

MAINTENANCE SAFETY

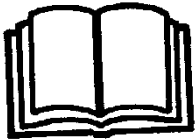


WARNING

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

CORRECT



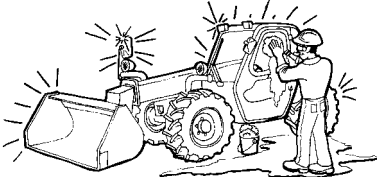
B-10731a

⚠ Never service the Massey Ferguson Telescopic Handler without instructions.



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

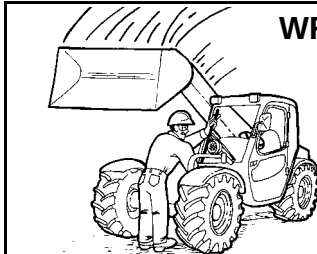
CORRECT



B-16082

⚠ Cleaning and maintenance are required daily.

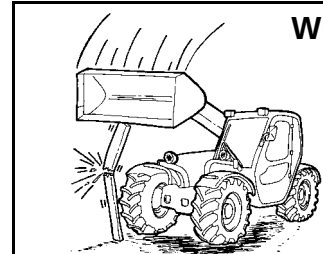
WRONG



B-16080

⚠ Disconnecting or loosening any hydraulic tubeline, hose, fitting, component or a part failure can cause boom to drop. Do not go under boom when raised unless supported by an approved boom stop. Replace if damaged.

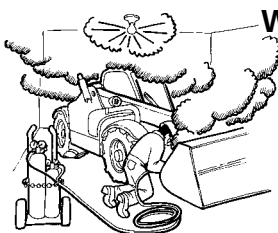
WRONG



B-16079

⚠ Never work on Telescopic Handler with boom up unless boom is held by an approved boom stop. Replace if damaged.
⚠ Never modify equipment or add attachments not approved by Massey Ferguson Company.

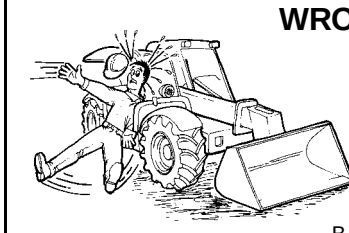
WRONG



B-16081

⚠ Have good ventilation when welding or grinding painted parts.
⚠ Wear dust mask when grinding painted parts. Toxic dust and gas can be produced.
⚠ Avoid exhaust fume leaks which can kill without warning. Exhaust system must be tightly sealed.

WRONG



B-16078

⚠ 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.

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 Massey Ferguson SERVICE PERSONNEL**. Always use genuine Massey Ferguson replacement parts. The Service Safety Training Course is available from your Massey Ferguson dealer.

MSW12-0601

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**SAFETY &
MAINTENANCE**

**HYDRAULIC
SYSTEM**

**HYDROSTATIC
SYSTEM**

**DRIVE
SYSTEM**

MAIN FRAME

**ELECTRICAL
SYSTEM &
ANALYSIS**

**ENGINE
SERVICE**

HVAC

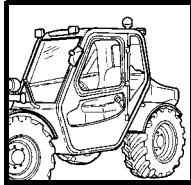
SPECIFICATIONS

FOREWORD

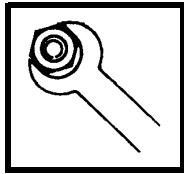
This manual is for the Massey Ferguson Telescopic Handler mechanic. It provides necessary servicing and adjustment procedures for the Massey Ferguson Telescopic Handler and its component parts and systems. Refer to the Operation & Maintenance Manual for operating instructions, Starting procedure, daily checks, etc.

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

1. Check that ROPS/FOPS (including right side window) is in good condition and is not modified.



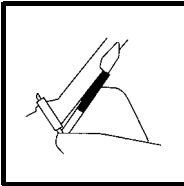
2. Check that ROPS mounting hardware is tightened and is Massey Ferguson approved.



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



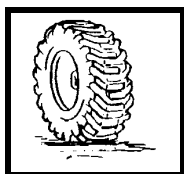
4. Check boom support device, replace if damaged.



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



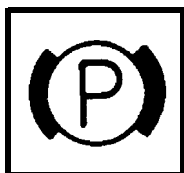
6. Check tyres for wear and pressure. Use only approved tyres.



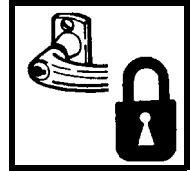
7. Check for correct function of the work lights.



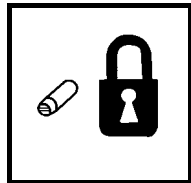
8. The parking brake must function correctly.



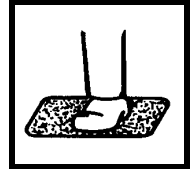
9. Enclosure door latches must open and close freely.



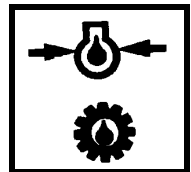
10. Attachment locking pins must function correctly and be in good condition.



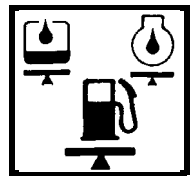
11. Safety treads must be in good condition.



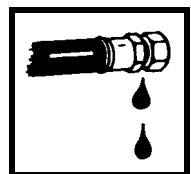
12. Check for correct function of indicator lamps and gauges.



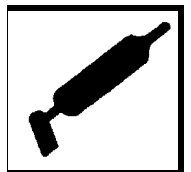
13. Check hydraulic fluid level, engine oil level and fuel supply.



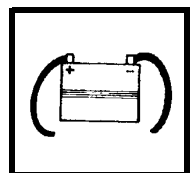
14. Inspect for fuel, oil or hydraulic fluid leaks.



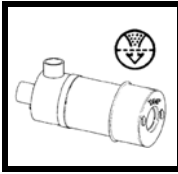
15. Lubricate the Telescopic Handler.



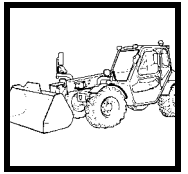
16. Check the condition of the battery and cables.



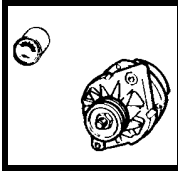
17. Inspect the air cleaner for damage or leaks. Check the condition of the element.



20. Operate the Telescopic Handler and check all functions.



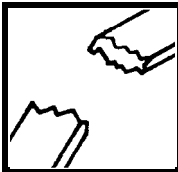
18. Check the electrical charging system.



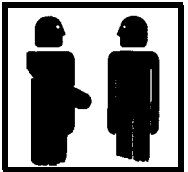
21. Check for any field modification not completed.



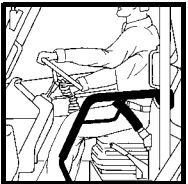
19. Inspect for loosen or broken parts or connections.



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



23. Check that LORS™ is in good condition and is not modified.



**CALIFORNIA
PROPOSITION 65 WARNING**

Diesel engine exhaust and some of its constituents are known to the State of California to cause cancer, birth defects and other reproductive harm.

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SAFETY INSTRUCTIONS



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



WARNING

Warnings on the machine and in the manuals are for your safety. Failure to obey warnings can cause injury or death.

W-2044-1285

IMPORTANT

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

I-2019-0284

The following publications provide information on the safe use and maintenance of the Telescopic Handler 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 Telescopic Handler gives operating information as well as routine maintenance and service procedures. It is a part of the Telescopic Handler and must stay with the machine when it is sold. Replacement Operation & Maintenance Manuals can be ordered from your Massey Ferguson Telescopic Handler dealer.

- The Telescopic Handler has machine signs (decals) which instruct on the safe operation and care. The signs and their locations are shown in the Operation & Maintenance Manual. Replacement signs are available from your Massey Ferguson Telescopic Handler dealer.
- The Telescopic Handler has a plastic Operator's Handbook fastened to the operator cab/canopy. Its 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 Massey Ferguson dealer for more information on translated versions.
- The EMI Safety Manual (available in Spanish) delivered with the Telescopic Handler 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 Telescopic Handler Operator Training Course is available through your local dealer. This course is intended to provide rules and practices for correct operation of the Massey Ferguson Telescopic Handler.
- The Service Safety Training Course is available from your Massey Ferguson dealer. This course provides information for safe and correct service procedures for Massey Ferguson Telescopic Handler.



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

SI15-0803

SAFETY INSTRUCTIONS (CONT'D)

FIRE PREVENTION

The machine has 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.

- Do not use the machine where exhaust, arcs, sparks or hot components can contact flammable material, explosive dust or gases.
- The operator cab/canopy, engine compartment and engine cooling system must be inspected every day and cleaned if necessary to prevent fire hazards and overheating.
- Check all electrical wiring and connections for damage. Keep the battery terminals clean and tight. Repair or replace any damaged part.
- Check fuel and hydraulic tubes, hoses and fittings for damage and leakage. Never use open flame or bare skin to check for leaks. 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.
- Do not use ether or starting fluids on any engine which has glow plugs or thermal starting systems. These starting aids can cause explosion and injure you or bystanders.
- Always clean the machine, disconnect the battery, and disconnect the wiring from the electronic 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.
- Stop the engine and let it cool before adding fuel. No smoking!
- Use the procedure in the Operation & Maintenance Manual for connecting the battery and for jump starting.

Figure 1



- Know where fire extinguishers and first aid kits are located and how to use them. Fire extinguishers are available from your Massey Ferguson dealer. The fire extinguisher can be installed in the location shown in **[Figure 1]**.

SI16-0803

SERIAL NUMBER LOCATIONS

Always use the serial number of the Telescopic Handler 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.

Telescopic Handler Serial Number

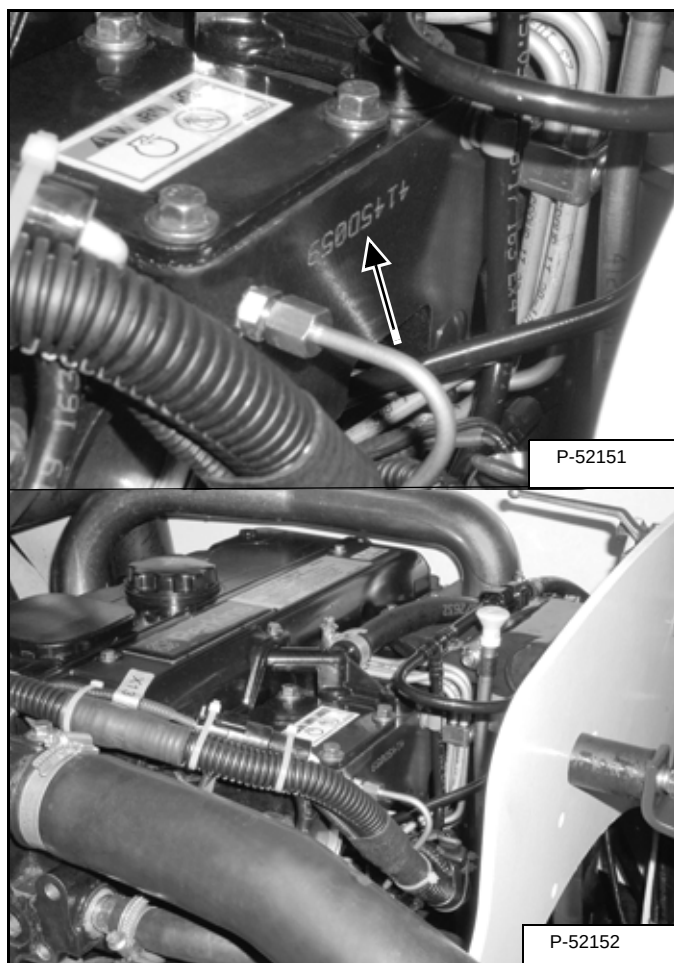
Figure 2



The front, on the right side of the chassis **[Figure 2]**.

Engine Serial Number

Figure 3



The engine serial number is stamped on a plate near the injection pump or at the rear of the cylinder block **[Figure 3]**. Always use the full number when ordering replacement parts.

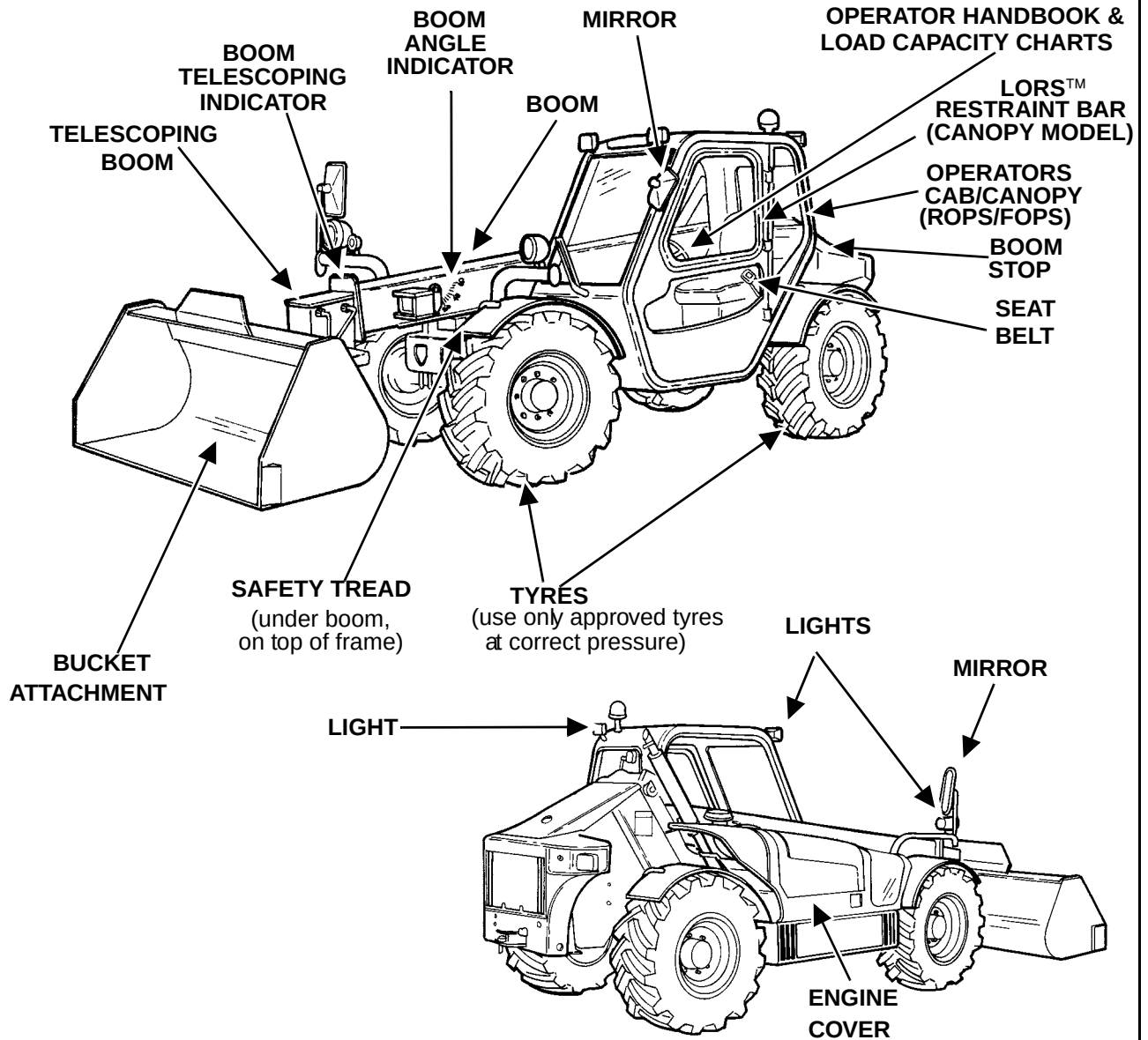
Other Serial Numbers

Some components may also have serial numbers. Always use these serial numbers when requesting parts.

Delivery Report

The Delivery Report must be filled out by the dealer and signed by the owner or operator when the Telescopic Handler is delivered. An explanation of the form must be given to the owner. Make sure it is filled out completely.

Massey Ferguson Telescopic Handler IDENTIFICATION



B-15886
B-23131

MAINTENANCE SAFETY

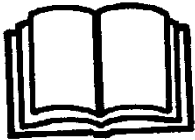


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W-2003-0199

CORRECT



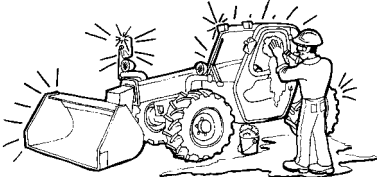
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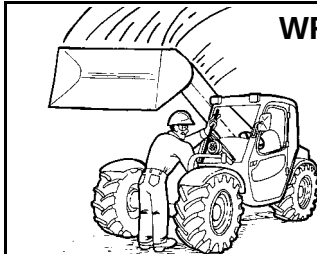
CORRECT



B-16082

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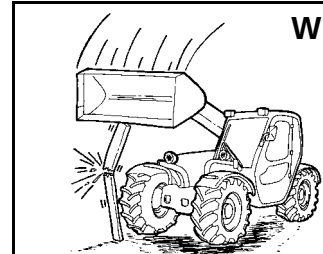
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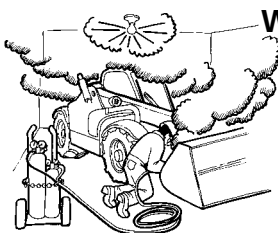
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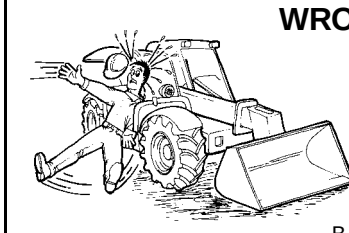
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B-16078

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MSW12-0601

SAFETY AND MAINTENANCE

SAFETY & MAINTENANCE

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LIFTING AND BLOCKING THE TELEHANDLER

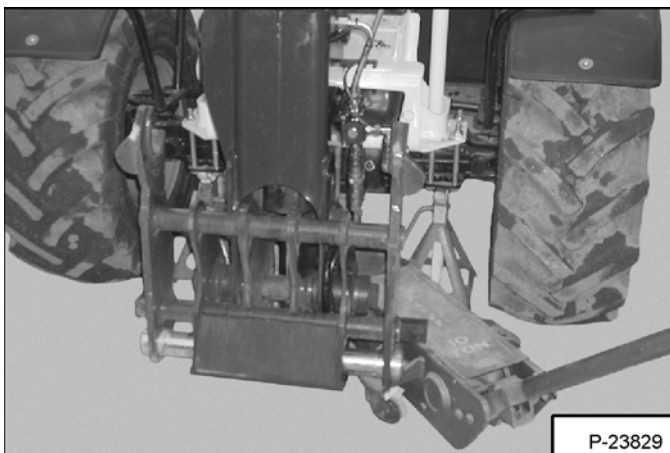
Procedure

WARNING

Put jackstands under the front axles and rear corners of the frame before running the engine for service. Failure to use jackstands can allow the machine to fall or move and cause injury or death.

W-2017-0286

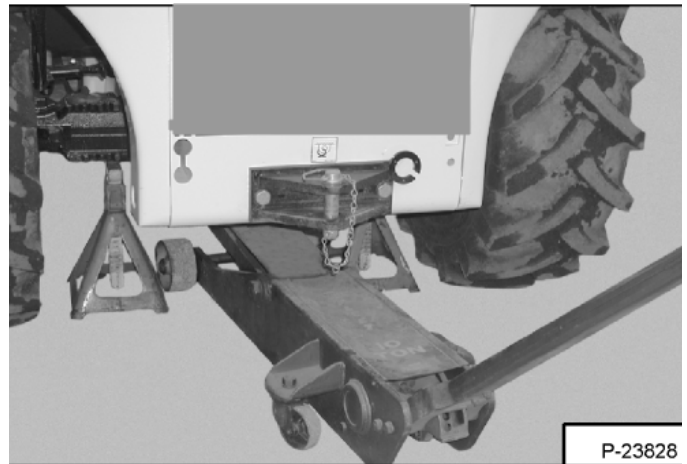
Figure 10-10-1



Always park the machine on a level surface.

STOP the engine. Put the floor jack under the center of the front axle. Lift the Telehandler and install jackstands [Figure 10-10-1].

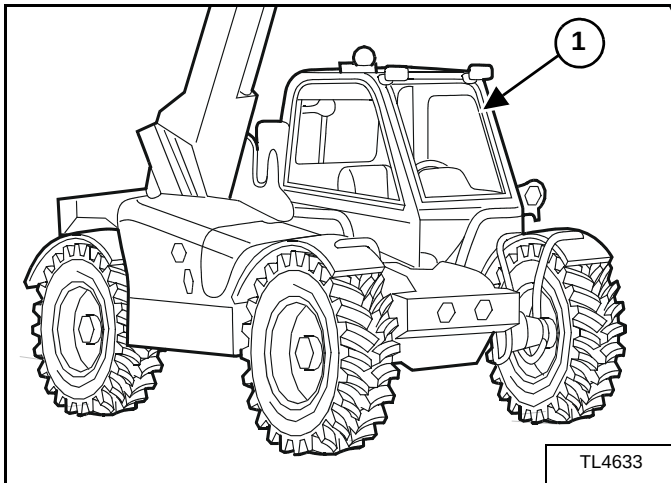
Figure 10-10-2



Put the floor jack under the center of the rear axle. Lift the Telehandler and install jackstands [Figure 10-10-2].

OPERATOR CAB/CANOPY

Figure 10-20-1



The Telescopic Handler has an operator cab or canopy (ROPS and FOPS) (Item 1) [Figure 10-20-1] to protect the operator from rollover and falling objects. Check with your dealer if the operator cab or canopy has been damaged. Never operate without right window. The seat belt must be worn for roll over protection.

ROPS/FOPS - Roll Over Protective Structure per SAE J1040 and ISO 3471, and Falling Object Protective Structure per SAE J1043 and ISO 3449 (FOPS Level II).

WARNING

Never modify operator cab or canopy by welding, grinding, drilling holes or adding attachments unless instructed to do so by Massey Ferguson. Do not operate without right window. Changes to the cab or canopy can cause loss of operator protection from rollover and falling objects, and result in serious injury or death.

W-2396-1202

Emergency Exit

Figure 10-20-2



Turn the handle (Inset) [Figure 10-20-2] and push the rear window open. (Models with enclosed cab only.) Exit through the rear window opening [Figure 10-20-2].

OPERATOR CAB/CANOPY (CONT'D)

Cab Door

Figure 10-20-3

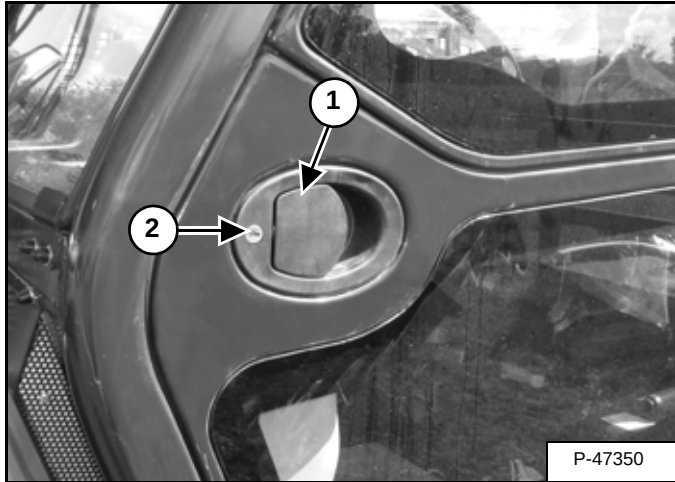
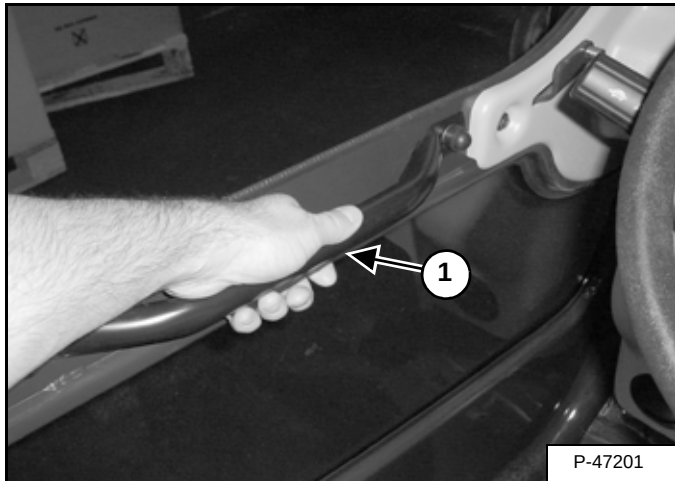


Figure 10-20-4

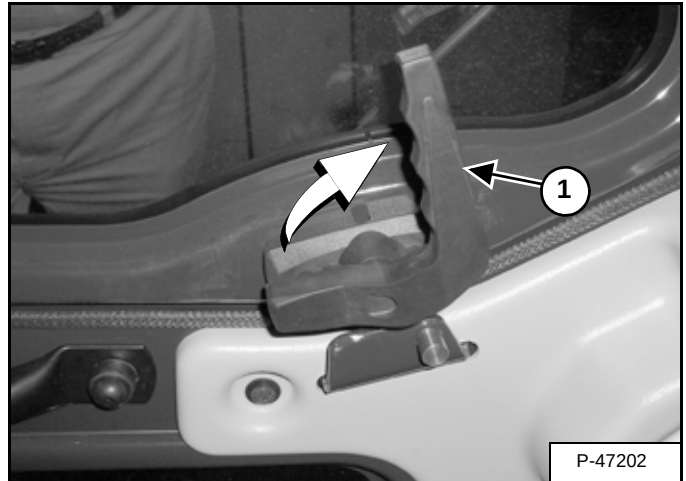


The cab door can be opened from the outside of the cab using the latch (Item 1) [Figure 10-20-3] and open from the inside of the cab when you squeeze the latch (Item 1) [Figure 10-20-4] (as shown).

The cab door can be locked (Item 2) [Figure 10-20-3] with the start key.

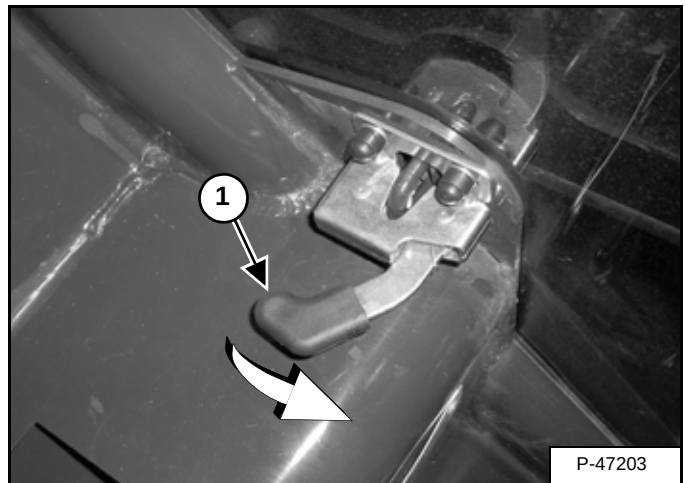
Cab Door Window

Figure 10-20-5



Turn the handle (Item 1) [Figure 10-20-5] (as shown). Push open the window fully until it latches against the cab.

Figure 10-20-6



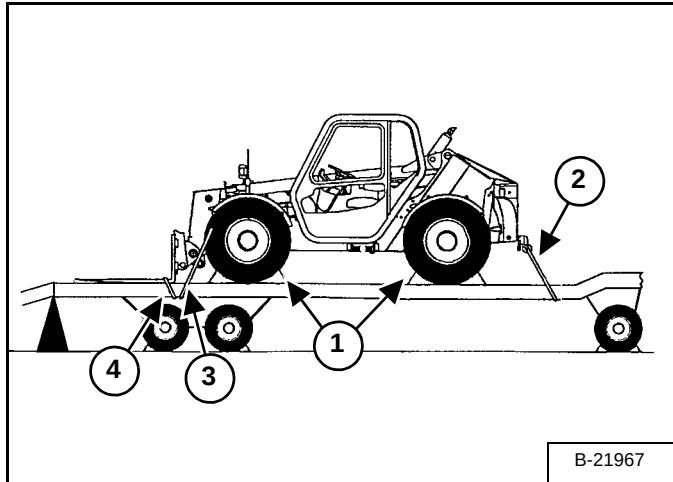
Pull the lever (Item 1) [Figure 10-20-6] inside the cab to disengage the latch and close the window.

TRANSPORTING THE TELESCOPIC HANDLER

Procedure

Always drive the Telescopic Handler backwards (heavy end up) onto the transport vehicle.

Figure 10-30-1



The rear of the trailer must be blocked or supported **[Figure 10-30-1]** when loading or unloading the Telescopic Handler to prevent the front end of the trailer from raising up.

Be sure the transport and towing vehicles are of adequate size and capacity. (See Contents Page Spec-01 for weight of the Telescopic Handler.

Fasten the Telescopic Handler to the transport vehicle to prevent it from moving during sudden stops or when going up or down slopes.

- Block the wheels (Item 1) **[Figure 10-30-1]**.
- Fasten the machine frame to the transport vehicle (Items 2 & 3) **[Figure 10-30-1]**.
- Attach the forks or bucket attachment to the transport vehicle (Item 4) **[Figure 10-30-1]**.



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.

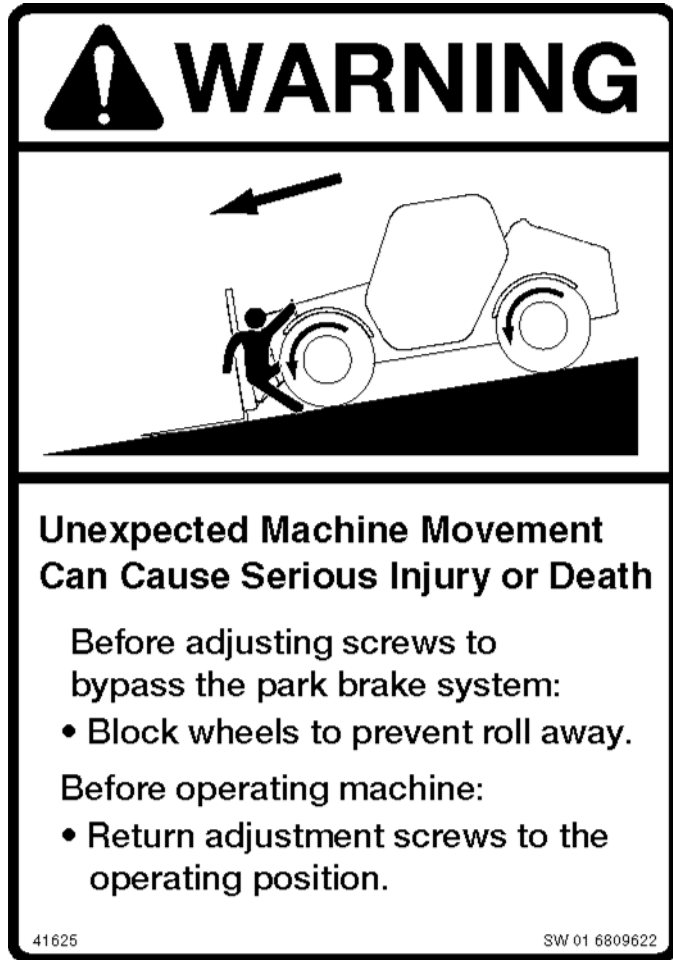
W-2058-0494

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TOWING THE TELESCOPIC HANDLER

Procedure

The Telescopic Handler can be towed a short distance such as removing it from mud or loading onto a transport vehicle.



Releasing Brake Disks: To release the brake disks, turn each of the six (6) screws (Item 1) **[Figure 10-40-1]** in only one half turn at a time; then repeat until all six screws are all the way in. (It will take 4 & 1/2 to 5 turns to fully release the brakes.) Record the number of turns so that you can return them to the same position later.

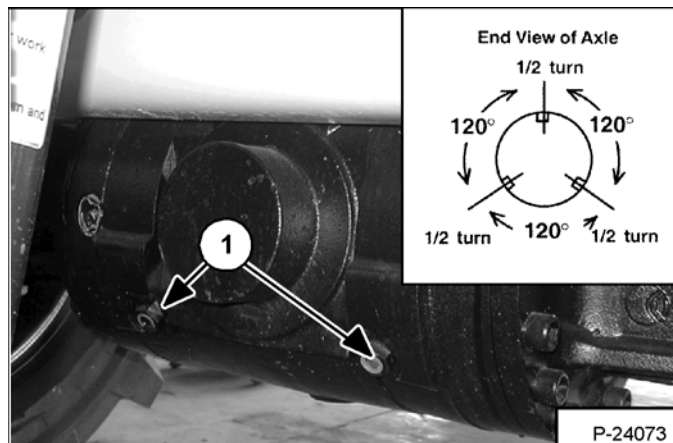
NOTE: This procedure is required on the front axle only.

NOTE: If one screw is turned all the way in before you start turning the others, the brake can be damaged.

There are three screws on each side (right and left) located 120° apart **[Figure 10-40-1]**.

Block the wheels to prevent the machine from rolling.

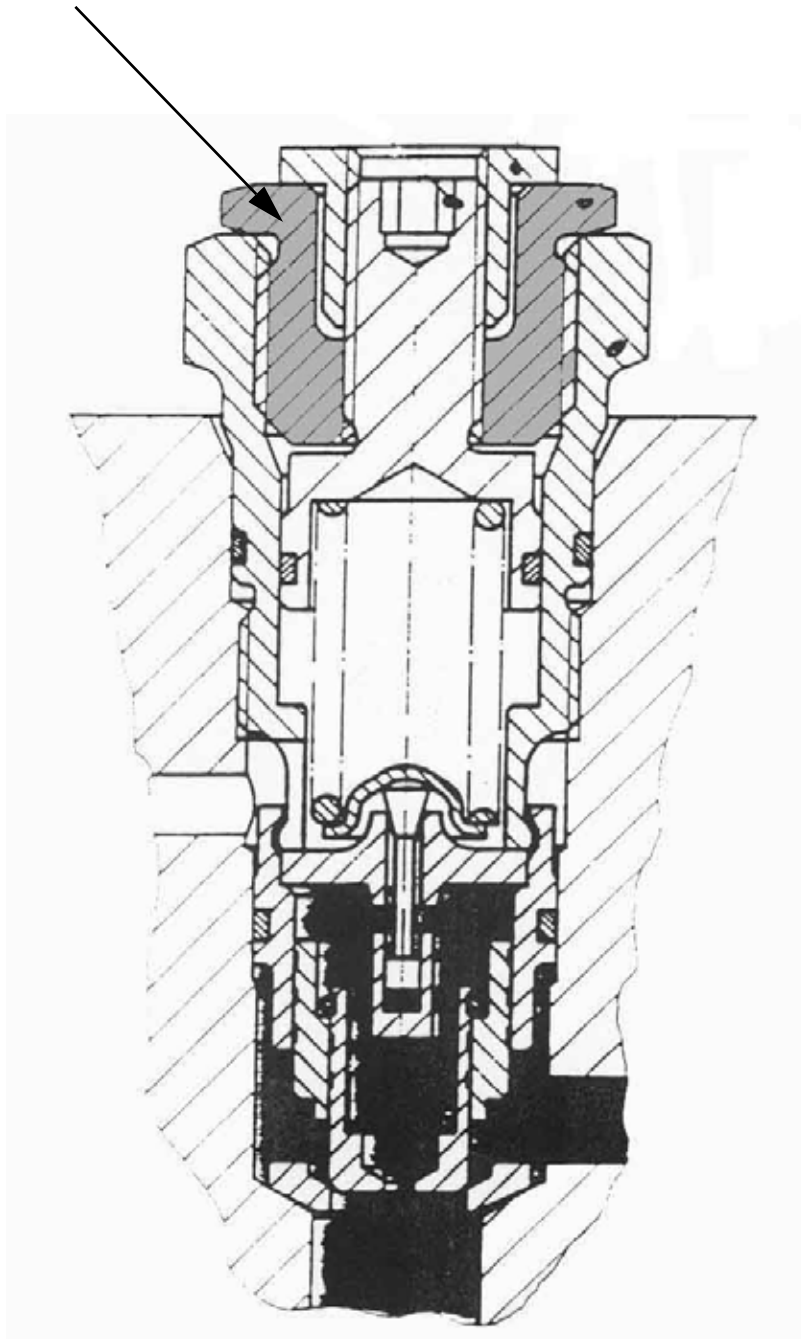
Figure 10-40-1



TOWING PROCEDURE

Before you tow a machine, you have to unscrew the by-pass for 2.5 turns.

Note : This action will not change the relief valve setting.



SERVICE SCHEDULE

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 Massey Ferguson Telescopic Handler.



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	Daily	50	250	500	n 1000
Engine Oil	Check the oil level and add oil as needed.					
Hydraulic Fluid	Check fluid level and add as needed.					
Articulation Pins	Lubricate with multi-purpose lithium based grease.					
Safety Signs, Safety Tread and Mirrors	Check for damaged signs (decals), safety tread and mirrors. Replace if damaged or worn.					
Fuel Filter	Clean the sediment bowl/water trap.					
Nuts & Bolts	Check for loose nuts and bolts. Tighten as needed.					
Seat Belt and Restraint Bar (if equipped)	Check the condition of the seat belt. Check the Restraint Bar (if equipped). Clean dirt and debris from moving parts.					
Brakes	Check for function. Service as necessary.					
Back-up Alarm	Check for function. Replace as necessary.					
Lateral Operator Restraint System (if equipped)	Check that hydraulic and drive functions are deactivated when the restraint bar is raised. check indicator light on center instrument panel. See details in this Operation & Maintenance Manual.					
Tires	Check for wear or damage. Inflate to correct pressure. Be sure all tires are inflated to the same pressure. Use only approved tires.					
Engine Air Filter And Air System	Check condition indicator, replace element when required and empty dust cup as needed. Check air system for leaks. See air cleaner section for more information.					
Engine Cooling System	Clean debris from oil cooler, radiator and air conditioner condenser. check coolant level cold in reservoir. Add premixed coolant as needed (See <i>ENGINE COOLING SYSTEM</i> , Page PM-16). Check cooling system for leaks.					
King Pins, U-Joints, Axle Oscillation (Front/Rear), Attach. Frame Pivot(s), Tilt/Lift Cyl., Boom Pivot, Leveling Cyl. (if equipped)	Lubricate with multi-purpose lithium based grease.					
Telescopic Boom Slide	Lubricate with multi-purpose lithium based grease. Check wear blocks for adjustment or replacement.					
Hydraulic Hoses, Tubelines & Connections	Check condition of hoses, tubelines and connectors. Repair or replace as needed.					
Battery	Check electrolyte level. Add distilled water as needed.					
Wheel Nuts	Check wheel nut torque. Tighten as needed [221 ft.-lbs. (300 Nm)].	†				
Restraint Bar Spring Pivot	Lubricate with multi-purpose lithium based grease.					
Alt. & Air Cond. Belt (if equipped)	Check belt tension and adjust as needed.		I			
Engine Oil and Filter	Replace the engine oil and filter. See <i>SPECIFICATIONS</i> Page SPEC-01 for correct capacity. Use a genuine Massey Ferguson filter.		I			
Fuel Filter	Replace the fuel filter element. Use a genuine Massey Ferguson filter.		I			
Hydraulic Fluid Filter	Replace the hydraulic filter element. Use a genuine Massey Ferguson filter.		I			
Hydrostatic Fluid Filter	Replace the hydraulic filter element. Use a genuine Massey Ferguson filter.		I			
Hydraulic Fluid and Filter	Replace the hydraulic fluid and filter element. See <i>SPECIFICATIONS</i> .					
Front & Rear Axle Fluid	Replace the axle fluid. See <i>SPECIFICATIONS</i> .		®		‡	
Engine Coolant	Check freeze protection of antifreeze -34 F (-30 C). Flush cooling system and replace with premixed coolant (See <i>ENGINE COOLING SYSTEM</i> , PM-16).					
Telescopic Boom Wear Blocks	Check for wear and adjust as needed. Replace as necessary.					
Pivot Pins and Bushings	Check for wear on the pivot pins and bushings.					

† Check wheel nut torque every 8 hours for the first 24 hours.

I Perform service first time, then as indicated in chart.

® Check level.

‡ Replace fluid first time, then as indicated in chart.

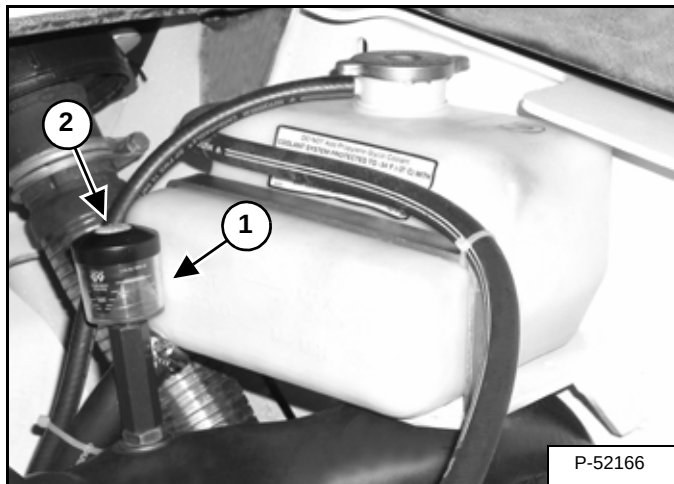
O Or every 6 months

n Or every 12 months

AIR CLEANER SERVICE

Replacing Filter Element

Figure 10-60-1

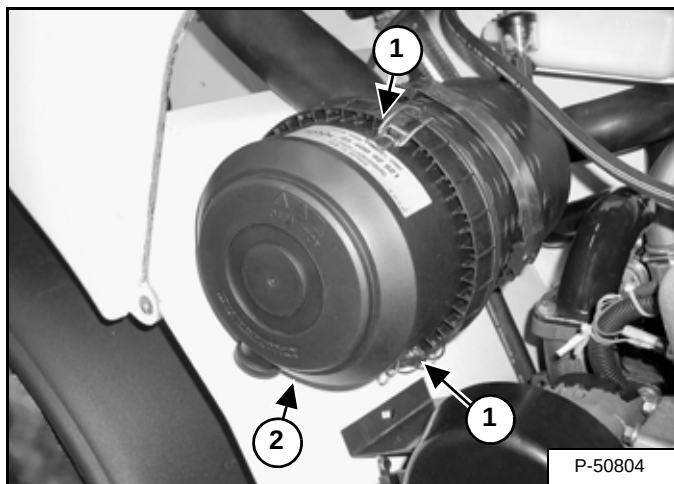


Replace the large (outer) filter element only when the red ring shows in the window of the condition indicator (Item 1) [Figure 10-60-1].

NOTE: Before replacing the filter element, push the button on the condition indicator (Item 2) [Figure 10-60-1]. Start the engine. If the red ring does not show, do not replace the filter element.

Replace the inner filter every third time the outer filter is replaced or when the red ring still shows in the indicator window after the outer filter has been replaced.

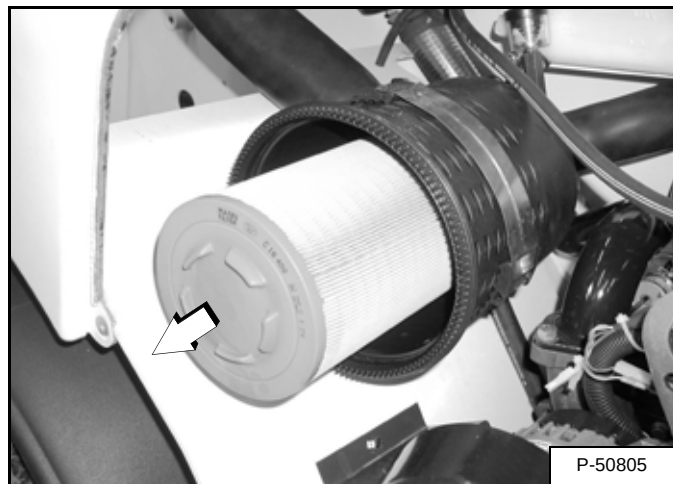
Figure 10-60-2



Loosen the filter housing clamps (Item 1) [Figure 10-60-2].

Release the fastener and remove the cover (Item 2) [Figure 10-60-2].

Figure 10-60-3



Pull the element straight out [Figure 10-60-3].

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

Install a new outer element.

Install the dust cover and fasten [Figure 10-60-3].

Connect the filter housing clamps.

AIR CLEANER SERVICE (CONT'D)

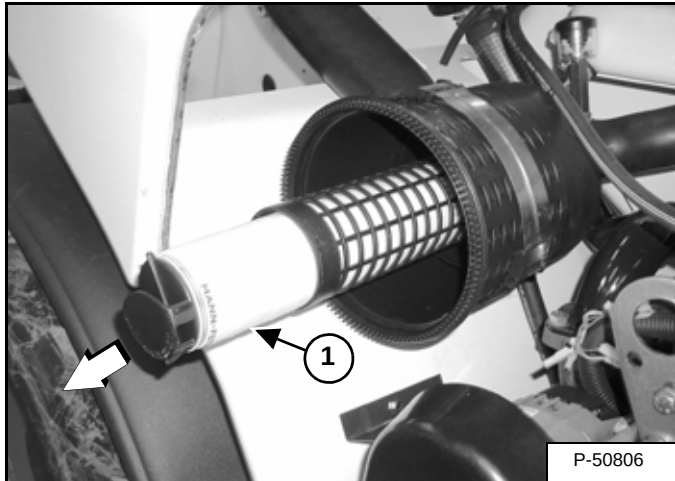
Replacing Filter Element (Cont'd)

Inner Filter

Remove the outer element.

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

Figure 10-60-4



Remove the inner filter (Item 1) [Figure 10-60-4] and install a new element.

Install the outer element.

Install the dust cover and fasten [Figure 10-60-4].

Connect the filter housing clamp (Item 1) [Figure 10-60-4].

ENGINE COOLING SYSTEM

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

WARNING

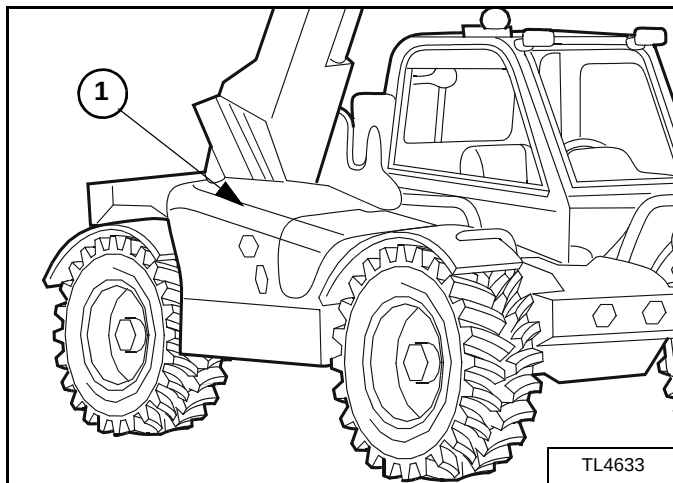
Wear safety glasses to prevent eye injury when any of the following conditions exist:

- When fluids are under pressure.
- Flying debris or loose material is present.
- Engine is running.
- Tools are being used.

W-2019-1285

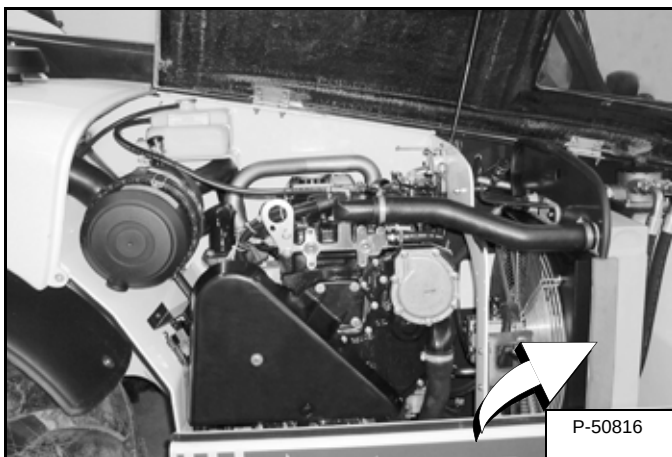
Cleaning The Cooling System

Figure 10-70-1



Open the engine cover (Item 1) [Figure 10-70-1].

Figure 10-70-2



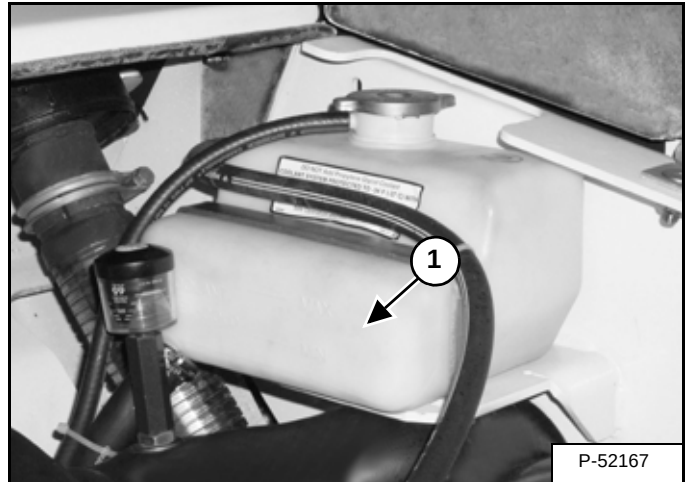
Use low air pressure or water pressure to clean the radiator and oil cooler [Figure 10-70-2].

Checking The Coolant Level

Open the engine cover.

Check the coolant level in the coolant reservoir.

Figure 10-70-3



The coolant level must be between the MIN and MAX marks (Item 1) [Figure 10-70-3] on the coolant reservoir when the engine is cold.

Close the engine cover.

IMPORTANT

AVOID ENGINE DAMAGE

Always use the correct ratio of water to antifreeze.

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

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

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

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ENGINE COOLING SYSTEM (CONT'D)

Replacing The Coolant

! WARNING

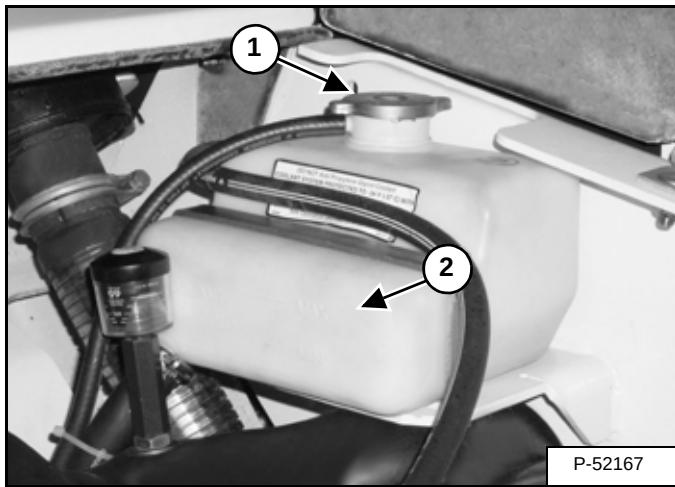
AVOID BURNS

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

W-2070-1203

Open the engine cover.

Figure 10-70-4



Remove the cap (Item 1) [Figure 10-70-4] from the coolant reservoir.

Remove the fan shield.

IMPORTANT

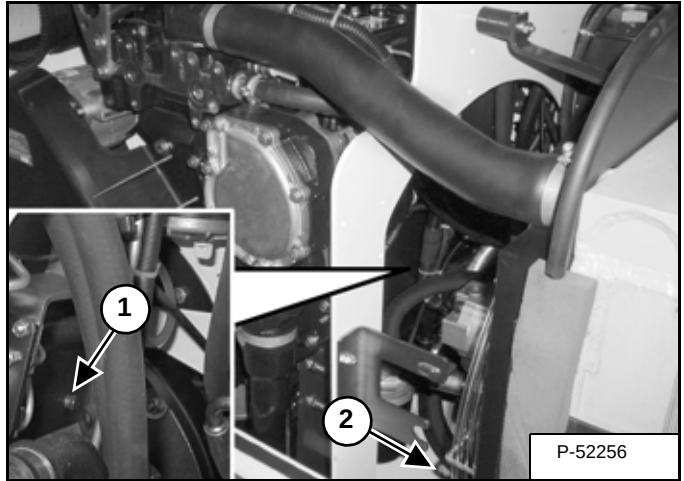
AVOID ENGINE DAMAGE

Always use the correct ratio of water to anti freeze. 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

Figure 10-70-5



Remove the engine block drain plug (Item 1) [Figure 10-70-5].

Open the drain valve (Item 2) [Figure 10-70-5] and drain all of the coolant into a container. Dispose of used coolant in an environmentally safe manner.

Close the drain valve.

Mix the coolant in a separate container.

NOTE: The Telescopic Handler is factory filled with ethylene glycol coolant.

Add premixed coolant, 50% water and 50% ethylene glycol to the reservoir if the coolant level is low.

One gallon (3,8 L) of ethylene glycol mixed with one gallon (3,8 L) 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 ethylene glycol in your cooling system.

Fill the radiator with the premixed coolant. Install the radiator cap.

Add coolant to the reservoir. The coolant level must be between the MIN and MAX marks (Item 2) [Figure 10-70-4] on the coolant reservoir.

Run the engine until it is at operating temperature.

Stop the engine.

Check the coolant level (cold) in the reservoir when cool.

Add coolant as needed.

FUEL SYSTEM

Fuel Specifications

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

The following is one suggested blending guideline which should prevent fuel gelling problems in cold temperatures:

TEMP. F° (C°)	NO. 2	NO. 1
+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

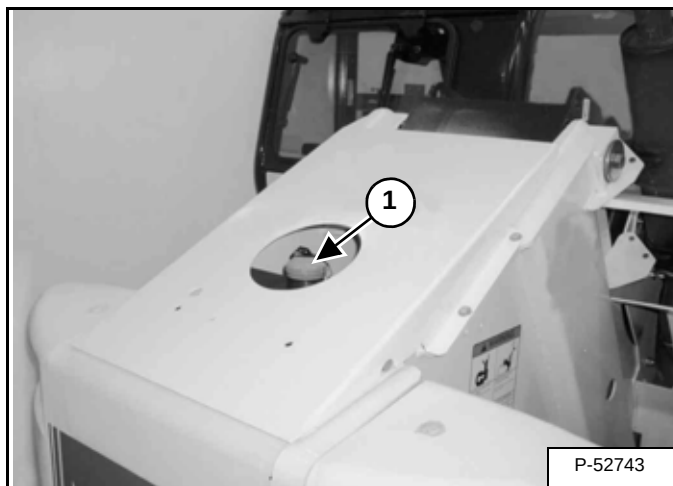


WARNING

Stop and cool the engine before adding fuel. **NO SMOKING!** Failure to obey warnings can cause an explosion or fire.

W-2063-0887

Figure 10-80-1



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

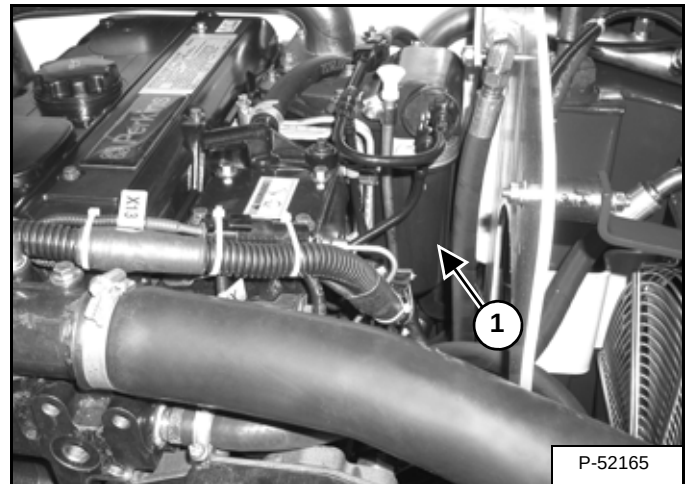
Use a clean, approved safety container to add fuel of the correct specifications. Add fuel only in an area that has free movement of air and no open flames or sparks. **NO SMOKING!**

Install and tighten the fuel fill cap [Figure 10-80-1].

Fuel Filter

See the *SERVICE SCHEDULE* Content Page 10-01 for the service interval when to clean the sediment bowl.

Figure 10-80-2



See the *SERVICE SCHEDULE* Page 10-01 for the service interval when to replace the fuel filter.

Remove the filter element (Item 1) [Figure 10-80-2].

Clean the area around the filter housing.

Put oil on the seal of the new filter element.

Install the fuel filter, and hand tighten.



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

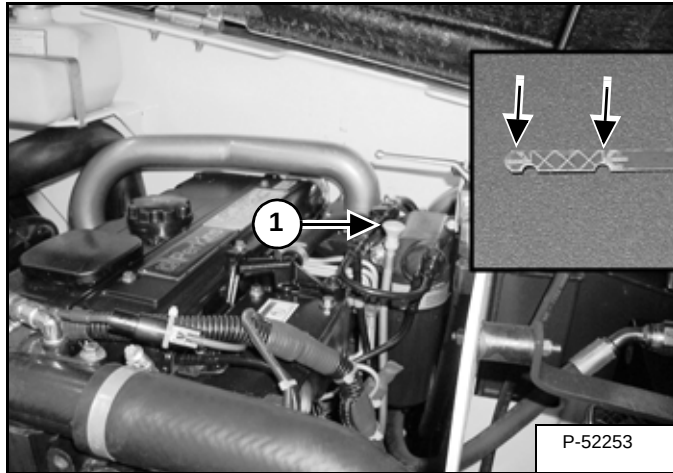
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ENGINE LUBRICATION SYSTEM

Checking Engine Oil

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

Figure 10-90-1



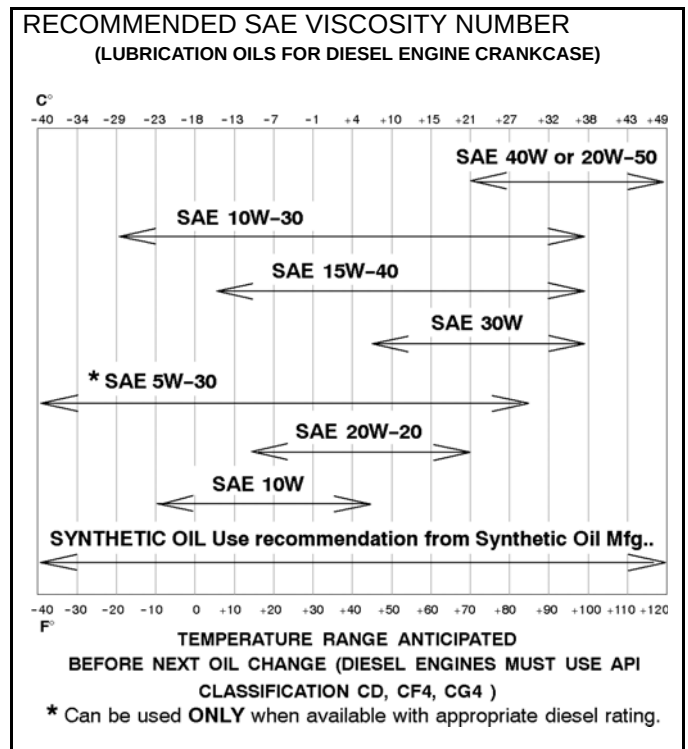
Open the engine cover and remove the dipstick (Item 1) [Figure 10-90-1].

Keep the oil level between the marks on the dipstick (Inset) [Figure 10-90-1].

Use a good quality motor oil that meets API Service Classification of CD or better. (See *Oil Chart* , [Figure 10-90-2].)

Oil Chart

Figure 10-90-2



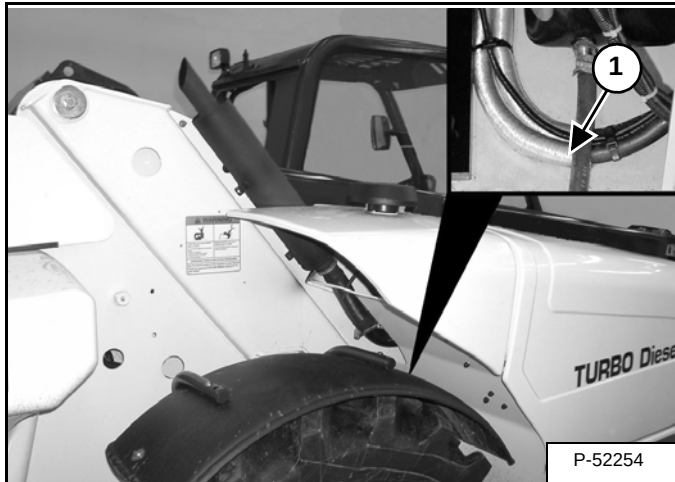
ENGINE LUBRICATION SYSTEM (CONT'D)

Replacing Oil And Filter

See the *SERVICE SCHEDULE* Page 10-01 for the service interval for replacing the engine oil and filter.

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

Figure 10-90-3



Remove the access panel at the rear of the engine compartment. Route the hose (Item 1) [Figure 10-90-3] out through the access hole. Remove the cap.

Drain the oil into a container and recycle or dispose of used oil in an environmentally safe manner.

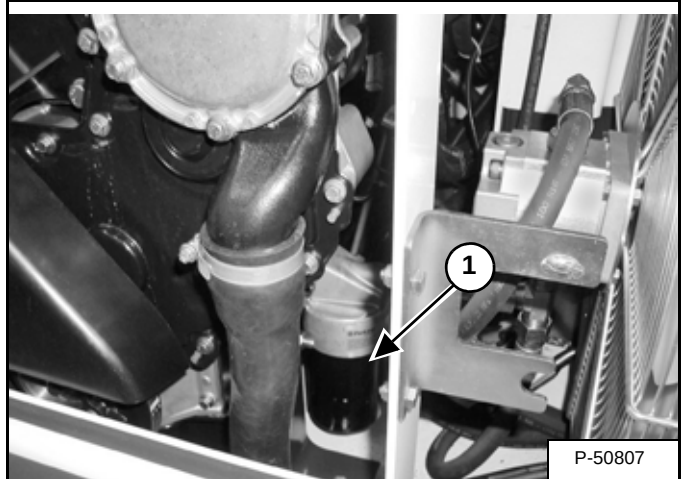
Install cap and put the drain hose into the engine compartment, install the access cover.

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

Figure 10-90-4



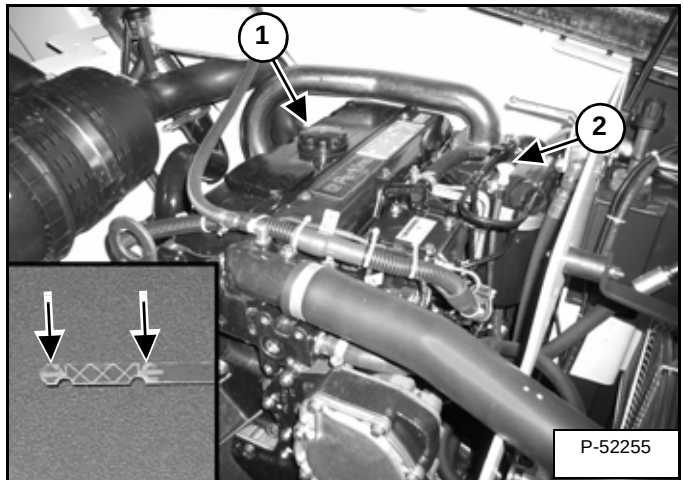
Open the engine cover.

Remove the oil filter (Item 1) [Figure 10-90-4].

Clean the filter housing surface.

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

Figure 10-90-5



Remove the filler cap (Item 1) [Figure 10-90-5].

Put oil in the engine. (See *SPECIFICATIONS* Page SPEC-01, for Capacity). (See Oil Chart on Page 10-90-1.)

Install fill cap, start the engine and let it run for several minutes.

Stop the engine, and check for leaks at the oil filter.

Remove the dipstick (Item 2) [Figure 10-90-5] and check the oil level. Add oil as needed if it is not at the top mark [Figure 10-90-5] on the dipstick.

HYDRAULIC/HYDROSTATIC SYSTEM

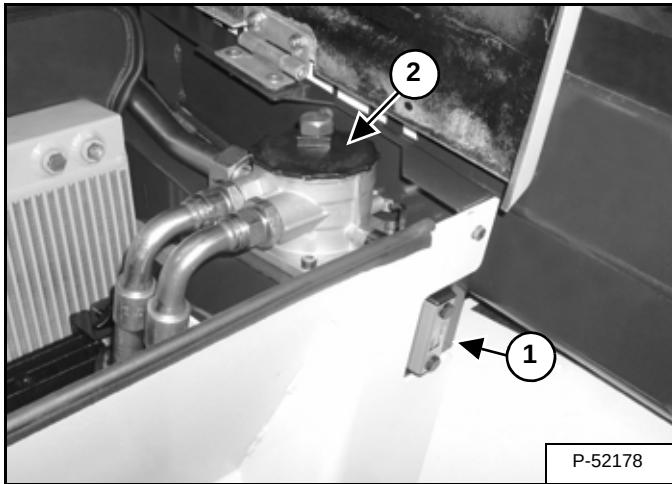
Checking And Adding Fluid

Use only recommended fluid in the hydraulic system.
(See *SPECIFICATIONS* Page SPEC-01.)

Stop the machine on a level surface. Lower the boom all the way.

Stop the engine.

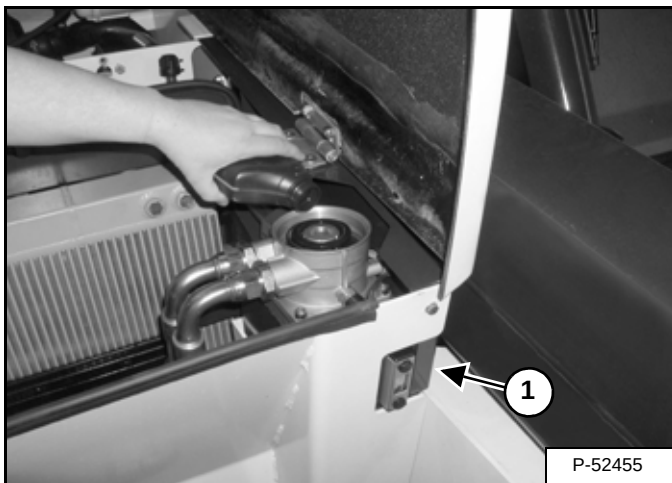
Figure 10-100-1



Check the fluid level at the sight gauge (Item 1) [Figure 10-100-1].

Remove the fill cap (Item 2) [Figure 10-100-1].

Figure 10-100-2



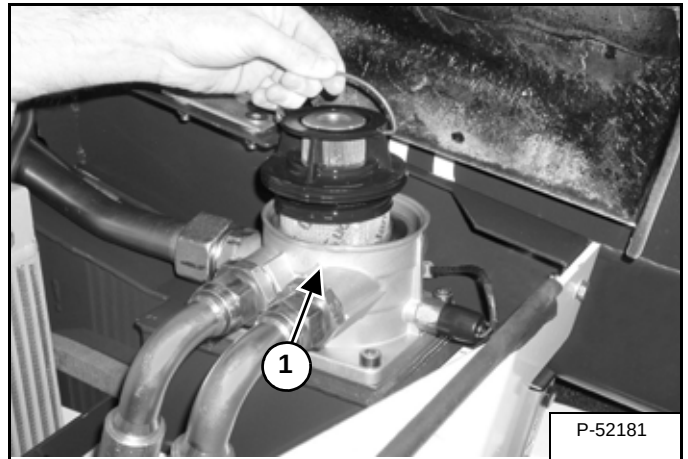
When adding oil, slowly pour the oil through the filter as needed, until visible in the sight gauge (Item 1) [Figure 10-100-2].

Replacing Hydraulic/Hydrostatic Filter

See the *SERVICE SCHEDULE* Page 10-01 for the correct service intervals.

Open the engine cover and remove the fill cap (Item 2) [Figure 10-100-1].

Figure 10-100-3



Remove the filter element (Item 1) [Figure 10-100-3].

Clean the surface of the filter housing where the seal contacts the housing.

Put clean oil on the seal of the new filter element.

Install and hand tighten the filter element.

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

WARNING

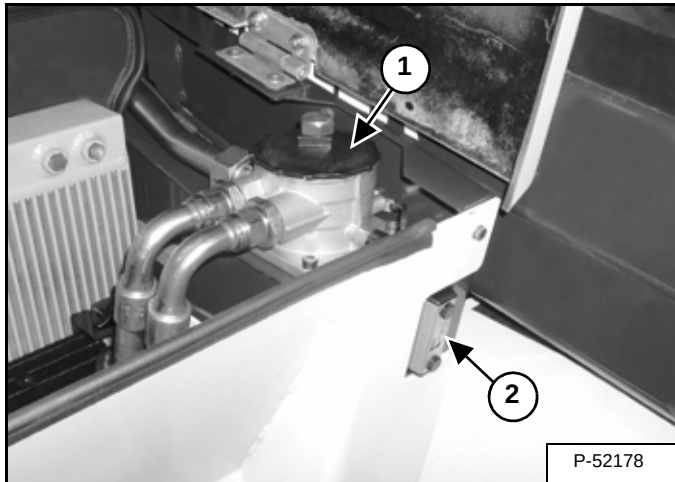
Always clean up spilled fuel or oil. Keep heat, flames, sparks or lighted tobacco away from fuel and oil. Failure to use care around combustibles can cause explosion or fire which can result in injury or death.

W-2103-1285

HYDRAULIC/HYDROSTATIC SYSTEM (CONT'D)

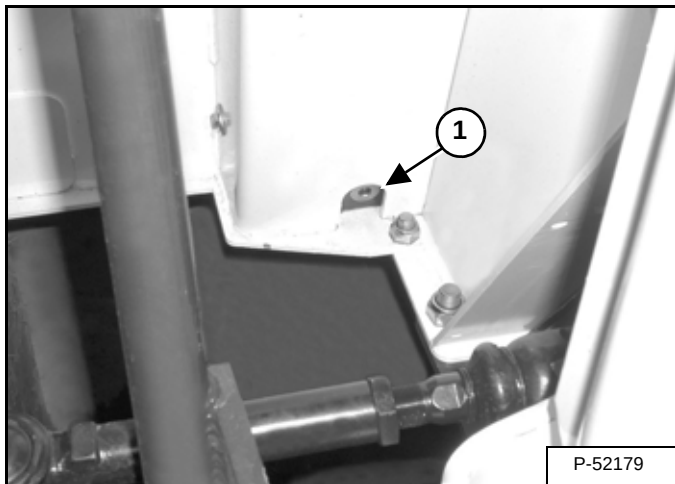
Replacing Hydraulic Fluid

Figure 10-100-4



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

Figure 10-100-5



Remove the reservoir drain plug (Item 1) **[Figure 10-100-5]** behind the right front wheel and drain the fluid into a container. Recycle or dispose of the fluid in an environmentally safe manner. Reinstall the drain plug and tighten.

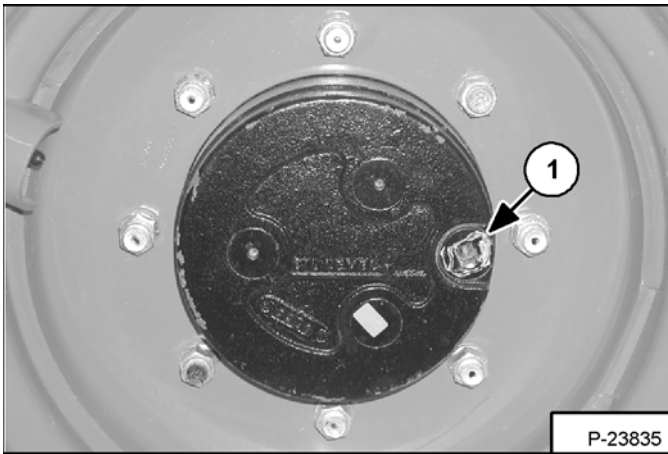
Add fluid until it is at the center of the sight gauge (Item 2) **[Figure 10-100-4]**.

Install the fill cap.

AXLES (FRONT AND REAR)

Checking Oil Level (Planetary Carrier)

Figure 10-110-1



Put the machine on a level surface with the plug positioned as shown (Item 1) **[Figure 10-110-1]**.

Remove the plug (Item 1) **[Figure 10-110-1]**. The oil level should be at the bottom edge of the plug hole.

Add gear lube through the hole if the oil level is below the hole. (See *FUEL, COOLANT AND LUBRICANT Chart*, Contents Page SPEC-01 for capacity and type.)

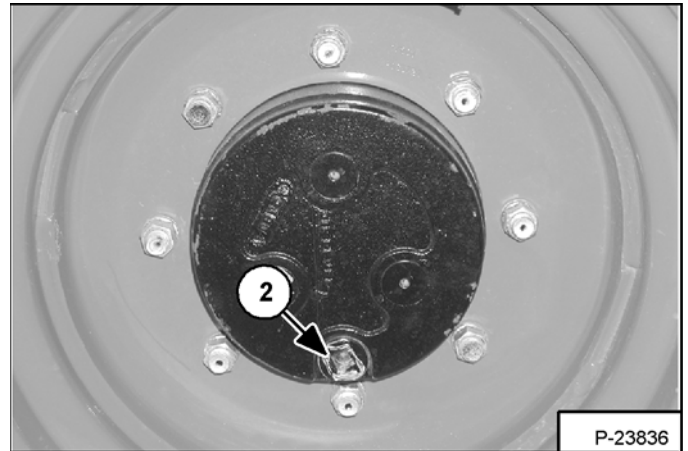
Install and tighten the plug.

Repeat the procedure for the other side.

Draining Oil (Planetary Carrier)

See the *SERVICE SCHEDULE* Contents Page 10-01 for the correct service interval.

Figure 10-110-2



Put the machine on a level surface with the plug positioned as shown (Item 1) **[Figure 10-110-2]**.

Remove the plug (Item 1) **[Figure 10-110-2]** and drain into a container. Recycle or dispose of the used lubricant in an environmentally safe manner.

Reposition the plug hole and add gear lube until the lube level is at the bottom edge of the plug hole (Item 1) **[Figure 10-110-1]**. (See *FUEL, COOLANT AND LUBRICANT Chart*, Contents Page SPEC-01 for capacity and type.)

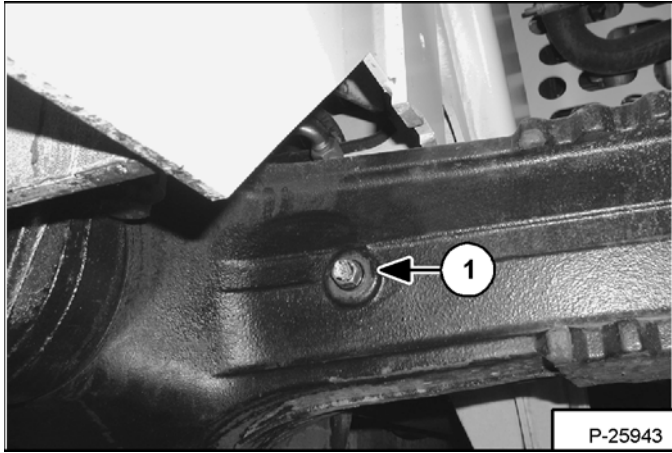
Install and tighten the plug.

Repeat the procedure for the other side.

AXLES (FRONT AND REAR) (CONT'D)

Checking Oil Level (Rear Differential)

Figure 10-110-3



With the machine on a level surface, remove the plug (Item 1) [Figure 10-110-3]. The oil level should be at the bottom edge of the plug hole.

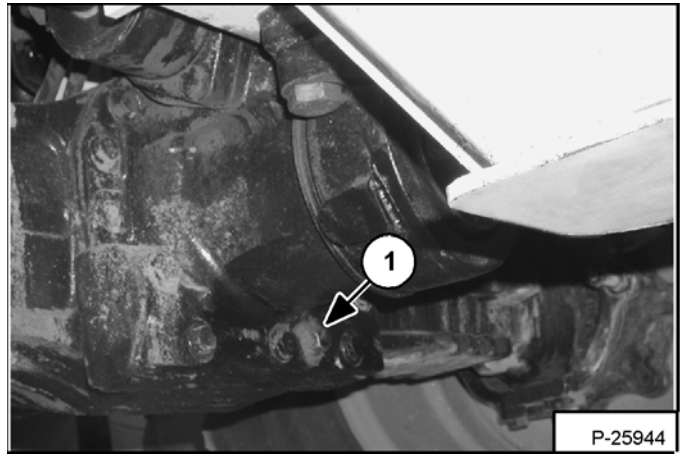
Add oil through the hole if the oil level is below the hole. (See *FUEL, COOLANT AND LUBRICANT Chart Content*, Page SPEC-01 for capacity and type.)

Install and tighten the plug.

Draining Oil (Rear Differential)

See the *SERVICE SCHEDULE Content*, Page 10-01 for the correct service interval.

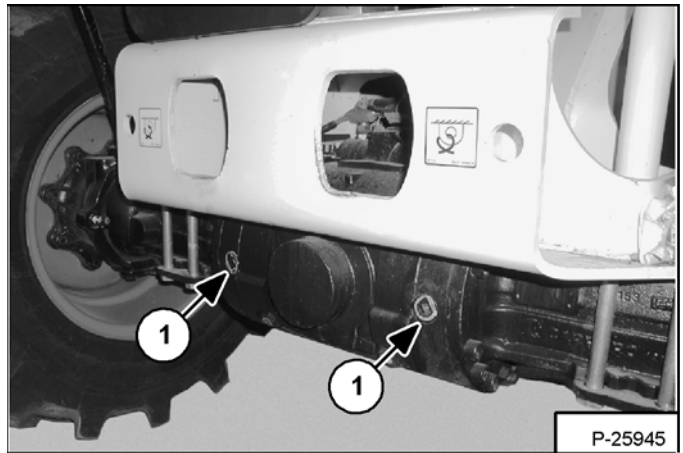
Figure 10-110-4



With the machine on a level surface remove the plug (Item 1) [Figure 10-110-4] and drain the oil into a container. Recycle or dispose of the used lubricant in an environmentally safe manner. Install and tighten the plug.

Checking Oil Level (Front Differential)

Figure 10-110-5



Put the machine on a level surface with the plugs positioned as shown (Item 1) [Figure 10-110-5].

Remove the plugs (Item 1) [Figure 10-110-5]. The oil level should be at the bottom edge of the plug hole.

Add oil through the hole if the oil level is below the hole. (See *FUEL, COOLANT AND LUBRICANT Chart Content*, Page SPEC-01 for capacity and type.)

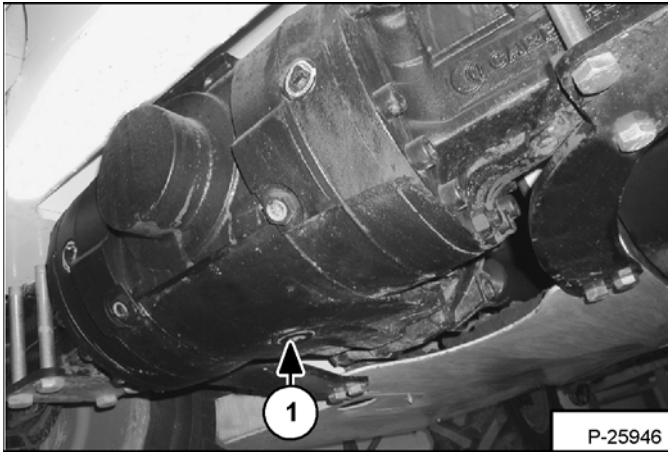
Install and tighten the plugs.

AXLES (FRONT AND REAR) (CONT'D)

Draining Oil (Front Differential)

See the *SERVICE SCHEDULE* Content, Page 10-01 for the correct service interval.

Figure 10-110-6



With the machine on a level surface, remove the plug (Item 1) **[Figure 10-110-6]** and drain into a container. Recycle or dispose of the used lubricant in an environmentally safe manner.

Install and tighten the plug.

LUBRICATION

Procedure

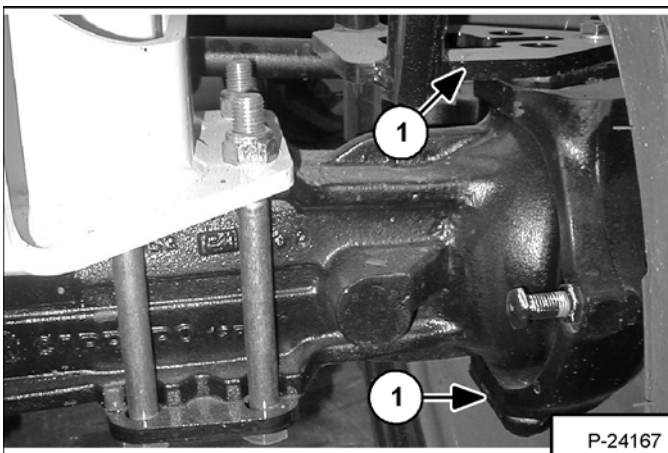
Lubricate as specified in the SERVICE SCHEDULE, (See Contents Page 10-01) for the best performance of the machine.

Record the operating hours each time you lubricate so that it is performed at the correct interval.

Always use a good quality lithium based multi-purpose grease. Apply lubricant until extra grease shows.

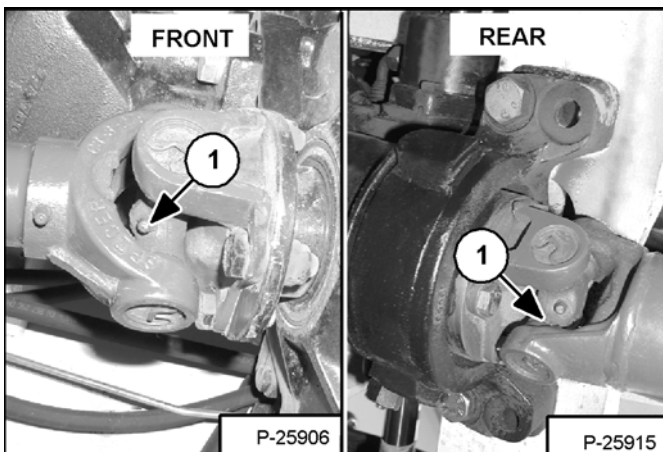
Lubricate the following locations on the Telehandler:

Figure 10-120-1



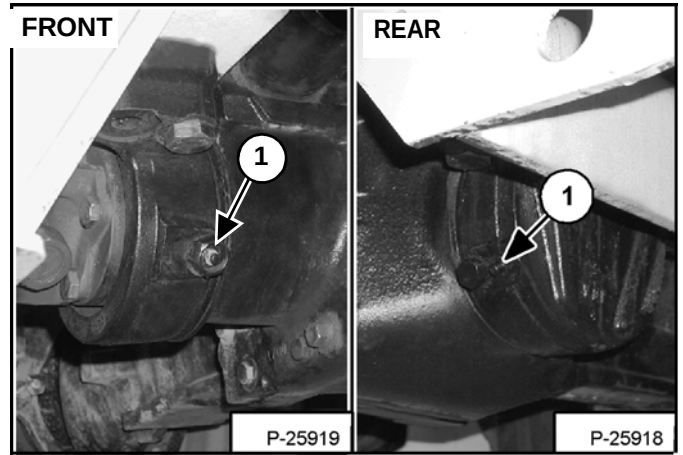
1. Axle Pivots - Top and bottom (Item 1) [Figure 10-120-1] all four wheels.

Figure 10-120-2



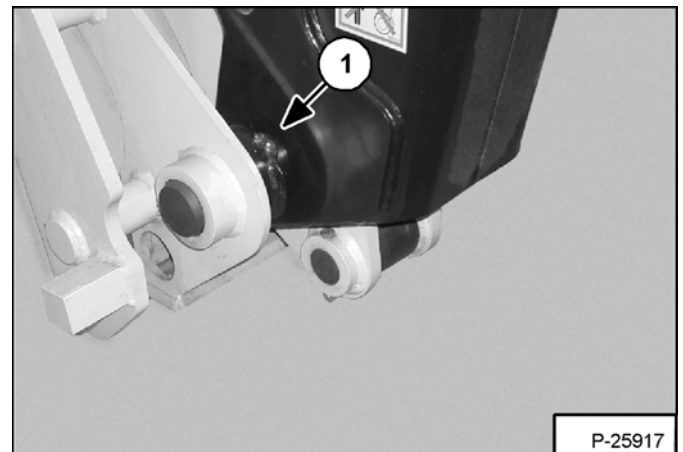
2. Universal Joints - Front and Rear (Item 1) [Figure 10-120-2].

Figure 10-120-3



3. Axle Oscillation - Front and Rear Axle (Item 1) [Figure 10-120-3].

Figure 10-120-4

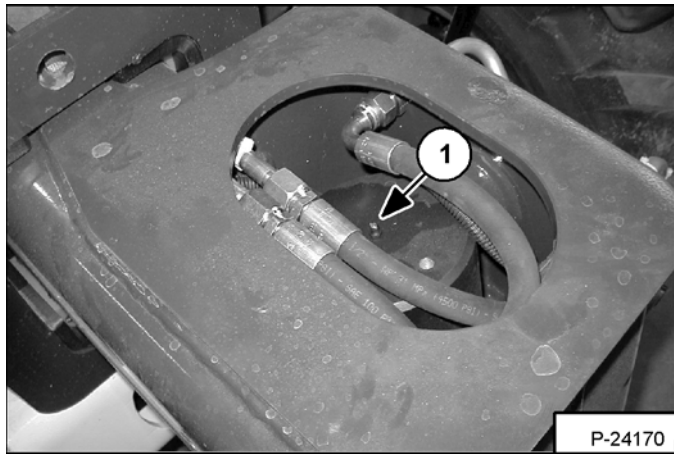


4. Attachment Frame Pivot (Item 1) [Figure 10-120-4]. (Both sides)

LUBRICATION (CONT'D)

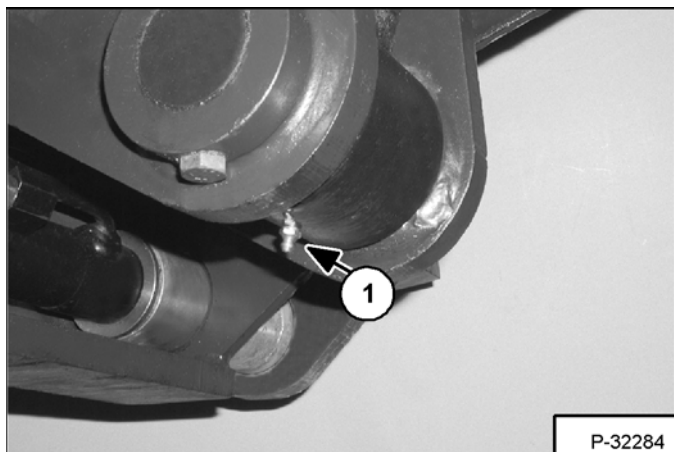
Procedure (Cont'd)

Figure 10-120-5



5. Tilt Cylinder Base End (Item 1) [Figure 10-120-5].

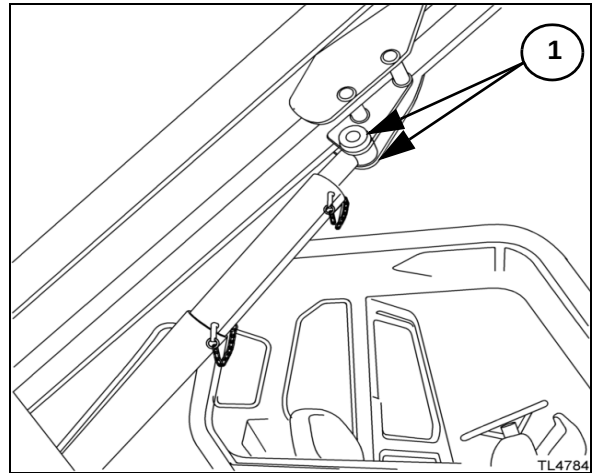
Figure 10-120-6



6. Tilt Cylinder Rod End (Item 1) [Figure 10-120-6].

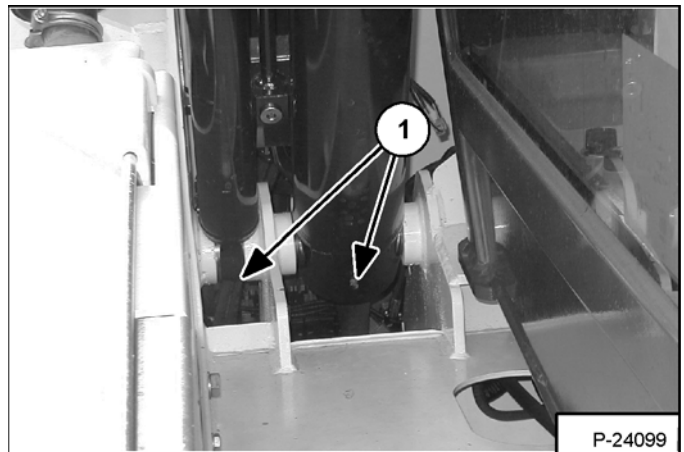
NOTE: Raise the boom and install Boom Stop (See *Installing Boom Stop* Contents Page 10-01) before lubricating the Boom and slave Cylinders.

Figure 10-120-7



7. Lift Cylinder Base End, Slave Cylinder Rod End (Item 1) [Figure 10-120-7].

Figure 10-120-8

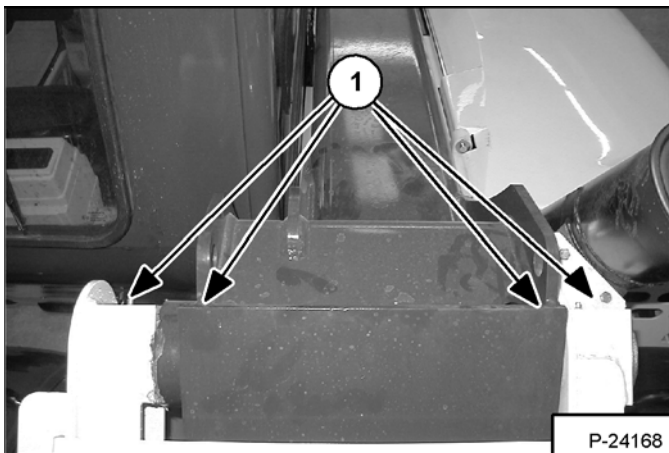


8. Lift Cylinder Rod End, Slave Cylinder Base End (Item 1) [Figure 10-120-8].

LUBRICATION (CONT'D)

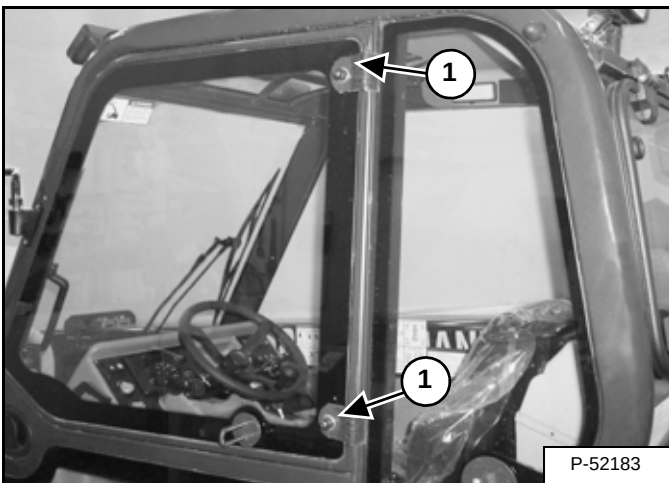
Procedure (Cont'd)

Figure 10-120-9



9. Boom Pivot (Item 1) [Figure 10-120-9] (Four Places).

Figure 10-120-10



10. Cab Door Hinges (Item 1) [Figure 10-120-10] (Upper).

Figure 10-120-11



11. Cab door hinges (Item 1) [Figure 10-120-11] (Lower).

Figure 10-120-12

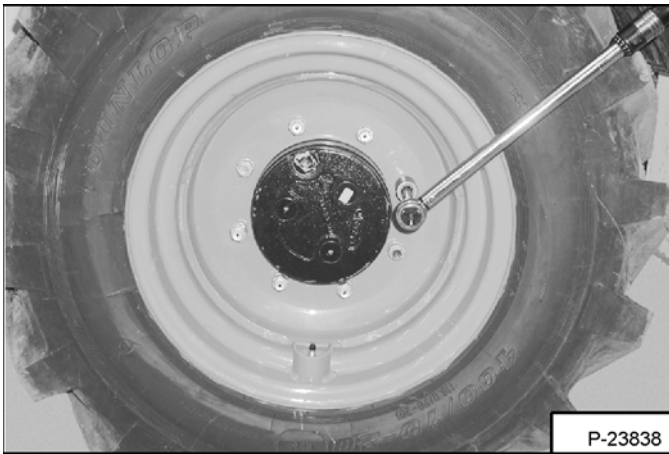


12. Boom Slide [Figure 10-120-12] (Four Places).

TYRE MAINTENANCE

Wheel Nuts

Figure 10-130-1



See the *SERVICE SCHEDULE* Contents Page 10-01 for the service interval to check the wheel nuts. The correct torque is 221 ft.-lbs. (300 Nm) torque [Figure 10-130-1].

tyre Rotation

Check the tyres regularly for wear, damage and pressure. (See Contents Page SPEC-01 for the correct tyre pressure.)

Rear tyres usually wear faster than front tyres. To keep the wear even, move the front tyres to the rear and rear tyres to the front.

It is important to keep the same size tyres on each side of the Telehandler. If different sizes are used, each tyre will be turning at a different rate and cause excessive wear. The tread bars of all the tyres must face the same direction.

Recommended tyre pressure must be maintained to avoid excessive tyre wear and loss of stability and handling capability. Check for the correct pressure before operating the Telehandler.

Tyre Mounting



WARNING

Do not inflate tyres above specified pressure. Failure to use correct tyre mounting procedure can cause an explosion which can result in injury or death.

W-2078-1285

Tyres are to be repaired only by an authorized person using the correct procedures and type of equipment.

Tyres and rims must always be checked for correct size before mounting. Check rim and tyre bead for damage. The rim flange must be cleaned and free of rust. The tyre bead and rim flange must be lubricated with a rubber lubricant before mounting the tyre.

Avoid excessive pressure which can rupture the tyre and cause serious injury or death.

During inflation of the tyre, check the tyre pressure frequently to avoid over inflation.

SPARK ARRESTOR MUFFLER

Procedure

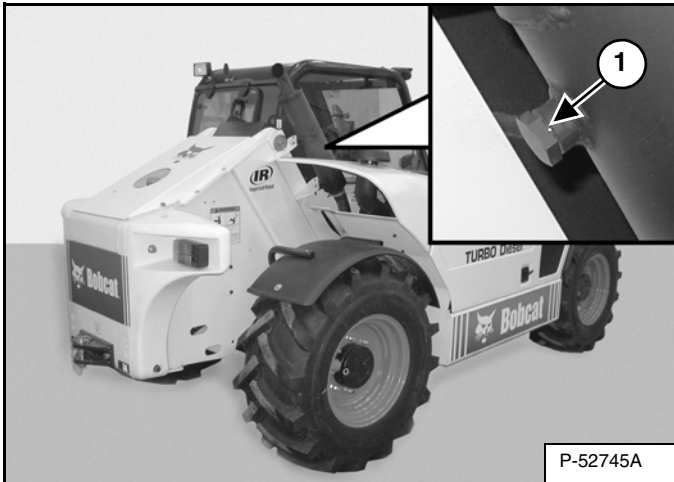


WARNING

When the engine is running during service, the Travel Direction Lever must be in neutral and the parking brake engaged. Failure to do so can cause injury or death.

W-2397-0301

Figure 10-140-1



See the *SERVICE SCHEDULE* Contents Page 10-01 for the service interval for cleaning the spark arrestor muffler.

Do not operate the machine with a defective exhaust system.

Stop the engine.

Remove the plug (Item 1) [Figure 10-140-1] 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.

This will force contaminants out through the cleanout hole.

Stop the engine.

Install and tighten the plug.

IMPORTANT

This loader 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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APPROVED BOOM STOP

If the boom is raised for service or maintenance, use the following procedure to install and remove the boom stop.

Installing The Approved Boom Stop

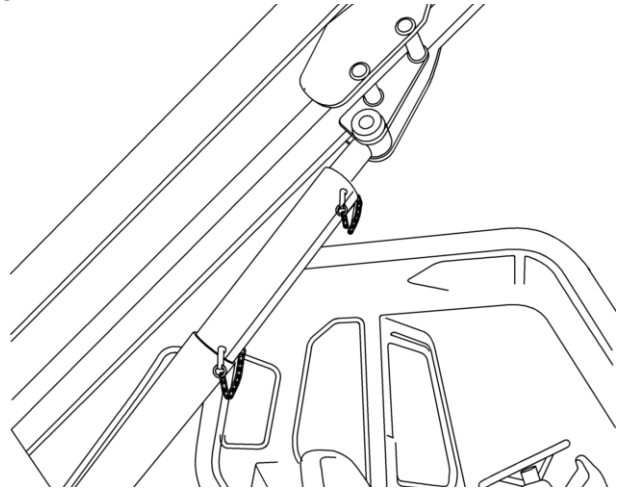
- Put the Telehandler on a flat, solid and level surface.
- With the operator in the seat, the seat belt fastened, restraint bar lowered, (if equipped) Travel Direction Control and the parking brake engaged, start the engine and raise the boom and stop the engine.

Figure 10-150-1



- Have a second person remove the boom stop (Item 1) [Figure 10-150-1] from the storage position.

Figure 10-150-2



- Install the boom stop over the rod of the boom cylinder (the larger one) [Figure 10-150-2].
- Install the pins and secure with fasteners [Figure 10-150-2].
- Start the engine and lower the boom slowly [Figure 10-150-2] so that the boom stop is held securely.

Removing The Approved Boom Stop

- Start the engine and raise the boom. Stop the engine.
- Remove the fasteners, pins and boom stop.
- Put the boom stop in the storage position and secure with pins and fasteners.
- Start the engine and lower the boom

ENGINE COVER

Opening And Closing The Engine Cover

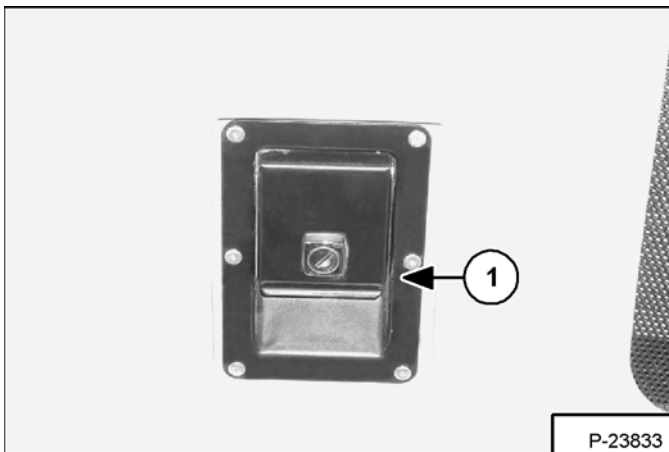
WARNING

AVOID INJURY OR DEATH

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

W-2012-0497

Figure 10-160-3



Release the latch (Item 1) **[Figure 10-160-3]** and raise the engine cover.

Close the engine cover before operating the Telehandler.

LATERAL OPERATOR RESTRAINT SYSTEM (LORS™)

System Inspection

Figure 10-170-1



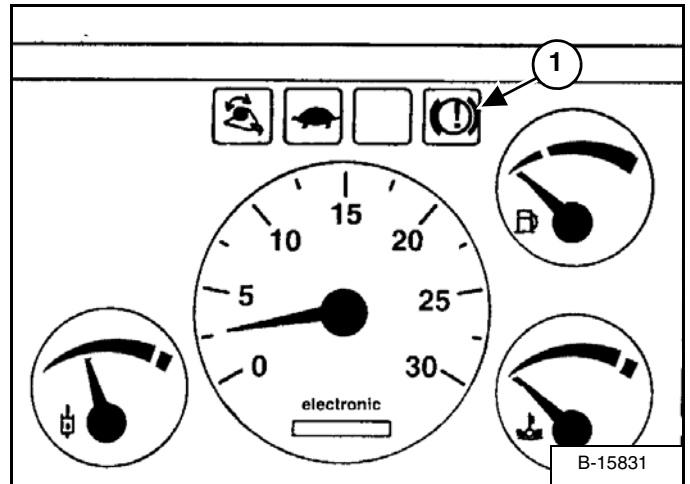
With the engine off, raise and lower the restraint bar (Item 1) [Figure 10-170-1]. Make sure the restraint bar moves freely and that there are no damaged or loose parts.

The restraint bar has an over-center spring that is used to keep the bar in either the up or down position. Check the spring and guides for damage and make sure the restraint bar remains in the full up position when it is raised.

Sit in the seat and fasten the seat belt. Engage the parking brake and lower the restraint bar. Start the engine and raise the boom. While the boom is raising, raise the restraint bar. The boom must stop when the restraint bar is raised.

Repeat this procedure for boom down, tilt out, tilt back, boom extend, boom retract and auxiliary hydraulics. Each time the respective functions must deactivate.

Figure 10-170-2



Lower the restraint bar, disengage the parking brake, and put the Travel Direction Lever (**F-N-R**) in Forward (**F**) position. Move the machine forward slowly and raise the restraint bar. The machine must stop when the restraint bar is raised. The light (Item 1) [Figure 10-170-2] will come ON when the bar is raised. Repeat this procedure for the Reverse (**R**) position.

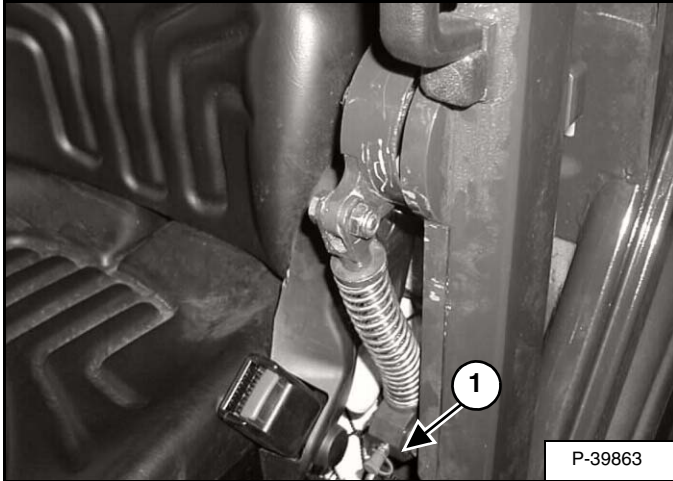
LATERAL OPERATOR RESTRAINT SYSTEM (LORS™) (CONT'D)

System Maintenance

See the SERVICE SCHEDULE Content Page 10-01, and on the TELEHANDLER for correct service interval.

Use compressed air to clean any debris or dirt from the restraint bar pivot area. Do not lubricate the main pivot.

Figure 10-170-3



The spring guide pivot (Item 1) **[Figure 10-170-3]** must be lubricated every 250 hours or as required with multi-purpose lithium based grease.

If the Lateral Operator Restraint System (LORS™) does not function correctly, check all wiring and connections. Replace parts that are worn or damaged. Use only genuine Massey Ferguson replacement parts.

See your dealer for parts and service

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Parts Identification	20-50-3
Removal And Installation	20-50-1

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HYDRAULIC SYSTEM INFORMATION

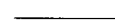
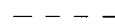
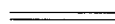
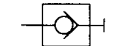
GLOSSARY OF HYDRAULIC/HYDROSTATIC SYMBOLS

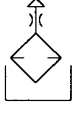
SYMBOL DESCRIPTION

SYMBOL DESCRIPTION

FLOW LINES and CONNECTIONS

BASIC and MISCELLANEOUS SYMBOLS

	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)

	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

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HYDRAULIC SYSTEM INFORMATION (CONT'D)

GLOSSARY OF HYDRAULIC/HYDROSTATIC SYMBOLS

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)

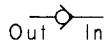
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HYDRAULIC SYSTEM INFORMATION (CONT'D)

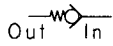
GLOSSARY OF HYDRAULIC/HYDROSTATIC SYMBOLS

SYMBOL DESCRIPTION

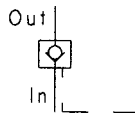
NON-RETURN VALVE, SHUTTLE VALVE: Valve which allows free flow in one direction only



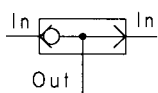
NON-RETURN VALVE (Check Valve) - Used as Replenishing Valve, Load Check Valve or Anticavitation Valve - Opens if the Inlet pressure is higher than the Outlet pressure. Often contains internal spring which has NO significant pressure value



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



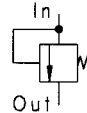
PILOT CONTROLLED NON-RETURN VALVE - It is possible to open the valve by pilot pressure



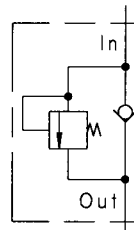
SHUTTLE VALVE - The Inlet port connected to the higher pressure is automatically connected to the Outlet port while the other Inlet port is closed

SYMBOL DESCRIPTION

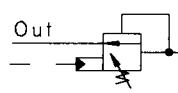
PRESSURE CONTROL VALVE: Valve ensuring the control of pressure



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

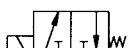


DUAL PRESSURE RELIEF VALVE - When the inlet pressure overcomes the opposing force of the spring, the valve opens permitting flow from the Outlet port. Pilot pressure provides a second pressure value.

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

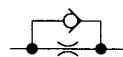


SOLENOID ACTIVATED DIRECTIONAL CONTROL VALVE (Two Position) - controlled by an electric solenoid (with return spring)



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

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HYDRAULIC SYSTEM INFORMATION (CONT'D)

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 Massey Ferguson Service Personnel only.



WARNING

Check for correct function after adjustments, repairs or service. Failure to make correct repairs or adjustments can cause injury or death.

W-2004-1285

PROBLEM	CAUSE
The hydraulic system will not operate.	1, 2, 3, 6
The hydraulic oil temperature warning light comes ON when hydraulics are operating.	1, 2
Slow hydraulic system action.	1, 2, 4, 8
Hydraulic action is not smooth.	1, 3, 4, 5
Boom goes up slowly at full engine RPM.	1, 2, 4, 5, 6, 7
The boom comes down with the lever in neutral position.	7, 8, 9

KEY TO CORRECT THE CAUSE

1. The fluid level is not correct..
2. The hydraulic pump has damage.
3. Relief valve is not at the correct pressure.
4. Suction leak on the inlet side of the hydraulic pump.
5. Fluid is cold. Wrong viscosity fluid. (See Section SPEC-01.)
6. Using the machine for more than its rated capacity.
7. Internal leak in the lift cylinder.
8. External leak from the cylinder(s).
9. Damaged lift spool.

HYDRAULIC SYSTEM INFORMATION (CONT'D)

Tightening Procedures

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

To tighten the hydraulic fittings, tubelines etc. See Contents, Page Spec-01 Section - *Hydraulic Connection Specifications*, for the correct procedure and torque.

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.

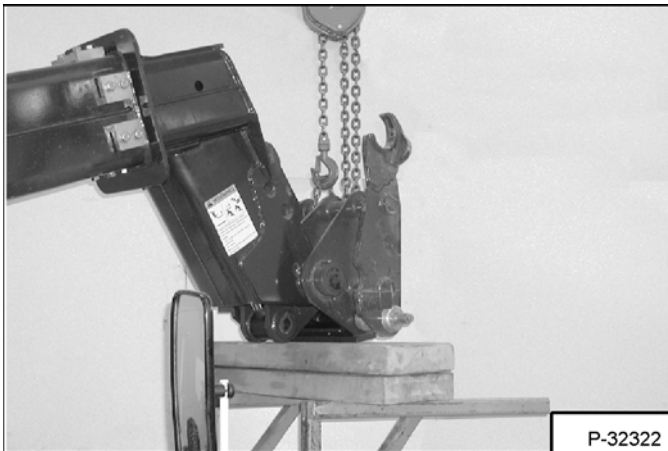
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LIFT CYLINDER

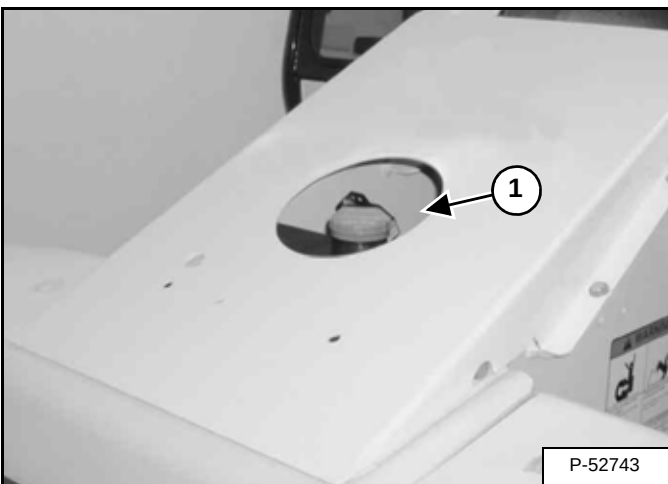
Removal And Installation

Figure 20-20-1



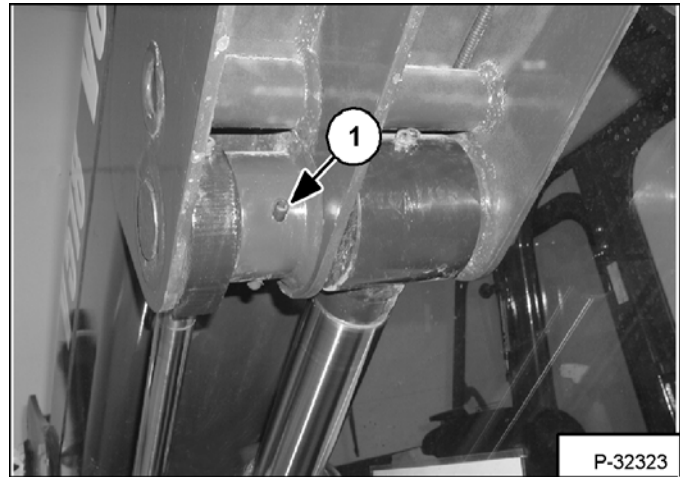
Raise the boom and support on adequate stands [Figure 20-20-1].

Figure 20-20-2



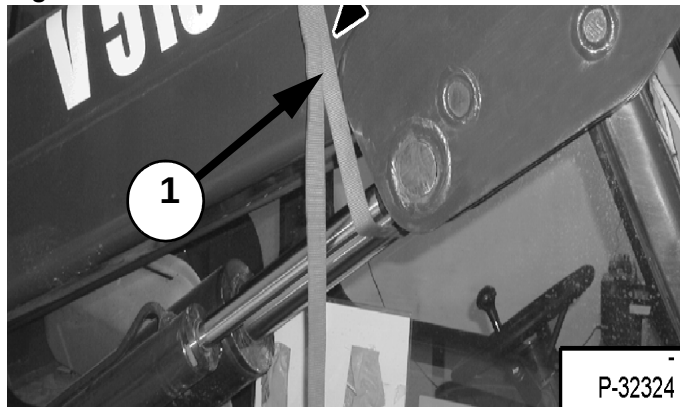
Remove the rear cover (Item 1) [Figure 20-20-2] from the Telescopic Handler.

Figure 20-20-3



Remove the rod end pivot pin retainer pin (Item 1) [Figure 20-20-3].

Figure 20-20-4

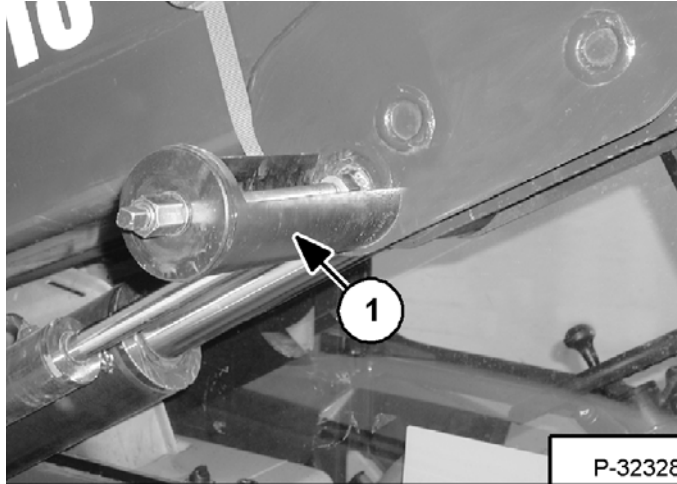


Support both cylinders using a cinch strap (Item 1) [Figure 20-20-4].

LIFT CYLINDER (CONT'D)

Removal And Installation (Cont'd)

Figure 20-20-5



Remove the upper pivot pin using a pin removal tool (Item 1) [Figure 20-20-5].

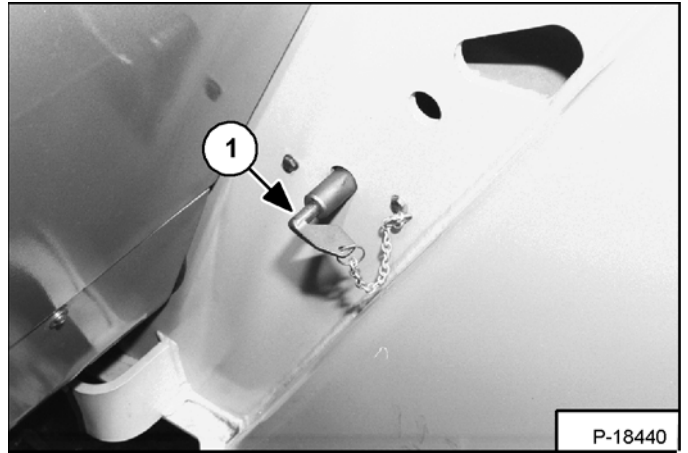
WARNING

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

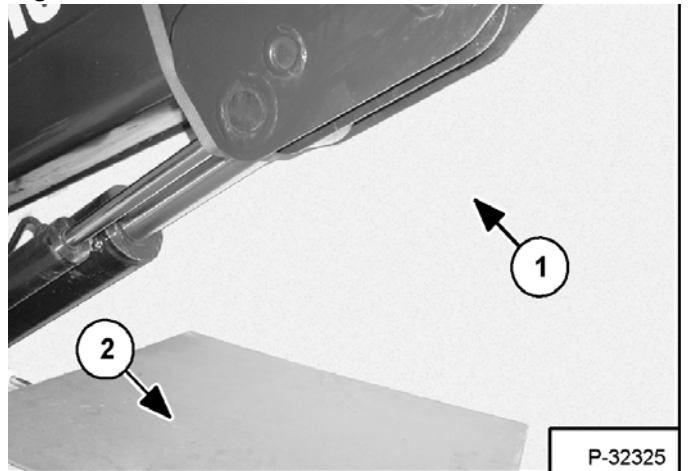
NOTE: If a nut must be welded onto the pin for removal, the following three steps must be performed.

Figure 20-20-6



1. Rotate the battery disconnect switch (Item 1) [Figure 20-20-6] to the right to disconnect the power supply from the battery.

Figure 20-20-7

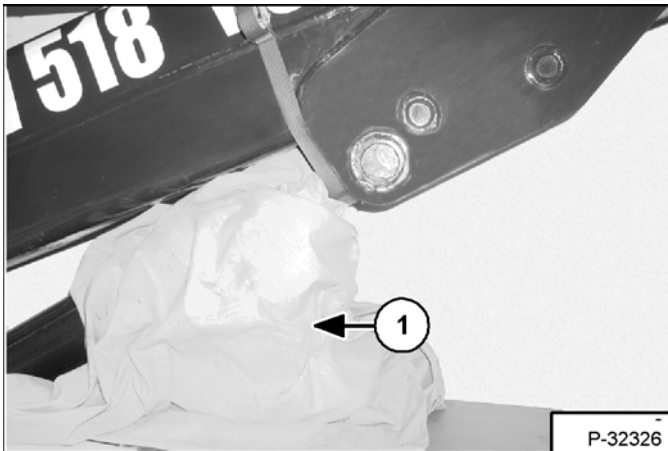


2. The side window (Item 1) and frame openings (Item 2) [Figure 20-20-7] must be protected from sparks.

LIFT CYLINDER (CONT'D)

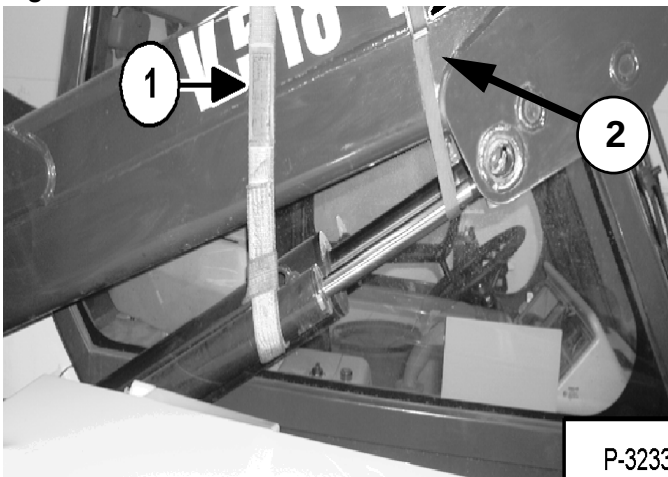
Removal And Installation (Cont'd)

Figure 20-20-8



3. The cylinder rod must be wrapped with a damp welding blanket (Item 1) [Figure 20-20-8] to prevent damage.

Figure 20-20-9



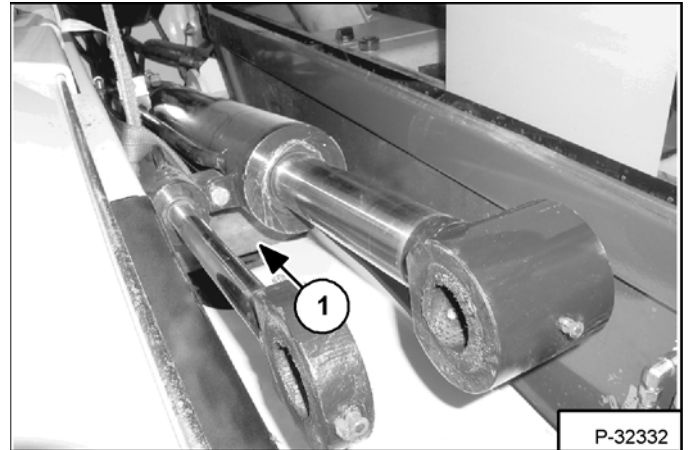
Lift and support the cylinders using a hoist and lifting strap (Item 1). Remove the cinch strap (Item 2) [Figure 20-20-9].

IMPORTANT

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

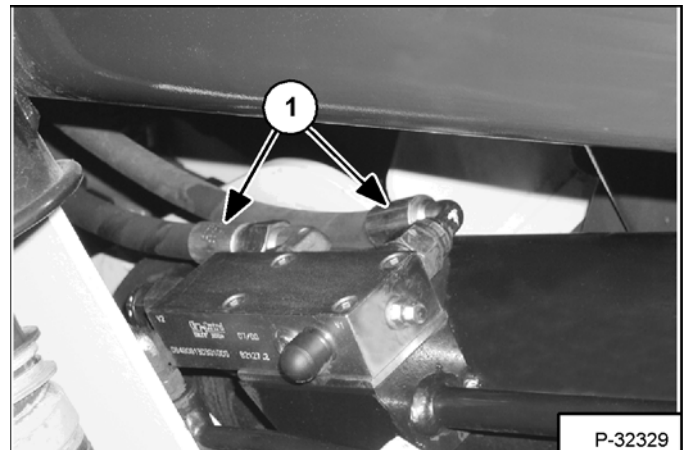
I-2003-0888

Figure 20-20-10



Lower both cylinders onto a wood block (Item 1) [Figure 20-20-10].

Figure 20-20-11



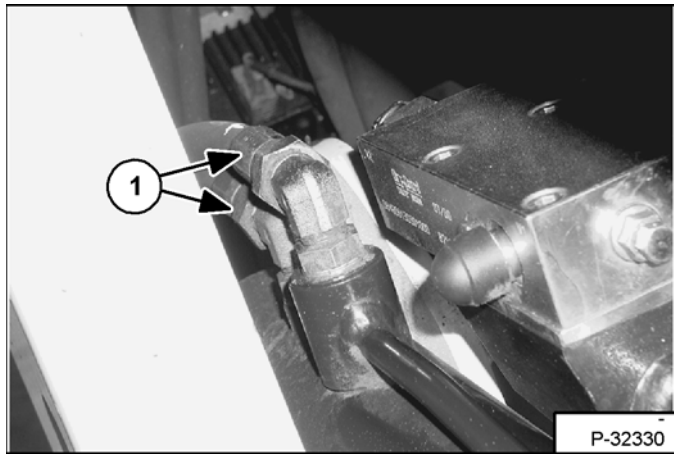
Remove the two hoses (Item 1) [Figure 20-20-11] from the load lock.

NOTE: Mark the hoses for correct installation.

LIFT CYLINDER (CONT'D)

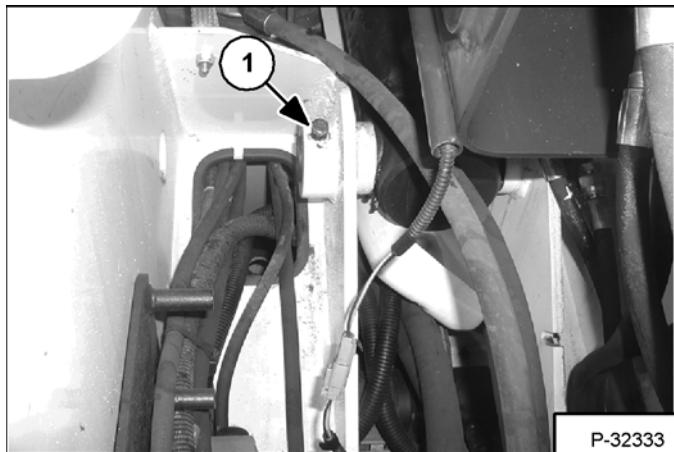
Removal And Installation (Cont'd)

Figure 20-20-12



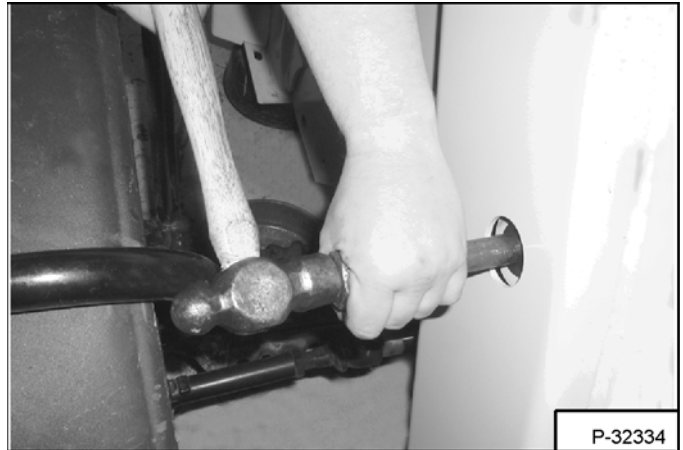
Remove the two hoses (Item 1) [Figure 20-20-12] from the cylinder.

Figure 20-20-13



Remove the base end pivot pin retainer bolt (Item 1) [Figure 20-20-13].

Figure 20-20-14



Remove the base end pivot pin [Figure 20-20-14].

Figure 20-20-15



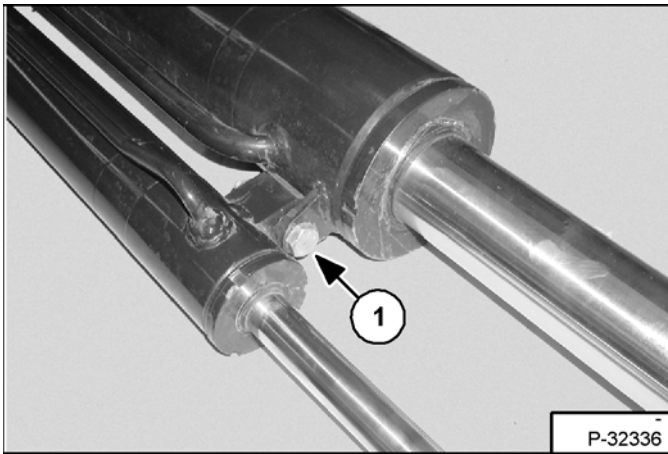
Lift and remove both cylinders from the Telescopic Handler [Figure 20-20-15].

NOTE: Protect the side window from possible damage.

LIFT CYLINDER (CONT'D)

Removal And Installation (Cont'd)

Figure 20-20-16

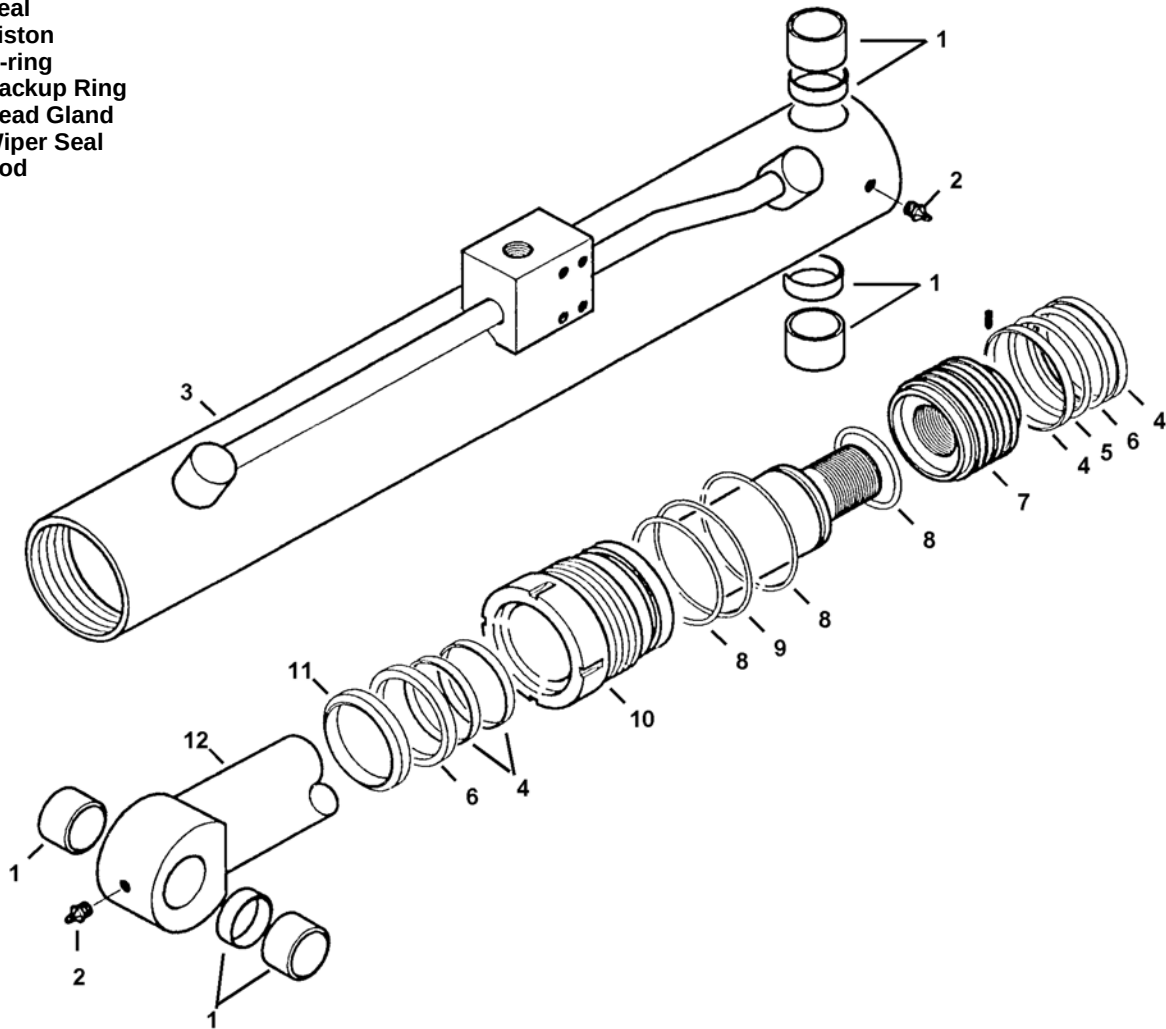


Remove the bolt and nut (Item 1) [Figure 20-20-16] and separate the lift cylinder and bucket positioning cylinder.

LIFT CYLINDER (CONT'D)

Parts Identification

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



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LIFT CYLINDER (CONT'D)

Disassembly

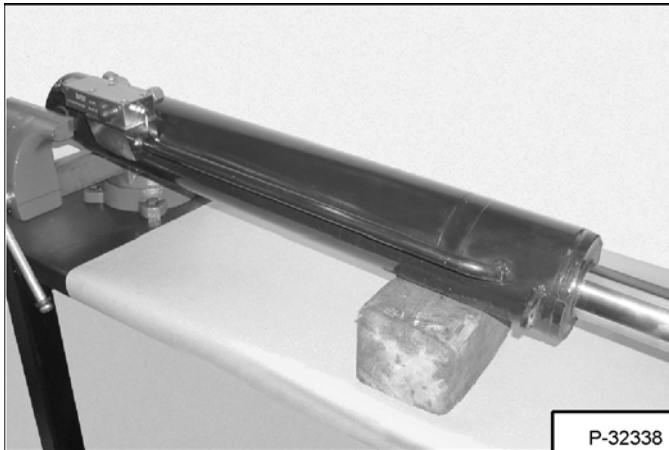
Use the following tools to disassemble the cylinder:

MEL1074-O-ring Seal Hook

MEL1353-Cylinder Gland Nut Wrench

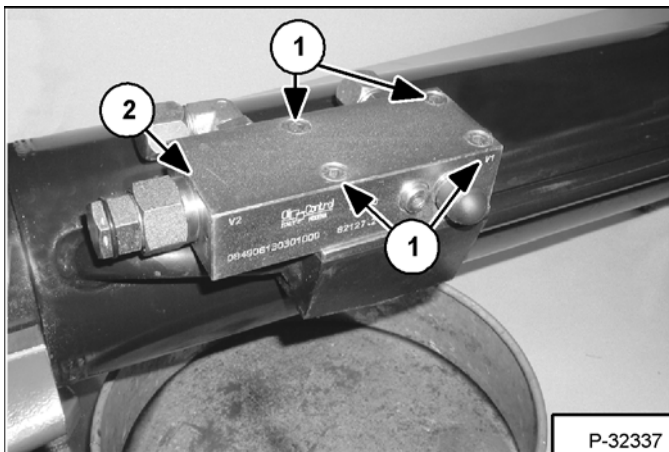
Clean the outside of the lift cylinder before disassembly.

Figure 20-20-17



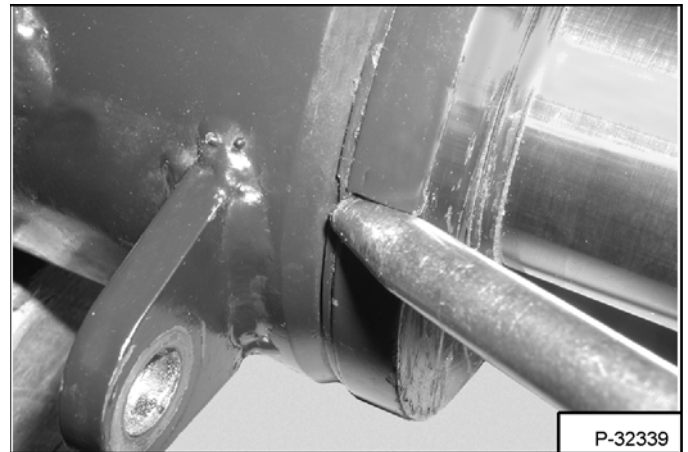
Put the cylinder in a vise [Figure 20-20-17].

Figure 20-20-18



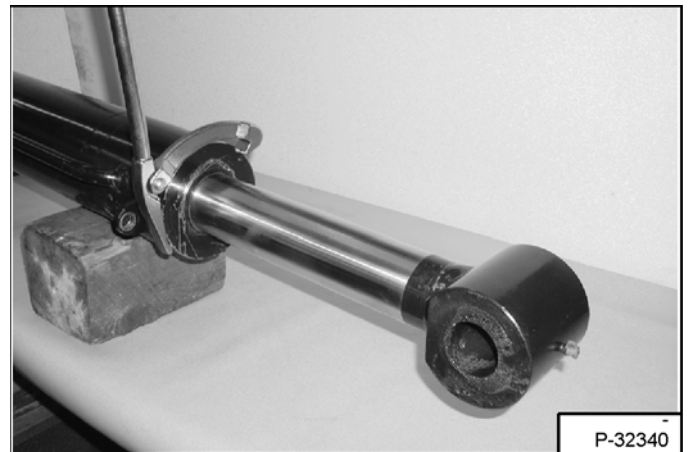
Remove the four bolts (Item 1) and remove the load lock (Item 2) [Figure 20-20-18].

Figure 20-20-19



Carefully peen the lock ring from the head gland [Figure 20-20-19].

Figure 20-20-20

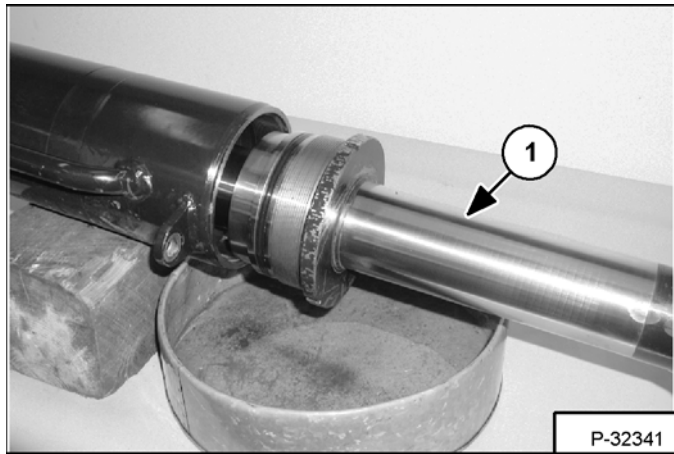


Loosen the head gland [Figure 20-20-20].

LIFT CYLINDER (CONT'D)

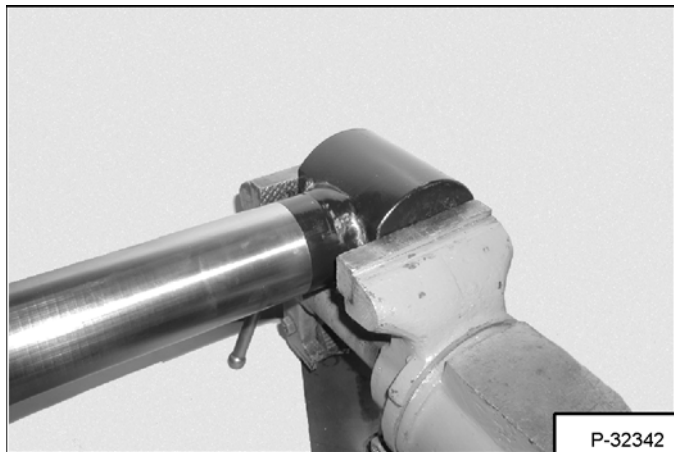
Disassembly (Cont'd)

Figure 20-20-21



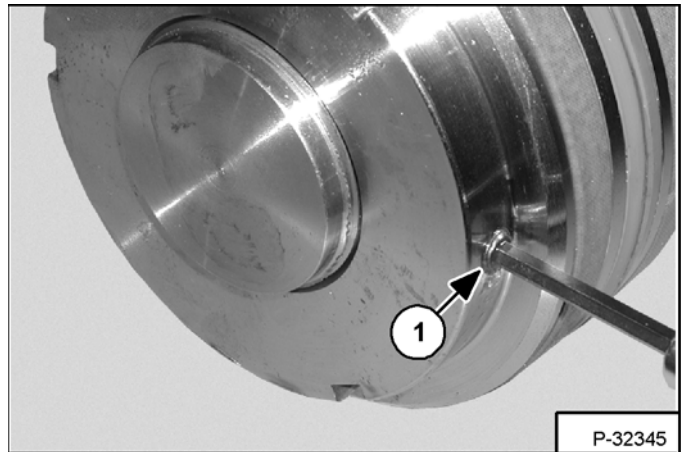
Remove the rod assembly (Item 1) [Figure 20-20-21] from the housing.

Figure 20-20-22



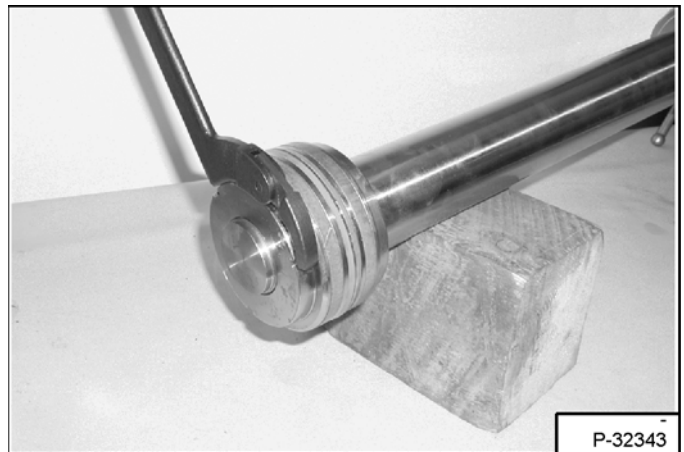
Put the rod end of the cylinder rod in a vise [Figure 20-20-22].

Figure 20-20-23



Remove the set screw (Item 1) [Figure 20-20-23] from the piston.

Figure 20-20-24

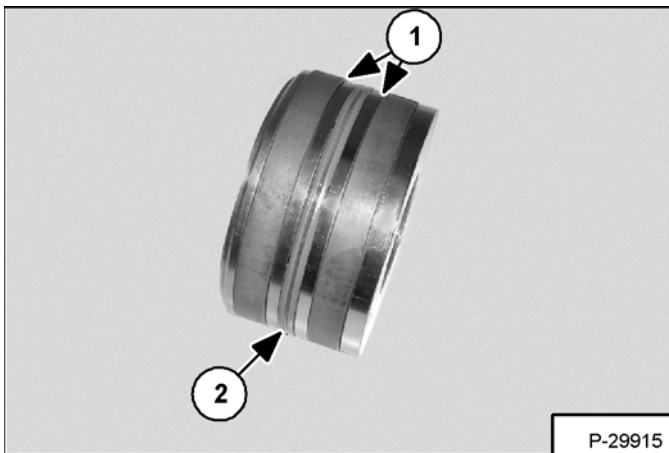


Support the cylinder rod on a wood block and remove the piston [Figure 20-20-24].

LIFT CYLINDER (CONT'D)

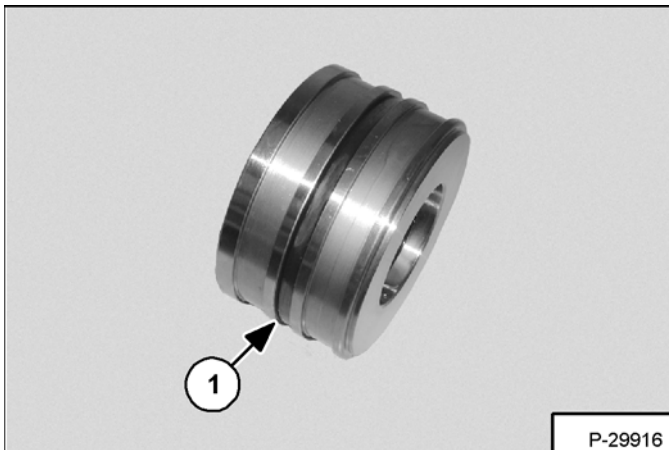
Disassembly (Cont'd)

Figure 20-20-25



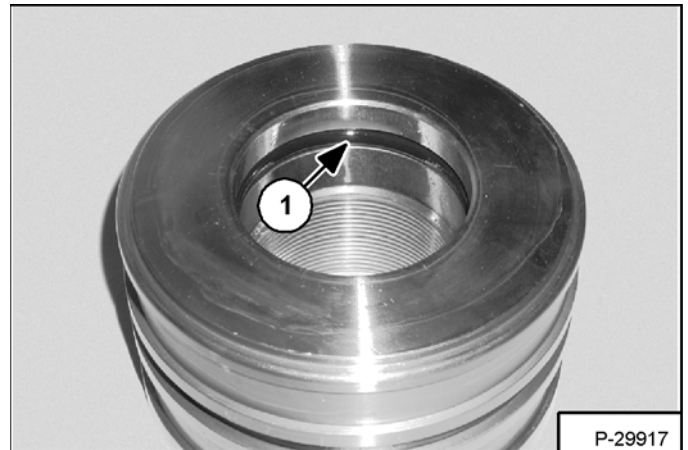
Remove the two wear rings (Item 1) and seal (Item 2) [Figure 20-20-25] from the piston.

Figure 20-20-26



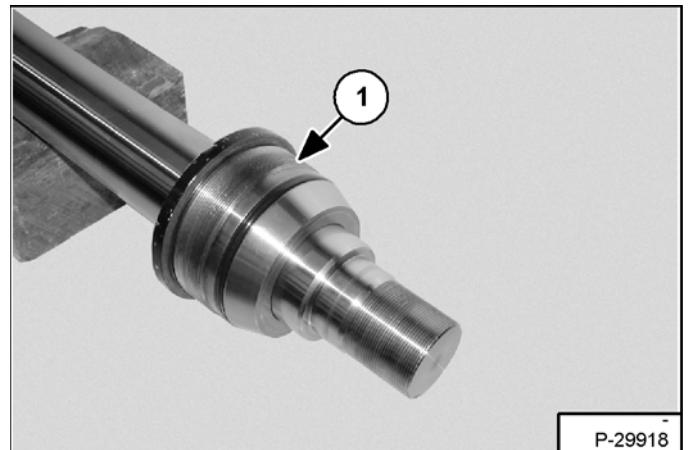
Remove the expander O-ring (Item 1) [Figure 20-20-26].

Figure 20-20-27



Remove the O-ring (Item 1) [Figure 20-20-27] from the piston.

Figure 20-20-28

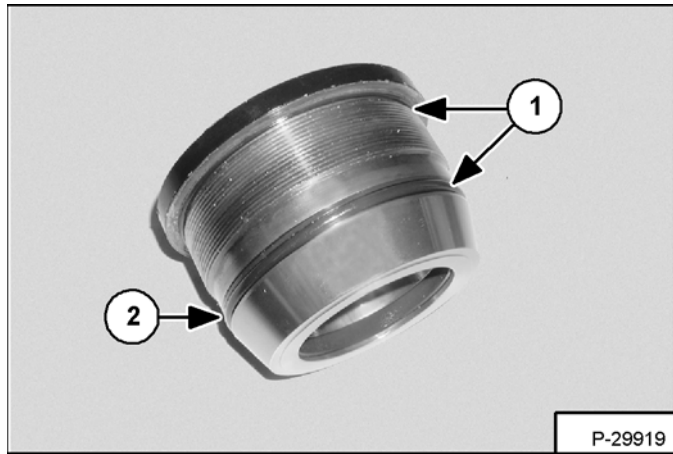


Remove the head gland (Item 1) [Figure 20-20-28] from the rod.

LIFT CYLINDER (CONT'D)

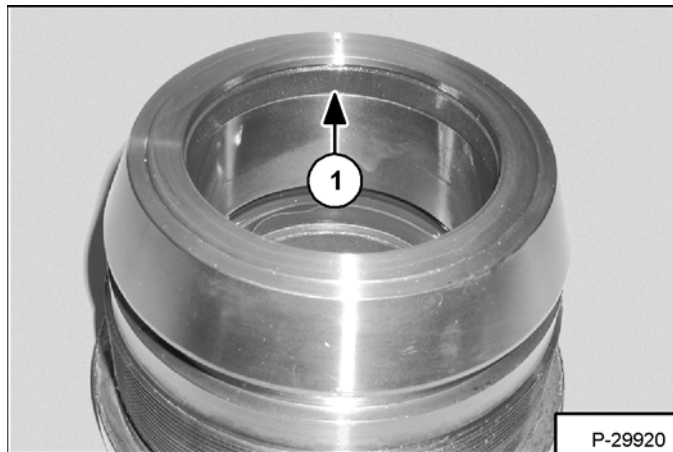
Disassembly (Cont'd)

Figure 20-20-29



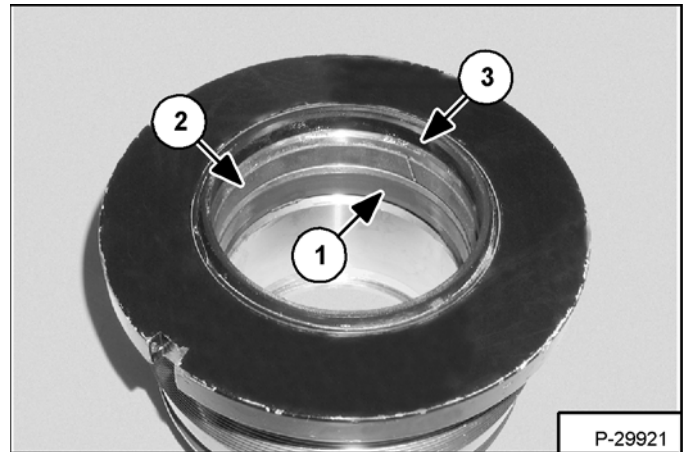
Remove the two O-rings (Item 1) and backup ring (Item 2) [Figure 20-20-29] from the head gland.

Figure 20-20-30



Remove the wear ring (Item 1) [Figure 20-20-30].

Figure 20-20-31



Remove the seal (Item 1), wear ring (Item 2) and wiper (Item 3) [Figure 20-20-31].

LIFT CYLINDER (CONT'D)

Assembly

Use the following tools to assemble the cylinder:

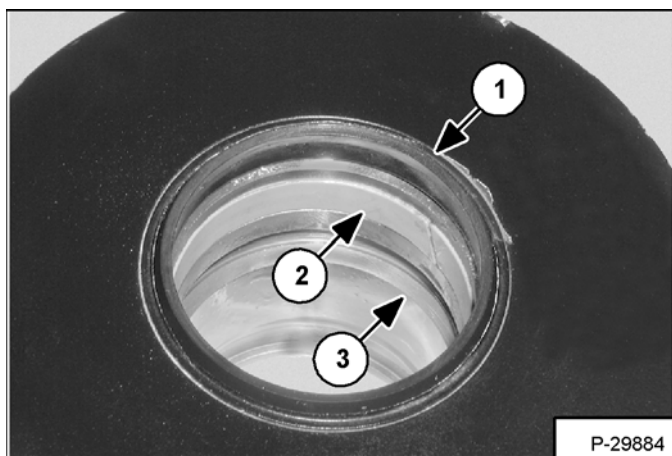
MEL1033-Rod Seal Installation Tool
MEL1353-Cylinder Gland Nut Wrench

Clean all parts in solvent and dry with compressed air.

