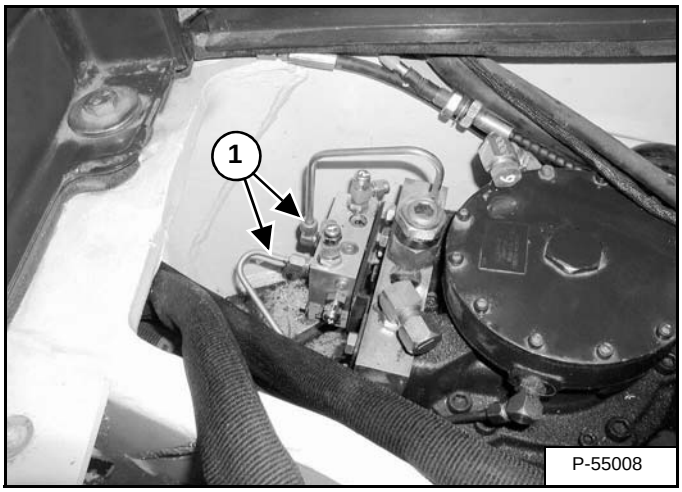


Remove the two hoses (Item 1) **[Figure 20-160-7]**.

https://www.pdfmanual4trucks.com/

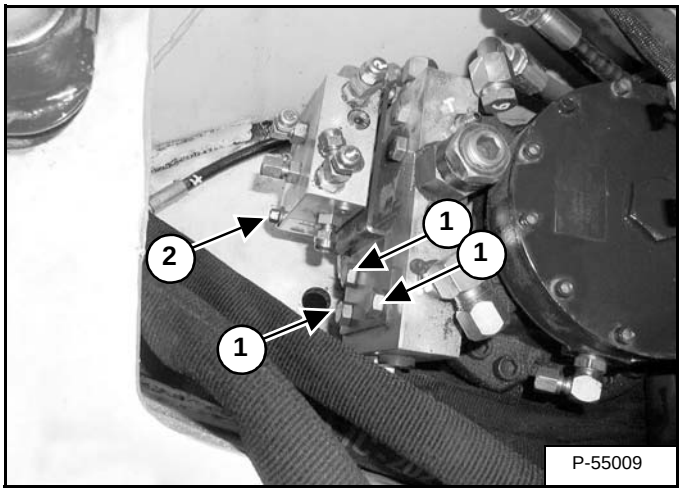
Removal And Installation (Cont'd)

Figure 20-160-8



Remove the tubelines (Item 1) **[Figure 20-160-8]**.

Figure 20-160-9



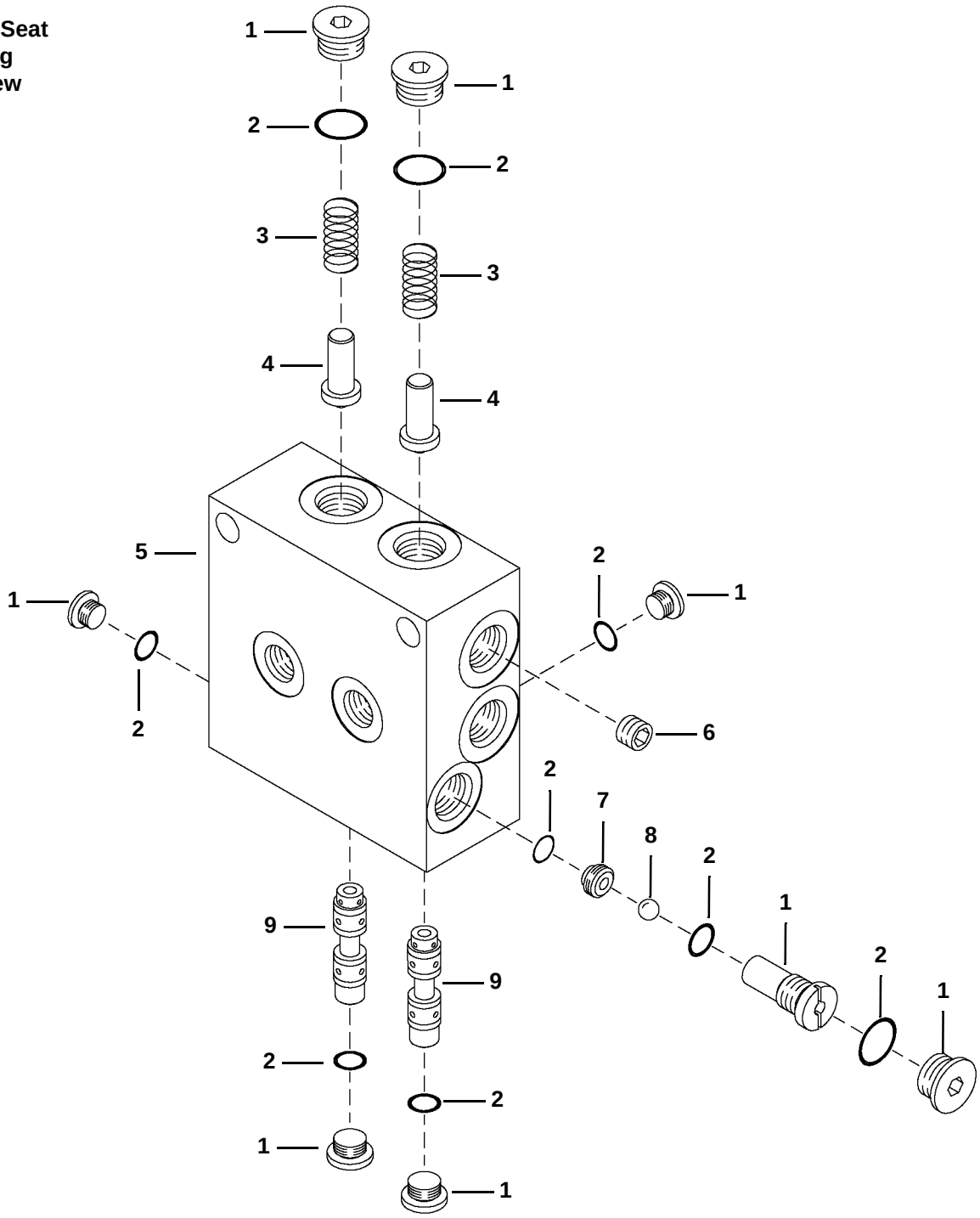
Remove the bolts (Item 1). Remove the dual sequence valve (Item 2) **[Figure 20-160-9]**.

Installation: Tighten the bolts to 45 ft.-lb. (61 N•m) torque.

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Parts Identification

1. Plug
2. O-Ring
3. Spring
4. Spring Seat
5. Housing
6. Setscrew
7. Seat
8. Ball
9. Spool



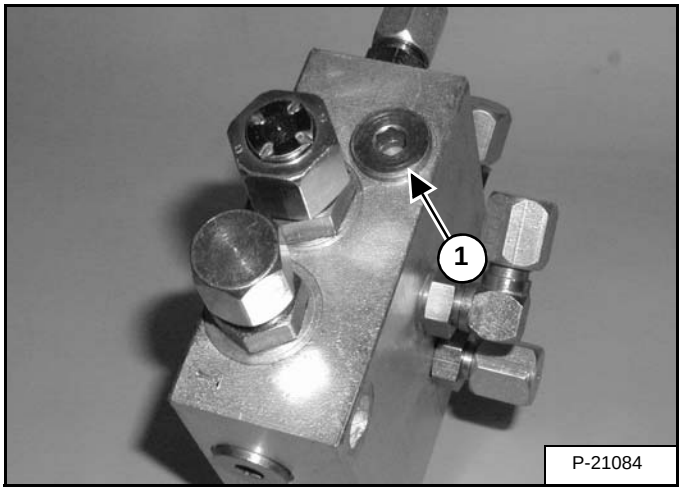
https://www.pdfmanual4trucks.com/

DUAL SEQUENCE VALVE (S/N 562611001 & ABOVE, 562811001 & ABOVE, 563111001 - 563113999 563211001 - 563213999) (CONT'D)

Disassembly And Assembly

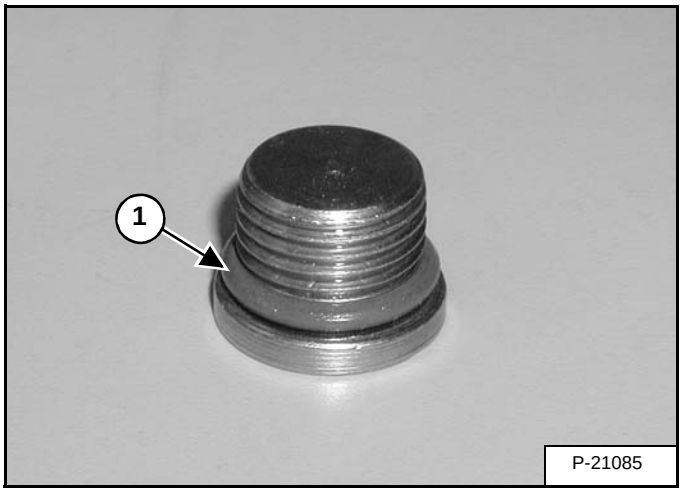
Clean the outside of the dual sequence valve before disassembly.

Figure 20-160-10



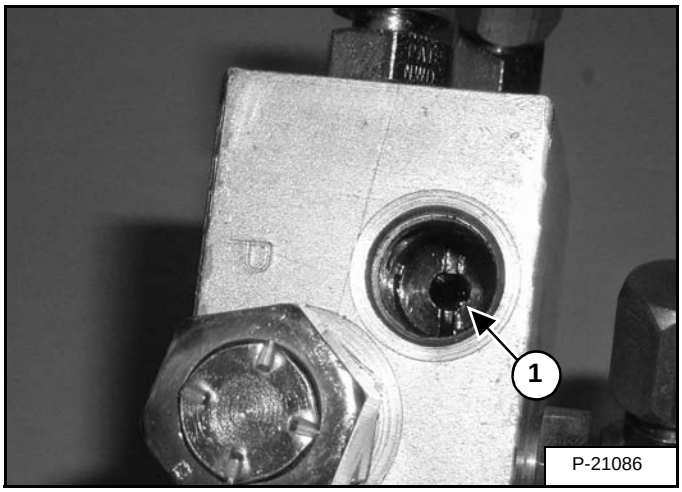
Remove the plug (Item 1) **[Figure 20-160-10]**.

Figure 20-160-11



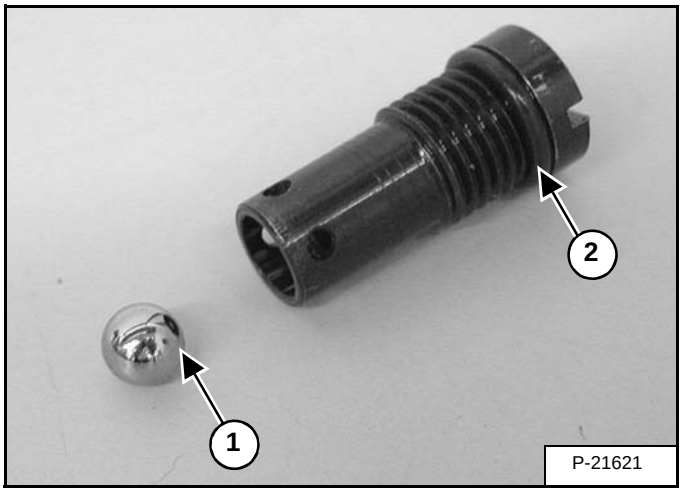
Remove the O-ring (Item 1) **[Figure 20-160-11]** from the plug.

Figure 20-160-12



Remove the plug (Item 1) **[Figure 20-160-12]**.

Figure 20-160-13



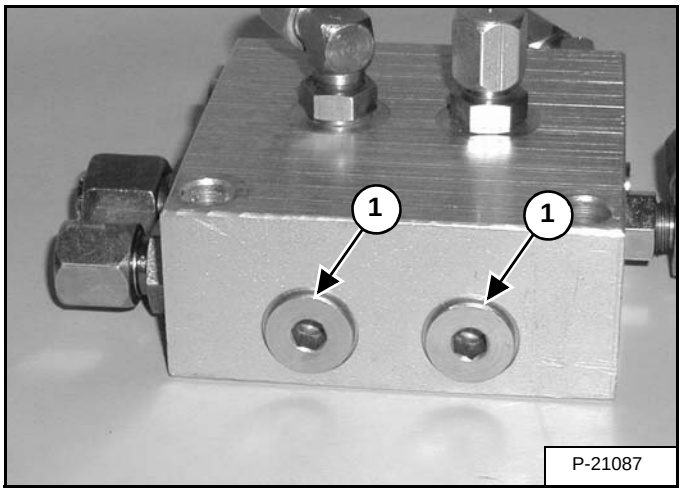
Remove the ball (Item 1) **[Figure 20-160-13]** from the plug.

Remove the O-ring (Item 2) **[Figure 20-160-13]**.

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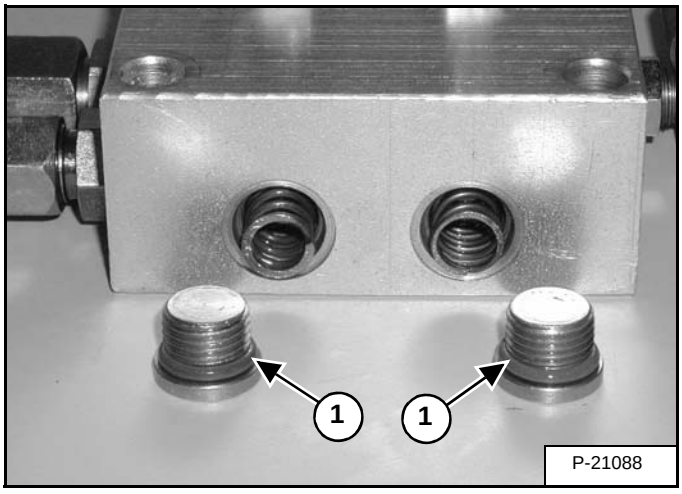
Disassembly And Assembly (Cont'd)

Figure 20-160-14



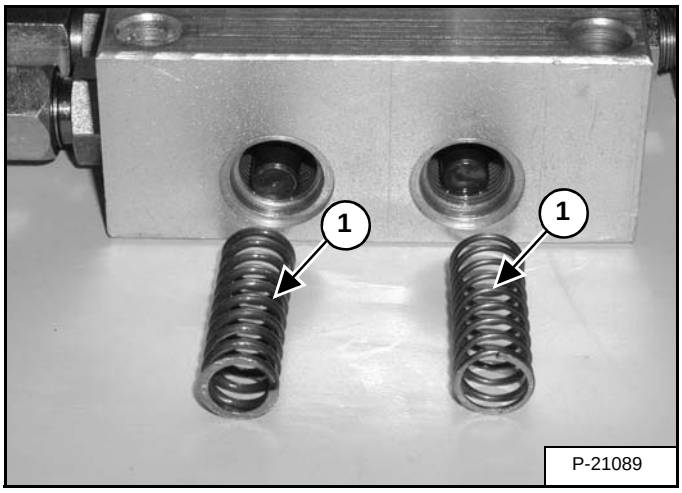
Remove the plugs (Item 1) **[Figure 20-160-14]**.

Figure 20-160-15



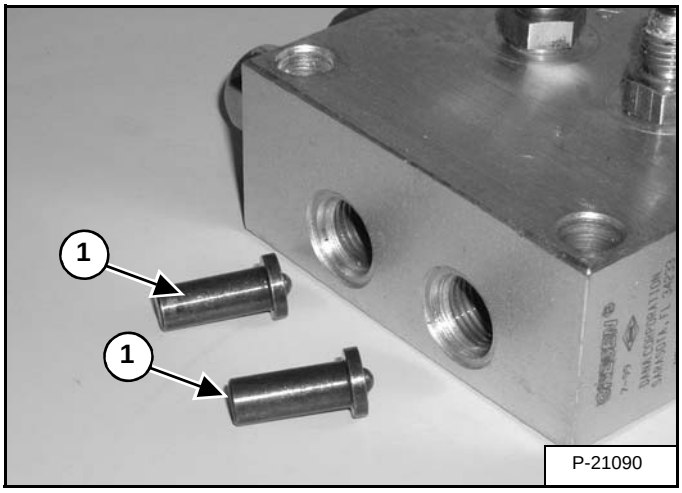
Remove the O-ring (Item 1) **[Figure 20-160-15]** from the plugs.

Figure 20-160-16



Remove the springs (Item 1) **[Figure 20-160-16]**.

Figure 20-160-17

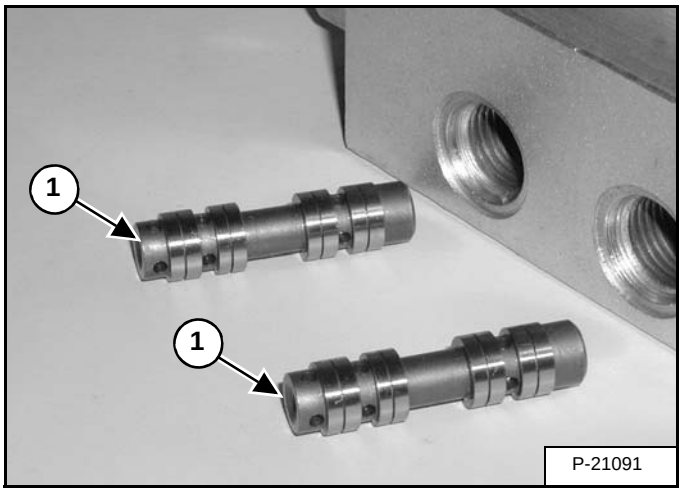


Remove the springs seats (Item 1) **[Figure 20-160-17]**.

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Disassembly And Assembly (Cont'd)

Figure 20-160-18



Remove the spools (Item 1) **[Figure 20-160-18]**.

Clean all parts in solvent and dry with compressed air.

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

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

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DUAL SEQUENCE VALVE (S/N 563214000 & ABOVE)

Removal And Installation

Stop the engine.

Lower the boom/bucket to the ground. Open the right side cover.

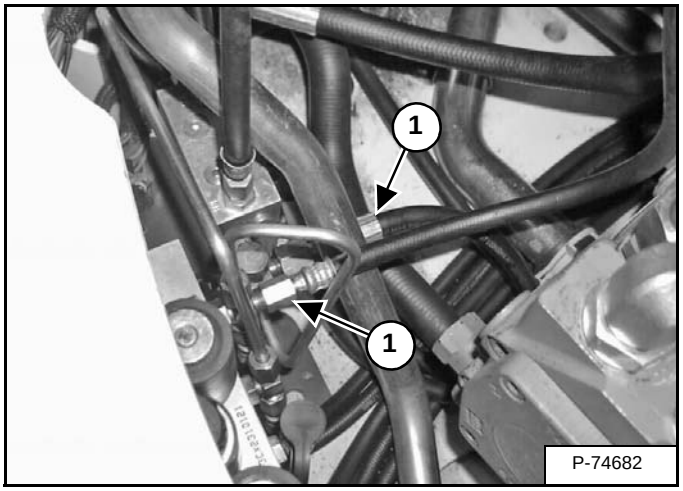
Mark all hoses for correct installation.

IMPORTANT

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

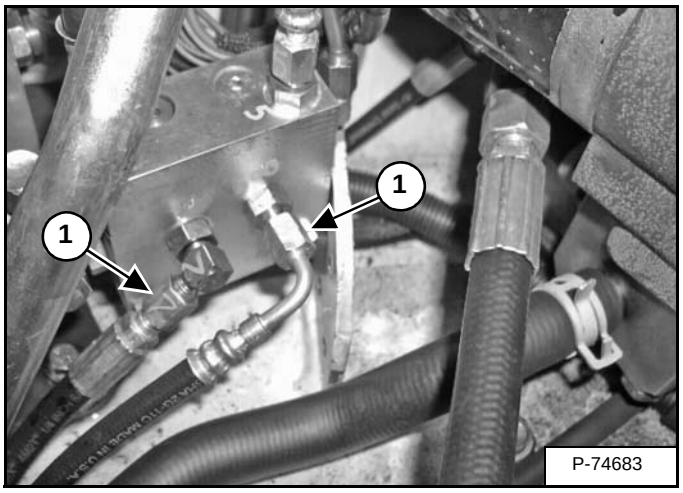
I-2003-0888

Figure 20-80-1



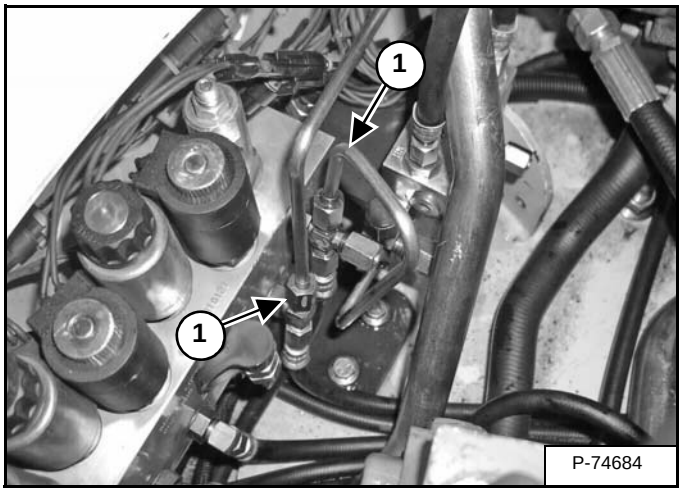
Remove the two hoses (Item 1) **[Figure 20-80-1]**.

Figure 20-161-2



Remove the hoses (Item 1) **[Figure 20-161-2]**.

Figure 20-161-3



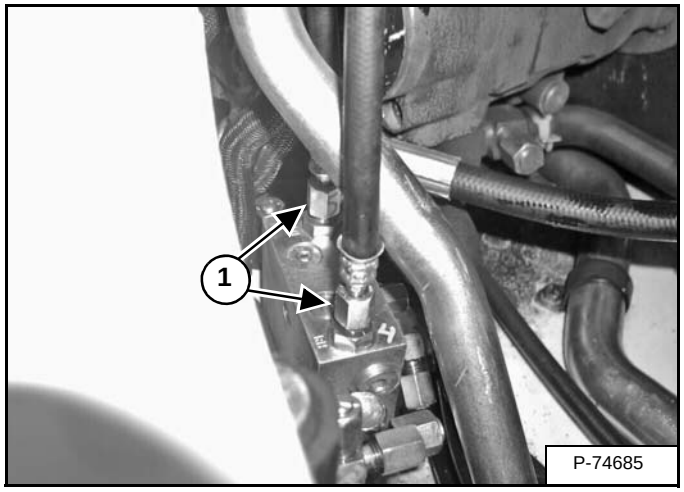
Remove the tubelines (Item 1) **[Figure 20-161-3]**.

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DUAL SEQUENCE VALVE (S/N 563214000 & ABOVE) (CONT'D)

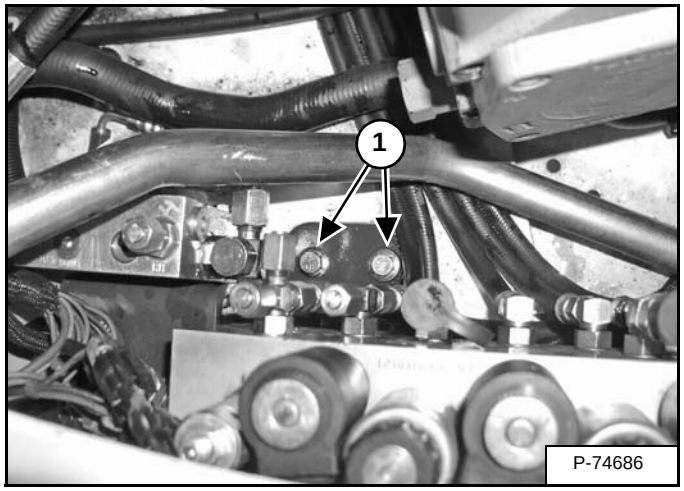
Removal And Installation (Cont'd)

Figure 20-161-4



Remove the hoses (Item 1) **[Figure 20-161-4]**.

Figure 20-161-5

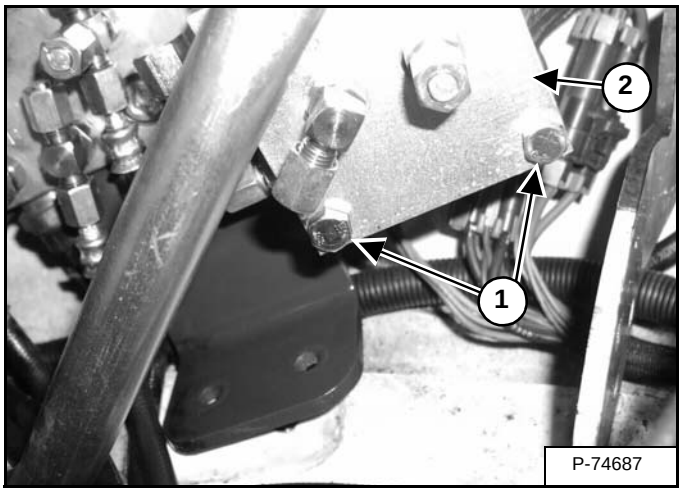


Remove the bolts (Item 1) **[Figure 20-161-5]**.

Installation: Tighten the bolts to 43-47 ft.-lb. (58-64 N•m) torque.

NOTE: The bolts (Item 1) [Figure 20-161-5] are removed so the bracket can be repositioned for bolt and nut removal in [Figure 20-161-6].

Figure 20-161-6



Remove the two bolts and nuts (Item 1) **[Figure 20-161-6]**.

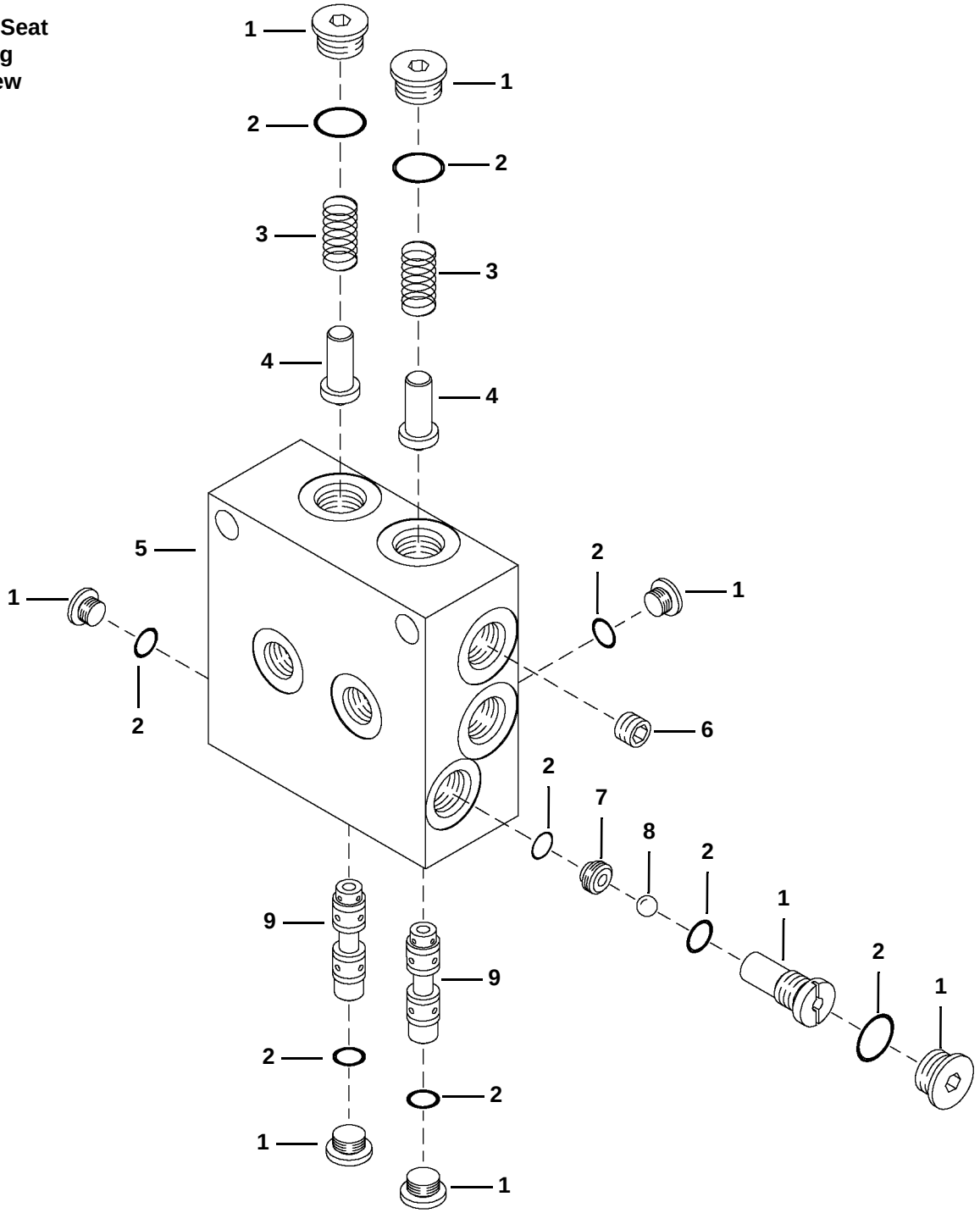
Remove the dual sequence valve (Item 2) **[Figure 20-161-6]** from the excavator.

Installation: Tighten the bolts to 24-26 ft.-lb. (33-35 N•m) torque.

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Parts Identification

1. Plug
2. O-Ring
3. Spring
4. Spring Seat
5. Housing
6. Setscrew
7. Seat
8. Ball
9. Spool



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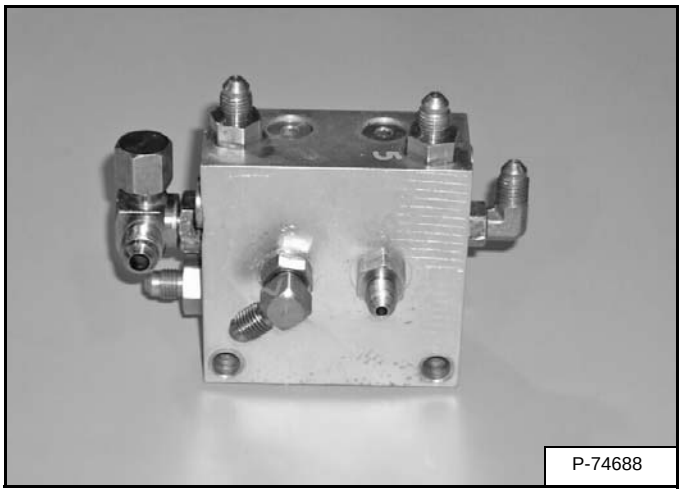
https://www.pdfmanual4trucks.com/

DUAL SEQUENCE VALVE (S/N 563214000 & ABOVE) (CONT'D)

Disassembly And Assembly

Clean the outside of the dual sequence valve before disassembly.

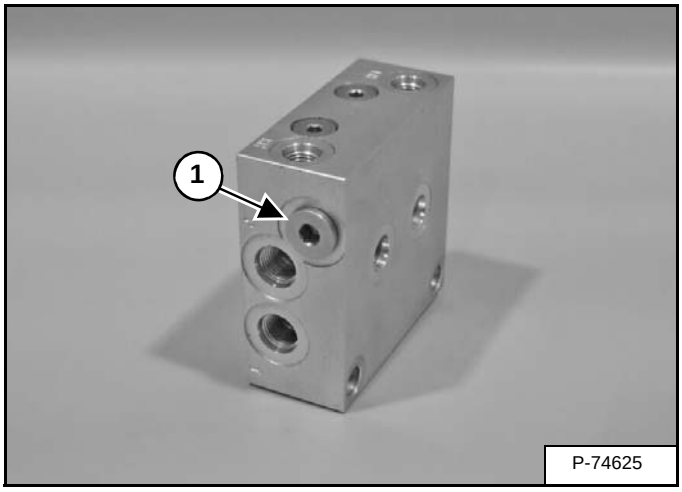
Figure 20-161-7



Remove the fittings **[Figure 20-161-7]** from the dual sequence valve.

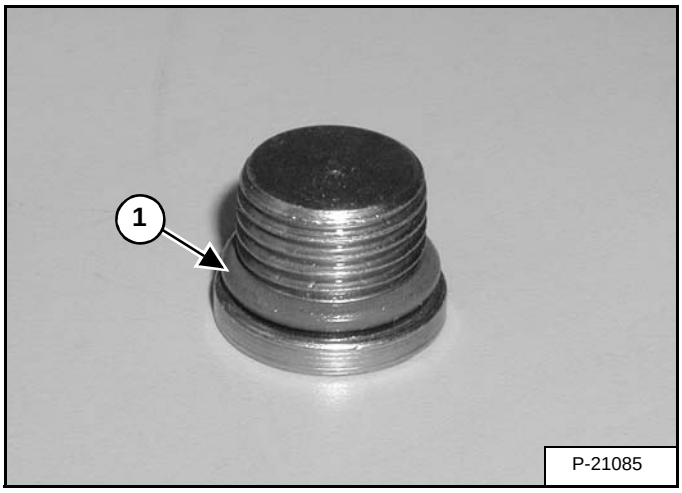
NOTE: Fittings may be different from what is shown, note orientation before removal.

Figure 20-161-8



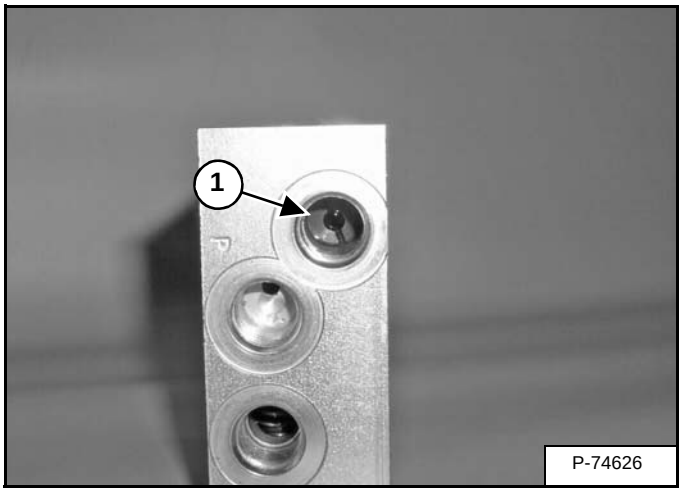
Remove the plug (Item 1) **[Figure 20-161-8]**.

Figure 20-161-9



Remove the O-ring (Item 1) **[Figure 20-161-9]** from the plug.

Figure 20-161-10

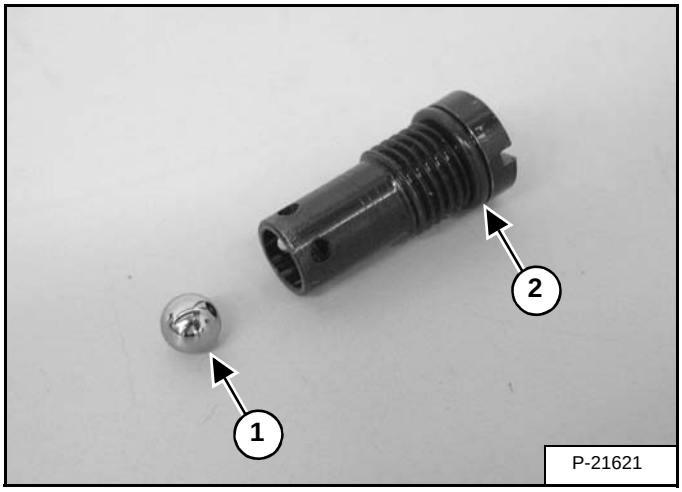


Remove the plug (Item 1) **[Figure 20-161-10]**.

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Disassembly And Assembly (Cont'd)

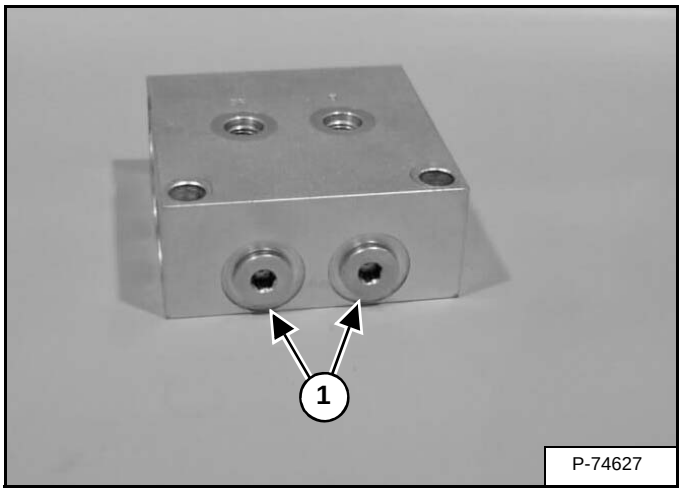
Figure 20-161-11



Remove the ball (Item 1) **[Figure 20-161-11]** from the plug.

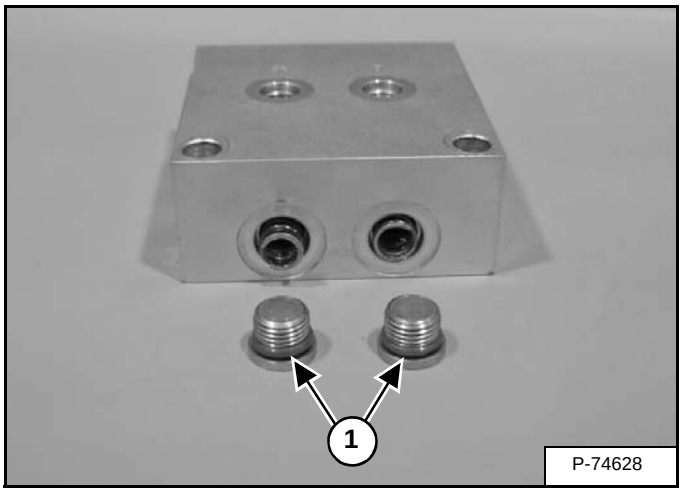
Remove the O-ring (Item 2) **[Figure 20-161-11]**.

Figure 20-161-12



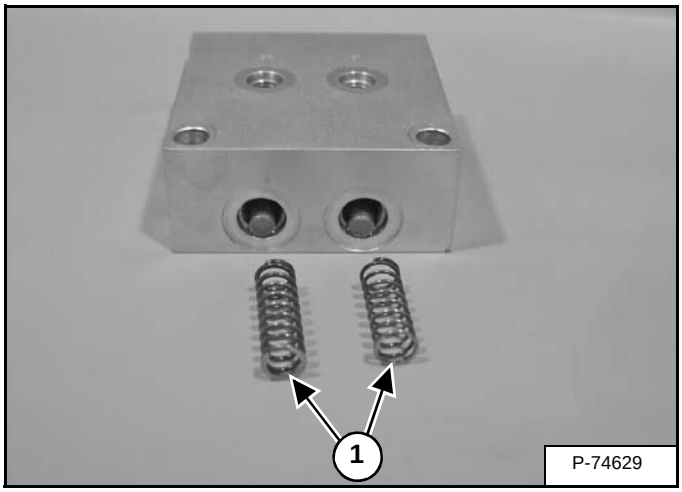
Remove the plugs (Item 1) **[Figure 20-161-12]**.

Figure 20-161-13



Remove the O-ring (Item 1) **[Figure 20-161-13]** from the plugs.

Figure 20-161-14

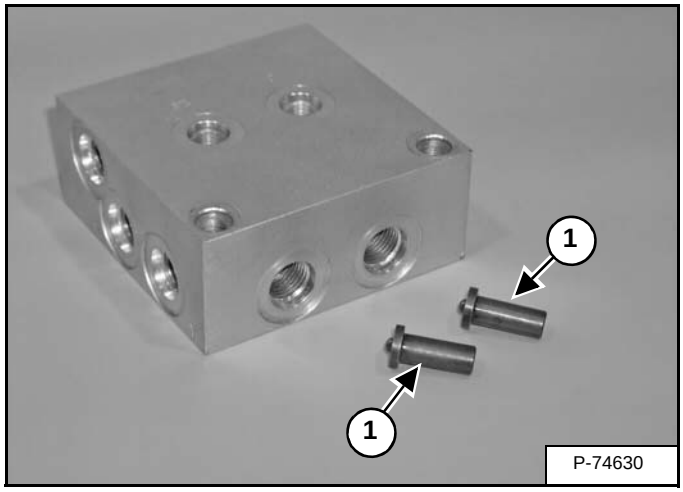


Remove the springs (Item 1) **[Figure 20-161-14]**.

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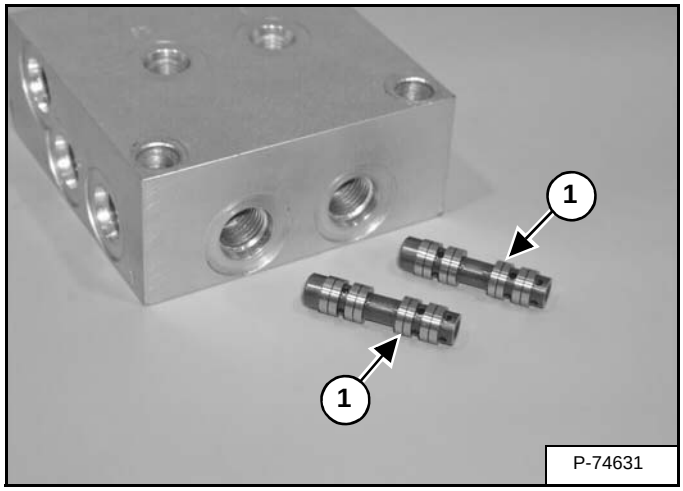
Disassembly And Assembly (Cont'd)

Figure 20-161-15



Remove the spring seats (Item 1) **[Figure 20-161-15]**.

Figure 20-161-16



Remove the spools (Item 1) **[Figure 20-161-16]**.

Clean all parts in solvent and dry with compressed air.

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

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

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DUAL SEQUENCE VALVE (S/N 563114000 & ABOVE)

Removal And Installation

Stop the engine.

Lower the boom/bucket to the ground. Open the right side cover.

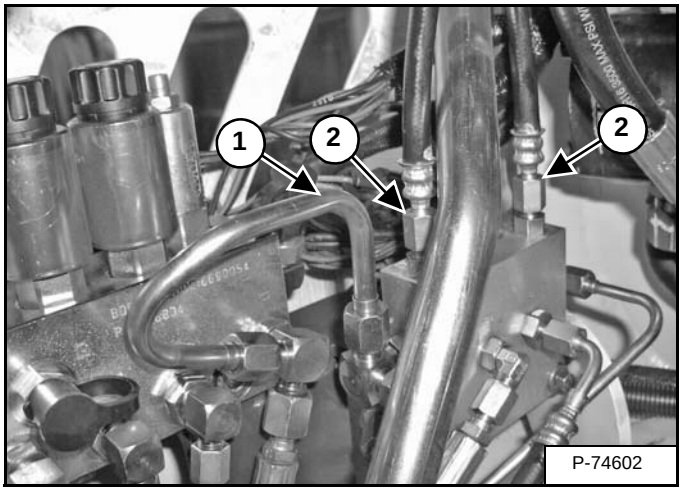
Mark all hoses for correct installation.

IMPORTANT

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

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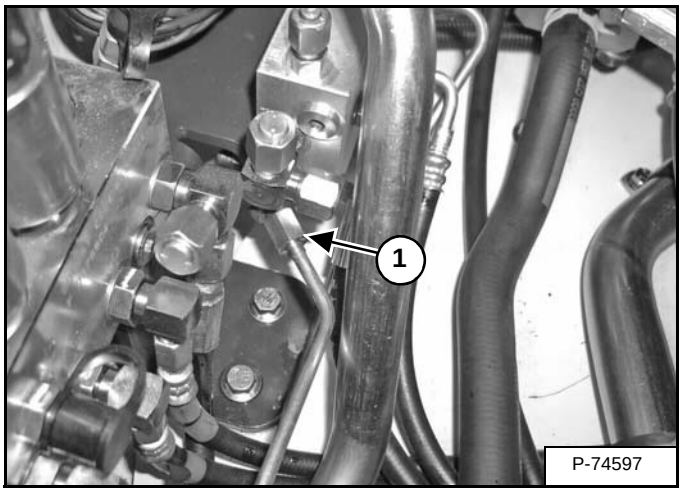
Figure 20-80-1



Remove the tubeline (Item 1) **[Figure 20-80-1]**.

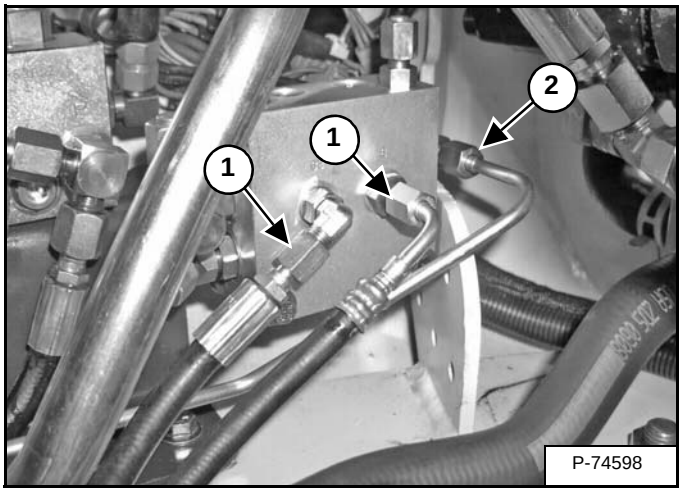
Remove the two hoses (Item 2) **[Figure 20-80-1]**.

Figure 20-162-2



Remove the tubeline (Item 1) **[Figure 20-162-2]**.

Figure 20-162-3



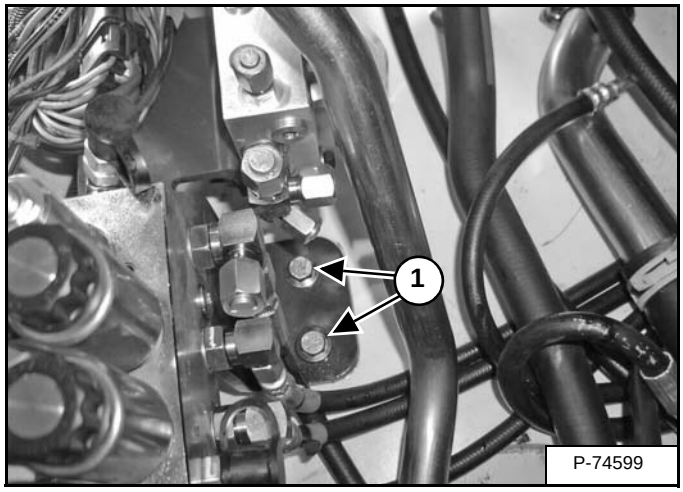
Remove the hoses (Item 1) **[Figure 20-162-3]**.

Remove the tubeline (Item 2) **[Figure 20-162-3]**.

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Removal And Installation (Cont'd)

Figure 20-162-4

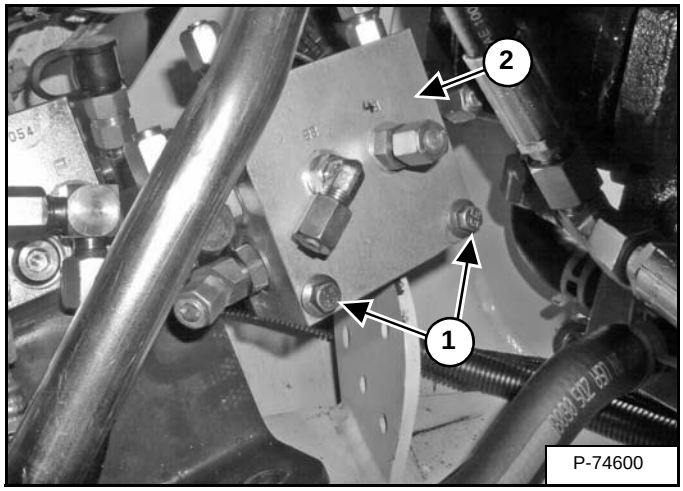


Remove the bolts (Item 1) **[Figure 20-162-4]**.

Installation: Tighten the bolts to 43-47 ft.-lb. (58-64 N•m) torque.

NOTE: The bolts (Item 1) [Figure 20-162-4] are removed so the bracket can be repositioned for bolt and nut removal in [Figure 20-162-5].

Figure 20-162-5



Remove the two bolts and nuts (Item 1) **[Figure 20-162-5]**.

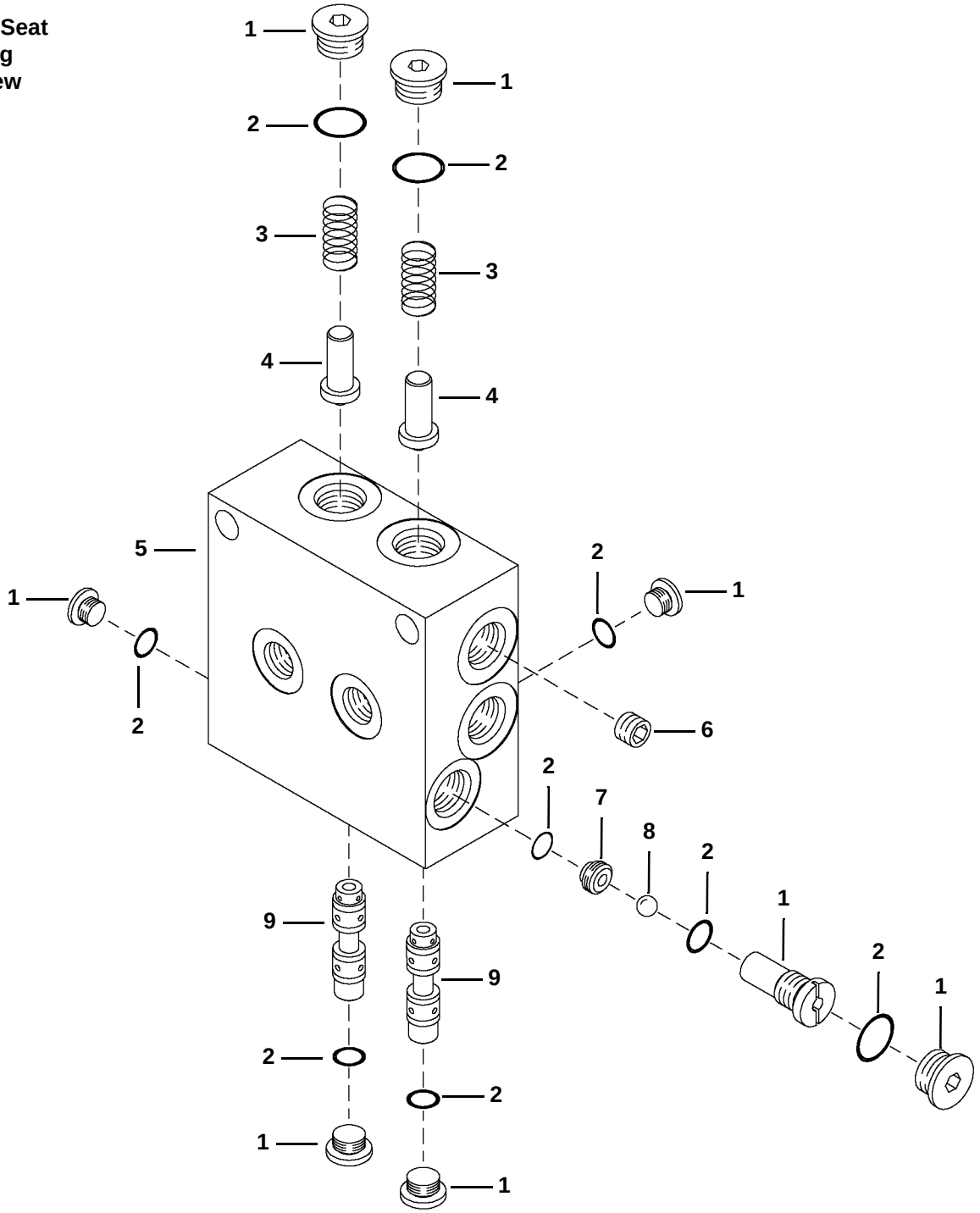
Remove the dual sequence valve (Item 2) **[Figure 20-162-5]**.

Installation: Tighten the bolts to 24-26 ft.-lb. (33-35 N•m) torque.

https://www.pdfmanual4trucks.com/

Parts Identification

1. Plug
2. O-Ring
3. Spring
4. Spring Seat
5. Housing
6. Setscrew
7. Seat
8. Ball
9. Spool



ts1901

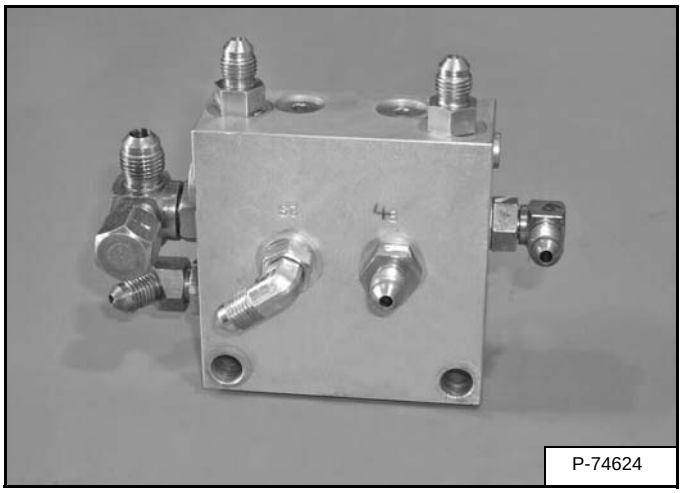
https://www.pdfmanual4trucks.com/

DUAL SEQUENCE VALVE (S/N 563114000 & ABOVE) (CONT'D)

Disassembly And Assembly

Clean the outside of the dual sequence valve before disassembly.

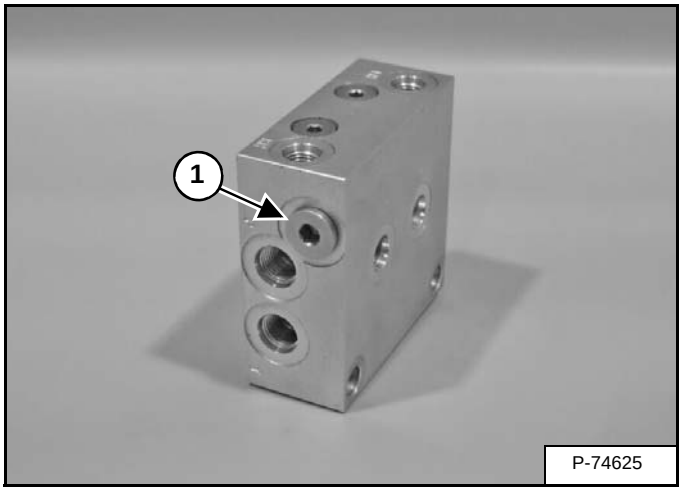
Figure 20-162-6



Remove the fittings **[Figure 20-162-6]** from the dual sequence valve.

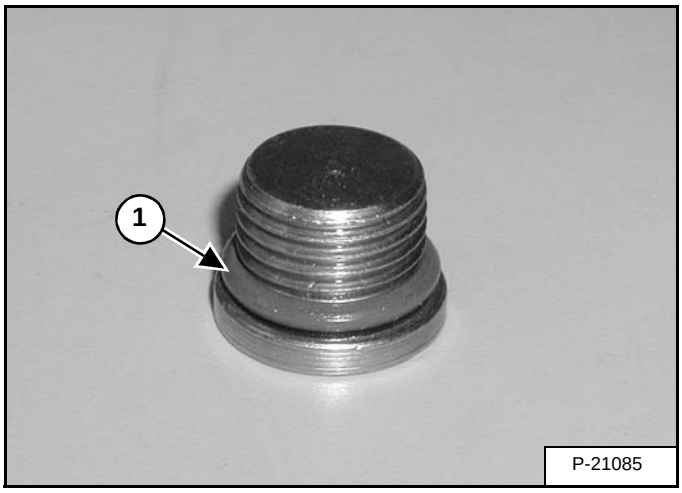
NOTE: Fittings may be different from what is shown, note orientation before removal.

Figure 20-162-7



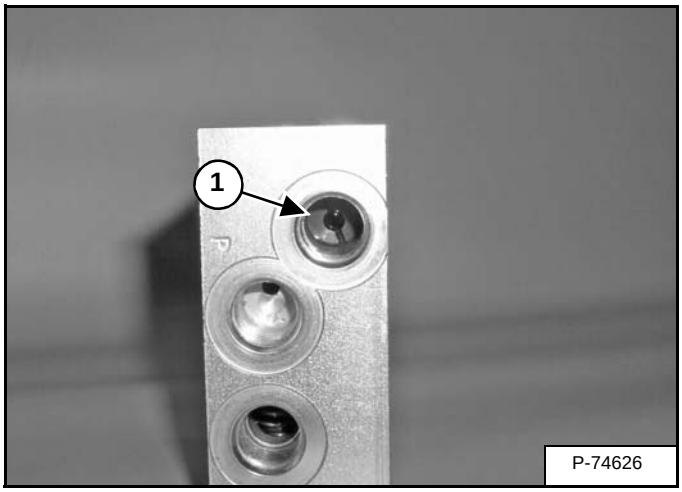
Remove the plug (Item 1) **[Figure 20-162-7]**.

Figure 20-162-8



Remove the O-ring (Item 1) **[Figure 20-162-8]** from the plug.

Figure 20-162-9

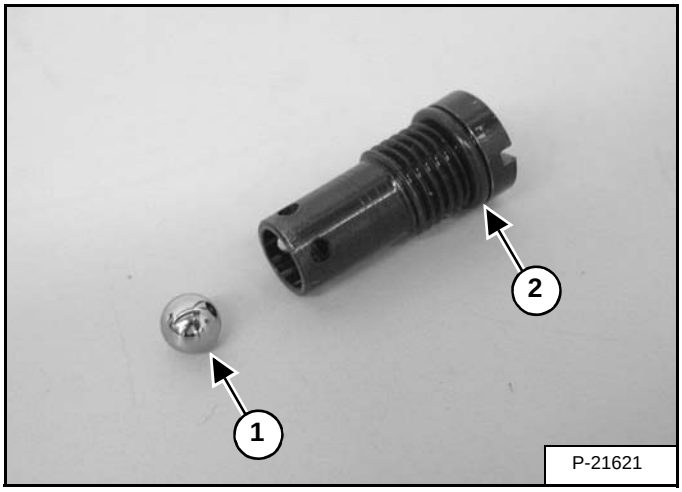


Remove the plug (Item 1) **[Figure 20-162-9]**.

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Disassembly And Assembly (Cont'd)

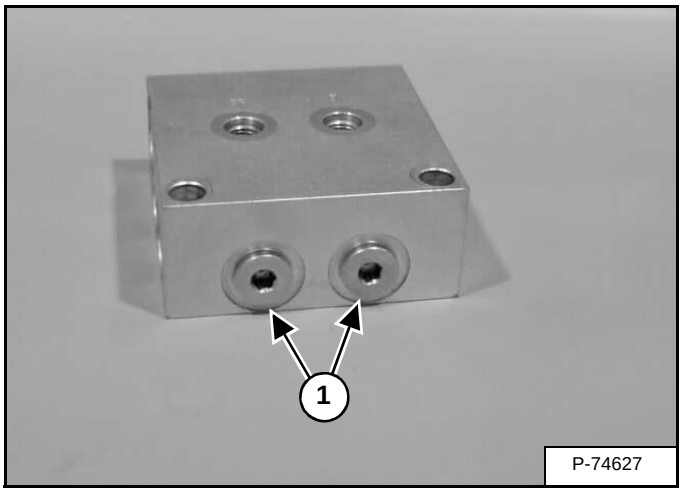
Figure 20-162-10



Remove the ball (Item 1) **[Figure 20-162-10]** from the plug.

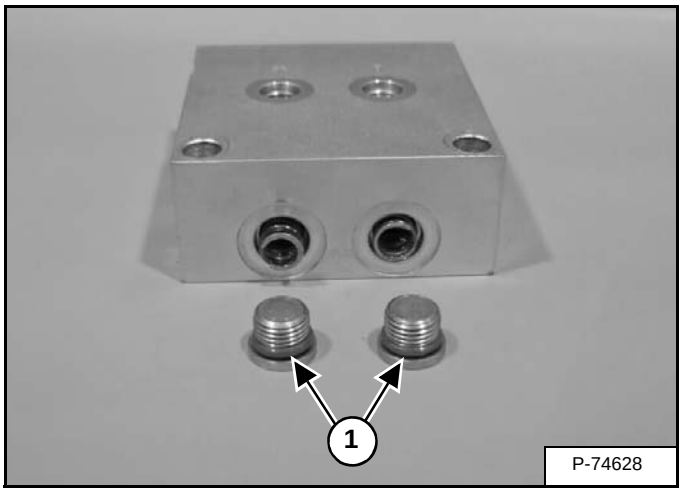
Remove the O-ring (Item 2) **[Figure 20-162-10]**.

Figure 20-162-11



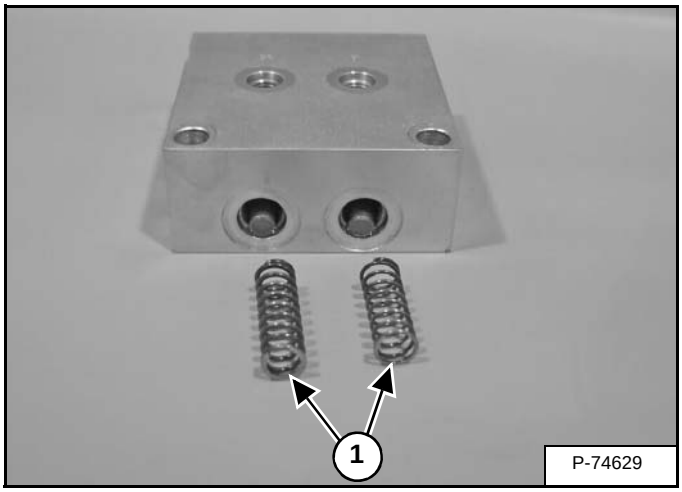
Remove the plugs (Item 1) **[Figure 20-162-11]**.

Figure 20-162-12



Remove the O-ring (Item 1) **[Figure 20-162-12]** from the plugs.

Figure 20-162-13

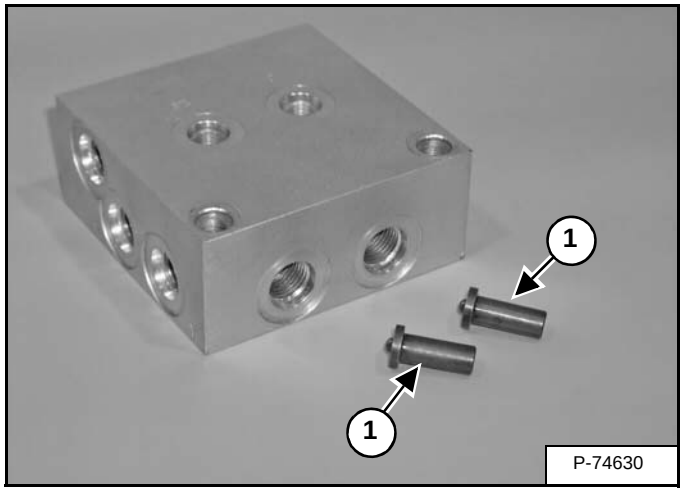


Remove the springs (Item 1) **[Figure 20-162-13]**.

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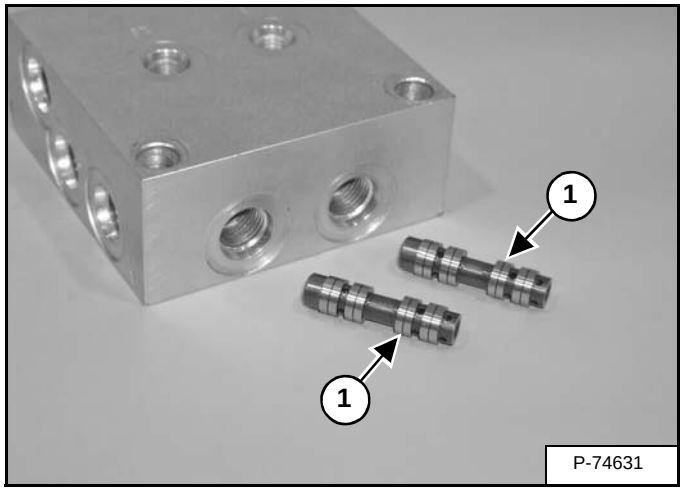
Disassembly And Assembly (Cont'd)

Figure 20-162-14



Remove the spring seats (Item 1) **[Figure 20-162-14]**.

Figure 20-162-15



Remove the spools (Item 1) **[Figure 20-162-15]**.

Clean all parts in solvent and dry with compressed air.

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

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

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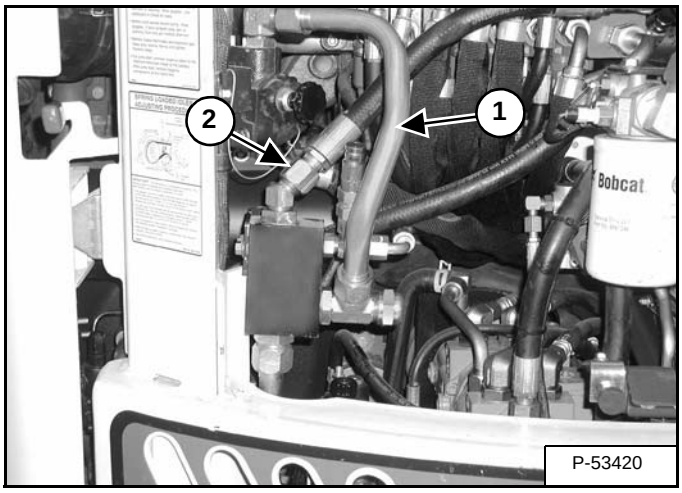
BUILD UP VALVE

Removal And Installation

Open the right side cover.

Drain the hydraulic reservoir. (See Replacing The Hydraulic Oil on Page 10-100-2)

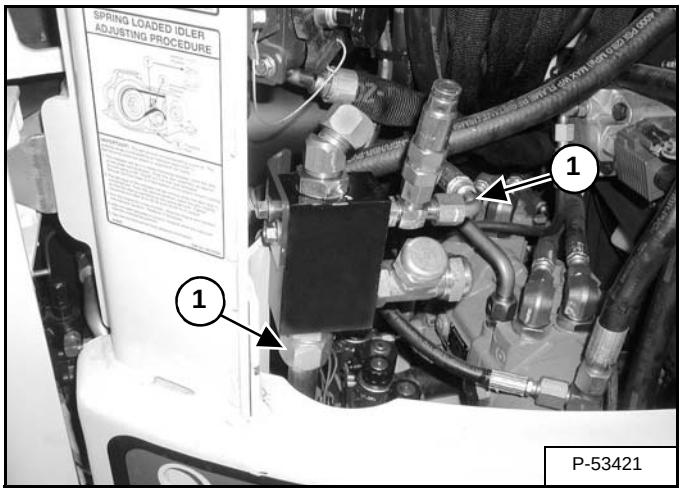
Figure 20-170-1



Remove the tubeline (Item 1) **[Figure 20-170-1]**. (If equipped.)

Remove the hose (Item 2) **[Figure 20-170-1]**.

Figure 20-170-2



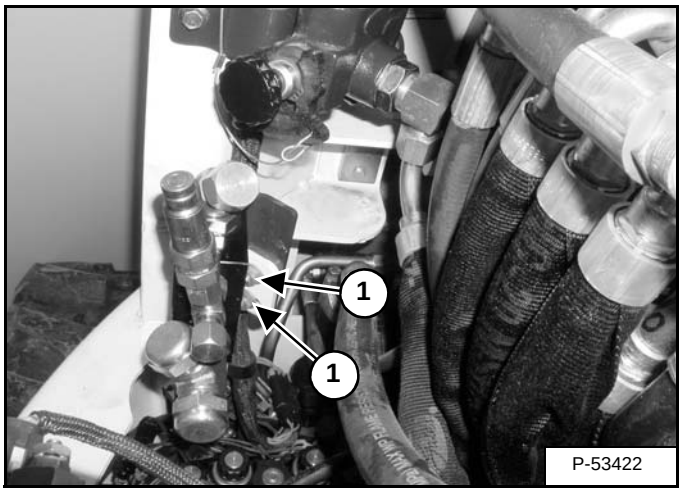
Remove the hose (Item 1) **[Figure 20-170-2]** from the valve.

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 20-170-3



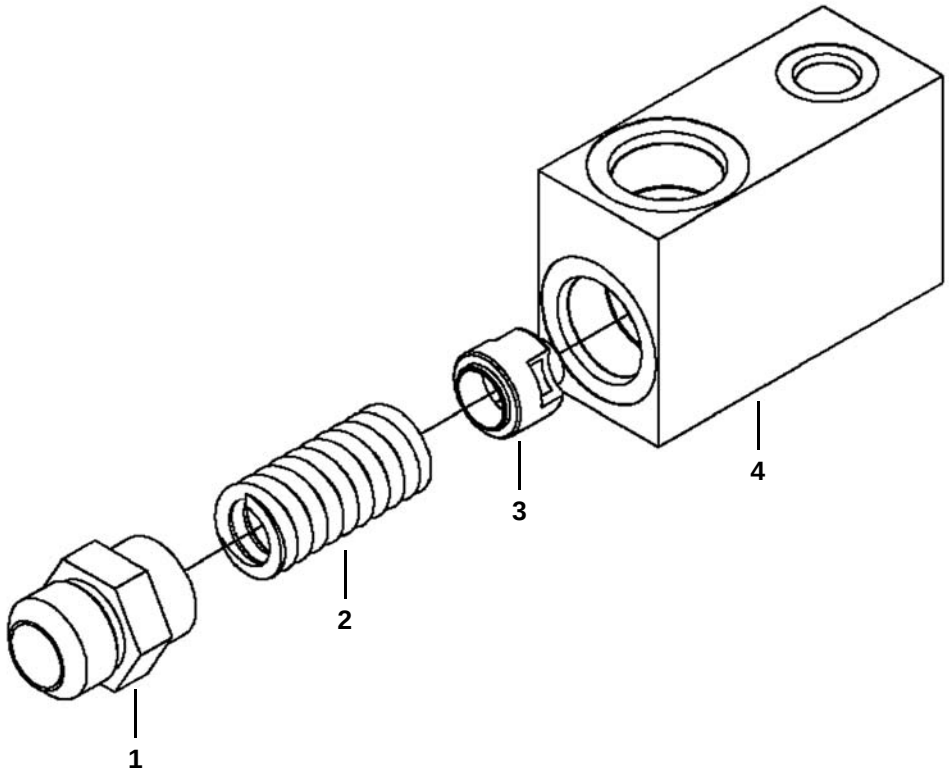
Remove the bolts (Item 3) **[Figure 20-170-3]**.

Remove the valve and bracket from the excavator.

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Parts Identification

1. Fitting
2. Spring
3. Poppet
4. Housing



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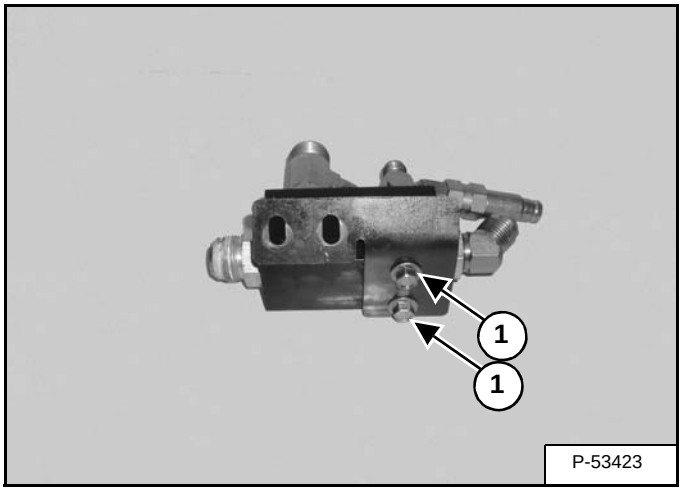
https://www.pdfmanual4trucks.com/

BUILD UP VALVE (CONT'D)

Disassembly And Assembly

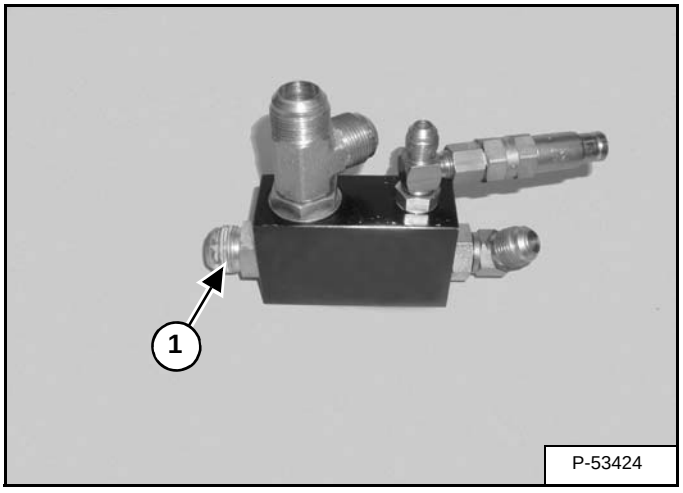
Clean the outside of the build up valve before disassembly.

Figure 20-170-4



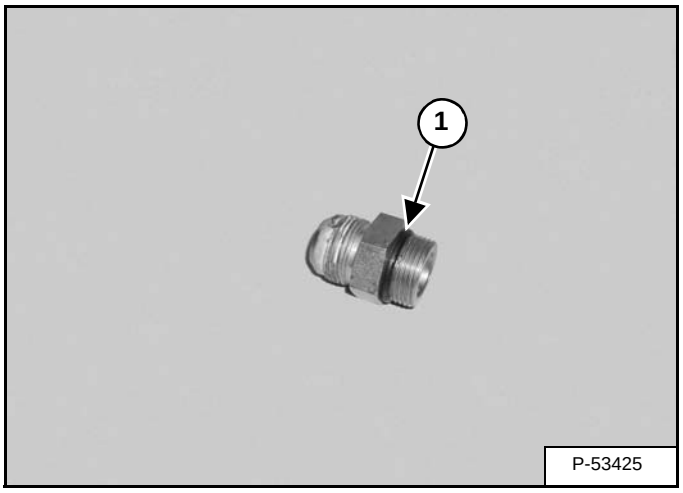
Remove the bolts (Item 1) **[Figure 20-170-4]**. Remove the mount bracket from the housing.

Figure 20-170-5



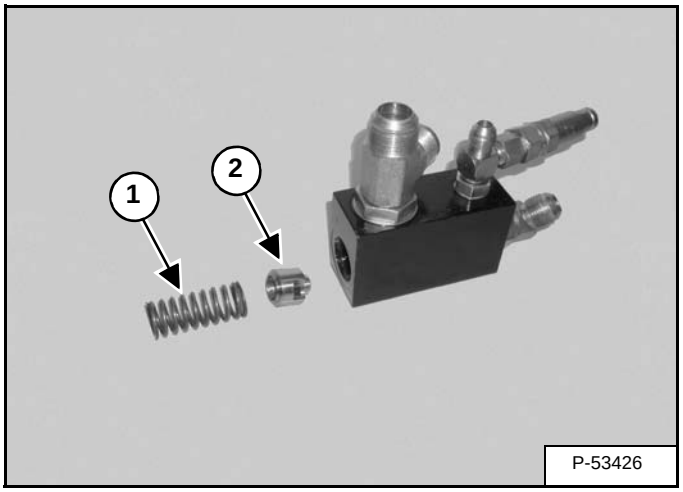
Remove the fitting (Item 1) **[Figure 20-170-5]** from the housing.

Figure 20-170-6



Remove the O-ring (Item 1) **[Figure 20-170-6]** from the fitting.

Figure 20-170-7

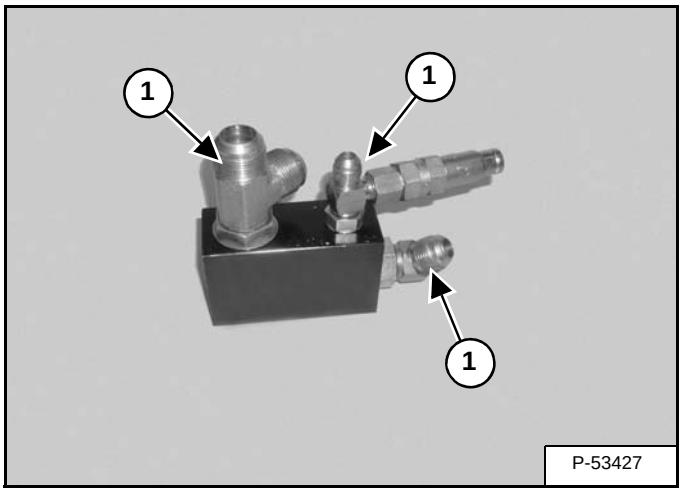


Remove the spring (Item 1) and poppet (Item 2) **[Figure 20-170-7]** from the housing.

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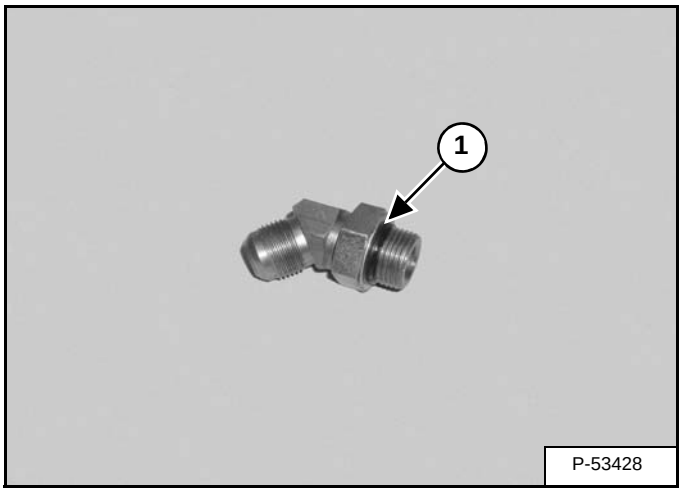
Disassembly And Assembly (Cont'd)

Figure 20-170-8



Remove the fittings (Item 1) **[Figure 20-170-8]** from the housing.

Figure 20-170-9



Remove the O-ring (Item 1) **[Figure 20-170-9]** from the fittings.

Clean all parts in solvent and dry with compressed air.

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

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

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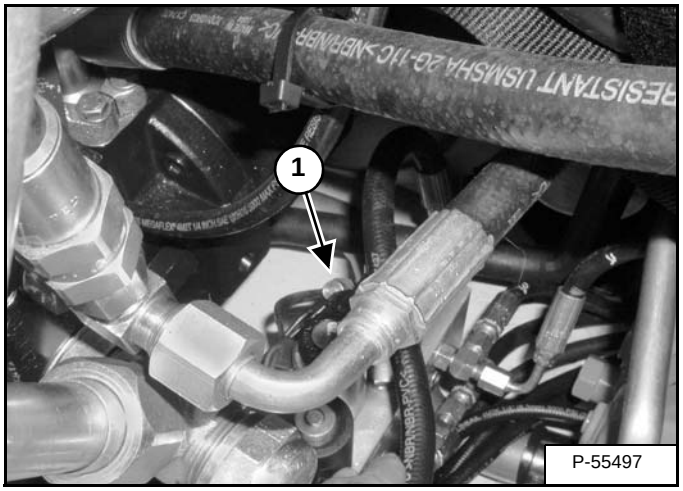
COOLING FAN

Description

The cooling fan motor is supplied with hydraulic fluid by the fan/charge pump. The solenoid is controlled by the Bobcat controller and the motor speed is varied by the controller depending on engine coolant temperature and/or hydraulic fluid temperature (whichever one is higher).

Testing

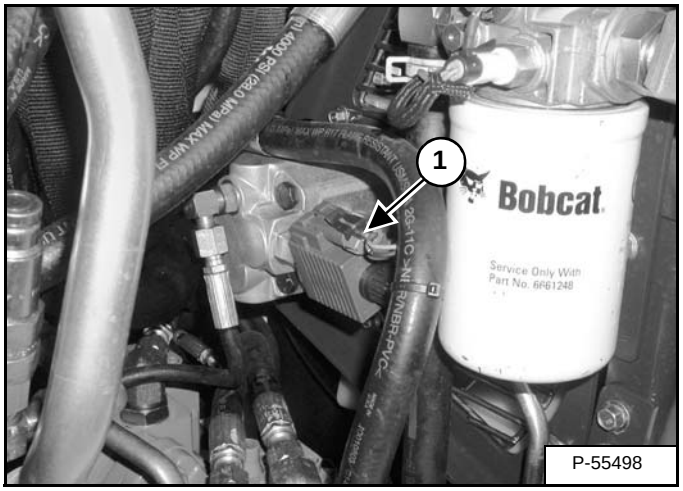
Figure 20-180-1



Locate the diagnostic coupler (Item 1) **[Figure 20-180-1]** on the P1 port of the manifold assembly.

Install a 5000 PSI (345 bar) gauge on the diagnostic coupler.

Figure 20-180-2



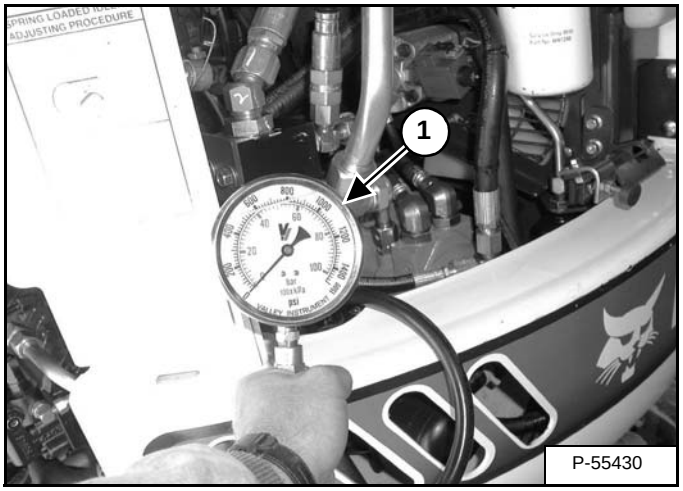
Disconnect the wire harness (Item 1) **[Figure 20-180-2]** from the cooling fan.

With an operator in the seat and the left console in the raised position, start the engine and run at low idle.

Lower the left console.

Increase the engine speed to high idle.

Figure 20-180-3



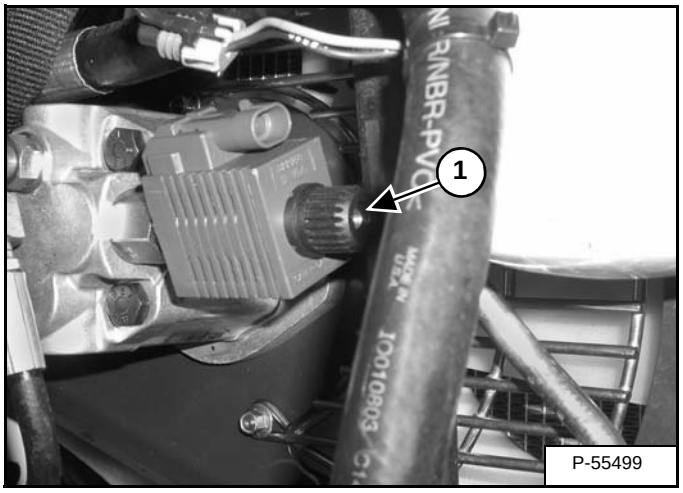
Check the pressure at the gauge (Item 1) **[Figure 20-180-3]**.

The pressure should be 1500 ± 50 PSI (103 ± 3,4 bar).

Stop the engine.

NOTE: Early model square solenoid shown in photos. The procedure for later model, round solenoid is the same.

Figure 20-180-4



If adjustment is needed, turn the adjustment screw (Item 1) **[Figure 20-180-4]** clockwise to increase pressure or counterclockwise to decrease the pressure.

NOTE: 1/4 turn clockwise will increase pressure approximately 50 PSI (3,4 bar).

Retest the valve after adjustment.

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Removal And Installation

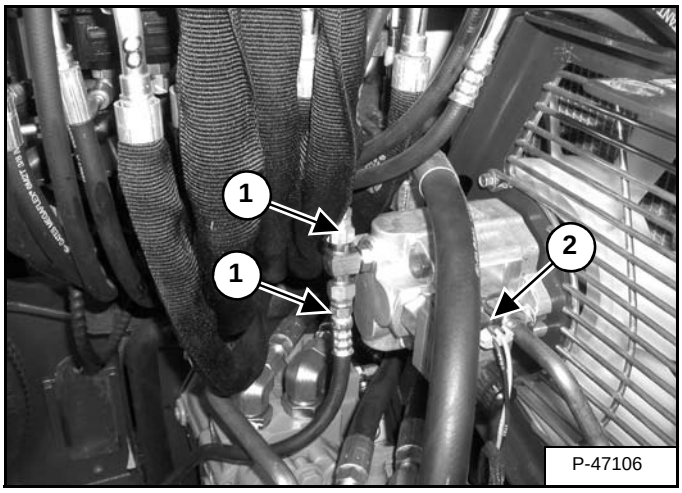
Remove the hydraulic filter mount. (See Removal And Installation on Page 20-120-1)

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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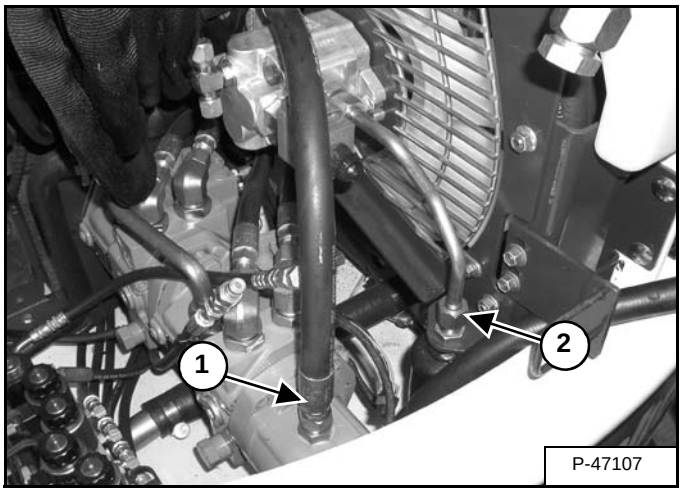
Figure 20-180-5



Remove the hoses (Item 1) and disconnect the wire harness (Item 2) **[Figure 20-180-5]**.

NOTE: Early model square solenoid shown in photos. The procedure for later model, round solenoid is the same.

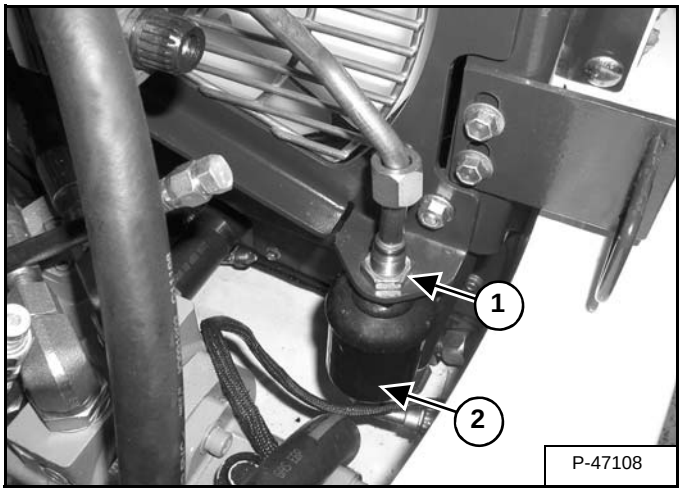
Figure 20-180-6



Remove the hose (Item 1) **[Figure 20-180-6]**.

Loosen the nut (Item 2) **[Figure 20-180-6]** on the tubeline.

Figure 20-180-7



Remove the nut (Item 1) and case drain filter (Item 2) **[Figure 20-180-7]**.

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Removal And Installation (Cont'd)

Figure 20-180-8

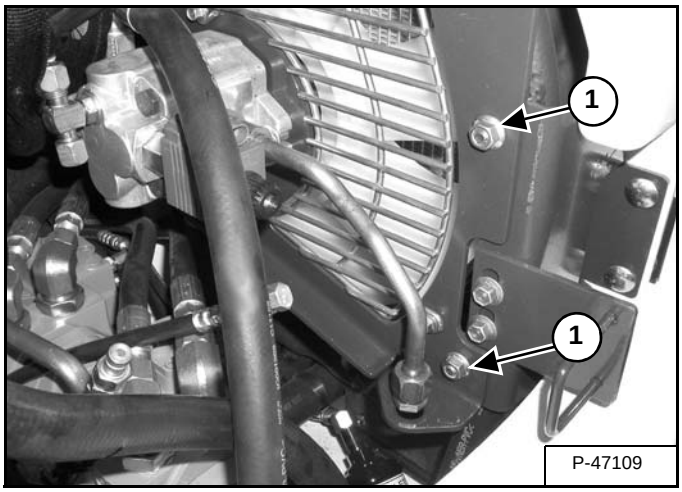
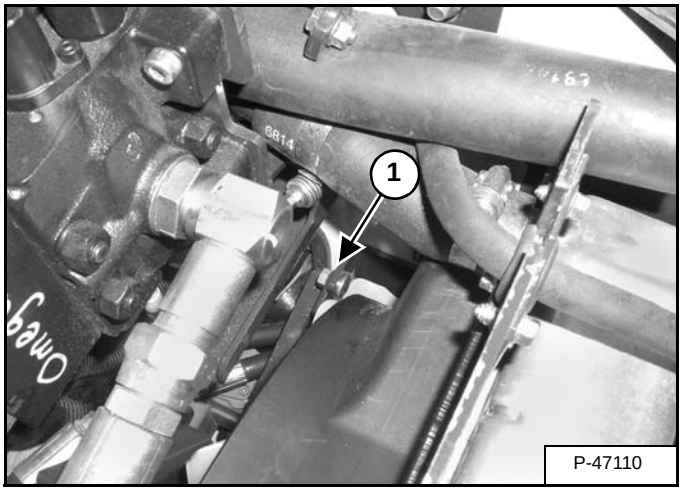


Figure 20-180-9

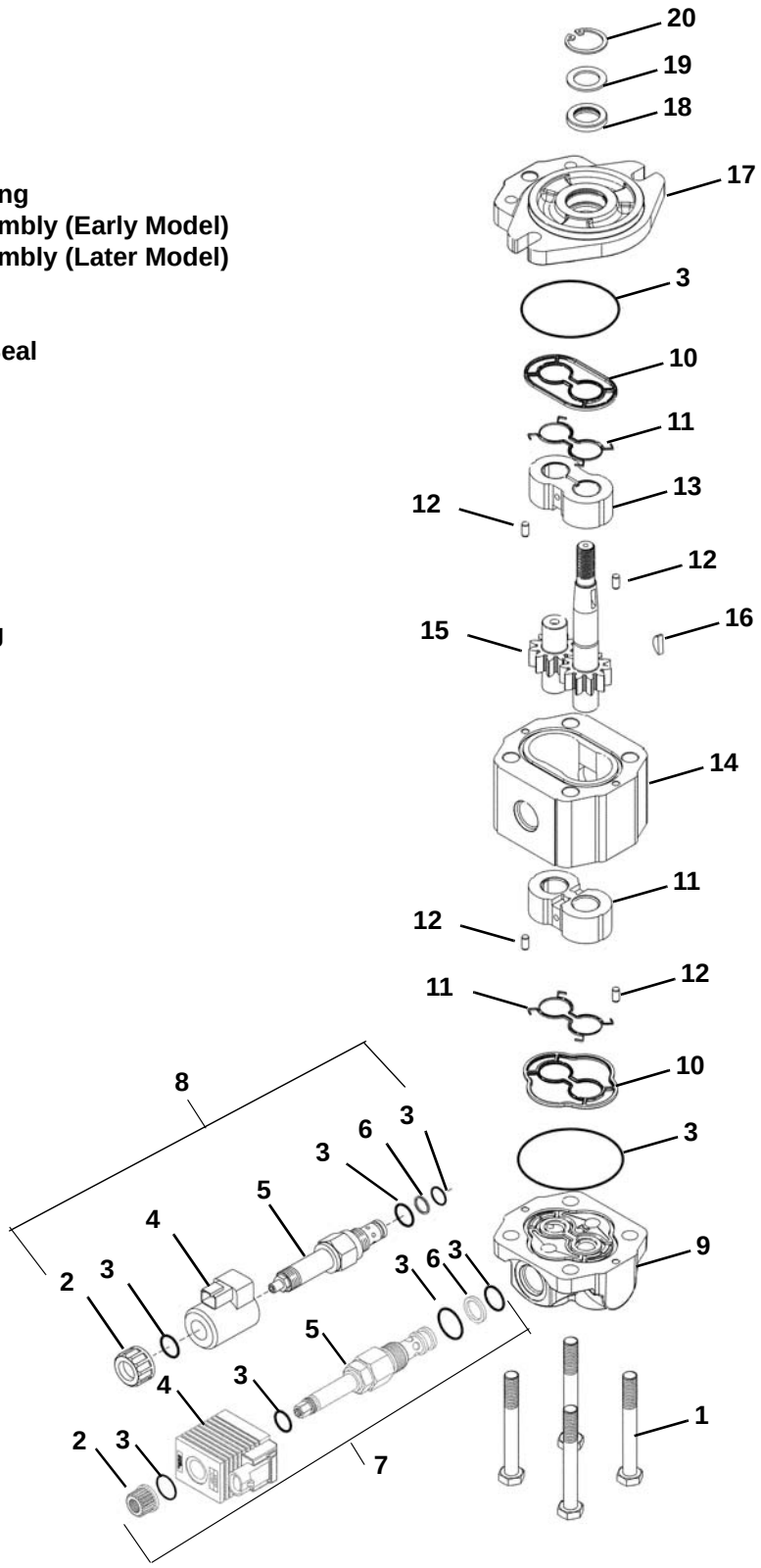


Remove the 3 nuts (Item 1) **[Figure 20-180-8]** & **[Figure 20-180-9]**. Remove the fan and mount assembly.

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Parts Identification

1. Bolt
2. Nut
3. O-Ring
4. Coil
5. Solenoid
6. Back-up Ring
7. Valve Assembly (Early Model)
8. Valve Assembly (Later Model)
9. End Plate
10. Seal
11. Back-up Seal
12. Dowel Pin
13. Bearing
14. Housing
15. Shaft
16. Key
17. End Plate
18. Seal
19. Washer
20. Snap Ring

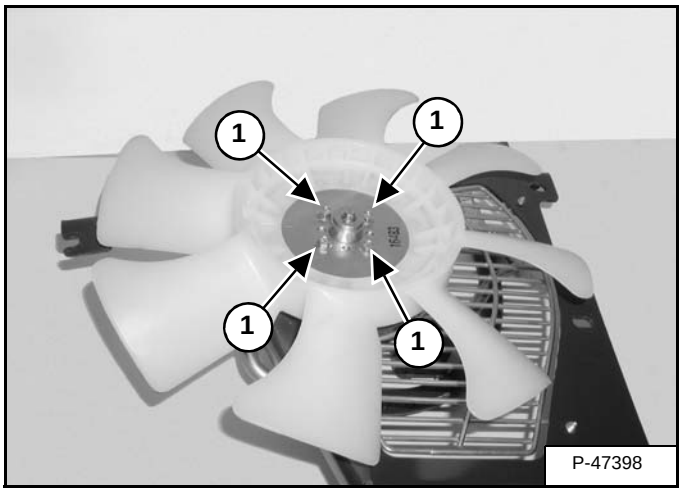


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Disassembly And Assembly

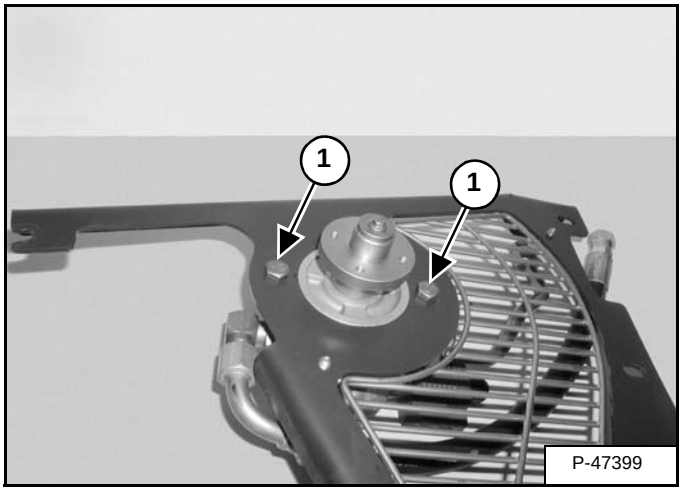
Figure 20-180-10



Remove the four bolts (Item 1) **[Figure 20-180-10]** and remove the fan.

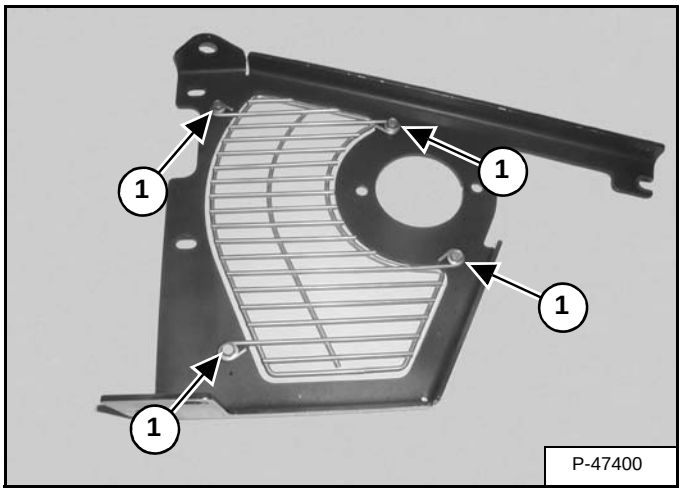
Installation: Tighten the bolts to 6-7 ft.-lb. (8-10 N•m) torque.

Figure 20-180-11



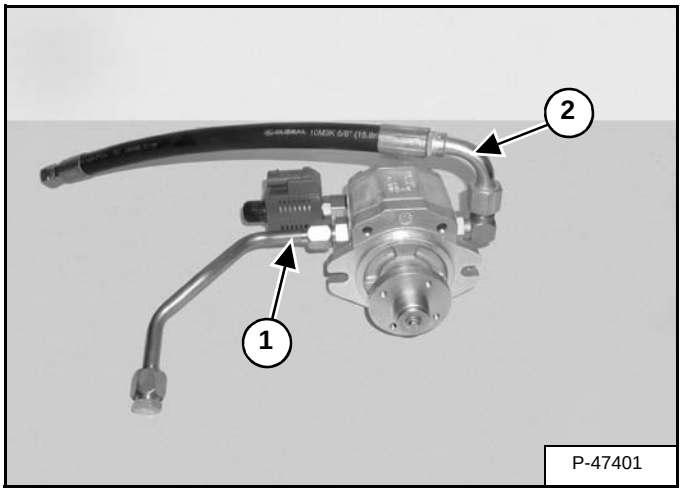
Remove the two bolts (Item 1) **[Figure 20-180-11]** and nuts. Remove the fan motor.

Figure 20-180-12



Remove the four bolts (Item 1) **[Figure 20-180-12]** and remove the guard.

Figure 20-180-13



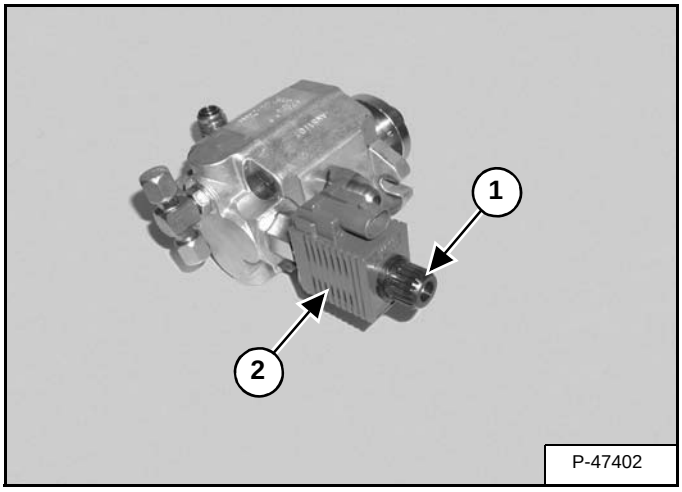
Remove the tubeline (Item 1) and hose (Item 2) **[Figure 20-180-13]** from the motor.

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Disassembly And Assembly (Cont'd)

NOTE: Early model square solenoid shown in photos. The procedure for later model, round solenoid is the same.

Figure 20-180-14



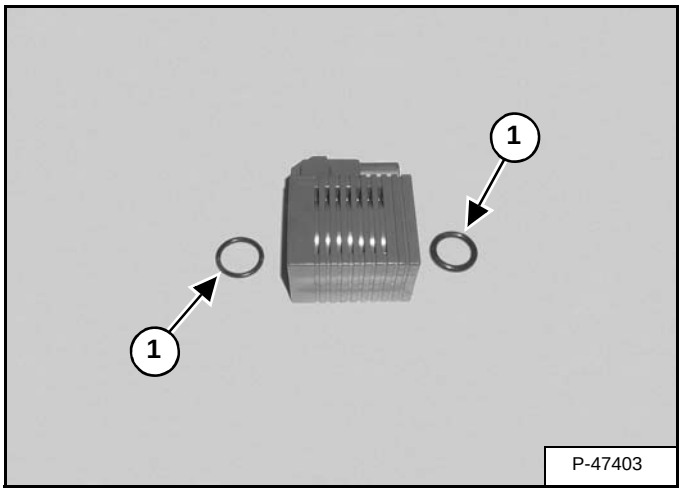
Remove the nut (Item 1) and coil (Item 2) **[Figure 20-180-14]**.

Installation: Tighten the nut to 3-5 ft.-lb. (4,1-6,1 N•m) torque.

NOTE: Overtightening the coil nut may cause coil or spool failure.

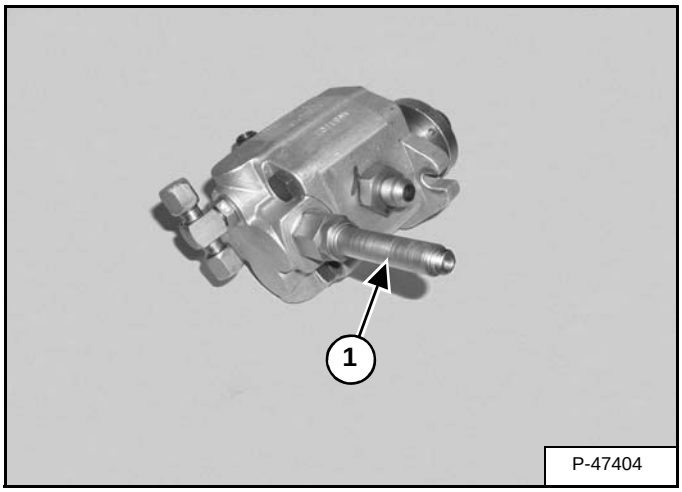
NOTE: Early model square solenoid shown in photos. The procedure for later model, round solenoid is the same.

Figure 20-180-15



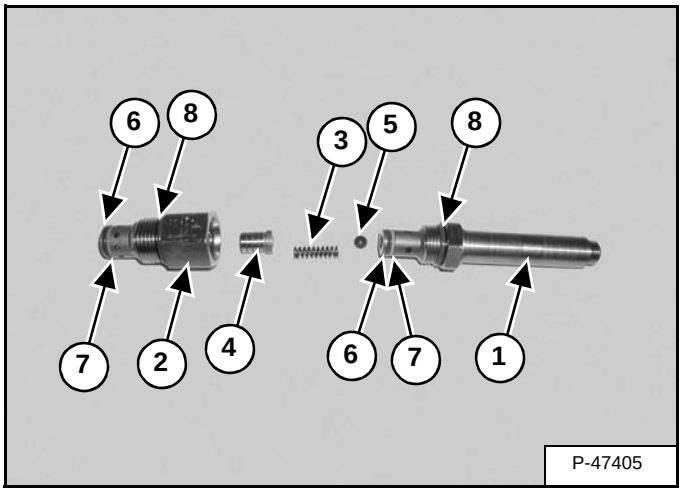
Remove the O-rings (Item 1) **[Figure 20-180-15]**.

Figure 20-180-16



Remove the solenoid (Item 1) **[Figure 20-180-16]**.

Figure 20-180-17



Remove the top of the solenoid (Item 1) from the base (Item 2) **[Figure 20-180-17]**.

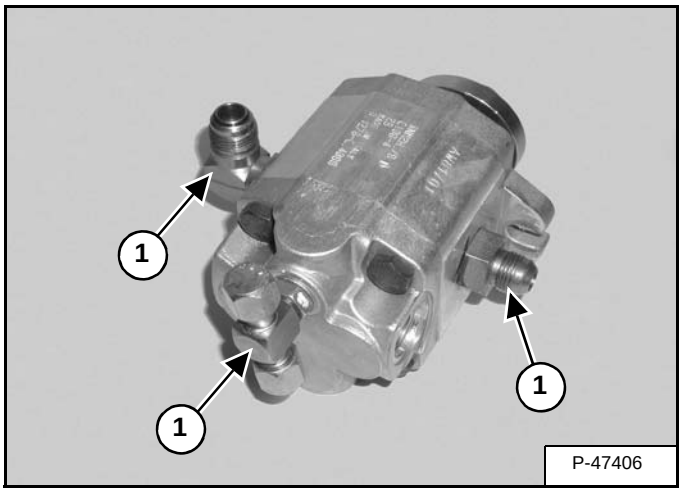
Remove the spring (Item 3), poppet (with internal screen and orifice) (Item 4) and orifice (Item 5) **[Figure 20-180-17]**.

Remove the O-ring (Item 6), back-up ring (Item 7) and O-ring (Item 8) **[Figure 20-180-17]** from both halves of the solenoid.

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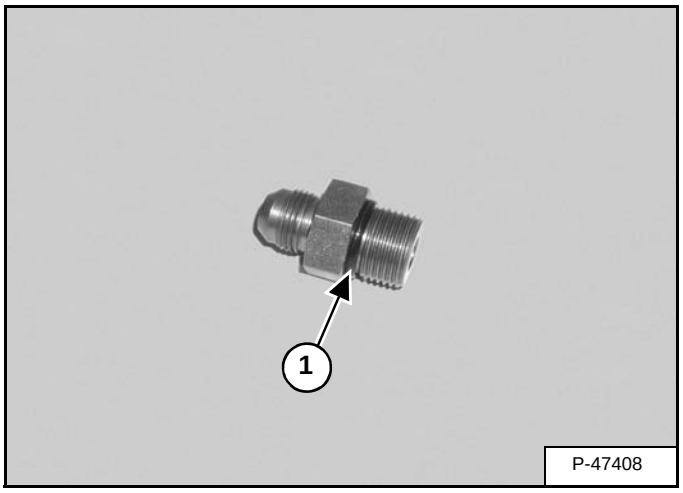
Disassembly And Assembly (Cont'd)

Figure 20-180-18



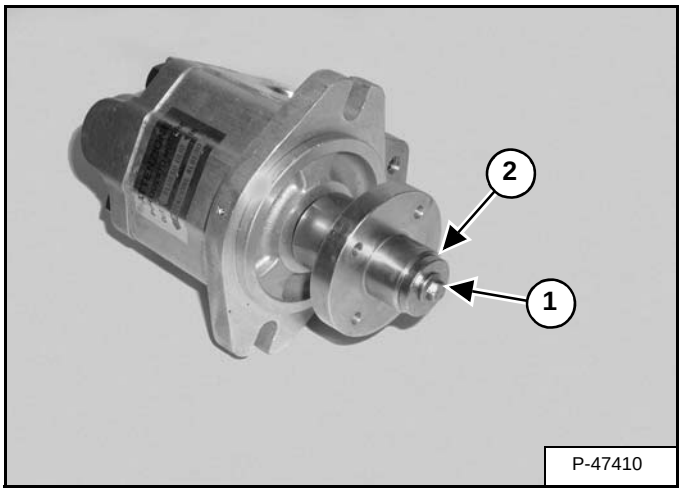
Remove the fittings (Item 1) **[Figure 20-180-18]**.

Figure 20-180-19



Remove the O-ring (Item 1) **[Figure 20-180-19]** from the fittings. (Straight fitting shown)

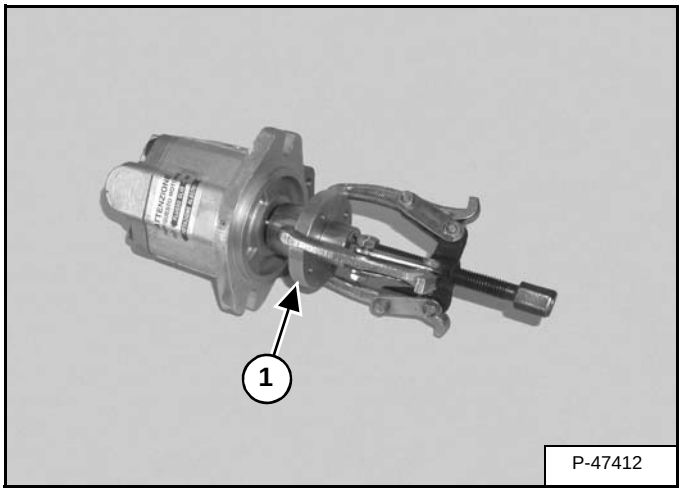
Figure 20-180-20



Remove the bolt (Item 1) and spacer (Item 2) **[Figure 20-180-20]**.

Reinstall the bolt in the end of the shaft.

Figure 20-180-21

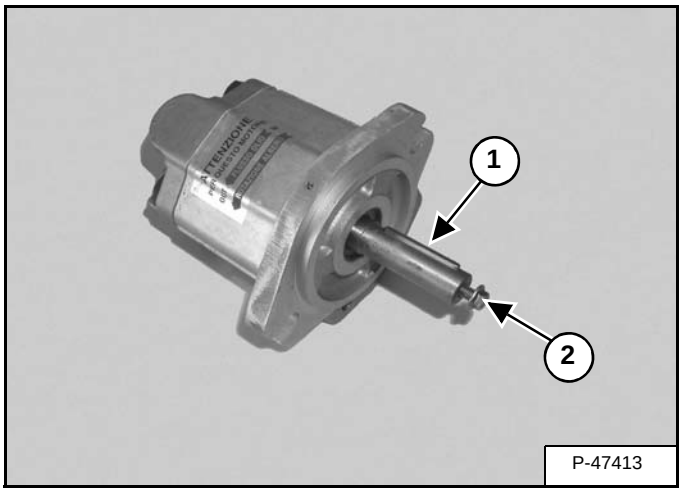


Use a three jaw puller to remove the hub (Item 1) **[Figure 20-180-21]**.

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Disassembly And Assembly (Cont'd)

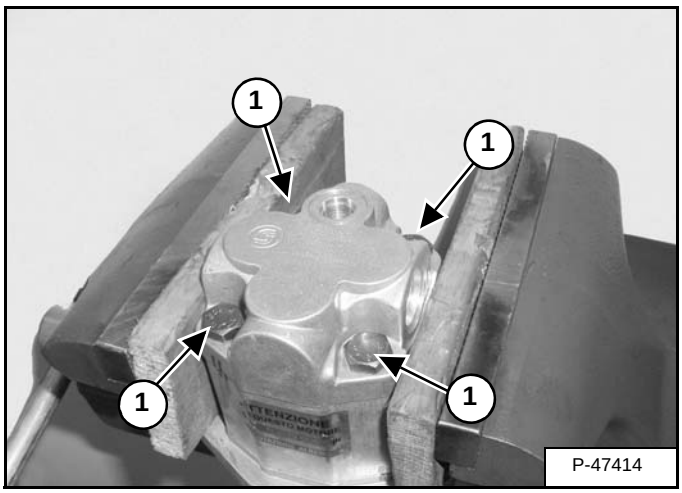
Figure 20-180-22



Remove the key (Item 1) and bolt (Item 2) **[Figure 20-180-22]**.

Mark the pump sections for ease of assembly.

Figure 20-180-23

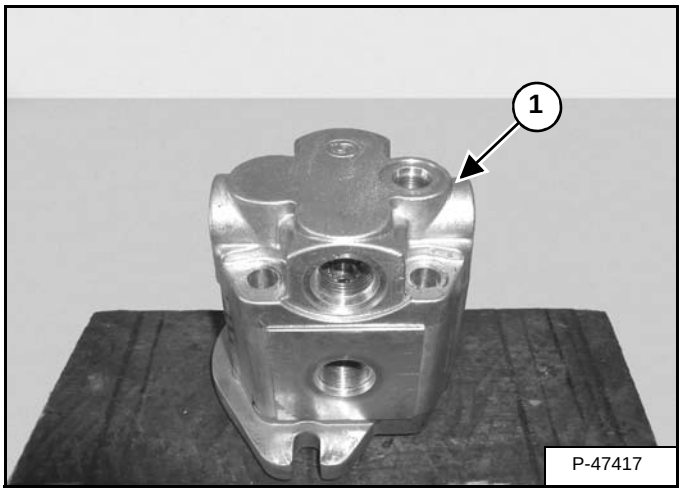


Place the motor in a vise equipped with padded jaws, remove the four bolts (Item 1) **[Figure 20-180-23]**.

Installation: Tighten the bolts to 29-37 ft.-lb. (40-50 N•m) torque.

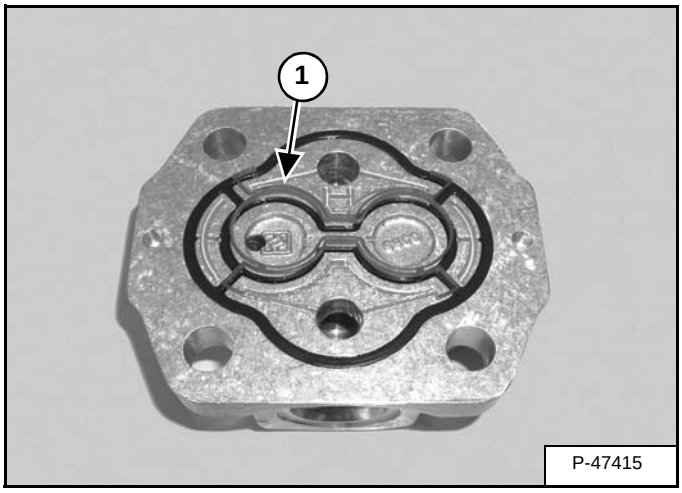
Remove the motor from the vise.

Figure 20-180-24



Remove the end plate (Item 1) **[Figure 20-180-24]**.

Figure 20-180-25

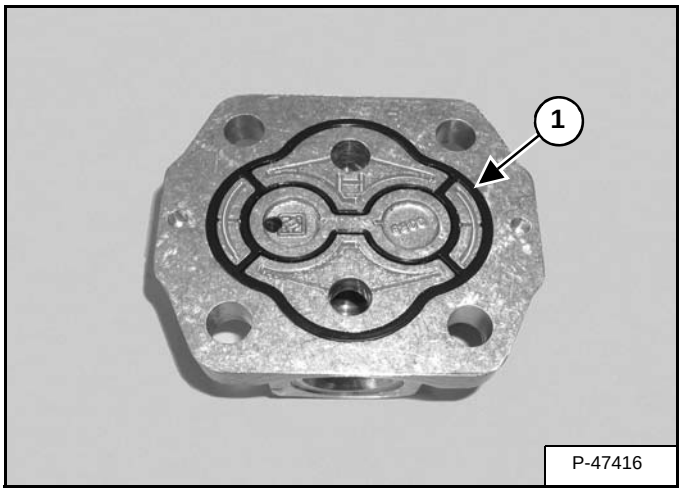


Remove the back-up seal (Item 1) **[Figure 20-180-25]**.

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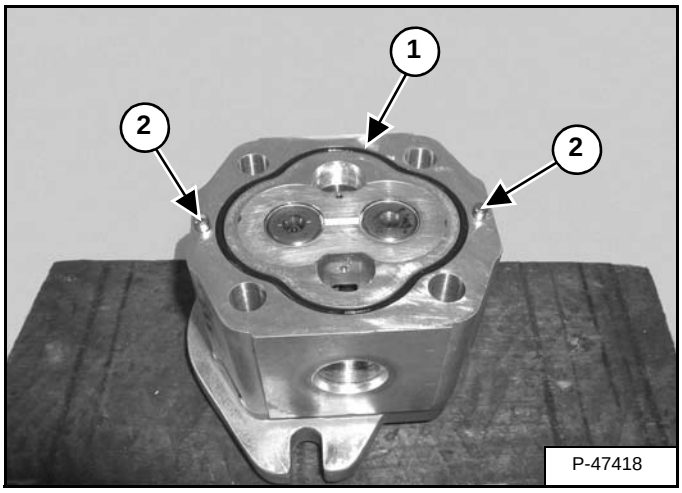
Disassembly And Assembly (Cont'd)

Figure 20-180-26



Remove the seal (Item 1) **[Figure 20-180-26]**.

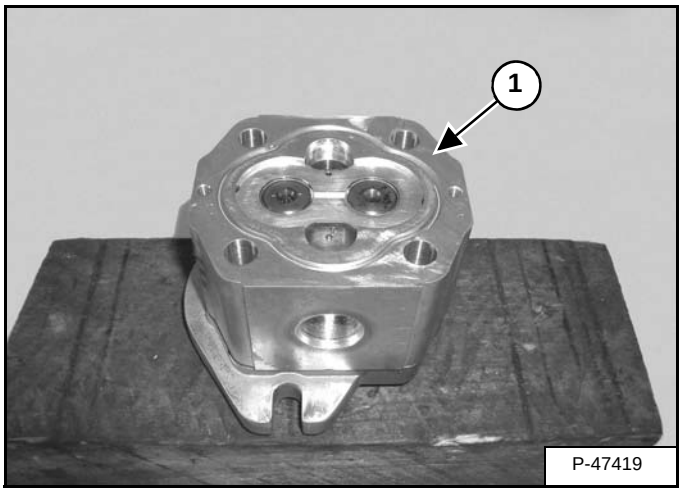
Figure 20-180-27



Remove the O-ring (Item 1) and dowel pins (Item 2) **[Figure 20-180-27]**.

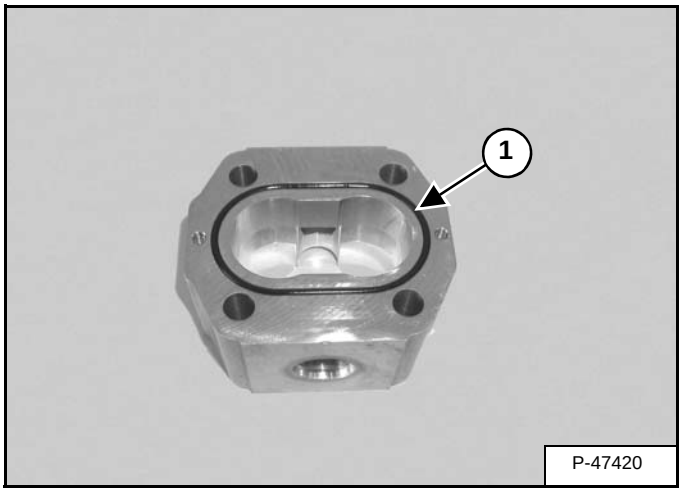
NOTE: The dowel pins may stay in the end plate when the end plate is removed.

Figure 20-180-28



Remove the housing (Item 1) **[Figure 20-180-28]**.

Figure 20-180-29

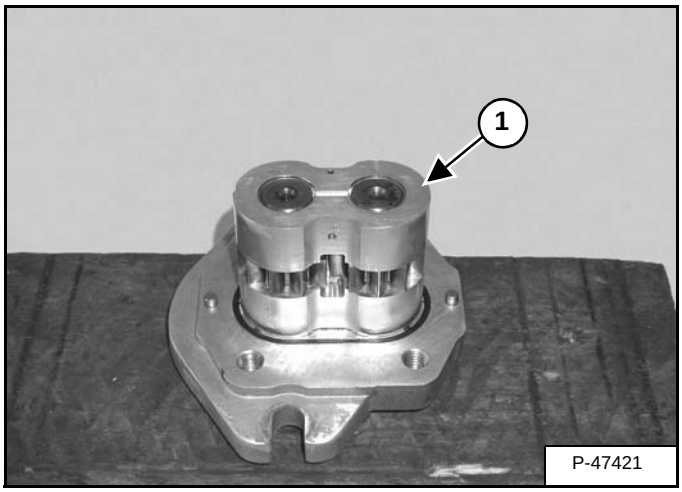


Turn the housing over and remove the O-ring (Item 1) **[Figure 20-180-29]**.

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Disassembly And Assembly (Cont'd)

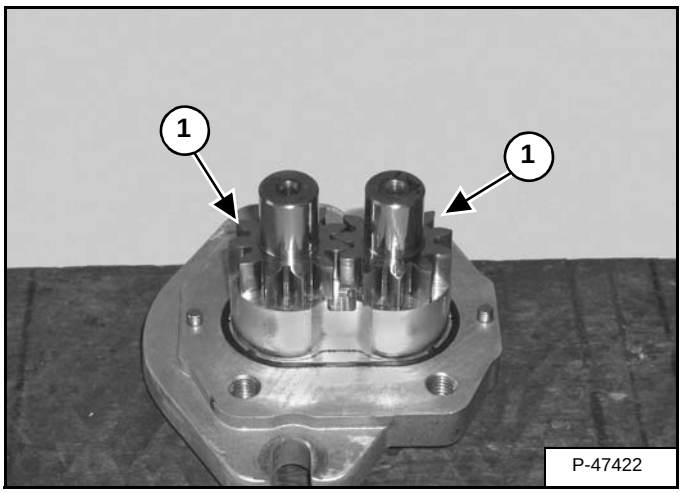
Figure 20-180-30



Note the orientation of the bearing (Item 1) **[Figure 20-180-30]**.

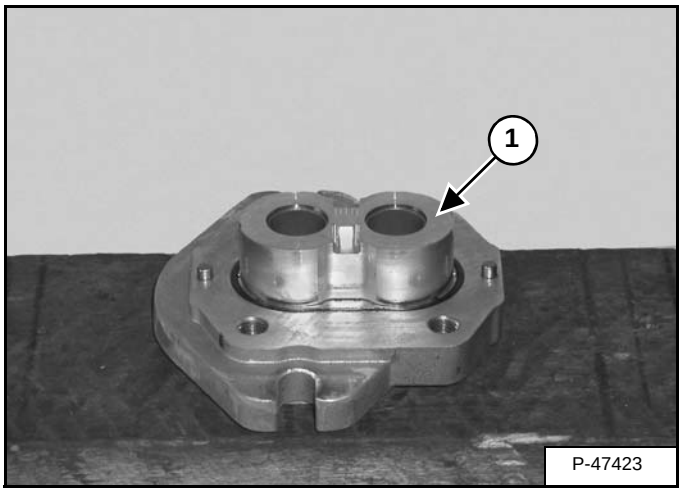
Remove the bearing.

Figure 20-180-31



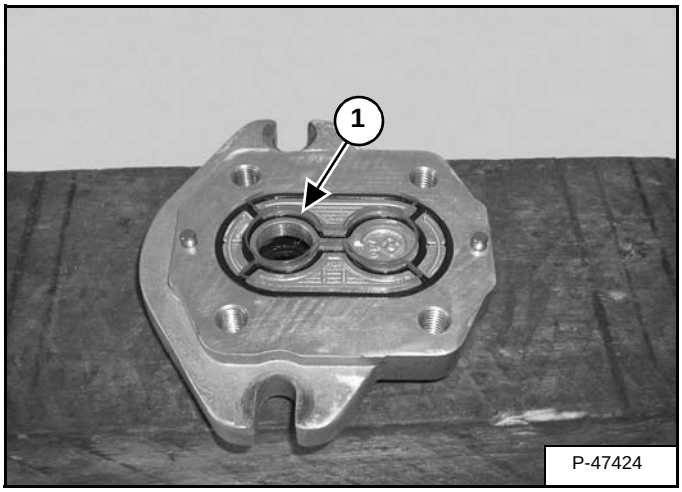
Remove the gears (Item 1) **[Figure 20-180-31]**.

Figure 20-180-32



Note the orientation of the bearing (Item 1) **[Figure 20-180-32]** and remove the bearing.

Figure 20-180-33

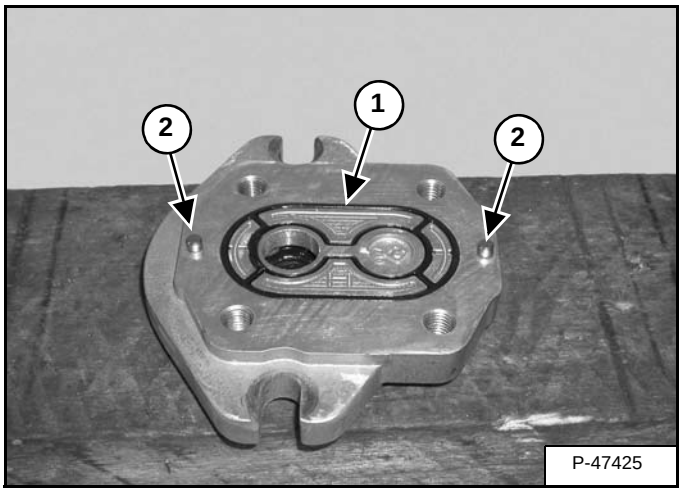


Remove the back-up seal (Item 1) **[Figure 20-180-33]**.

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Disassembly And Assembly (Cont'd)

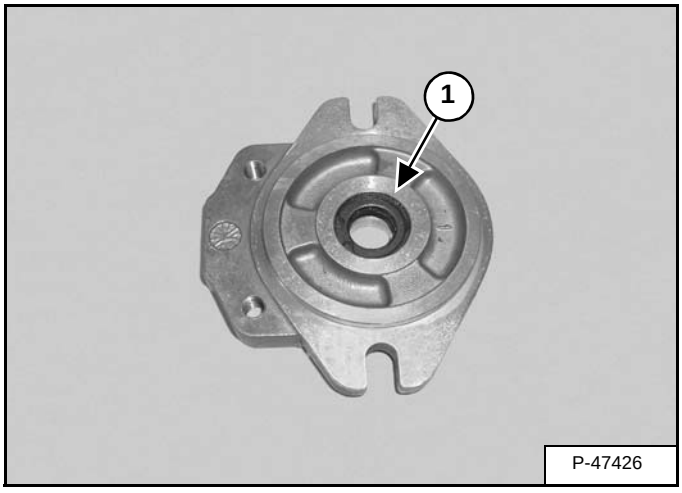
Figure 20-180-34



Remove the seal (Item 1) and dowel pins (Item 2) **[Figure 20-180-34]**.

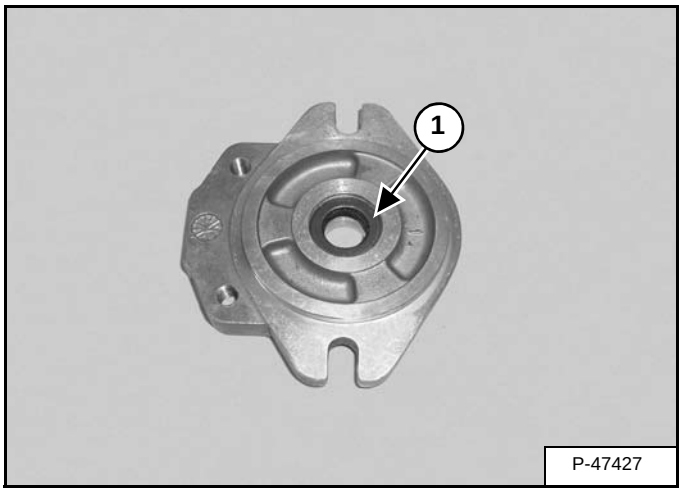
NOTE: The dowel pins may stay in the housing when the housing is removed.

Figure 20-180-35



Turn the plate over and remove the snap ring (Item 1) **[Figure 20-180-35]**.

Figure 20-180-36



Remove the seal (Item 1) **[Figure 20-180-36]**.

Assembly

Clean all parts in solvent and dry with compressed air.

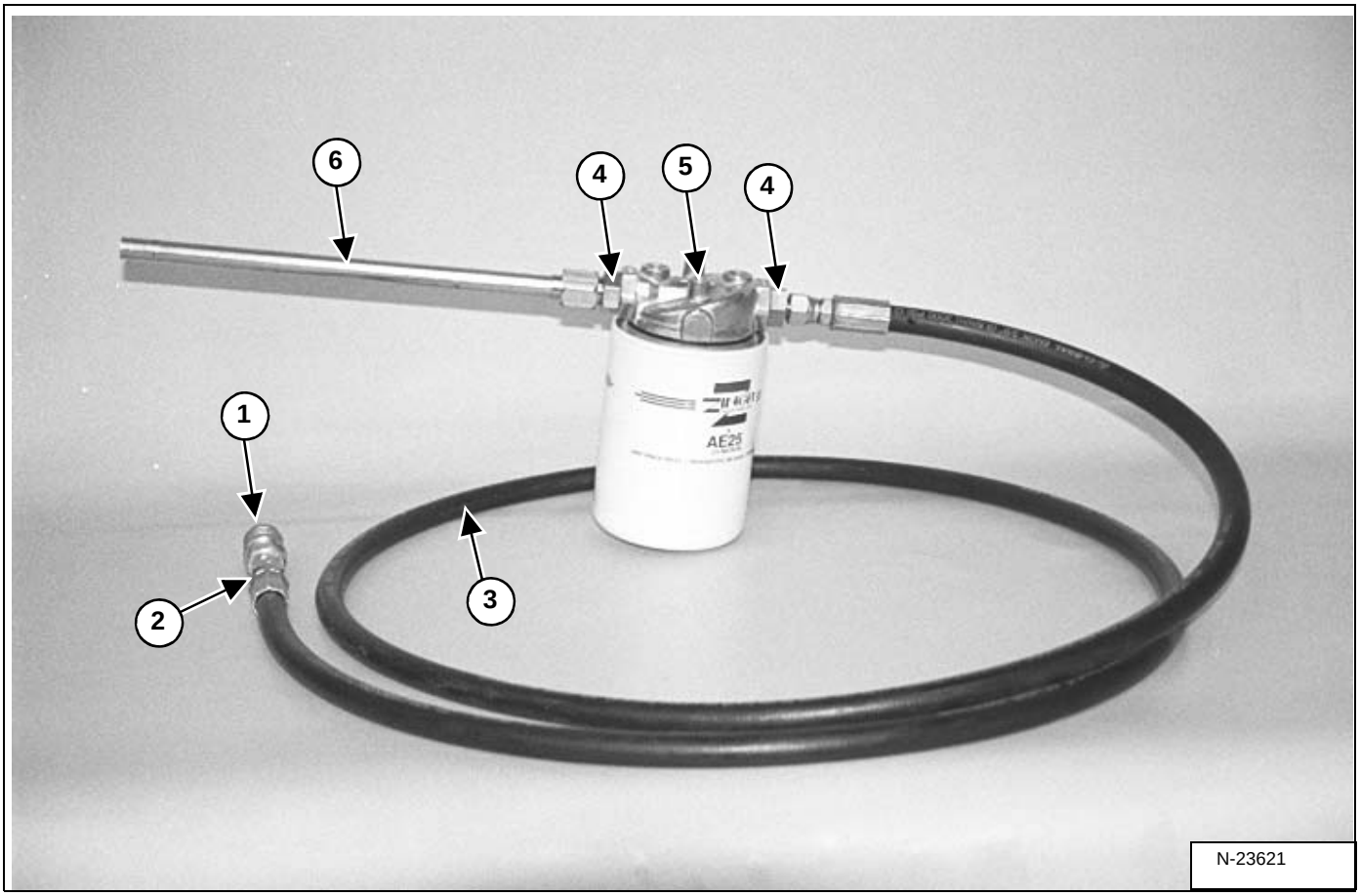
Replace any worn or damaged parts. Always use new seals and back-up seals.

Apply clean hydraulic fluid to the seals, back-up seals, and bearings during installation.

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REMOVING AIR FROM HYDRAULIC SYSTEM

Procedure



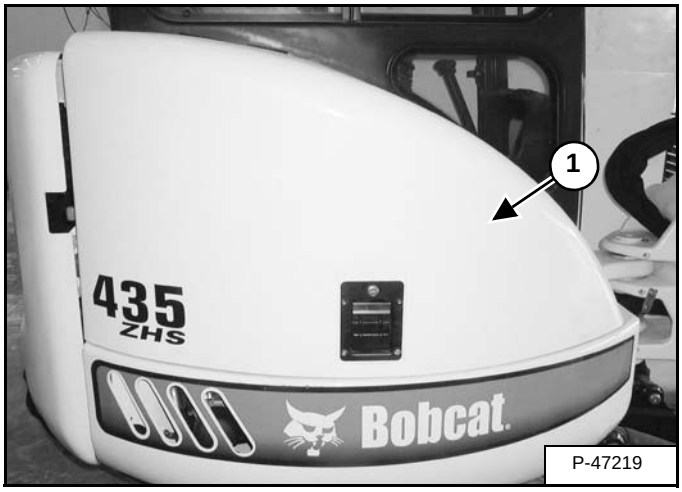
REF.	PART NO.	DESCRIPTION	QTY.
1	6651701	FEMALE QUICK COUPLER	1
2	6579648 or 6807034	FITTING	1
3		HOSE, .375" I.D. x 100" long (.5625"-18 JIC straight fittings-both ends)	1
4	743108 or 6715649	FITTING	2
5	6660727	FILTER ASSEMBLY (case drain filter assembly, 337/341.)	1
6		TUBELINE, .50 O.D. x 10" long (sleeve, ferrule and flare one end only)	1

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Procedure (Cont'd)

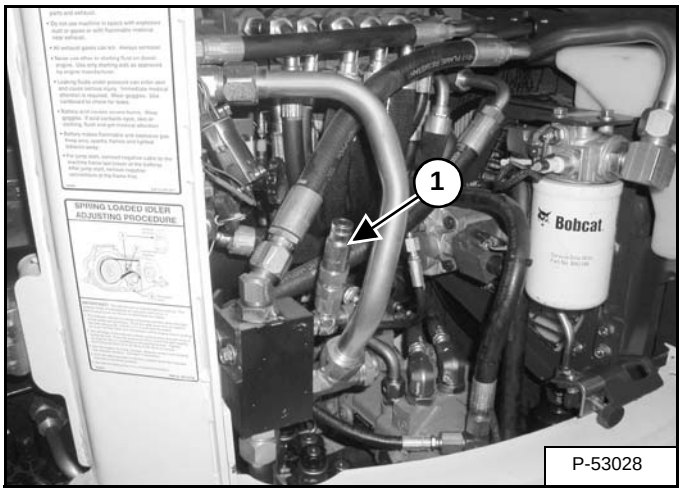
Open the right side cover.

Figure 20-190-1



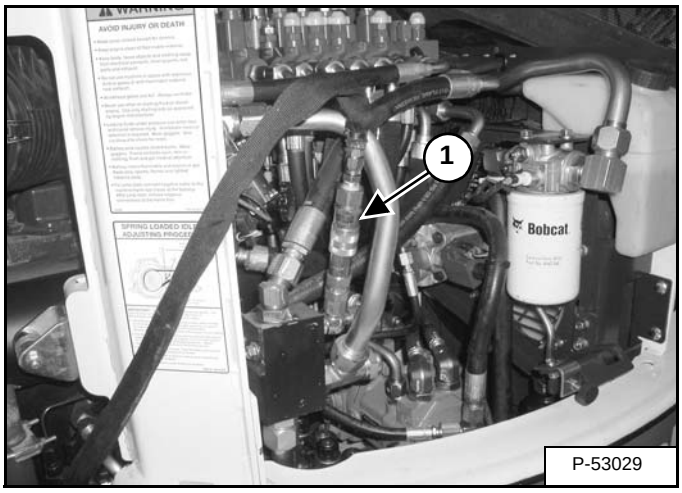
Open the right side cover (Item 1) **[Figure 20-190-1]**.

Figure 20-190-2



Locate the quick coupler (Item 1) **[Figure 20-190-2]** on the build up valve.

Figure 20-190-3



Install the female quick coupler (Item 1) **[Figure 20-190-3]** on the hydraulic hose of the air bleed tool, to the male quick coupler.

Open the tailgate.

Route the hose, and filter assembly of the bleed tool to the engine compartment of the Excavator.

Remove the cap from the hydraulic reservoir.

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Procedure (Cont'd)

Figure 20-190-4



Install the tubeline end of the bleed tool into the hydraulic reservoir **[Figure 20-190-4]**.

NOTE: Be sure the hydraulic system is filled with oil before starting the Excavator to prevent damage to the system.

Start the Excavator.

The Excavator piston pump has a minimum displacement stop, approximately 4 GPM (15,1 L/m) which is being circulated through the valve even when all functions are in neutral.

If additional air has gotten into some of the circuits (motors or cylinders), the Excavator can be operated with the bleed tool in place.

NOTE: When the Excavator is operated with bleed tool in place, the tailgate is open and must be protected. The cap is removed from the hydraulic reservoir, and the hydraulic system must be protected from contamination.

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BOOM SWING LOCK VALVE

Description

The boom swing lock valve prevents side to side movement of the boom until the boom swing circuit is engaged.

Removal And Installation

Remove the floormat and floor plate. (See Removal And Installation on Page 50-120-1)

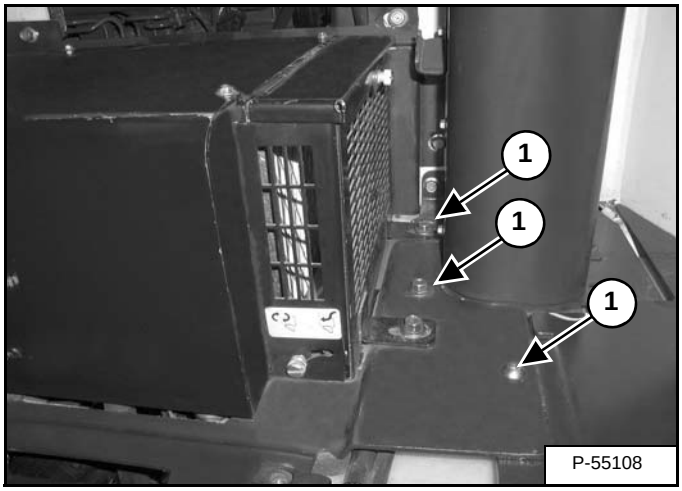
Remove the seat and seat mount. (See Removal And Installation on Page 50-40-1)

IMPORTANT

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

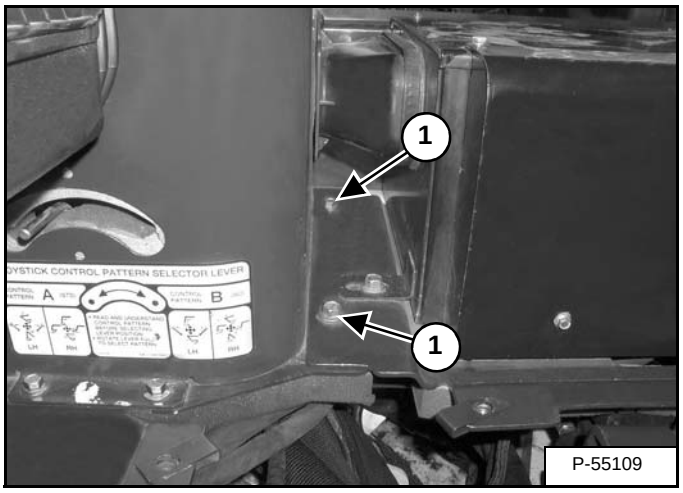
I-2003-0888

Figure 20-200-1



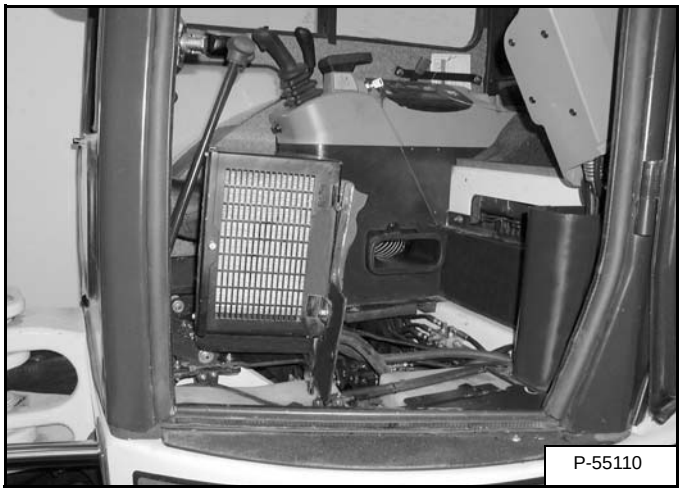
Remove the bolts (Item 1) **[Figure 20-200-1]** from the left side of the rear floor plate.

Figure 20-200-2



Remove the bolts (Item 1) **[Figure 20-200-2]** from the right side of the rear floor plate.

Figure 20-200-3



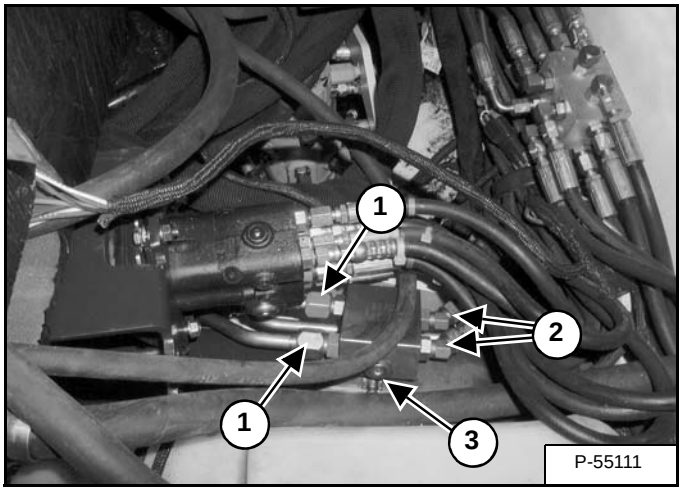
Reposition the evaporator/heater unit as shown **[Figure 20-200-3]**.

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Removal And Installation (Cont'd)

Mark the hoses and tubelines for proper installation.

Figure 20-200-4



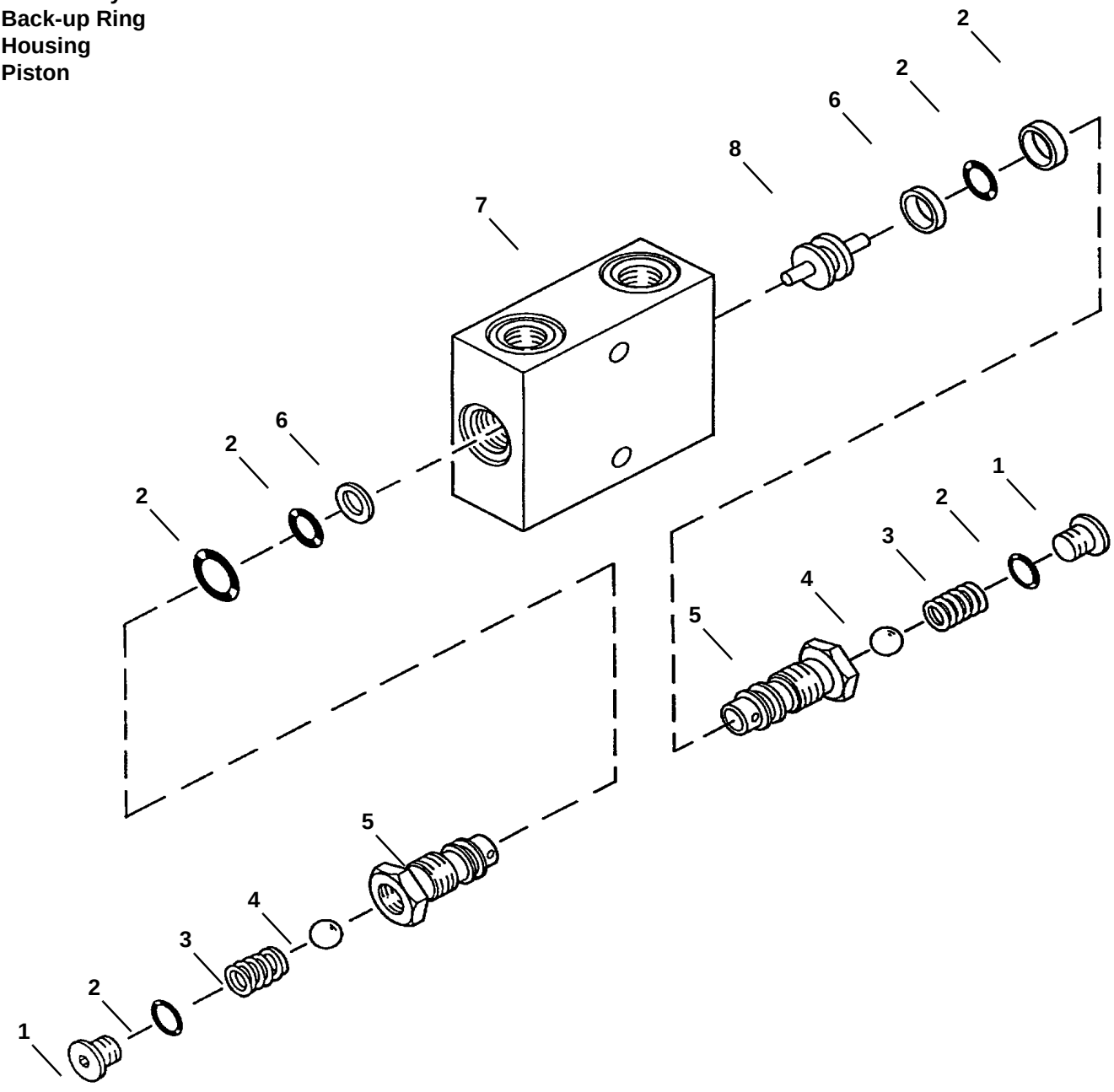
Remove the tubelines (Item 1), hoses (Item 2), and clamp (Item 3) **[Figure 20-200-4]**.

Remove the swing lock valve from the excavator.

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Parts Identification

1. Plug
2. O-Ring
3. Spring
4. Ball
5. Valve Body
6. Back-up Ring
7. Housing
8. Piston

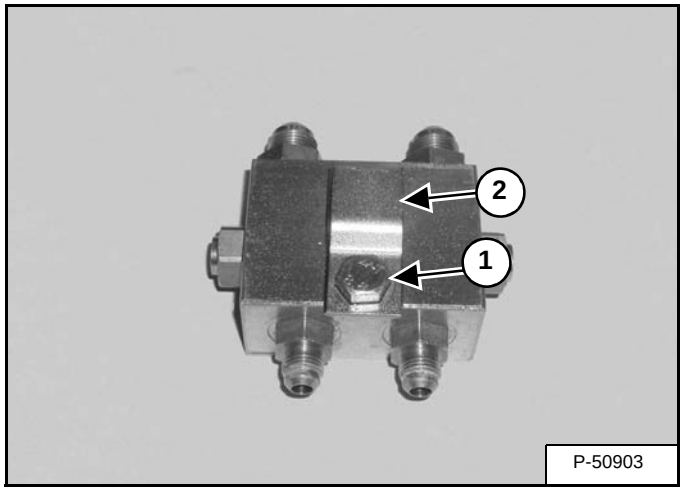


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Disassembly

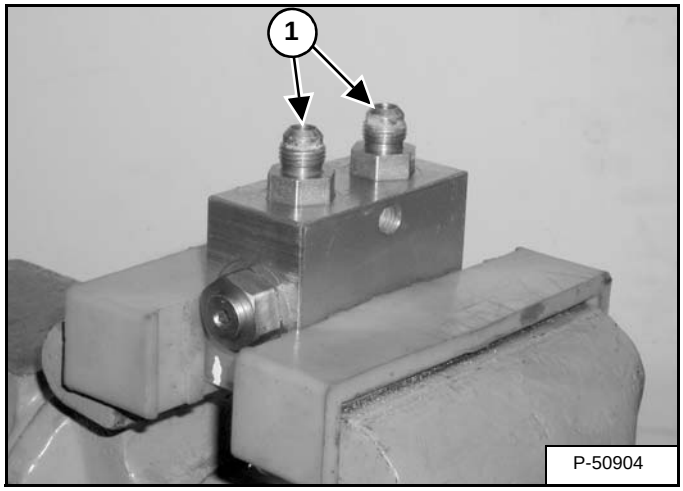
Clean the outside of the boom swing lock valve before disassembly.

Figure 20-200-5



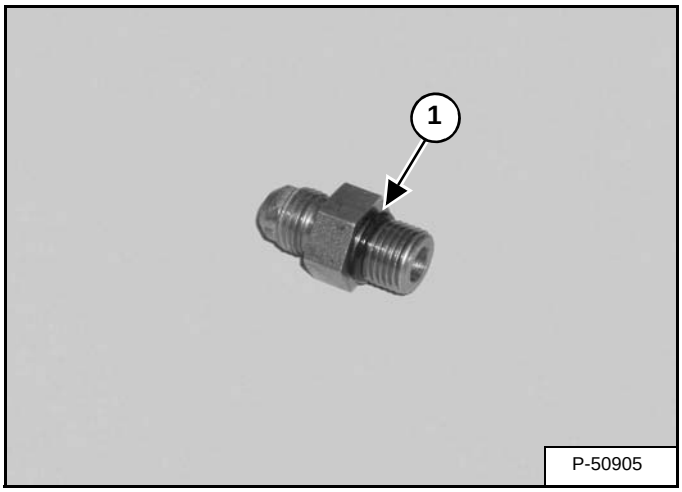
Remove the bolt (Item 1) and bracket (Item 2) **[Figure 20-200-5]**.

Figure 20-200-6



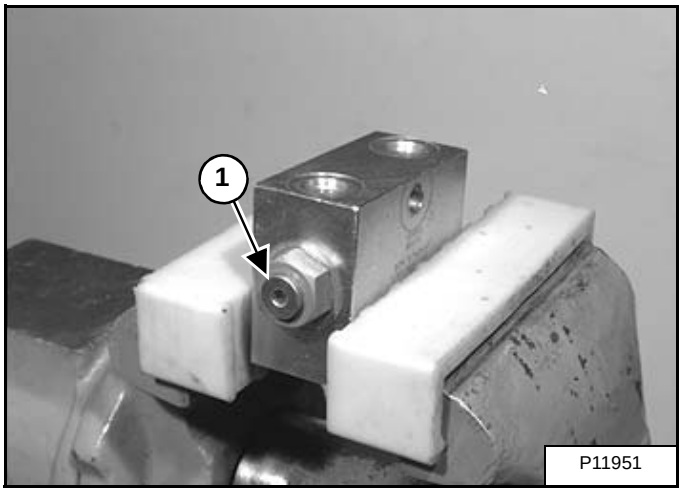
Remove the 4 fittings (Item 1) **[Figure 20-200-6]** (2 per side) from the housing.

Figure 20-200-7



Remove the O-ring (Item 1) **[Figure 20-200-7]** from the fittings.

Figure 20-200-8

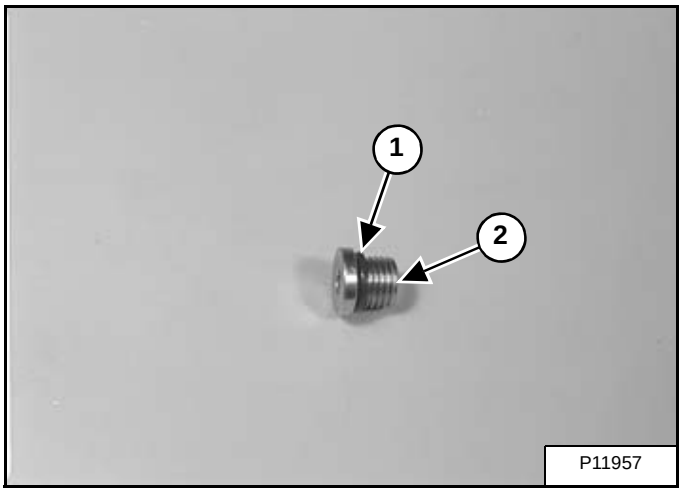


Remove the plug (Item 1) **[Figure 20-200-8]** from the valve body. (Both ends)

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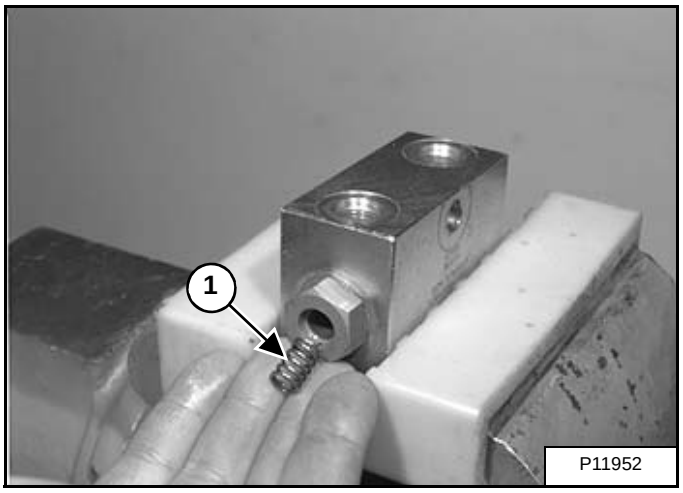
Disassembly (Cont'd)

Figure 20-200-9



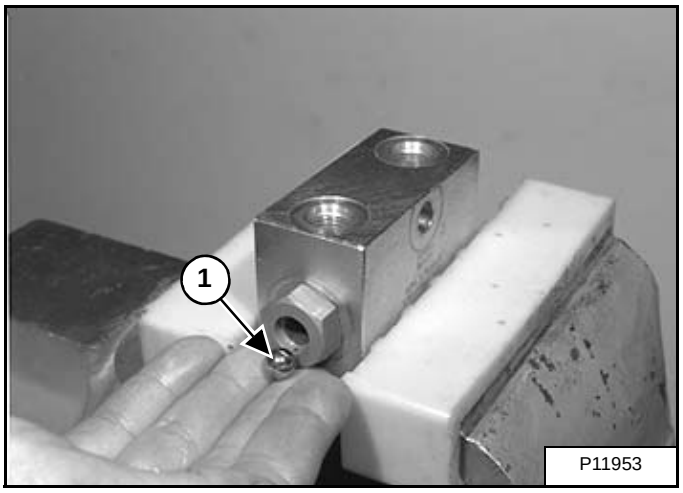
Remove the O-ring (Item 1) from the plugs (Item 2) **[Figure 20-200-9]**.

Figure 20-200-10



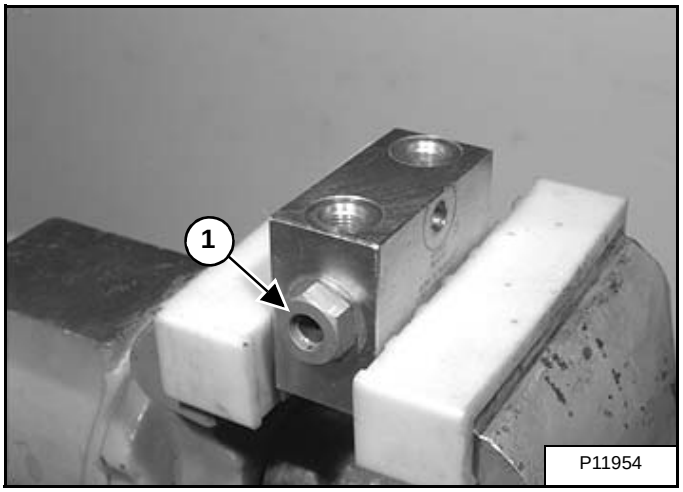
Remove the spring (Item 1) **[Figure 20-200-10]** from the valve body. (Both ends)

Figure 20-200-11



Remove the ball (Item 1) **[Figure 20-200-11]** from the valve body. (Both ends)

Figure 20-200-12

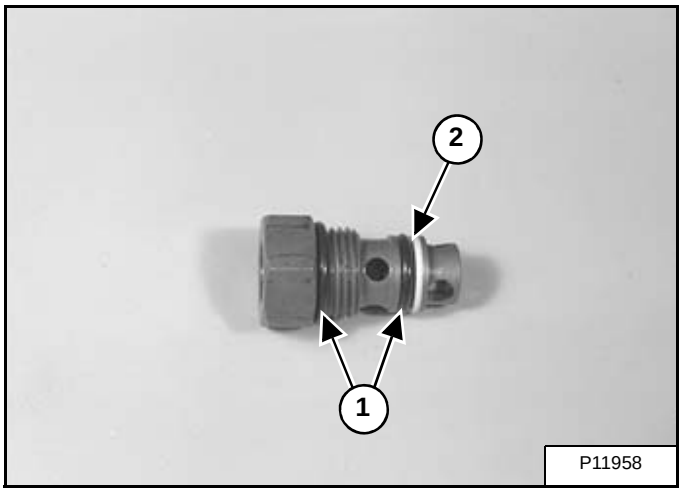


Remove the valve body (Item 1) **[Figure 20-200-12]** from the housing. (Both ends)

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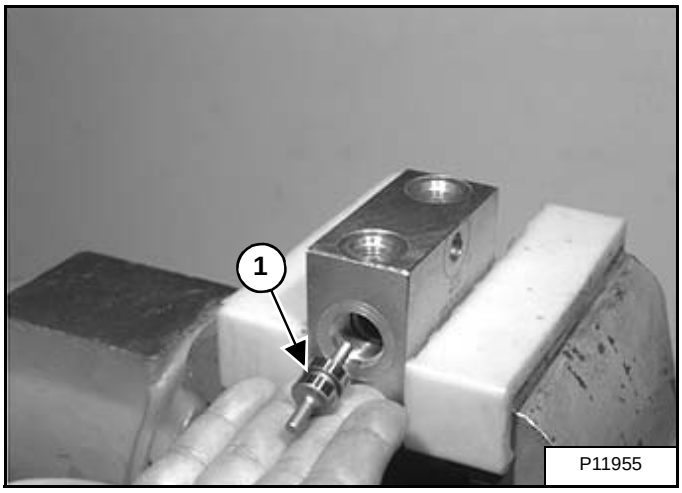
Disassembly (Cont'd)

Figure 20-200-13



Remove the O-rings (Item 1) and back-up ring (Item 2) **[Figure 20-200-13]** from the valve bodies.

Figure 20-200-14



Remove the spool (Item 1) **[Figure 20-200-14]**.

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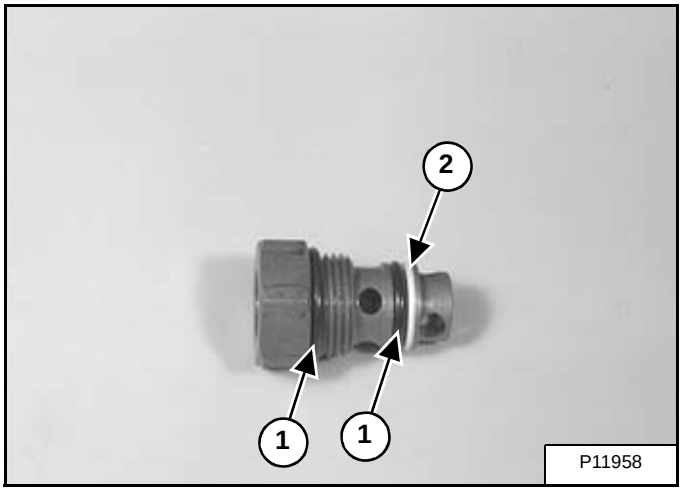
Assembly

Clean all parts in clean solvent and dry with compressed air.

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

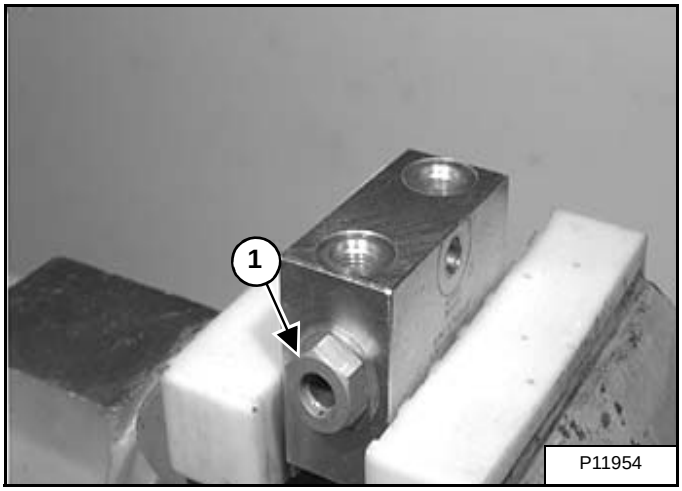
Always install new seals and O-rings. Lubricate all seals and O-rings with clean hydraulic fluid before installation.

Figure 20-200-15



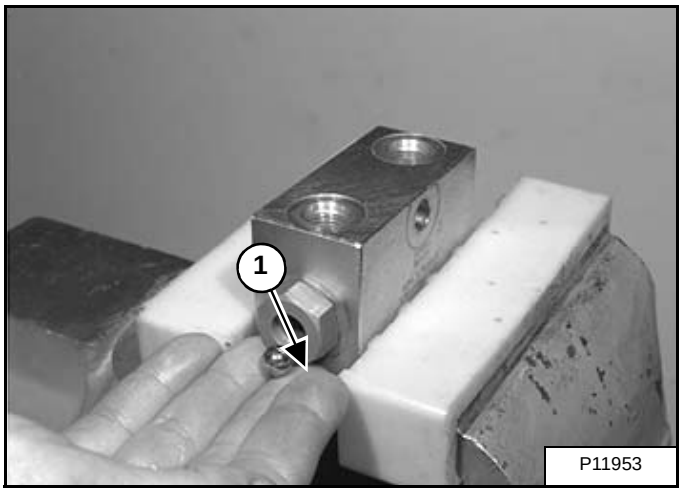
Install the O-rings (Item 1) and back-up ring (Item 2) **[Figure 20-200-15]** on the valve body.

Figure 20-200-16



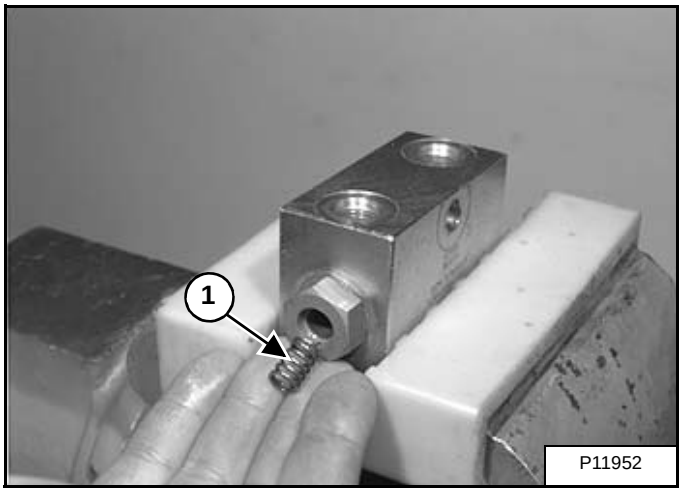
Install the valve body (Item 1) **[Figure 20-200-16]** into the valve housing. Tighten to 15 to 20 ft.-lb. (20 to 27 N•m) torque.

Figure 20-200-17



Put oil on the ball (Item 1) **[Figure 20-200-17]** and install in the valve body.

Figure 20-200-18

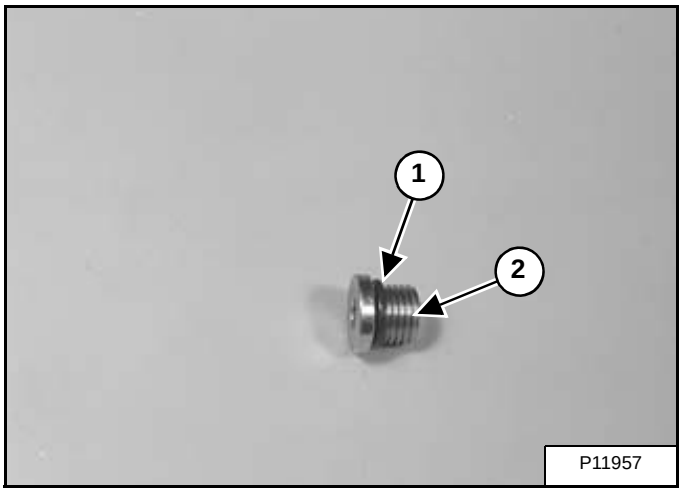


Install the spring (Item 1) **[Figure 20-200-18]**.

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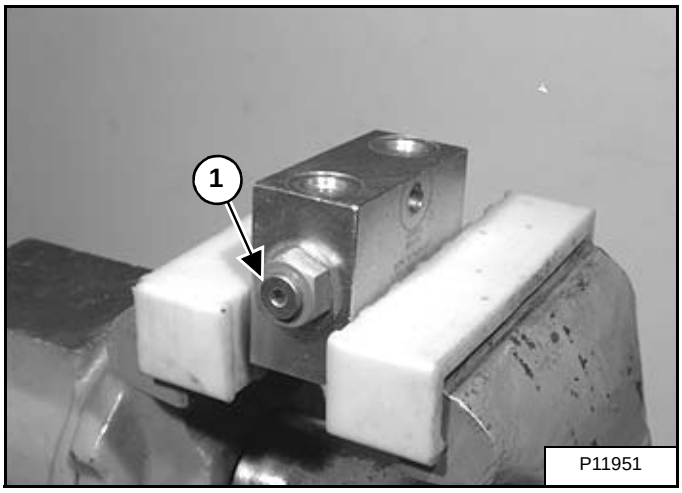
Assembly (Cont'd)

Figure 20-200-19



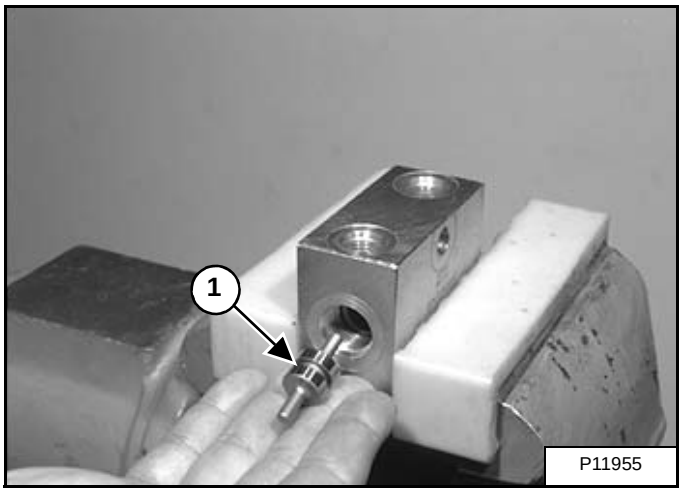
Install the O-ring (Item 1) on the plug (Item 2) **[Figure 20-200-19]**.

Figure 20-200-20



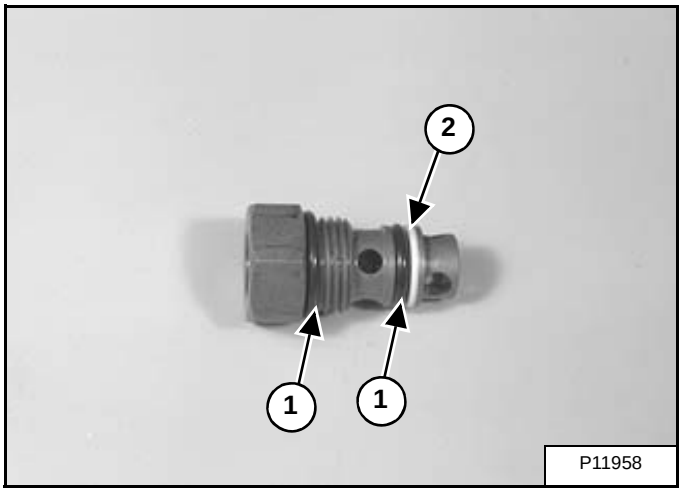
Install the plug (Item 1) **[Figure 20-200-20]** in the valve body. Tighten to 85 to 100 in.-lb. (9,6 to 11,3 N•m) torque.

Figure 20-200-21



Apply oil to the spool (Item 1) **[Figure 20-200-21]** and install the spool in the opposite end of the valve housing.

Figure 20-200-22

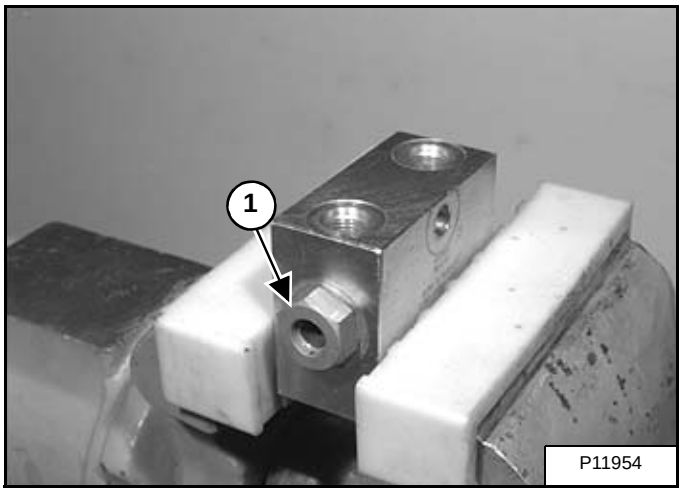


Install the O-rings (Item 1) and back-up ring (Item 2) **[Figure 20-200-22]** on the valve body.

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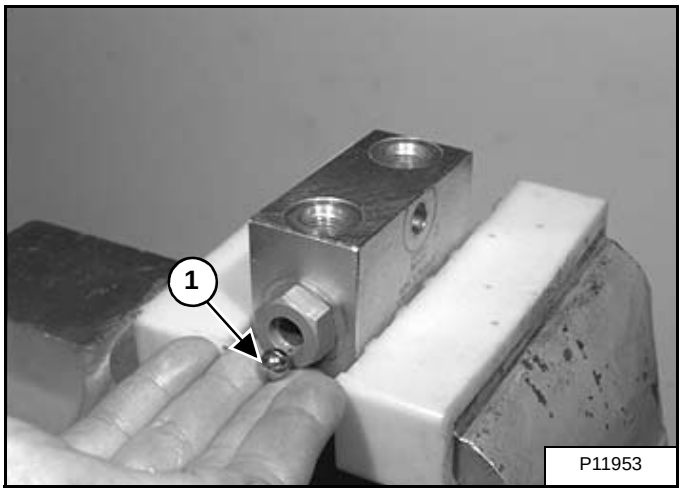
Assembly (Cont'd)

Figure 20-200-23



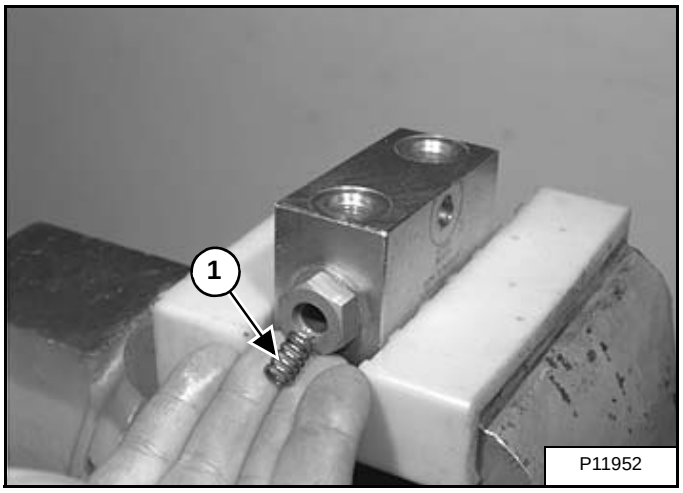
Install the valve body (Item 1) **[Figure 20-200-23]**. Tighten to 15 to 20 ft.-lb. (20 to 27 N•m) torque.

Figure 20-200-24



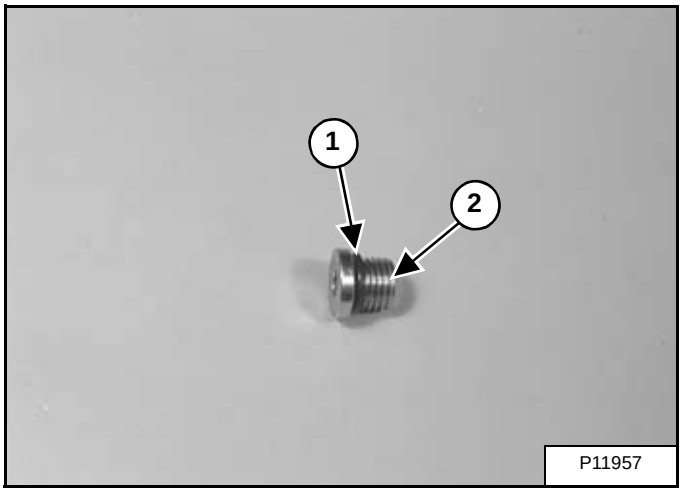
Install the ball (Item 1) **[Figure 20-200-24]**.

Figure 20-200-25



Install the spring (Item 1) **[Figure 20-200-25]**.

Figure 20-200-26

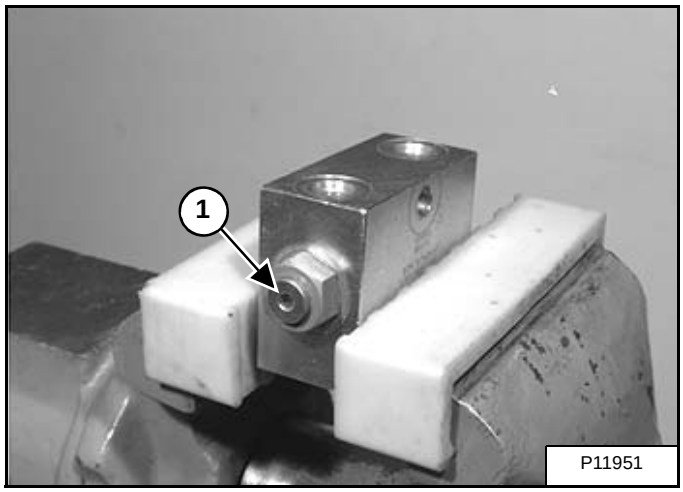


Install the O-ring (Item 1) on the plug (Item 2) **[Figure 20-200-26]**.

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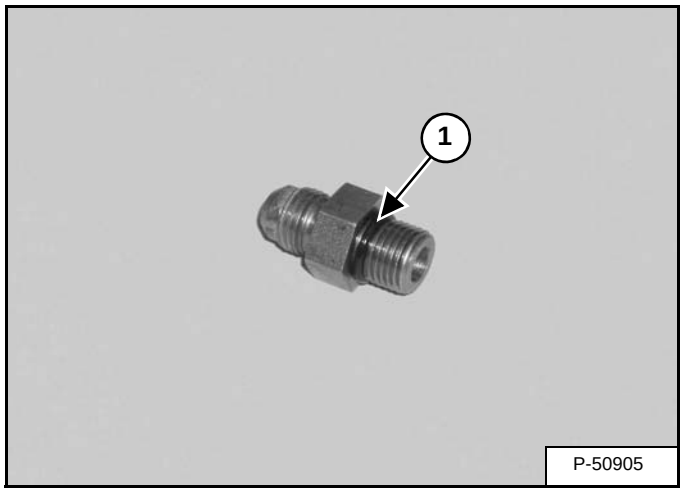
Assembly (Cont'd)

Figure 20-200-27



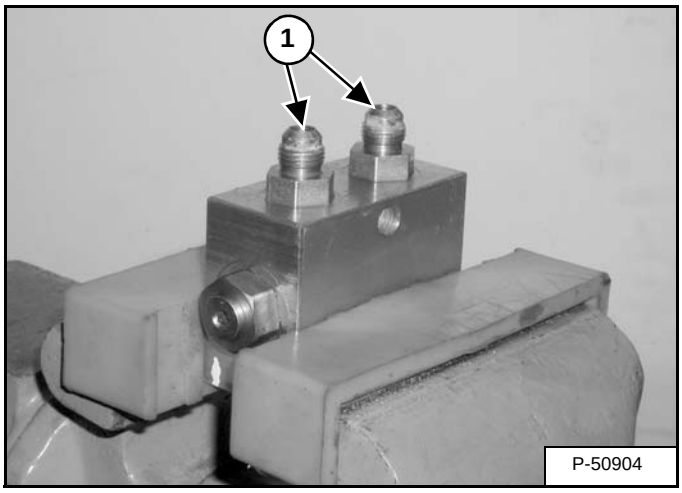
Install the plug (Item 1) **[Figure 20-200-27]**. Tighten to 85 to 100 in.-lb. (9,6 to 11,3 N•m) torque.

Figure 20-200-28



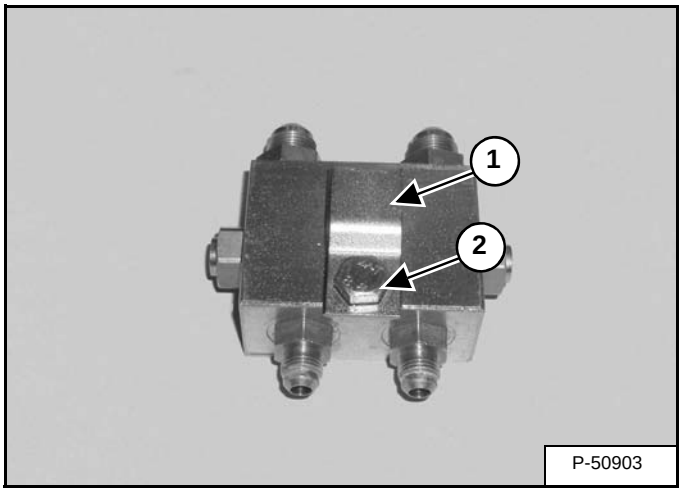
Install the O-ring (Item 1) **[Figure 20-200-28]** on the fittings.

Figure 20-200-29



Install the 4 fittings (Item 1) **[Figure 20-200-29]** (2 per side) on the valve.

Figure 20-200-30



Install the bracket (Item 1) and bolt (Item 2) **[Figure 20-200-30]**.

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HYDRAULIC X-CHANGE VALVE

Removal And Installation

IMPORTANT

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

I-2003-0888

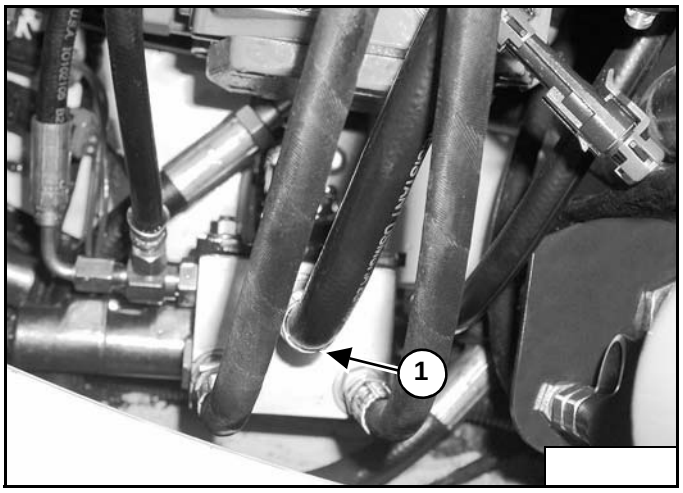
Lower the boom and blade to the ground.

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

Open the right side cover.

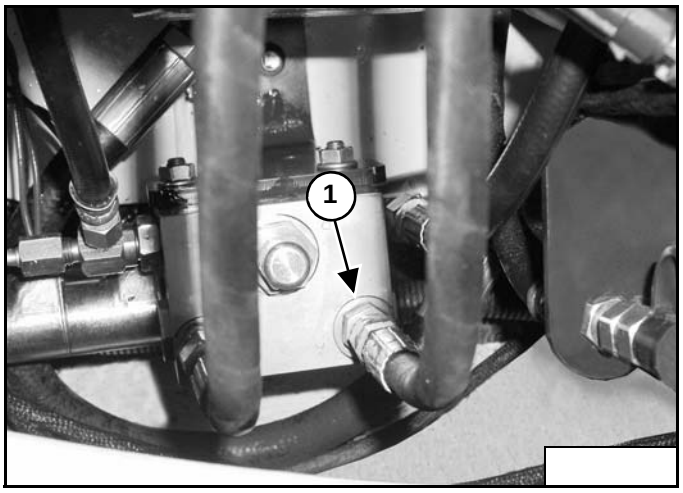
Mark all hoses for proper installation.

Figure 20-210-1



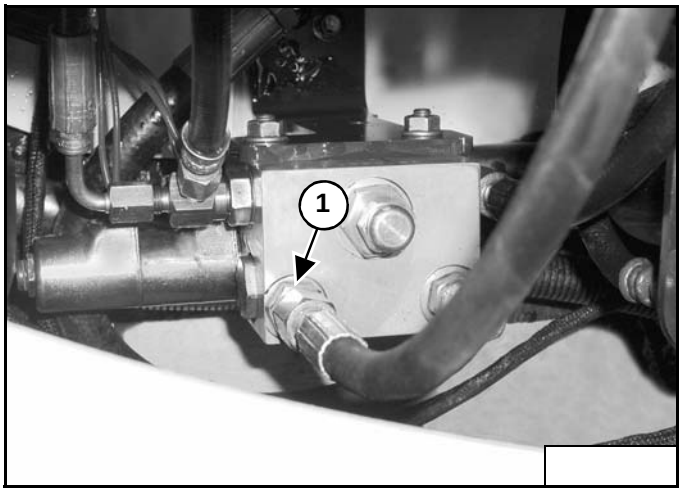
Remove the hose (Item 1) **[Figure 20-210-1]** from the “S” port on the X-change valve.

Figure 20-210-2



Remove the hose (Item 1) **[Figure 20-210-2]** from port “A” on the X-change valve.

Figure 20-210-3

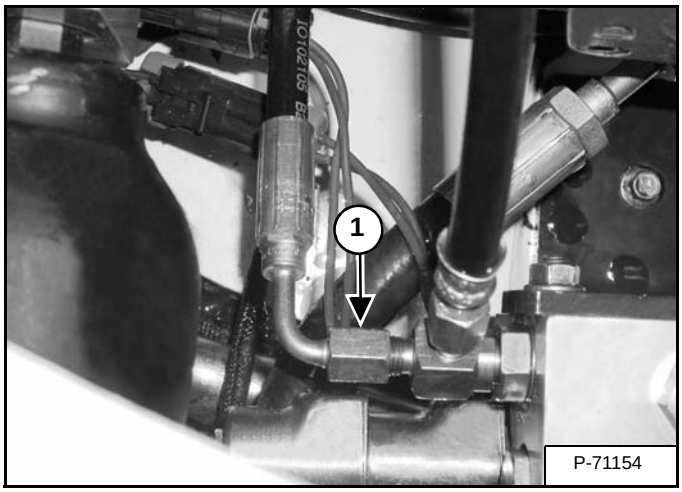


Remove the hose (Item 1) **[Figure 20-210-3]** from port “B” on the X-change valve.

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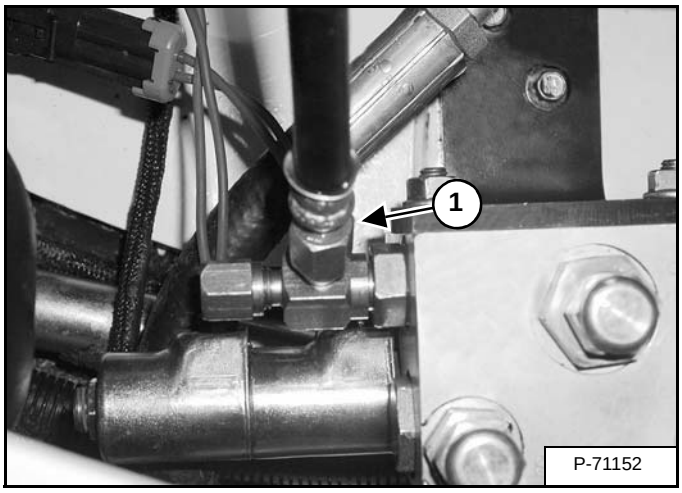
Removal And Installation (Cont'd)

Figure 20-210-4



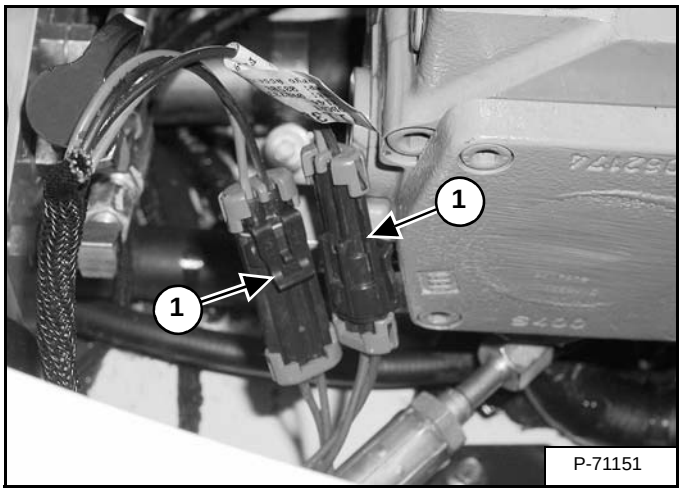
Remove the hose (Item 1) **[Figure 20-210-4]** from the "T" fitting on the X-change valve.

Figure 20-210-5



Remove the hose (Item 1) **[Figure 20-210-5]** from the "T" fitting on the X-change valve.

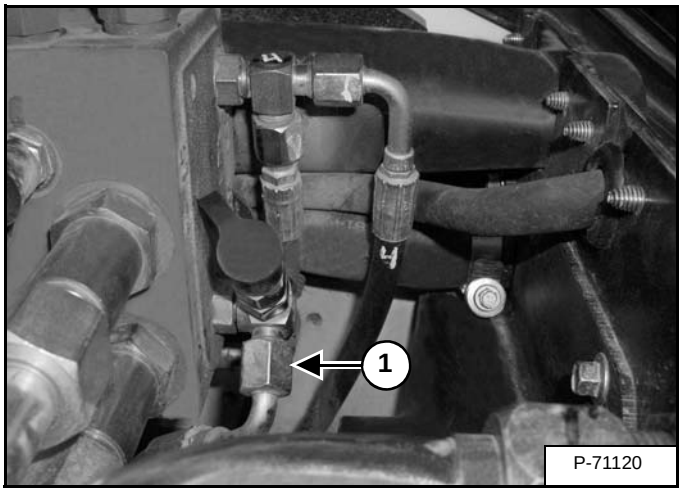
Figure 20-210-6



Disconnect the two electrical connectors (Item 1) **[Figure 20-210-6]** from the solenoids.

NOTE: Mark the wire connectors for correct installation.

Figure 20-210-7

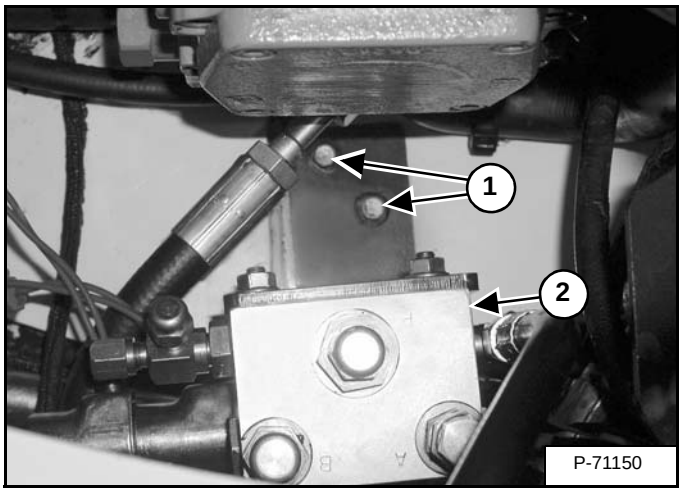


Remove the hose (Item 1) **[Figure 20-210-7]** from the hydraulic control valve.

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Removal And Installation (Cont'd)

Figure 20-210-8

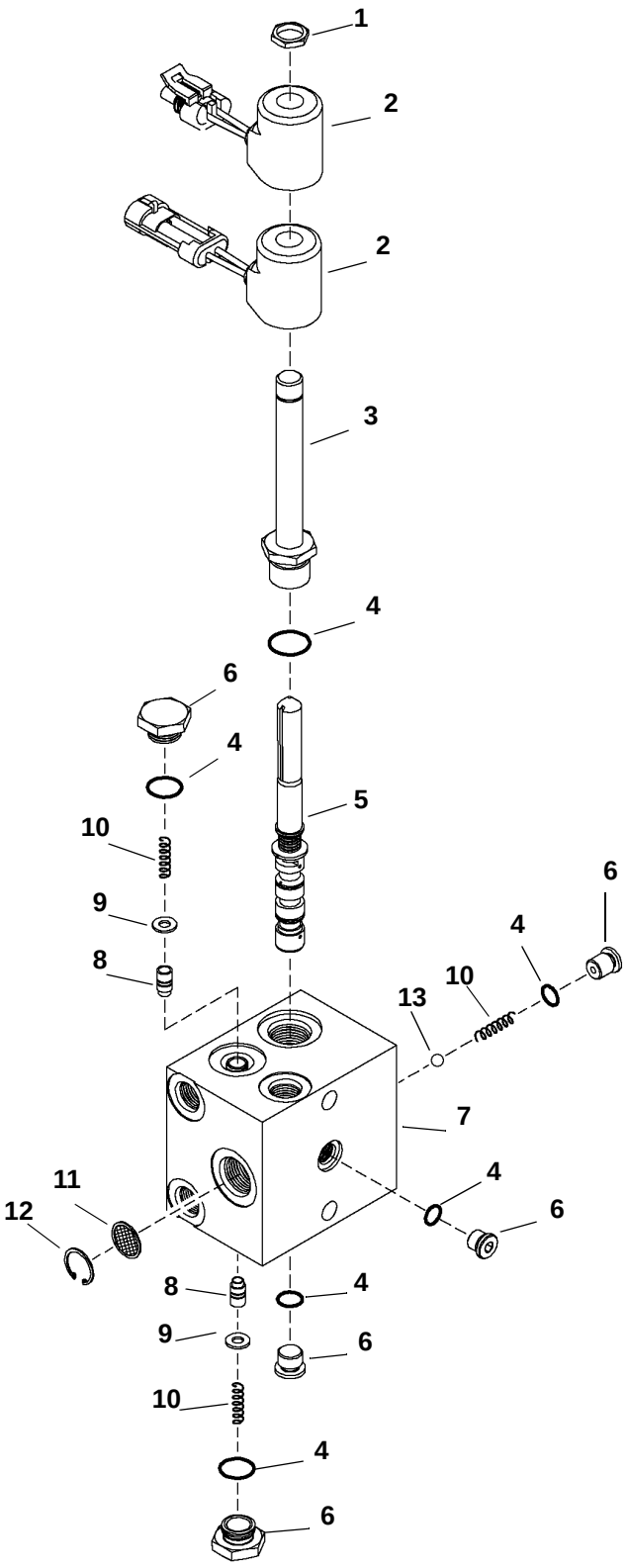


Remove the two mount bolts (Item 1) and the X-change valve (Item 2) **[Figure 20-210-8]**.

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Parts Identification

1. Nut
2. Solenoid
3. Spool
4. O-ring
5. Actuator Assembly
6. Plug
7. Valve
8. Poppet
9. Flat Washer
10. Spring
11. Screen
12. Snap Ring
13. Ball



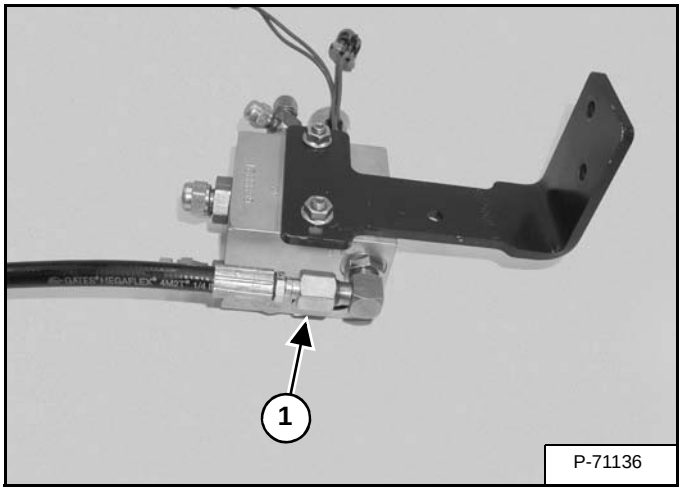
MS-1461S

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Disassembly

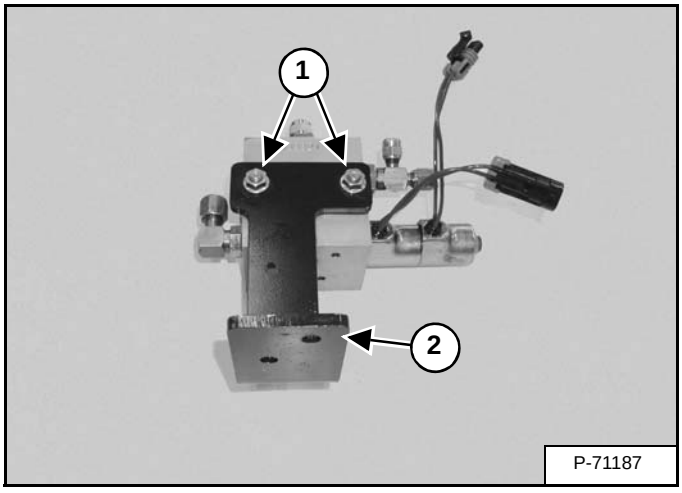
Clean the outside of the hydraulic X-Change valve before disassembly.

Figure 20-210-9



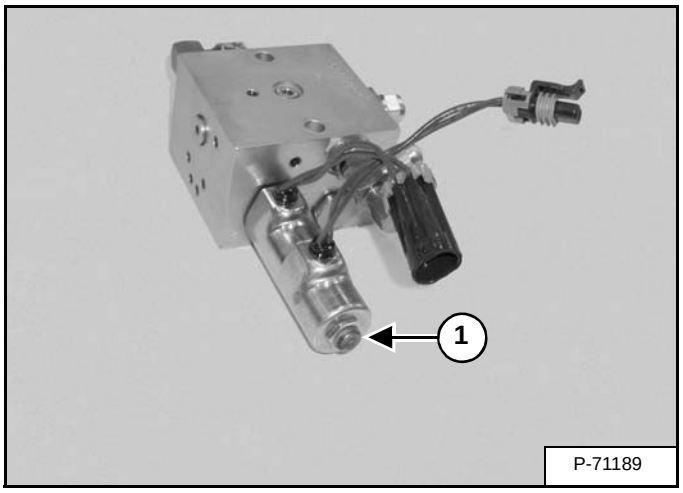
Remove the hose (Item 1) **[Figure 20-210-9]** from the X-Change valve.

Figure 20-210-10



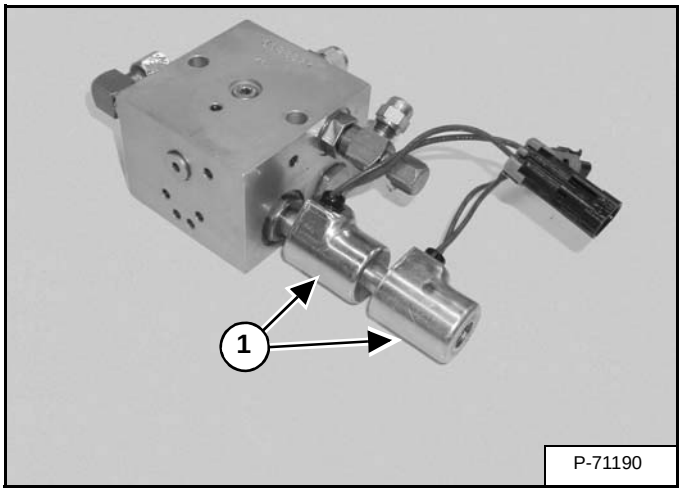
Remove the two nuts (Item 1) and the mount bracket (Item 2) **[Figure 20-210-10]**.

Figure 20-210-11



Remove the nut (Item 1) **[Figure 20-210-11]**.

Figure 20-210-12



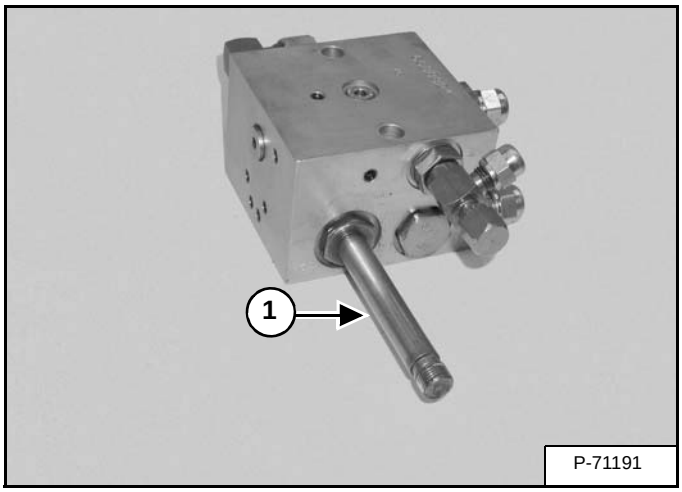
Remove the two solenoids (Item 1) **[Figure 20-210-12]**.

NOTE: Mark the solenoids for correct assembly.

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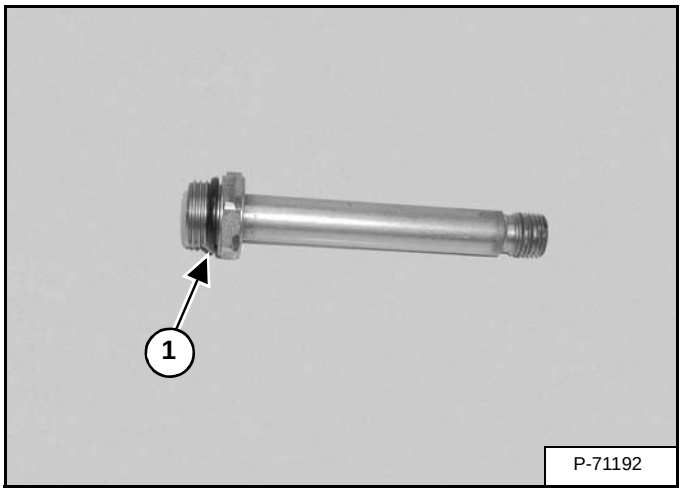
Disassembly (Cont'd)

Figure 20-210-13



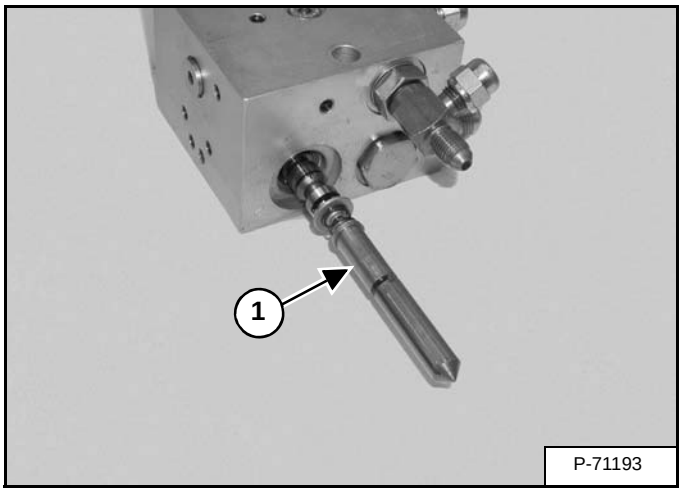
Remove the spool (Item 1) **[Figure 20-210-13]**.

Figure 20-210-14



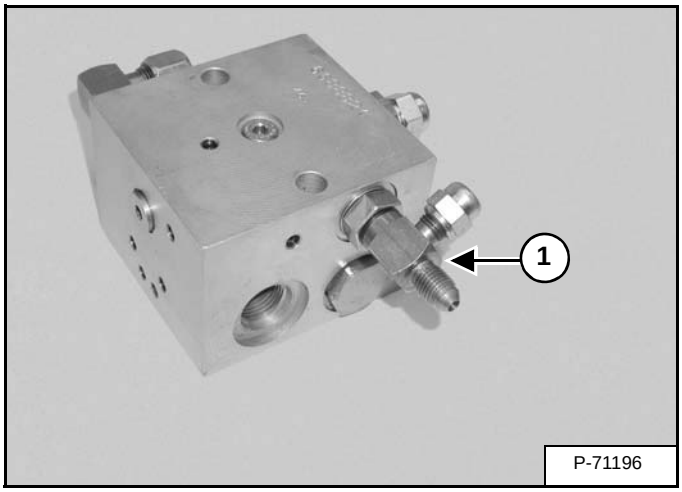
Remove the O-ring (Item 1) **[Figure 20-210-14]** from the spool.

Figure 20-210-15



Remove the actuator assembly (Item 1) **[Figure 20-210-15]**.

Figure 20-210-16

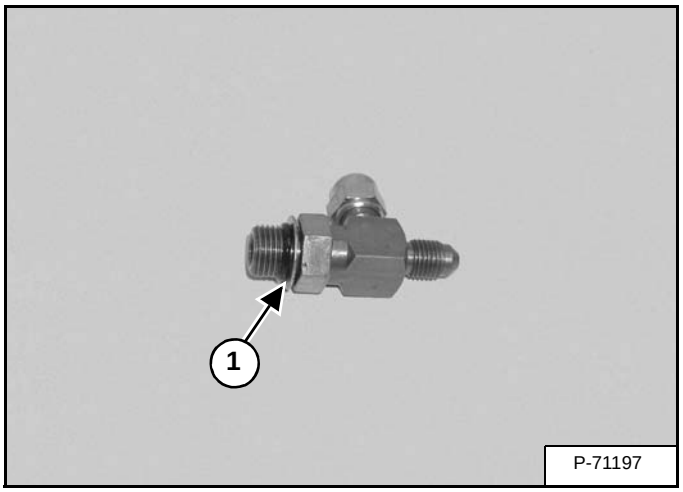


Remove the fitting (Item 1) **[Figure 20-210-16]**.

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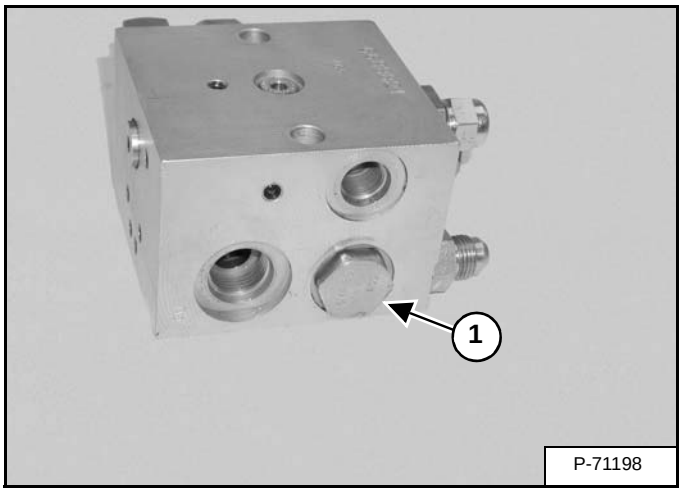
Disassembly (Cont'd)

Figure 20-210-17



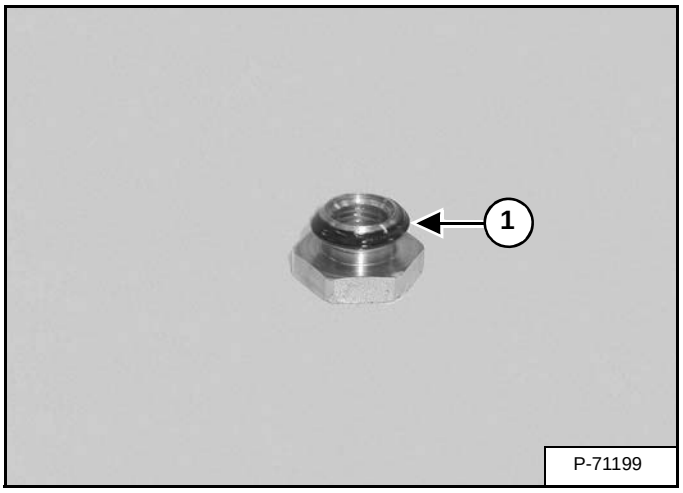
Remove the O-ring (Item 1) **[Figure 20-210-17]** from the fitting.

Figure 20-210-18



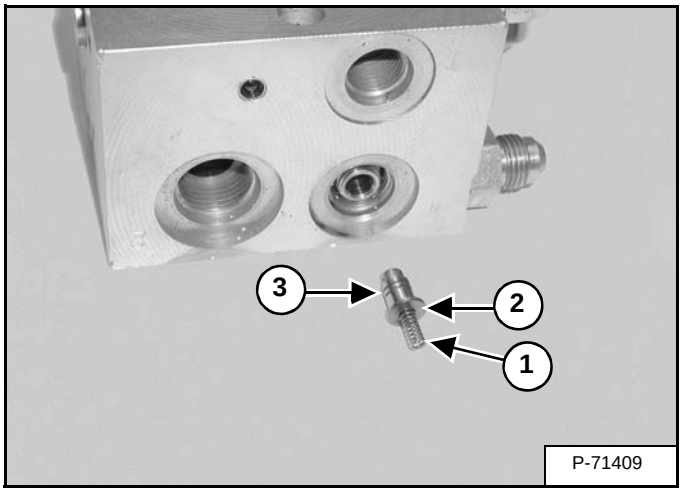
Remove the plug (Item 1) **[Figure 20-210-18]**.

Figure 20-210-19



Remove the O-ring (Item 1) **[Figure 20-210-19]** from the plug.

Figure 20-210-20

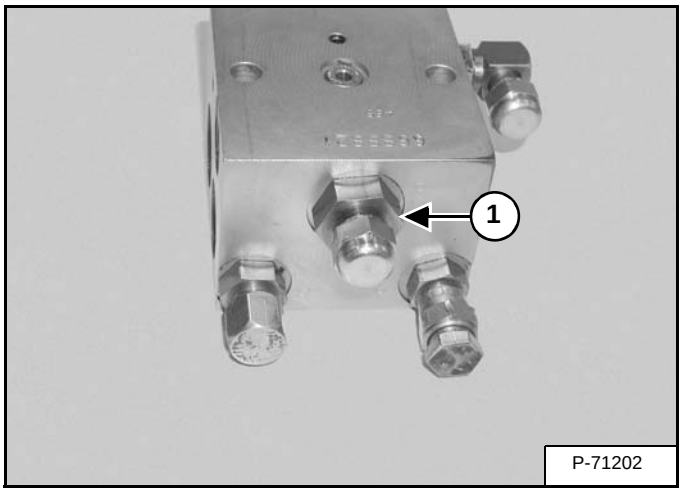


Remove the spring (Item 1), flat washer (Item 2) and poppet (Item 3) **[Figure 20-210-20]**.

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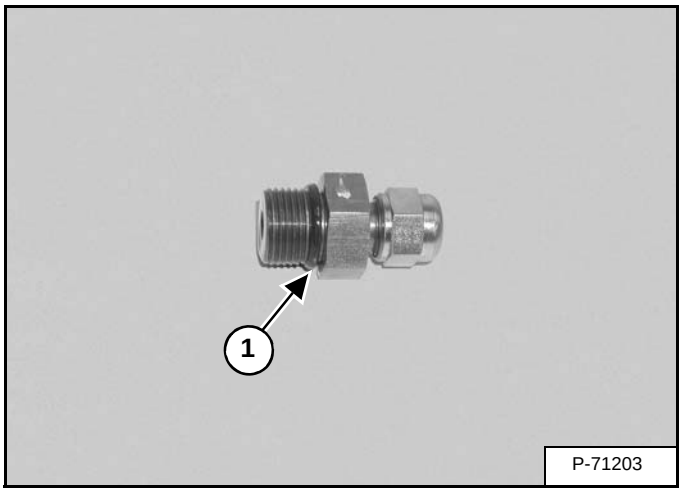
Disassembly (Cont'd)

Figure 20-210-21



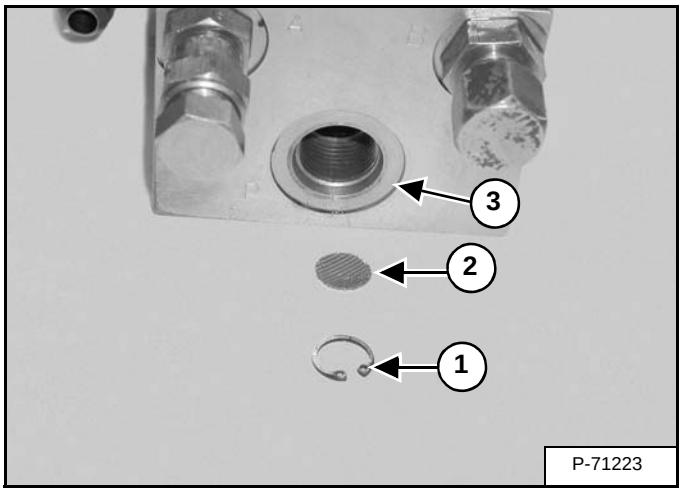
Remove the fitting (Item 1) **[Figure 20-210-21]**.

Figure 20-210-22



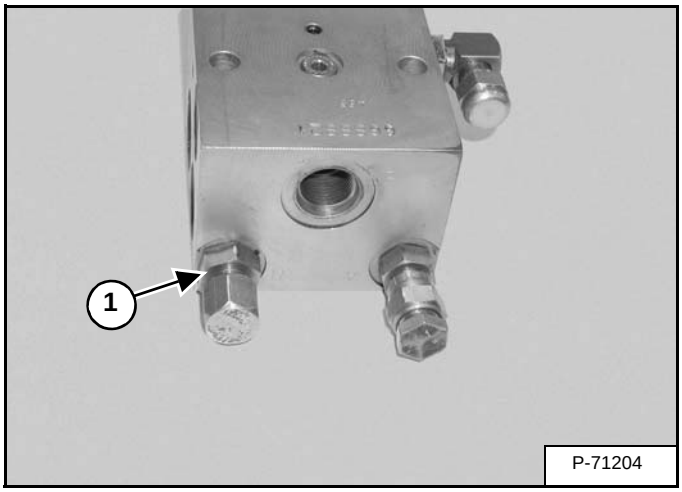
Remove the O-ring (Item 1) **[Figure 20-210-22]** from the fitting.

Figure 20-210-23



Remove the snap ring (Item 1) and screen (Item 2) from the "S" port (Item 3) **[Figure 20-210-23]**.

Figure 20-210-24

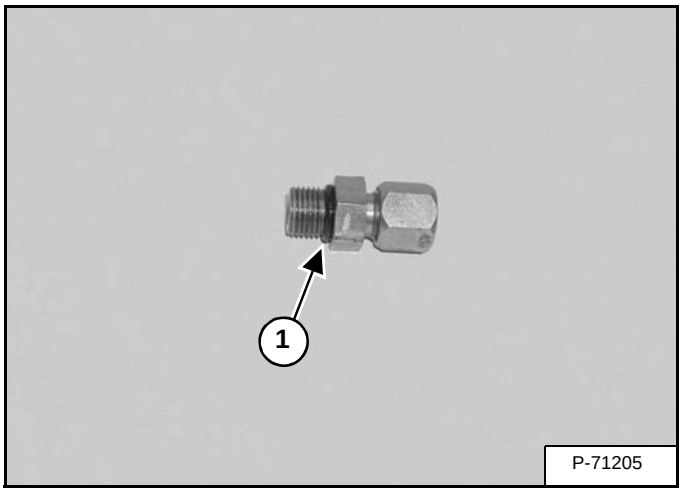


Remove the fitting (Item 1) **[Figure 20-210-24]**.

https://www.pdfmanual4trucks.com/

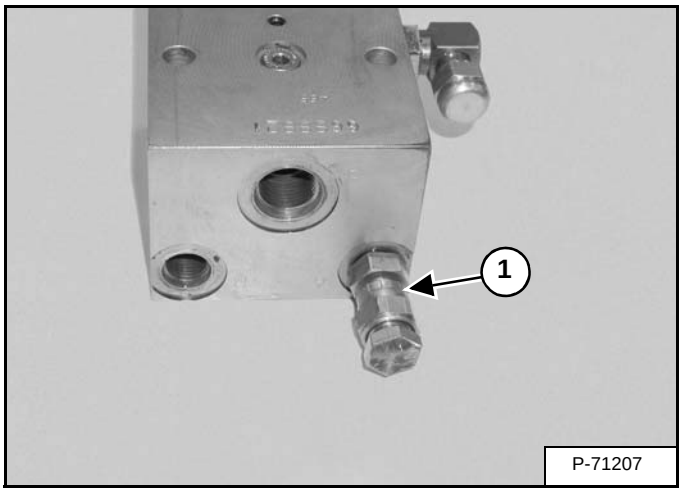
Disassembly (Cont'd)

Figure 20-210-25



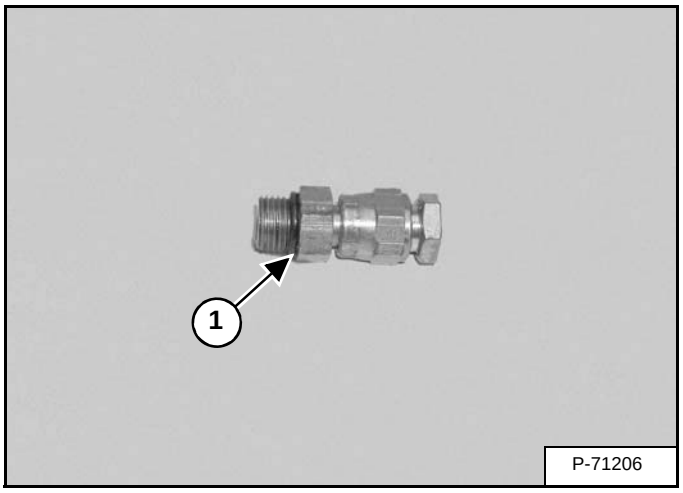
Remove the O-ring (Item 1) **[Figure 20-210-25]** from the fitting.

Figure 20-210-26



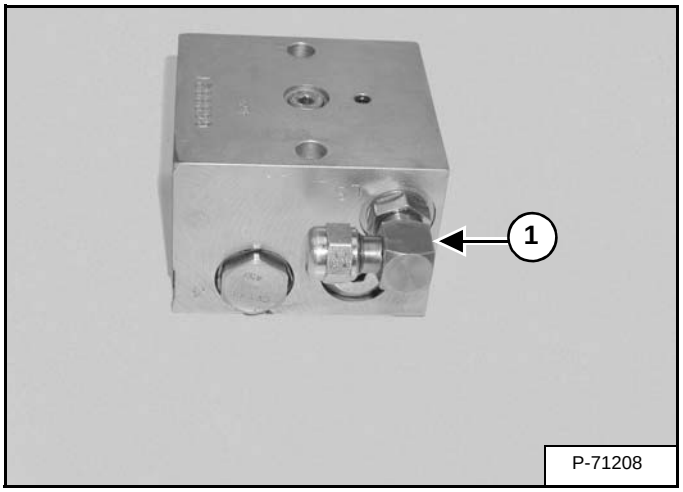
Remove the fitting (Item 1) **[Figure 20-210-26]**.

Figure 20-210-27



Remove the O-ring (Item 1) **[Figure 20-210-27]** from the fitting.

Figure 20-210-28

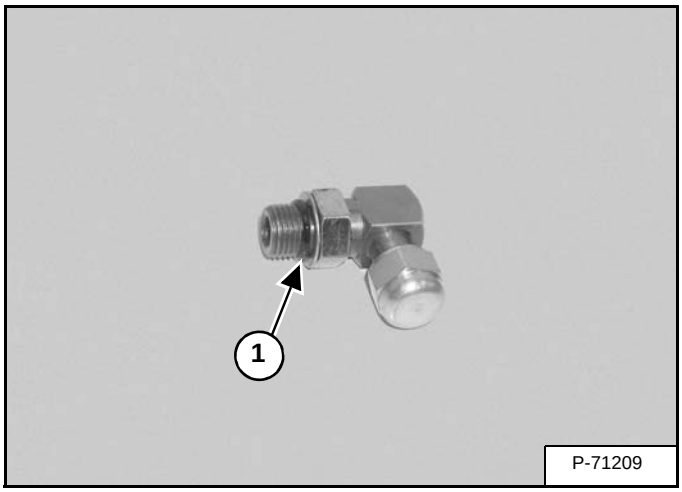


Remove the fitting (Item 1) **[Figure 20-210-28]**.

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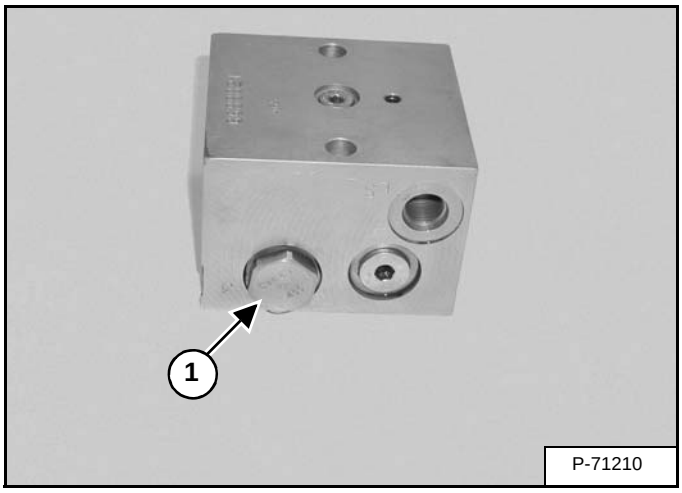
Disassembly (Cont'd)

Figure 20-210-29



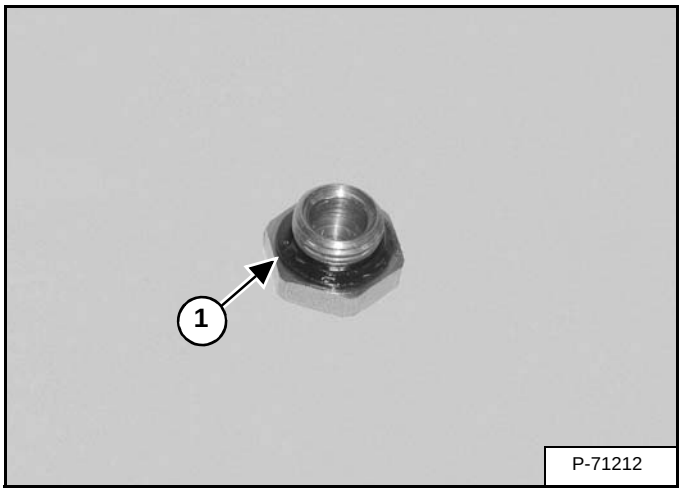
Remove the O-ring (Item 1) **[Figure 20-210-29]** from the fitting.

Figure 20-210-30



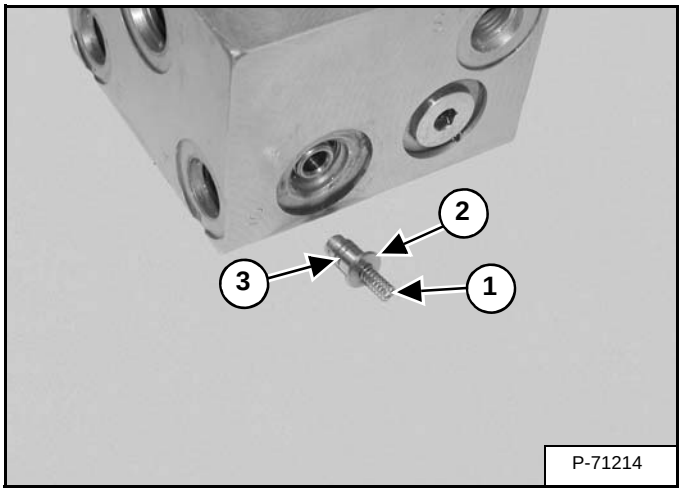
Remove the plug (Item 1) **[Figure 20-210-30]**.

Figure 20-210-31



Remove the O-ring (Item 1) **[Figure 20-210-31]** from the plug.

Figure 20-210-32

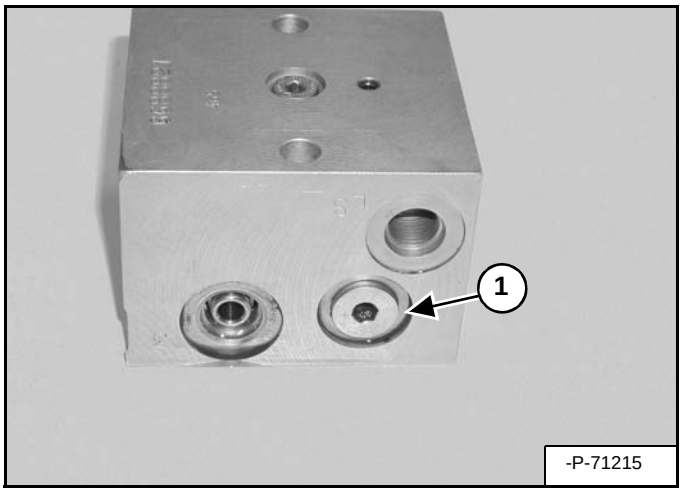


Remove the spring (Item 1), flat washer (Item 2) and poppet (Item 3) **[Figure 20-210-32]**.

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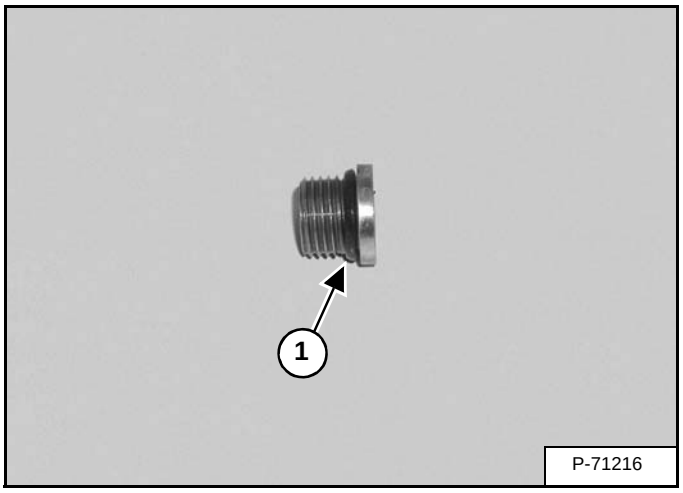
Disassembly (Cont'd)

Figure 20-210-33



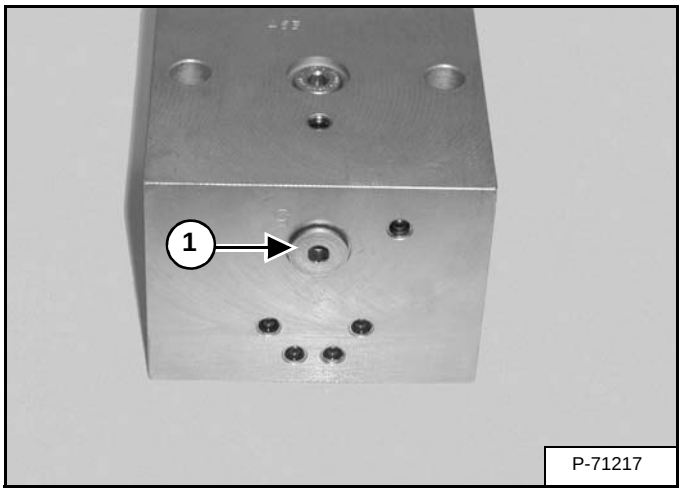
Remove the plug (Item 1) **[Figure 20-210-33]**.

Figure 20-210-34



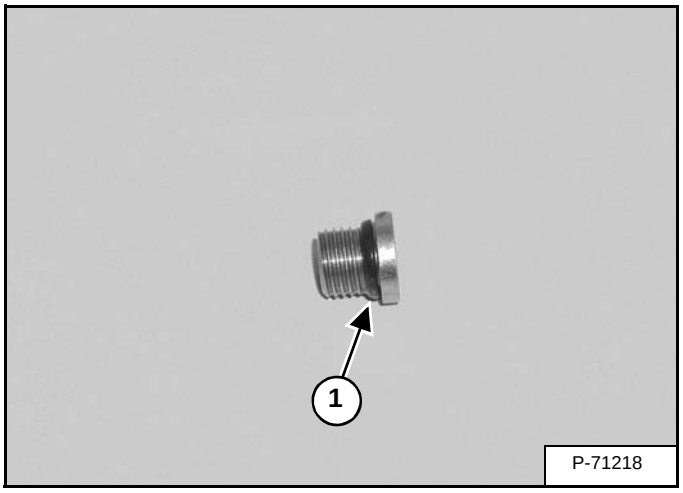
Remove the O-ring (Item 1) **[Figure 20-210-34]** from the plug.

Figure 20-210-35



Remove the plug (Item 1) **[Figure 20-210-35]**.

Figure 20-210-36

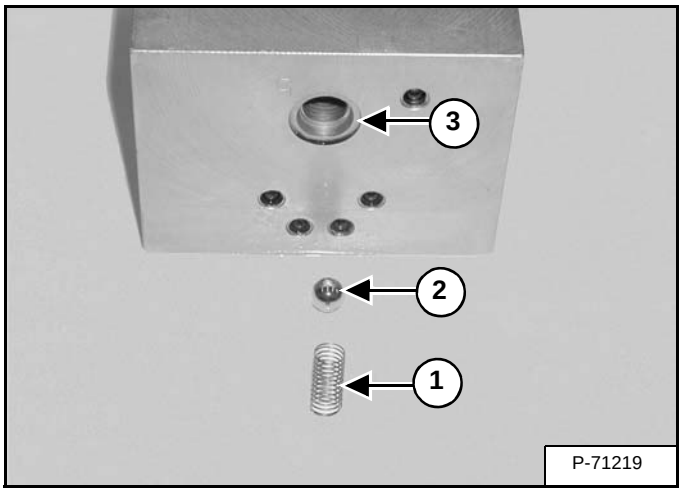


Remove the O-ring (Item 1) **[Figure 20-210-36]** from the plug.

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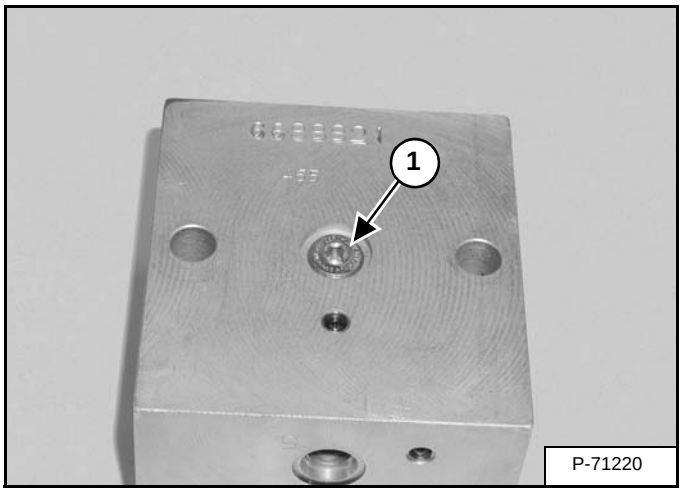
Disassembly (Cont'd)

Figure 20-210-37



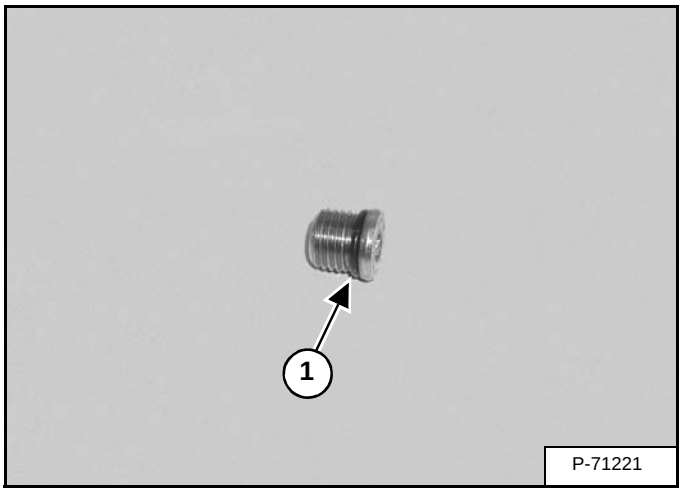
Remove the spring (Item 1) and ball (Item 2) from port 5 (Item 3) **[Figure 20-210-37]**.

Figure 20-210-38



Remove the plug (Item 1) **[Figure 20-210-38]**.

Figure 20-210-39



Remove the O-ring (Item 1) **[Figure 20-210-39]** from the plug.

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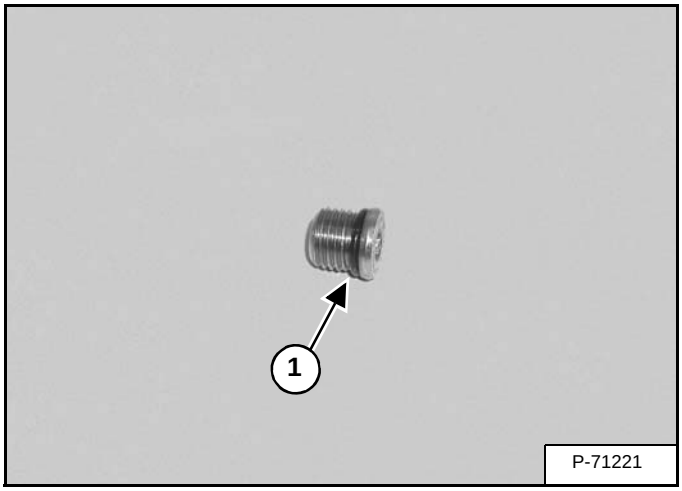
Assembly

Clean all parts in solvent and dry with compressed air.

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

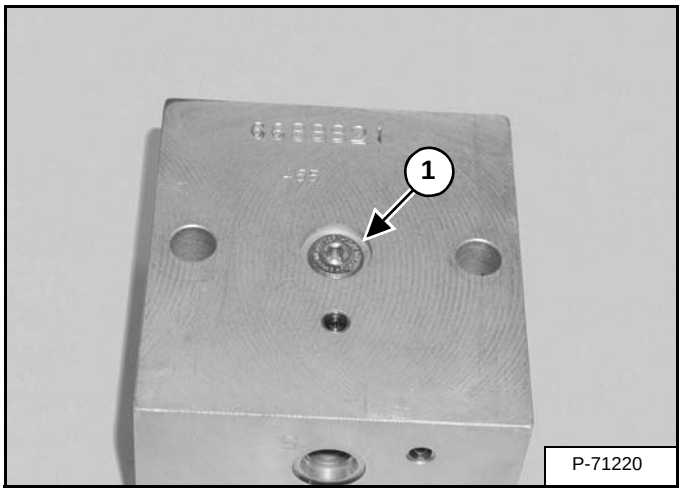
Always install new seals and O-rings. Lubricate all seals and O-rings with clean hydraulic fluid before installation.

Figure 20-210-40



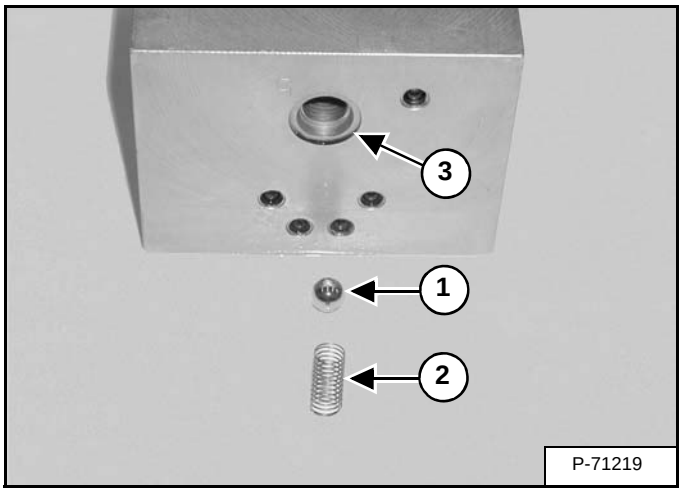
Install the O-ring (Item 1) **[Figure 20-210-40]** on the plug.

Figure 20-210-41



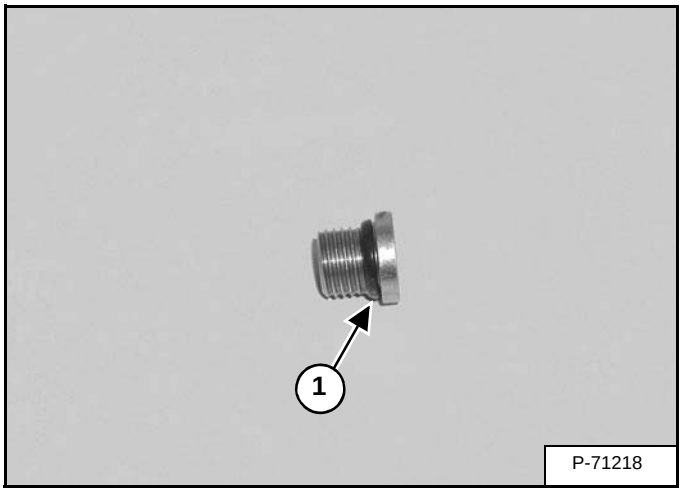
Install the plug (Item 1) **[Figure 20-210-41]**.

Figure 20-210-42



Install the ball (Item 1) and spring (Item 2) into port 5 (Item 3) **[Figure 20-210-42]**.

Figure 20-210-43

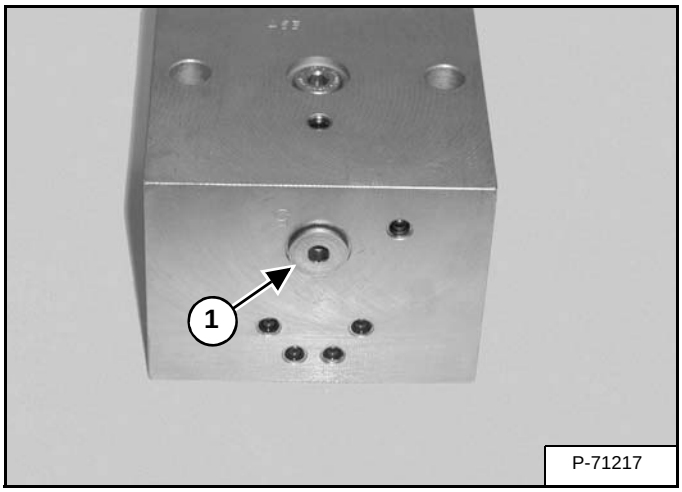


Install the O-ring (Item 1) **[Figure 20-210-43]** on the plug.

https://www.pdfmanual4trucks.com/

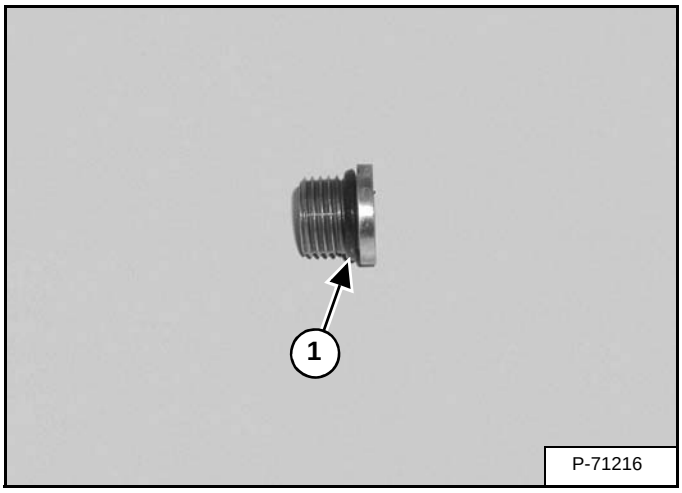
Assembly (Cont'd)

Figure 20-210-44



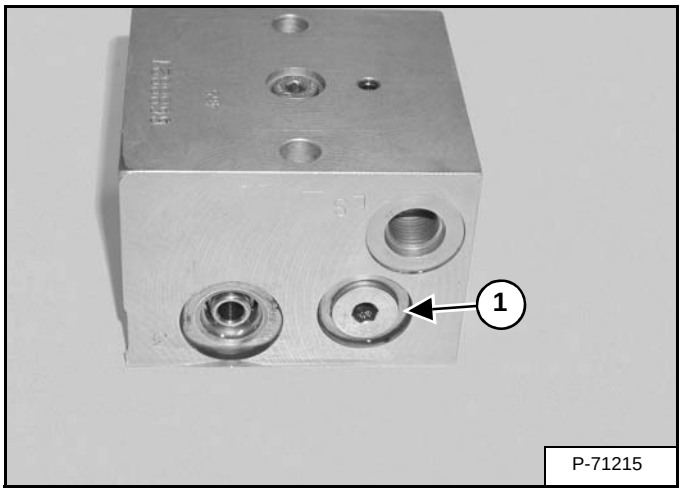
Install the plug (Item 1) **[Figure 20-210-44]**.

Figure 20-210-45



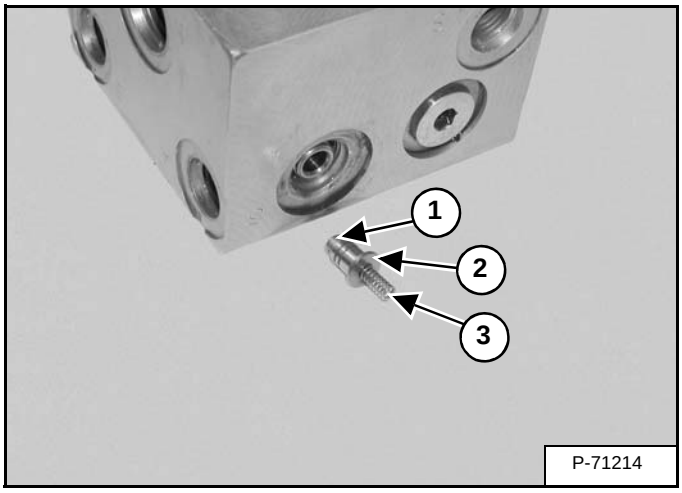
Install the O-ring (Item 1) **[Figure 20-210-45]** on the plug.

Figure 20-210-46



Install the plug (Item 1) **[Figure 20-210-46]**.

Figure 20-210-47

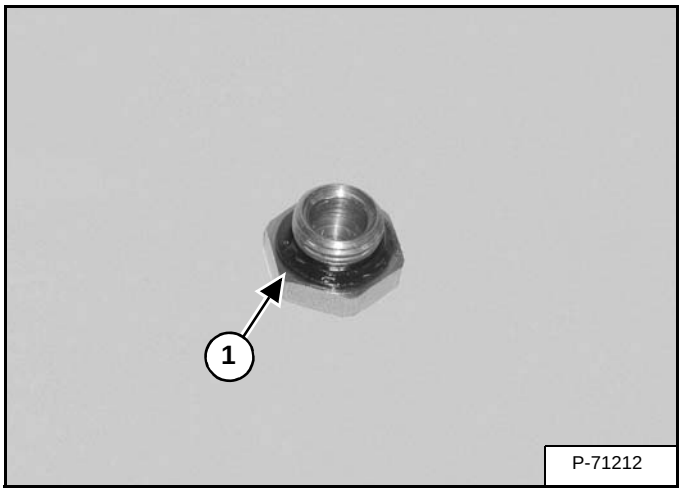


Install the poppet (Item 1), flat washer (Item 2) and spring (Item 3) **[Figure 20-210-47]**.

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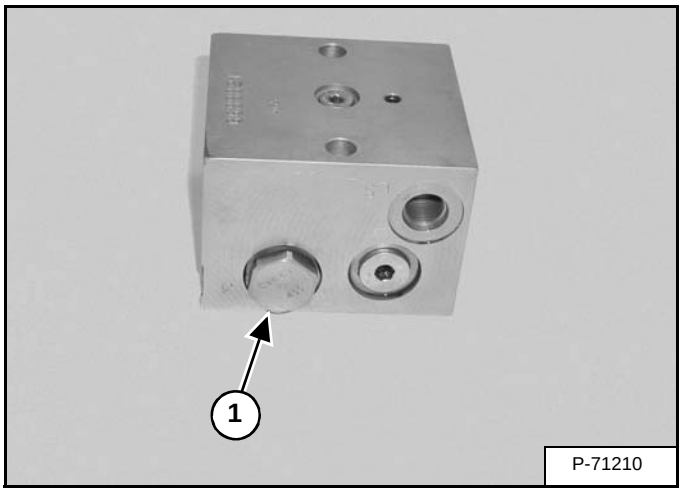
Assembly (Cont'd)

Figure 20-210-48



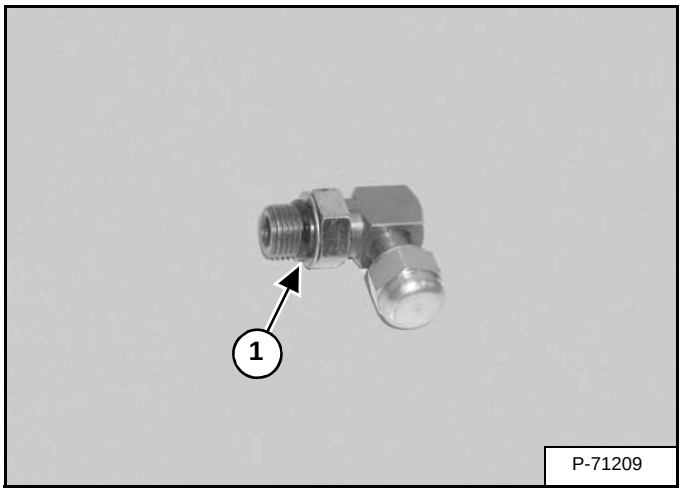
Install the O-ring (Item 1) **[Figure 20-210-48]**.

Figure 20-210-49



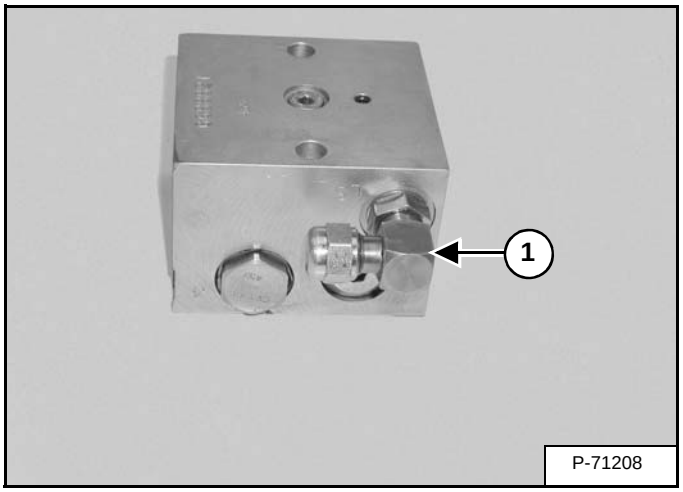
Install the plug (Item 1) **[Figure 20-210-49]**.

Figure 20-210-50



Install the O-ring (Item 1) **[Figure 20-210-50]** on the fitting.

Figure 20-210-51

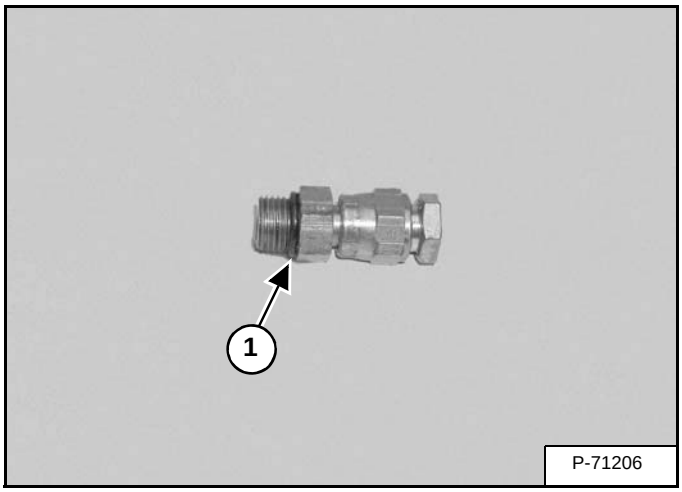


Install the fitting (Item 1) **[Figure 20-210-51]**.

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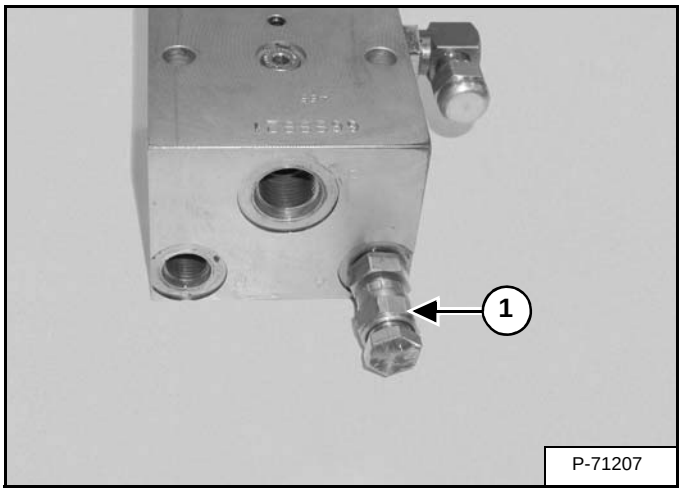
Assembly (Cont'd)

Figure 20-210-52



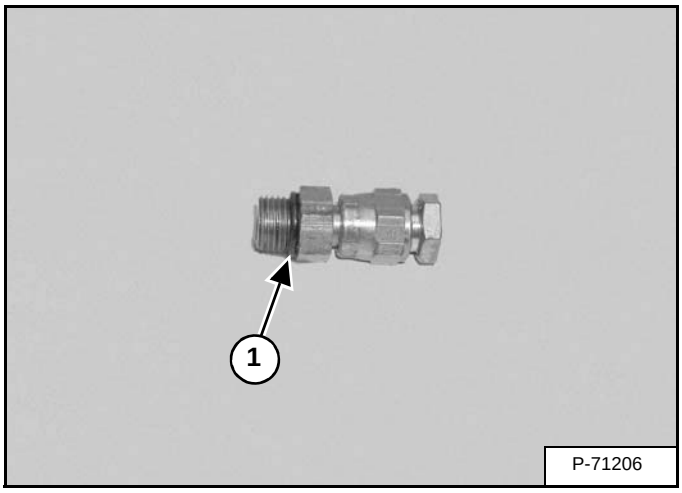
Install the O-ring (Item 1) **[Figure 20-210-52]** on the fitting.

Figure 20-210-53



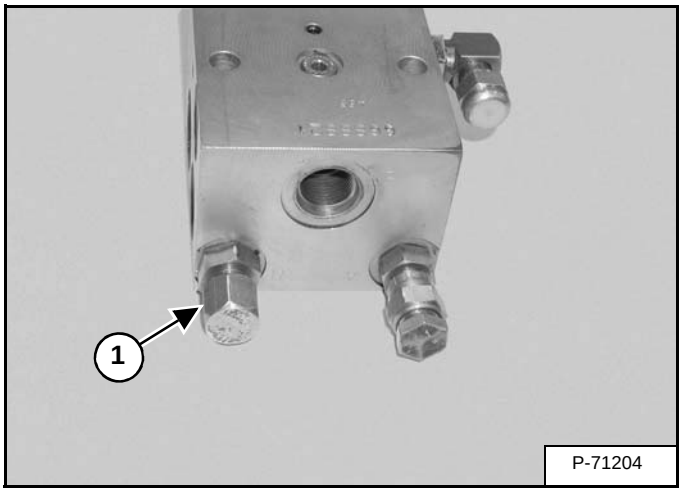
Install the fitting (Item 1) **[Figure 20-210-53]**.

Figure 20-210-54



Install the O-ring (Item 1) **[Figure 20-210-54]** on the fitting.

Figure 20-210-55

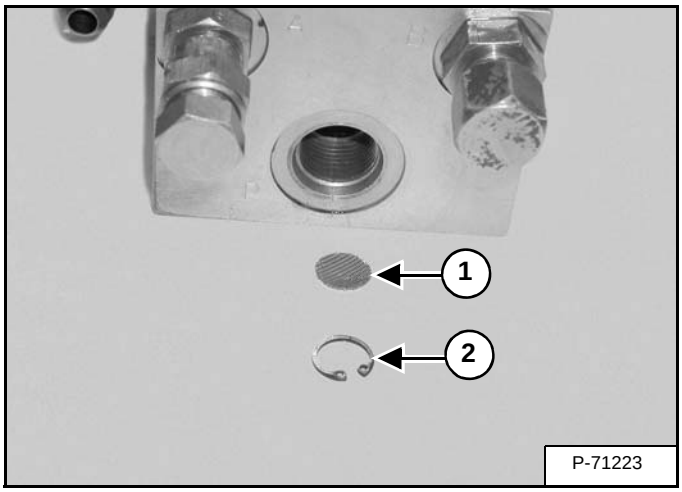


Install the fitting (Item 1) **[Figure 20-210-55]**.

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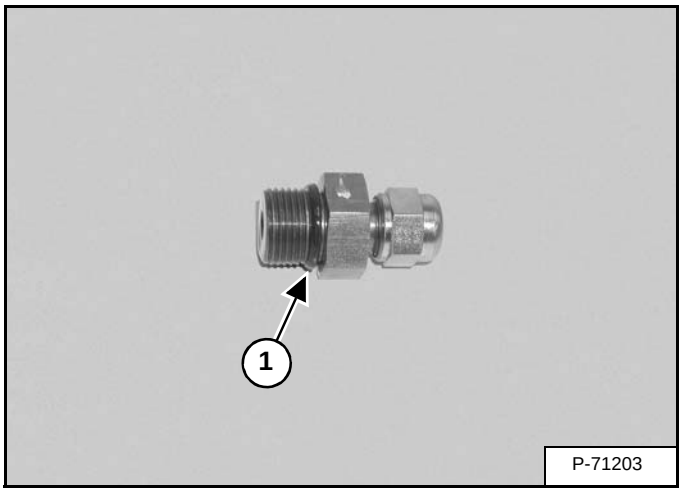
Assembly (Cont'd)

Figure 20-210-56



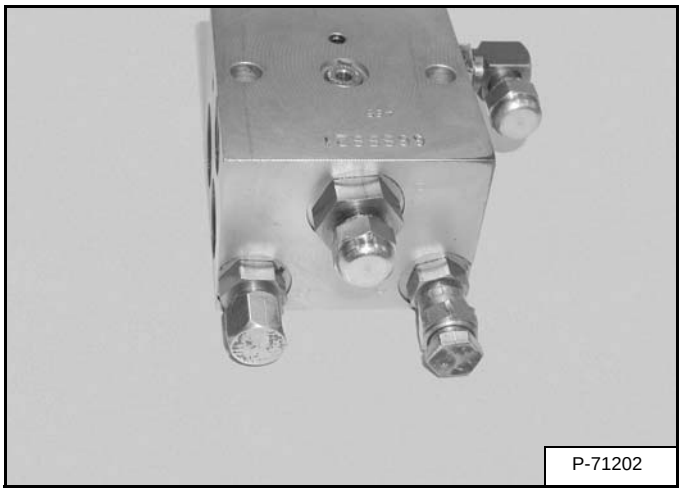
Install the screen (Item 1) and the snap ring (Item 2) **[Figure 20-210-56]** into the "S" port.

Figure 20-210-57



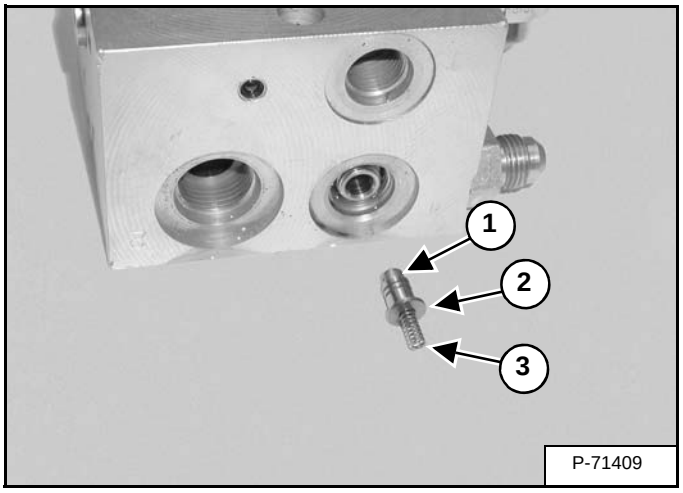
Install the O-ring (Item 1) **[Figure 20-210-57]** on the fitting.

Figure 20-210-58



Install the fitting (Item 1) **[Figure 20-210-58]**.

Figure 20-210-59

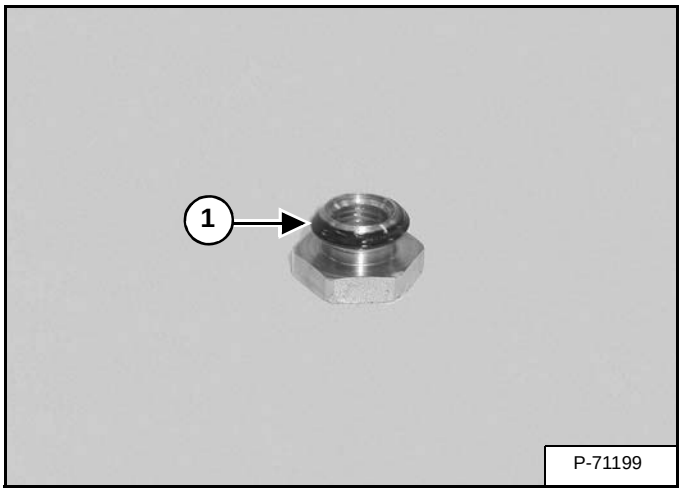


Install the poppet (Item 1), flat washer (Item 2) and spring (Item 3) **[Figure 20-210-59]**.

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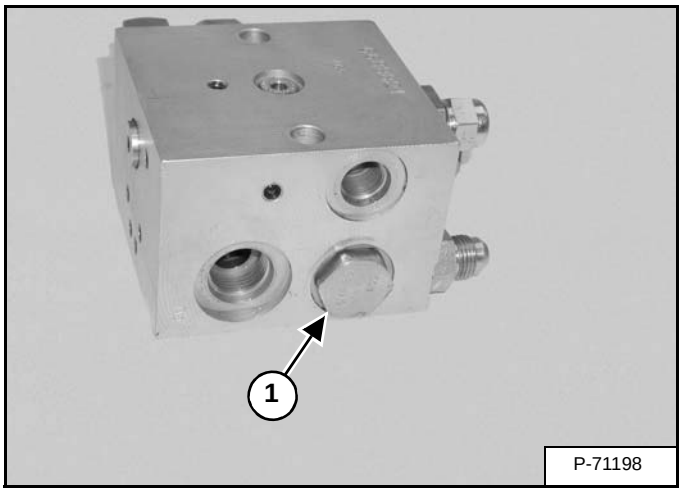
Assembly (Cont'd)

Figure 20-210-60



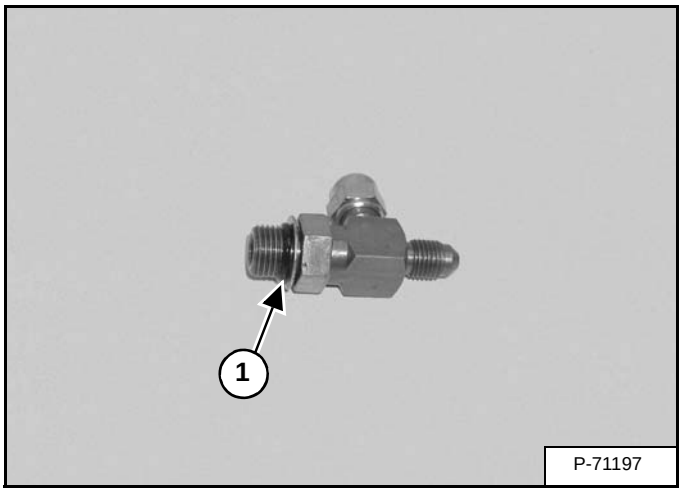
Install the O-ring (Item 1) **[Figure 20-210-60]** on the plug.

Figure 20-210-61



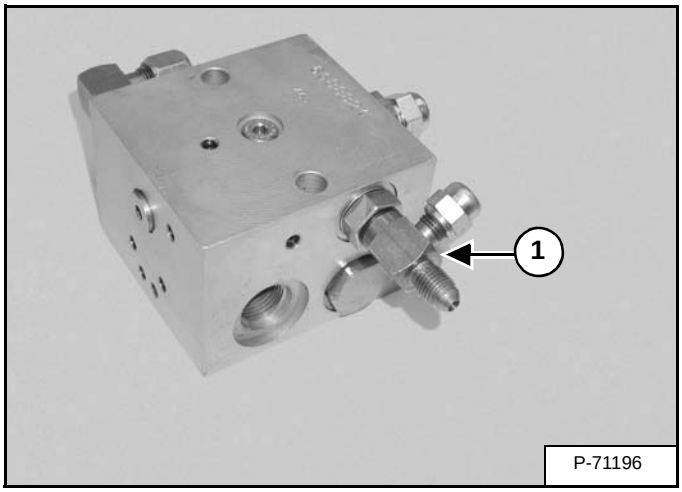
Install the plug (Item 1) **[Figure 20-210-61]**.

Figure 20-210-62



Install the O-ring (Item 1) **[Figure 20-210-62]** on the fitting.

Figure 20-210-63

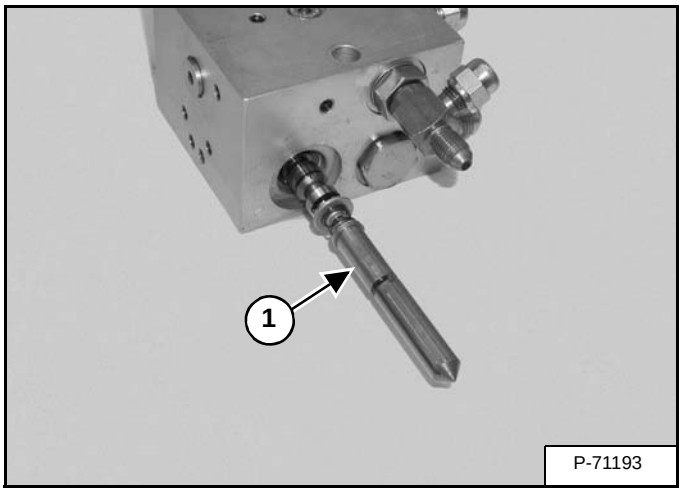


Install the fitting (Item 1) **[Figure 20-210-63]**.

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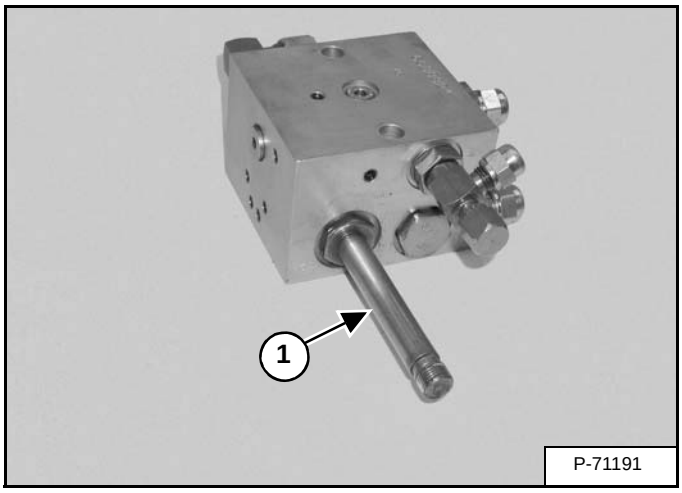
Assembly (Cont'd)

Figure 20-210-64



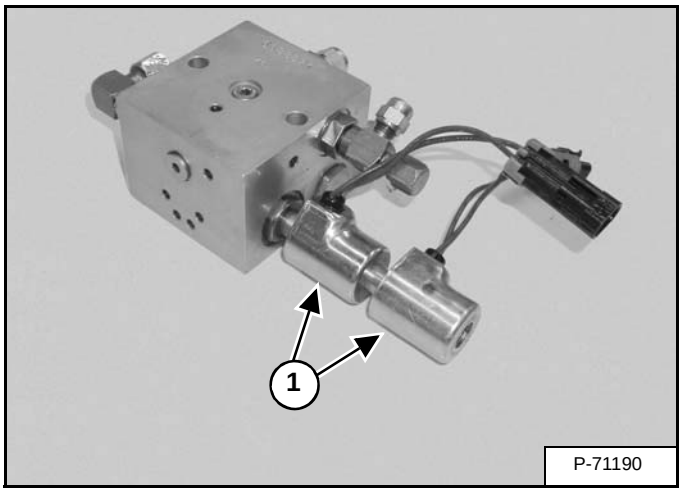
Install the actuator assembly (Item 1) **[Figure 20-210-64]**.

Figure 20-210-65



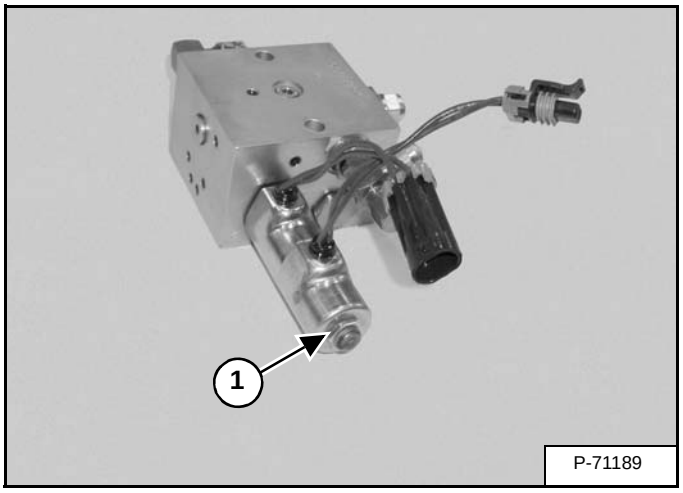
Install the spool (Item 1) **[Figure 20-210-65]**.

Figure 20-210-66



Install the solenoids (Item 1) **[Figure 20-210-66]**.

Figure 20-210-67



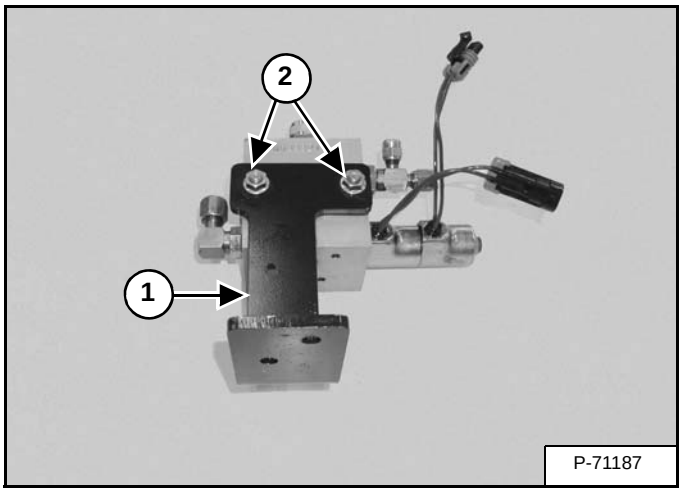
Install the nut (Item 1) **[Figure 20-210-67]**.

Do not overtighten.

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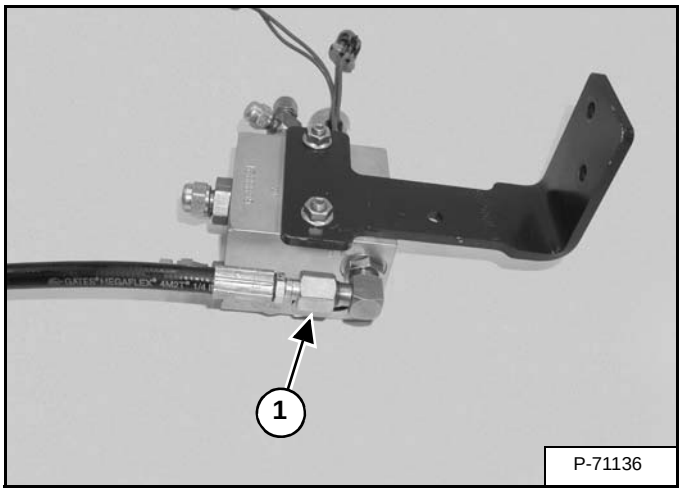
Assembly (Cont'd)

Figure 20-210-68



Install the mount bracket (Item 1), 2 bolts and 2 nuts (Item 2) **[Figure 20-210-68]**.

Figure 20-210-69



Install the hose (Item 1) **[Figure 20-210-69]**.

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HYDROSTATIC SYSTEM

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Removal And Installation 30-41-3

DRIVE BELT SHIELD 30-40-1
Removal And Installation 30-40-1

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Relief/Replenishing Valve Location 30-10-3
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HYDROSTATIC SYSTEM INFORMATION

Troubleshooting Chart

The following troubleshooting chart is provided for assistance in locating and correcting problems which are most common.

WARNING

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

W-2004-12858

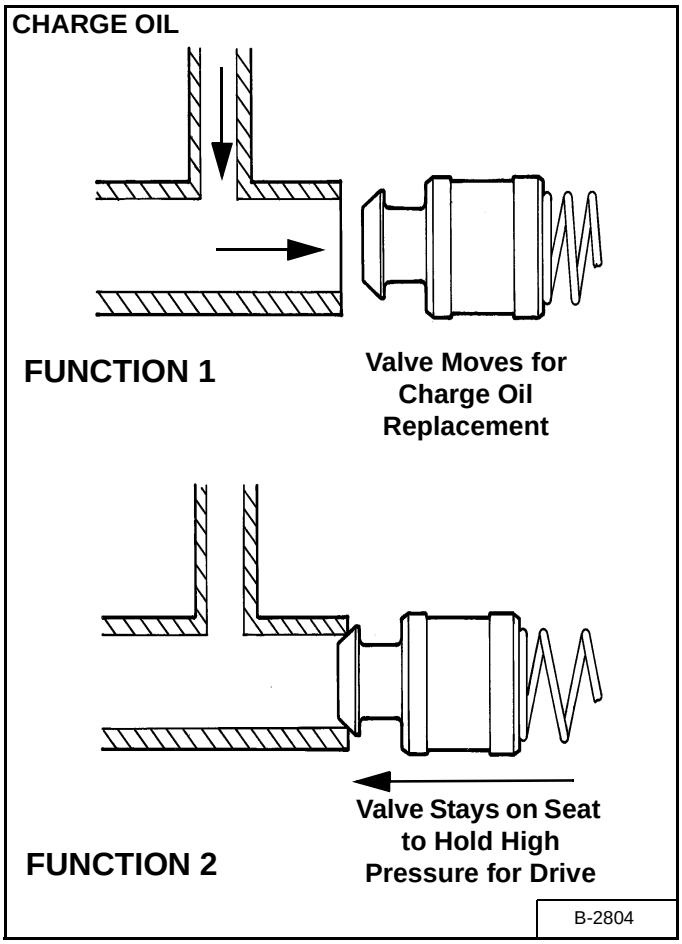
PROBLEM	CAUSE
No drive on one side, in one direction.	1, 2
No drive on one side in both directions.	2, 3, 4
The excavator does not move in a straight line.	2, 3, 4
The hydrostatic system is overheating.	5, 6, 7, 8
Service code 05-09 appears. (Warnings, low charge pressure.)	5, 8, 9, 10, 11

KEY TO CORRECT THE CAUSE
1. The hydrostatic pump replenishing valves not seating.
2. The steering linkage needs adjustment.
3. The hydrostatic pump has damage.
4. The travel motor has damage.
5. The hydraulic fluid is not at the correct level.
6. The oil cooler has a restriction.
7. The temperature sending switch is not operating correctly.
8. The excavator is not being operated at the correct RPM.
9. The hydraulic charge pressure sender is defective.
10. Pump is defective or worn hydrostatics.
11. Hydraulic filter is plugged.

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Relief/Replenishing Valve Function

Figure 30-10-1



The functions of the relief/replenishing valves are:

1. To give replacement fluid to the low pressure side of the hydrostatic circuit. Replacement fluid is needed because of normal internal leakage and the controlled flow to the oil cooler for cooling; Function 1 **[Figure 30-10-1]**.

2. To keep high pressure fluid out of the low pressure side of the hydrostatic circuitry; Function 2 **[Figure 30-10-1]**.

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Relief/Replenishing Valve Location

There are four 5076 PSI (350 bar) relief/replenishing valves on the hydrostatic pump.

Figure 30-10-2

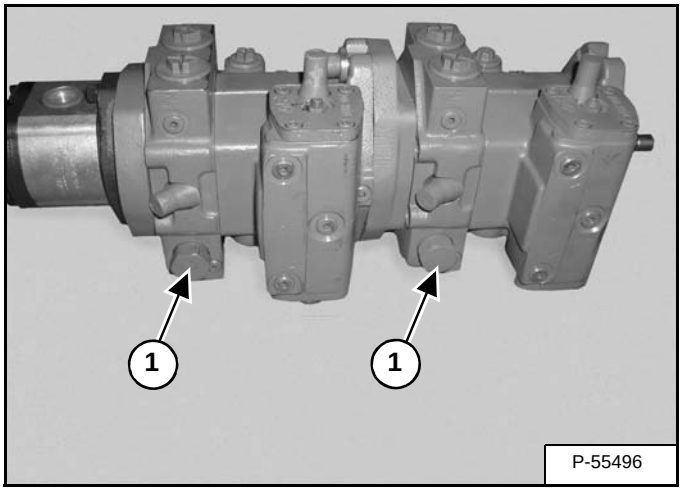
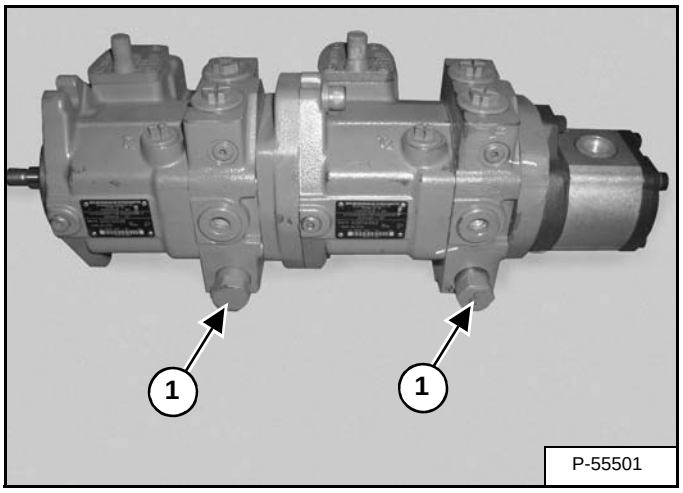


Figure 30-10-3

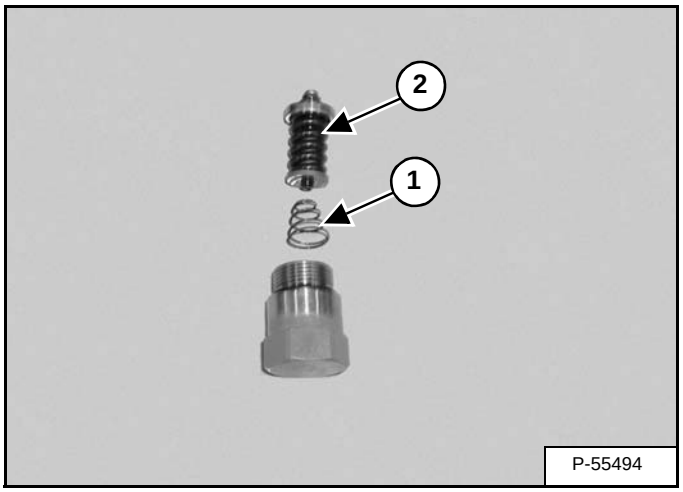


2 valves (Item 1) **[Figure 30-10-2]** are located on the front of the pump, and 2 valves (Item 1) **[Figure 30-10-3]** are located on the back of the pump.

NOTE: The hydrostatic pump is shown removed from the excavator for photo clarity.

Relief/Replenishing Valve Removal And Installation

Figure 30-10-4



Remove the plug (Item 1) **[Figure 30-10-2]** & **[Figure 30-10-3]**.