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

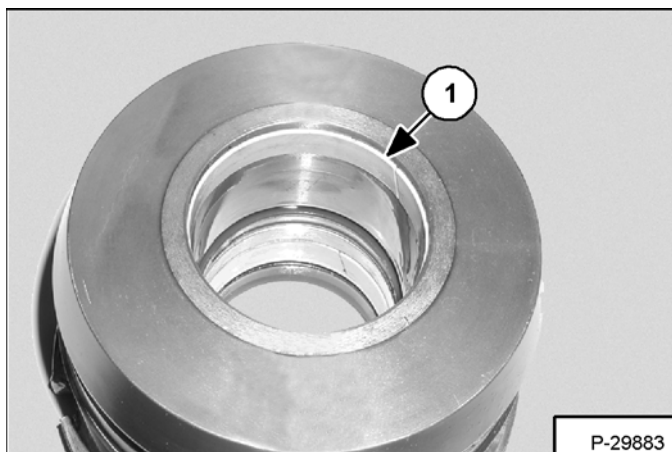
Always install new seals and O-rings. Lubricate all seals and O-rings with clean hydraulic fluid before installation.

Figure 20-20-32



Install the wiper (Item 1), wear ring (Item 2) and seal (Item 3) [Figure 20-20-32] into the head gland.

Figure 20-20-33



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

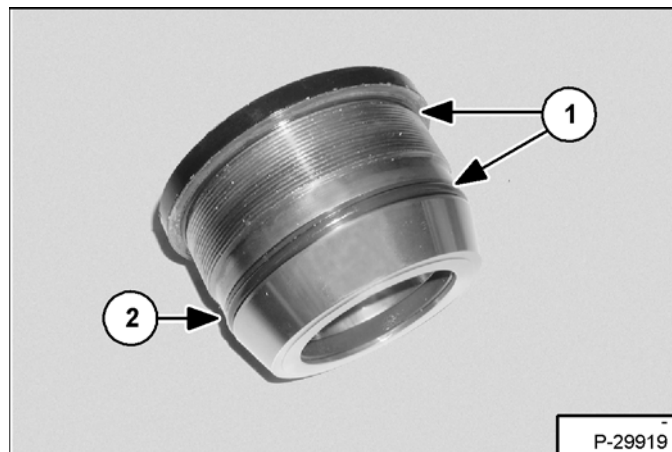
Figure 20-20-34



Install the center seal (Item 1) [Figure 20-20-34].

NOTE: The groove in the seal must point away from the wiper seal (Item 1) [Figure 20-20-32].

Figure 20-20-35

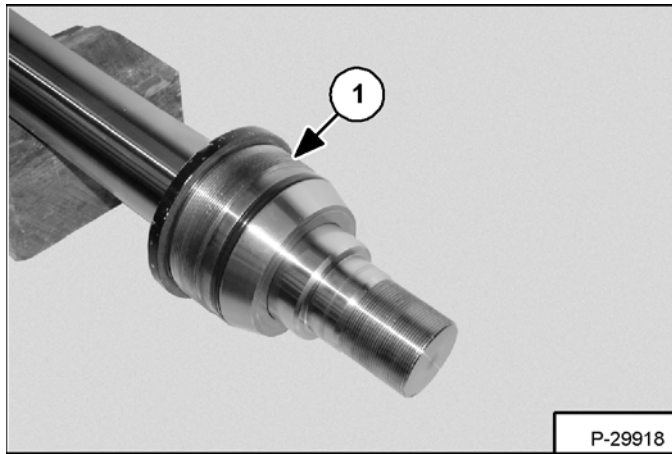


Install the two O-rings (Item 1) and backup ring (Item 2) [Figure 20-20-35].

LIFT CYLINDER (CONT'D)

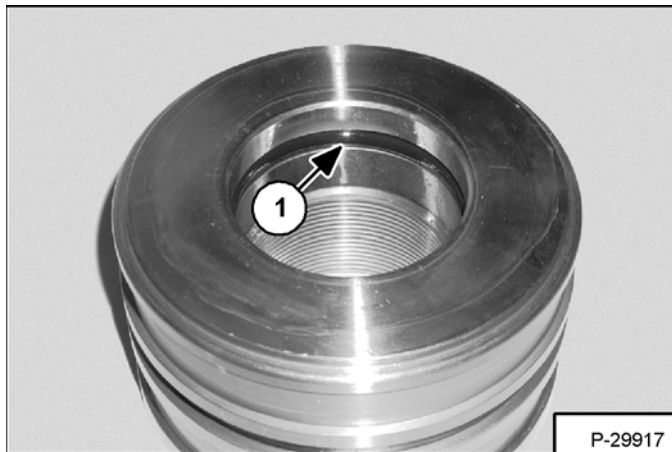
Assembly (Cont'd)

Figure 20-20-36



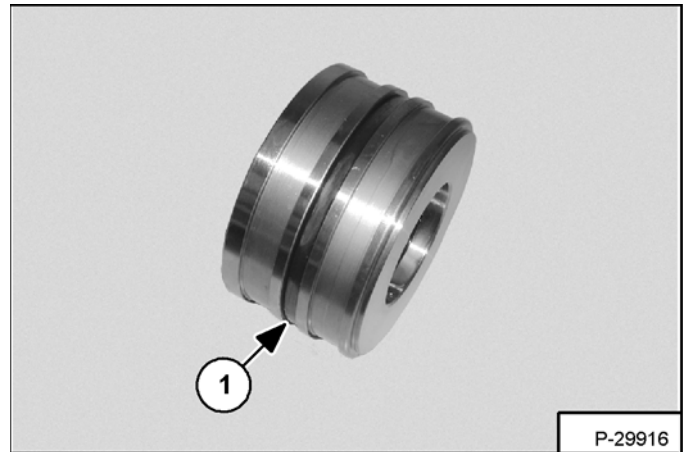
Install the head gland (Item 1) [Figure 20-20-36] onto the rod.

Figure 20-20-37



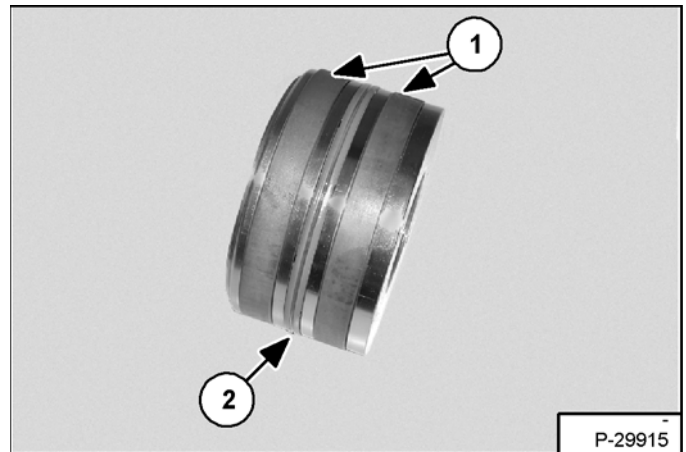
Install the O-ring (Item 1) [Figure 20-20-37] in the piston.

Figure 20-20-38



Install the expander O-ring (Item 1) [Figure 20-20-38] on the piston.

Figure 20-20-39

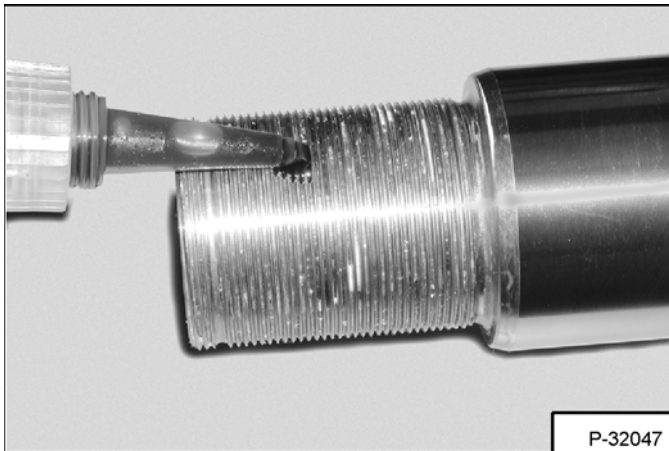


Install the two wear rings (Item 1) and seal (Item 2) [Figure 20-20-39] onto the piston.

LIFT CYLINDER (CONT'D)

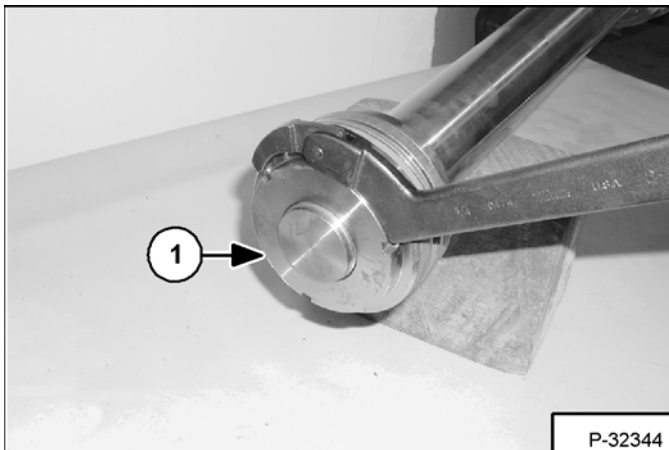
Assembly (Cont'd)

Figure 20-20-40



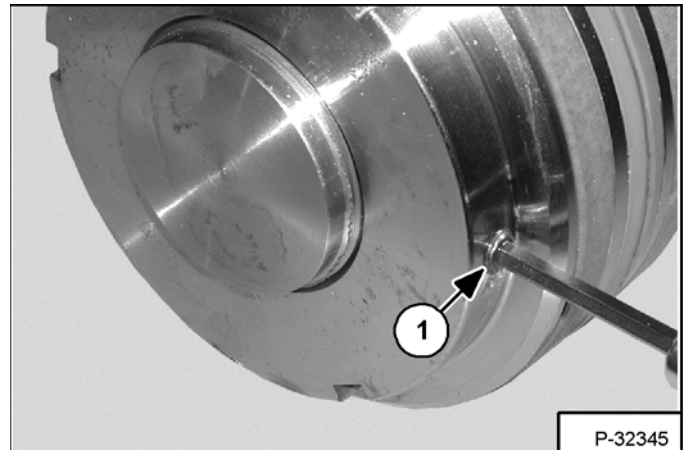
Clean off any old residue, and apply LOCTITE 242 or equivalent to the threads on the rod [Figure 20-20-40].

Figure 20-20-41



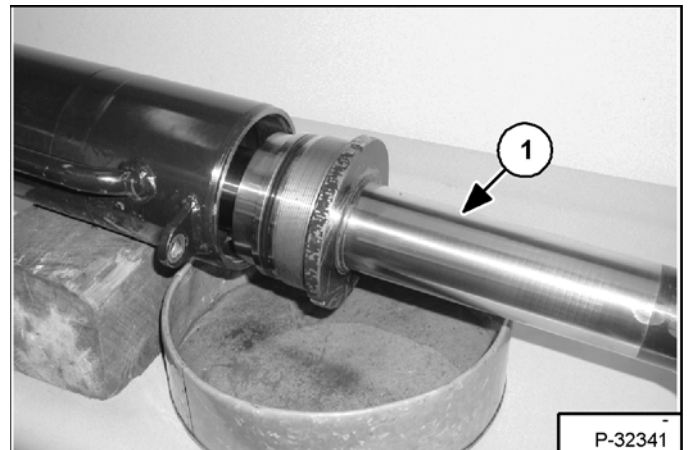
Install the piston (Item 1) [Figure 20-20-41] on the rod and tighten.

Figure 20-20-42



Install and tighten the set screw (Item 1) [Figure 20-20-42].

Figure 20-20-43

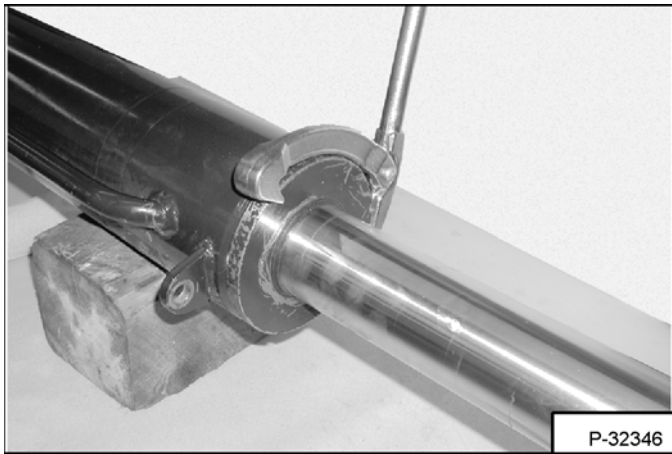


Install the rod assembly (Item 1) [Figure 20-20-43] into the housing.

LIFT CYLINDER (CONT'D)

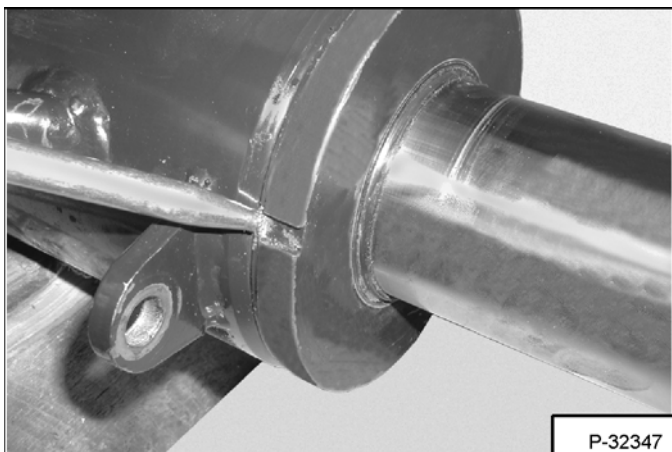
Assembly (Cont'd)

Figure 20-20-44



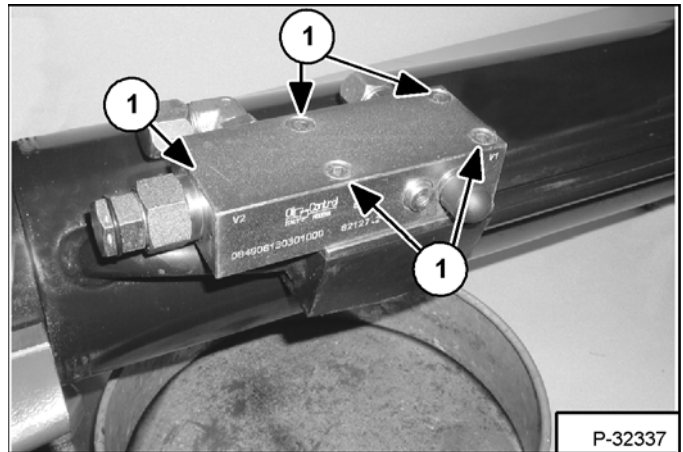
Tighten the head gland [Figure 20-20-44].

Figure 20-20-45



Peen the lock ring into the groove in the head gland [Figure 20-20-45].

Figure 20-20-46

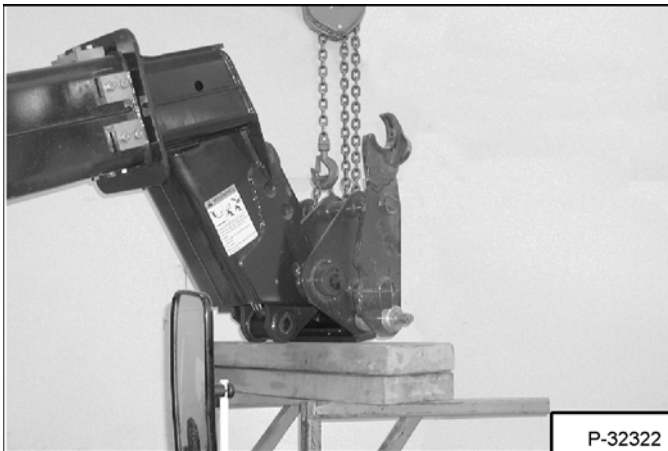


Install the load lock (Item 1) onto the cylinder and tighten the four bolts (Item 2) [Figure 20-20-46].

BUCKET POSITIONING CYLINDER

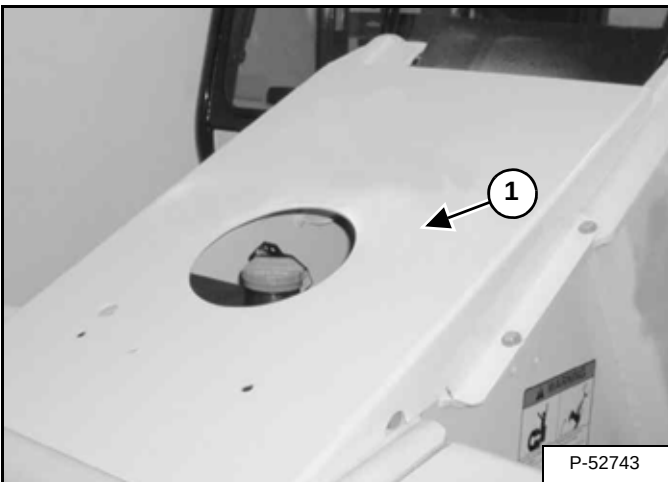
Removal And Installation

Figure 20-30-1



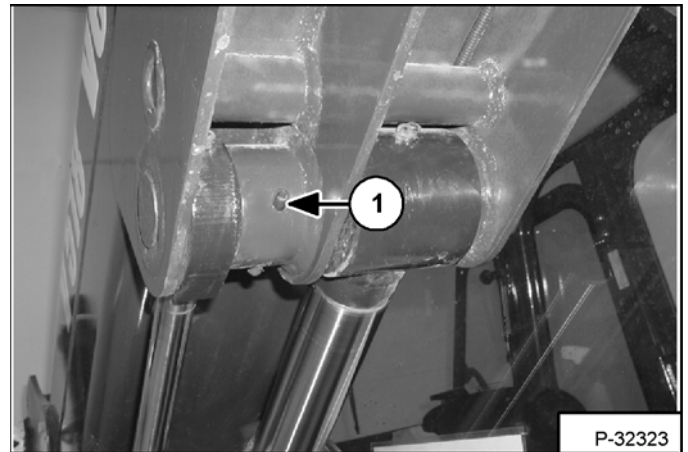
Raise the boom and support on adequate stands [Figure 20-30-1].

Figure 20-30-2



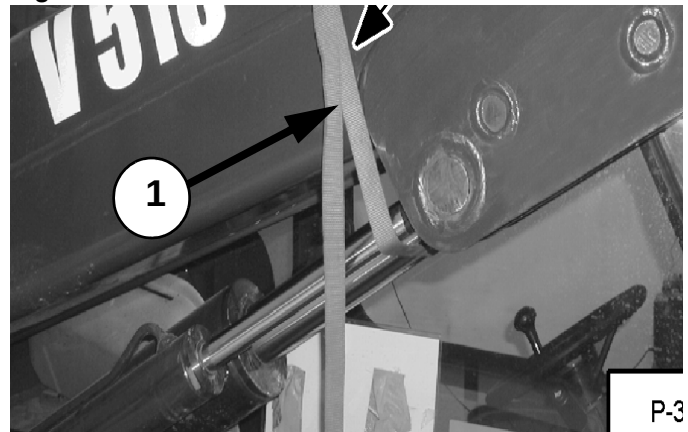
Remove the rear cover (Item 1) [Figure 20-30-2] from the machine.

Figure 20-30-3



Remove the rod end pivot pin retainer pin (Item 1) [Figure 20-30-3].

Figure 20-30-4

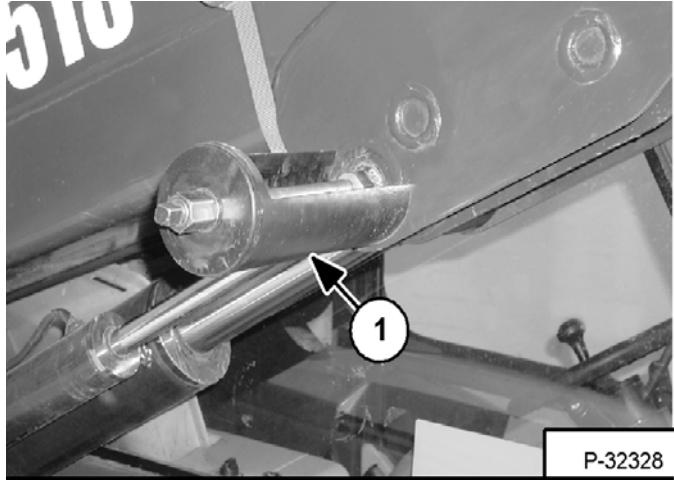


Support both cylinders using a cinch strap (Item 1) [Figure 20-30-4].

BUCKET POSITIONING CYLINDER (CONT'D)

Removal And Installation (Cont'd)

Figure 20-30-5



Remove the upper pivot pin using a pin removal tool (Item 1) [Figure 20-30-5].

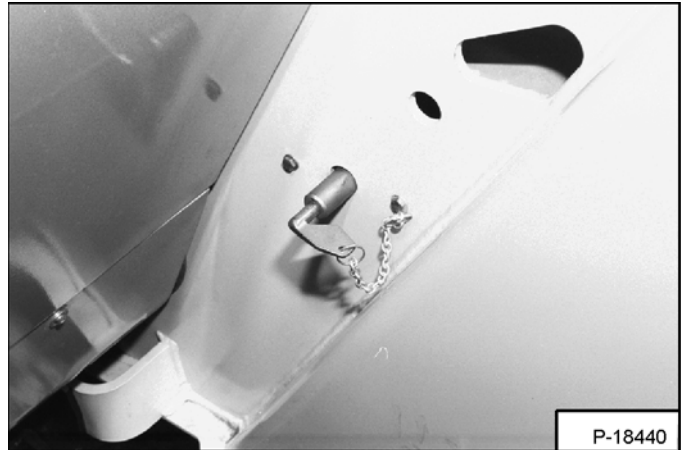
WARNING

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.

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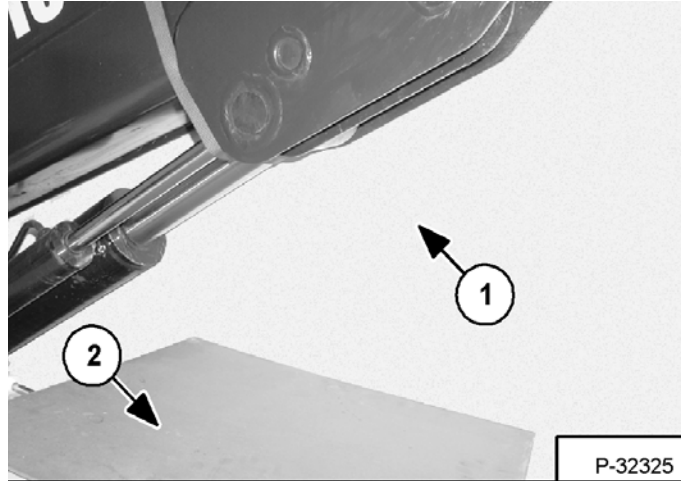
NOTE: If a nut must be welded onto the pin for removal the following three steps must be performed.

Figure 20-30-6



1. Rotate the battery disconnect switch (Item 1) [Figure 20-30-6] to the right to disconnect the power supply from the battery.

Figure 20-30-7

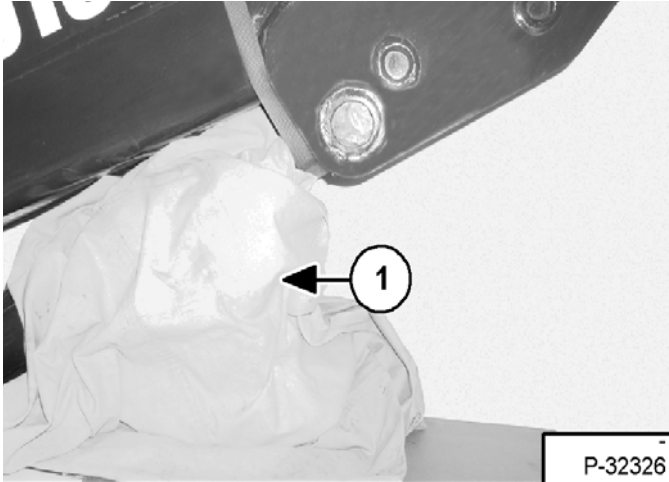


2. The side window (Item 1) and frame openings (Item 2) [Figure 20-30-7] must be protected from sparks.

BUCKET POSITIONING CYLINDER (CONT'D)

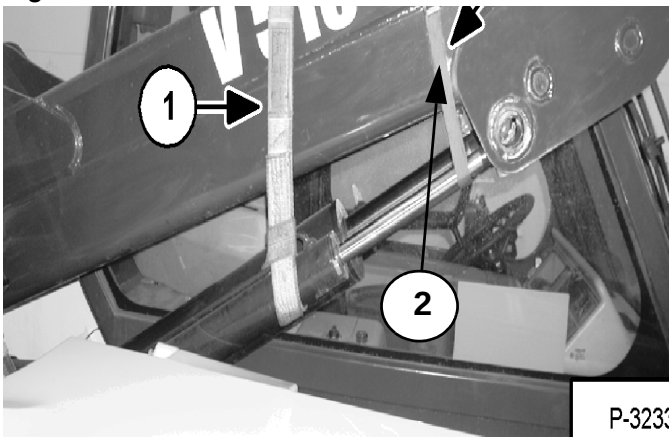
Removal And Installation (Cont'd)

Figure 20-30-8



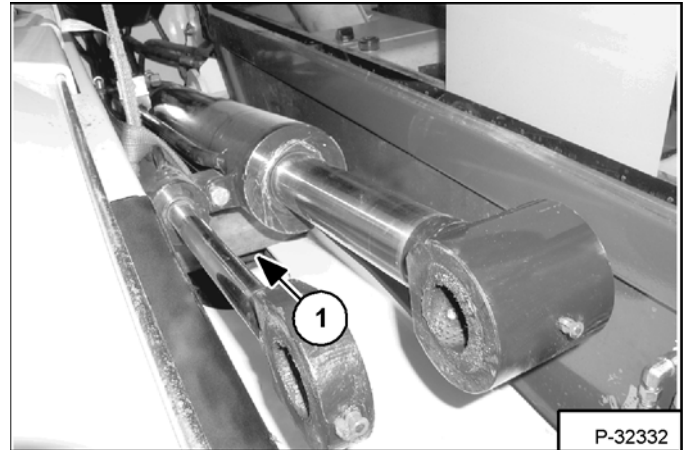
3. The cylinder rod must be wrapped with a damp welding blanket (Item 1) [Figure 20-30-8] to prevent damage.

Figure 20-30-9



Lift and support the cylinders using a hoist and lifting strap (Item 1). Remove the cinch strap (Item 2) [Figure 20-30-9].

Figure 20-30-10



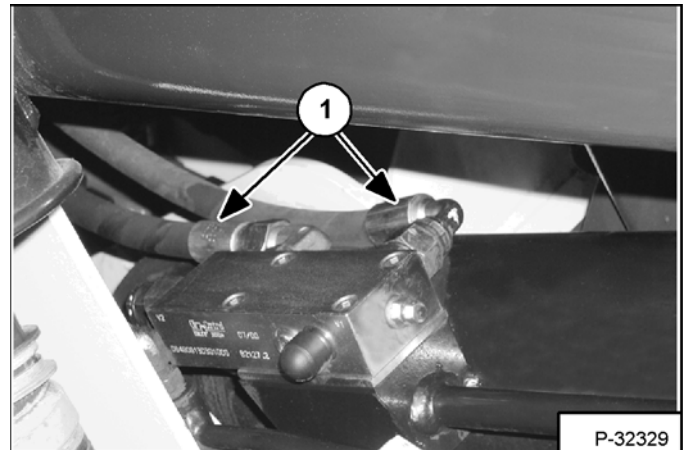
Lower both cylinders onto a wood block (Item 1) [Figure 20-30-10].

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 20-30-11



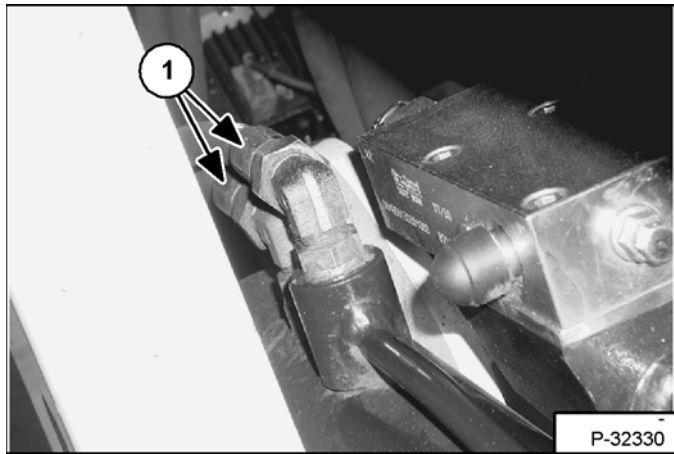
Remove the two hoses (Item 1) [Figure 20-30-11] from the load lock.

NOTE: Mark the hoses for correct installation.

BUCKET POSITIONING CYLINDER (CONT'D)

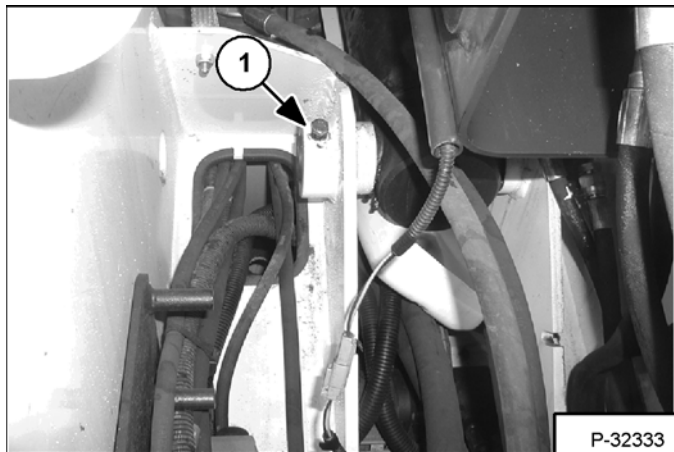
Removal And Installation (Cont'd)

Figure 20-30-12



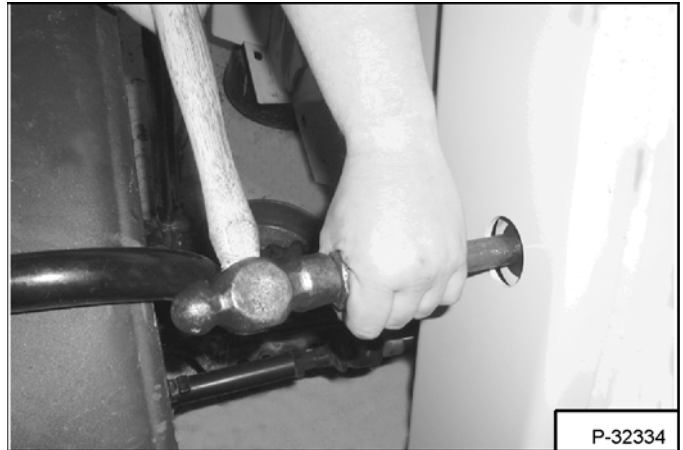
Remove the two hoses (Item 1) [Figure 20-30-12] from the cylinder.

Figure 20-30-13



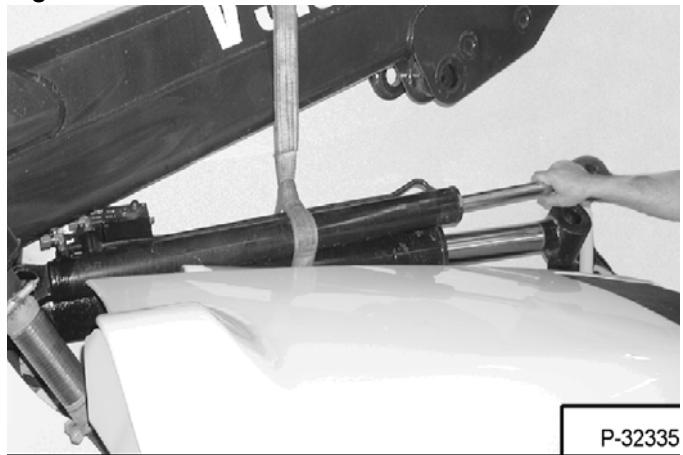
Remove the base end pivot pin retainer bolt (Item 1) [Figure 20-30-13].

Figure 20-30-14



Remove the base end pivot pin [Figure 20-30-14].

Figure 20-30-15



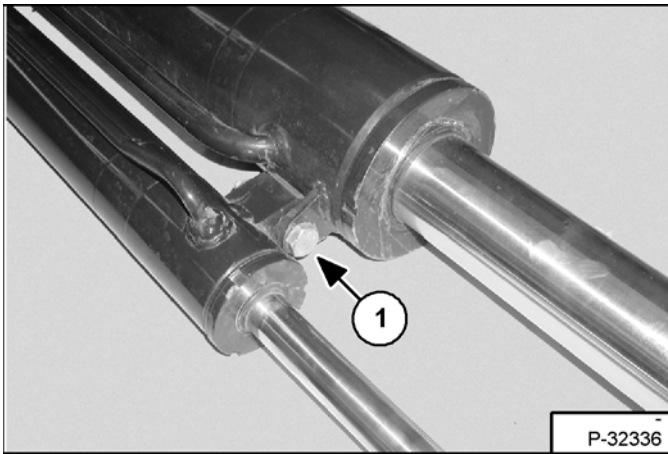
Lift and remove both cylinders from the Telescopic Handler [Figure 20-30-15].

NOTE: Protect the side window from possible damage.

BUCKET POSITIONING CYLINDER (CONT'D)

Removal And Installation (Cont'd)

Figure 20-30-16

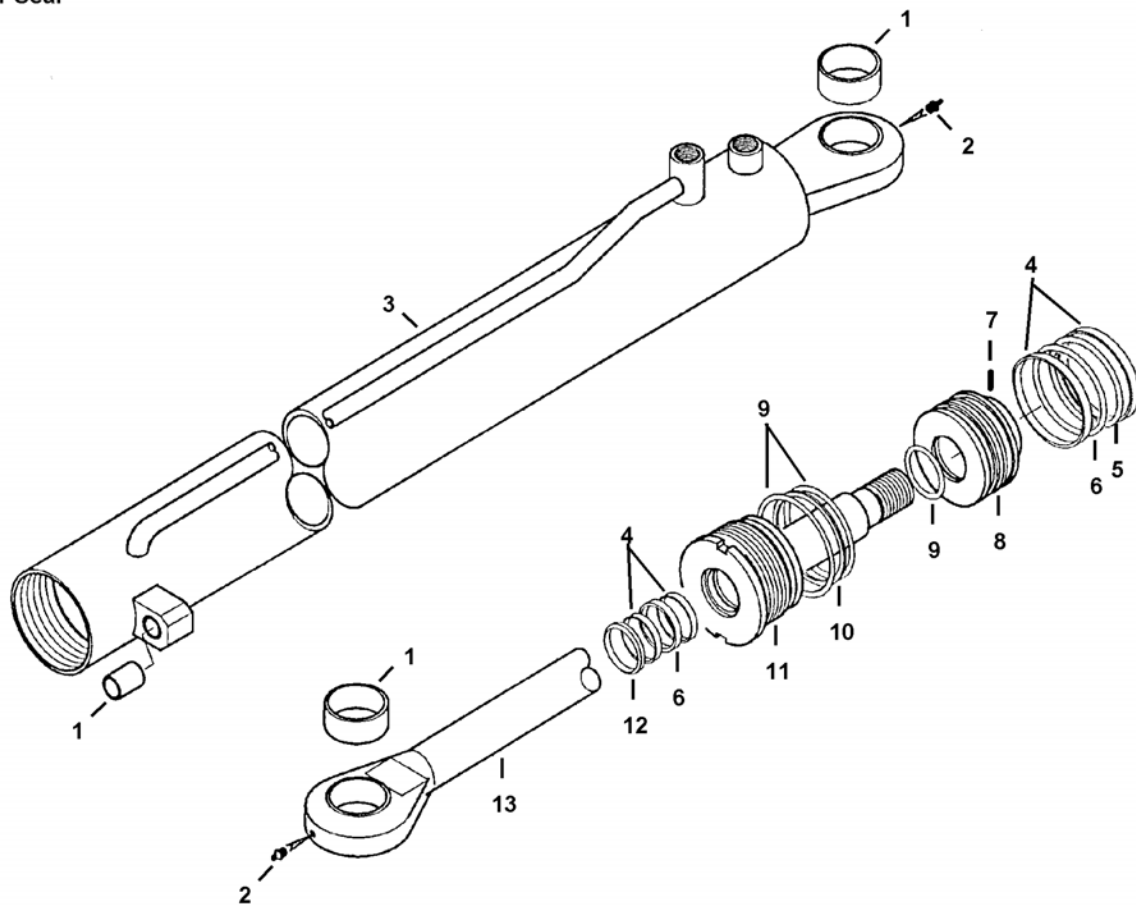


Remove the bolt and nut (Item 1) [Figure 20-30-16] and separate the lift cylinder and bucket positioning cylinder.

BUCKET POSITIONING CYLINDER (CONT'D)

Parts Identification

1. Bushing
2. Grease Fitting
3. Housing
4. Wear Ring
5. Expander O-ring
6. Seal
7. Set Screw
8. Piston
9. O-ring
10. Backup Ring
11. Head Gland
12. Wiper Seal
13. Rod



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BUCKET POSITIONING CYLINDER (CONT'D)

Disassembly

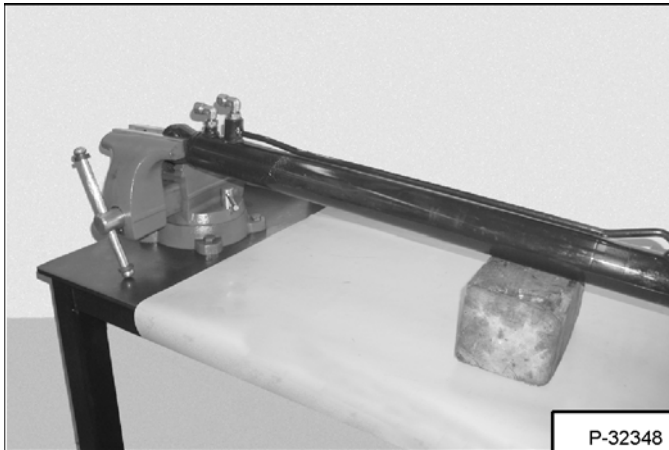
Use the following tools to disassemble the cylinder:

MEL1074-O-ring Seal Hook

MEL1353-Cylinder Gland Nut Wrench

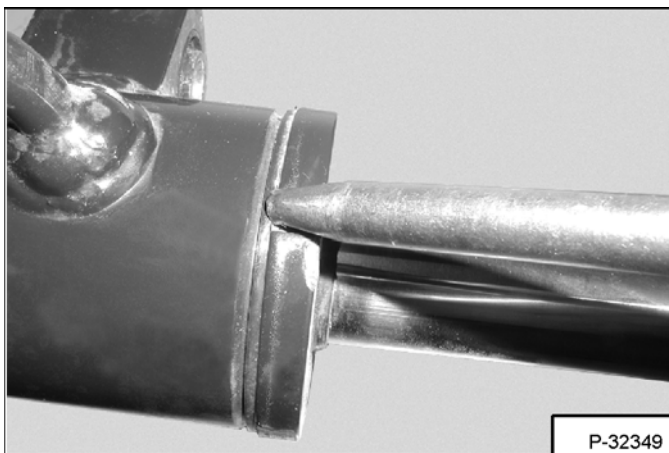
Clean the outside of the bucket positioning cylinder before disassembly.

Figure 20-30-17



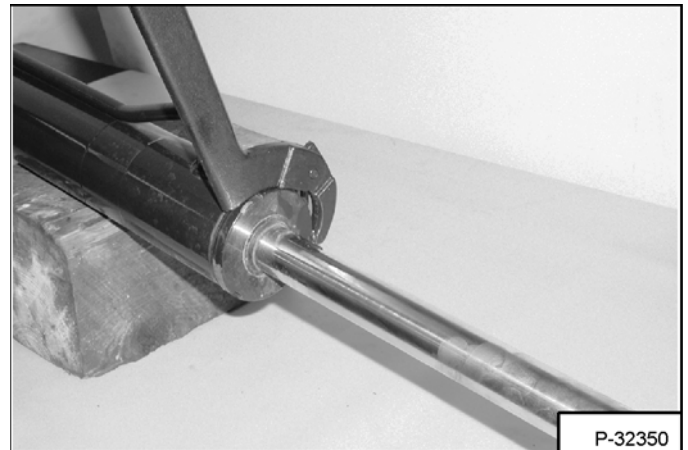
Put the cylinder in a vise [Figure 20-30-17].

Figure 20-30-18



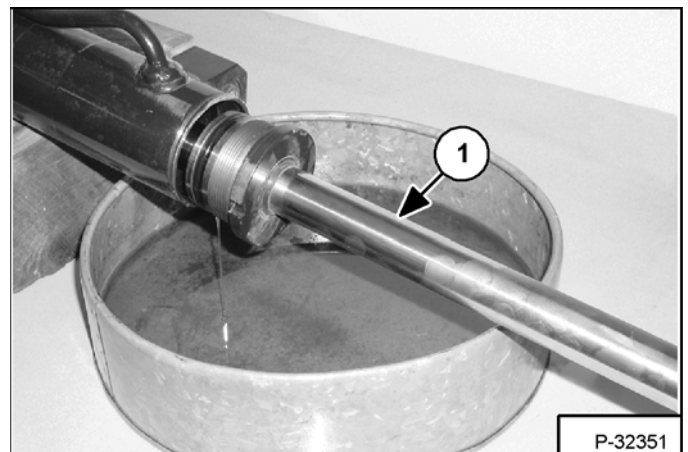
Carefully peen the lock ring from the head gland [Figure 20-30-18].

Figure 20-30-19



Remove the head gland [Figure 20-30-19].

Figure 20-30-20

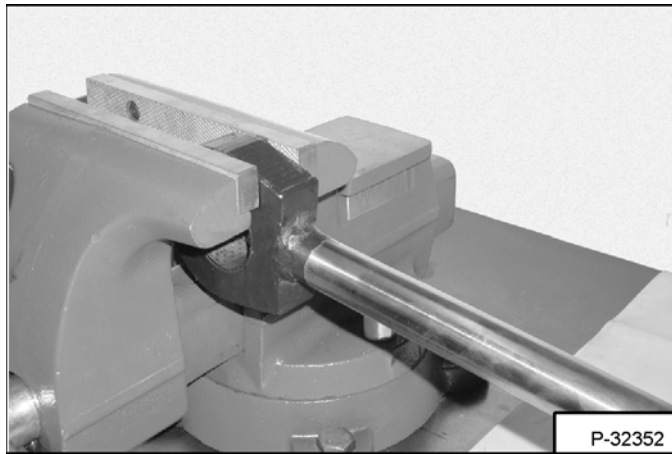


Remove the rod assembly (Item 1) [Figure 20-30-20] from the housing.

BUCKET POSITIONING CYLINDER (CONT'D)

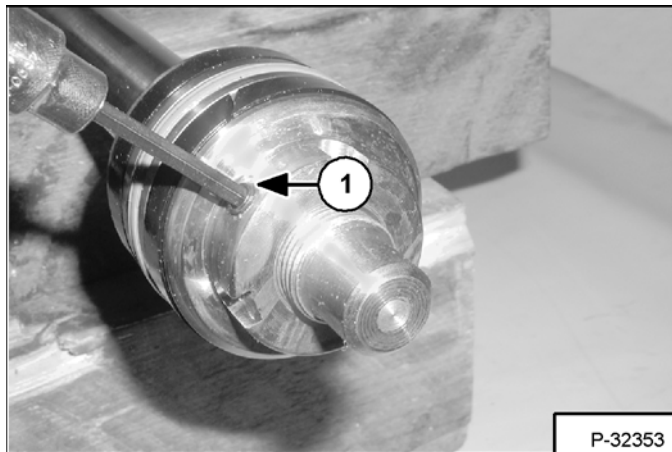
Disassembly (Cont'd)

Figure 20-30-21



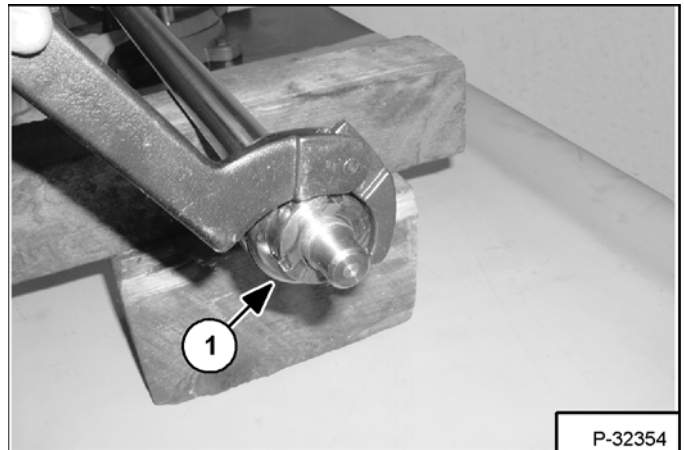
Put the rod end of the cylinder in a vise [Figure 20-30-21].

Figure 20-30-22



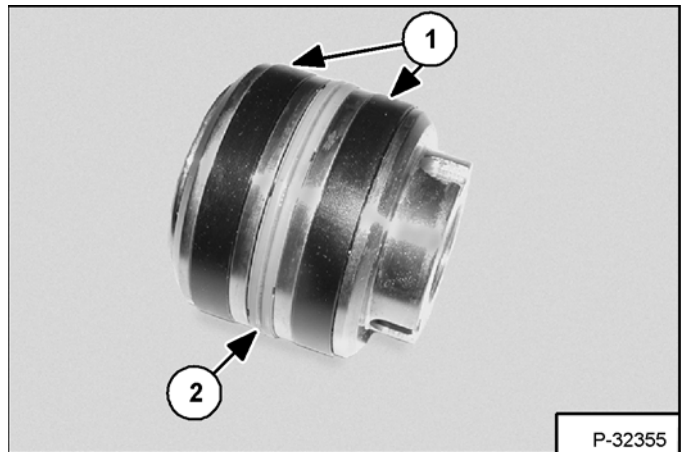
Support the cylinder rod on a wood block and remove the set screw (Item 1) [Figure 20-30-22] from the piston.

Figure 20-30-23



Remove the piston assembly (Item 1) [Figure 20-30-23] from the rod.

Figure 20-30-24

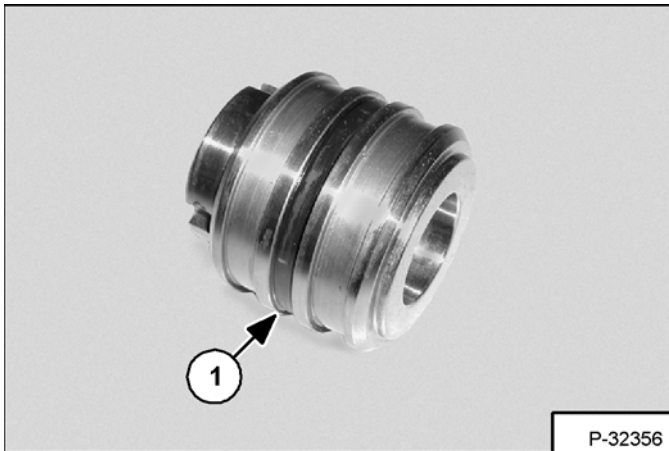


Remove the two wear rings (Item 1) and seal (Item 2) [Figure 20-30-24] from the piston.

BUCKET POSITIONING CYLINDER (CONT'D)

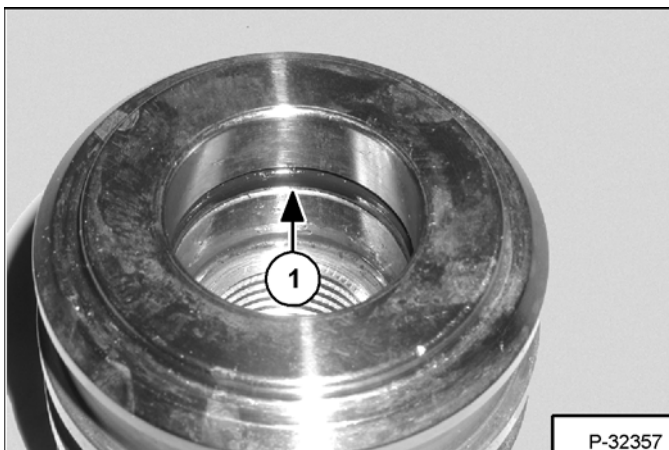
Disassembly (Cont'd)

Figure 20-30-25



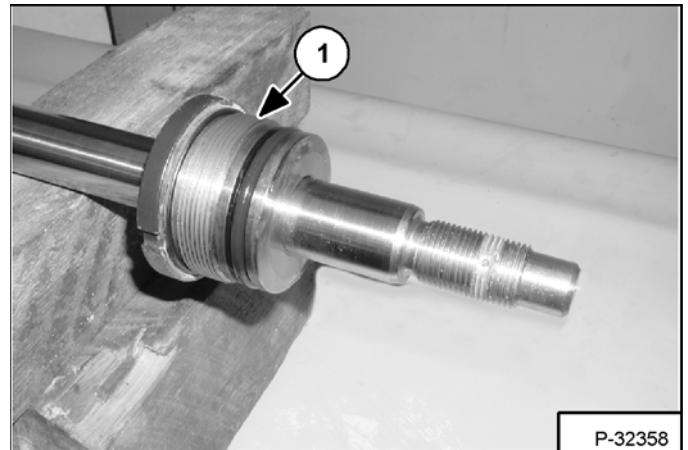
Remove the expander O-ring (Item 1) [Figure 20-30-25].

Figure 20-30-26



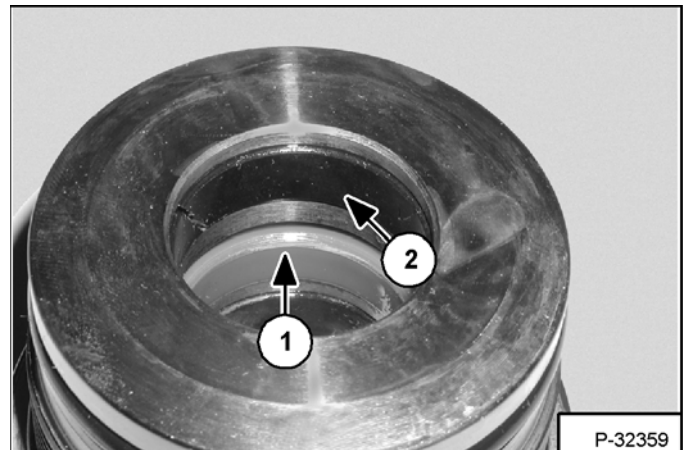
Remove the O-ring (Item 1) [Figure 20-30-26] from the piston.

Figure 20-30-27



Remove the head gland (Item 1) [Figure 20-30-27] from the rod.

Figure 20-30-28

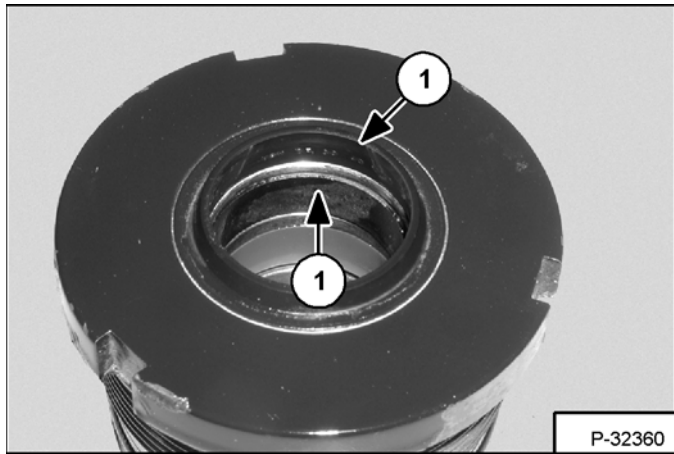


Remove the center seal (Item 1) and outer wear ring (Item 2) [Figure 20-30-28].

BUCKET POSITIONING CYLINDER (CONT'D)

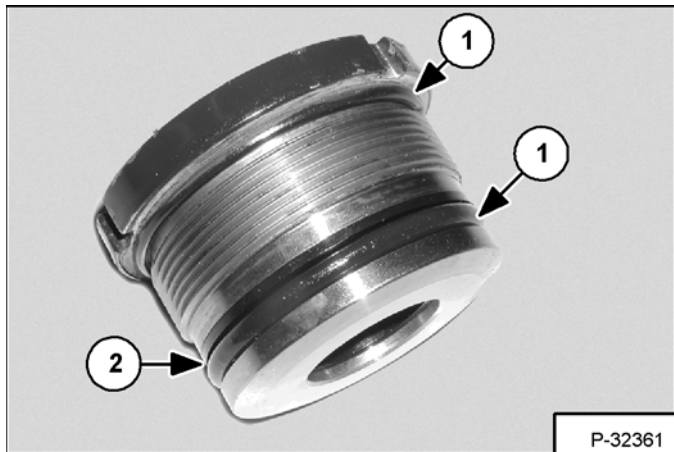
Disassembly (Cont'd)

Figure 20-30-29



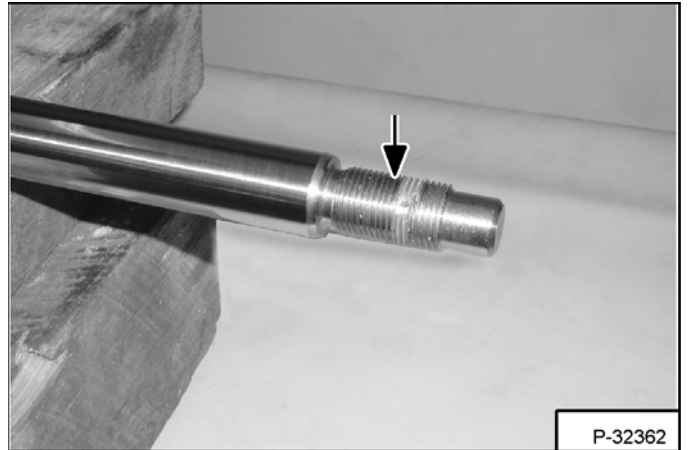
Remove the outer wear ring (Item 1) and wiper (Item 2) [Figure 20-30-29].

Figure 20-30-30



Remove the two O-rings (Item 1) and backup ring (Item 2) [Figure 20-30-30].

Figure 20-30-31



Remove any residue from the threads on the cylinder rod [Figure 20-30-31].

BUCKET POSITIONING CYLINDER (CONT'D)

Assembly

Use the following tools to assemble the cylinder:

MEL1033-Rod Seal Installation Tool

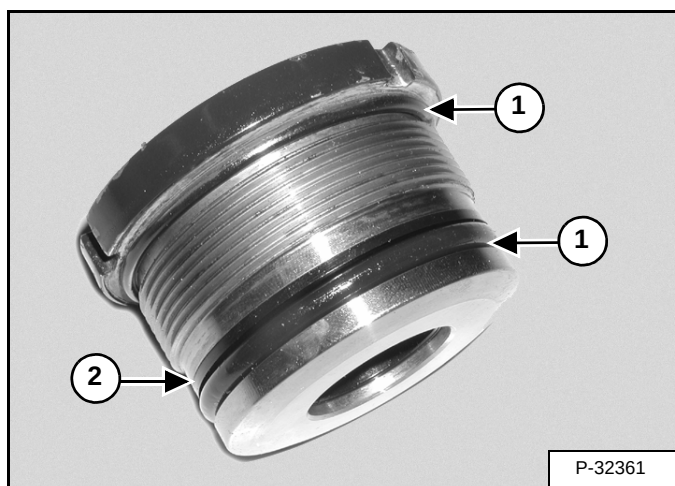
MEL1353-Cylinder Gland Nut Wrench

Clean all parts in solvent and dry with compressed air.

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

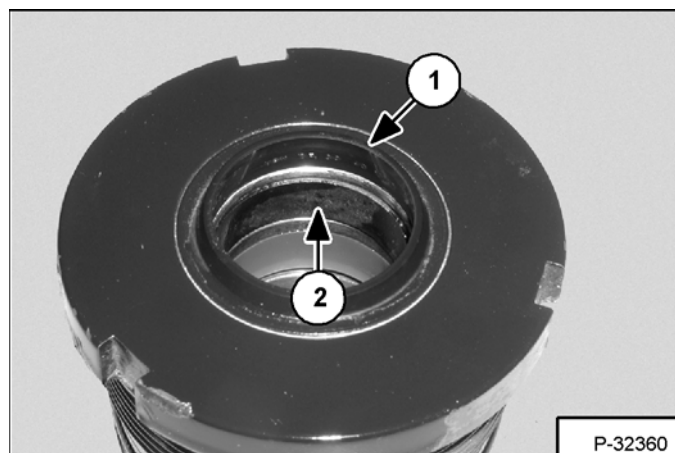
Always install new seals and O-rings. Lubricate all seals and O-rings with clean hydraulic fluid before installation.

Figure 20-30-32



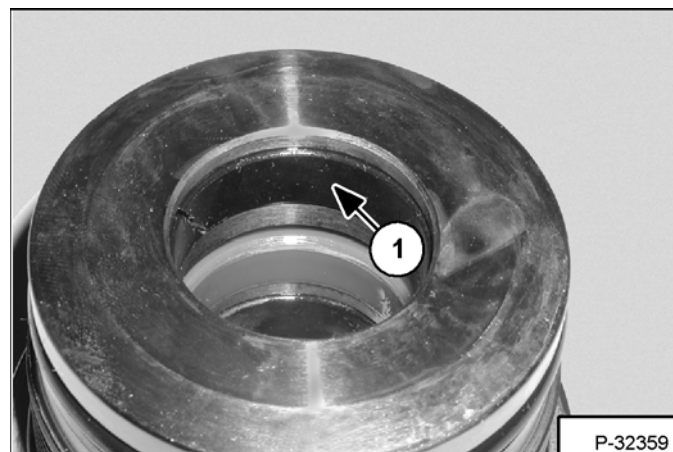
Install the two O-rings (Item 1) and backup ring (Item 2) [Figure 20-30-32] onto the head gland.

Figure 20-30-33



Install the wiper (Item 1) and wear ring (Item 2) [Figure 20-30-33].

Figure 20-30-34



Install the wear ring (Item 1) [Figure 20-30-34].

Figure 20-30-35



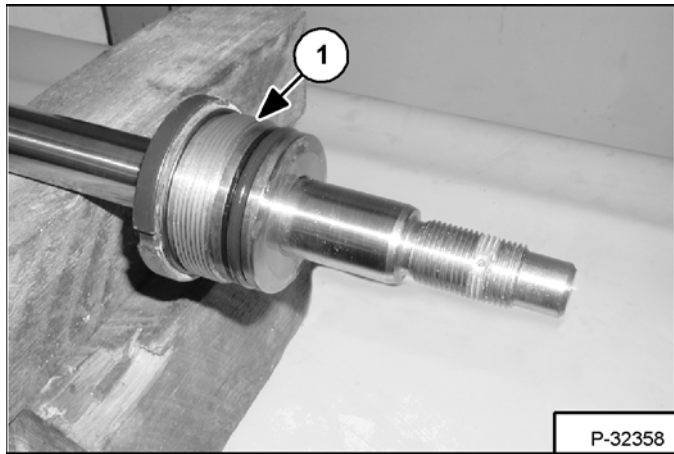
Install the center seal (Item 1) [Figure 20-30-35].

NOTE: The groove in the seal must point away from the wiper seal (Item 1) [Figure 20-30-33].

BUCKET POSITIONING CYLINDER (CONT'D)

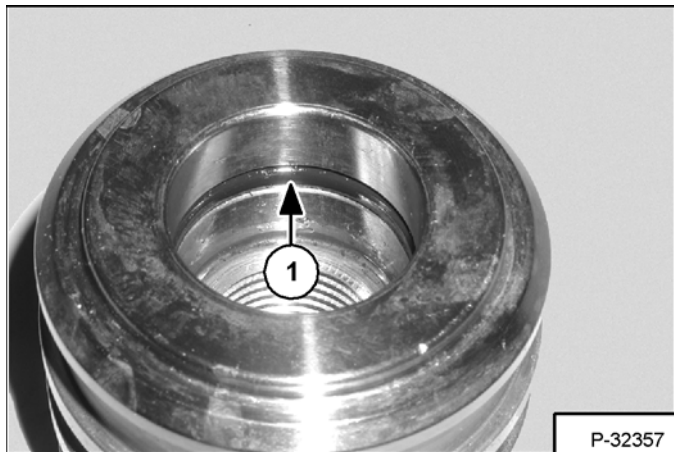
Assembly (Cont'd)

Figure 20-30-36



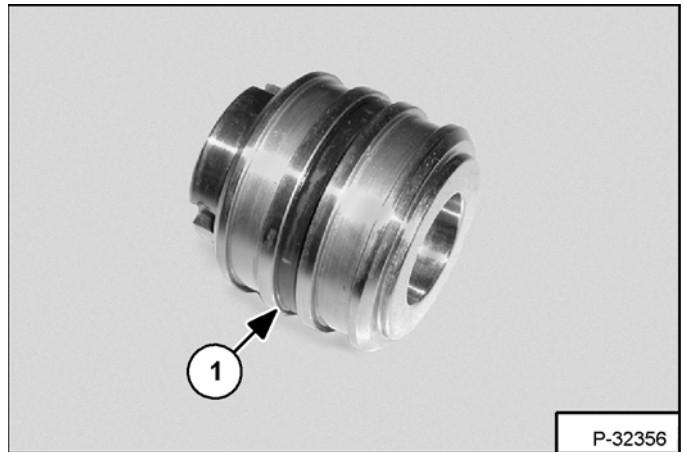
Install the head gland (Item 1) [Figure 20-30-36] onto the rod.

Figure 20-30-37



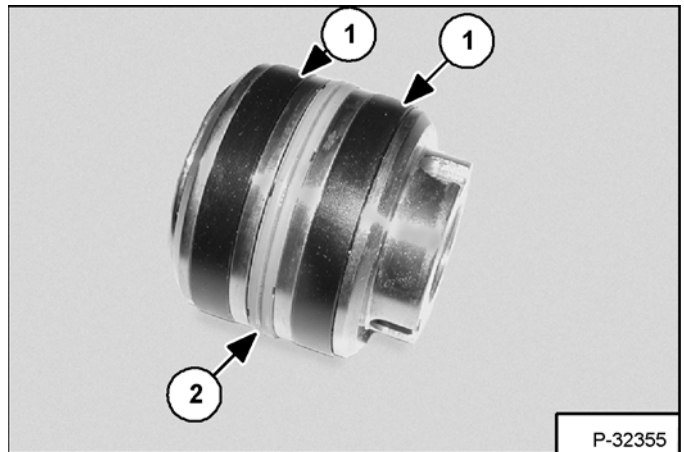
Install the O-ring (Item 1) [Figure 20-30-37] in the piston.

Figure 20-30-38



Install the expander O-ring (Item 1) [Figure 20-30-38] onto the piston.

Figure 20-30-39

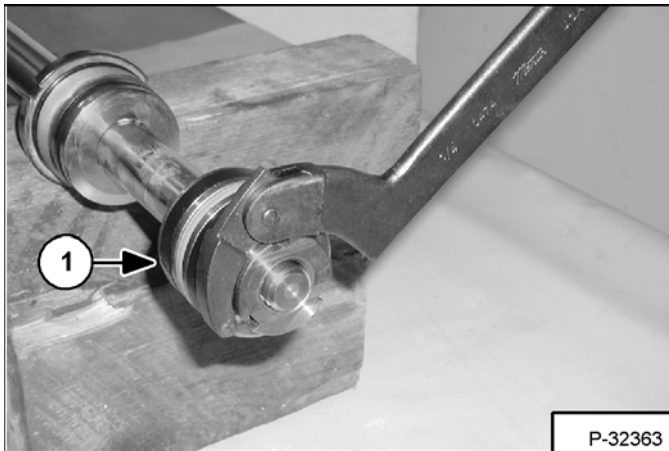


Install the two wear rings (Item 1) and seal (Item 2) [Figure 20-30-39].

BUCKET POSITIONING CYLINDER (CONT'D)

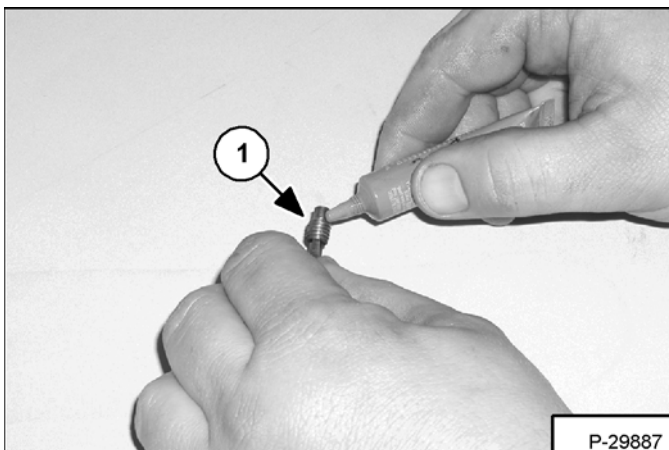
Assembly (Cont'd)

Figure 20-30-40



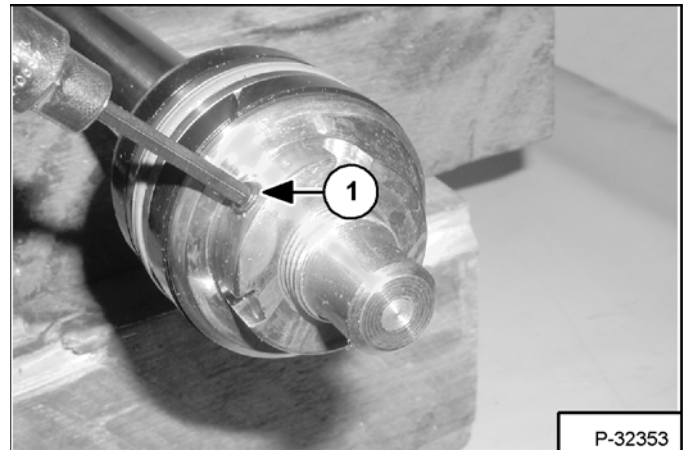
Install the piston (Item 1) [Figure 20-30-40] onto the rod.

Figure 20-30-41



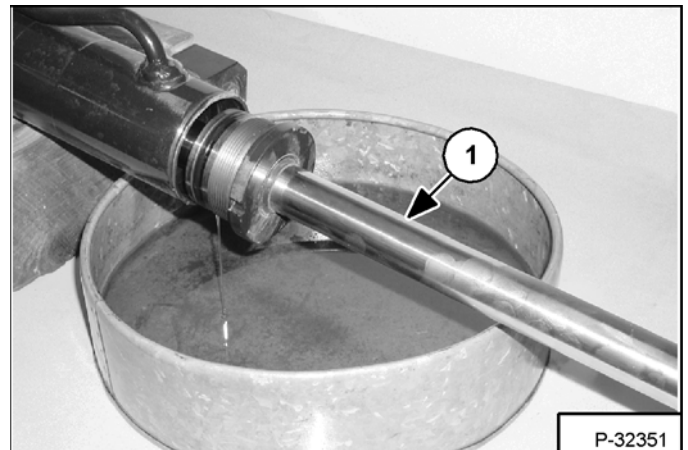
Apply LOCTITE 242 or equivalent to the set screw (Item 1) [Figure 20-30-41].

Figure 20-30-42



Install the set screw (Item 1) [Figure 20-30-42] into the piston and tighten.

Figure 20-30-43

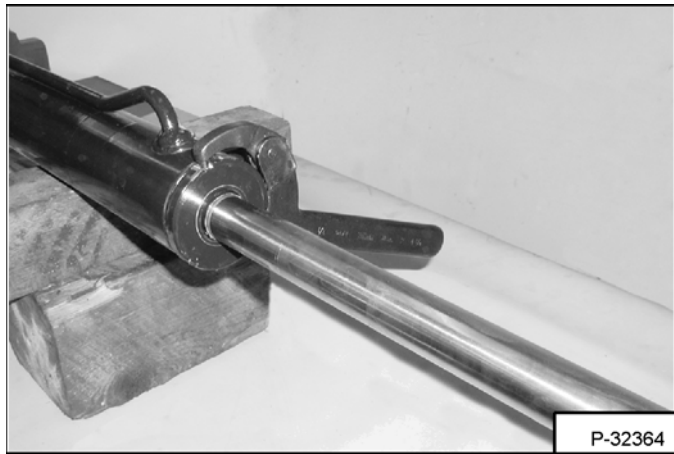


Install the rod assembly (Item 1) [Figure 20-30-43] into the housing.

BUCKET POSITIONING CYLINDER (CONT'D)

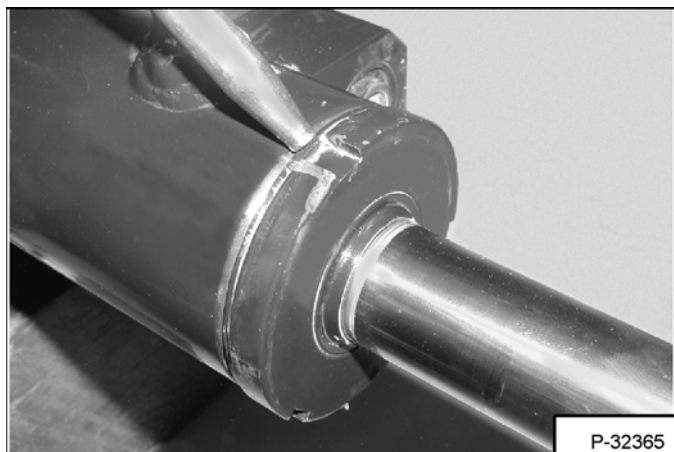
Assembly (Cont'd)

Figure 20-30-44



Tighten the head gland [Figure 20-30-44].

Figure 20-30-45

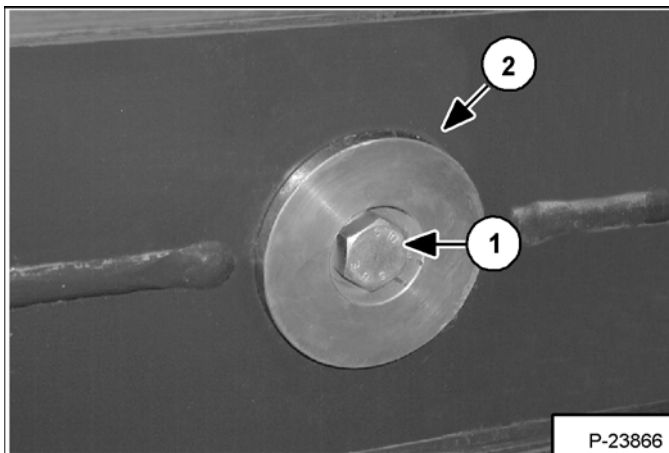


Carefully peen the lock ring over and into the nut [Figure 20-30-45].

EXTENSION CYLINDER

Cylinder Group Removal And Installation

Figure 20-40-1

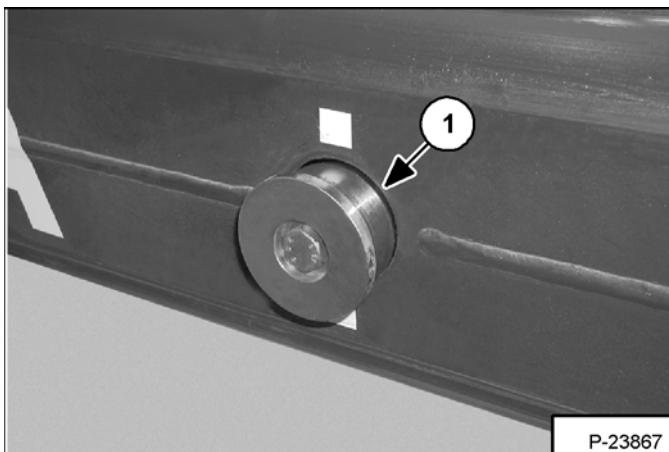


Remove the inner boom. (See Contents Page 50-01.)

Remove the bolt (Item 1) and washer (Item 2) [Figure 20-40-1] from one side of the cylinder pin.

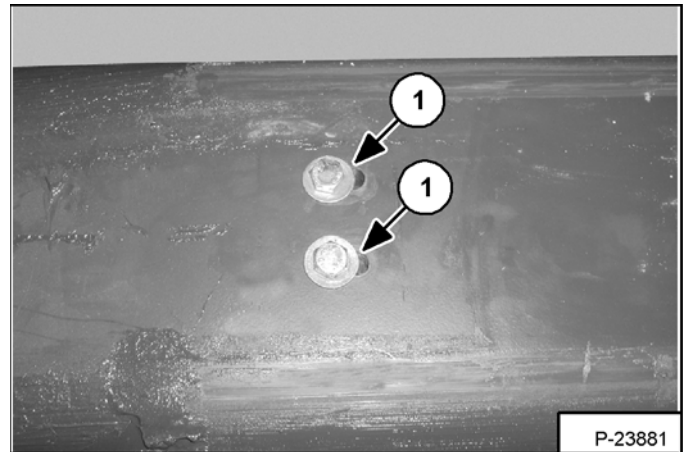
Installation: Tighten the bolt to 188-210 ft.-lbs. (255-285 Nm) torque.

Figure 20-40-2



Remove the pin assembly (Item 1) [Figure 20-40-2] from the opposite side.

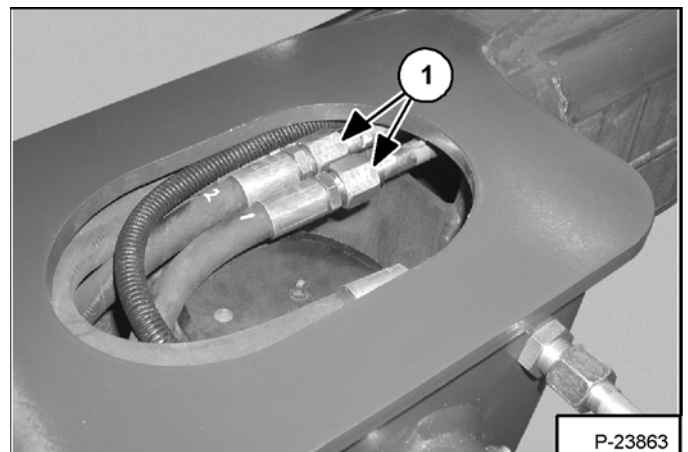
Figure 20-40-3



Remove the two bolts (Item 1) [Figure 20-40-3] from the top of the inner boom.

Installation: Tighten the bolts to 18 ft.-lbs. (24 Nm) torque.

Figure 20-40-4

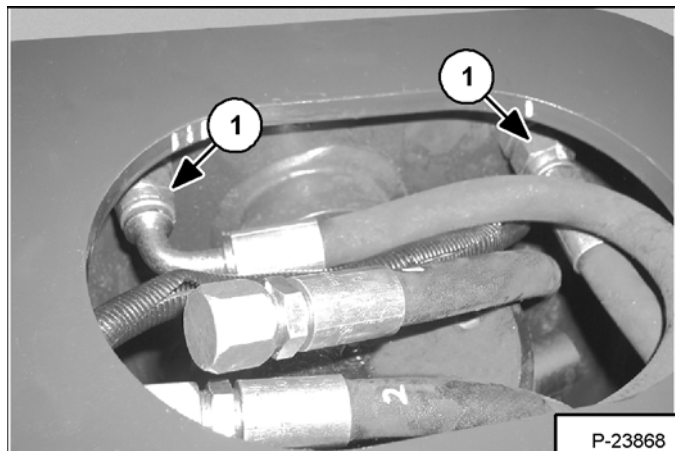


Remove the two hoses (Item 1) [Figure 20-40-4] from the tubelines.

EXTENSION CYLINDER (CONT'D)

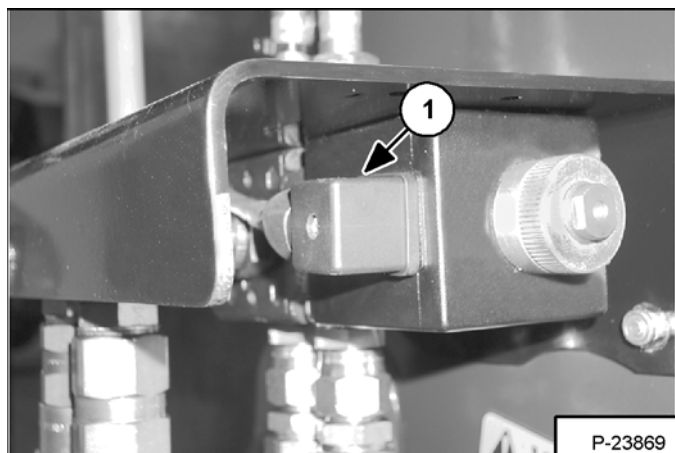
Cylinder Group Removal And Installation (Cont'd)

Figure 20-40-5



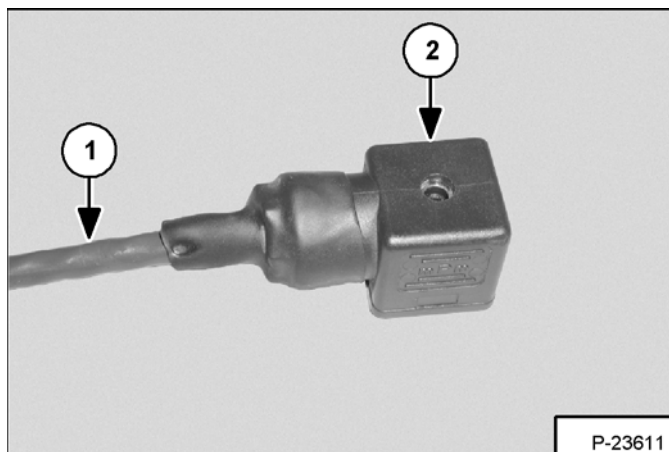
Remove the two hoses (Item 1) [Figure 20-40-5] from the bulkhead fittings.

Figure 20-40-6



Remove the electrical connector (Item 1) [Figure 20-40-6] from the auxiliary valve.

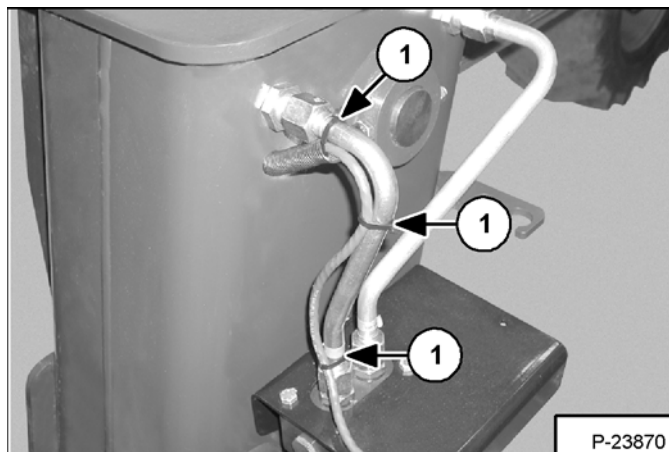
Figure 20-40-7



Remove the electrical harness (Item 1) from the connector housing (Item 2) [Figure 20-40-7].

NOTE: Mark the connector housing for correct installation.

Figure 20-40-8

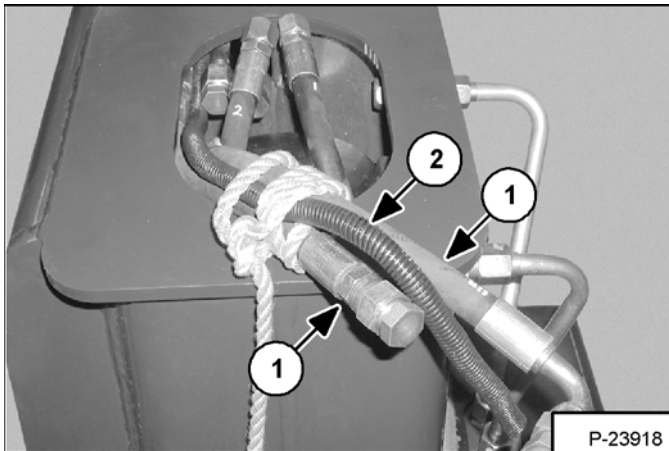


Remove the tie straps (Item 1) [Figure 20-40-8] and pull the electrical harness into the boom.

EXTENSION CYLINDER (CONT'D)

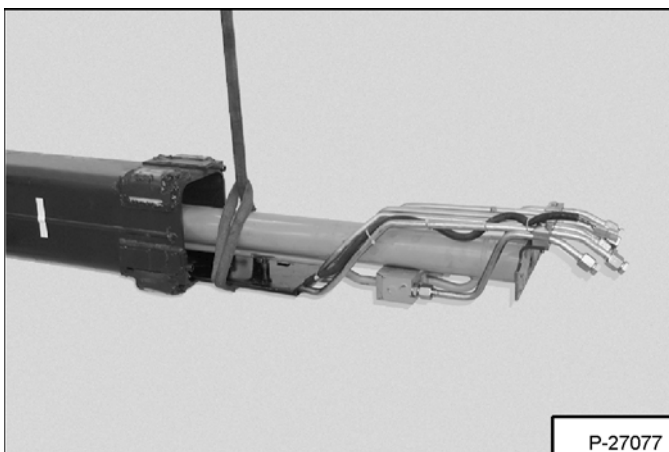
Cylinder Group Removal And Installation (Cont'd)

Figure 20-40-9



For ease of installation temporarily tie a rope onto the two hoses (Item 1) and electrical harness (Item 2) [Figure 20-40-9].

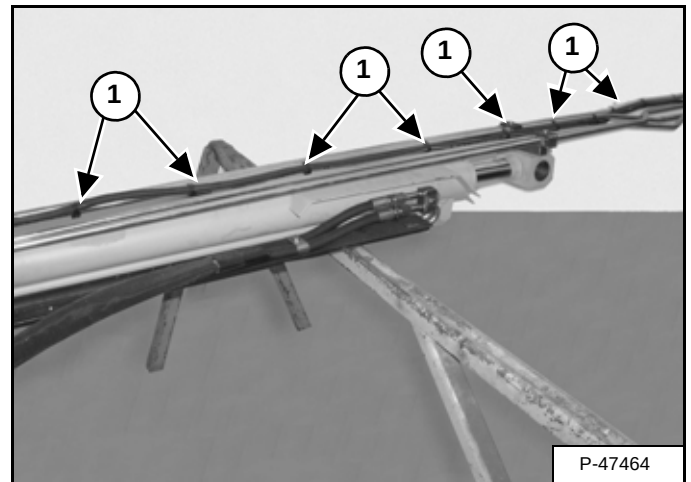
Figure 20-40-10



Remove the extension cylinder assembly from the boom [Figure 20-40-10].

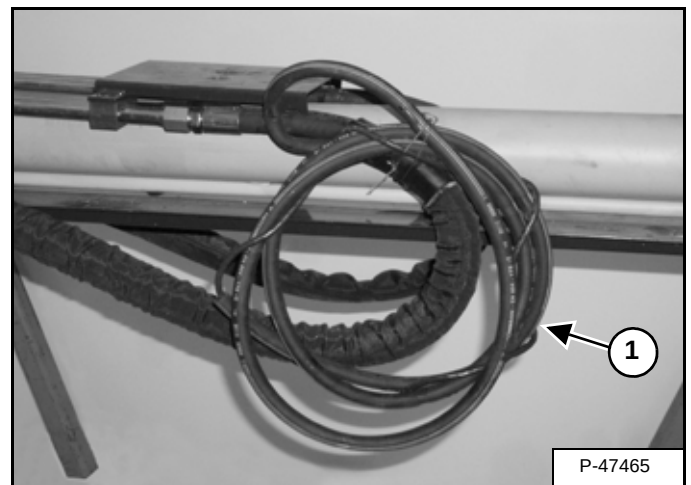
Upper Tubeline Removal

Figure 20-40-11



With the extension cylinder group supported on a work surface, remove the tie straps (Item 1) [Figure 20-40-11] from the electrical harness.

Figure 20-40-12

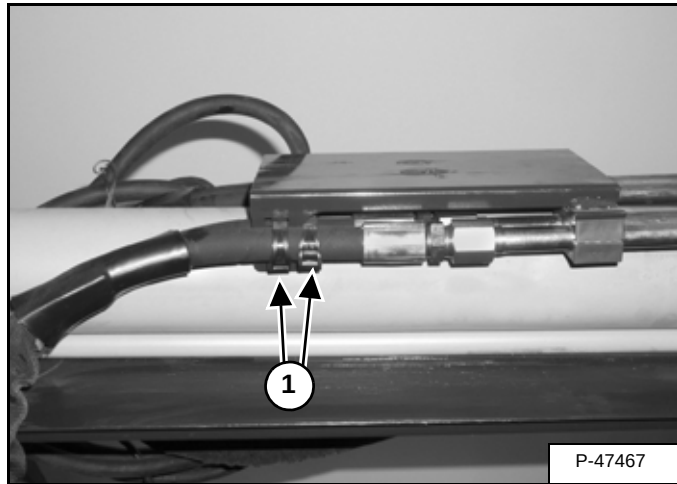


Roll up the electrical harness (Item 1) [Figure 20-40-12] and temporarily tie to the existing hose.

EXTENSION CYLINDER (CONT'D)

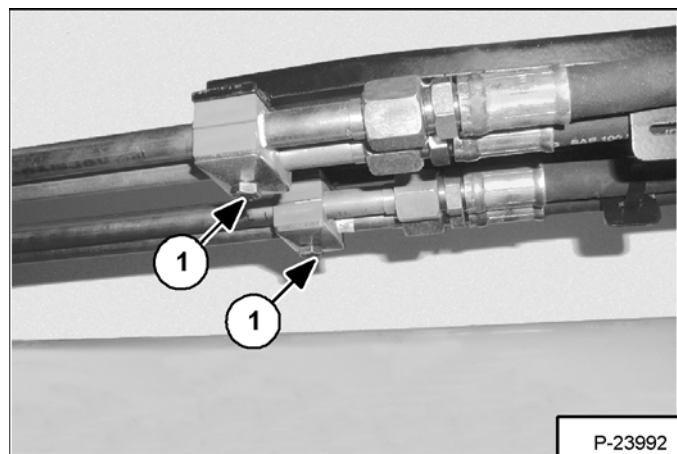
Upper Tubeline Removal (Cont'd)

Figure 20-40-13



Remove the two tie straps (Item 1) [Figure 20-40-13] from the hoses (both sides).

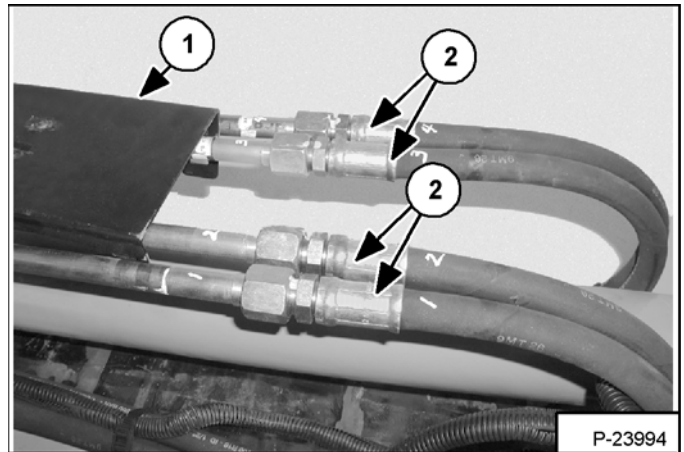
Figure 20-40-14



Loosen the tubeline clamp mounting bolts (Item 1) [Figure 20-40-14].

NOTE: Mark the location of the tubelines for correct assembly.

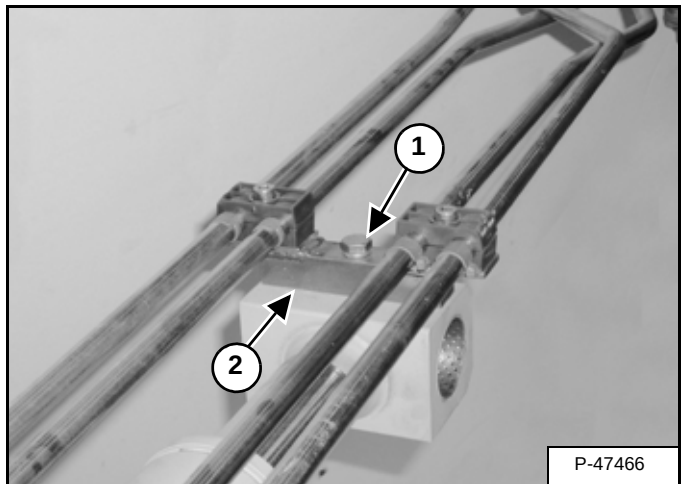
Figure 20-40-15



Slide the tubeline bracket assembly (Item 1) forward. Remove the four hoses (Item 2) [Figure 20-40-15] from the tubelines.

NOTE: Mark the hoses for correct assembly.

Figure 20-40-16



Remove the bolt (Item 1) [Figure 20-40-16] from the rod end of the cylinder.

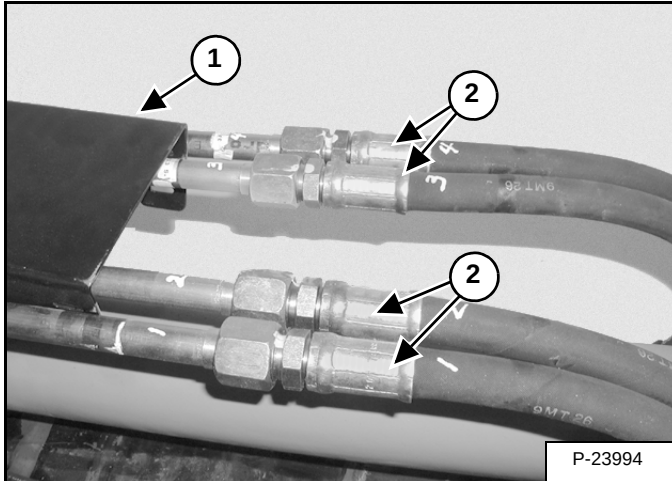
Lift and remove the tubelines from the top of the cylinder.

EXTENSION CYLINDER (CONT'D)

Upper Tubeline Installation

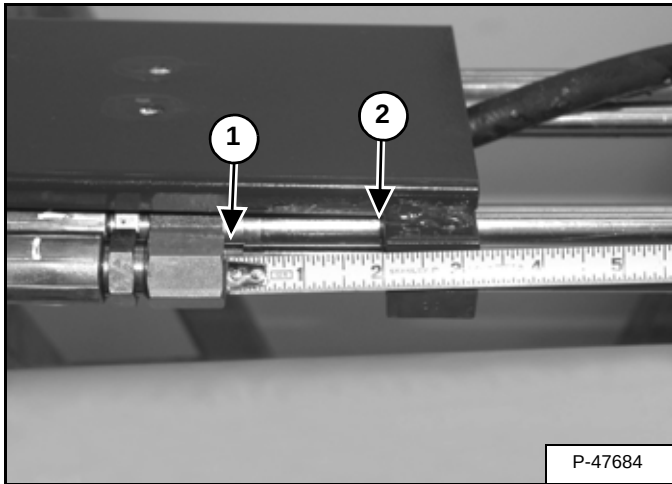
Set the tubeline assembly onto the extension cylinder and install the bolt (Item 1) and tighten to secure the tubeline clamp bracket (Item 2) [Figure 20-40-16] to the rod end of the cylinder.

Figure 20-40-17



Slide the tubeline bracket (Item 1) forward. Install the four hoses (Item 2) [Figure 20-40-17] on the tubelines.

Figure 20-40-18



Slide the tubeline bracket back. Measure the distance from the tubeline nut (Item 1) to the tubeline clamp (Item 2) [Figure 20-40-18].

The correct measurement must be 2.00 inches (50,8 mm) for all four tubelines.

Tighten the tubeline clamps.

Figure 20-40-19

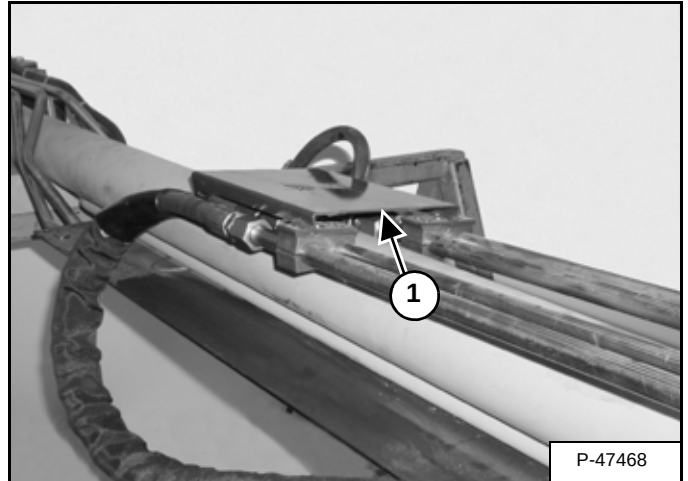
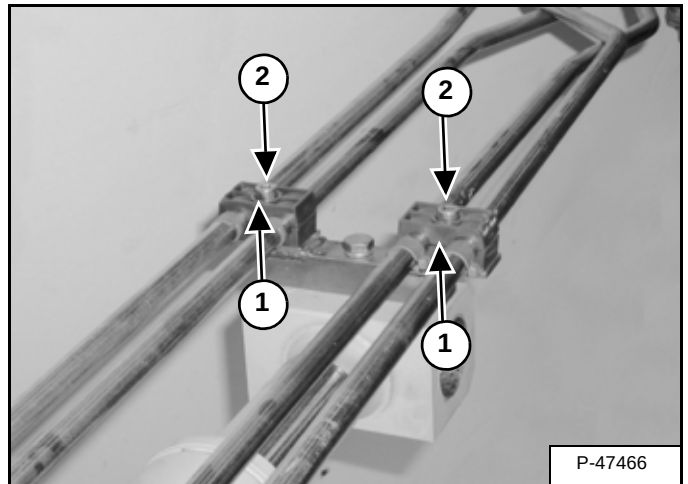


Figure 20-40-20



Measure the distance from the front of the tubeline bracket (Item 1) [Figure 20-40-19] to the back of the tubeline clamps (Item 1) [Figure 20-40-20]. The correct measurement must be 49 inches (1244,6 mm) for all four tubelines.

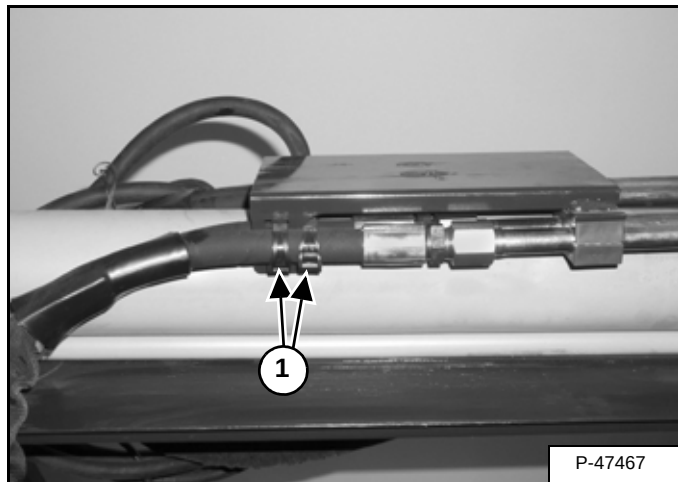
To move and adjust the tubeline clamps (Item 1) loosen the bolts (Item 2) [Figure 20-40-20].

When the tubeline clamps are in the correct position tighten the bolts.

EXTENSION CYLINDER (CONT'D)

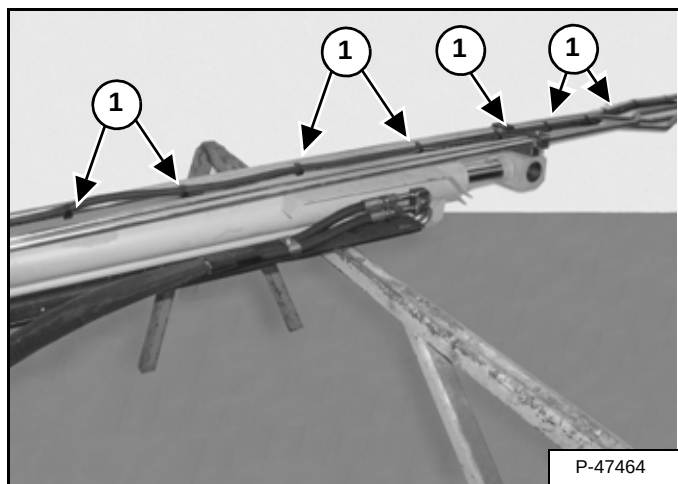
Upper Tubeline Installation (Cont'd)

Figure 20-40-21



Install two tie straps (Item 1) [Figure 20-40-21] (both sides) to secure the hoses to the tubeline bracket.

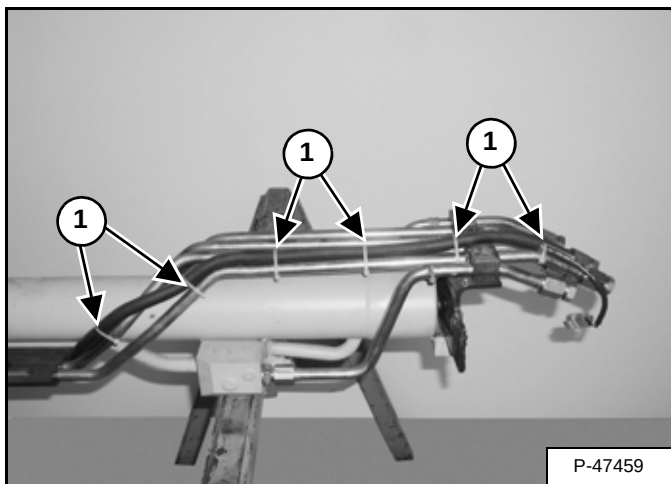
Figure 20-40-22



Secure the electrical harness to the inner tubeline (Item 1) using tie straps (Item 2) [Figure 20-40-22] approximately every 6-8 inches (152-203 mm).

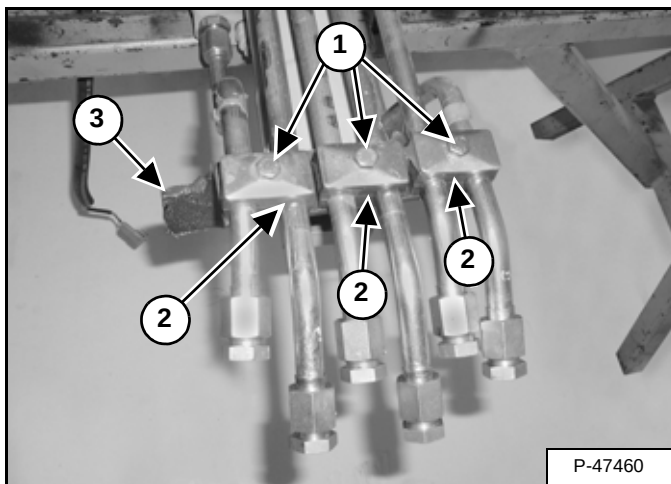
Extension Cylinder Removal And Installation

Figure 20-40-23



Remove the six tie straps (Item 1) [Figure 20-40-23] securing the electrical harness to the hose.

Figure 20-40-24

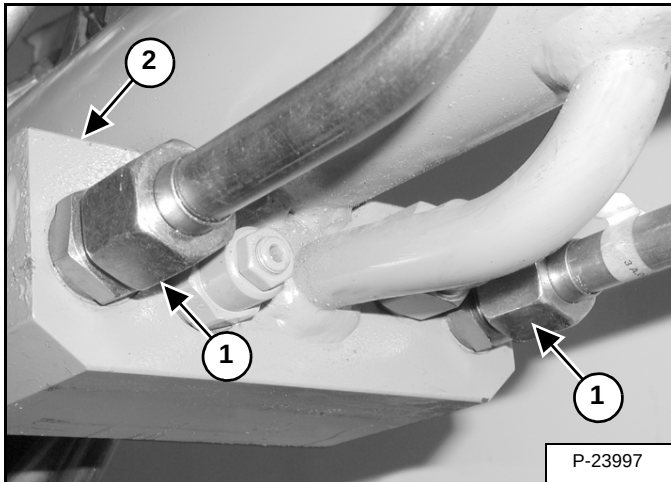


Remove the three bolts (Item 1) and tubeline clamps (Item 2) from the cylinder. Remove the bracket (Item 3) [Figure 20-40-24].

EXTENSION CYLINDER (CONT'D)

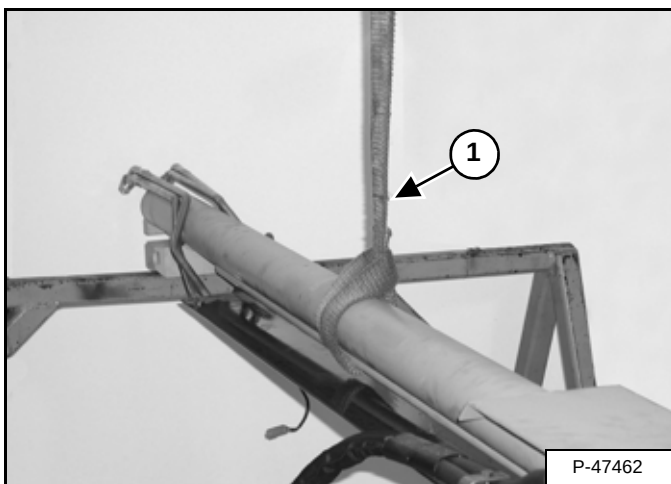
Extension Cylinder Removal And Installation (Cont'd)

Figure 20-40-25



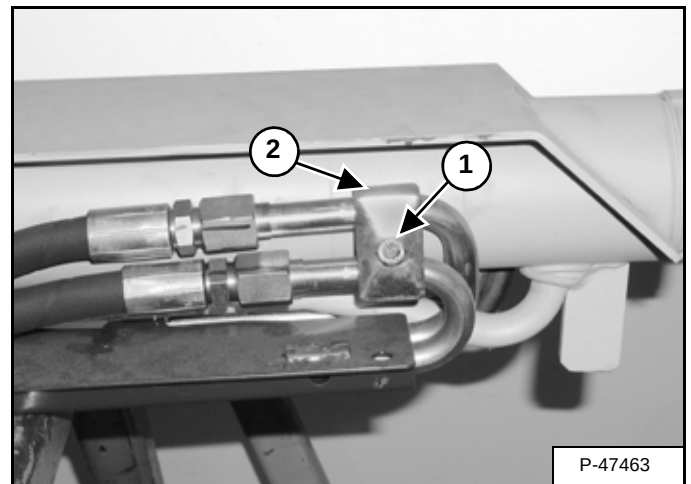
Remove the two tubelines (Item 1) from the load lock (Item 2) [Figure 20-40-25].

Figure 20-40-26



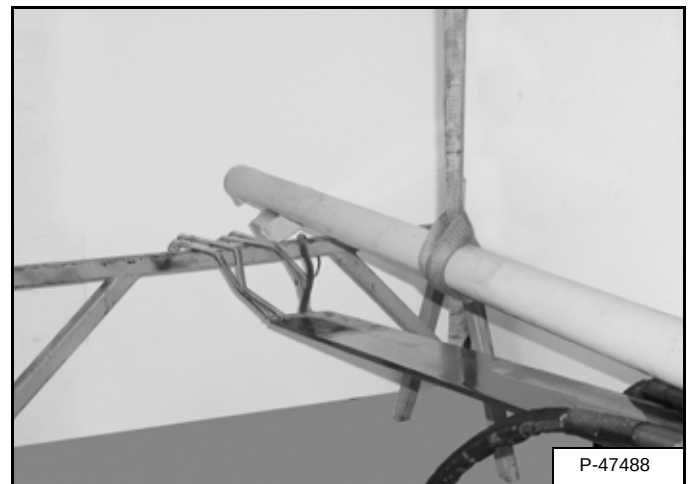
Install a hoist (Item 1) [Figure 20-40-26] to lift and support the extension cylinder.

Figure 20-40-27



Remove the bolt (Item 1) and tubeline clamp (Item 2) [Figure 20-40-27] from both sides of the cylinder.

Figure 20-40-28



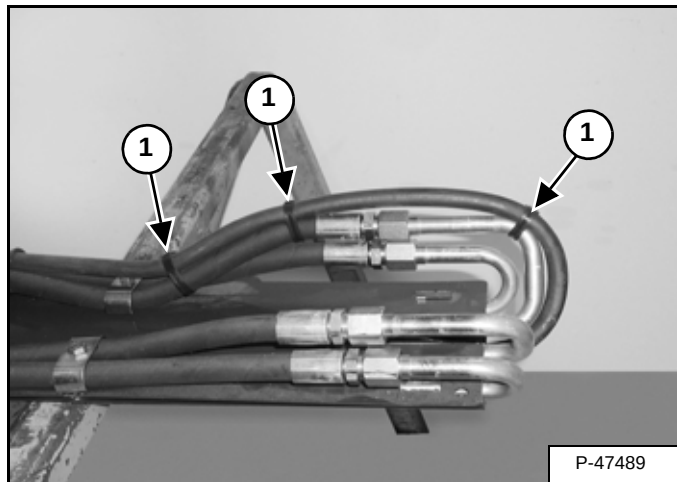
Slide the extension cylinder through the tubelines [Figure 20-40-28] and remove the cylinder.

NOTE: It may be necessary to reposition the lifting strap.

EXTENSION CYLINDER (CONT'D)

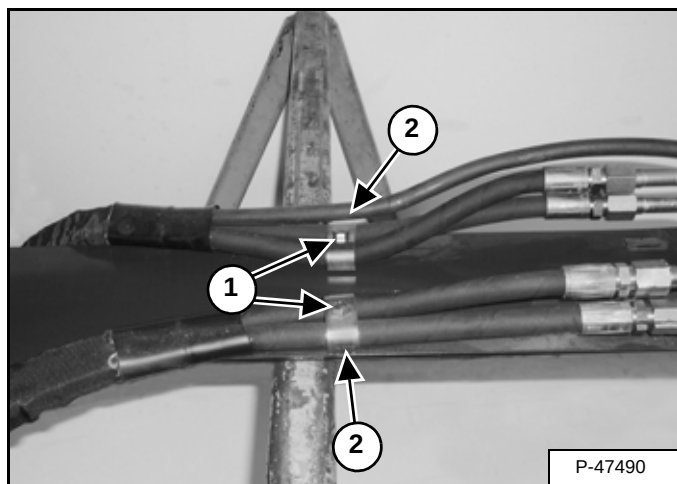
Tubeline Tray Disassembly

Figure 20-40-29



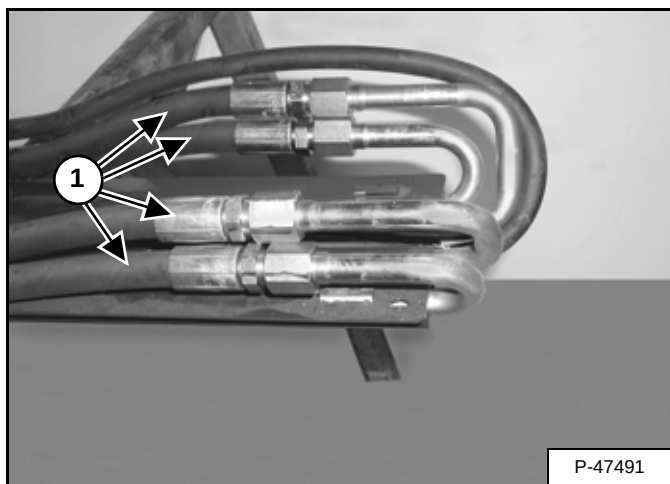
Remove the tie straps (Item 1) [Figure 20-40-29] securing the electrical harness to the hoses.

Figure 20-40-30



Remove the two bolts (Item 1) and tubeline mounting brackets (Item 2) [Figure 20-40-30].

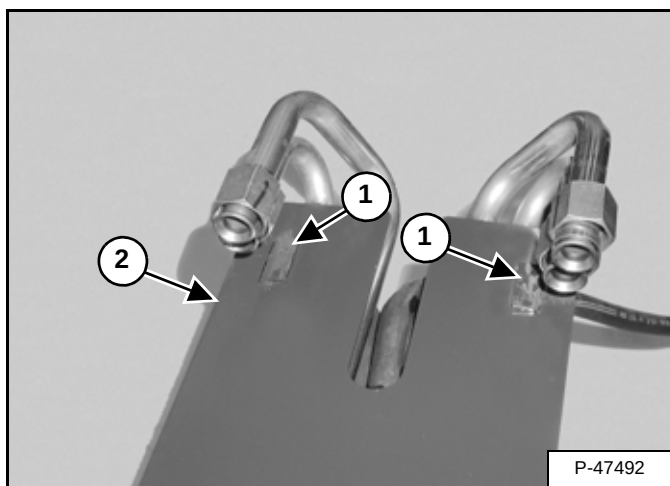
Figure 20-40-31



Remove the four hoses (Item 1) [Figure 20-40-31] from the tubelines.

NOTE: Mark the hoses for correct assembly.

Figure 20-40-32

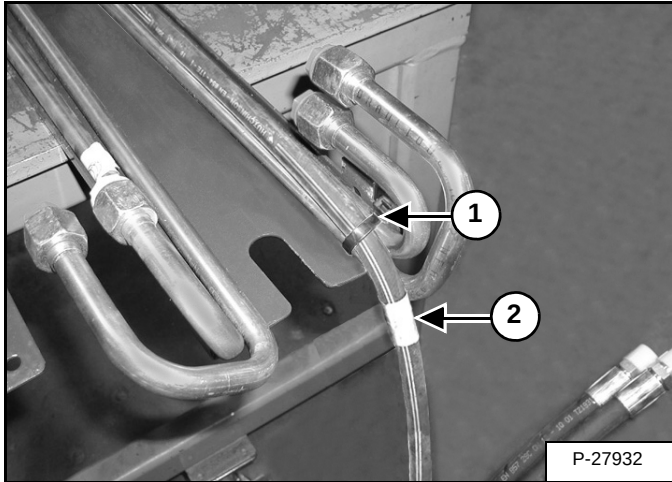


Straighten the two tabs (Item 1) (both ends) and remove the cover (Item 2) [Figure 20-40-32].

EXTENSION CYLINDER (CONT'D)

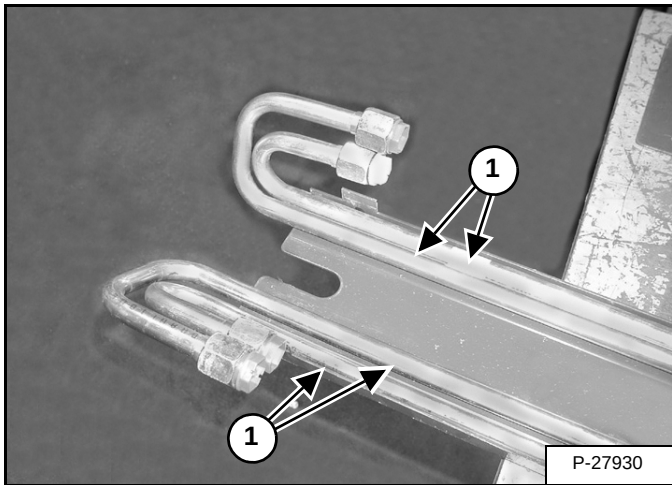
Tubeline Tray Disassembly (Cont'd)

Figure 20-40-33



Remove the tie strap (Item 1) from both ends of the electrical harness (Item 2) [Figure 20-40-33]. Remove the electrical harness.

Figure 20-40-34



Remove the tubelines (Item 1) [Figure 20-40-34].

Tubeline Tray Assembly

Figure 20-40-35

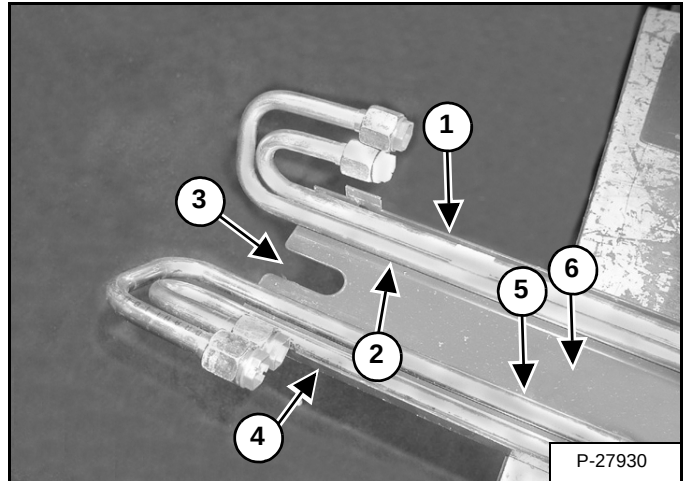
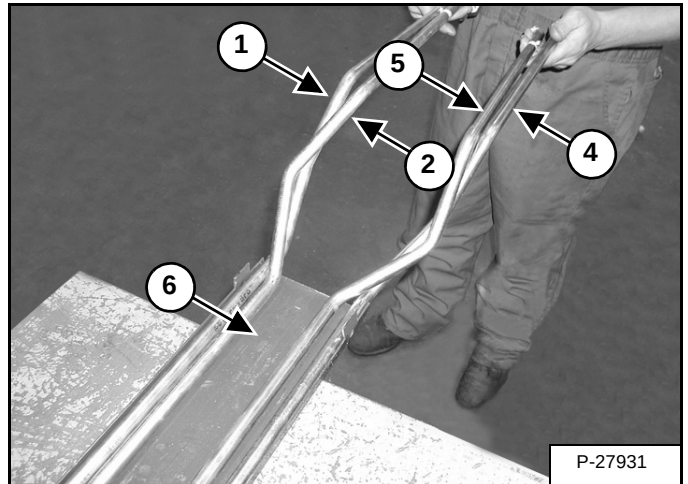


Figure 20-40-36



Place the tubelines (Item 1) and (Item 2) next to each other on the left side of the tray (Item 6) [Figure 20-40-35] & [Figure 20-40-36].

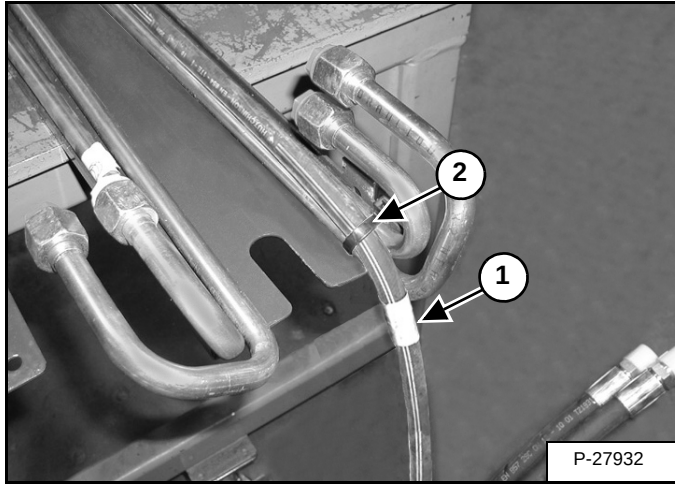
NOTE: The notch (Item 3) [Figure 20-40-35] represents the front of the tray.

Place the tubelines (Item 4) and (Item 5) next to each other on the right side of the tray (Item 6) [Figure 20-40-35] & [Figure 20-40-36].

EXTENSION CYLINDER (CONT'D)

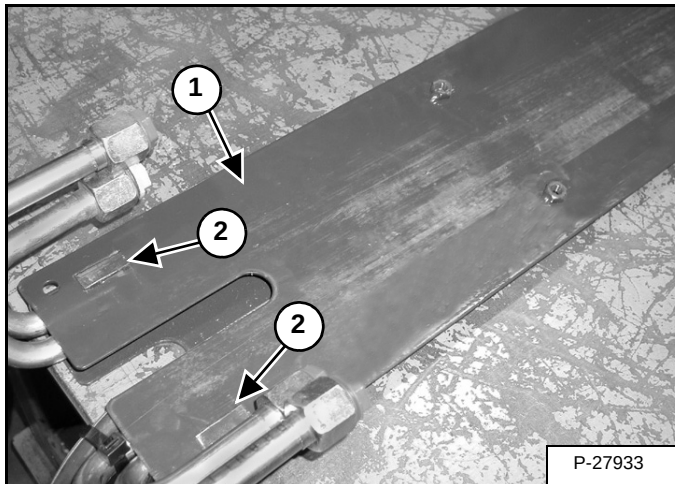
Tubeline Tray Assembly (Cont'd)

Figure 20-40-37



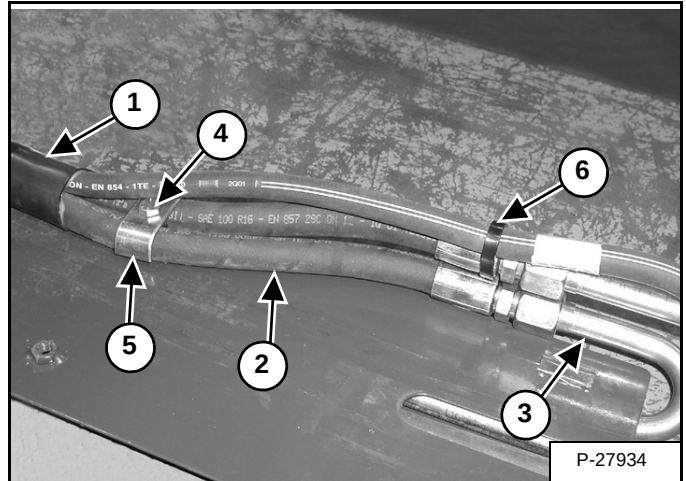
Place the electrical harness (Item 1) in the center of the two tubelines on the right side and secure using a tie strap (Item 2) [Figure 20-40-37] on each end of the tubelines.

Figure 20-40-38



With the tubelines held in position, install the tray cover (Item 1) on the tray. Bend the two tabs (Item 2) [Figure 20-40-38] on each end of the tray cover.

Figure 20-40-39



Install the hose/harness assembly (Item 1) [Figure 20-40-39] on the tubelines on the right side of the tray.

NOTE: The hose (Item 2) must be connected to the outside tubeline (Item 3) [Figure 20-40-39].

Apply LOCTITE #271 onto the bolt (Item 4) and install the hose bracket (Item 5) [Figure 20-40-39].

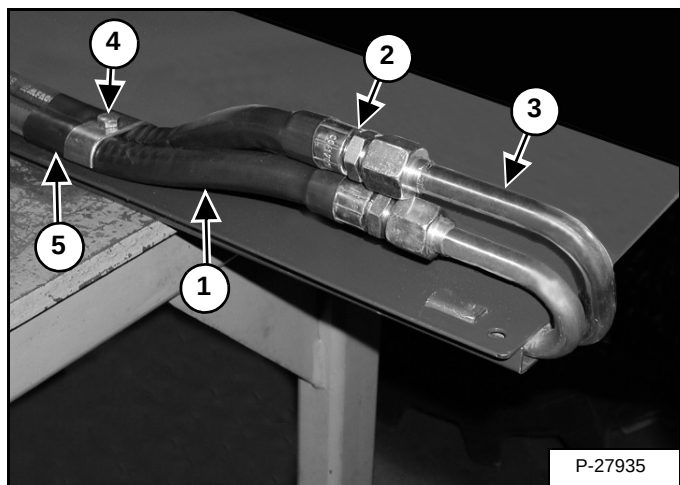
NOTE: Do not overtighten the bolt or damage will be done to the tubelines below.

Install a tie strap (Item 6) [Figure 20-40-39] on the electrical harness.

EXTENSION CYLINDER (CONT'D)

Tubeline Tray Assembly (Cont'd)

Figure 20-40-40



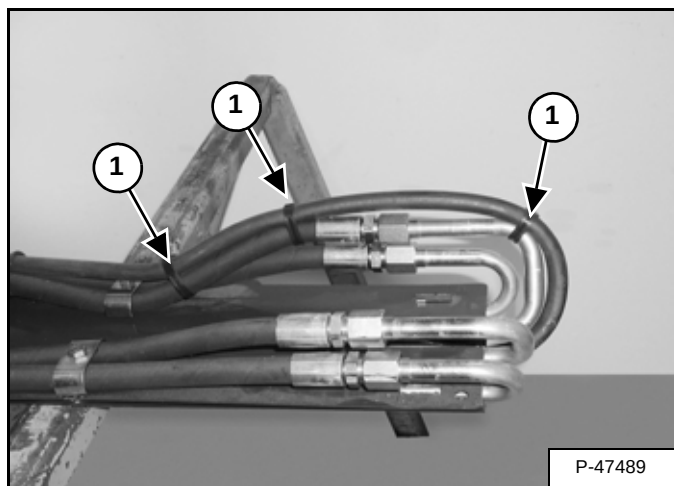
Install the hose assembly (Item 1) [Figure 20-40-40] on the two tubelines on the left side of the tray.

NOTE: The hose (Item 2) must be connected to the inside tubeline (Item 3) [Figure 20-40-40].

Apply LOCTITE #271 on the bolt (Item 4) and install the hose bracket (Item 5) [Figure 20-40-40].

NOTE: Do not overtighten the bolt or damage will be done to the tubelines below.

Figure 20-40-41

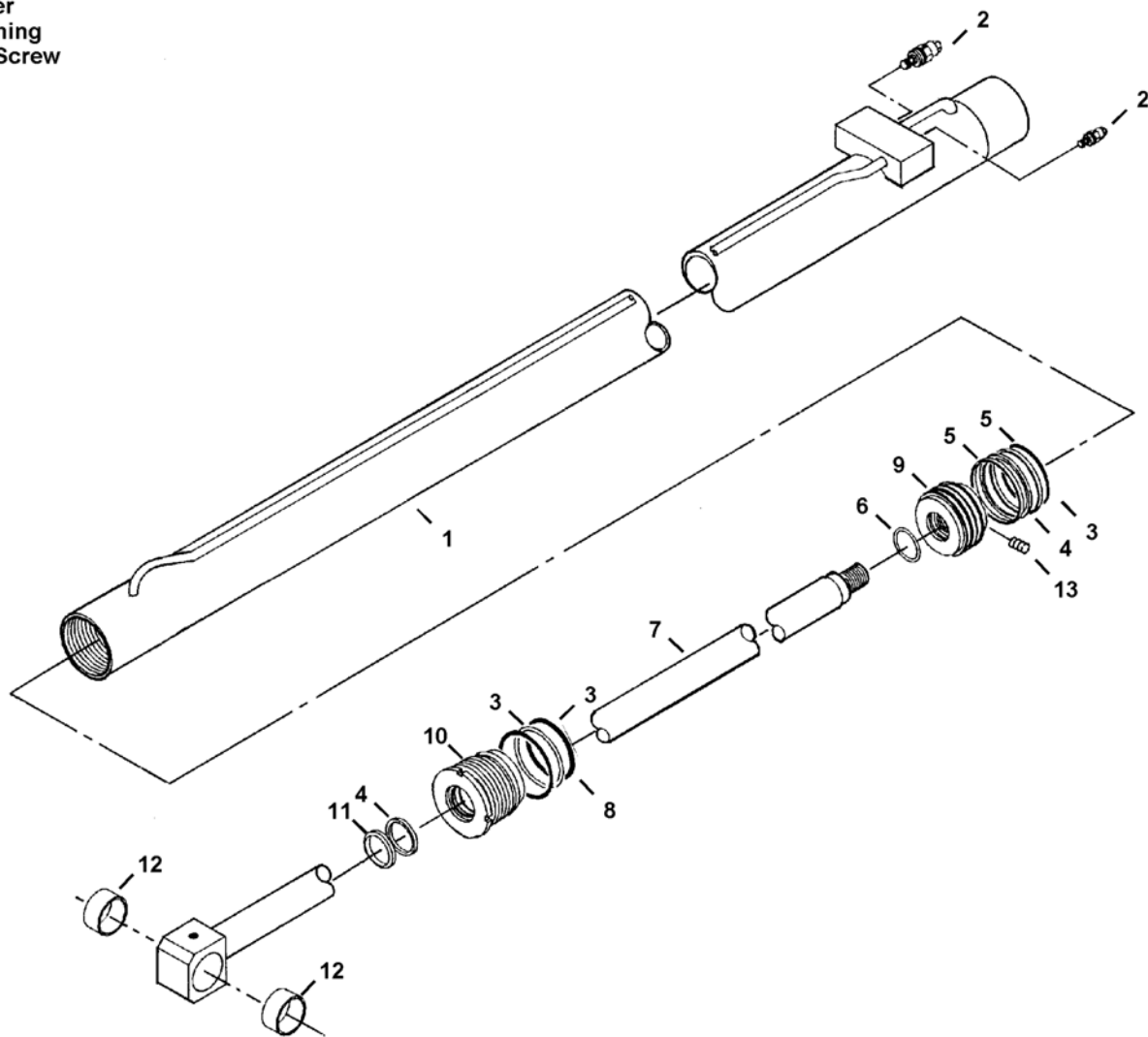


Install new tie straps (Item 1) [Figure 20-40-41] approximately every 6-8 inches (152-203 mm) to secure the electrical harness to the hose.

EXTENSION CYLINDER (CONT'D)

Parts Identification

1. Housing
2. Relief Valve
3. O-Ring
4. Seal
5. Wear Ring
6. O-Ring
7. Rod
8. Backup Ring
9. Piston
10. Head Gland
11. Wiper
12. Bushing
13. Set Screw



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EXTENSION CYLINDER (CONT'D)

Disassembly

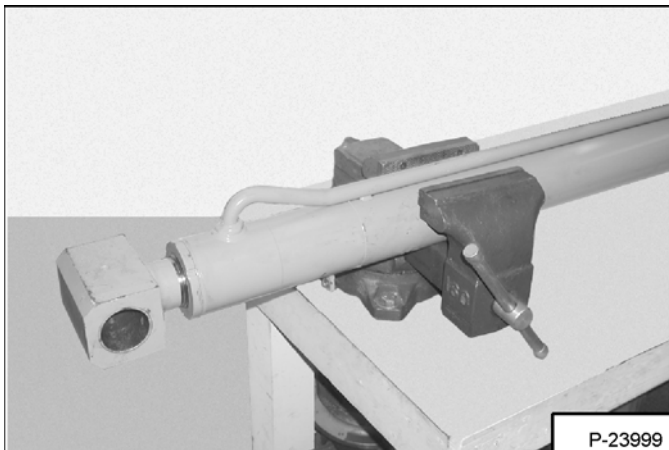
Use the following tool to disassemble the cylinder:

MEL1074-O-ring Seal Hook

Clean the outside of the extension cylinder before disassembly.

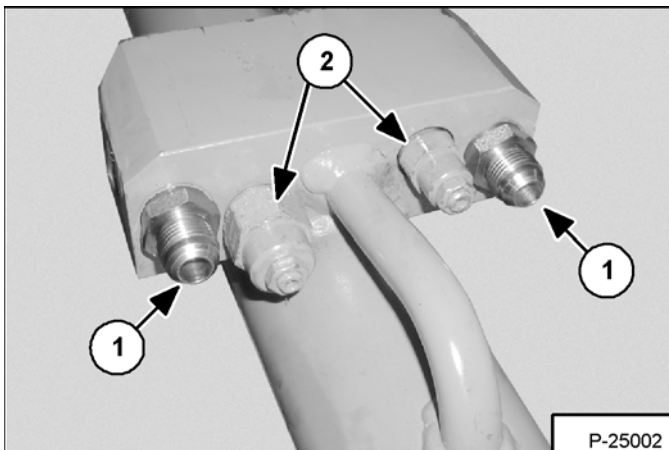
Mark the outside of the extension cylinder for ease of assembly.

Figure 20-40-42



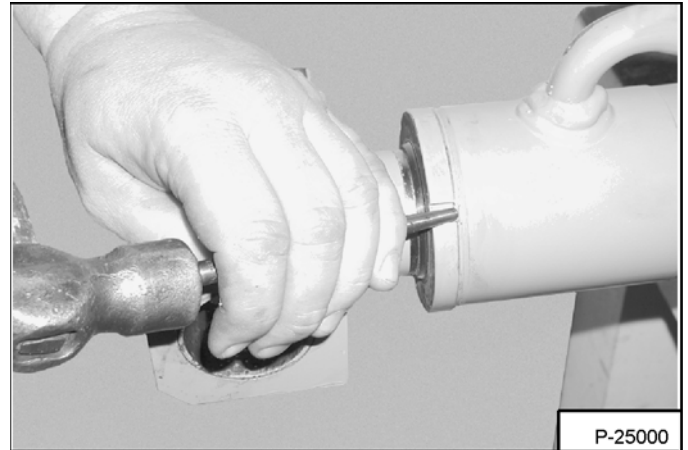
Put the cylinder in a vise [Figure 20-40-42].

Figure 20-40-43



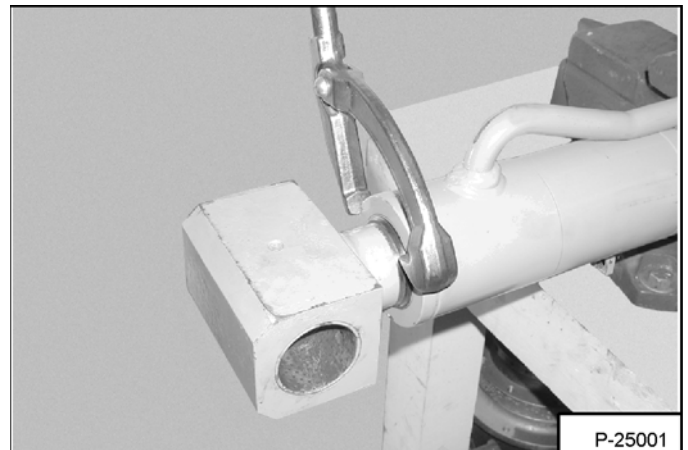
Remove the two fittings (Item 1) and relief valves (Item 2) [Figure 20-40-43].

Figure 20-40-44



Carefully peen the lock ring from the head gland [Figure 20-40-44].

Figure 20-40-45

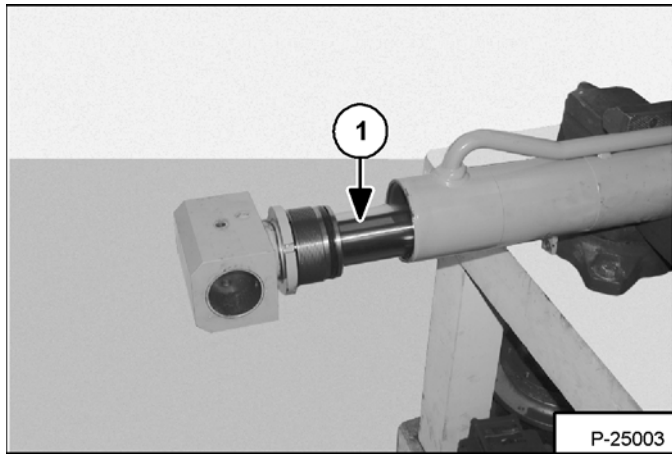


Loosen the head gland [Figure 20-40-45].

EXTENSION CYLINDER (CONT'D)

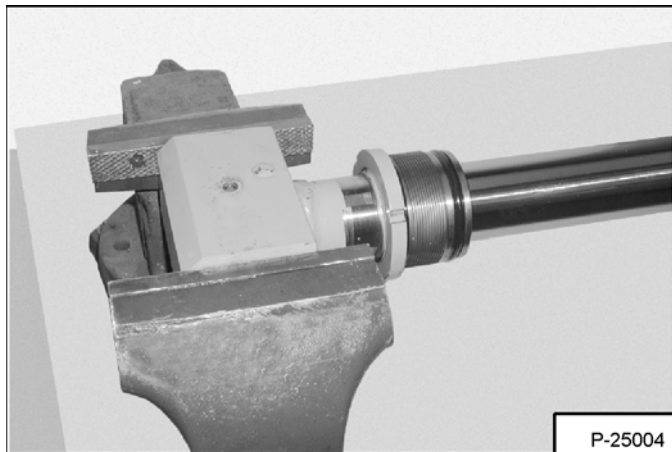
Disassembly (Cont'd)

Figure 20-40-46



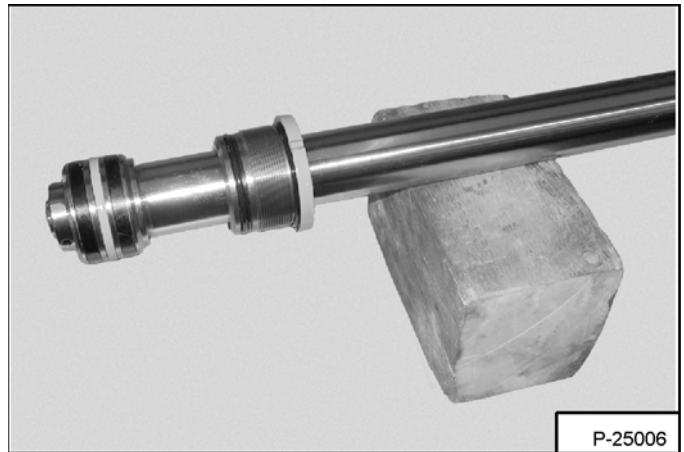
Remove the rod assembly (Item 1) [Figure 20-40-46] from the housing.

Figure 20-40-47



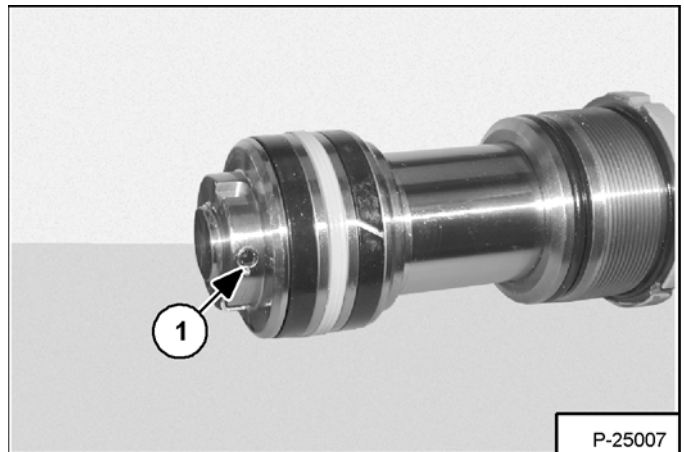
Put the rod end of the cylinder in a vise [Figure 20-40-47].

Figure 20-40-48



Support the cylinder rod on a wood block [Figure 20-40-48].

Figure 20-40-49

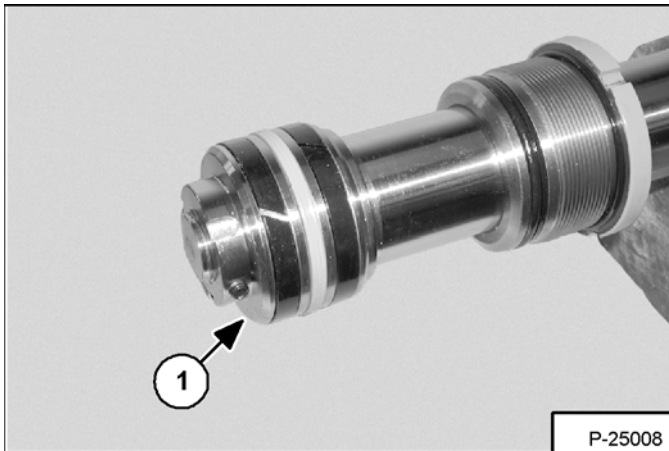


Loosen the set screw (Item 1) [Figure 20-40-49].

EXTENSION CYLINDER (CONT'D)

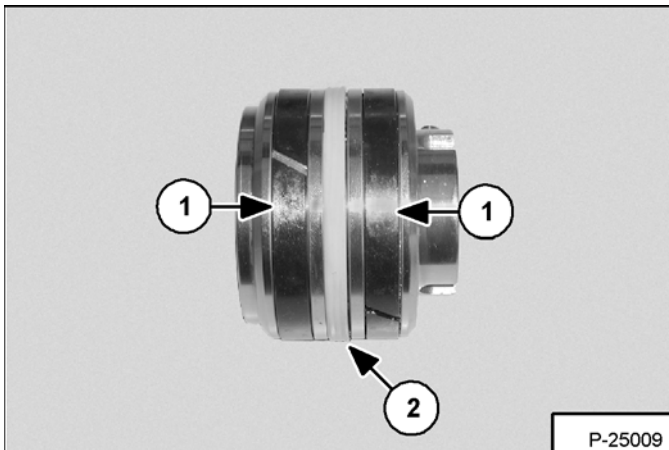
Disassembly (Cont'd)

Figure 20-40-50



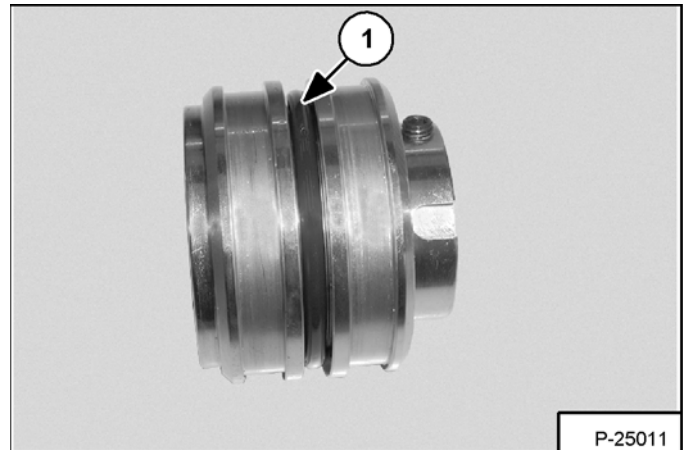
Remove the piston assembly (Item 1) [Figure 20-40-50] from the rod.

Figure 20-40-51



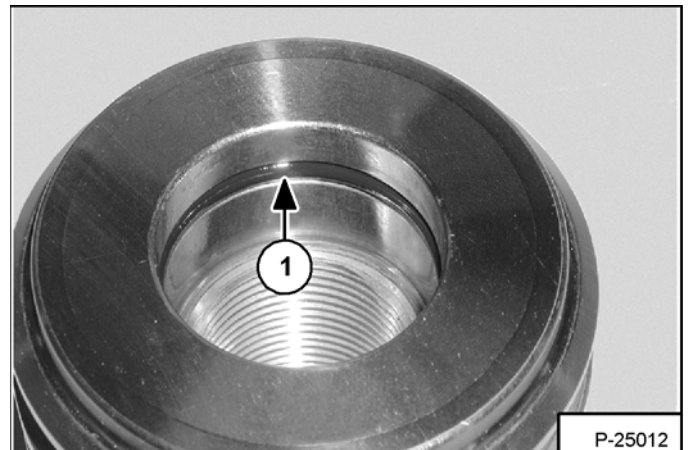
Remove the two wear rings (Item 1) and the seal (Item 2) [Figure 20-40-51] from the piston.

Figure 20-40-52



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

Figure 20-40-53

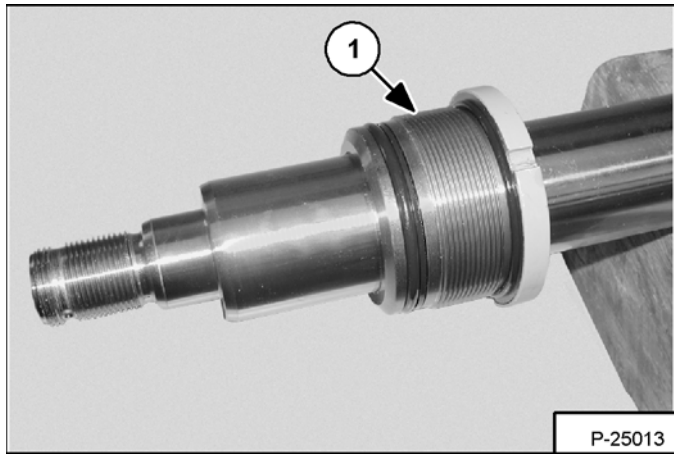


Remove the O-ring (Item 1) [Figure 20-40-53] from the piston.

EXTENSION CYLINDER (CONT'D)

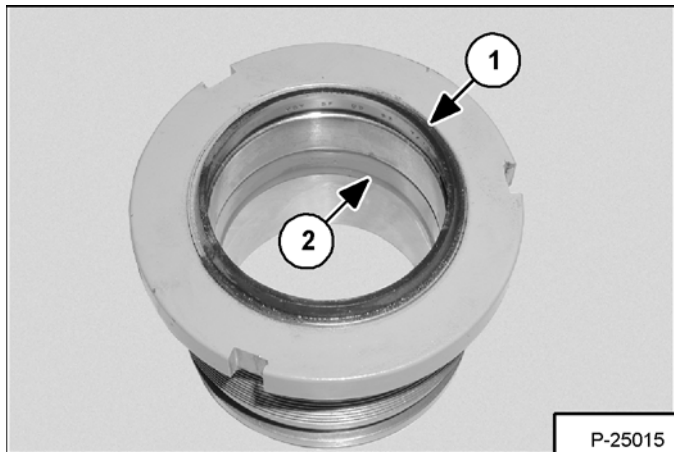
Disassembly (Cont'd)

Figure 20-40-54



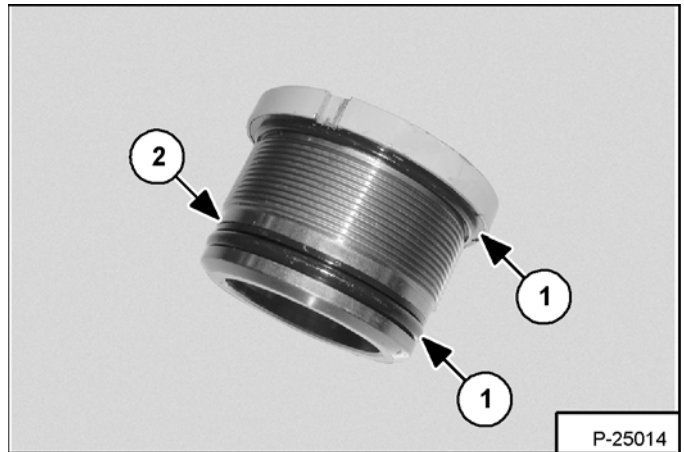
Remove the head gland (Item 1) [Figure 20-40-54] from the rod.

Figure 20-40-55



Remove the wiper (Item 1) and seal (Item 2) [Figure 20-40-55] from the head gland.

Figure 20-40-56



Remove the two O-rings (Item 1) and backup ring (Item 2) [Figure 20-40-56].

EXTENSION CYLINDER (CONT'D)

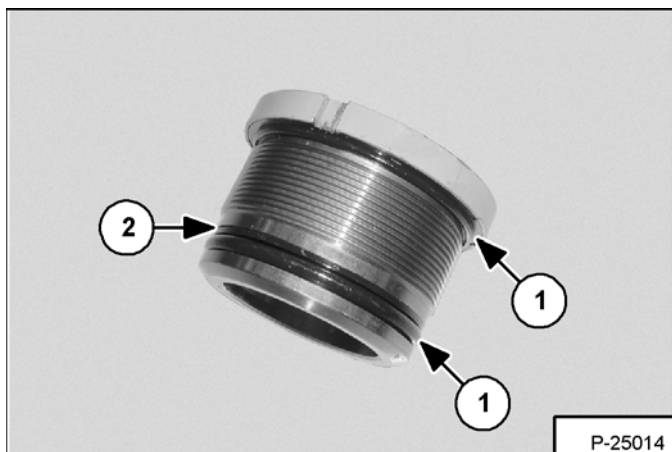
Assembly

Clean all parts in solvent and dry with compressed air.

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

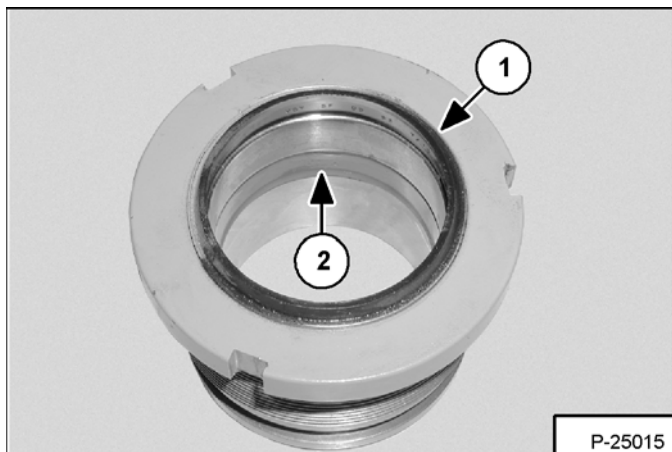
Always install new seals and O-rings. Lubricate all seals and O-rings with clean hydraulic fluid before installation.

Figure 20-40-57



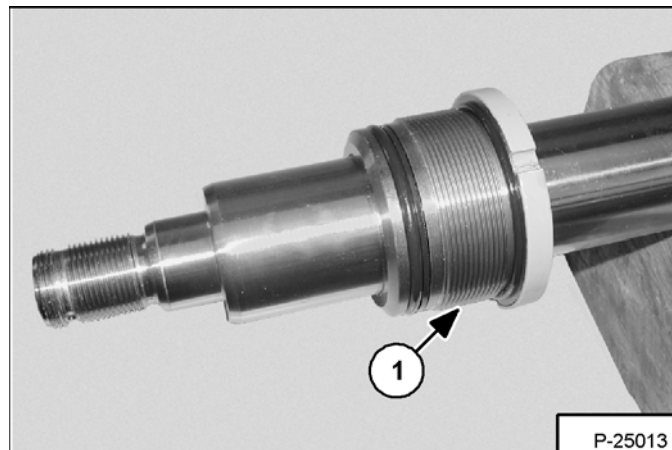
Install the two O-rings (Item 1) and backup ring (Item 2) [Figure 20-40-57] on the head gland.

Figure 20-40-58



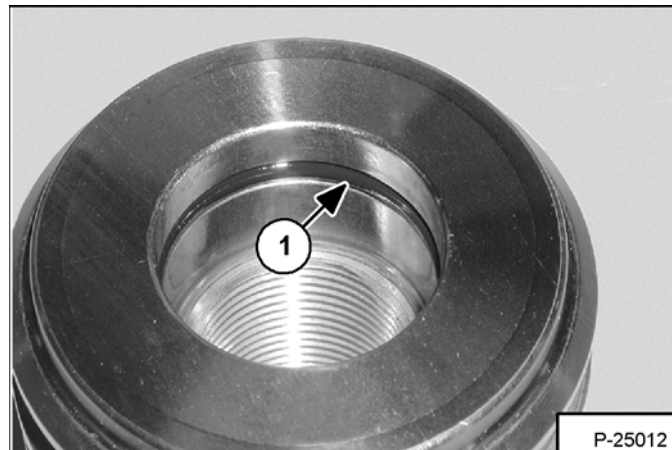
Install the wiper (Item 1) and seal (Item 2) [Figure 20-40-58].

Figure 20-40-59



Install the head gland (Item 1) [Figure 20-40-59] onto the cylinder rod.

Figure 20-40-60

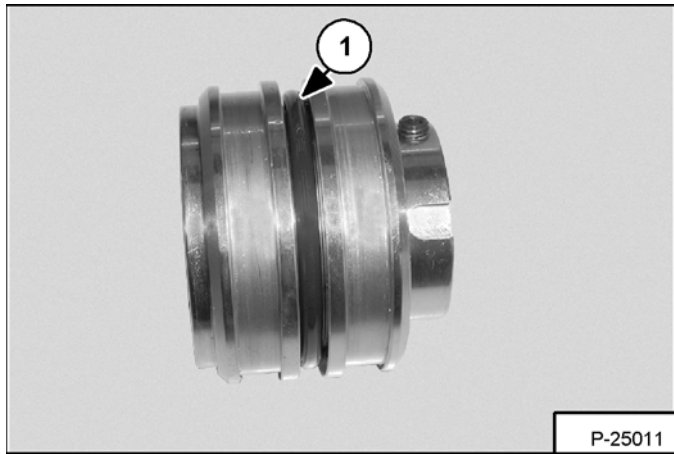


Install the O-ring (Item 1) [Figure 20-40-60] in the piston.

EXTENSION CYLINDER (CONT'D)

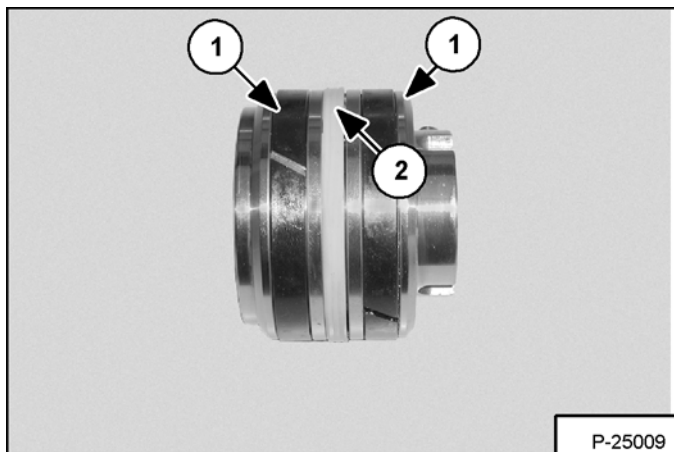
Assembly (Cont'd)

Figure 20-40-61



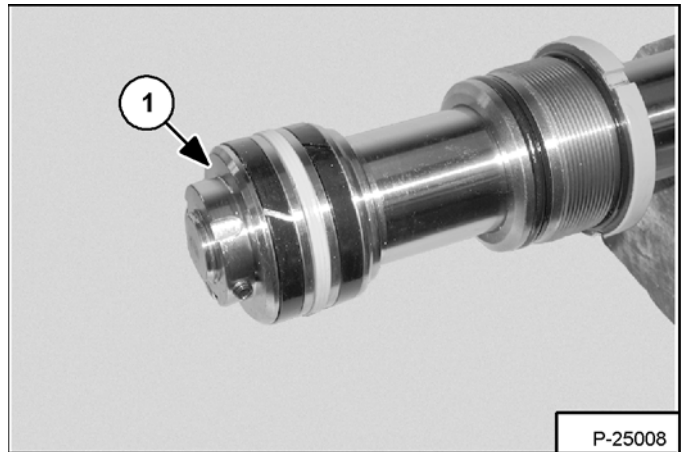
Install the expander O-ring (Item 1) [Figure 20-40-61].

Figure 20-40-62



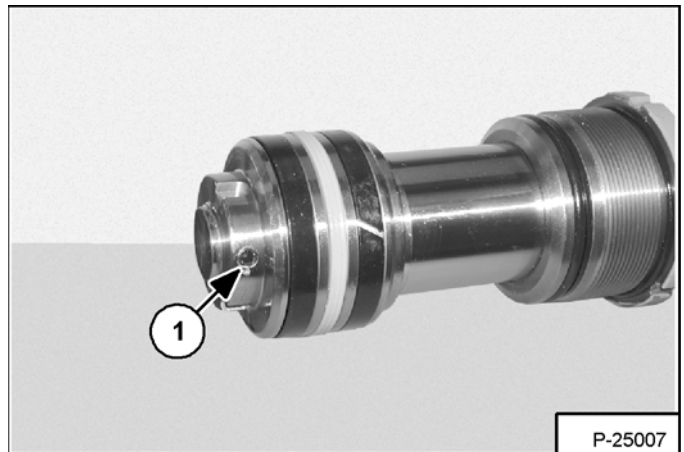
Install the two wear rings (Item 1) and seal (Item 2) [Figure 20-40-62] onto the piston.

Figure 20-40-63



Install the piston (Item 1) [Figure 20-40-63] onto the rod and hand tighten.

Figure 20-40-64

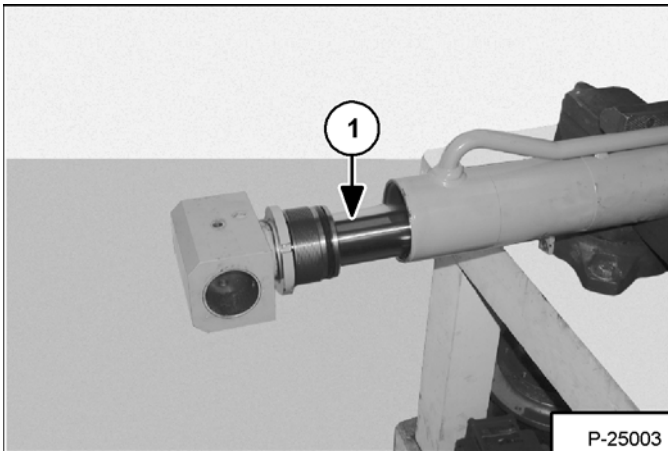


Tighten the set screw (Item 1) [Figure 20-40-64].

EXTENSION CYLINDER (CONT'D)

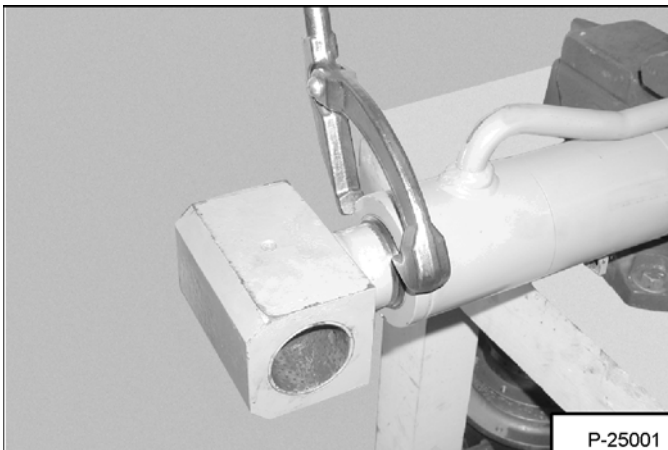
Assembly (Cont'd)

Figure 20-40-65



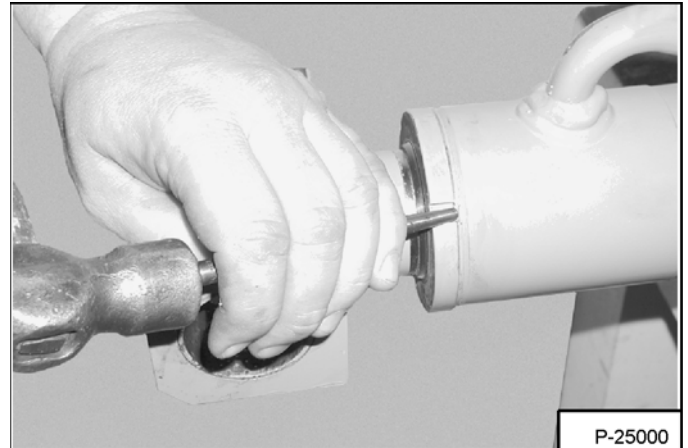
Install the rod assembly (Item 1) [Figure 20-40-65] in to the housing.

Figure 20-40-66



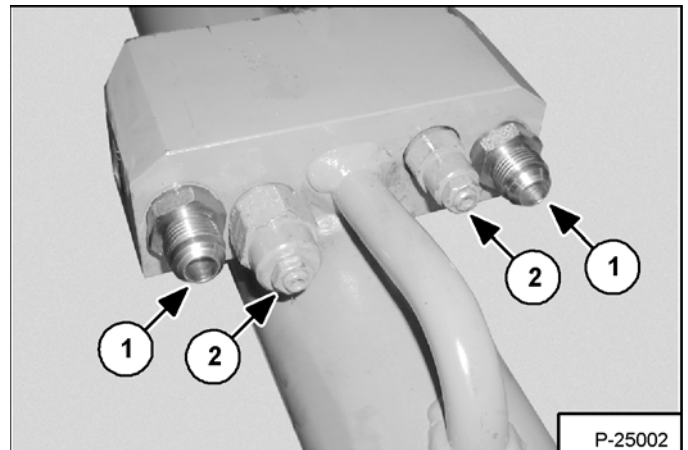
Tighten the head gland [Figure 20-40-66].

Figure 20-40-67



Using a punch seat the lock ring to keep the head gland from turning [Figure 20-40-67].

Figure 20-40-68



Install the two fittings (Item 1) and two relief valves (Item 2) [Figure 20-40-68].

TILT CYLINDER

Removal And Installation

Figure 20-50-1



Remove the quick tach assembly. (See Contents Page 50-01.)

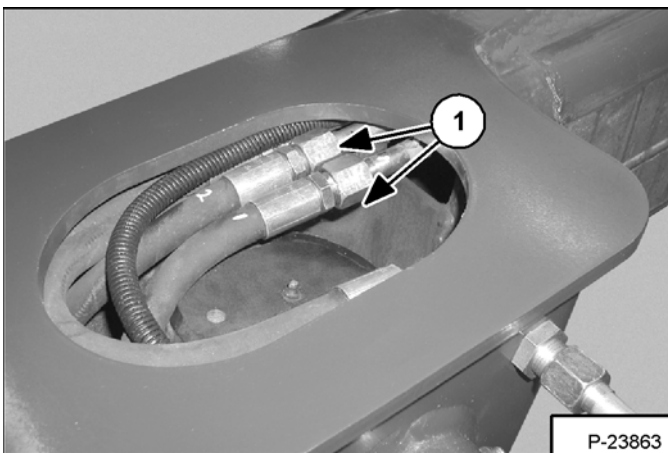
Raise the boom approximately 1-1/2 ft. and install a wood block under the boom [Figure 20-50-1].

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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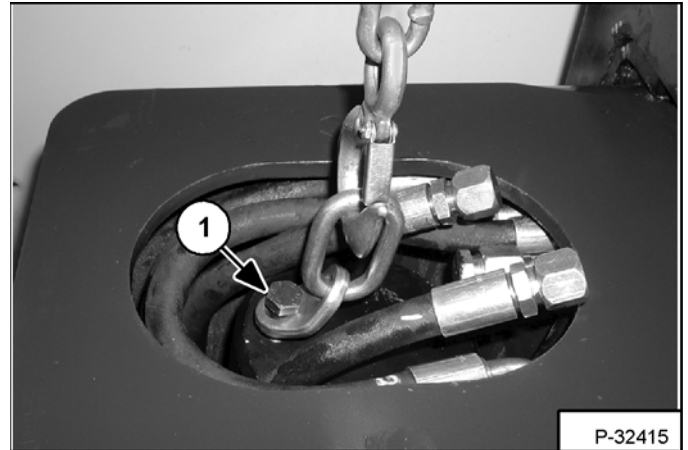
Figure 20-50-2



Remove the two hoses (Item 1) [Figure 20-50-2] from the tubelines.

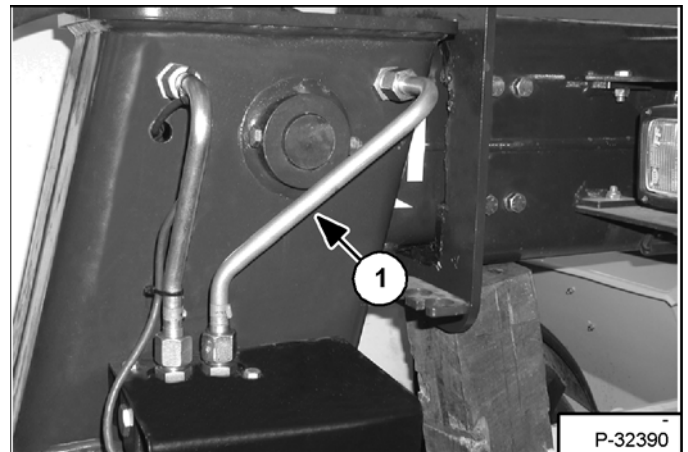
NOTE: Mark the hoses for correct installation.

Figure 20-50-3



Install a lifting ring (Item 1) [Figure 20-50-3] and hoist to the top of the cylinder.

Figure 20-50-4

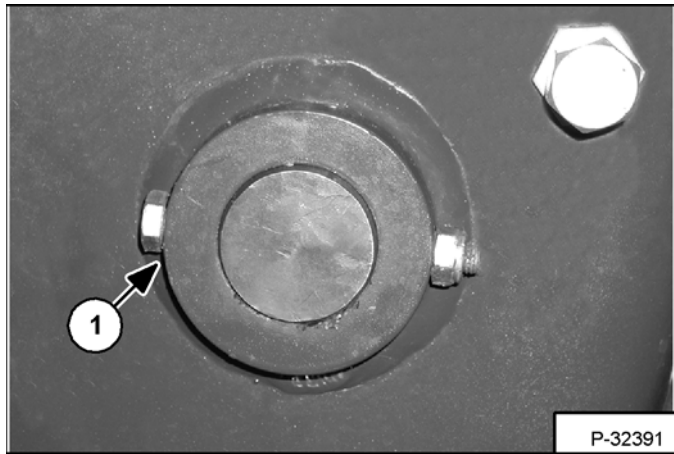


If equipped with secondary auxiliary hydraulics remove the tubeline (Item 1) [Figure 20-50-4].

TILT CYLINDER (CONT'D)

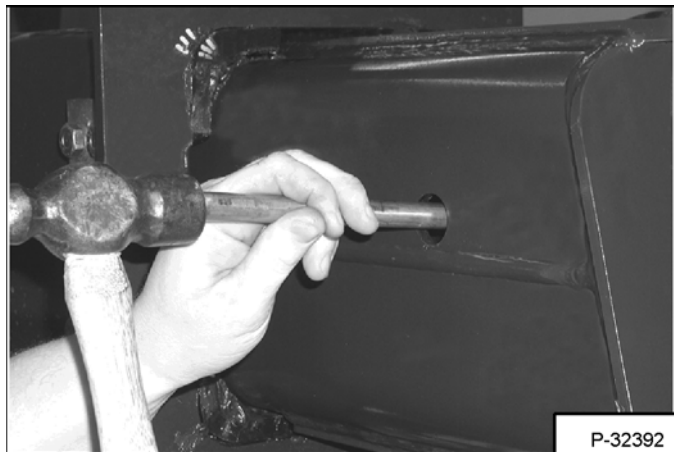
Removal And Installation (Cont'd)

Figure 20-50-5



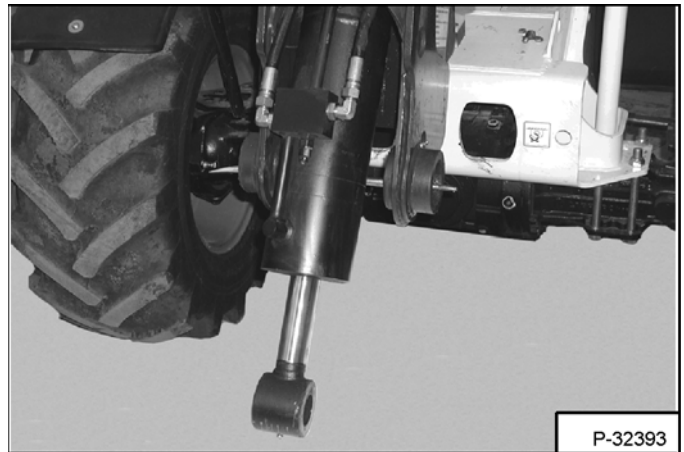
Remove the pivot pin retainer bolt (Item 1) [Figure 20-50-5].

Figure 20-50-6



Remove the pivot pin [Figure 20-50-6].

Figure 20-50-7

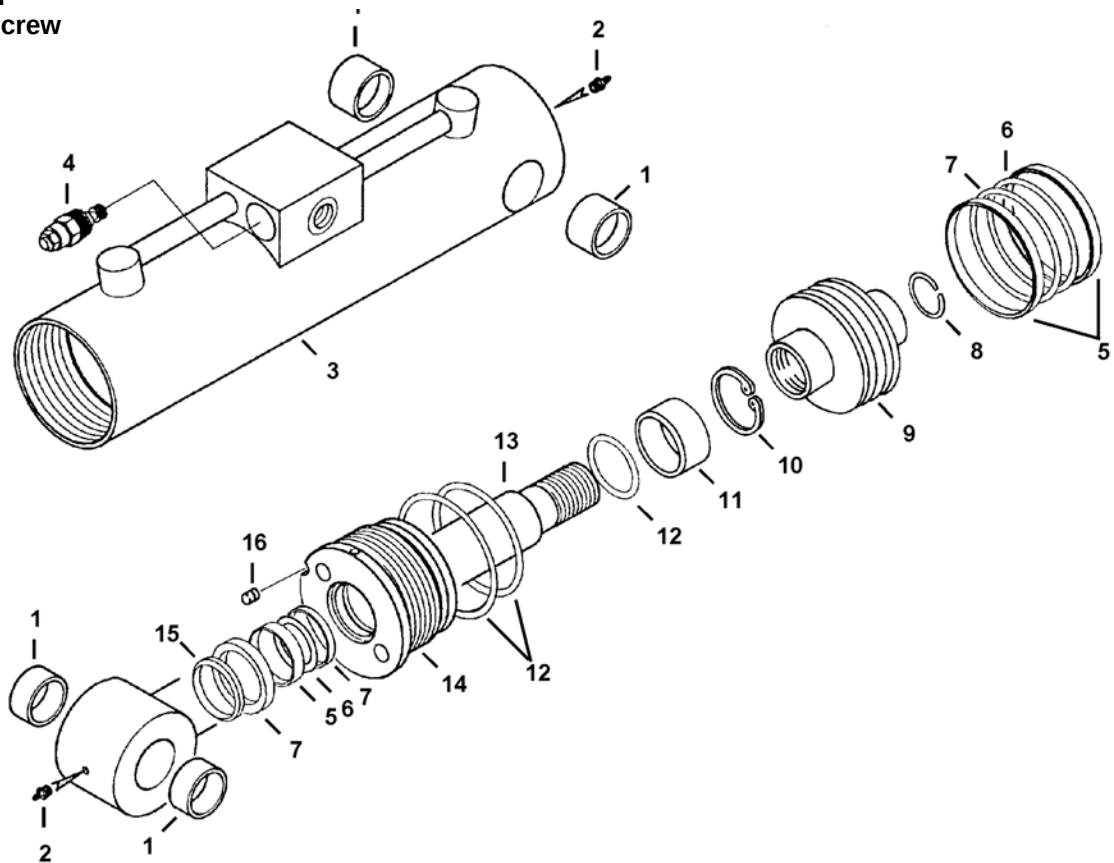


Lower the cylinder from the boom and remove [Figure 20-50-7].

TILT CYLINDER (CONT'D)

Parts Identification

1. Bushing
2. Grease Fitting
3. Housing
4. Relief Cartridge
5. Wear Ring
6. Expander O-ring
7. Seal
8. Lock Ring
9. Piston
10. Snap Ring
11. Cushion Sleeve
12. O-ring
13. Rod
14. Head Gland
15. Wiper
16. Set Screw



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TILT CYLINDER (CONT'D)

Disassembly

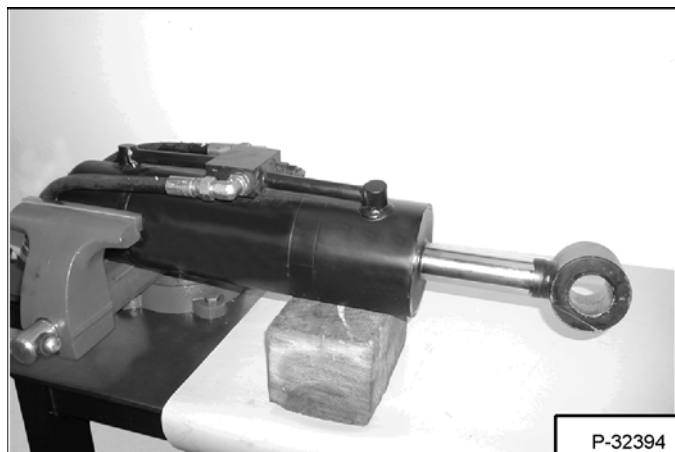
Use the following tools to disassemble the cylinder:

MEL1074-O-ring Seal Hook

MEL1075-Adjustable Gland Nut Wrench

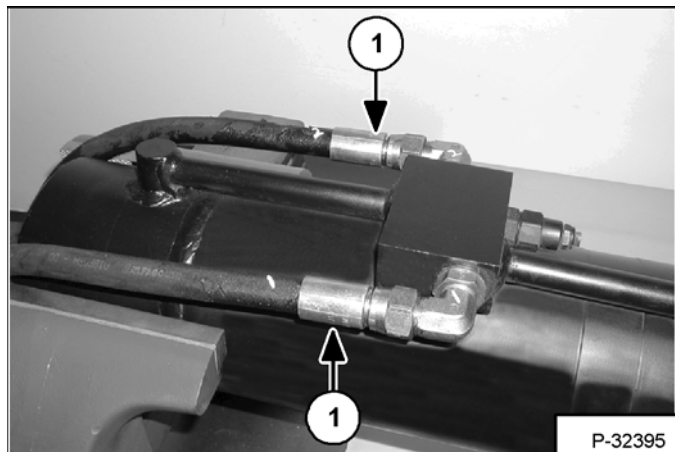
Clean the outside of the tilt cylinder before disassembly.

Figure 20-50-8



Put the cylinder in a vise [Figure 20-50-8].

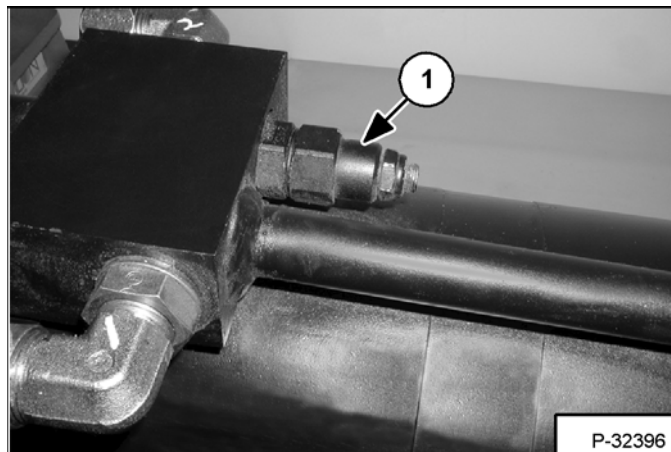
Figure 20-50-9



Remove the two hoses (Item 1) [Figure 20-50-9] from the cylinder.

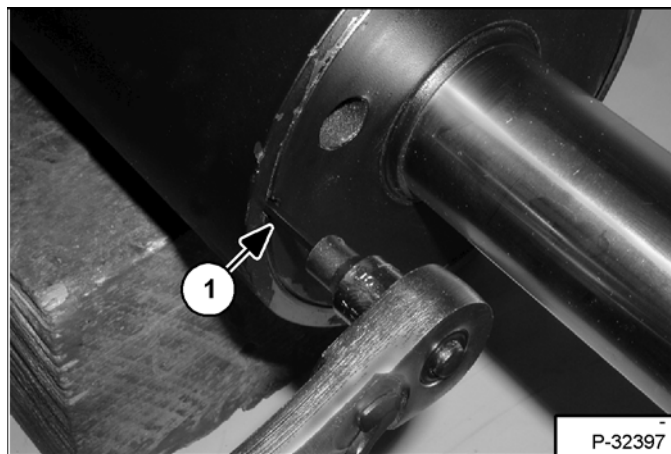
NOTE: Mark the location of the hoses for correct assembly.

Figure 20-50-10



Remove the relief cartridge (Item 1) [Figure 20-50-10].

Figure 20-50-11

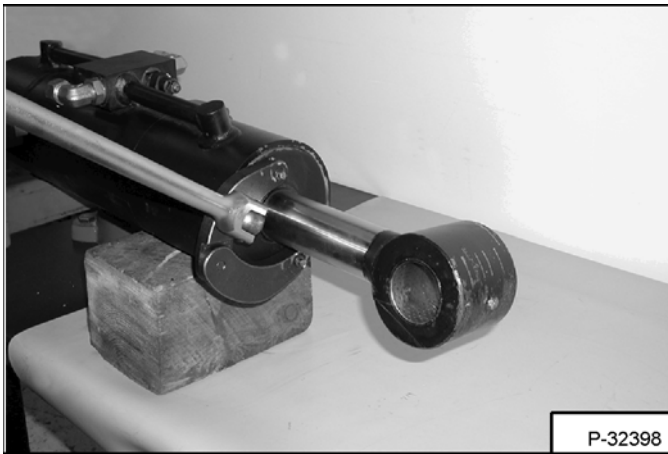


Remove the set screw (Item 1) [Figure 20-50-11].

TILT CYLINDER (CONT'D)

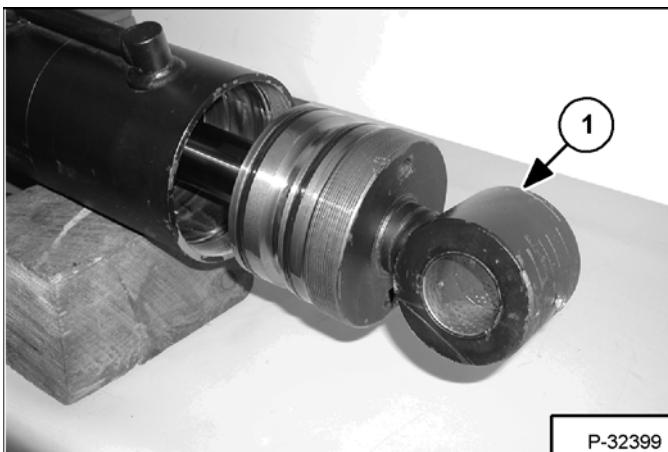
Disassembly (Cont'd)

Figure 20-50-12



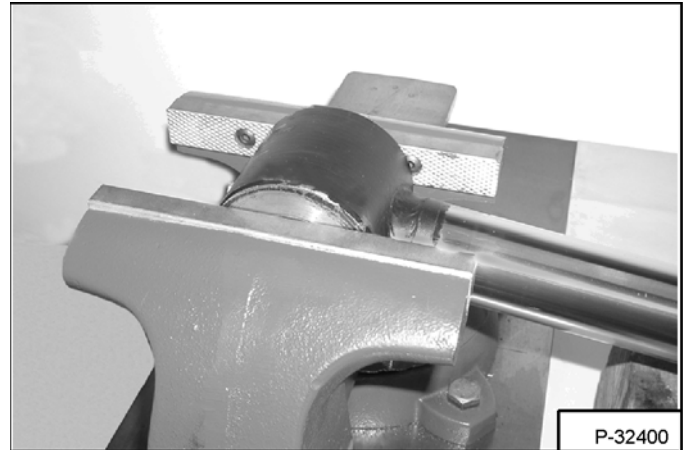
Loosen the head gland [Figure 20-50-12].

Figure 20-50-13



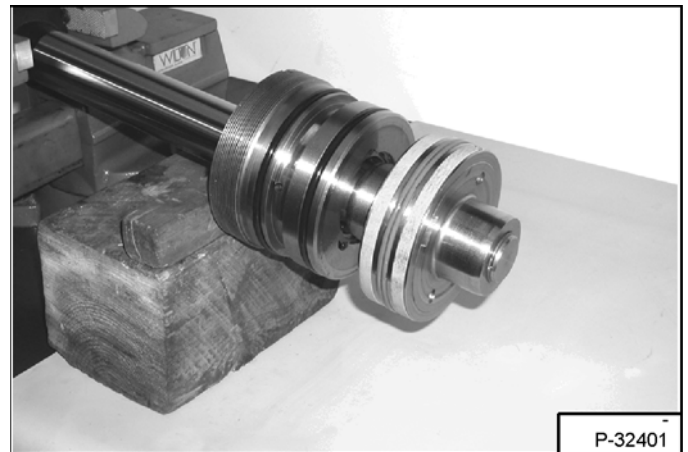
Remove the rod assembly (Item 1) [Figure 20-50-13].

Figure 20-50-14



Put the rod end of the cylinder in a vise [Figure 20-50-14].

Figure 20-50-15

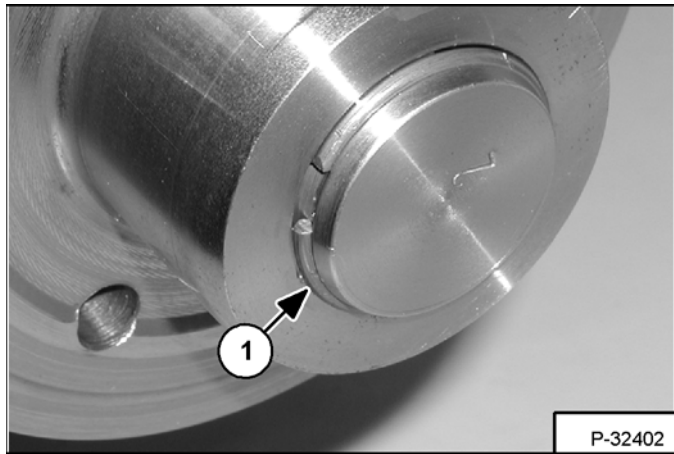


Support the cylinder rod on a wood block [Figure 20-50-15].

TILT CYLINDER (CONT'D)

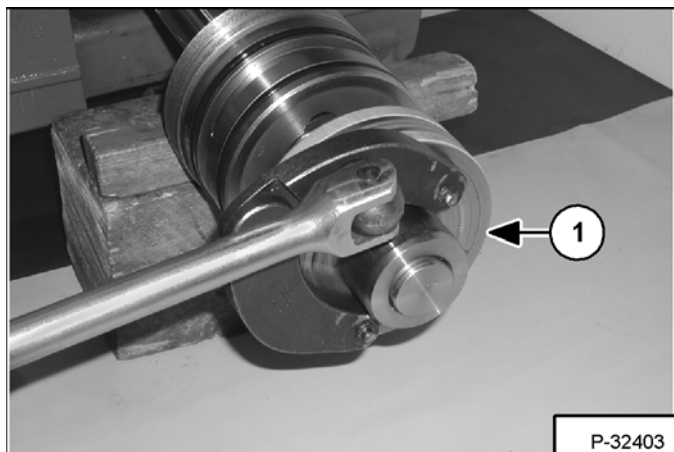
Disassembly (Cont'd)

Figure 20-50-16



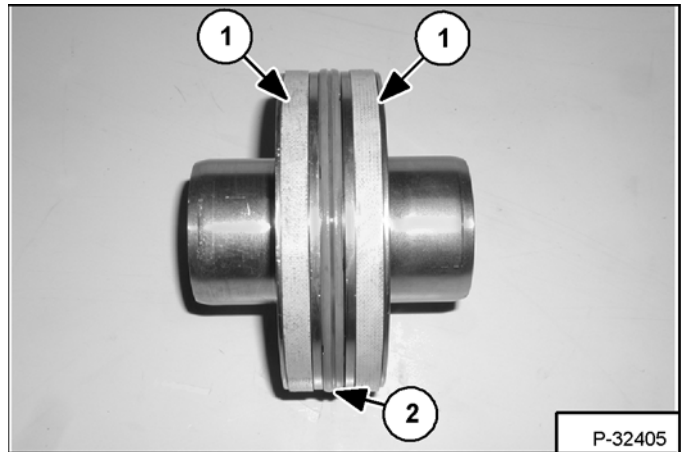
Remove the lock ring (Item 1) [Figure 20-50-16].

Figure 20-50-17



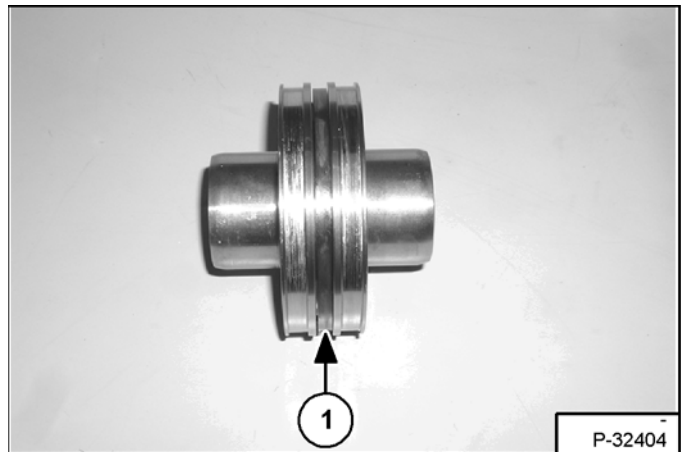
Remove the piston (Item 1) [Figure 20-50-17] from the rod.

Figure 20-50-18



Remove the two wear rings (Item 1) and seal (Item 2) [Figure 20-50-18] from the piston.

Figure 20-50-19

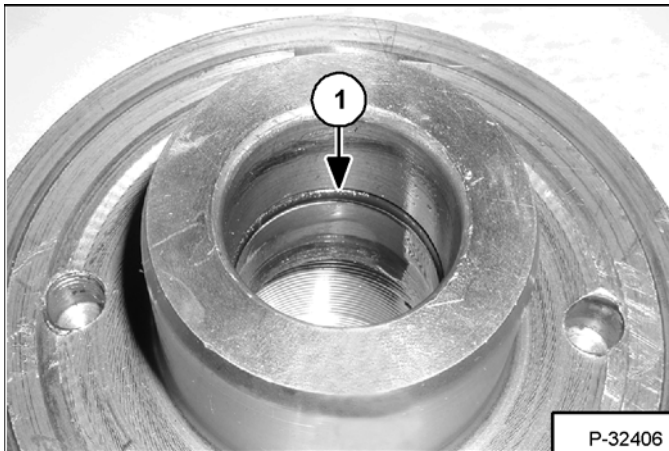


Remove the expander O-ring (Item 1) [Figure 20-50-19].

TILT CYLINDER (CONT'D)

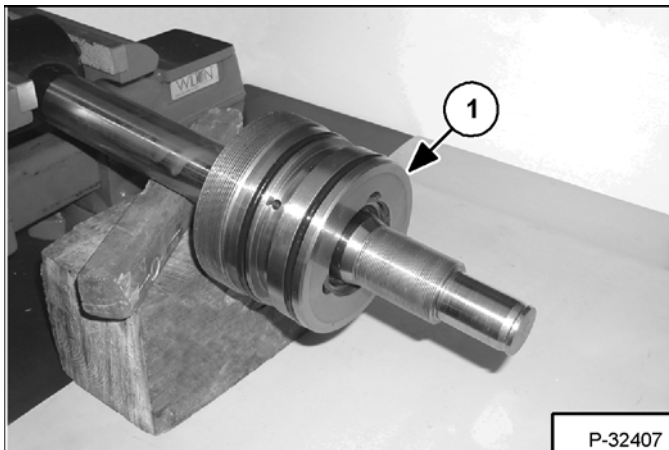
Disassembly (Cont'd)

Figure 20-50-20



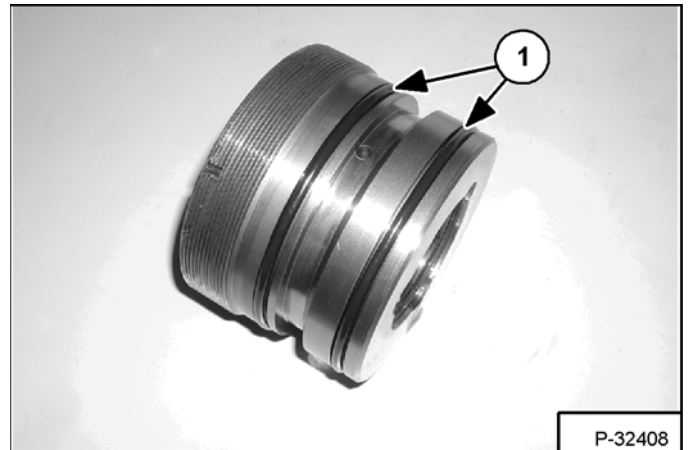
Remove the O-ring (Item 1) [Figure 20-50-20] from the inside of the piston.

Figure 20-50-21



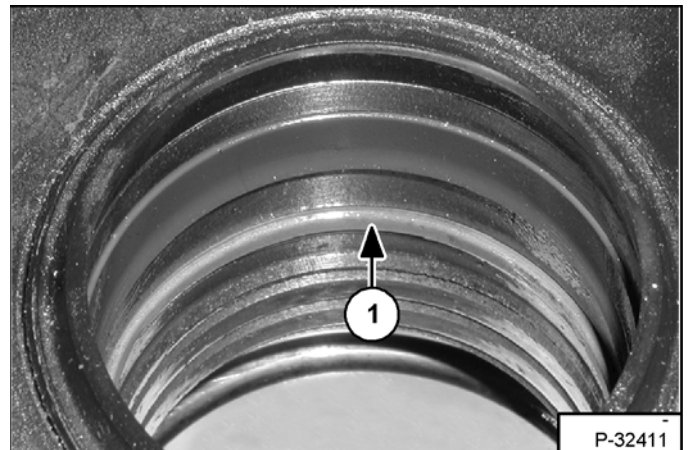
Remove the head gland (Item 1) [Figure 20-50-21] from the rod.

Figure 20-50-22



Remove the two O-rings (Item 1) [Figure 20-50-22] from the head gland.

Figure 20-50-23

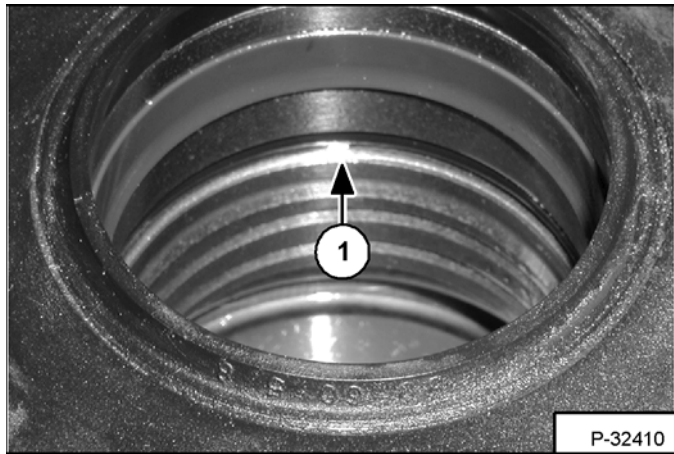


Remove the seal (Item 1) [Figure 20-50-23] from the head gland.

TILT CYLINDER (CONT'D)

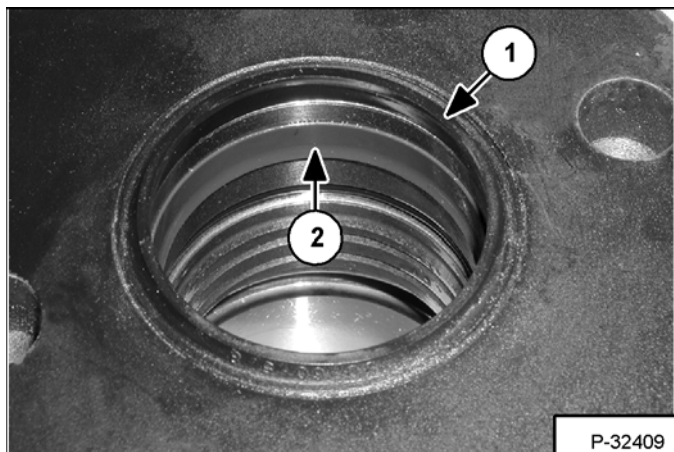
Disassembly (Cont'd)

Figure 20-50-24



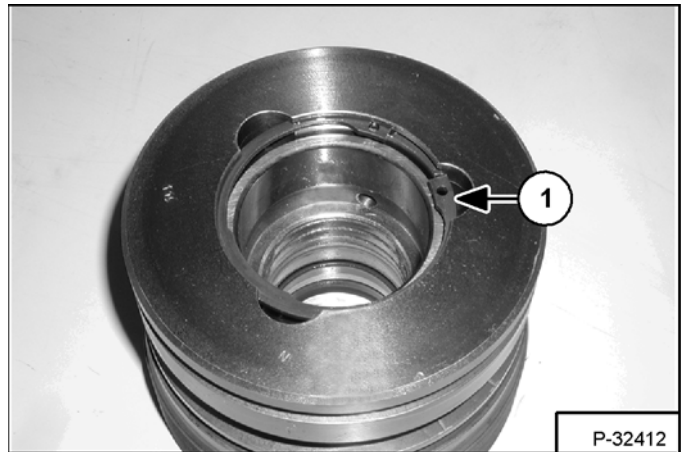
Remove the expander O-ring (Item 1) [Figure 20-50-24].

Figure 20-50-25



Remove the wiper (Item 1) and seal (Item 2) [Figure 20-50-25] from the head gland.

Figure 20-50-26



Remove the snap ring (Item 1) [Figure 20-50-26].

Figure 20-50-27



Remove the cushion sleeve (Item 1) [Figure 20-50-27] from the head gland.

TILT CYLINDER (CONT'D)

Assembly

Use the following tool to assemble the cylinder:

MEL1075-Adjustable Gland Nut Wrench

Clean all parts in solvent and dry with compressed air.

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

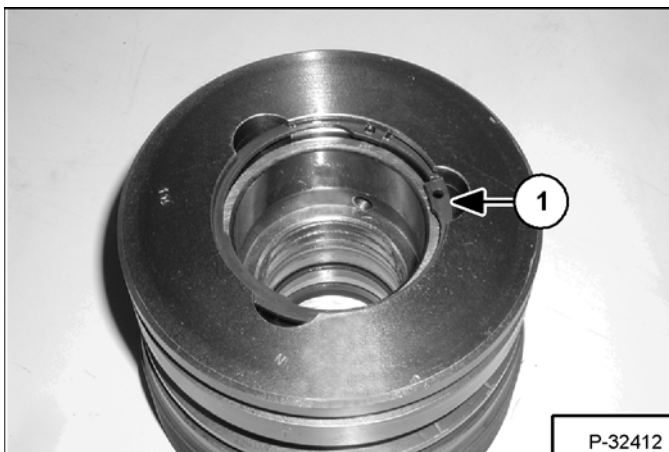
Always install new seals and O-rings. Lubricate all seals and O-rings with clean hydraulic fluid before installation.

Figure 20-50-28



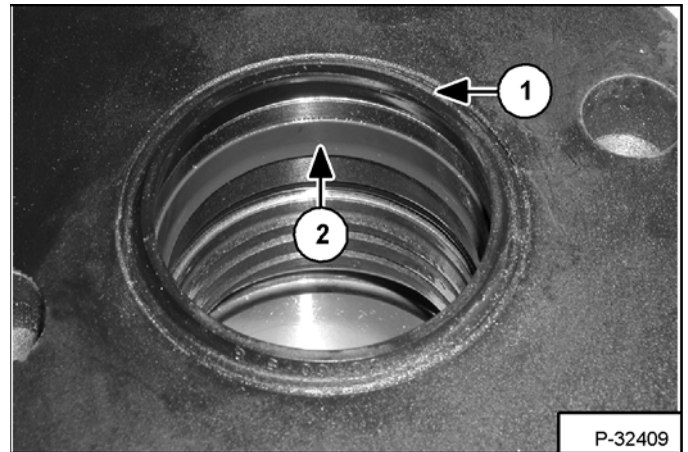
Install the cushion sleeve (Item 1) [Figure 20-50-28] into the head gland.

Figure 20-50-29



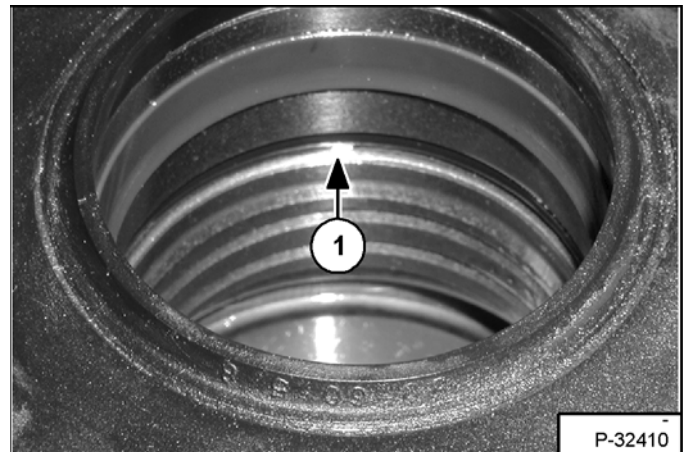
Install the snap ring (Item 1) [Figure 20-50-29].

Figure 20-50-30



Install the wiper (Item 1) and seal (Item 2) [Figure 20-50-30] into the head gland.

Figure 20-50-31

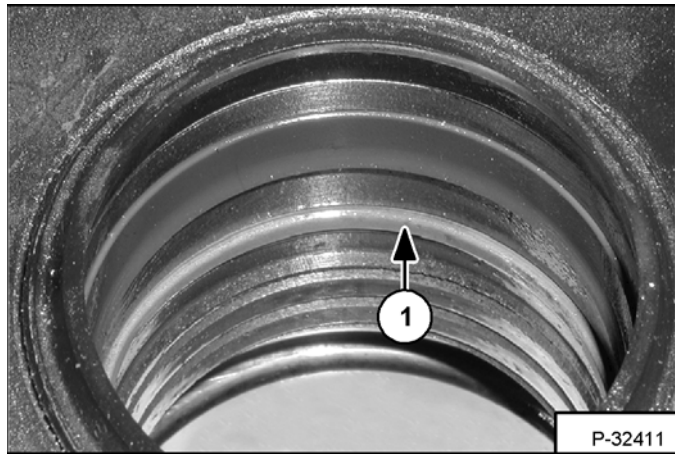


Install the expander O-ring (Item 1) [Figure 20-50-31].

TILT CYLINDER (CONT'D)

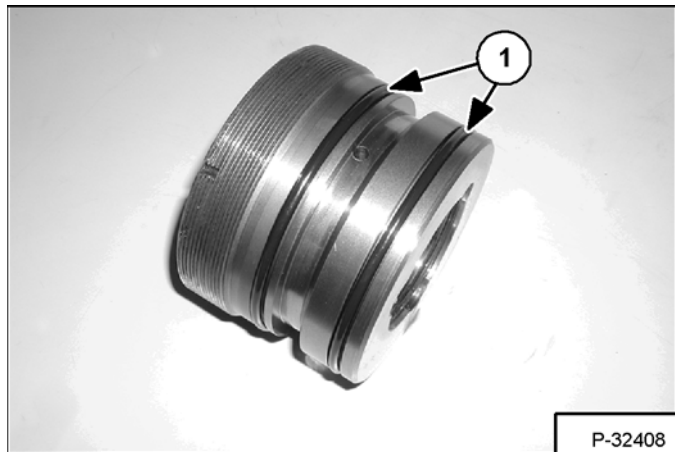
Assembly (Cont'd)

Figure 20-50-32



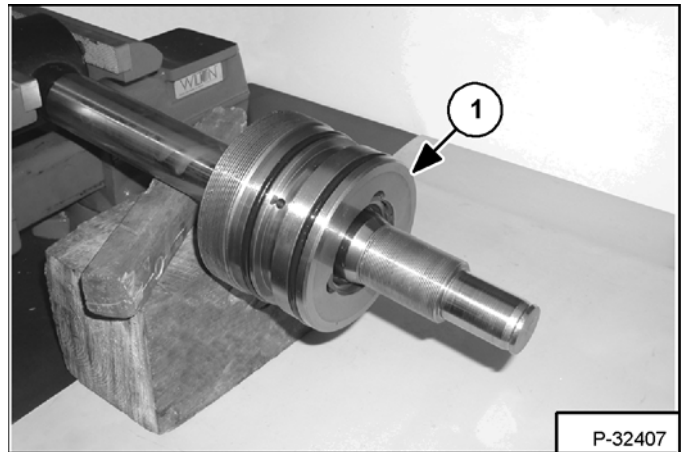
Install the seal (Item 1) [Figure 20-50-32] into the head gland.

Figure 20-50-33



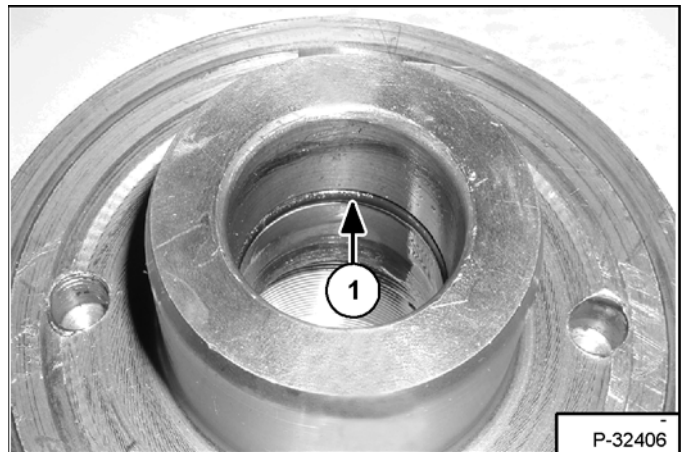
Install the two O-rings (Item 1) [Figure 20-50-33] onto the head gland.

Figure 20-50-34



Install the head gland (Item 1) [Figure 20-50-34] onto the rod.

Figure 20-50-35

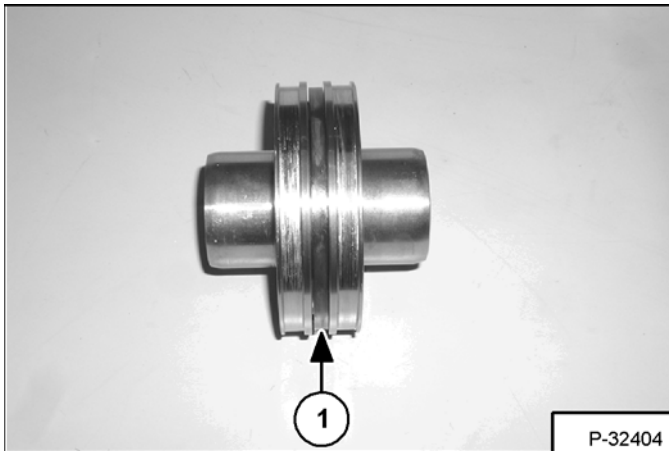


Install the O-ring (Item 1) [Figure 20-50-35] inside the piston.

TILT CYLINDER (CONT'D)

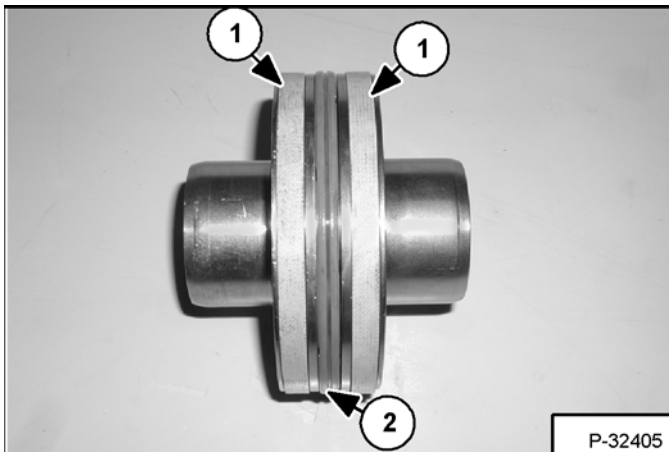
Assembly (Cont'd)

Figure 20-50-36



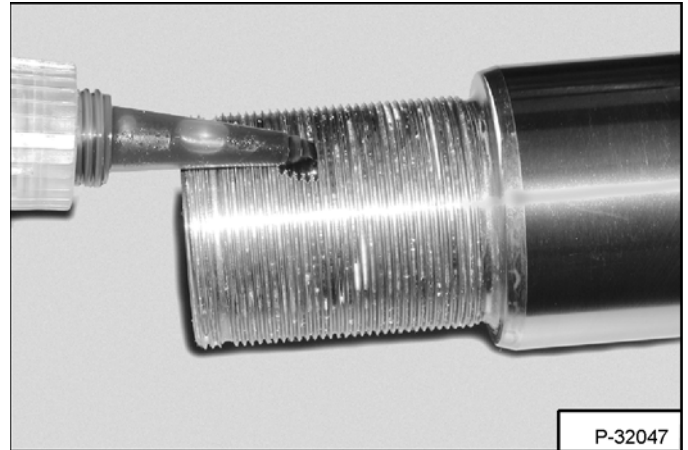
Install the expander O-ring (Item 1) [Figure 20-50-36] onto the piston.

Figure 20-50-37



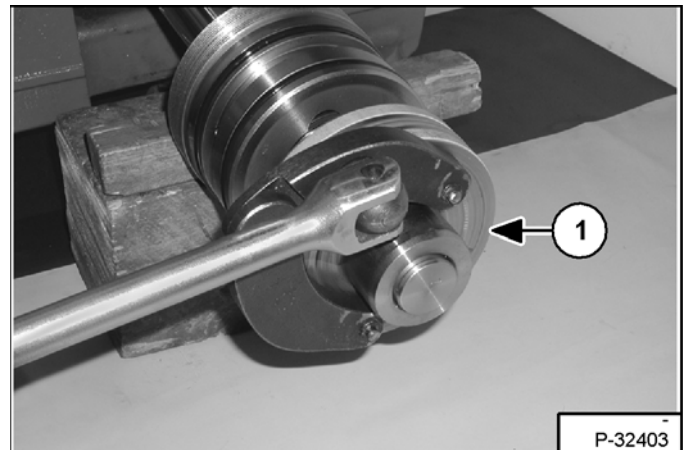
Install the two wear rings (Item 1) and seal (Item 2) [Figure 20-50-37].

Figure 20-50-38



Clean off any old residue, and apply LOCTITE 242 or equivalent to the threads on the rod [Figure 20-50-38].

Figure 20-50-39

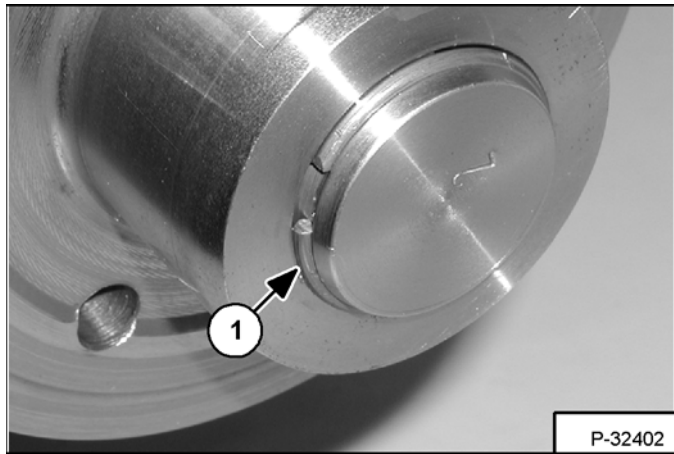


Install the piston (Item 1) [Figure 20-50-39] onto the rod.

TILT CYLINDER (CONT'D)

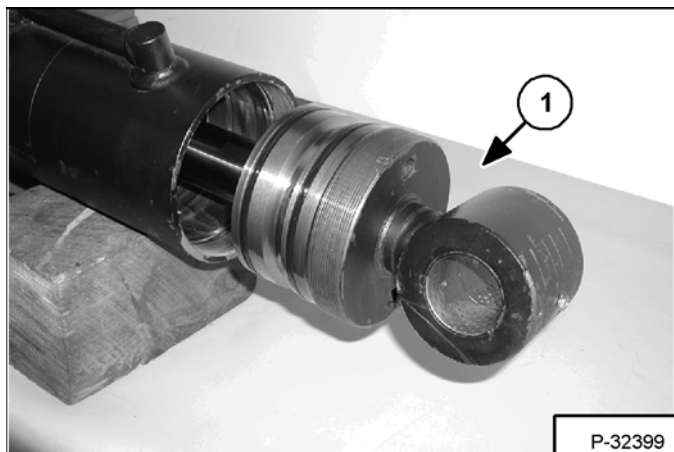
Assembly (Cont'd)

Figure 20-50-40



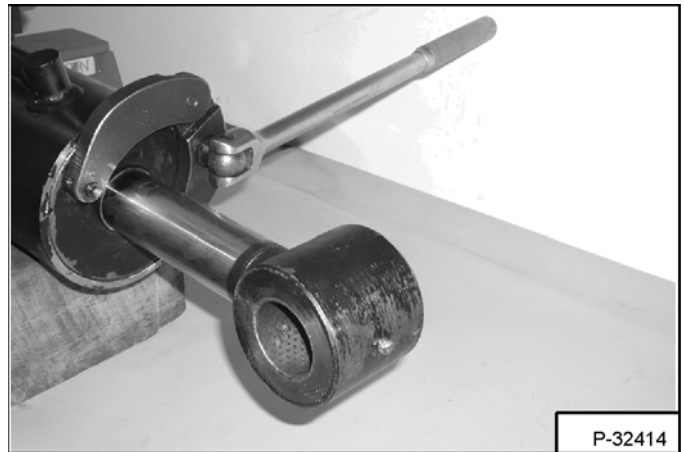
Install the lock ring (Item 1) [Figure 20-50-40].

Figure 20-50-41



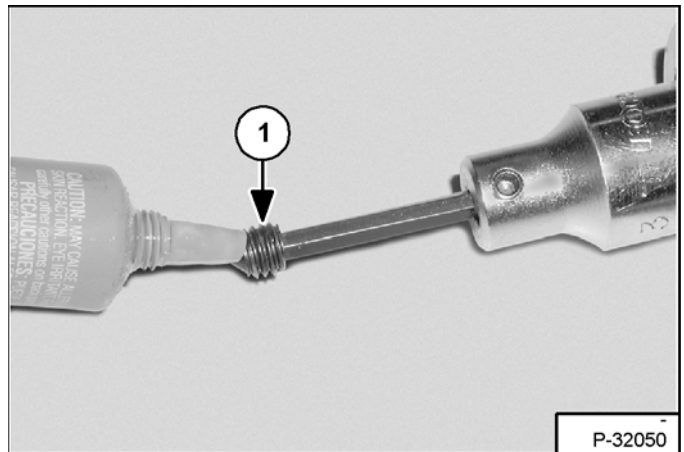
Install the piston/rod assembly (Item 1) [Figure 20-50-41] into the housing.

Figure 20-50-42



Tighten the head gland [Figure 20-50-42].

Figure 20-50-43

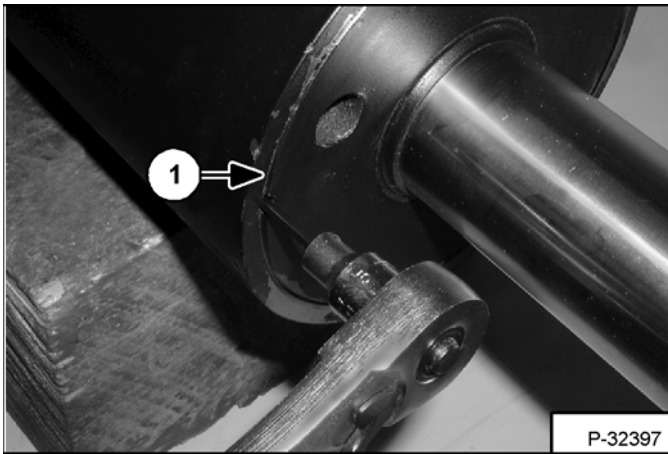


Apply LOCTITE 242 or equivalent to the set screw (Item 1) [Figure 20-50-43].

TILT CYLINDER (CONT'D)

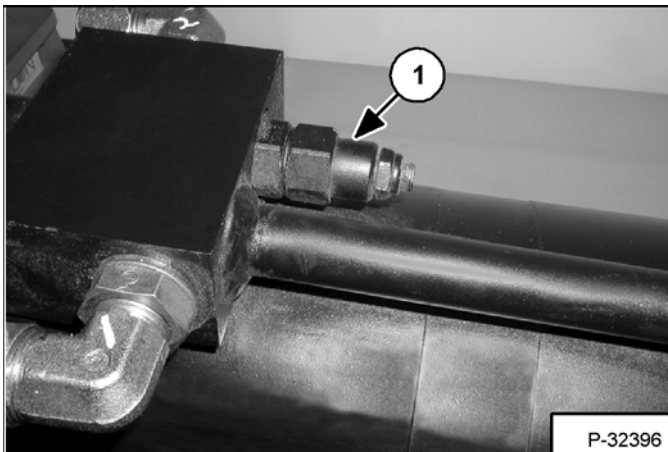
Assembly (Cont'd)

Figure 20-50-44



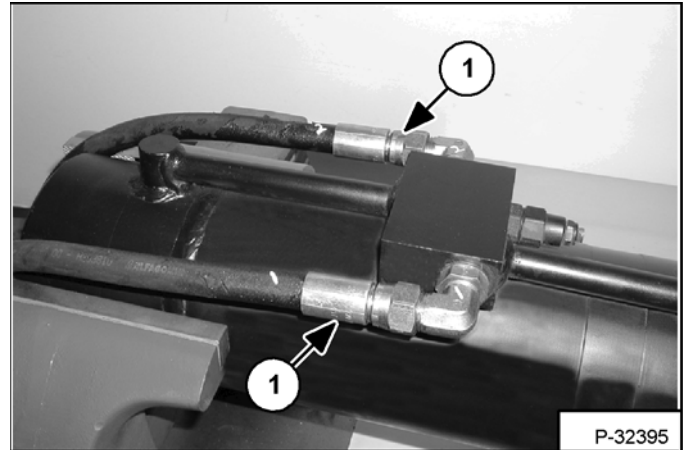
Install the set screw (Item 1) [Figure 20-50-44] and tighten.

Figure 20-50-45



Install the relief cartridge (Item 1) [Figure 20-50-45].

Figure 20-50-46

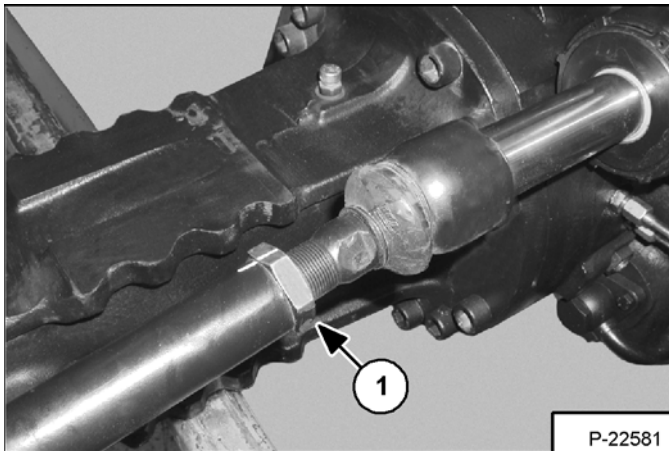


Install the two hoses (Item 1) [Figure 20-50-46].

STEERING CYLINDER (FRONT)

Removal And Installation

Figure 20-60-1

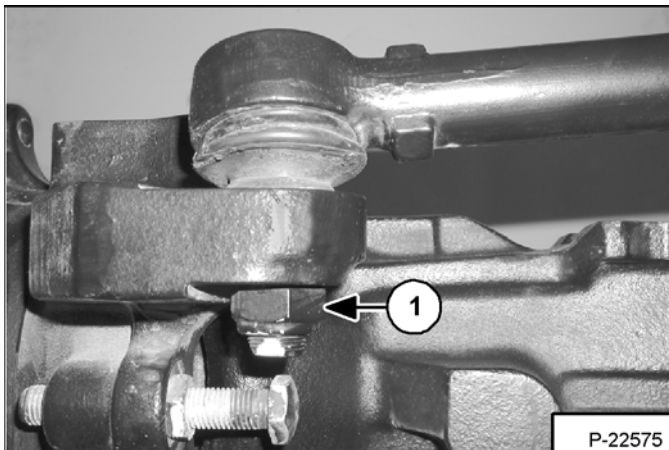


Remove the front axle. (See Contents Page 40-01.)

Loosen the tie rod jam nut (Item 1) [Figure 20-60-1], mark the location of the nut for ease of assembly.

Installation: Tighten the jam nut to 185 ft.-lbs. (250 Nm) torque.

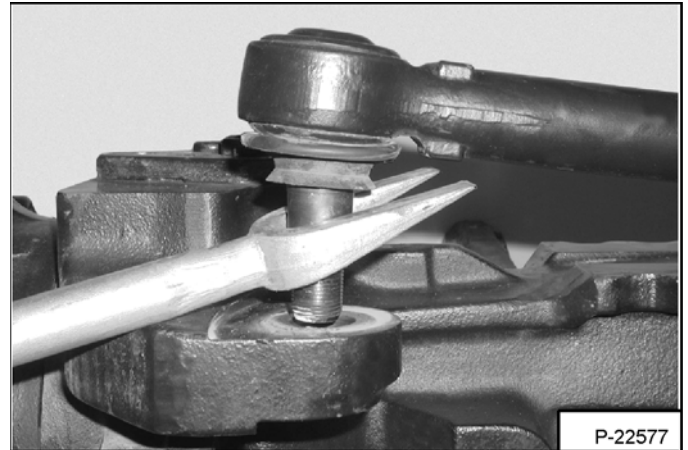
Figure 20-60-2



Loosen and remove the tie rod nut (Item 1) [Figure 20-60-2].

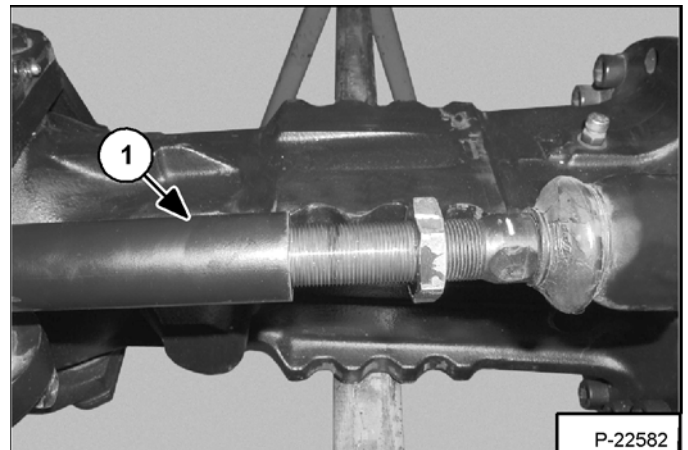
Installation: Tighten the nut to 160 ft.-lbs. (220 Nm) torque.

Figure 20-60-3



Remove the tie rod end from the axle [Figure 20-60-3].

Figure 20-60-4

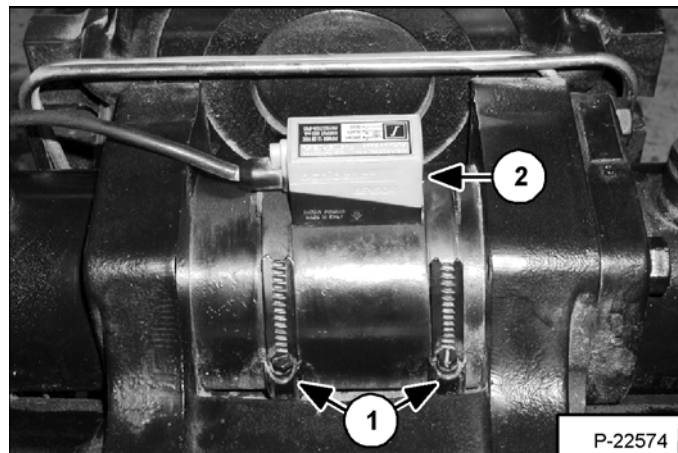


Remove the tie rod ends (Item 1) [Figure 20-60-4] from the steering cylinder.

STEERING CYLINDER (FRONT) (CONT'D)

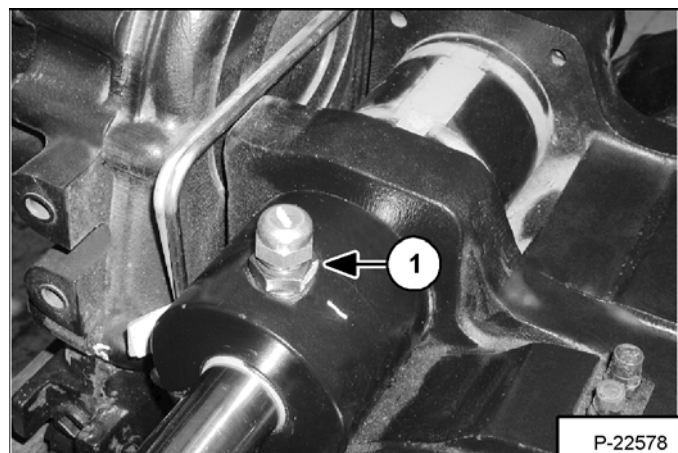
Removal And Installation (Cont'd)

Figure 20-60-5



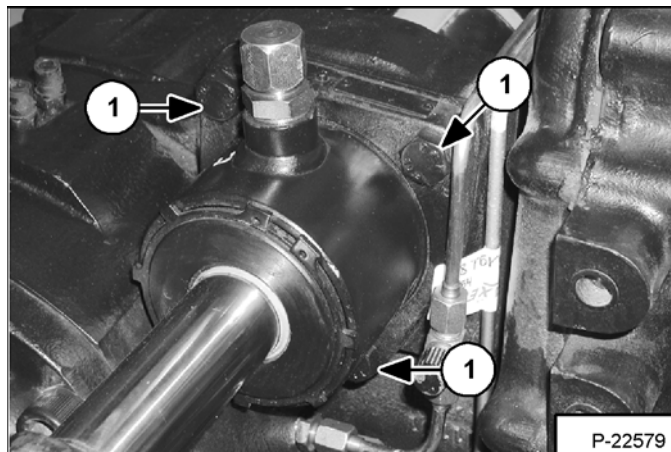
Remove both clamps (Item 1) and remove the centering sensor (Item 2) [Figure 20-60-5] from the cylinder.

Figure 20-60-6



Remove the fitting (Item 1) [Figure 20-60-6] from the cylinder.

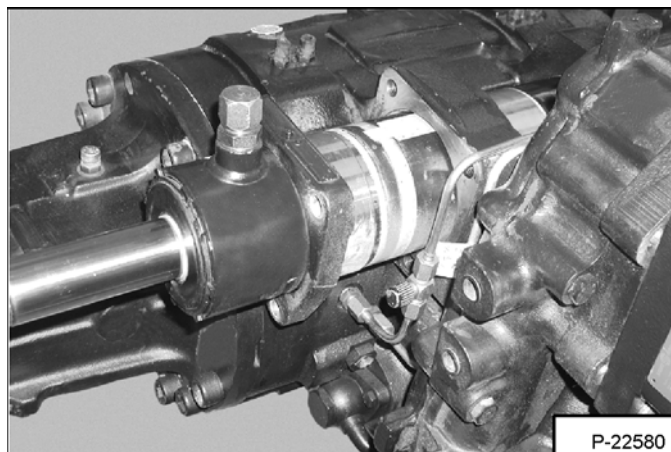
Figure 20-60-7



Remove the three bolts (Item 1) [Figure 20-60-7] from the cylinder retainer plate.

Assembly: Apply Loctite 270 to the three bolts and tighten to 88 ft.-lbs. (120 Nm) torque.

Figure 20-60-8

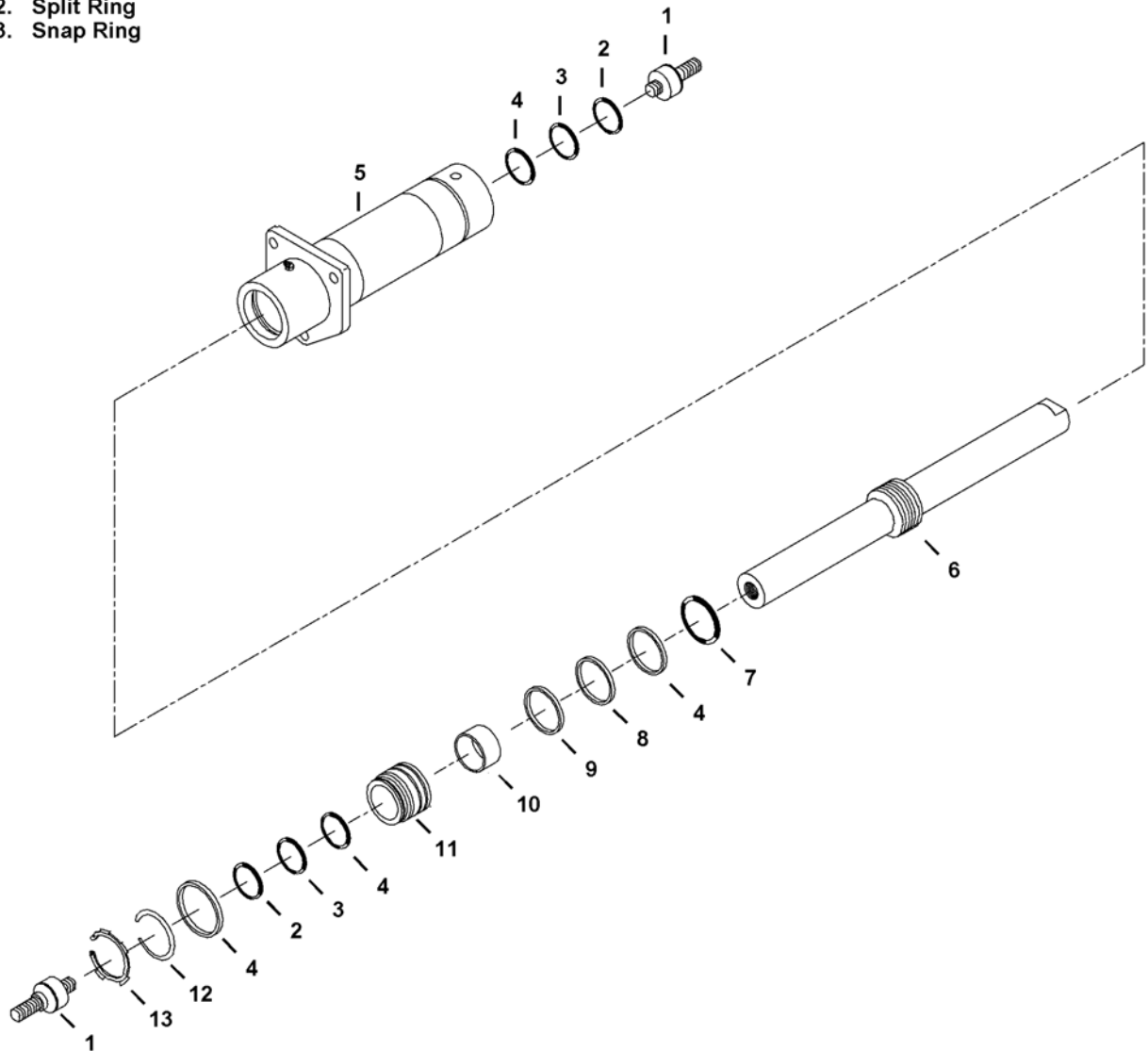


Remove the cylinder from the axle [Figure 20-60-8].

STEERING CYLINDER (FRONT) (CONT'D)

Parts Identification

1. Swivel End
2. Wiper
3. Backup Washer
4. Seal
5. Housing
6. Rod
7. O-Ring
8. Magnetic Sensor
9. Wear Ring
10. Spacer
11. Head Gland
12. Split Ring
13. Snap Ring



MS-01116

STEERING CYLINDER (FRONT) (CONT'D)

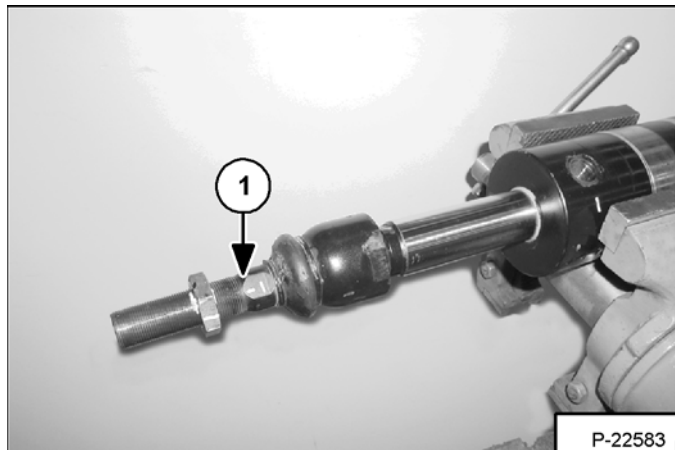
Disassembly

Use the following tool to disassemble the cylinder:

MEL1074-O-ring Seal Hook

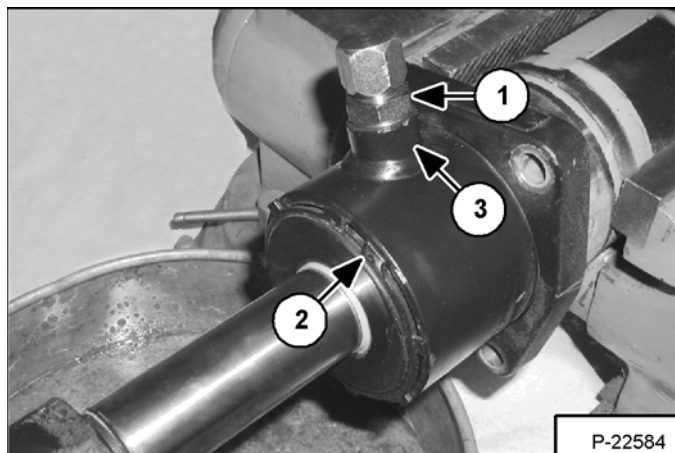
Clean the outside of the steering cylinder before disassembly.

Figure 20-60-9



Put the cylinder in a vise and remove the tie rod swivel ends (Item 1) [Figure 20-60-9] from the rod.

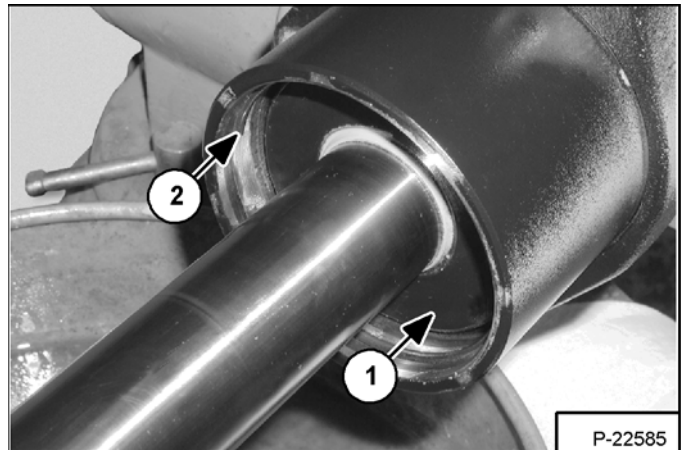
Figure 20-60-10



Place a drain pan under the cylinder, remove the fitting (Item 1) and snap ring (Item 2) [Figure 20-60-10] from the cylinder.

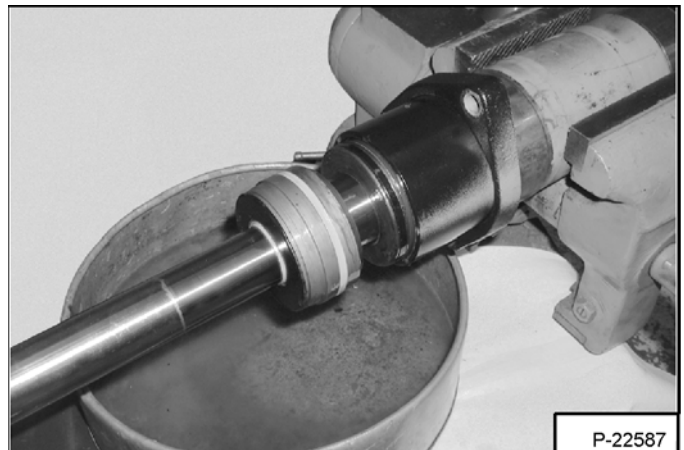
NOTE: Rotate the cylinder in the vise so the fitting port (Item 3) [Figure 20-60-10] is positioned down to allow the oil to drain into the pan.

Figure 20-60-11



Drive the head gland (Item 1) inwards. Remove the internal snap ring (Item 2) [Figure 20-60-11].

Figure 20-60-12

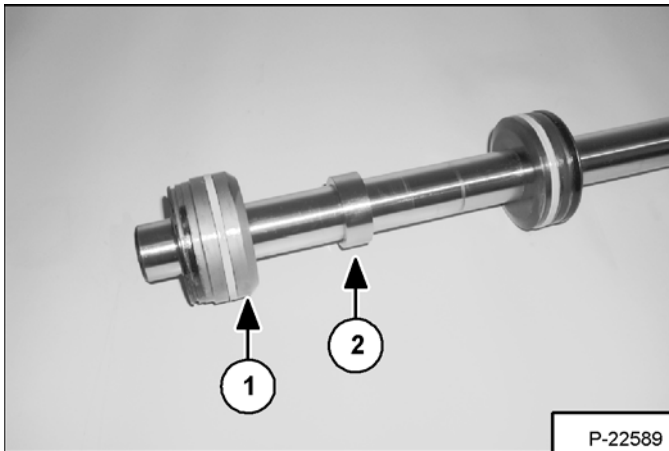


Remove the rod assembly from the housing [Figure 20-60-12].

STEERING CYLINDER (FRONT) (CONT'D)

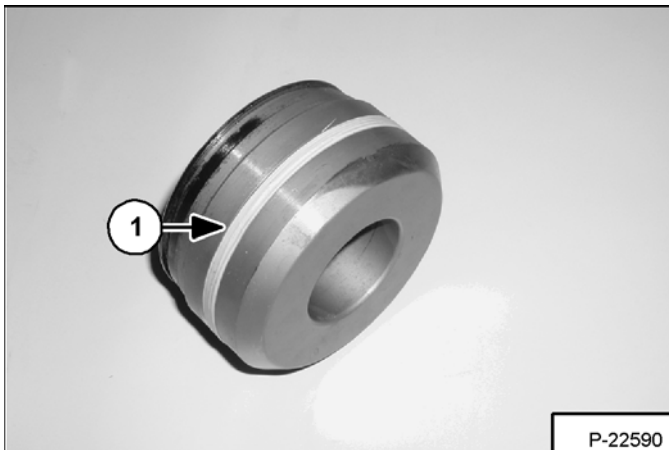
Disassembly (Cont'd)

Figure 20-60-13



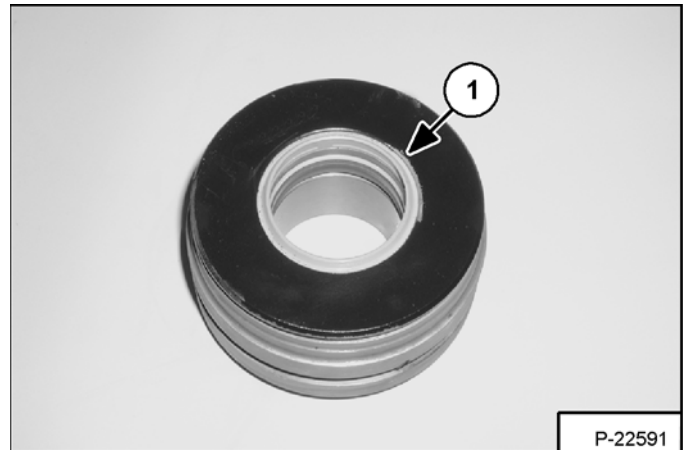
Remove the head assembly (Item 1) and spacer (Item 2) [Figure 20-60-13] from the rod.

Figure 20-60-14



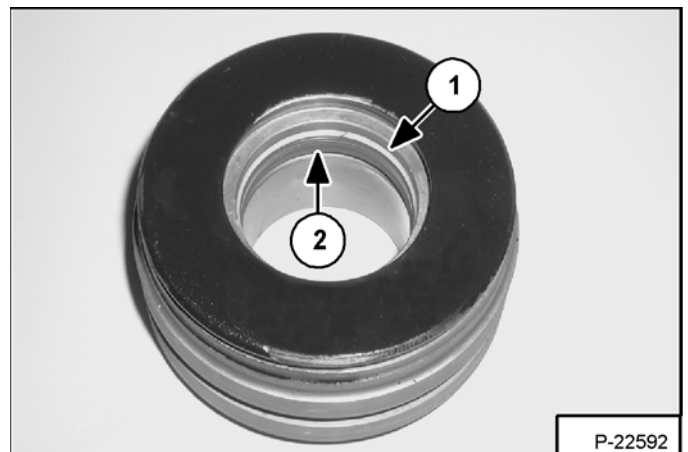
Remove the outer seal (Item 1) [Figure 20-60-14] from the head.

Figure 20-60-15



Remove the wiper seal (Item 1) [Figure 20-60-15].

Figure 20-60-16

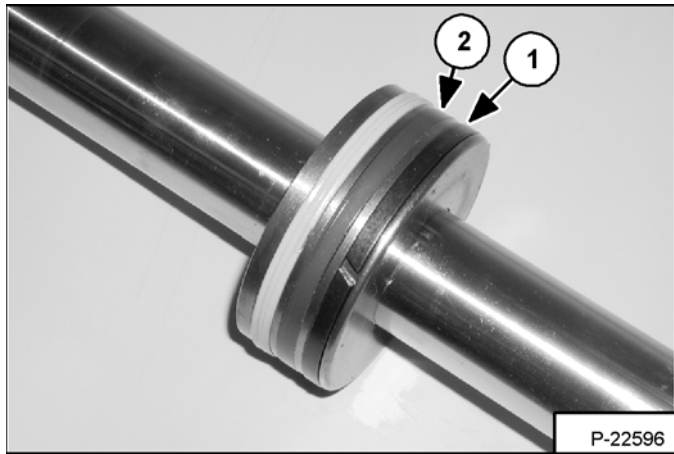


Remove the backup ring (Item 1) and rod seal (Item 2) [Figure 20-60-16] from the head gland.

STEERING CYLINDER (FRONT) (CONT'D)

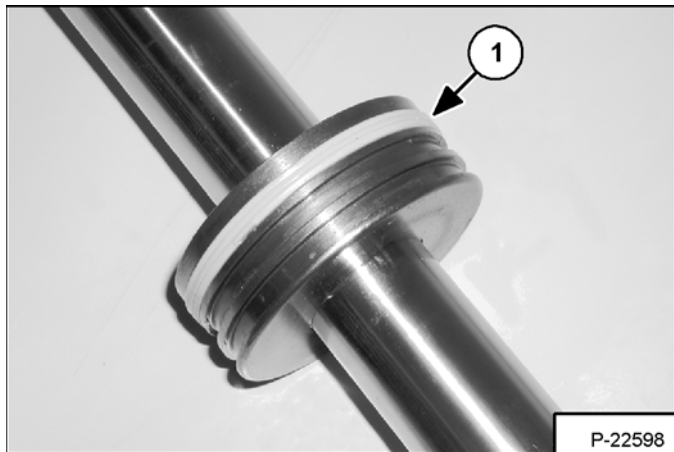
Disassembly (Cont'd)

Figure 20-60-17



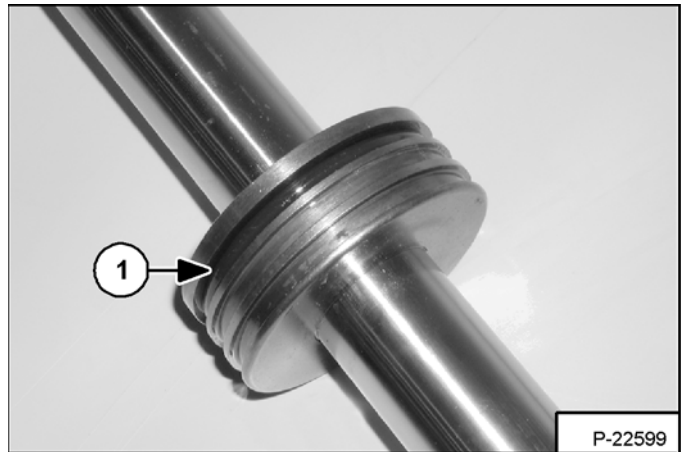
Remove the wear ring (Item 1) and magnetic sensor ring (Item 2) [Figure 20-60-17] from the piston.

Figure 20-60-18



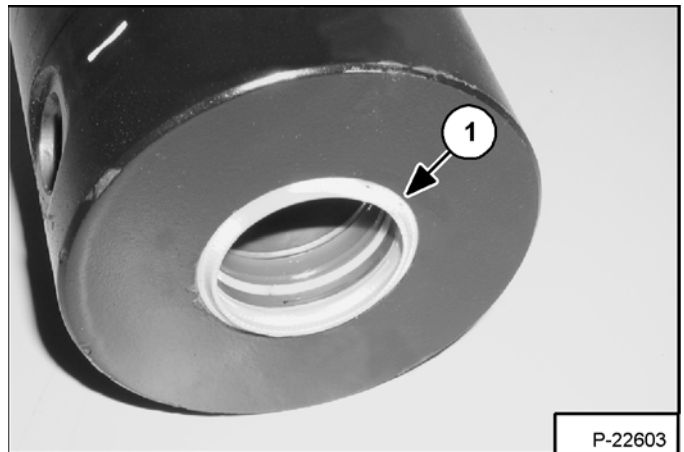
Remove the seal (Item 1) [Figure 20-60-18].

Figure 20-60-19



Remove the expander O-ring (Item 1) [Figure 20-60-19].

Figure 20-60-20

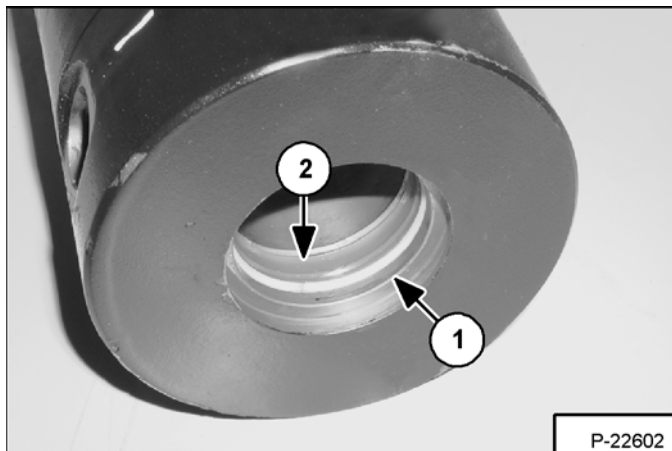


Remove the wiper seal (Item 1) [Figure 20-60-20] from the housing.

STEERING CYLINDER (FRONT) (CONT'D)

Disassembly (Cont'd)

Figure 20-60-21



Remove the backup ring (Item 1) and rod seal (Item 2) [Figure 20-60-21] from the housing.

Assembly

Use the following tools to assembly the cylinder:

MEL1033-Rod Seal Installation Tool
MEL1396-1-Universal Seal Expander

Clean all parts in solvent and dry with compressed air.

Figure 20-60-22

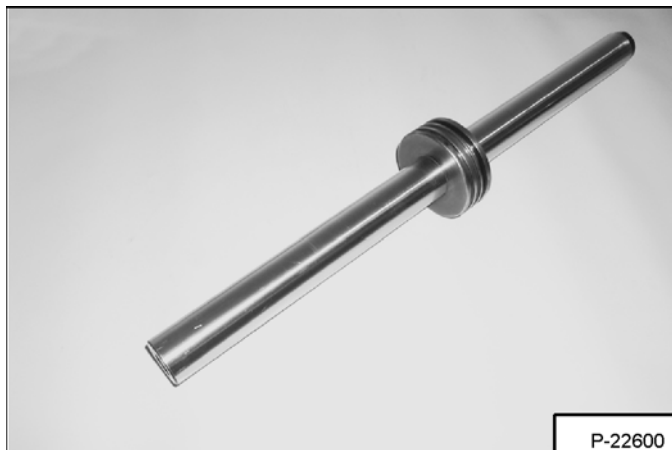
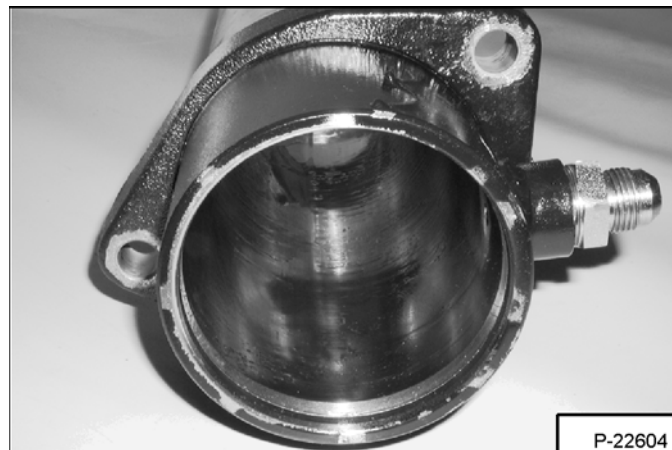


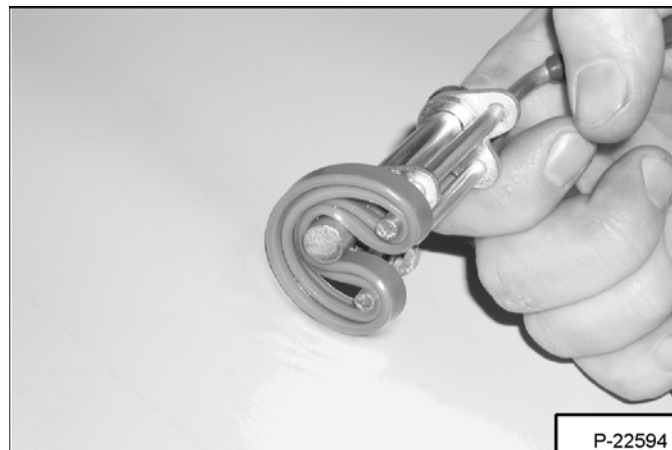
Figure 20-60-23



Inspect the cylinder parts for wear or damage. Replace any worn or damaged parts [Figure 20-60-22] & [Figure 20-60-23].

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

Figure 20-60-24



Install the rod seal on the rod seal installation tool [Figure 20-60-24].

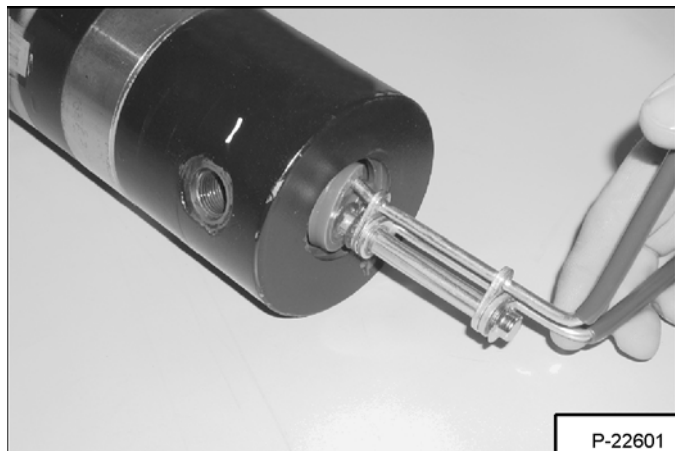
NOTE: During installation the O-ring side of the seal must be toward the inside of the cylinder.

Rotate the handles to collapse the rod seal [Figure 20-60-24].

STEERING CYLINDER (FRONT) (CONT'D)

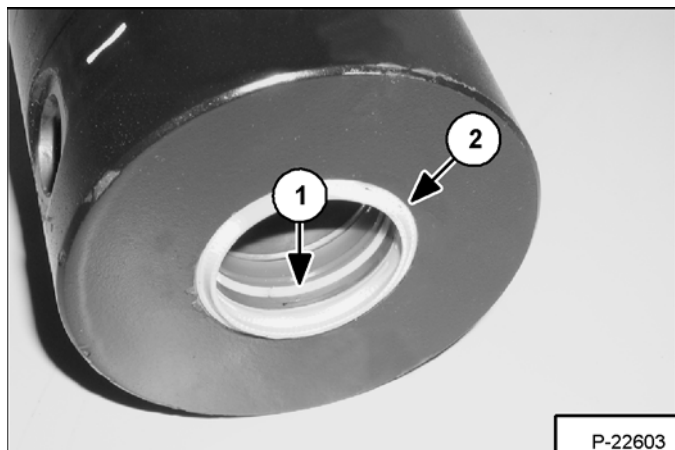
Assembly (Cont'd)

Figure 20-60-25



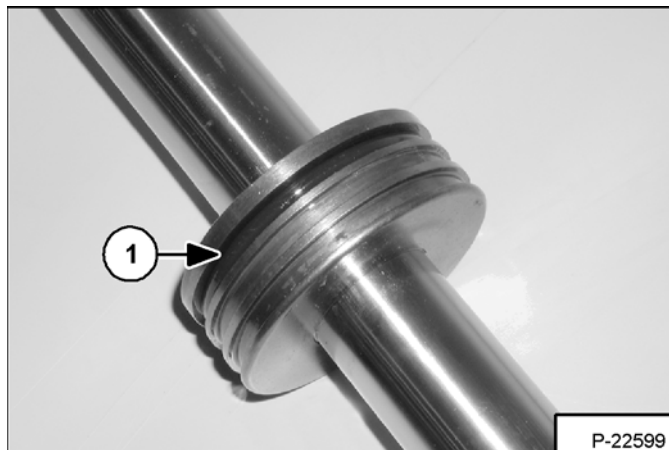
Install the rod seal in the housing [Figure 20-60-25].

Figure 20-60-26



Install the backup ring (Item 1) and wiper seal (Item 2) [Figure 20-60-26] into the housing.

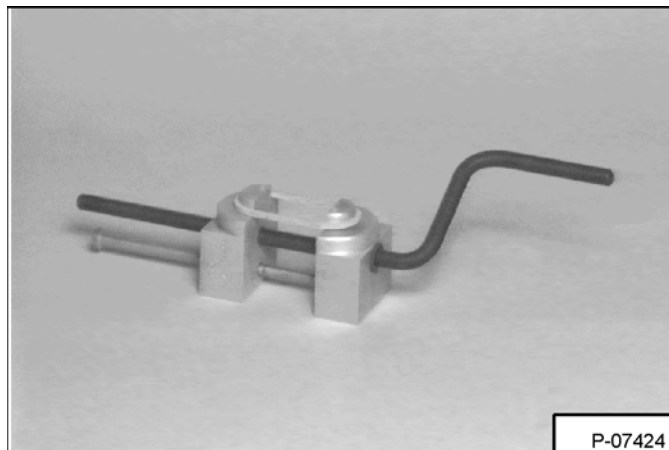
Figure 20-60-27



Install the expander O-ring (Item 1) [Figure 20-60-27] onto the piston.

NOTE: The expander O-ring (Item 1) [Figure 20-60-27] is installed in the piston groove closest to the machined end of the cylinder rod.

Figure 20-60-28



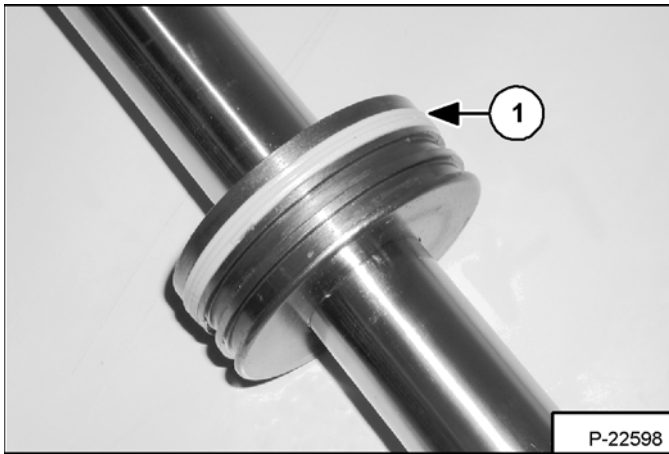
Install a new seal on the tool and slowly stretch it until it fits the piston [Figure 20-60-28].

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

STEERING CYLINDER (FRONT) (CONT'D)

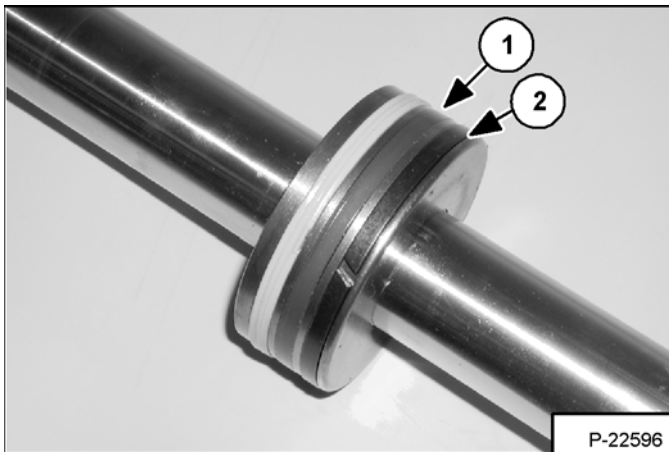
Assembly (Cont'd)

Figure 20-60-29



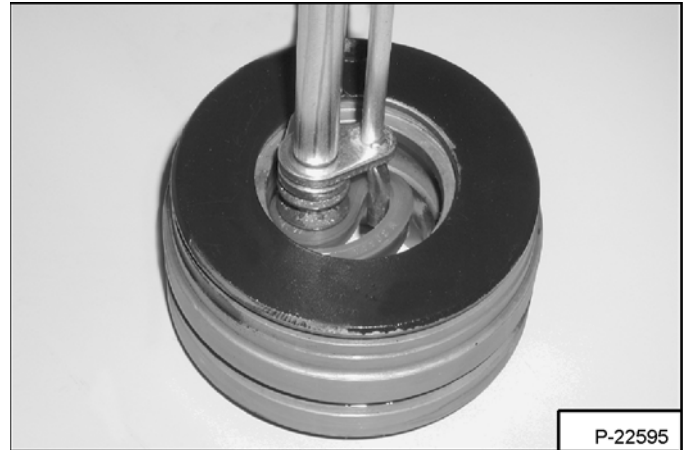
Install the seal (Item 1) [Figure 20-60-29] onto the piston, over the expander O-ring.

Figure 20-60-30



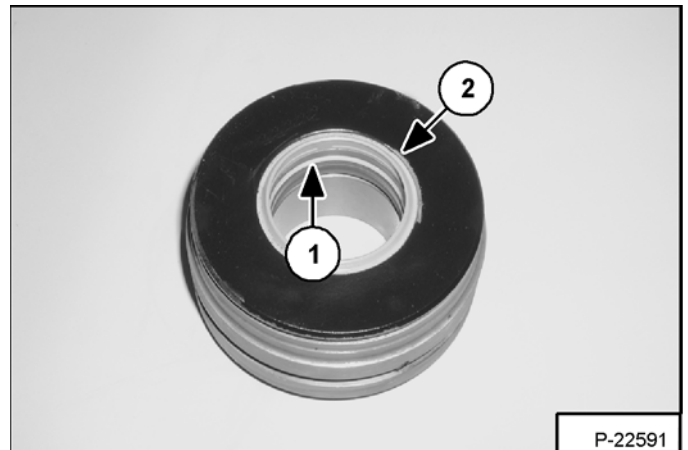
Install the magnetic sensor ring (Item 1) and wear ring (Item 2) [Figure 20-60-30].

Figure 20-60-31



Install a new seal into the head gland [Figure 20-60-31].

Figure 20-60-32

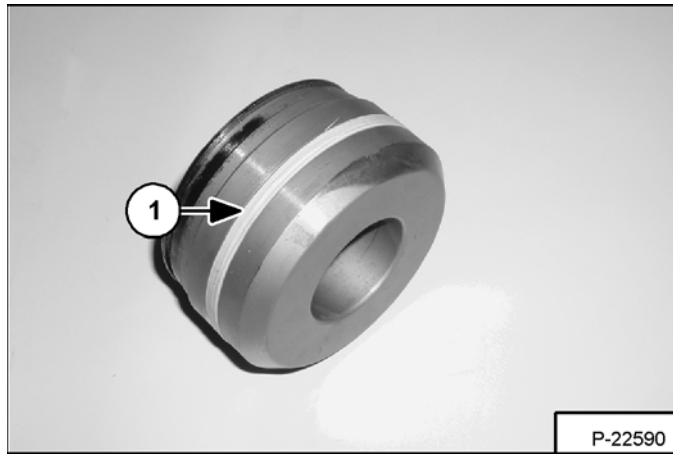


Install a new backup ring (Item 1) and wiper seal (Item 2) [Figure 20-60-32] into the head gland.

STEERING CYLINDER (FRONT) (CONT'D)

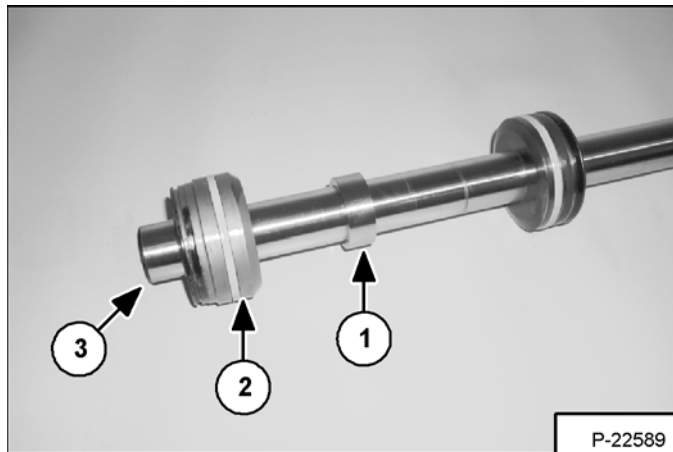
Assembly (Cont'd)

Figure 20-60-33



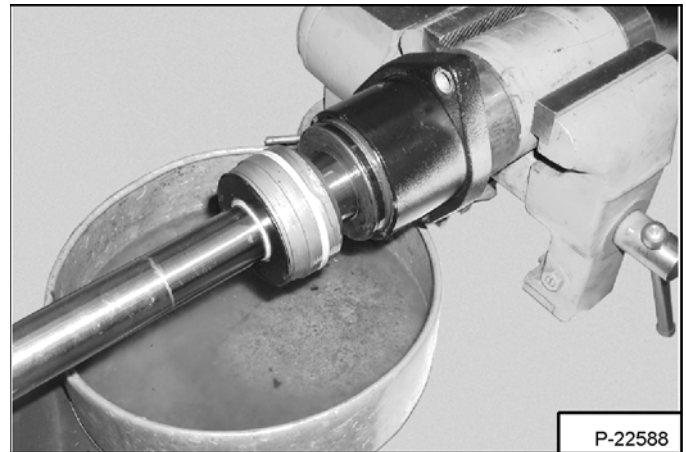
Install a new outer seal (Item 1) [Figure 20-60-33] onto the head gland.

Figure 20-60-34



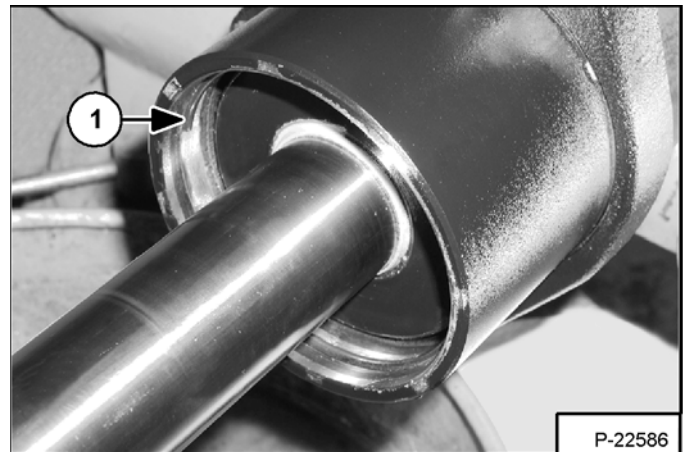
Install the spacer (Item 1) and head (Item 2) onto the machined end (Item 3) [Figure 20-60-34] of the cylinder rod.

Figure 20-60-35



Lubricate the piston and seal and install into the housing [Figure 20-60-35].

Figure 20-60-36

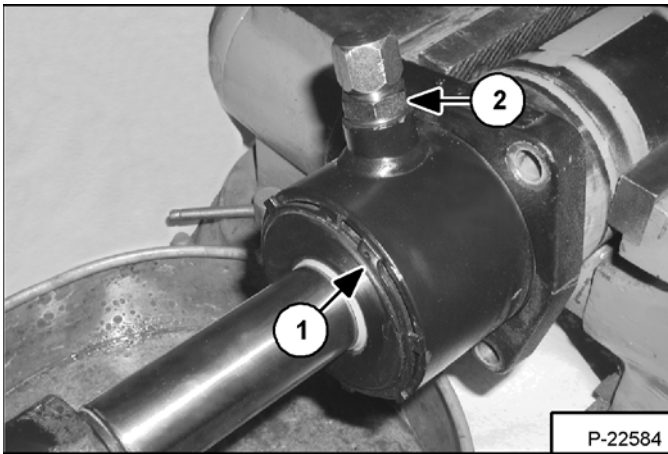


Lubricate and install the head gland into the housing and install the internal snap ring (Item 1) [Figure 20-60-36].

STEERING CYLINDER (FRONT) (CONT'D)

Assembly (Cont'd)

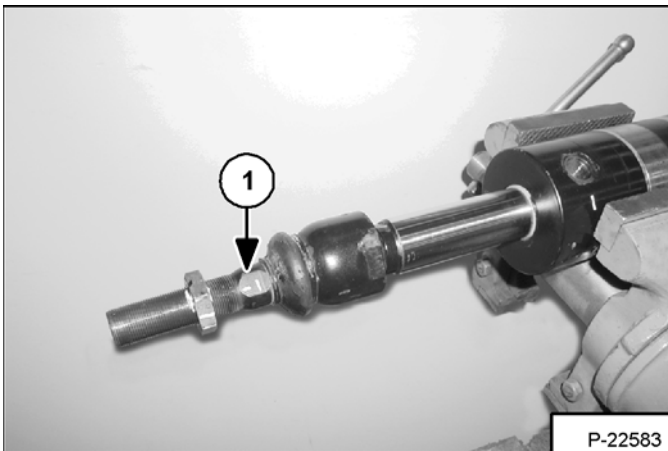
Figure 20-60-37



Pull the cylinder rod out until you are able to install the snap ring (Item 1) [Figure 20-60-37] onto the groove in the head gland.

Install the fitting (Item 2) [Figure 20-60-37].

Figure 20-60-38



Install the tie rod swivel ends (Item 1) [Figure 20-60-38] onto the cylinder rod. Tighten to 300 ft.-lbs. (406 Nm) torque.

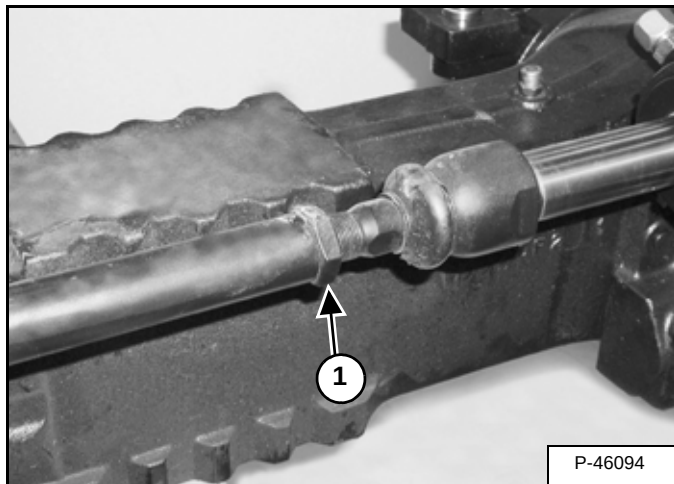
STEERING CYLINDER (REAR)

Removal And Installation

Remove the rear axle. (See Content Page 40-01.)

Place the axle on suitable stands.

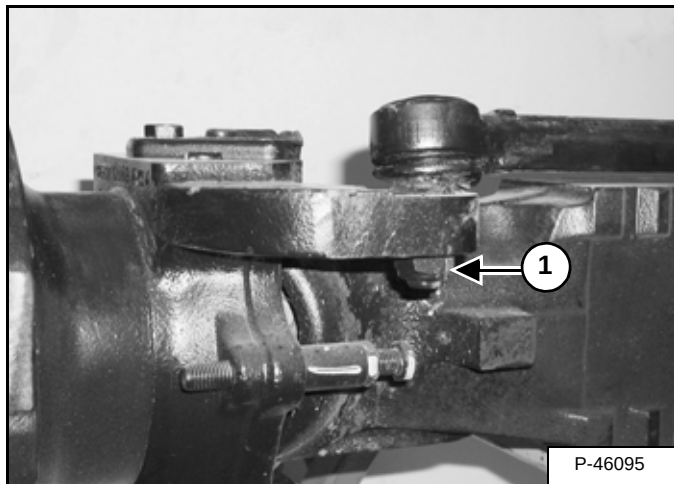
Figure 20-61-1



Loosen the tie rod jam nut (Item 1) [Figure 20-61-1], mark the location of the nut for ease of installation. (Both sides)

Installation: Tighten the jam nut to 185 ft.-lbs. (250 Nm) torque.

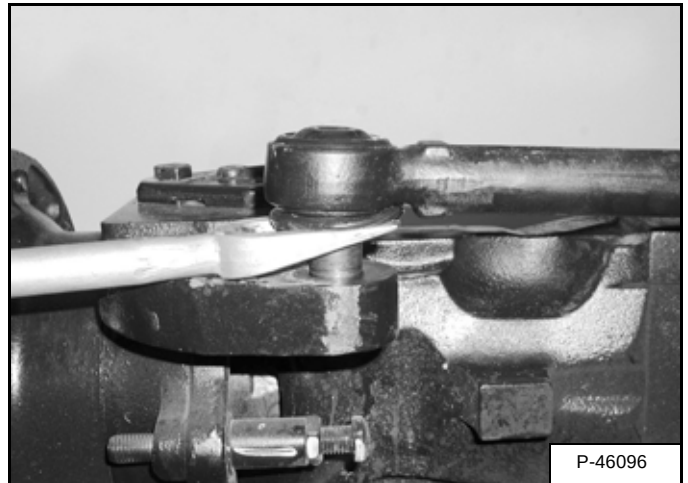
Figure 20-61-2



Loosen and remove the tie rod nut (Item 1) [Figure 20-61-2]. (Both sides)

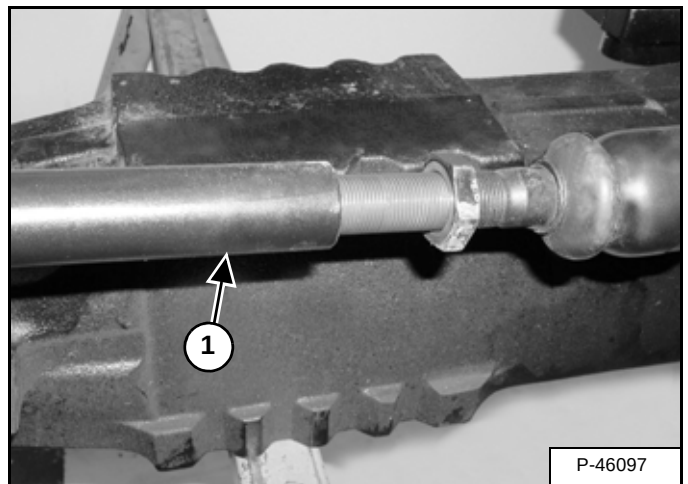
Installation: Tighten the nut to 160 ft.-lbs. (220 Nm) torque.

Figure 20-61-3



Remove the tie rod end from the axle [Figure 20-61-3]. (Both sides)

Figure 20-61-4

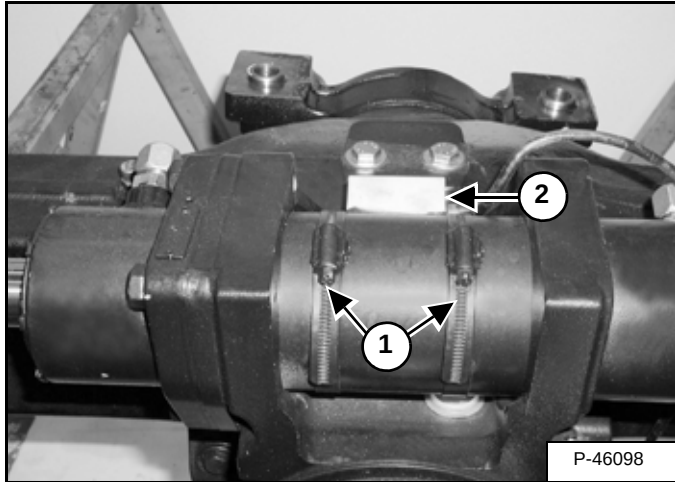


Remove the tie rod ends (Item 1) [Figure 20-61-4] from the steering cylinder. (Both sides)

STEERING CYLINDER (REAR) (CONT'D)

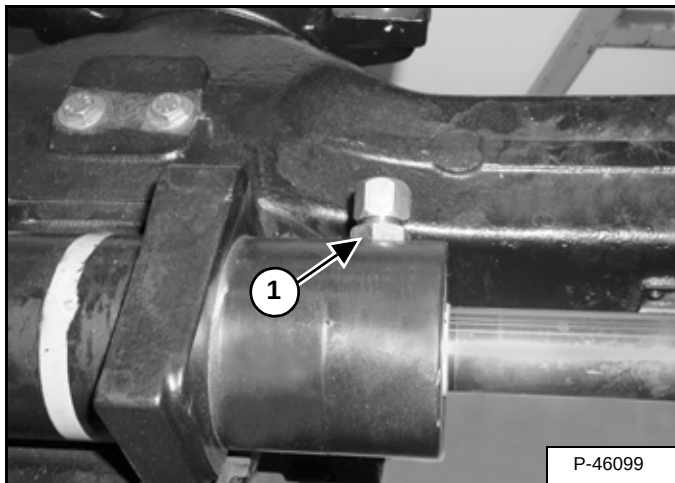
Removal And Installation (Cont'd)

Figure 20-61-5



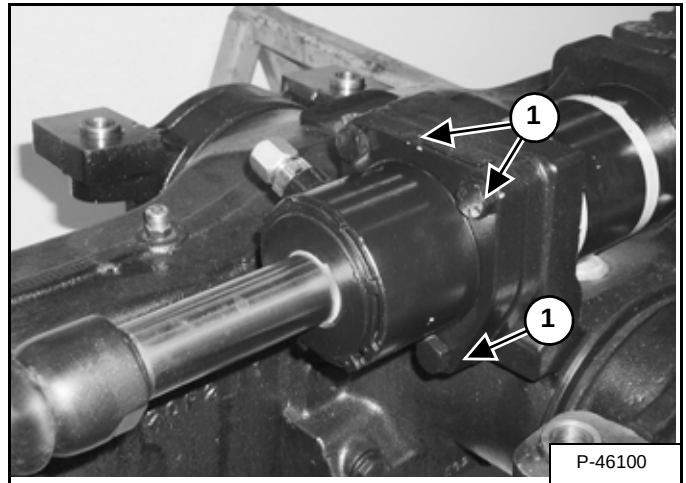
Remove both clamps (Item 1) and remove the centering sensor (Item 2) [Figure 20-61-5] from the cylinder.

Figure 20-61-6



Remove the fitting (Item 1) [Figure 20-61-6] from the cylinder.

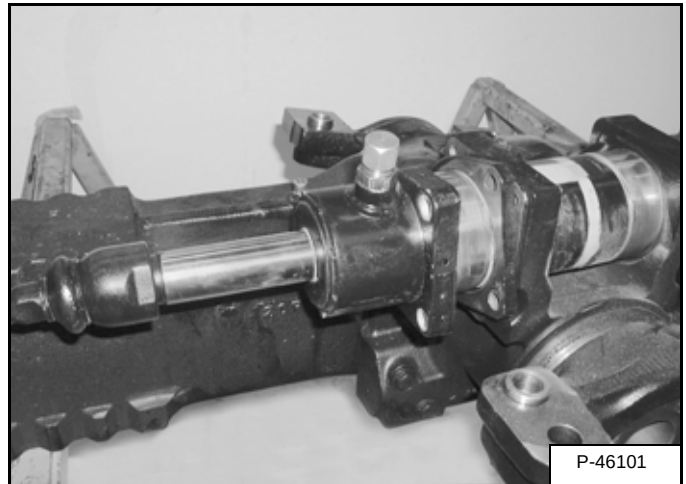
Figure 20-61-7



Remove the three bolts (Item 1) [Figure 20-61-7] from the cylinder retainer plate.

Assembly: Apply Loctite 270 to the three bolts and tighten to 88 ft.-lbs. (120 Nm) torque.

Figure 20-61-8

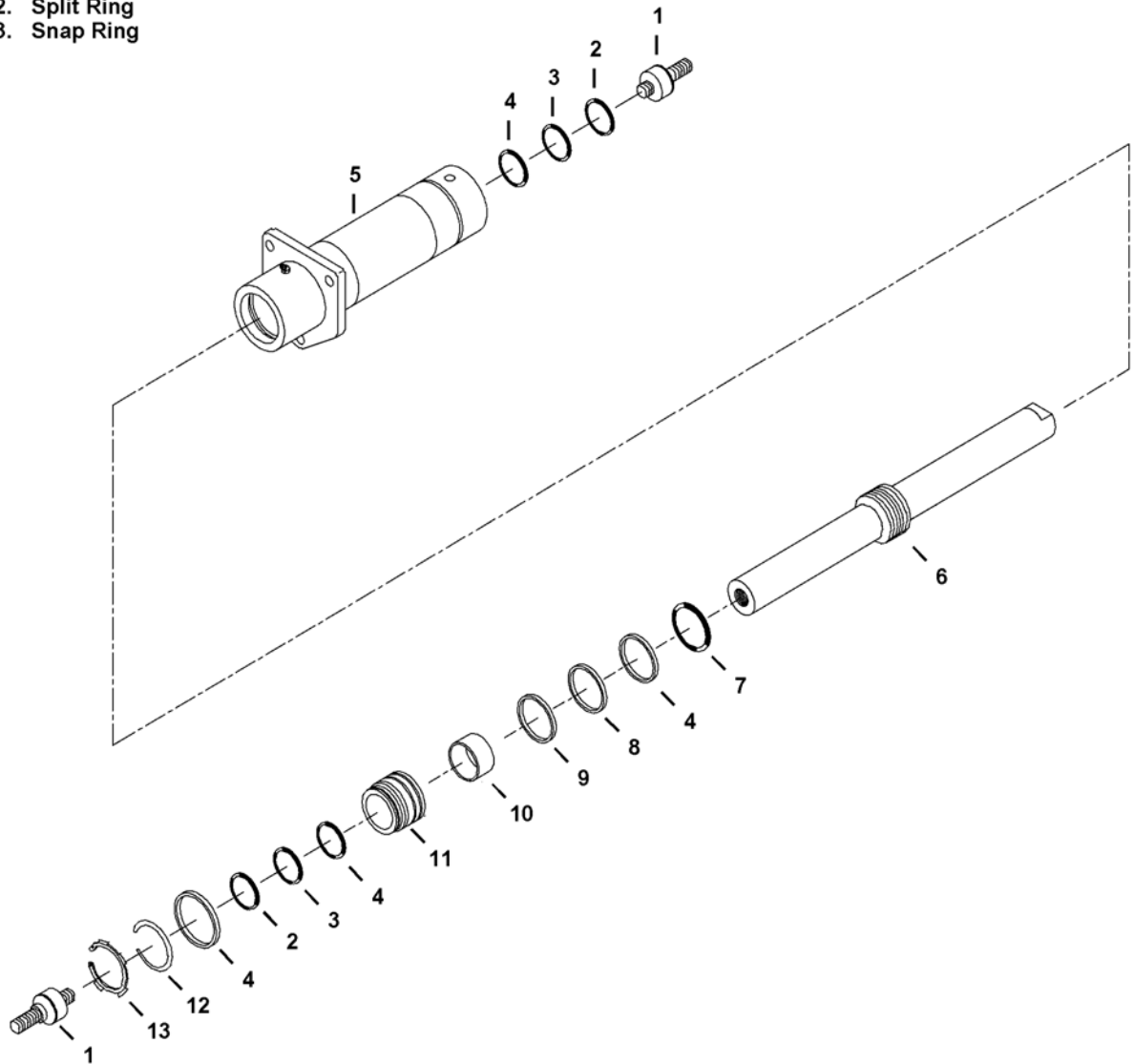


Remove the cylinder from the axle [Figure 20-61-8].

STEERING CYLINDER (REAR) (CONT'D)

Parts Identification

1. Swivel End
2. Wiper
3. Backup Washer
4. Seal
5. Housing
6. Rod
7. O-Ring
8. Magnetic Sensor
9. Wear Ring
10. Spacer
11. Head Gland
12. Split Ring
13. Snap Ring



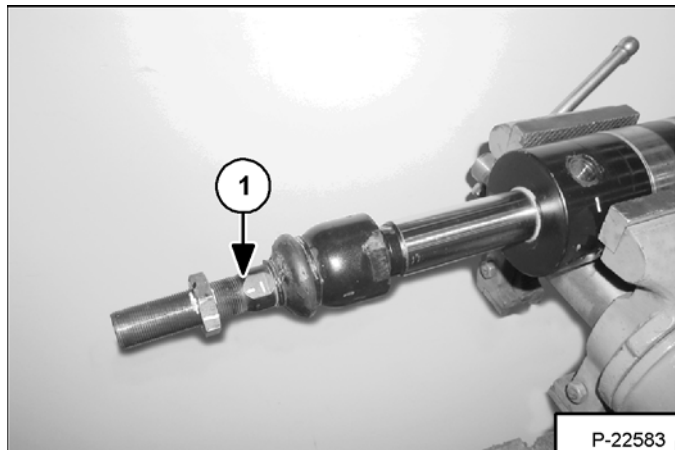
MS-01116

STEERING CYLINDER (REAR) (CONT'D)

Disassembly

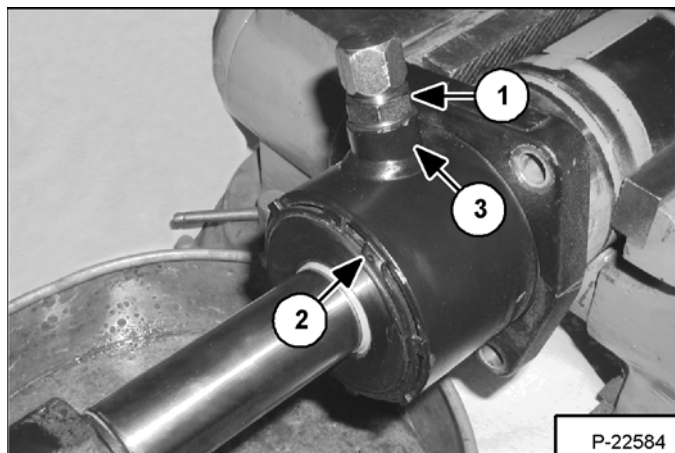
Clean the outside of the steering cylinder before disassembly.

Figure 20-61-9



Put the cylinder in a vise and remove the tie rod swivel ends (Item 1) [Figure 20-61-9] from the rod.

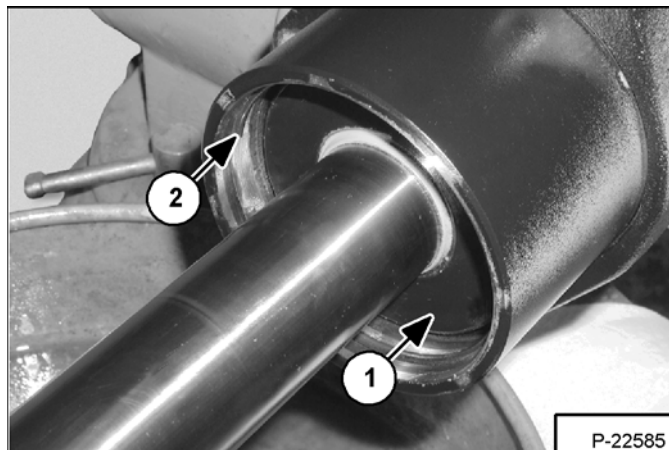
Figure 20-61-10



Place a drain pan under the cylinder, remove the fitting (Item 1) and snap ring (Item 2) [Figure 20-61-10] from the cylinder.

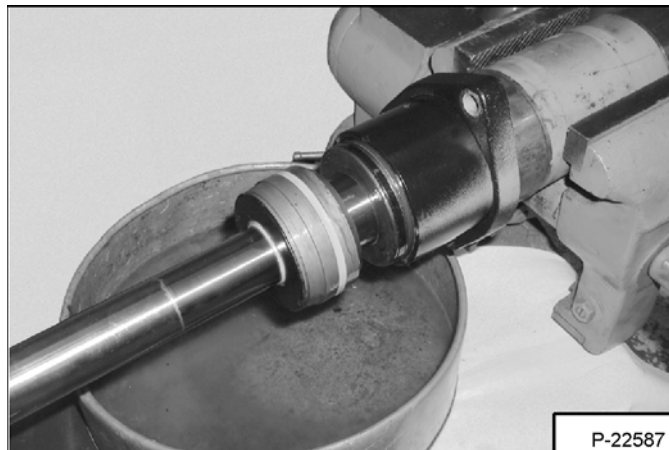
NOTE: Rotate the cylinder in the vise so the fitting port (Item 3) [Figure 20-61-10] is positioned down to allow the oil to drain into the pan.

Figure 20-61-11



Drive the head gland (Item 1) inwards. Remove the internal snap ring (Item 2) [Figure 20-61-11].

Figure 20-61-12

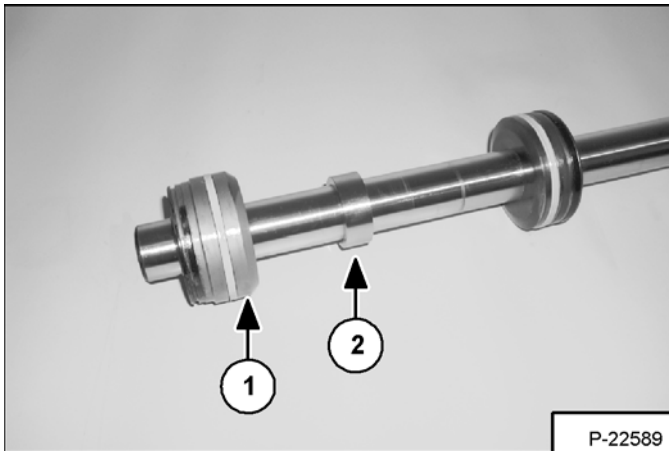


Remove the rod assembly from the housing [Figure 20-61-12].

STEERING CYLINDER (REAR) (CONT'D)

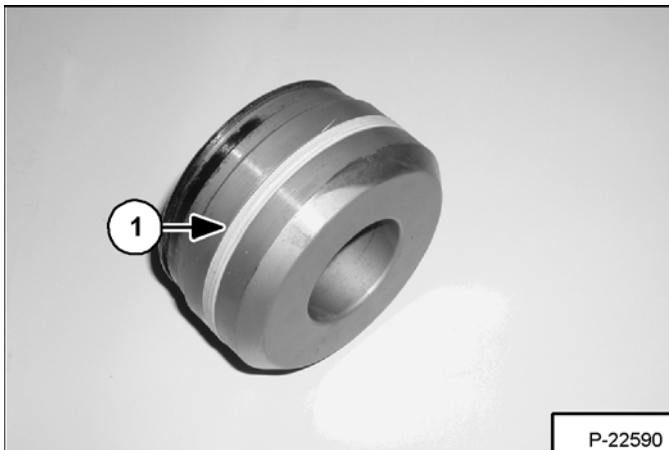
Disassembly (Cont'd)

Figure 20-61-13



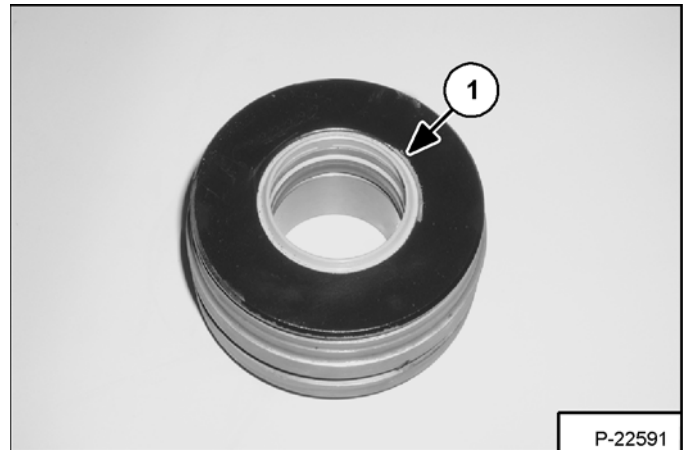
Remove the head gland (Item 1) and spacer (Item 2) [Figure 20-61-13] from the rod.

Figure 20-61-14



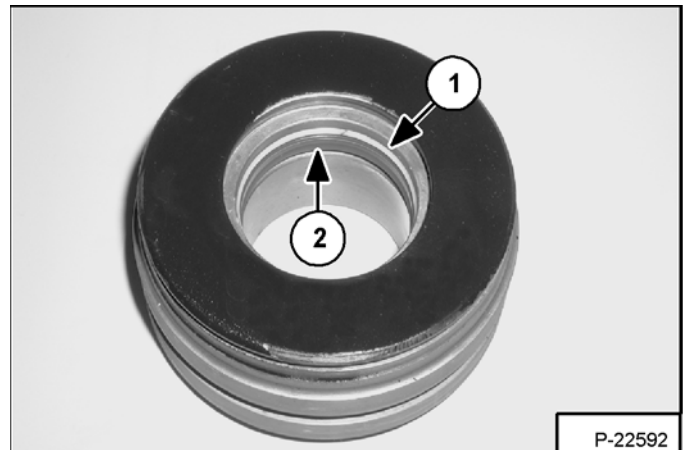
Remove the outer seal (Item 1) [Figure 20-61-14] from the head gland.

Figure 20-61-15



Remove the wiper seal (Item 1) [Figure 20-61-15].

Figure 20-61-16

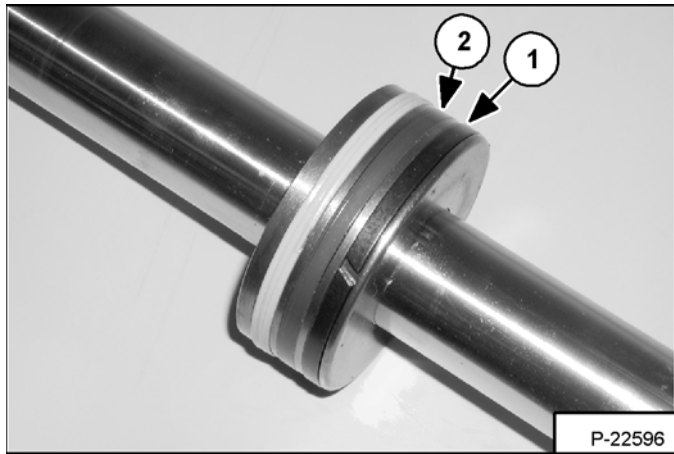


Remove the backup ring (Item 1) and rod seal (Item 2) [Figure 20-61-16] from the head gland.

STEERING CYLINDER (REAR) (CONT'D)

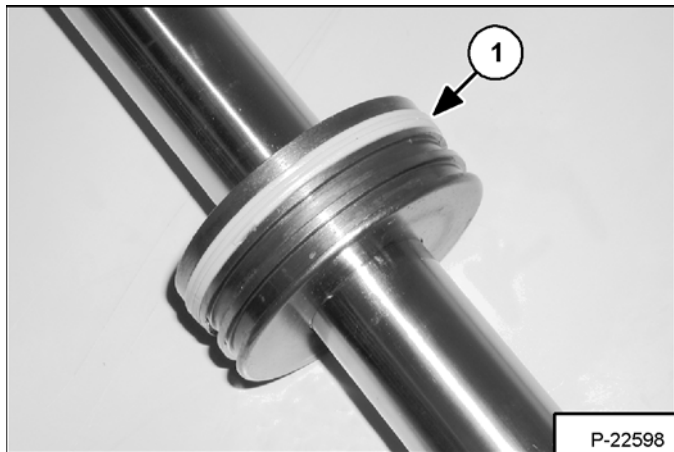
Disassembly (Cont'd)

Figure 20-61-17



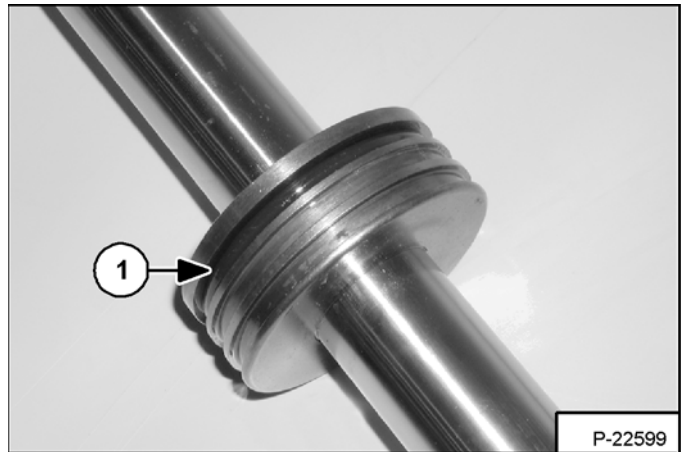
Remove the wear ring (Item 1) and magnetic sensor ring (Item 2) [Figure 20-61-17] from the piston.

Figure 20-61-18



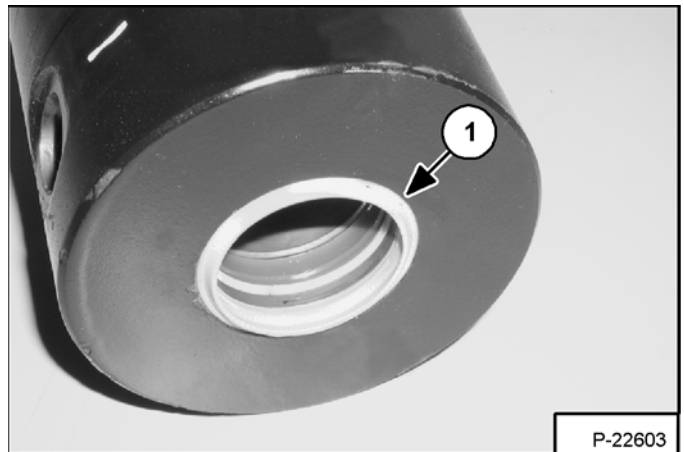
Remove the seal (Item 1) [Figure 20-61-18].

Figure 20-61-19



Remove the expander O-ring (Item 1) [Figure 20-61-19].

Figure 20-61-20

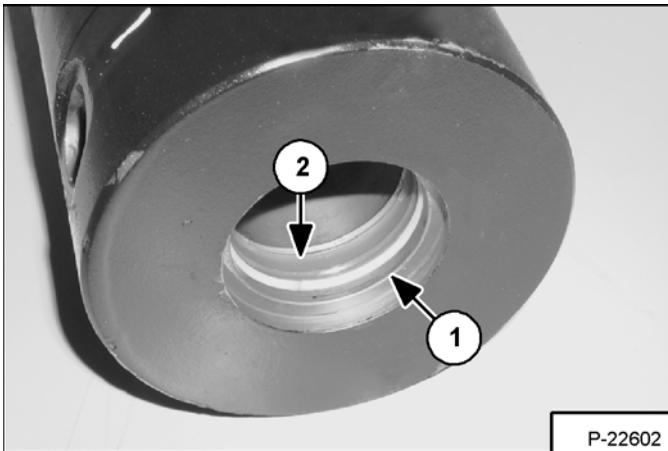


Remove the wiper seal (Item 1) [Figure 20-61-20] from the housing.

STEERING CYLINDER (REAR) (CONT'D)

Disassembly (Cont'd)

Figure 20-61-21



Remove the backup ring (Item 1) and rod seal (Item 2) [Figure 20-61-21] from the housing.

Assembly

Use the following tools to assembly the cylinder:

MEL1033-Rod Seal Installation Tool
MEL1396-1-Universal Seal Expander

Clean all parts in solvent and dry with compressed air.

Figure 20-61-22

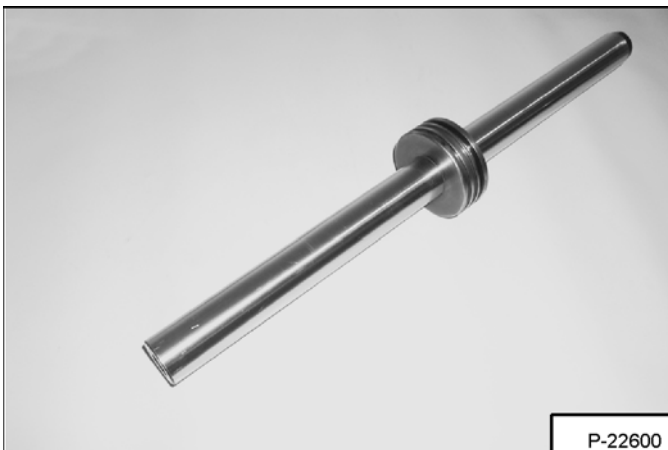
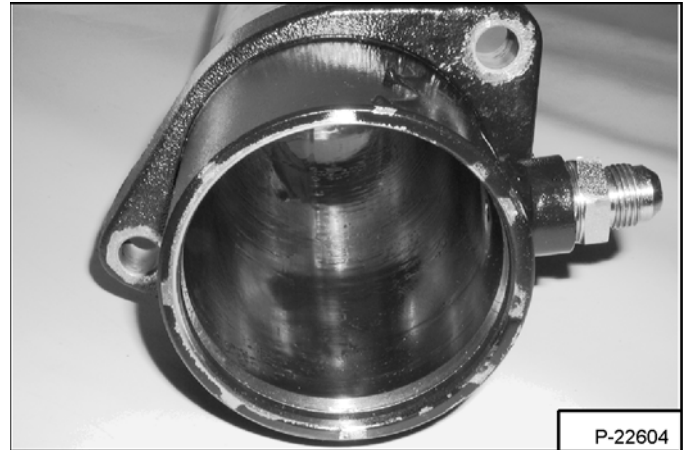


Figure 20-61-23

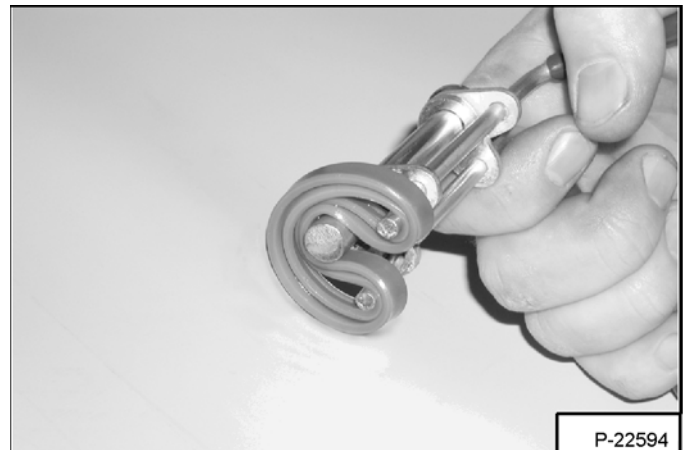


Inspect all parts for wear or damage. Replace any worn or damaged parts [Figure 20-61-22] & [Figure 20-61-23].

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

Always use new O-rings and seals.

Figure 20-61-24



Install the rod seal on the rod seal installation tool [Figure 20-61-24].

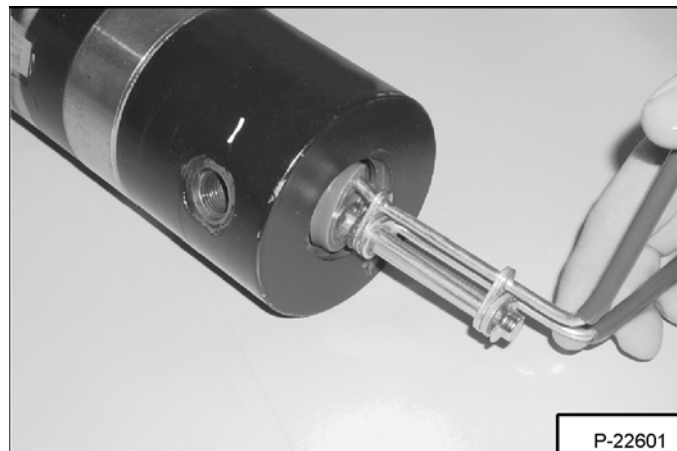
NOTE: During installation the O-ring side of the seal must be toward the inside of the cylinder.

Rotate the handles to collapse the rod seal [Figure 20-61-24].