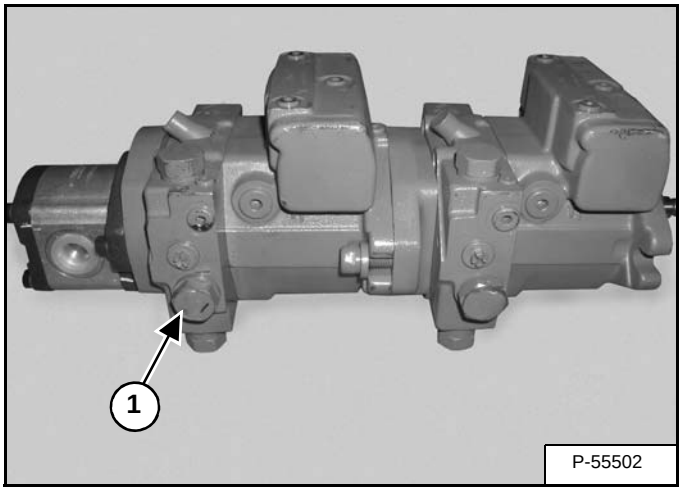
Remove the spring (Item 1) and relief valve assembly (Item 2) **[Figure 30-10-4]**.

Installation: The spring (Item 1) must be retained on the relief valve assembly (Item 2) **[Figure 30-10-4]** before installing the valve assembly in the pump.

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Charge Pressure Relief Valve Removal And Installation

Figure 30-10-5



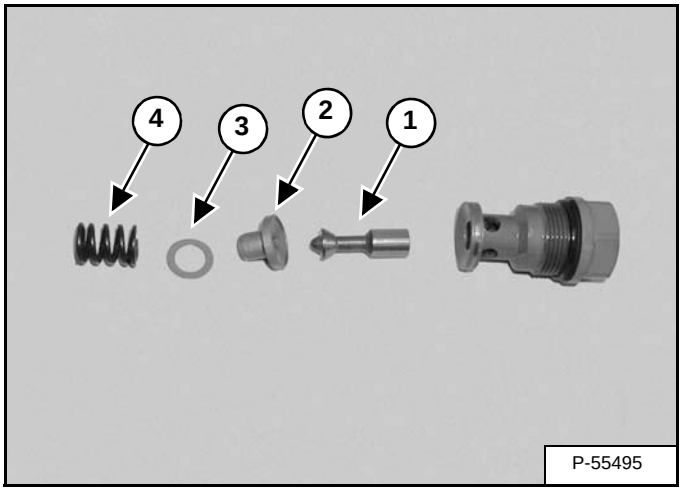
There is 1 220 PSI (15,2 bar) charge pressure relief valve (Item 1) **[Figure 30-10-5]** located on the bottom of the hydrostatic pump.

NOTE: The hydrostatic pump is shown removed from the excavator for photo clarity.

Remove the plug (Item 1) **[Figure 30-10-5]**.

Charge Pressure Relief Valve Disassembly And Assembly

Figure 30-10-6



Remove the spool (Item 1), spring seat (Item 2), shim (Item 3), and spring (Item 4) **[Figure 30-10-6]**.

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TRAVEL PILOT PRESSURE

Description

The fan/charge pump supplies hydraulic fluid to the manifold assembly. The pilot pressure solenoid is controlled by the Bobcat controller and the solenoid is varied by the controller depending on engine RPM.

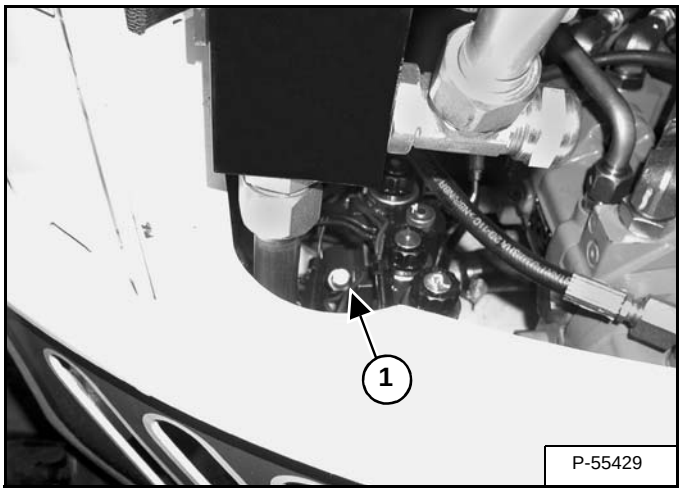
Testing

The C1 port measures pilot pressure sent from the manifold to the travel controller, while the M port measures pilot pressure sent from the travel controller to the hydrostatic pump. The pressure must be the same on both ports.

Pilot pressure is only seen at the M port when a travel lever is engaged.

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

Figure 30-20-1



Open right side cover and locate the C1 port (Item 1) **[Figure 30-20-1]** on the manifold.

Install a 500 PSI (35 bar) gauge on the diagnostic port.

Figure 30-20-2

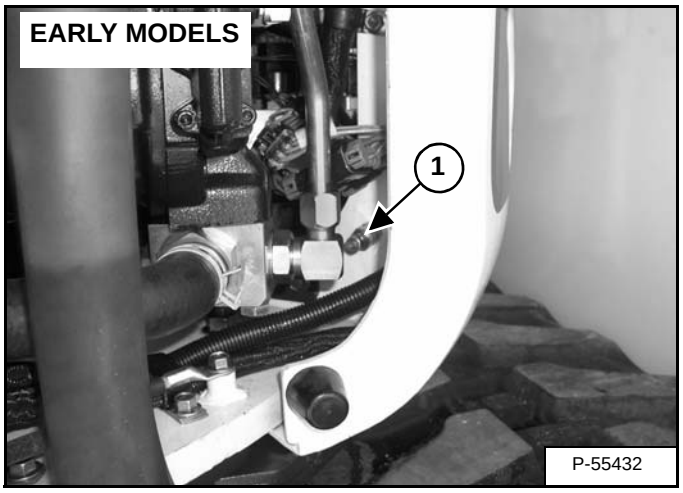
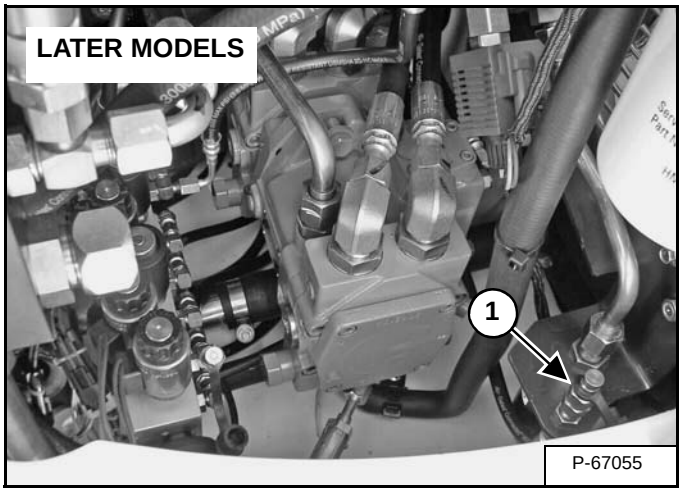


Figure 30-20-3



EARLY MODELS: Open the tailgate and locate the M port (Item 1) **[Figure 30-20-2]**.

LATER MODELS: Open the right side cover and locate the M port (Item 1) **[Figure 30-20-3]**.

Install a 500 PSI (35 bar) gauge on the diagnostic port.

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TRAVEL PILOT PRESSURE (CONT'D)

Testing (Cont'd)

Figure 30-20-4

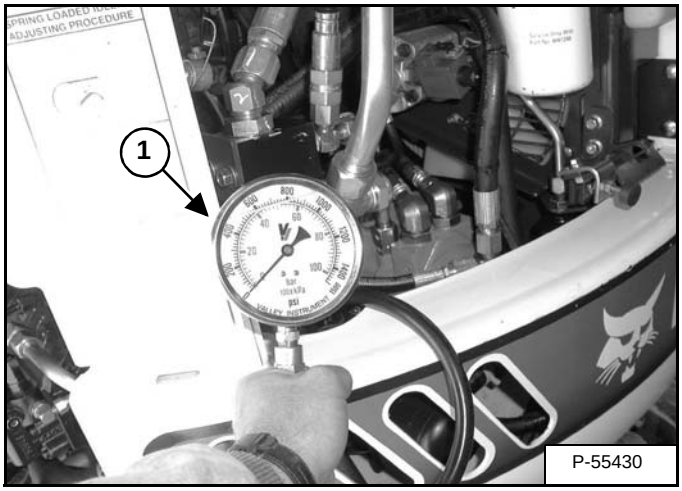
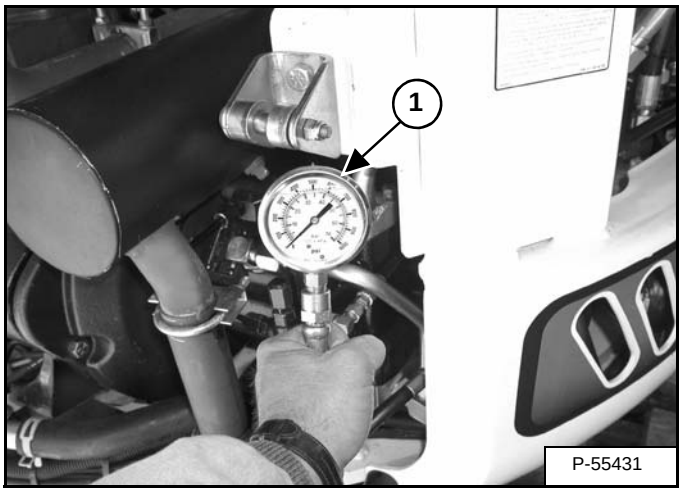


Figure 30-20-5



The pressure readings at the gauge on the C1 port (Item 1) **[Figure 30-20-4]** and M Port (Item 1) **[Figure 30-20-5]** are measured at 3 different engine RPM.

NOTE: Early model M port location shown in photo. For location of later model M port, see [Figure 30-20-3].

Use Controller HPC1 setting only (with version 41 or higher software) when performing this test.

NOTE: Reset the controller to HPC1 setting prior to performing this test.

Start the engine. Engage the engine RPM function on the control panel. Fully engage the right travel lever in the forward travel direction. Check the gauge pressures at the following engine RPM.

NOTE: The travel levers must be stroked before pressure at the M port can be measured.

Engine RPM	C1 Port Pressure	M Port Pressure
less than 1000	250 PSI (17,2 bar)	250 PSI (17,2 bar)
1000 to 2250	250 to 290 PSI (17,2 to 20 bar)	250 to 290 PSI (17,2 to 20 bar)
2250 to 2700	290 to 380 PSI (20 to 26,2 bar)	290 to 360 PSI (20 to 24,8 bar) NOTE: The travel control valve limits the M port to 360 PSI (24,8 bar) max. pressure

NOTE: At approximately 300 PSI (20,7 bar), the M port pressure will start to become slightly less than the C1 port.

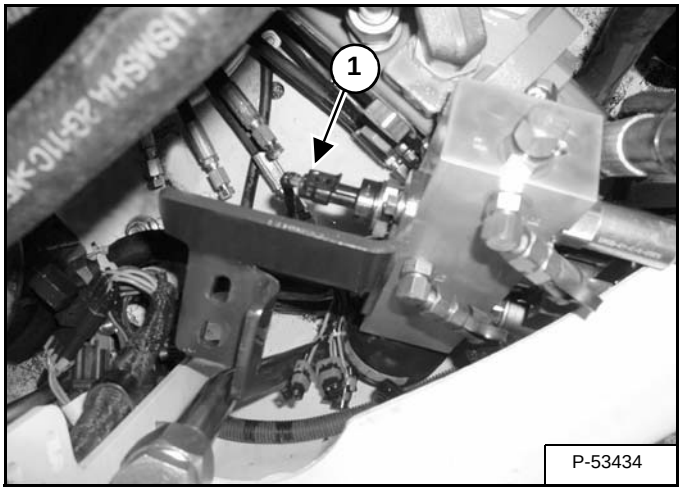
Repeat the procedure for the reverse travel direction.

Repeat the procedure for the left travel lever in both the forward and reverse travel directions.

If the C1 and M pressures are equal, but lower than allowed, verify the engine RPM is correct. If the engine RPM is correct check and adjust the pressure reducing valve.

NOTE: The pressures should be the same on both the left and right travel levers when stroked in both the forward and reverse directions. Adjust linkage until the pressures are the same.

Figure 30-20-6



Low pressure could also be cause by a faulty charge pressure sender (Item 1) **[Figure 30-20-6]** located on the bottom of the manifold assembly.

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HYDROSTATIC PUMP

Removal And Installation

Remove the cooling fan. (See Removal And Installation on Page 20-180-2)

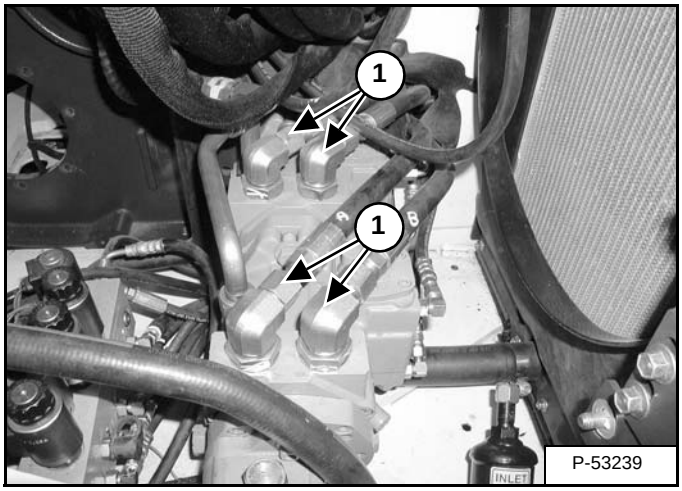
Remove the engine. (See Removal And Installation on Page 70-60-1.)

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.

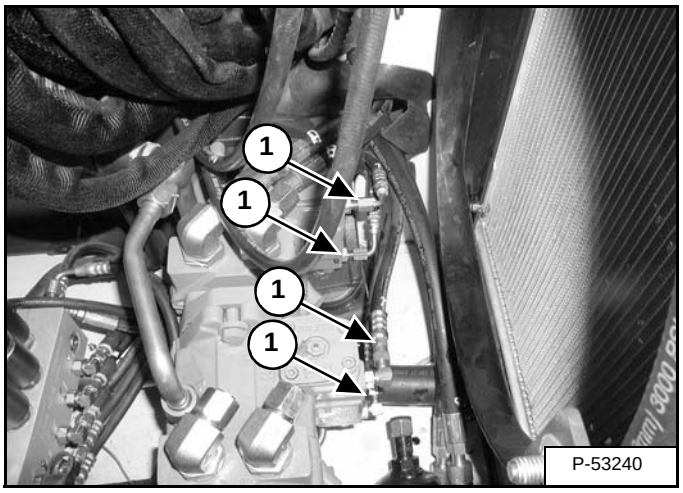
I-2003-0888

Figure 30-30-1



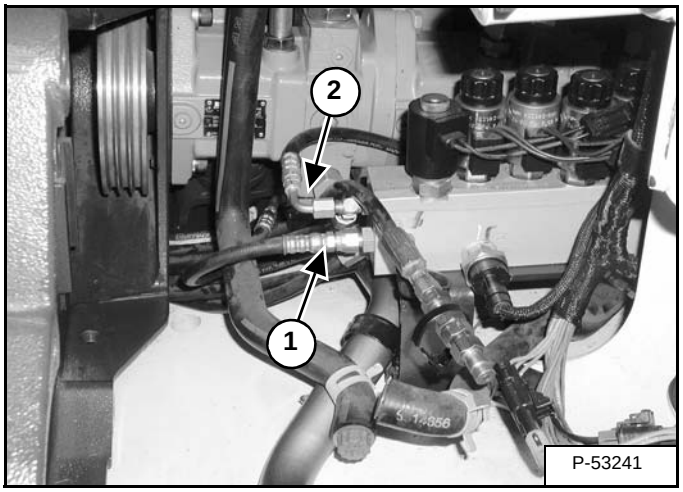
Mark and remove the hoses (Item 1) **[Figure 30-30-1]** from the top of the pump.

Figure 30-30-2



Remove the hoses (Item 1) **[Figure 30-30-2]** from the front of the pump.

Figure 30-30-3

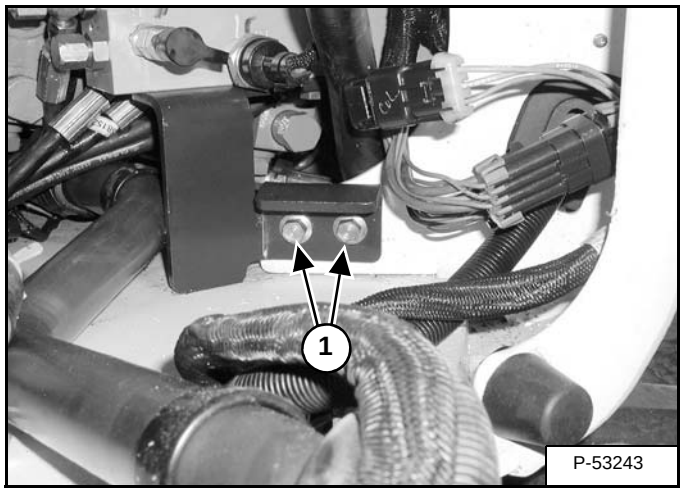


Remove the hose (Item 1) from the manifold. Loosen and turn the hose (Item 2) **[Figure 30-30-3]** down to provide clearance.

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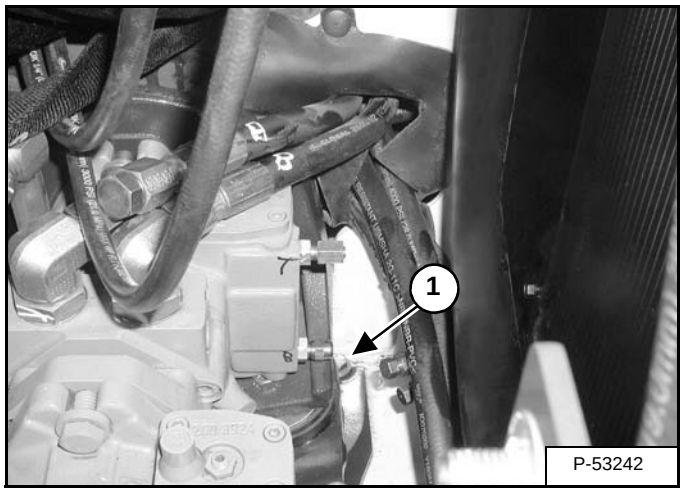
Removal And Installation (Cont'd)

Figure 30-30-4



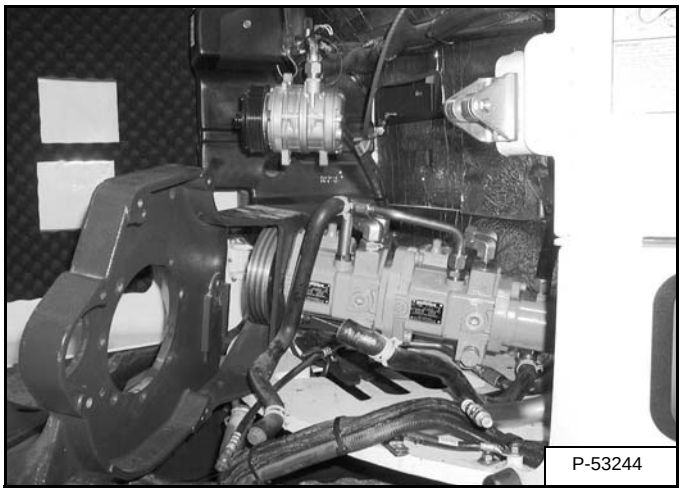
Remove the bolts (Item 1) **[Figure 30-30-4]** and reposition the manifold.

Figure 30-30-5



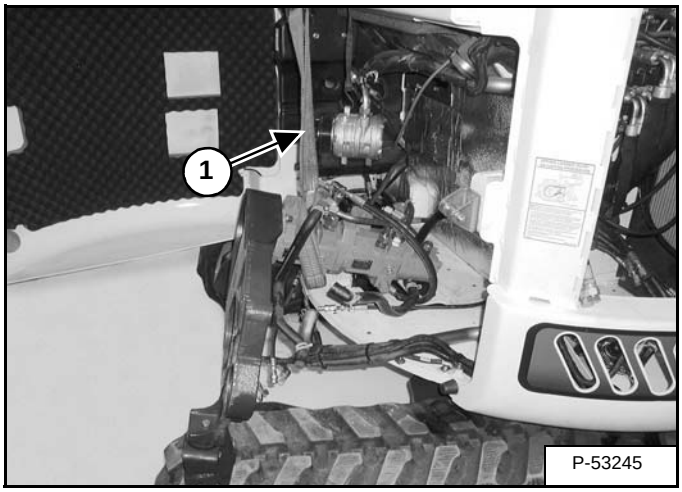
Remove the bolt (Item 1) **[Figure 30-30-5]**.

Figure 30-30-6



Slide the pump and mount assembly towards the back of the excavator **[Figure 30-30-6]**.

Figure 30-30-7



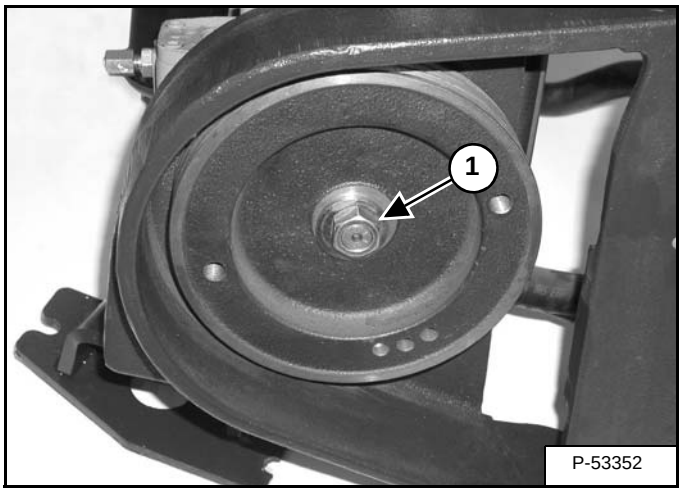
Install a sling (Item 1) **[Figure 30-30-7]** and hoist on the pump and mount assembly.

Remove the pump and mount assembly from the excavator.

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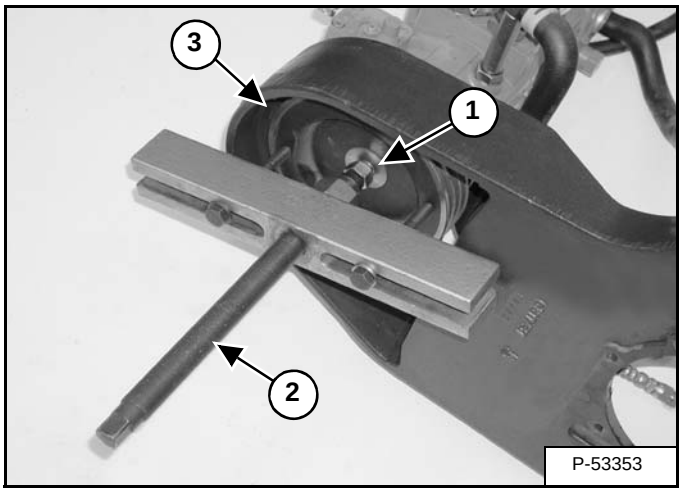
Removal And Installation (Cont'd)

Figure 30-30-8



Remove the nut (Item 1) **[Figure 30-30-8]** and washer.

Figure 30-30-9

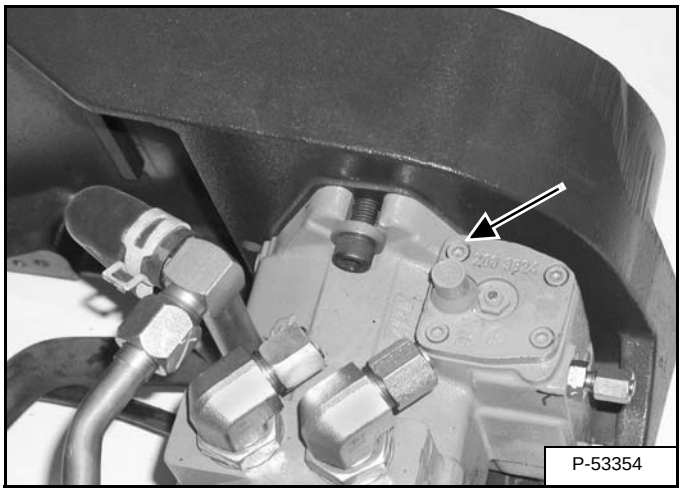


Install the nut (Item 1) to protect the threaded end of the shaft. Install a puller (Item 2) on the pulley (Item 3) **[Figure 30-30-9]**.

Loosen the pulley (Item 3). Remove the puller (Item 2), pulley (Item 3), nut (Item 1) **[Figure 30-30-9]** and key.

Installation: Tighten the nut to 175 to 200 ft.-lb. (237 to 271 N•m) torque.

Figure 30-30-10



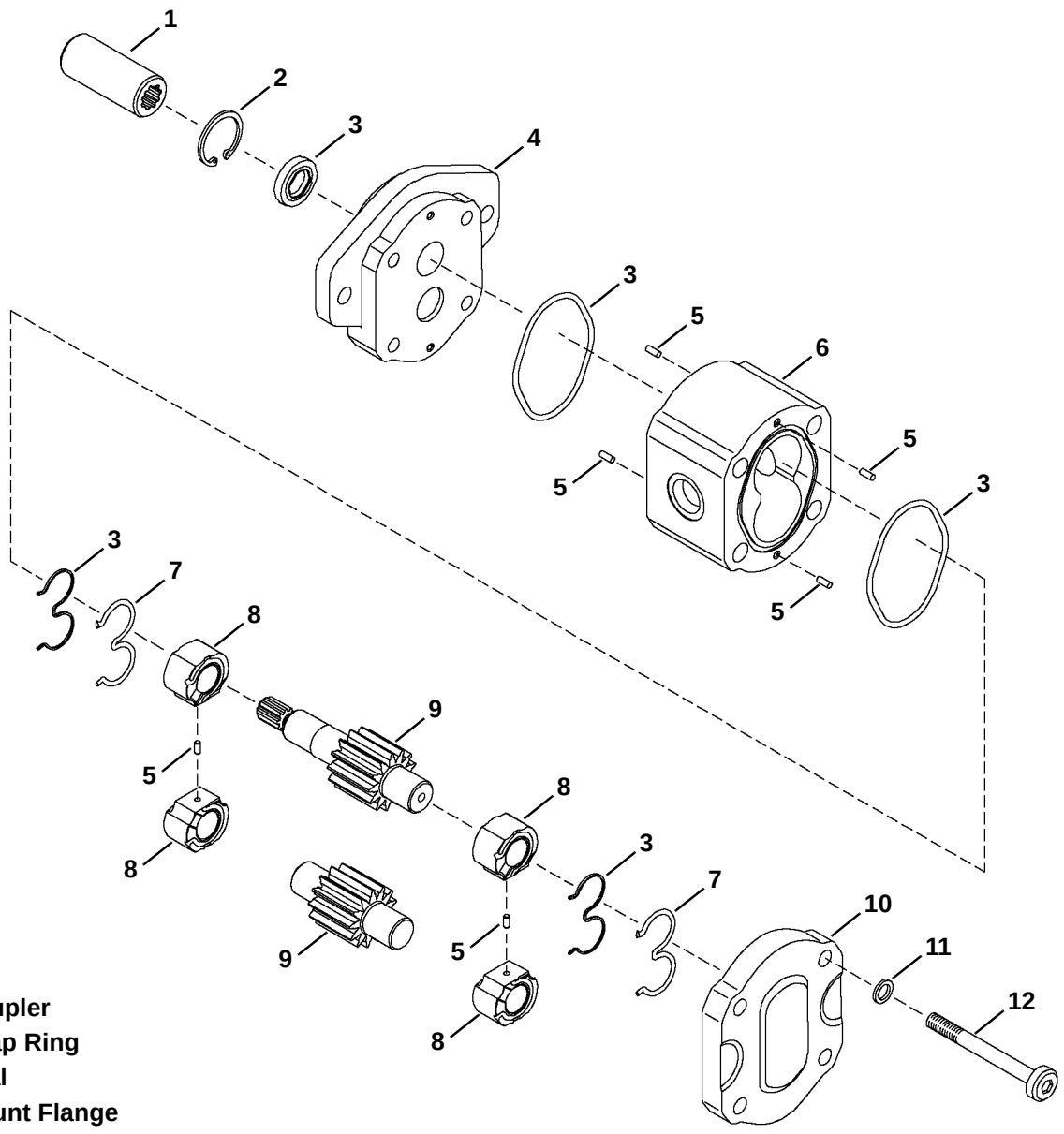
Remove the top and bottom bolts (Item 1) **[Figure 30-30-10]** and washers.

Remove the pump from the mount.

Installation: Tighten the bolts to 65 to 75 ft.-lb. (88 to 95 N•m) torque.

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Fan/Charge Pump Parts Identification



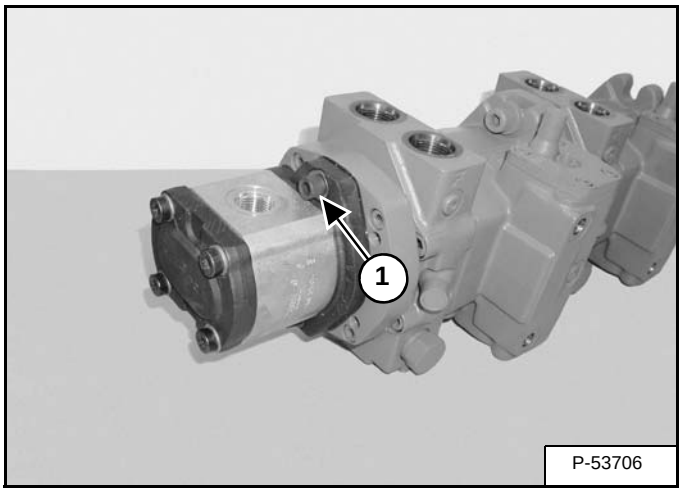
1. Coupler
2. Snap Ring
3. Seal
4. Mount Flange
5. Pin
6. Housing
7. Back-up Ring
8. Bearing
9. Gear
10. End Cap
11. Washer
12. Bolt

MS

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Fan/Charge Pump Disassembly And Assembly

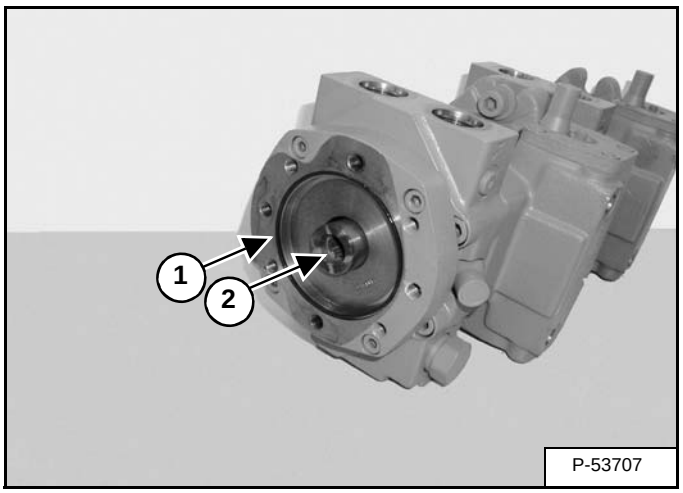
Figure 30-30-11



Remove the 2 bolts (Item 1) **[Figure 30-30-11]** and washers.

Remove the pump.

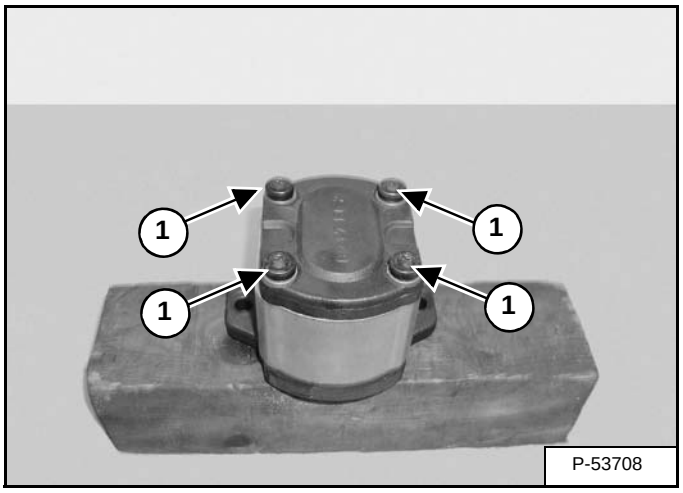
Figure 30-30-12



Remove the O-ring (Item 1) and coupler (Item 2) **[Figure 30-30-12]**.

Mark the end cap, housing, and mounting flange for ease of assembly.

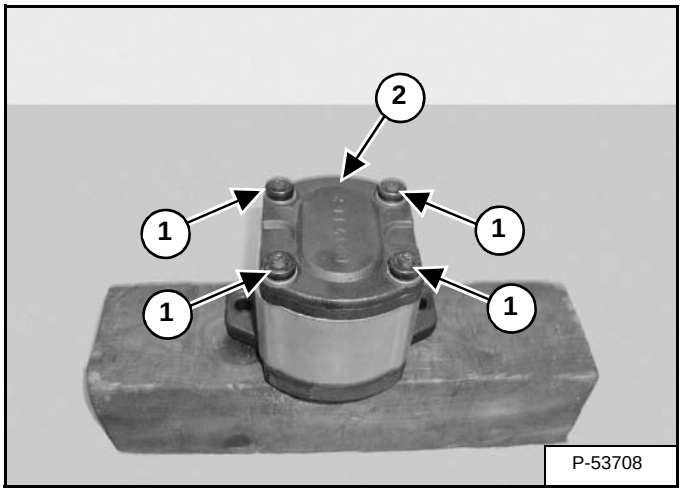
Figure 30-30-13



Loosen the bolts (Item 1) **[Figure 30-30-13]**.

Installation: Tighten the bolts to 45 to 48 ft.-lb. (60 to 65 N•m) torque.

Figure 30-30-14

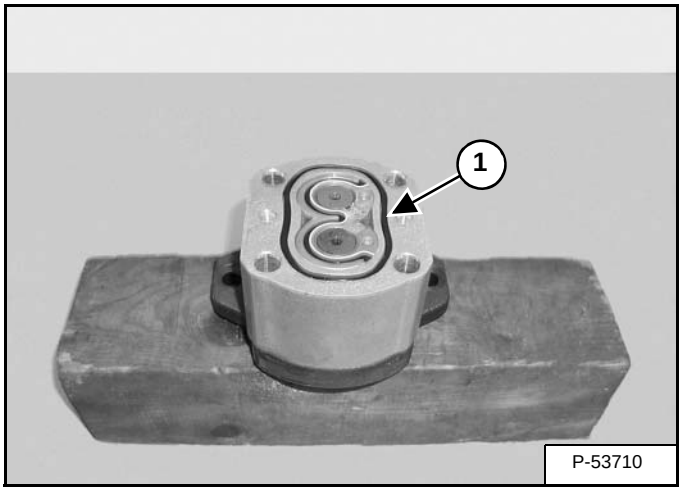


Remove the bolts (Item 1) and end cap (Item 2) **[Figure 30-30-14]**.

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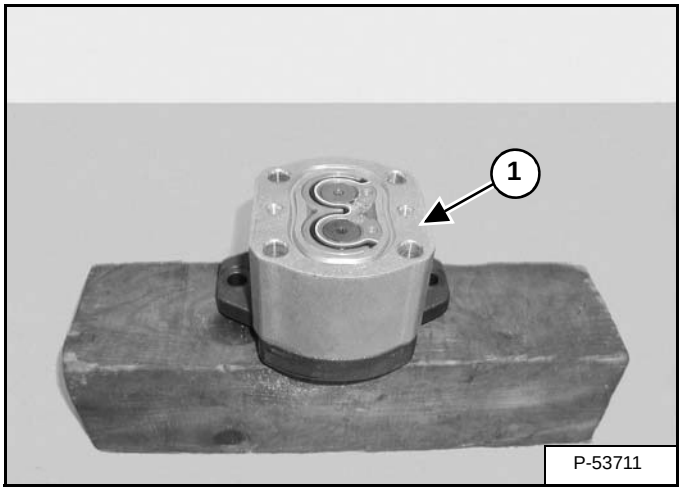
Fan/Charge Pump Disassembly And Assembly (Cont'd)

Figure 30-30-15



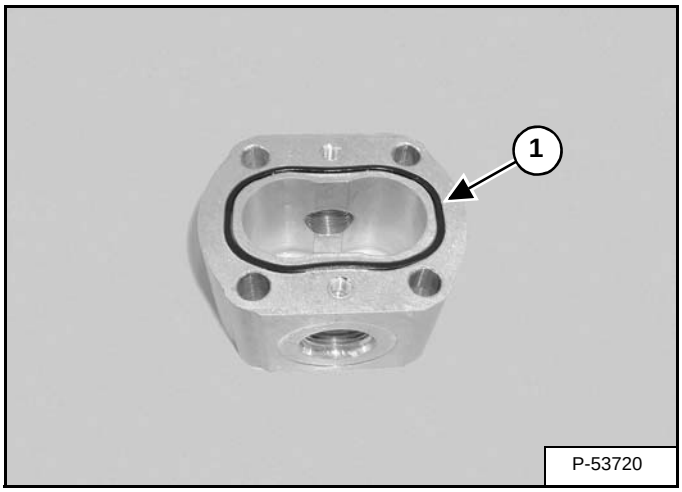
Remove the seal (Item 1) **[Figure 30-30-15]**.

Figure 30-30-16



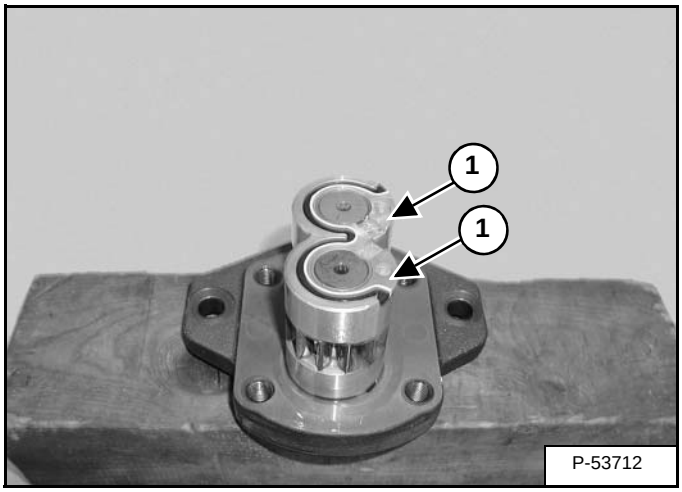
Remove the housing (Item 1) **[Figure 30-30-16]**.

Figure 30-30-17



Turn the housing over and remove the seal (Item 1) **[Figure 30-30-17]**.

Figure 30-30-18

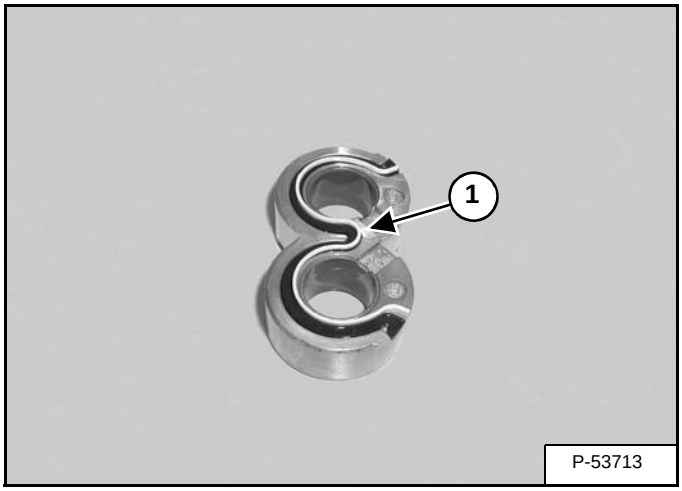


Record the orientation of the bearings and remove the bearing/seal assemblies (Item 1) **[Figure 30-30-18]**.

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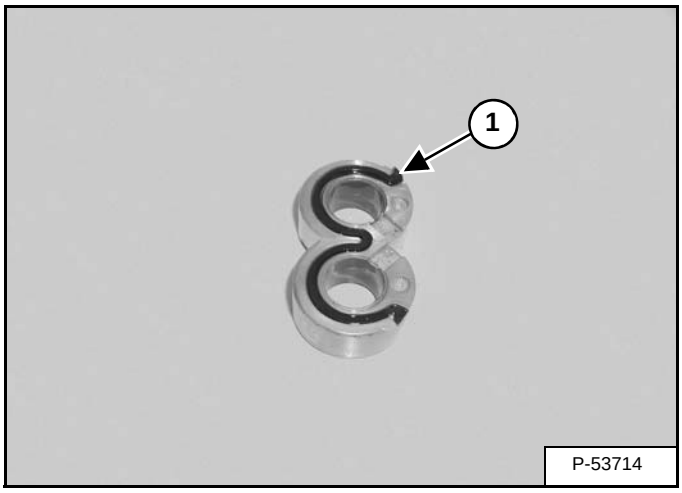
Fan/Charge Pump Disassembly And Assembly (Cont'd)

Figure 30-30-19



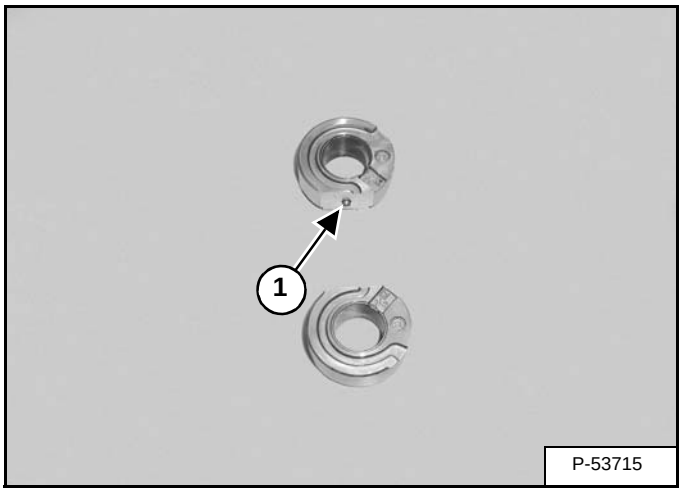
Remove the back-up ring (Item 1) **[Figure 30-30-19]**.

Figure 30-30-20



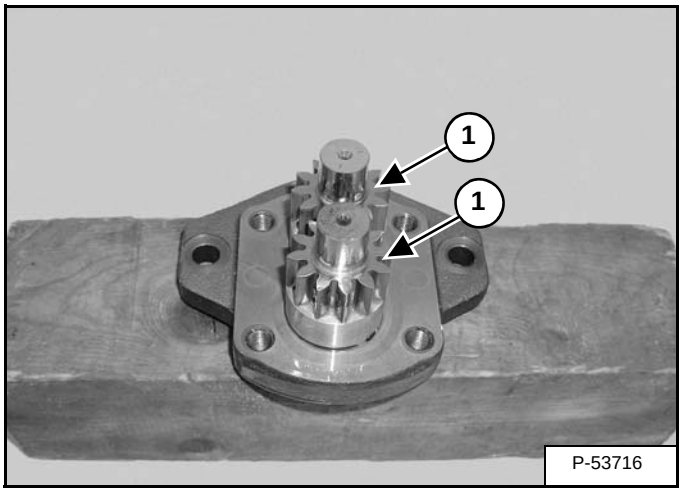
Remove the seal (Item 1) **[Figure 30-30-20]**.

Figure 30-30-21



Separate the bearings and remove the dowel pin (Item 1) **[Figure 30-30-21]**.

Figure 30-30-22

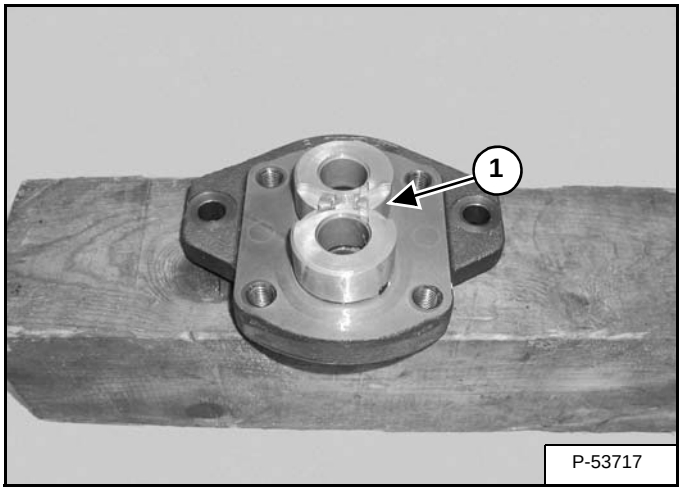


Remove the gears (Item 1) **[Figure 30-30-22]**.

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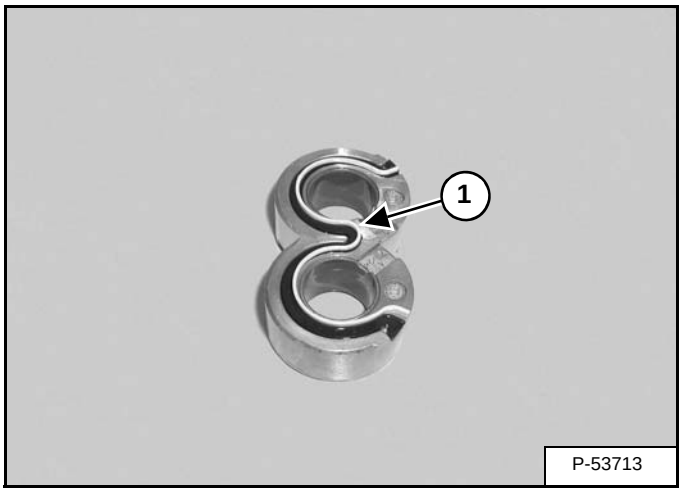
Fan/Charge Pump Disassembly And Assembly (Cont'd)

Figure 30-30-23



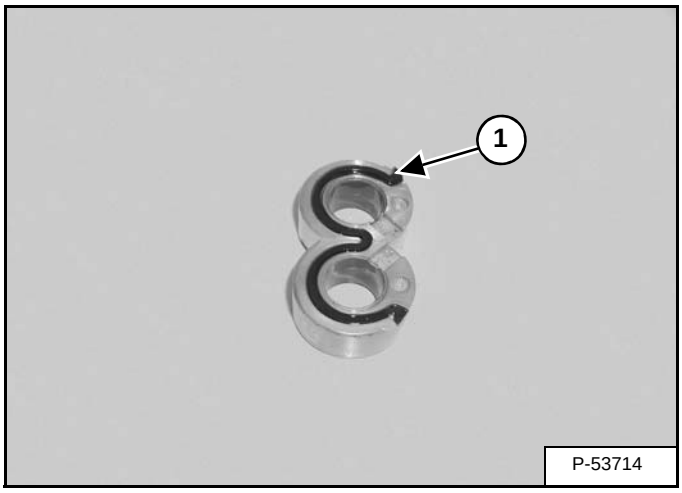
Remove the bearings (Item 1) **[Figure 30-30-23]**.

Figure 30-30-24



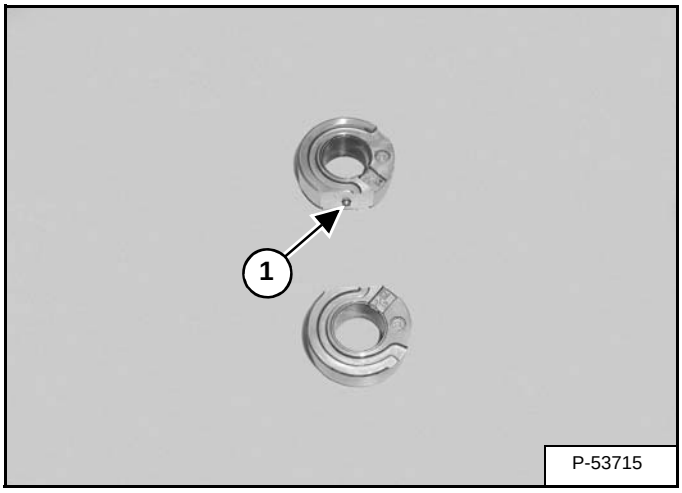
Remove the back-up ring (Item 1) **[Figure 30-30-24]**.

Figure 30-30-25



Remove the seal (Item 1) **[Figure 30-30-25]**.

Figure 30-30-26

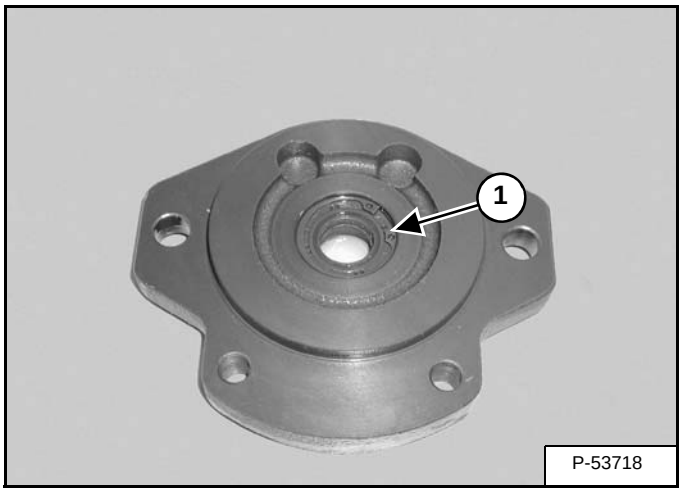


Separate the bearings and remove the dowel pin (Item 1) **[Figure 30-30-26]**.

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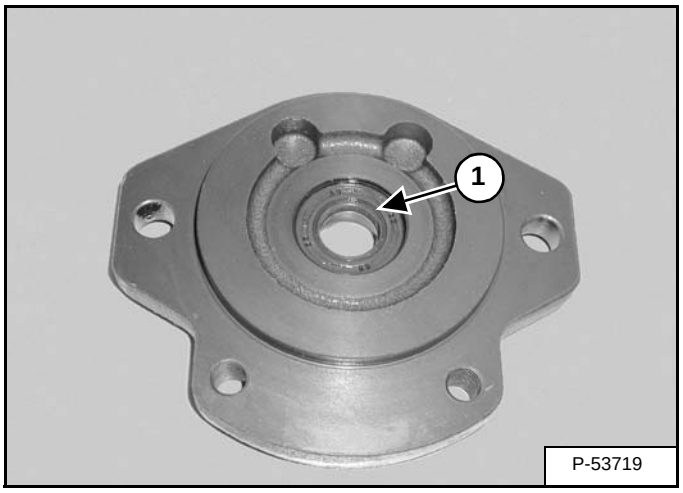
Fan/Charge Pump Disassembly And Assembly (Cont'd)

Figure 30-30-27



Remove the snap ring (Item 1) **[Figure 30-30-27]**.

Figure 30-30-28

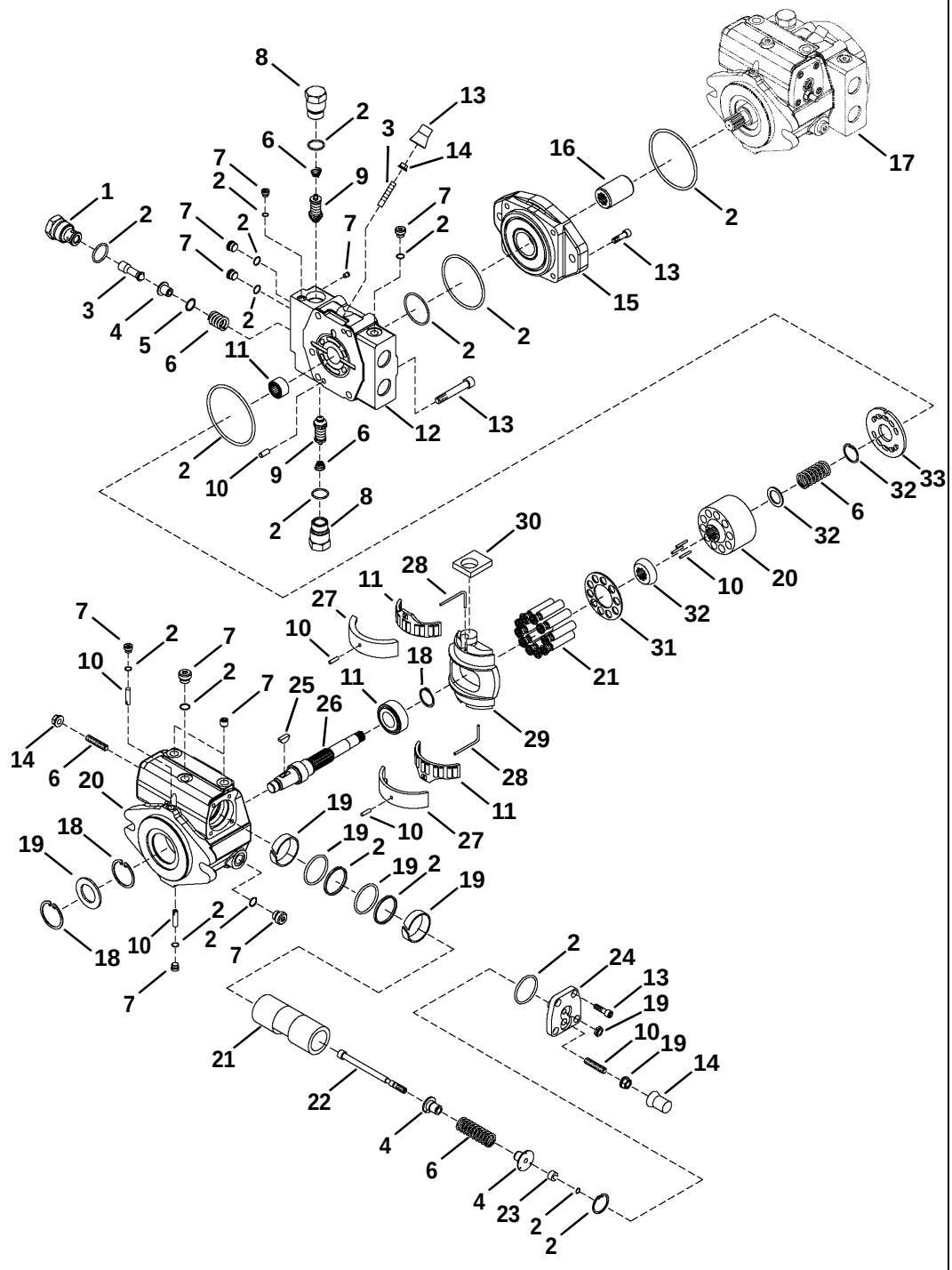


Remove the seal (Item 1) **[Figure 30-30-28]**.

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Parts Identification (Front) (S/N 562611001 & Above, 562811001 & Above And 563211001 & Above)

1. Charge Pressure Relief Valve
2. O-Ring
3. Spool
4. Spring Seat
5. Shim
6. Spring
7. Plug
8. Relief/Replenishing Valve
9. Relief
10. Pin
11. Bearing
12. Port Block
13. Bolt
14. Nut
15. Plate
16. Coupler
17. Rear Pump
18. Snap Ring
19. Seal
20. Housing
21. Piston
22. Spacer
23. Spring Seat Keepers
24. Cover
25. Key
26. Shaft
27. Race
28. Control Rod
29. Swash Plate
30. Servo Block
31. Retainer
32. Washer
33. Valve Plate

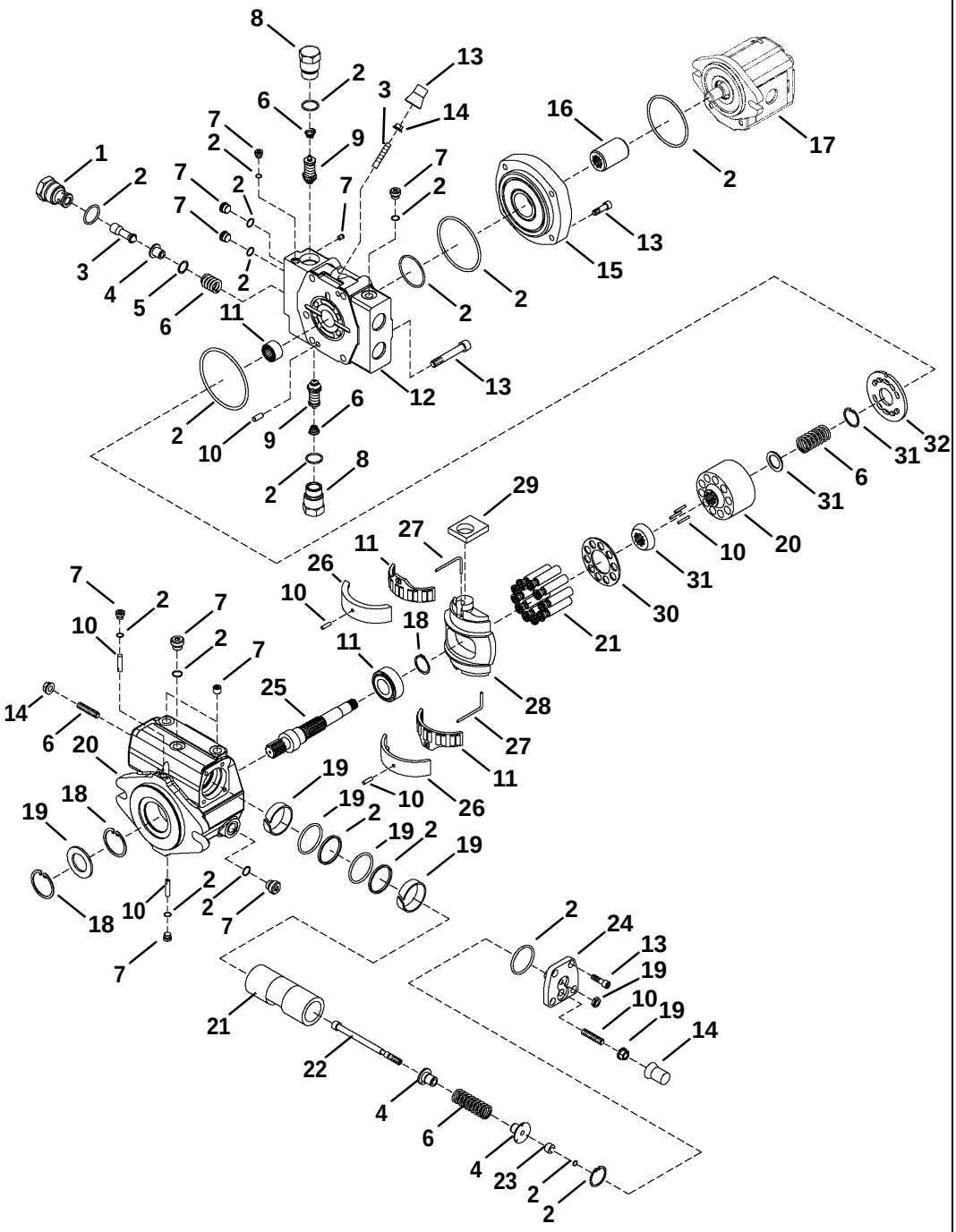


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Parts Identification (Rear) (S/N 562611001 & Above And 562811001 & Above)

1. Charge Pressure Relief Valve
2. O-Ring
3. Spool
4. Spring Seat
5. Shim
6. Spring
7. Plug
8. Relief/Replenishing Valve
9. Relief
10. Pin
11. Bearing
12. Port Block
13. Bolt
14. Nut
15. Plate
16. Coupler
17. Charge Pump
18. Snap Ring
19. Seal
20. Housing
21. Piston
22. Spacer
23. Spring Seat Keepers
24. Cover
25. Shaft
26. Race
27. Control Rod
28. Swash Plate
29. Servo Block
30. Retainer
31. Washer
32. Valve Plate

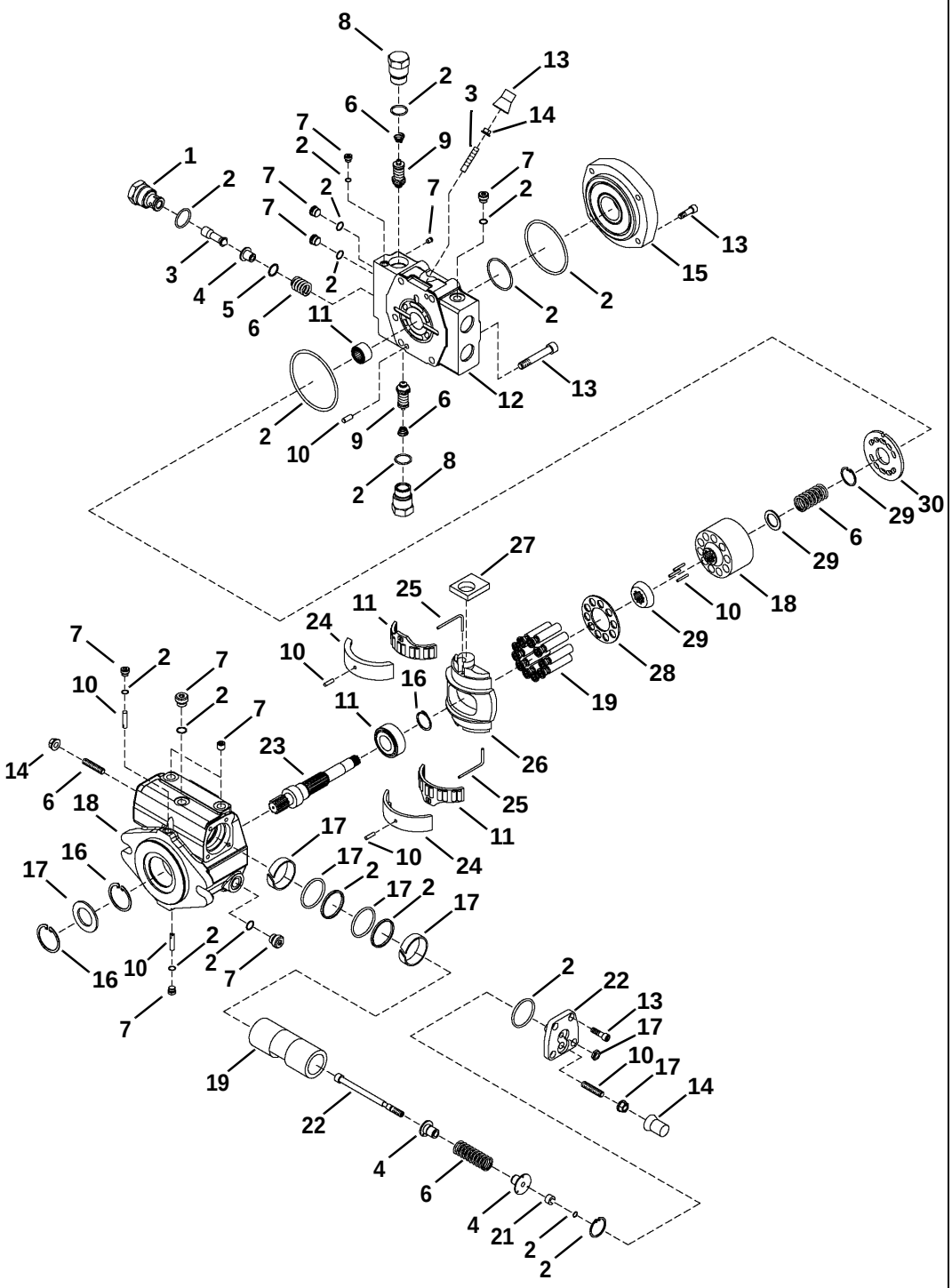


MS

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Parts Identification (Rear) (S/N 563211001 & Above)

1. Charge Pressure Relief Valve
2. O-Ring
3. Spool
4. Spring Seat
5. Shim
6. Spring
7. Plug
8. Relief/Replenishing Valve
9. Relief
10. Pin
11. Bearing
12. Port Block
13. Bolt
14. Nut
15. End Cap
16. Snap Ring
17. Seal
18. Housing
19. Piston
20. Spacer
21. Spring Seat Keeper
22. Cover
23. Shaft
24. Race
25. Control Rod
26. Swash Plate
27. Servo Plate
28. Retainer
29. Washer
30. Valve Plate

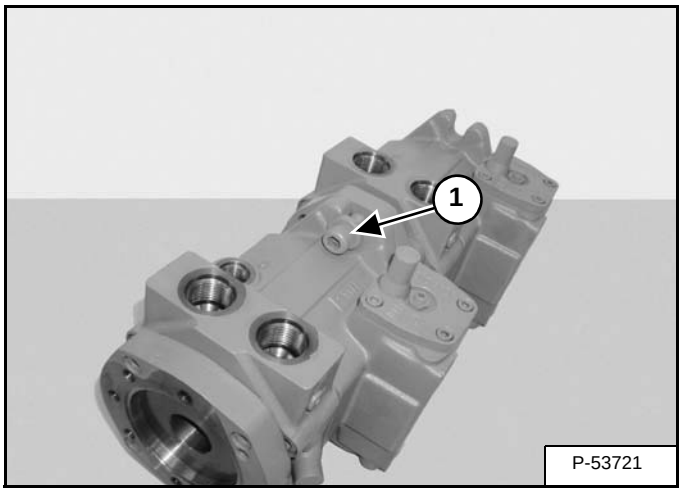


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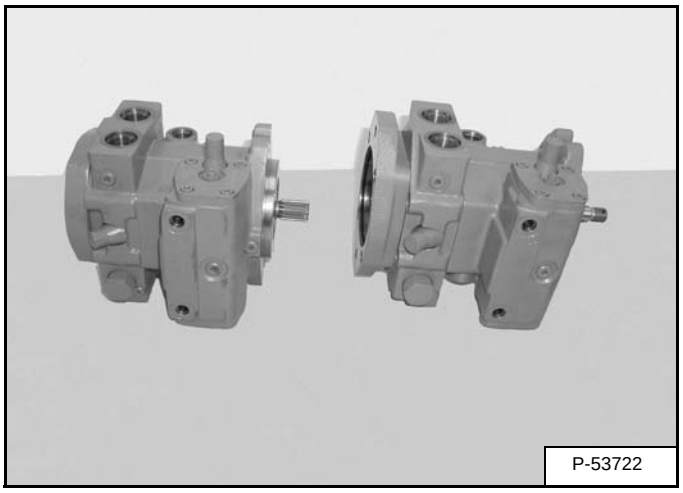
Disassembly

Figure 30-30-29



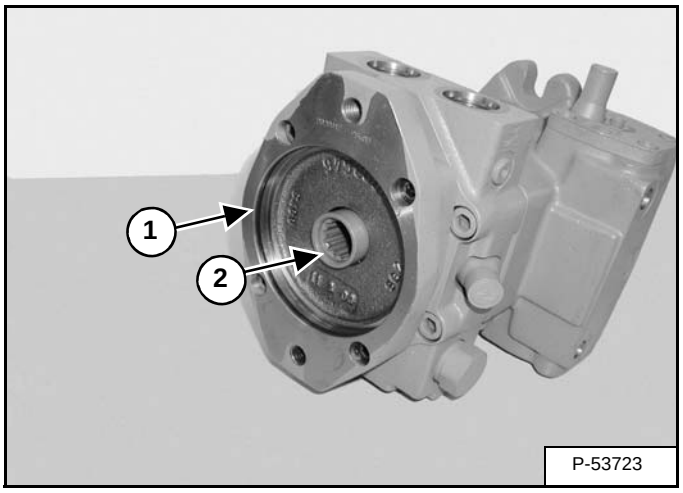
Remove the 2 bolts (Item 1) **[Figure 30-30-29]** and washers.

Figure 30-30-30



Separate the pumps **[Figure 30-30-30]**.

Figure 30-30-31

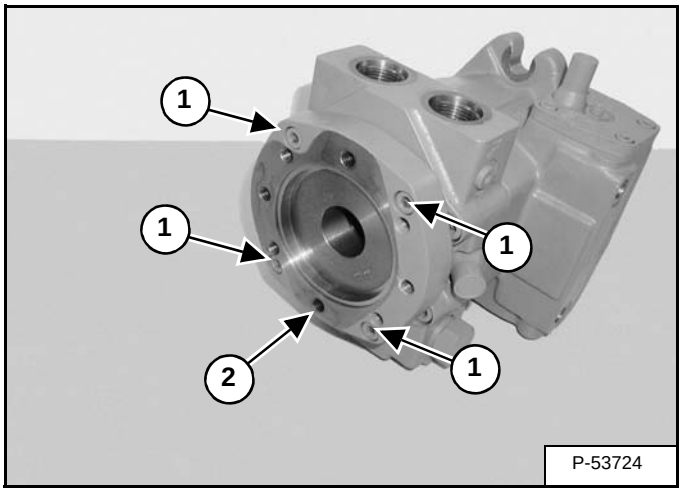


Remove the O-ring (Item 1) and coupler (Item 2) **[Figure 30-30-31]**.

Mark the side of the pump for ease of assembly.

NOTE: The disassembly procedure is shown on 1 pump. The procedure is the same for both pumps.

Figure 30-30-32



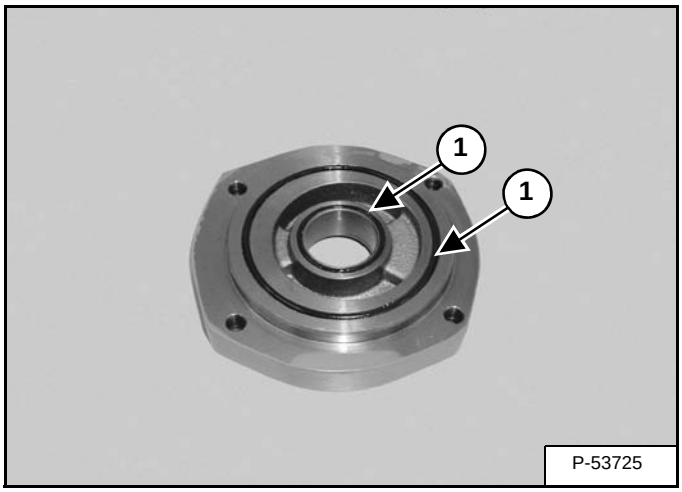
Remove the bolts (Item 1) **[Figure 30-30-32]**.

Remove the plate (Item 2) **[Figure 30-30-32]**.

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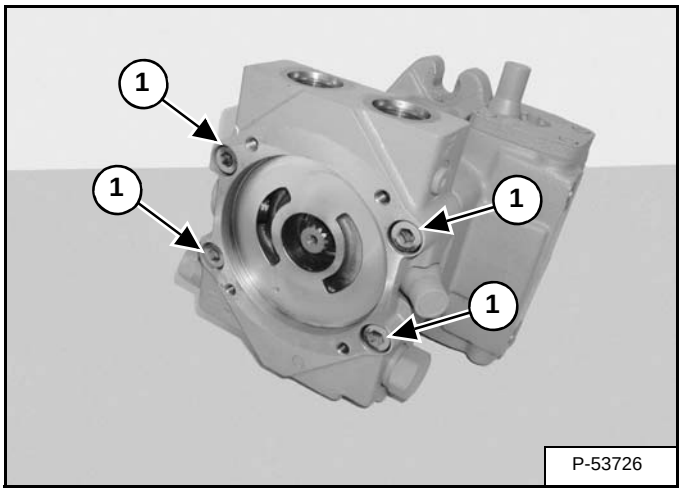
Disassembly (Cont'd)

Figure 30-30-33



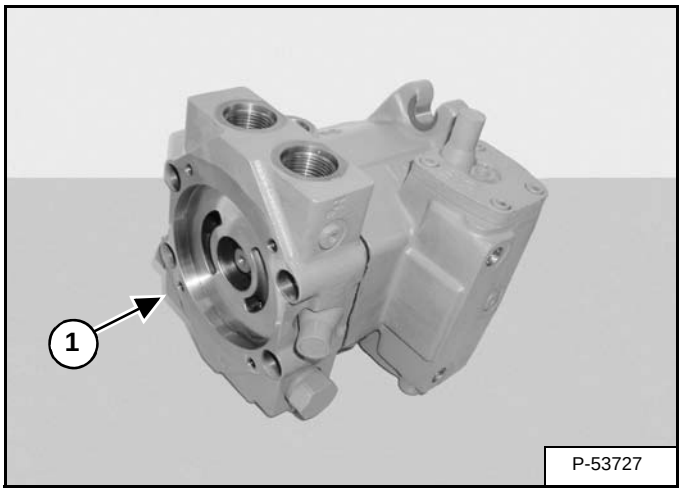
Remove the O-rings (Item 1) **[Figure 30-30-33]**.

Figure 30-30-34



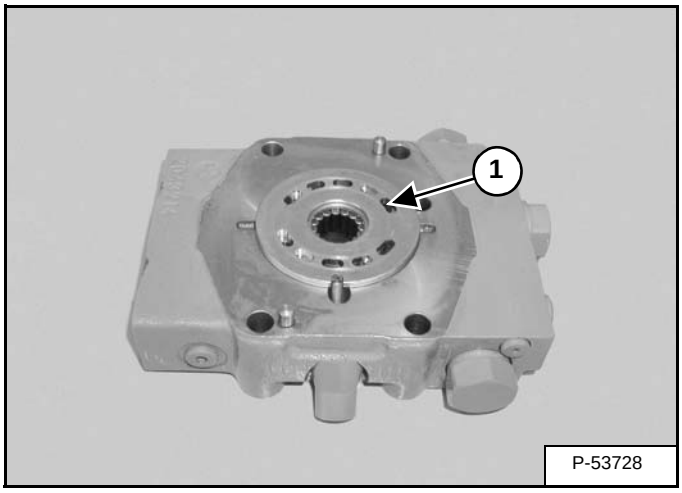
Remove the bolts (Item 1) **[Figure 30-30-34]**.

Figure 30-30-35



Remove the port block (Item 1) **[Figure 30-30-35]**.

Figure 30-30-36

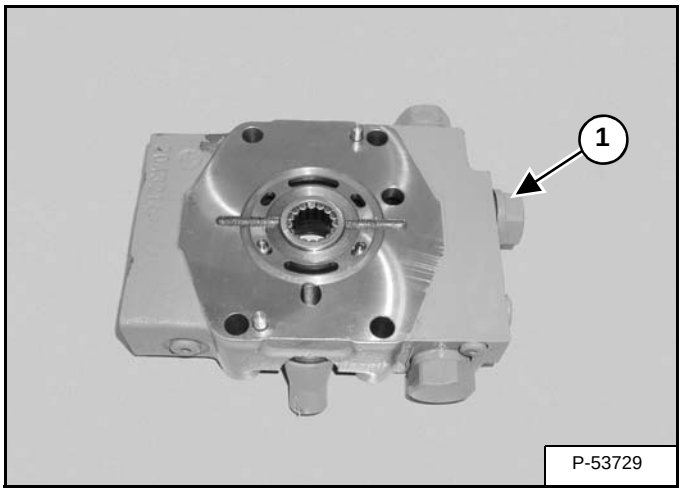


Remove the valve plate (Item 1) **[Figure 30-30-36]**.

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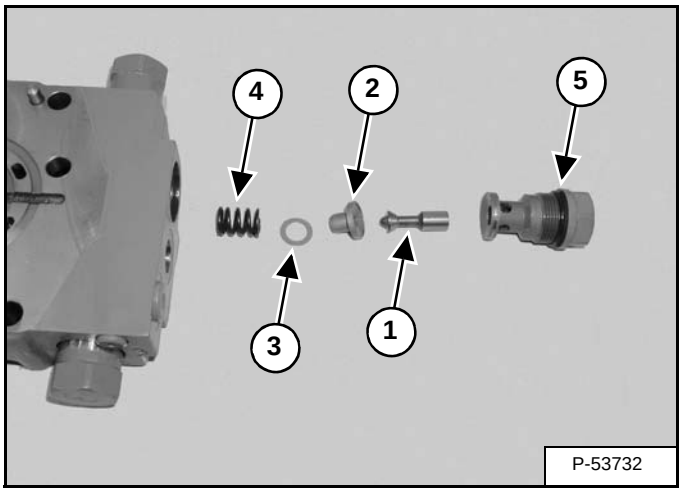
Disassembly (Cont'd)

Figure 30-30-37



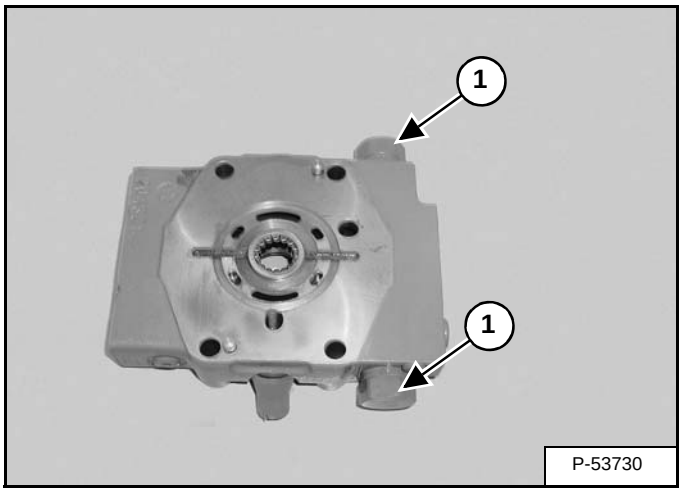
Remove the charge pressure relief valve (Item 1) **[Figure 30-30-37]**.

Figure 30-30-38



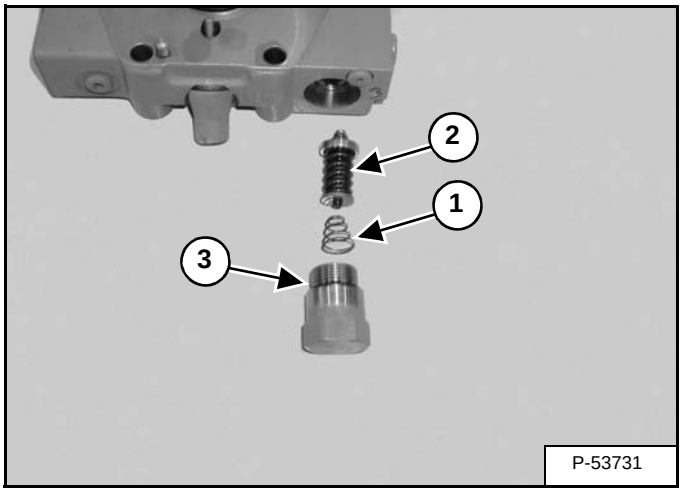
Remove the spool (Item 1), spring seat (Item 2), shim (Item 3) and spring (Item 4). Remove the O-ring (Item 5) **[Figure 30-30-38]**.

Figure 30-30-39



Remove the high pressure relief/replenishing valves (Item 1) **[Figure 30-30-39]**.

Figure 30-30-40

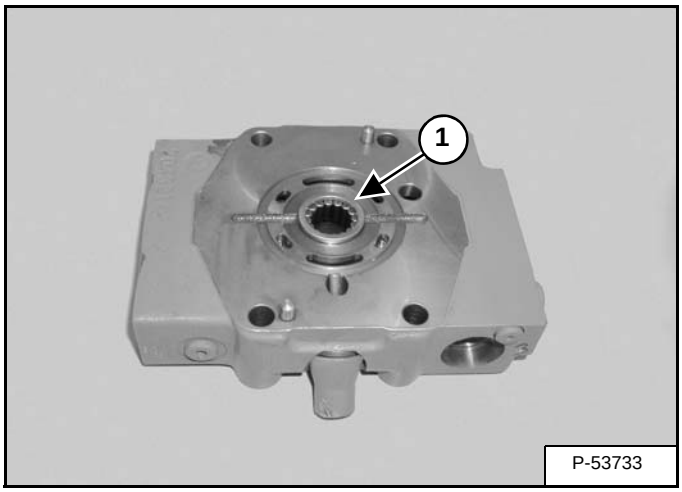


Remove the spring (Item 1) and relief (Item 2) from both sides. Remove the O-ring (Item 3) **[Figure 30-30-40]** from both plugs.

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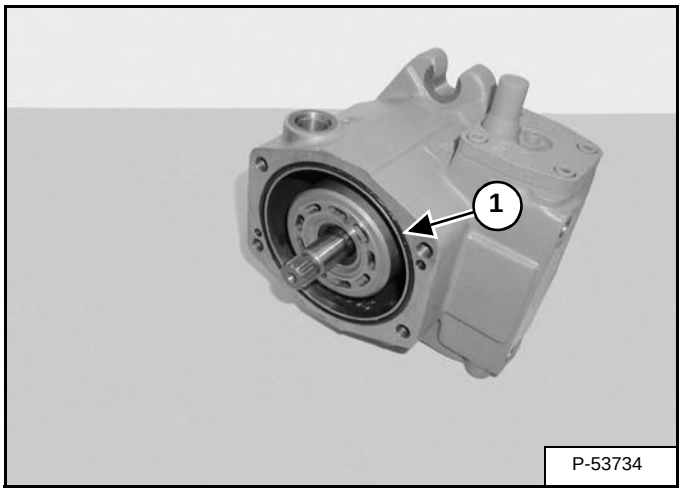
Disassembly (Cont'd)

Figure 30-30-41



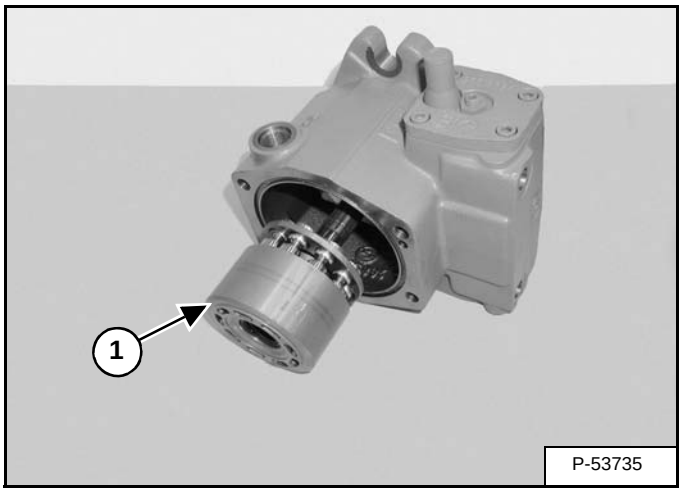
Remove the bearing (Item 1) **[Figure 30-30-41]**.

Figure 30-30-42



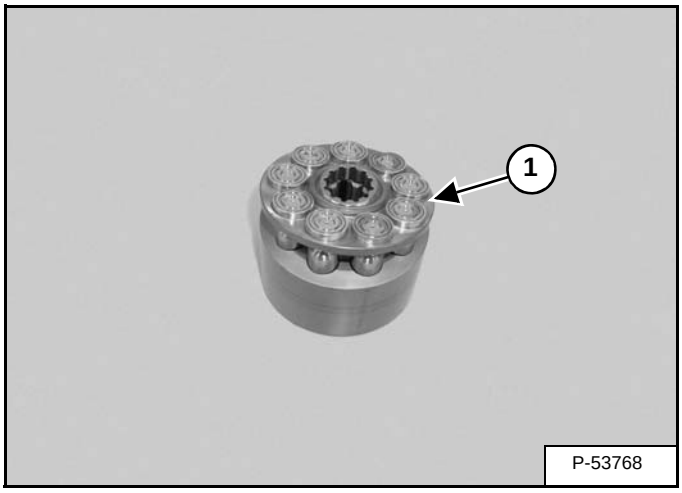
Remove the O-ring (Item 1) **[Figure 30-30-42]**.

Figure 30-30-43



Remove the rotating group (Item 1) **[Figure 30-30-43]**.

Figure 30-30-44

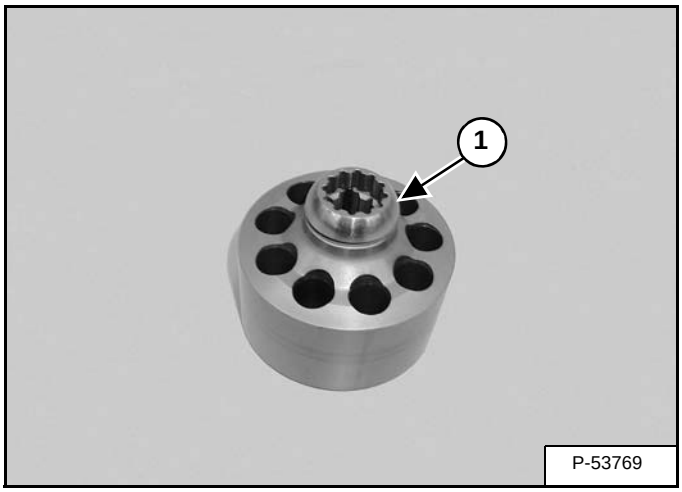


Remove the pistons and retainer (Item 1) **[Figure 30-30-44]**.

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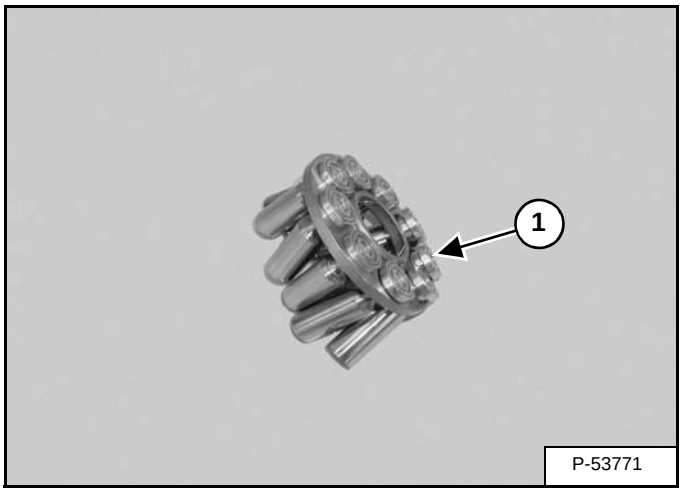
Disassembly (Cont'd)

Figure 30-30-45



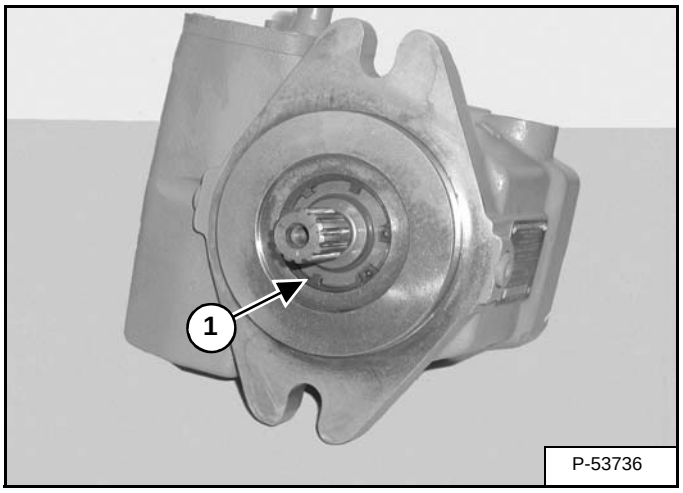
Remove the spherical washer (Item 1) **[Figure 30-30-45]**.

Figure 30-30-46



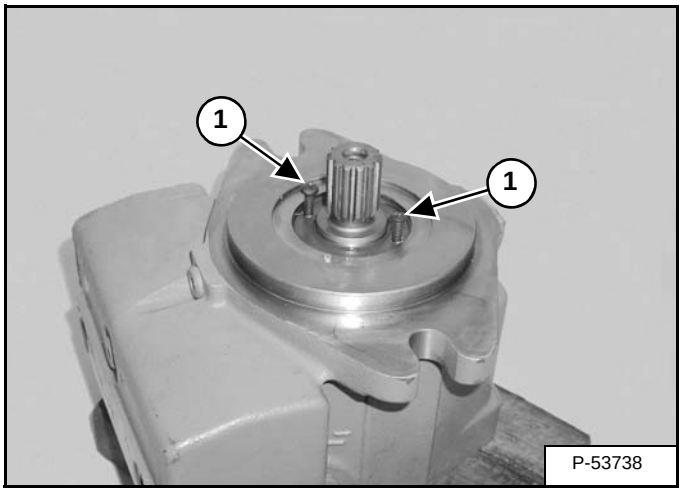
Remove the pistons (Item 1) **[Figure 30-30-46]** from the piston retainer.

Figure 30-30-47



Remove the snap ring (Item 1) **[Figure 30-30-47]**.

Figure 30-30-48



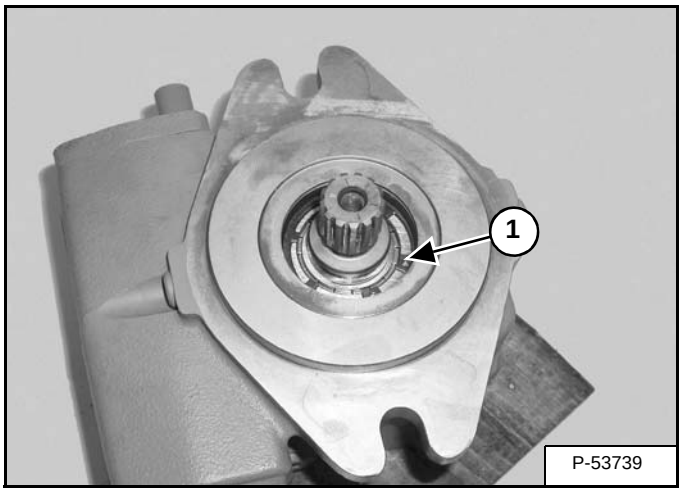
Install 2 sheet metal screws (Item 1) **[Figure 30-30-48]** 180° apart into the seal.

Use pliers to grasp the sheet metal screws and remove the seal.

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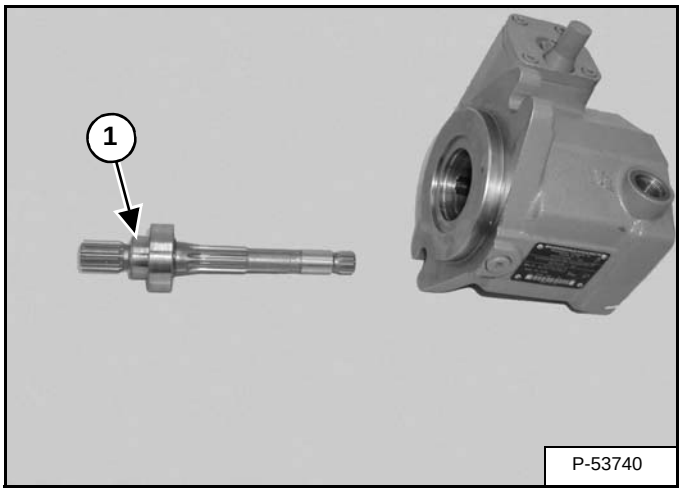
Disassembly (Cont'd)

Figure 30-30-49



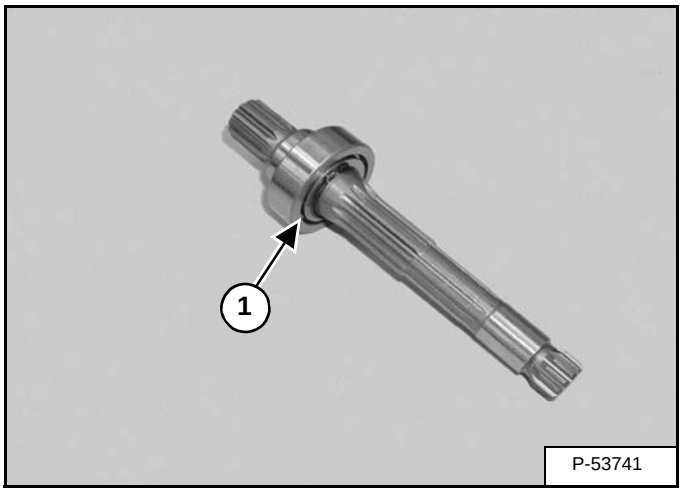
Remove the snap ring (Item 1) **[Figure 30-30-49]**.

Figure 30-30-50



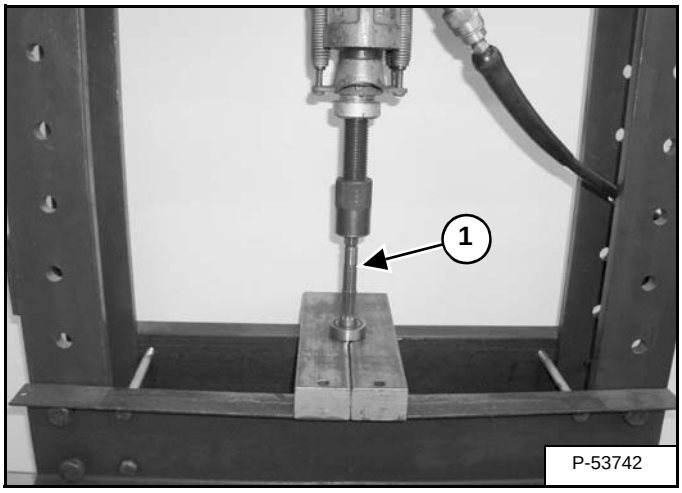
Remove the shaft (Item 1) **[Figure 30-30-50]** from the housing.

Figure 30-30-51



Remove the snap ring (Item 1) **[Figure 30-30-51]**.

Figure 30-30-52

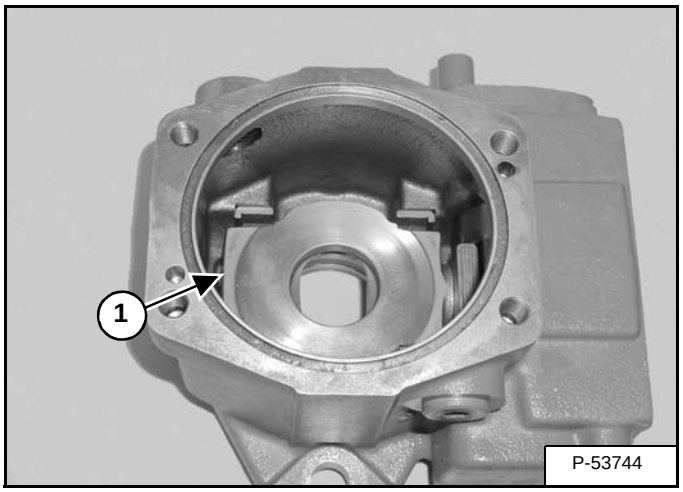


Press the bearing off of the shaft (Item 1) **[Figure 30-30-52]**.

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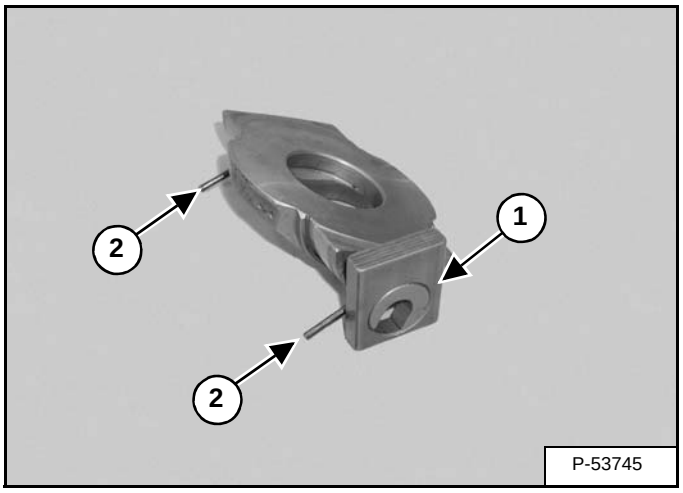
Disassembly (Cont'd)

Figure 30-30-53



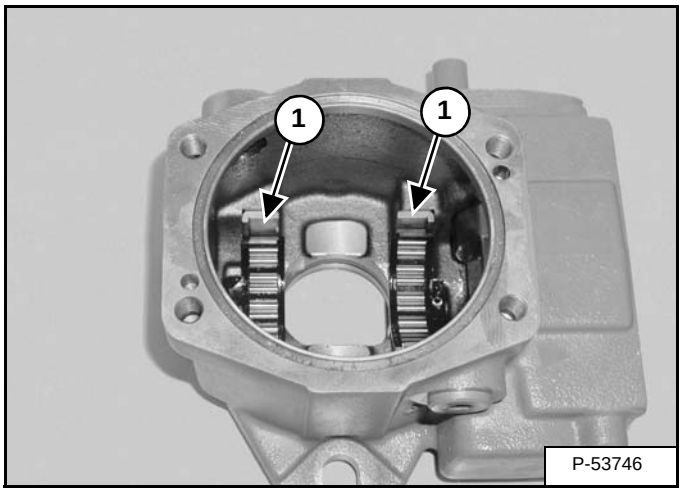
Remove the swash plate assembly (Item 1) **[Figure 30-30-53]**.

Figure 30-30-54



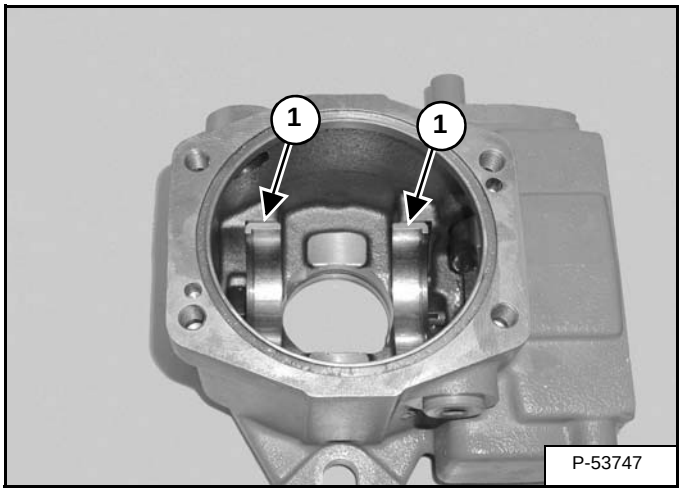
Remove the servo piston block (Item 1) and control rods (Item 2) **[Figure 30-30-54]** from the swash plate.

Figure 30-30-55



Remove the bearings (Item 1) **[Figure 30-30-55]**.

Figure 30-30-56

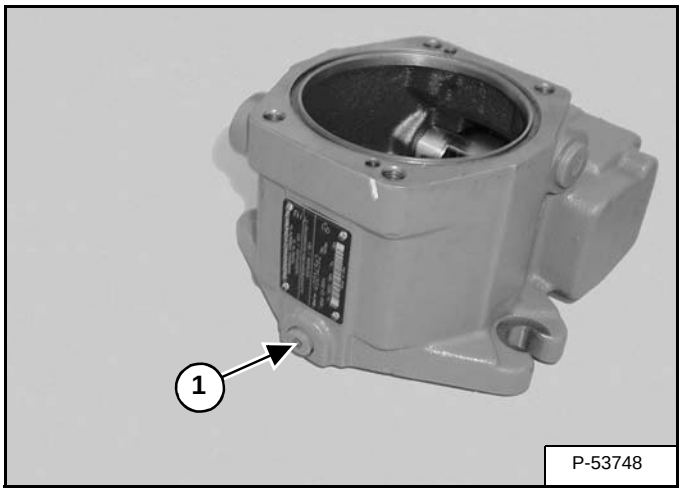


Remove the bearing races (Item 1) **[Figure 30-30-56]**.

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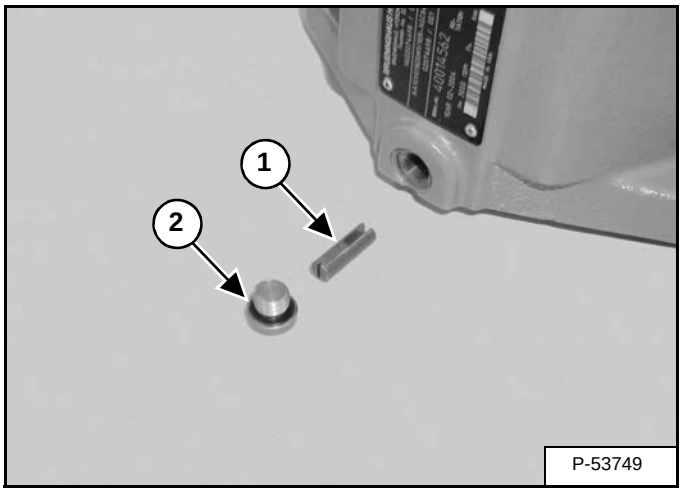
Disassembly (Cont'd)

Figure 30-30-57



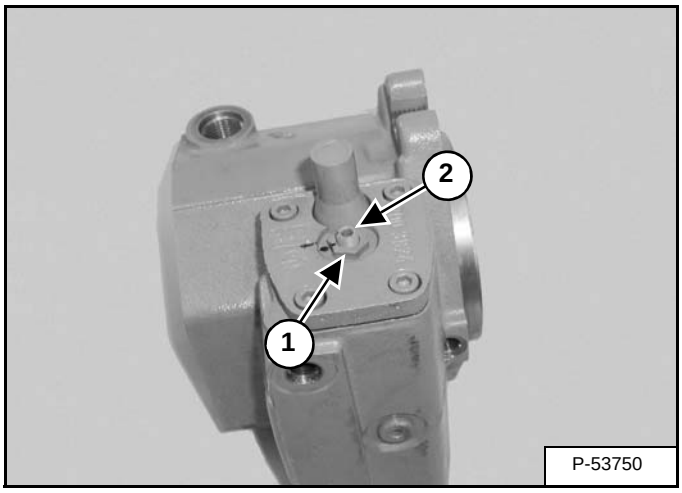
Remove the plug (Item 1) **[Figure 30-30-57]** from both sides of the pump housing.

Figure 30-30-58



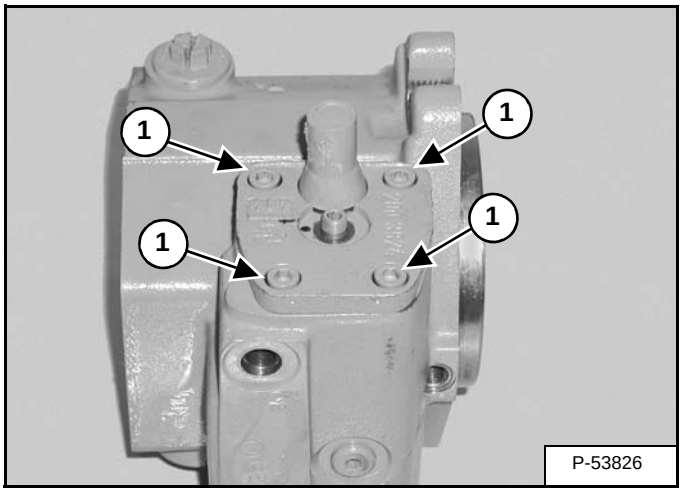
Remove the locating pin (Item 1). Remove the O-ring (Item 2) **[Figure 30-30-58]** from the plug (both sides).

Figure 30-30-59



Remove the nut (Item 1) from the servo piston adjustment bolt (Item 2) **[Figure 30-30-59]**.

Figure 30-30-60

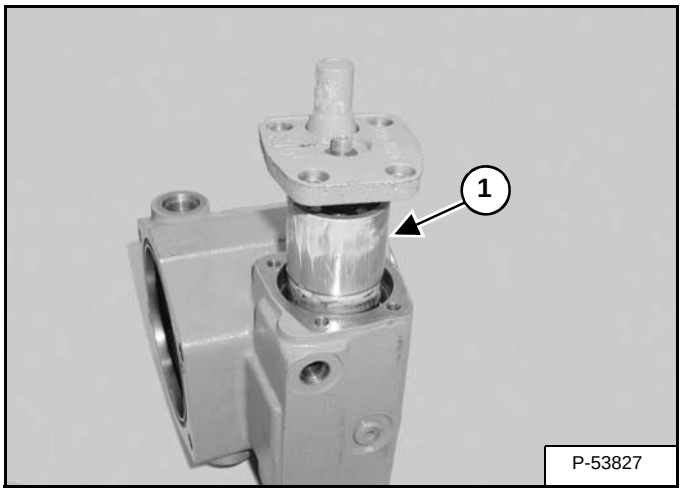


Remove the bolts (Item 1) **[Figure 30-30-60]**.

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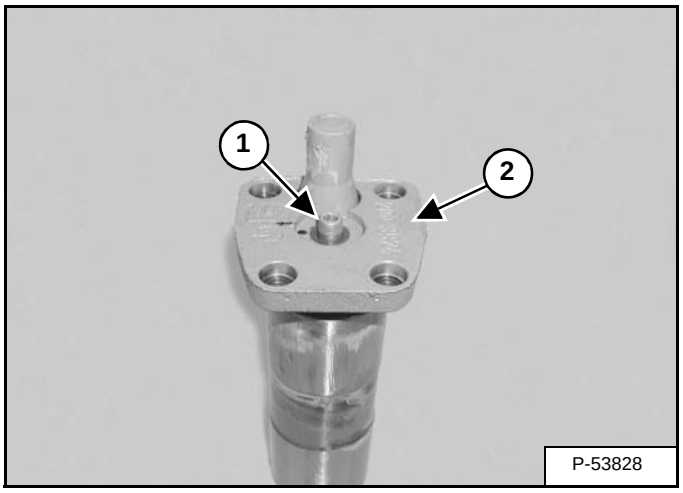
Disassembly (Cont'd)

Figure 30-30-61



Remove the servo piston (Item 1) **[Figure 30-30-61]**.

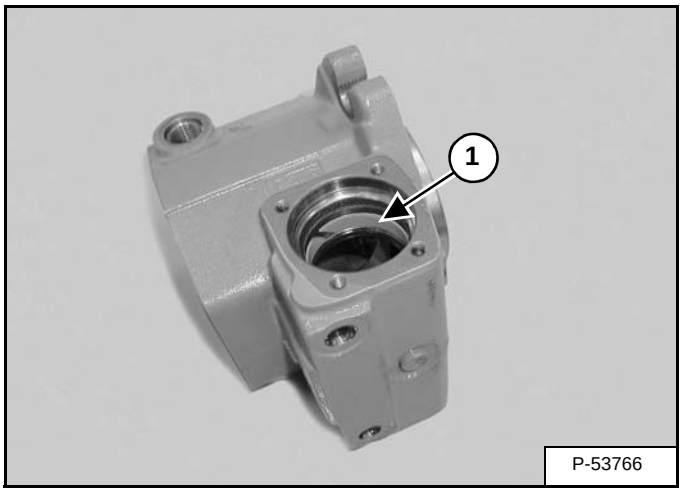
Figure 30-30-62



Measure and record the servo piston adjustment bolt height (Item 1) **[Figure 30-30-62]**.

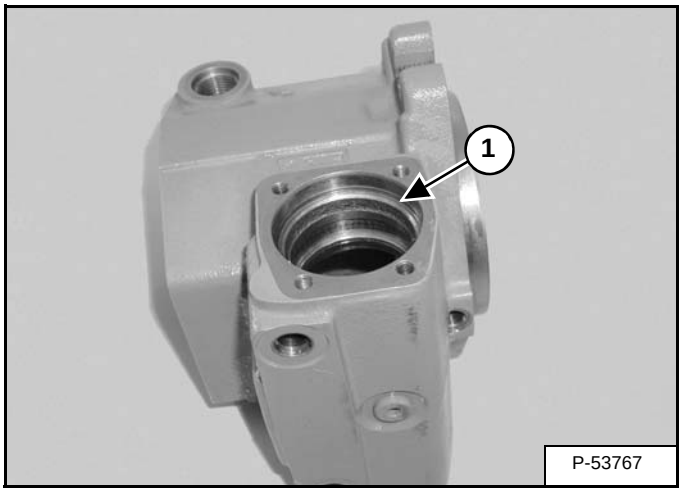
Turn the servo piston cover (Item 2) **[Figure 30-30-62]** counterclockwise to remove the cover from the piston.

Figure 30-30-63



Remove the split seal (Item 1) **[Figure 30-30-63]**. (Top and bottom)

Figure 30-30-64

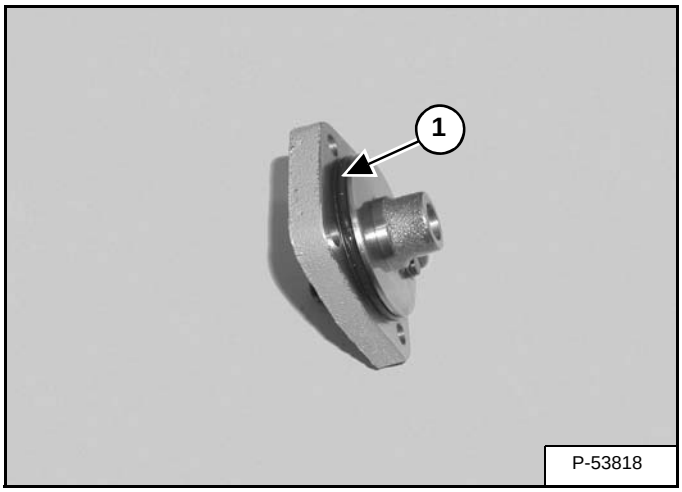


Remove the seal (Item 1) **[Figure 30-30-64]**. (Top and bottom)

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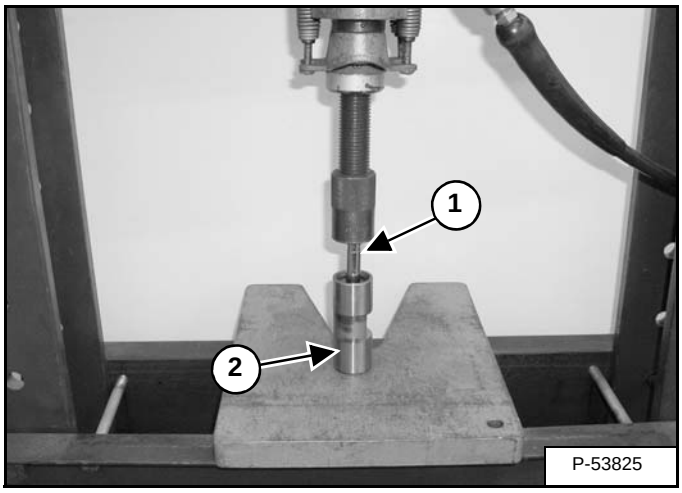
Disassembly (Cont'd)

Figure 30-30-65



Remove the O-ring (Item 1) **[Figure 30-30-65]**.

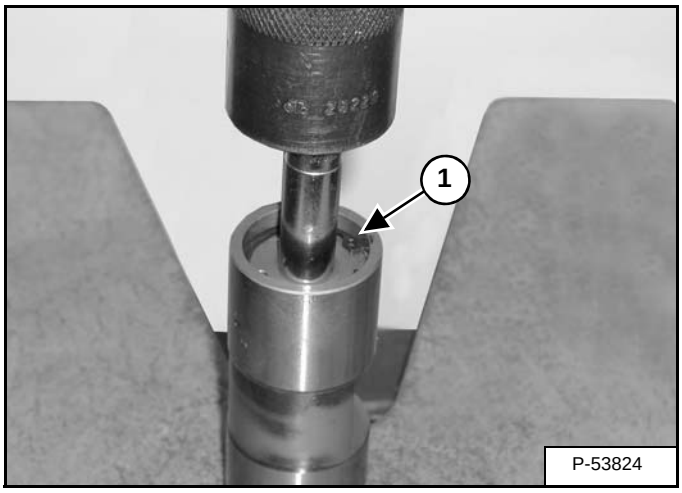
Figure 30-30-66



Install a spacer tube (Item 1) **[Figure 30-30-66]** over the adjustment bolt.

Place the spacer tube/servo piston (Item 2) **[Figure 30-30-66]** in a press or vise.

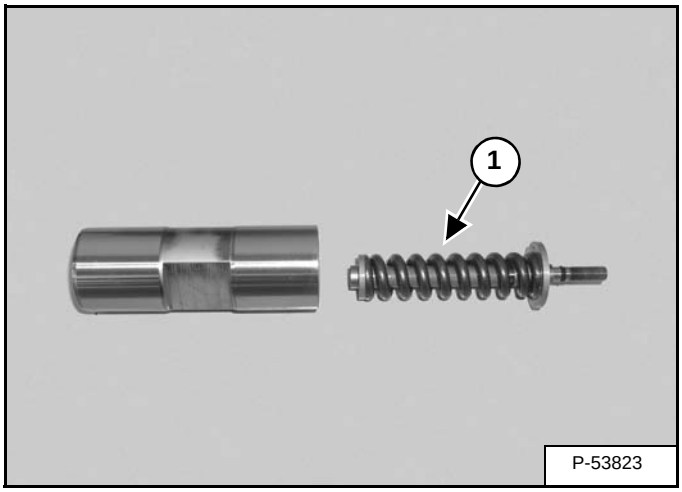
Figure 30-30-67



Press slightly to overcome spring pressure and remove the snap ring (Item 1) **[Figure 30-30-67]**.

Remove the piston from the vise or press.

Figure 30-30-68

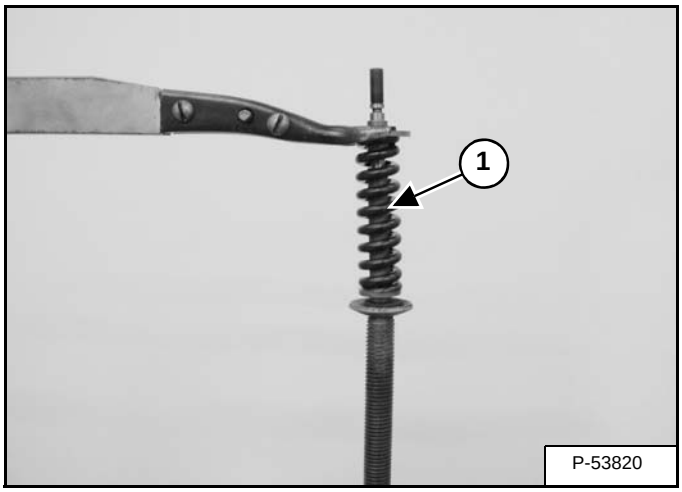


Remove the adjustment assembly (Item 1) **[Figure 30-30-68]** from the piston.

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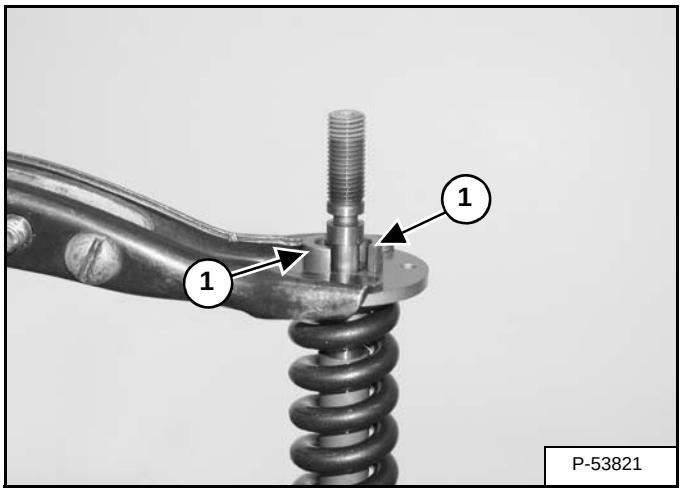
Disassembly (Cont'd)

Figure 30-30-69



Use a valve spring compressor to compress the spring (Item 1) **[Figure 30-30-69]**.

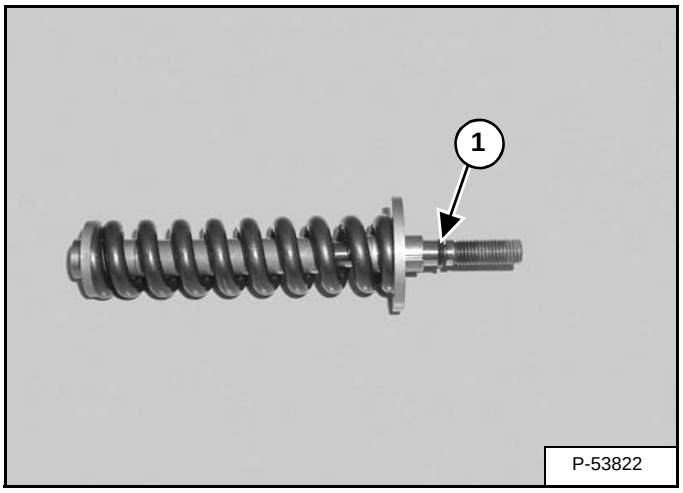
Figure 30-30-70



Remove the spring seat keepers (Item 1) **[Figure 30-30-70]**.

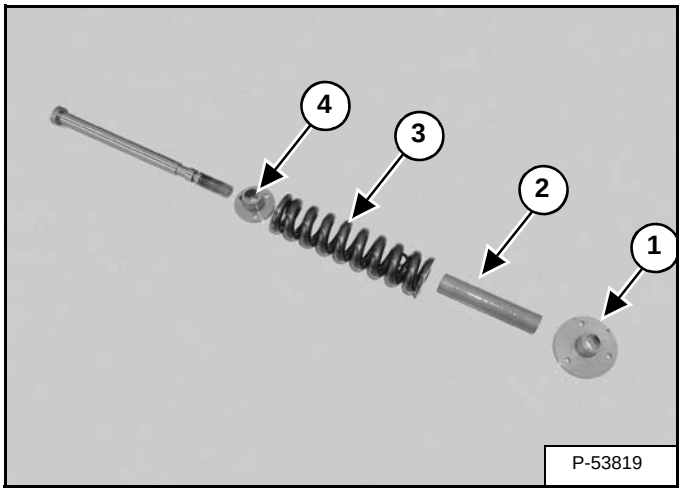
Remove the adjustment bolt/spring assembly from the valve spring compressor.

Figure 30-30-71



Remove the O-ring (Item 1) **[Figure 30-30-71]**.

Figure 30-30-72



Remove the spring seat (Item 1), spacer (Item 2), spring (Item 3) and spring seat (Item 4) **[Figure 30-30-72]** from the bolt.

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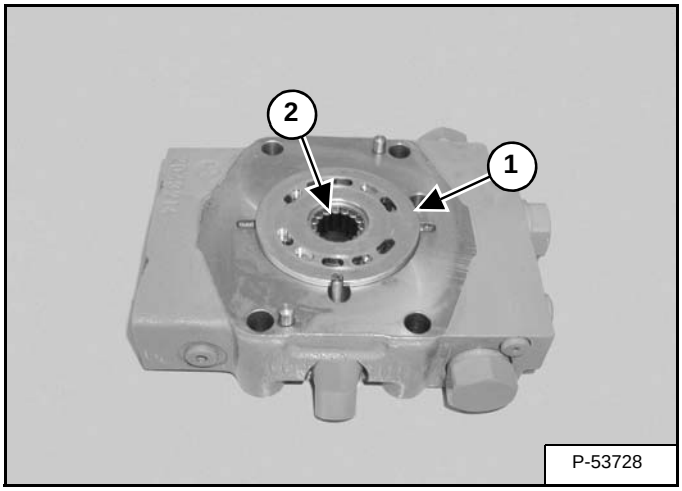
Inspection

Clean all the parts in solvent and dry with compressed air. DO NOT use cloth or paper because small pieces of material can get into the system and cause damage.

Always install new O-rings and seals.

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

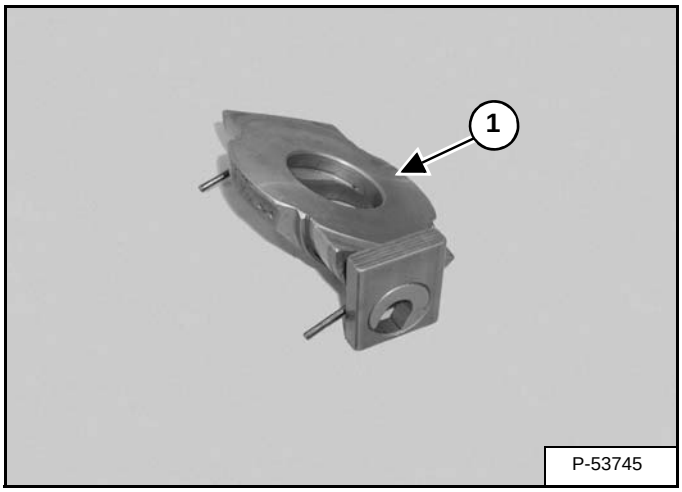
Figure 30-30-73



Check the valve plate (Item 1) **[Figure 30-30-73]**, the surface must be smooth and free of scratches. If scratches can be felt with a fingernail, replace the plate.

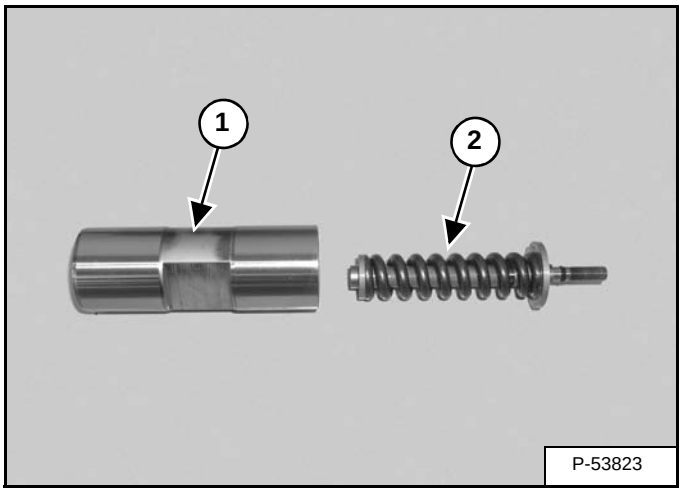
Check the port block bearing (Item 2) **[Figure 30-30-73]**.

Figure 30-30-74



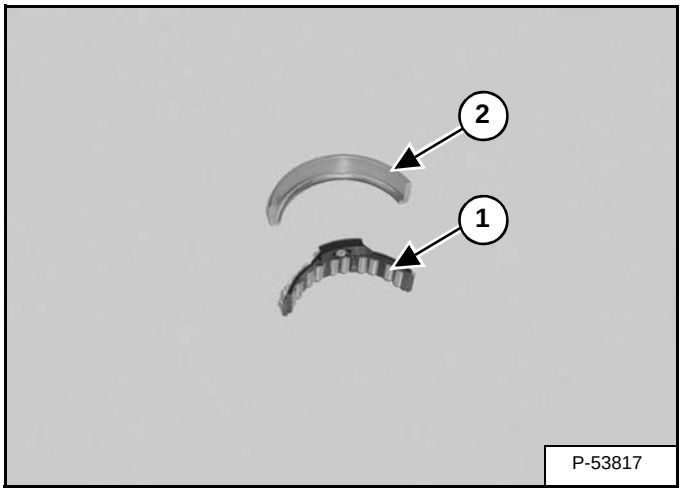
Check the swash plate (Item 1) **[Figure 30-30-74]**, the surface must be smooth and free of scratches.

Figure 30-30-75



Check the servo piston (Item 1) and spring assembly (Item 2) **[Figure 30-30-75]** for wear or damage.

Figure 30-30-76

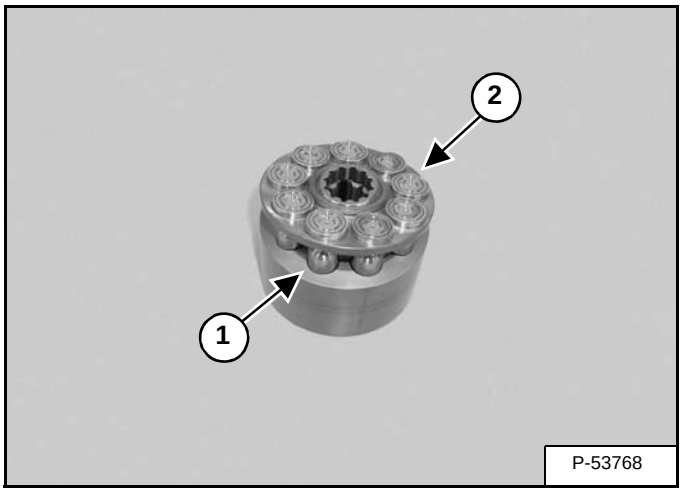


Check the swash plate bearings (Item 1) and races (Item 2) **[Figure 30-30-76]** for wear and damage.

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Inspection (Cont'd)

Figure 30-30-77



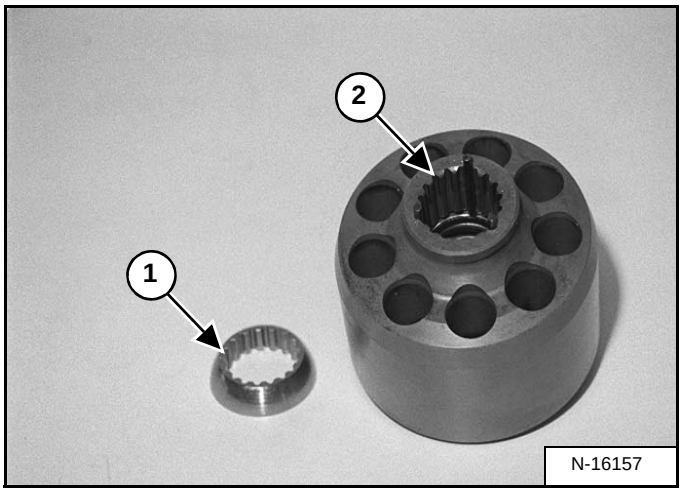
Check that each piston (Item 1) **[Figure 30-30-77]** moves freely in the cylinder block bore.

Check each piston and piston shoe (Item 2) **[Figure 30-30-77]** for wear or scratches.

Check the shoe plate, the shoe plate must be flat with no signs of cracks or wear.

Check the end of the cylinder block, the surface must be smooth and free of scratches.

Figure 30-30-78



Check the cylinder block bores for wear and scratches **[Figure 30-30-78]**.

Check the spherical washer (Item 1) **[Figure 30-30-78]** for wear or damage.

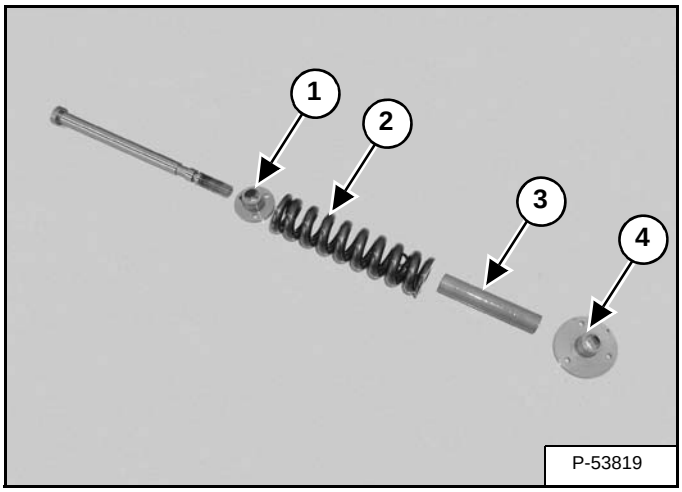
Check the pins (Item 2) **[Figure 30-30-78]**, the pins must not be bent and the same length.

If there is any defect in the rotating group, the complete unit must be replaced.

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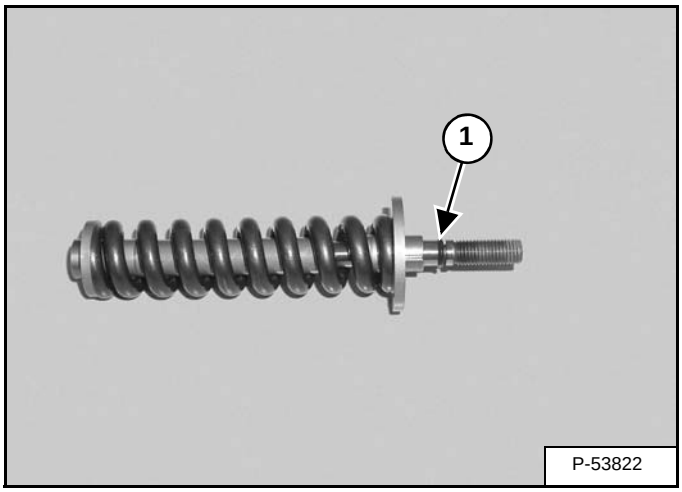
Assembly

Figure 30-30-79



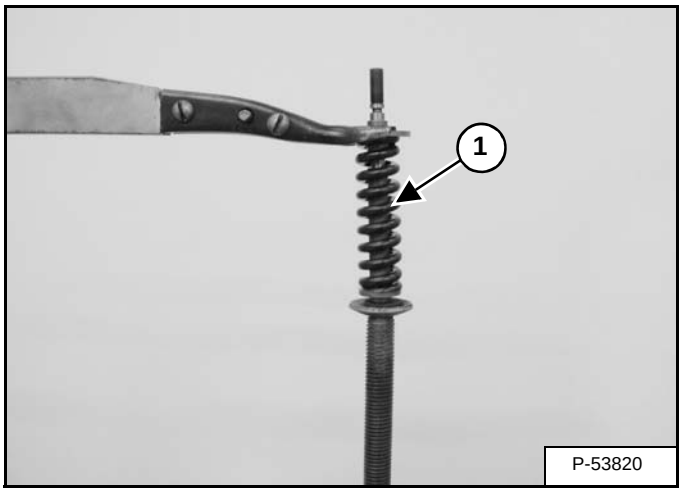
Install the spring seat (Item 1), spring (Item 2), spacer (Item 3) and spring seat (Item 4) **[Figure 30-30-79]** on the bolt.

Figure 30-30-80



Install the O-ring (Item 1) **[Figure 30-30-80]**.

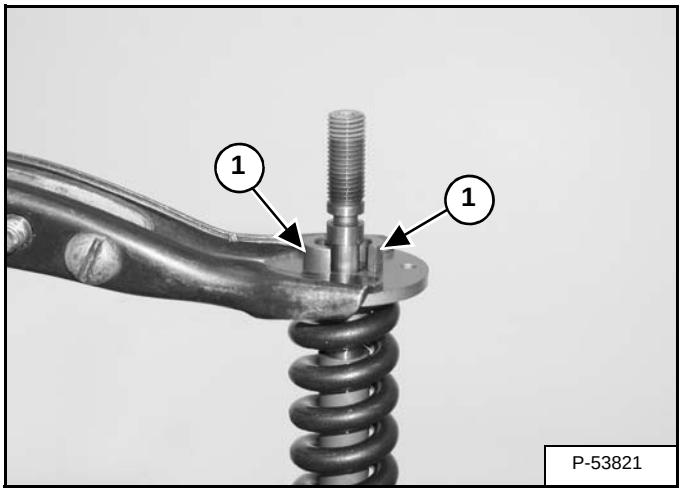
Figure 30-30-81



Install the spring assembly (Item 1) **[Figure 30-30-81]** in a valve spring compressor.

Compress the spring.

Figure 30-30-82



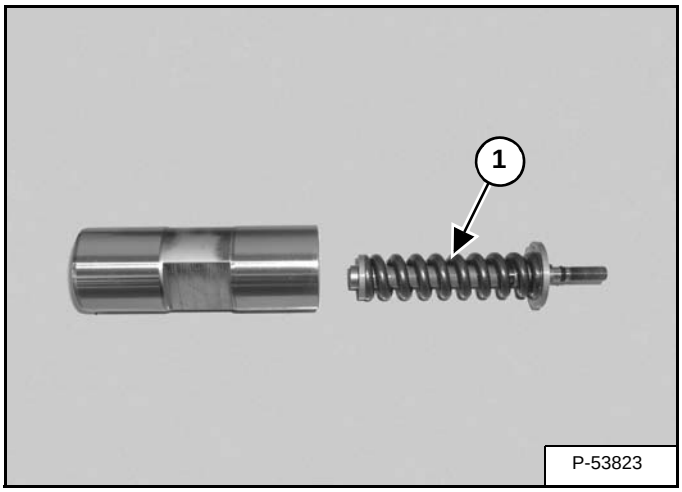
Install the spring seat keepers (Item 1) **[Figure 30-30-82]** in the groove of the adjustment bolt.

Remove the spring assembly from the valve spring compressor.

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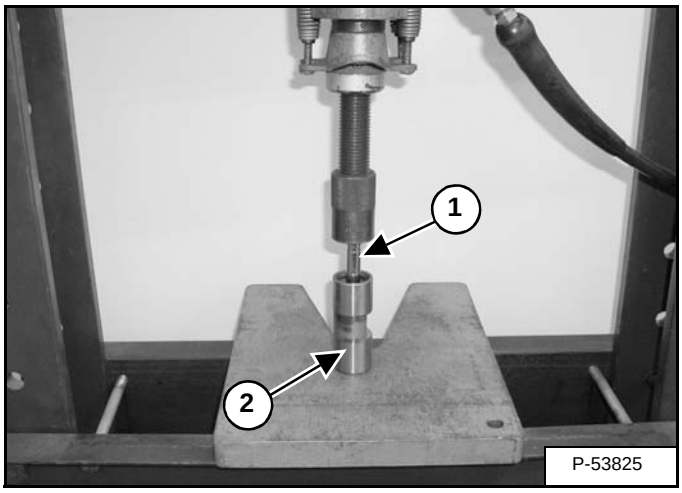
Assembly (Cont'd)

Figure 30-30-83



Install the spring assembly (Item 1) **[Figure 30-30-83]** in the servo piston.

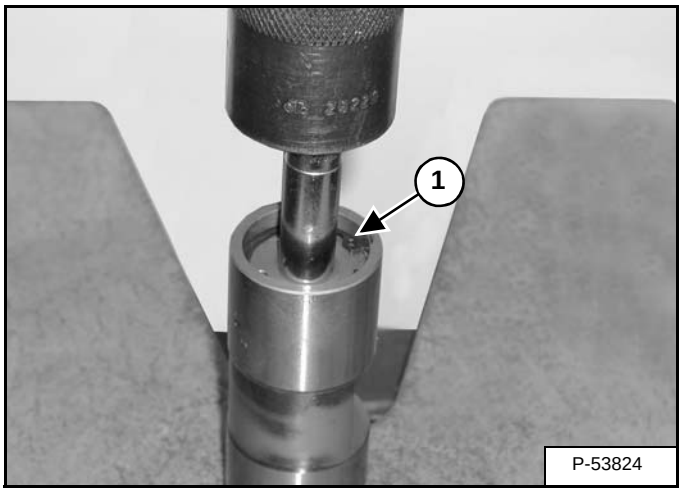
Figure 30-30-84



Install a spacer tube (Item 1) **[Figure 30-30-84]** over the adjustment bolt.

Place the spacer tube/servo piston (Item 2) **[Figure 30-30-84]** in a press or vise.

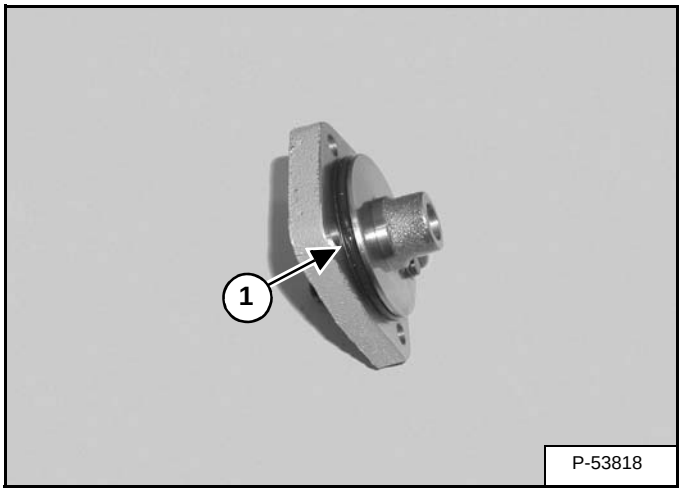
Figure 30-30-85



Press slightly to overcome spring pressure and install the snap ring (Item 1) **[Figure 30-30-85]**.

Remove the piston from the press.

Figure 30-30-86

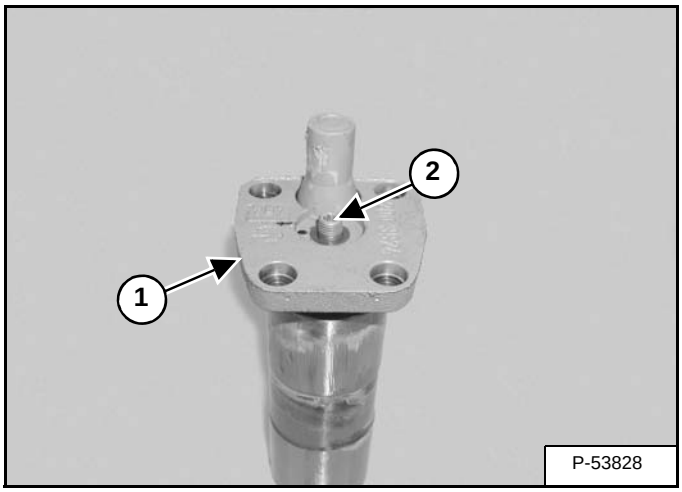


Install the O-ring (Item 1) **[Figure 30-30-86]**.

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Assembly (Cont'd)

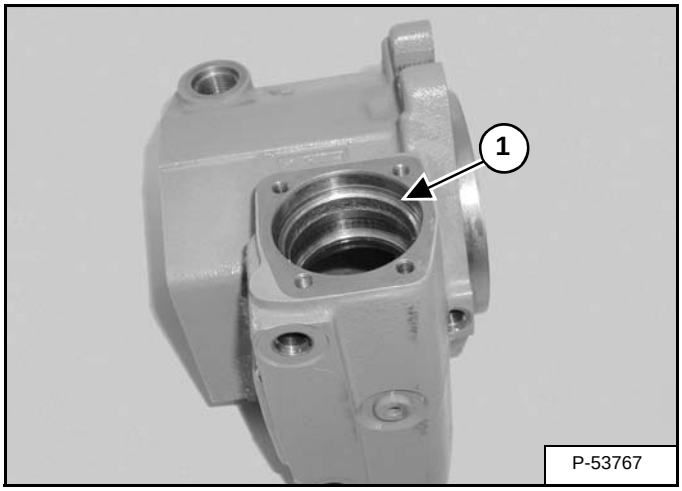
Figure 30-30-87



Turn the servo piston cover (Item 1) **[Figure 30-30-87]** clockwise to install the cover on the piston.

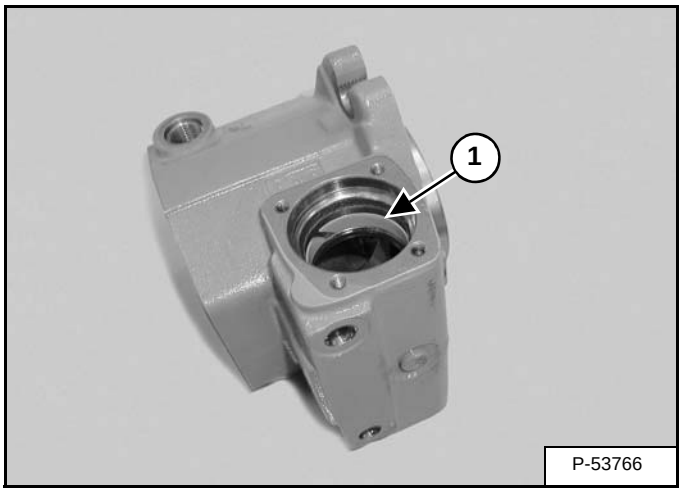
Install the cover so the adjustment bolt (Item 2) **[Figure 30-30-87]** is at the height recorded earlier.

Figure 30-30-88



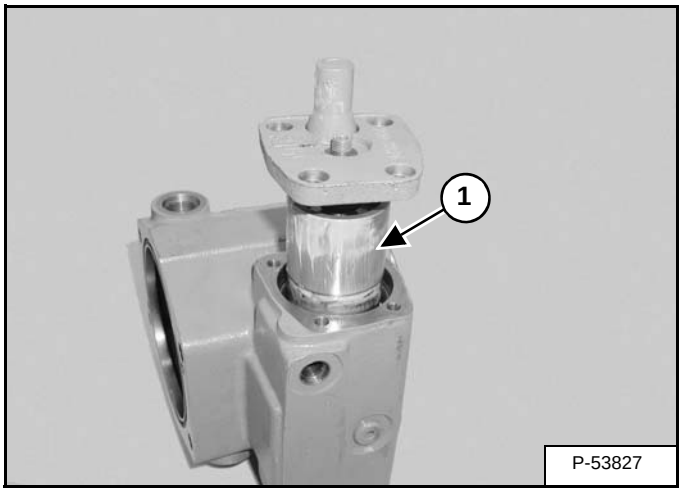
Install the seals (Item 1) **[Figure 30-30-88]** in the pump housing. (Top and bottom)

Figure 30-30-89



Install the split seals (Item 1) **[Figure 30-30-89]** in the pump housing. (Top and bottom)

Figure 30-30-90

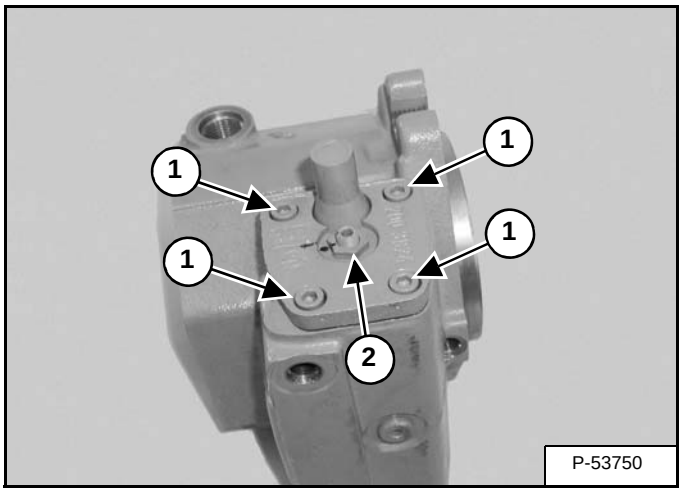


Apply assembly lube to the servo piston. Install the servo piston (Item 1) **[Figure 30-30-90]**.

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Assembly (Cont'd)

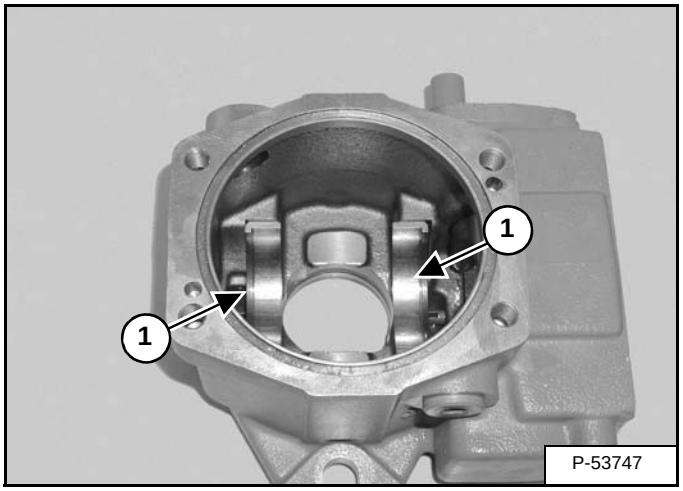
Figure 30-30-91



Install the bolts (Item 1) **[Figure 30-30-91]**. Tighten the bolts to 85 in.-lb. (9,6 N•m) torque.

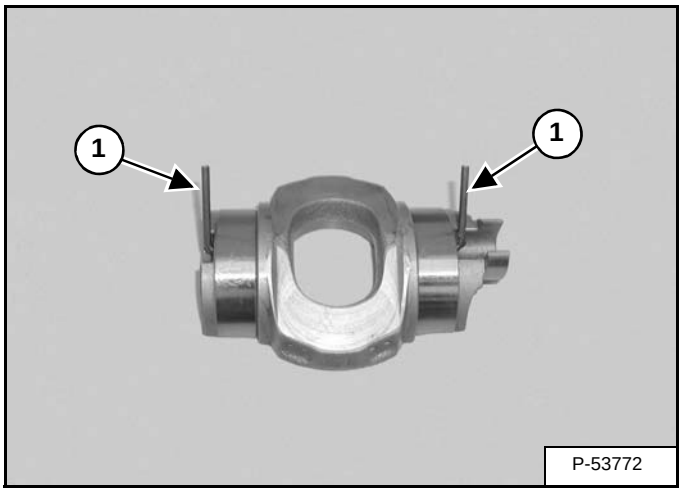
Install but do not tighten the lock nut (Item 2) **[Figure 30-30-91]**.

Figure 30-30-92



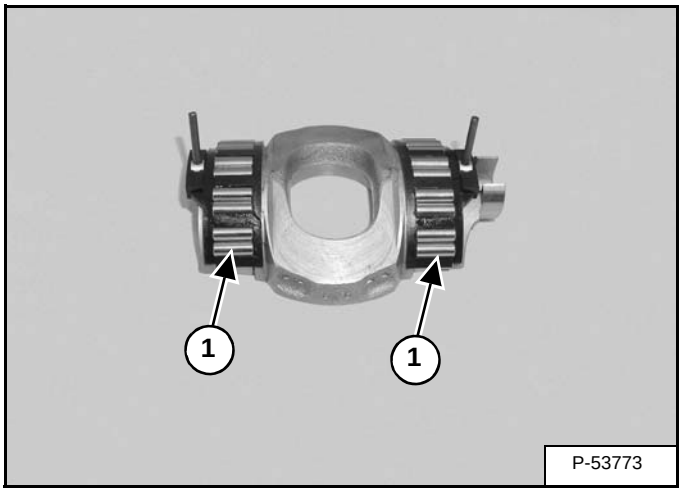
Install the bearing races (Item 1) **[Figure 30-30-92]**.

Figure 30-30-93



Install the control rods (Item 1) **[Figure 30-30-93]** on the swash plate.

Figure 30-30-94

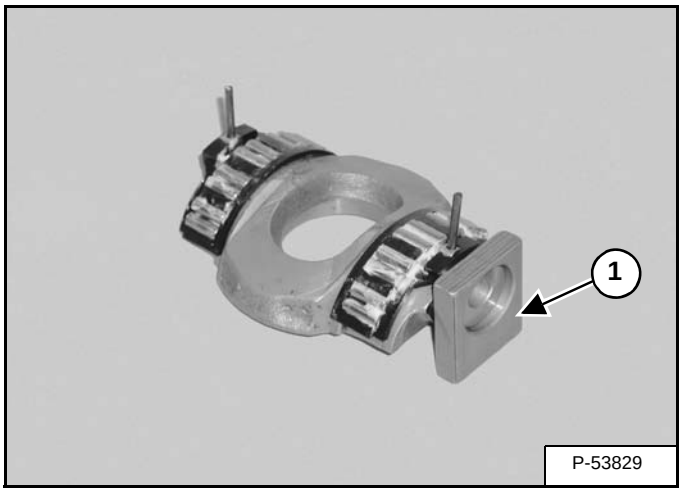


Apply assembly lube on the bearings. Install the bearings (Item 1) **[Figure 30-30-94]** over the control rods and on the swash plate.

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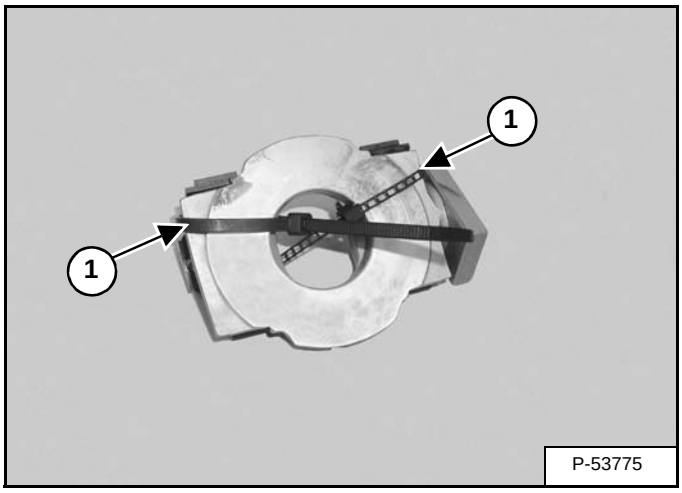
Assembly (Cont'd)

Figure 30-30-95



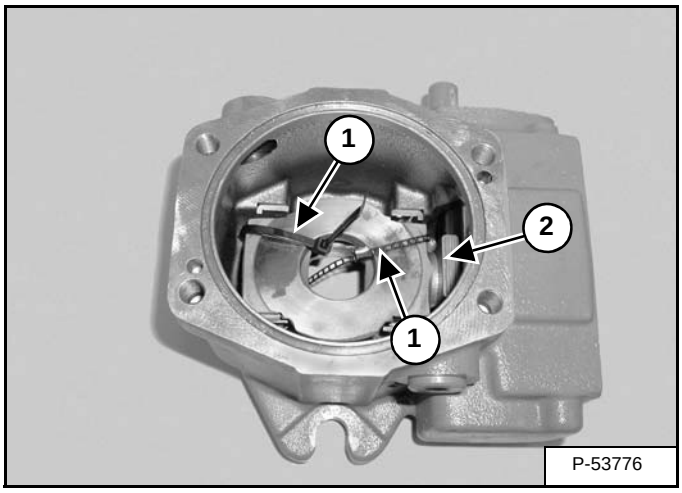
Install the servo piston block (Item 1) **[Figure 30-30-95]**.

Figure 30-30-96



Install tie straps (Item 1) **[Figure 30-30-96]** on the swash plate assembly to temporarily hold the assembly together.

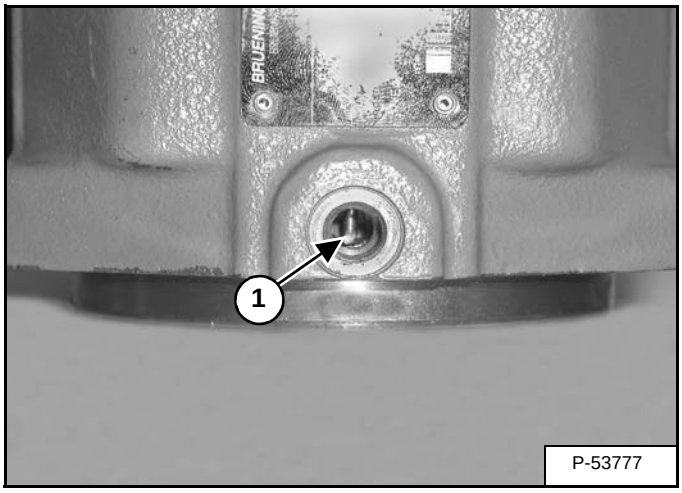
Figure 30-30-97



Install the swash plate assembly in the pump housing. Cut and remove the tie straps (Item 1) **[Figure 30-30-97]**.

After removing the tie straps, make sure the servo piston block (Item 2) **[Figure 30-30-97]** is engaged in the slot of the servo piston.

Figure 30-30-98

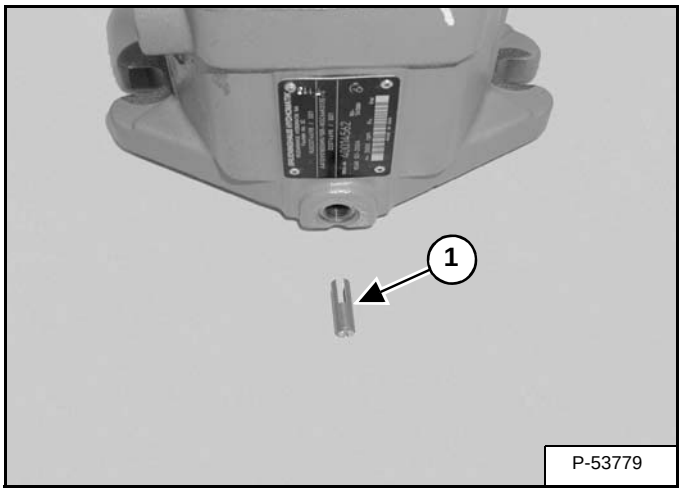


Use a small flat blade screwdriver to center the control rod (Item 1) **[Figure 30-30-98]** in the pump housing (both sides).

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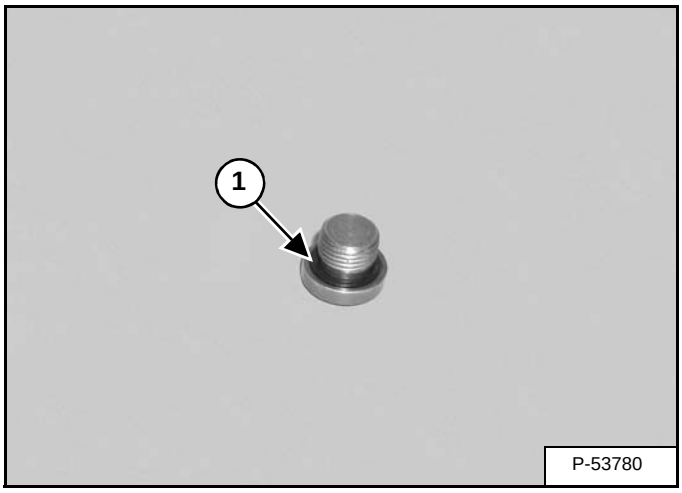
Assembly (Cont'd)

Figure 30-30-99



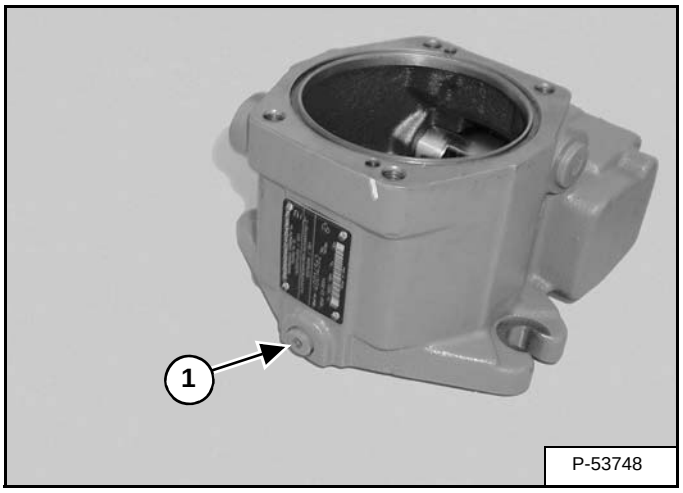
Install the locating pin (Item 1) **[Figure 30-30-99]** so the slot in the pin engages the control rod. (Both sides)

Figure 30-30-100



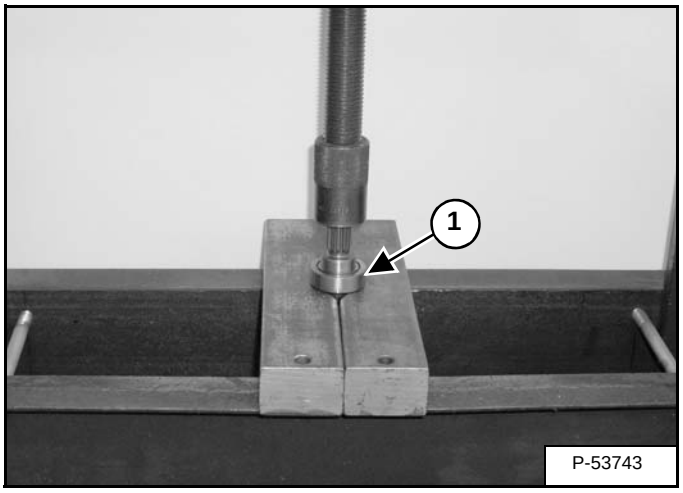
Install the O-ring (Item 1) **[Figure 30-30-100]** on both plugs.

Figure 30-30-101



Install the plug (Item 1) **[Figure 30-30-101]**. (Both sides)

Figure 30-30-102

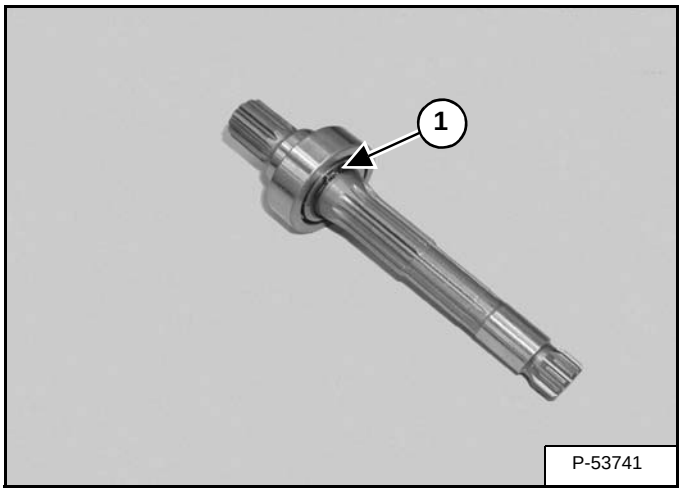


Press the bearing (Item 1) **[Figure 30-30-102]** on the shaft.

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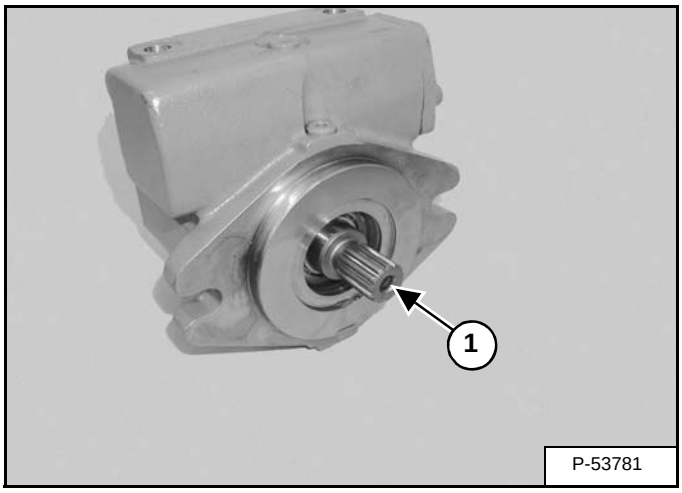
Assembly (Cont'd)

Figure 30-30-103



Install the snap ring (Item 1) **[Figure 30-30-103]**.

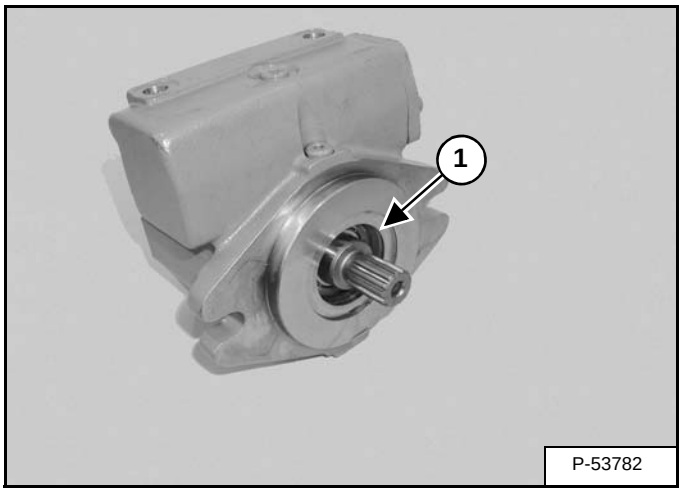
Figure 30-30-104



Install the shaft (Item 1) **[Figure 30-30-104]** in the pump housing.

NOTE: Do not dislodge the swash plate assembly while installing the shaft.

Figure 30-30-105



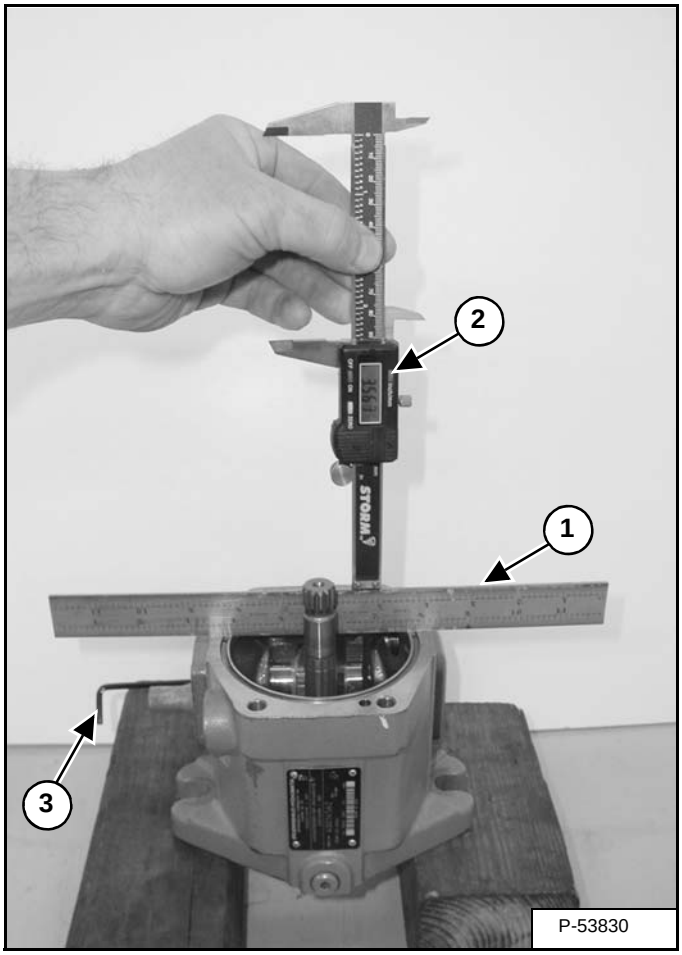
Install the snap ring (Item 1) **[Figure 30-30-105]**.

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Assembly (Cont'd)

To set neutral at the servo piston and swash plate, do the following procedure:

Figure 30-30-106



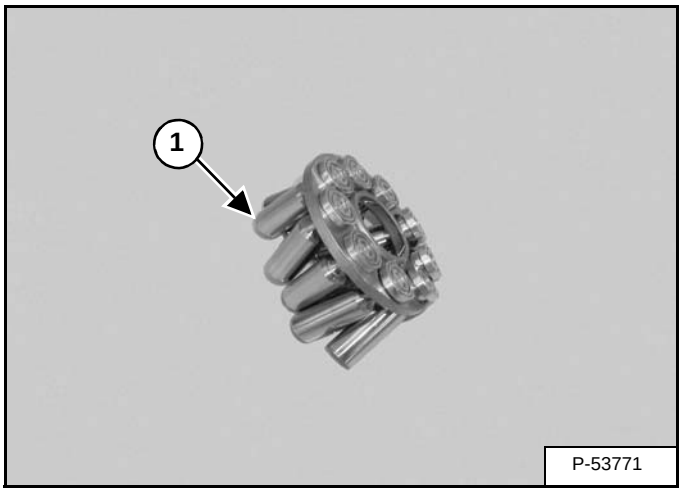
Put a straight edge (Item 1) **[Figure 30-30-106]** across the pump housing.

Use a calipers (Item 2) **[Figure 30-30-106]** and measure the distance on one side of the swash plate. Then measure the other side of the swash plate.

Turn the servo piston adjustment screw (Item 3) **[Figure 30-30-106]** until both sides of the swash plate measure the same distance.

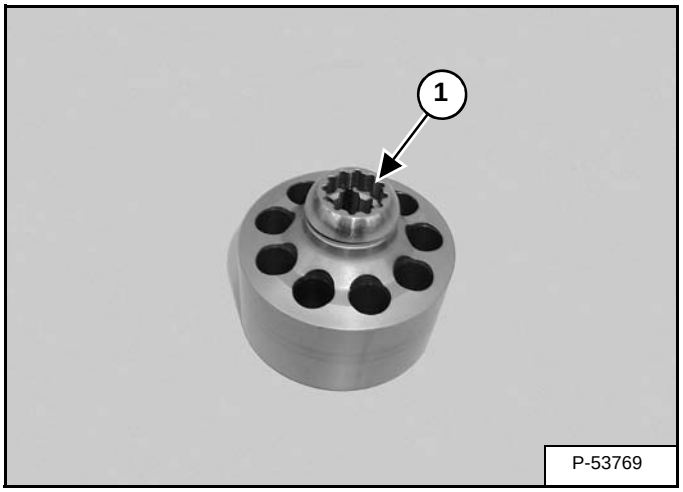
Hold the adjustment screw and tighten the lock nut after the swash plate neutral setting is obtained.

Figure 30-30-107



Install the pistons (Item 1) **[Figure 30-30-107]** in the piston retainer.

Figure 30-30-108

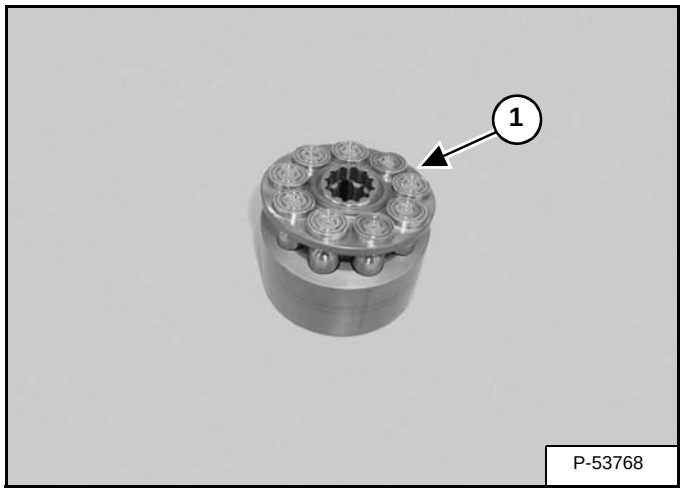


Install the spherical washer (Item 1) **[Figure 30-30-108]** on the cylinder block.

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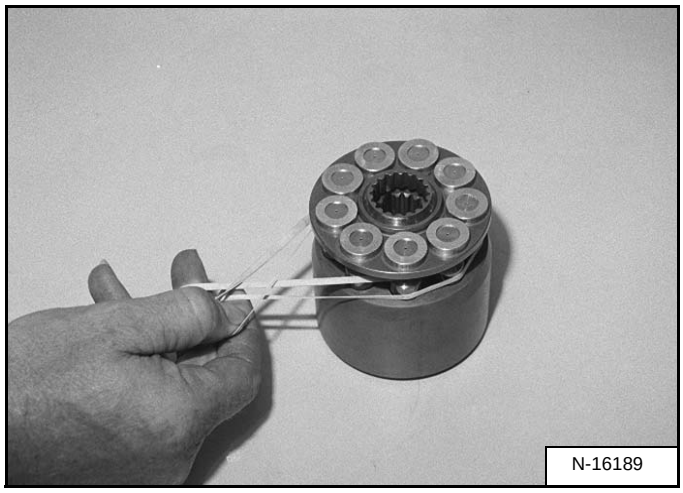
Assembly (Cont'd)

Figure 30-30-109



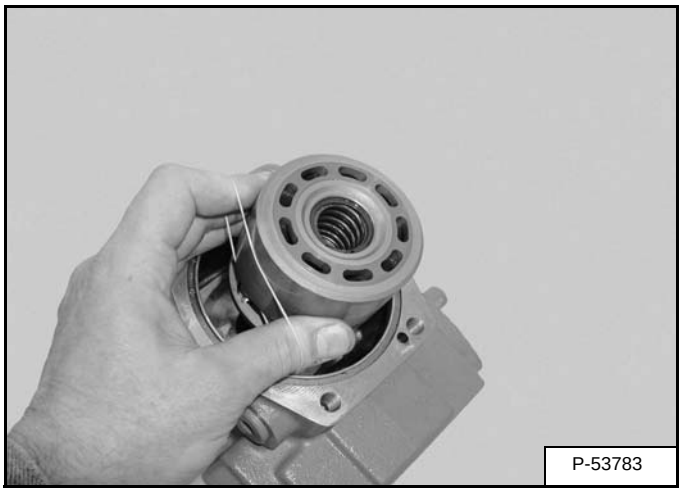
Install the piston assembly (Item 1) **[Figure 30-30-109]** in the cylinder block.

Figure 30-30-110



Put a rubber band around the pistons to keep the pistons in position **[Figure 30-30-110]**.

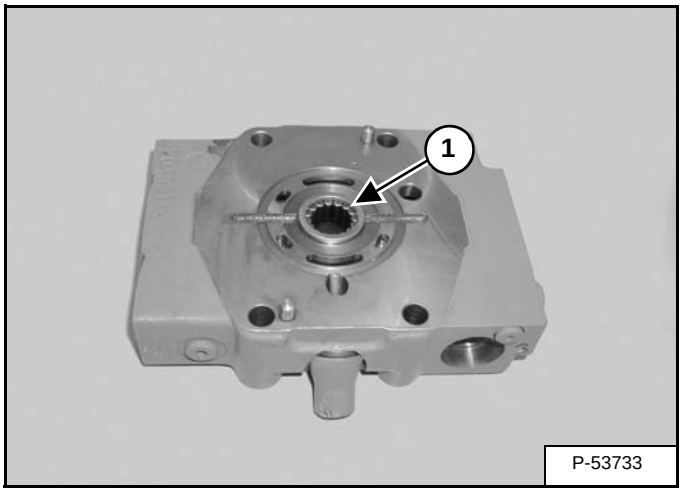
Figure 30-30-111



Install the rotating group into the pump housing **[Figure 30-30-111]**.

When the rotating group is seated on the swash plate, remove the rubber band.

Figure 30-30-112

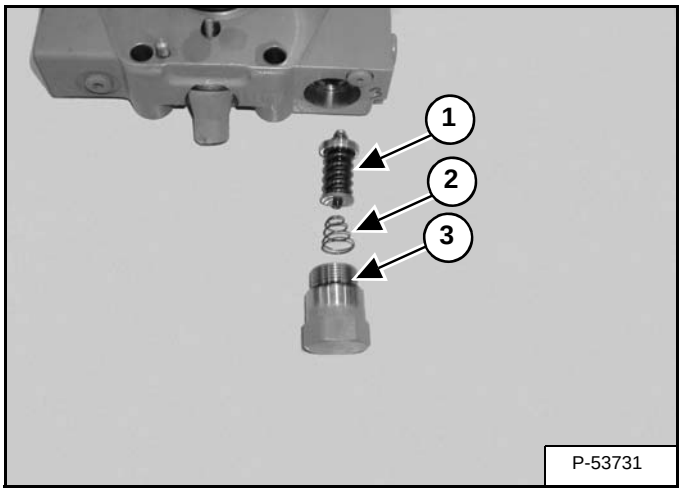


Install the bearing (Item 1) **[Figure 30-30-112]** in the port block.

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Assembly (Cont'd)

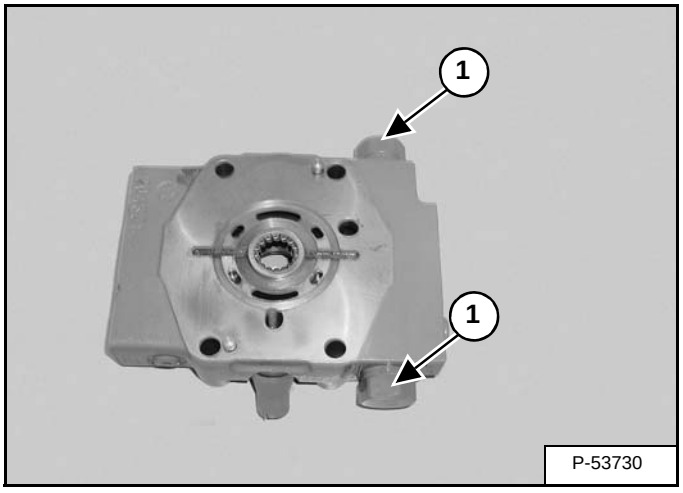
Figure 30-30-113



Install the high pressure relief (Item 1) and spring (Item 2) **[Figure 30-30-113]** (both sides).

Install the O-ring (Item 3) **[Figure 30-30-113]** on both plugs.

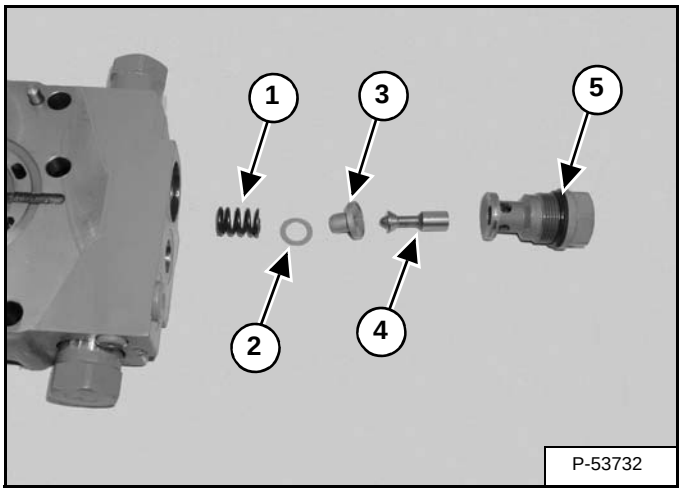
Figure 30-30-114



Install the plugs (Item 1) **[Figure 30-30-114]**.

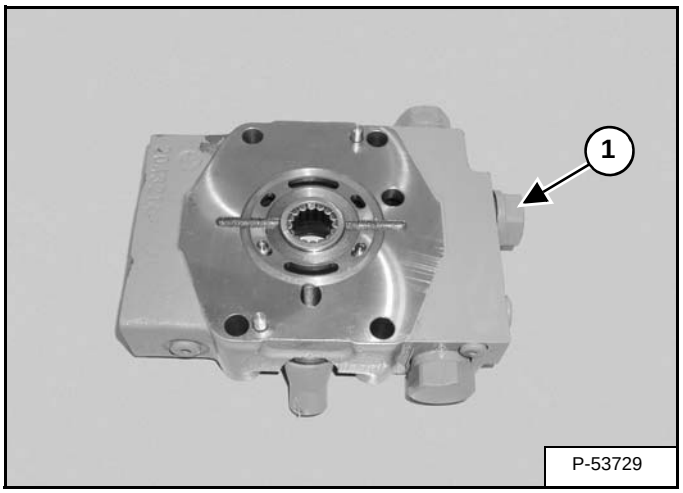
Tighten the high pressure relief/replenishing valves to 30 ft.-lb. (41 N•m) torque.

Figure 30-30-115



Install the spring (Item 1), shim (Item 2), spring seat (Item 3) and spool (Item 4). Install the O-ring (Item 5) **[Figure 30-30-115]** on the plug.

Figure 30-30-116



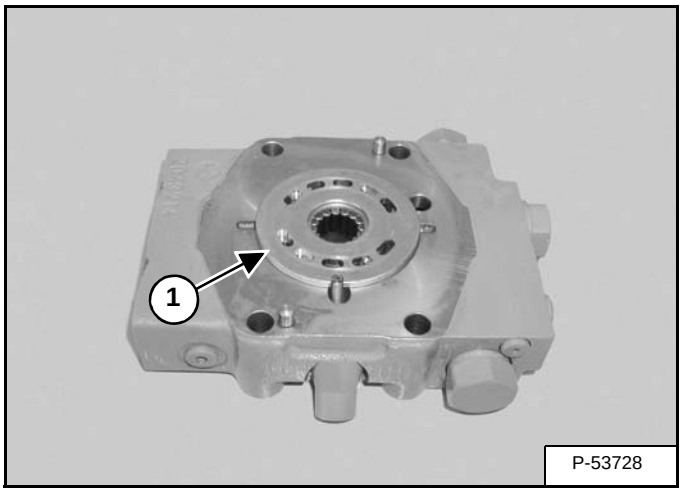
Install the plug (Item 1) **[Figure 30-30-116]**.

Tighten the charge pressure relief valve to 30 ft.-lb (41 N•m) torque.

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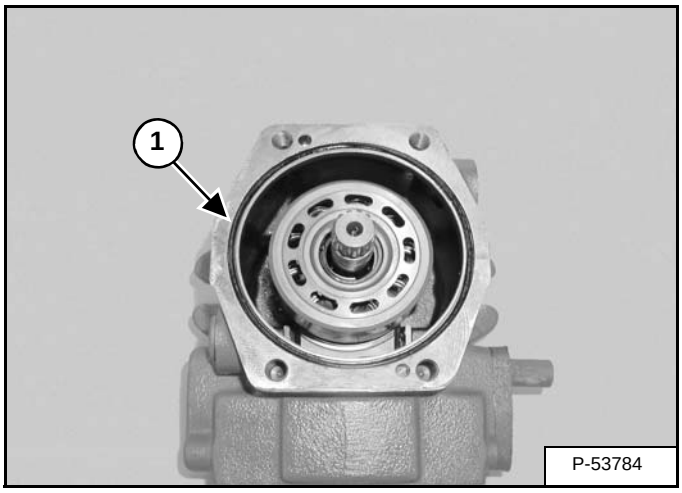
Assembly (Cont'd)

Figure 30-30-117



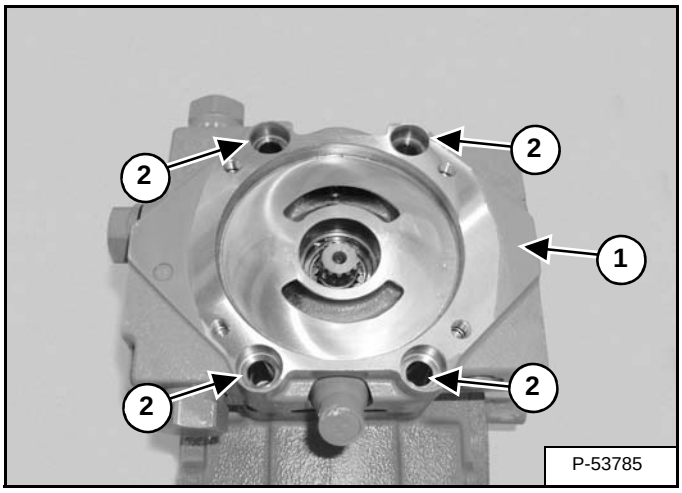
Apply assembly lube on the valve plate. Install the valve plate (Item 1) **[Figure 30-30-117]** on the port block.

Figure 30-30-118



Install the O-ring (Item 1) **[Figure 30-30-118]**.

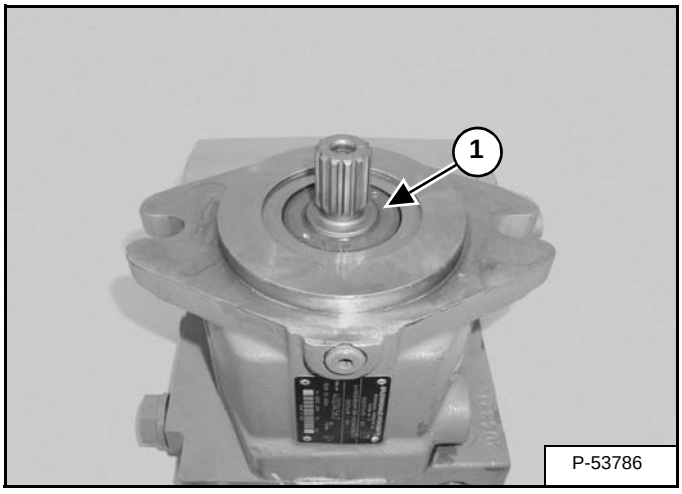
Figure 30-30-119



Install the port block (Item 1) and bolts (Item 2) **[Figure 30-30-119]**.

Tighten the bolts to 85 ft.-lb. (115 N•m) torque.

Figure 30-30-120

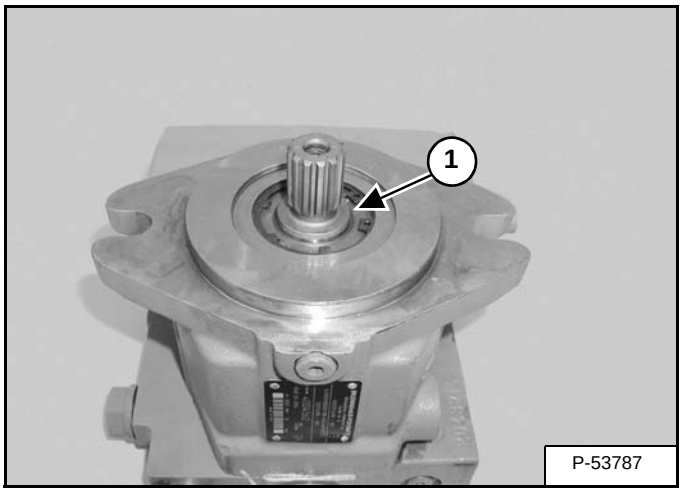


Turn the pump over and install the seal (Item 1) **[Figure 30-30-120]**.

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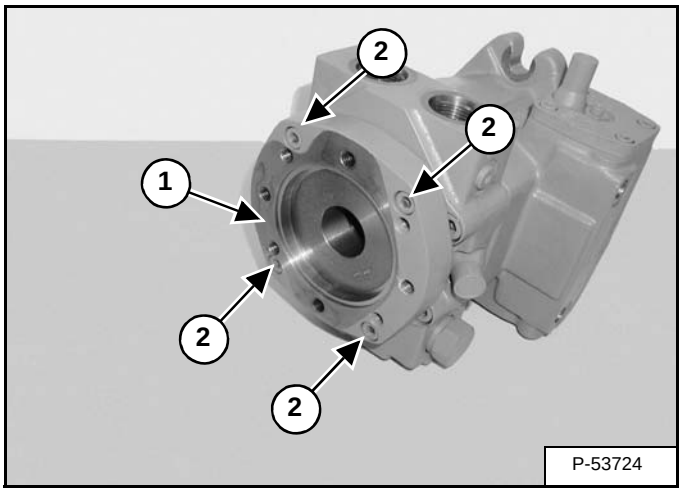
Assembly (Cont'd)

Figure 30-30-121



Install the snap ring (Item 1) **[Figure 30-30-121]**.

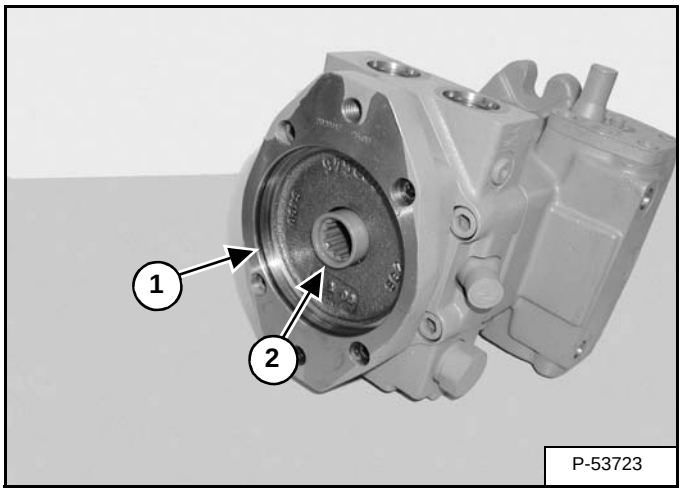
Figure 30-30-122



Install the plate (Item 1) and bolts (Item 2) **[Figure 30-30-122]**.

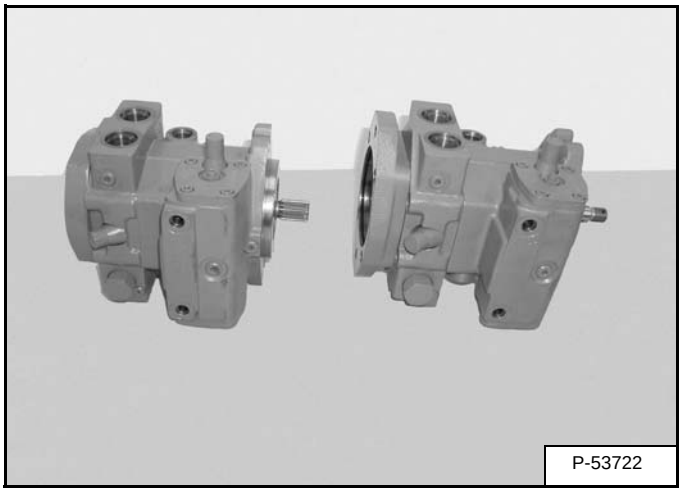
Tighten the bolts to 34 ft.-lb. (46 N•m) torque.

Figure 30-30-123



Install the O-ring (Item 1) and pump coupler (Item 2) **[Figure 30-30-123]**.

Figure 30-30-124

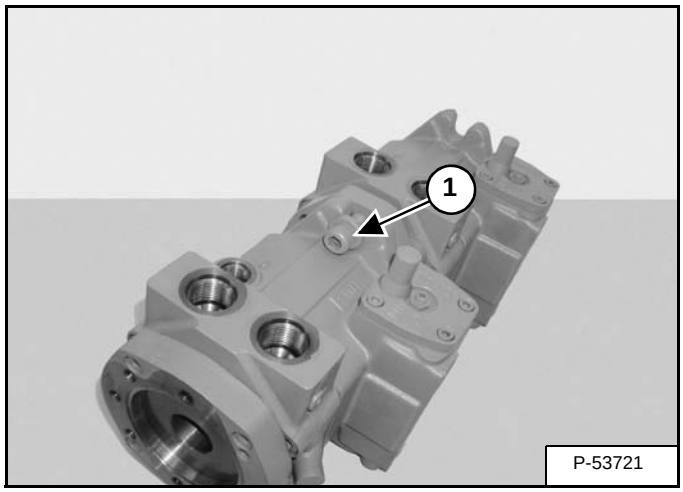


Install the 2 hydrostatic pumps together **[Figure 30-30-124]**.

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Assembly (Cont'd)

Figure 30-30-125



Install the top and bottom bolt (Item 1) **[Figure 30-30-125]** and washer.

Hydrostatic Pump Start-Up

Disconnect the fuel shut-off solenoid at the fuel injection pump.

Crank the engine, with the starter, for 15 to 20 seconds.

Connect the fuel shut-off solenoid.

Start the engine and run at idle speed for 5 to 7 minutes before operating the excavator. Do Not run the engine above idle speed while doing the above procedure.

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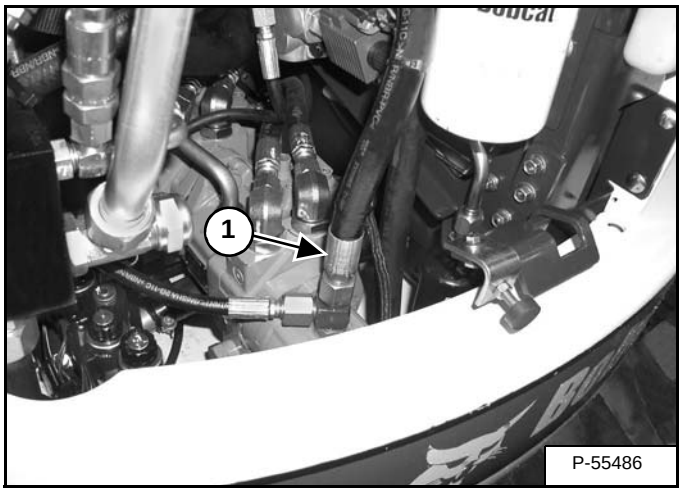
FAN/CHARGE PUMP

Description

The fan/charge pump supplies hydraulic fluid to the manifold, cooling fan motor, and charge pressure to the hydrostatic pump.

Testing

Figure 30-31-1



Remove the hose (Item 1) **[Figure 30-31-1]** from the pump.

Figure 30-31-2



Connect the hydraulic tester inlet side (Item 1) **[Figure 30-31-2]** to the pump.

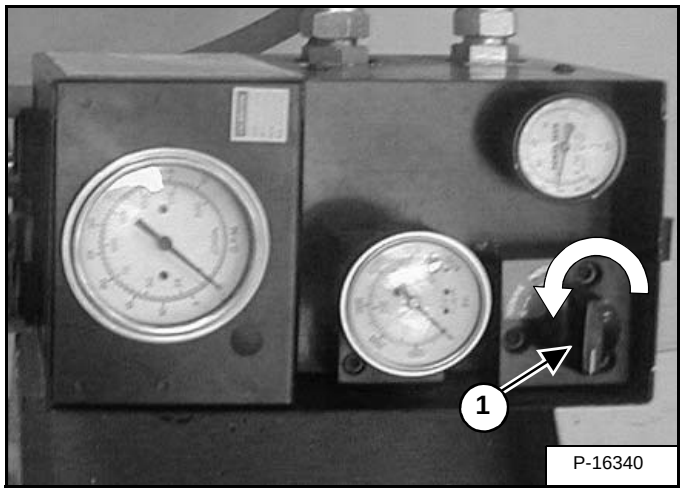
Connect the hydraulic tester outlet side (Item 2) **[Figure 30-31-2]** to the hose.

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FAN/CHARGE PUMP (CONT'D)

Testing (Cont'd)

Figure 30-31-3



Turn the hydraulic tester flow control (Item 1) **[Figure 30-31-3]** counterclockwise until all restriction is removed.

Start the engine and run at low RPM. Make sure the tester his connected correctly. If no flow is indicated at the tester, the hoses are connected wrong.

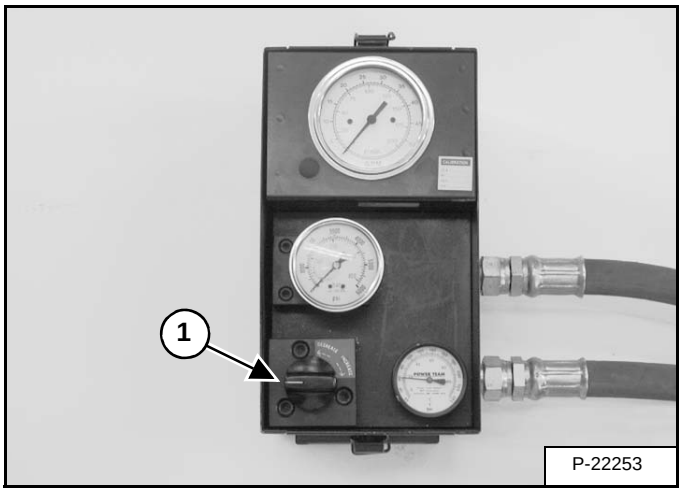
Increase the engine speed to full RPM. Warm the hydraulic fluid to a minimum temperature of 140° F (60° C) by turning the restrictor valve until the gauge reads about 1000 PSI (69 bar).

After the temperature is correct, open the restrictor valve fully.

Record the pump free flow GPM (L/min).

Pump flow on a new pump is 9.3 GPM (35,2 L/min) at 2770 engine rpm.

Figure 30-31-4



Close the flow control knob (Item 1) **[Figure 30-31-4]** slowly to 1500 PSI (103 bar).

Record the pump high pressure flow GPM (L/min).

NOTE: The high pressure flow must be at least 80% of free flow.

$$\%= \frac{\text{HIGH PRESSURE FLOW (GPM)}}{\text{FREE FLOW (GPM)}} \times 100$$

If the high pressure flow is less than 80% of free flow, remove the pump for repair or replacement.

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DRIVE BELT SHIELD

Removal And Installation

Remove the muffler. (See Removal And Installation on Page 70-20-1).

Remove the hydraulic pump. (See HYDRAULIC PUMP (S/N 562611001 & ABOVE AND 562811001 & ABOVE) on Page 20-50-1 or See HYDRAULIC PUMP (S/N 563111001 & Above AND 563211001 & above) on Page 20-51-1).

Figure 30-40-1

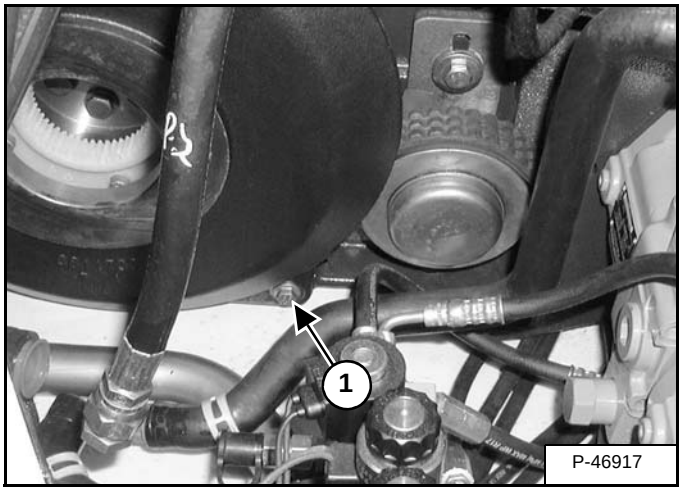
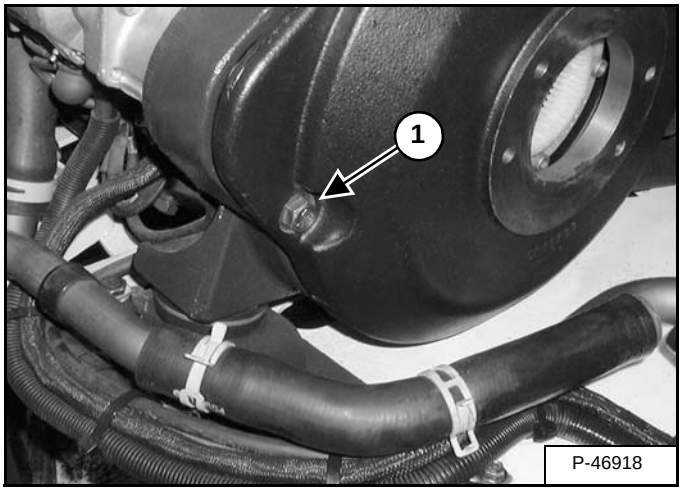
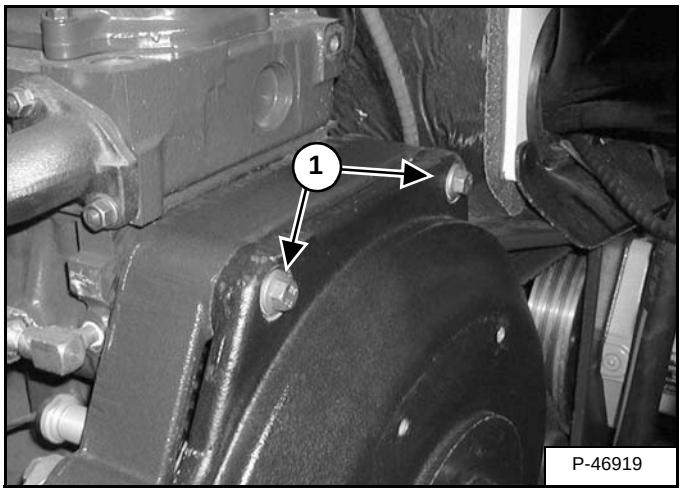


Figure 30-40-2



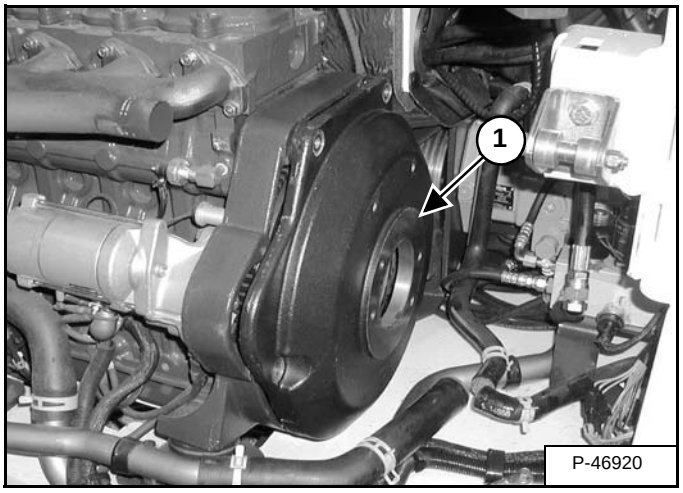
Remove the two bottom bolts (Item 1) **[Figure 30-40-1]** & **[Figure 30-40-2]**.

Figure 30-40-3



Remove the two bolts (Item 1) **[Figure 30-40-3]**.

Figure 30-40-4



Remove the shield (Item 1) **[Figure 30-40-4]**.

Installation: Align the dowel pins in the shield with the holes in the bell housing.

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DRIVE BELT

Adjustment

The drive belt must be inspected and adjusted after the first 50 hrs of operation. Adjust the drive belt at 250 hrs thereafter.

Incorrect belt tension can cause hydrostatic pump failure or excessive belt wear.

Open the right side cover.

Figure 30-41-1

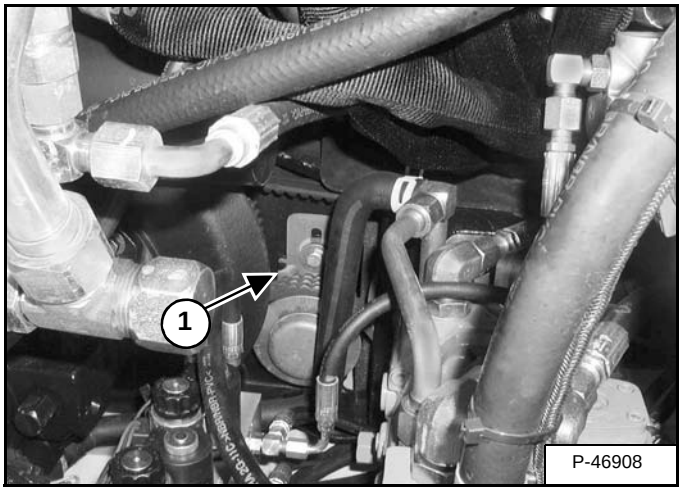
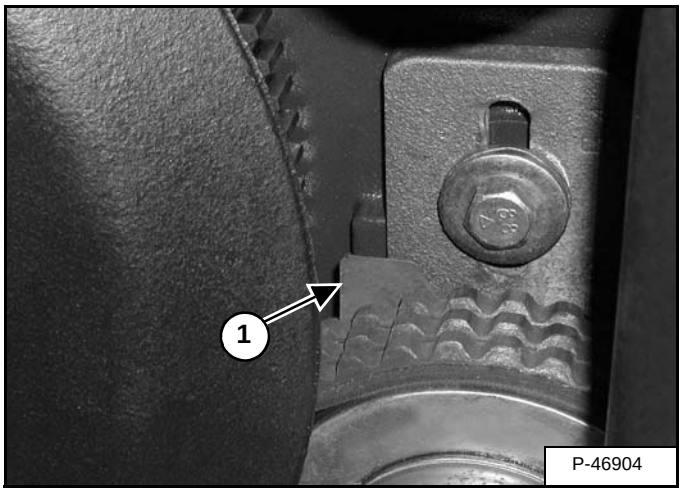
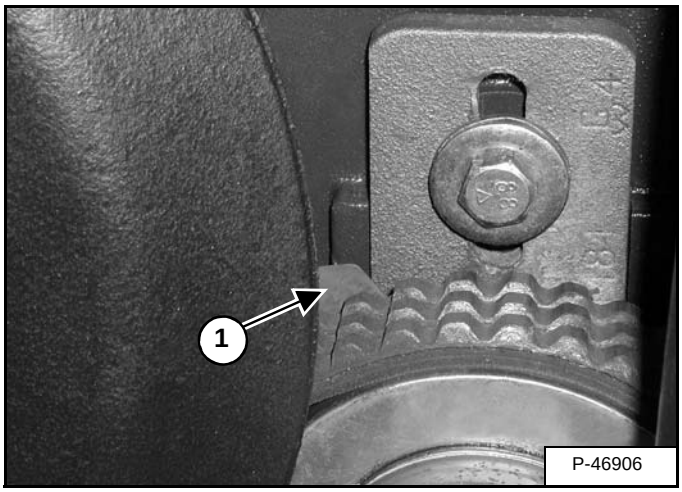


Figure 30-41-2



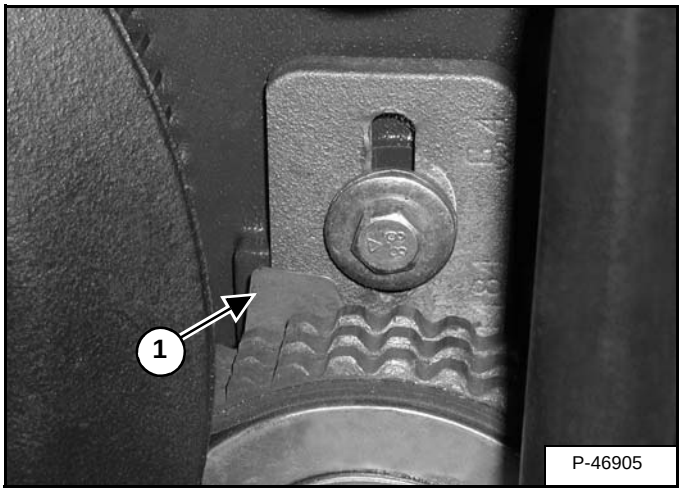
When the belt tension indicator (Item 1) **[Figure 30-41-1]** & **[Figure 30-41-2]** is in the position as shown, the belt tension is correct.

Figure 30-41-3



When the belt tension indicator (Item 1) **[Figure 30-41-3]** is in the position as shown, the belt tension is too loose.

Figure 30-41-4

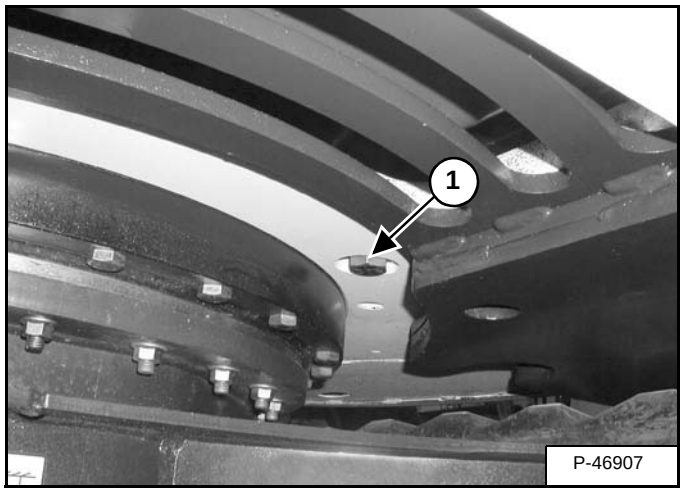


When the bolt tension indicator (Item 1) **[Figure 30-41-4]** is in the position shown, the belt tension is too tight.

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Adjustment (Cont'd)

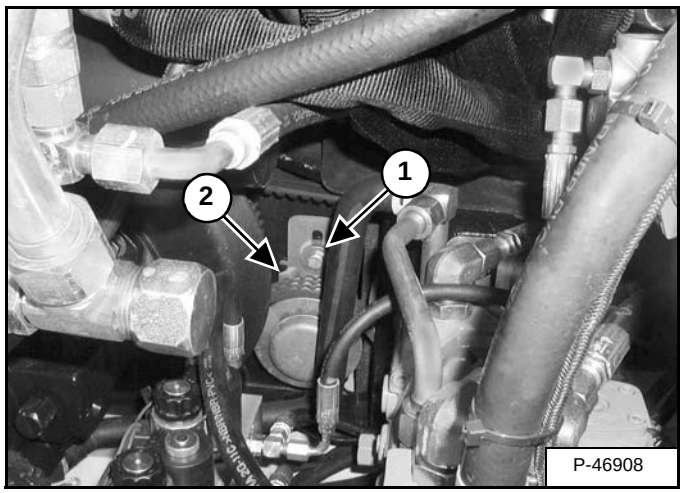
Figure 30-41-5



Install a 0.750-10 UNC x 2.50 inch bolt (Item 1) **[Figure 30-41-5]** through the upperstructure and into the mount.

Tighten the bolt until it contacts the idler.

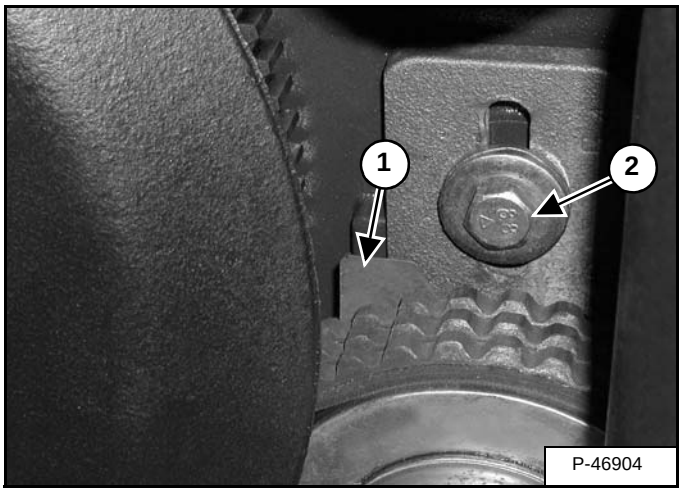
Figure 30-41-6



Loosen the bolt (Item 1) **[Figure 30-41-6]**.

Turn the bolt (Item 1) **[Figure 30-41-5]** out (counter clockwise) until the indicator (Item 2) **[Figure 30-41-6]** begins to rotate counter clockwise. This will indicate that the idler is operating on spring tension.

Figure 30-41-7



Turn the bolt (Item 1) **[Figure 30-41-5]** in (clockwise) until the indicator (Item 1) **[Figure 30-41-7]** is at the position shown.

Tighten the bolt (Item 2) **[Figure 30-41-7]** to 30-33 ft.-lbs. (40-45 Nm) torque.

Remove the bolt (Item 1) **[Figure 30-41-5]** from the mount.

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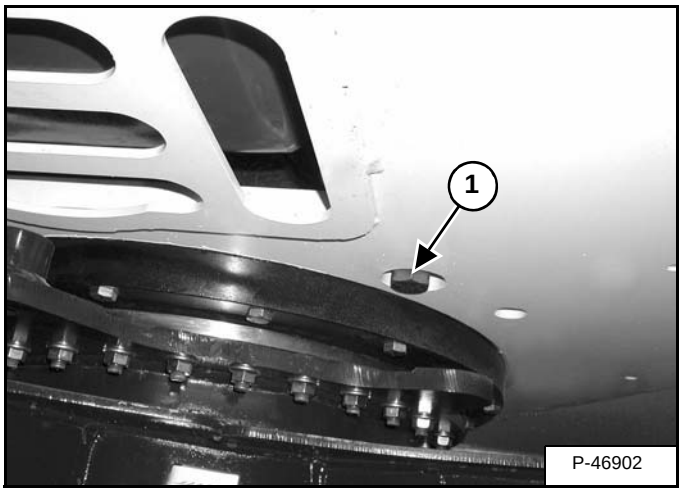
Removal And Installation

Remove the muffler. (See Removal And Installation on Page 70-20-1)

Remove the hydraulic pump. (See HYDRAULIC PUMP (S/N 562611001 & ABOVE AND 562811001 & ABOVE) on Page 20-50-1 or See HYDRAULIC PUMP (S/N 563111001 & Above AND 563211001 & above) on Page 20-51-1)

Remove the drive belt shield. (See Removal And Installation on Page 30-40-1)

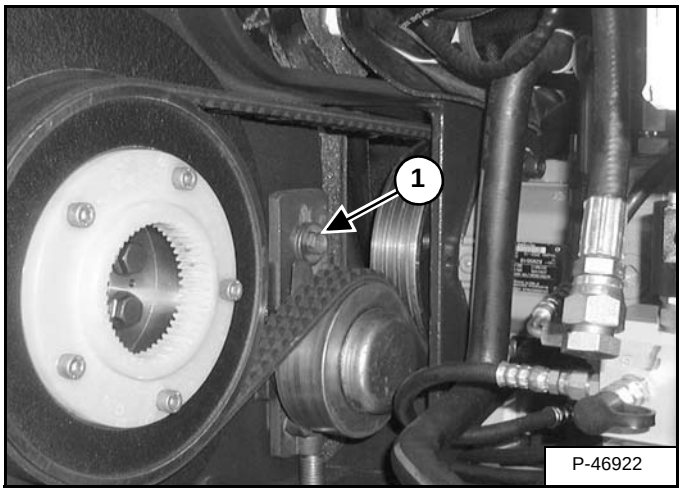
Figure 30-41-8



Install a 0.750-10 UNC x 2.50 inch bolt (Item 1) **[Figure 30-41-8]** through the upperstructure and in to the mount.

Tighten the bolt until it contacts the idler.

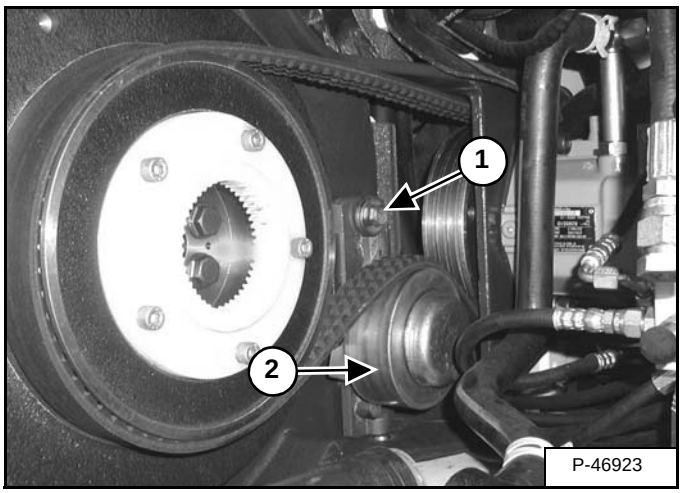
Figure 30-41-9



Loosen the idler bolt (Item 1) **[Figure 30-41-9]**.

Turn the bolt (Item 1) **[Figure 30-41-8]** counter clockwise until all the belt tension has been released.

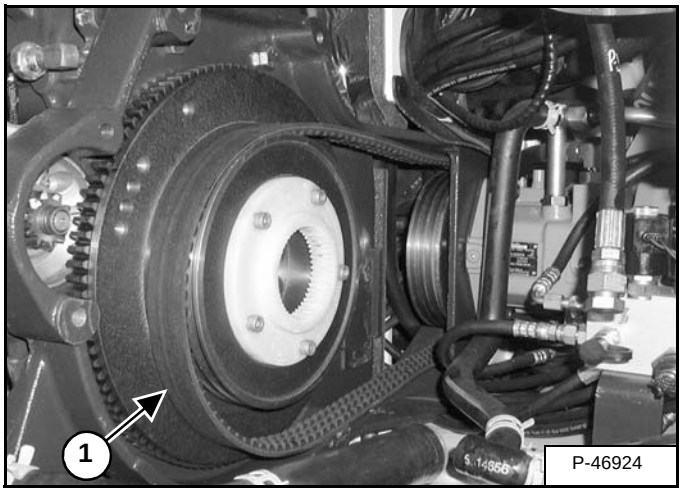
Figure 30-41-10



Remove the bolt (Item 1) **[Figure 30-41-10]** and washer.

Remove the idler (Item 2) **[Figure 30-41-10]**.

Figure 30-41-11

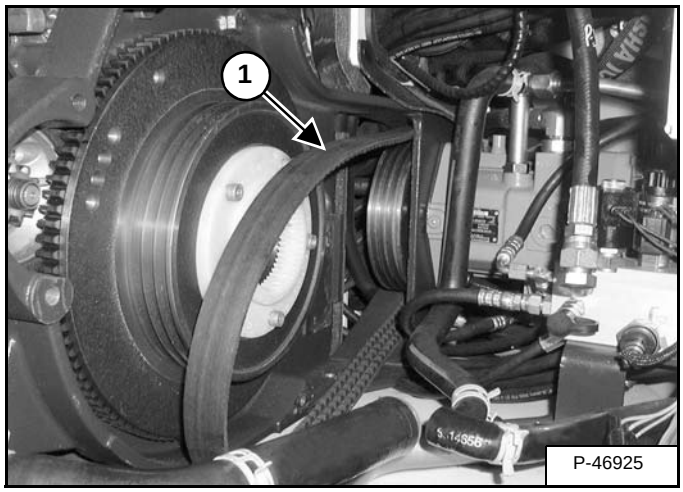


Remove the belt (Item 1) **[Figure 30-41-11]** from the fly wheel.

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Removal And Installation (Cont'd)

Figure 30-41-12



Remove the belt (Item 1) **[Figure 30-41-12]** from the hydrostat.

Installation: See Adjustment on Page 30-41-1 after installing the drive belt.

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Removal And Installation 40-12-1

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Removal And Installation 40-11-1

ANGLE BLADE CUTTING EDGE 40-13-1
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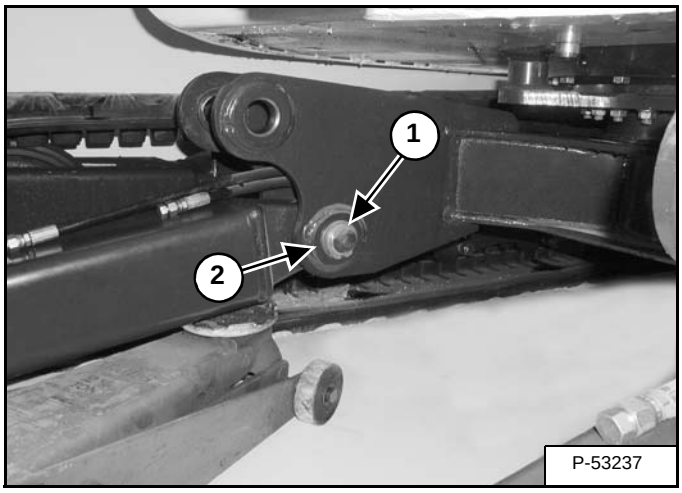
BLADE

Removal And Installation

Remove the blade cylinders. (See Removal And Installation on Page 20-24-2)

Place a jack under the blade arms.

Figure 40-10-1



Remove the snapring (Item 1), washer and pin (Item 2) **[Figure 40-10-1]** from both blade arms.

Lower the jack and remove the blade.

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ANGLE BLADE ASSEMBLY

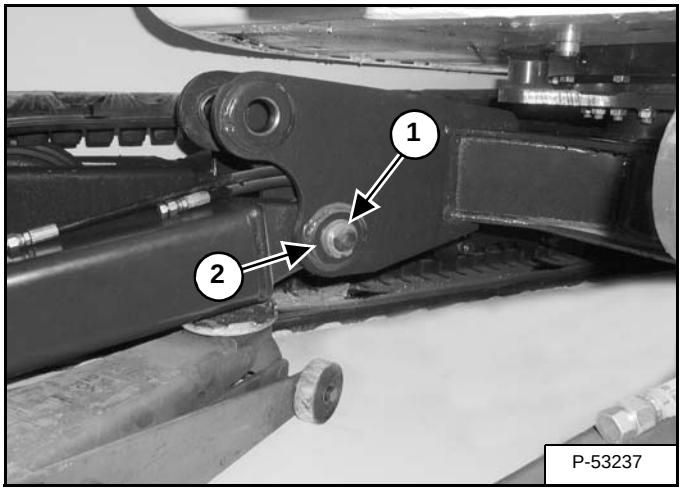
Removal And Installation

Remove the blade cylinders. (See Removal And Installation on Page 20-24-2.)

Remove the angle blade cylinder. (See Removal And Installation on Page 20-26-2.)

Place a jack under the blade arms.

Figure 40-11-1



Remove the snapring (Item 1), washer and pin (Item 2) **[Figure 40-11-1]** from both blade arms.

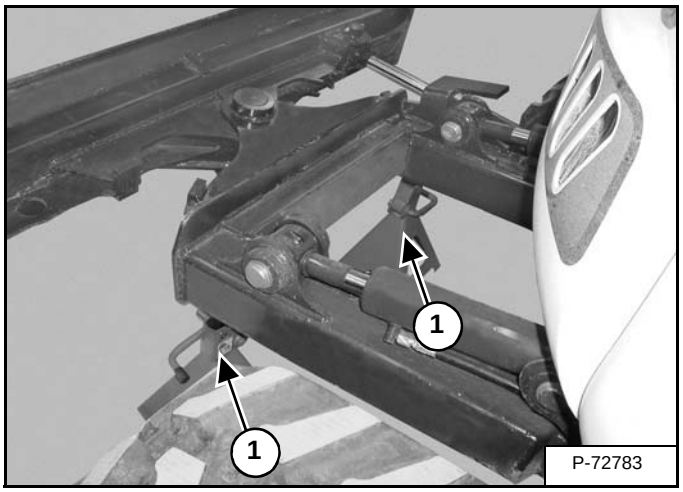
Lower the jack and remove the blade.

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ANGLE BLADE

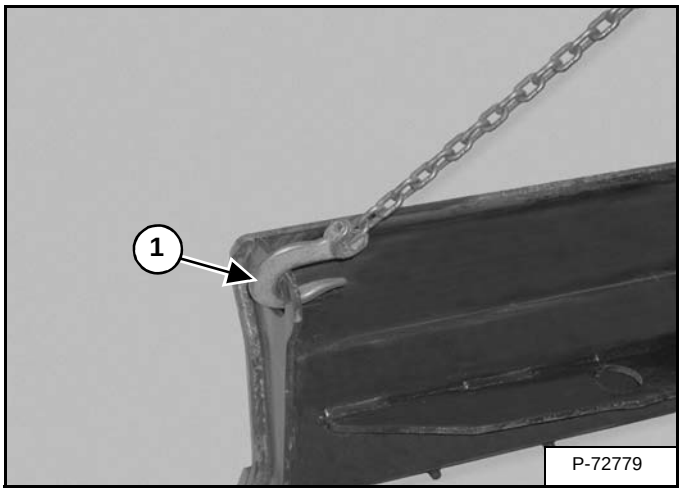
Removal And Installation

Figure 40-12-1



Raise the blade fully and install jackstands (Item 1) **[Figure 40-12-1]** under the blade arms.

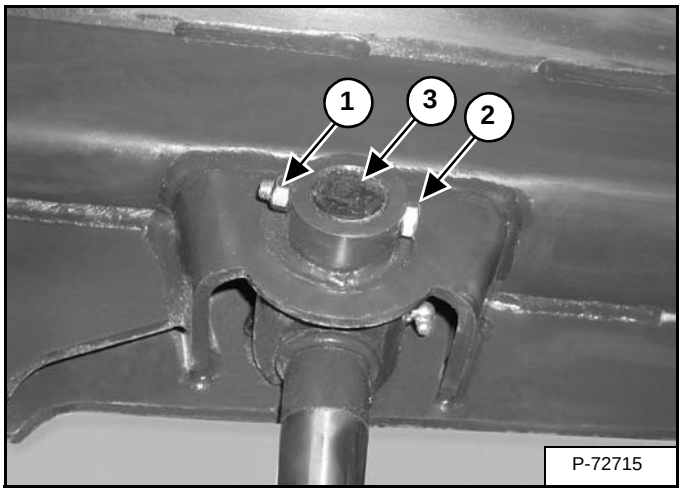
Figure 40-12-2



Attach a chain (Item 1) **[Figure 40-12-2]** and hoist to both ends of the blade.

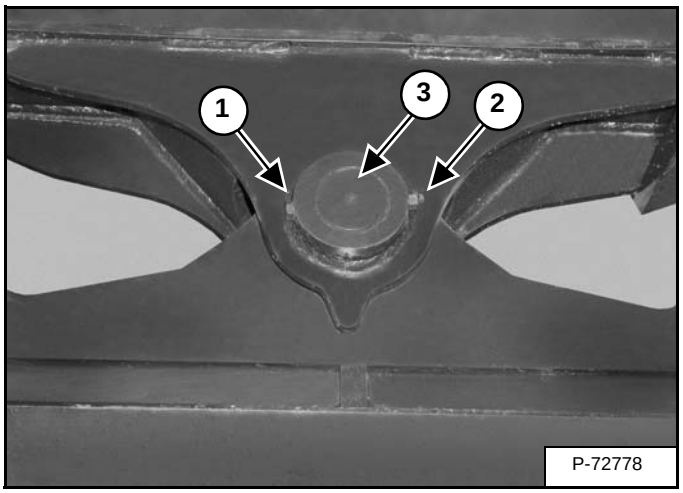
Apply slight upward pressure on the blade.

Figure 40-12-3



Remove the nut (Item 1), bolt (Item 2) and pin (Item 3) **[Figure 40-12-2]** from the rod end of the angle blade cylinder.

Figure 40-12-4



Remove the nut (Item 1), bolt (Item 2) and pin (Item 3) **[Figure 40-12-4]**.

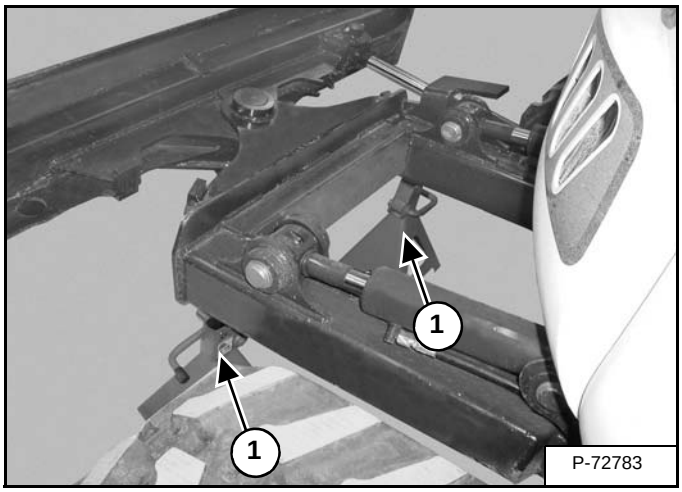
Remove the angle blade.

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ANGLE BLADE CUTTING EDGE

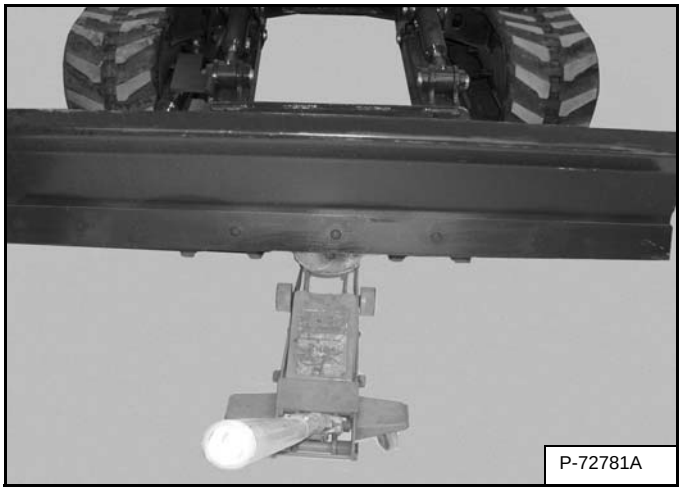
Removal And Installation

Figure 40-13-1



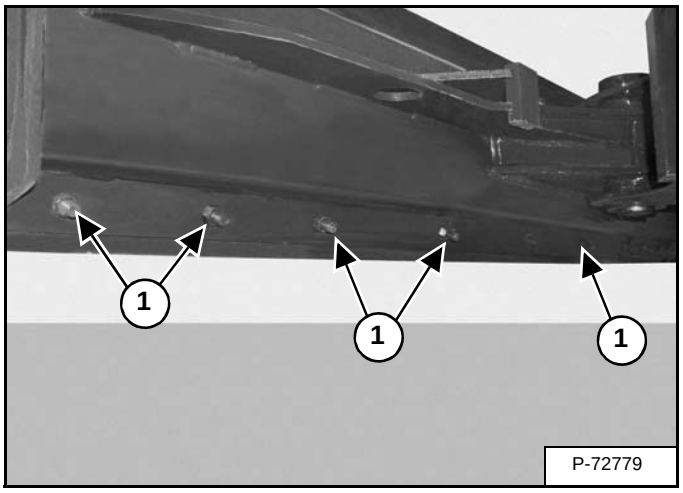
Raise the blade fully and install jackstands (Item 1) **[Figure 40-13-1]** under the blade arms.

Figure 40-13-2



Place a jack under the cutting edge **[Figure 40-13-2]**.

Figure 40-13-3



Remove the nuts (Item 1) **[Figure 40-13-3]** and bolts from the cutting edge.

Lower the jack and remove the cutting edge.

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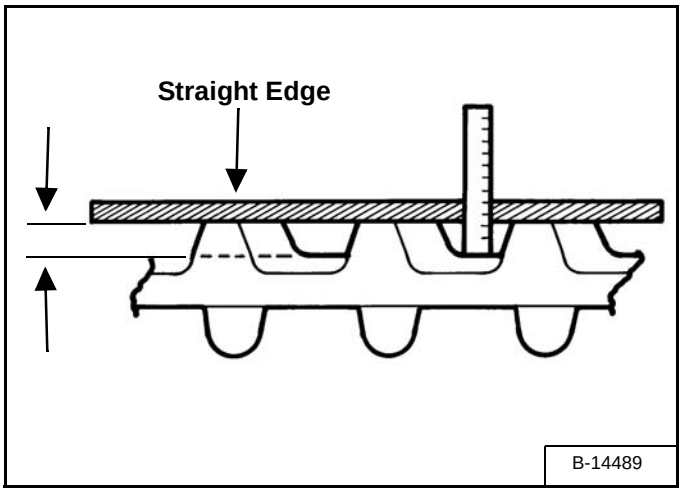
TRACKS

Track Lug Height

Rubber Track

The lug height of a new rubber track is 0.984 in. (25,0 mm).

Figure 40-20-1



To find the percentage of wear on an excavator track, measure the height of the lug by placing a straight edge across the top of 3 lugs and measure the distance from the base of the track to the bottom of the straight edge **[Figure 40-20-1]**.

Divide this measurement by the new track height and multiply by 100. This will give the percentage of track lug left.

Example: lug height 0.787 in. (20,0 mm)

$$\frac{0.787}{0.984} \times 100 = 80$$

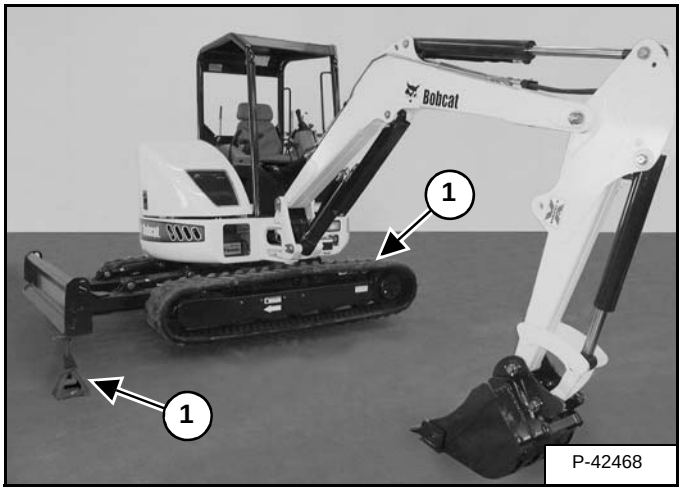
80% of the track lug is remaining with 20% wear on the track lugs.

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Rubber Track Clearance

NOTE: The wear of the pins and bushings on the undercarriage vary with the working conditions and the different types of soil conditions. It is necessary to inspect track tension and maintain the correct tension. See the Service Schedule for the correct service interval. (See Chart on Page 10-50-1)

Figure 40-20-2



Raise 1 side of the machine (Approximately 4 in. [102 mm]) using the boom and arm **[Figure 40-20-2]**.

Raise the blade fully and install jackstands (Item 1) **[Figure 40-20-2]** under the blade and track frame. Lower the boom until all machine weight is on the jackstands.

Stop the engine.

⚠ WARNING

AVOID INJURY OR DEATH
Keep fingers and hands out of pinch points when checking the track tension.

W-2142-0189

Figure 40-20-3

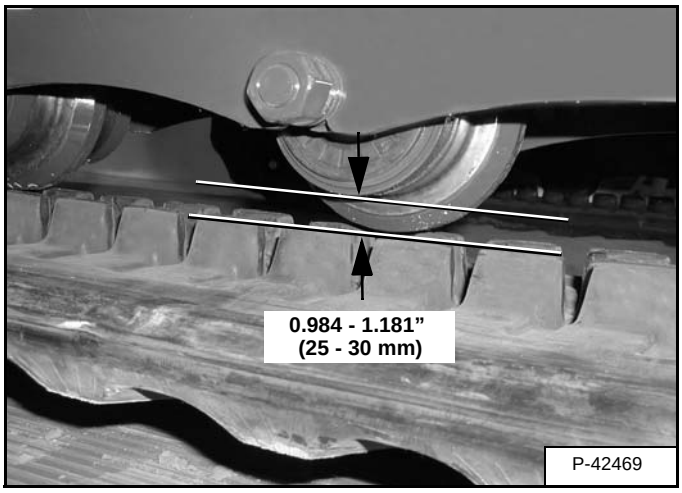
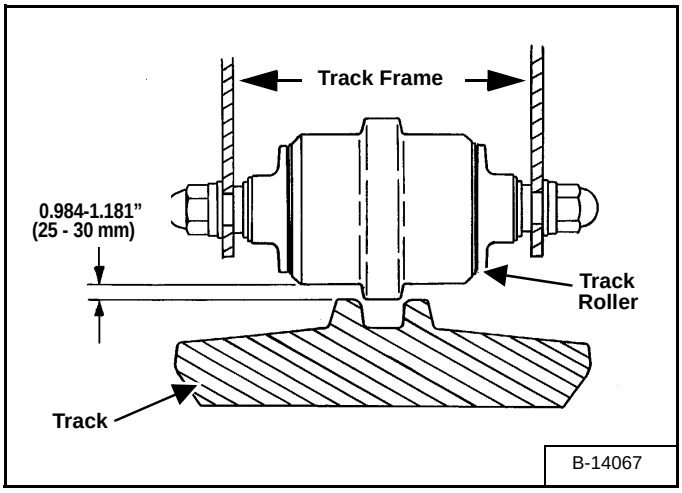


Figure 40-20-4



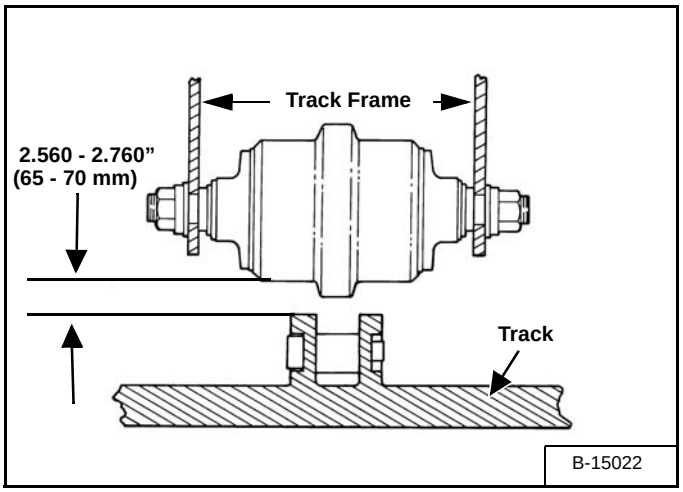
Measure the clearance at the middle track roller. Do not get fingers into pinch points between the track and the track roller. Use a bolt or a dowel of the appropriate size to check the gap between the contact edge of the roller and the top edge of the track guide **[Figure 40-20-3]** & **[Figure 40-20-4]**.

Rubber Track Clearance - 0.984 to 1.181 in. (25 to 30 mm)

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Steel Track Clearance

Figure 40-20-5



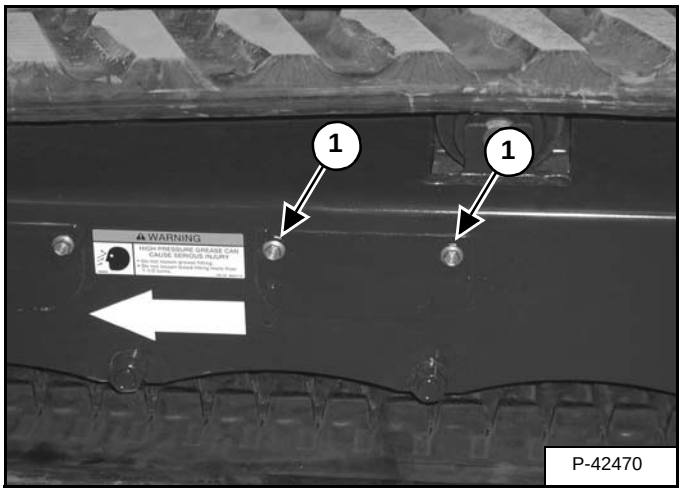
Measure the track clearance at the middle track roller. Do not get fingers into pinch points between the track and the track roller. Us a bolt or dowel of the appropriate size to check the gap between the contact edge of the roller and the top edge of the track guide **[Figure 40-20-5]**.

Steel Track Clearance - 2.560 to 2.760 in. (65 to 70 mm)



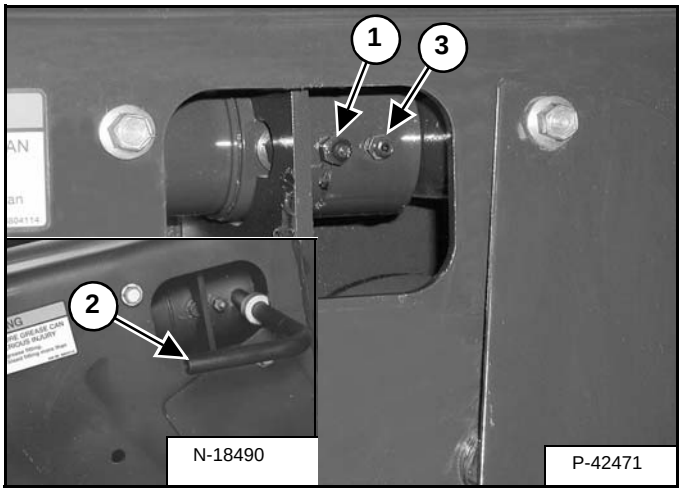
Adjustment

Figure 40-20-6



Loosen the 2 bolts from the cover (Item 1) **[Figure 40-20-6]**. Pivot the cover downward.

Figure 40-20-7



Add grease to the fitting (Item 1) **[Figure 40-20-7]** until the track tension is correct.

Use tool MEL1560 (Item 2) to loosen the bleed fitting (Item 3) **[Figure 40-20-7]** to release tension from the track.

NOTE: Do not loosen the grease fitting (Item 1) [Figure 40-20-7].

Repeat the procedure for the other side.

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Rubber Track Removal And Installation

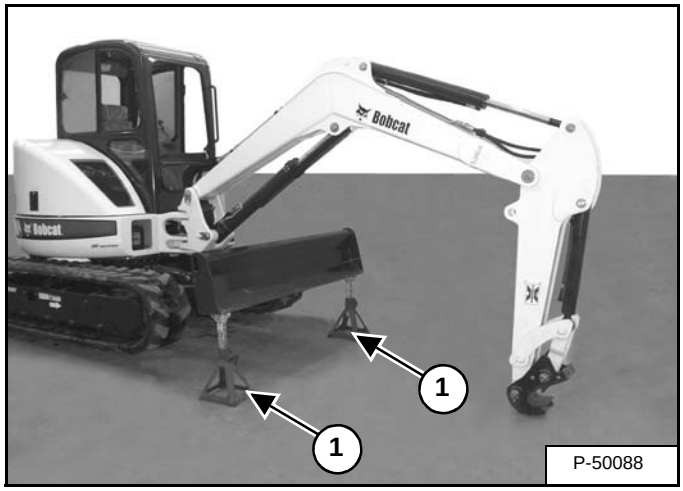
⚠ WARNING

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

W-2218-1195

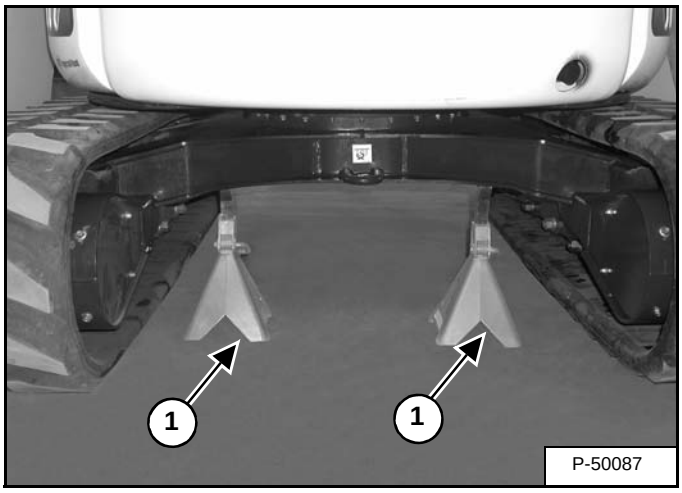
Raise the blade fully.

Figure 40-20-8



Use the boom and arm to lift the blade end of the machine up approximately 3.0 in. (75 mm) and install jackstands (Item 1) **[Figure 40-20-8]** under the blade.

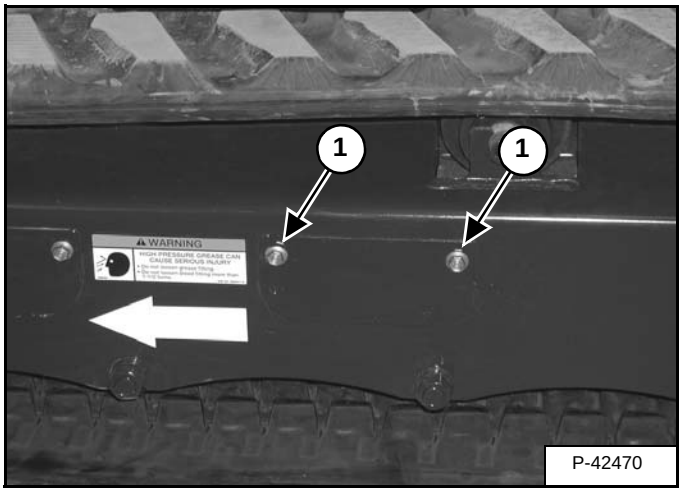
Figure 40-20-9



Swing the upperstructure 180° and use the boom and arm to slowly lift the opposite end of the undercarriage approximately 3.0 in. (75 mm). Install jackstands (Item 1) **[Figure 40-20-9]** under the undercarriage.

Stop the engine.

Figure 40-20-10

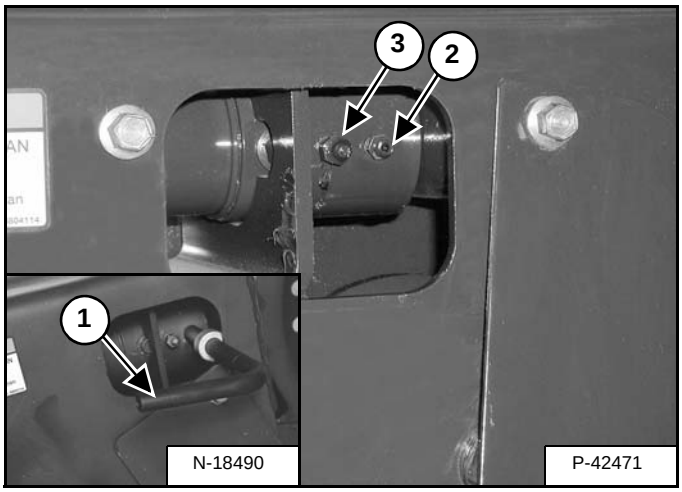


Loosen the 2 bolts (Item 1) **[Figure 40-20-10]** from the cover. Pivot the cover down.

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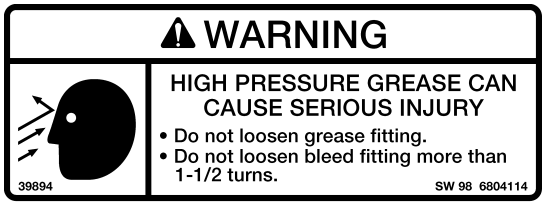
Rubber Track Removal And Installation (Cont'd)

Figure 40-20-11



Use tool MEL1560 (Item 1) to loosen the bleed fitting (Item 2) **[Figure 40-20-11]** to release tension from the track.

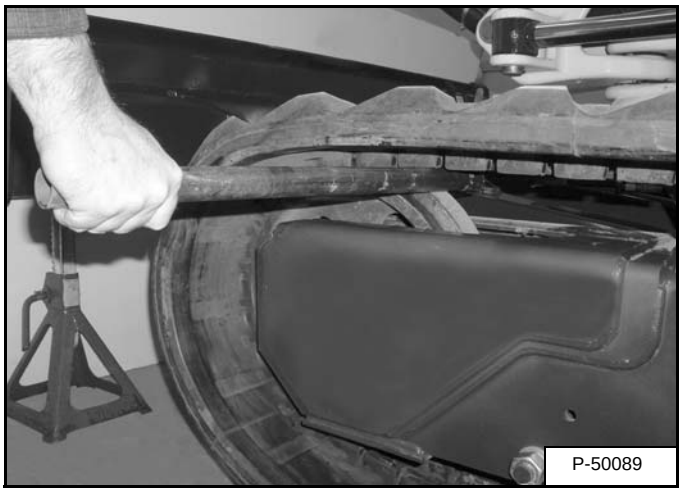
NOTE: Do not loosen the grease fitting (Item 3) [Figure 40-20-11].



Start the engine.

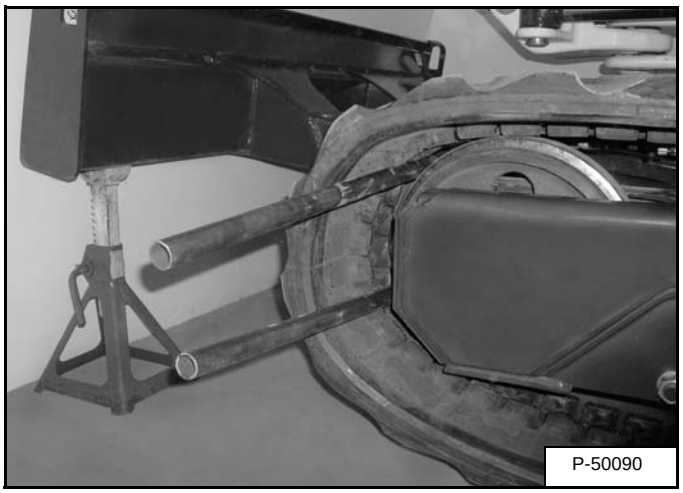
Slowly turn the track in the forward direction.

Figure 40-20-12



Insert a steel rod or pipe (approximately 1.250 in. [30 mm] diameter) between the track and the idler wheel **[Figure 40-20-12]**.

Figure 40-20-13



Insert a second steel rod or pipe, at a distance of 4 lugs from the first, between the track and the idler wheel. Continue to turn the track until the first pipe contacts the track frame **[Figure 40-20-13]**.

Stop the engine.

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Rubber Track Removal And Installation (Cont'd)

Figure 40-20-14



Insert a pry bar between the track and the idler wheel and pry out on the track until the track slides off the idler wheel **[Figure 40-20-14]**.

Remove the track.

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Steel Track Removal And Installation

Removal

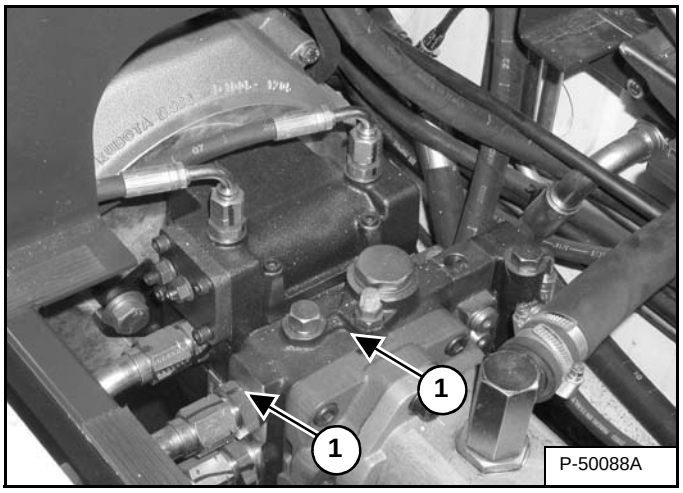
⚠ WARNING

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

W-2218-1195

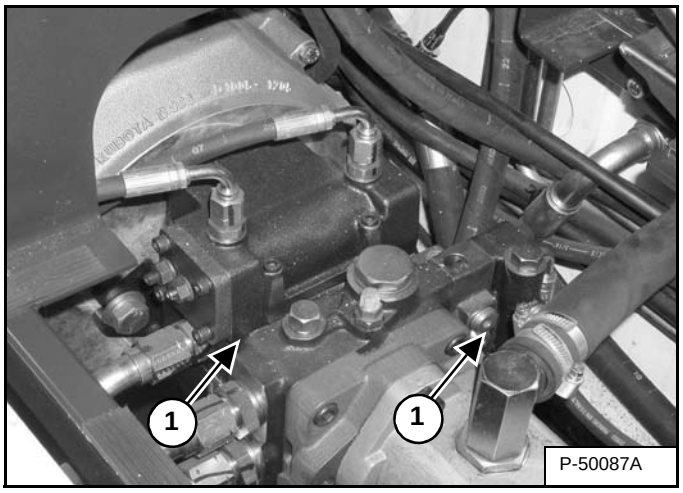
Raise the blade fully.

Figure 40-20-15



Use the boom and arm to lift the blade end of the machine up approximately 3.0 in. (75 mm) and install jackstands (Item 1) **[Figure 40-20-15]** under the blade.

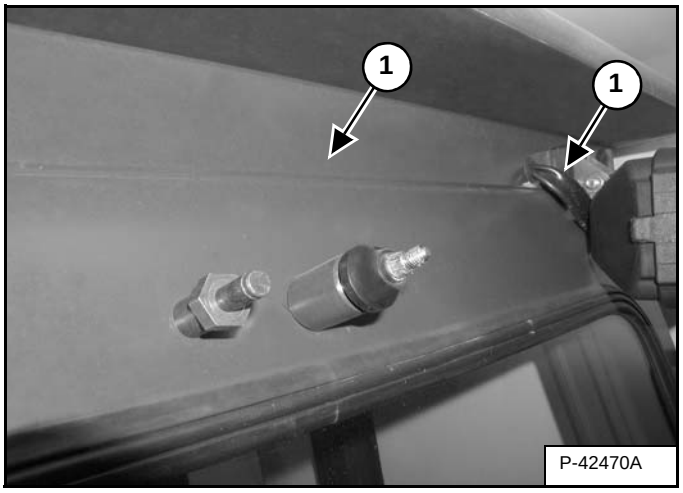
Figure 40-20-16



Swing the upperstructure 180° and use the boom and arm to slowly lift the opposite end of the undercarriage approximately 3.0 in. (75 mm). Install jackstands (Item 1) **[Figure 40-20-16]** under the undercarriage.

Stop the engine.

Figure 40-20-17

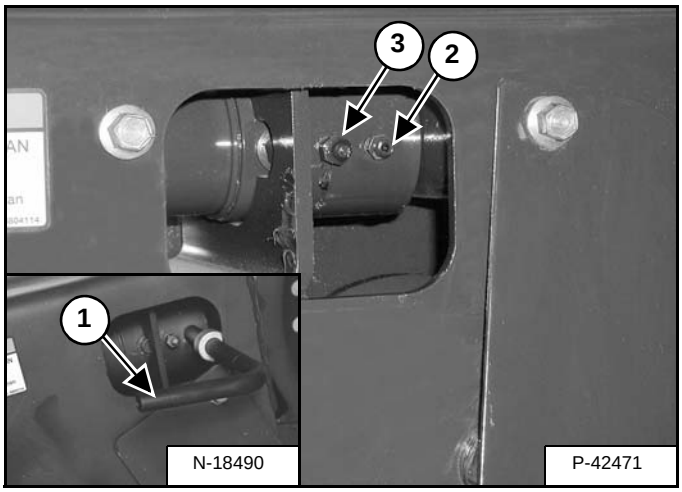


Loosen the 2 bolts (Item 1) **[Figure 40-20-17]** from the cover. Pivot the cover down.

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Steel Track Removal And Installation (Cont'd)

Figure 40-20-18



Use tool MEL1560 (Item 1) to loosen the bleed fitting (Item 2) **[Figure 40-20-18]** to release tension from the track.

NOTE: Do not loosen the grease fitting (Item 3) [Figure 40-20-18].

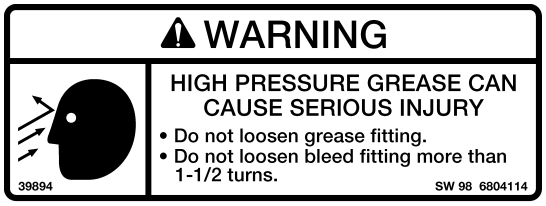
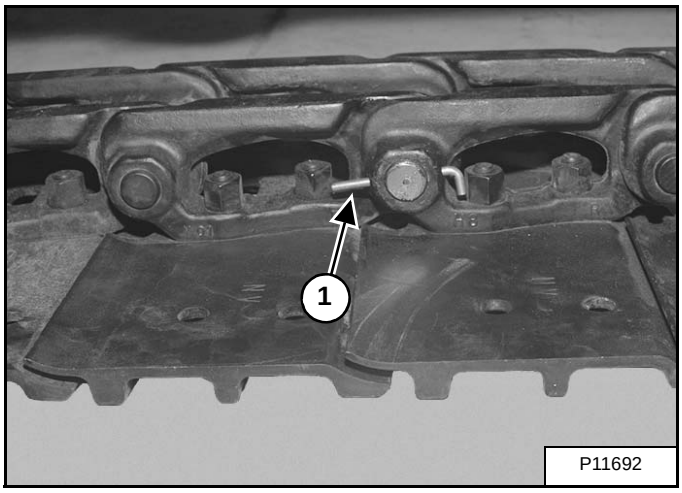
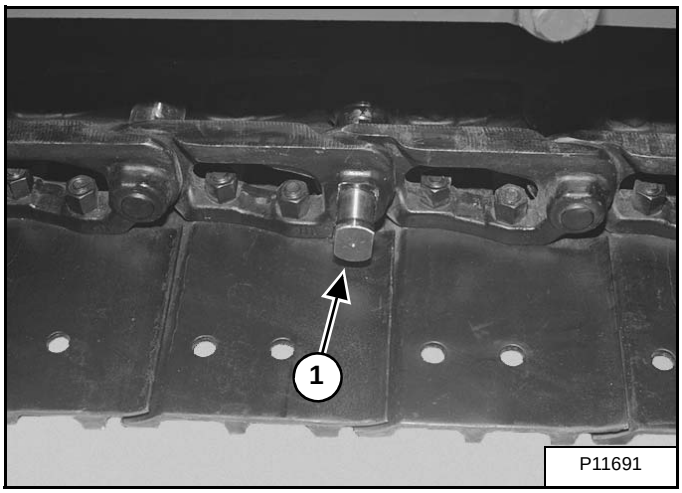


Figure 40-20-19



Straighten and remove the retaining pin (Item 1) **[Figure 40-20-19]** from the master link pin, on the inside of the track.

Figure 40-20-20

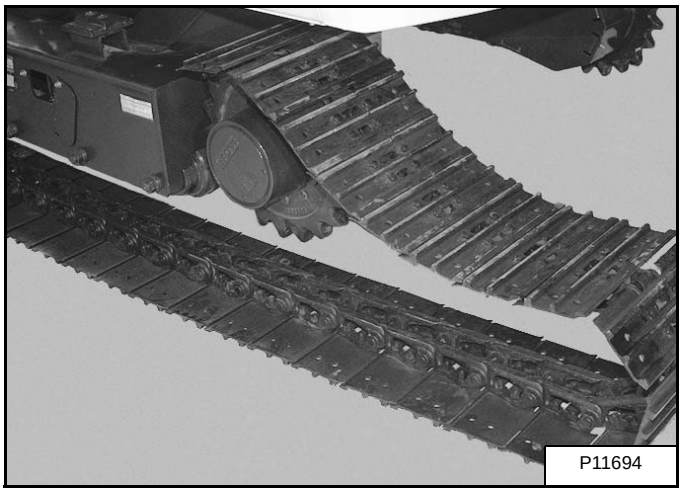


Drive the master link pin (Item 1) **[Figure 40-20-20]** towards the outside of the track frame. Remove the pin.

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Steel Track Removal And Installation (Cont'd)

Figure 40-20-21



Start the excavator and run at low idle. Slowly engage the travel motor in the reverse direction. Continue to engage the travel motor in the reverse direction until the track has been driven off the track frame **[Figure 40-20-21]**.

⚠ WARNING

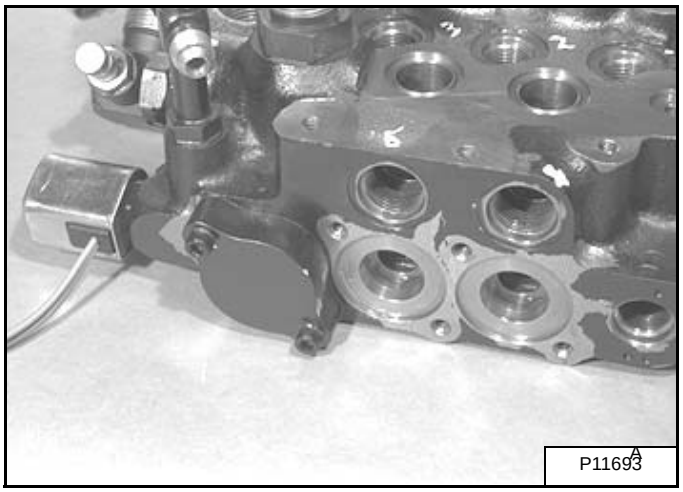
AVOID INJURY OR DEATH

Drive motor must be operated slowly to avoid any sudden movements that could cause injury or death.

W-2174-0195

Installation

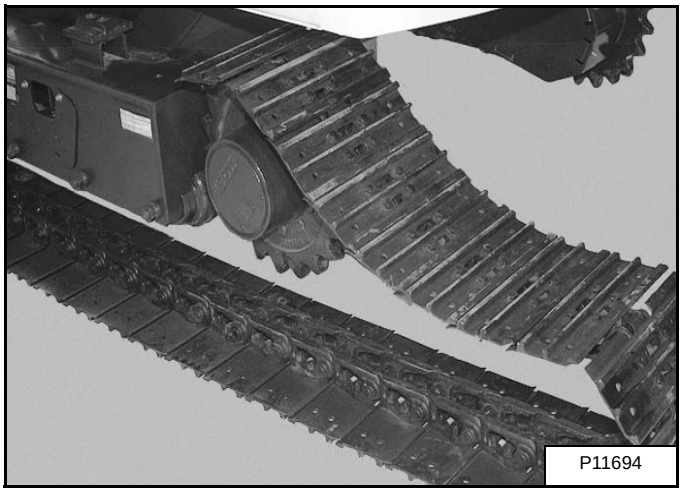
Figure 40-20-22



Position the track under the track frame **[Figure 40-20-22]**.

NOTE: Position the track so the master link pin is installed from the outside of the track frame.

Figure 40-20-23

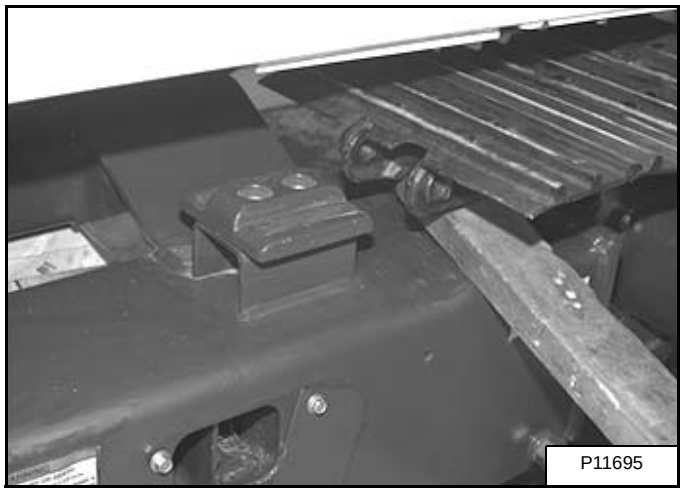


Pull the opposite end of the track up and forward. Position the end links of the steel track onto the sprocket **[Figure 40-20-23]**.

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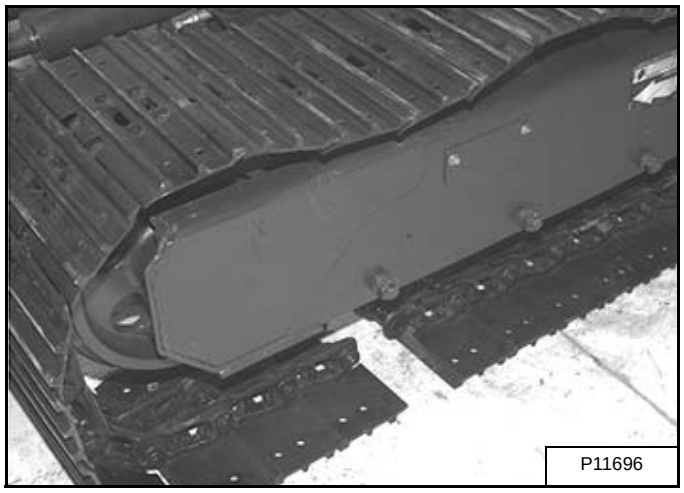
Steel Track Removal And Installation (Cont'd)

Figure 40-20-24



With the help of a second person, start the Excavator and run the engine at low idle. Make sure that the swing locking lever is in the locked position. Use the travel lever (on which side the track is being installed) to slowly turn the drive motor in the forward direction. Hold the end of the track up as the drive motor slowly moves the track forward. Guide the end of the track over the top of the guide block and up to and over the front idler wheel **[Figure 40-20-24]**.

Figure 40-20-25



Continue to run the drive motor until the track is positioned as shown **[Figure 40-20-25]**.

Stop the engine.

WARNING

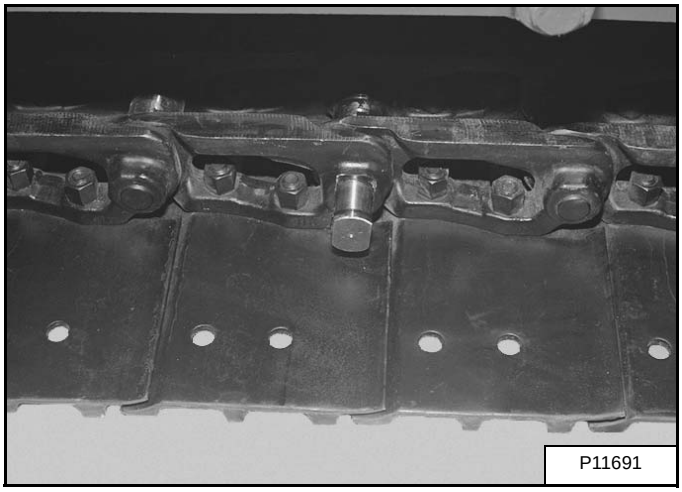
AVOID INJURY OR DEATH

Drive motor must be operated slowly to avoid any sudden movements that could cause injury or death.

W-2174-0195

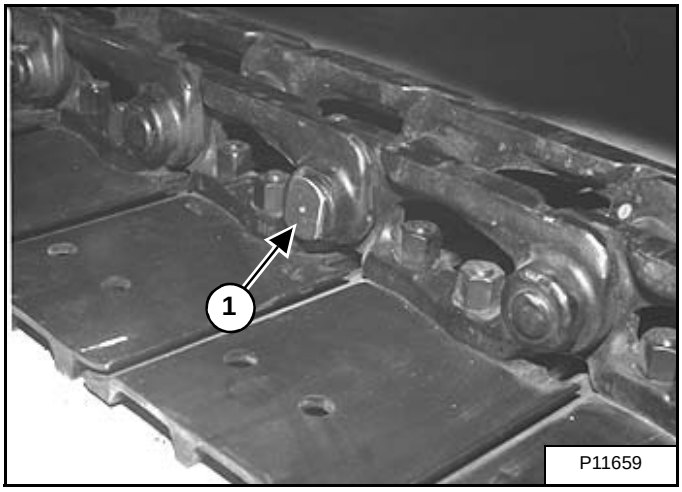
Put the two ends of the track together and use a drift pin to hold the links together.

Figure 40-20-26



Insert the master link pin (Item 1) **[Figure 40-20-26]** in the track link hole.

Figure 30-20-27

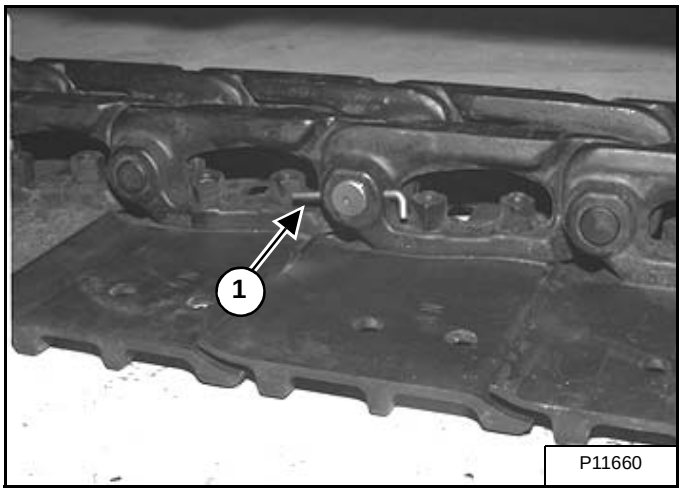


Tap the master link pin (Item 1) **[Figure 30-20-27]** in to the track link hole until the pin is fully seated.

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Steel Track Removal And Installation (Cont'd)

Figure 40-20-28



Install the retaining pin (Item 1) **[Figure 40-20-28]** in the master link pin.

Bend the retaining pin over after installation.

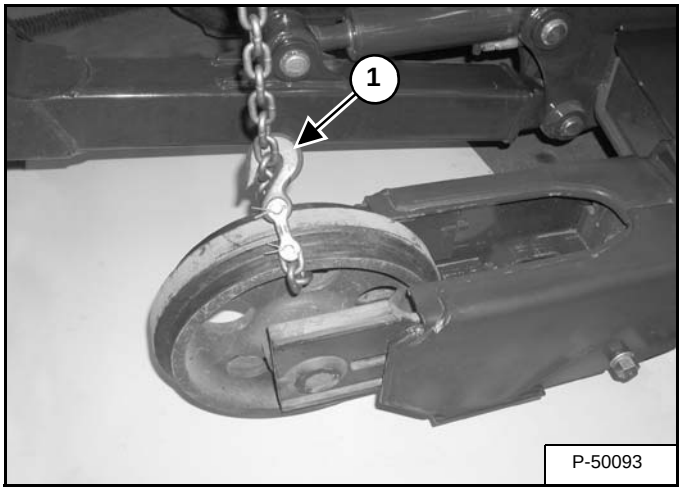
See Adjustment on Page 40-20-3 for adding grease to the grease spring and for checking track tension.

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Disassembly And Assembly

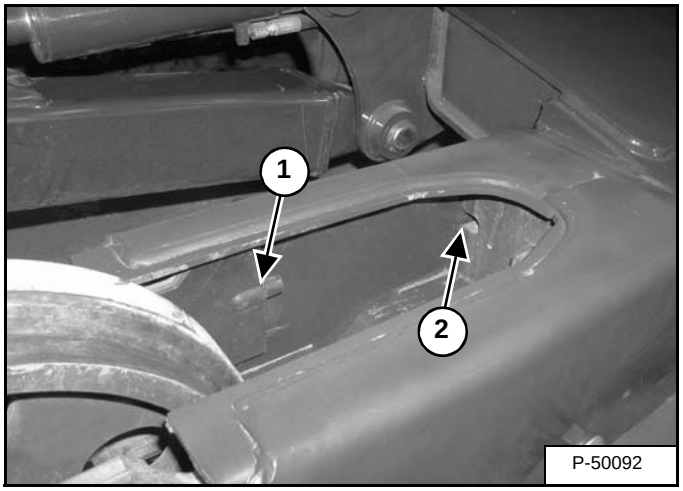
Remove the track. (See Rubber Track Removal And Installation on Page 40-20-4 or Steel Track Removal And Installation on Page 40-20-7)

Figure 40-30-1



Install a chain hoist (Item 1) **[Figure 40-30-1]** on the idler.

Figure 40-30-2



Installation: The pin (Item 1) must engage the hole (Item 2) **[Figure 40-30-2]** in the recoil spring.

WARNING



P-62574

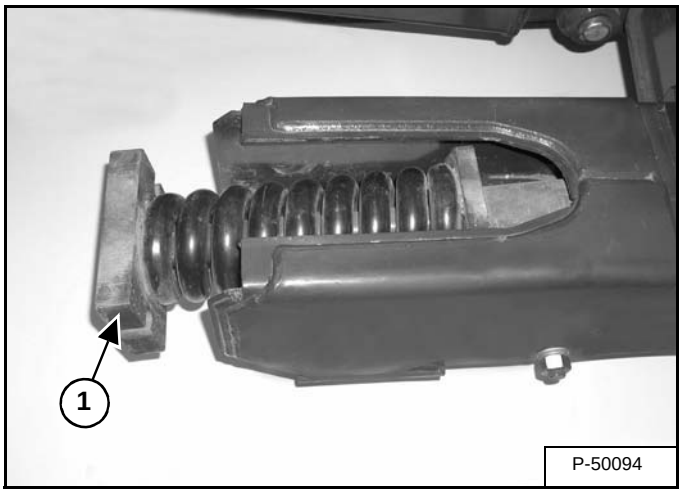
AVOID INJURY OR DEATH

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

W-2617-1004

DO NOT DISASSEMBLE OR REPAIR THE COIL SPRING ASSEMBLY (Item 1) **[Figure 40-30-3]**.

Figure 40-30-3

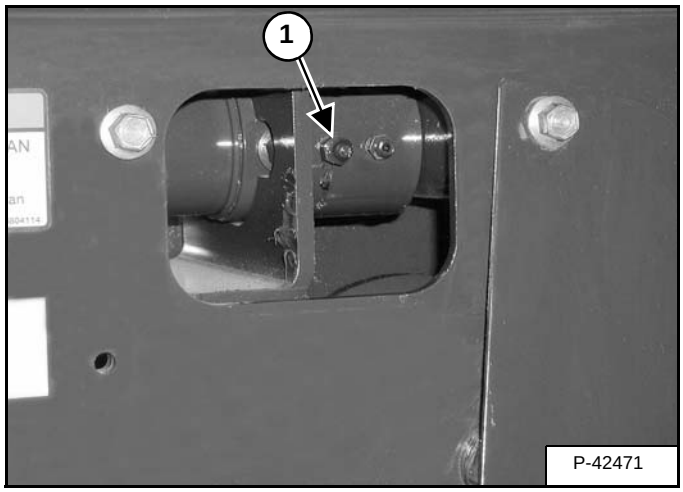


Remove the recoil spring (Item 1) **[Figure 40-30-3]**.

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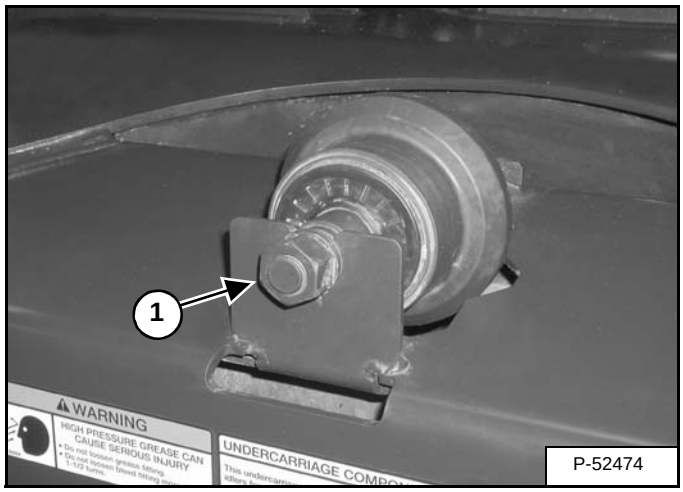
Disassembly And Assembly (Cont'd)

Figure 40-30-4



NOTE: When installing the recoil spring. The grease fitting (Item 1) [Figure 40-30-4] must be to the outside of the frame.

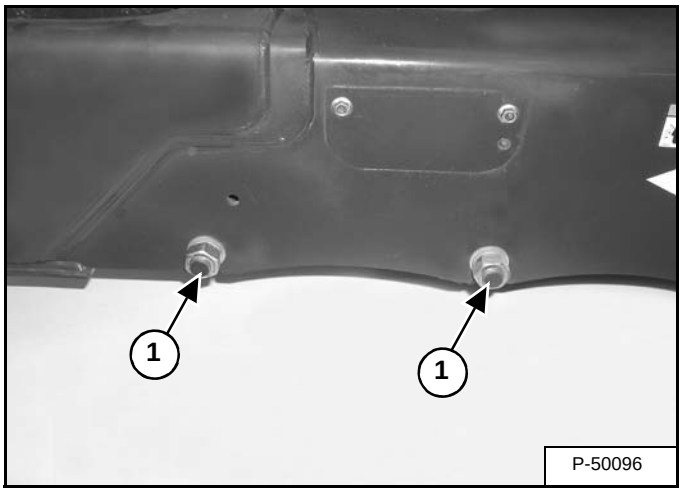
Figure 40-30-5



Loosen the nuts (Item 1) **[Figure 40-30-5]** on the upper track roller.

Installation: Tighten the nuts to 125 to 140 ft.-lb. (170 to 190 N•m) torque.

Figure 40-30-6

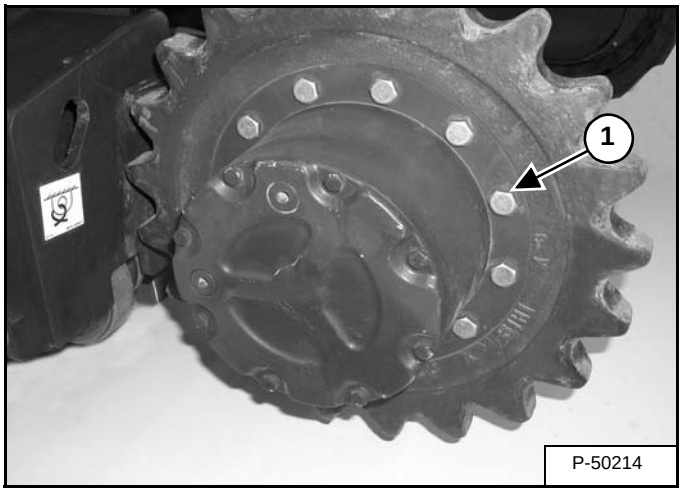


Loosen the nuts (Item 1) **[Figure 40-30-6]** on the track roller on both sides of the track frame.

Installation: Tighten the nuts to 125 to 140 ft.-lb. (170 to 190 N•m) torque.

Remove the track roller.

Figure 40-30-7



Remove the bolts (Item 1) **[Figure 40-30-7]**.

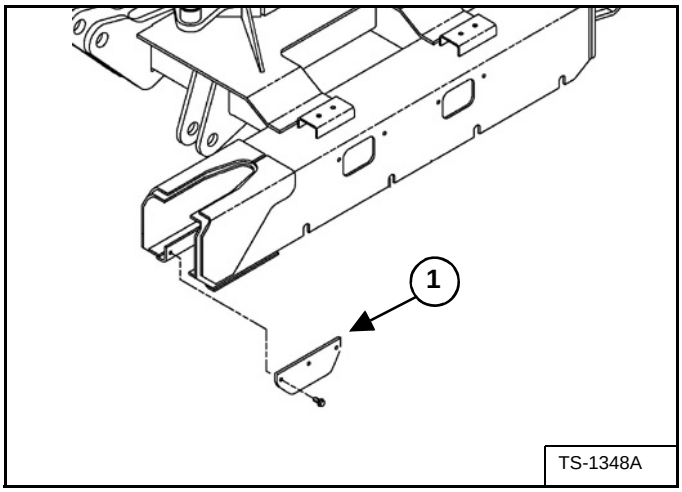
Installation: Apply thread lock adhesive (Loctite™ 242) on the bolts and tighten to 118 to 133 ft.-lb. (160 to 180 N•m) torque.

Remove the drive sprocket from the travel motor.

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Disassembly And Assembly (Cont'd)

Figure 40-30-8



Remove the 4 guide plates (2 per side) (Item 1) **[Figure 40-30-8]** from the track frame (steel tracks only).

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Recoil Spring Cylinder Disassembly And Assembly

DO NOT DISASSEMBLE OR REPAIR THE COIL SPRING ASSEMBLY (Item 2) **[Figure 40-30-9]**.

⚠ WARNING



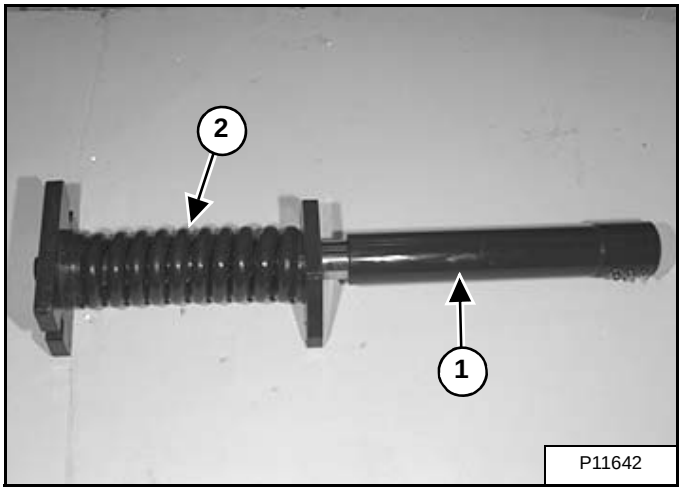
P-62574

AVOID INJURY OR DEATH

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

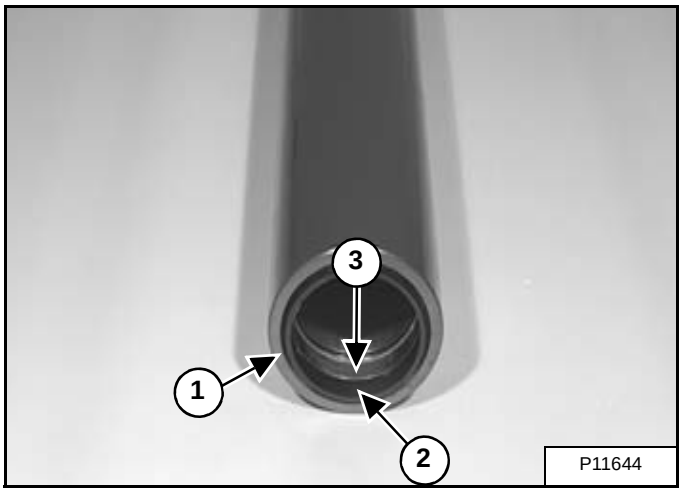
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Figure 40-30-9



Remove the cylinder (Item 1) from the coil spring assembly (Item 2) **[Figure 40-30-9]**.