STEERING CYLINDER (REAR) (CONT'D)

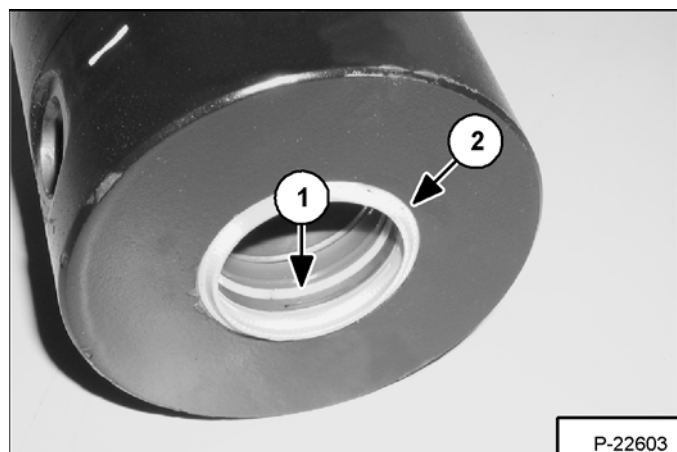
Assembly (Cont'd)

Figure 20-61-25



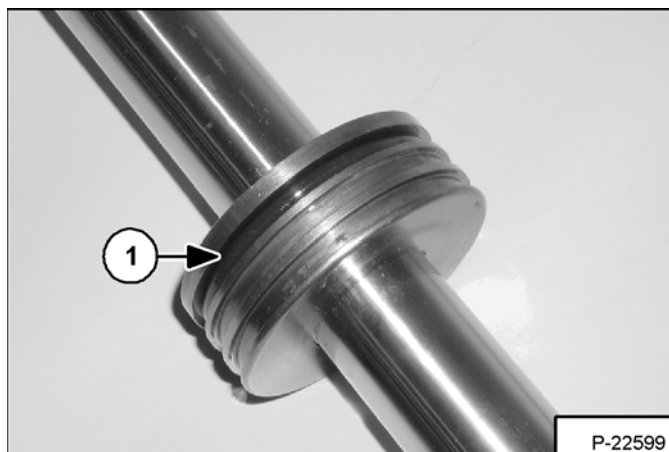
Install the rod seal in the housing [Figure 20-61-25].

Figure 20-61-26



Install the backup ring (Item 1) and wiper seal (Item 2) [Figure 20-61-26] into the housing.

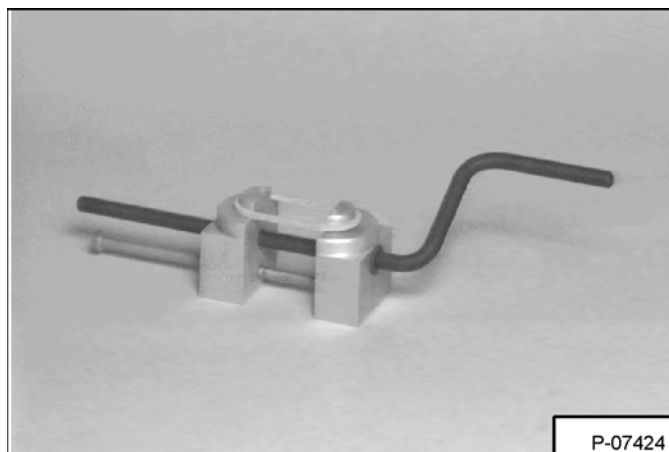
Figure 20-61-27



Install the expander O-ring (Item 1) [Figure 20-61-27] onto the piston.

NOTE: The expander O-ring (Item 1) [Figure 20-61-27] is installed in the piston groove closest to the machined end of the cylinder rod.

Figure 20-61-28



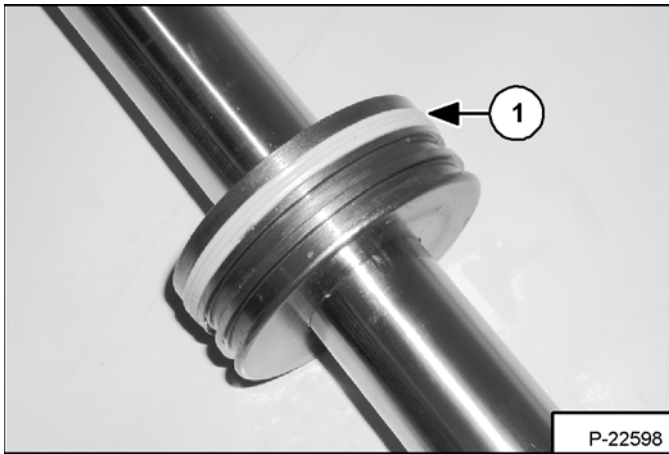
Install a new seal on the tool and slowly stretch it until it fits the piston [Figure 20-61-28].

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

STEERING CYLINDER (REAR) (CONT'D)

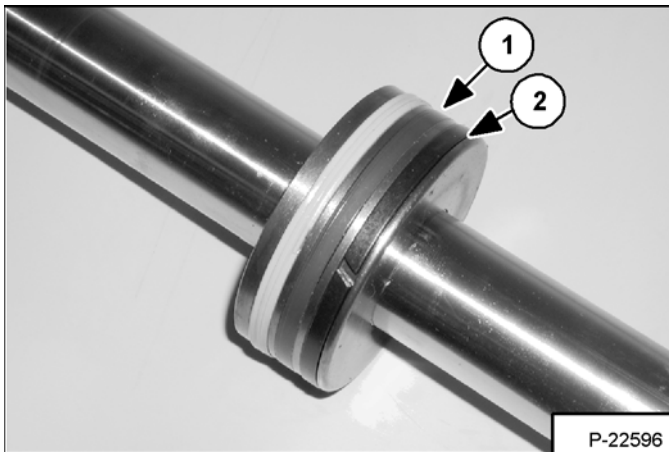
Assembly (Cont'd)

Figure 20-61-29



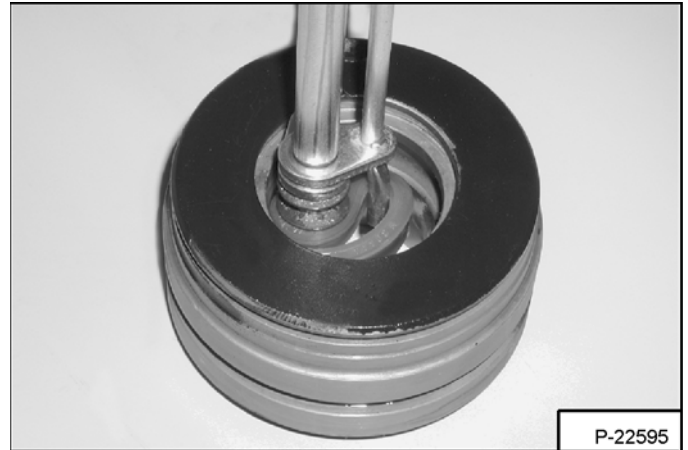
Install the seal (Item 1) [Figure 20-61-29] onto the piston, over the expander O-ring.

Figure 20-61-30



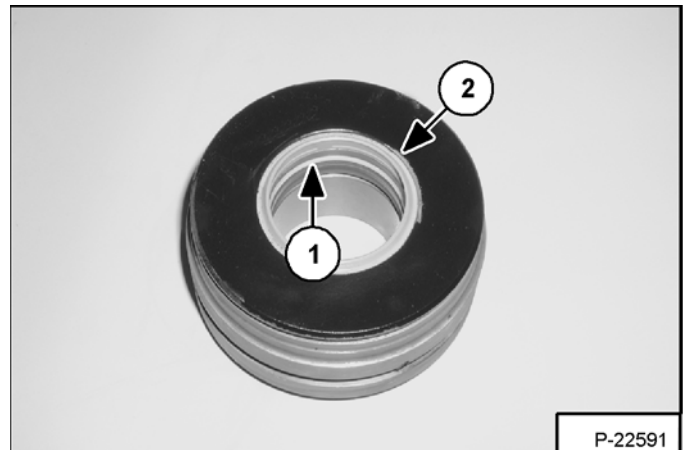
Install the magnetic sensor ring (Item 1) and wear ring (Item 2) [Figure 20-61-30].

Figure 20-61-31



Install a new seal into the head gland [Figure 20-61-31].

Figure 20-61-32

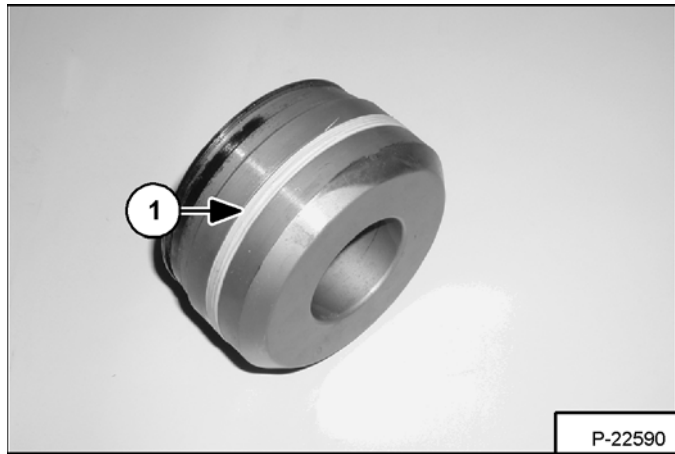


Install a new backup ring (Item 1) and wiper seal (Item 2) [Figure 20-61-32] into the head gland.

STEERING CYLINDER (REAR) (CONT'D)

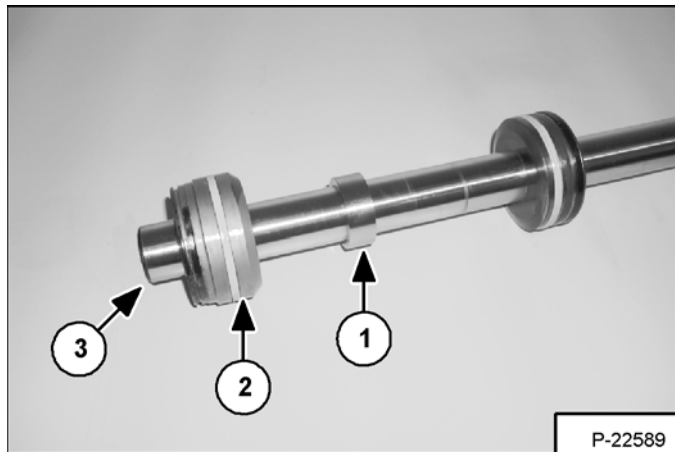
Assembly (Cont'd)

Figure 20-61-33



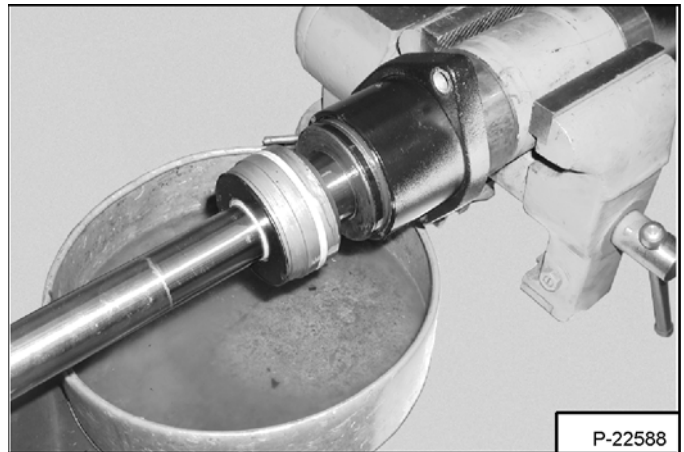
Install a new outer seal (Item 1) [Figure 20-61-33] onto the head gland.

Figure 20-61-34



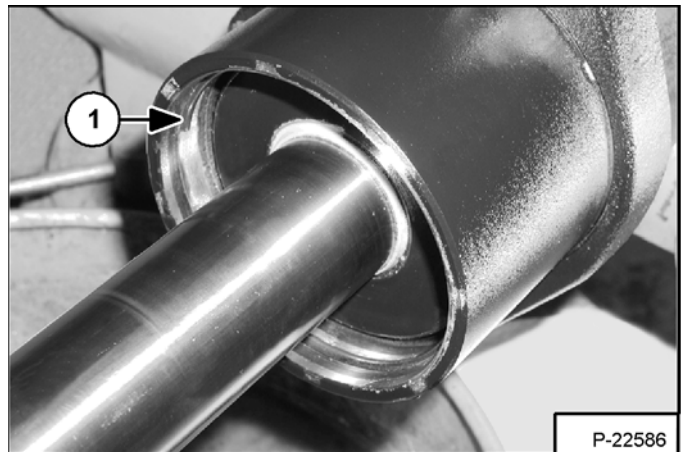
Install the spacer (Item 1) and head (Item 2) onto the machined end (Item 3) [Figure 20-61-34] of the cylinder rod.

Figure 20-61-35



Lubricate the piston and seal and install into the housing [Figure 20-61-35].

Figure 20-61-36

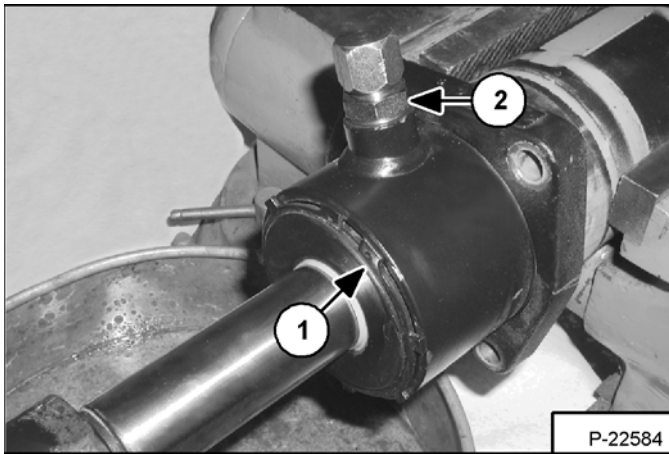


Lubricate and install the head gland into the housing and install the internal snap ring (Item 1) [Figure 20-61-36].

STEERING CYLINDER (REAR) (CONT'D)

Assembly (Cont'd)

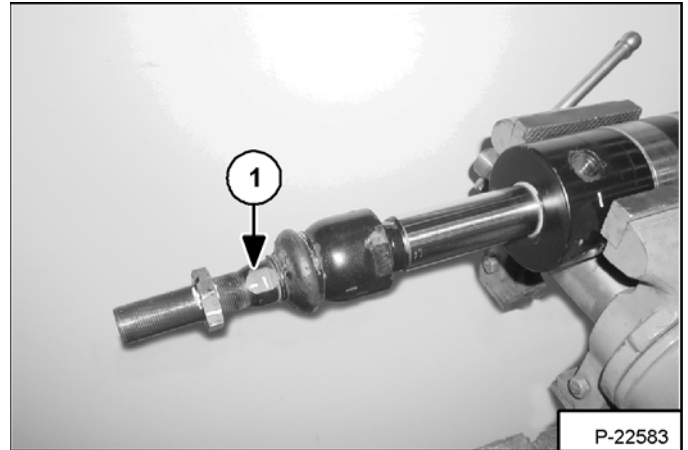
Figure 20-61-37



Pull the cylinder rod out until you are able to install the snap ring (Item 1) [Figure 20-61-37] onto the groove in the head gland.

Install the fitting (Item 2) [Figure 20-61-37].

Figure 20-61-38

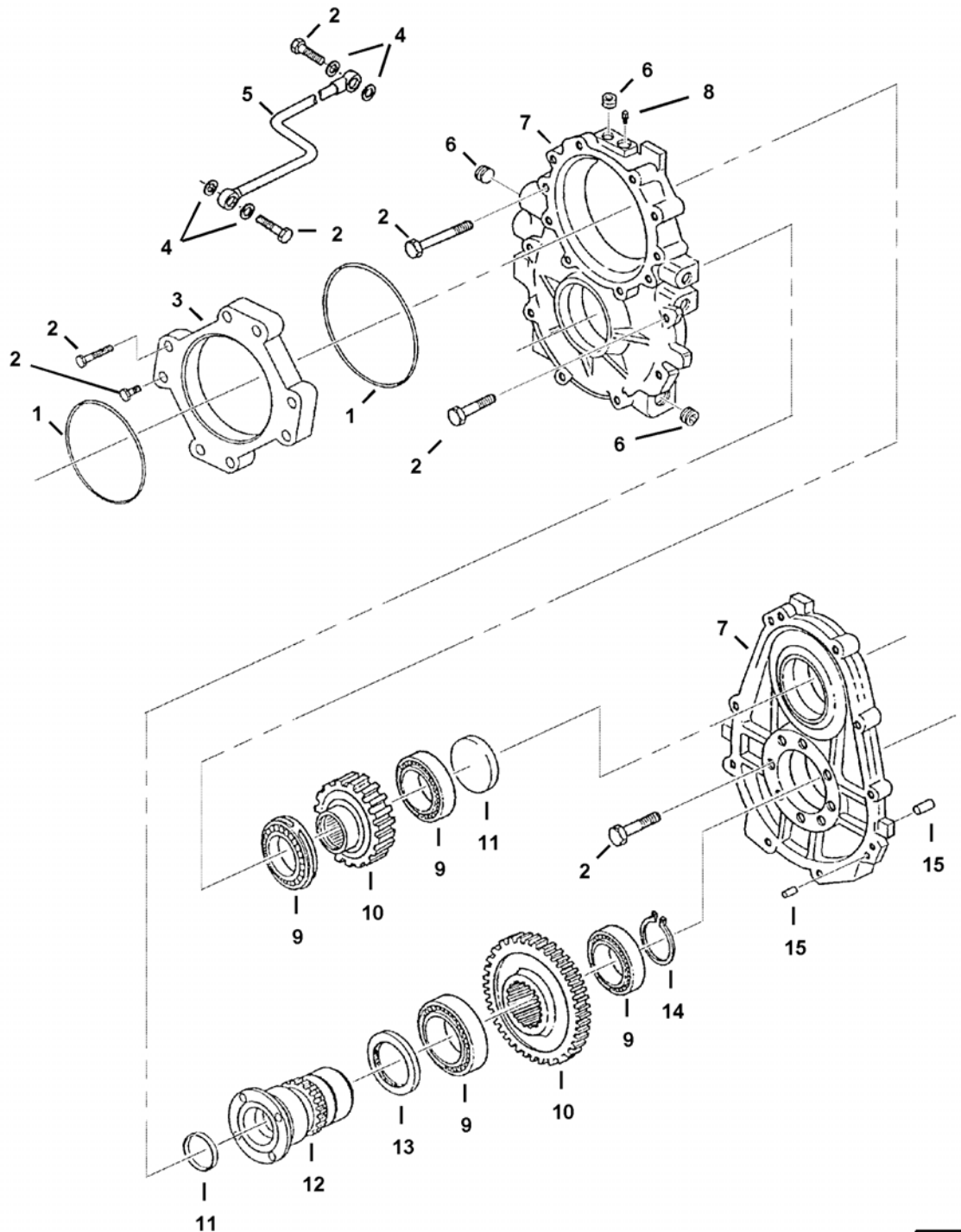


Install the tie rod swivel ends (Item 1) [Figure 20-61-38] onto the cylinder rod. Tighten to 300 ft.-lbs. (406 Nm) torque.

DRIVE BOX

Parts Identification

1. O-Ring
2. Bolt
3. Mounting Flange
4. Washer
5. Tubeline
6. Plug
7. Housing
8. Breather
9. Bearing
10. Gear
11. Plug
12. Shaft
13. Seal
14. Snap Ring
15. Dowel



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DRIVE BOX (CONT'D)

Disassembly

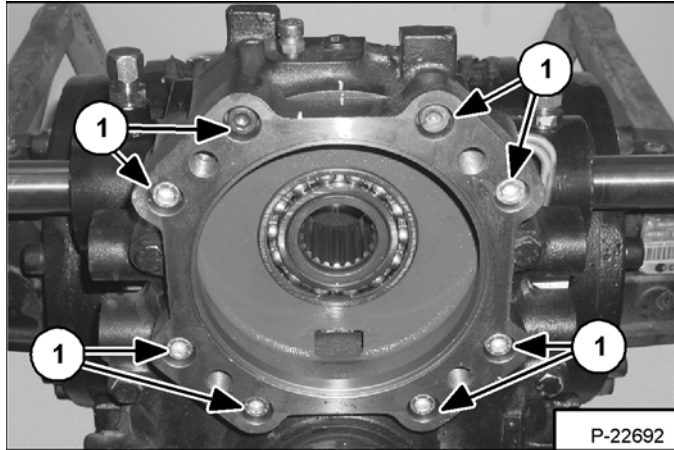
Remove the front axle. (See Contents Page 40-01.)

Remove the drive motor. (See Contents Page 30-01.)

Clean the outside of the drive box before disassembly.

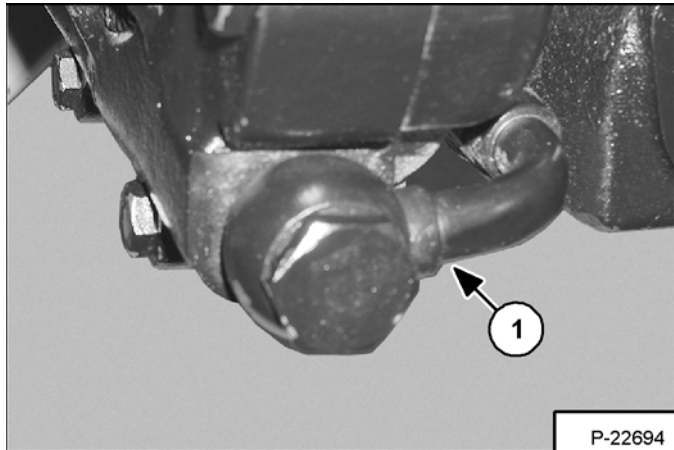
Mark the outside of the drive box for ease of assembly.

Figure 20-70-1



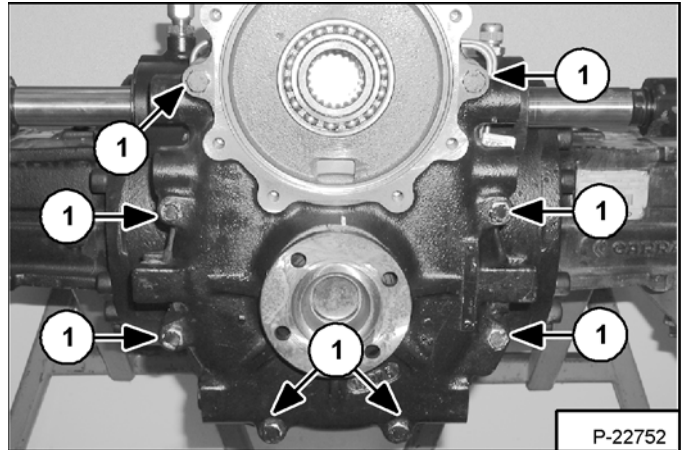
Mark the mounting flange and housing for correct assembly. Remove the eight mounting bolts (Item 1) [Figure 20-70-1]. Remove the mounting flange.

Figure 20-70-2



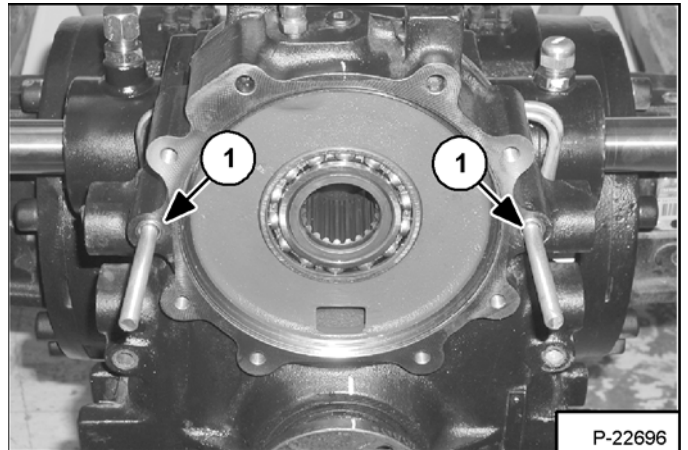
Place a drain pan under the drive box, remove the hose (Item 1) [Figure 20-70-2] and drain the oil from the drive box.

Figure 20-70-3



Remove the eight cover mounting bolts (Item 1) [Figure 20-70-3].

Figure 20-70-4

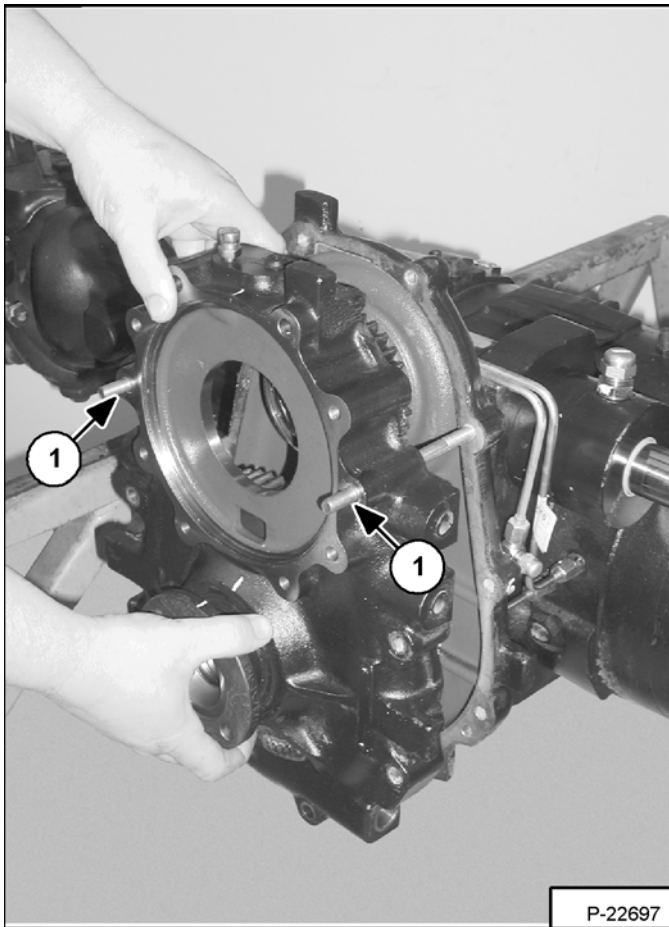


Install two guide bolts (Item 1) [Figure 20-70-4] to support the housing cover when removing it from the dowels.

DRIVE BOX (CONT'D)

Disassembly (Cont'd)

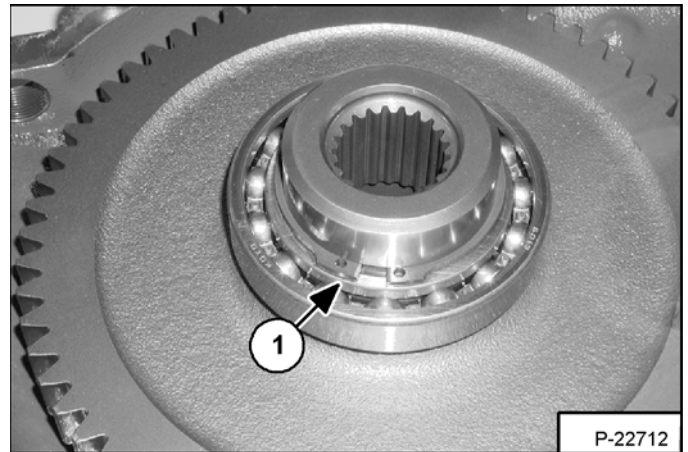
Figure 20-70-5



Remove the cover from the rear housing [Figure 20-70-5].

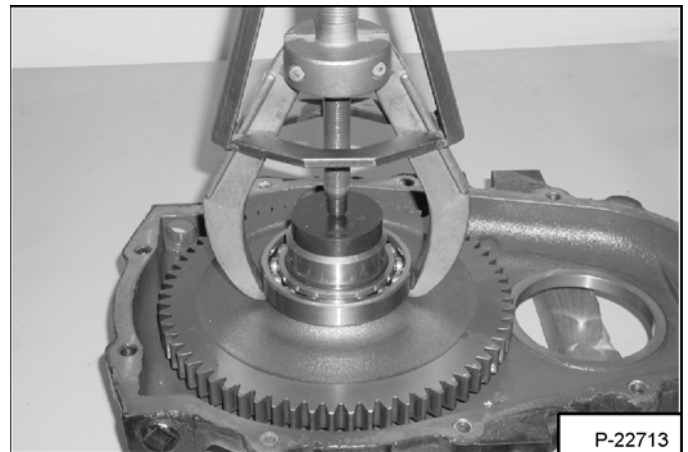
Remove the two guide bolts (Item 1) [Figure 20-70-5].

Figure 20-70-6



With the cover supported on a work surface, remove the snap ring (Item 1) [Figure 20-70-6].

Figure 20-70-7

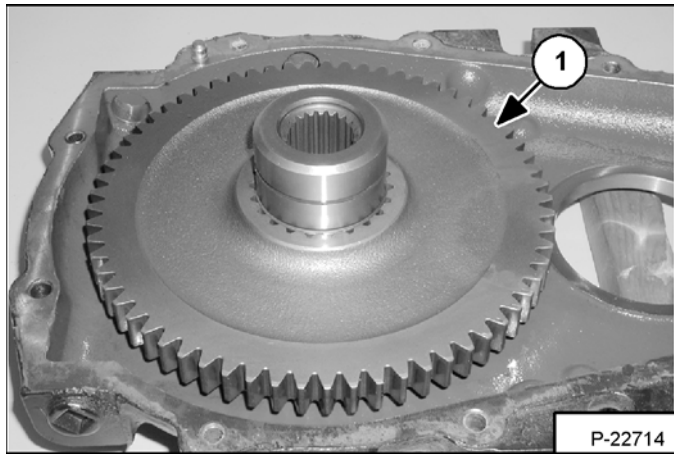


Remove the bearing from the shaft [Figure 20-70-7].

DRIVE BOX (CONT'D)

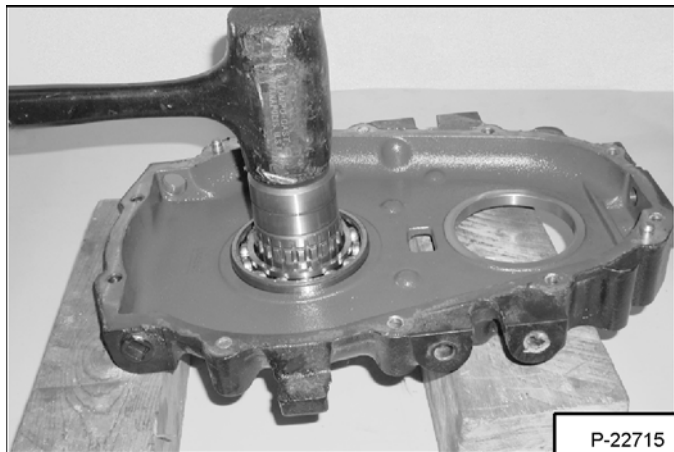
Disassembly (Cont'd)

Figure 20-70-8



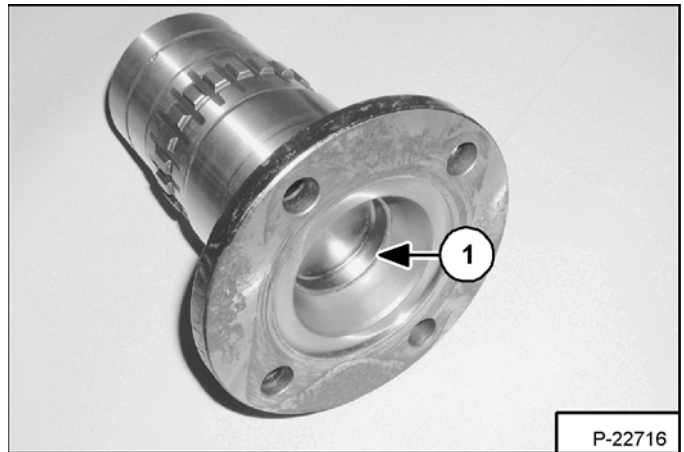
Remove the gear (Item 1) [Figure 20-70-8] from the shaft.

Figure 20-70-9



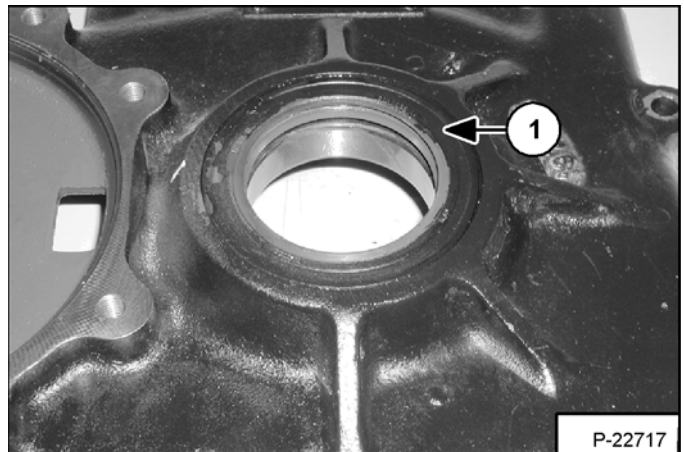
Remove the shaft from the bearing and housing [Figure 20-70-9].

Figure 20-70-10



Remove the plug (Item 1) [Figure 20-70-10] from the shaft.

Figure 20-70-11

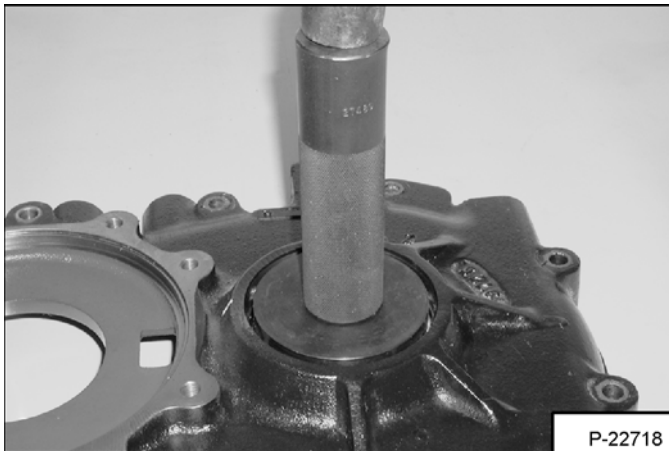


Remove the shaft seal (Item 1) [Figure 20-70-11] from the housing.

DRIVE BOX (CONT'D)

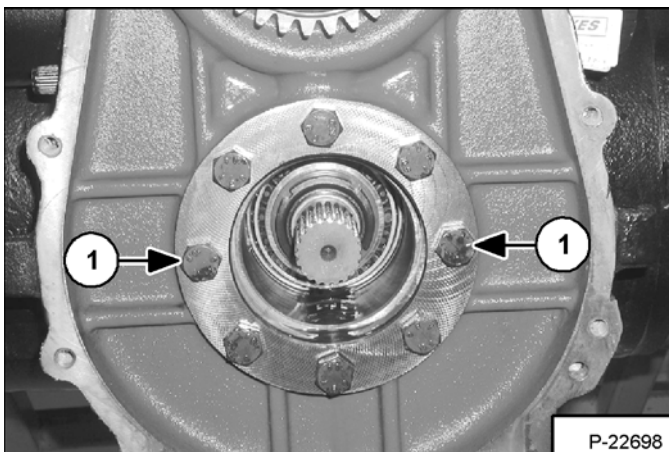
Disassembly (Cont'd)

Figure 20-70-12



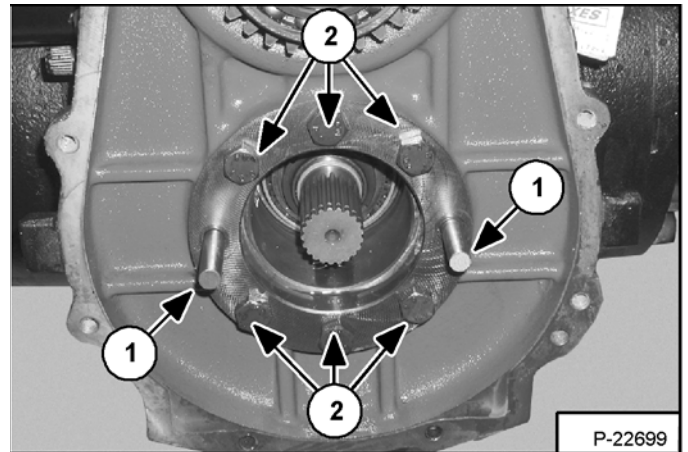
Remove the bearing from the housing [Figure 20-70-12].

Figure 20-70-13



Remove two of the rear housing mounting bolt (Item 1) [Figure 20-70-13].

Figure 20-70-14

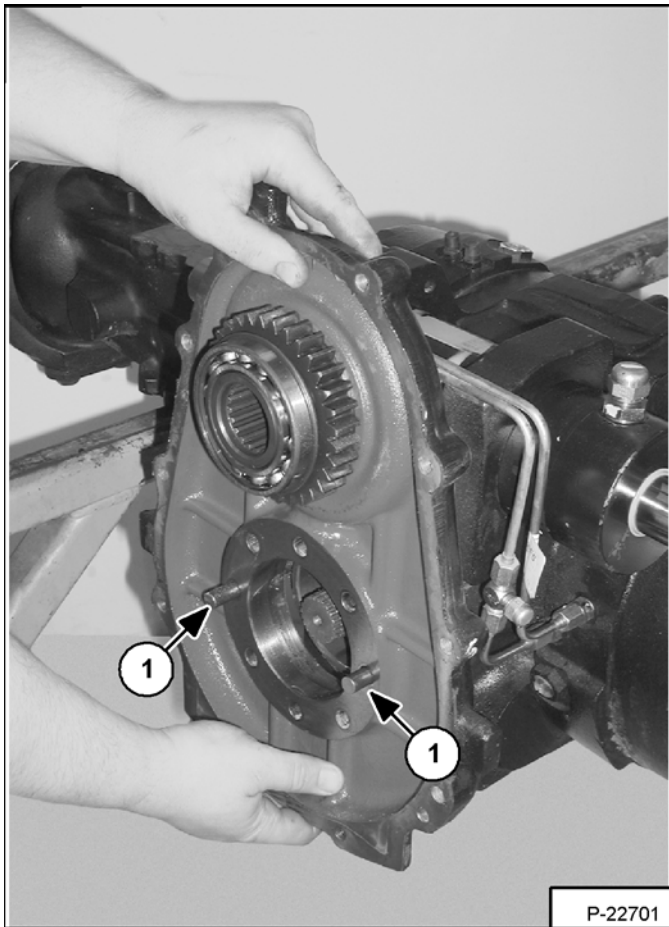


Install two guide bolts (Item 1) [Figure 20-70-14] and remove the six remaining mounting bolts.

DRIVE BOX (CONT'D)

Disassembly (Cont'd)

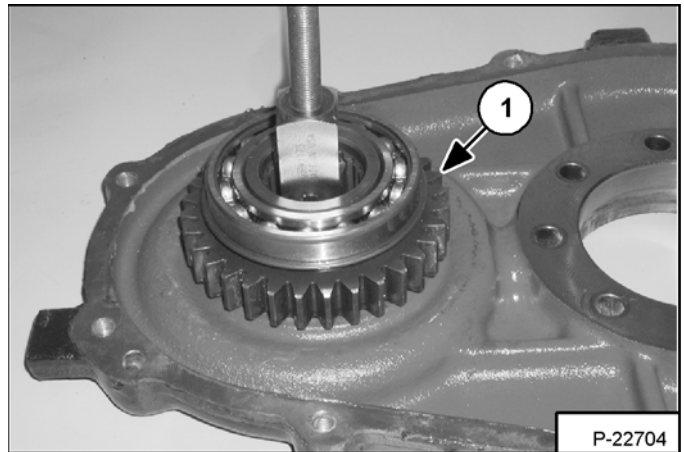
Figure 20-70-15



Remove the rear cover from the axle housing [Figure 20-70-15].

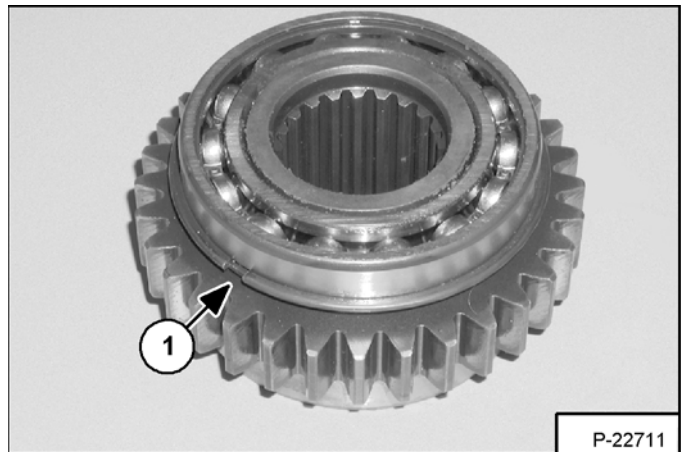
Remove the two guide bolts (Item 1) [Figure 20-70-15].

Figure 20-70-16



With the cover supported on a work surface, remove the gear/bearing assembly (Item 1) [Figure 20-70-16].

Figure 20-70-17

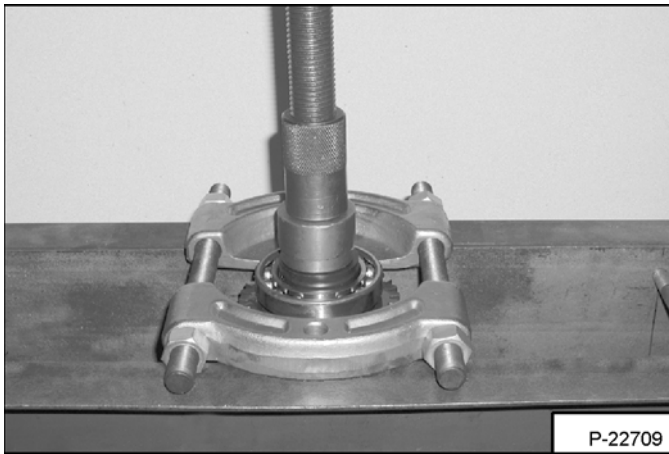


Remove the snap ring (Item 1) [Figure 20-70-17] from the bearing.

DRIVE BOX (CONT'D)

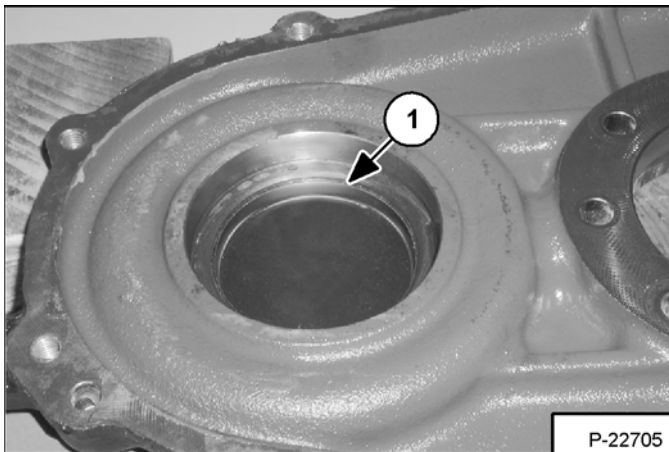
Disassembly (Cont'd)

Figure 20-70-18



Using a press, remove both bearings from the gear [Figure 20-70-18].

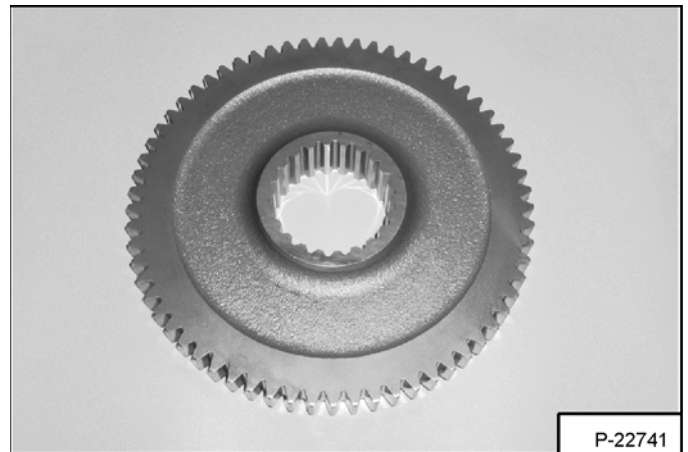
Figure 20-70-19



Remove the plug (Item 1) [Figure 20-70-19] from the rear housing.

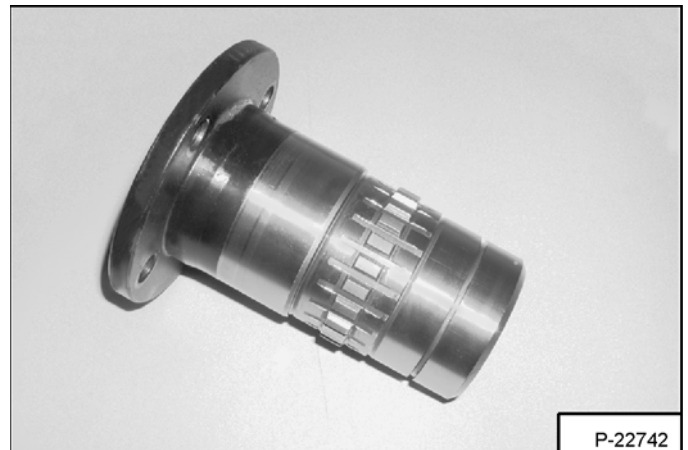
Inspection

Figure 20-70-20



Inspect the gears for cracked or damaged teeth. Replace any damaged parts [Figure 20-70-20].

Figure 20-70-21



Inspect the splines on the shaft for wear or damaged. Replace if worn or damaged [Figure 20-70-21].

DRIVE BOX (CONT'D)

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.

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

Prior to assembly

Clean all sealant residue from the mating surfaces (Item 1) [Figure 20-70-22] & [Figure 20-70-23] on both housings.

Clean all LOCTITE residue from mounting plate bolt holes (Item 2) [Figure 20-70-23].

Figure 20-70-24

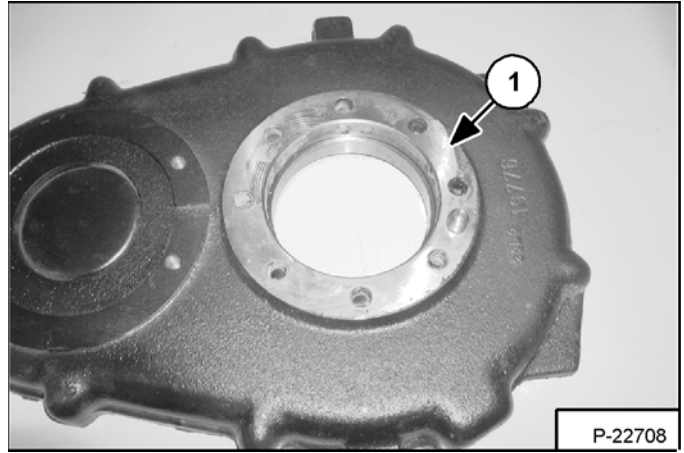


Figure 20-70-22

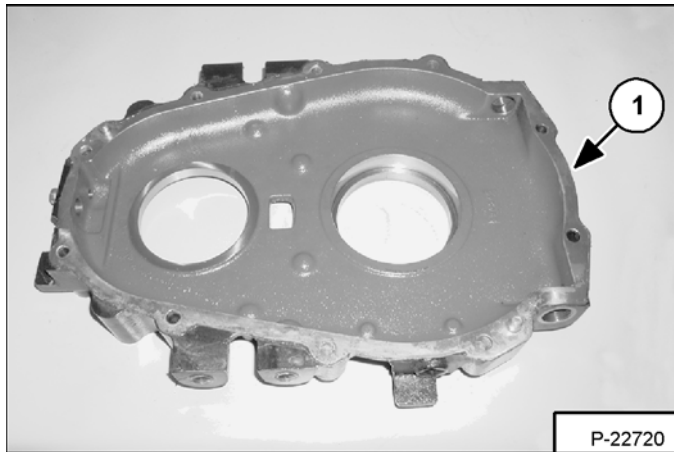


Figure 20-70-25

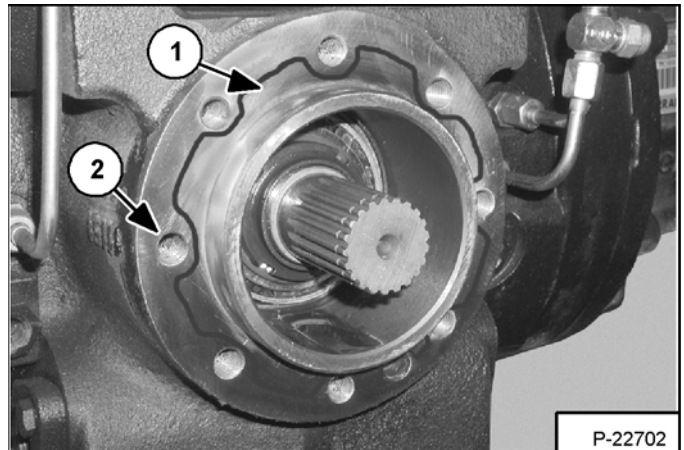
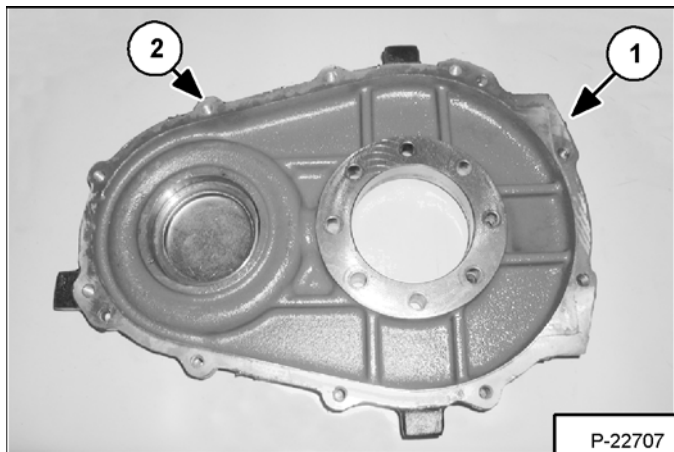


Figure 20-70-23



Clean all sealant residue from the mounting surfaces (Item 1) [Figure 20-70-24] & [Figure 20-70-25].

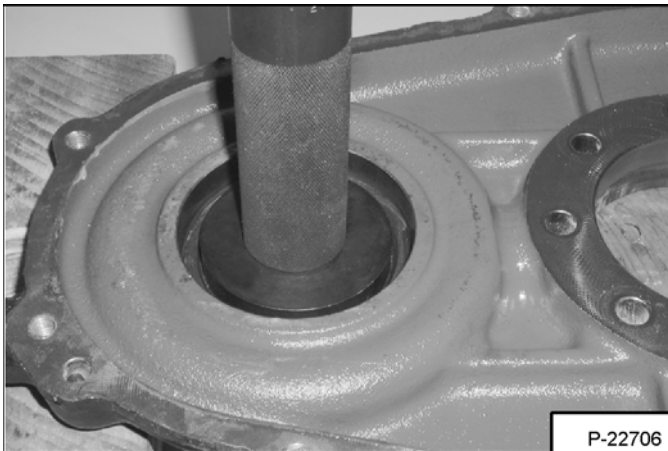
Clean all LOCTITE residue from the mounting flange bolt holes (Item 2) [Figure 20-70-25].

Clean all LOCTITE from the mounting bolts.

DRIVE BOX (CONT'D)

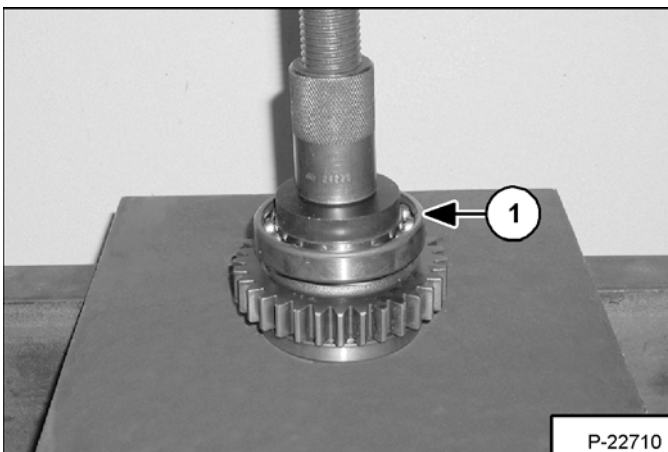
Assembly (Cont'd)

Figure 20-70-26



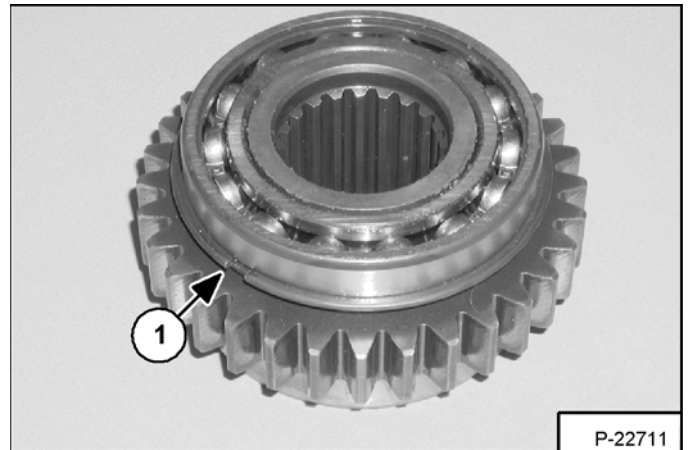
Install the plug into the rear housing [Figure 20-70-26].

Figure 20-70-27



Install both bearings (Item 1) [Figure 20-70-27] onto the gear.

Figure 20-70-28



Install the snap ring (Item 1) [Figure 20-70-28] in the groove in the bearing.

Figure 20-70-29

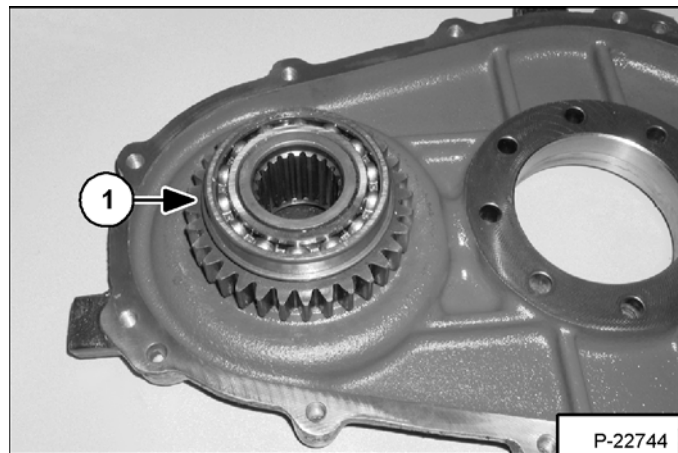


Apply a small amount of LOCTITE 609 or equivalent into the bearing seat in the rear housing [Figure 20-70-29].

DRIVE BOX (CONT'D)

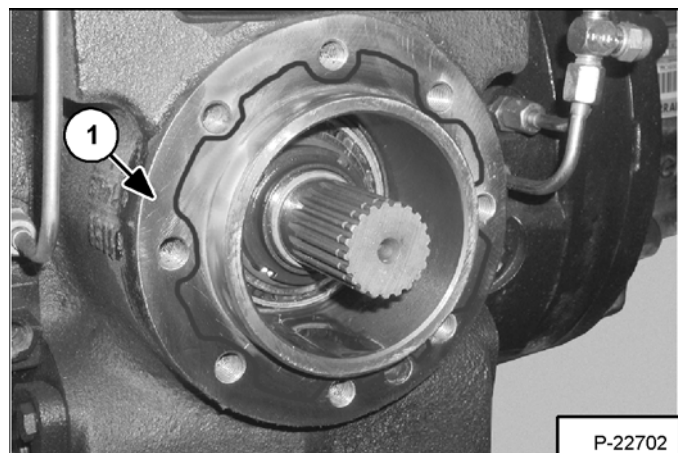
Assembly (Cont'd)

Figure 20-70-30



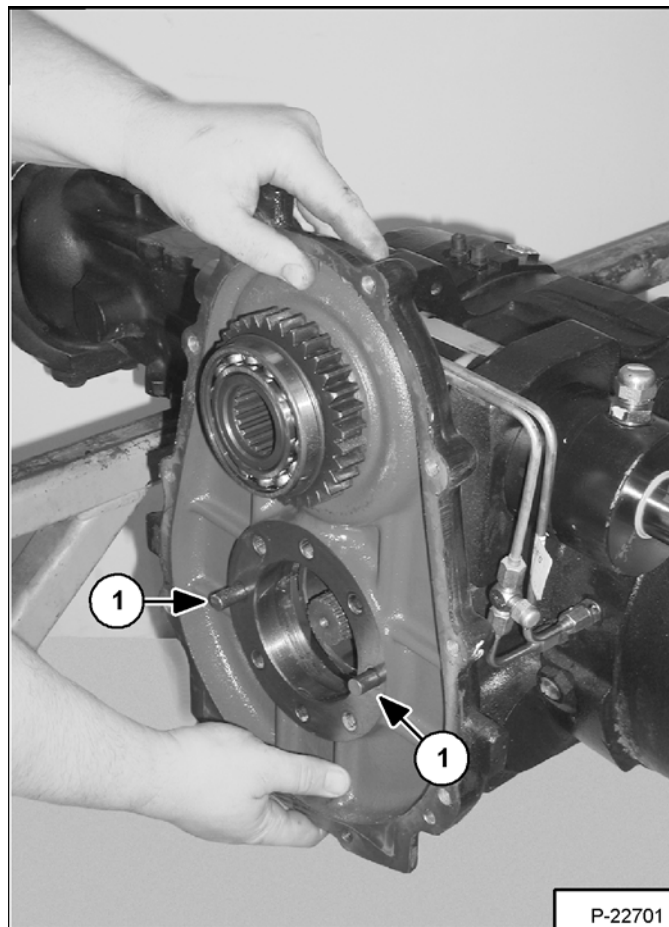
Install the gear/bearing assembly (Item 1) [Figure 20-70-30] into the rear housing.

Figure 20-70-31



Apply a 3 mm bead of LOCTITE 510 gasket eliminator (or equivalent) to the axle mounting flange (Item 1) [Figure 20-70-31] in the pattern shown.

Figure 20-70-32



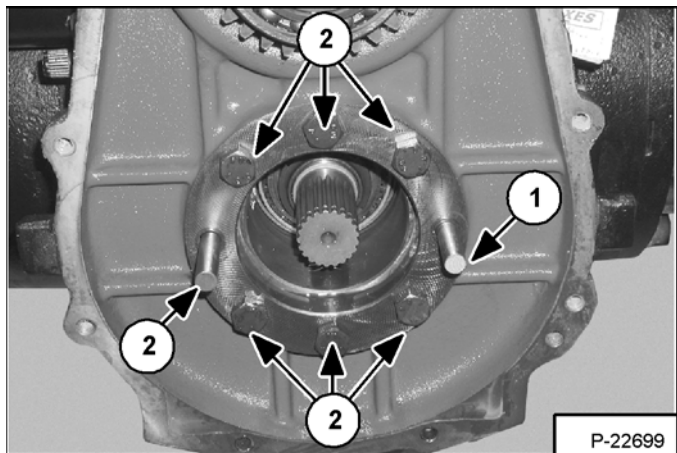
Install the two guide bolts (Item 1) [Figure 20-70-32] into the axle mounting flange.

Install the rear cover onto the axle mounting flange [Figure 20-70-32].

DRIVE BOX (CONT'D)

Assembly (Cont'd)

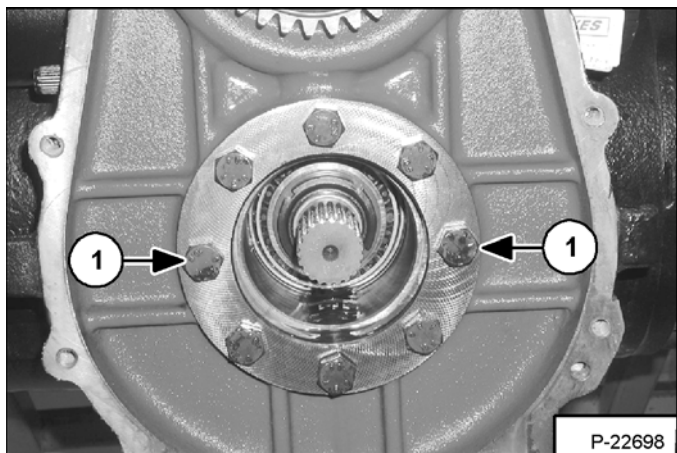
Figure 20-70-33



Apply LOCTITE 270 (or equivalent) to the six mounting bolts (Item 1) [Figure 20-70-33] and install. Tighten to 88 ft.-lbs. (120 Nm) torque.

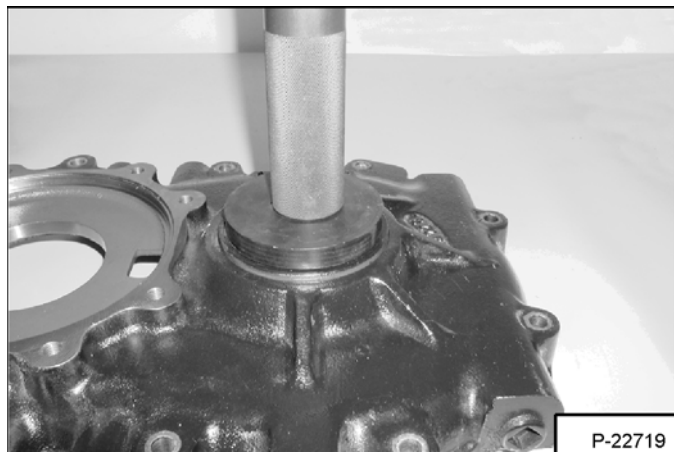
Remove the two guide bolts (Item 2) [Figure 20-70-33].

Figure 20-70-34



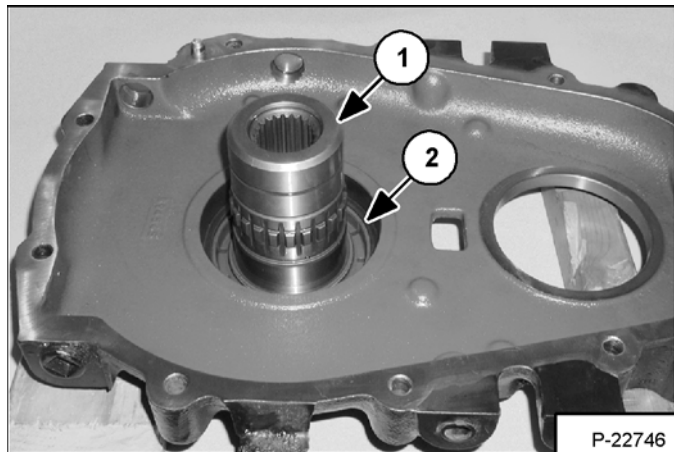
Apply LOCTITE 270 (or equivalent) to the two remaining mounting bolts (Item 1) [Figure 20-70-34]. Install and tighten the bolts to 88 ft.-lbs. (120 Nm) torque.

Figure 20-70-35



Install the seal (Item 1) [Figure 20-70-35] into the housing.

Figure 20-70-36

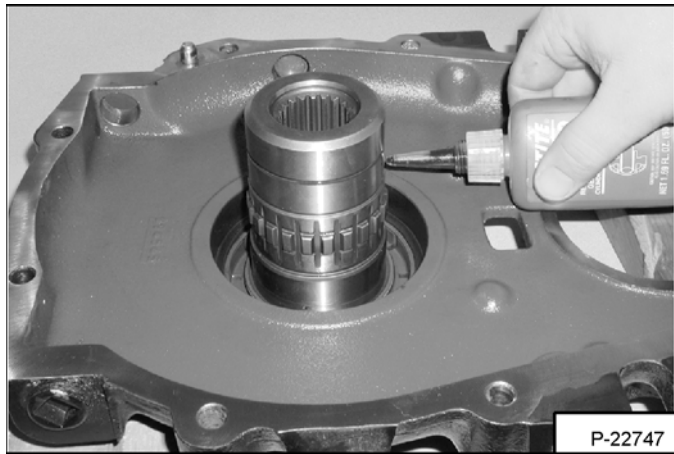


Install the shaft (Item 1) through the seal (Item 2) [Figure 20-70-36] and support the housing with blocks.

DRIVE BOX (CONT'D)

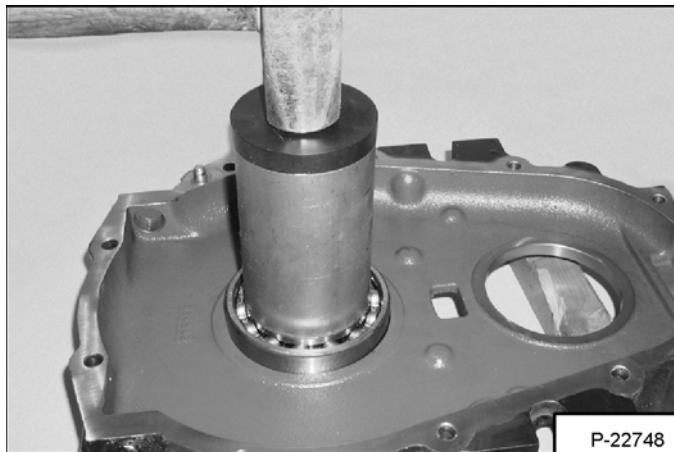
Assembly (Cont'd)

Figure 20-70-37



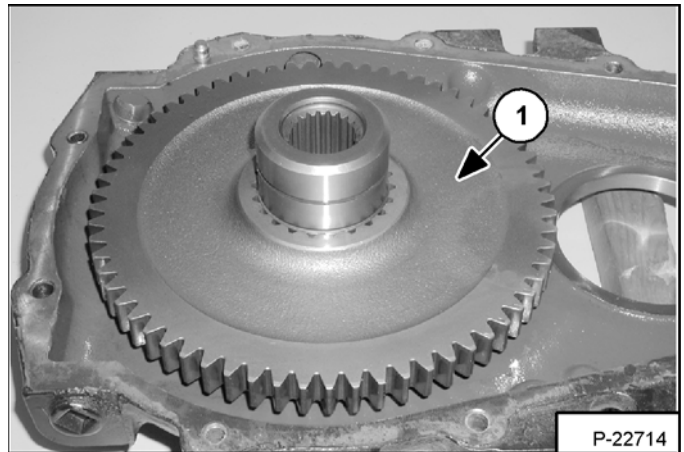
Apply a small amount of LOCTITE 609 (or equivalent) on the bearing seat **[Figure 20-70-37]**.

Figure 20-70-38



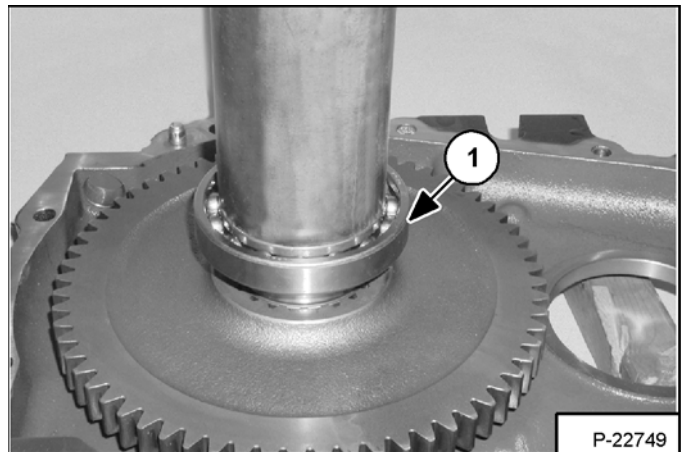
Install the bearing onto the shaft until it is fully seated in the housing **[Figure 20-70-38]**.

Figure 20-70-39



Install the gear (Item 1) **[Figure 20-70-39]** onto the shaft.

Figure 20-70-40

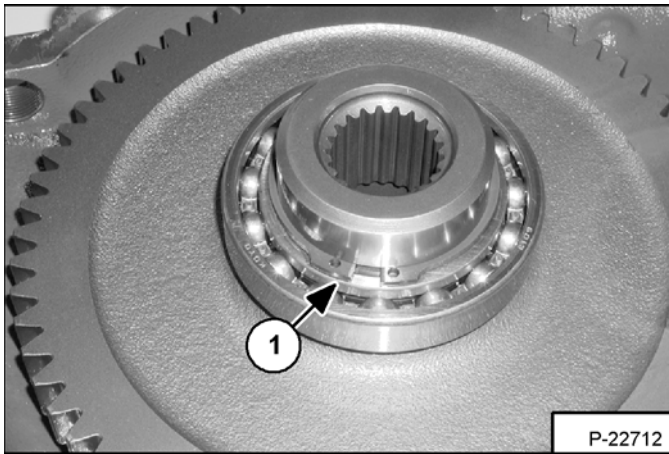


Install the bearing (Item 1) **[Figure 20-70-40]** onto the shaft.

DRIVE BOX (CONT'D)

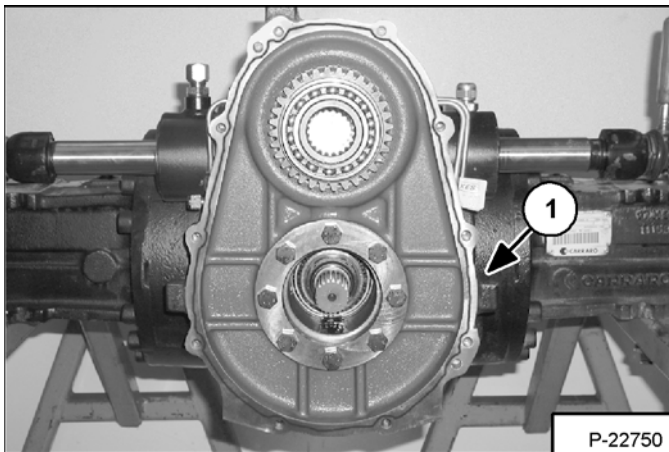
Assembly (Cont'd)

Figure 20-70-41



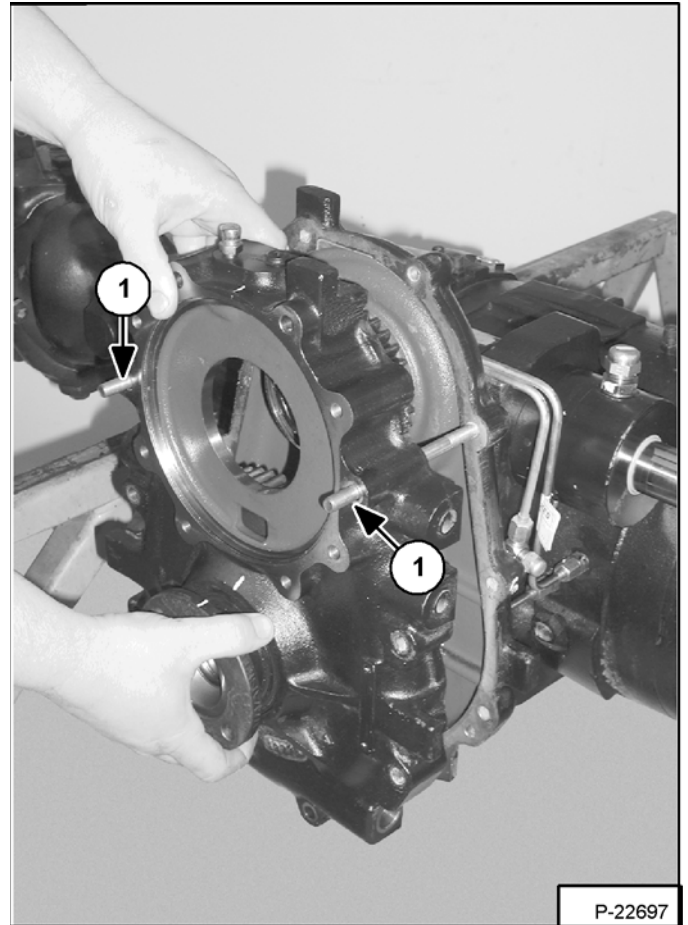
Install the snap ring (Item 1) [Figure 20-70-41] onto the shaft.

Figure 20-70-42



Apply a 3 mm bead of LOCTITE 510 Gasket Eliminator (or equivalent) to the rear housing surface (Item 1) [Figure 20-70-42] in the pattern shown.

Figure 20-70-43



Install two guide bolts (Item 1) [Figure 20-70-43].

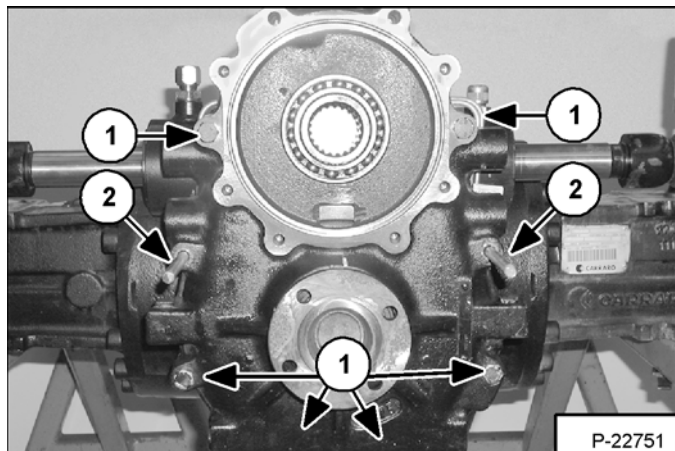
Install the cover [Figure 20-70-43].

NOTE: The splines and gears must be aligned to fully install the cover onto the dowels.

DRIVE BOX (CONT'D)

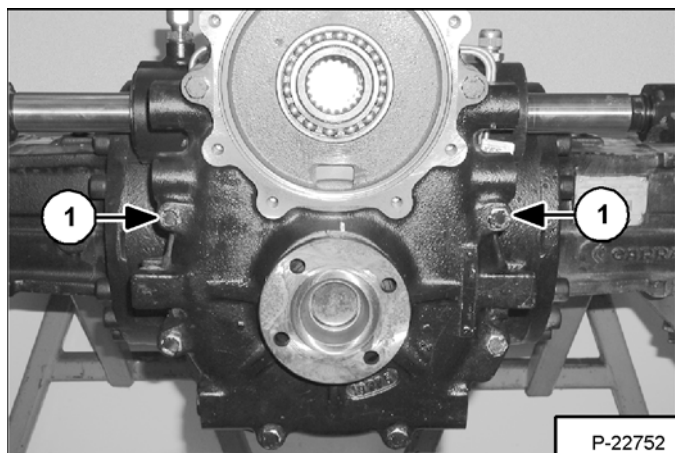
Assembly (Cont'd)

Figure 20-70-44



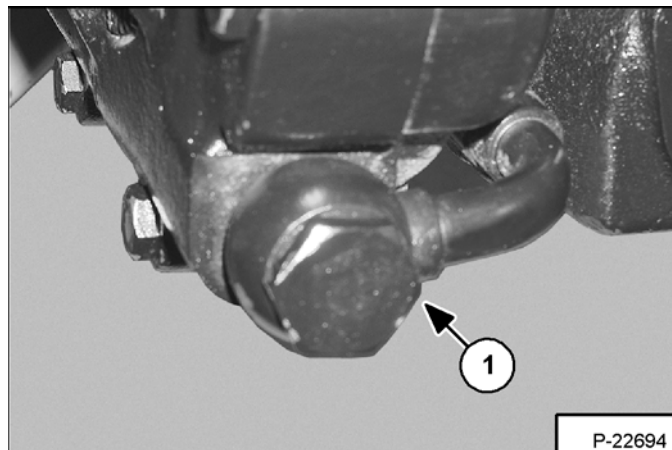
Install six cover bolts (Item 1) and remove the guide bolts (Item 2) [Figure 20-70-44].

Figure 20-70-45



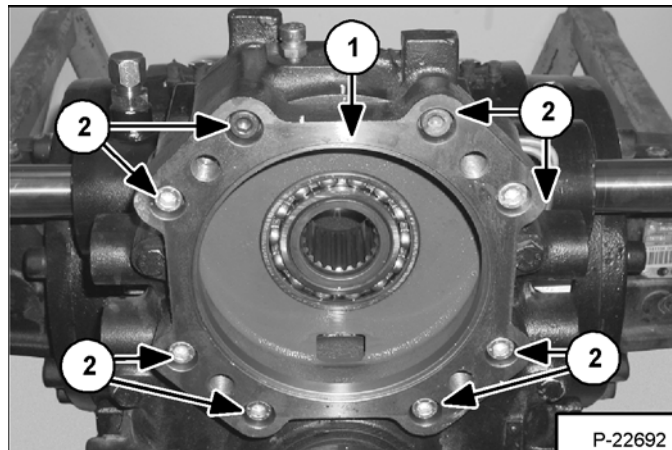
Install the two remaining cover bolts (Item 1) [Figure 20-70-45]. Tighten all bolts to 44 ft.-lbs. (60 Nm) torque.

Figure 20-70-46



Reconnect the hose (Item 1) [Figure 20-70-46] and tighten.

Figure 20-70-47



Install the mounting flange (Item 1) and tighten the eight mounting bolts (Item 2) [Figure 20-70-47] to 44 ft.-lbs. (60 Nm) torque.

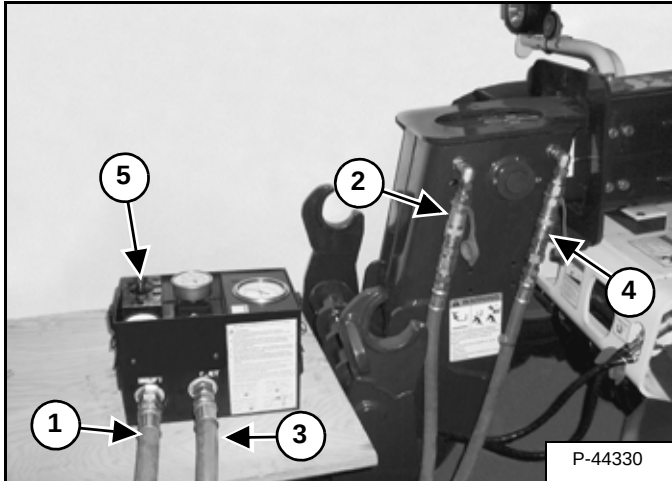
MAIN RELIEF VALVE

Testing And Adjustment

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

MEL10003-Hydraulic Tester

Figure 20-80-1



Connect the inlet hose (Item 1) from the tester to the front coupler (Item 2) **[Figure 20-80-1]**.

Connect the outlet hose (Item 3) from the tester to the rear coupler (Item 4) **[Figure 20-80-1]**.

IMPORTANT

The hydraulic tester must be in the fully open position before you start the engine.

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Figure 20-80-2



Start the engine, lower the restraint bar (if equipped) and run at low idle RPM. Push the detent rocker switch (Item 1) and front auxiliary rocker switch (Item 2) **[Figure 20-80-2]**. Make sure the tester is connected correctly. If no flow is indicated on the tester, the hoses are connected wrong. With the hoses connected correctly, increase the engine speed to 2200 RPM.

Warm the fluid to 140° F (60° C) by turning the restrictor control (Item 5) **[Figure 20-80-1]** on the tester to about 1000 psi (69 Bar). DO NOT exceed system relief pressure. Open the restrictor control knob and record the free flow (GPM) at 2200 RPM.

There should be 13 GPM (55 L/min) free flow. Turn the restrictor control (Item 5) **[Figure 20-80-1]** on the tester until the main relief opens. The correct pressure should be 3843 PSI (265 Bar).

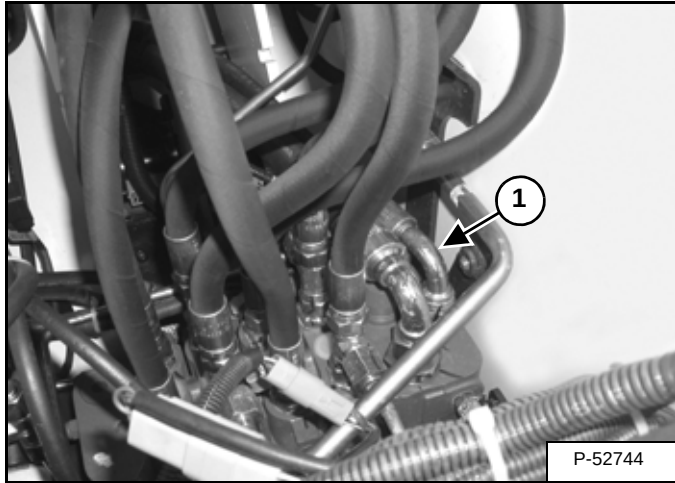
If adjustment is needed, (See Page 20-80-2).

MAIN RELIEF VALVE (CONT'D)

Testing And Adjustment (Cont'd)

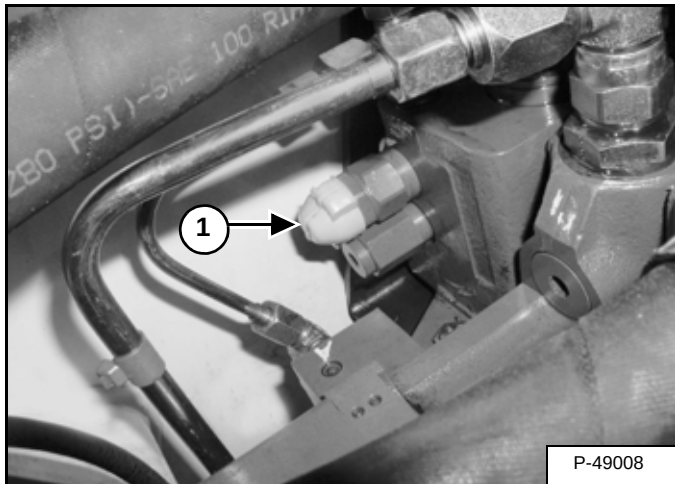
Remove the rear cover.

Figure 20-80-3



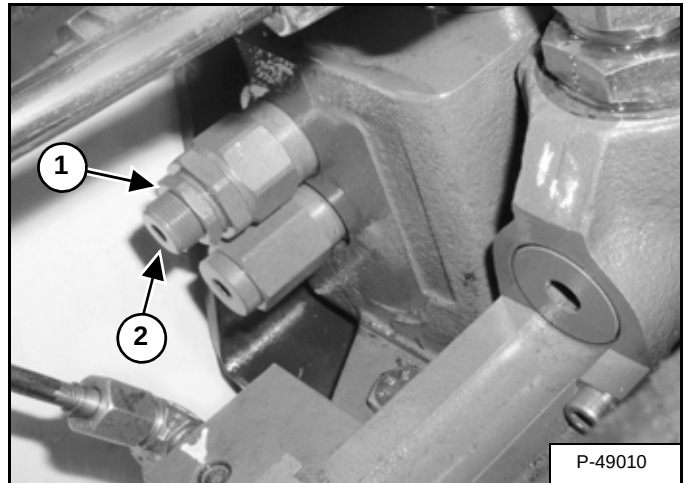
Locate the main relief valve (Item 1) [Figure 20-80-3] on the front right side of the control valve.

Figure 20-80-4



Remove the tamper proof cap (Item 1) [Figure 20-80-4].

Figure 20-80-5



Loosen the lock nut (Item 1) and turn the adjustment screw (Item 2) [Figure 20-80-5] clockwise to increase the pressure or counterclockwise to decrease the pressure.

NOTE: A 1/4 of a turn = 150 psi (10.34 Bar).

Retest the main relief valve after adjustment.

MAIN RELIEF VALVE (CONT'D)

Removal and Installation

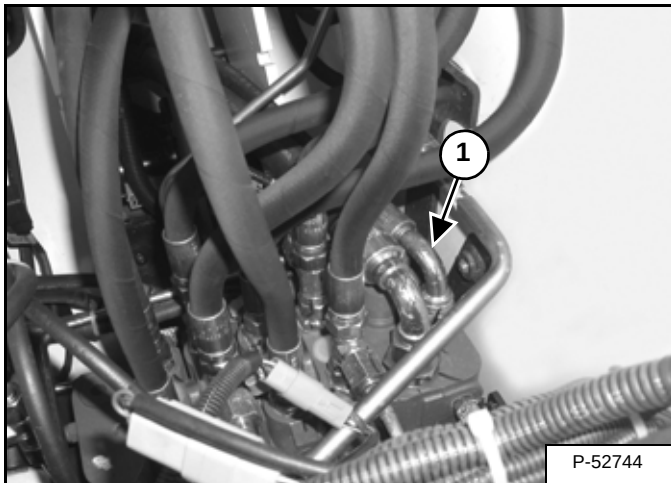
IMPORTANT

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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Remove the rear cover.

Figure 20-80-6



Locate the main relief valve on the front right side of the control valve.

Clean the area around the control valve.

Remove the main relief valve (Item 1) **[Figure 20-80-6]**.

Installation: Tighten the main relief valve to 33 ft.-lbs. (45 Nm) torque.

QUICK TACH CYLINDER

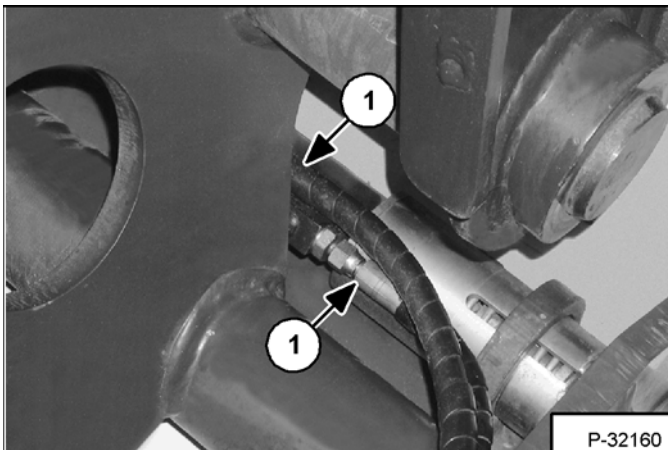
Removal And Installation

Figure 20-90-1



Rotate the quick tach forward and place on wood blocks [Figure 20-90-1].

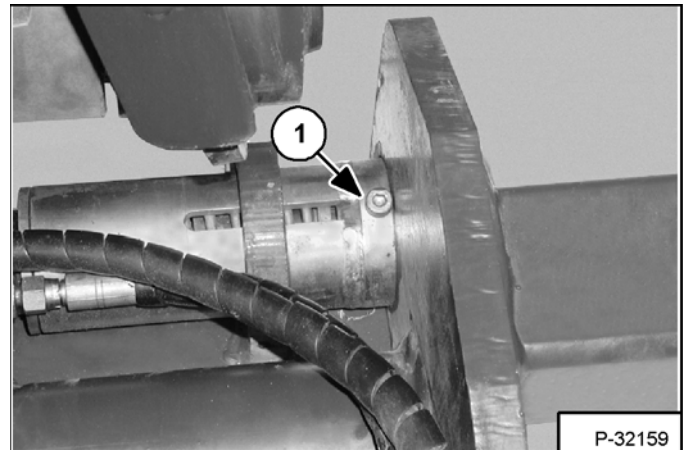
Figure 20-90-2



Remove the two hoses (Item 1) [Figure 20-90-2] from the cylinder.

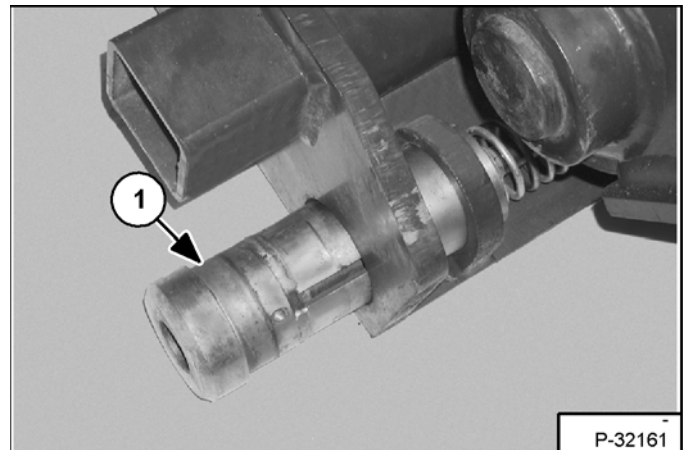
NOTE: Mark the hoses for correct assembly.

Figure 20-90-3



Remove the bolt (Item 1) [Figure 20-90-3] from each side of the cylinder.

Figure 20-90-4

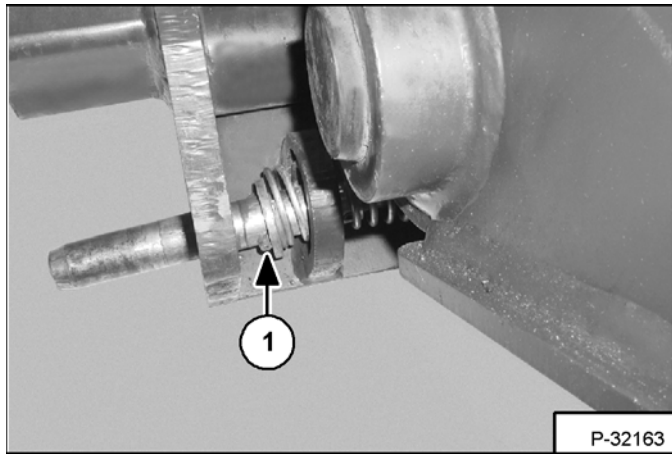


Remove the end bushing (Item 1) [Figure 20-90-4].

QUICK TACH CYLINDER (CONT'D)

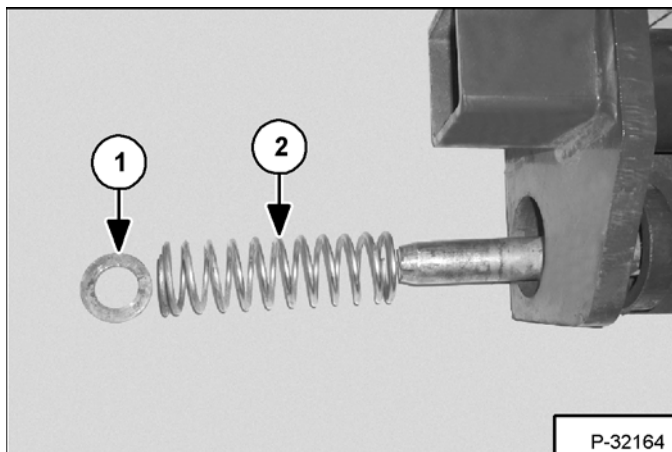
Removal And Installation (Cont'd)

Figure 20-90-5



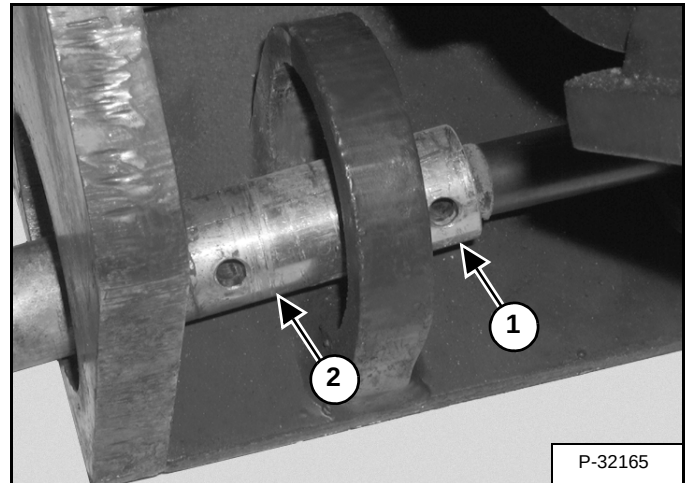
Remove the roll pin (Item 1) [Figure 20-90-5].

Figure 20-90-6



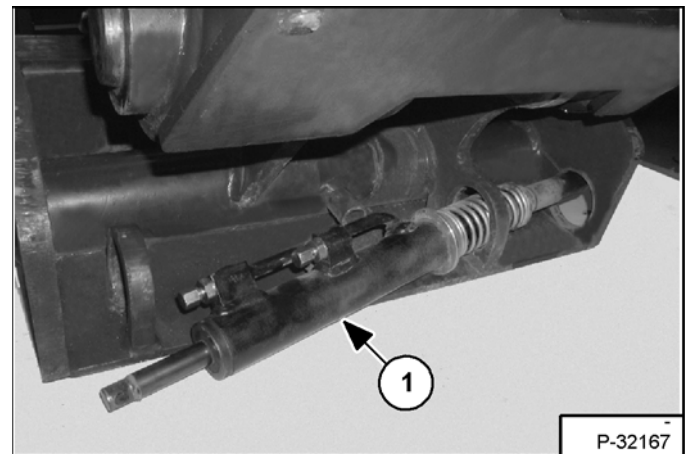
Remove the washer (Item 1) and spring (Item 2) [Figure 20-90-6] from the cylinder rod extension.

Figure 20-90-7



Remove the roll pin (Item 1) and remove the extension rod (Item 2) [Figure 20-90-7] from the cylinder rod.

Figure 20-90-8

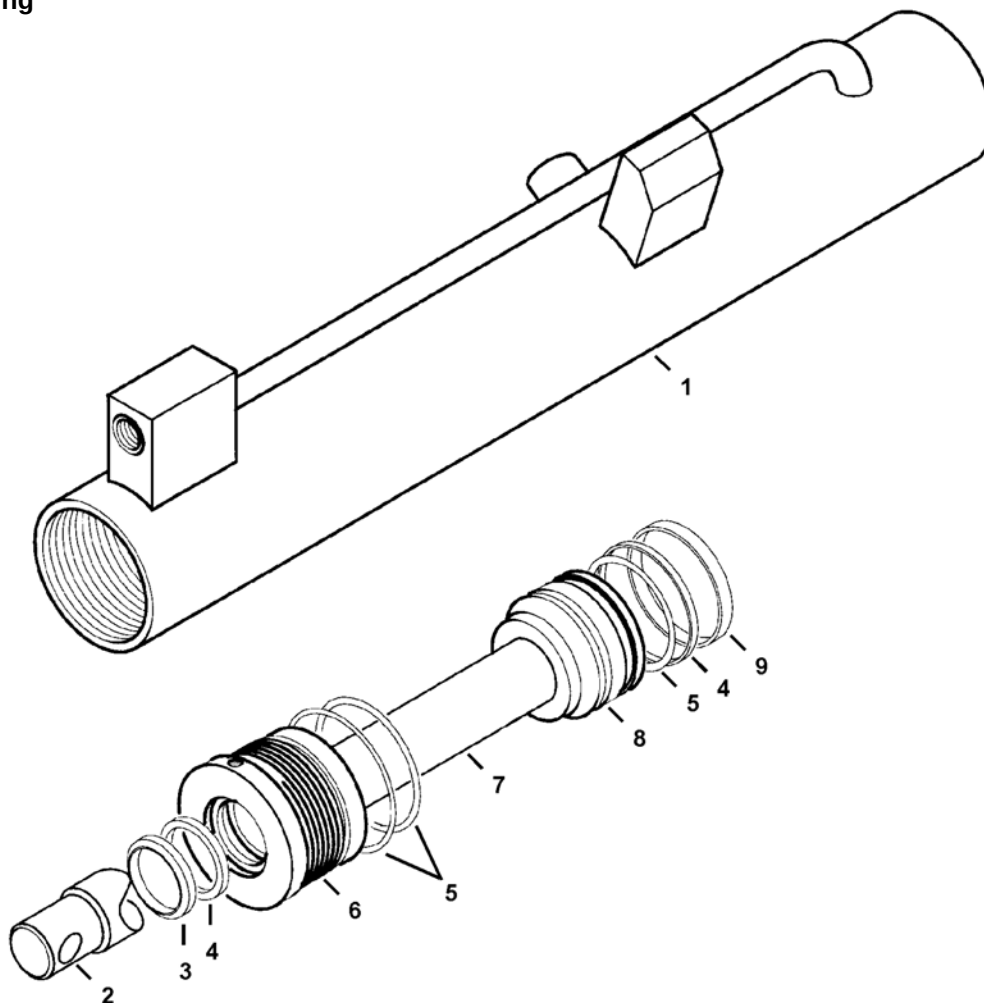


Remove the cylinder (Item 1) [Figure 20-90-8].

QUICK TACH CYLINDER (CONT'D)

Parts Identification

1. Housing
2. Extension
3. Wiper
4. Seal
5. O-ring
6. Head Gland
7. Rod
8. Piston
9. Wear Ring



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QUICK TACH CYLINDER (CONT'D)

Disassembly

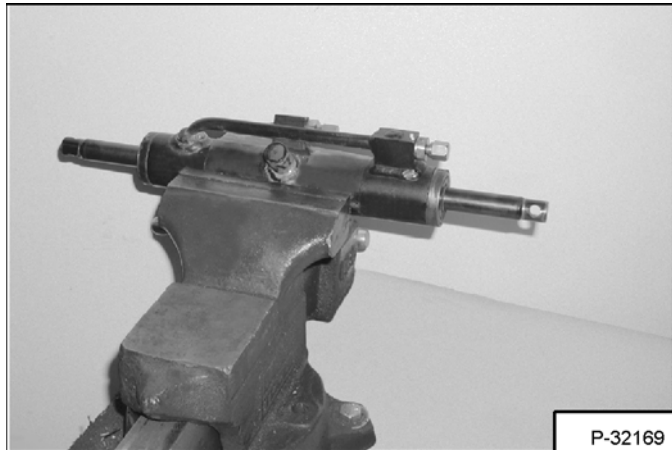
Use the following tools to disassemble the cylinder:

MEL1074-O-ring Seal Hook

MEL1076-Cylinder Wrench

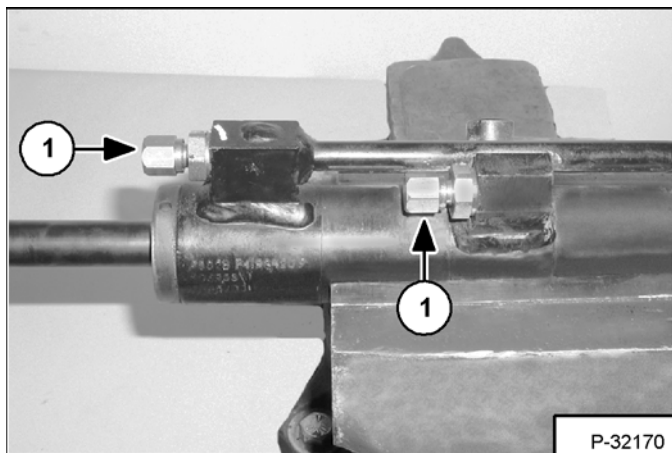
Clean the outside of the quick tach cylinder before disassembly.

Figure 20-90-9



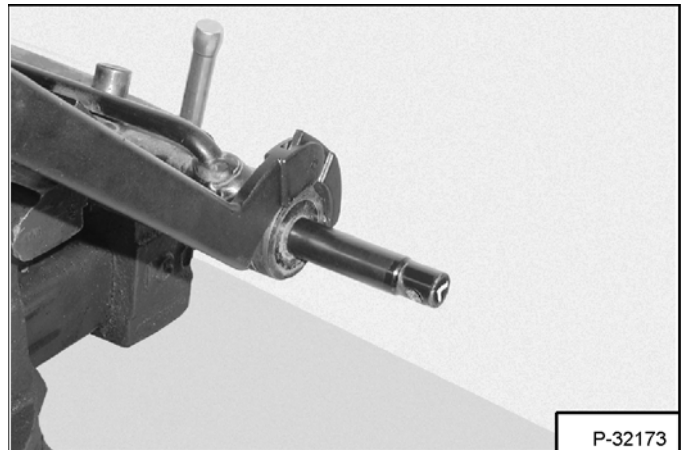
Place the cylinder in a vise [Figure 20-90-9].

Figure 20-90-10



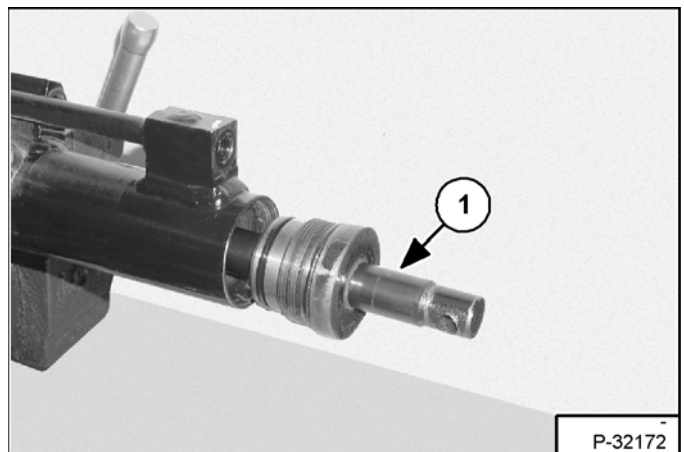
Remove the two fittings (Item 1) [Figure 20-90-10].

Figure 20-90-11



Loosen the head gland [Figure 20-90-11].

Figure 20-90-12

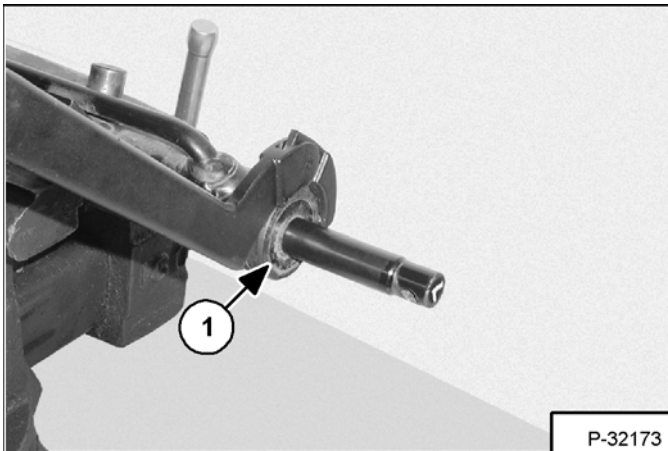


Remove the rod assembly (Item 1) [Figure 20-90-12] from the housing.

QUICK TACH CYLINDER (CONT'D)

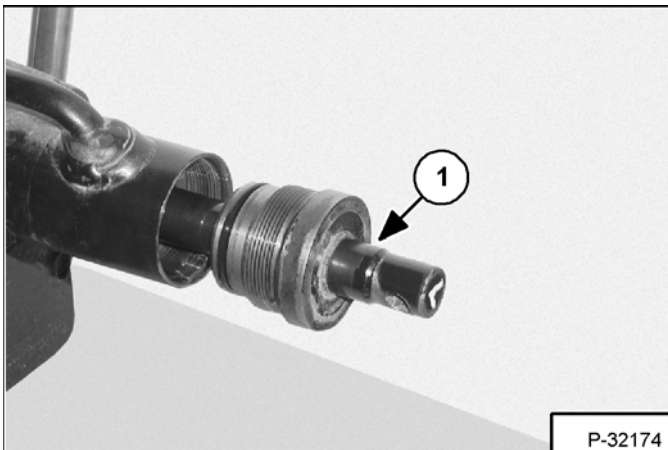
Disassembly (Cont'd)

Figure 20-90-13



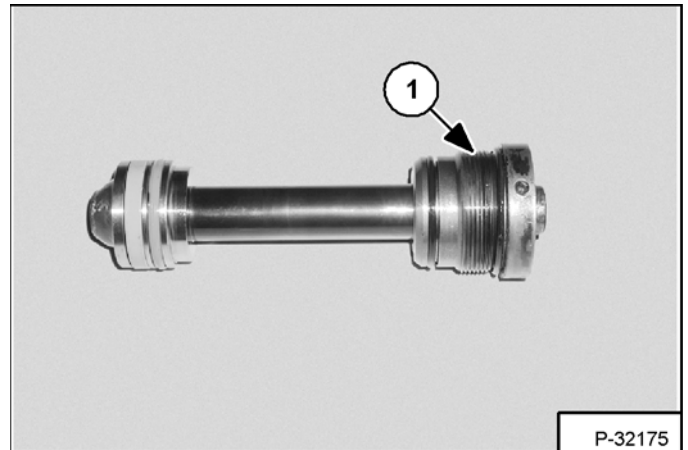
Loosen the second head gland (Item 1) [Figure 20-90-13] on the opposite side.

Figure 20-90-14



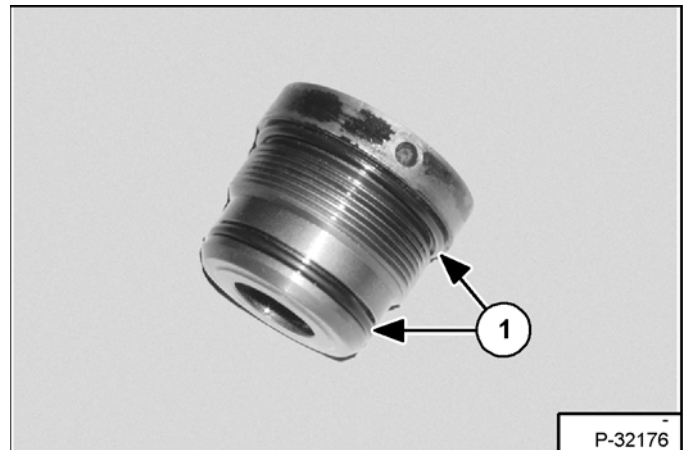
Remove the rod assembly (Item 1) [Figure 20-90-14] from the housing.

Figure 20-90-15



Remove the head (Item 1) [Figure 20-90-15] from each rod.

Figure 20-90-16

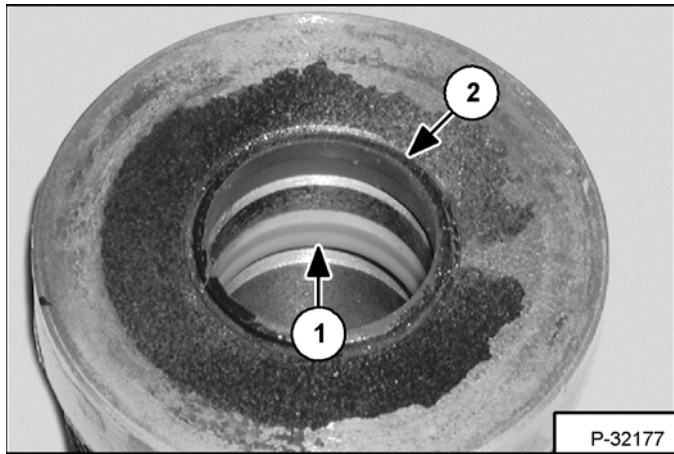


Remove the O-rings (Item 1) [Figure 20-90-16] from each head gland.

QUICK TACH CYLINDER (CONT'D)

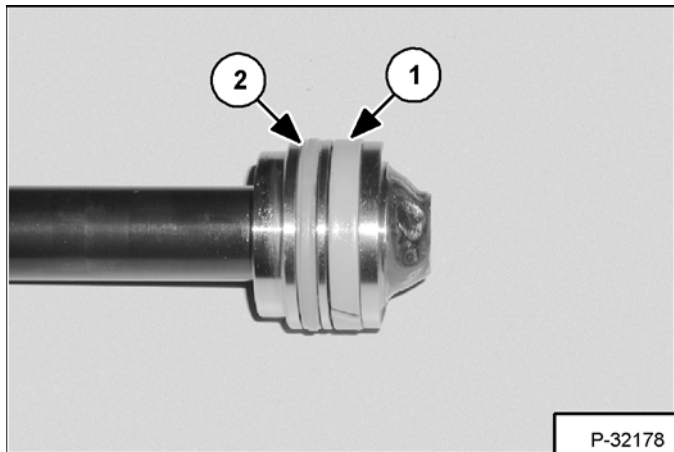
Disassembly (Cont'd)

Figure 20-90-17



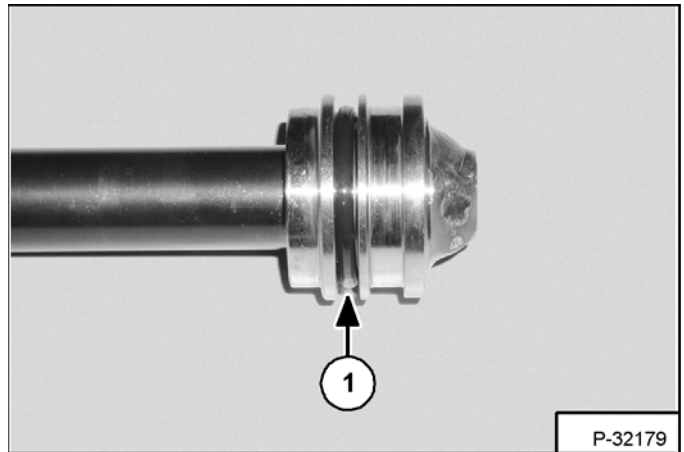
Remove the seal (Item 1) and wiper (Item 2) [Figure 20-90-17] from each head gland.

Figure 20-90-18



Remove the wear ring (Item 1) and seal (Item 2) [Figure 20-90-18] from each piston.

Figure 20-90-19



Remove the expander O-ring (Item 1) [Figure 20-90-19] from each piston.

QUICK TACH CYLINDER (CONT'D)

Assembly

Use the following tool to assemble the cylinder:

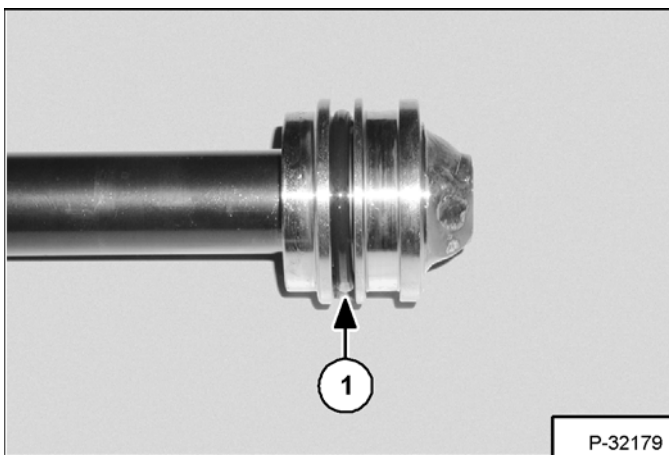
MEL1076-Cylinder Wrench

Clean all parts in solvent and dry with compressed air.

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

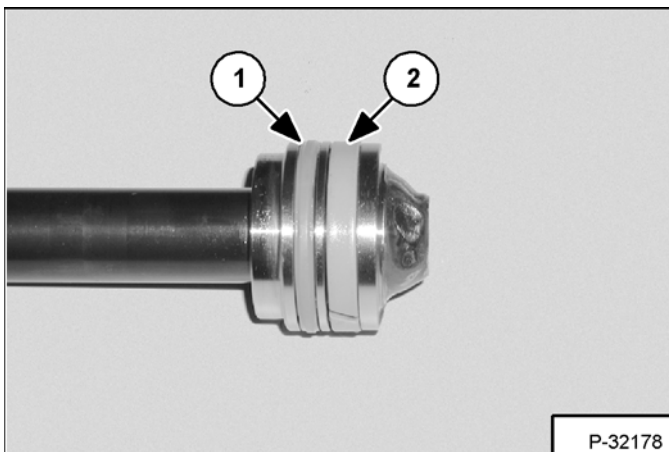
Always install new seals and O-rings. Lubricate all seals and O-rings with clean hydraulic fluid before installation.

Figure 20-90-20



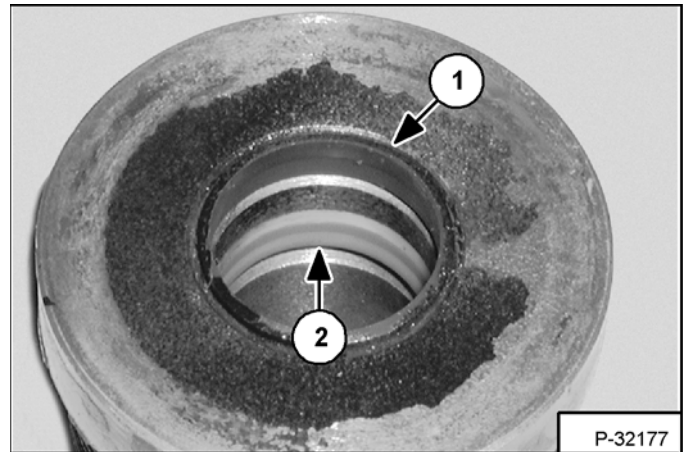
Install a new expander O-ring (Item 1) [Figure 20-90-20] on each piston.

Figure 20-90-21



Install a new seal (Item 1) and wear ring (Item 2) [Figure 20-90-21] on each piston.

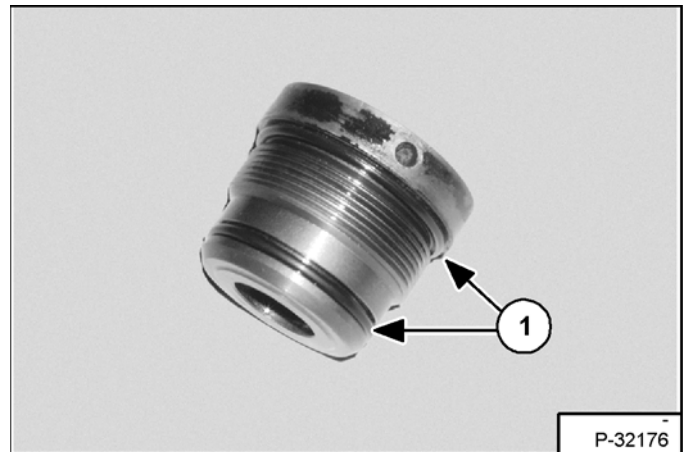
Figure 20-90-22



Install the wiper (Item 1) and seal (Item 2) [Figure 20-90-22] in each head gland.

NOTE: The groove in the seal must point away from the wiper seal (Item 1) [Figure 20-90-22].

Figure 20-90-23

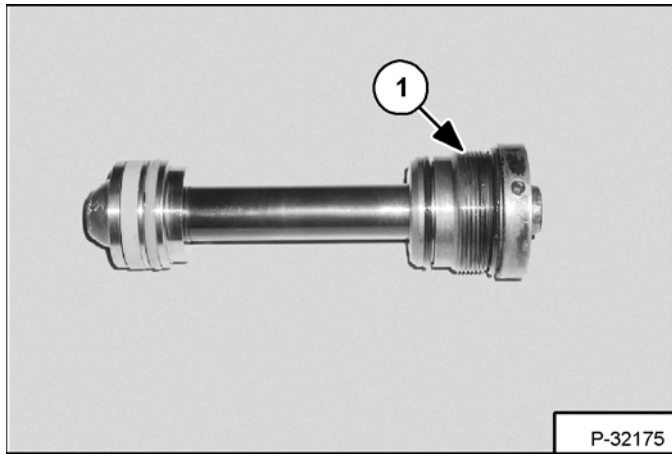


Install the two O-rings (Item 1) [Figure 20-90-24] on each head gland.

QUICK TACH CYLINDER (CONT'D)

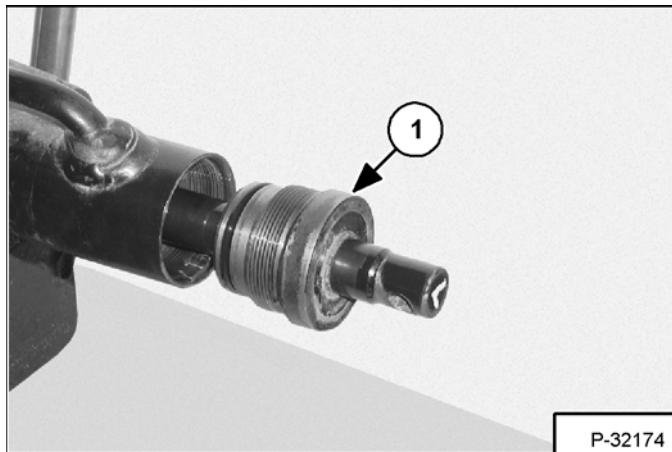
Assembly (Cont'd)

Figure 20-90-24



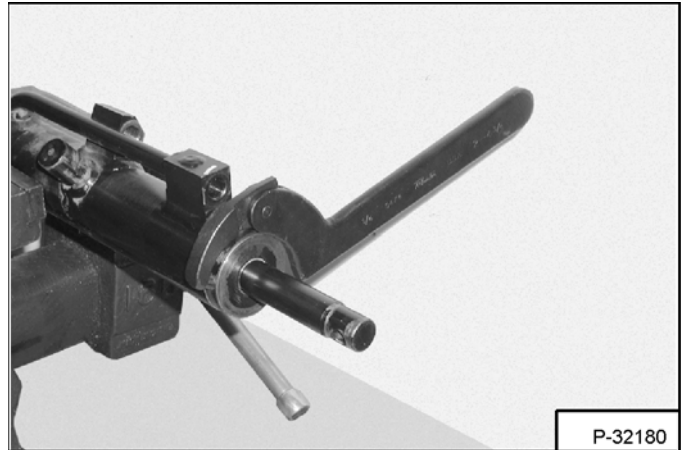
Install each head gland (Item 1) [Figure 20-90-24] onto the rod.

Figure 20-90-25



Install each rod assembly (Item 1) [Figure 20-90-25] into the housing.

Figure 20-90-26



Tighten both head glands [Figure 20-90-26].

PORT RELIEF VALVES

Adjustment Procedure

IMPORTANT

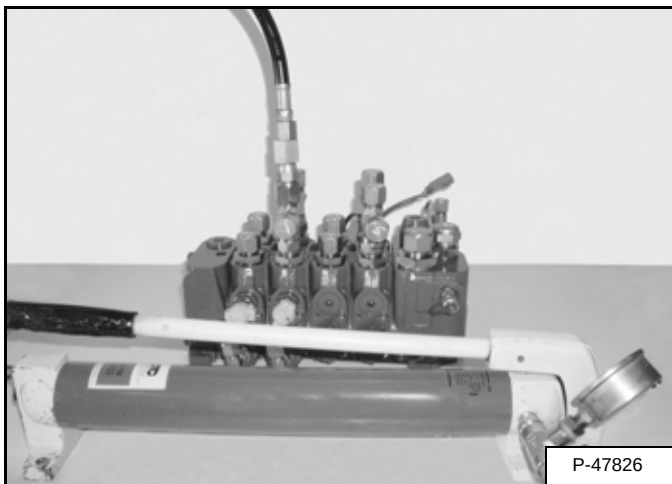
When repairing hydrostatic and hydraulic systems, clean the work area before disassembly and keep all parts clean. Always use caps and plugs on hoses, tubelines and ports to keep dirt out. Dirt can quickly damage the system.

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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 Massey Ferguson hydraulic fluid.

NOTE: The valve is shown removed from the machine for photo clarity.

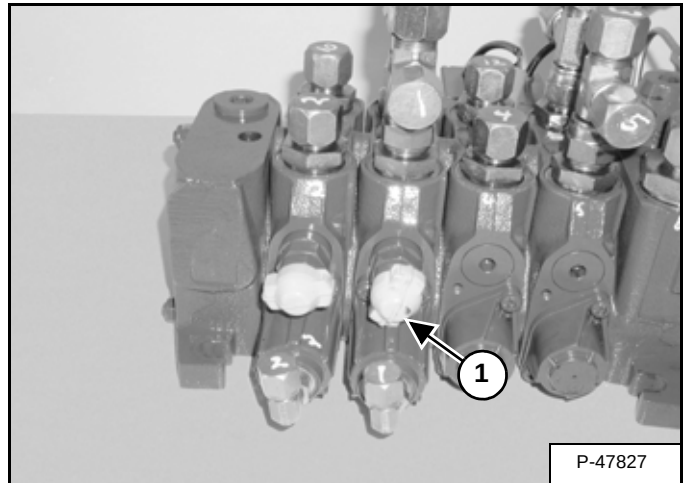
Figure 20-100-1



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 20-100-1]. Pressurize this section with the hand pump until the port relief valve opens and record the pressure reading.

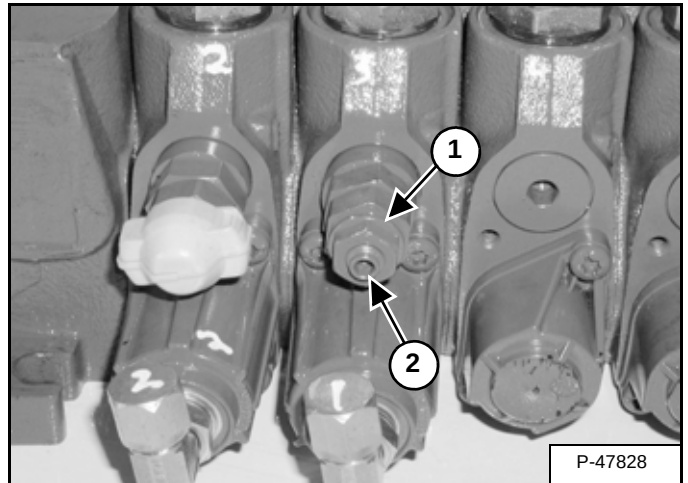
If the port relief pressure setting needs to be adjusted, release the hand pump pressure valve.

Figure 20-100-2



Remove the protective end cap (Item 1) [Figure 20-100-2].

Figure 20-100-3



Loosen the lock nut (Item 1) [Figure 20-100-3]

Turn the adjusting screw (Item 2) [Figure 20-100-3] clockwise to increase the pressure and counterclockwise to reduce the pressure.

NOTE: One-quarter turn is approximately 400 PSI (27.5 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.

STEERING MODE VALVE BLOCK

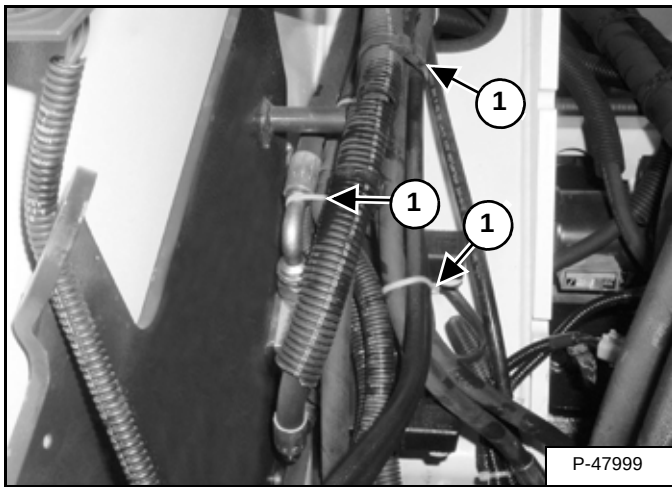
Removal And Installation

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.

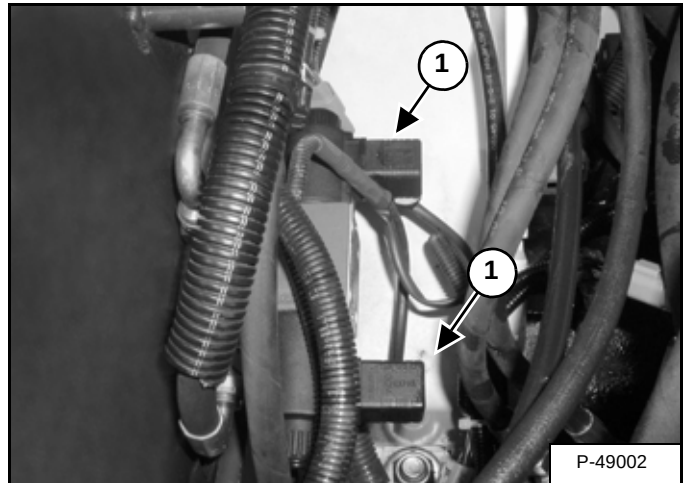
W-2145-0290

Figure 20-110-1



Remove the tie straps (Item 1) [Figure 20-110-1].

Figure 20-110-2



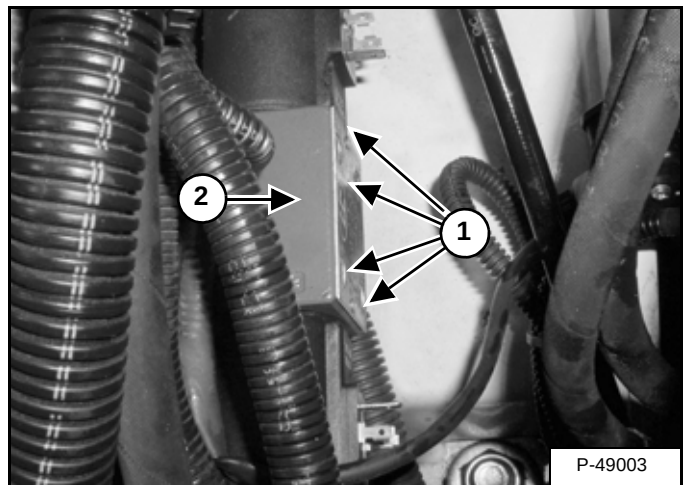
Relieve hydraulic pressure.

Remove the retainer screw from the two wire connectors (Item 1) [Figure 20-110-2].

Remove the wire connectors from the two solenoids.

NOTE: Mark the location of the wire connectors for correct installation.

Figure 20-110-3



Remove the four mounting bolts (Item 1) [Figure 20-110-3].

NOTE: Mark the location of the valve on the block.

Remove the valve (Item 2) [Figure 20-110-3] from the block.

STEERING MODE VALVE BLOCK (CONT'D)

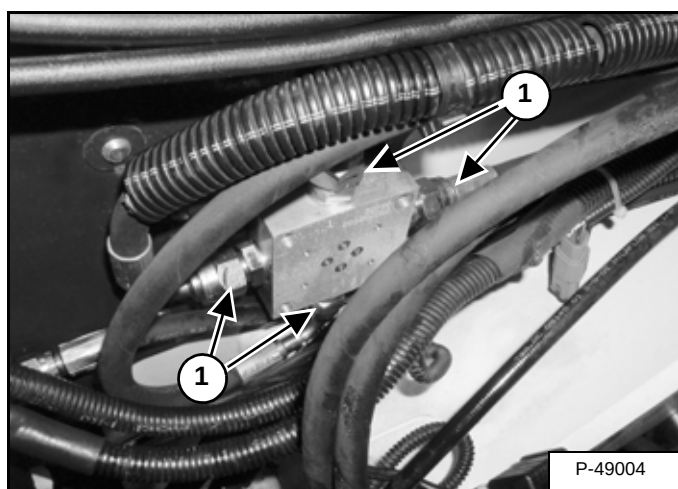
Removal And Installation (Cont'd)

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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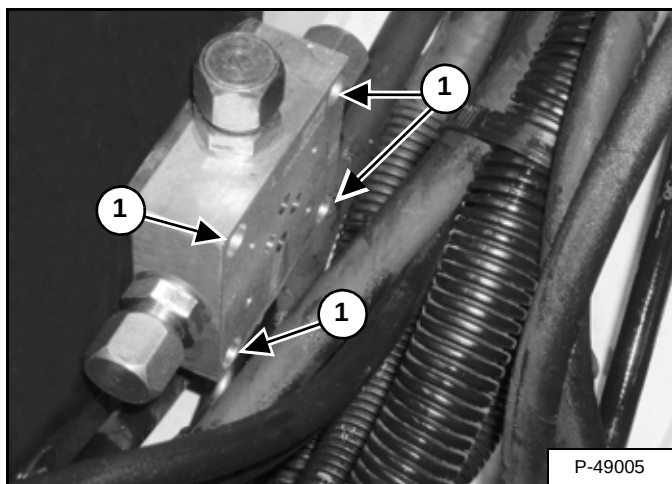
Figure 20-110-4



Remove the four hoses (Item 1) [Figure 20-110-4].

NOTE: Mark the location of the hoses.

Figure 20-110-5

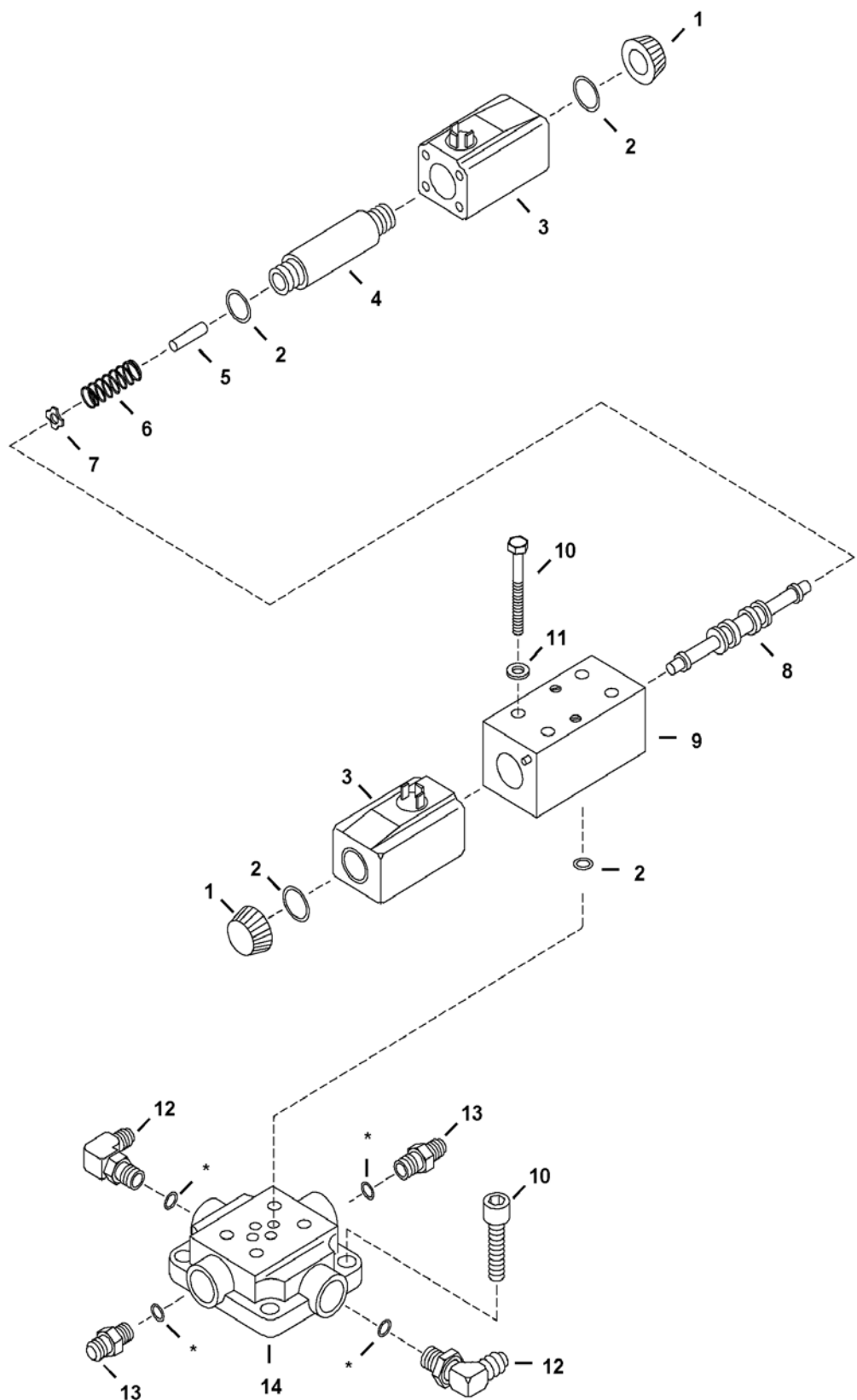


Remove the four mounting bolts (Item 1) [Figure 20-110-5] and remove the block.

STEERING MODE VALVE BLOCK (CONT'D)

Parts Identification

1. Nut
2. O-Ring
3. Solenoid
4. Shaft
5. Pin
6. Spring
7. Retainer
8. Spool
9. Housing
10. Bolt
11. Washer
12. Elbow
13. Adapter
14. Housing



* Supplied with fitting.

MS-01152

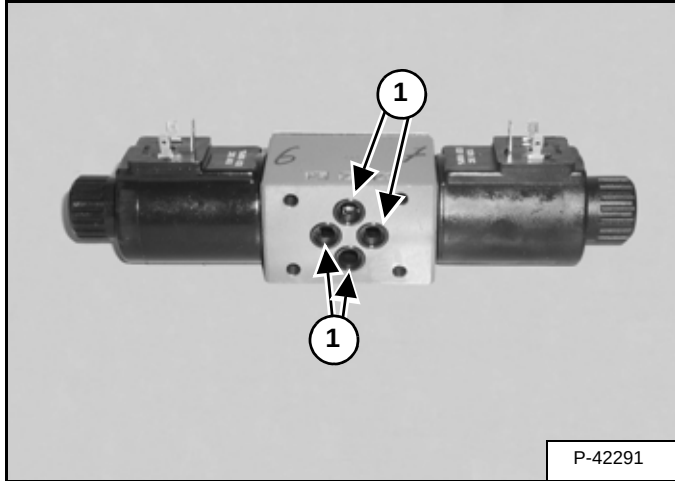
STEERING MODE VALVE BLOCK (CONT'D)

Disassembly

Clean the outside of the valve block before disassembly.

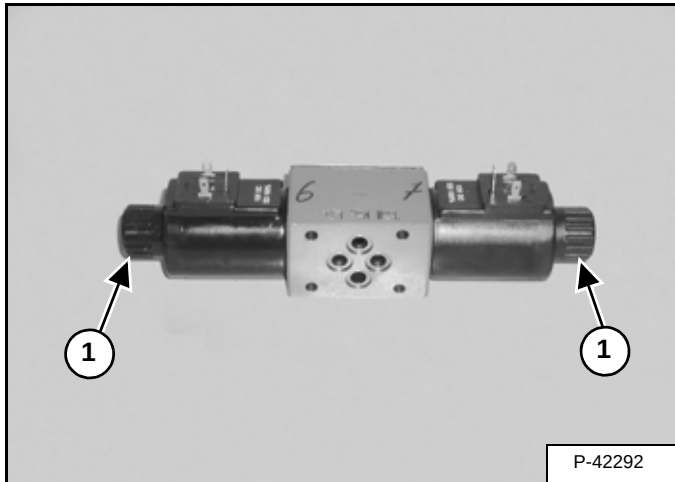
Mark the outside of the valve block for ease of assembly.

Figure 20-110-6



Remove the four O-rings (Item 1) [Figure 20-110-6] from the housing.

Figure 20-110-7



Remove the nut (Item 1) [Figure 20-110-7] from each solenoid.

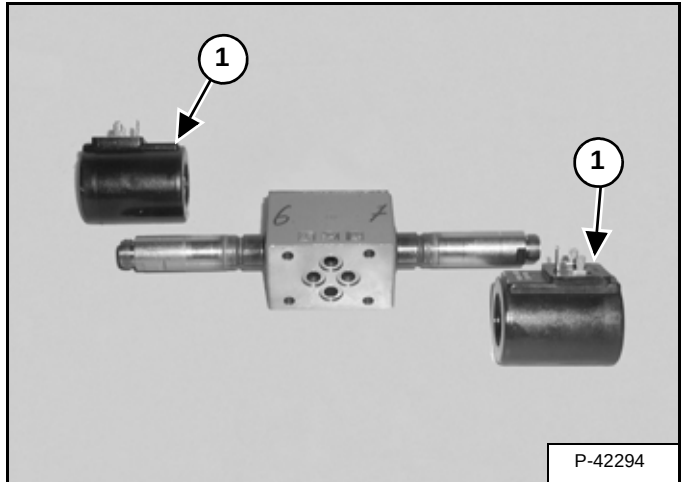
NOTE: Mark the location of the solenoids.

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.

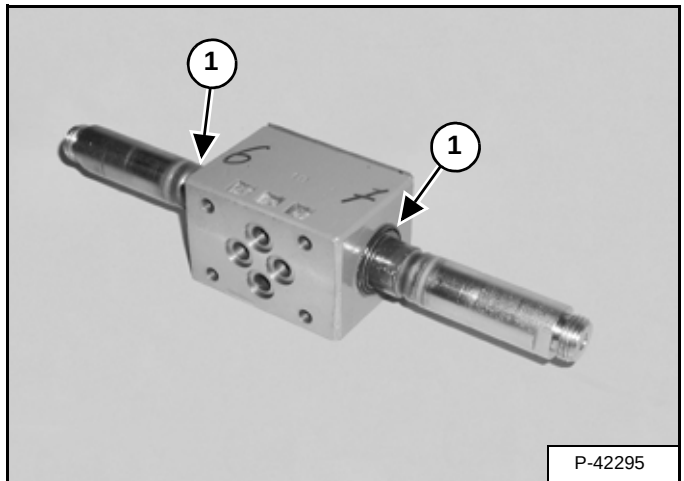
I-2003-0888

Figure 20-110-8



Remove the solenoids (Item 1) [Figure 20-110-8] from the solenoid shafts.

Figure 20-110-9

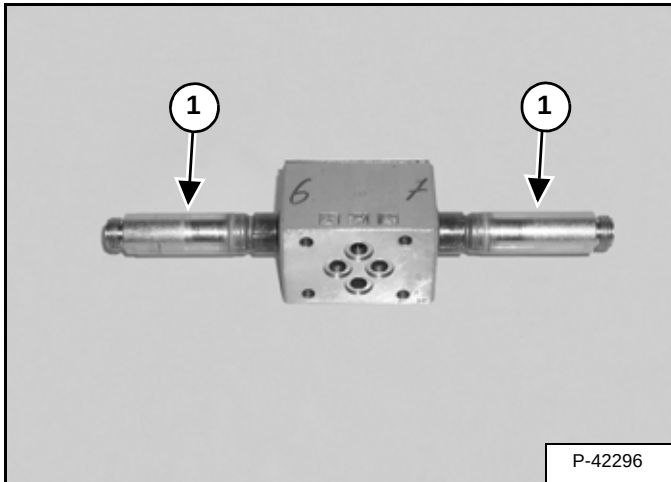


Remove the O-ring (Item 1) [Figure 20-110-9] from both shafts.

STEERING MODE VALVE BLOCK (CONT'D)

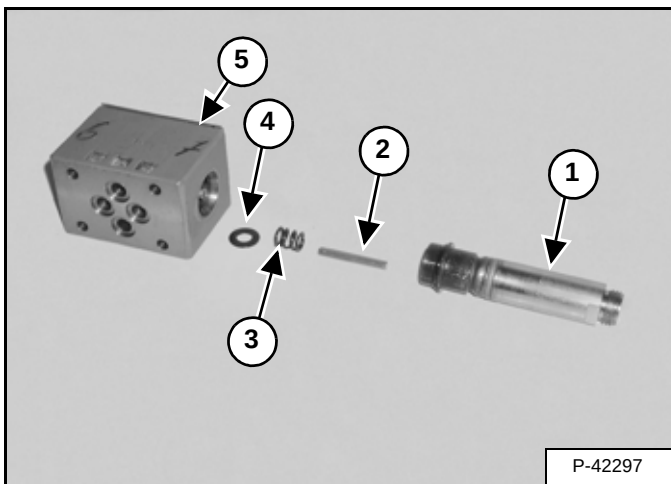
Disassembly (Cont'd)

Figure 20-110-10



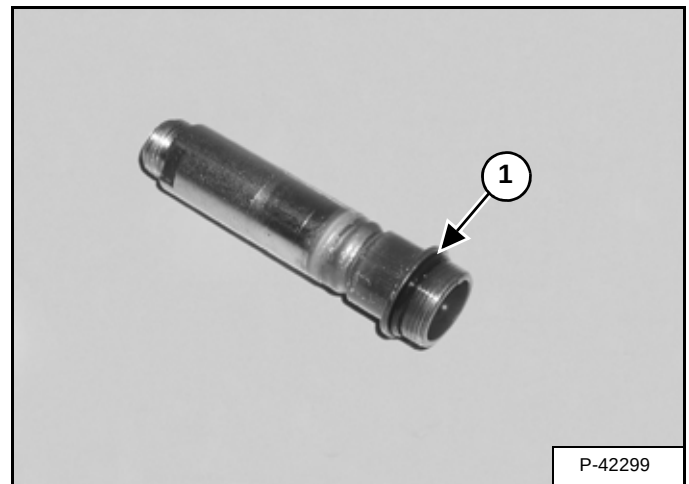
Loosen the shafts (Item 1) [Figure 20-110-10].

Figure 20-110-11



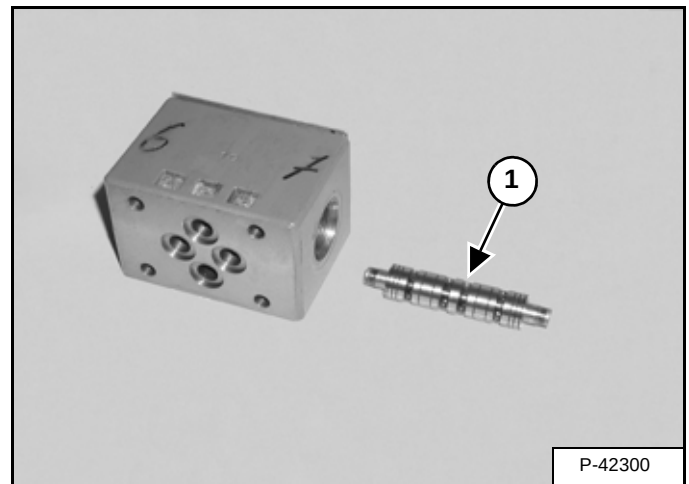
Remove the shaft (Item 1), pin (Item 2), spring (Item 3) and spring retainer (Item 4) from the housing (Item 5) [Figure 20-110-11]. (Both Sides)

Figure 20-110-12



Remove the O-ring (Item 1) [Figure 20-110-12] from each shaft.

Figure 20-110-13



Carefully remove the spool (Item 1) [Figure 20-110-13] from the housing.

STEERING MODE VALVE BLOCK (CONT'D)

Solenoid Testing

Figure 20-110-14



Use a circuit tester, touch one probe to the prong and the other probe to the other prong [Figure 20-110-14], there must be continuity. If there is no continuity, replace the solenoid.

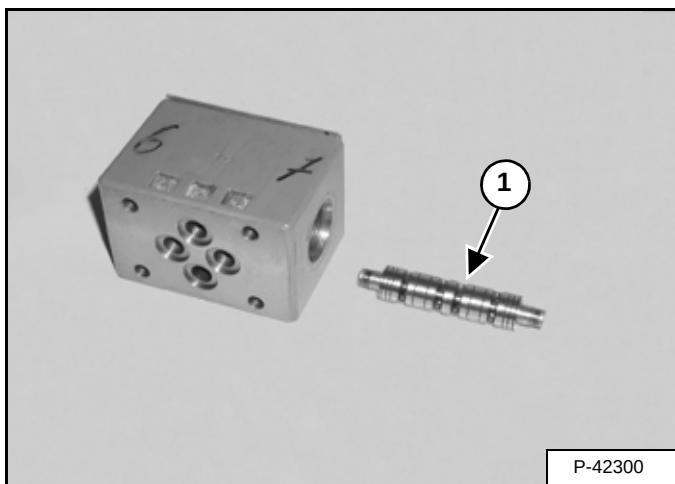
Assembly

Clean all parts in solvent and dry with compressed air.

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

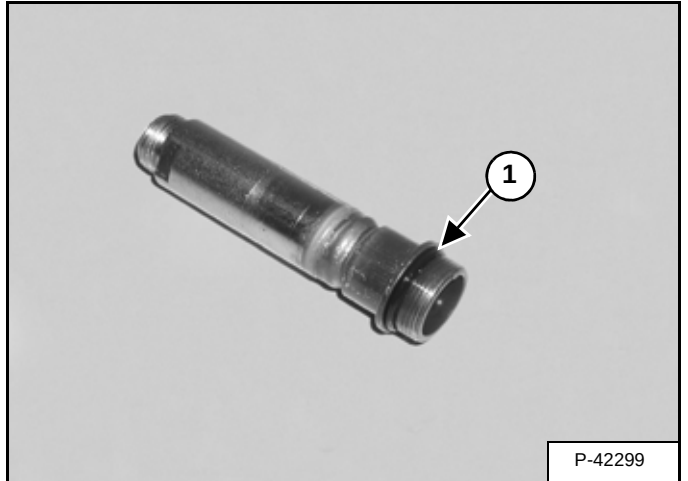
Always install new seals and O-rings. Lubricate all seals and O-rings with clean hydraulic fluid before installation.

Figure 20-110-15



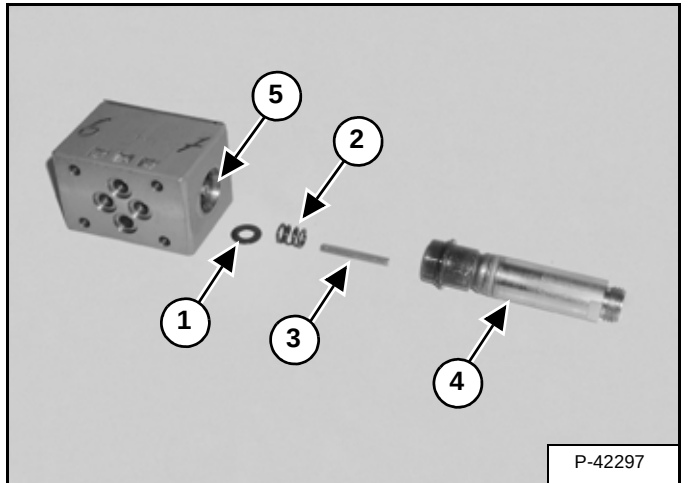
Carefully install the spool (Item 1) [Figure 20-110-15].

Figure 20-110-16



Install a new O-ring (Item 1) [Figure 20-110-16] on each shaft.