Figure 40-30-10



Remove the seal (Item 1), back-up ring (Item 2), and O-ring (Item 3) **[Figure 40-30-10]**

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TRACK DAMAGE IDENTIFICATION

Cutting Of Steel Cords

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

Damage:

Figure 40-40-1

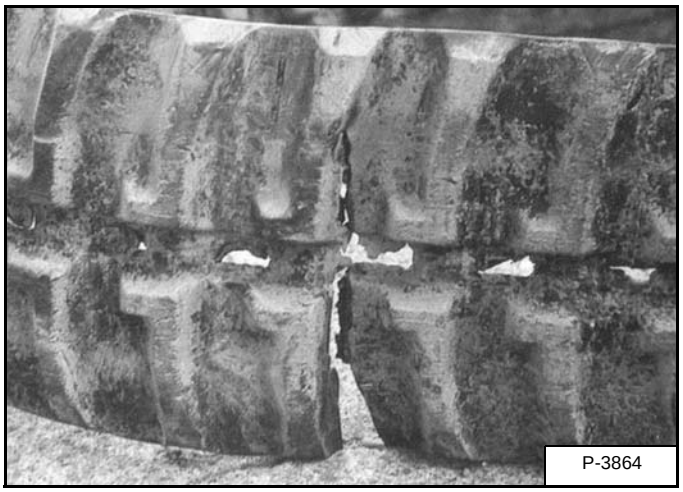
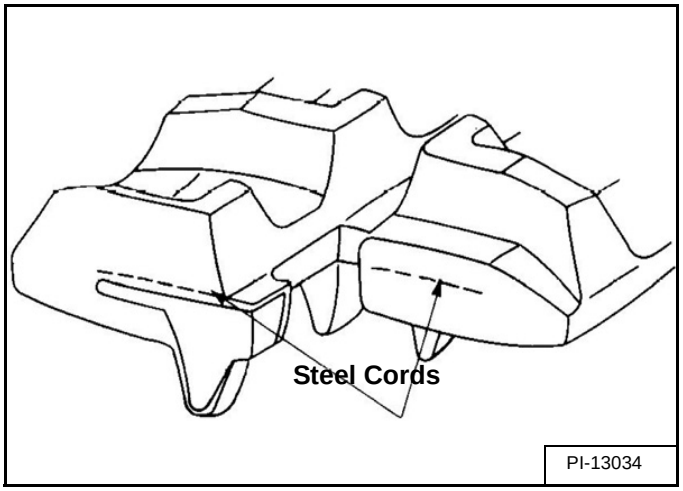


Figure 40-40-2



Embedded steel cords are cut off **[Figure 40-40-1]** & **[Figure 40-40-2]**.

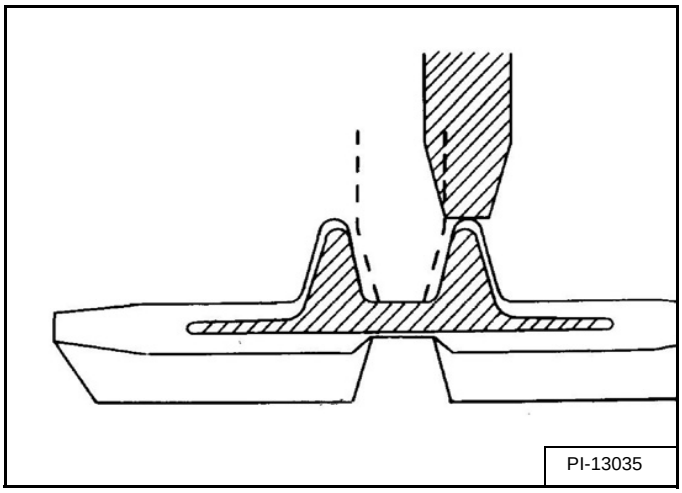
Replacement:

Replacement is required **[Figure 40-40-1]** & **[Figure 40-40-2]**.

Causes Of The Damage:

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

Figure 40-40-3



When the rubber track is detracting, the idler or sprocket rides on the projections of the embedded metal **[Figure 40-40-3]**.

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

The rubber track is clogged with stones or foreign obstacles.

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

Prevention:

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

Periodical checking on site of the recommended track tension. (See Adjustment on Page 40-20-3)

Avoiding quick turns on bumpy and rocky fields.

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

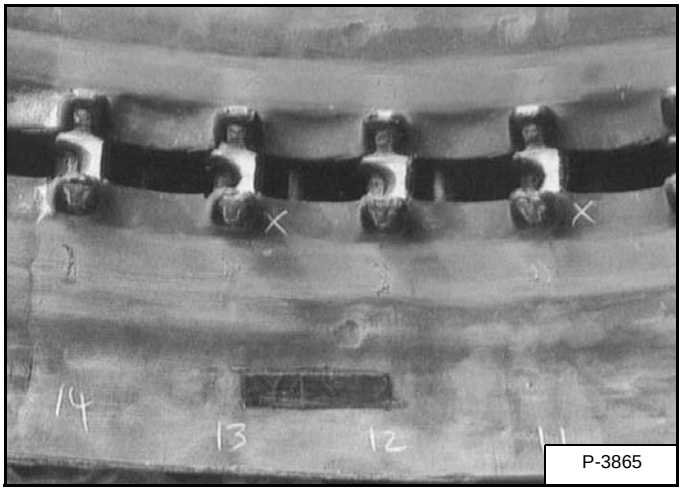
Driving over sharp objects should be avoided. If this is impossible, do not make turns while driving over sharp objects.

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Abrasion Of Embedded Metals

Damage:

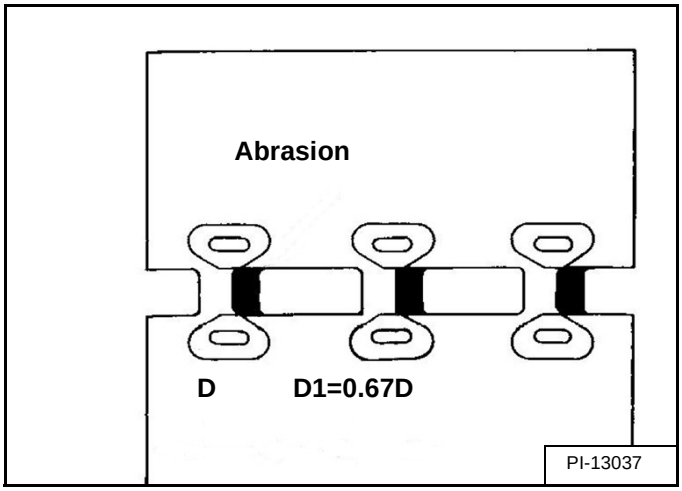
Figure 40-40-4



In proportion to the service time, embedded metals will gradually wear away by friction **[Figure 40-40-4]**.

Replacement:

Figure 40-40-5



Replacement is required when the width of the embedded metals (D1) becomes 67% of their original width (D) **[Figure 40-40-5]**.

Causes Of The Damage:

When the track rollers, sprockets and idler gears roll over the embedded metals, abrasion of embedded metals is inevitable. The following cases sometimes accelerate their abrasion:

Rubber tracks are driven with an extraordinary heavy load on them.

Rubber tracks are used on sandy fields.

Prevention:

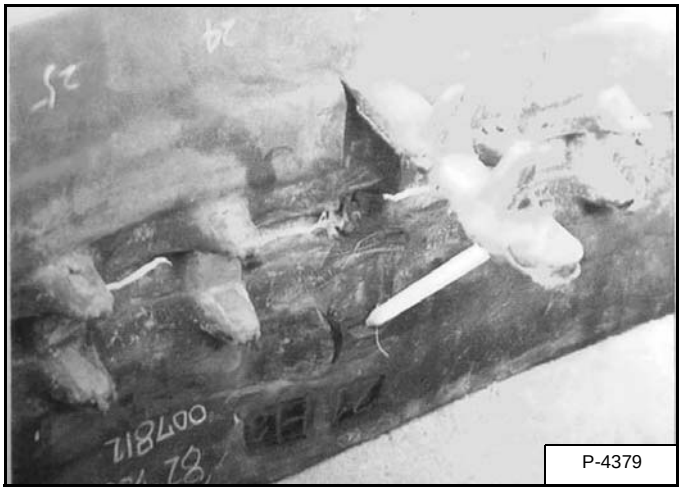
As long as rubber tracks are used under normal operating conditions, abnormal abrasion is unlikely to occur. The level of abrasion should be carefully checked when the machines are used for dozing which generate a heavy load for rubber tracks, and when they are operated under a sandy field condition for a long time.

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Separation Of Embedded Metals

Damage:

Figure 40-40-6



Extraordinary outer forces applied to embedded metals cause their separation from the rubber track's body **[Figure 40-40-6]**.

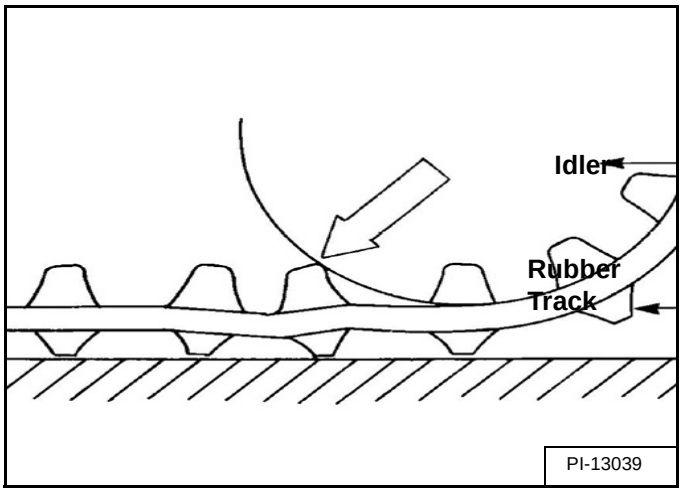
Replacement:

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

Causes Of The Damage:

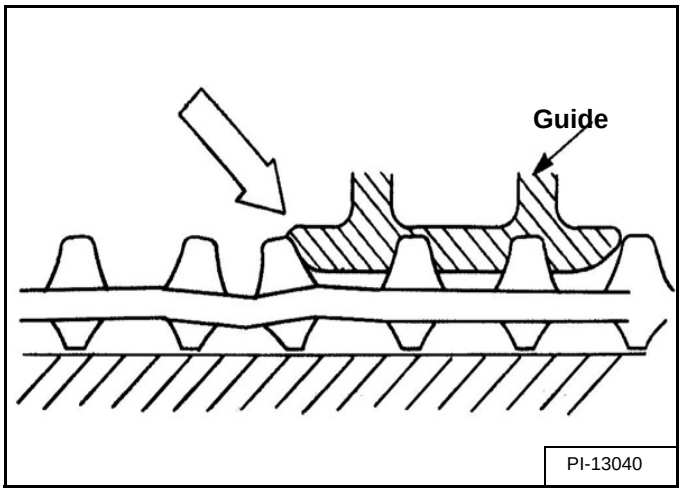
Embedded metals are adhered between the steel cords and the rubber body. The following cases generate external forces greater than the adhesion strength, causing separation of the embedded metals:

Figure 40-40-7



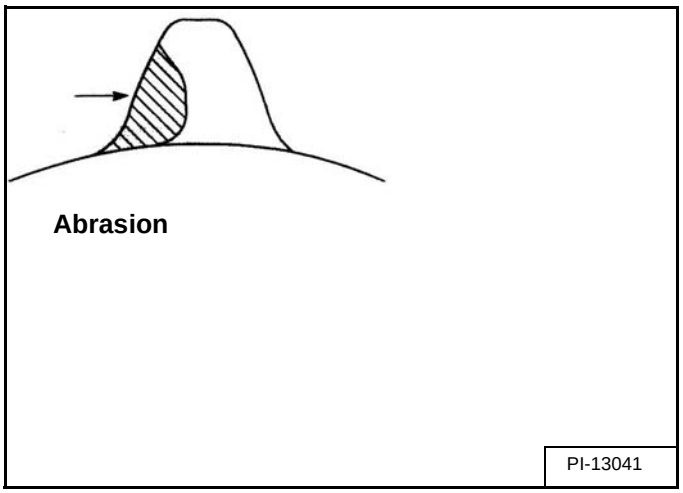
When the idler continually rides on the projections of embedded metals, the embedded metals will eventually peel off **[Figure 40-40-7]**.

Figure 40-40-8



When a rubber track is detracted, it becomes stuck between the guide or the undercarriage frame, causing the separation of embedded metals **[Figure 40-40-8]**.

Figure 40-40-9



Abnormally worn sprockets as shown will pull embedded metals out **[Figure 40-40-9]**.

Prevention:

Similar to the prevention against the cutting of the steel cords:

Recommended track tension should be periodically checked. (See Adjustment on Page 40-20-3)

Quick turns on bumpy and rocky fields should be avoided.

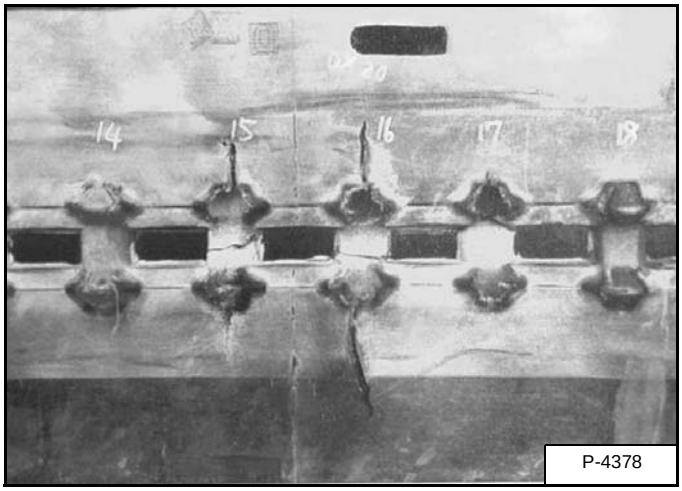
If abnormal wear of sprockets is observed, they should be immediately replaced.

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Separation Of Embedded Metals Due To Corrosion

Damage:

Figure 40-40-10



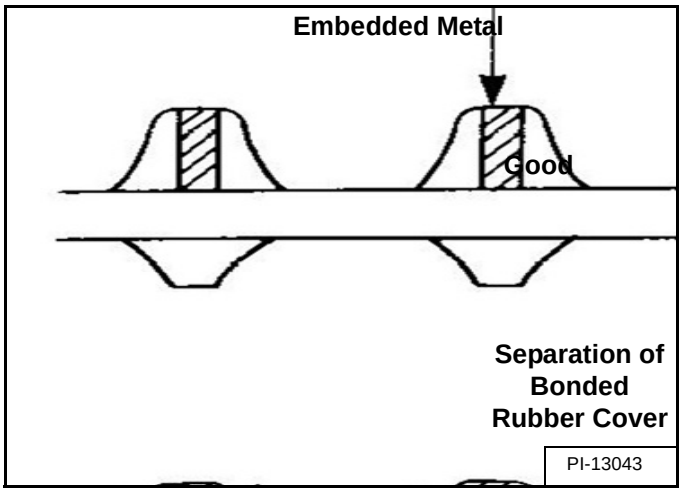
Due to corrosion of embedded metals, the adhesion to the rubber body deteriorates, resulting in complete separation **[Figure 40-40-10]**.

Replacement:

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

Causes Of The Damage:

Figure 40-40-11



Embedded metals are bonded to the rubber body. The following operating conditions cause embedded metals to corrode, causing deterioration of the bonding, and finally resulting in separation of the embedded metals from the rubber body **[Figure 40-40-11]**.

Excessively salty fields, like the sea shore.

Strong acidic or alkali soil conditions

Compost spread grounds

On tracks that are out of adjustment, the track rollers, idlers and sprockets will gradually wear the rubber surface at track roller side, causing exposure of the embedded metals. Consequently the embedded metals will corrode resulting in their separation from the rubber body.

Prevention:

If rubber tracks are used under such field conditions as described under (Causes of the damage), they should be washed with plenty of water. After being completely dried, they should be stored correctly.

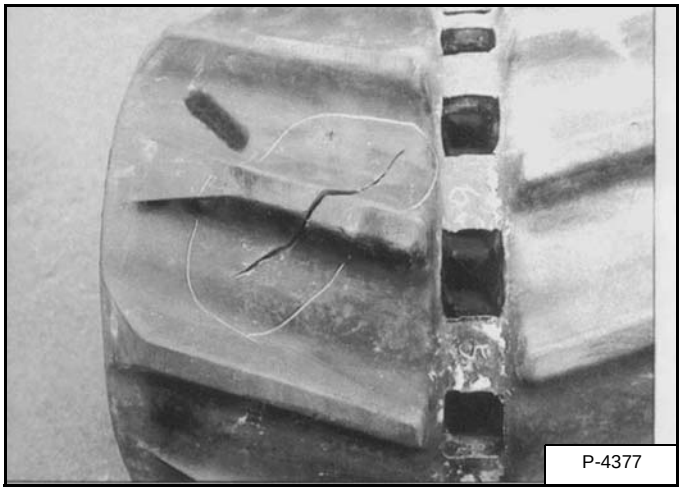
When the bonded rubber cover is separated from the embedded metal projections and the metals in the rubber body become loose, it is time to consider replacement of the rubber track.

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Cuts On The Lug Side Rubber

Damage:

Figure 40-40-12



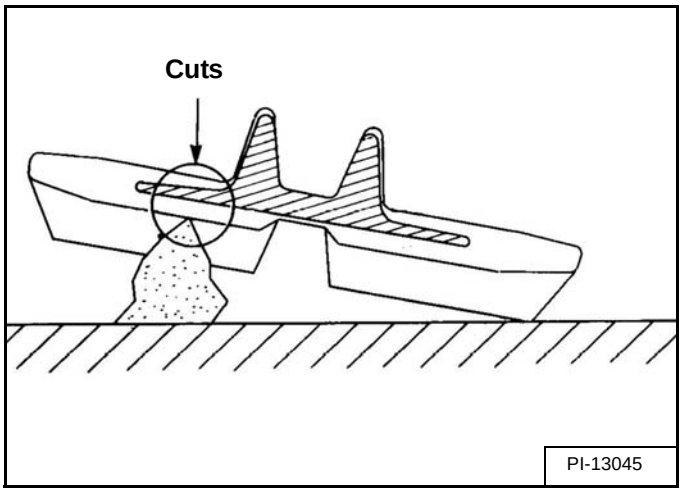
Cuts on the lug side rubber often occurs as one of the most typical failure modes **[Figure 40-40-12]**

Replacement:

When a cut on the lug side rubber reaches the embedded steel cords, it should be immediately repaired with cold vulcanization rubber.

Causes Of The Damage:

Figure 40-40-13



When rubber tracks drive over projections or sharp stones in the fields, the concentrated forces applied cause cuts on the lug side rubber surface. In case of making turns on projections, the lug side rubber surface will have an even higher chance to be cut. If the cuts run through the embedded steel cords, it might result in the steel cords' breakage due to their corrosion. It is highly recommended to repair the cuts with cold vulcanization rubber as soon as they are observed **[Figure 40-40-13]**.

Prevention:

Machine operators are requested to drive with great attention to the ground's surface especially in terrains of the following type:

Construction sites

Demolition sites

Paths covered with rocks and wood

Concrete ridges

Stumpy fields

When operating on terrains as mentioned above, high speed, quick turns and overloading should be avoided.

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Cracks On The Lug Side Rubber Due To Fatigue

Damage:

Figure 40-40-14

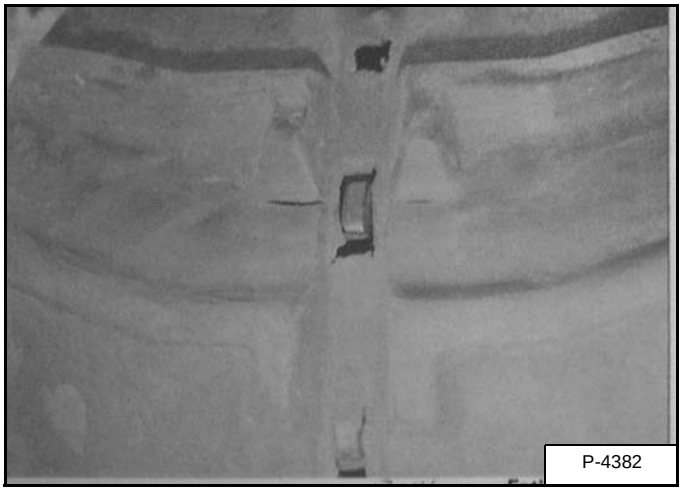
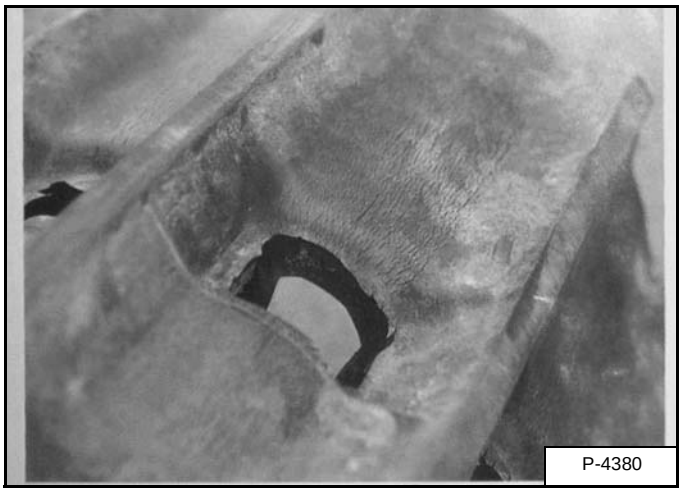


Figure 40-40-15



Small cracks around the root of the lug as a result from operation fatigue **[Figure 40-40-14]** & **[Figure 40-40-15]**.

Replacement:

When the cracks reach so deep that they expose the steel cords, track replacement is required.

Causes Of The Damage:

Because of wound stress applied to rubber tracks around the undercarriage parts during operation, the fatigue especially causes cracks on the lug side rubber surface. Once the cracks occur, they gradually deteriorate with even small external cracks. Also when operating near seashores or under cold temperatures, rubber tracks are more likely to suffer from ozone cracks.

Prevention:

Rubber tracks are designed with special rubber compounds to prevent cracks due to fatigue. However, external injuries on the lug side rubber sometimes cause more chance of cracking. Machine operators should observe soil conditions when driving, so as not to cause external injuries to the lug side rubber. In order to minimize the occurrence of ozone cracks, attention should be paid to the following instructions for maintenance:

Avoid exposing stored tracks to direct sun light.

Avoid exposing stored tracks to direct rain and snow fall.

Store tracks in well ventilated warehouses.

Use the tracks at least once a month.

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Lug Abrasion

Prevention:

Figure 40-40-16

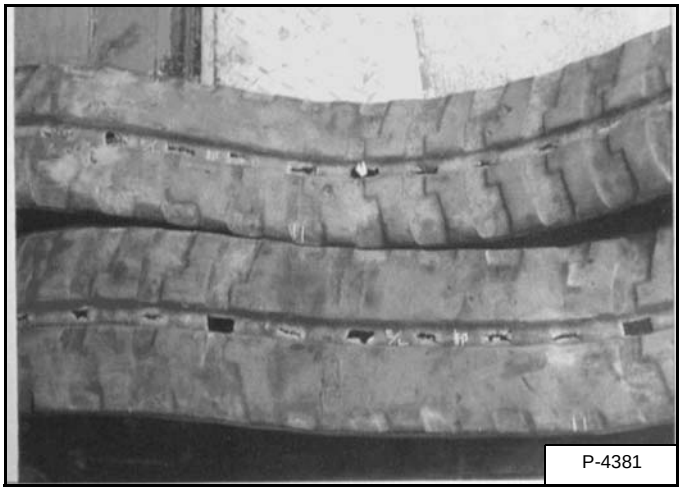
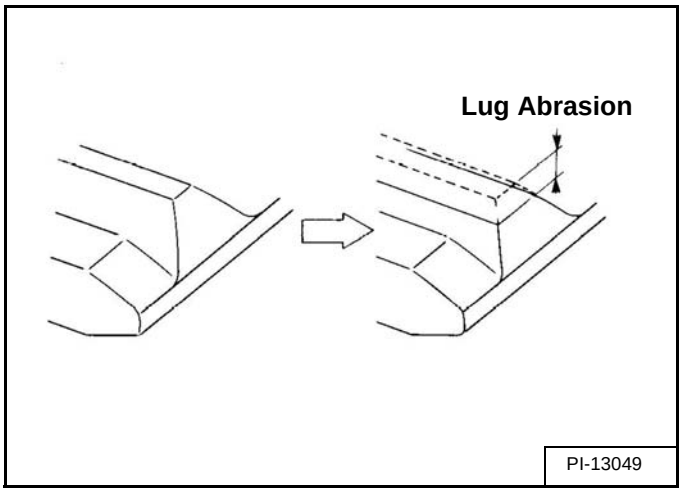


Figure 40-40-17



As its service time proceeds, the lug side inevitably undergoes abrasion **[Figure 40-40-16]** & **[Figure 40-40-17]**.

Replacement:

No replacement is required.

Causes Of The Damage:

Lug abrasion is more or less inevitable. Even if lug abrasion is proceeding, the rubber track can be used. However, as the traction performance deteriorates accordingly, it is highly recommended to replace the abraded tracks with new ones when the lug height becomes less than 5 mm.

Prevention:

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

Making quick and repeated turns on concrete and asphalt roads

Driving up and down hilly paths with slippage

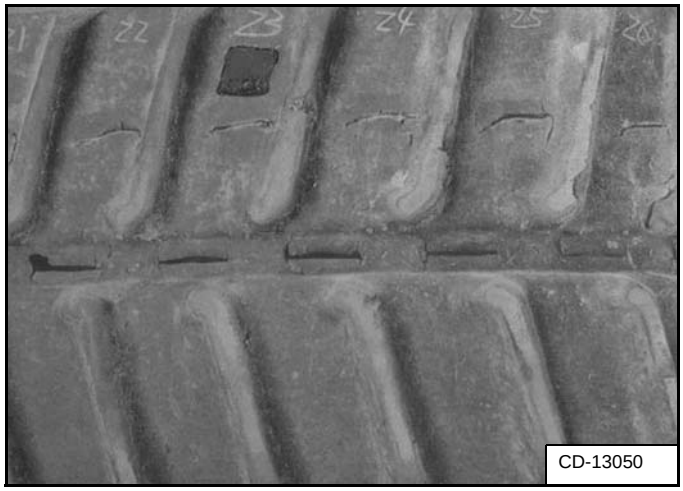
Making frequent turns on paths covered with rocks and wood.

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Cracks And Cuts On The Lug Side Rubber

Damage:

Figure 40-40-18



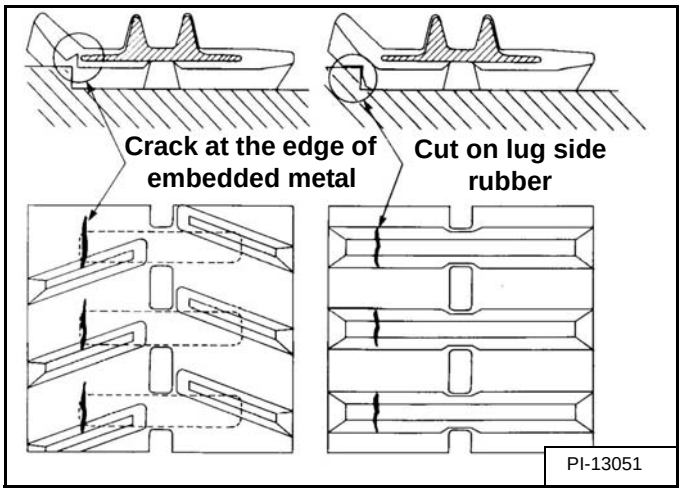
Sometimes cracks and cuts on the lug side rubber at the edges of the embedded metals can be observed **[Figure 40-40-18]**.

Replacement:

Basically, no replacement is required unless the cuts on the lug side rubber are discovered all around the edges of the embedded metals, as this will result in a complete cut off.

Causes Of The Damage:

Figure 40-40-19



When rubber tracks drive over sharp projections, intensive stress is applied to the lug side rubber surface, especially at the edges of embedded metals, causing cracks and cuts in the area around the embedded metals **[Figure 40-40-19]**.

Prevention:

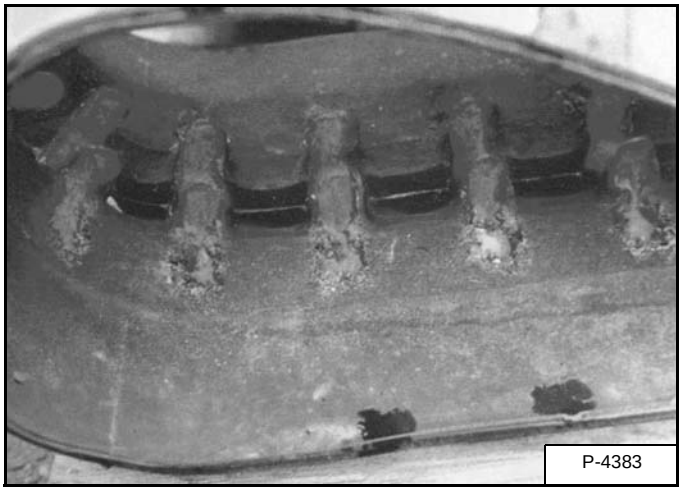
To avoid extensive stress applied to the lug root where metals are embedded, machine operators are requested to avoid driving over stumps and ridges.

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Abrasion Of The Track Roller Side

Damage:

Figure 40-40-20



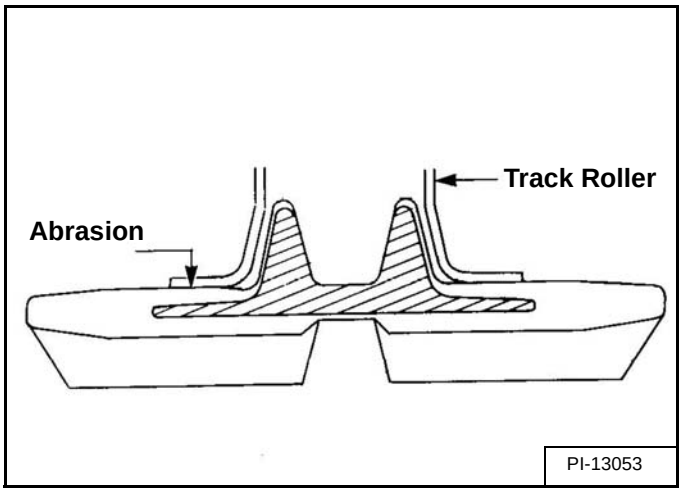
The rubber surface on which track rollers run is gradually abraded. It will end in the exposure of the embedded metals **[Figure 40-40-20]**.

Replacement:

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

Causes Of The Damage:

Figure 40-40-21



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

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

Prevention:

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

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TRACK DAMAGE IDENTIFICATION (CONT'D)

Cuts On The Edges Of Track Roller Side

Damage:

Figure 40-40-22

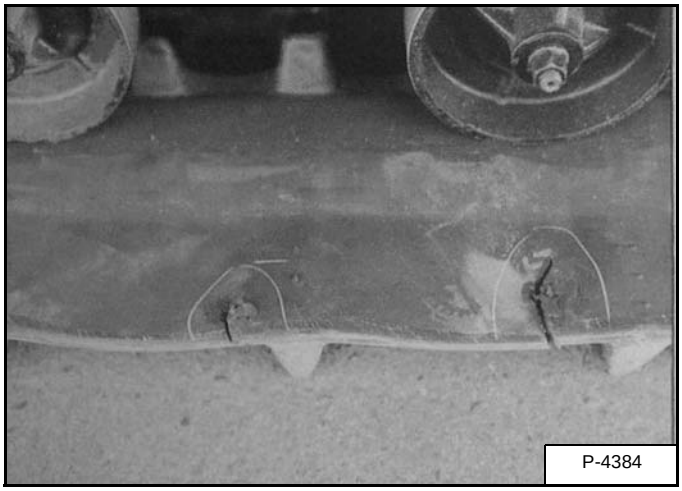
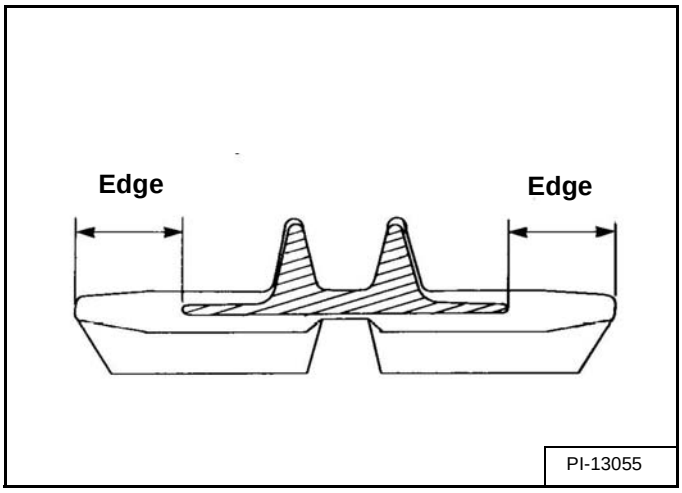


Figure 40-40-23



Both edges of a rubber track have no special reinforcements. It sometimes occurs during operation that they are cut or torn off **[Figure 40-40-22]** & **[Figure 40-40-23]**.

Replacement:

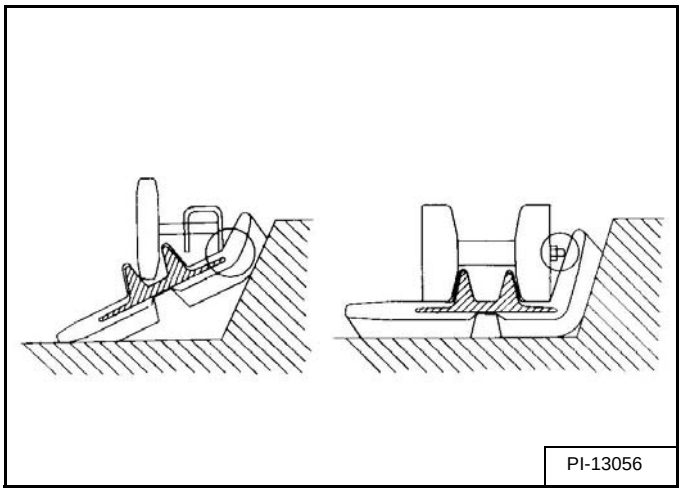
In such case, the rubber track does not have to be replaced.

Causes Of The Damage:

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

In case of damage by objects on the operating ground:

Figure 40-40-24



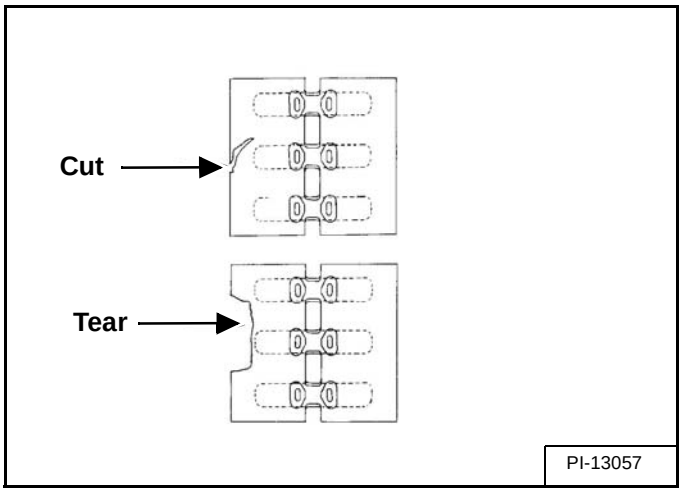
The edges of rubber track are often deformed largely due to a bumpy ground surface, stones and other objects, which cause extensive stress on the edges resulting in the damage. Especially, when a machine drives over concrete ridges, this type of damage easily occurs **[Figure 40-40-24]**.

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Cuts On The Edges Of Track Roller Side (Cont'd)

In case of damage by interference with the machine frame:

Figure 40-40-25



If a machine continues operating with rubber tracks being detracted, the rubber tracks may get caught up in the machine frame or undercarriage parts resulting in damage. Furthermore, when a machine travels along side slopes, the rubber tracks are deformed so much that they come into contact with the machine frame and undercarriage parts, which causes cutting, gouging and rubbing of rubber tracks in the end **[Figure 40-40-25]**.

Prevention:

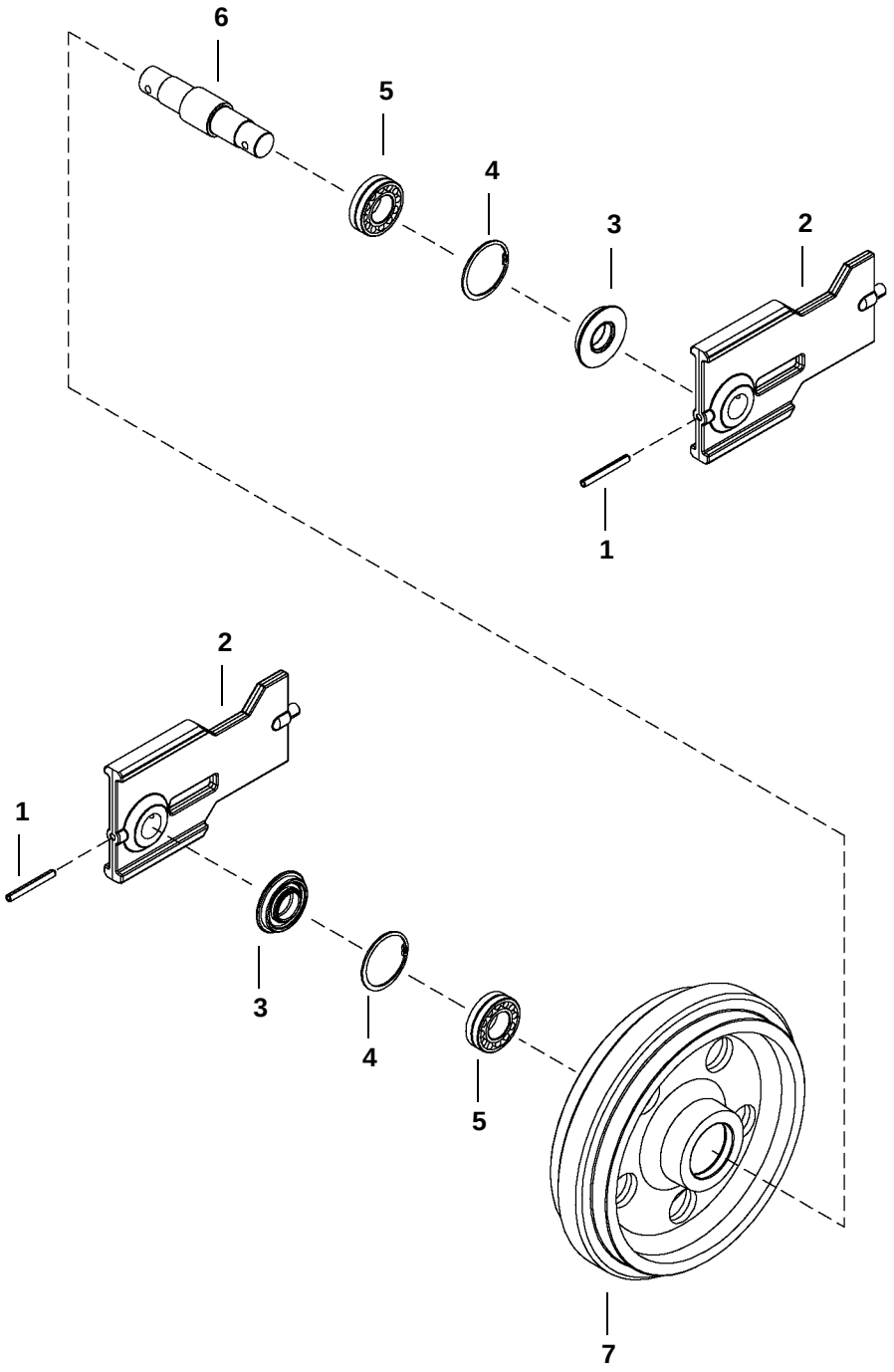
When traveling, a machine operator should be careful not to drive over any projections on the ground. He should also prevent rubber tracks from coming into contact with concrete walls, ditches and ridges. If rubber tracks are detracked, the machine should be stopped immediately for retracting.

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TRACK IDLER

Parts Identification

1. Roll Pin
2. Block
3. Seal
4. Snap Ring
5. Bearing
6. Shaft
7. Idler



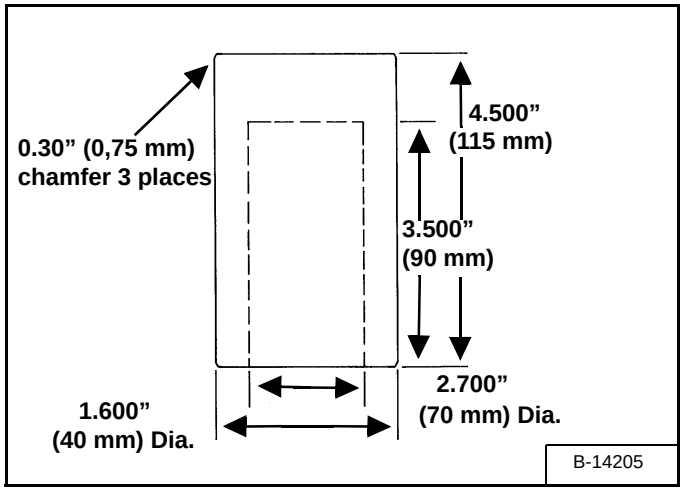
PE1911S

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Disassembly

The following tools must be fabricated for this procedure:

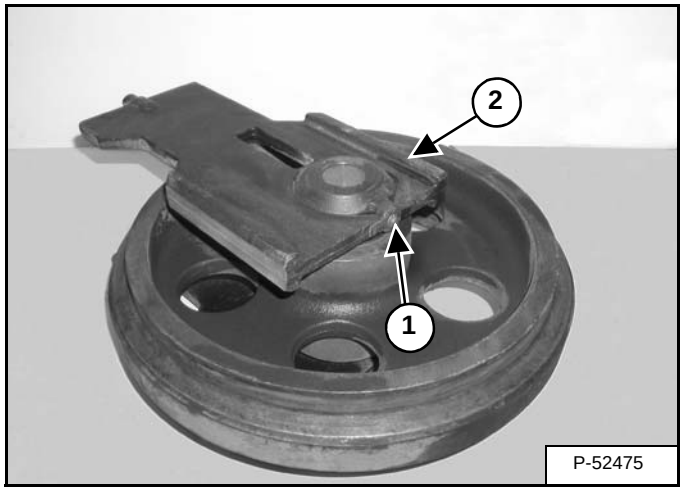
Figure 40-50-1



1. Driver Tool - see **[Figure 40-50-1]**.

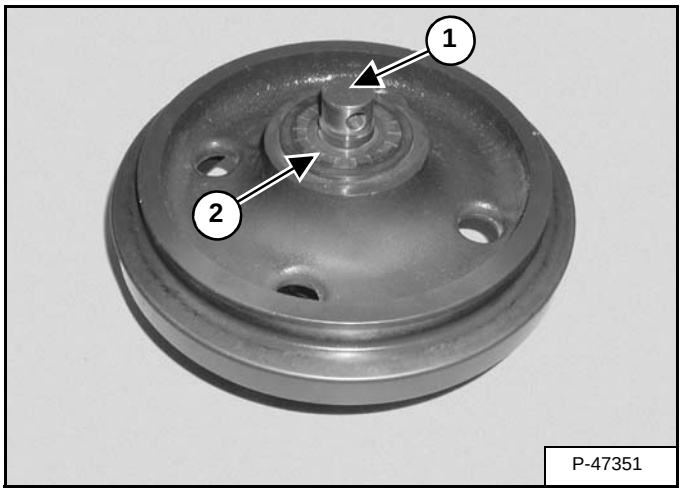
2. Support Fixture - Tube, 3.0 in. ID x 0.250 in. wall x 6.0 in. long (76,2 mm ID x 6,35 mm wall x 152,4 mm long).

Figure 40-50-2



Remove the roll pin (Item 1) and block (Item 2) from each end of the shaft **[Figure 40-50-2]**.

Figure 40-50-3

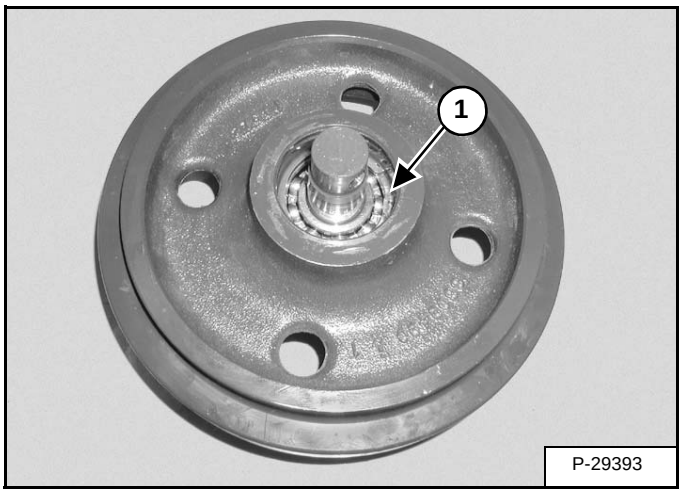


Remove any corrosion or paint from both ends of the exposed shaft (Item 1) **[Figure 40-50-3]** that could affect seal removal or damage the new seal during installation.

Apply penetrating oil to both ends of the exposed shaft to ease removal of the seal.

Remove the seal (Item 2) **[Figure 40-50-3]** from both sides of the idler.

Figure 40-50-4

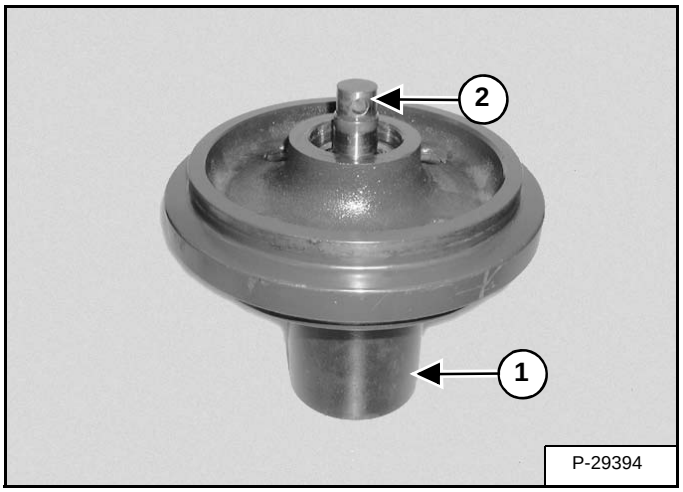


Remove the snap ring (Item 1) **[Figure 40-50-4]** from both sides of the idler.

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Disassembly (Cont'd)

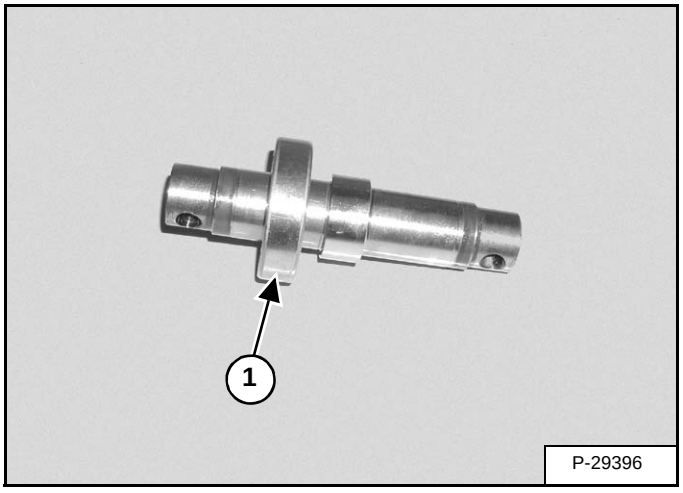
Figure 40-50-5



Place the idler on the support fixture (Item 1) **[Figure 40-50-5]**.

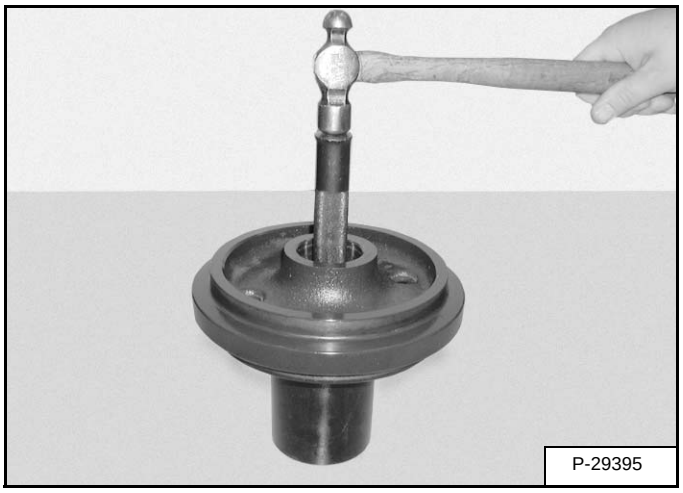
Using a soft faced hammer, tap the shaft (Item 2) **[Figure 40-50-5]** and bearing out the bottom of the idler.

Figure 40-50-6



Slide the bearing (Item 1) **[Figure 40-50-6]** off the shaft.

Figure 40-50-7

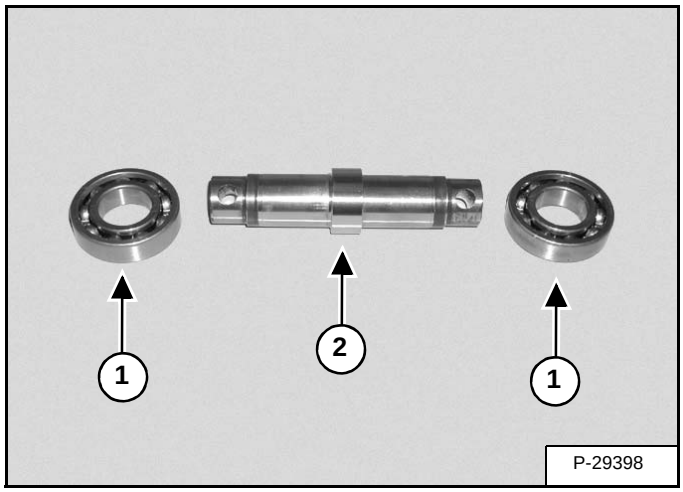


Turn the idler over, and using a bearing driver, remove the second bearing **[Figure 40-50-7]**.

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Assembly

Figure 40-50-8

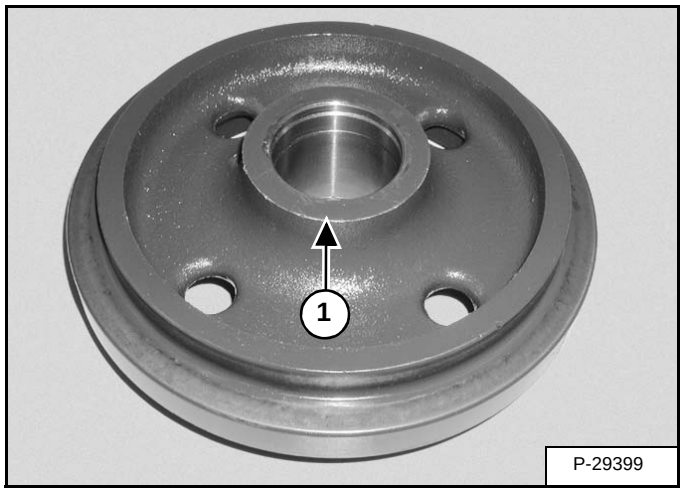


Inspect the bearings (Item 1) and shaft (Item 2) **[Figure 40-50-8]** for wear or damage.

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

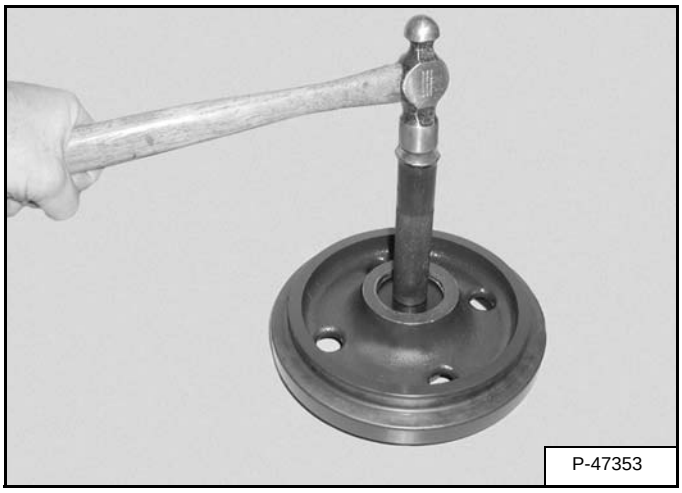
Replace any worn or damaged parts.

Figure 40-50-9



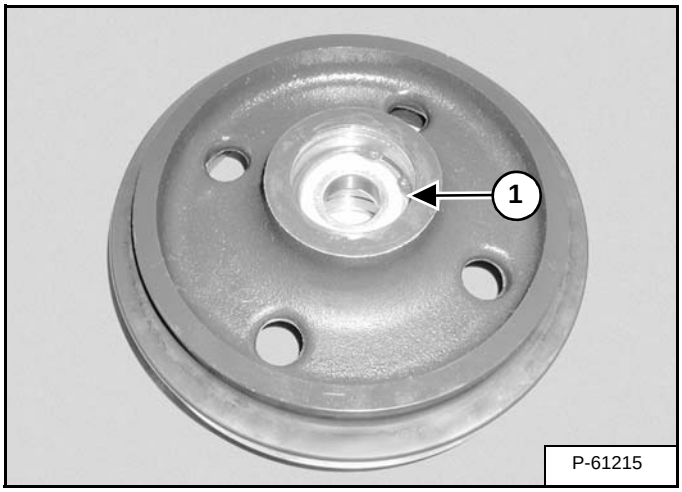
Remove all paint and corrosion from the seal surface (Item 1) **[Figure 40-50-9]** on both sides of the idler.

Figure 40-50-10



Using a bearing driver, install the bearing in the idler **[Figure 40-50-10]**.

Figure 40-50-11

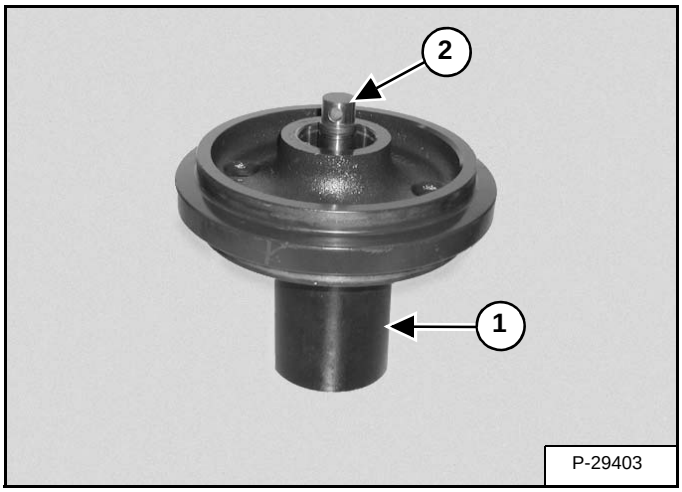


Install the snap ring (Item 1) **[Figure 40-50-11]**.

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Assembly (Cont'd)

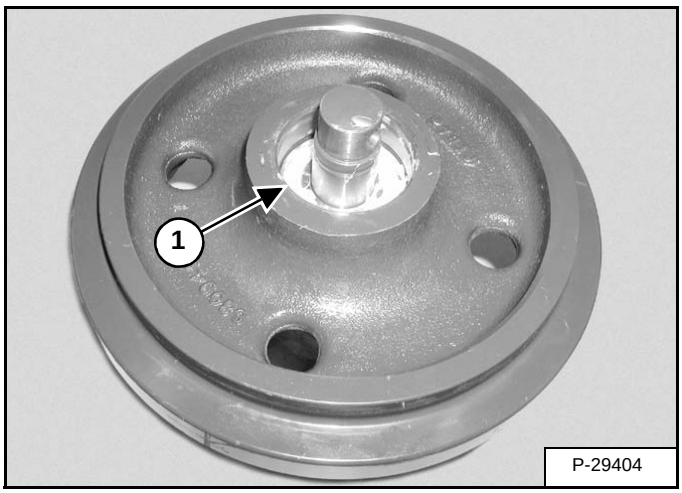
Figure 40-50-12



Turn the idler over and place the idler on the support fixture (Item 1) **[Figure 40-50-12]**.

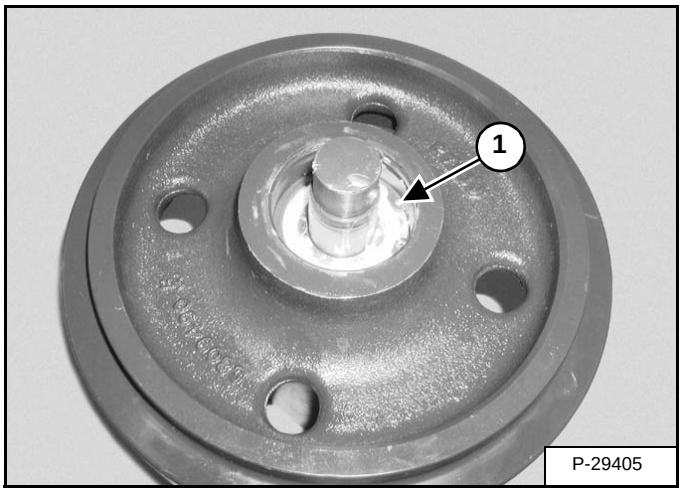
Install the shaft (Item 2) **[Figure 40-50-12]**.

Figure 40-50-13



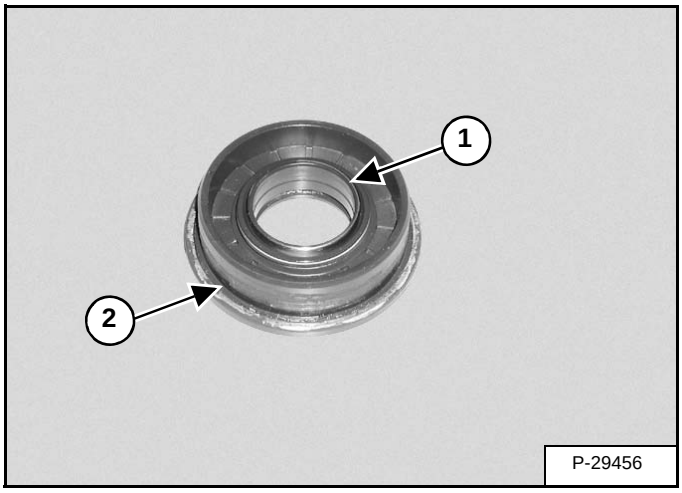
Install the bearing (Item 1) **[Figure 40-50-13]**. Use a brass drift to seat the bearing on the shaft.

Figure 40-50-14



Install the snap ring (Item 1) **[Figure 40-50-14]**.

Figure 40-50-15



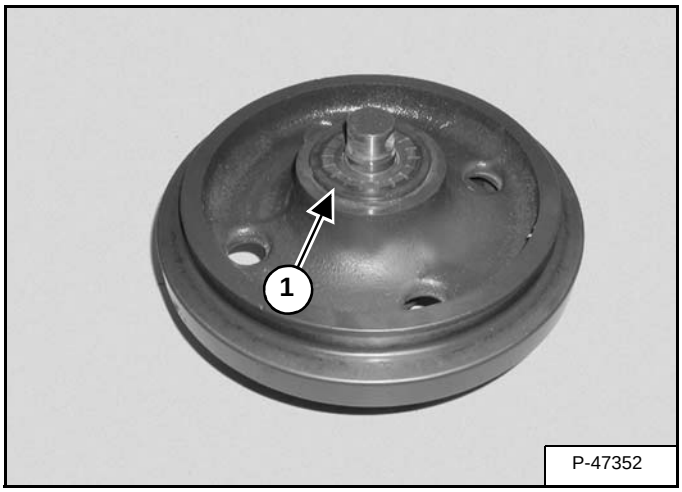
Apply assembly lube to the inside diameter (Item 1) **[Figure 40-50-15]** of the seal.

Apply a small bead of high temperature silicone sealant around the flange surface (Item 2) **[Figure 40-50-15]** of the seal.

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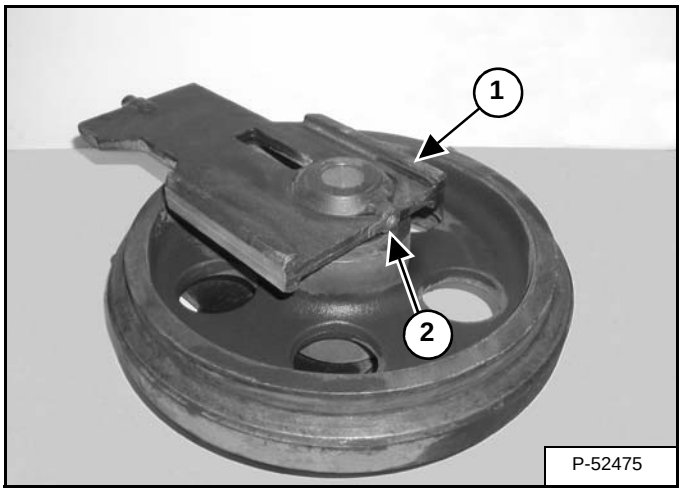
Assembly (Cont'd)

Figure 40-50-16



Using the driving tool, install the seal (Item 1) **[Figure 40-50-16]** on both sides of the idler.

Figure 40-50-17



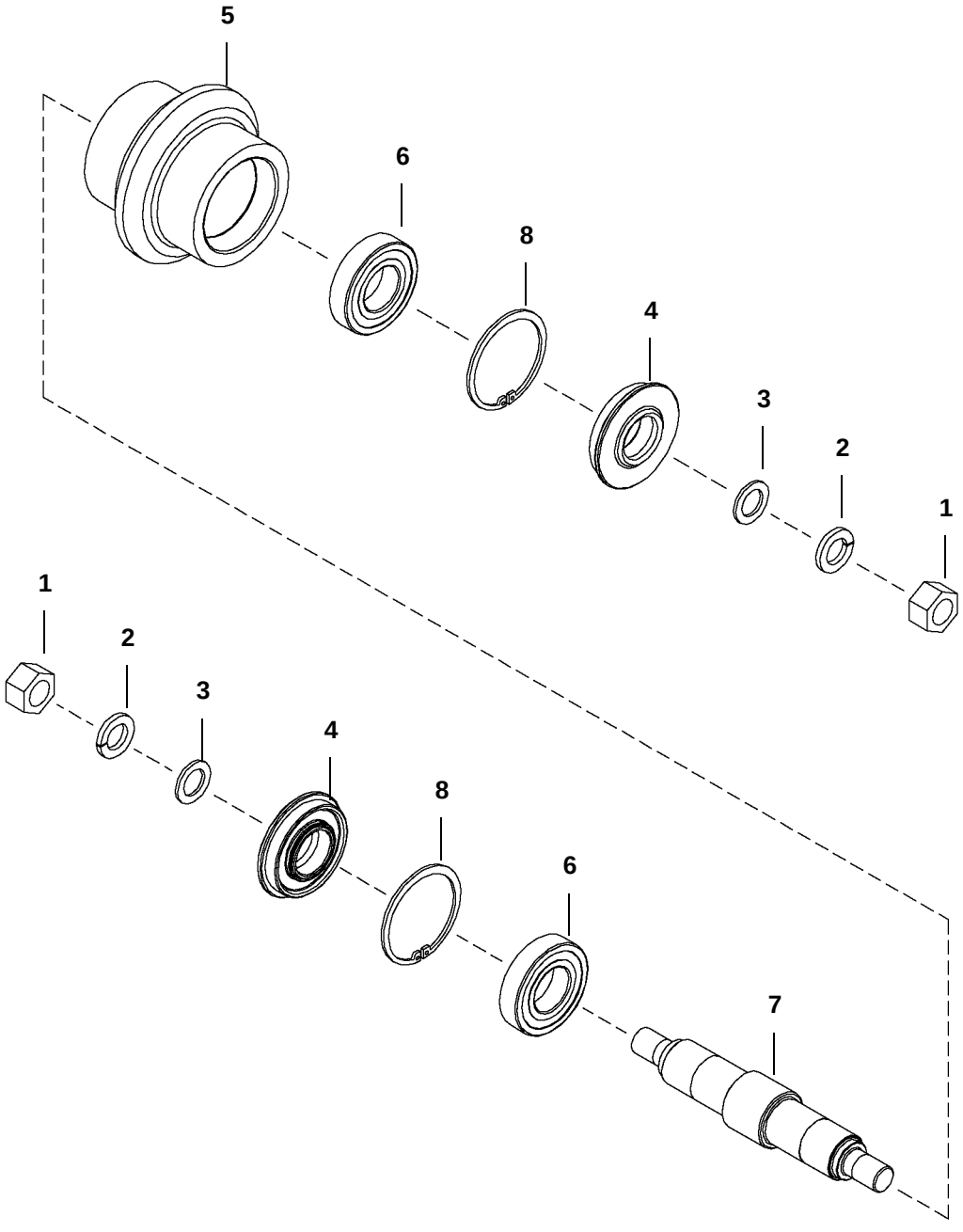
Install the block (Item 1) and roll pin (Item 2) **[Figure 40-50-17]** on both sides of the shaft.

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UPPER TRACK ROLLER

Parts Identification

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



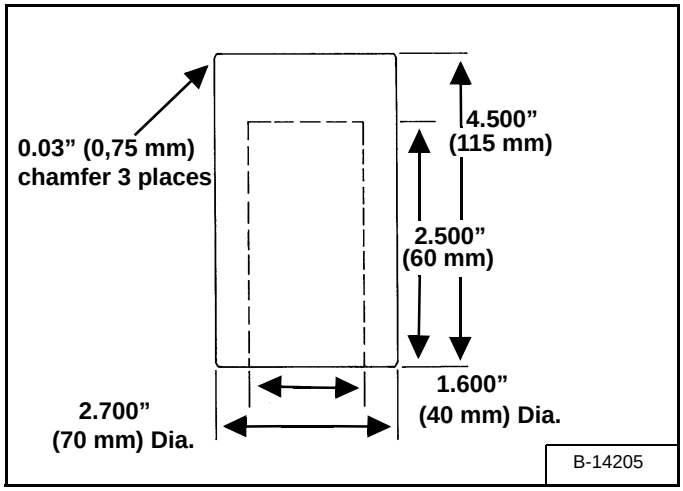
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Disassembly

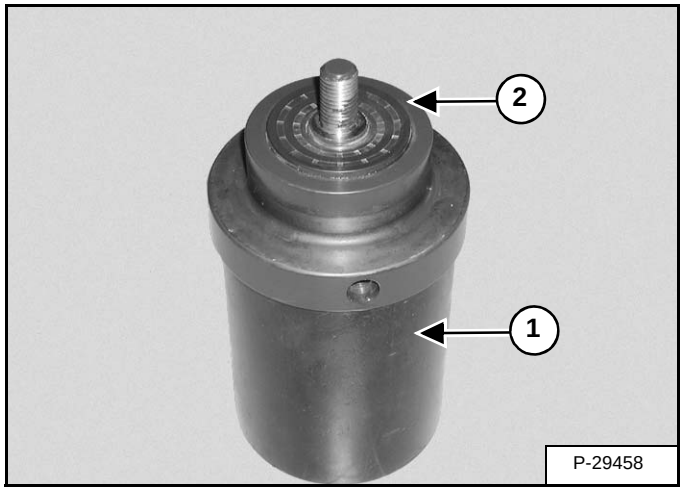
The following tools must be fabricated for this procedure:

Figure 40-60-1



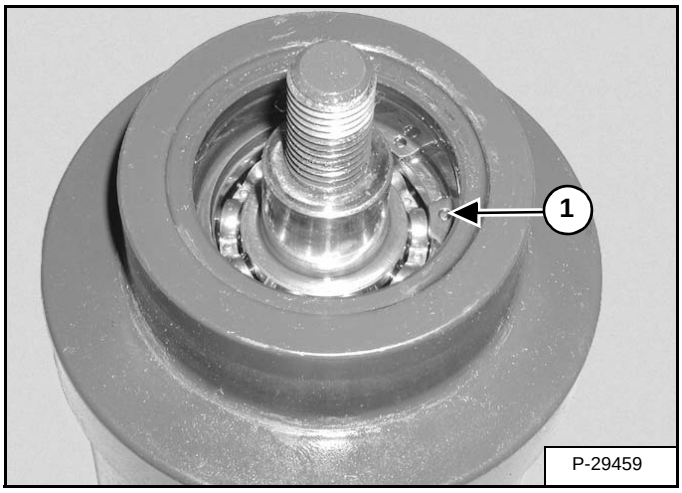
1. Driver Tool - See **[Figure 40-60-1]**.
2. Support Fixture - Tubing, 3.0 inches ID x 0.250 inches wall x 6.0 inches long.

Figure 40-60-2



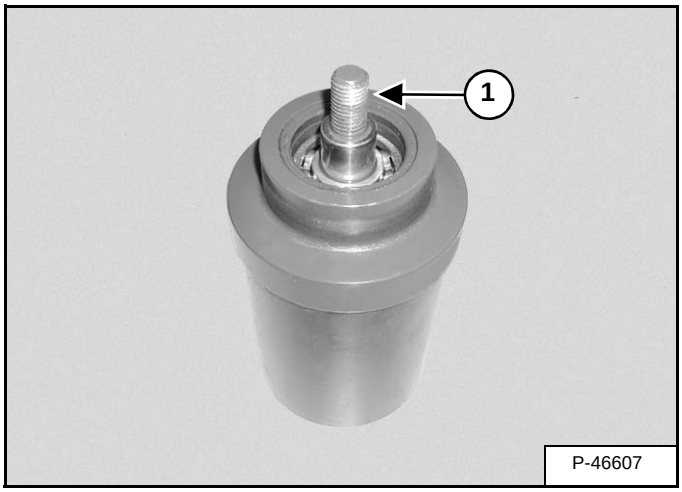
Support the roller in the support fixture (Item 1). Remove the seal (Item 2) **[Figure 40-60-2]** from both sides of the roller.

Figure 40-60-3



Remove the snap ring (Item 1) **[Figure 40-60-3]** from both sides of the roller.

Figure 40-60-4

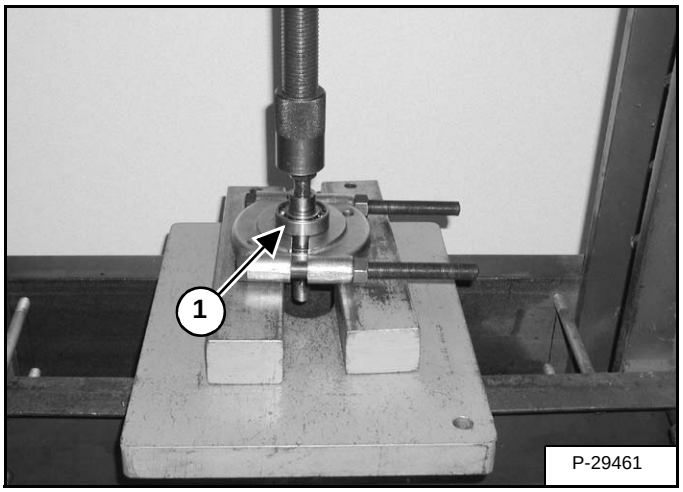


Tap the shaft (Item 1) **[Figure 40-60-4]** and bearings out of the roller.

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Disassembly (Cont'd)

Figure 40-60-5

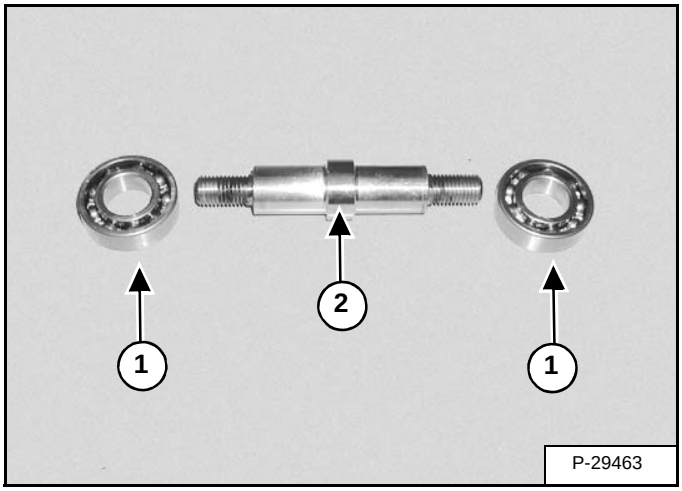


Press the bearings (Item 1) **[Figure 40-60-5]** off the shaft.

Assembly

Clean all parts in solvent and dry with compressed air.

Figure 40-60-6



Inspect the bearings (Item 1) and shaft (Item 2) **[Figure 40-60-6]** for wear or damage.

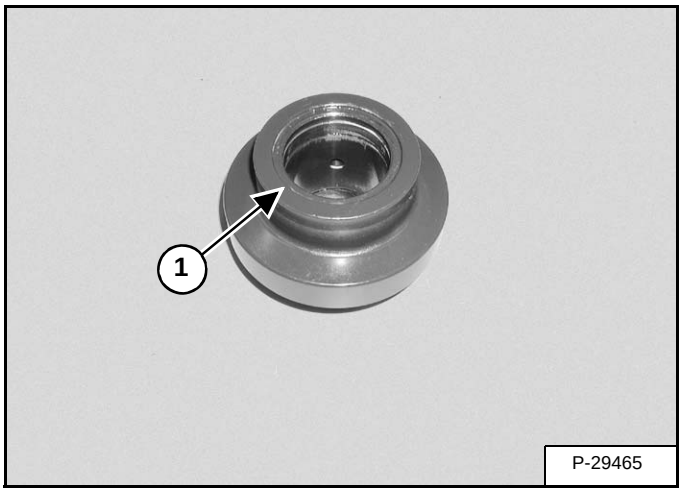
The bearings are sealed. If the bearings do not roll smoothly or if the seals are damaged, replace the bearings.

Replace any worn or damaged parts.

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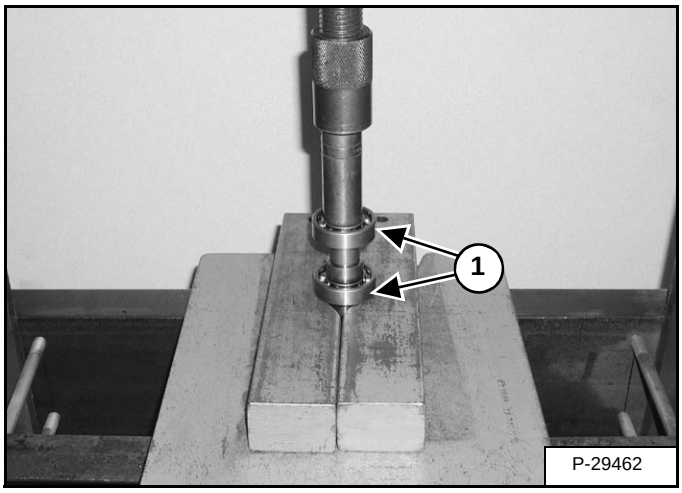
Assembly (Cont'd)

Figure 40-60-7



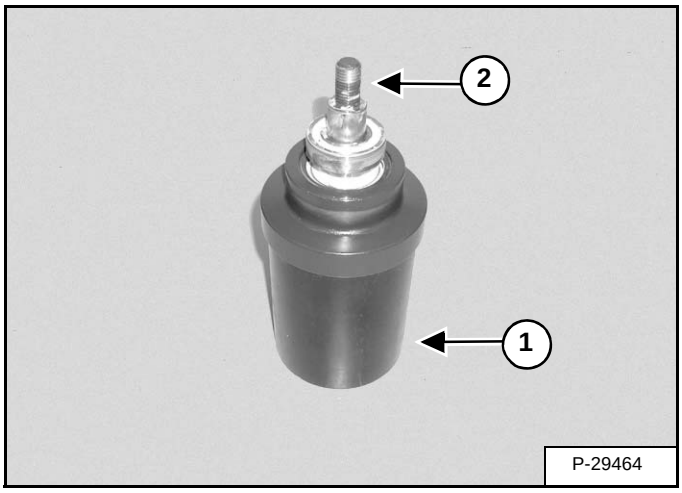
Remove all paint and corrosion from the seal surface (Item 1) **[Figure 40-60-7]** on both sides of the roller.

Figure 40-60-8



Press the bearings (Item 1) **[Figure 40-60-8]** on the shaft.

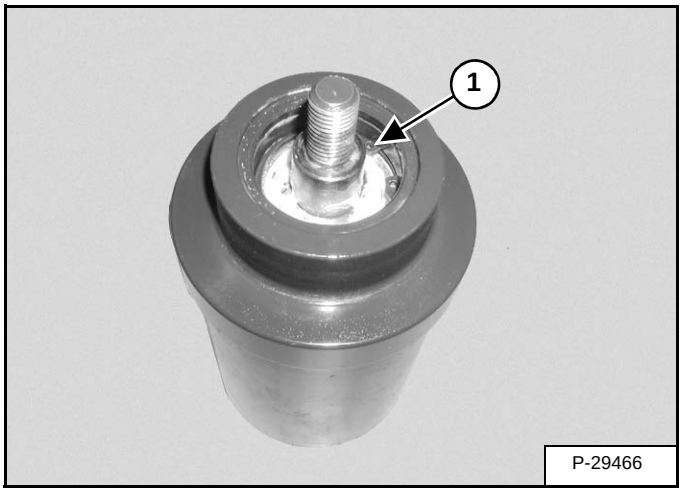
Figure 40-60-9



Place the roller on the support fixture (Item 1) **[Figure 40-60-9]**.

Tap the shaft and bearing assembly (Item 2) **[Figure 40-60-9]** into the roller.

Figure 40-60-10

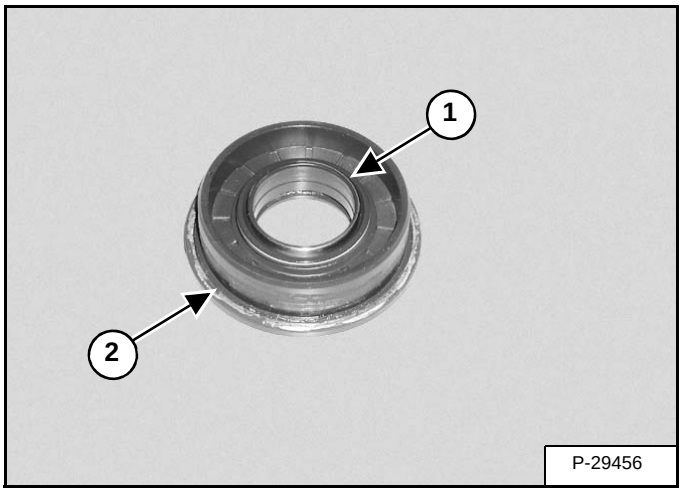


Install the snap ring (Item 1) **[Figure 40-60-10]** on both sides of the roller.

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Assembly (Cont'd)

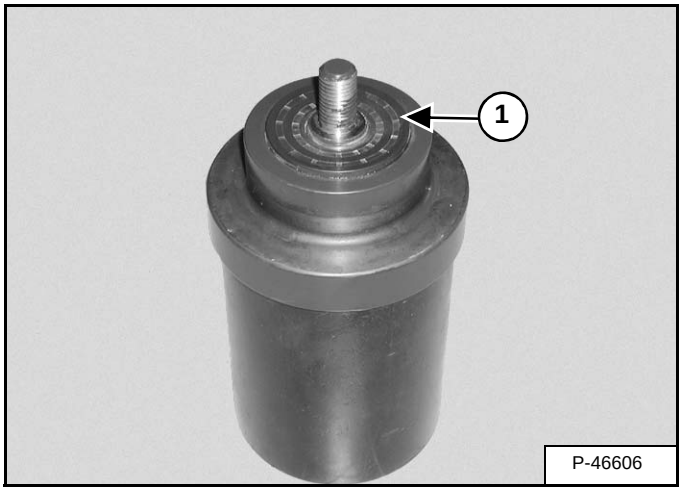
Figure 40-60-11



Apply assembly lube to the inside diameter (Item 1) **[Figure 40-60-11]** of the seal.

Apply a small bead of high temperature silicone sealant around the flange surface (Item 2) **[Figure 40-60-11]** of the seal.

Figure 40-60-12



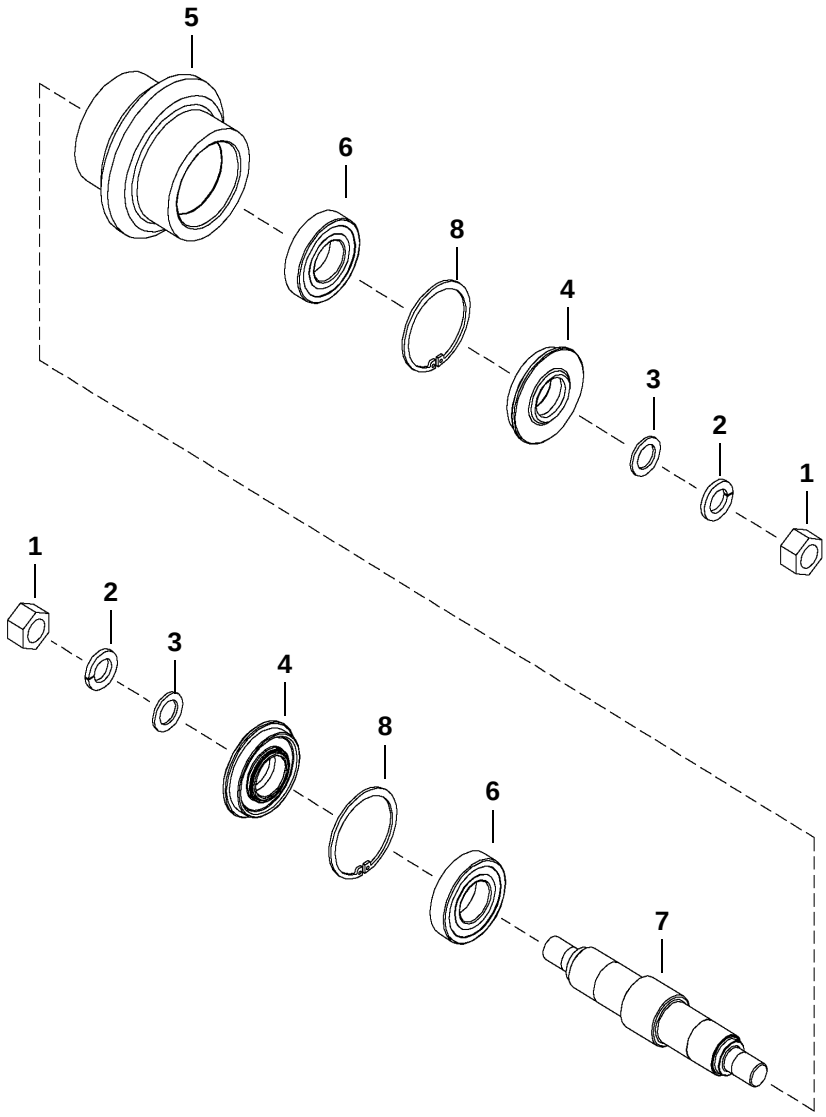
Using the driving tool, install the seal (Item 1) **[Figure 40-60-12]** on both sides of the roller.

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LOWER TRACK ROLLER

Parts Identification

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



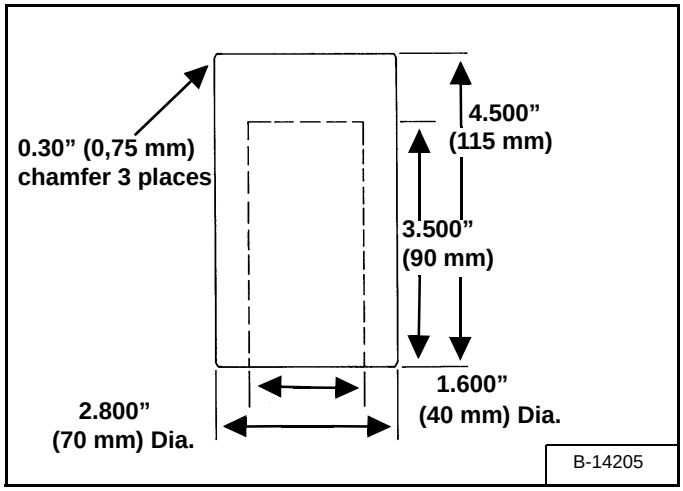
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Disassembly

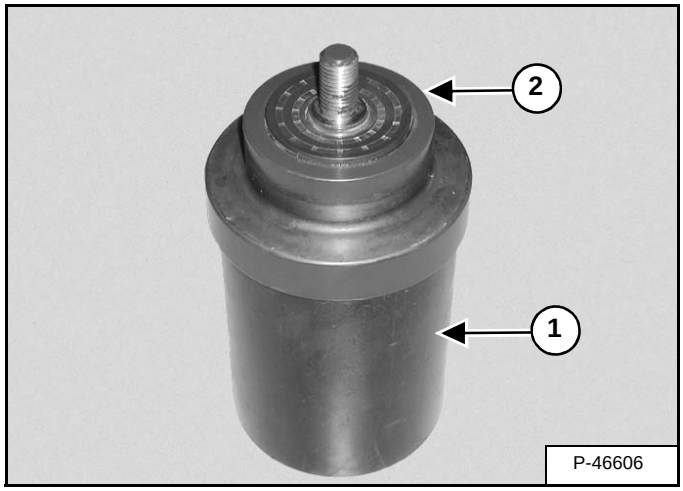
The following tools must be fabricated for this procedure:

Figure 40-70-1



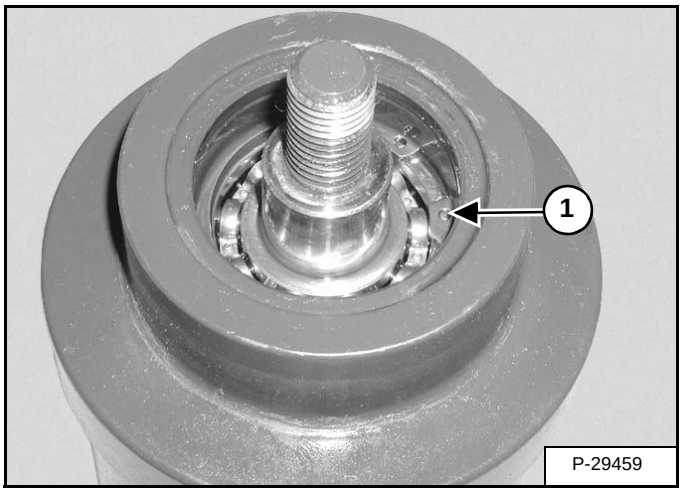
1. Driver Tool - See **[Figure 40-70-1]**.
2. Support Fixture - Tubing, 3.0 inches ID x 0.250 inches wall x 6.0 inches long.

Figure 40-70-2



Support the roller in the support fixture (Item 1). Remove the seal (Item 2) **[Figure 40-70-2]** from both sides of the roller.

Figure 40-70-3

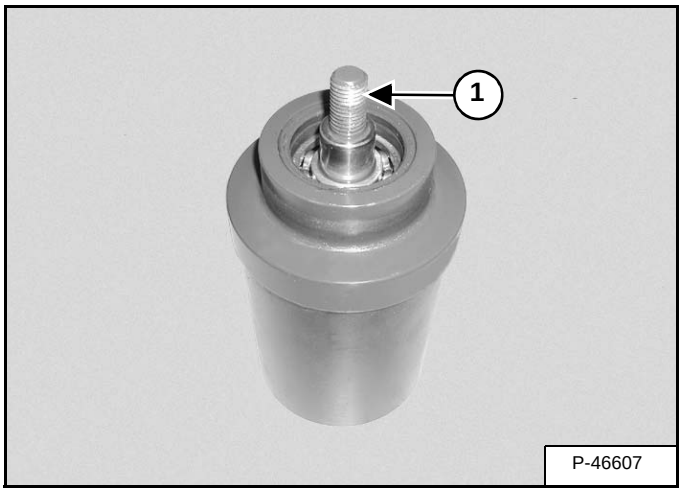


Remove the snap ring (Item 1) **[Figure 40-70-3]** from both sides of the roller.

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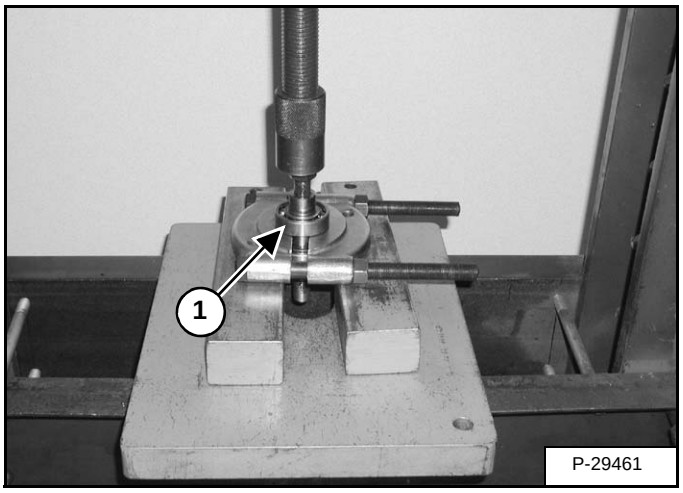
Disassembly (Cont'd)

Figure 40-70-4



Tap the shaft (Item 1) **[Figure 40-70-4]** and bearings out of the roller.

Figure 40-70-5

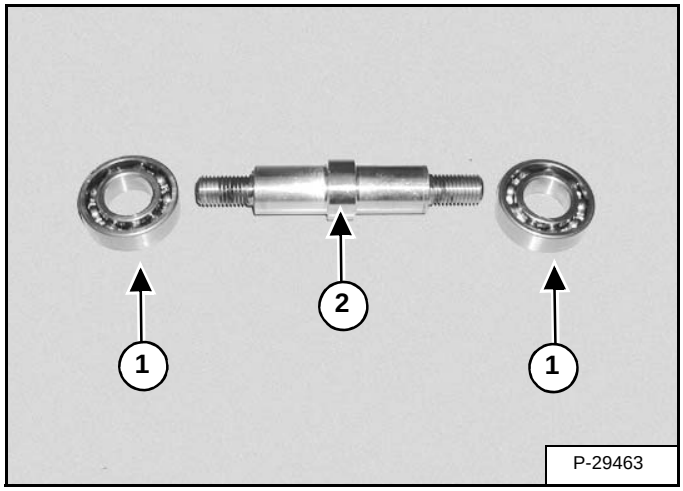


Press the bearings (Item 1) **[Figure 40-70-5]** off the shaft.

Assembly

Clean all parts in solvent and dry with compressed air.

Figure 40-70-6

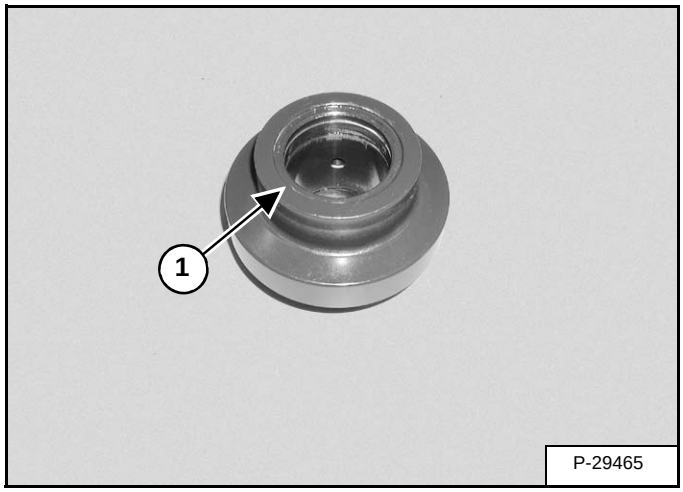


Inspect the bearings (Item 1) and shaft (Item 2) **[Figure 40-70-6]** for wear or damage.

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

Replace any worn or damaged parts.

Figure 40-70-7

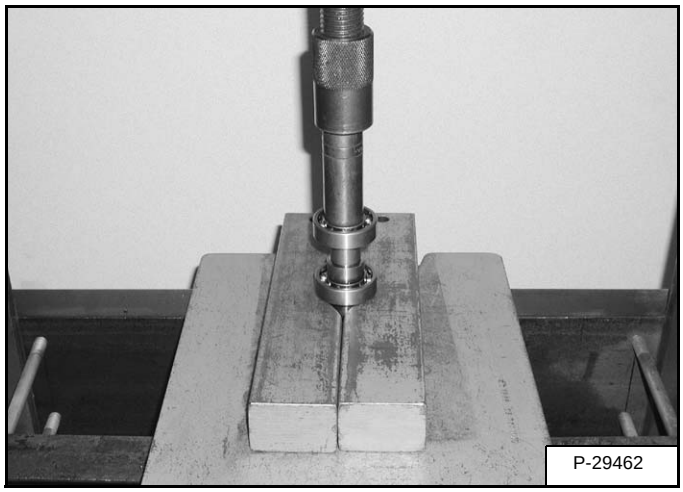


Remove all paint and corrosion from the seal surface (Item 1) **[Figure 40-70-7]** on both sides of the roller.

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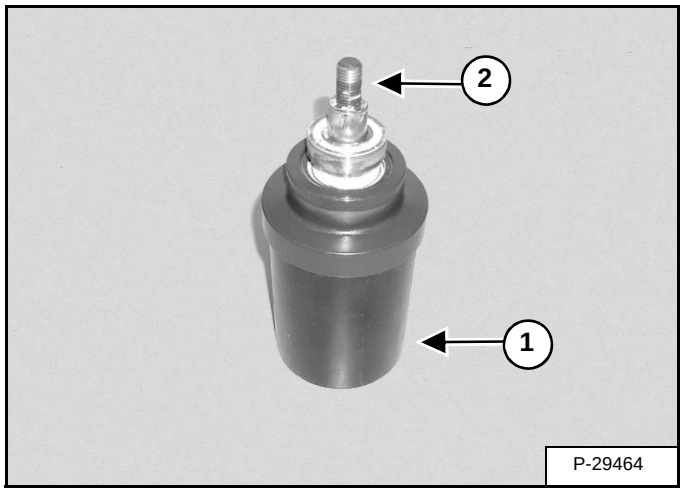
Assembly (Cont'd)

Figure 40-70-8



Press the bearings (Item 1) **[Figure 40-70-8]** on the shaft.

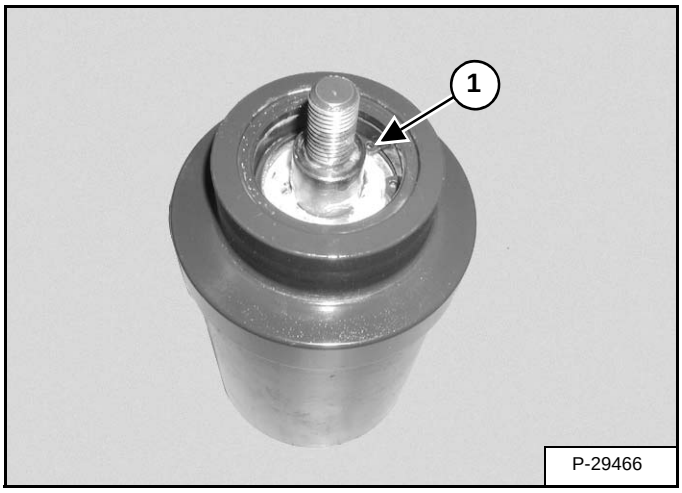
Figure 40-70-9



Place the roller on the support fixture (Item 1) **[Figure 40-70-9]**.

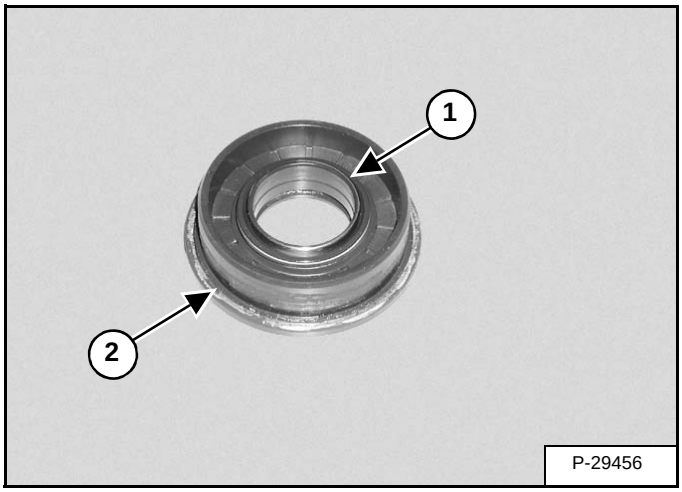
Tap the shaft and bearing assembly (Item 2) **[Figure 40-70-9]** into the roller.

Figure 40-70-10



Install the snap ring (Item 1) **[Figure 40-70-10]** on both sides of the roller.

Figure 40-70-11



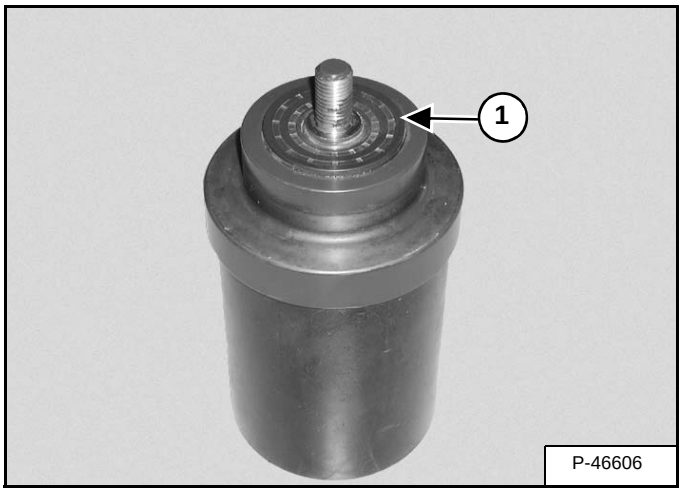
Apply assembly lube to the inside diameter (Item 1) **[Figure 40-70-11]** of the seal.

Apply a small bead of high temperature silicone sealant around the flange surface (Item 2) **[Figure 40-70-11]** of the seal.

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Assembly (Cont'd)

Figure 40-70-12



Using the driving tool, install the seal (Item 1) **[Figure 40-70-12]** on both sides of the roller.

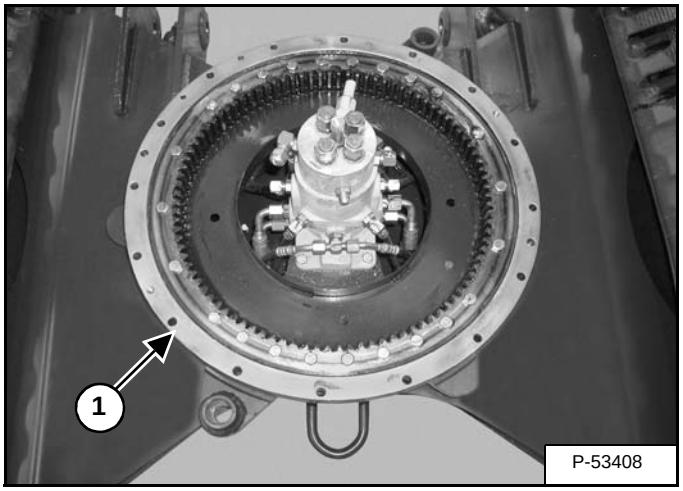
https://www.pdfmanual4trucks.com/

SWING CIRCLE GEAR

Swing Bearing Removal

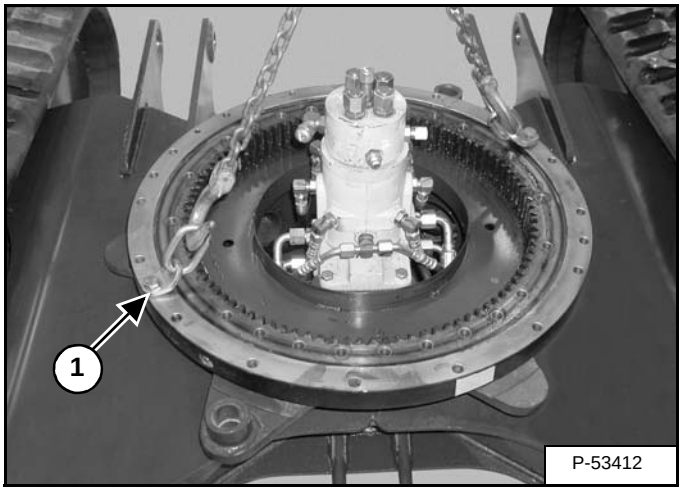
Remove the upperstructure. (See Removal on Page 50-10-1)

Figure 40-80-1



Remove the bolts and nuts that hold the swing bearing (Item 1) **[Figure 40-80-1]** to the track frame.

Figure 40-80-2

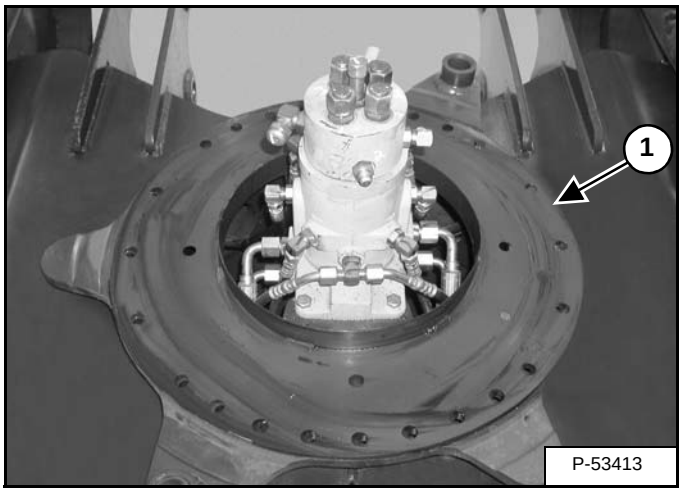


Install lifting brackets (Item 1) **[Figure 40-80-2]** on the swing bearing.

Install a lifting hoist on the brackets.

Remove the swing bearing.

Figure 40-80-3



Remove the grease cover (Item 1) **[Figure 40-80-3]** from the track frame.

Clean and inspect the grease cover for damage. Replace as necessary.

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Swing Bearing Installation

Figure 40-80-4

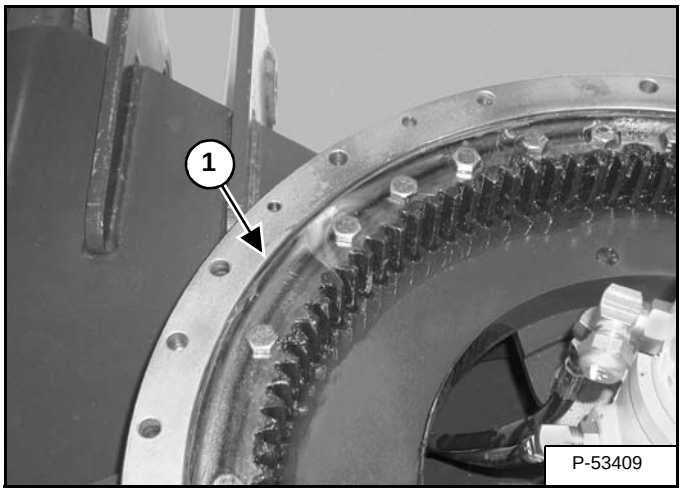
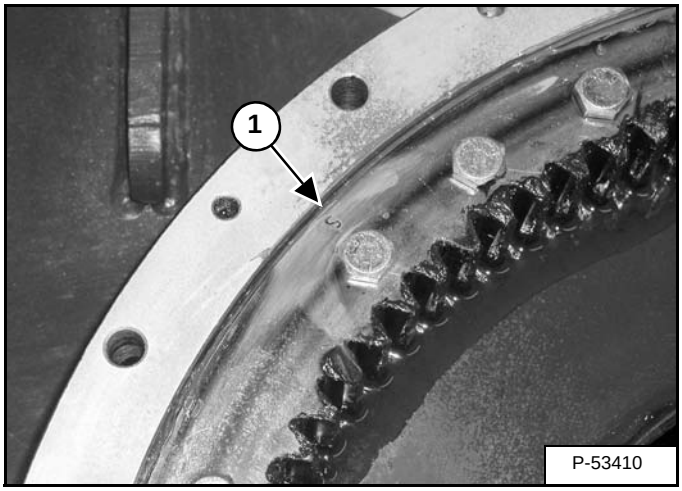


Figure 40-80-5

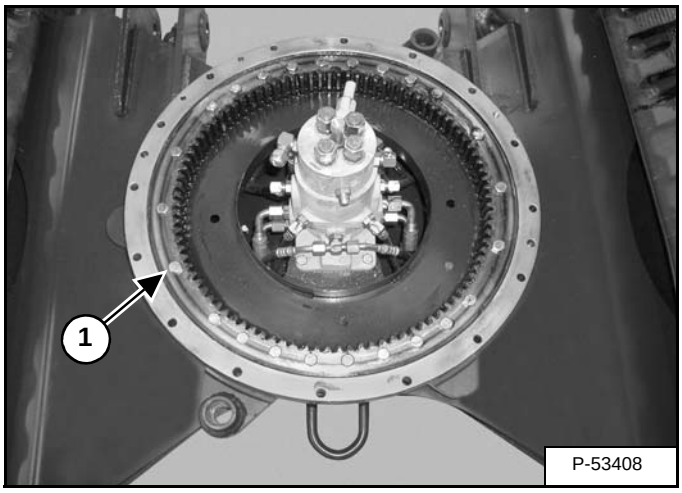


If reusing the existing swing bearing, use top, side and edge aligning marks to put the swing bearing in the correct location. If installing a new swing bearing find the soft zone area (Item 1) **[Figure 40-80-4]** & **[Figure 40-80-5]**.

Install the swing bearing so the inside soft zone (Item 1) **[Figure 40-80-4]** & **[Figure 40-80-5]** is at either the left hand or right hand side of the excavator.

NOTE: Do not put the soft zone to the front or rear of the excavator.

Figure 40-80-6



Install the bolts (Item 1) **[Figure 40-80-5]** and lock nuts.

Tighten to 78-85 ft.-lbs. (106-115 Nm) torque.

Put lubriplate grease or equivalent on the swing bearing gear.

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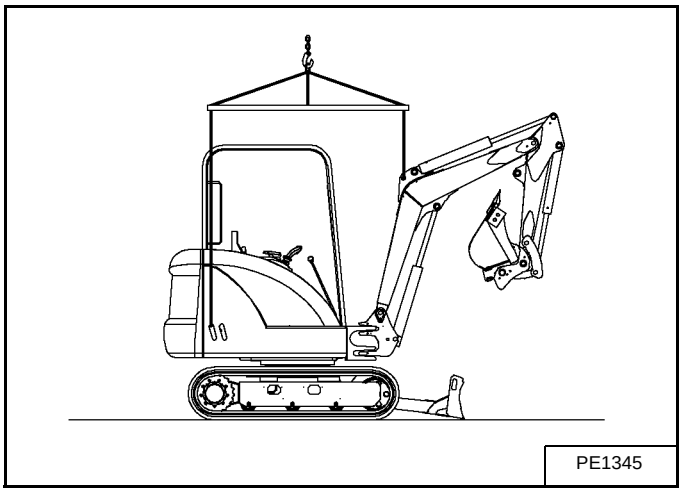
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UPPERSTRUCTURE

Removal

Figure 50-10-1



Fully extend the cylinders of the bucket, arm, and boom so that the Excavator is in the position as shown **[Figure 50-10-1]**.

Lower the blade all the way.

Put all the control levers in neutral.

The boom must be in full raised position and centered to the front of the Excavator **[Figure 50-10-1]**.

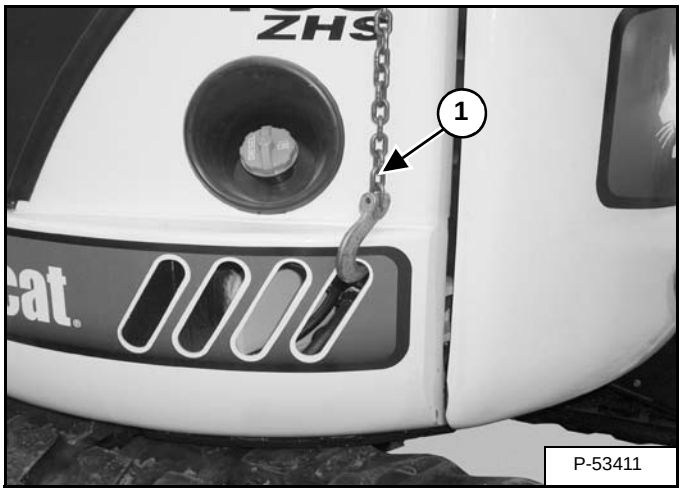
⚠ WARNING

AVOID INJURY OR DEATH

- **Use a lifting fixture with sufficient capacity for the weight of the excavator plus any added attachments.**
- **Maintain center of gravity and balance when lifting.**
- **Do not swing boom or upperstructure. Engage the swing locking lever.**
- **Never lift with operator on machine.**

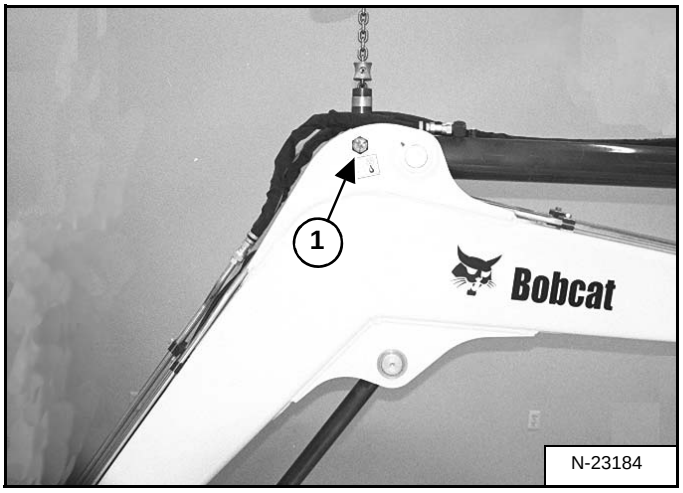
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Figure 50-10-2



Fasten chains to the rear of the upperstructure on both sides (Item 1) **[Figure 50-10-2]** and up to a lifting fixture above the canopy/cab **[Figure 50-10-1]**. The lifting fixture must extend over the sides of the canopy/cab to prevent the chains from hitting the ROPS/TOPS.

Figure 50-10-3



Install a one inch (25 mm) bolt and nut (Grade 5 or 8) through the holes at the boom (Item 1) **[Figure 50-10-3]**. Fasten a chain from the bolt to the lift fixture **[Figure 50-10-1]**.

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Removal (Cont'd)

Remove the swing motor. (See Removal And Installation on Page 20-90-1.)

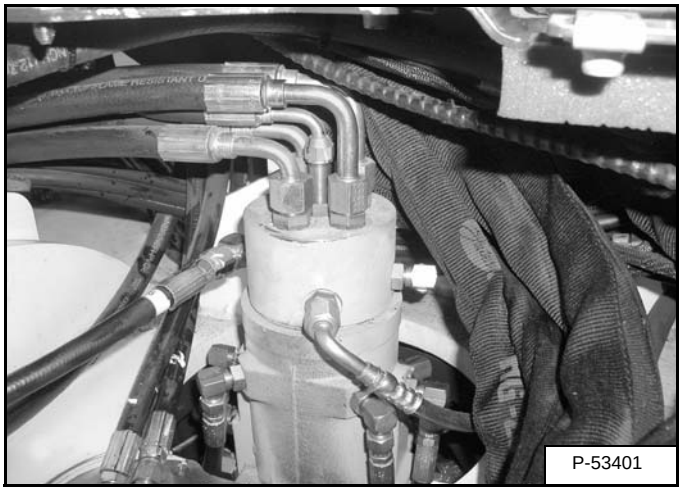
Remove the swing motor drive carrier. (See Removal And Installation on Page 20-91-1.)

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.

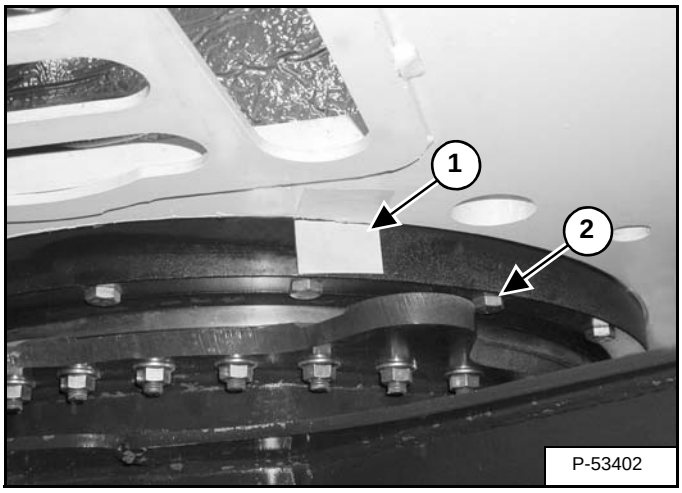
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Figure 50-10-4



Mark and remove the hoses from the top of the swivel joint **[Figure 50-10-4]**.

Figure 50-10-5



Mark the upperstructure to the swing bearing and to the track frame for assembly (Item 1) **[Figure 50-10-5]**.

Partially disassemble the upperstructure from the swing bearing by removing all but four bolts which are spaced at 90° from each other (Item 2) **[Figure 50-10-5]**.

The upperstructure must be rotated to gain access to the bolts for removal. With the help of a second person, manually turn the upperstructure to provide clearance for bolt removal.

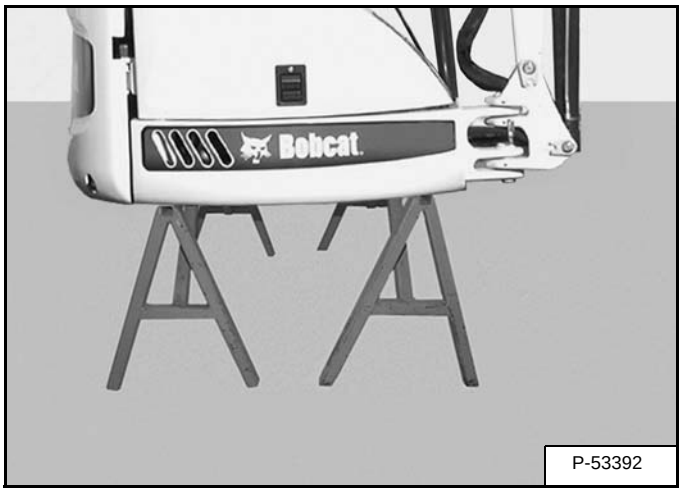
NOTE: For disassembly safety a minimum of four evenly spaced bolts must remain installed, to be removed later.

Apply a small amount of lifting pressure to the upperstructure with the lift sling. Remove the four remaining bolts holding the upperstructure to the swing bearing.

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Removal (Cont'd)

Figure 50-10-6

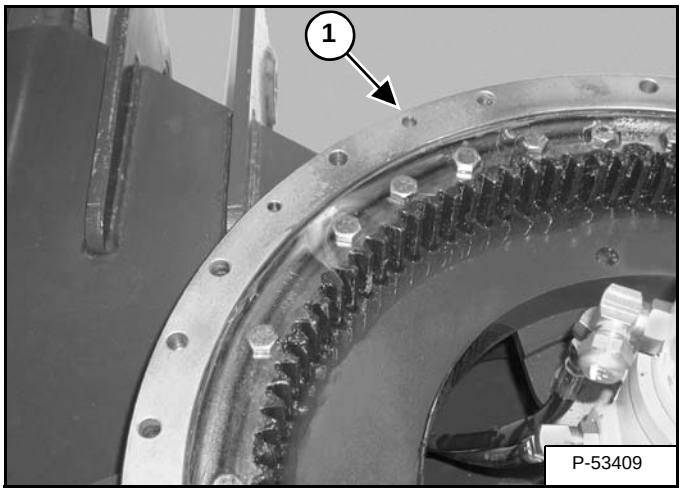


Lift the upperstructure off of the swing bearing. Put the upperstructure on suitable supporting stands or blocks **[Figure 50-10-6]**.

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Installation

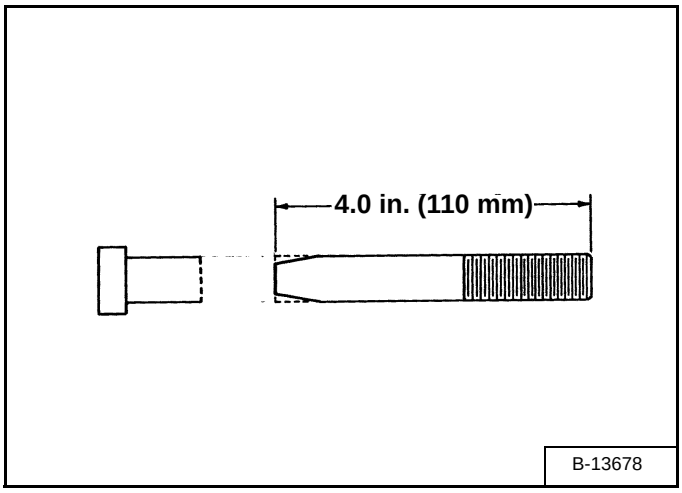
Figure 50-10-7



Rotate the swing bearing so the plug (outside soft zone) (Item 1) **[Figure 50-10-7]** is to the left hand side of the Excavator.

NOTE: The upperstructure can only be installed on the swing bearing in one position. Match the mount holes in the swing bearing to the mount holes in the upperstructure.

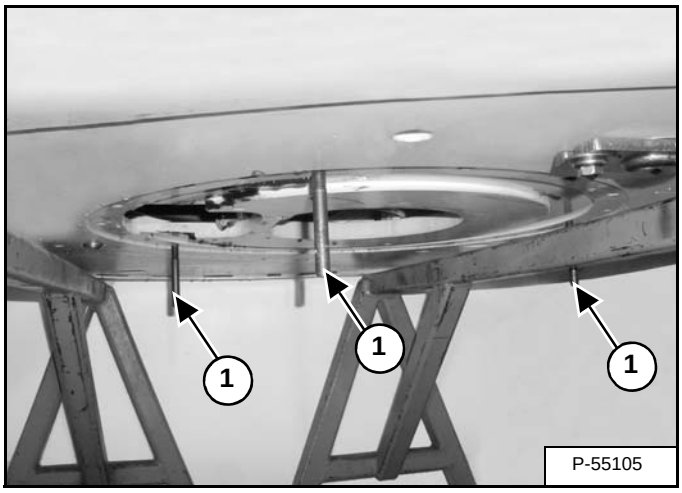
Figure 50-10-8



Make three alignment pins by using M14 X 110 mm long bolts. Cut the head off of these bolts at 4.0 inch (102 mm). Taper the end of the bolts **[Figure 50-10-8]**.

Use a tap in the holes in the upperstructure to remove any dried thread lock adhesive.

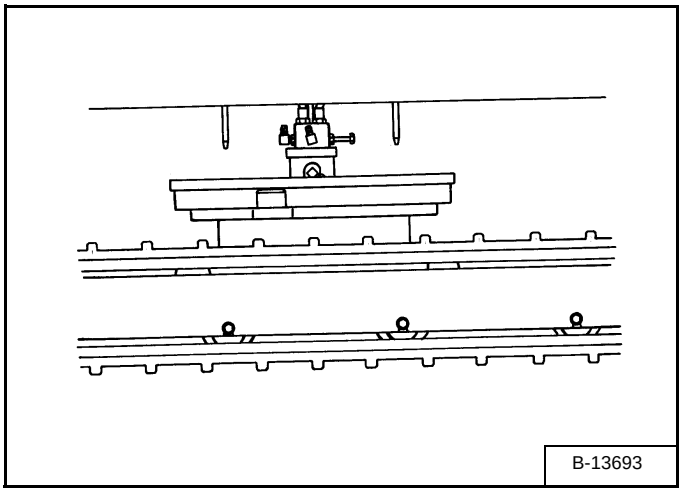
Figure 50-10-9



Install the bolts (Item 1) **[Figure 50-10-9]** into the upperstructure at approximately 120° apart. These will act as alignment pins while lowering the upperstructure onto the swing bearing.

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

Figure 50-10-10

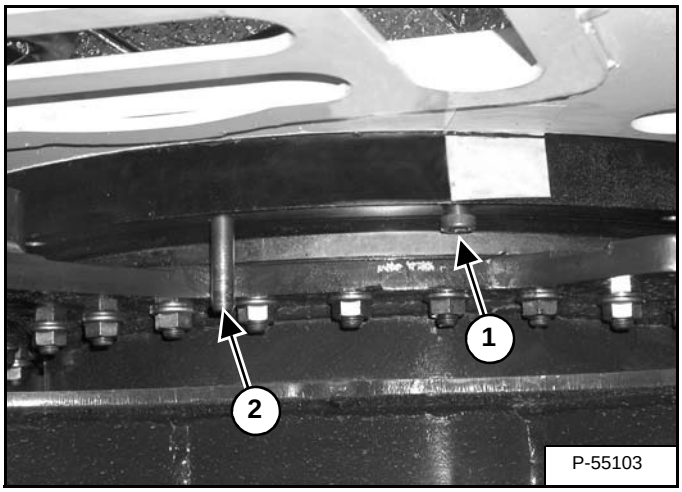


Make sure the swivel joint is centered into the upperstructure access hole **[Figure 50-10-10]**.

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Installation (Cont'd)

Figure 50-10-11



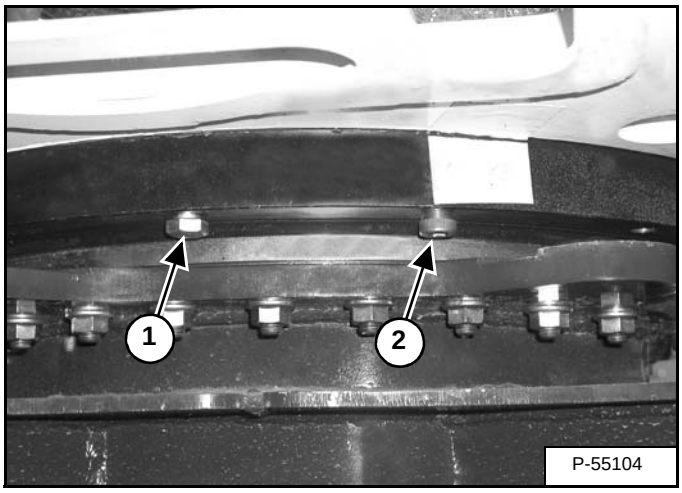
Install the three tapered head alignment bolts (Item 1) **[Figure 50-10-11]** through the swing bearing and into the upperstructure. These bolts should be spaced at approximately 120°.

This procedure will correctly align the upperstructure for correct swing motor gear to swing bearing ring gear clearance.

Tighten these three tapered bolts to 60 ft.-lbs. (81 Nm) torque.

Remove the three alignment pins (Item 2) **[Figure 50-10-11]** from the upperstructure.

Figure 50-10-12

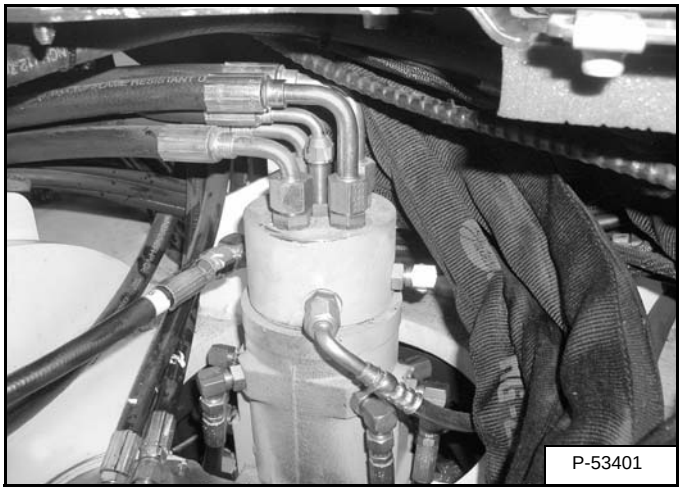


Apply thread lock adhesive (LOCKTITE #242) to the threads of the bolts. Install the bolts (Item 1) **[Figure 50-10-12]** into all holes (except the three with the alignment bolts installed).

Tighten the bolts to 118-133 ft.-lbs. (160-180 Nm) torque.

Remove the three alignment bolts (Item 2) **[Figure 50-10-12]**. Install the three remaining bolts. Tighten the bolts to 118-133 ft.-lbs. (160-180 Nm) torque.

Figure 50-10-13



Install the hoses on the swivel joint **[Figure 50-10-12]**.

Remove the chains and lifting fixture.

Install the swing motor drive carrier. (See Removal And Installation on Page 20-91-1)

Check the backlash between the gears by moving the frame back and forth at several points throughout 360° of frame rotation. There must be some backlash present.

Install the swing motor. (See Removal And Installation on Page 20-90-11)

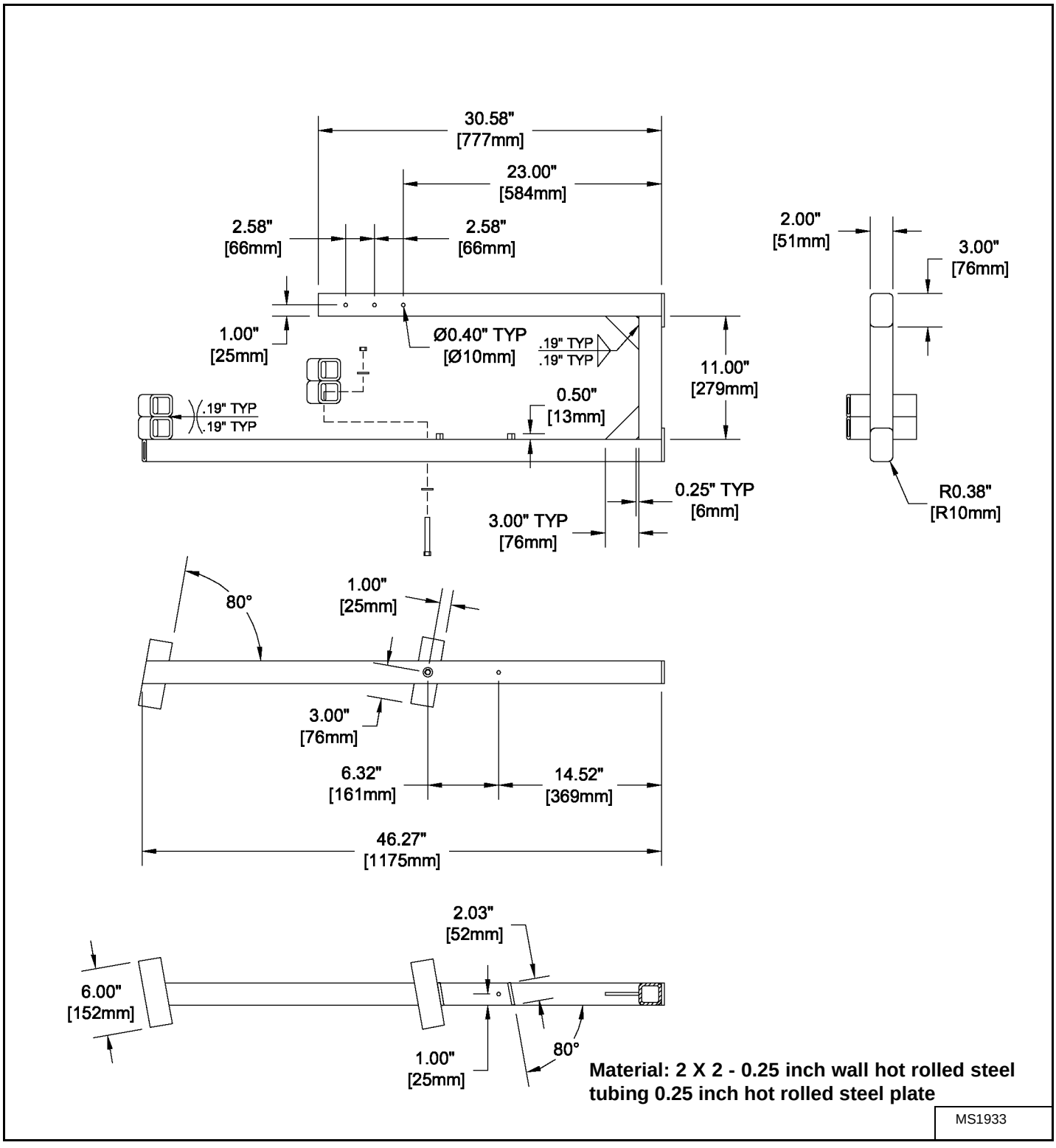
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ROPS CANOPY

Removal And Installation

Build the service lifting bracket used to remove and install the canopy. Use the dimensions shown **[Figure 50-20-1]** to build the service lifting bracket.

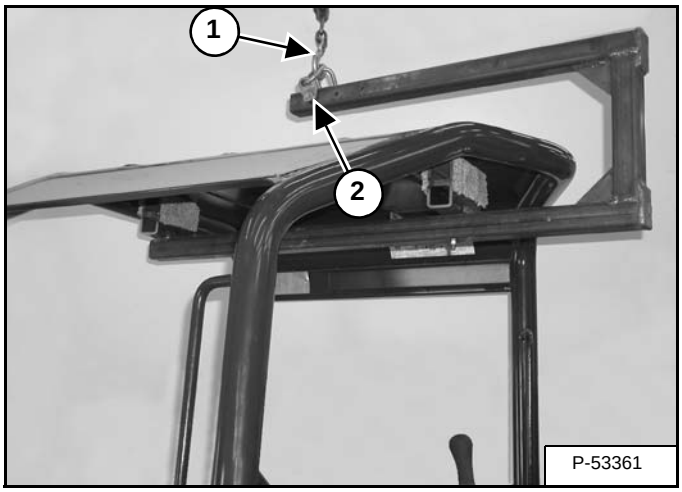
Figure 50-20-1



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Removal And Installation (Cont'd)

Figure 50-20-2



Install the cab/canopy service lifting racket on the canopy **[Figure 50-20-2]**.

Install the chain hoist (Item 1) in the end hole of the lifting bracket (Item 2) **[Figure 50-20-2]**.

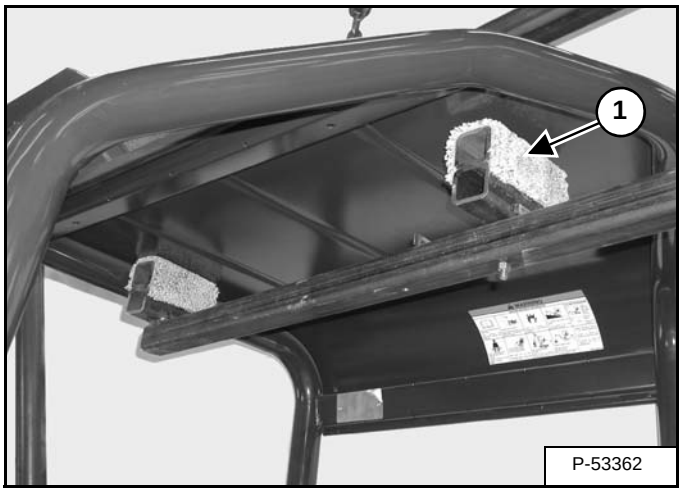
NOTE: Use a chain hoist of sufficient capacity.

⚠ WARNING

Never use the cab/canopy service lifting bracket to lift the excavator. The bracket is not strong enough and can fail causing serious injury or death.

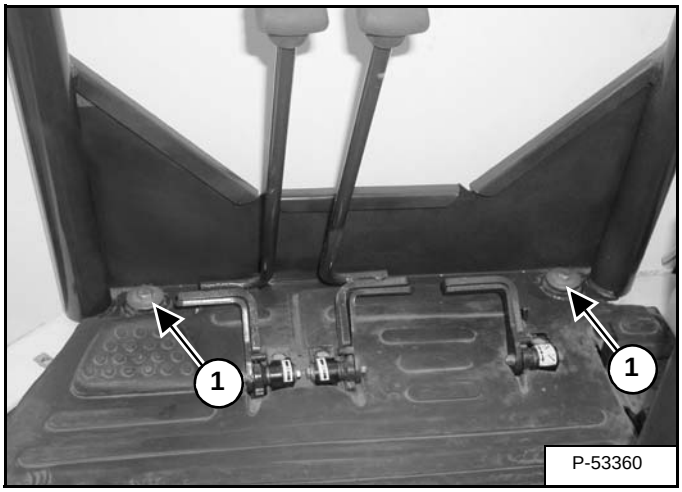
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Figure 50-20-3



Adjust the lifting bracket to the proper width by moving the bracket (Item 1) **[Figure 50-20-3]**.

Figure 50-20-4



Remove the bolts and washers (Item 1) **[Figure 50-20-4]** from the front of the canopy.

Installation: Tighten the bolts to 118-133 ft.-lbs. (160-180 Nm) torque.

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Removal And Installation (Cont'd)

Figure 50-20-5

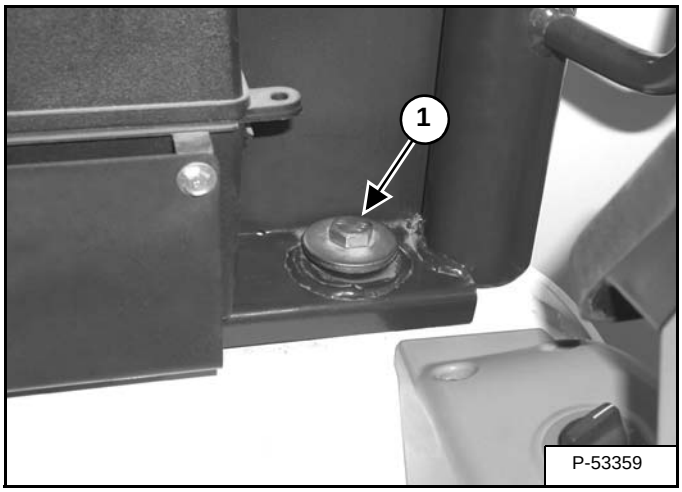
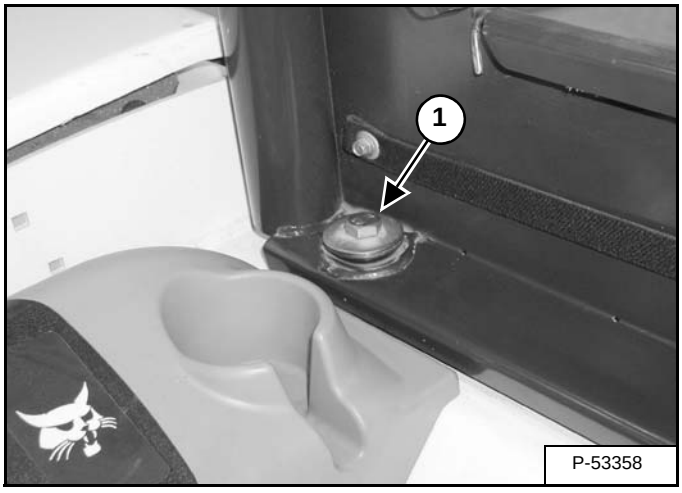


Figure 50-20-6



Remove the bolts and washers (Item 1) **[Figure 50-20-5]** & **[Figure 50-20-5]** from the rear of the canopy.

Installation: Tighten the bolts to 118-133 ft.-lbs. (160-180 Nm) torque.

Remove the canopy.

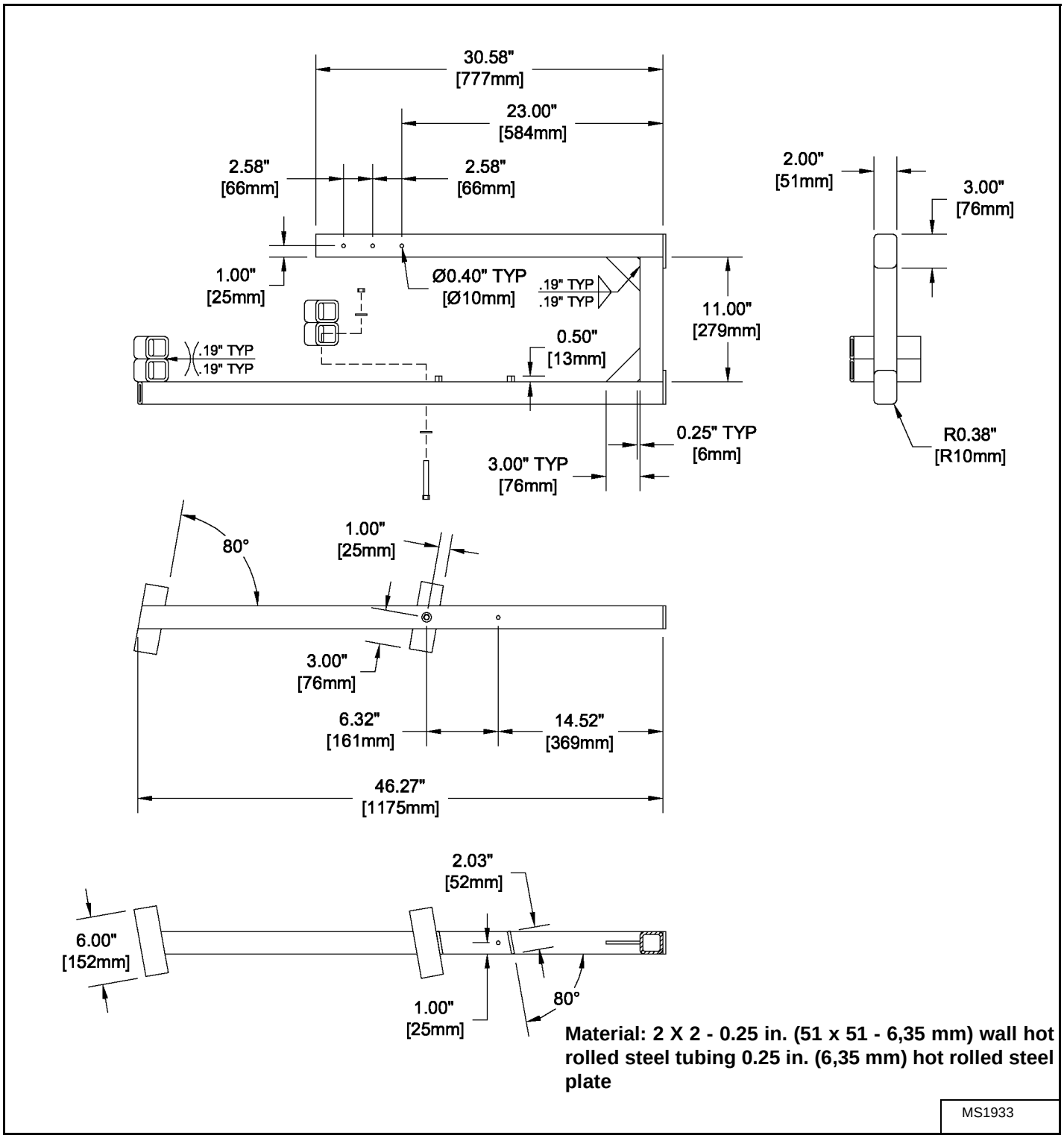
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CAB

Removal And Installation

Build the service lifting bracket used to remove and install the cab. Use the dimensions shown **[Figure 50-30-1]** to build the service lifting bracket.

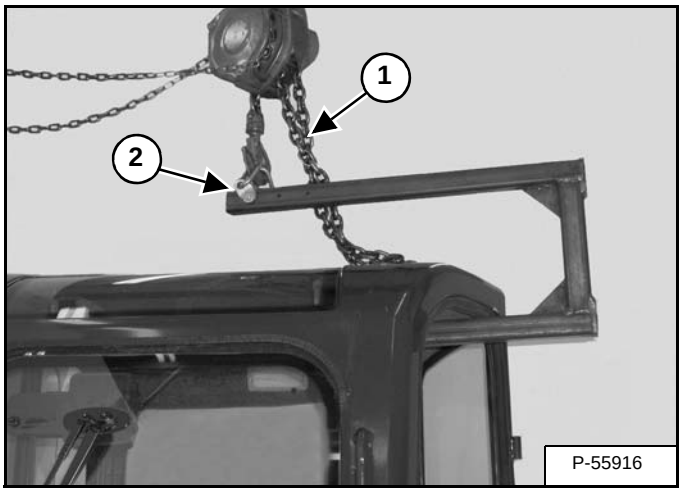
Figure 50-30-1



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Removal And Installation (Cont'd)

Figure 50-30-2



Install the chain hoist (Item 1) in the end hole of the lifting bracket (Item 2) **[Figure 50-30-2]**.

Install the cab/canopy service lifting bracket on the cab **[Figure 50-30-2]**.

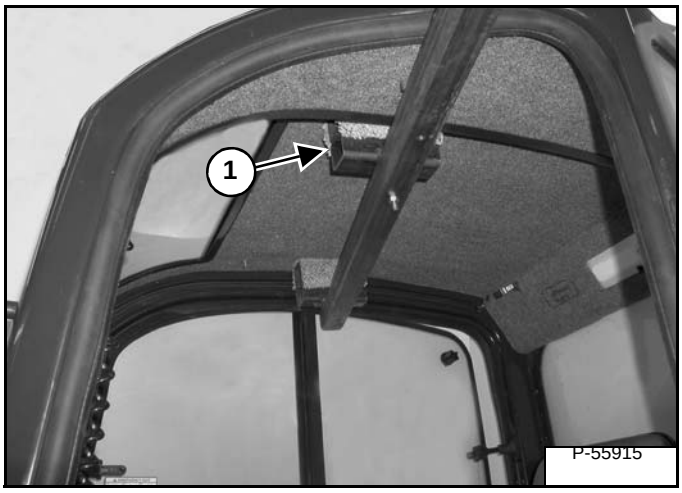
NOTE: Use a chain hoist of sufficient capacity.

⚠ WARNING

Never use the cab/canopy service lifting bracket to lift the Excavator. The bracket is not strong enough and can fail causing serious injury or death.

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Figure 50-30-3

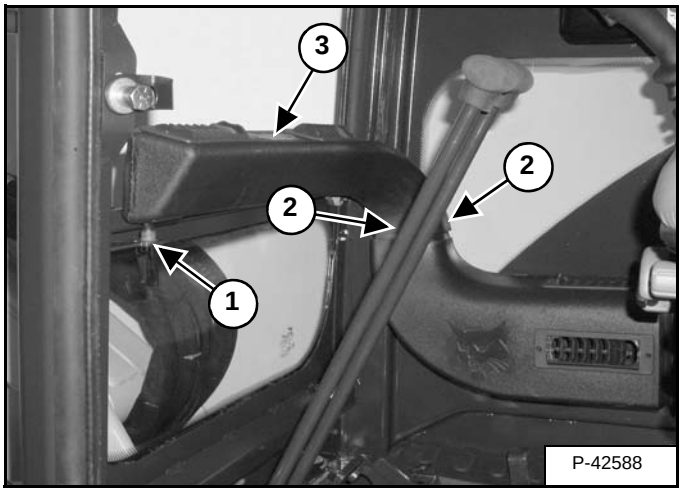


Adjust the lifting bracket to the proper width by moving the bracket (Item 1) **[Figure 50-30-3]**.

The cab may be equipped with either the A/C or heater duct.

A/C Duct

Figure 50-30-4

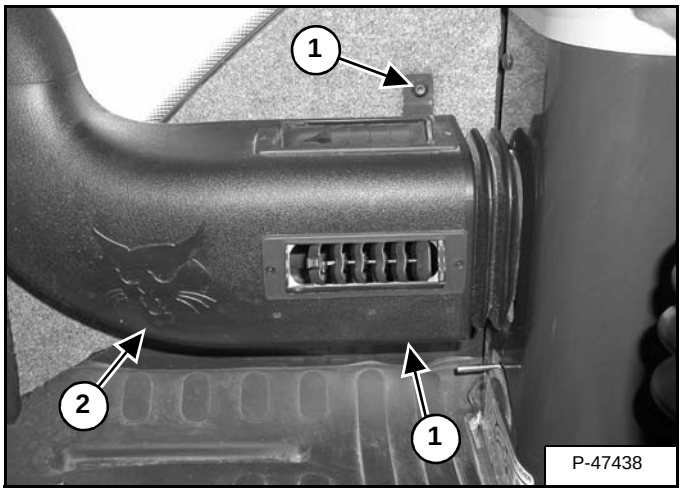


Pull down on the lock (Item 1), remove the screws (Item 2), and remove the A/C duct (Item 3) **[Figure 50-30-4]**.

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Removal And Installation (Cont'd)

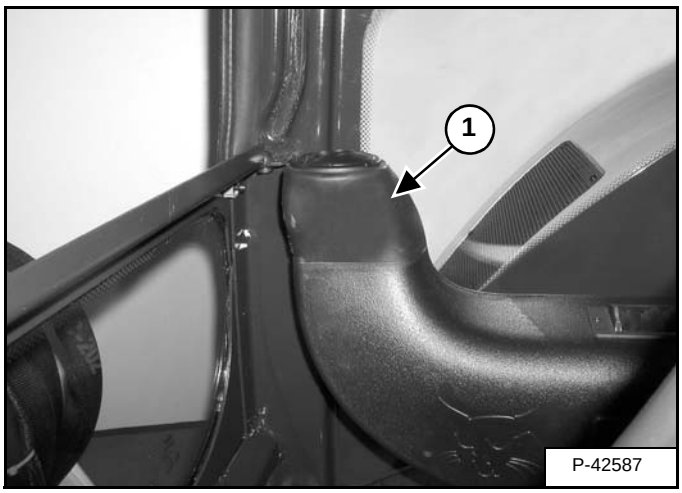
Figure 50-30-5



Remove the screws (Item 1). Remove the air manifold (Item 2) **[Figure 50-30-5]**.

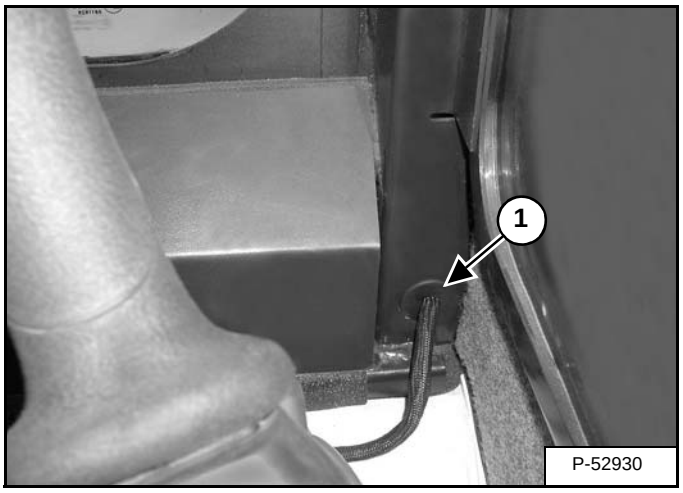
Heater Duct

Figure 50-30-6



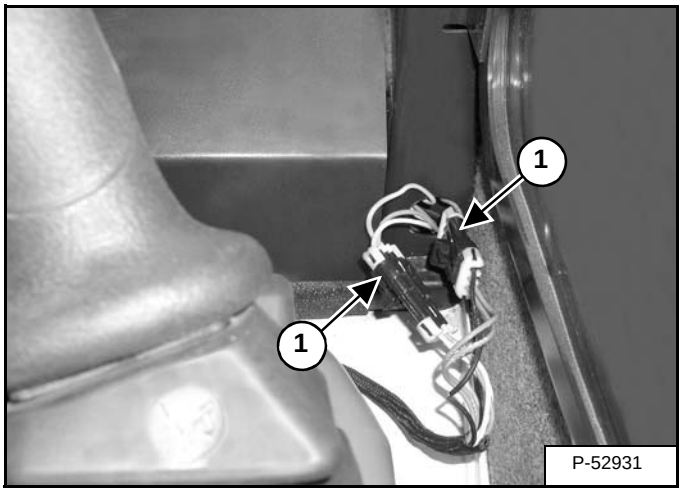
Remove the screws and pull straight up to remove the heater duct (Item 1) **[Figure 50-30-6]**.

Figure 50-30-7



Remove the grommet (Item 1) **[Figure 50-30-7]** located in the left rear corner of the cab.

Figure 50-30-8

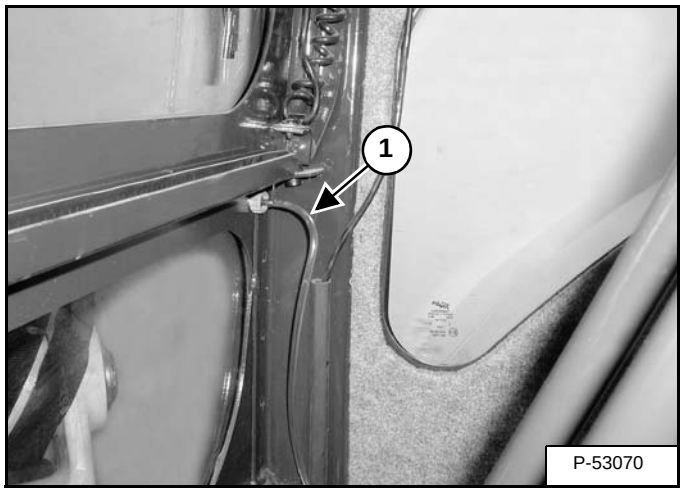


Remove the wire harness from the cab frame and disconnect the wire connectors (Item 1) **[Figure 50-30-8]**.

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Removal And Installation (Cont'd)

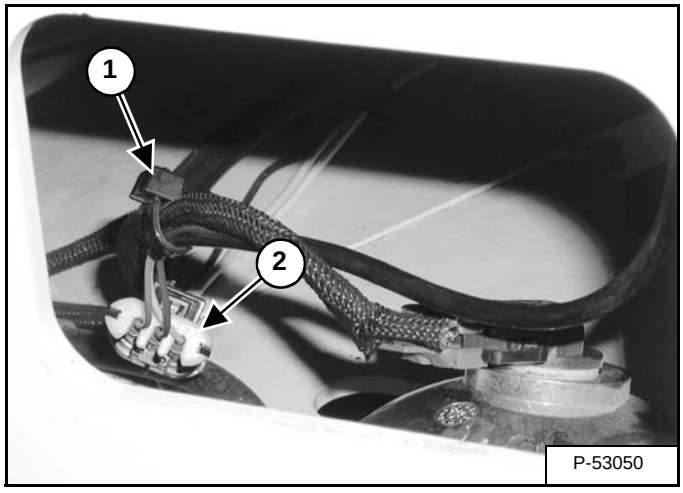
Figure 50-30-9



Remove the windshield washer hose (Item 1) **[Figure 50-30-9]** from the nozzle.

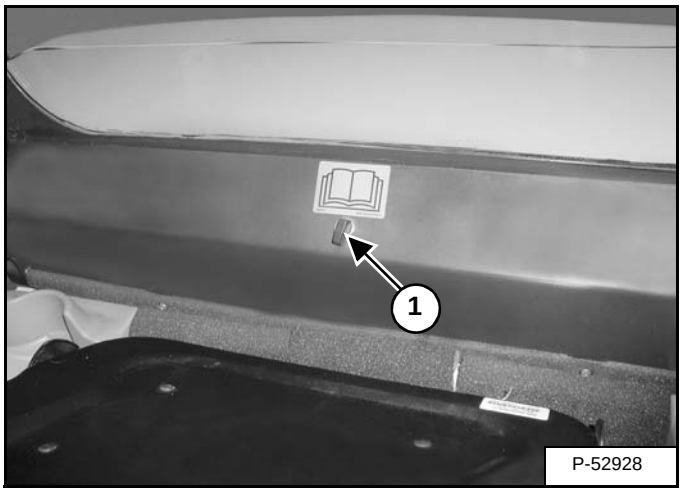
Remove the upperstructure light. (See Removal And Installation on Page 60-50-1)

Figure 50-30-10



Remove the tie strap (Item 1) and disconnect the wire harness (Item 2) **[Figure 50-30-10]**.

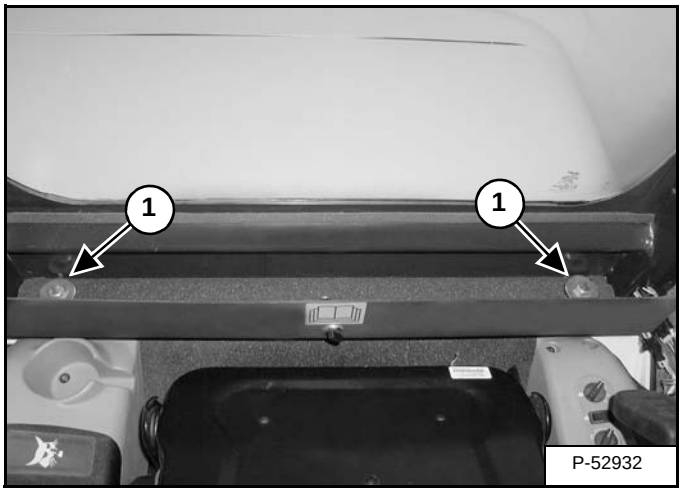
Figure 50-30-11



Open the Operation & Maintenance Manual storage door (Item 1) **[Figure 50-30-11]**.

NOTE: Later models are not equipped with the storage door.

Figure 50-30-12



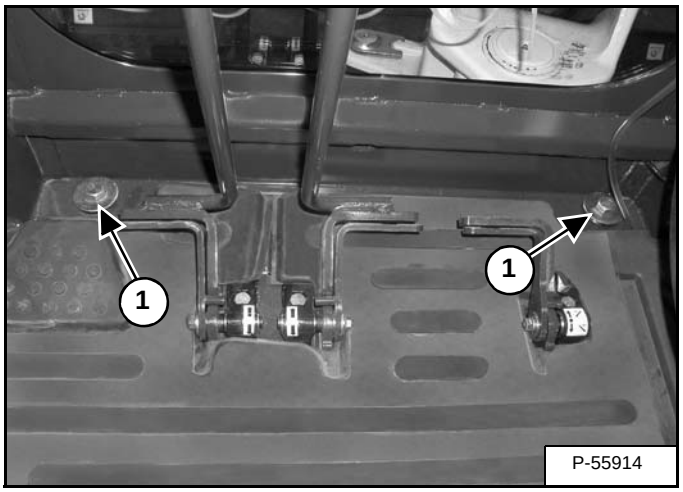
Remove the bolts and washers (Item 1) **[Figure 50-30-12]** from the rear of the cab.

Installation: Tighten the bolts to 111 to 129 ft.-lb. (150 to 175 N•m) torque.

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Removal And Installation (Cont'd)

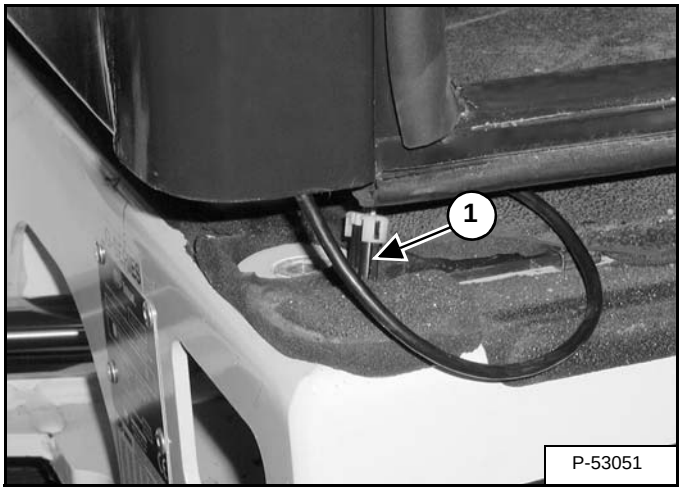
Figure 50-30-13



Remove the bolts and washers (Item 1) **[Figure 50-30-13]** from the front of the cab.

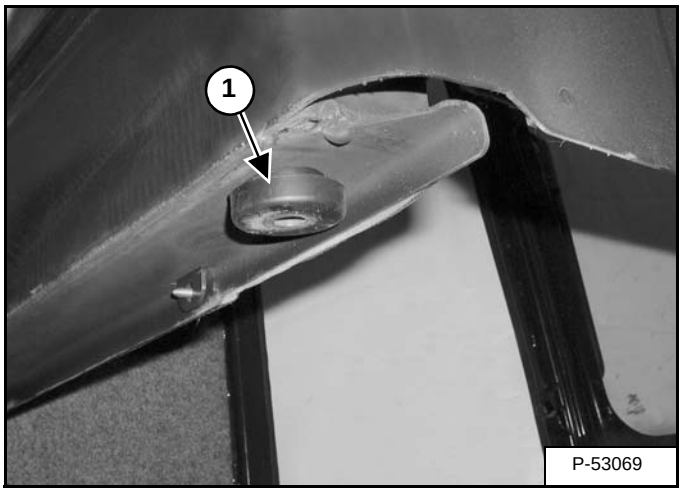
Installation: Tighten the bolts to 111 to 129 ft.-lb. (150 to 175 N•m) torque.

Figure 50-30-14



Guide the wiring harness (Item 1) **[Figure 50-30-14]** through the upperstructure as the cab is being removed.

Figure 50-30-15



Installation: Install the cab mounts (Item 1) **[Figure 50-30-15]** on the 4 corners of the cab.

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Door Removal And Installation

Figure 50-30-16



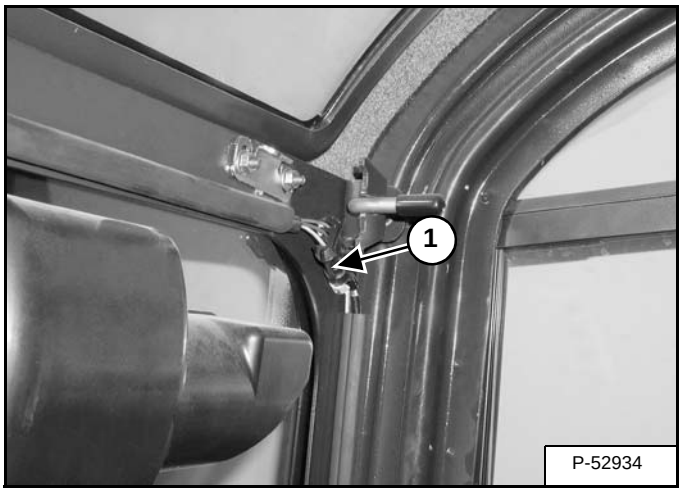
The door can be removed from the cab by slowly swinging the door back and forth while lifting up on the door **[Figure 50-30-16]**.

Installation: Align the hinges and swing the door back and forth until the door weight settles the hinges to full engagement.

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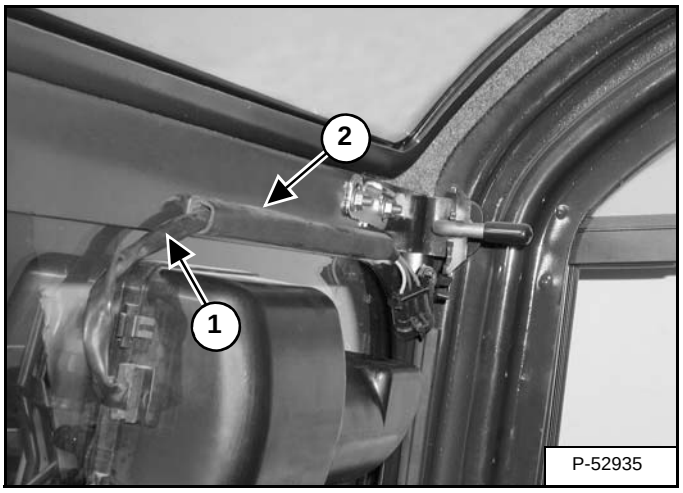
Front Window Removal And Installation

Figure 50-30-17



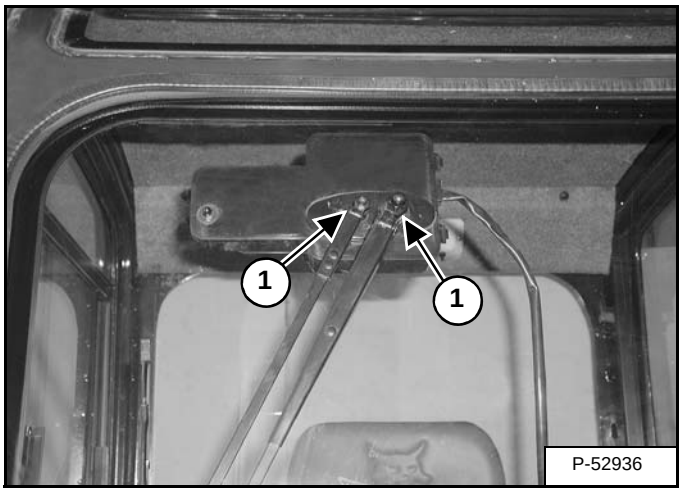
Disconnect the wire harness (Item 1) **[Figure 50-30-17]**.

Figure 50-30-18



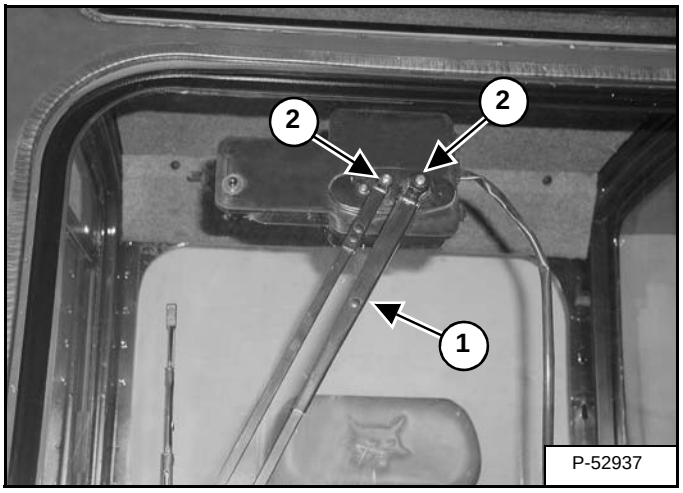
Remove the wire harness (Item 1) from the channel (Item 2) **[Figure 50-30-18]**.

Figure 50-30-19



Remove the nuts (Item 1) **[Figure 50-30-19]**.

Figure 50-30-20

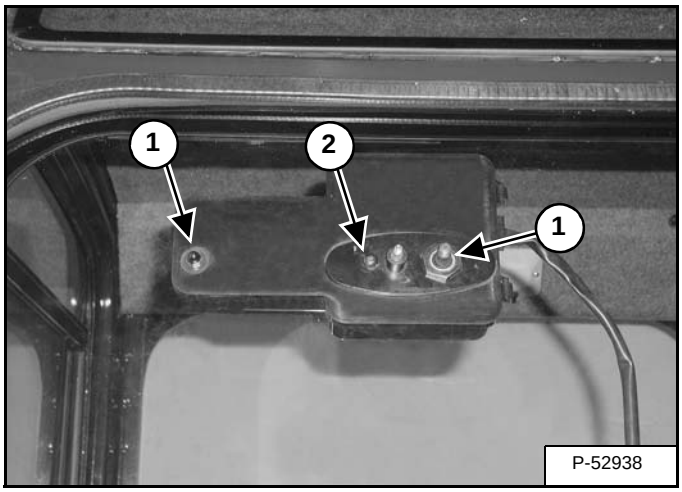


Remove the wiper assembly (Item 1) from the pivot mounts (Item 2) **[Figure 50-30-20]**.

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Front Window Removal And Installation (Cont'd)

Figure 50-30-21

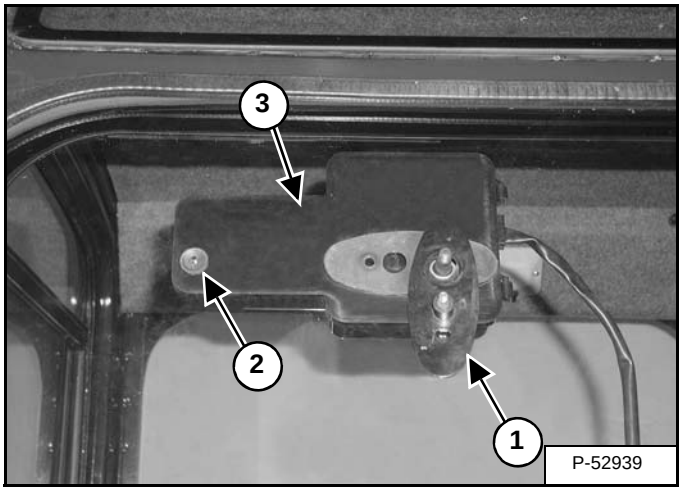


Remove the nuts and washers (Item 1) **[Figure 50-30-21]**.

Remove the bolt (Item 2) **[Figure 50-30-21]**.

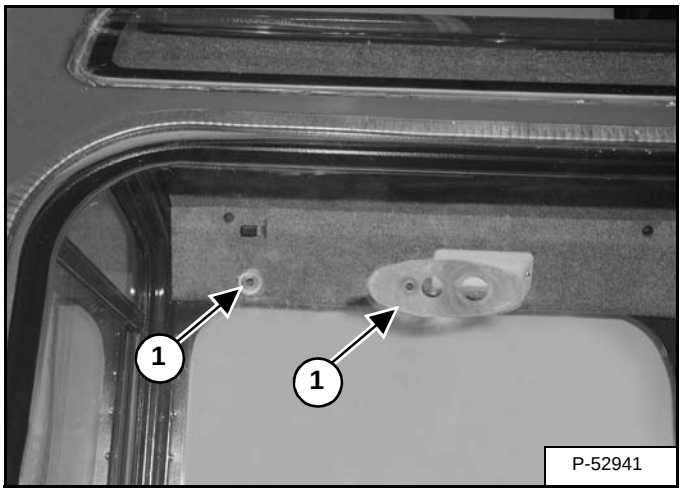
NOTE: Support the wiper motor before removing the mounting hardware.

Figure 50-30-22



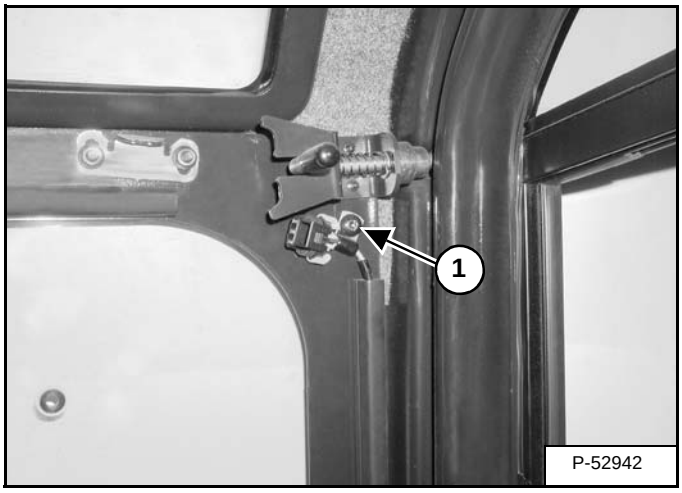
Remove the plate (Item 1), washer (Item 2), and wiper motor (Item 3) **[Figure 50-30-22]**.

Figure 50-30-23



Remove the seals (Item 1) **[Figure 50-30-23]**.

Figure 50-30-24

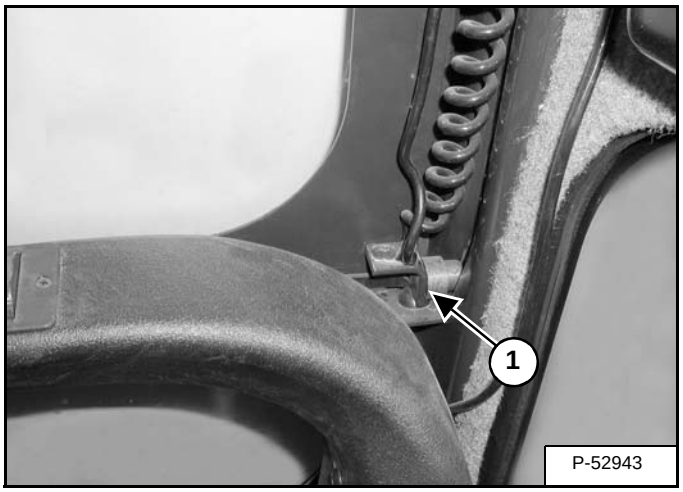


Remove the screw (Item 1) **[Figure 50-30-24]** holding the wire harness clamp to the top of the front window.

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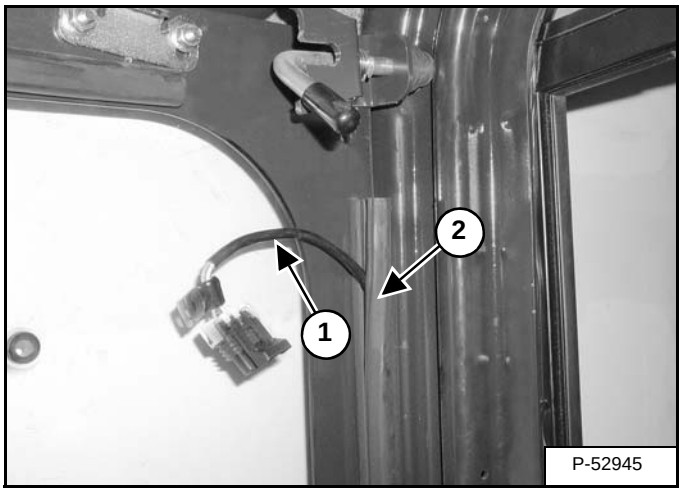
Front Window Removal And Installation (Cont'd)

Figure 50-30-25



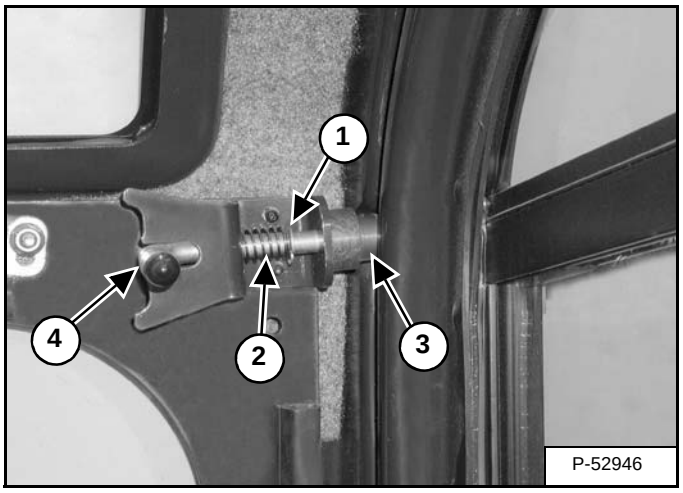
Remove the bolt (Item 1) **[Figure 50-30-25]** holding the wire harness clamp to the bottom of the front window.

Figure 50-30-26



Remove the wire harness (Item 1) from the channel (Item 2) **[Figure 50-30-26]**.

Figure 50-30-27



With the help of a second person holding the front window, remove the retainer (Item 1), spring (Item 2), roller (Item 3), and handle (Item 4) **[Figure 50-30-27]** from both sides of the front window.

Figure 50-30-28



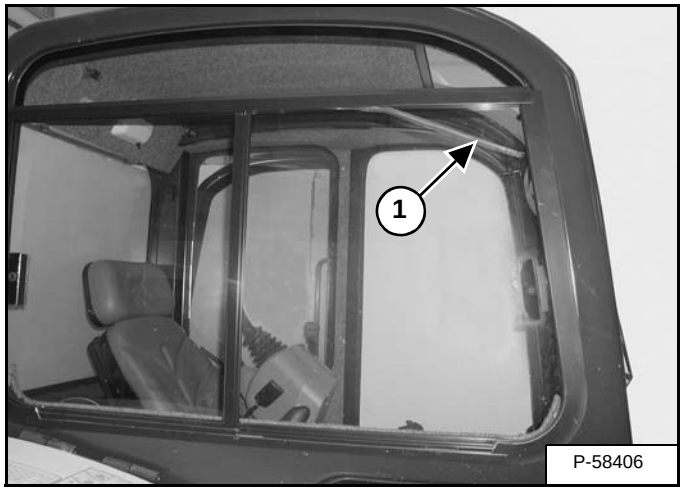
Tilt the front window (Item 1) **[Figure 50-30-28]**. Remove the front window from the cab frame.

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Right Side Rear Sliding Window Removal And Installation

Close and latch the front and rear sliding windows.

Figure 50-30-29



Use a pick to pull the felt (Item 1) **[Figure 50-30-29]** from the top window channel.

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

Figure 50-30-30



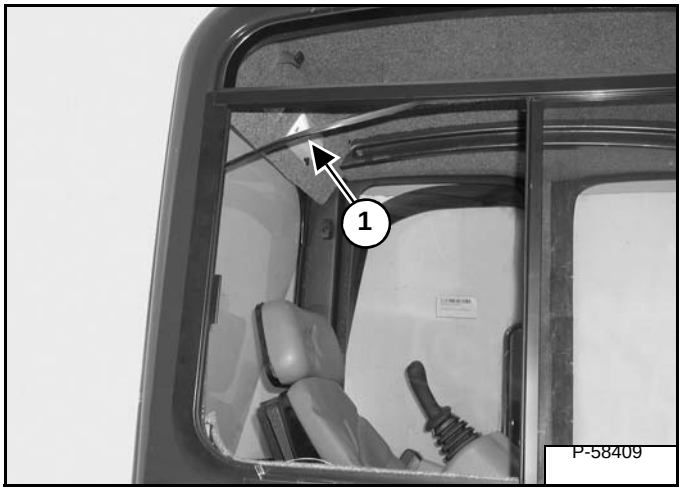
Lift the window up into the top channel and tilt the bottom edge out **[Figure 50-30-30]**. Remove the window from the excavator.

Right Side Front Sliding Window Removal And Installation

NOTE: The rear sliding window must be removed before the front sliding window can be removed.

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

Figure 50-30-31



Use a pick to pull the felt (Item 1) **[Figure 50-30-31]** from the inside top window channel.

Figure 50-30-32



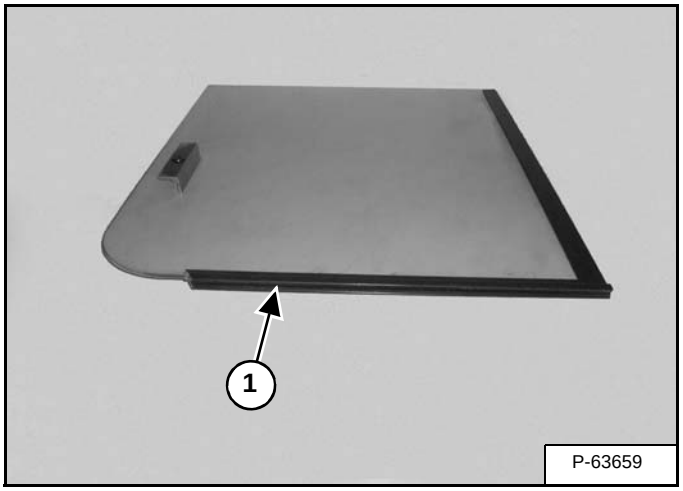
Lift the window up into the channel and tilt the bottom edge out **[Figure 50-30-32]**. Remove the window from the excavator.

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Right Side Front And Rear Sliding Window Weather Strip Removal And Installation

Remove the window.

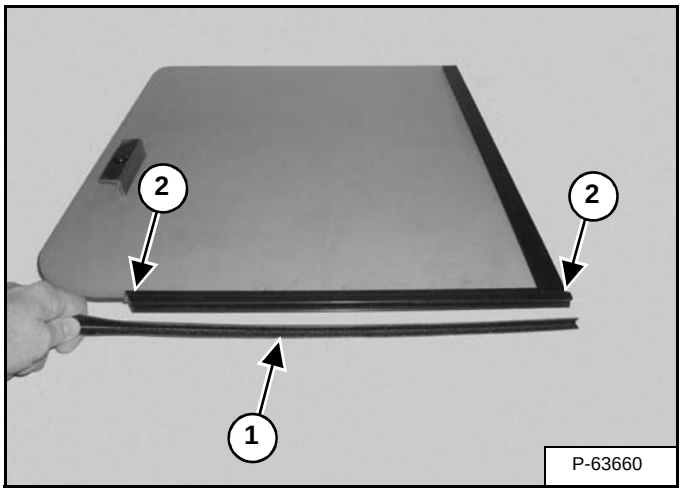
Figure 50-30-33



Remove the weather strip (Item 1) **[Figure 50-30-33]** from the bottom channel of the window.

Installation: Clean the bottom channel. Apply a bead of adhesive in the channel.

Figure 50-30-34

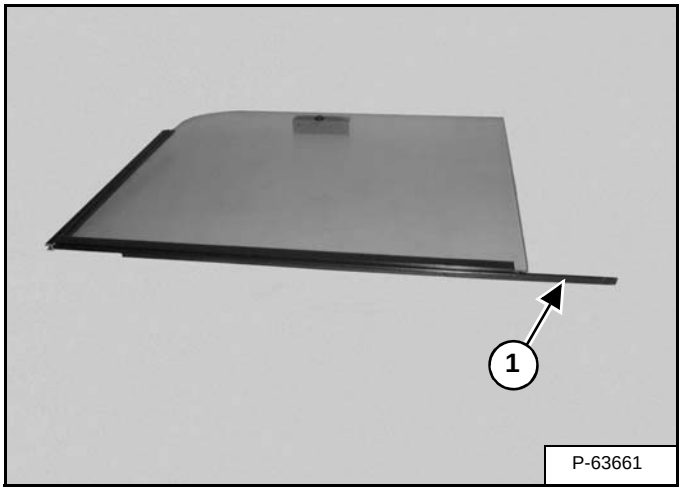


Install the new weather strip (Item 1). Cut the weather strip flush with the ends of the window channel (Item 2) **[Figure 50-30-34]**.

Right Side Front And Rear Sliding Window Wiper Strip Removal And Installation

Remove the window.

Figure 50-30-35



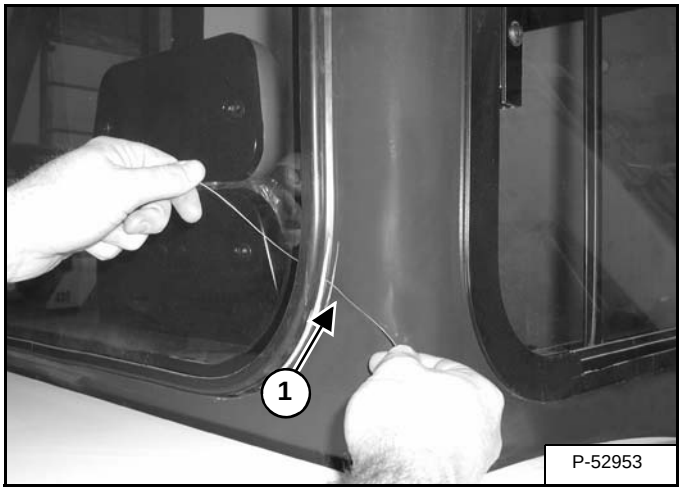
Remove the wiper strip (Item 1) **[Figure 50-30-35]** from the window channel.

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Glass Removal

Use the following procedure to remove the glass from the cab and right side window assembly.

Figure 50-30-36



Push a small diameter wire (Item 1) **[Figure 50-30-36]** through the adhesive. Pull the wire around the perimeter of the glass to cut the adhesive.

Remove the glass.

NOTE: The right side window frame is aluminum and will be destroyed when removed.

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Glass Installation

Rear and front lower glass

Remove the majority of the old urethane adhesive from the perimeter of the cab.

NOTE: Leave a thin film of the old urethane on the cab frame, fresh urethane will bond to the remaining film.

Prime and paint any bare metal or scratches.

Clean the metal surfaces with general purposes adhesive cleaner. Clean the glass surface with glass cleaner.

Figure 50-30-37

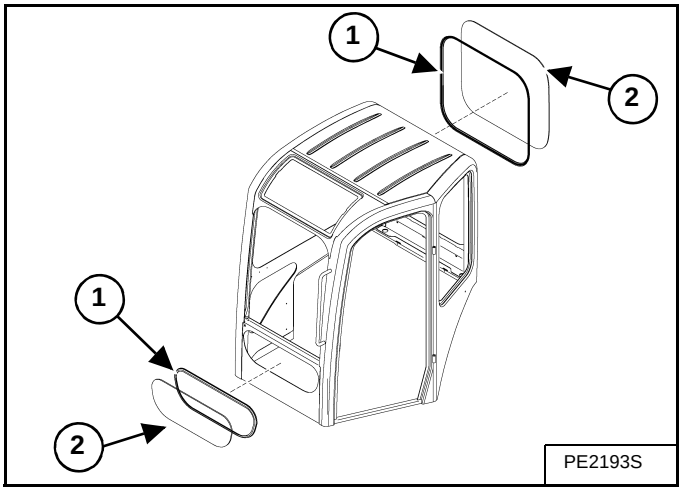
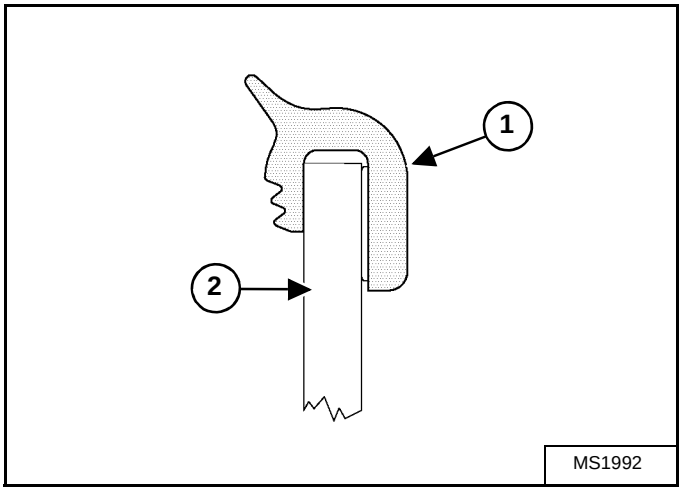


Figure 50-30-38



Install the seal (Item 1) on the glass (Item 2) **[Figure 50-30-37]** & **[Figure 50-30-38]**.

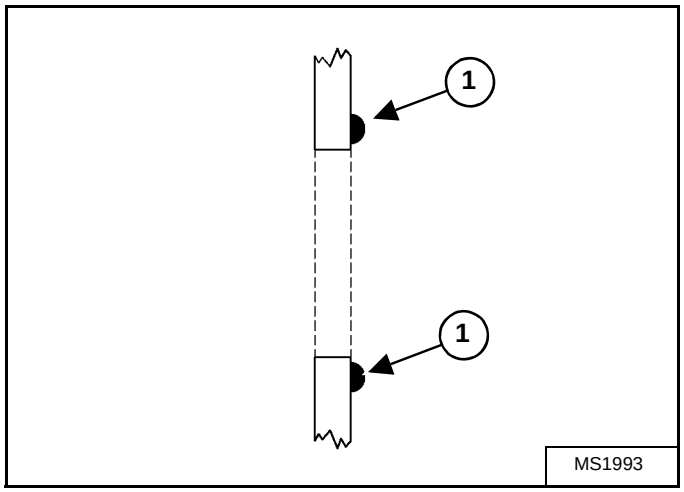
Shake the combo primer for 1 minute.

Apply the combo primer to the perimeter of the cab and glass (Item 2) **[Figure 50-30-38]**. Apply the primer in 1 direction only, using a dauber. Do not dip the dauber in the primer more than once. Use multiple daubers if needed.

Allow the combo primer to dry for 5 minutes. Dry time doubles if the primer is applied in 2 coats.

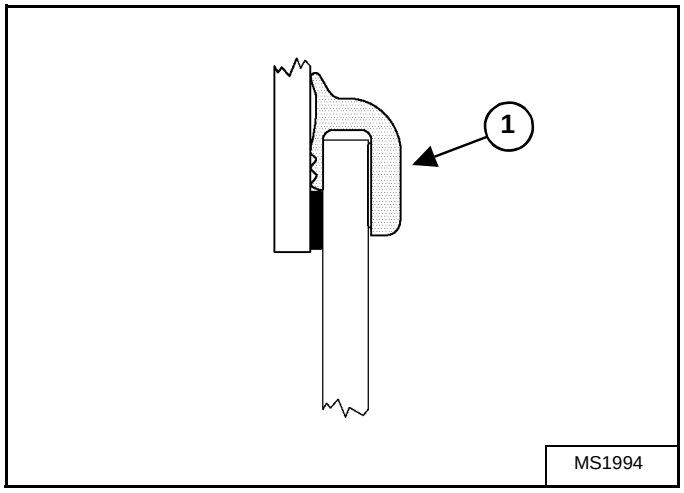
Cut the tip of the adhesive tube to the desired shape and size to provide a bead height sufficient to give good contact with the glass around the entire perimeter.

Figure 50-30-39



Apply a 0.3 x 0.25 in. (7,62 x 6,35 mm) bead of urethane adhesive (Item 1) **[Figure 50-30-39]** to the perimeter of the cab.

Figure 50-30-40



Install the glass and seal assembly (Item 1) **[Figure 50-30-40]**. Press the glass into the cab to make complete contact with the adhesive. Tape the glass in place.

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Glass Installation (Cont'd)

Allow 2 hours for curing at normal conditions (65° F (18° C), 75% relative humidity).

Remove the tape after the adhesive is cured.

Top, right side and left side glass

Remove the majority of the old urethane adhesive from the perimeter of the cab.

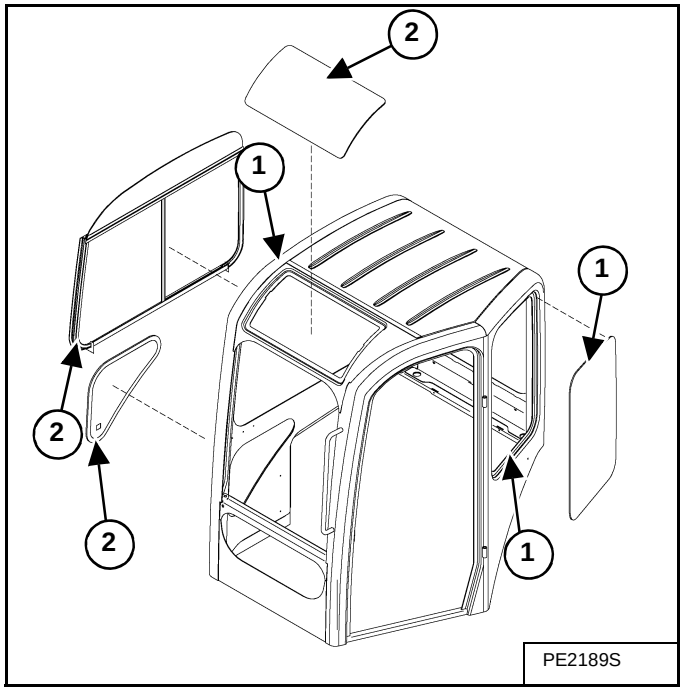
NOTE: Leave a thin film of the old urethane on the cab frame, fresh urethane will bond to the remaining film.

Prime and paint any bare metal or scratches.

Clean the metal surfaces with general purposes adhesive cleaner. Clean the glass surface with glass cleaner.

Shake the combo primer for 1 minute.

Figure 50-30-41

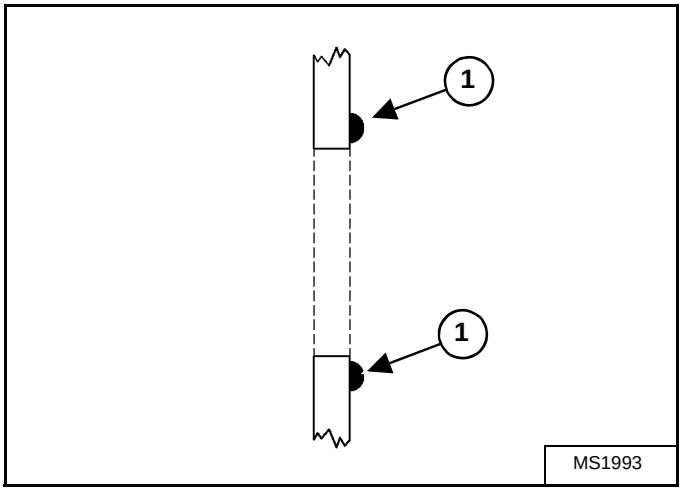


Apply combo primer to the perimeter of the cab (Item 1) and glass (Item 2) **[Figure 50-30-41]**. Apply the primer in 1 direction only, using a dauber. Do not dip the dauber in the primer more than once. Use multiple daubers if needed.

Allow the combo primer to dry for 5 minutes. Dry time doubles if the primer is applied in 2 coats.

Cut the tip of the adhesive tube to the desired shape and size to provide a bead height sufficient to give good contact with the glass around the entire perimeter.

Figure 50-30-42

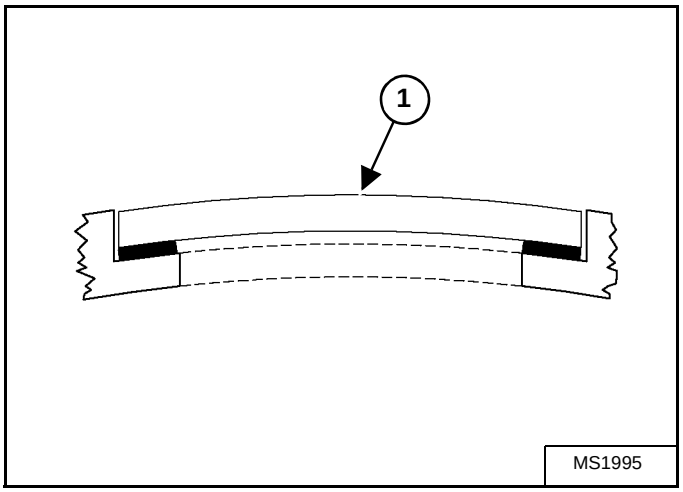


Apply a 0.3 x 0.25 in. (7,62 x 6,35 mm) bead of urethane adhesive (Item 1) **[Figure 50-30-42]** to the perimeter of the cab.

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Glass Installation (Cont'd)

Figure 50-30-43



Install the glass (Item 1) **[Figure 50-30-43]**. Press the glass into the cab to make complete contact with the adhesive. Tape the glass in place.

Allow 2 hours for curing at normal conditions (65° F (18° C), 75% relative humidity).

Remove the tape after the adhesive is cured.

Door and front window glass

The door and front window glass are not available separately.

Order and install the door or front window frame and glass assembly.

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SEAT AND SEAT MOUNT

Removal And Installation

Figure 50-40-1

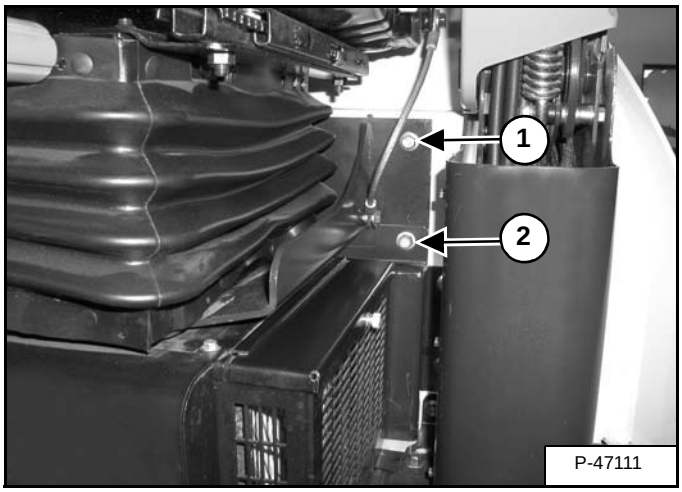
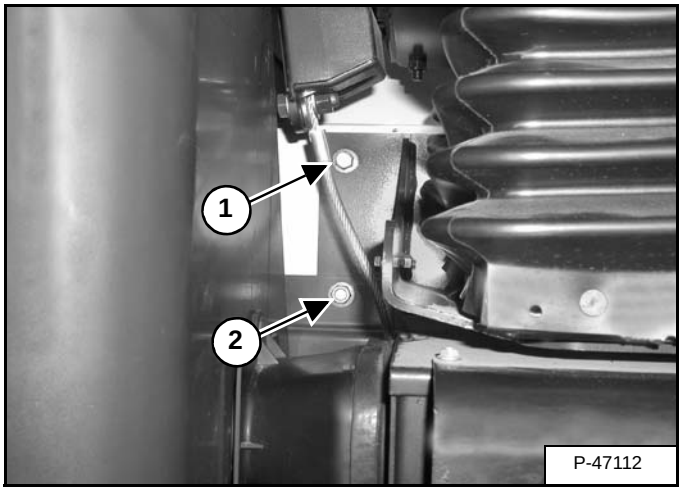


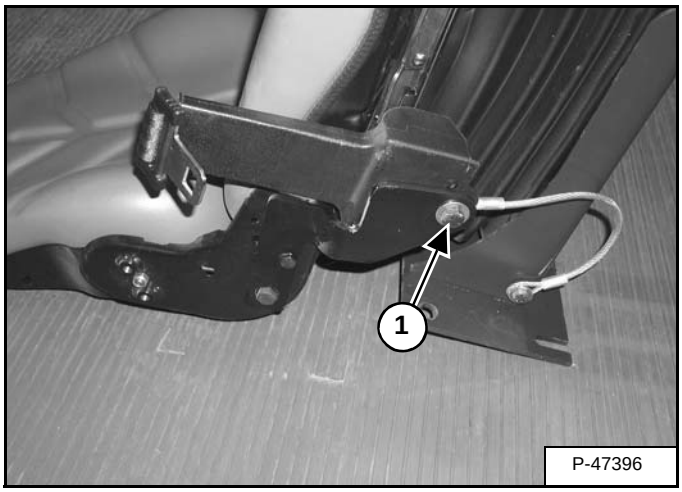
Figure 50-40-2



Remove the top two bolts (Item 1) **[Figure 50-40-1] [Figure 50-40-2]**.

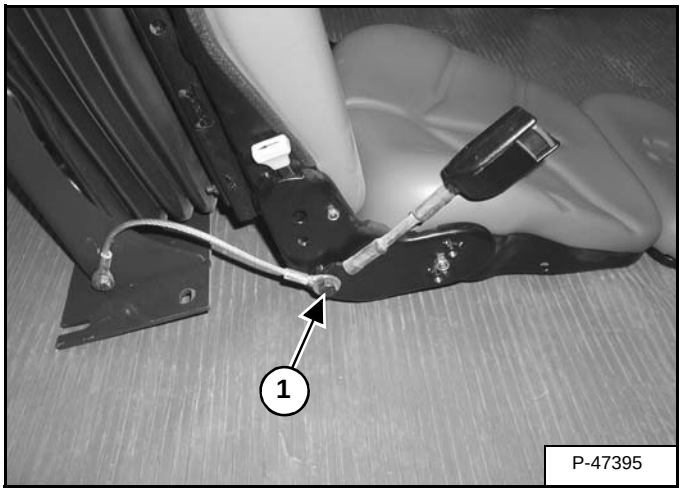
Loosen the bottom two bolts (Item 2) **[Figure 50-40-1] [Figure 50-40-2]** and remove the seat and seat mount.

Figure 50-40-3



Remove the seat belt mounting bolt (Item 1) **[Figure 50-40-3]** and remove the seat belt.

Figure 50-40-4

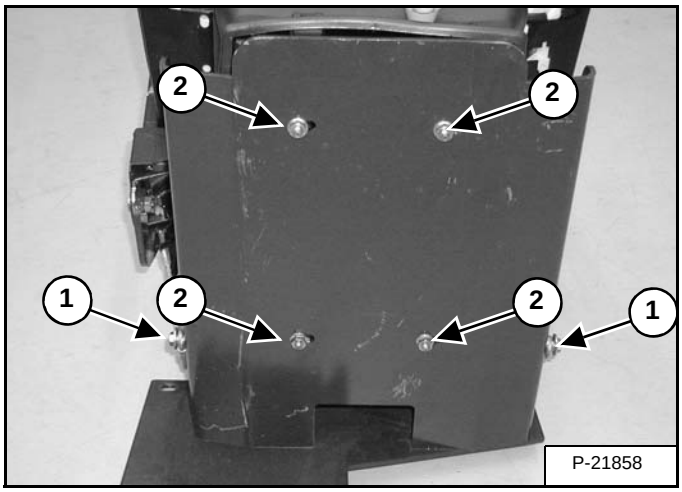


Remove the seat belt mounting bolt (Item 1) **[Figure 50-40-4]** and remove the seat belt.

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Removal And Installation (Cont'd)

Figure 50-40-5



Remove the two bolts (Item 1) **[Figure 50-40-5]** from the seat cables.

Remove the four seat mount bolts (Item 2) **[Figure 50-40-5]**.

Remove the seat mount from the seat.

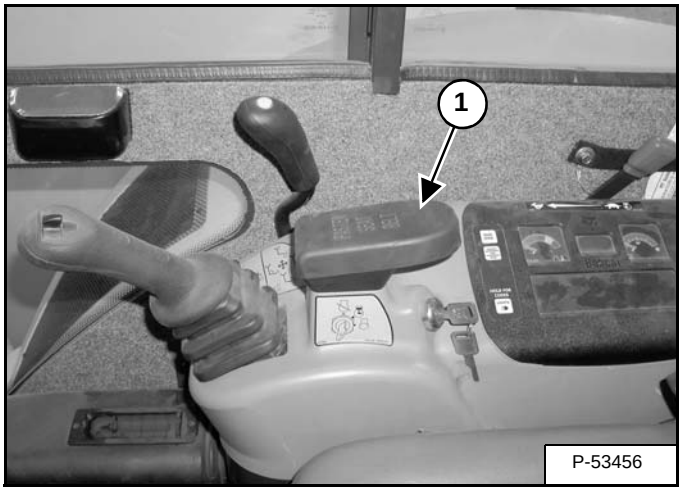
https://www.pdfmanual4trucks.com/

RIGHT CONSOLE

Console Cover Removal And Installation

Remove the floormat. (See Removal And Installation on Page 50-120-1)

Figure 50-50-1



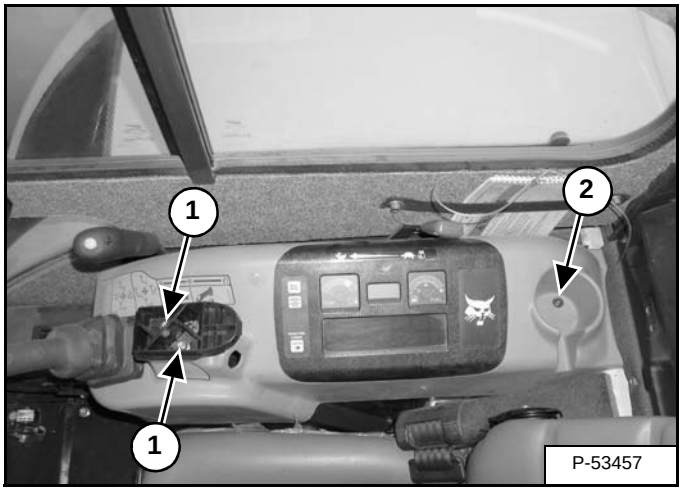
Remove the cover (Item 1) **[Figure 50-50-1]** from the arm rest.

Lift up on the rear of the cover and slide the cover ahead to remove it.

Remove the key and nut from the key switch (Item 2) **[Figure 50-50-1]** (if equipped). Allow the switch to drop inside the console.

NOTE: The key switch must be removed to remove and install the console cover. It interferes with the arm rest bracket.

Figure 50-50-2



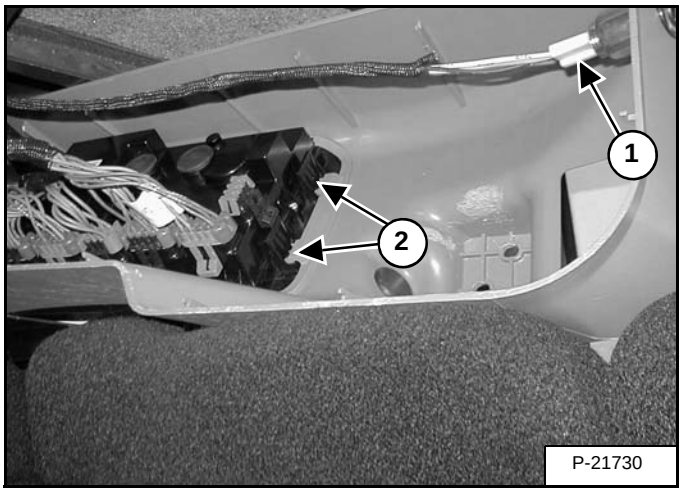
Remove the two mount bolts (Item 1) **[Figure 50-50-2]** from the arm rest.

Remove the arm rest.

Remove the screw (Item 2) **[Figure 50-50-2]** from the cup holder.

Lift the console cover up and over the joystick lever.

Figure 50-50-3

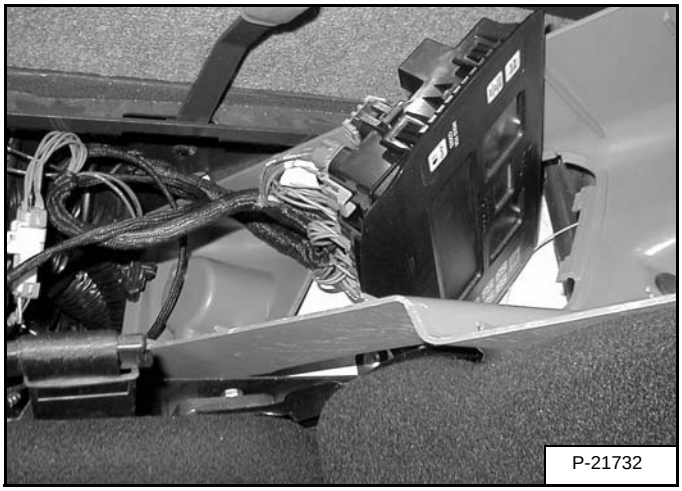


Disconnect the accessory outlet electrical connector (Item 1) **[Figure 50-50-3]**.

Remove the controller from the console cover by pressing the mounting tabs (Item 2) **[Figure 50-50-3]**.

It is NOT necessary to disconnect the instrument panel wires.

Figure 50-50-4



Turn the controller to allow it to pass through the console cover **[Figure 50-50-4]**.

Remove the console cover.

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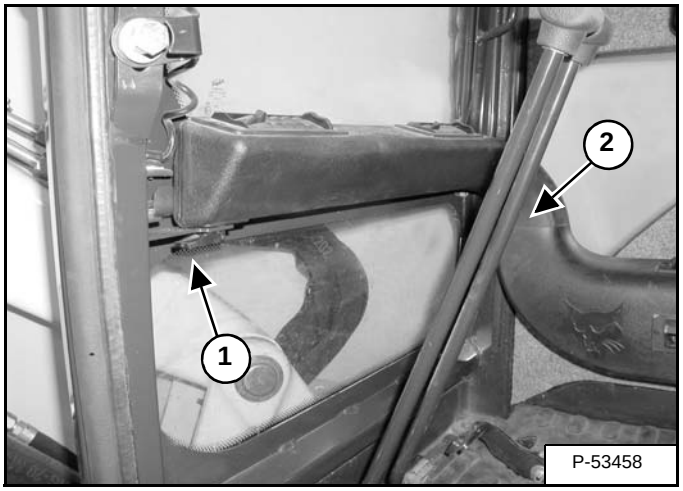
Console Base Removal And Installation

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

The excavator will be equipped with either the A/C duct or heater duct.

A/C Duct

Figure 50-50-5



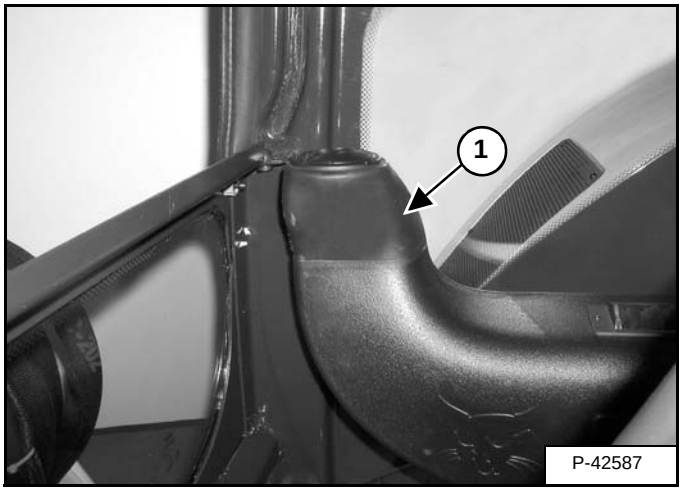
Rotate the lock (Item 1) **[Figure 50-50-5]** down.

Remove the screw (Item 2) **[Figure 50-50-5]**.

Remove the air conditioning duct (Item 2) **[Figure 50-50-5]**.

Heater Duct

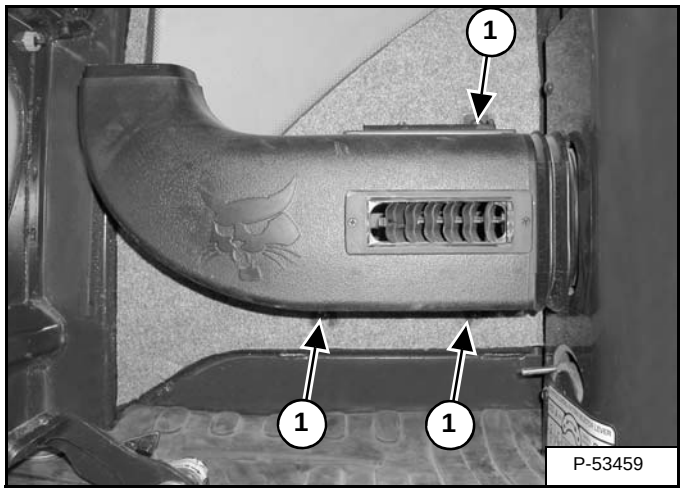
Figure 50-50-6



Remove the screw and pull straight up to remove the duct (Item 1) **[Figure 50-50-6]**.

Remove the screw (Item 3) **[Figure 50-50-6]**.

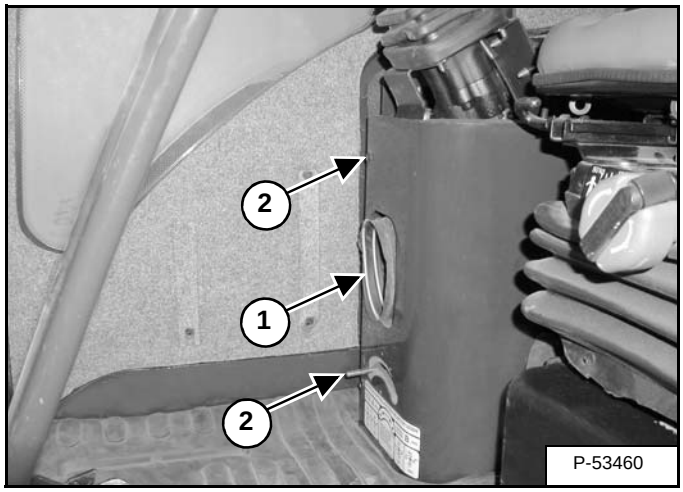
Figure 50-50-7



Remove the three screws (Item 1) **[Figure 50-50-7]**.

Remove the duct (Item 2) **[Figure 50-50-7]**.

Figure 50-50-8



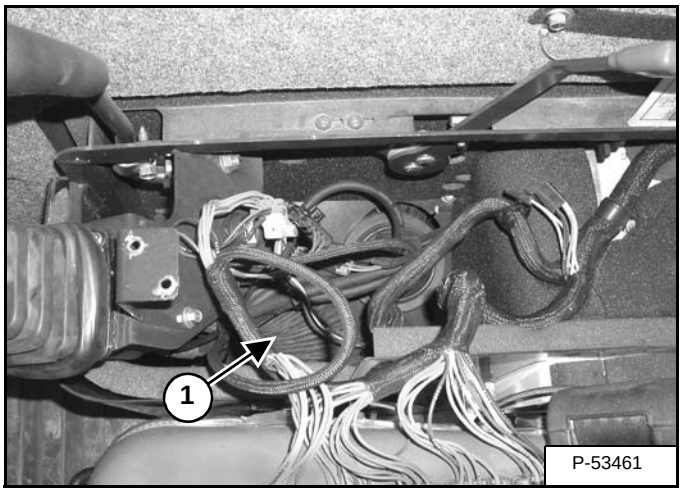
Push the hose (Item 1) **[Figure 50-50-8]** inside the console base.

Remove the bolts (Item 2) **[Figure 50-50-8]**.

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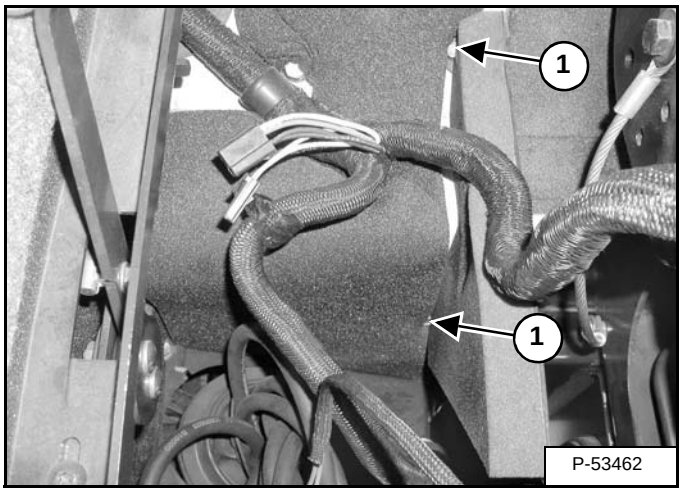
Console Base Removal And Installation (Cont'd)

Figure 50-50-9



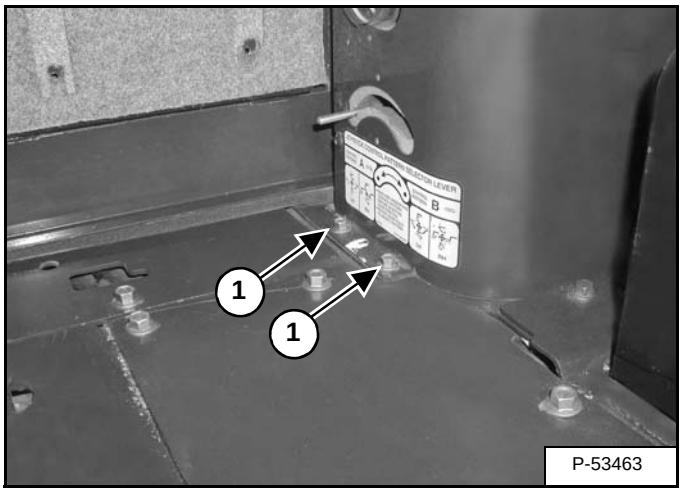
Remove the hose (Item 1) **[Figure 50-50-9]**.

Figure 50-50-10



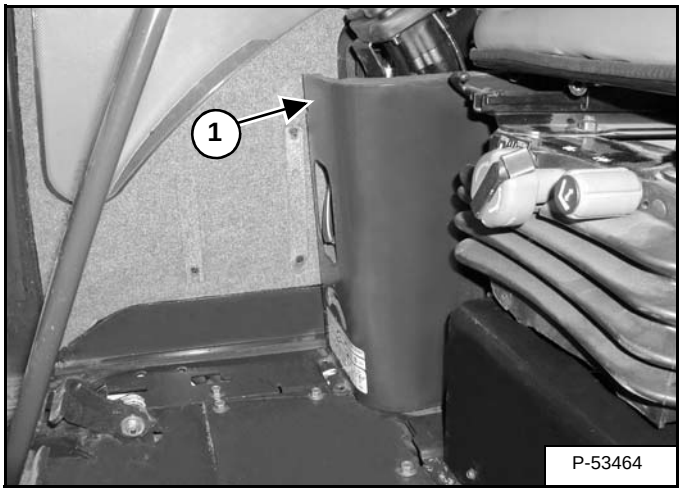
Remove the bolts (Item 1) **[Figure 50-50-10]**.

Figure 50-50-11



Remove the two lower mounting bolts (Item 1) **[Figure 50-50-11]**.

Figure 50-50-12



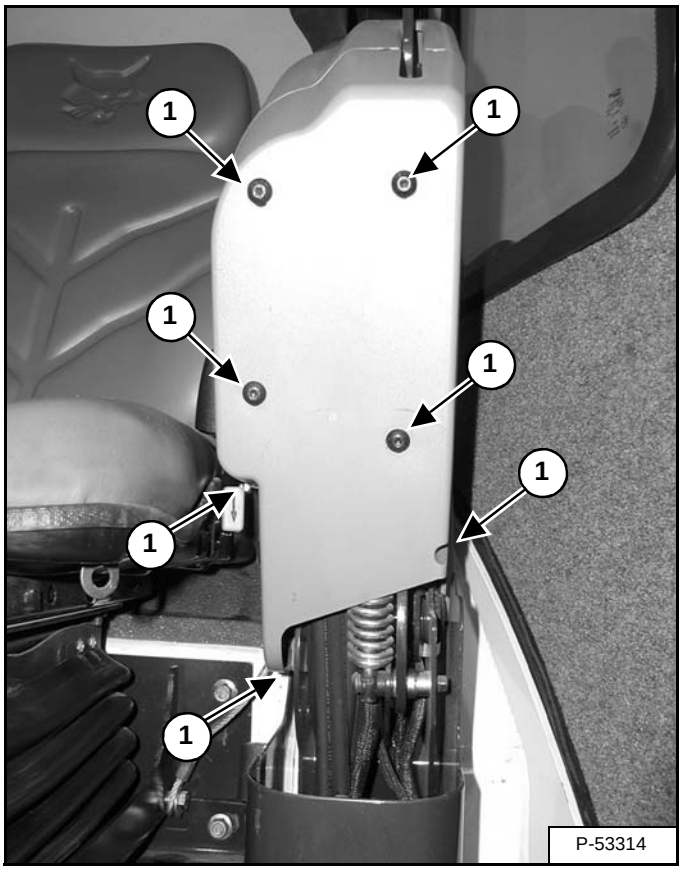
Slide the console base (Item 1) **[Figure 50-50-12]** forward and remove the base from the excavator.

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LEFT CONSOLE

Lower Console Cover Removal And Installation

Figure 50-60-1

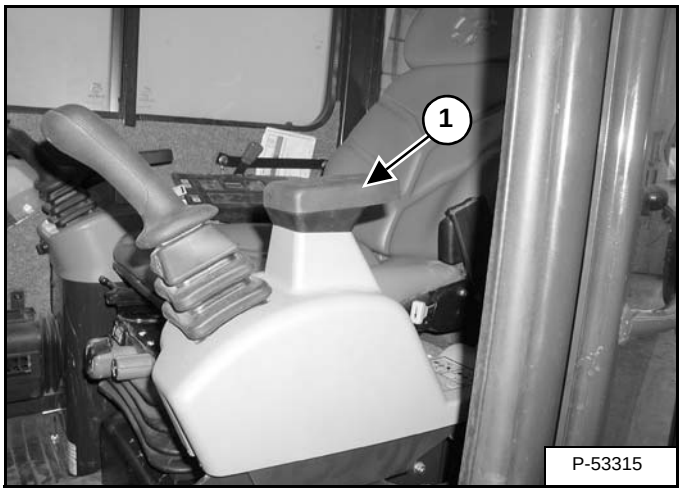


Remove the seven screws (Item 1) **[Figure 50-60-1]** from the lower half of the console cover.

Remove the lower half of the console cover.

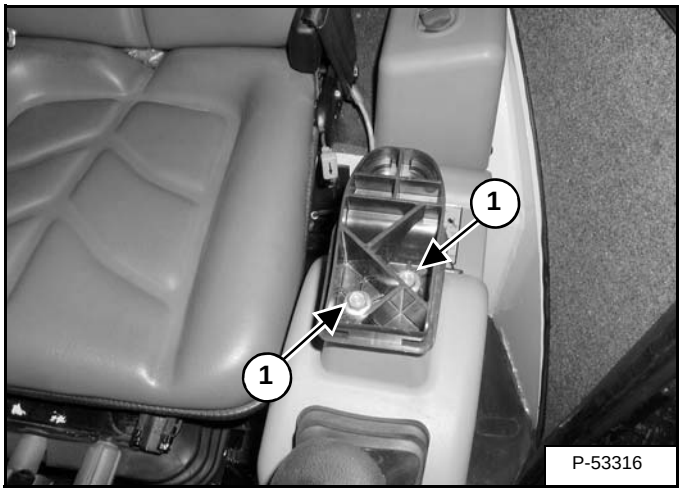
Lower the console.

Figure 50-60-2



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

Figure 50-60-3



Remove the bolts (Item 1) **[Figure 50-60-3]** from the arm rest.

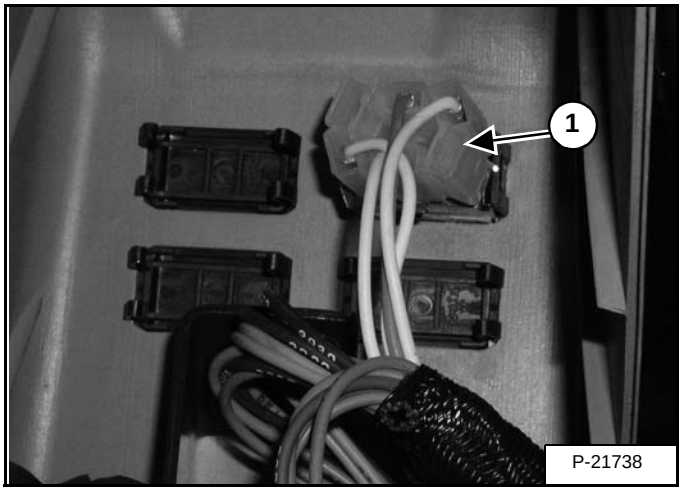
Remove the arm rest.

Raise the upper half of the console cover.

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Lower Console Cover Removal And Installation (Cont'd)

Figure 50-60-4



Disconnect the electrical connector (Item 1) **[Figure 50-60-4]**.

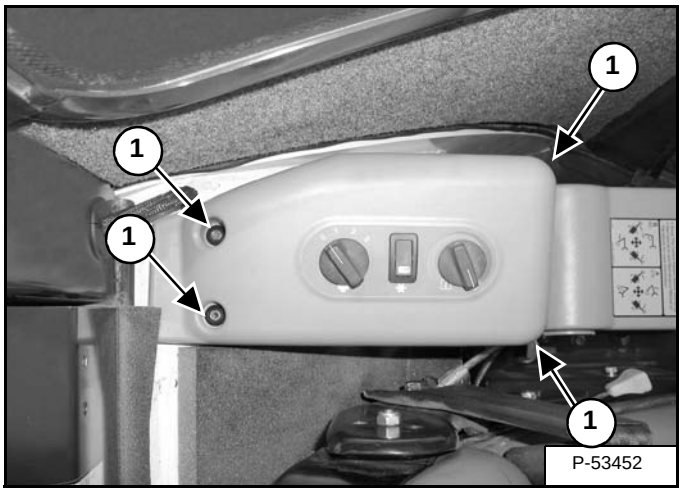
NOTE: These connectors are keyed so they can be plugged in only one way.

Remove the console cover.

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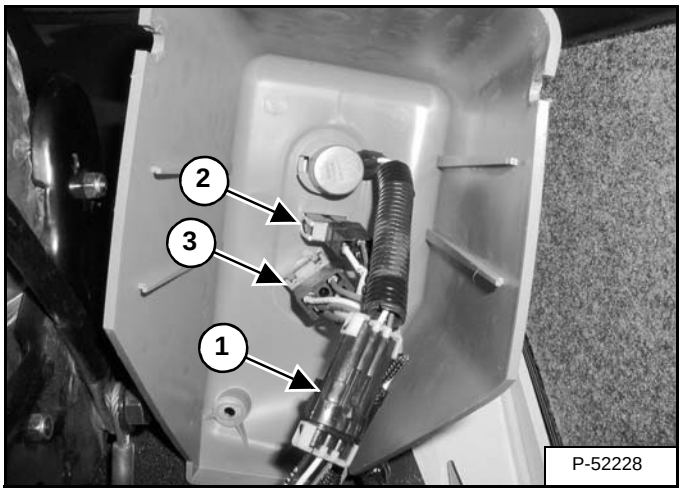
Upper Console Cover Removal And Installation

Figure 50-60-5



Remove the four console cover screws (Item 1) **[Figure 50-60-5]**.

Figure 50-60-6



Lift the console cover and disconnect the harness (Item 1) **[Figure 50-60-6]** from the potentiometer harness. (If equipped with Heater/AC.)

Disconnect the harness (Item 2) **[Figure 50-60-6]** from the A/C switch. (If equipped with Heater/AC.)

Disconnect the harness (Item 3) **[Figure 50-60-6]** from the blower switch. (If equipped with Heater/AC.)

Remove the console from the excavator.

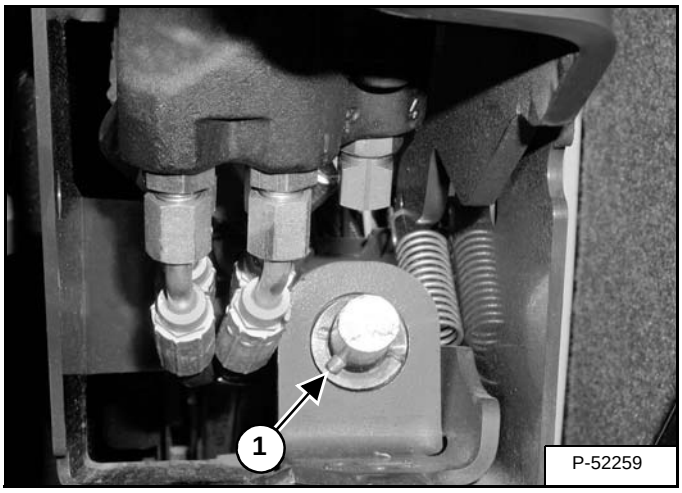
https://www.pdfmanual4trucks.com/

Compression Spring Removal And Installation

Remove the lower console cover. (See Lower Console Cover Removal And Installation on Page 50-60-1)

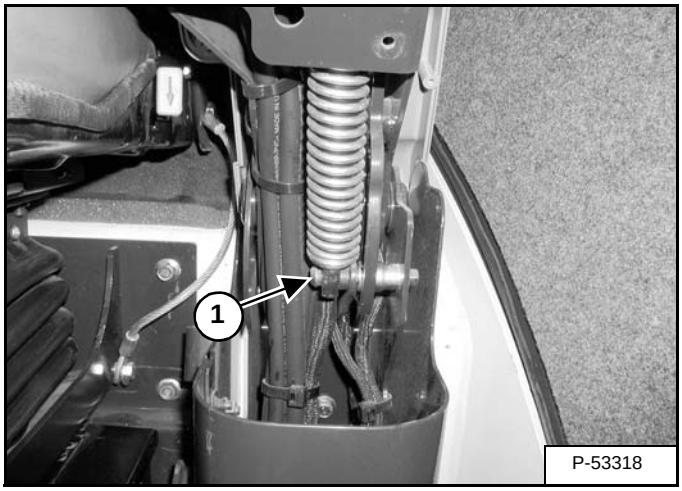
Lower the console.

Figure 50-60-7



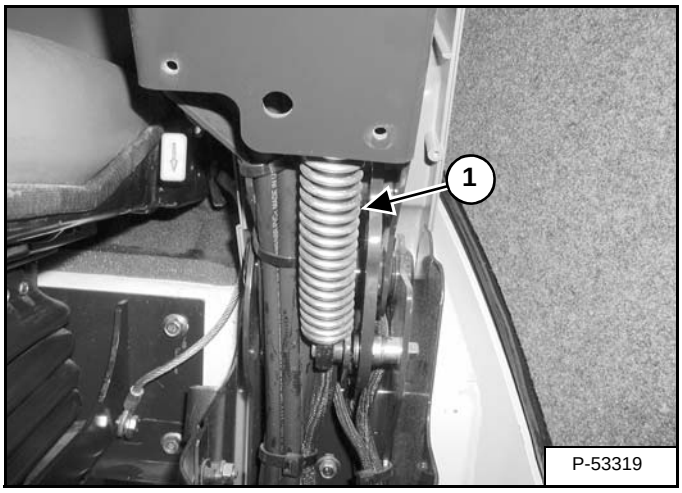
Install a pin (Item 1) **[Figure 50-60-7]** in the top of the compression spring rod.

Figure 50-60-8



Support the console in the raised position. Remove the bolt (Item 1) **[Figure 50-60-8]**.

Figure 50-60-9

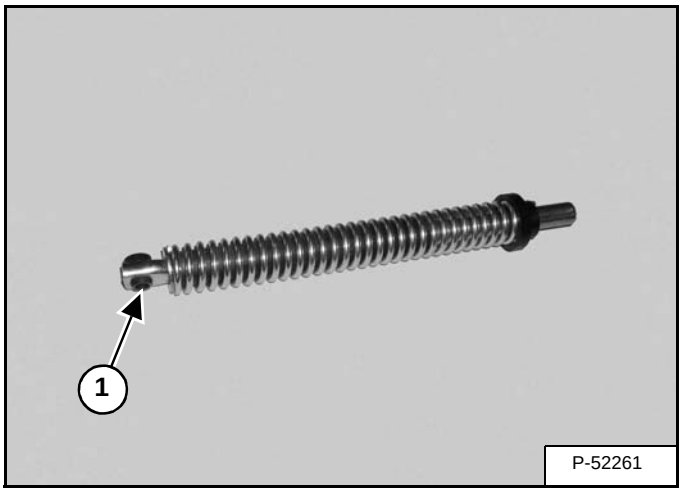


Remove the spring assembly (Item 1) **[Figure 50-60-9]** from the console.

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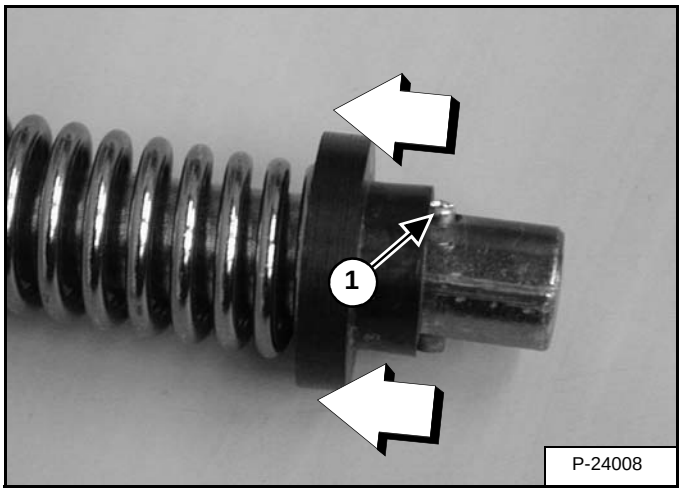
Compression Spring Disassembly And Assembly

Figure 50-60-10



Remove the bushing (Item 1) **[Figure 50-60-10]**.

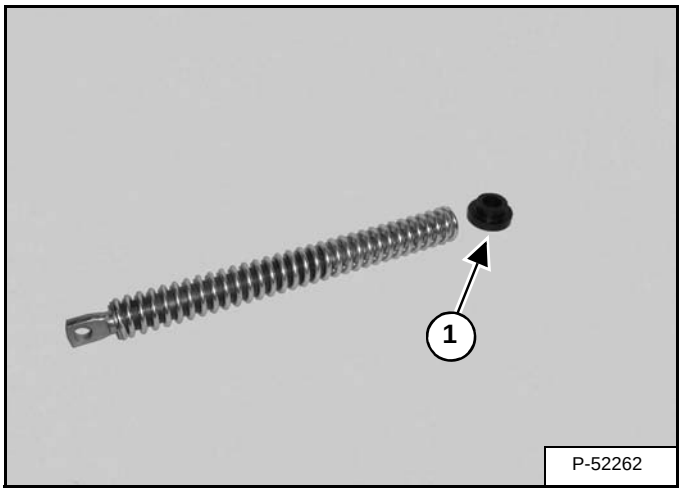
Figure 50-60-11



Apply pressure against the spring, and remove the pin (Item 1) **[Figure 50-60-11]** from the shaft.

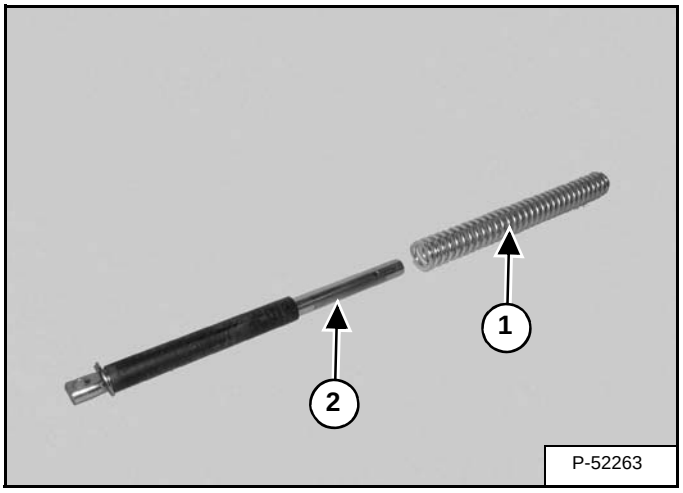
Release the pressure from the spring.

Figure 40-60-12



Remove the bushing (Item 1) **[Figure 40-60-12]**.

Figure 50-60-13

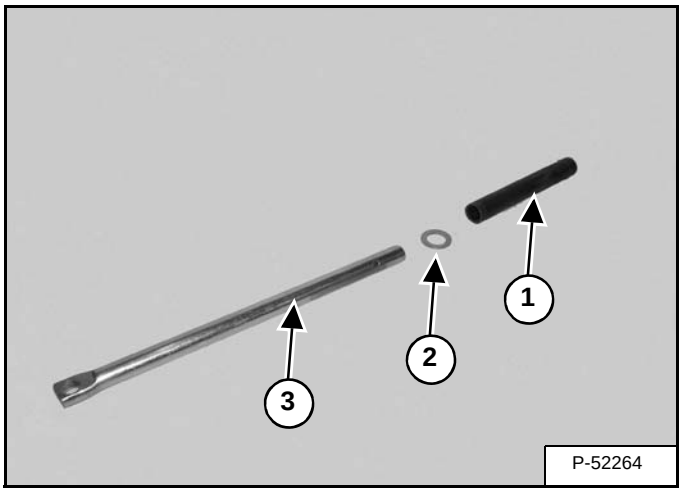


Remove the spring (Item 1) from the shaft (Item 2) **[Figure 50-60-13]**.

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Compression Spring Disassembly And Assembly (Cont'd)

Figure 50-60-14



Remove the sleeve (Item 1) and washer (Item 2) from the shaft (Item 3) **[Figure 50-60-14]**.

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Lock Lever Removal And Installation

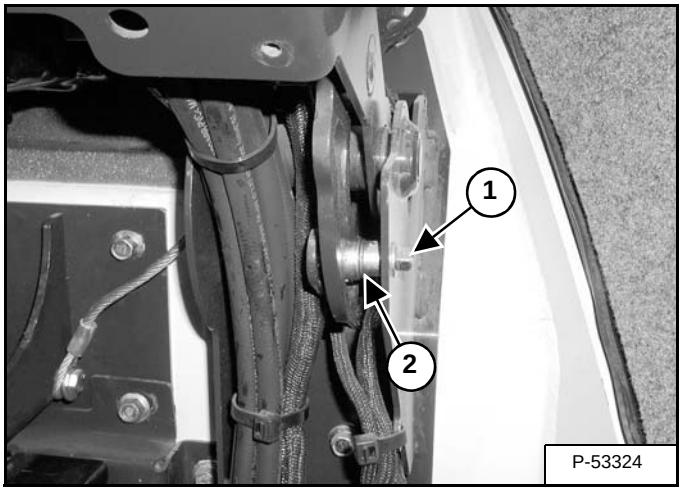
Remove the upper console cover.

Remove the lower console cover.

Remove the console base.

Remove the compression spring assembly from the console.

Figure 50-60-15

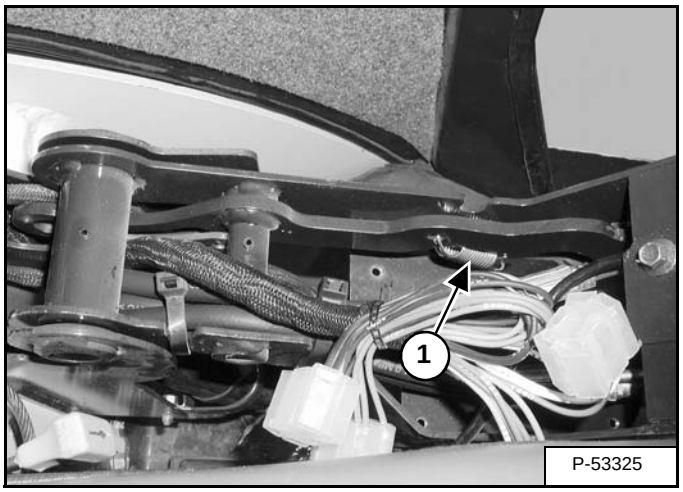


Remove the bolt (Item 1) from the lock lever roller bearing assembly (Item 2) **[Figure 50-60-15]**.

Remove the roller bearing assembly.

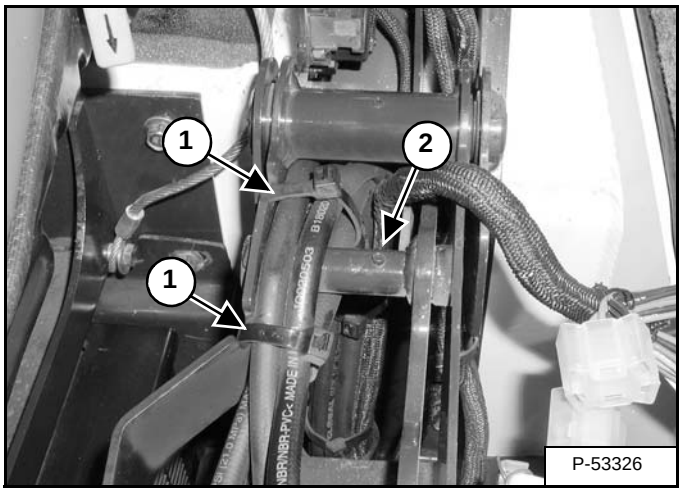
Lower the console.

Figure 50-60-16



Remove the lock lever spring (Item 1) **[Figure 50-60-16]**.

Figure 50-60-17

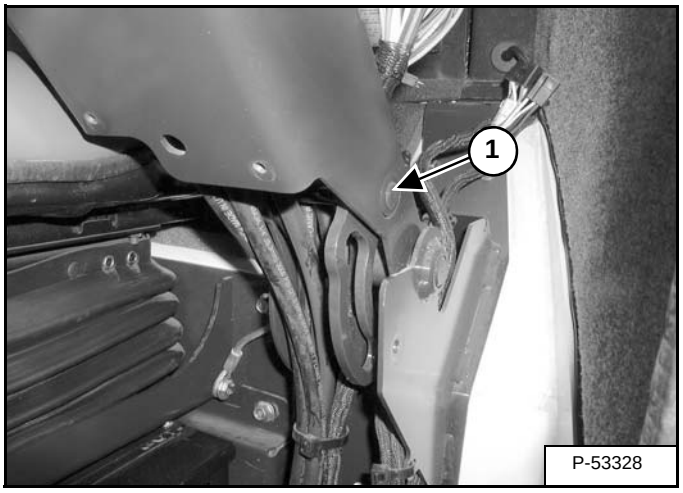


Remove the tie straps (Item 1) **[Figure 50-60-17]**.

Remove the roll pin (Item 2) **[Figure 50-60-17]** from the lock lever pivot pin.

Raise and support the console.

Figure 50-60-18



Remove the lock lever pivot pin (Item 1) **[Figure 50-60-18]** from the lever assembly.

Remove the lock lever.

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Console Removal And Installation

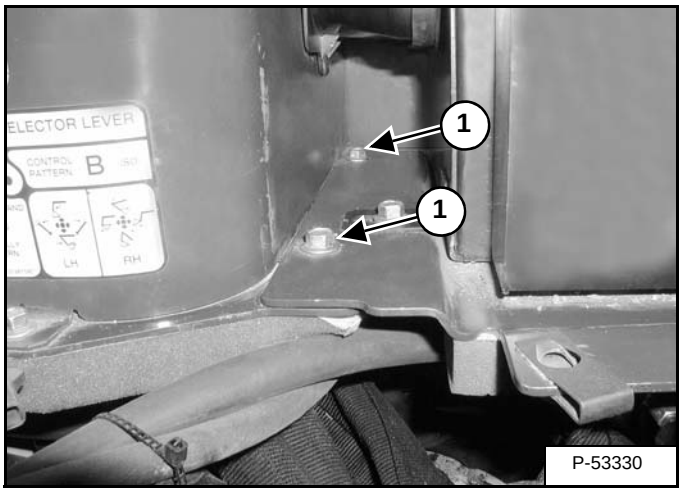
Remove the seat and seat mount. (See Removal And Installation on Page 50-40-1)

Remove the floormat and floor plate. (See Removal And Installation on Page 50-120-1)

Remove the upper console cover. (See Upper Console Cover Removal And Installation on Page 50-60-3)

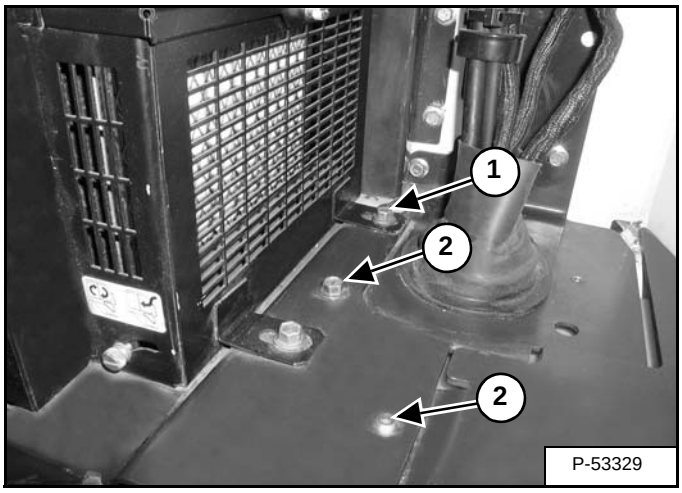
Remove the lower console cover. (See Lower Console Cover Removal And Installation on Page 50-60-1)

Figure 50-60-19



Remove the bolts (Item 1) **[Figure 50-60-19]** from the right side of the floor plate.

Figure 50-60-20



Remove the bolt (Item 1) **[Figure 50-60-20]** from the left side of the evaporator/heater unit.

Remove the bolts (Item 2) **[Figure 50-60-20]** from the rear floor plate.

Figure 50-60-21



Relocate the evaporator/heater unit as shown **[Figure 50-60-21]**.

Remove the console base. (See Console Base Removal And Installation on Page 50-60-16)

IMPORTANT

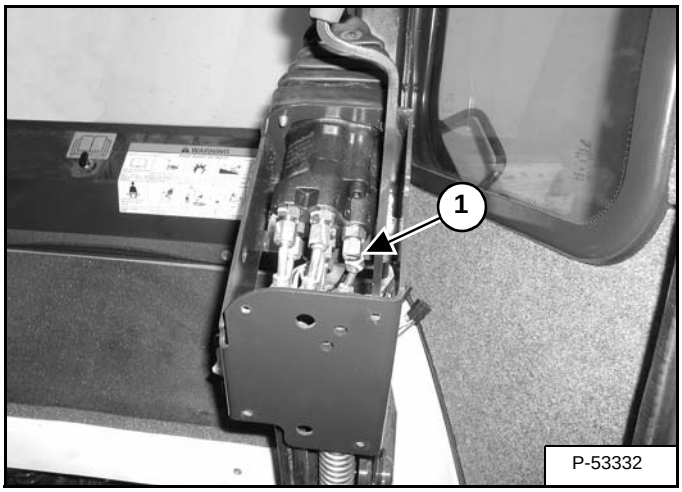
When repairing hydrostatic and hydraulic systems, clean the work area before disassembly and keep all parts clean. Always use caps and plugs on hoses, tubelines and ports to keep dirt out. Dirt can quickly damage the system.

I-2003-0888

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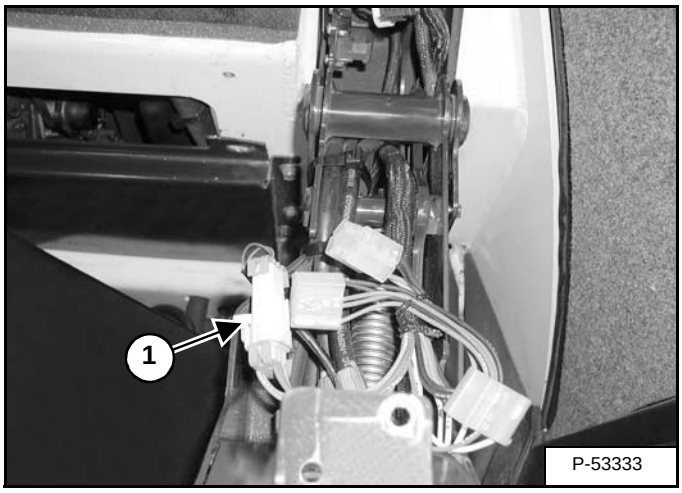
Console Removal And Installation (Cont'd)

Figure 50-60-22



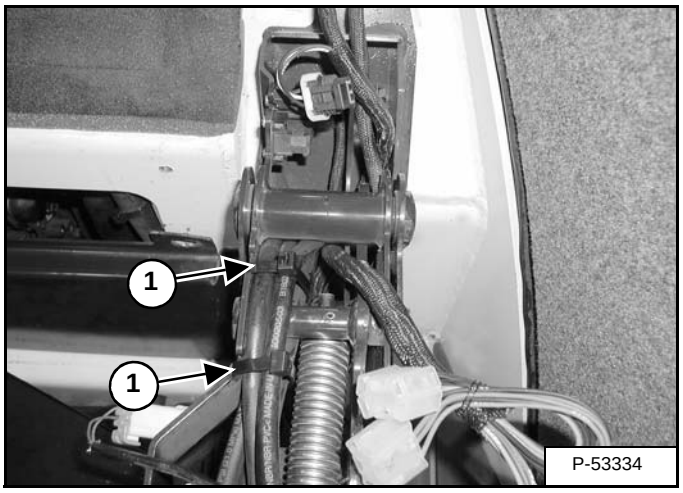
Remove the six hoses (Item 1) **[Figure 50-60-22]** from the joystick.

Figure 50-60-23



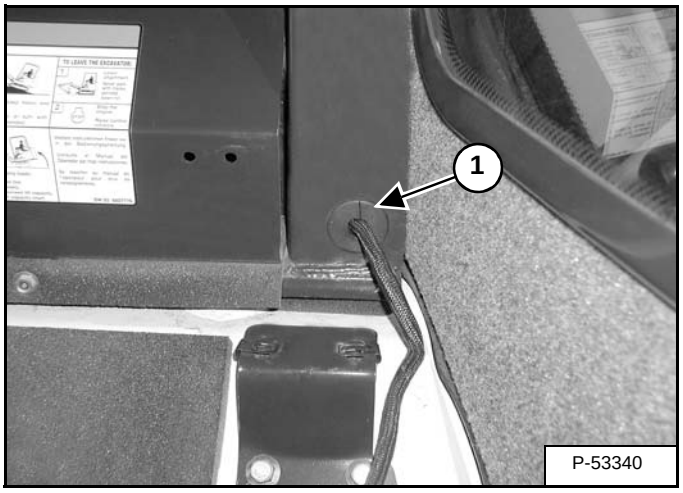
Lower the console. Disconnect the joystick wire harness (Item 1) **[Figure 50-60-23]**.

Figure 50-60-24



Remove the tie straps (Item 1) **[Figure 50-60-24]**.

Figure 50-60-25

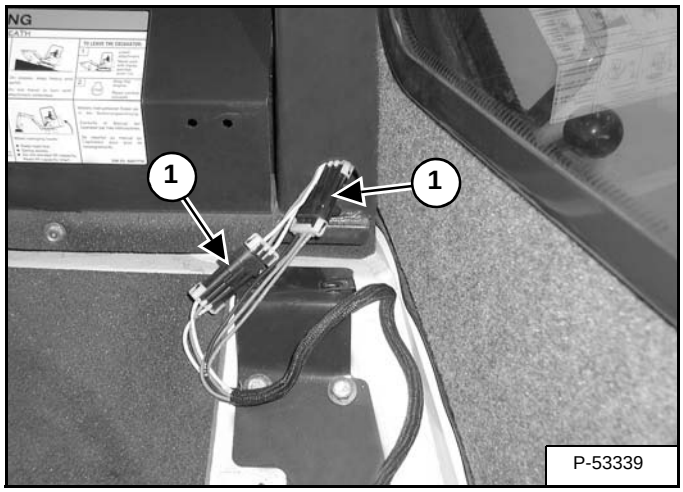


Remove the grommet (Item 1) **[Figure 50-60-25]**.

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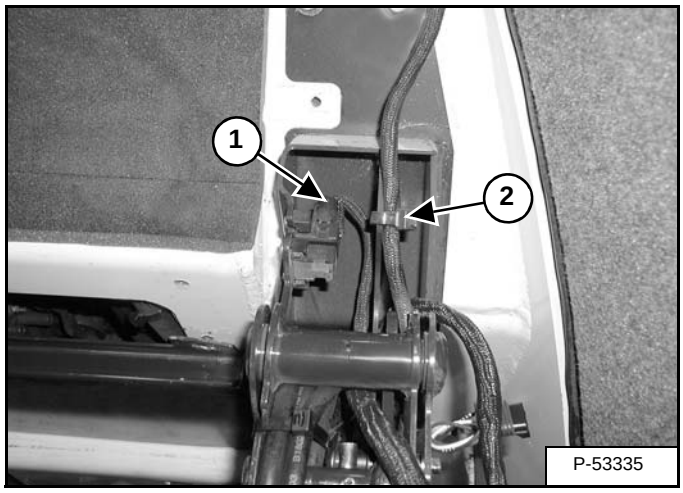
Console Removal And Installation (Cont'd)

Figure 50-60-26



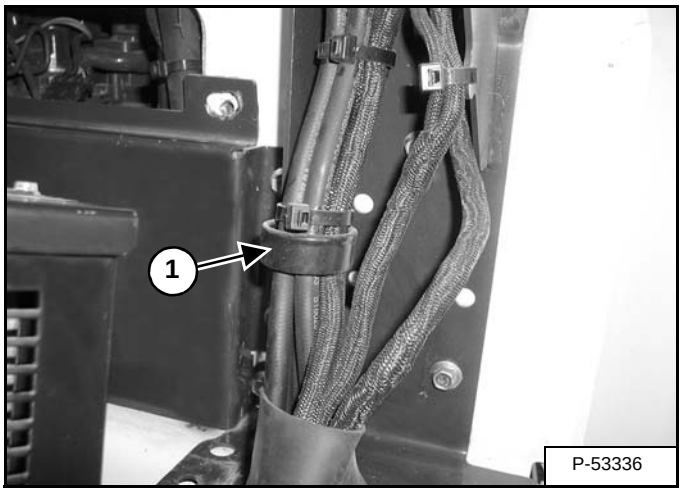
Pull the wire harness out and disconnect the wire harness connectors (Item 1) **[Figure 50-60-26]**.

Figure 50-60-27



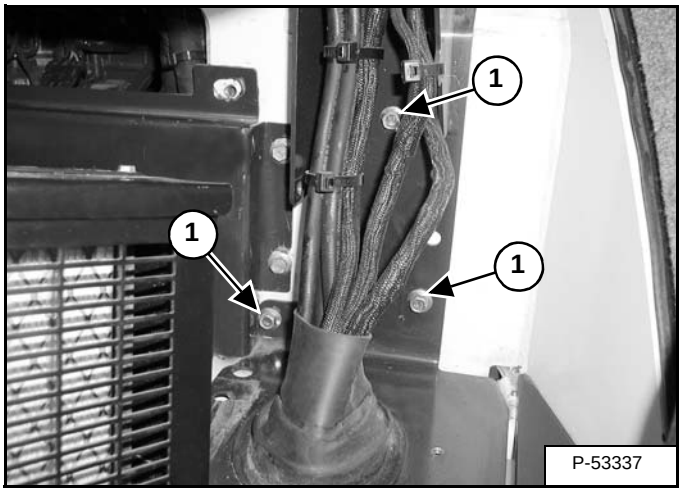
Disconnect the wire harness (Item 1). Remove the tiestrap (Item 2) **[Figure 50-60-27]**.

Figure 50-60-28



Remove the hose clamp (Item 1) **[Figure 50-60-28]**.

Figure 50-60-29

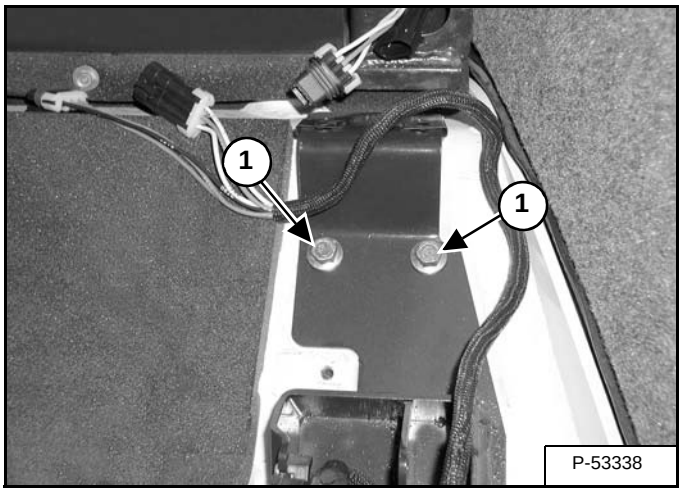


Remove the bolts (Item 1) **[Figure 50-60-29]**.

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Console Removal And Installation (Cont’d)

Figure 50-60-30



Remove the bolts (Item 1) **[Figure 50-60-30]**.

Figure 50-60-31

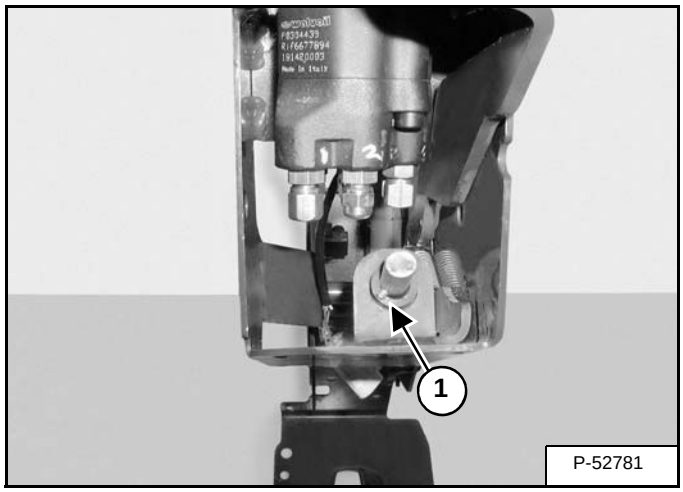


Remove the console (Item 1) **[Figure 50-60-31]**.

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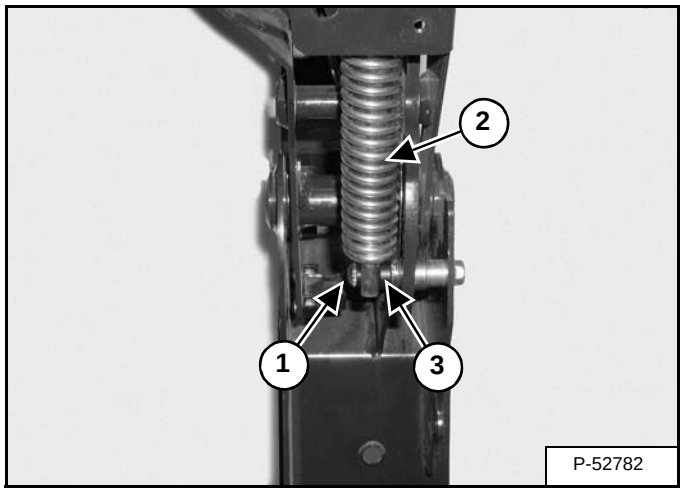
Disassembly And Assembly

Figure 50-60-32



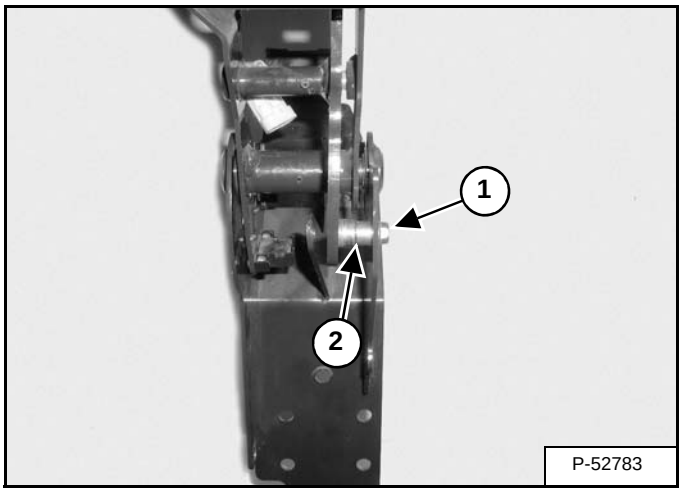
Install a pin (Item 1) **[Figure 50-60-42]** in the shaft.

Figure 50-60-33



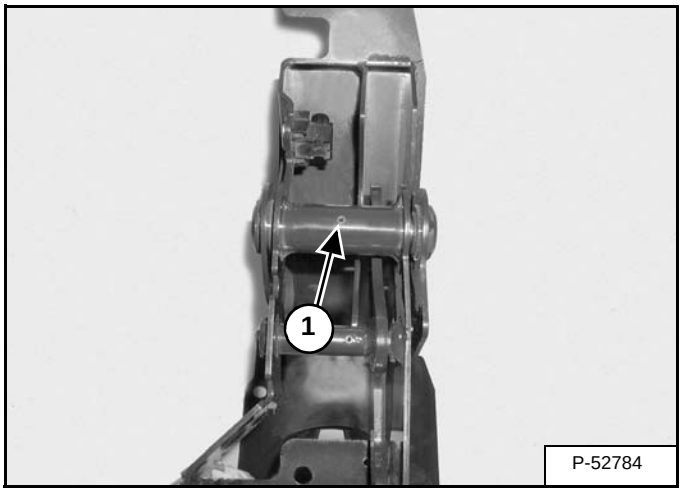
Remove the bolt (Item 1), spring assembly (Item 2), and bushing (Item 3) **[Figure 50-60-33]**.

Figure 50-60-34



Remove the bolt (Item 1) and bushing (Item 2) **[Figure 50-60-34]**.

Figure 50-60-35

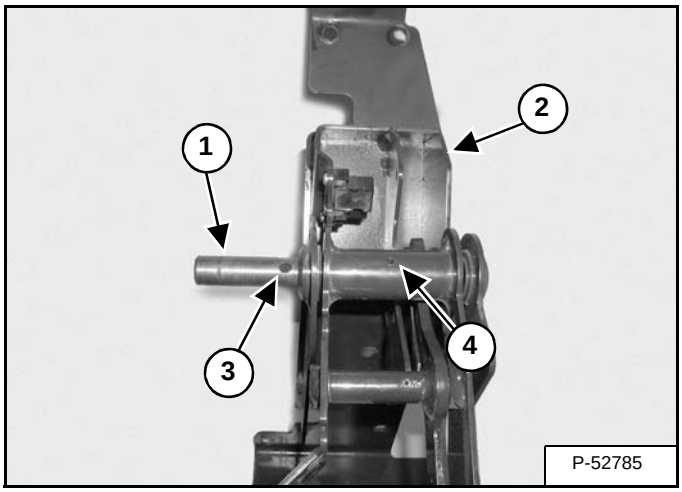


Remove the roll pin (Item 1) **[Figure 50-60-35]**.

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Disassembly And Assembly (Cont'd)

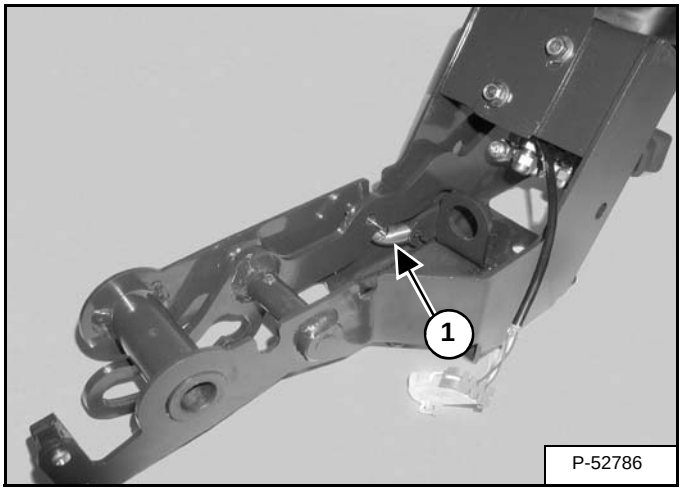
Figure 50-60-36



Remove the pin (Item 1). Remove the bracket (Item 2) **[Figure 50-60-36]**.

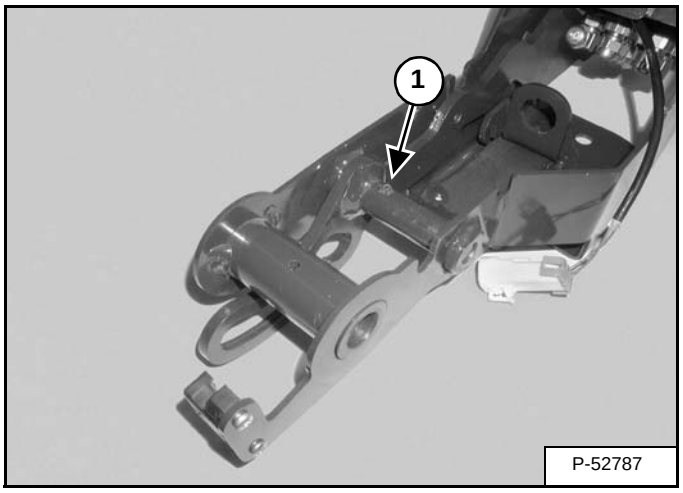
Installation: Align the hole (Item 3) in the pin with the hole (Item 4) **[Figure 50-60-36]** in the bracket.

Figure 50-60-37



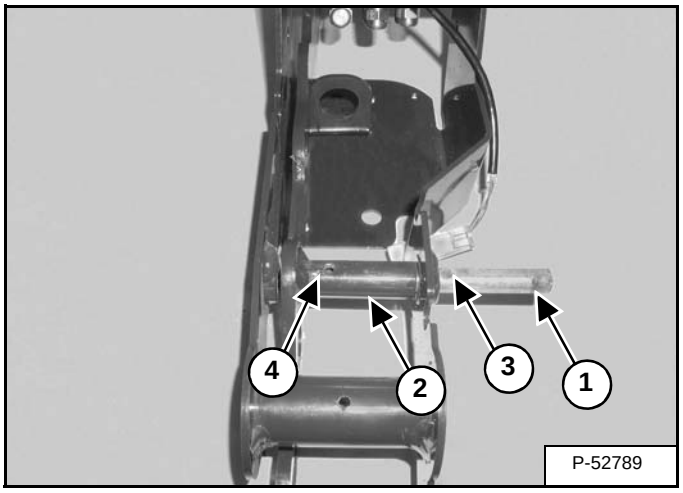
Remove the spring (Item 1) **[Figure 50-60-37]**.

Figure 50-60-38



Remove the rollpin (Item 1) **[Figure 50-60-38]**.

Figure 50-60-39



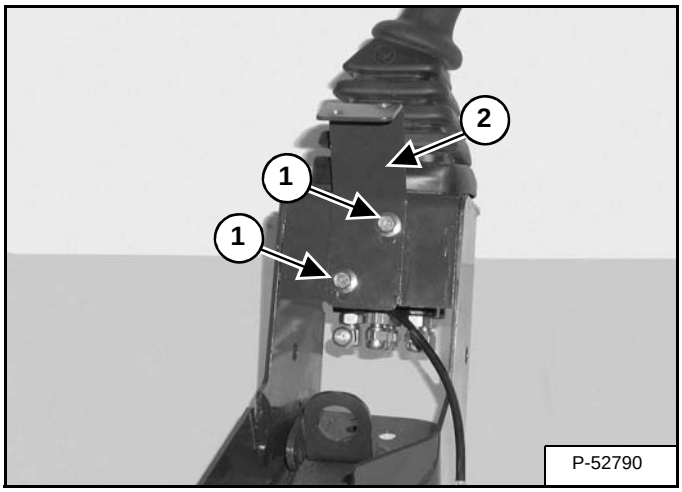
Remove the pin (Item 1) from the bracket (Item 2) **[Figure 50-60-38]**.

Installation: Align the hole (Item 3) in the pin with the hole (Item 4) **[Figure 50-60-38]** in the bracket.

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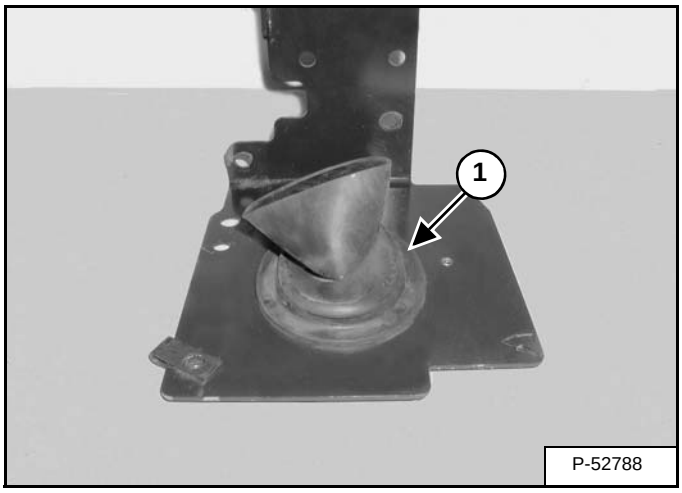
Disassembly And Assembly (Cont'd)

Figure 50-60-40



Remove the bolts (Item 1). Remove the bracket (Item 2) **[Figure 50-60-40]**.

Figure 50-60-41



Remove the dust boot (Item 1) **[Figure 50-60-41]**.

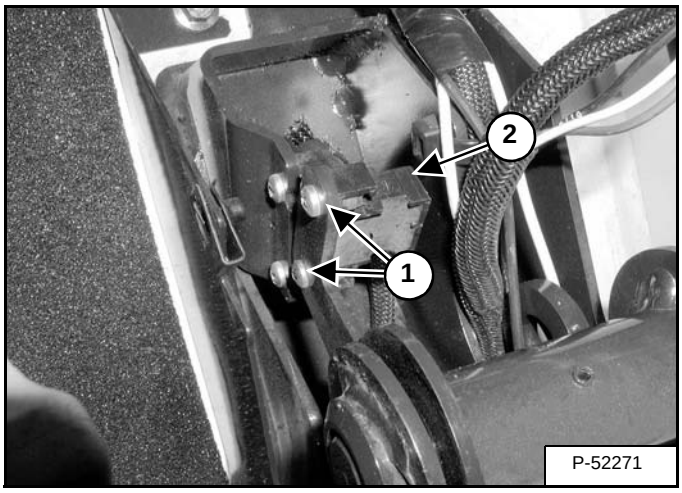
https://www.pdfmanual4trucks.com/

Console Switch Removal And Installation

Remove the upper console cover. (See Upper Console Cover Removal And Installation on Page 50-60-3)

Remove the lower console cover. (See Lower Console Cover Removal And Installation on Page 50-60-1)

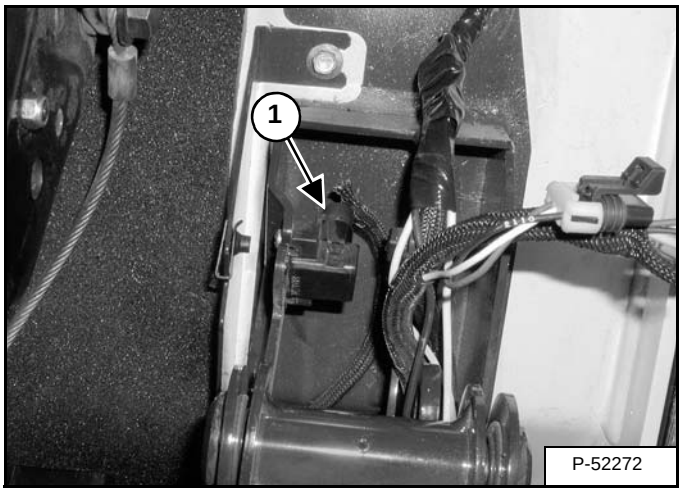
Figure 50-60-42



Remove the screws (Item 1) **[Figure 50-60-42]** from the magnet side of the sensor.

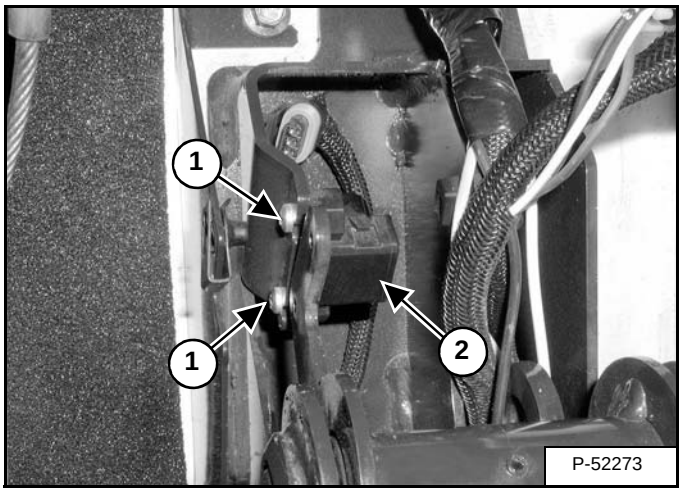
Remove the magnet (Item 2) **[Figure 50-60-42]**.

Figure 50-60-43



Remove the wire harness (Item 1) **[Figure 50-60-43]** from the console switch.

Figure 50-60-44



Remove the screws (Item 1) from the console switch (Item 2) **[Figure 50-60-44]**.

Remove the console switch.

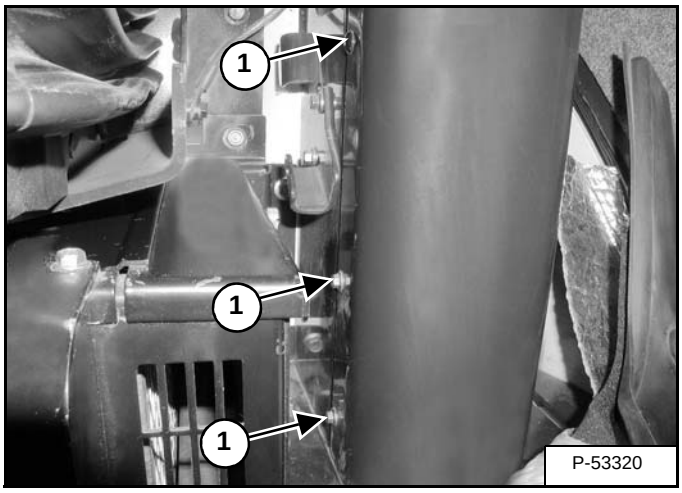
https://www.pdfmanual4trucks.com/

Console Base Removal And Installation

Remove the upper console cover. (See Upper Console Cover Removal And Installation on Page 50-60-3)

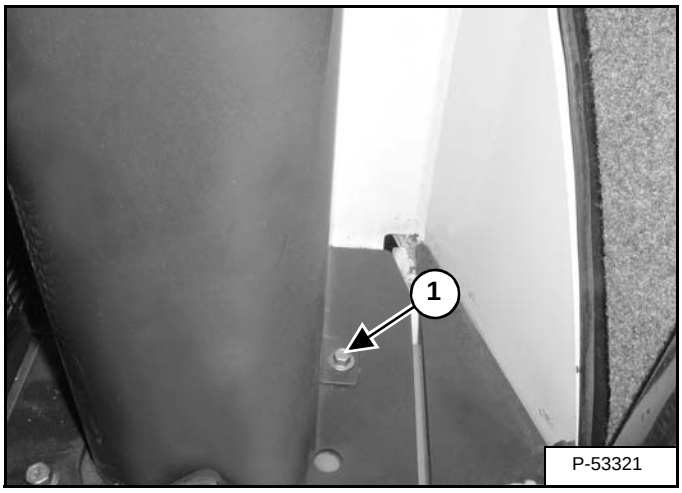
Remove the lower console cover. (See Lower Console Cover Removal And Installation on Page 50-60-1)

Figure 50-60-45



Remove the bolts (Item 1) **[Figure 50-60-45]** from the console base cover.

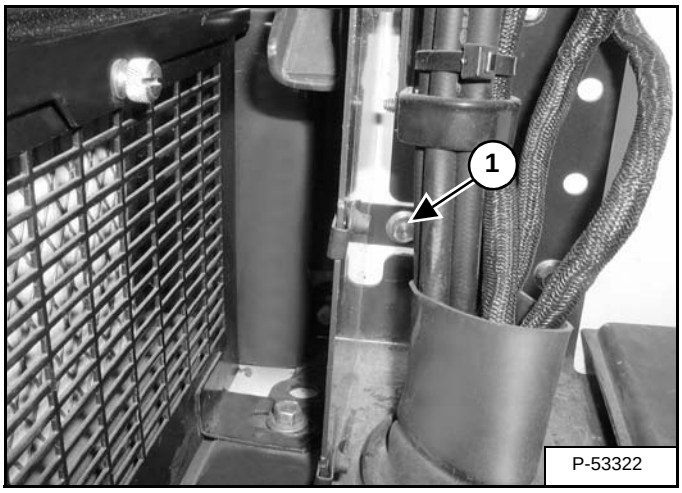
Figure 50-60-46



Remove the bolt (Item 1) **[Figure 50-60-46]** from the console base cover.

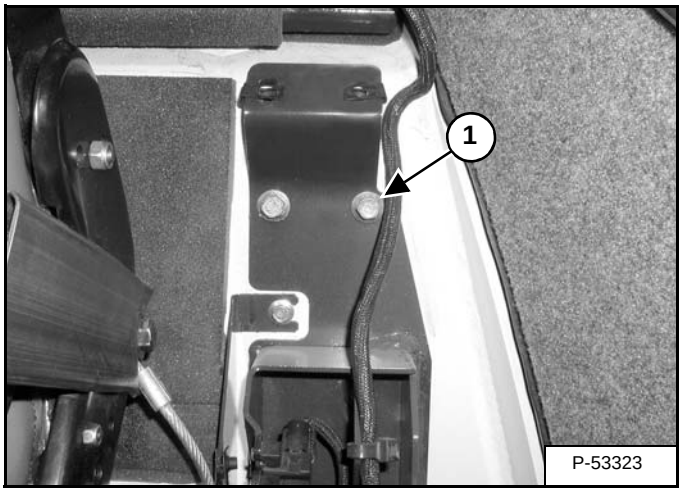
Remove the console base cover.

Figure 50-60-47



Remove the bolt (Item 1) **[Figure 50-60-47]** from the mount bracket.

Figure 50-60-48



Remove the bolt (Item 1) from the mount bracket (Item 2) **[Figure 50-60-48]**.

Remove the console base mount bracket.