Figure 20-110-17

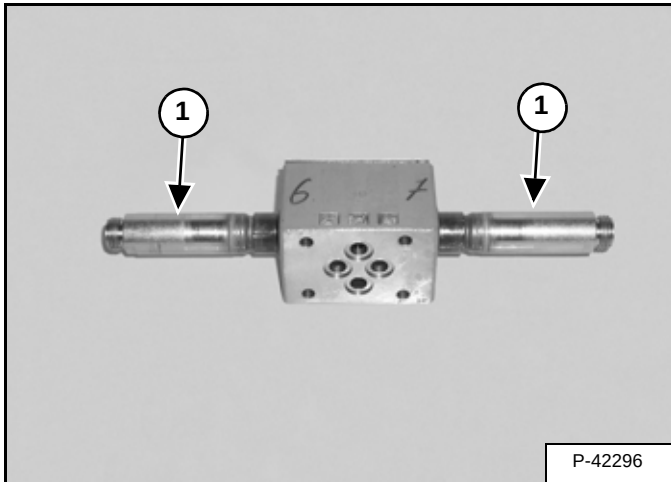


Install the spring retainer (Item 1), spring (Item 2), pin (Item 3) and shaft (Item 4) in the housing (Item 5) [Figure 20-110-17]. (Both Sides)

STEERING MODE VALVE BLOCK (CONT'D)

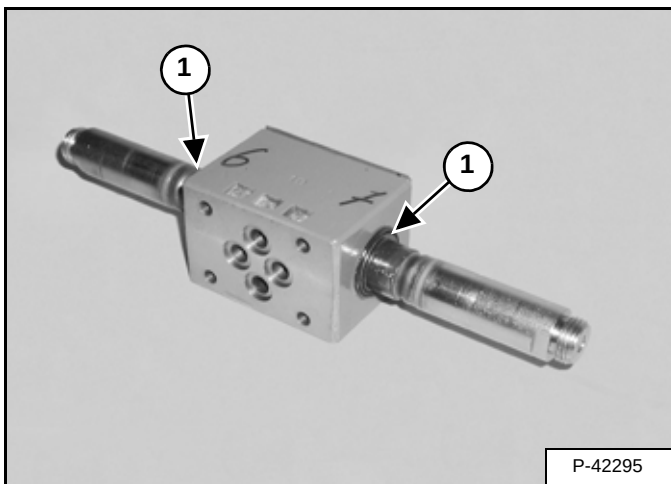
Assembly (Cont'd)

Figure 20-110-18



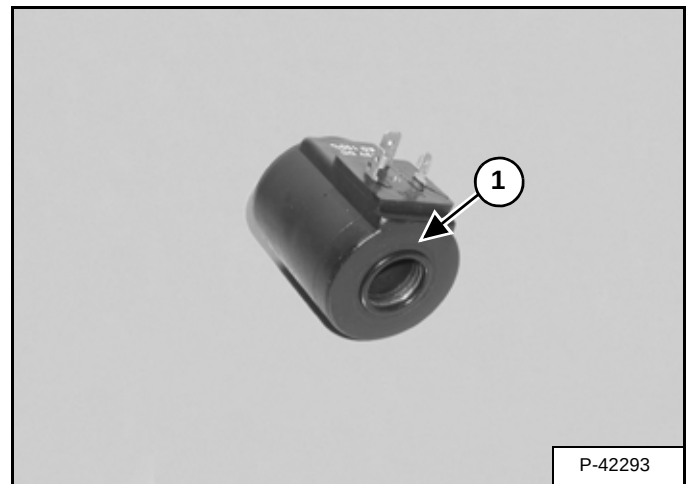
Tighten each shaft (Item 1) [Figure 20-110-18].

Figure 20-110-19



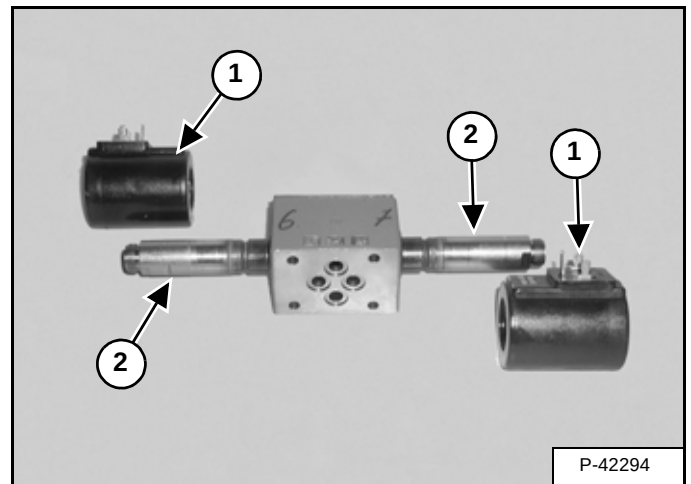
Install an O-ring (Item 1) [Figure 20-110-19] on each shaft.

Figure 20-110-20



Install the O-ring (Item 1) [Figure 20-110-20] on the two solenoids.

Figure 20-110-21

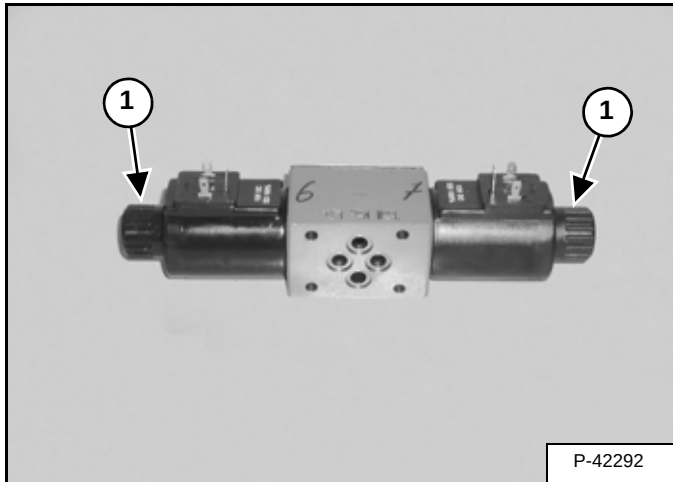


Install the solenoids (Item 1) on the shafts (Item 2) [Figure 20-110-21].

STEERING MODE VALVE BLOCK (CONT'D)

Assembly (Cont'd)

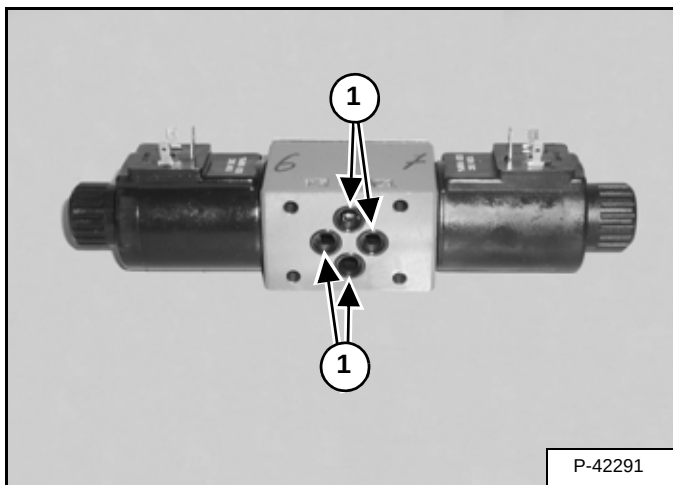
Figure 20-110-22



Install the nuts (Item 1) [Figure 20-110-22] on each shaft and hand tighten.

NOTE: Do not overtighten the nuts.

Figure 20-110-23

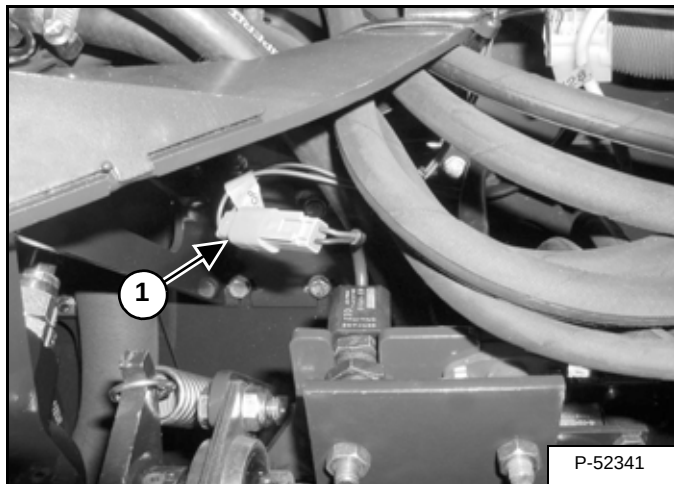


Install the four O-rings (Item 1) [Figure 20-110-23] on the housing

BRAKE VALVE

Removal And Installation

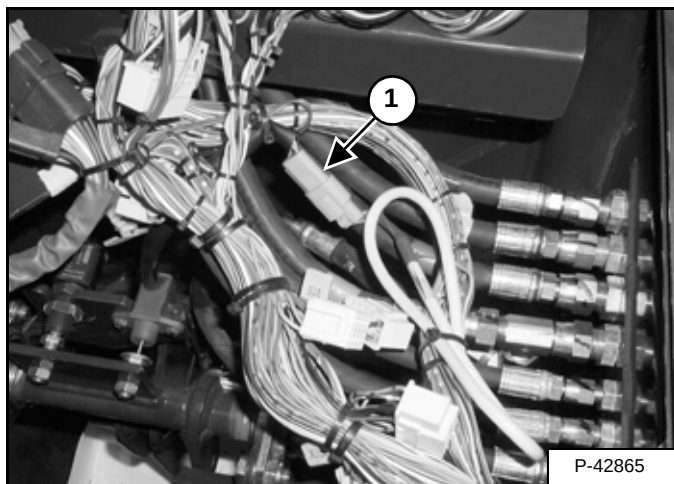
Figure 20-120-1



Remove the dash cover/column cover. (See Content Page 50-01.)

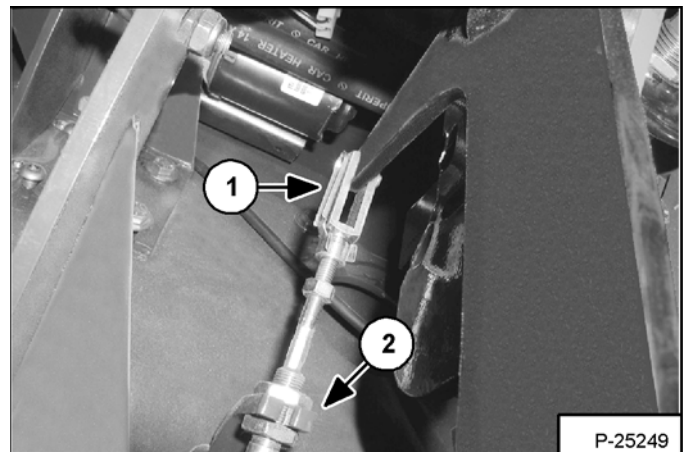
Disconnect the two harness connectors (Item 1) [Figure 20-120-1] from the brake light switch.

Figure 20-120-2



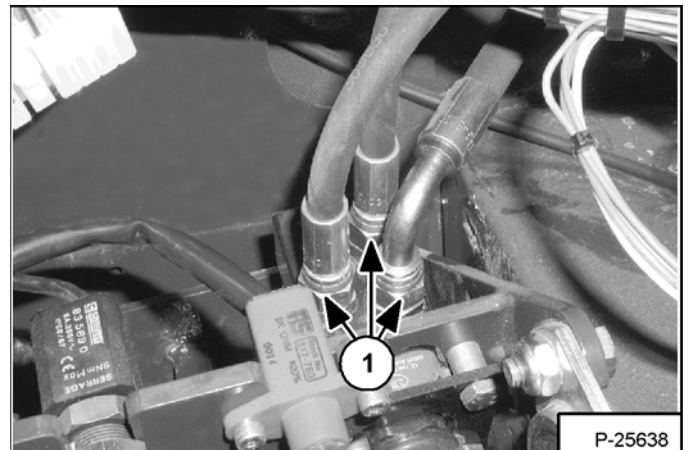
Disconnect the harness connector (Item 1) [Figure 20-120-2] from the inching switch.

Figure 20-120-3



Remove the accelerator cable (Item 1) from the pedal and mounting bracket (Item 2) [Figure 20-120-3].

Figure 20-120-4



Remove the three hoses (Item 1) [Figure 20-120-4] from the brake valve.

NOTE: Mark hoses for correct installation.

IMPORTANT

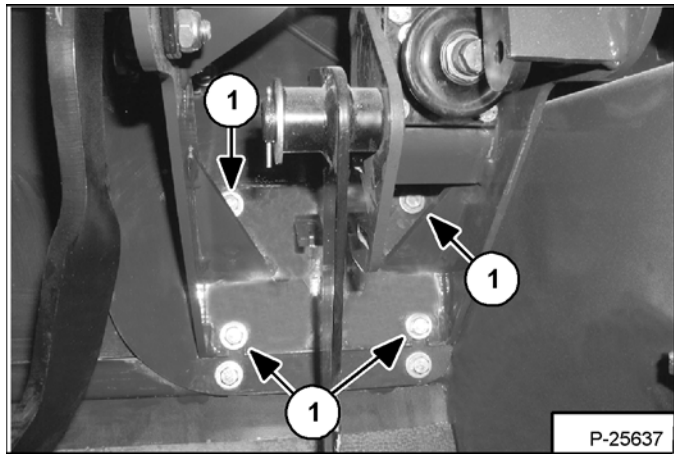
When repairing hydrostatic and hydraulic systems, clean the work area before disassembly and keep all parts clean. Always use caps and plugs on hoses, tubelines and ports to keep dirt out. Dirt can quickly damage the system.

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BRAKE VALVE (CONT'D)

Removal and Installation (Cont'd)

Figure 20-120-5

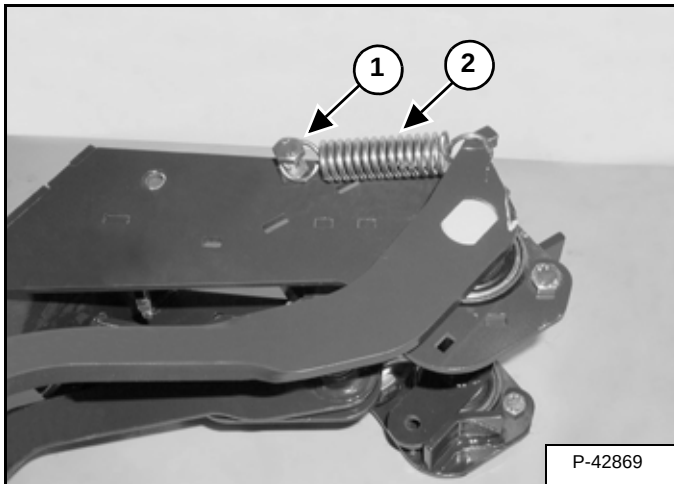


Remove the mounting bolts (Item 1) [Figure 20-120-5].

Remove the pedal assembly.

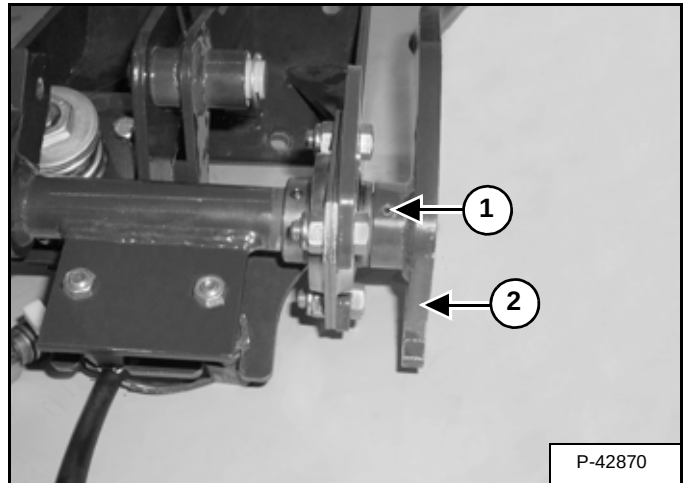
Disassembly And Assembly

Figure 20-120-6



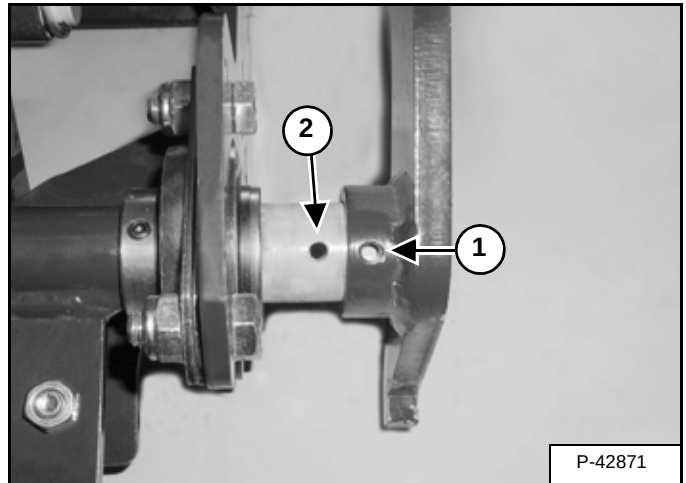
Remove the bolt (Item 1) and spring (Item 2) [Figure 20-120-6].

Figure 20-120-7



Remove the roll pin (Item 1) and pedal (Item 2) [Figure 20-120-7].

Figure 20-120-8

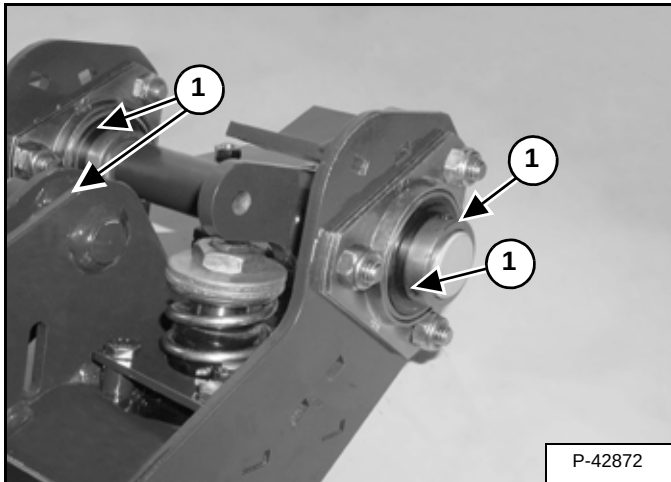


Assembly: Align the hole (Item 1) in the pedal with the hole (Item 2) [Figure 20-120-8] in the shaft.

BRAKE VALVE (CONT'D)

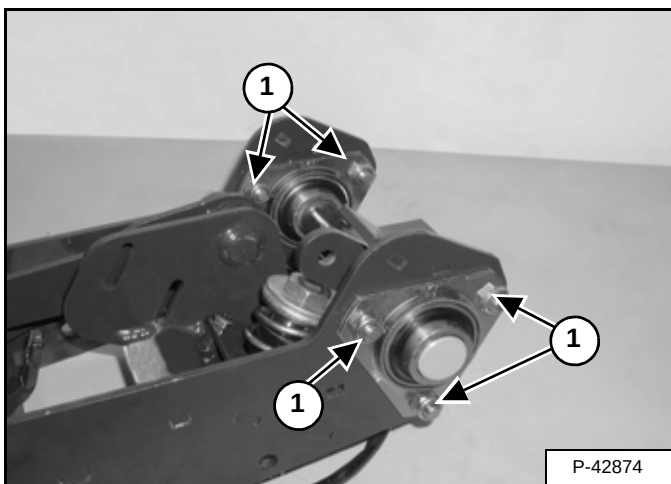
Disassembly And Assembly (Cont'd)

Figure 20-120-9



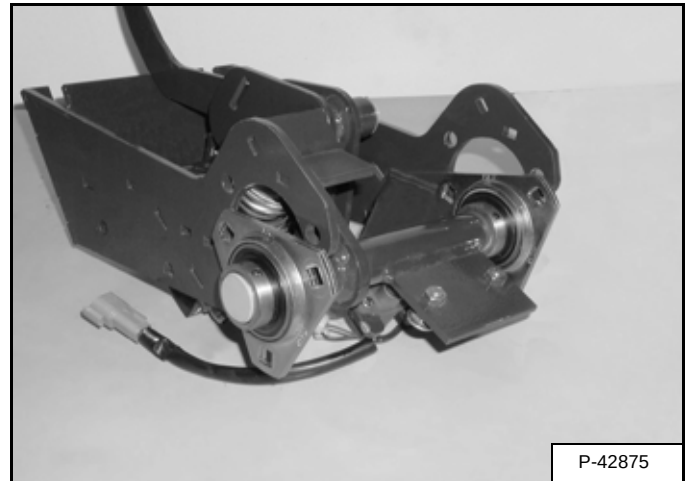
Loosen the two set screws (Item 1) [Figure 20-120-9] on the two bearings.

Figure 20-120-10



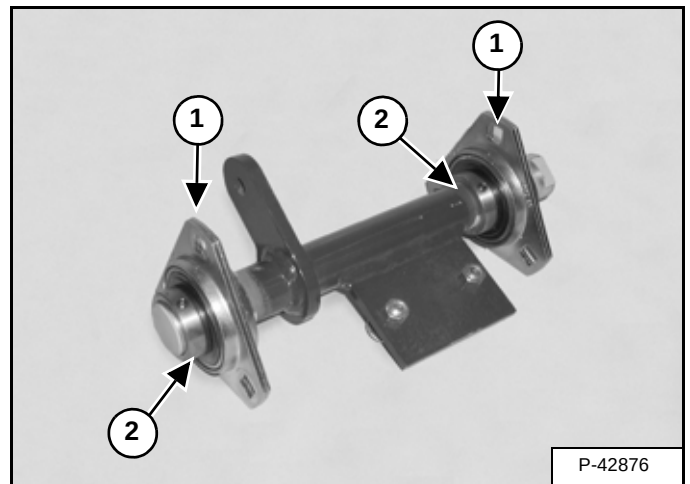
Remove the three bolts (Item 1) [Figure 20-120-10] from both bearing flanges.

Figure 20-120-11



Remove the shaft and bearing assembly [Figure 20-120-11].

Figure 20-120-12

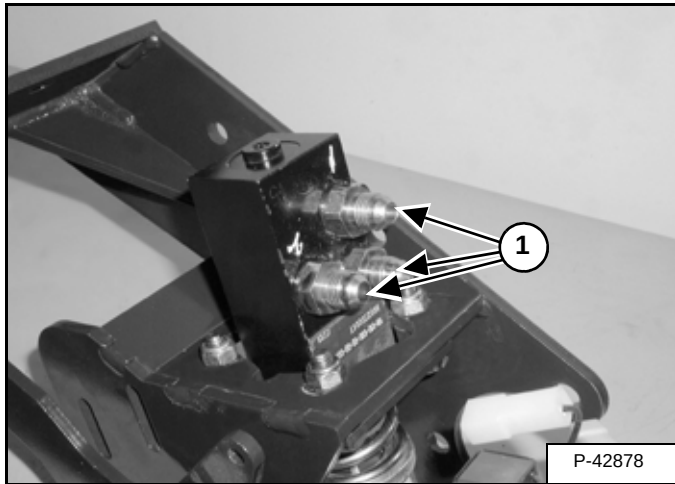


Remove the flanges (Item 1) and bearings (Item 2) [Figure 20-120-12].

BRAKE VALVE (CONT'D)

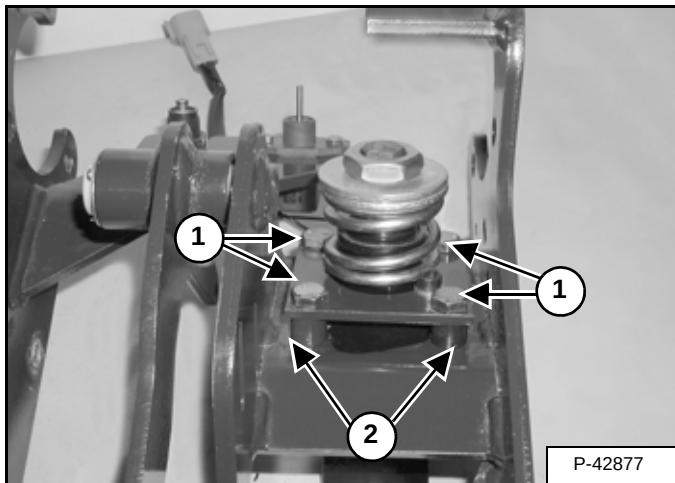
Disassembly And Assembly (Cont'd)

Figure 20-120-13



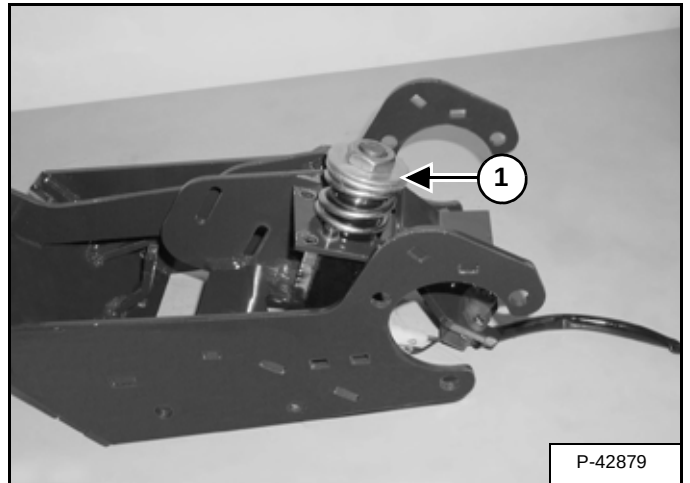
Remove the three fittings (Item 1) [Figure 20-120-13] from the brake valve.

Figure 20-120-14



Remove the four bolts (Item 1) spacers (Item 2) [Figure 20-120-14] and nuts from the brake valve.

Figure 20-120-15



Remove the brake valve (Item 1) [Figure 20-120-15]

GEAR PUMP

Not Available At Time Of Printing

FAN MOTOR

Not Available At Time Of Printing

HYDRAULIC RESERVOIR

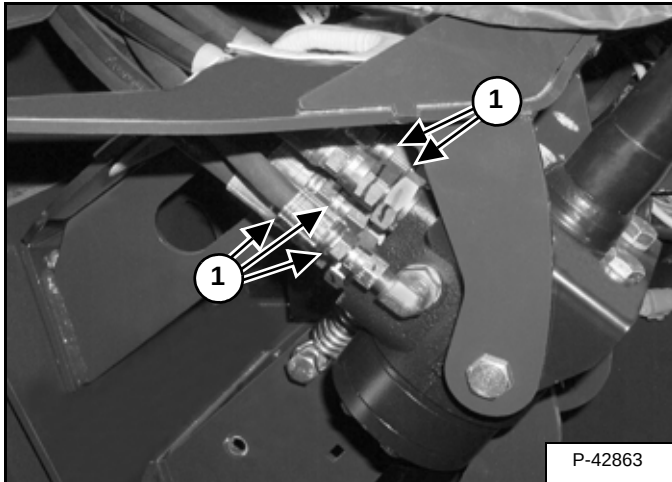
Not Available At Time Of Printing

STEERING VALVE

Removal And Installation

Remove the dash cover/column cover. (See Contents Page 50-01.)

Figure 20-160-1



Remove the five hoses (Item 1) [Figure 20-160-1] from the steering valve.

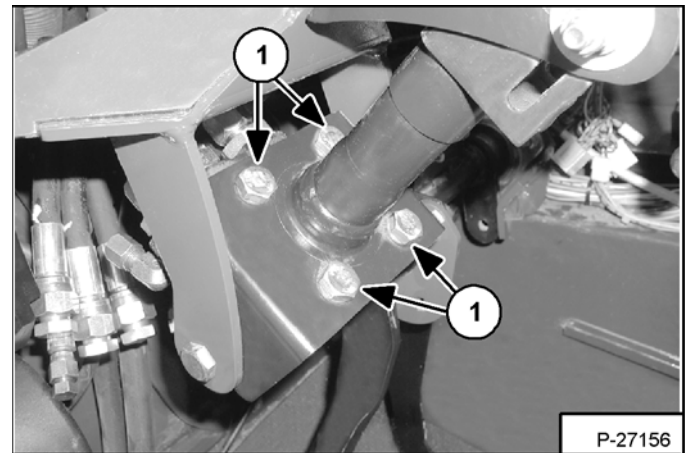
NOTE: Mark hoses for correct installation.

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 20-160-2

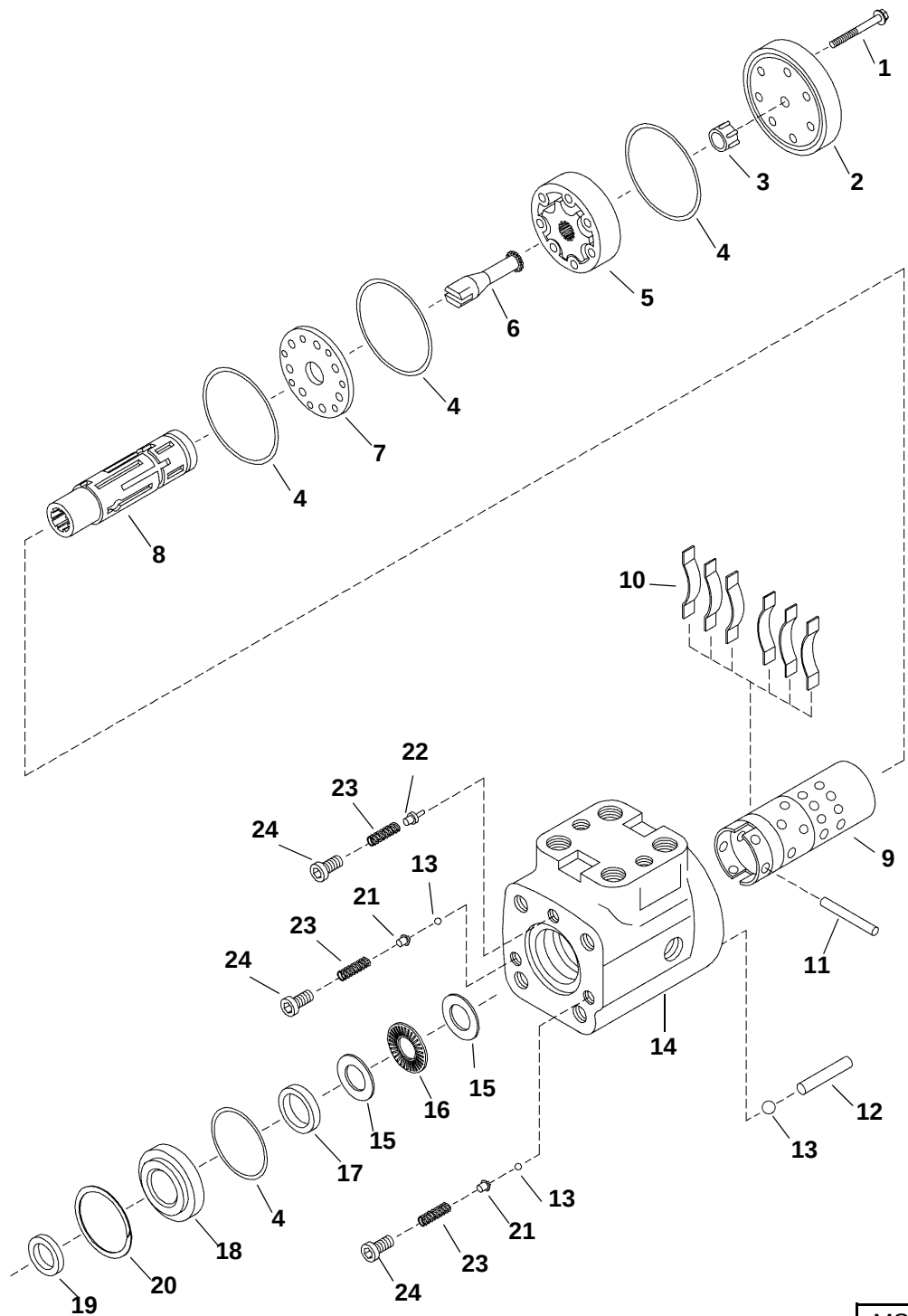


Remove the four bolts (Item 1) [Figure 20-160-2] and remove the steering valve.

STEERING VALVE (CONT'D)

Parts Identification

1. Bolt
2. End Cap
3. Spacer Gear
4. O-ring
5. Geroler Assembly
6. Drive Shaft
7. Valve Plate
8. Spool
9. Sleeve
10. Springs
11. Drive Pin
12. Pin
13. Check Ball
14. Housing
15. Thrust Washer
16. Thrust Bearing
17. Quad Ring
18. Seal Housing
19. Seal
20. Retainer Ring
21. Ball Seat
22. Poppet
23. Spring
24. Plug



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STEERING VALVE (CONT'D)

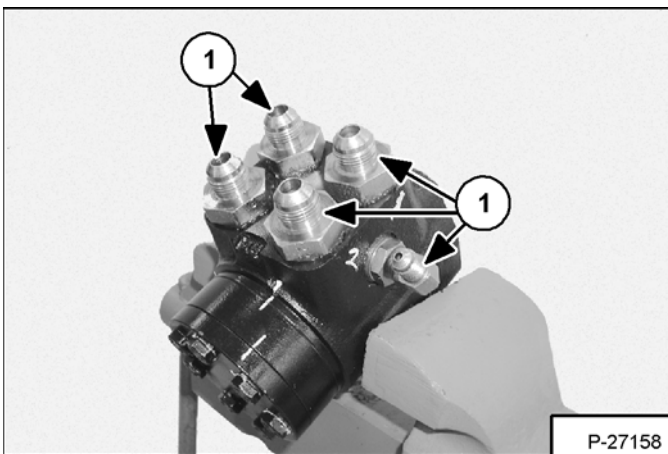
Disassembly

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.

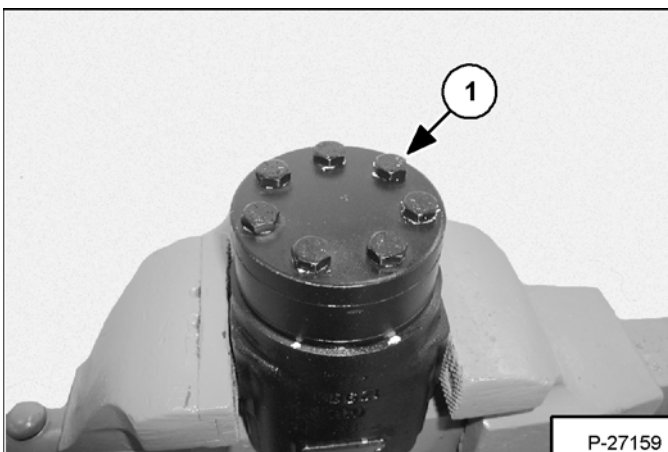
I-2003-0888

Figure 20-160-3



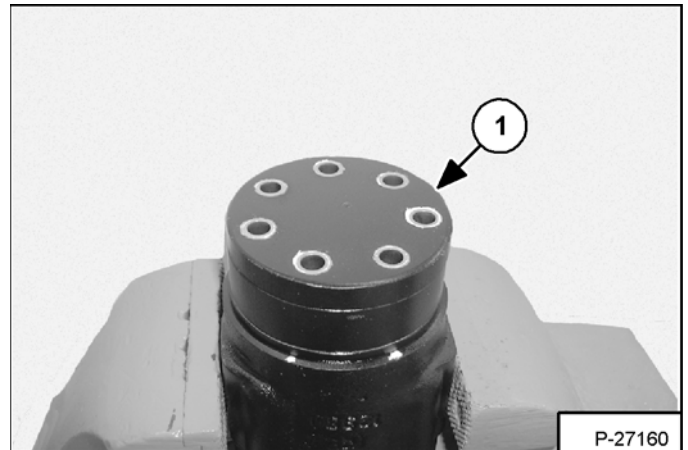
Remove the fittings (Item 1) from the steering valve [Figure 20-160-3].

Figure 20-160-4



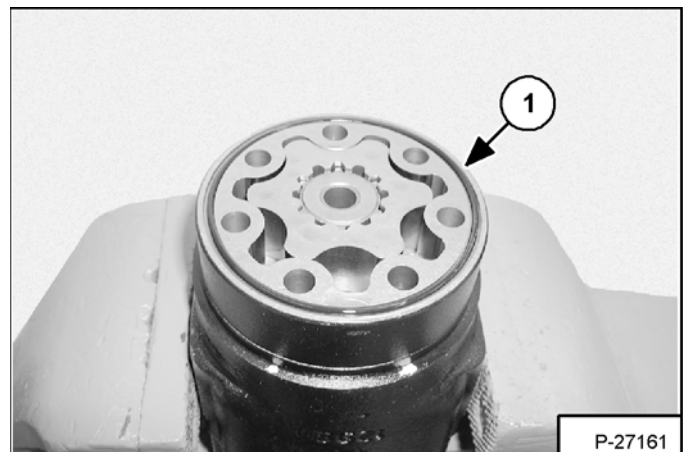
Remove the seven end cap bolts (Item 1) [Figure 20-160-4].

Figure 20-160-5



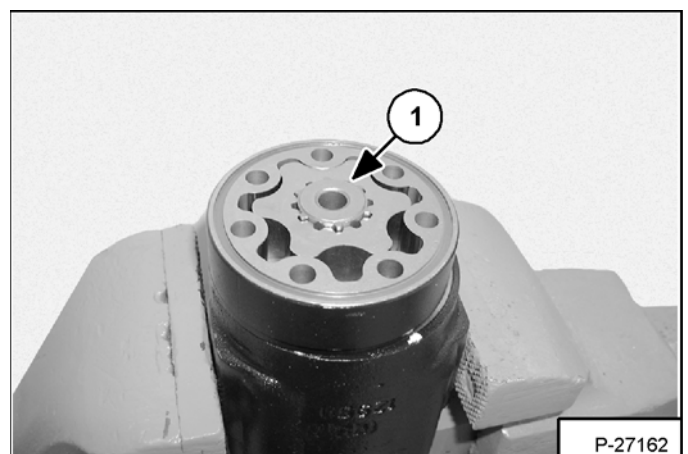
Remove the end cap (Item 1) [Figure 20-160-5].

Figure 20-160-6



Remove and discard the O-ring (Item 1) [Figure 20-160-6].

Figure 20-160-7

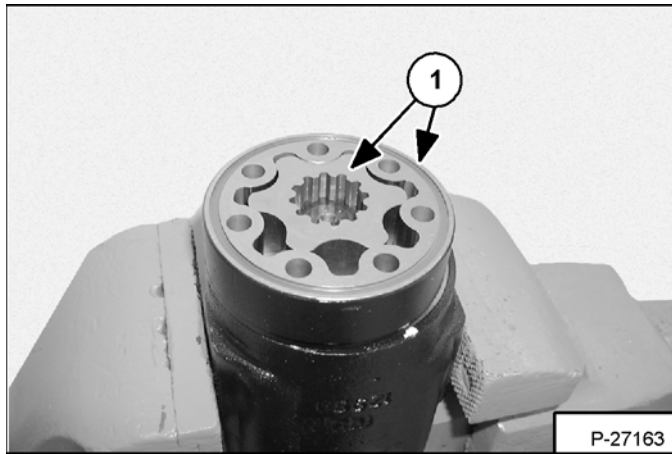


Remove the spacer gear (Item 1) [Figure 20-160-7].

STEERING VALVE (CONT'D)

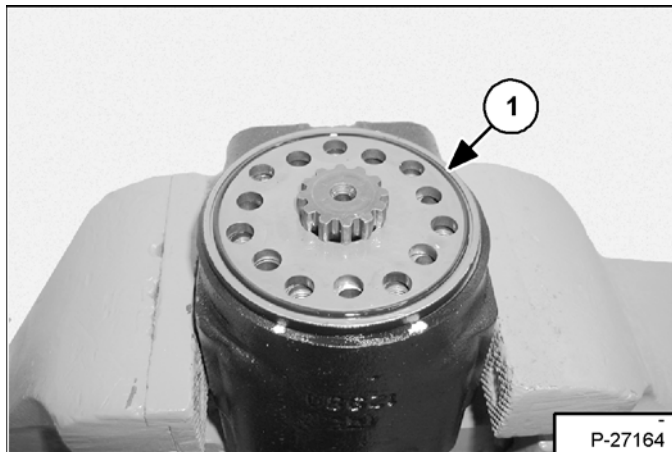
Disassembly (Cont'd)

Figure 20-160-8



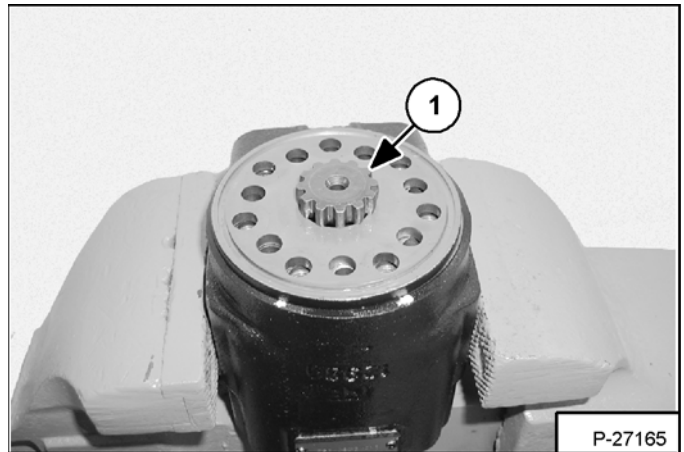
Remove the geroler assembly (Item 1) [Figure 20-160-8].

Figure 20-160-9



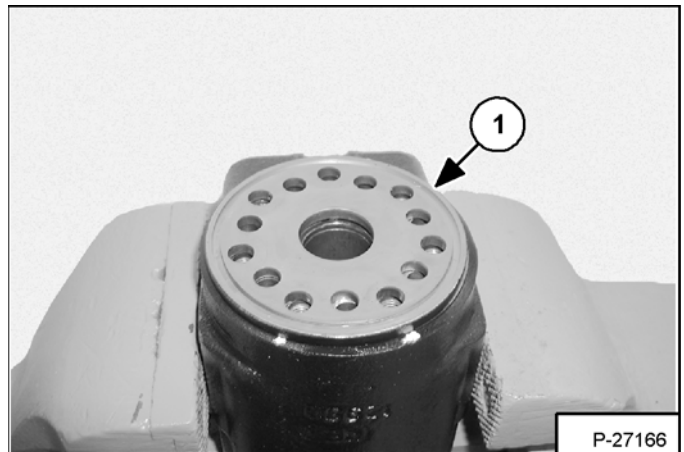
Remove the O-ring (Item 1) [Figure 20-160-9] from the valve plate.

Figure 20-160-10



Remove the drive shaft (Item 1) [Figure 20-160-10].

Figure 20-160-11

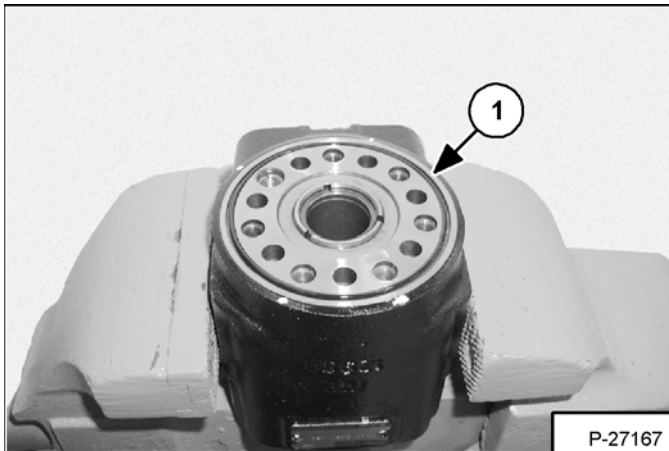


Remove the valve plate (Item 1) [Figure 20-160-11].

STEERING VALVE (CONT'D)

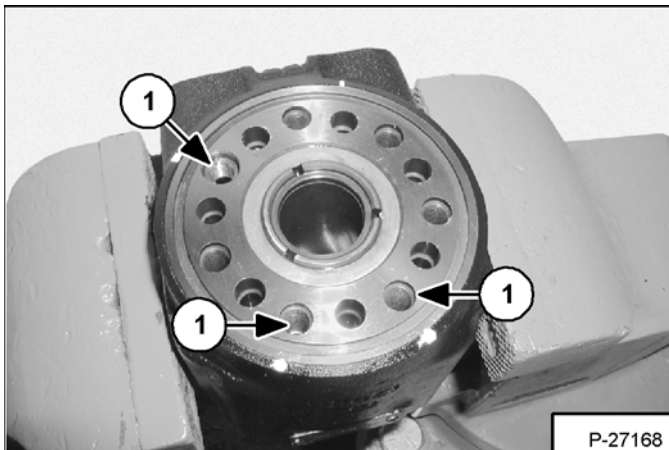
Disassembly (Cont'd)

Figure 20-160-12



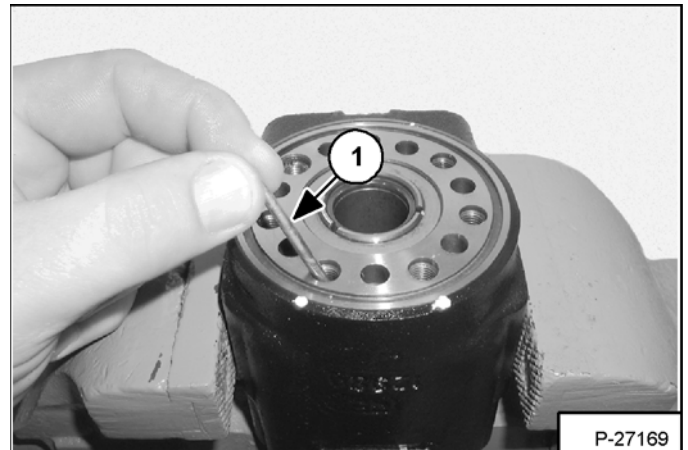
Remove the O-ring (Item 1) [Figure 20-160-12] from the housing.

Figure 20-160-13



Mark the location of the three ports (Item 1) [Figure 20-160-13] for correct assembly.

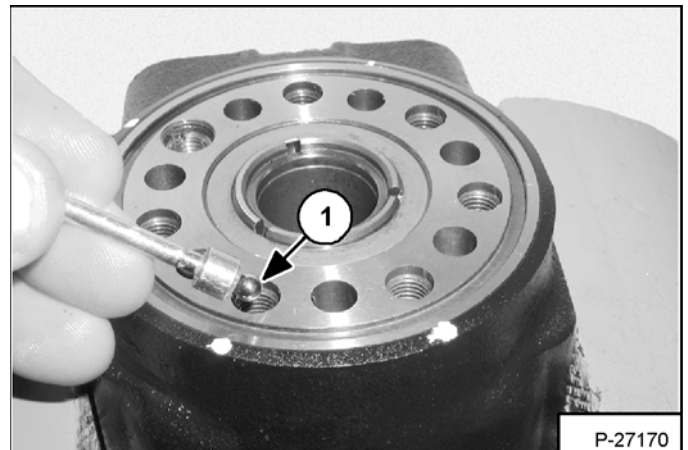
Figure 20-160-14



Remove the three pins (Item 1) [Figure 20-160-14] from each port.

NOTE: Record the location of each pin for correct assembly.

Figure 20-160-15



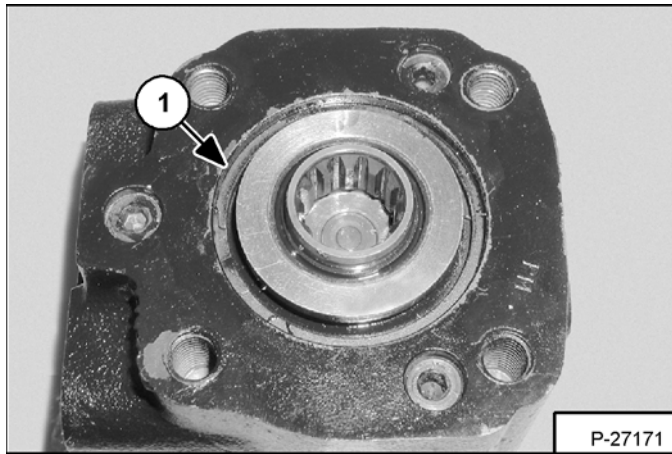
Remove the three check balls (Item 1) [Figure 20-160-15] from each port.

NOTE: Record the location of each check ball for correct assembly.

STEERING VALVE (CONT'D)

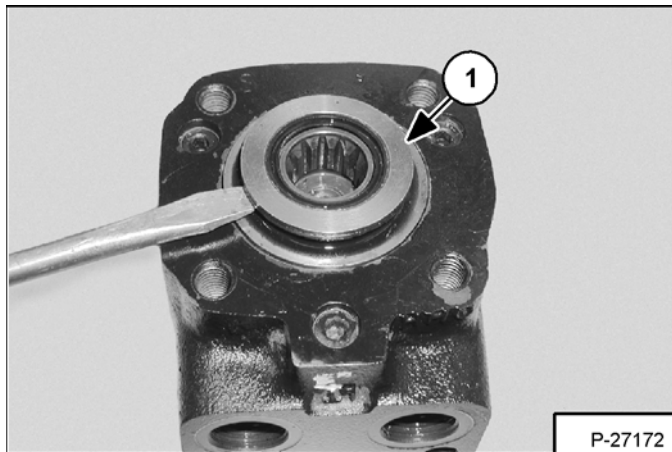
Disassembly (Cont'd)

Figure 20-160-16



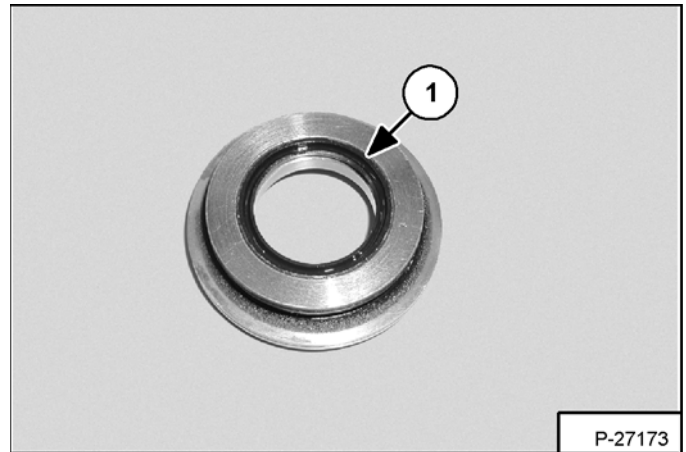
Remove the seal retainer ring (Item 1) [Figure 20-160-16].

Figure 20-160-17



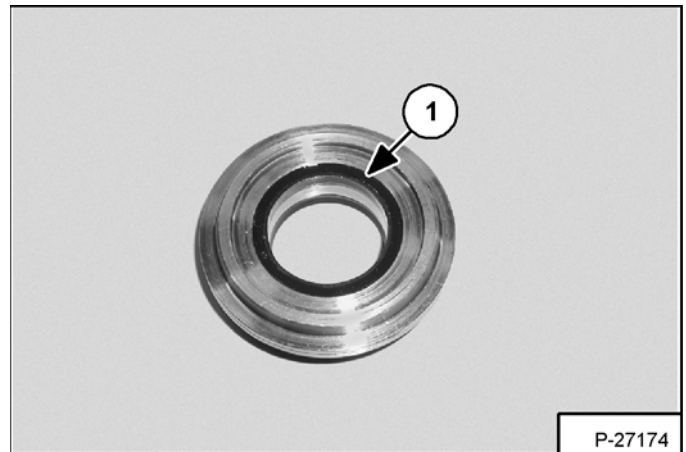
Remove the seal housing (Item 1) [Figure 20-160-17] by prying upward.

Figure 20-160-18



Remove and discard the seal (Item 1) [Figure 20-160-18].

Figure 20-160-19

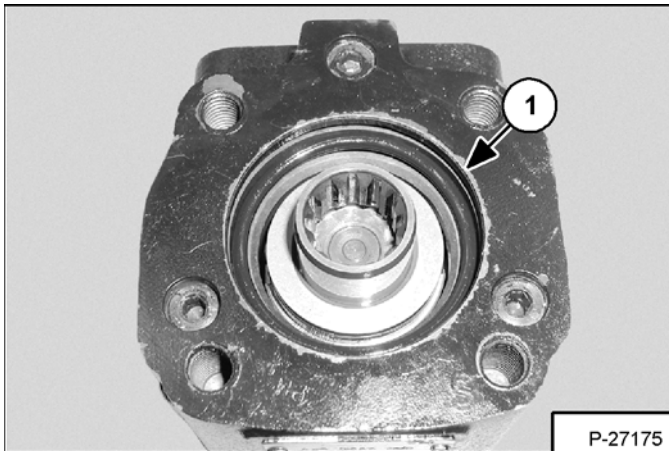


Remove and discard the quad ring seal (Item 1) [Figure 20-160-19].

STEERING VALVE (CONT'D)

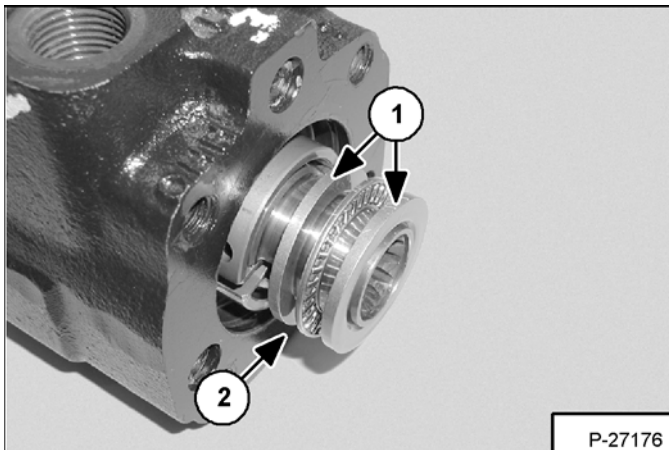
Disassembly (Cont'd)

Figure 20-160-20



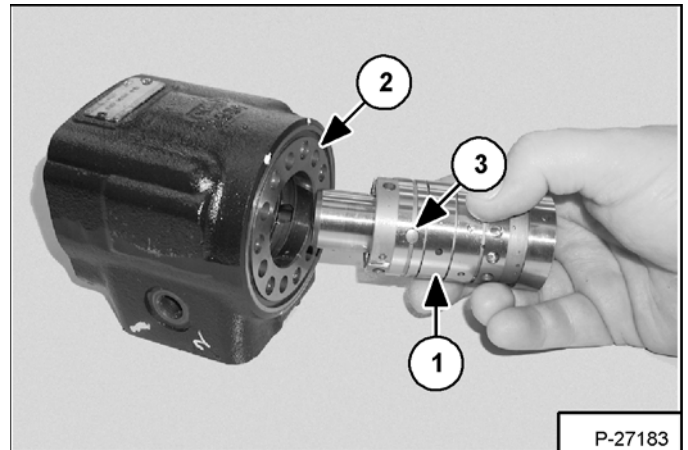
Remove and discard the O-ring (Item 1) [Figure 20-160-20] from the housing.

Figure 20-160-21



Remove the two thrust washers (Item 1) and thrust bearing (Item 2) [Figure 20-160-21] from the spool.

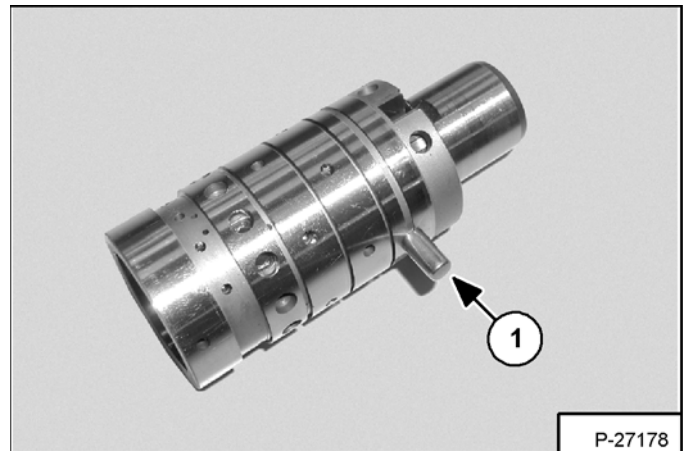
Figure 20-160-22



Remove the control spool/sleeve assembly (Item 1) from the metering end of the housing (Item 2) [Figure 20-160-22].

NOTE: When removing the spool, keep the drive pin (Item 3) [Figure 20-160-22] horizontal. If the pin becomes vertical, it may drop from the spool and get caught in an oil passage inside the housing.

Figure 20-160-23

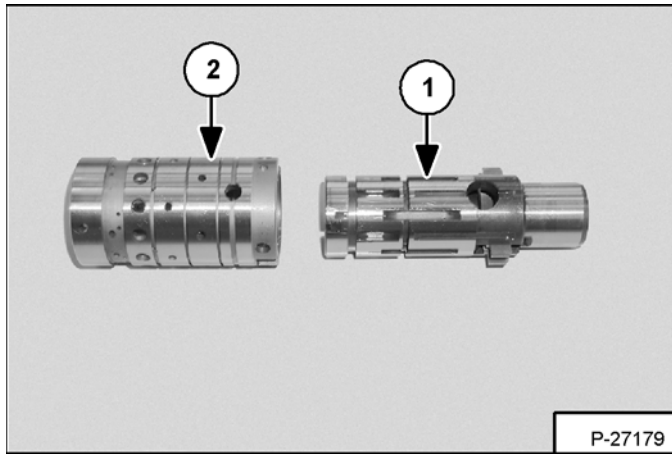


Remove the drive pin (Item 1) [Figure 20-160-23].

STEERING VALVE (CONT'D)

Disassembly (Cont'd)

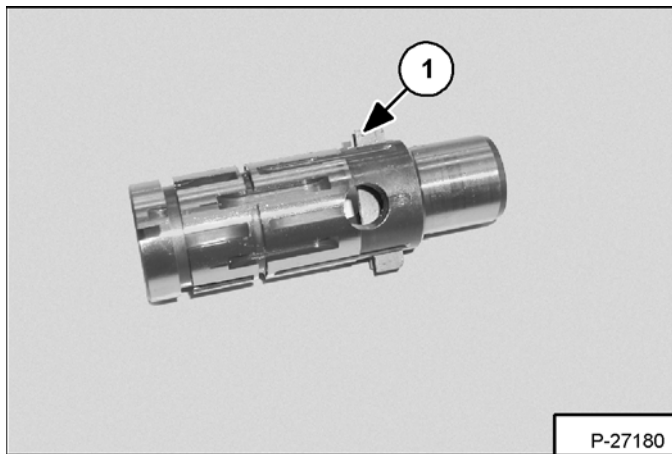
Figure 20-160-24



Remove the spool (Item 1) from the sleeve (Item 2) [Figure 20-160-24].

NOTE: If the spool and sleeve will not slide or rotate within each other freely or in the housing, they must be replaced.

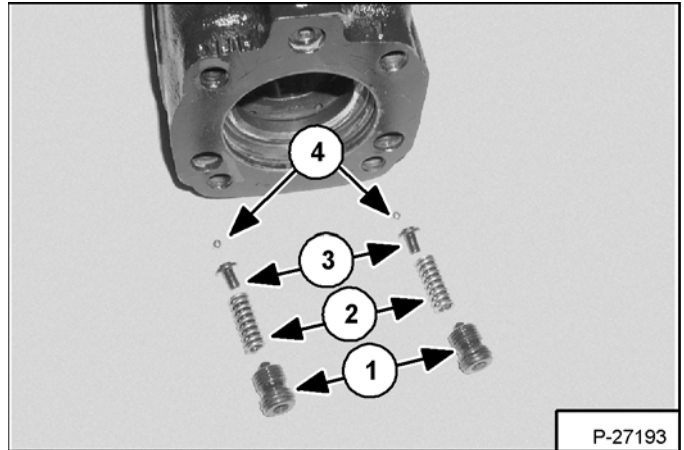
Figure 20-160-25



Remove the springs (Item 1) [Figure 20-160-25] from the spool.

NOTE: There are six springs positioned three per side and back to back.

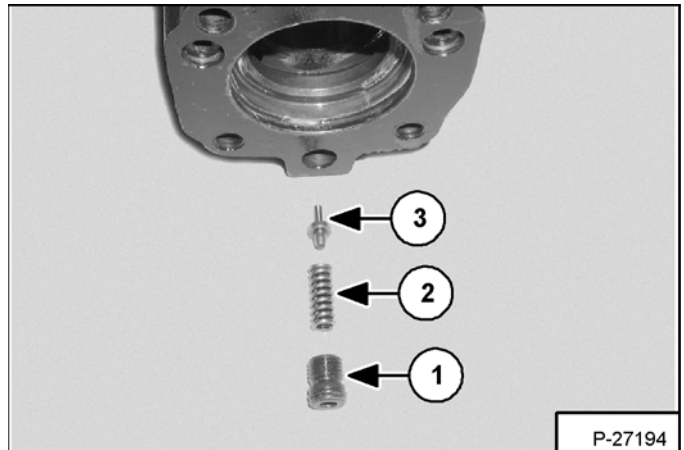
Figure 20-160-26



Remove the two check valve plugs (Item 1), springs (Item 2), ball seat (Item 3) and check ball (Item 4) [Figure 20-160-26] from the housing.

NOTE: Record the location of each check ball assembly for correct assembly.

Figure 20-160-27



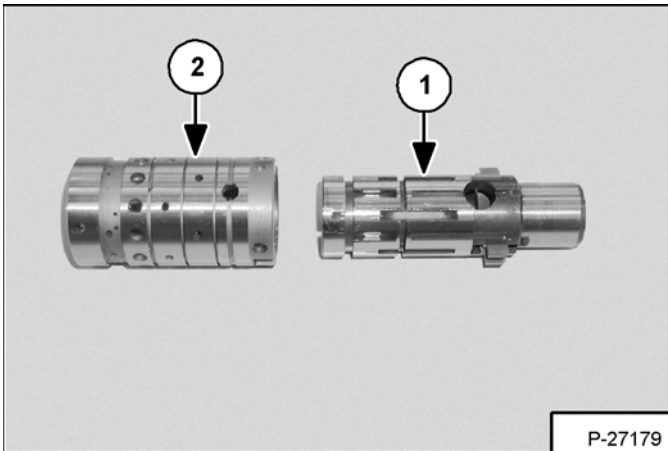
Remove the check valve plug (Item 1), spring (Item 2) and poppet (Item 3) [Figure 20-160-27] from the housing.

NOTE: Record the location of the port for correct assembly.

STEERING VALVE (CONT'D)

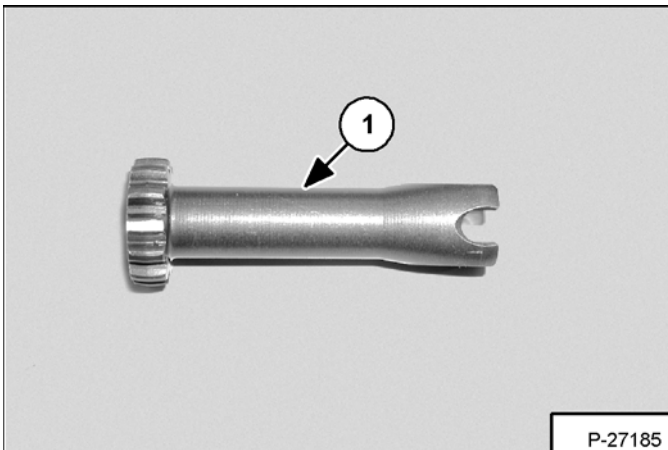
Inspection

Figure 20-160-28



Inspect the spool (Item 1) and sleeve (Item 2) [Figure 20-160-28] for any damage or wear. Replace as needed.

Figure 20-160-29



Inspect the drive shaft (Item 1) [Figure 20-160-29] for damage or wear.

Assembly

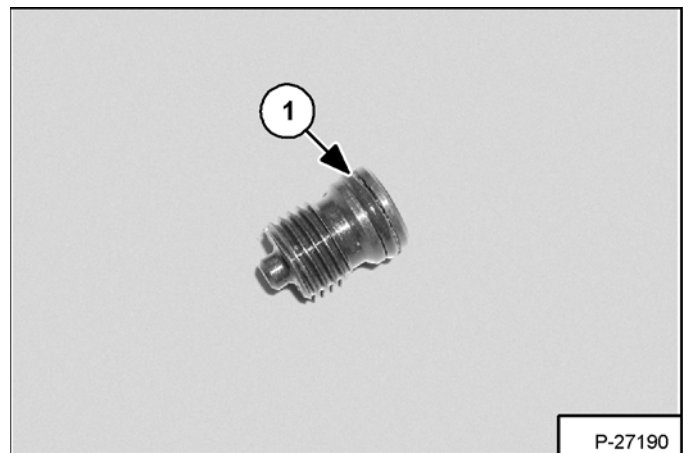
IMPORTANT

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

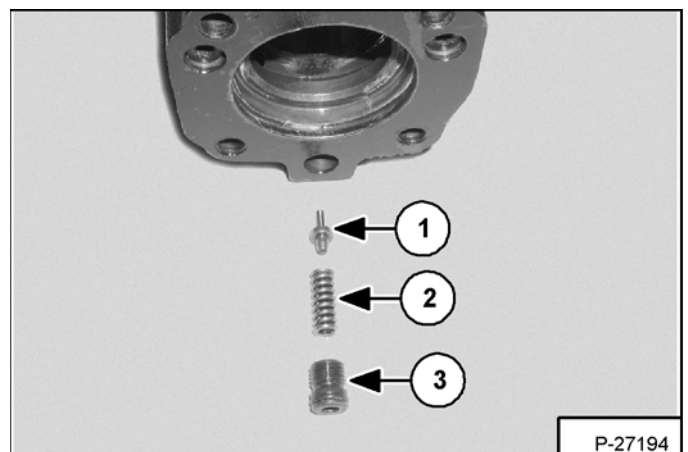
Prior to assembly, clean and lightly oil all parts.

Figure 20-160-30



Install a new O-ring (Item 1) [Figure 20-160-30] on the three check valve plugs.

Figure 20-160-31

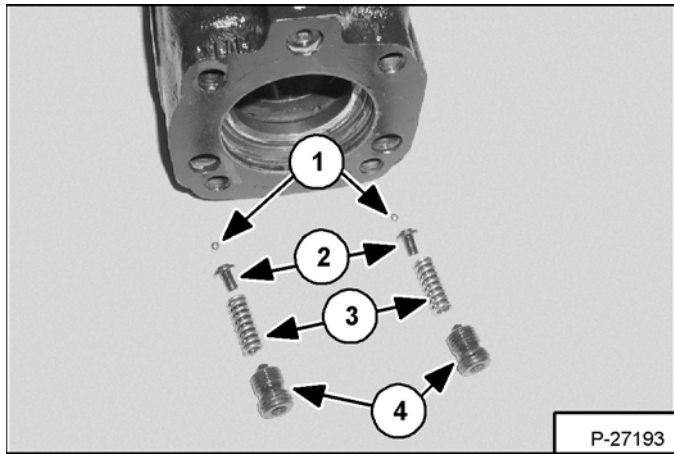


Install the poppet (Item 1), spring (Item 2) and plug (Item 3) [Figure 20-160-31] into the correct port marked earlier.

STEERING VALVE (CONT'D)

Assembly (Cont'd)

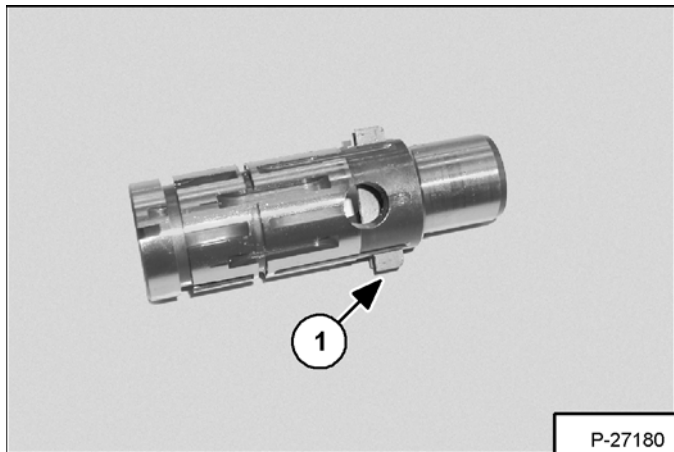
Figure 20-160-32



Install the check ball (Item 1), ball seat (Item 2), spring (Item 3) and plug (Item 4) [Figure 20-160-32] into the correct port marked earlier.

Turn each of the port plugs (Item 3) [Figure 20-160-31] and (Item 4) [Figure 20-160-32] in the housing until they are tight, then back each of them out 1-1/2 turns.

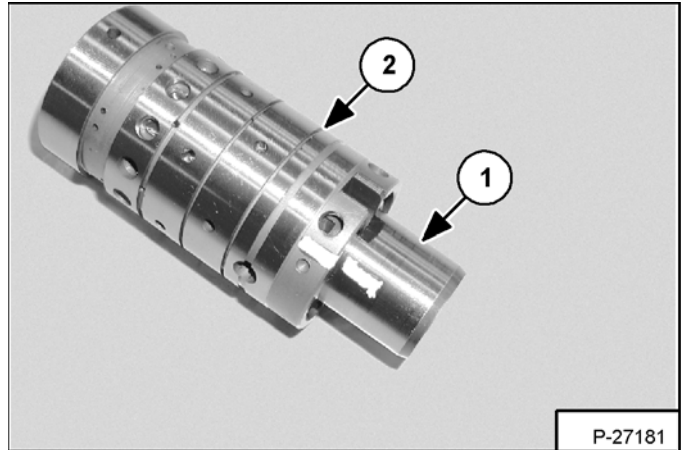
Figure 20-160-33



Install the springs (Item 1) [Figure 20-160-33] into the spool.

NOTE: There are six springs and should be positioned three per side and back to back.

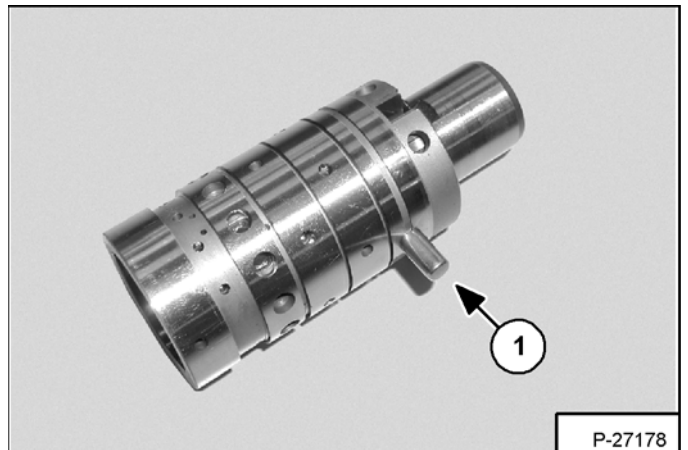
Figure 20-160-34



Install the spool (Item 1) into the sleeve (Item 2) [Figure 20-160-34].

NOTE: The spool should turn freely inside the sleeve.

Figure 20-160-35

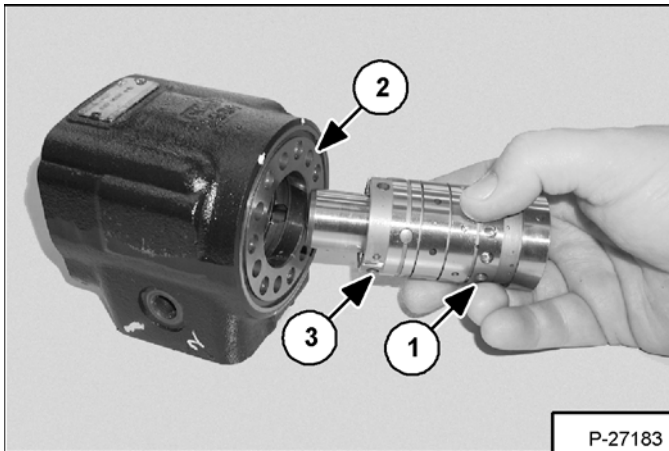


Install the drive pin (Item 1) [Figure 20-160-35].

STEERING VALVE (CONT'D)

Assembly (Cont'd)

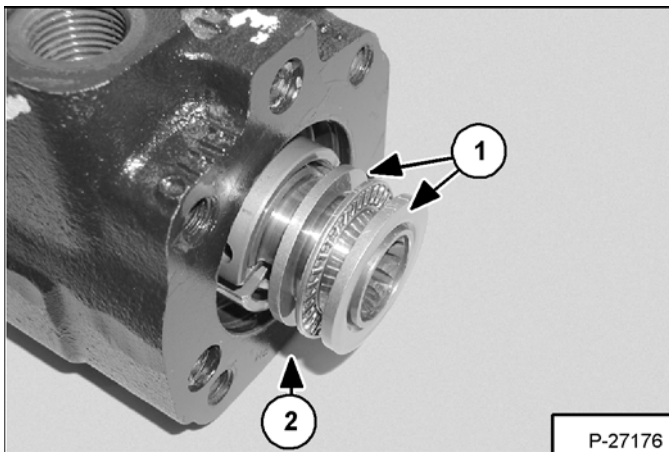
Figure 20-160-36



Install the control spool/sleeve assembly (Item 1) into the metering end of the housing (Item 2) [Figure 20-160-36].

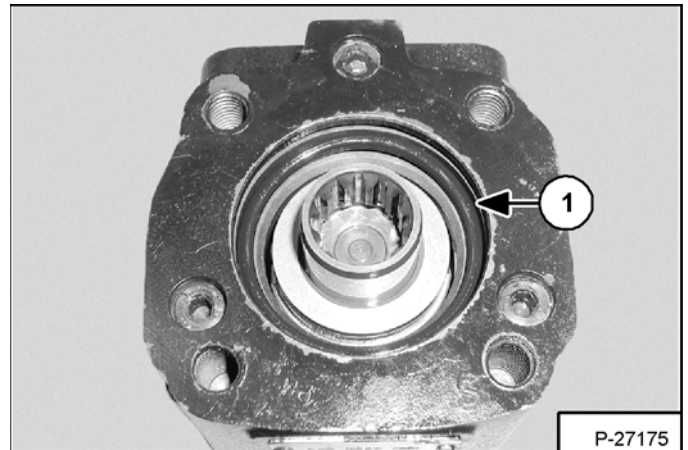
NOTE: When installing the spool assembly keep the drive pin (Item 3) [Figure 20-160-36] horizontal. If the pin becomes vertical it may drop from the spool and get caught in an oil passage inside the housing.

Figure 20-160-37



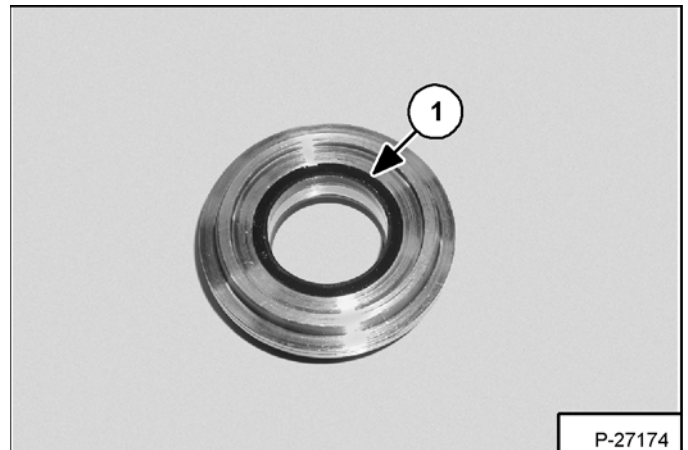
Install the two thrust washers (Item 1) and thrust bearing (Item 2) [Figure 20-160-37] on the spool.

Figure 20-160-38



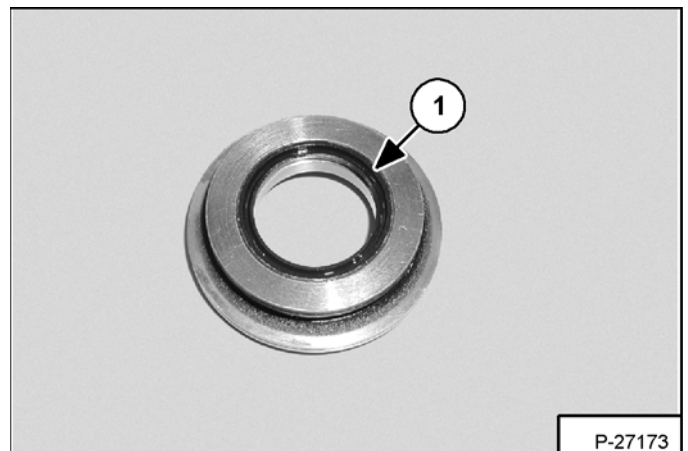
Install a new O-ring (Item 1) [Figure 20-160-38] into the housing.

Figure 20-160-39



Install a new quad ring seal (Item 1) [Figure 20-160-39].

Figure 20-160-40

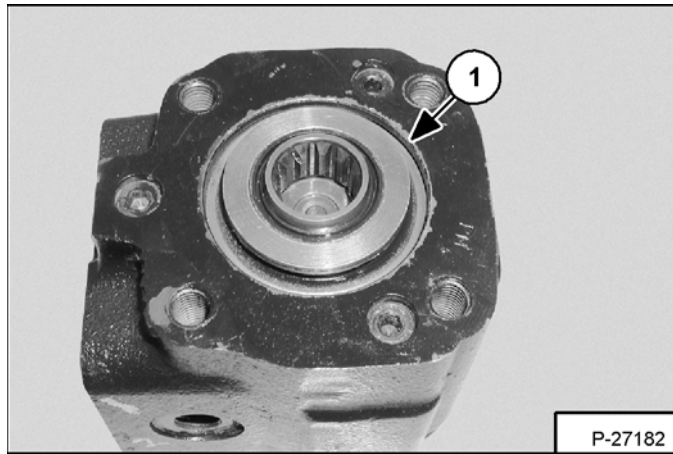


Install a new seal (Item 1) [Figure 20-160-40].

STEERING VALVE (CONT'D)

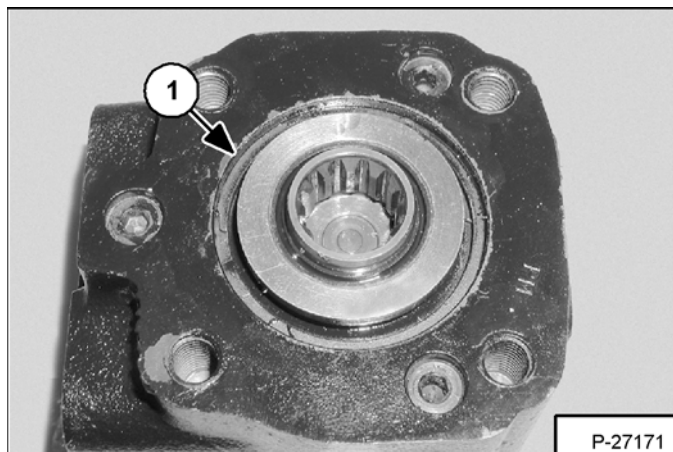
Assembly (Cont'd)

Figure 20-160-41



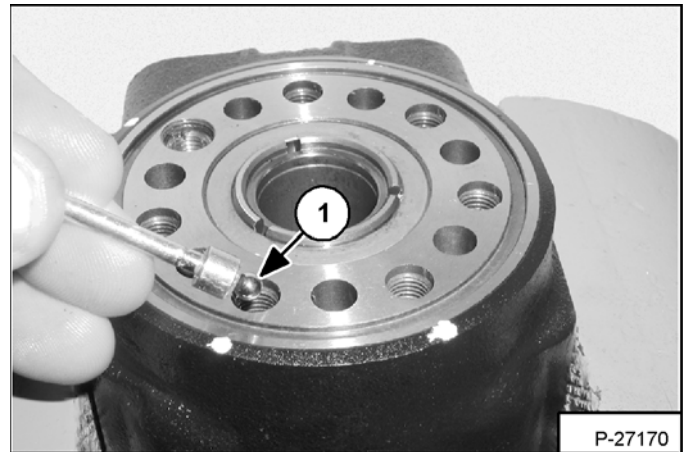
Install the seal housing (Item 1) [Figure 20-160-41].

Figure 20-160-42



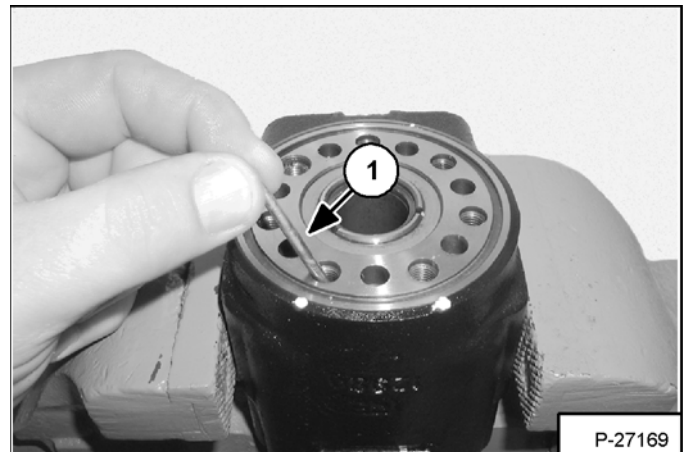
Install the seal retainer ring (Item 1) [Figure 20-160-42].

Figure 20-160-43



Install the three check balls (Item 1) [Figure 20-160-43] in their proper port (marked earlier).

Figure 20-160-44

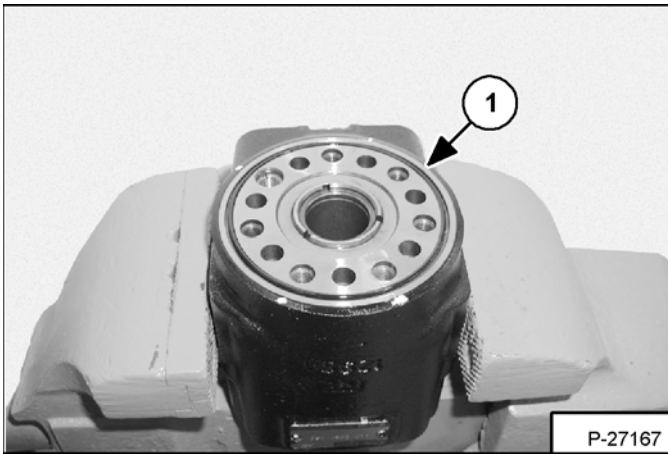


Install the three pins (Item 1) [Figure 20-160-44] in their proper port (marked earlier).

STEERING VALVE (CONT'D)

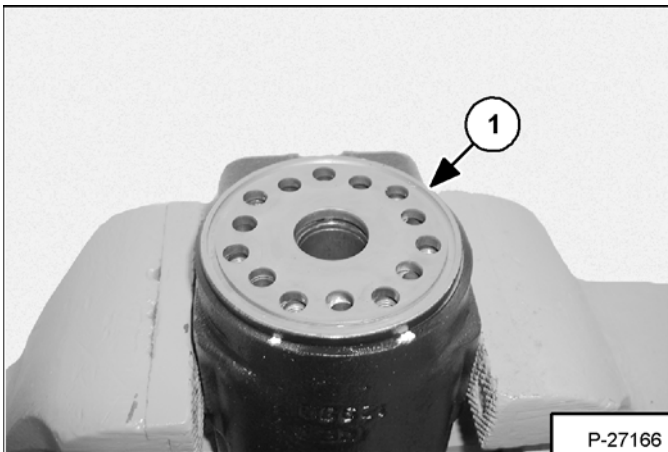
Assembly (Cont'd)

Figure 20-160-45



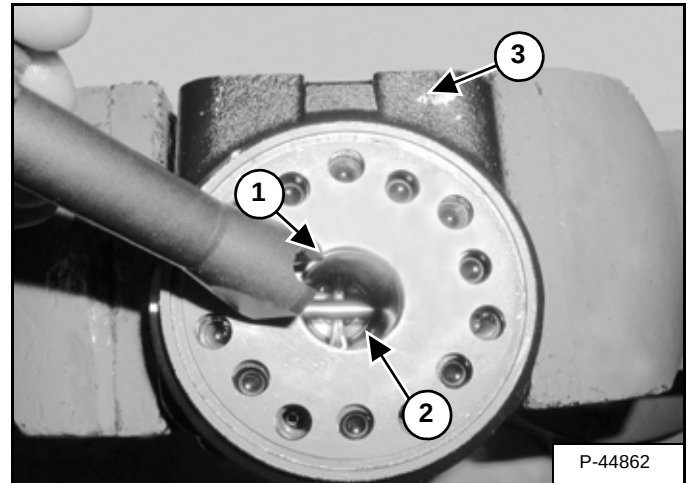
Install a new O-ring (Item 1) [Figure 20-160-45] into the housing groove.

Figure 20-160-46



Align and install the 14 hole valve plate (Item 1) [Figure 20-160-46] on the housing.

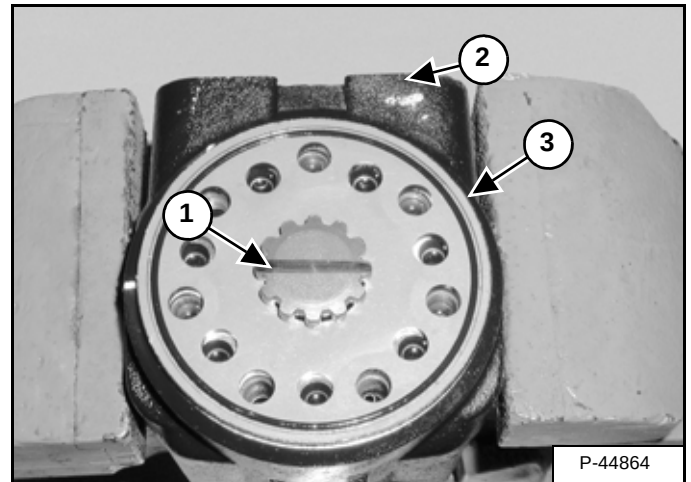
Figure 20-160-47



Align the groove (Item 1) in the drive shaft with the drive pin (Item 2) [Figure 20-160-47] and install the drive shaft. Be sure the drive shaft is engaged with the pin.

NOTE: The pin (Item 2) must be parallel with the port face of the housing (Item 3) [Figure 20-160-47].

Figure 20-160-48



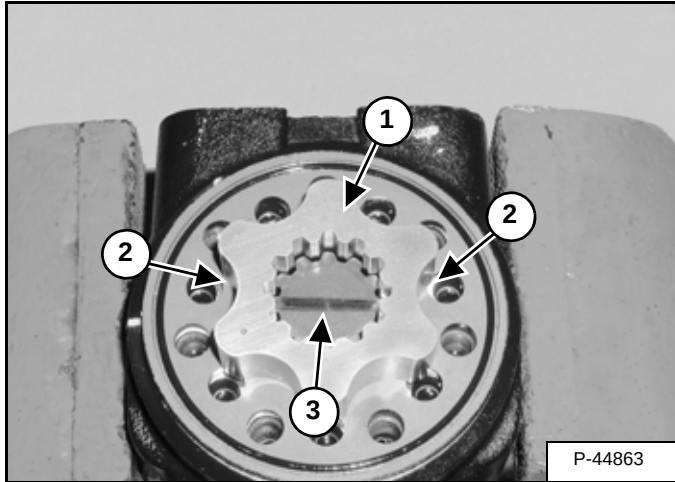
To assure proper geroler alignment, mark the top of the drive shaft (Item 1) (as shown) parallel to the port face (Item 2) [Figure 20-160-48].

Install a new O-ring (Item 3) [Figure 20-160-48] into the valve plate groove.

STEERING VALVE (CONT'D)

Assembly (Cont'd)

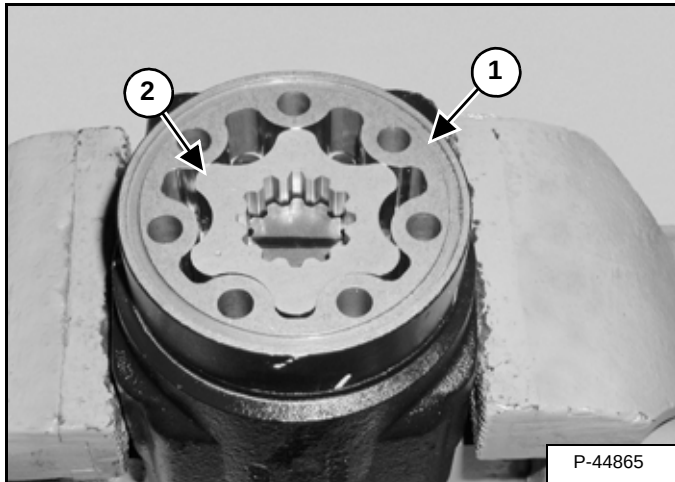
Figure 20-160-49



Install the geroler star (Item 1) [Figure 20-160-49] onto the valve plate and drive shaft.

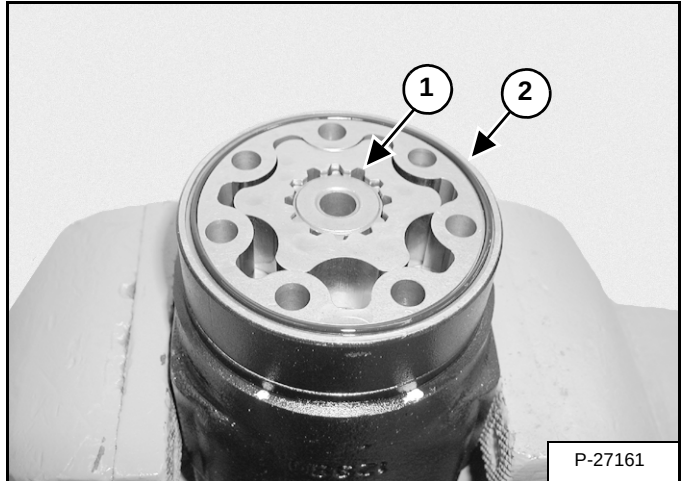
NOTE: Align the two valleys (Item 2) of the star with the mark on the drive gear (Item 3) [Figure 20-160-49].

Figure 20-160-50



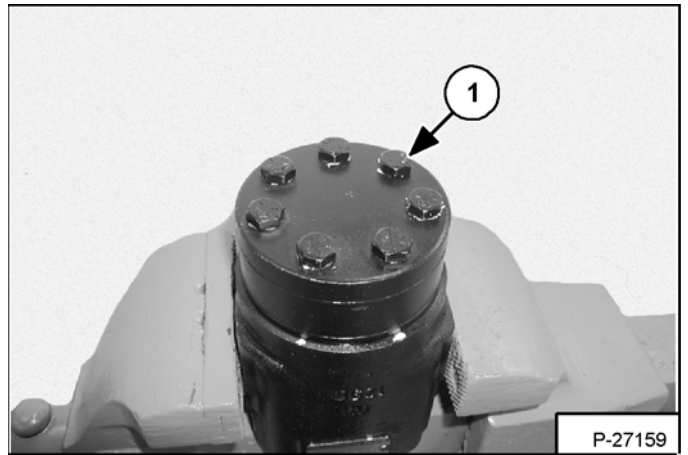
Install the outer gear (Item 1) onto the star (Item 2) [Figure 20-160-50] and align the bolt holes without disengaging the drive shaft.

Figure 20-160-51



Install the spacer gear (Item 1) and a new O-ring (Item 2) [Figure 20-160-51] into the geroler plate groove.

Figure 20-160-52

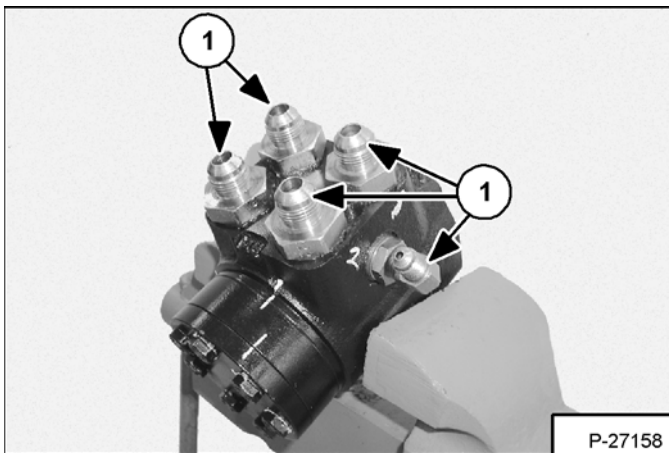


Install the end cap using the seven bolts (Item 1) [Figure 20-160-52]. Tighten to 8-13 ft.-lbs. (11-18 Nm) torque in a criss cross pattern.

STEERING VALVE (CONT'D)

Assembly (Cont'd)

Figure 20-160-53



Install the fittings (Item 1) [Figure 20-160-53] as shown.

HYDRAULIC CONTROL VALVE

Not Available At Time Of Printing

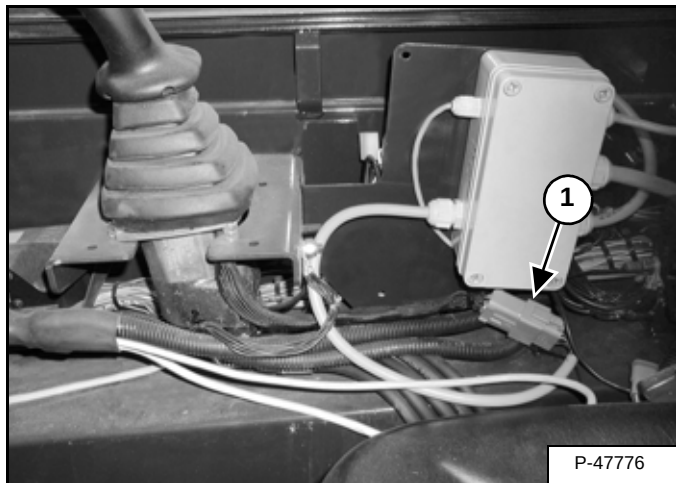
JOYSTICK

Handle Removal And Installation

Remove the dash cover/steering column cover. (See Contents Page 50-01.)

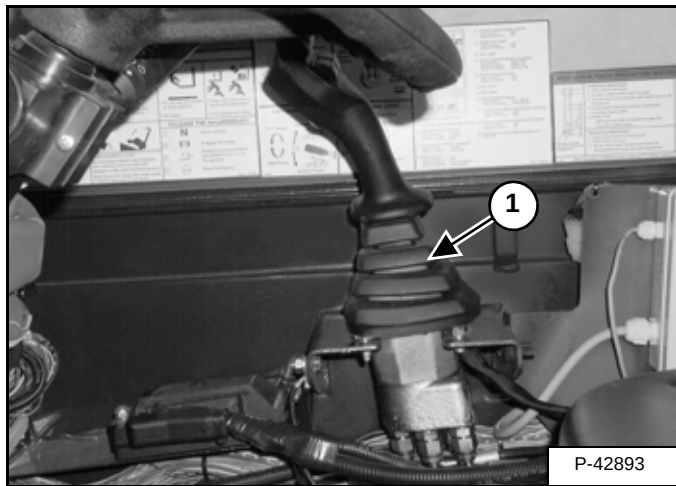
Remove the joystick panel. (See Contents page 50-01.)

Figure 20-180-1



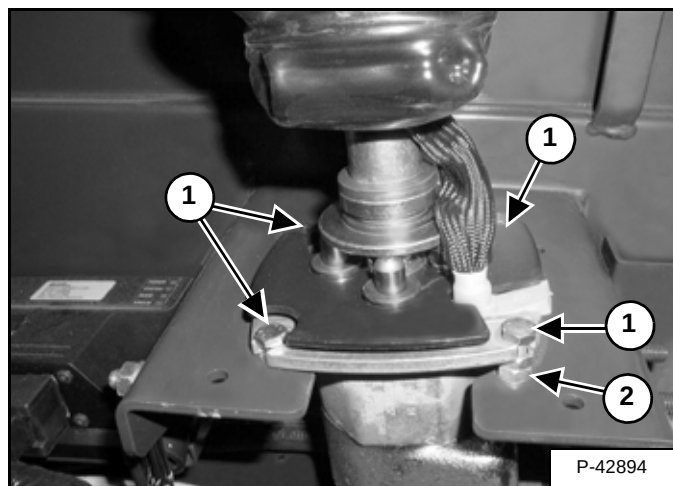
Disconnect the electrical connector (Item 1) [Figure 20-180-1].

Figure 20-180-2



Raise the dust boot (Item 1) [Figure 20-180-2].

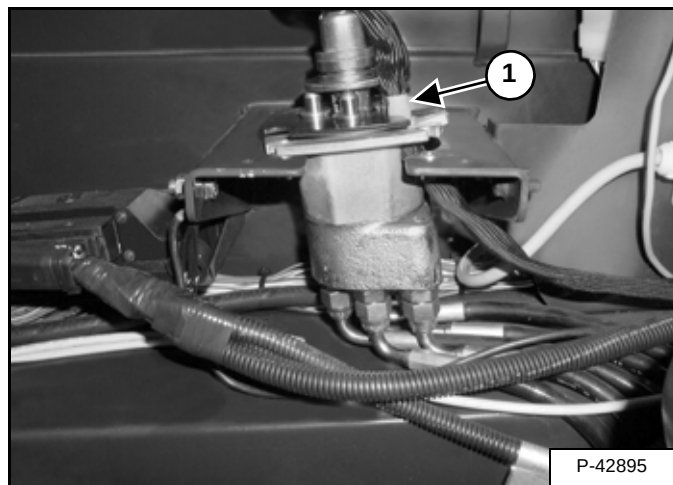
Figure 20-180-3



Remove the four mounting bolts (Item 1) and spacer nuts (Item 2) [Figure 20-180-3].

Installation: Note the location and quantity of the spacer nuts for correct installation.

Figure 20-180-4

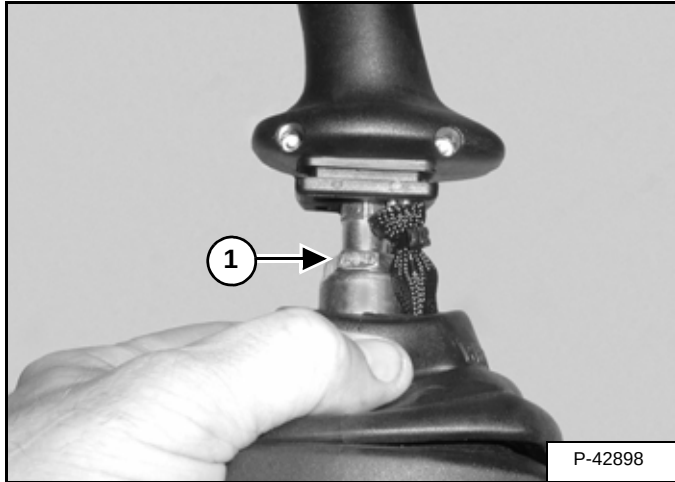


Remove the grommet and wire harness retainer (Item 1) [Figure 20-180-4] from the housing.

JOYSTICK (CONT'D)

Handle Removal And Installation (Cont'd)

Figure 20-180-5



Loosen the nut (Item 1) [Figure 20-180-5] and turn the handle counterclockwise.

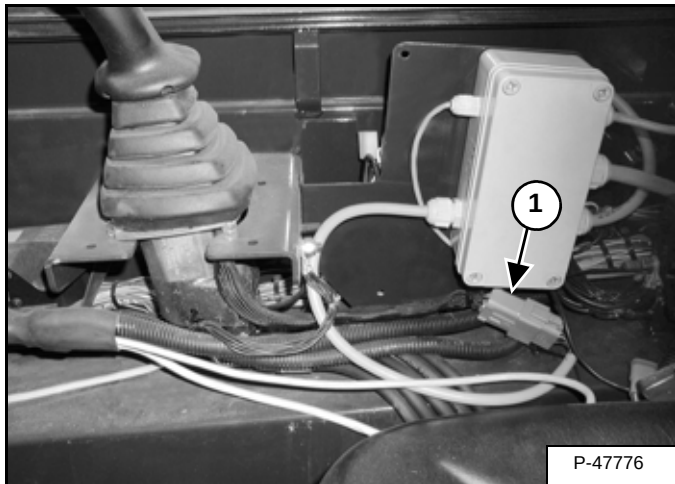
Remove the handle/harness assembly from the dust boot.

Joystick Removal And Installation

Remove the dash cover/steering column cover. (See Contents Page 50-01.)

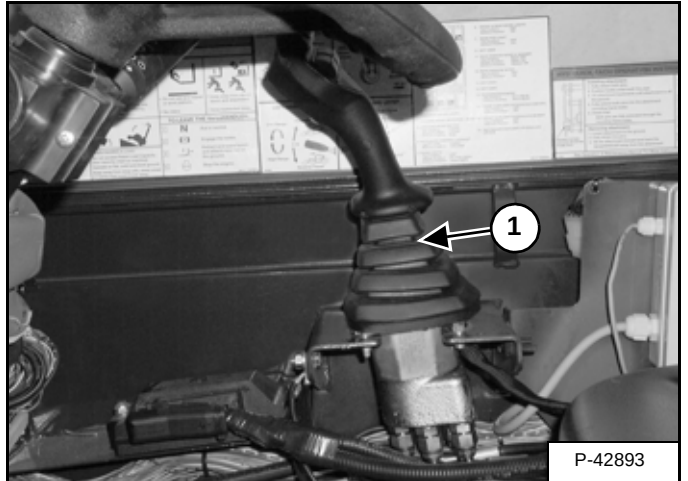
Remove the joystick panel. (See Contents page 50-01.)

Figure 20-180-6



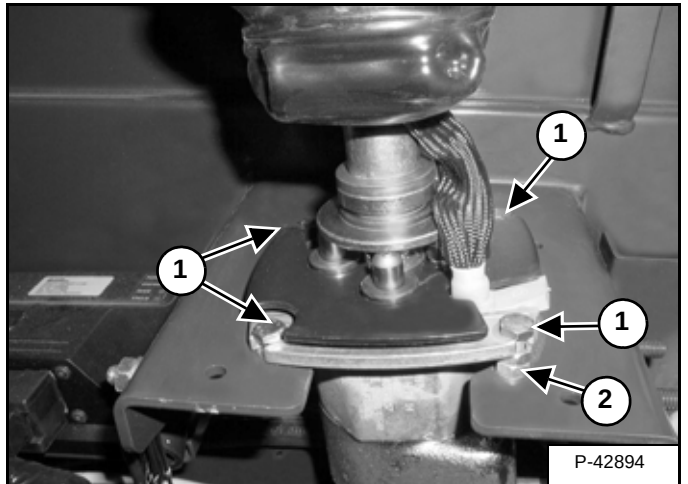
Disconnect the electrical connector (Item 1) [Figure 20-180-6].

Figure 20-180-7



Raise the dust boot (Item 1) [Figure 20-180-7].

Figure 20-180-8



Remove the four mounting bolts (Item 1) and spacer nuts (Item 2) [Figure 20-180-8].

Installation: Note the location and quantity of the spacer nuts for correct installation.

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

JOYSTICK (CONT'D)

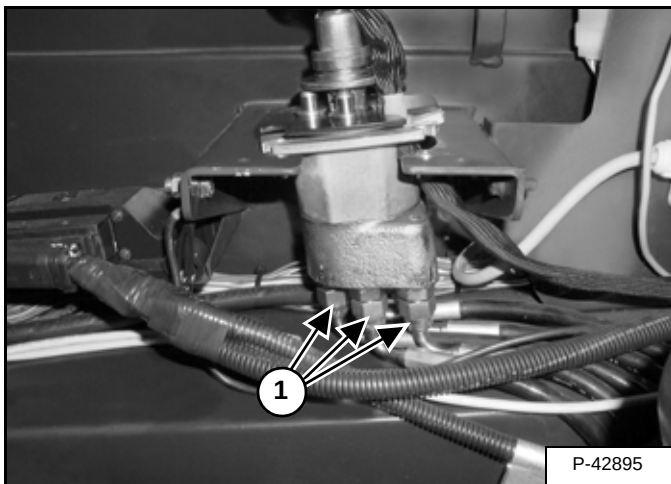
Joystick Removal And Installation (Cont'd)

IMPORTANT

When making repairs on hydraulic system, clean the work area before disassemble 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-2056-0793

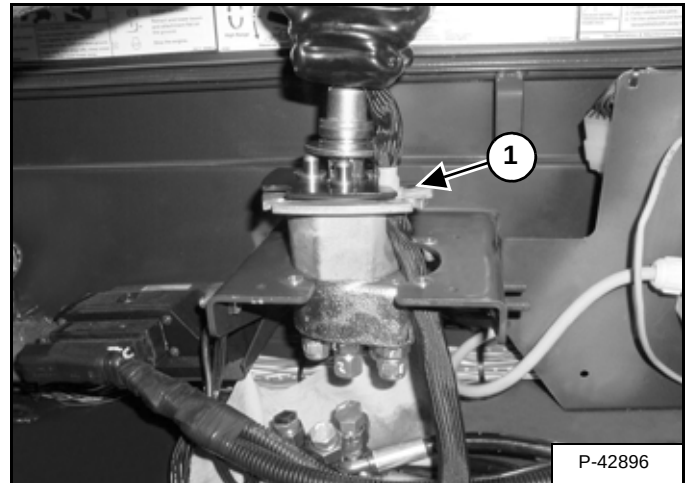
Figure 20-180-9



Remove the six hoses (Item 1) [Figure 20-180-9] from the joystick.

Install caps and plugs.

Figure 20-180-10

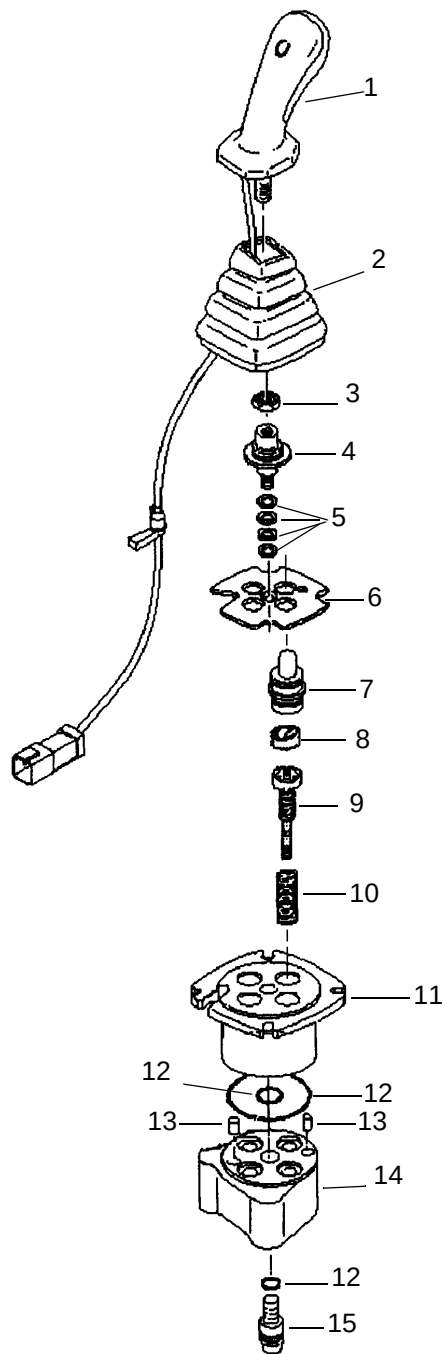


Remove the joystick assembly (Item 1) [Figure 20-180-10].

JOYSTICK (CONT'D)

Parts Identification

1. Handle
2. Dust Boot
3. Nut
4. Swivel Joint
5. Shim
6. Plate
7. Plunger Assembly
8. Seal
9. Spool Assembly
10. Spring
11. Valve Body (Top)
12. O-Ring
13. Alignment Pin
14. Valve Body (Bottom)
15. Bolt



B-16943

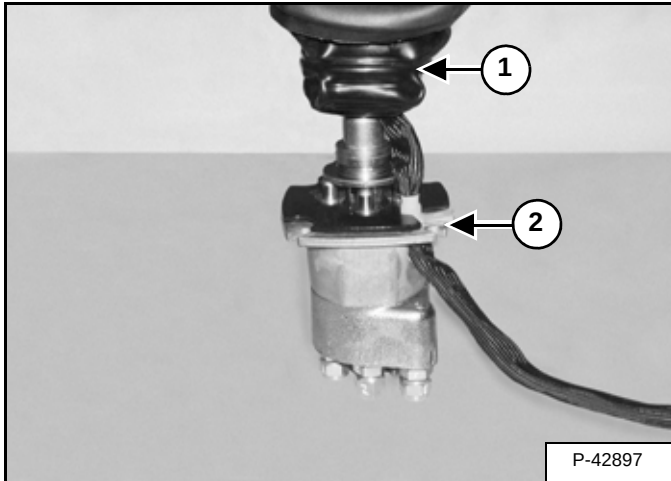
JOYSTICK (CONT'D)

Disassembly And Assembly

Clean the outside of the joystick before disassembly.

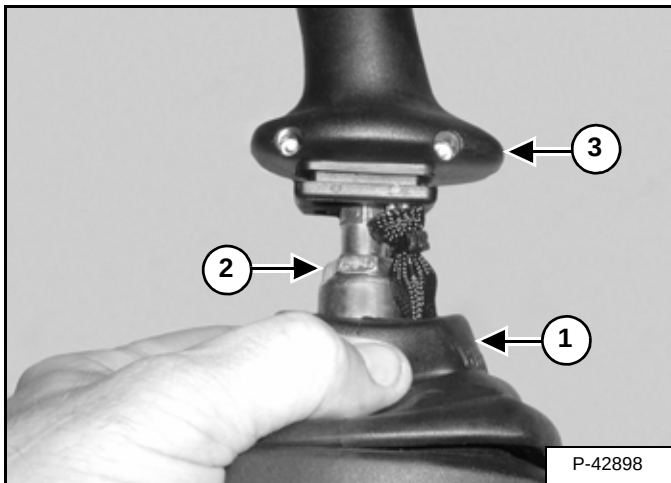
Mark the outside of the joystick for ease of assembly.

Figure 20-180-11



Raise the dust boot (Item 1) and remove the wire harness retainer and grommet (Item 2) [Figure 20-180-11].

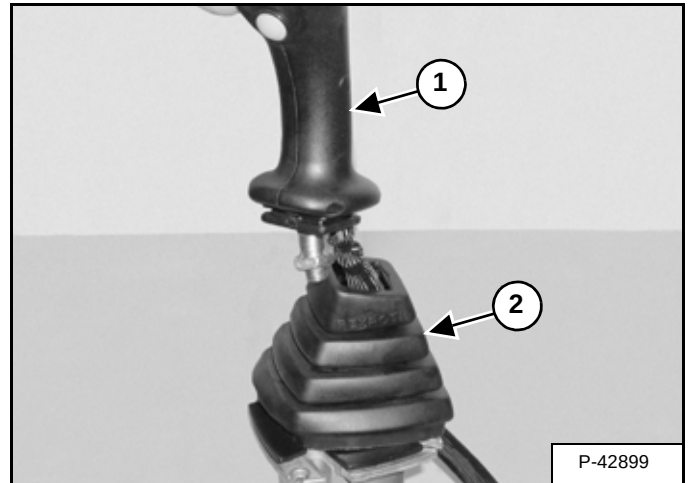
Figure 20-180-12



Lower the dust boot (Item 1) and loosen the nut (Item 2) [Figure 20-180-12].

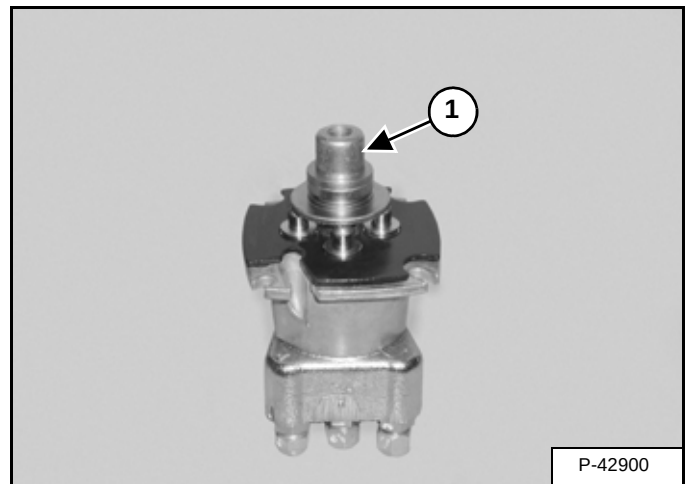
Rotate the handle (Item 3) [Figure 20-180-12] counterclockwise to remove.

Figure 20-180-13



Remove the handle (Item 1) and dust boot (Item 2) [Figure 20-180-13].

Figure 20-180-14

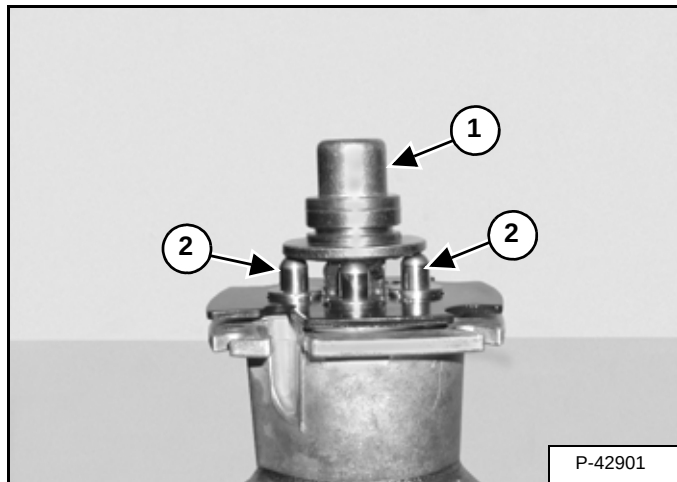


Remove the swivel joint (Item 1) [Figure 20-180-14].

JOYSTICK (CONT'D)

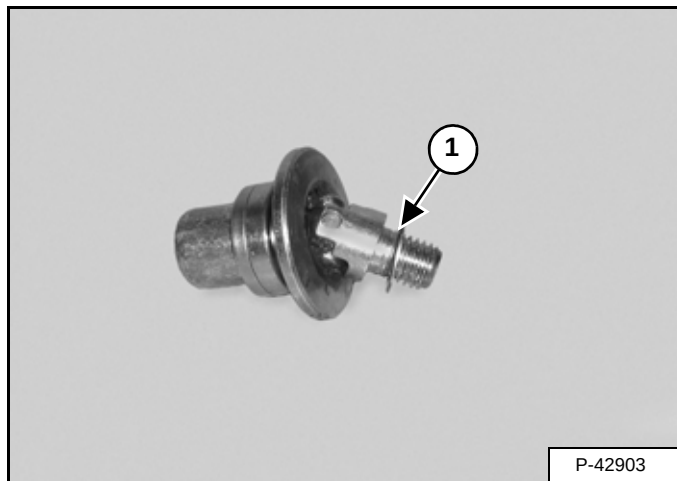
Disassembly And Assembly (Cont'd)

Figure 20-180-15



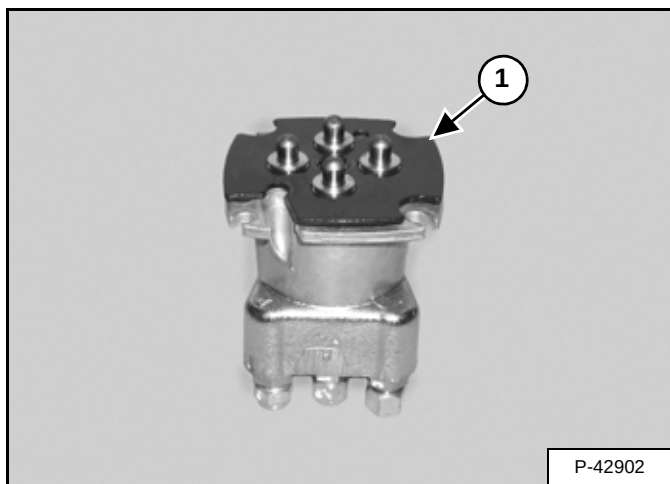
Assembly: The swivel joint (Item 1) should make light contact evenly with the plungers (Item 2) [Figure 20-180-15].

Figure 20-180-16



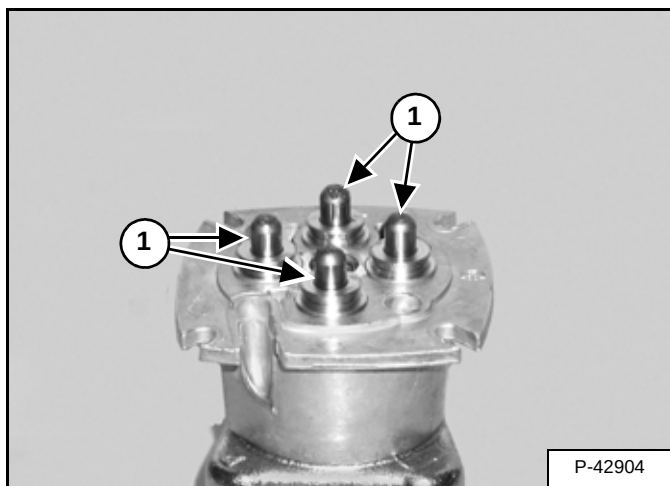
Remove the shim (Item 1)[Figure 20-180-16] from the swivel joints.

Figure 20-180-17



Remove the plate (Item 1) [Figure 20-180-17] from the housing.

Figure 20-180-18



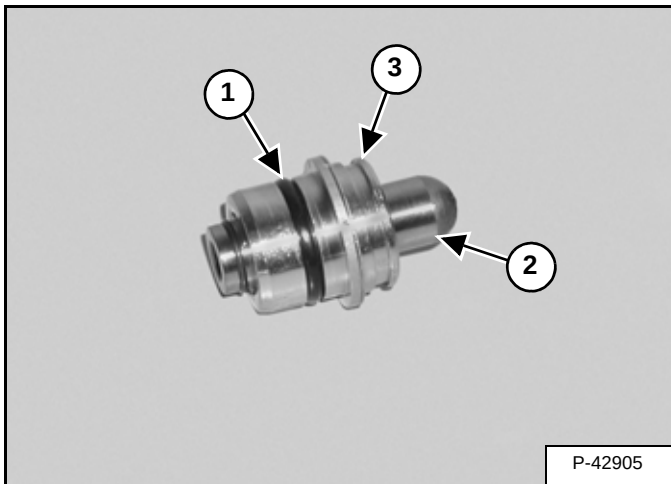
Mark and remove the four plunger assemblies (Item 1) [Figure 20-180-18] from the housing.

NOTE: Install the plunger assemblies in the same bore the plungers were removed from.

JOYSTICK (CONT'D)

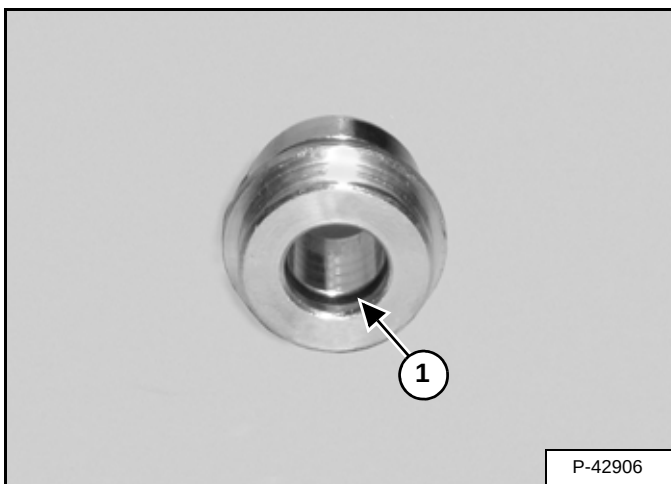
Disassembly And Assembly (Cont'd)

Figure 20-180-19



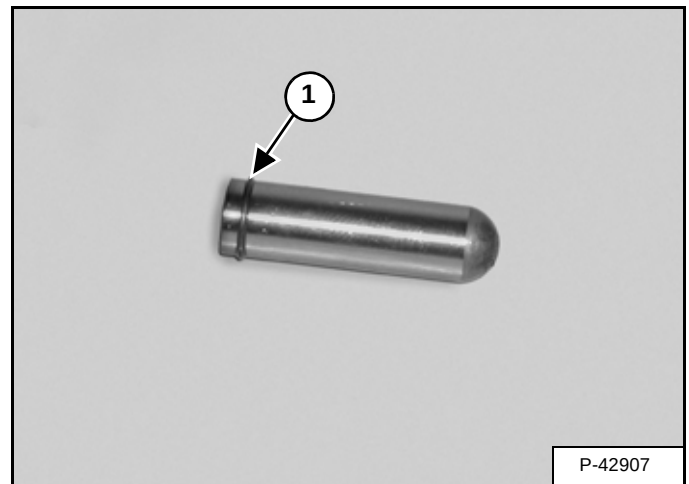
Remove the O-ring (Item 1) and rod (Item 2) from the plunger body (Item 3) [Figure 20-180-19].

Figure 20-180-20



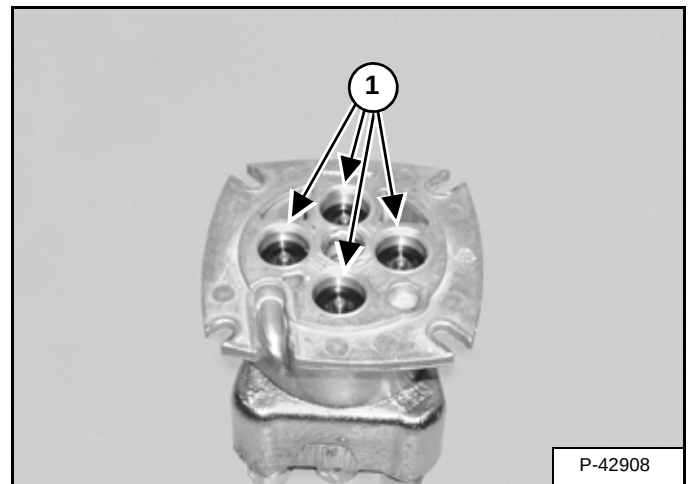
Remove the O-ring (Item 1) [Figure 20-180-20] from the inside of the plunger body.

Figure 20-180-21



Remove the seal (Item 1) [Figure 20-180-21] from the rod.

Figure 20-180-22



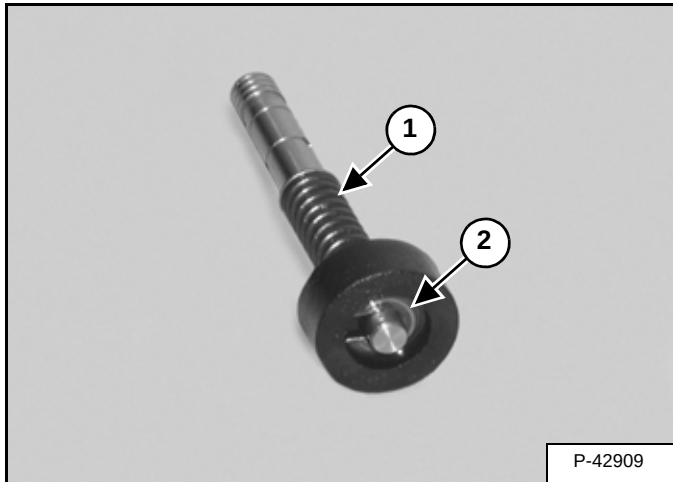
Mark and remove the four spool assemblies (Item 1) [Figure 20-180-22] from the housing.

NOTE: Install the spool assemblies in the same bore the spools were removed from.

JOYSTICK (CONT'D)

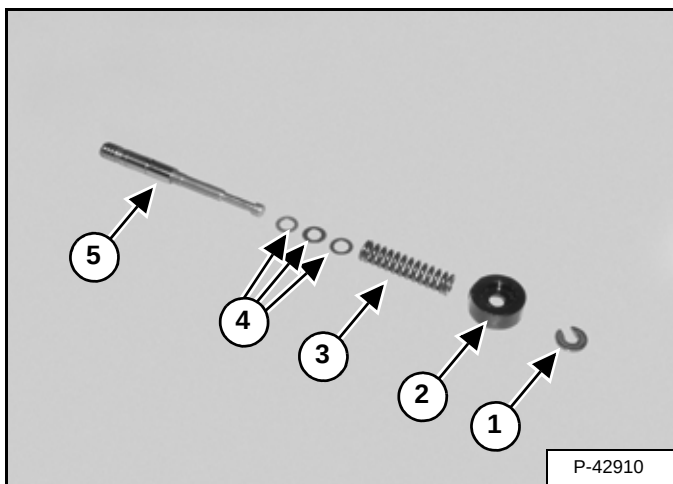
Disassembly And Assembly (Cont'd)

Figure 20-180-23



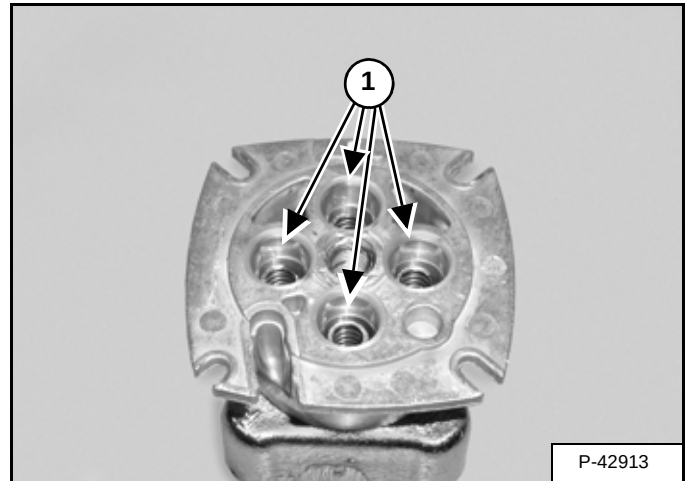
Compress the spring (Item 1) to remove the retainer (Item 2) [Figure 20-180-23].

Figure 20-180-24



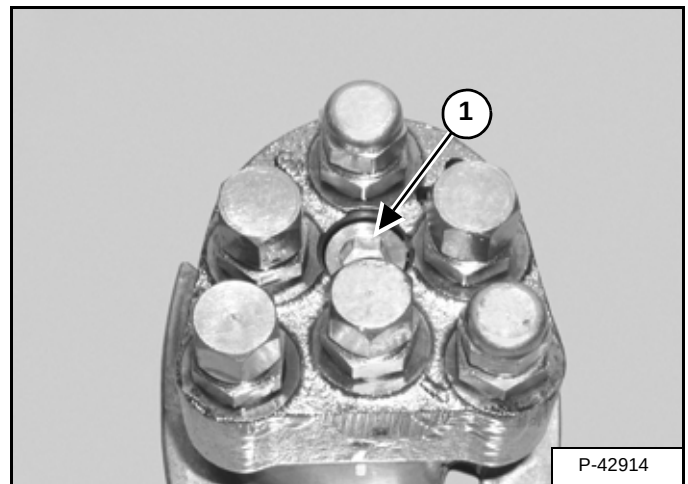
Remove the retainer (Item 1), piston (Item 2), spring (Item 3) and shims (Item 4) from the spool (Item 5) [Figure 20-180-24].

Figure 20-180-25



Remove the four springs (Item 1) [Figure 20-180-25] from the housing,

Figure 20-180-26

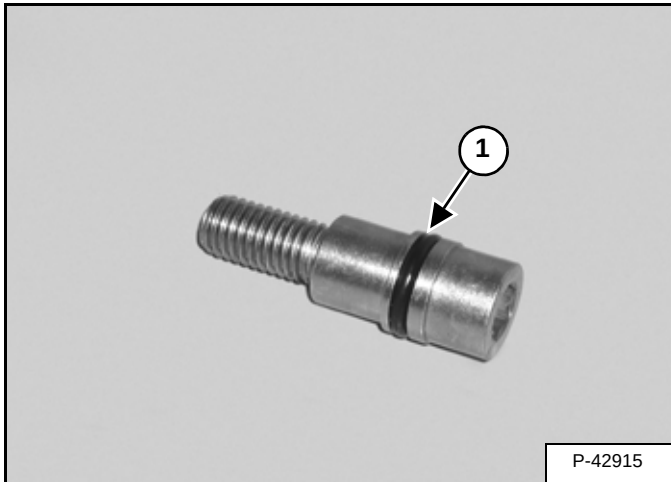


Remove the bolt (Item 1) [Figure 20-180-26] from the end cap.

JOYSTICK (CONT'D)

Disassembly And Assembly (Cont'd)

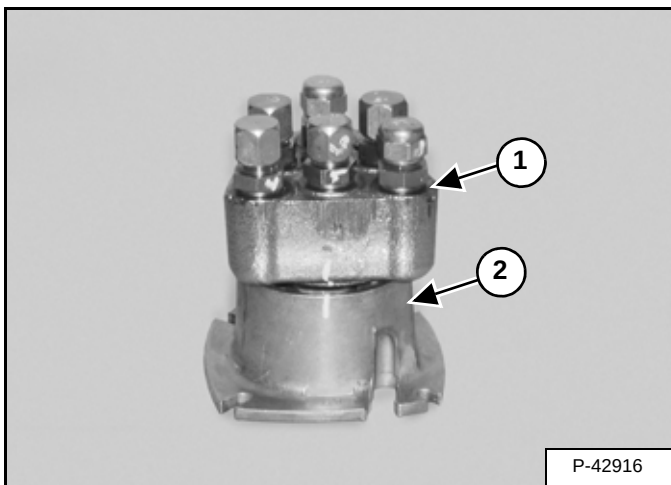
Figure 20-180-27



Remove the O-ring (Item 1) [Figure 20-180-27] from the bolt.

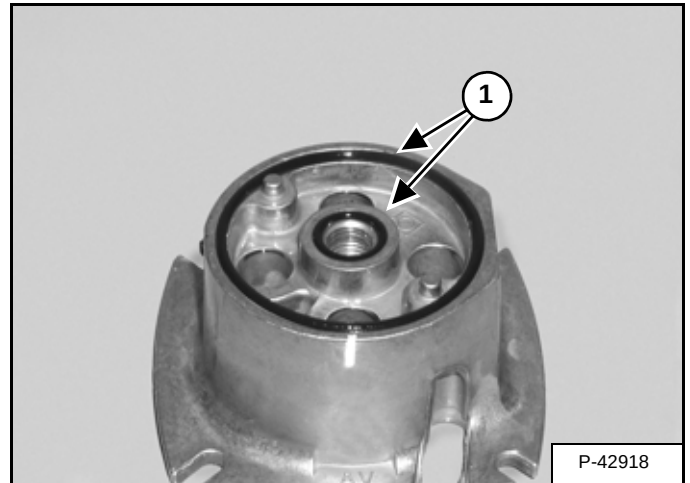
Mark the sections for correct assembly.

Figure 20-180-28



Remove the end cap (Item 1) from the housing (Item 2) [Figure 20-180-28].

Figure 20-180-29



Remove the two O-rings (Item 1) [Figure 20-180-29] from the housing,

Clean all parts in solvent and dry with compressed air. Inspect the push rod crown for wear. Replace all components showing excessive wear.

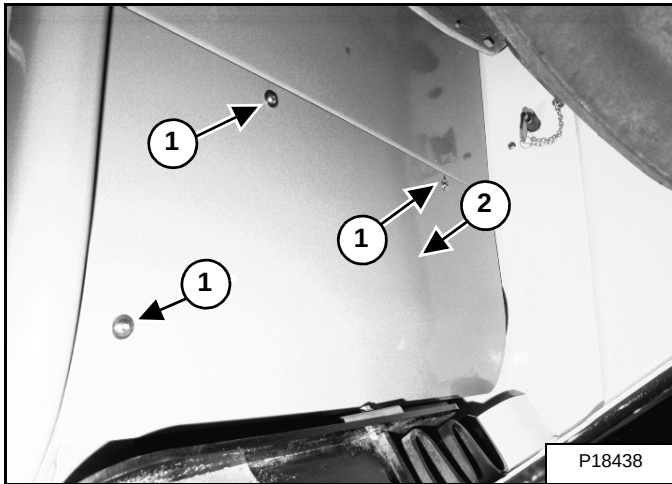
Always install new seals and O-rings.

Lubricate the components with clean hydraulic oil during assembly.

PARKING BRAKE

Pressure Switch Removal And Installation

Figure 20-190-1



Relieve the hydraulic pressure.

Remove the three screws (Item 1) from the access panel (Item 2) [Figure 20-190-1].

Remove the access panel.

Remove the battery. (See Contents, Page 60-01.)

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

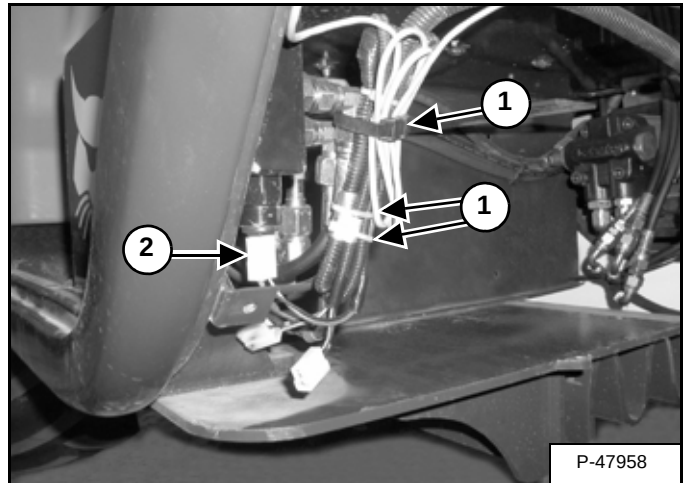
IMPORTANT

When making repairs on hydraulic system, clean the work area before disassemble 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-2056-0793

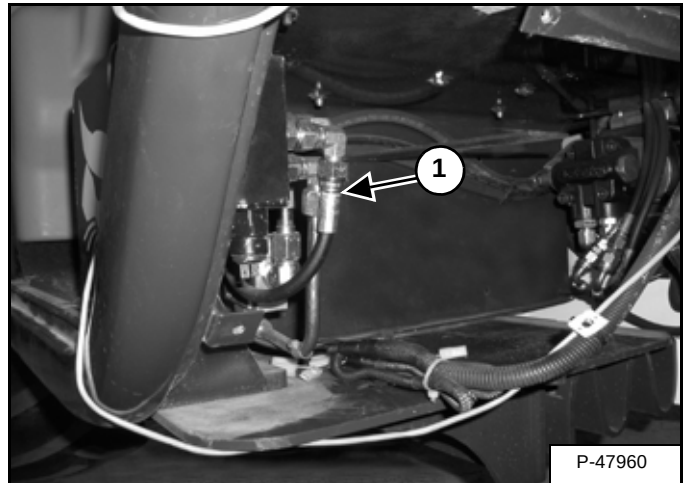
Mark all hoses and electrical connectors for correct installation.

Figure 20-190-2



Remove the tie straps (Item 1) and disconnect the two electrical connectors (Item 2) [Figure 20-190-2].

Figure 20-190-3

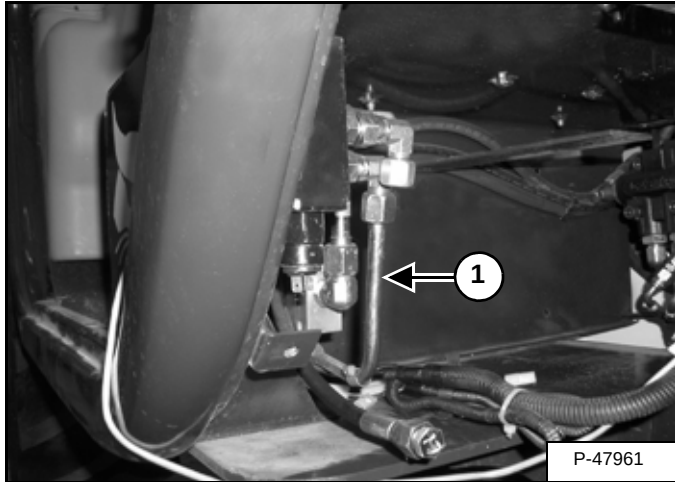


Remove the hose (Item 1) [Figure 20-190-3].

PARKING BRAKE (CONT'D)

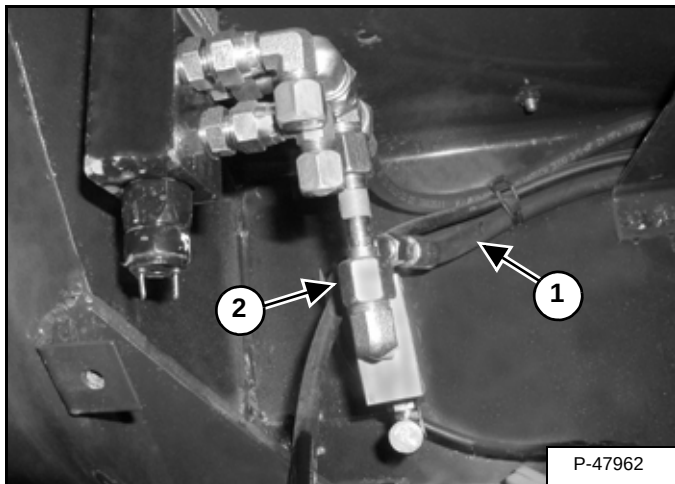
Pressure Switch Removal And Installation (Cont'd)

Figure 20-190-4



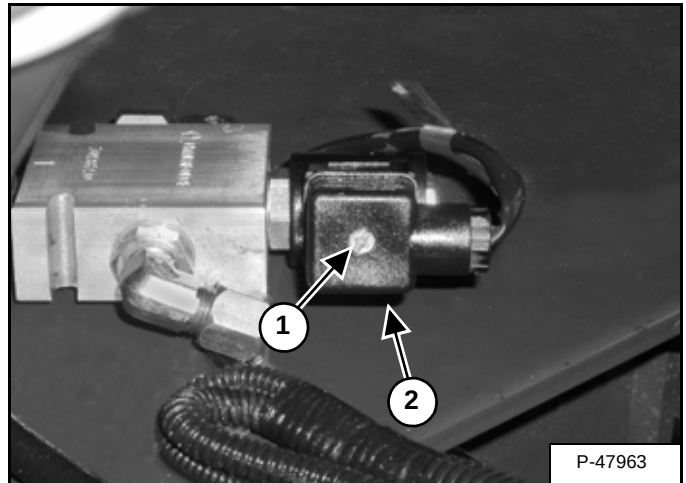
Remove the tubeline (Item 1) [Figure 20-190-4].

Figure 20-190-5



Remove the hose (Item 1) and tubeline (Item 2) [Figure 20-190-5].

Figure 20-190-6



Reposition the pressure switch, loosen the screw (Item 1) and remove the electrical connector (Item 2) [Figure 20-190-6]. Remove the pressure switch.

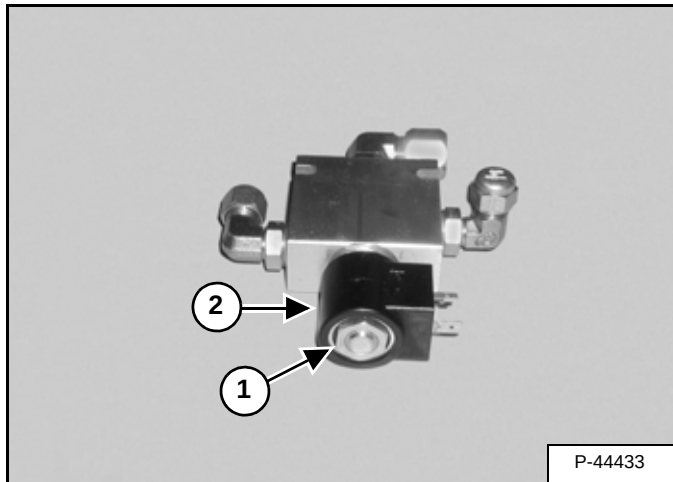
PARKING BRAKE (CONT'D)

Pressure Switch Disassembly And Assembly

Clean the outside of the pressure switch before disassembly.

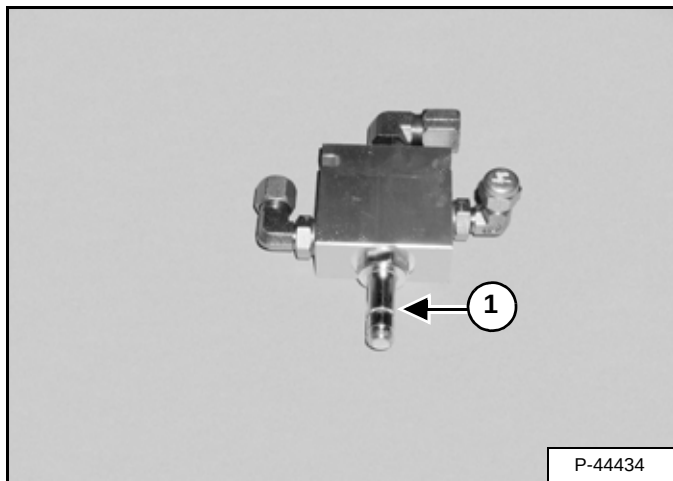
Mark the outside of the pressure switch for ease of assembly.

Figure 20-190-7



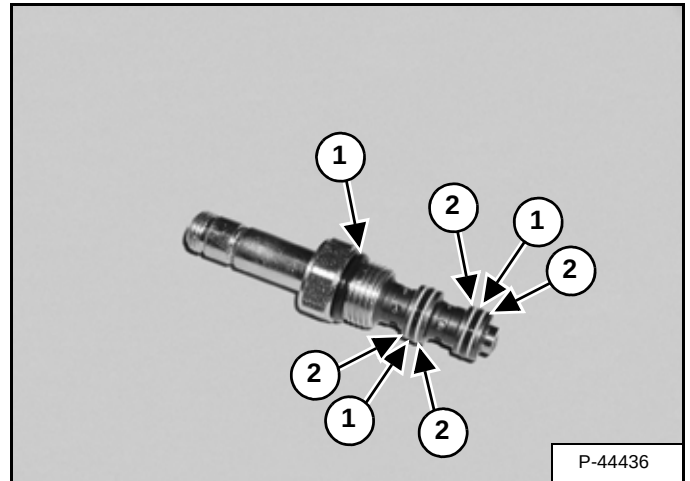
Remove the nut (Item 1) and coil (Item 2) [Figure 20-190-7] from the spool.

Figure 20-190-8



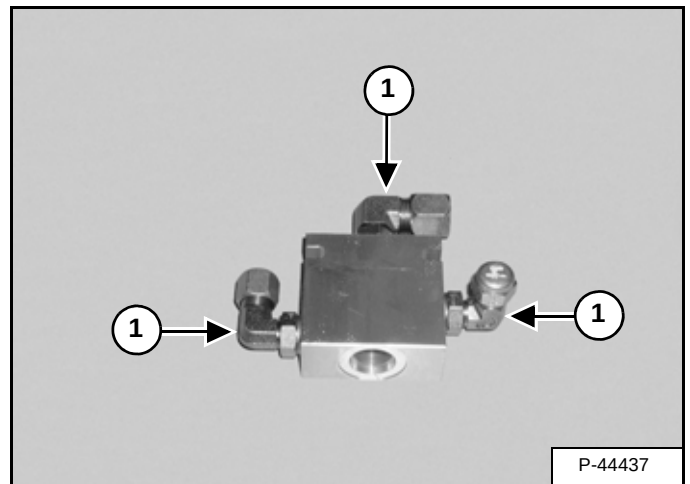
Remove the spool (Item 1) [Figure 20-190-8].

Figure 20-190-9



Remove the three O-rings (Item 1) and four backup rings (Item 2) [Figure 20-190-9] from the spool.

Figure 20-190-10



Remove the fittings (Item 1) [Figure 20-190-10].

Clean all parts in solvent and dry with compressed air.

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

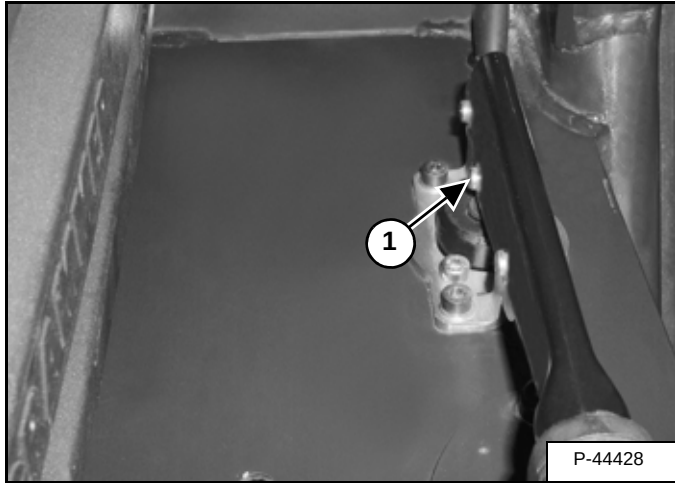
Always install new seals and O-rings. Lubricate all seals and O-rings with clean hydraulic fluid before installation.

PARKING BRAKE (CONT'D)

Parking Brake Valve Removal And Installation

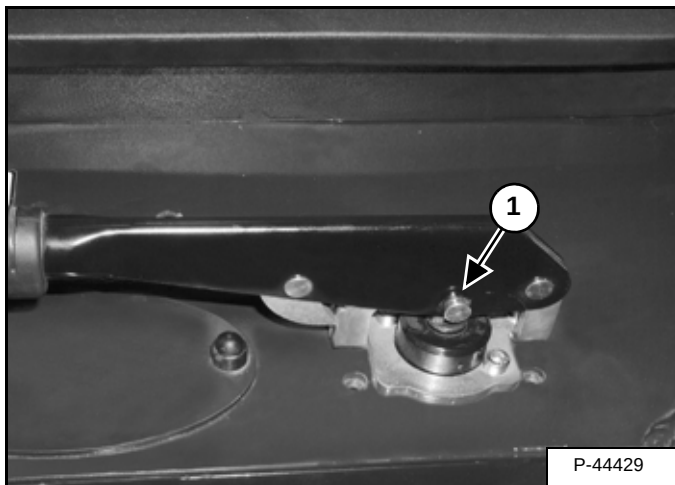
Remove the pressure switch. (See page 20-190-1.)

Figure 20-190-11



Remove the pin retainer (Item 1) [Figure 20-190-11].

Figure 20-190-12



Remove the pin (Item 1) [Figure 20-190-12] from the lever.

Figure 20-190-13

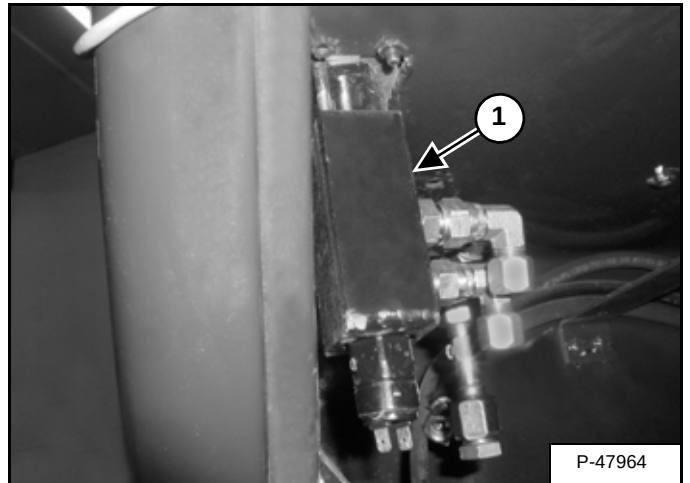
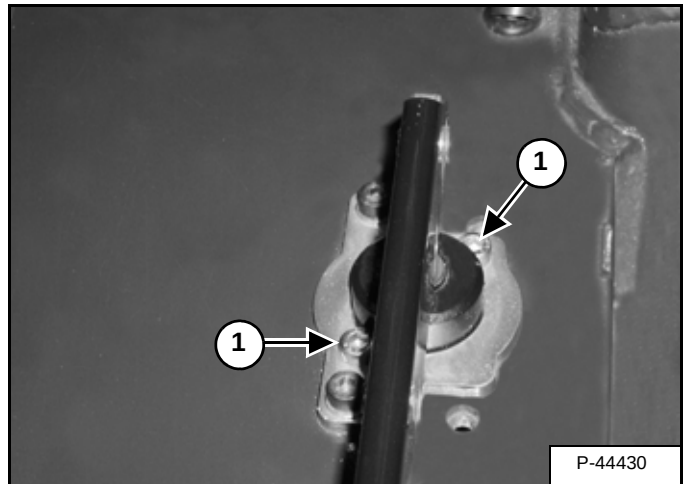


Figure 20-190-14



Support the brake valve (Item 1) [Figure 20-190-13] and remove the two screws (Item 1) [Figure 20-190-14].

Remove the parking brake valve.

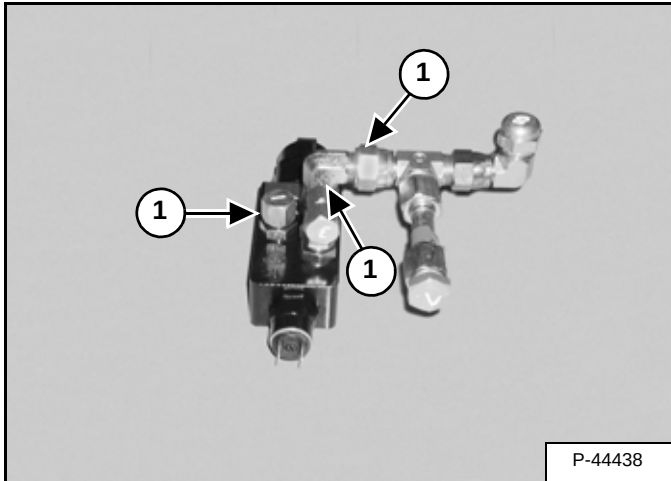
PARKING BRAKE (CONT'D)

Parking Brake Valve Disassembly And Assembly

Clean the outside of the brake valve before disassembly.

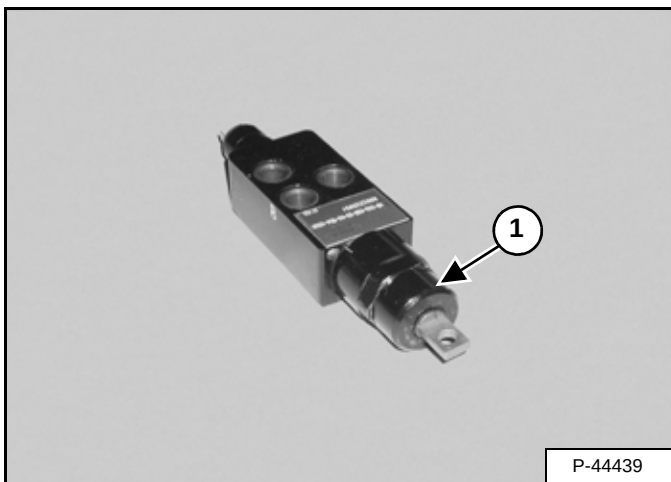
Mark the outside of the brake valve for ease of assembly.

Figure 20-190-15



Remove the fittings (Item 1) [Figure 20-190-15].

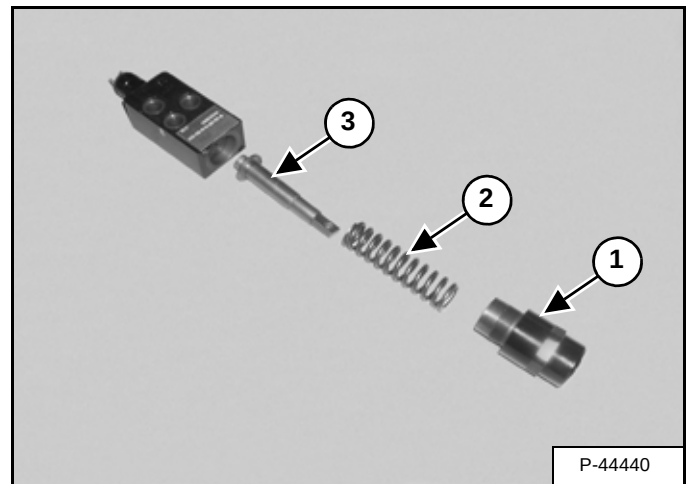
Figure 20-190-16



Loosen the collar (Item 1) [Figure 20-190-16].

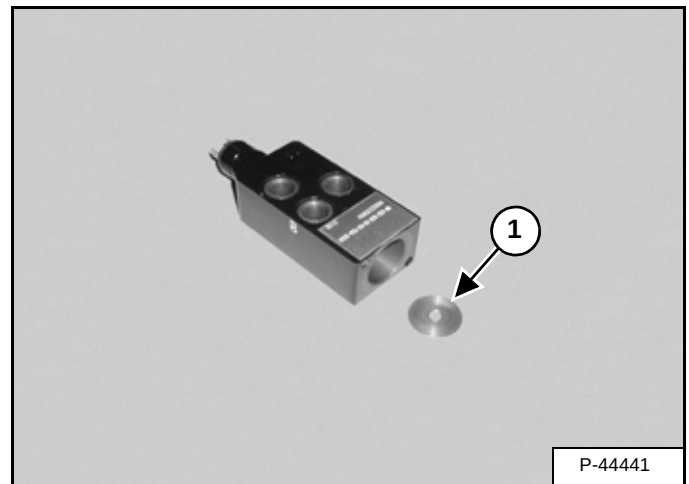
NOTE: Use care removing the collar. The collar is under spring pressure.

Figure 20-190-17



Remove the collar (Item 1), spring (Item 2) and shaft (Item 3) [Figure 20-190-17] from the housing.

Figure 20-190-18

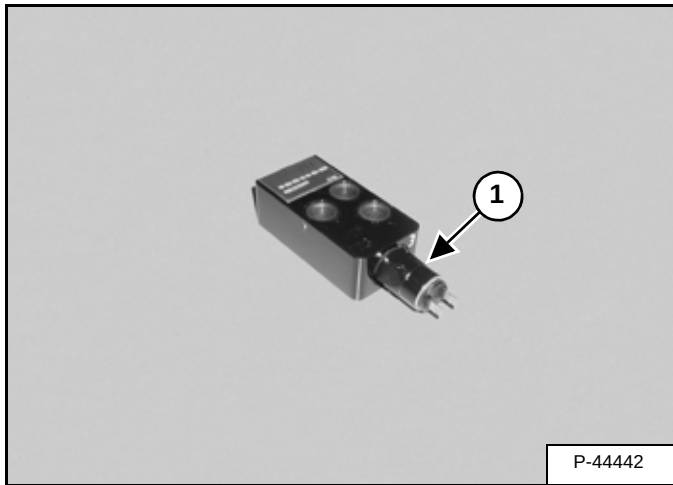


Remove the washer (Item 1) [Figure 20-190-18] from the housing.

PARKING BRAKE (CONT'D)

Parking Brake Valve Disassembly And Assembly (Cont'd)

Figure 20-190-19



Remove the electrical connector (Item 1) **[Figure 20-190-19]** from the housing.

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.

PRESSURE REDUCING VALVE

Not Available At Time Of Printing

ACCUMULATOR

Not Available At Time Of Printing

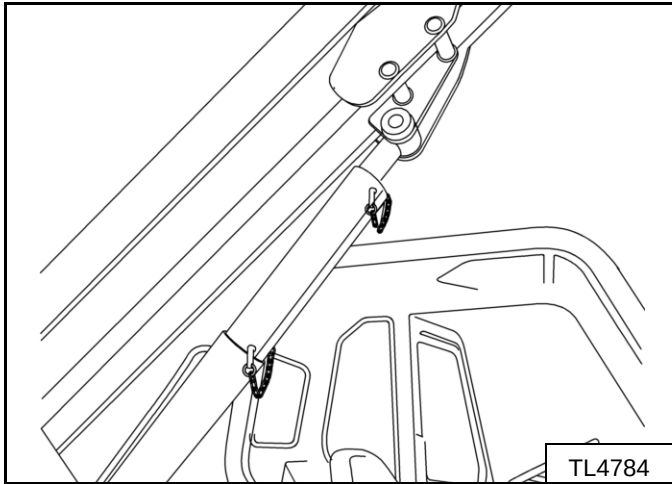
TOW VALVE

Not Available At Time Of Printing

FRONT AUXILIARY HYDRAULIC PRESSURE RELEASE VALVE

Removal And Installation

Figure 20-230-1



Raise the boom and install the boom stop [Figure 20-230-1].

Stop the engine.

Engage the parking brake.

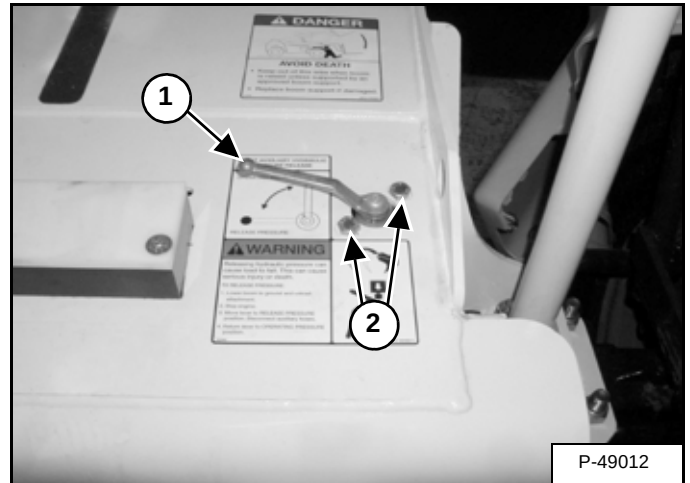
Exit the machine.

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.

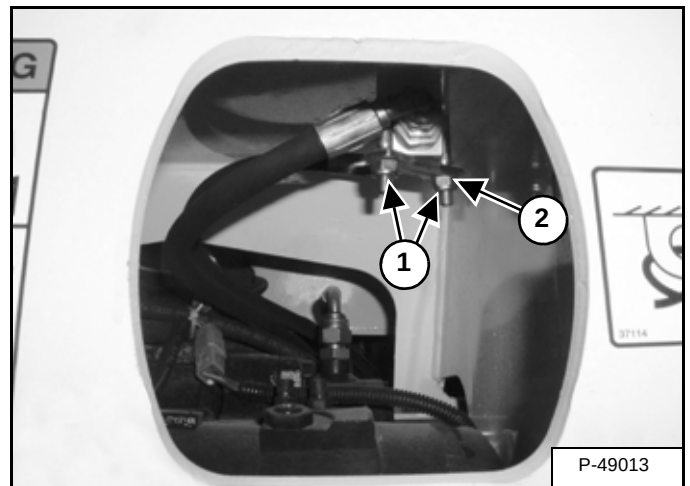
W-2145-0290

Figure 20-230-2



Turn the handle (Item 1) [Figure 20-230-2] to relieve hydraulic pressure.

Figure 20-230-3

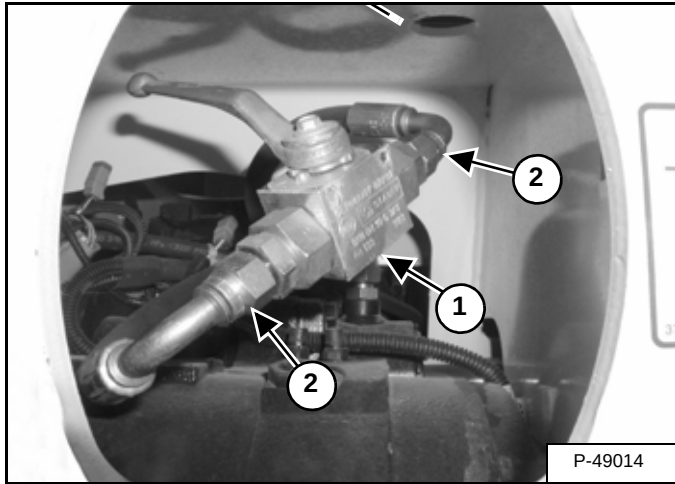


Remove the two bolts (Item 2) [Figure 20-230-2], nuts (Item 1) and strap (Item 2) [Figure 20-230-3].

FRONT AUXILIARY HYDRAULIC PRESSURE RELEASE VALVE (CONT'D)

Removal And Installation (Cont'd)

Figure 20-230-4



Relocate the valve (Item 1) and remove the two hoses (Item 2) [Figure 20-230-4].

Mark the hoses for correct installation.

Remove the valve.

IMPORTANT

When making repairs on hydraulic system, clean the work area before disassemble 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.

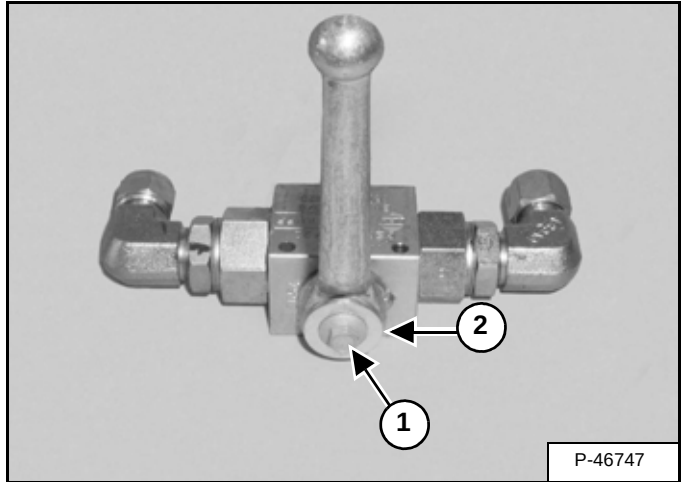
I-2056-0793

Disassembly And Assembly

Clean the outside of the pressure release valve before disassembly.

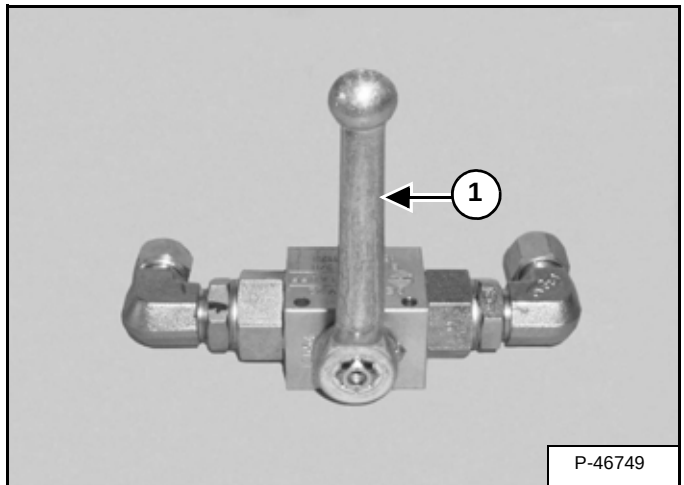
Mark the outside of the pressure release valve for ease of assembly.

Figure 20-230-5



Remove the screw (Item 1) and washer (Item 2) [Figure 20-230-5].

Figure 20-230-6

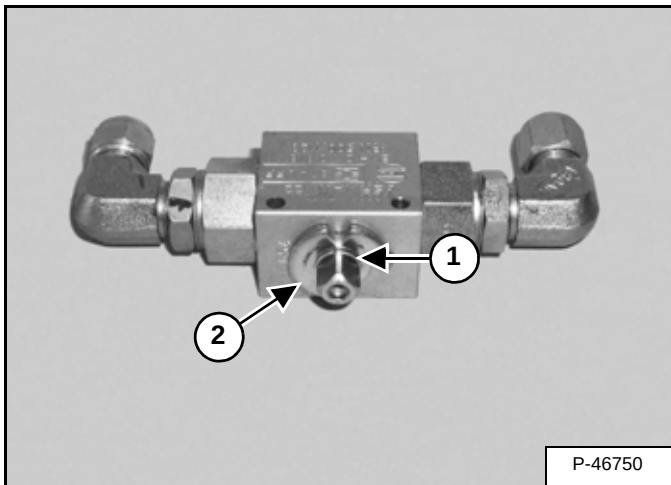


Remove the handle (Item 1) [Figure 20-230-6].

FRONT AUXILIARY HYDRAULIC PRESSURE RELEASE VALVE (CONT'D)

Disassembly And Assembly (Cont'd)

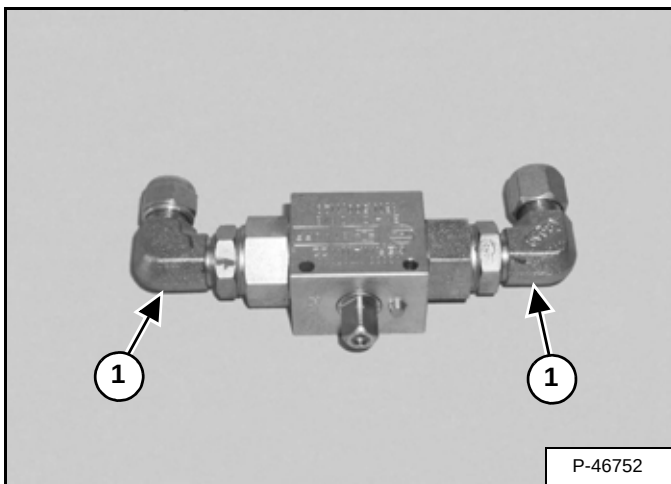
Figure 20-230-7



Remove the retainer (Item 1) and stop plate (Item 2) [Figure 20-230-7].

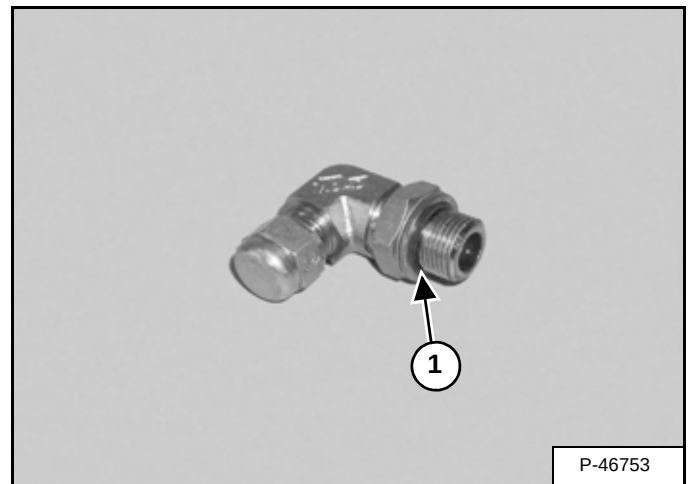
NOTE: Record the position of the stop plate for proper assembly.

Figure 20-230-8



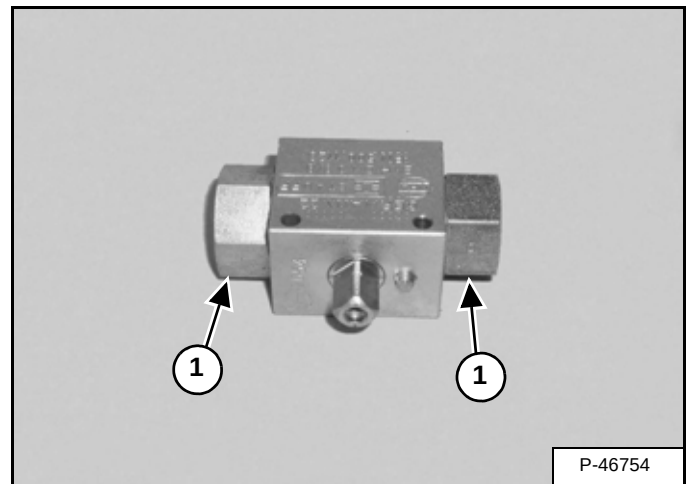
Remove the two fittings (Item 1) [Figure 20-230-8].

Figure 20-230-9



Remove the O-ring (Item 1) [Figure 20-230-9] from the fittings.

Figure 20-230-10

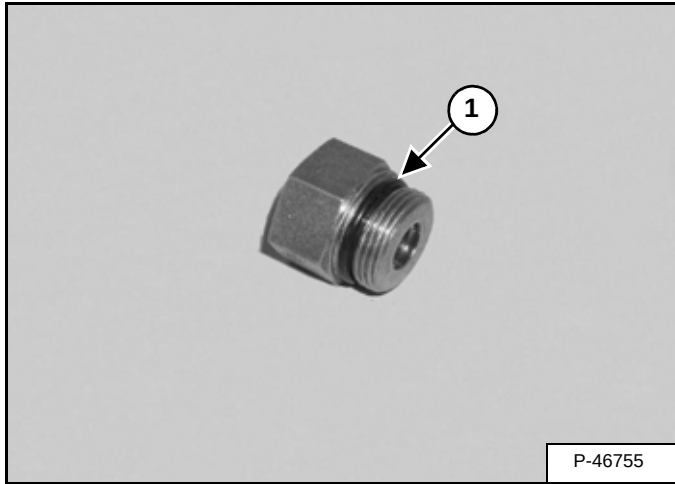


Remove the two adapters (Item 1) [Figure 20-230-10].

FRONT AUXILIARY HYDRAULIC PRESSURE RELEASE VALVE (CONT'D)

Disassembly And Assembly (Cont'd)

Figure 20-230-11



Remove the O-ring (Item 1) [Figure 20-230-11] from the adapters.

Figure 20-230-12

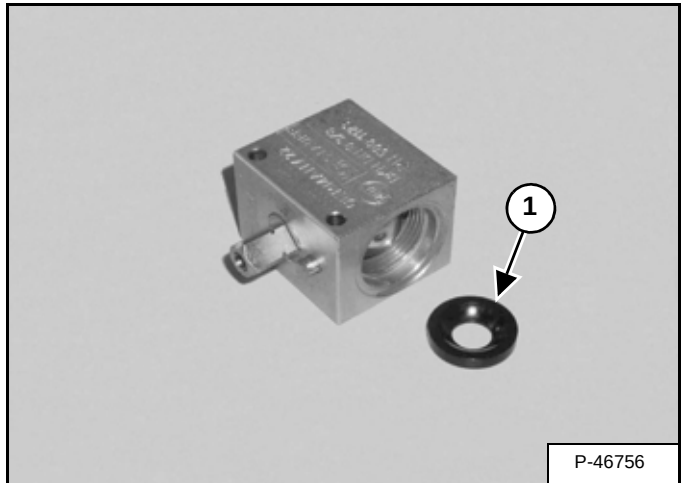
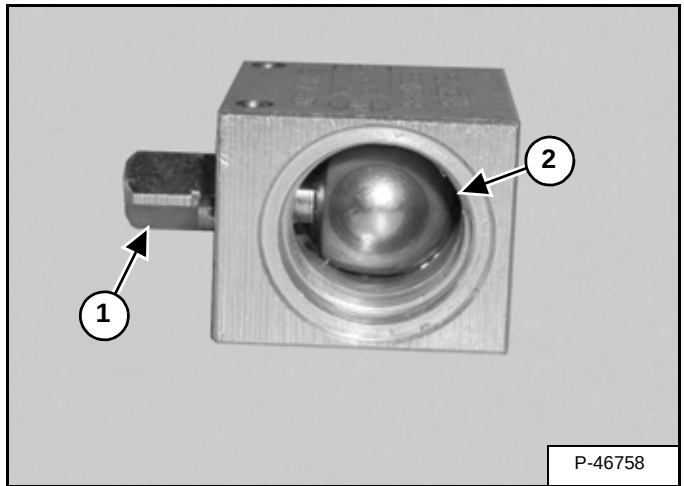


Figure 20-230-13



Remove the seal (Item 1) [Figure 20-230-12] from the valve. (Both sides)

Assembly: The concave side of the seal (Item 1) [Figure 20-230-12] fits over the ball (Item 2) [Figure 20-230-13].

Turn the shaft (Item 1) until the shaft and ball (Item 2) [Figure 20-230-13] are in the position shown.

Assembly: Record the position of the shaft and ball for proper assembly.

FRONT AUXILIARY HYDRAULIC PRESSURE RELEASE VALVE (CONT'D)

Disassembly And Assembly (Cont'd)

Figure 20-230-14

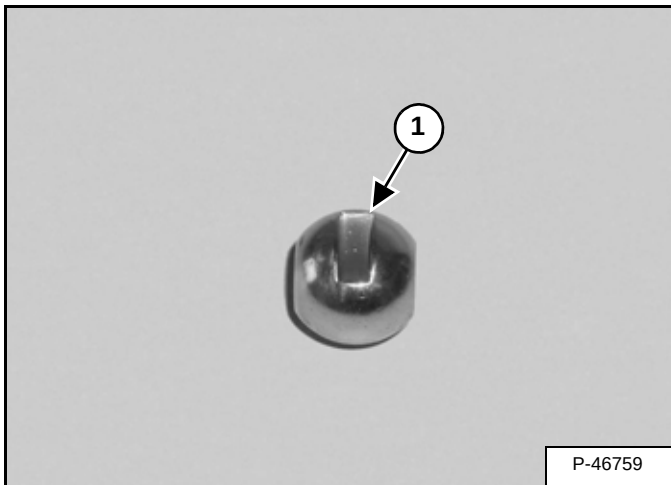
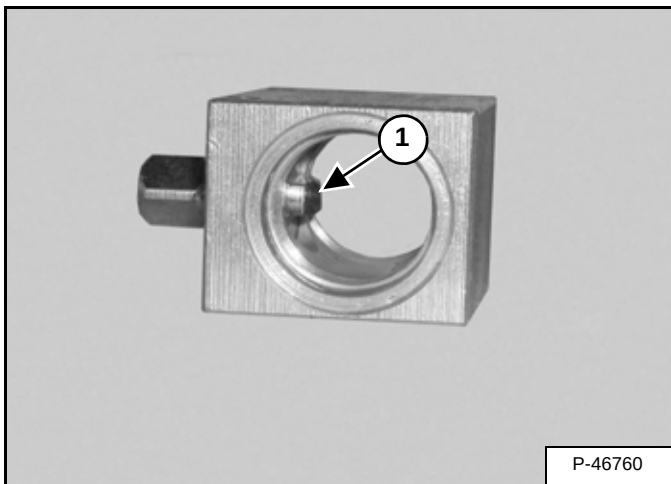
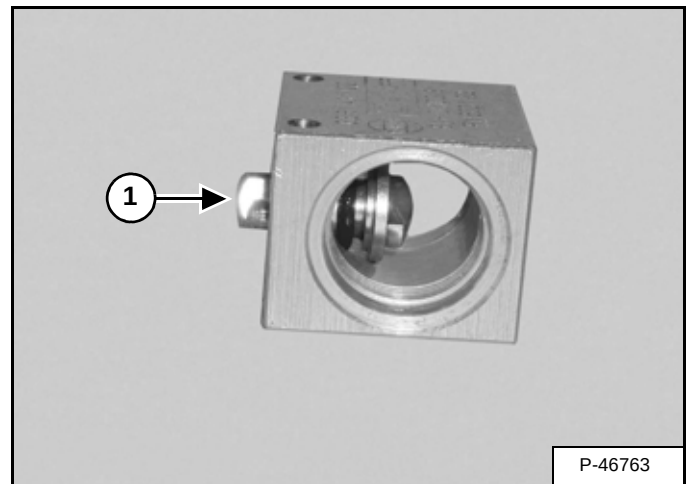


Figure 20-230-15



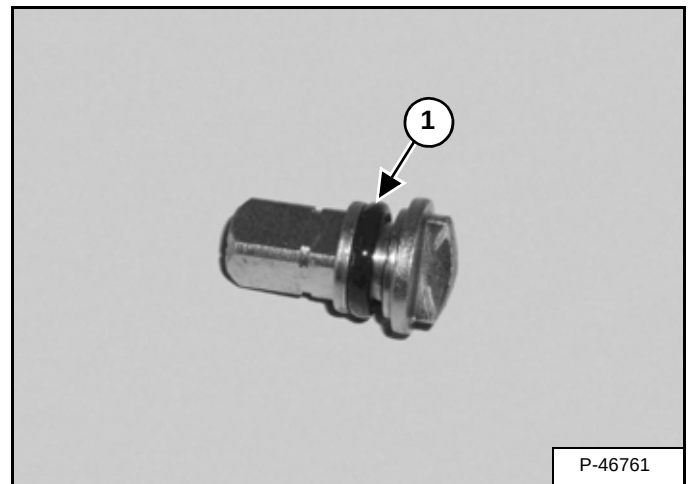
Assembly: Align the slot (Item 1) [Figure 20-230-14] with the notch (Item 1) [Figure 20-230-15] in the shaft.

Figure 20-230-16



Remove the shaft (Item 1) [Figure 20-230-16] by pressing the shaft into the housing.

Figure 20-230-17

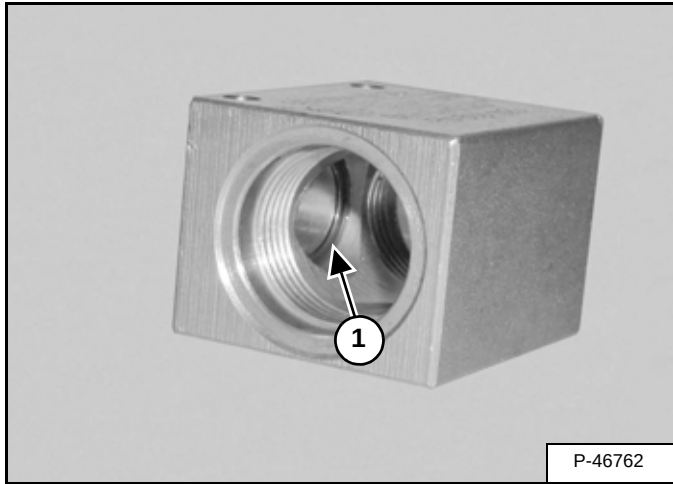


Remove the O-ring (Item 1) [Figure 20-230-17] from the shaft.

FRONT AUXILIARY HYDRAULIC PRESSURE RELEASE VALVE (CONT'D)

Disassembly And Assembly (Cont'd)

Figure 20-230-18



Remove the seal (Item 1) **[Figure 20-230-18]** from the housing.

Wash the components in clean solvent and dry with compressed air.

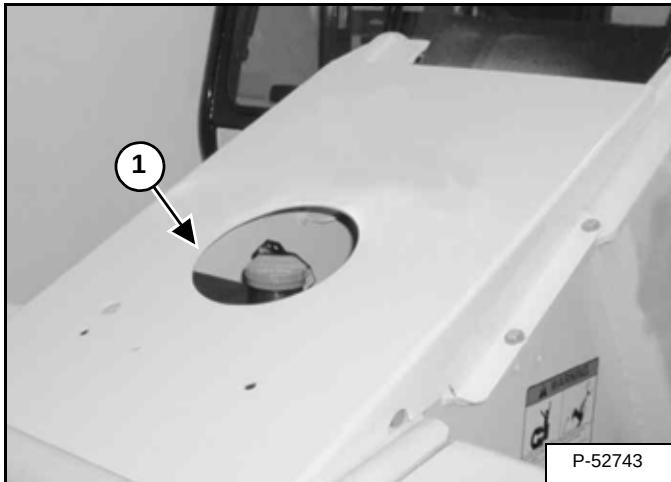
Check the components for wear or damage. Replace any worn or damaged components. Always use new O-rings and seals.

Apply clean hydraulic fluid to the O-rings and seals during assembly.

FLOW CONTROL VALVE

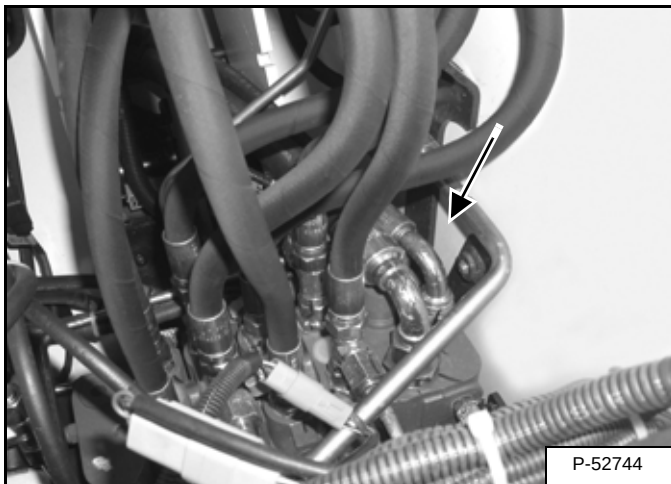
Removal And Installation

Figure 20-240-1



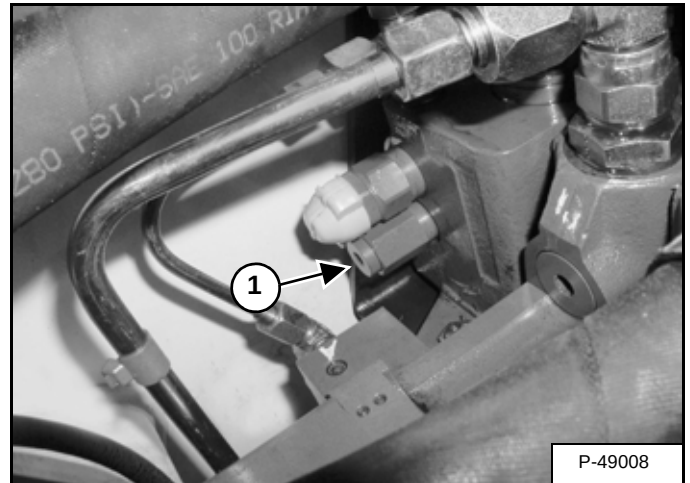
Remove the rear cover (Item 1) [Figure 20-240-1].

Figure 20-240-2



The flow control valve is located on the front right side of the hydraulic control valve.

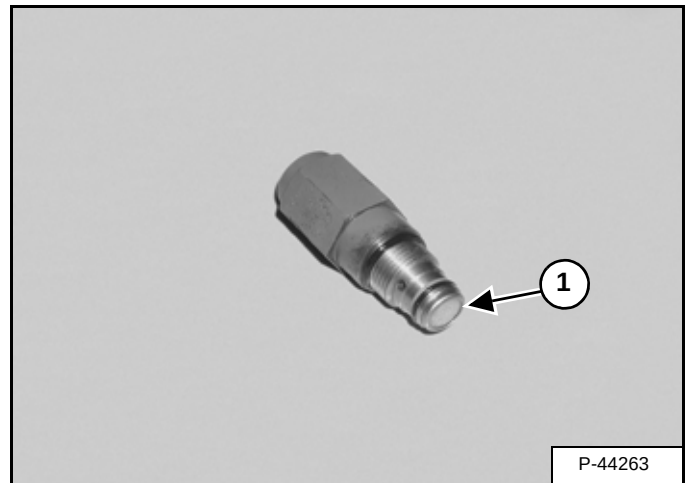
Figure 20-240-3



Remove the flow control valve (Item 1) [Figure 20-240-3] from the front of the hydraulic control valve.

Installation: Tighten the flow control valve to 15 ft.-lbs. (20 Nm) torque..

Figure 20-240-4



Remove and clean the filter (Item 1) [Figure 20-240-4].

NOTE: Check the filter for any damage. Replace the filter if required.

HYDROSTATIC SYSTEM

HYDROSTATIC DRIVE MOTOR	30-30-1
Assembly	30-30-18
Disassembly	30-30-5
Inspection	30-30-16
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Removal And Installation	30-30-1
HYDROSTATIC PUMP	30-40-1
Assembly	30-40-24
Disassembly	30-40-7
Inspection	30-40-20
Parts Identification	30-40-2
Removal And Installation	30-40-1
HYDROSTATIC SYSTEM INFORMATION	30-10-1
Replenishing Valve Function	30-10-2
Troubleshooting Chart	30-10-1
OIL COOLER	30-20-1
Not Available At Time Of Printing	30-20-1

HYDROSTATIC SYSTEM

HYDROSTATIC 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 authorised Massey Ferguson Service Personnel only.



WARNING

Check for correct function after adjustments, repairs or service. Failure to make correct repairs or adjustments can cause injury or death.

W-2004-1285

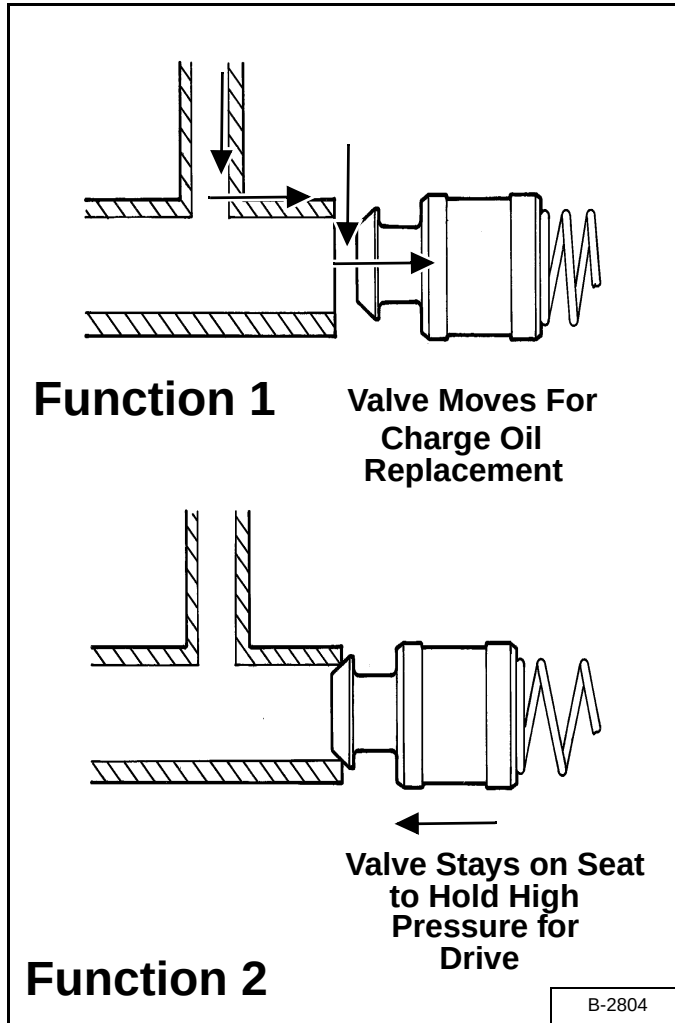
PROBLEM	CAUSE
The Telehandler does not move	1, 2
The Telehandler does not move in a straight line.	3, 4
The hydrostatic system is overheating.	5, 6, 7, 8
Warning light comes ON.	5, 8, 9, 10, 11

KEY TO CORRECT THE CAUSE
1. The hydrostatic pump has damage.
2. The hydrostatic motor has damage.
3. The tyres do not have the correct tyre pressure.
4. The tyres are not the same size.
5. The hydrostatic 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 Telehandler is not being operated at the correct RPM.
9. The sender is defective.
10. Pump is defective or worn hydrostatics
11. Hydraulic filter is plugged.

HYDROSTATIC SYSTEM INFORMATION (CONT'D)

Replenishing Valve Function

Figure 30-10-1



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

The functions of the 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].

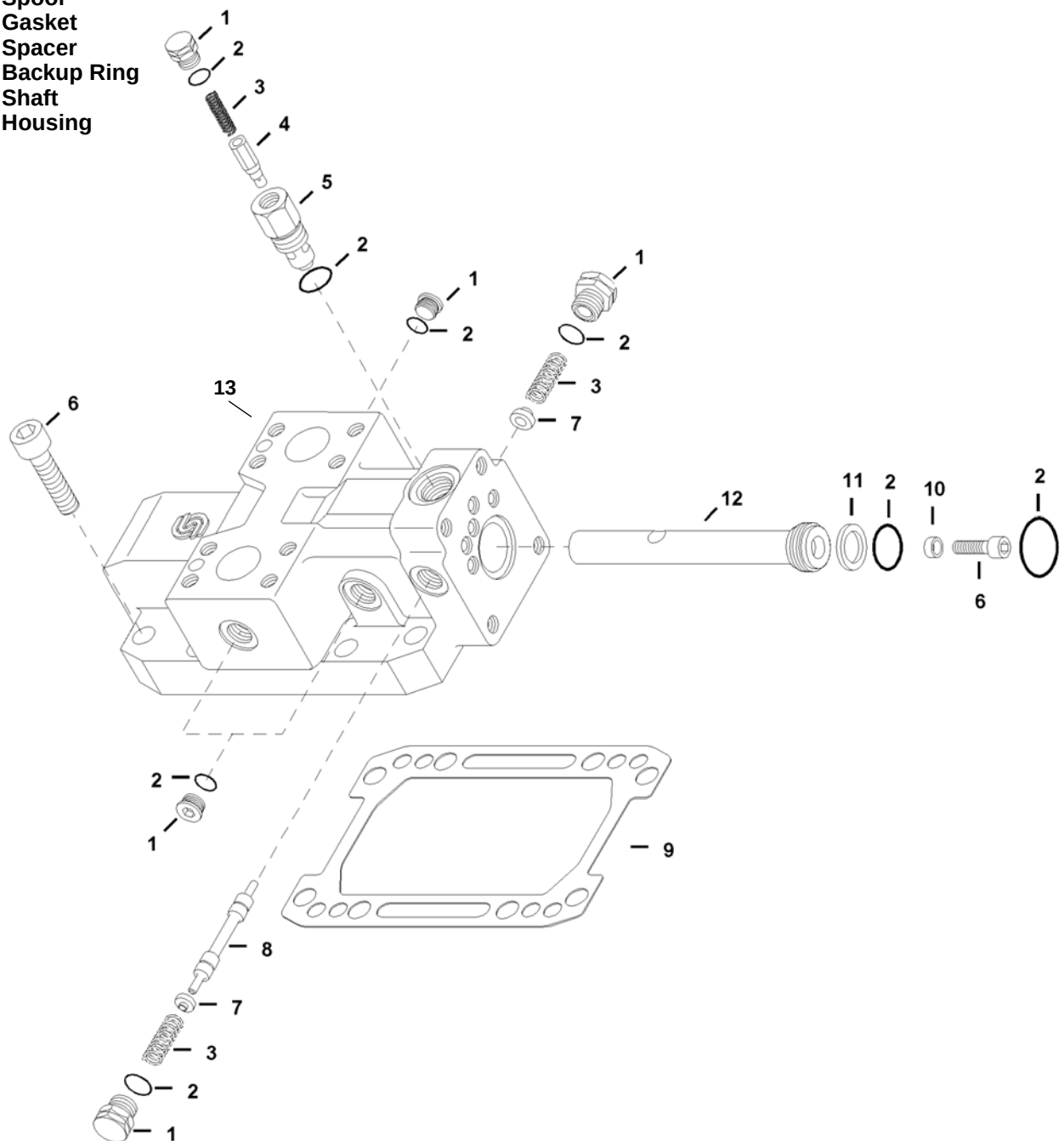
OIL COOLER

Not Available At Time Of Printing

HYDROSTATIC DRIVE MOTOR

Parts Identification

1. Plug
2. O-ring
3. Spring
4. Poppet
5. Housing
6. Bolt
7. Spring Seat
8. Spool
9. Gasket
10. Spacer
11. Backup Ring
12. Shaft
13. Housing

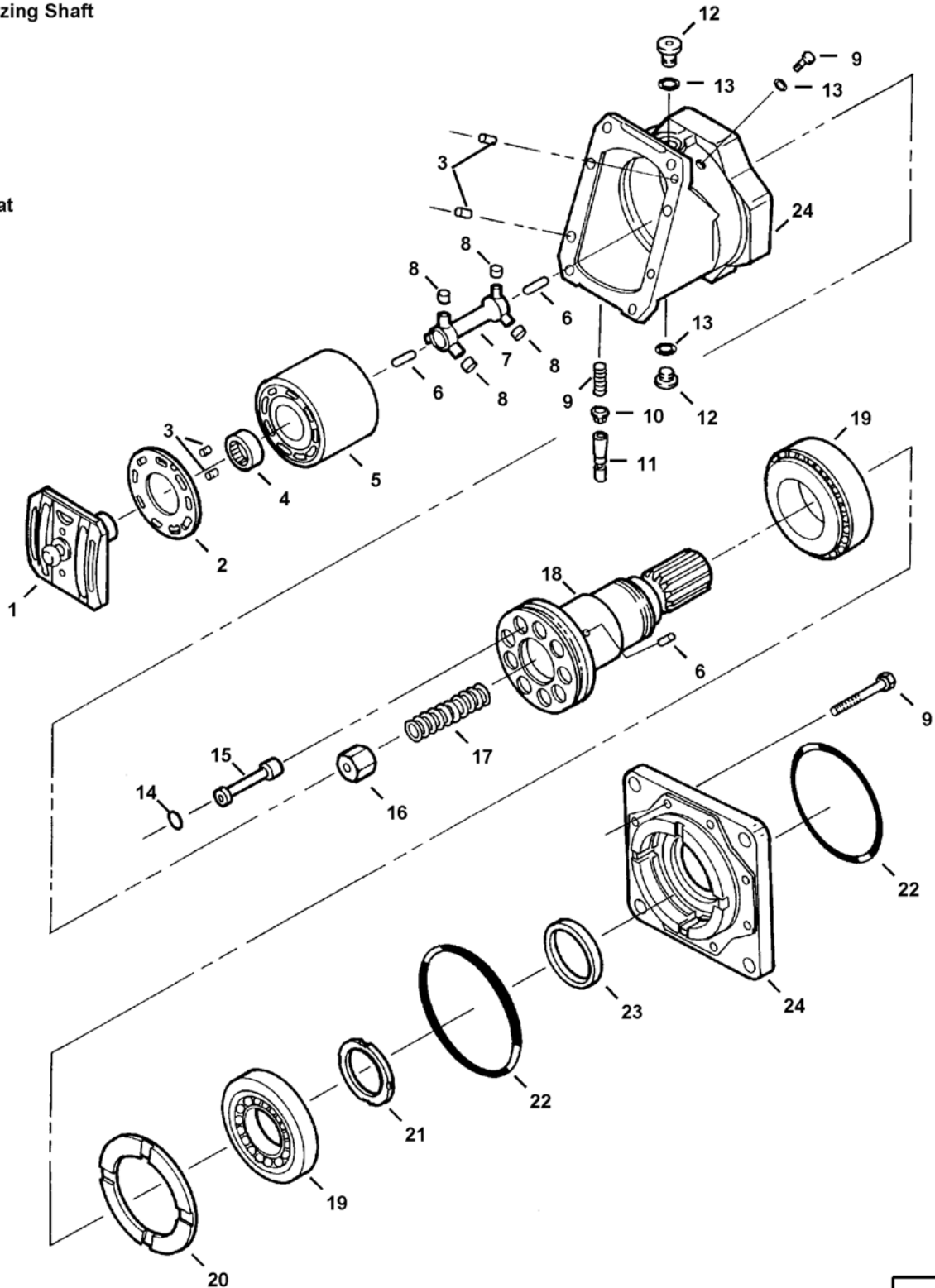


B15938

HYDROSTATIC DRIVE MOTOR (CONT'D)

Parts Identification (Cont'd)

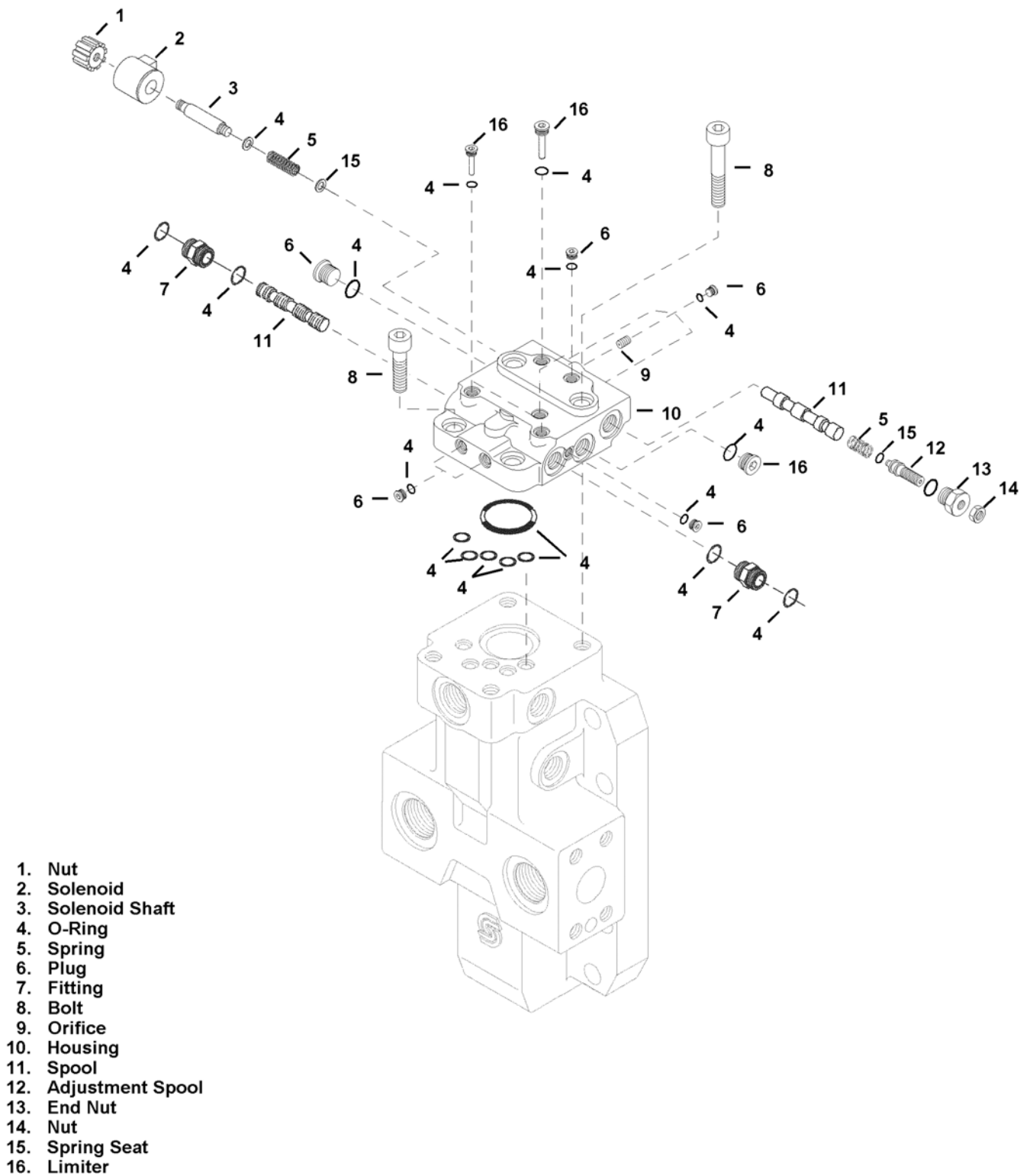
1. Valve Segment
2. Plate
3. Pins
4. Bearing
5. Cylinder
6. Pin
7. Synchronizing Shaft
8. Rollers
9. Bolt
10. Nut
11. Cap
12. Plug
13. O-Ring
14. Ring
15. Piston
16. Spring Seat
17. Spring
18. Shaft
19. Bearing
20. Spacer
21. Nut
22. O-Ring
23. Seal
24. Housing



B-15937

HYDROSTATIC DRIVE MOTOR (CONT'D)

Parts Identification (Cont'd)



B-15939

HYDROSTATIC DRIVE MOTOR (CONT'D)

Disassembly

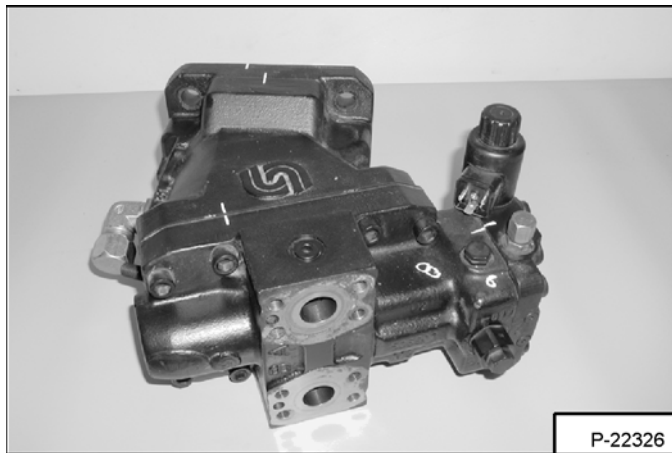
Clean the outside of the drive motor before disassembly.

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.

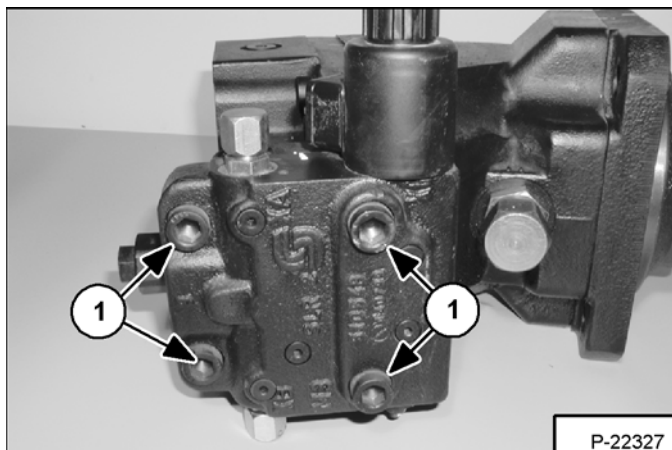
I-2003-0888

Figure 30-30-5



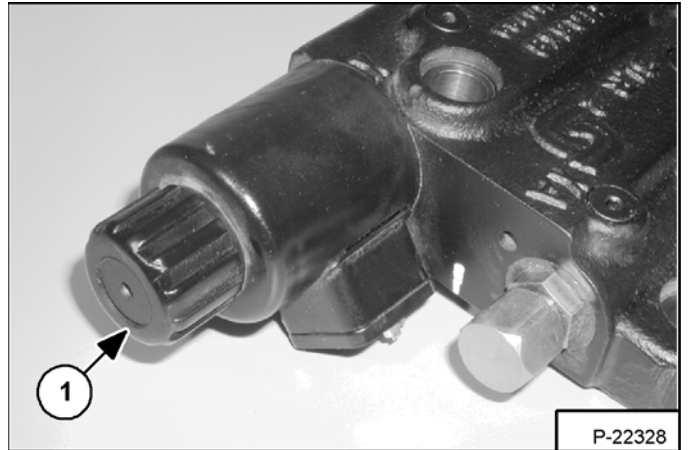
Place the hydrostatic drive motor on a work surface, mark the sections for correct assembly [Figure 30-30-2].

Figure 30-30-6



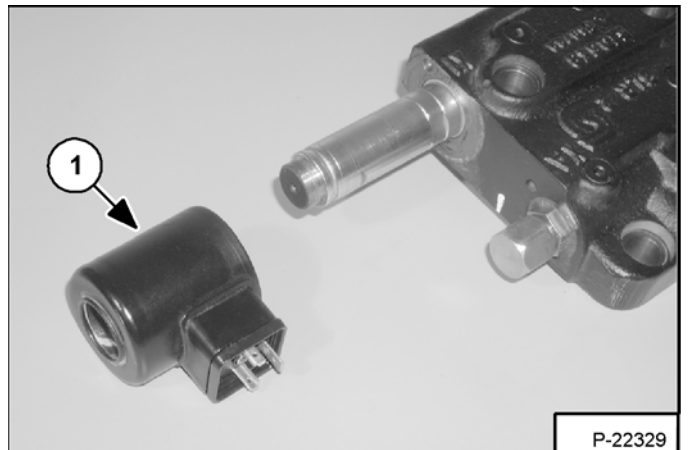
Remove the four bolts (Item 1) [Figure 30-30-3] and remove the solenoid housing.

Figure 30-30-7



Remove the solenoid nut (Item 1) [Figure 30-30-4].

Figure 30-30-8

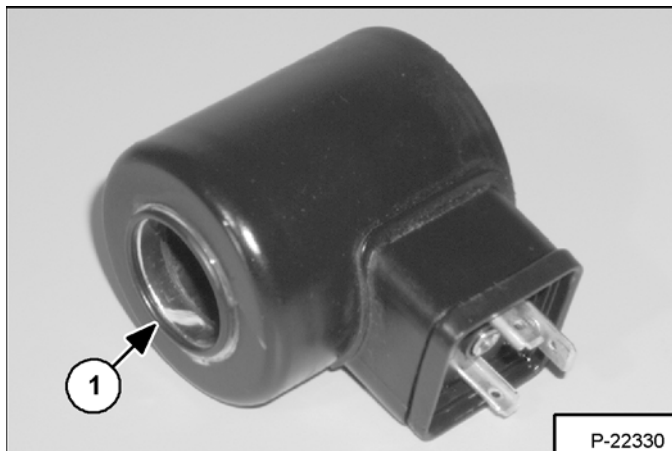


Remove the solenoid (Item 1) [Figure 30-30-5] from the shaft.

HYDROSTATIC DRIVE MOTOR (CONT'D)

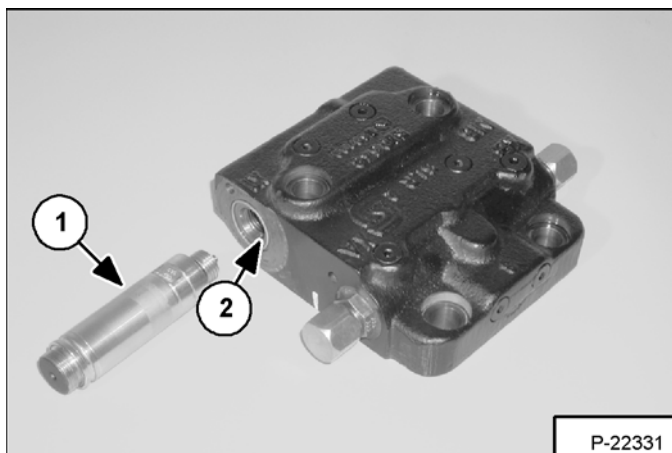
Disassembly (Cont'd)

Figure 30-30-9



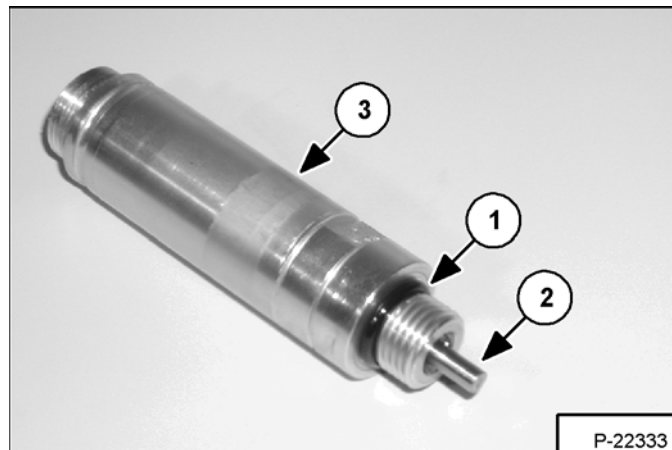
Remove and discard the O-ring (Item 1) [Figure 30-30-6] from the solenoid.

Figure 30-30-10



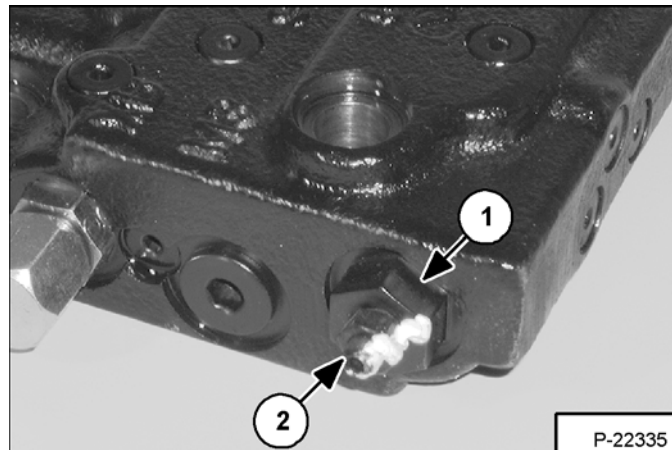
Remove the solenoid shaft (Item 1) and O-ring (Item 2) [Figure 30-30-7] from the housing.

Figure 30-30-11



Remove the O-ring (Item 1) and pin (Item 2) from the solenoid shaft (Item 3) [Figure 30-30-8].

Figure 30-30-12



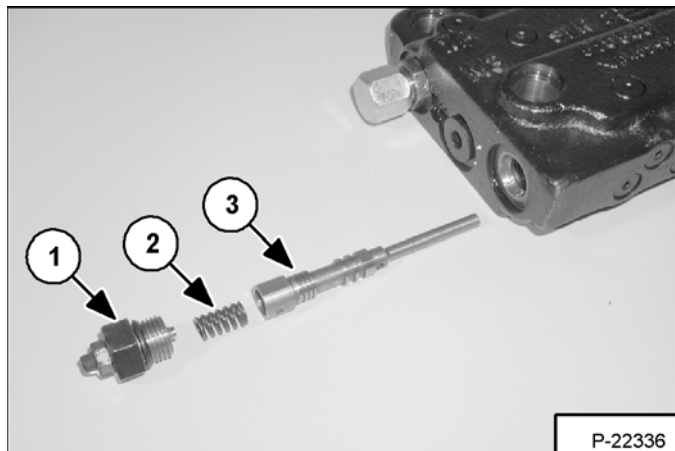
Loosen the large nut (Item 1) [Figure 30-30-9] on the compensator valve.

Do not loosen the small nut (Item 2) [Figure 30-30-9].

HYDROSTATIC DRIVE MOTOR (CONT'D)

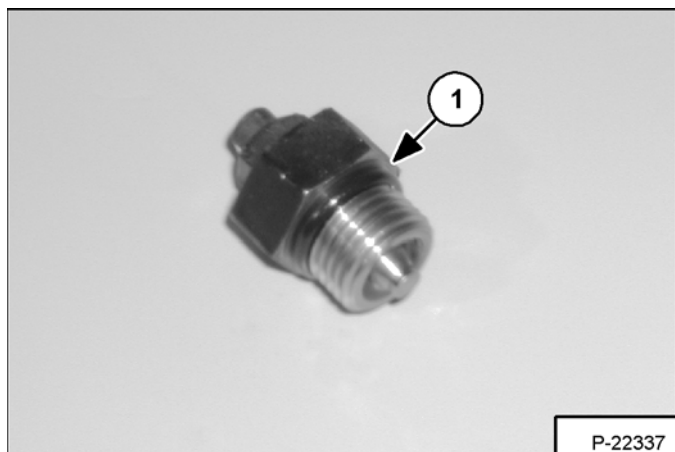
Disassembly (Cont'd)

Figure 30-30-13



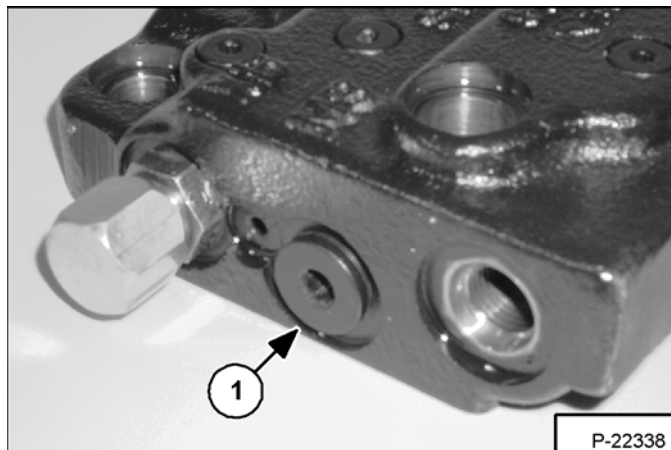
Remove the adjusting screw (Item 1), valve spring (Item 2) and spool assembly (Item 3) [Figure 30-30-10] from the housing.

Figure 30-30-14



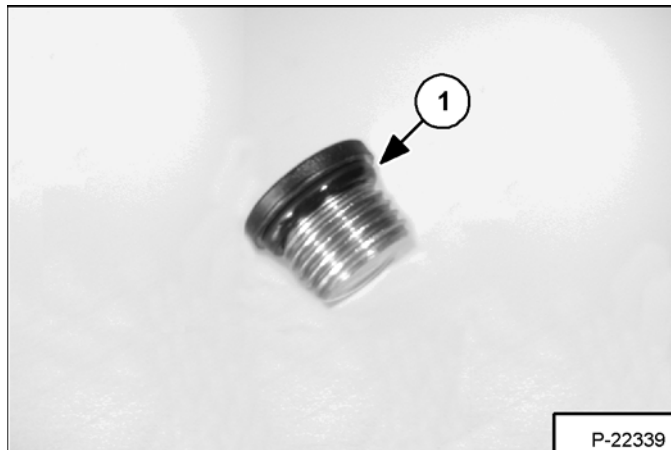
Remove and discard the O-ring (Item 1) [Figure 30-30-11] from the adjustment screw.

Figure 30-30-15



Remove the plug (Item 1) [Figure 30-30-12] from the housing.

Figure 30-30-16

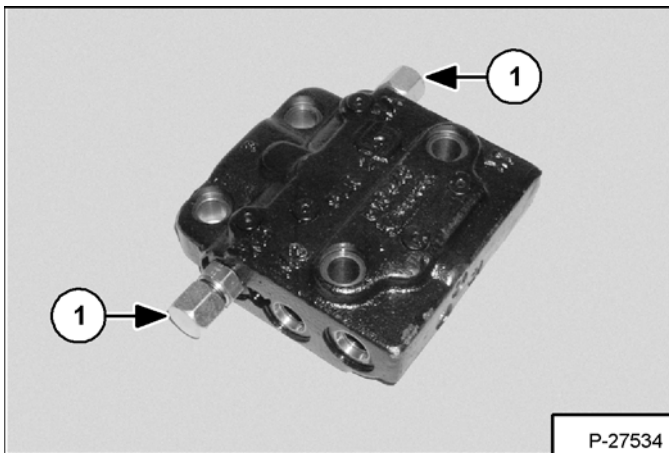


Remove and discard the O-ring (Item 1) [Figure 30-30-13] from the plug.

HYDROSTATIC DRIVE MOTOR (CONT'D)

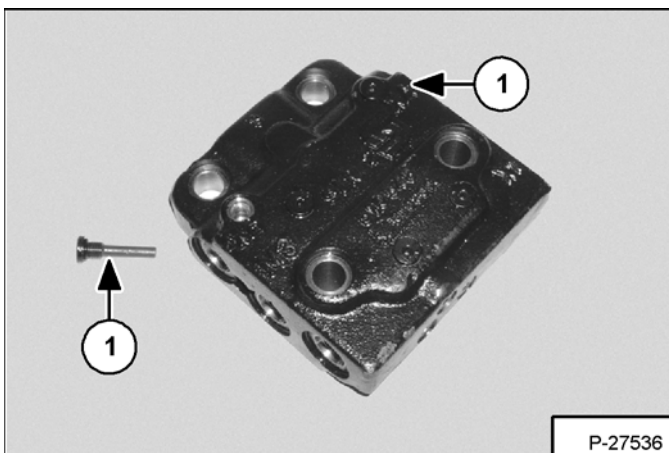
Disassembly (Cont'd)

Figure 30-30-17



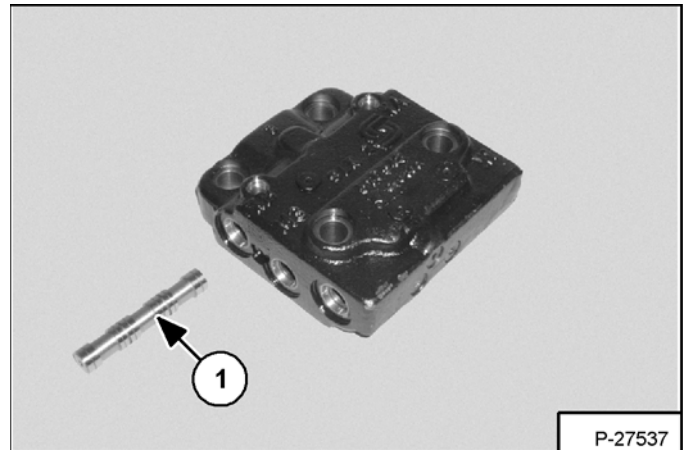
Remove the two fittings (Item 1) [Figure 30-30-14] from the housing.

Figure 30-30-18



Remove both spool limiters (Item 1) [Figure 30-30-15].

Figure 30-30-19

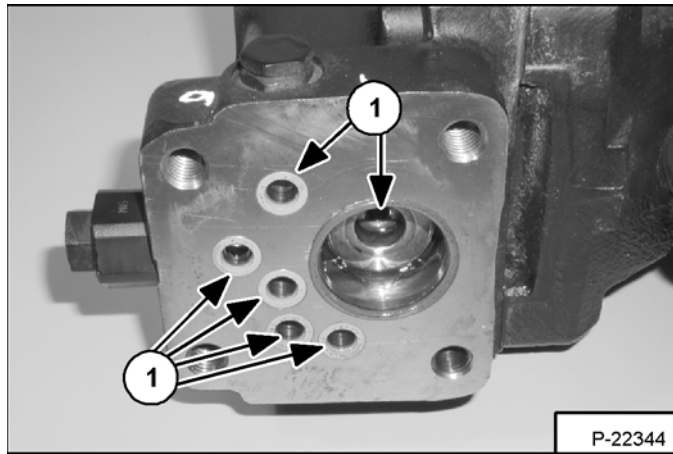


Remove the spool (Item 1) [Figure 30-30-16].

HYDROSTATIC DRIVE MOTOR (CONT'D)

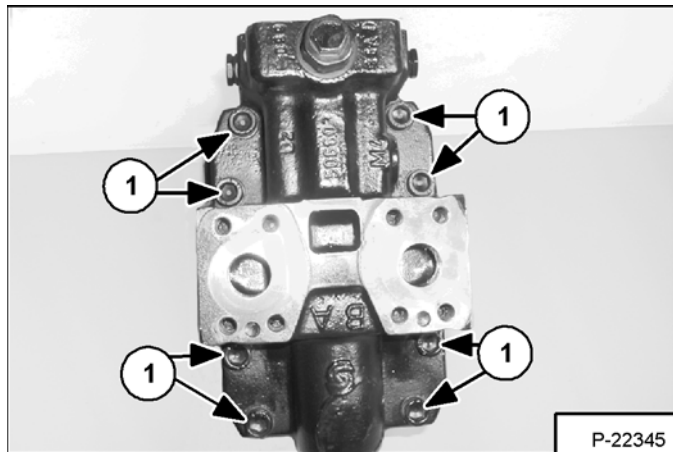
Disassembly (Cont'd)

Figure 30-30-20



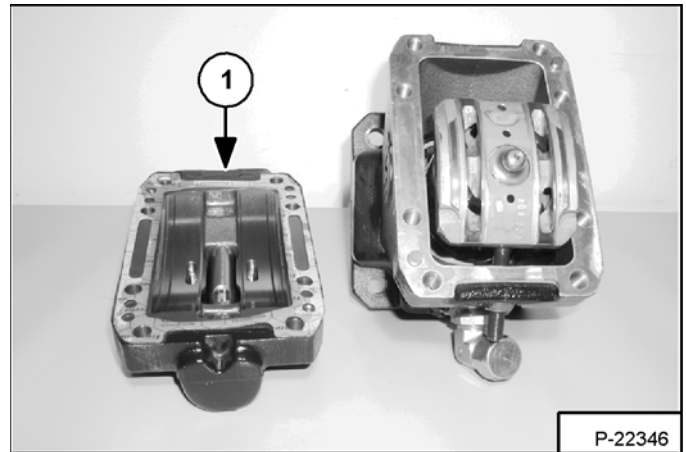
Remove and discard the six O-rings (Item 1) [Figure 30-30-17] from the housing.

Figure 30-30-21



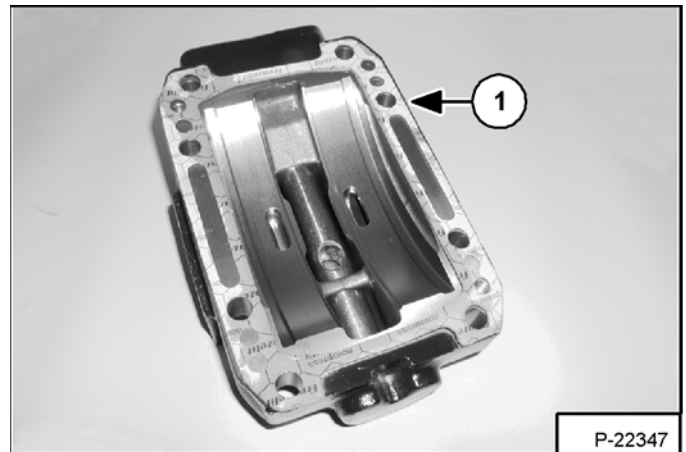
Remove the eight bolts (Item 1) [Figure 30-30-18] from the end cap.

Figure 30-30-22



Lift and remove the end cap (Item 1) [Figure 30-30-19] from the housing.

Figure 30-30-23

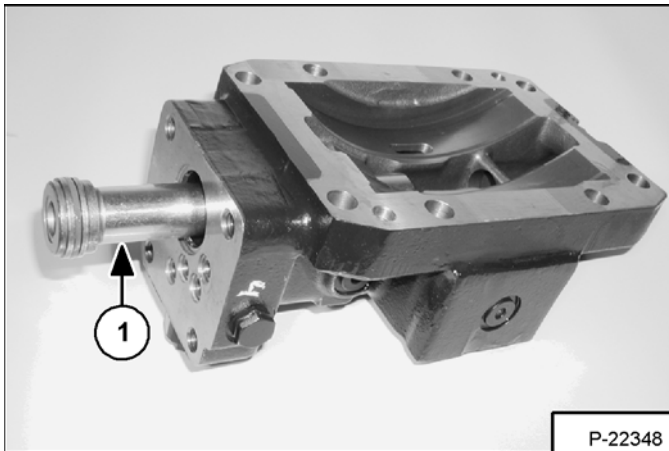


Remove the gasket (Item 1) [Figure 30-30-20] from the end cap.

HYDROSTATIC DRIVE MOTOR (CONT'D)

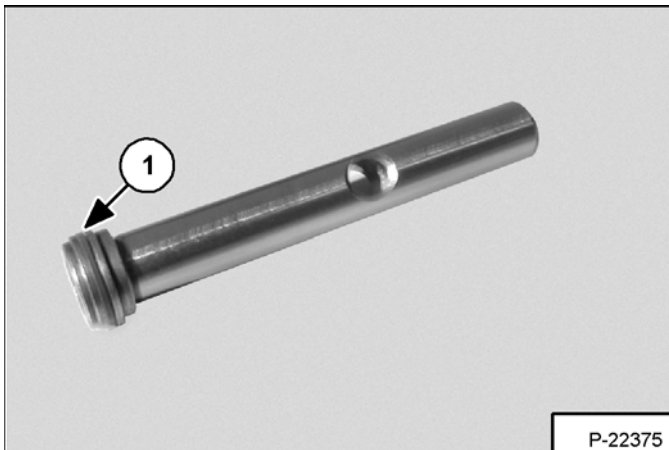
Disassembly (Cont'd)

Figure 30-30-24



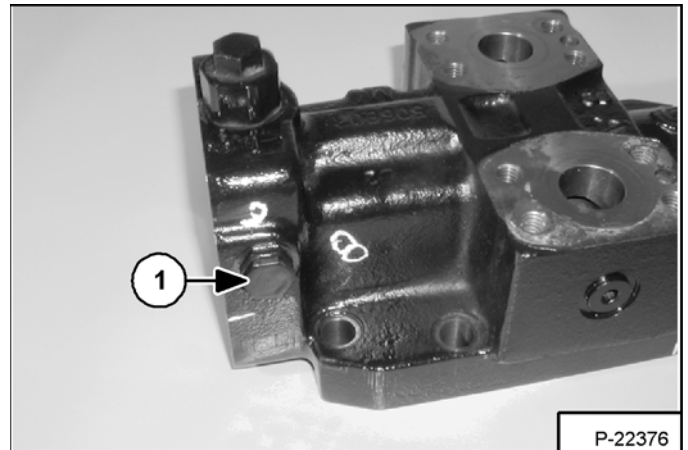
Remove the piston (Item 1) [Figure 30-30-21] from the end cap.

Figure 30-30-25



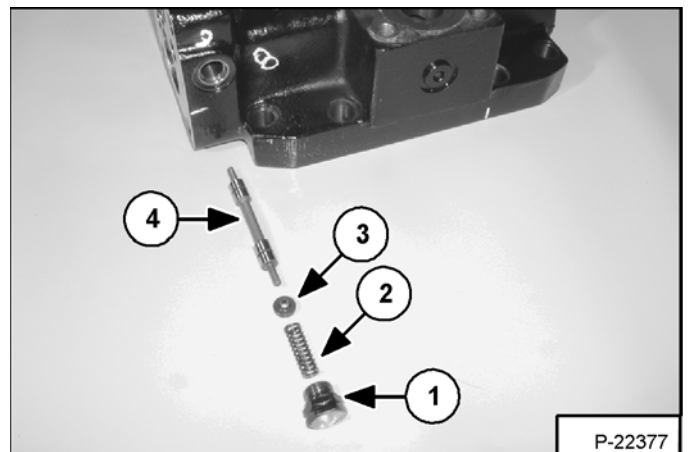
Remove the seal (Item 1) [Figure 30-30-22] from the piston.

Figure 30-30-26



Loosen the plug (Item 1) [Figure 30-30-23].

Figure 30-30-27

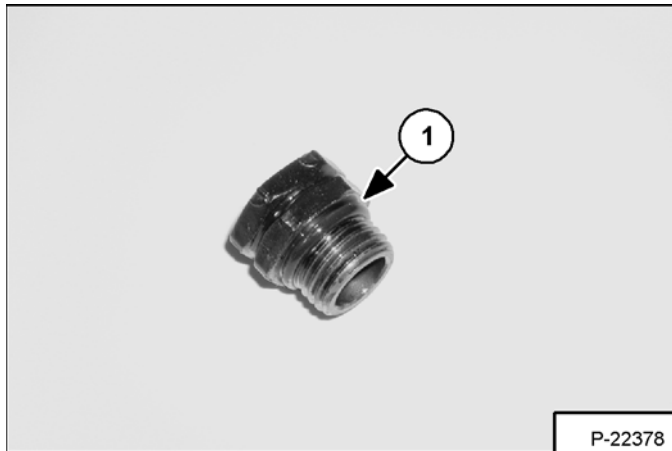


Remove the plug (Item 1), spring (Item 2), spring seat (Item 3) and spool (Item 4) [Figure 30-30-24] from the housing.

HYDROSTATIC DRIVE MOTOR (CONT'D)

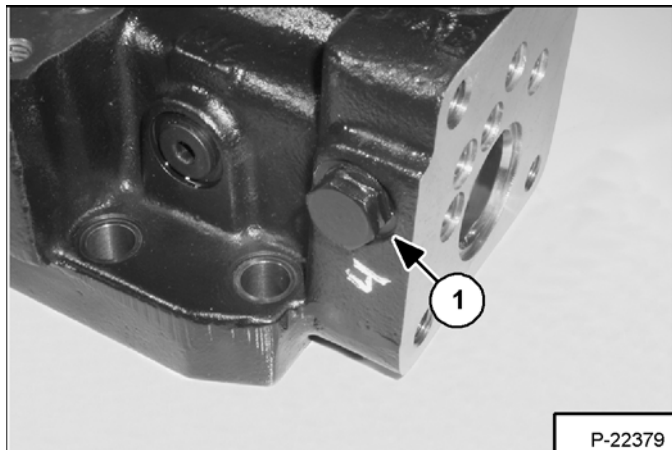
Disassembly (Cont'd)

Figure 30-30-28



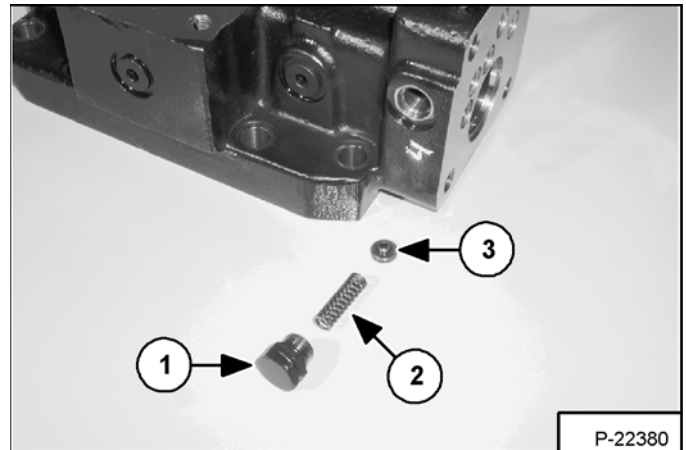
Remove and discard the O-ring (Item 1) [Figure 30-30-25] from the plug.

Figure 30-30-29



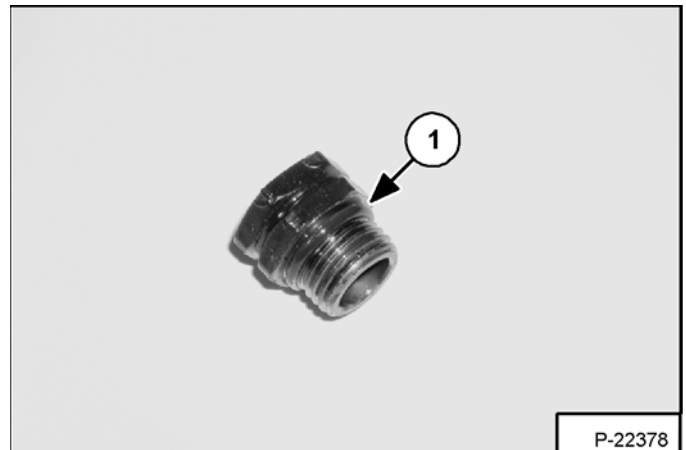
Loosen the plug (Item 1) [Figure 30-30-26].

Figure 30-30-30



Remove the plug (Item 1), spring (Item 2) and spring seat (Item 3) [Figure 30-30-27] from the housing.

Figure 30-30-31

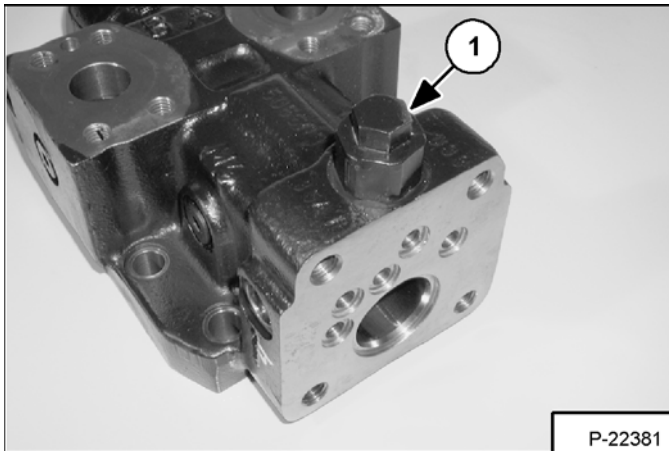


Remove and discard the O-ring (Item 1) [Figure 30-30-28] from the plug.

HYDROSTATIC DRIVE MOTOR (CONT'D)

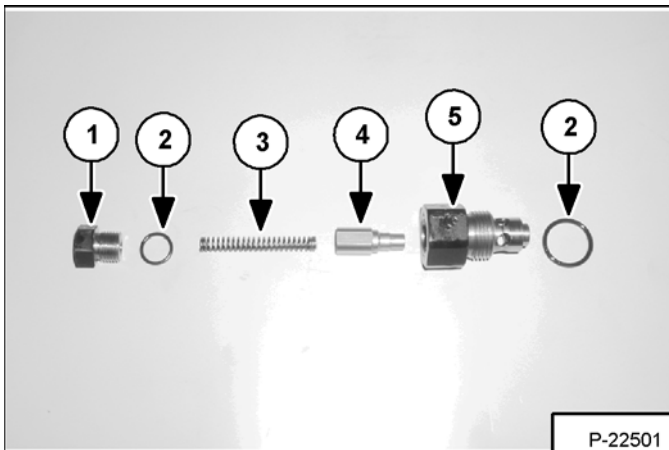
Disassembly (Cont'd)

Figure 30-30-32



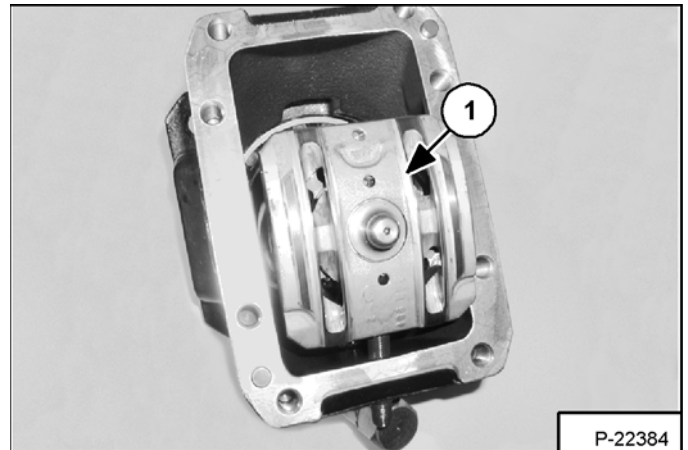
Loosen and remove the relief valve (Item 1) [Figure 30-30-29] from the housing.

Figure 30-30-33



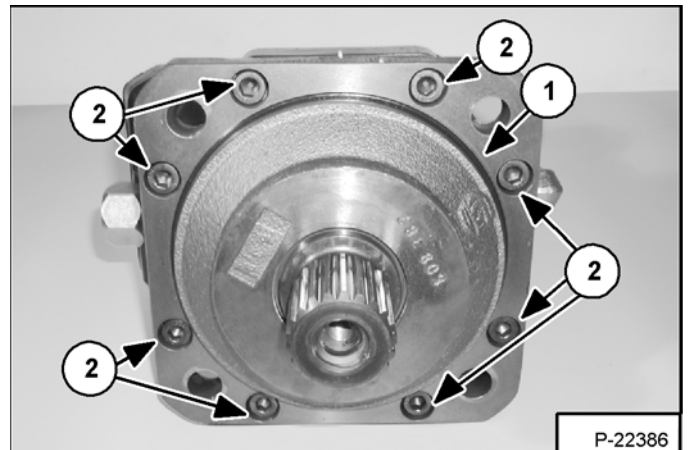
Remove the plug (Item 1), O-rings (Item 2), spring (Item 3) and poppet (Item 4) from the relief valve housing (Item 5) [Figure 30-30-30].

Figure 30-30-34



Remove the valve segment (Item 1) [Figure 30-30-31] from the cylinder.

Figure 30-30-35

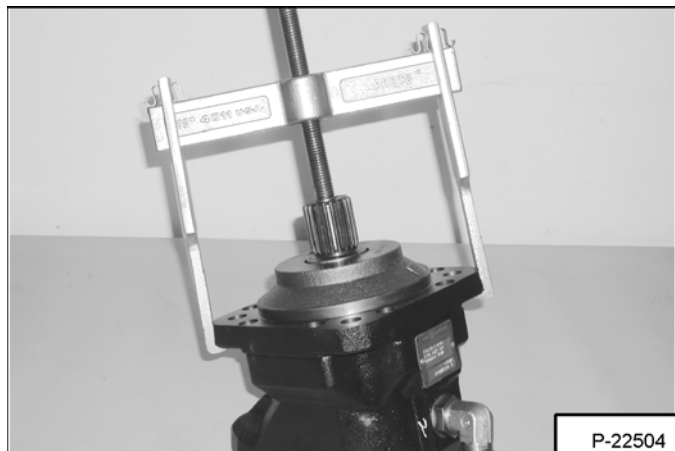


Remove and discard the O-ring (Item 1). Remove eight mounting bolts (Item 2) [Figure 30-30-32] from the mounting plate.

HYDROSTATIC DRIVE MOTOR (CONT'D)

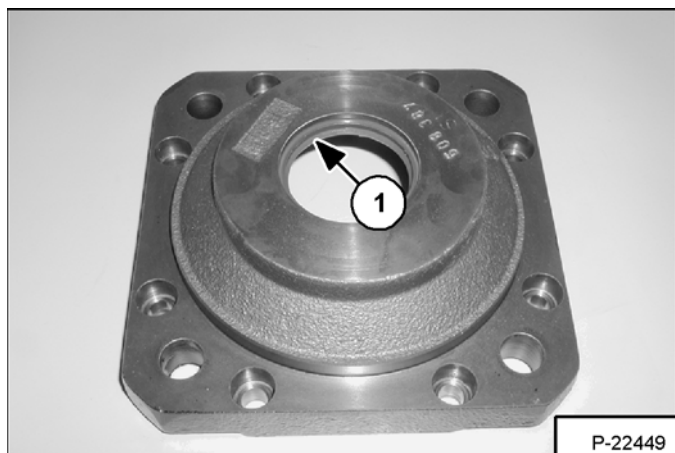
Disassembly (Cont'd)

Figure 30-30-36



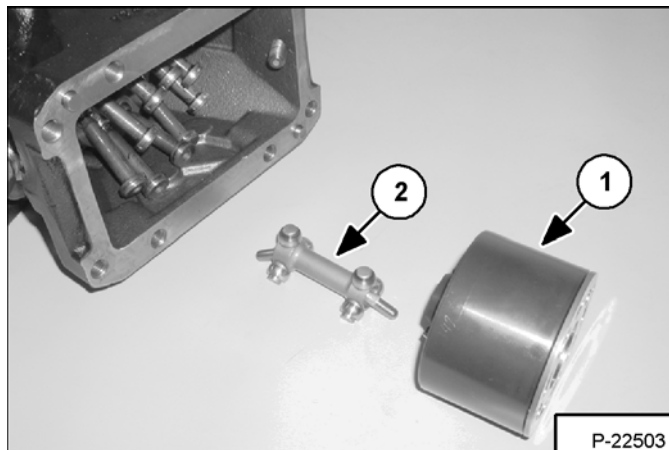
Remove the mounting plate (Item 1) [Figure 30-30-33] using a suitable puller.

Figure 30-30-37



Remove and discard the seal (Item 1) [Figure 30-30-34] from the mounting plate.

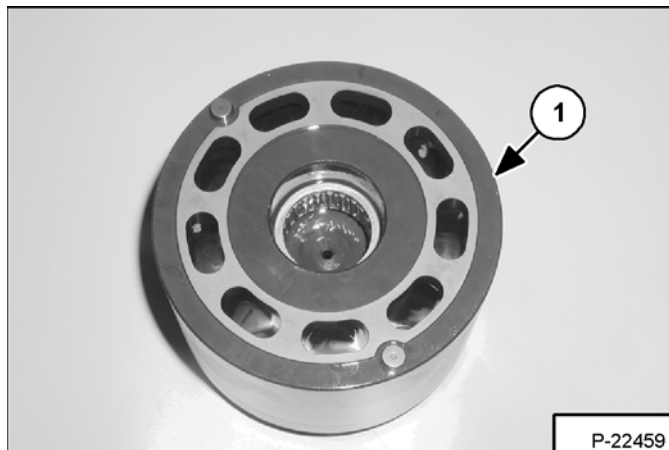
Figure 30-30-38



Remove the cylinder block (Item 1) and synchronizing shaft assembly (Item 2) [Figure 30-30-35] from the housing.

NOTE: It is not important that the pistons are installed in their original position.

Figure 30-30-39

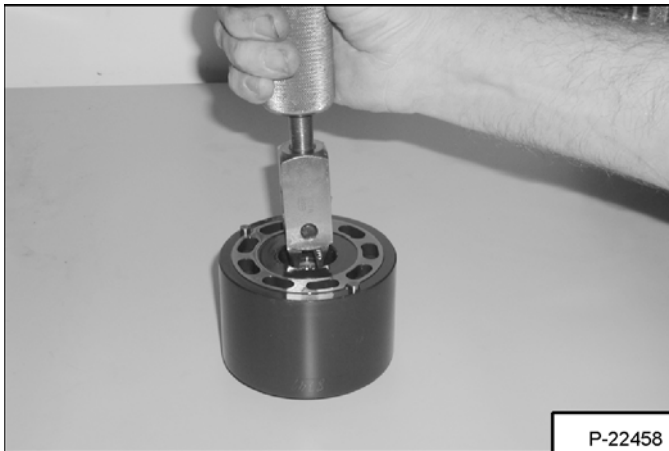


Remove the bearing plate (Item 1) [Figure 30-30-36] from the cylinder block.

HYDROSTATIC DRIVE MOTOR (CONT'D)

Disassembly (Cont'd)

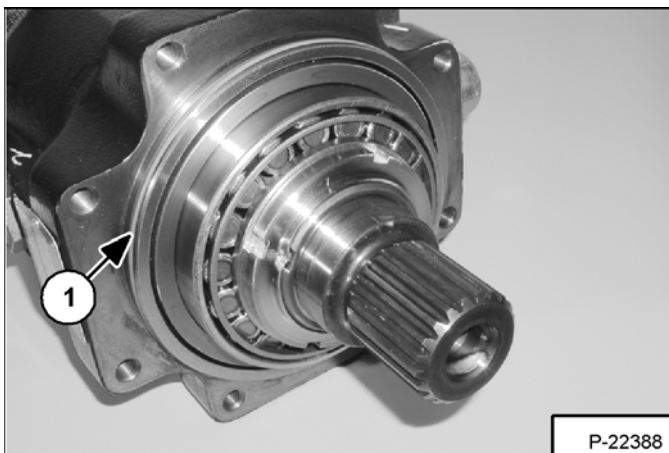
Figure 30-30-40



Remove the bearing from the cylinder block [Figure 30-30-37].

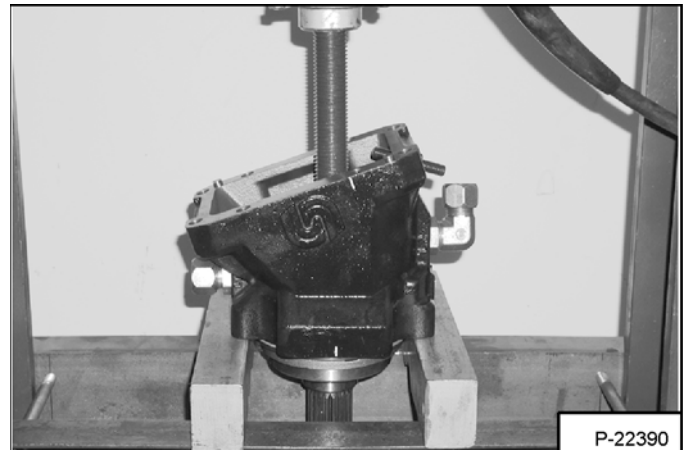
DO NOT damage the bearing plate surface of the cylinder block.

Figure 30-30-41



Remove the O-ring (Item 1) [Figure 30-30-38] from the housing.

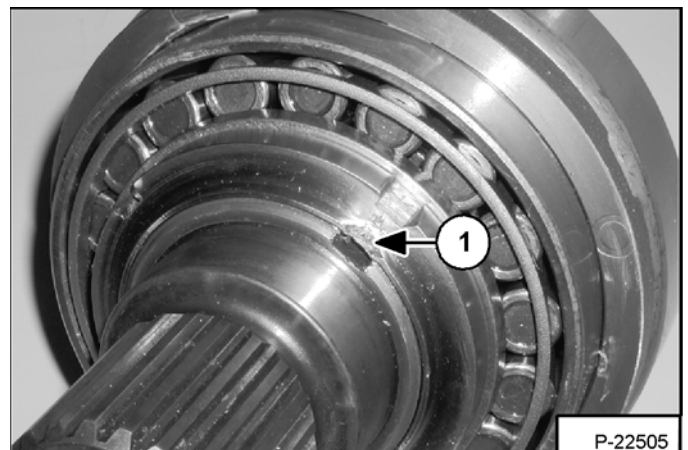
Figure 30-30-42



Press the piston/shaft assembly from the housing [Figure 30-30-39].

DO NOT damage the pistons.

Figure 30-30-43

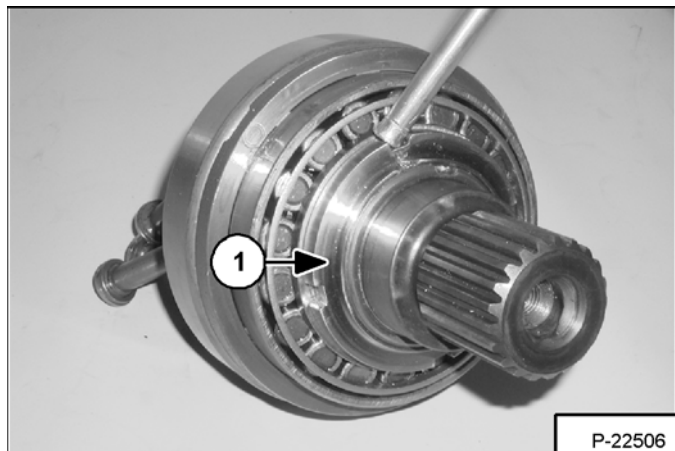


Pry up the peened notch (Item 1) [Figure 30-30-40] in the ring nut.

HYDROSTATIC DRIVE MOTOR (CONT'D)

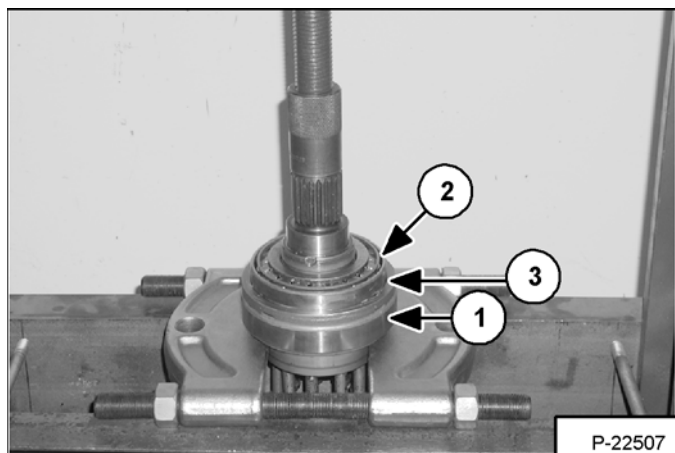
Disassembly (Cont'd)

Figure 30-30-44



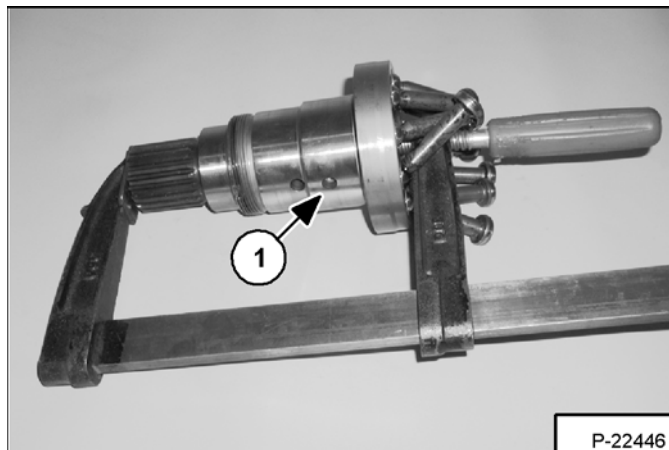
Remove the ring nut (Item 1) [Figure 30-30-41] from the shaft.

Figure 30-30-45



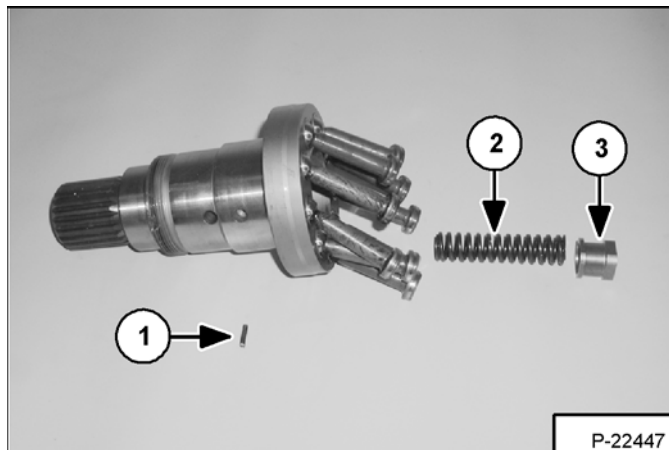
Remove the large bearing and race (Item 1), small bearing and race (Item 2) and spacer (Item 3) [Figure 30-30-42] from the shaft.

Figure 30-30-46



Using a clamp, compress the spring seat and spring, and drive the pin (Item 1) [Figure 30-30-43] inwards. Release the clamp.

Figure 30-30-47

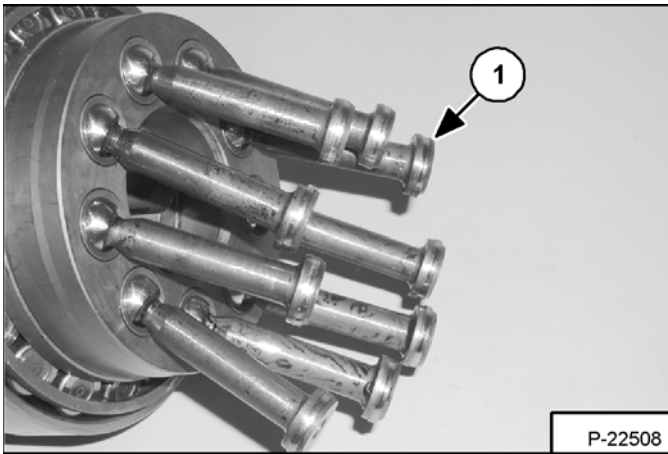


Remove the pin (Item 1), spring (Item 2) and spring seat (Item 3) [Figure 30-30-44] from the shaft assembly.

HYDROSTATIC DRIVE MOTOR (CONT'D)

Disassembly (Cont'd)

Figure 30-30-48



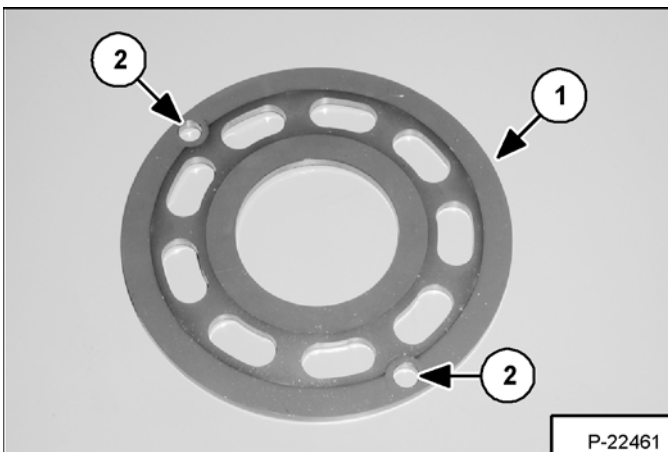
Remove the piston rings (Item 1) [Figure 30-30-45] from the pistons.

NOTE: If any portion of the shaft assembly, bearings or races must be replaced, the complete shaft/bearing assembly must be replaced. The only serviceable part is the piston rings (Item 1) [Figure 30-30-45].

Inspection

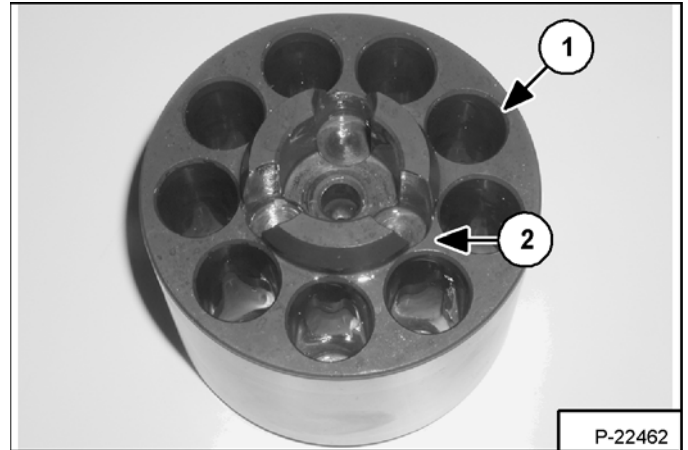
Clean all parts in solvent and use air pressure to dry them. DO NOT use cloth or paper as small pieces of material can get into the system and cause damage.

Figure 30-30-49



Inspect the running (bronze) surface of the bearing plate (Item 1) and locating pin holes (Item 2) [Figure 30-30-46] for wear. Replace if damaged or worn.

Figure 30-30-50



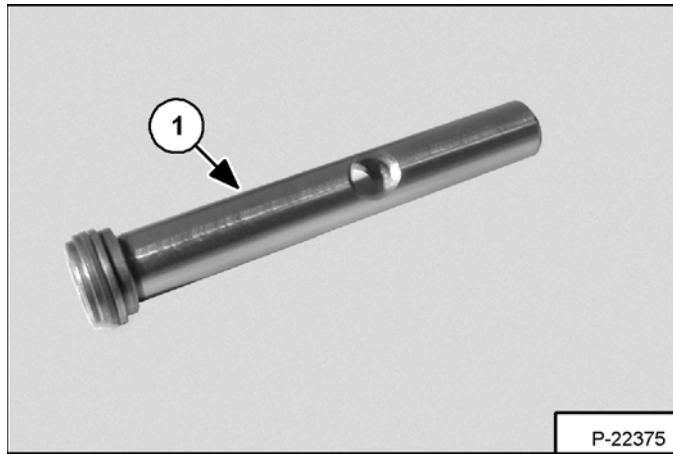
Inspect the cylinder block assembly for wear or damage. The piston bores (Item 1) must be smooth. The races for the synchronizing shaft rollers (Item 2) [Figure 30-30-47] must not be worn.

If there is any defect in the cylinder block or pistons, the complete rotating group must be replaced.

HYDROSTATIC DRIVE MOTOR (CONT'D)

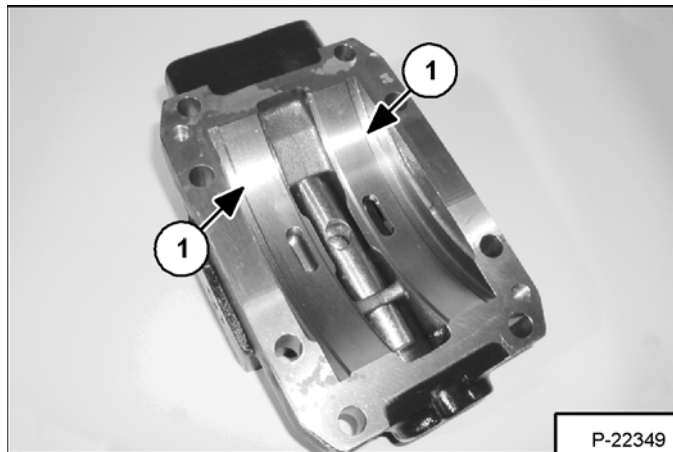
Inspection (Cont'd)

Figure 30-30-51



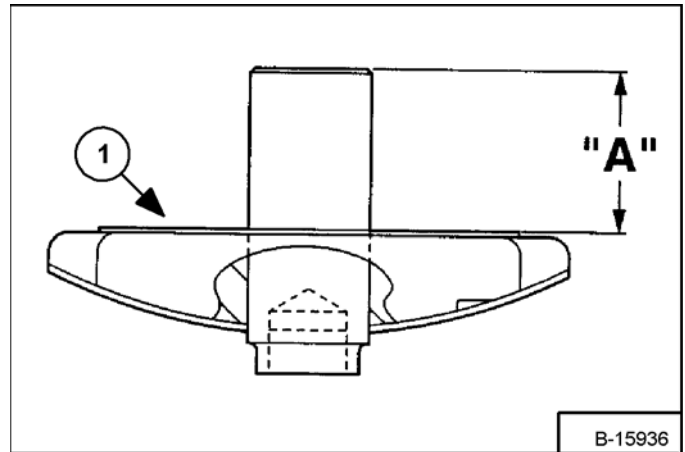
Inspect the piston (Item 1) [Figure 30-30-48] for wear or damage.

Figure 30-30-52



Inspect the swash plate running surface (Item 1) [Figure 30-30-49] in the end cap for wear or damage.

Figure 30-30-53



Inspect the valve segment for damage or wear on the sealing surface (Item 1) [Figure 30-30-50].

Check that the spindle is located correctly in the valve segment by measuring distance "A" [Figure 30-30-50]. If this dimension is not within 1.36 to 1.37 inch (34.5 to 34.7 mm) the assembly must be replaced.

HYDROSTATIC DRIVE MOTOR (CONT'D)

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.

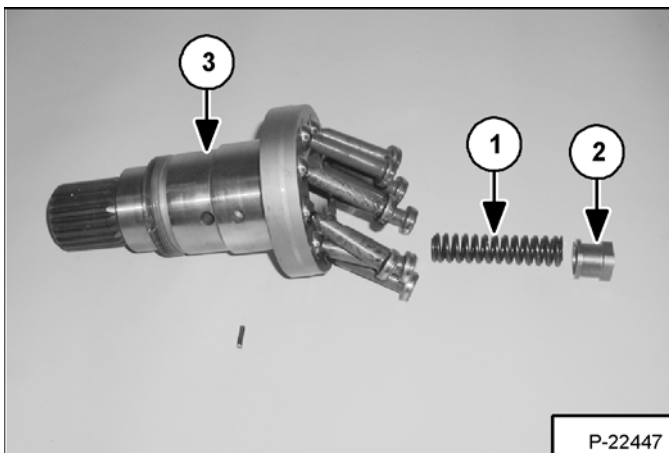
I-2003-0888

Clean all parts in solvent and dry with compressed air.

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

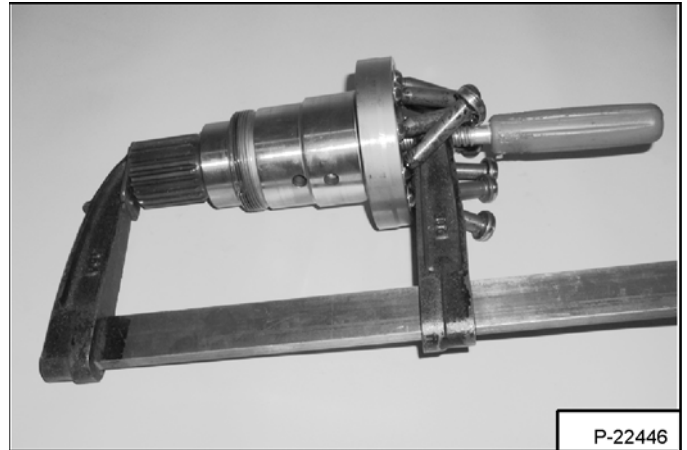
Always install new seals and O-rings. Lubricate all seals and O-rings with clean hydraulic fluid before installation.

Figure 30-30-54



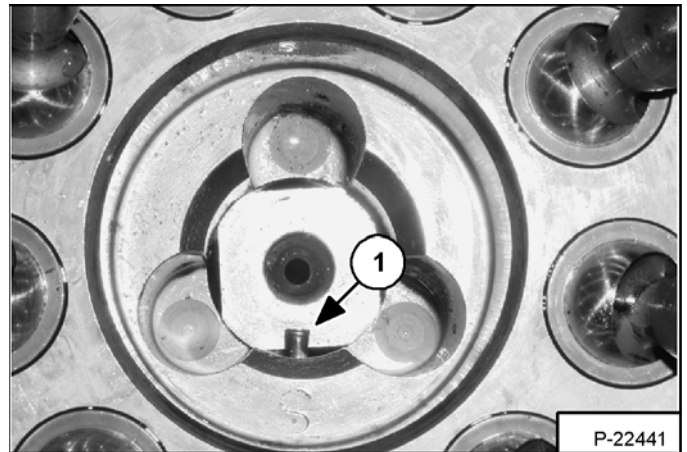
Install the spring (Item 1) and spring seat (Item 2) into the shaft assembly (Item 3) [Figure 30-30-51].

Figure 30-30-55



Using a clamp, compress the spring and spring seat [Figure 30-30-52].

Figure 30-30-56



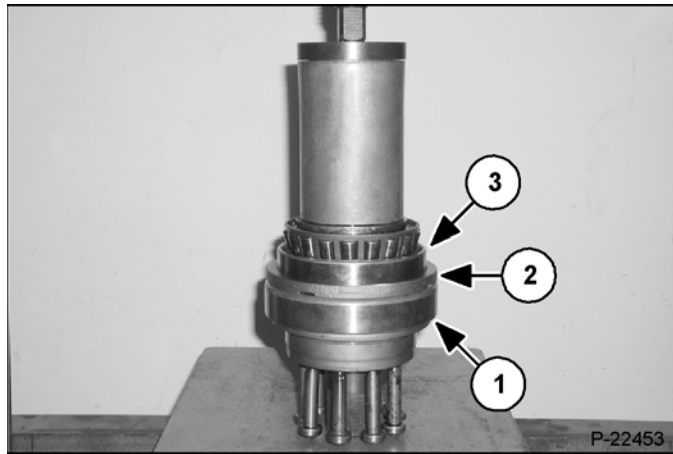
Install the pin (Item 1) [Figure 30-30-53] as shown.

NOTE: Clamp is removed for photo clarity.

HYDROSTATIC DRIVE MOTOR (CONT'D)

Assembly (Cont'd)

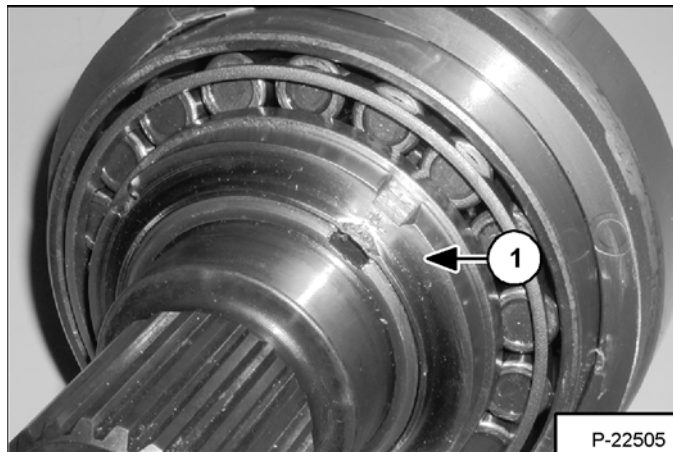
Figure 30-30-57



Support the shaft assembly in a press without causing damage to the pistons, install the large bearing and race (Item 1), spacer (Item 2) and small bearing and race (Item 3) [Figure 30-30-54] into the shaft assembly.

NOTE: Be sure not to over press the bearings, they should be able to roll freely.

Figure 30-30-58



Install the ring nut (Item 1) [Figure 30-30-55] onto the shaft.

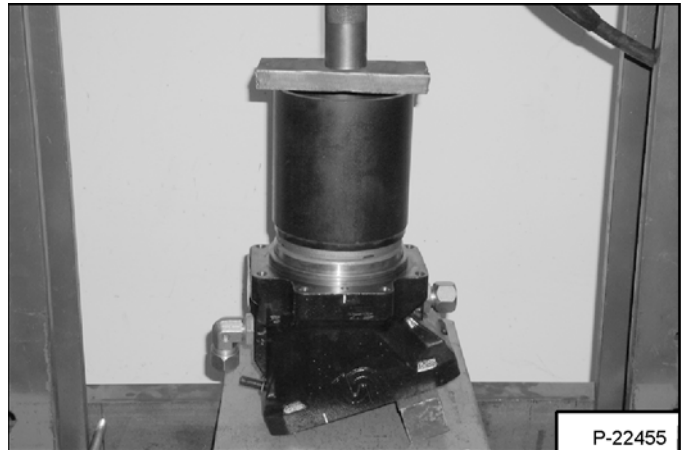
NOTE: Do not over tighten the ring nut and that there is no noticeable looseness in the bearing.

Figure 30-30-59



Using a punch seat the ring nut into the groove in the shaft. [Figure 30-30-56].

Figure 30-30-60



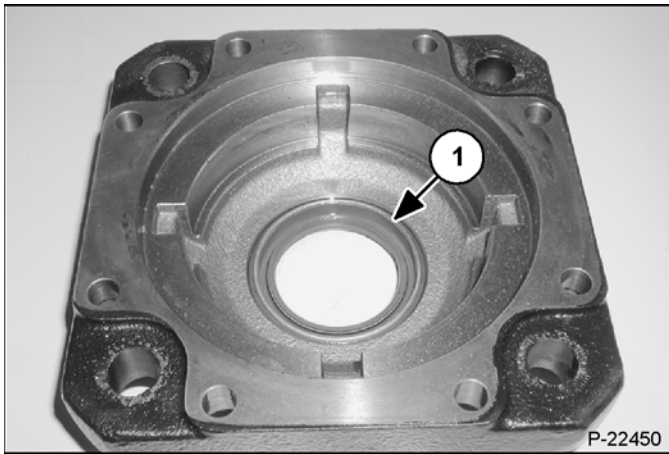
Press the piston/shaft assembly into the housing [Figure 30-30-57].

DO NOT DAMAGE THE PISTONS.

HYDROSTATIC DRIVE MOTOR (CONT'D)

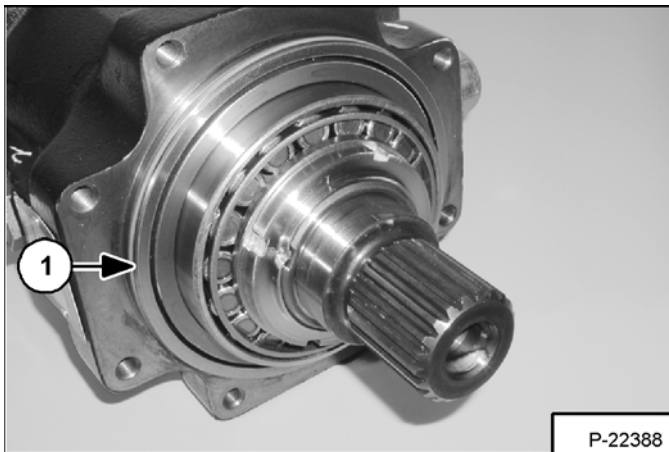
Assembly (Cont'd)

Figure 30-30-61



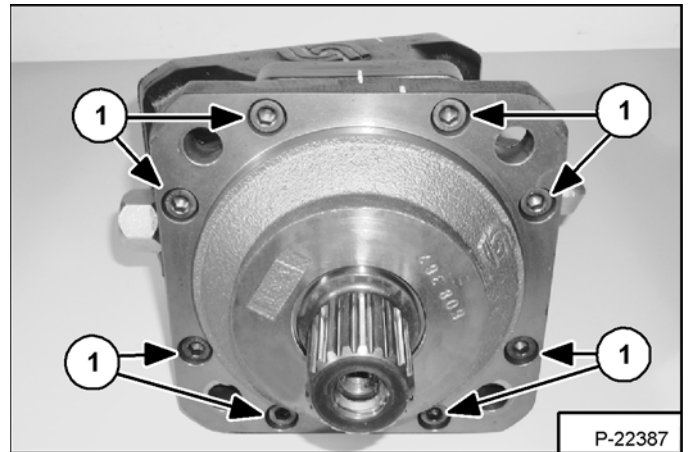
Install a new seal (Item 1) [Figure 30-30-58] into the mounting plate until it is fully seated.

Figure 30-30-62



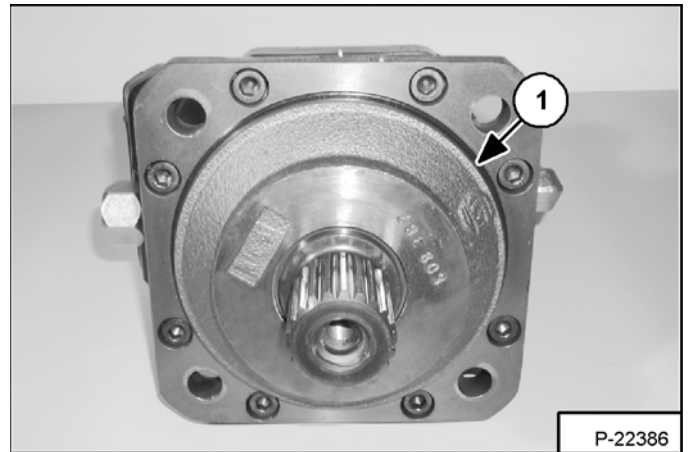
Install a new O-ring (Item 1) [Figure 30-30-59] onto the housing.

Figure 30-30-63



Install the mounting plate onto the housing, install the eight mounting bolts (Item 1) [Figure 30-30-60] and tighten to 46 ft.-lbs. (63 Nm) torque.

Figure 30-30-64

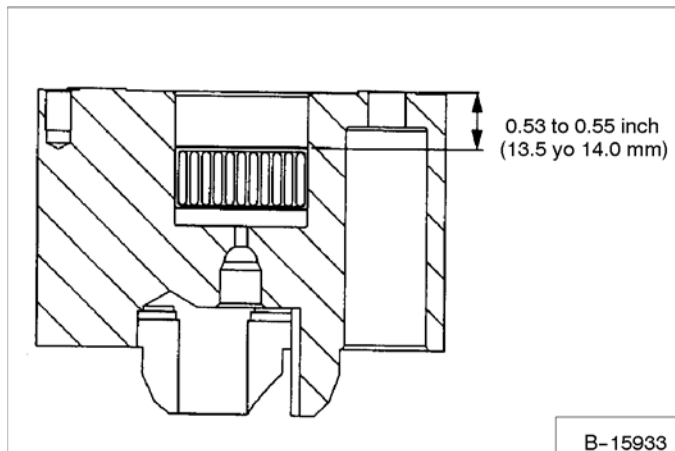


Install a new O-ring (Item 1) [Figure 30-30-61] onto the mounting plate.

HYDROSTATIC DRIVE MOTOR (CONT'D)

Assembly (Cont'd)

Figure 30-30-65



Press a new bearing into the cylinder block until it is located 0.53 to 0.55 inch (13.5 to 14.0 mm) below the bearing plate surface [Figure 30-30-62].

Figure 30-30-66

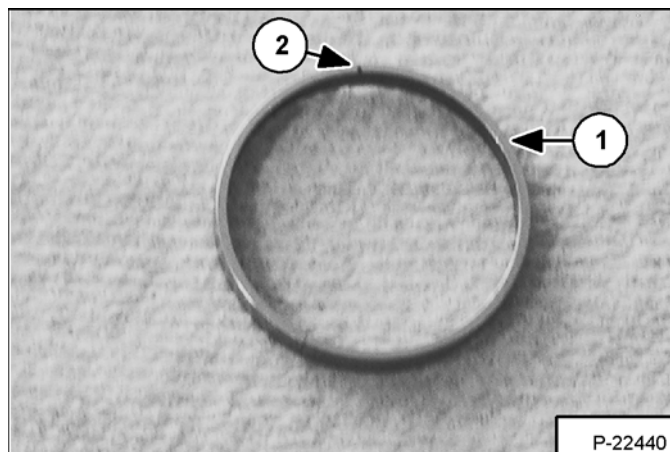
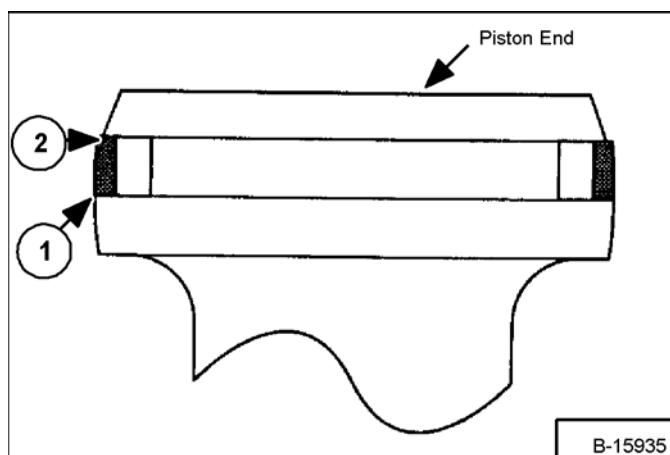


Figure 30-30-67



Install new piston rings (Item 1) [Figure 30-30-63] onto the pistons, make sure the spherical surface (Item 1) [Figure 30-30-64] conforms to the shape of the piston.

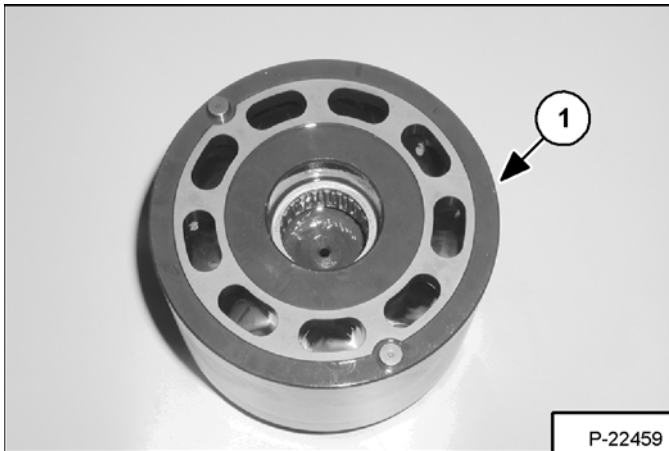
An identification mark (Item 2) [Figure 30-30-63] & [Figure 30-30-64] is on the "outer" side of the piston ring.

The ends of the piston rings must NOT overlap each other.

HYDROSTATIC DRIVE MOTOR (CONT'D)

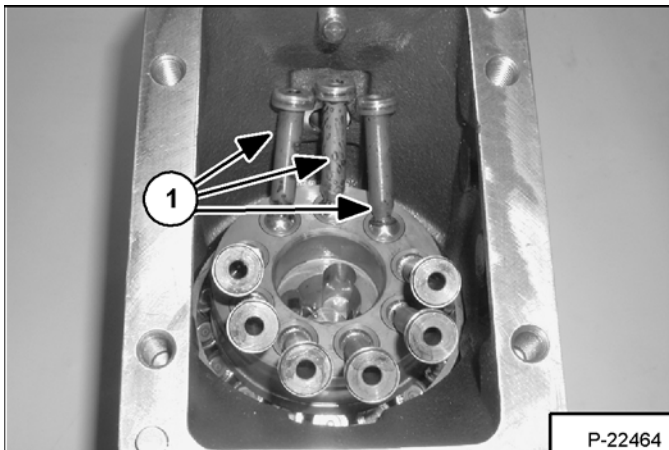
Assembly (Cont'd)

Figure 30-30-68



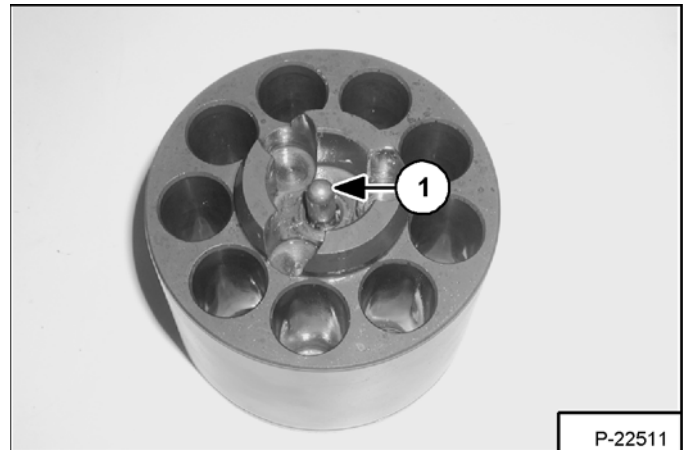
Install the bearing plate (Item 1) [Figure 30-30-65] with the bronze surface facing up onto the cylinder block.

Figure 30-30-69



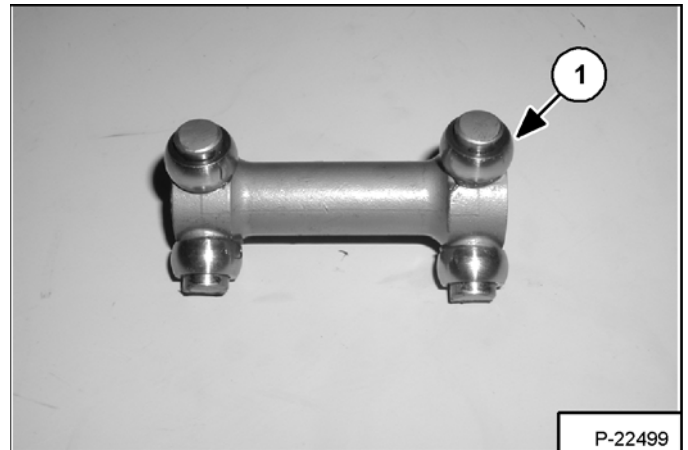
Position the housing on end, tip the three pistons (Item 1) [Figure 30-30-66] closest to the minimum angle stop out toward the housing.

Figure 30-30-70



Install the synchronizing shaft support pin (Item 1) [Figure 30-30-67] into the cylinder block and retain with grease.

Figure 30-30-71

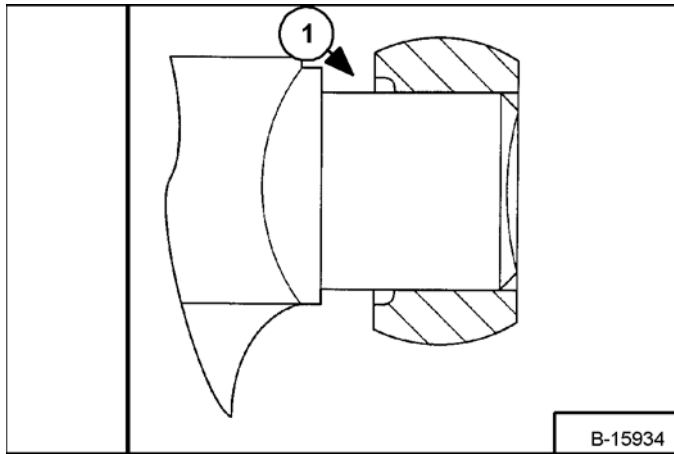


Install the six synchronizing shaft rollers (Item 1) [Figure 30-30-68] onto the synchronizing shaft and retain with grease.

HYDROSTATIC DRIVE MOTOR (CONT'D)

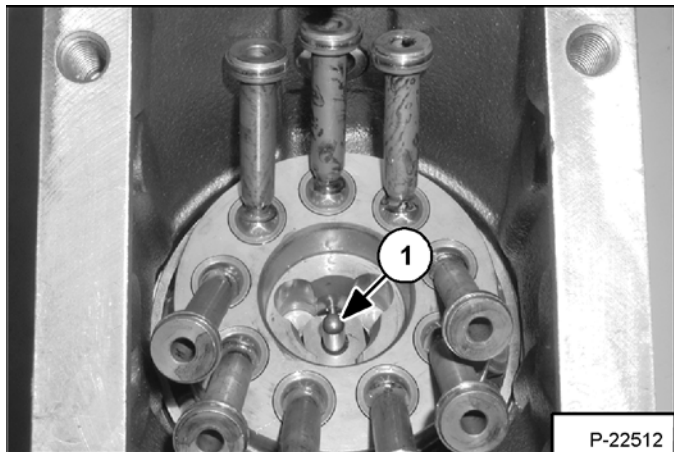
Assembly (Cont'd)

Figure 30-30-72



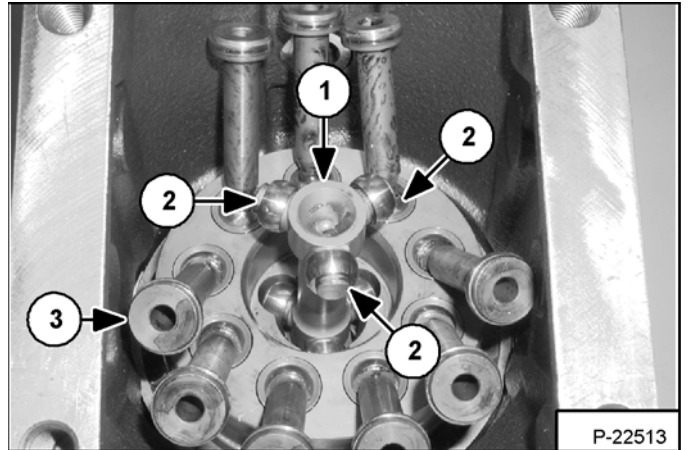
NOTE: The recess (Item 1) [Figure 30-30-69] on each roller **MUST** face the synchronizing shaft.

Figure 30-30-73



Install the synchronizing shaft support pin (Item 1) [Figure 30-30-70] into the motor shaft assembly and retain with grease.

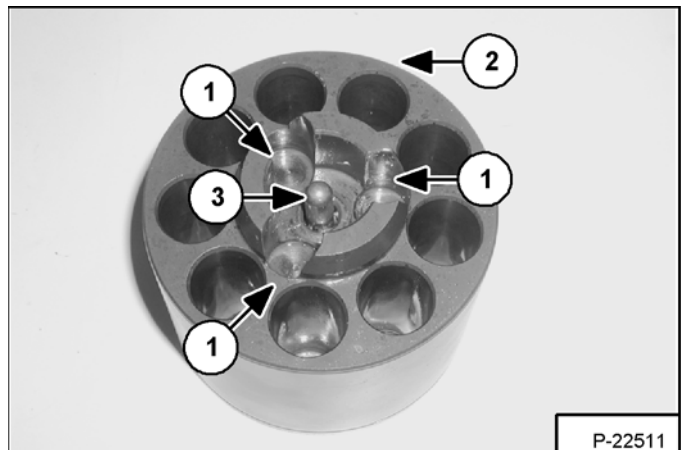
Figure 30-30-74



Install the synchronizing shaft and rollers (Item 1) [Figure 30-30-71] into the motor shaft races. When properly installed the synchronizing shaft should move freely in all directions.

NOTE: The motor shaft end of the synchronizing shaft is smaller than the cylinder end.

Figure 30-30-75



When installing the cylinder block, the races (Item 1) [Figure 30-30-72] in the cylinder block must be positioned so the synchronizing shaft rollers (Item 2) [Figure 30-30-72] and pistons (Item 3) [Figure 30-30-71] and their bores (Item 2) [Figure 30-30-72] are aligned.

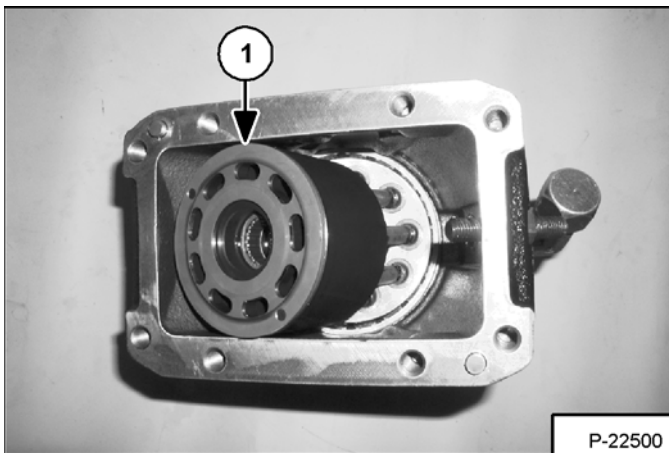
Install the six pistons (Item 3) [Figure 30-30-71] into the cylinder bores, tilt the block so the synchronizing shaft rollers enter their races in the block and the support pin (Item 3) [Figure 30-30-72] enter the recess.

Lift the cylinder block slightly and guide the three remaining pistons in position.

HYDROSTATIC DRIVE MOTOR (CONT'D)

Assembly (Cont'd)

Figure 30-30-76

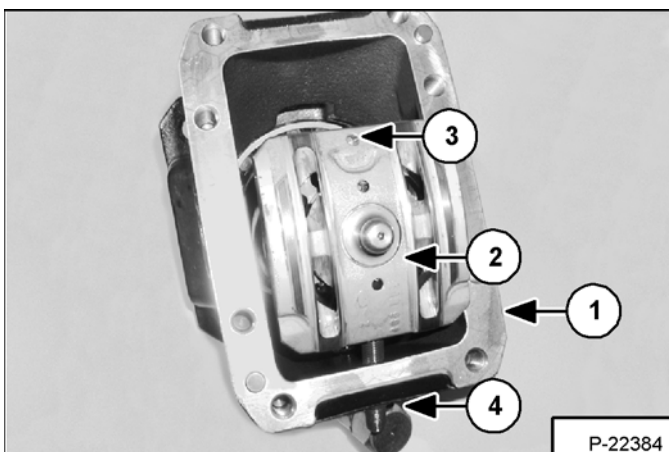


If the cylinder block (Item 1) [Figure 30-30-73] is properly installed, there should be very little rotational free-play between the block and the motor shaft.

NOTE: A brass rod may be used to guide the pistons into their bores.

Lubricate the pistons and cylinder block bores with hydraulic oil.

Figure 30-30-77

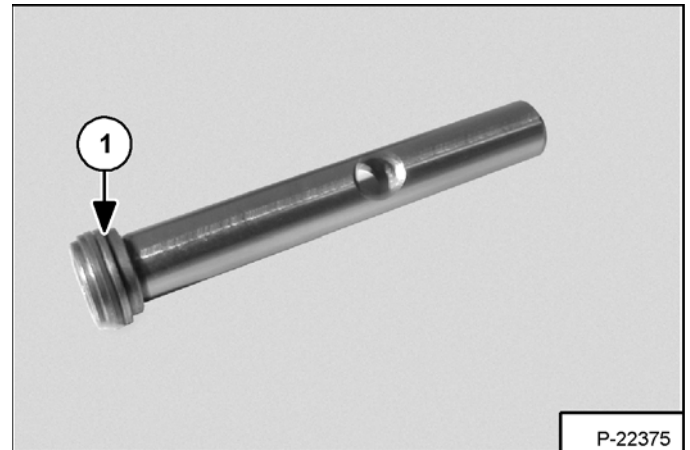


Install a new gasket (Item 1) [Figure 30-30-74] onto the housing.

Install the valve segment (Item 2) [Figure 30-30-74] onto the cylinder block and retain with heavy grease.

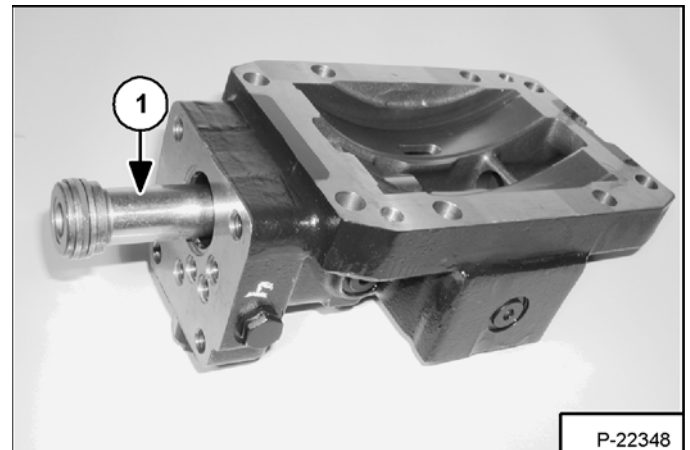
NOTE: The hole (Item 3) in the valve segment should be opposite the minimum displacement adjustment screw (Item 4) [Figure 30-30-74].

Figure 30-30-78



Install a new seal (Item 1) [Figure 30-30-75] onto the piston.

Figure 30-30-79

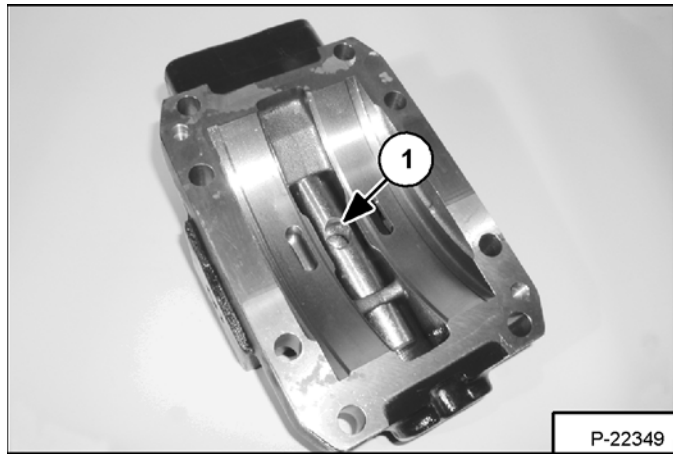


Lubricate and install the piston (Item 1) [Figure 30-30-76] into the end cap.

HYDROSTATIC DRIVE MOTOR (CONT'D)

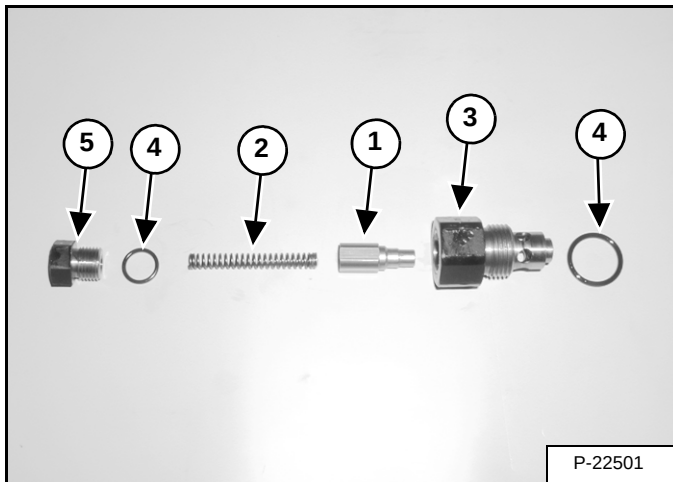
Assembly (Cont'd)

Figure 30-30-80



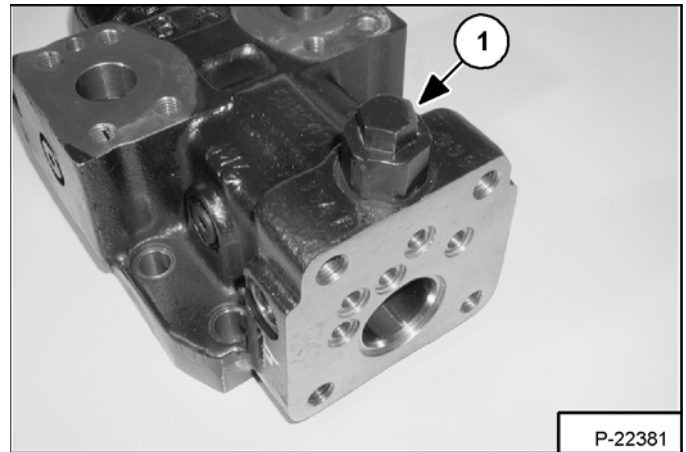
NOTE: Note the position of the hole (Item 1) [Figure 30-30-77] in the end cap.

Figure 30-30-81



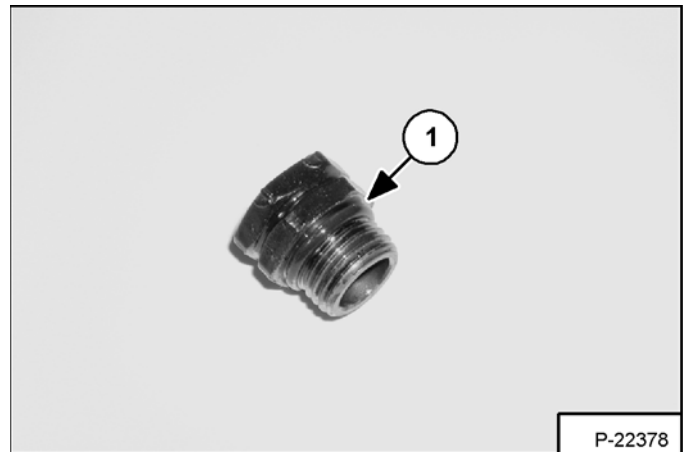
Assemble the poppet (Item 1) and spring (Item 2) into the relief valve housing (Item 3) install O-rings (Item 4) and plug (Item 5) [Figure 30-30-78].

Figure 30-30-82



Install the relief valve (Item 1) [Figure 30-30-79] into the housing and tighten to 38 ft.-lbs. (52 Nm) torque.

Figure 30-30-83

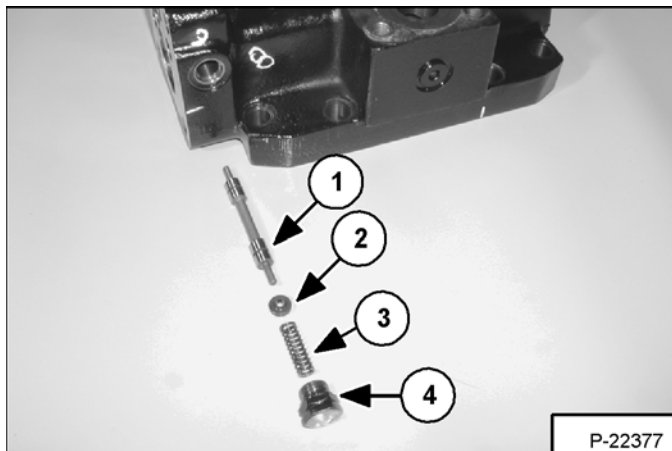


Install a new O-ring (Item 1) [Figure 30-30-80] onto the plug.