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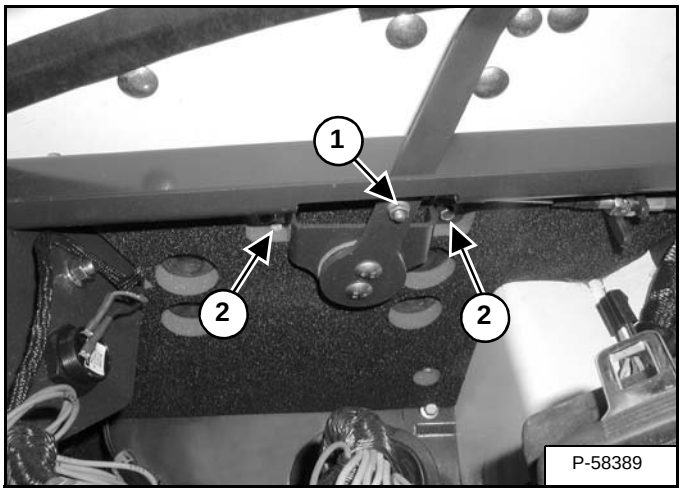
ENGINE SPEED CONTROL

Removal And Installation

NOTE: The Removal And Installation Procedure for the engine speed control is the same for both early and later models. Early model is shown.

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

Figure 50-70-1



Remove the nut (Item 1) **[Figure 50-70-1]**.

Remove the bolts (Item 2) **[Figure 50-70-1]**.

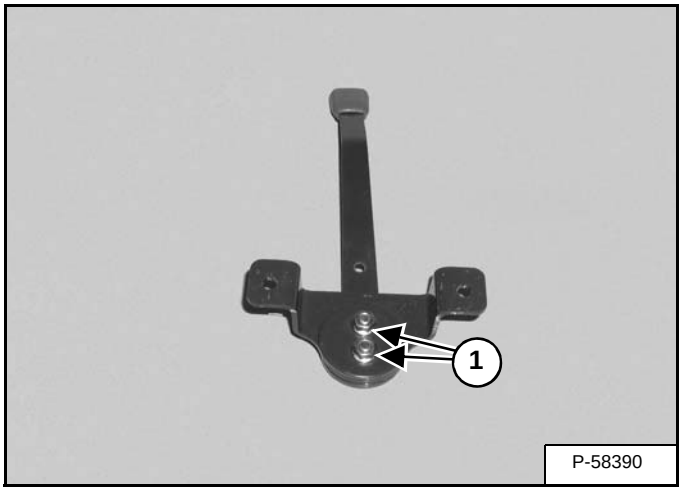
Remove the speed control assembly.

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Disassembly And Assembly

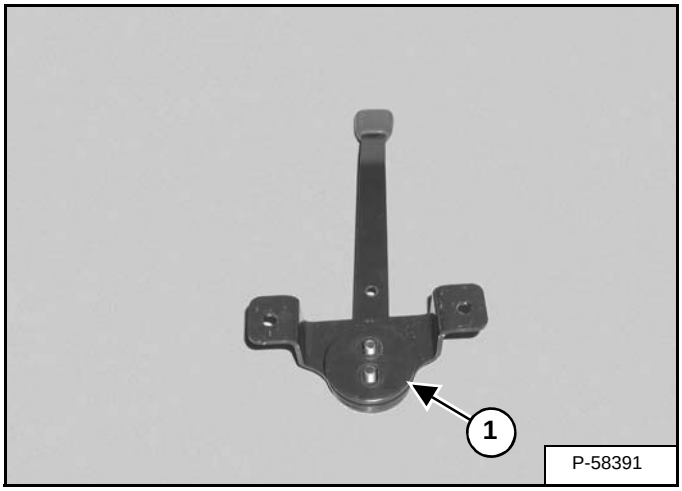
NOTE: The Disassembly And Assembly Procedure for the engine speed control is the same for both early and later models. Early model is shown.

Figure 50-70-2



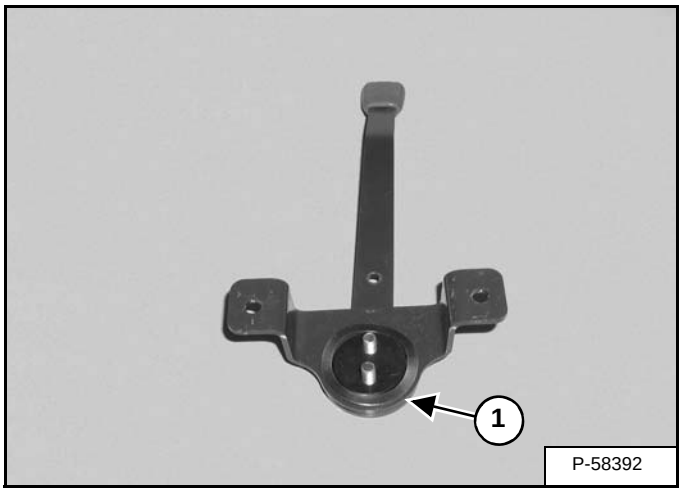
Remove the nuts (Item 1) **[Figure 50-70-2]**.

Figure 50-70-3



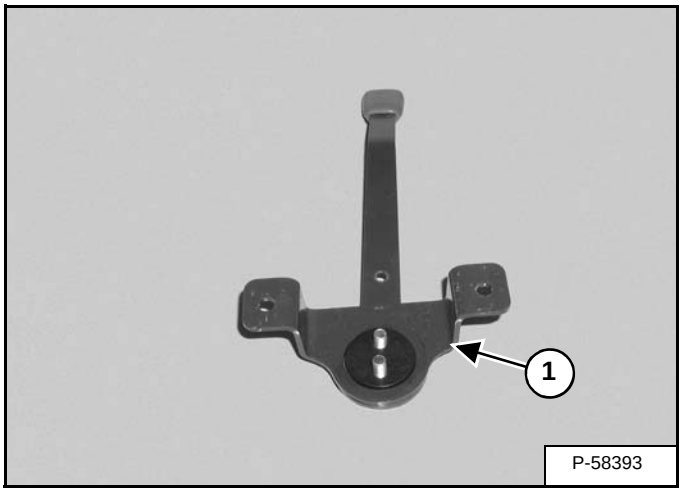
Remove the plate (Item 1) **[Figure 50-70-3]**.

Figure 50-70-4



Remove the wave washers (Item 1) **[Figure 50-70-4]**.

Figure 50-70-5

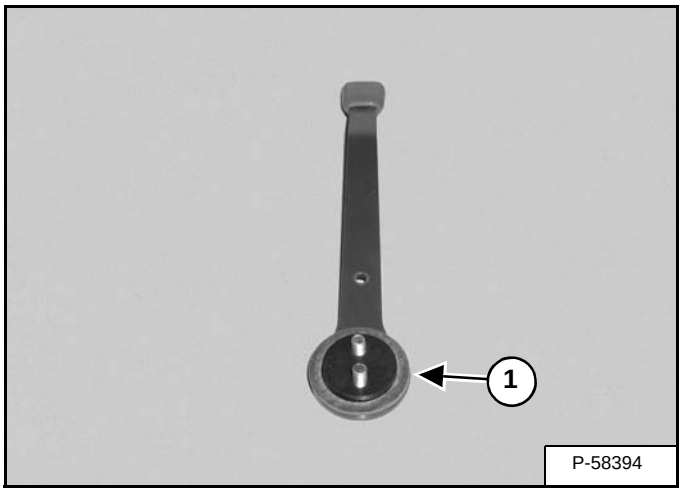


Remove the bracket (Item 1) **[Figure 50-70-5]**.

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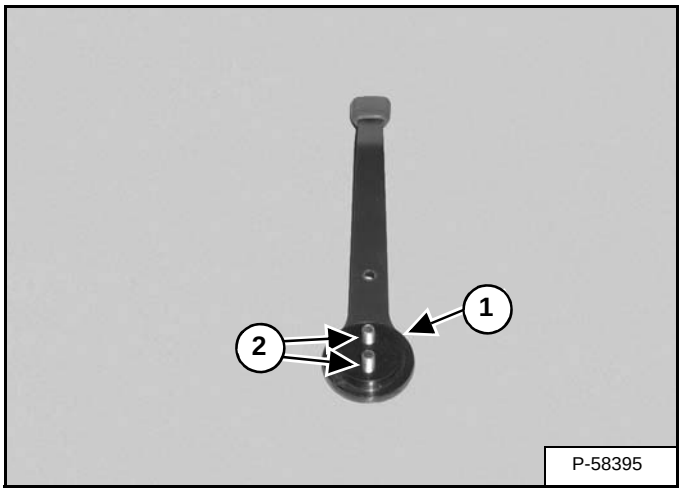
Disassembly And Assembly (Cont'd)

Figure 50-70-6



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

Figure 50-70-7

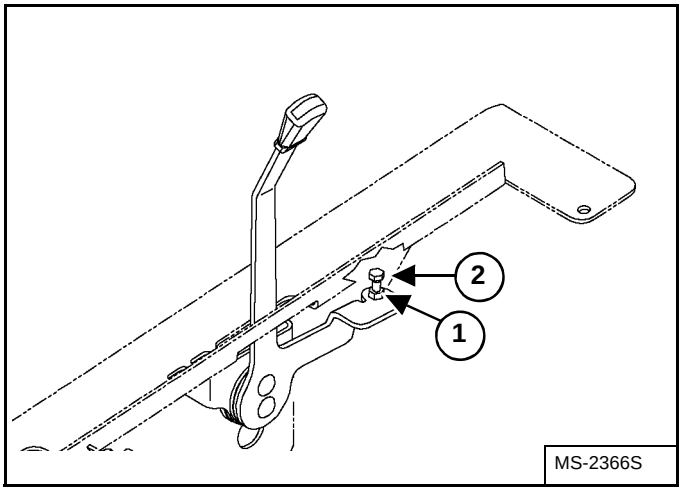


Remove the bushing (Item 1) and bolts (Item 2) **[Figure 50-70-7]**.

Adjustment (Later Models)

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

Figure 50-70-8



Loosen the jam nut (Item 1) and adjust the bolt (Item 2) **[Figure 50-70-8]** until the engine runs at 2615 RPM.

Tighten the jam nut (Item 1) **[Figure 50-70-8]**.

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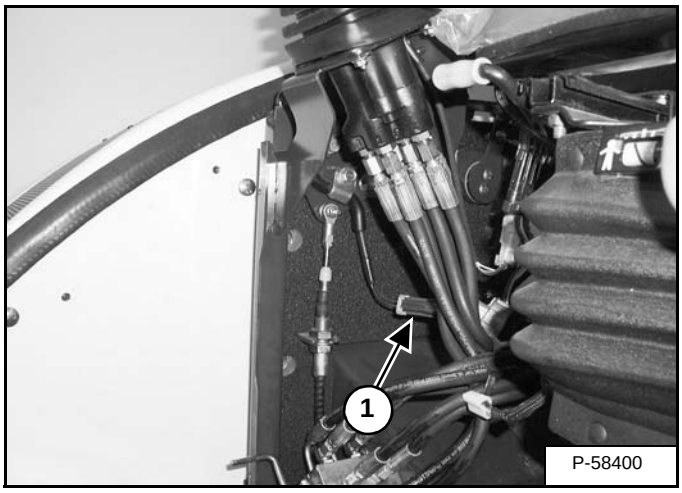
BLADE CONTROL

Lever Removal And Installation

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

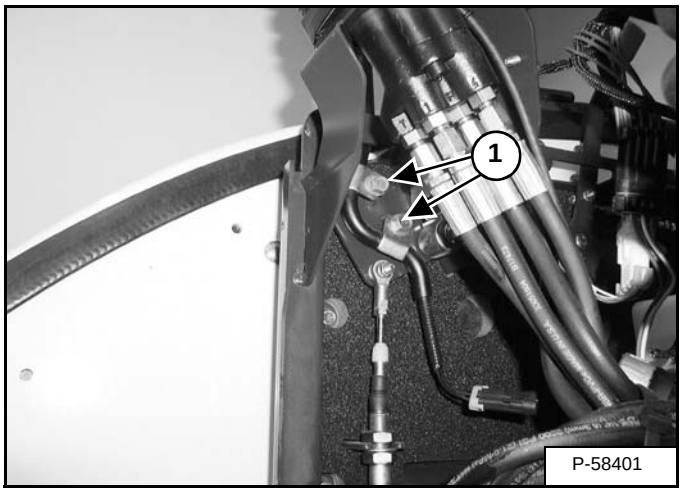
Remove the right lower console base. (See Console Base Removal And Installation on Page 50-50-2)

Figure 50-80-1



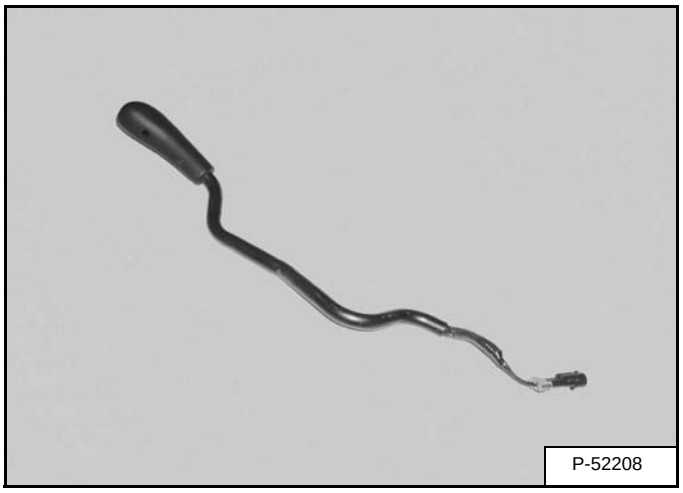
Disconnect the two speed wire harness (Item 1) **[Figure 50-80-1]**.

Figure 50-80-2



Remove the bolts (Item 1) **[Figure 50-80-2]**.

Figure 50-80-3



Remove the blade control lever from the excavator **[Figure 50-80-3]**.

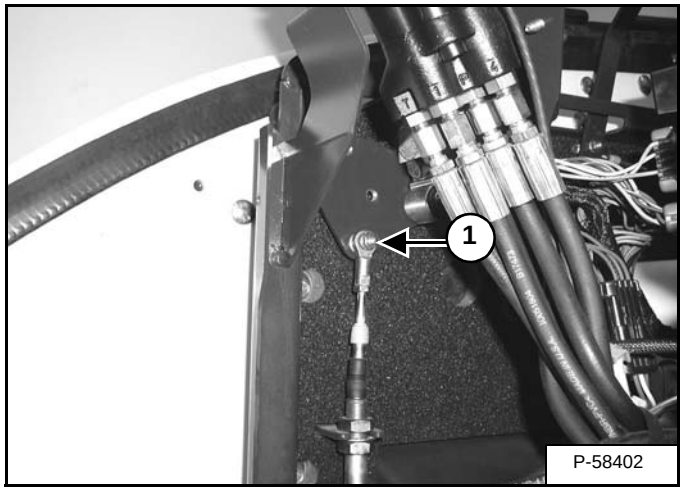
NOTE: If the two-speed switch needs to be replaced, the complete blade control lever must be replaced.

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Linkage Removal And Installation

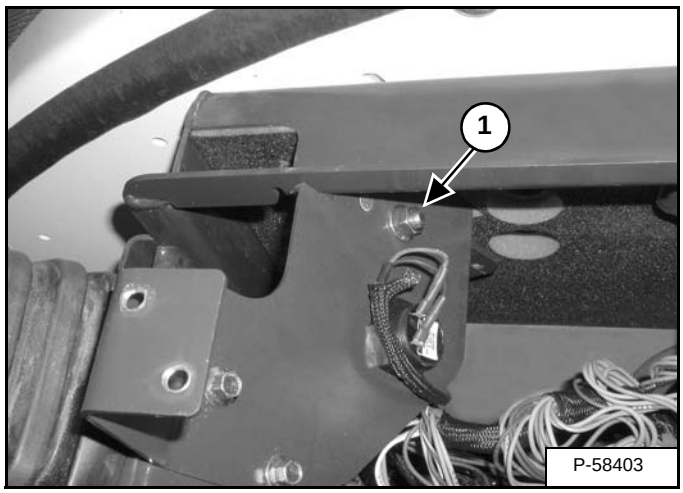
Remove the blade control lever. (See "Lever Removal And Installation" on Page 50-80-1)

Figure 50-80-4



Remove the nut (Item 1) and bolt **[Figure 50-80-4]**.

Figure 50-80-5



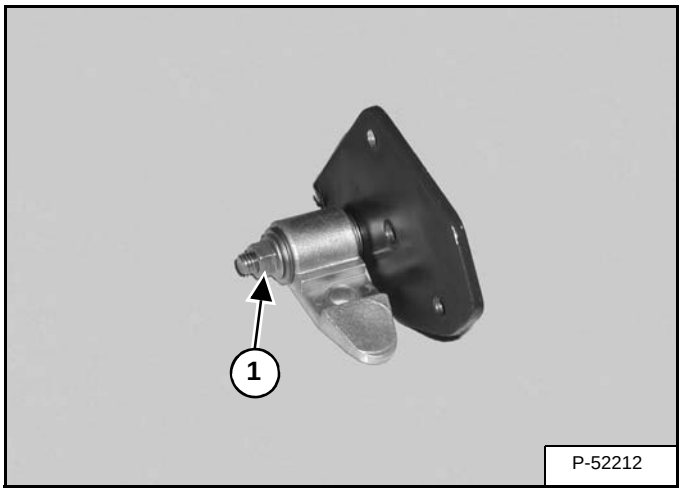
Remove the nut (Item 1) and bolt **[Figure 50-80-5]**.

Remove the blade control pivot mount.

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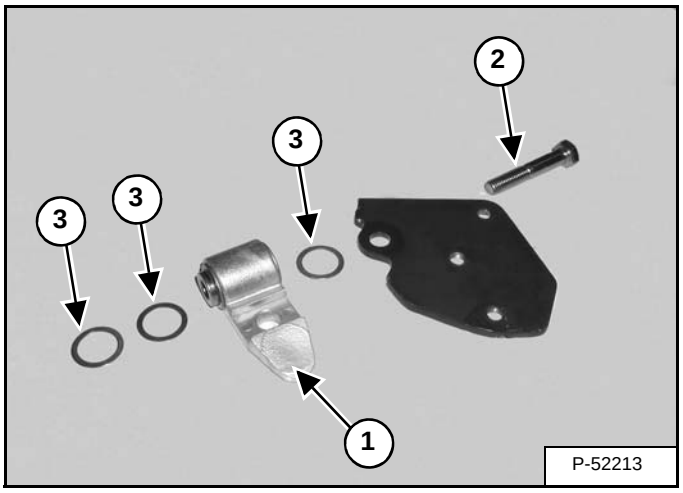
Linkage Disassembly And Assembly

Figure 50-80-6



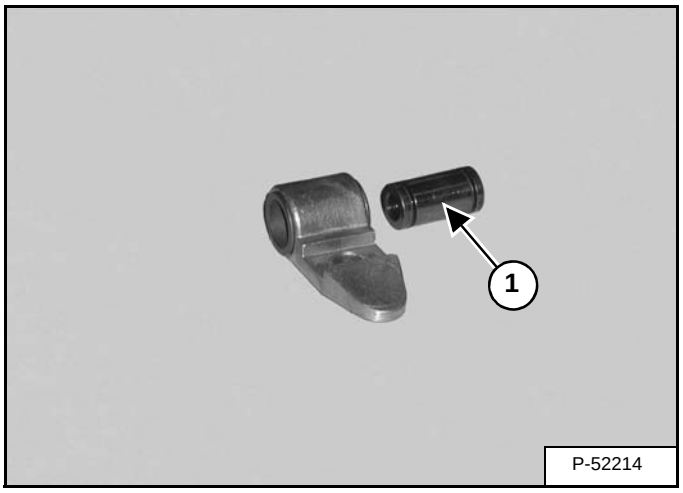
Remove the nut (Item 1) **[Figure 50-80-6]**.

Figure 50-80-7



Remove the pivot mount (Item 1), bolt (Item 2), and washers (Item 3) **[Figure 50-80-7]**.

Figure 50-80-8

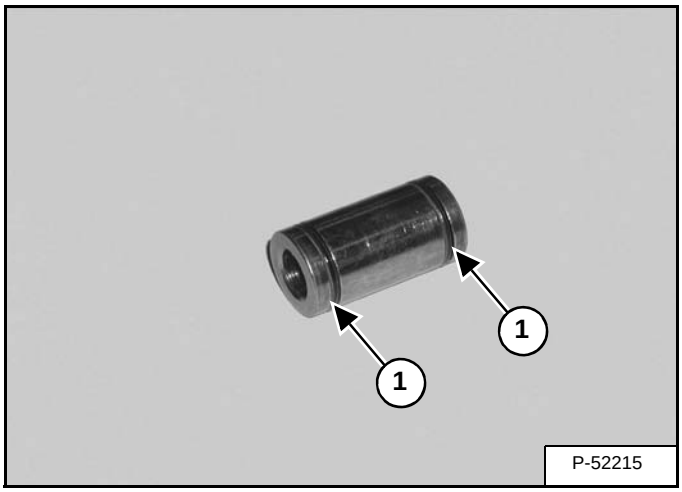


Remove the sleeve (Item 1) **[Figure 50-80-8]** from the pivot mount.

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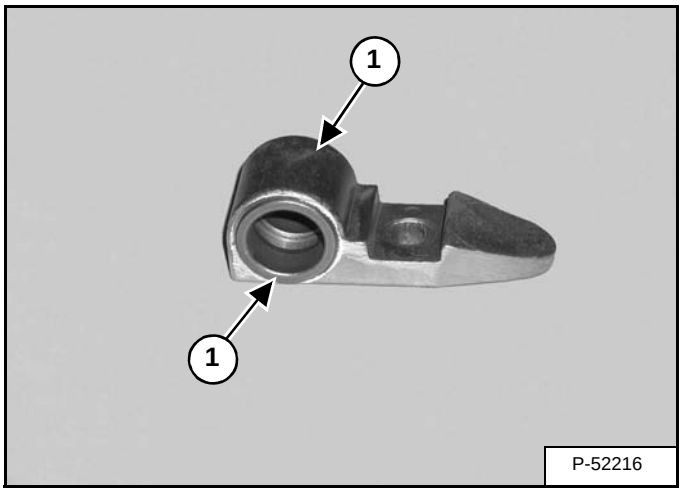
Linkage Disassembly And Assembly (Cont'd)

Figure 50-80-9



Remove the O-rings (Item 1) **[Figure 50-80-9]** from the sleeve.

Figure 50-80-10



Remove the bushing (Item 1) **[Figure 50-80-10]** from the pivot mount. (Both sides)

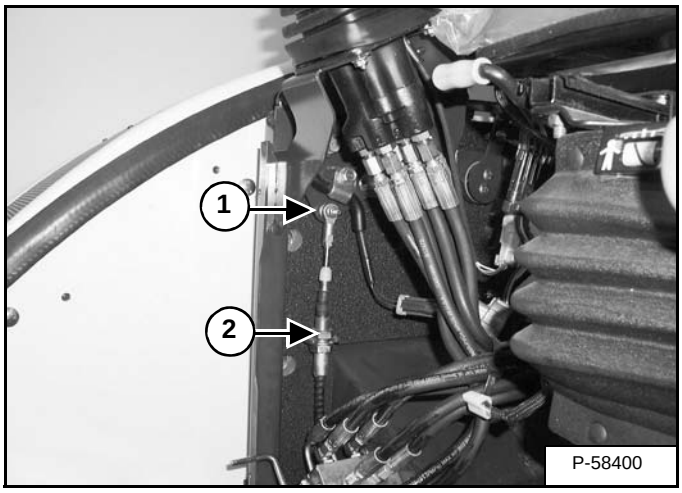
https://www.pdfmanual4trucks.com/

Control Cable Removal And Installation

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

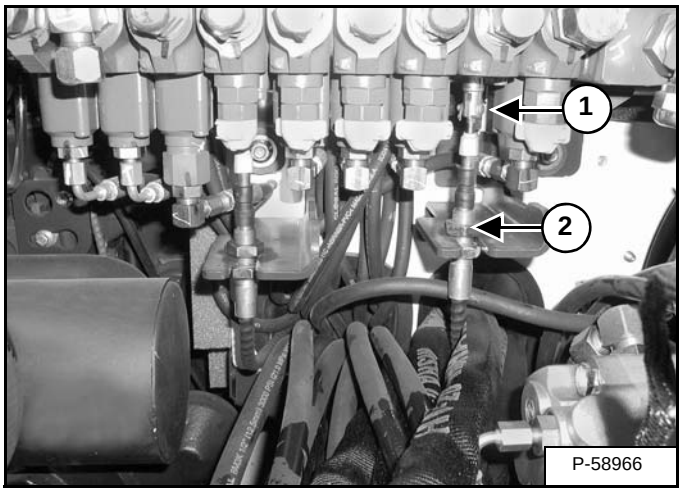
Remove the right lower console base. (See Console Base Removal And Installation on Page 50-50-2)

Figure 50-80-11



Remove the nut (Item 1) and loosen the nut (Item 2) **[Figure 50-80-11]** from the lower pivot.

Figure 50-80-12



Remove the cotter pin and clevis pin (Item 1) **[Figure 50-80-12]**.

Loosen the nut (Item 2) **[Figure 50-80-12]**.

NOTE: The hoses are shown removed for photo clarity.

Remove the control cable from the excavator.

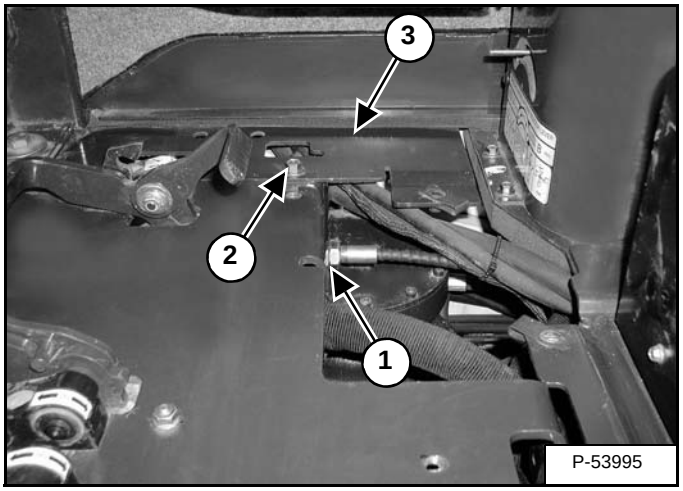
https://www.pdfmanual4trucks.com/

RIGHT PEDAL AND LINKAGE

Pedal Removal And Installation

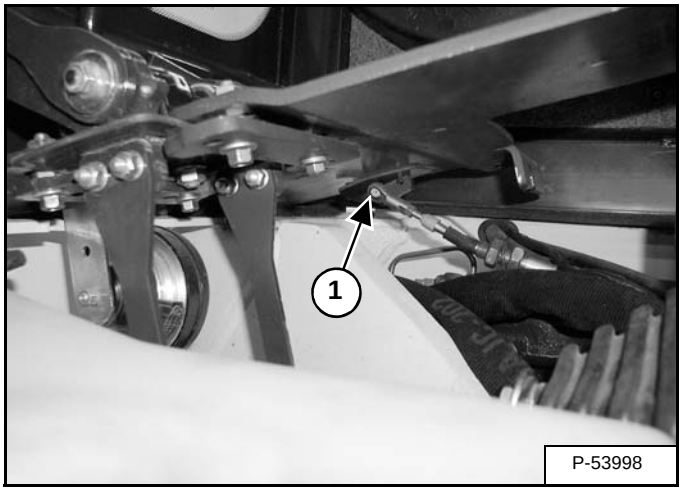
Remove the floormat and floor plate. (See Removal And Installation on Page 50-120-1)

Figure 50-90-1



Loosen the nut (Item 1) on the control cable. Remove the bolt (Item 2) and right floor plate (Item 3) **[Figure 50-90-1]**.

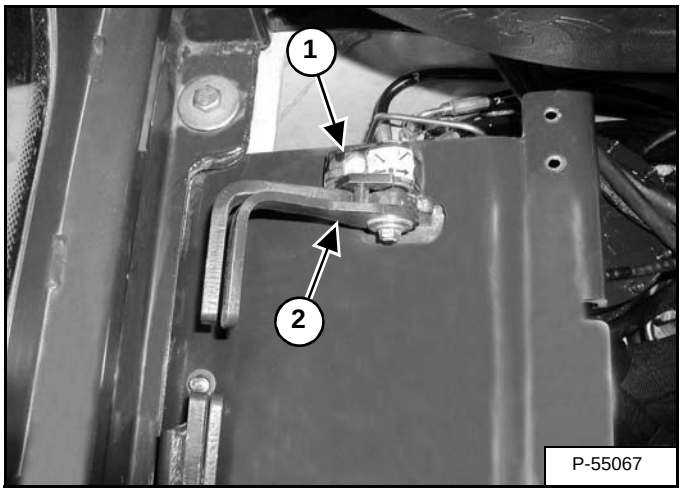
Figure 50-90-2



Remove the nut from the ball joint (Item 1) **[Figure 50-90-2]**.

NOTE: The travel control valve is shown remove for photo clarity.

Figure 50-90-3

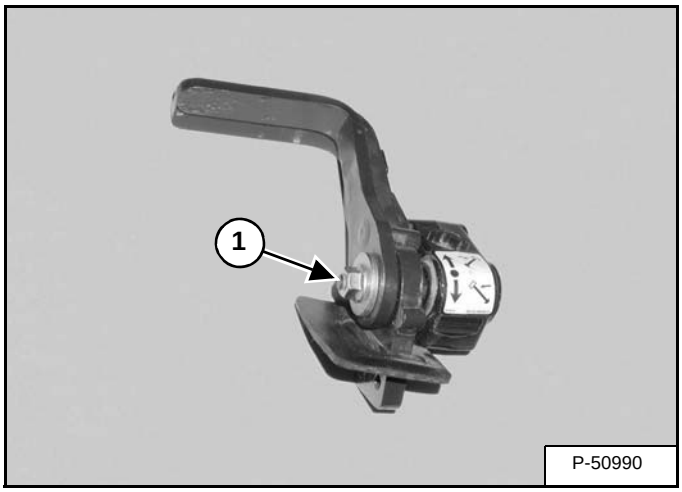


Remove the bolt (Item 1) and nut. Remove the right pedal (Item 2) **[Figure 50-90-3]**.

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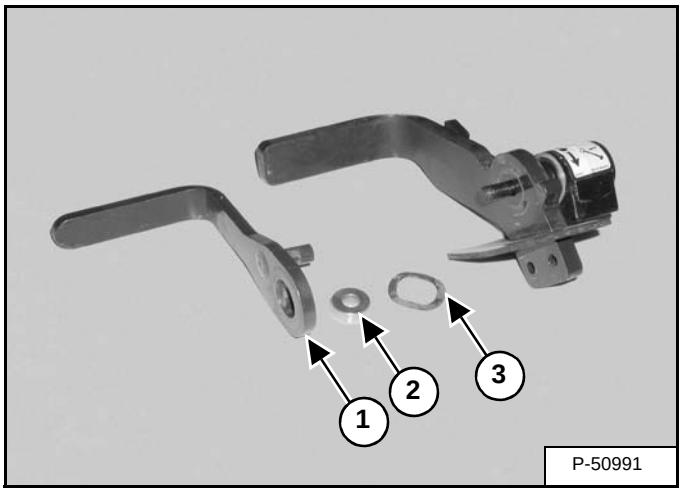
Pedal Disassembly And Assembly

Figure 50-90-4



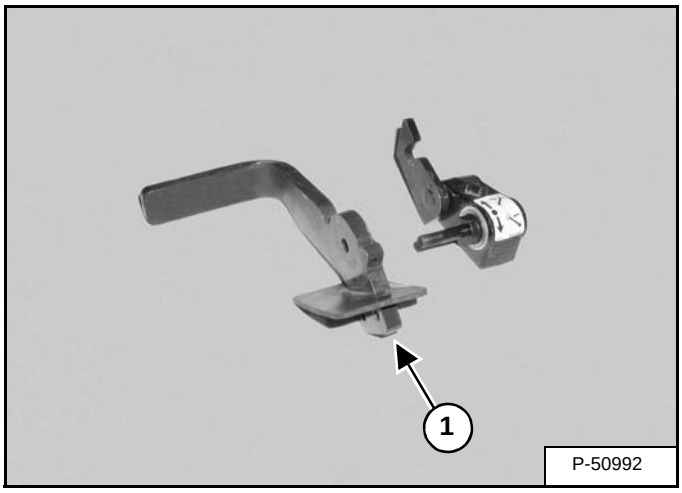
Remove the nut and washer (Item 1) **[Figure 50-90-4]**.

Figure 50-90-5



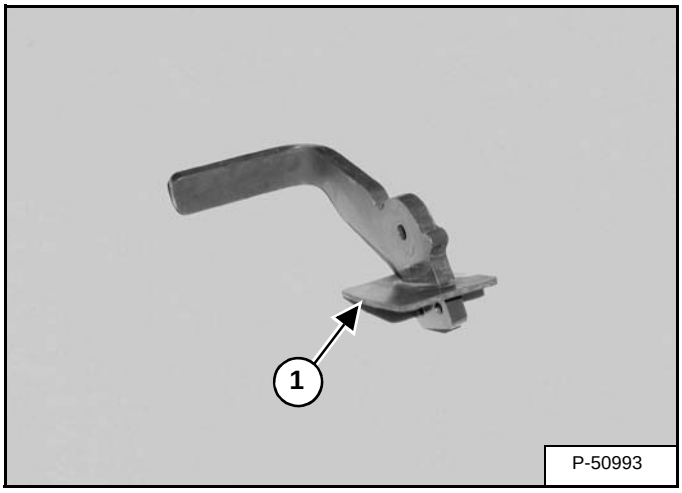
Remove the rear pedal (Item 1) bushing (Item 2) and wave washer (Item 3) **[Figure 50-90-5]**.

Figure 50-90-6



Remove the front pedal (Item 1) **[Figure 50-90-6]**.

Figure 50-90-7

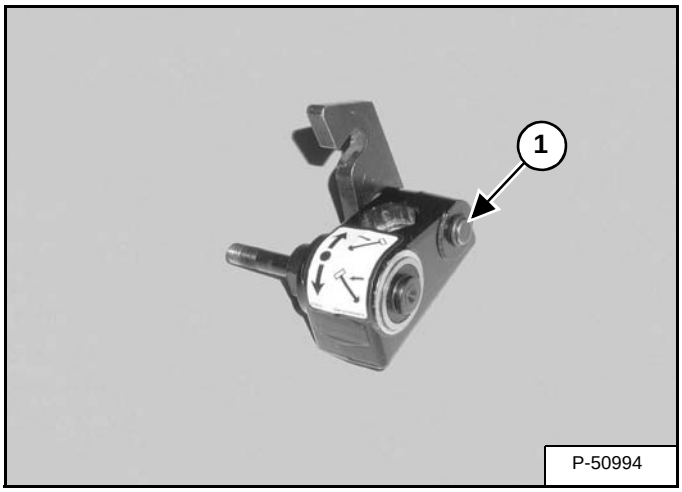


Remove the dust cover (Item 1) **[Figure 50-90-7]**.

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Pedal Disassembly And Assembly (Cont'd)

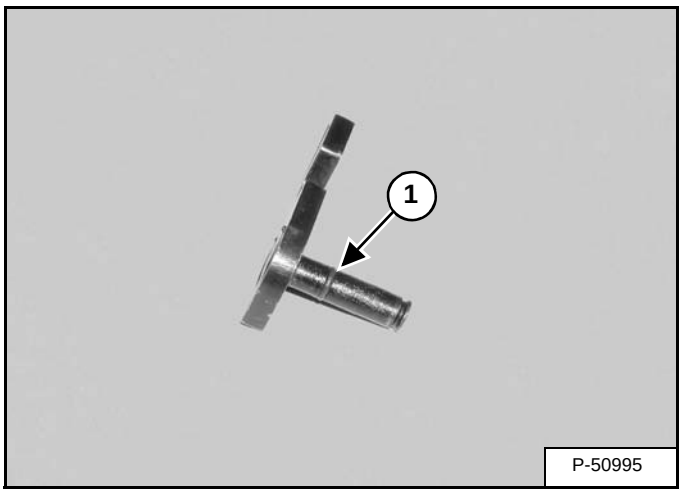
Figure 50-90-8



Remove the O-ring (Item 1) **[Figure 50-90-8]** from the pedal lock.

Remove the pedal lock from the pedal mount.

Figure 50-90-9



Remove the O-ring (Item 1) **[Figure 50-90-9]** from the pedal lock.

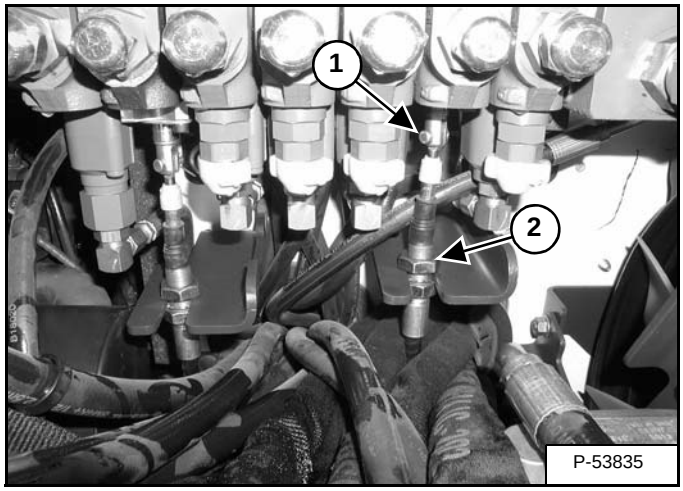
NOTE: Do not lubricate the O-rings (Item 1) [Figure 50-90-8] and [Figure 50-90-9]. The O-rings provide a friction fit to prevent the lock from moving freely.

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Control Cable Removal And Installation

Remove the floormat and floor plate. (See Removal And Installation on Page 50-120-1)

Figure 50-90-10

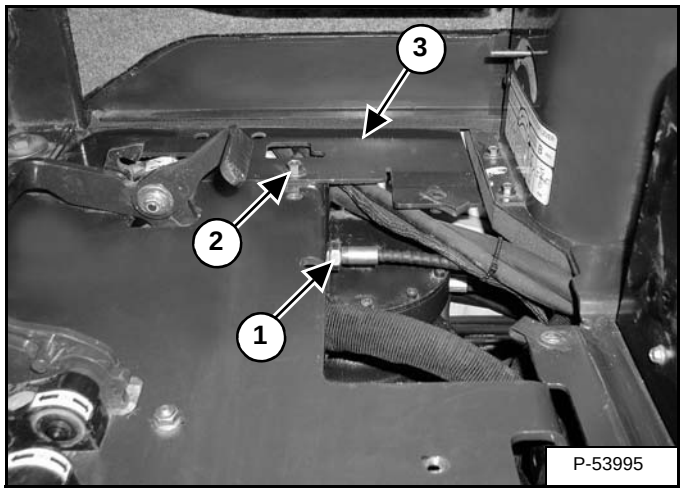


At the control valve remove the cotter pin and clevis pin (Item 1) **[Figure 50-90-10]**.

Loosen the nut (Item 2) **[Figure 50-90-10]**.

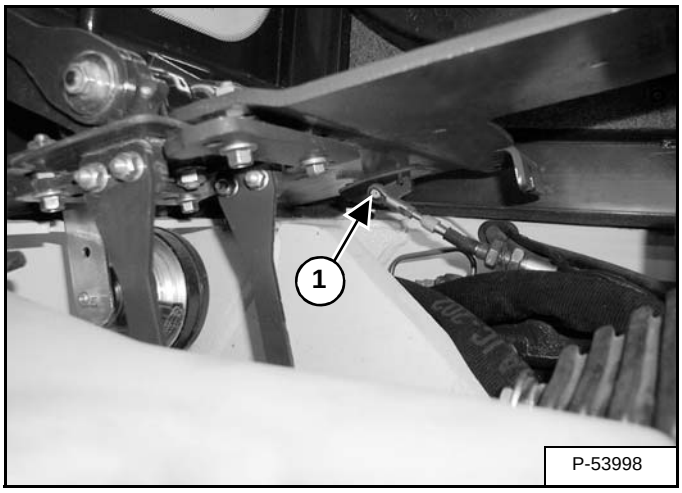
NOTE: The hoses are shown removed for photo clarity.

Figure 50-90-11



Loosen the nut (Item 1). Remove the bolt (Item 2) and right floor plate (Item 3) **[Figure 50-90-11]**.

Figure 50-90-12



Remove the nut (Item 1) **[Figure 50-90-12]** from the ball joint.

NOTE: The travel control valve is shown removed for photo clarity.

Remove the control cable.

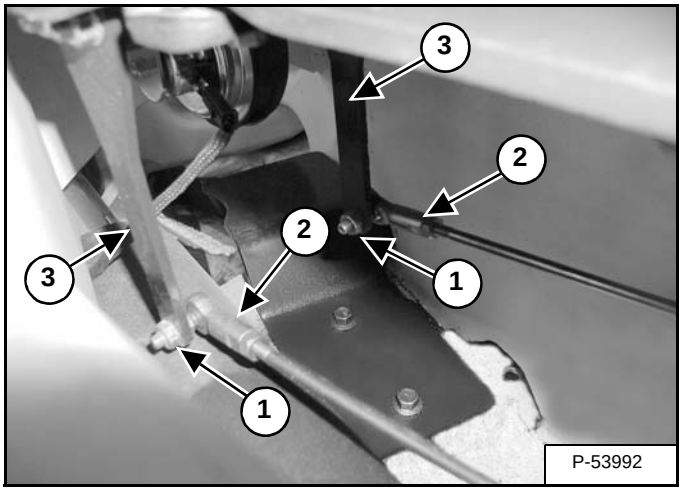
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TRAVEL CONTROLS

Removal And Installation

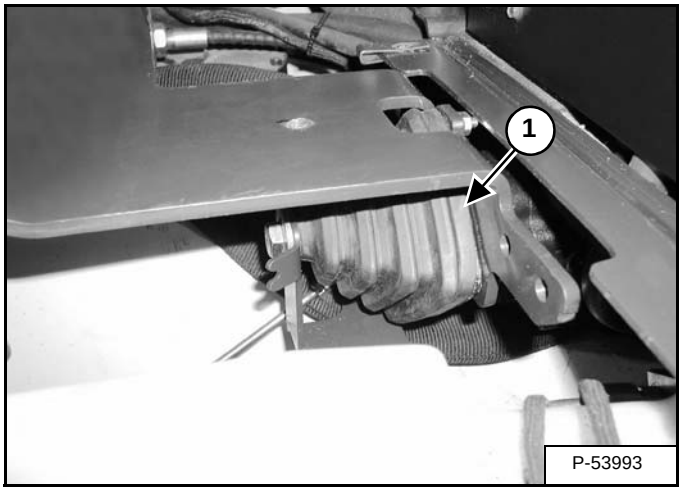
Remove the floormat and floor plate. (See Removal And Installation on Page 50-120-11)

Figure 50-100-1



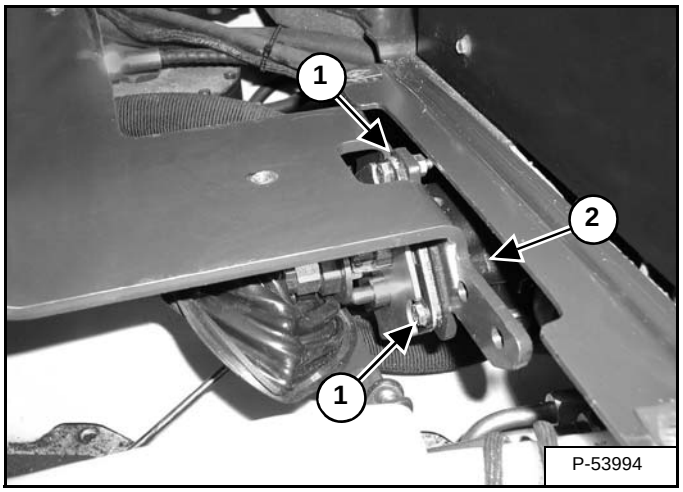
Remove the nuts (Item 1). Remove the travel control linkage (Item 2) from the linkage bars (Item 3) **[Figure 50-100-1]**.

Figure 50-100-2



Remove the dust boot (Item 1) **[Figure 50-100-2]** from the travel control valve.

Figure 50-100-3



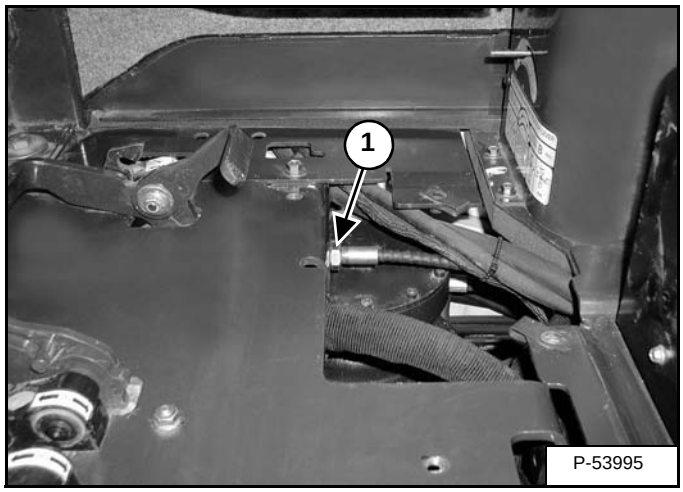
Remove the three bolts (Item 1) and nuts from the travel control valve (Item 2) **[Figure 50-100-3]**.

Lower the travel control valve.

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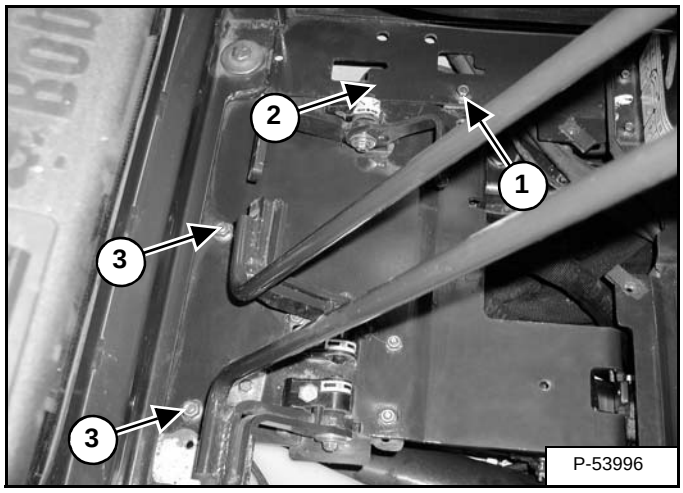
Removal And Installation (Cont'd)

Figure 50-100-4



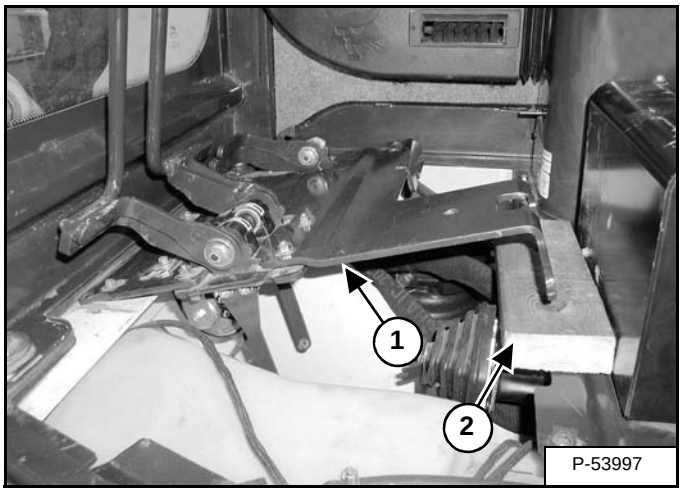
Loosen the nut (Item 1) **[Figure 50-100-4]** on the right pedal cable.

Figure 50-100-5



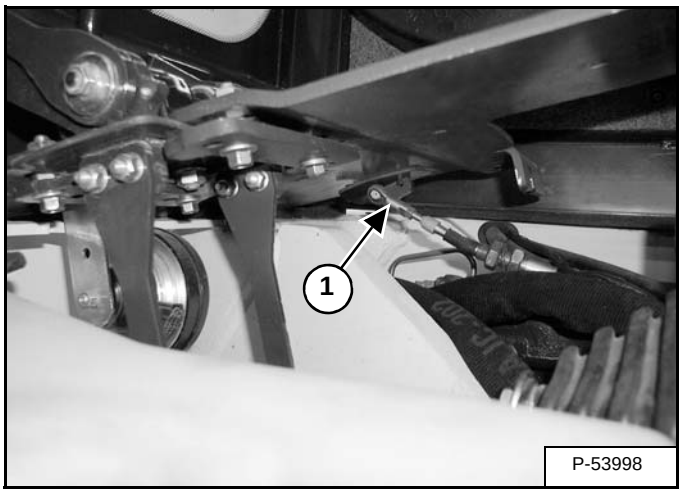
Remove the bolt (Item 1). Remove the right floor plate (Item 2). Remove the two nuts (Item 3) **[Figure 50-100-5]**.

Figure 50-100-6



Raise the travel control mount plate (Item 1). Install a block (Item 2) **[Figure 50-100-6]** under the rear of the plate.

Figure 50-100-7

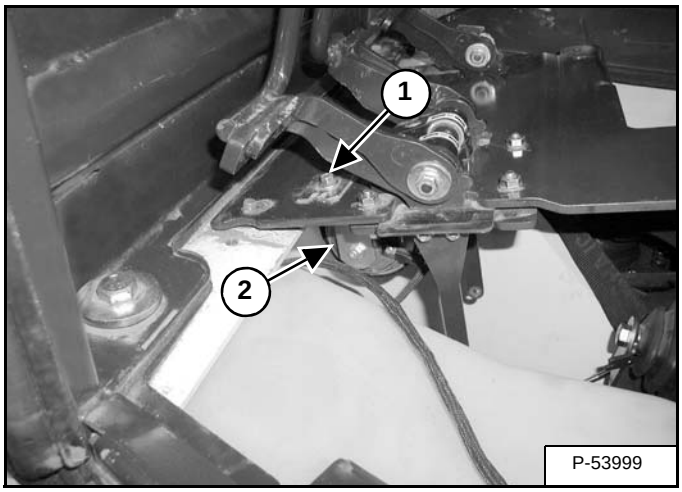


Remove the nut from the right pedal cable (Item 1) **[Figure 50-100-7]**. Remove the cable from the right pedal.

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Removal And Installation (Cont'd)

Figure 50-100-8



Remove the bolt and nut (Item 1) from the horn (Item 2) **[Figure 50-100-8]**. Lower the horn.

Figure 50-100-9

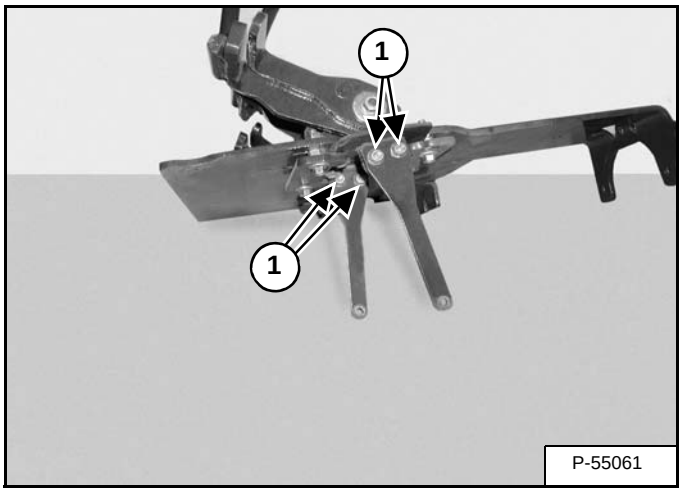


Remove the travel control assembly (Item 1) **[Figure 50-100-9]** from the Excavator.

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Disassembly And Assembly

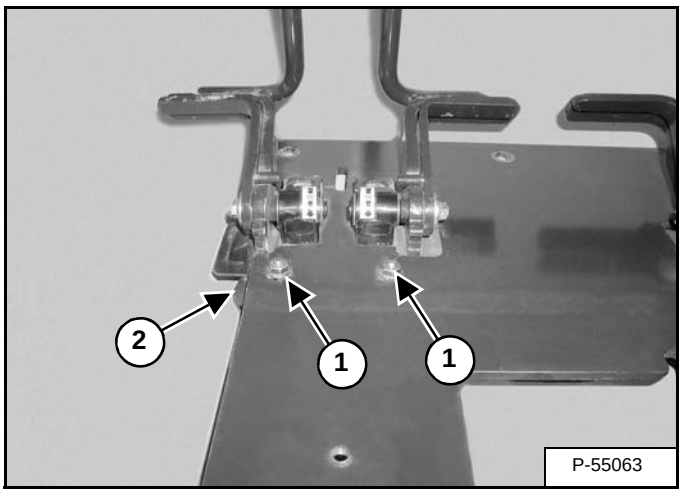
Figure 50-100-10



Remove the bolts (Item 1) **[Figure 50-100-10]** from both linkage bars.

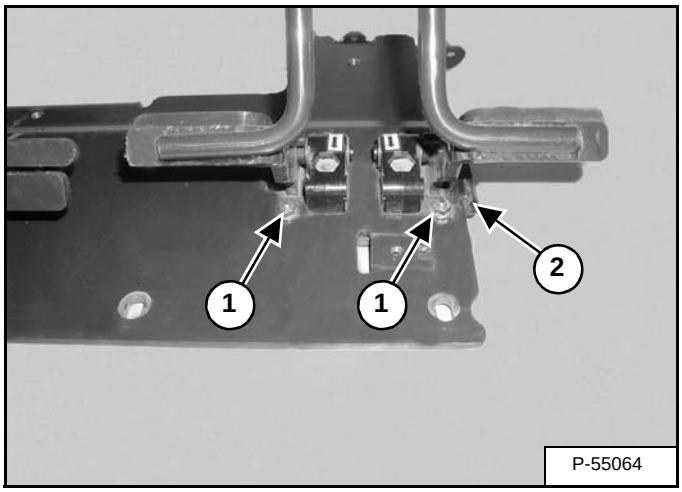
Remove the linkage bars from the steering levers.

Figure 50-100-11



Remove the bolts (Item 1) from the rear stop plate (Item 2) **[Figure 50-100-11]**. Remove the rear stop plate.

Figure 50-100-12

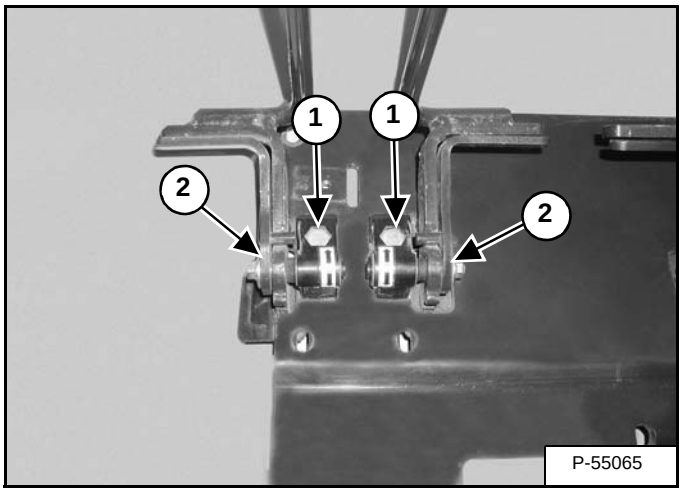


Remove the bolts (Item 1) from the front stop plate (Item 2) **[Figure 50-100-12]**. Remove the front stop plate.

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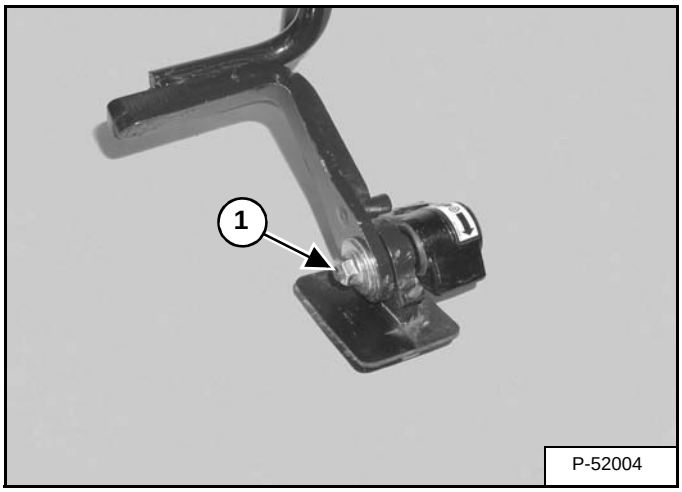
Disassembly And Assembly (Cont'd)

Figure 50-100-13



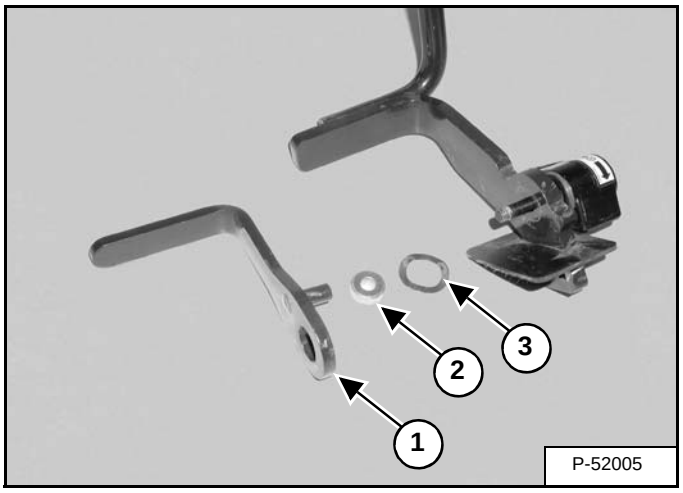
Remove the bolt (Item 1) from both travel control assemblies (Item 2) **[Figure 50-100-13]**. Remove the control assemblies.

Figure 50-100-14



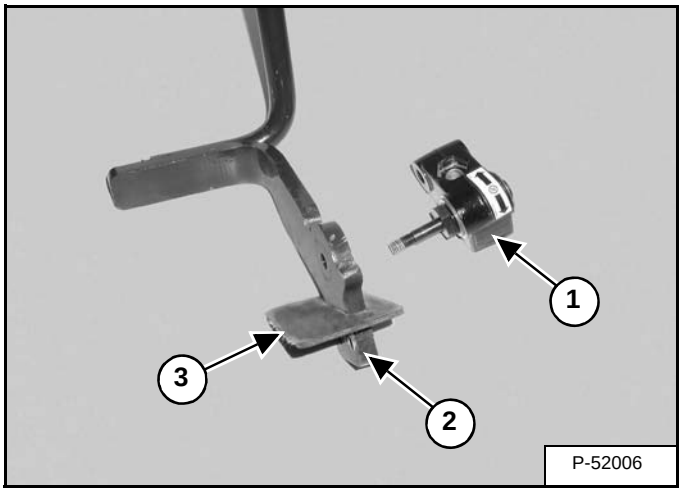
Remove the nut and washer (Item 1) **[Figure 50-100-14]**.

Figure 50-100-15



Remove the foot pedal (Item 1), bushing (Item 2) and wave washer (Item 3) **[Figure 50-100-15]**.

Figure 50-100-16



Remove the lever mount (Item 1) from the control lever (Item 2) **[Figure 50-100-16]**.

Remove the dust cover (Item 3) **[Figure 50-100-16]**.

NOTE: After the lever components are installed in the Excavator, the levers must be adjusted for neutral, forward and reverse.

Assembly

Clean all parts in solvent and dry with compressed air.

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

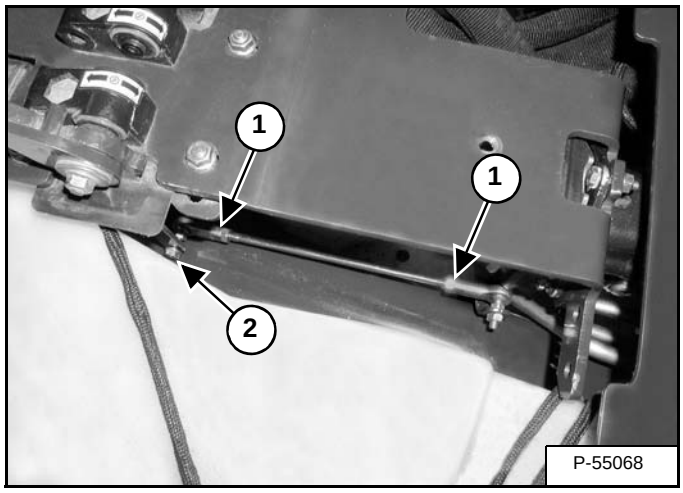
https://www.pdfmanual4trucks.com/

Adjustment

Remove the floor mat and floor plate. (See Removal And Installation on Page 50-120-1)

Neutral

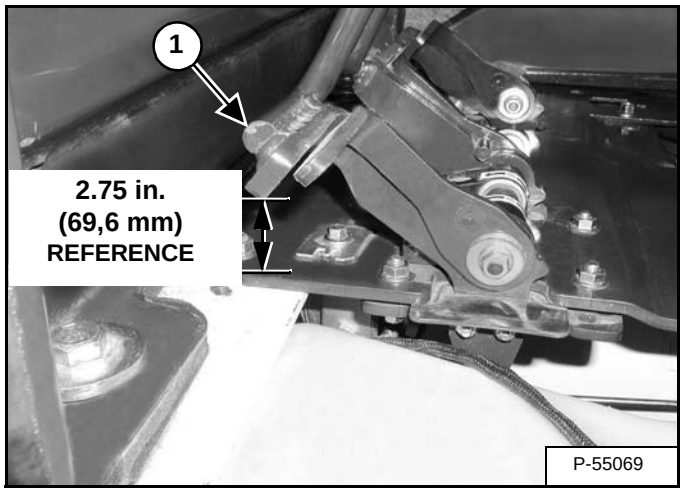
Figure 50-100-17



Loosen the nuts (Item 1) **[Figure 50-100-17]** on the travel linkage.

Remove the nut on the ball joint (Item 2) **[Figure 50-100-17]**.

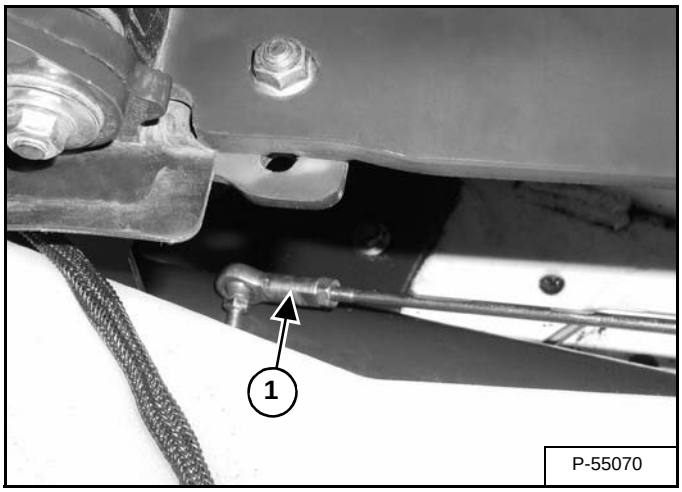
Figure 50-100-18



Hold the travel lever (Item 1) **[Figure 50-100-18]** in the neutral position.

Neutral position is approximately 2.75 inch (69,6 mm) (reference dimension only) above the top of the pedal mount plate **[Figure 50-100-17]**. Hold the levers in this position and adjust the linkage as follows.

Figure 50-100-19



Turn the ball joint (Item 1) **[Figure 50-100-19]** to adjust the travel lever length.

Install the ball joint and tighten the ball joint nuts.

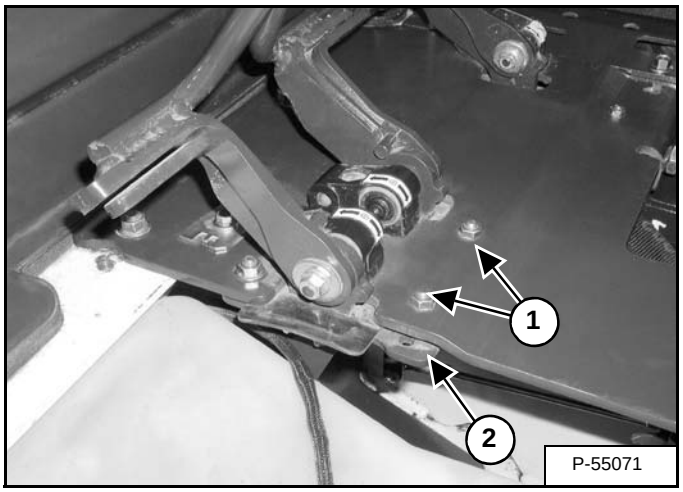
Repeat the procedure for the opposite travel lever.

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Adjustment (Cont'd)

Forward Lever Stop:

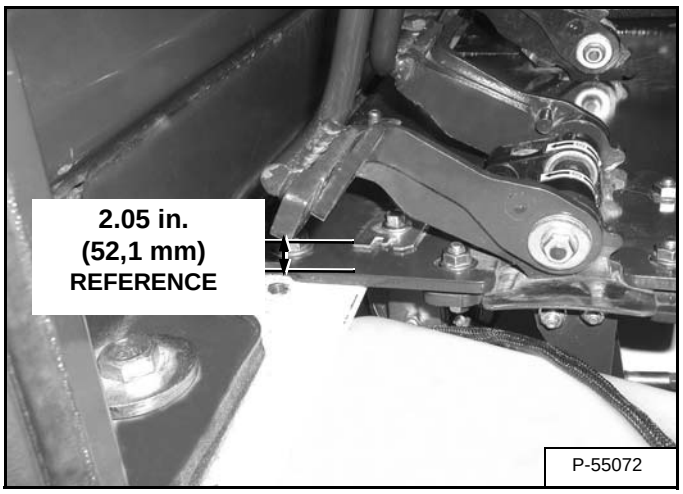
Figure 50-100-20



Loosen the bolts (Item 1) on the pedal stop (Item 2) **[Figure 50-100-20]**.

Hold both travel levers in the forward position.

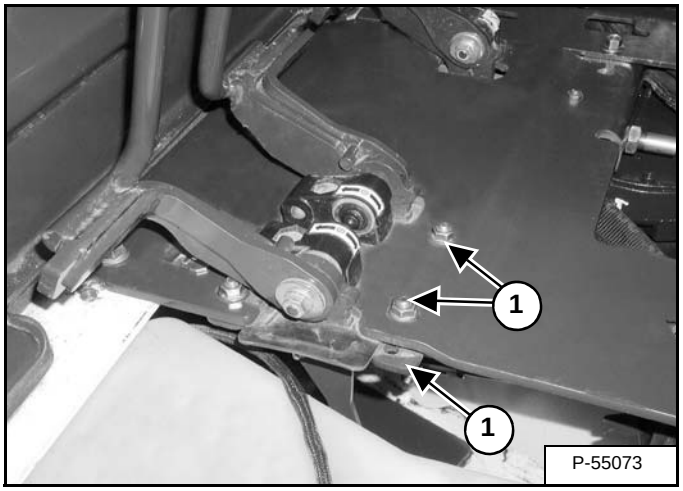
Figure 50-100-21



Forward position is approximately 2.05 inch (52,1 mm) (reference dimension only) above the top to the pedal mount plate **[Figure 50-100-21]**.

The levers will need to be pushed fully forward until the travel control spool is at full stroke. Hold the lever fully forward and proceed to adjusting the pedal stop in the next step.

Figure 50-100-22



Slide the rear pedal stop (Item 1) **[Figure 50-100-22]** forward until it contacts both levers.

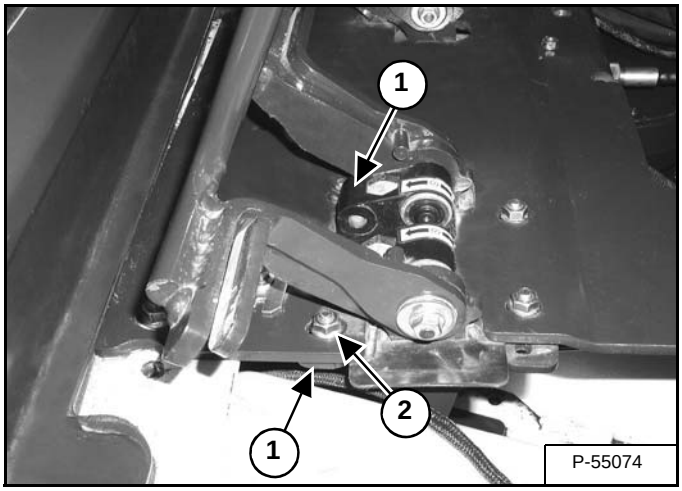
Tighten the bolts (Item 2) **[Figure 50-100-22]** on the pedal stop.

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Adjustment (Cont'd)

Reverse Lever Stop:

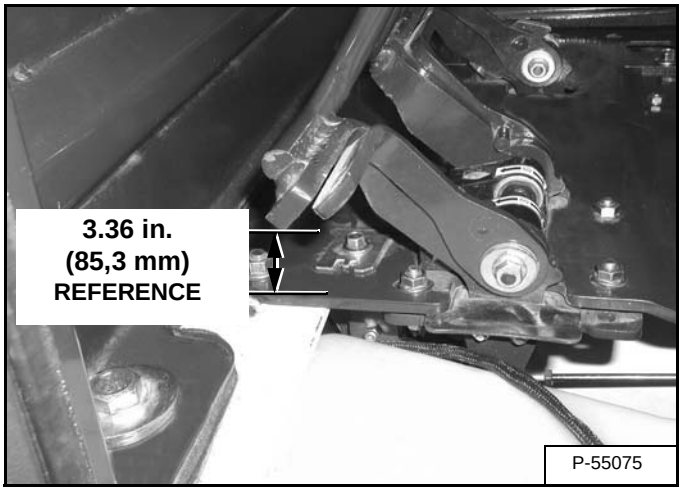
Figure 50-100-23



Loosen the bolts (Item 1) on the pedal stop (Item 2) **[Figure 50-100-23]**.

Hold both travel levers in the reverse position.

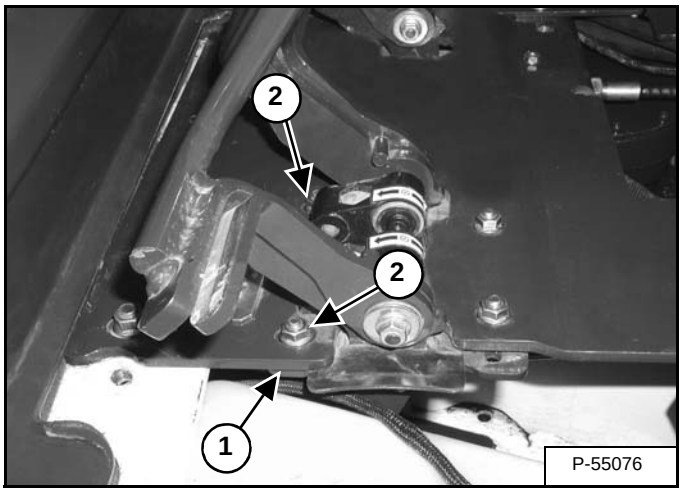
Figure 50-100-24



Reverse position is approximately 3.36 inch (85,3 mm) (reference dimension only) above the top of the pedal mount plate **[Figure 50-100-24]**.

The levers will need to be pulled fully back until the travel control spool is at full stroke. Hold the lever fully back and proceed to adjusting the pedal stop in the next step.

Figure 50-100-25



Slide the front pedal stop (Item 1) **[Figure 50-100-25]** until it contacts both levers.

Tighten the bolts (Item 2) **[Figure 50-100-25]** on the front pedal stop.

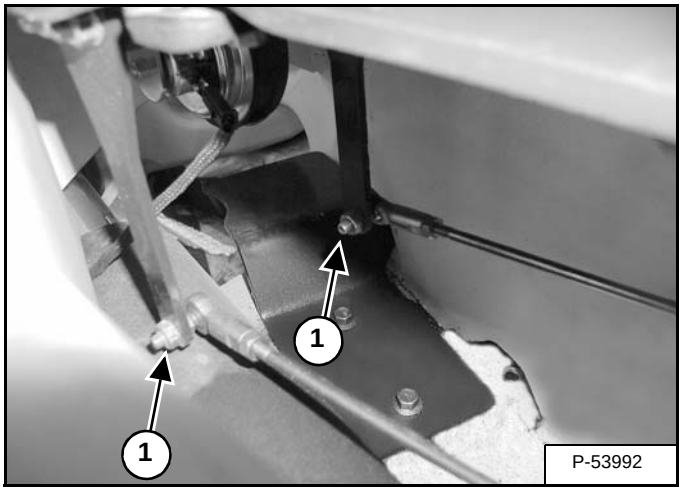
https://www.pdfmanual4trucks.com/

CONTROL LINKAGE ASSEMBLY

Removal And Installation

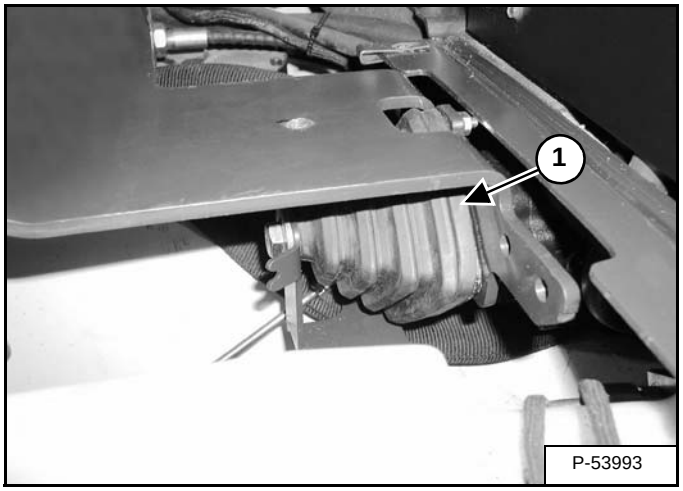
Remove the floor mat and floor plate. (See Removal And Installation on Page 50-120-1)

Figure 50-110-1



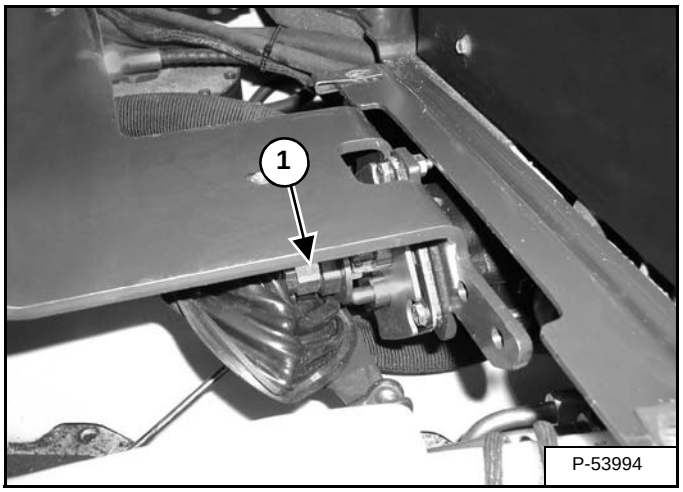
Remove the nuts (Item 1) **[Figure 50-110-1]**, from the left and right linkage bars.

Figure 50-110-2



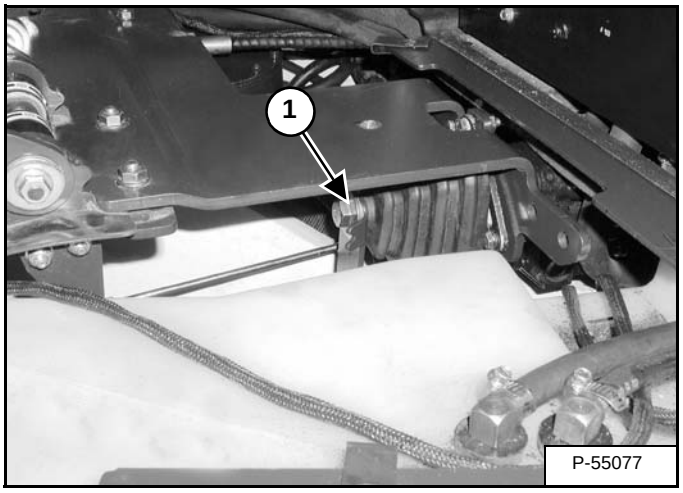
Pull the dust boot (Item 1) **[Figure 50-110-2]** forward.

Figure 50-110-3



Hold the nut (Item 1) **[Figure 50-110-3]**.

Figure 50-110-4



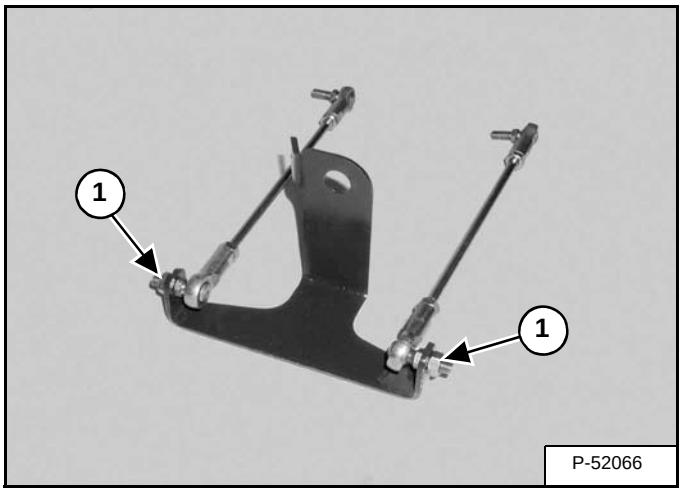
Remove the bolt (Item 1) **[Figure 50-110-4]**.

Remove the control linkage from the Excavator.

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Removal And Installation (Cont'd)

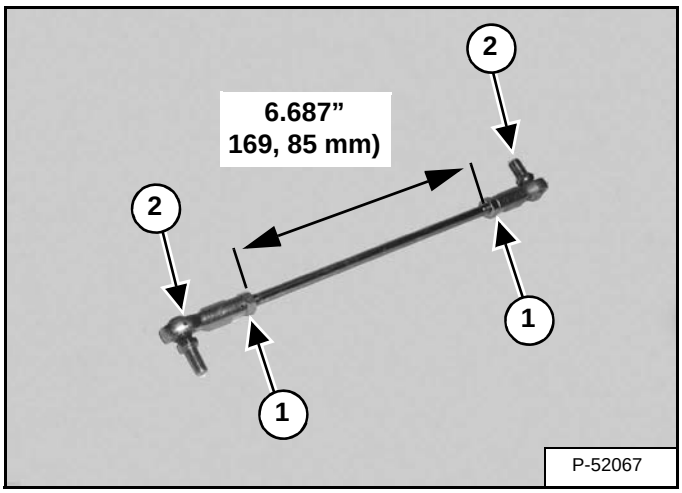
Figure 50-110-5



Remove the nuts (Item 1) **[Figure 50-110-5]** and remove the linkage rods from the mounting plate.

Inspect the ball joints, and replace as needed.

Figure 50-110-6



Loosen the nuts (Item 1). Remove the ball joints (Item 2) **[Figure 50-110-6]**.

Installation: The travel controls must be adjusted for neutral, forward and reverse. (See Adjustment on Page 50-100-6)

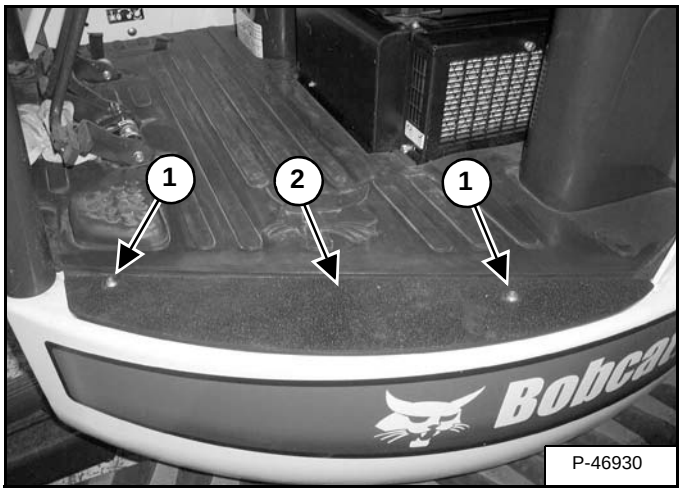
Initial adjustment on the ball joints is 6.687 inch (169, 85 mm).

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FLOOR MAT AND FLOOR PLATES

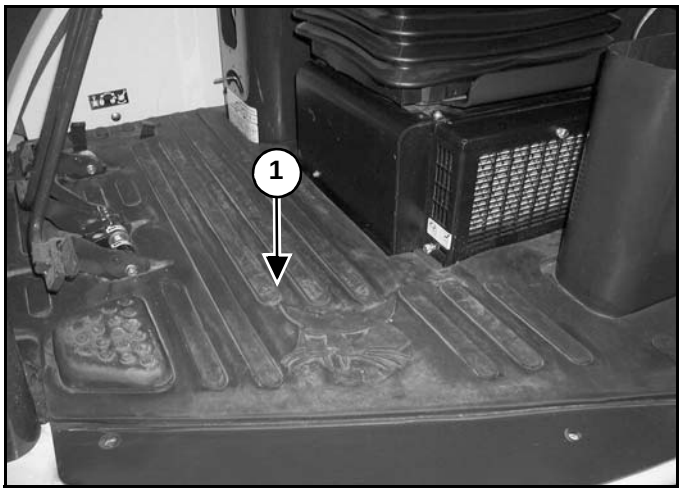
Removal And Installation

Figure 50-120-1



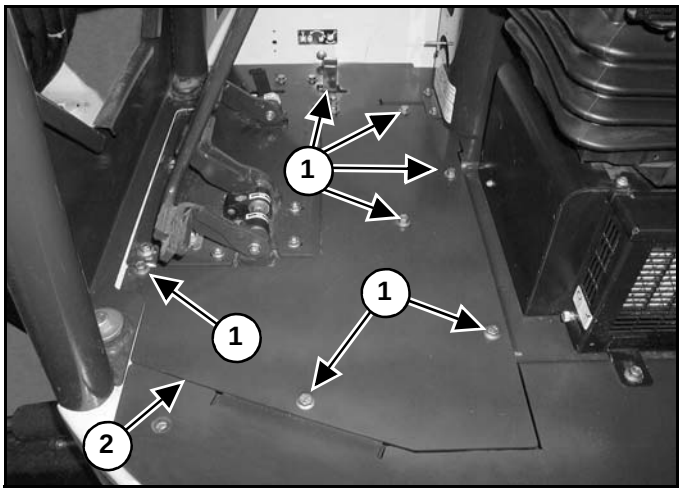
Remove the two bolts (Item 1) and plate (Item 2) **[Figure 50-120-1]**.

Figure 50-120-2



Pull up on and remove the floormat (Item 1) **[Figure 50-120-2]**.

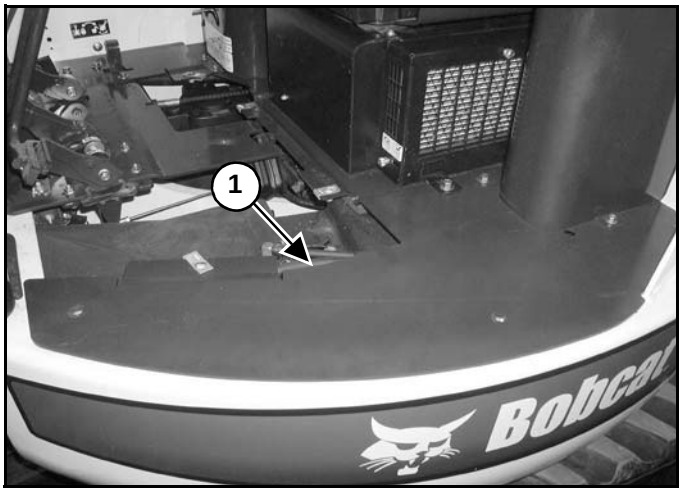
Figure 50-120-3



Mark and remove the bolts (Item 1) from the floor plate (Item 2) **[Figure 50-120-3]**.

Remove the floor plate.

Figure 50-120-4



Lift up on and remove the outboard floor plate (Item 1) **[Figure 50-120-4]**.

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FUEL TANK

Removal And Installation

Drain the fuel tank. (See Draining The Fuel Tank on Page 10-80-2)

Remove the seat and seat mount. (See Removal And Installation on Page 50-40-1)

Remove the evaporator/heater unit. (See Removal And Installation on Page 80-190-1)

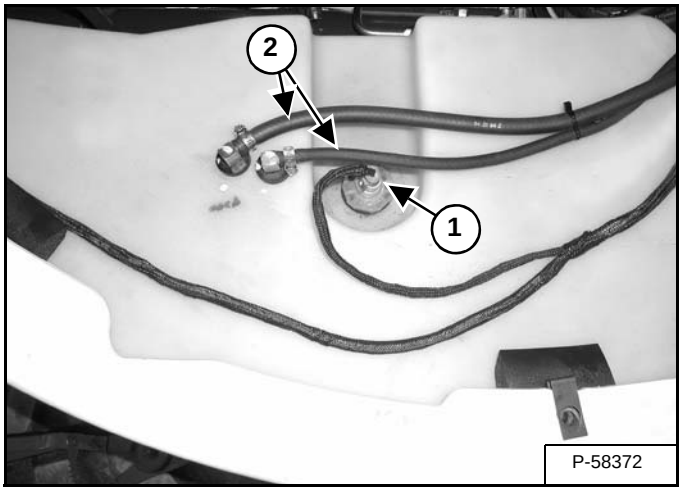
Remove the left console. (See Console Removal And Installation on Page 50-60-8)

Remove the swing cylinder. (See Removal And Installation on Page 20-22-3)

Remove the travel controls. (See Removal And Installation on Page 50-100-1)

Remove the upperstructure light. (See Removal And Installation on Page 60-50-1)

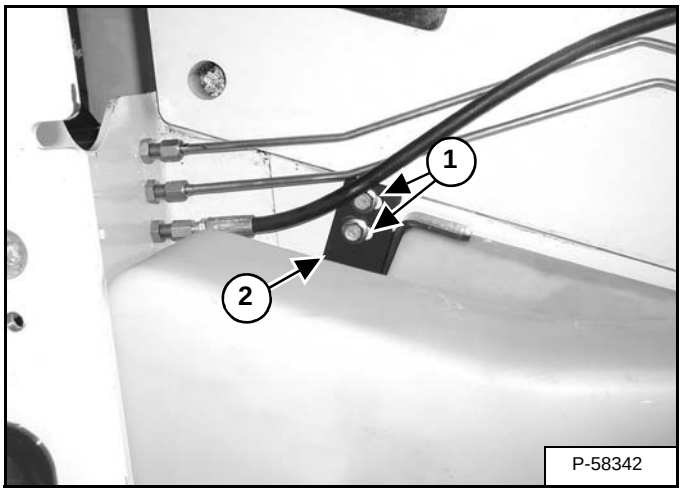
Figure 50-130-1



Remove the wire harness (Item 1) **[Figure 50-130-1]** from the fuel level sender.

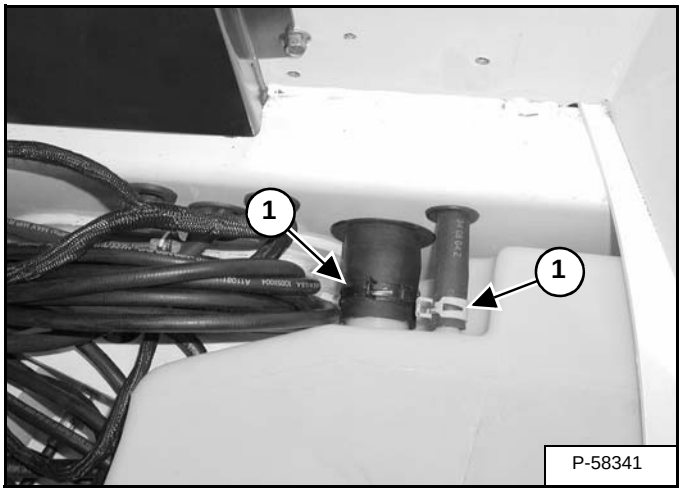
Remove the hoses (Item 2) **[Figure 50-130-1]** from the top of the fuel tank.

Figure 50-130-2



Remove the bolts (Item 1) and clamp (Item 2) **[Figure 50-130-2]**.

Figure 50-130-3



Remove the clamps (Item 1) **[Figure 50-130-3]** and hoses from the fuel tank.

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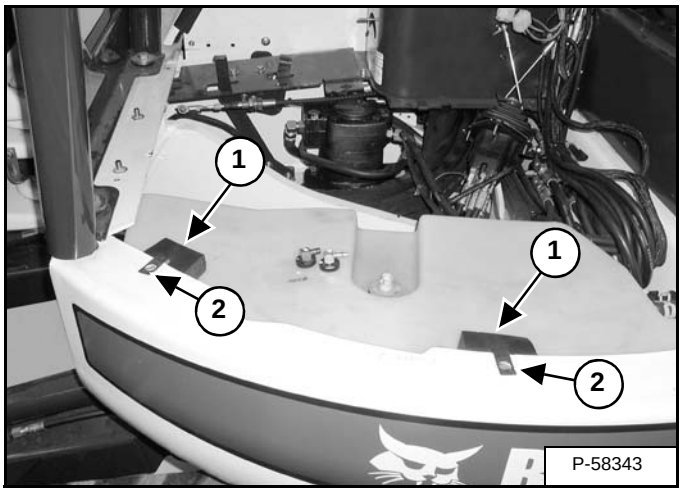
Removal And Installation (Cont'd)

Figure 50-130-4



Move the fuel tank forward and to the right. Remove the fuel tank **[Figure 50-130-4]**.

Figure 50-130-5



Installation: Install the pads (Item 1) under the nuts (Item 2) **[Figure 50-130-5]** to prevent the floor plate bolts from damaging the fuel tank.

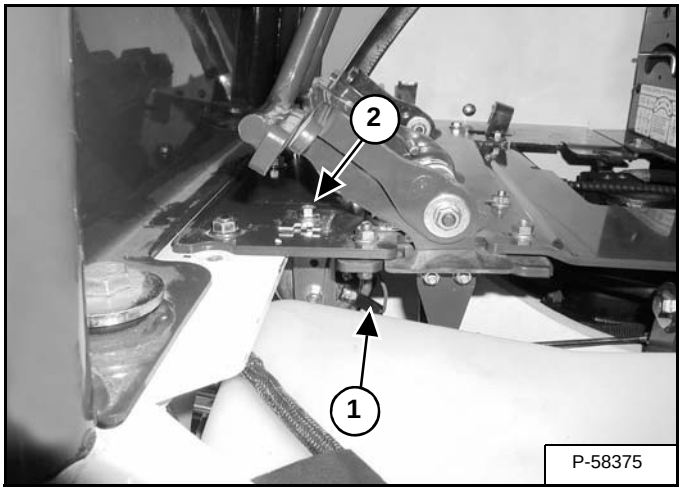
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HORN

Removal And Installation (Earlier Models)

Remove the floor mat and floor plate. (See Removal And Installation on Page 50-120-1)

Figure 50-140-1



Disconnect the horn wire (Item 1) **[Figure 50-140-1]**.

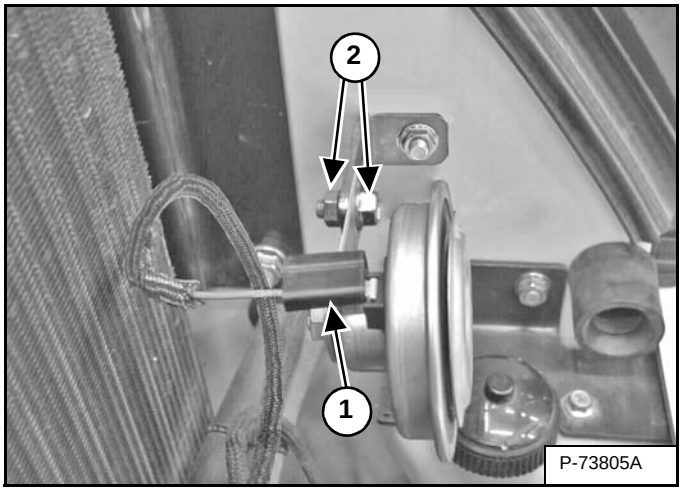
Remove the bolt (Item 2) **[Figure 50-140-1]**.

Remove the horn from the excavator.

Removal And Installation (Later Models)

Open right side cover.

Figure 40-140-2



Disconnect the horn wire (Item 1) **[Figure 40-140-2]**.

Remove the nut, lockwasher, and bolt (Item 2) **[Figure 40-140-2]**.

Remove the horn from the excavator.

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SWING FRAME

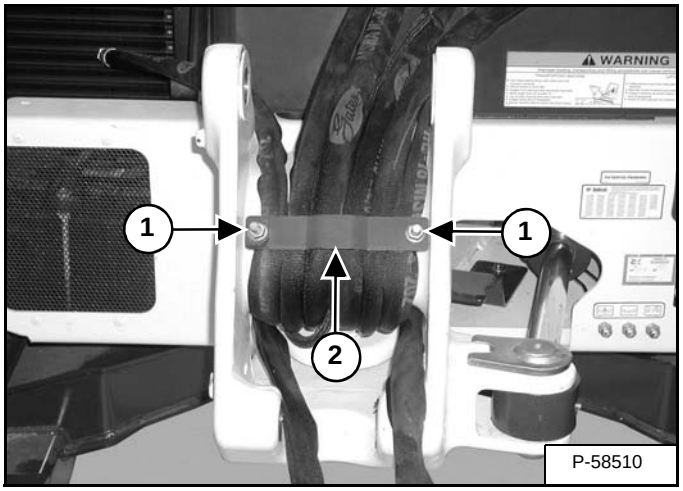
Boom Swing Bracket Removal And Installation

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

Remove the arm. (See Removal And Installation on Page 50-170-1)

Remove the boom. (See Removal And Installation on Page 50-160-1)

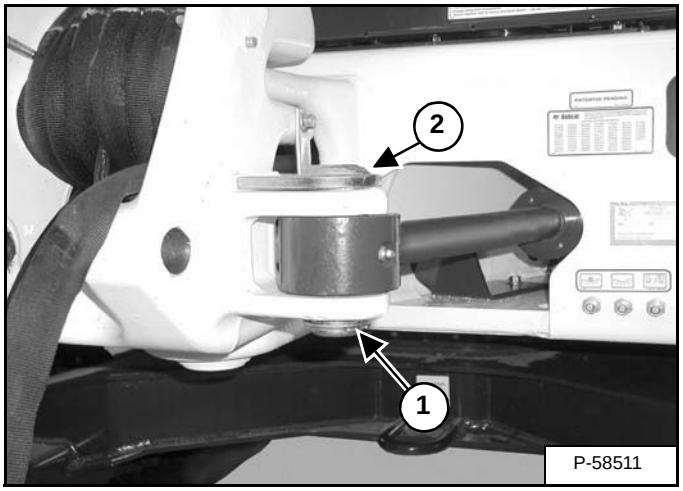
Figure 50-150-1



Remove the bolts (Item 1) and the clamp (Item 2) **[Figure 50-150-1]**.

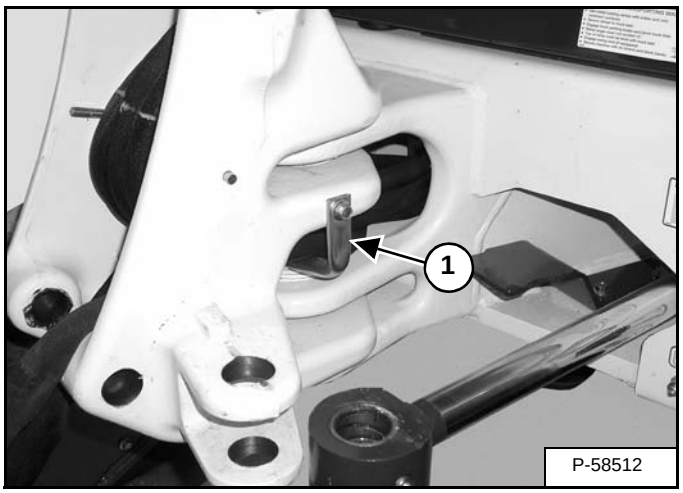
NOTE: When the hoses have been removed from the clamped position, the hoses must be measured for correct clamped length and position. (See Boom Swing Bracket Hose Installation on Page 50-150-5)

Figure 50-150-2



Remove the snap ring (Item 1), washer, and pin (Item 2) **[Figure 50-150-2]** from the boom swing cylinder.

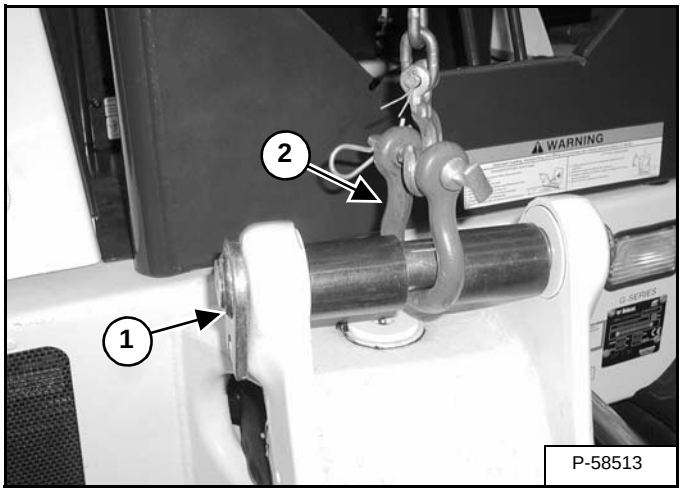
Figure 50-150-3



Remove the hose guide (Item 1) **[Figure 50-150-3]**.

Reposition the hoses to gain clearance.

Figure 50-150-4



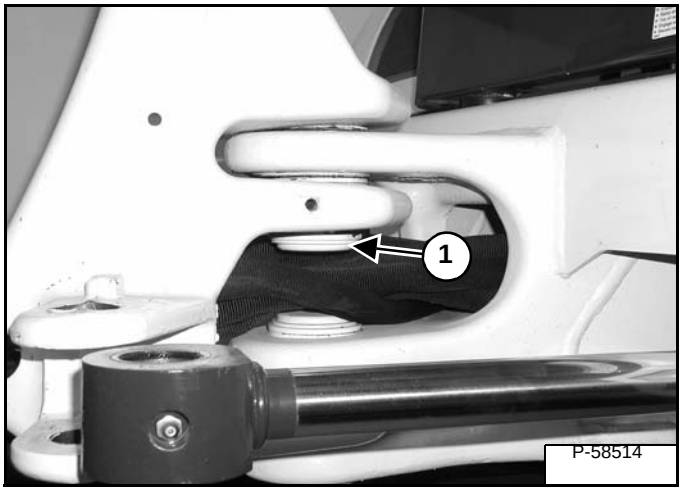
Install the boom pin (Item 1) using spacers to position a lifting clevis (Item 2) **[Figure 50-150-4]** on the center of the boom pin.

NOTE: The spacers will prevent the clevis from sliding on the boom pin, causing the boom swing bracket to tip from side to side.

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Boom Swing Bracket Removal And Installation (Cont'd)

Figure 50-150-5



Remove the snap ring (Item 1) **[Figure 50-150-5]** and washer from the top pin.

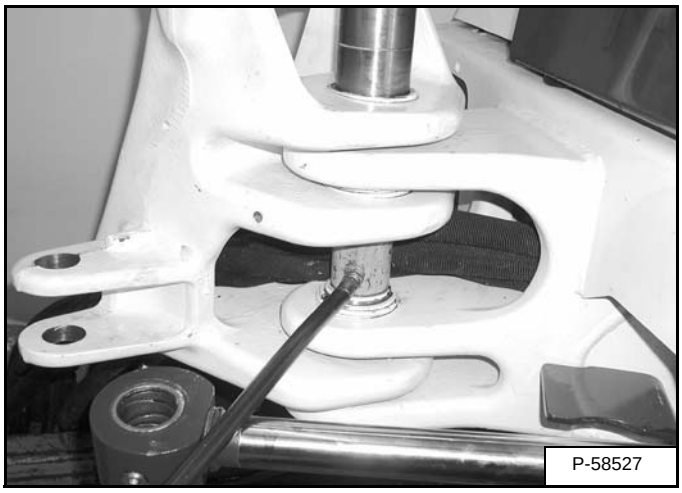
IMPORTANT

Do Not use a porta-power to press out the swing bracket pivot pins without the lower pin being supported. Excess pressure can cause the swing bracket casting to crack.

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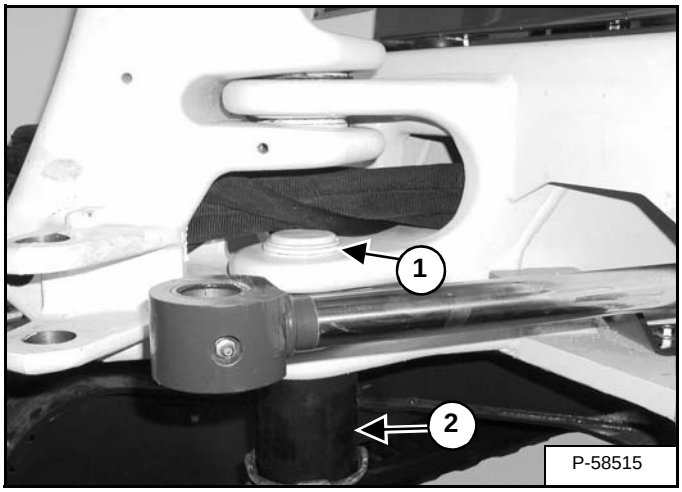
Support the bottom pin with a jack.

Figure 50-150-6



Install a porta-power between the top and bottom pins and press the top pin out **[Figure 50-150-6]**.

Figure 50-150-7



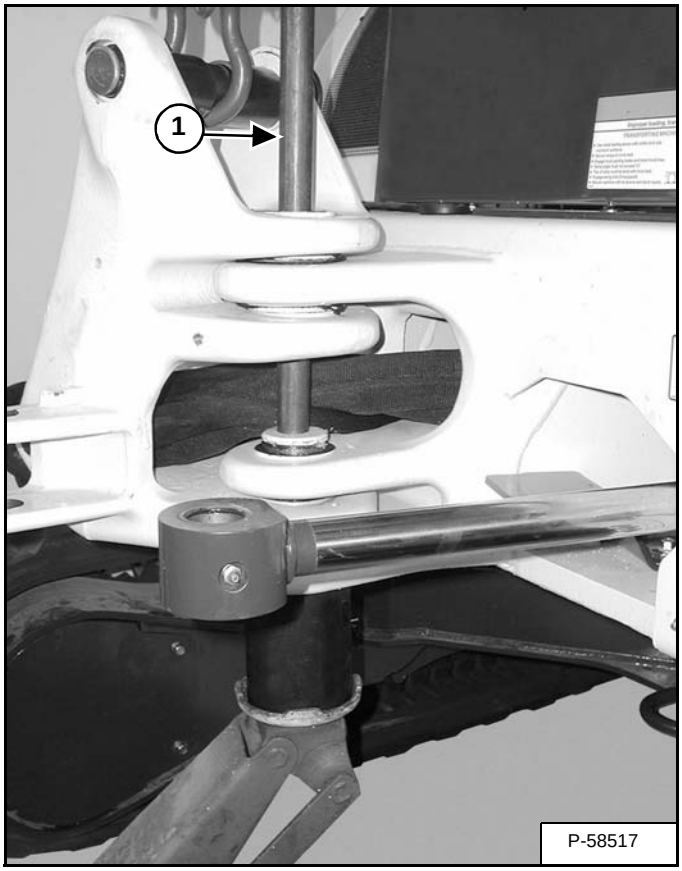
Remove the snap ring (Item 1) **[Figure 50-150-7]** and washer from the pin.

Install a spacer tube (Item 2) **[Figure 50-150-7]** and jack under the swing bracket to support the casting. The spacer tube must be large enough to allow the pin to be driven in the center of the spacer for pin removal.

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Boom Swing Bracket Removal And Installation (Cont'd)

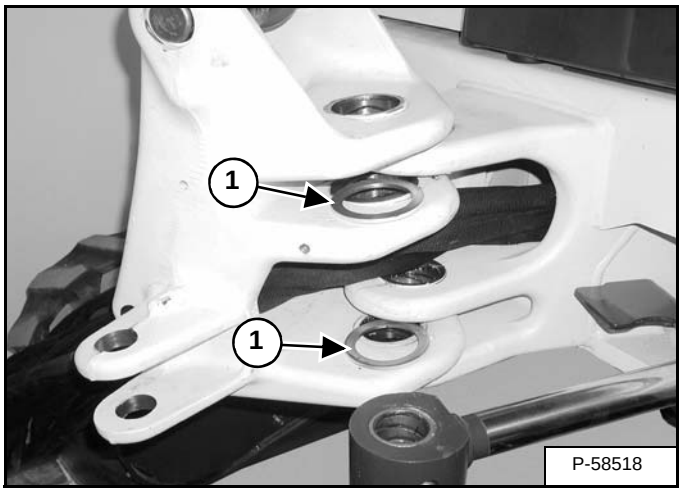
Figure 50-150-8



Use a large punch (Item 1) **[Figure 50-150-8]** and drive the bottom swing bracket pin out.

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

Figure 50-150-9



Remove the top and bottom spacer (Item 1) **[Figure 50-150-9]** from the swing bracket.

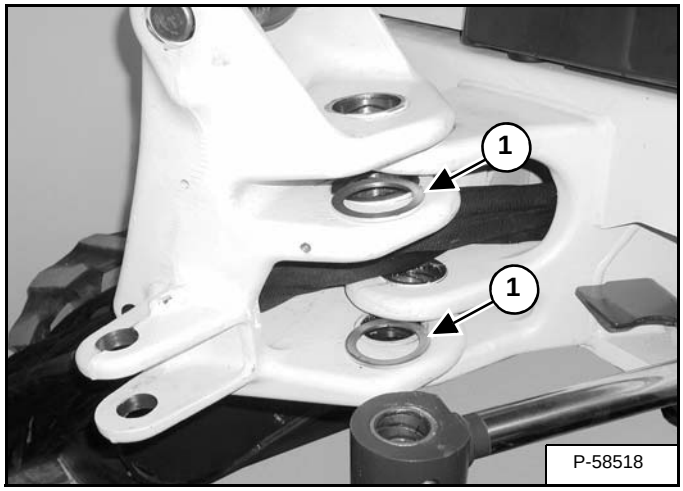
Remove the swing bracket.

Inspect the bushings for damage. Replace damaged bushings as necessary. (See "Bushing Removal" on Page 50-150-6)

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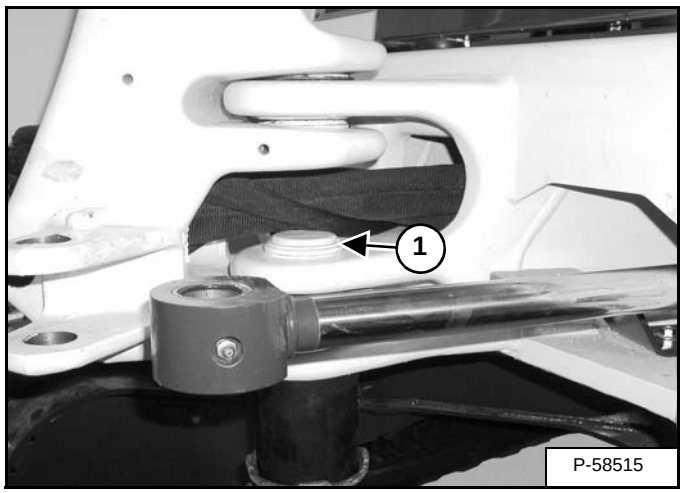
Boom Swing Bracket Removal And Installation (Cont'd)

Figure 50-150-10



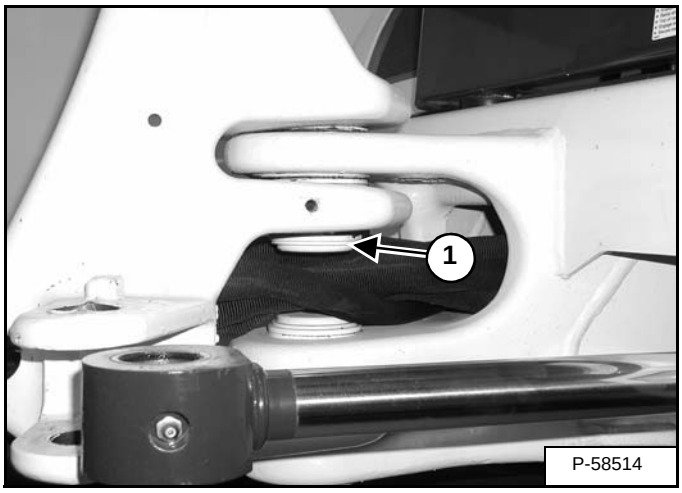
Installation: Install the top and bottom spacer (Item 1) **[Figure 50-150-10]** on the swing bracket. Install the swing bracket.

Figure 50-150-11



Installation: Align the boom swing bracket and install the lower pin. Install the washer and snap ring (Item 1) **[Figure 50-150-11]**. Lift up on the boom swing bracket.

Figure 50-150-12

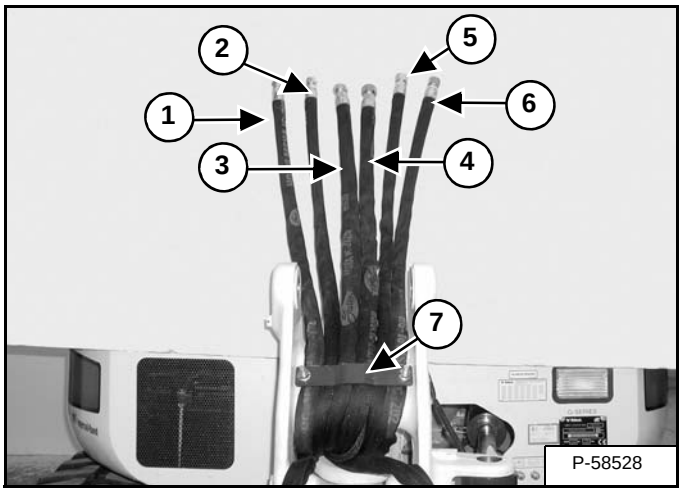


Installation: Install the top pin, washer and snap ring (Item 1) **[Figure 50-150-12]**.

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Boom Swing Bracket Hose Installation

Figure 50-150-13

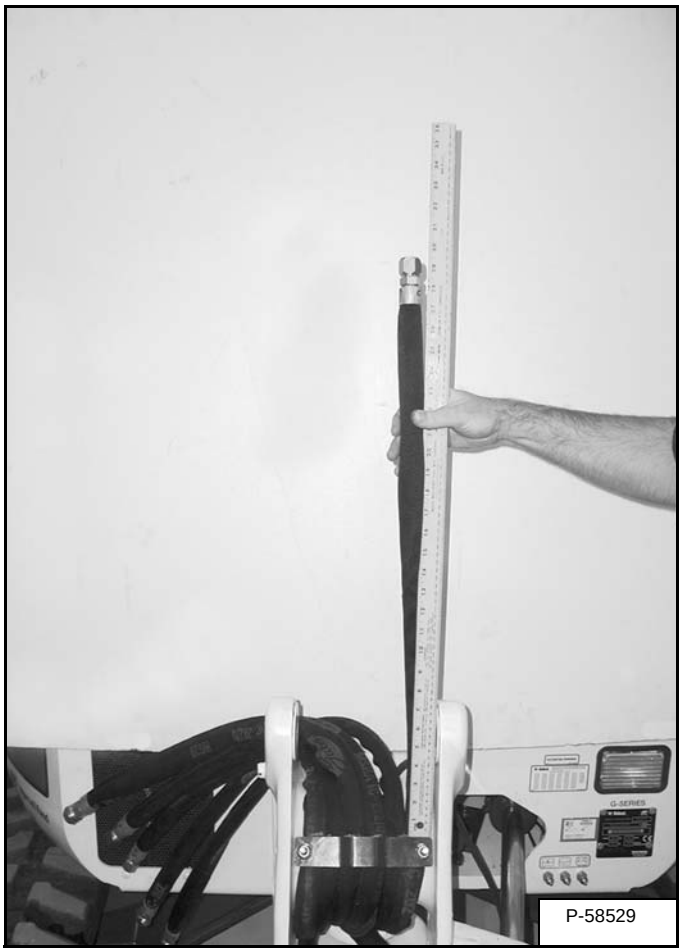


Route the hoses through the boom swing bracket as follows **[Figure 50-150-13]**:

1. Bucket Base End Hose
2. Bucket Rod End Hose
3. Arm Base End Hose
4. Male Quick Coupler Hose
5. Arm Rod End Hose
6. Female Quick Coupler Hose

Install the hoses and hose clamp (Item 7) **[Figure 50-150-13]**. Do not tighten the clamp at this time.

Figure 50-150-14



Measure the length of the hoses from the top of the clamp to the end of each hose **[Figure 50-150-14]**.

Tighten the clamp bolts when the hoses are 30 inches (762 mm) from the top of the clamp.

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Bushing Removal

IMPORTANT

Do Not point (hammer) on the boom swing bracket. Excess pressure can cause the casting to crack.

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The following parts will be needed for removal and installation of the boom swing bracket bushings:

Bolt - 3/4 x 6 inches or (19 x 153 mm) long.

Nut - 3/4 inch or (19 mm)

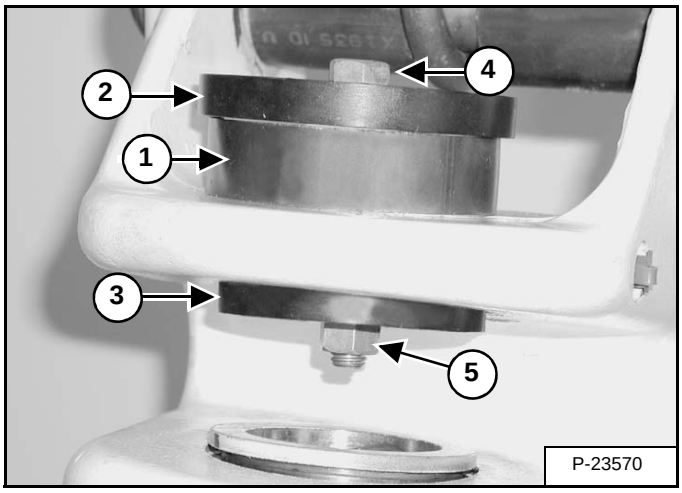
Washer -7/8 I.D. x 3-1/8 O.D. x 3/8 inch thick or (22 mm I.D. x 79 mm O.D. x 10 mm thick

Washer - 7/8 I.D. x 3-1/2 O.D. x 3/8 inch thick or (22 mm I.D. x 89 mm O.D. x 10 mm thick)

Washer - 7/8 I.D. x 4-1/2 O.D. x 1/2 inch thick or (22 mm I.D. 114 mm O.D. x 13 mm thick)

Spacer - 3-1/2 I.D. x 4-1/4 O.D. x 1-1/2 inch thick or (89 mm I.D. x 108 mm O.D. x 38 mm thick).

Figure 50-150-15



Install the spacer (Item 1) and washer (Item 2) **[Figure 50-150-15]** over the flanged end of the bushing.

The spacer (Item 1) **[Figure 50-150-15]** must be centered over the bushing to avoid contact between the bushing and the spacer during removal.

Install the washer (Item 3) **[Figure 50-150-15]** onto the opposite end of the bushing. This washer must be centered on the bushing and must not contact the casting.

Install the bolt (Item 4) and the nut (Item 5) **[Figure 50-150-15]** through the washers and the spacer.

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

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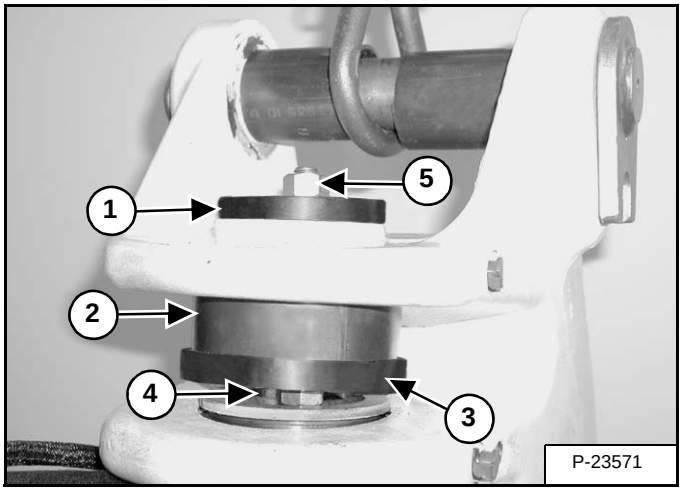
Bushing Installation

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

Center the bushing on the casting hole.

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

Figure 50-150-16



Put the washer (Item 1) **[Figure 50-150-16]** over the flanged end of the bushing.

Put the spacer (Item 2) and the washer (Item 3) **[Figure 50-150-16]** over the bushing hole casting. Center the spacer and the washer over the bushing hole.

Install the bolt (Item 4) through the washers, the spacer and the bushing. Install the nut (Item 5) **[Figure 50-150-16]**.

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

Figure 50-150-17

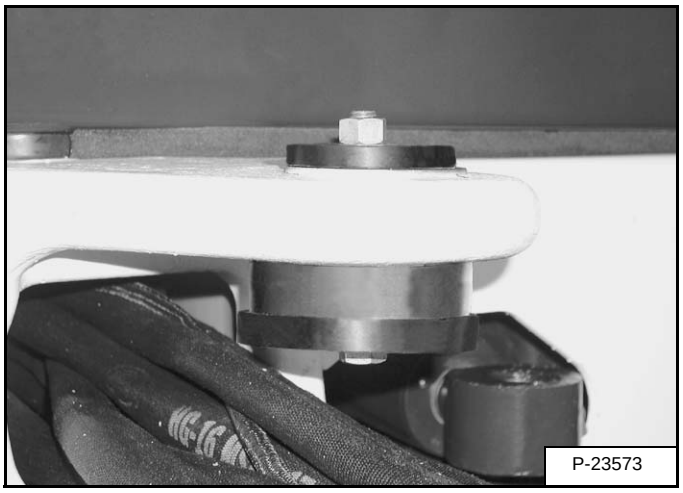
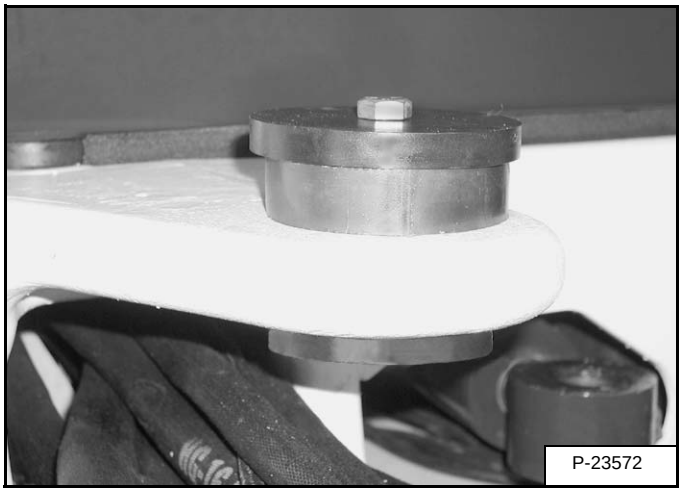


Figure 50-150-18



The same procedure is used to remove and install the bushings into the frame castings **[Figure 50-150-17]** & **[Figure 50-150-18]**.

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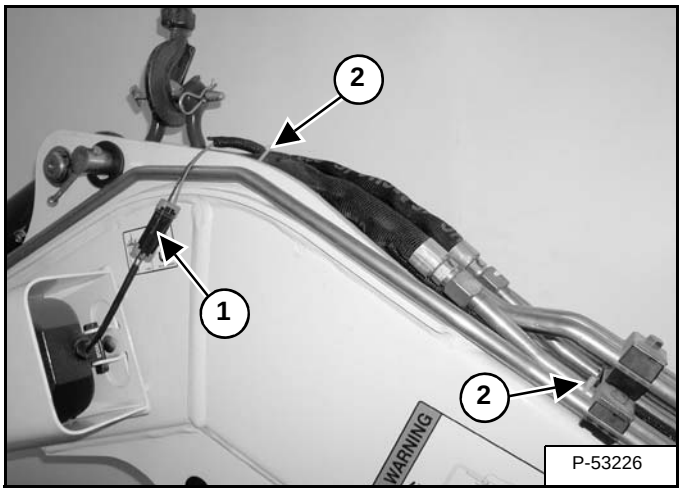
BOOM

Removal And Installation

Remove the arm. (See Removal And Installation on Page 50-170-1)

Remove the boom cylinder. (See Removal And Installation on Page 20-20-3)

Figure 50-160-1



Disconnect the boom light wire harness (Item 1) **[Figure 50-160-1]**.

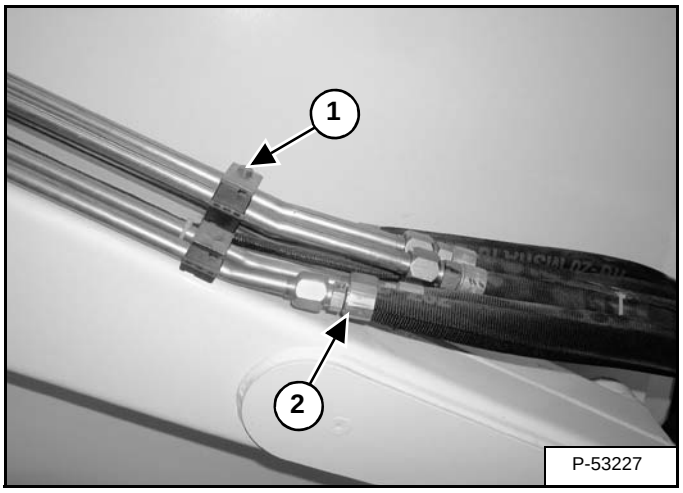
Cut and remove the cable ties (Item 2) **[Figure 50-160-1]**.

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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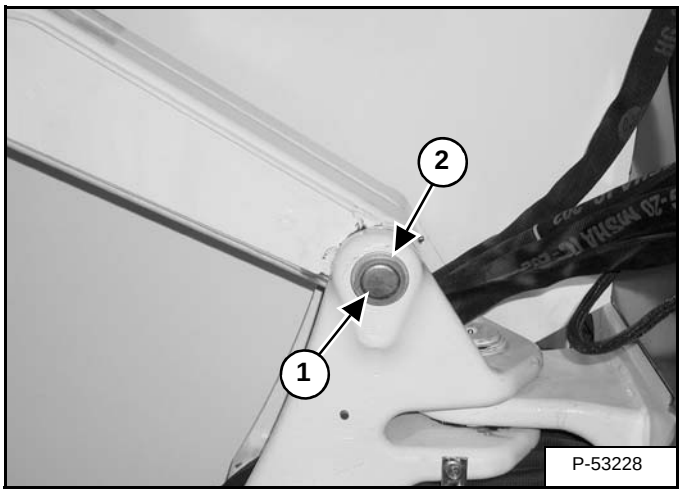
Figure 50-160-2



Remove the tubeline clamp (Item 1) **[Figure 50-160-2]**.

Mark and remove the hoses (Item 2) **[Figure 50-160-2]**.

Figure 50-160-3



Remove the snapring (Item 1), washers (Item 2) **[Figure 50-160-3]** and pin.

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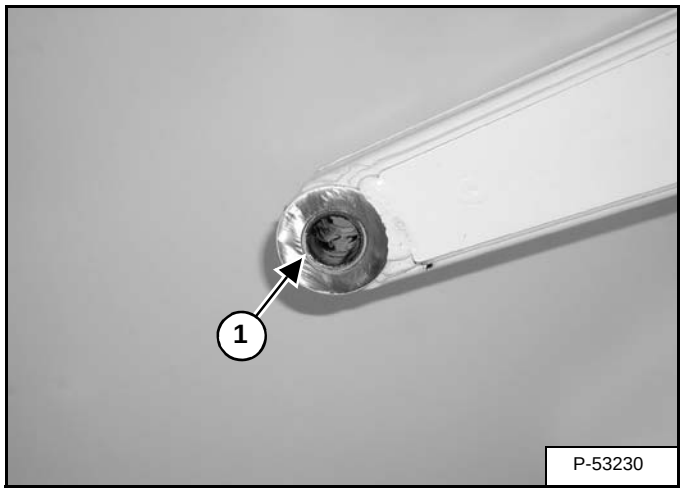
Removal And Installation (Cont'd)

Figure 50-160-4



Remove the boom **[Figure 50-160-4]**.

Figure 50-160-5

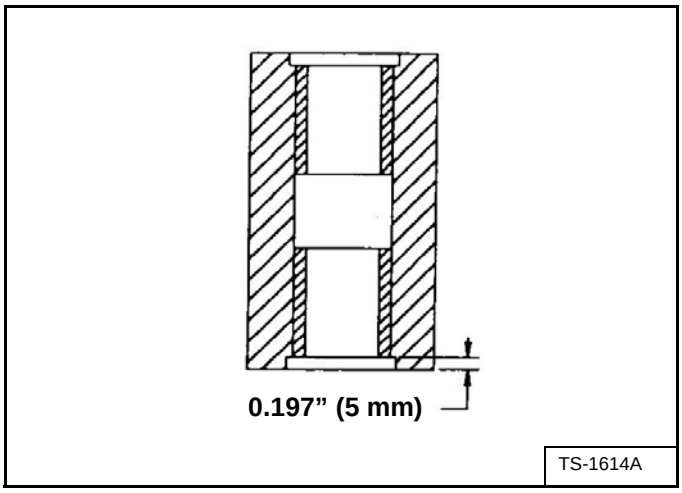


Remove the seals (Item 1) **[Figure 50-160-5]** from both sides of the boom.

Remove the bushings from both sides of the boom.

Install the new bushings in the boom.

Figure 50-160-6



Install the bushings until they are seated 0.197 inch (5 mm) in the pin boss **[Figure 50-160-6]**. (Both sides)

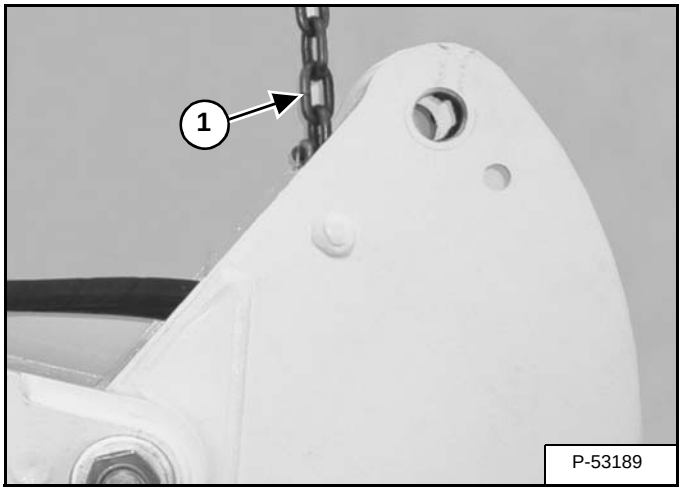
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ARM

Removal And Installation

Remove the arm cylinder. (See Removal and Installation on Page 20-21-3)

Figure 50-170-1



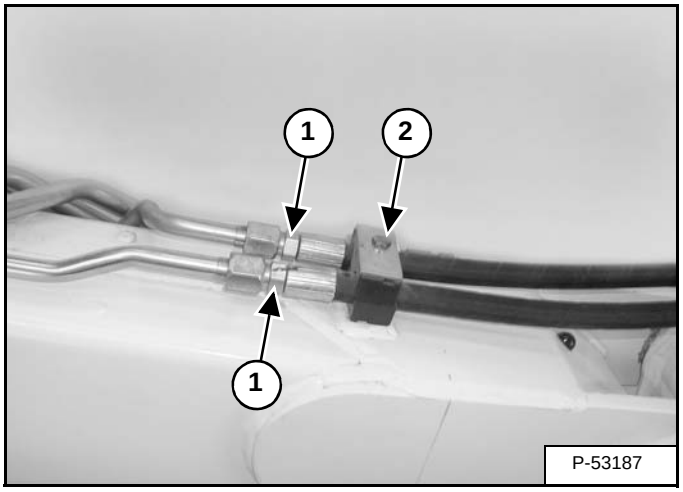
Support the arm with a chain hoist (Item 1) **[Figure 50-170-1]**.

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.

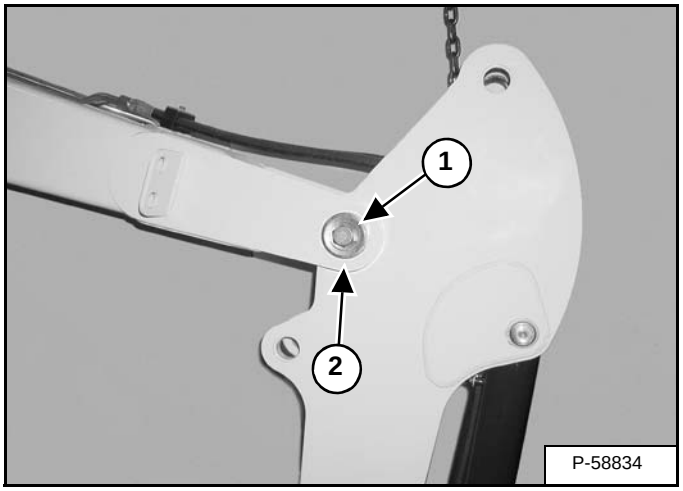
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Figure 50-170-2



Mark and remove the hoses (Item 1). Remove the bolt (Item 2) **[Figure 50-170-2]** and tubeline clamps.

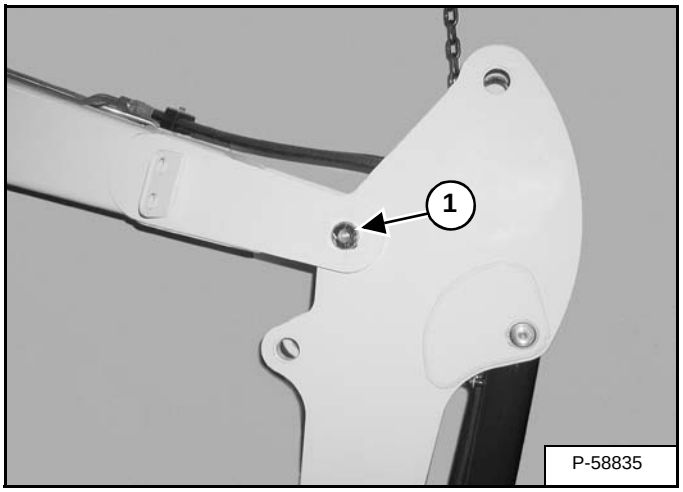
Figure 50-170-3



Remove the bolt (Item 1) and washers (Item 2) **[Figure 50-170-3]**.

Installation: Tighten the bolt until it is seated firmly against the boom. Do not over tighten and deflect the boom mounting plates.

Figure 50-170-4



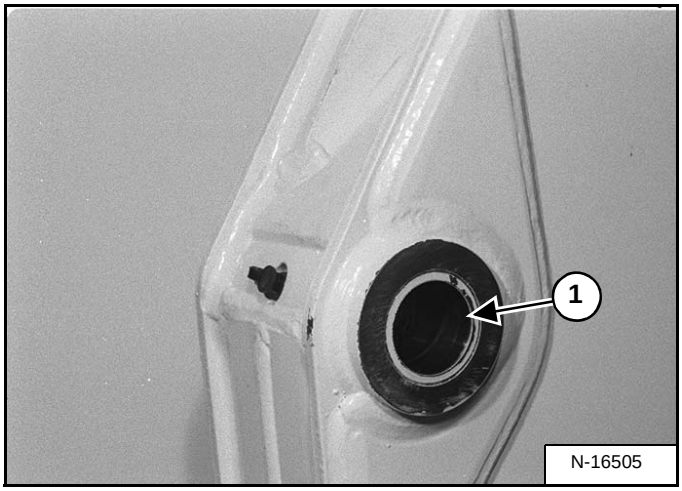
Remove the pin (Item 1) **[Figure 50-170-4]**.

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Arm To Boom Bushing Removal And Installation

Remove the seal from both sides of the arm.

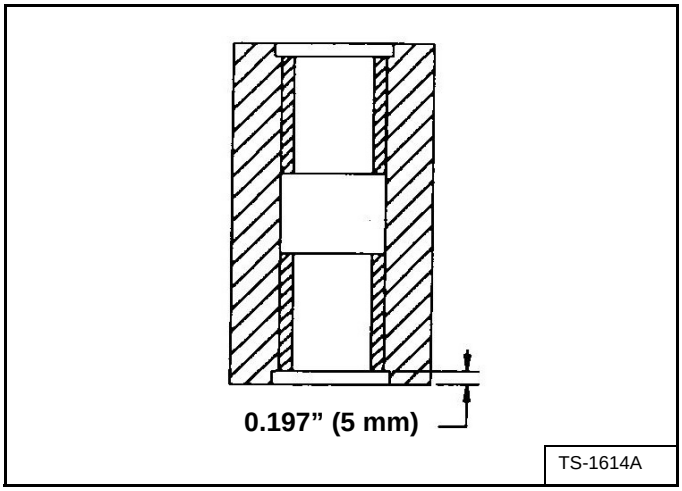
Figure 50-170-5



Remove the bushings (Item 1) **[Figure 50-170-5]** from both sides of the arm.

Install the new bushings in the arm.

Figure 50-170-6



Install the bushings until they are seated 0.197 inches (5 mm) in the pin boss **[Figure 50-170-6]** (both sides).

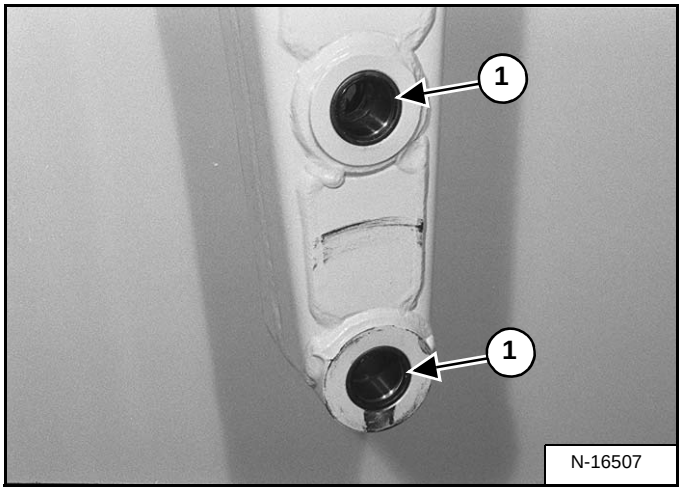
Install new seals, on both sides of the arm.

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Arm To Bucket And Bucket Link Bushing Removal & Installation

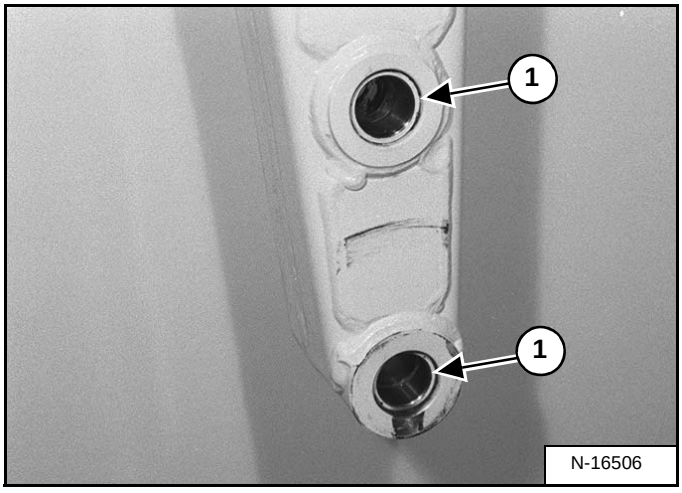
Remove the seal from both sides of the arm.

Figure 50-170-7



Remove the dust seals (Item 1) **[Figure 50-170-7]** from both sides of the arm.

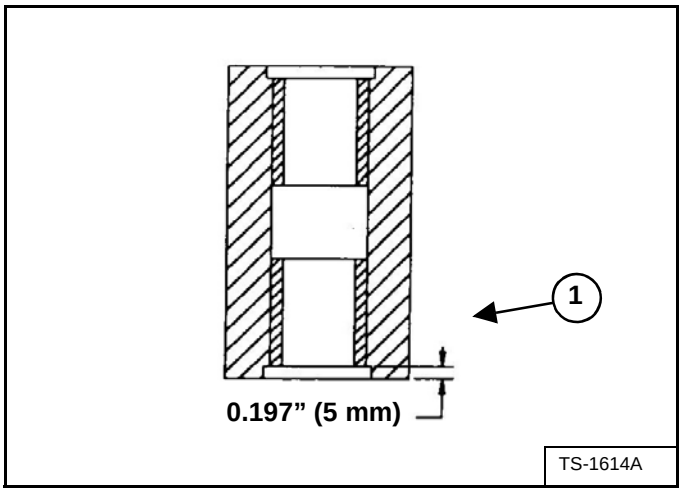
Figure 50-170-8



Remove the bushings (Item 1) **[Figure 50-170-8]** from both sides of the arm.

Install the new bushings in the arm.

Figure 50-170-9



Install the bushings until they are seated 0.197 inches (5 mm) in the pin boss **[Figure 50-170-9]** (both sides).

Install the seals on both sides of the arm.

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Bucket Teeth Removal And Installation

WARNING

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

- **Pressurized fluids and springs or other stored energy components.**
- **Flying debris or loose material is present.**
- **Engine is running.**
- **Tools are being used.**

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Position the bucket so the bucket teeth are at a 30° angle up from the ground for accessibility to the teeth.

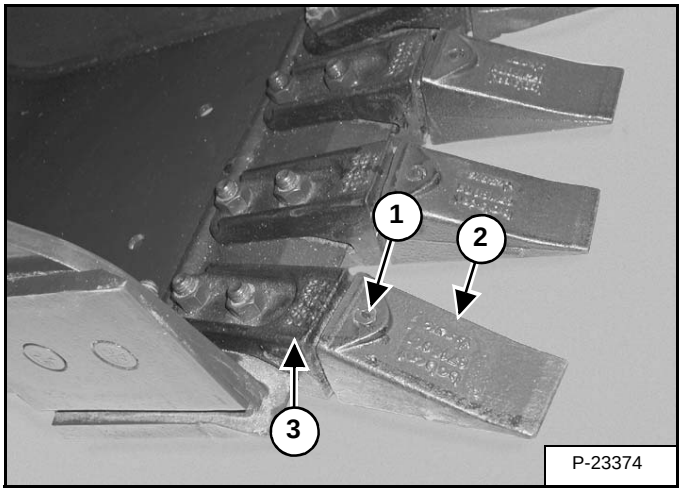
Lower the boom until the bucket is fully on the ground.

Stop the engine and exit the excavator.

NOTE: Early and later style tooth points and retaining pins are not interchangeable.

Early Style bucket Teeth

Figure 50-180-1

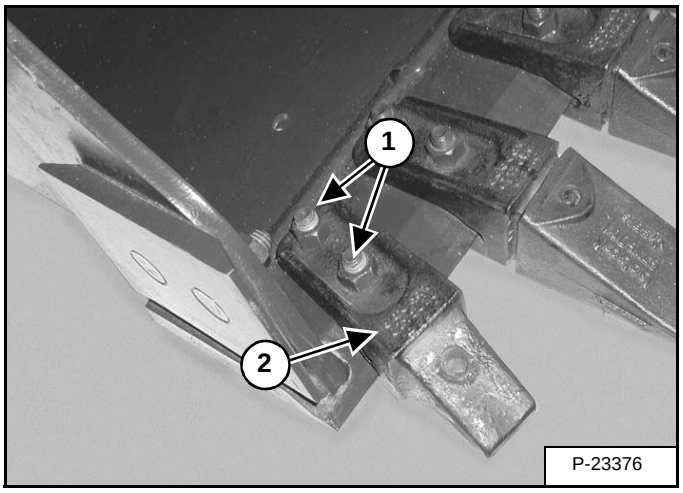


Remove the retaining pin (Item 1) from the tooth point (Item 2) **[Figure 50-180-1]**.

Remove the tooth point (Item 2) from the shank (Item 3) **[Figure 50-180-1]**.

Installation: Position the new tooth point on the shank and install a new retaining pin. Install the retaining pin until it is flush with the top of the point.

Figure 50-180-2

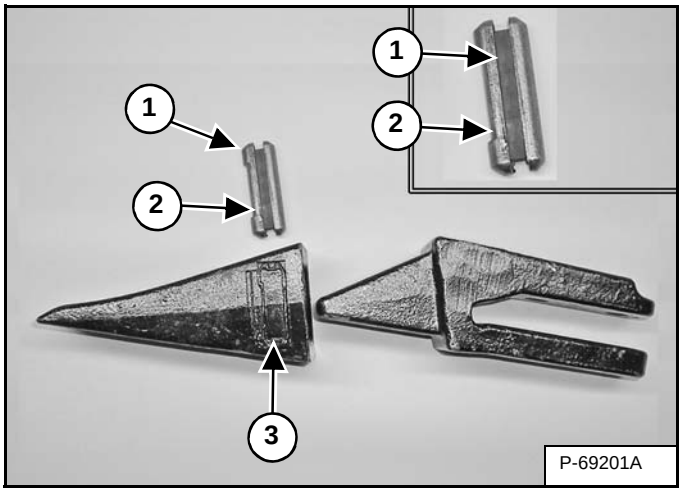


Remove the two nuts (Item 1) and bolts from the tooth shank (Item 2) **[Figure 50-180-2]**. Remove the tooth shank.

Installation: Tighten the nuts to 90 - 100 ft.-lb. (125 - 135 N•m) torque.

Later Style Bucket Teeth

Figure 50-180-3



The removal and installation procedure for the later style tooth point and tooth assembly is the same as the early. style.

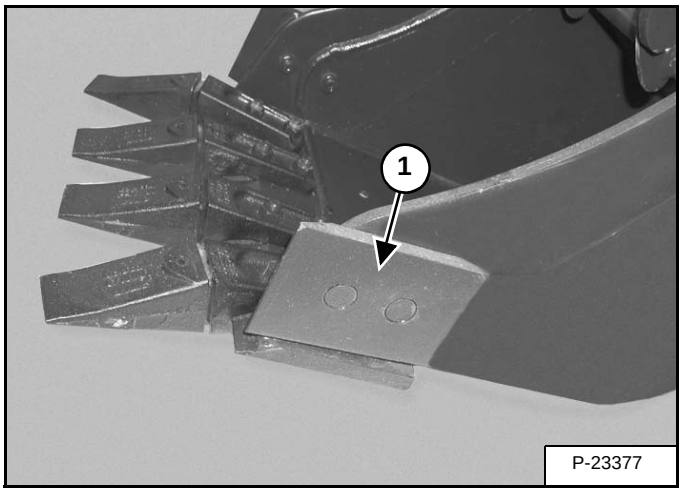
The later style tooth has a unique retaining pin (Item 1). The retaining pin must be installed as shown [notch (Item 2) to the front] for proper fit and tooth retention. The side of the tooth point (Item 3) **[Figure 50-180-3]** also shows the correct orientation of the retaining pin.

Installation: Position the new tooth point on the shank and install a new retaining pin. Install the retaining pin until it is flush with the top of the point.

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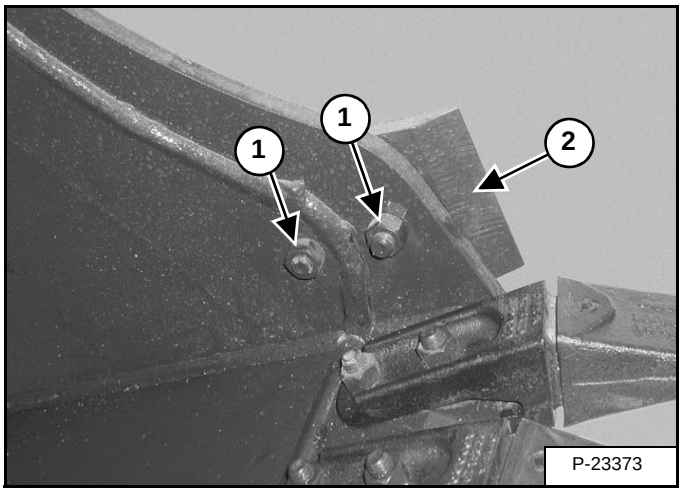
Bucket Side Cutting Edge Removal And Installation

Figure 50-180-4



The bucket side cutting edges (Item 1) **[Figure 50-180-4]** are reversible.

Figure 50-180-5



Remove the two bolts and nuts (Item 1) **[Figure 50-180-5]**.

Installation: Tighten the nuts to 90 - 100 ft.-lb. (125 - 135 N•m) torque.

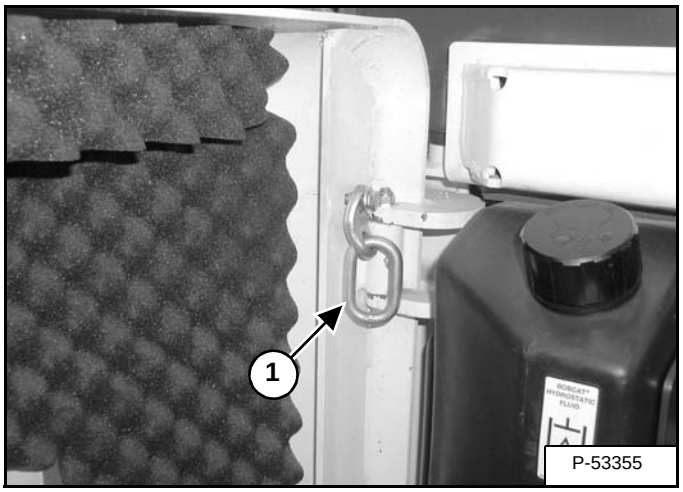
Remove the cutting edge (Item 2) **[Figure 50-180-5]**.

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TAILGATE

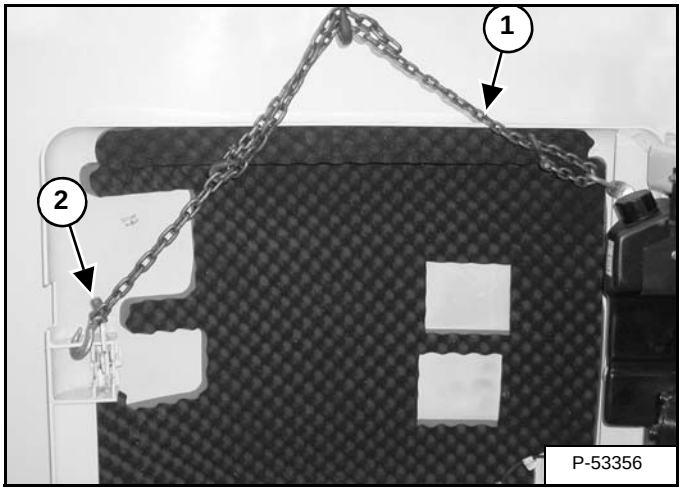
Removal And Installation

Figure 50-190-1



Install a grade 8 3/8 inch diameter bolt, lifting bracket (Item 1) **[Figure 50-190-1]** and nut to the slot in the top hinge side of the tailgate.

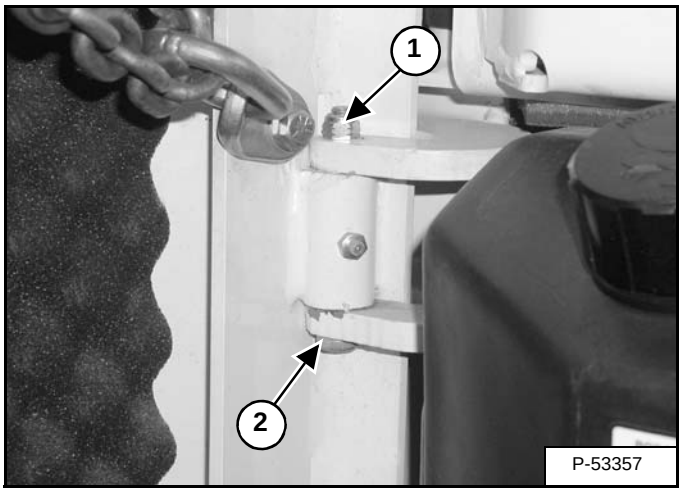
Figure 50-190-2



Install a chain hoist (Item 1) **[Figure 50-190-2]** on the lift bracket.

Attach the opposite end of the hoist on the latch side (Item 2) **[Figure 50-190-2]** of the tailgate.

Figure 50-190-3



Remove the nut (Item 1) and bolt (Item 3) **[Figure 50-190-3]** from the top and bottom hinge.

With the help of an assistant, remove the tailgate from the upperstructure.

Installation: Do NOT overtighten the hinge bolts and deflect the hinges.

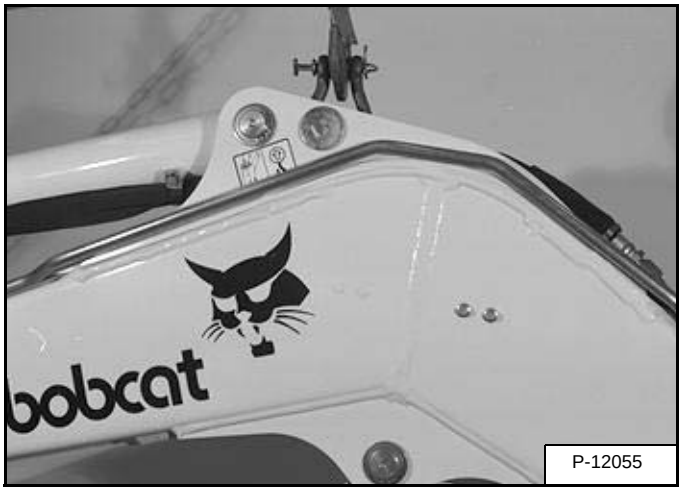
https://www.pdfmanual4trucks.com/

X-CHANGE

Removal And Installation

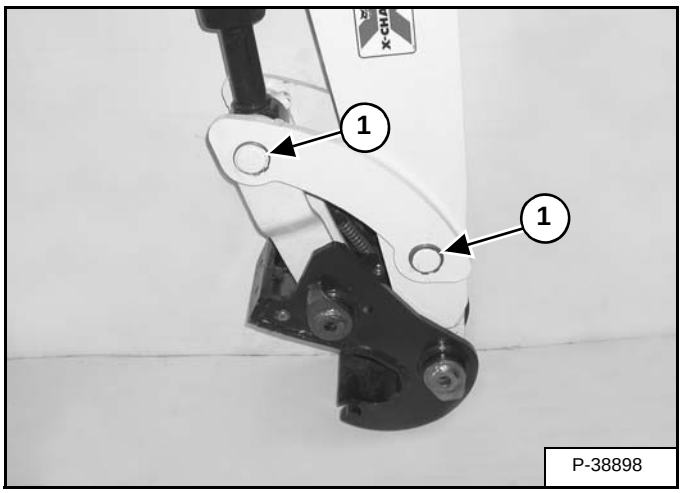
Remove the bucket. (See the Operation & Maintenance Manual for the correct removal procedure)

Figure 50-200-1



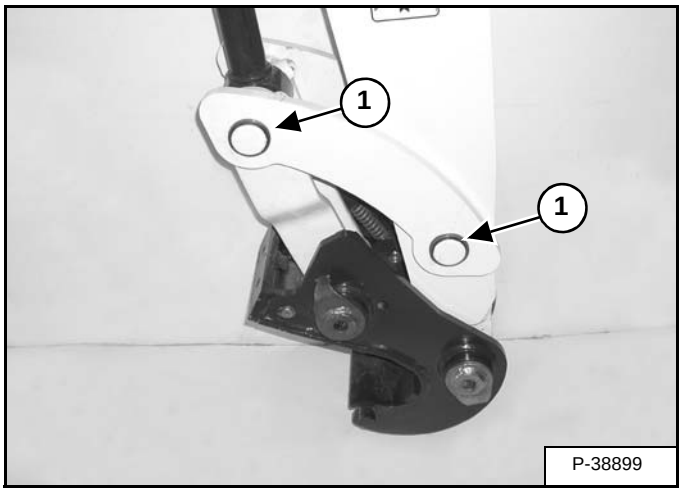
Support the boom with a hoist **[Figure 50-200-1]**.

Figure 50-200-2



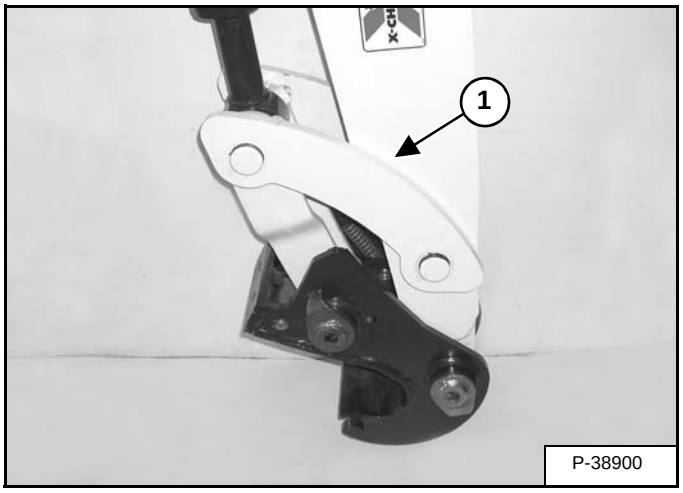
Remove the snap rings (Item 1) **[Figure 50-200-2]**.

Figure 50-200-3



Remove the washers (Item 1) **[Figure 50-200-3]**.

Figure 50-200-4

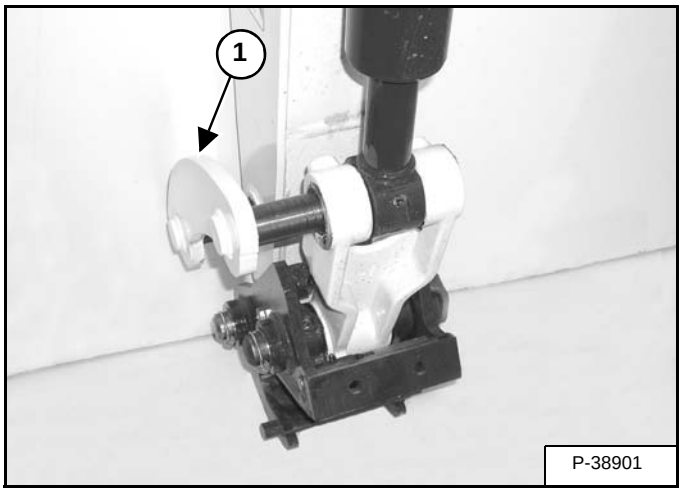


Remove the plate (Item 1) **[Figure 50-200-4]**.

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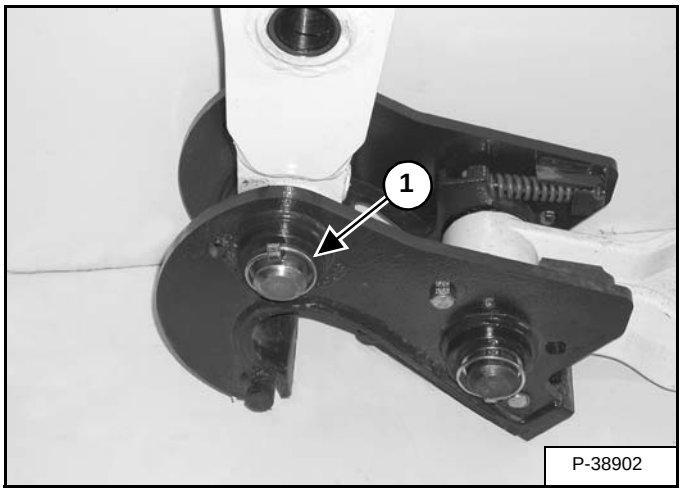
Removal And Installation (Cont'd)

Figure 50-200-5



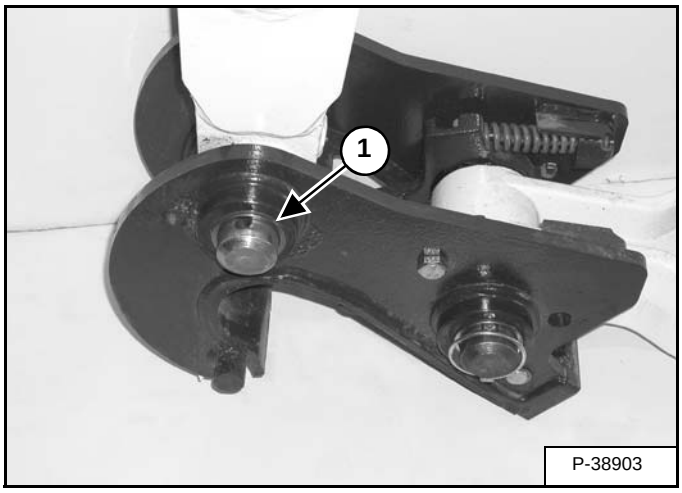
Remove the link (Item 1) **[Figure 50-200-5]**.

Figure 50-200-6



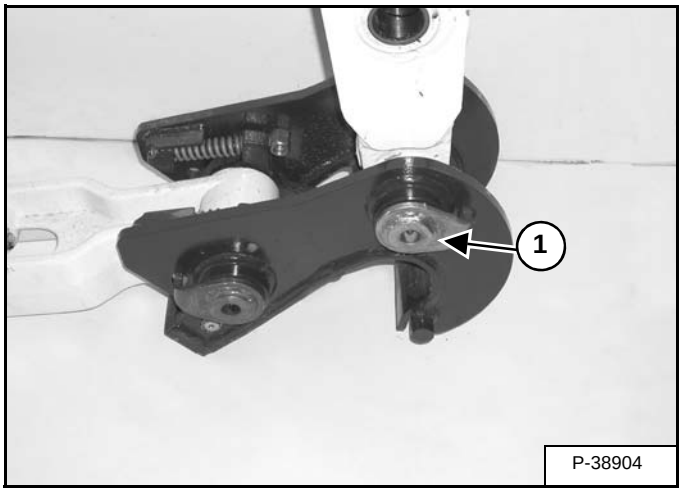
Remove the snap ring (Item 1) **[Figure 50-200-6]**.

Figure 50-200-7



Remove the washer (Item 1) **[Figure 50-200-7]**.

Figure 50-200-8

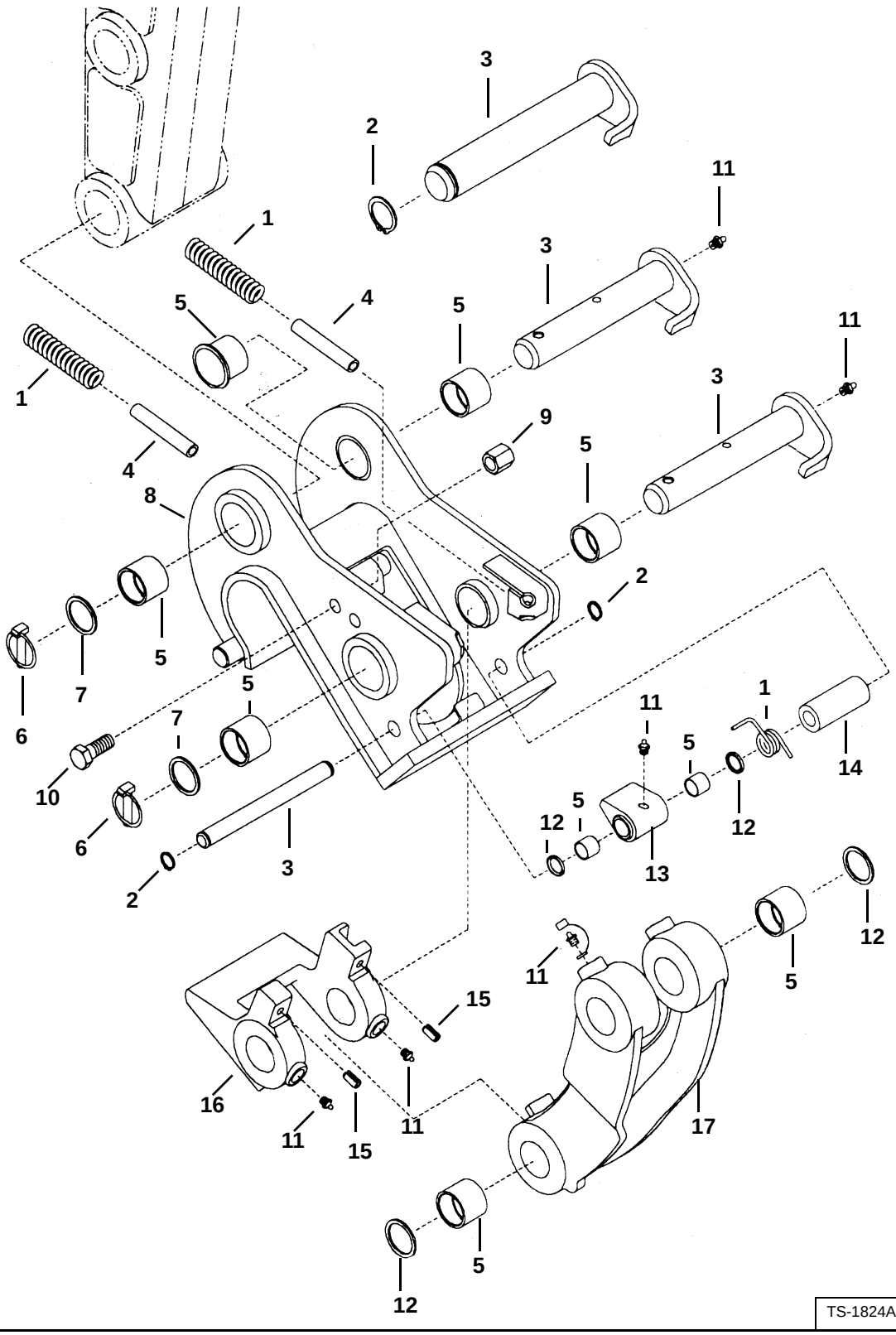


Remove the pin (Item 1) **[Figure 50-200-8]** and remove the X-CHANGE™ from the arm.

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Parts Identification

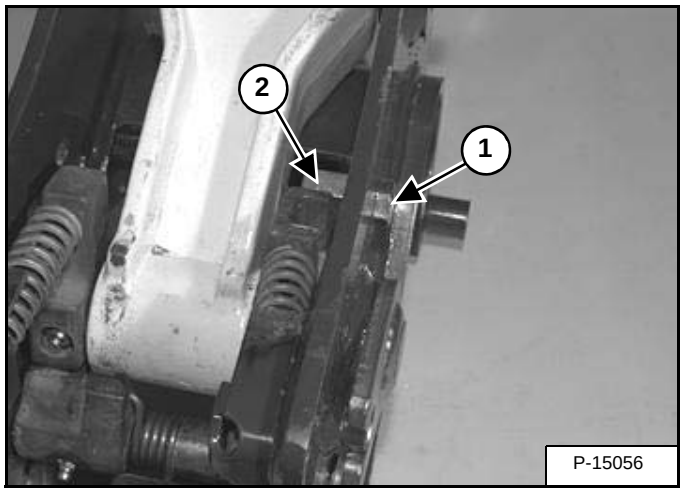
1. Spring
2. Snap Ring
3. Pin
4. Hose
5. Bushing
6. Retainer
7. Washer
8. Bracket
9. Nut
10. Bolt
11. Grease Fitting
12. Seal
13. Catch
14. Spacer
15. Roll Pin
16. Latch
17. Link



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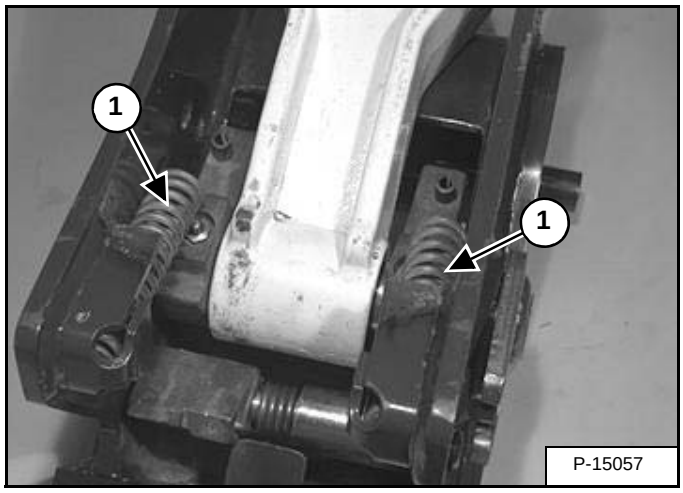
Disassembly

Figure 50-200-9



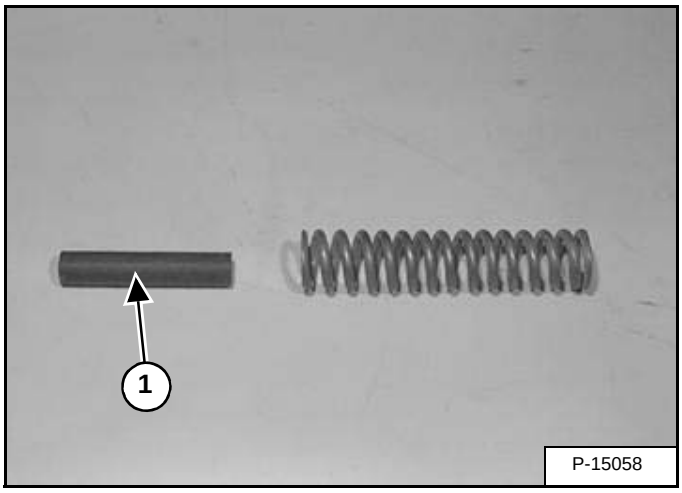
Remove the bolt (Item 1) and nut (Item 2) **[Figure 50-200-9]**.

Figure 50-200-10



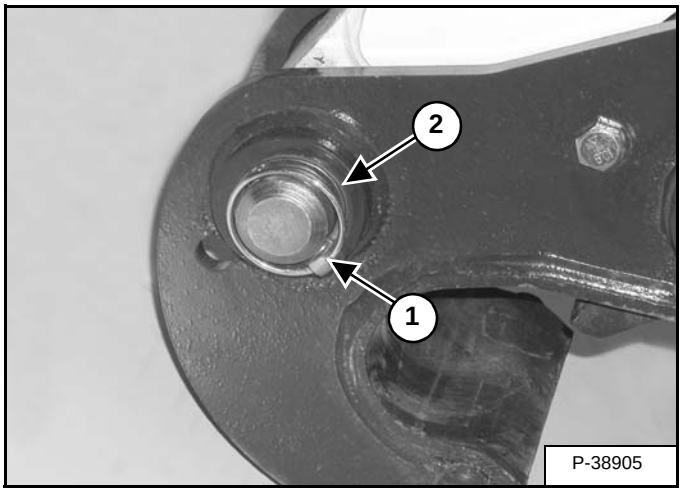
Remove the springs (Item 1) **[Figure 50-200-10]**.

Figure 50-200-11



Remove the rubber hose (Item 1) **[Figure 50-200-11]**.

Figure 50-200-12

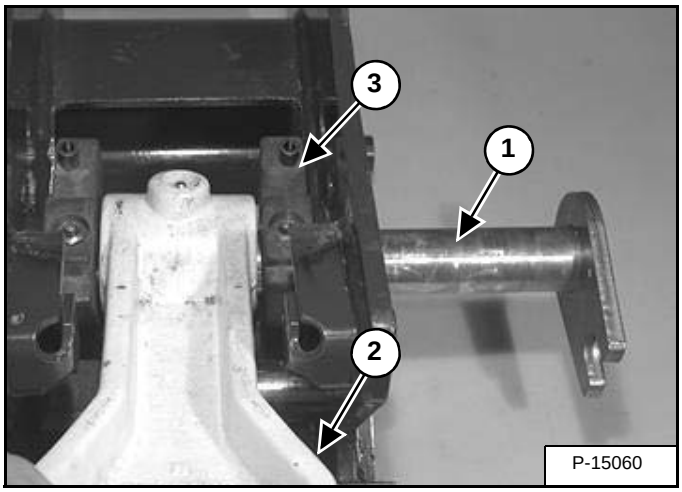


Remove the retainer (Item 1) and washer (Item 2) **[Figure 50-200-12]**.

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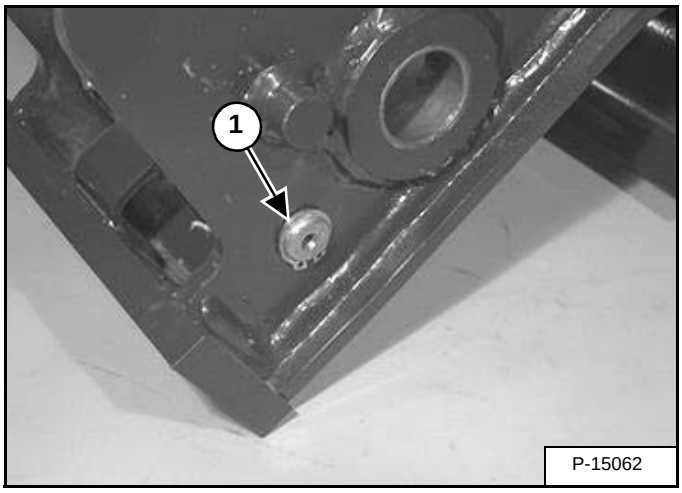
Disassembly (Cont'd)

Figure 50-200-13



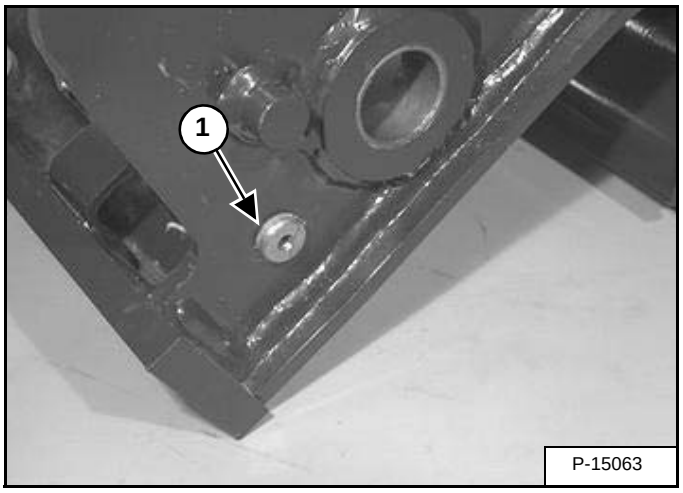
Remove the pin (Item 1), link (Item 2), and latch (Item 3) **[Figure 50-200-13]**.

Figure 50-200-14



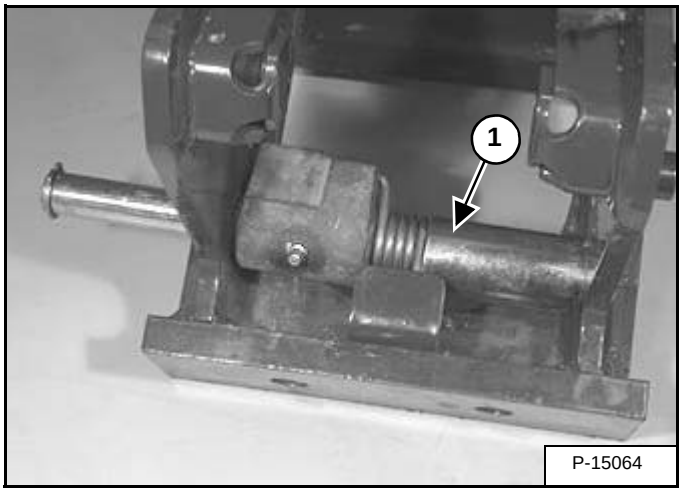
Remove the snap ring (Item 1) **[Figure 50-200-14]**.

Figure 50-200-15



Partially remove the pin (Item 1) **[Figure 50-200-15]**.

Figure 50-200-16

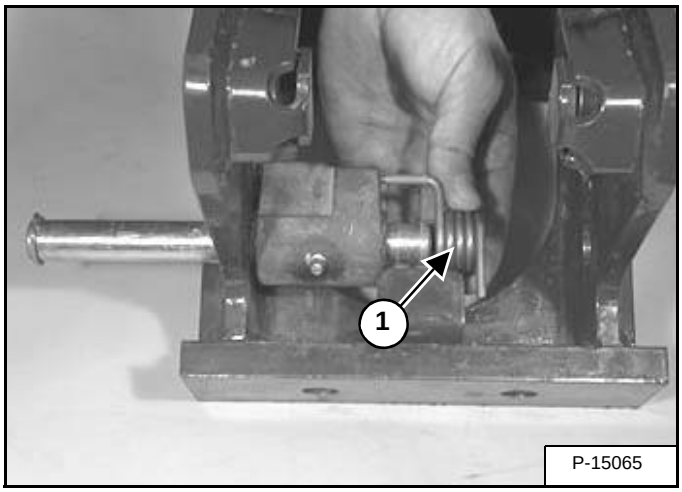


Remove the pin far enough to remove the spacer (Item 1) **[Figure 50-200-16]**.

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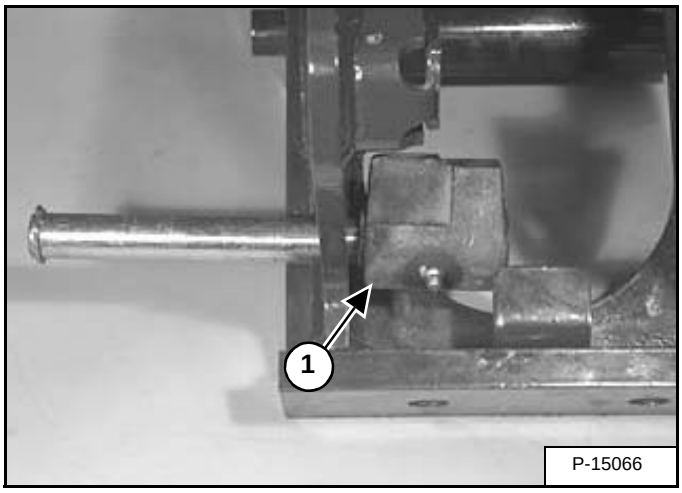
Disassembly (Cont'd)

Figure 50-200-17



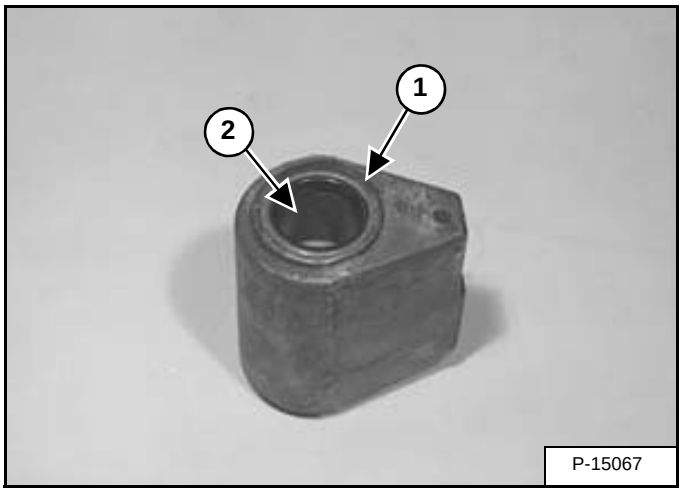
Remove the spring (Item 1) **[Figure 50-200-17]**.

Figure 50-200-18



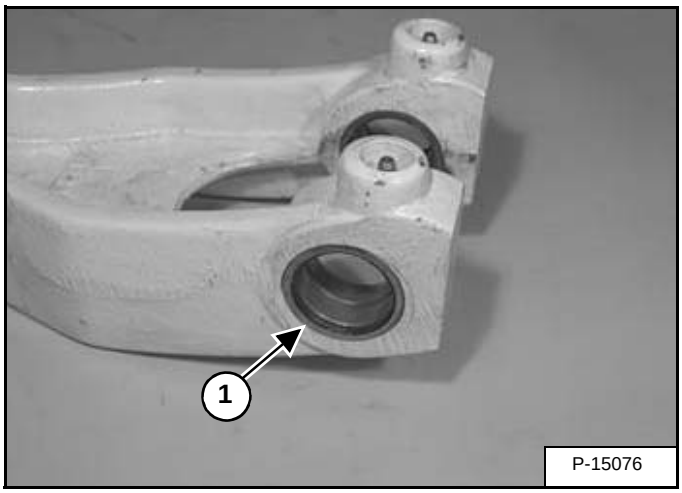
Completely remove the pin and remove the catch (Item 1) **[Figure 50-200-18]**.

Figure 50-200-19



Remove the seal (Item 1) from both sides of the catch. Remove the bushings (Item 2) **[Figure 50-200-19]** from inside the catch.

Figure 50-200-20

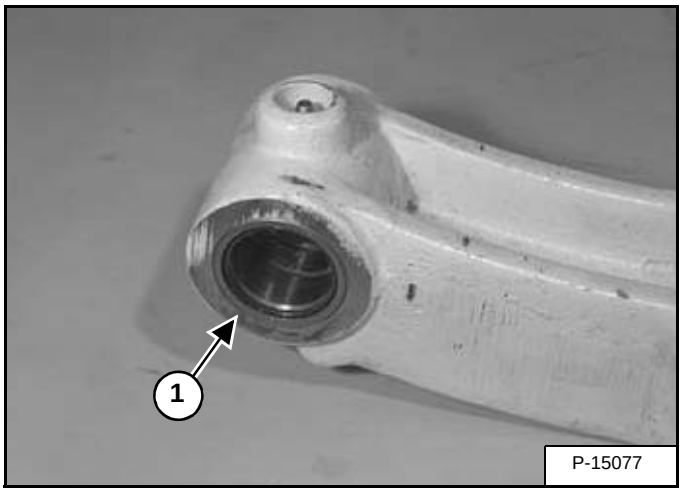


Remove the four seals (two per side) (Item 1) **[Figure 50-200-20]** from the top pivot point of the link.

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Disassembly (Cont'd)

Figure 50-200-21



Remove the two seals (one per side) (Item 1) **[Figure 50-200-21]** from the bottom pivot point of the link.

Figure 50-200-22

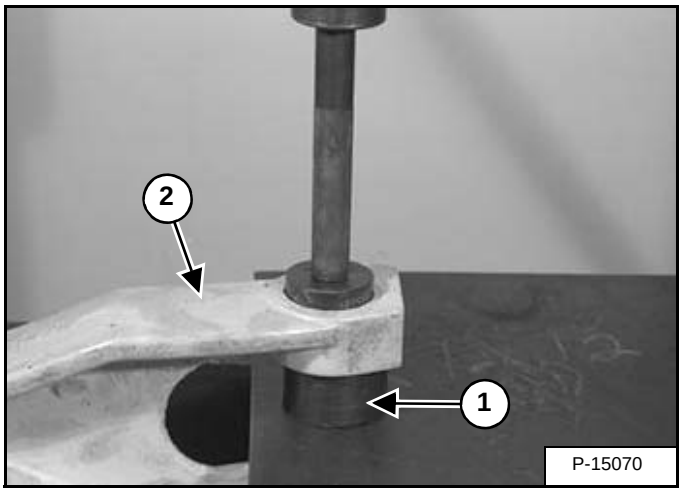
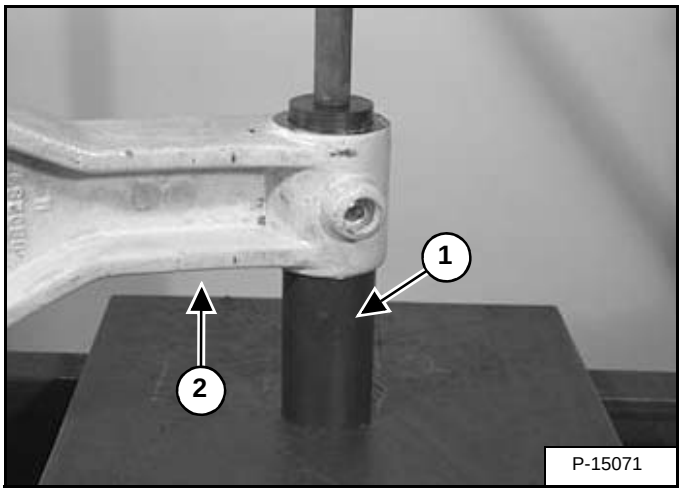


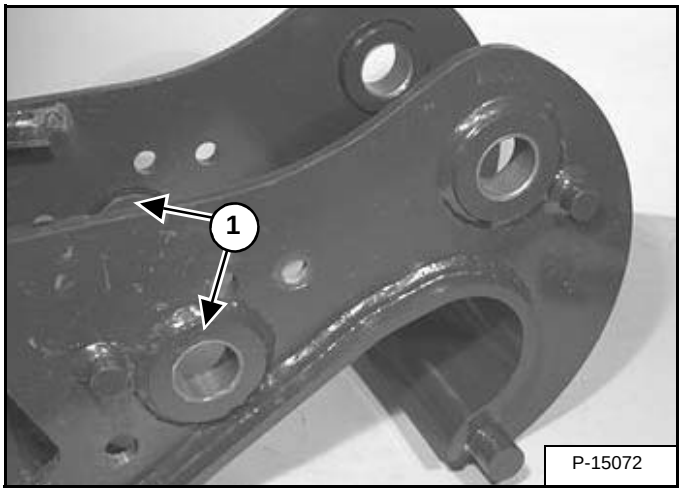
Figure 50-200-23



Use thick walled tubing (Item 1) **[Figure 50-200-22]** & **[Figure 50-200-23]** with an inside diameter larger than the outside diameter of the link bushing to support the link (Item 2) **[Figure 50-200-22]** & **[Figure 50-200-23]** and remove the bushings.

NOTE: Properly support the cast link to prevent damage when installing or removing the bushings.

Figure 50-200-24



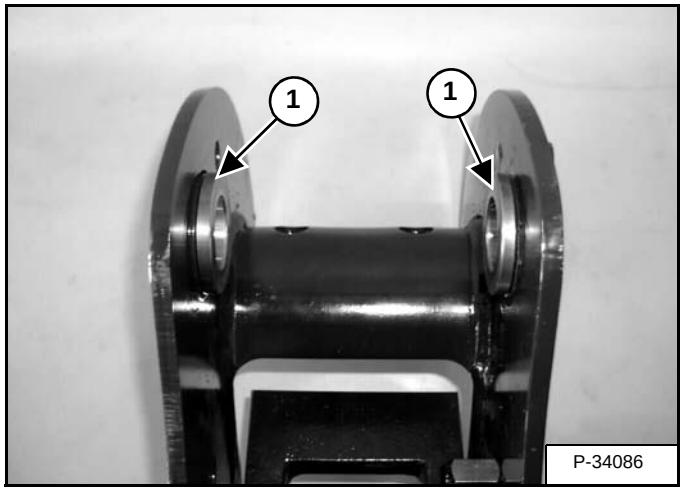
Remove the two bushings (Item 1) **[Figure 50-200-24]** from the X-Change frame.

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Disassembly (Cont'd)

NOTE: On early model excavators use step [Figure 50-200-25].

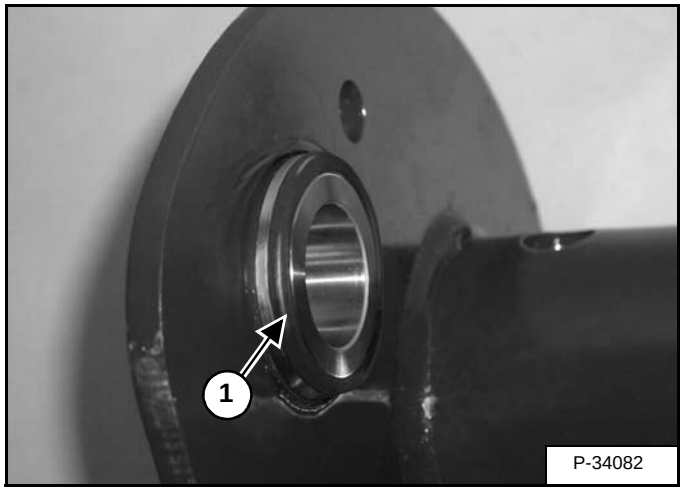
Figure 50-200-25



Remove the bushings (Item 1) **[Figure 50-200-25]**.

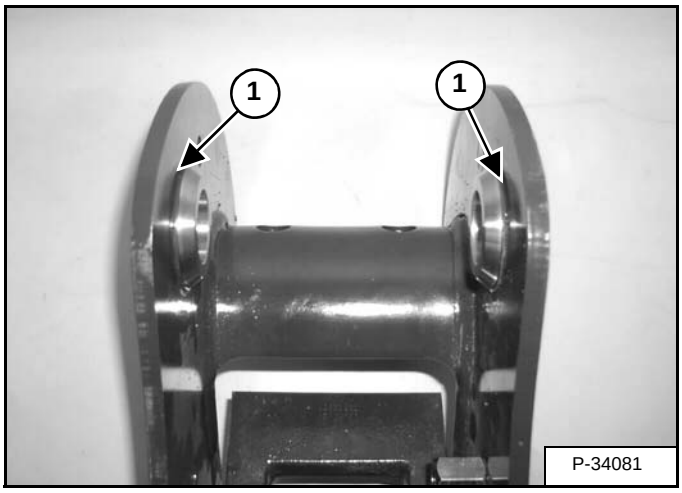
NOTE: On later model excavators use steps [Figure 50-200-26] & [Figure 50-200-27].

Figure 50-200-26



Remove the O-ring (Item 1) **[Figure 50-200-26]** (both sides).

Figure 50-200-27



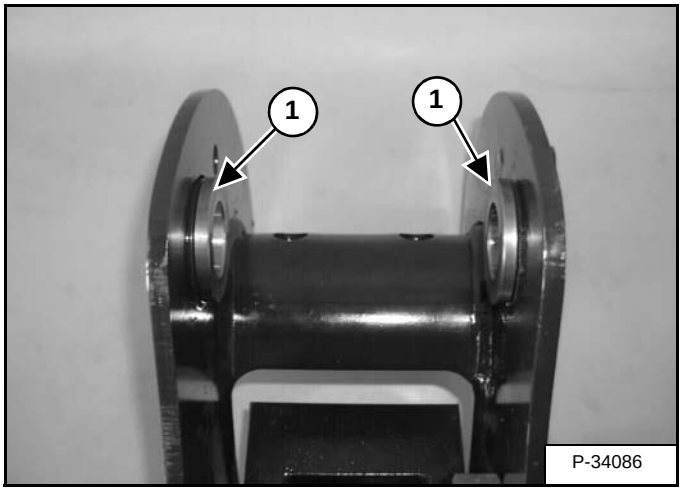
Remove the bushings (Item 1) **[Figure 50-200-27]**.

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Assembly

NOTE: On early model excavators use Step [Figure 50-200-28].

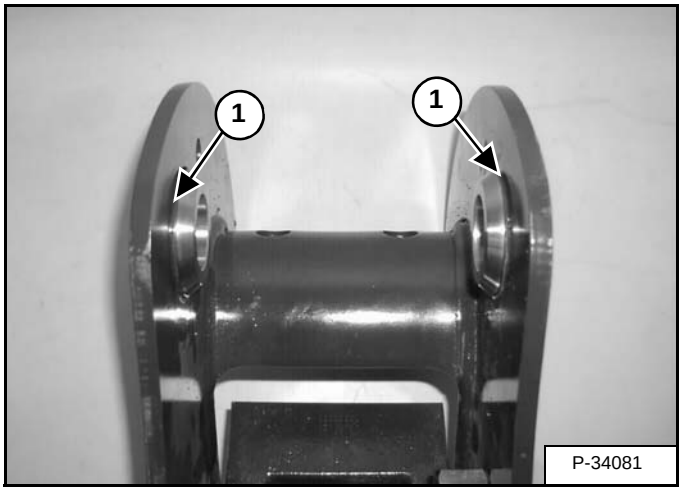
Figure 50-200-28



Install the bushings (Item 1) **[Figure 50-200-28]**.

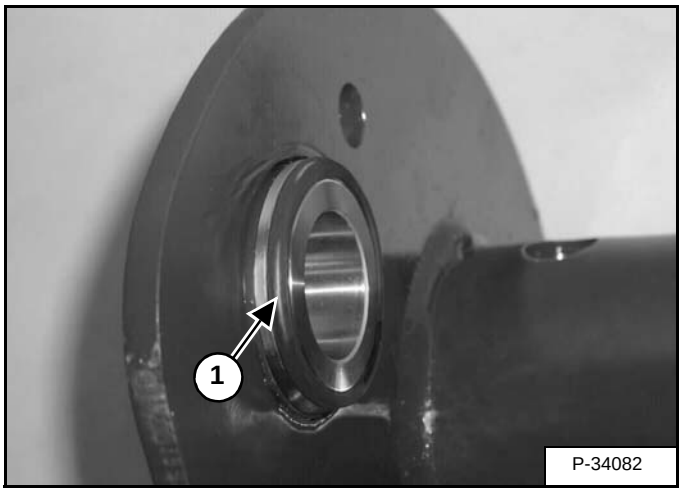
NOTE: On later model excavators use Step [Figure 50-200-29] & [Figure 50-200-30].

Figure 50-200-29



Install the bushings (Item 1) **[Figure 50-200-29]**.

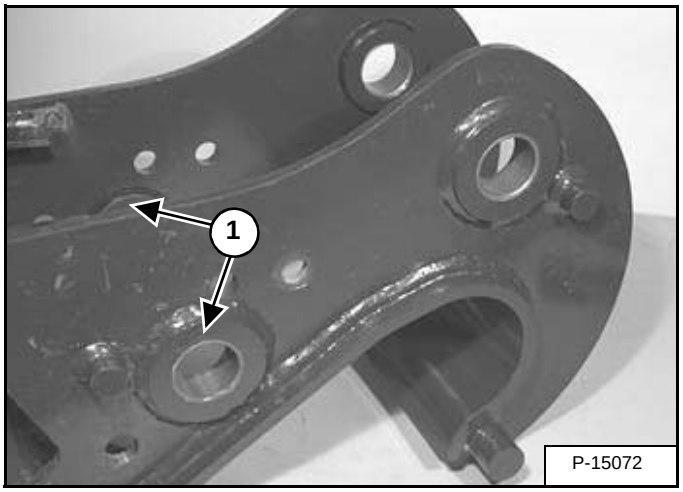
Figure 50-200-30



Install the O-ring (Item 1) **[Figure 50-200-30]** (both sides). Use grease to hold the O-rings in place.

(All Models)

Figure 50-200-31

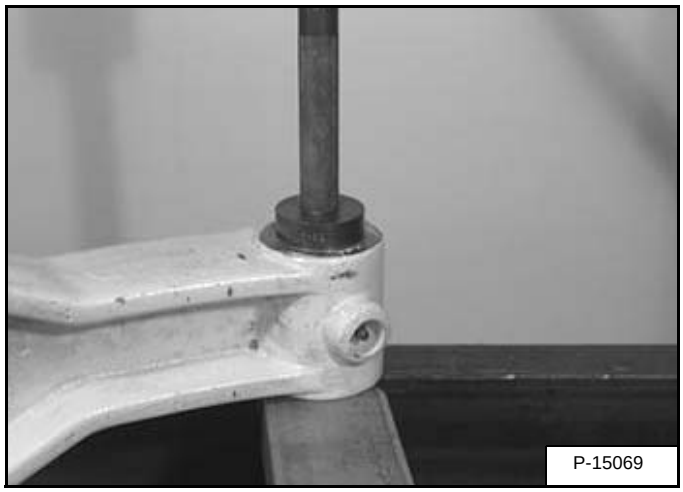


Install the two bushings (Item 1) **[Figure 50-200-31]** and apply grease to all four bushings.

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Assembly (Cont'd)

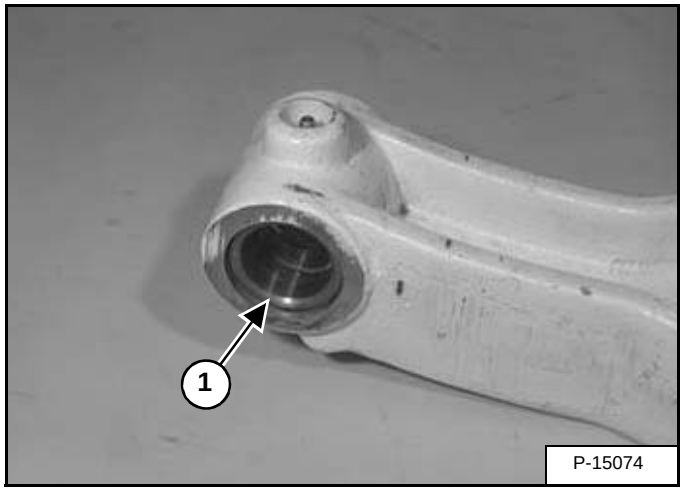
Figure 50-200-32



Install the bushings in both sides of the link **[Figure 50-200-32]**.

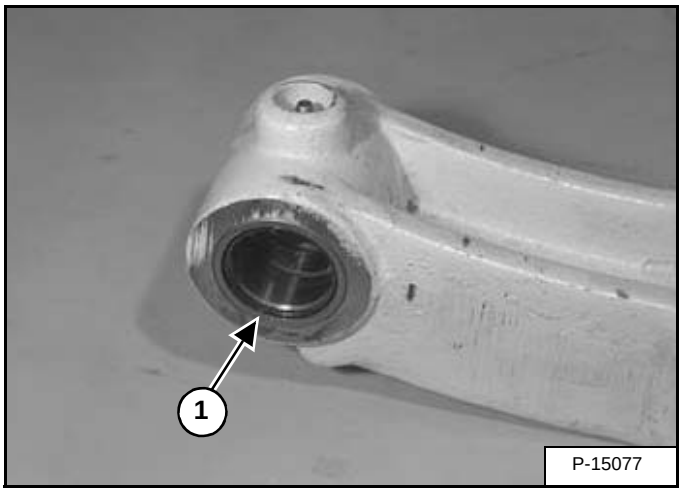
NOTE: Properly support the cast link to prevent damage when installing or removing the bushings.

Figure 50-200-33



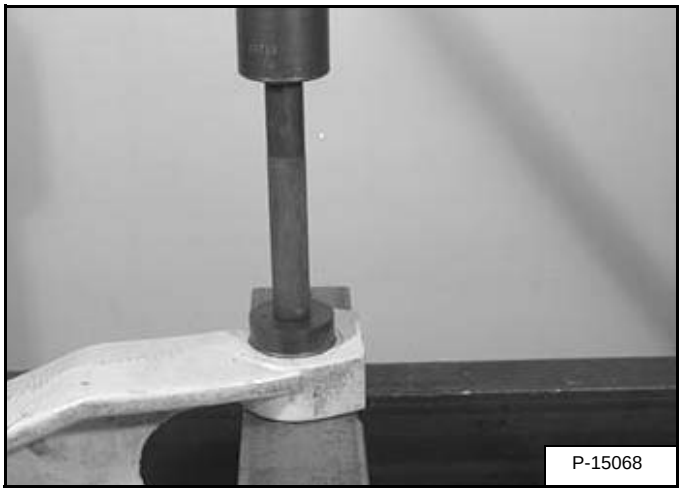
Press the bushings (Item 1) **[Figure 50-200-33]** until the seal will fit flush in the link.

Figure 50-200-34



Install the two seals (Item 1) **[Figure 50-200-34]** (one per side).

Figure 50-200-35



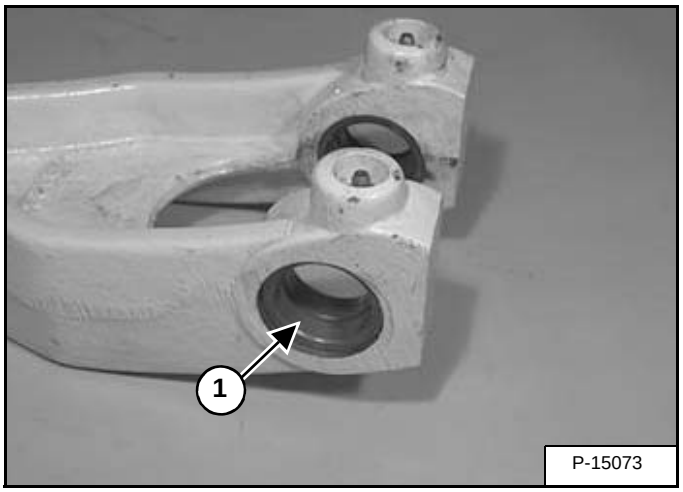
Install the bushings in both sides of the link **[Figure 50-200-35]**.

NOTE: Properly support the cast link to prevent damage when installing or removing the bushings.

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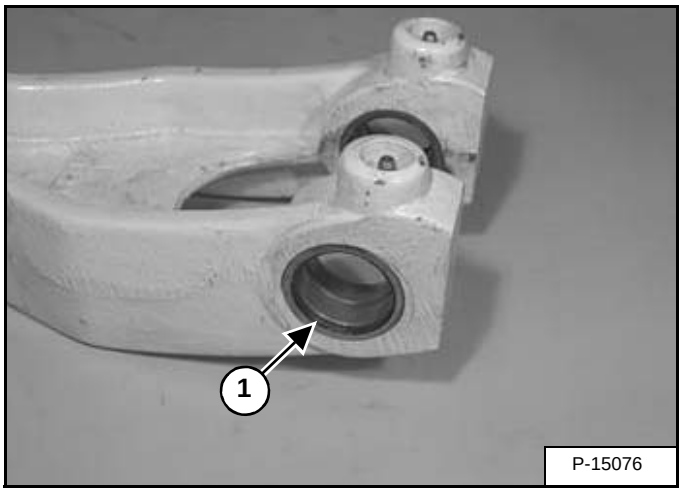
Assembly (Cont'd)

Figure 50-200-36



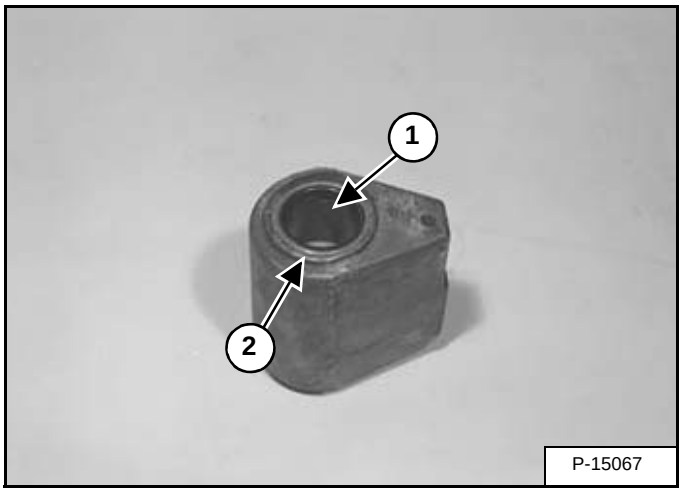
Press the bushings (Item 1) **[Figure 50-200-36]** in until the seal will fit flush.

Figure 50-200-37



Install the four seals (Item 1) **[Figure 50-200-37]** (one per side).

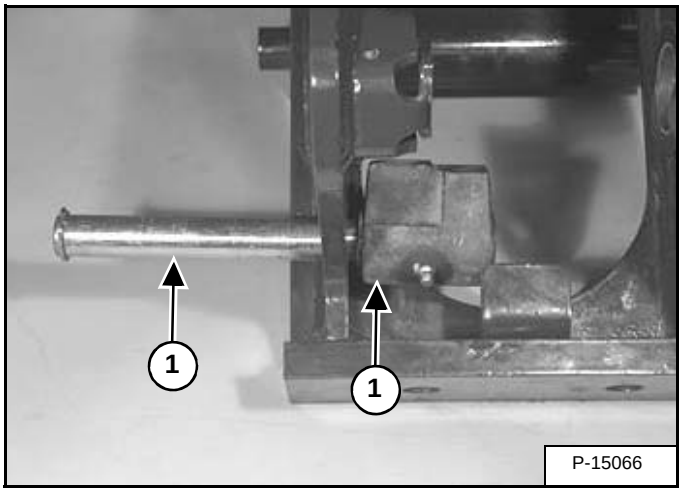
Figure 50-200-38



Install the bushings (Item 1) **[Figure 50-200-38]** in the catch.

Install the seal (Item 2) **[Figure 50-200-38]** on both sides of the catch.

Figure 50-200-39

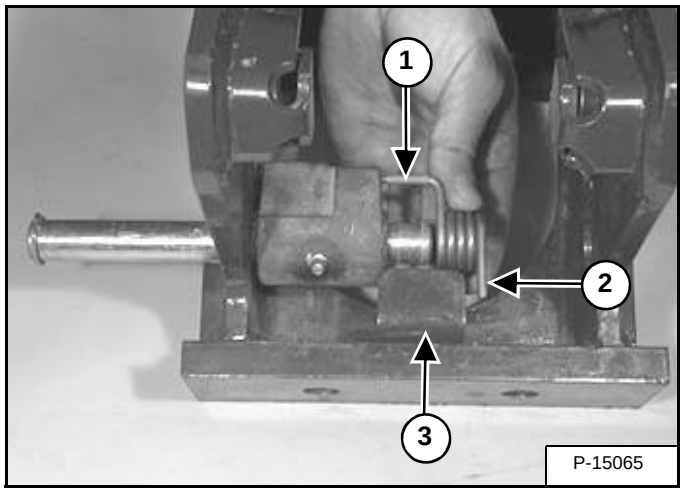


Partial install the pin (Item 1) **[Figure 50-200-39]**.

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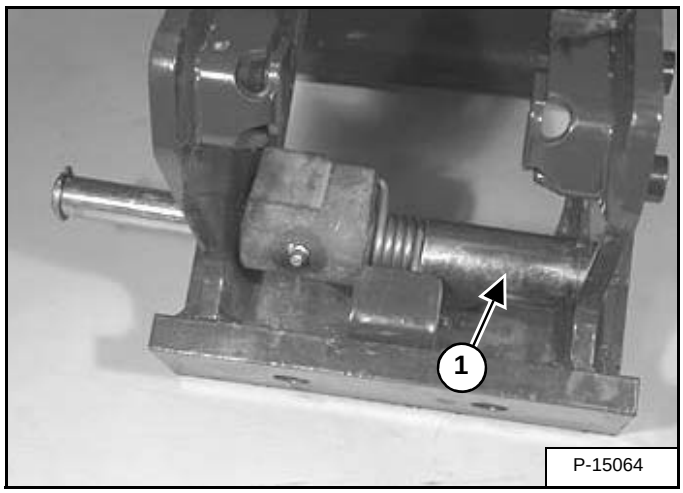
Assembly (Cont'd)

Figure 50-200-40



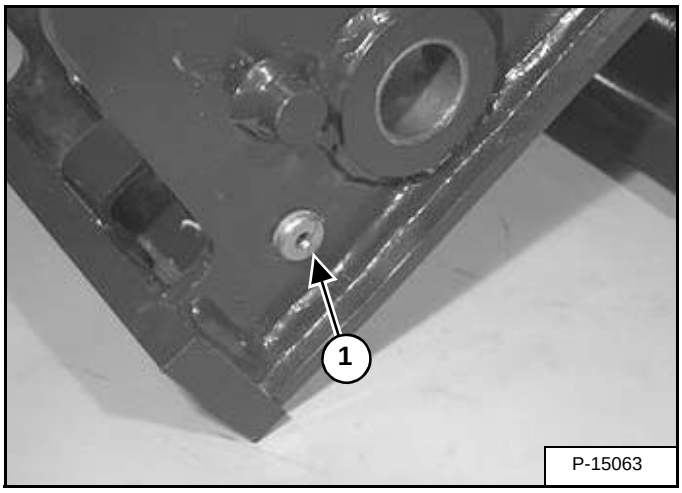
Install the spring on the pin, with the angled end of the spring (Item 1) engaging the hole in the catch. Put the straight end of the spring (Item 2) under the spring retainer (Item 3) **[Figure 50-200-40]**.

Figure 50-200-41



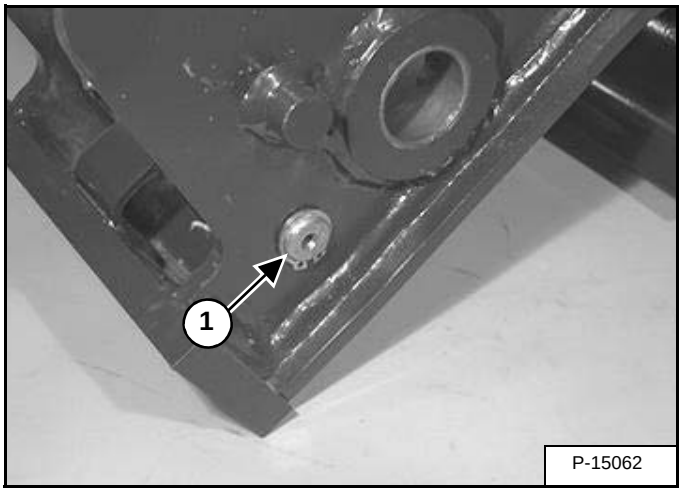
Install the spacer (Item 1) **[Figure 50-200-41]**.

Figure 50-200-42



Completely install the pin (Item 1) **[Figure 50-200-42]**.

Figure 50-200-43

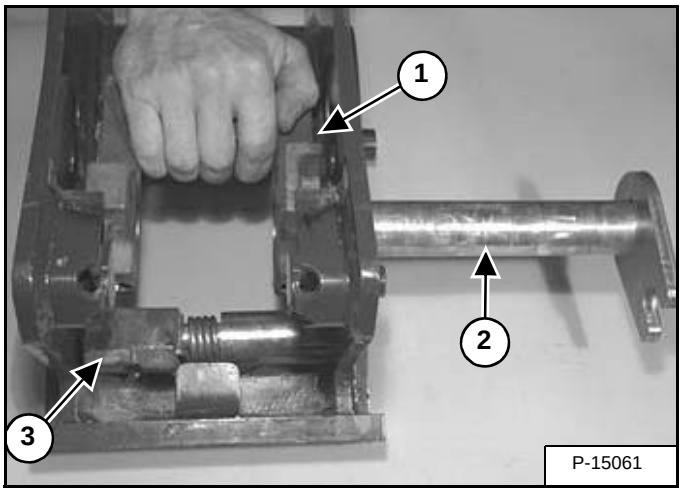


Install the snap ring (Item 1) **[Figure 50-200-43]**.

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Assembly (Cont'd)

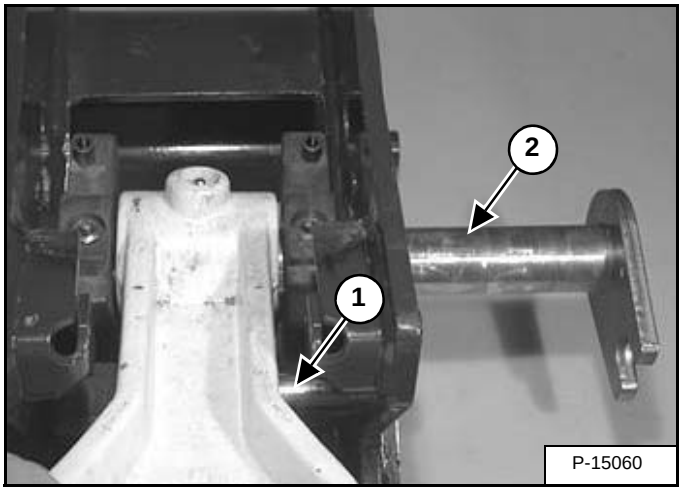
Figure 50-200-44



Align the latch (Item 1) and partially install the pin (Item 2) **[Figure 50-200-44]**.

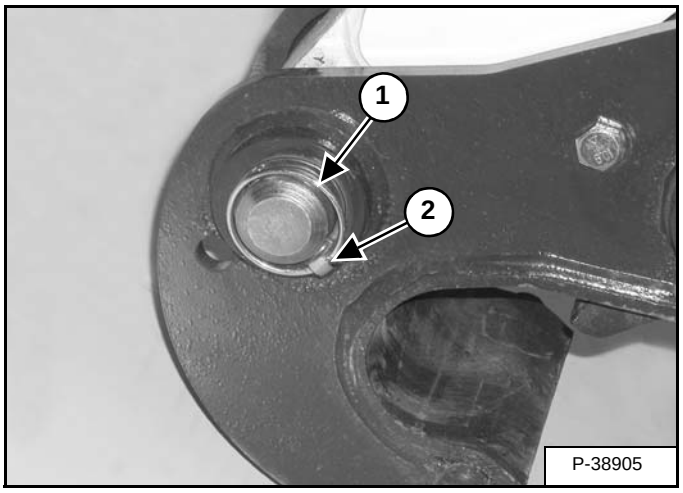
Rotate the catch toward the latch so the end of the catch (Item 3) **[Figure 50-200-44]** is under the latch.

Figure 50-200-45



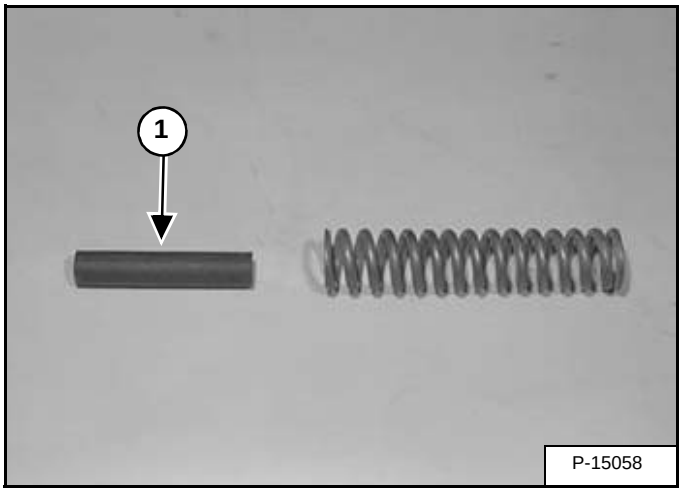
Install the link (Item 1) and completely install the pin (Item 2) **[Figure 50-200-45]**.

Figure 50-200-46



Install the washer (Item 1) and retainer (Item 2) **[Figure 50-200-46]**.

Figure 50-200-47



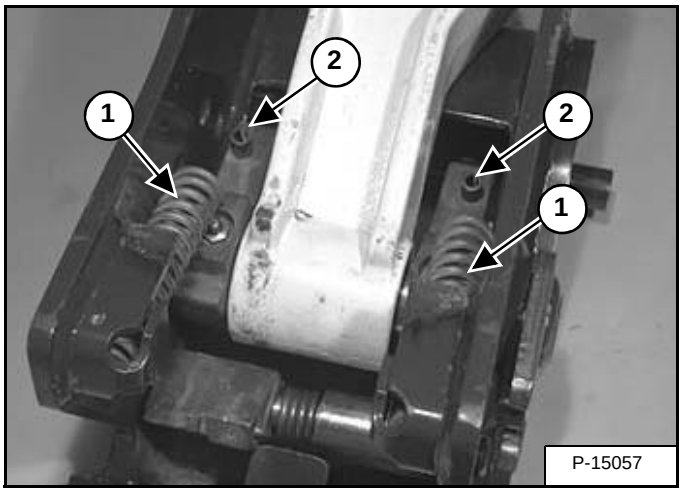
Install the hose (Item 1) **[Figure 50-200-47]** in the spring.

NOTE: The hose helps prevent the spring from being filled with dirt or mud. When replacing the hose, cut to a length of 2.750 - 3.0 inches (108 - 118 mm).

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Assembly (Cont'd)

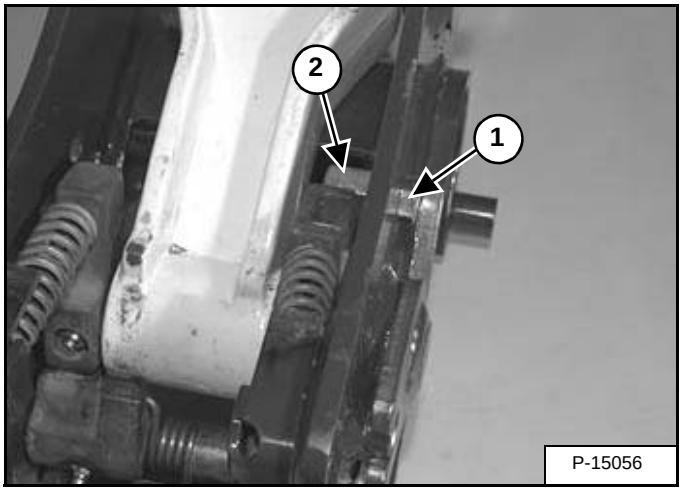
Figure 50-200-48



Install the springs (Item 1) **[Figure 50-200-48]** in the X-Change.

Pull the latch up until the springs (Item 1) seat over the roll pins (Item 2) **[Figure 50-200-48]**.

Figure 50-200-49



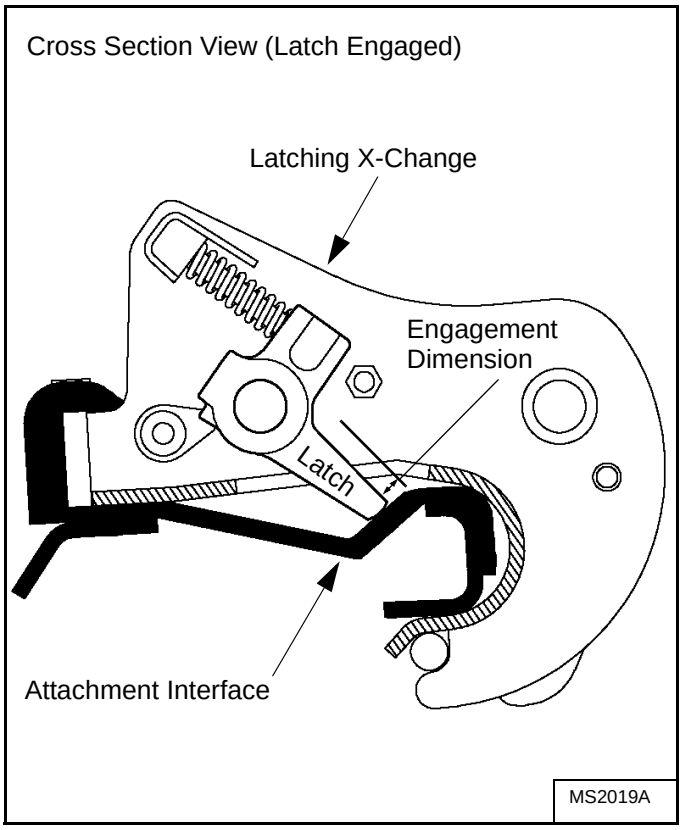
Apply thread lock adhesive (LOCTITE 242) to the bolt threads and install the bolt (Item 1) and nut (Item 2) **[Figure 50-200-49]**

Tighten the bolt to 118 - 133 ft.-lbs. (160 - 180 Nm) torque.

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Check Proper Latch Engagement

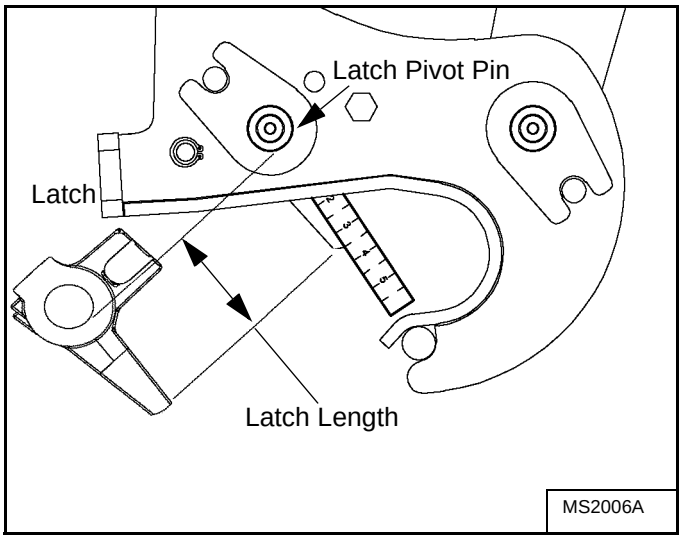
Figure 50-200-50



Maximum latch length and minimum latch engagement dimensions are provided. ***Latch length must be checked before checking latch engagement*** **[Figure 50-200-50]**.

Before making any measurements, clean the excavator X-Change and the attachment interface. Inspect both components to be certain they are free of debris and are not damaged.

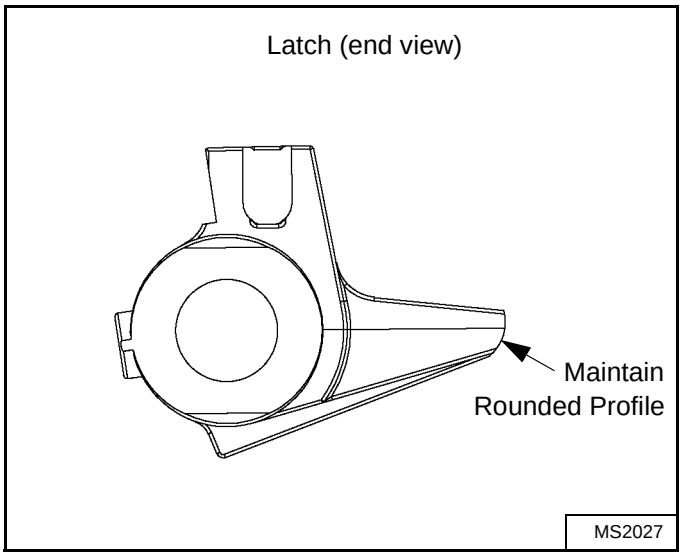
Figure 50-200-51



Measure the installed latch length. Measure from the edge of the latch pivot pin to the end of the latch. ***The latch does not need to be removed to measure. Maximum latch length is 3.94 inches (100 mm)*** **[Figure 50-200-51]**.

If the latch length is greater than maximum, it should be replaced or the end can be ground to achieve maximum latch length.

Figure 50-200-52



If you grind the latch, maintain the rounded profile of the end **[Figure 50-200-52]**.

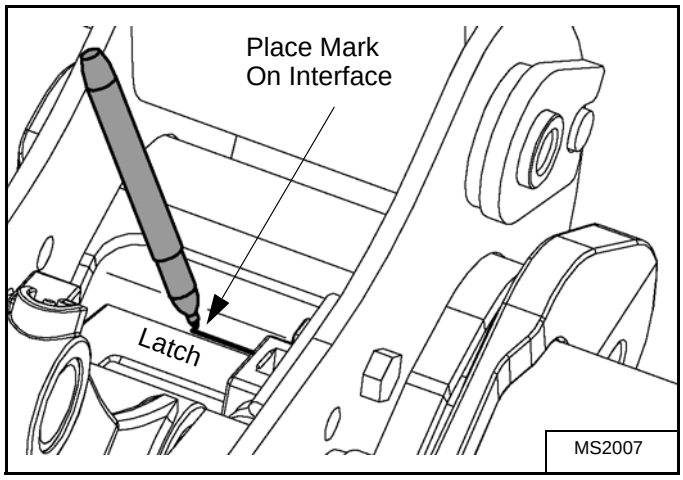
After verifying the latch length, check the attachment interface.

Install the attachment.

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Check Proper Latch Engagement (Cont'd)

Figure 50-200-53

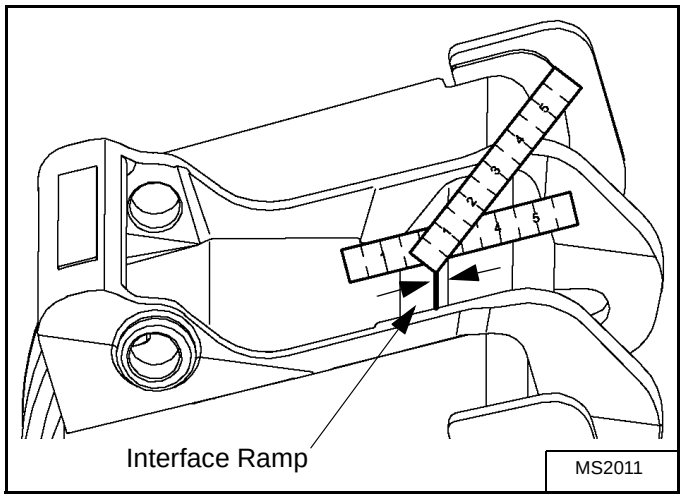


With the attachment installed on the machine and lowered to the ground, place a mark on the interface just above the latch **[Figure 50-200-53]**.

Note: The mark should reflect the line of sight across the top edge of the latch. It is not intended to reflect the actual contact point of the latch and interface.

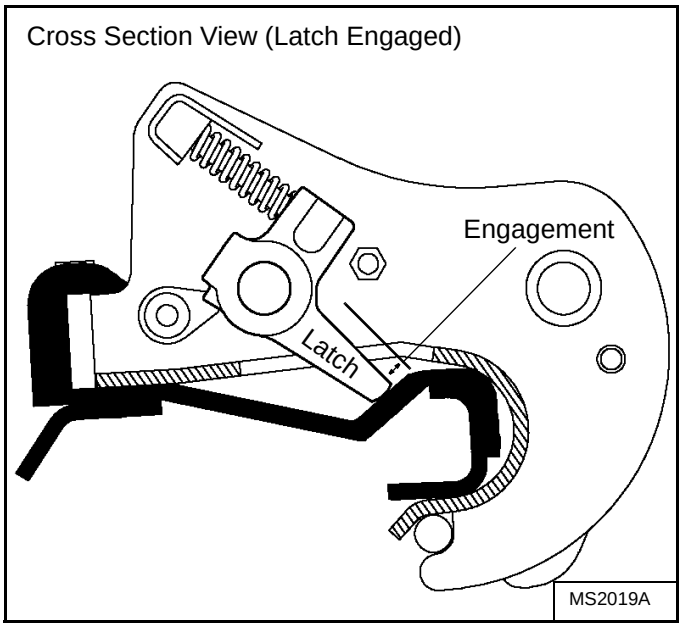
Remove the attachment.

Figure 50-200-54



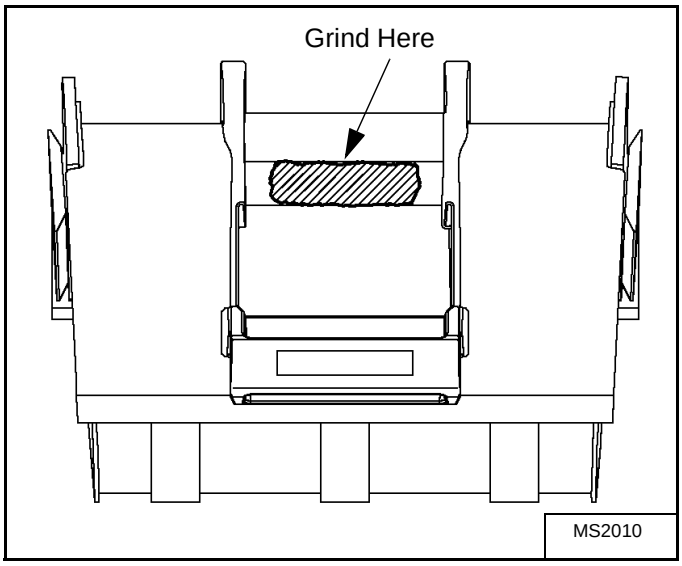
Measure the latch engagement. Measure from the mark previously made to the center of the radius at the top of the interface ramp. Two rulers are required. **Minimum latch engagement is 0.50 inches (12.7 mm) [Figure 50-200-54]**.

Figure 50-200-55



If latch engagement is less than 0.50 Inches (12.7 mm), remove material from the ramp of the interface **[Figure 50-200-54]** & **[Figure 50-200-55]**.

Figure 50-200-56



Using a grinder, remove material from the interface ramp in the area shown. ***The grind area must be wider than the latch, but does not need to extend all the way to the sides of the interface.*** Maintain the original profile and flatness of the ramp. Remove between 0.06 - 0.12 inches (1.5 - 3.0 mm) of material **[Figure 50-200-56]**.

Install the attachment on the machine, mark the interface **[Figure 50-200-53]** and measure the new latch engagement **[Figure 50-200-54]**.

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Check Proper Latch Engagement (Cont'd)

⚠ WARNING

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

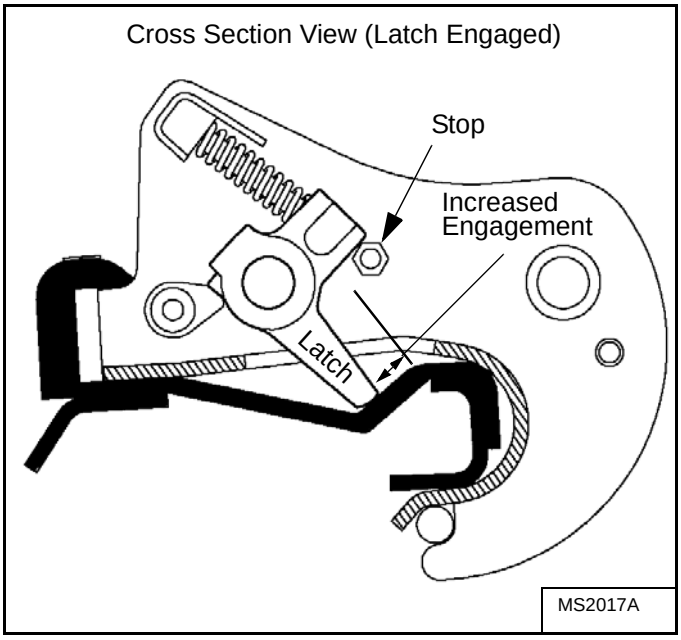
- **When fluids are under pressure.**
- **Flying debris or loose material is present.**
- **Engine is running.**
- **Tools are being used.**

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If latch engagement is less than 0.50 Inches (12.7 mm), remove more material from the ramp of the interface.

Install the attachment on the machine, mark the interface and measure the new latch engagement again to verify latch engagement is 0.50 Inches (12.7 mm) or more.

Figure 50-200-57



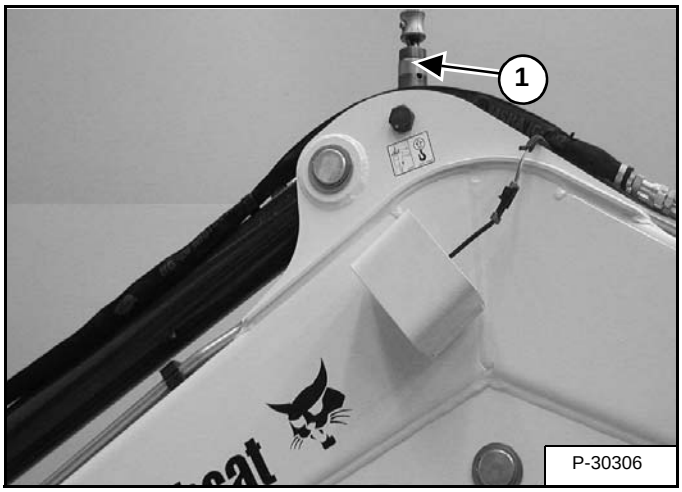
The latch may wear and become shorter, increasing latch engagement. Latch wear is dependent on the type of attachment used and the application. If wear becomes excessive, the latch will rest on the stop. The attachment will remain securely installed on the machine in this position, however the attachment can exhibit rattling noise during operation because the attachment interface is shifting slightly within the X-Change. Visual inspection can detect if the latch is resting on the stop without measurement. Latch replacement is recommended when wear becomes this excessive. **[Figure 50-200-57]**.

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X-CHANGE (PIN ON)

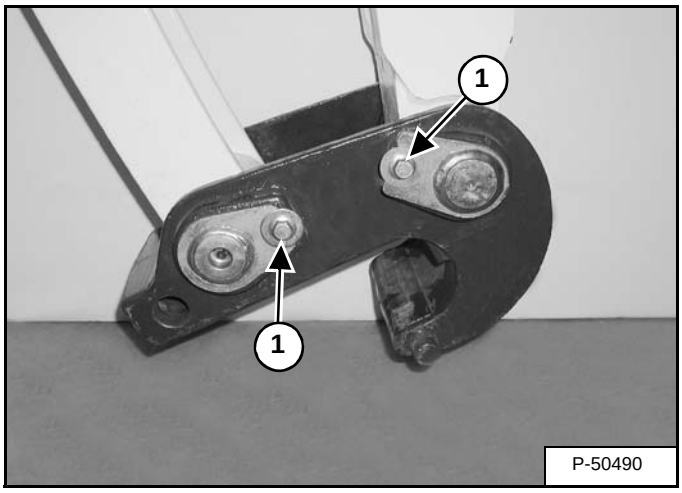
Removal And Installation

Figure 50-210-1



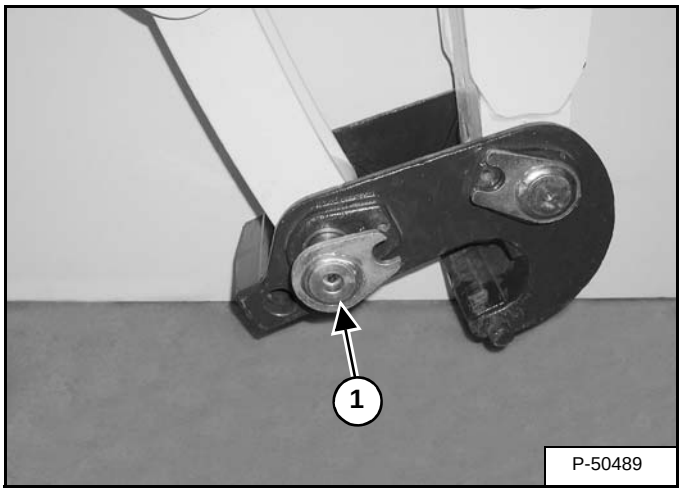
Support the boom with a hoist (Item 1) **[Figure 50-210-1]** and release the pressure on the boom cylinder.

Figure 50-210-2



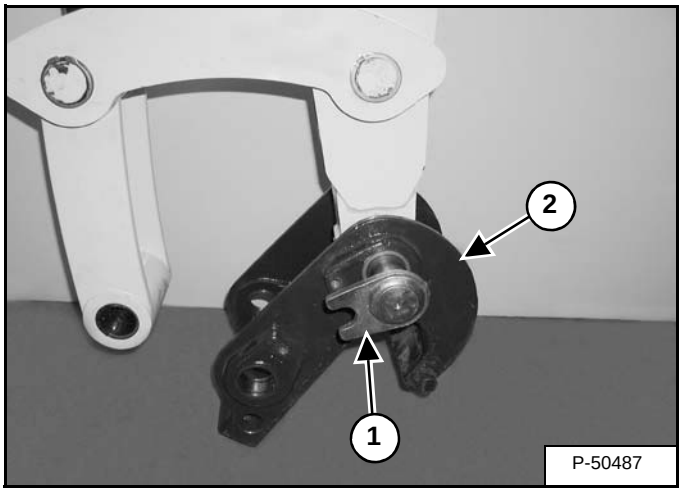
Remove the bolts, washers, and spacers (Item 1) **[Figure 50-210-2]**.

Figure 50-210-3



Remove the pin (Item 1) **[Figure 50-210-3]**.

Figure 50-210-4

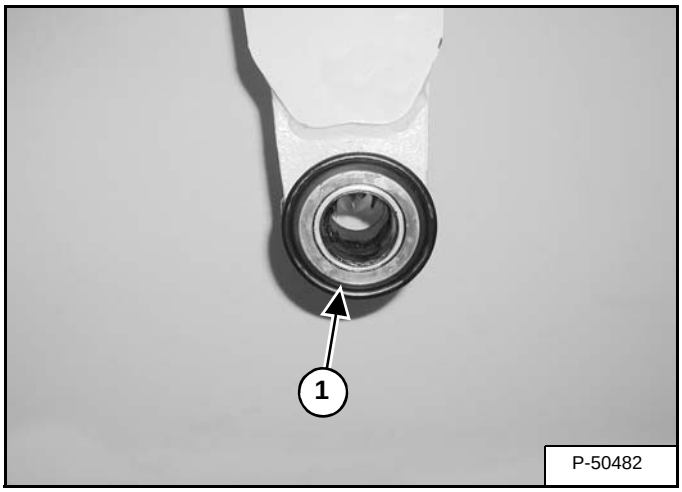


Remove the pin (Item 1). Remove the X-CHANGE™ (Item 2) **[Figure 50-210-4]**.

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Removal And Installation (Cont'd)

Figure 50-210-5

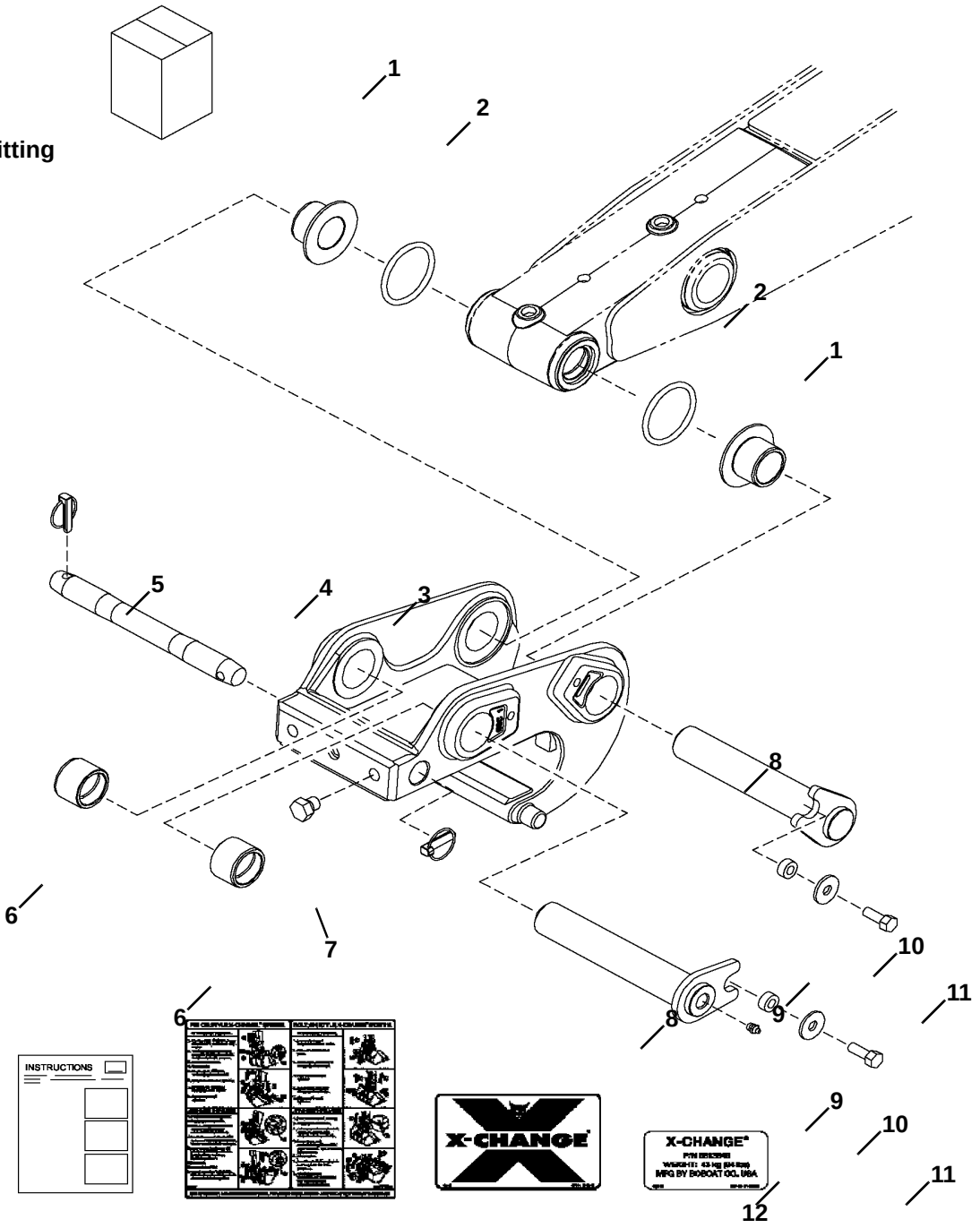


Remove the O-ring (Item 1) **[Figure 50-210-5]** from the arm. (Both sides)

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Parts Identification

1. Bushing
2. O-ring
3. X-Change
4. Lock Pin
5. Pin
6. Bushing
7. Plug
8. Pin
9. Bushing
10. Washer
11. Bolt
12. Grease Fitting

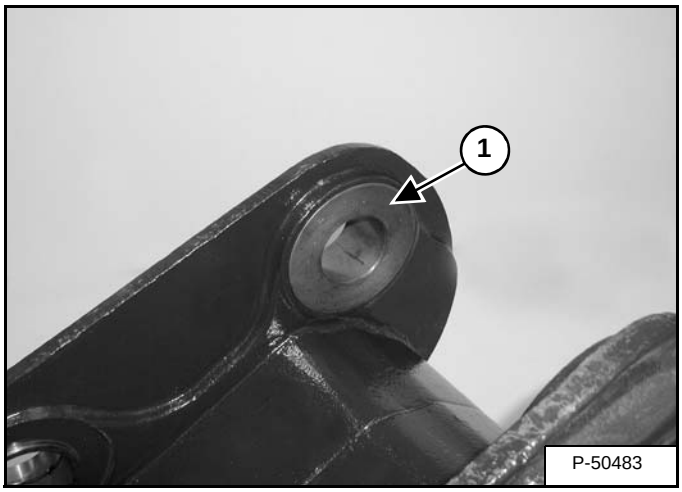


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Disassembly And Assembly

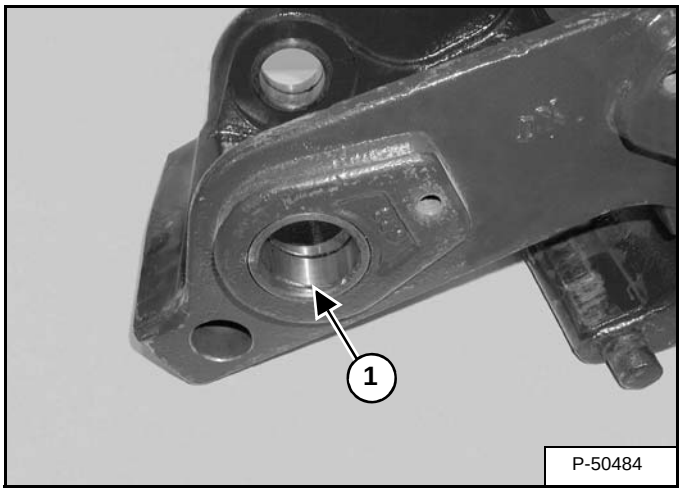
Figure 50-210-6



Remove the bushing (Item 1) **[Figure 50-210-6]**.

Installation: The bushings must be fully seated.

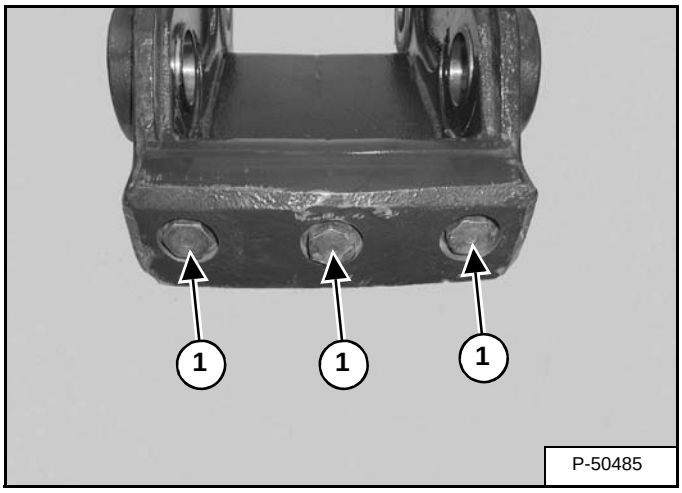
Figure 50-210-7



Remove the bushing (Item 1) **[Figure 50-210-7]**. (Both sides)

Installation: The bushings must be installed flush with the outside of the X-Change.

Figure 50-210-8



Remove the three plugs (Item 1) **[Figure 50-210-8]**.

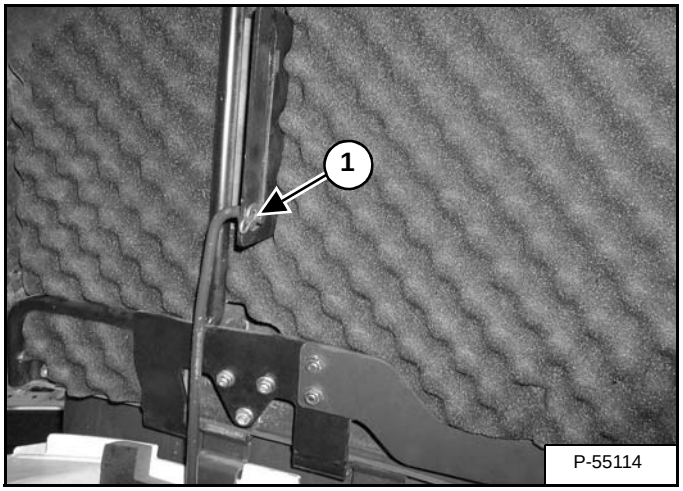
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RIGHT SIDE COVER

Removal And Installation

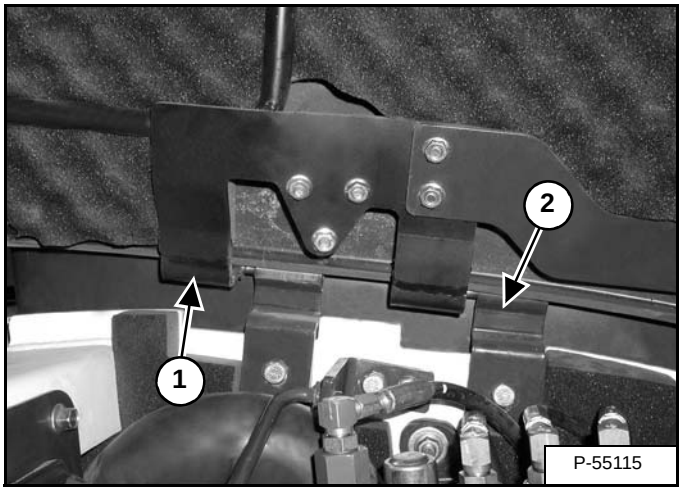
Open and support the right side cover.

Figure 50-220-1



Remove the pin and washer (Item 1) **[Figure 50-220-1]** from the support rod.

Figure 50-110-2



Slide the right side cover to the rear of the Excavator to remove the hinges (Item 1) from the brackets (Item 2) **[Figure 50-110-2]**.

Remove the right side cover from the Excavator.

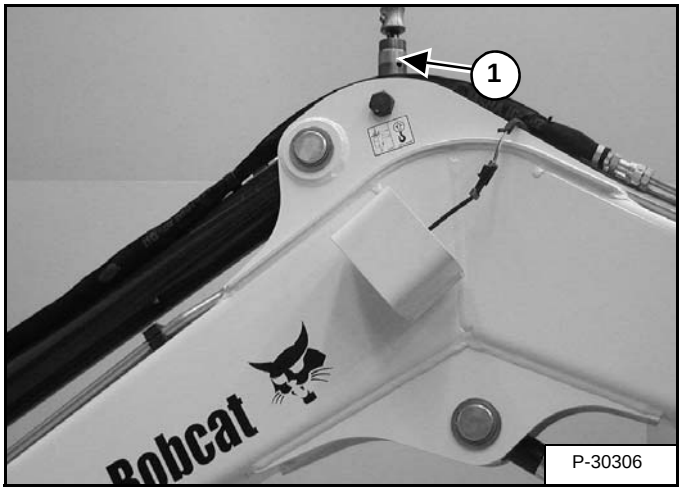
https://www.pdfmanual4trucks.com/

X-CHANGE (HYDRAULIC)

Removal And Installation

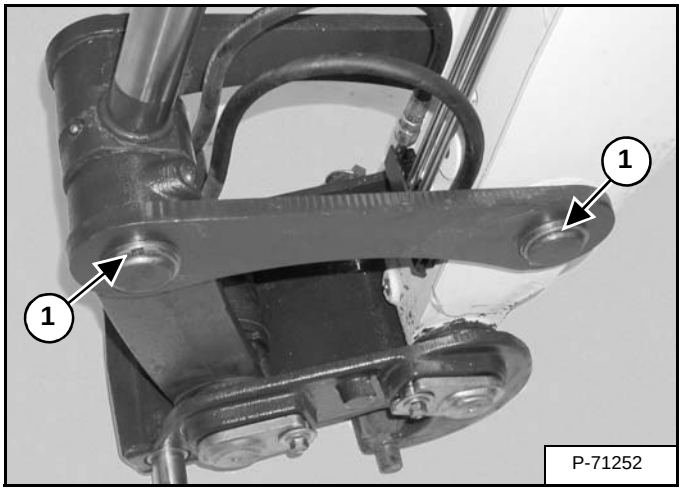
Remove the bucket. (See Operation & Maintenance Manual for the correct removal procedure.)

Figure 50-230-1



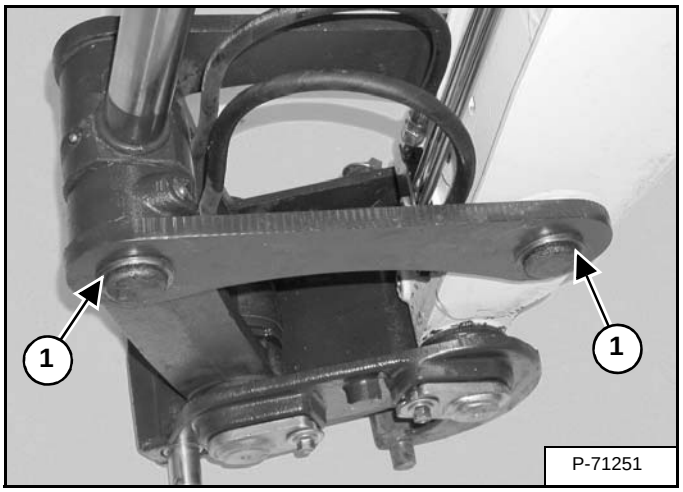
Support the boom with a hoist (Item 1) **[Figure 50-230-1]** and release the pressure on the boom cylinder.

Figure 50-230-2



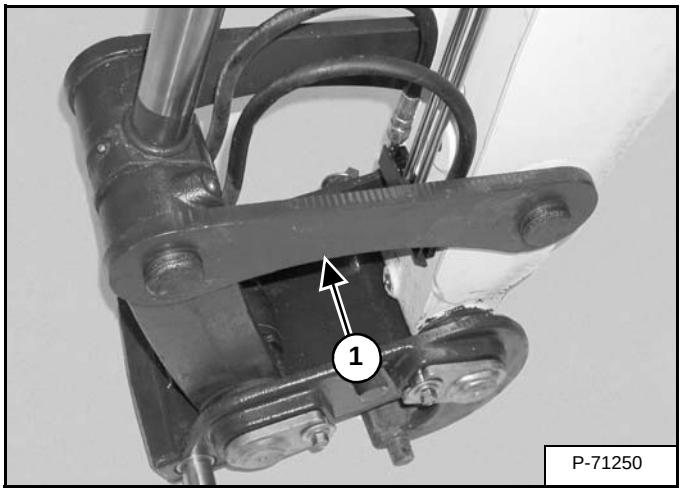
Remove the snap rings (Item 1) **[Figure 50-230-2]**.

Figure 50-230-3



Remove the washers (Item 1) **[Figure 50-230-3]**.

Figure 50-230-4

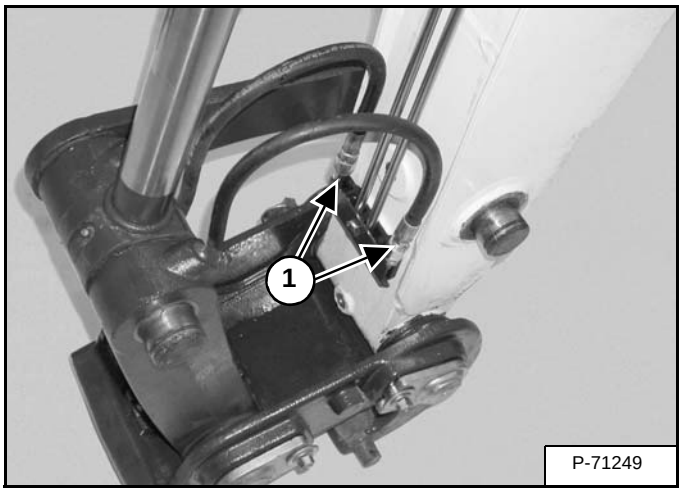


Remove the plate (Item 1) **[Figure 50-230-4]**.

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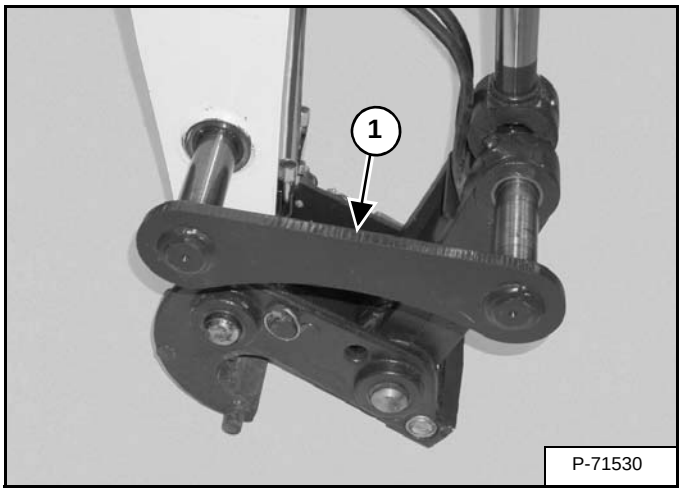
Removal And Installation (Cont'd)

Figure 50-230-5



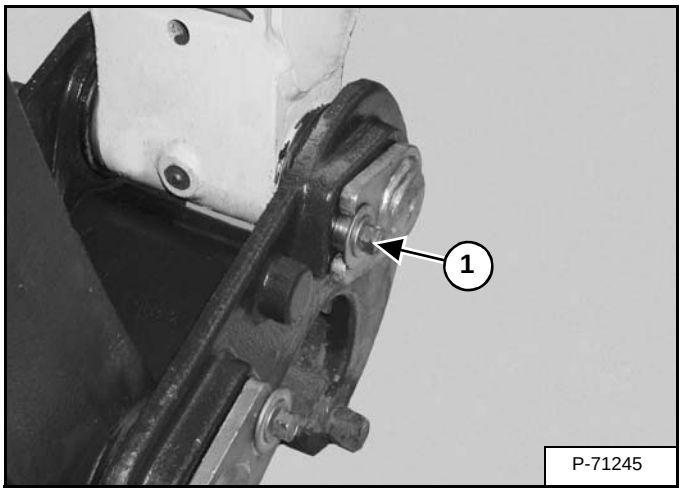
Remove the two hydraulic hoses (Item 1) **[Figure 50-230-5]** from the tubelines.

Figure 50-230-6



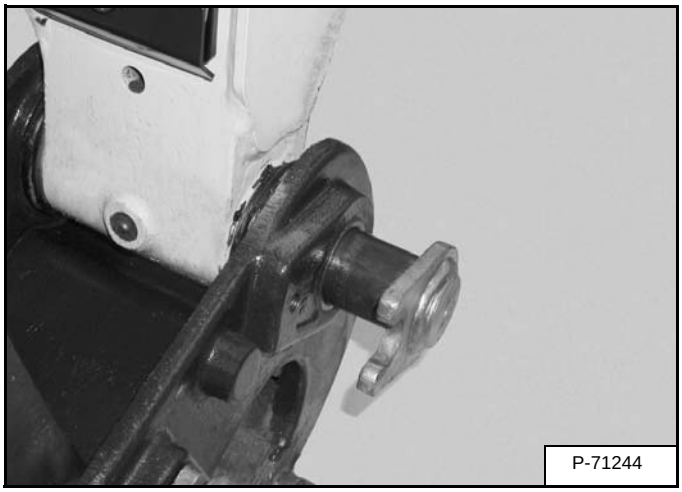
Remove the link (Item 1) **[Figure 50-230-6]**.

Figure 50-230-7



Remove the bolt, washer and spacer (Item 1) **[Figure 50-230-7]**.

Figure 50-230-8



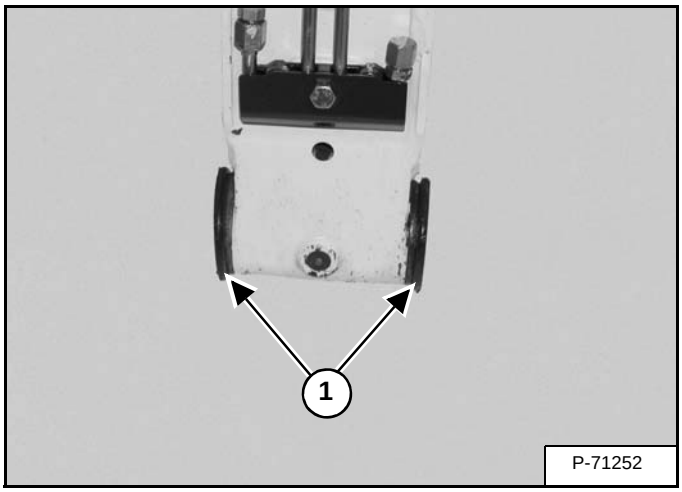
Remove the pin (Item 1) **[Figure 50-230-8]**.

Remove the hydraulic X-Change.

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Removal And Installation (Cont'd)

Figure 50-230-9

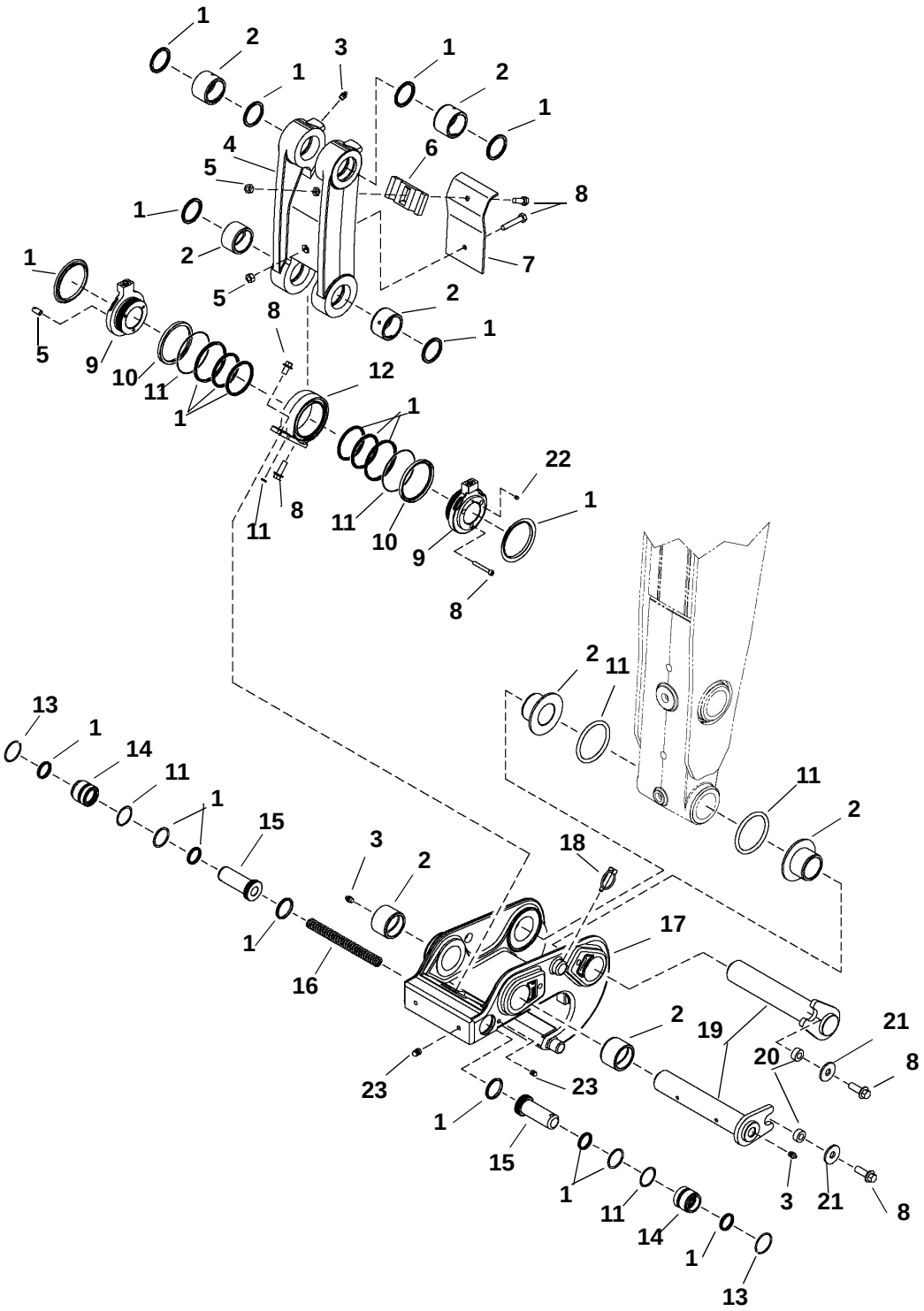


Remove the O-rings (Item 1) **[Figure 50-230-9]** from the arm.

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Parts Identification

1. Seal
2. Bushing
3. Grease Fitting
4. Bucket Link
5. Nut
6. Foam Block
7. Cover
8. Bolt
9. Swivel End
10. Wear Ring
11. O-Ring
12. Swivel Base
13. Retaining Ring
14. Piston Head
15. Piston
16. Spring
17. X-Change Assembly
18. Retainer Pin
19. Pin
20. Spacer
21. Washer
22. Dowel Pin
23. Expansion Plug

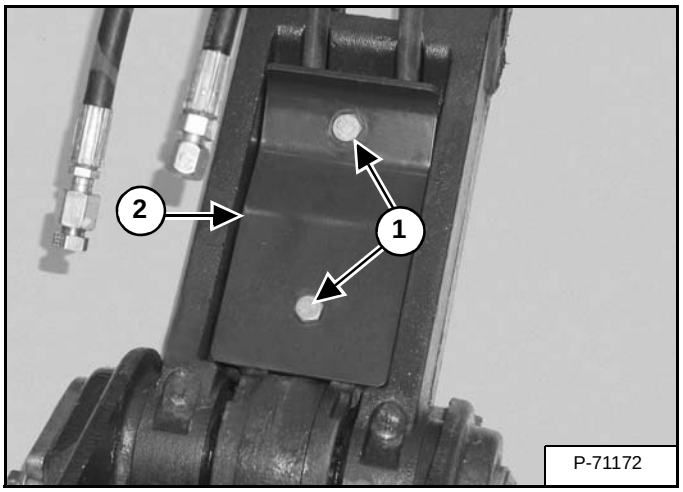


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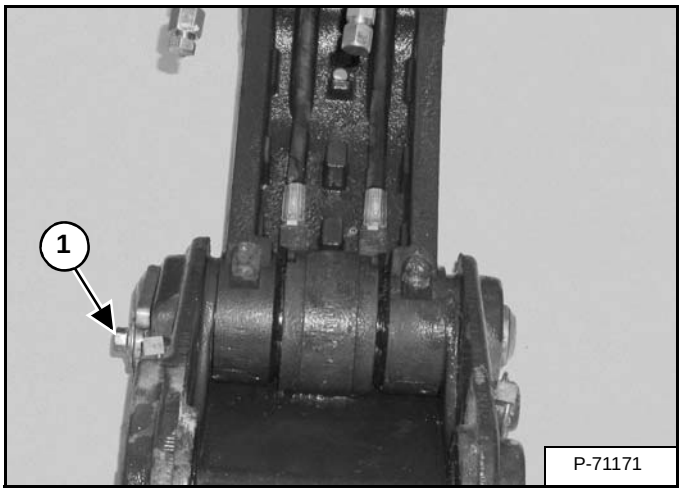
Disassembly

Figure 50-230-10



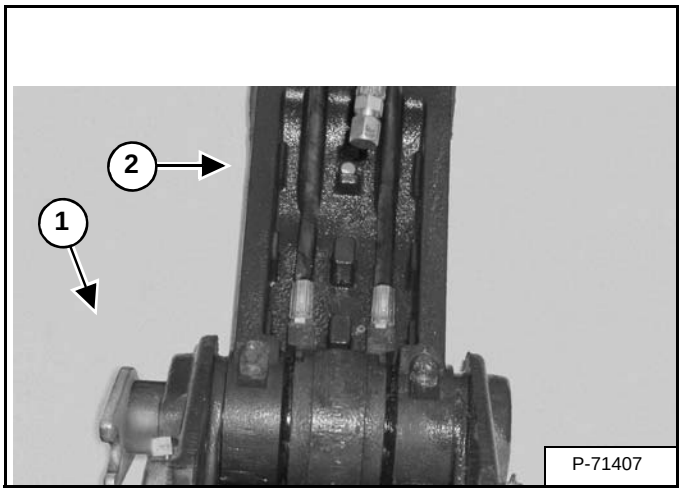
Remove the two bolts (Item 1) and the cover (Item 2) **[Figure 50-230-10]**.

Figure 50-230-11



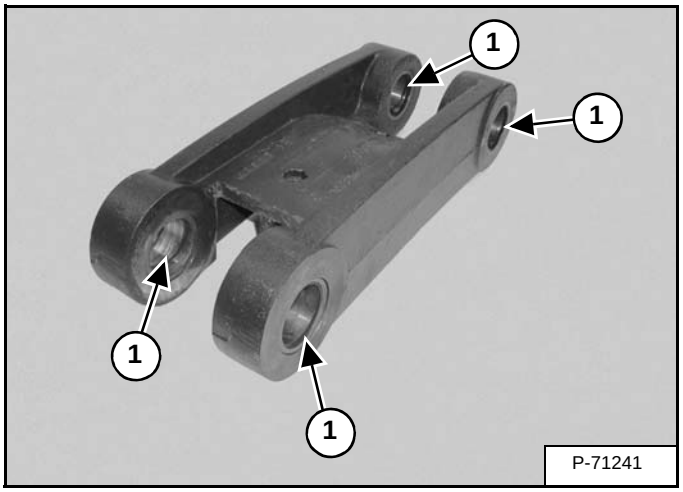
Remove the bolt (Item 1) **[Figure 50-230-11]** washer and spacer.

Figure 50-230-12



Remove the pin (Item 1) and the bucket link (Item 2) **[Figure 50-230-12]**.

Figure 50-230-13

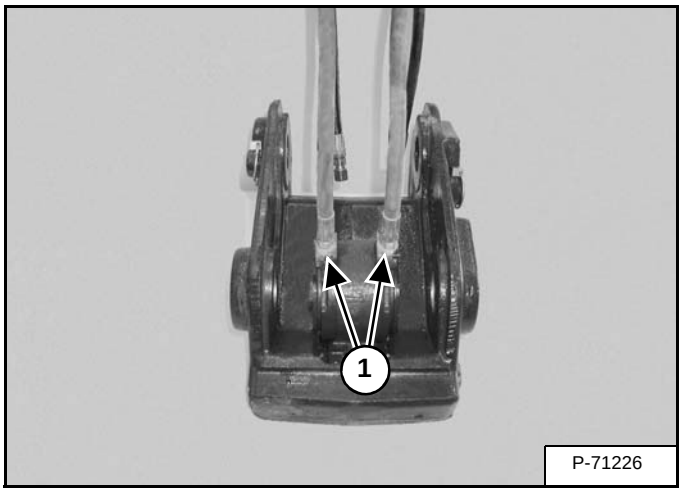


Remove the dust seals and bushings (Item 1) **[Figure 50-230-13]** from the bucket link.

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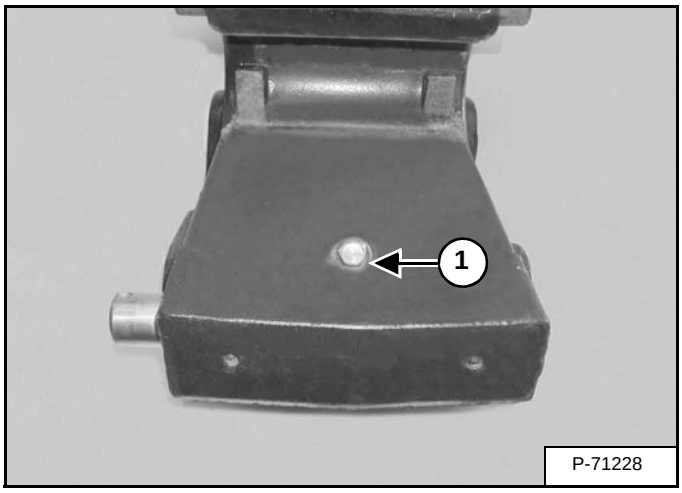
Disassembly (Cont'd)

Figure 50-230-14



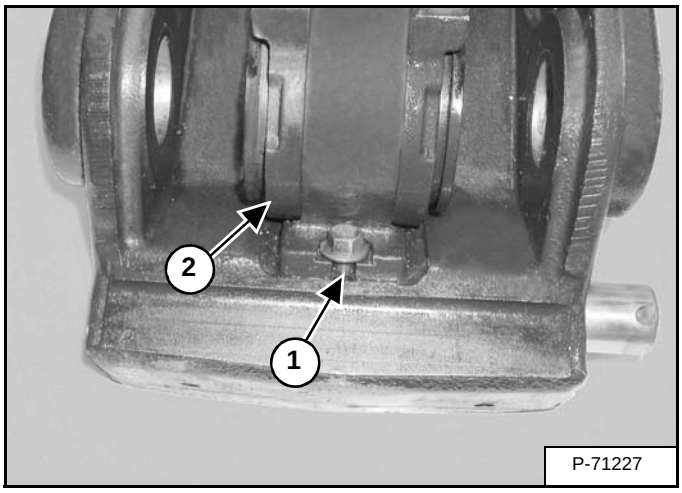
Remove the two hydraulic hoses (Item 1) **[Figure 50-230-14]** from the swivel ends.

Figure 50-230-15



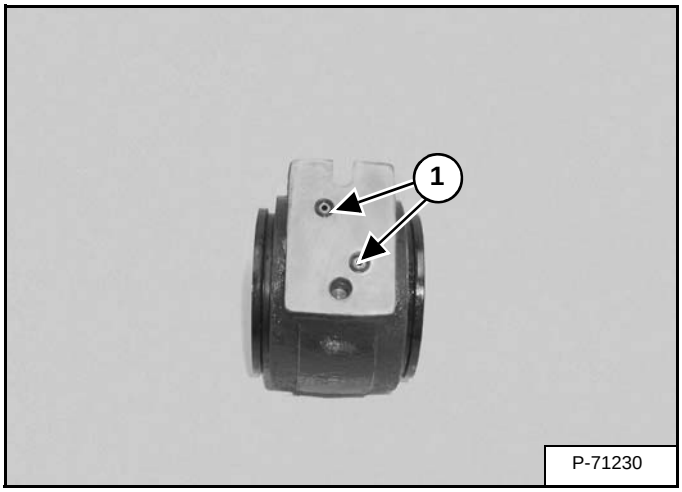
Remove the bolt (Item 1) **[Figure 50-230-15]**.

Figure 50-230-16



Remove the bolt (Item 1), nut, and the swivel assembly (Item 2) **[Figure 50-230-16]**.

Figure 50-230-17

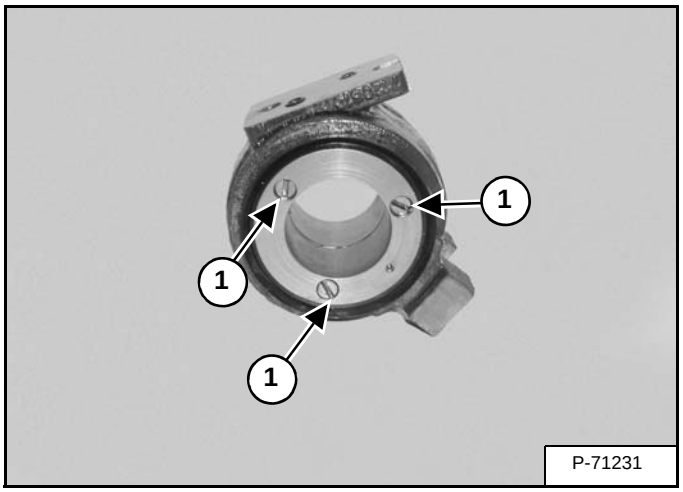


Remove the O-rings (Item 1) **[Figure 50-230-17]** from the swivel assembly.

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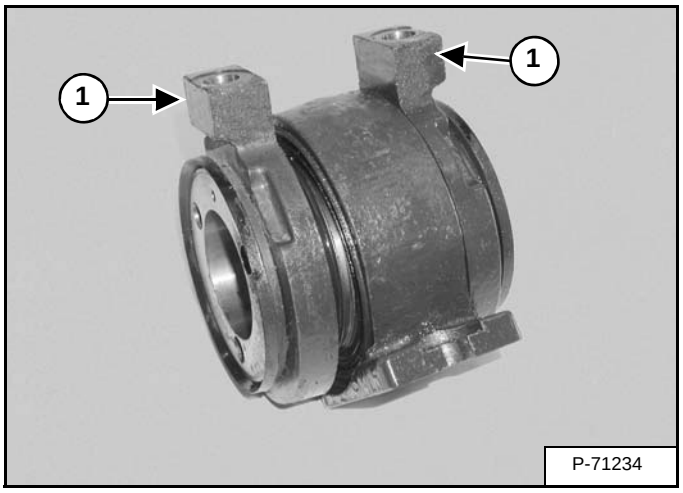
Disassembly (Cont'd)

Figure 50-230-18



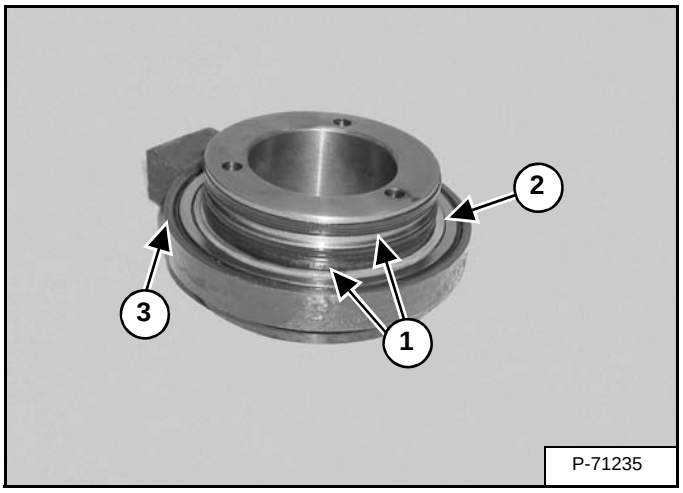
Remove the screws (Item 1) **[Figure 50-230-18]** and nuts from the swivel assembly.

Figure 50-230-19



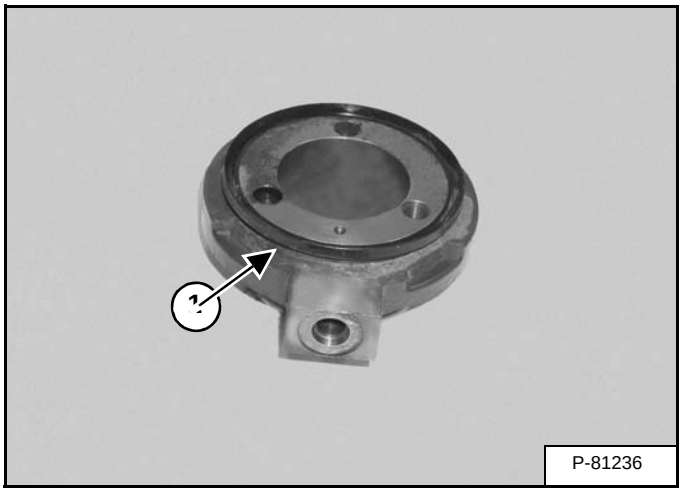
Remove the two swivel ends (Item 1) **[Figure 50-230-19]**.

Figure 50-230-20



Remove the seals (Item 1), wear ring (Item 2) and the O-ring (Item 3) **[Figure 50-230-20]** from the swivel end.