HYDROSTATIC DRIVE MOTOR (CONT'D)

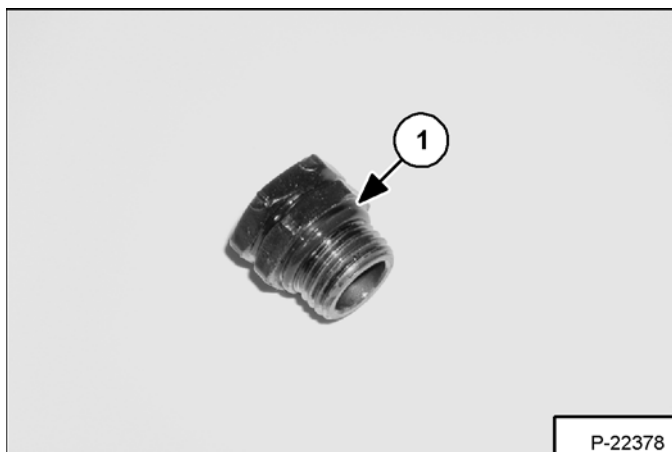
Assembly (Cont'd)

Figure 30-30-84



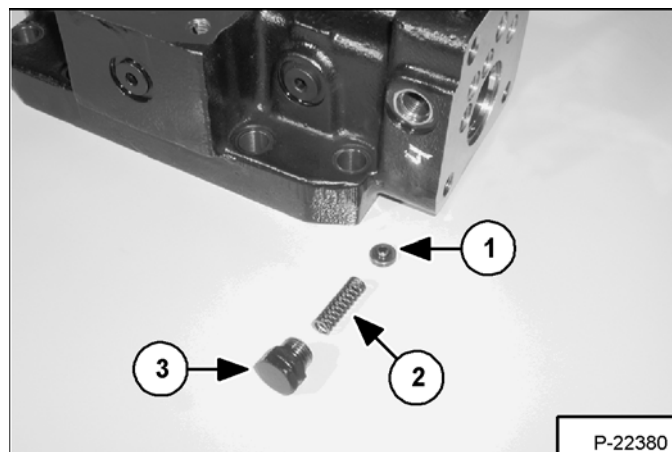
Install the spool (Item 1), spring seat (Item 2), spring (Item 3) and plug (Item 4) [Figure 30-30-81] into the housing and tighten to 30 ft.-lbs. (41 Nm) torque.

Figure 30-30-85



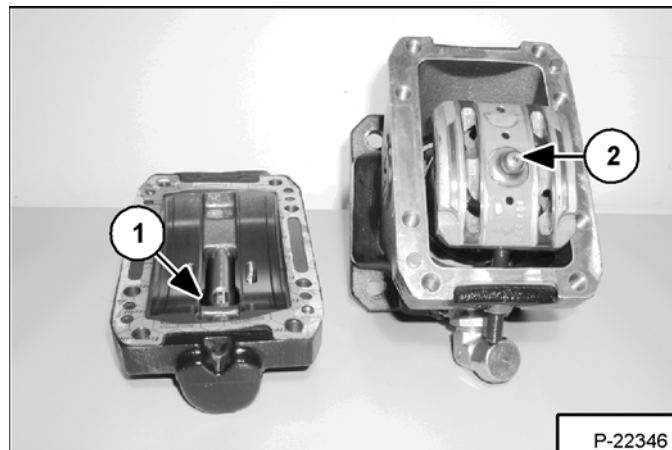
Install a new O-ring (Item 1) [Figure 30-30-82] onto the plug.

Figure 30-30-86



Install the spring seat (Item 1), spring (Item 2) and plug (Item 3) [Figure 30-30-83] into the housing and tighten to 30 ft.-lbs. (41 Nm) torque.

Figure 30-30-87

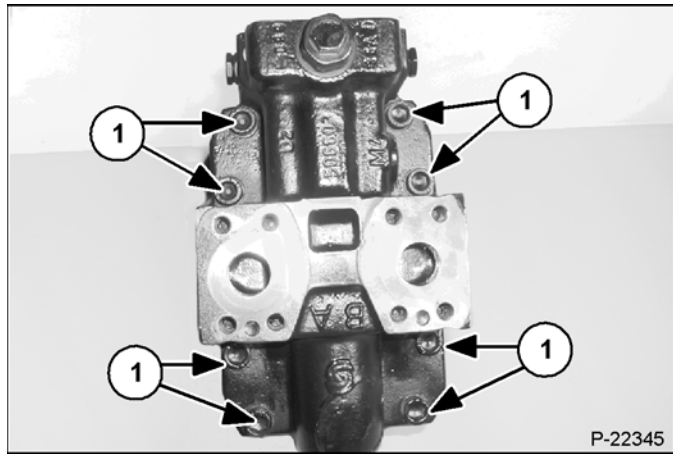


Align the hole in the piston (Item 1) and the valve segment (Item 2) [Figure 30-30-84].

HYDROSTATIC DRIVE MOTOR (CONT'D)

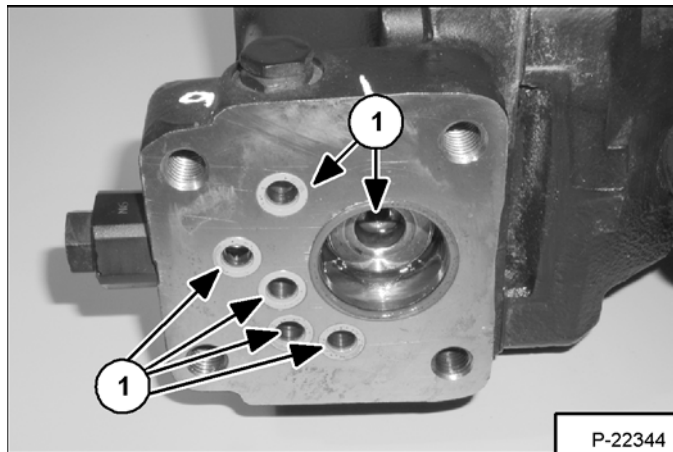
Assembly (Cont'd)

Figure 30-30-88



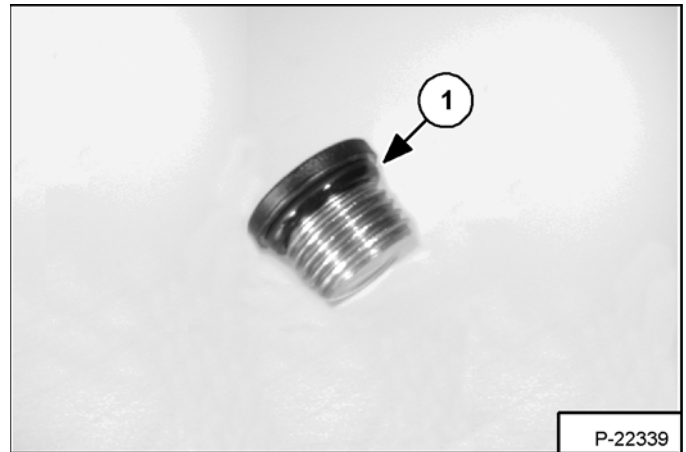
Install the end cap housing and tighten the eight bolts (Item 1) [Figure 30-30-85] to 85 ft.-lbs. (115 Nm) torque.

Figure 30-30-89



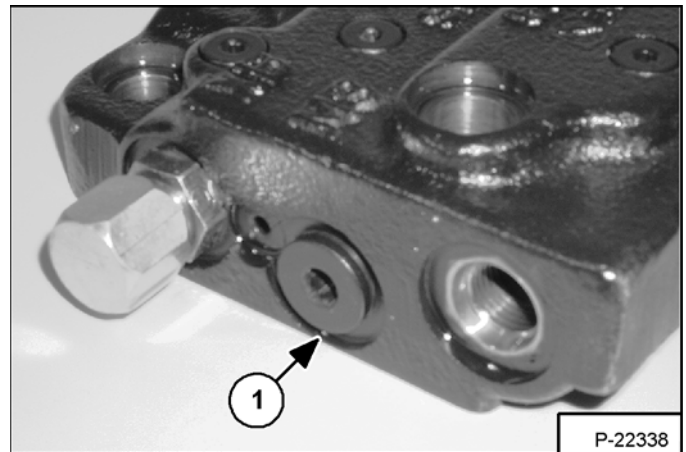
Install six new O-rings (Item 1) [Figure 30-30-86] onto the housing.

Figure 30-30-90



Install a new O-ring (Item 1) [Figure 30-30-87] onto the plug.

Figure 30-30-91

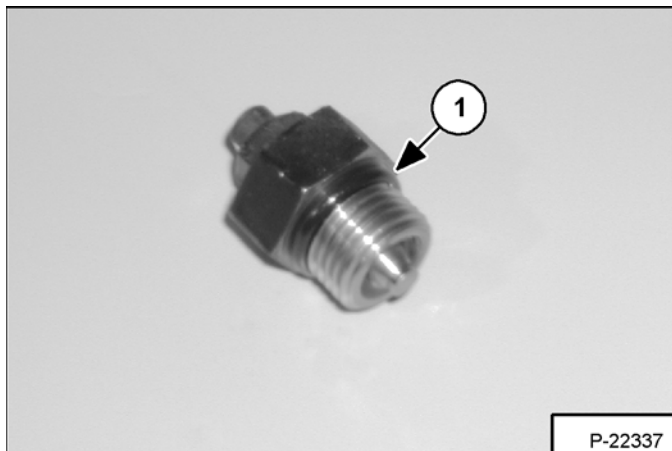


Install the plug (Item 1) [Figure 30-30-88] into the housing.

HYDROSTATIC DRIVE MOTOR (CONT'D)

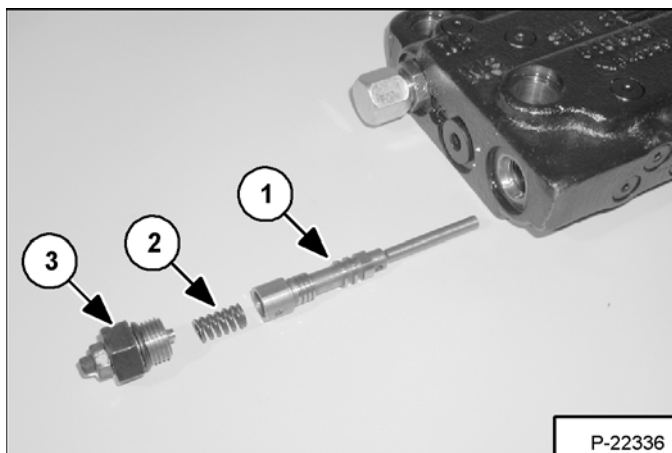
Assembly (Cont'd)

Figure 30-30-92



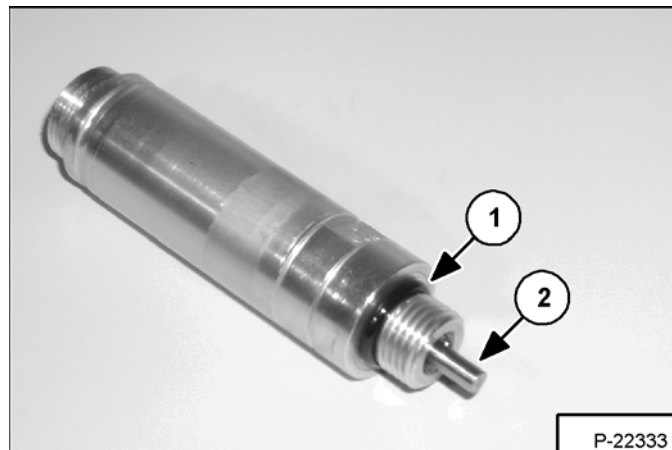
Install a new O-ring (Item 1) [Figure 30-30-89] onto the adjustment screw.

Figure 30-30-93



Install the spool (Item 1), spring (Item 2) and adjusting screw (Item 3) [Figure 30-30-90] into the housing and tighten to 7 ft.-lbs. (9 Nm) torque.

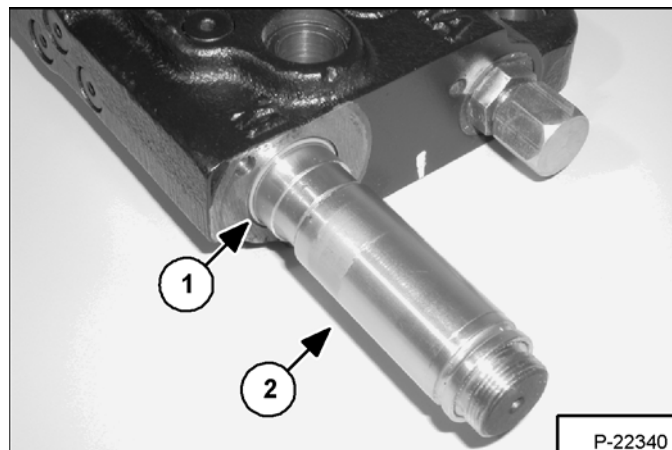
Figure 30-30-94



Install a new O-ring (Item 1) [Figure 30-30-91] onto the solenoid shaft.

Lightly lubricate the pin (Item 2) [Figure 30-30-91] and install into the solenoid shaft.

Figure 30-30-95

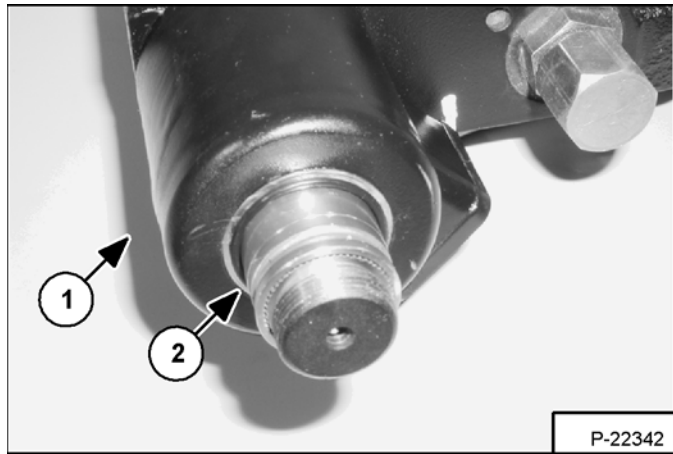


Install a new O-ring (Item 1) and solenoid shaft assembly (Item 2) [Figure 30-30-92] into the housing.

HYDROSTATIC DRIVE MOTOR (CONT'D)

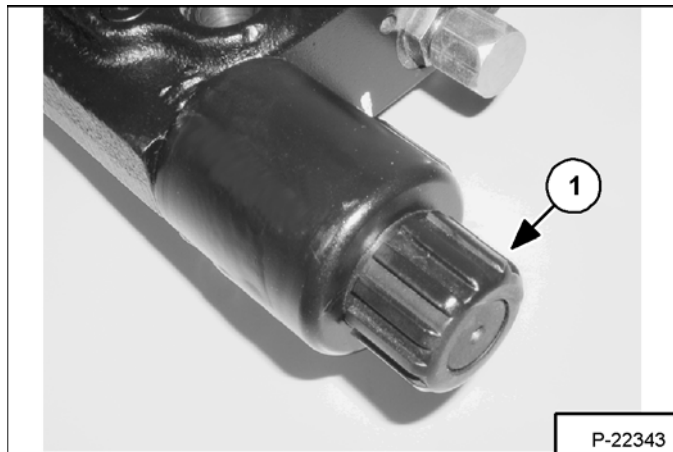
Assembly (Cont'd)

Figure 30-30-96



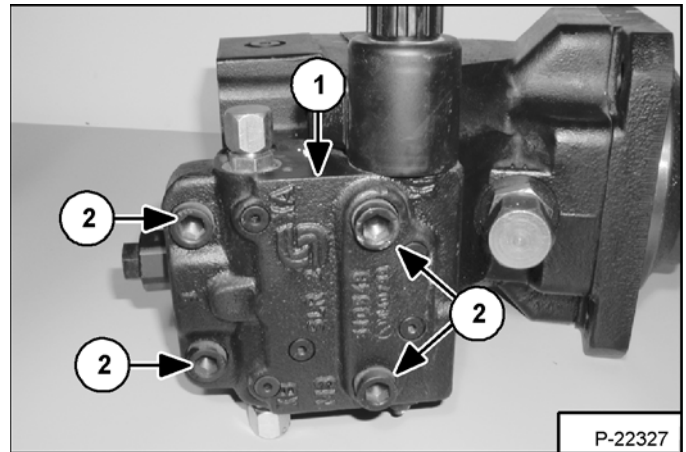
Install the solenoid housing (Item 1) onto the shaft and install a new O-ring (Item 2) [Figure 30-30-93].

Figure 30-30-97



Install the solenoid nut (Item 1) [Figure 30-30-94] and hand tighten.

Figure 30-30-98

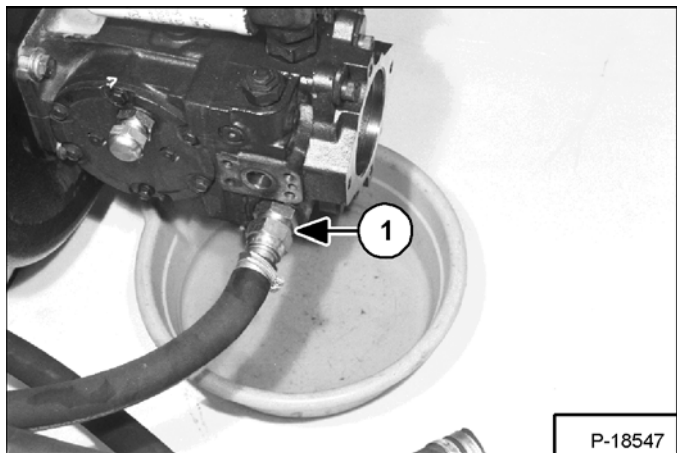


Install the solenoid housing assembly (Item 1) with four bolts (Item 2) [Figure 30-30-95]. Tighten the bolts to 58 ft.-lbs. (78 Nm) torque.

HYDROSTATIC PUMP

Removal And Installation

Figure 30-40-1

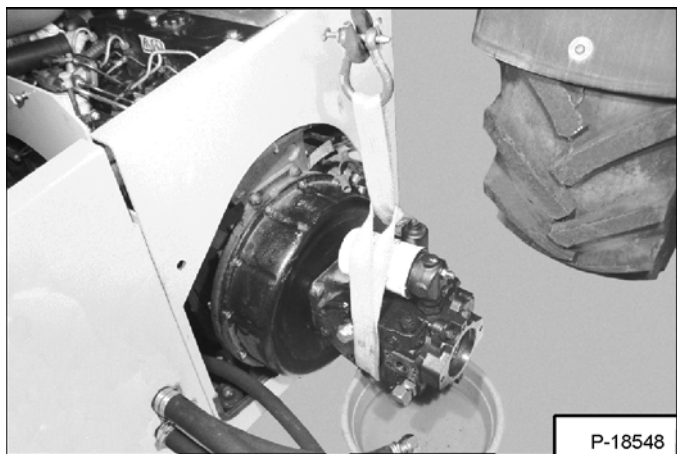


Remove the gear pumps. (See Content Page 20-01.)

Remove the engine/hydrostat assembly. (See Content Page 70-01.)

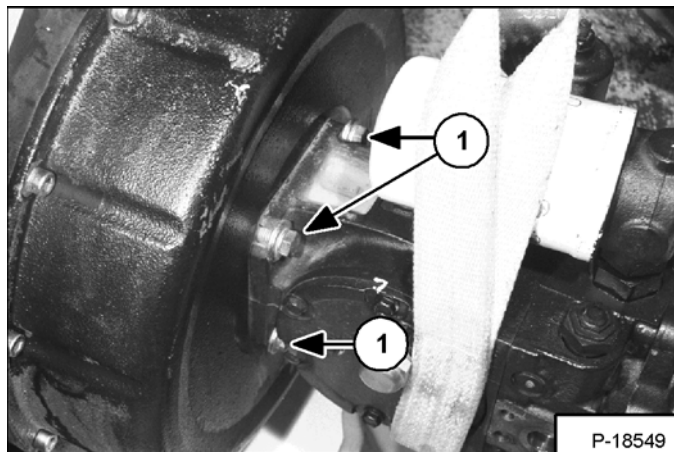
Remove the return hose (Item 1) [Figure 30-40-1] from the hydrostatic pump.

Figure 30-40-2



Install a chain hoist and lifting strap to lift and support the hydrostatic pump [Figure 30-40-2].

Figure 30-40-3



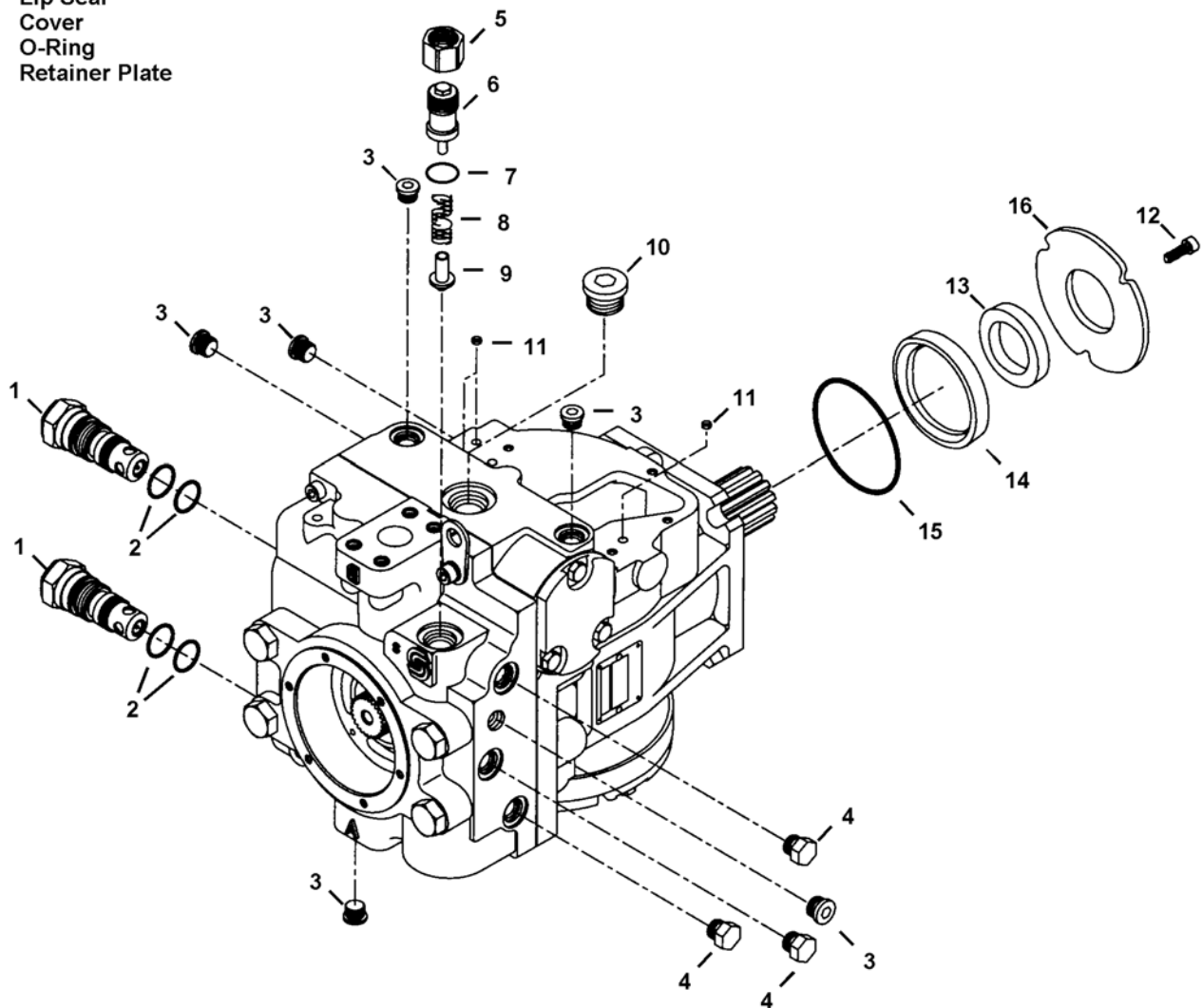
Remove the four mounting bolts (Item 1) [Figure 30-40-3] from the hydrostatic pump.

Assembly: Tighten the mounting bolts to 69-78 ft.-lbs. (94-106 Nm) torque.

HYDROSTATIC PUMP (CONT'D)

Parts Identification

1. Multi-Function Valve Assembly
2. O-Ring
3. Plug
4. Plug
5. Nut
6. Charge Relief
7. O-Ring
8. Spring
9. Poppet
10. Plug
11. Control Filter Screen
12. Bolt
13. Lip Seal
14. Cover
15. O-Ring
16. Retainer Plate

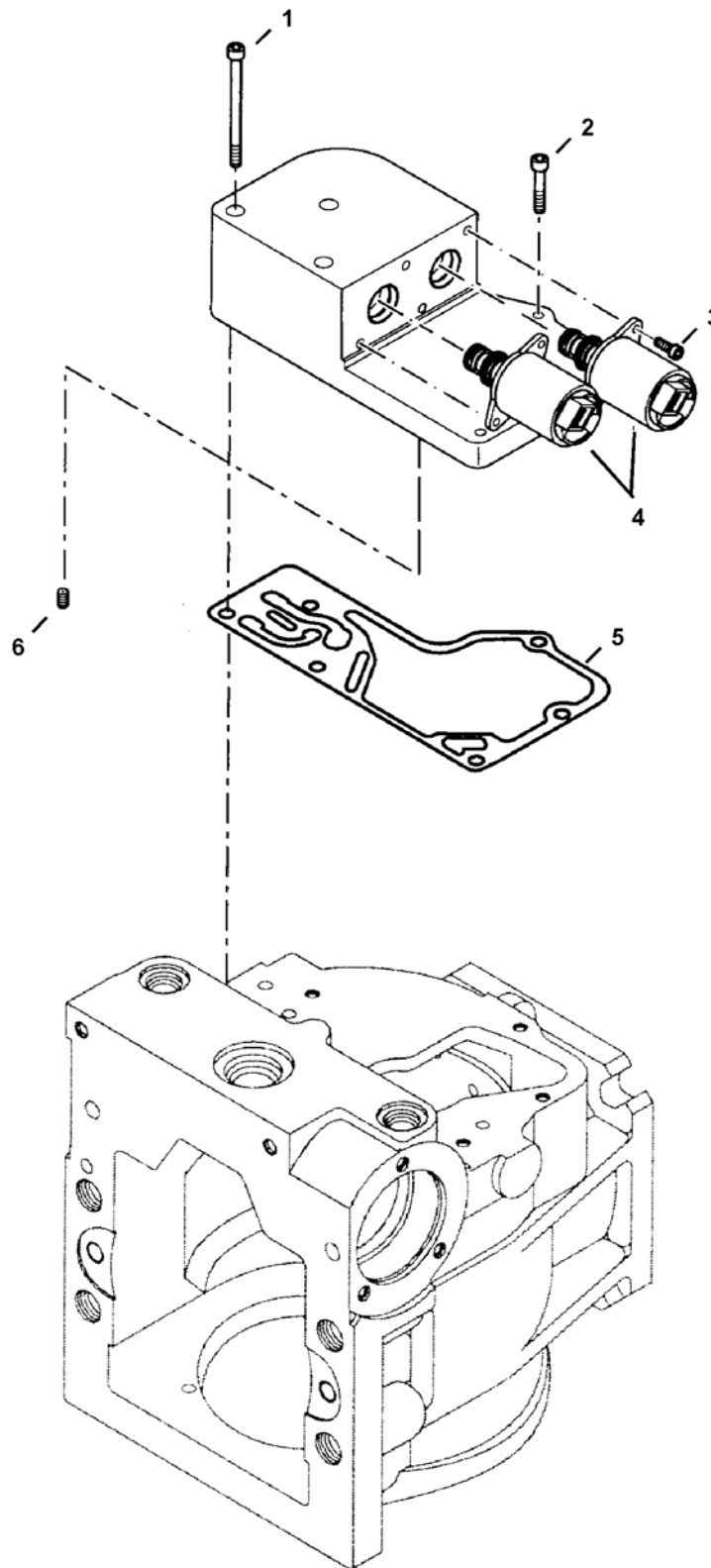


B-15899

HYDROSTATIC PUMP (CONT'D)

Parts Identification (Cont'd)

1. Bolt
2. Bolt
3. Bolt
4. Solenoid
5. Gasket
6. Plug

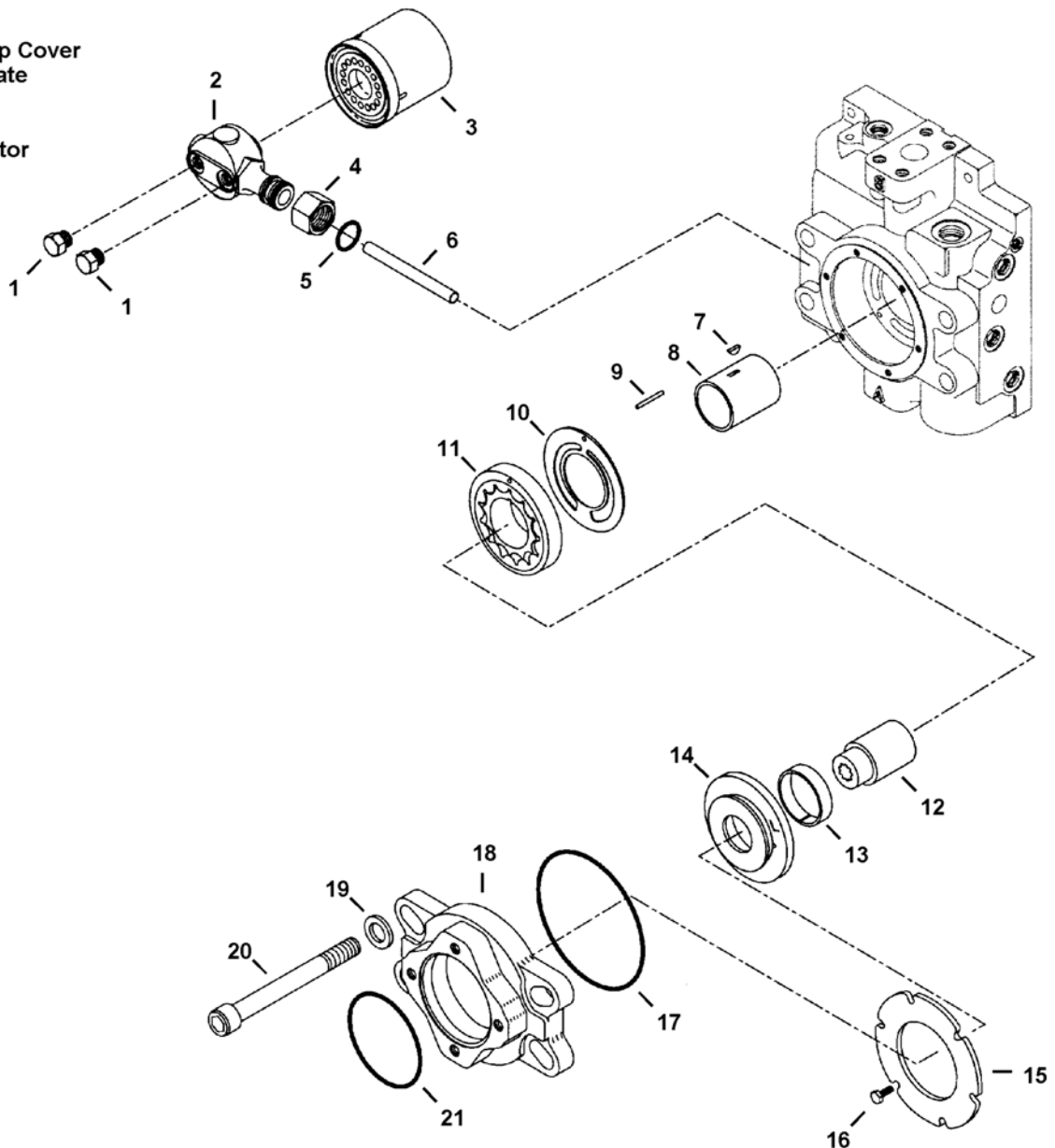


B-15900

HYDROSTATIC PUMP (CONT'D)

Parts Identification (Cont'd)

1. Plug
2. Filter Head
3. Filter
4. Nut
5. O-Ring
6. Tube
7. Key
8. Charge Pump Shaft
9. Pin
10. Wear Plate
11. Gears
12. Coupling
13. Seal
14. Charge Pump Cover
15. Retaining Plate
16. Bolt
17. O-Ring
18. Flange Adaptor
19. Washer
20. Bolt
21. O-Ring

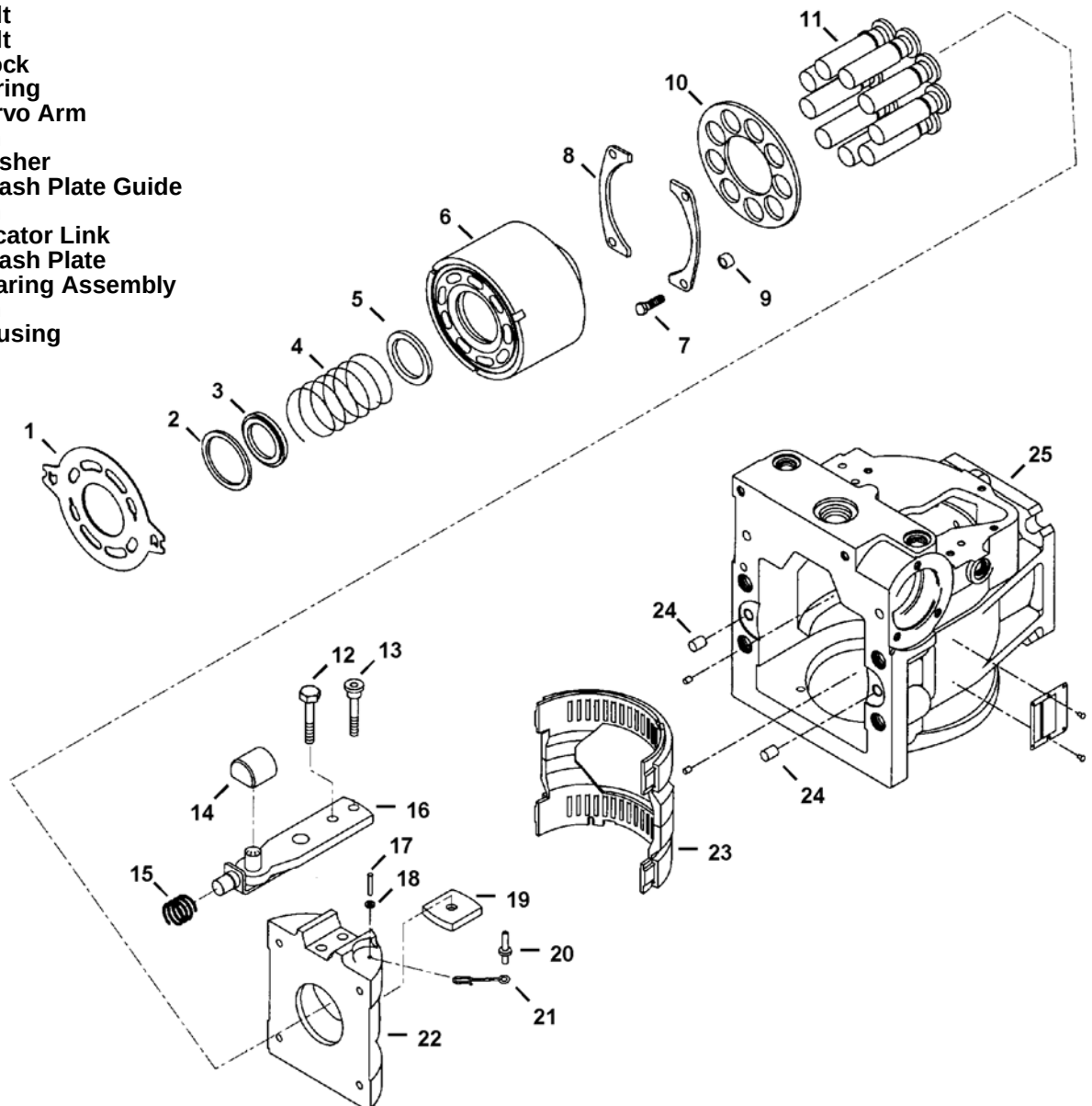


B-15901

HYDROSTATIC PUMP (CONT'D)

Parts Identification (Cont'd)

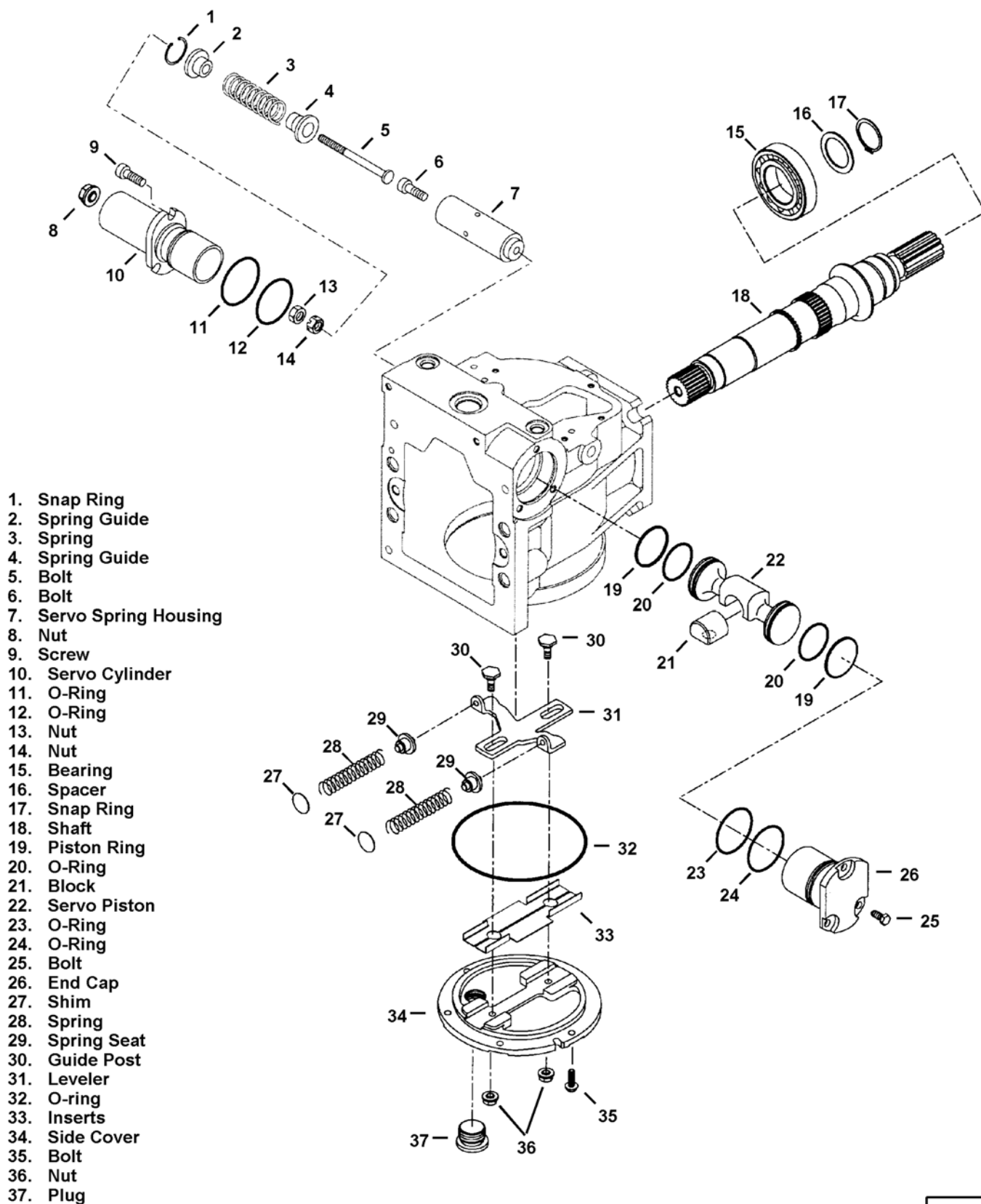
1. Valve Plate
2. Retaining Ring
3. Spring Retainer
4. Spring
5. Spring Seat
6. Cylinder
7. Bolt
8. Slipper Guide Bearing
9. Spacer
10. Slipper Guide
11. Piston
12. Bolt
13. Bolt
14. Block
15. Spring
16. Servo Arm
17. Pin
18. Washer
19. Swash Plate Guide
20. Pin
21. Locator Link
22. Swash Plate
23. Bearing Assembly
24. Pin
25. Housing



B-15902

HYDROSTATIC PUMP (CONT'D)

Parts Identification (Cont'd)



B-15903

HYDROSTATIC PUMP (CONT'D)

Disassembly

Clean the outside of the pump before disassembly.

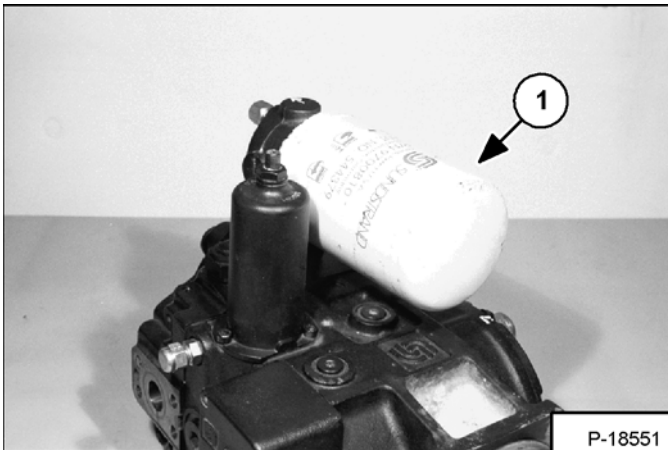
Mark the outside of the pump for ease of assembly.

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.

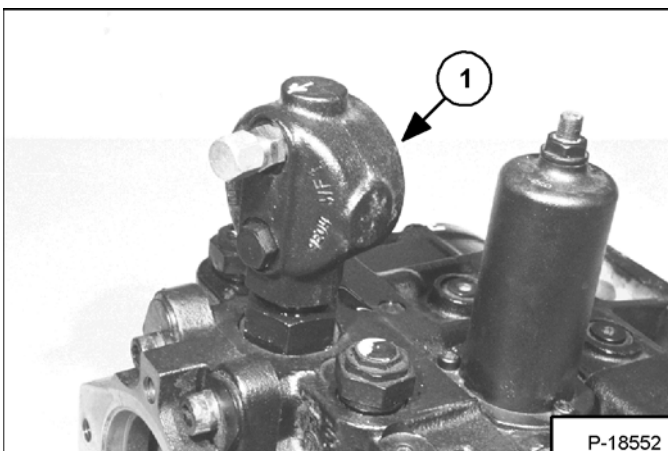
I-2003-0888

Figure 30-40-4



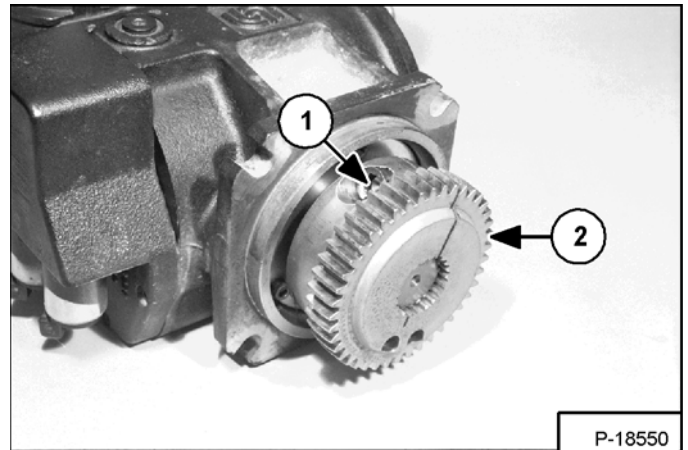
Remove and discard the filter (Item 1) [Figure 30-40-4].

Figure 30-40-5



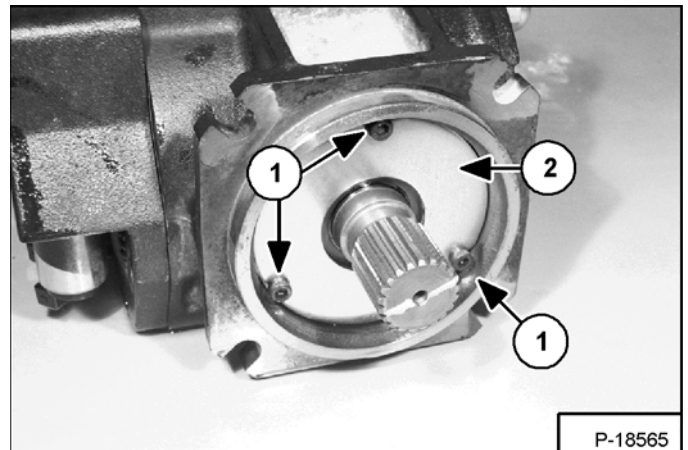
Remove the filter head (Item 1) [Figure 30-40-5] from the pump housing.

Figure 30-40-6



Remove the retainer bolt (Item 1). Remove the coupler gear (Item 2) [Figure 30-40-6] from the shaft.

Figure 30-40-7



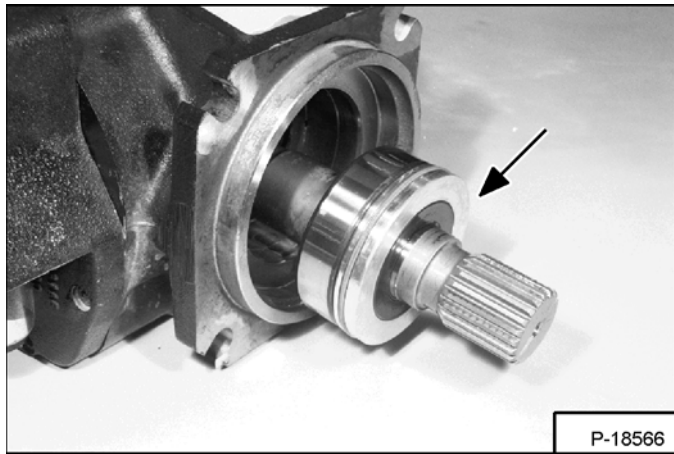
Remove the three bolts (Item 1) [Figure 30-40-7].

Remove the retainer plate (Item 2) [Figure 30-40-7] from the pump housing.

HYDROSTATIC PUMP (CONT'D)

Disassembly (Cont'd)

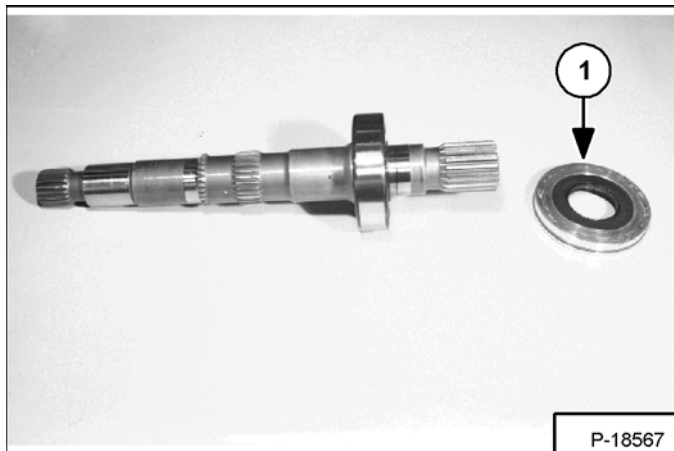
Figure 30-40-8



Remove the shaft and bearing assembly from the housing [Figure 30-40-8].

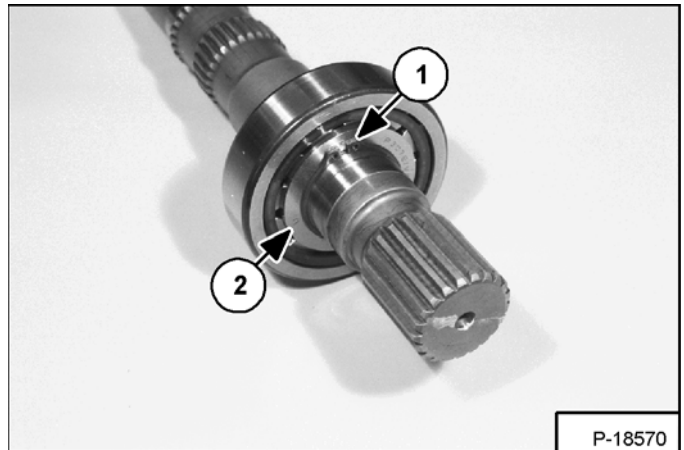
NOTE: If the shaft or bearing assembly become stuck in the housing, lightly tap on the shaft.

Figure 30-40-9



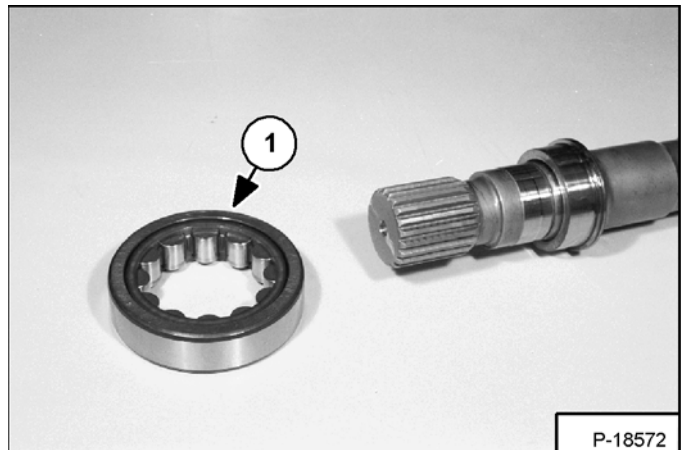
Remove the shaft seal (Item 1) [Figure 30-40-9] from the shaft.

Figure 30-40-10



Remove the snap ring (Item 1) and spacer washer (Item 2) [Figure 30-40-10] from the shaft.

Figure 30-40-11



Remove the bearing (Item 1) [Figure 30-40-11] from the shaft.

HYDROSTATIC PUMP (CONT'D)

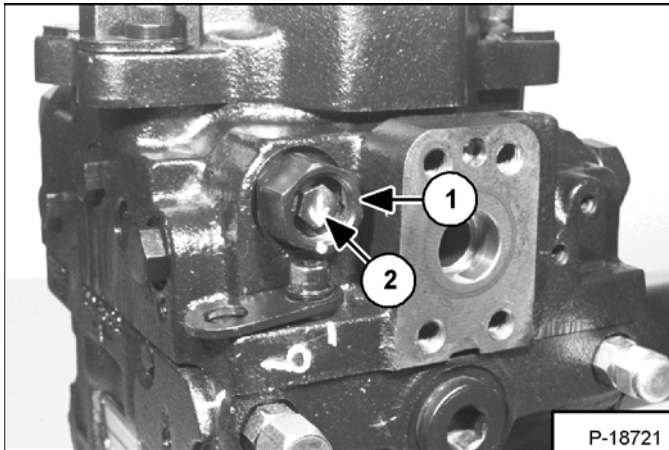
Disassembly (Cont'd)

Place the pump on the work surface with the charge pump up.

Mark the pump housings for correct assembly.

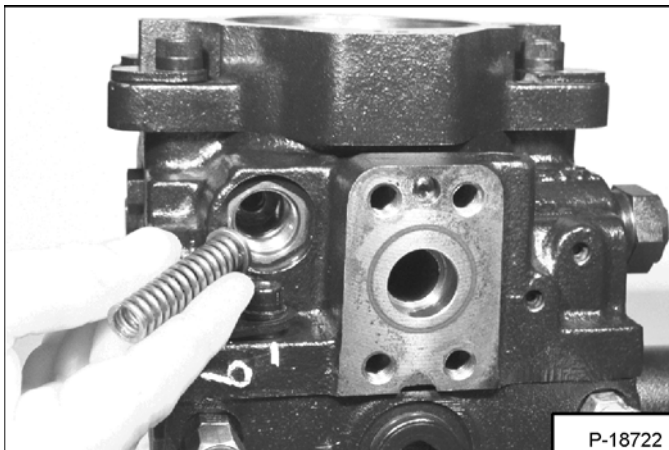
Before removing the relief valve mark the plug, lock nut and housing for approximate assembly adjustment.

Figure 30-40-12



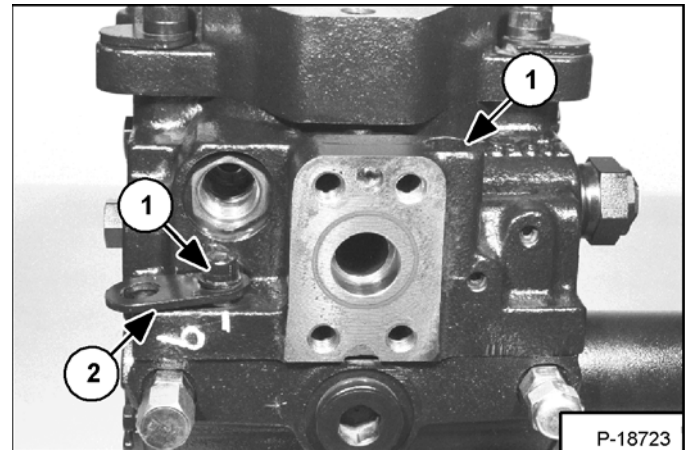
Remove the relief valve lock nut (Item 1) and the plug (Item 2) [Figure 30-40-12].

Figure 30-40-13



Remove the spring and relief poppet from the charge pump housing [Figure 30-40-13].

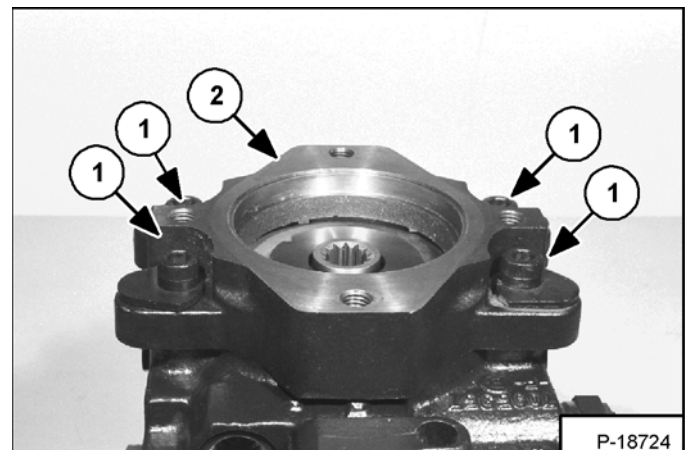
Figure 30-40-14



Remove the two mounting bolts (Item 1) [Figure 30-40-14].

NOTE: Remove the lifting bracket (Item 2) [Figure 30-40-14] from the pump.

Figure 30-40-15



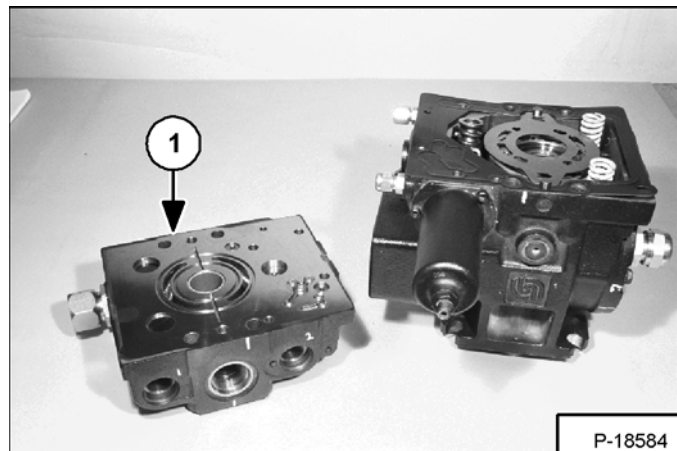
Remove the four mounting bolts (Item 1) [Figure 30-40-15] from the flange adapter.

Remove the flange adapter (Item 2) [Figure 30-40-15].

HYDROSTATIC PUMP (CONT'D)

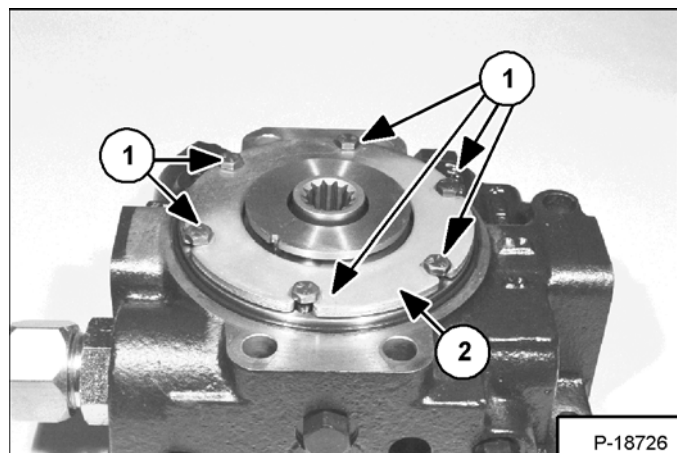
Disassembly (Cont'd)

Figure 30-40-16



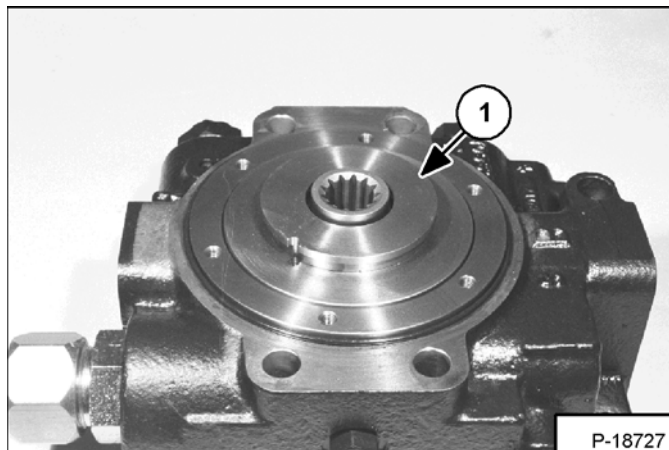
Lift and remove the charge pump (Item 1) [Figure 30-40-16] from the pump housing.

Figure 30-40-17



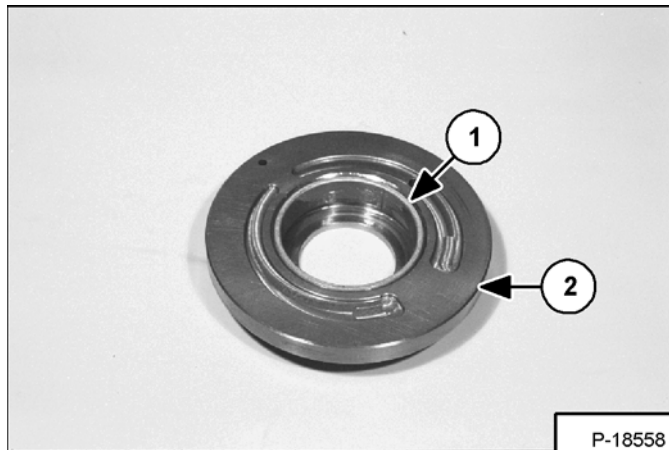
Remove the six bolts (Item 1) and remove the retaining plate (Item 2) [Figure 30-40-17] from the charge pump.

Figure 30-40-18



Remove the charge pump cover (Item 1) [Figure 30-40-18].

Figure 30-40-19

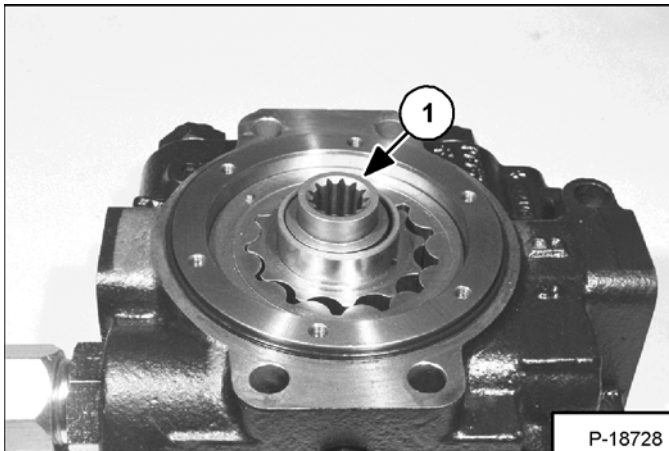


Only if wear marks are present, remove the bushing (Item 1) from the charge pump cover (Item 2) [Figure 30-40-19].

HYDROSTATIC PUMP (CONT'D)

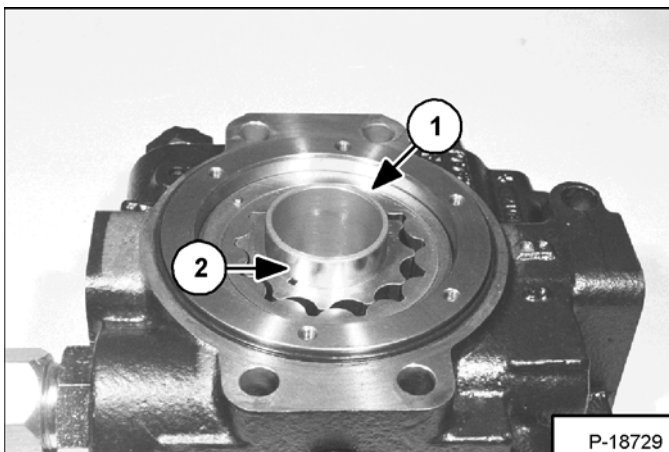
Disassembly (Cont'd)

Figure 30-40-20



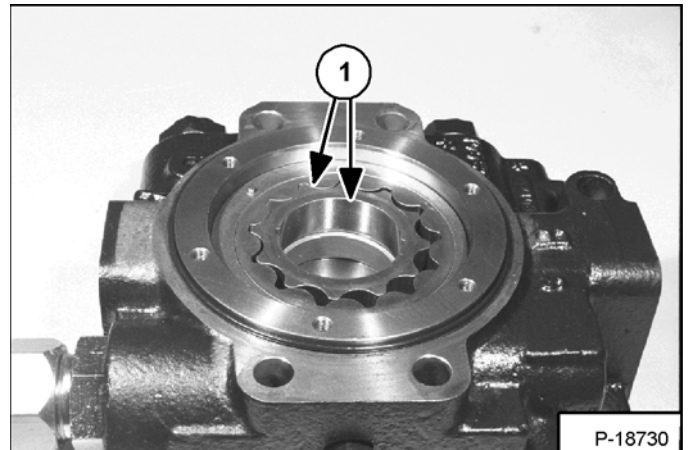
Remove the coupler (Item 1) [Figure 30-40-20].

Figure 30-40-21



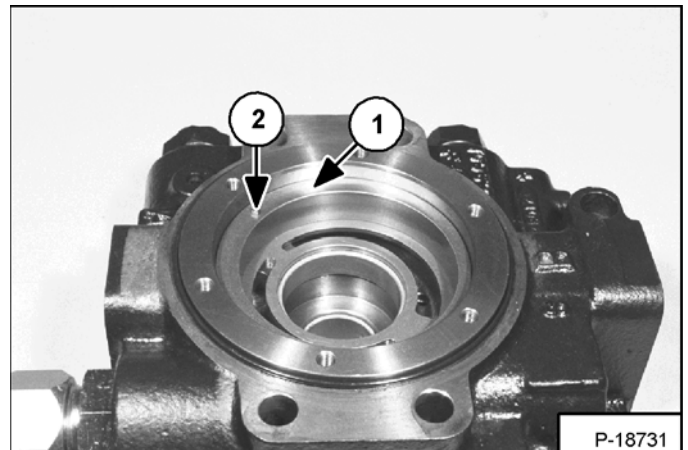
Remove the charge pump shaft (Item 1) and key (Item 2) [Figure 30-40-21] from the pump.

Figure 30-40-22



Remove the charge pump gears (Item 1) [Figure 30-40-22].

Figure 30-40-23



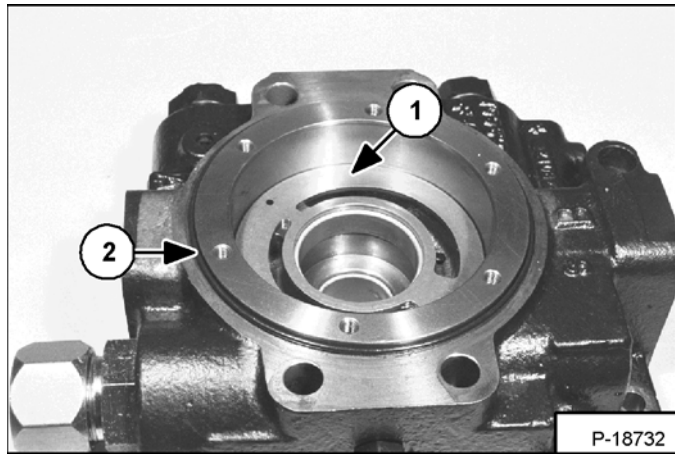
Remove the eccentric ring (Item 1) and alignment pin (Item 2) [Figure 30-40-23] from the pump.

Note the position of the alignment pin.

HYDROSTATIC PUMP (CONT'D)

Disassembly (Cont'd)

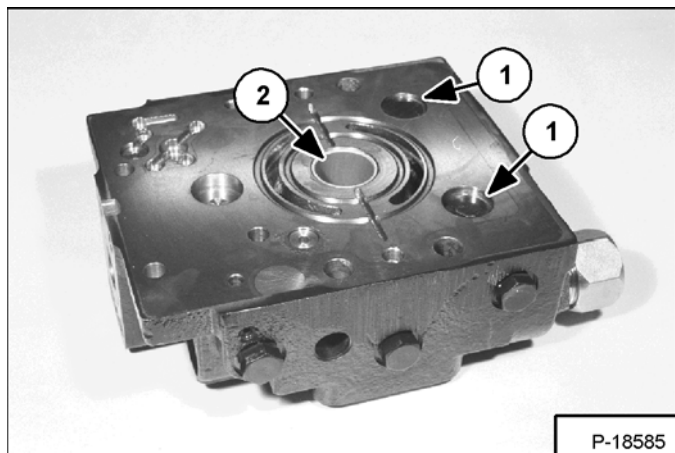
Figure 30-40-24



Remove the charge pump wear plate (Item 1) [Figure 30-40-24].

Remove the O-ring (Item 2) [Figure 30-40-24].

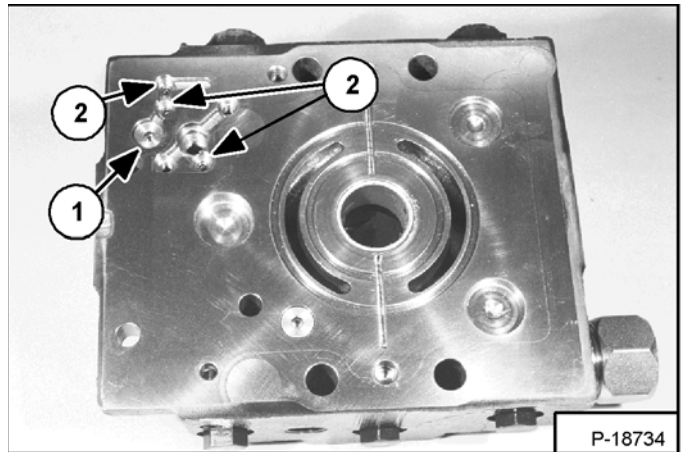
Figure 30-40-25



Remove the swash plate leveler spring shims (Item 1) [Figure 30-40-25] from the spring pockets.

Inspect the journal bearing (Item 2) [Figure 30-40-25]. Replace as needed.

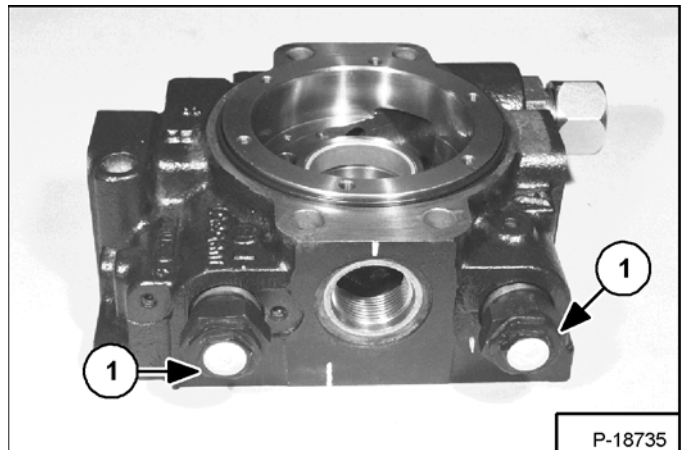
Figure 30-40-26



For proper operation, if the plugs are removed from the housing they must be returned to their original position [Figure 30-40-26].

Installation: Tighten the servo relief valve plug (Item 1) to 9 ft.-lbs. (12 Nm) torque. Tighten the rotation pipe plugs (Item 2) [Figure 30-40-26] to 4 ft.-lbs. (5.4 Nm) torque.

Figure 30-40-27

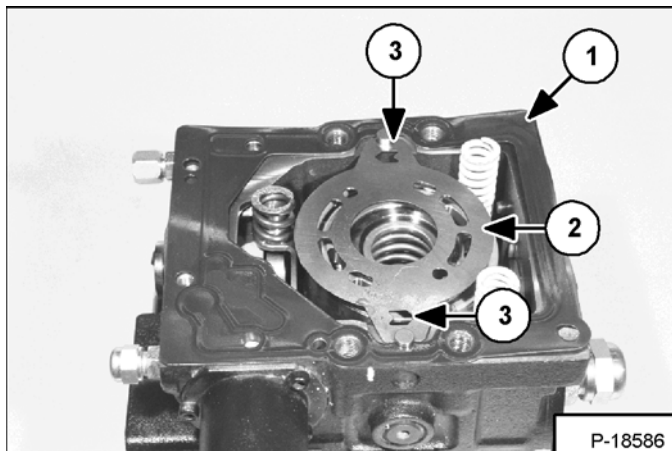


Remove the multi-function valve assemblies (Item 1) [Figure 30-40-27] from the housing.

HYDROSTATIC PUMP (CONT'D)

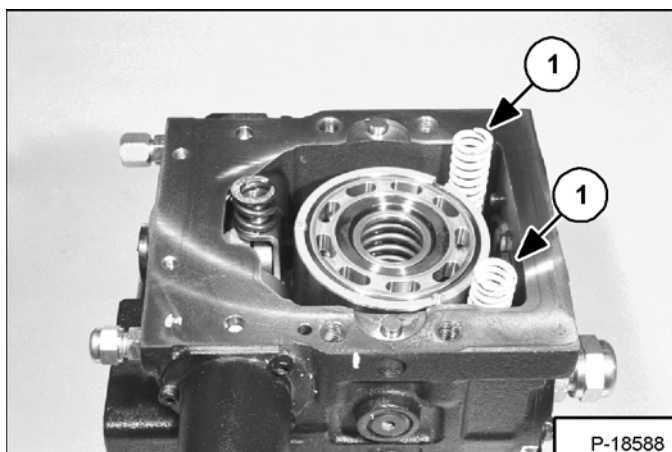
Disassembly (Cont'd)

Figure 30-40-28



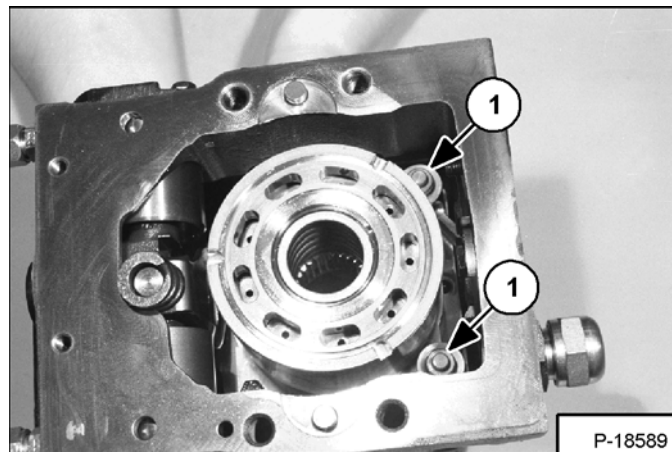
Remove the gasket (Item 1) and the valve plate (Item 2) from the housing. Note the direction of the arrows (Item 3) [Figure 30-40-28] on the valve plate for proper assembly.

Figure 30-40-29



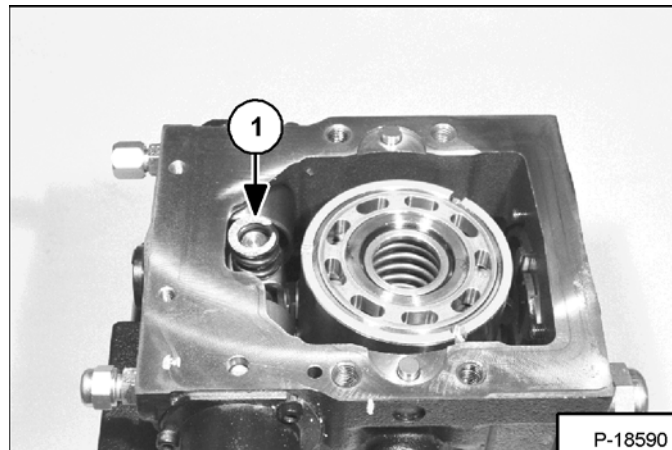
Remove the two leveler springs (Item 1) [Figure 30-40-29].

Figure 30-40-30



Remove both spring seats (Item 1) [Figure 30-40-30] from the swash plate leveler.

Figure 30-40-31

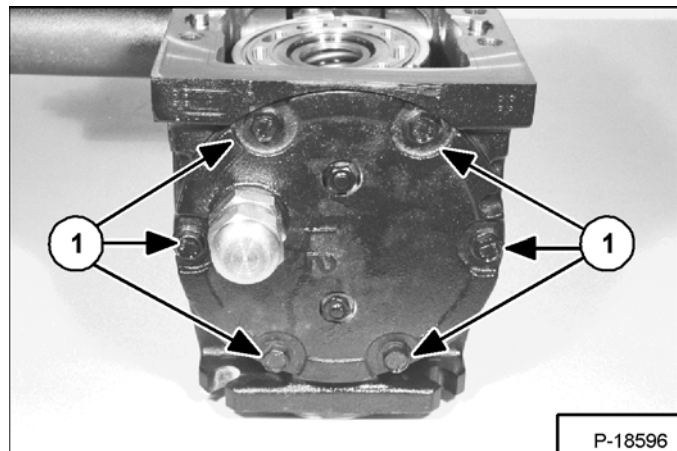


Remove the swash plate hold down spring (Item 1) [Figure 30-40-31].

HYDROSTATIC PUMP (CONT'D)

Disassembly (Cont'd)

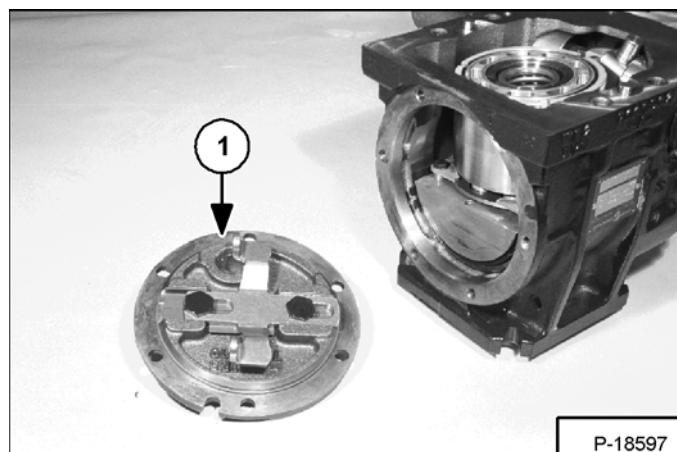
Figure 30-40-32



Mark the position of the side cover.

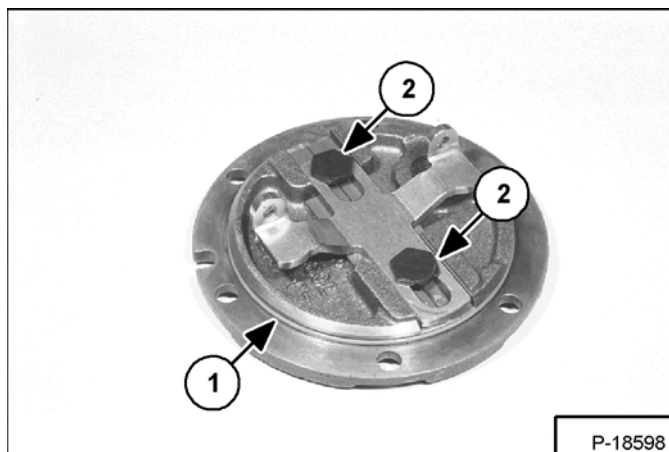
Remove the six bolts (Item 1) [Figure 30-40-32] from the side cover.

Figure 30-40-33



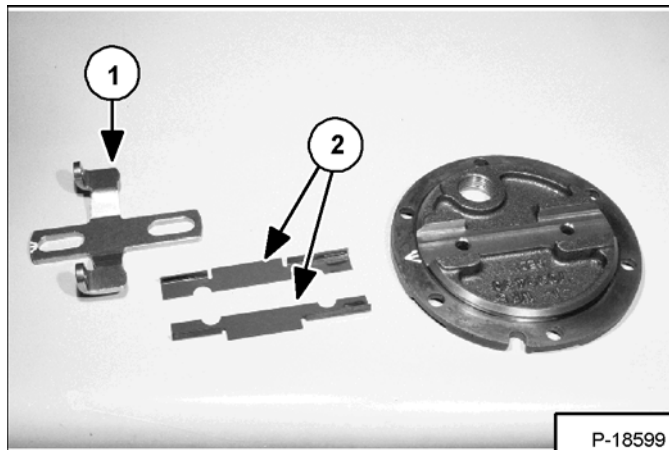
Remove the side cover/swash plate leveler assembly from the housing [Figure 30-40-33].

Figure 30-40-34



Remove and discard the O-ring (Item 1). Loosen and remove both guide posts (Item 2) [Figure 30-40-34].

Figure 30-40-35



Remove the leveler (Item 1) and slide inserts (Item 2) [Figure 30-40-35] from the side cover.

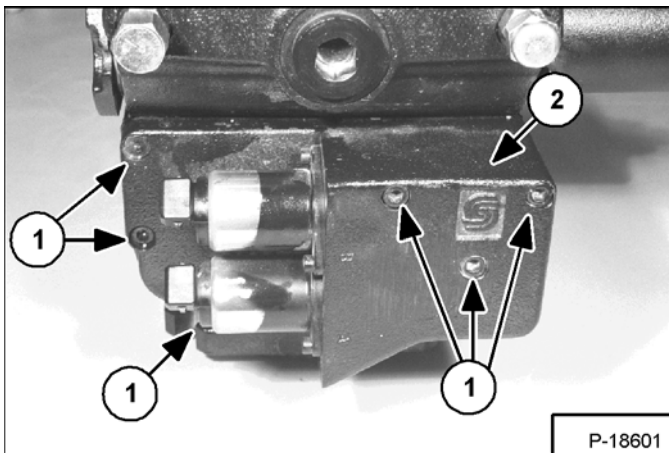
Inspect the slide inserts for wear or damage.

Replace if needed.

HYDROSTATIC PUMP (CONT'D)

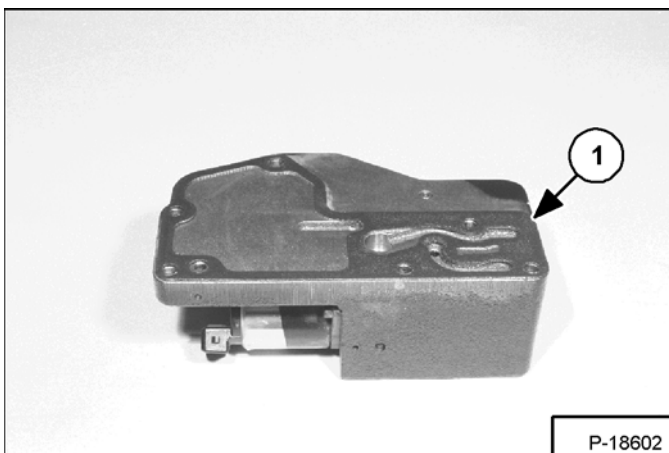
Disassembly (Cont'd)

Figure 30-40-36



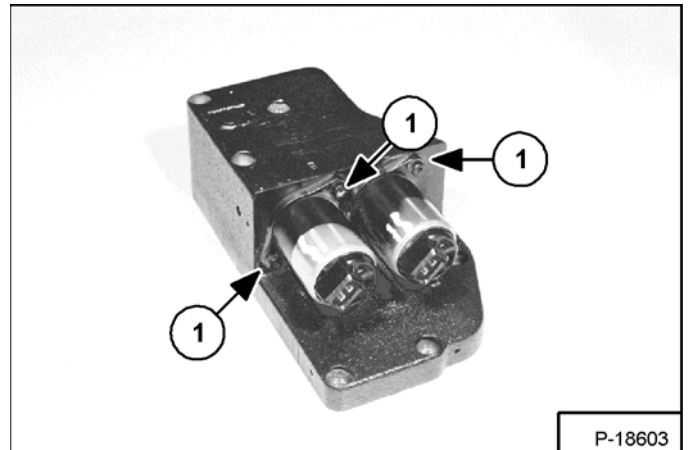
Remove the six solenoid manifold mounting bolts (Item 1). Remove the manifold (Item 2) [Figure 30-40-36].

Figure 30-40-37



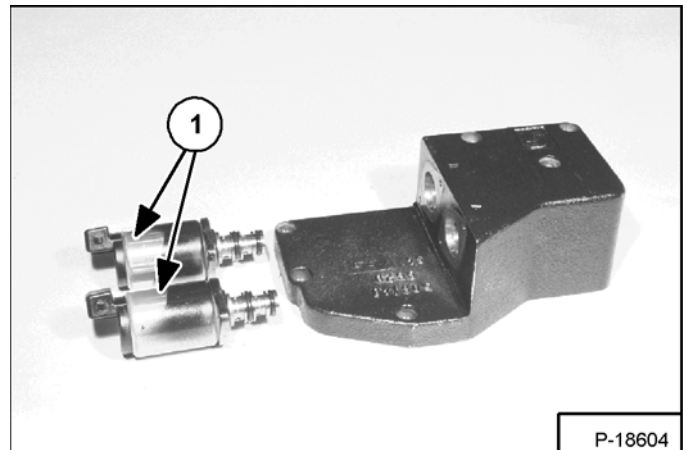
Remove the gasket (Item 1) [Figure 30-40-37] from the manifold.

Figure 30-40-38



Remove the four solenoid mounting bolts (Item 1) [Figure 30-40-38].

Figure 30-40-39

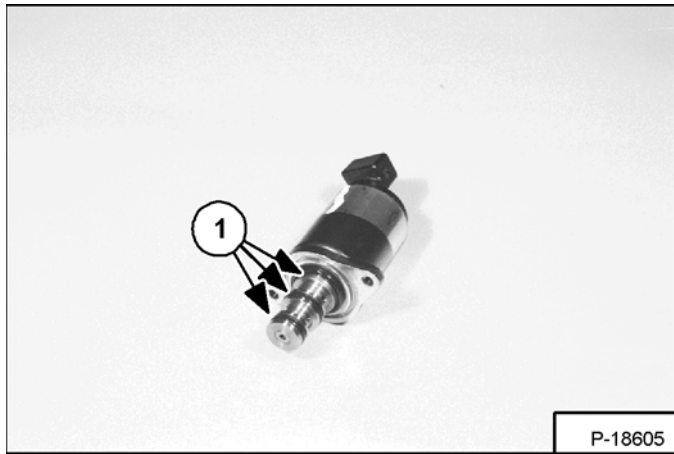


Remove the solenoids (Item 1) [Figure 30-40-39] from the manifold.

HYDROSTATIC PUMP (CONT'D)

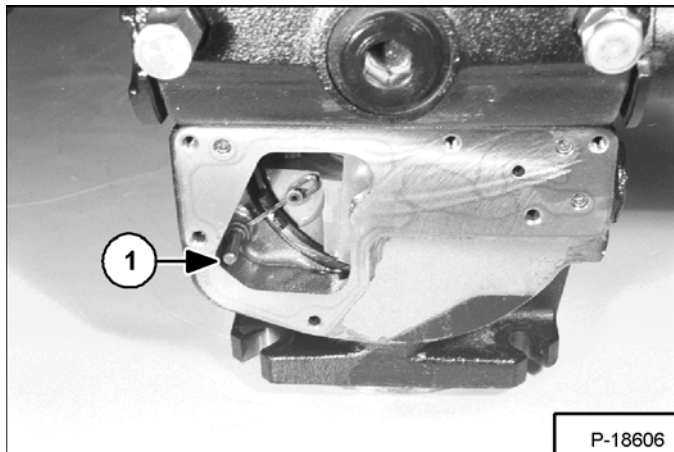
Disassembly (Cont'd)

Figure 30-40-40



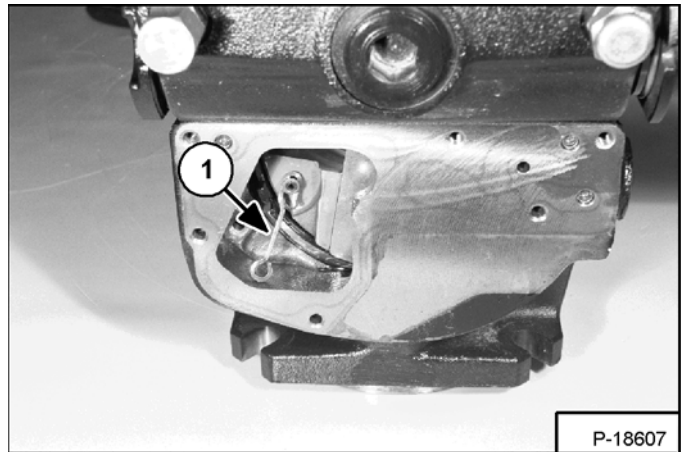
Remove and discard the three O-rings (Item 1) [Figure 30-40-40] from the solenoid.

Figure 30-40-41



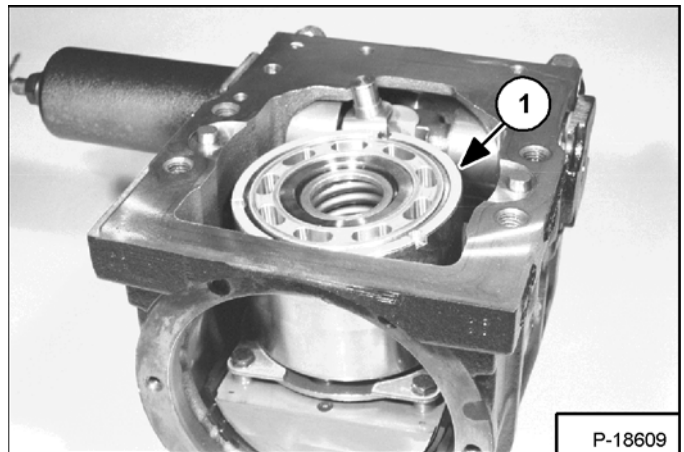
Remove the anchor pin (Item 1) [Figure 30-40-41].

Figure 30-40-42



Remove the cage locator link (Item 1) [Figure 30-40-42] from the swash plate.

Figure 30-40-43

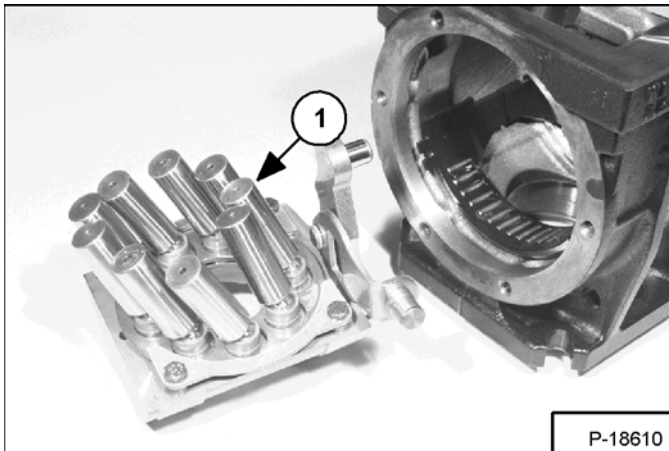


Remove the cylinder block (Item 1) [Figure 30-40-43] through the housing end opening. The swash plate and piston assembly will remain in the housing.

HYDROSTATIC PUMP (CONT'D)

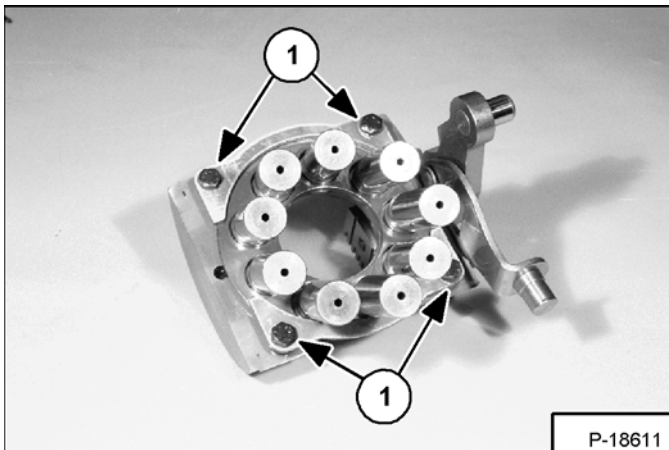
Disassembly (Cont'd)

Figure 30-40-44



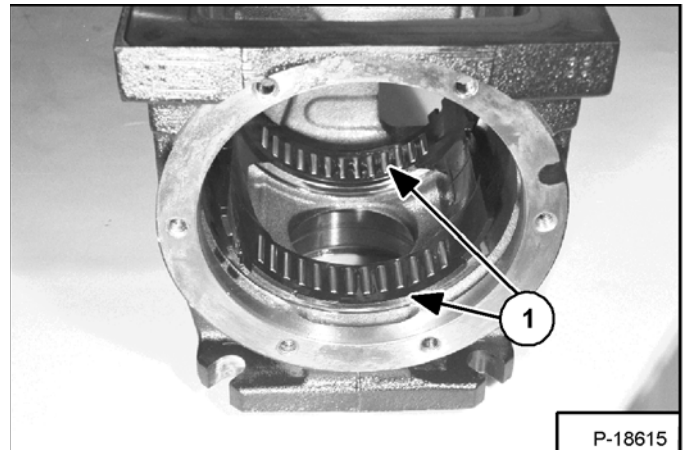
Remove the swash plate/piston assembly (Item 1) [Figure 30-40-44] from the pump housing.

Figure 30-40-45



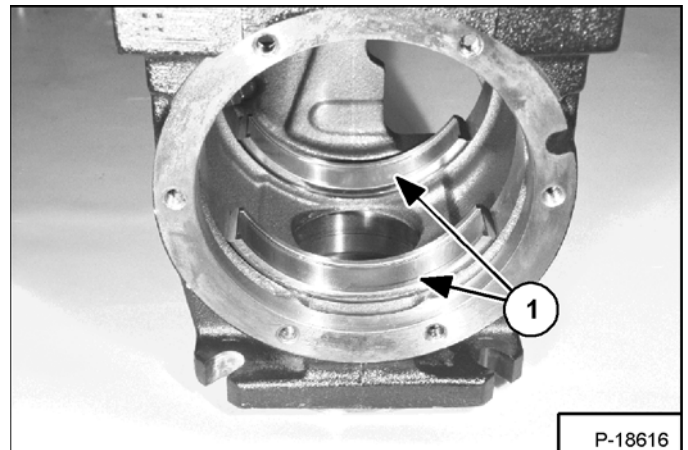
Remove the four slipper guide bearing retainer bolts (Item 1) [Figure 30-40-45].

Figure 30-40-46



Remove the swash plate bearings (Item 1) [Figure 30-40-46] from the housing.

Figure 30-40-47

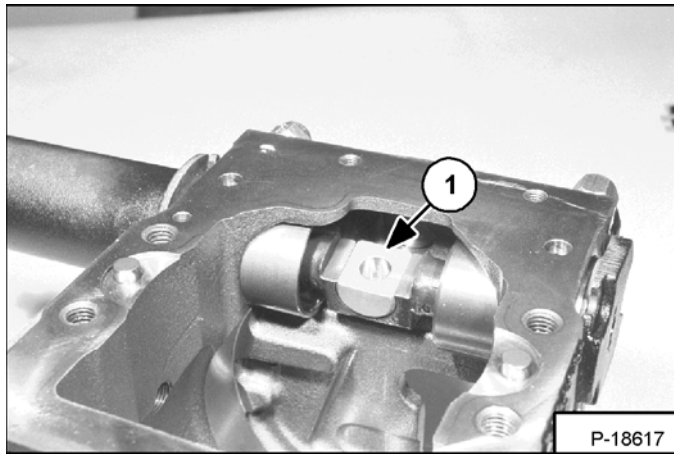


Remove the swash plate bearing races (Item 1) [Figure 30-40-47] from the housing.

HYDROSTATIC PUMP (CONT'D)

Disassembly (Cont'd)

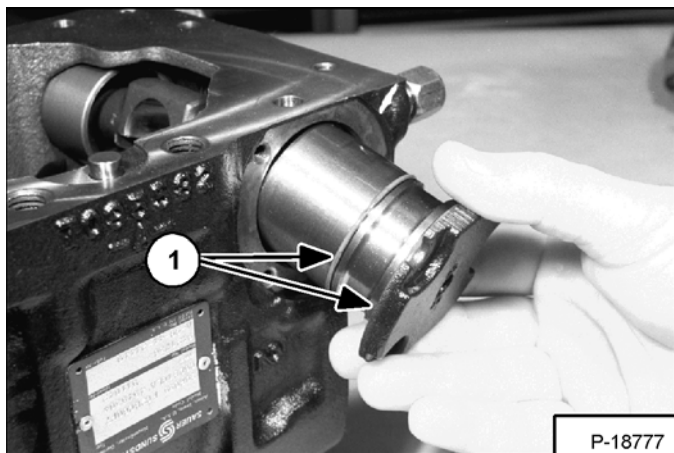
Figure 30-40-48



Remove the bronze slider block (Item 1) [Figure 30-40-48] from the servo piston.

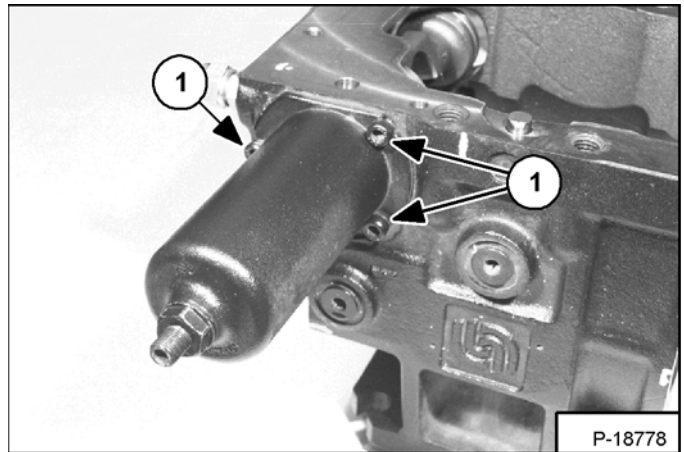
Mark the position of the servo end covers.

Figure 30-40-49



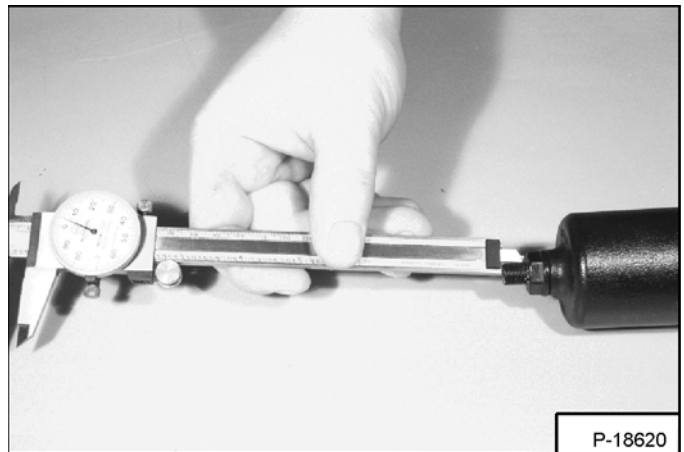
Remove the three bolts and remove the servo end cover. Remove and discard both O-rings (Item 1) [Figure 30-40-49].

Figure 30-40-50



Remove the three bolts (Item 1) [Figure 30-40-50] and remove the servo adjustment cover.

Figure 30-40-51

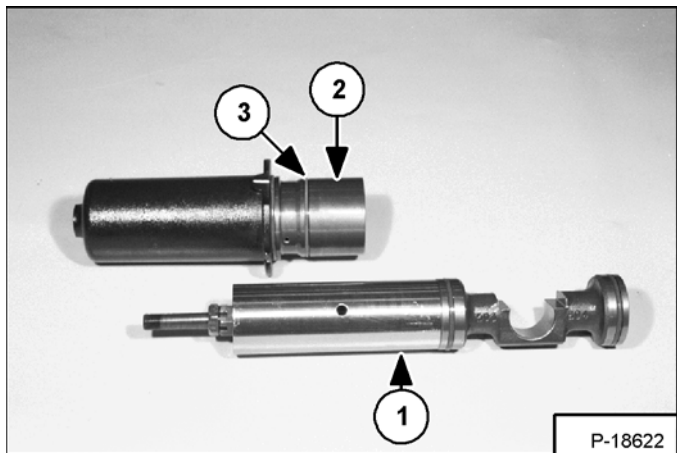


Measure and record the adjustment setting for approximate installation adjustment [Figure 30-40-51].

HYDROSTATIC PUMP (CONT'D)

Disassembly (Cont'd)

Figure 30-40-52



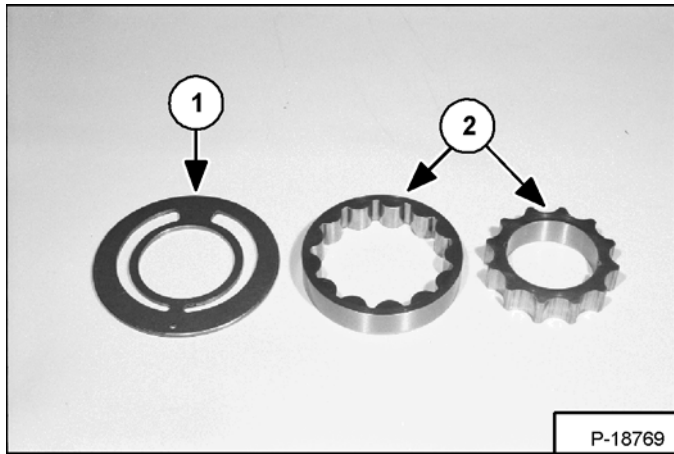
Remove the servo piston (Item 1) from the housing (Item 2) [Figure 30-40-52].

Remove and discard the O-ring (Item 3) [Figure 30-40-52].

HYDROSTATIC PUMP (CONT'D)

Inspection

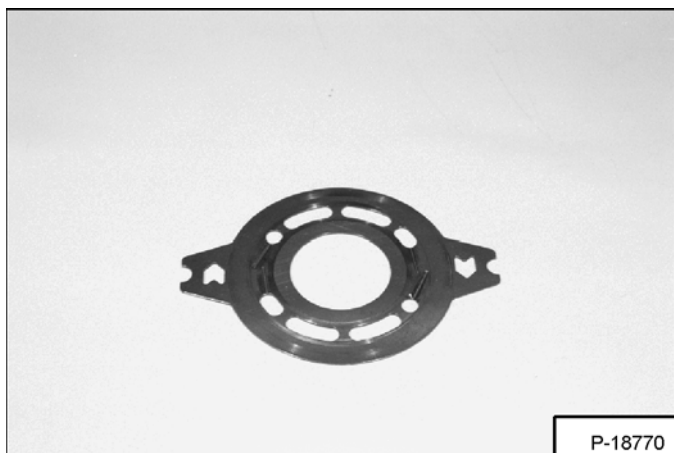
Figure 30-40-53



Clean all parts in solvent and use air pressure to dry them. DO NOT use cloth or paper as small pieces of material can get into the system and cause damage.

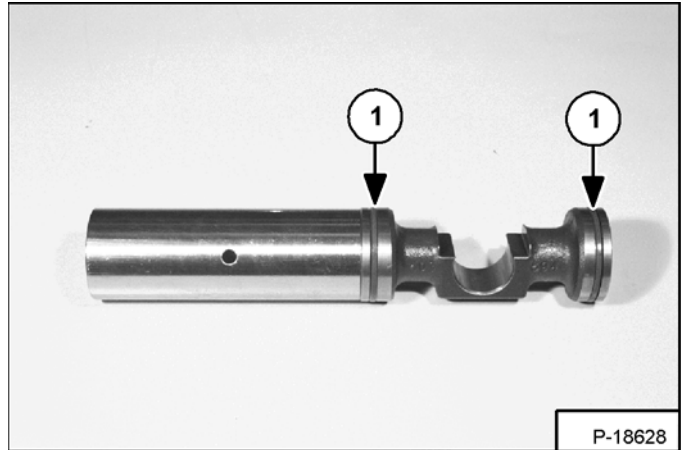
Check the wear plate (Item 1) and charge pump gears (Item 2) [Figure 30-40-53] for damage or wear.

Figure 30-40-54



Check the valve plate [Figure 30-40-54], the surface must be smooth and free of scratches. If scratches can be felt with a finger nail, replace the part.

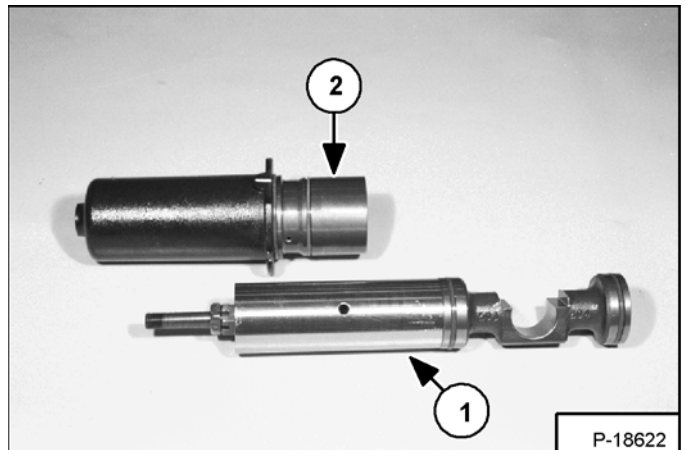
Figure 30-40-55



Inspect the servo piston and seal rings (Item 1) [Figure 30-40-55] for wear. If worn, remove the seal rings and expander O-rings from the piston.

Install new expander O-rings into the grooves in the servo piston. Carefully install the piston seal rings over the expander rings. Do not overstretch the piston seal rings.

Figure 30-40-56

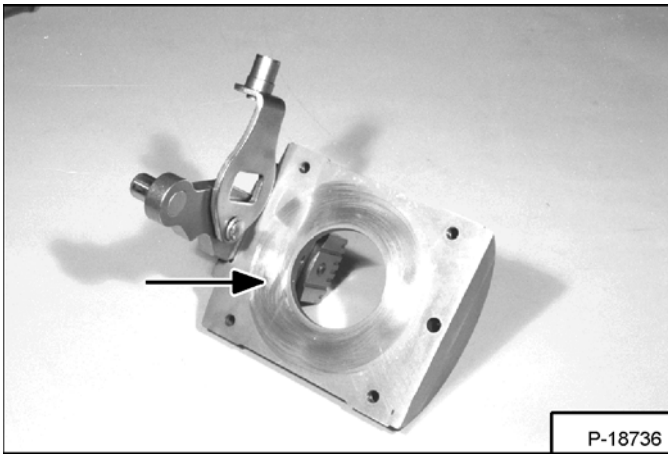


Lubricate the seal rings and carefully slide the servo piston (Item 1) into the cylinder (Item 2) [Figure 30-40-56]. Allow the assembly to set for 5 minutes to allow the seal rings to return to their original size.

HYDROSTATIC PUMP (CONT'D)

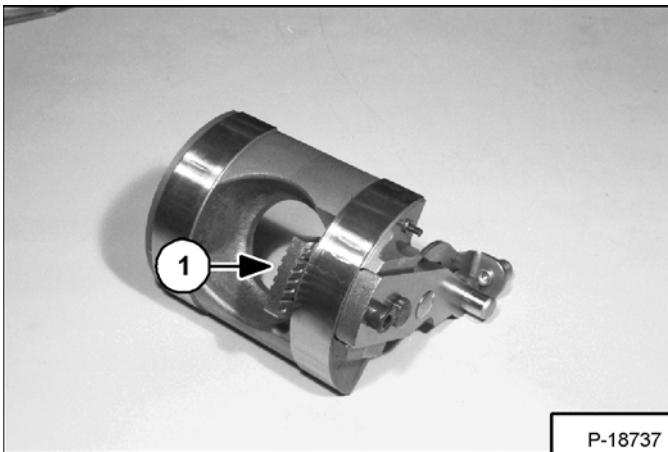
Inspection (Cont'd)

Figure 30-40-57



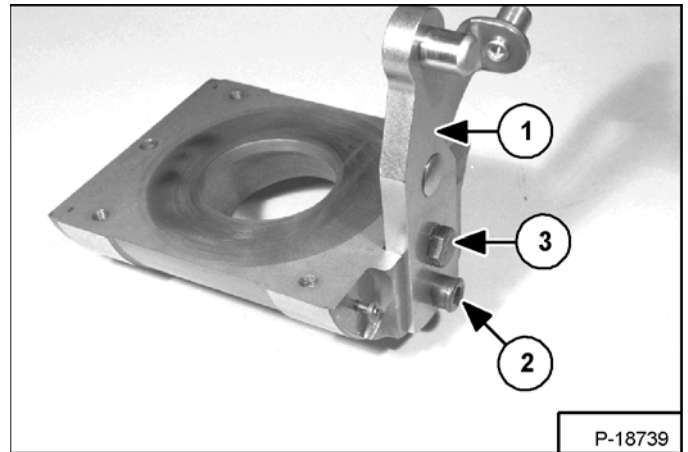
Check the swash plate assembly surface, it must be smooth and free of scratches [Figure 30-40-57].

Figure 30-40-58



Inspect the swash plate guide (Item 1) [Figure 30-40-58] for wear. Replace as needed.

Figure 30-40-59



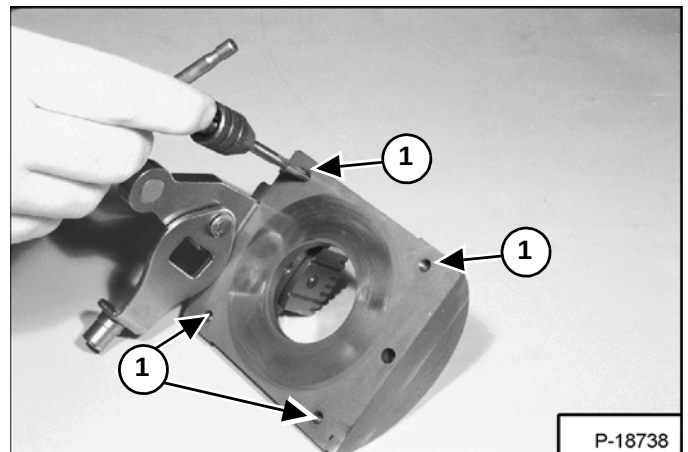
Servo arm (Item 1) [Figure 30-40-59] alignment is critical for proper pump operation. For this reason, removal of the servo arm from the swash plate is not recommended.

If the servo arm must be removed from the swash plate. Remove the swash plate guide bolt (Item 2) and the servo arm mounting bolt (Item 3) [Figure 30-40-59].

Installation: The servo arm (Item 1) [Figure 30-40-59] must be carefully aligned with the slot and threaded holes in the swash plate while installing, and must be pressed completely into the swash plate slot.

Tighten the swash plate guide bolt and servo arm bolt to 24 ft.-lbs. (32 Nm) torque.

Figure 30-40-60



The threaded holes (Item 1) [Figure 30-40-60] in the swash plate must be cleaned prior to assembly.

HYDROSTATIC PUMP (CONT'D)

Inspection (Cont'd)

Figure 30-40-61

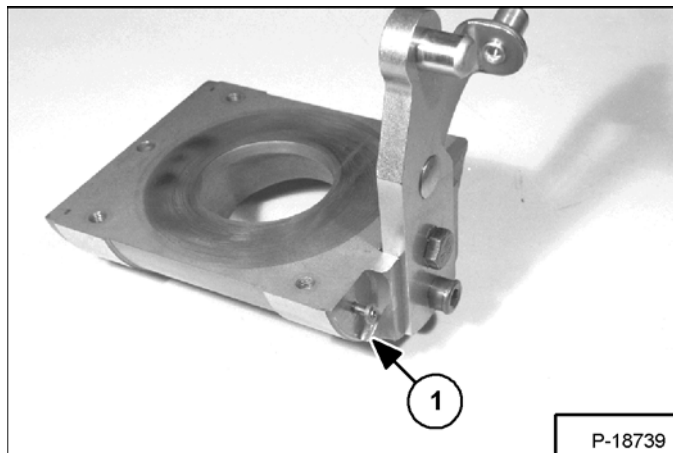
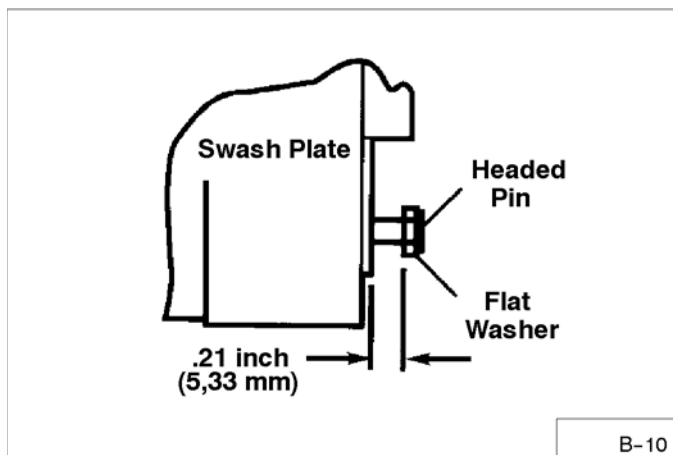


Figure 30-40-62



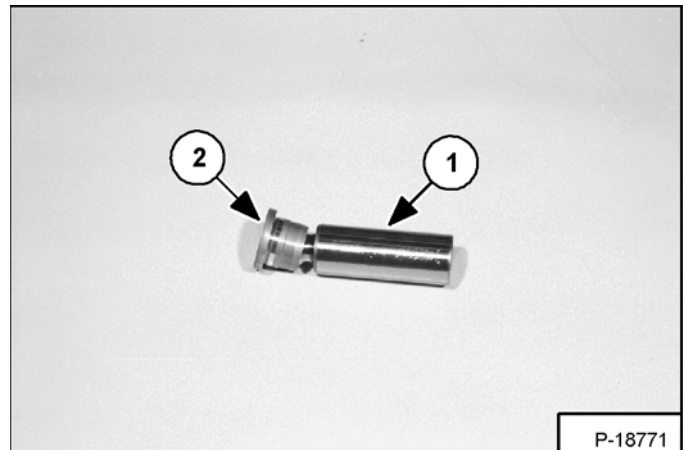
If the headed roll pin and flat washer (Item 1) [Figure 30-40-61] must be installed in the swash plate, the distance between the washer and the side of the swash plate must be .21 inch (5,33 mm) [Figure 30-40-62].

Figure 30-40-63



Check the swash plate bearings (Item 1) [Figure 30-40-63] for wear and damage. Replace as needed.

Figure 30-40-64

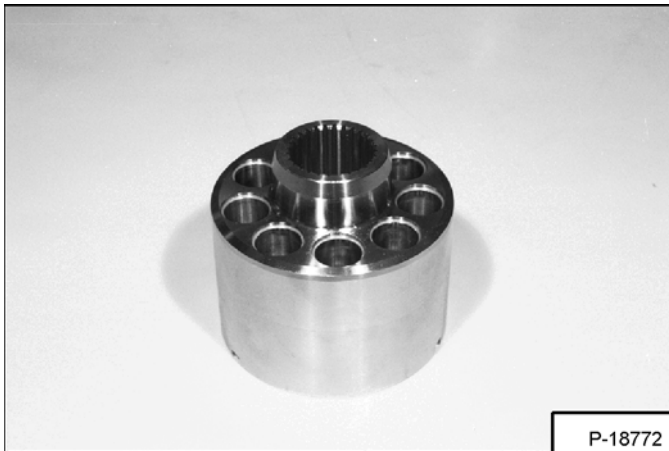


Check each piston (Item 1) and piston shoe (Item 2) [Figure 30-40-64] for wear or scratches.

HYDROSTATIC PUMP (CONT'D)

Inspection (Cont'd)

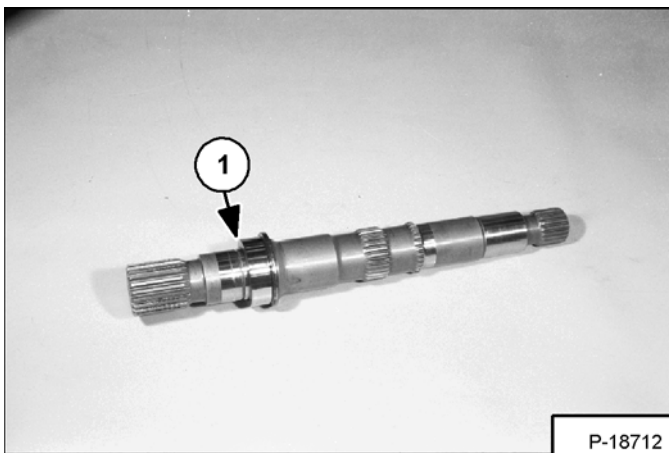
Figure 30-40-65



Check the cylinder block bores for wear or scratches [Figure 30-40-65].

If there is any defect in the cylinder block or pistons, the complete rotating group must be replaced.

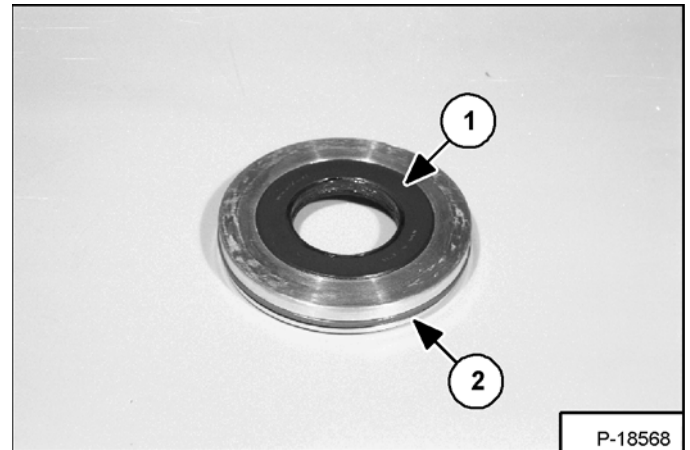
Figure 30-40-66



Check the shaft for wear or damage in the spline and bearing areas [Figure 30-40-66].

Check the bearing for correct operation. Remove the race (Item 1) [Figure 30-40-66] from the shaft only if it is necessary to replace the bearing.

Figure 30-40-67



Inspect the shaft seal (Item 1) [Figure 30-40-67]. Replace if needed.

Remove and discard the O-ring (Item 2) [Figure 30-40-67].

Inspect the multi-function valve cartridge for damage to parts or O-rings.

Figure 30-40-68



Replace O-rings as needed [Figure 30-40-68].

HYDROSTATIC PUMP (CONT'D)

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.

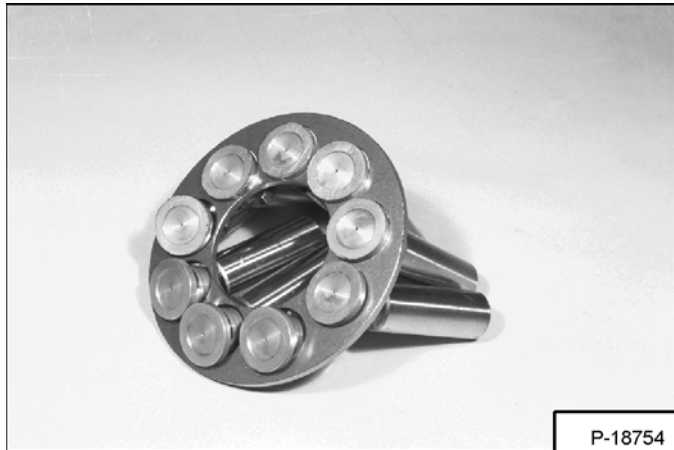
I-2003-0888

Clean all parts in solvent and dry with compressed air.

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

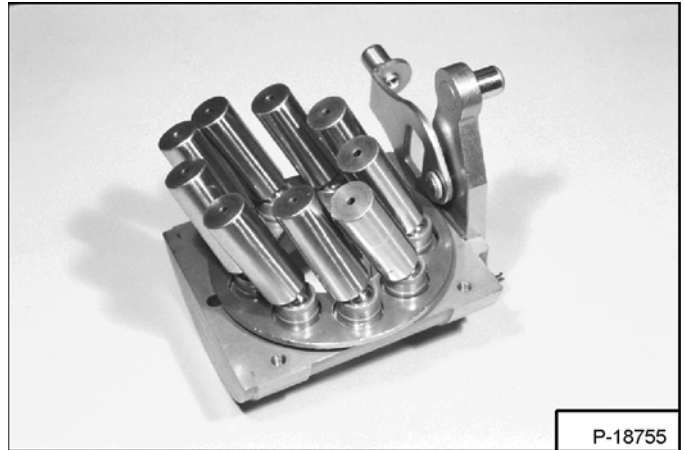
Always install new seals and O-rings. Lubricate all seals and O-rings with clean hydraulic fluid before installation.

Figure 30-40-69



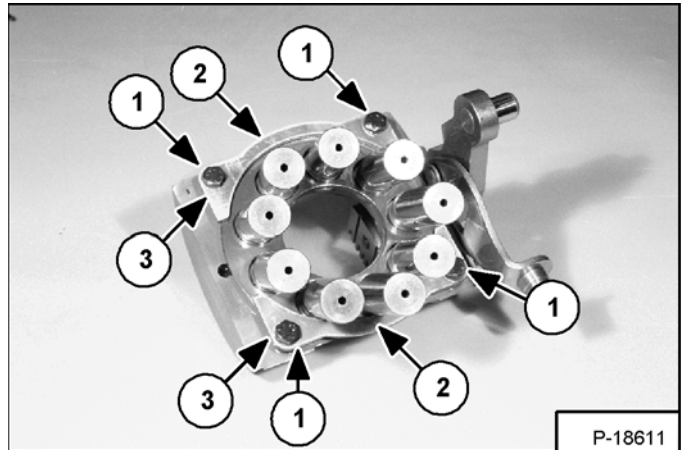
Put the piston assemblies into the slipper guide [Figure 30-40-69].

Figure 30-40-70



Lubricate the slipper running surface on the swash plate, center the piston and guide on the swash plate [Figure 30-40-70].

Figure 30-40-71



Apply LOCTITE #242 to four NEW retainer bolts (Item 1). Install the slipper guide bearings (Item 2) and spacers (Item 3) [Figure 30-40-71].

Tighten the four bolts to 10 ft.-lbs. (13,5 Nm) torque.

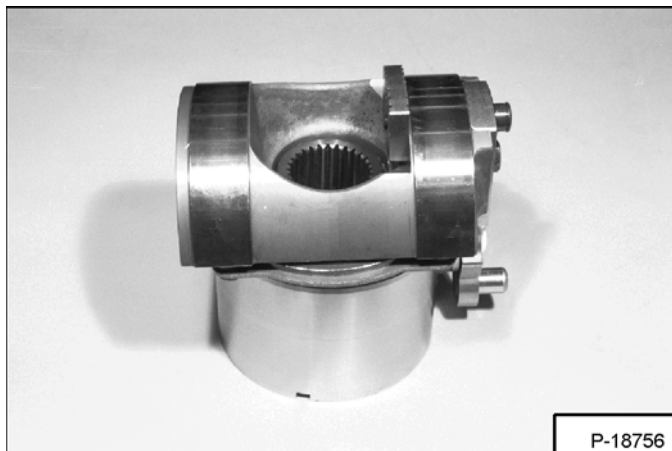
NOTE: Always use NEW retainer bolts with proper locking compound.

NOTE: The slipper guides and piston slippers must slide freely on the swash plate.

HYDROSTATIC PUMP (CONT'D)

Assembly (Cont'd)

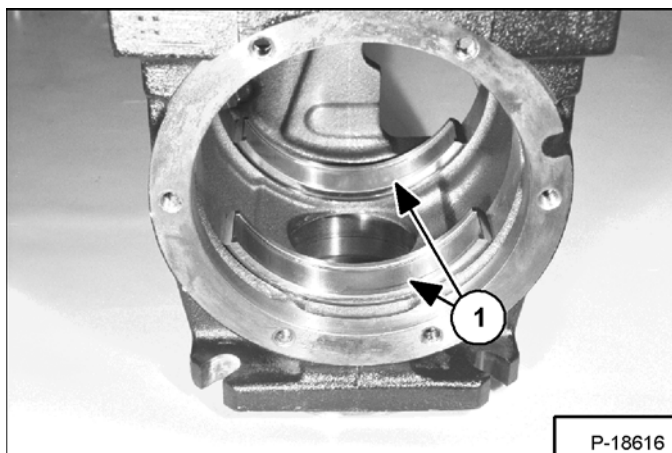
Figure 30-40-72



Lubricate the pistons and cylinder block bores. Install the assembled swash plate and pistons into the cylinder block [Figure 30-40-72].

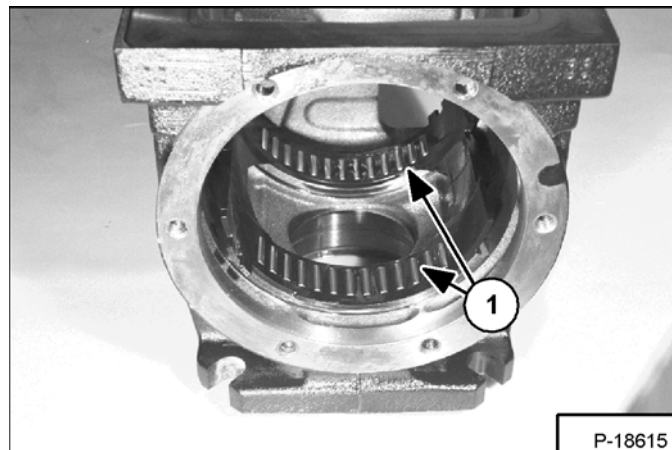
NOTE: The pistons and bores are not selectively fitted.

Figure 30-40-73



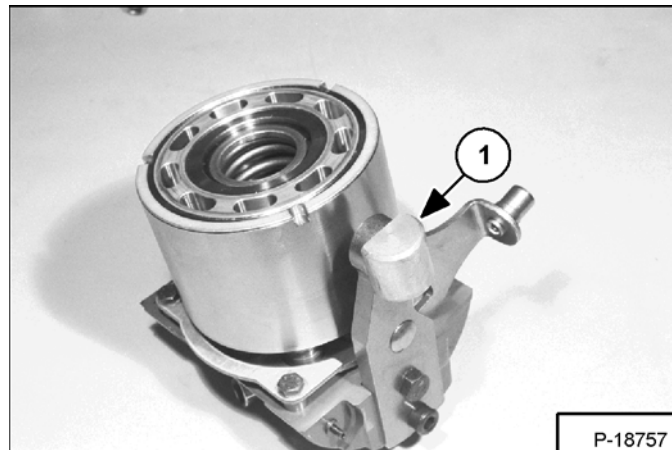
Install the swash plate bearing races (Item 1) [Figure 30-40-73] into the housing. Note the locating pins are offset in the housing to assure proper assembly.

Figure 30-40-74



Assemble and lubricate the bearing cage (Item 1) [Figure 30-40-74], and install it on the bearing races.

Figure 30-40-75

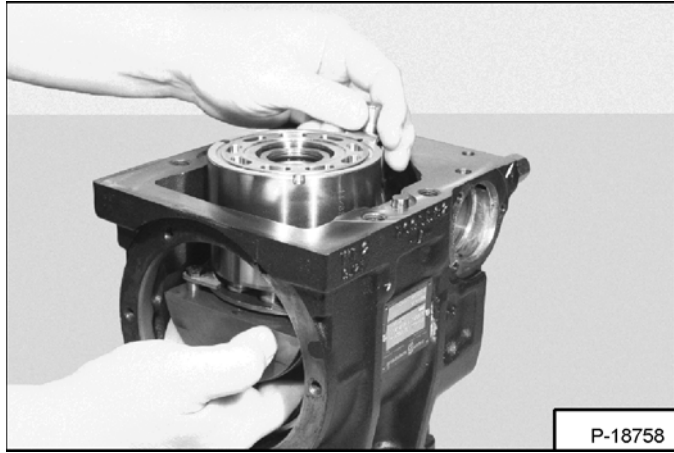


Install the bronze slider block (Item 1) [Figure 30-40-75] on the swash plate servo arm.

HYDROSTATIC PUMP (CONT'D)

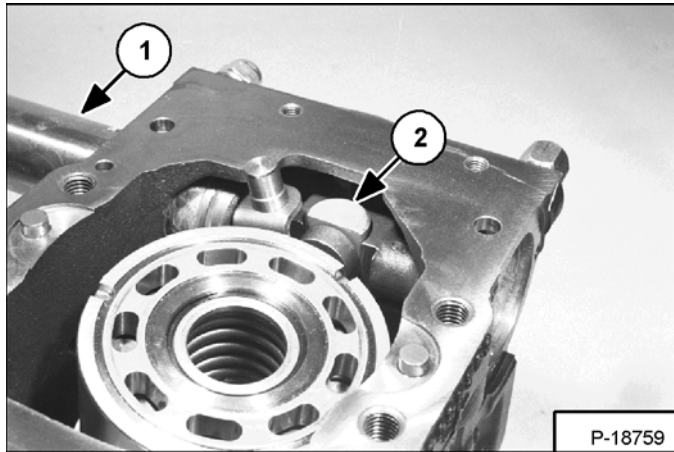
Assembly (Cont'd)

Figure 30-40-76



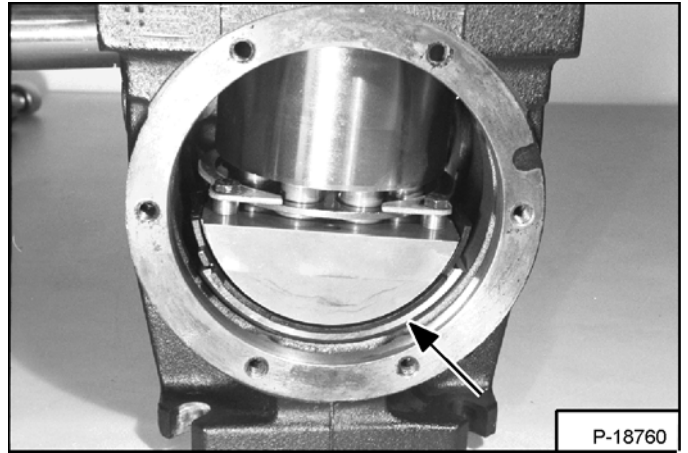
Carefully lower the cylinder block and swash plate assembly into the housing [Figure 30-40-76].

Figure 30-40-77



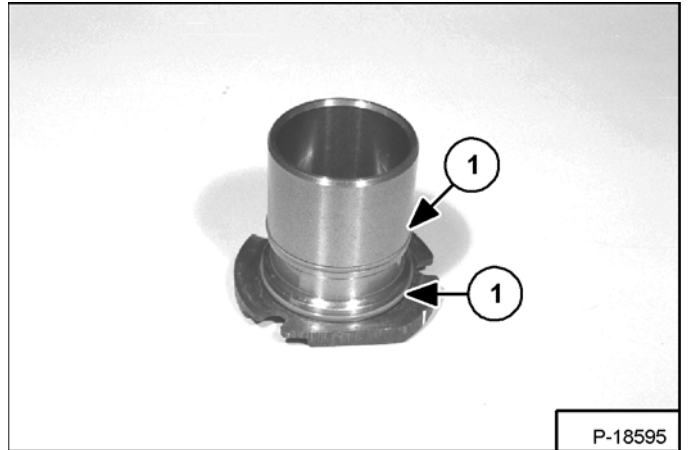
Holding the cylinder block and swash plate assembly approximately 1/2" (12 mm) above the bearings. Position the servo piston (Item 1) on the bronze slider block (Item 2) [Figure 30-40-77]. Take care not to wedge the block, the parts should slide freely.

Figure 30-40-78



Lower the cylinder block and swash plate assembly until the swash plate is properly located on the bearings [Figure 30-40-78].

Figure 30-40-79



Install new O-rings (Item 1) [Figure 30-40-79] on the servo end cap.

Lightly lubricate the O-rings and the inner surface of the end cap.

HYDROSTATIC PUMP (CONT'D)

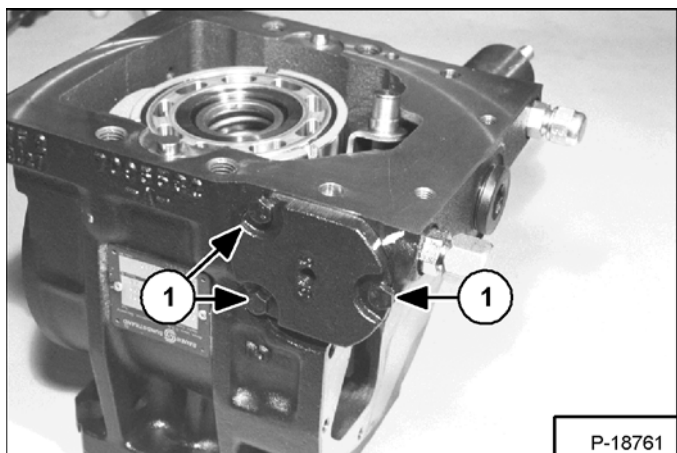
Assembly (Cont'd)

Figure 30-40-80



Hold the servo piston in position and install the servo end cap [Figure 30-40-80].

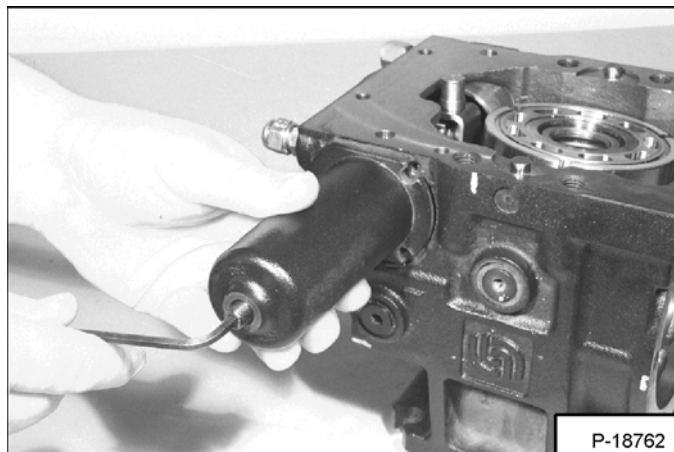
Figure 30-40-81



Install the three end cap mounting bolts (Item 1) [Figure 30-40-81]. Tighten to 10 ft.-lbs. (13,5 Nm) torque.

Lightly lubricate the O-rings and inner surface of the adjustment cover.

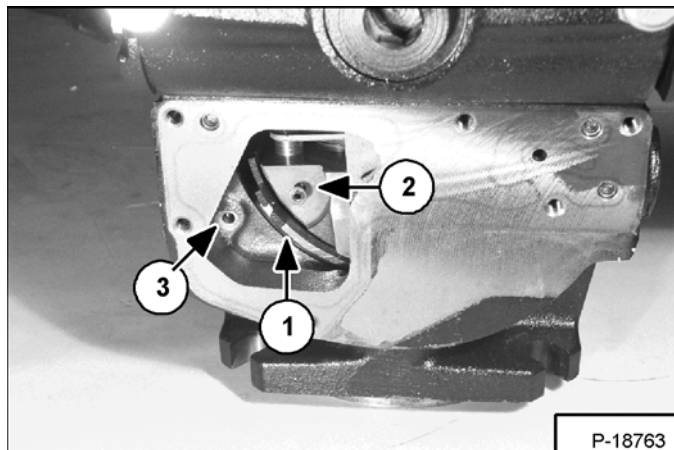
Figure 30-40-82



Install the servo adjustment cover over the servo piston until the piston adjustment screw touches the cover. Using a hex wrench, turn the adjustment screw counterclockwise while holding the cover until it is in position [Figure 30-40-82].

NOTE: Do not install the bolts at this time.

Figure 30-40-83

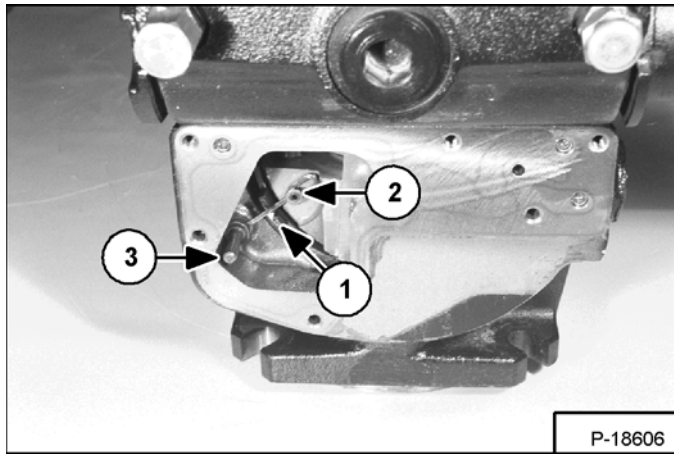


Align the slot in the swash plate bearing cage (Item 1) with the pin (Item 2) in the swash plate and the pin hole (Item 3) [Figure 30-40-83] in the housing.

HYDROSTATIC PUMP (CONT'D)

Assembly (Cont'd)

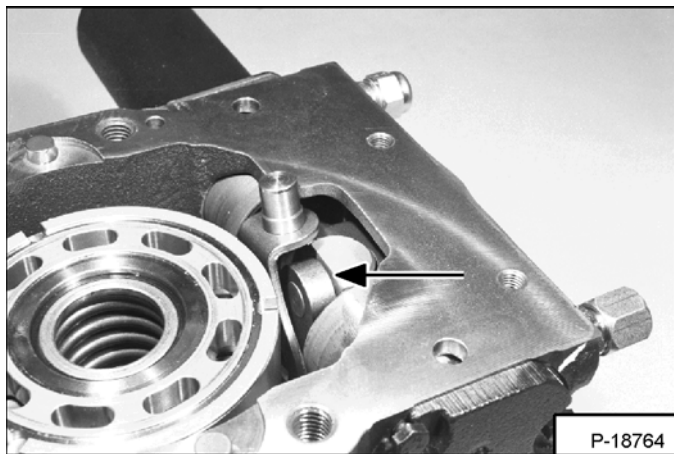
Figure 30-40-84



Hook the cage locator link (Item 1) over the pin (Item 2) [Figure 30-40-84] between the swash plate and washer. Rotate the link into the slot in the bearing cage.

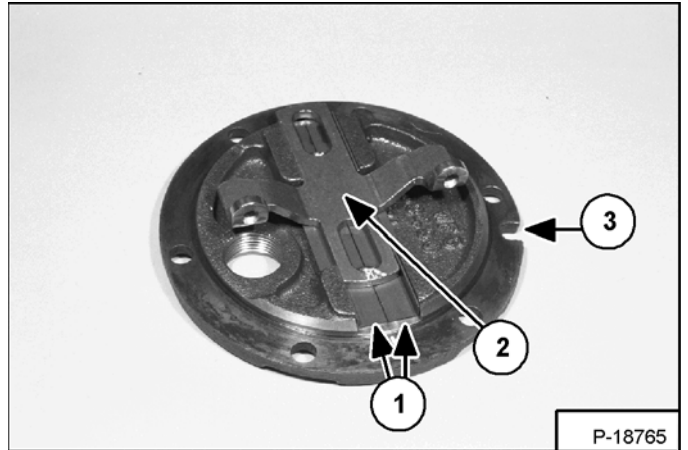
Install the anchor pin (Item 3) [Figure 30-40-84] through the locator link and into the housing.

Figure 30-40-85



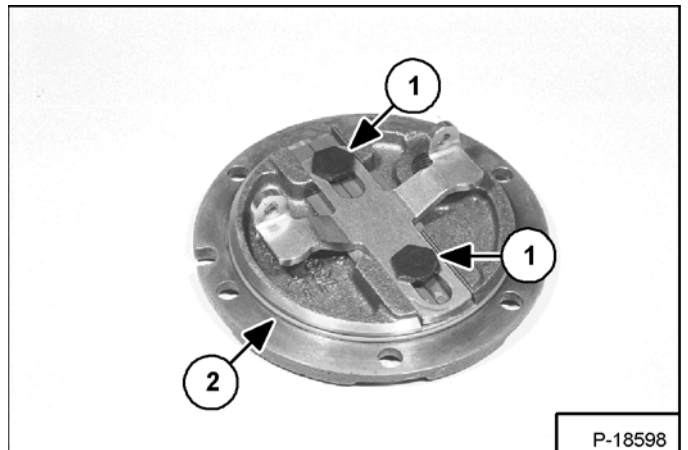
Push the swashplate assembly toward the servo piston until the swash plate guide contacts the bearing races. Check for clearance between the servo arm and the slider block [Figure 30-40-85]. If no clearance is present, recheck the assembly of the bearing cage and races.

Figure 30-40-86



Position the two side cover inserts (Item 1) and swashplate leveler (Item 2) on the side cover. Note the orientation of the leveler and the notch (Item 3) [Figure 30-40-86] in the cover.

Figure 30-40-87



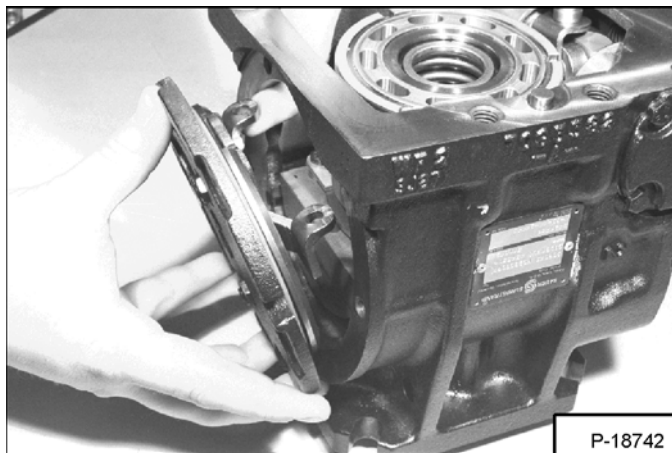
Install the two guide post bolts (Item 1) [Figure 30-40-87] through the leveler and inserts. Install the sealing nuts and tighten to 17 ft.-lbs. (23 Nm) torque.

Install a new O-ring (Item 2) [Figure 30-40-87] on the cover.

HYDROSTATIC PUMP (CONT'D)

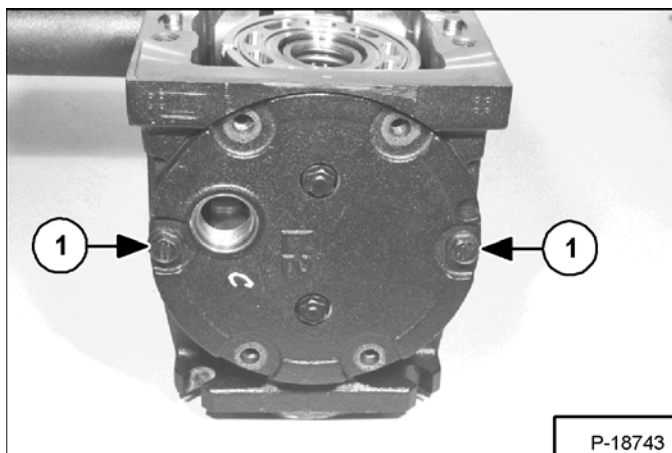
Assembly (Cont'd)

Figure 30-40-88



Lift the swash plate leveler and install the side cover [Figure 30-40-88].

Figure 30-40-89

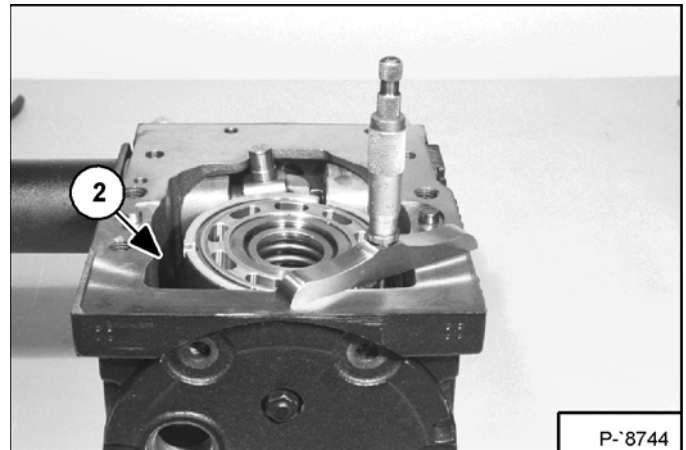


Install the two side cover bolts (Item 1) [Figure 30-40-89] finger tight.

Apply a force of 5 - 10 ft.-lbs. (22 - 44 Nm) to the swash plate leveler to make sure both leveler arms contact the swash plate.

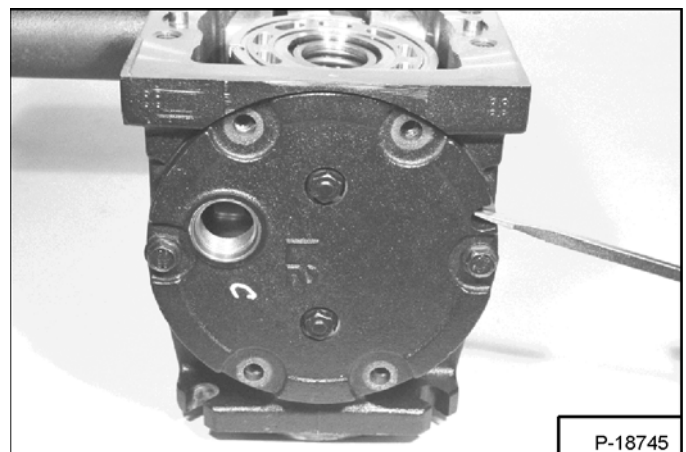
Make sure the swash plate assembly is seated correctly on the bearings.

Figure 30-40-90



Use a depth micrometer to measure the distance from the end cap to the swash plate surface (Item 1). Take a second measurement at a point 90° (Item 2) [Figure 30-40-90] from the first point of measurement. These measurements must not vary more than .001 inches (.025 mm).

Figure 30-40-91

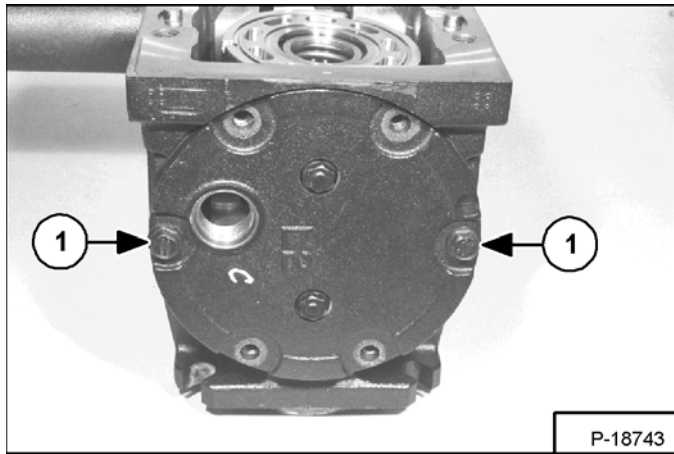


Rotate the side cover [Figure 30-40-91] (which will also rotate the leveler and swash plate) until the zero angle position is established, as determined by a second depth measurement.

HYDROSTATIC PUMP (CONT'D)

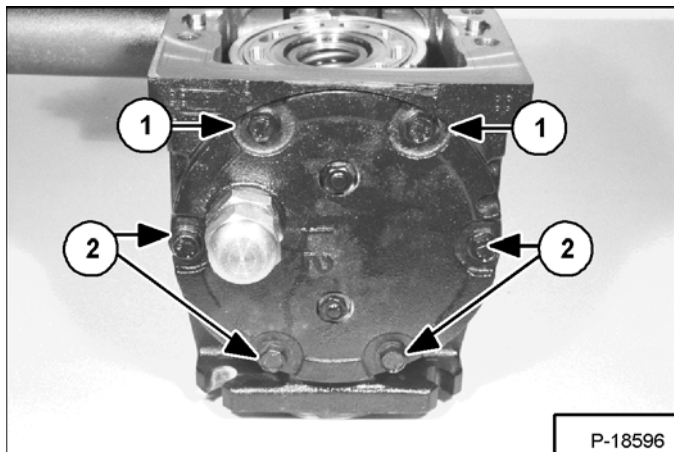
Assembly (Cont'd)

Figure 30-40-92



After the zero angle position has been established, tighten the two side cover bolts (Item 1) [Figure 30-40-92].

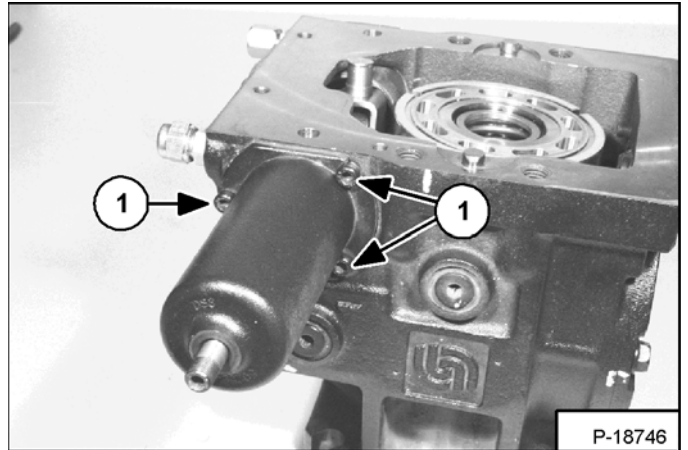
Figure 30-40-93



Install the four remaining side cover bolts, apply LOCTITE #242 to the threads of the "thru" bolts (Item 1) [Figure 30-40-93].

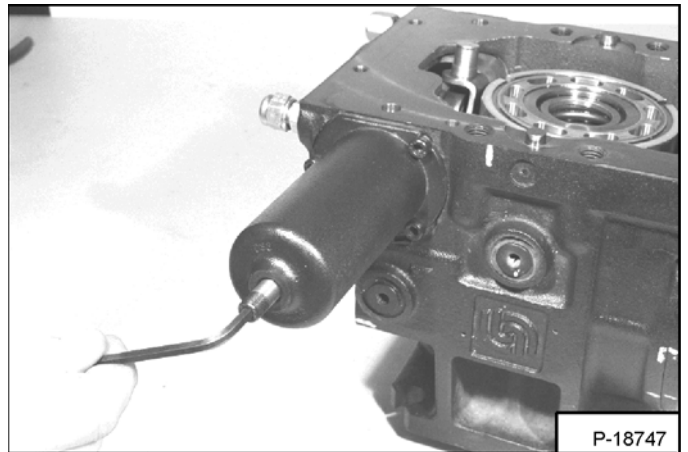
First tighten the four side cover bolts (Item 2) to 24 ft.-lbs. (32,5 Nm) torque. Tighten the two remaining side cover bolts (Item 1) [Figure 30-40-93] to 18.5 ft.-lbs. (25 Nm) torque.