Figure 50-230-21

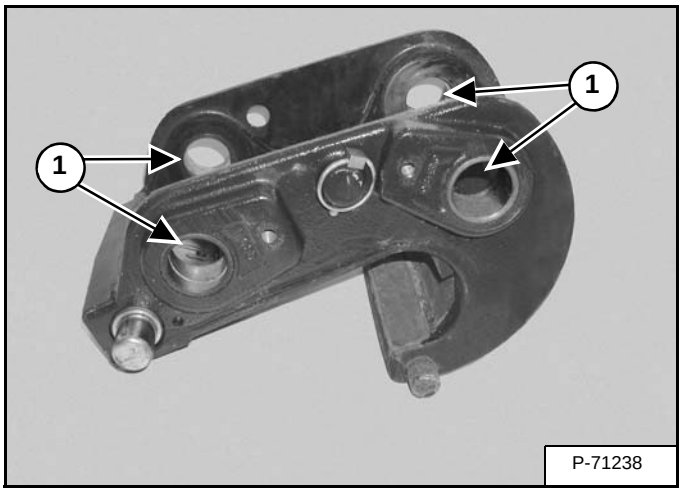


Remove the dust seal (Item 1) **[Figure 50-230-21]**. (Both swivel ends)

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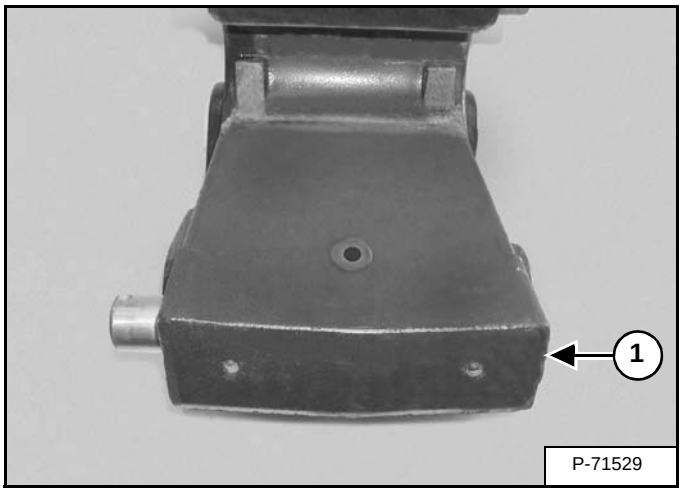
Disassembly (Cont'd)

Figure 50-230-22



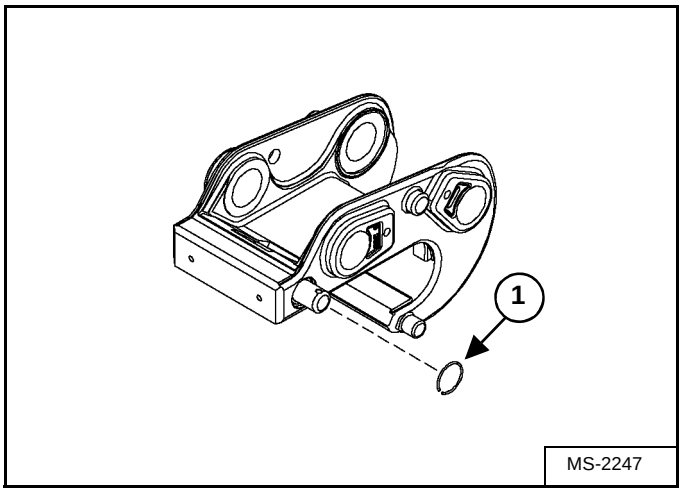
Remove the four bushings (Item 1) **[Figure 50-230-22]**.

Figure 50-230-23



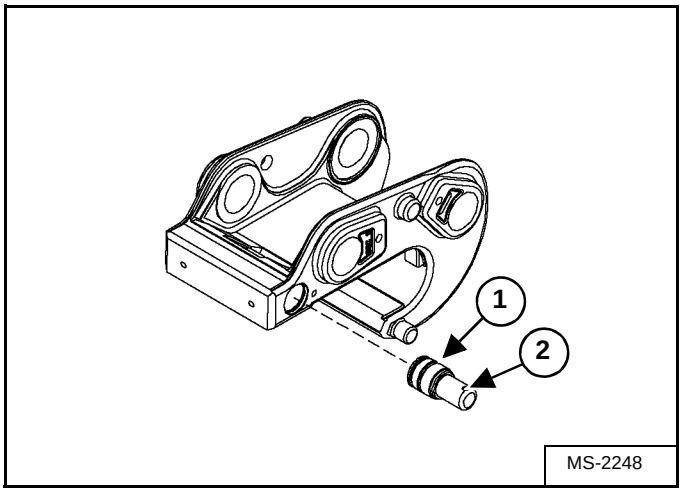
Apply inward pressure on the piston (Item 1) **[Figure 50-230-23]**. (Both sides)

Figure 50-230-24



Remove the retaining ring (Item 1) **[Figure 50-230-24]**. (Both sides)

Figure 50-230-25



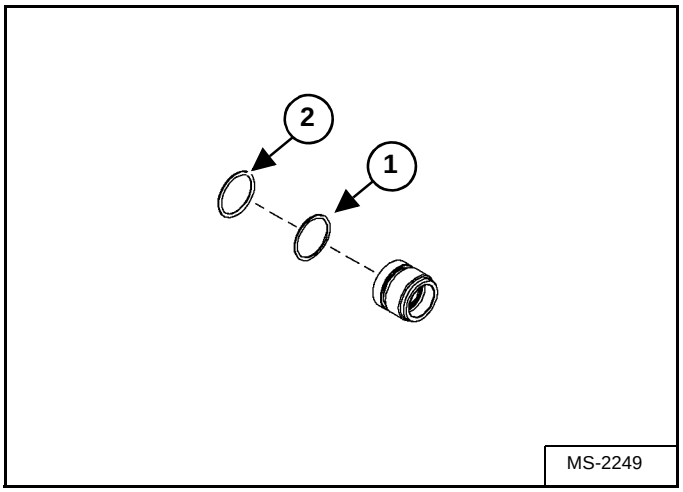
Remove the piston head (Item 1) and the piston (Item 2) **[Figure 50-230-25]**. (Both sides)

Separate the piston head (Item 1) and the piston (Item 2) **[Figure 50-230-25]**. (Both sides)

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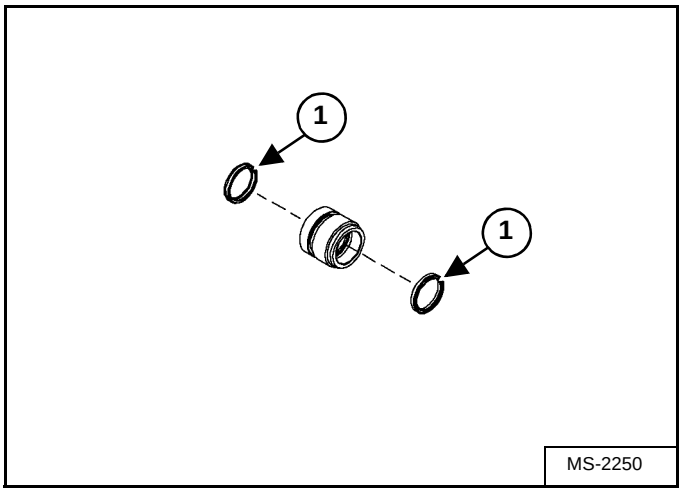
Disassembly (Cont'd)

Figure 50-230-26



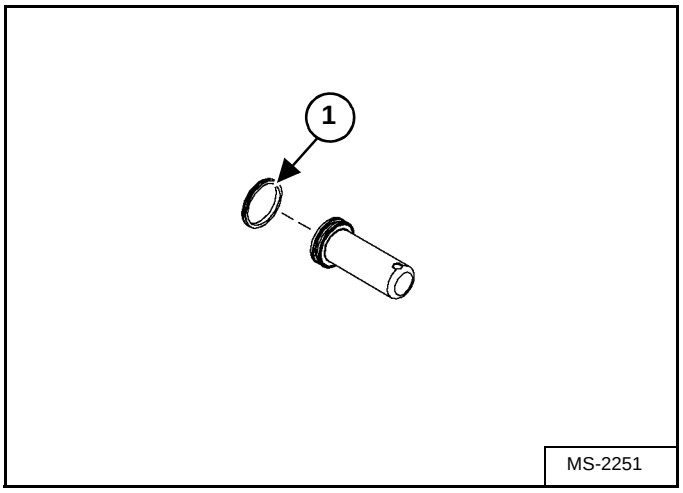
Remove the back-up ring (Item 1) and the O-ring (Item 2) **[Figure 50-230-26]** from the piston head.

Figure 50-230-27



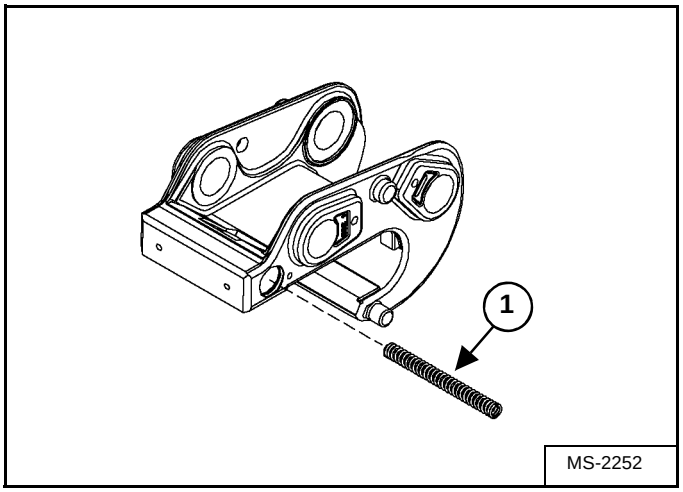
Remove the two pin seals (Item 1) **[Figure 50-230-27]** from inside the piston head.

Figure 50-230-28



Remove the piston seal (Item 1) **[Figure 50-230-28]** from the piston.

Figure 50-230-29



Remove the compression spring (Item 1) **[Figure 50-230-29]**.

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Assembly

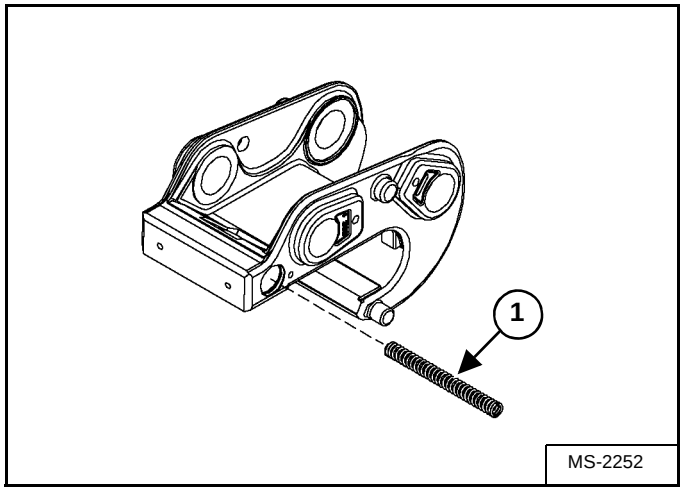
Clean all parts in solvent and dry with compressed air.

Inspect the cylinder parts for wear or damage. Replace any worn or damaged parts.

Always install new O-rings and seals.

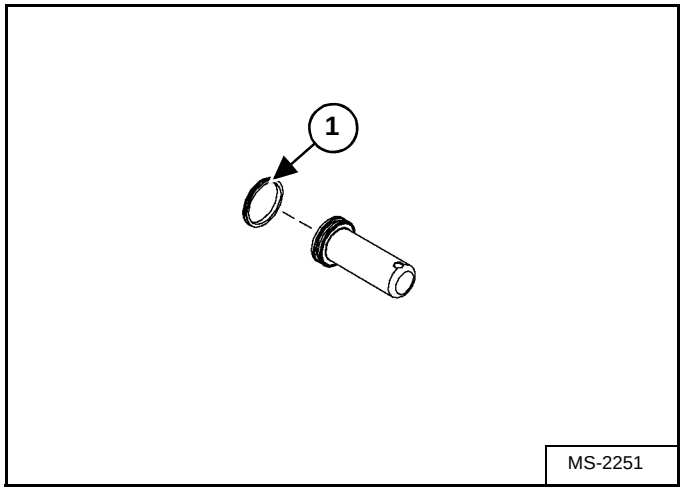
Lubricate all O-rings and seals with hydraulic oil during installation.

Figure 50-230-30



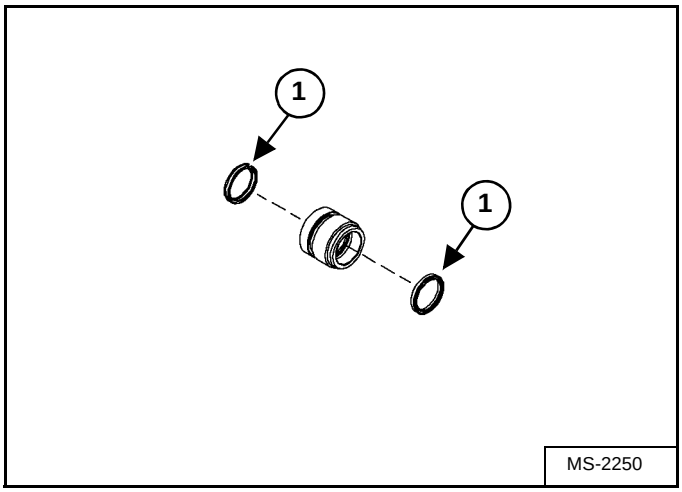
Install the compression spring (Item 1) **[Figure 50-230-30]**.

Figure 50-230-31



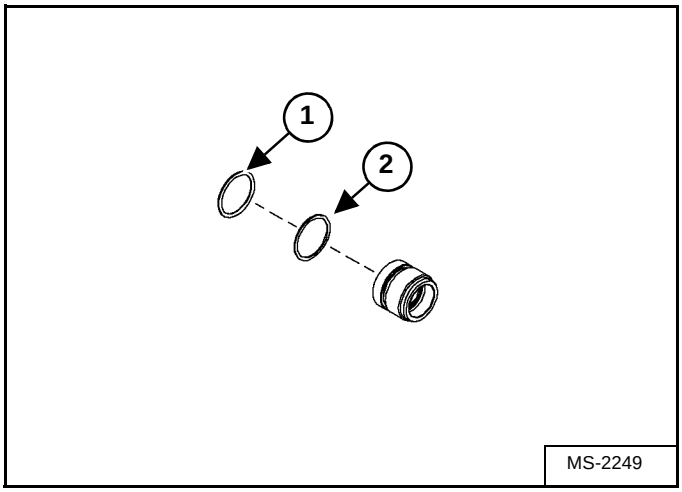
Install the piston seal (Item 1) **[Figure 50-230-31]** on the piston.

Figure 50-230-32



Install the two pin seals (Item 1) **[Figure 50-230-32]** on the inside of the piston head.

Figure 50-230-33

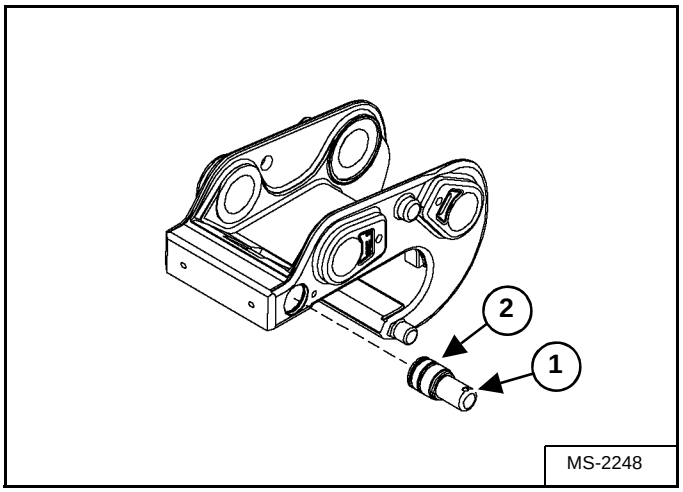


Install the O-ring (Item 1) and back-up ring (Item 2) **[Figure 50-230-33]** on the piston head.

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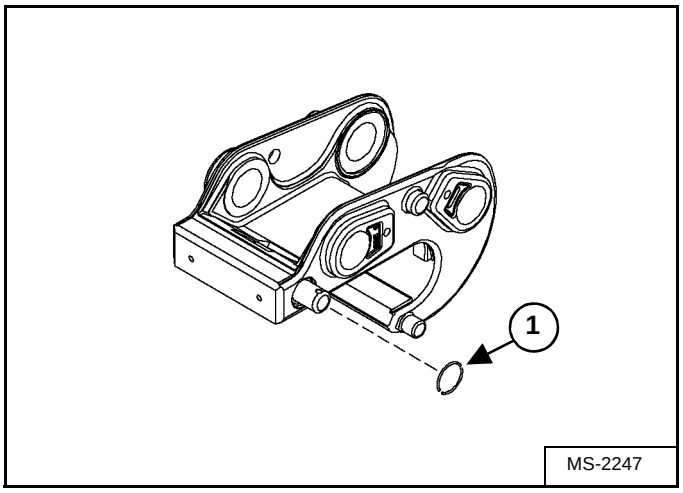
Assembly (Cont'd)

Figure 50-230-34



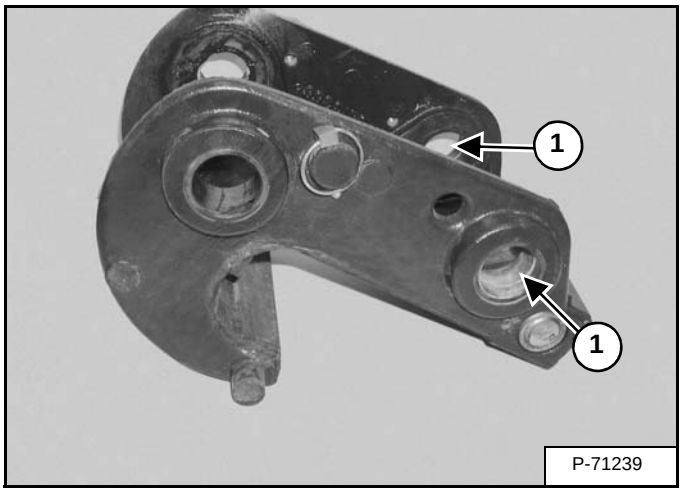
Install the piston (Item 1) and the piston head (Item 2) **[Figure 50-230-34]**.

Figure 50-230-35



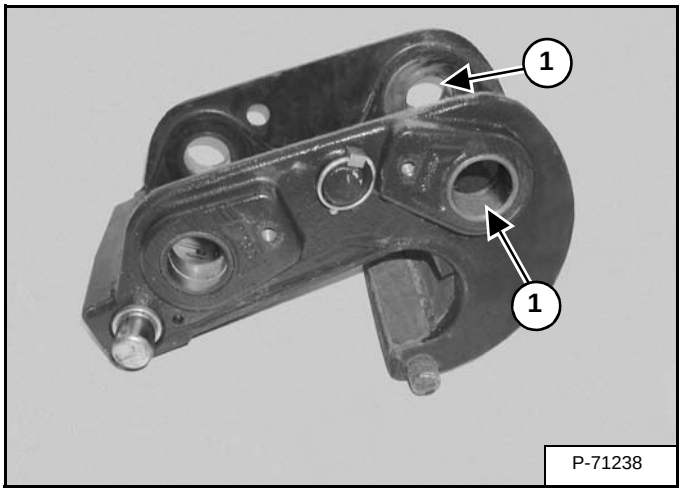
Apply inward pressure on the piston and install the retaining ring (Item 1) **[Figure 50-230-35]**.

Figure 50-230-36



Install the bushings (Item 1) **[Figure 50-230-36]**.

Figure 50-230-37

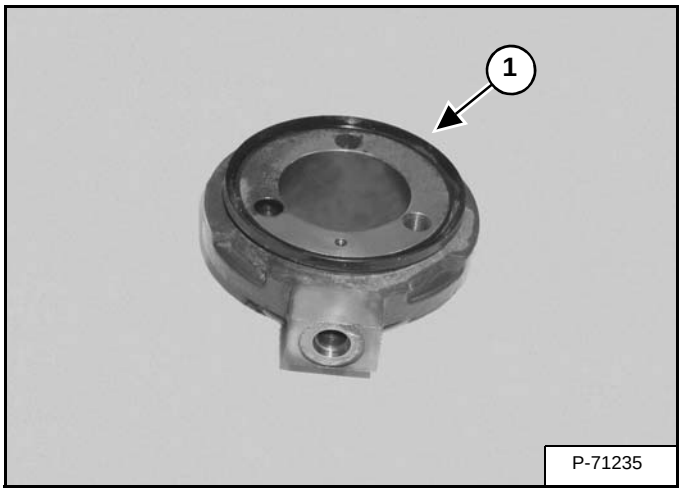


Install the bushings (Item 1) **[Figure 50-230-37]**.

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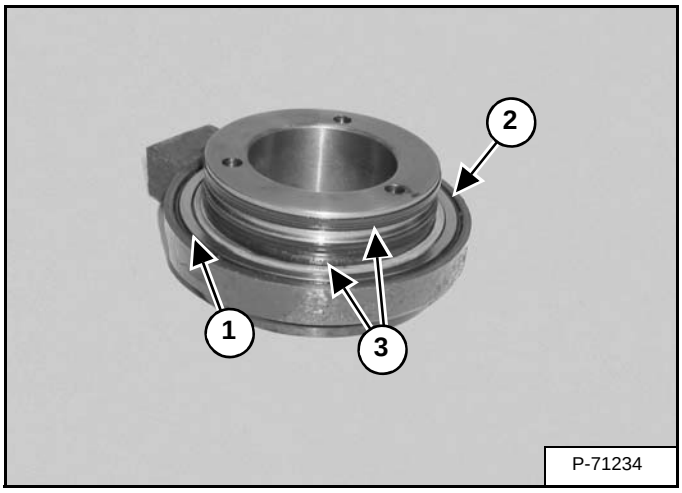
Assembly (Cont'd)

Figure 50-230-38



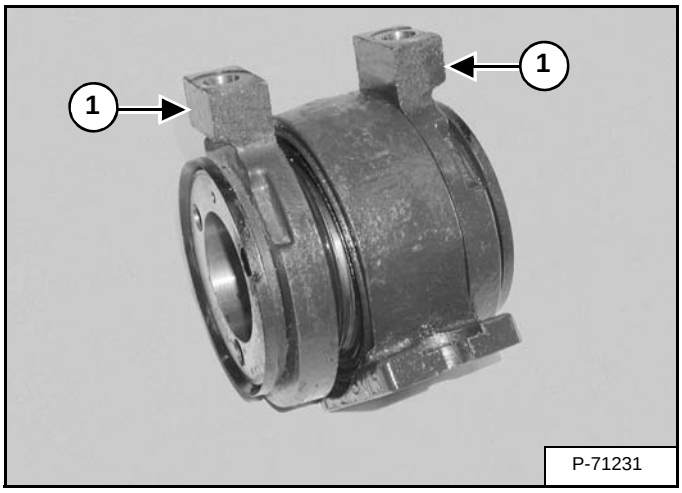
Install the dust seal (Item 1) **[Figure 50-230-38]** on the swivel.

Figure 50-230-39



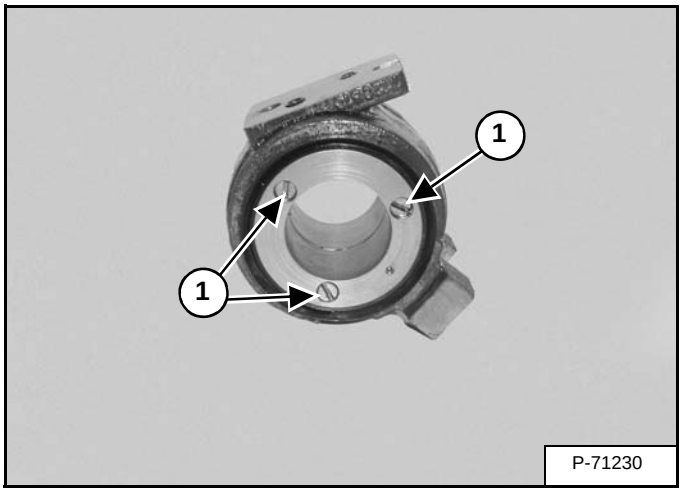
Install the O-ring (Item 1) wear ring (Item 2) and the seals (Item 3) **[Figure 50-230-39]**.

Figure 50-230-40



Install the swivel ends (Item 1) **[Figure 50-230-40]** onto the base.

Figure 50-230-41

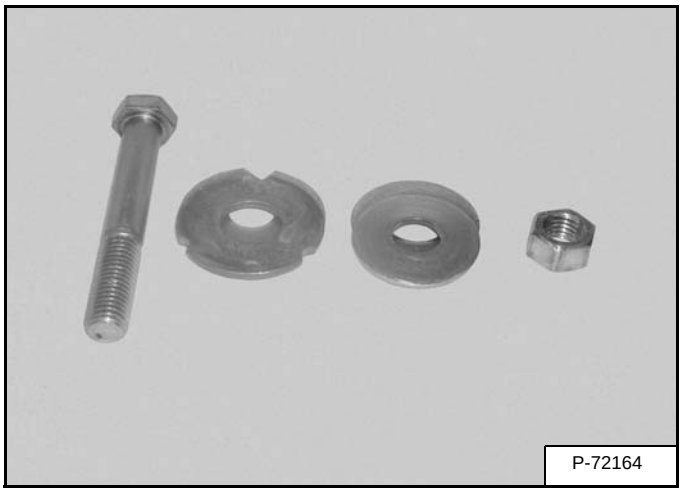


Install the screws (Item 1) **[Figure 50-230-41]** and nuts in the swivel assembly. Do not tighten at this time.

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Assembly (Cont'd)

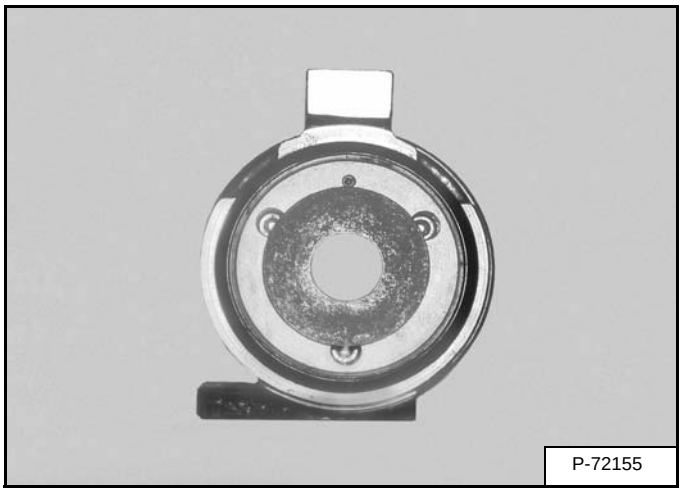
Figure 50-230-42



It is necessary to fabricate a preload tool to get the proper torque on the swivel assembly screws. The tool consists of a 5/8 x 5 in. course thread bolt, two 5/8 x 2-1/4 in. flat washers, two 5/8 x 2 in. flat washers and a 5/8 course thread nut **[Figure 50-230-42]**.

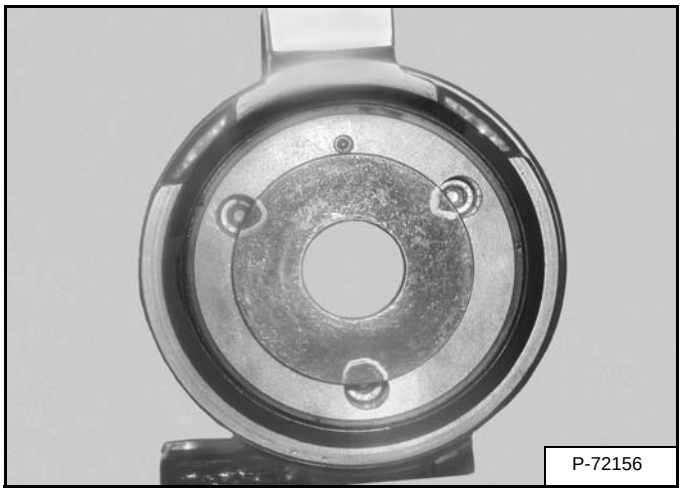
NOTE: This procedure must be followed to ensure the swivel assembly screws are tightened to the proper torque value.

Figure 50-230-43



Center a 2-1/4 in. flat washer on one side of the swivel assembly **[Figure 50-230-43]**.

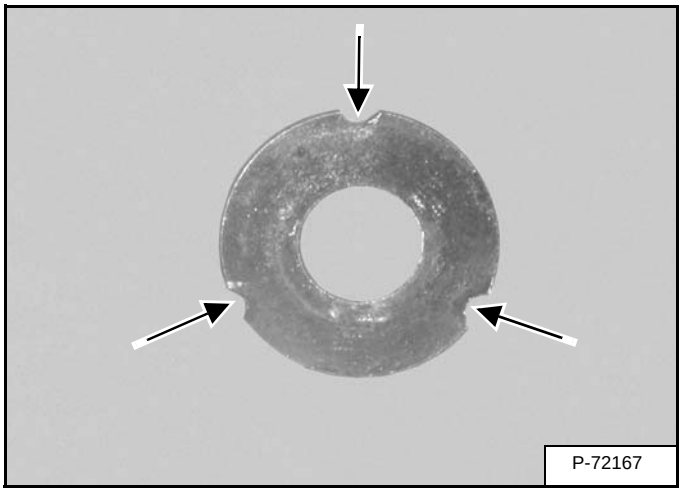
Figure 50-230-44



Using a marker, mark the three screw holes on the washer **[Figure 50-230-44]**.

Repeat for the opposite side.

Figure 50-230-45



Using a grinder, remove material identified in the previous step **[Figure 50-230-45]**.

⚠ WARNING

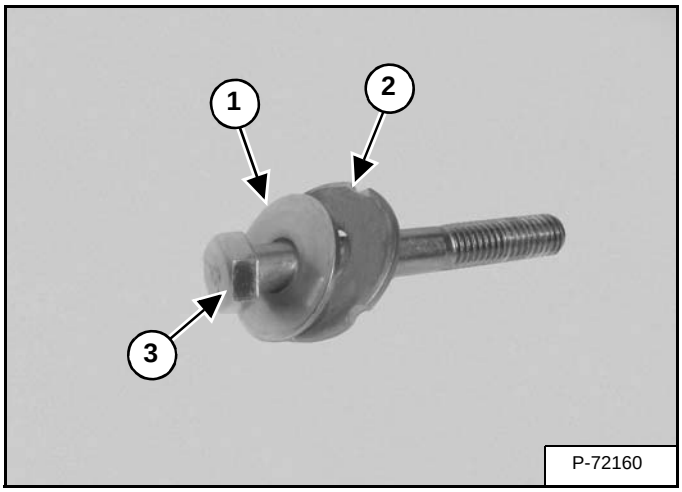
Eye and body protection is required when welding or grinding. Wear approved goggles, helmet and clothing. Failure to wear eye and body protection can result in serious injury.

W-2009-1285

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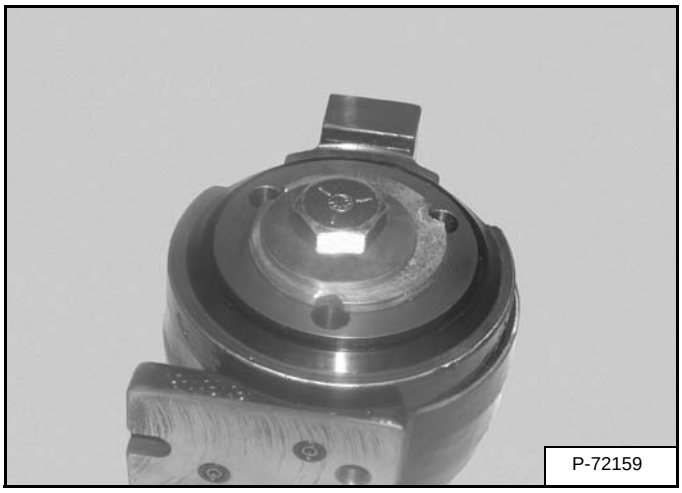
Assembly (Cont'd)

Figure 50-230-46



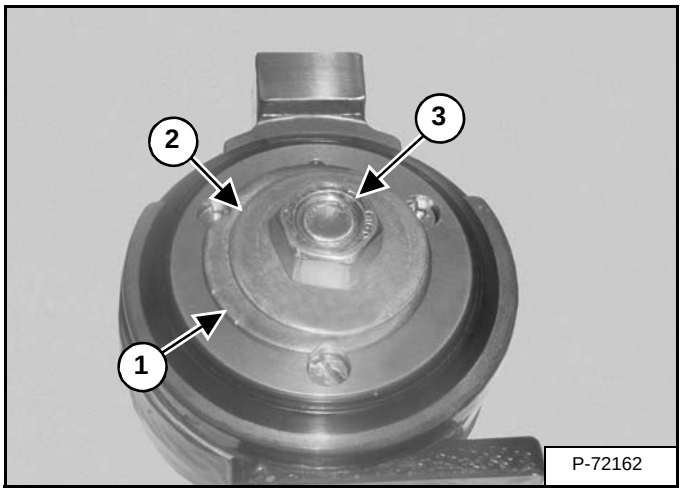
Install a 2 in. flat washer (Item 1), 2-1/4 in. flat washer (Item 2) onto the bolt (Item 3) **[Figure 50-230-46]**.

Figure 50-230-47



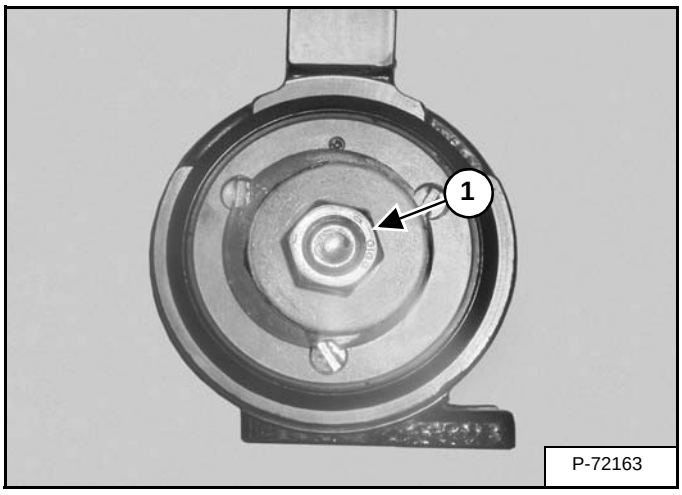
Insert the bolt through the center of the swivel assembly aligning the notches in the flat washer with the screw holes **[Figure 50-230-47]**.

Figure 50-230-48



Turn the swivel assembly over and install the remaining 2-1/4 in. flat washer (Item 1), 2 in. flat washer (Item 2) and nut (Item 3) **[Figure 50-230-48]**.

Figure 50-230-49



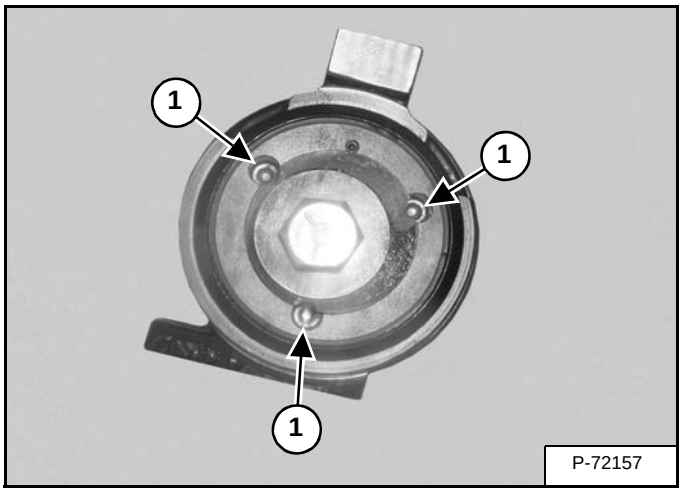
NOTE: Ensure the notches in both washers are aligned with the screw holes on the swivel assembly [Figure 50-230-49].

Tighten the preload tool nut (Item 1) **[Figure 50-230-49]** to 83 ft.-lb. (112.5 N•m) torque.

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Assembly (Cont'd)

Figure 50-230-50

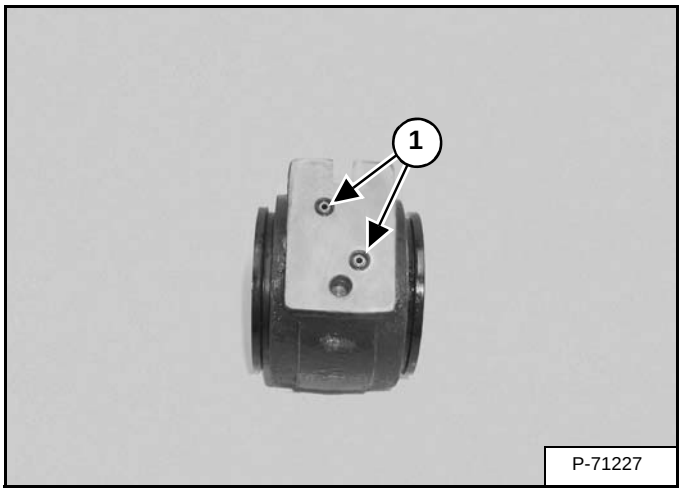


Tighten the swivel assembly screws (Item 1) **[Figure 50-230-50]** to 10.4-11.6 ft.-lb. (14,2-15,8 N•m) torque.

NOTE: This procedure must be followed to ensure the swivel assembly screws are tightened to the proper torque value.

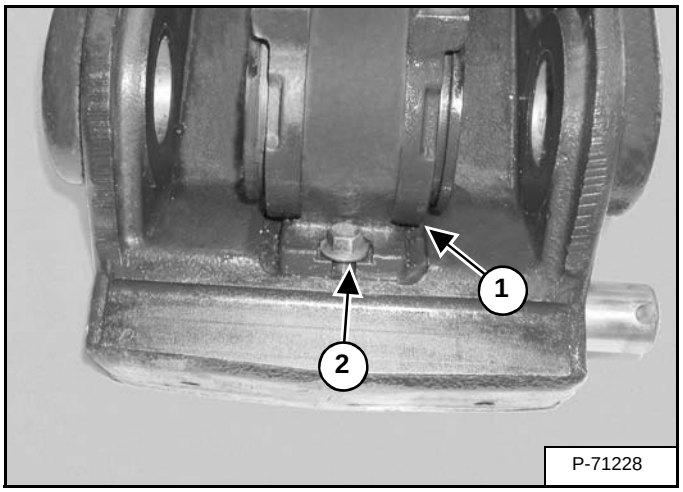
Remove the preload tool.

Figure 50-230-51



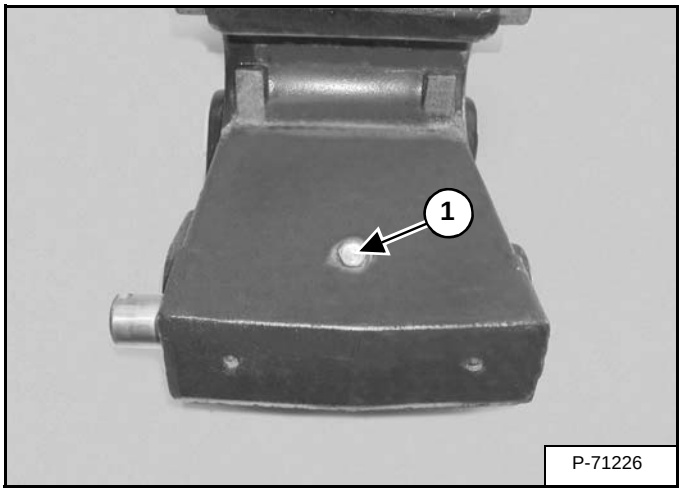
Install the two O-rings (Item 1) **[Figure 50-230-51]** into the swivel assembly.

Figure 50-230-52



Install the swivel assembly (Item 1) using the bolt (Item 2) **[Figure 50-230-52]**.

Figure 50-230-53

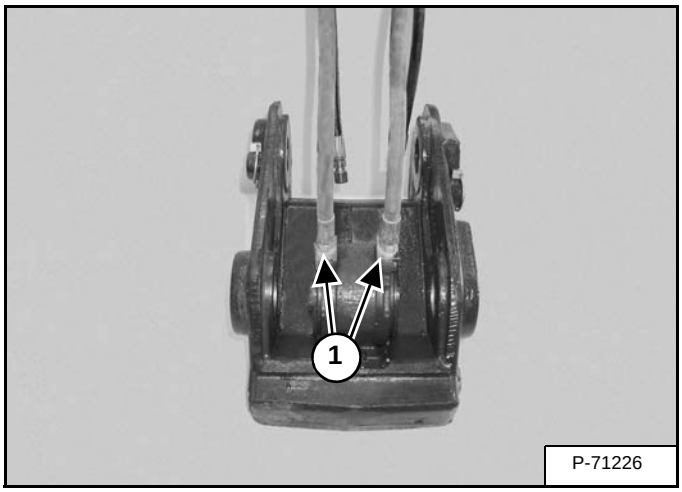


Install the bolt (Item 1) **[Figure 50-230-53]** and nut.

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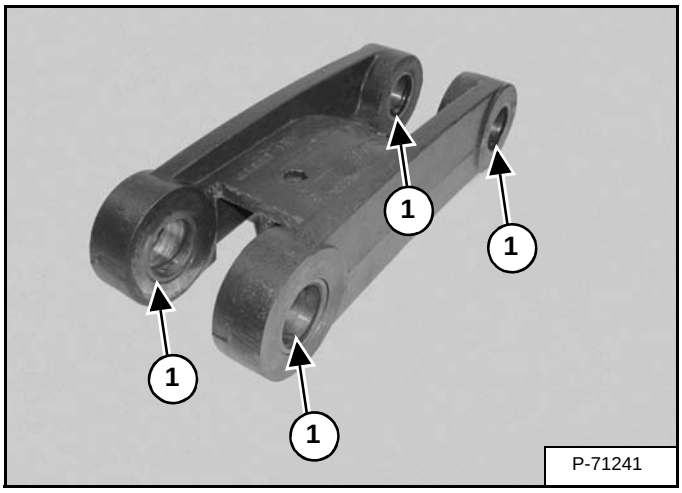
Assembly (Cont'd)

Figure 50-230-54



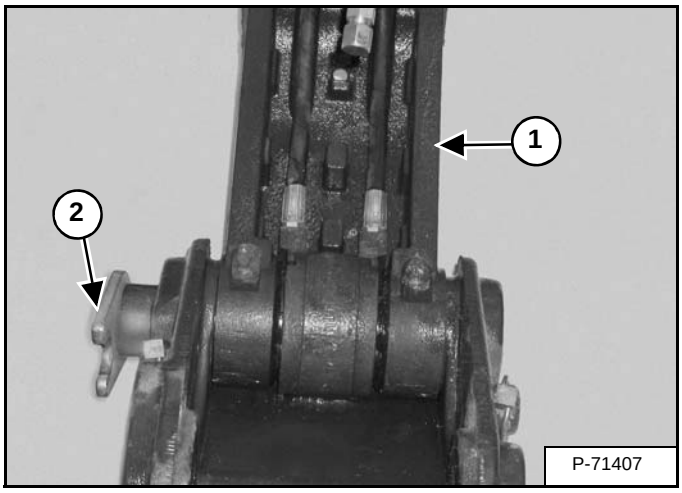
Install the hydraulic hoses (Item 1) **[Figure 50-230-54]** onto the swivel ends.

Figure 50-230-55



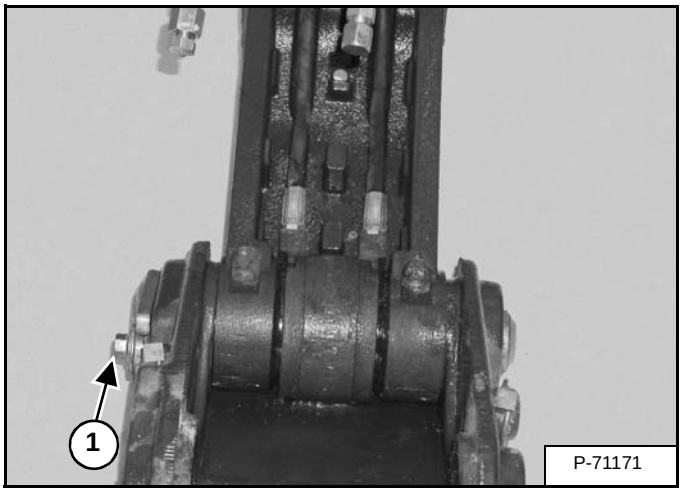
Install the bushings (Item 1) **[Figure 50-230-55]** and dust seals into the bucket link.

Figure 50-230-56



Install the bucket link (Item 1) and pin (Item 2) **[Figure 50-230-56]**.

Figure 50-230-57

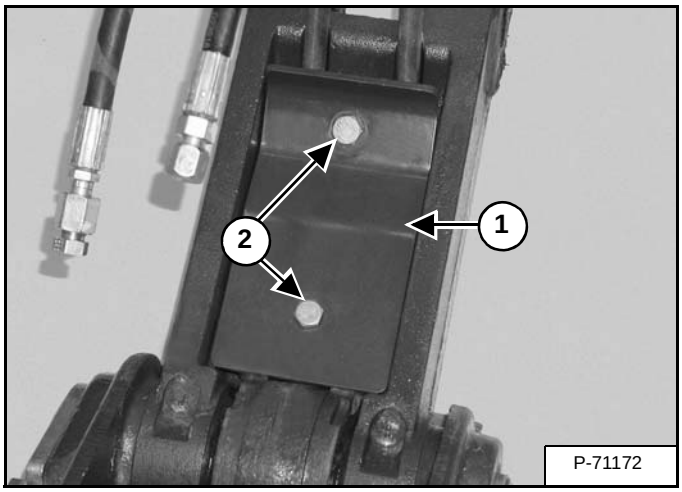


Install the spacer, flat washer and bolt (Item 1) **[Figure 50-230-57]**.

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Assembly (Cont'd)

Figure 50-230-58



Install the foam block and cover (Item 1) using the two bolts (Item 2) **[Figure 50-230-58]** and nuts.

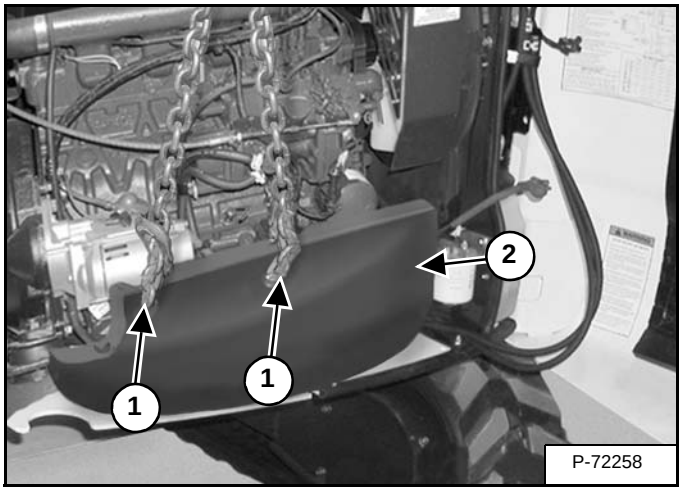
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COUNTERWEIGHT

Removal And Installation

Open the tailgate.

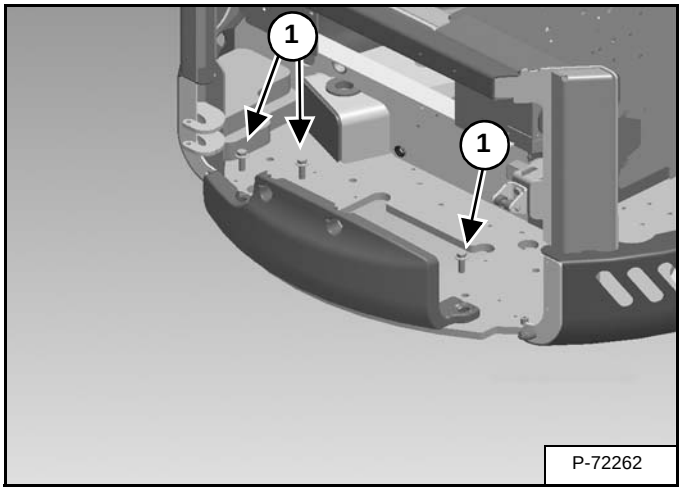
Figure 50-240-1



Install a hoist and chain (Item 1) through the two holes in the counterweight and apply slight upward pressure on the counter weight (Item 2) **[Figure 50-240-1]**.

Early Models

Figure 50-240-2



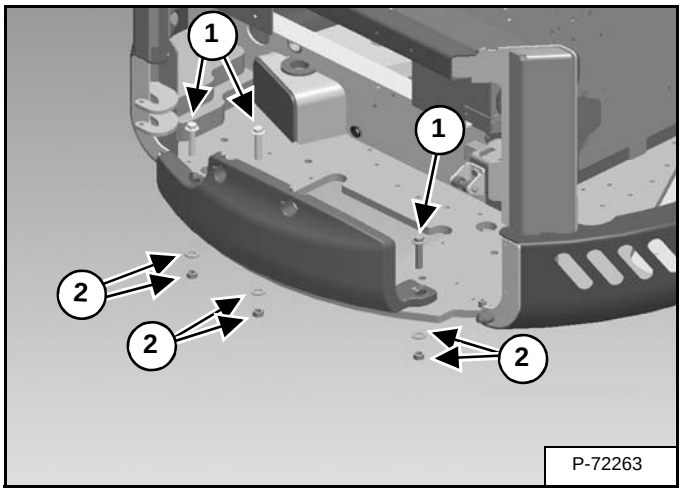
Remove the three bolts (Item 1) **[Figure 50-240-2]** from the counter weight. Remove the counter weight.

NOTE: Lifting hoist and engine removed for photo clarity.

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

Middle Models

Figure 50-240-3



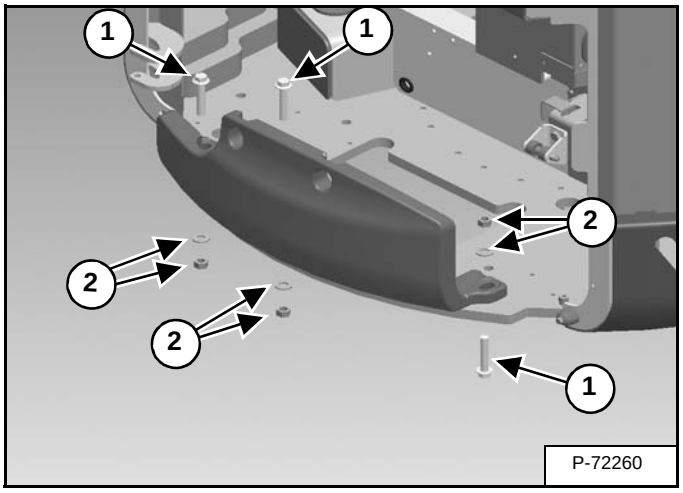
Remove the three bolts (Item 1), washer and nuts (Item 2) **[Figure 50-240-3]** from the counter weight. Remove the counter weight.

NOTE: Lifting hoist and engine removed for photo clarity.

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

Later Models

Figure 50-240-4



Remove the three bolts (Item 1), washer and nuts (Item 2) **[Figure 50-240-4]** from the counter weight. Remove the counter weight.

NOTE: Lifting hoist and engine removed for photo clarity.

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

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WIRING SCHEMATIC

435 (S/N 562611001 AND ABOVE)
(S/N 562811001 - 562811347)
(PRINTED NOVEMBER 2007)
V-0381

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WIRES CONNECT BY LETTER ACROSS CONNECTORS

SOME CONNECTOR BODIES NOT SHOWN FOR DRAWING CLARITY

BATTERY FEED 1000-1999 RED, RED/WHT, RNG
GROUND 2000-2999 BLK
MONITORING 3000-3999 LBL
HYDRAULIC 4000-4999 LGN
ATTACHMENT CONTROLS 5000-5999 YEL
LIGHTS 6000-6999 PNK
ACCESSORIES 7000-7999 WHT
ENGINE 8000-8999 TAN
COMMUNICATION 9000-9999 PUR

RED = RED
RNG = ORANGE
BLK = BLACK
LBL = LIGHT BLUE
DBL = DARK BLUE
LGN = LIGHT GREEN
DGN = DARK GREEN
YEL = YELLOW
PNK = PINK
WHT = WHITE
BRN = BROWN
TAN = TAN
PUR = PURPLE
GRY = GRAY

CONTROL MODULE CONNECTORS J1-J6

J3: F L POT SIGNAL 4830; G SENSOR POWER (+5V) 4300; D CONSOLE 3900; C HYD TEMP 3300; H SENSOR GROUND 4310; A FUEL SENDER 3100; B ENGINE TEMP 3200; E TRAVEL PILOT 3420

J4: F HYD OIL FILTER 3430; K ENGINE SPEED VR 3600; G ENG OIL PRESS 3500; H STARTER STATUS 9360; D ENGINE SPEED HALL 8550; A GLOW PLUG STATUS 8120; B FUEL PULL STATUS 8550; C CRANK 9350; J KEY 9330

J1: A STARTER 9370; K SWITCHED POWER RELAY 8000; B FUEL HOLD 8150; L FUEL PULL 8110; G GROUND 2100; D GROUND 2110; C LIGHT 6210; E BATTERY 1110; F BATTERY 1120; H GLOW PLUG 8510

J5: K CAN SHIELD 9700; A CAN LOW 9900; B CAN HIGH 9500; F R POT SIGNAL 4320; E 2 SPEED 4960; G DETENT 4920; J L SKI UP; H L SKI DOWN; D R SKI DOWN; C R SKI UP

J2: F PIEZO OUT 9320; D GROUND; G LOAD MOMENT 3700; J 2 SPEED PWM 3710; H PWM WORKGROUP 4500; K AUX. MALE COUPLER 4580; E AUX. FEMALE COUPLER 4550; C 4590; A B

J6: D TRAVEL PILOT 4510; J COOLING FAN 4590; G UNUSED #1; E SPARE DIG #2; C SPARE DIG #1; H SPARE ANG #2; A ACON INPUT 7400; B UNUSED #3; K UNUSED #2; F

LH CONSOLE HARNESS 6812096

CONSOLE SENSOR

FUEL SENDER 33-240 ohm

LEFT HANDLE: DETENT, RED, BRN

HORN

LOAD MOMENT SWITCH (OPTIONAL) C621

FRAME LIGHT

BEACON SWITCH (OPTIONAL) C622

WIPER SWITCH (OPTIONAL) C620

FUEL PUMP

HARNESS, FUEL PUMP 6815091

C208 C209

CAB AND WIPER WIRING (IF SO EQUIPPED) HARNESS 6814793 AND 6814792

BEACON

DOME LIGHT

LEFT WORK LIGHT (OPT)

WORK LIGHT HARNESS

RIGHT WORK LIGHT (OPT)

MOTOR WIPER

6814792

FUEL SHUTOFF SOLENOID (LATER MODELS)

FUEL SHUT OFF
HOLD – 0.33 OHM
PULL – 24.5 OHM

WHT TO BLK = 0.26 ohm
RED TO BLK = 10.9 ohm

FUEL SHUTOFF SOLENOID (EARLY MODELS)

6814830

GLOW PLUGS 0.4 ohm

SPEED SENSOR (VR)

ENGINE COOLANT SENDER 500-3000 ± 30 ohm

ENGINE OIL PRESSURE SWITCH

STARTER

BATTERY

ALTERNATOR

GROUNDS

ENGINE HARNESS 6814829

C457: H 3900; B 3100; D 4830; E 4370; F 4380; C; K; G; J 3700; A 1730

LOAD MOMENT (OPTIONAL) C458: 3700 – 3710; A 7130; B 2650

TRAVEL ALARM (OPTIONAL)

HYD TEMP SENDER 538-1824 ±30 ohm: 3300

HYD FILTER SWITCH: 3320

TRAVEL PILOT PRESSURE SENDER 0.5 - 7.5 V: A; C; B

C459: A 3400; C 3420; B 3410

C461: E 6230; F 7110; D 1460; C 6300; J 2930; K; G 2790; A 6400; B 8700; H 2700

AUX SOCKET C465: 1 6400; 2 7210; 2840

C462: + 7110; – 2820

WASHER BOTTLE

BOOM LIGHT HARNESS 6808415

C460: 6220; 2940

C468

BOOM LIGHT

C452: A 8150; B 8100; C 8500

C450: F 8550; C 3600; A 3620; B 3200; D; E 1030; G 1040

C451: C 3500; A 9360; D 9390; E; G; F 1480

HEATER C161: C B A B; 2740; 1160; 1740; 7400

FUSE 6 25A 1310

ACD POWER 1320 FUSE 4 25A 1050

WIPER POWER 1460 FUSE 1 10A

ALT HEATER 1480 FUSE 3 25A 1740

SWITCH POWER FUSE 2 20A 7200; 7200; 1470; 2830

RADIO CONN

RADIO MEMORY 1; 7220; 7210

15A FUSE 12 1360

FUEL SHUTOFF: 8100; 8120; 8110; 87A 87 86 30 85; 2030; 2040

25A FUSE 8 1310

SWITCHED POWER: 1050; 8000; 87A 87 86 30 85; 1330; 2000; 2010

LIGHT RELAY: 6200; 6210; 87A 87 86 30 85; 1370; 2030; 2040

20A FUSE 11 1360

GLOW PLUGS: 8500; 8510; 87A 87 86 30 85; 1060; 2040; 2050

25A FUSE 9 1150

FUSE 10 25A 1140; 1150

STARTER: 9390; 9380; 87A 87 86 30 85; 1070; 2050

5A FUSE 7 1310 9400

RELAY GROUNDS 2000-2050 ARE CONNECTED IN SERIES

1030; 1040

RIGHT HAND CONSOLE HARNESS 6814920

4920; 1770; 4360; 4320; 4350

C456: BRN; RED; WHT; GRN; BLK

RIGHT HANDLE: DETENT; PWM

BUZZER 9320 2610

4960 TWO-SPEED (BLADE LEVER) 1780

HYDRAULIC MANIFOLD VALVE SOLENOIDS

TWO-SPEED 8 ohm nominal at 12 VDC C416: A 4500; B 2500; YELLOW TIE STRAP

WORK GROUP LOCKOUT 8 ohm nominal at 12 VDC C418: A 4560; B 2560; GREEN TIE STRAP

AUX. MALE COUPLER 7.2 ohm nominal at 12 VDC C419: A 4580; B 2580; BLUE TIE STRAP

AUX. FEMALE COUPLER 7.2 ohm nominal at 12 VDC C420: A 4550; B 2550; RED TIE STRAP

PILOT PRESSURE 7.2 ohm nominal at 12 VDC C413: A 4510; B 2510; ORANGE TIE STRAP

COOLING FAN 9.0 ohm nominal at 12 VDC C414: A 4590; B 2590

ACD & REMOTE START CONNECTOR C453: A B C D E F G

9500; 9600; 9700; 1320; 1140; 2710

120 ohm

GROUNDS: 2310 – 2000, 2100, 2110, 2650, 2700, 2740,2790, 2830, 2930, 2940; 2300 – 2500, 2510, 2550, 2560, 2580, 2590, 2820

C455: 9330; 9340; 9400; WHT; DGN; RED; START; RUN; OFF; IGNITION SWITCH

15A ACC FUSE 12	STARTER	GLOW PLUGS	LIGHTS	FUEL PULL	25A ACC FUSE 4	25A FUEL FUSE 8
20A LIGHTS FUSE 11					25A ALT HEATER FUSE 3	5A IGN FUSE 7
25A ACC FUSE 10				SWITCH POWER	20A SW POWER FUSE 2	25A 15A/10A FUSE 6
25A CONTROLLER FUSE 9					10A IGNITION FUSE 1	FUSE 5

V-0381 (11-15-07)

WIRING SCHEMATIC

435 (S/N 562811346 AND ABOVE)
(S/N 563111001 AND ABOVE)
(S/N 563211001 AND ABOVE)
(PRINTED NOVEMBER 2007)
V-0631

WIRES CONNECT BY LETTER ACROSS CONNECTORS

SOME CONNECTOR BODIES NOT SHOWN FOR DRAWING CLARITY

BATTERY FEED 1000-1999 RED, RED/WHT, RNG
GROUND 2000-2999 BLK
MONITORING 3000-3999 LBL
HYDRAULIC 4000-4999 LGN
ATTACHMENT CONTROLS 5000-5999 YEL
LIGHTS 6000-6999 PNK
ACCESSORIES 7000-7999 WHT
ENGINE 8000-8999 TAN
COMMUNICATION 9000-9999 PUR

RED = RED
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DBL = DARK BLUE
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YEL = YELLOW
PNK = PINK
WHT = WHITE
BRN = BROWN
TAN = TAN
PUR = PURPLE
GRY = GRAY

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CONTROL MODULE CONNECTORS J1-J6

J3 J4 J1 J5 J2 J6

LH CONSOLE HARNESS 7101609

RIGHT HAND CONSOLE HARNESS 7105175

CAB HARNESS 7102833 (IF EQUIPPED)

WIPER HARNESS 7100772

BOOM LIGHT HARNESS 6808415

WORK LIGHT HARNESS

ENGINE HARNESS 6814829

HARNESS, FUEL PUMP 6815091

7105174 (Used on Fast Track Machines Only)

6814830

HYDRAULIC MANIFOLD VALVE SOLENOIDS

RELAY GROUNDS 2000-2050 ARE CONNECTED IN SERIES

V-0631 (11-15-07)

435 WIRING SCHEMATIC OPTIONS
(S/N 562611001 AND ABOVE)
(S/N 562811001 AND ABOVE)
(S/N 563111001 AND ABOVE)
(S/N 563211001 AND ABOVE)

(PRINTED NOVEMBER 2007)
V-0382

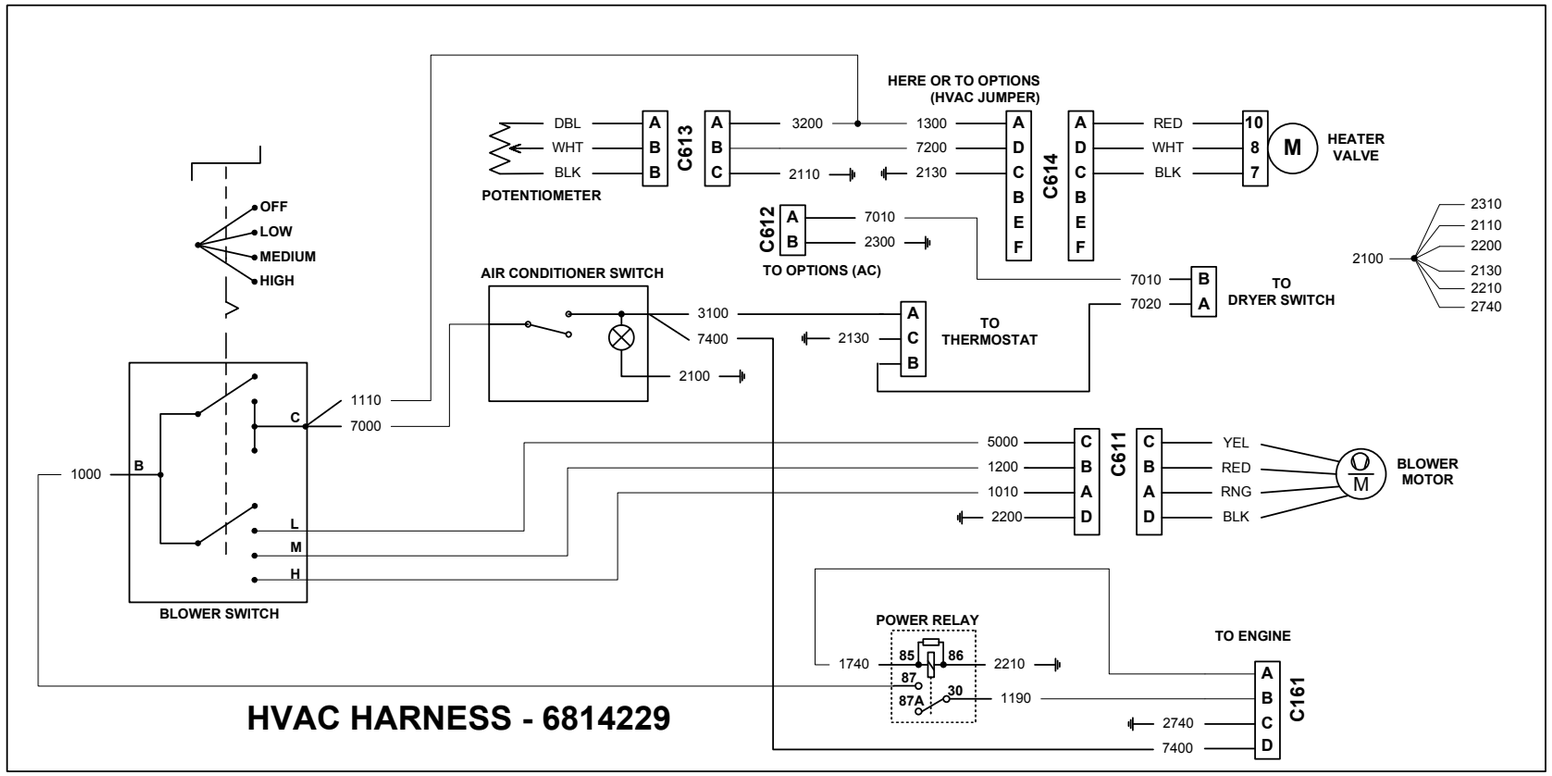
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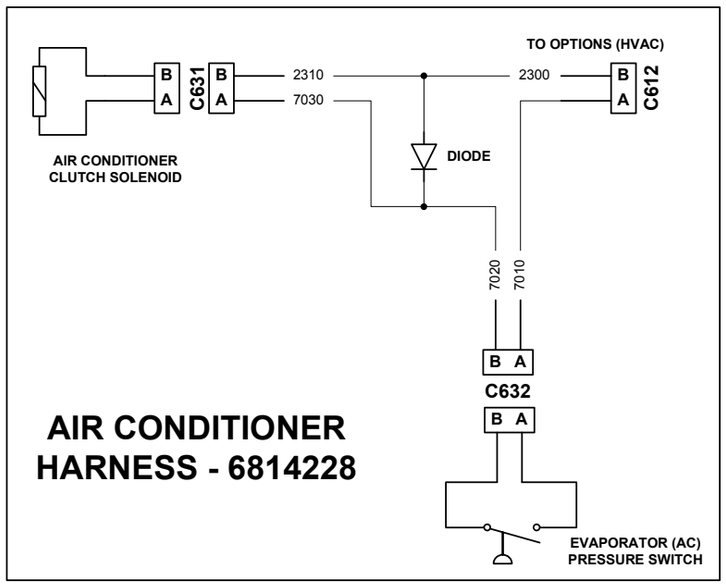
WIRES CONNECT BY LETTER ACROSS CONNECTORS

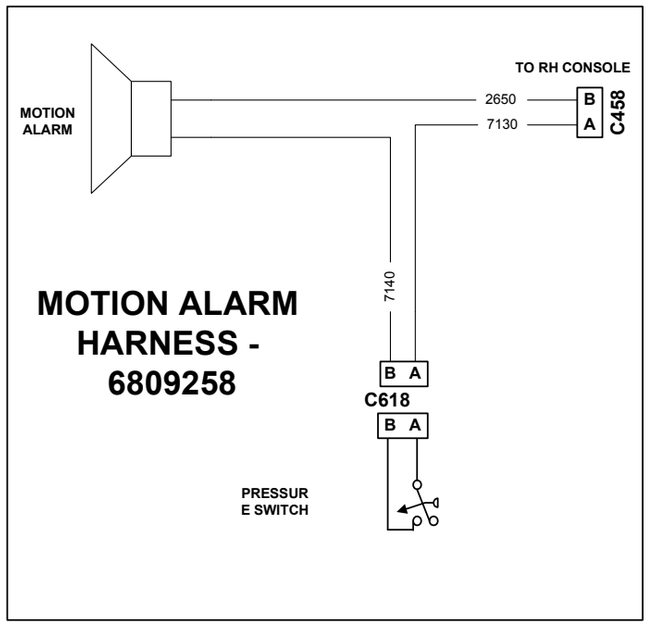
SOME CONNECTOR BODIES NOT SHOWN FOR DRAWING CLARITY

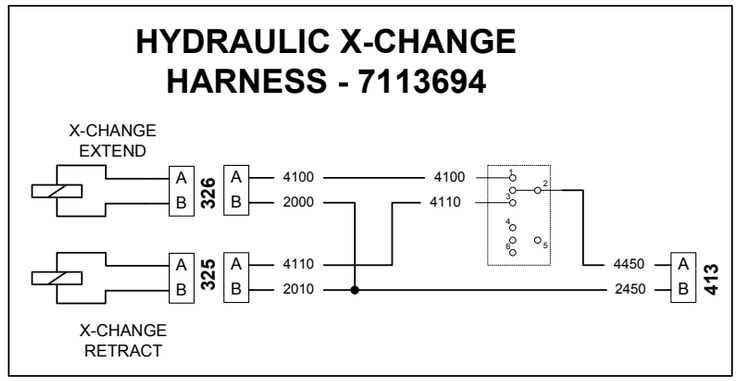
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BATTERY FEED 1000-1999 RED, RED/WHT, RNG
GROUND 2000-2999 BLK
MONITORING 3000-3999 LBL
HYDRAULIC 4000-4999 LGN
ATTACHMENT CONTROLS 5000-5999 YEL
LIGHTS 6000-6999 PNK
ACCESSORIES 7000-7999 WHT
ENGINE 8000-8999 TAN
COMMUNICATION 9000-9999 PUR









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ELECTRICAL SYSTEM INFORMATION

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.

WARNING

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

W-2003-0199

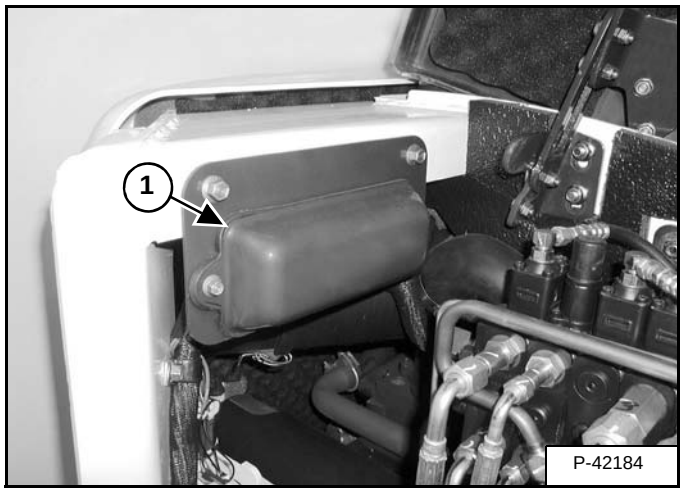
PROBLEM	CAUSE
Battery will not take charge.	1, 2, 3, 4, 5
Alternator will not charge.	1, 2, 5
Starter will not turn engine.	2, 3, 4, 6, 7, 8, 9

KEY TO CORRECT THE CAUSE
1. Engine accessory drive belt is loose or damaged.
2. Battery connections are dirty or loose.
3. Battery is damaged.
4. The ground connection is not making a good contact.
5. The alternator is damaged.
6. The engine is locked.
7. The starter is damaged.
8. The wiring or the solenoid is damaged.
9. Check the fuses.

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Description

Figure 60-10-1



The Excavator has a 12 volt, negative ground electrical system. The electrical system is protected by fuses located under the right side cover of the Excavator (Item 1) **[Figure 60-10-1]**. The fuses will protect the electrical system when there is an electrical overload. The reason for the overload must be found before starting the engine again.

The battery cables must be clean and tight. Check the electrolyte level in the battery. Add distilled water as needed. Remove acid or corrosion from the battery and cables with a sodium bicarbonate and water solution.

Put Battery Saver P/N 6664458 or grease on the battery terminals and cable ends to prevent corrosion.

⚠ WARNING

Batteries contain acid which burns eyes and skin on contact. Wear goggles, protective clothing and rubber gloves to keep acid off body.

In case of acid contact, wash immediately with water. In case of eye contact get prompt medical attention and wash eye with clean, cool water for at least 15 minutes.

If electrolyte is taken internally drink large quantities of water or milk! DO NOT induce vomiting. Get prompt medical attention.

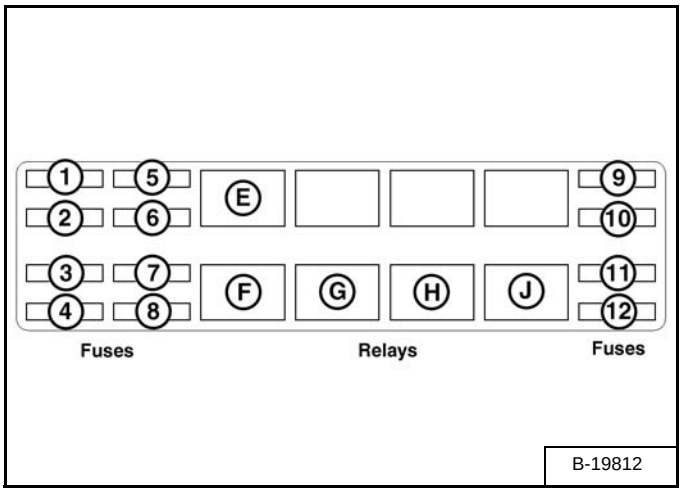
W-2065-1296

Fuse And Relay Location

A decal is inside the cover to show location and amp ratings.

Remove the cover to check or replace the fuses and relays.

Figure 60-10-2



The location and sizes are shown below and **[Figure 60-10-2]**.

REF	DESCRIPTION	AMP	REF	DESCRIPTION	AMP
1	***Not Used***	- -	11	Lights	20
2	Heater	25	12	ACC Plug	15
3	Ignition	5			
4	Fuel Solenoid	25			
5	Wiper	5			
6	Switch Power	20			
7	Alternator/ Heater	25			
8	ACD	25			
9	Controller	25			
10	ACD	25			

Always replace fuses using the same type and capacity.

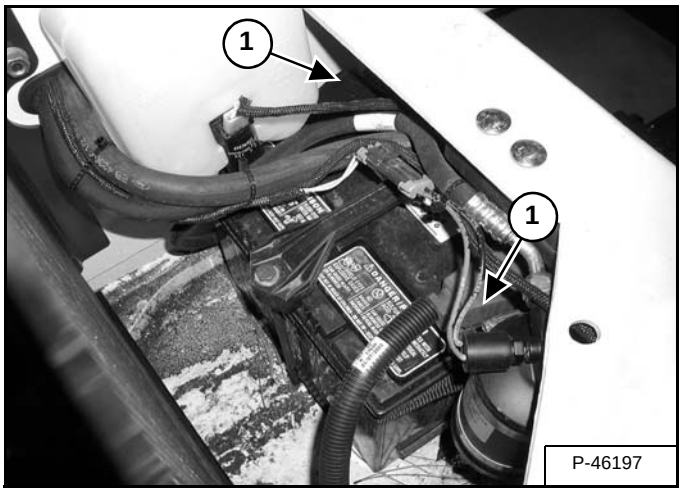
REF	DESCRIPTION
E	**Switch Power**
F	Fuel Solenoid
G	Lights
H	Glow Plug
J	Starter

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BATTERY

Servicing

Figure 60-20-1



The battery is located under the right side cover **[Figure 60-20-1]**.

The battery cables (Item 1) **[Figure 60-20-1]** must be clean and tight. Remove acid or corrosion from the battery and cables using a sodium bicarbonate and water solution. Cover the battery terminals and cable ends with battery saver grease to prevent corrosion.

Figure 60-20-2

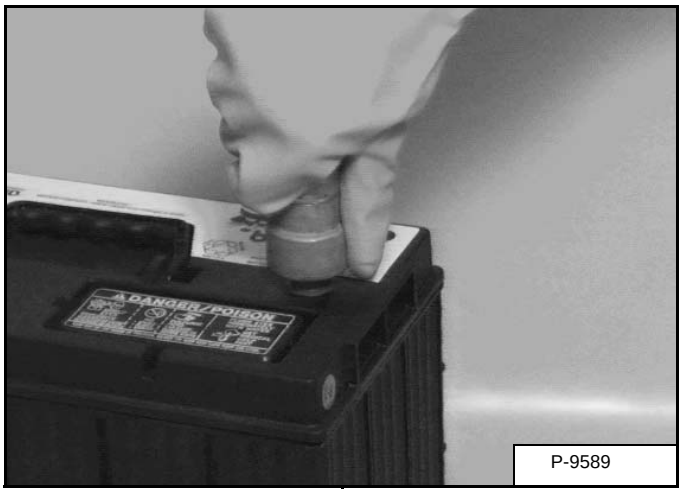
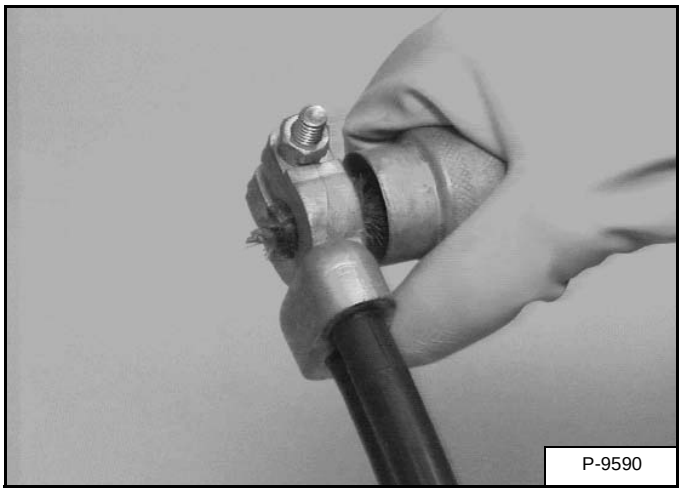


Figure 60-20-3



Clean the battery terminals and cable ends even when installing a new battery **[Figure 60-20-2]** & **[Figure 60-20-3]**.

Check for broken or loose connections.

If the battery cables are removed for any reason, disconnect the negative (-) cable first. When installing the battery cables, make the last connection the negative (-) cable to the battery.

The original equipment battery is maintenance free. If a replacement battery is installed, check the electrolyte level in the battery.

If electrolyte level is lower than 1/2 inch (13 mm) above the plates, add distilled water only.

Cover the battery terminals and cable ends with battery saver grease to prevent corrosion.

⚠ WARNING

Batteries contain acid which burns eyes and skin on contact. Wear goggles, protective clothing and rubber gloves to keep acid off body.

In case of acid contact, wash immediately with water. In case of eye contact get prompt medical attention and wash eye with clean, cool water for at least 15 minutes.

If electrolyte is taken internally drink large quantities of water or milk! DO NOT induce vomiting. Get prompt medical attention.

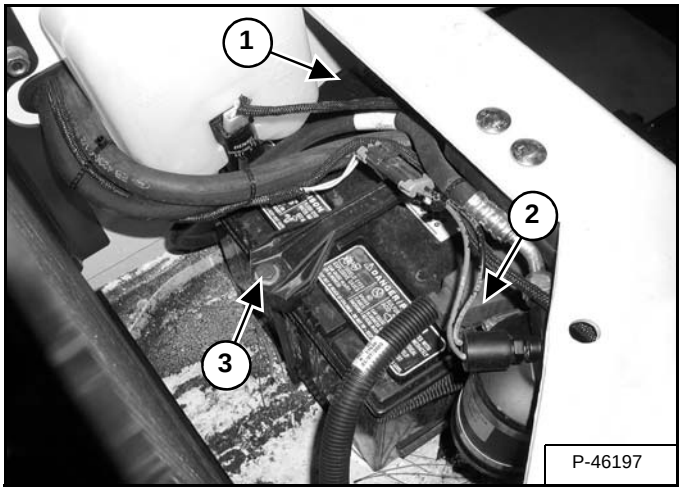
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Removing And Installing The Battery

Open the right side cover.

Figure 60-20-4



Disconnect the negative (-) cable (Item 1) **[Figure 60-20-4]** first.

Disconnect the positive (+) cable (Item 2) **[Figure 60-20-4]**.

Remove the bolts (Item 3) **[Figure 60-20-4]** and remove the hold down clamp.

Remove the battery.

Always clean the terminals and the cable ends, even when installing a new battery.

Install the battery. Install the hold down clamp and tighten the bolts.

Connect the battery cables. Connect the negative (-) cable (Item 1) **[Figure 60-20-4]** last to prevent sparks.

⚠ WARNING

Batteries contain acid which burns eyes and skin on contact. Wear goggles, protective clothing and rubber gloves to keep acid off body.

In case of acid contact, wash immediately with water. In case of eye contact get prompt medical attention and wash eye with clean, cool water for at least 15 minutes.

If electrolyte is taken internally drink large quantities of water or milk! DO NOT induce vomiting. Get prompt medical attention.

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Using A Booster Battery (Jump Starting)

IMPORTANT

If jump starting the excavator from a second machine:
When jump starting the excavator from a battery installed in a second machine. Make sure the second machine is NOT running while using the glow plugs. High voltage spikes from a running machine can burn out the glow plugs.

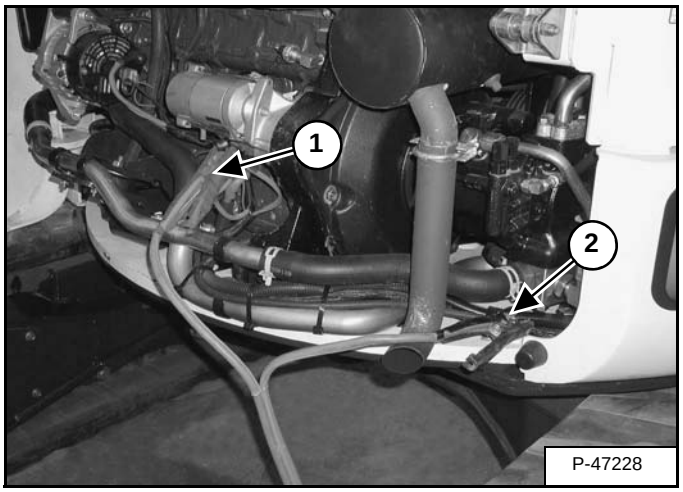
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If it is necessary to use a booster battery to start the engine, BE CAREFUL! There must be one person in the operator's seat and one person to connect and disconnect the battery cables.

Be sure the key switch is OFF. The booster battery must be 12 volt.

Open the tailgate.

Figure 60-20-5



Connect one end of the first cable to the positive (+) terminal of the booster battery. Connect the other end of the same cable to the positive (+) terminal (Item 1) **[Figure 60-20-5]** of the excavator starter.

Connect one end of the second cable to the negative (-) terminal of the booster battery. Connect the other end of the same cable to the negative excavator cable (Item 2) **[Figure 60-20-5]** where it is fastened to the frame.

NOTE: See Cold Temperature Starting Procedure, in the correct Operation And Maintenance Manual.

Start the engine. After the engine has started, remove the ground (-) cable first (Item 2) **[Figure 60-20-5]**.

Disconnect the cable from the excavator starter (Item 1) **[Figure 60-20-5]**.

⚠ WARNING

Batteries contain acid which burns eyes and skin on contact. Wear goggles, protective clothing and rubber gloves to keep acid off body.

In case of acid contact, wash immediately with water. In case of eye contact get prompt medical attention and wash eye with clean, cool water for at least 15 minutes.

If electrolyte is taken internally drink large quantities of water or milk! DO NOT induce vomiting. Get prompt medical attention.

W-2065-1296

⚠ WARNING

Keep arcs, sparks flames and lighted tobacco away from batteries. When *jumping* from booster battery make final connection (negative) at engine frame.

Do not jump start or charge a frozen or damaged battery. Warm battery to 60°F (16°C) before connecting to a charger. Unplug charger before connecting or disconnecting cables to battery. Never lean over battery while boosting, testing or charging.

Battery gas can explode and cause serious injury.

W-2066-1296

IMPORTANT

Damage to the alternator can occur if:

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

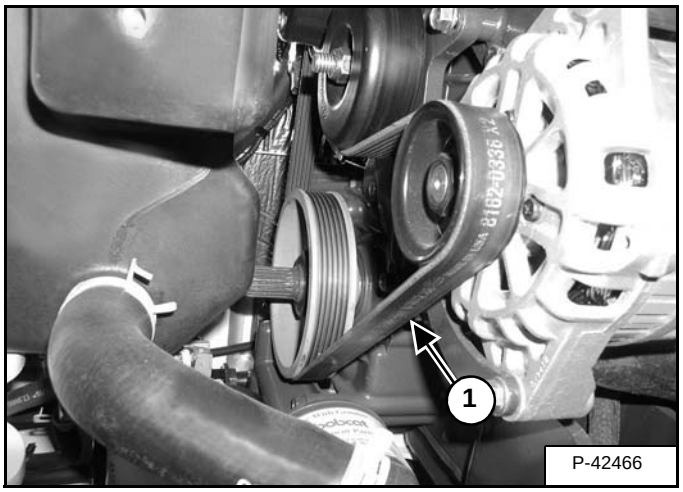
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ALTERNATOR

Engine Accessory Drive Belt

Figure 60-30-1



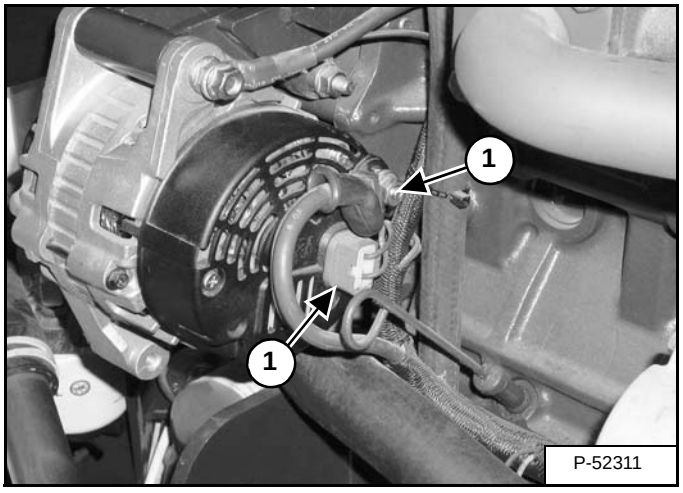
Check and adjust the engine accessory drive belt (Item 1) **[Figure 60-30-1]** every 100 hours of excavator operation. (See ENGINE ACCESSORY DRIVE BELT on Page 10-140-1)

Removal And Installation

Disconnect the battery. (See Removing And Installing The Battery on Page 60-20-2)

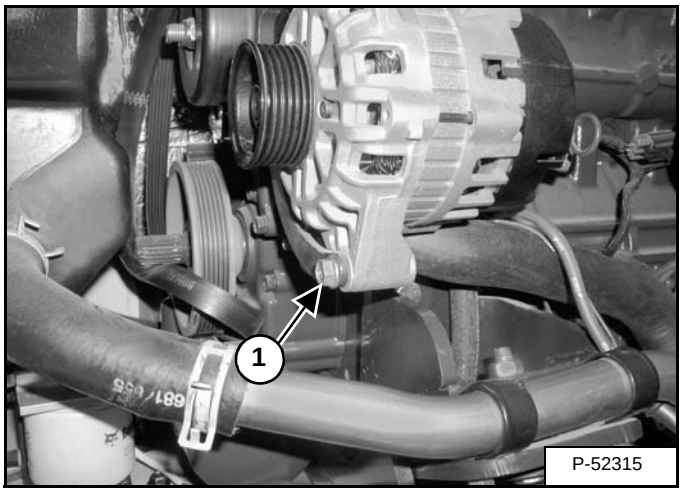
Remove the engine accessory drive belt. (See ENGINE ACCESSORY DRIVE BELT on Page 10-140-1)

Figure 60-30-2



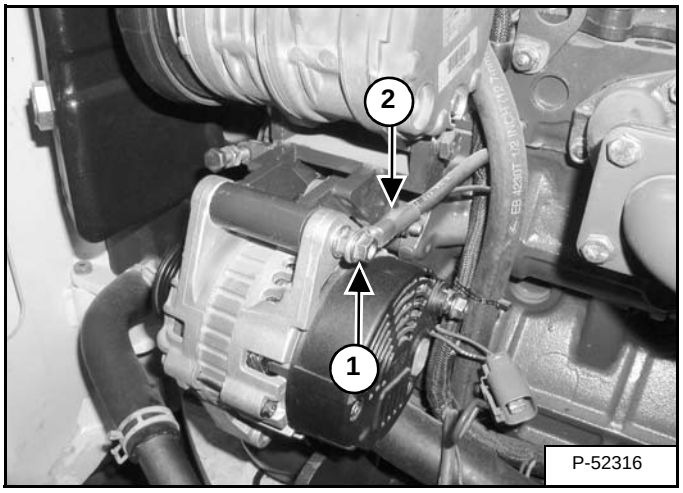
Disconnect the wire harness (Item 1) **[Figure 60-30-2]** from the alternator.

Figure 60-30-3



Remove the bottom bolt (Item 1) **[Figure 60-30-3]**.

Figure 60-30-4

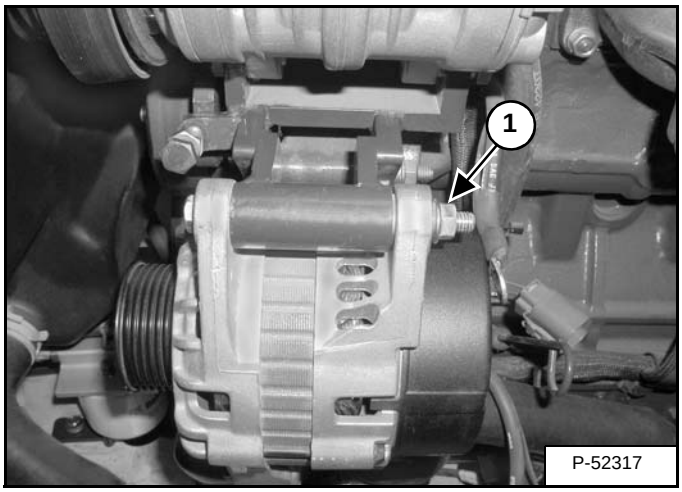


Remove the nut (Item 1) and ground cable (Item 2) **[Figure 60-30-4]**.

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Removal And Installation (Cont'd)

Figure 60-30-5



Remove the bolt and nut (Item 1) **[Figure 60-30-5]** and remove the alternator.

Alternator Identification

Figure 60-30-6

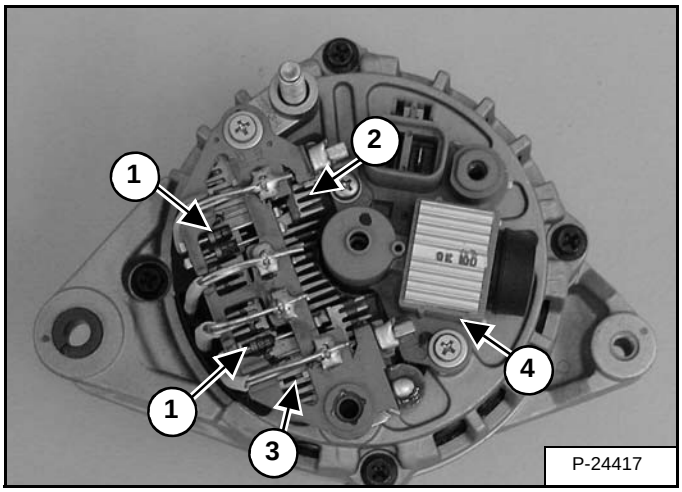
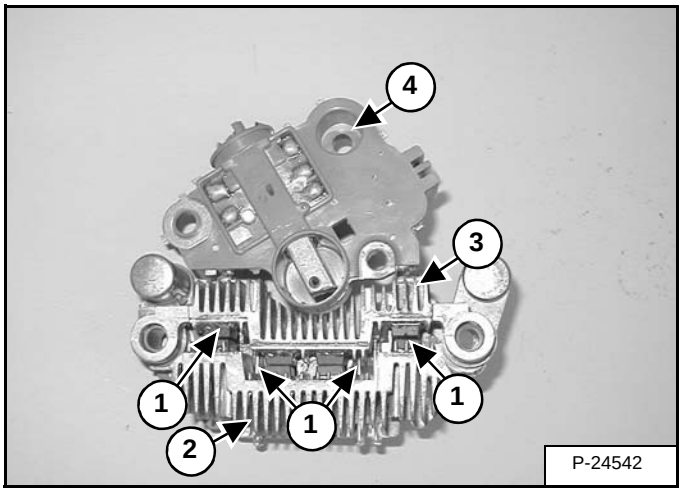


Figure 60-30-7



The back cover has been removed to show alternator rectifier/regulator assembly. The alternator contains field coil diodes (low current) (Item 1) **[Figure 60-30-6]**, grounded heat sink (Item 2), B+ power heat sink (Item 3), regulator (Item 4) **[Figure 60-30-6]** & **[Figure 60-30-7]** and 4 pair of large power diodes (Item 1) **[Figure 60-30-7]** on the underside of the rectifier.

NOTE: The rectifier/regulator assembly has been removed from the alternator and flipped over for component identification.

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Charging System Check

IMPORTANT

Damage to the alternator can occur if:
- **Engine is operated with battery cables disconnected.**
- **Battery cables are connected when using a fast charger or when welding on the excavator. (Remove both cables from the battery.)**
- **Extra battery cables (booster cables) are connected wrong.**

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If the charging system malfunctions check the following:

Check the condition and tension of the engine accessory drive belt. (See ENGINE ACCESSORY DRIVE BELT on Page 10-140-1) If belt is worn or deteriorated replace.

Inspect the alternator wiring harness and connectors at alternator. Harness and connectors must be clean and tight.

Check the fuse for the alternator in the fuse panel. If the fuse is burned, find the cause and repair/replace. If the fuse is in doubt, remove and check the fuse for continuity.

Check the electrolyte level in the battery. Add distilled water as needed. (Does not apply to maintenance free batteries.)

Verify the charge of the battery. Make sure battery is fully charged.

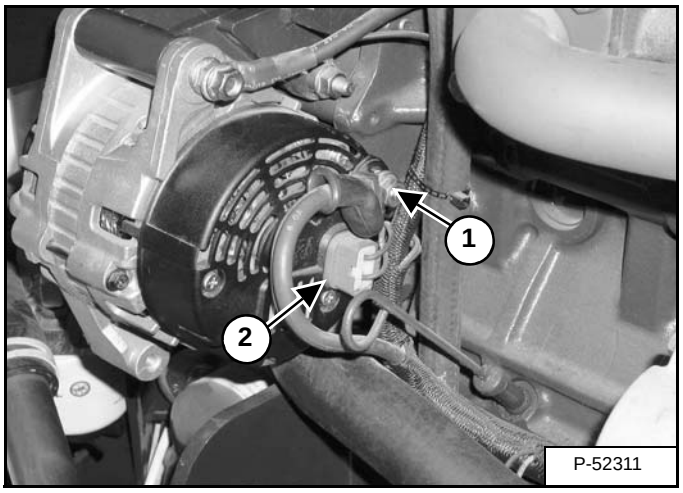
Disconnect the battery cables (negative first, then positive). Inspect the cable clamps and battery posts for corrosion. Remove acid or corrosion from the battery and cables with a sodium bicarbonate and water solution. Put grease on the cable ends and battery terminals to prevent corrosion. Reconnect the cable to the positive terminal.

With the key off, connect a test light between the negative battery post and the disconnected negative cable clamp.

1. If the test light does not light up, reattach the clamp and proceed to alternator voltage test. (See Alternator Voltage Test on Page 60-30-4.)

2. If the test light lights up, there is a short (drain) in the electrical system of the excavator. The short must be repaired before the charging system can be checked.

Figure 60-30-8



3. Disconnect the alternator B+ terminal (Item 1) and L & S terminal connector (Item 2) **[Figure 60-30-8]**. If the test light goes out, the alternator is faulty. If the test light stays on, find the short in the system and repair it.

⚠ WARNING

Batteries contain acid which burns eyes and skin on contact. Wear goggles, protective clothing and rubber gloves to keep acid off body.
In case of acid contact, wash immediately with water. In case of eye contact get prompt medical attention and wash eye with clean, cool water for at least 15 minutes.
If electrolyte is taken internally drink large quantities of water or milk! DO NOT induce vomiting. Get prompt medical attention.

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⚠ WARNING

Keep arcs, sparks, flames and lighted tobacco away from batteries. When jumping from booster battery make final connection (negative) at engine frame.
Do not jump start or charge a frozen or damaged battery. Warm battery to 60°F. (16°C.) before connecting to a charger. Unplug charger before connecting or disconnecting cables to battery. Never lean over battery while boosting, testing or charging. Battery gas can explode and cause serious injury.

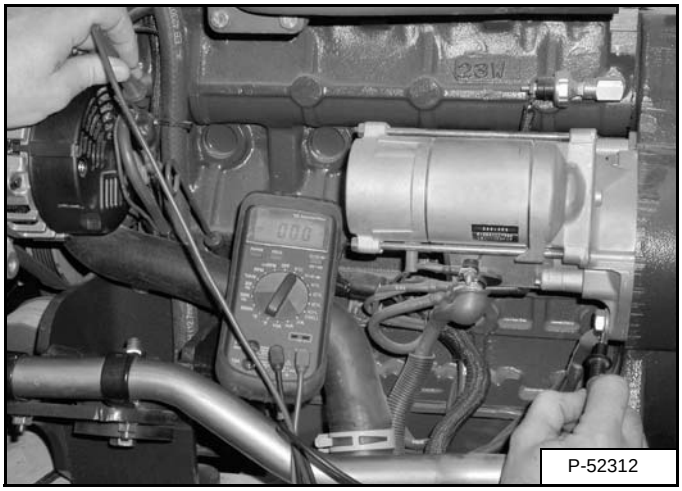
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Alternator Voltage Test

Open the tailgate.

Figure 60-30-9



Start the engine and run at low idle. With a voltmeter, check the voltage between the B+ terminal and ground at the starter **[Figure 60-30-9]**.

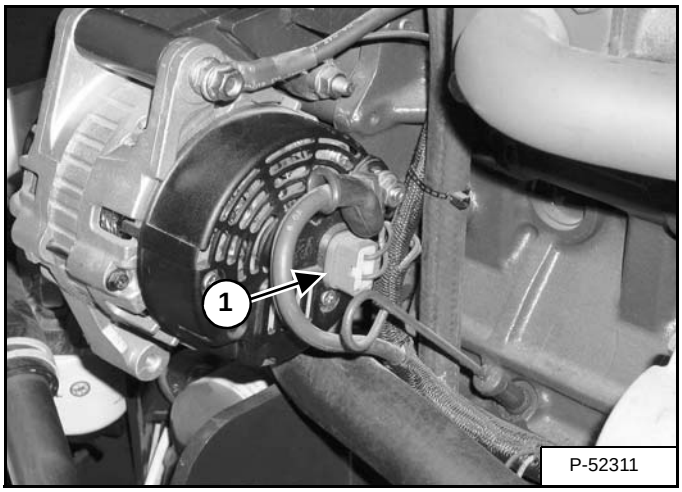
The voltage must be higher than 13.5 volts but lower than 14.7 volts at 70° F (21° C) (Alternator Temperature).

If the voltage is higher that 14.7 volts, proceed to the high voltage test.

If the voltage is lower than 13.5 volts, run the engine at high idle and recheck voltage. If voltage is still below 13.5 volts, proceed with the low voltage test.

Low Voltage Test

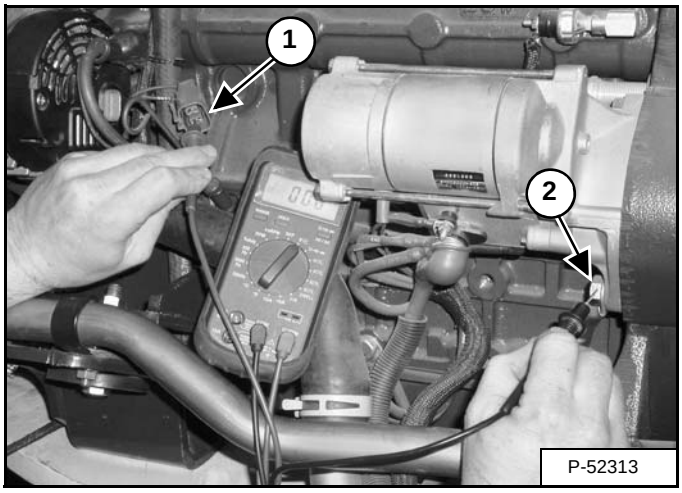
Figure 60-30-10



Turn engine OFF and remove the L & S terminal connector (Item 1) **[Figure 60-30-10]** from the alternator.

Turn the key to the ON position.

Figure 60-30-11

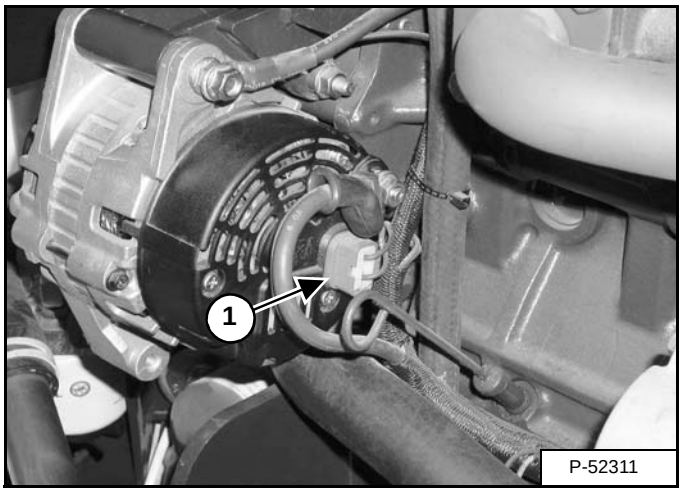


Check the voltage across the "L" terminal (Item 1) and ground (Item 2) **[Figure 60-30-11]**. The voltage should be what the battery voltage is. If not, check the wire harness, relay and fuses. If the wire harness, relay and fuses are good then remove alternator for replacement or repair.

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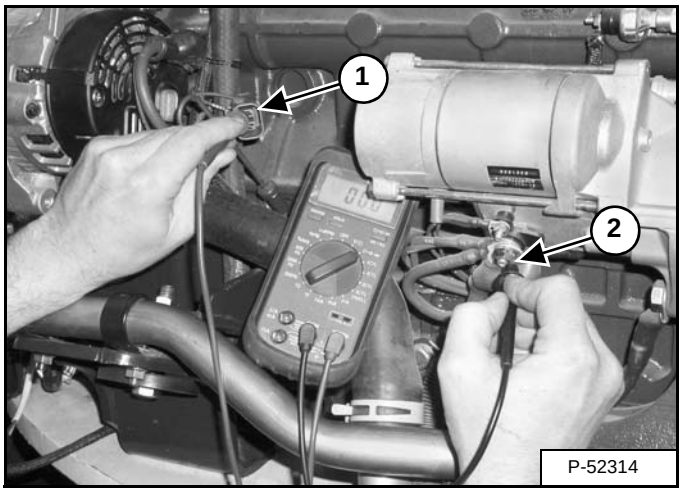
High Voltage Test

Figure 60-30-12



Turn engine OFF and remove the L & S Terminal connector (Item 1) **[Figure 60-30-12]** from the alternator.

Figure 60-30-13

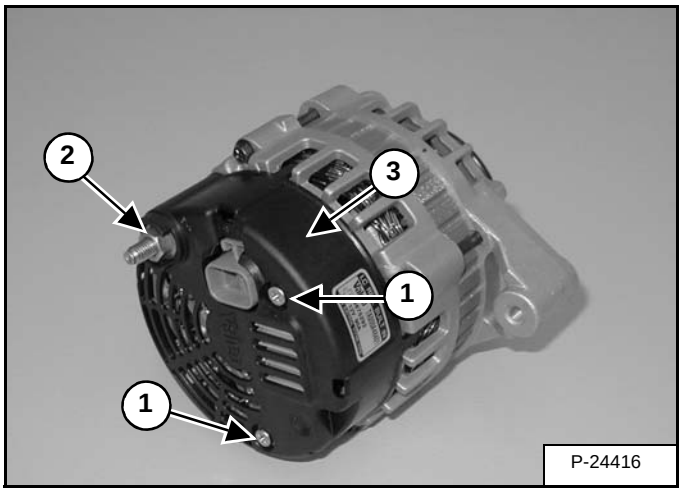


Check the continuity between the "S" terminal (Item 1) and the positive (+) terminal on the battery or starter terminal (Item 2) **[Figure 60-30-13]**. There should be continuity. If no continuity, replace wire harness.

If voltage is still above 14.7 volts at 70° F (21° C) (Alternator Temperature), then remove alternator for replacement or repair.

Rectifier Continuity (Diode) Test

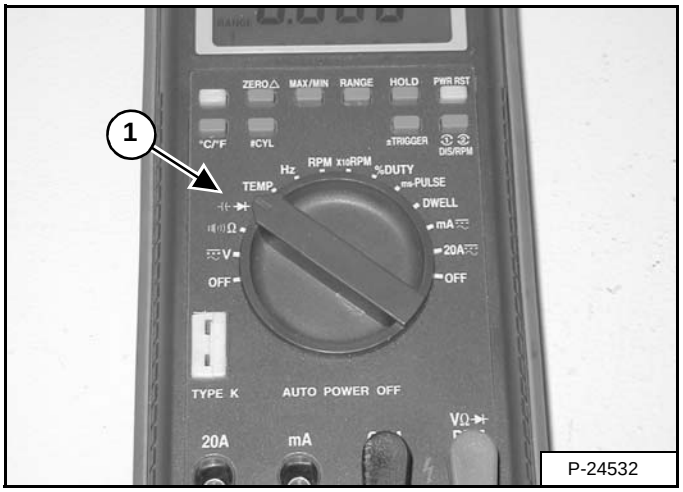
Figure 60-30-14



Remove the 2 screws (Item 1), nut/washer (Item 2) and the plastic cover (Item 3) **[Figure 60-30-14]** from the alternator.

NOTE: In the diode tests there should be continuity in 1 direction only. Meter readings should be different when probes are reversed. If the diode being tested shows no continuity or continuity in both directions, replace the rectifier assembly.

Figure 50-30-15

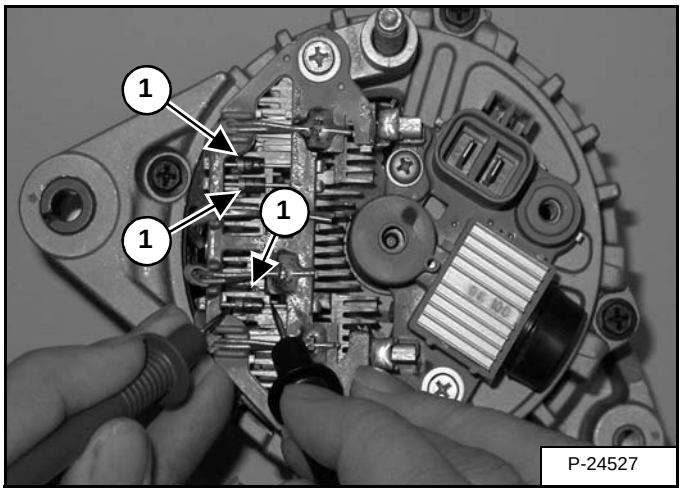


NOTE: Use the diode function (Item 1) [Figure 50-30-15] on the multimeter.

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Rectifier Continuity (Diode) Test (Cont'd)

Figure 60-30-16

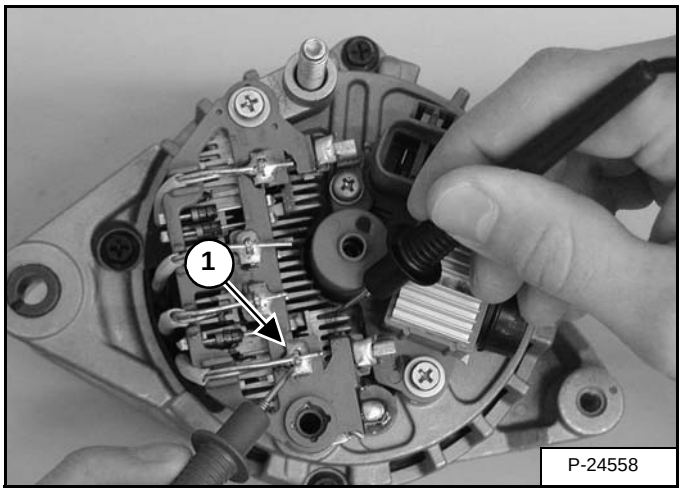


Touch the probes to the terminals (Item 1) **[Figure 60-30-16]** of each diode and read the meter.

Reverse the probes to check the diode in the other direction.

Meter readings should be different when probes are reversed.

Figure 60-30-17



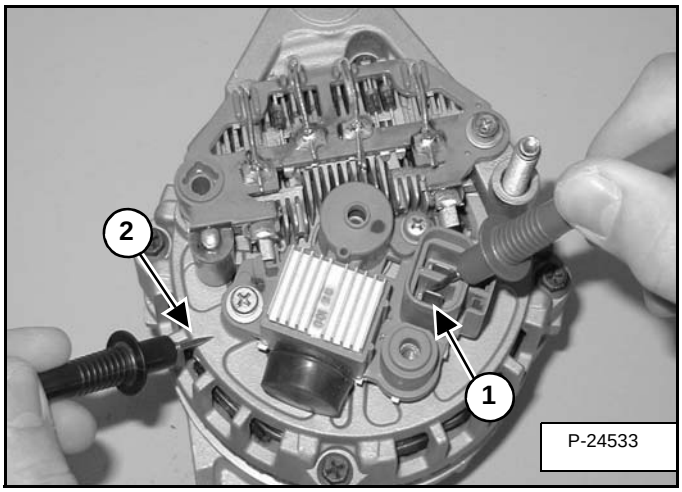
Touch 1 probe to the diode (Item 1) **[Figure 60-30-17]** and the other probe to each heat sink and read the meter.

Reverse the probes to check the diode in the other direction.

Meter readings should be different when probes are reversed.

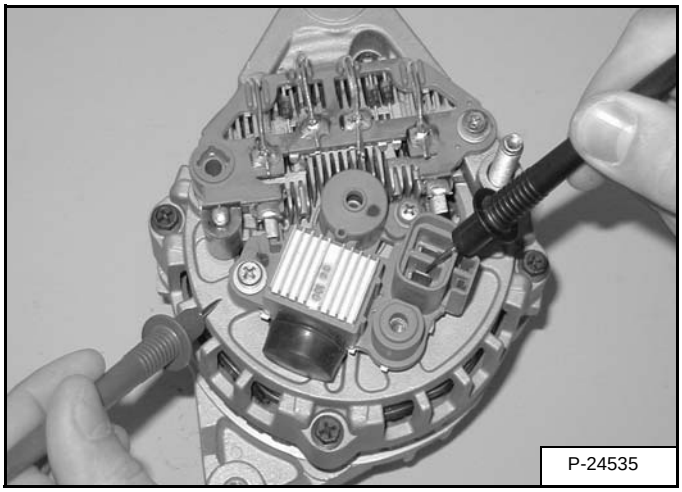
Alternator Regulator Test

Figure 60-30-18



Touch 1 probe to the "L" terminal (Item 1) and the other probe to the ground (Item 2) **[Figure 60-30-18]**.

Figure 60-30-19



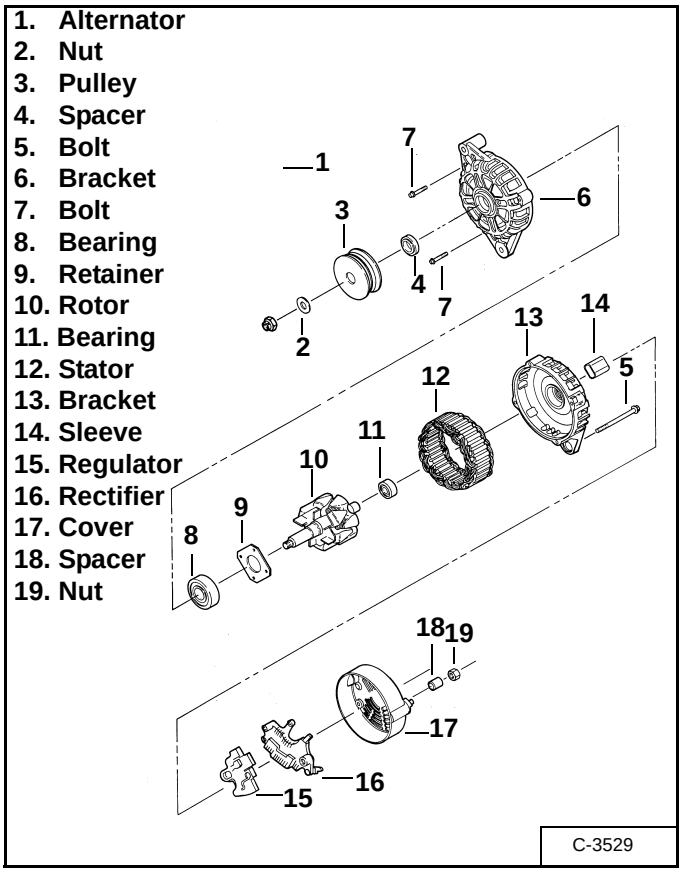
Reverse the probes to check in the other direction **[Figure 60-30-19]**.

There should be continuity in 1 direction only. Meter readings should be different when probes are reversed. If there is no continuity or continuity in both directions, replace regulator.

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Parts Identification

Figure 60-30-20



Disassembly

Disassemble the alternator. (See **Parts Identification [Figure 60-30-20]**)

Remove the regulator cover.

Remove the 4 bolts holding halves together.

Pry the halves apart (use a press if needed).

Use a soft jaw vise to hold rotor while removing pulley nut.

Remove front case half from the rotor using a plastic hammer or press.

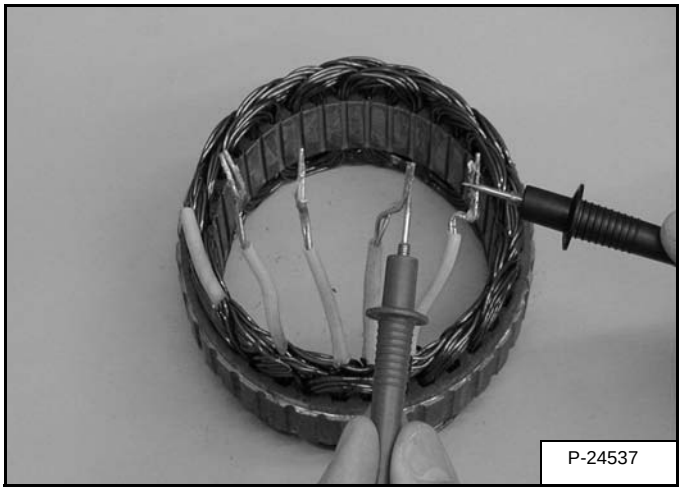
Unsolder the stator leads from the rectifier. Remove the stator.

Unsolder the 2 leads between the rectifier and regulator. Remove the regulator from rectifier.

Stator Continuity Test

Use an ohmmeter to test the stator.

Figure 60-30-21



Touch the probes to 2 of the bare stator wires **[Figure 60-30-21]**.

Move 1 of the probes to the third wire.

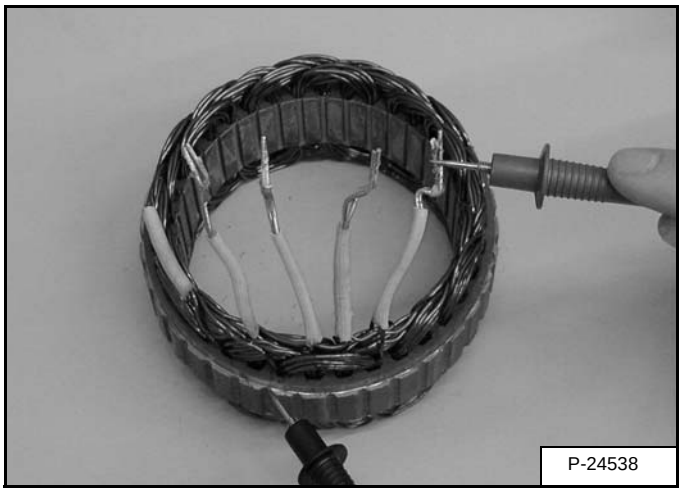
The readings should be the same.

If there is no continuity, replace the stator.

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Stator Ground Test

Figure 60-30-22



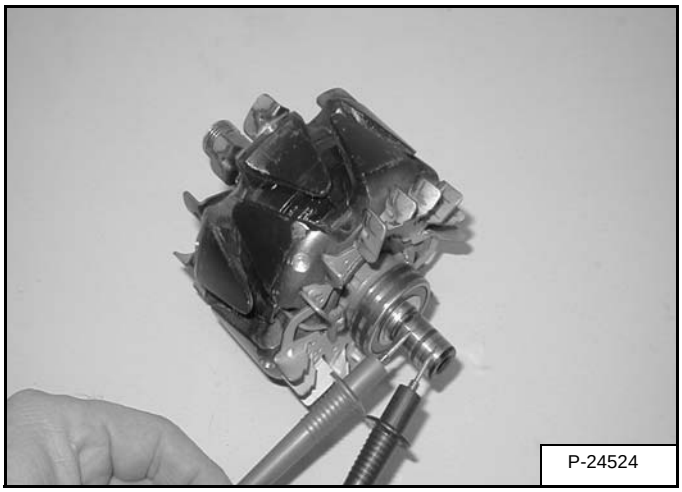
Touch 1 probe to a bare stator lead and the other probe to the bare metal surface of the stator **[Figure 60-30-22]**.

There should be no continuity.

Replace the stator if there is continuity.

Rotor Continuity Test

Figure 60-30-23



Touch the probes to the slip rings **[Figure 60-30-23]**.

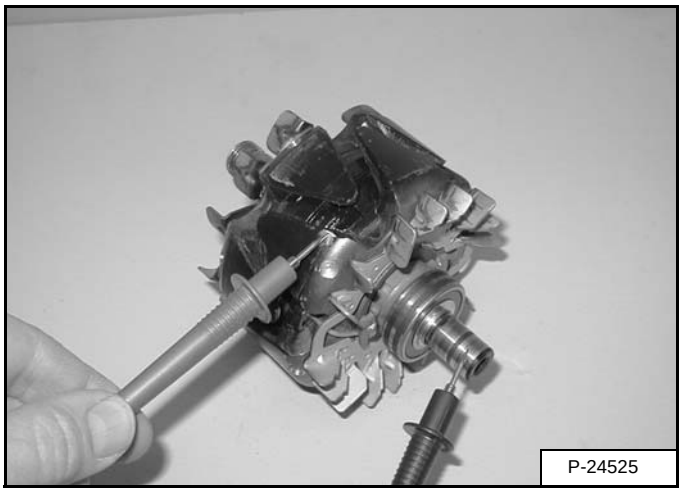
The ohmmeter should read between 3.0 - 4.0 ohms.

If there is no continuity replace the rotor.

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Rotor Ground Test

Figure 60-30-24



Touch 1 probe to 1 of the slip rings and the other probe to the rotor shaft **[Figure 60-30-24]**.

There should be no continuity.

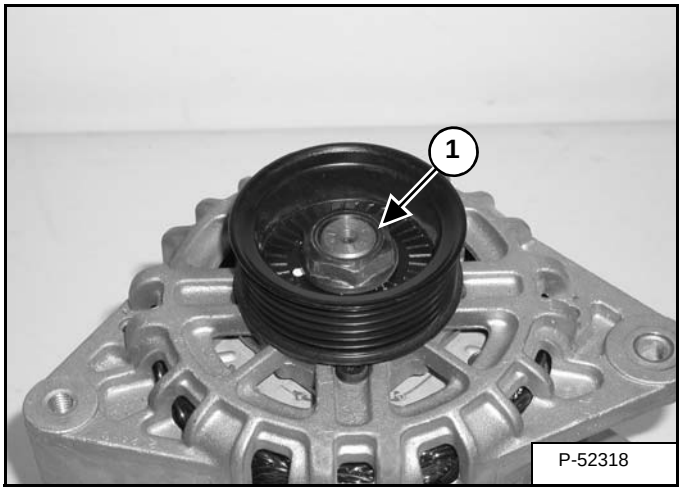
Replace the rotor if there is continuity.

Assembly

Reverse the order of disassembly.

Do not assemble the rear case half.

Figure 60-30-25



Place the rotor in soft jaws when tightening the shaft nut (Item 1) **[Figure 60-30-25]**. Tighten to 72 ± 14.5 ft.-lb. (98 ± 20 N•m) torque.

Install the rear case half and the remaining parts.

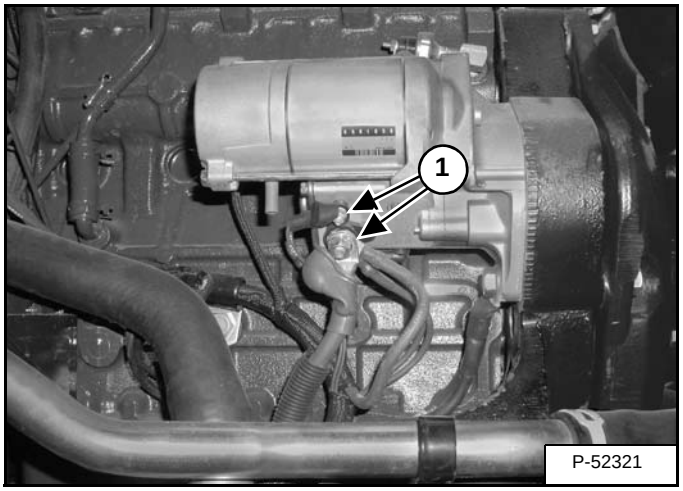
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STARTER

Removal And Installation

Disconnect the negative (-) cable from the battery. (See Removing And Installing The Battery on Page 60-20-2)

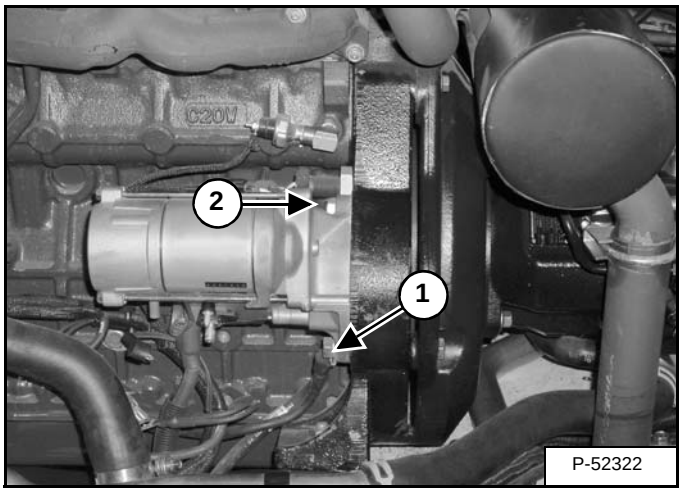
Figure 60-40-1



Pull the protective covers back and remove the two nuts (Item 1) **[Figure 60-40-1]** from the starter wire harness connectors.

Remove the starter wires.

Figure 60-40-2



Remove the bottom bolt (Item 1) **[Figure 60-40-2]** and ground cables.

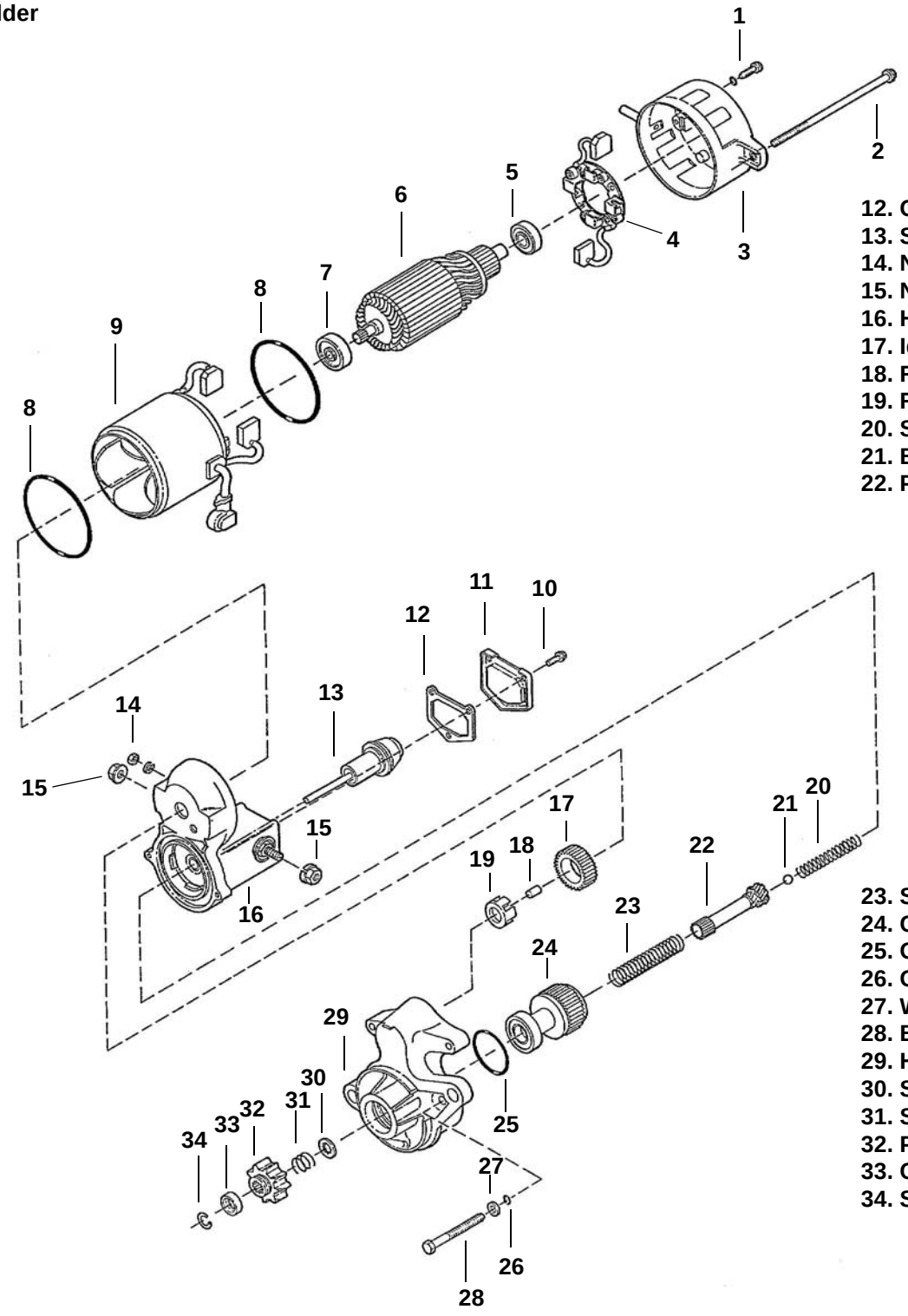
Remove the top bolt (Item 2) **[Figure 60-40-2]**.

Remove the starter.

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Parts Identification

1. Screw
2. Bolt
3. Brush Cover
4. Brush Holder
5. Bearing
6. Armature
7. Bearing
8. O-Ring
9. Frame
10. Bolt
11. Cover
12. Gasket
13. Switch
14. Nut
15. Nut
16. Housing
17. Idler Gear
18. Roller
19. Retainer
20. Spring
21. Ball
22. Pinion Shaft
23. Spring
24. Clutch
25. O-Ring
26. O-Ring
27. Washer
28. Bolt
29. Housing
30. Spring Seat
31. Spring
32. Pinion Gear
33. Collar
34. Snap Ring

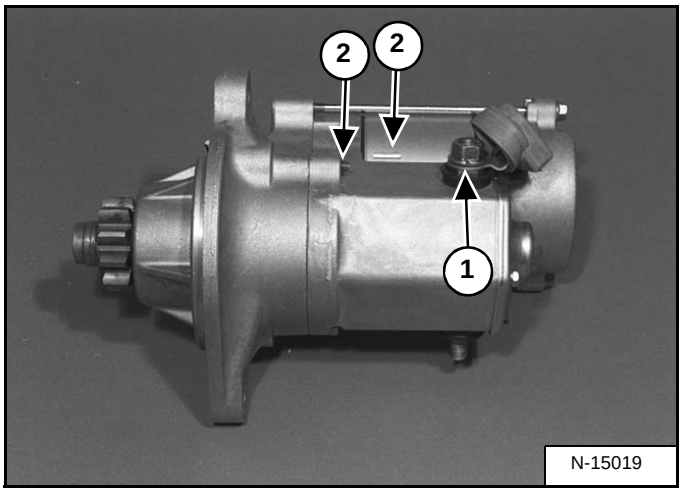


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Disassembly

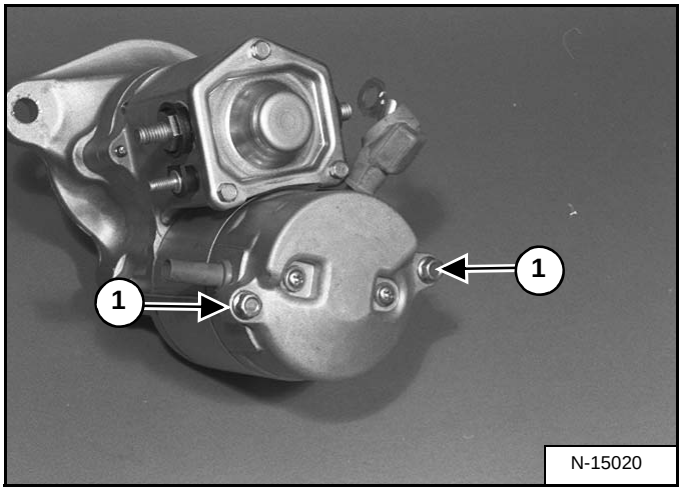
Figure 60-40-3



Remove the cable (Item 1) **[Figure 60-40-3]** from the magnetic switch.

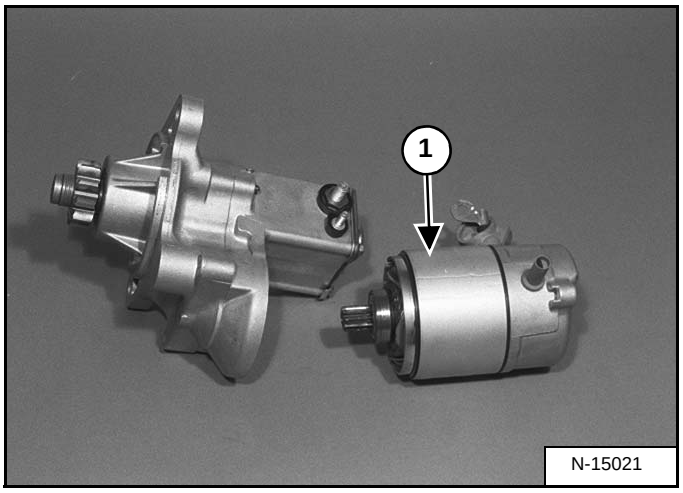
Mark the frame and magnetic switch (Item 2) **[Figure 60-40-3]** for ease of assembly.

Figure 60-40-4



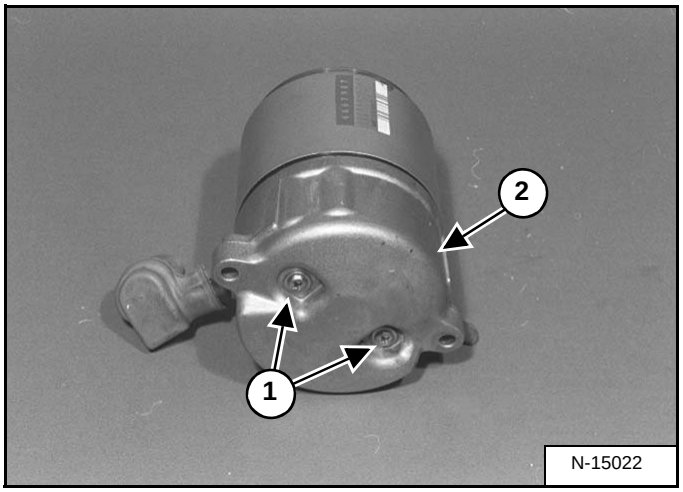
Remove the bolts (Item 1) **[Figure 60-40-4]**.

Figure 60-40-5



Remove the frame (Item 1) **[Figure 60-40-5]** from the magnetic switch.

Figure 60-40-6



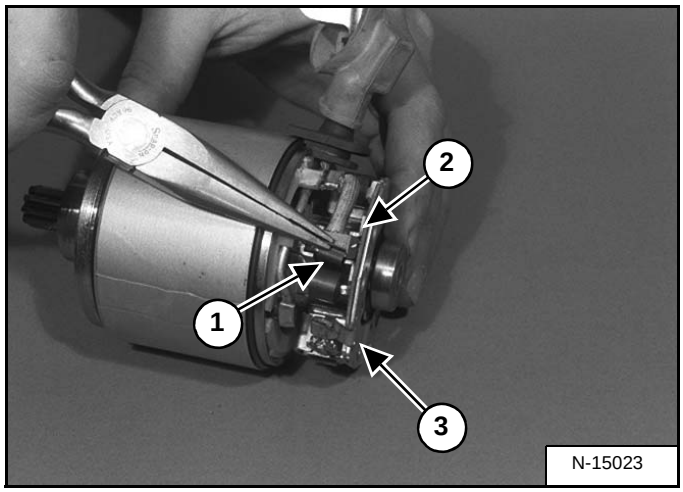
Remove the screws (Item 1) from the brush cover (Item 2) **[Figure 60-40-6]**.

Remove the cover (Item 2) **[Figure 60-40-6]**.

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Disassembly (Cont'd)

Figure 60-40-7

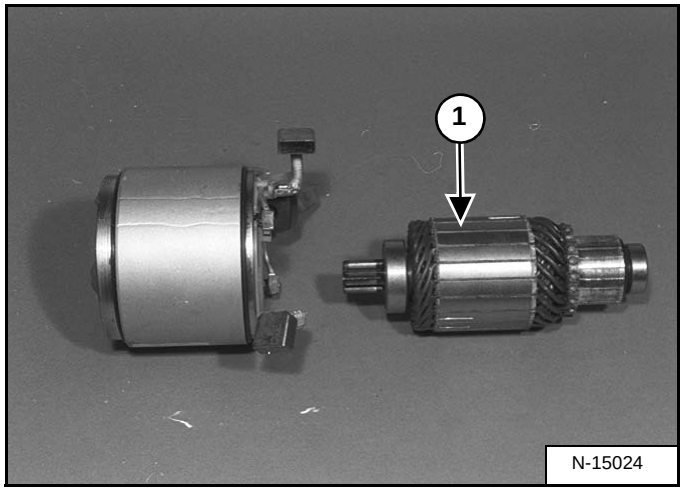


Using a needle nose pliers, pull the brush springs (Item 1) back and remove the brushes (Item 2) **[Figure 60-40-7]**.

NOTE: The brushes are non-replaceable, If the brushes are worn, order a new brush holder (for the negative brushes) and yolk (for the positive brushes).

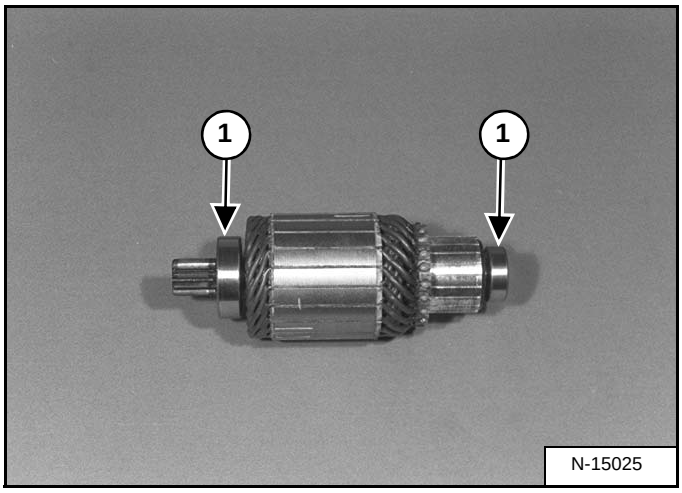
Remove the brush holder (Item 3) **[Figure 60-40-7]** from the end of the armature.

Figure 60-40-8



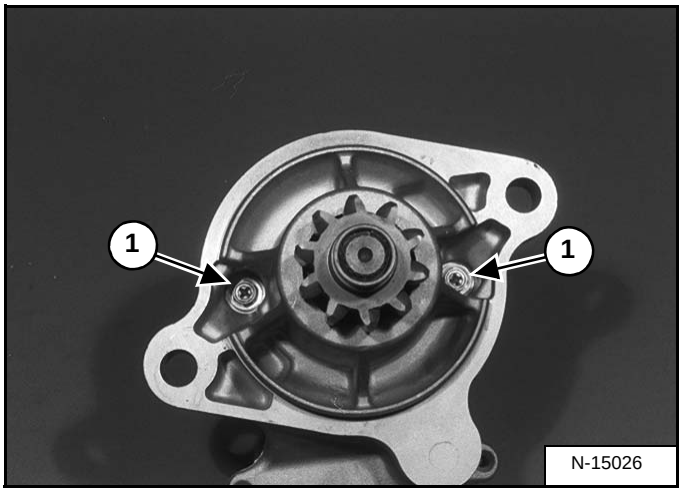
Remove the armature (Item 1) **[Figure 60-40-8]** from the frame.

Figure 60-40-9



Remove the bearings (Item 1) **[Figure 60-40-9]** from both ends of the armature.

Figure 60-40-10

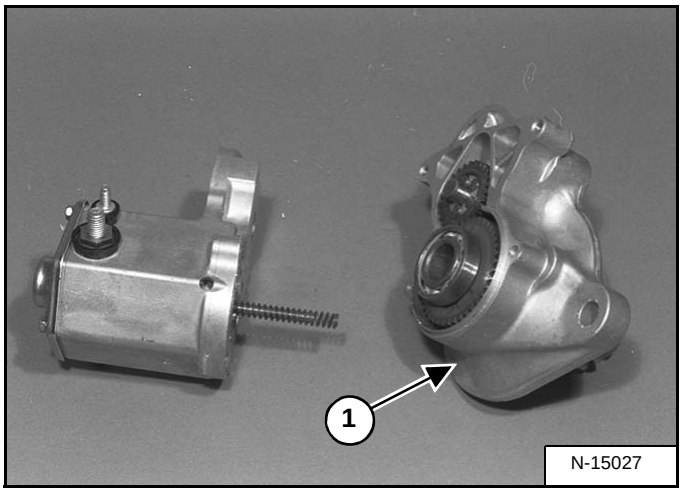


Remove the bolts (Item 1) **[Figure 60-40-10]** from the starter housing.

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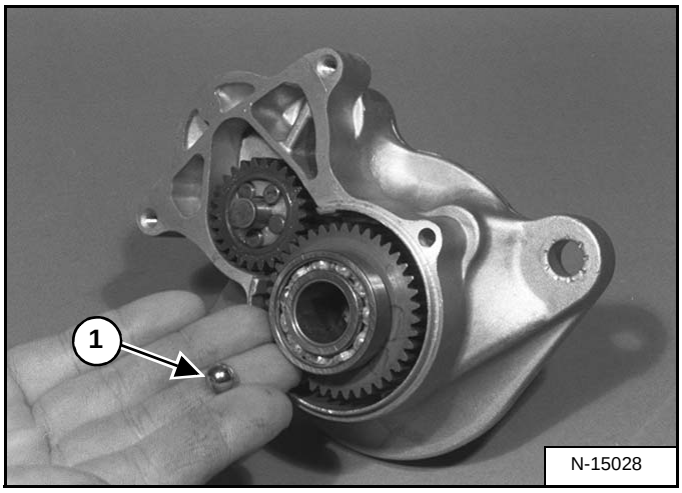
Disassembly (Cont'd)

Figure 60-40-11



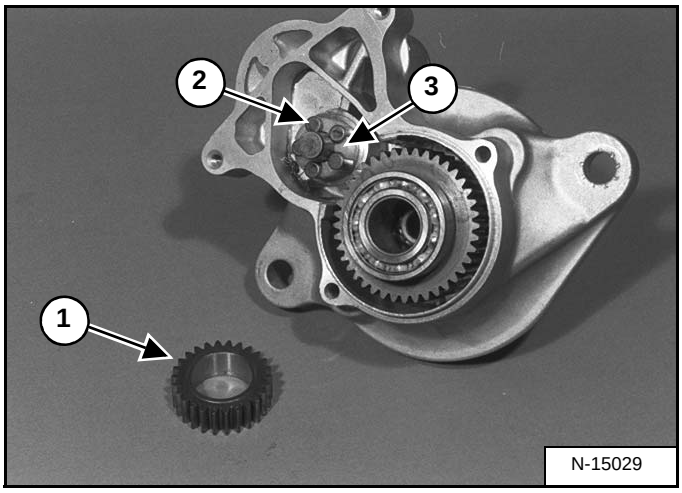
Remove the starter housing (Item 1) **[Figure 60-40-11]** from the magnetic switch housing.

Figure 60-40-12



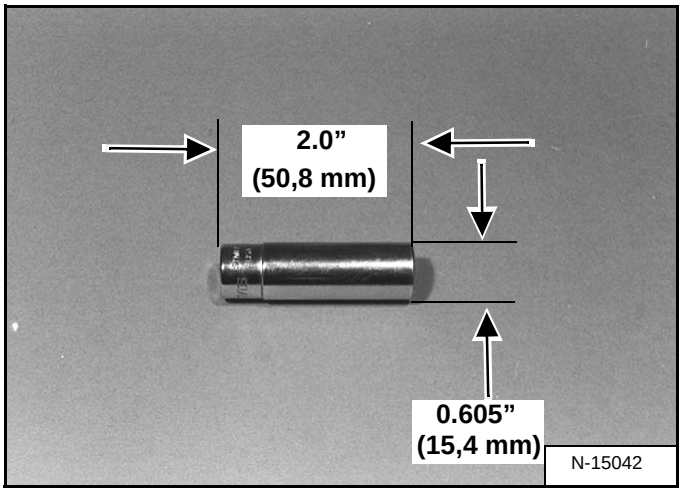
Remove the ball (Item 1) **[Figure 60-40-12]** from the pinion shaft.

Figure 60-40-13



Remove the idler gear (Item 1), rollers (Item 2) and retainer (Item 3) **[Figure 60-40-13]**.

Figure 60-40-14

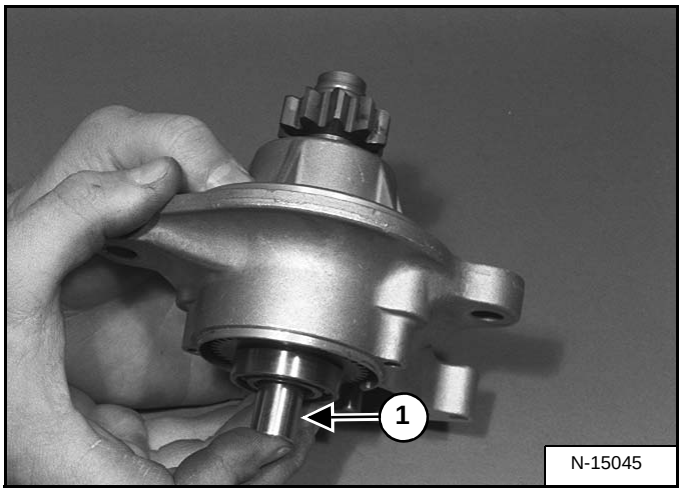


In order to remove the snap ring from the pinion shaft, a tube 0.605 inches (15,4 mm) in diameter by 2.0 inches (50,8 mm) in length is needed **[Figure 60-40-14]**.

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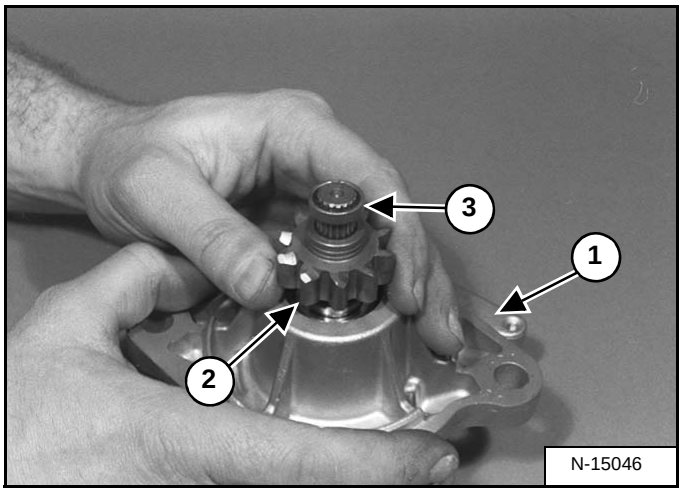
Disassembly (Cont'd)

Figure 60-40-15



Install the tube (Item 1) **[Figure 60-40-15]** in the over running clutch.

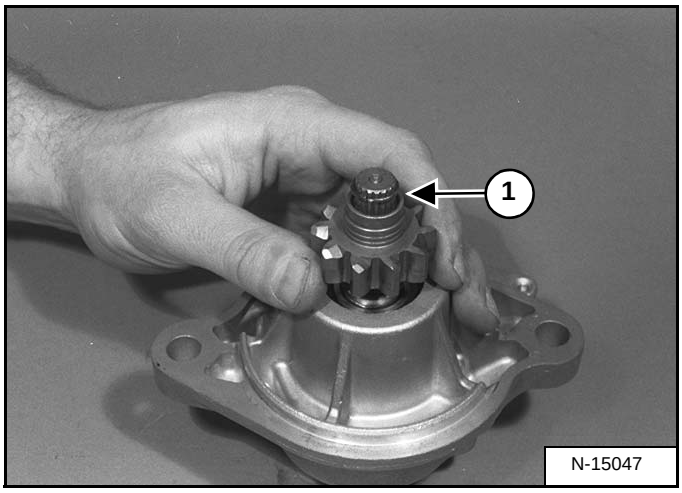
Figure 60-40-16



Press down on the starter carrier (Item 1) to extend the pinion shaft. Press down on the pinion (Item 2) **[Figure 60-40-16]**.

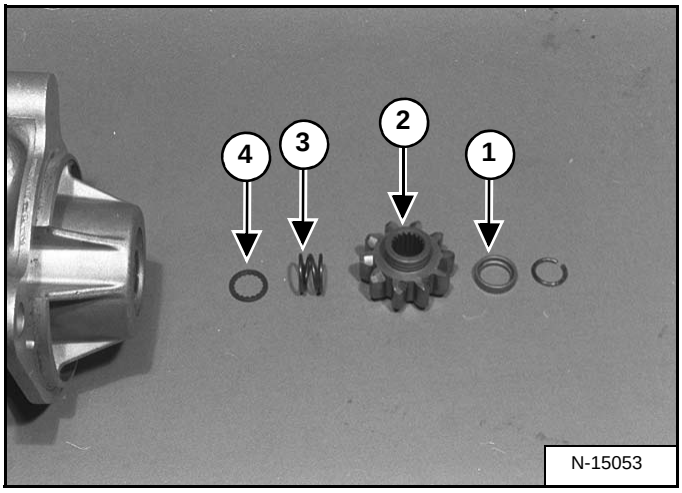
Press the collar (Item 3) **[Figure 60-40-16]** down to gain access to the snap ring.

Figure 60-40-17



Remove the snap ring (Item 1) **[Figure 60-40-17]**.

Figure 60-40-18

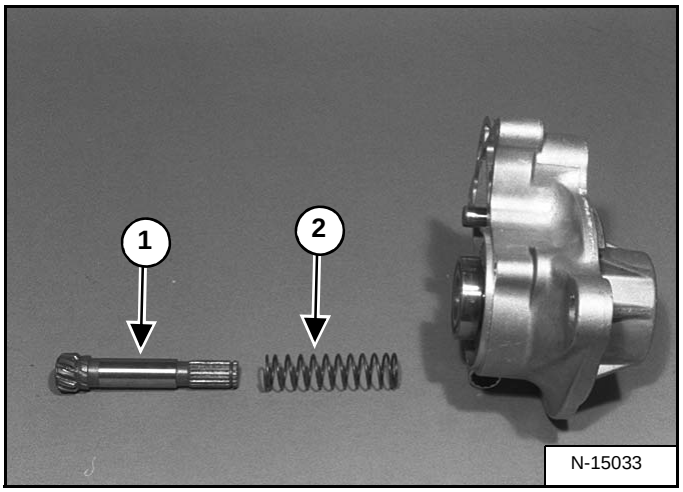


Remove the collar (Item 1), pinion (Item 2), spring (Item 3), and spring seat (Item 4) **[Figure 60-40-18]**.

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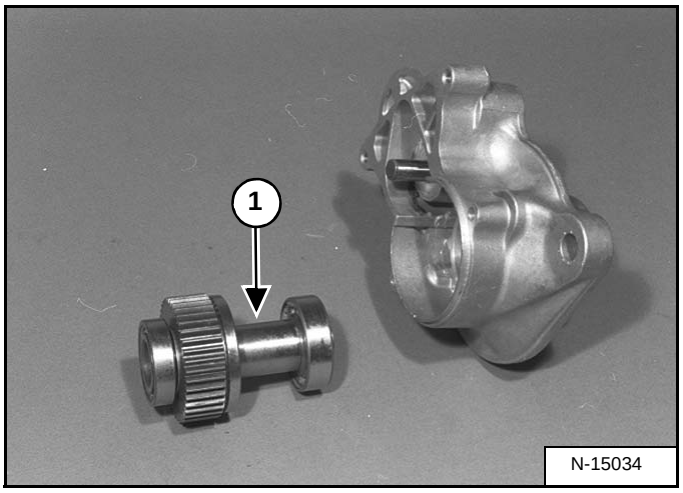
Disassembly (Cont'd)

Figure 60-40-19



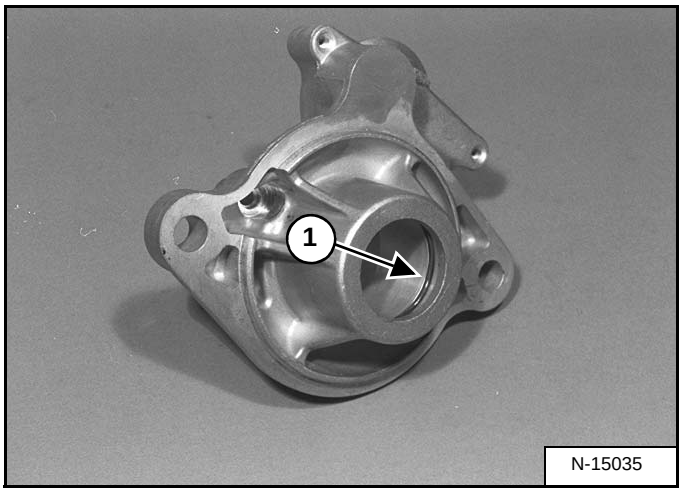
Remove the pinion shaft (Item 1) and spring (Item 2) **[Figure 60-40-19]** from the starter drive.

Figure 60-40-20



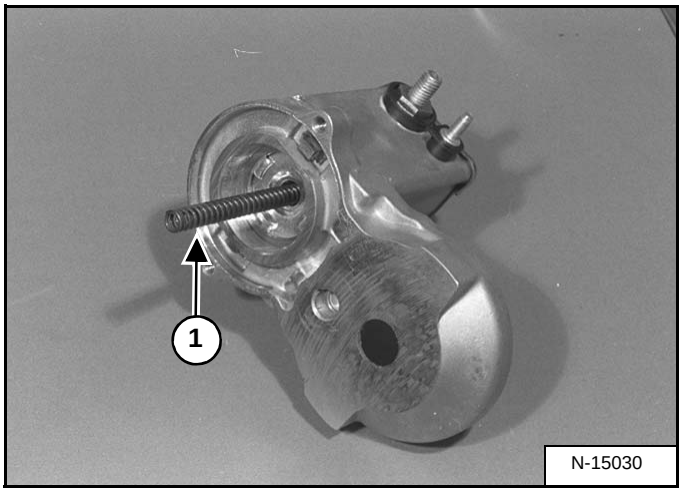
Remove the over running clutch (Item 1) **[Figure 60-40-20]**.

Figure 60-40-21



Remove the O-ring (Item 1) **[Figure 60-40-21]** from the starter housing.

Figure 60-40-22

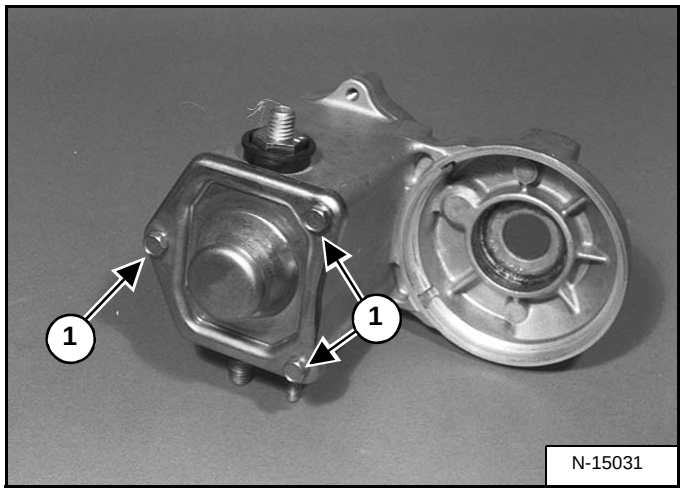


Remove the spring (Item 1) **[Figure 60-40-22]** from the magnetic switch.

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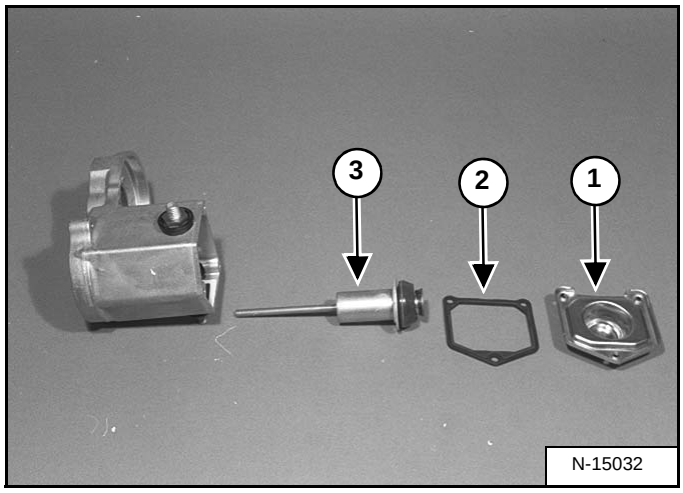
Disassembly (Cont'd)

Figure 60-40-23



Remove the bolts (Item 1) **[Figure 60-40-23]** from the magnetic switch cover.

Figure 60-40-24



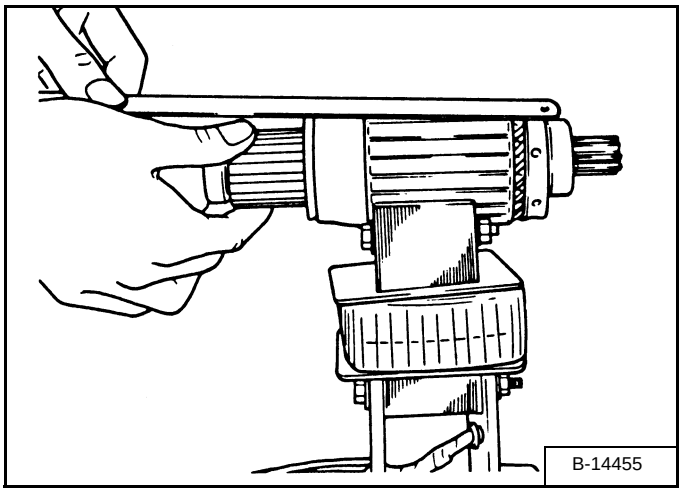
Remove the cover (Item 1), gasket (Item 2) and switch (Item 3) **[Figure 60-40-24]**.

Inspection And Repair

Inspect the brush cover for discoloration, indicating the starter has been overheated.

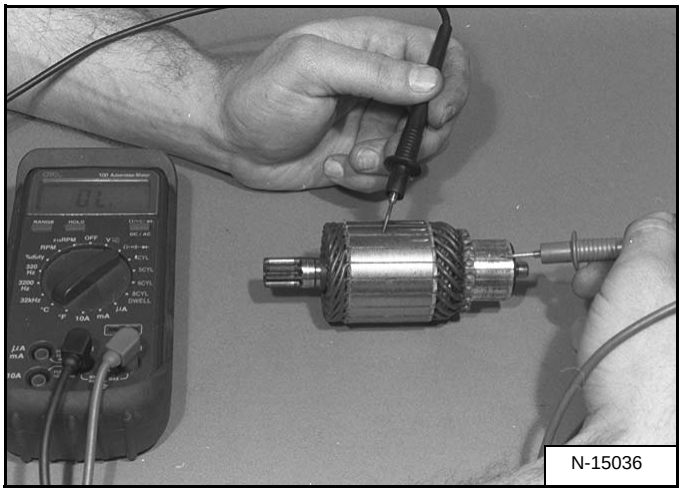
Inspect the pinion teeth for wear and damage.

Figure 60-40-25



Armature Short-Circuit Test: Use a growler tester, put the armature on the growler and hold a hack saw blade against the armature core while slowly rotating the armature **[Figure 60-40-25]**. A short-circuited armature causes the blade to vibrate and be attracted to the core. An armature which is short-circuited must be replaced.

Figure 60-40-26

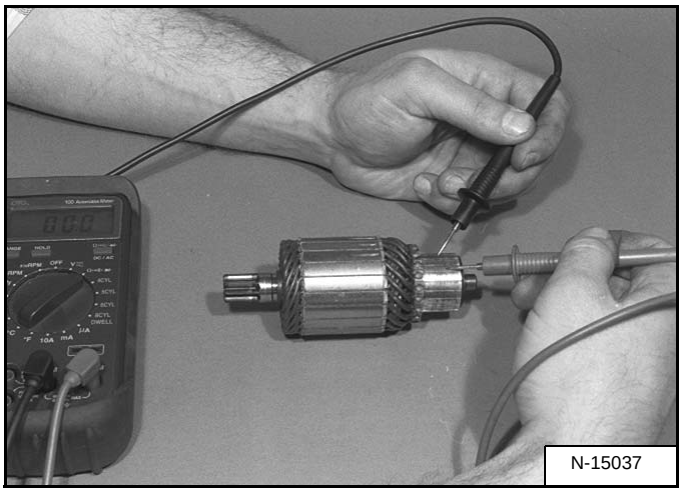


Armature Winding Ground Test: Use a circuit tester, touch one probe to a commutator segment and the other probe to the armature core **[Figure 60-40-26]**. There should be no continuity. If there is continuity, the armature is grounded and must be replaced.

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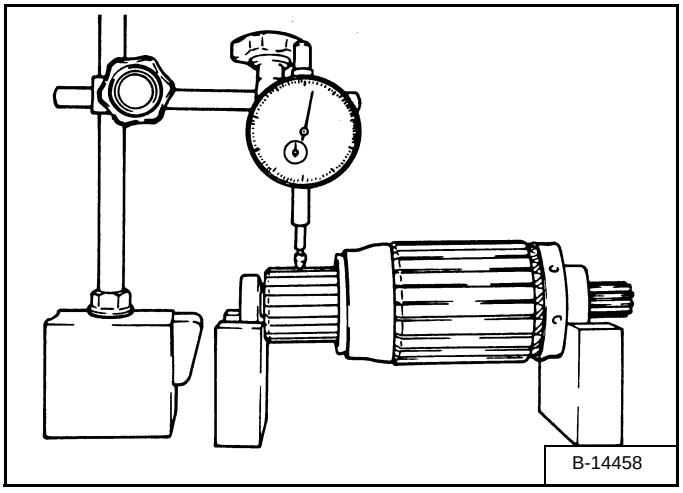
Inspection And Repair (Cont'd)

Figure 60-40-27



Armature Winding Continuity Test: Use a circuit tester, touch the probes to two commutator segments **[Figure 60-40-27]**. There must be continuity at any point. If there is no continuity, the winding is open-circuited, replace the armature.

Figure 60-40-28

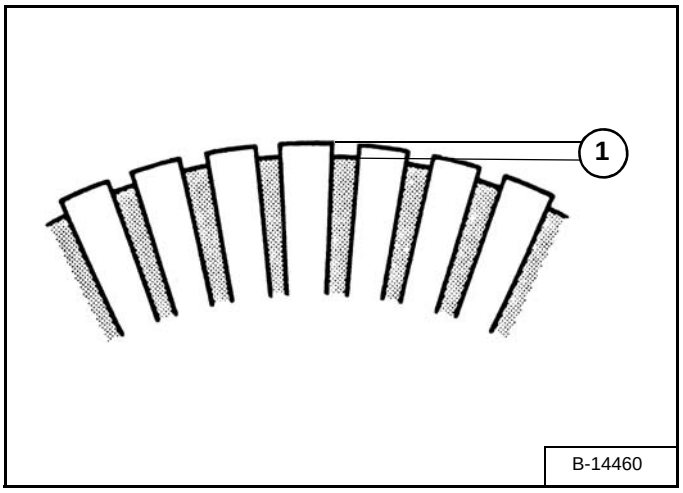


Commutator Run-Out Test: Check the commutator run-out as shown in **[Figure 60-40-28]**.

Service Limit - 0.020 inch (0,4 mm)

If the commutator exceeds the service limit, repair as needed.

Figure 60-40-29



Measure the segment mica depth (Item 1) **[Figure 60-40-29]**.

Service Limit - 0.008 inch (0,2 mm)

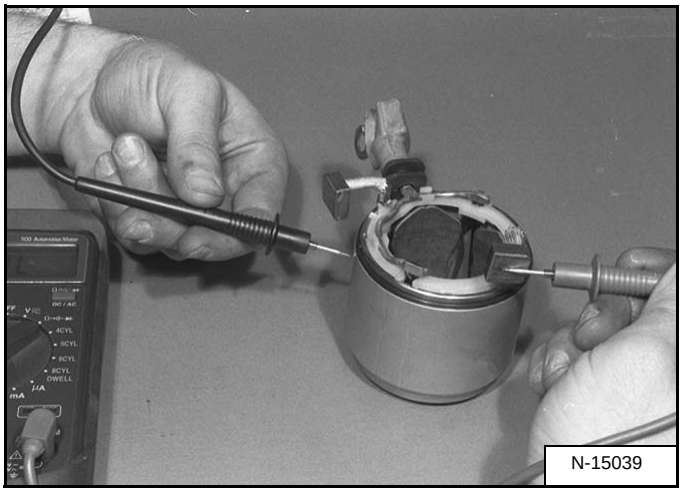
If it is worn, replace the armature.

Check the commutator surface for burned spots which usually indicates an open-circuit, and correct it using #400 sand paper.

Check the field windings for wear and damage.

Check all the connections for clean and tight solder joints.

Figure 60-40-30



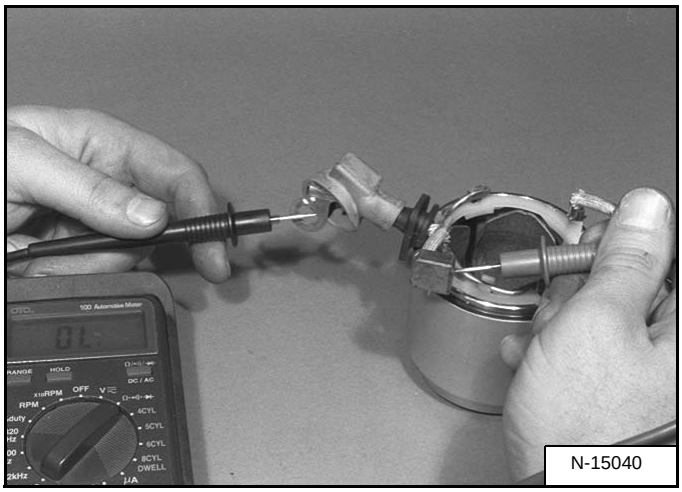
Field Winding Ground Test: Use a circuit tester, touch one probe to the field winding end of the brush and the other probe to the surface of the frame **[Figure 60-40-30]**. There should be no continuity. If there is continuity, the field windings are grounded.

Replace the field windings.

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Inspection And Repair (Cont'd)

Figure 60-40-31



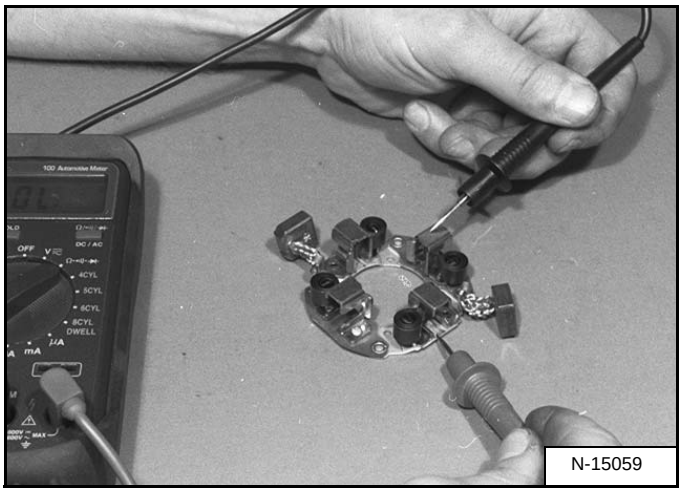
Field Windings Continuity Test: Use a circuit tester, touch one probe to the wire and the other probe to the brush **[Figure 60-40-31]**. There must be continuity. If there is no continuity, the field windings are open-circuited. Replace the yoke if the field windings have an open circuit.

Inspect the brushes for wear and damage.

Replace the brush holder or yoke assembly if the brushes are worn or damaged.

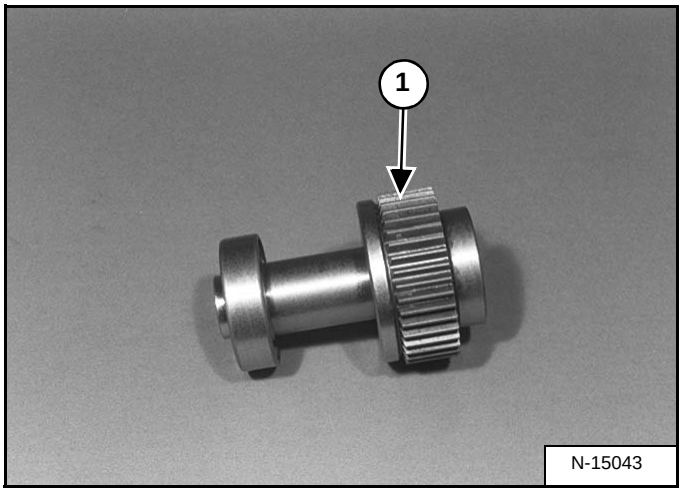
Check brush springs, for damage or rust. Replace as needed.

Figure 60-40-32



Brush Holder Insulation Test: Use a circuit tester, touch one probe to the positive brush holder plate and the other probe to the holder plate **[Figure 60-40-32]**. There should be no continuity. If there is continuity, replace or repair.

Figure 60-40-33



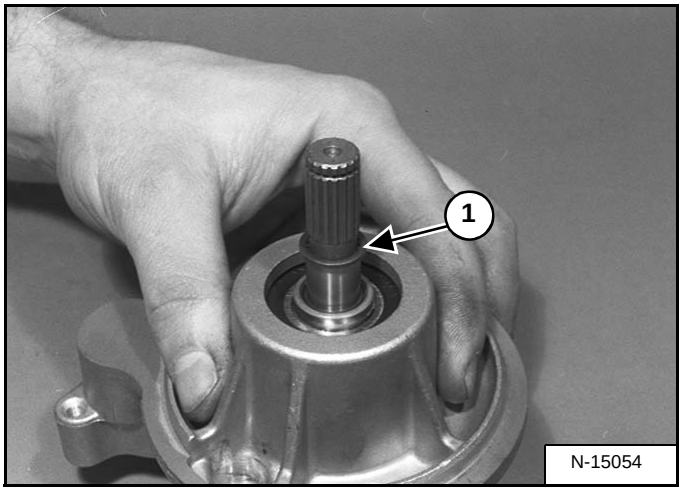
Inspect the over running clutch (Item 1) **[Figure 60-40-33]**, it must rotate freely in the direction of the starter rotation and locked in the opposite rotation.

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Assembly

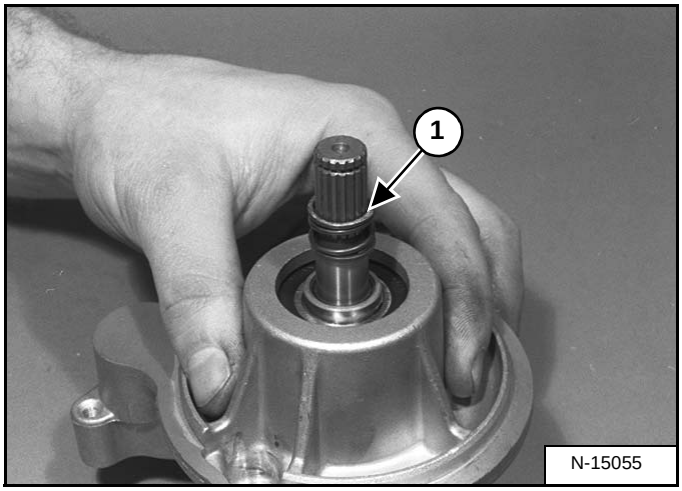
Place the starter drive on the bench, and press down on the starter drive housing.

Figure 60-40-34



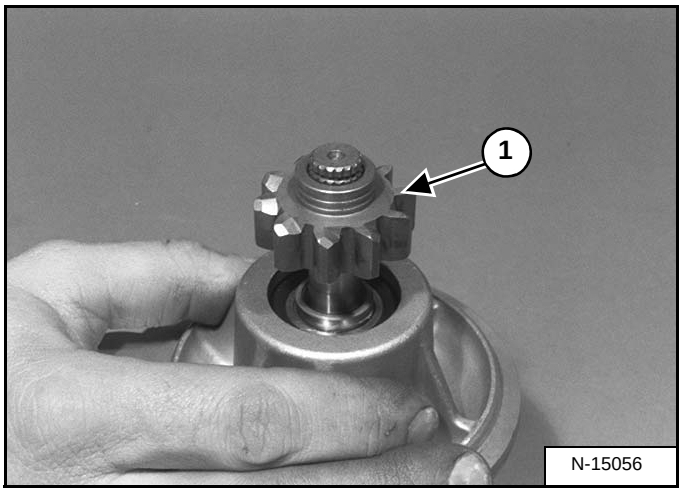
Install the spring seat (Item 1) **[Figure 60-40-34]** on the pinion shaft.

Figure 60-40-35



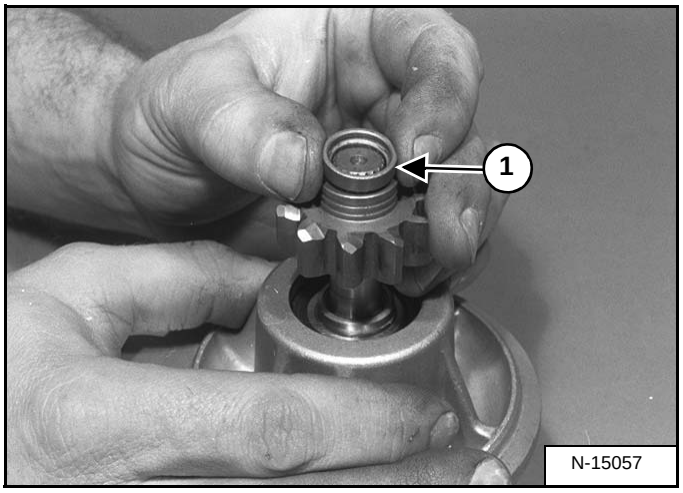
Install the spring (Item 1) **[Figure 60-40-35]**.

Figure 60-40-36



Install the pinion (Item 1) **[Figure 60-40-36]**.

Figure 60-40-37

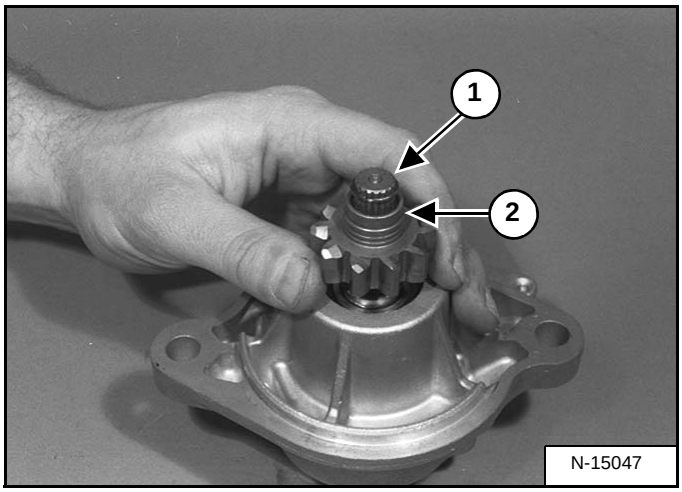


Install the collar (Item 1) **[Figure 60-40-37]**.

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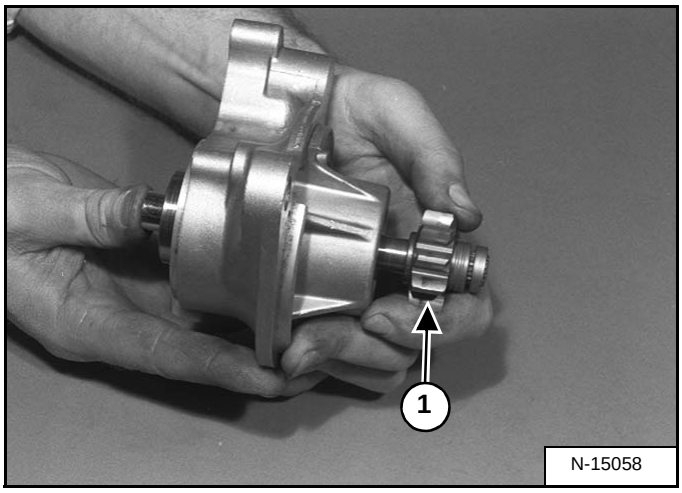
Assembly (Cont'd)

Figure 60-40-38



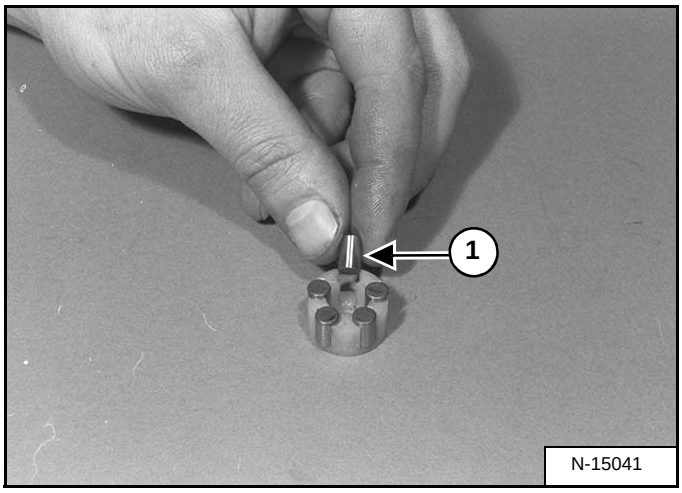
Install the snap ring (Item 1). Pull the collar (Item 2) **[Figure 60-40-38]** over the snap ring.

Figure 60-40-39



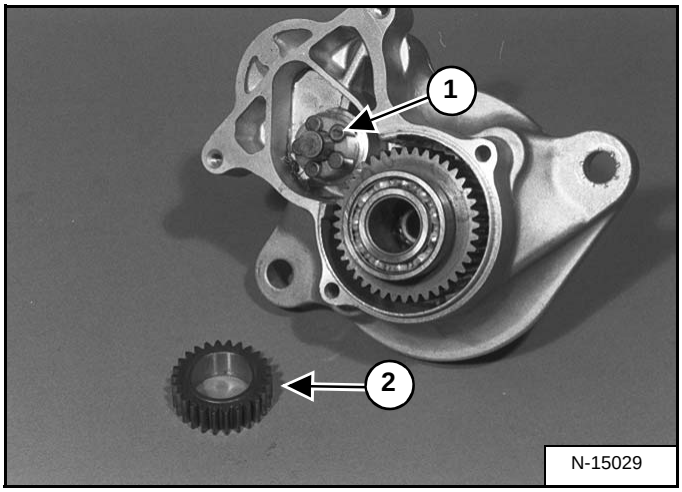
With the pinion shaft extended, extend and release the pinion (Item 1) **[Figure 60-40-39]**. The pinion must return to the fully retracted position.

Figure 60-40-40



Install the rollers (Item 1) **[Figure 60-40-40]** in the retainer.

Figure 60-40-41



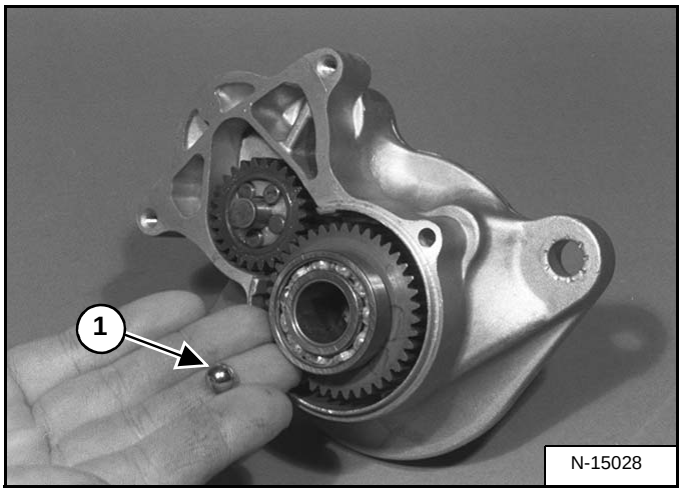
Install the roller/retainer assembly (Item 1) **[Figure 60-40-41]** on the starter housing.

Install the idler gear (Item 2) **[Figure 60-40-41]** over the roller/retainer assembly.

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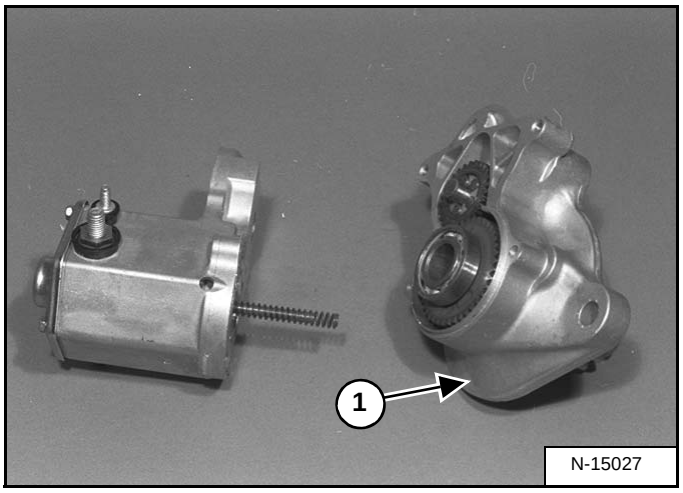
Assembly (Cont'd)

Figure 60-40-42



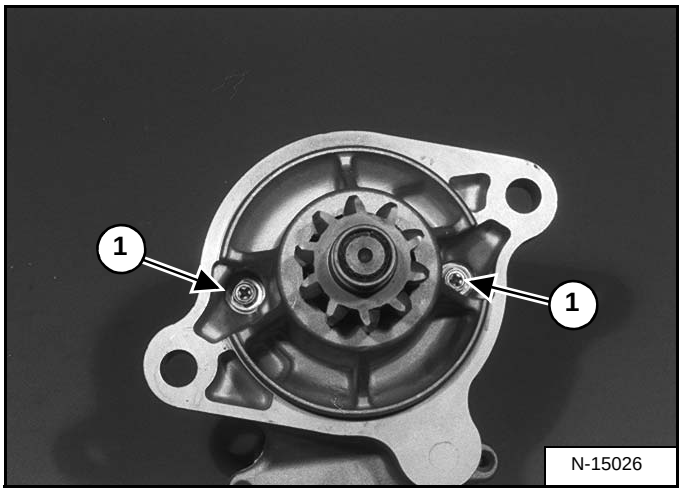
Install the ball (Item 1) **[Figure 60-40-42]** in the pinion shaft.

Figure 60-40-43



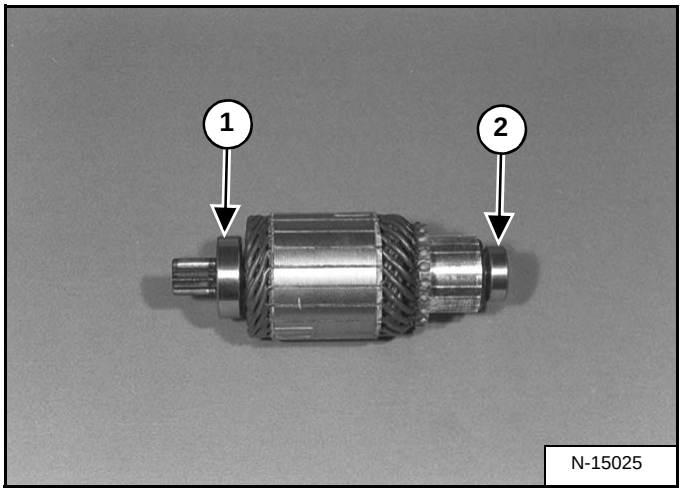
Install the starter drive (Item 1) **[Figure 60-40-43]** on the magnetic switch.

Figure 60-40-44



Install the two bolts (Item 1) **[Figure 60-40-44]**. Tighten the bolts to 60-104 in.-lbs. (7-12 Nm) torque.

Figure 60-40-45

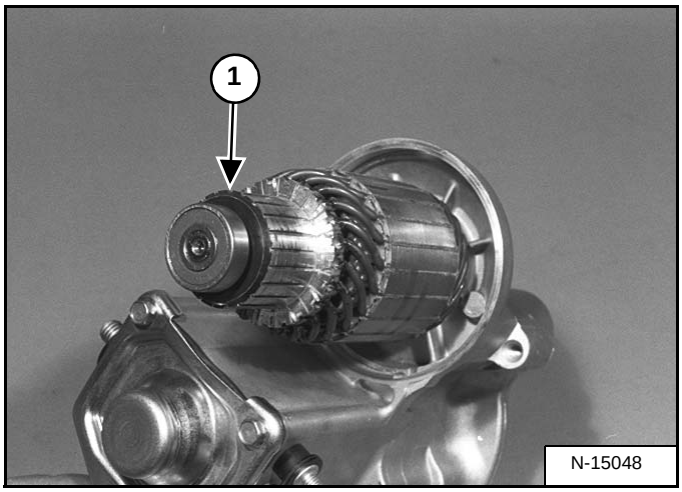


Install the bearings (Items 1 & 2) **[Figure 60-40-45]** on both ends of the armature.

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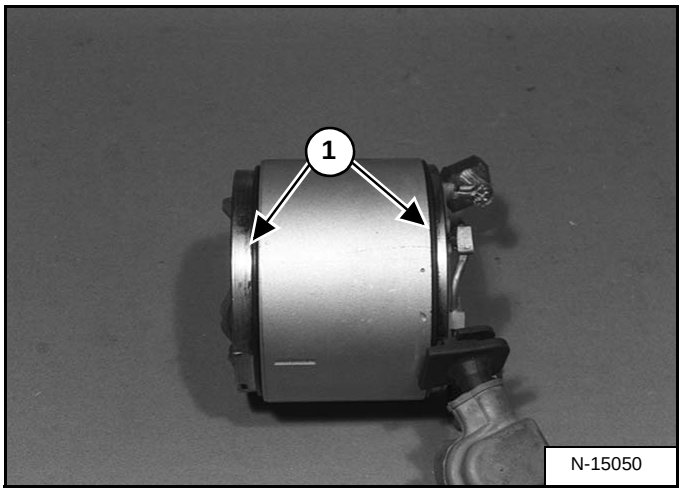
Assembly (Cont'd)

Figure 60-40-46



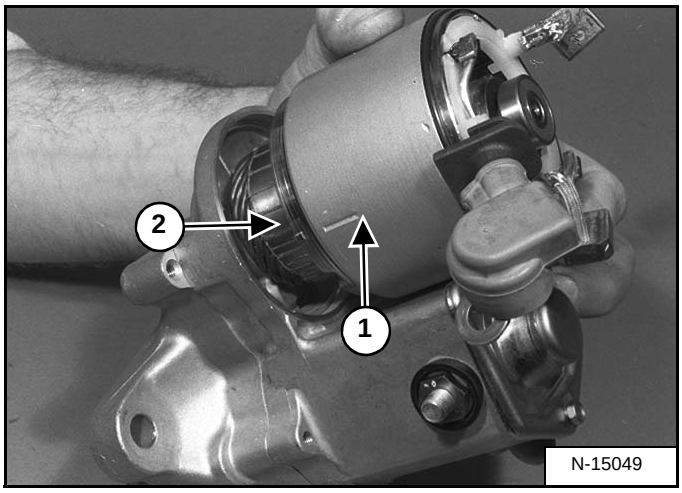
Install the armature (Item 1) **[Figure 60-40-46]** in the magnetic switch housing.

Figure 60-40-47



Install the new O-rings (Item 1) **[Figure 60-40-47]** on both ends of the frame.

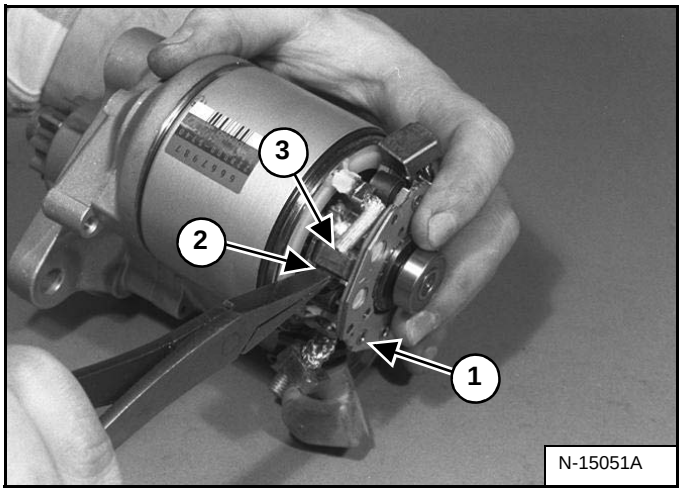
Figure 60-40-48



Install the frame (Item 1) **[Figure 60-40-48]** over the armature.

NOTE: Make sure the tab (Item 2) [Figure 60-40-48] on the frame is aligned with the slot in the magnetic switch housing.

Figure 60-40-49



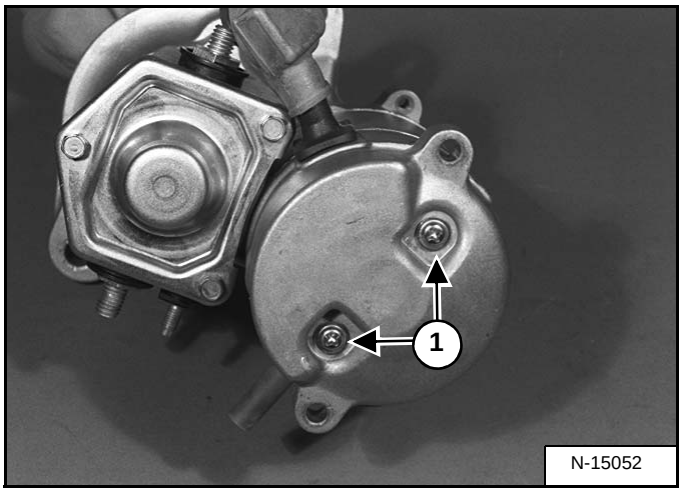
Install the brush holder (Item 1) **[Figure 60-40-49]** on the armature.

Using a needle nose pliers, pull the spring (Item 2) back and install the brushes (Item 3) **[Figure 60-40-49]**.

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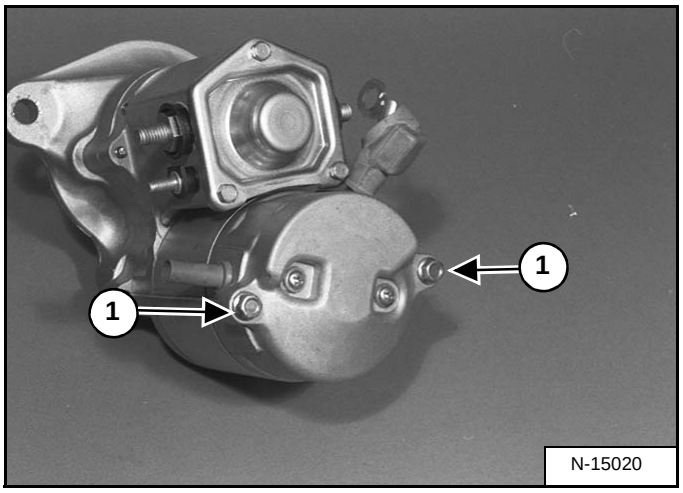
Assembly (Cont'd)

Figure 60-40-50



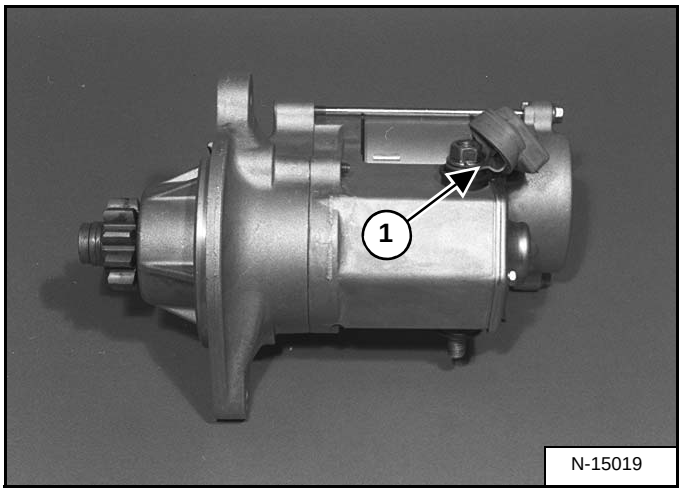
Install the brush cover and screws (Item 1) **[Figure 60-40-50]**.

Figure 60-40-51



Install the bolts (Item 1) **[Figure 60-40-51]**. Tighten the bolts to 60-104 in.-lbs. (7-12 Nm) torque.

Figure 60-40-52



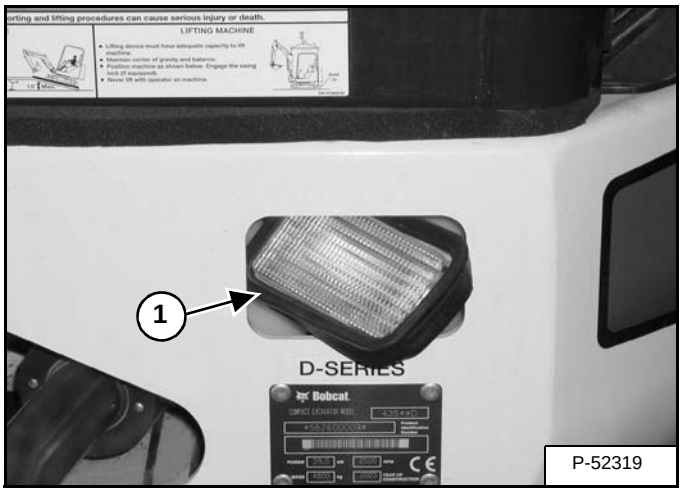
Install the cable (Item 1) **[Figure 60-40-52]** on the terminal. Tighten the terminal nut to 4-7 ft.-lbs. (5-9 Nm) torque.

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LIGHTS

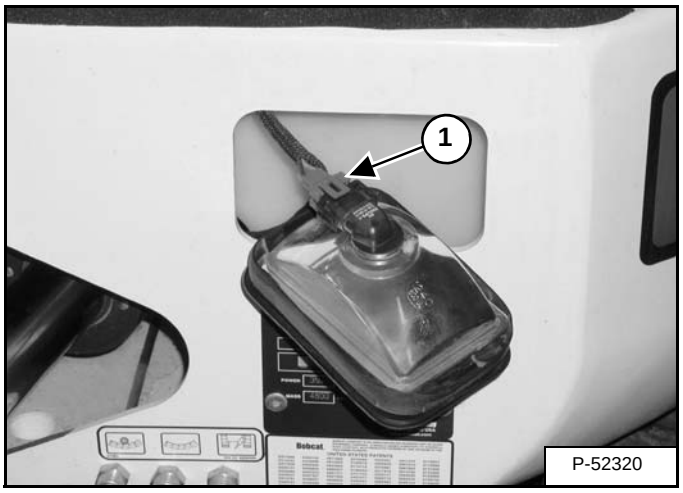
Removal And Installation

Figure 60-50-1



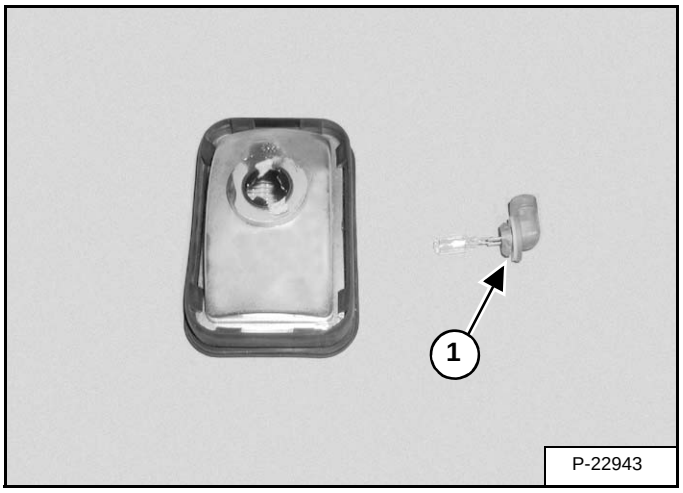
To remove the upperstructure light, pivot the light (Item 1) **[Figure 60-50-1]** back inside the frame.

Figure 60-50-2



Disconnect the wire harness (Item 1) **[Figure 60-50-2]**.

Figure 60-50-3

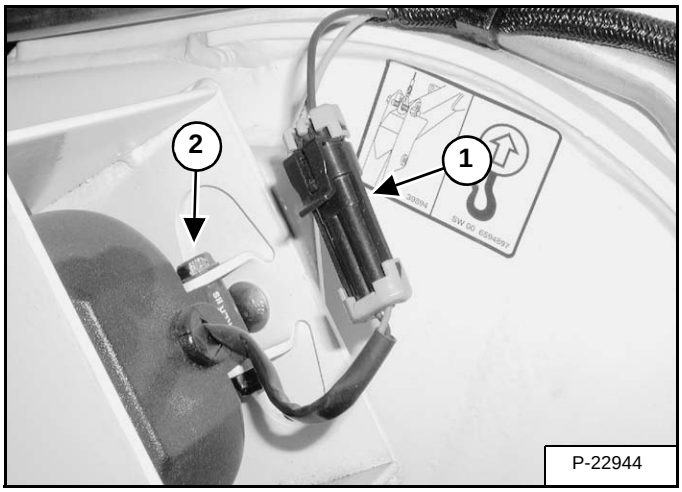


Remove the light bulb assembly (Item 1) **[Figure 60-50-3]** from the lens.

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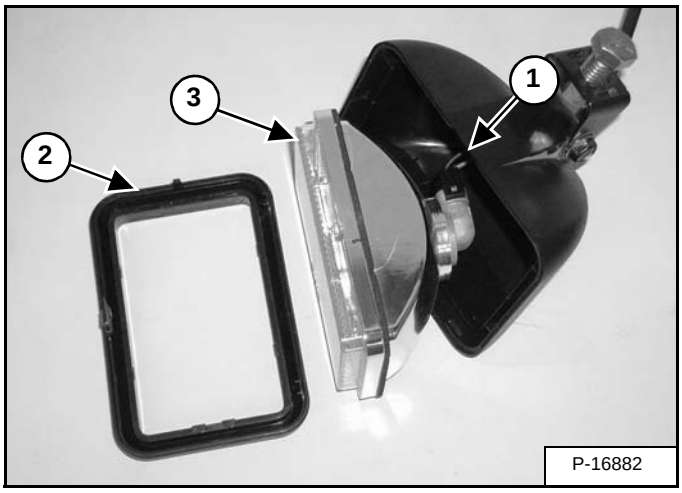
Boom Light Removal and Installation (Earlier Models)

Figure 60-50-4



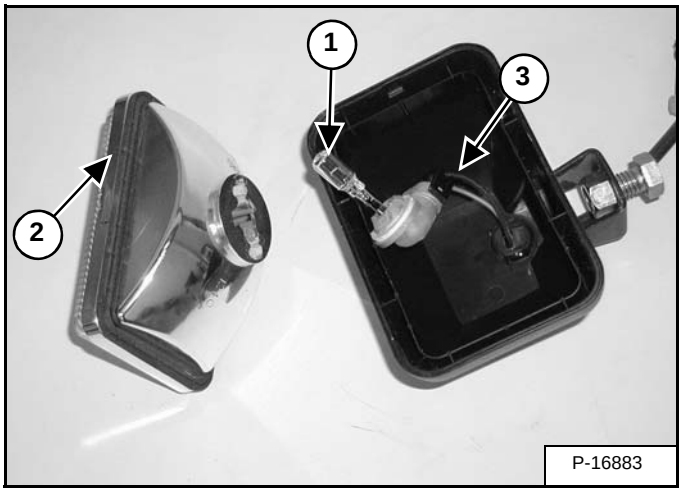
To remove the boom light, disconnect the wire harness (Item 1) and remove the nut and bolt (Item 2) **[Figure 60-50-4]**.

Figure 60-50-5



Remove the screw (Item 1), remove the cover (Item 2) and lens assembly (Item 3) **[Figure 60-50-5]**.

Figure 60-50-6



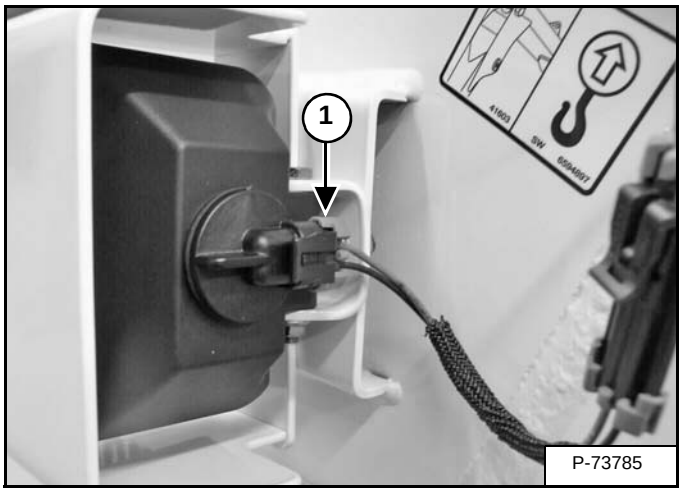
Remove the light bulb assembly (Item 1) from the lens assembly (Item 2) **[Figure 60-50-6]**.

Disconnect the wire connector (Item 3) **[Figure 60-50-6]** from the light bulb assembly.

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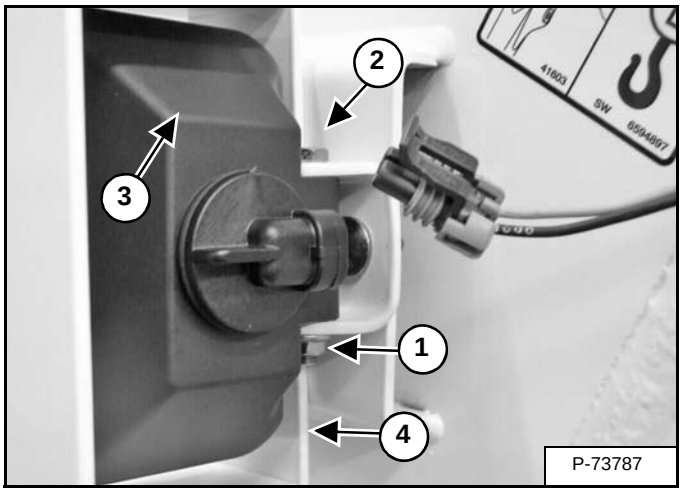
Boom Light Removal and Installation (Later Models)

Figure 60-50-7



Disconnect the wire harness (Item 1) **[Figure 60-50-7]**.

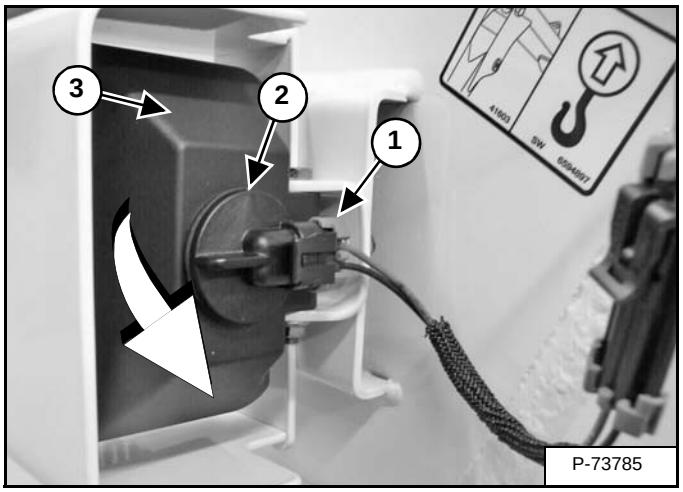
Figure 60-50-8



Remove the nut (Item 1) and bolt (Item 2). Remove the boom light (Item 3) from the boom light guard (Item 4) **[Figure 60-50-8]**.

Boom Light Bulb Replacement (Later Models)

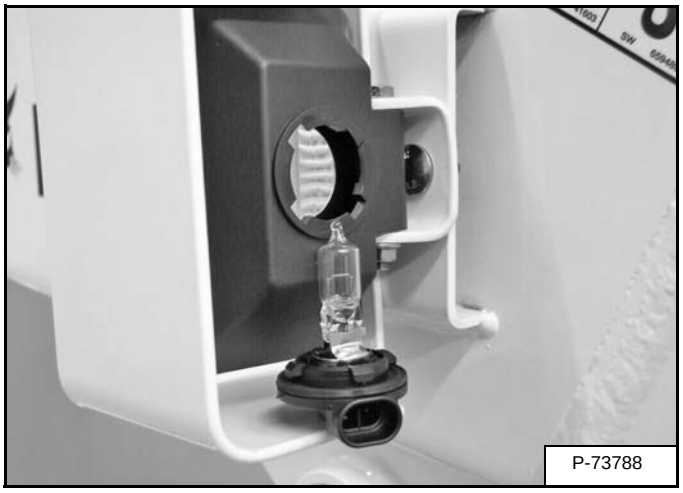
Figure 60-50-9



Disconnect the wire harness (Item 1) **[Figure 60-50-9]**.

Rotate light bulb assembly (Item 2) counterclockwise and pull straight out from the boom light (Item 3) **[Figure 60-50-9]**.

Figure 60-50-10



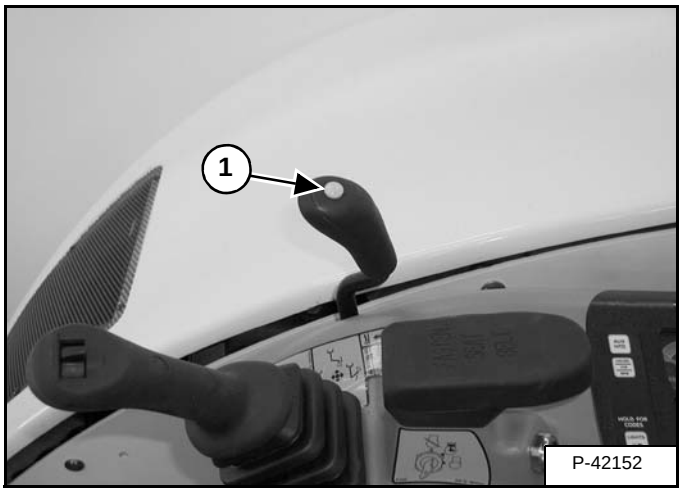
NOTE: Do not touch glass of halogen bulb with your fingers or allow bulb to come in contact with oils. If contaminated, the bulb should be cleaned with mild alcohol and a clean cloth [Figure 60-50-10].

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TWO SPEED SWITCH

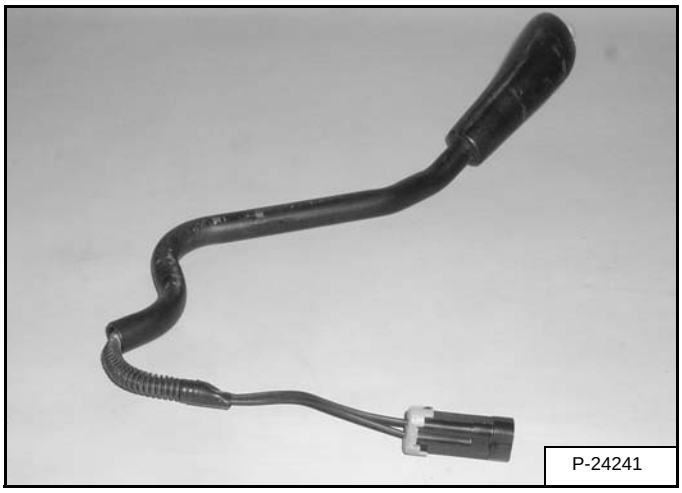
Removal And Installation

Figure 60-60-1



The two-speed switch (Item 1) **[Figure 60-60-1]** is located in the blade handle.

Figure 60-60-2



Remove the blade control lever from the excavator **[Figure 60-60-2]**. (See Lever Removal And Installation on Page 50-80-1)

NOTE: If the two-speed switch needs to be replaced, the complete blade control lever must be replaced.

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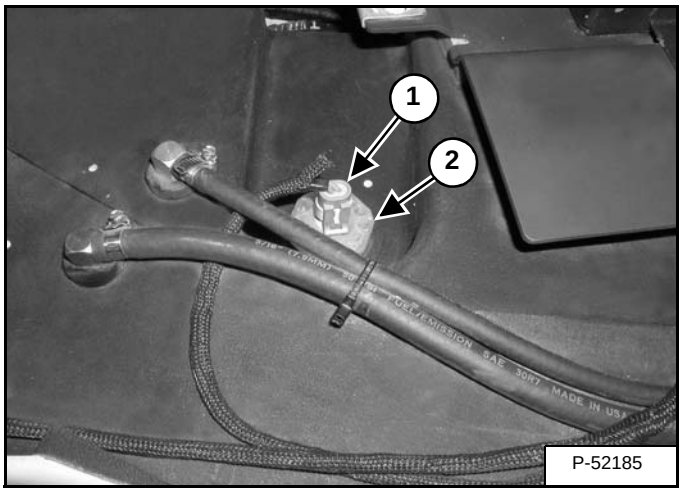
FUEL LEVEL SENDER

Removal And Installation

Remove the negative battery cable. (See Removing And Installing The Battery on Page 60-20-2)

Remove the floor mat and floor plate. (See Removal And Installation on Page 50-120-1)

Figure 60-70-1



Disconnect the harness (Item 1) **[Figure 60-70-1]** from the fuel sender.

Remove the fuel sender (Item 2) **[Figure 60-70-1]**. The sender threads into the tank, use a wrench to remove the sender.

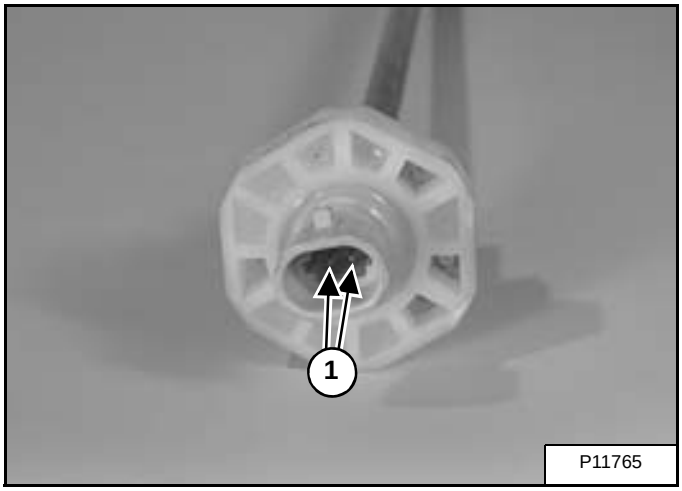
https://www.pdfmanual4trucks.com/

FUEL LEVEL SENDER (CONT'D)

Testing

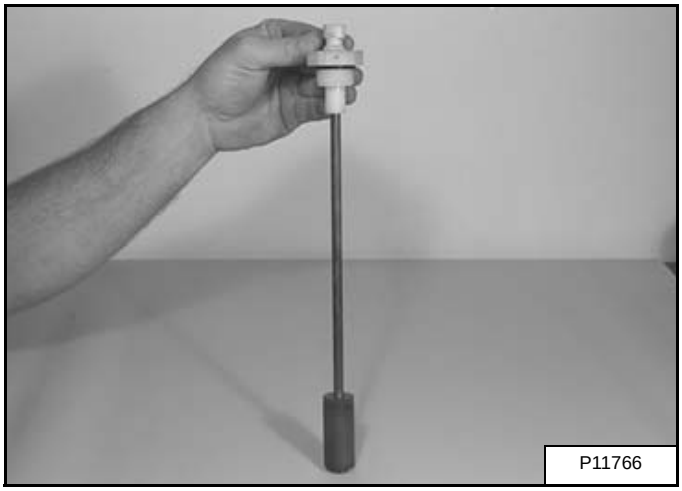
Use an ohmmeter to check the resistance of the fuel sender.

Figure 60-70-2



Insert one of the ohm tester leads into each of the fuel sender electrical connectors (Item 1) **[Figure 60-70-2]** in the end of the fuel sender.

Figure 60-70-3

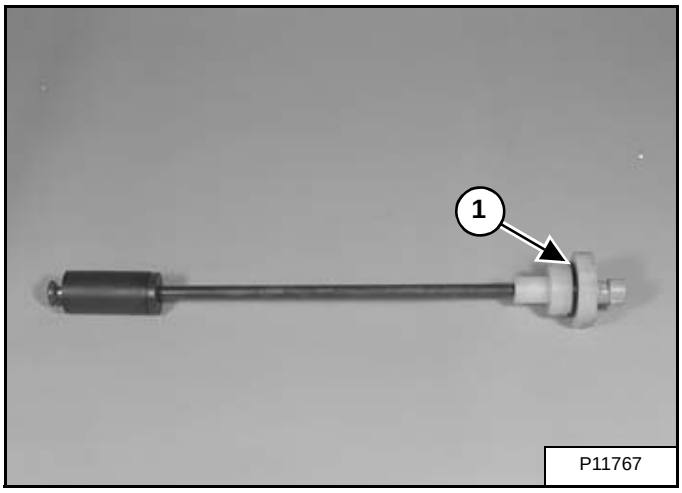


With the fuel sender in the position shown **[Figure 60-70-3]**, read the ohms in the empty position. Slide the float upwards and the ohm reading will decrease. See resistance chart below.

The resistance should read as follows:

FULL: 15-35 Ohms.
HALF: 82-97 Ohms.
EMPTY: 230-250 Ohms.

Figure 60-70-4



Inspect the O-ring (Item 1) **[Figure 60-70-4]** and replace as needed

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DIAGNOSTICS SERVICE CODE

Number Codes List

CODE		CODE	
02-16	Hydraulic charge filter not connected	20-02	Two speed output error ON
02-17	Hydraulic charge filter plugged	20-03	Two speed output error OFF
03-09	Battery voltage low	21-02	Glow plug output error ON
03-10	Battery voltage high	21-03	Glow plug output error OFF
03-11	Battery voltage extremely high		
03-14	Battery voltage extremely low	22-02	Starter relay output error ON
03-22	Battery voltage out of range low	22-03	Starter relay output error OFF
04-14	Oil pressure extremely low	26-02	Front base output error ON
04-15	Oil pressure shutdown level	26-03	Front base output error OFF
05-09	Hydraulic charge pressure low	27-02	Front rod output error ON
05-14	Hydraulic charge pressure extremely low	27-03	Front rod output error OFF
05-15	Hydraulic charge pressure shutdown level		
05-21	Hydraulic charge pressure out of range high	28-02	Diverter output error ON
05-22	Hydraulic charge pressure out of range low	28-03	Diverter output error OFF
06-10	Engine speed high	30-28	Watch dog failure
06-11	Engine speed extremely high		
06-15	Engine speed shutdown level	31-28	Recovery mode failure
06-18	Engine speed out of range high		
		33-23	Controller not calibrated
07-10	Hydraulic oil temperature high		
07-11	Hydraulic oil temperature extremely high	35-05	Hydraulic fan solenoid short to battery
07-15	Hydraulic oil temperature shutdown level	35-06	Hydraulic fan solenoid short to ground
07-21	Hydraulic oil temperature out of range high		
07-22	Hydraulic oil temperature out of range low	60-21	Sec. aux. thumbswitch out of range high
		60-22	Sec. aux. thumbswitch out of range low
08-10	Engine coolant temperature high	60-23	Sec. aux. thumbswitch not calibrated
08-11	Engine coolant temperature extremely high		
08-15	Engine coolant temperature shutdown level	62-04	Load moment monitoring in error
08-21	Engine coolant temperature out of range high		
08-22	Engine coolant temperature out of range low	63-05	Work group/travel console sensor
		63-06	Work group/travel console sensor
09-09	Fuel level low		
09-21	Fuel level out of range high	64-05	Switched power/acc. relay short to battery
09-22	Fuel level out of range low	64-06	Switched power/acc. relay short to ground
		64-07	Switched power/acc. relay open circuit
12-21	Primary auxiliary PWM switch out of range high		
12-22	Primary auxiliary PWM switch out of range low	65-02	Work group/travel lockout solenoid error ON
12-23	primary auxiliary PWM switch not calibrated	65-03	Work group/travel lockout solenoid error OFF
		65-05	Work group/travel lockout solenoid short to battery
13-05	Fuel shut-off hold solenoid short to battery	65-06	Work group/travel lockout solenoid short to ground
13-06	Fuel shut-off hold solenoid short to ground	65-07	Work group/travel lockout solenoid open circuit
13-07	Fuel Shut-off hold solenoid secondary open circuit		
		66-05	Travel solenoid short to battery
14-02	Fuel shut-off pull solenoid short to batter	66-06	Travel solenoid short to ground
14-03	Fuel shut-off pull solenoid short to ground		

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DELUXE INSTRUMENT PANEL SETUP

Passwords

All new machines with Deluxe Instrumentation arrive at Bobcat Dealerships with the panel in locked mode. This means that a password must be used to start the engine.

For security purposes, your dealer may change the password and also set it in the locked mode. Your dealer will provide you with the password.

Master Password:
A permanent, randomly selected password is set at the factory which cannot be changed. This password is used for service by the Bobcat dealer if the Owner Password is not known; or to change the Owner Password.

Owner Password:
There is only 1 Owner Password (**CodE 0**). It must be used to change the owner or operator passwords. See below for changing the Owner Password.

Operator Password:
There can be up to 3 operator Passwords (**CodE 1, CodE 2, CodE 3**). See below for changing the Operator Password.

Password Entry (For Starting and Operating the Machine)

Press ENTER CODE button (Item 1). The panel will become lighted and there will be 2 short beeps. **CodE** will appear on the LCD (Item 2) **[Figure 60-90-1]**.

NOTE: After you press ENTER CODE you have 40 seconds to use the keypad (Item 3) [Figure 60-90-1] to enter the password. (If more than 40 seconds is used, the process will abort and you will need to start over.

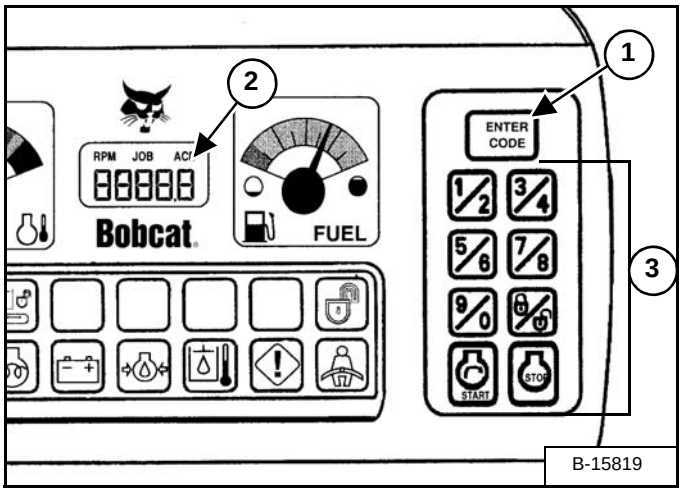
Enter the password. For each digit that you enter, a dash will appear on the LCD. If the password was entered correctly, there will be 1 long beep.

NOTE: If the password was incorrect there will be 3 short beeps and *Error* **will appear on the LCD. Press the ENTER CODE button again and start over. After 3 failed attempts, you must wait 3 minutes to try again.**

You are now ready to start and operate the machine.

If you will be changing passwords, do not start the engine. (See Changing The Owner or Operator Password at right.)

Figure 60-90-1



Changing The Owner or Operator Password

Perform Password Entry at left, but do not start the engine.

Press and hold the ENTER CODE button (Item 1) for 3 seconds. CodE 1 will appear on the LCD (Item 2) **[Figure 60-90-1]**.

Press the ENTER CODE button until the desired Code (CodE 0, CodE 1, CodE2, CodE 3) appears. CodE 0 is Owner Password, the other codes are Operator passwords. You now have 40 seconds to use the keypad (Item 3) **[Figure 60-90-1]** to enter each digit of a new 4 digit password.

Enter the new 4 digit password. After the fourth digit is entered, there will be 2 short beeps and **rPEAt** will appear.

Re-enter the new 4 digit password to verify. If the new passwords match, there will be 2 short beeps, **Code** will appear for 1 second and then the LCD will return to HOURMETER function.

NOTE: If the new passwords do not **match, there will be 1 long beep and Error will appear for 1 second and then the LCD will return to HOURMETER function.**

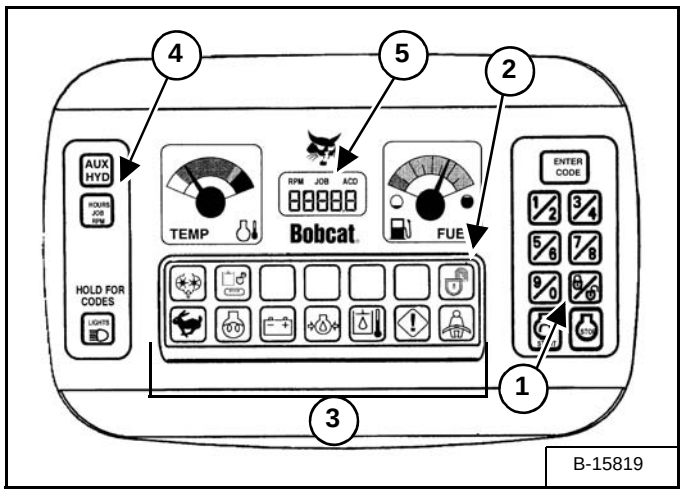
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Password Lockout Feature

This allows the operator to Unlock the password feature so that a password does not need to be used every time you start the engine.

Perform Password Entry (See Password Entry (For Starting and Operating the Machine) on Page 60-90-1.) (the engine can be started or stopped.)

Figure 60-90-2



Press the Lock/Unlock button (Item 1) **[Figure 60-90-2]**. The LCD will continuously alternate from **UnLoc** to **CodE** for 1 second periods.

Perform Password Entry again.

UnLoc will appear in the LCD (Item 5), the Unlocked Icon (Item 2) will appear in the Icon Display Area (Item 3) **[Figure 60-90-2]** and there will be 2 short beeps.

To start an Unlocked system, press the ENTER CODE button and press the START button.

When you stop the engine with the system unlocked, you will hear 1 long beep every 3 seconds for 15 seconds.

To lock the system again, press the Lock/Unlock button (Item 1) **[Figure 60-90-2]** and enter the password during the 15 second period.

Job Clock

The JOB CLOCK can be set to record accumulated hours for a particular job.

Press and release the HOURS/JOB/RPM button (Item 4) until JOB light is ON at the top, center of the LCD (Item 5) **[Figure 60-90-2]**.

While the JOB light is ON, press and hold the HOURS/JOB/RPM button (Item 4) **[Figure 60-90-2]** until the LCD returns to zero.

This process will clear the accumulated hours and will begin recording JOB CLOCK time again. (This does not affect the HOURMETER which continues to record the total operating hours of the excavator.)

Pressing the HOURS/JOB/RPM button again or pressing the START button will return the LCD to HOURMETER function.

RPM

The LCD (Item 5) **[Figure 60-90-2]** can be set to display engine RPM.

With the engine running, press and release the HOURS/JOB/RPM button (Item 4) until RPM light is ON at the top, center of the LCD (Item 5) **[Figure 60-90-2]**.

Engine RPM is now displayed in the LCD.

Press the HOURS/JOB/RPM button (Item 4) **[Figure 60-90-2]** again the return to HOURMETER function.

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ENGINE SERVICE

AIR CLEANER 70-30-1
Removal And Installation 70-30-1

ENGINE. 70-60-1
Removal And Installation 70-60-1

ENGINE COMPONENTS & TESTING (S/N 562611001 & ABOVE) . . 70-50-1
Checking The Glow Plug 70-50-5
Engine Compression Checking 70-50-1
Fuel Injection Pump Check 70-50-8
Fuel Injection Pump Removal And Installation 70-50-9
Fuel Injection Pump Timing 70-50-13
Fuel Injector Nozzle Check 70-50-19
Fuel Injector Nozzles Removal And Installation. 70-50-15
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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
Slow cranking speed	1, 2, 3, 4
Engine will not start	2, 5, 6, 7, 8, 9, 11, 12, 13, 14, 15, 16, 17, 19, 27, 28, 29
Difficult to start	5, 7, 8, 9, 10, 11, 12, 13, 15, 16, 17, 18, 19, 20, 25, 27, 28, 29
No power from engine	8, 9, 10, 11, 12, 13, 15, 16, 17, 21, 22, 24, 25, 26, 28, 29
Engine is mis-firing	8, 9, 11, 12, 13, 15, 16, 17, 21, 22, 24, 25, 26, 28
Too much fuel consumption	10, 12, 13, 15, 16, 17, 19, 20, 21, 23, 24, 25, 27, 28, 29
Black exhaust	10, 12, 13, 15, 16, 17, 19, 20, 21, 23, 24, 25, 27, 28, 29
Blue/white exhaust	4, 10, 15, 16, 17, 21, 23, 27, 29, 30, 50
Low oil pressure	4, 31, 32, 33, 34, 35, 37, 38, 39, 52
Engine knocking	13, 15, 16, 19, 22, 24, 25, 27, 29, 31, 40, 41, 53
Engine running rough	7, 8, 9, 10, 11, 12, 13, 17, 18, 22, 24, 25, 26, 29, 40, 53
Vibration	12, 13, 17, 21, 22, 25, 26, 29, 40, 42, 43
High oil pressure	4, 33, 36
Overheating	10, 12, 13, 15, 16, 20, 21, 40, 44, 45, 46, 47, 48, 51
Too much crankcase pressure	22, 27, 29, 30, 40, 49
Poor compression	10, 16, 21, 24, 25, 27, 28, 29, 30, 41, 53
Start and stop	9, 10, 11

KEY TO CORRECT THE CAUSE	
1. Battery capacity low	28. Worn valves and seat
2. Bad electrical connections	29. Broken or worn piston rings
3. Faulty starter motor	30. Worn valve stems or guides
4. Incorrect grade of oil	31. Worn or damaged bearings
5. Low cranking speed	32. Not enough oil in the oil pan
6. Fuel tank empty	33. Switch is defective
7. Faulty stop control operation	34. Oil pump worn
8. Plugged fuel line	35. Relief valve is stuck open
9. Plugged fuel filter	36. Relief valve is stuck closed
10. Restriction in the air cleaner	37. Broken relief valve spring
11. Air in the fuel system	38. Faulty suction pipe
12. Faulty fuel injection pump	39. Plugged oil filter
13. Faulty fuel injectors	40. Piston seizure
14. Broken injection pump drive	41. Incorrect piston height
15. Incorrect injection pump timing	42. Faulty engine mounting
16. Incorrect valve timing	43. Incorrect alignment of flywheel
17. Poor compression	44. Faulty thermostat
18. Plugged fuel tank vent	45. Restriction in water jacket
19. Incorrect grade of fuel	46. Loose alternator belt
20. Exhaust pipe restriction	47. Plugged radiator
21. Cylinder head gasket leaking	48. Plugged breather pipe
22. Over heating	49. Plugged breather pipe
23. Cold running	50. Damaged valve stem oil deflectors
24. Incorrect tappet adjustment	51. Coolant level too low
25. Sticking valves	52. Plugged oil pump pipe strainer
26. Incorrect high pressure fuel lines	53. Broken valve spring
27. Worn cylinder bores	

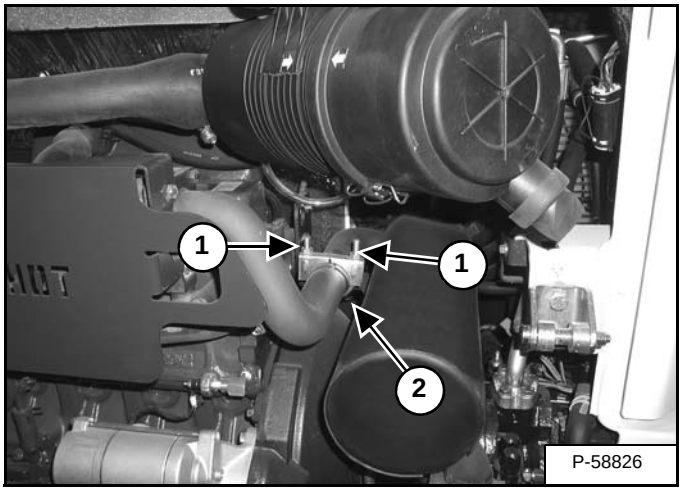
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MUFFLER

Removal And Installation

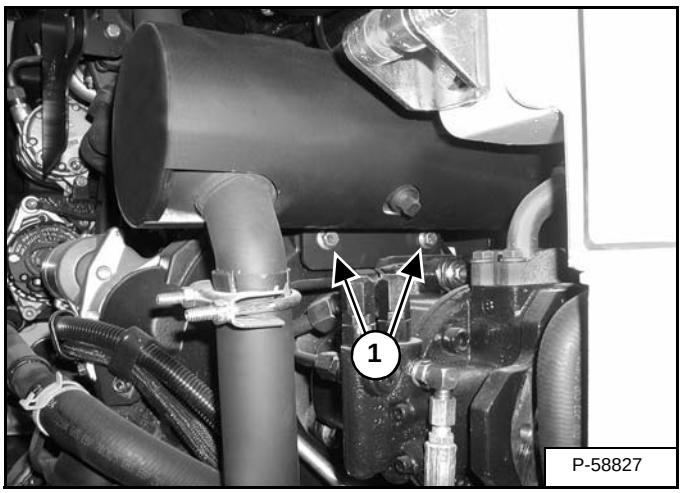
Open the tailgate.

Figure 70-20-1



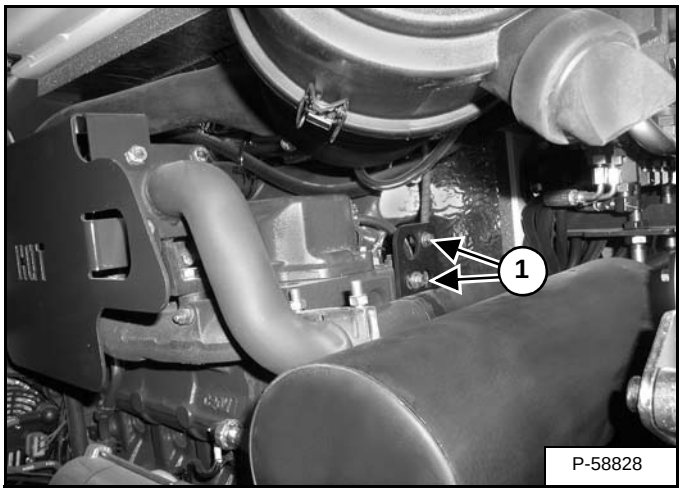
Loosen the nuts (Item 1) on the clamp (Item 2) **[Figure 70-20-1]**. Move the clamp back.

Figure 70-20-2



Remove the bottom bolts (Item 1) **[Figure 70-20-2]**.

Figure 70-20-3



Remove the top bolts (Item 1) **[Figure 70-20-3]**.

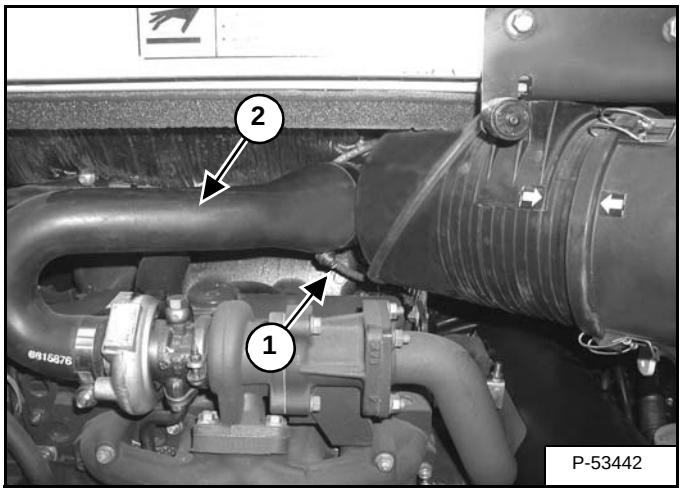
Remove the muffler.

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AIR CLEANER

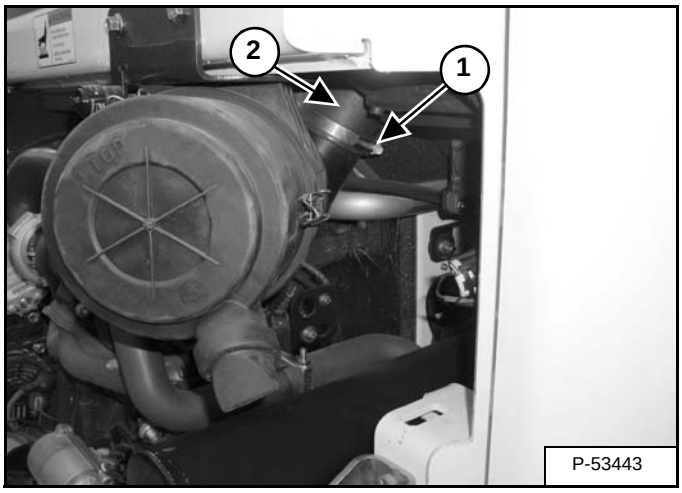
Removal And Installation

Figure 70-30-1



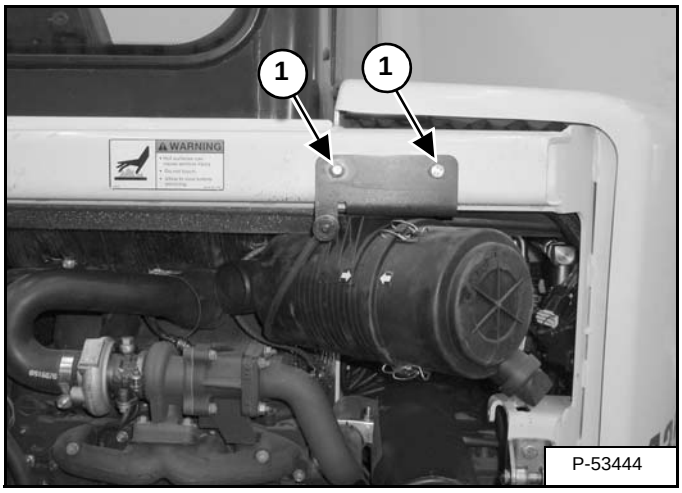
Loosen the clamp (Item 1). Remove the hose (Item 2) **[Figure 70-30-1]** from the air cleaner outlet.

Figure 70-30-2



Loosen the clamp (Item 1). Remove the hose (Item 2) **[Figure 70-30-2]** from the air cleaner inlet.

Figure 70-30-3



Remove the bolts (Item 1) **[Figure 70-30-3]**.

Remove the air cleaner from the Excavator.

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RADIATOR

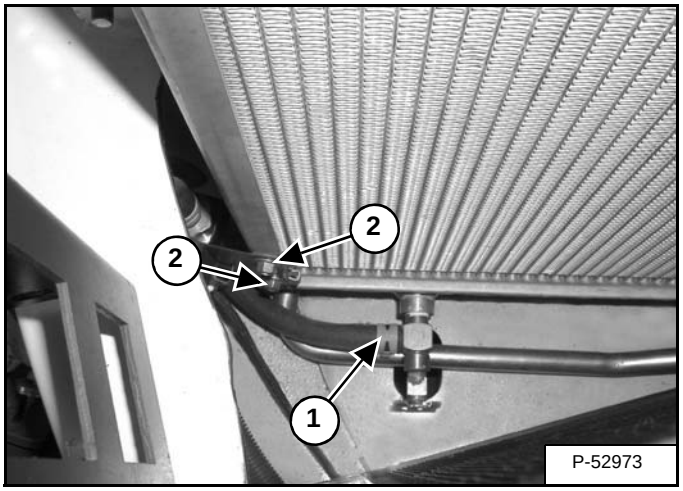
Removal And Installation

Drain the coolant. (See Replacing The Coolant on Page 10-70-2)

Remove the cooling fan. (See Removal And Installation on Page 20-180-2)

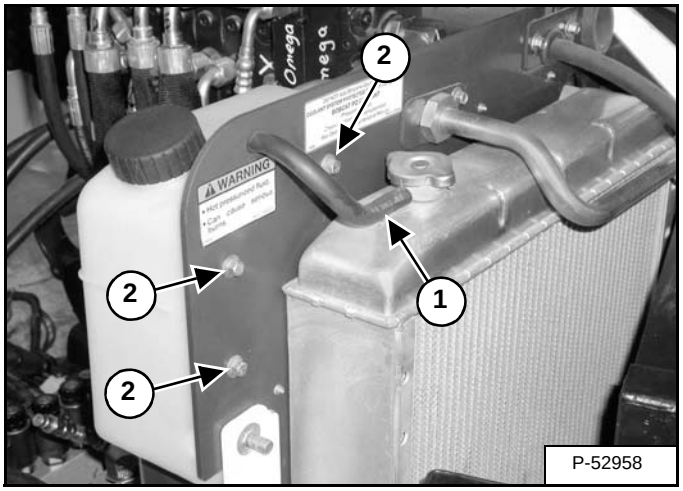
Remove the battery. (See Removing And Installing The Battery on Page 60-20-2)

Figure 70-40-1



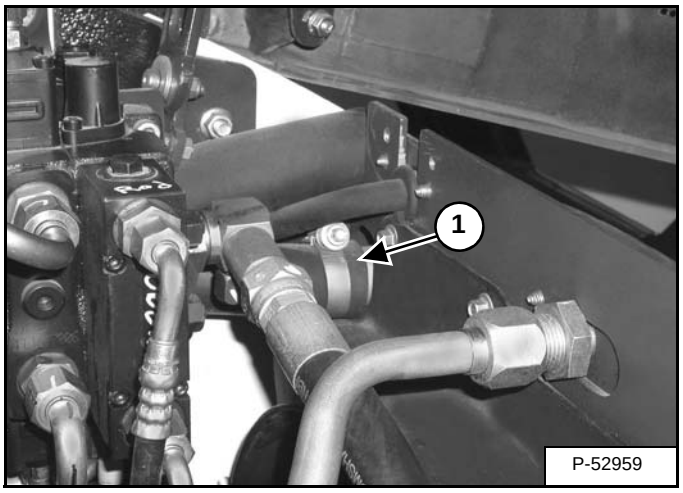
Remove the heater hose (Item 1). Remove the bolts (Item 2) **[Figure 70-40-1]** and reposition the heater valve.

Figure 70-40-2



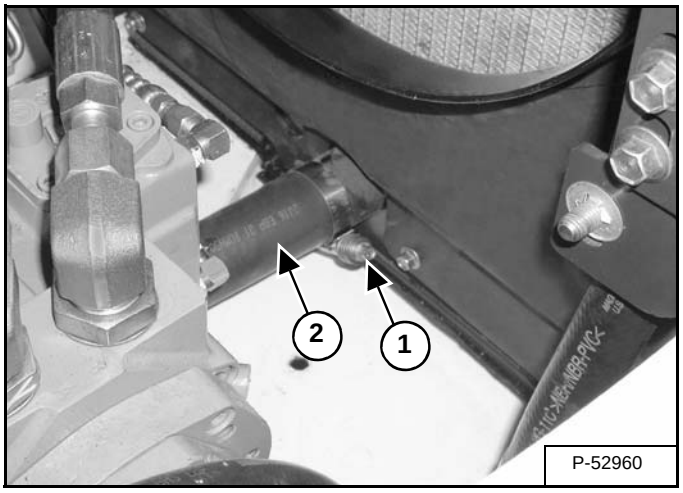
Remove the hose (Item 1). Remove the bolts (Item 2) **[Figure 70-40-2]** and coolant recovery tank.

Figure 70-40-3



Loosen the clamp (Item 1) **[Figure 70-40-3]**.

Figure 70-40-4

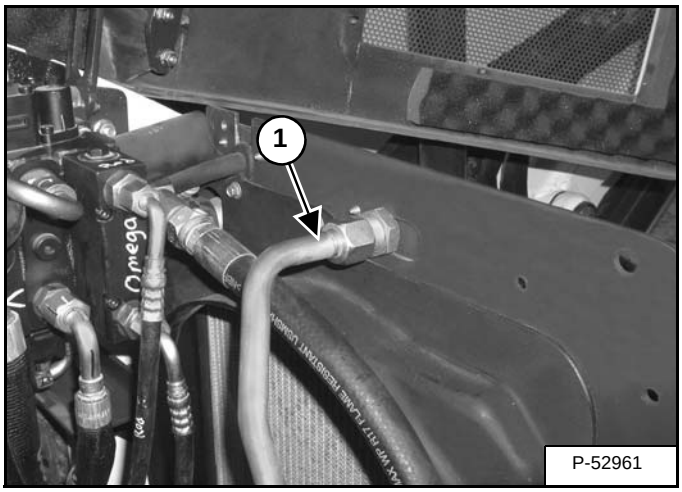


Loosen the clamp (Item 1) and remove the hose (Item 2) **[Figure 70-40-4]**.

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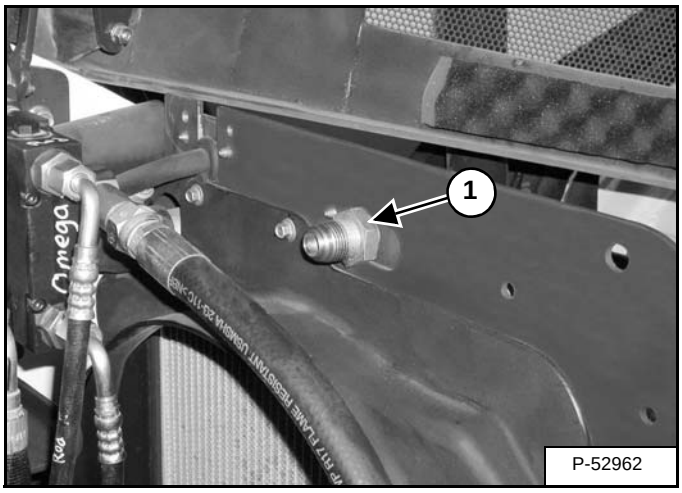
Removal And Installation (Cont'd)

Figure 70-40-5



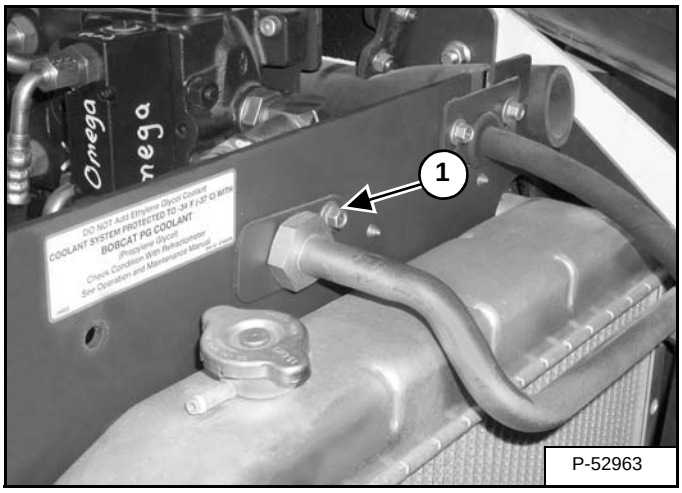
Remove the tubeline (Item 1) **[Figure 70-40-5]**.

Figure 70-40-6



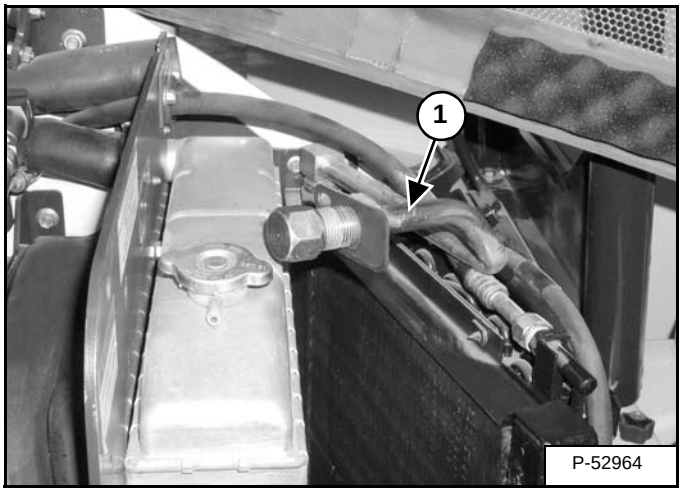
Remove the nut (Item 1) **[Figure 70-40-6]**.

Figure 70-40-7



Remove the bolt (Item 1) **[Figure 70-40-7]**.

Figure 70-40-8



Pivot the tubeline (Item 1) **[Figure 70-40-8]** away from the radiator.

IMPORTANT

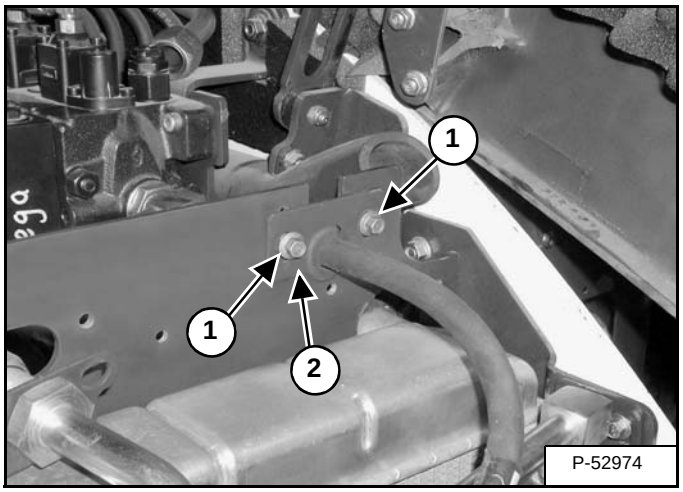
When repairing hydrostatic and hydraulic systems, clean the work area before disassembly and keep all parts clean. Always use caps and plugs on hoses, tubelines and ports to keep dirt out. Dirt can quickly damage the system.

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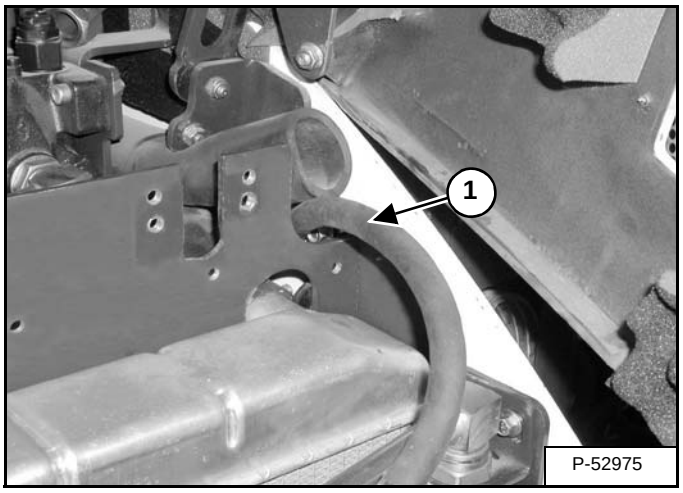
Removal And Installation (Cont'd)

Figure 70-40-9



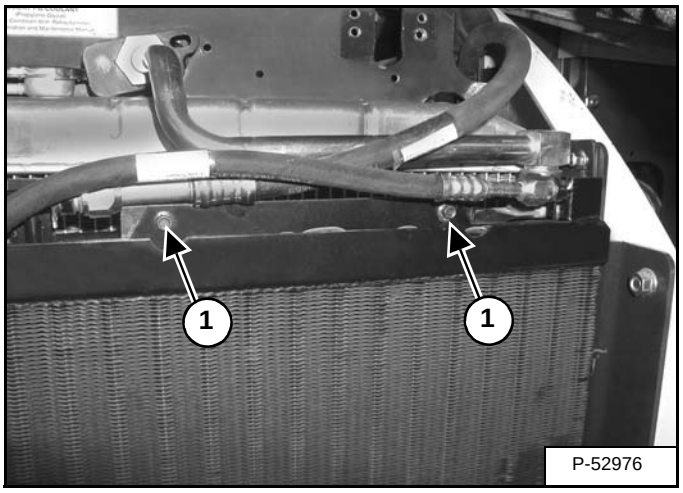
Remove the bolts (Item 1). Remove the clamp (Item 2) **[Figure 70-40-9]**.

Figure 70-40-10



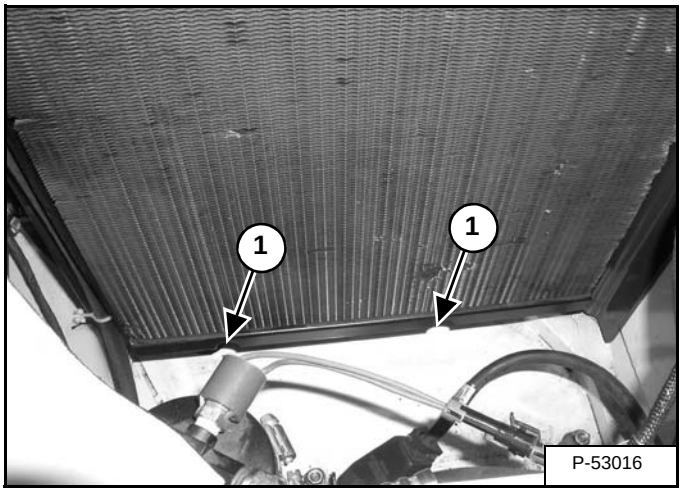
Reposition the A/C hose (Item 1) **[Figure 70-40-10]**.

Figure 70-40-11



Remove the top A/C condenser bolts (Item 1) **[Figure 70-40-11]**.

Figure 70-40-12

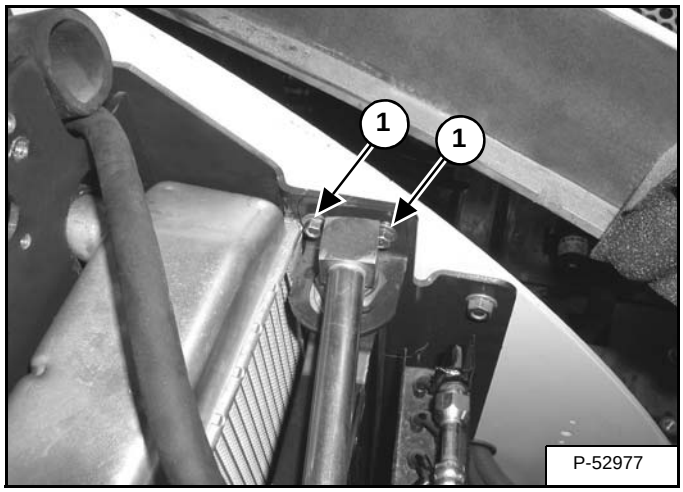


Remove the bottom A/C condenser bolts (Item 1) **[Figure 70-40-12]**.

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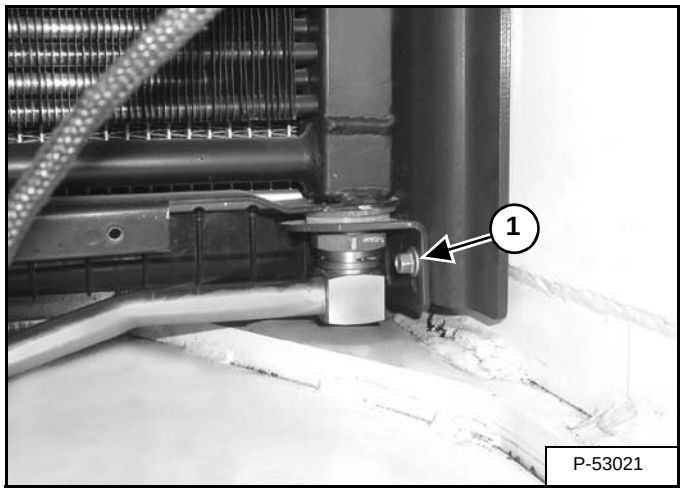
Removal And Installation (Cont'd)

Figure 70-40-13



Remove the top oil cooler mount bolts (Item 1) **[Figure 70-40-13]**.

Figure 70-40-14



Remove the bottom oil cooler mount bolts (Item 1) **[Figure 70-40-14]**.

Figure 70-40-15

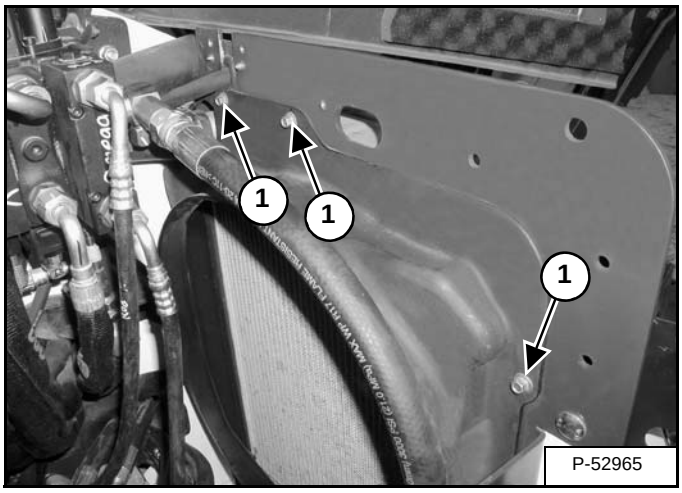
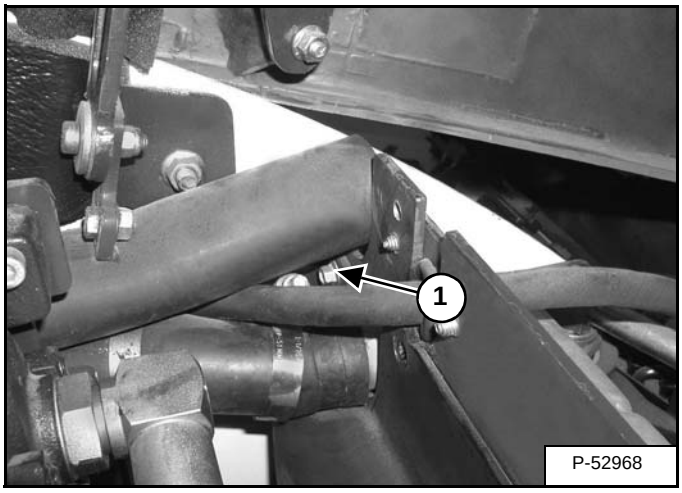


Figure 70-40-16



Remove the top shroud bolts (Item 1) **[Figure 70-40-15]** & **[Figure 70-40-16]**.

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Removal And Installation (Cont'd)

Figure 70-40-17

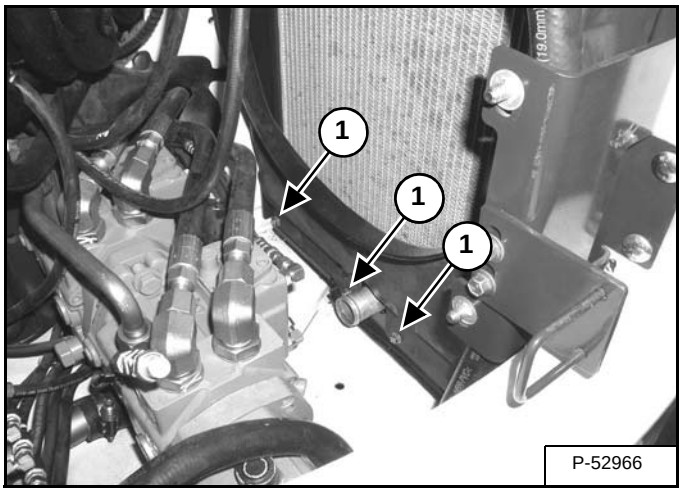
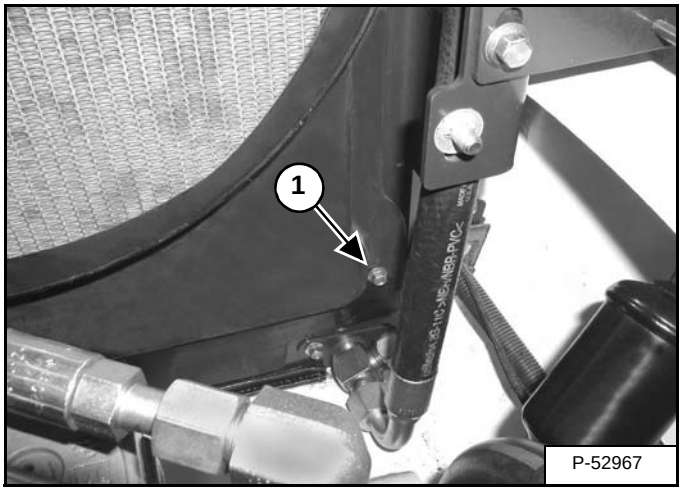


Figure 70-40-18



Remove the bottom shroud bolts (Item 1) **[Figure 70-40-17]** & **[Figure 70-40-18]**.

Figure 70-40-19

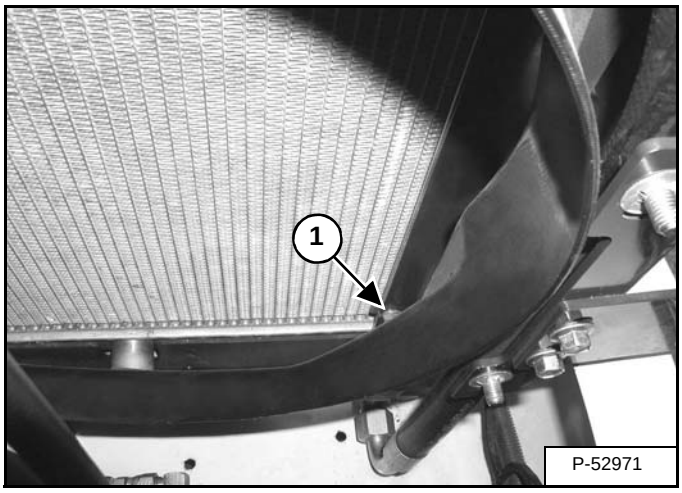
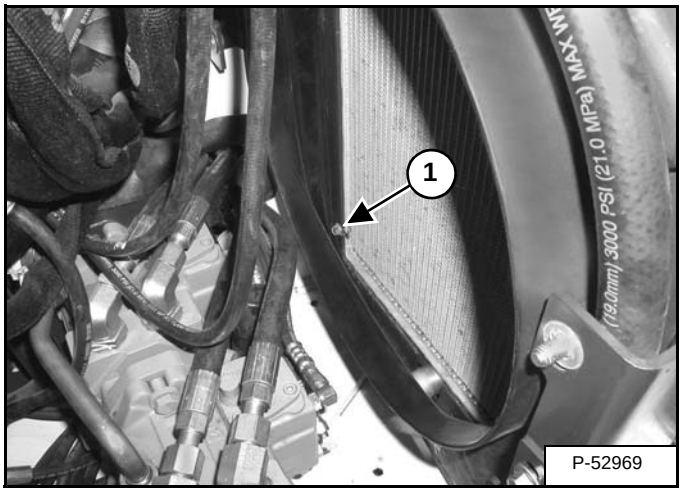


Figure 70-40-20



Remove the bottom radiator bolts (Item 1) **[Figure 70-40-19]** & **[Figure 70-40-20]**.

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Removal And Installation (Cont'd)

Figure 70-40-21

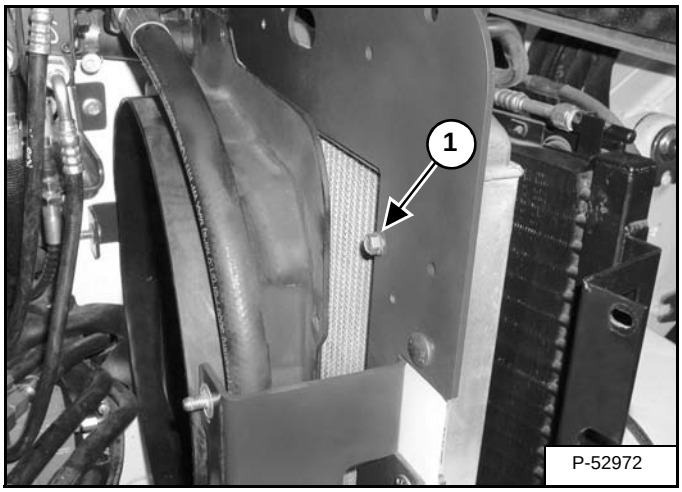
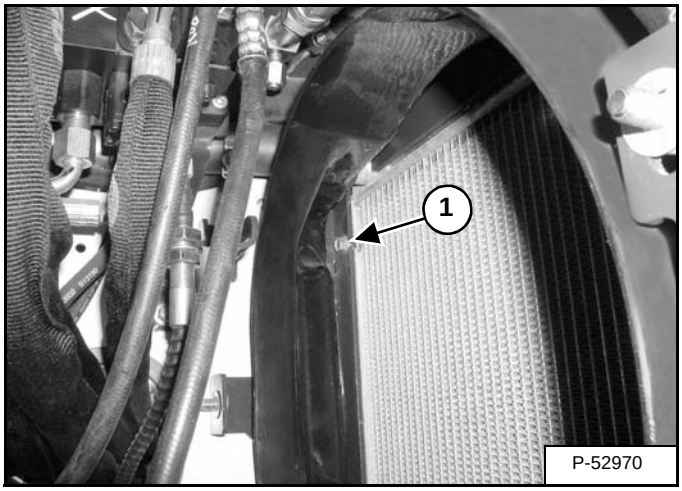
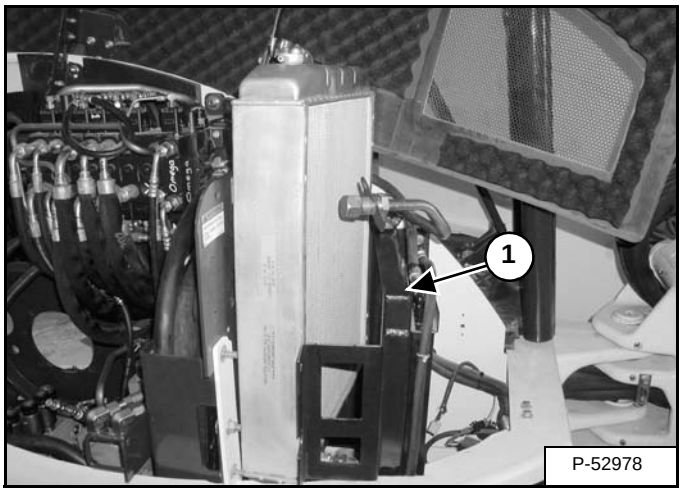


Figure 70-40-22



Pull the shroud back and remove the top radiator bolts (Item 1) **[Figure 70-40-21]** & **[Figure 70-40-22]**.

Figure 70-40-23



Reposition the oil cooler and A/C condenser (Item 1) **[Figure 70-40-23]** to the front of the Excavator.

Pull the radiator towards the front of the Excavator and remove the radiator.

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ENGINE COMPONENTS & TESTING (S/N 562611001 & ABOVE)

Engine Compression Checking

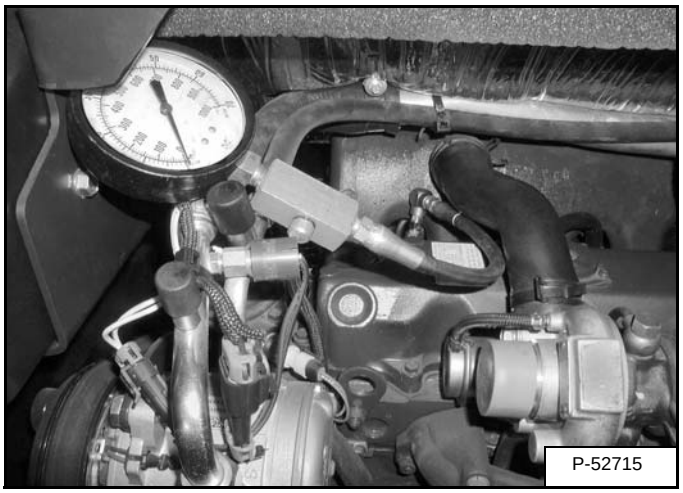
The tools listed will be needed to do the following procedure:

MEL10630 - Engine Compression Kit
MEL 1352 - Compression Adapter

The engine must be at operating temperature.

Remove the glow plugs. (See Glow Plug Removal And Installation on page 70-50-2.)

Figure 70-50-1



Install the correct compression adapter into the cylinder head **[Figure 70-50-1]**.

Connect the compression gauge **[Figure 70-50-1]**.

Make sure the speed control lever is at low engine idle.

Disconnect the fuel stop solenoid.

Crank the engine with the starter at 200 to 300 RPM.

Compression Pressure	412 to 440 PSI (28,4 to 30,3 bar)
Allowable Limit (minimum)	355 PSI (24,5 bar)

Repeat the procedure for the remaining cylinders.

The compression must be no lower than the allowable limit, with no more than 10% variance among cylinders.

Connect the fuel stop solenoid.

Remove the compression gauge.

Remove the adapter.

Install the glow plugs. (See Glow Plug Removal And Installation on page 70-50-2.)

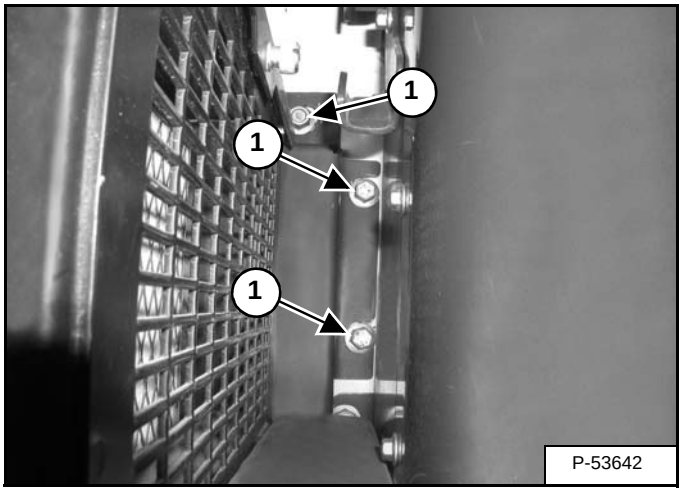
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Glow Plug Removal And Installation

Disconnect the negative (-) cable from the battery.

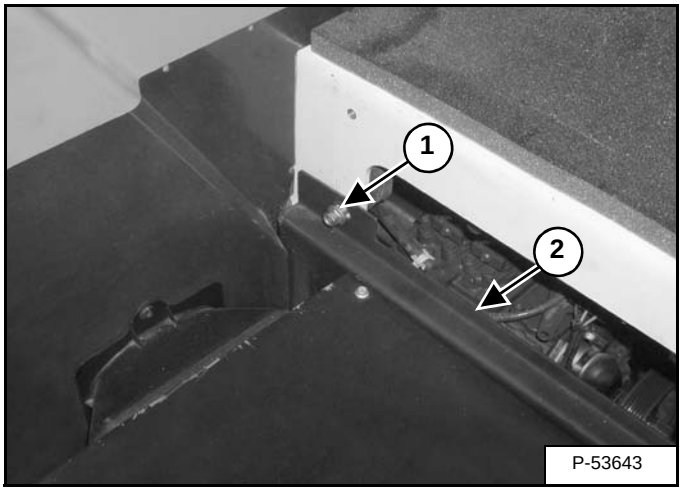
Remove the seat and seat mount. (See Removal And Installation on Page 50-40-1)

Figure 70-50-2



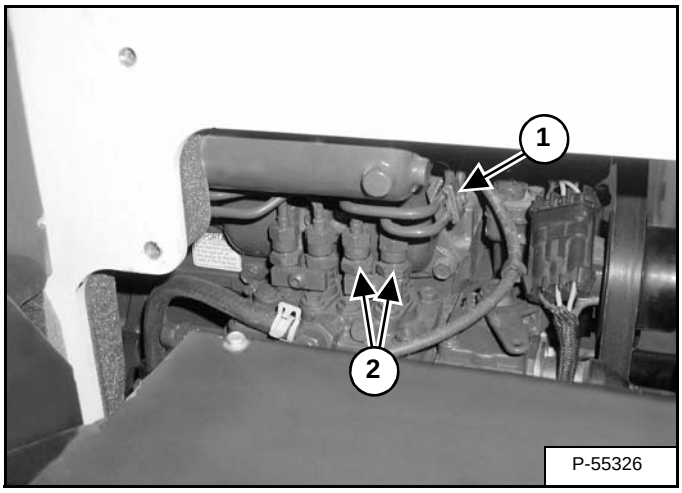
Remove the bolts (Item 1) **[Figure 70-50-2]** from the rear access panel.

Figure 70-50-3



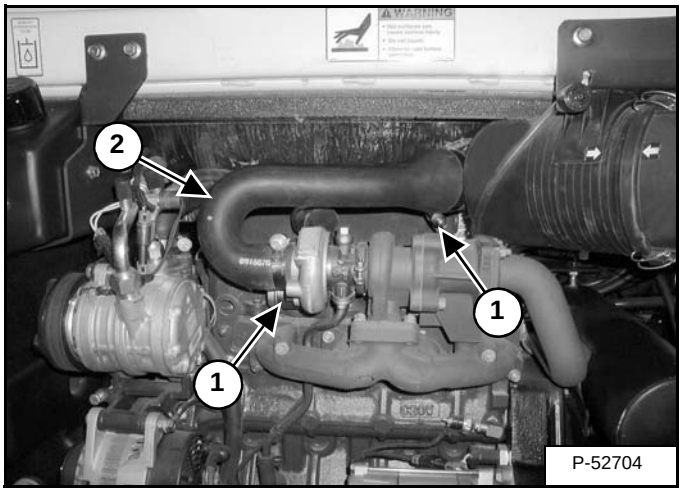
Remove the bolts (Item 1). Remove the rear access panel (Item 2) **[Figure 70-50-3]**.

Figure 70-50-4



Loosen the clamp (Item 1). Loosen the fuel line fittings (Item 2) **[Figure 70-50-4]**.

Figure 70-50-5

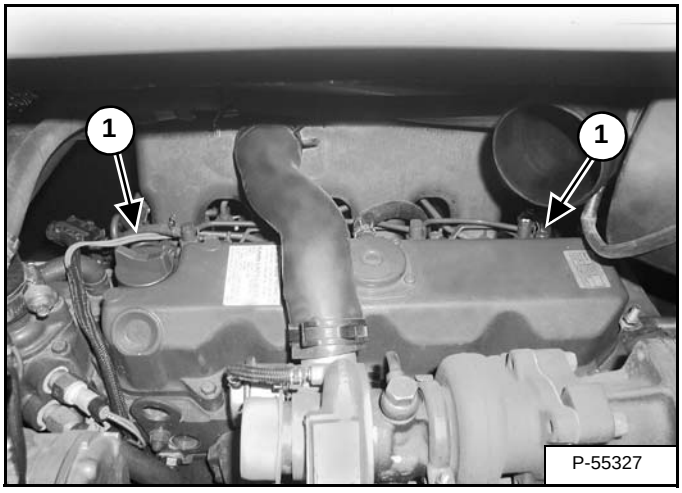


Loosen the clamps (Item 1). Remove the hose (Item 2) **[Figure 70-50-5]**.

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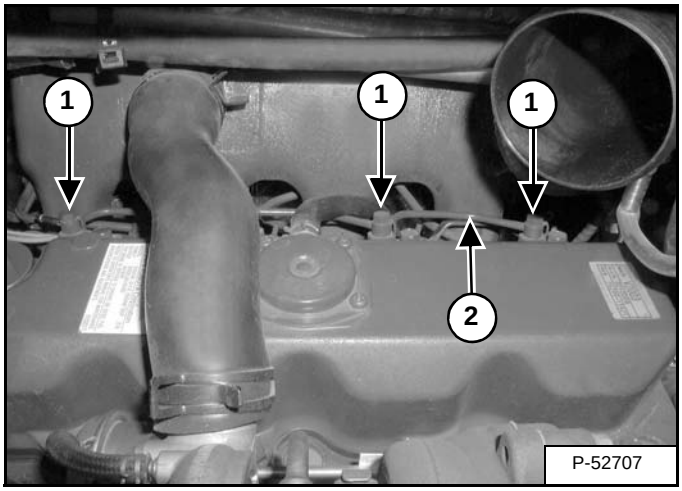
Glow Plug Removal And Installation (Cont'd)

Figure 70-50-6



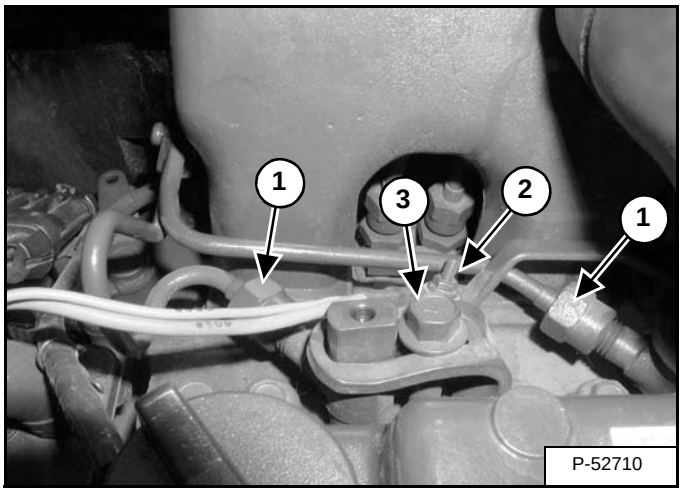
Remove the hoses (Item 1) **[Figure 70-50-6]**.

Figure 70-50-7



Remove the bolt (Item 1) from the 4 fuel injectors. Remove the fuel line (Item 2) **[Figure 70-50-7]**.

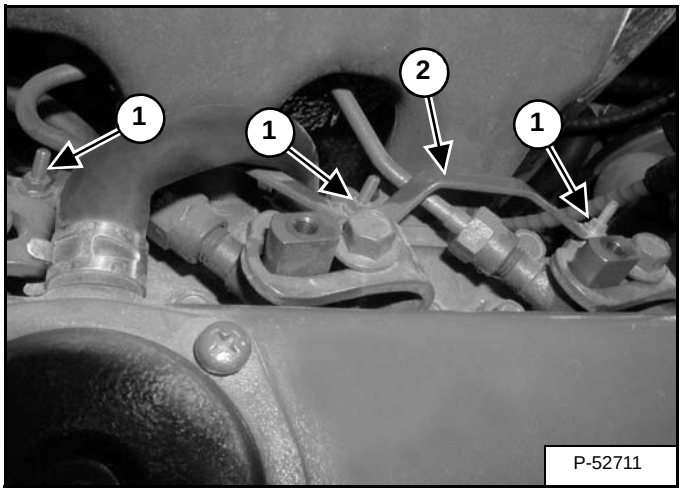
Figure 70-50-8



Loosen the fuel line fittings (Item 1) **[Figure 70-50-8]**.

Remove the nut (Item 2) and wire harness (Item 3) **[Figure 70-50-8]**.

Figure 70-50-9

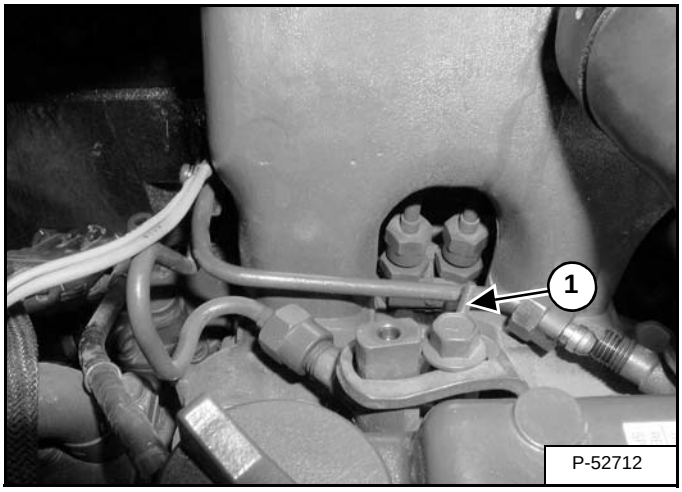


Remove the nut (Item 1) from the 3 remaining glow plugs. Remove the connecting strap (Item 2) **[Figure 70-50-9]**.

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Glow Plug Removal And Installation (Cont'd)

Figure 70-50-10



Remove the 4 glow plugs (Item 1) **[Figure 70-50-10]**.

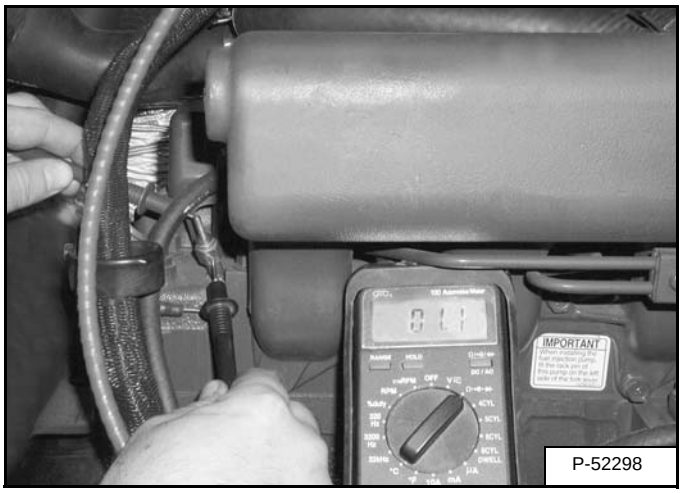
Installation: Tighten the glow plugs to 15 to 18 ft.-lb. (20 to 25 N•m) torque.

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Checking The Glow Plug

Disconnect the glow plug wire connector and connecting strap.

Figure 70-50-11



Use an ohmmeter to check the glow plugs **[Figure 70-50-11]**.

Touch 1 probe to the end of the glow plug and the other probe to the body of the glow plug.

The reading should be approximately 1.0 ohms. If the resistance is infinite, the coil of the glow plug is broken. If the resistance is 0 the glow plug is short circuited.

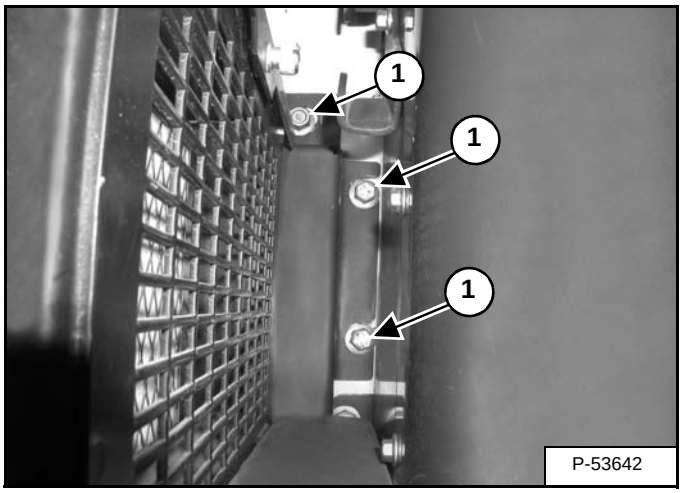
Repeat the procedure for each glow plug.

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Fuel Shut-off Solenoid Removal And Installation

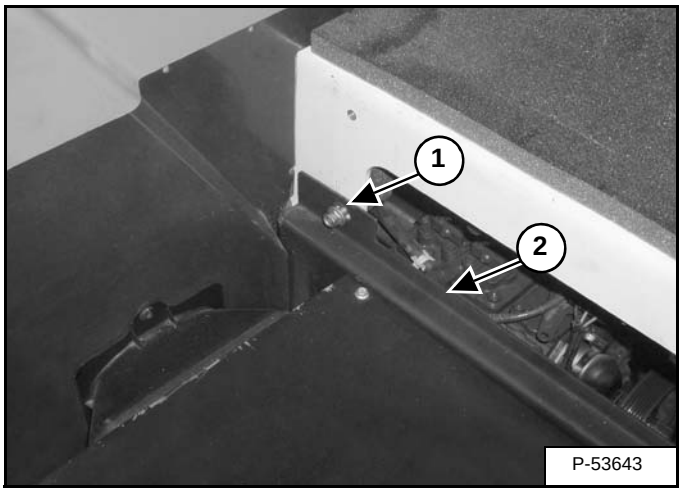
Remove the seat and seat mount. (See Removal And Installation on Page 50-40-1)

Figure 70-50-12



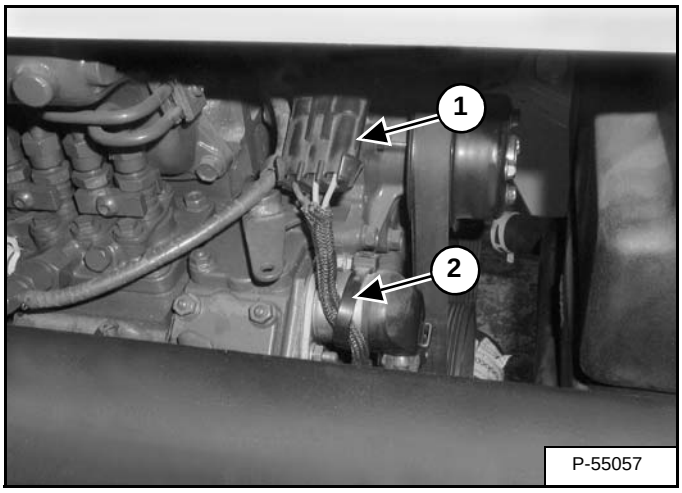
Remove the bolts (Item 1) **[Figure 70-50-12]** from the rear access panel.

Figure 70-50-13



Remove the bolts (Item 1). Remove the rear access panel (Item 2) **[Figure 70-50-13]**.

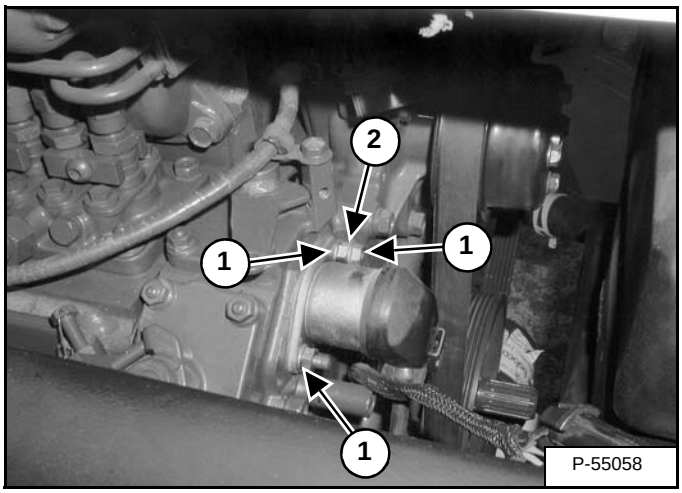
Figure 70-50-14



Disconnect the wire harness (Item 1) **[Figure 70-50-14]**.

Remove the tie strap (Item 2) **[Figure 70-50-14]**.

Figure 70-50-15



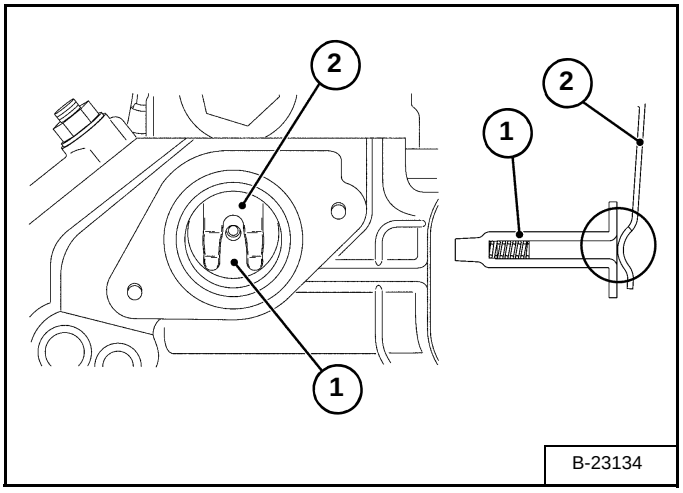
Remove the nuts (Item 1) and wire harness (Item 2) **[Figure 70-50-15]** from the solenoid mount bracket.

Remove the solenoid.

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Fuel Shut-off Solenoid Removal And Installation (Cont'd)

Figure 70-50-16



Installation: The guide (Item 1) on the fuel shut-off solenoid must contact the boost lever (Item 2) **[Figure 70-50-16]**.

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Fuel Injection Pump Check

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

⚠ WARNING

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

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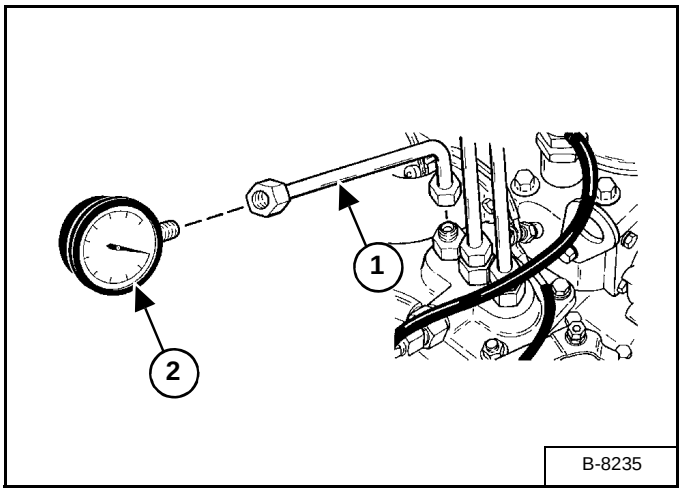
The tools listed will be needed to do the following procedure:

MEL 1237 - Adapter Fuel Line
MEL 1173-1 Pressure Gauge

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

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

Figure 70-50-17



Connect the adapter fuel line (Item 1) to the fitting and connect the pressure gauge (Item 2) **[Figure 70-50-17]**.

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

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

Fuel Tightness of Pump Element Allowable Limit	2133 to 1990 PSI (147 to 137 bar)

With the speed control lever at the low engine idle position, turn the flywheel until the pressure is at 1990 to 2133 PSI (137 to 147 bar).

Turn the flywheel back approximately 1/2 turn. Keep the flywheel at this position, and measure the time it takes the pressure to decrease from 1849 PSI (127,5 bar).

Fuel Tightness of Delivery Valve Allowable Limit	5 seconds

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Fuel Injection Pump Removal And Installation

IMPORTANT

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

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IMPORTANT

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

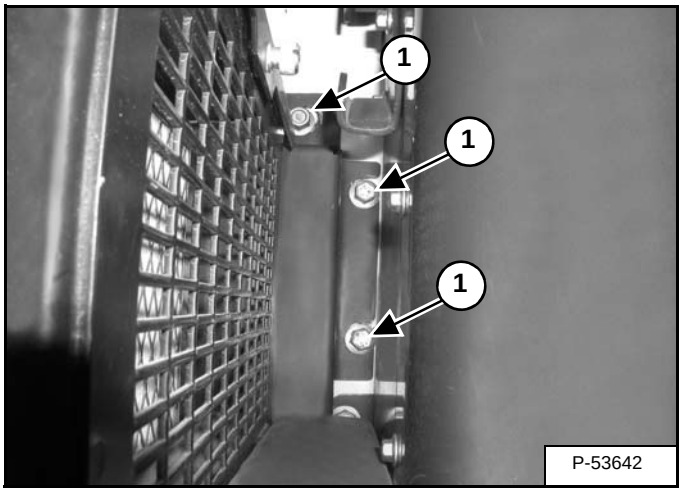
I-2028-0289

Remove the seat and seat mount. (See Removal And Installation on Page 50-40-1)

Disconnect the negative (-) cable from the battery.

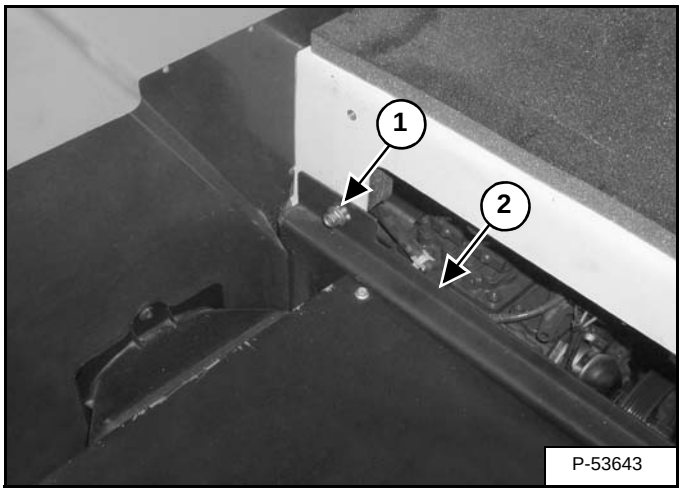
Clean around the injection pump.

Figure 70-50-18



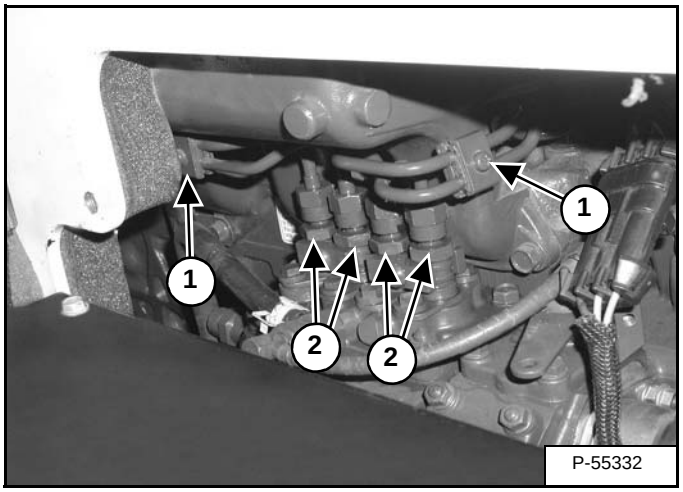
Remove the bolts (Item 1) **[Figure 70-50-18]** from the rear access panel.

Figure 70-50-19



Remove the bolts (Item 1). Remove the rear access panel (Item 2) **[Figure 70-50-19]**.

Figure 70-50-20



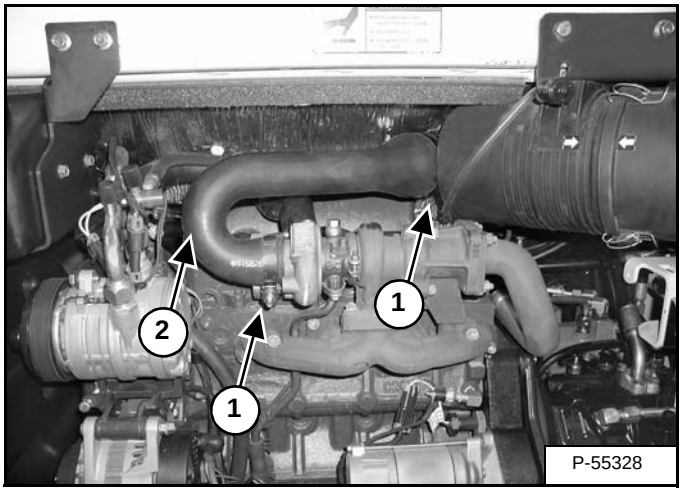
Loosen the clamps (Item 1). Loosen the fuel line fittings (Item 2) **[Figure 70-50-20]**.

Open the tailgate.

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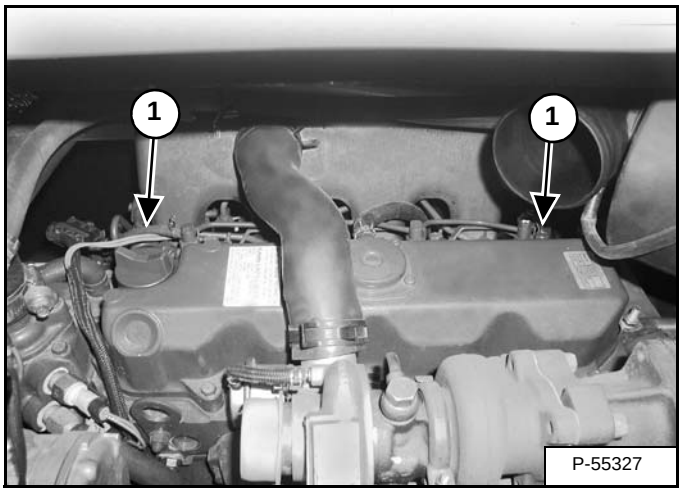
Fuel Injection Pump Removal And Installation (Cont'd)

Figure 70-50-21



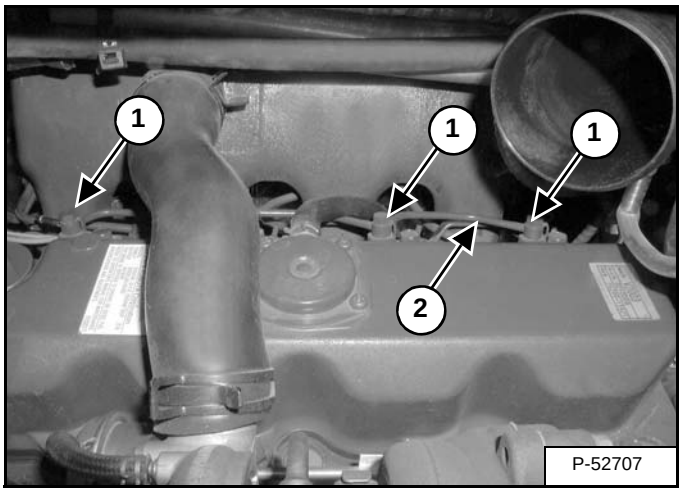
Loosen the clamps (Item 1). Remove the hose (Item 2) **[Figure 70-50-21]**.

Figure 70-50-22



Remove the hoses (Item 1) **[Figure 70-50-22]**.

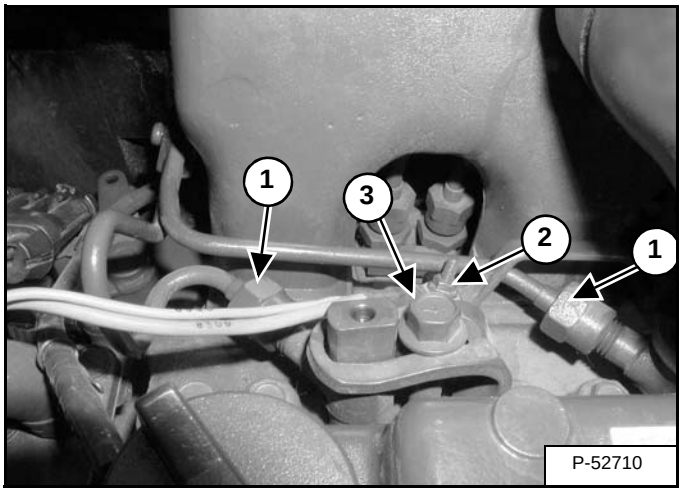
Figure 70-50-23



Remove the bolt (Item 1) **[Figure 70-50-23]** from the 4 fuel injectors.

Remove the fuel line (Item 2) **[Figure 70-50-23]**.

Figure 70-50-24

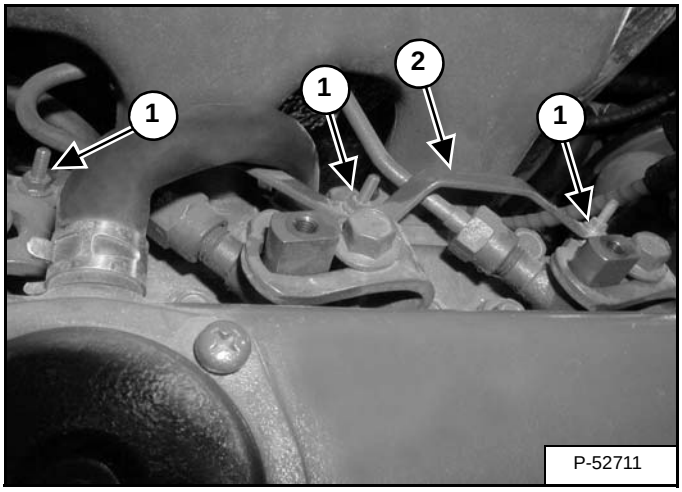


Remove the fuel line fittings (Item 1). Remove the nut (Item 2). Remove the wire harness (Item 3) **[Figure 70-50-24]**.

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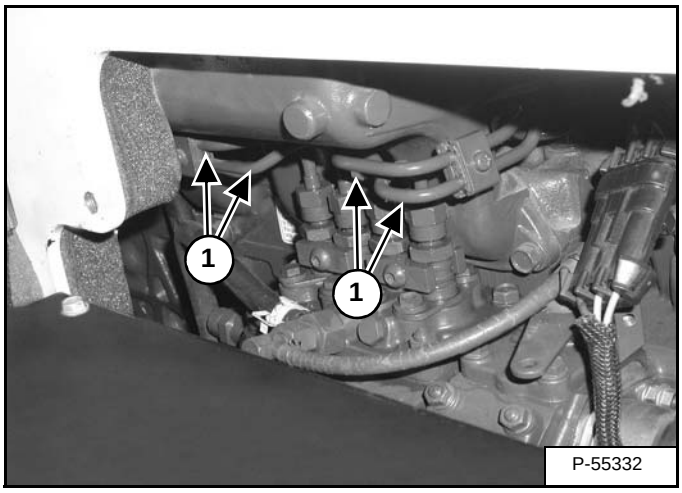
Fuel Injection Pump Removal And Installation (Cont'd)

Figure 70-50-25



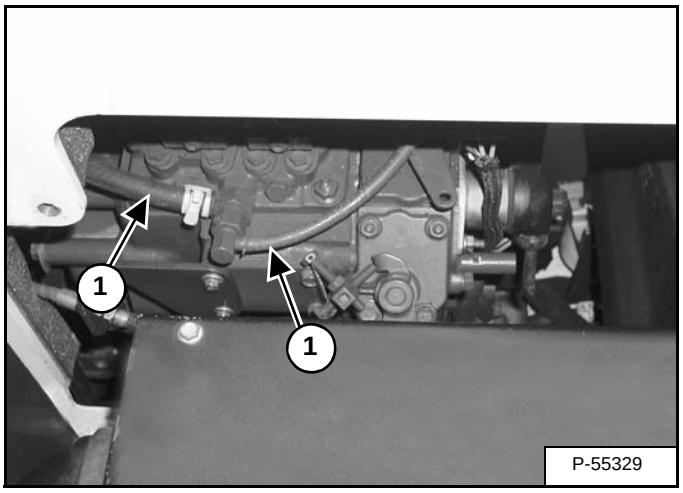
Remove the nut (Item 1) from the 3 remaining glow plugs Remove the connecting strap (Item 2) **[Figure 70-50-25]**.

Figure 70-50-26



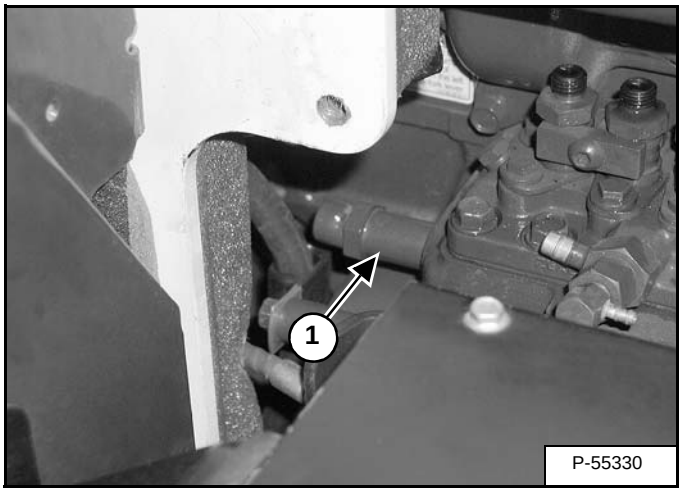
Remove the high pressure fuel lines (Item 1) **[Figure 70-50-26]** from the fuel injectors and fuel injection pump.

Figure 70-50-27



Remove the hoses (Item 1) **[Figure 70-50-27]**.

Figure 70-50-28



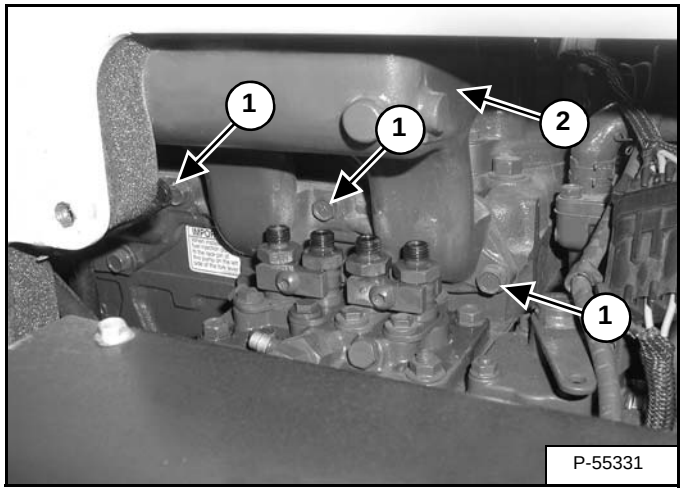
Remove the high idle body (Item 1) **[Figure 70-50-28]** and copper washer.

Installation: Tighten the high idle body to 33 to 36 ft.-lb. (44 to 49 N•m) torque.

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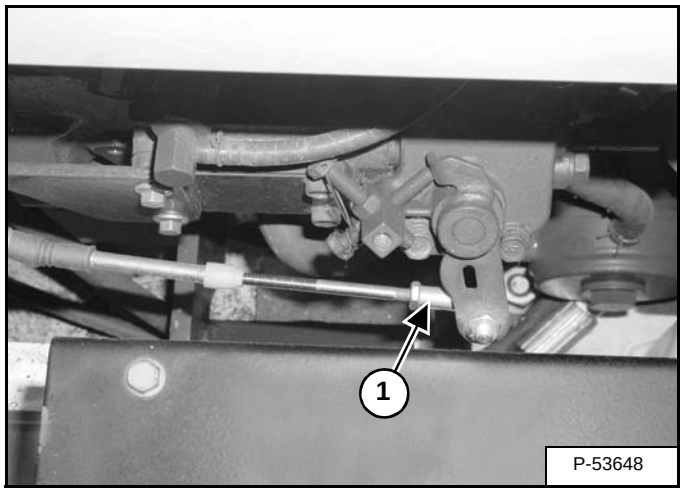
Fuel Injection Pump Removal And Installation (Cont'd)

Figure 70-50-29



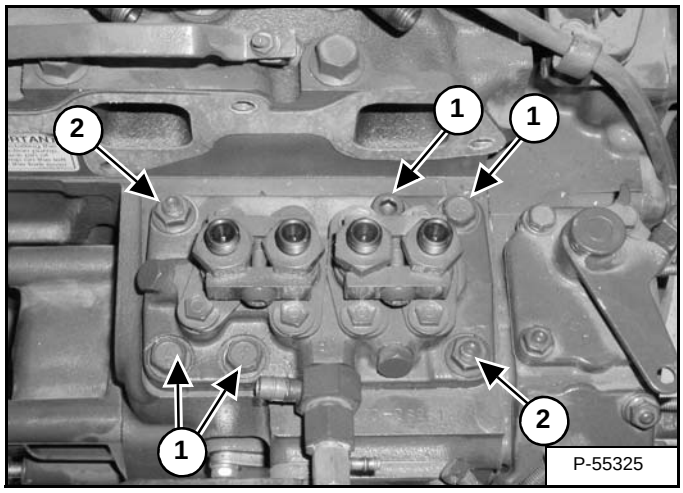
Remove the bolts (Item 1) from the manifold (Item 2) **[Figure 70-50-29]**. Remove the manifold.

Figure 70-50-30



Disconnect the speed control cable (Item 1) **[Figure 70-50-30]** from the injection pump.

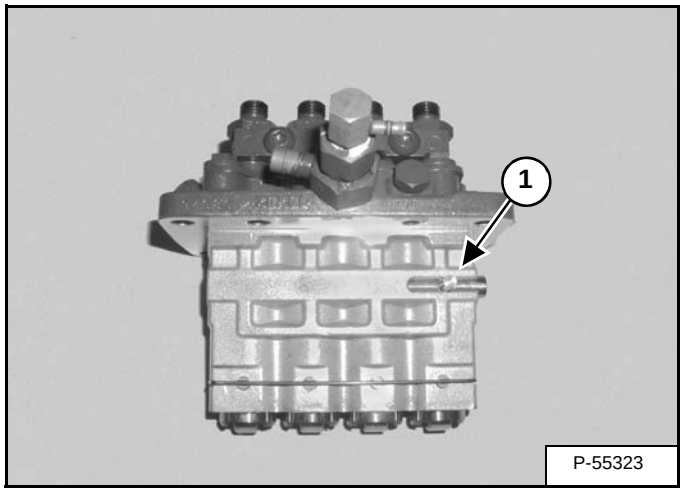
Figure 70-50-31



Remove the bolts (Item 1) and nuts (Item 2) **[Figure 70-50-31]** from the injection pump.

Remove the injection pump.

Figure 70-50-32



Installation: When the injection pump is installed the rack pin (Item 1) **[Figure 70-50-32]** must be aligned with the slot in the engine block and positioned on the left side of the fork lever. If the rack pin is not installed correctly engine damage can result.

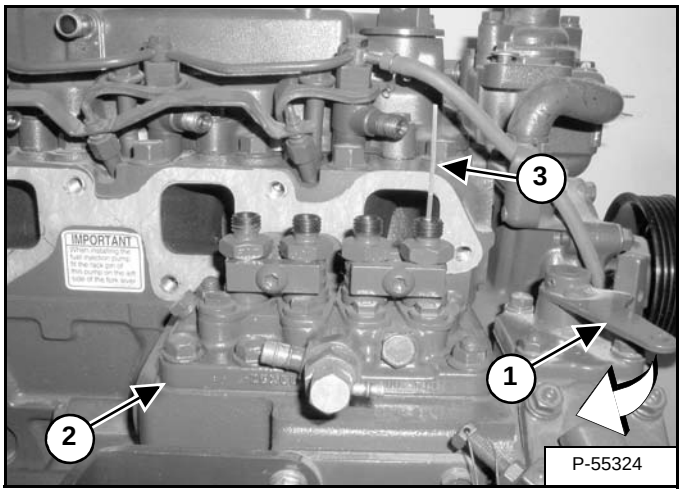
NOTE: Make sure the same number of shims with the same thickness are installed under the injection pump. The shims are used for engine timing.

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Fuel Injection Pump Timing

NOTE: The engine is shown removed for photo clarity.

Figure 70-50-33



Remove the number 1 cylinder pressure line from the injection pump.

Disconnect the fuel shut-off linkage (Item 1) **[Figure 70-50-33]** from the injection pump.

Timing the injection pump is done by changing the number of shims (Item 2) **[Figure 70-50-33]** between the injection pump and engine block.

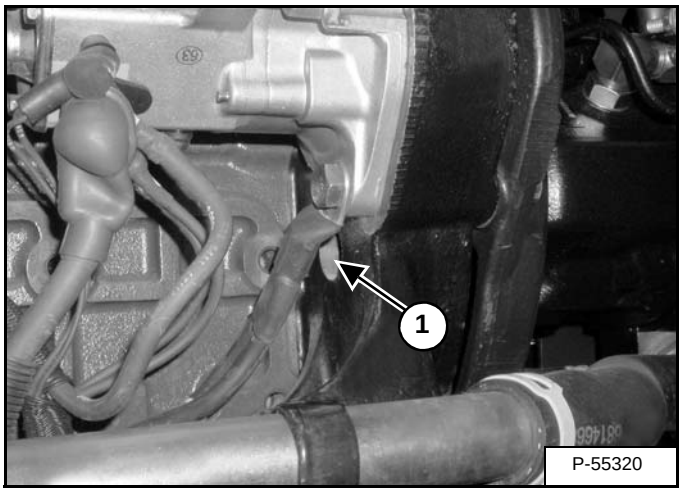
Turn the fuel supply lever to the ON position. install a short plastic tube (Item 3) **[Figure 70-50-33]** in the fitting of the number 1 cylinder port. Point the tube up (vertical).

Turn the engine counterclockwise until fuel flows out of the injection pumps number 1 cylinder nozzle. (Install a tool on the crankshaft at the front of the engine to turn the engine.)

NOTE: The fuel must flow out of the nozzle for 1 firing cycle before timing can be attempted.

Pull the stop lever (Item 1) **[Figure 70-50-33]** 0.232 to 0.302 in. (5,9 to 7,7 mm) from the free position toward the stop position.

Figure 70-50-34



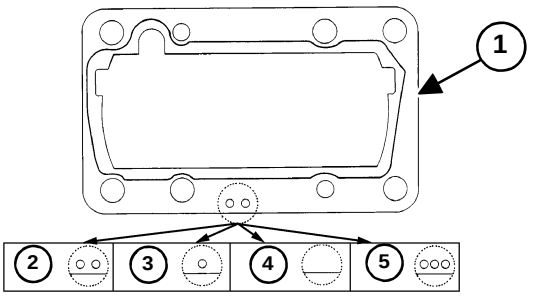
Continue to turn the engine slowly (for approximately 1-3/4 turns after fuel stops flowing from the injection pump nozzle), until the timing mark on the side of the flywheel is at the bottom edge of the timing hole (Item 1) **[Figure 70-50-34]** in the flywheel housing.

Slowly turn the engine counterclockwise: as soon as fuel starts to flow at the top of the injection pump nozzle stop turning the engine.

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Fuel Injection Pump Timing (Cont'd)

Figure 70-50-35



Add or subtract shims (Item 1) **[Figure 70-50-35]** to time the engine. The engine is correctly timed when the correct mark on the flywheel is aligned with the notch in the timing hole.

NOTE: Shims (Item 1) are available in 4 thicknesses. Shims with the 2 holes (Item 2) are 0,20 mm thick, shims with 1 hole (Item 3) are 0,25 mm thick, shims with no holes (Item 4) are 0,30 thick and shims with 3 holes (Item 5) [Figure 70-50-35] are 0,35 mm thick.

NOTE: Increasing the thickness of the shim pack by 0,050 mm retards the injection timing by 0.5°. Decreasing the shim pack by 0,050 mm advances the timing by 0.500°.

The correct engine timing is 17° to 19° B.T.D.C.

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Fuel Injector Nozzles Removal And Installation

⚠ WARNING

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

W-2072-0496

Some problems caused by faulty injector nozzles:

- The engine is hard to start or will not start.
- Rough engine operation at idle.
- The engine will not have full power.
- The engine exhaust smoke is black, white or blue.

IMPORTANT

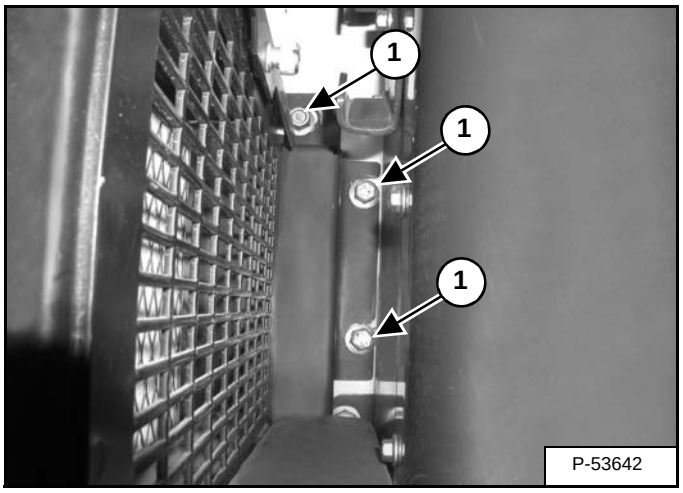
Do not bend the high pressure fuel injection tubes when removing or installing them.

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Disconnect the negative (-) cable from the battery.

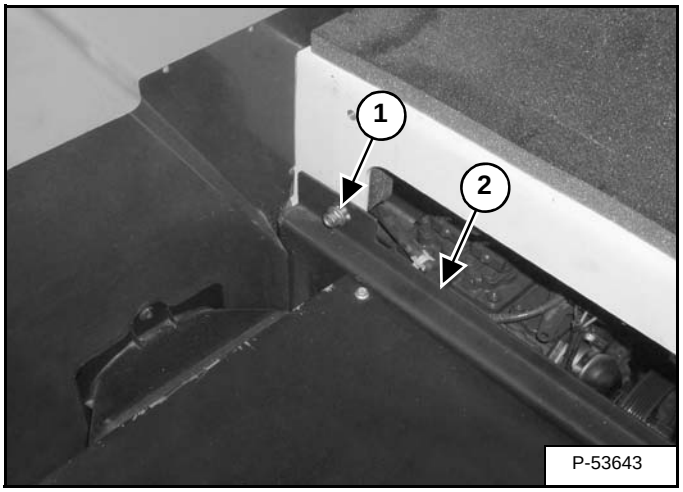
Remove the seat and seat mount. (See Removal And Installation on Page 50-40-1)

Figure 70-50-36



Remove the bolts (Item 1) **[Figure 70-50-36]** from the rear access panel.

Figure 70-50-37



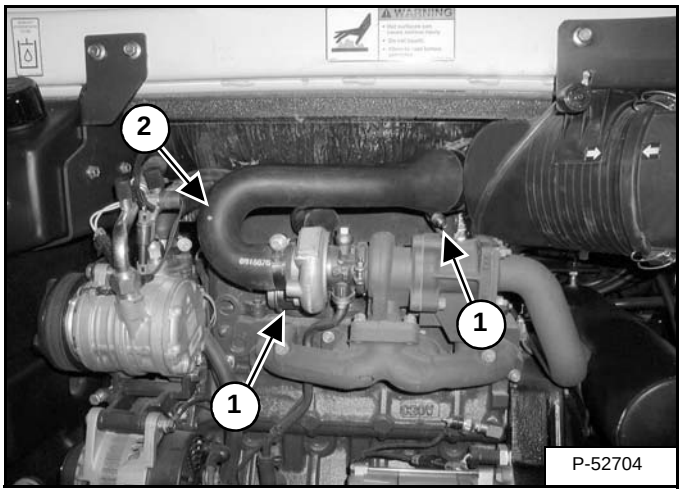
Remove the bolts (Item 1). Remove the rear access panel (Item 2) **[Figure 70-50-37]**.

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Fuel Injector Nozzles Removal And Installation (Cont'd)

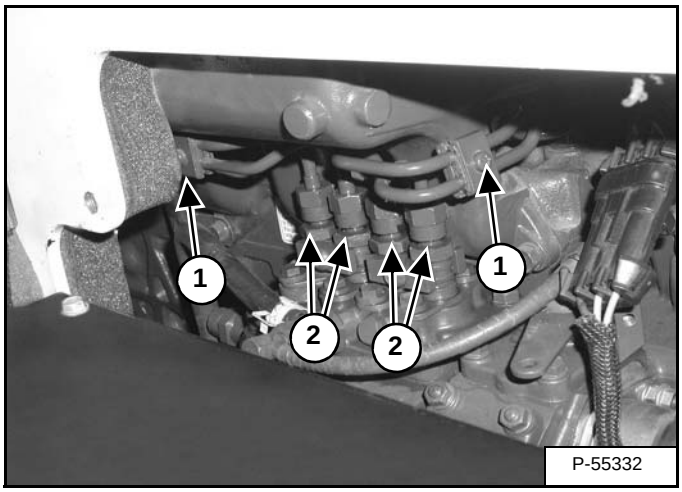
Open the tailgate.

Figure 70-50-38



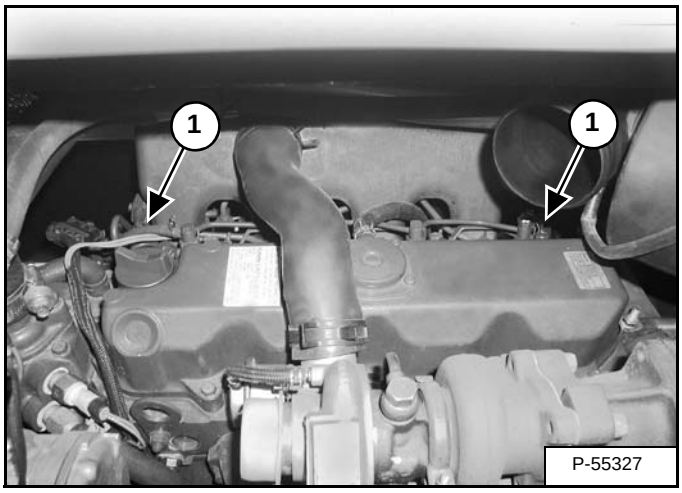
Loosen the clamps (Item 1). Remove the hose (Item 2) **[Figure 70-50-38]**.

Figure 70-50-39



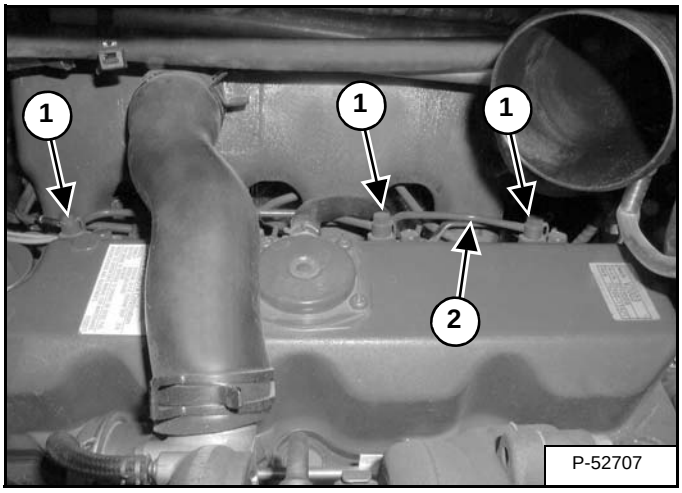
Loosen the clamps (Item 1). Loosen the fuel line fittings (Item 2) **[Figure 70-50-39]**.

Figure 70-50-40



Remove the hoses (Item 1) **[Figure 70-50-40]**.

Figure 70-50-41

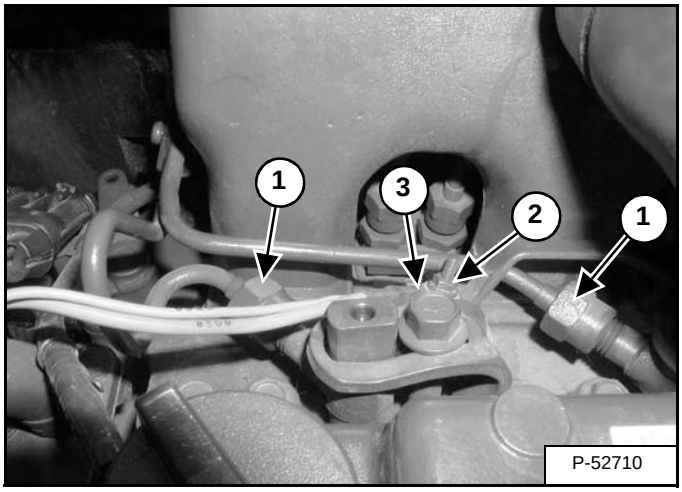


Remove the bolt (Item 1) from the 4 fuel injectors. Remove the fuel line (Item 2) **[Figure 70-50-41]**.

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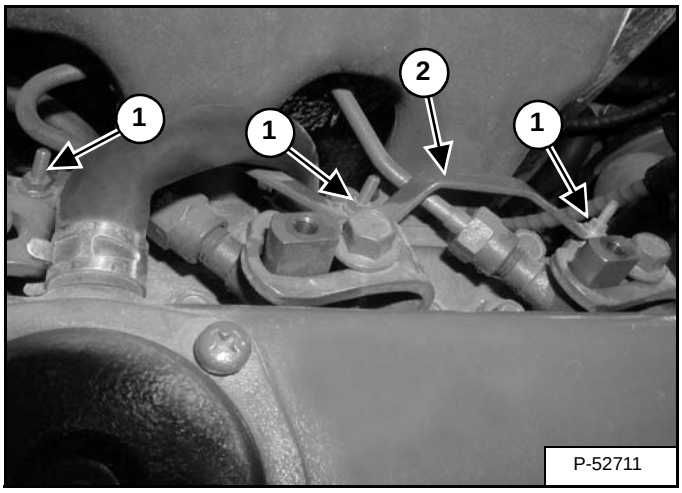
Fuel Injector Nozzles Removal And Installation (Cont'd)

Figure 70-50-42



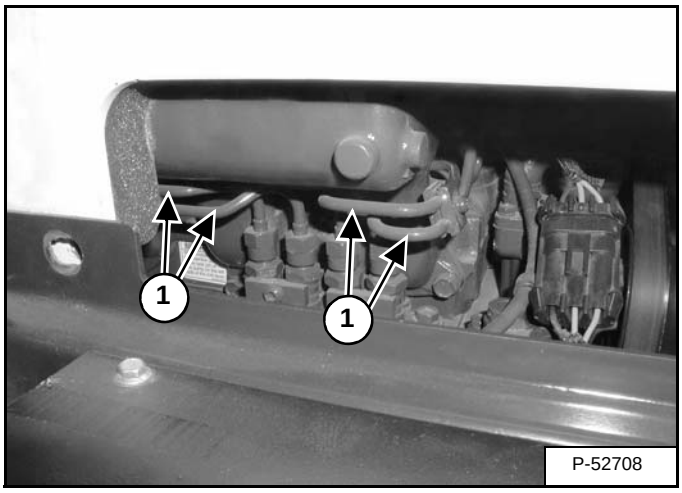
Remove the fuel line fittings (Item 1). Remove the nut (Item 2). Remove the wire harness (Item 3) **[Figure 70-50-42]**.

Figure 70-50-43



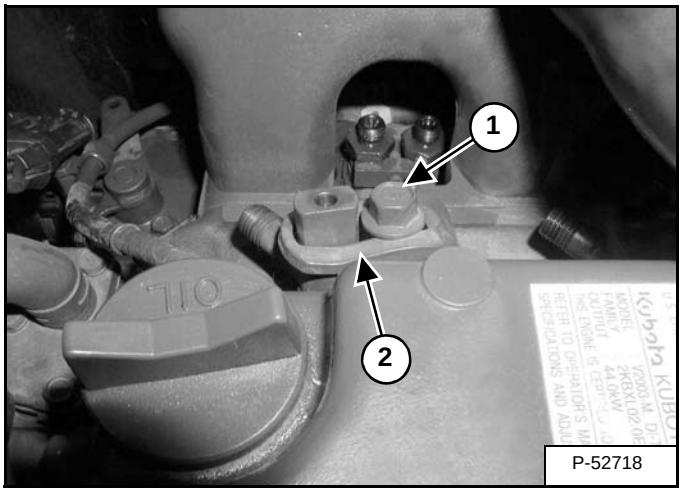
Remove the nut (Item 1) from the 3 remaining glow plugs. Remove the connecting strap (Item 2) **[Figure 70-50-43]**.

Figure 70-50-44



Remove the fuel lines (Item 1) **[Figure 70-50-44]**.

Figure 70-50-45



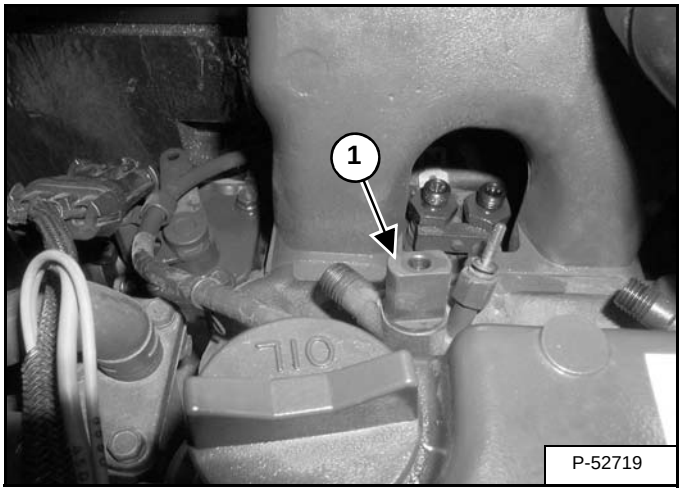
Remove the bolt (Item 1) and clamp (Item 2) **[Figure 70-50-45]** from the fuel injectors.

Installation: Tighten the bolts to 19 to 22 ft.-lb. (26 to 29 N•m) torque.

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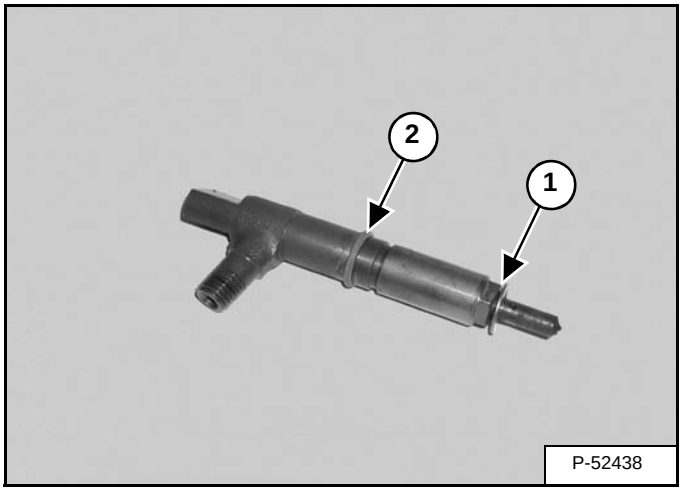
Fuel Injector Nozzles Removal And Installation (Cont'd)

Figure 70-50-46



Remove the injector nozzles (Item 1) **[Figure 70-50-46]**.

Figure 70-50-47



Remove the washer (Item 1) and O-ring (Item 2) **[Figure 70-50-47]** from the injector nozzles.

NOTE: Replace the copper washer (Item 1) and O-ring (Item 2) [Figure 70-50-47] anytime new or used fuel injectors are installed.

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Fuel Injector Nozzle Check

IMPORTANT

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

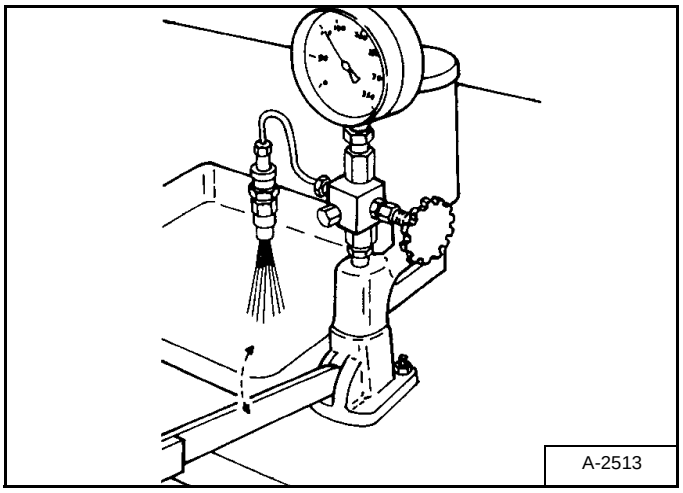
When temperatures are below -20°F (-30°C), the hydrostatic oil must be heated or kept warm. The hydrostatic system will not get enough oil at low temperatures. Park the machine in an area where the temperature will be above 0°F (-18°C) if possible.

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

MEL 10018 - Injector Nozzle Tester

Figure 70-50-48



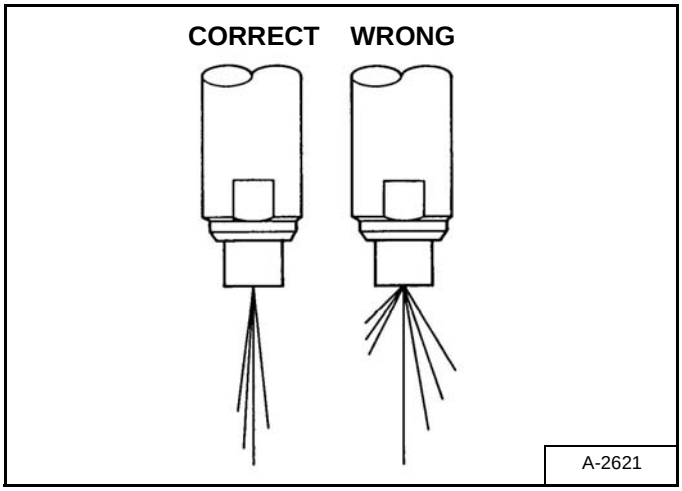
Connect the nozzle to the tester with the nozzle down **[Figure 70-50-48]**.

Operate the hand lever at a slow rate and record the opening pressure. If the pressure is not correct, replace the fuel injection nozzle.

Fuel Injection Pressure	1990 to 2133 PSI (137 to 147 bar)

Check for inside leakage. Operate the hand lever until the pressure is 1850 PSI (127,5 bar). Keep the nozzle under this pressure for 10 seconds, check to see if fuel leaks from the nozzle. If fuel leaks, replace the nozzle.

Figure 70-50-49



Check that the spray pattern is correct **[Figure 70-50-49]**.

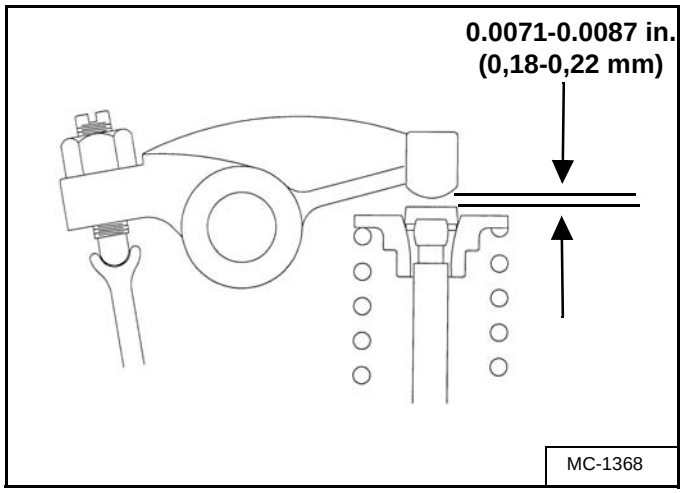
1. Fuel does not come out the side of the nozzle.
2. Drops of fuel are not present at the nozzle.
3. The injector has an even flow coming from the nozzle.

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Valve Clearance Adjustment

Adjust the valve clearance with the engine stopped and cold.

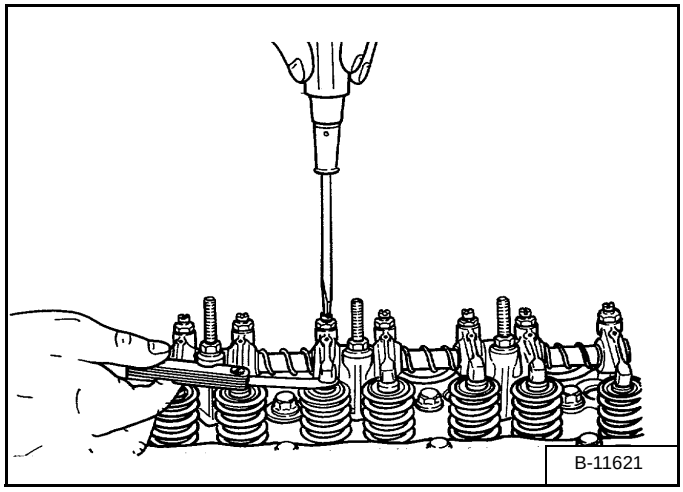
Figure 70-50-50



The correct valve clearance is 0.0071 to 0.0087 in. (0,18 to 0,22 mm) **[Figure 70-50-50]**.

Make sure the piston is at T.D.C. when making the adjustment for the valves of the particular cylinder.

Figure 70-50-51



Put the correct size feeler gauge between the rocker arm and valve stem. Turn the adjustment bolt until the clearance is correct **[Figure 70-50-51]**.

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ENGINE COMPONENTS & TESTING (S/N 562811001 & ABOVE, 563111001 & ABOVE AND 563211001 & ABOVE)

Engine Compression Checking

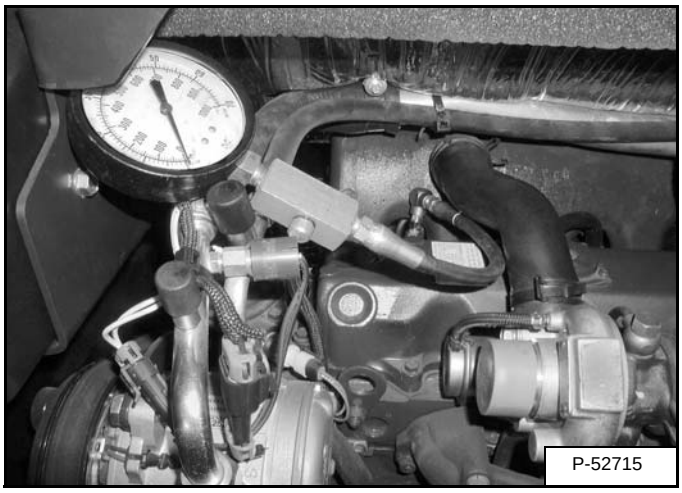
The tools listed will be needed to do the following procedure:

MEL10630 - Engine Compression Kit
MEL 1352 - Compression Adapter

The engine must be at operating temperature.

Remove the glow plugs. (See Glow Plug Removal And Installation on page 70-51-2.)

Figure 70-51-1



Install the correct compression adapter into the cylinder head **[Figure 70-51-1]**.

Connect the compression gauge **[Figure 70-51-1]**.

Make sure the speed control lever is at low engine idle.

Disconnect the fuel stop solenoid.

Crank the engine with the starter at 200-300 RPM.

Compression Pressure	512 to 583 PSI (35 to 40 bar)
Allowable Limit (minimum)	370 PSI (26 bar)

Repeat the procedure for the remaining cylinders.

The compression must be no lower than the allowable limit, with no more than 10% variance among cylinders.

Connect the fuel stop solenoid.

Remove the gauge.

Remove the adapter.

Install the glow plugs. (See Glow Plug Removal And Installation on page 70-51-2.)

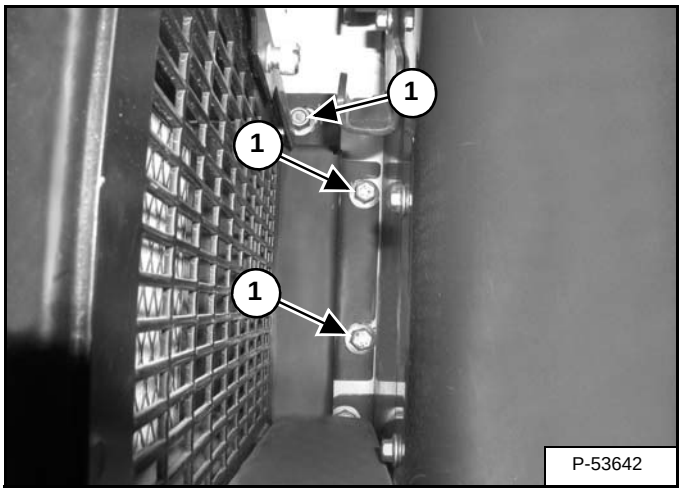
https://www.pdfmanual4trucks.com/

Glow Plug Removal And Installation

Disconnect the negative (-) cable from the battery.

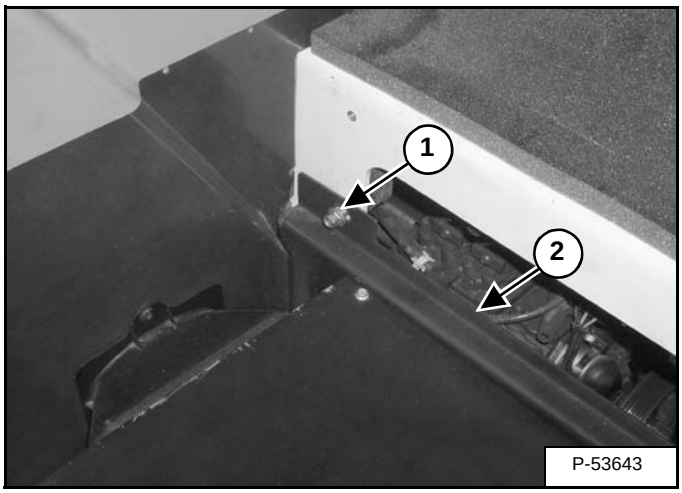
Remove the seat and seat mount. (See Removal And Installation on Page 50-40-1)

Figure 70-51-2



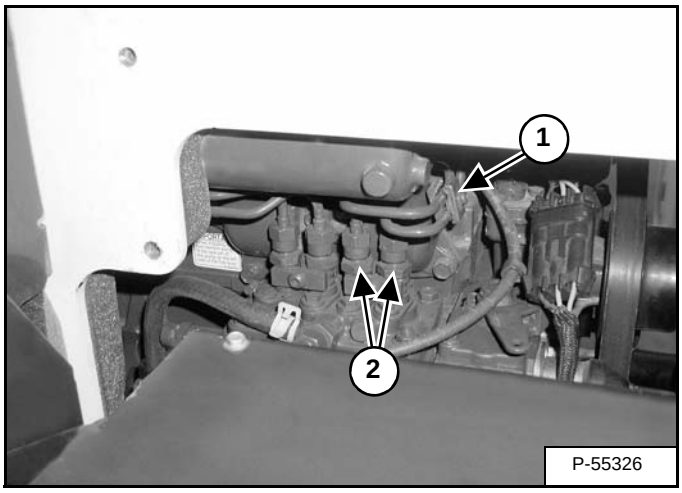
Remove the bolts (Item 1) **[Figure 70-51-2]** from the rear access panel.

Figure 70-51-3



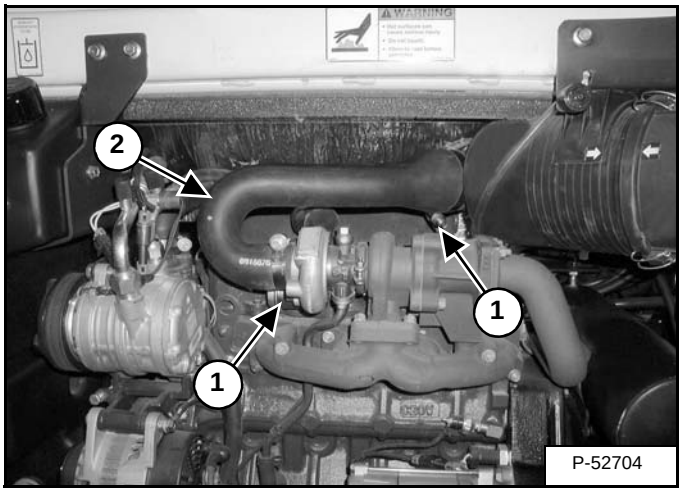
Remove the bolt (Item 1). Remove the rear access panel (Item 2) **[Figure 70-51-3]**.

Figure 70-51-4



Loosen the clamp (Item 1). Loosen the fuel line fittings (Item 2) **[Figure 70-51-4]**.

Figure 70-51-5

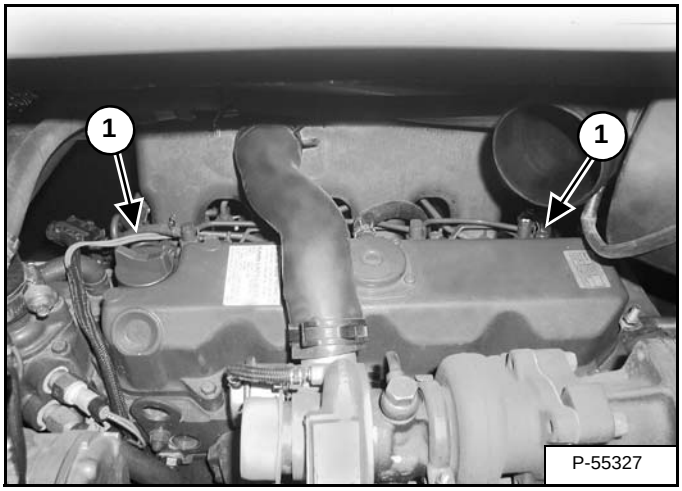


Loosen the clamps (Item 1). Remove the hose (Item 2) **[Figure 70-51-5]**.

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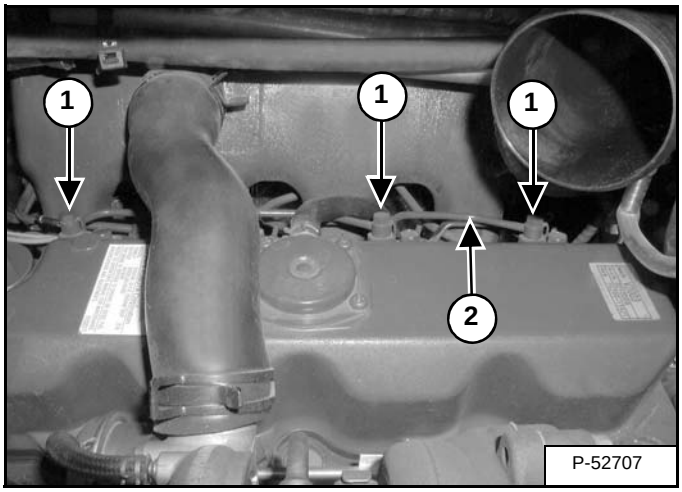
Glow Plug Removal And Installation (Cont'd)

Figure 70-51-6



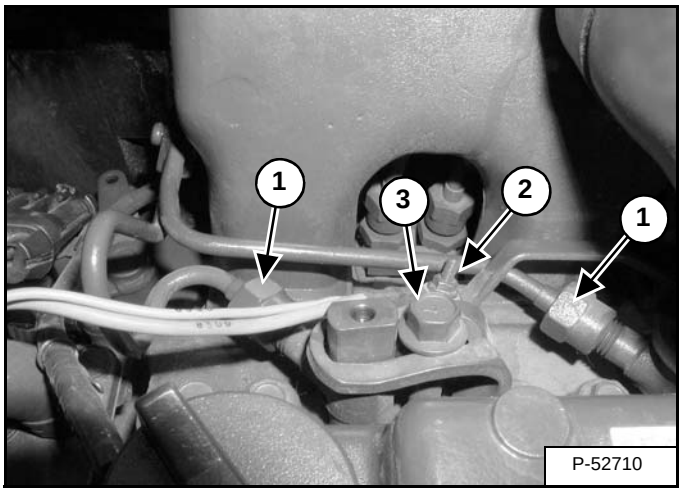
Remove the hoses (Item 1) **[Figure 70-51-6]**.

Figure 70-51-7



Remove the bolt (Item 1) from the 4 fuel injectors. Remove the fuel line (Item 2) **[Figure 70-51-7]**.

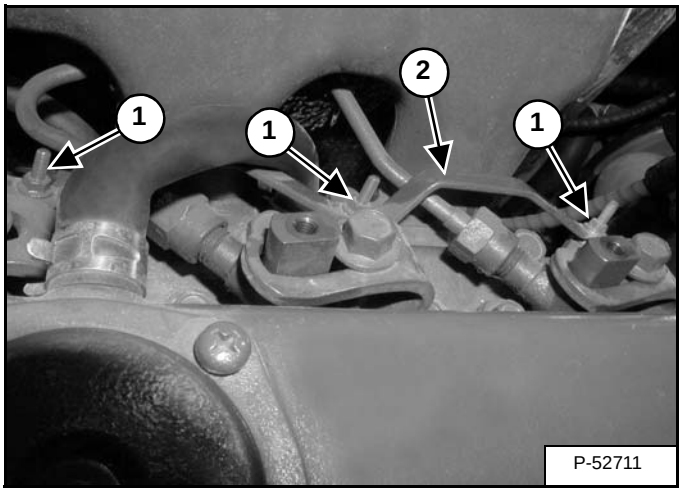
Figure 70-51-8



Loosen the fuel line fitting (Item 1) **[Figure 70-51-8]**.

Remove the nut (Item 2) and wire harness (Item 3) **[Figure 70-51-8]**.

Figure 70-51-9

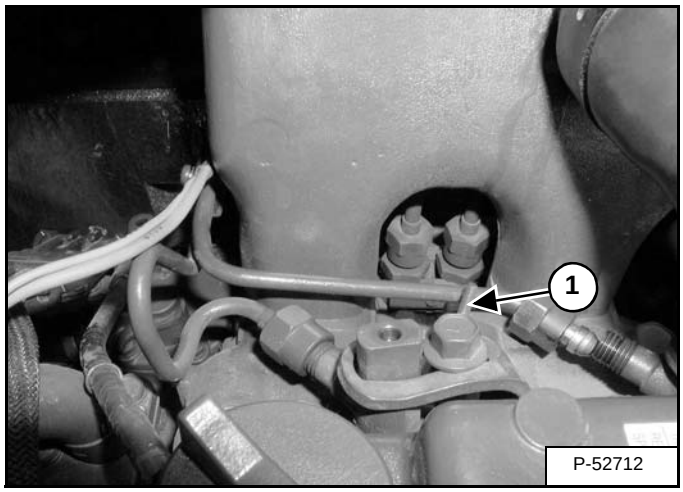


Remove the nut (Item 1) from the 3 remaining glow plugs. Remove the connecting strap (Item 2) **[Figure 70-51-9]**.

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Glow Plug Removal And Installation (Cont'd)

Figure 70-51-10



Remove the 4 glow plugs (Item 1) **[Figure 70-51-10]**.

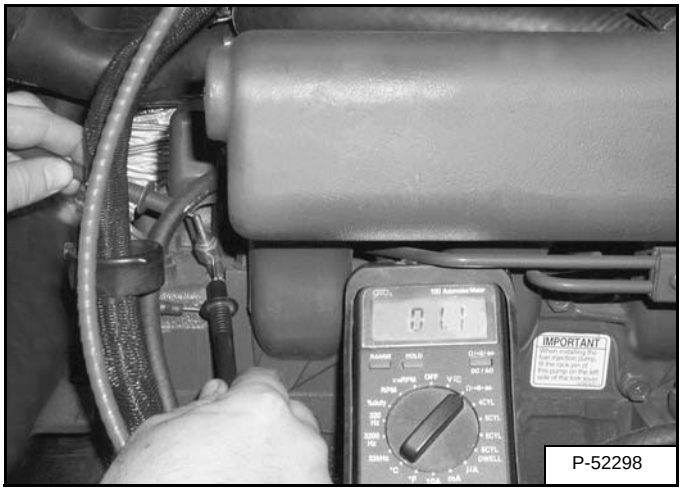
Installation: Tighten the glow plugs to 15 to 18 ft.-lb. (20 to 25 N•m) torque.

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Checking The Glow Plug

Disconnect the glow plug wire connector and connecting strap.

Figure 70-51-11



Use an ohmmeter to check the glow plugs **[Figure 70-51-11]**.

Touch one probe to the end of the glow plug and the other probe to the body of the glow plug.

The reading should be approximately 1.0 ohms. If the resistance is infinite, the coil of the glow plug is broken. If the resistance is 0 the glow plug is short circuited.

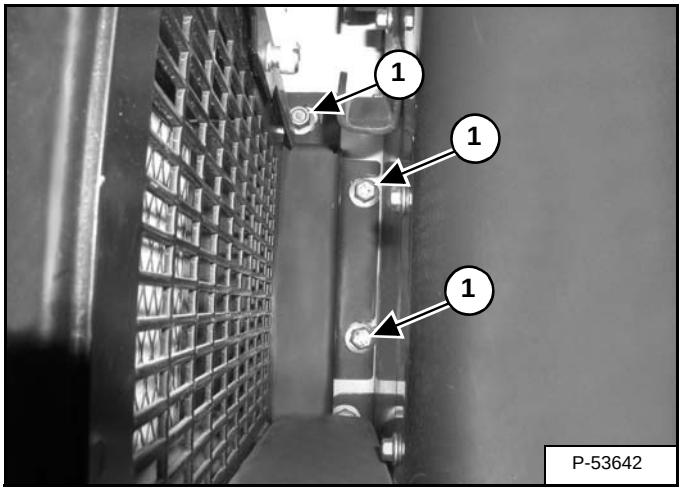
Repeat the procedure for each glow plug.

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Fuel Shut-off Solenoid Removal And Installation

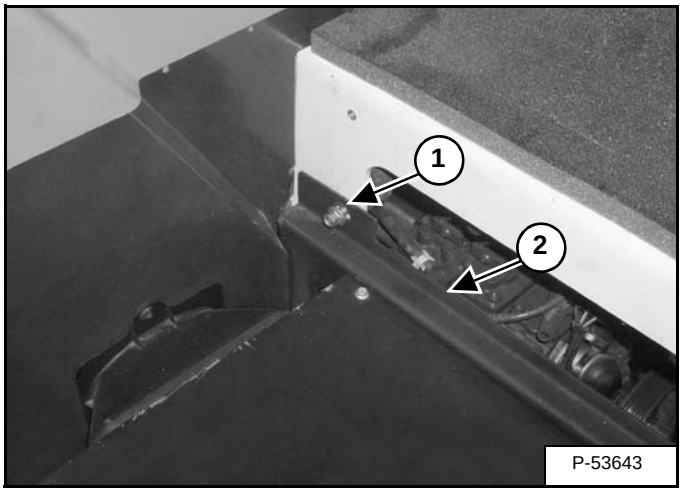
Remove the seat and seat mount. (See Removal And Installation on Page 50-40-1)

Figure 70-51-12



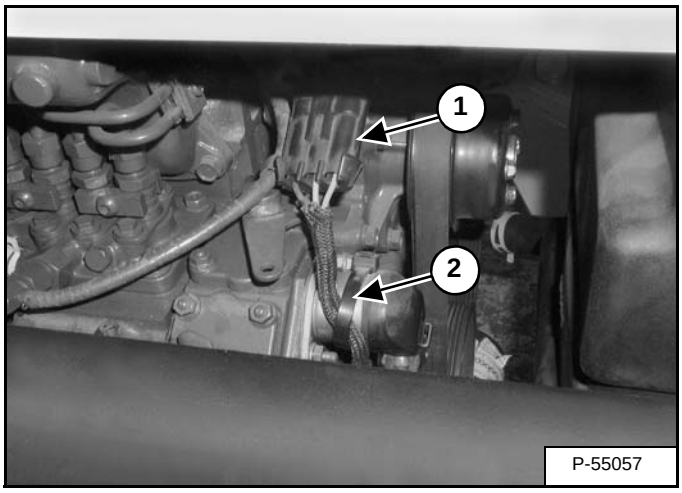
Remove the bolts (Item 1) **[Figure 70-51-12]** from the rear access panel.

Figure 70-51-13



Remove the bolts (Item 1). Remove the rear access panel (Item 2) **[Figure 70-51-13]**.

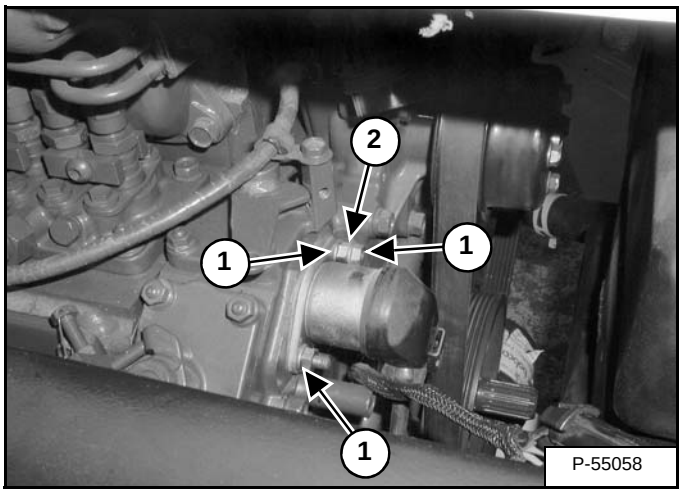
Figure 70-51-14



Disconnect the wire harness (Item 1) **[Figure 70-51-14]**.

Remove the tie strap (Item 2) **[Figure 70-51-14]**.

Figure 70-51-15



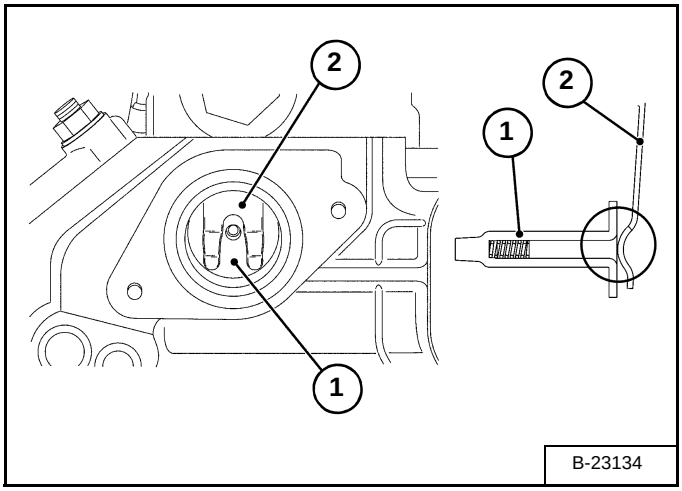
Remove the nuts (Item 1) and wire harness (Item 2) **[Figure 70-51-15]** from the solenoid mount bracket.

Remove the solenoid.

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Fuel Shut-off Solenoid Removal And Installation (Cont'd)

Figure 70-51-16



Installation: The guide (Item 1) on the fuel shut-off solenoid must contact the boost lever (Item 2) **[Figure 70-51-16]**.

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Fuel Injection Pump Check

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

⚠ WARNING

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

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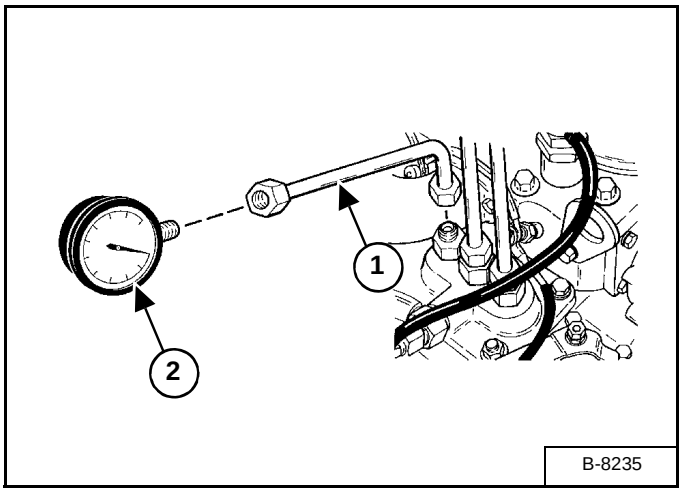
The tools listed will be needed to do the following procedure:

MEL 1237 - Adapter Fuel Line
MEL 1173-1 Pressure Gauge

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

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

Figure 70-51-17



Connect the adapter fuel line (Item 1) to the fitting and connect the pressure gauge (Item 2) **[Figure 70-51-17]**.

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

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

Fuel Tightness of Pump Element Allowable Limit	2702 to 2916PSI (187 to 201 bar)

With the speed control lever at the low engine idle position, turn the flywheel until the pressure is at 2702 to 2916 PSI (137 to 147 bar).

Turn the flywheel back approximately 1/2 turn. Keep the flywheel at this position, and measure the time it takes the pressure to decrease from 1850 PSI (127,5 bar).

Fuel Tightness of Delivery Valve Allowable Limit	5 seconds

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Fuel Injection Pump Removal And Installation

IMPORTANT

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

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IMPORTANT

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

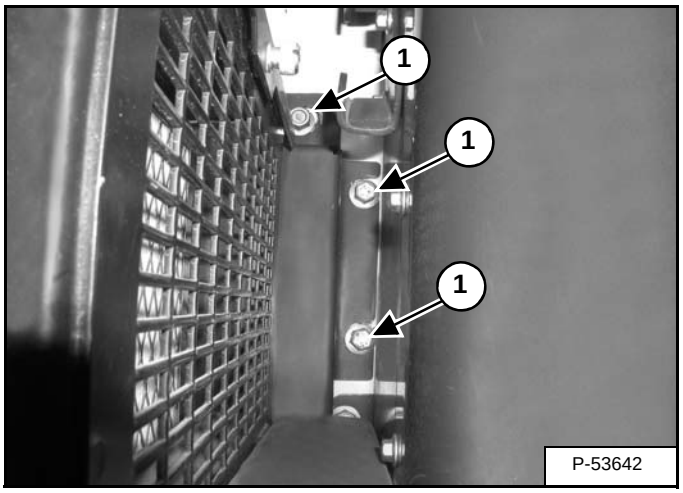
I-2028-0289

Remove the seat and seat mount. (See Removal And Installation on Page 50-40-1)

Disconnect the negative (-) cable from the battery.

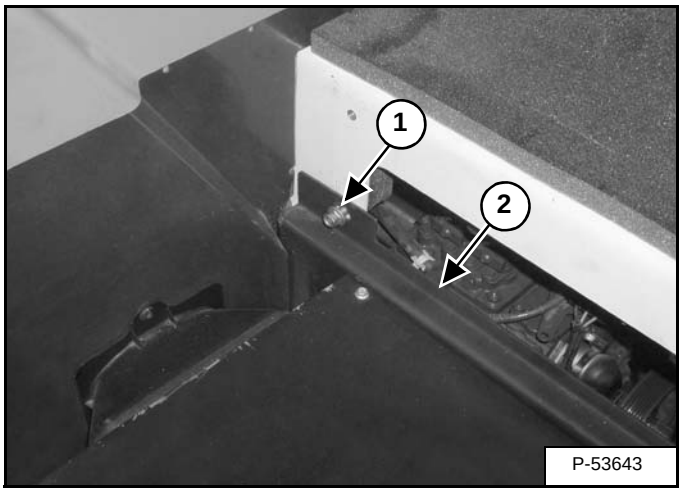
Clean around the injection pump.

Figure 70-51-18



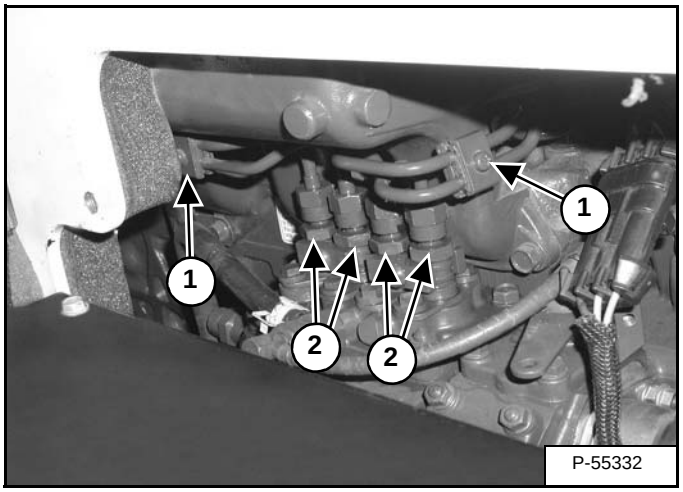
Remove the bolts (Item 1) **[Figure 70-51-18]** from the rear access panel.

Figure 70-51-19



Remove the bolts (Item 1). Remove the rear access panel (Item 2) **[Figure 70-51-19]**.

Figure 70-51-20



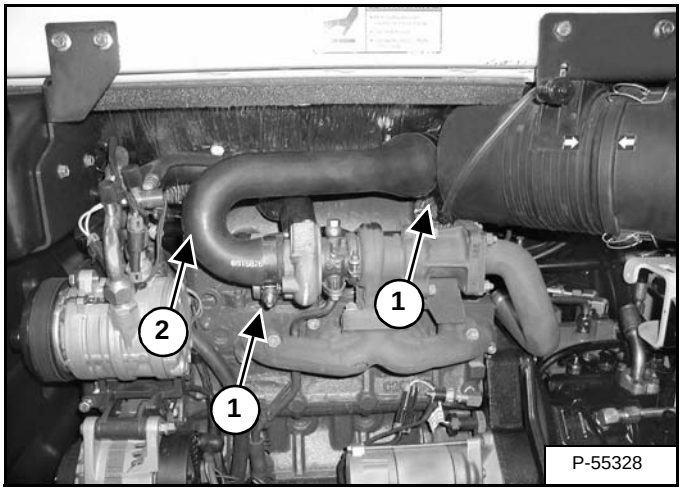
Loosen the clamps (Item 1). Loosen the fuel line fittings (Item 2) **[Figure 70-51-20]**.

Open the tailgate.

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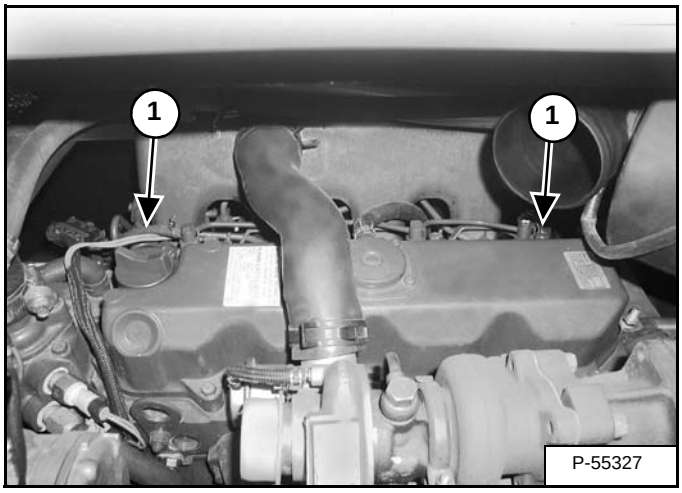
Fuel Injection Pump Removal And Installation (Cont'd)

Figure 70-51-21



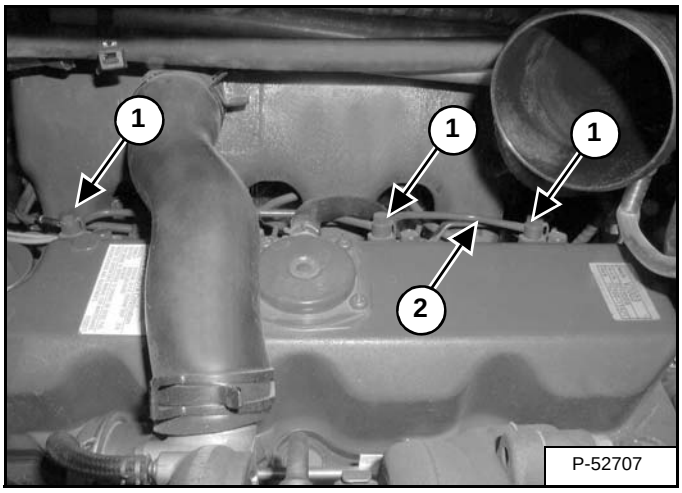
Loosen the clamps (Item 1). Remove the hose (Item 2) **[Figure 70-51-21]**.

Figure 70-51-22



Remove the hoses (Item 1) **[Figure 70-51-22]**.

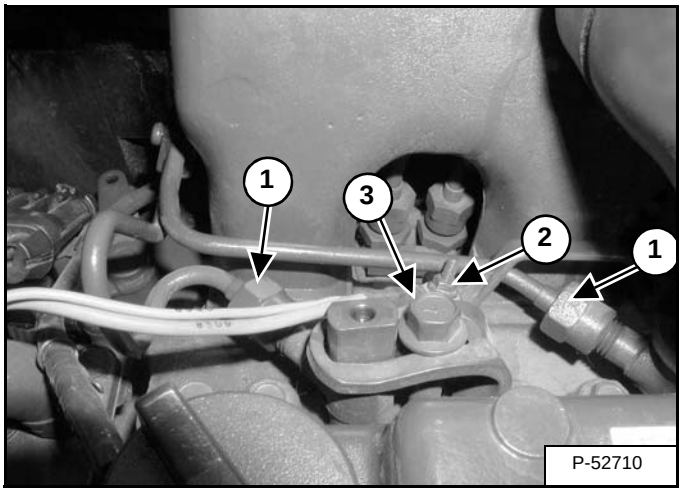
Figure 70-51-23



Remove the bolt (Item 1) **[Figure 70-51-23]** from the 4 fuel injectors.

Remove the fuel line (Item 2) **[Figure 70-51-23]**.

Figure 70-51-24

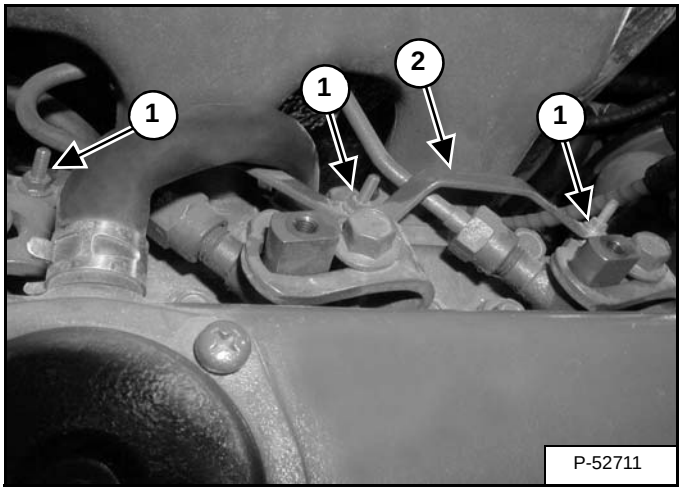


Remove the fuel line fittings (Item 1). Remove the nut (Item 2). Remove the wire harness (Item 3) **[Figure 70-51-24]**.

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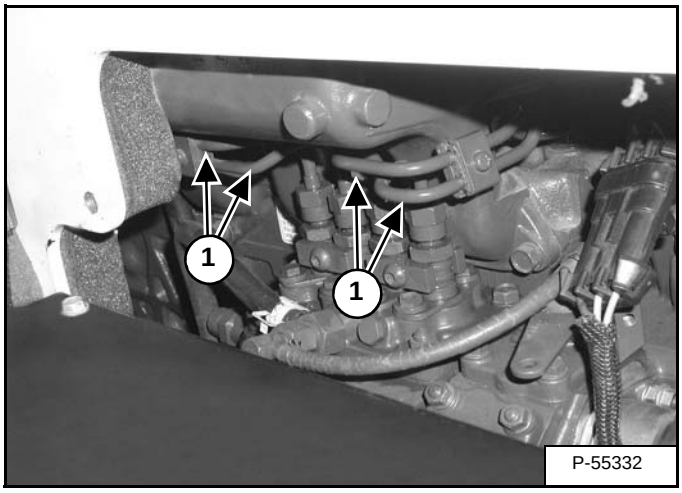
Fuel Injection Pump Removal And Installation (Cont'd)

Figure 70-51-25



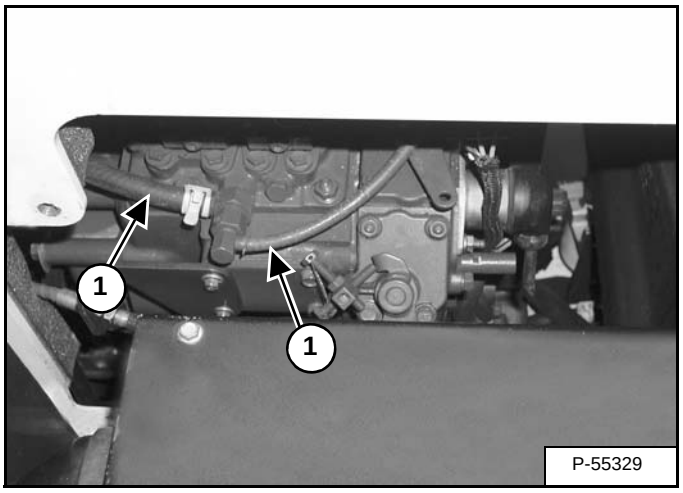
Remove the nut (Item 1) from the 3 remaining glow plugs. Remove the connecting strap (Item 2) **[Figure 70-51-25]**.

Figure 70-51-26



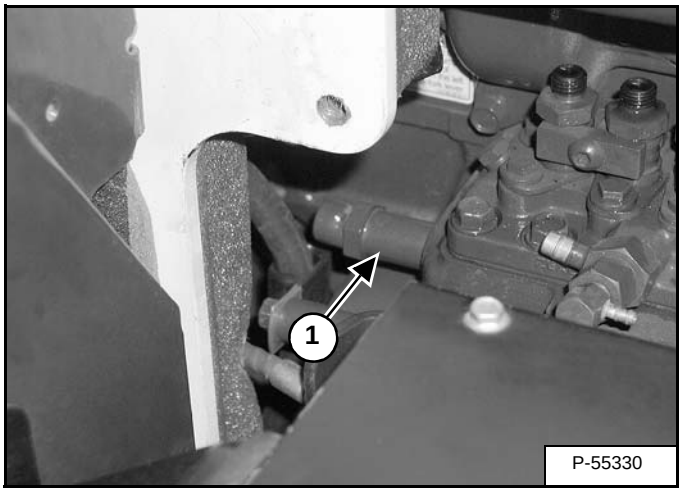
Remove the high pressure fuel lines (Item 1) **[Figure 70-51-26]** from the fuel injectors and fuel injection pump.

Figure 70-51-27



Remove the hoses (Item 1) **[Figure 70-51-27]**.

Figure 70-51-28



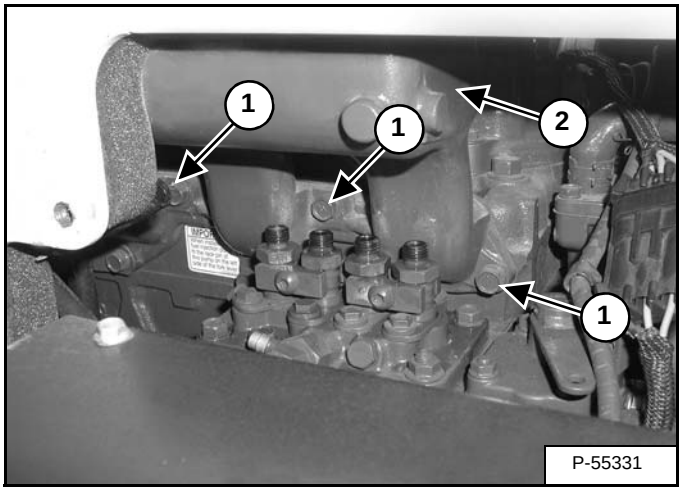
Remove the high idle body (Item 1) **[Figure 70-51-28]** and copper washer.

Installation: Tighten the high idle body to 33 to 36 ft.-lb. (44 to 49 N•m) torque.

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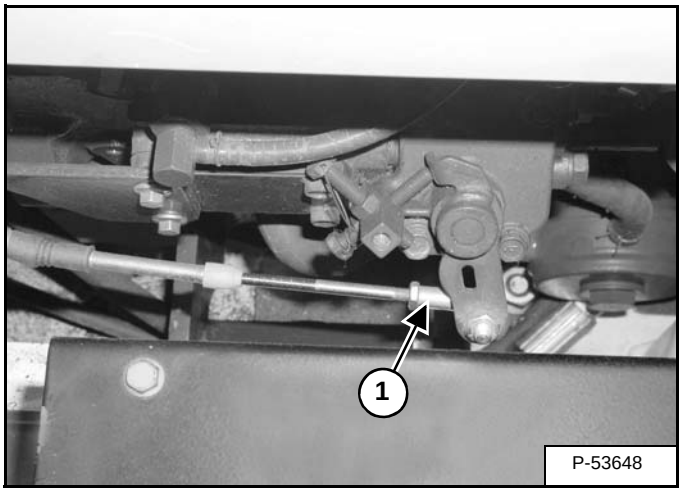
Fuel Injection Pump Removal And Installation (Cont'd)

Figure 70-51-29



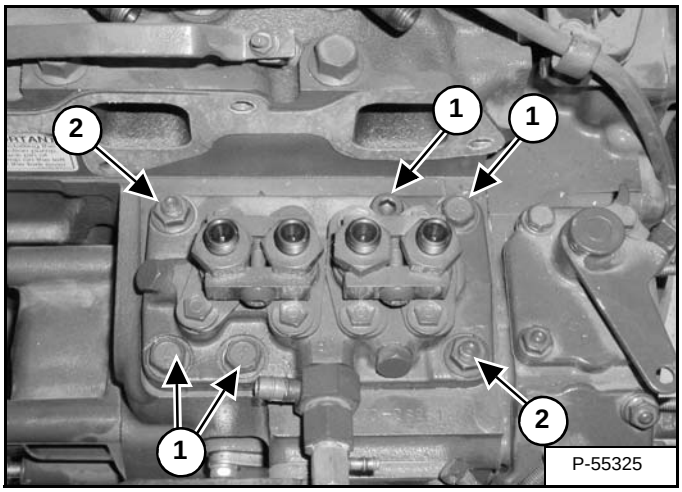
Remove the bolts (Item 1) from the manifold (Item 2) **[Figure 70-51-29]**. Remove the manifold.

Figure 70-51-30



Disconnect the speed control cable (Item 1) **[Figure 70-51-30]** from the injection pump.

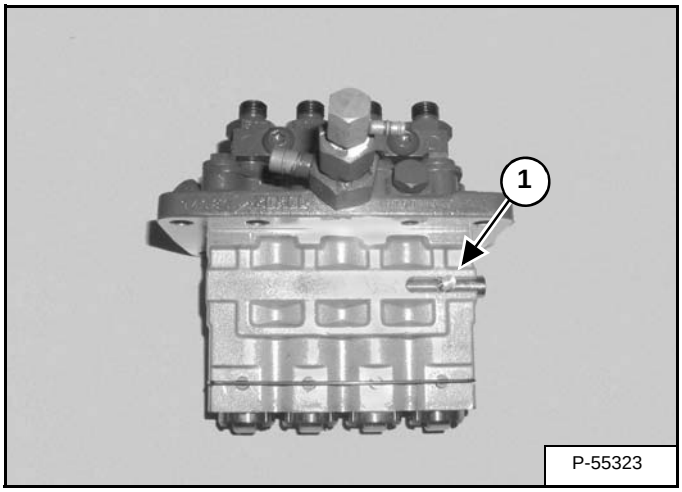
Figure 70-51-31



Remove the bolts (Item 1) and nuts (Item 2) **[Figure 70-51-31]** from the injection pump.

Remove the injection pump.

Figure 70-51-32



Installation: When the injection pump is installed the rack pin (Item 1) **[Figure 70-51-32]** must be aligned with the slot in the engine block and positioned on the left side of the fork lever. If the rack pin is not installed correctly engine damage can result.

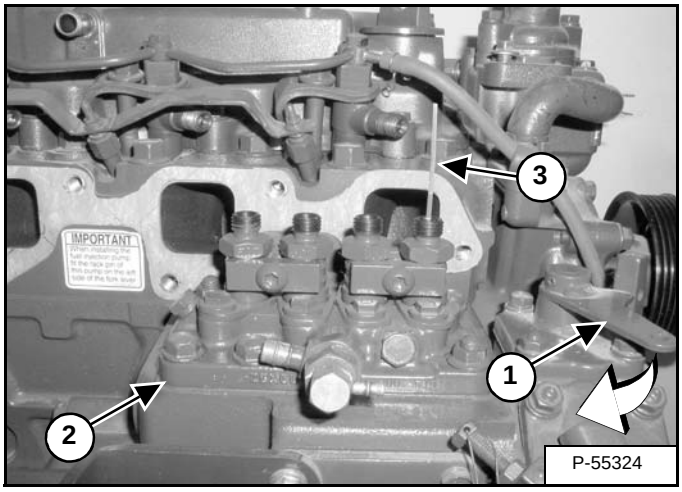
NOTE: Make sure the same number of shims with the same thickness are installed under the injection pump. The shims are used for engine timing.

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Fuel Injection Pump Timing

NOTE: The engine is shown removed for photo clarity.

Figure 70-51-33



Remove the number 1 cylinder pressure line from the injection pump.

Disconnect the fuel shut-off linkage (Item 1) **[Figure 70-51-33]** from the injection pump.

Timing the injection pump is done by changing the number of shims (Item 2) **[Figure 70-51-33]** between the injection pump and engine block.

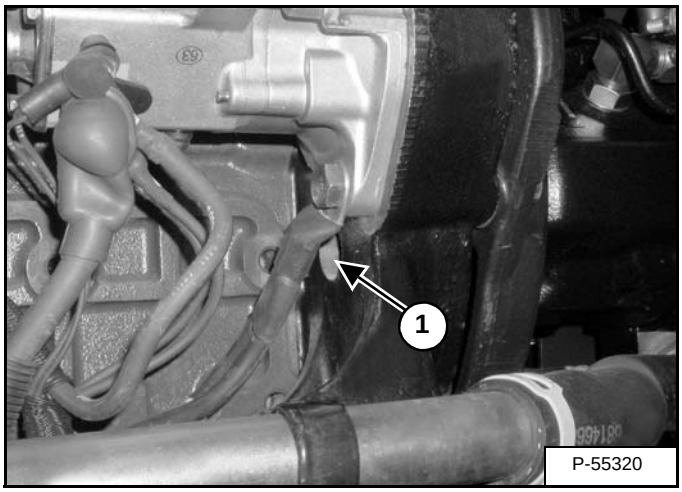
Turn the fuel supply lever to the ON position. install a short plastic tube (Item 3) **[Figure 70-51-33]** in the fitting of the number 1 cylinder port. Point the tube up (vertical).

Turn the engine counterclockwise until fuel flows out of the injection pumps number 1 cylinder nozzle. (Install a tool on the crankshaft at the front of the engine to turn the engine.)

NOTE: The fuel must flow out of the nozzle for 1 firing cycle before timing can be attempted.

Pull the stop lever (Item 1) **[Figure 70-51-33]** 0.232 to 0.302 in. (5,9 to 7,7 mm) from the free position toward the stop position.

Figure 70-51-34



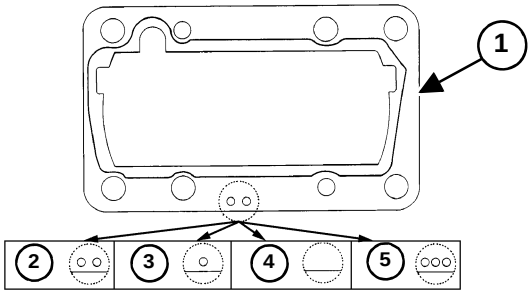
Continue to turn the engine slowly (for approximately 1-3/4 turns after fuel stops flowing from the injection pump nozzle), until the timing mark on the side of the flywheel is at the bottom edge of the timing hole (Item 1) **[Figure 70-51-34]** in the flywheel housing.

Slowly turn the engine counterclockwise: as soon as fuel starts to flow at the top of the injection pump nozzle stop turning the engine.

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Fuel Injection Pump Timing (Cont'd)

Figure 70-51-35



Add or subtract shims (Item 1) **[Figure 70-51-35]** to time the engine. The engine is correctly timed when the correct mark on the flywheel is aligned with the notch in the timing hole.

NOTE: Shims (Item 1) are available in 4 thicknesses. Shims with the 2 holes (Item 2) are 0,20 mm thick, shims with 1 hole (Item 3) are 0,25 mm thick, shims with no holes (Item 4) are 0,30 mm thick and shims with 3 holes (Item 5) [Figure 70-51-35] are 0,35 mm thick.

NOTE: Increasing the thickness of the shim pack by 0,050 mm retards the injection timing by 0.5°. Decreasing the shim pack by 0,050 mm advances the timing by 0.500°.

The correct engine timing is 7.5° to 9.0° B.T.D.C.

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Fuel Injector Nozzles Removal And Installation

⚠ WARNING

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

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Some problems caused by faulty injector nozzles:

- The engine is hard to start or will not start.
- Rough engine operation at idle.
- The engine will not have full power.
- The engine exhaust smoke is black, white or blue.

IMPORTANT

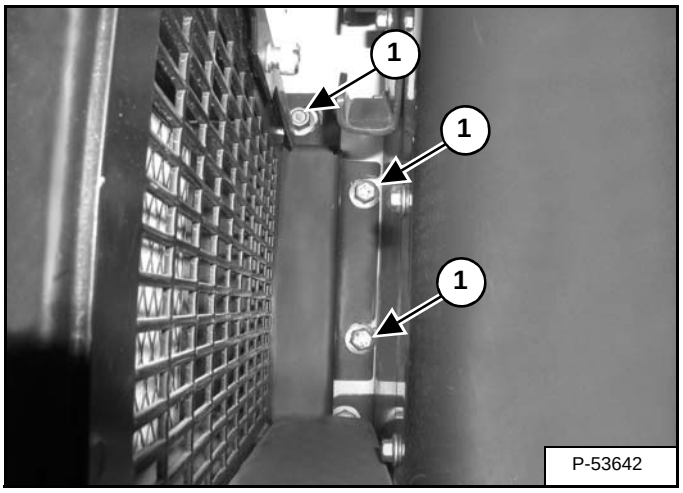
Do not bend the high pressure fuel injection tubes when removing or installing them.

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Disconnect the negative (-) cable from the battery.

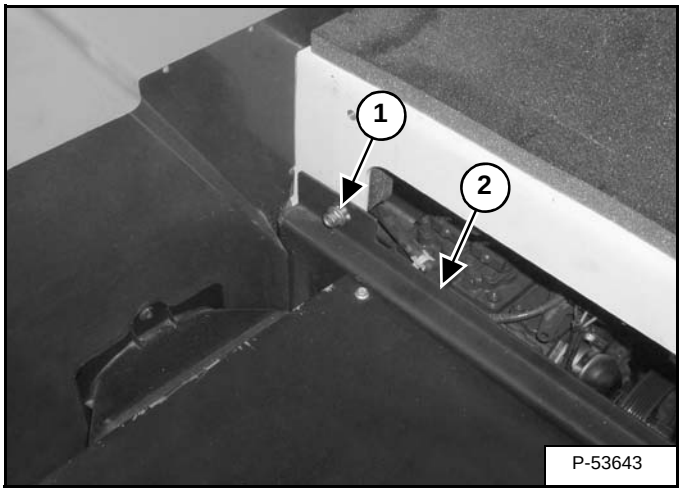
Remove the seat and seat mount. (See Removal And Installation on Page 50-40-1)

Figure 70-51-36



Remove the bolts (Item 1) **[Figure 70-51-36]** from the rear access panel.

Figure 70-51-37



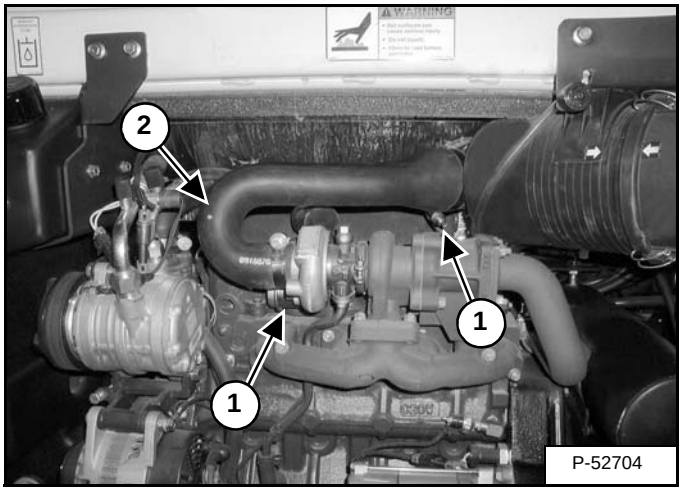
Remove the bolts (Item 1). Remove the rear access panel (Item 2) **[Figure 70-51-37]**.

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Fuel Injector Nozzles Removal And Installation (Cont'd)

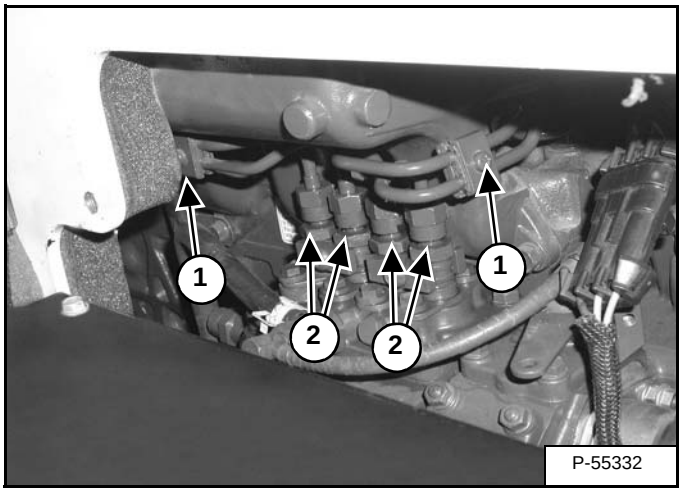
Open the tailgate.

Figure 70-51-38



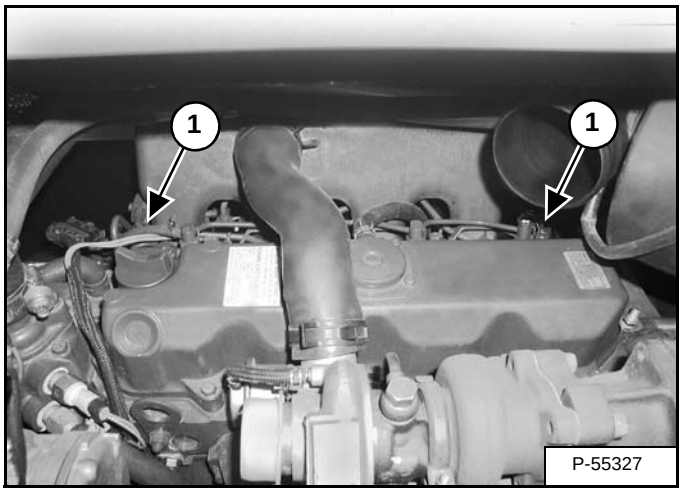
Loosen the clamps (Item 1). Remove the hose (Item 2) **[Figure 70-51-38]**.

Figure 70-51-39



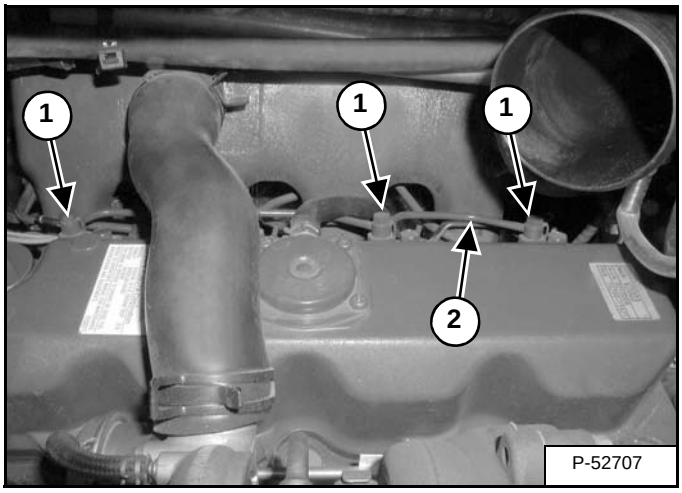
Loosen the clamps (Item 1). Loosen the fuel line fittings (Item 2) **[Figure 70-51-39]**.

Figure 70-51-40



Remove the hoses (Item 1) **[Figure 70-51-40]**.

Figure 70-51-41

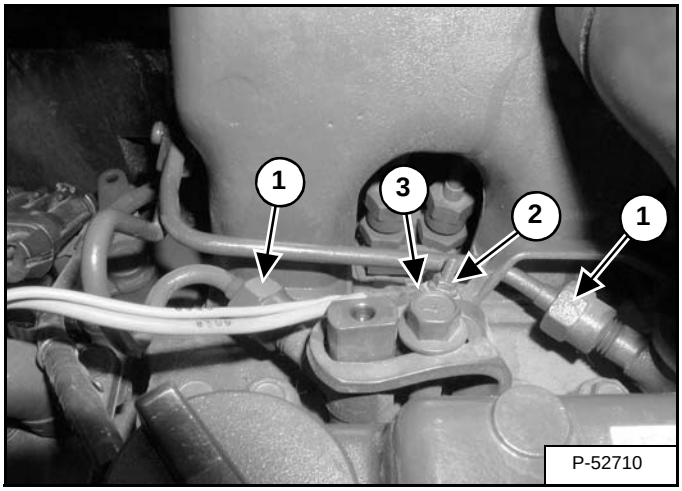


Remove the bolt (Item 1) from the 4 fuel injectors. Remove the fuel line (Item 2) **[Figure 70-51-41]**.

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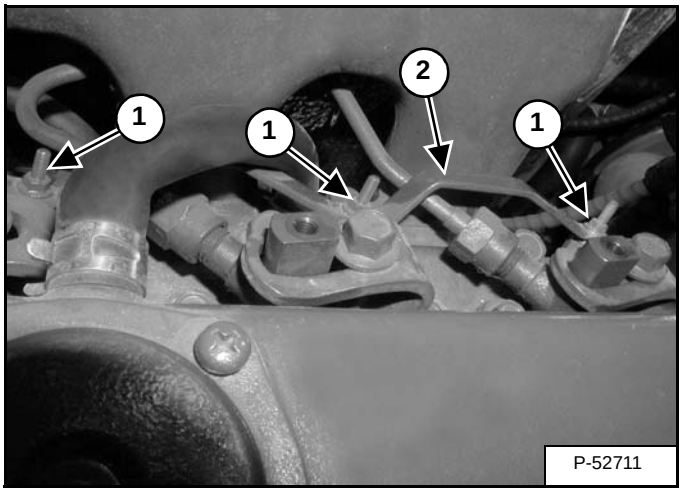
Fuel Injector Nozzles Removal And Installation (Cont'd)

Figure 70-51-42



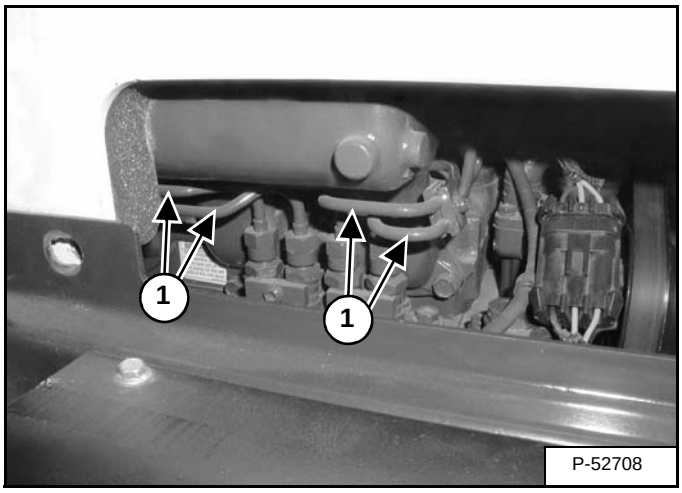
Remove the fuel line fittings (Item 1). Remove the nut (Item 2). Remove the wire harness (Item 3) **[Figure 70-51-42]**.

Figure 70-51-43



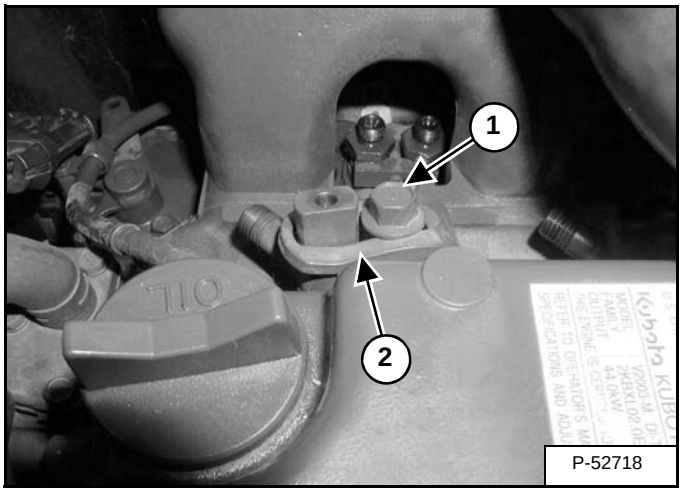
Remove the nut (Item 1) from the 3 remaining glow plugs. Remove the connecting strap (Item 2) **[Figure 70-51-43]**.

Figure 70-51-44



Remove the fuel lines (Item 1) **[Figure 70-51-44]**.

Figure 70-51-45



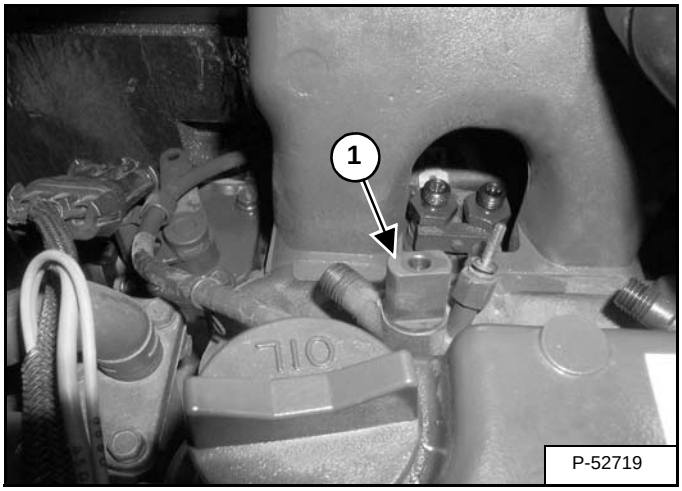
Remove the bolt (Item 1) and clamp (Item 2) **[Figure 70-51-45]** from the fuel injectors.

Installation: Tighten the bolts to 19 to 22 ft.-lb. (26 to 29 N•m) torque.

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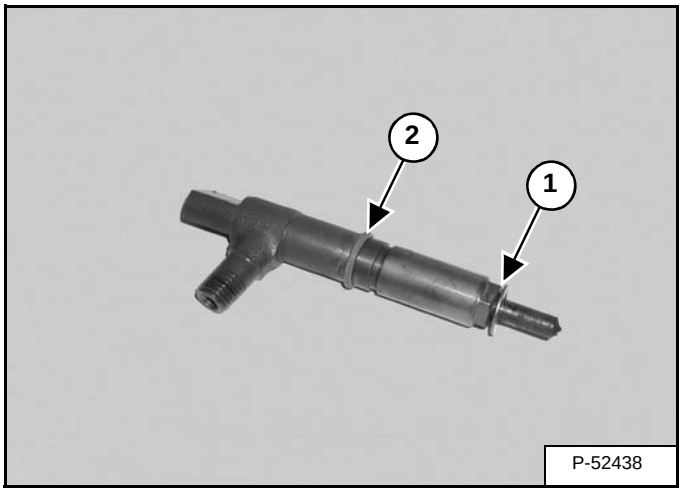
Fuel Injector Nozzles Removal And Installation (Cont'd)

Figure 70-51-46



Remove the injector nozzles (Item 1) **[Figure 70-51-46]**.

Figure 70-51-47



Remove the washer (Item 1) and O-ring (Item 2) **[Figure 70-51-47]** from the injector nozzles.

NOTE: Replace the copper washer (Item 1) and O-ring (Item 2) [Figure 70-51-47] anytime new or used fuel injectors are installed.

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Fuel Injector Nozzle Check

IMPORTANT

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

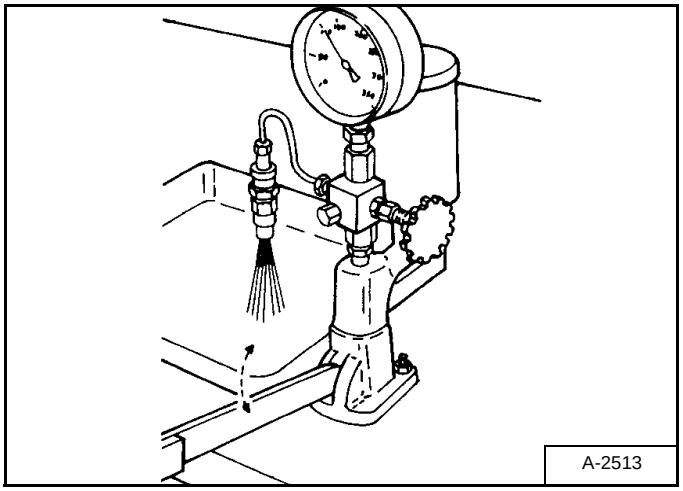
When temperatures are below -20°F (-30°C), the hydrostatic oil must be heated or kept warm. The hydrostatic system will not get enough oil at low temperatures. Park the machine in an area where the temperature will be above 0°F (-18°C) if possible.

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

MEL 10018 - Injector Nozzle Tester

Figure 70-51-48



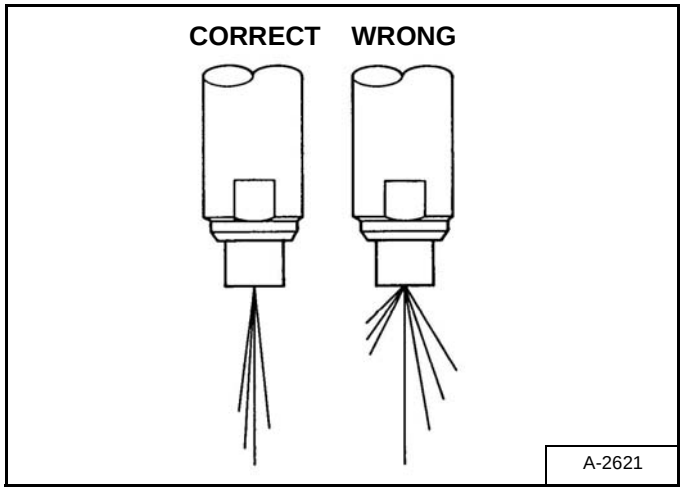
Connect the nozzle to the tester with the nozzle down **[Figure 70-51-48]**.

Operate the hand lever at a slow rate and record the opening pressure. If the pressure is not correct, replace the fuel injection nozzle.

Fuel Injection Pressure	2702 to 2916 PSI (187 to 201 bar)

Check for inside leakage. Operate the hand lever until the pressure is 1850 PSI (127,5 bar). Keep the nozzle under this pressure for 10 seconds, check to see if fuel leaks from the nozzle. If fuel leaks, replace the nozzle.

Figure 70-51-49



Check that the spray pattern is correct **[Figure 70-51-49]**.

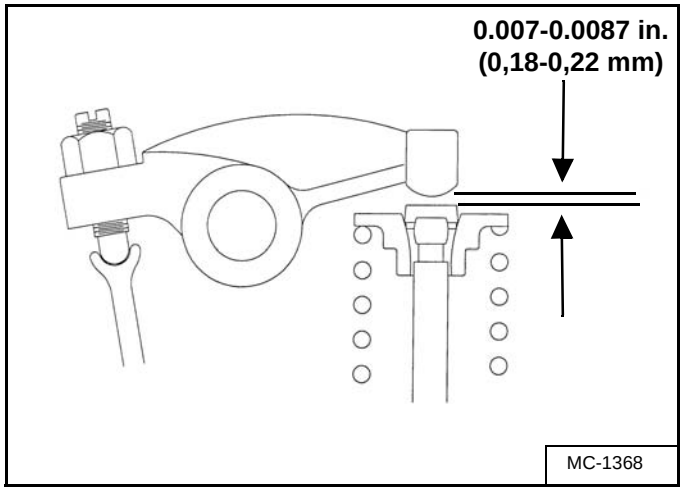
1. Fuel does not come out the side of the nozzle.
2. Drops of fuel are not present at the nozzle.
3. The injector has an even flow coming from the nozzle.

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Valve Clearance Adjustment

Adjust the valve clearance with the engine stopped and cold.

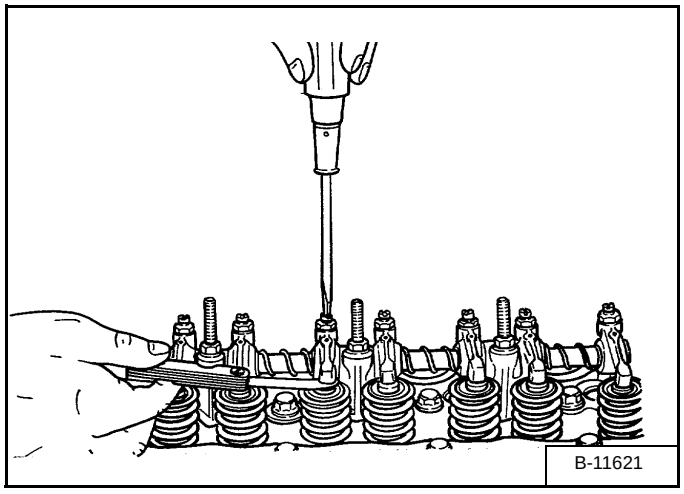
Figure 70-51-50



The correct valve clearance is 0.007 to 0.0087 in. (0,18 to 0,22 mm) **[Figure 70-51-50]**.

Make sure the piston is at T.D.C. when making the adjustment for the valves of the particular cylinder.

Figure 70-51-51



Put the correct size feeler gauge between the rocker arm and valve stem. Turn the adjustment bolt until the clearance is correct **[Figure 70-51-51]**.

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ENGINE

Removal And Installation

Disconnect the battery. (See BATTERY on Page 60-20-1.)

Remove the air cleaner. (See AIR CLEANER on Page 70-30-1.)

Remove the muffler. (See MUFFLER on Page 70-20-1.)

Drain the hydraulic reservoir. (See HYDRAULIC RESERVOIR on Page 20-130-1.)

Remove the hydraulic pump. (See HYDRAULIC PUMP (S/N 562611001 & ABOVE AND 562811001 & ABOVE) on Page 20-50-1.)

Remove the hydraulic pump. (See HYDRAULIC PUMP (S/N 563111001 & Above AND 563211001 & above) on Page 20-51-1.)

Remove the flywheel. (See ENGINE FLYWHEEL (EARLY MODELS) on Page 70-70-1.)

Remove the flywheel. (See ENGINE FLYWHEEL (LATER MODELS) on Page 70-71-1.)

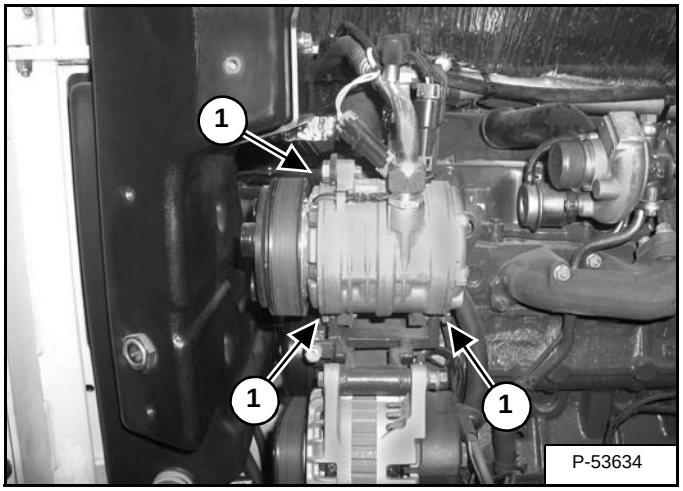
Drain the radiator. (See RADIATOR on Page 70-40-1.)

Remove the seat and seat mount. (See SEAT AND SEAT MOUNT on Page 50-40-1.)

Remove the starter. (See STARTER on Page 60-40-1.)

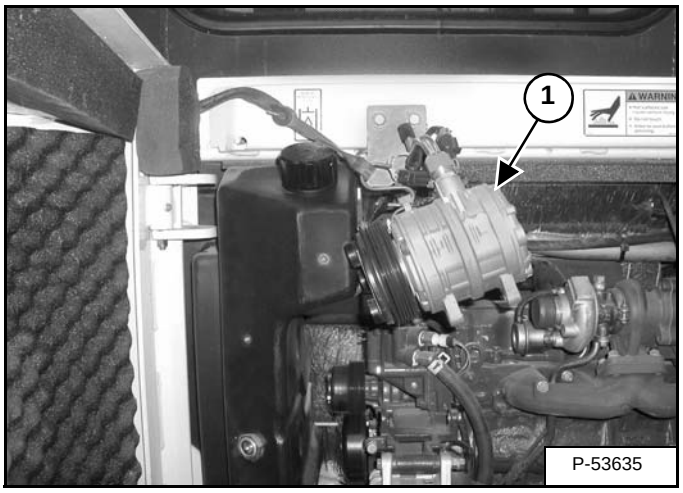
Remove the engine accessory drive belt. (See ENGINE ACCESSORY DRIVE BELT on Page 10-140-1.)

Figure 70-60-1



Remove the bolts (Item 1) **[Figure 70-60-1]** from the A/C compressor.

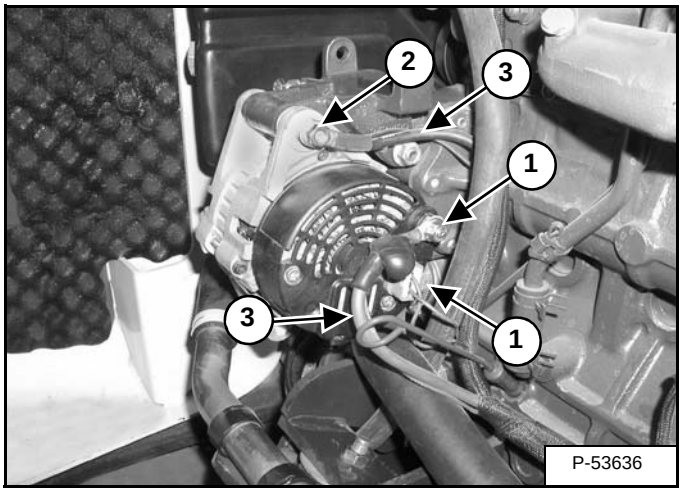
Figure 70-60-2



Suspend and support the compressor (Item 1) **[Figure 70-60-2]**.

NOTE: The A/C system does not need to be evacuated if the compressor hoses are not removed.

Figure 70-60-3



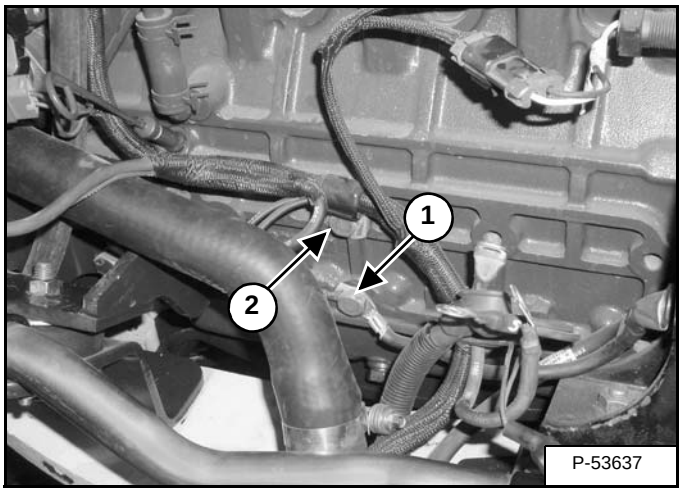
Disconnect the wire harness (Item 1) **[Figure 70-60-3]** from the alternator.

Remove the nut (Item 2) and ground cable (Item 3) **[Figure 70-60-3]**.

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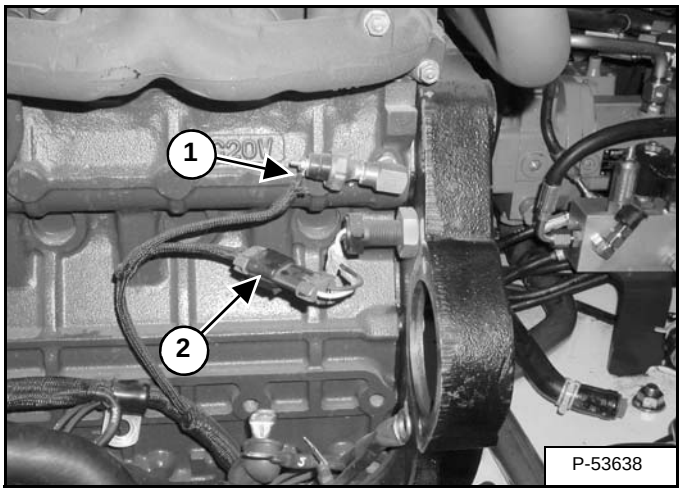
Removal And Installation (Cont'd)

Figure 70-60-4



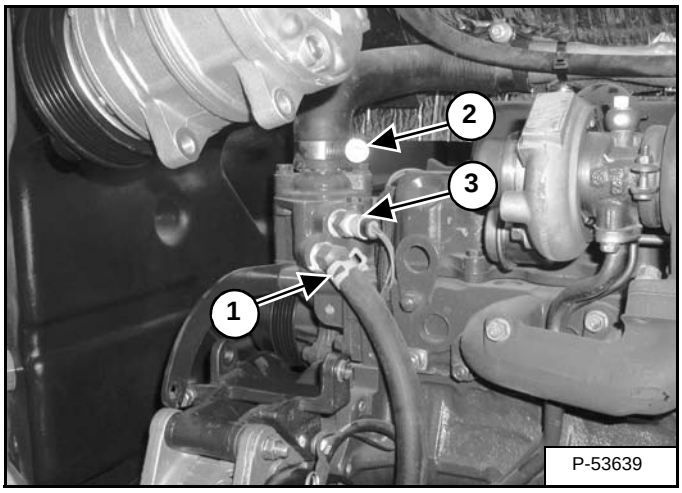
Remove the bolt (Item 1) and ground wires from the engine block. Remove the bolt (Item 2) **[Figure 70-60-4]** and wire harness clamp.

Figure 70-60-5



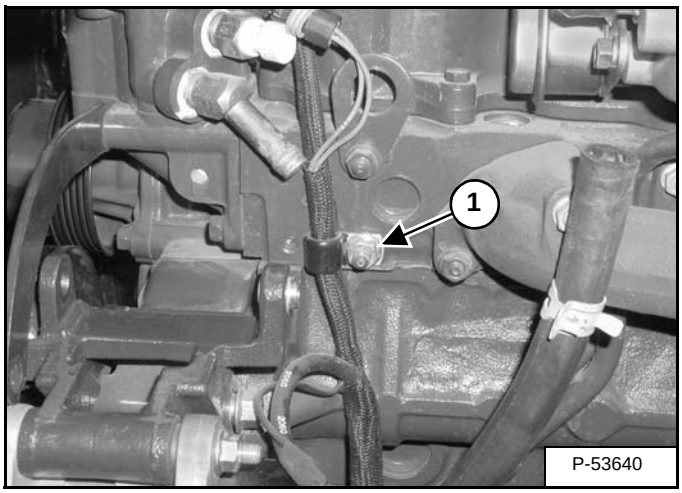
Disconnect the oil pressure switch (Item 1) and engine speed sensor (Item 2) **[Figure 70-60-5]** from the wire harness.

Figure 70-60-6



Remove the heater hose (Item 1) and radiator hose (Item 2). Disconnect the temperature sender (Item 3) **[Figure 70-60-6]**.

Figure 70-60-7

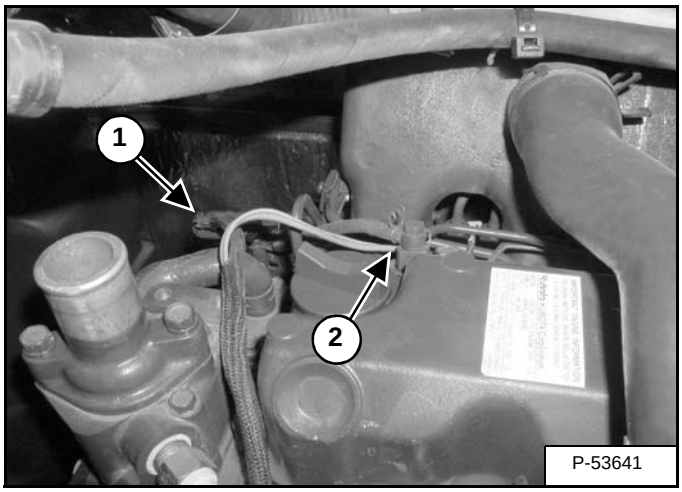


Remove the nut and clamp (Item 1) **[Figure 70-60-7]**.

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Removal And Installation (Cont'd)

Figure 70-60-8

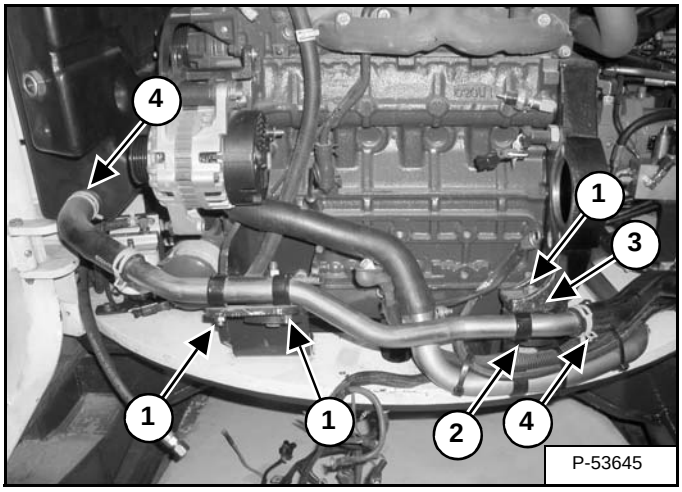


Disconnect the engine shut off (Item 1) and glow plug wire harness (Item 2) **[Figure 70-60-8]**.

Relocate the wire harness to the bottom of the engine compartment.

NOTE: Later models may use different components for clamping the hoses and tubes. Mark the components for ease of assembly.

Figure 70-60-9



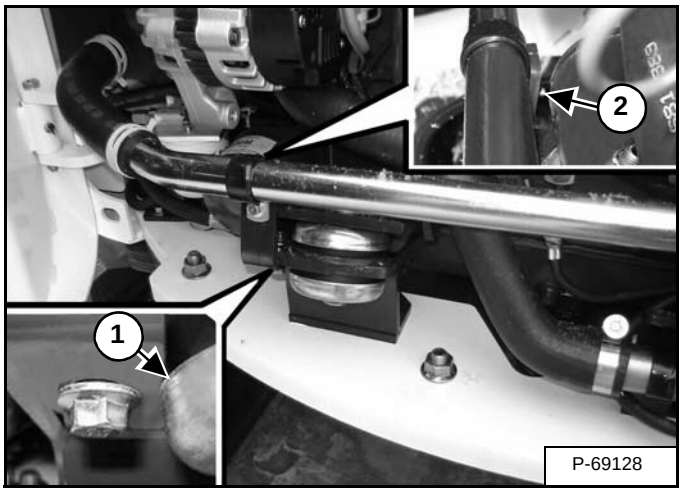
Remove the bolts (Item 1) from the hose clamps (Item 2) **[Figure 70-60-9]**.

Remove the spacer (Item 3) **[Figure 70-60-9]**.

Loosen the clamps (Item 4) **[Figure 70-60-9]** and remove the hose/tubeline assembly.

Installation (Later models)

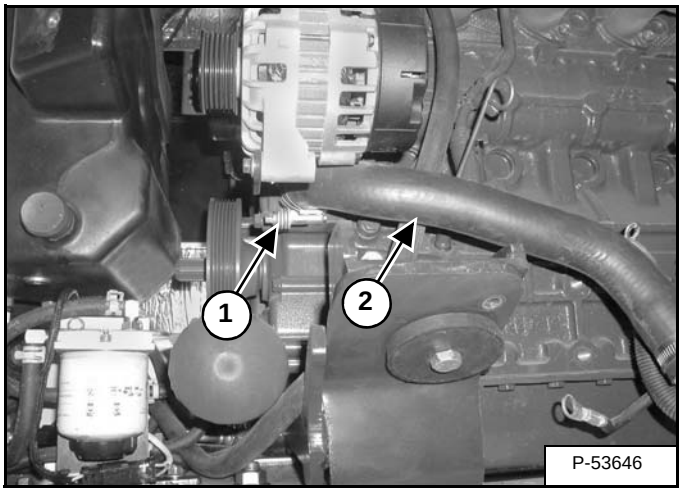
Figure 70-60-10



Verify the cup and the bracket (Item 1) **[Figure 70-60-10]** are not overlapping. When cup contacts bracket, the engine is not properly isolated. If the cup is contacting bracket, loosen bracket and slide bracket over or in extreme cases grind the bracket edge to provide clearance between cup and bracket.

Verify the screw (Item 2) **[Figure 70-60-10]** is not touching engine bracket. If the screw is touching the engine bracket, slightly bend the tubeline bracket away from the engine bracket to provide clearance.

Figure 70-60-11

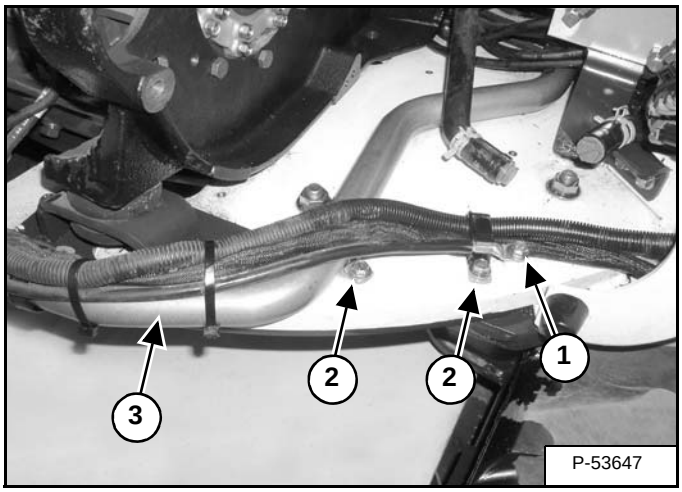


Loosen the clamp (Item 1) and remove the radiator hose (Item 2) **[Figure 70-60-11]**.

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Removal And Installation (Cont'd)

Figure 70-60-12



Remove the bolt (Item 1) from the ground cable. Remove the bolts (Item 2) **[Figure 70-60-12]** from the clamps.

Reposition the wire harness and tube assembly (Item 3) **[Figure 70-60-12]** to the right side of the engine compartment.

Figure 70-60-13

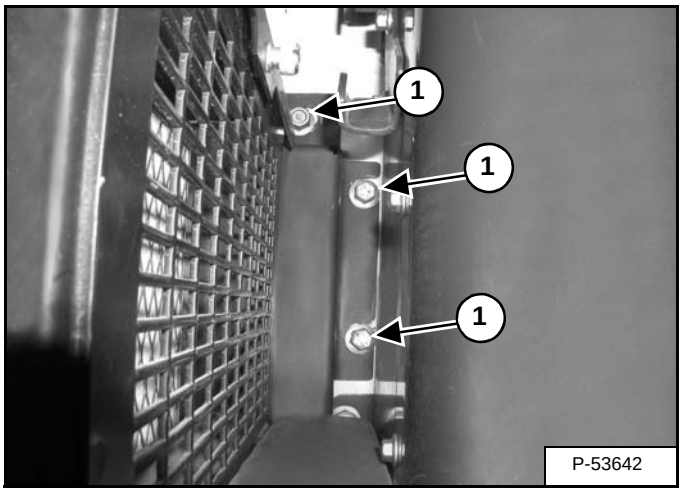
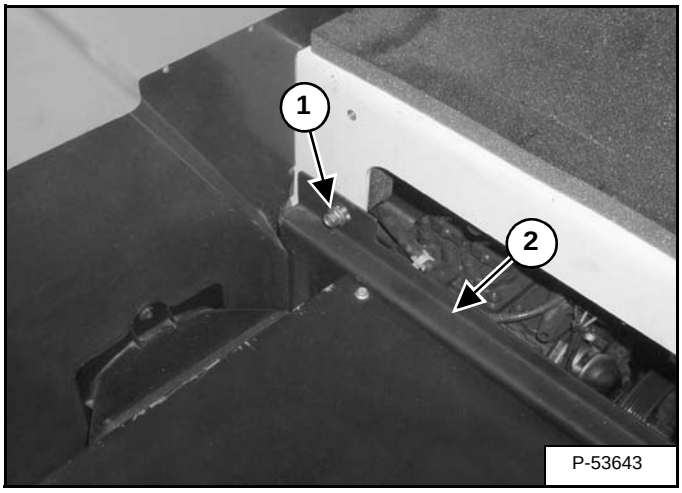


Figure 70-60-14



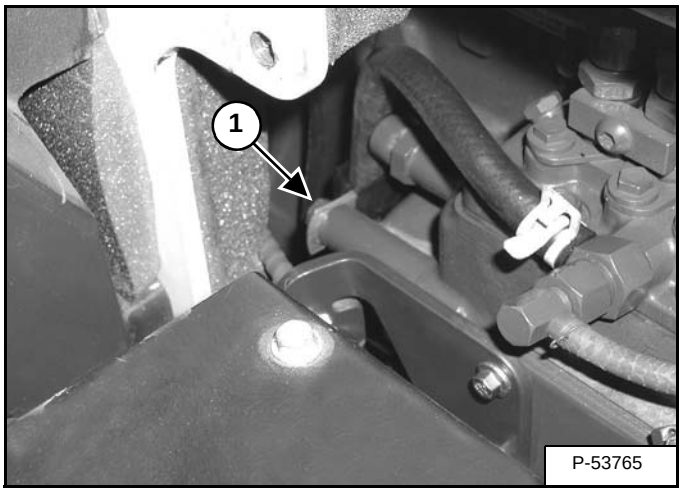
Remove the bolts (Item 1) **[Figure 70-60-13]** & **[Figure 70-60-14]**.

Remove the cover (Item 2) **[Figure 70-60-14]**.

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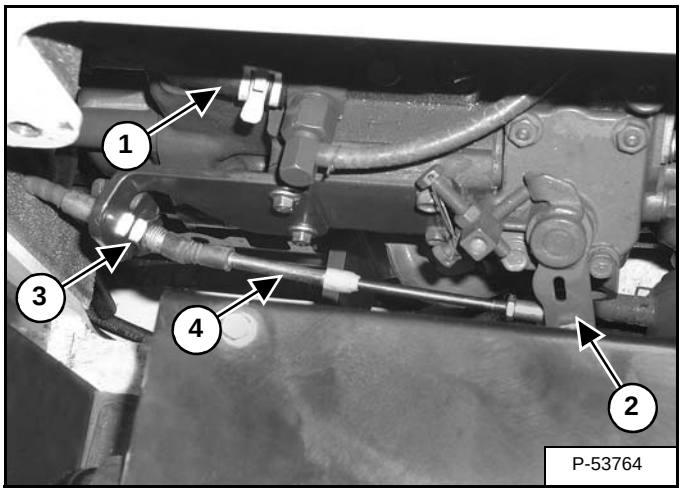
Removal And Installation (Cont'd)

Figure 70-60-15



Remove the bolt (Item 1) **[Figure 70-60-15]** and clamp.

Figure 70-60-16

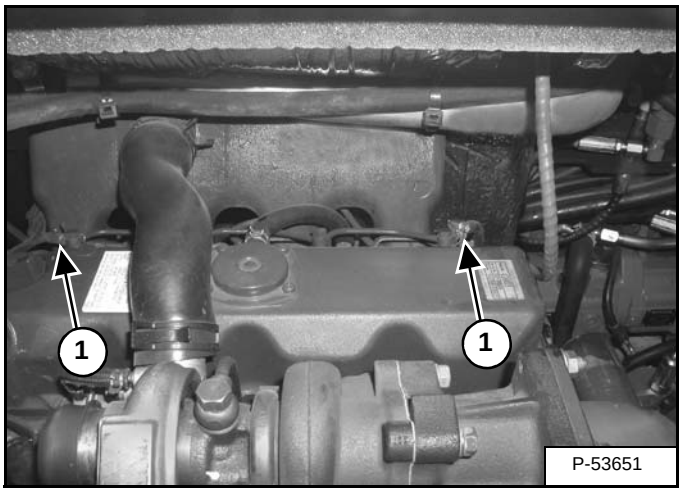


Remove the fuel supply hose (Item 1) **[Figure 70-60-16]**.

Remove the nut (Item 2) from the engine speed control cable **[Figure 70-60-16]**.

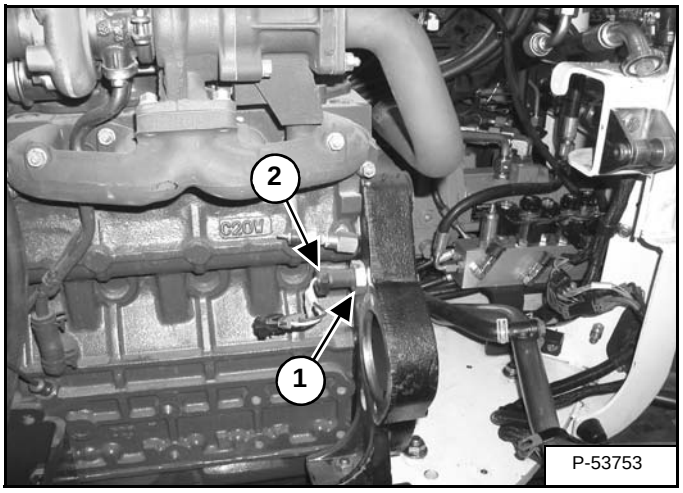
Loosen the nut (Item 3) and remove the cable (Item 4) from the mount **[Figure 70-60-16]**.

Figure 70-60-17



Remove the hoses (Item 1) **[Figure 70-60-17]**.

Figure 70-60-18

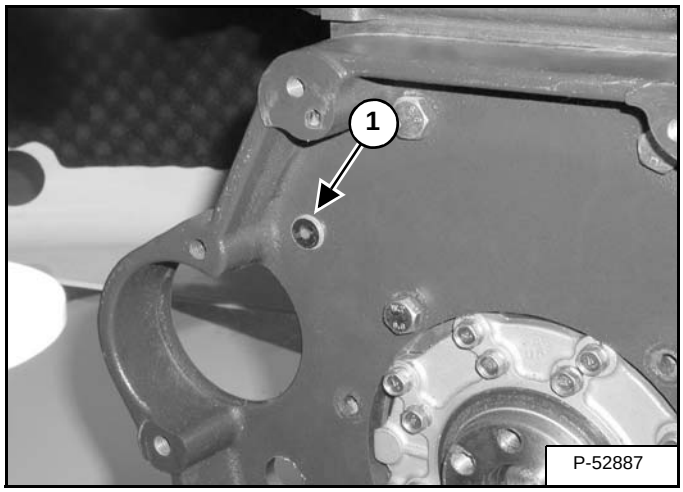


Loosen the nut (Item 1) and remove the engine speed sensor (Item 2) **[Figure 70-60-18]**.

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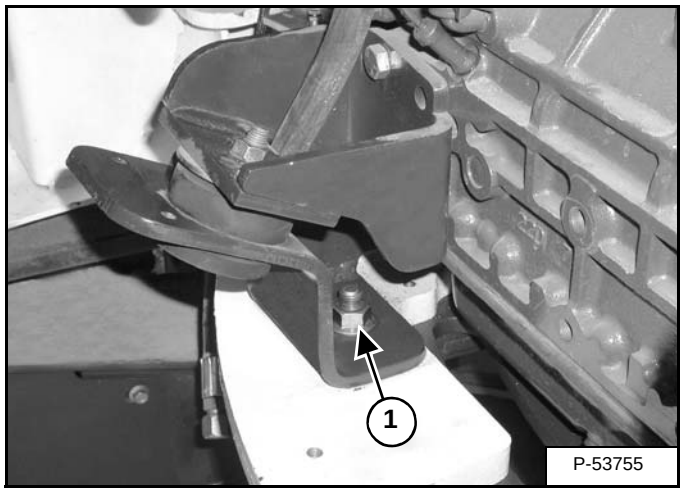
Removal And Installation (Cont'd)

Figure 70-60-19



Installation: The sensor (Item 1) **[Figure 70-60-19]** must protrude 0.11 inches (2.8 mm) past the flywheel housing.

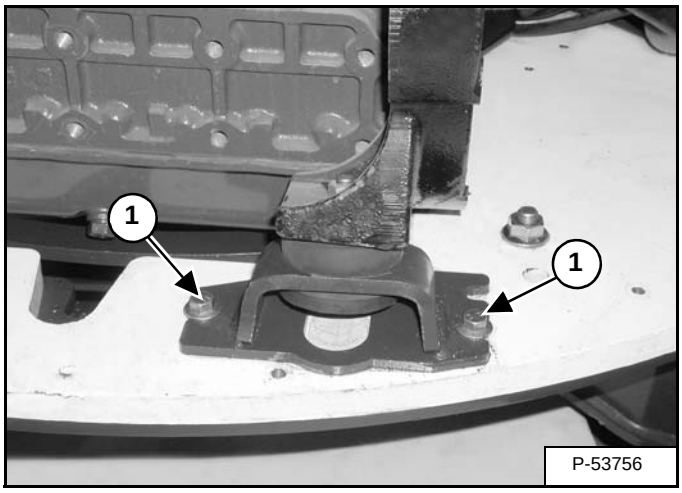
Figure 70-60-20



Remove the left front and rear engine mount bolts and nuts (Item 1) **[Figure 70-60-20]**.

NOTE: Motor mounts on later models may appear different than the photos but the procedure is the same.

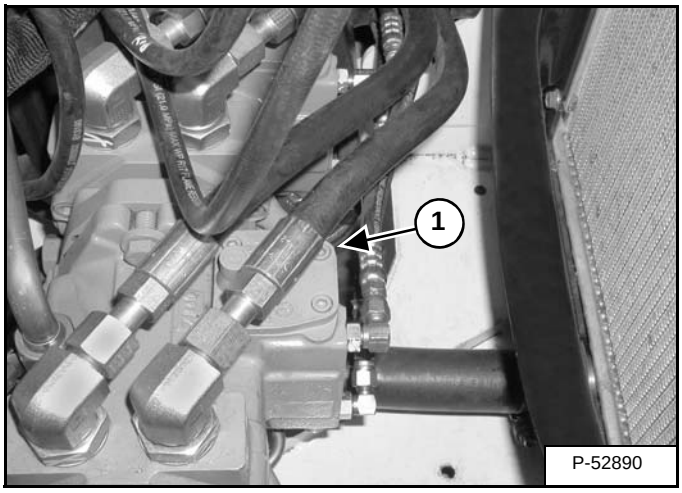
Figure 70-60-21



Remove the right rear engine mount bolts (Item 1) **[Figure 70-60-21]**.

NOTE: Motor mounts on later models may appear different than the photos but the procedure is the same.

Figure 70-60-22



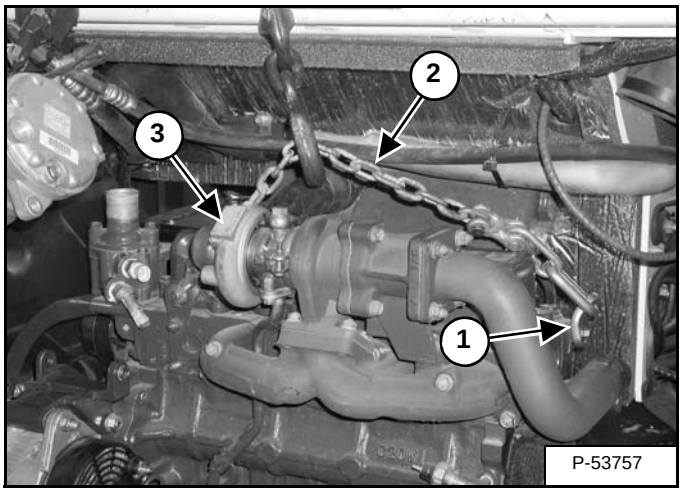
Remove the front engine/hydrostatic mount bolt (Item 1) **[Figure 70-60-22]**.

NOTE: The cooling fan is removed for photo clarity.

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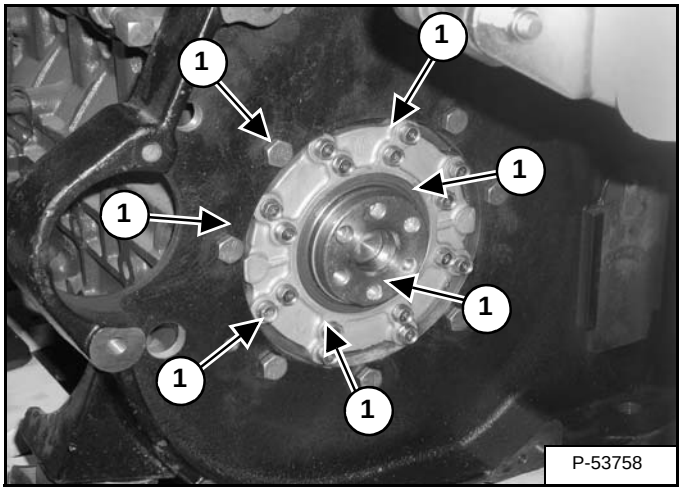
Removal And Installation (Cont'd)

Figure 70-60-23



Install a lifting bracket (Item 1) on the engine. Install a chain (Item 2) and hoist on the left lift bracket (Item 3) **[Figure 70-60-23]** and on the lifting bracket.

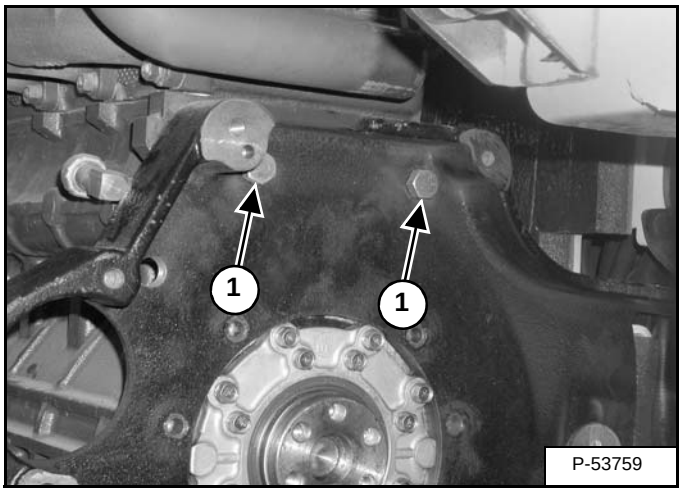
Figure 70-60-24



Remove the bolts (Item 1) **[Figure 70-60-24]**.

Installation: Apply thread adhesive (Loctite 242) to the bolt threads. Tighten the bolts to 29 - 37 ft.-lb. (40 - 50 N•m) torque.

Figure 70-60-25

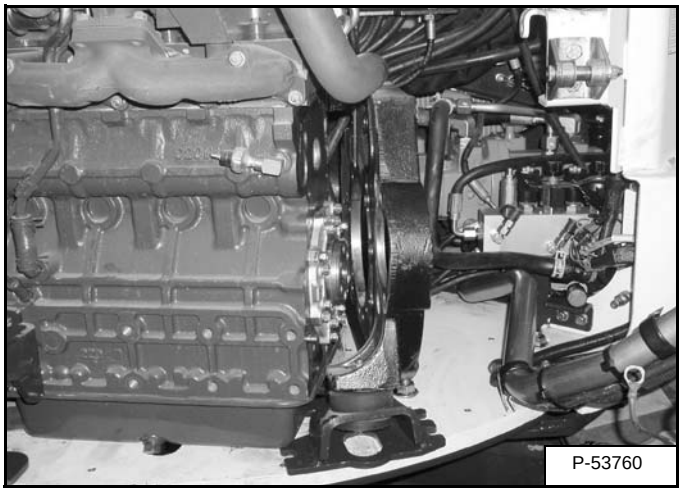


Remove the bolts (Item 1) **[Figure 70-60-25]**.

Installation: Apply thread adhesive (Loctite 242) to the bolt threads. Tighten the bolts to 48 - 55 ft.-lb (65 - 74 N•m torque).

Slightly raise and slide the engine/hydrostatic assembly towards the rear of the excavator.

Figure 70-60-26



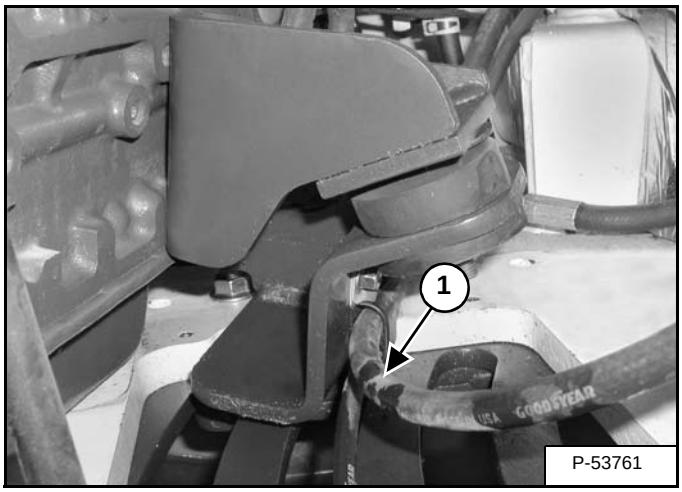
Separate the engine from the flywheel housing **[Figure 70-60-26]**.

Pull the engine out of the compartment.

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Removal And Installation (Cont'd)

Figure 70-60-27



Remove the fuel lines (Item 1) **[Figure 70-60-27]** from the left front engine mount.

NOTE: Later models may use different components for clamping the hoses. Mark the components for ease of assembly.

Remove the engine.

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ENGINE FLYWHEEL (EARLY MODELS)

Removal And Installation

Remove the muffler. (See Removal And Installation on Page 70-20-1)

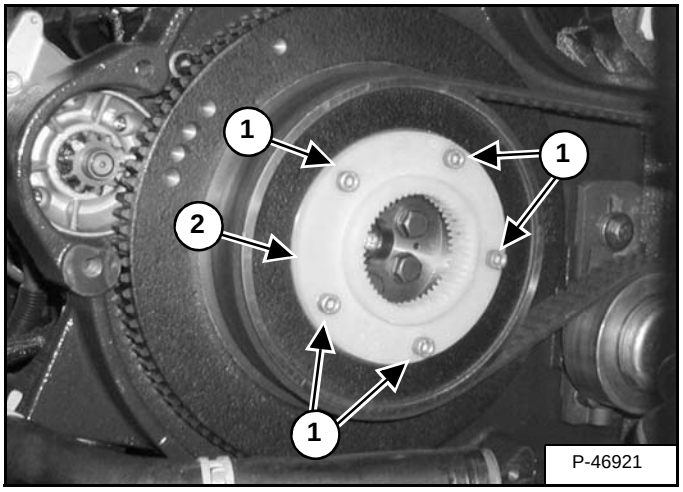
Remove the hydraulic pump (S/N 562611001 & Above, 562811001 & Above And 563211001 & Above). (See HYDRAULIC PUMP (S/N 562611001 & ABOVE AND 562811001 & ABOVE) on Page 20-50-1)

Remove the hydraulic pump (S/N 563111001 & Above). (See Removal And Installation on Page 20-51-16.)

Remove the drive belt shield. (See Removal And Installation on Page 30-40-1)

Remove the drive belt. (See Removal And Installation on Page 30-41-3)

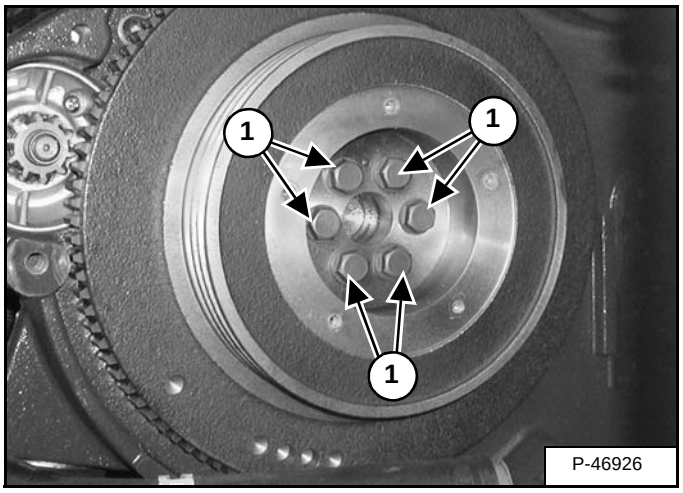
Figure 70-70-1



Remove the 5 bolts (Item 1). Remove the coupler (Item 2) **[Figure 70-70-1]**.

Installation: Apply thread lock adhesive (Loctite™ 242) to the bolt threads. Tighten the bolts to 27 to 32 ft.lb. (37 to 43 N•m) torque.

Figure 70-70-2



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

Installation: Tighten the bolts to 72 to 80 ft.-lb. (98 to 108 N•m) torque.

Remove the flywheel.

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Hydraulic Pump Coupler

Remove the muffler. (See Removal And Installation on Page 70-20-1)

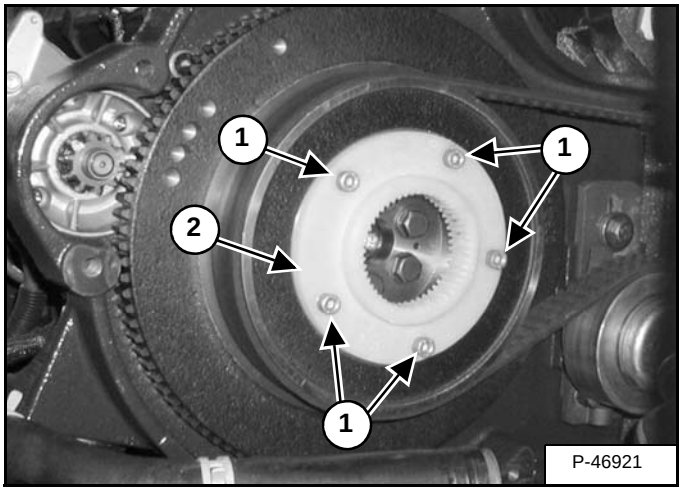
Remove the hydraulic pump (S/N 562611001 & Above, 562811001 & Above And 563211001 & Above). (See Removal And Installation on Page 20-50-17.)

Remove the hydraulic pump (S/N 563111001 & Above). (See Removal And Installation on Page 20-51-16.)

Remove the drive belt shield. (See Removal And Installation on Page 30-40-1)

Remove the drive belt. (See Removal And Installation on Page 30-41-3)

Figure 70-70-3



Remove the 5 bolts (Item 1). Remove the coupler (Item 2) **[Figure 70-70-3]**.

Installation: Apply thread lock adhesive (Loctite™ 242) to the bolt threads. Tighten the bolts to 27 to 32 ft.-lb. (37 to 43 N•m) torque.

Remove the hydraulic pump coupler.

Flywheel Ring Gear

⚠ WARNING

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-2019-1285

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

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

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

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

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ENGINE FLYWHEEL (LATER MODELS)

Removal And Installation

Remove the muffler. (See Removal And Installation on Page 70-20-1)

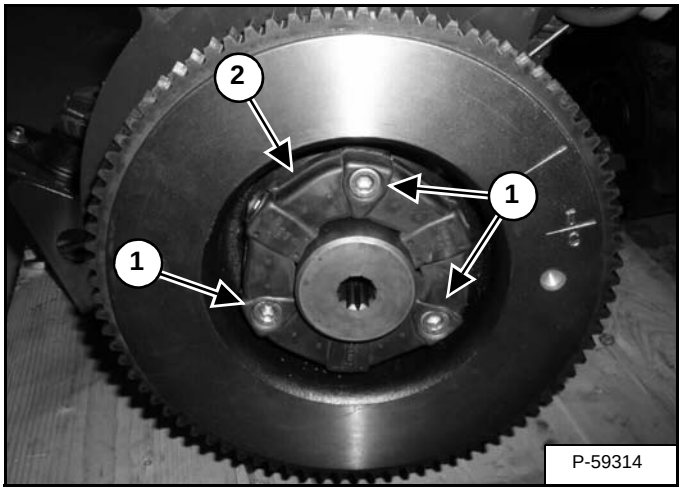
Remove the hydraulic pump (S/N 562611001 & Above, 562811001 & Above and 563211001 & Above). (See Removal And Installation on Page 20-50-17)

Remove the hydraulic pump (S/N and 563111001 & Above). (See Removal And Installation on Page 20-51-16)

Remove the drive belt shield. (See Removal And Installation on Page 30-40-1)

Remove the drive belts. (See Removal And Installation on Page 30-41-3)

Figure 70-71-1

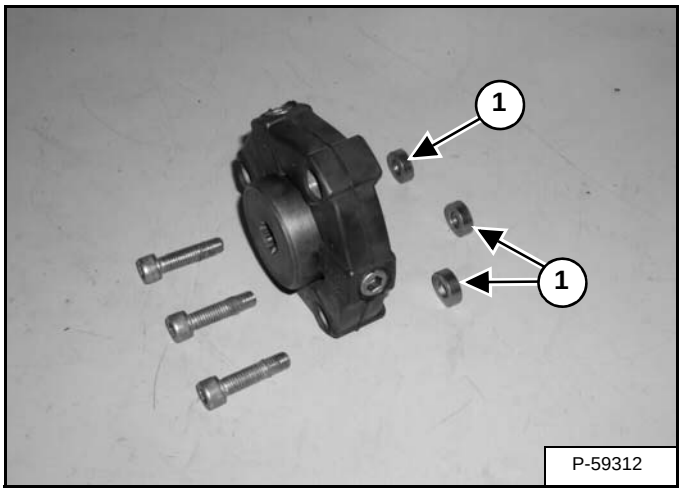


Remove the 3 bolts (Item 1) from the hydraulic pump coupler (Item 2) **[Figure 70-71-1]**.

Installation: Apply Loctite™ 242 to bolts and tighten the bolts to 27 to 32 ft.-lb. (37 to 43 N•m) torque.

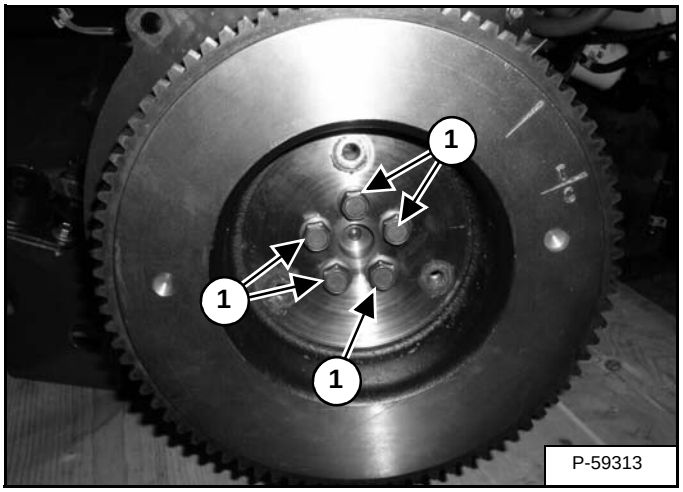
Remove the hydraulic pump coupler.

Figure 70-71-2



Each hydraulic pump coupler bolt has a spacer (Item 1) **[Figure 70-71-2]** between coupler and flywheel.

Figure 70-71-3



Remove the 5 bolts (Item 1) **[Figure 70-71-3]** from the flywheel.

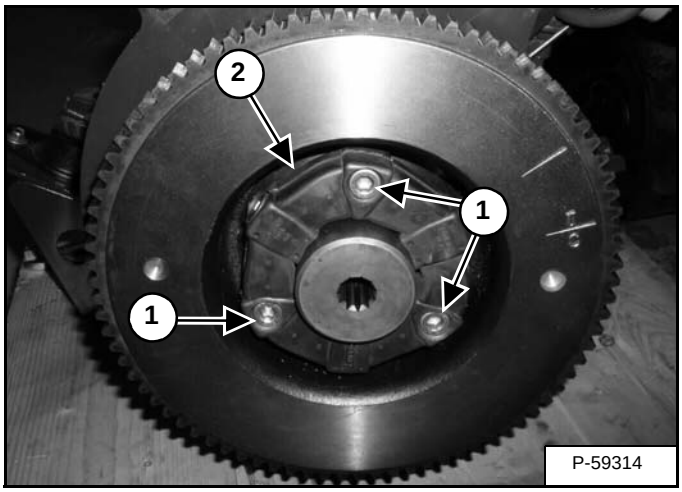
Installation: Tighten the bolts to 72 to 80 ft.-lb. (98 to 108 N•m) torque.

Remove the flywheel.

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Hydraulic Pump Coupler

Figure 70-71-4

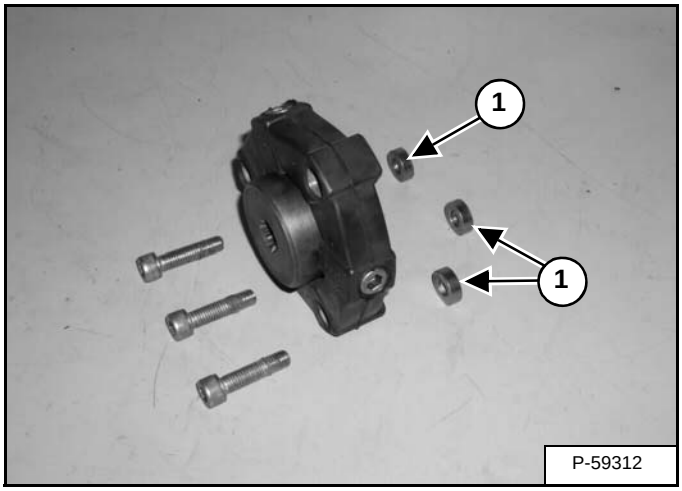


Remove the 3 bolts (Item 1) from the hydraulic pump coupler (Item 2) **[Figure 70-71-4]**.

Installation: Apply Loctite™ 242 to bolts and tighten the bolts to 27 to 32 ft.-lb. (37 to 43 N•m) torque.

Remove the hydraulic pump coupler.

Figure 70-71-5



Each hydraulic pump coupler bolt has a spacer (Item 1) **[Figure 70-71-5]** between coupler and flywheel.

Flywheel Ring Gear

⚠ WARNING

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-2019-1285

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

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

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

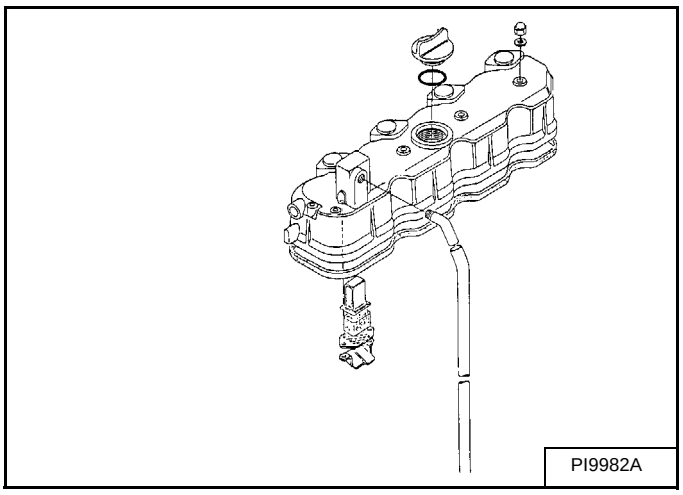
Fit the ring gear over the flywheel. Make sure the gear is seated correctly.

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RECONDITIONING THE ENGINE (S/N 562611001 AND ABOVE)

Cylinder Head Removal And Installation

Figure 70-80-1



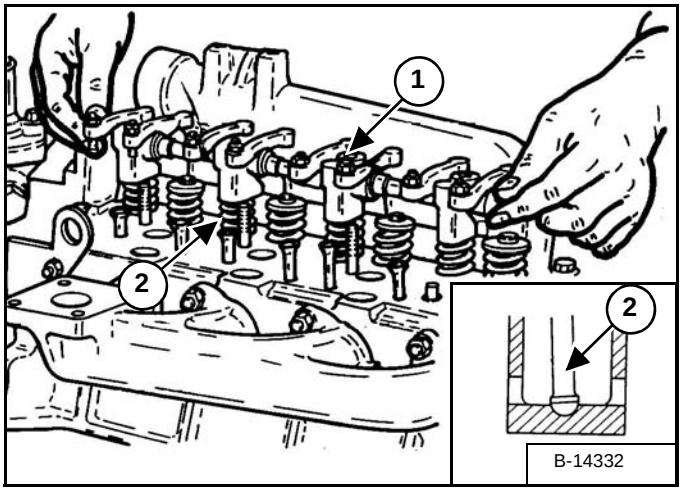
Remove the nuts from the top of the valve cover and remove the valve cover and gasket **[Figure 70-80-1]**.

Remove the fuel injector nozzles. (See ENGINE COMPONENTS & TESTING (S/N 562611001 & ABOVE) on Page 70-50-1 or See ENGINE COMPONENTS & TESTING (S/N 562811001 & ABOVE, 563111001 & ABOVE AND 563211001 & ABOVE) on Page 70-51-1)

Remove the glow plugs. (See ENGINE COMPONENTS & TESTING (S/N 562611001 & ABOVE) on Page 70-50-1 or See ENGINE COMPONENTS & TESTING (S/N 562811001 & ABOVE, 563111001 & ABOVE AND 563211001 & ABOVE) on Page 70-51-1)

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

Figure 70-80-2

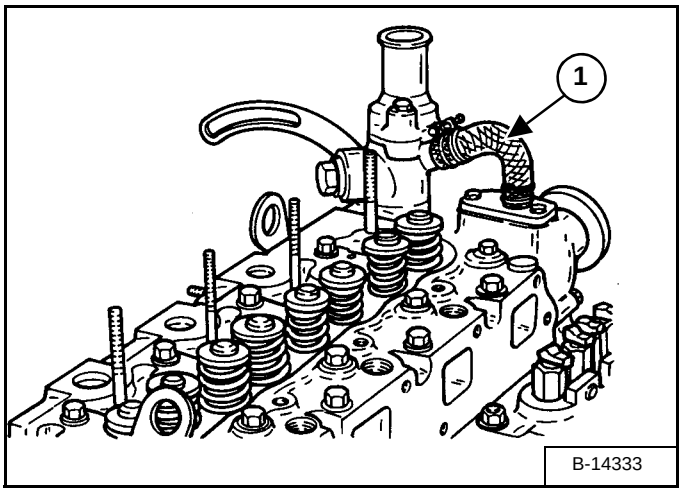


Remove the rocker arm and shaft assembly (Item 1) **[Figure 70-80-2]**.

Remove the push rods (Item 2) **[Figure 70-80-2]**.

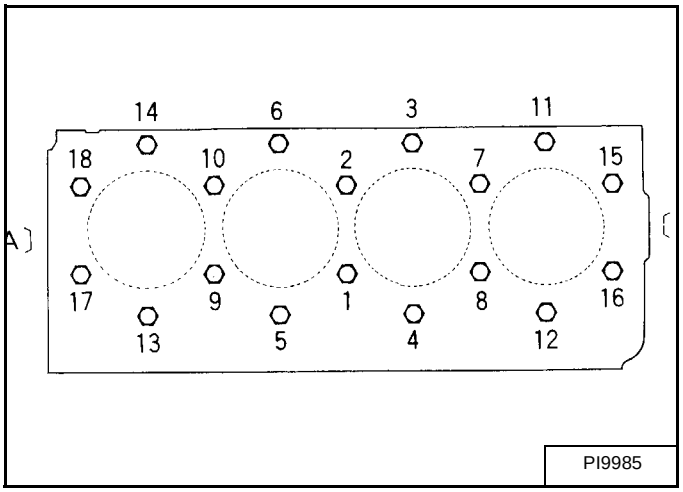
Remove the intake and exhaust manifolds.

Figure 70-80-3



Remove the water return hose (Item 1) **[Figure 70-80-3]**.

Figure 70-80-4



Remove the cylinder head bolts in order of #18 to #1 **[Figure 70-80-4]**.

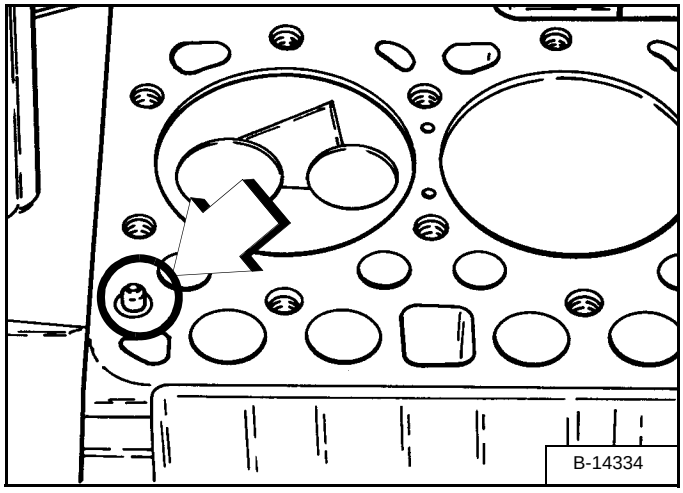
Installation: Put oil on the bolt threads. Tighten the bolts in the correct sequence (#1 to #18) to 69 to 72 ft.-lb. (93 to 98 N•m) torque.

NOTE: Re-tighten the cylinder head bolts in the correct sequence after the engine has been run for 30 minutes.

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Cylinder Head Removal And Installation (Cont'd)

Figure 70-80-5



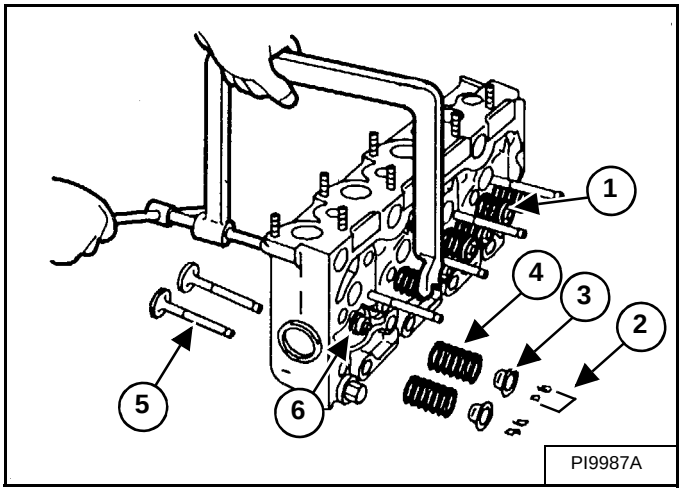
Installation: Always use new head gasket and new O-ring. Make sure the O-ring is seated over the dowel **[Figure 70-80-5]**.

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RECONDITIONING THE ENGINE (S/N 562611001 AND ABOVE) (CONT'D)

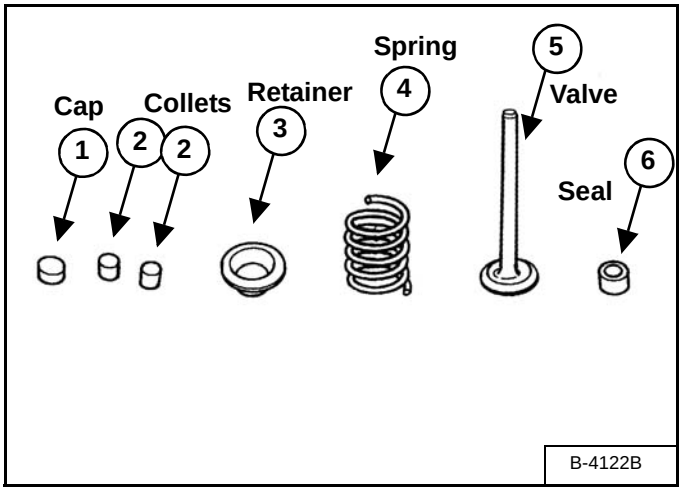
Cylinder Head Disassembly And Assembly

Figure 70-80-6



Use a valve spring compressor to compress the valve spring **[Figure 70-80-6]**.

Figure 70-80-7

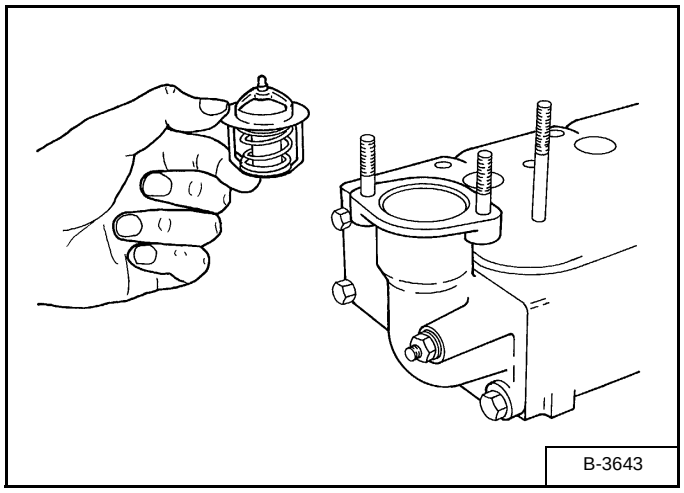


Remove the valve cap (Item 1) **[Figure 70-80-6]** & **[Figure 70-80-7]** and valve spring collet (Item 2) **[Figure 70-80-6]** & **[Figure 70-80-7]**.

Remove the valve spring retainer (Item 3) **[Figure 70-80-6]** & **[Figure 70-80-7]** and the spring (Item 4) **[Figure 70-80-6]** & **[Figure 70-80-7]**.

Remove the seal (Item 6) **[Figure 70-80-6]** & **[Figure 70-80-7]** and valve (Item 5) **[Figure 70-80-6]** & **[Figure 70-80-7]**.

Figure 70-80-8



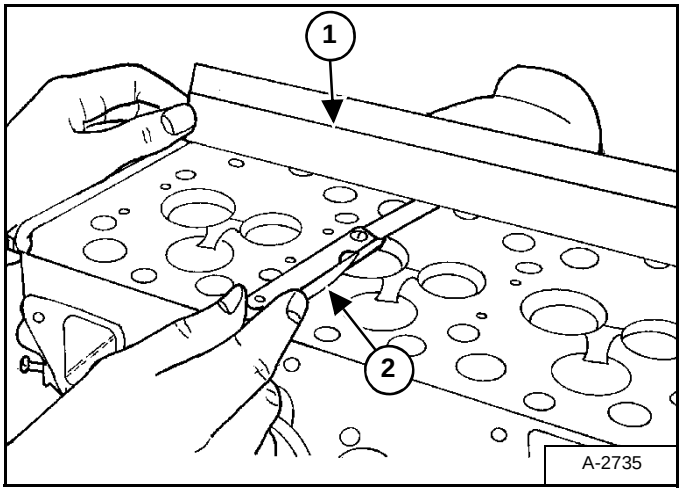
Remove the thermostat housing. Remove the thermostat from the cylinder head **[Figure 70-80-8]**.

The thermostat will start to open at 157° to 163°F (70° to 73° C) and be fully open at 185°F (85°C).

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Cylinder Head Servicing

Figure 70-80-9

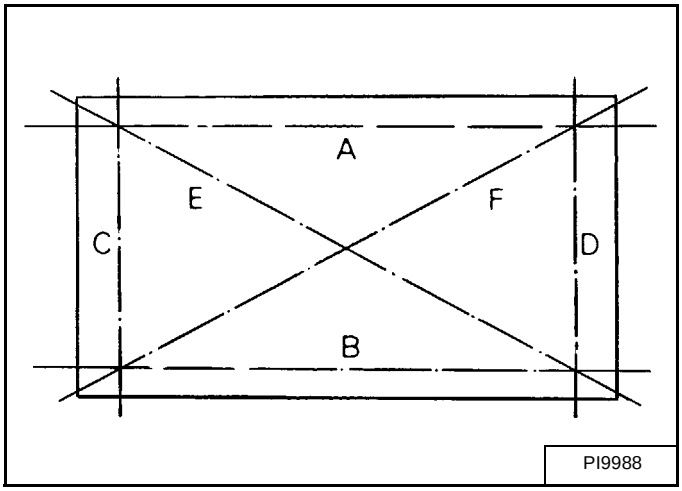


Put a straight edge (Item 1) **[Figure 70-80-9]** on the cylinder head.

NOTE: Do not put the straight edge across combustion chambers.

Put a feeler gauge (Item 2) **[Figure 70-80-9]** between the straight edge and the surface of the cylinder head.

Figure 70-80-10

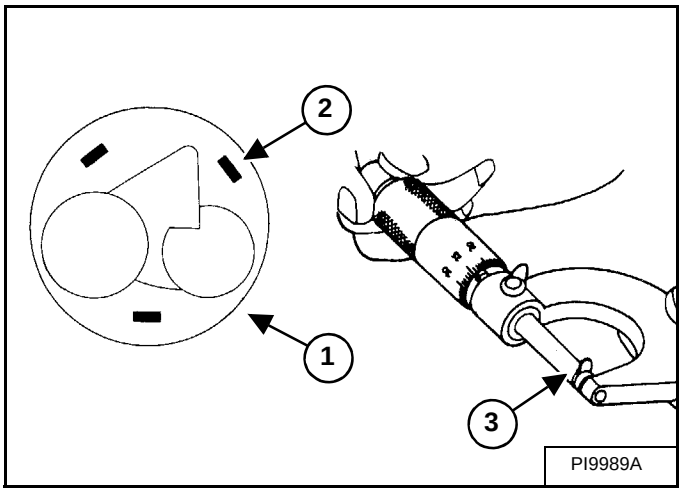


Put the straight edge on the cylinder head's 4 sides and 2 diagonal as shown in figure **[Figure 70-80-10]**.

The maximum distortion of the head surface is ± 0.0019 in. (± 0,05 mm) in 19.700 in. (500 mm). If the measurement exceeds the specification, replace the cylinder head.

Cylinder Head Top Clearance

Figure 70-80-11



Install the cylinder head gasket. Put the piston (Item 1) **[Figure 70-80-11]** being checked at T.D.C.

Put 3 pieces of 0.06 in. (1,5 mm) diameter solder (Item 2) **[Figure 70-80-11]** on the top of the piston. Use grease to hold them in position.

NOTE: Put the solder in position so they do not touch the valves.

Turn the piston to bottom dead center.

Install the cylinder head and tighten to the correct torque in the correct sequence. See Cylinder Head Removal And Installation on Page 70-80-1

Turn the crankshaft until the piston exceeds T.D.C. Remove the cylinder head.

Remove the solder wire (Item 3) **[Figure 70-80-11]** and measure it.

If the measurement exceeds the specifications, check the oil clearance of the crank pin journal or the piston pin.

Top Clearance - 0.0217 to 0.0276 in. (0,55 to 0,7 mm)

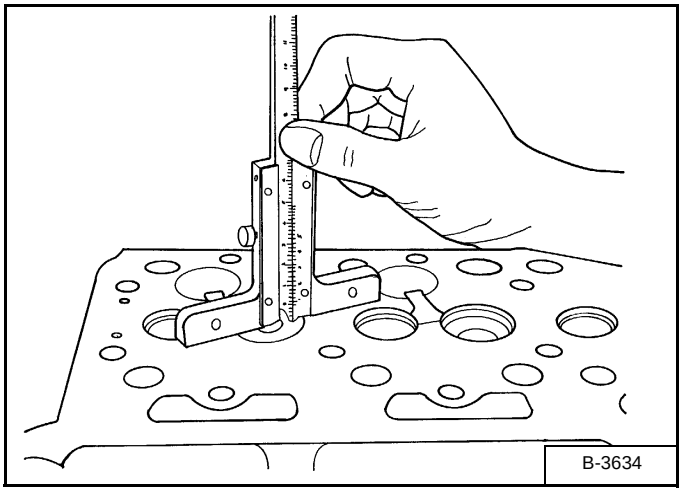
https://www.pdfmanual4trucks.com/

Valve Guide Checking

Remove the valve and spring from the cylinder head. (See Cylinder Head Disassembly And Assembly on Page 70-80-3)

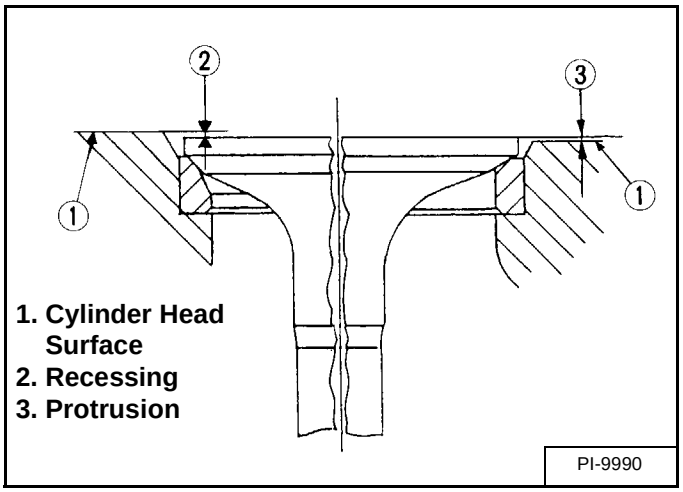
Clean the valve seat and combustion chamber.

Figure 70-80-12



Install the valve into the guide. Measure the valve recessing or protrusion with a depth gauge **[Figure 70-80-12]**.

Figure 70-80-13



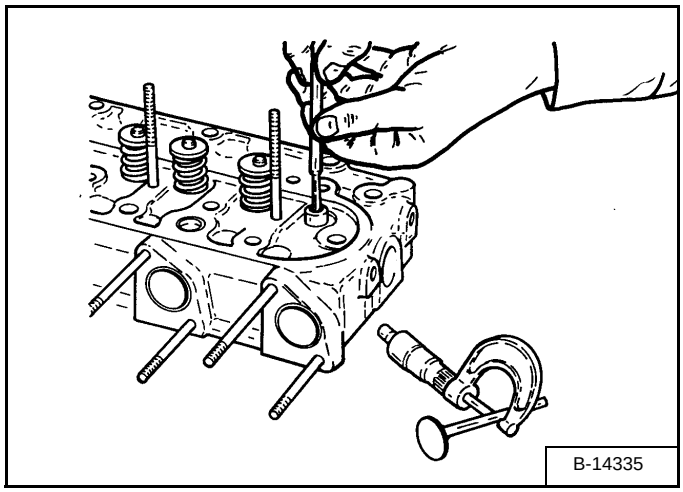
1. Cylinder Head Surface
2. Recessing
3. Protrusion

If the measurement exceeds the allowable limit, replace the valve or cylinder head **[Figure 70-80-13]**.

Protrusion	0.002 in. (0,05 mm)
Recessing	0.0059 in. (0,15 mm)
Allowable Limit (Recessing)	0.016 in. (0,4 mm)

Remove the carbon from the valve guide.

Figure 70-80-14



Measure the valve stem O.D. **[Figure 70-80-14]**.

Measure the valve guide I.D. **[Figure 70-80-14]**.

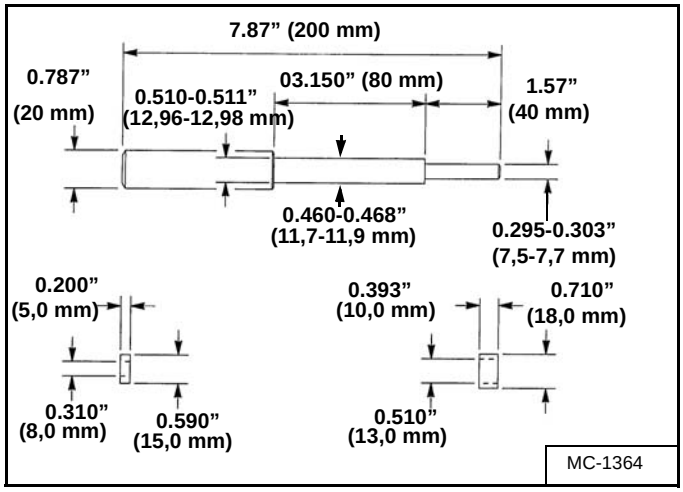
Calculate the clearance. If the clearance exceeds the allowable limit, replace the valve and/or valve guide.

Valve Guide I.D.	0.3156 to 0.3161 in. (8,015 to 8,03 mm)
Valve Stem O.D.	0.3134 to 0.3140 in. (7,96 to 7,975 mm)
Clearance Between Valve Stem and Guide	0.0016 to 0.0026 in. (0,04 to 0,07 mm)
Allowable Limit	0.0039 in. (0,1 mm)

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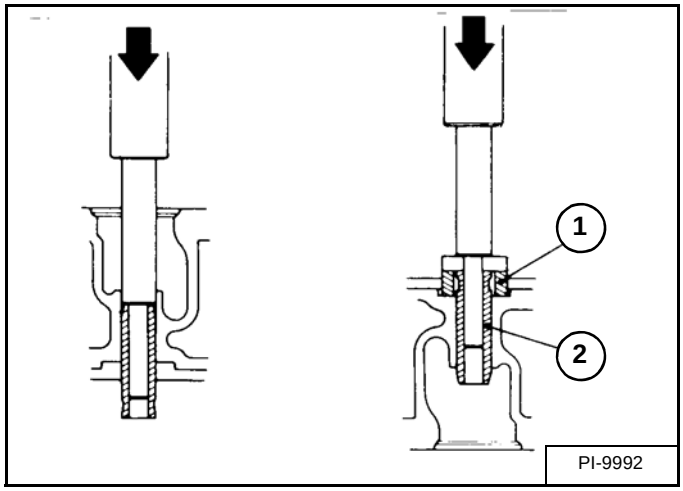
Valve Guide Checking (Cont'd)

Figure 70-80-15



To remove and replace the valve guide, make the driver tool as shown in figure **[Figure 70-80-15]**.

Figure 70-80-16



Press the used valve guide out of the cylinder head using the special driver tool **[Figure 70-80-16]**.

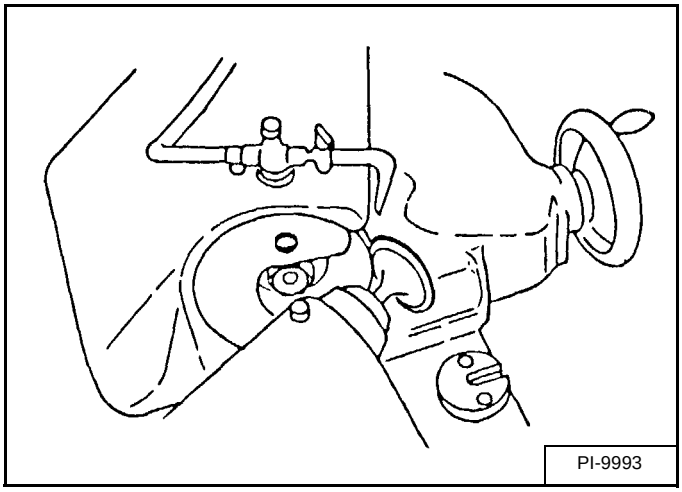
Put oil on the outside diameter of the new valve guide. Press the new valve guide into the cylinder head from the top side. Use the special driver tools (Items 1 & 2) **[Figure 70-80-16]**, press the new guide until the tool contacts the cylinder head.

Ream the valve guide to the correct specifications.

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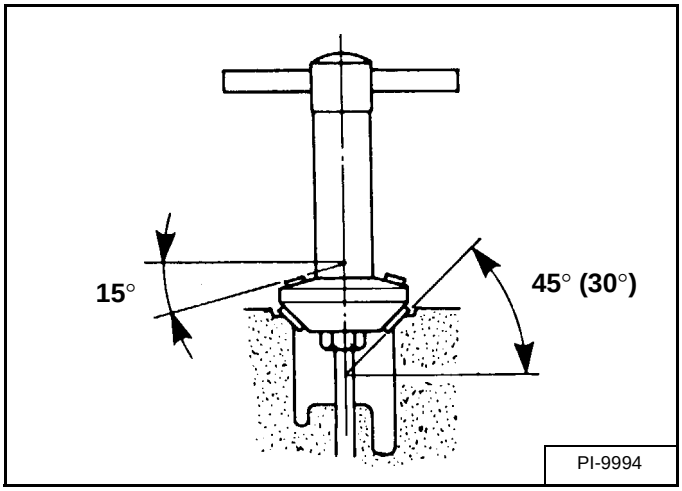
Reconditioning The Valve And Valve Seat

Figure 70-80-17



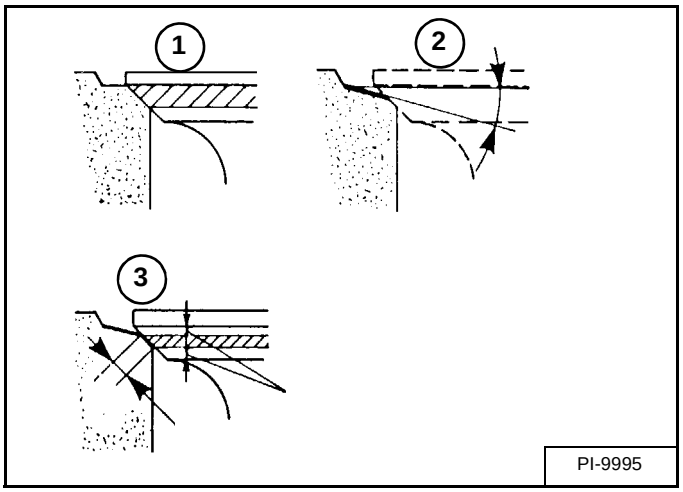
Grind the valve face to the correct angle using a valve refacer **[Figure 70-80-17]**.

Figure 70-80-18



Grind the valve seat surface in the cylinder head to the correct angle **[Figure 70-80-18]**.

Figure 70-80-19



Check the seat surface and valve face (Item 1) **[Figure 70-80-19]**.

If the seat surface is too wide, use a 15 degree cutter on the exhaust or a 30 degree cutter on the intake valve seats (Item 2) to get the correct width (Item 3) **[Figure 70-80-19]**.

Valve Seat Width

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

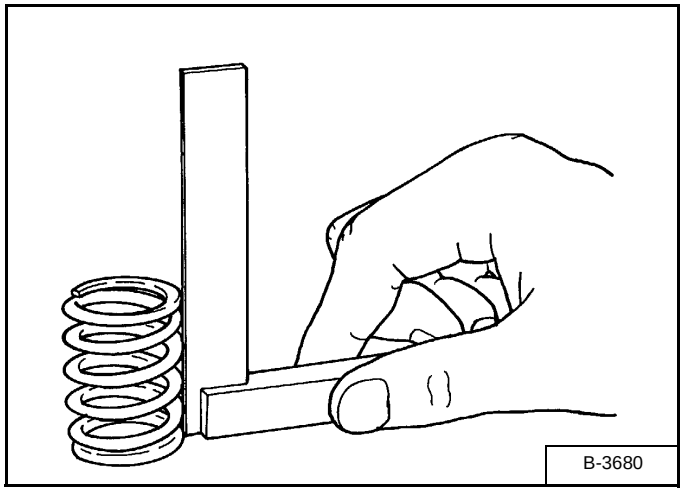
Valve Seat & Face Angle

Intake	60°
Exhaust	45°

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Valve Spring

Figure 70-80-20



Measure the length of the valve spring. If the measurement is less than the allowable limit, replace the spring **[Figure 70-80-20]**.

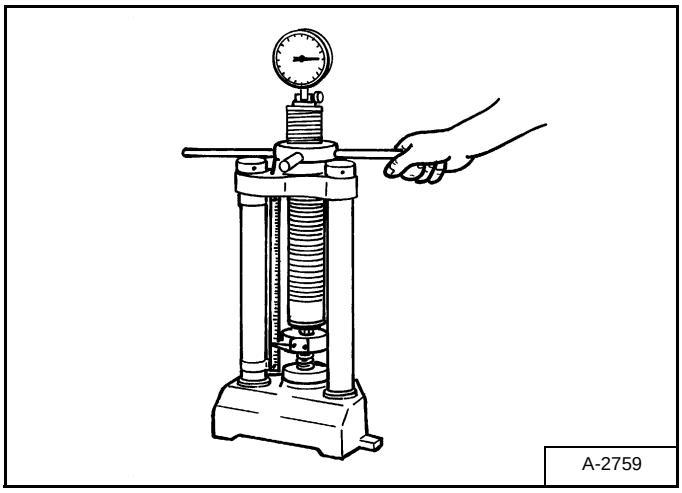
Free Length	1.6417 to 1.6614 in. (41,7 to 42,2 mm)
Allowable Limit	1.622 in. (41,2 mm)

Put the spring on a flat surface, place a square on the side of the spring **[Figure 70-80-20]**.

Rotate the spring and measure the maximum tilt. If the measurement excess the allowable limit, replace the spring.

Tilt	0.039 in. (1,0 mm)

Figure 70-80-21



Put the spring on a tester and compress to specified length **[Figure 70-80-21]**.

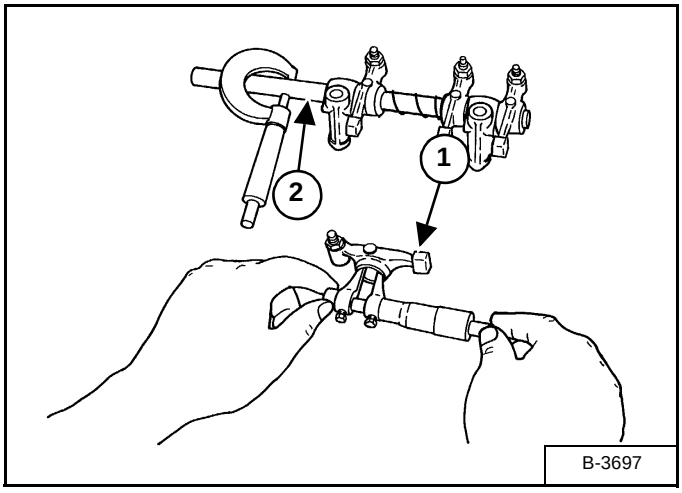
Read the compressed load on the gauge. If the measurement exceeds allowable limit, replace the spring.

Setting Length	1.378 in. (35,0 mm)
Setting Load	26.4 lb. (117,4 N)
Allowable Limit	22.5 lb. (100,0 N)

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Rocker Arm And Shaft Checking

Figure 70-80-22



Measure the rocker arm I.D. (Item 1) **[Figure 70-80-22]** with an inside micrometer.

Measure the rocker arm shaft O.D. (Item 2) **[Figure 70-80-22]** with an outside micrometer.

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

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

Oil Clearance Between Rocker Arm & Shaft	0.006 to 0.0018 in. (0,016 to 0,045 mm)
Allowable Limit	0.0059 in. (0,15 mm)
Rocker Arm Shaft O.D.	0.5501 to 0.5506 in. (13,973 to 13,984 mm)
Rocker Arm I.D.	0.5512 to 0.5519 in. (14,0 to 14,18 mm)

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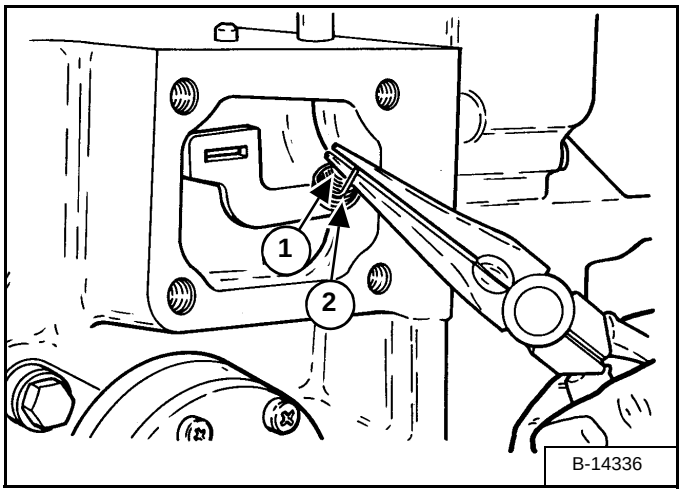
RECONDITIONING THE ENGINE (S/N 562611001 AND ABOVE) (CONT'D)

Timing Gearcase Cover Removal And Installation

Remove the fuel injection pump. (See ENGINE COMPONENTS & TESTING (S/N 562611001 & ABOVE) on Page 70-50-1 or See ENGINE COMPONENTS & TESTING (S/N 562811001 & ABOVE, 563111001 & ABOVE AND 563211001 & ABOVE) on Page 70-51-1)

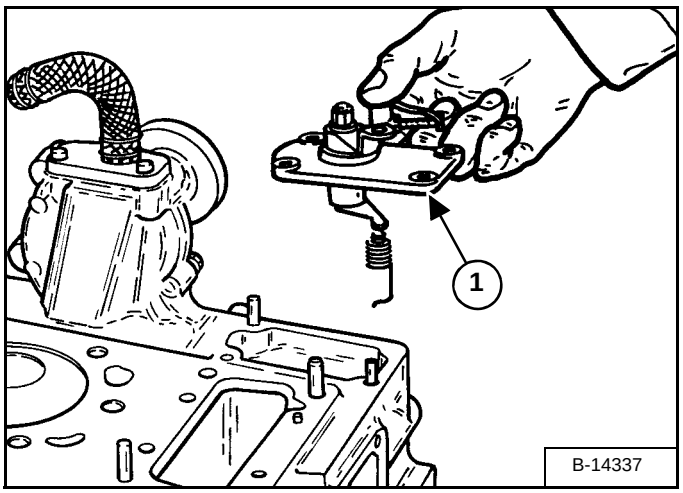
Remove the cylinder head, rocker arms and push rods. (See Cylinder Head Removal And Installation on Page 70-80-1)

Figure 70-80-23



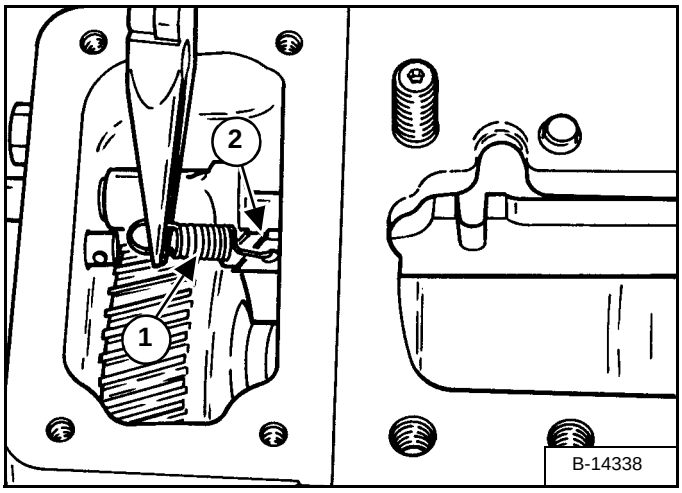
Disconnect the 2 governor springs (Items 1 & 2) **[Figure 70-80-23]**.

Figure 70-80-24



Remove the speed control plate (Item 1) **[Figure 70-80-24]** with the governor springs.

Figure 70-80-25



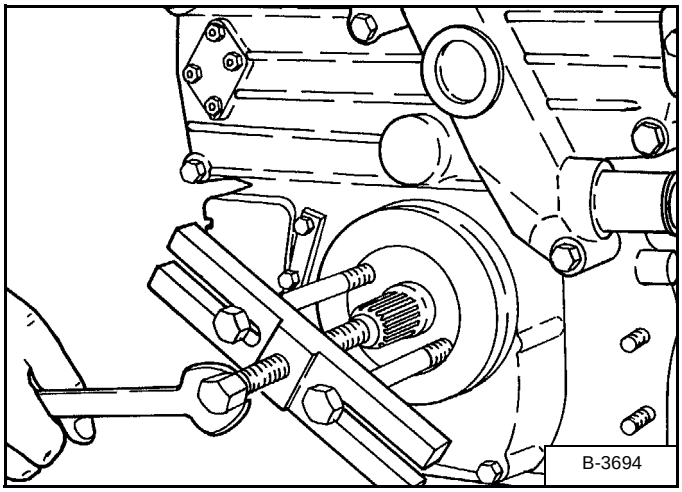
Remove the start spring (Item 1) from the fork lever (Item 2) **[Figure 70-80-25]**.

Installation: Be careful; do not drop the spring into the gearcase.

Remove the crankshaft pulley nut.

Installation: Tighten the nut to 101 to 116 ft.-lb. (137 to 157 N•m) torque.

Figure 70-80-26

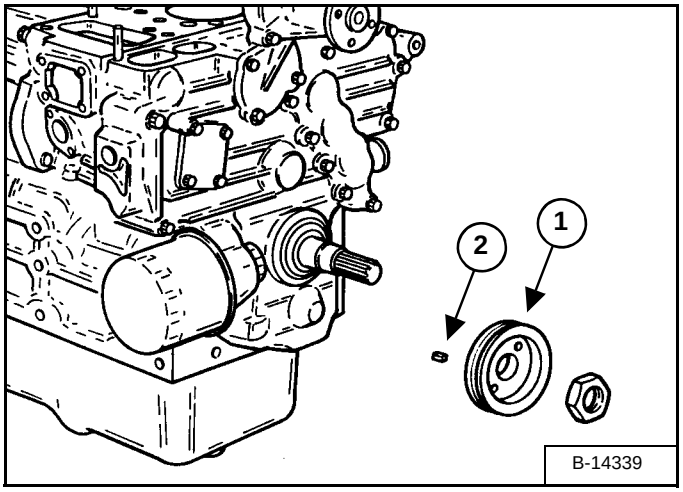


Use a puller and remove the crankshaft pulley **[Figure 70-80-26]**.

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Timing Gearcase Cover Removal And Installation (Cont'd)

Figure 70-80-27

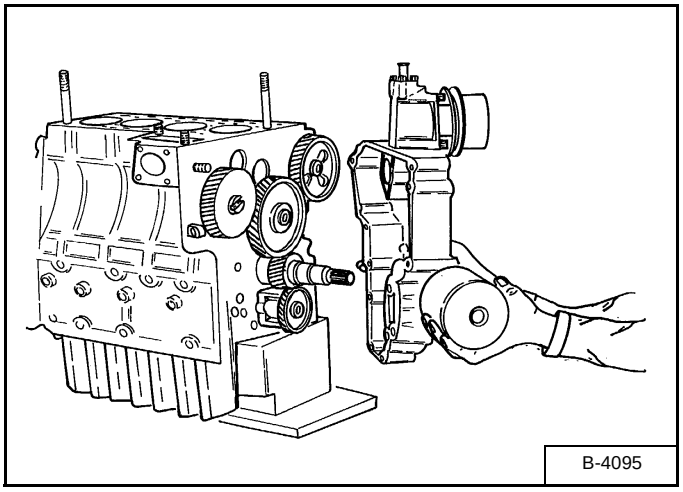


Remove the crankshaft pulley (Item 1) and key (Item 2) **[Figure 70-80-27]**.

Remove the bolts from the timing gearcase cover.

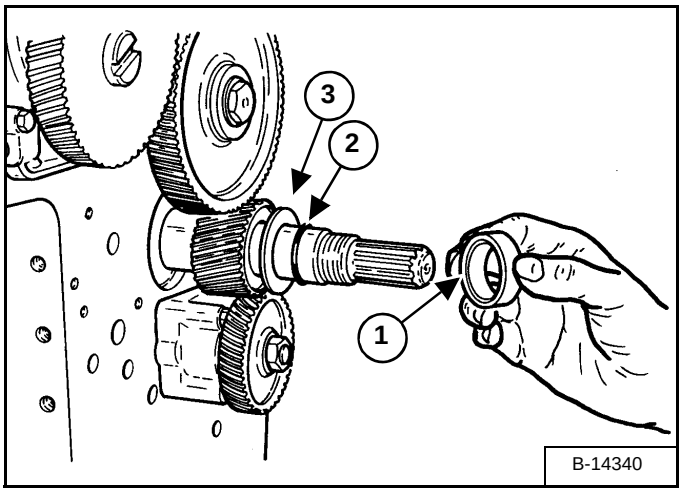
Installation: Tighten the bolts to 13 to 15 ft.-lb. (18 to 23 N•m) torque.

Figure 70-80-28



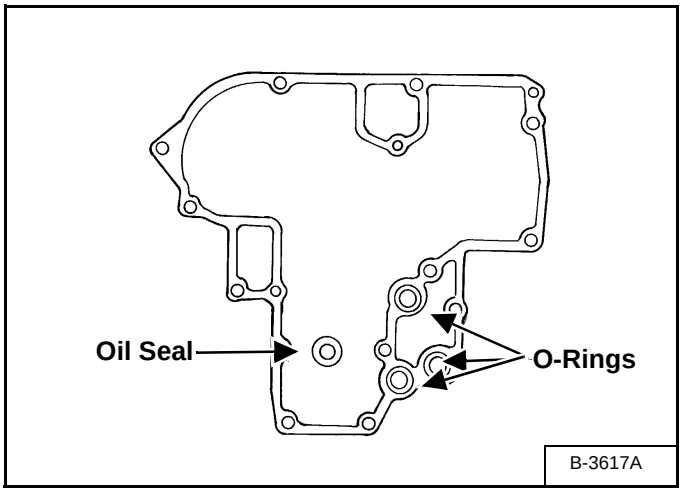
Remove the timing gearcase cover **[Figure 70-80-28]**.

Figure 70-80-29



Remove the crankshaft collar (Item 1), O-ring (Item 2) and oil slinger (Item 3) **[Figure 70-80-29]**.

Figure 70-80-30



Installation: Install new O-rings and oil seal into the timing gearcase cover **[Figure 70-80-30]**.

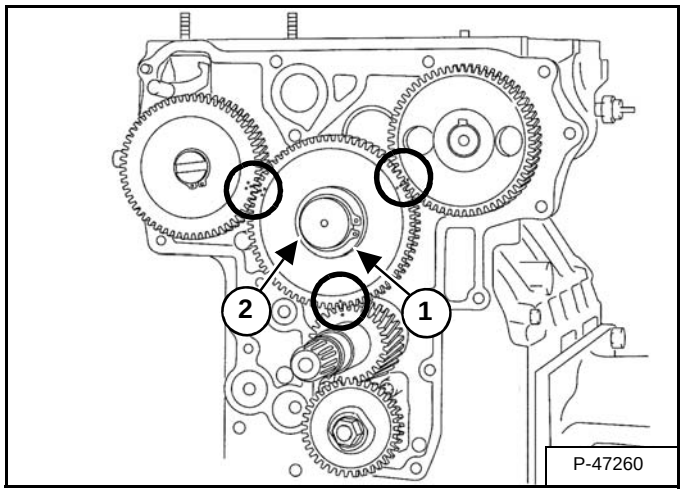
NOTE: When a new timing gearcase cover is installed, to establish the correct position of the injection pump fuel rack stop before removing it from the old timing gearcase cover, the distance from the machined surface of the gearcase (gasket surface) to the end of the stop should be measured. The stop should then be installed in the new gearcase and set to the same distance that was previously measured. Do not try to test operate the engine to establish if it has enough power. The adjustment must be set by a qualified service personnel for the injection pump.

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Idler Gear And Camshaft Removal And Installation

Remove the timing gearcase cover. (See Timing Gearcase Cover Removal And Installation on Page 70-80-10)

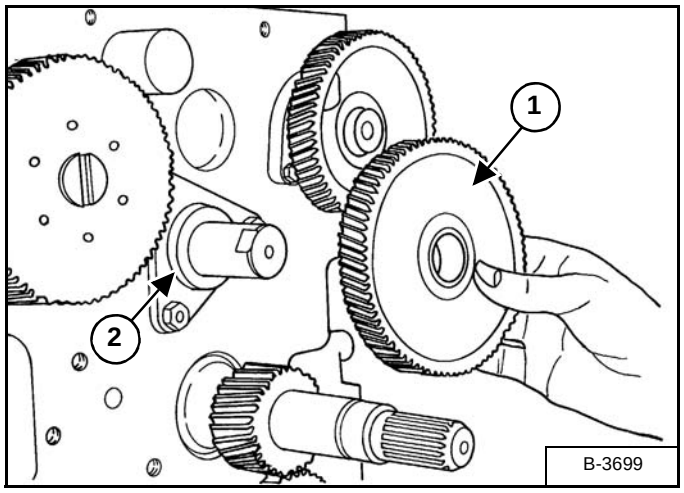
Figure 70-80-31



Remove the snap ring (Item 1) and collar from the idler gear shaft (Item 2) **[Figure 70-80-31]**.

Installation: Make sure the timing marks are in correct alignment when installing the timing gears **[Figure 70-80-31]**.

Figure 70-80-32



Remove the idler gear (Item 1) **[Figure 70-80-32]**.

Remove the idler gear collar (Item 2) **[Figure 70-80-32]**.

Remove the idler gear shaft mounting bolts.

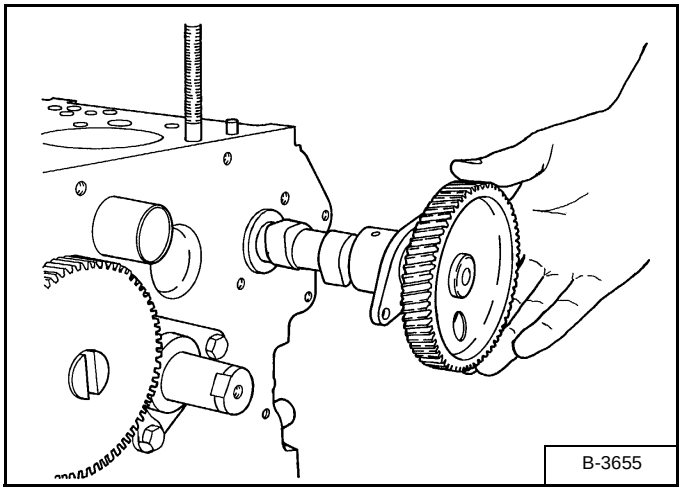
Installation: Tighten the mounting bolts to 17 to 20 ft.-lb (23 to 27 N•m) torque.

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

Remove the bolts.

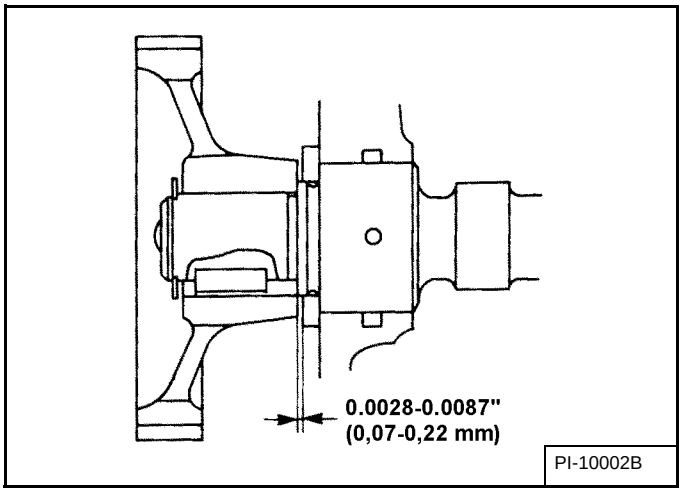
Installation: Tighten the camshaft retainer bolts to 17 to 20 ft.-lb. (23 to 27 N•m) torque.

Figure 70-80-33



Remove the camshaft from the engine block **[Figure 70-80-33]**.

Figure 70-80-34



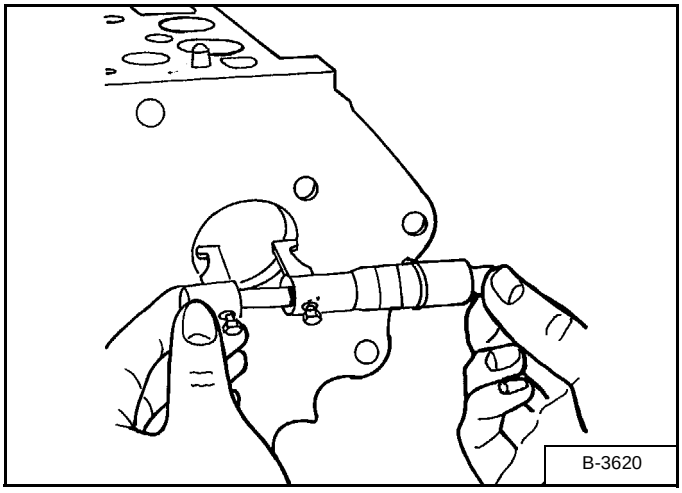
Installation: Check the camshaft end play. If clearance exceeds the allowable limit, replace the camshaft retainer plate **[Figure 70-80-34]**.

Camshaft End Play	0.0028 to 0.0087 in. (0,07 to 0,22 mm)
Allowable Limit	0.0118 in. (0,3 mm)

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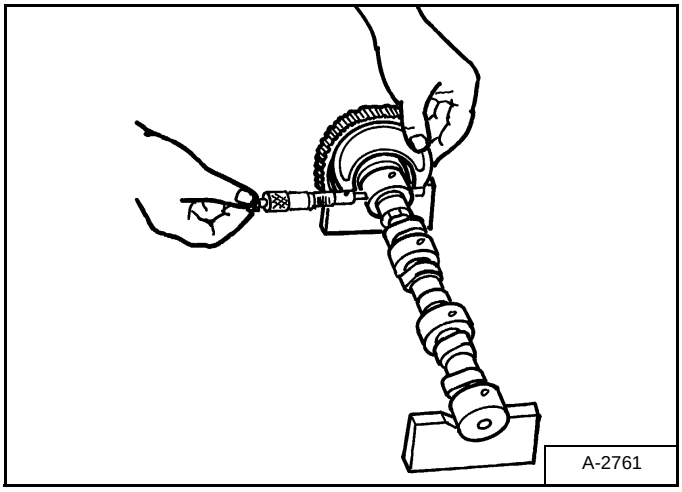
Camshaft Servicing

Figure 70-80-35



Measure the camshaft bearing in the engine block **[Figure 70-80-35]**.

Figure 70-80-36

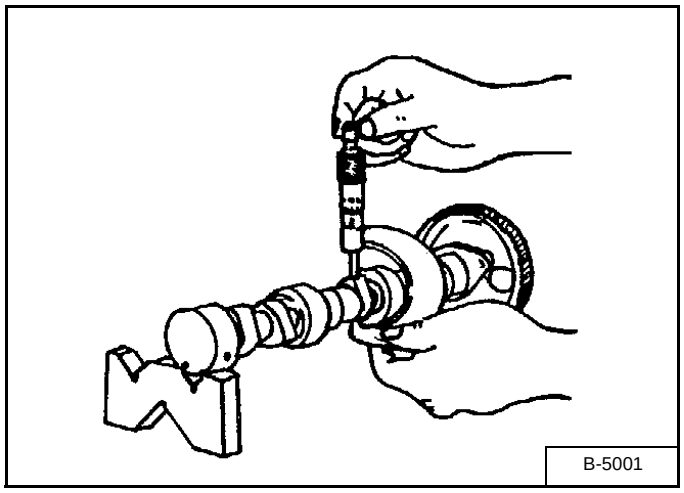


Measure the camshaft journal **[Figure 70-80-36]**.

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

Bearing I.D.	1.5748 to 1.5758 in. (40,0 to 40,025 mm)
Journal O.D.	1.5722 to 1.5728 in. (39,934 to 39,950 mm)
Oil Clearance of Camshaft Journal	0.002 to 0.0036 in. (0,05 to 0,091 mm)
Allowable Limit	0.0059 in. (0,15 mm)

Figure 70-80-37

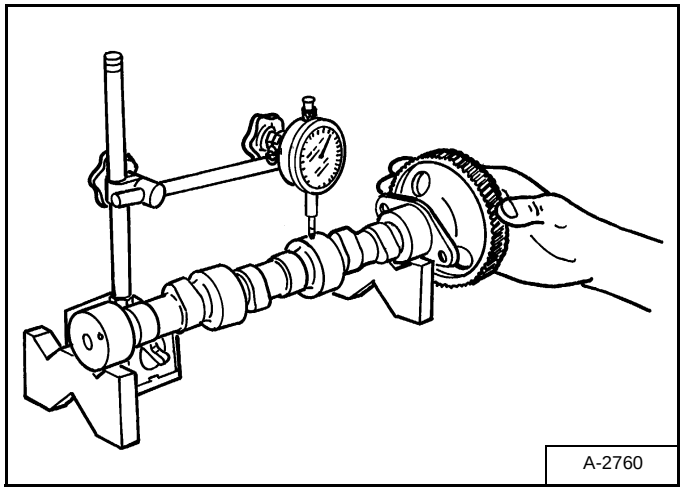


Measure the cam lobes at their highest point **[Figure 70-80-37]**.

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

Cam Lobe Height (Int.)	1.3346 in. (33,9 mm)
Allowable Limit (Int.)	1.3328 in. (33,85 mm)
Cam Lobe Height (Exh.)	1.3177 in. (33,47 mm)
Allowable Limit (Exh.)	1.3157 in. (33,42 mm)

Figure 70-80-38



Put the camshaft in V-blocks. Install a dial indicator **[Figure 70-80-38]**.

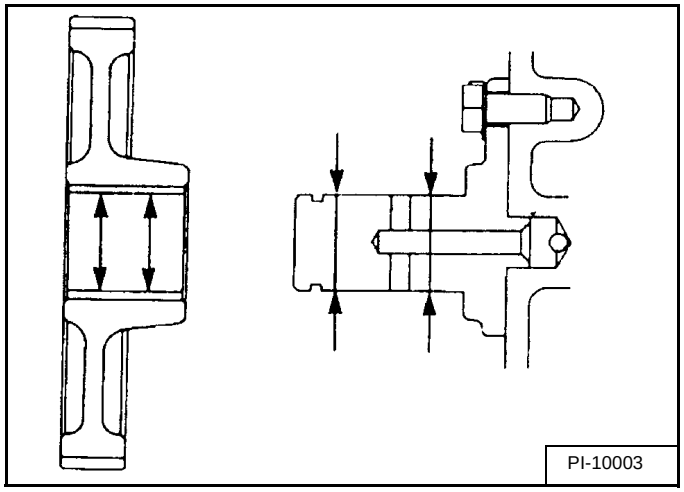
Turn the camshaft at a slow rate. If the misalignment exceeds the allowable limit, replace the camshaft.

Camshaft Alignment Allowable Limit	0.00039 in. (0,01 mm)

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Idler Gear And Shaft Servicing

Figure 70-80-39



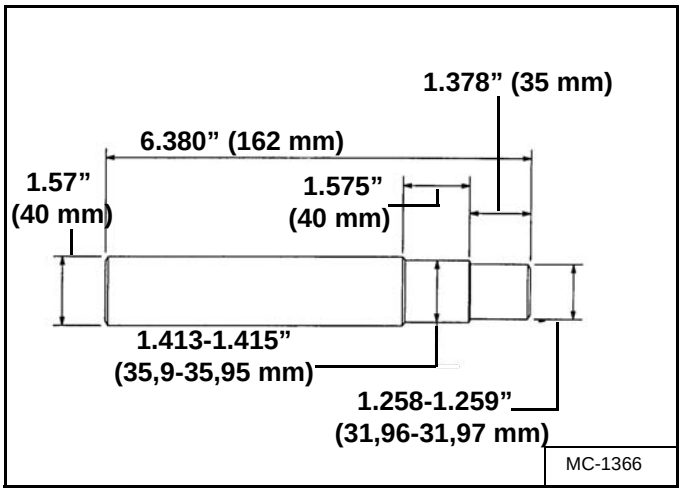
Measure the O.D. of the idler gear shaft **[Figure 70-80-39]**.

Measure the I.D. of the idler gear bushing **[Figure 70-80-39]**.

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

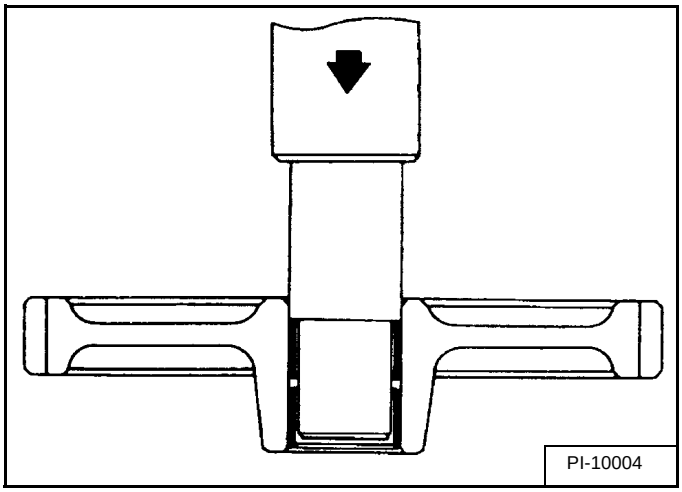
Idler Gear Shaft O.D.	1.4944 to 1.4951 in. (31,959 to 31,975 mm)
Idler Gear Bushing I.D.	1.4961 to 1.4970 in. (38,0 to 38,025 mm)
Clearance Between Idler Shaft & Gear Bushing	0.001 to 0.0026 in. (0,025 to 0,066 mm)
Allowable Limit	0.0039 in. (0,1 mm)

Figure 70-80-40



To replace the idler gear bushing, make a driver tool as shown in figure **[Figure 70-80-40]**.

Figure 70-80-41



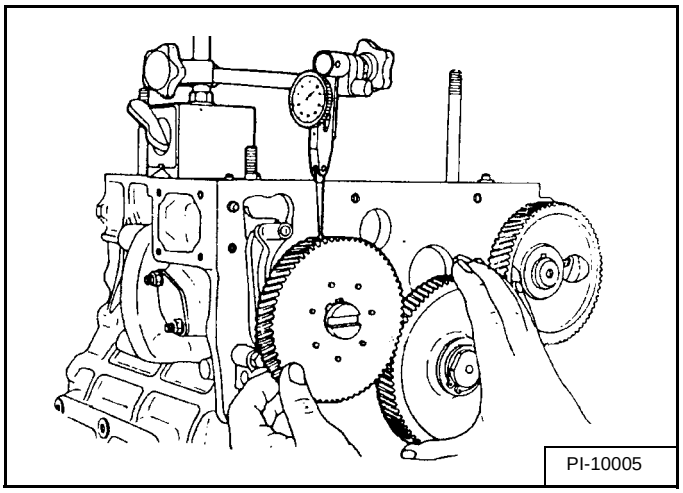
Use a press and special driver tool, to remove the old bushing and install the new bushing **[Figure 70-80-41]**.

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Timing Gears Checking Backlash

When the gears are installed, check the backlash of the gears.

Figure 70-80-42



Install a dial indicator **[Figure 70-80-42]**.

Hold one gear while turning the other gear **[Figure 70-80-42]**.

If the backlash exceeds the allowable limit, check the oil clearance of the shaft and gear. If the oil clearance is correct, replace the gear.

Crank Gear & Idler Gear	0.0016 to 0.0044 in. (0,0415 to 0,1122)
Allowable Limit	0.0059 in. (0,15 mm)
Cam Gear & Idler Gear	0.0016 to 0.0045 in. (0,0415 to 0,1154 mm)
Allowable Limit	0.059 in. (0,15 mm)
Injection Pump Gear & Idler Gear	
	0.0016 to 0.0045 in. (0,0415 to 0,1154 mm)
Allowable Limit	0.0059 in. (0,15 mm)
Oil Pump Gear & Crankgear	0.0016 to 0.0043 in. (0,0415 to 0,109 mm)
Allowable Limit	0.0059 in. (0,15 mm)

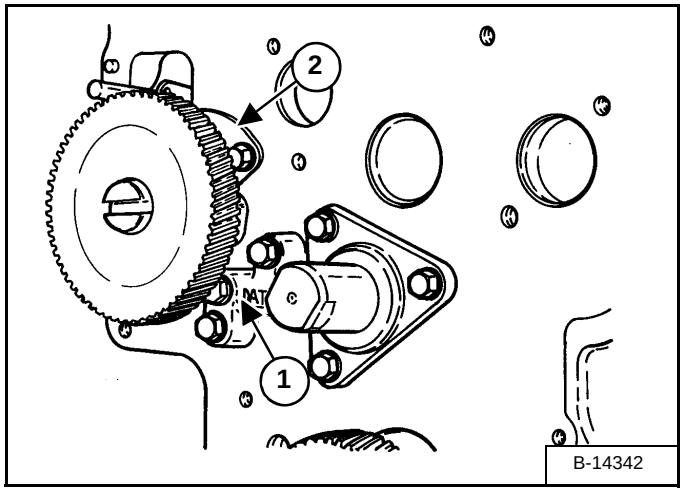
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Fuel Camshaft Removal And Installation

Remove the timing gearcase cover. (See Timing Gearcase Cover Removal And Installation on Page 70-80-10)

Remove the idler gear. (See Idler Gear And Camshaft Removal And Installation on Page 70-80-12)

Figure 70-80-43

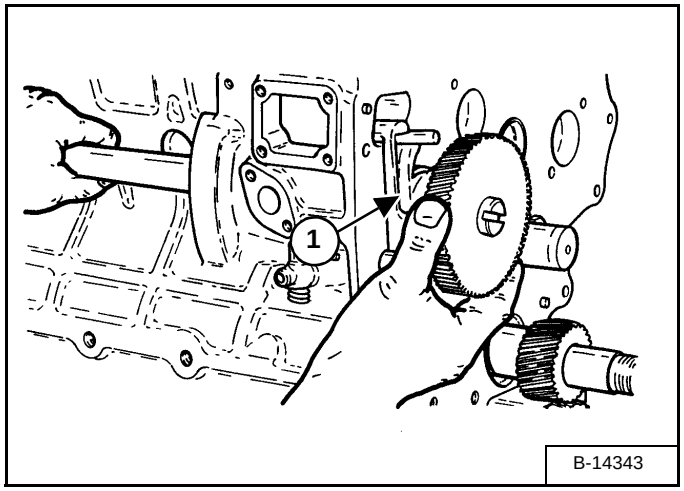


Remove the bolt (Item 1) from the retainer plate (Item 2) **[Figure 70-80-43]**.

Installation: Tighten the bolt to 60 to 72 in.-lb. (6,8 to 8,1 N•m) torque.

Remove the fuel camshaft retainer plate (Item 2) **[Figure 70-80-43]**.

Figure 70-80-44

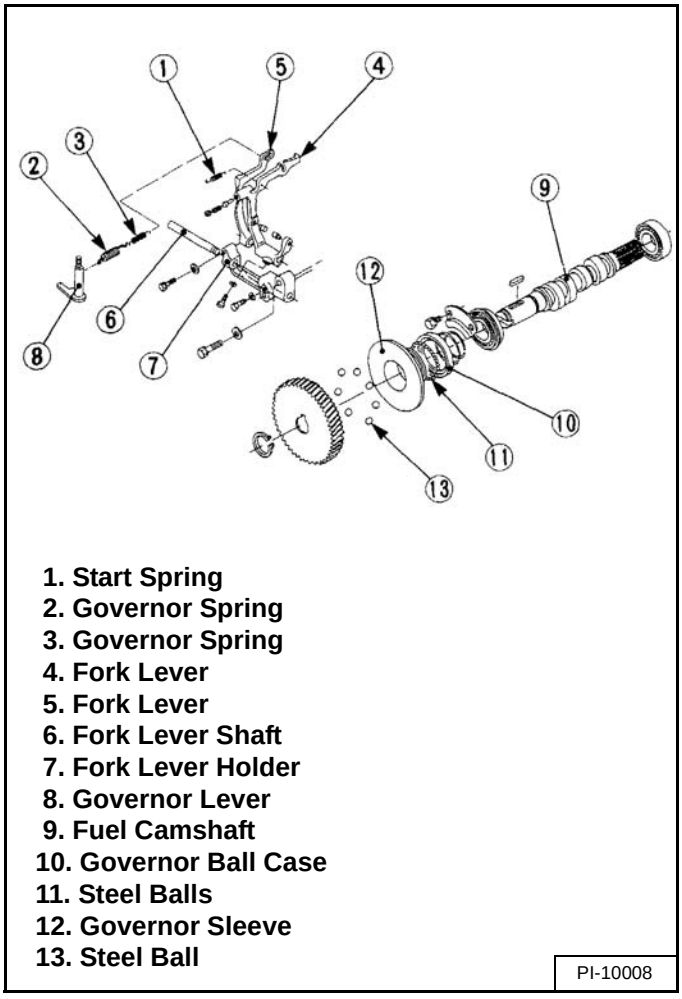


Remove the fuel camshaft and fork lever assembly (Item 1) **[Figure 70-80-44]** at the same time.

Fuel Camshaft Governor

The governor serves to keep the engine speed constant by automatically adjusting the amount of fuel supplied to the engine according to changes in the load.

Figure 70-80-45



Disassemble and assemble the governor and fuel camshaft as shown **[Figure 70-80-45]**.

Check all the parts for wear or damage and replace as needed.

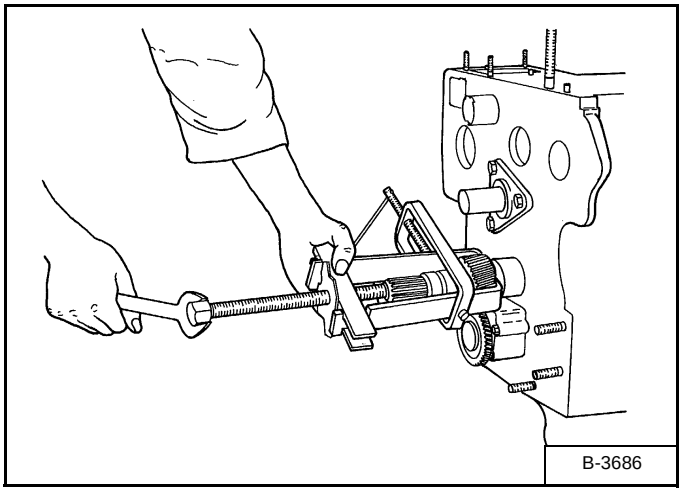
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Crankshaft Gear Removal And Installation

Remove the timing gearcase cover. (See Timing Gearcase Cover Removal And Installation on Page 70-80-10)

Remove the idler gear. (See Idler Gear And Camshaft Removal And Installation on Page 70-80-12)

Figure 70-80-46



Remove the crankshaft gear with a puller **[Figure 70-80-46]**.

Remove the crankshaft key.

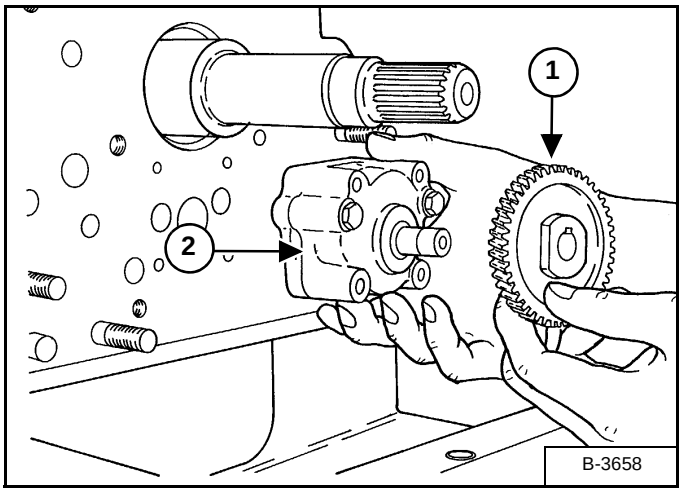
Installation: Install the crankshaft key. Heat the crankshaft gear to 176° F (80°C) and fit it on the crankshaft.

Oil Pump Removal And Installation

Remove the timing gearcase cover. (See Timing Gearcase Cover Removal And Installation on Page 70-80-10)

Remove the crankshaft gear.

Figure 70-80-47



Remove the nut from the oil pump shaft. Use a puller to remove the oil pump gear (Item 1) **[Figure 70-80-47]**.

Installation: Tighten the nut on the oil pump shaft to 46 to 54 ft.-lb. (62 to 73 N•m) torque.

Remove the oil pump mounting bolts. Remove the oil pump (Item 2) **[Figure 70-80-47]**.

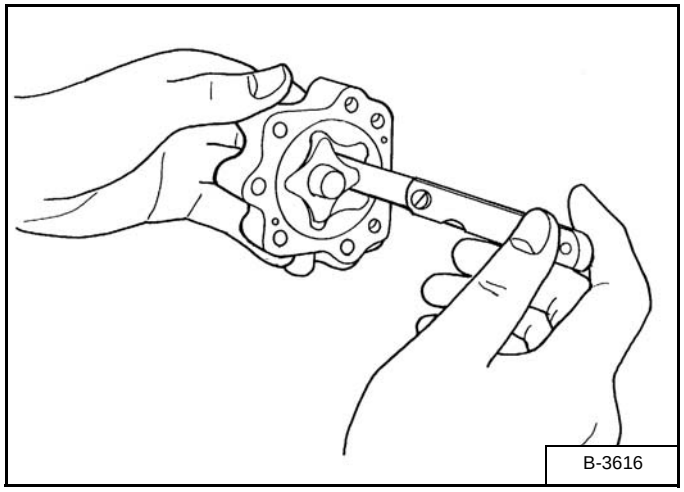
Installation: Tighten the oil pump mounting bolts to 60 to 72 ft.-lb. (6,9 to 8,1 N•m) torque.

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RECONDITIONING THE ENGINE (S/N 562611001 AND ABOVE) (CONT'D)

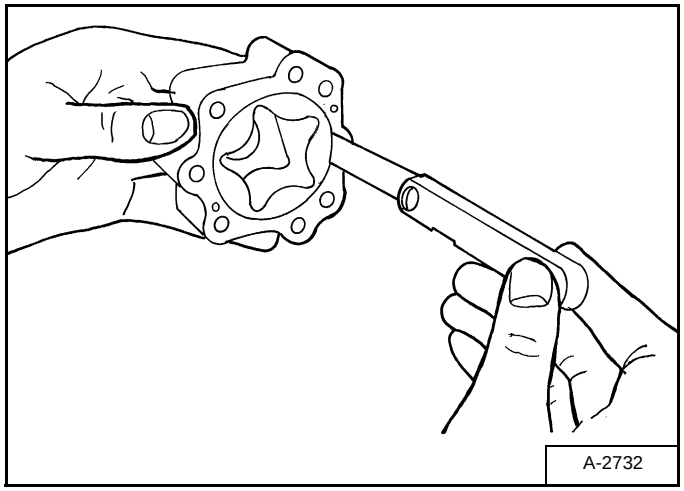
Oil Pump Service

Figure 70-80-48



Measure the clearance between the lobes of the inner rotor and outer rotor **[Figure 70-80-48]**.

Figure 70-80-49



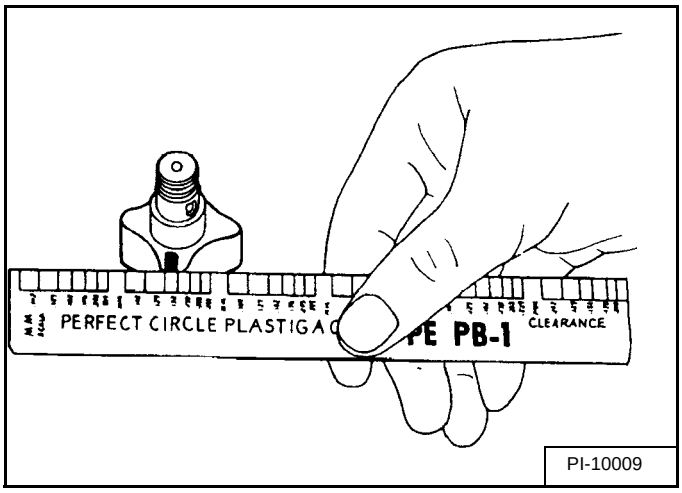
Measure the clearance between the outer rotor and pump body **[Figure 70-80-49]**.

If the clearance exceeds the allowable limit, replace the oil pump.

Clearance Between Inner & Outer Rotor
0.0039 to 0.0063 in.
(0,1 to 0,16 mm)

Clearance Between Outer Rotor & Body
0.0043 to 0.0075 in.
(0,11 to 0,19 mm)

Figure 70-80-50



Put a piece of press gauge on the rotor face **[Figure 70-80-50]**.

Install the cover and tighten the bolts.

Remove the cover carefully. Measure the width of the press gauge **[Figure 70-80-50]**.

If the clearance exceeds the allowable limit replace the oil pump.

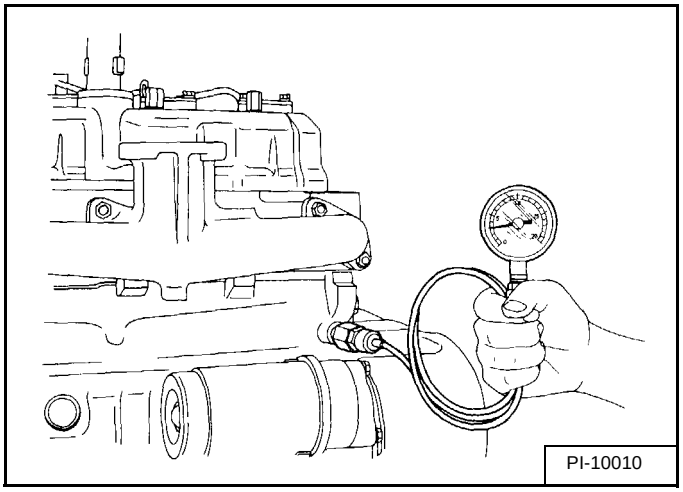
End Clearance 0.0041 to 0.0059 in.
(0,105 to 0,15 mm)

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Checking Engine Oil Pressure

Remove the oil pressure sender.

Figure 70-80-51



Install a pressure gauge **[Figure 70-80-51]**.

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

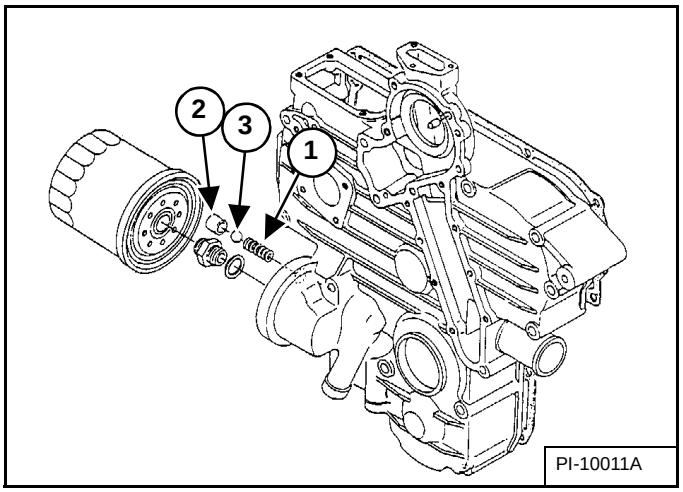
If the oil pressure is less than the allowable limit, check the following items:

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

At Idle Speed Allowable Limit	7 PSI (0,49 bar)
At Rated Speed	43 to 64 PSI (2,97 to 4,41 bar)
Allowable Limit	36 PSI (2,48 bar)

Relief Valve

Figure 70-80-52



Remove the valve seat (Item 2), ball (Item 3), and spring (Item 1) **[Figure 70-80-52]**.

Check the parts for wear or damage and replace as needed.

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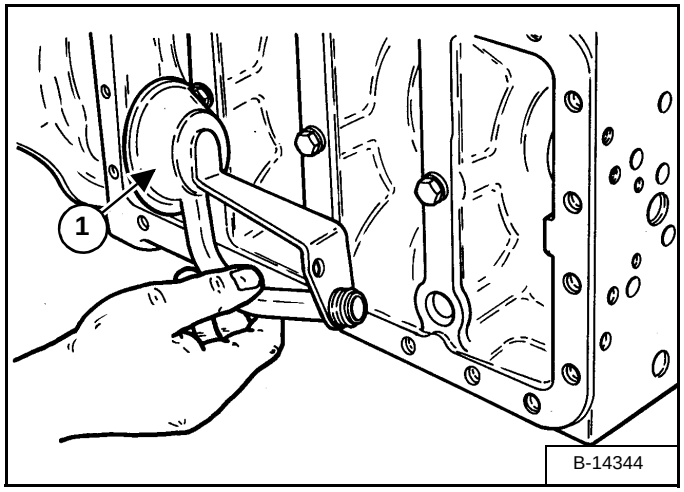
Piston And Connecting Rod Removal And Installation

Remove the cylinder head. (See Cylinder Head Removal And Installation on Page 70-80-1)

Remove the top edge from the cylinder bore with a ridge reamer.

Remove the oil pan.

Figure 70-80-53



Remove the oil pump strainer (Item 1) **[Figure 70-80-53]**.

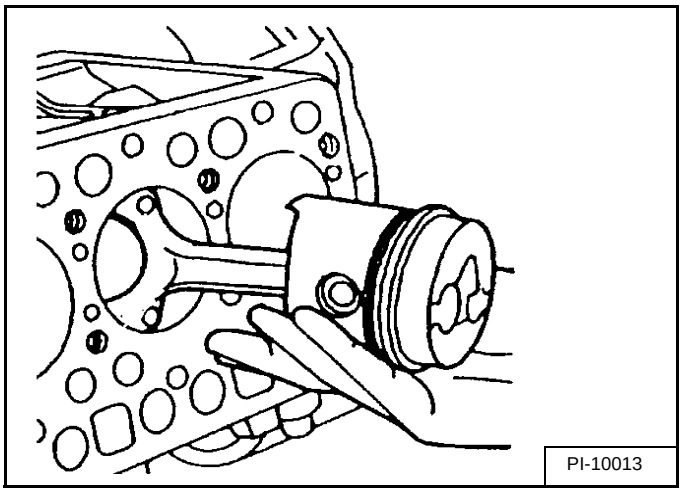
Turn the flywheel and put a pair of connecting rods at bottom dead center.

Remove the connecting rod bolts.

Installation: Tighten the connecting rod bolts to 33-36 ft.-lb. (44-49 N•m) torque.

W/O Flange Bolt	27 to 30 ft.-lb. (37 to 41 N•m)
W/ Flange Bolt	33 to 36 ft.-lb. (45 to 49 N•m)

Figure 70-80-54

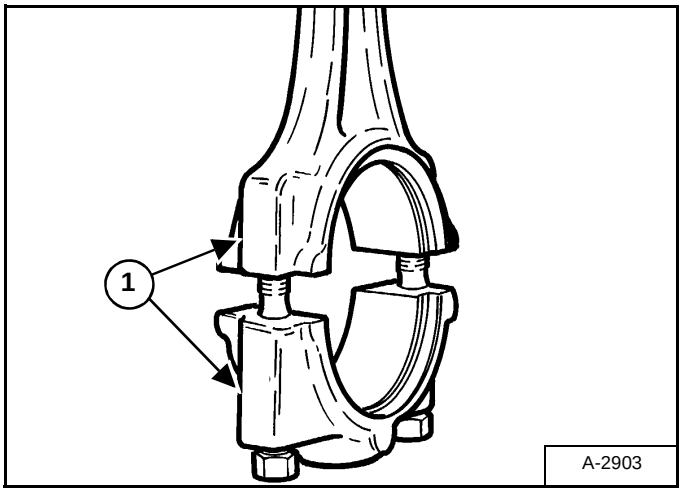


Remove the rod cap and bearing.

Use a hammer handle and push the piston/connecting rod assembly out of the cylinder bore **[Figure 70-80-54]**.

NOTE: Make sure the pistons are marked so they will be returned to the same cylinder bore.

Figure 70-80-55



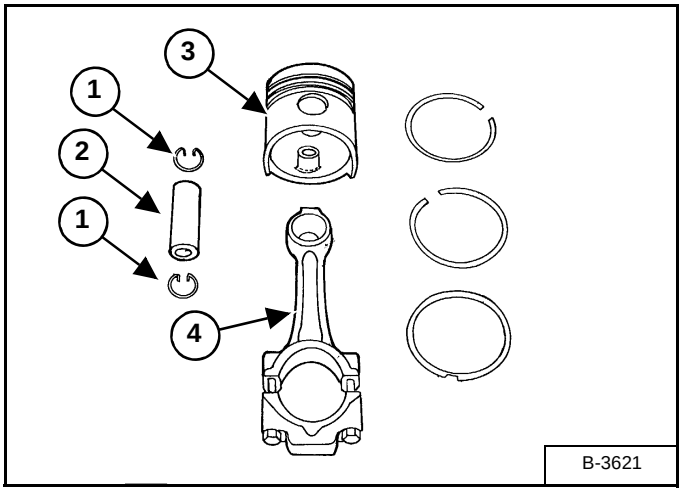
Installation: Make sure the marks on the connecting rod and bearing are aligned when installing the bearing cap **[Figure 70-80-55]**.

Repeat the procedure to remove the other piston/ connecting rod assemblies from the engine block.

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Piston And Connecting Rod Removal And Installation (Cont'd)

Figure 70-80-56

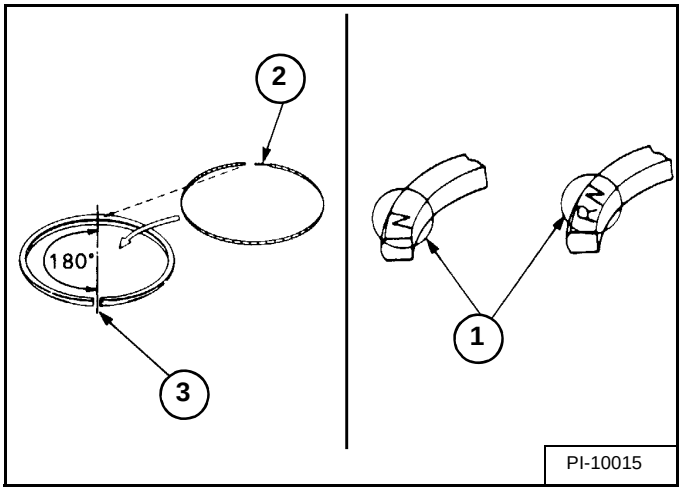


Remove the piston rings **[Figure 70-80-56]**.

Remove the snap ring (Item 1) and piston pin (Item 2) **[Figure 70-80-56]**.

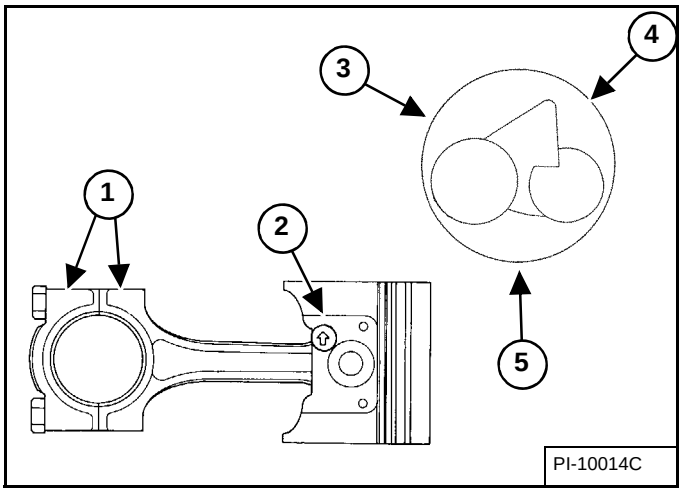
Separate the piston (Item 3) from the connecting rod (Item 4) **[Figure 70-80-56]**.

Figure 70-80-57



Installation: When installing new rings, assemble the ring so the mark (Item 1) near the gap faces the top of the piston. When installing the oil ring, place the expander joint (Item 2) on the opposite side of the oil ring gap (Item 3) **[Figure 70-80-57]**.

Figure 70-80-58

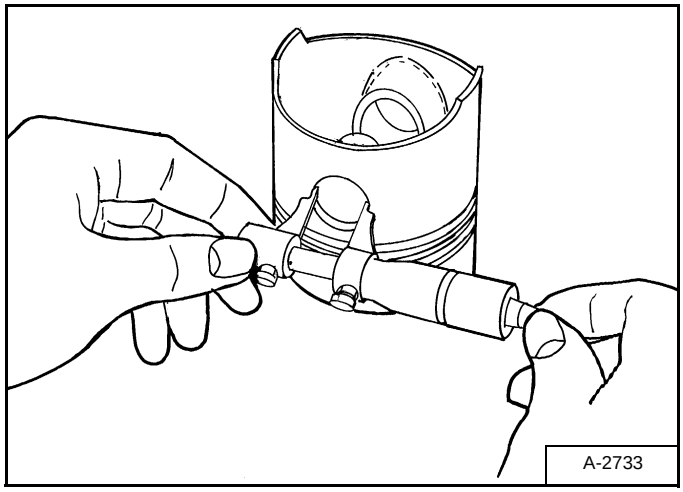


Installation: When reassembling, align the marks (Item 1) on the connecting rod and piston (Item 2). Heat the piston in oil to 176° F. (80° C.) for 10 to 15 minutes and tap the piston pin into position. Place the piston rings so that there are gaps every 120° (Items 3, 4 & 5) **[Figure 70-80-58]** with no gap facing the piston pin in the cylinder.

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Piston And Connecting Rod Servicing

Figure 70-80-59

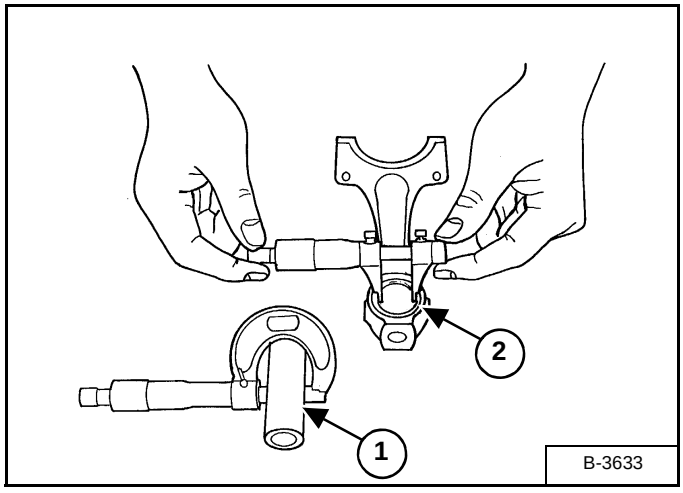


Measure the I.D. of the piston pin bore in both horizontal and vertical directions **[Figure 70-80-59]**.

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

Piston Bore I.D.	0.9843 to 0.9848 in. (25,0 to 25,013 mm)
Allowable Limit	0.9862 in. (25,05 mm)

Figure 70-80-60



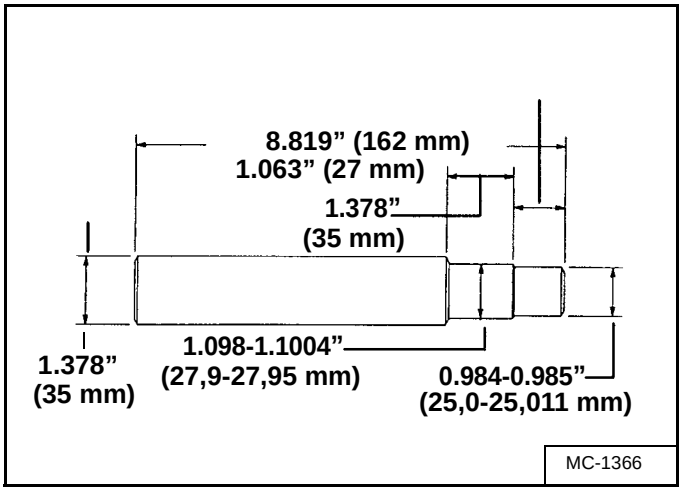
Measure the O.D. of the piston pin (Item 1) **[Figure 70-80-60]**.

Measure the I.D. of the connecting rod small end (Item 2) **[Figure 70-80-60]**.

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

Piston Pin O.D.	0.9843 to 0.9847 in. (25,0 to 25,011 mm)
Bushing I.D.	0.9852 to 0.9858 in. (25,025 to 25,04 mm)
Oil Clearance Between Piston Pin & Bushing	0.0006 to 0.0015 in. (0,014 to 0,038 mm)
Allowable Limit	0.0059 in. (0,15 mm)
Service Replacement Part	0.0006 to 0.003 in. (0,015 to 0,07 mm)

Figure 70-80-61

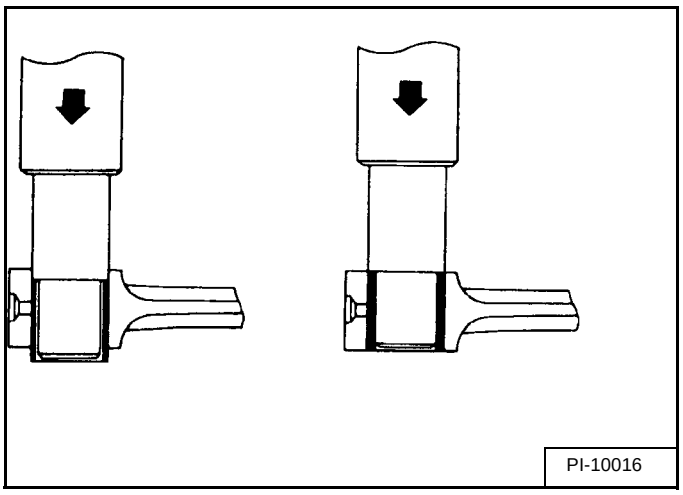


To replace the connecting rod small end bushing, make a driver tool as shown in figure **[Figure 70-80-61]**.

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Piston And Connecting Rod Servicing (Cont'd)

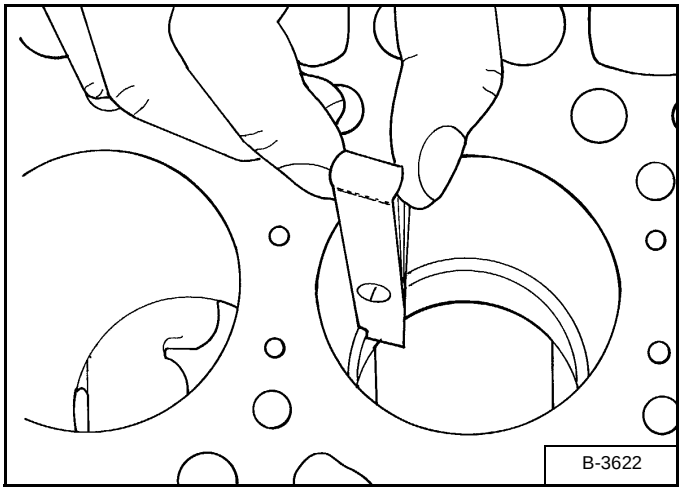
Figure 70-80-62



Use a press and special driver tool to remove the small end bushing **[Figure 70-80-62]**.

Installation: Clean the small end bushing and bore. Put oil on the bushing and press into the connecting rod until it is flush **[Figure 70-80-62]**.

Figure 70-80-63

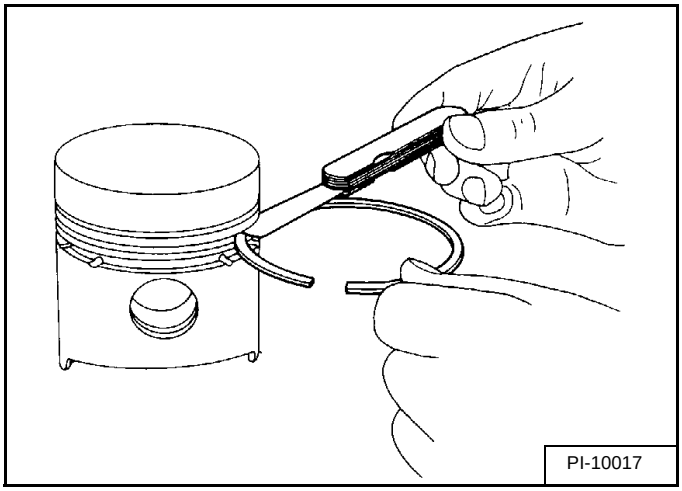


Install a piston ring into the lower part of the cylinder bore. Measure the ring gap with a feeler gauge **[Figure 70-80-63]**.

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

Compression Ring Gap	0.0118 to 0.017 in. (0,3 to 0,5 mm)
Oil Ring Gap	0.0098 to 0.0177 in. (0,25 to 0,45 mm)
Allowable Limit	0.0492 in. (1,25 mm)

Figure 70-80-64



Remove the carbon from the ring grooves. Measure the clearance between the ring and groove with a feeler gauge **[Figure 70-80-64]**.

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

Second Compression Ring	0.0037 to 0.0047 in. (0,093 to 0,120 mm)
Allowable Limit	0.00079 in. (0,2 mm)
Oil Ring	0.0008 to 0.002 in. (0,02 to 0,052 mm)
Allowable Limit	0.0059 in. (0,15 mm)

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Connecting Rod Alignment

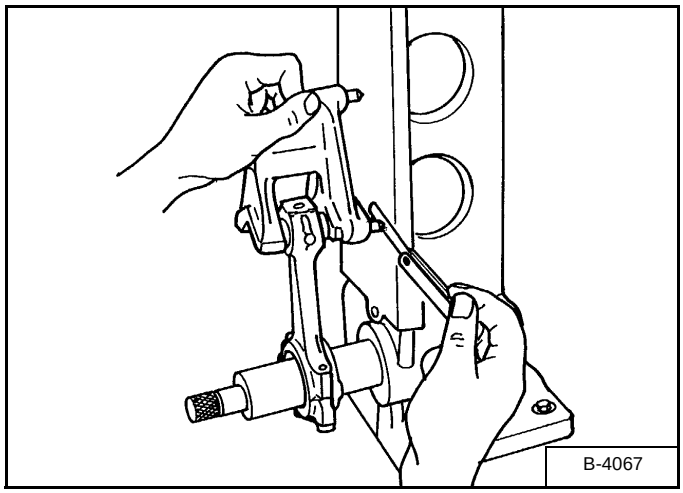
NOTE: The small end bushing is the basis of this check, check the bushing for wear before doing this check.

Install the piston pin into the connecting rod.

Install the connecting rod on an alignment tool.

Put the gauge over the piston pin and move it against the face plate.

Figure 70-80-65



If the gauge does not fit squarely against the face plate, measure the space between the gauge and face plate **[Figure 70-80-65]**.

If the measurement exceeds the allowable limit, replace the connecting rod.

Rod Alignment Allowable Limit	0.002 in. (0,05 mm)

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Crankshaft And Bearings Removal And Installation

Remove the piston and connecting rod assemblies. (See Piston And Connecting Rod Removal And Installation on Page 70-80-20)

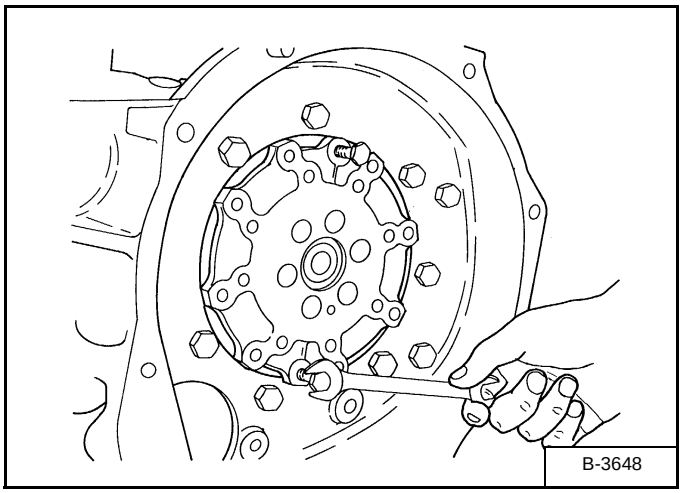
Remove the engine flywheel (Early Models). (See Removal And Installation on Page 70-70-1)

Remove the engine flywheel (Later Models). (See Removal And Installation on Page 70-71-1)

Remove the bolts which fasten the bearing case cover to the block.

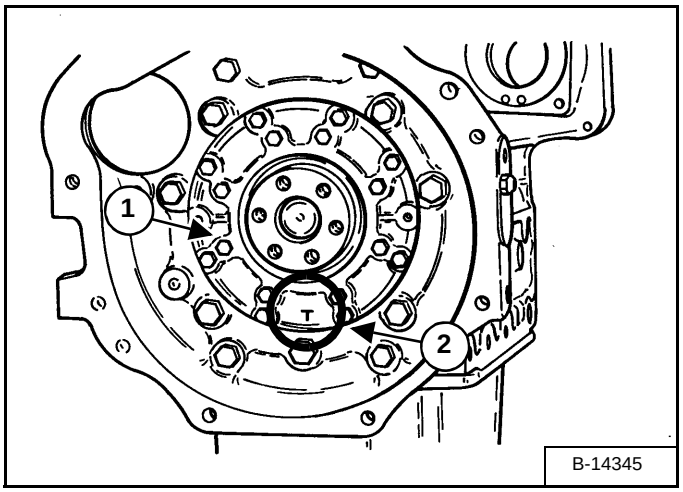
Installation: Tighten the bearing case cover bolts to 13 to 15 ft.-lb. (18 to 21 N•m) torque.

Figure 70-80-66



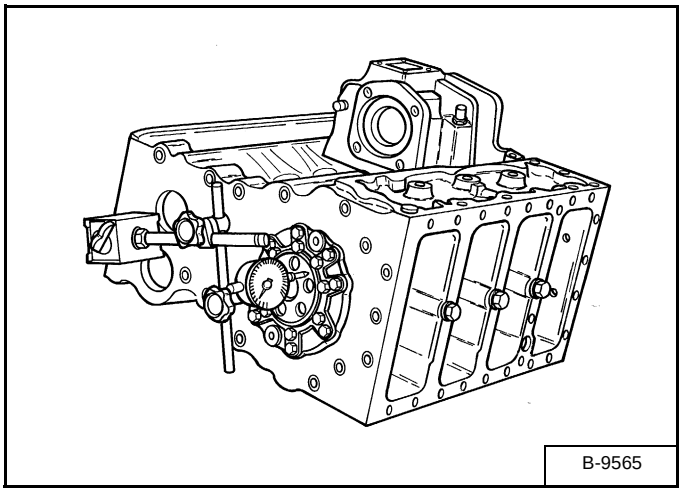
Install 2 bolts into the bearing case cover and pull the cover out **[Figure 70-80-66]**.

Figure 70-80-67



Installation: When installing the cover (Item 1), make sure the casting mark (Item 2) **[Figure 70-80-67]** is in the down position.

Figure 70-80-68



Before removing the crankshaft/main bearings, check the end play. Install a dial indicator. Measure the end play by moving the crankshaft back and forth **[Figure 70-80-68]**.

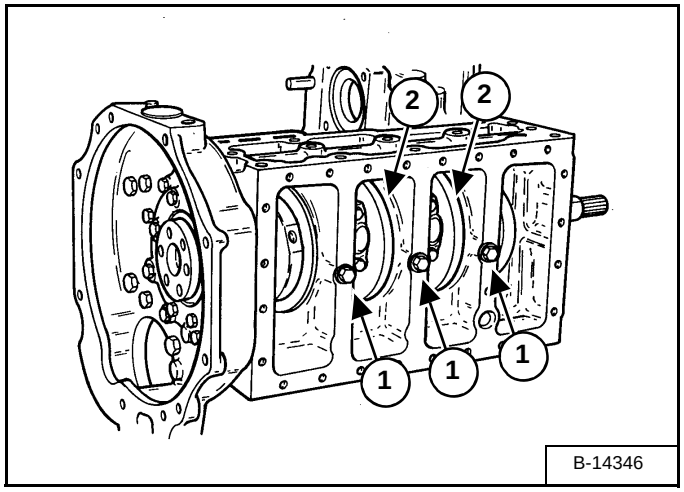
If the measurement exceeds the allowable limit, replace the thrust washers.

End Play	0.0059 to 0.0122 in. (0,15 to 0,31 mm)
Allowable Limit	0.0197 in. (0,5 mm)

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Crankshaft And Bearings Removal And Installation (Cont'd)

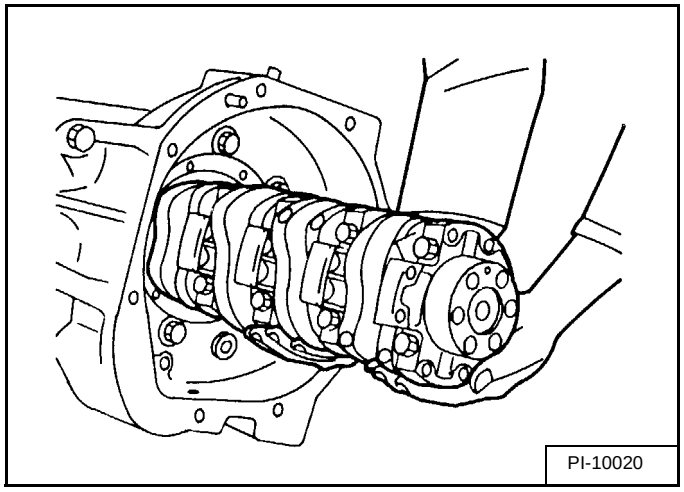
Figure 70-80-69



Remove the main bearing bolts (Item 1) **[Figure 70-80-69]**.

Installation: Align the bearing case hole (Item 2) **[Figure 70-80-69]** with the hole in the block. Put oil on the bolt threads and tighten to 51 to 54 ft.-lb. (69 to 74 N•m) torque.

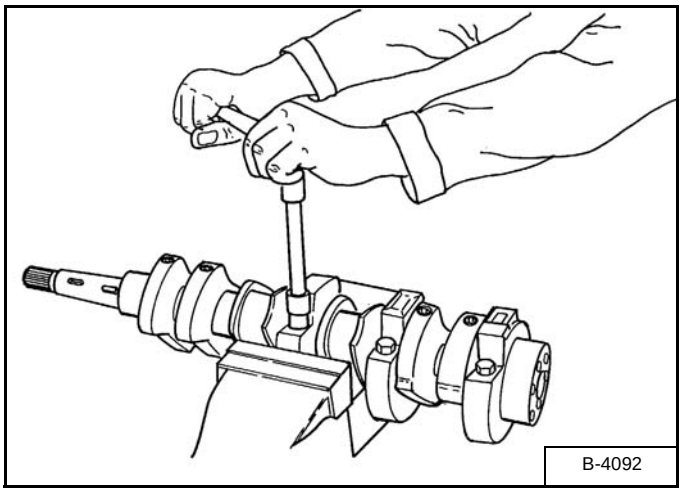
Figure 70-80-70



Remove the crankshaft/main bearing assembly from the engine block (Item 1) **[Figure 70-80-70]**.

Mark the bearing case halves for correct installation.

Figure 70-80-71

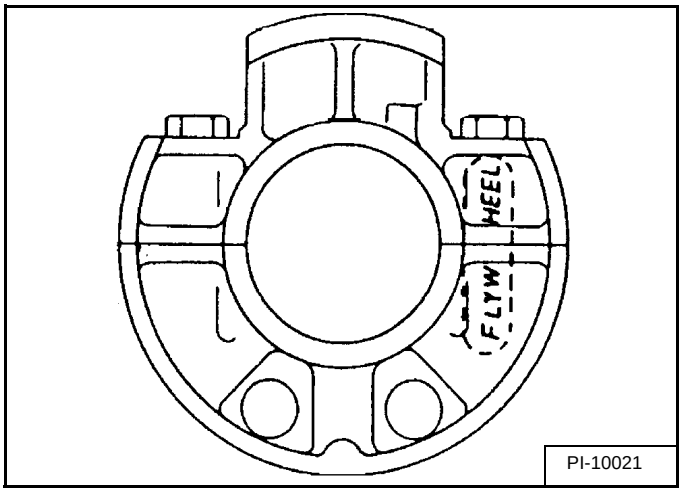


Remove the 2 bearing case bolts **[Figure 70-80-71]**.

Remove the bearing case and bearing.

Installation: Tighten the bearing case bolts to 34 to 38 ft.-lb. (46 to 51 N•m) torque.

Figure 70-80-72

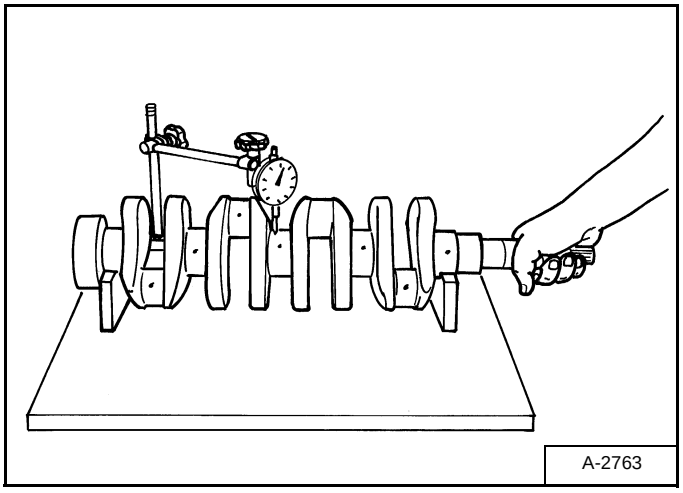


Installation: When installing the main bearing case assemblies, face the mark FLYWHEEL to the flywheel side of the engine block **[Figure 70-80-72]**. The thrust washers oil grooves must face outward.

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Crankshaft And Bearings Servicing

Figure 70-80-73



Put the crankshaft on V-blocks. Install a dial indicator on the center journal **[Figure 70-80-73]**.

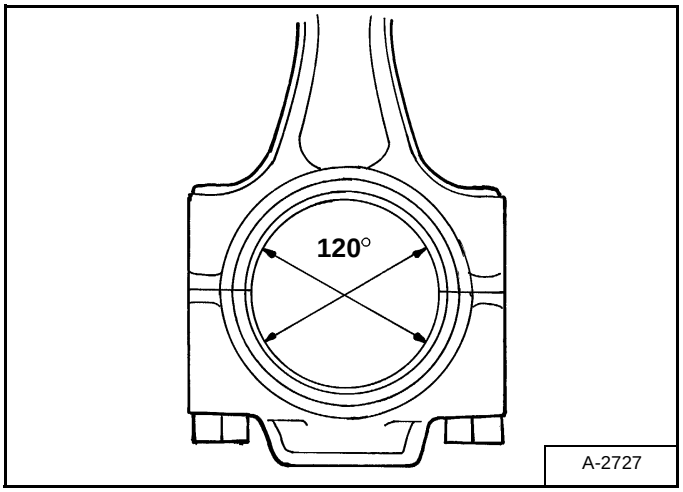
Turn the crankshaft at a slow rate to get the misalignment (half measurement). If the misalignment exceeds the allowable limit, replace the crankshaft.

Alignment	0.00079 in. (0,2 mm)

Tighten the connecting rod cap bolts as follows:

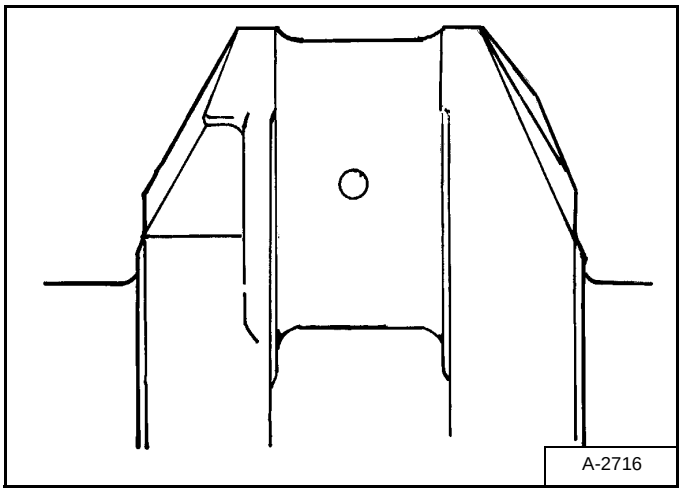
W/O Flange Bolt	27 to 30 ft.-lb. (37 to 41 N•m)
W/ Flange Bolt	33 to 36 ft.-lb. (44 to 49 N•m)

Figure 70-80-74



Measure the crankpin bearing I.D. **[Figure 70-80-74]**.

Figure 70-80-75

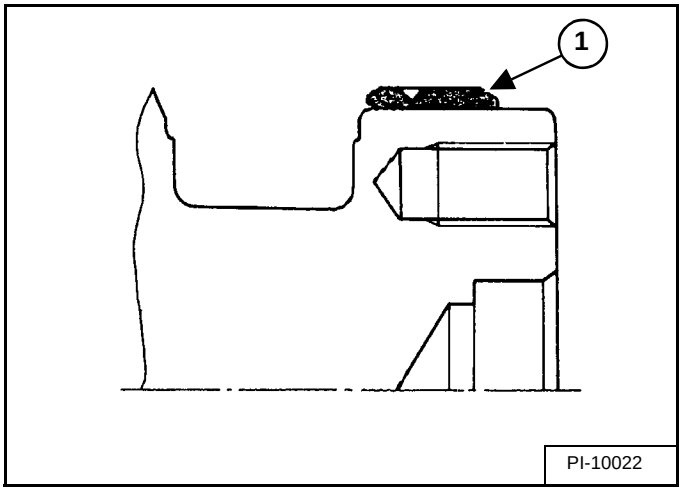


Measure the crankpin O.D. **[Figure 70-80-75]**.

Calculate the oil clearance.

Crankpin Bearing I.D.	1.8504 to 1.8522 in. (47,0 to 47,046 mm)
Crankpin O.D.	1.8488 to 1.8494 in. (49,959 to 46,975 mm)
Oil Clearance	0.0009 to 0.0034 in. (0,025 to 0,087 mm)

Figure 70-80-76



Check the wear on the crankshaft sleeve **[Figure 70-80-76]**. If the wear exceeds the allowable limit or the seal leaks oil, replace the sleeve.

Wear of Sleeve	0.0004 in. (0,1 mm)

The special tool set will be needed to replace the crankshaft sleeve.

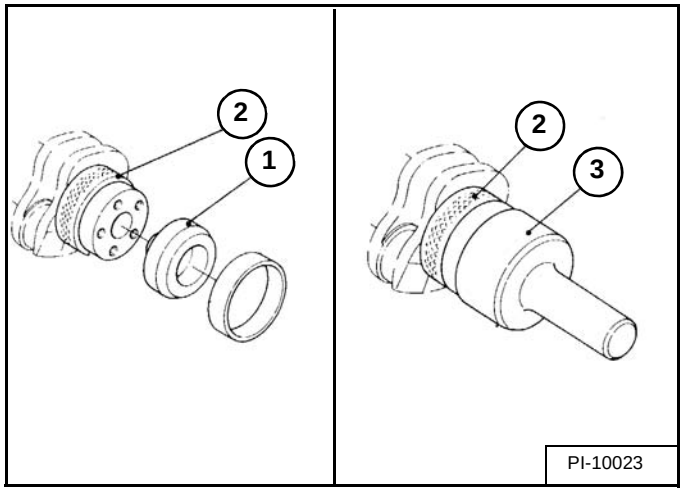
Remove the sleeve.

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RECONDITIONING THE ENGINE (S/N 562611001 AND ABOVE) (CONT'D)

Crankshaft And Bearings Servicing (Cont'd)

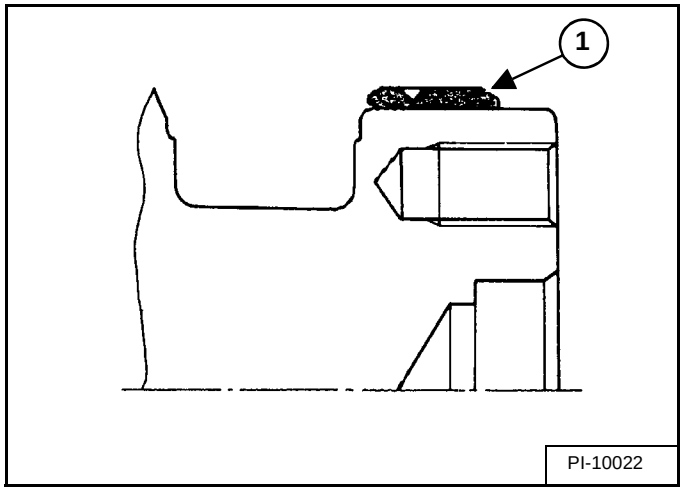
Figure 70-80-77



Install the sleeve guide (Item 1) and stop (Item 2) **[Figure 70-80-77]**.

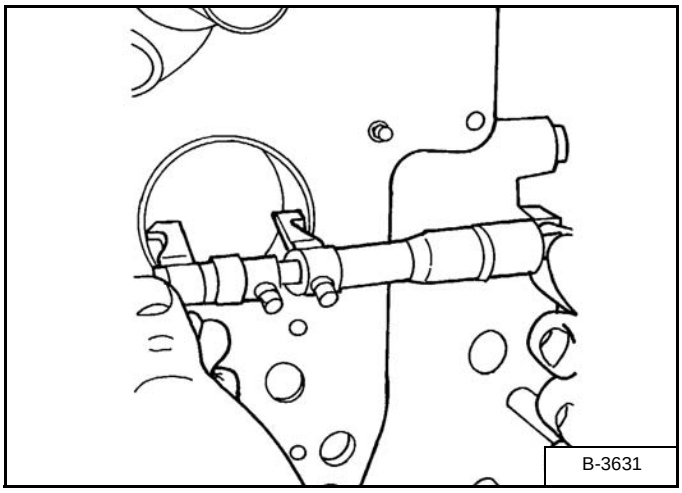
Heat the sleeve to 302 to 392° F (150° to 200° C). Install the sleeve on the crankshaft using the special driver tool (Item 3) **[Figure 70-80-77]**.

Figure 70-80-78



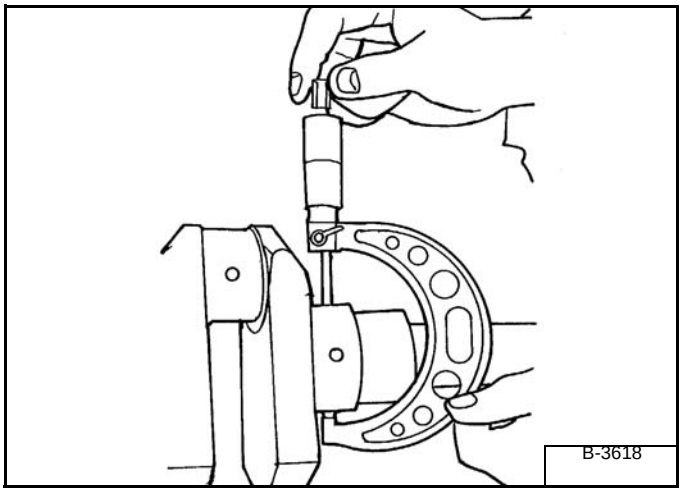
NOTE: The sleeve is installed with the larger chamfered surface to the front of the crankshaft (Item 1) [Figure 70-80-78].

Figure 70-80-79



Measure the I.D. of the No. 1 crankshaft bearing **[Figure 70-80-79]**.

Figure 70-80-80



Measure the O.D. of the crankshaft journal **[Figure 70-80-80]**.

Calculate the oil clearance.

If the clearance exceeds the allowable limit, replace the crankshaft bearing.

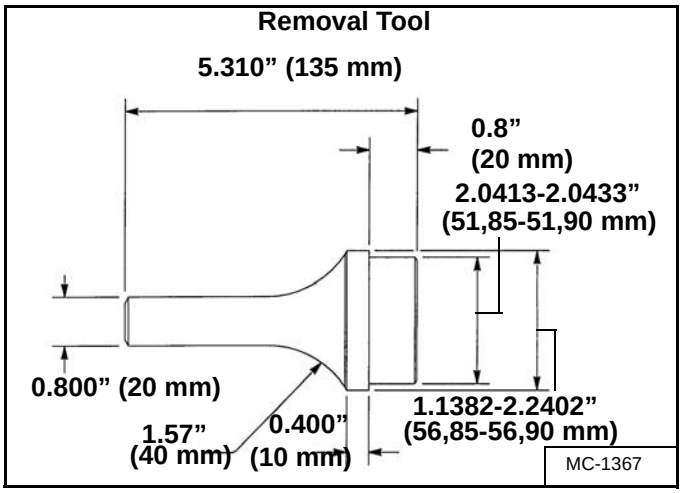
Engine S/N 3R9999 & Below	
Bearing I.D.	2.0465 to 2.0488 in. (51,98 to 52,039 mm)
Crankshaft Journal O.D.	2.0441 to 2.0449 in. (51,921 to 51,94 mm)
Oil Clearance	0.0016 to 0.0046 in. (0,04 to 0,118 mm)
Allowable Limit	0.0079 in. (0,2 mm)

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Crankshaft And Bearings Servicing (Cont'd)

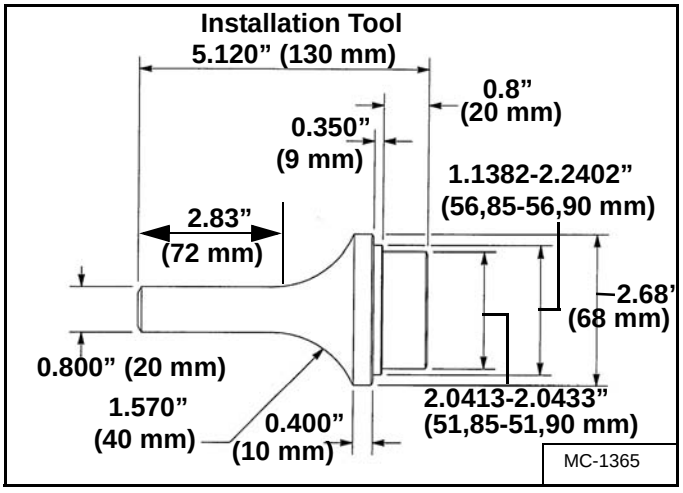
Engine S/N 3S001 & Above	
Bearing I.D.	2.3614 to 2.3637 in. (59,98 to 60,039 mm)
Crankshaft Journal O.D.	2.3591 to 2.3598 in. (59,921 to 59,940 mm)
Oil Clearance	0.0016 to 0.0041 in. (0,04 to 0,104mm)
Allowable Limit	0.008 in. (0,2 mm)

Figure 70-80-81



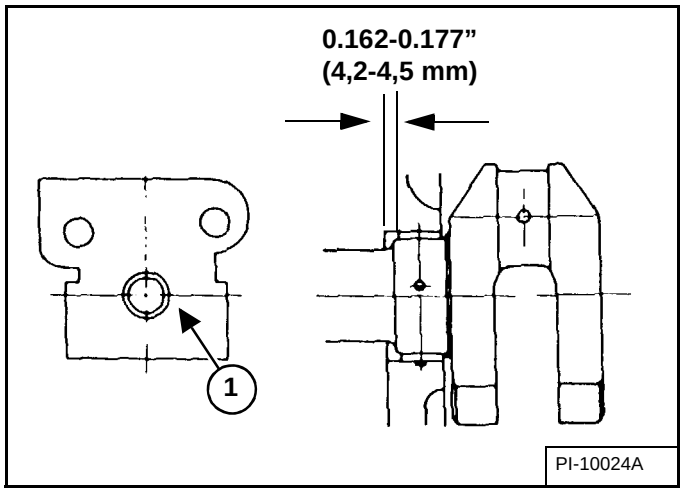
To remove the front bearing make the tool as shown in figure **[Figure 70-80-81]**.

Figure 70-80-82



To install the front bearing make the tool as shown in figure **[Figure 70-80-82]**.

Figure 70-80-83



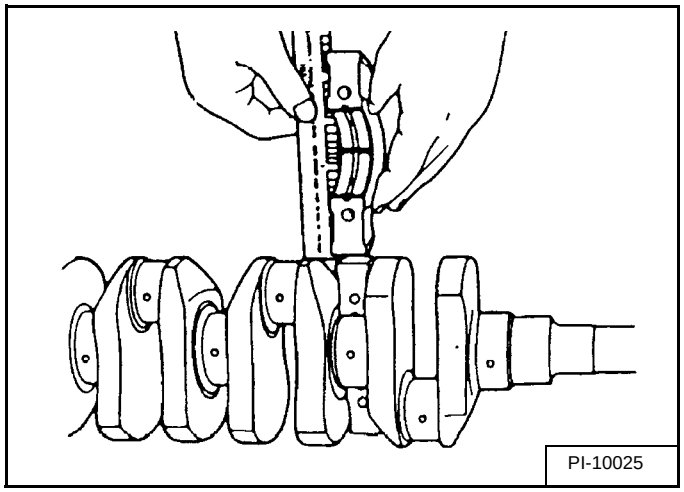
Remove the front bearing (Item 1) **[Figure 70-80-83]** with the special removal tool.

Installation: Clean the new bearing and bore, put oil on them. Install the new bearing with the installation driver tool **[Figure 70-80-83]**.

Clean the crankshaft journal and bearing. Put a strip of press gauge on the center journal.

Install the main bearing case halves and tighten the bolts. Remove the bearing case halves.

Figure 70-80-84



Measure the flattened press gauge **[Figure 70-80-84]**.

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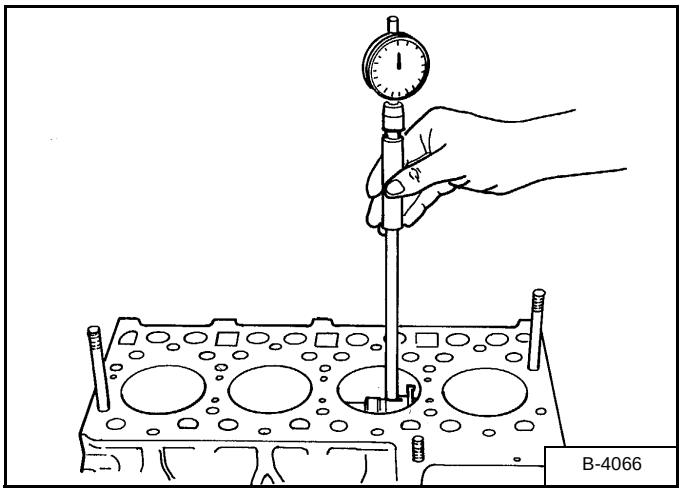
Crankshaft And Bearings Servicing (Cont'd)

If the clearance exceeds the allowable limit, replace the crankshaft bearing.

Engine S/N 3R9999 & Below	
Crankshaft Journal O.D.	2.0441 to 2.0449 in. (51,921 to 51,94 mm)
Bearing I.D.	2.0465 to 2.0488 in. (51,98 to 52,025 mm)
Oil Clearance	0.0016 to 0.0041 in. (0,04 to 0,104 mm)
Allowable Limit	0.0079 in. (0,2 mm)
Engine S/N 3S001 & Above	
Crankshaft Journal O.D.	2.3591 to 2.3598 in. (59,921 to 59,94 mm)
Bearing I.D.	2.3614 to 2.3632 in. (59,98 to 60,025 mm)
Oil Clearance	0.001 to 0.0034 in. (0,025 to 0,087mm)
Allowable Limit	0.008 in. (0,2 mm)

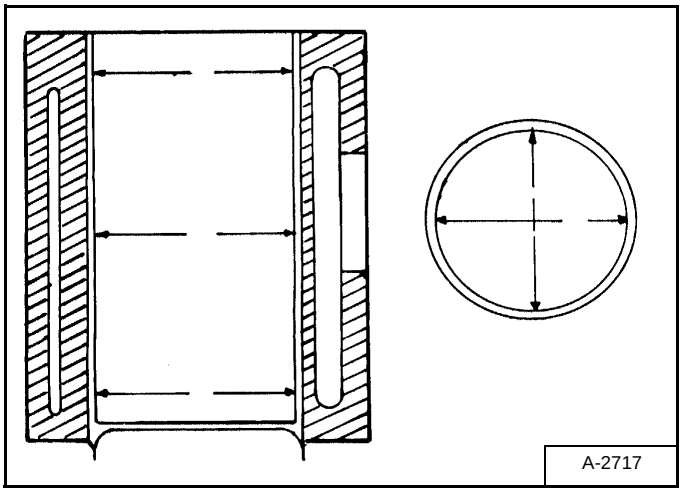
Cylinder Bore Checking

Figure 70-80-85



Use a gauge to check the inside measurement of the cylinder bore **[Figure 70-80-85]**.

Figure 70-80-86



Measure the 6 points as shown in figure **[Figure 70-80-86]** to find the maximum wear.

The specifications are 3.2677 to 3.2689 in. (83,0 to 83,022 mm). The wear limit is +0.0059 in. (+0,15 mm).

If the cylinder bore is not within specifications, re-bore the cylinder for oversize piston.

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Water Pump Removal And Installation

Drain the cooling system.

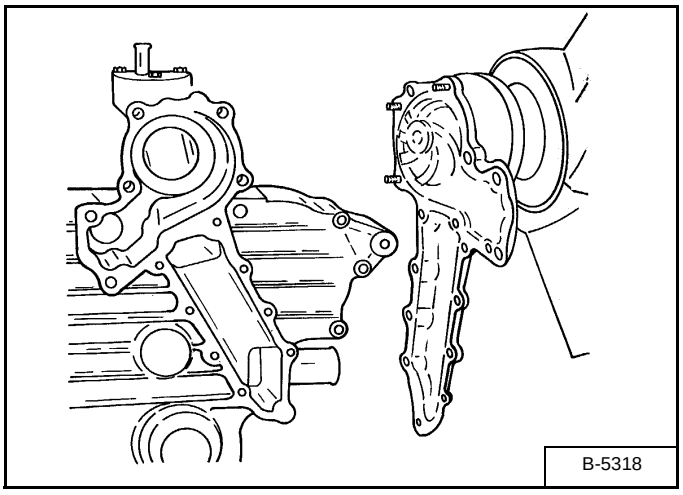
Remove the radiator. (See Removal And Installation on Page 70-40-1)

Remove the alternator belt.

Remove the fan.

Remove the water pump bolts.

Figure 70-80-87

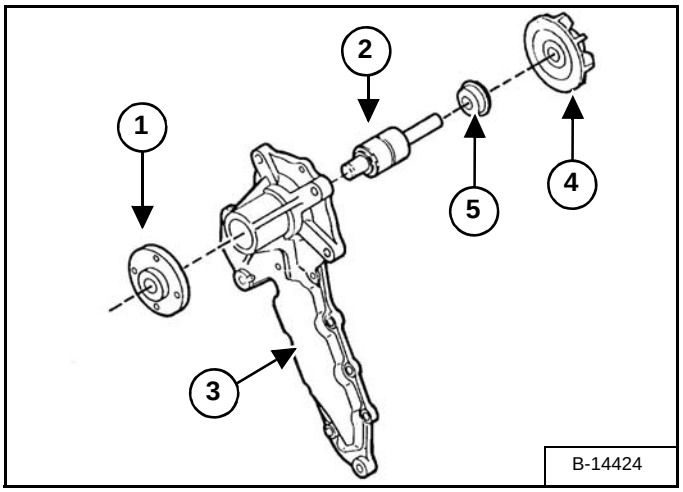


Remove the water pump **[Figure 70-80-87]**.

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

Water Pump Disassembly And Assembly

Figure 70-80-88



Put the water pump (Item 3) **[Figure 70-80-88]** in a vise.

Remove the pulley (Item 1) **[Figure 70-80-88]**.

Drive the shaft (Item 2) out of the impeller (Item 4) side of the water pump **[Figure 70-80-88]**.

Remove the seal (Item 5) **[Figure 70-80-88]**.

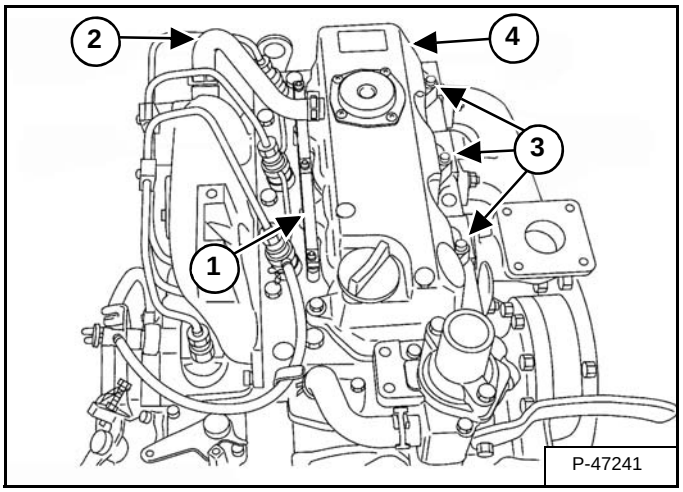
Install a new seal (Item 5) **[Figure 70-80-88]** when assembling the water pump.

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RECONDITIONING THE ENGINE (S/N 562811001 & ABOVE, 563111001 & ABOVE AND 563211001 & ABOVE)

Cylinder Head Removal And Installation

Figure 70-81-1

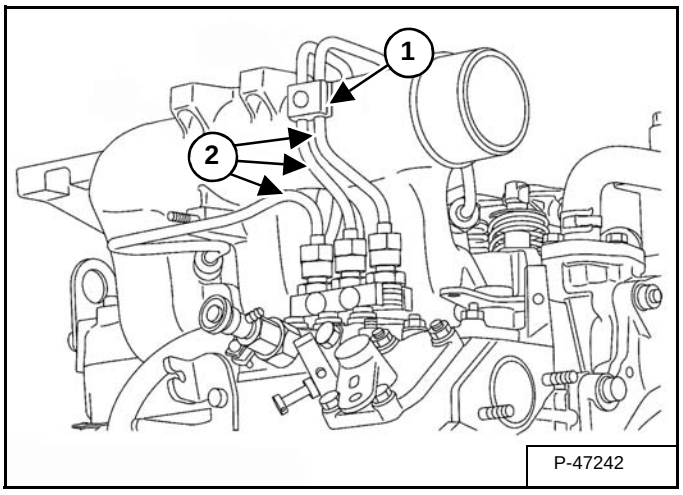


Remove the glow plug lead (Item 1), breather hose (Item 2), and valve cover bolts (Item 3) **[Figure 70-81-1]**.

Remove the valve cover (Item 4) **[Figure 70-81-1]** and gasket.

Installation: Tighten the valve cover bolts to 5 to 8 ft.-lb. (7 to 11 N•m)

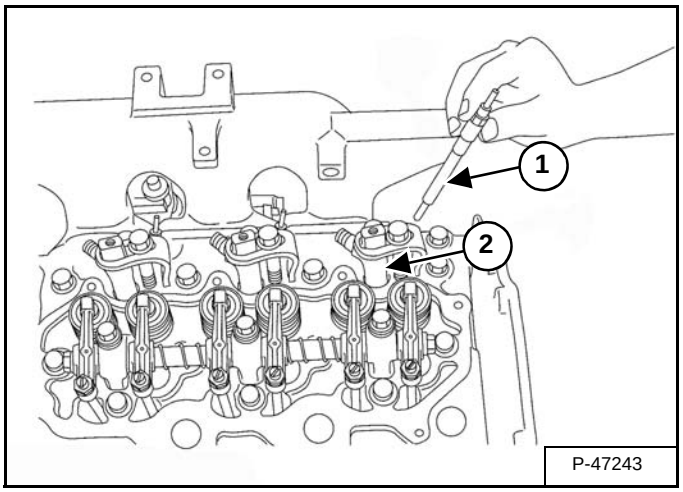
Figure 70-81-2



Loosen the bolts on the clamps (Item 1) and remove the injection tubes (Item 2) **[Figure 70-81-2]**.

Remove the overflow tube assembly.

Figure 70-81-3

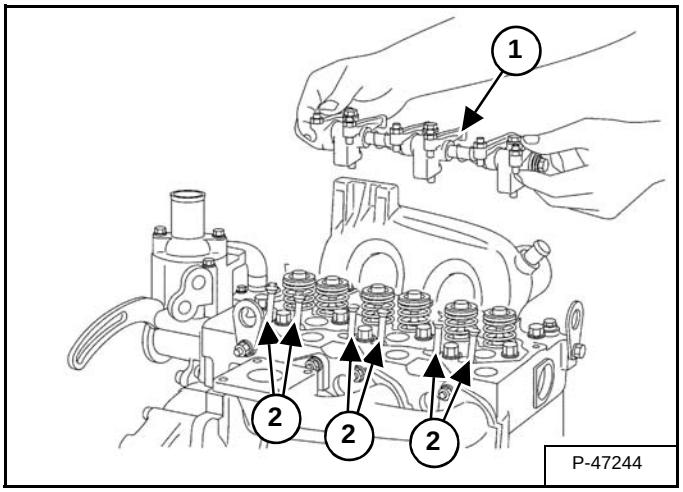


Remove the glow plugs (Item 1) and fuel injector holder assemblies (Item 2) **[Figure 70-81-3]**.

Installation: Tighten the glow plugs to 15 to 18 ft.-lb. (20 to 25 N•m) torque.

Tighten the injector holders to 19 to 22 ft.-lb. (26 to 29 N•m) torque.

Figure 70-81-4



Remove the rocker arm bolts and remove the rocker arm assembly (Item 1) **[Figure 70-81-4]**.

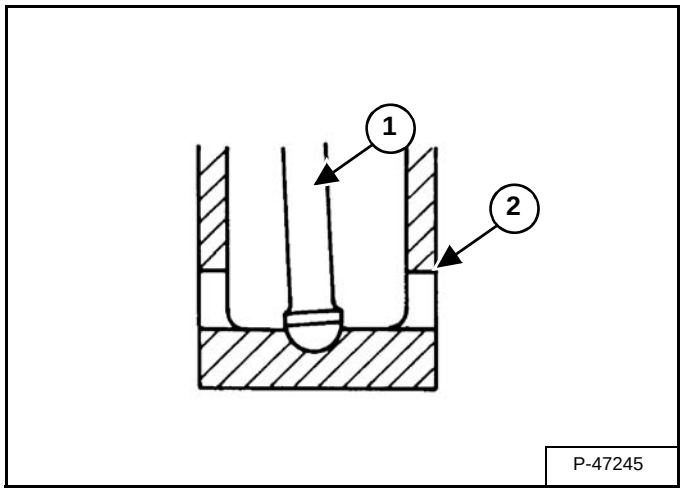
Installation: Tighten the bolts to 17 to 20 ft.-lb. (23,5 to 27,5 N•m) torque.

Remove the pushrods (Item 2) **[Figure 70-81-4]**.

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Cylinder Head Removal And Installation (Cont'd)

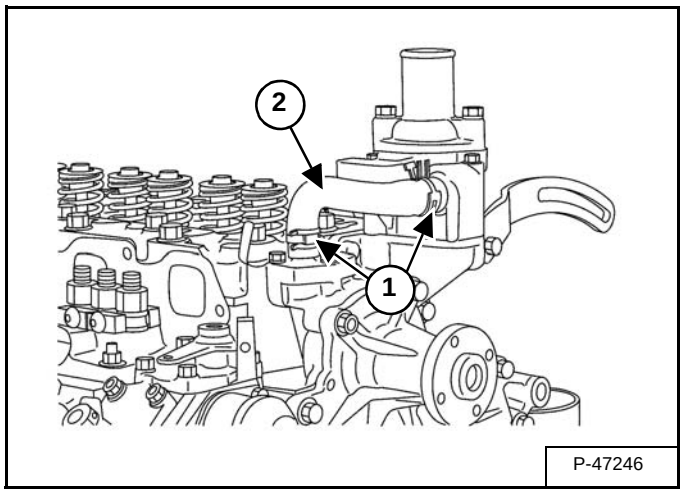
Figure 70-81-5



Installation: The push rod (Item 1) must be seated in the tappet (Item 2) **[Figure 70-81-5]** correctly or the push rods will be damaged.

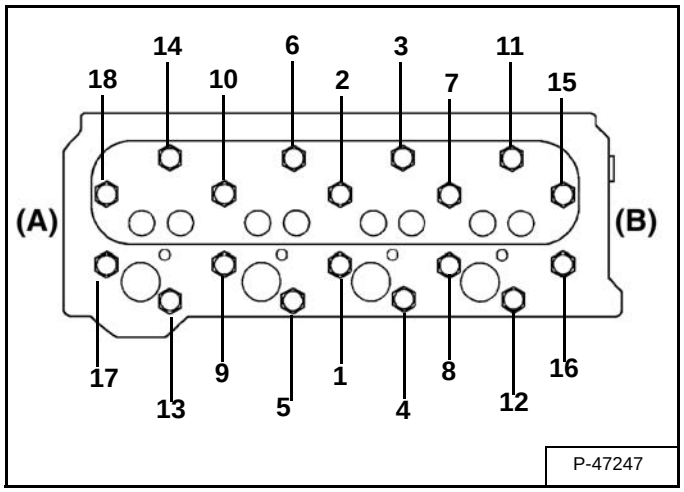
After installing the rocker arm assembly and push rods, the valve lash must be adjusted. (See Valve Clearance Adjustment on Page 70-51-20)

Figure 70-81-6



Remove the clamps (Item 1) and remove the hose (Item 2) **[Figure 70-81-6]**.

Figure 70-81-7



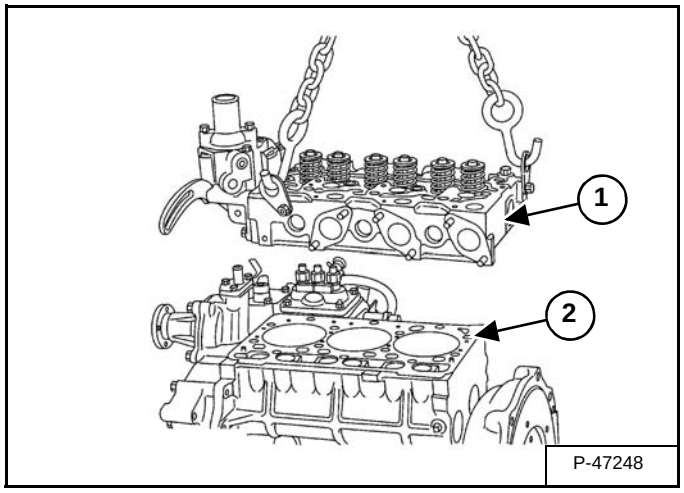
Remove the cylinder head bolts in order of #18 to #1 **[Figure 70-81-7]**.

NOTE: (A) is the gearcase side, (B) is the flywheel side.

Installation: Put oil on the bolt threads. Tighten the bolts in the correct sequence in order of #1to #18 to 69 to 72 ft.-lb. (93 to 98 N•m) torque.

NOTE: Re-tighten the cylinder head bolts in the correct sequence after the engine has been run for 30 minutes.

Figure 70-81-8

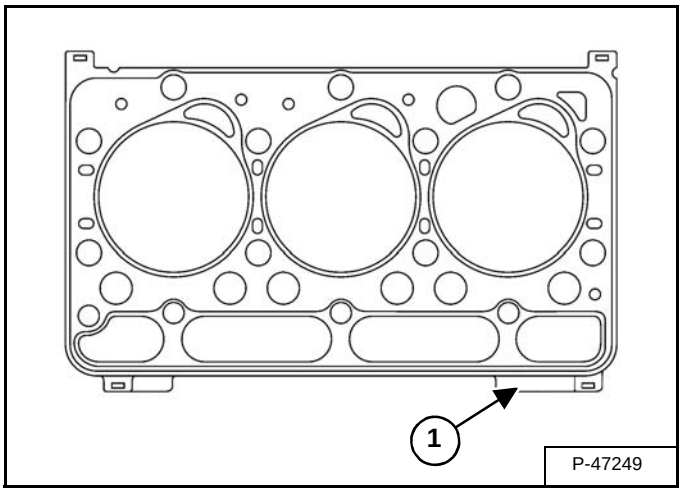


Remove the cylinder head (Item 1) and gasket (Item 2) **[Figure 70-81-8]**.

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Cylinder Head Removal And Installation (Cont'd)

Figure 70-81-9

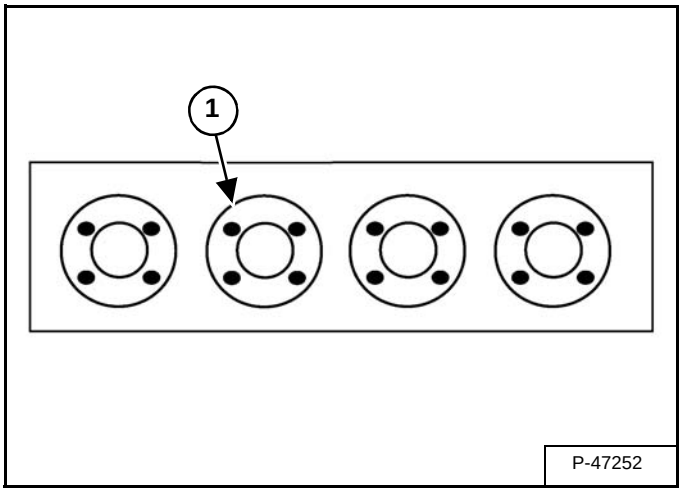


When replacing just the gasket, use a new gasket that has the same mark (Item 1) **[Figure 70-81-9]** as the original gasket.

When replacing the gasket after an engine rebuild, the piston protrusion must be measured.

(See Cylinder Head Top Clearance on Page 70-81-5)

Figure 70-81-10



Measure and record the protrusion of each piston in the 4 places shown (Item 1) **[Figure 70-81-10]**. Find the average of each piston, then find the combined average of the 4 pistons.

Figure 70-81-11

Gasket Size (Number)	Piston Protrusion
15	0,475 to 0,525 mm 0.0187 to 0.0207 in.
20	0,525 to 0,575 mm 0.0207 to 0.0226 in.
25	0,575 to 0,625 mm 0.0226 to 0.0246 in.
30	0,625 to 0,067 mm 0.0246 to 0.0266 in.
35	0,675 to 0,725 mm 0.0266 to 0.0285 in.

Select the correct gasket size (thickness) from the chart **[Figure 70-81-11]**.

Find the measurement of the highest piston protrusion and the lowest piston protrusion (recorded earlier) for each piston.

If the highest measurement exceeds the piston protrusion of the selected gasket, use the gasket which is 1 size larger. If the measurement exceeds gasket size 35, the engine must be disassembled, clearances checked, and reassembled.

If the measurement is 2 sizes smaller than the selected gasket or smaller than gasket size 15, the engine must be disassembled, clearances checked, and reassembled.

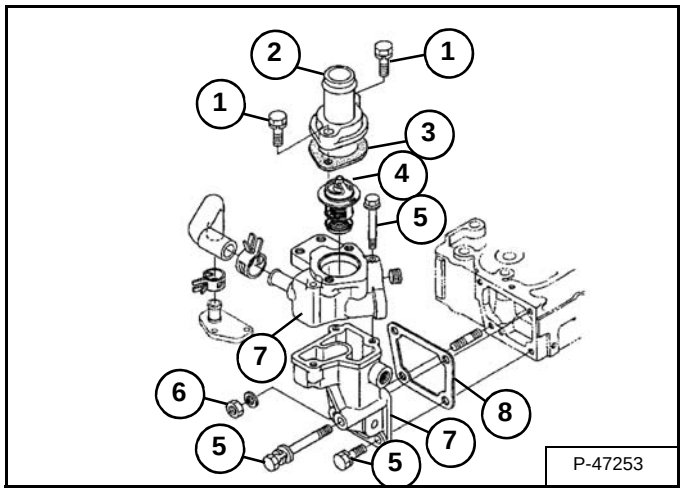
After the gasket and cylinder head have been installed, turn the crankshaft by hand to be sure there is no interference between the piston, cylinder, and valves.

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RECONDITIONING THE ENGINE (S/N 562811001 & ABOVE, 563111001 & ABOVE AND 563211001 & ABOVE) (CONT'D)

Cylinder Head Disassembly And Assembly

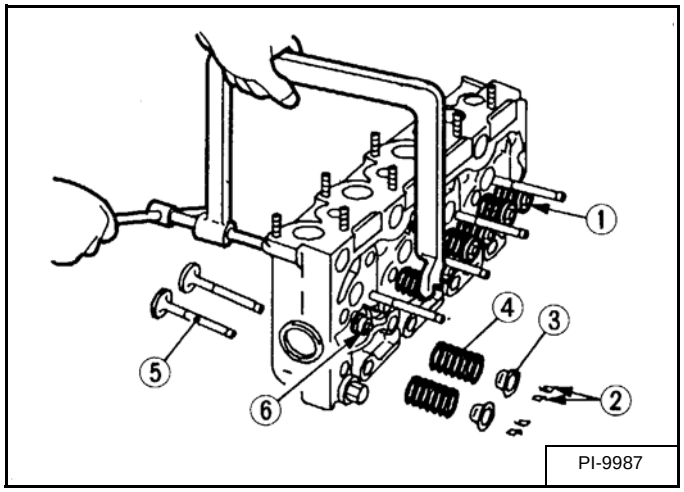
Figure 70-81-12



Remove the bolts (Item 1), housing (Item 2), gasket (Item 3) and thermostat (Item 4) **[Figure 70-81-12]**.

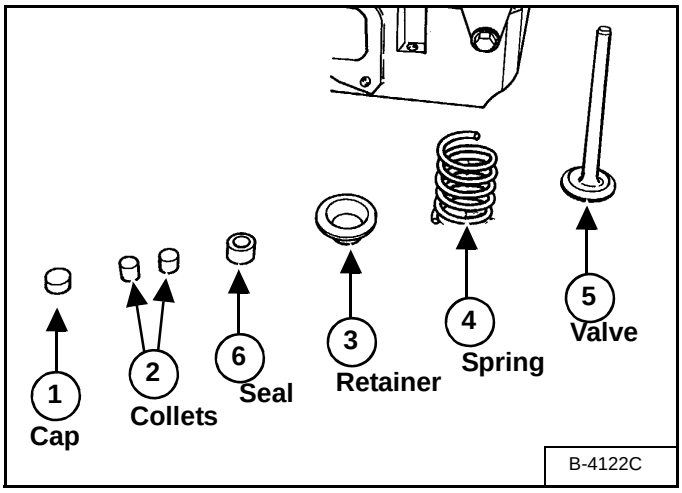
Remove bolts (Item 5), nut (Item 6), top and bottom housing (Item 7), and gasket (Item 8) from the cylinder head **[Figure 70-81-12]**.

Figure 70-81-13



Use a valve spring compressor to compress the valve spring **[Figure 70-81-13]**.

Figure 70-81-14



Remove the valve cap (Item 1) and valve spring collet (Item 2) **[Figure 70-81-13]** & **[Figure 70-81-14]**.

Remove the valve spring retainer (Item 3) and the spring (Item 4) **[Figure 70-81-13]** & **[Figure 70-81-14]**.

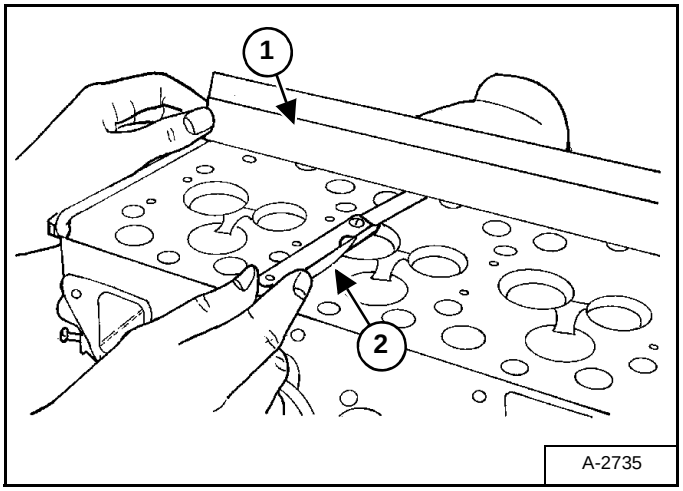
Remove the seal (Item 6) and the valve (Item 5) **[Figure 70-81-13]** & **[Figure 70-81-14]**.

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Cylinder Head Servicing

Clean the surface of the cylinder head.

Figure 70-81-15

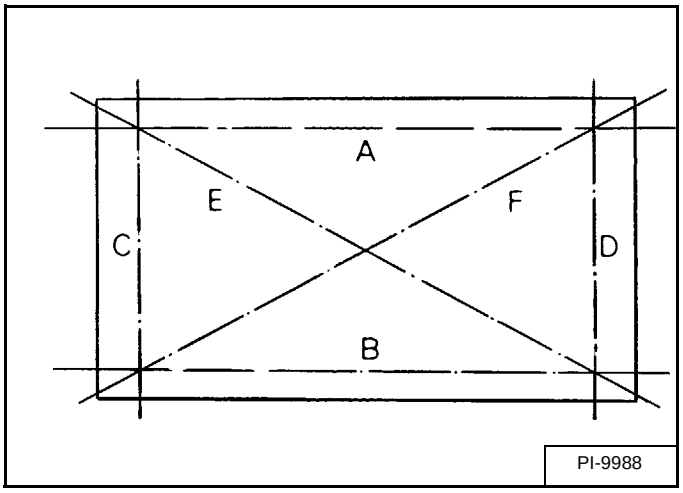


Put a straight edge (Item 1) **[Figure 70-81-15]** on the cylinder head.

NOTE: Do not put the straight edge across combustion chambers.

Put a feeler gauge (Item 2) **[Figure 70-81-15]** between the straight edge and the surface of the cylinder head.

Figure 70-81-16

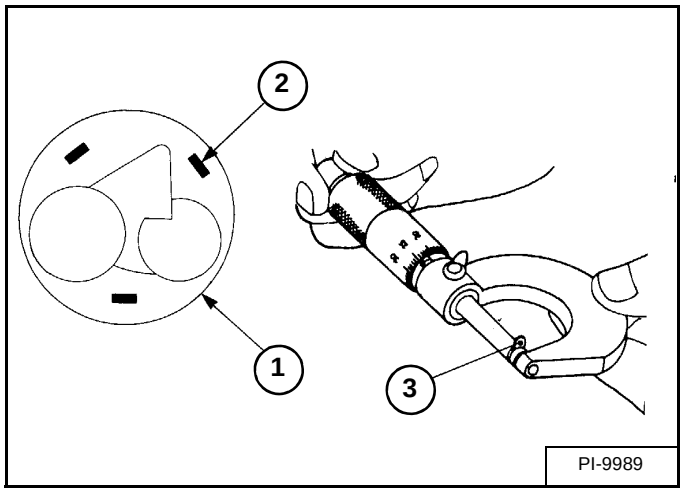


Put the straight edge on the cylinder head's 4 sides and 2 diagonal as shown in figure **[Figure 70-81-16]**.

The maximum distortion of the head surface is ± 0.002 in. (± 0,05 mm). If the measurement exceeds the specification, replace the cylinder head.

Cylinder Head Top Clearance

Figure 70-81-17



Install the cylinder head gasket. Put the piston (Item 1) **[Figure 70-81-17]** being checked at T.D.C.

Put 3 pieces of 0.06 in. (1,5 mm) diameter solder (Item 2) **[Figure 70-81-17]** on the top of the piston. Use grease to hold them in position.

NOTE: Put the solder in position so they do not touch the valves.

Turn the piston to bottom dead center.

Install the cylinder head and tighten to the correct torque in the correct sequence. (See Cylinder Head Removal And Installation on Page 70-81-1)

Turn the crankshaft until the piston exceeds T.D.C. Remove the cylinder head.

Remove the solder wire (Item 3) **[Figure 70-81-17]** and measure it.

If the measurement exceeds the specifications, check the oil clearance of the crank pin journal or the piston pin.

Top Clearance	0.0236 to 0.0276 in. (0,60 to 0,70 mm)

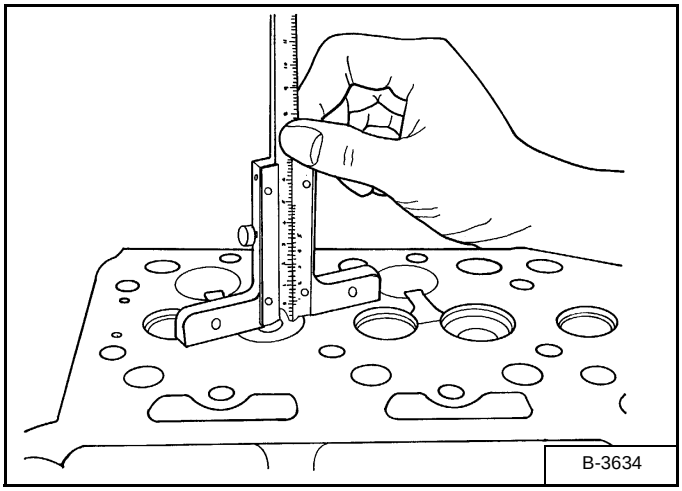
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Valve Guide Checking

Remove the valve and spring from the cylinder head. (See Cylinder Head Disassembly And Assembly on Page 70-81-4)

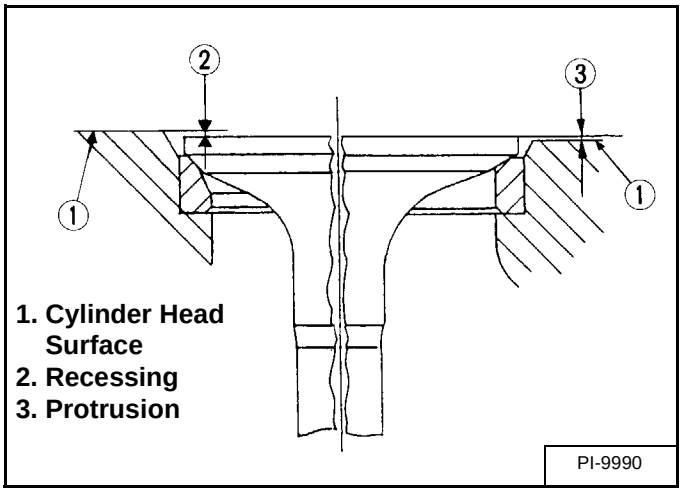
Clean the valve seat and combustion chamber.

Figure 70-81-18



Install the valve into the guide. Measure the valve recessing or protrusion with a depth gauge **[Figure 70-81-18]**.

Figure 70-81-19



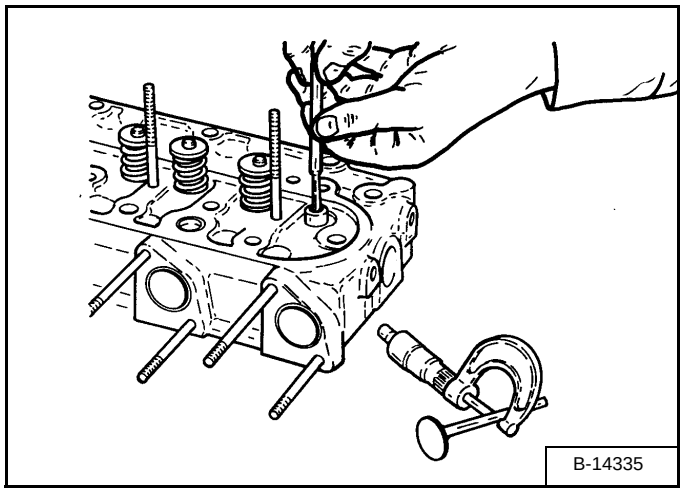
1. Cylinder Head Surface
2. Recessing
3. Protrusion

If the measurement exceeds the allowable limit, replace the valve or cylinder head **[Figure 70-81-19]**.

Protrusion	0.002 in. (0,05 mm)
Recessing	0.006 in. (0,15 mm)
Allowable Limit (Recessing)	0.0157 in. (0,4 mm)

Remove the carbon from the valve guide.

Figure 70-81-20



Measure the valve stem O.D. **[Figure 70-81-20]**.

Measure the valve guide I.D. **[Figure 70-81-20]**.

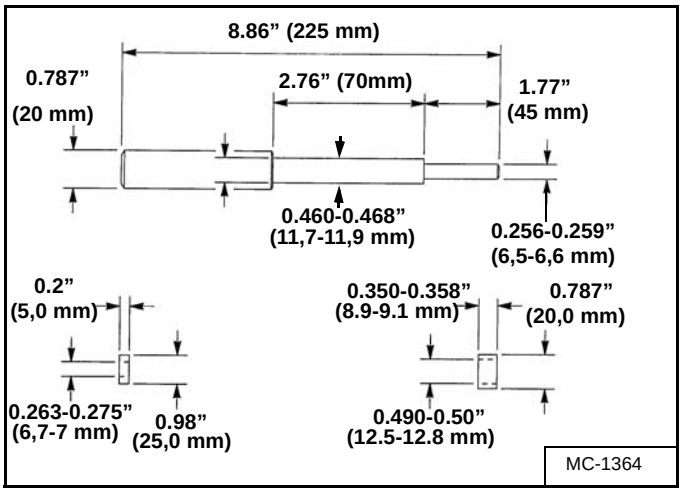
Calculate the clearance. If the clearance exceeds the allowable limit, replace the valve and/or valve guide.

Valve Guide I.D.	0.3156 to 0.3161 in. (8,015 to 8,03 mm)
Valve Stem O.D.	0.3134 to 0.3140 in. (7,96 to 7,98 mm)
Clearance Between Valve Stem and Guide	0.0016 to 0.0028 in. (0,04 to 0,07 mm)
Allowable Limit	0.0039 in. (0,1 mm)

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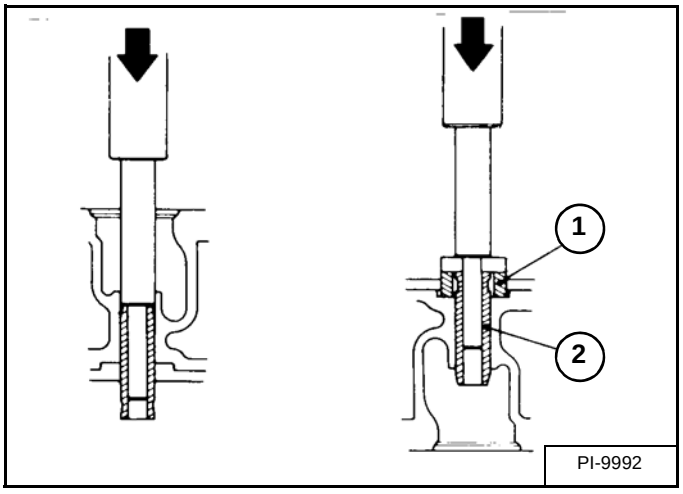
Valve Guide Checking (Cont'd)

Figure 70-81-21



To remove and replace the valve guide, make the driver tool as shown in figure **[Figure 70-81-21]**.

Figure 70-81-22



Press the used valve guide out of the cylinder head using the special driver tool **[Figure 70-81-22]**.

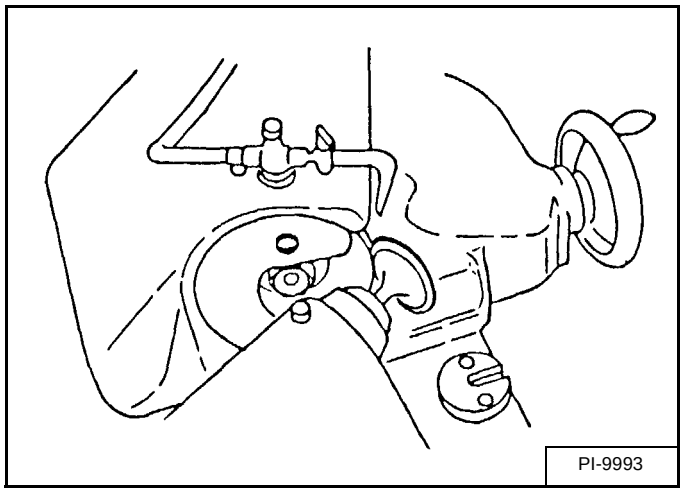
Put oil on the outside diameter of the new valve guide. Press the new valve guide into the cylinder head from the top side. Use the special driver tools (Items 1 & 2) **[Figure 70-81-22]**, press the new guide until the tool contacts the cylinder head.

Ream the valve guide to the correct specifications.

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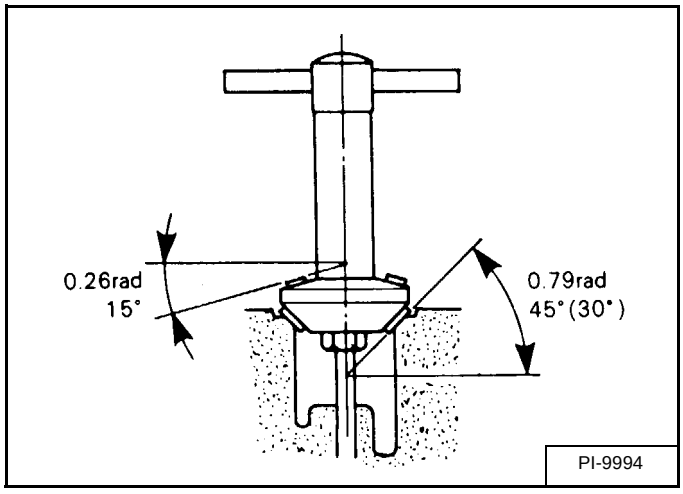
Reconditioning The Valve And Valve Seat

Figure 70-81-23



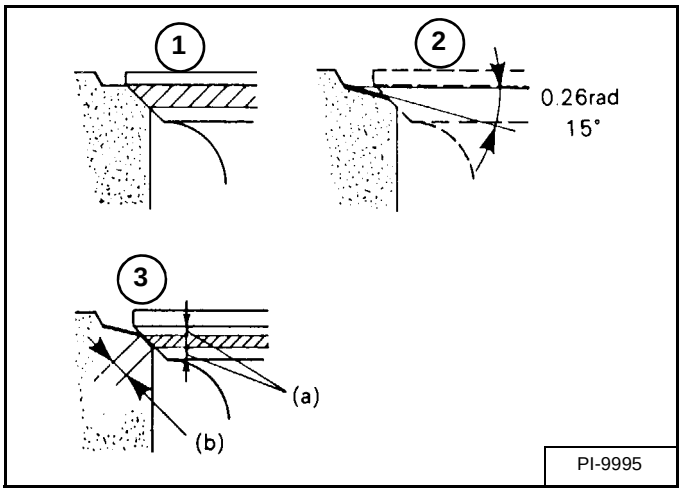
Grind the valve face to the correct angle using a valve re-facer **[Figure 70-81-23]**.

Figure 70-81-24



Grind the valve seat surface in the cylinder head to the correct angle **[Figure 70-81-24]**.

Figure 70-81-25



Check the seat surface and valve face (Item 1) **[Figure 70-81-25]**.

If the seat surface is too wide, use a 15 degree cutter on the exhaust or a 30 degree cutter on the intake valve seats (Item 2) to get the correct width (Item 3) **[Figure 70-81-25]**.

Valve Seat Width

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

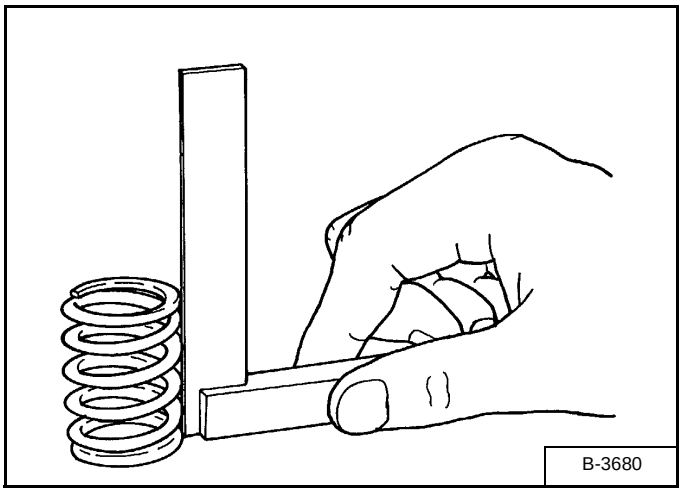
Valve Seat & Face Angle

Intake	60°
Exhaust	45°

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Valve Spring

Figure 70-81-26



Measure the length of the valve spring. If the measurement is less than the allowable limit, replace the spring **[Figure 70-81-26]**.

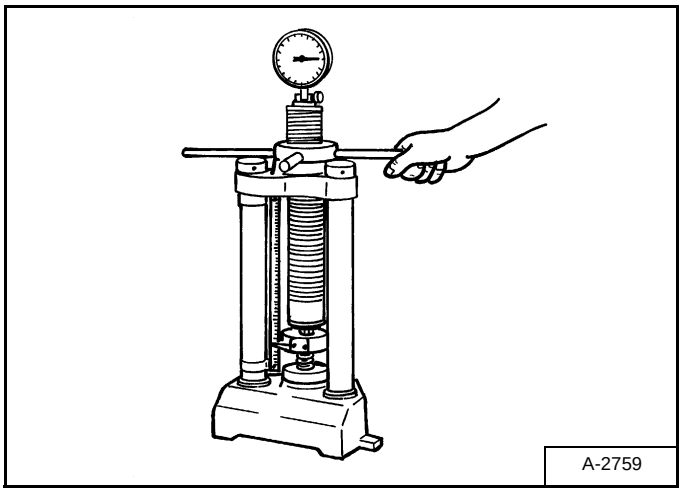
Free Length	1.642 to 1.661 in. (41,7 to 42,2 mm)
Allowable Limit	1.622 in. (41,2 mm)

Put the spring on a flat surface, place a square on the side of the spring **[Figure 70-81-26]**.

Rotate the spring and measure the maximum tilt. If the measurement excess the allowable limit, replace the spring.

Tilt	0.039 in. (1,0 mm)

Figure 70-81-27



Put the spring on a tester and compress to specified length **[Figure 70-81-27]**.

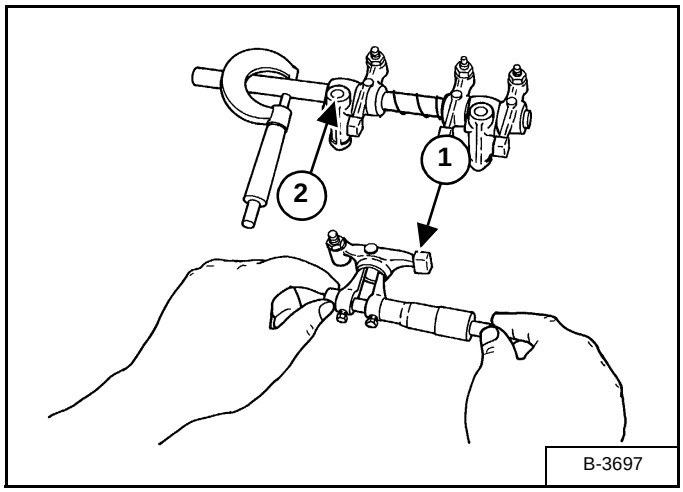
Read the compressed load on the gauge. If the measurement exceeds allowable limit, replace the spring.

Setting Length	1.378 in. (35,0 mm)
Setting Load	26.4 lb. (117,6 N)
Allowable Limit	22.5 lb. (100,0 N)

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Rocker Arm And Shaft Checking

Figure 70-81-28



Measure the rocker arm I.D. (Item 1) **[Figure 70-81-28]** with an inside micrometer.

Measure the rocker arm shaft O.D. (Item 2) **[Figure 70-81-28]** with an outside micrometer.

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

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

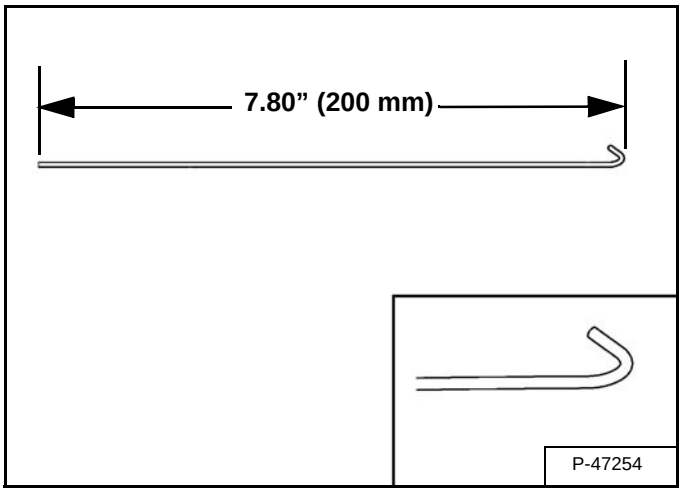
Oil Clearance Between Rocker Arm & Shaft	0.0006 to 0.0018 in. (0,02 to 0,05 mm)
Allowable Limit	0.004 in. (0,10 mm)
Rocker Arm Shaft O.D.	0.5501 to 0.5506 in. (13,97 to 13,98 mm)
Rocker Arm I.D.	0.5512 to 0.5519 in. (14,0 to 14,02 mm)

Timing Gearcase Cover Removal And Installation

Remove the fuel injection pump. (See Fuel Injection Pump Removal And Installation on Page 70-51-9)

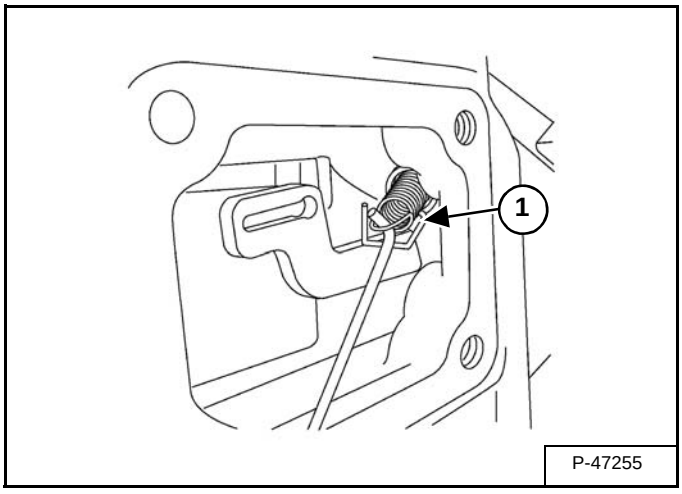
Remove the cylinder head, rocker arms and push rods. (See Cylinder Head Removal And Installation on Page 70-81-1)

Figure 70-81-29



Bend a hook on the end of a 7.80 in. (200 mm) long, 0.050 in. (1,2 mm) diameter hard wire **[Figure 70-81-29]**.

Figure 70-81-30

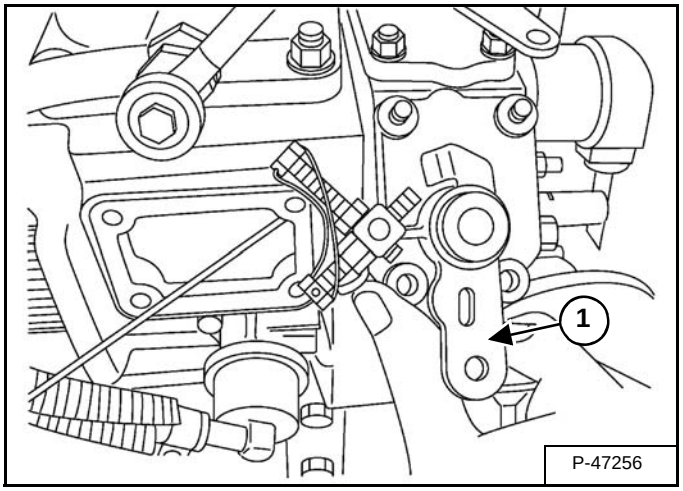


Disconnect the 2 governor springs (Item 1) **[Figure 70-81-30]**.

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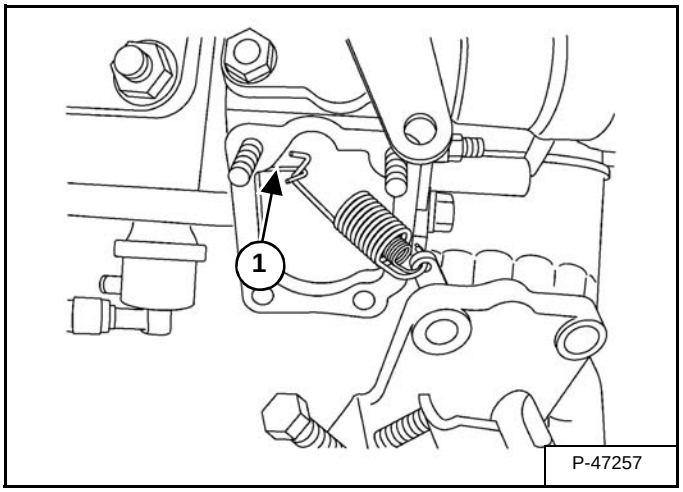
Timing Gearcase Cover Removal And Installation (Cont'd)

Figure 70-81-31



Remove the speed control plate (Item 1) **[Figure 70-81-31]**.

Figure 70-81-32



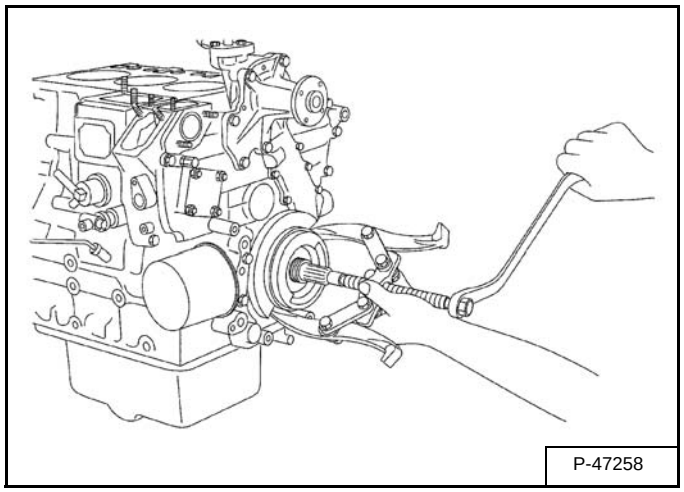
Remove the wire (Item 1) **[Figure 70-81-32]** from the springs.

Installation: Do not drop the governor springs into the gear case.

Remove the crankshaft pulley nut.

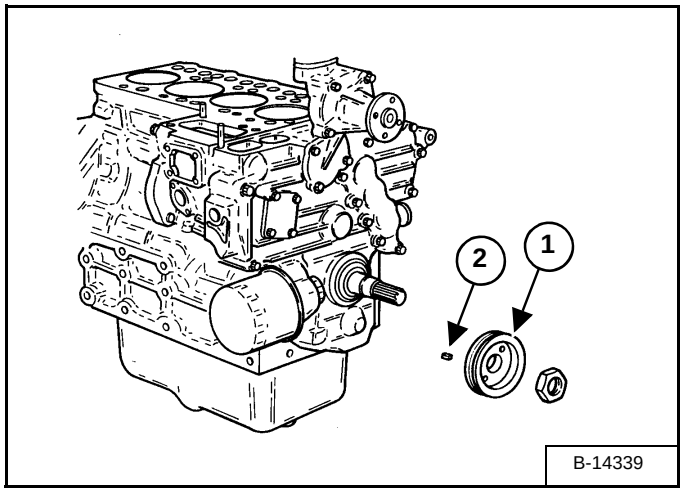
Installation: Tighten the nut to 101 to 116 ft.-lb. (137 to 157 N•m) torque.

Figure 70-81-33



Use a puller and remove the crankshaft pulley. **[Figure 70-81-33]**.

Figure 70-81-34



Remove the crankshaft pulley (Item 1) and key (Item 2) **[Figure 70-81-34]**.

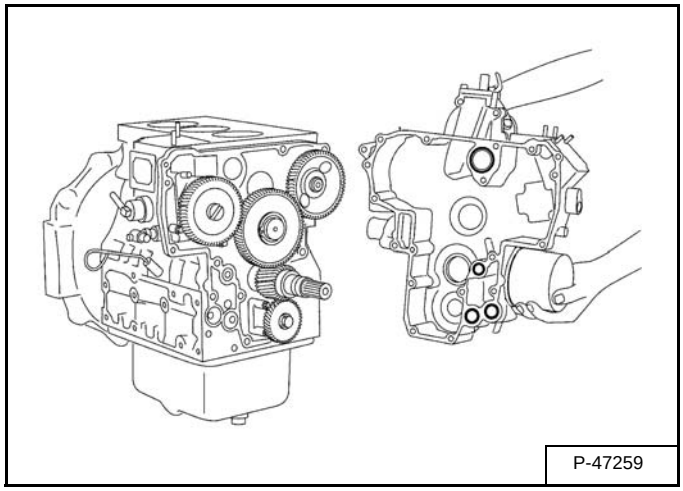
Remove the bolts from the timing gearcase cover.

Installation: Tighten the bolts to 13 to 15 ft.-lb. (18 to 20 N•m) torque.

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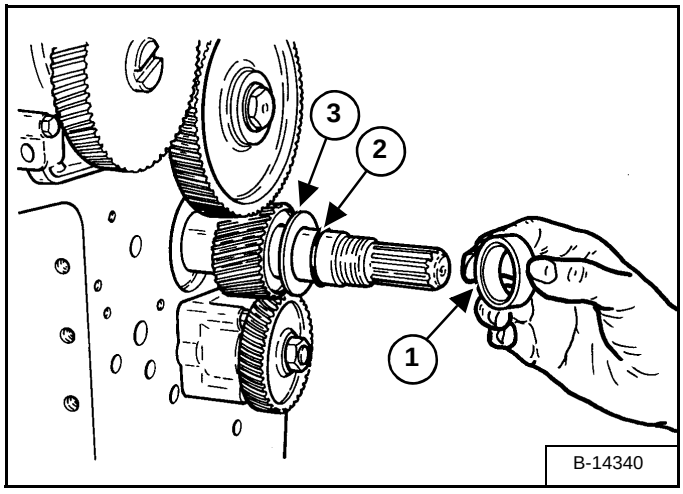
Timing Gearcase Cover Removal And Installation (Cont'd)

Figure 70-81-35



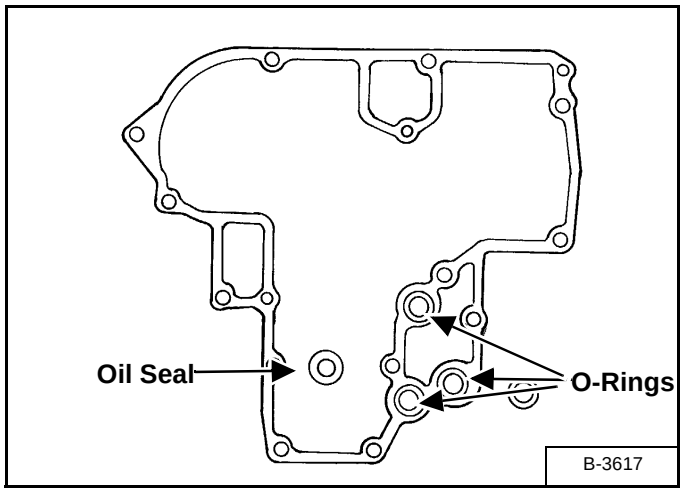
Remove the timing gearcase cover **[Figure 70-81-35]**.

Figure 70-81-36



Remove the crankshaft collar (Item 1), O-ring (Item 2) and oil slinger (Item 3) **[Figure 70-81-36]**.

Figure 70-81-37



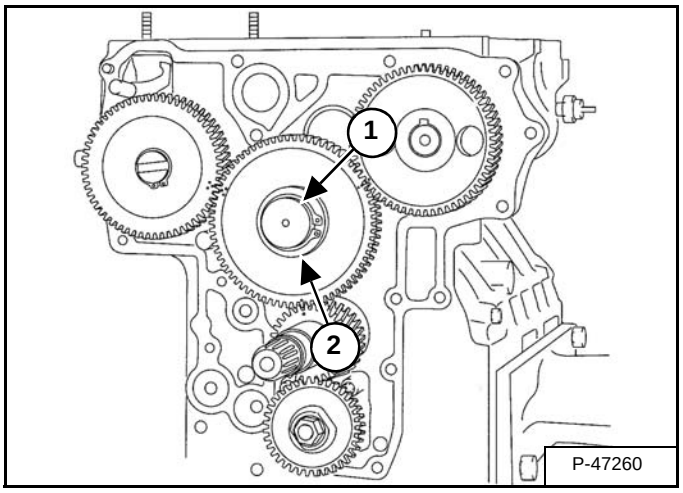
Installation: Install new O-rings and oil seal into the timing gearcase cover **[Figure 70-81-37]**.

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Idler Gear And Camshaft Removal And Installation

Remove the timing gearcase cover. (See Timing Gearcase Cover Removal And Installation on Page 70-81-10)

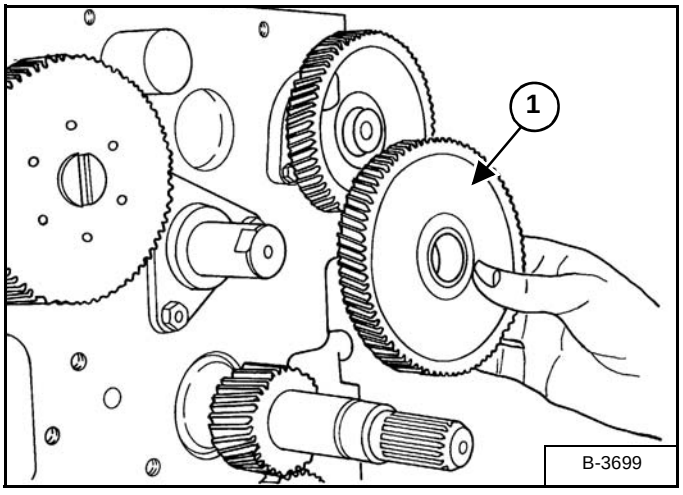
Figure 70-81-38



Remove the snap ring (Item 1) and collar from the idler gear shaft (Item 2) **[Figure 70-81-38]**.

Installation: Make sure the timing marks are in correct alignment when installing the timing gears **[Figure 70-81-38]**.

Figure 70-81-39

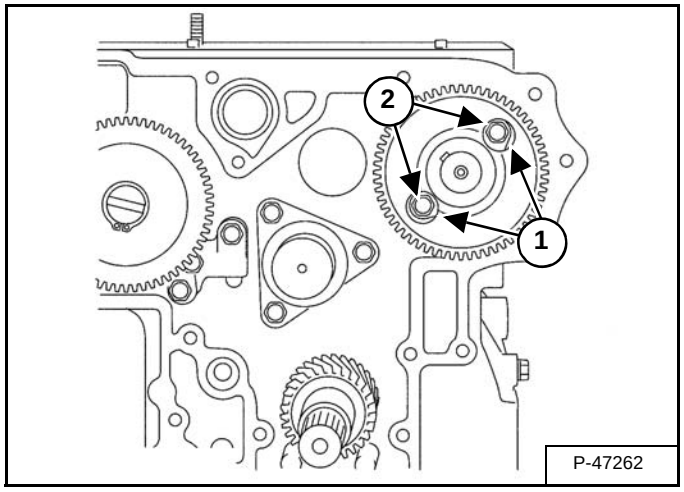


Remove the idler gear (Item 1) **[Figure 70-81-39]**.

Installation: Check the idler gear end play. If the clearance exceeds the allowable limit, replace the gear collar.

Idler Gear End Play	0.005 to 0.019 in. (0,12 to 0,48 mm)
Allowable Limit	0.035 in. (0,9 mm)

Figure 70-81-40

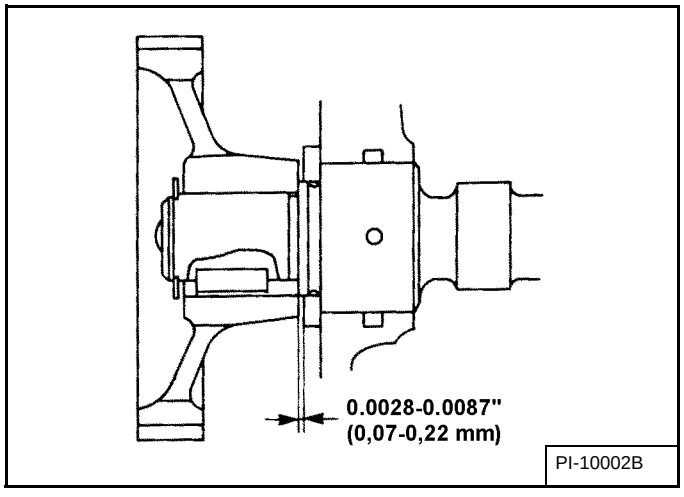


Align the holes (Item 1) on the camshaft gear with the camshaft retainer plate bolts (Item 2) **[Figure 70-81-40]**. Remove the bolts.

Installation: Tighten the camshaft retainer bolts to 17 to 20 ft.-lb. (23 to 27 N•m) torque.

Remove the camshaft from the engine block.

Figure 70-81-41



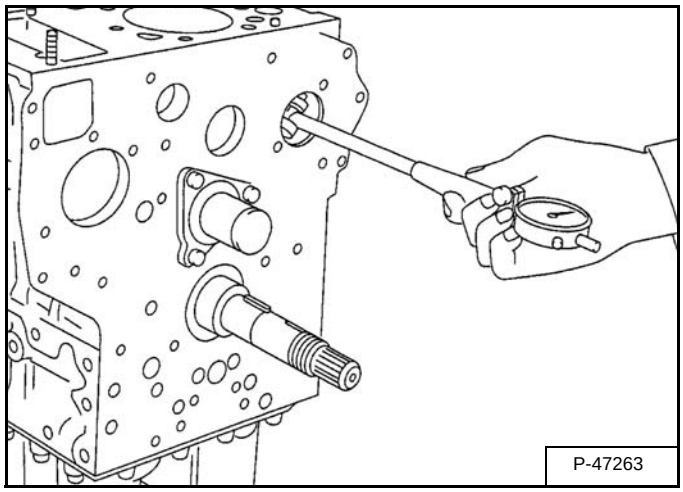
Installation: Check the camshaft end play. If clearance exceeds the allowable limit, replace the camshaft retainer plate **[Figure 70-81-41]**.

Camshaft End Play	0.0028 to 0.0087 in. (0,07 to 0,22 mm)
Allowable Limit	0.012 in. (0,3 mm)

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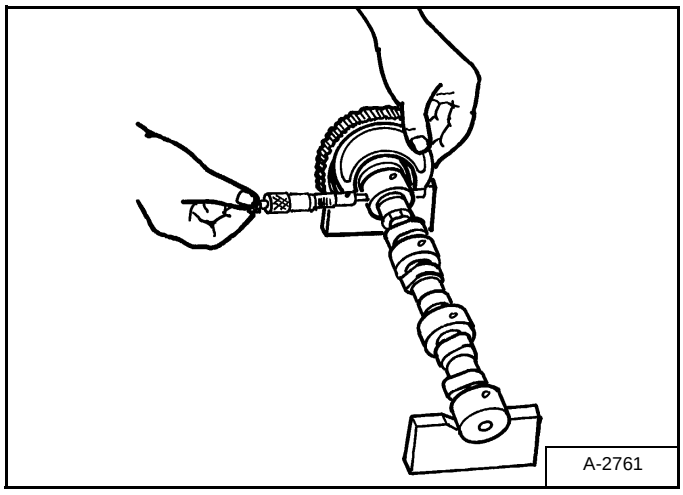
Camshaft Servicing

Figure 70-81-42



Measure the cylinder block bore in the engine block **[Figure 70-81-42]**.

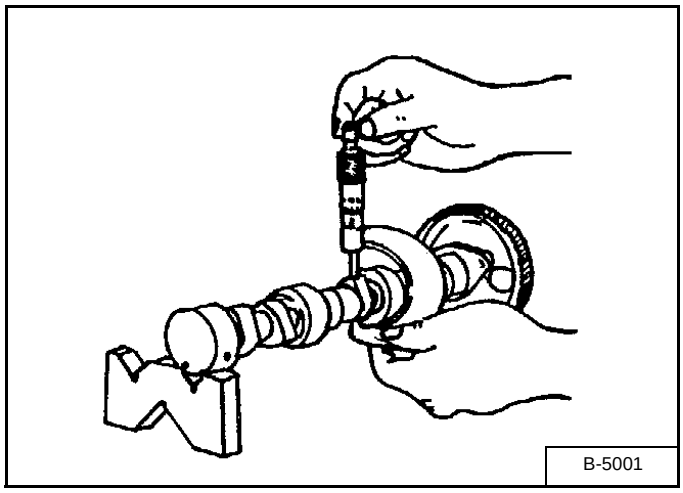
Figure 70-81-43



Measure the camshaft journal **[Figure 70-81-43]**. Calculate the oil clearance. If the clearance exceeds the allowable limit, replace the camshaft.

Cylinder Block Bore I.D.	1.575 to 1.576 in. (40,0 to 40,025 mm)
Journal O.D.	1.572 to 1.573 in. (39,93 to 39,95 mm)
Oil Clearance of Camshaft Journal	
	0.002 to 0.0036 in. (0,05 to 0,091 mm)
Allowable Limit	0.006 in. (0,15 mm)

Figure 70-81-44

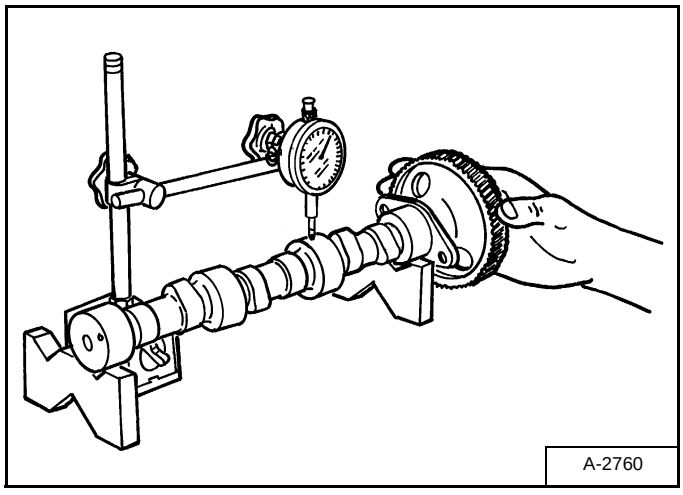


Measure the cam lobes at their highest point **[Figure 70-81-44]**.

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

Cam Lobe Height	1.335 in. (33,9 mm)
Allowable Limit	1.333 in. (33,85 mm)

Figure 70-81-45



Put the camshaft in V-blocks. Install a dial indicator **[Figure 70-81-45]**.

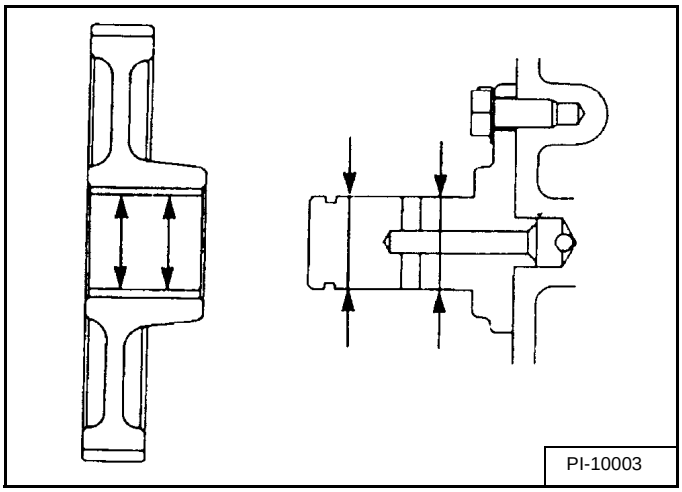
Turn the camshaft at a slow rate. If the misalignment exceeds the allowable limit, replace the camshaft.

Camshaft Alignment Allowable Limit	0.0004 in. (0,01 mm)

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Idler Gear And Shaft Servicing

Figure 70-81-46



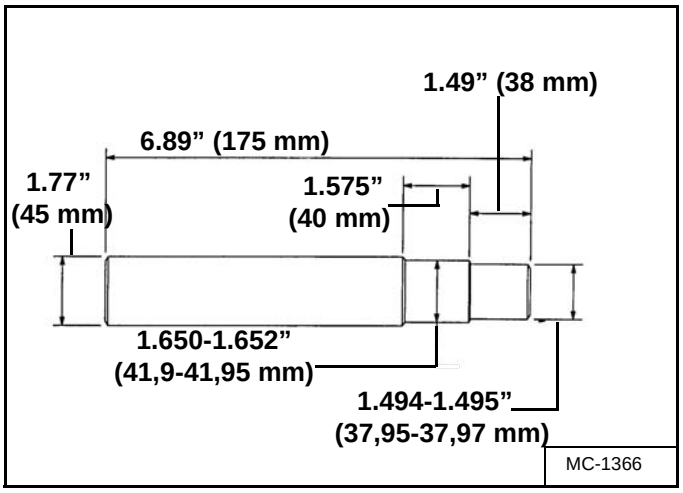
Measure the O.D. of the idler gear shaft **[Figure 70-81-46]**.

Measure the I.D. of the idler gear bushing **[Figure 70-81-46]**.

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

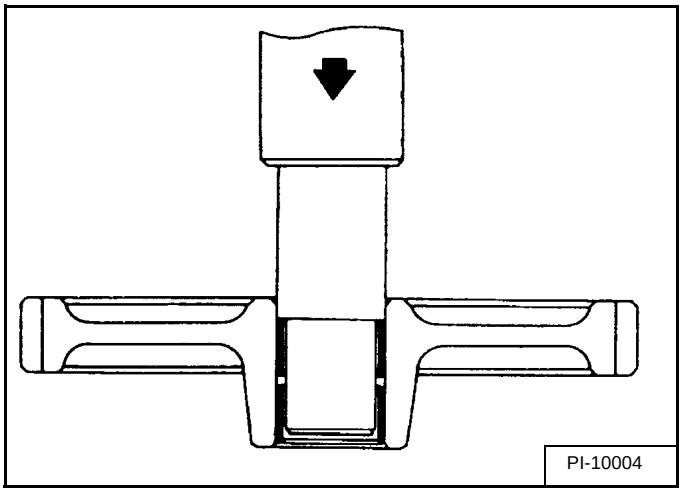
Idler Gear Shaft O.D.	1.494 to 1.495 in. (37,96 to 37,98 mm)
Idler Gear Bushing I.D.	1.496 to 1.497 in. (38,0 to 38,03 mm)
Clearance Between Idler Shaft & Gear Bushing	0.001 to 0.0026 in. (0,025 to 0,066 mm)
Allowable Limit	0.004 in. (0,1 mm)

Figure 70-81-47



To replace the idler gear bushing, make a driver tool as shown in figure **[Figure 70-81-47]**.

Figure 70-81-48



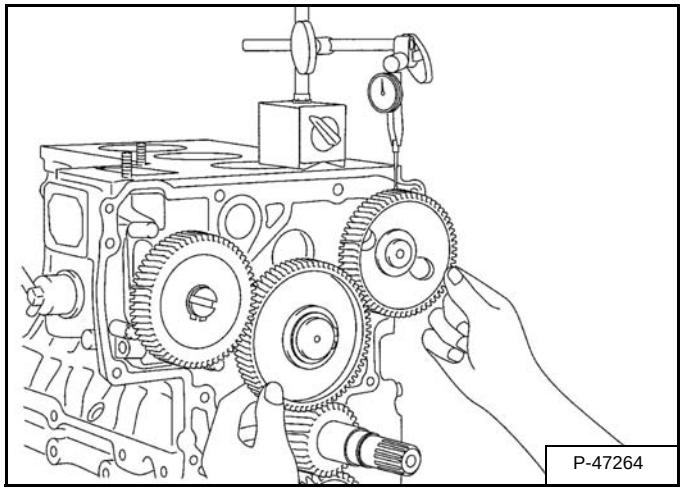
Use a press and special driver tool, to remove the old bushing and install the new bushing **[Figure 70-81-48]**.

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Timing Gears Checking Backlash

When the gears are installed, check the backlash of the gears.

Figure 70-81-49



Install a dial indicator **[Figure 70-81-49]**.

Hold 1 gear while turning the other gear **[Figure 70-81-49]**.

If the backlash exceeds the allowable limit, check the oil clearance of the shaft and gear. If the oil clearance is correct, replace the gear.

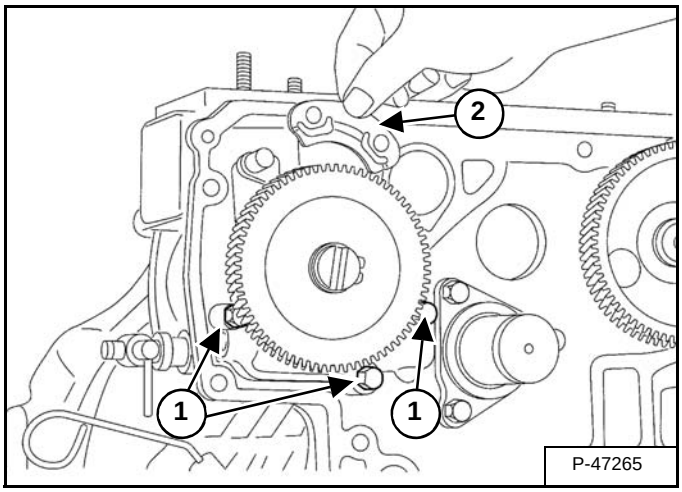
Crank Gear & Idler Gear	0.0016 to 0.0044 in. (0,042 to 0,112 mm)
Allowable Limit	-0.006 in. (0,15 mm)
Cam Gear & Idler Gear	0.0016 to 0.0045 in. (0,042 to 0,115 mm)
Allowable Limit	0.006 in. (0,15 mm)
Injection Pump Gear & Idler Gear	0.0016 to 0.0045 in. (0,042 to 0,115 mm)
Allowable Limit	0.006 in. (0,15 mm)
Oil Pump Gear & Crankgear	0.0016 to 0.0043 in. (0,042 to 0,109 mm)
Allowable Limit	0.006 in. (0,15 mm)

Fuel Camshaft Removal And Installation

Remove the timing gearcase cover. (See Timing Gearcase Cover Removal And Installation on Page 70-81-10)

Remove the idler gear. (See Idler Gear And Camshaft Removal And Installation on Page 70-81-13)

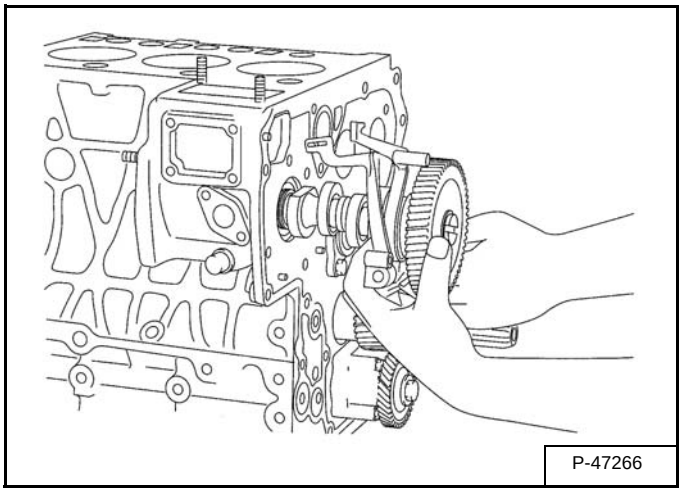
Figure 70-81-50



Remove the 3 bolts (Item 1) **[Figure 70-81-50]**.

Remove the 2 bolts and fuel camshaft retainer plate (Item 2) **[Figure 70-81-50]**.

Figure 70-81-51



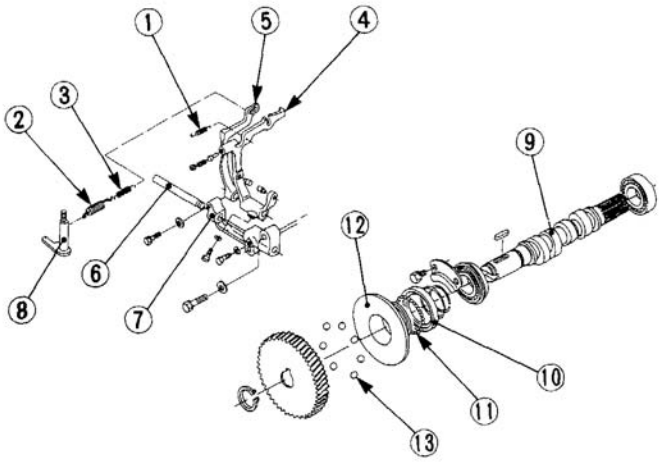
Remove the fuel camshaft and fork lever assembly at the same time **[Figure 70-81-51]**.

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Fuel Camshaft Governor

The governor serves to keep the engine speed constant by automatically adjusting the amount of fuel supplied to the engine according to changes in the load.

Figure 70-81-52



1. Start Spring
2. Governor Spring
3. Governor Spring
4. Fork Lever
5. Fork Lever
6. Fork Lever Shaft
7. Fork Lever Holder
8. Governor Lever
9. Fuel Camshaft
10. Governor Ball Case
11. Steel Balls
12. Governor Sleeve
13. Steel Ball

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Disassemble and assemble the governor and fuel camshaft as shown in figure **[Figure 70-81-52]**.

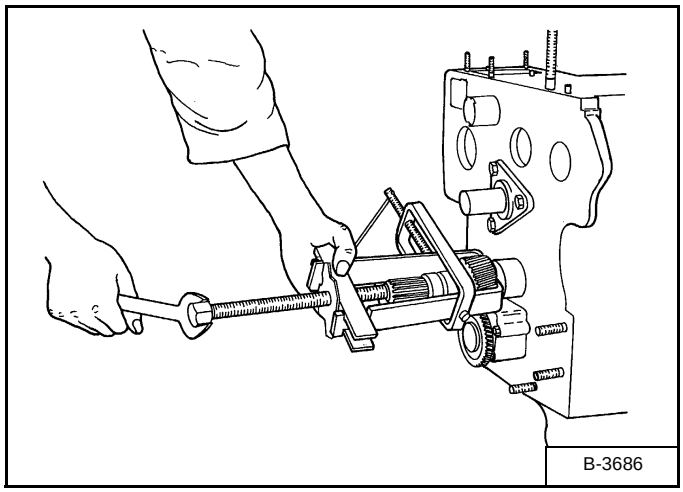
Check all the parts for wear or damage and replace as needed.

Crankshaft Gear Removal And Installation

Remove the timing gearcase cover. (See Timing Gearcase Cover Removal And Installation on Page 70-81-10)

Remove the idler gear. (See Idler Gear And Camshaft Removal And Installation on Page 70-81-13)

Figure 70-81-53



B-3686

Remove the crankshaft gear with a puller **[Figure 70-81-53]**.

Remove the crankshaft key.

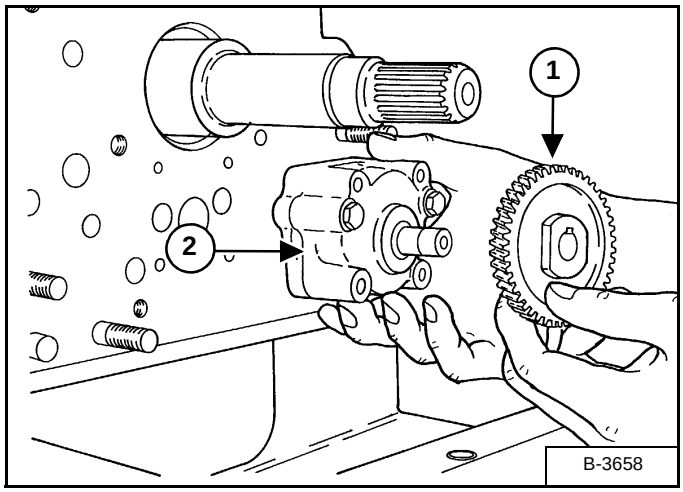
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Oil Pump Removal And Installation

Remove the timing gearcase cover. (See Timing Gearcase Cover Removal And Installation on Page 70-81-10)

Remove the crankshaft gear.

Figure 70-81-54



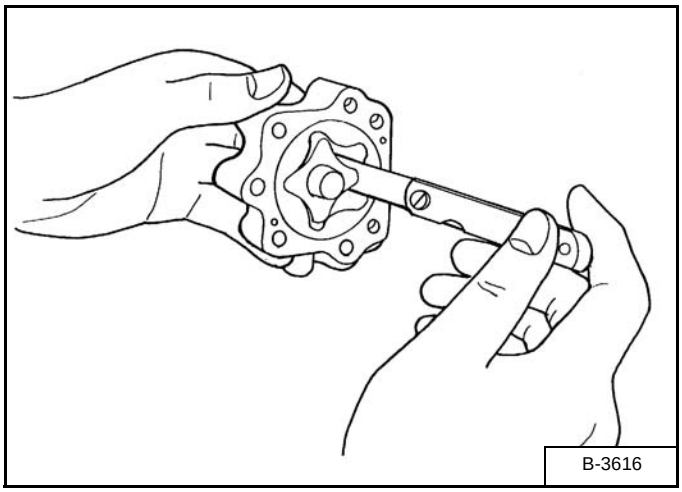
Remove the nut from the oil pump shaft. Use a puller to remove the oil pump gear (Item 1) **[Figure 70-81-54]**.

Remove the oil pump mounting bolts. Remove the oil pump (Item 2) **[Figure 70-81-54]**.

Installation: Tighten the oil pump mounting bolts to 60 to 72 in.-lb. (6,9 to 8,1 N•m) torque.

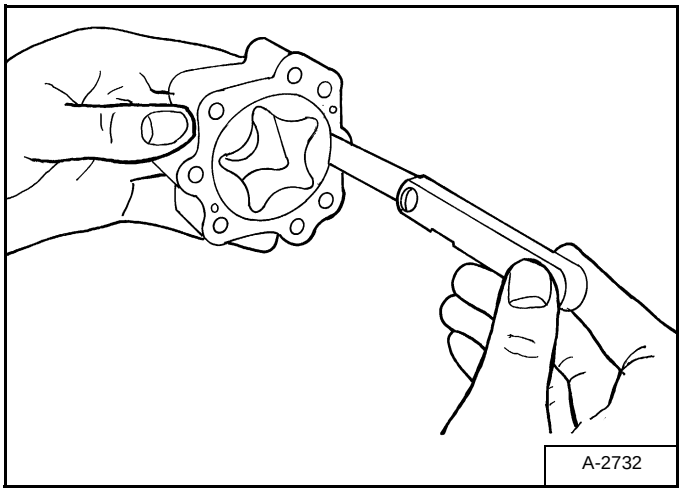
Oil Pump Service

Figure 70-81-55



Measure the clearance between the lobes of the inner rotor and outer rotor **[Figure 70-81-55]**.

Figure 70-81-56



Measure the clearance between the outer rotor and pump body **[Figure 70-81-56]**.

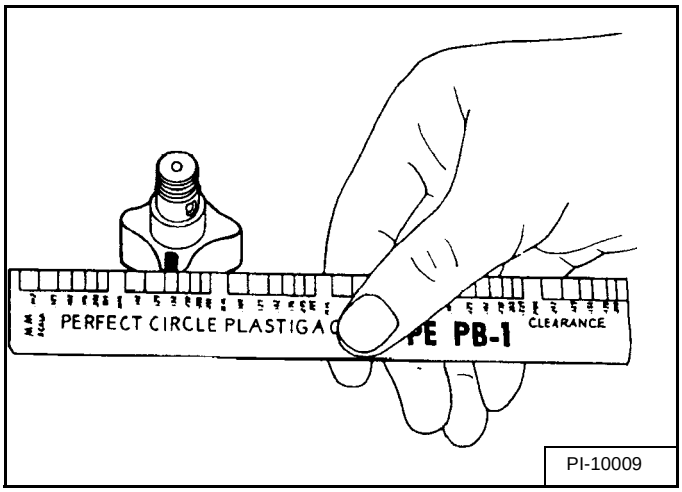
If the clearance exceeds the allowable limit, replace the oil pump.

Clearance Between Inner & Outer Rotor
0.0012 to 0.0055 in.
(0,03 to 0,14 mm)
Clearance Between Outer Rotor & Body
0.0043 to 0.0075 in.
(0,11 to 0,19 mm)

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Oil Pump Service (Cont'd)

Figure 70-81-57



Put a piece of press gauge on the rotor face **[Figure 70-81-57]**.

Install the cover and tighten the bolts.

Remove the cover carefully. Measure the width of the press gauge **[Figure 70-81-57]**.

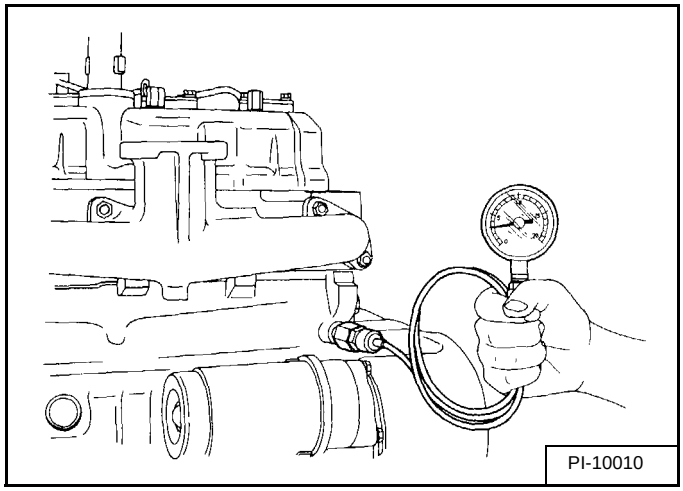
If the clearance exceeds the allowable limit replace the oil pump.

End Clearance	0.0041 to 0.0059 in. (0,105 to 0,15 mm)

Checking Engine Oil Pressure

Remove the oil pressure sender.

Figure 70-81-58



Install a pressure gauge **[Figure 70-81-58]**.

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

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

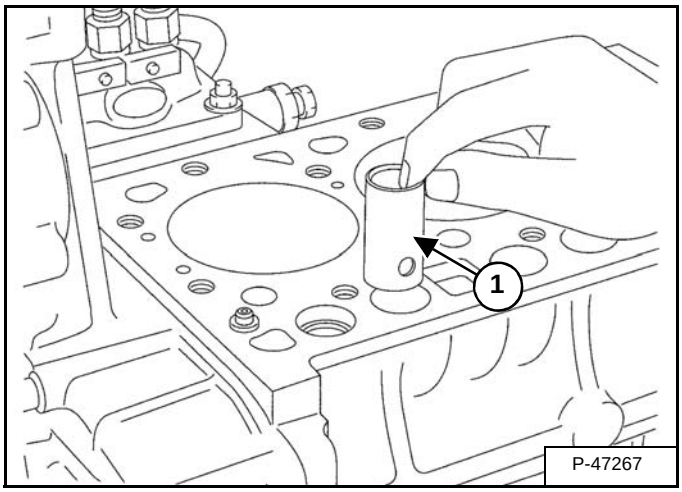
* Engine Oil Level Low
* Oil Pump Defective
* Oil Galley Plugged
* Oil Strainer Plugged
* Excessive Clearance at the Rod & Main Bearings
* Oil Pump Relief Valve Stuck

At Idle Speed Allowable Limit	7 PSI (0,48 bar)
At Rated Speed	43 to 64 PSI (2,9 to 4,4 bar)
Allowable Limit	36 PSI (2,5 bar)

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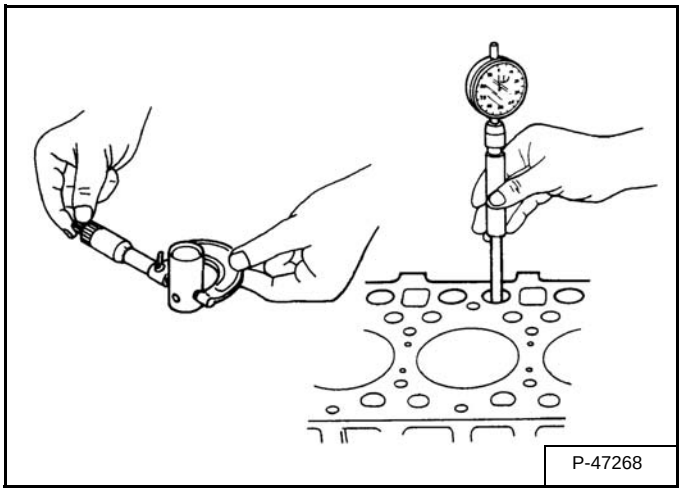
Valve Tappets

Figure 70-81-59



Remove the valve tappets (Item 1) **[Figure 70-81-59]**.

Figure 70-81-60



Measure the O.D. of the tappet **[Figure 70-81-60]**.

Measure the ID of the tappet bore **[Figure 70-81-60]**.

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

Tappet OD	0.943 to 0.944 in. (23,96 to 23,98 mm)
Tappet Bore ID	0.945 to 0.946 in. (24,0 to 24,021 mm)
Clearance Between Tappet and Tappet Bore	0.0008 to 0.0024 in. (0,02 to 0,062 mm)
Allowable limit	0.0028 in. (0,07 mm)

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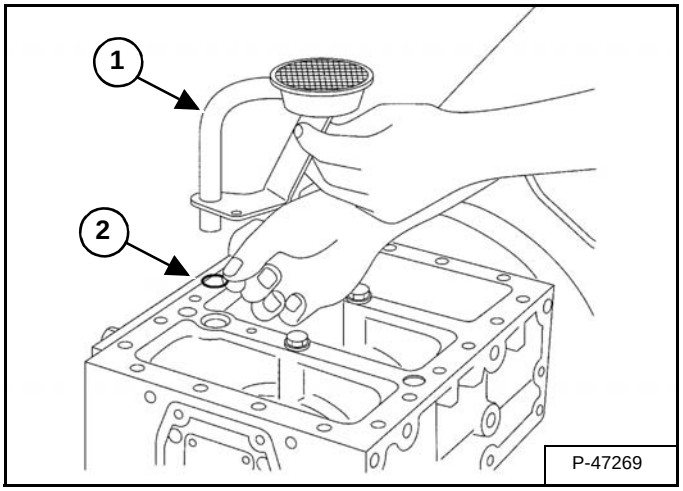
Piston And Connecting Rod Removal And Installation

Remove the cylinder head. (See Cylinder Head Removal And Installation on Page 70-81-1)

Remove the top edge from the cylinder bore with a ridge reamer.

Remove the oil pan.

Figure 70-81-61



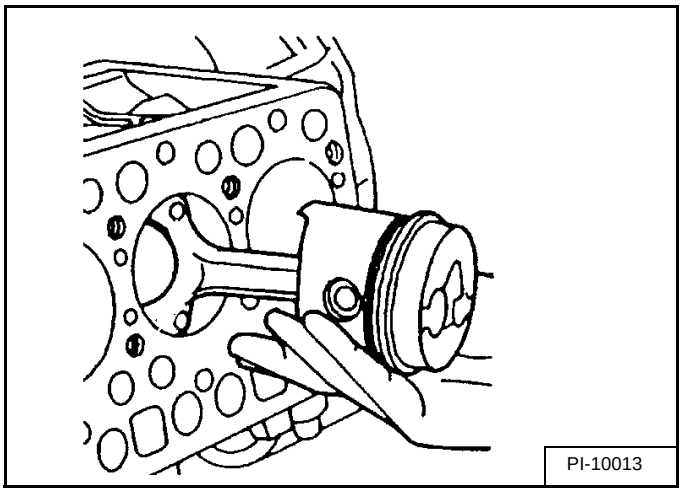
Remove the oil pump strainer (Item 1) and O-ring (Item 2) **[Figure 70-81-61]** by tapping the edge of the strainer with a soft faced hammer.

Turn the flywheel and put a pair of connecting rods at bottom dead center.

Remove the connecting rod bolts.

Installation: Tighten the connecting rod bolts to 33 to 36 ft.-lb. (44 to 49 N•m) torque.

Figure 70-81-62

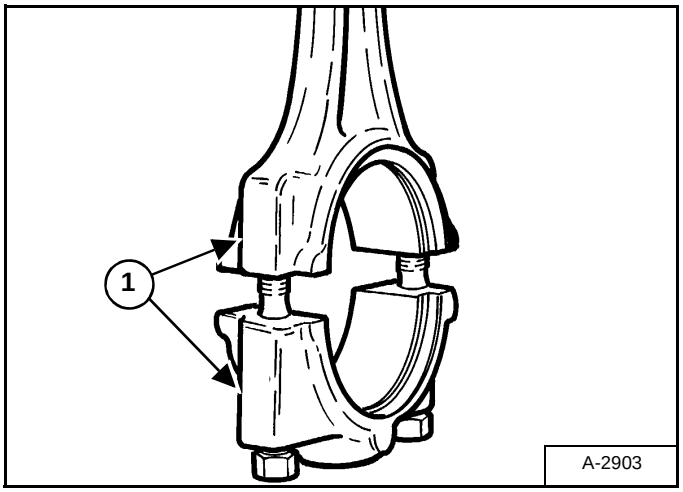


Remove the rod cap and bearing.

Use a hammer handle and push the piston/connecting rod assembly out of the cylinder bore **[Figure 70-81-62]**.

NOTE: Make sure the pistons are marked so they will be returned to the same cylinder bore.

Figure 70-81-63



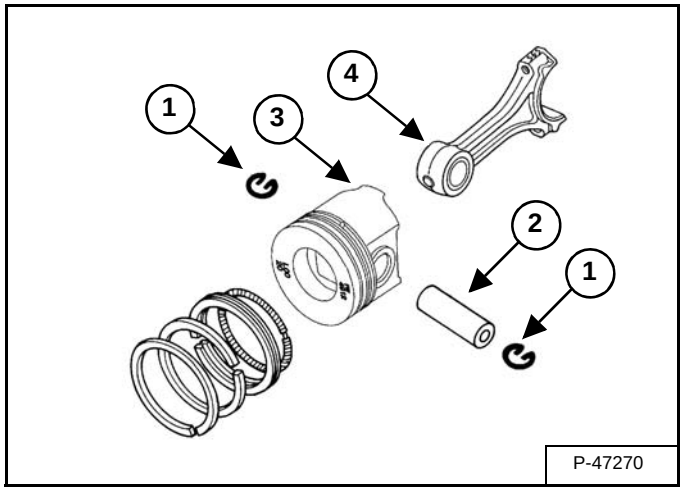
Installation: Make sure the marks (Item 1) **[Figure 70-81-63]** on the connecting rod and bearing are aligned when installing the bearing cap.

Repeat the procedure to remove the other piston/ connecting rod assemblies from the engine block.

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Piston And Connecting Rod Removal And Installation (Cont'd)

Figure 70-81-64

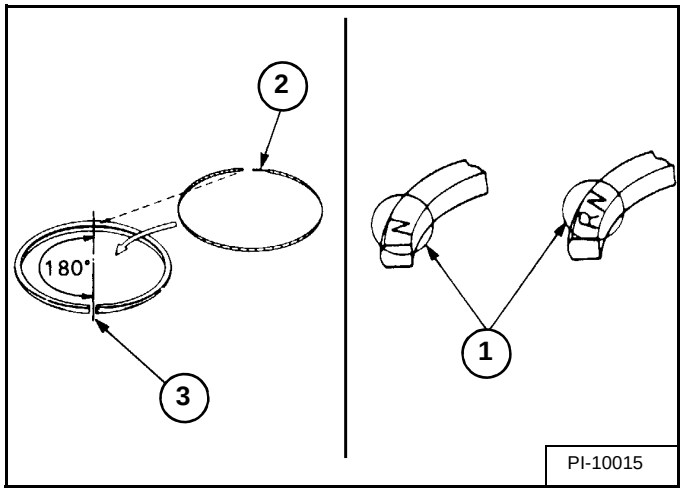


Remove the piston rings **[Figure 70-81-64]**.

Remove the snap ring (Item 1) and piston pin (Item 2) **[Figure 70-81-64]**.

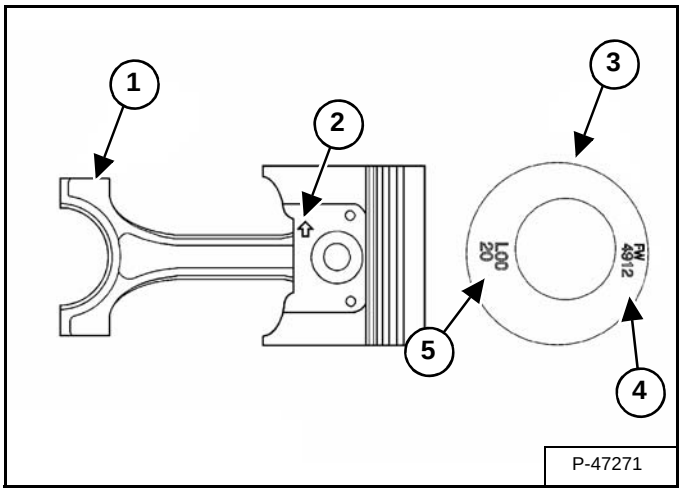
Separate the piston (Item 3) from the connecting rod (Item 4) **[Figure 70-81-64]**.

Figure 70-81-65



Installation: When installing new rings, assemble the ring so the mark (Item 1) near the gap faces the top of the piston. When installing the oil ring, place the expander joint (Item 2) on the opposite side of the oil ring gap (Item 3) **[Figure 70-81-65]**.

Figure 70-81-66

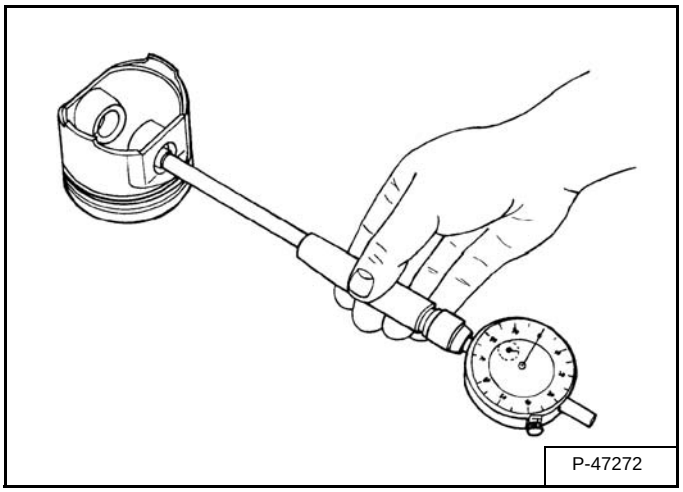


Installation: When reassembling, align the marks on the connecting rod (Item 1) and piston (Item 2). Heat the piston in clean engine oil to 176° F. (80° C.) and tap the piston pin into position. Place the piston rings so that there are gaps every 120° (Items 3, 4 & 5) **[Figure 70-81-66]** with no gap facing the piston pin in the cylinder.

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Piston And Connecting Rod Servicing

Figure 70-81-67

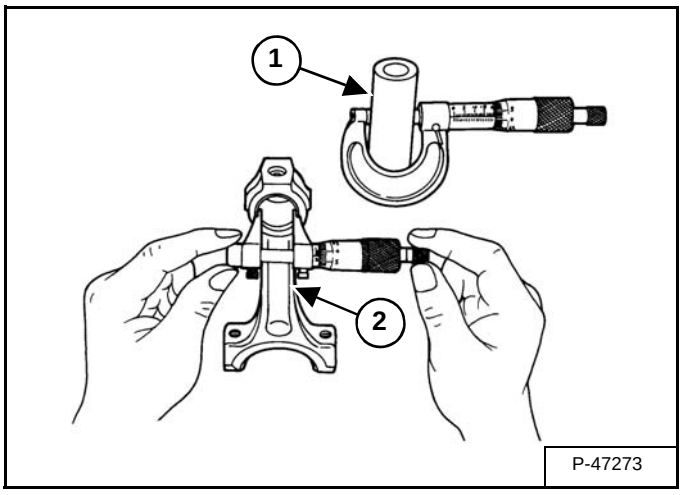


Measure the I.D. of the piston pin bore in both horizontal and vertical directions **[Figure 70-81-67]**.

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

Piston Bore I.D.	0.984 to 0.985 in. (25,0 to 25,013 mm)
Allowable Limit	0.986 in. (25,05 mm)

Figure 70-81-68



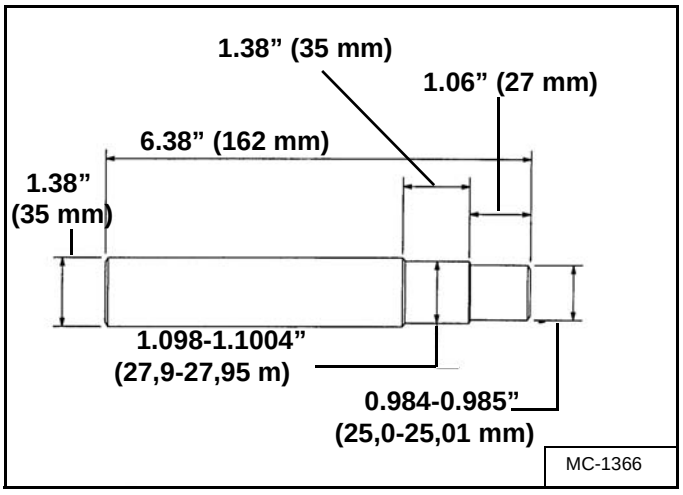
Measure the O.D. of the piston pin (Item 1) **[Figure 70-81-68]**.

Measure the I.D. of the connecting rod small end (Item 2) **[Figure 70-81-68]**.

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

Piston Pin O.D.	0.984 to 0.985 in. (25,0 to 25,011 mm)
Bushing I.D.	0.985 to 0.986 in. (25,025 to 25,04 mm)
Oil Clearance Between Piston Pin & Bushing	0.0006 to 0.0015 in. (0,014 to 0,038 mm)
Allowable Limit	0.002 in. (0,05 mm)

Figure 70-81-69

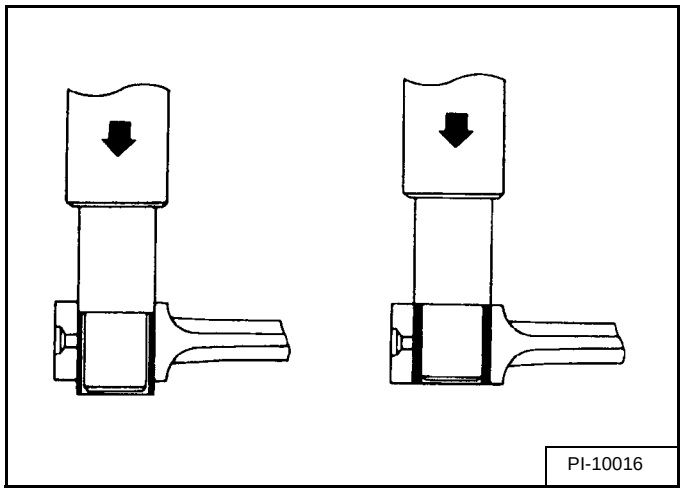


To replace the connecting rod small end bushing, make a driver tool as shown in figure **[Figure 70-81-69]**.

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Piston And Connecting Rod Servicing (Cont'd)

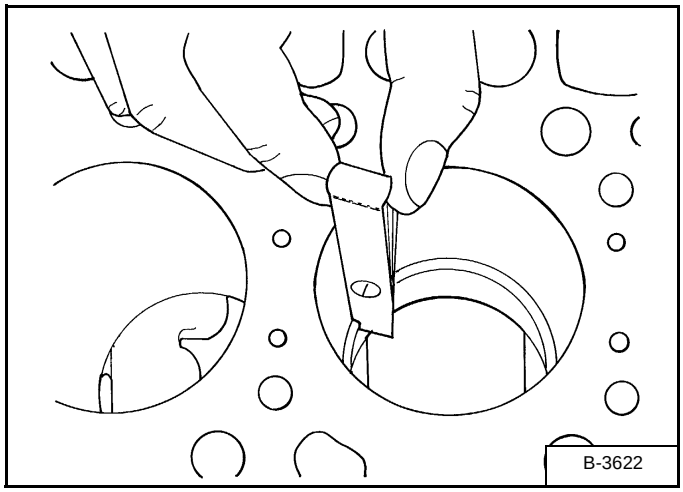
Figure 70-81-70



Use a press and special driver tool to remove the small end bushing **[Figure 70-81-70]**.

Installation: Clean the small end bushing and bore. Put oil on the bushing and press into the connecting rod until it is flush **[Figure 70-81-70]**.

Figure 70-81-71

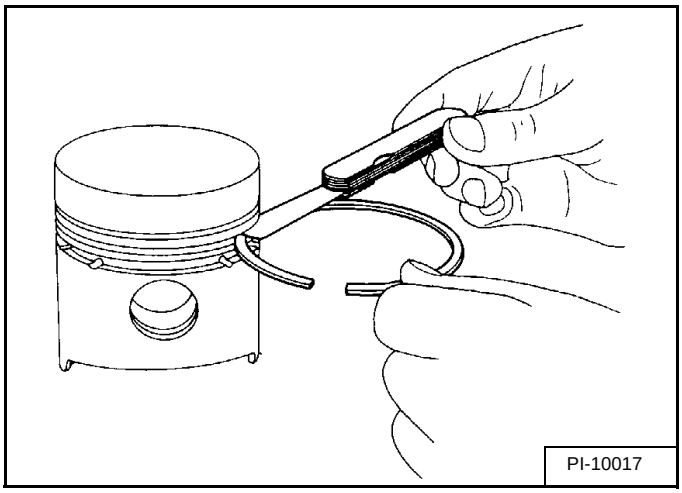


Install a piston ring into the lower part of the cylinder bore. Measure the ring gap with a feeler gauge **[Figure 70-81-71]**.

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

Top Ring Gap	0.008 to 0.0138 in. (0,2 to 0,35 mm)
Second Ring Gap	0.016 to 0.022 in. (0,40 to 0,55 mm)
Oil Ring Gap	0.01 to 0.018 in. (0,25 to 0,45 mm)
Allowable Limit	0.05 in. (1,25 mm)

Figure 70-81-72



Remove the carbon from the ring grooves. Measure the clearance between the ring and groove with a feeler gauge **[Figure 70-81-72]**.

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

Second Ring	0.004 to 0.005 in. (0,09 to 0,13 mm)
Oil Ring	0.0008 to 0.0023 in. (0,2 to 0,06 mm)

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Connecting Rod Alignment

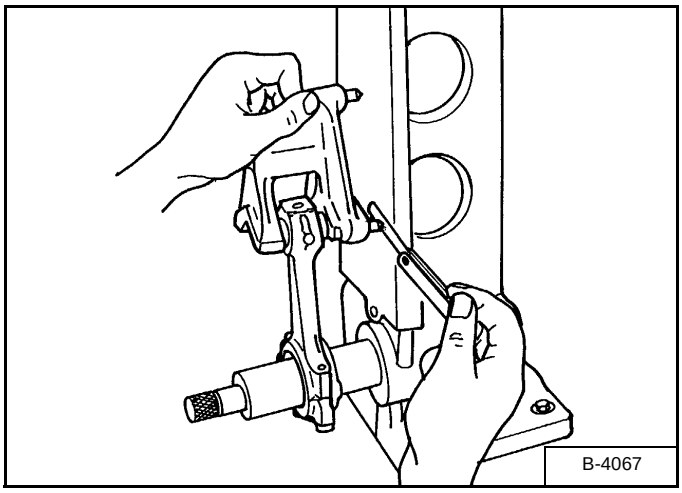
NOTE: The small end bushing is the basis of this check, check the bushing for wear before doing this check.

Install the piston pin into the connecting rod.

Install the connecting rod on an alignment tool.

Put the gauge over the piston pin and move it against the face plate.

Figure 70-81-73



If the gauge does not fit squarely against the face plate, measure the space between the gauge and face plate **[Figure 70-81-73]**.

If the measurement exceeds the allowable limit, replace the connecting rod.

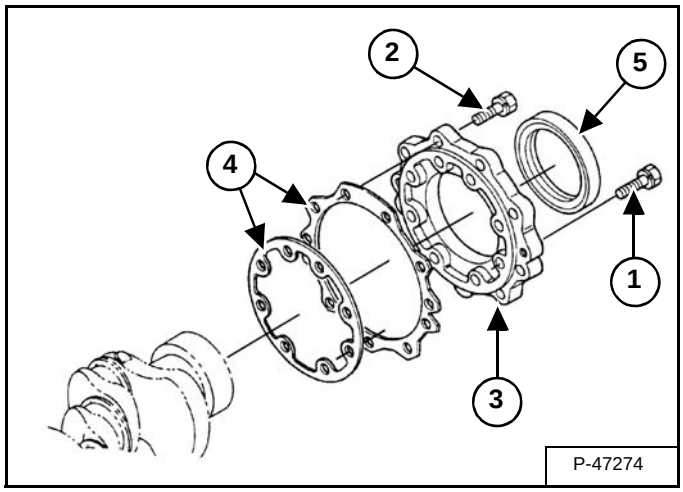
Rod Alignment	0.002 in. (0,05 mm)

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Crankshaft And Bearings Removal And Installation

Remove the piston and connecting rod assemblies. (See Piston And Connecting Rod Removal And Installation on Page 70-81-21)

Figure 70-81-74



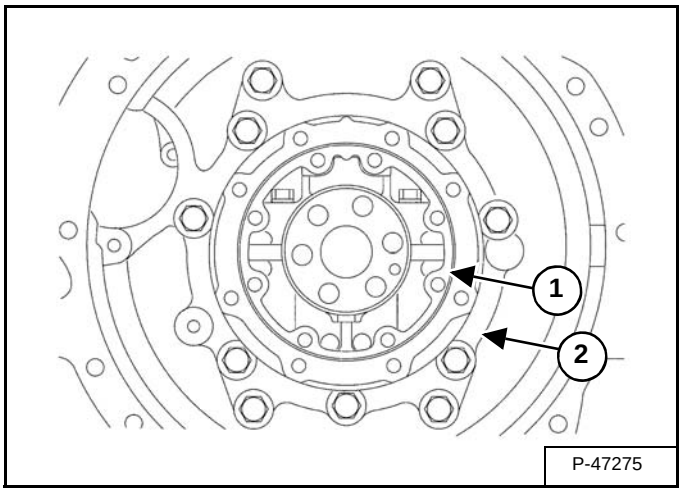
Mark and remove the inside screws (Item 1) first, then remove the outside screws (Item 2) **[Figure 70-81-74]**.

NOTE: The inside bolts are different length than the outside bolts.

Install 2 screws in the bearing case cover and remove the cover (Item 3) **[Figure 70-81-74]**.

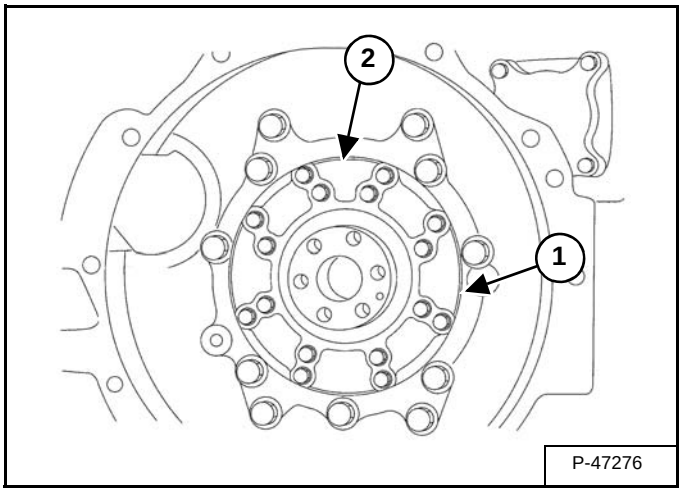
Remove the 2 gaskets (Item 4) and oil seal (Item 5) **[Figure 70-81-74]** from the cover.

Figure 70-81-75



Installation: Install the gaskets (Item 1) & (Item 2) **[Figure 70-81-75]** as shown.

Figure 70-81-76

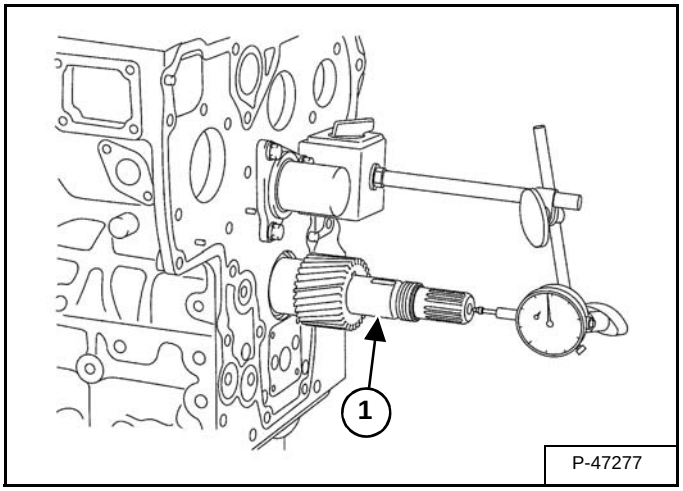


Install the bearing case cover (Item 1) with the casting mark (Item 2) **[Figure 70-81-76]** in the upward position. Tighten the bolts to 17 to 20 ft.-lb. (24 to 28 N•m) torque.

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Crankshaft And Bearings Removal And Installation (Cont'd)

Figure 70-81-77

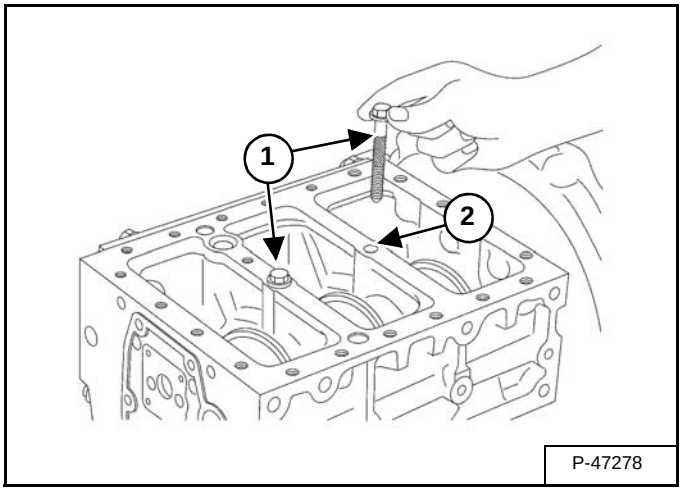


Before removing the crankshaft/main bearings, check the end play. Install a dial indicator. Move the crankshaft (Item 1) **[Figure 70-81-77]** to the flywheel side, zero the dial indicator. Measure the end play by pulling the crankshaft toward the gear case side.

If the measurement exceeds the allowable limit, replace the thrust washers.

End Play	0.006 to 0.014 in. (0,15 to 0,35 mm)
Allowable Limit	0.020 in. (0,5 mm)

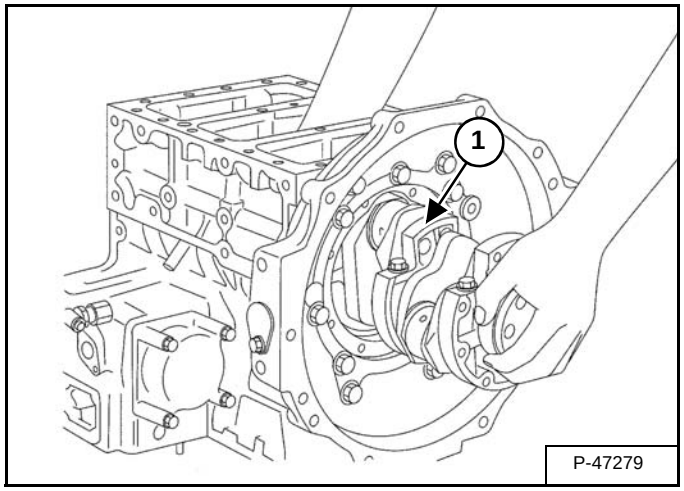
Figure 70-81-78



Remove the main bearing bolts (Item 1) **[Figure 70-81-78]**.

Installation: Align the bearing case hole with the hole in the block (Item 2) **[Figure 70-81-78]**. Put oil on the bolt threads and tighten to 51 to 54 ft.-lb. (69 to 74 N•m) torque.

Figure 70-81-79

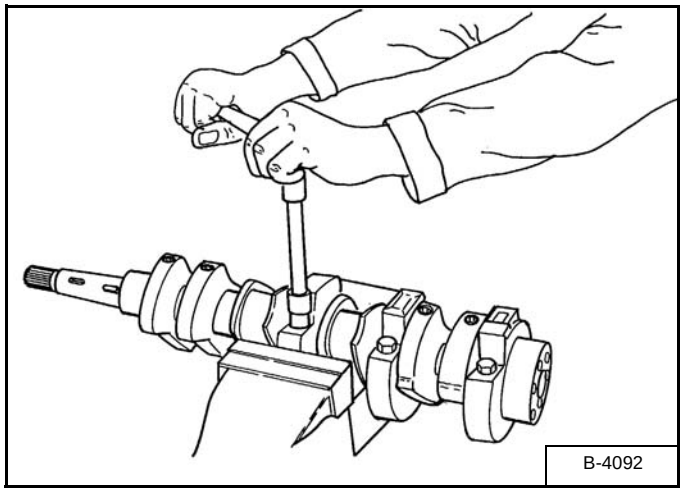


Remove the crankshaft/main bearing assembly from the engine block **[Figure 70-81-79]**.

NOTE: Turn the crankshaft as needed to allow the crank pin journals to pass through the cut out (Item 1) [Figure 70-81-79] of the engine block.

Mark the bearing case halves for correct installation.

Figure 70-81-80



Remove the 2 bearing case bolts **[Figure 70-81-80]**.

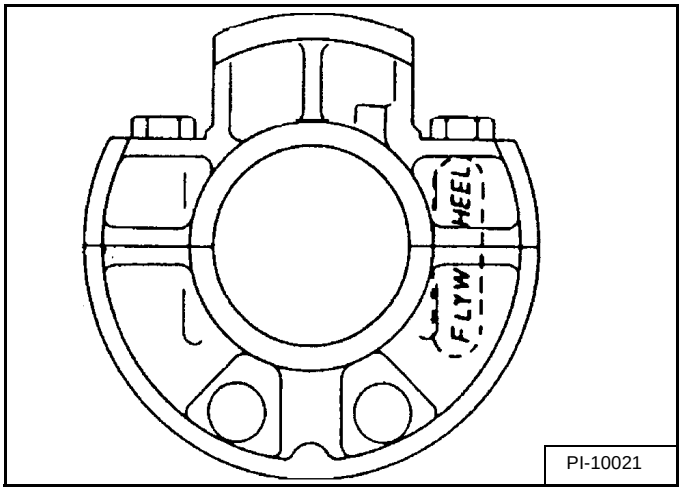
Remove the bearing case and bearing.

Installation: Tighten the bearing case bolts to 34 to 38 ft.-lb. (46 to 51 N•m) torque.

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Crankshaft And Bearings Removal And Installation (Cont'd)

Figure 70-81-81

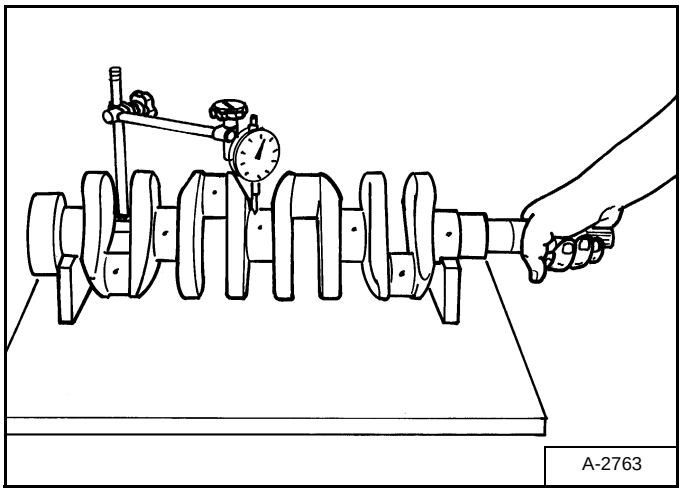


Installation: When installing the main bearing case assemblies, face the mark FLYWHEEL to the flywheel side of the engine block **[Figure 70-81-81]**. The thrust washers oil grooves must face outward.

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Crankshaft And Bearings Servicing

Figure 70-81-82



Put the crankshaft on V-blocks. Install a dial indicator on the center journal **[Figure 70-81-82]**.

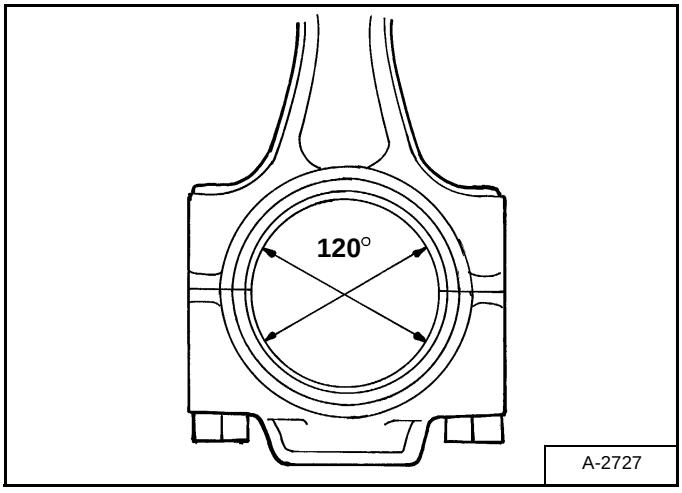
Turn the crankshaft at a slow rate to obtain the misalignment (1/2 of the alignment measurement).

If the misalignment exceeds the allowable limit, replace the crankshaft.

Alignment	0.0008 in. (0,02 mm)

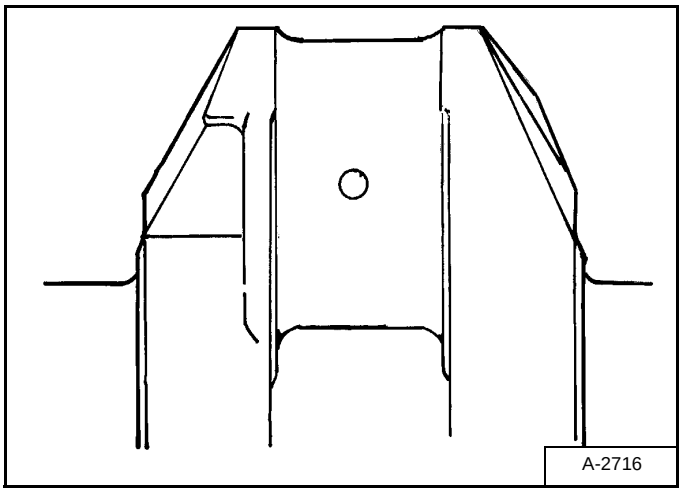
Tighten the connecting rod bolts to 33 to 36 ft.-lb. (44 to 49 N•m) torque.

Figure 70-81-83



Measure the crankpin bearing I.D. **[Figure 70-81-83]**.

Figure 70-81-84

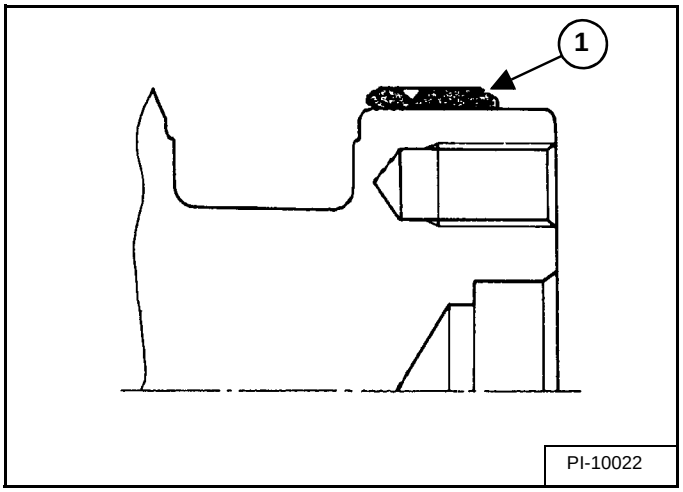


Measure the crankpin O.D. **[Figure 70-81-84]**.

Calculate the oil clearance.

Crankpin Bearing I.D.	1.850 to 1.852 in. (47,0 to 47,05 mm)
Crankpin O.D.	1.8488 to 1.8494 in. (49,96 to 46,98 mm)
Oil Clearance	0.001 to 0.0034 in. (0,025 to 0,087 mm)
Allowable Limit	0.008 in. (0,2 mm)

Figure 70-81-85



Check the wear on the crankshaft sleeve **[Figure 70-81-85]**.

If the wear exceeds the allowable limit or the seal leaks oil, replace the sleeve.

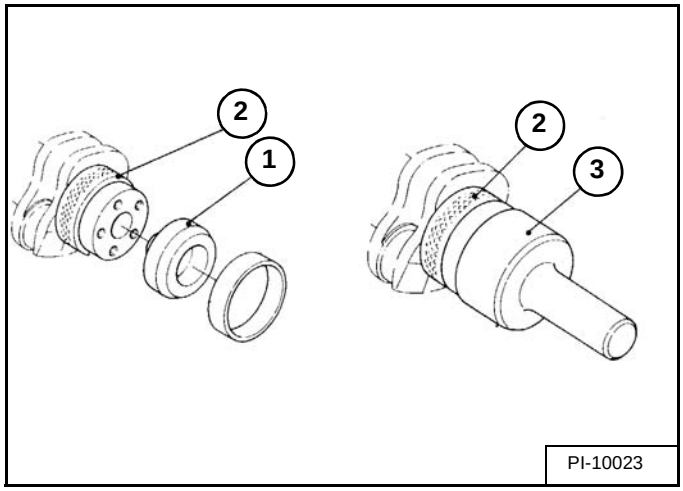
Wear of Sleeve	0.0004 in. (0,1 mm)

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Crankshaft And Bearings Servicing (Cont'd)

The special tool set will be needed to replace the crankshaft sleeve. Remove the sleeve.

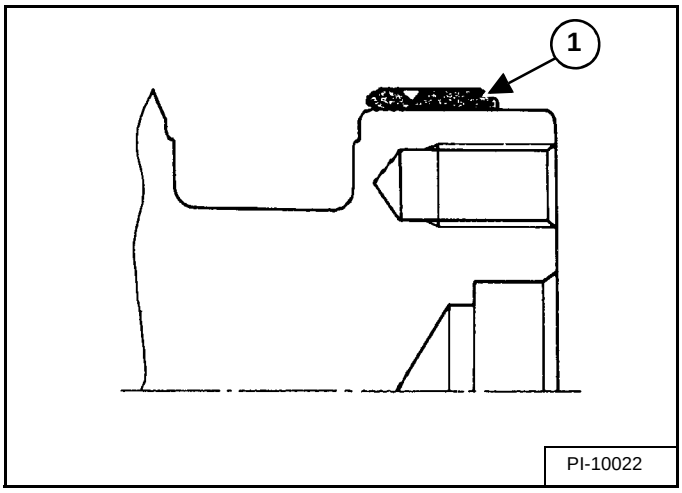
Figure 70-81-86



Install the sleeve guide (Item 1) and stop (Item 2) **[Figure 70-81-86]**.

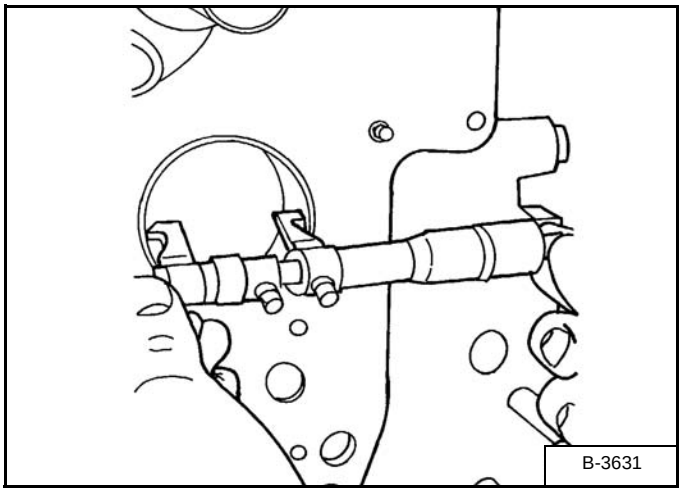
Heat the sleeve to 302 to 392° F (150° to 200° C). Install the sleeve on the crankshaft using the special driver tool (Item 3) **[Figure 70-81-86]**.

Figure 70-81-87



NOTE: The sleeve is installed with the larger chamfered surface to the front of the crankshaft (Item 1) [Figure 70-81-87].

Figure 70-81-88

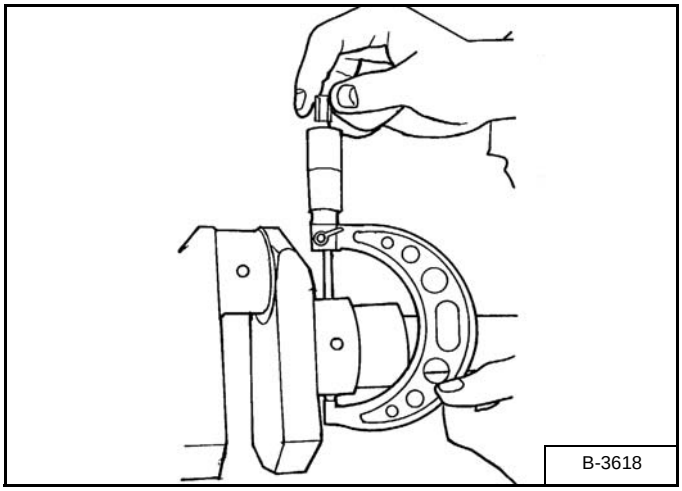


Measure the I.D. of the No. 1 crankshaft bearing **[Figure 70-81-88]**.

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Crankshaft And Bearings Servicing (Cont'd)

Figure 70-81-89



Measure the O.D. of the crankshaft journal **[Figure 70-81-89]**.

Calculate the oil clearance.

If the clearance exceeds the allowable limit, replace the crankshaft bearing.

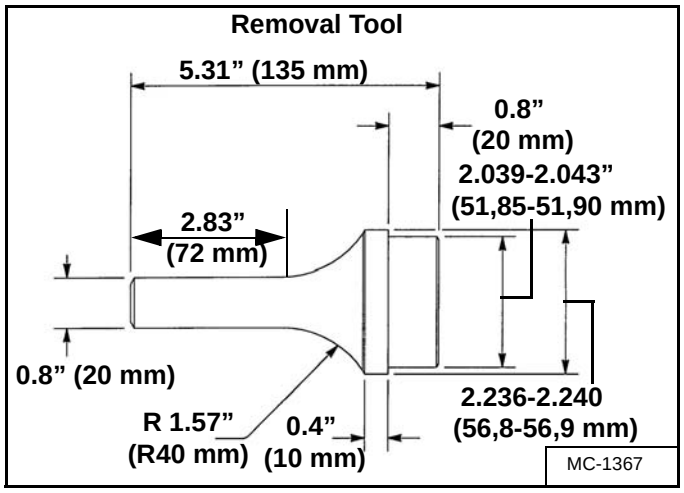
Engine S/N 3R9999 & Below

Bearing I.D.	2.046 to 0.049 in. (51,98 to 52,04 mm)
Crankshaft Journal O.D.	2.044 to 2.045 in. (51,92 to 51,94 mm)
Oil Clearance	0.0016 to 0.0041 in. (0,04 to 0,104 mm)
Allowable Limit	0.008 in. (0,2 mm)

Engine S/N 3S9999 & Below

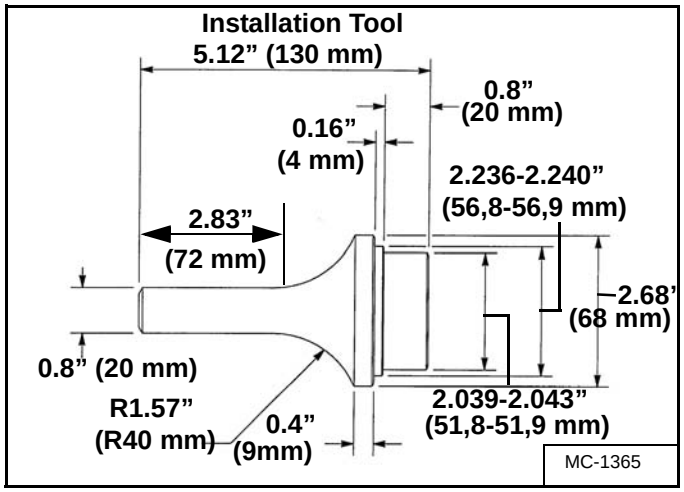
Bearing I.D.	2.3614 to 2.3637 in. (59,98 to 60,039 mm)
Crankshaft Journal O.D.	2.3591 to 2.3598 in. (59,921 to 59,940 mm)
Oil Clearance	0.0016 to 0.0041 in. (0,04 to 0,104 mm)
Allowable Limit	0.008 in. (0,2 mm)

Figure 70-81-90



To remove the front bearing make the tool as shown in figure **[Figure 70-81-90]**.

Figure 70-81-91

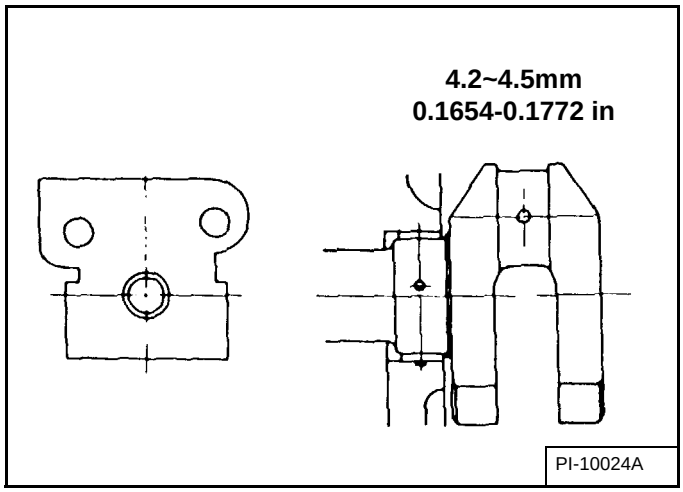


To install the front bearing make the tool as shown in figure **[Figure 70-81-91]**.

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Crankshaft And Bearings Servicing (Cont'd)

Figure 70-81-92



Remove the front bearing with the special removal tool **[Figure 70-81-92]**.

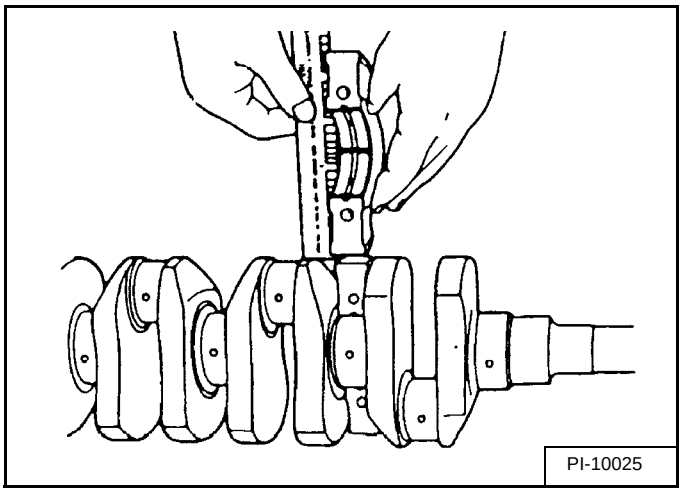
Installation: Clean the new bearing and bore, apply oil to the bearing and bore. Install the new bearing with the seam (Item 1) **[Figure 70-81-92]** towards the exhaust manifold side, using the installation driver tool.

Clean the crankshaft journal and bearing. Put a strip of press gauge on the center journal.

Install the main bearing case halves and tighten the bolts. Remove the bearing case halves.

NOTE: DO NOT turn the crankshaft with the press gauge installed. Incorrect measurements will be obtained.

Figure 70-81-93



Measure the flattened press gauge **[Figure 70-81-93]**.

If the clearance exceeds the allowable limit, replace the crankshaft bearing.

Engine S/N 3R9999 & Below

Crankshaft Journal O.D.	2.044 to 2.045 in. (51,92 to 51,94 mm)
Bearing I.D.	2.046 to 0.048 in. (51,98 to 52,03 mm)
Oil Clearance	0.001 to 0.0034 in. (0,025 to 0,087 mm)
Allowable Limit	0.008 in. (0,2 mm)

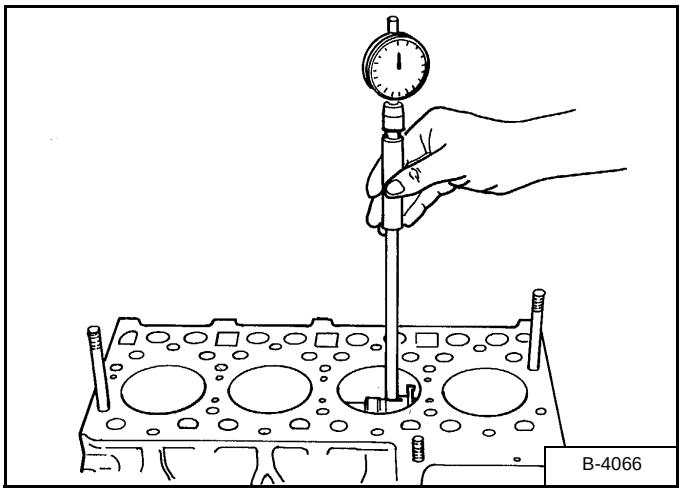
Engine S/N 3S9999 & Below

Crankshaft Journal O.D.	2.3591 to 2.3598 in. (59,921 to 59,940 mm)
Bearing I.D.	2.3614 to 2.3632 in. (59,98 to 60,025 mm)
Oil Clearance	0.001 to 0.0034 in. (0,025 to 0,087 mm)
Allowable Limit	0.008 in. (0,2 mm)

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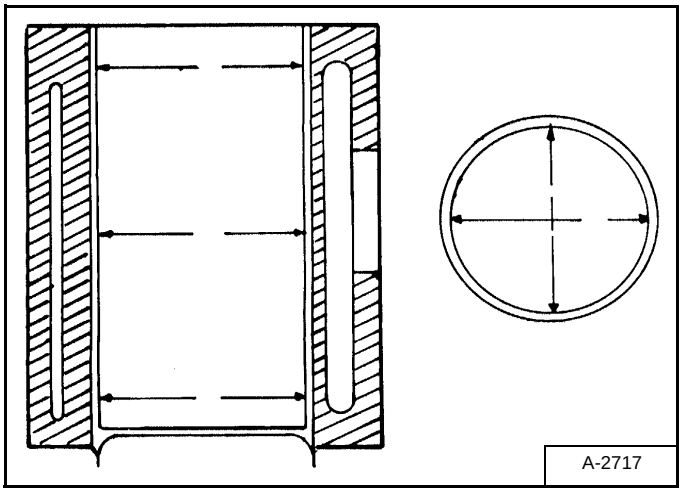
Cylinder Bore Checking

Figure 70-81-94



Use a gauge to check the inside measurement of the cylinder bore **[Figure 70-81-94]**.

Figure 70-81-95



Measure the 6 points as shown in figure **[Figure 70-81-95]** to find the maximum wear.

The specifications is 3.268 to 3.269 in. (83,0 to 83,022 mm). The wear limit is +0.006 in. (+0,15 mm).

If the cylinder bore is not within specifications, re-bore the cylinder for oversize piston.

Water Pump Removal And Installation

Drain the cooling system.

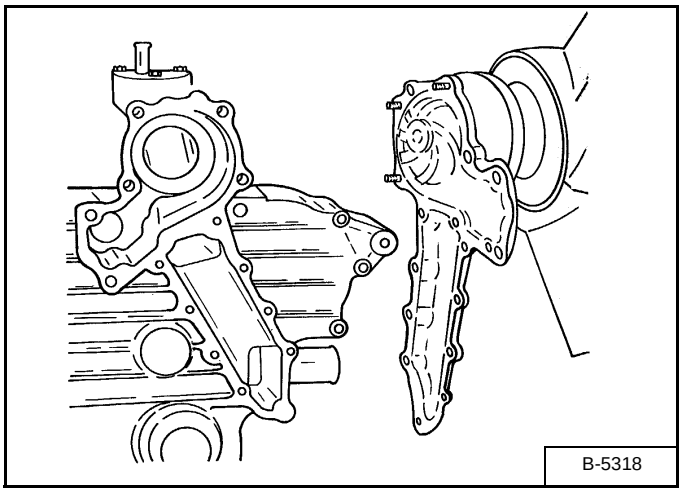
Remove the radiator. (See Removal And Installation on Page 70-40-1)

Remove the alternator belt.

Remove the fan.

Remove the water pump bolts.

Figure 70-81-96



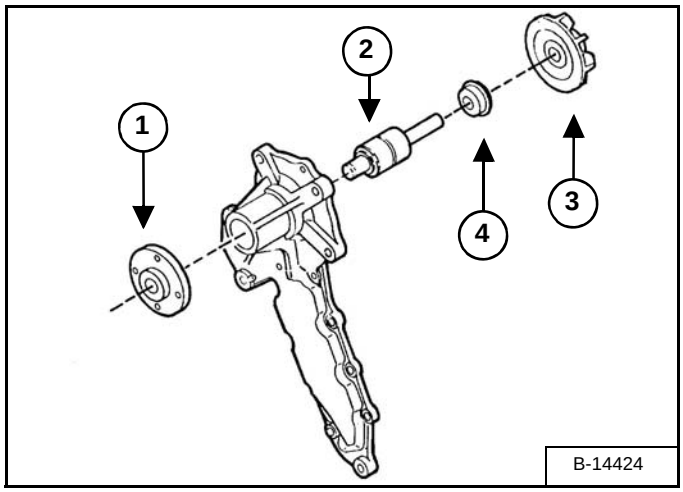
Remove the water pump **[Figure 70-81-96]**.

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

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Water Pump Disassembly And Assembly

Figure 70-81-97



Remove the flange (Item 1) **[Figure 70-81-97]**.

Press the shaft (Item 2) and impeller (Item 3) **[Figure 70-81-97]** out the impeller side of the water pump.

Remove the impeller (Item 3) **[Figure 70-81-97]** from the shaft.

Remove the seal (Item 4) **[Figure 70-81-97]**.

Install a new seal (Item 4) **[Figure 70-81-97]** when assembling the water pump.

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HEATING, VENTILATION, AIR CONDITIONING

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HEATER COIL (EARLY MODELS)

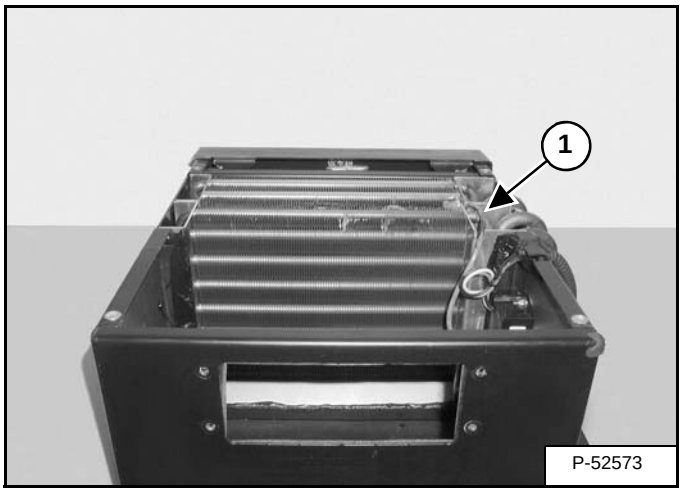
NOTE: The procedure shown is for models with HVAC. For models with heater only, the evaporator will not be installed as shown. The procedure for removal of both styles is similar.

Removal And Installation

Remove the evaporator/heater unit from the excavator. (See Removal And Installation on Page 80-190-1)

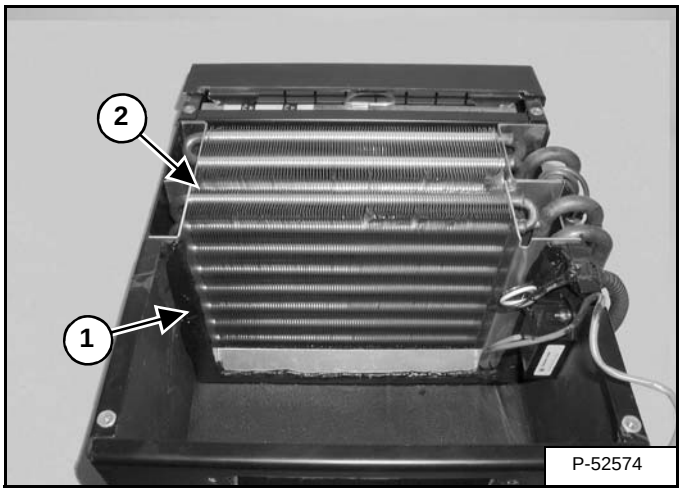
Remove the heater/AC fan. (See Removal And Installation on Page 80-20-1)

Figure 80-10-1



Remove the thermostat probe (Item 1) **[Figure 80-10-1]** from the evaporator. Move the probe to allow clearance for the heater coil removal.

Figure 80-10-2



Remove the refrigerator tape (Item 1) **[Figure 80-10-2]** from the sides and bottom of the heater coil.

Lift the heater coil (Item 2) **[Figure 80-10-2]** straight up and remove it from the evaporator/heater unit.

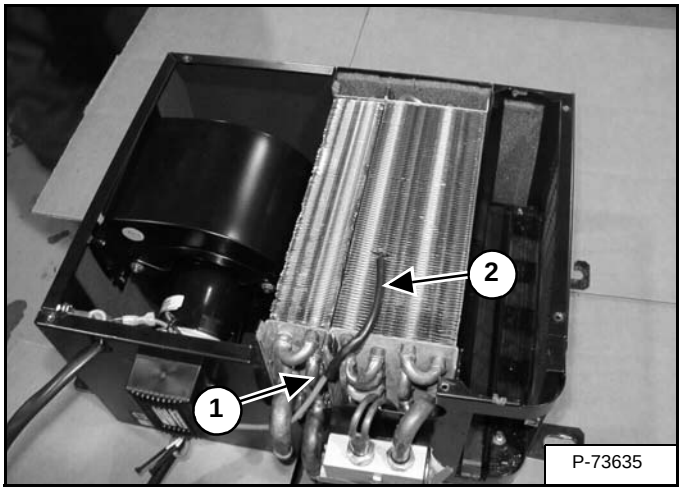
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HEATER COIL (LATER MODELS)

Removal And Installation With A/C

Remove the evaporator/heater unit from the excavator. (See Removal And Installation on Page 80-190-1)

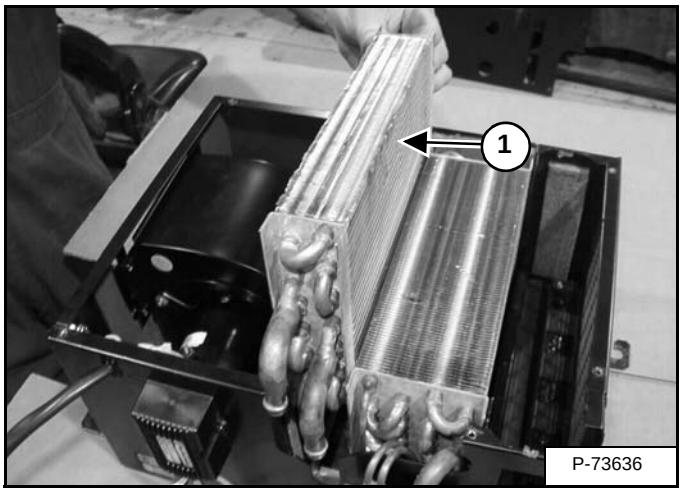
Figure 80-11-1



Remove the tie strap (Item 1) **[Figure 80-11-1]**.

Remove the thermostat probe (Item 2) **[Figure 80-11-1]** from the evaporator. Move the probe to allow clearance for the heater coil removal.

Figure 80-11-2

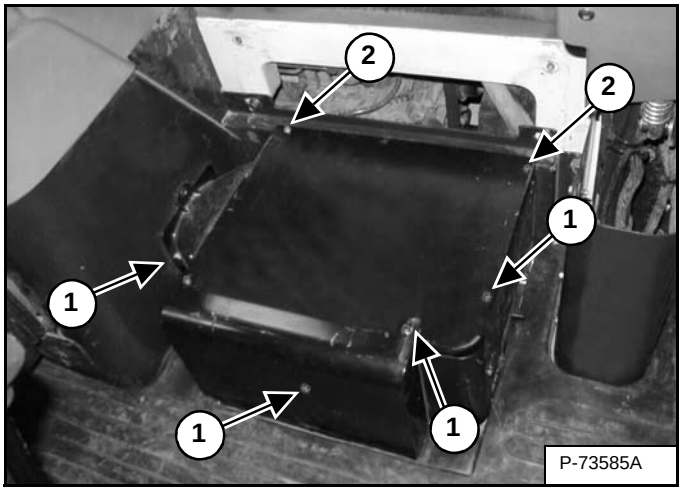


Lift the heater coil (Item 1) **[Figure 80-11-2]** straight up and remove it from the evaporator/heater unit.

Removal And Installation Without A/C

Remove the operator seat and seat mount. (See Removal And Installation on Page 50-40-1)

Figure 80-11-3

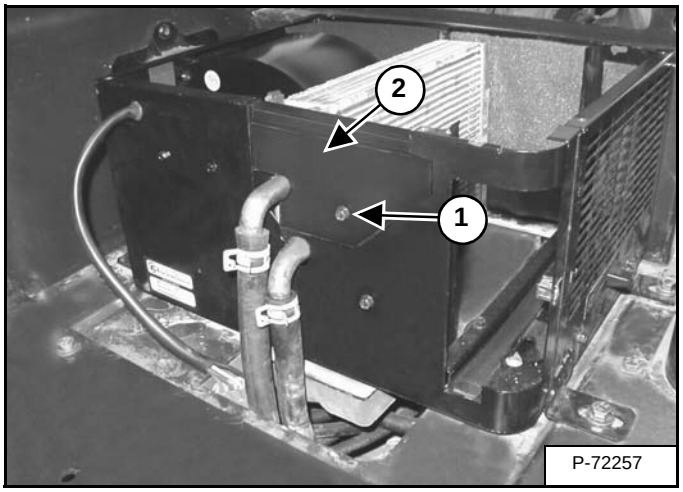


Remove the bolts (Item 1) **[Figure 80-11-3]** from the heater unit front cover.

Remove the front cover from the unit.

Remove the bolts (Item 2) **[Figure 80-11-3]** from the heater cover and remove cover.

Figure 80-11-4

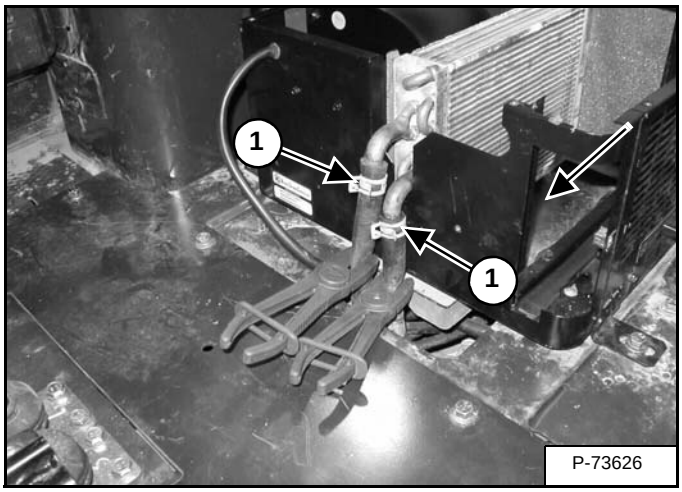


Remove the bolt (Item 1) and cover (Item 2) **[Figure 80-11-4]** from the unit.

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Removal And Installation Without A/C (Cont'd)

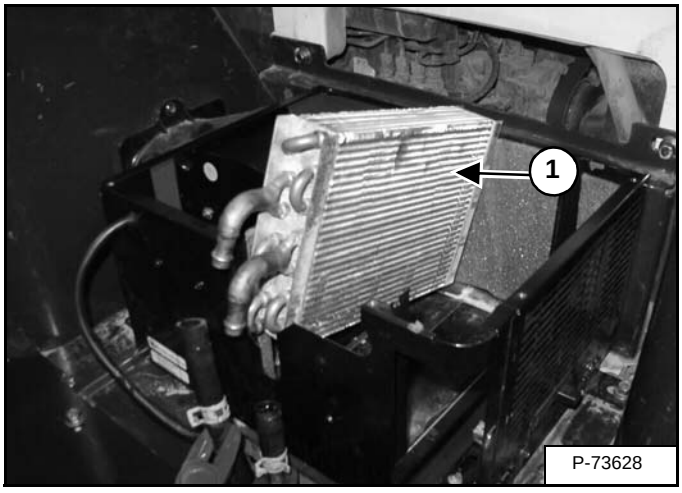
Figure 80-11-5



Clamp the heater hoses using clamping pliers and remove the hose clamps (Item 1) **[Figure 80-11-5]** from the hoses.

Remove the heater hoses from the heater coil.

Figure 80-11-6



Lift the heater coil (Item 1) **[Figure 80-11-6]** straight up and remove it from the heater unit.

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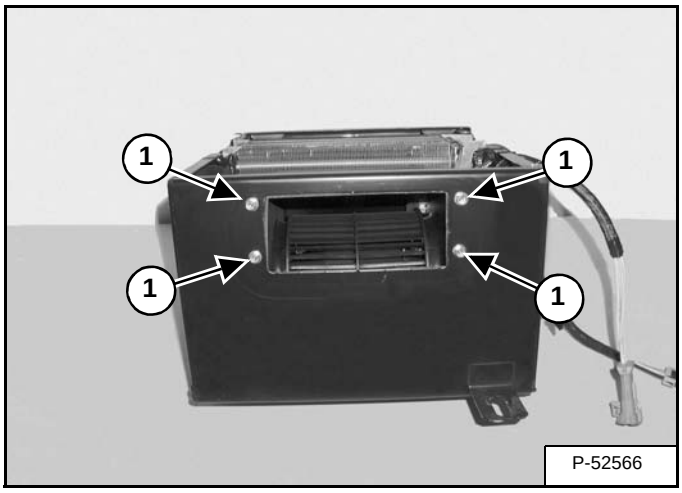
BLOWER FAN (EARLY MODELS)

Removal And Installation

Remove the heater/AC unit from the excavator. (See Removal And Installation on Page 80-190-1)

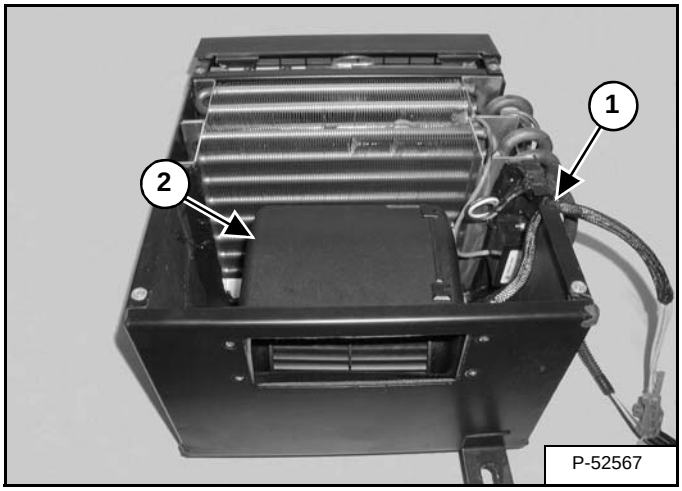
Remove the top cover from the heater/AC unit. (See Disassembly And Assembly on Page 80-190-2)

Figure 80-20-1



Remove the bolts (Item 1) **[Figure 80-20-1]**.

Figure 80-20-2



Remove the wire harness and grommet (Item 1) **[Figure 80-20-2]** from the housing.

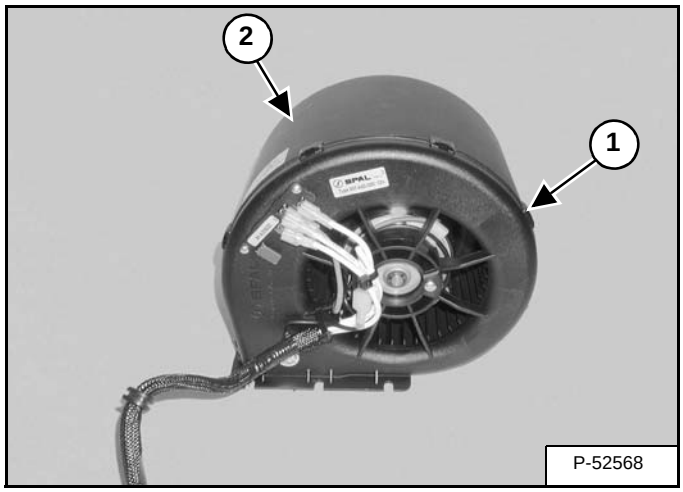
Remove the fan assembly (Item 2) **[Figure 80-20-2]**.

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BLOWER FAN (EARLY MODELS) (CONT'D)

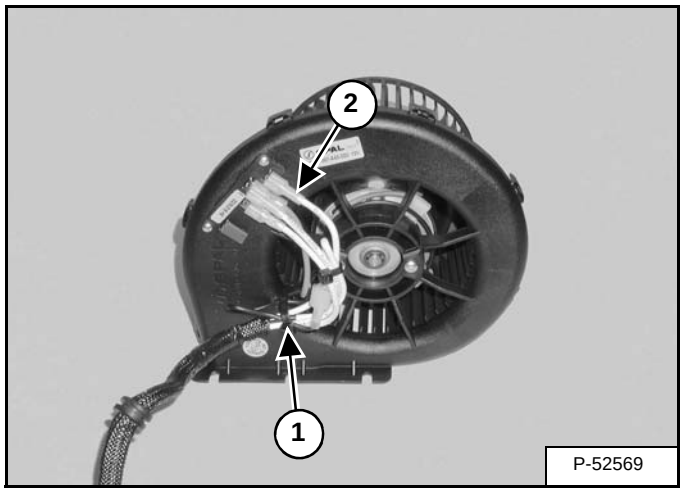
Disassembly And Assembly

Figure 80-20-3



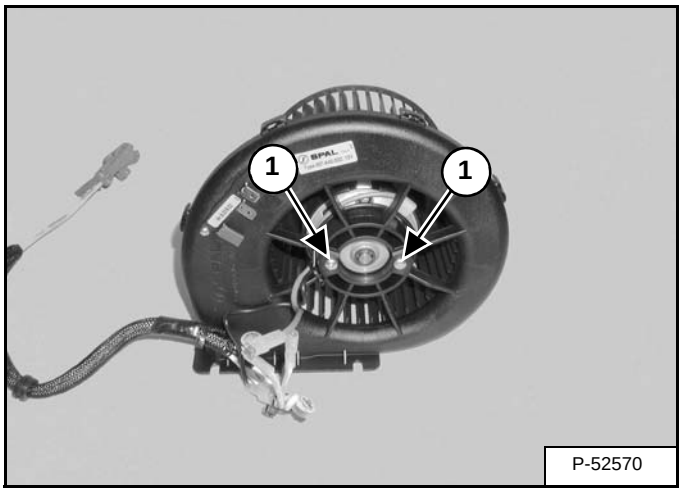
Release the clips (Item 1) on the housing (Item 2) **[Figure 80-20-3]**. Remove the housing.

Figure 80-20-4



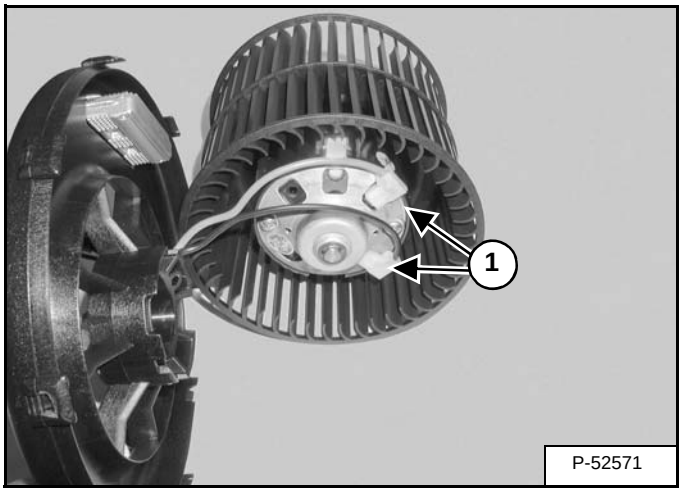
Remove the tie strap (Item 1). Mark the wires for proper installation. Remove the wires (Item 2) **[Figure 80-20-4]**.

Figure 80-20-5



Remove the bolts (Item 1) **[Figure 80-20-5]** from the fan motor.

Figure 80-20-6

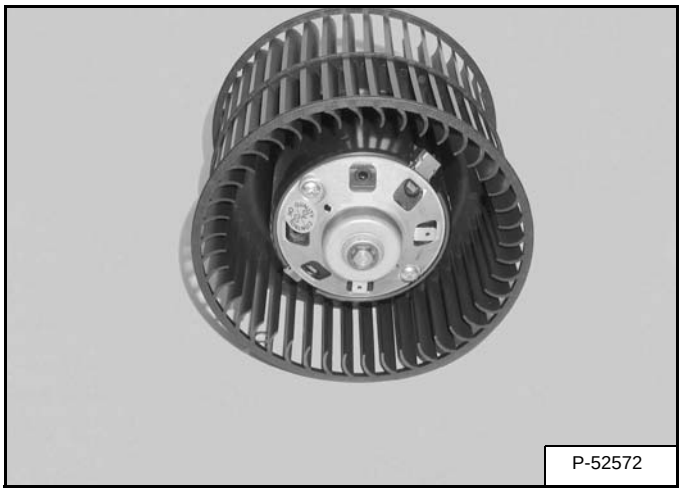


Mark the wires for proper installation and remove the wires (Item 1) **[Figure 80-20-6]** from the fan motor.

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Disassembly And Assembly (Cont'd)

Figure 80-20-7



The fan/motor assembly is not serviceable and must be replaced as an assembly **[Figure 80-20-7]**.

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BLOWER FAN (LATER MODELS)

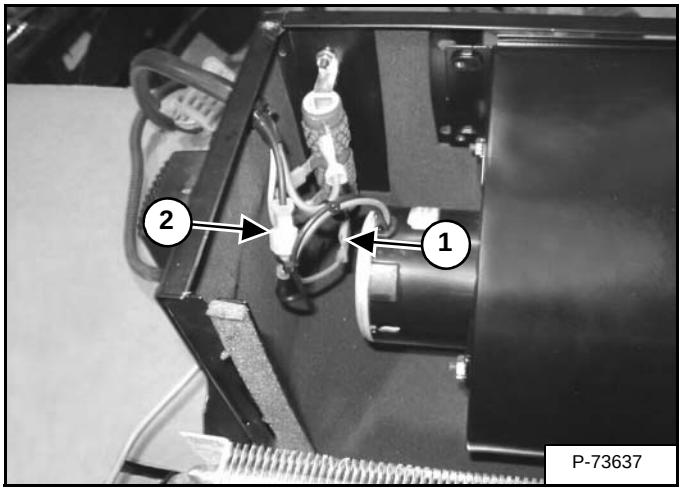
Removal And Installation

Remove the heater unit from the excavator. (See Removal And Installation on Page 80-190-1)

Remove the top cover from the heater unit. (See Disassembly And Assembly on Page 80-190-2)

Remove the heater coil from the heater/AC unit. (See HEATER COIL (LATER MODELS) on Page 80-11-1)

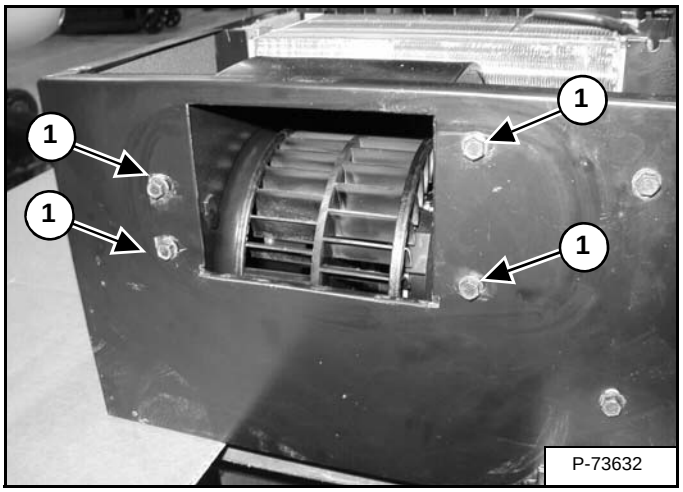
Figure 80-21-1



Disconnect the orange fan motor wire (Item 1) **[Figure 80-21-1]** from the resistor.

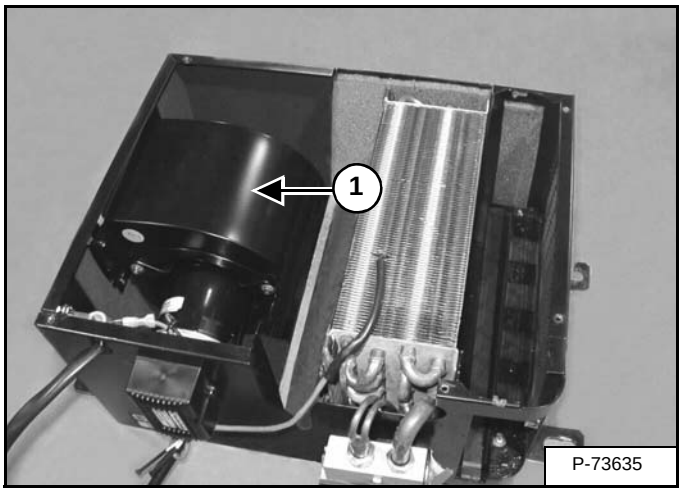
Disconnect the black fan motor wire (Item 2) **[Figure 80-21-1]** from the black wire on the wire harness.

Figure 80-21-2



Remove the four bolts (Item 1) **[Figure 80-21-2]** from the blower fan housing in the heater unit.

Figure 80-21-3



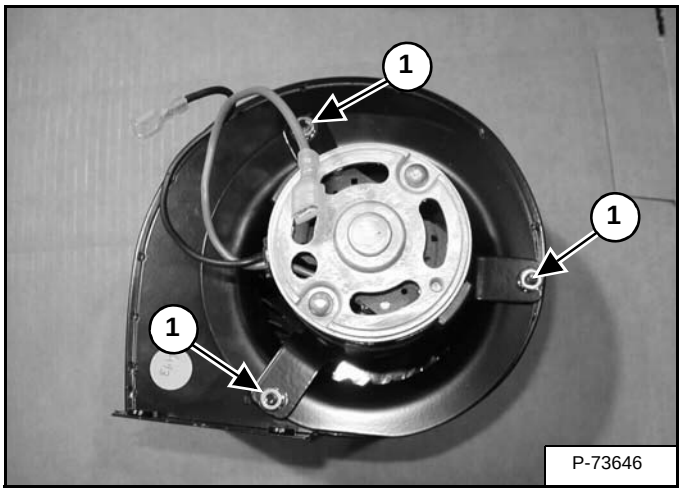
Remove the blower fan (Item 1) **[Figure 80-21-3]** from the heater unit.

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BLOWER FAN (LATER MODELS) (CONT'D)

Disassembly And Assembly

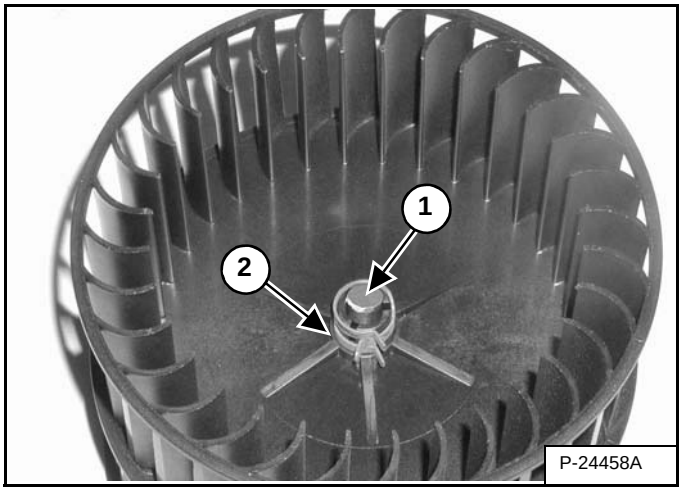
Figure 80-21-4



Remove the three mounting nuts (Item 1) **[Figure 80-21-4]** from the blower fan housing.

Remove the blower motor and fan from the blower housing unit.

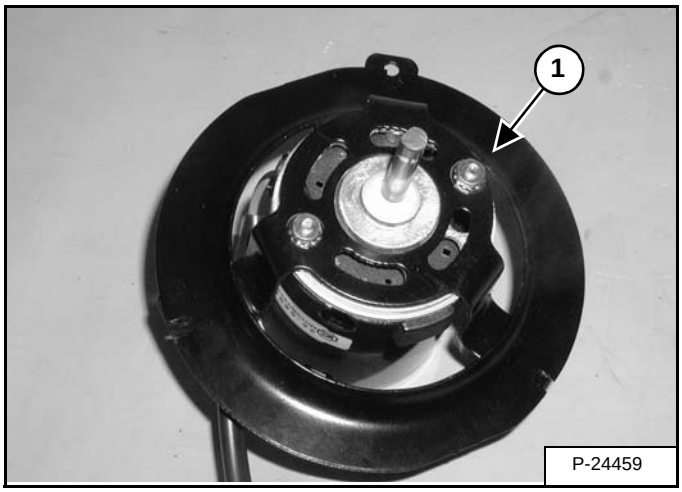
Figure 80-21-5



Mark the fan shaft (Item 1) **[Figure 80-21-5]** and blower wheel, for the proper installation of the blower wheel.

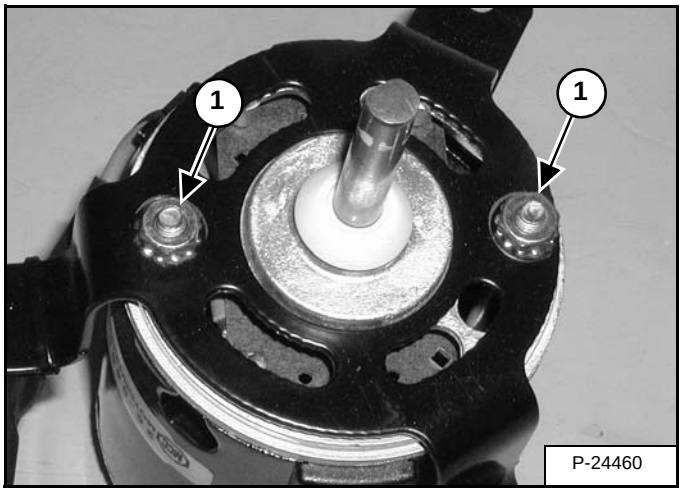
Remove the clamp (Item 2) **[Figure 80-21-5]** and remove the blower wheel from the fan shaft.

Figure 80-21-6



Remove the outside ring (Item 1) **[Figure 80-21-6]** from the fan motor.

Figure 80-21-7

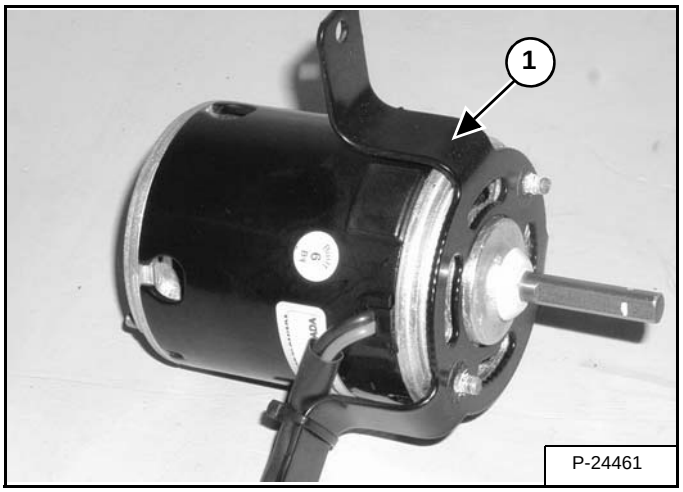


Remove the two mounting nuts (Item 1) **[Figure 80-21-7]** from the fan motor mount bracket.

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Disassembly And Assembly (Cont'd)

Figure 80-21-8

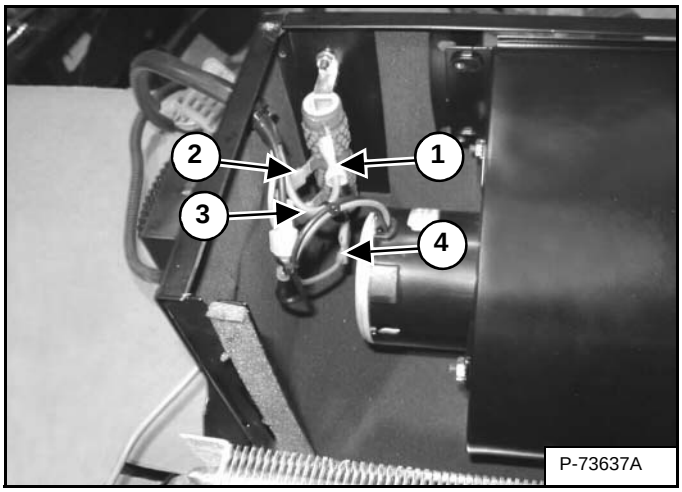


Remove the fan motor mount bracket (Item 2) **[Figure 80-21-8]** from the motor.

Inspect the fan motor, and if it needs replacing, it must be replaced as a complete unit.

Resistor Removal And Installation

Figure 80-21-9



Remove the four electrical wires from the resistor **[Figure 80-21-9]**.

Wire Installation

Install the Orange wire from the wire harness (Item 1) **[Figure 80-21-9]** on the top terminal of the resistor.

Install the Red wire from the wire harness (Item 2) **[Figure 80-21-9]** on the 2nd terminal of the resistor.

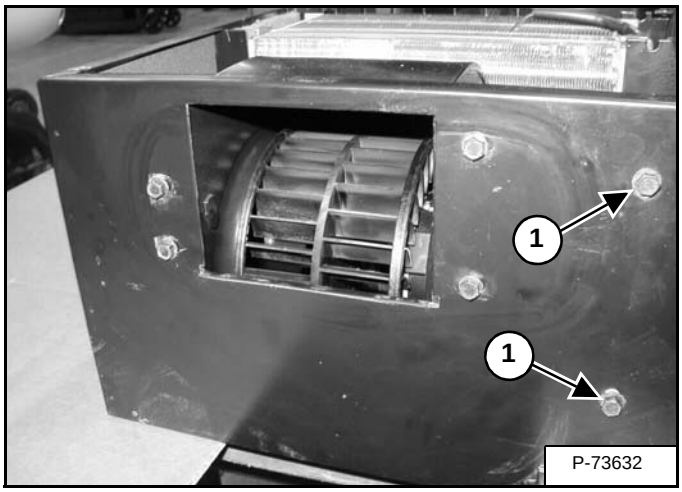
Install the Yellow wire from the wire harness (Item 3) **[Figure 80-21-9]** on the 3rd terminal of the resistor.

Install the Orange wire from the heater fan motor (Item 4) **[Figure 80-21-9]** on the bottom terminal of the resistor.

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Resistor Removal And Installation (Cont'd)

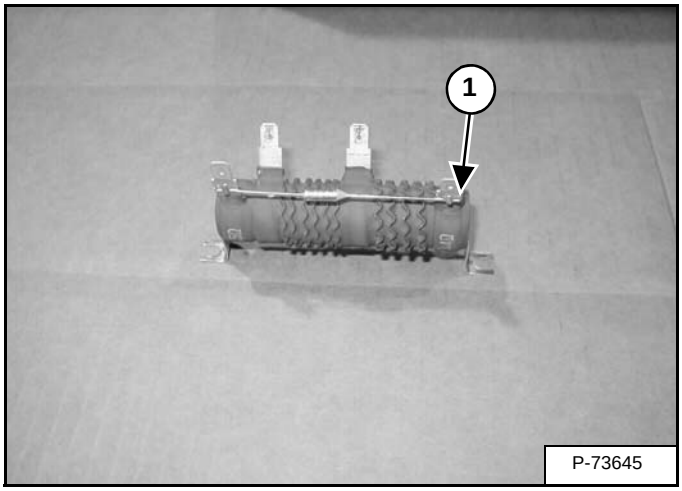
Figure 80-21-10



Loosen the two resistor mount bolts **[Figure 80-21-10]**.

Remove the resistor from the unit.

Figure 80-21-11



Inspect the resistor (Item 1) **[Figure 80-21-11]** and replace as needed.

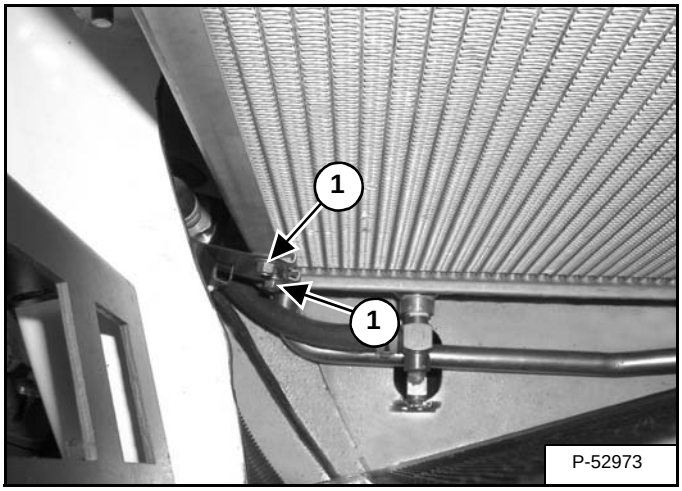
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HEATER VALVE

Removal And Installation

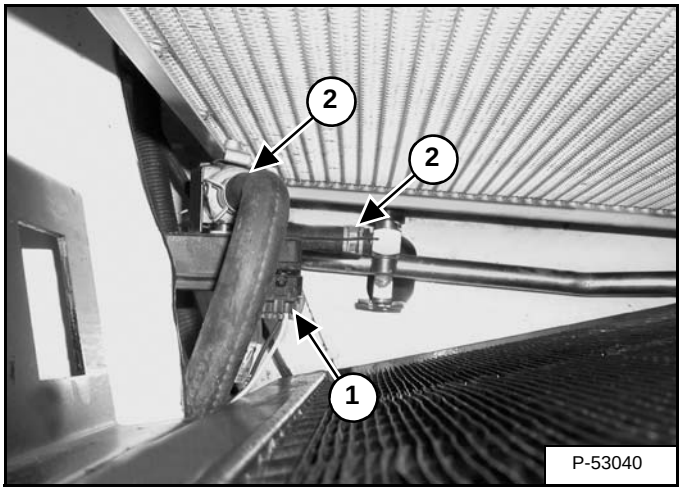
Drain the coolant. (See Replacing The Coolant on Page 10-70-2)

Figure 80-30-1



Remove the bolts (Item 1) **[Figure 80-30-1]** and relocate the valve to the front of the radiator.

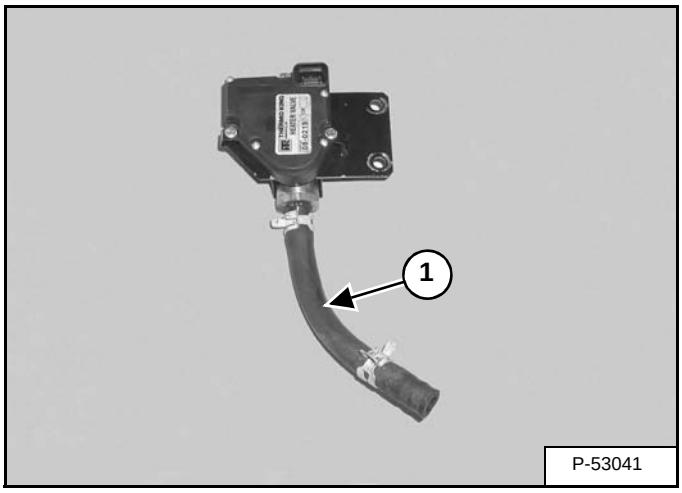
Figure 80-30-2



Disconnect the wire harness (Item 1). Remove the hoses (Item 2) **[Figure 80-30-2]**.

Remove the valve from the excavator.

Figure 80-30-3



Remove the hose (Item 1) **[Figure 80-30-3]** from the valve.

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AIR CONDITIONING SYSTEM FLOW

Principals

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

The compressor (Item 1) Page 80-40-3 takes in heated, low pressure refrigerant gas through the suction valve (low pressure side) and as the name indicates, pressurizes the heated refrigerant and forces it through the discharge valve (high pressure side) on the condenser (Item 2) Page 80-40-3.

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

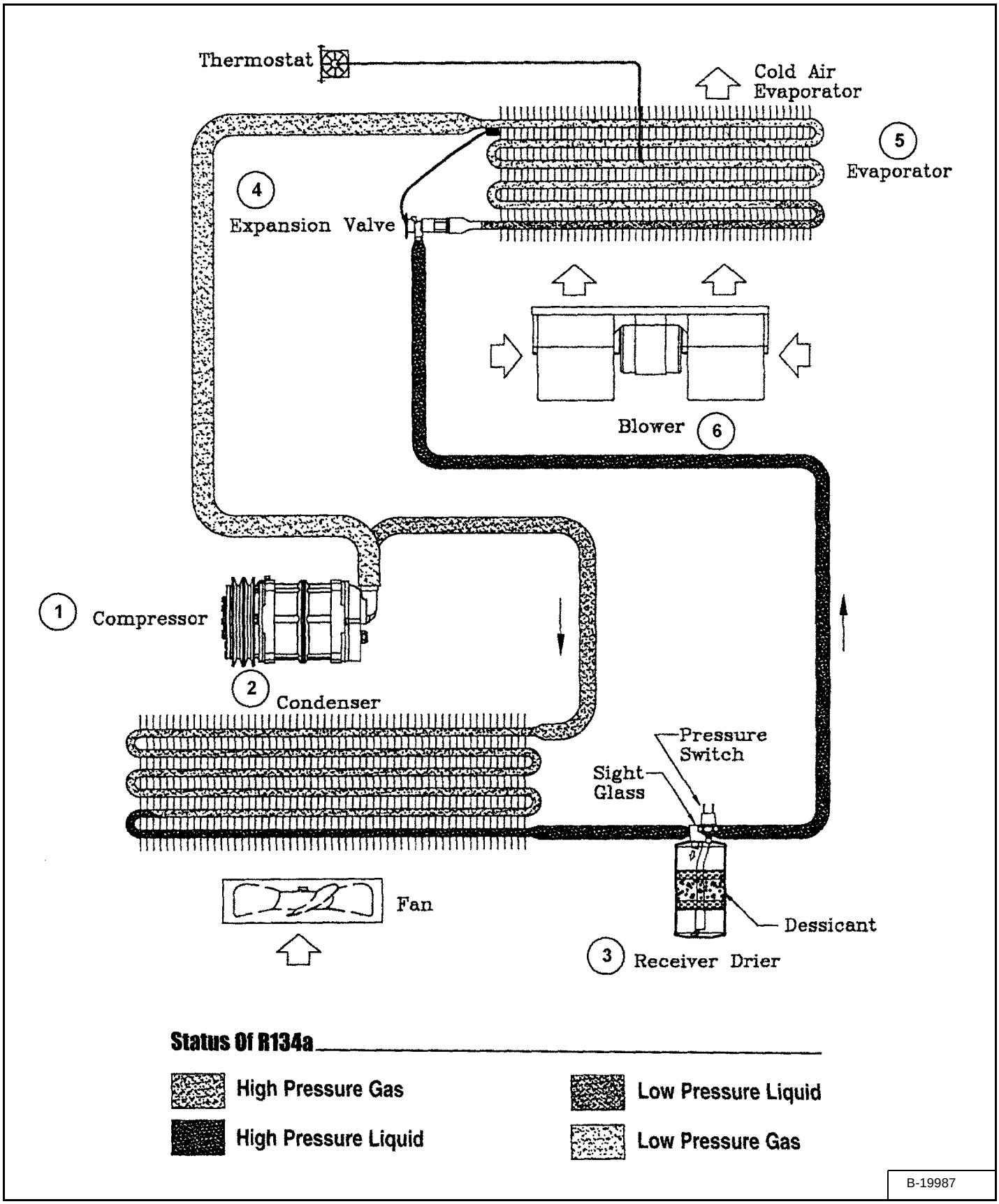
The liquid refrigerant moves on to the receiver/drier (Item 3) Page 80-40-3 where impurities such as moisture and dirt are filtered out. The receiver/drier also serves as the storage tank for the liquid refrigerant. The liquid refrigerant (still under high pressure) flows to the expansion valve (Item 4) Page 80-40-3.

The expansion valve meters the amount of refrigerant into the evaporator coil (Item 5) Page 80-40-3. As the refrigerant passes through the expansion valve, it again changes its physical state. It becomes a low temperature, low-pressure liquid and saturated vapor. The low pressure liquid immediately starts to boil and vaporize as it enters the evaporator. The hot humid air of the machine's cab is drawn through or blown into the evaporator by the evaporator fan (Item 6) Page 80-40-3. Since the refrigerant is colder than the air, it absorbs the heat from the air and produces cooled air, which is pushed into the cab by the fan. The moisture in the air condenses on the evaporator coil and drips into the drain pan, which directs the water out of the cab.

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

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Chart

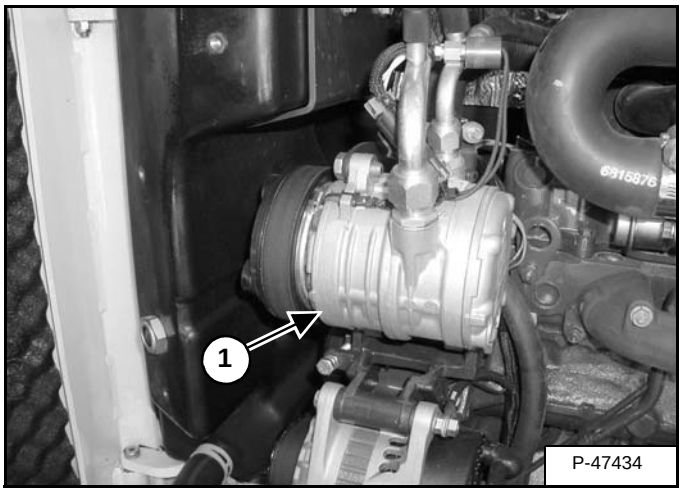


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COMPONENTS

Identification

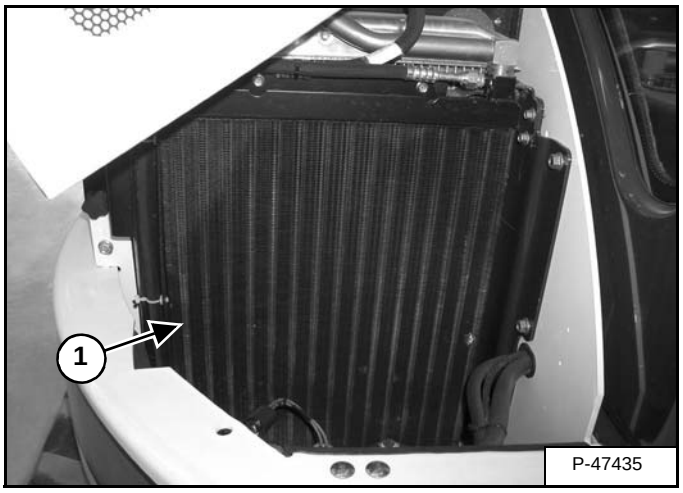
Figure 80-50-1



Compressor: The compressor (Item 1) **[Figure 80-50-1]** is the pump that circulates the refrigerant throughout the system. It raises the pressure of the refrigerant for heat transfer through the condenser and evaporator.

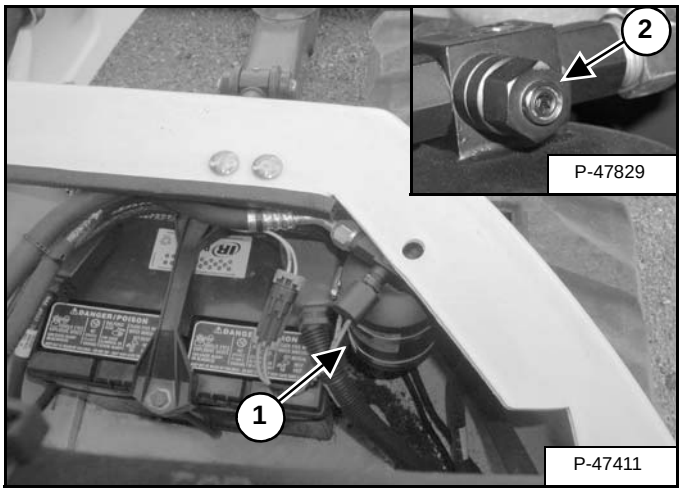
NOTE: The A/C system (Compressor) is recommended to be turned on for at least 5 minutes weekly throughout the year to lubricate the internal components.

Figure 80-50-2



Condenser: The condenser (Item 1) **[Figure 80-50-2]** is the unit that receives the high pressure, high temperature refrigerant vapor from the compressor and condenses it into a high temperature liquid.

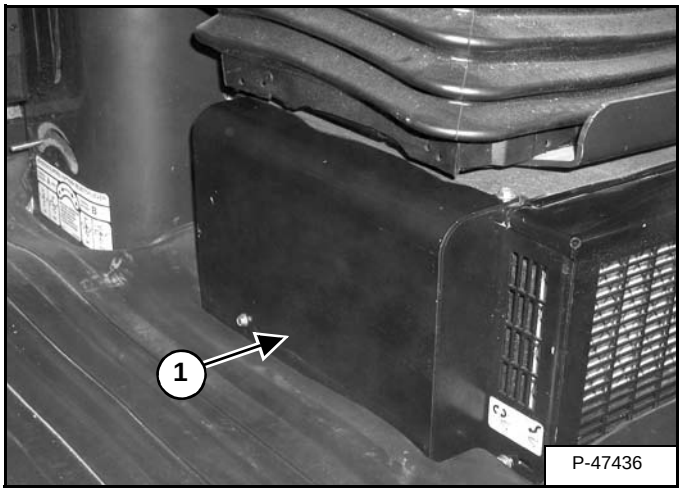
Figure 80-50-3



Receiver/Drier: The receiver/drier (Item 1) **[Figure 80-50-3]** is the unit that receives the liquid refrigerant from the condenser and removes moisture and foreign matter from the system. It also serves as a storage tank for the extra liquid refrigerant until it is needed by the evaporator.

Pressure Relief Valve: (Located on the back of the receiver/drier) The pressure relief valve (Item 2) **[Figure 80-50-3]** is located on the receiver drier assembly. This small brass valve is a safety feature that is designed to open and release the A/C charge if the pressure reaches 535 PSI.

Figure 80-50-4



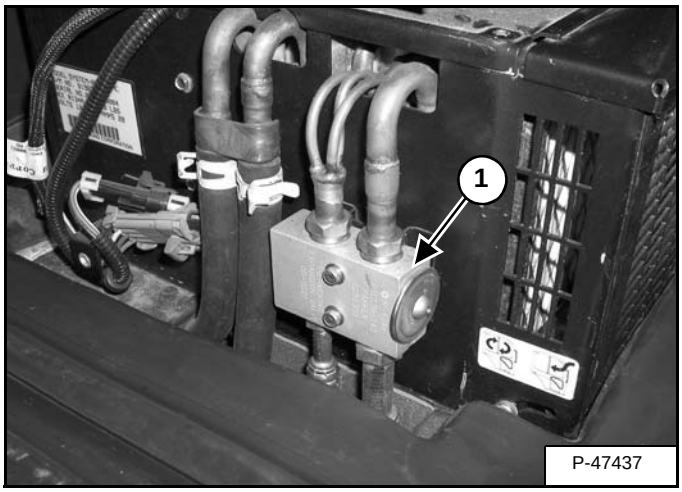
Heater/Evaporator Unit: The heater/evaporator unit (Item 1) **[Figure 80-50-4]** is located under the operator seat in the excavator cab. The unit delivers the cold air for the A/C and warm air for heat into the cab. The unit contains the blower, heat & A/C coils, thermostat and expansion valve.

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COMPONENTS (CONT'D)

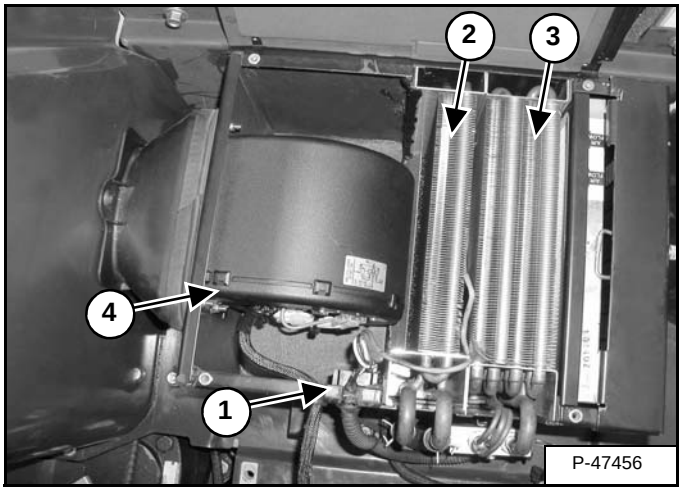
Identification (Cont'd)

Figure 80-50-5



Expansion Valve: The expansion valve (Item 1) **[Figure 80-50-5]** controls the amount of refrigerant entering the evaporator coil.

Figure 80-50-6



Thermostat: The thermostat (Item 1) **[Figure 80-50-6]** controls the temperature of the evaporator coil.

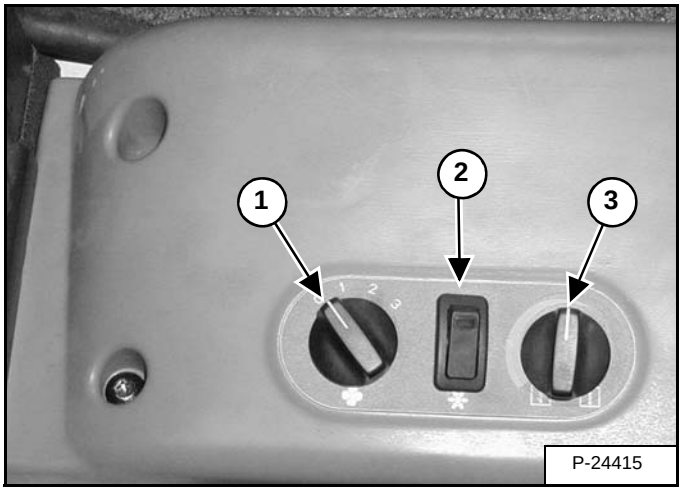
Heater Coil: The heater coil (Item 2) **[Figure 80-50-6]** supplies the warm air into the cab by passing air through the coil.

Evaporator Coil: The evaporator coil (Item 3) **[Figure 80-50-6]** cools and dehumidifies the air before it enters the cab.

Heater/Evaporator Blower: The blower (Item 4) **[Figure 80-50-6]** is used to push air through the heater and evaporator coils and into the cab.

Control Panel: The panel has three separate components.

Figure 80-50-7

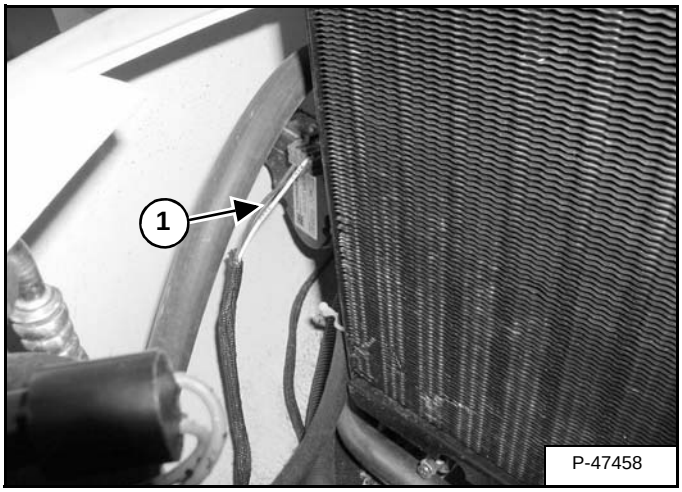


Fan Switch: This is a four position rotary switch (Item 1) **[Figure 80-50-7]**. When the fan switch is in the off position the A/C will not engage, but the heat valve will operate, as it is controlled by the ignition power.

A/C Switch: The rocker switch (Item 2) **[Figure 80-50-7]** will be illuminated when the A/C is engaged.

Potentiometer: The potentiometer (Item 3) **[Figure 80-50-7]** controls the Heat Valve from fully Off to fully On. This can be used in conjunction with the A/C for defrost of the windows and temperature control.

Figure 80-50-8



Heater Valve: The heater valve (Item 1) **[Figure 80-50-8]** is used to control the amount of engine coolant that flows to the heater coil.

The heater valve is located under the right side cover.

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COMPONENTS (CONT'D)

Identification (Cont'd)

Figure 80-50-9

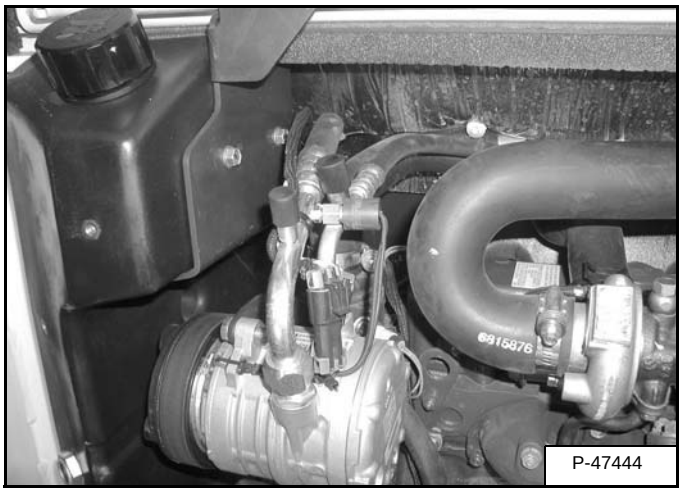
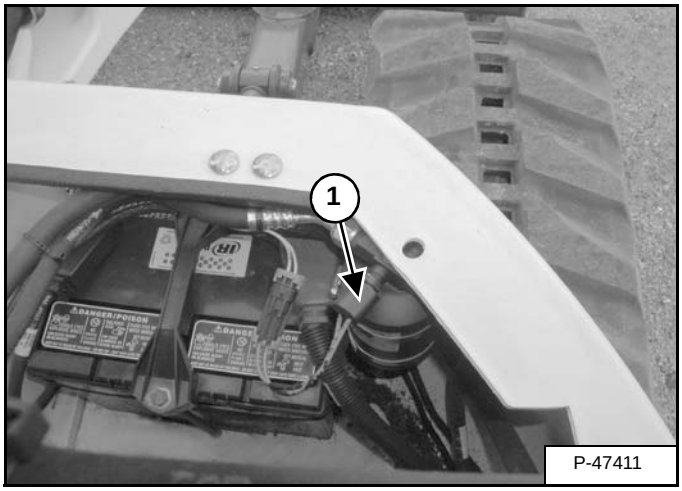


Figure 80-50-10



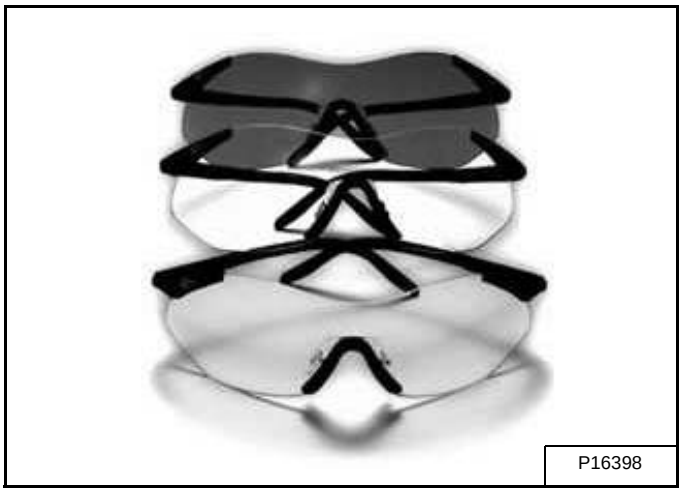
Pressure Switches: The pressure switch (Item 1) **[Figure 80-50-9]** & **[Figure 80-50-10]** will disengage the compressor clutch at high pressure readings over 384 PSI. (2647 kPa) on the high side, or low pressure readings under 28 PSI (193 kPa) on the high side, which indicates loss of refrigerant.

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Safety Equipment

In servicing A/C and heater systems you will be exposed to high pressures, temperatures and several chemical hazards. Moving belts and pulleys are normal shop hazards.

Figure 80-60-1



In addition to exercising caution in your work, DO WEAR SAFETY GLASSES OR A FACE SHIELD **[Figure 80-60-1]** when you are using R-134a, a leak detector, adjusting service valves or the manifold gage set connectors. Safety glasses or a transparent face shield are practical safety items and one or the other is absolutely required.

⚠ WARNING

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

W-2371-0500

Figure 80-60-2



R-134a inside a canister or in an A/C system is a liquid under pressure. When it escapes or releases into the air, **ITS TEMPERATURE DROPS TO 21.6 F DEGREES "INSTANTLY"**. If it spills on your skin or in your eyes you should flood the area with cool water and **SEEK MEDICAL ATTENTION FAST!** It is a good idea to wear gloves **[Figure 80-60-2]** to prevent frost bite if you should get refrigerant on your hands.

⚠ WARNING

HFC 134A refrigerant can be dangerous if not properly handled. Liquid 134A may cause blindness if it contacts the eyes and may cause serious frostbite if it contacts the skin.

- **Gaseous 134A becomes lethal (phosgene) gas when it contacts open flame or very hot substances.**
- **NEVER SMOKE when there is the possibility of even small amounts of 134A in the air.**

Any servicing work that involves release or addition of 134A to the system must be done by a competent refrigeration dealer who has the proper equipment, knowledge, and experience to service refrigeration equipment.

W-2373-0500

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Heater Air Filter

Remove the Heater/AC unit. (See Removal And Installation on Page 80-190-1)

Clean the filter by shaking or using low air pressure.

Replace the filter two to four times per year under normal operating conditions, up to weekly under extremely dusty operating conditions.

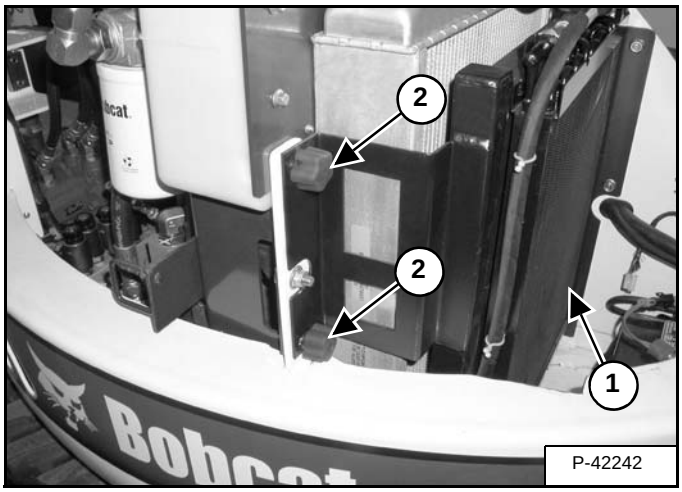
Engine Accessory Drive Belt

Check the condition of the belt and adjust as needed every 100 hours of operation. (See ENGINE ACCESSORY DRIVE BELT on Page 10-140-1)

Cleaning The Condenser

Open the right side cover.

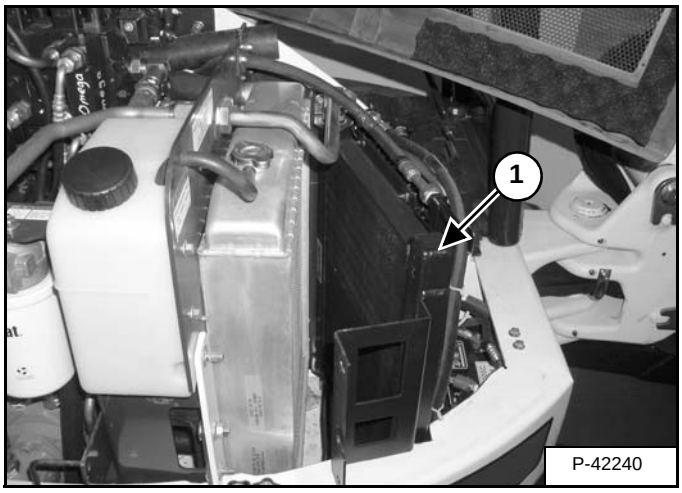
Figure 80-70-1



Check the condenser (Item 1) **[Figure 80-70-1]** for mud or dirt.

Remove the two nuts (Item 2) **[Figure 80-70-1]**.

Figure 80-70-2



Pivot the oil cooler/condenser (Item 1) **[Figure 80-70-2]** away from the radiator.

Use air pressure or water pressure to clean the oil cooler/condenser assembly.

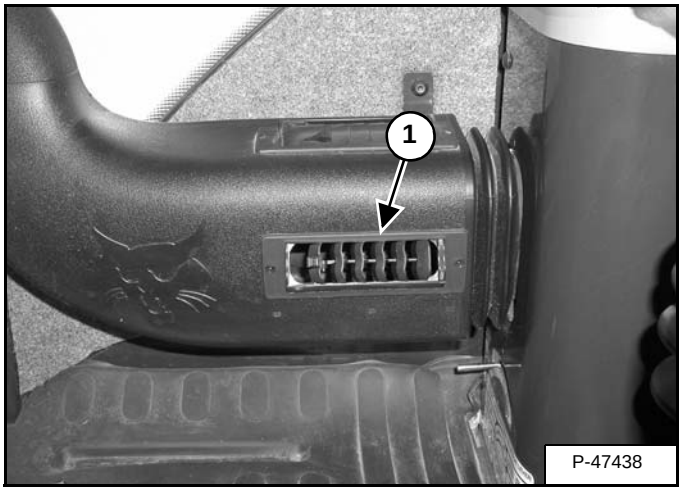
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BASIC TROUBLESHOOTING (EARLY MODELS)

Poor A/C Performance

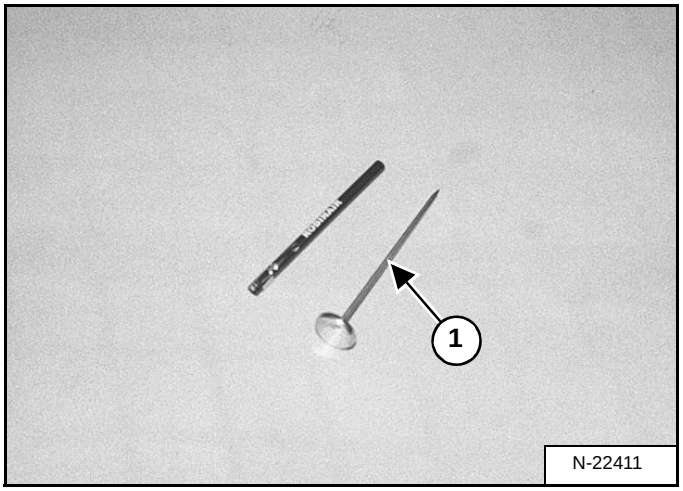
Start the excavator. Engage the A/C system with the blower fan on high. Run the excavator at full RPM for approximately 15 minutes, with the cab door closed.

Figure 80-80-1



Close the louvers at the front window duct and on the top of the lower duct (Item 1) **[Figure 80-80-1]**.

Figure 80-80-2



Check the temperature at the louvers (Item 1) **[Figure 80-80-2]** with a thermometer.

The louver temperature should be between 36-53° F. (2,2-11,6°C) depending on the amount of humidity in the air.

If louver temperature is too high see System Troubleshooting Chart. (See SYSTEM TROUBLESHOOTING CHART on Page 80-100-1)

Check the fan for proper operation or noise, and replace if necessary. (See Removal And Installation on Page 80-20-1)

Check the engine accessory drive belt. (See Belt Tension on Page 10-140-1)

Check the A/C condenser for dirt or mud, and clean if necessary. (See Cleaning The Condenser on Page 80-70-1)

Check the A/C evaporator coil for dirt or mud, and clean if necessary. (See Replacing The Coolant on Page 10-70-2.)

Inspect the sight glass located on the receiver/drier for air bubbles. (See Removal And Installation on Page 80-160-1.)

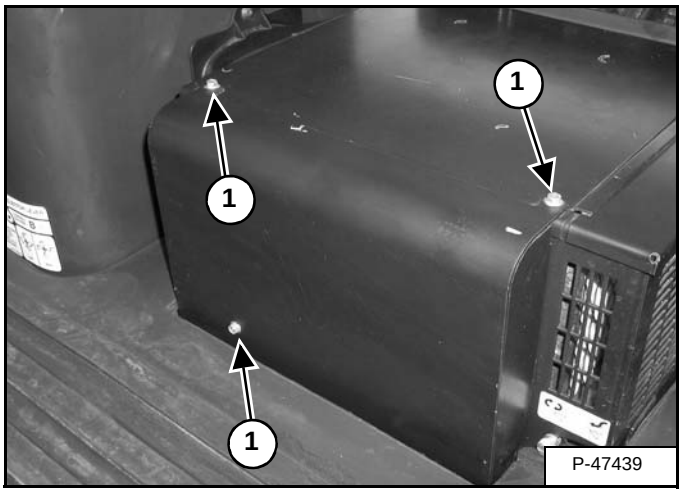
Check the engine coolant to see if it is bypassing the heater valve. (See Removal And Installation on Page 80-30-1)

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Cleaning The A/C Evaporator Coil & Heater Coil

Remove the operator seat from the cab. (See Removal And Installation on Page 50-40-1)

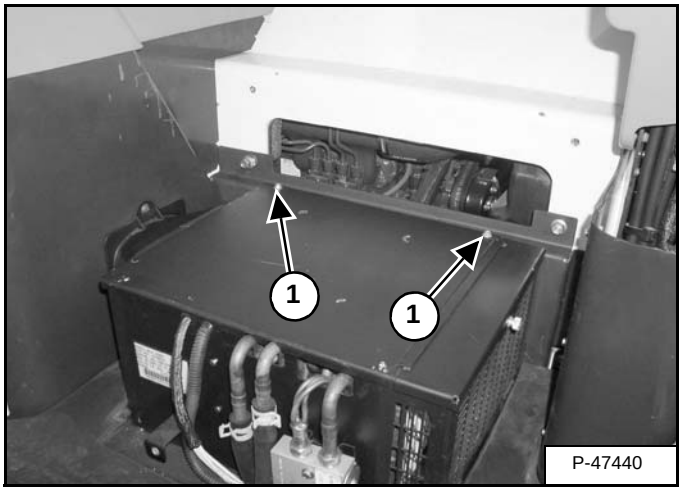
Figure 80-80-3



Remove the three bolts (Item 1) **[Figure 80-80-3]** that hold the front cover to the heater/evaporator unit.

Remove the front cover.

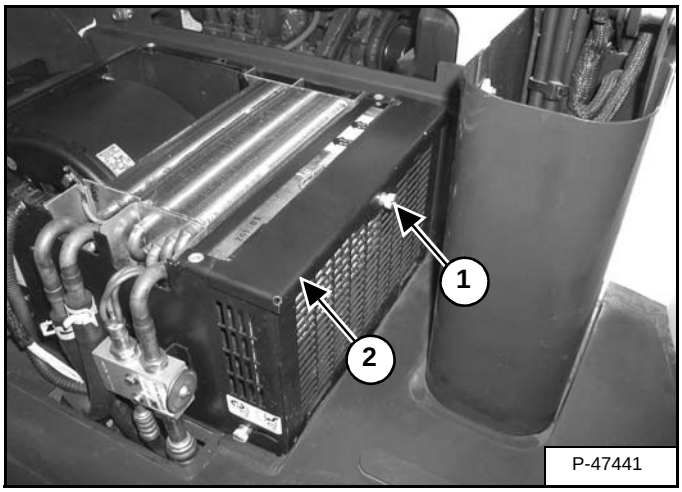
Figure 80-80-4



Remove the two bolts (Item 1) **[Figure 80-80-4]**.

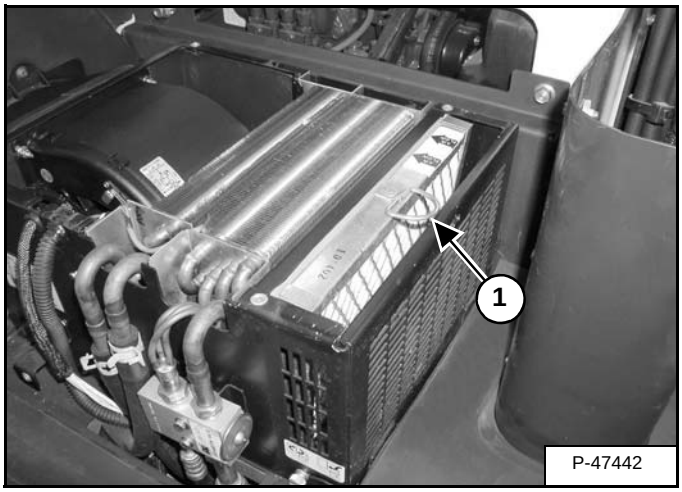
Remove the cover.

Figure 80-80-5



Remove the screw (Item 1) and cover (Item 2) **[Figure 80-80-5]**.

Figure 80-80-6

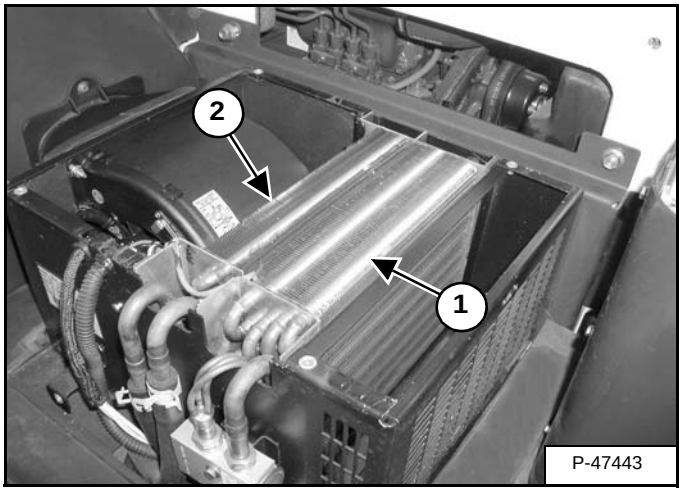


Remove the filter (Item 1) **[Figure 80-80-6]**.

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Cleaning The A/C Evaporator Coil & Heater Coil (Cont'd)

Figure 80-80-7

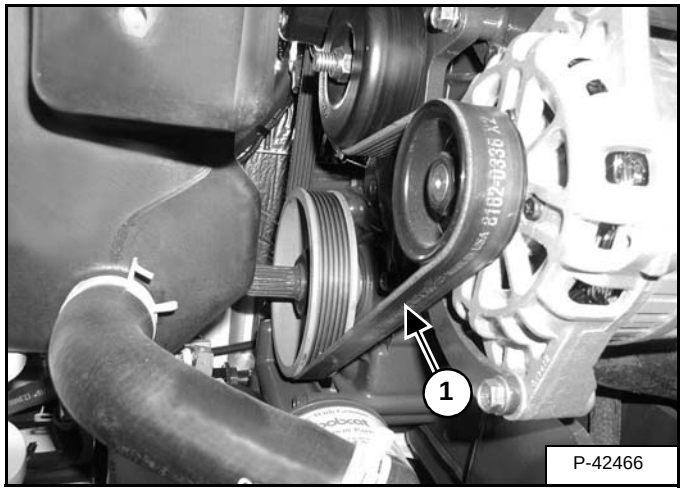


Clean the evaporator coil (Item 1) and the heater coil (Item 2) **[Figure 80-80-7]** with air or water.

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Engine Accessory Drive Belt

Figure 80-80-8



Inspect and adjust the accessory drive belt (Item 1) **[Figure 80-80-8]** as needed every 100 hours of operation. (See ENGINE ACCESSORY DRIVE BELT on Page 10-140-11)

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Checking The Electrical System

If the excavator A/C system shows no blower motor function, no A/C switch light, and no A/C compressor function, do the following checks at the A/C relay.

Remove the floormat and floor plate. (See Removal And Installation on Page 50-120-1)

Figure 80-80-9

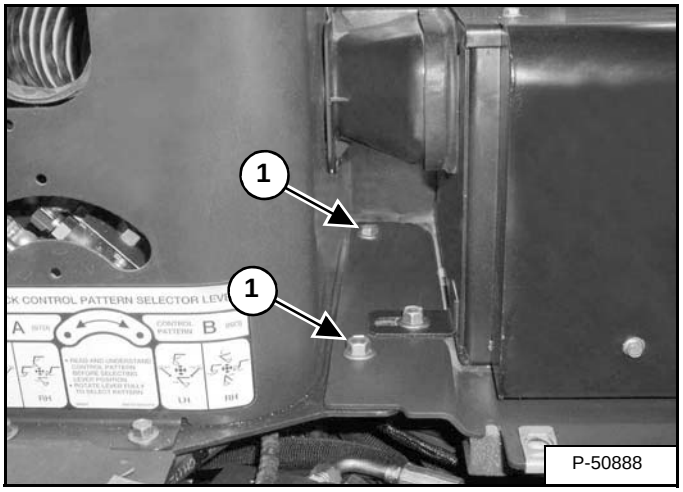
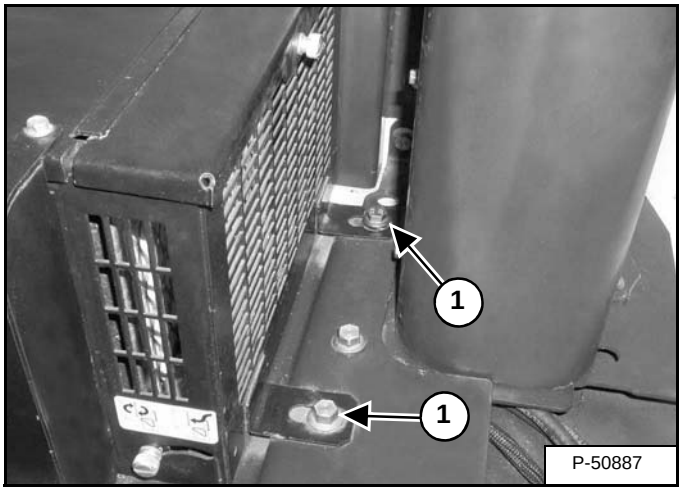
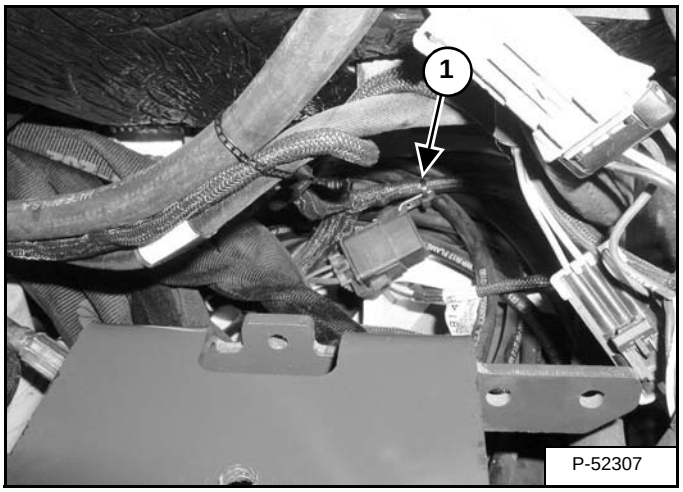


Figure 80-80-10



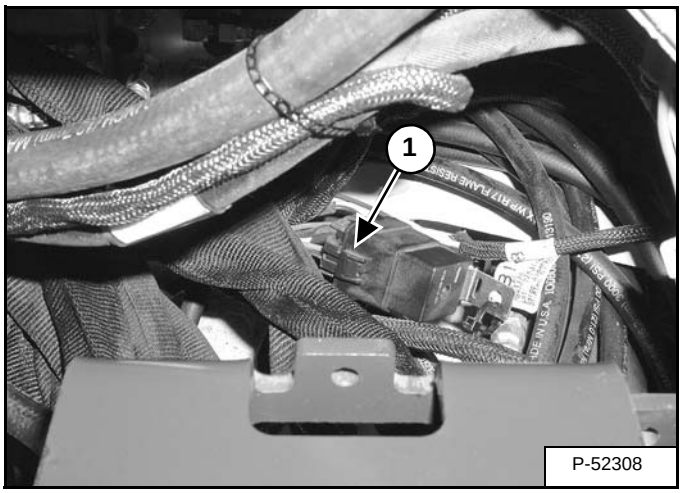
Remove the four bolts (Item 1) **[Figure 80-80-9]** & **[Figure 80-80-10]**. Tip the A/C unit back to provide access to the A/C relay.

Figure 80-80-11



Remove the cable tie (Item 1) **[Figure 80-80-11]** from the relay mount, as it is attached to the excavator wiring harness.

Figure 80-80-12



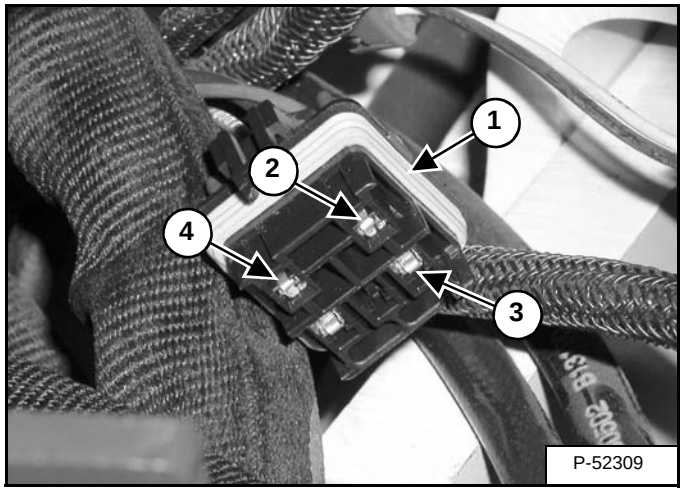
Depress the tab (Item 1) **[Figure 80-80-12]** on the relay.

Disconnect the relay from the wiring harness.

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Checking The Electrical System (Cont'd)

Figure 80-80-13



With a multimeter, check the voltage at the excavator A/C relay wiring harness connector (Item 1) **[Figure 80-80-13]**.

The voltage at Pin 30 (Item 2) **[Figure 80-80-13]** (Red Wire # 1190) should be 12 volts at all times.

If there is no voltage check the fuse #6, at the fuse box. (See **[Figure 80-80-16 on Page 80-80-7]**)

If the fuse is good, refer to the electrical schematic to trace wire # 1190 to its source.

The voltage at Pin 85 (Item 3) **[Figure 80-80-13]** (Orange Wire #1740) should be 12 volts when the key switch is in the ON position.

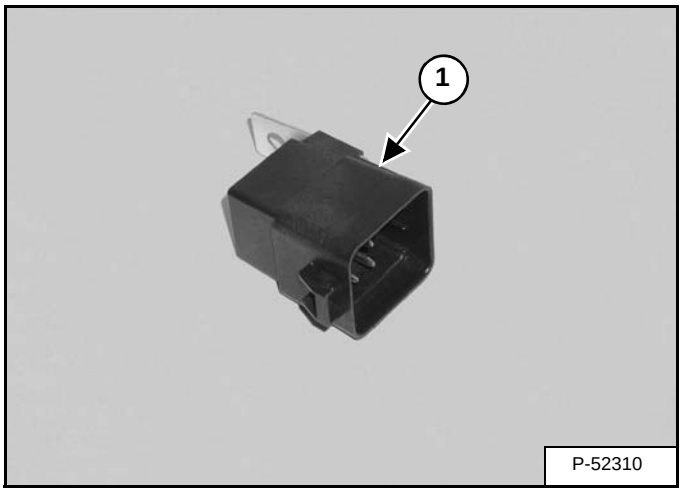
If there is no voltage check the fuse #3 at the fuse box. (See **[Figure 80-80-13 on Page 80-80-6]**)

If the fuse is good, refer to the electrical schematic to trace wire #1740 to its source.

Pin 86 (Item 4) **[Figure 80-80-13]** (Black Wire #2210) is the ground wire. Check for continuity at Pin 86 to ground.

If there is no continuity trace wire #2210 to its source using the electrical schematic.

Figure 80-80-14

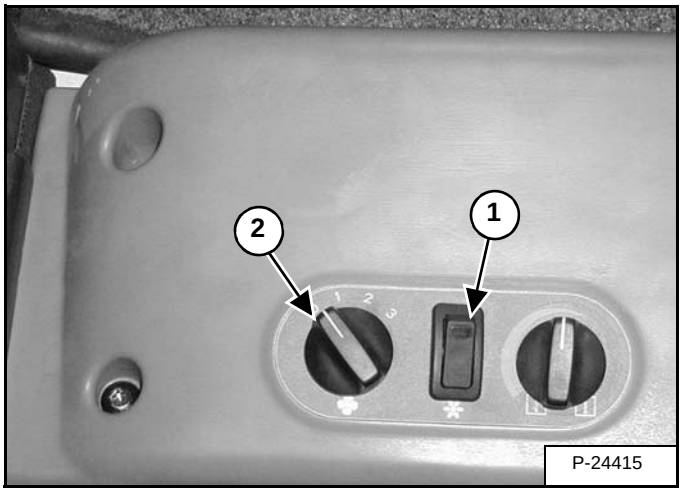


If the voltages and continuity checks are good, but the problem still persists, replace the A/C relay (Item 1) **[Figure 80-80-14]**.

Check to see if the compressor clutch is engaging.

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

Figure 80-80-15



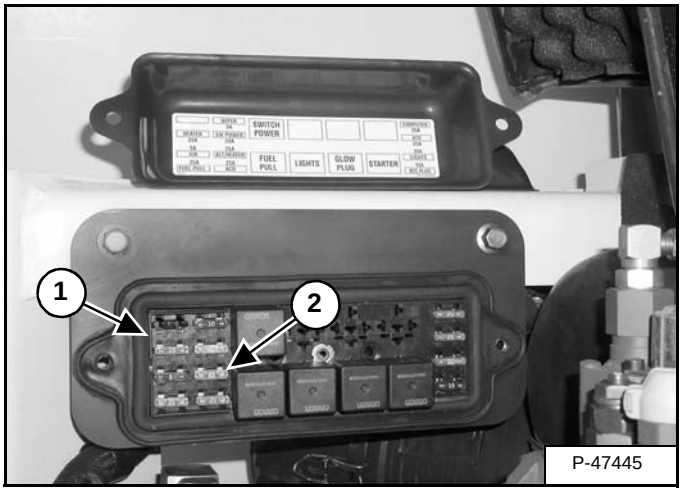
Push the A/C switch (Item 1) to the ON position. Turn the blower fan switch (Item 2) **[Figure 80-80-15]** to the first ON position.

The compressor clutch should make a *click* sound, which indicates the clutch is engaging.

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Checking The Electrical System (Cont'd)

Figure 80-80-16

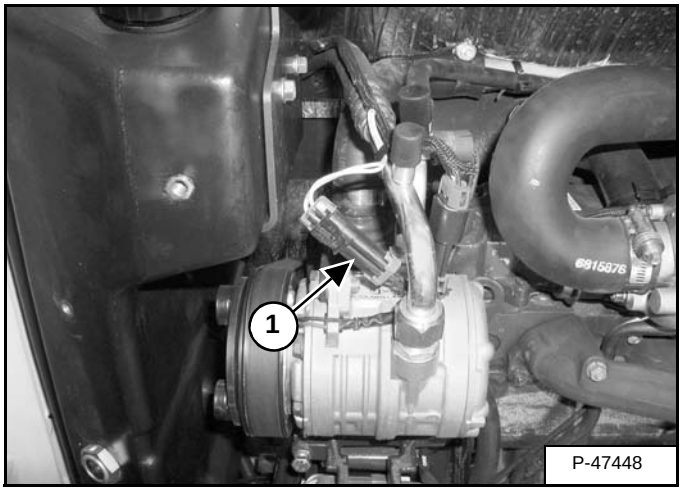


If the compressor clutch does not engage, check the fuses (Item 1 & 2) **[Figure 80-80-16]** located in the engine compartment.

Replace the fuse if burned out.

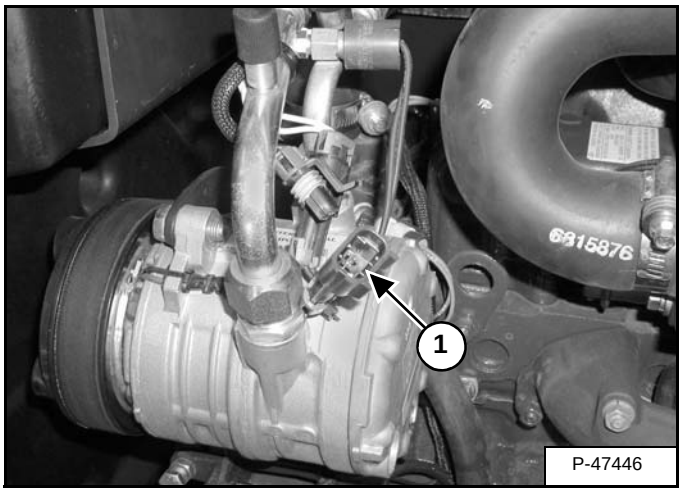
NOTE: The decal inside the fuse cover, refers to the fuses as HEATER and ALT/HEATER. These fuses control the power for both the heater and the A/C systems.

Figure 80-80-17



If the fuses check out good, disconnect the wire harness (Item 1) **[Figure 80-80-17]** from the compressor clutch wire.

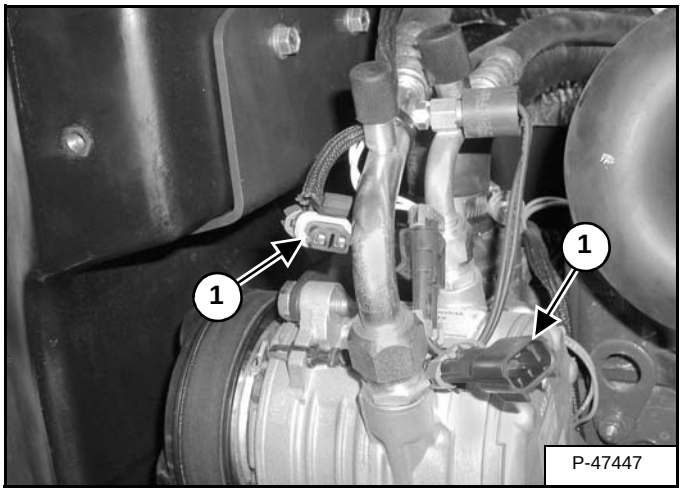
Figure 80-80-18



With a multimeter, check the resistance to the compressor clutch (Item 1) **[Figure 80-80-18]**.

If there is no resistance value, replace the compressor clutch. (See Compressor Clutch Disassembly And Assembly on Page 80-140-2)

Figure 80-80-19



With a multimeter, check the voltage to the compressor clutch at the excavator harness (Item 1) **[Figure 80-80-19]**.

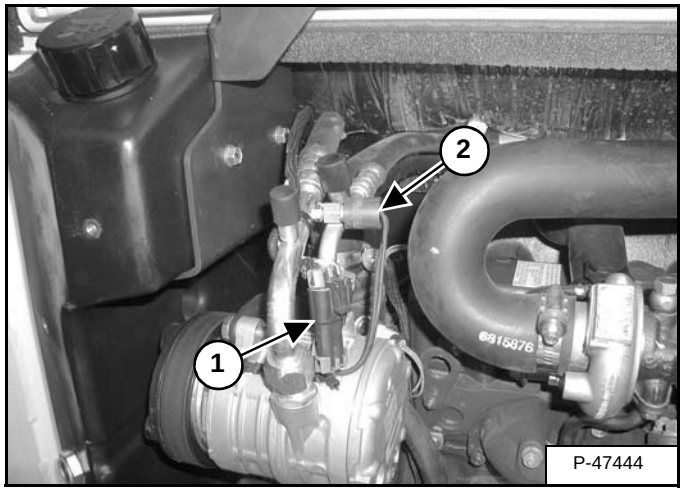
If the voltage reading is approximately 12 volts, the system is operating correctly.

If there is no power at the clutch, reconnect the wiring harness to the compressor clutch.

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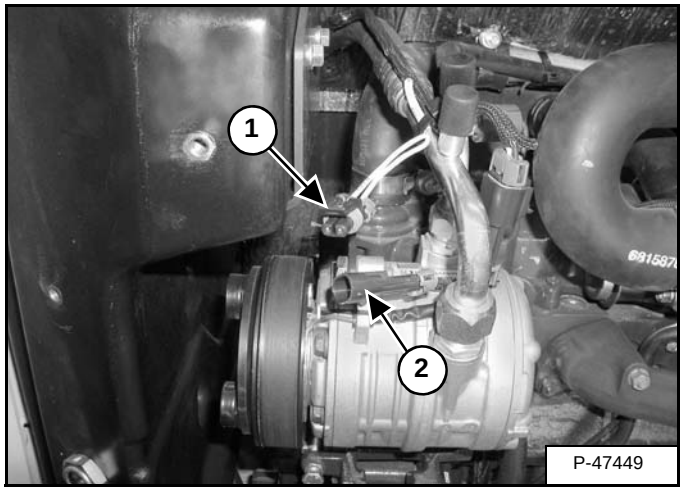
Checking The Electrical System (Cont'd)

Figure 80-80-20



Disconnect the harness (Item 1) from the pressure switch (Item 2) **[Figure 80-80-20]**.

Figure 80-80-21

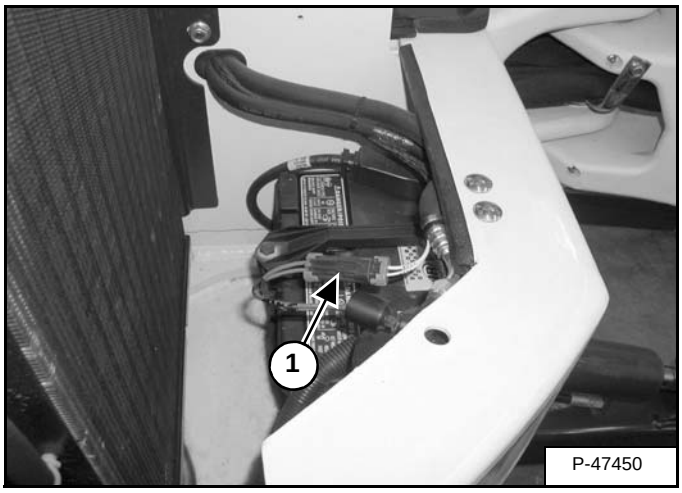


Using a multimeter check the wire harness (Item 1) **[Figure 80-80-21]** for voltage.

The voltage should be approximately 12 volts.

Connect the wire harness.

Figure 80-80-22

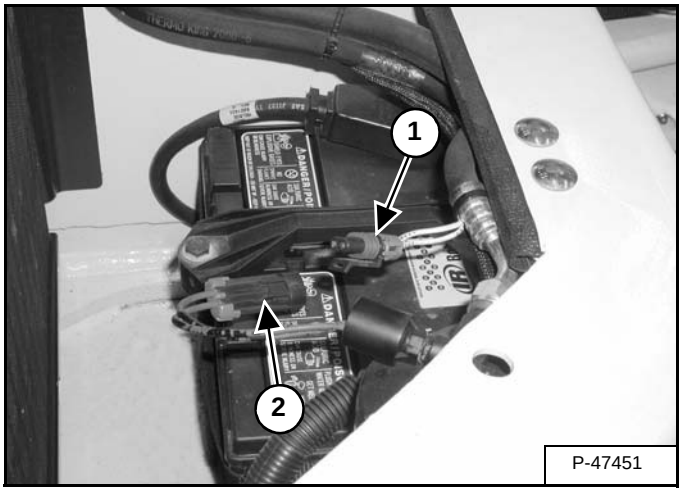


Disconnect the loader harness (Item 1) **[Figure 80-80-22]** from the pressure switch.

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Checking The Electrical System (Cont'd)

Figure 80-80-23



Using a multimeter check the wire harness (Item 1) **[Figure 80-80-23]** for voltage.

The voltage should be approximately 12 volts.

If there is voltage at the harness, check the resistance at the pressure switch (Item 2) **[Figure 80-80-21]** & **[Figure 80-80-23]**.

If there is no resistance value, check for low or high refrigerant levels in the system. (See Gauge Pressure Related Troubleshooting on Page 80-100-2.)

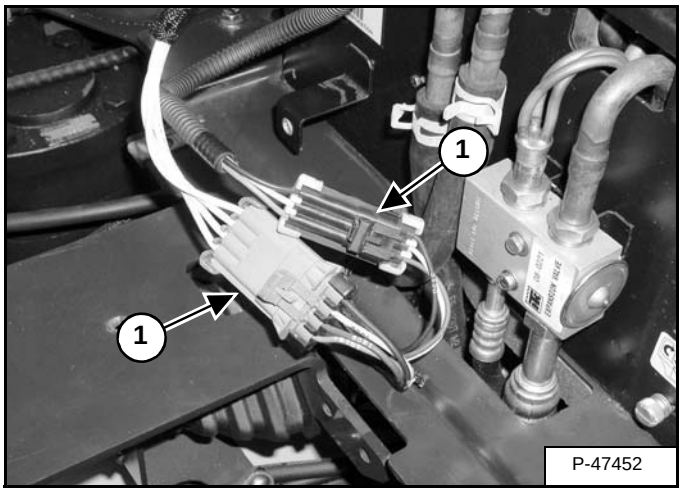
If a resistance value is observed, the pressure switch is good.

If there is no voltage at the wiring harness check the harness for broken wires. if there are no broken wires reconnect the loader harness to the pressure switch.

Remove the floor mat and floor plate. (See Removal And Installation on Page 50-120-1)

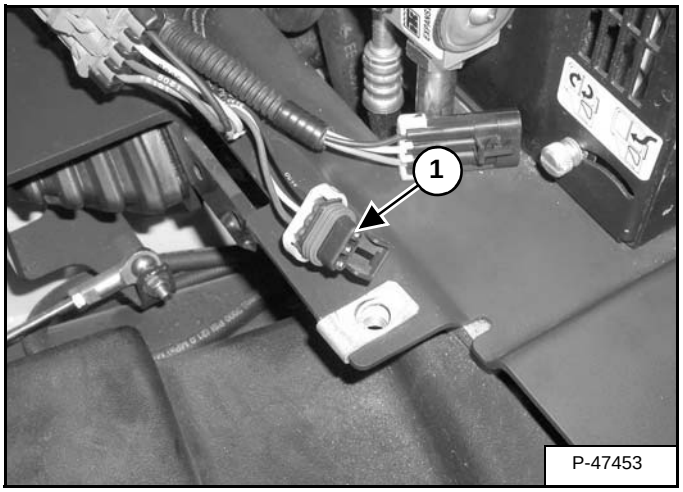
Relocate the wire harness up through the floor plate.

Figure 80-80-24



Disconnect the thermostat/blower fan wiring connectors (Item 1) **[Figure 80-80-24]** from the wiring harness.

Figure 80-80-25



Check the harness (Item 1) **[Figure 80-80-25]** for voltage. The voltage should be 12 volts between the blue wire (#3100) and the ground wire (#2120).

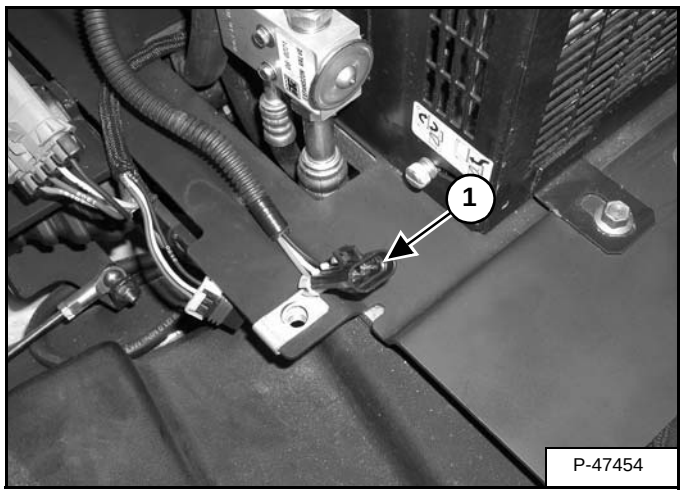
If there is no voltage at the wiring harness, check the harness for broken wires.

If there is voltage at the wiring harness, check the thermostat for resistance.

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Checking The Electrical System (Cont'd)

Figure 80-80-26



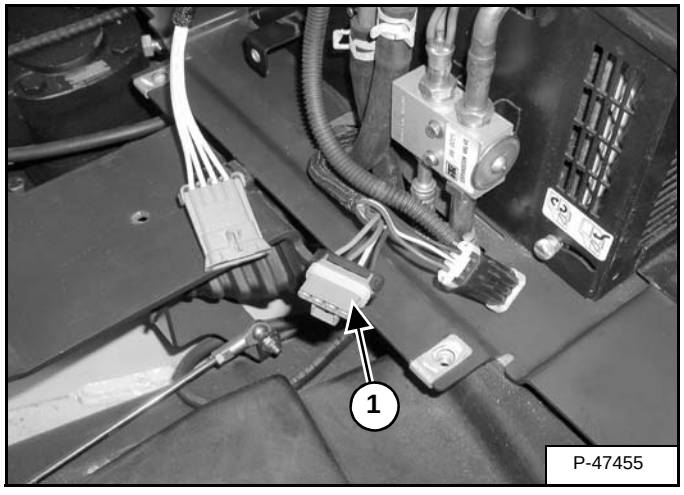
The resistance value of the thermostat should be 10 ohms at 68° F (20° C) between the blue wire (#3100) and ground wire (#2120) at the connector (Item 1) **[Figure 80-80-26]**.

If there is no resistance value, replace the thermostat. (See Removal And Installation on Page 80-200-1)

If there is no voltage at the wiring harness check the harness for broken wires.

If there are no broken wires use the following procedure to check the blower fan and switch.

Figure 80-80-27



Check the wire harness (Item 1) **[Figure 80-80-27]** for voltage to the blower fan.

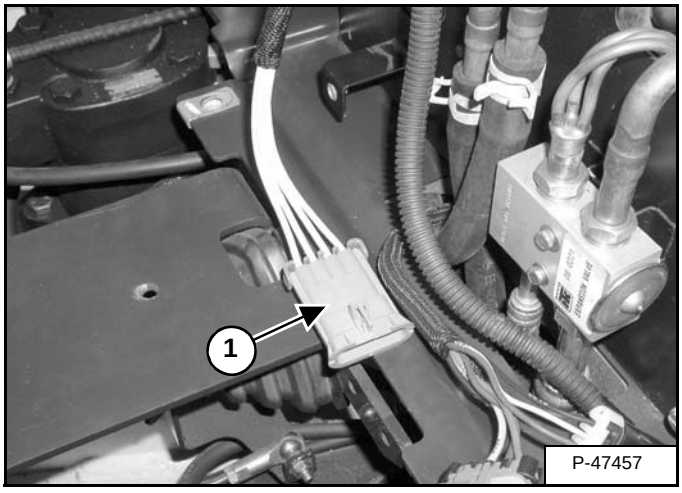
Place the blower switch in position 1. Check for voltage at the harness connector (Item 1) **[Figure 80-80-27]**, Pin 3. (YELLOW wire #5000). The voltage should be 12 volts.

Place the blower switch in position 2. Check for voltage at the harness connector (Item 1) **[Figure 80-80-27]**, Pin 2. (RED wire #1200). The voltage should be 12 volts.

Place the blower switch in position 3. Check for voltage at the harness connector (Item 1) **[Figure 80-80-27]**, Pin 1. (ORANGE wire #1010). The voltage should be 12 volts.

If there is no voltage at the wiring harness, check the harness for broken wires.

Figure 80-80-28



If there is voltage at the wiring harness, check the resistance to the blower fan at the thermostat/blower fan wiring connector (Item 1) **[Figure 80-80-28]**.

Check the resistance between Pin 4 (WHITE wire #2220) and Pin 3 (WHITE wire #5000).

Check the resistance between Pin 4 (WHITE wire #2200) and Pin 2 (WHITE wire #1200).

Check the resistance between Pin 4 (WHITE wire #2200) and Pin 1 (WHITE wire #1010).

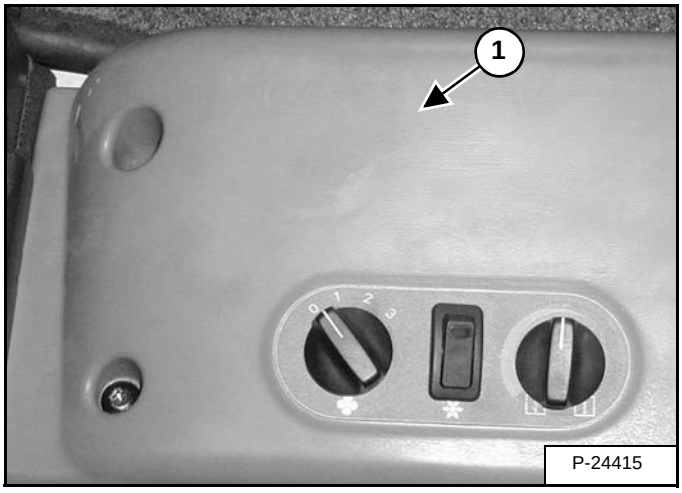
If there is no resistance value at any of these pins, replace the blower fan. (See Removal And Installation on Page 80-20-1)

If there is resistance value at any of the pins, check the climate controls at the control panel inside the excavator cab.

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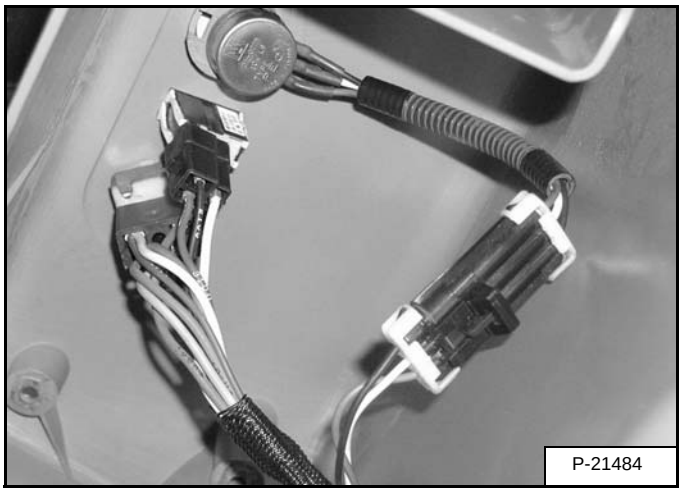
Checking The Electrical System (Cont'd)

Figure 80-80-29



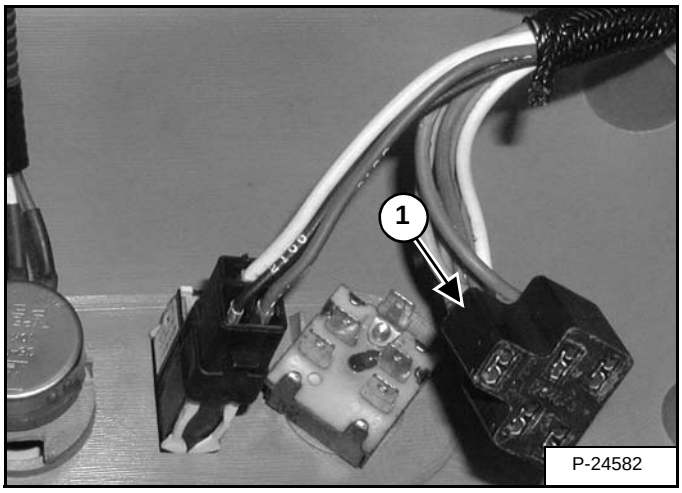
Remove the left upper console (Item 1) **[Figure 80-80-29]**. (See Console Removal And Installation on Page 50-60-8)

Figure 80-80-30



Position the console and wiring harness in the cab so the wiring harness can be checked **[Figure 80-80-30]**.

Figure 80-80-31



Disconnect the wiring harness (Item 1) **[Figure 80-80-31]** from the blower switch.

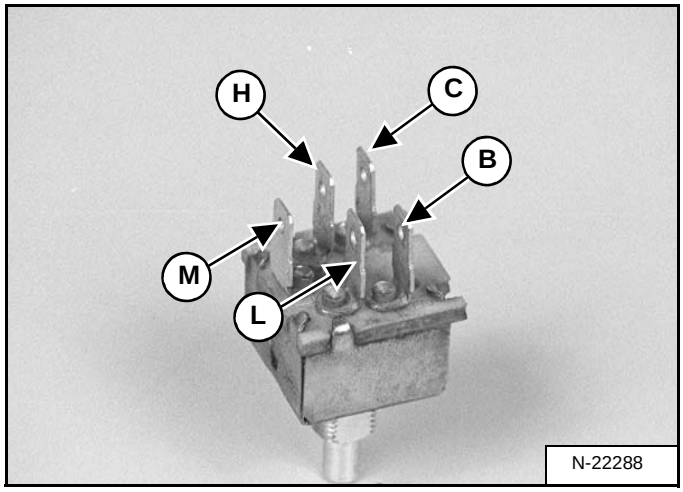
Check the harness for voltage. The voltage should be 12 volts.

If there is no voltage at the wiring harness, check the harness for broken wires.

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Checking The Electrical System (Cont'd)

Figure 80-80-32



If there is voltage at the wiring harness, check the blower switch (Item 1) **[Figure 80-80-32]** for resistance.

With the switch in the OFF position, there should be zero resistance between all terminals.

With the switch in the **1** position, there should be resistance between **C** terminal and **B** terminal. And also between the **C** terminal and the **L** terminal frame **[Figure 80-80-32]**.

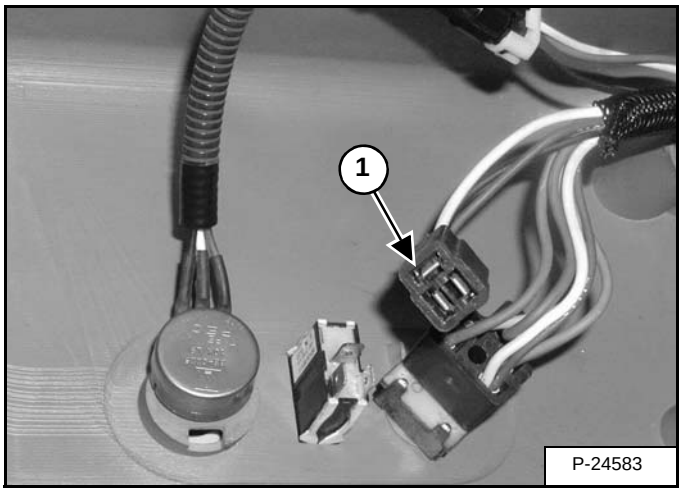
With the switch in the **2** position, there should be resistance between **C** terminal and **B** terminal. And also between the **C** terminal and the **M** terminal frame **[Figure 80-80-32]**.

With the switch in the **3** position, there should be resistance between **C** terminal and **B** terminal. And also between the **C** terminal and the **H** terminal frame **[Figure 80-80-32]**.

If any of the above resistance tests fail, replace the blower switch.

If the above resistance tests are good, check the A/C switch.

Figure 80-80-33



Disconnect the harness (Item 1) **[Figure 80-80-33]** from the A/C switch.

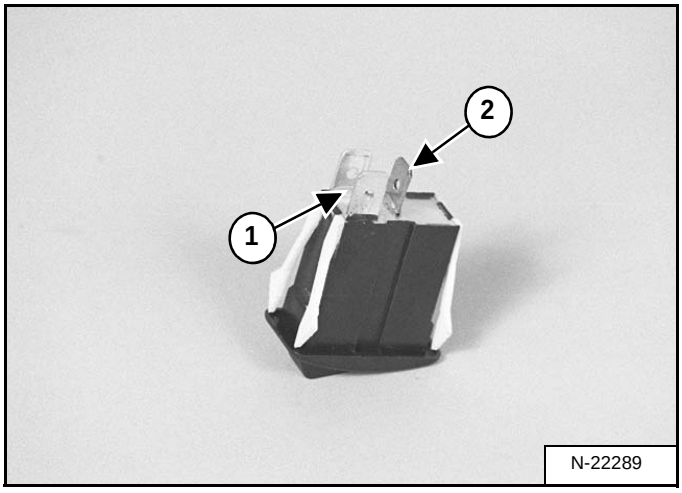
Check the harness for voltage. The voltage should be 12 volts.

If there is no voltage at the wiring harness, check the harness for broken wires.

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Checking The Electrical System (Cont'd)

Figure 80-80-34



If there is voltage at the wiring harness, check the A/C switch **[Figure 80-80-34]** for resistance.

With the switch in the OFF position there should be no resistance between any of the three terminals on the A/C switch.

With the switch in the ON position there should be resistance between terminal (Item 1) and terminal (Item 2) **[Figure 80-80-34]**.

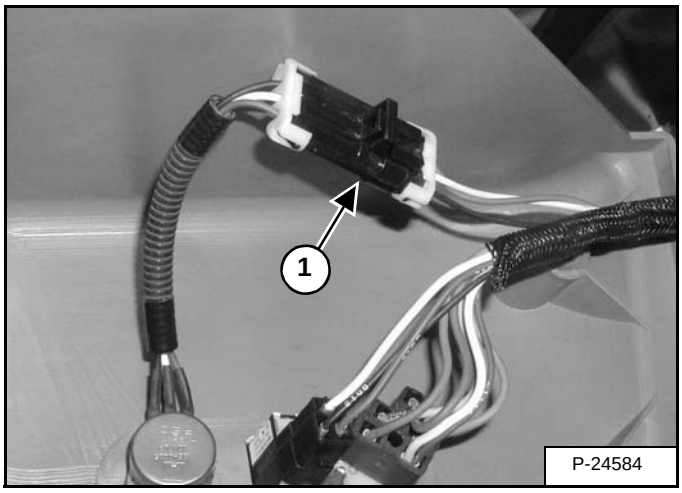
If no resistance value is found, replace the A/C switch.

If a resistance value is found, check the potentiometer.

The potentiometer will effect the A/C system and also effect the operation of the heater.

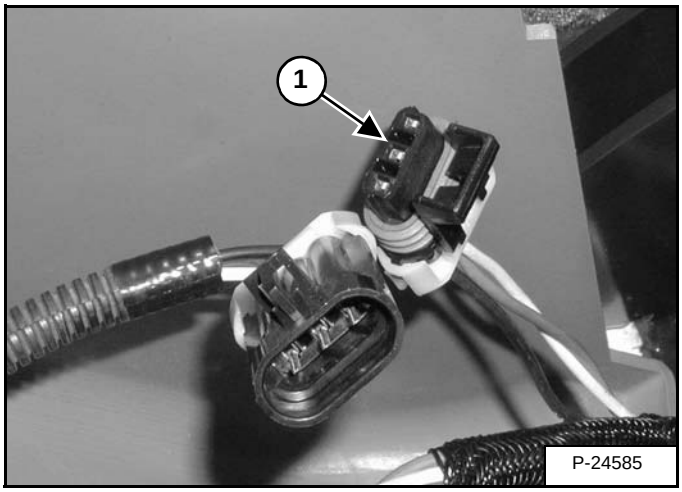
If heater valve does not open, or close, or the A/C does not work, check the potentiometer.

Figure 80-80-35



Disconnect the harness (Item 1) **[Figure 80-80-35]** from the potentiometer.

Figure 80-80-36



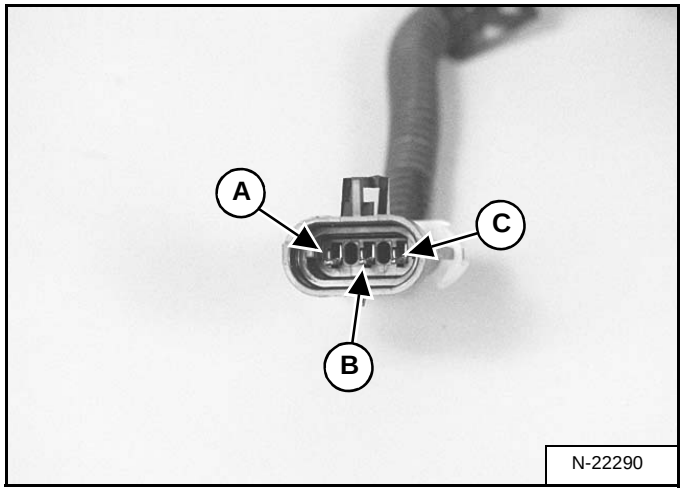
Check the harness (Item 1) **[Figure 80-80-36]** for voltage. Between pins **A** and **C** the voltage should be 12 volts.

If there is no voltage at the wiring harness, check the harness for broken wires.

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Checking The Electrical System (Cont'd)

Figure 80-80-37

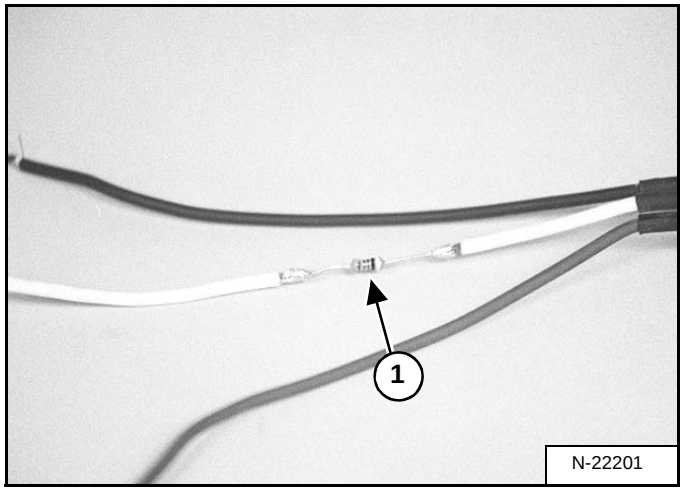


If there is voltage at the wiring harness, check the potentiometer **[Figure 80-80-37]** for resistance.

The resistance should be 10K Ohm's between wire terminal **A** and wire terminal **C** frame **[Figure 80-80-37]**.

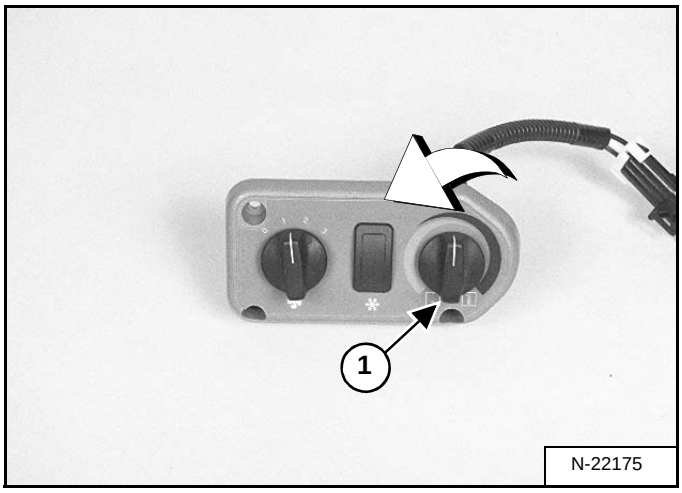
If no resistance is found replace the potentiometer.

Figure 80-80-38



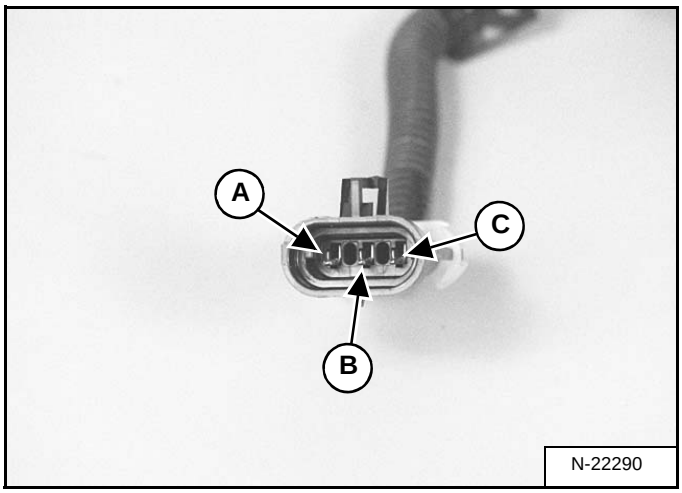
The white wire **B**, (Item 1) **[Figure 80-80-38]**, on the potentiometer, is a resister wire.

Figure 80-80-39



To check the resistance of the white wire, turn the potentiometer control (Item 1) **[Figure 80-80-39]** to the full A/C position.

Figure 80-80-40



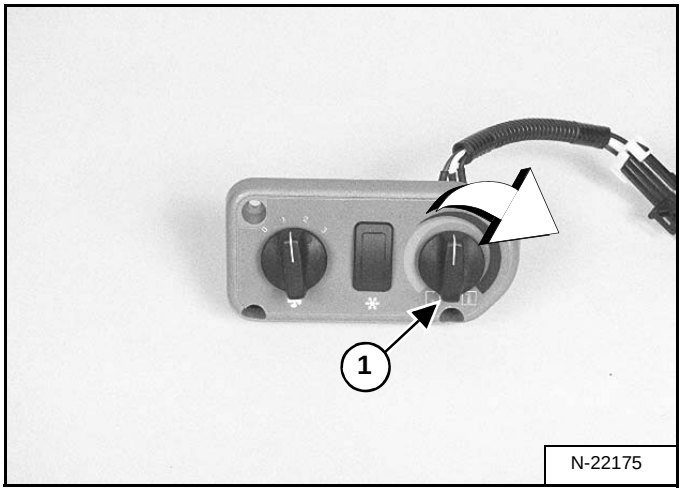
The resistance between the wire terminal **A** and wire terminal **B** frame **[Figure 80-80-40]** should be approximately 49K Ohm's.

Check the resistance between the wire terminal **C** and wire terminal **B** frame **[Figure 80-80-40]** should be approximately 39k Ohm's.

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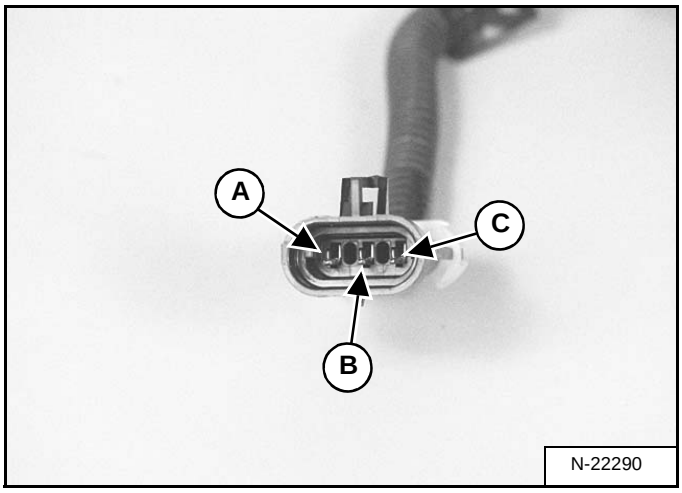
Checking The Electrical System (Cont'd)

Figure 80-80-41



To check the resistance of the white wire, turn the potentiometer control (Item 1) **[Figure 80-80-41]** to the full Heat position.

Figure 80-80-42



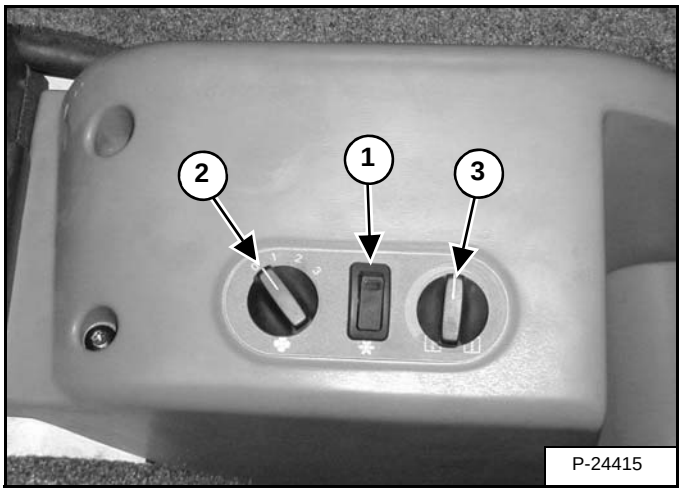
Check the resistance between the wire terminal **A** and wire terminal **B** frame **[Figure 80-80-42]** should be approximately 39K Ohm's.

Check the resistance between the wire terminal **C** and wire terminal **B** frame **[Figure 80-80-42]** should be approximately 49K Ohm's.

If the resistance is not found replace the potentiometer.

Engine Coolant By-Passing The Heater Valve

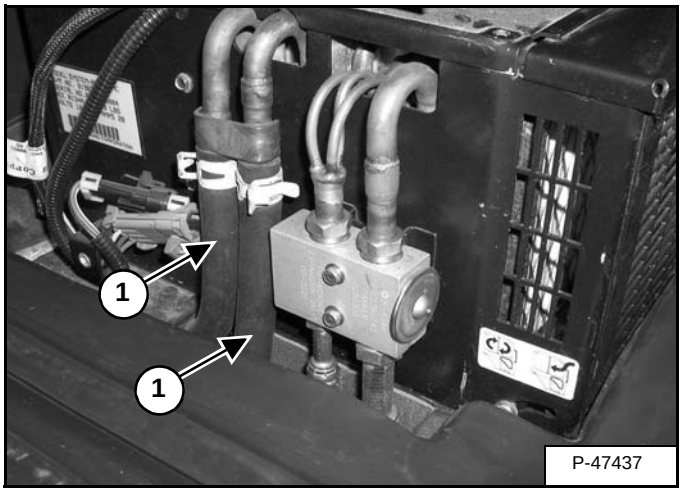
Figure 80-80-43



Push the A/C switch (Item 1) to the OFF position. Turn the fan switch (Item 2) to the High Speed position. Turn the temperature control (Item 3) **[Figure 80-80-43]** to the High A/C position, with the engine OFF.

Start the excavator and run at high idle for ten minutes.

Figure 80-80-44



Check the heater hoses (Item 1) **[Figure 80-80-44]** for temperature.

If the hose is hot, the heater valve is leaking internally and needs to be replaced.

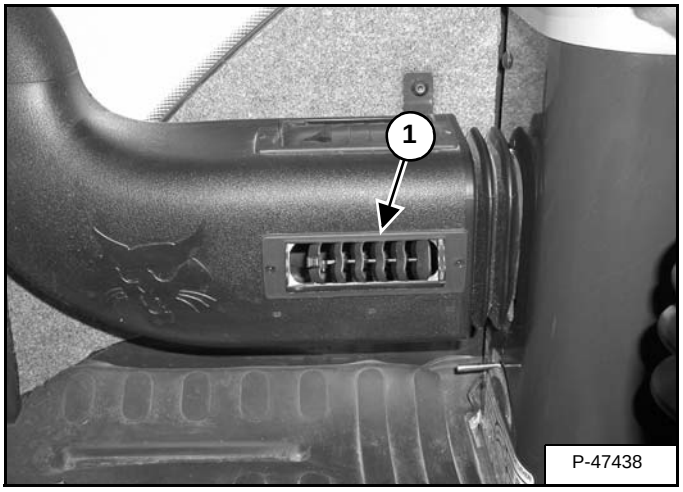
https://www.pdfmanual4trucks.com/

BASIC TROUBLESHOOTING (LATER MODELS)

Poor A/C Performance

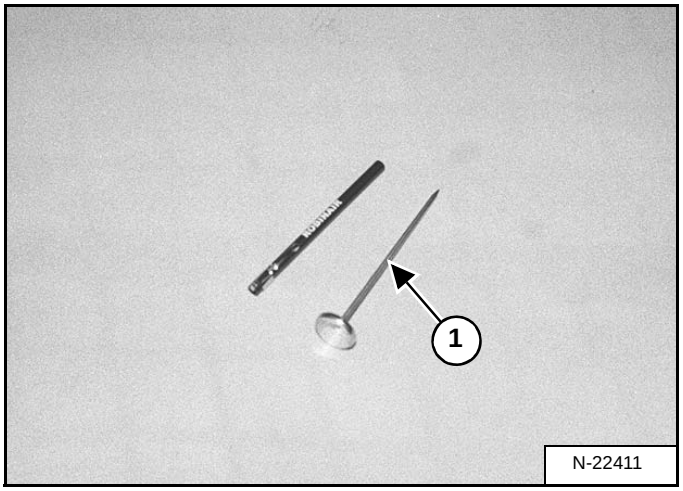
Start the excavator. Engage the A/C system with the blower fan on high. Run the excavator at full RPM for approximately 15 minutes, with the cab door closed.

Figure 80-81-1



Close the louvers at the front window duct and on the top of the lower duct (Item 1) **[Figure 80-81-1]**.

Figure 80-81-2



Check the temperature at the louvers (Item 1) **[Figure 80-81-2]** with a thermometer.

The louver temperature should be between 36-53° F. (2,2-11,6°C) depending on the amount of humidity in the air.

If louver temperature is too high see System Troubleshooting Chart. (See SYSTEM TROUBLESHOOTING CHART on Page 80-100-1)

Check the fan for proper operation or noise, and replace if necessary. (See Removal And Installation on Page 80-20-1)

Check the engine accessory drive belt. (See Belt Tension on Page 10-140-1)

Check the A/C condenser for dirt or mud, and clean if necessary. (See Cleaning The Condenser on Page 80-70-1)

Check the A/C evaporator coil for dirt or mud, and clean if necessary. (See Replacing The Coolant on Page 10-70-2.)

Inspect the sight glass located on the receiver/drier for air bubbles. (See Removal And Installation on Page 80-160-1.)

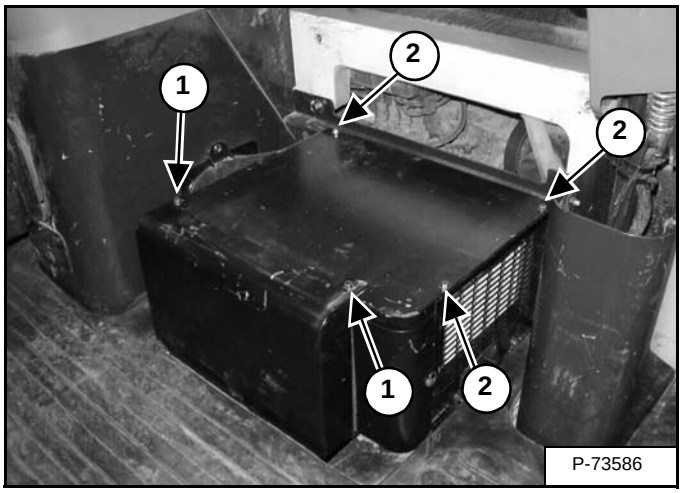
Check the engine coolant to see if it is bypassing the heater valve. (See Removal And Installation on Page 80-30-1)

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Cleaning The A/C Evaporator Coil & Heater Coil

Remove the operator seat from the cab. (See Removal And Installation on Page 50-40-1)

Figure 80-81-3

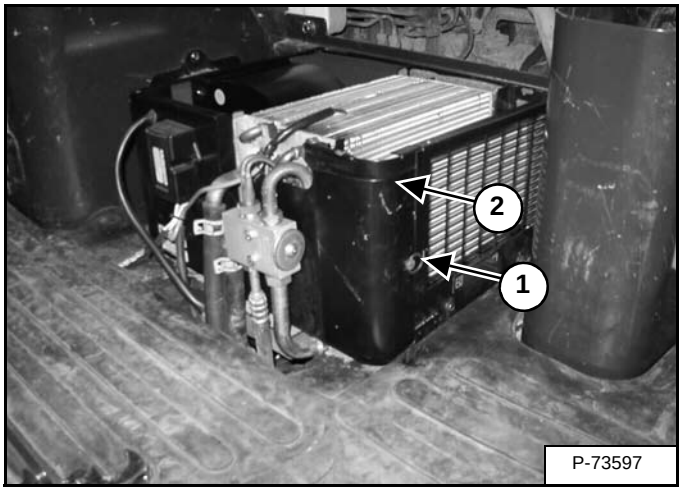


Remove the bolts (Item 1) **[Figure 80-81-3]** that hold the front cover to the heater/evaporator unit.

Remove the front cover.

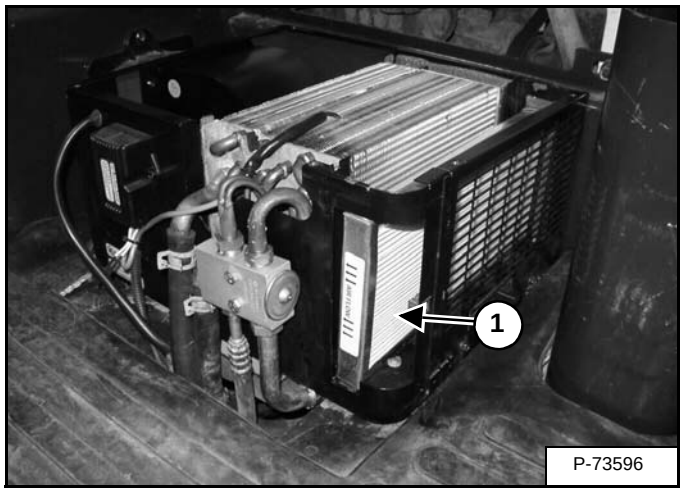
Remove the three bolts (Item 2) **[Figure 80-81-3]** from the heater/evaporator unit cover and remove the cover.

Figure 80-81-4



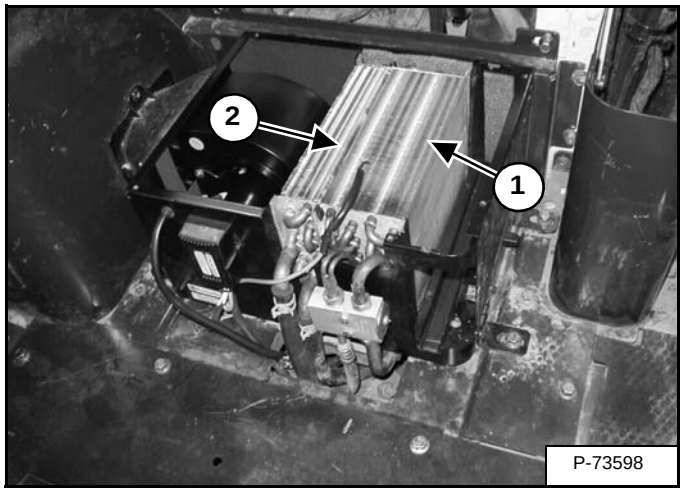
Turn the fastener (Item 1) 1/4 turn and remove the cover (Item 2) **[Figure 80-81-4]**.

Figure 80-81-5



Remove the filter (Item 1) **[Figure 80-81-5]**.

Figure 80-81-6

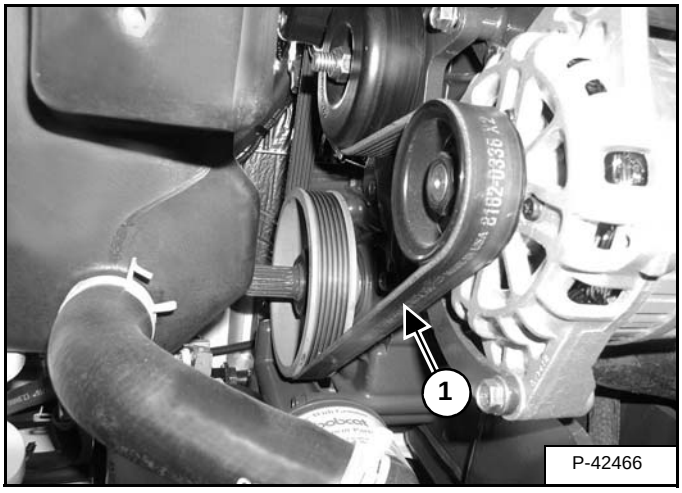


Clean the evaporator coil (Item 1) and the heater coil (Item 2) **[Figure 80-81-6]** with air or water.

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Engine Accessory Drive Belt

Figure 80-81-7



Inspect and adjust the accessory drive belt (Item 1) **[Figure 80-81-7]** as needed every 100 hours of operation. (See ENGINE ACCESSORY DRIVE BELT on Page 10-140-11)

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Checking The Electrical System

If the excavator A/C system shows no blower motor function, no A/C switch light, and no A/C compressor function, do the following checks at the A/C relay.

Remove the floormat and floor plate. (See Removal And Installation on Page 50-120-1)

Figure 80-81-8

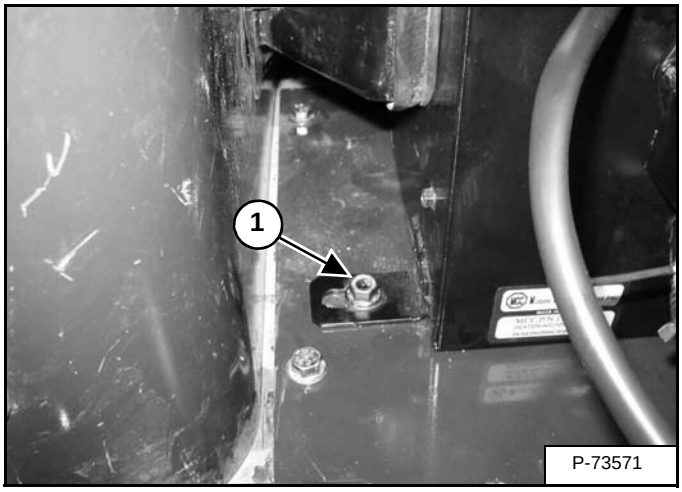
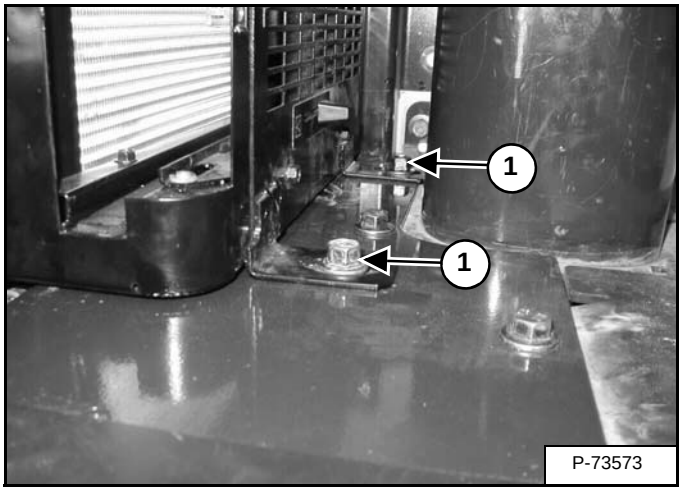
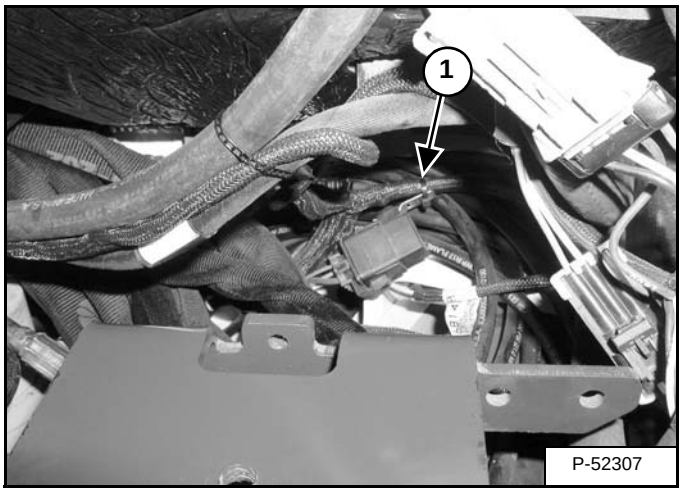


Figure 80-81-9



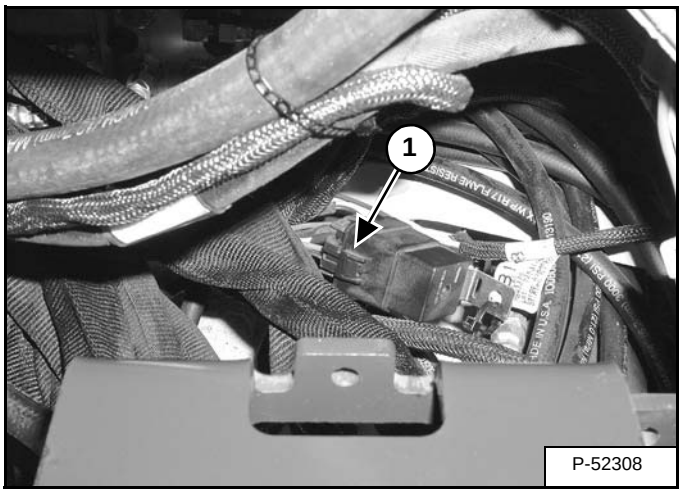
Remove the three bolts (Item 1) **[Figure 80-81-8]** & **[Figure 80-81-9]**. Tip the A/C unit back to provide access to the A/C relay.

Figure 80-81-10



Remove the cable tie (Item 1) **[Figure 80-81-10]** from the relay mount, as it is attached to the excavator wiring harness.

Figure 80-81-11



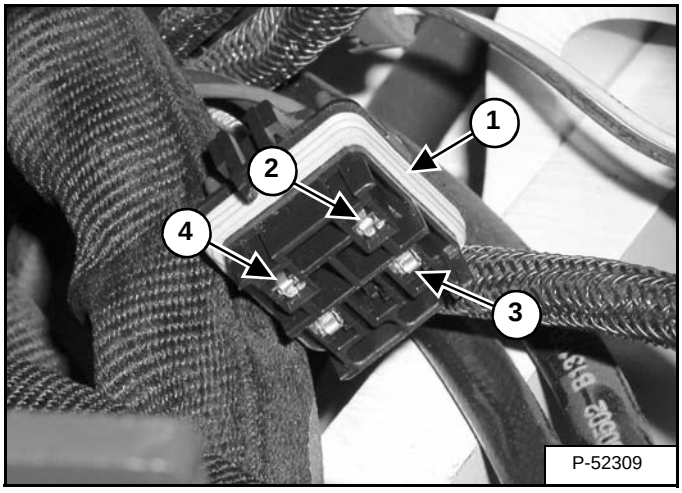
Depress the tab (Item 1) **[Figure 80-81-11]** on the relay.

Disconnect the relay from the wiring harness.

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Checking The Electrical System (Cont'd)

Figure 80-81-12



With a multimeter, check the voltage at the excavator A/C relay wiring harness connector (Item 1) **[Figure 80-81-12]**.

The voltage at Pin 30 (Item 2) **[Figure 80-81-12]** (Red Wire # 1190) should be 12 volts at all times.

If there is no voltage check the fuse #6, at the fuse box. (See **[Figure 80-81-15 on Page 80-81-6]**)

If the fuse is good, refer to the electrical schematic to trace wire # 1190 to its source.

The voltage at Pin 85 (Item 3) **[Figure 80-81-12]** (Orange Wire #1740) should be 12 volts when the key switch is in the ON position.

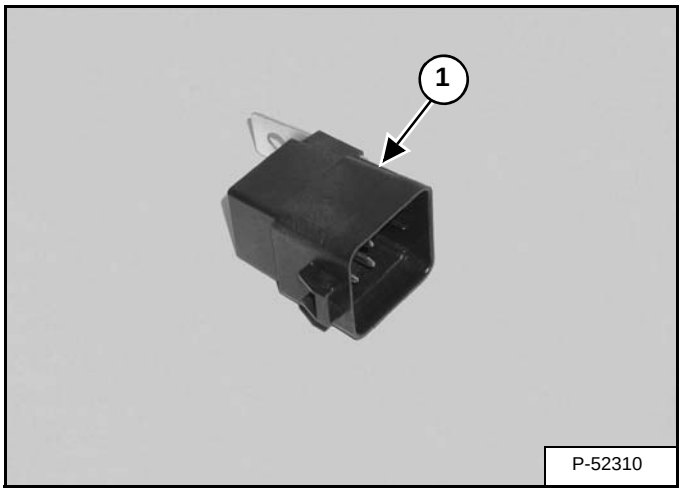
If there is no voltage check the fuse #3 at the fuse box. (See **[Figure 80-81-12 on Page 80-81-5]**)

If the fuse is good, refer to the electrical schematic to trace wire #1740 to its source.

Pin 86 (Item 4) **[Figure 80-81-12]** (Black Wire #2210) is the ground wire. Check for continuity at Pin 86 to ground.

If there is no continuity trace wire #2210 to its source using the electrical schematic.

Figure 80-81-13

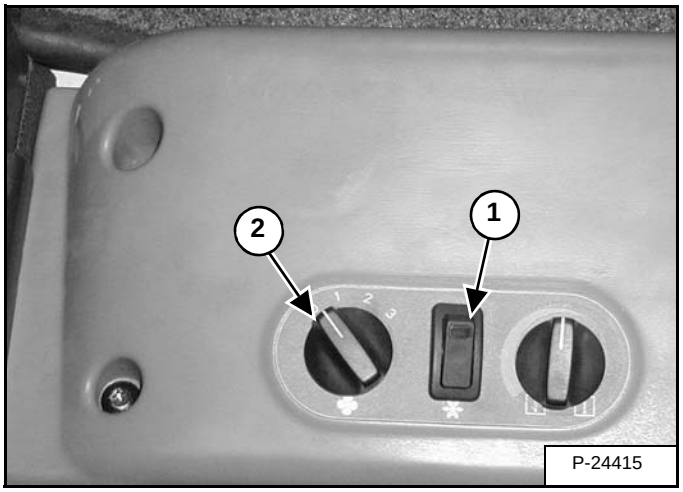


If the voltages and continuity checks are good, but the problem still persists, replace the A/C relay (Item 1) **[Figure 80-81-13]**.

Check to see if the compressor clutch is engaging.

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

Figure 80-81-14



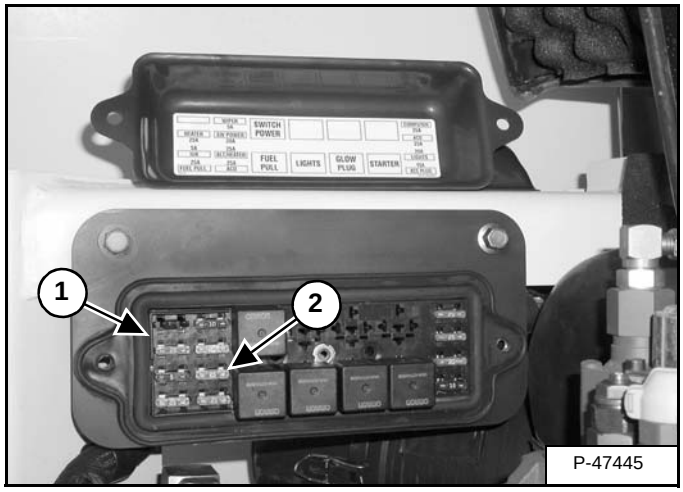
Push the A/C switch (Item 1) to the ON position. Turn the blower fan switch (Item 2) **[Figure 80-81-14]** to the first ON position.

The compressor clutch should make a *click* sound, which indicates the clutch is engaging.

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Checking The Electrical System (Cont'd)

Figure 80-81-15

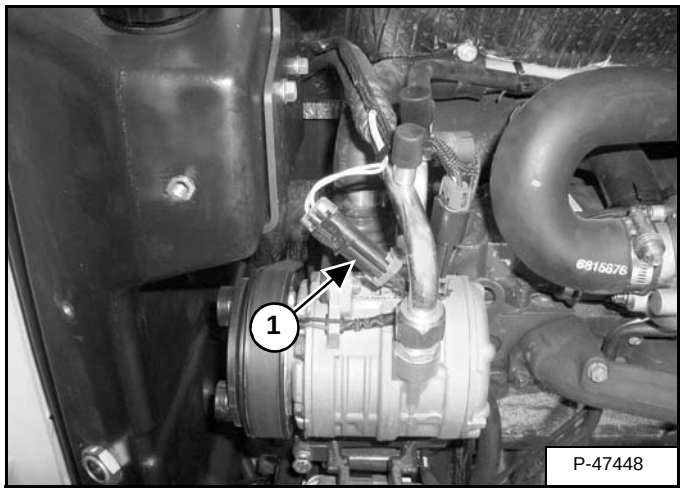


If the compressor clutch does not engage, check the fuses (Item 1 & 2) **[Figure 80-81-15]** located in the engine compartment.

Replace the fuse if burned out.

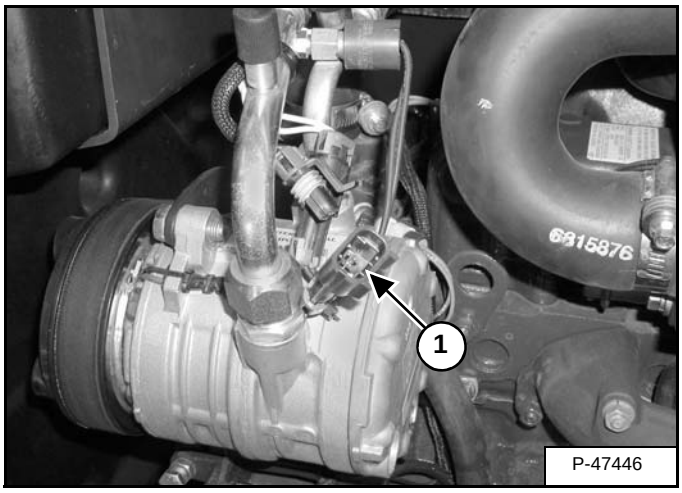
NOTE: The decal inside the fuse cover, refers to the fuses as HEATER and ALT/HEATER. These fuses control the power for both the heater and the A/C systems.

Figure 80-81-16



If the fuses check out good, disconnect the wire harness (Item 1) **[Figure 80-81-16]** from the compressor clutch wire.

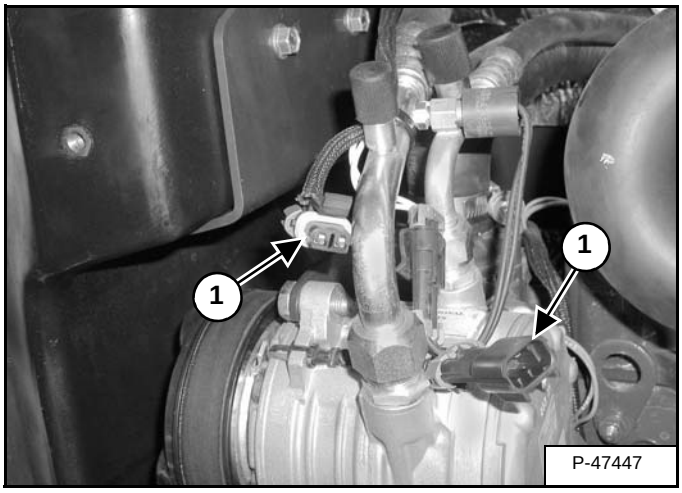
Figure 80-81-17



With a multimeter, check the resistance to the compressor clutch (Item 1) **[Figure 80-81-17]**.

If there is no resistance value, replace the compressor clutch. (See Compressor Clutch Disassembly And Assembly on Page 80-140-2)

Figure 80-81-18



With a multimeter, check the voltage to the compressor clutch at the excavator harness (Item 1) **[Figure 80-81-18]**.

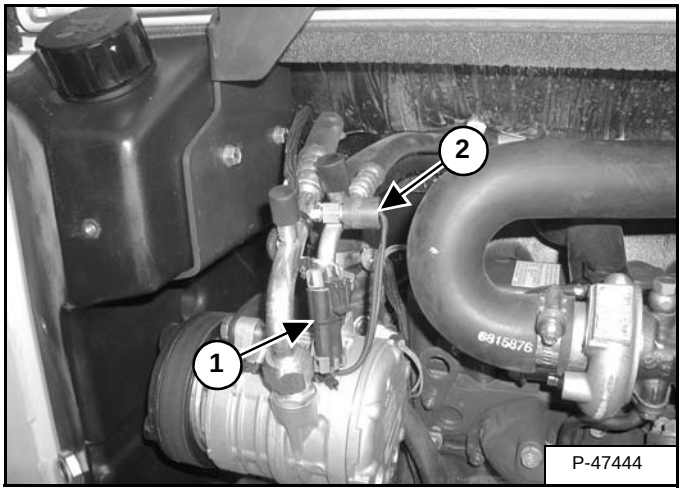
If the voltage reading is approximately 12 volts, the system is operating correctly.

If there is no power at the clutch, reconnect the wiring harness to the compressor clutch.

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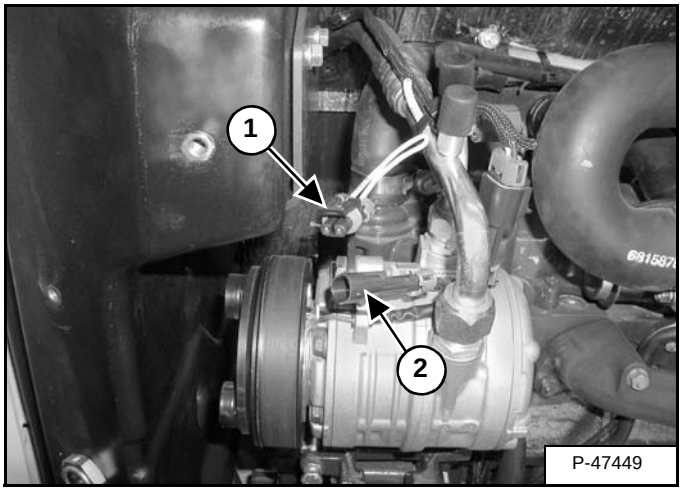
Checking The Electrical System (Cont'd)

Figure 80-81-19



Disconnect the harness (Item 1) from the pressure switch (Item 2) **[Figure 80-81-19]**.

Figure 80-81-20

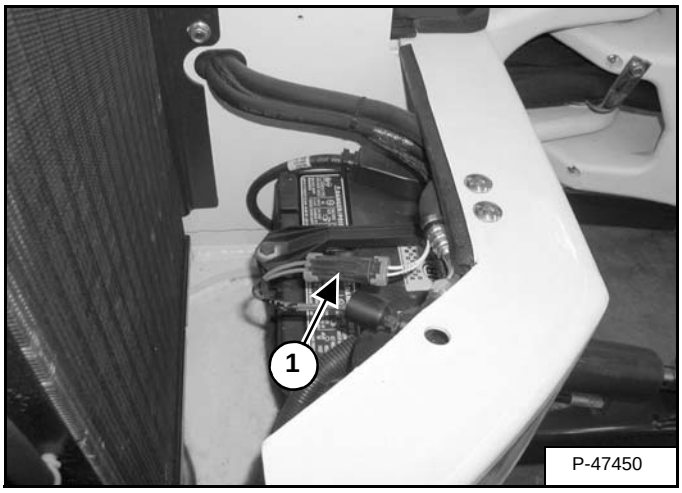


Using a multimeter check the wire harness (Item 1) **[Figure 80-81-20]** for voltage.

The voltage should be approximately 12 volts.

Connect the wire harness.

Figure 80-81-21

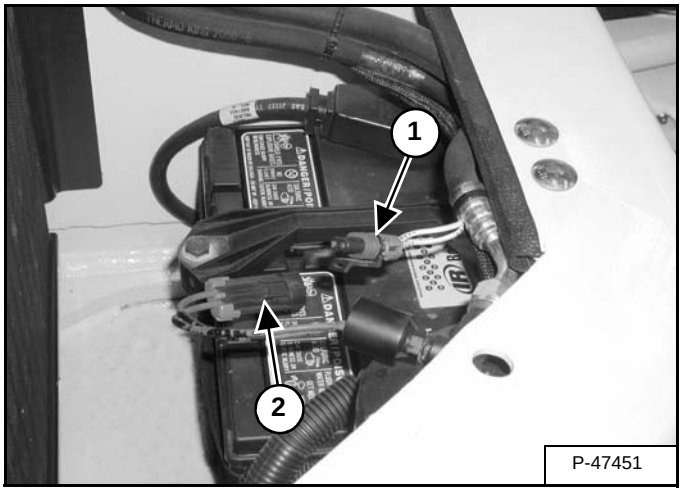


Disconnect the loader harness (Item 1) **[Figure 80-81-21]** from the pressure switch.

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Checking The Electrical System (Cont'd)

Figure 80-81-22



Using a multimeter check the wire harness (Item 1) **[Figure 80-81-22]** for voltage.

The voltage should be approximately 12 volts.

If there is voltage at the harness, check the resistance at the pressure switch (Item 2) **[Figure 80-81-20 on Page 80-81-7]** & **[Figure 80-81-22]**.

If there is no resistance value, check for low or high refrigerant levels in the system. (See Gauge Pressure Related Troubleshooting on Page 80-100-2.)

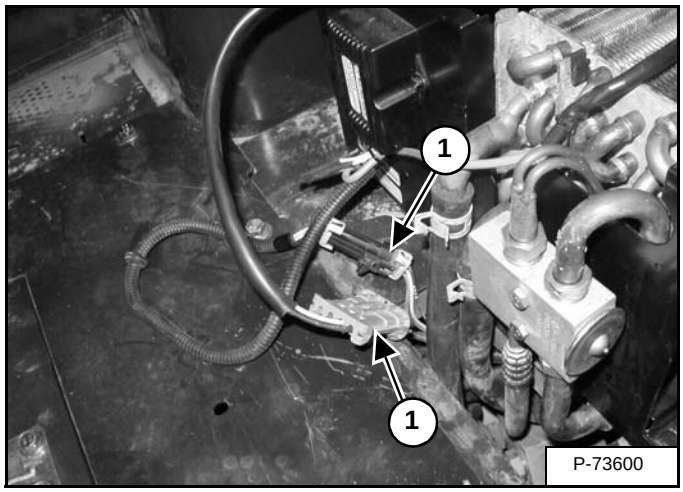
If a resistance value is observed, the pressure switch is good.

If there is no voltage at the wiring harness check the harness for broken wires. if there are no broken wires reconnect the loader harness to the pressure switch.

Remove the floor mat and floor plate. (See Removal And Installation on Page 50-120-1)

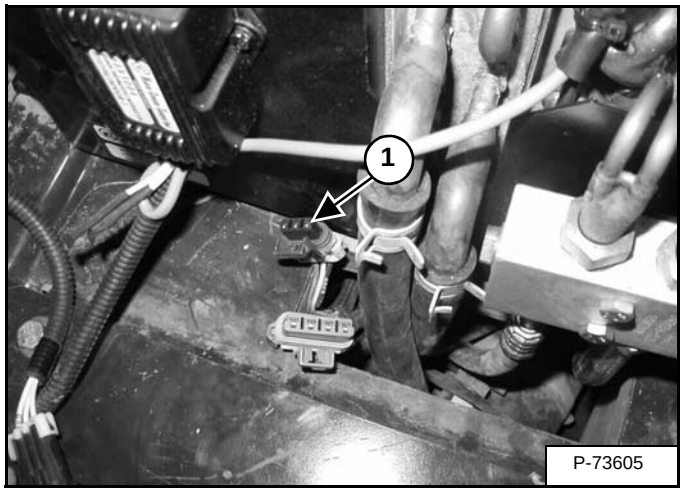
Relocate the wire harness up through the floor plate.

Figure 80-81-23



Disconnect the thermostat/blower fan wiring connectors (Item 1) **[Figure 80-81-23]** from the wiring harness.

Figure 80-81-24



Check the harness (Item 1) **[Figure 80-81-24]** for voltage. The voltage should be 12 volts between the blue wire (#3100) and the ground wire (#2120).

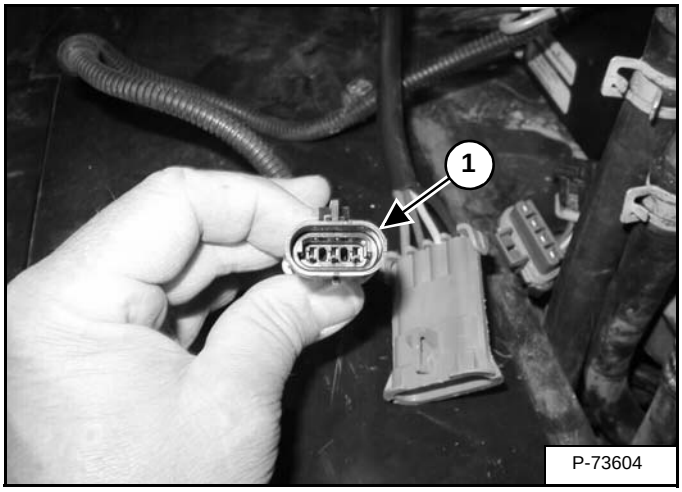
If there is no voltage at the wiring harness, check the harness for broken wires.

If there is voltage at the wiring harness, check the thermostat for resistance.

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Checking The Electrical System (Cont'd)

Figure 80-81-25



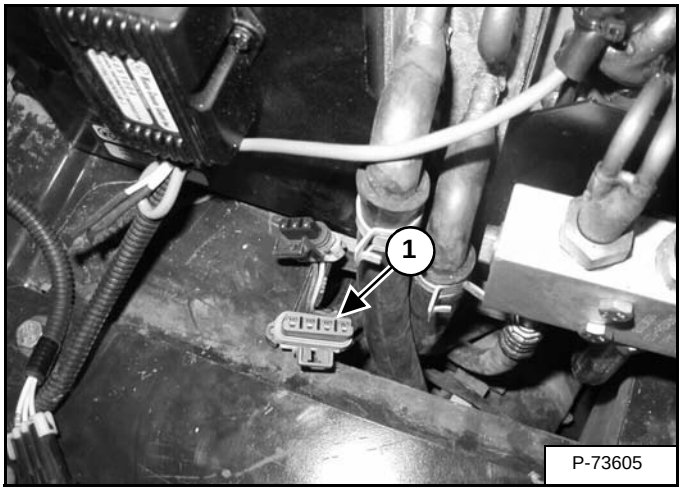
The resistance value of the thermostat should be 10 ohms at 68° F (20° C) between the blue wire (#3100) and ground wire (#2120) at the connector (Item 1) **[Figure 80-81-25]**.

If there is no resistance value, replace the thermostat. (See Removal And Installation on Page 80-200-1)

If there is no voltage at the wiring harness check the harness for broken wires.

If there are no broken wires use the following procedure to check the blower fan and switch.

Figure 80-81-26



Check the wire harness (Item 1) **[Figure 80-81-26]** for voltage to the blower fan.

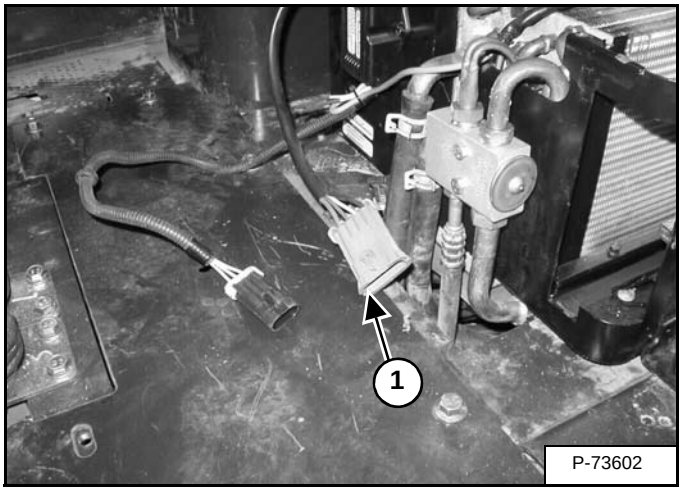
Place the blower switch in position 1. Check for voltage at the harness connector (Item 1) **[Figure 80-81-26]**, Pin 3. (YELLOW wire #5000). The voltage should be 12 volts.

Place the blower switch in position 2. Check for voltage at the harness connector (Item 1) **[Figure 80-81-26]**, Pin 2. (RED wire #1200). The voltage should be 12 volts.

Place the blower switch in position 3. Check for voltage at the harness connector (Item 1) **[Figure 80-81-26]**, Pin 1. (ORANGE wire #1010). The voltage should be 12 volts.

If there is no voltage at the wiring harness, check the harness for broken wires.

Figure 80-81-27



If there is voltage at the wiring harness, check the resistance to the blower fan at the thermostat/blower fan wiring connector (Item 1) **[Figure 80-81-27]**.

Check the resistance between Pin 4 (WHITE wire #2220) and Pin 3 (WHITE wire #5000).

Check the resistance between Pin 4 (WHITE wire #2200) and Pin 2 (WHITE wire #1200).

Check the resistance between Pin 4 (WHITE wire #2200) and Pin 1 (WHITE wire #1010).

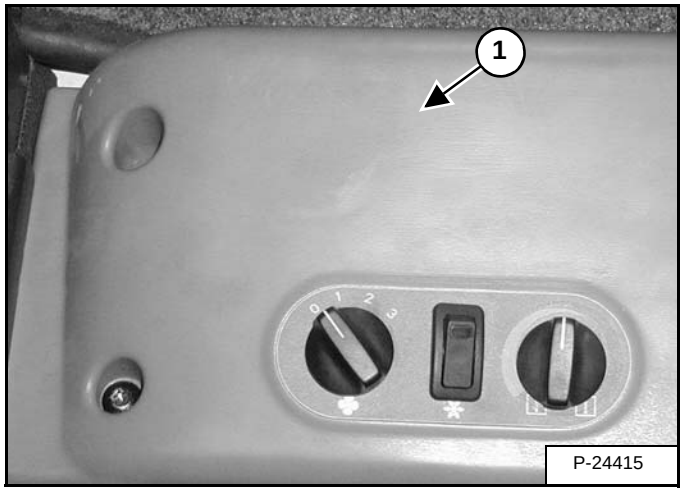
If there is no resistance value at any of these pins, replace the blower fan. (See Removal And Installation on Page 80-20-1)

If there is resistance value at any of the pins, check the climate controls at the control panel inside the excavator cab.

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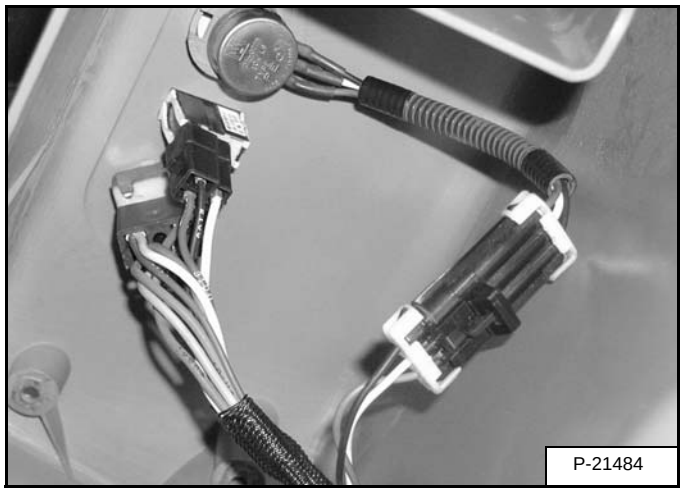
Checking The Electrical System (Cont'd)

Figure 80-81-28



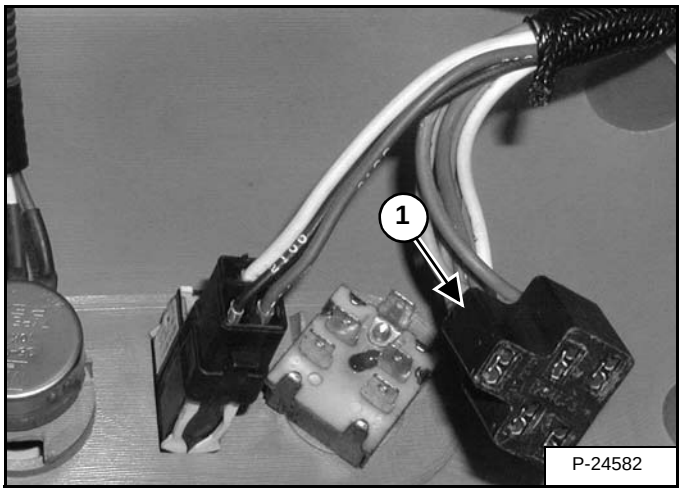
Remove the left upper console (Item 1) **[Figure 80-81-28]**. (See Console Removal And Installation on Page 50-60-8)

Figure 80-81-29



Position the console and wiring harness in the cab so the wiring harness can be checked **[Figure 80-81-29]**.

Figure 80-81-30



Disconnect the wiring harness (Item 1) **[Figure 80-81-30]** from the blower switch.

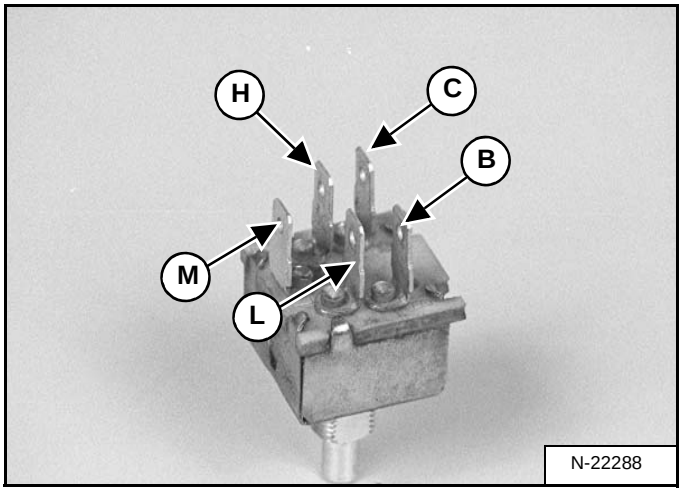
Check the harness for voltage. The voltage should be 12 volts.

If there is no voltage at the wiring harness, check the harness for broken wires.

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Checking The Electrical System (Cont'd)

Figure 80-81-31



If there is voltage at the wiring harness, check the blower switch (Item 1) **[Figure 80-81-31]** for resistance.

With the switch in the OFF position, there should be zero resistance between all terminals.

With the switch in the **1** position, there should be resistance between **C** terminal and **B** terminal. And also between the **C** terminal and the **L** terminal frame **[Figure 80-81-31]**.

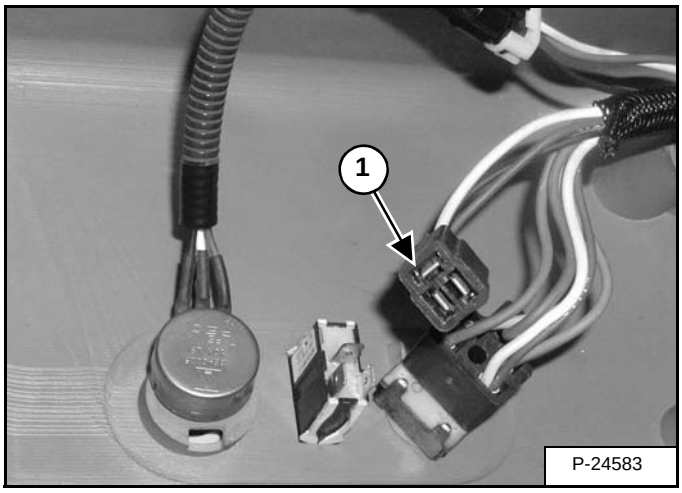
With the switch in the **2** position, there should be resistance between **C** terminal and **B** terminal. And also between the **C** terminal and the **M** terminal frame **[Figure 80-81-31]**.

With the switch in the **3** position, there should be resistance between **C** terminal and **B** terminal. And also between the **C** terminal and the **H** terminal frame **[Figure 80-81-31]**.

If any of the above resistance tests fail, replace the blower switch.

If the above resistance tests are good, check the A/C switch.

Figure 80-81-32



Disconnect the harness (Item 1) **[Figure 80-81-32]** from the A/C switch.

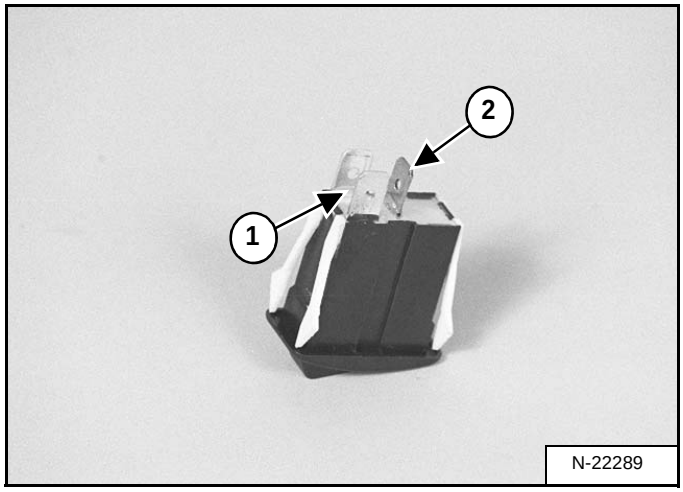
Check the harness for voltage. The voltage should be 12 volts.

If there is no voltage at the wiring harness, check the harness for broken wires.

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Checking The Electrical System (Cont'd)

Figure 80-81-33



If there is voltage at the wiring harness, check the A/C switch **[Figure 80-81-33]** for resistance.

With the switch in the OFF position there should be no resistance between any of the three terminals on the A/C switch.

With the switch in the ON position there should be resistance between terminal (Item 1) and terminal (Item 2) **[Figure 80-81-33]**.

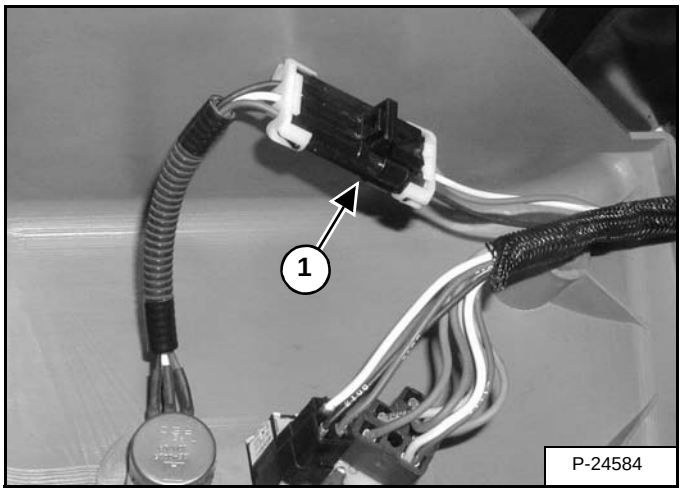
If no resistance value is found, replace the A/C switch.

If a resistance value is found, check the potentiometer.

The potentiometer will effect the A/C system and also effect the operation of the heater.

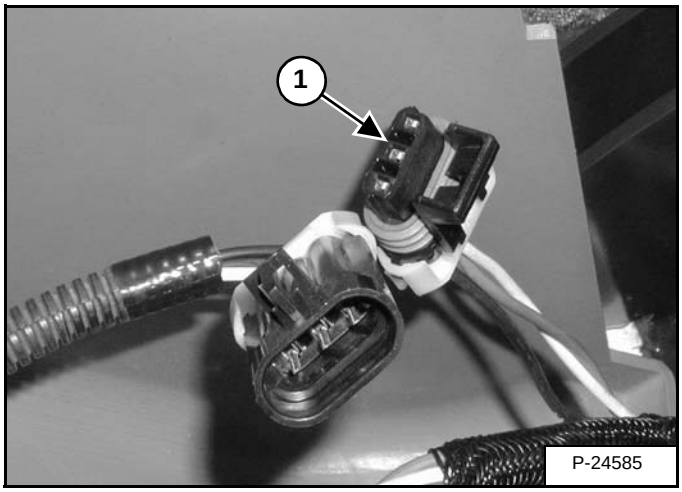
If heater valve does not open, or close, or the A/C does not work, check the potentiometer.

Figure 80-81-34



Disconnect the harness (Item 1) **[Figure 80-81-34]** from the potentiometer.

Figure 80-81-35



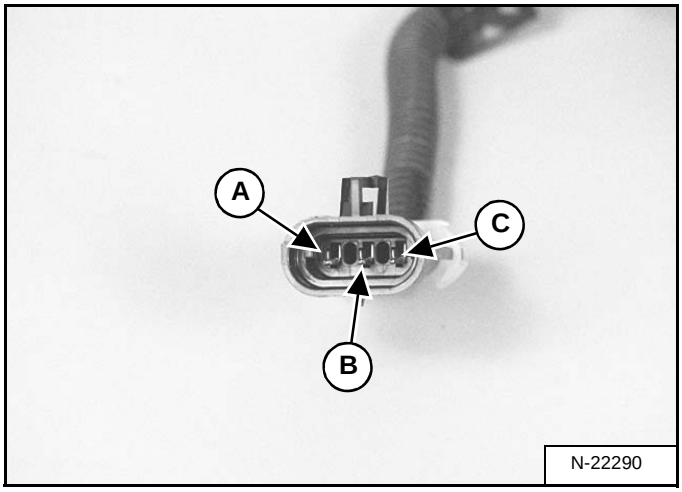
Check the harness (Item 1) **[Figure 80-81-35]** for voltage. Between pins **A** and **C** the voltage should be 12 volts.

If there is no voltage at the wiring harness, check the harness for broken wires.

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Checking The Electrical System (Cont'd)

Figure 80-81-36

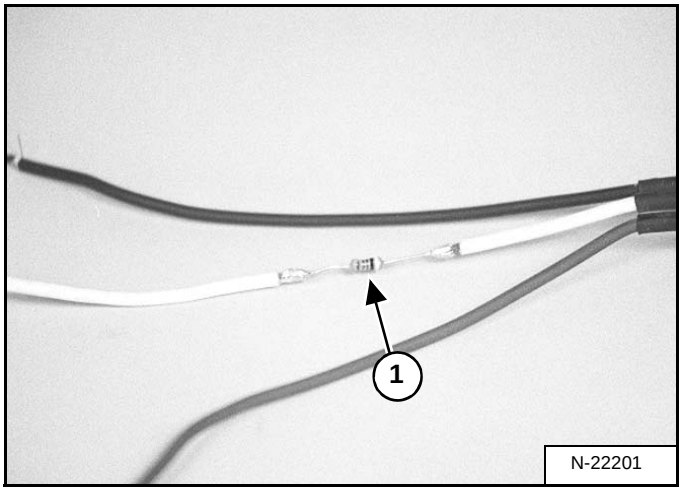


If there is voltage at the wiring harness, check the potentiometer **[Figure 80-81-36]** for resistance.

The resistance should be 10K Ohm's between wire terminal **A** and wire terminal **C** frame **[Figure 80-81-36]**.

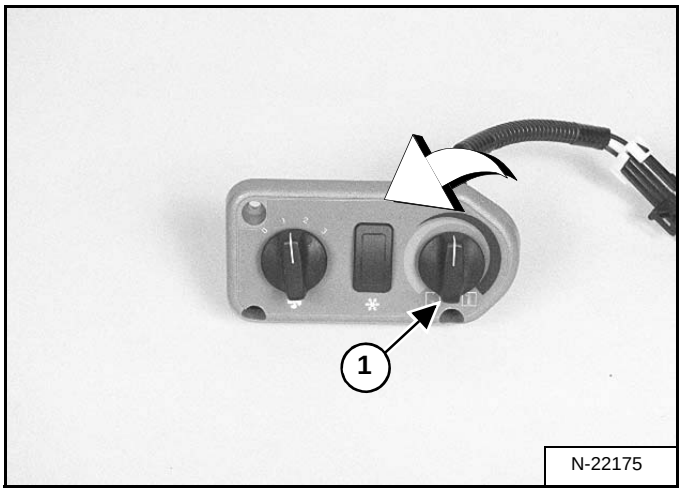
If no resistance is found replace the potentiometer.

Figure 80-81-37



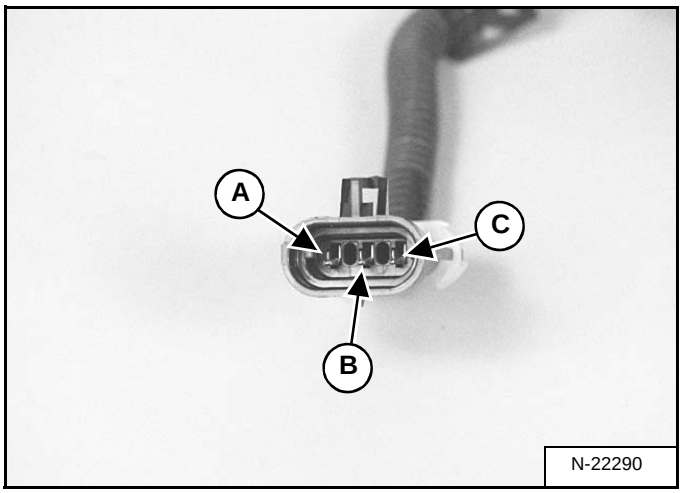
The white wire **B**, (Item 1) **[Figure 80-81-37]**, on the potentiometer, is a resister wire.

Figure 80-81-38



To check the resistance of the white wire, turn the potentiometer control (Item 1) **[Figure 80-81-38]** to the full A/C position.

Figure 80-81-39



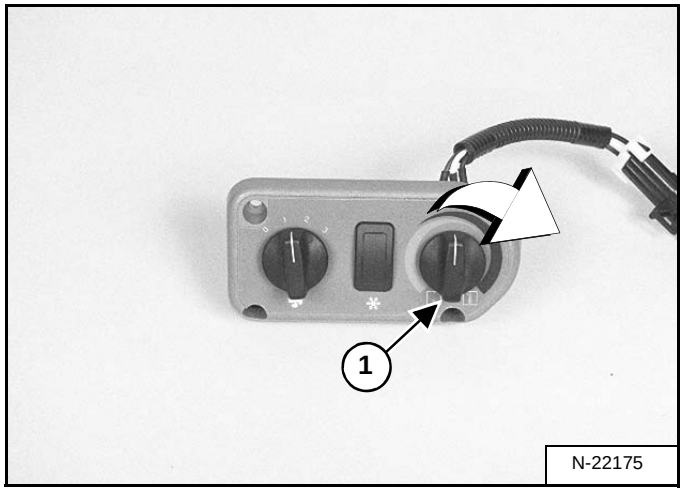
The resistance between the wire terminal **A** and wire terminal **B** frame **[Figure 80-81-39]** should be approximately 49K Ohm's.

Check the resistance between the wire terminal **C** and wire terminal **B** frame **[Figure 80-81-39]** should be approximately 39k Ohm's.

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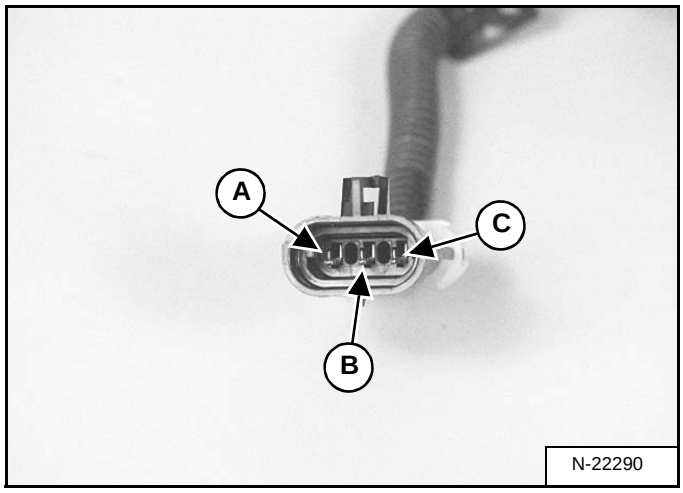
Checking The Electrical System (Cont'd)

Figure 80-81-40



To check the resistance of the white wire, turn the potentiometer control (Item 1) **[Figure 80-81-40]** to the full Heat position.

Figure 80-81-41



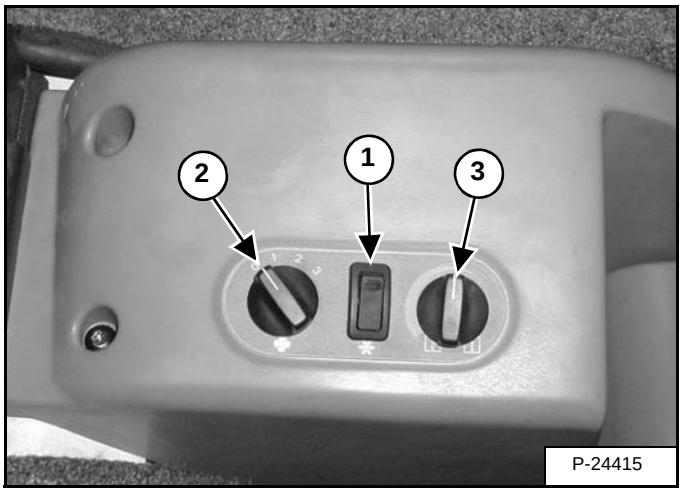
Check the resistance between the wire terminal **A** and wire terminal **B** frame **[Figure 80-81-41]** should be approximately 39K Ohm's.

Check the resistance between the wire terminal **C** and wire terminal **B** frame **[Figure 80-81-41]** should be approximately 49K Ohm's.

If the resistance is not found replace the potentiometer.

Engine Coolant By-Passing The Heater Valve

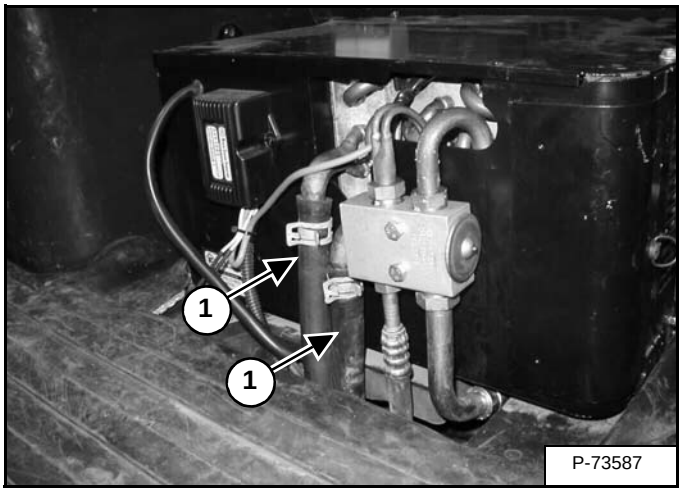
Figure 80-81-42



Push the A/C switch (Item 1) to the OFF position. Turn the fan switch (Item 2) to the High Speed position. Turn the temperature control (Item 3) **[Figure 80-81-42]** to the High A/C position, with the engine OFF.

Start the excavator and run at high idle for ten minutes.

Figure 80-81-43



Check the heater hoses (Item 1) **[Figure 80-81-43]** for temperature.

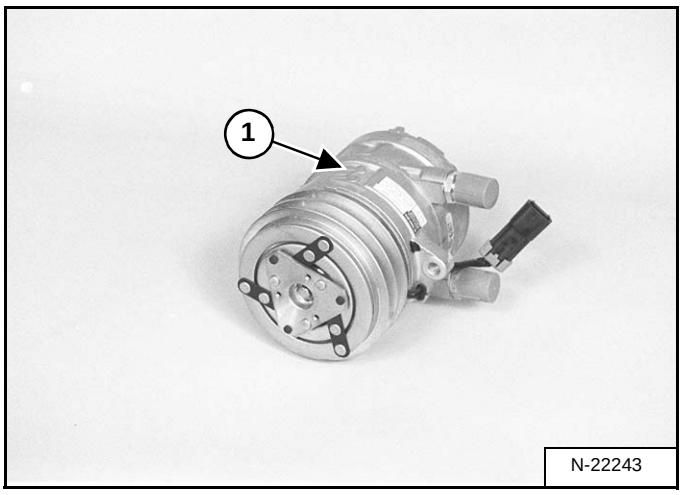
If the hose is hot, the heater valve is leaking internally and needs to be replaced.

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GENERAL AIR CONDITIONING SERVICE GUIDELINES

Compressor Oil

Figure 80-90-1



The compressor (Item 1) **[Figure 80-90-1]** is factory filled with **150-170 cc's** (5-5.6 oz.) of PAG oil (Poly Alkelene Glycol).

Unlike engine oil, it is not necessary to frequently check or change the compressor oil.

It is necessary to check, replenish or replace the compressor oil in the following cases:

1. When the evaporator, condenser or receiver-drier is replaced.

2. When refrigerant has leaked from the system.

3. When refrigerant is suddenly released from the cooling cycle.

4. When any oil related problems occur in the cooling cycle.

When one of the components (the evaporator, condenser or receiver-drier) is replaced, **one ounce** (30 cc) of PAG oil should be added for each component replaced.

If the A/C compressor is changed, no oil should be added to the system, because the compressor comes factory filled with oil.

NOTE: Only PAG oil should be used. Never mix R-12 and R-134a Oils.

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Compressor Oil Check

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

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

If the amount of refrigerant in the system has decreased, charge the system. (See Charging Procedure With A Manifold Gauge Set on Page 80-130-4)

Open the cab door and windows.

Run the blower at maximum speed.

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

Remove the compressor from the excavator. (See Removal And Installation on Page 80-140-1)

Figure 80-90-2

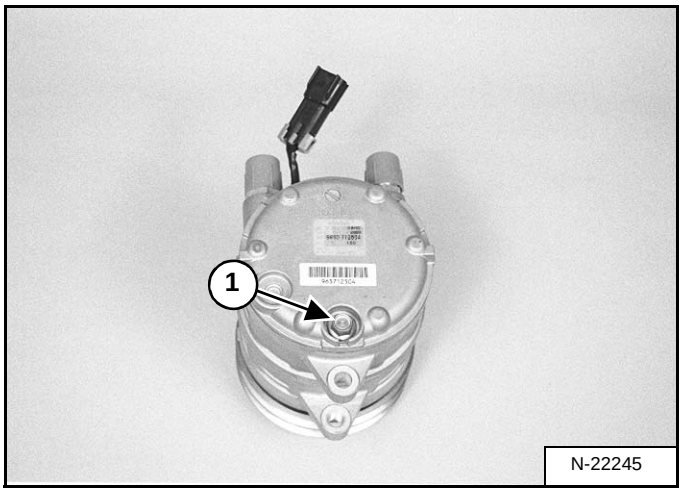
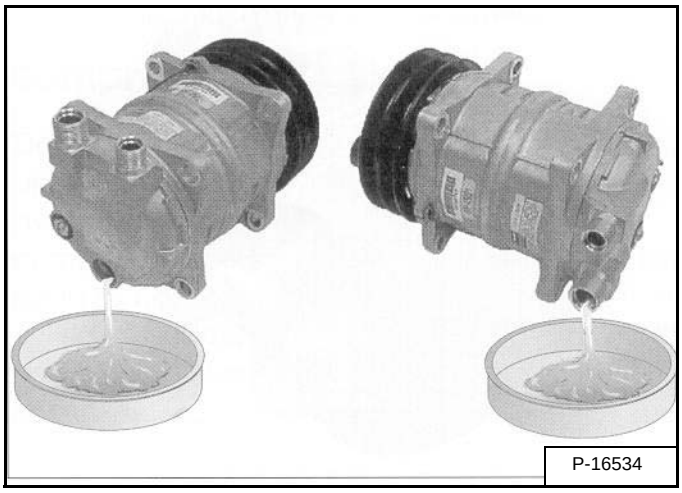


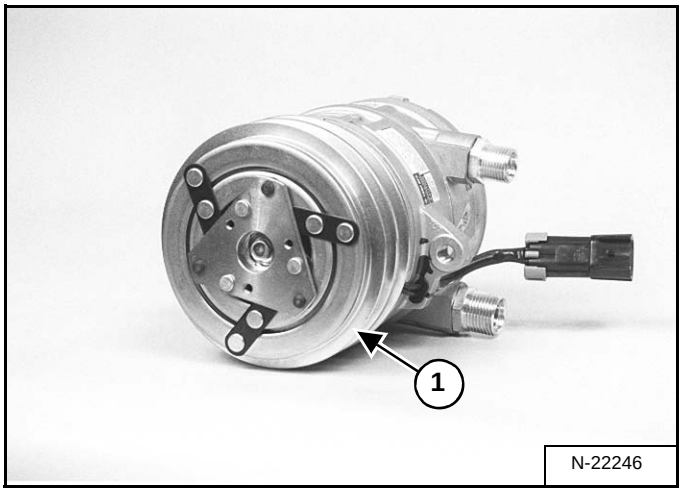
Figure 80-90-3



Remove the oil drain plug (Item 1) **[Figure 80-90-2]** and drain the oil through the connectors and the oil drain hole **[Figure 80-90-3]**.

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

Figure 80-90-4



NOTE: After draining the oil through the drain hole and the connectors, extract the remaining oil through the discharge-side connector by rotating the drive pulley (Item 1) [Figure 80-90-4] several times by hand.

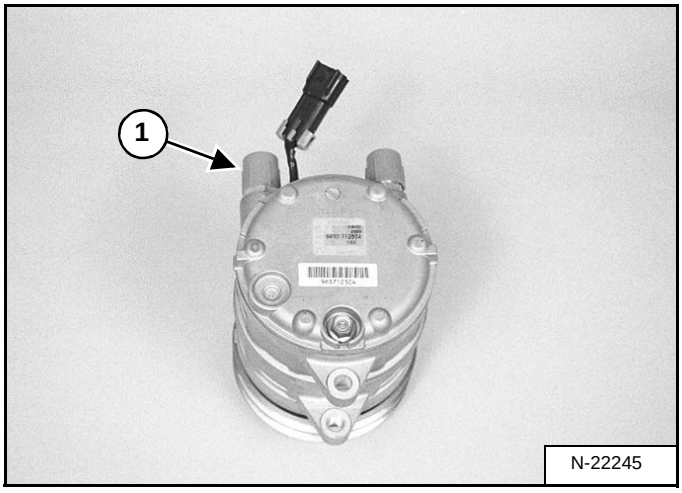
Measure the drained oil in a measuring cylinder.Check the oil for contamination, dirt, metal shavings, or varnish color, discard the oil if contaminated.

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

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Compressor Oil Check (Cont'd)

Figure 80-90-5



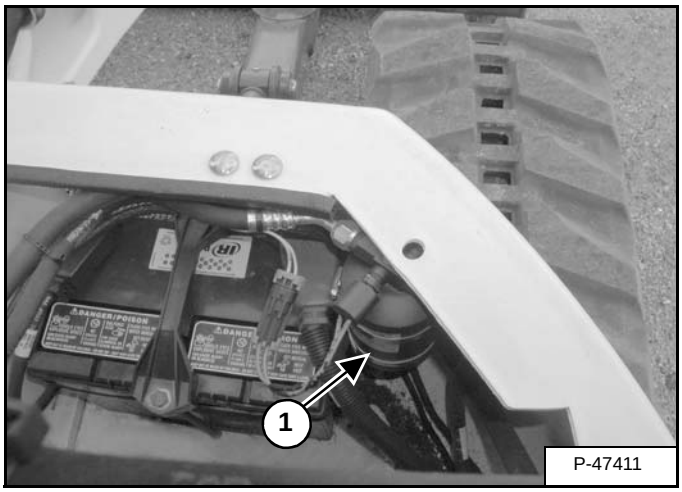
Add new compressor oil through the suction side connector (Item 1) **[Figure 80-90-5]**.

Installation: **Add 150 -170 cc's (5-5.6 oz.) of PAG oil**.

NOTE: The suction port on the compressor is marked with an S and is the larger port on the compressor.

Component Replacement And Refrigeration Leaks

Figure 80-90-6



Whenever the A/C system is opened to the atmosphere or there has been a leak in the system, the receiver/drier (Item 1) **[Figure 80-90-6]** must be changed.

Never leave hose fittings, compressor fittings or components uncapped while working on the A/C system.

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SYSTEM TROUBLESHOOTING CHART

Blower Motor Does Not Operate

	POSSIBLE CAUSE	INSPECTION	SOLUTION
1.	Blown Fuse.	Inspect the fuse/wiring.	Replace fuse/repair wiring.
2.	Broken wiring or bad connection.	Check the fan motor ground and connectors.	Repair the wiring or connector.
3.	Fan motor malfunction.	Check the lead wires from the motor with a circuit tester.	Replace Motor.
4.	Resistor malfunction.	Check resistor using a circuit tester.	Replace Resistor.
5.	Fan motor switch malfunction.	Check power into and out of the fan switch.	Replace Fan Switch.

Blower motor operates normally, but air flow is insufficient

	POSSIBLE CAUSE	INSPECTION	SOLUTION
1.	Evaporator inlet obstruction	Check evaporator for plugging.	Remove obstruction and clean evaporator fins with air or water.
2.	Air leak.	Check to make sure air hoses are properly hooked to Louvers, and air ducts.	Repair of adjust.
3.	Defective thermo. switch (frozen evaporator).	Check thermostat using a circuit tester.	Replace thermostat.

Insufficient cooling although air flow and compressor operation are normal

	POSSIBLE CAUSE	INSPECTION	SOLUTION
1.	System low on refrigerant.	The high side pressure will be low and bubbles may be present in sight glass on receive drier.	Repair any leaks and recharge the refrigerant to the correct level.
2.	Excessive refrigerant.	The high pressure side pressure will be high.	Use refrigerant recovery equipment to capture excess refrigerant. Charge to the correct refrigerant level.

The compressor does not operate at all, or operates improperly

	POSSIBLE CAUSE	INSPECTION	SOLUTION
1.	Loose drive belt.	The belt is vibrating or oscillating.	Adjust tension.
2.	Internal compressor malfunction.	The compressor is locked up and the belt slips.	Replace compressor.
		Magnetic clutch related	
3.	Low battery voltage.	Clutch slips.	Recharge the battery.
4.	Faulty coil.	Clutch slips.	Replace the magnetic clutch.
5.	Oil on the clutch surface.	Clutch slips.	Replace or clean the clutch surface.
6.	Open oil.	Clutch does not engage and there is not reading when a circuit tester is connected between the coil and terminals.	Replace clutch.
7.	Broken wiring or poor ground.	Clutch will not engage. Inspect the ground and connections.	Repair.
8.	Wiring harness components.	Test the conductance of the pressure switch, thermostat, Relay, etc.	Check operation.

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SYSTEM TROUBLESHOOTING CHART (CONT'D)

Gauge Pressure Related Troubleshooting

Normal compressor suction (low side) and discharge (high side) pressure at ambient temperatures of 86-96 degrees F (30-38 degrees C) and compressor speed of approximately 2000 RPM are:
High pressure side pressure: 210-265 PSI
Low pressure side pressure: 15-33 PSI
As a rule of thumb the high side pressure will be around eight times greater then the low side pressure.

	POSSIBLE CAUSE	INSPECTION	SOLUTION
	Low pressure side Too high.	The low pressure side pressure normally becomes too high when the high pressure side pressure is too high. As this is explained below, the following inspection is only used when the low pressure side is too high.	
1.	Expansion valve opens too far.	Frost is present on the suction hose.	Replace expansion valve
2.	Defective compressor	The high and low pressure side gauge pressures equalize when the magnetic clutch is disengaged.	Replace compressor.
	Low pressure side Too low.		
1.	Low refrigerant charge	The high side pressure will be low and bubbles may be present in sight glass on receiver drier.	Repair any leaks and recharge the refrigerant to the correct level.
2.	Clogged or closed expansion valve.	The expansion valve's inlet side is frosted. Moisture or other Contaminants can be the cause.	Clean or replace the expansion Valve.
3.	Restriction between drier and expansion valve.	Frost on the line between drier and expansion valve. A Negative low pressure reading may be shown.	Flush system or replace hose.
4.	Thermostat malfunction.	The evaporator is frozen.	Adjust thermostat's temperature setting or probe placement or replace thermostat.
	High pressure side Too high.		
1.	Poor condenser performance.	Dirty or clogged condenser fins. Condenser fans not Operating.	Clean fins, and/or repair the fan.
2.	Excessive refrigerant.	The high pressure side pressure will be high.	Use refrigerant recovery equipment to capture excess refrigerant. Charge to the correct refrigerant level.
3.	Excessive oil charge	The high pressure side will be high.	Evacuate system. Remove oil from condenser and compressor. Measure oil from compressor and add correct oil charge back into compressor. Flush system with nitrogen. Replace drier.
4.	Air in system.	Pressure is high on both high and low sides.	Evacuate and recharge with Refrigerant.
5.	Restriction in drier, condenser or high pressure line.	High pressure side will be high, and low pressure side will be low.	Evacuate and flush system replacing defective parts.
	High pressure side Too low.		
1.	Low refrigerant charge.	The high side pressure will be low and bubbles may be present in sight glass on receiver drier.	Repair any leaks and recharge the refrigerant to the correct level.

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Gauge Pressure Related Troubleshooting (Cont'd)

	POSSIBLE CAUSE	INSPECTION	SOLUTION
	System pressures Equal		
1.	Clutch not operating	See magnetic clutch related topics above.	
2.	Compressor not pumping.	Equal high and low pressures.	Replace compressor.

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TEMPERATURE/PRESSURE

Chart

NORMAL EVAPORATOR RANGE	
TEMP F.	**PSIG**
16	15.69
18	17.04
20	18.43
22	19.87
24	21.35
26	22.88
28	24.47
30	26.10
32	27.79
34	29.52
36	31.32
38	33.17
40	35.07
42	37.03
44	39.05
45	40.09
50	45.48
55	51.27
60	57.47
65	64.10
70	71.19
75	78.75
80	86.80
85	95.40
90	104.40
91	106.30
92	108.20

NORMAL EVAPORATOR RANGE	
TEMP F.	**PSIG**
93	110.20
94	112.10
95	114.10
100	124.30
102	128.50
104	132.90
106	137.30
108	141.90
110	146.50
112	151.30
114	156.10
116	161.10
118	166.10
120	171.30
122	176.60
124	182.00
126	187.50
128	193.10
130	198.90
135	213.70
140	229.40
145	245.80
150	263.00
155	281.10
160	300.10
166	320.10
170	340.80

Evaporator

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

Condenser

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

Example: Ambient Temperature = 90 degrees F.
90 degrees F.
+40 degrees F.
130 degrees F. condenser temperature = 200 psig

Conditions and pressures will vary from system to system.

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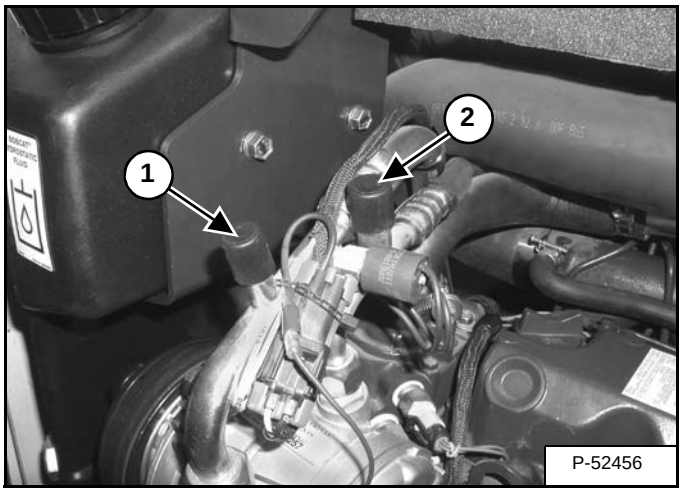
Chart

Service Company/Phone Number: Date: Machine Model: Machine Serial Number: Machine Hours:		Machine Dealer: Customer:	
Pre Service Conditions	15 Minutes	30 Minutes	Notes
Ambient Temperature:			
Louver Temperature:			
Cab Temperature at Head Position:			
Temperature into Condenser:			
High Side Pressure			
Low Side Pressure			
Ambient Humidity			
Observations:			
Explain services required:			
Post Service Conditions	15 Minutes	30 Minutes	Notes
Ambient Temperature:			
Louver Temperature:			
Cab Temperature at Head Position:			
Temperature into Condenser:			
High Side Pressure			
Low Side Pressure			
Ambient Humidity			
Observations:			

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Reclamation Procedure

Figure 80-130-1



Open the tailgate and locate the low pressure port (Item 1), and high pressure port (Item 2) **[Figure 80-130-1]**.

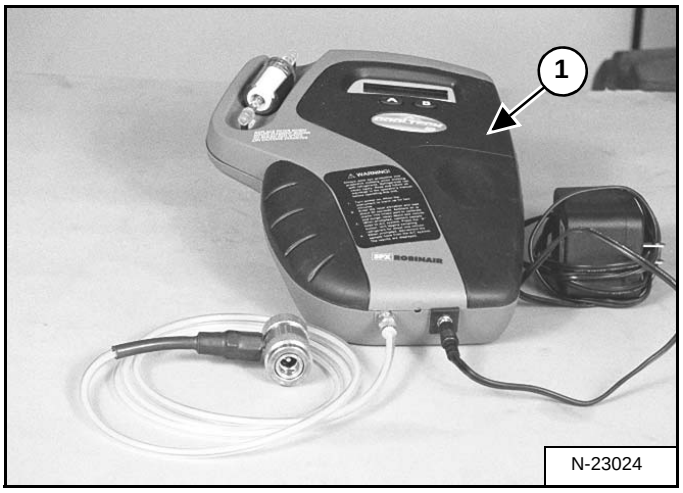
⚠ WARNING

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

W-2371-0500

NOTE: This procedure is run with the excavator engine OFF, and the A/C switch in the OFF position.

Figure 80-130-2



NOTE: Before reclaiming a refrigeration system, it is recommended to identify the type of refrigerant that is in the A/C system and if it is pure enough to use. The tool MEl 1592, Refrigerant Identifier (Item 1) [Figure 80-130-2] will determine, the kind of refrigerant and any possible harmful or dangerous substances that may be present in the system. Thus preventing mixing of dangerous material with your reclaimed R-134a in your reclaimer, and further contamination to other A/C systems that are reclaimed and charged from your MEL 1581 Recovery/Recycling/Recharging Machine.

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Reclamation Procedure (Cont'd)

Figure 80-130-3



Remove the protective cap and connect the Refrigerant Identifier to the low pressure hose (Item 1) **[Figure 80-130-3]**.

Connect the Refrigerant Identifier to its power source.

Follow the steps displayed on the refrigerant identifier screen.

Follow two minutes for the refrigerant identifier to display the type of refrigerant and air content. An alarm will sound if potentially flammable hydrocarbons are present and will also indicate on the visual display.

Disconnect the refrigerant identifier from the excavator A/C.

If the refrigerant is dangerous or flammable, it must be evacuated from the A/C system into a separate container and properly and safely disposed of.

If R134a is found, evacuate the system.

IMPORTANT: Only A/C trained technicians should perform the reclaiming and recharging procedure.

WARNING

HFC 134A refrigerant can be dangerous if not properly handled. Liquid 134A may cause blindness if it contacts the eyes and may cause serious frostbite if it contacts the skin.

- **Gaseous 134A becomes lethal (phosgene) gas when it contacts open flame or very hot substances.**
- **NEVER SMOKE when there is the possibility of even small amounts of 134A in the air.**

Any servicing work that involves release or addition of 134A to the system must be done by a competent refrigeration dealer who has the proper equipment, knowledge, and experience to service refrigeration equipment.

W-2373-0500

Figure 80-130-4



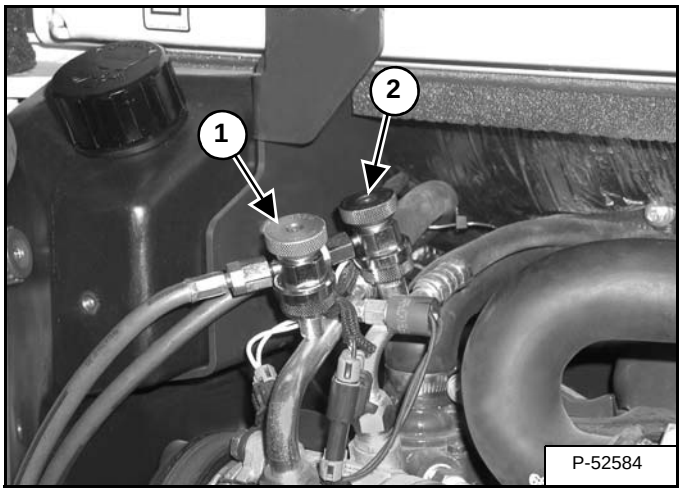
Use an approved recover/charging unit **[Figure 80-130-4]** to evacuate the system.

Connect the reclaimer to the excavator A/C charge ports.

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Reclamation Procedure (Cont'd)

Figure 80-130-5



Connect the Red hose (Item 1) **[Figure 80-130-5]** to the high pressure port and open the valve.

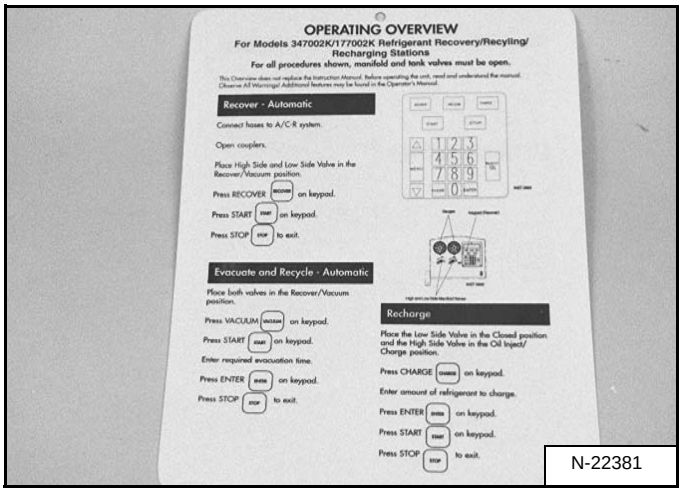
Connect the Blue hose (Item 1) **[Figure 80-130-5]** to the low pressure port and open the valve.

Figure 80-130-6



Turn the reclaimer unit (Item 1) **[Figure 80-130-6]** to the ON position and follow the on screen instructions.

Figure 80-130-7



NOTE: The reclaimer unit has a complete step by step set of instructions [Figure 80-130-7] to follow for reclamation and recharging of the A/C system. A trained technician should follow these instructions as they my very slightly depending on the model and brand of reclaimer used.

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Charging Procedure With A Manifold Gauge Set

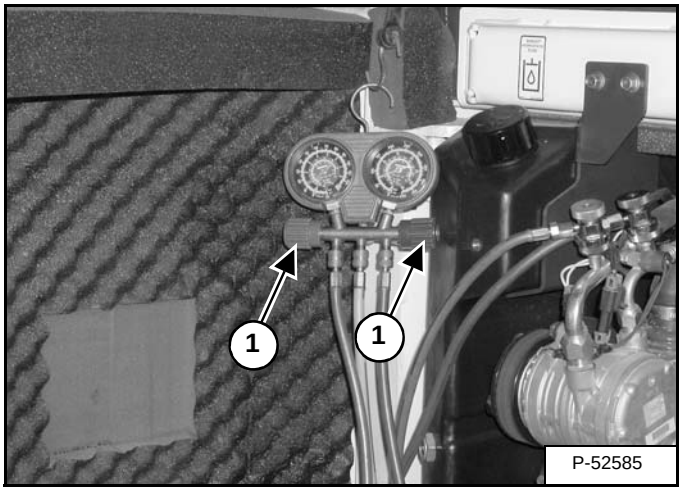
Open the tailgate.

WARNING

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

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Figure 80-130-8

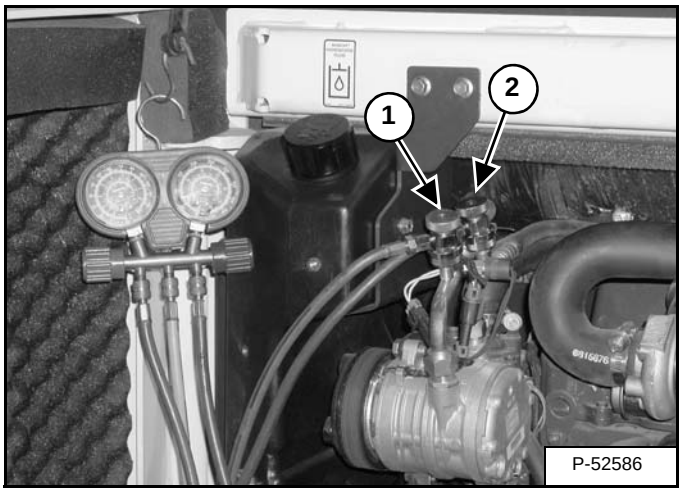


Check to see that the hand valves (Item 1) **[Figure 80-130-8]** are closed on the manifold gauge set.

If there is any refrigerant in the A/C system, it must be recovered by an approved A/C reclamation procedure. (See Reclamation Procedure on Page 80-130-1)

Connect the gauges to the excavator A/C charge ports.

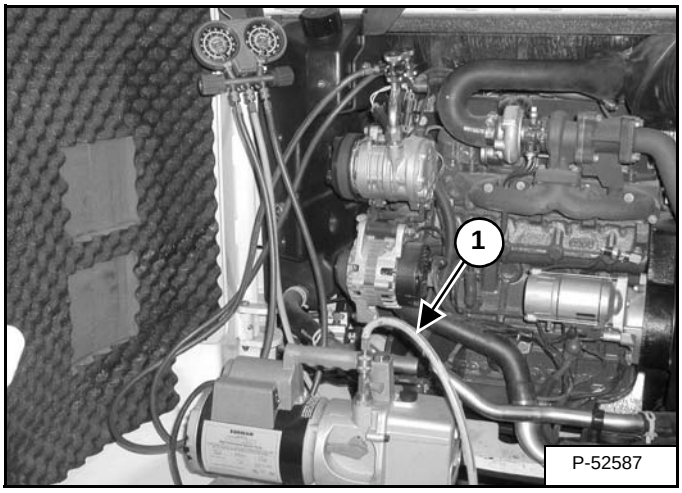
Figure 80-130-9



Connect the Red hose (Item 1) **[Figure 80-130-9]** to the high pressure port and open the valve.

Connect the Blue hose (Item 2) **[Figure 80-130-9]** to the low pressure port and open the valve.

Figure 80-130-10

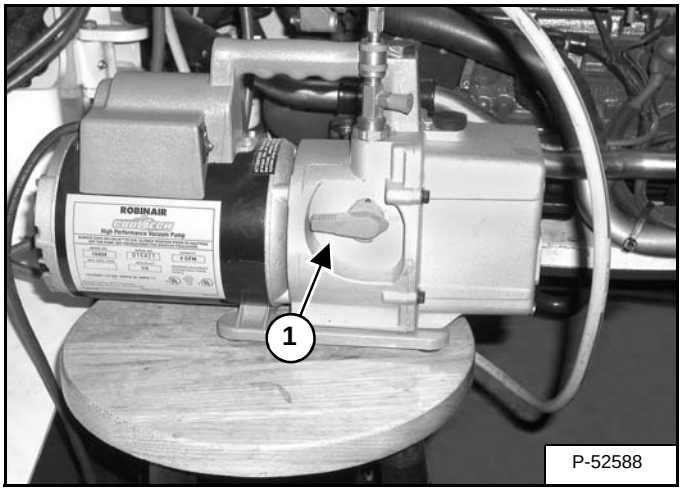


Connect the Yellow hose (Item 1) **[Figure 80-130-10]** to the vacuum pump.

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Charging Procedure With A Manifold Gauge Set (Cont'd)

Figure 80-130-11

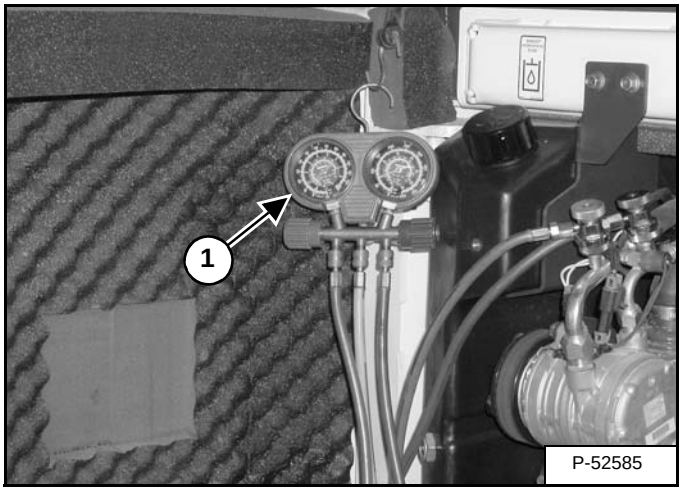


Start the vacuum pump and open ISO-valve (Item 1) **[Figure 80-130-11]** on the vacuum pump.

Run the vacuum pump for at least 5-10 minutes to make sure that a vacuum has been pulled on the system.

Close the ISO-valve (Item 1) **[Figure 80-130-11]** (which isolates the vacuum pump from the A/C system) and turn OFF the vacuum pump.

Figure 80-130-12

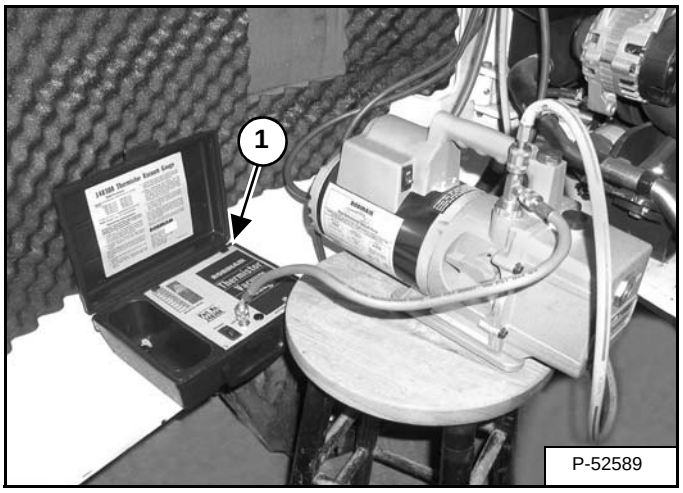


Note vacuum pressure indicated on the low pressure (Blue) gauge (Item 1) **[Figure 80-130-12]**. Let stand for 5-10 minutes and recheck the pressure for changes.

If the pressure drops, this may be an indication of a leak in the A.C system.

Determine the problem with the A/C system and repair it.

Figure 80-130-13



A thermistor vacuum gauge (Item 1) **[Figure 80-130-13]** can be used to determine the critical vacuum level during evacuation. it is a solid state instrument that constantly monitors and visually indicates the vacuum level.

The thermistor vacuum gauge is used with the vacuum pump **[Figure 80-130-13]**.

Start the vacuum pump and open ISO-valve on the vacuum pump.

Be sure that both hand valves, and both charge port valves are open.

Run the vacuum pump for at least 45 minutes to make sure that all the moisture is boiled out of the system.

Stop the vacuum pump and close the ISO-valve on the vacuum pump.

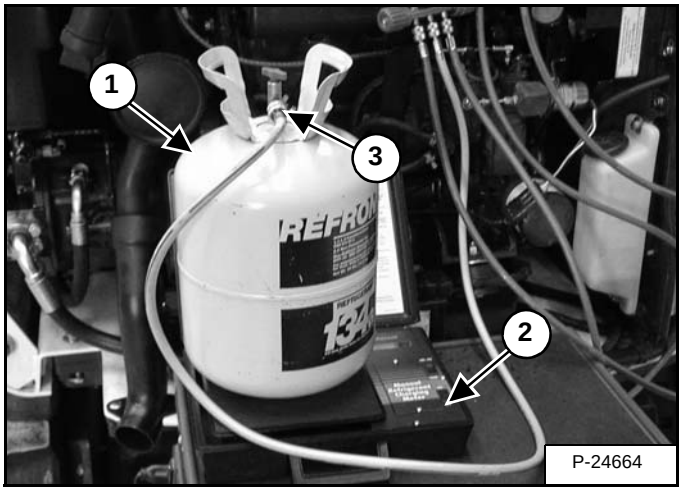
Close both hand valves on the manifold gauge set and remove the yellow hose from the vacuum pump that goes to the manifold gauge set.

Remove the vacuum pump and thermistor vacuum gauge.

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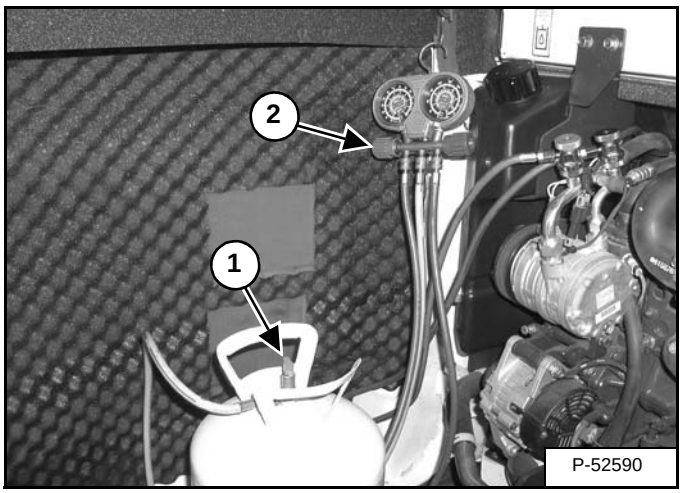
Charging Procedure With A Manifold Gauge Set (Cont'd)

Figure 80-130-14



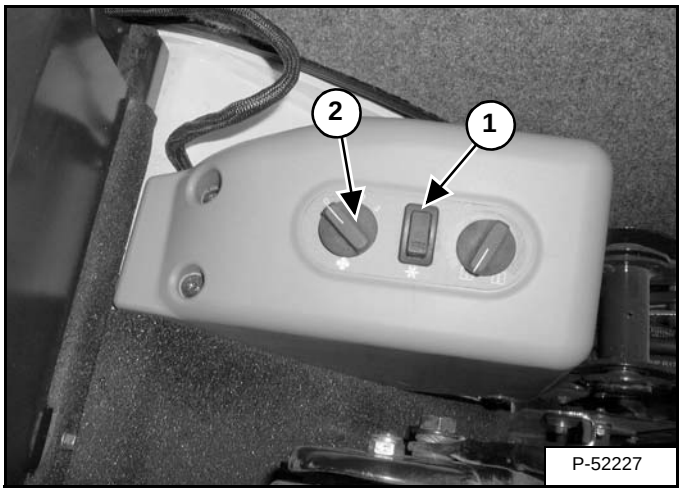
Note vacuum pressure indicated on the low pressure (Blue) gauge (Item 1) **[Figure 80-130-14]**. Let stand for 5-10 minutes and recheck the pressure for changes.

Figure 80-130-15



Open the valve on the refrigerant container (Item 1) and open the low pressure hand valve (Blue) (Item 2) **[Figure 80-130-15]** on he manifold gauge set. Allow the vacuum to pull in the refrigerant until the pressure stabilizes.

Figure 80-130-16



Press the A/C (Item 1) **[Figure 80-130-16]** switch to ON position.

Turn the fan switch (Item 2) **[Figure 80-130-16]** to HIGH position.

Start the engine, with the left console in the raised position, and run at medium speed.Watch the scale and run the system until the predetermined amount of refrigerant is added to the A/C system.

The *Early Model* A/C system holds 2.0 lb. (0,9 kg) of refrigerant.

The *Later Model* A/C system holds 2.25 lb. (1,0 Kg) of refrigerant.

IMPORTANT: To determine whether the A/C system is an early or later system see Condenser Removal and Installation. (See Removal And Installation on Page 80-150-1)

Turn OFF the valve on the refrigerant container, and hand valves on the manifold gauge set.

Turn OFF the engine, and remove the A/C charging equipment from the excavator.

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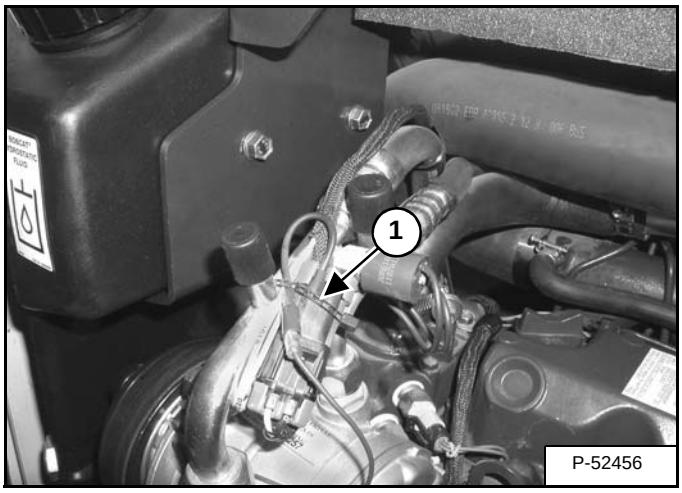
COMPRESSOR

Removal And Installation

Evacuate the A/C system. (See Charging Procedure With A Manifold Gauge Set on Page 80-130-4)

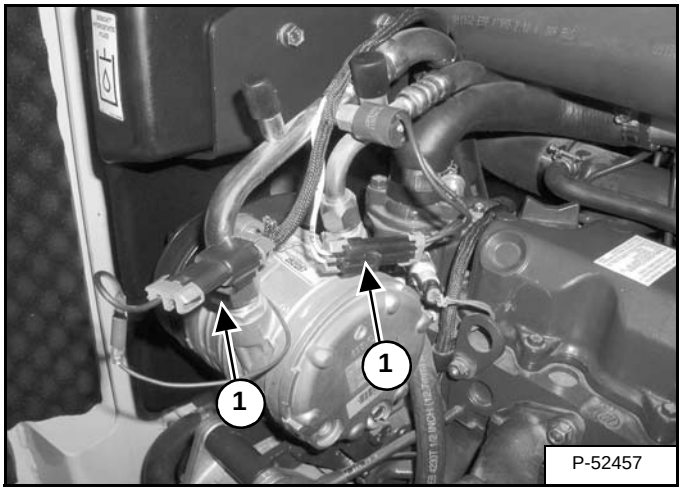
Remove the engine accessory drive belt. (See ENGINE ACCESSORY DRIVE BELT on Page 10-140-1)

Figure 80-140-1



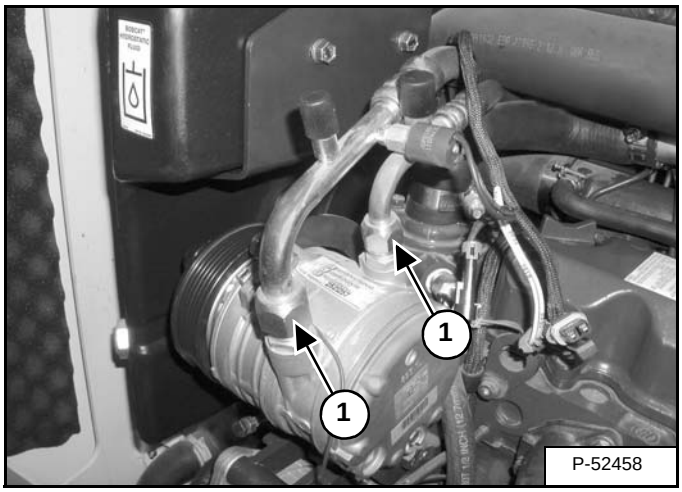
Cut and remove the cable tie (Item 1) **[Figure 80-140-1]**.

Figure 80-140-2



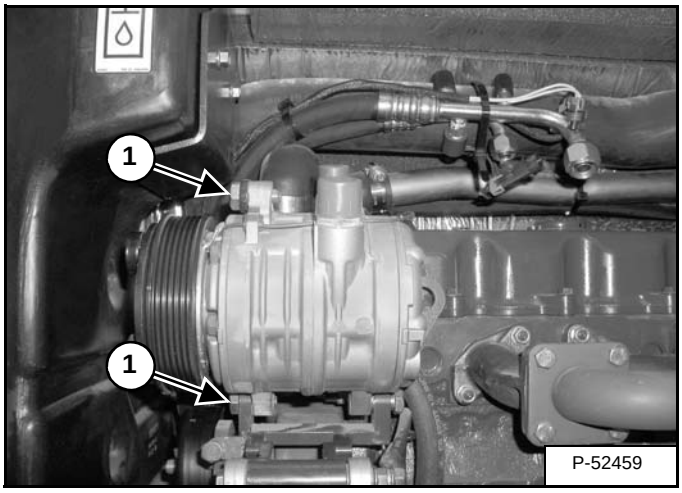
Disconnect the wire harness (Item 1) **[Figure 80-140-2]**.

Figure 80-140-3



Remove the hoses (Item 1) **[Figure 80-140-3]**.

Figure 80-140-4

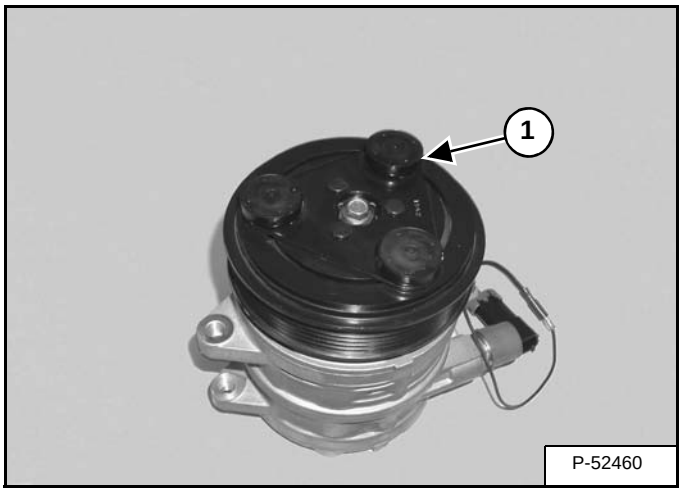


Remove the three bolts (Item 1) **[Figure 80-140-4]** and remove the compressor.

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Compressor Clutch Disassembly And Assembly

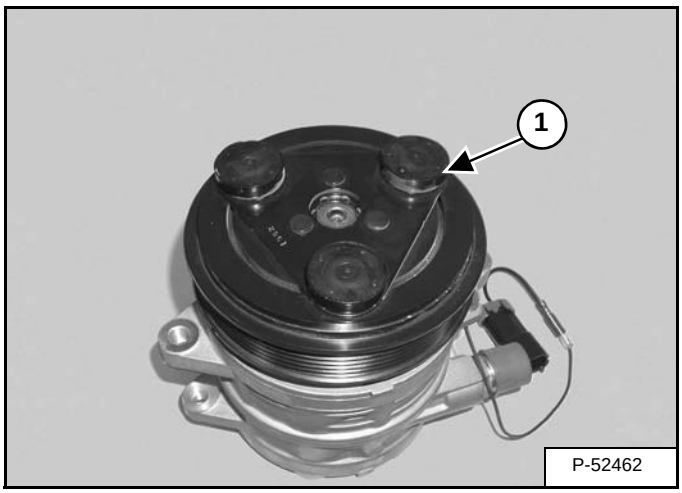
Figure 80-140-5



Remove the bolt (Item 1) **[Figure 80-140-5]**.

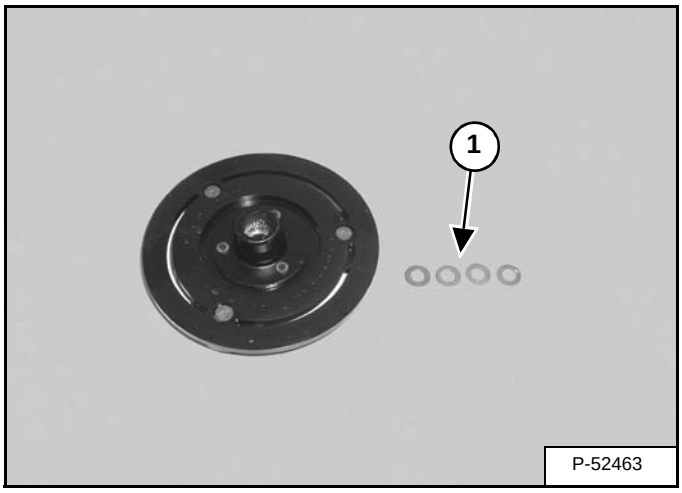
Installation: Tighten the bolt to 8-10 ft.-lb. (12-14 N•m) torque.

Figure 80-140-6



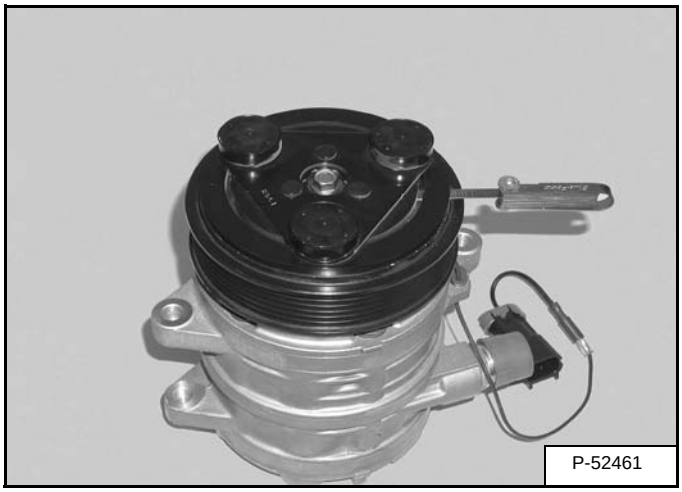
Pull straight up on the armature plate (Item 1) **[Figure 80-140-6]** and remove the armature plate from the compressor clutch.

Figure 80-140-7



Remove the shims (Item 1) **[Figure 80-140-7]** from either the armature shaft or armature plate.

Figure 80-140-8



Installation: Install the needed shims until the correct clearance between the armature plate and compressor clutch is obtained **[Figure 80-140-8]**.

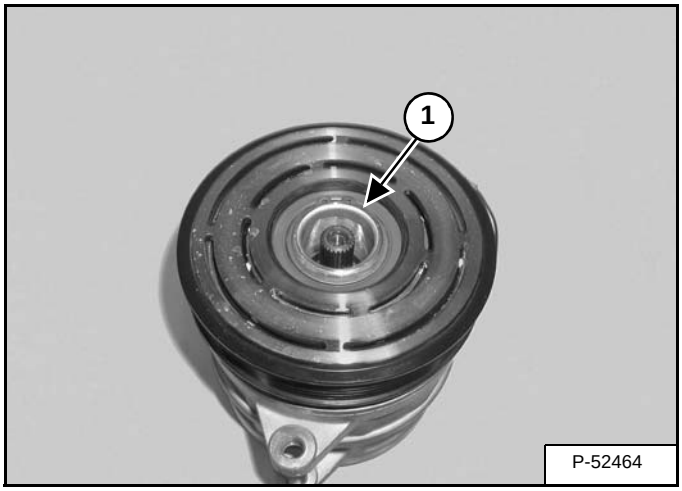
The specified clearance for the clutch is 0.01-0.02 in. (0.3-0.6 mm). Adjusting shims are available in the following thicknesses:

0.039 in. (0.1 mm)
0.0118 in. (0.3 mm)
0.0197 in. (0.5 mm)

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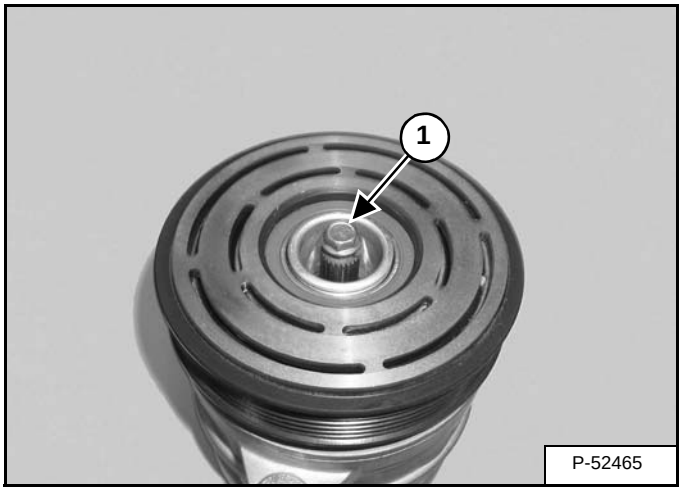
Compressor Clutch Disassembly And Assembly (Cont'd)

Figure 80-140-9



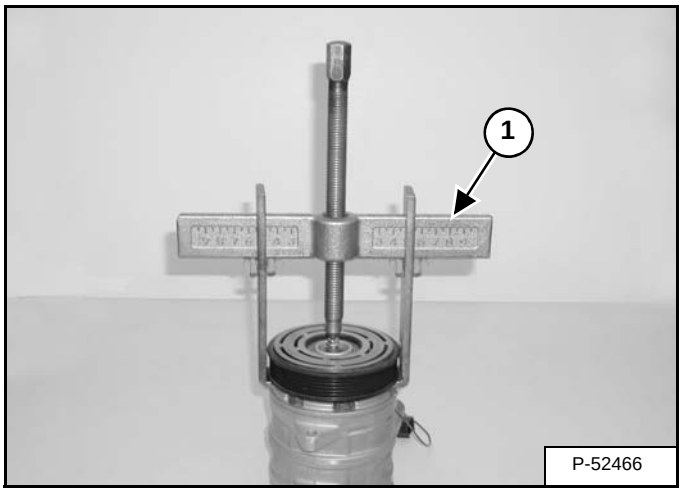
Remove the snap ring (Item 1) **[Figure 80-140-9]**.

Figure 80-140-10



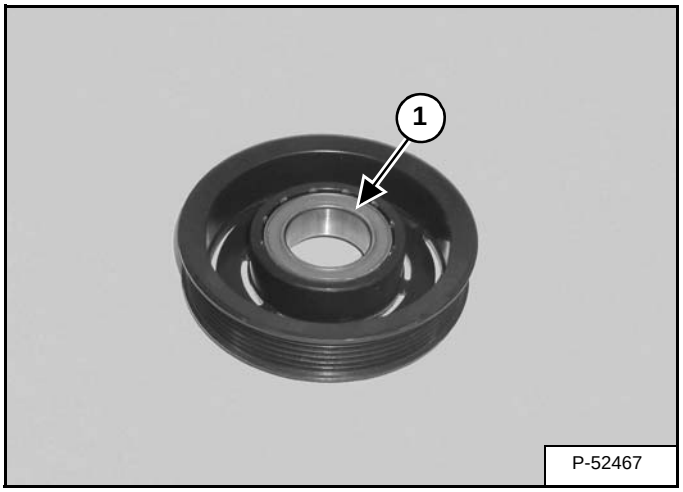
Install the bolt (Item 1) **[Figure 80-140-10]**.

Figure 80-140-11



Install a puller (Item 1) **[Figure 80-140-11]** on the pulley and remove the pulley/bearing assembly.

Figure 80-140-12

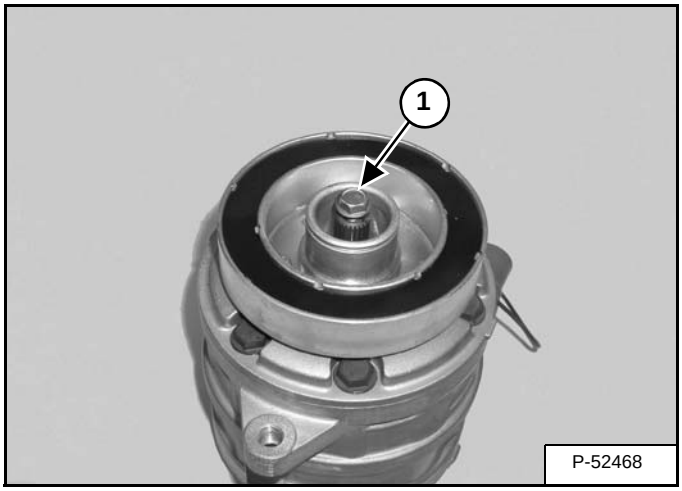


The bearing (Item 1) **[Figure 80-140-12]** is staked in to the pulley and is not serviceable separately.

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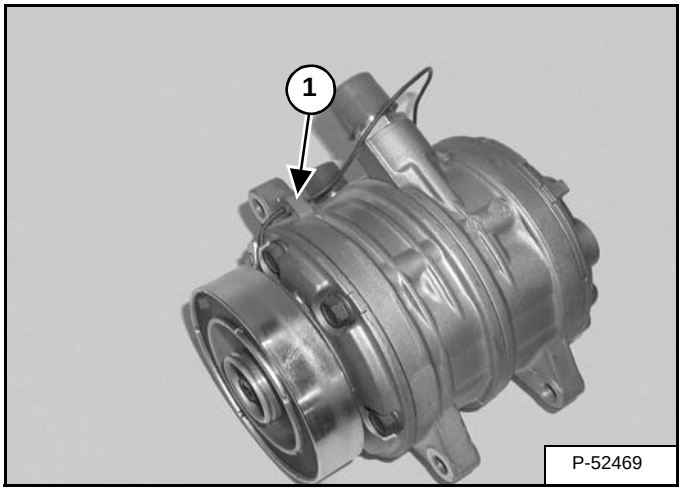
Compressor Clutch Disassembly And Assembly (Cont'd)

Figure 80-140-13



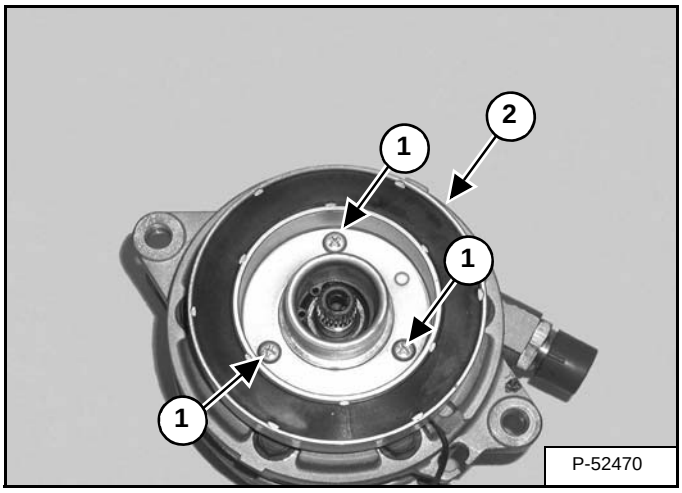
Remove the bolt (Item 1) **[Figure 80-140-13]** from the shaft.

Figure 80-140-14



Slide the grommet and wire harness (Item 1) **[Figure 80-140-14]** from the wire holder.

Figure 80-140-15



Remove the three screws (Item 1) **[Figure 80-140-15]** from the compressor.

Installation: Tighten the screws to 3-5 ft.-lb. (4-6 N•m) torque.

Remove the coil (Item 2) **[Figure 80-140-15]** from the compressor.

The compressor is not serviceable and must be replaced as a complete unit.

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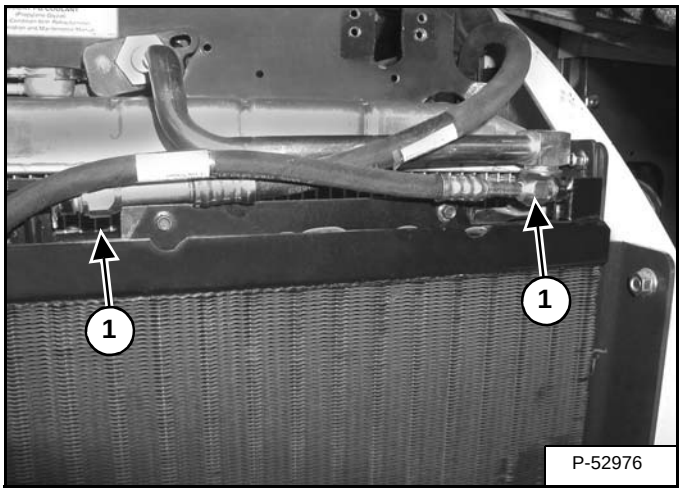
CONDENSER

Removal And Installation

Evacuate the A/C system. (See Charging Procedure With A Manifold Gauge Set on Page 80-130-4)

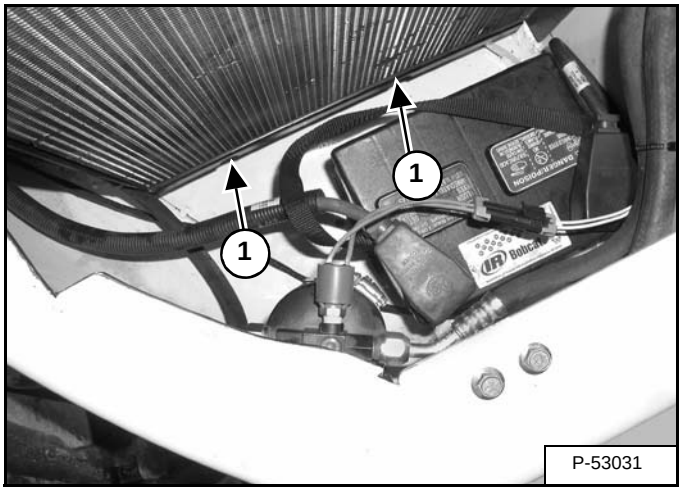
Open the right side cover.

Figure 80-150-1



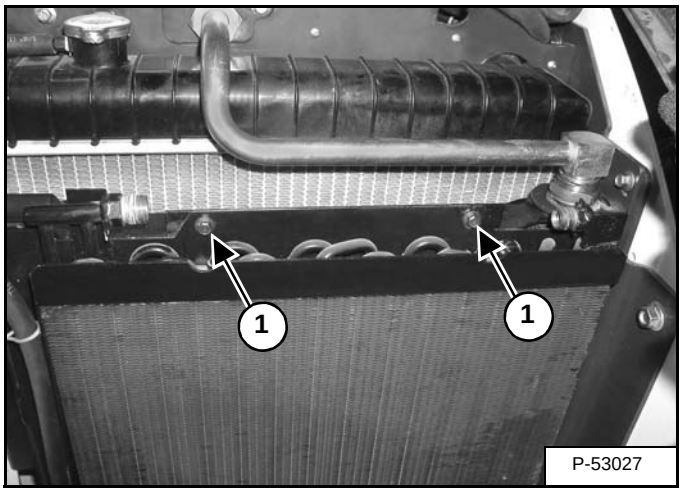
Remove the hoses (Item 1) **[Figure 80-150-1]**.

Figure 80-150-2



Remove the two bottom screws (Item 1) **[Figure 80-150-2]**.

Figure 80-150-3



Remove the screws (Item 1) **[Figure 80-150-3]**.

Remove the condenser from the excavator.

To determine early or later models, measure the thickness of the condenser (including the side bracket).

EARLY MODELS 1.65 in. (42 mm) thick.

LATER MODELS 1.85 in. (47 mm) thick.

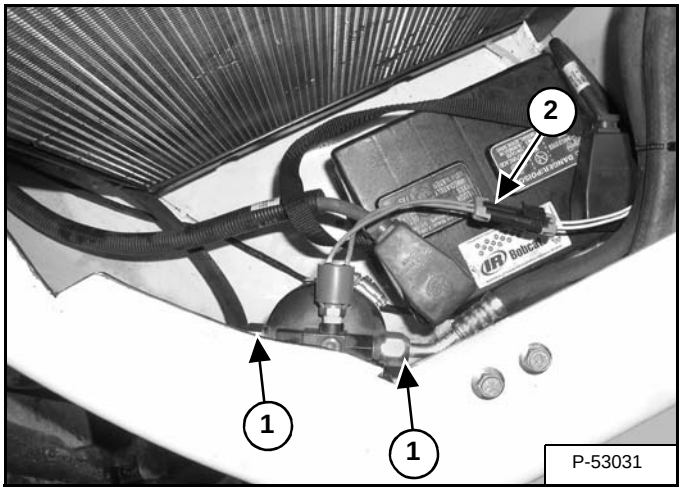
https://www.pdfmanual4trucks.com/

RECEIVER/DRIER

Removal And Installation

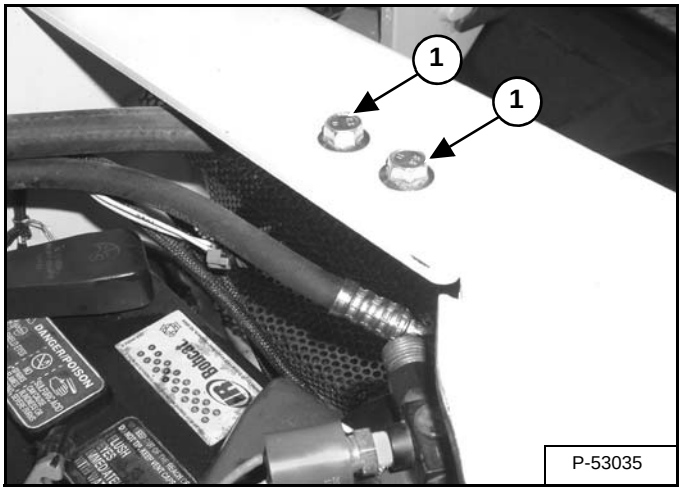
Evacuate the A/C system. (See Charging Procedure With A Manifold Gauge Set on Page 80-130-4)

Figure 80-160-1



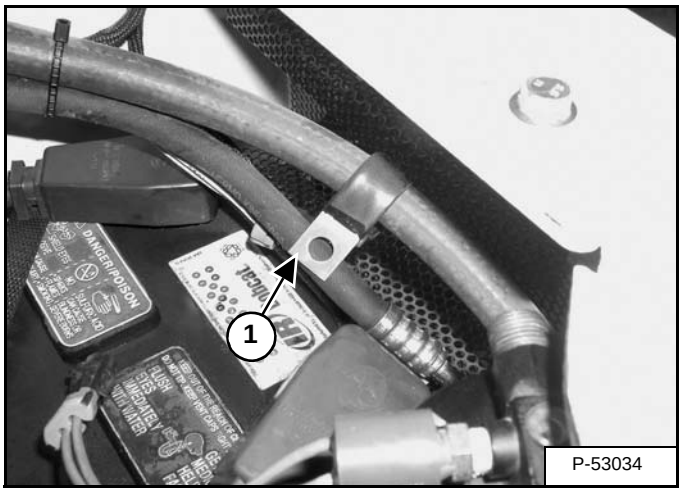
Remove the hoses (Item 1). Disconnect the wire harness (Item 2) **[Figure 80-160-1]**.

Figure 80-160-2



Remove the bolts (Item 1) **[Figure 80-160-2]** and nuts.

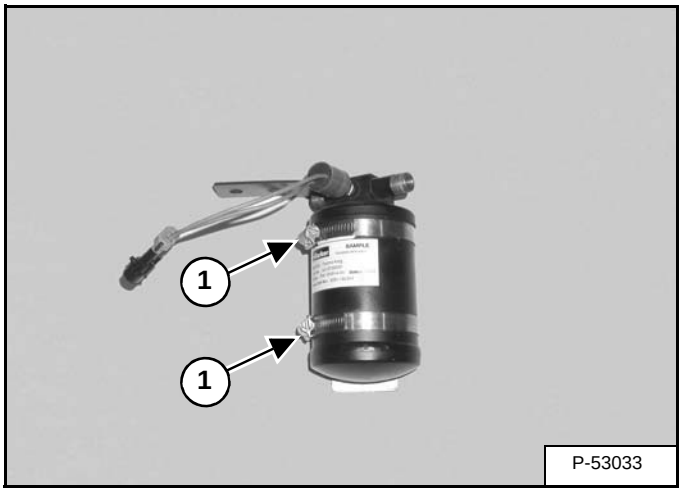
Figure 80-160-3



Installation: Install the hose clamp (Item 1) **[Figure 80-160-3]** over the bolt.

Remove the receiver/dryer from the excavator.

Figure 80-160-4



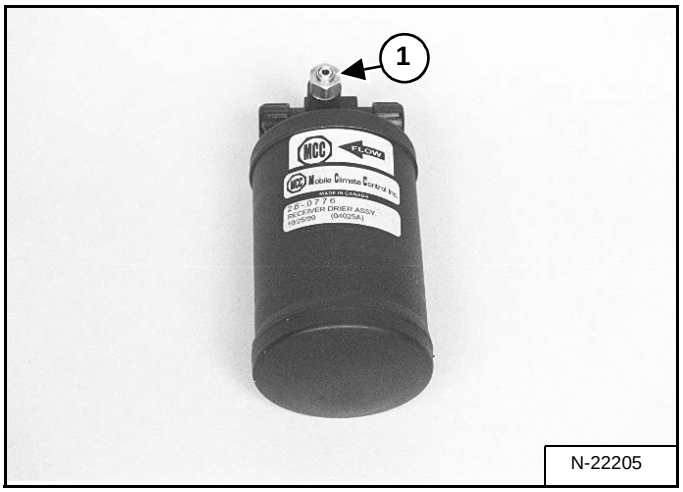
Loosen the clamps (Item 1) **[Figure 80-160-4]** and remove the receiver/dryer from the mount.

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PRESSURE RELIEF VALVE

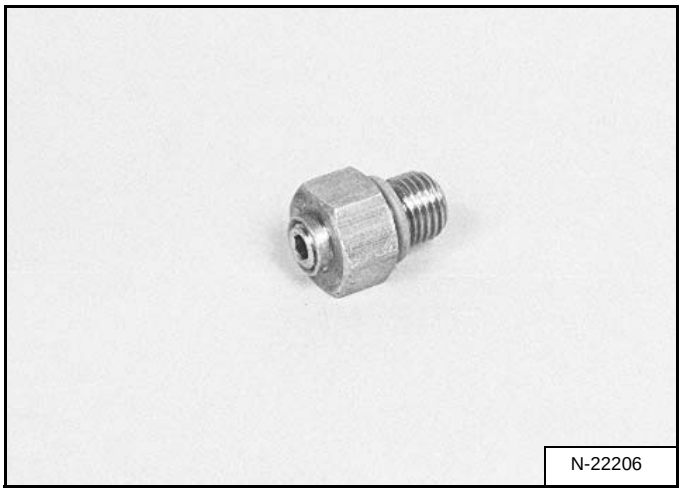
Removal And Installation

Figure 80-170-1



The pressure relief valve (Item 1) **[Figure 80-170-1]** is located on the receiver/drier assembly.

Figure 80-170-2



The pressure relief valve **[Figure 80-170-2]** is designed to open and release the A/C charge if the pressure reaches 535 PSI (37 Bar).

This will cause the A/C system to shut down, saving the compressor.

The Pressure Relief Valve is a secondary protection device in the A/C system, with the Pressure Switch shutting down the system at 384 PSI (26.5 Bar).

NOTE: If a Pressure Relief Valve is found open, check the A/C system for problems. Replace the complete receiver/drier unit.

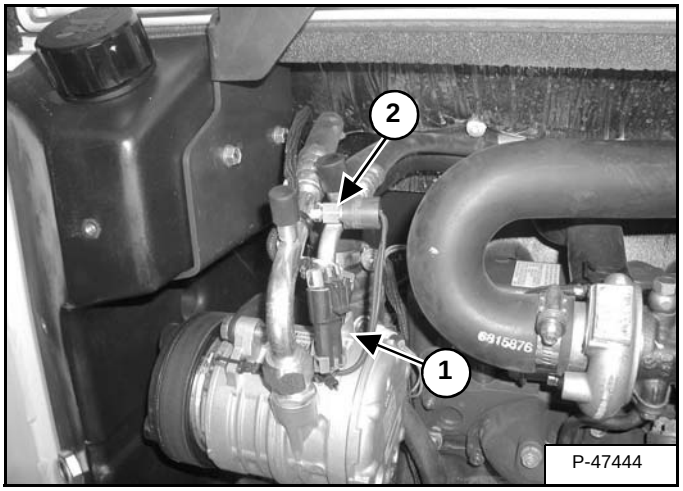
https://www.pdfmanual4trucks.com/

PRESSURE SWITCH

Removal And Installation

Open the tailgate.

Figure 80-180-1



Disconnect the wire harness (Item 1) **[Figure 80-180-1]** from the pressure switch.

NOTE: The pressure switch can be changed without evacuating the A/C system.

WARNING

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

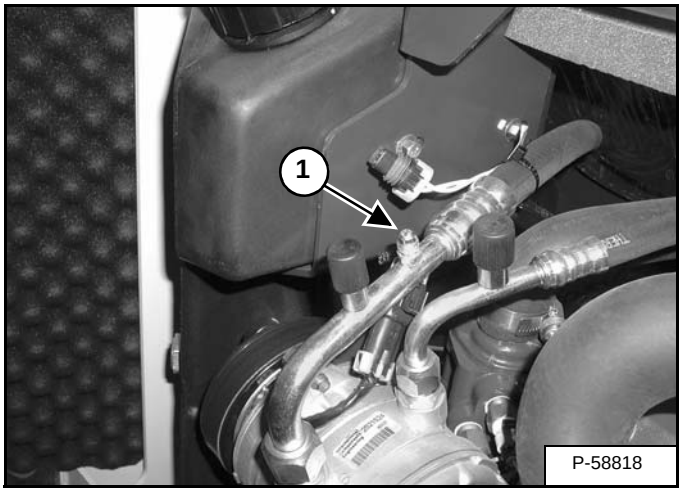
W-2371-0500

Remove the pressure switch (Item 2) **[Figure 80-180-1]** from the A/C high pressure hose.

Remove the pressure switch from the excavator.

Shreader Valve Removal And Installation

Figure 80-180-2



The shreader valve (Item 1) **[Figure 80-180-2]** is located in the A/C high pressure hose.

Evacuate the A/C system. (See Charging Procedure With A Manifold Gauge Set on Page 80-130-4)

Remove the pressure switch.

With a tire valve core removal tool, remove the valve core from the hose.

Replace with a new core.

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EVAPORATOR/HEATER UNIT (EARLY MODELS)

Removal And Installation

Remove the operator seat and seat mount. (See Removal And Installation on Page 50-40-1)

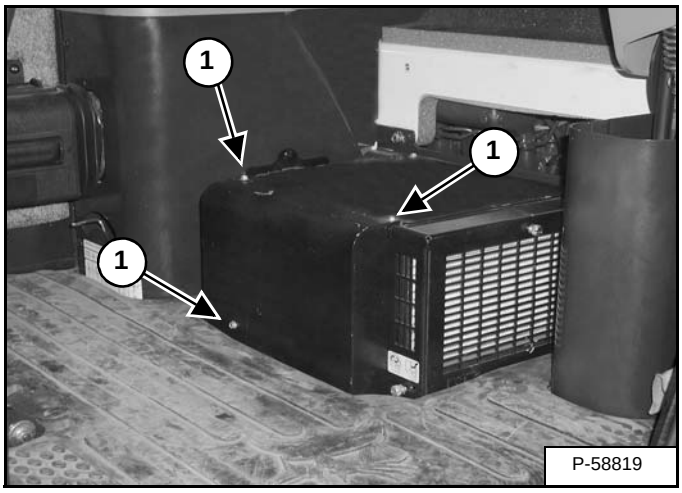
Evacuate the A/C system. (See Charging Procedure With A Manifold Gauge Set on Page 80-130-4)

⚠ WARNING

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

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Figure 80-190-1

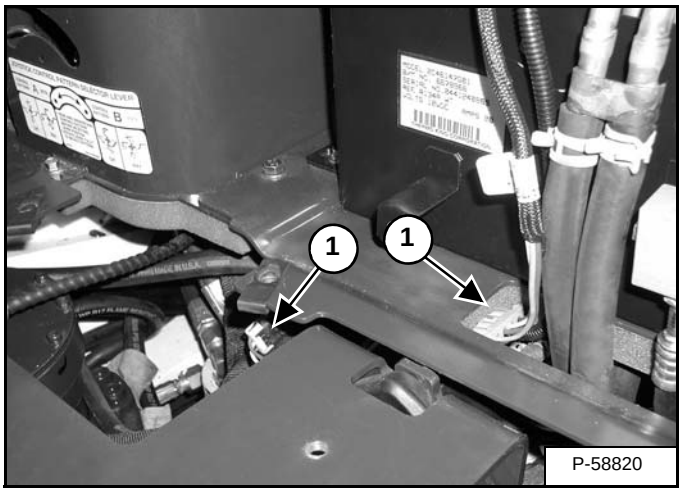


Remove the bolts (Item 1) **[Figure 80-190-1]** from the evaporator/heater unit front cover.

Remove the front cover from the unit.

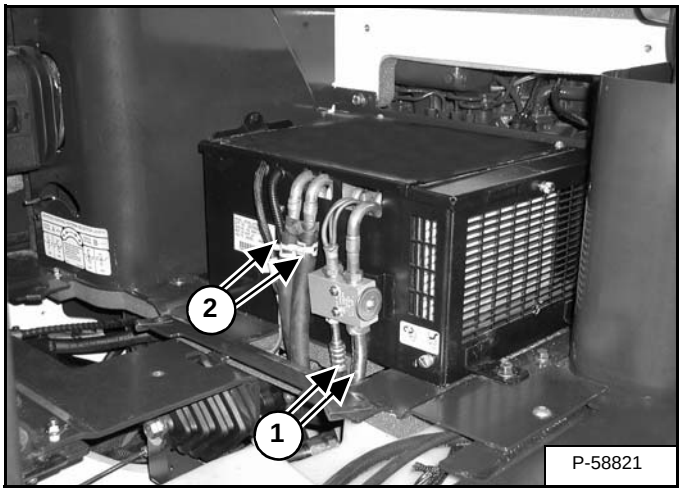
Remove the floormat and floor plate. (See Removal And Installation on Page 50-120-1)

Figure 80-190-2



Disconnect the wire connectors (Item 1) **[Figure 80-190-2]**.

Figure 80-190-3



Remove the A/C hoses (Item 1) **[Figure 80-190-3]** from the expansion valve.

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

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

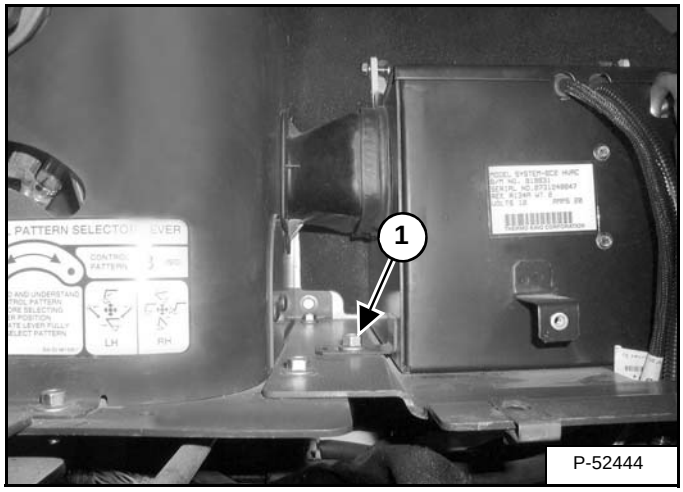
Remove the clamps (Item 2) **[Figure 80-190-3]** from the heater hoses.

Remove the heater hoses from the heater coil.

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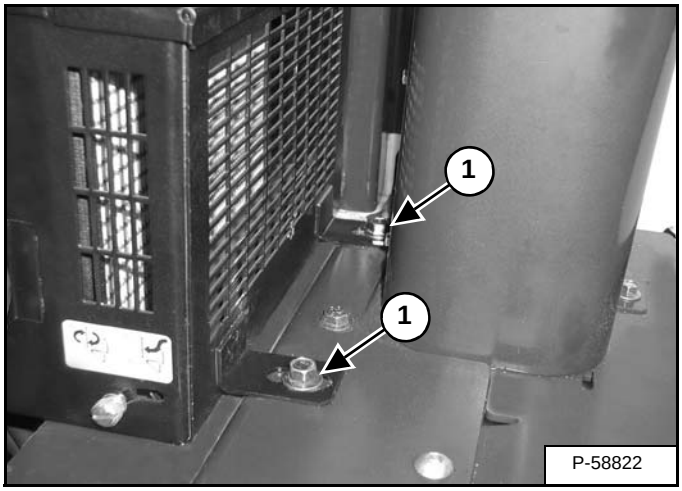
Removal And Installation (Cont'd)

Figure 80-190-4



Remove the bolt (Item 1) **[Figure 80-190-4]** on the right side of the evaporator/heater unit.

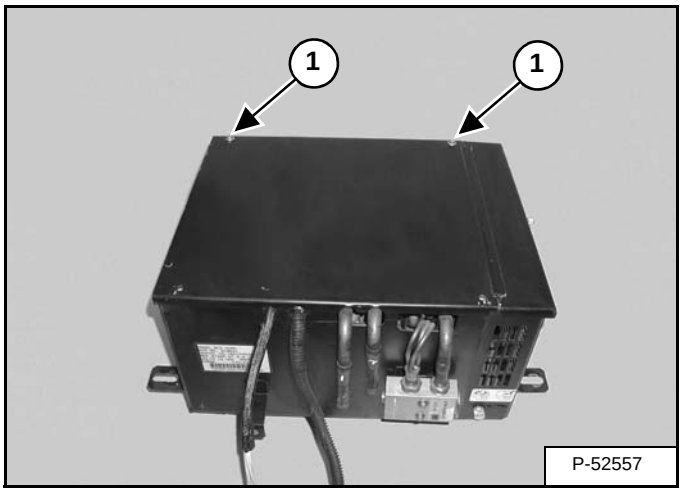
Figure 80-190-5



Remove the bolts (Item 1) **[Figure 80-190-5]** from the left side of the evaporator/heater unit and remove the unit from the excavator.

Disassembly And Assembly

Figure 80-190-6



Remove the bolts (Item 1) **[Figure 80-190-6]** from the evaporator/heater unit cover.

Remove the cover from the unit.

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EVAPORATOR/HEATER UNIT (LATER MODELS)

Removal And Installation

Remove the operator seat and seat mount. (See Removal And Installation on Page 50-40-1)

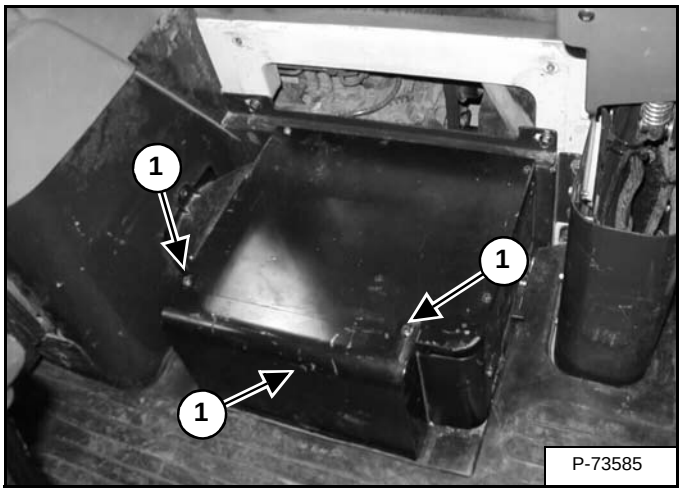
Evacuate the A/C system. (See Charging Procedure With A Manifold Gauge Set on Page 80-130-4)

⚠ WARNING

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

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Figure 80-191-1

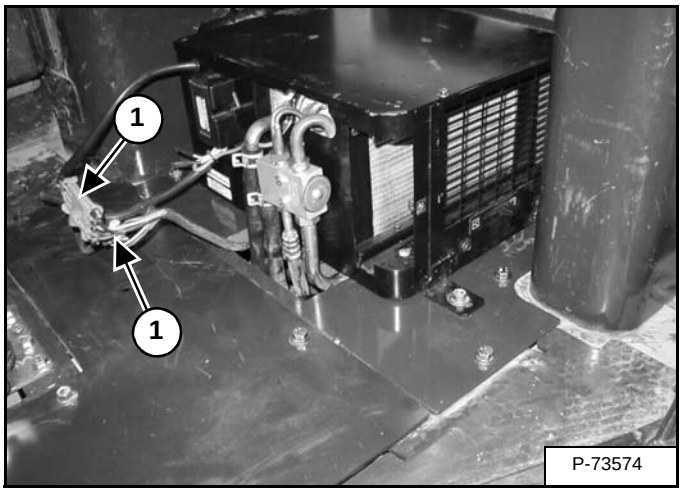


Remove the bolts (Item 1) **[Figure 80-191-1]** from the evaporator/heater unit front cover.

Remove the front cover from the unit.

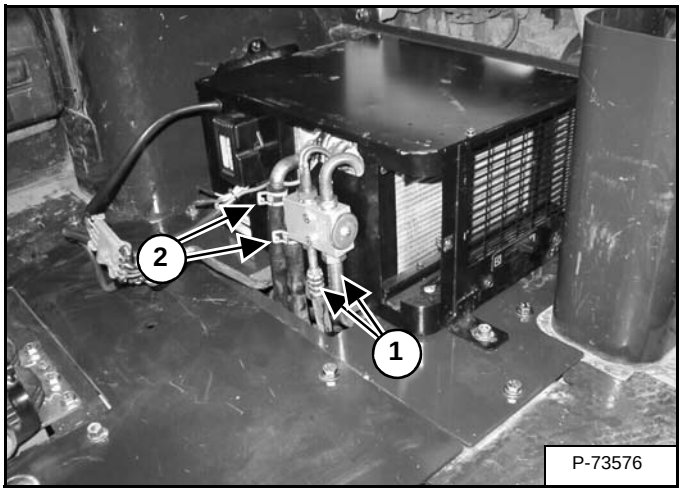
Remove the floormat and floor plate. (See Removal And Installation on Page 50-120-1)

Figure 80-191-2



Disconnect the wire connectors (Item 1) **[Figure 80-191-2]**.

Figure 80-191-3



Remove the A/C hoses (Item 1) **[Figure 80-191-3]** from the expansion valve.

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

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

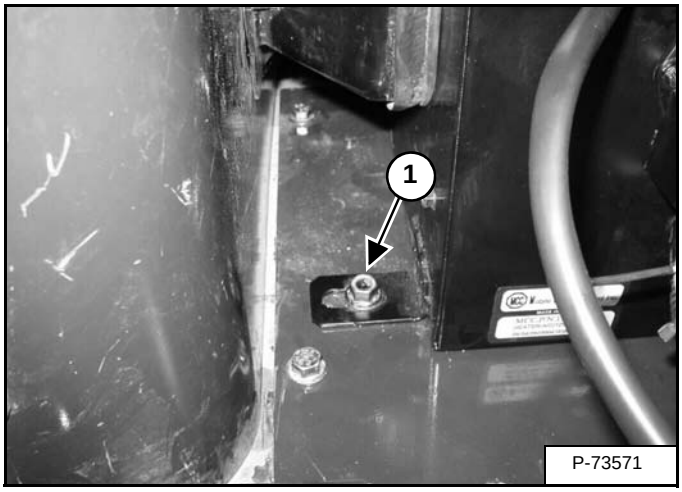
Remove the clamps (Item 2) **[Figure 80-191-3]** from the heater hoses.

Remove the heater hoses from the heater coil.

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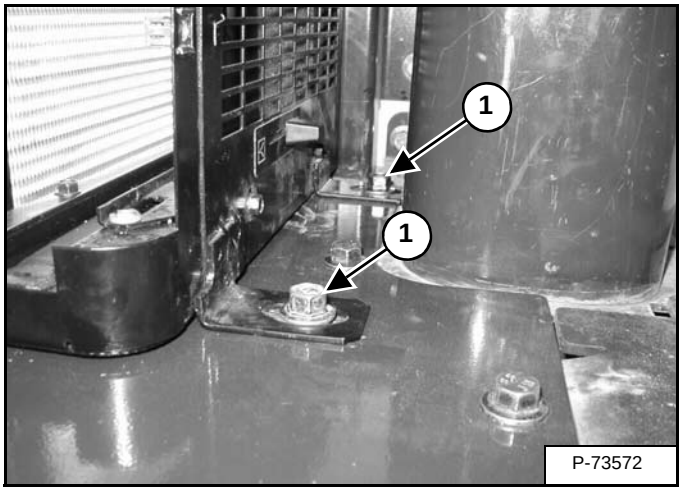
Removal And Installation (Cont'd)

Figure 80-191-4



Remove the bolt (Item 1) **[Figure 80-191-4]** on the right side of the evaporator/heater unit.

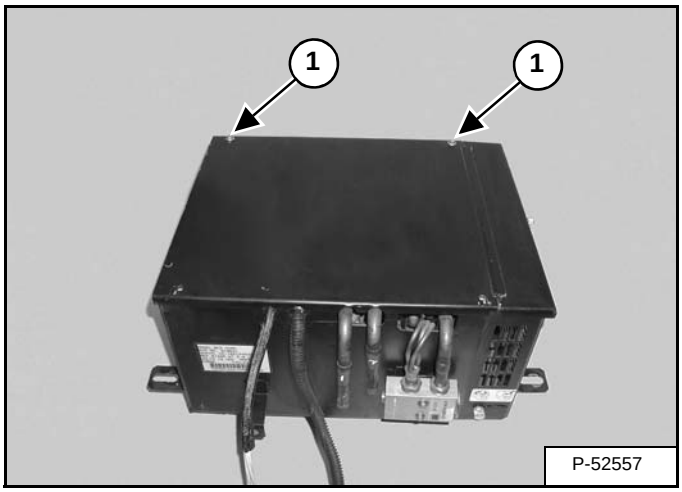
Figure 80-191-5



Remove the bolts (Item 1) **[Figure 80-191-5]** from the left side of the evaporator/heater unit and remove the unit from the excavator.

Disassembly And Assembly

Figure 80-191-6



Remove the bolts (Item 1) **[Figure 80-191-6]** from the evaporator/heater unit cover.

Remove the cover from the unit.

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THERMOSTAT (EARLY MODELS)

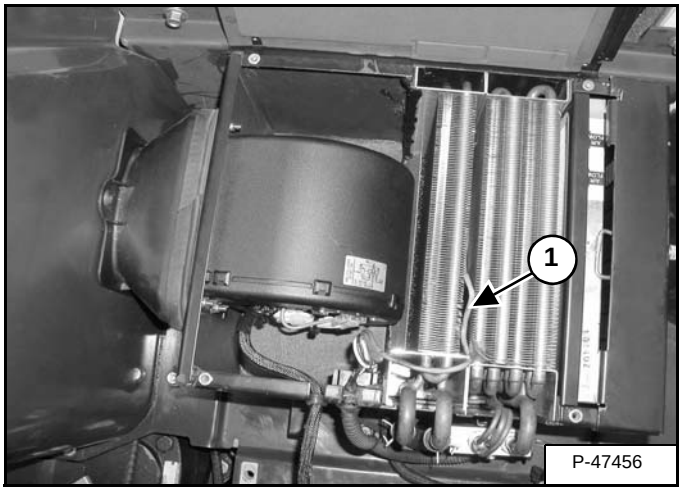
Removal And Installation

NOTE: The thermostat can be changed without evacuating the A/C system, or removing the evaporator/heater unit from the excavator.

Remove the seat and seat mount. (See Removal And Installation on Page 50-40-1)

Remove the front and top covers from the evaporator/ heater unit. (See Disassembly And Assembly on Page 80-190-2)

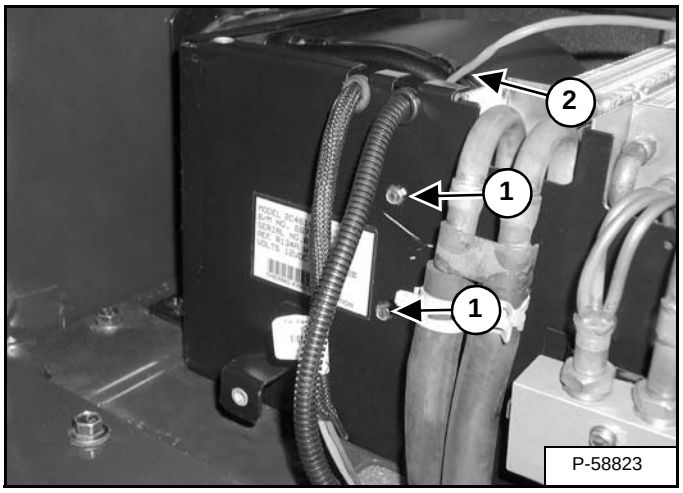
Figure 80-200-1



NOTE: Mark the location of the probe before removal. Reinstall the probe in the same location. Moving the thermostat probe location in the evaporator coil will affect air conditioning performance.

Remove the thermostat probe (Item 1) **[Figure 80-200-1]** from the A/C evaporator coil.

Figure 80-200-2



Remove the two bolts (Item 1) **[Figure 80-200-2]**.

Remove the thermostat (Item 2) **[Figure 80-200-2]** from the unit.

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THERMOSTAT (LATER MODELS)

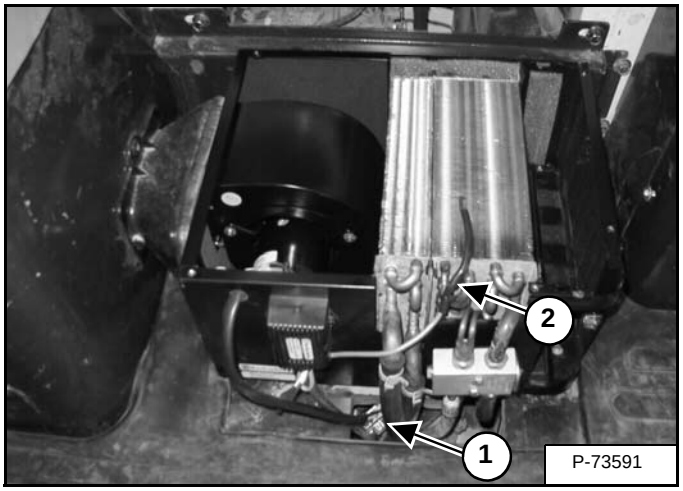
Removal And Installation

NOTE: The thermostat can be changed without evacuating the A/C system, or removing the evaporator/heater unit from the excavator.

Remove the seat and seat mount. (See Removal And Installation on Page 50-40-1)

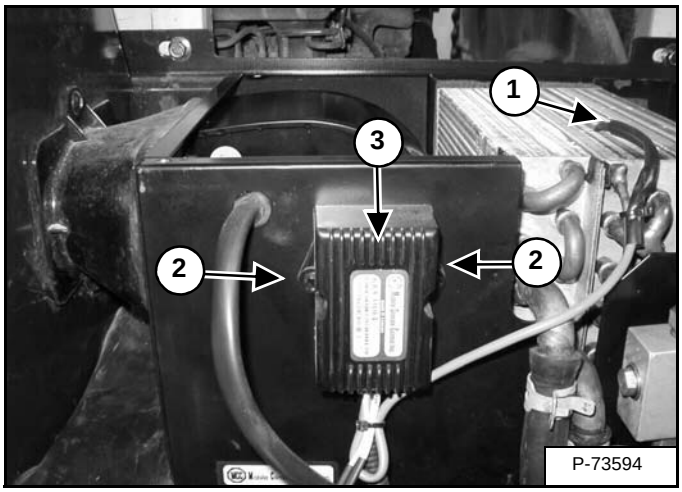
Remove the front and top covers from the evaporator/ heater unit. (See Disassembly And Assembly on Page 80-191-2)

Figure 80-201-1



Disconnect the thermostat connector (Item 1) and remove the tie strap (Item 2) **[Figure 80-201-1]**.

Figure 80-201-2



NOTE: Mark the location of the probe before removal. Reinstall the probe in the same location. Moving the thermostat probe location in the evaporator coil will affect air conditioning performance.

Remove the thermostat probe (Item 1) **[Figure 80-201-2]** from the A/C evaporator coil.

Remove the two bolts (Item 2) **[Figure 80-201-2]**.

Remove the thermostat (Item 3) **[Figure 80-201-2]** from the unit.

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EXPANSION VALVE (EARLY MODELS)

Removal And Installation

Evacuate the A/C system. (See Charging Procedure With A Manifold Gauge Set on Page 80-130-4)

Remove the seat and seat mount. (See Removal And Installation on Page 50-40-1)

Remove the front and top covers from the evaporator/ heater unit. (See Disassembly And Assembly on Page 80-190-2)

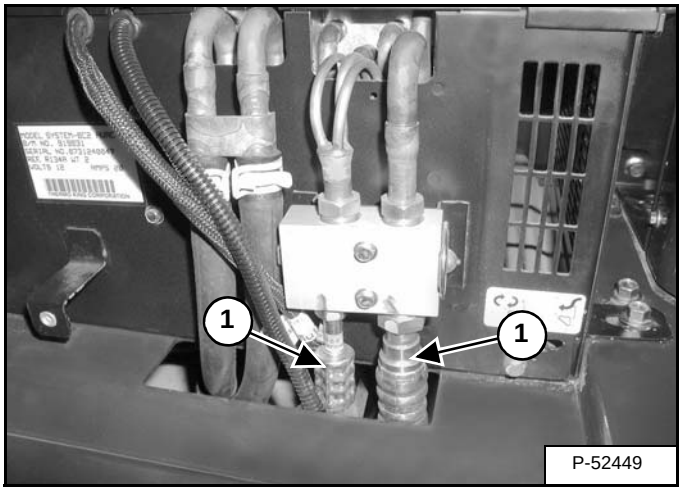
NOTE: The expansion valve can be changed without removing the evaporator/heater unit from the excavator.

⚠ WARNING

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

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Figure 50-30-1



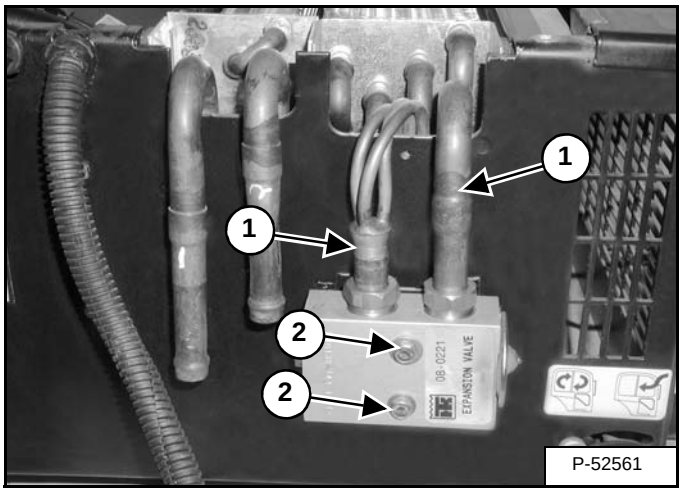
Remove the A/C hoses (Item 1) **[Figure 50-30-1]** from the expansion valve.

Installation: Tighten the A/C hose fittings to 22 ft.-lb. (29,8 N•m) torque.

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

Mark the expansion valve for proper installation.

Figure 80-210-2



Remove the evaporator fittings (Item 1) **[Figure 80-210-2]** from the expansion valve.

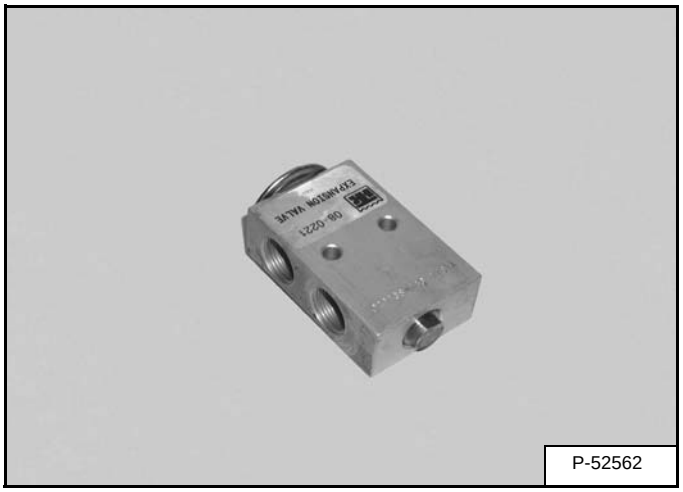
Installation: Tighten the evaporator fittings to 22 ft.-lb. (29,8 N•m) torque.

Remove the bolts (Item 2) **[Figure 80-210-2]**.

Remove the expansion valve from the excavator.

Cap and plug the evaporator tubelines and the expansion valve fittings with the proper A/C caps and plugs.

Figure 80-210-3



The expansion valve is not serviceable and must be replaced as an assembly **[Figure 80-210-3]**.

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EXPANSION VALVE (LATER MODELS)

Removal And Installation

Evacuate the A/C system. (See Charging Procedure With A Manifold Gauge Set on Page 80-130-4)

Remove the seat and seat mount. (See Removal And Installation on Page 50-40-1)

Remove the front and top covers from the evaporator/ heater unit. (See Disassembly And Assembly on Page 80-190-2)

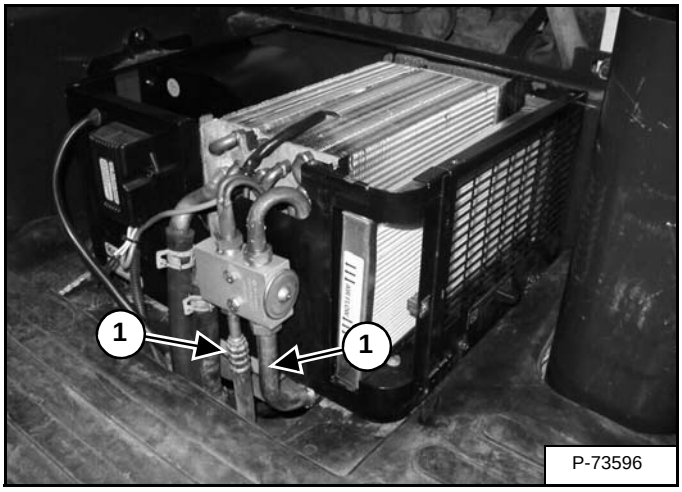
NOTE: The expansion valve can be changed without removing the evaporator/heater unit from the excavator.

⚠ WARNING

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

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Figure 80-211-1



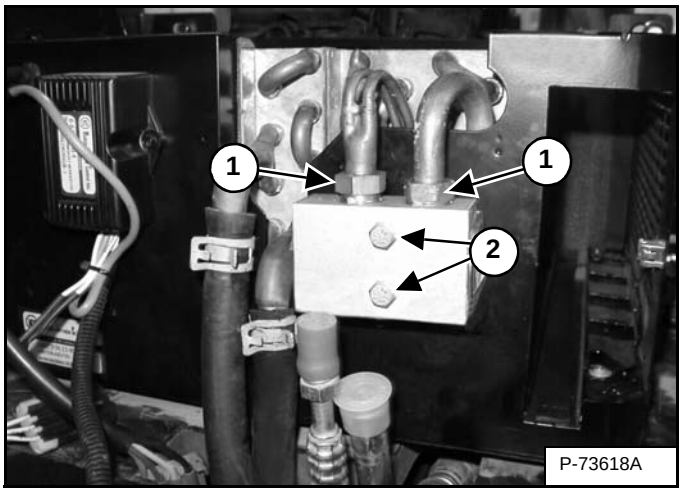
Remove the A/C hoses (Item 1) **[Figure 80-211-1]** from the expansion valve.

Installation: Tighten the A/C hose fittings to 22 ft.-lb. (29,8 N•m) torque.

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

Mark the expansion valve for proper installation.

Figure 80-211-2



Remove the evaporator fittings (Item 1) **[Figure 80-211-2]** from the expansion valve.

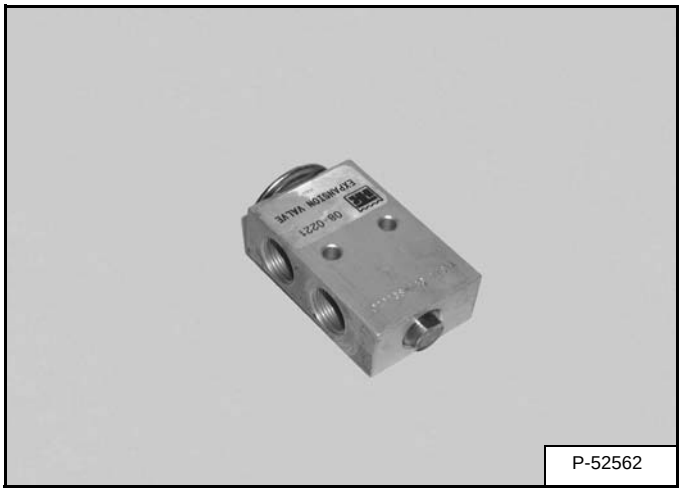
Installation: Tighten the evaporator fittings to 22 ft.-lb. (29,8 N•m) torque.

Remove the bolts (Item 2) **[Figure 80-211-2]**.

Remove the expansion valve from the excavator.

Cap and plug the evaporator tubelines and the expansion valve fittings with the proper A/C caps and plugs.

Figure 80-211-3



The expansion valve is not serviceable and must be replaced as an assembly **[Figure 80-211-3]**.

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EVAPORATOR (EARLY MODELS)

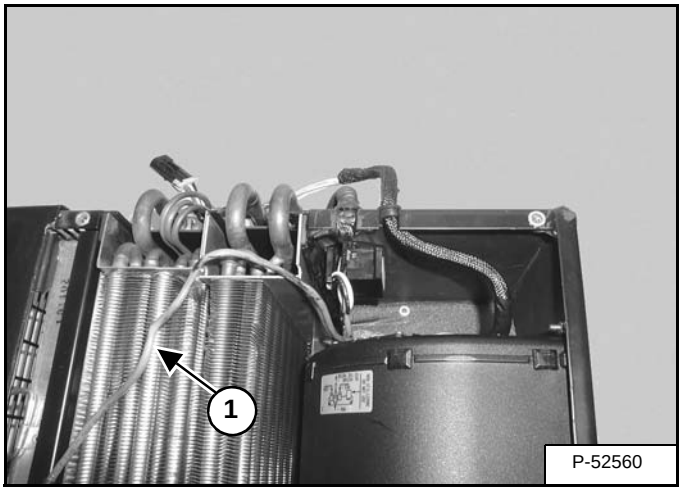
Removal And Installation

Evacuate the A/C system. (See Charging Procedure With A Manifold Gauge Set on Page 80-130-4)

Remove the evaporator/heater unit from the excavator. (See Removal And Installation on Page 80-190-1)

Remove the expansion valve. (See Removal And Installation on Page 80-210-1)

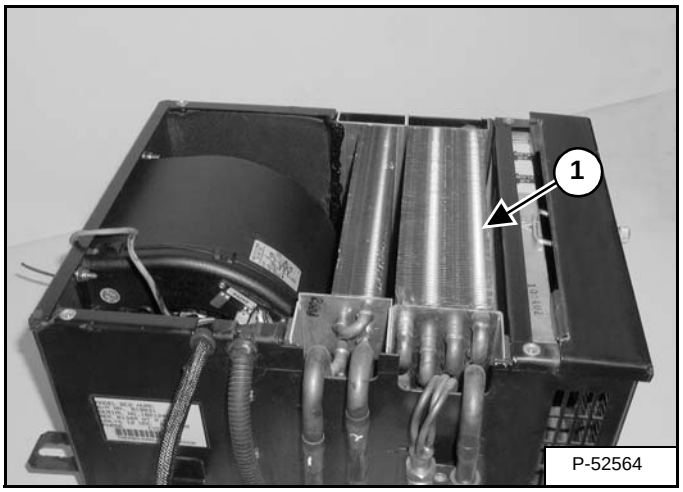
Figure 80-220-1



NOTE: Mark the location of the probe before removal. Reinstall the probe in the same location. Moving the thermostat probe location in the evaporator coil will affect air conditioning performance.

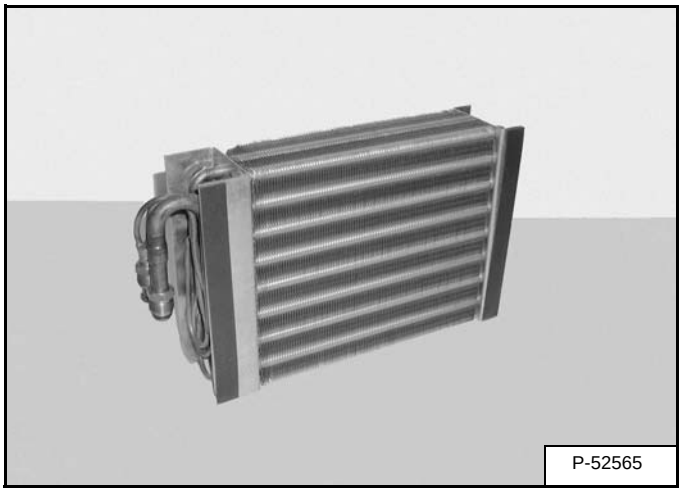
Remove the thermostat probe (Item 1) **[Figure 80-220-1]** from the evaporator.

Figure 80-220-2



Lift the evaporator (Item 1) **[Figure 80-220-2]** straight up from the evaporator/heater unit.

Figure 80-220-3



Inspect the evaporator coil **[Figure 80-220-3]** for leaks, and replace as needed.

Clean with low water or air pressure.

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EVAPORATOR (LATER MODELS)

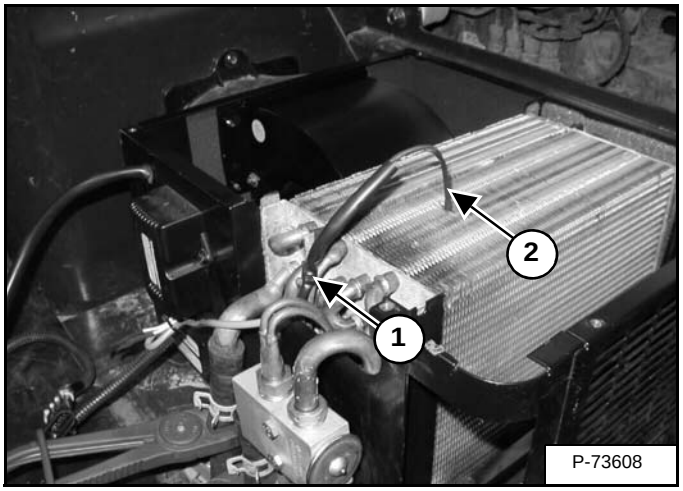
Removal And Installation

Evacuate the A/C system. (See Charging Procedure With A Manifold Gauge Set on Page 80-130-4)

Remove the evaporator/heater unit from the excavator. (See Removal And Installation on Page 80-191-1)

Remove the expansion valve. (See Removal And Installation on Page 80-211-1)

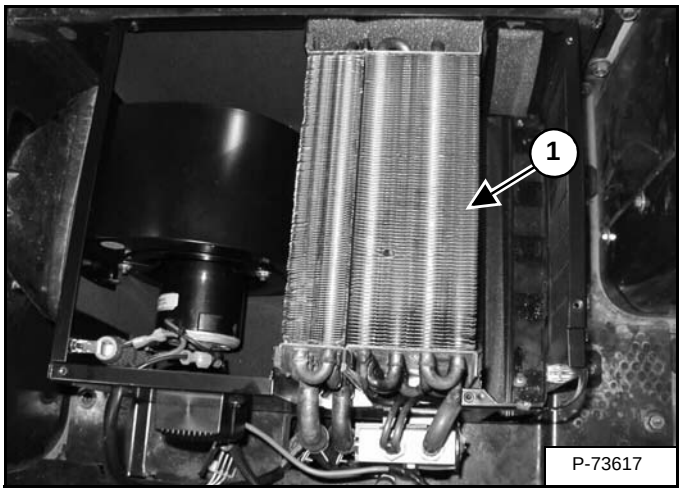
Figure 80-221-1



NOTE: Mark the location of the probe before removal. Reinstall the probe in the same location. Moving the thermostat probe location in the evaporator coil will affect air conditioning performance.

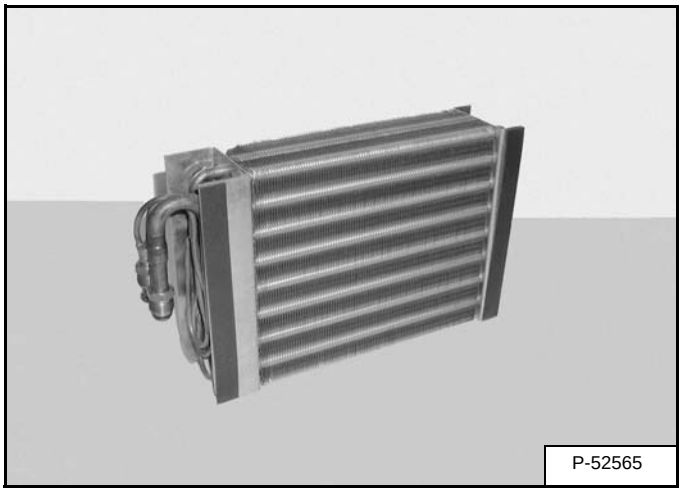
Remove the tie strap (Item 1) and thermostat probe (Item 2) **[Figure 80-221-1]** from the evaporator.

Figure 80-221-2



Lift the evaporator (Item 1) **[Figure 80-221-2]** straight up from the evaporator/heater unit.

Figure 80-221-3



Inspect the evaporator coil **[Figure 80-221-3]** for leaks, and replace as needed.

Clean with low water or air pressure.

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SPECIFICATIONS

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Decimal And Millimeter Equivalents. SPEC-70-1
U.S. To Metric Conversion Chart SPEC-70-1

ENGINE SPECIFICATIONS (S/N 562611001 & ABOVE). SPEC-20-1
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Connecting Rods SPEC-20-3
Crankshaft SPEC-20-4
Crankshaft Re-Grind Data SPEC-20-6
Cylinder Head SPEC-20-1
Cylinders SPEC-20-3
Engine Bolt Torque. SPEC-20-5
Fuel Injection Nozzles SPEC-20-1
Fuel Injection Pump SPEC-20-1
Oil Pump SPEC-20-3
Pistons SPEC-20-3
Piston Rings. SPEC-20-3
Rocker Arms SPEC-20-2
Tappet SPEC-20-2
Thermostat. SPEC-20-4
Timing Gear SPEC-20-4
Valves SPEC-20-1
Valve Springs SPEC-20-2
Valve Timing. SPEC-20-2

ENGINE SPECIFICATIONS (S/N 562811001 & ABOVE, 563111001 & ABOVE AND 563211001 & ABOVE). SPEC-21-1
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Connecting Rods SPEC-21-3
Crankshaft SPEC-21-4
Crankshaft Re-Grind Data SPEC-21-6
Cylinder Head SPEC-21-1
Cylinders SPEC-21-3
Engine Bolt Torque. SPEC-21-5
Fuel Injection Nozzles SPEC-21-1
Fuel Injection Pump SPEC-21-1
Oil Pump SPEC-21-3
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Valve Timing. SPEC-21-2

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Chart SPEC-60-1

HYDRAULIC CONNECTION SPECIFICATIONS SPEC-40-1
Flare Fitting SPEC-40-2
O-Ring Face Seal Connection SPEC-40-1
O-Ring Flare Fitting SPEC-40-3
Port Seal Fitting SPEC-40-5
Straight Thread O-ring Fitting. SPEC-40-1
Tubelines And Hoses SPEC-40-1

HYDRAULIC FLUID SPECIFICATIONS SPEC-50-1
Specifications SPEC-50-1

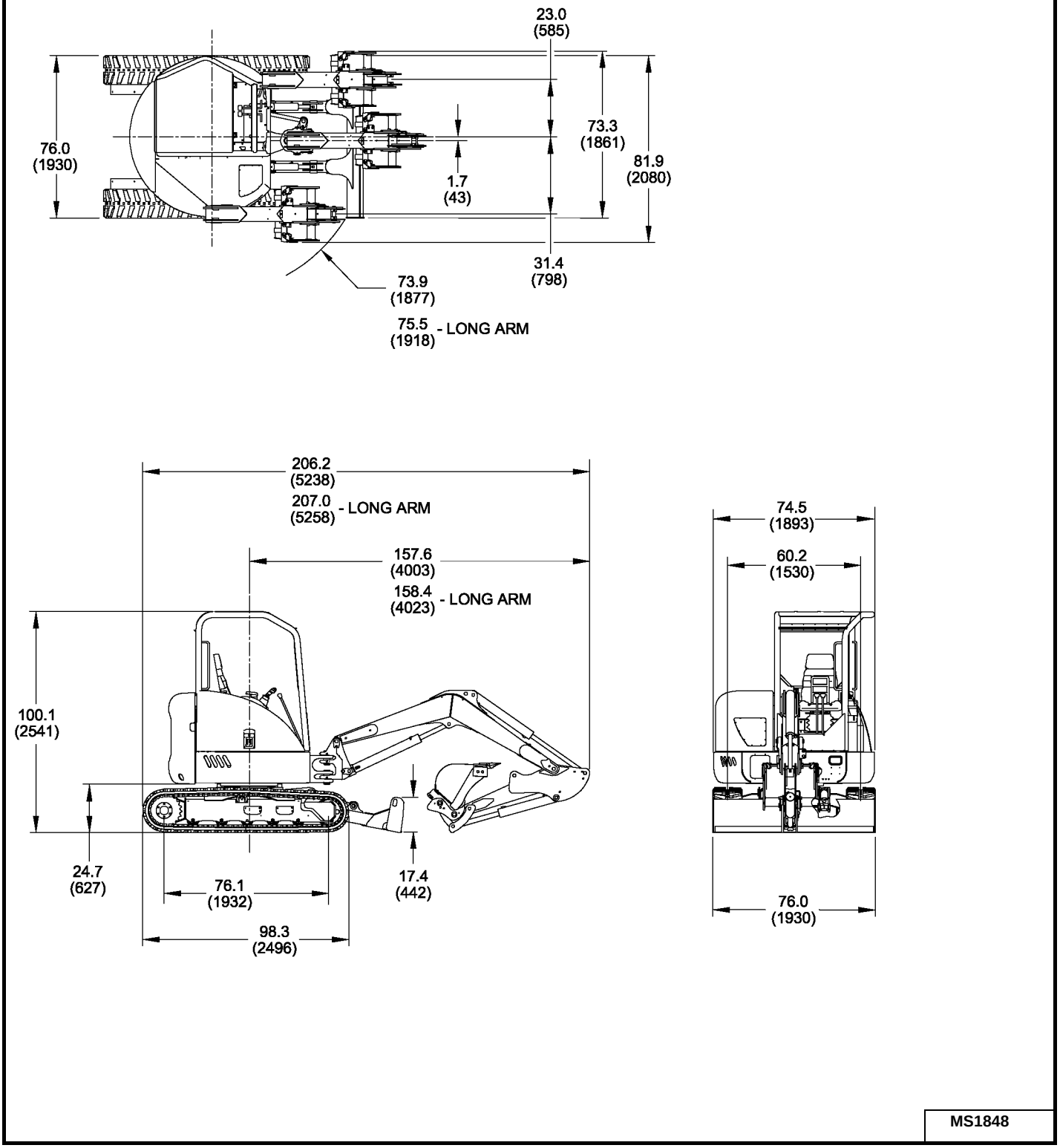
SPECIFICATIONS. SPEC-10-1
Controls SPEC-10-3
Drive System (S/N 562611001 & Above, 562811001 & Above And 563211001 & Above) SPEC-10-6
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Electrical SPEC-10-7
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Excavator Machine Dimensions. SPEC-10-1
Hydraulic Cycle Times SPEC-10-6
Hydraulic Cylinders SPEC-10-6
Hydraulic System SPEC-10-5
Performance (S/N 562611001 & Above, 562811001 & Above And 563211001 & Above) SPEC-10-3
Performance (S/N 563111001 & Above) SPEC-10-3
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Undercarriage SPEC-10-7

TORQUE SPECIFICATIONS SPEC-30-1
Torque For General Metric Bolts SPEC-30-2
Torque for General SAE Bolts SPEC-30-1

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Excavator Machine Dimensions

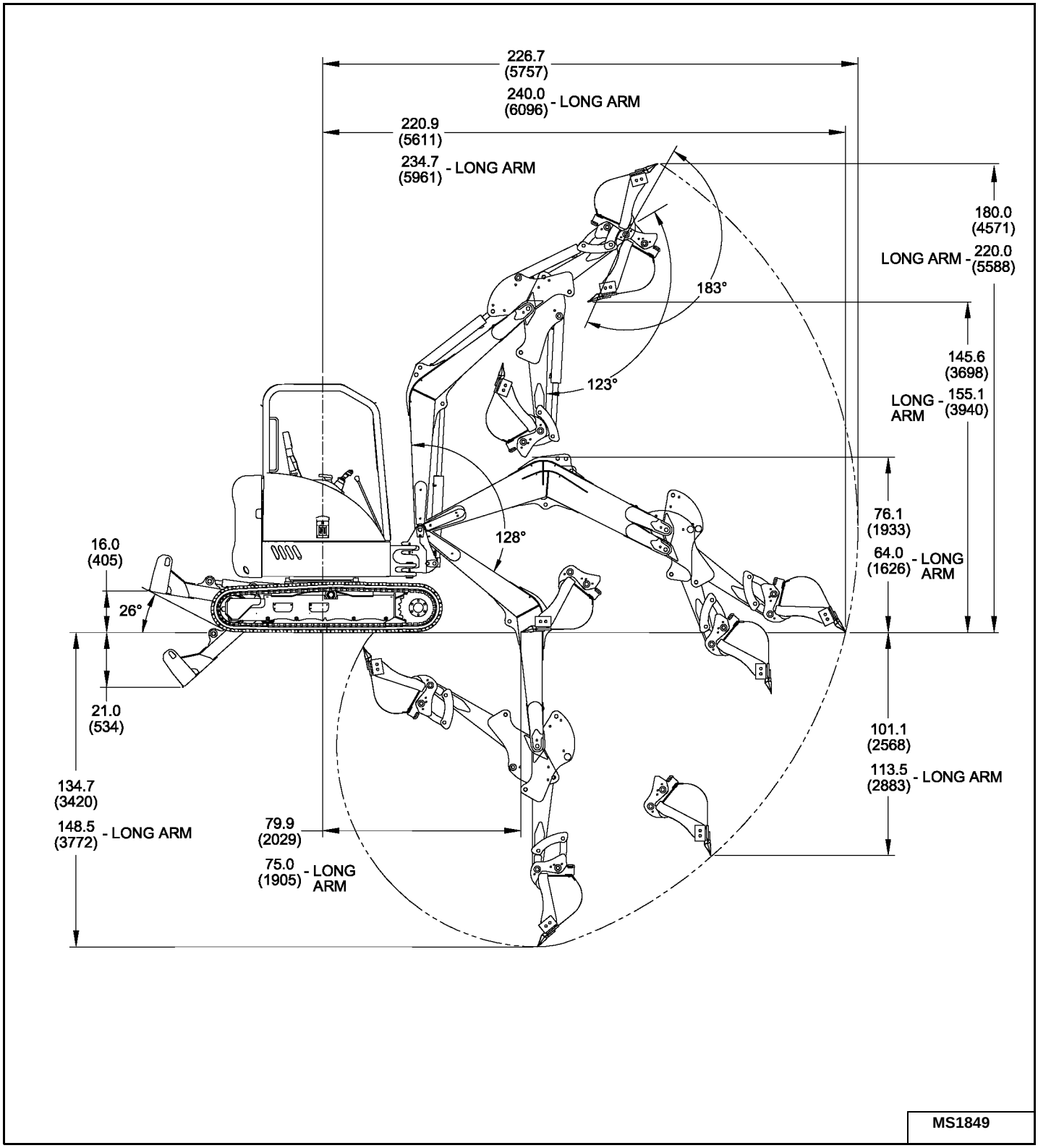
- All dimensions are shown in inches. Respective metric dimensions are given in millimeters enclosed by parentheses.
- Where applicable, specification conform to SAE or ISO standards and are subject to change without notice.



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Excavator Machine Dimensions (Cont'd)

- All dimensions are shown in inches. Respective metric dimensions are given in millimeters enclosed by parentheses.
- Where applicable, specification conform to SAE or ISO standards and are subject to change without notice.



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Performance (S/N 562611001 & Above, 562811001 & Above And 563211001 & Above)

435 operating weight w/ canopy, rubber tracks, and 24 in. (609 mm) bucket	10555 lb. (4785 kg)
Travel Speed	Low Range 2.80 MPH (4,51 km/hr) High Range 5.40 MPH (8,70 km/hr)
Steel tracks add 74 lb. (33 kg) Cab w/heater add 305 lb. (138 kg) Cab w/HVAC add 355 lb. (161 kg)	

Performance (S/N 563111001 & Above)

435 operating weight w/ canopy, rubber tracks, and 24 in. (609 mm) bucket	10555 lb. (4785 kg)
Travel Speed	Low Range 1.80 MPH (2,90 km/hr) High Range 3.0 MPH (4,8 km/hr)
Steel tracks add 74 lb. (33 kg) Cab w/heater add 305 lb. (138 kg) Cab w/HVAC add 355 lb. (161 kg)	

Controls

Steering	2 hand levers or foot pedals
Hydraulics	2 hand operated levers (joysticks) control boom, bucket, arm and upperstructure slew
Auxiliary Hydraulics	Electric switch in right joystick
Blade	Right hand lever
Boom Swing	Right foot pedal
Upperstructure Slew Lock Service Holding	 Automatically applied slew brake integrated in slew motor Automatically applied slew brake integrated in slew motor
Vehicle Steering	Direction and speed controlled by 2 pilot operated hand levers/foot pedals.

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Engine

Machine Serial Number	S/N 562611001 & Above	S/N 562811001 & Above, 563111001 & Above and 563211001 & Above
Make/Model	Kubota V2003-M-DI-TEB-BC-1	Kubota V2003-M-DI-TE2B-BC-1
Fuel/Cooling	Diesel/Liquid	
Horsepower, Maximum	49 HP (36,5 kW)	
Maximum Governed Speed	2500 RPM	
High Idle Speed	2770 RPM	
Low Idle Speed	1195 to 1245 RPM	
Maximum Torque	125.1 ft.-lb.	
Number Of Cylinders	4	
Displacement	122 ci (2,0 L)	
Bore/Stroke	3.27 x 3.64 in. (83 x 92,4 mm)	
Lubrication	Pressure System with Filter	
Crankcase Ventilation	Closed Breathing	
Air Cleaner	Dry replaceable paper dual cartridge	
Ignition	Diesel-Compression	

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Hydraulic System

Machine Serial Number	562611001 & Above 562811001 & Above	563111001 & Above	563211001 & Above
Pump - Hydraulic	Engine driven, variable displacement piston pump, with pressure compensating, load sensing and torque limiter controls	Engine driven, variable displacement piston pump with pressure compensating, load sensing and torque limiter controls with external gear pump	Engine driven, variable displacement piston pump with pressure compensating, load sensing and torque limiter controls with external gear pump
Pump Capacity - Piston Pump Gear Pump	 29.7 GPM (112.5 L/min) 9.3 GPM (35,2 L/min)	 29.7 GPM (112,5 L/min) 9.3 GPM (35,2 L/min)	 29.7 GPM (112,5 L/min) 9.3 GPM (35,2 L/min)
Auxiliary Flow	19.8 GPM (75,0 L/min)	19.8 GPM (75,0 L/min)	19.8 GPM (75,0 L/min)
Control Valve	7 spool closed center	9 spool closed center	7 spool closed center
Drive Motor (Two)	Axial piston	Axial piston	Axial piston
Slew Motor	Orbit motor	Orbit motor	Orbit motor
System Relief Pressure Boom, Boom Swing, Bucket, Arm, Auxiliary, Blade	3625 PSI (250 bar)	3625 PSI (250 bar)	3625 PSI (250 bar)
Slew Relief Pressure	2800 PSI (193 bar)	2800 PSI (193 bar)	2800 PSI (193 bar)
Joystick Pressure	435 PSI (30 bar)	435 PSI (30 bar)	435 PSI (30 bar)
Auxiliary Relief	3045 PSI (210 bar)	3045 PSI (210 bar)	3045 PSI (210 bar)
Travel Relief	5076 PSI (350 bar)	5076 PSI (350 bar)	5076 PSI (350 bar)
Arm Port Relief Base And Rod End	4206 PSI (290 bar)	4206 PSI (290 bar)	4206 PSI (290 bar)
Boom Port Relief Base And Rod End	4206 PSI (290 bar)	4206 PSI (290 bar)	4206 PSI (290 bar)
Bucket Port Relief Base And Rod End	4206 PSI (290 bar)	4206 PSI (290 bar)	4206 PSI (290 bar)
Blade Port Relief Base End	3770 PSI (260 bar)	3770 PSI (260 bar)	3770 PSI (260 bar)
Main Hydraulic Filter Bypass	50 PSI (3,4 bar)	50 PSI (3,4 bar)	50 PSI (3,4 bar)
Case Drain And Fan Motor Filter Bypass	50 PSI (3,4 bar)	50 PSI (3,4 bar)	50 PSI (3,4 bar)

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Hydraulic Cylinders

Cylinder	Bore	Rod	Stroke
Boom (cushion up)	3.75 in. (92,25 mm)	2.0 in. (50,8 mm)	26.72 in. (678,6 mm)
Arm (cushion retract)	3.25 in. (82,6 mm)	2.0in. (50,8 mm)	26.0 in. (660,4 mm)
Bucket	3.0 in. (76,2 mm)	1.75 in. (44,5 mm)	20.63 in. (524 mm)
Boom Swing (cushion left/right)	3.25 in. (82,6 mm)	2.0 in. (50,8 mm)	23.51 in. (597,2 mm)
Blade	3.25 in. (82,6 mm)	1.75 in. (44,5 mm)	6.10 in. (154,9 mm)

Hydraulic Cycle Times

Machine Serial Number	562611001 & Above And 562811001 & Above	563111001 & Above And 563211001 & Above
Bucket Curl	2.2 seconds	2.2 seconds
Bucket Dump	1.6 seconds	1.6 seconds
Arm Retract	3.8 seconds	3.8 seconds
Arm Extend	2.6 seconds	2.6 seconds
Boom Raise	3.8 seconds	3.8 seconds
Boom Lower	5.0 seconds	5.0 seconds
Boom Swing Left	6.6 seconds	6.6 seconds
Boom Swing Right	5.9 seconds	5.9 seconds
Blade Raise	2.4 seconds	2.4 seconds
Blade Lower	2.4 seconds	2.4 seconds
Slew	9.6 RPM	9.30 RPM

Drive System (S/N 562611001 & Above, 562811001 & Above And 563211001 & Above)

Travel Motor	Each track is driven by hydrostatic axial piston motor
Drive Reduction	35:8:1 Two stage planetary
Max Draw Bar Pull (theoretical @ 90% efficiency)	10489 ft.-lb. (46657 N•m)

Drive System (S/N 563111001 & Above)

Travel Motor	Each track is driven by hydrostatic axial piston motor
Drive Reduction	62:55:1 Two stage planetary
Max Draw Bar Pull (theoretical @ 90% efficiency)	11024 ft.-lb. (49037 N•m)

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Undercarriage

Crawler	Tractor Design
Rollers	Sealed rollers with box section track roller frame
Track Adjusters	Grease type track adjusters with shock absorbing recoil spring

Track (S/N 562611001 & Above And 562811001 & Above)

Width	15.7 in. (400 mm)
Number of shoes (steel track)	39
Number of rollers	5 (on bottom) / 1 (on top) per side
435 W/Standard Arm Ground Pressure Rubber Track Steel Track	 4.07 PSI (0,281 bar) 4.09 PSI (0,282 bar)

Track (S/N 563111001 & Above And 563211001 & Above)

Width	15.7 in. (400 mm)
Number of shoes (steel track)	39
Number of rollers	5 (on bottom) / 1 (on top) per side
435 W/Standard Arm Ground Pressure Rubber Track Steel Track	 4.0 PSI (0,276 bar) 4.03 PSI (0,278 bar)
435 W/Long Arm Ground Pressure Rubber Track Steel Track	 4.10 PSI (0,283 bar) 4.13 PSI (0,285 bar)

Electrical

Alternator	12 volts, 90 Amp open frame w/ internal regulator
Battery	12 volt negative ground 600 CCA @ 0° F (-18° C), 115 mn reserve capacity @ 25 amps
Starter	12 volt gear reduction 2.7 HP (2,0 kW)

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ENGINE SPECIFICATIONS (S/N 562611001 & ABOVE)

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

Fuel Injection Nozzles

Opening Pressure	1991 to 2133 PSI (137 to 147 bar)
Fuel Tightness Nozzle Seat	Dry Nozzle at 1849 PSI (127,5 bar)

Fuel Injection Pump

Fuel Tightness Plunger	10 sec: initial pressure 2133 to 1990 PSI (147 to 137 bar)
Limit Permitted	5 seconds
Injection Timing	17 to 19 degrees B.T.D.C.
High Idle	2550 to 2600 RPM
Low Idle	1125 to 1175 RPM

Cylinder Head

Cylinder Head Surface Distortion	0.0019 (0,05) in 19.70 (500) Max.
Thickness of Gasket (Used)	0.0452 to 0.0492 (1,15 to 1,25)
(New)	0.0511 to 0.0551 (1,3 to 1,4)
Top Clearance (Piston to Head)	0.0217 to 0.0276 (0,55 to 0,70)
Compression	412 to 440 PSI (28,4 to 30,3 bar)
Allowable Limit	355 PSI (24,5 bar)
Allowable Difference Between Cylinders	10% or less

Valves

Valve Seat Width	0.0835 (2,12)
O.D. of Valve Stems	0.3134 to 0.3140 (7,96 to 7,975)
I.D. of Valve Guides	0.3156 to 0.3161 (8,015 to 8,03)
Clearance Between Valve Stem & Guide	0.0016 to 0.0026 (0,04 to 0,07)
Allowable Limit	0.0039 (0,1)
Valve Clearance (Cold)	0.0071 to 0.0087 (0,18 to 0,22)
Valve Recessing (Protrusion)	0.002 (0,05)
(Recess)	0.0059 (0,15)
Allowable Limit (Recess)	0.016 (0,4)
Valve Seat Angle (Int.)	60 degrees
Valve Seat Angle (Exh.)	45 degrees

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Valve Springs

Free Length	1.6417 to 1.6614 (41,7 to 42,2)
Allowable Limit	1.622 (41,2)
Fitted Length	1.378 (35,0)
Compress to Fitted Length	26.4 lb. (117,4 N)
Allowable Limit	22.5 lb. (100,0 N)
Inclination Allowable Limit	0.039 (1,0)

Valve Timing

Intake Valve (Open)	20 degrees B.T.D.C.
(Close)	45 degrees A.B.D.C.
Exhaust Valve (Open)	55 degrees B.T.D.C.
(Close)	14 degrees A.T.D.C.

Rocker Arms

O.D. of Rocker Arm Shaft	0.5501 to 0.5506 (13,973 to 13,984)
I.D. of Rocker Arm Bushings	0.5512 to 0.5519 (14,0 to 14,18)
Clearance Between Rocker Arm & Bushing	0.0006 to 0.0018 (0,016 to 0,045)
Allowable Limit	0.0059 (0,15)

Camshaft

Journal O.D.	1.5722 to 1.5728 (39,934 to 39,950)
Bearing I.D.	1.5748 to 1.5758 (40,0 to 40,025)
Oil Clearance	0.002 to 0.0036 (0,05 to 0,091)
Allowable Limit	0.0059 (0,15)
Alignment Allowable Limit	0.00039 (0,01)
Cam Lobe Height (Int)	1.3346 (33,90)
Allowable Height (Int)	1.3328 (33,85)
Cam Lobe Height (Exh)	1.3177 (33,47)
Allowable Height (Exh)	1.3157 (33,42)
End Clearance	0.0028 to 0.0087 (0,07 to 0,22)
Allowable Limit	0.0118 (0,3)

Tappet

Clearance Between Tappet & Guide	0.0008 to 0.0024 (0,02 to 0,062)
Allowable Limit	0.0028 (0,07)
Tappet O.D.	0.9433 to 0.9441 (23,959 to 23,980)
Tappet Guide I.D.	0.9449 to 0.9457 (24,0 to 24,021)

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Cylinders

Cylinder Liner Bore I.D.	3.2677 to 3.2686 (83,0 to 83,022)
Allowable Limit	+0.0059 (+0,15)

Piston Rings

Ring Gap (Top & 2nd Ring)	0.0118 to 0.017 (0,3 to 0,45)
Limit Permitted	0.0492 (1,25)
Ring Gap (Oil Ring)	0.0098 to 0.0177 (0,25 to 0,45)
Limit Permitted	0.0492 (1,25)
Side Clearance of Ring Groove:	
Top Ring	Zero Clearance
Second Ring	0.0037 to 0.0047 (0,093 to 0,12)
Allowable Limit	0.0079 (0,20)
Oil RIng	0.0008 to 0.002 (0,02 to 0,052)
Allowable Limit	0.0059 (0,15)

Pistons

Piston Pin Bore	0.9843 to 0.9848 (25,0 to 25,013)
Limit Permitted	0.9862 (25,05)

Connecting Rods

Piston Pin O.D.	0.9843 to 0.9847 (25,002 to 25,011)
Small End Bushing I.D.	0.9852 to 0.9858 (25,025 to 25,04)
Clearance Between Piston Pin & Small End Bushing	0.0006 to 0.0015 (0,014 to 0,038)
Allowable Limit	0.0059 (0,015)
Connecting Rod Alignment Limit Permitted	0.002 (0,05)

Oil Pump

Oil Pressure at Rated RPM	43 to 64 PSI (2,97 to 4,41 bar)
Limited Permitted	36 PSI (2,48 bar)
Idle Speed	14 PSI (0,96 bar)
Limit Permitted	7 PSI (0,49 bar)
Clearance Between Inner Rotor & Outer Rotor	0.0039 to 0.0063 (0,1 to 0,16)
Outer Rotor & Pump Body	0.0043 to 0.0075 (0,11 to 0,19)
End Clearance Between Inner Rotor & Cover	0.0041 to 0.0059 (0,105 to 0,15)

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Crankshaft

Crankshaft Alignment Allowable Limit	0.00079 (0,02)
Oil Clearance Between Journal & Bearing #1	0.0016 to 0.0046 (0,04 to 0,118)
Allowable Limit	0.0079 (0,2)
Journal O.D. #1	2.0441 to 2.0449 (51,921 to 51,94)
Bearing I.D. #1	2.0465 to 2.0488 (51,98 to 52,039)
Oil Clearance Between Journal & Bearing #2	0.0016 to 0.0041 (0,04 to 0,104)
Allowable Limit	0.0079 (0,2)
Journal O.D. #2	2.0441 to 2.0449 (51,921 to 51,94)
Bearing I.D. #2	2.0465 to 2.0488 (51,98 to 52,025)
Oil Clearance Between Crank Pin & Bearing	0.0009 to 0.0034 (0,025 to 0,087)
Allowable Limit	0.0079 (0,2)
Crank Pin O.D.	1.8488 to 1.8494 (46,959 to 46,975)
Crank Pin Bearing I.D.	1.8504 to 1.8522 (47,0 to 47,046)
Crankshaft Side Clearance	0.0059 to 0.0122 (0,15 to 0,31)
Allowable Limit	0.0197 (0,5)

Timing Gear

Timing Gear Backlash	
Crank Gear - Idle Gear	0.0016 to 0.0044 (0,0415 to 0,1122)
Idle Gear - Cam Gear	0.0016 to 0.0045 (0,0415 to 0,1154)
Idle Gear - Injection Pump Gear	0.0016 to 0.0045 (0,0415 to 0,1154)
Idle Gear - Oil Pump Gear	0.0016 to 0.0043 (0,0415 to 0,1090)
Allowable Limit	0.0059 (0,15)
Clearance Between Idle Gear Shaft & Idle Gear Bushing	0.001 to 0.0026 (0,025 to 0,066)
Allowable Limit	0.0039 (0,10)
Idler Gear Side Clearance	0.0079 to 0.020 (0,2 to 0,51)

Thermostat

Valve Opening Temperature	157 to 163°F (70 to 73°C)
Valve Fully Open	185°F (85°C)

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Engine Bolt Torque

	Ft.-Lb.	**N•m**
Camshaft Retainer Plate Bolts	17 to 20	23 to 27
* Connecting Rod Bolts W/O Flange	27 to 30	37 to 41
W/Flange	33 to 36	44 to 49
* Crankshaft Nut	101 to 116	137 to 157
* Cylinder Head Bolts	69 to 72	93 to 98
Drain Plug	24 to 28	32 to 37
* Flywheel Bolts	72 to 80	98 to 108
Fuel Camshaft Retainer Bolts	5 to 6	6,8 to 8,1
Fuel Injection Tubeline Fittings	18 to 25	25 to 34
Glow Plugs	15 to 18	20 to 25
* Idler Gear Shaft Bolt	17 to 20	23 to 28
Injection Nozzles	36 to 51	49 to 69
Injection Pump Mounting Bolts	17 to 20	23 to 27
Injector Nozzle Body	43 to 58	59 to 79
* Main Bearing Bolts	51 to 54	69 to 74
* Main Bearing Case Bolts	34 to 38	46 to 51
Oil Switch	11 to 15	15 to 20
Rear Bearing Case Cover Bolts	13 to 15	18 to 20
Timing Gearcase Cover Bolts	13 to 17	18 to 23

* Lightly Oiled Threads

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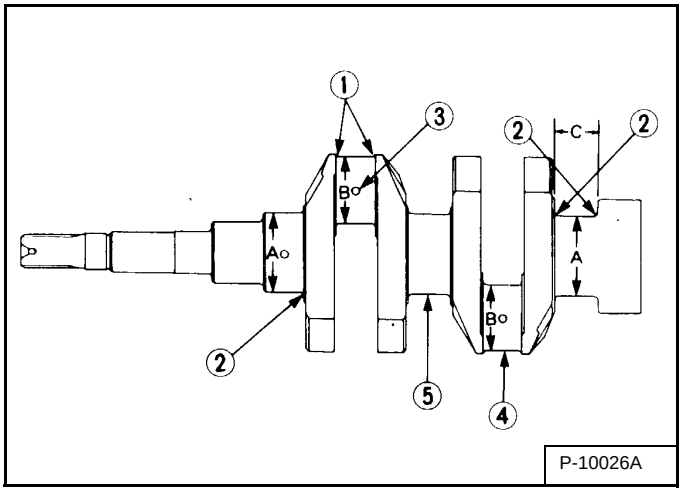
ENGINE SPECIFICATIONS (S/N 562611001 & ABOVE) (CONT'D)

Crankshaft Re-Grind Data

If the standard size bearing cannot be used due to excessive wear of the crankpin and crank journal use undersize or oversize bearings.

For undersize or oversize bearing use, follow the precautions noted below.

Figure SPEC-20-1



Grind the crankpin and journal with a wheel which has specified round corner and width without shoulder **[Figure SPEC-20-1]**.

1. 0.1299 to 0.1457 in. (3,3 to 3,7 mm) radius.
2. 0.1102 to 0.1260 in. (2,8 to 3,2 mm) radius.
3. Be sure to chamfer the oil hole circumference to 0.04 to 0.06 in. (1,0 to 1,5 mm) radius with and oil stone.
4. The crankpin must be fine finished to higher than (0,4S).
5. The crank journal must be fine-finished to higher than (0,4S).
6. The crank journal side surface must be fine-finished to higher than (0,4S).

SIZE	CODE NO.	NAME OF BEARING	BEARING MARK	CRANKSHAFT PROCESSING DIM.	
-0.008 in. (0,2 mm)	17331-2391-1	Crankshaft Bearing 1 0.008 in. minus (0,2 minus)	020 US	A	2.0363 to 2.037 in. (51,721 to 51,74 mm)
-0.008 in. (0,2 mm)	17331-2393-1	Crankshaft Bearing 2 0.008 in. minus (0,2 minus)	020 US		
-0.016 in. (0,4 mm)	17331-2392-1	Crankshaft Bearing 1 0.016 in. minus (0,4 minus)	040 US		2.0284 to 2.0291 in. (51,521 to 51,54 mm)
-0.016 in. (0,4 mm)	17331-2394-1	Crankshaft Bearing 2 0.016 in. minus (0,4 minus)	040 US		
-0.008 in. (0,2 mm)	17331-2297-1	Crank Pin Bearing 0.008 in. minus (0,2 minus)	020 US	B	1.8409 to 1.8415 in. (46,759 to 46,775 mm)
-0.016 in. (0,4 mm)	17331-2298-1	Crank Pin Bearing 0.016 in. minus (0,4 minus)	040 US		1.8330 to 1.8337 in. (46,559 to 46,575mm)
+0.008 in. (+0,2 mm)	15221-2395-1	Thrust Bearing 1 - 0.008 in. plus (0,2 mm plus)	020 US	C	1.8330 to 1.8337 in. (46,559 to 46,575 mm)
	19202-2397-1	Thrust Bearing 2 - 0.008 in. plus (0,2 mm plus)			
+0.016 in. (+0,4 mm)	15221-2396-1	Thrust Bearing 1 - 0.016 in. plus (0,4 mm plus)	040 US		1.0315 to 1.0335 in. (26,20 to 25,25 mm)
	19202-2398-1	Thrust Bearing 2 - 0.016 in. plus (0,4 mm plus)			

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ENGINE SPECIFICATIONS (S/N 562811001 & ABOVE, 563111001 & ABOVE AND 563211001 & ABOVE)

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

Fuel Injection Nozzles

Opening Pressure	2702 to 2916 PSI (187 to 201 bar)
Fuel Tightness Nozzle Seat	Dry Nozzle at 2418 PSI (167 bar)

Fuel Injection Pump

Fuel Tightness Plunger	10 sec: initial pressure 1850 PSI (127,5 bar)
Allowable Limit	5 seconds
Injection Timing	7.5 to 9 degrees B.T.D.C.
High Idle	2770 RPM
Low Idle	1195 to 1245 RPM

Cylinder Head

Cylinder Head Surface Distortion	0.002 (0,05) in 19.70 (500) Max.
Top Clearance (Piston to Head)	0.0236 to 0.0276 (0,60 to 0,70)
Compression	512 to 583 PSI (35 to 40 bar) @ 290 RPM
Allowable Limit	370 PSI (26 bar) @ 290 RPM
Allowable Difference Between Cylinders	10% or less

Valves

Valve Seat Width (Intake & Exhaust)	0.0835 (2,12)
O.D. of Valve Stems	0.3134 to 0.3140 (7,96 to 7,98)
I.D. of Valve Guides	0.3156 to 0.3161 (8,015 to 8,03)
Clearance Between Valve Stem & Guide	0.0016 to 0.0028 (0,04 to 0,07)
Allowable Limit	0.0039 (0,1)
Valve Clearance (Cold)	0.007 to 0.0087 (0,18 to 0,22)
Valve Recessing (Protrusion)	0.002 (0,05)
(Recess)	0.006 (0,15)
Allowable Limit (Recess)	0.0157 (0,4)
Valve Seat Angle (Int.)	60 degrees
Valve Seat Angle (Exh.)	45 degrees

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

Valve Springs

Free Length	1.642 to 1.661 (41,7 to 42,2)
Allowable Limit	1.622 (41,2)
Fitted Length	1.378 (35,0)
Compress to Fitted Length	26.4 lb. (117,6 N)
Allowable Limit	22.5 lb. (100,0 N)
Inclination Allowable Limit	0.039 (1,0)

Valve Timing

Intake Valve (Open)	9 degrees B.T.D.C.
(Close)	45 degrees A.B.D.C.
Exhaust Valve (Open)	50 degrees B.B.D.C.
(Close)	12 degrees A.T.D.C.

Rocker Arms

O.D. of Rocker Arm Shaft	0.5501 to 0.5506 (13,97 to 13,98)
I.D. of Rocker Arm	0.5512 to 0.5519 (14,0 to 14,02)
Clearance Between Rocker Arm & Shaft	0.0006 to 0.0018 (0,02 to 0,05)
Allowable Limit	0.004 (0,1)

Camshaft

Journal O.D.	1.572 to 1.573 (39,93 to 39,95)
Cylinder Block Bore I.D.	1.575 to 1.576 (40,0 to 40,025)
Oil Clearance	0.002 to 0.0036 (0,05 to 0,091)
Allowable Limit	0.006 (0,15)
Alignment Allowable Limit	0.0004(0,01)
Cam Lobe Height	1.335 (33,9)
Allowable Limit	1.333 (33,85)
End Clearance	0.0028 to 0.0087 (0,07 to 0,22)
Allowable Limit	0.012 (0,3)

Tappet

Clearance Between Tappet & Guide	0.0008 to 0.0024 (0,02 to 0,062)
Allowable Limit	0.0028 (0,07)
Tappet O.D.	0.943 to 0.944 (23,96 to 23,98)
Tappet Guide I.D.	0.945 to 0.946 (24,0 to 24,021)

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Cylinders

Cylinder Bore I.D. (Standard)	3.268 to 3.269 (83,00 to 83,022)
Allowable Limit (Standard)	+0.006 (+0,15)
Cylinder Bore I.D. (Oversize)	3.2776 to 3.2784 (83,25 to 83,27)
Allowable Limit (Oversize)	+0.006 (+0,15)

Piston Rings

Ring Gap (Top)	0.008 to 0.0138 (0,20 to 0,35)
Ring Gap (2nd Ring)	0.016 to 0.022 (0,40 to 0,55)
Ring Gap (Oil Ring)	0.010 to 0.018 (0,25 to 0,45)
Allowable Limit (All Rings)	0.05 (1,25)
Side Clearance of Ring Groove:	
2nd Ring	0.004 to 0.005 (0,09 to 0,13)
Allowable Limit	0.008 (0,20)
Oil Ring	0.0008 to 0.0023 (0,02 to 0,06)
Allowable Limit	0.006 (0,15)

Pistons

Piston Pin Bore	0.984 to 0.985 (25,0 to 25,013)
Allowable Limit	0.986 (25,05)

Connecting Rods

Piston Pin O.D.	0.984 to 0.985 (25,0 to 25,011)
Small End Bushing I.D.	0.985 to 0.986 (25,025 to 25,04)
Clearance Between Piston Pin & Small End Bushing	0.0006 to 0.0015 (0,014 to 0,038)
Connecting Rod Alignment Allowable Limit	0.002 (0,05)

Oil Pump

Oil Pressure at Rated RPM	43 to 64 PSI (2,9 to 4,4 bar)
Allowable Limit	36 PSI (2,5 bar)
Idle Speed Allowable Limit	7 PSI (0,48 bar)
Clearance Between Inner Rotor & Outer Rotor	0.0012 to 0.0055 (0,03 to 0,14 mm)
Outer Rotor & Pump Body	0.0043 to 0.0075 (0,11 to 0,19)
End Clearance Between Inner Rotor & Cover	0.0041 to 0.0059 (0,105 to 0,15)
Allowable Limit	0.008 (0,2)

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

Crankshaft

	Engine S/N 3R9999 & Below	All Models	Engine S/N 3S0001 & Above
Crankshaft Alignment Allowable Limit		0.0008 (0,02)	
Oil Clearance Between Journal & Bearing #1		0.0016 to 0.0041 (0,04 to 0,104)	
Allowable Limit		0.008 (0,2)	
Journal O.D. #1	2.044 to 2.045 (51,92 to 51,94)		2.3591 to 2.3598 (59,921 to 59,940)
Bearing I.D. #1	2.046 to 2.049 (51,98 to 52,04)		2.3614 to 2.3637 (59,980 to 60,039)
Oil Clearance Between Journal & Bearing #2		0.0016 to 0.0041 (0,04 to 0,104)	
Allowable Limit		0.008 (0,2)	
Journal O.D. #2	2.044 to 2.045 (51,92 to 51,94)		2.3591 to 2.3598 (59,921 to 59,940)
Bearing I.D. #2	2.046 to 2.048 (51,98 to 52,03)		2.3614 to 2.3632 (59,980 to 60,025)
Oil Clearance Between Crank Pin & Bearing		0.001 to 0.0034 (0,025 to 0,087)	
Allowable Limit		0.008 (0,2)	
Crank Pin O.D.		1.8488 to 1.8494 (46,96 to 46,98)	
Crank Pin Bearing I.D.		1.850 to 1.852 (47,0 to 47,05)	
Crankshaft Side Clearance		0.006 to 0.014 (0,15 to 0,35)	
Allowable Limit		0.020 (0,5)	

Timing Gear

Timing Gear Backlash	
Crank Gear - Idle Gear	0.0016 to 0.0044 (0,042 to 0,112)
Idle Gear - Cam Gear	0.0016 to 0.0045 (0,042 to 0,115)
Idle Gear - Injection Pump Gear	0.0016 to 0.0045 (0,042 to 0,115)
Crank Gear - Oil Pump Gear	0.0016 to 0.0043 (0,042 to 0,109)
Allowable Limit	0.006 (0,15)
Clearance Between Idle Gear Shaft & Idle Gear Bushing	0.001 to 0.0026 (0,025 to 0,066)
Allowable Limit	0.004 (0,10)
Idler Gear Side Clearance	0.005 to 0.019 (0,12 to 0,48)

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Thermostat

Valve Opening Temperature	177 to 182°F (81 to 84°C)
Valve Fully Open	203°F (95°C)

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

Engine Bolt Torque

	Ft.-Lb.	**N•m**
Camshaft Retainer Plate Bolts	17 to 20	23 to 27
* Connecting Rod Bolts	33 to 36	44 to 49
* Crankshaft Nut	101 to 116	137 to 157
* Cylinder Head Bolts	69 to 72	93 to 98
* Flywheel Bolts	72 to 80	98 to 108
Fuel Injection Tubeline Fittings	11 to 18	15 to 25
Glow Plugs	15 to 18	20 to 25
* Idler Gear Shaft Bolt	17 to 20	23 to 28
Injection Nozzle Clamp	19 to 22	26 to 29
* Main Bearing Bolts	51 to 54	69 to 74
* Main Bearing Case Bolts	34 to 38	46 to 51
Oil Switch	11 to 15	15 to 20
Rear Bearing Case Cover Bolts	17 to 20	24 to 28

* Lightly Oiled Threads

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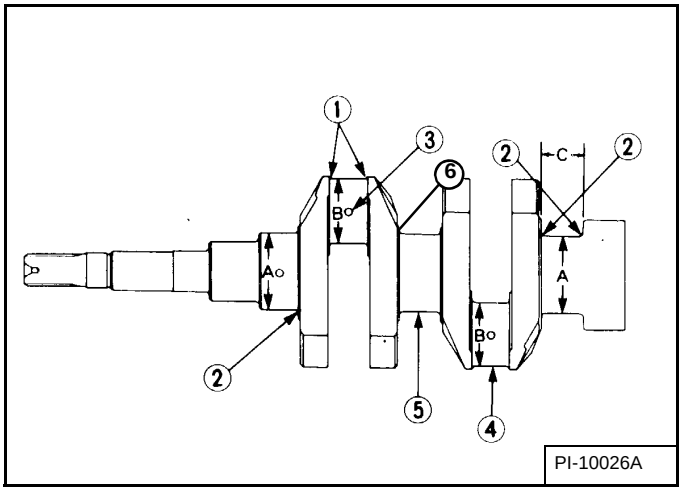
ENGINE SPECIFICATIONS (S/N 562811001 & ABOVE, 563111001 & ABOVE AND 563211001 & ABOVE) (CONT'D)

Crankshaft Re-Grind Data

If the standard size bearing cannot be used due to excessive wear of the crankpin and crank journal use undersize or oversize bearings.

For undersize or oversize bearing use, follow the precautions noted below.

Figure SPEC-20-1



Grind the crankpin and journal with a wheel which has specified round corner and width without shoulder **[Figure SPEC-20-1]**.

1. 0.1299 to 0.1457 in. (3,3 to 3,7 mm) radius.
2. 0.1102 to 0.1260 in. (2,8 to 3,2 mm) radius.
3. Chamfer the oil hole circumference to 0.04 to 0.06 in. (1,0 to 1,5 mm) radius with an oil stone.
4. The crankpin must be fine finished to higher than (0,8S).
5. The crank journal must be fine-finished to higher than (0,8S).
6. The crank journal side surface must be fine-finished to higher than (0,8S).

SIZE	CODE NO.	NAME OF BEARING	BEARING MARK	CRANKSHAFT PROCESSING DIM.	
-0.008 in. (0,2 mm)	1A091-23911	Crankshaft Bearing 1 0.008 in. minus (0,2 minus)	020 US	A	2.0363 to 2.037 in. (51,721 to 51,74 mm)
-0.008 in. (0,2 mm)	1A091-23931	Crankshaft Bearing 2 0.00 in. minus (0,2 minus)	020 US		
-0.016 in. (0,4 mm)	1A091-23921	Crankshaft Bearing 1 0.016 in. minus (0,4 minus)	040 US	A	2.0284 to 2.0291 in. (51,521 to 51,54 mm)
-0.016 in. (0,4 mm)	1A091-23941	Crankshaft Bearing 2 0.016 in. minus (0,4 minus)	040 US		
-0.008 in. (0,2 mm)	17331-22970	Crank Pin Bearing 0.008 in. minus (0,2 minus)	020 US	B	1.8409 to 1.8415 in. (46,759 to 46,775 mm)
-0.016 in. (0,4 mm)	17331-22980	Crank Pin Bearing 0.016 in. minus (0,4 minus)	040 US	B	1.8330 to 1.8337 in. (46,559 to 46,575 mm)
+0.008 in. (+0,2 mm)	1A091-23951	Thrust Bearing 1 - 0.008 in. plus (0,2 mm plus)	020 OS	C	1.0315 to 1.0335 in. (26,20 to 26,25 mm)
	1A091-23971	Thrust Bearing 2 - 0.008 in. plus (0,2 mm plus)			
+0.016 in. (+0,4 mm)	1A091-23961	Thrust Bearing 1 - 0.016 in. plus (0,4 mm plus)	040 OS	C	1.0394 to 1.0413 in. (26,4 to 26,45 mm)
	1A091-23981	Thrust Bearing 2 - 0.016 in. plus (0,4 mm plus)			

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TORQUE SPECIFICATIONS

Torque for General SAE Bolts

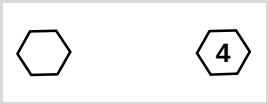
The following table shows standard torque specifications for bolts with zinc phosphate coating. Bolts purchased from Bobcat that have zinc phosphate coating are specified by the letter H following the part number.

THREAD SIZE		SAE GRADE 5	SAE GRADE 8
INCH. LBS. (Nm)	.250	80-90 (9,0-10,2)	110-120 (12,4-13,6)
	.3125	180-200 (20,3-22,6)	215-240 (24,2-27,1)
FOOT LBS. (Nm)	.375	25-28 (34-38)	35-40 (47-54)
	.4375	40-45 (54-61)	60-65 (81-88)
	.500	65-70 (88-95)	90-100 (122-136)
	.5625	90-100 (122-136)	125-140 (170-190)
	.625	125-140 (170-190)	175-190 (240-260)
	.750	220-245 (300-330)	300-330 (410-450)
	.875	330-360 (450-490)	475-525 (645-710)
	1.000	475-525 (645-710)	725-800 (985-1085)
	1.125	650-720 (880-975)	1050-1175 (1425-1600)
	1.250	900-1000 (1200-1360)	1475-1625 (2000-2200)
	1.375	1200-1350 (1630-1830)	2000-2200 (2720-2980)
	1.500	1500-1650 (2040-2240)	2600-2850 (3530-3870)
	1.625	2000-2800 (2720-2980)	3450-3800 (4680-5150)
	1.750	2500-2750 (3390-3730)	4300-4800 (5830-6500)
	1.875	3150-3500 (4270-4750)	5500-6100 (7450-8300)
	2.000	3800-4200 (5150-5700)	6500-7200 (8800-9800)

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TORQUE SPECIFICATIONS (CONT'D)

Torque For General Metric Bolts

GRADE		STANDARD SCREW AND BOLT			SPECIAL SCREW AND BOLT		
							
NOMINAL DIAMETER	**UNIT**	**N M**	**KFG M**	**FT LBS**	**N M**	**KFG M**	**FT LBS**
M6		7.9 to 9.3	0.80 to 0.95	5.8 to 6.9	9.8 to 11.3	1.00 to 1.15	7.23 to 8.32
M8		17.7 to 20.6	1.8 to 2.1	13.0 to 15.2	23.5 to 27.5	2.4 to 2.8	17.4 to 20.3
M10		39.2 to 45.1	4.0 to 4.6	28.9 to 33.3	48.1 to 55.9	4.9 to 5.7	35.4 to 41.2
M12		62.8 to 72.6	6.4 to 7.4	46.3 to 53.5	77.5 to 90.2	7.9 to 9.2	57.1 to 66.5

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HYDRAULIC CONNECTION SPECIFICATIONS

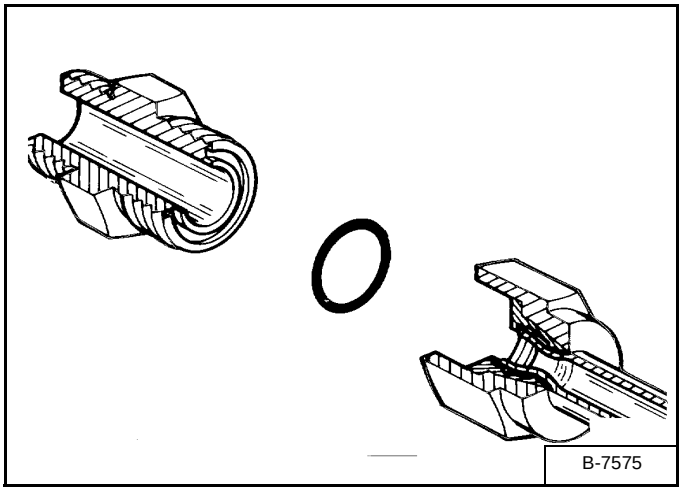
O-Ring Face Seal Connection

IMPORTANT

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

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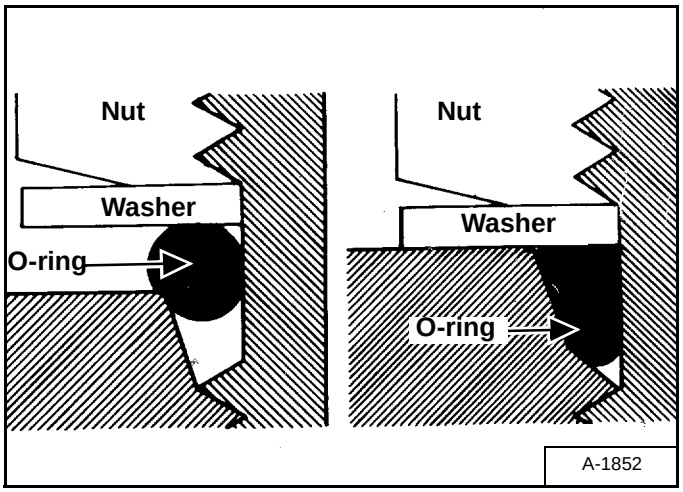
Figure SPEC-40-1



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

Straight Thread O-ring Fitting

Figure SPEC-40-2



Lubricate the O-ring before installing the fitting. Loosen the jam nut and install the fitting. Tighten the jam nut until the washer is tight against the surface **[Figure SPEC-40-2]**.

Tubelines And Hoses

Replace any tubelines that are bent or flattened. They will restrict flow, which will slow hydraulic action and cause heat.

Replace hoses which show signs of wear, damage or weather cracked rubber.

Always use two wrenches when loosening and tightening hose or tubeline fittings.

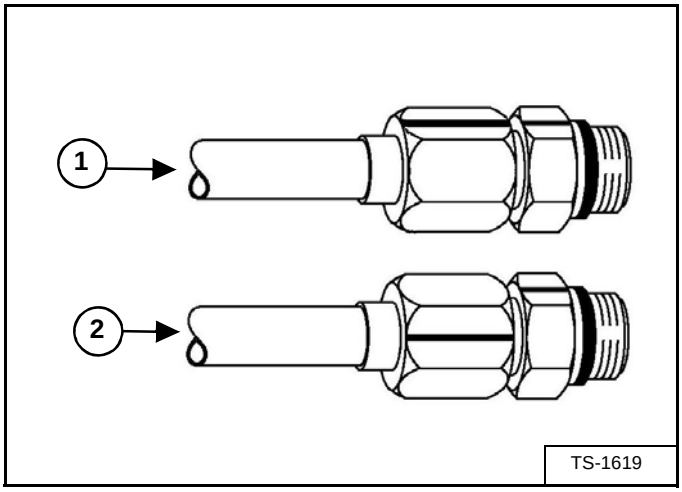
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HYDRAULIC CONNECTION SPECIFICATIONS (CONT'D)

Flare Fitting

Use the following procedure to tighten the flare fitting:

Figure SPEC-40-3



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

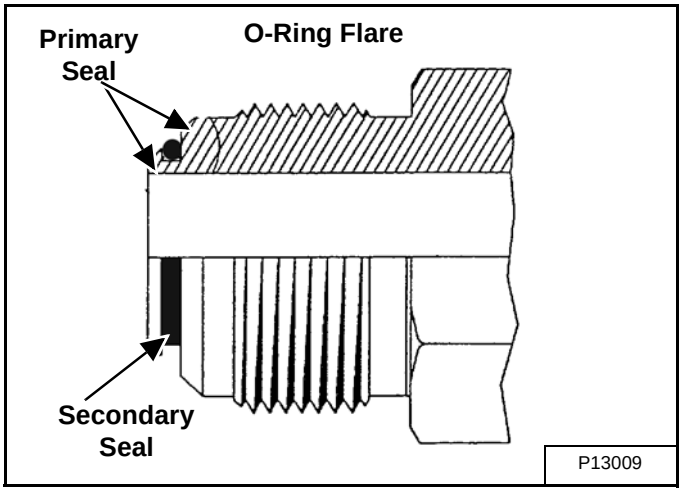
Use the chart below to find the correct tightness needed (Item 2) **[Figure SPEC-40-3]**. If the fitting leaks after tightening, disconnect it and inspect the seat area for damage.

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

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O-Ring Flare Fitting

Figure SPEC-40-4

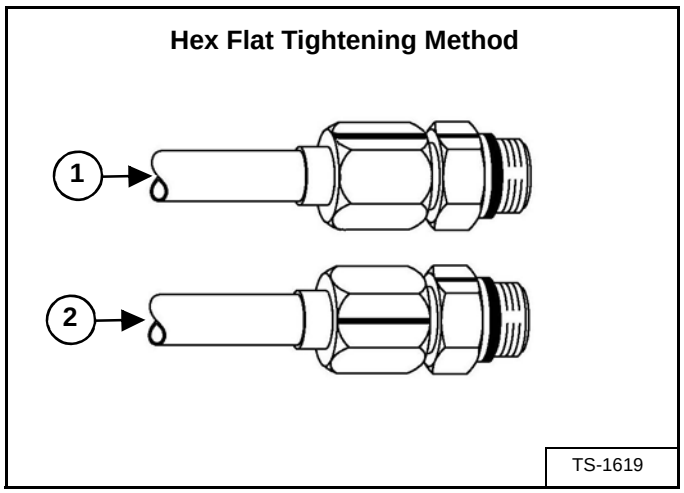


The flare is the primary seal, the O-ring is the secondary seal and helps absorb vibration and pressure pulses at the connection **[Figure SPEC-40-4]**.

If necessary, the O-ring-flare fitting can be used without an O-ring.

Use the following procedure to tighten the O-ring flare fitting.

Figure SPEC-40-5



Tighten the nut until it contacts with the seat. Make a mark across the flats of both the male and female parts of the connection (Item 1) **[Figure SPEC-40-5]**.

Use the chart below to find the correct tightness needed (Item 2) **[Figure SPEC-40-5]**. If the fitting leaks after tightening, disconnect it and inspect the seat area for

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

* If a torque wrench is used to tighten a new fitting to a used hose/tubeline.	** If using the hex flat tightening method to tighten a new fitting to a new hose/tubeline.
* If a torque wrench is used to tighten a used fitting to a new hose/tubeline.	** If using the hex flat tightening method to tighten a new fitting to a used hose/tubeline.
* If a torque wrench is used to tighten a new fitting to a new hose/tubeline.	*** If using the hex flat tightening method to tighten a used fitting to a new hose/tubeline.

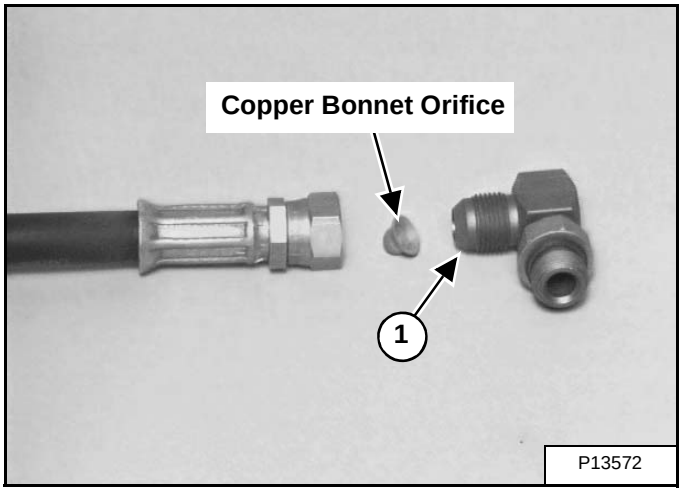
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O-Ring Flare Fitting (Cont'd)

NOTE: O-ring flare fittings are not recommended in all applications. Use the standard flare fittings in these applications.

Do not use a O-ring flare fitting when a copper bonnet orifice is used. When tightened the connection at the bonnet may distort the flare face and prevent it from sealing.

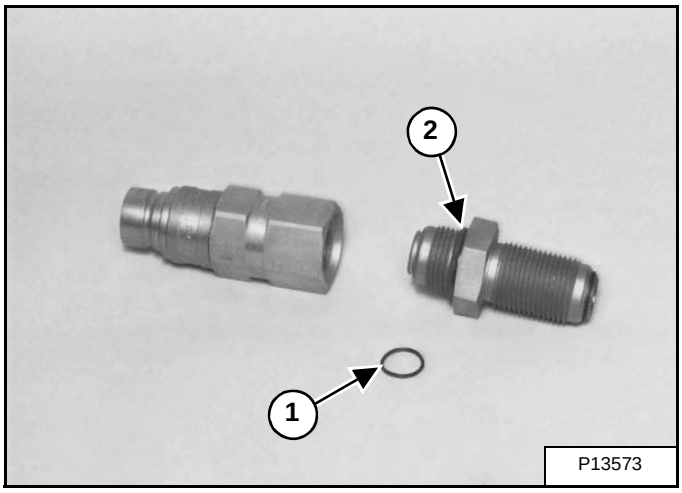
Figure SPEC-40-6



Use a standard flare fitting (Item 1) **[Figure SPEC-40-6]** as shown.

When a O-ring flare fitting is used as a straight thread port adapter the O-ring flare face is not used to seal. The O-ring may come off the fitting and enter the system.

Figure SPEC-40-7



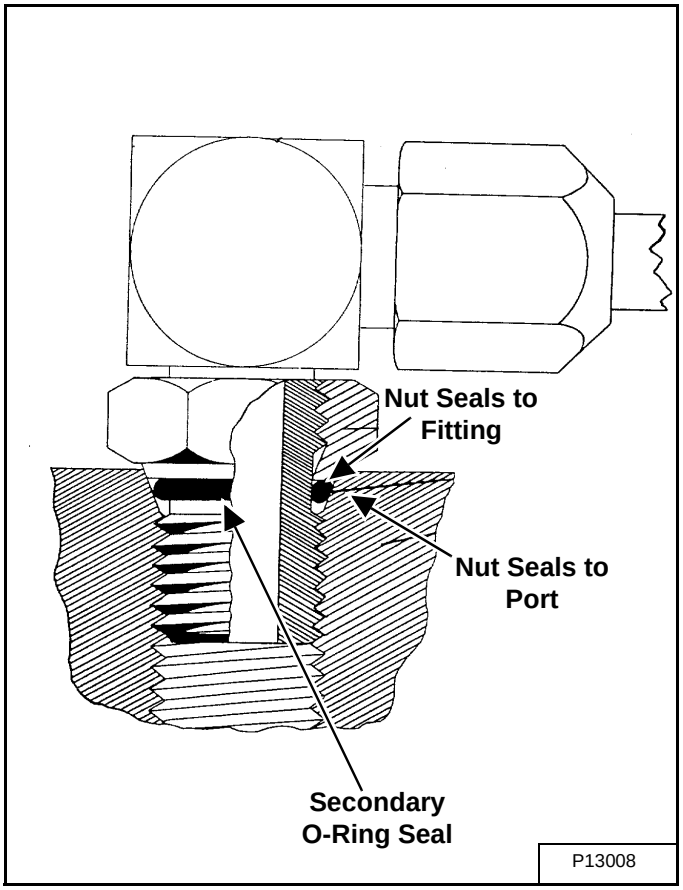
Always remove the O-ring (Item 1) **[Figure SPEC-40-7]** from the flare face as shown.

An O-ring (Item 2) **[Figure SPEC-40-7]** is added to the flat boss of the fitting to seal the connection in this application.

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Port Seal Fitting

Figure SPEC-40-8



The nut is the primary seal, the O-ring is the secondary seal and helps absorb vibration and pressure pulses at the connection **[Figure SPEC-40-8]**.

The hex portion of the nut does not contact the surface of the component when the nut is tight.

Use the following procedure to tighten the port seal fitting:

Port seal and nut, washer and O-ring (O-ring Boss) fittings use the same tightening torque valve chart.

If a torque wrench cannot be used, use the following method.

Tighten the nut until it just makes metal to metal contact, you can feel the resistance.

Tighten the nut with a wrench no more than one hex flat maximum.

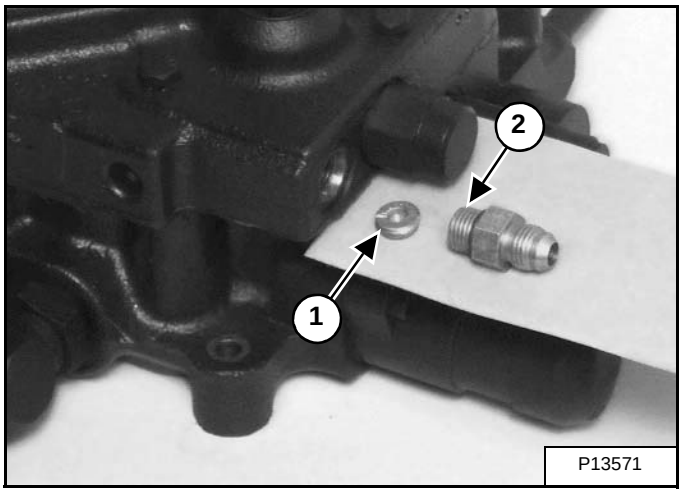
Do not over tighten the port seal fitting.

PORT SEAL AND O-RING BOSS TIGHTENING TORQUE		
FITTING NUT WRENCH SIZE	**THREAD SIZE (NM)**	**TORQUE FT.-LBS. (NM)**
11/16"	9/16" - 18	22 (30)
15/16"	3/4" - 16	40 (54)
1-1/8"	7/8" - 14	60 (81)
1-1/4"	1-1/16" - 12	84 (114)
1-1/2"	1-5/16" - 12	118 (160)

NOTE: If a torque wrench cannot be used, use the hex flat tightening method as an approximate guideline.

NOTE: Port seal fittings are not recommended in all applications. Use O-ring boss fittings in these applications.

Figure SPEC-40-9



Do not use port seal fittings when a thread in orifice (Item 1) **[Figure SPEC-40-9]** is used in the port. The orifice may interfere with the fitting and prevent it from sealing.

Use an O-ring boss fitting (Item 1) **[Figure SPEC-40-9]** as shown.

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HYDRAULIC FLUID SPECIFICATIONS

Specifications

Use Bobcat hydraulic fluid.

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

Bobcat hydraulic fluid is available in 2.5 gal. (9,5 L) (P/N 6903117 qty 2), 5 gal. (18.9 L) (P/N 6903118) and 55 gal. (208 L) (P/N 6903119).

⚠ WARNING

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

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

⚠ WARNING

During cold weather 32°F (0°C) and below, do not operate machine until the engine has run for at least five (5) minutes at less than half throttle. This warm-up period is necessary for foot pedal operation and safe stopping. Do not operate controls during warm-up period. When temperatures are below -20°F (30°C), the hydrostatic oil must be heated or kept warm. The hydrostatic system will not get enough oil at low temperatures. Park the machine in an area where the temperature will be above 0°F (-18°C), if possible.

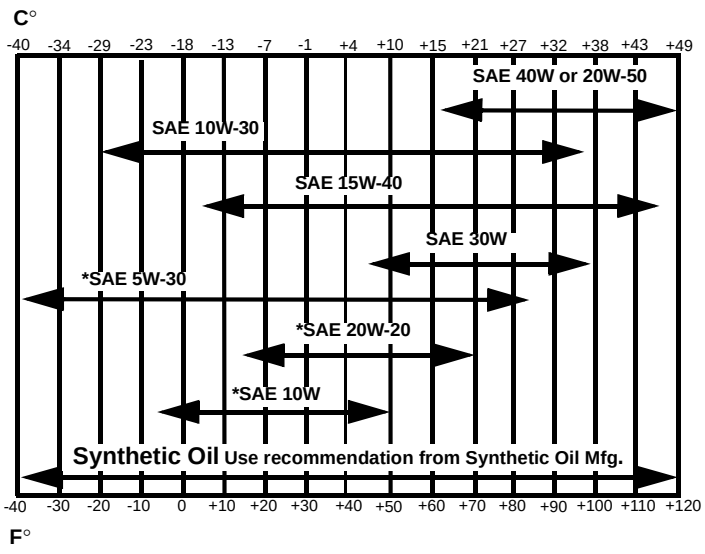
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FUEL, COOLANT AND LUBRICANTS

Chart

Use this chart for correct selection of Fuel, Coolant and Lubricants.

RESERVOIR	KIND OF FLUID	RECOMMENDED SAE VISCOSITY NUMBER (LUBRICATION OILS FOR DIESEL ENGINE CRANKCASE)	CAPACITY REFILL
Engine oil w/ filter	*Use SAE Viscosity Number as Listed With API Classification CD or Better	 **TEMPERATURE RANGE ANTICIPATED BEFORE NEXT OIL CHANGE (DIESEL ENGINES MUST USE API CLASSIFICATION CD, CF4, CG4)** *Can be used ONLY when available with appropriate diesel rating.	7.5 qts. (7,1 L)
Fuel Tank	Diesel Fuel	**Temp. F°** / **No. 2** / **No. 1** + 15° (9°) 100% 0% Down to -20° (-29°) 50% 50% Below -20° (-29°) 0% 100%	17.8 gal. (67,4 L)
Cooling System	**Coolant Mixture		4.5 gal. (17.0 L)
Hydraulic Tank	Bobcat Fluid	P/N 6903117 - 2.5 gal (9.52 L) P/N 6903118 - 5 gal (18.9 L) P/N 6903119 - 55 gal (208 L)	Tank Cap. 9.7 gal. (36,7 L)
Travel Motor (each)	Gear Lube	SAE - 90W	0.55 qt (0.5 L)

ENGINE OIL SPECIFICATIONS

When fuel sulphur content is less than 0.5% change the engine oil and filter as shown in the Service Schedule. (See Chart on Page 10-50-1)

Change engine oil and filter according to the following chart if fuel sulphur content is above 0.5%.

FUEL SULPHUR CONTENT	CHANGE INTERVAL OF ENGINE & OIL FILTER
0.5 to 1.0%	1/2 of Regular Interval
Above 1.0%	1/4 of Regular Interval

***** *COOLANT MIXTURE*

Propylene Glycol (Factory Installed)

Add premixed coolant; 47% water and 53% propylene glycol to the recovery tank if the coolant level is low.

One gallon and one pint of propylene glycol mixed with one gallon of water is the correct mixture of coolant to provide a -34°F (-37°C) freeze protection.

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

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CONVERSIONS

Decimal And Millimeter Equivalents

FRACTIONS	DECIMALS	MM
1/64	0.015625	0.397
1/32	0.03125	0.794
3/64	0.046875	1.191
1/16	0.0625	1.588
5/64	0.078125	1.984
3/32	0.09375	2.381
7/64	0.109375	2.778
1/8	0.1250	3.175
9/64	0.140625	3.572
5/32	0.15625	3.969
11/64	0.171875	4.366
3/16	0.1876	4.762
13/64	0.203125	5.159
7/32	0.21875	5.556
15/64	0.234375	5.953
1/4	0.2500	6.350
17/64	0.265625	6.747
9/32	0.28125	7.144
19/64	0.296875	7.541
5/16	0.3125	7.938
21/64	0.328125	8.334
11/32	0.34375	8.731
23/64	0.359375	9.128
3/8	0.3750	9.525
25/64	0.390625	9.922
13/32	0.40625	10.319
27/64	0.421875	10.716
7/16	0.4375	11.112
29/64	0.453125	11.509
15/32	0.46875	11.906
31/64	0.484375	12.303
1/2	0.5000	12.700

FRACTIONS	DECIMALS	MM
33/64	0.515625	13.097
17/32	0.53125	13.494
35/64	0.546875	13.891
9/16	0.5625	14.288
37/64	0.578125	14.684
19/32	0.59375	15.081
39/64	0.609375	15.478
5/8	0.6250	15.875
41/64	0.640625	16.272
21/32	0.65625	16.669
43/64	0.671875	17.066
11/16	0.6875	17.462
45/64	0.703125	17.859
23/32	0.71875	18.256
47/64	0.734375	18.653
3/4	0.7500	19.050
49/64	0.765625	19.447
25/32	0.78125	19.844
51/64	0.796875	20.241
13/16	0.8125	20.638
53/64	0.828125	21.034
27/32	0.84375	21.431
55/64	0.859375	21.828
7/8	0.8750	22.225
57/64	0.890625	22.622
29/32	0.90625	23.019
59/64	0.921875	23.416
15/16	0.9375	23.812
61/64	0.953125	24.209
31/32	0.96875	24.606
63/64	0.984375	25.003
1	1.000	25.400

1 mm = 0.03937”

0.001 = 0.0254 mm

U.S. To Metric Conversion Chart

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

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ROUTE TO ATTENTION	
PARTS MANAGER	☐
SERVICE MANAGER	☒
SALES MANAGER	☐

SERVICE MANUAL REVISION

NOTICE **Insert This Sheet With The Below Listed Manual For Future Reference.**

Revision No: 435-1
Date: 12 February, 2004
Product: Bobcat Excavator
Model: 435
Manual No: 6902331 (10-03)

The following pages are a revision to the above Service Manual.

Take out existing pages and put in the new pages as listed below:

TAKE OUT	PUT IN	REVISION DESCRIPTION
Cover	Cover	Serial Number Added
20-01, 20-02	20-01, 20-02	Revised text
20-50-1 through 20-50-54	20-50-1 through 20-50-54	Revised text
	20-110-1 through 20-110-18	Added text
	20-111-1 through 20-111-18	Added text
	20-150-1 through 20-150-4	Added text
40-01, 40-02	40-01, 40-02	Revised text
40-20-1 through 40-20-6	40-20-1 through 40-20-8	Revised text
	60-10-1, 60-10-2	Added text
80-01, 80-02	80-01, 80-02	Revised text
	80-50-1 through 80-50-4	Added text
	80-70-1, 80-70-2	Added text

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ROUTE TO ATTENTION	
PARTS MANAGER	☐
SERVICE MANAGER	☒
SALES MANAGER	☐

SERVICE MANUAL REVISION

NOTICE **Insert This Sheet With The Below Listed Manual For Future Reference.**

Revision No: **435-2**
Date: **6 March, 2004**
Product: **Bobcat Excavator**
Model: **435**
Manual No: **6902331 (10-03)**

The following pages are a revision to the above Service Manual.

Take out existing pages and put in the new pages as listed below:

TAKE OUT	PUT IN	REVISION DESCRIPTION
435 HYD/HYD SCHEMATIC S/N 562611001 AND ABOVE Printed October 2003 V-380	435 HYD/HYD SCHEMATIC S/N 562611001 AND ABOVE S/N 562811001 AND ABOVE Printed March 2004 V-380	Revised Schematic
20-01 through 20-02	20-01 through 20-02	Revised Text
20-10-1 through 20-10-6	20-10-1 through 20-10-6	Revised Text
20-50-1 through 20-50-54	20-50-1 through 20-50-54	Revised Text
20-60-1 through 20-60-24	20-60-1 through 20-60-28	Revised Text
	20-112-1 through 20-112-6	Added Text
	20-180-1 through 20-180-10	Added Text
40-01, 40-02	40-01, 40-02	Revised Text
40-30-1, 40-30-2	40-30-1 through 40-30-4	Revised Text
	40-50-1 through 40-50-6	Added Text
	40-60-1 through 40-60-6	Added Text
	40-70-1 through 40-70-6	Added Text
50-01, 50-02	50-01, 50-02	Revised Text
	50-210-1 through 50-210-4	Added Text
60-01, 60-02	60-01, 60-02	Revised Text
WIRING SCHEMATIC 435 (S/N 562611001 AND ABOVE) Printed October 2003 V-0381	WIRING SCHEMATIC 435 (S/N 562611001 AND ABOVE) (S/N 562811001 AND ABOVE) Printed March 2004 V-0381	Revised Schematic

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TAKE OUT	PUT IN	REVISION DESCRIPTION
WIRING SCHEMATIC OPTIONS 435 (S/N 562611001 AND ABOVE) Printed October 2003 V-0382	WIRING SCHENMATIC OPTIONS 435 (S/N 562611001 AND ABOVE) (S/N 562811001 AND ABOVE) Printed March 2004 V-0382	Revised Schematic
	60-30-1 through 60-30-10	Added Text
60-40-1 through 60-40-16	60-40-1 through 60-40-16	Revised Text
	60-50-1, 60-50-2	Added Text
	60-70-1, 60-70-2	Added Text
60-80-1, 60-80-2	60-80-1, 60-80-2	Revised Text
80-01, 80-02	80-01, 80-02	Revised Text
	80-80-1 through 80-80-16	Added Text
	80-130-1 through 80-130-6	Added Text
	80-140-1 through 80-140-4	Added Text

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ROUTE TO ATTENTION	
PARTS MANAGER	☐
SERVICE MANAGER	☒
SALES MANAGER	☐

SERVICE MANUAL REVISION

NOTICE **Insert This Sheet With The Below Listed Manual For Future Reference.**

Revision No: **435-3**
Date: **10 May, 2004**
Product: **Bobcat Excavator**
Model: **435**
Manual No: **6902331 (10-03)**

The following pages are a revision to the above Service Manual.

Take out existing pages and put in the new pages as listed below:

TAKE OUT	PUT IN	REVISION DESCRIPTION
20-01 through 20-04	20-01 through 20-04	Revised Text
	20-20-1 through 20-20-12	Added Text
	20-21-1 through 20-21-12	Added Text
	20-23-1 through 20-23-10	Added Text
	20-24-1 through 20-24-8	Added Text
20-50-1 through 20-50-54	20-50-1 through 20-50-56	Revised Text
20-70-1 through 20-70-12	20-70-1 through 20-70-34	Revised Text
20-112-1 through 20-112-6	20-112-1 through 20-112-6	Revised Text
	20-120-1, 20-120-2	Added Text
	20-130-1, 20-130-2	Added Text
	20-140-1 through 20-140-4	Added Text
20-150-1, 20-150-2	20-150-1 through 20-150-4	Revised Text
	20-170-1 through 20-170-4	Added Text
	20-190-1 through 20-190-4	Added Text
30-01, 30-02	30-01, 30-02	Revised Text
	30-30-1 through 30-30-34	Added Text
40-01, 40-02	40-01, 40-02	Revised Text
	40-10-1, 40-10-2	Added Text
	40-80-1, 40-80-2	Added Text

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TAKE OUT	PUT IN	REVISION DESCRIPTION
50-01, 50-02	50-01, 50-02	Revised Text
	50-10-01 through 50-10-6	Added Text
	50-20-01 through 50-20-4	Added Text
	50-50-1 through 50-50-4	Added Text
	50-60-01 through 50-60-16	Added Text
	50-160-01, 50-160-2	Added Text
	50-180-01, 50-180-2	Added Text
	50-190-01, 50-190-2	Added Text
70-01, 70-02	70-01, 70-02	Revised Text
	70-20-1, 70-20-2	Added Text
	70-30-1, 70-30-2	Added Text
	70-40-1 through 70-40-6	Added Text
	70-60-1 through 70-60-8	Added Text
	70-70-1, 70-70-2	Added Text
	70-71-1, 70-71-2	Added Text
80-01, 80-02	80-01, 80-02	Revised Text
	80-30-1, 80-30-2	Added Text
	80-150-1, 80-150-2	Added Text
	80-160-1, 80-160-2	Added Text

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SERVICE MANUAL REVISION

ROUTE TO ATTENTION	
PARTS MANAGER	☐
SERVICE MANAGER	☒
SALES MANAGER	☐

NOTICE **Insert This Sheet With The Below Listed Manual For Future Reference.**

Revision No: **435-4**
Date: **11 June 2004**
Product: **Bobcat Excavator**
Model: **435**
Manual No: **6902331 (10-03)**

The following pages are a revision to the above Service Manual.

Take out existing pages and put in the new pages as listed below:

TAKE OUT	PUT IN	REVISION DESCRIPTION
20-01	20-01	Revised Text
	20-22	Added Text
	20-31	Added Text
	20-32	Added Text
	20-33	Added Text
	20-40	Added Text
20-60	20-60	Revised Text
	20-90	Added Text
20-150	20-150	Added Text
	20-160	Added Text
20-180	20-180	Revised Text
	20-200	Added Text
30-01	30-01	Revised Text
30-10	30-10	Revised Text
30-20	30-20	Revised Text
	30-31	Added Text
50-01	50-01	Revised Text
50-10	50-10	Revised Text
	50-90	Added Text
	50-100	Added Text
	50-110	Added Text
	50-220	Added Text

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TAKE OUT	PUT IN	REVISION DESCRIPTION
70-01	70-01	Revised Text
	70-50	Added Text
	70-80	Added Text
	70-81	Added Text
SPEC-01	SPEC-01	Revised Text
SPEC-10	SPEC-10	Revised Text

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SERVICE MANUAL REVISION

ROUTE TO ATTENTION	
PARTS MANAGER	☐
SERVICE MANAGER	☒
SALES MANAGER	☐

NOTICE **Insert This Sheet With The Below Listed Manual For Future Reference.**

Revision No: **435-5**
Date: **15 Feb 2005**
Product: **Bobcat Excavator**
Model: **435**
Manual No: **6902331 (10-03)**

The following sections are a revision to the above Service Manual.

Take out existing sections and put in the new sections as listed below:

TAKE OUT	PUT IN	REVISION DESCRIPTION
I - VIII	I - VIII	Revised Text
10-01	10-01	Revised Text
10-20	10-20	Revised Text
10-50	10-50	Revised Text
10-80	10-80	Revised Text
10-100	10-100	Revised Text
20-01	20-01	Revised Text
20-20	20-20	Revised Text
	20-25	Added Text
20-31	20-31	Revised Text
20-40	20-40	Revised Text
	20-41	Added Text
20-50	20-50	Revised Text
	20-51	Added Text
20-60	20-60	Revised Text
	20-61	Added Text
20-70	20-70	Revised Text
	20-71	Added Text
20-80	20-80	Revised Text
20-90	20-90	Revised Text
20-91	20-91	Revised Text
	20-100	Added Text
20-180	20-180	Revised Text
30-01	30-01	Revised Text
30-10	30-10	Revised Text
30-20	30-20	Revised Text

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TAKE OUT	PUT IN	REVISION DESCRIPTION
40-01	40-01	Revised Text
40-50	40-50	Revised Text
40-60	40-60	Revised Text
40-70	40-70	Revised Text
40-80	40-80	Revised Text
50-01	50-01	Revised Text
	50-30	Added Text
50-50	50-50	Revised Text
50-60	50-60	Revised Text
	50-70	Added Text
	50-80	Added Text
50-120	50-120	Revised Text
	50-130	Added Text
	50-140	Added Text
	50-150	Added Text
50-160	50-160	Revised Text
	50-170	Added Text
50-200	50-200	Revised Text
60-01	60-01	Revised Text
60-20	60-20	Revised Text
	60-60	Added Text
60-80	60-80	Revised Text
70-01	70-01	Revised Text
70-20	70-20	Revised Text
70-80	70-80	Revised Text
70-81	70-81	Revised Text
80-01	80-01	Revised Text
	80-10	Added Text
	80-20	Added Text
80-80	80-80	Revised Text
80-90	80-90	Revised Text
80-110	80-110	Revised Text
	80-140	Added Text
	80-170	Added Text
	80-180	Added Text
	80-190	Added Text
	80-200	Added Text
	80-210	Added Text
	80-220	Added Text
SPEC-01	SPEC-01	Revised Text
SPEC-10	SPEC-10	Revised Text
	SPEC-20	Added Text
	SPEC-21	Added Text
SPEC-50	SPEC-50	Revised Text
SPEC-60	SPEC-60	Revised Text

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SERVICE MANUAL REVISION

ROUTE TO ATTENTION	
PARTS MANAGER	☐
SERVICE MANAGER	☒
SALES MANAGER	☐

NOTICE **Insert This Sheet With The Below Listed Manual For Future Reference.**

Revision No: **435-6**
Date: **17 Sept 2005**
Product: **Bobcat Excavator**
Model: **435**
Manual No: **6902331 (10-03)**

The following sections are a revision to the above Service Manual.

Take out existing sections and put in the new sections as listed below:

TAKE OUT	PUT IN	REVISION DESCRIPTION
Cover	Cover	Revised Text
Alphabetical Index	Alphabetical Index	Revised Text
Contents	Contents	Revised Text
20-01	20-01	Revised Text
20-10	20-10	Revised Text
20-31	20-31	Revised Text
20-50	20-50	Revised Text
20-51	20-51	Revised Text
20-61	20-61	Revised Text
20-71	20-71	Revised Text
20-90	20-90	Revised Text
20-100	20-100	Revised Text
20-112	20-112	Revised Text
	20-113	Added Text
20-150	20-150	Revised Text
20-160	20-160	Revised Text
20-170	20-170	Revised Text
20-180	20-180	Revised Text
20-200	20-200	Revised Text
30-01	30-01	Revised Text
30-10	30-10	Revised Text
30-20	30-20	Revised Text
30-30	30-30	Revised Text
30-31	30-31	Revised Text

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TAKE OUT	PUT IN	REVISION DESCRIPTION
40-01	40-01	Revised Text
40-20	40-20	Revised Text
40-30	40-30	Revised Text
40-50	40-50	Revised Text
50-01	50-01	Revised Text
50-30	50-30	Revised Text
60-01	60-01	Revised Text
60-30	60-30	Revised Text
60-90	60-90	Revised Text
70-01	70-01	Revised Text
70-50	70-50	Revised Text
	70-51	Added Text
70-60	70-60	Revised Text
70-70	70-70	Revised Text
70-71	70-71	Revised Text
70-80	70-80	Revised Text
70-81	70-81	Revised Text
80-01	80-01	Revised Text
SPEC-01	SPEC-01	Revised Text
SPEC-10	SPEC-10	Revised Text
SPEC-20	SPEC-20	Revised Text
SPEC-21	SPEC-21	Revised Text

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SERVICE MANUAL REVISION

ROUTE TO ATTENTION	
PARTS MANAGER	☐
SERVICE MANAGER	☒
SALES MANAGER	☐

NOTICE **Insert This Sheet With The Below Listed Manual For Future Reference.**

Revision No: **435-7**
Date: **5 December 2005**
Product: **Bobcat Excavator**
Model: **435**
Manual No: **6902331 (10-03)**

The following sections are a revision to the above Service Manual.

Take out existing sections and put in the new sections as listed below:

TAKE OUT	PUT IN	REVISION DESCRIPTION
20-180	20-180	Revised Text
30-20	30-20	Revised Text
50-100	50-100	Revised Text

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SERVICE MANUAL REVISION

ROUTE TO ATTENTION	
PARTS MANAGER	☐
SERVICE MANAGER	☒
SALES MANAGER	☐

NOTICE **Insert This Sheet With The Below Listed Manual For Future Reference.**

Revision No: 435-8
Date: 24 March 2006
Product: Bobcat Excavator
Model: 435
Manual No: 6902331 (10-03)

435 Service Manual (P/N 6902331) Dated (2-06) contains updated service information which replaces the previous 435 Service Manual (P/N 6902331) Dated (10-03)

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ROUTE TO ATTENTION	
PARTS MANAGER	☐
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SALES MANAGER	☐

SERVICE MANUAL REVISION

NOTICE **Insert This Sheet With The Below Listed Manual For Future Reference.**

Revision No: **435-9**
Date: **1 July 2006**
Product: **Bobcat Excavator**
Model: **435**
Manual No: **6902331 (2-06)**

The following Sections are a revision to the above Service Manual.

Cover
ALPHABETICAL INDEX

10-110

HYDRAULIC SCHEMATIC
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20-71
20-210

30-10

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70-60

SPEC-10

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SERVICE MANUAL REVISION

ROUTE TO ATTENTION	
PARTS MANAGER	☐
SERVICE MANAGER	☒
SALES MANAGER	☐

NOTICE **Insert This Sheet With The Below Listed Manual For Future Reference.**

Revision No: **435-10**
Date: **15 November 2006**
Product: **Bobcat Excavator**
Model: **435**
Manual No: **6902331 (11-06)**

The following Sections are a revision to the above Service Manual

.	Front Cover	80-01
		80-10
	20-180	80-11
		80-20
	50-01	80-21
	50-70	80-30
	50-230	80-40
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		80-60
	60-01	80-70
	Electrical Schematics	80-80
	60-50	80-81
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		80-191
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		80-221

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SERVICE MANUAL REVISION

ROUTE TO ATTENTION	
PARTS MANAGER	☐
SERVICE MANAGER	☒
SALES MANAGER	☐

NOTICE **Insert This Sheet With The Below Listed Manual For Future Reference.**

Revision No: **435-11**
Date: **15 November 2007**
Product: **Bobcat Excavator**
Model: **435**
Manual No: **6902331 (11-06)**

The following Sections are a revision to the above Service Manual

. Front Cover

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SERVICE MANUAL REVISION

ROUTE TO ATTENTION	
PARTS MANAGER	☐
SERVICE MANAGER	☒
SALES MANAGER	☐

NOTICE **Insert This Sheet With The Below Listed Manual For Future Reference.**

Revision No: **435-12**
Date: **15 April 2008**
Product: **Bobcat Excavator**
Model: **435**
Manual No: **6902331 (4-08)**

The following Sections are a revision to the above Service Manual

. COVER

ALPHABETICAL INDEX

20-01
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20-114

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