Figure 30-40-94



Install the three servo adjustment cover mounting bolts (Item 1) [Figure 30-40-94]. Tighten to 10 ft.-lbs. (13,5 Nm) torque.

Figure 30-40-95

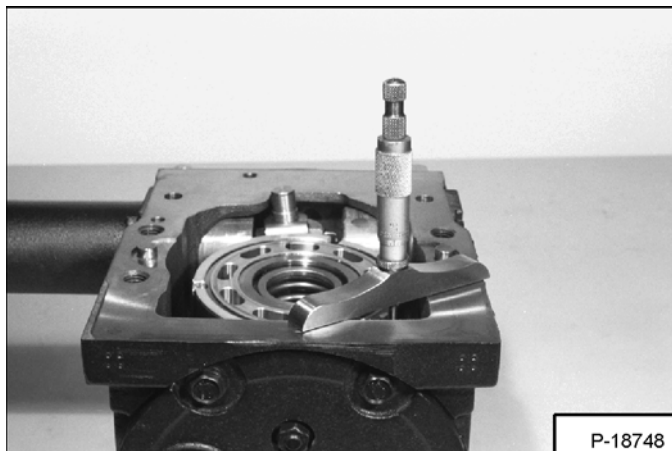


Turn the adjustment screw on the servo, which will rotate the swash plate assembly until a zero angle position is established [Figure 30-40-95].

HYDROSTATIC PUMP (CONT'D)

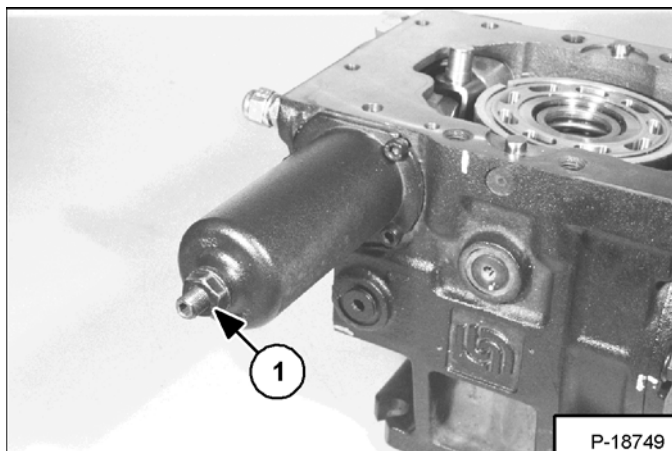
Assembly (Cont'd)

Figure 30-40-96



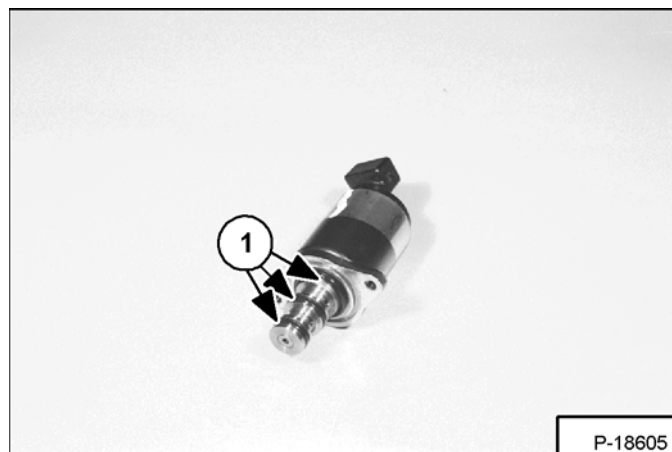
Use a depth micrometer to measure the distance from the end cap to the swash plate surface [Figure 30-40-96]. Take a second measurement at a point 180° from the first point of measurement. These measurements must not vary more than .001 inch (.025 mm).

Figure 30-40-97



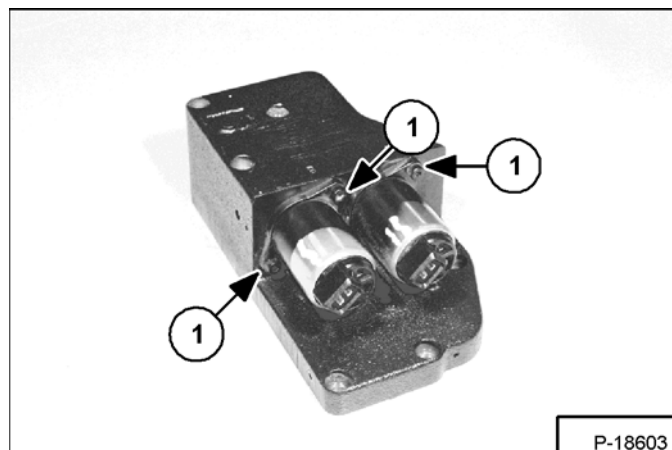
Without turning the servo adjustment screw, install the sealed nut (Item 1) [Figure 30-40-97] and tighten.

Figure 30-40-98



Install new O-rings (Item 1) [Figure 30-40-98] on the solenoid spool.

Figure 30-40-99

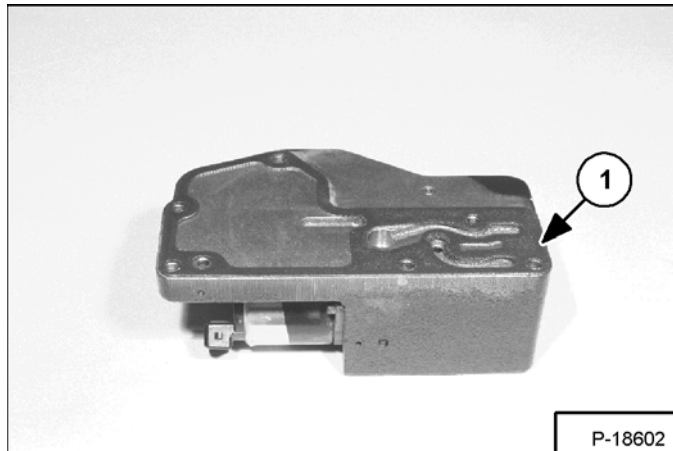


Lightly lubricate both solenoid spools and install into the manifold housing and retain with the four screws (Item 1) [Figure 30-40-99].

HYDROSTATIC PUMP (CONT'D)

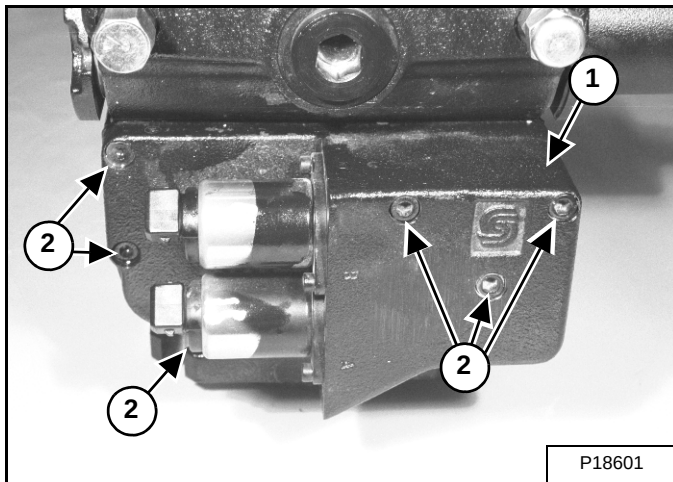
Assembly (Cont'd)

Figure 30-40-100



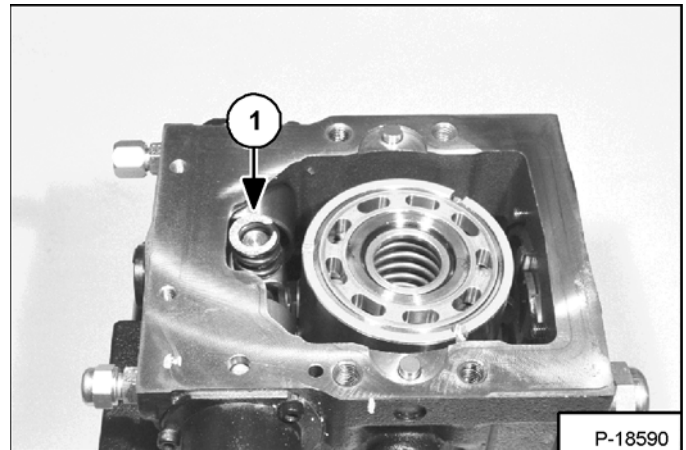
Apply assembly lube on the gasket (Item 1) [Figure 30-40-100] and install on the manifold housing.

Figure 30-40-101



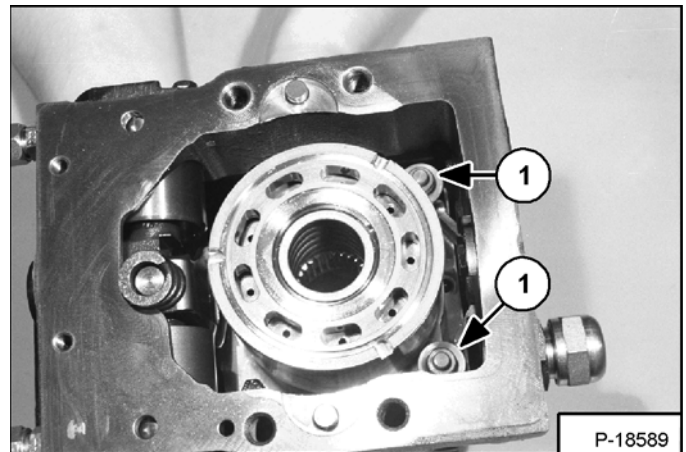
Install the manifold assembly (Item 1) on the pump with the six screws (Item 2) [Figure 30-40-101].

Figure 30-40-102



Install the spring (Item 1) [Figure 30-40-102] on the servo arm link.

Figure 30-40-103

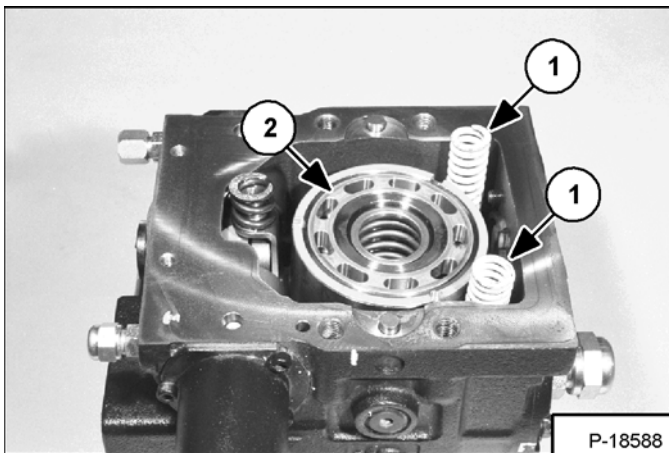


Install the spring seats (Item 1) [Figure 30-40-103] on the leveler arms.

HYDROSTATIC PUMP (CONT'D)

Assembly (Cont'd)

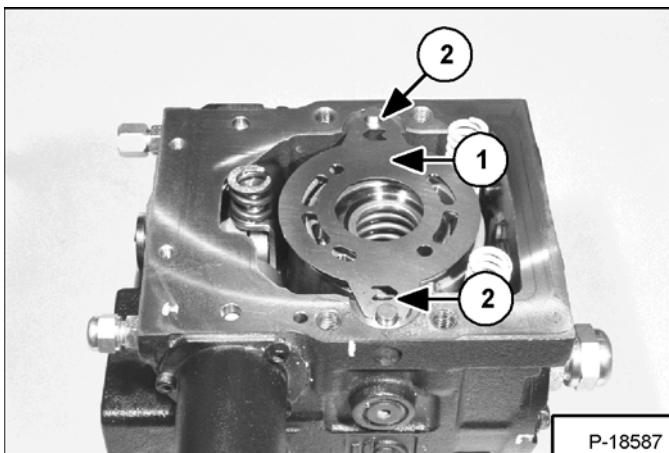
Figure 30-40-104



Install both springs (Item 1) [Figure 30-40-104] on the leveler spring seats.

Lubricate the running surface of the cylinder (Item 2) [Figure 30-40-104].

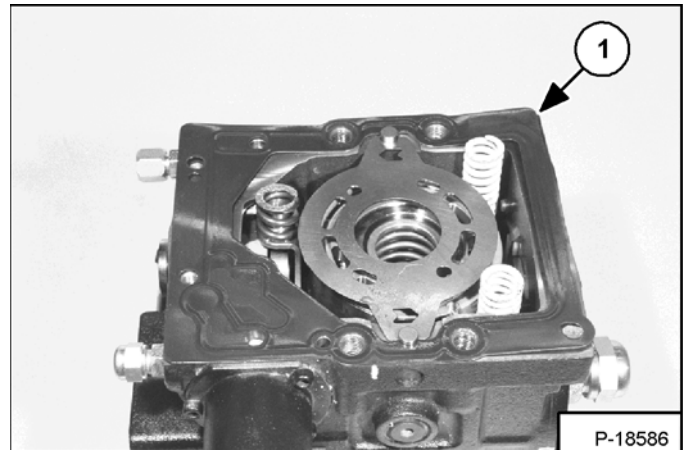
Figure 30-40-105



Install the valve plate (Item 1) [Figure 30-40-105] on the alignment pins.

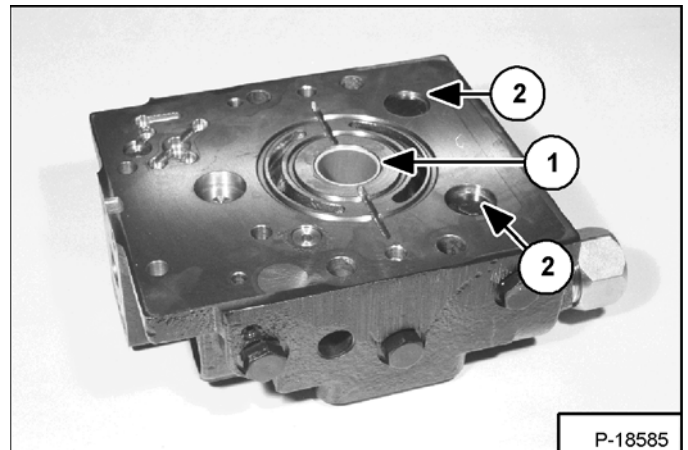
NOTE: The direction of the arrow cut outs (Item 2) [Figure 30-40-105] in the valve plate.

Figure 30-40-106



Install a new gasket (Item 1) [Figure 30-40-106] on the housing.

Figure 30-40-107



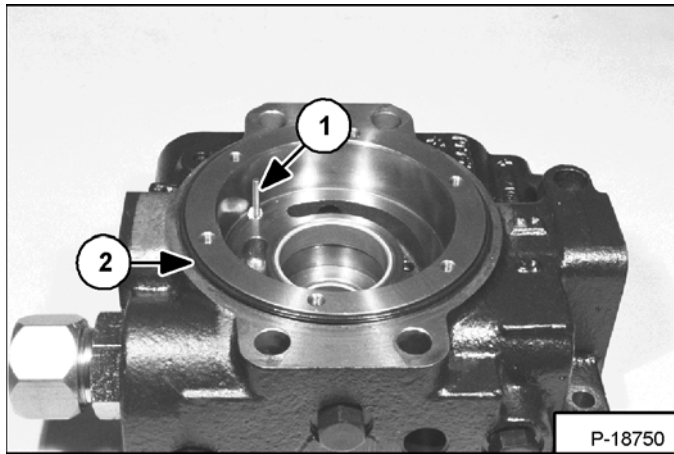
Lubricate the end cap journal bearing (Item 1). Install the hardened shims (Item 2) [Figure 30-40-107] in the charge pump pockets for the swash plate leveler springs. Retain the shims with assembly lube.

Turn the charge pump housing over.

HYDROSTATIC PUMP (CONT'D)

Assembly (Cont'd)

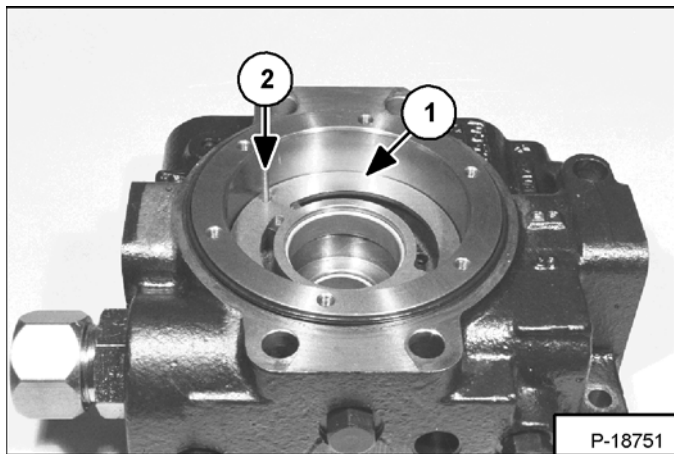
Figure 30-40-108



Lightly lubricate the alignment pin (Item 1) [Figure 30-40-108] and install into the charge pump housing, in the position marked at time of disassembly. This will properly align the wear plate and eccentric ring.

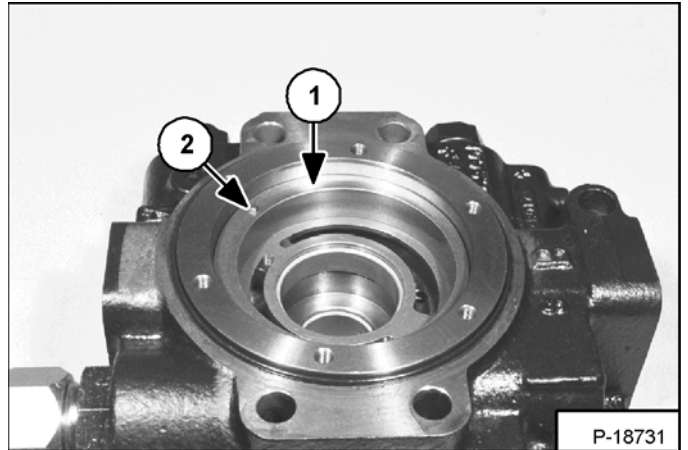
Install a new O-ring (Item 2) [Figure 30-40-108].

Figure 30-40-109



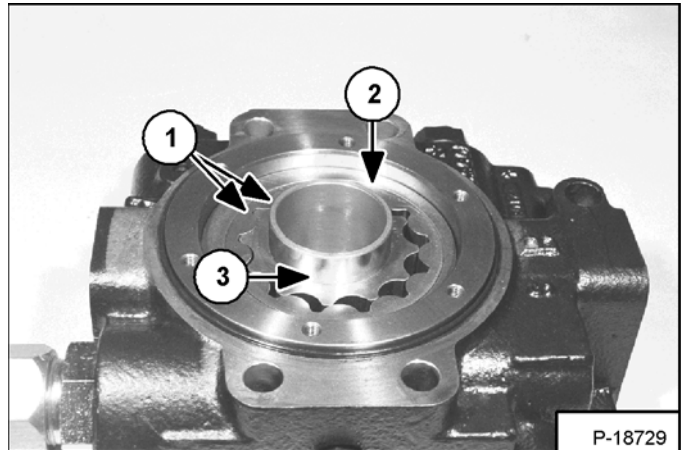
Lubricate both sides of the wear plate (Item 1) and install in the charge pump. Align the wear plate with the alignment pin (Item 2) [Figure 30-40-109].

Figure 30-40-110



Install the eccentric ring (Item 1) in the charge pump and align with the alignment pin (Item 2) [Figure 30-40-110].

Figure 30-40-111

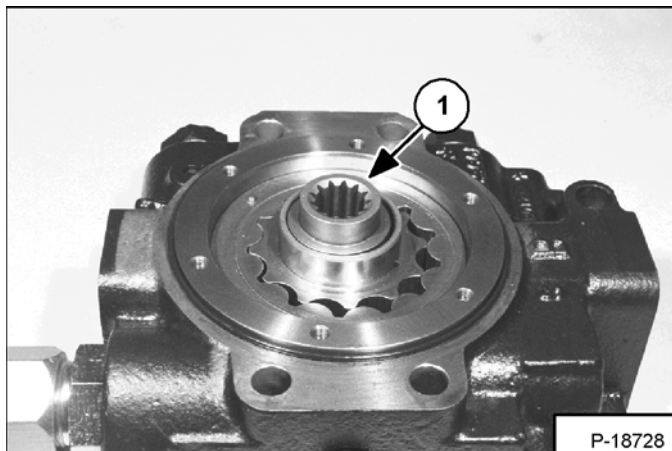


Apply assembly lube and install the charge pump gears (Item 1), charge pump shaft (Item 2) and key (Item 3) [Figure 30-40-111] into the pump.

HYDROSTATIC PUMP (CONT'D)

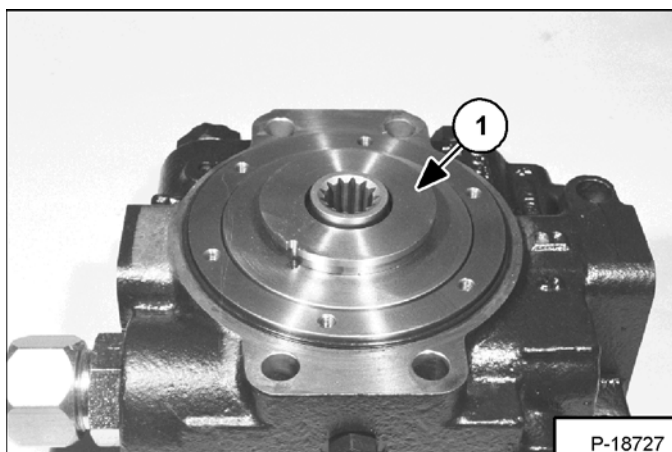
Assembly (Cont'd)

Figure 30-40-112



Install the coupler (Item 1) [Figure 30-40-112].

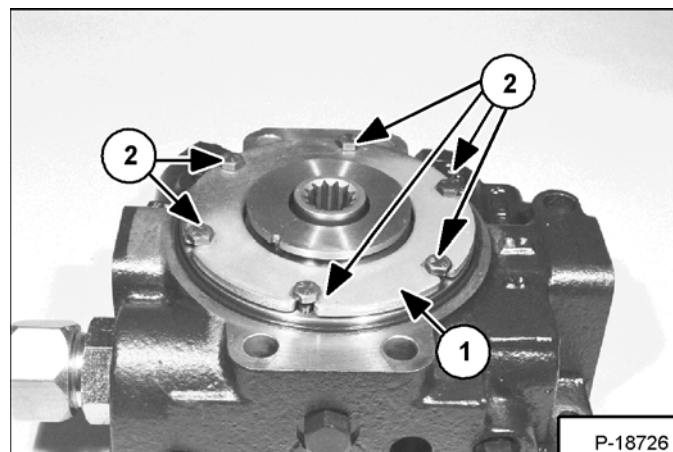
Figure 30-40-113



Install the charge pump cover (Item 1) [Figure 30-40-113].

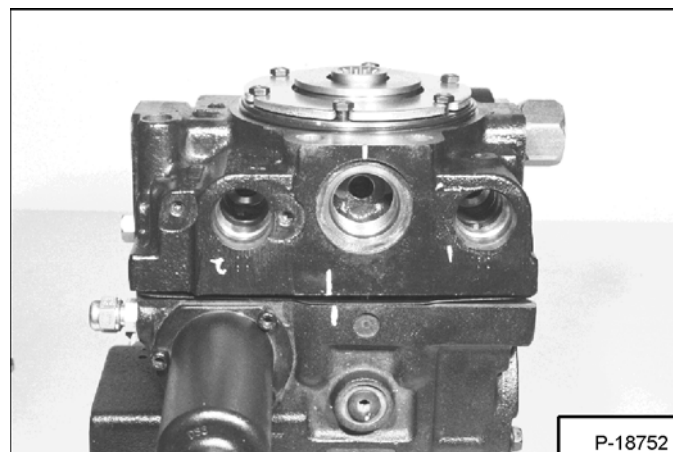
Rotate until the pin hole in the cover aligns with the pin.

Figure 30-40-114



Install the retaining plate cover (Item 1) and six bolts (Item 2) [Figure 30-40-114]. Tighten the bolts to 10 ft.-lbs. (13,5 Nm) torque.

Figure 30-40-115



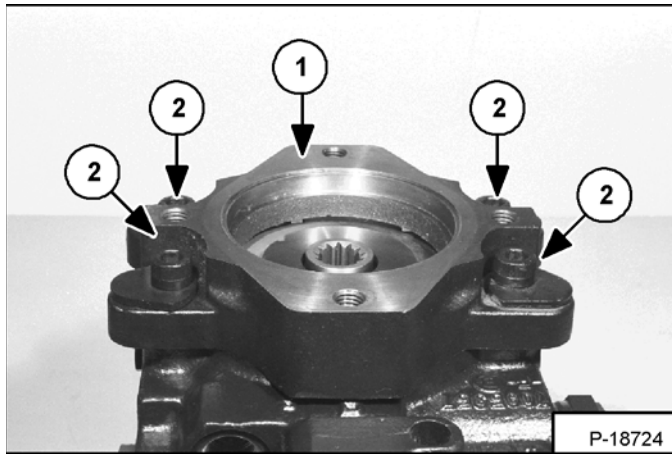
Lower the charge pump onto the pump housing while positioning the three springs in their pockets [Figure 30-40-115].

When properly installed, the charge pump will engage the alignment pins, but the springs will hold the charge pump housing 1/8 to 1/4 (3 to 8 mm) away from the pump housing.

HYDROSTATIC PUMP (CONT'D)

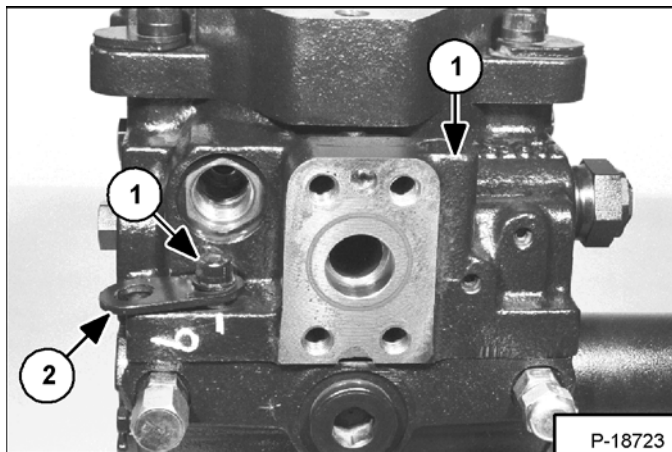
Assembly (Cont'd)

Figure 30-40-116



Install the flange adapter (Item 1) and four bolts (Item 2) [Figure 30-40-116]. Tighten the bolts to 90 ft.-lbs. (122 Nm) torque.

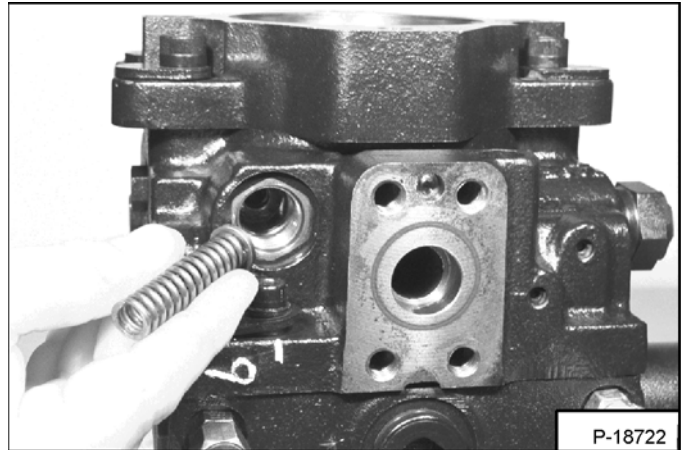
Figure 30-40-117



Install the two mounting bolts (Item 1) [Figure 30-40-117] and tighten to 28 ft.-lbs. (38 Nm) torque.

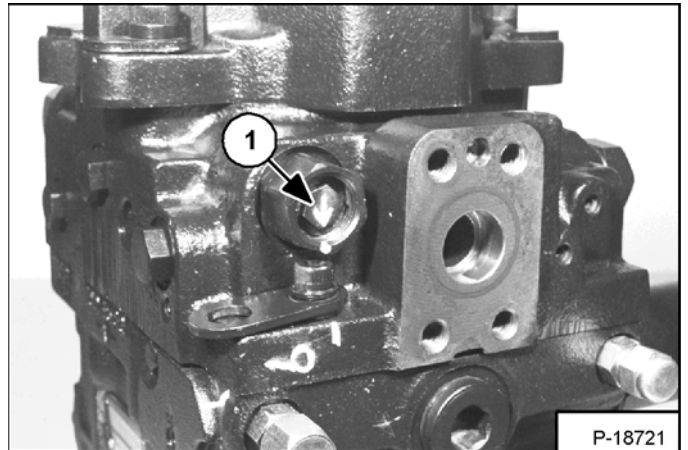
NOTE: Install the lifting bracket (Item 2) [Figure 30-40-117].

Figure 30-40-118



Install the spring and relief poppet into the charge pump [Figure 30-40-118].

Figure 30-40-119



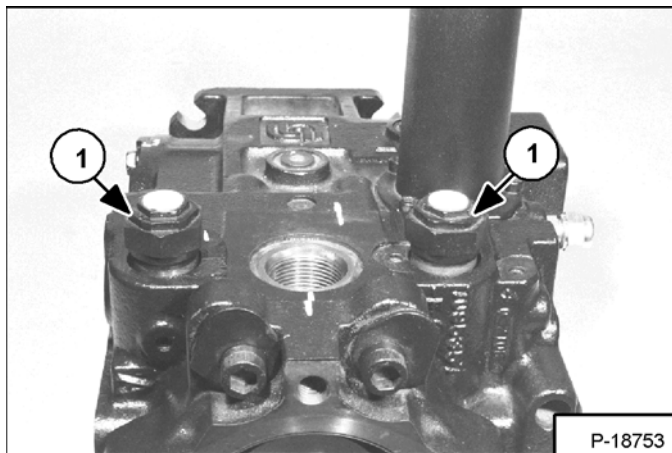
Install the plug with lock nut (Item 1) [Figure 30-40-119], align the marks made at disassembly. Tighten the lock nut to 38 ft.-lbs. (52 Nm) torque.

See page _____ for additional adjustment in machine.

HYDROSTATIC PUMP (CONT'D)

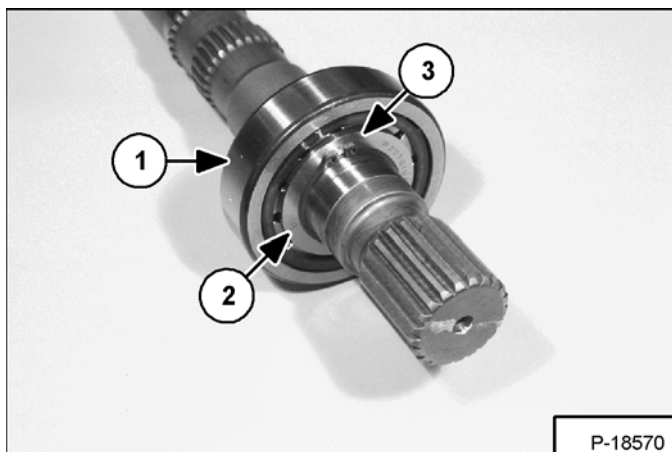
Assembly (Cont'd)

Figure 30-40-120



Lightly lubricate and install both multi-function valve assemblies (Item 1) [Figure 30-40-120] in the charge pump. Tighten to 66 ft.-lbs. (89 Nm) torque.

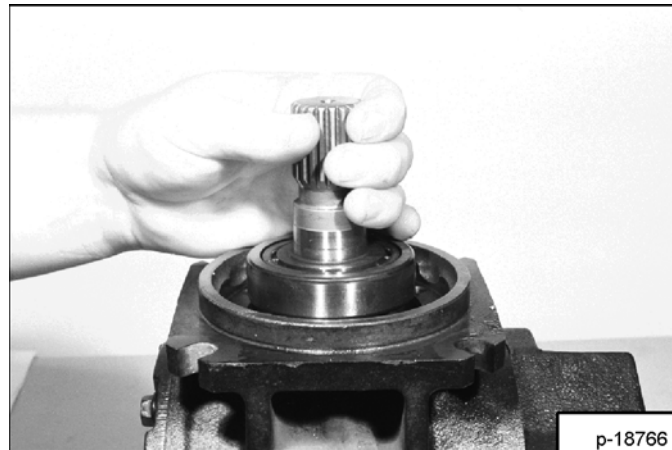
Figure 30-40-121



Install the bearing (Item 1), the spacer washer (Item 2) and the snap ring (Item 3) [Figure 30-40-121] on the drive shaft.

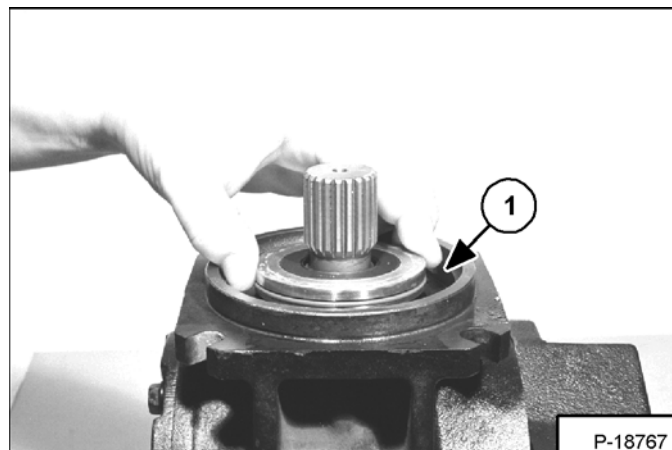
Position the pump on the charge pump end.

Figure 30-40-122



Install the shaft and bearing assembly, aligning the shaft spline with the cylinder block spline. Continue to lower the shaft and align with the charge pump journal bearing and charge pump coupler [Figure 30-40-122].

Figure 30-40-123



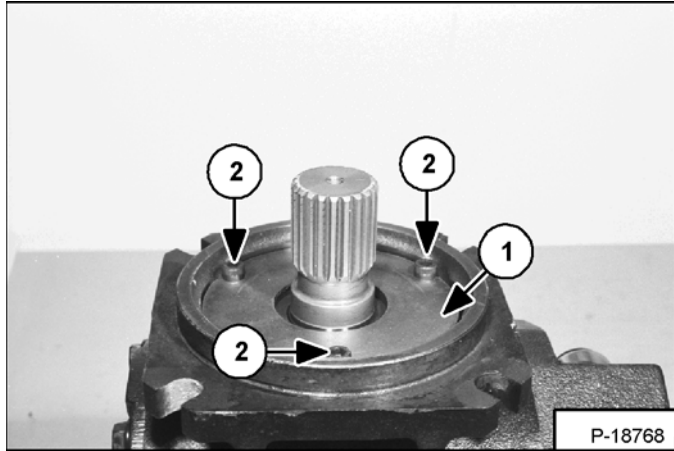
Install a new O-ring (Item 1) [Figure 30-40-123].

Lubricate the seal with assembly lube and install the seal assembly on the drive shaft and in the housing [Figure 30-40-122].

HYDROSTATIC PUMP (CONT'D)

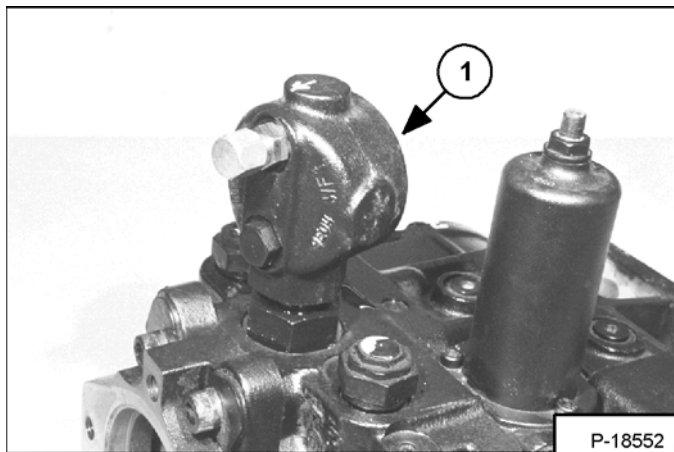
Assembly (Cont'd)

Figure 30-40-124



Install the retainer plate (Item 1) and three bolts (Item 2) [Figure 30-40-124]. Tighten the bolts in a sequenced pattern to 12 ft.-lbs. (16 Nm) torque.

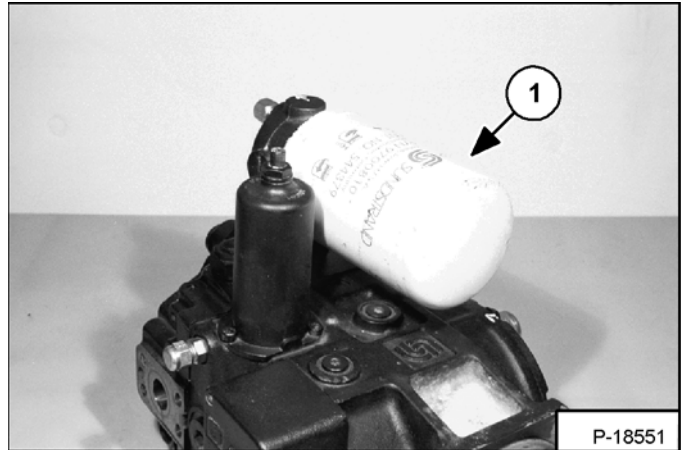
Figure 30-40-125



Install the filter head (Item 1) [Figure 30-40-125] on the pump.

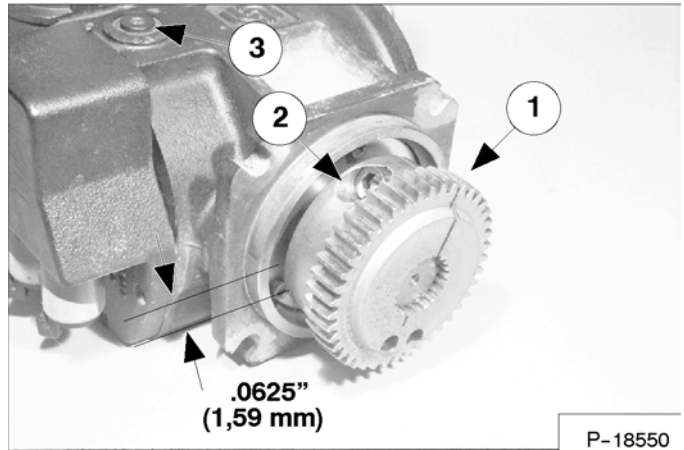
Tighten to 90 ft.-lbs. (122 Nm) torque.

Figure 30-40-126



Install a new filter (Item 1) [Figure 30-40-126] on the pump.

Figure 30-40-127

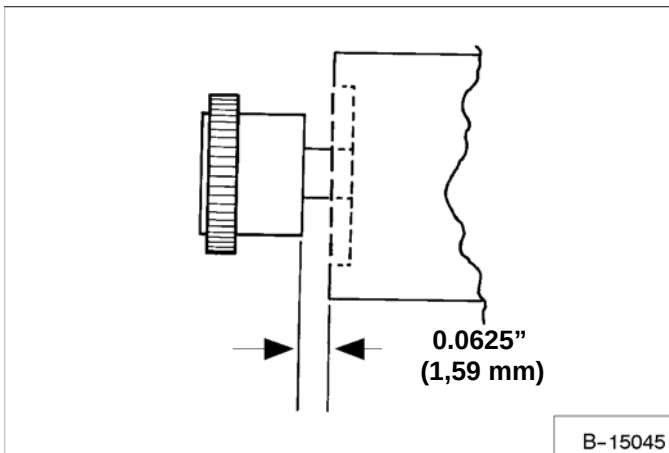


Install the coupler gear (Item 1) on the shaft and install the bolt (Item 2) [Figure 30-40-127].

HYDROSTATIC PUMP (CONT'D)

Assembly (Cont'd)

Figure 30-40-128



NOTE: When installing the coupler, maintain a .0625 inch (1,59 mm) gap from the pump mount flange to the coupler [Figure 30-40-127] & [Figure 30-40-128].

Remove the case plug (Item 3) [Figure 30-40-127] and fill with clean hydraulic fluid prior to start up.

Rotate the pump shaft with a torque wrench to assure correct assembly. The torque required to turn the shaft (after "break away") should be within:

MINIMUM	MAXIMUM
4 ft.-lbs. (5,4 Nm)	9 ft.-lbs. (12,2 Nm)

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DRIVE SYSTEM

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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 authorised Massey Ferguson Service Personnel only.

PROBLEM	CAUSE
Pinion or Ring gear tooth broken	1, 2, 3, 4, 5, 6
Pinion teeth pitted	5, 11
Axle housing bent	12, 13
Worn or pitted bearings	3, 5, 6, 11, 14
Oil leakage	6, 9, 14
Excessive wear on input shaft splines	3, 16, 17, 19
Pinion teeth fatigue	7, 12, 17, 19
Side gear spline worn	17, 19
Thrust washer surface worn	5, 6, 7
Inner diameter of tapered roller bearing worn	5, 6, 18, 19
Bent or broken half shaft	19
Half shaft broken at wheel side	20, 21

KEY TO CORRECT THE CAUSE
1. Excessive gear load
2. Incorrect gear adjustment (excessive play)
3. Pinion nut loose
4. Incorrect gear adjustment (insufficient play)
5. Insufficient lubrication
6. Contaminated oil
7. Incorrect lubrication
8. Worn bearings
9. Operation at high temperature
10. Low oil level
11. Excessive use
12. Overloaded
13. Accident
14. Normal Wear
15. Lip seal damaged
16. Pinion axle play
17. Continuous overload
18. Excessive pinion axle play
19. Vehicle intensively operated or overloaded
20. Wheel loose
21. Beam housing bent

AXLE AND DIFFERENTIAL (FRONT)

General Information

For photo clarity, the following axle procedures are done with the complete axle assembly removed from the machine, although the planetary carrier, wheel hub, steering knuckle and drive axle procedures may be done with the axle assembly installed in the machine. For complete axle repair, the following must be done.

Axle removal. (See Content Page 40-01.)

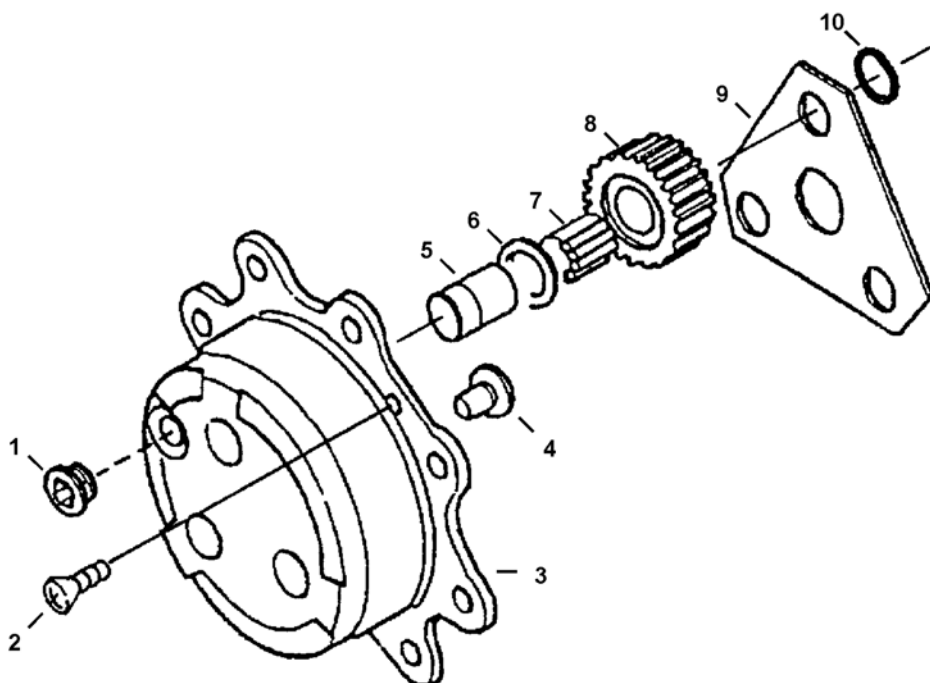
Drive motor removal. (See Content Page 30-01.)

Drive box removal. (See Content Page 20-01.)

Steering cylinder removal. (See Content Page 20-01.)

Planetary Carrier Parts Identification

1. Plug
2. Bolt
3. Planetary Carrier
4. Thrust Pin
5. Shaft
6. Thrust Washer
7. Needle Bearings
8. Gear
9. Thrust Plate
10. Snap Ring



B-16012

AXLE AND DIFFERENTIAL (FRONT) (CONT'D)

Planetary Carrier Disassembly

Clean the outside of the planetary carrier before disassembly.

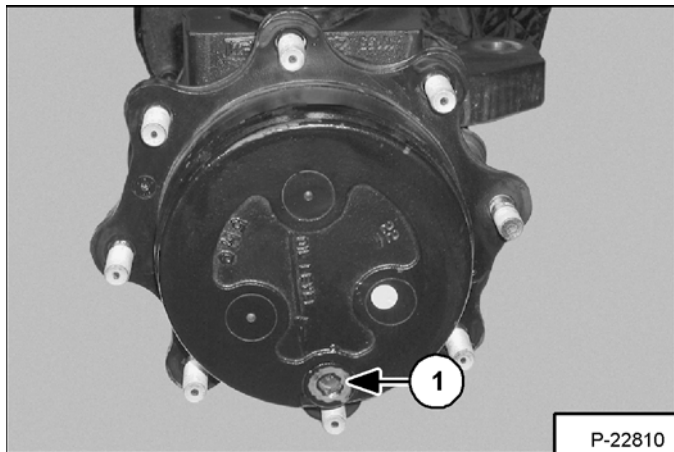
Mark the outside of the planetary carrier for ease of assembly.

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.

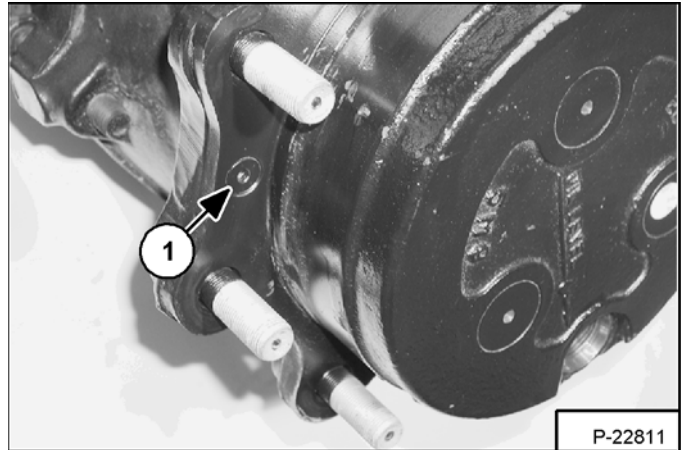
I-2003-0888

Figure 40-20-1



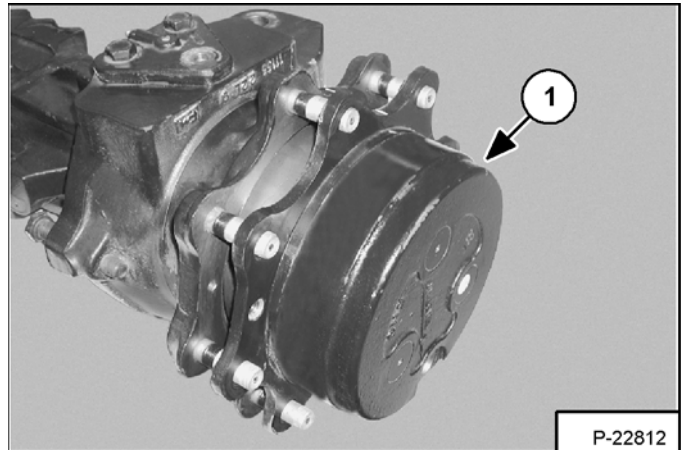
With the drain plug (Item 1) [Figure 40-20-1] in the position shown, place a drain pan under the hub and remove the plug.

Figure 40-20-2



Remove the two screws (Item 1) [Figure 40-20-2] from the planetary carrier.

Figure 40-20-3

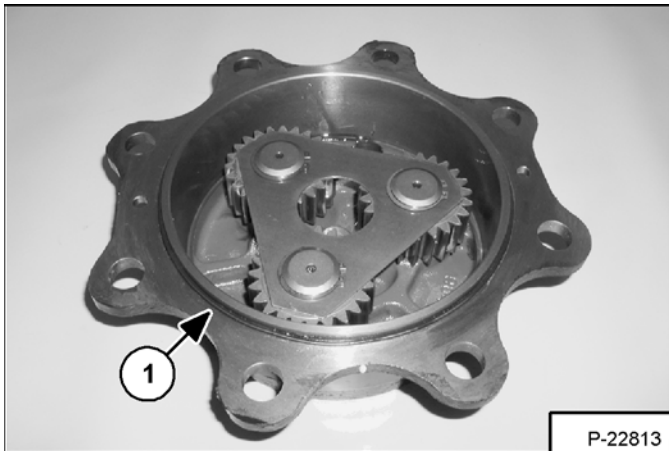


Remove the planetary carrier (Item 1) [Figure 40-20-3] from the axle.

AXLE AND DIFFERENTIAL (FRONT) (CONT'D)

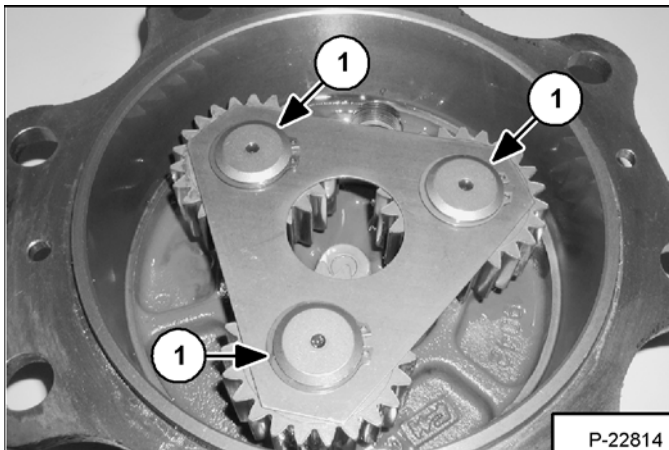
Planetary Carrier Disassembly (Cont'd)

Figure 40-20-4



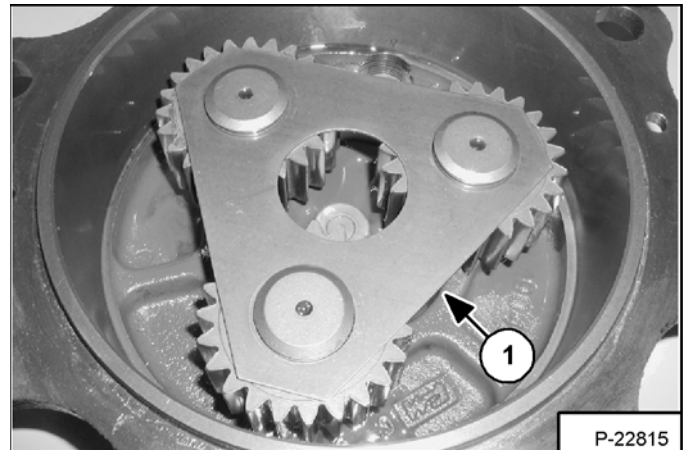
Remove and discard the O-ring (Item 1) [Figure 40-20-4] from the planetary carrier.

Figure 40-20-5



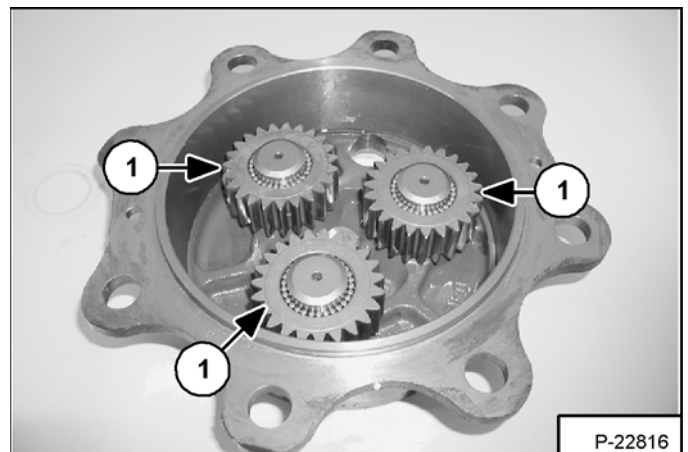
Remove the three snap rings (Item 1) [Figure 40-20-5].

Figure 40-20-6



Remove the thrust plate (Item 1) [Figure 40-20-6].

Figure 40-20-7



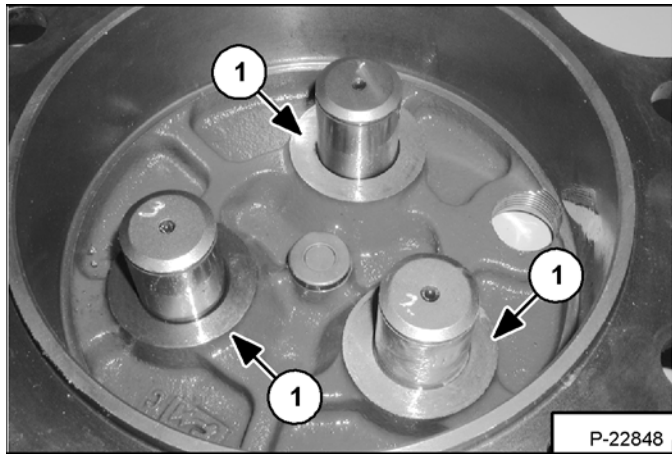
Remove the three gears (Item 1) [Figure 40-20-7] with needle bearings from each gear shaft.

NOTE: Mark the gear location for correct assembly.

AXLE AND DIFFERENTIAL (FRONT) (CONT'D)

Planetary Carrier Disassembly (Cont'd)

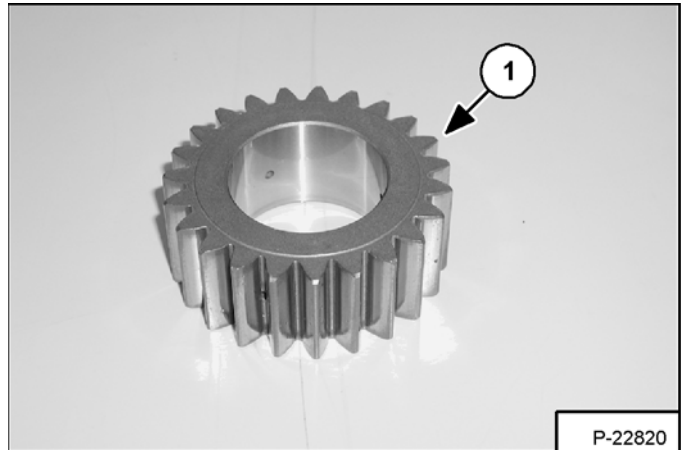
Figure 40-20-8



Remove the thrust washers (Item 1) [Figure 40-20-8] from each shaft.

Planetary Carrier Inspection

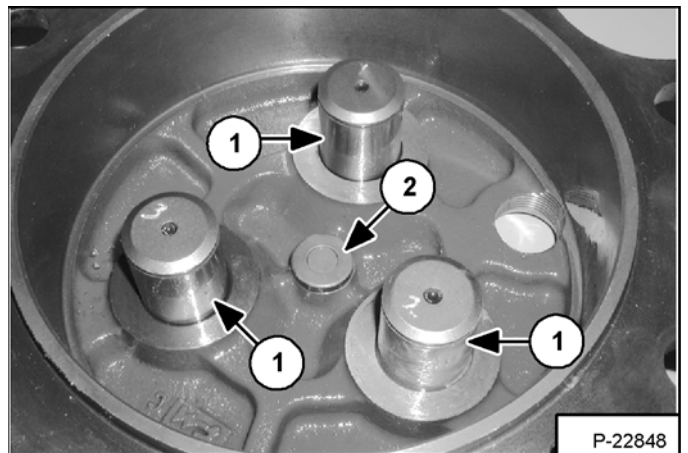
Figure 40-20-9



Inspect the planetary gears (Item 1) [Figure 40-20-9] for worn or cracked teeth.

If any of the planetary gears are damaged, replace all the planetary gears and drive axle end of the drive axle assembly. One damaged gear can cause a microscopic fatigue crack in mating teeth and cause premature failure after servicing.

Figure 40-20-10



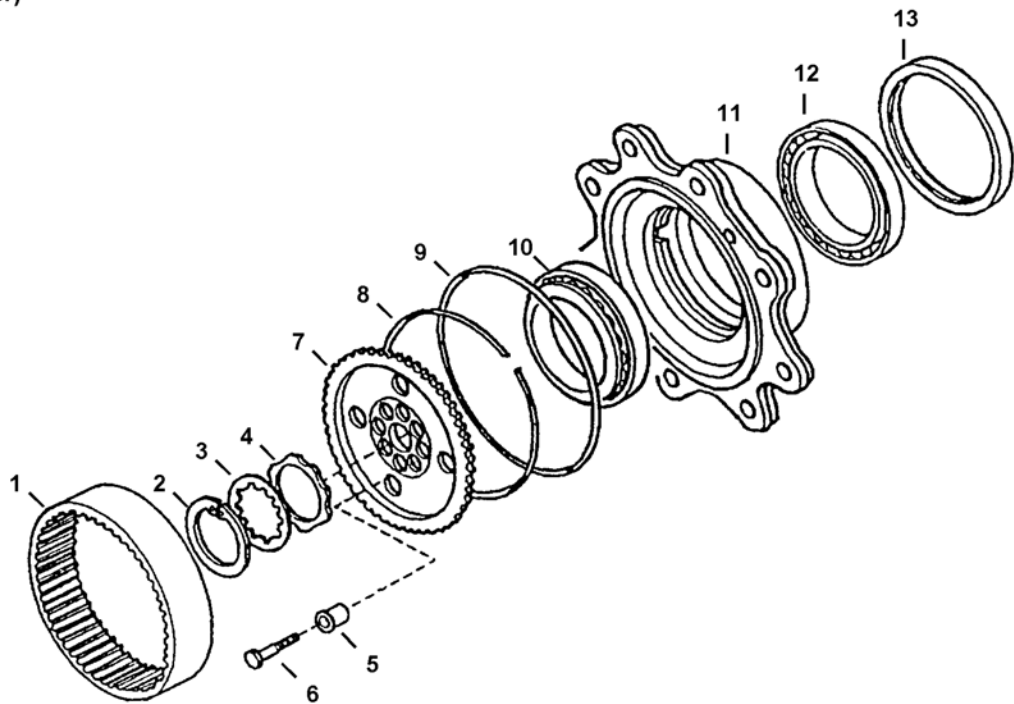
If any of the bearing shafts (Item 1) [Figure 40-20-10] are damaged, replace all bearing shafts.

If the thrust pin (Item 2) [Figure 40-20-10] is worn, replace the entire planetary carrier.

AXLE AND DIFFERENTIAL (FRONT) (CONT'D)

Wheel Hub Parts Identification

1. Ring Gear
2. Snap Ring
3. Thrust Washer
4. Spacer
5. Bushing
6. Bolt
7. Gear
8. Retainer Ring
9. O-Ring
10. Bearing (outer)
11. Hub
12. Bearing (inner)
13. Seal

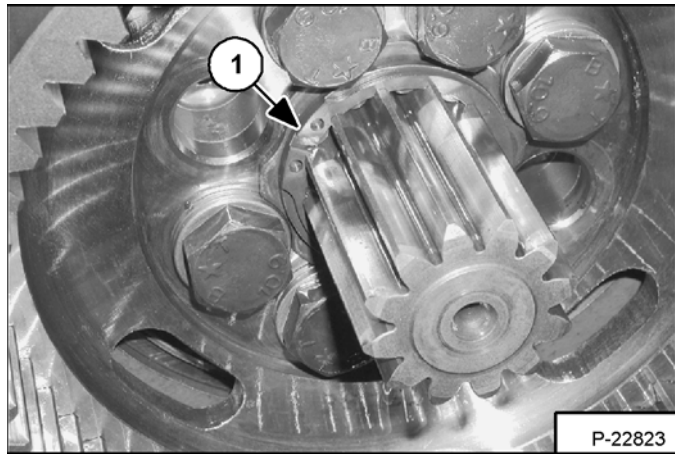


B-16011

AXLE AND DIFFERENTIAL (FRONT) (CONT'D)

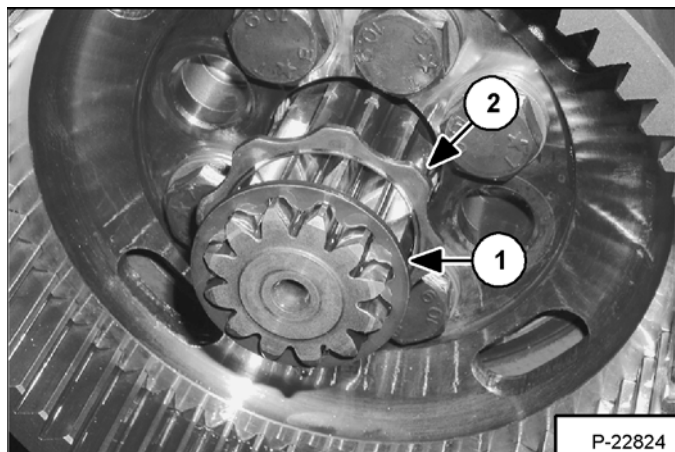
Wheel Hub Disassembly

Figure 40-20-11



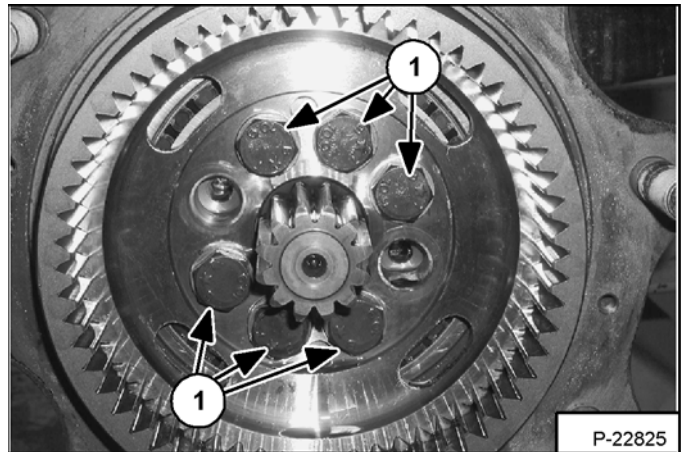
Remove the snap ring (Item 1) [Figure 40-20-11].

Figure 40-20-12



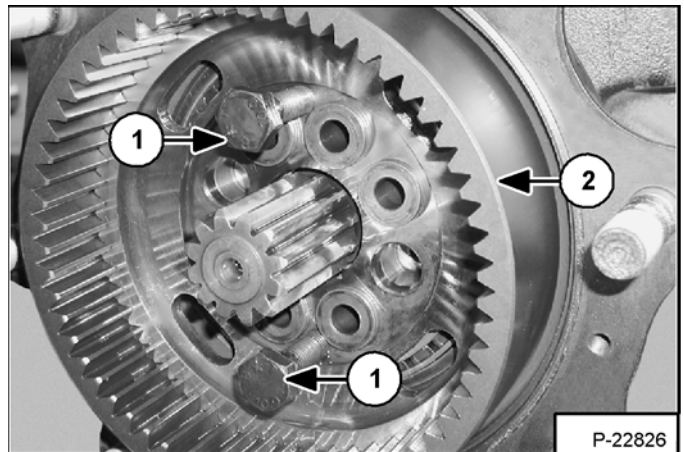
Remove the thrust washer (Item 1) and spacer (Item 2) [Figure 40-20-12].

Figure 40-20-13



Remove the six ring gear mounting bolts (Item 1) [Figure 40-20-13].

Figure 40-20-14

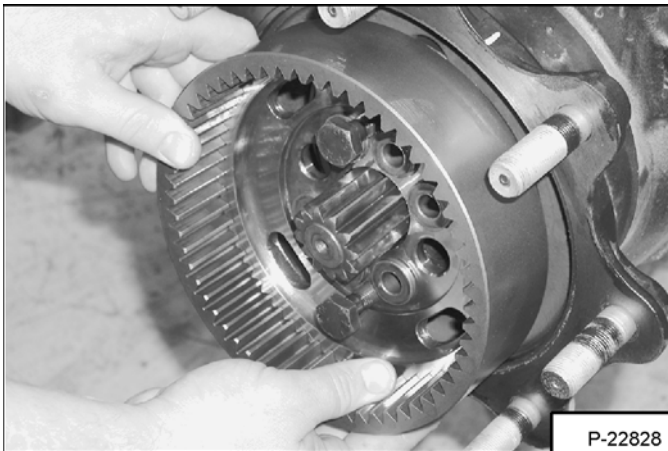


Install two bolts (Item 1) into the ring gear as shown, and tighten equally pushing the ring gear assembly (Item 2) [Figure 40-20-14] from the shaft.

AXLE AND DIFFERENTIAL (FRONT) (CONT'D)

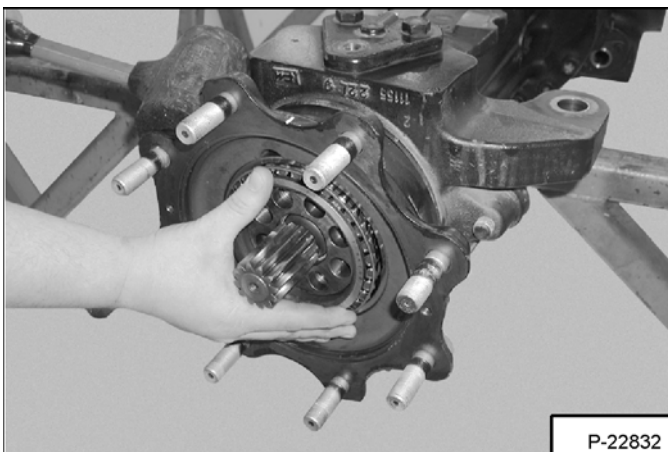
Wheel Hub Disassembly (Cont'd)

Figure 40-20-15



Remove the ring gear assembly [Figure 40-20-15].

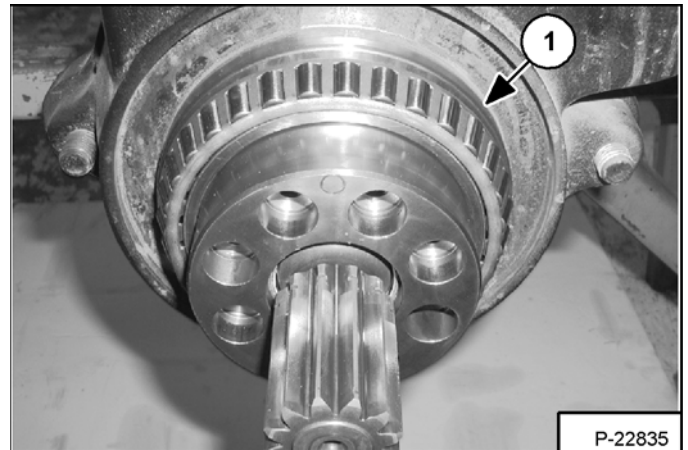
Figure 40-20-16



Remove the outer bearing and hub assembly from the axle [Figure 40-20-16].

NOTE: Use care while removing, as assembly may remove easy.

Figure 40-20-17



Remove the inner bearing (Item 1) [Figure 40-20-17] from the swivel housing.

Figure 40-20-18

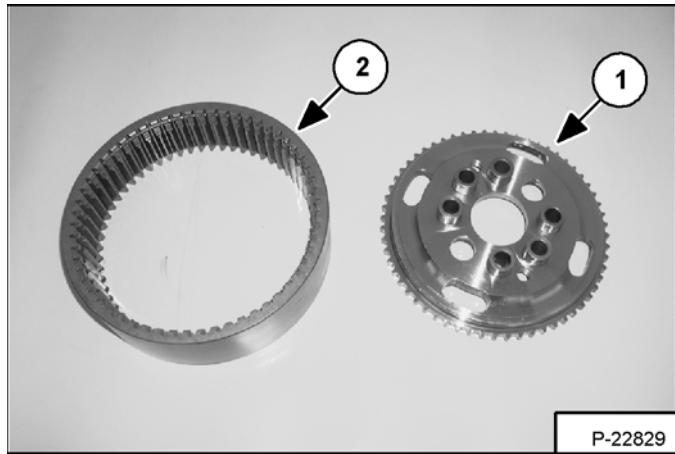


Remove the retainer ring (Item 1) [Figure 40-20-18] from the ring gear assembly.

AXLE AND DIFFERENTIAL (FRONT) (CONT'D)

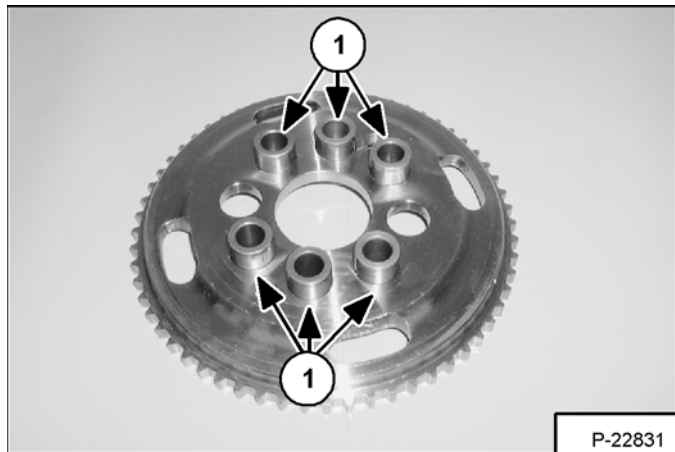
Wheel Hub Disassembly (Cont'd)

Figure 40-20-19



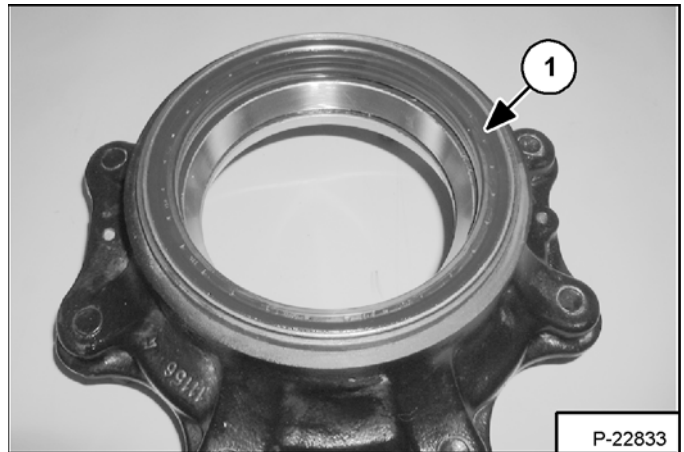
Remove the gear (Item 1) from the ring gear (Item 2) [Figure 40-20-19].

Figure 40-20-20



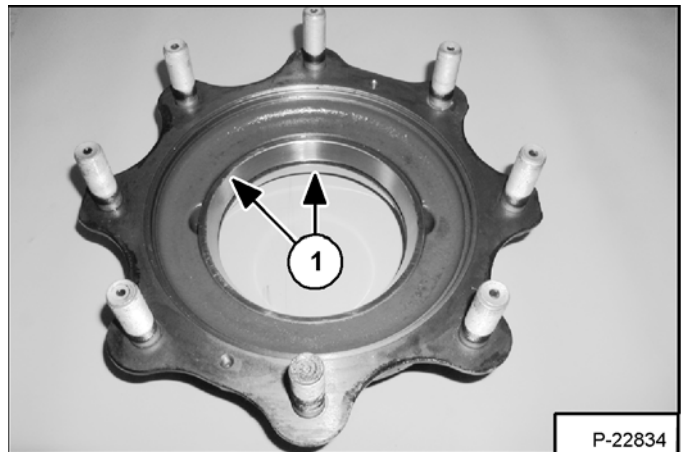
Remove the six bushings (Item 1) [Figure 40-20-20] from the gear if damaged or worn.

Figure 40-20-21



Remove the seal (Item 1) [Figure 40-20-21] from the hub.

Figure 40-20-22

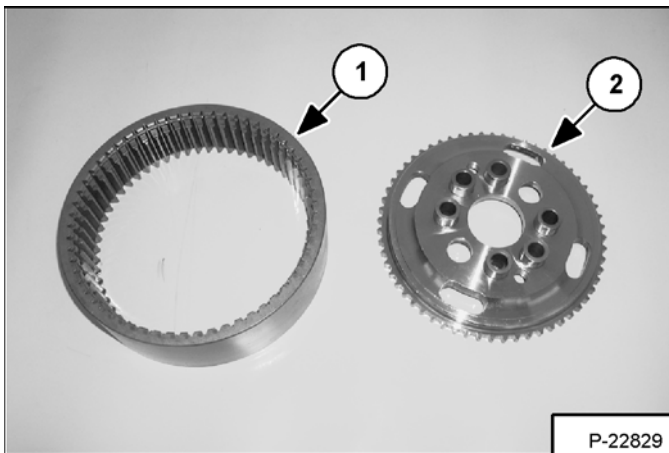


Using a brass drift remove both bearing races (Item 1) [Figure 40-20-22] from the hub.

AXLE AND DIFFERENTIAL (FRONT) (CONT'D)

Wheel Hub Inspection

Figure 40-20-23

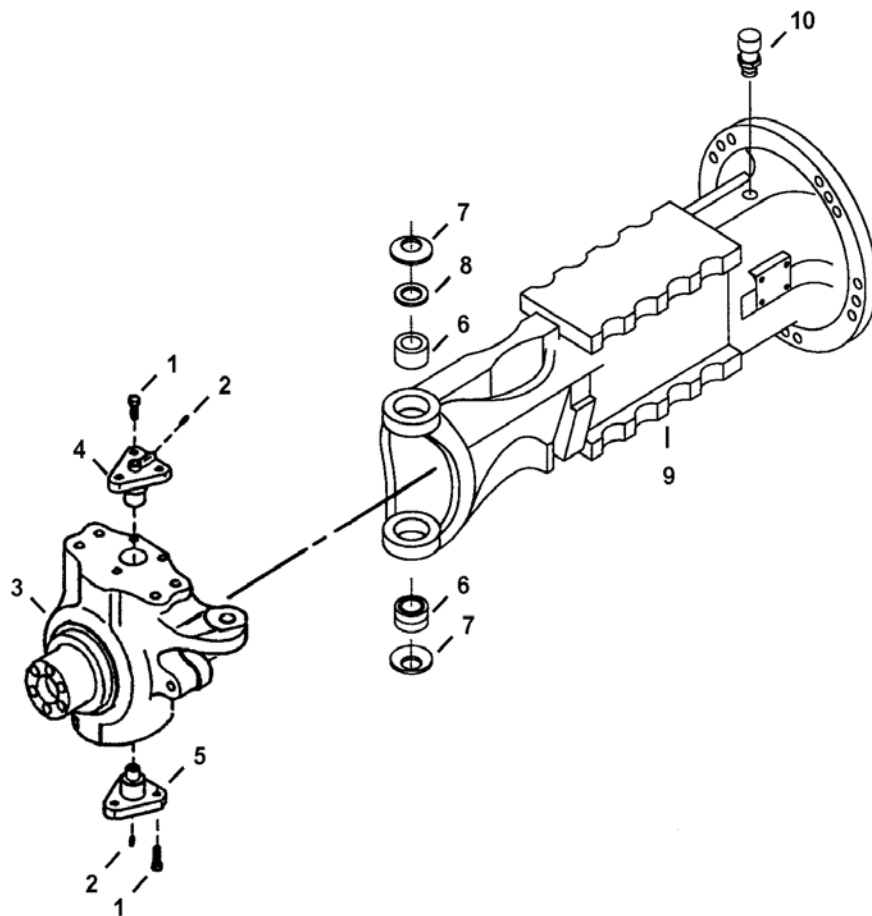


Inspect the ring gear (Item 1) and inner gear (Item 2) [Figure 40-20-23] for broken or damaged teeth.

If the ring gear or inner gear are damaged, replace both parts.

Steering Knuckle Parts Identification

1. Bolt
2. Grease Fitting
3. Knuckle Housing
4. King Pin (upper)
5. King Pin (lower)
6. Bushing
7. Washer
8. Spacer Washer
9. Housing
10. Vent



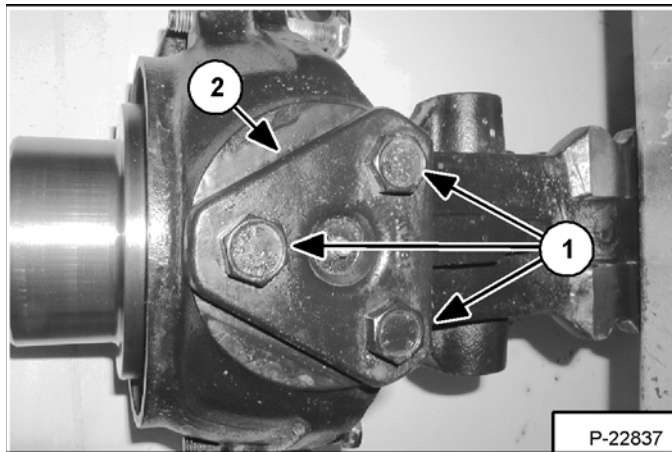
AXLE AND DIFFERENTIAL (FRONT) (CONT'D)

Steering Knuckle Disassembly

Clean the outside of the steering knuckle before disassembly.

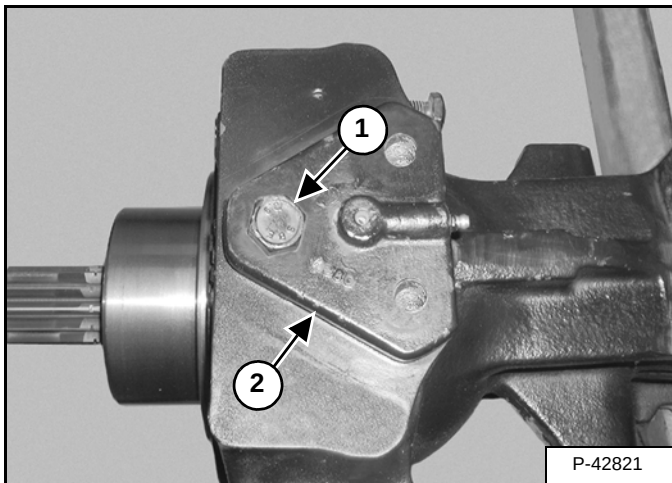
Mark the outside of the steering knuckle for ease of assembly.

Figure 40-20-24



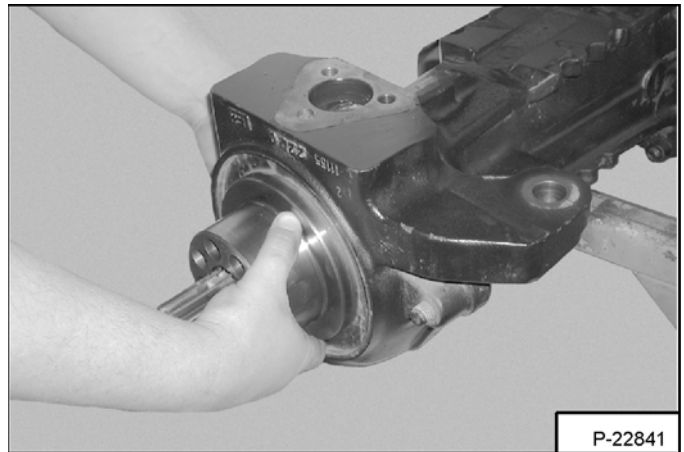
Remove the three bolts (Item 1) and king pin (Item 2) [Figure 40-20-24] from the bottom of the knuckle.

Figure 40-20-25



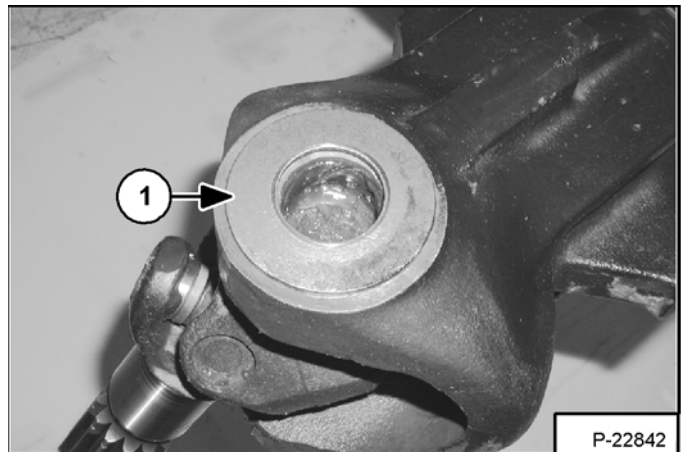
Remove the bolt (Item 1) and king pin (Item 2) [Figure 40-20-25] from the top of the knuckle.

Figure 40-20-26



Lift and remove the knuckle assembly from the axle [Figure 40-20-26].

Figure 40-20-27



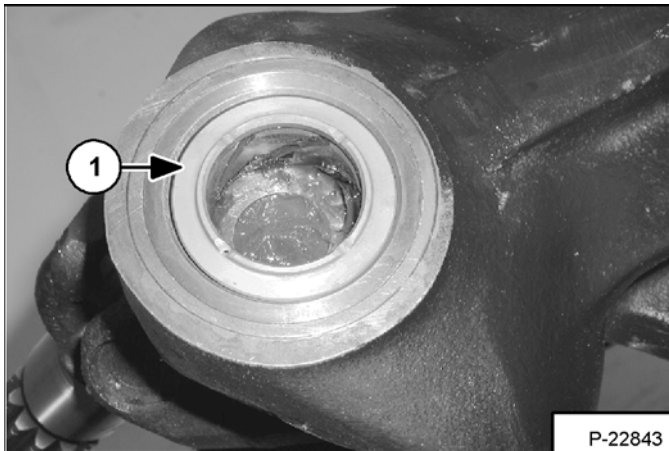
Remove the Belleville washers (Item 1) [Figure 40-20-27] from the top and bottom of the axle.

NOTE: The bottom Belleville washer is smaller than the top Belleville washer.

AXLE AND DIFFERENTIAL (FRONT) (CONT'D)

Steering Knuckle Disassembly (Cont'd)

Figure 40-20-28



Remove the spacer washer (Item 1) [Figure 40-20-28] from the top of the axle.

Figure 40-20-29

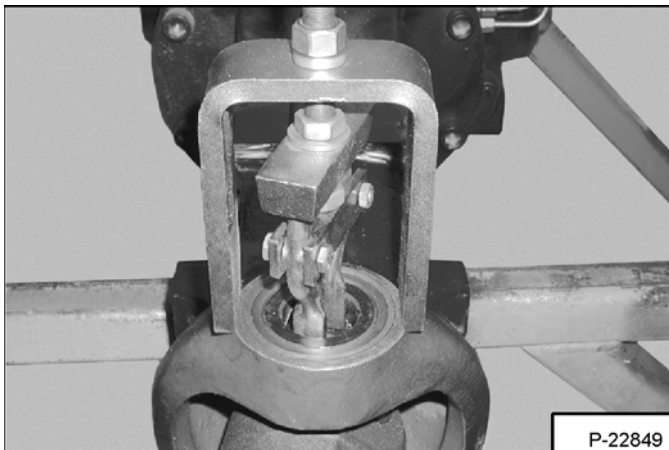
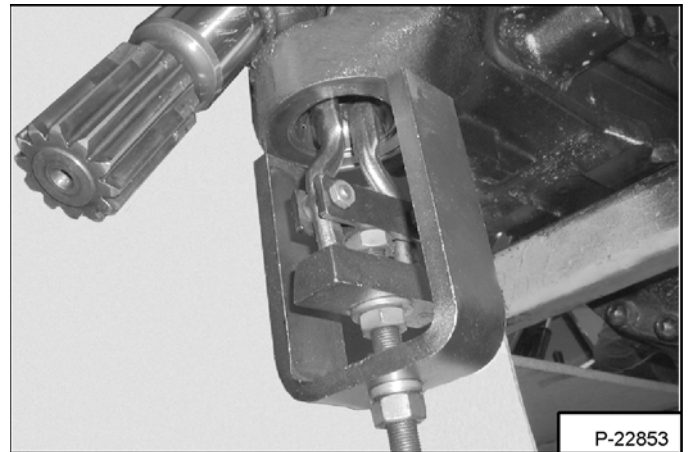
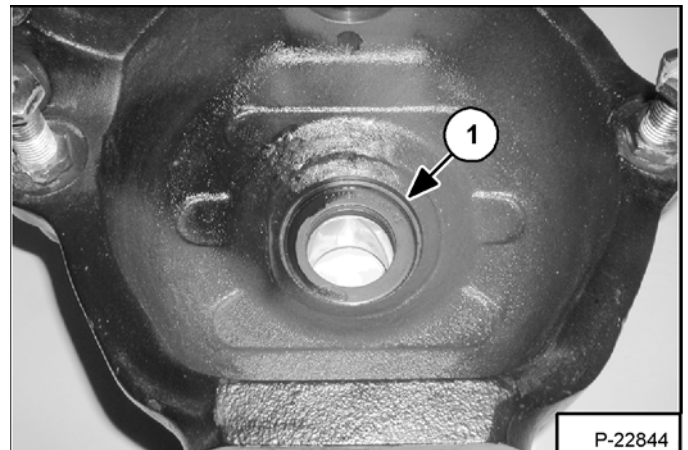


Figure 40-20-30



Using a puller, remove the top and bottom bushings from the axle [Figure 40-20-29] & [Figure 40-20-30].

Figure 40-20-31

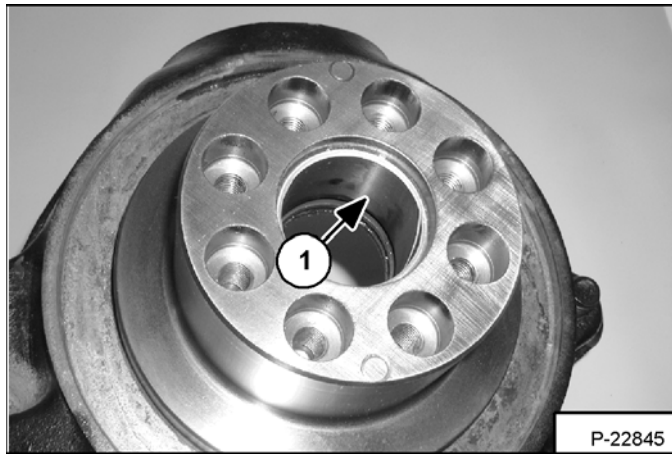


Remove the seal (Item 1) [Figure 40-20-31] from the knuckle assembly.

AXLE AND DIFFERENTIAL (FRONT) (CONT'D)

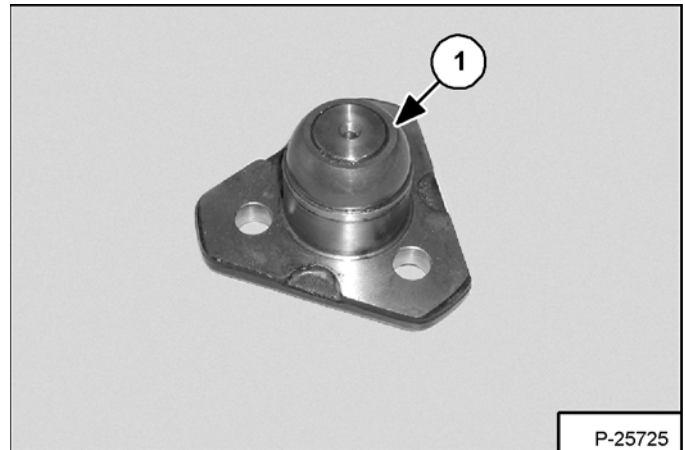
Steering Knuckle Disassembly (Cont'd)

Figure 40-20-32



Remove the bushing (Item 1) [Figure 40-20-32] from the knuckle assembly.

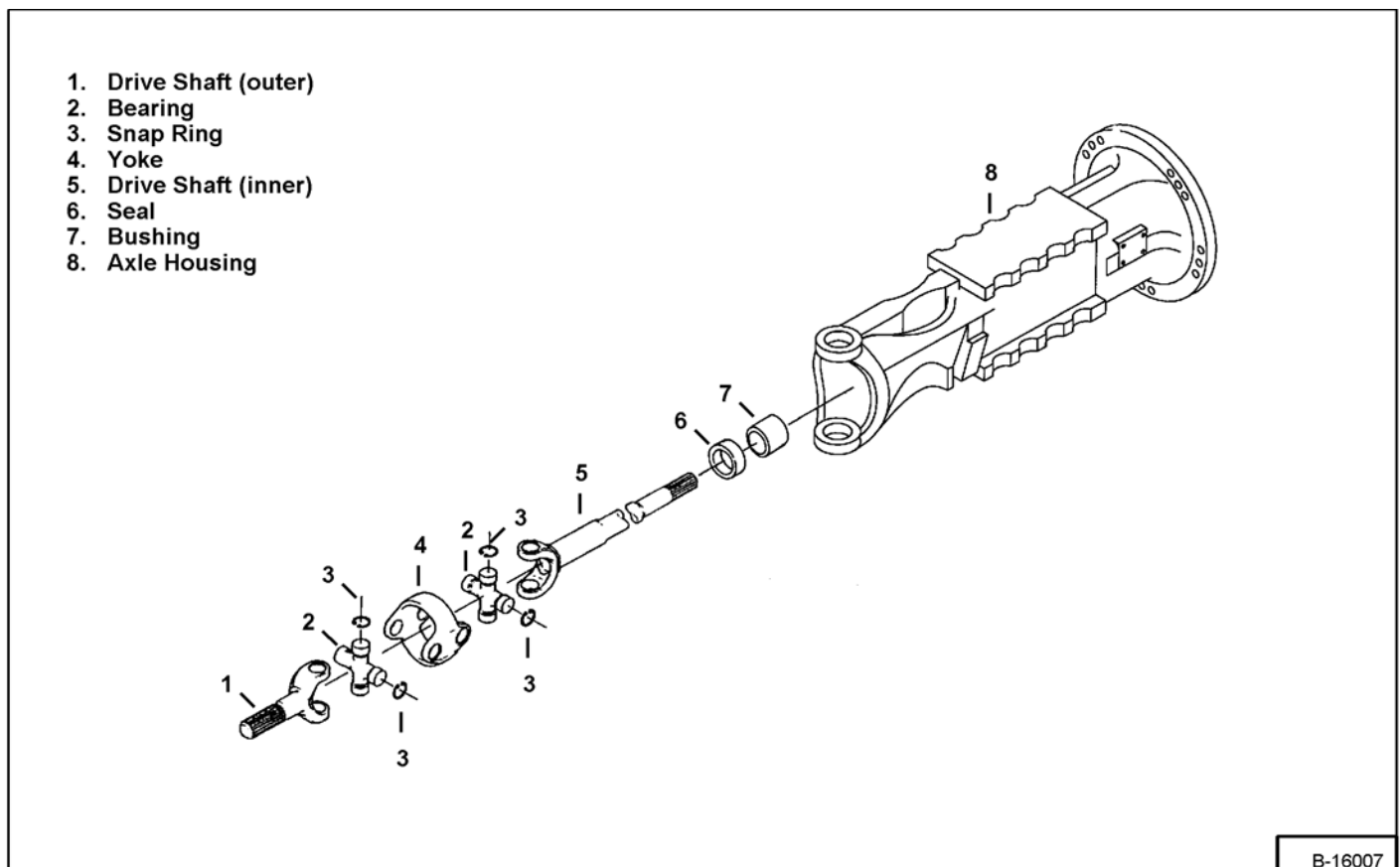
Figure 40-20-33



Remove the ball type bearing (Item 1) [Figure 40-20-33] from the lower king pin.

NOTE: Removal procedure will destroy the ball bearing.

Axle Housing/Drive Axle Parts Identification



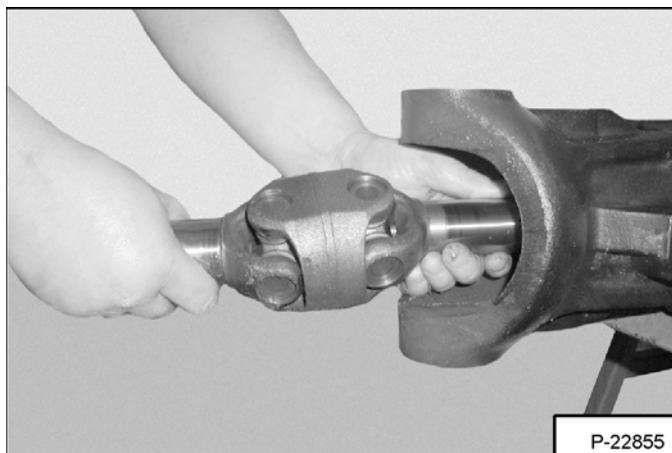
AXLE AND DIFFERENTIAL (FRONT) (CONT'D)

Axle Housing/Drive Axle Disassembly

Clean the outside of the axle housing before disassembly.

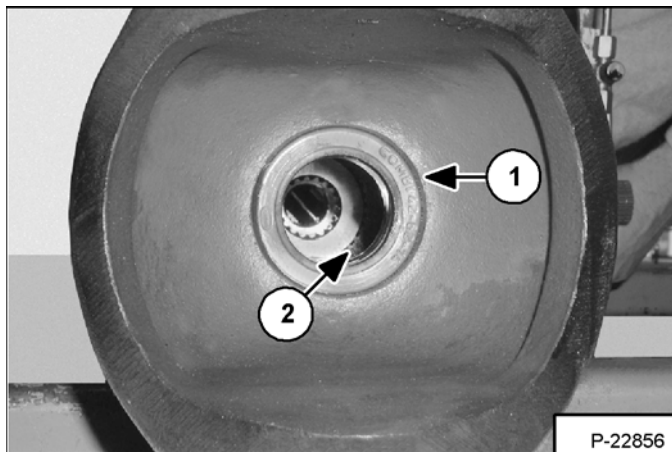
Mark the outside of the axle housing for ease of assembly.

Figure 40-20-34



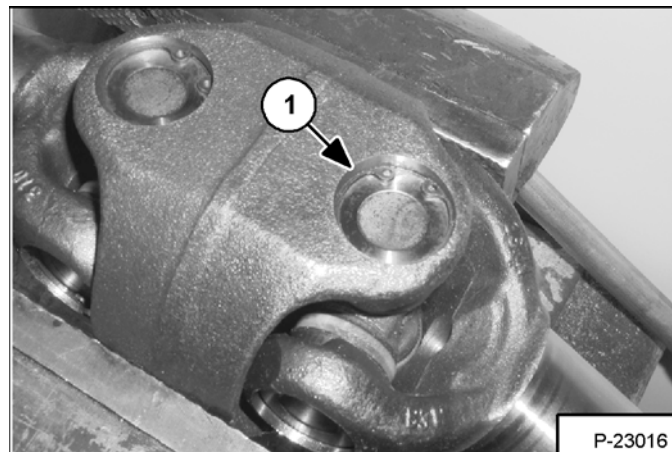
Remove the drive axle from the axle housing [Figure 40-20-34].

Figure 40-20-35



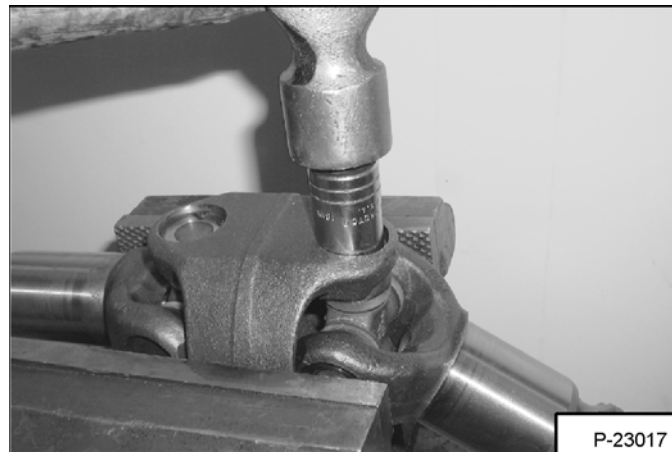
Remove the seal (Item 1) and bushing (Item 2) [Figure 40-20-35] from the axle end housing.

Figure 40-20-36



Remove the two snap rings (Item 1) [Figure 40-20-36] across from each other.

Figure 40-20-37



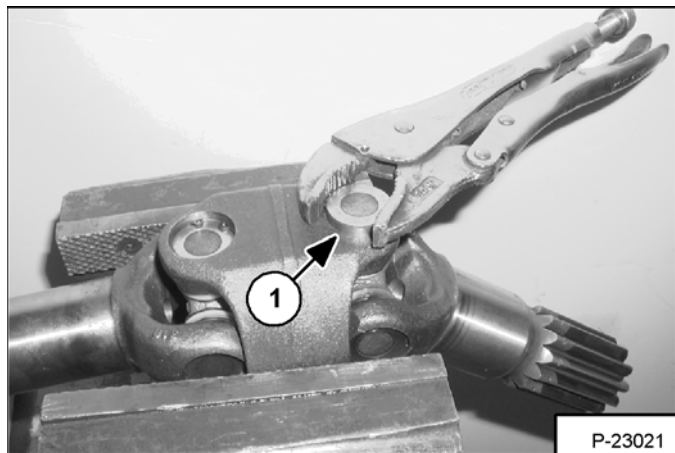
Drive the upper bearing cup down to push the opposite bearing cup partially through the yoke [Figure 40-20-37].

NOTE: The bottom bearing cup will not be completely removed.

AXLE AND DIFFERENTIAL (FRONT) (CONT'D)

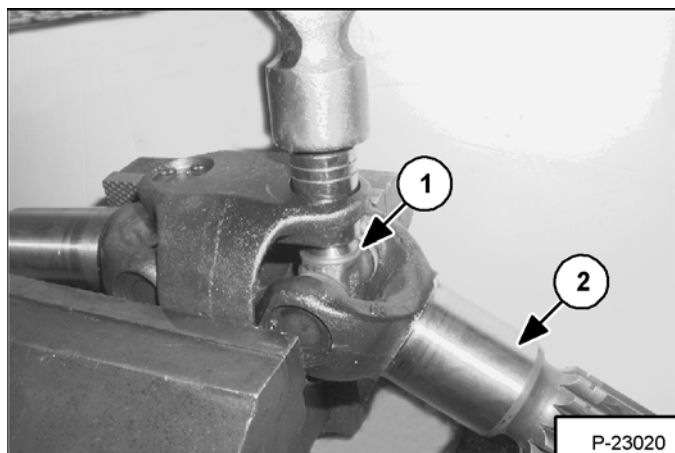
Axle Housing/Drive Axle Disassembly (Cont'd)

Figure 40-20-38



Turn the shaft over and remove the bearing cup (Item 1) [Figure 40-20-38].

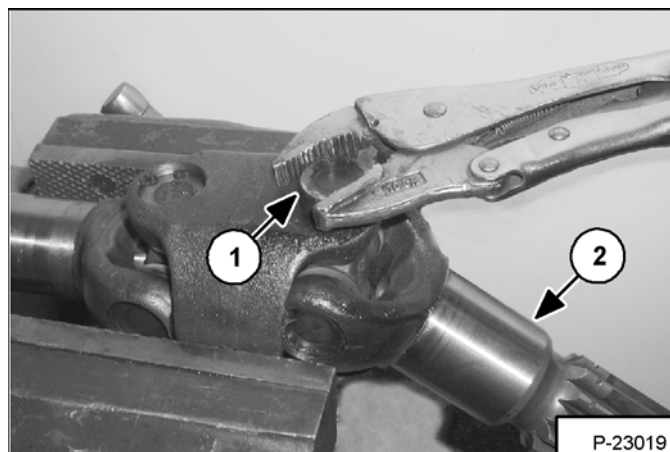
Figure 40-20-39



Drive the cross (Item 1) [Figure 40-20-39] down to push the opposite bearing cup through the yoke.

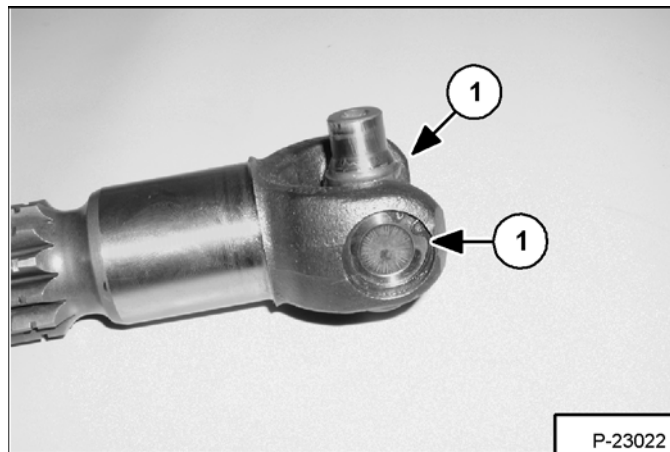
NOTE: Drive shaft end (Item 2) [Figure 40-20-39] may fall out of the yoke.

Figure 40-20-40



Turn the shaft over and remove the bearing cup (Item 1). Remove the drive shaft (Item 2) [Figure 40-20-40] from the yoke.

Figure 40-20-41

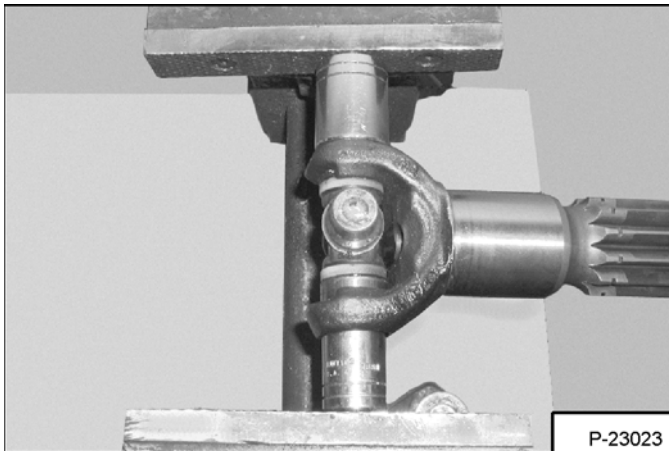


Remove the two snap rings (Item 1) [Figure 40-20-41] from the yoke.

AXLE AND DIFFERENTIAL (FRONT) (CONT'D)

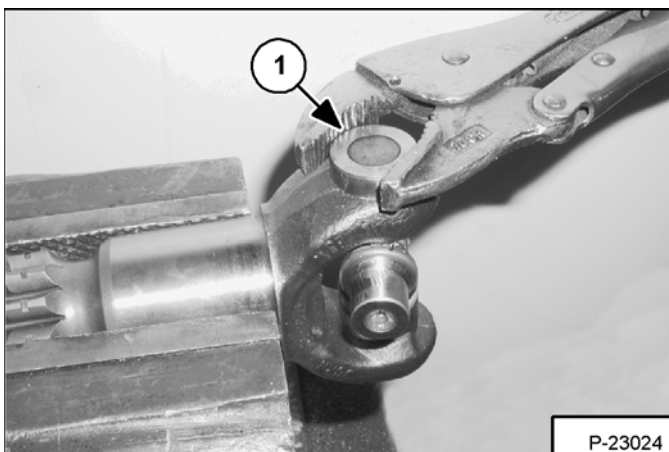
Axle Housing/Drive Axle Disassembly (Cont'd)

Figure 40-20-42



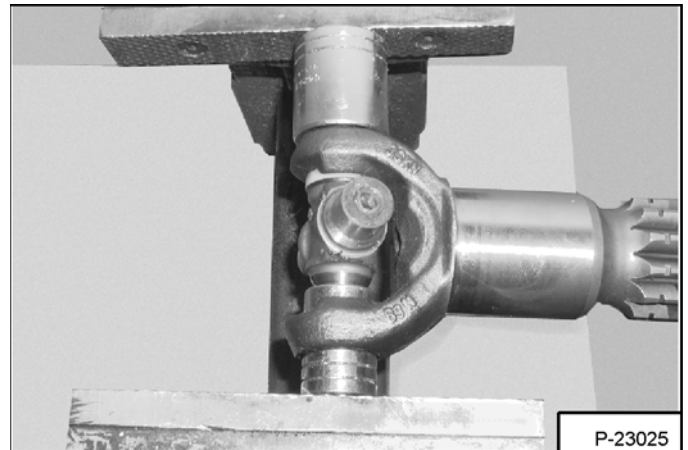
Using two different size sockets and a vice, press one bearing cup into the yoke while pushing the opposite bearing cup through the yoke [Figure 40-20-42].

Figure 40-20-43



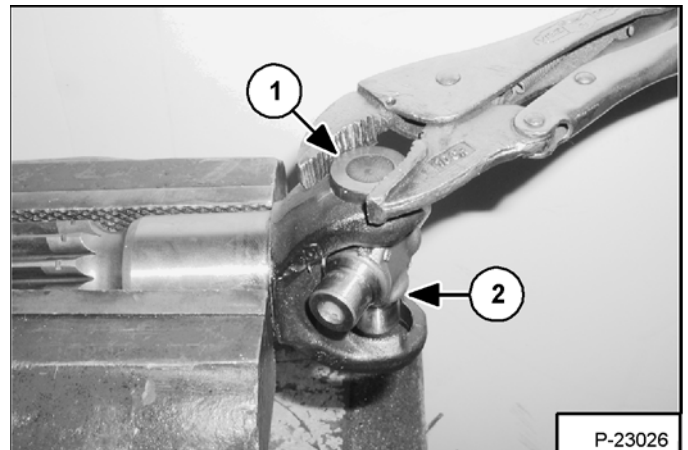
Remove the bearing cup (Item 1) [Figure 40-20-43].

Figure 40-20-44



Press the second bearing cup through the yoke [Figure 40-20-44].

Figure 40-20-45

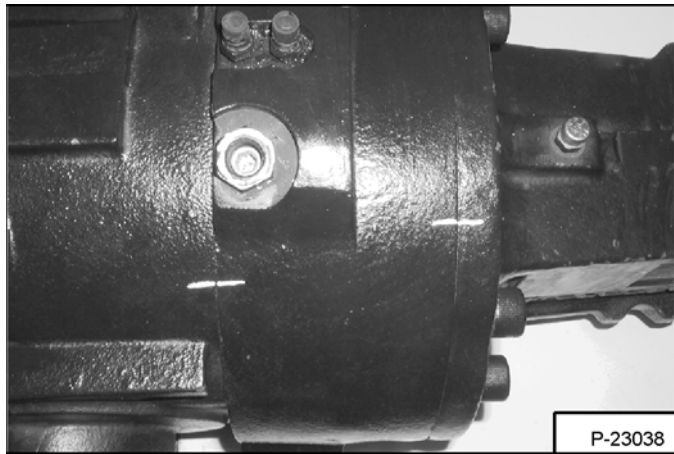


Remove the bearing cup (Item 1) and cross (Item 2) [Figure 40-20-45] from the yoke.

AXLE AND DIFFERENTIAL (FRONT) (CONT'D)

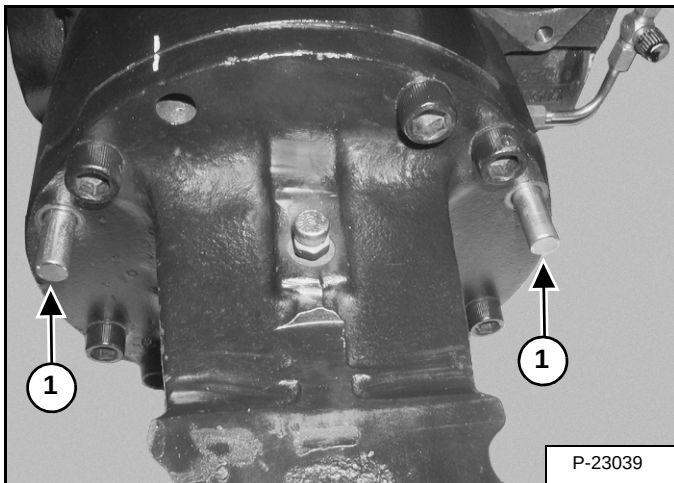
Axle Housing/Drive Axle Disassembly (Cont'd)

Figure 40-20-46



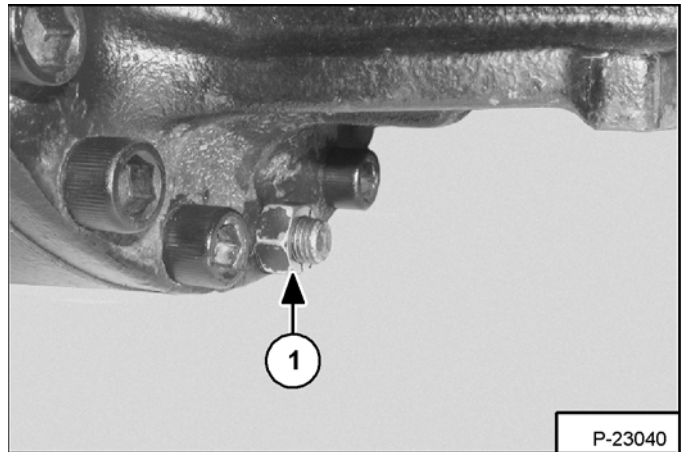
With the axle supported on a secure work surface or floor mark the axle housing to the center housing for correct assembly [Figure 40-20-46].

Figure 40-20-47



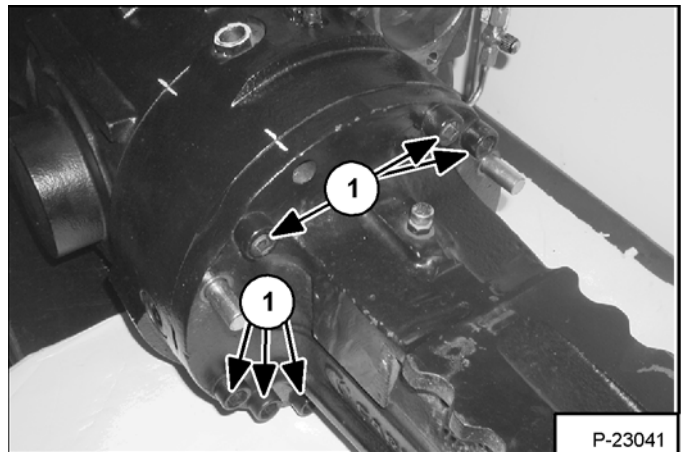
Remove the two axle housing mounting bolts and install two alignment bolts (Item 1) [Figure 40-20-47].

Figure 40-20-48



Remove the nut (Item 1) [Figure 40-20-48] from the bottom of the housing.

Figure 40-20-49

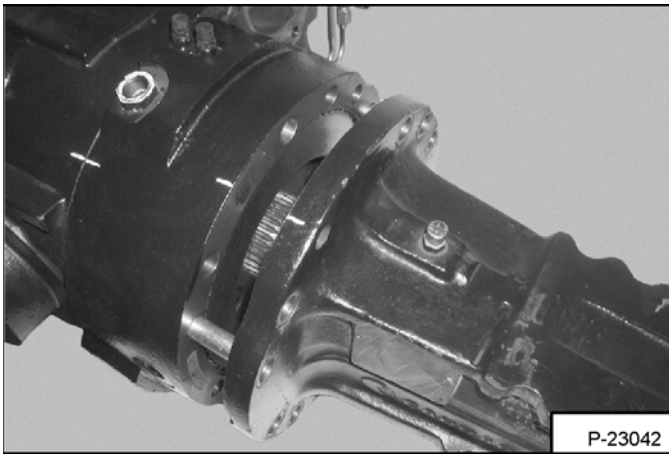


Remove the remaining mounting bolts (Item 1) [Figure 40-20-49].

AXLE AND DIFFERENTIAL (FRONT) (CONT'D)

Axle Housing/Drive Axle Disassembly (Cont'd)

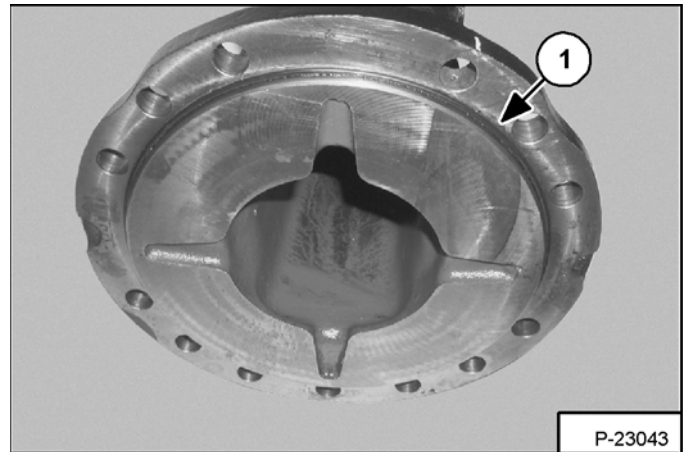
Figure 40-20-50



Separate the axle housing from the brake housing [Figure 40-20-50].

Remove the axle housing.

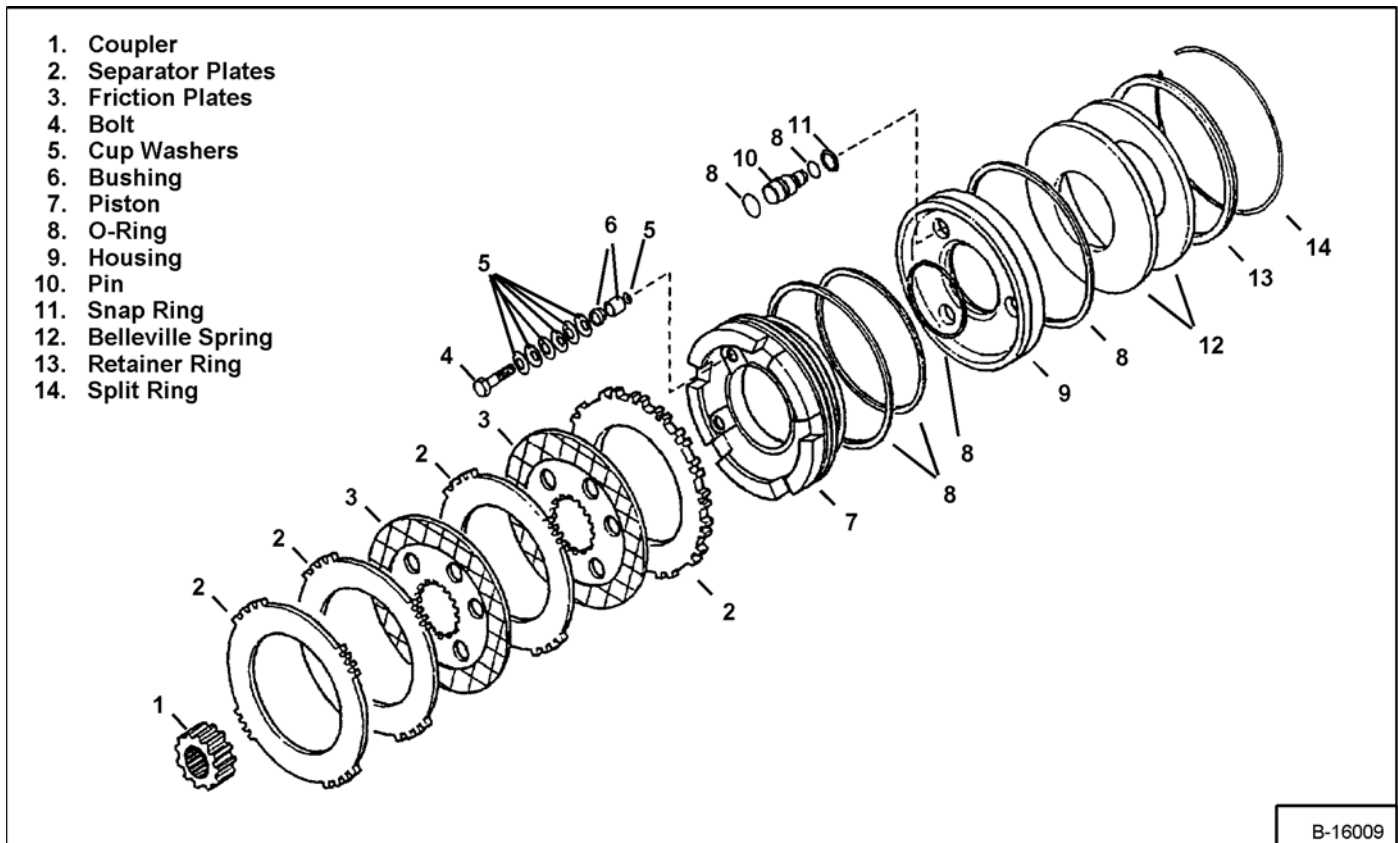
Figure 40-20-51



Remove the O-ring (Item 1) [Figure 40-20-51] from the axle housing.

AXLE AND DIFFERENTIAL (FRONT) (CONT'D)

Brake Group Parts Identification

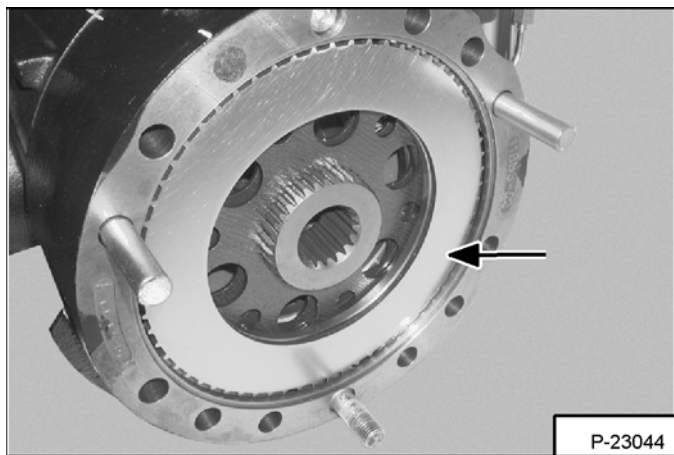


Brake Group Disassembly

Clean the outside of the brake group before disassembly.

Mark the outside of the brake group for ease of assembly.

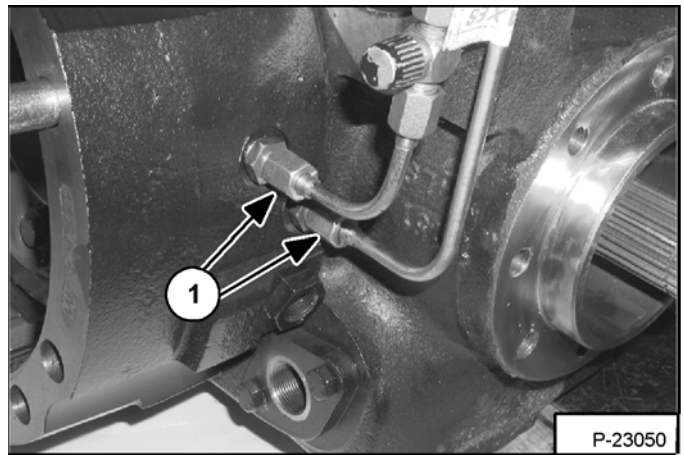
Figure 40-20-52



Remove the brake separator plates, friction plates and coupler from the brake housing [Figure 40-20-52].

NOTE: For friction plate replacement do not remove the brake housing.

Figure 40-20-53



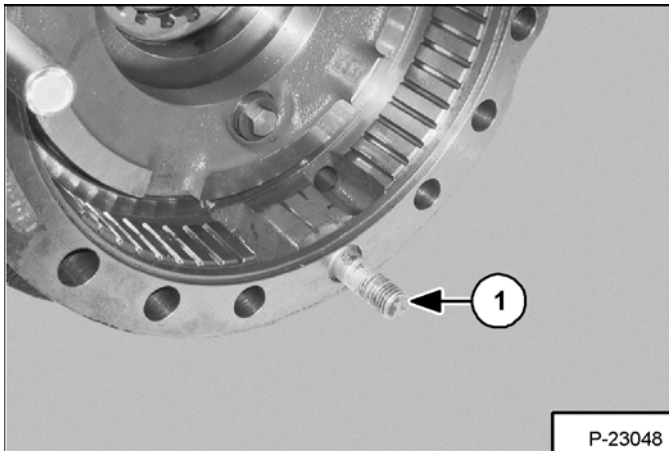
Remove the tube lines (Item 1) [Figure 40-20-53].

NOTE: Mark the tube lines for correct installation.

AXLE AND DIFFERENTIAL (FRONT) (CONT'D)

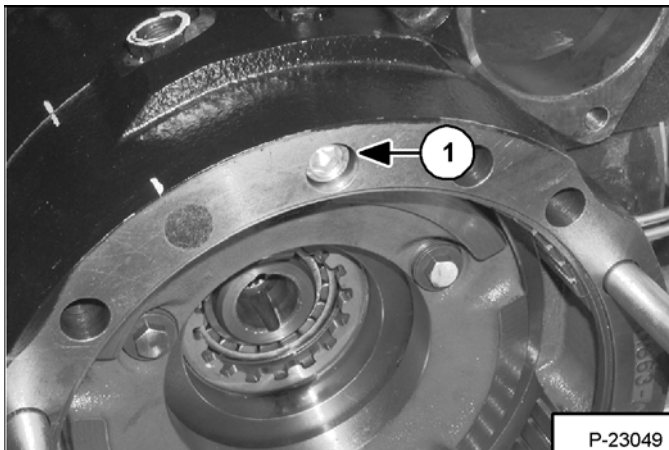
Brake Group Disassembly (Cont'd)

Figure 40-20-54



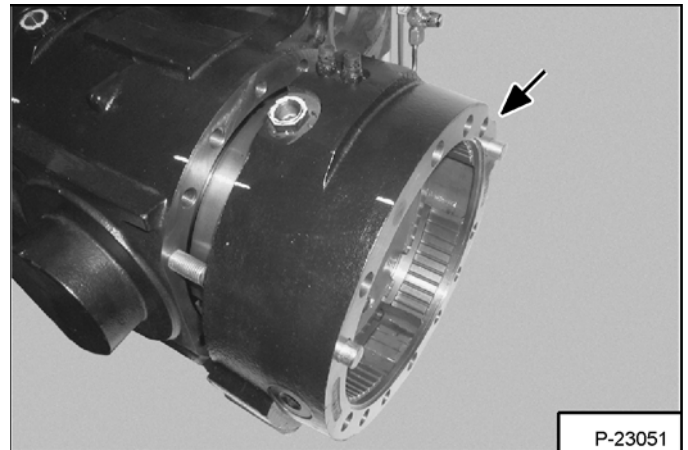
Remove the stud bolt (Item 1) [Figure 40-20-54] from the housing.

Figure 40-20-55



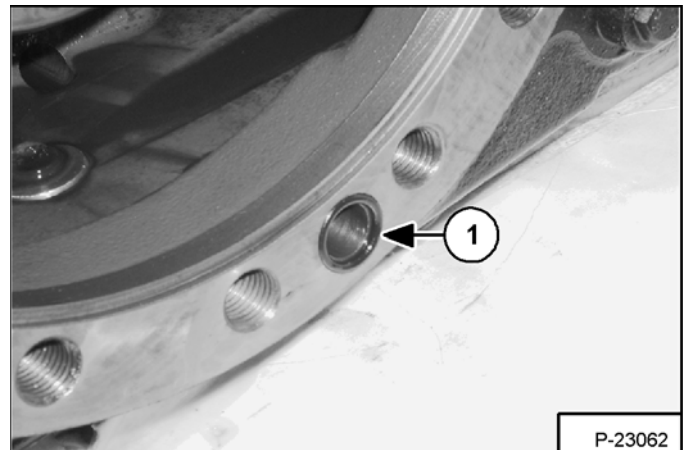
Remove the upper mounting bolt (Item 1) [Figure 40-20-55] from the housing.

Figure 40-20-56



Separate and remove the brake housing from the center housing [Figure 40-20-56].

Figure 40-20-57

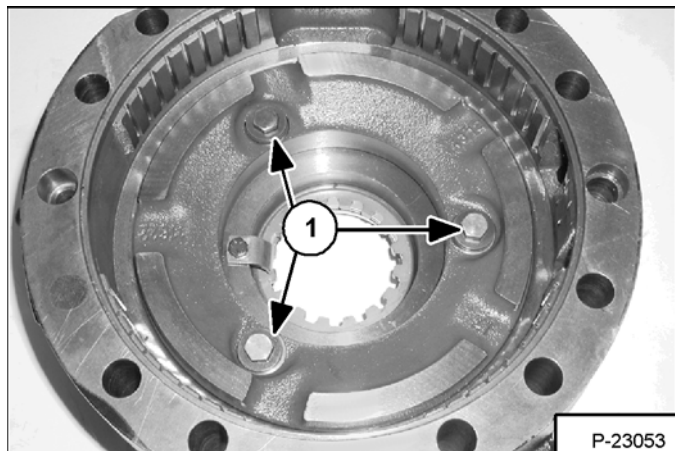


Remove and discard the O-ring (Item 1) [Figure 40-20-57] from the center housing.

AXLE AND DIFFERENTIAL (FRONT) (CONT'D)

Brake Group Disassembly (Cont'd)

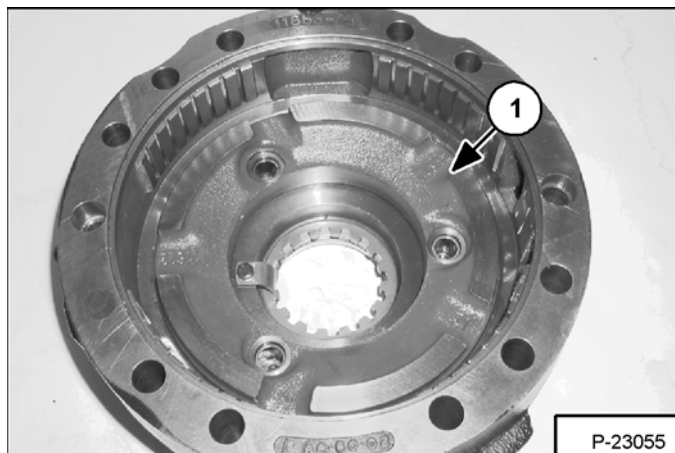
Figure 40-20-58



Remove the three bolts (Item 1) [Figure 40-20-58] from the brake housing.

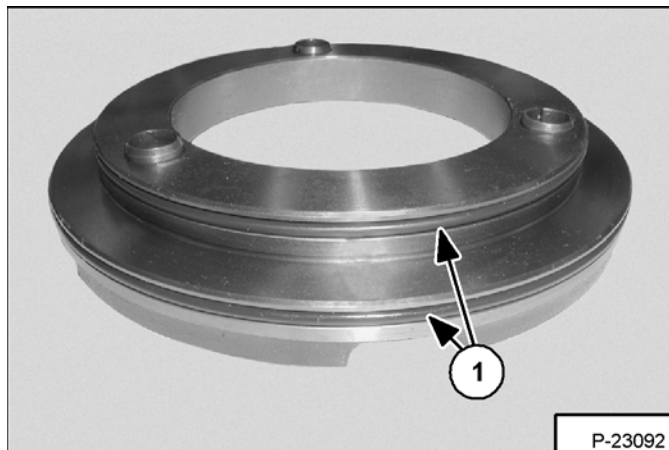
NOTE: There are six bevel washers nested in opposing direction on each bolt.

Figure 40-20-59



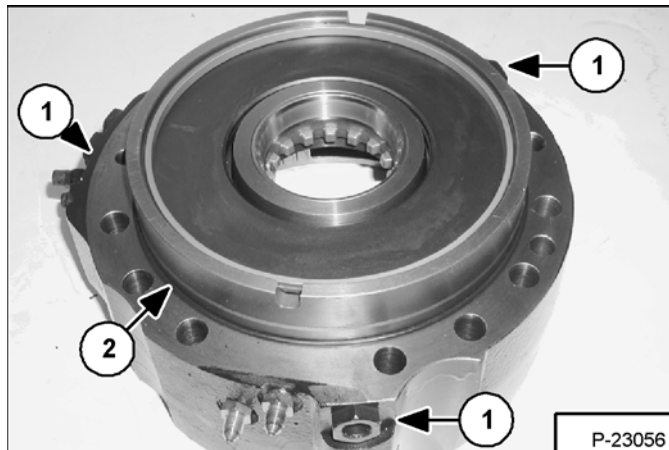
Remove the piston (Item 1) [Figure 40-20-59] from the brake housing.

Figure 40-20-60



Remove and discard the two O-rings (Item 1) [Figure 40-20-60] from the piston.

Figure 40-20-61



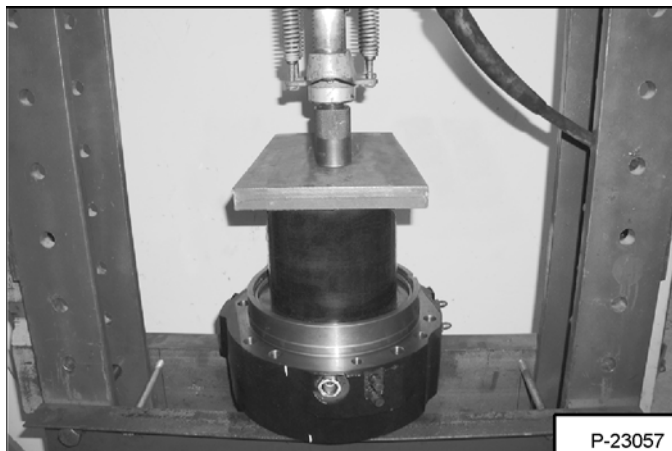
Turn the three brake adjusting screws (Item 1) [Figure 40-20-61] out (counterclockwise) equally.

Remove and discard the O-ring (Item 2) [Figure 40-20-61].

AXLE AND DIFFERENTIAL (FRONT) (CONT'D)

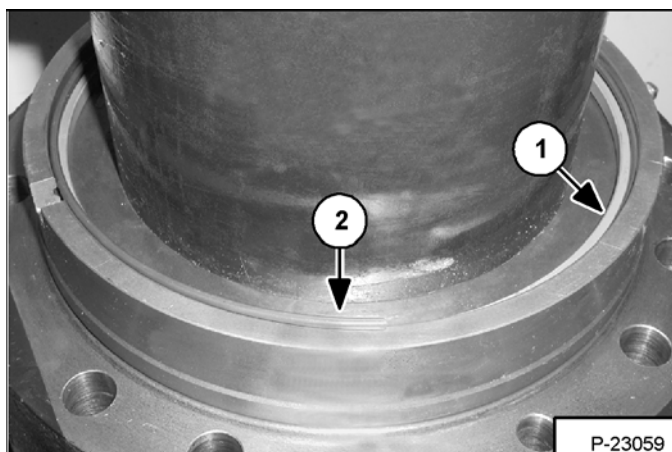
Brake Group Disassembly (Cont'd)

Figure 40-20-62



Using a 6-1/2 inch O.D. tube and suitable press, apply enough downward pressure on the Belleville springs allowing the split ring retainer ring to drop down [Figure 40-20-62].

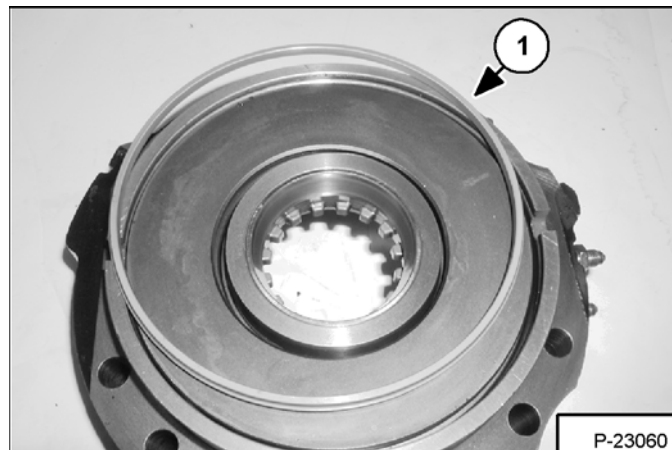
Figure 40-20-63



With the split ring retainer ring (Item 1) in the down position, remove the split ring (Item 2) [Figure 40-20-63].

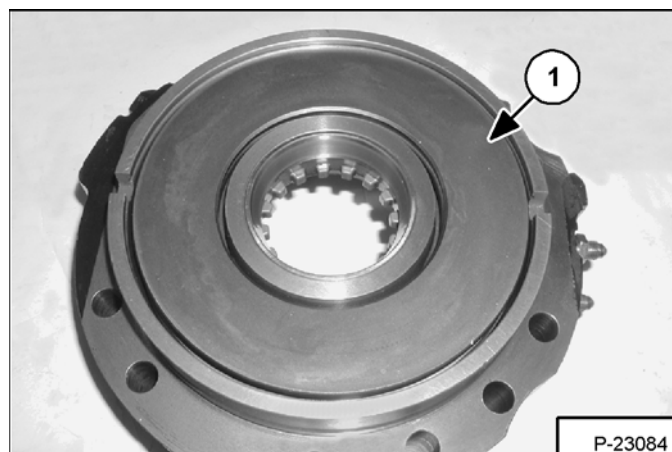
Carefully release the pressure and remove the brake housing from the press.

Figure 40-20-64



Remove the split ring retainer (Item 1) [Figure 40-20-64].

Figure 40-20-65

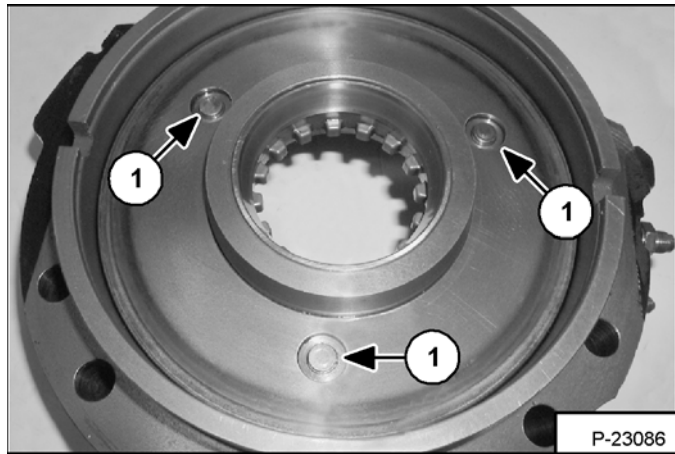


Remove the two Belleville springs (Item 1) [Figure 40-20-65].

AXLE AND DIFFERENTIAL (FRONT) (CONT'D)

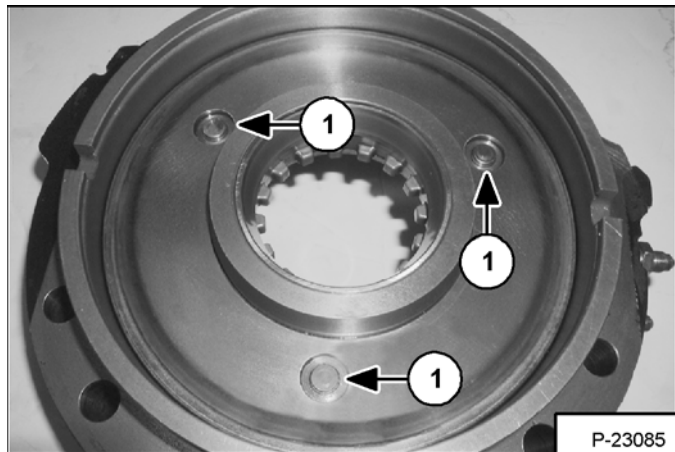
Brake Group Disassembly (Cont'd)

Figure 40-20-66



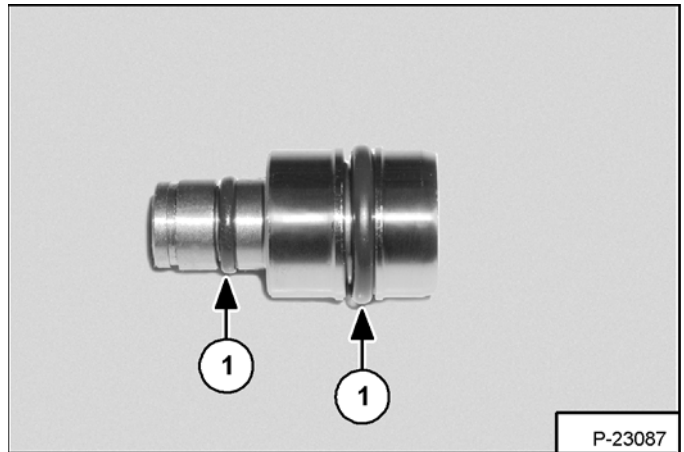
Remove the three snap rings (Item 1) [Figure 40-20-66] from the pins.

Figure 40-20-67



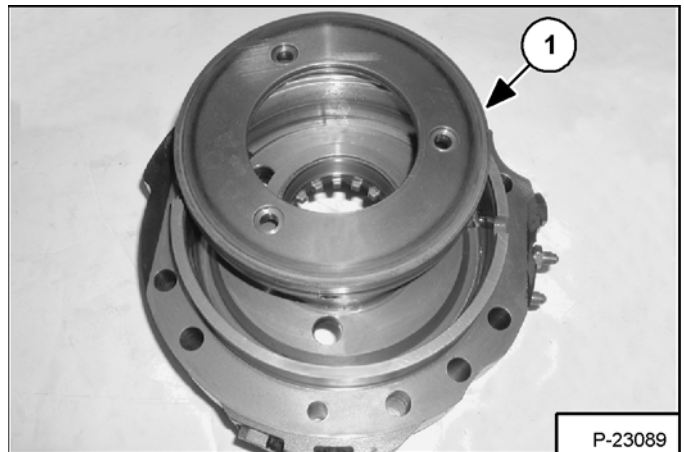
Push the three pins (Item 1) [Figure 40-20-67] from the brake plate.

Figure 40-20-68



Remove and discard the two O-rings (Item 1) [Figure 40-20-68] from the pins.

Figure 40-20-69

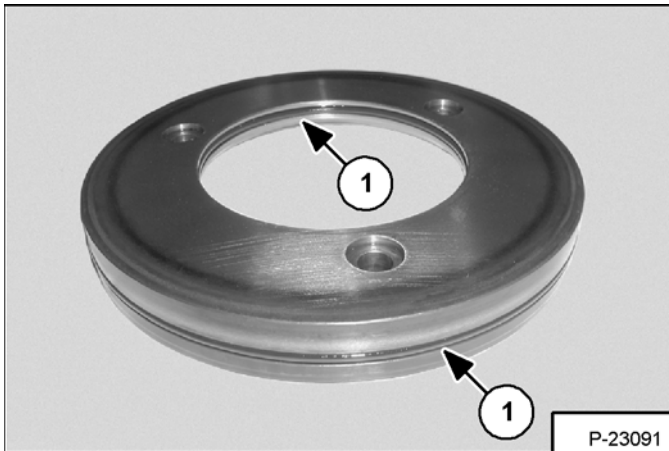


Remove the brake plate (Item 1) [Figure 40-20-69] from the brake housing.

AXLE AND DIFFERENTIAL (FRONT) (CONT'D)

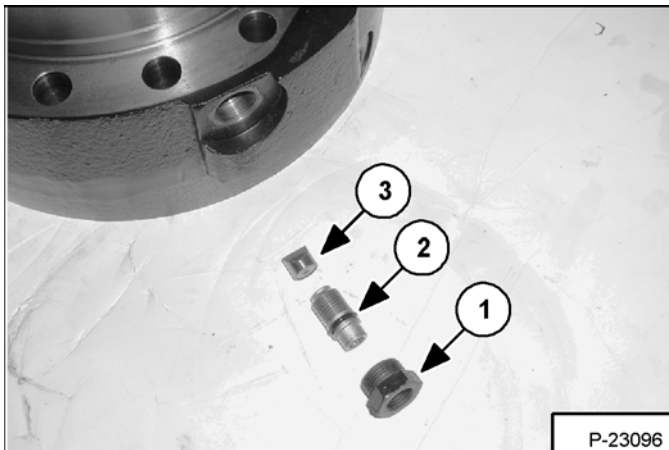
Brake Group Disassembly (Cont'd)

Figure 40-20-70



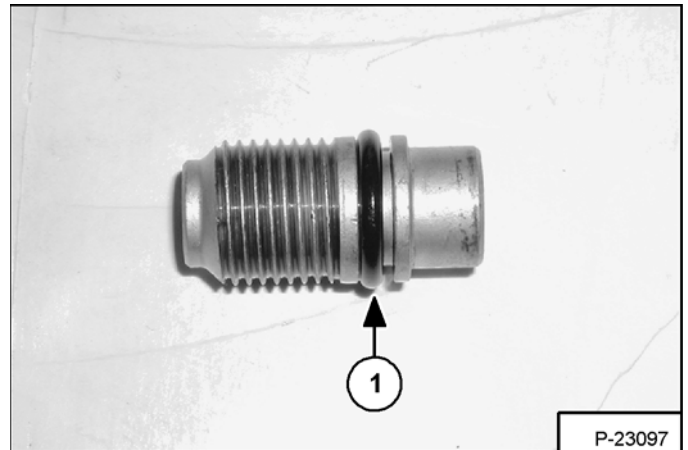
Remove the two O-rings (Item 1) [Figure 40-20-70] from the brake plate.

Figure 40-20-71



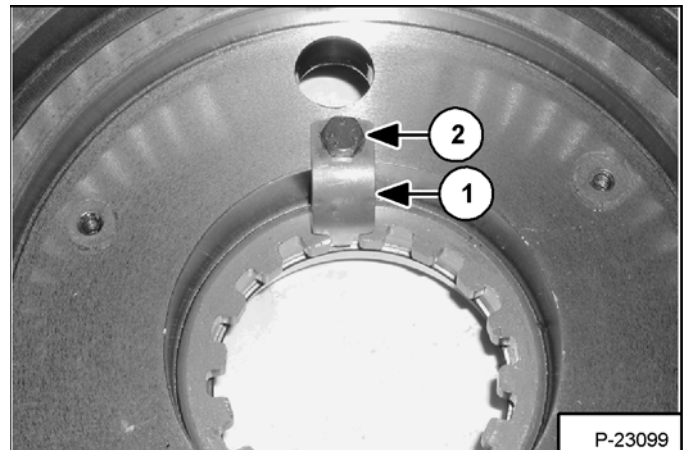
Remove the jam nut (Item 1) adjusting screw (Item 2) and wedge (Item 3) [Figure 40-20-71] from the brake housing.

Figure 40-20-72



Remove and discard the O-ring (Item 1) [Figure 40-20-72] from the adjusting screw.

Figure 40-20-73

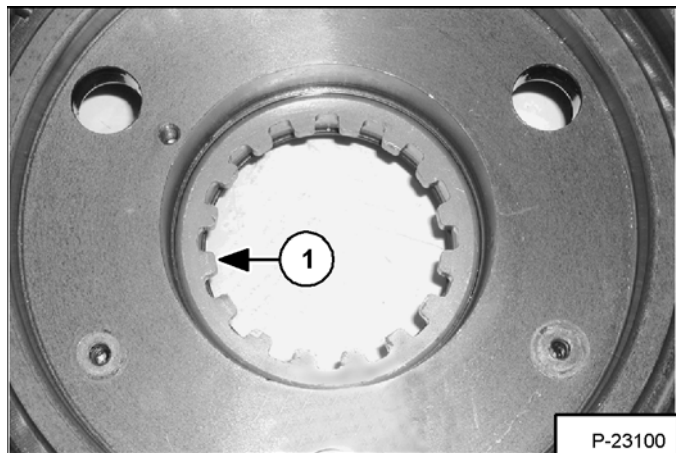


Turn the brake housing over and remove the lock nut retainer (Item 1) and bolt (Item 2) [Figure 40-20-73].

AXLE AND DIFFERENTIAL (FRONT) (CONT'D)

Brake Group Disassembly (Cont'd)

Figure 40-20-74



Remove the internal nut (Item 1) [Figure 40-20-74] from the brake housing by rotating counterclockwise using special tool CA119030.

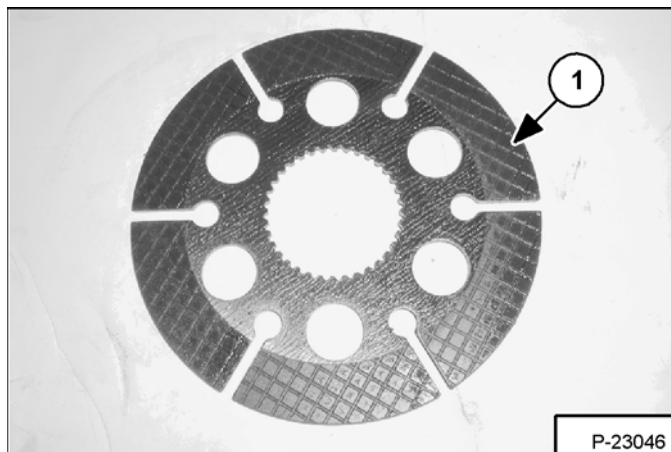
Figure 40-20-75



Remove the race by gently tapping out of the brake housing [Figure 40-20-75].

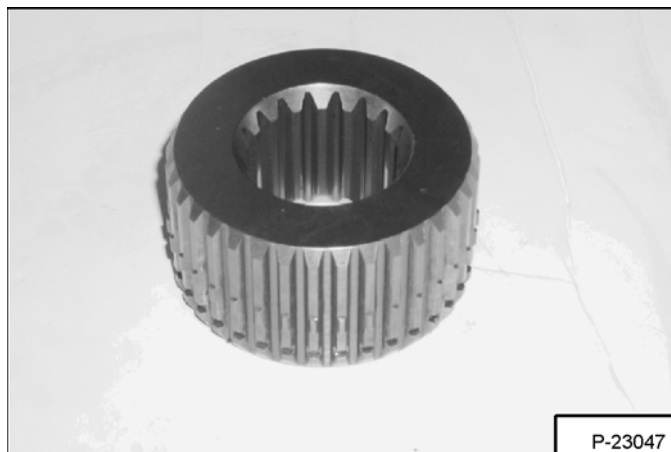
Brake Group Inspection

Figure 40-20-76



Inspect the friction plates (Item 1) [Figure 40-20-76] for wear. Replace all friction plates at the same time.

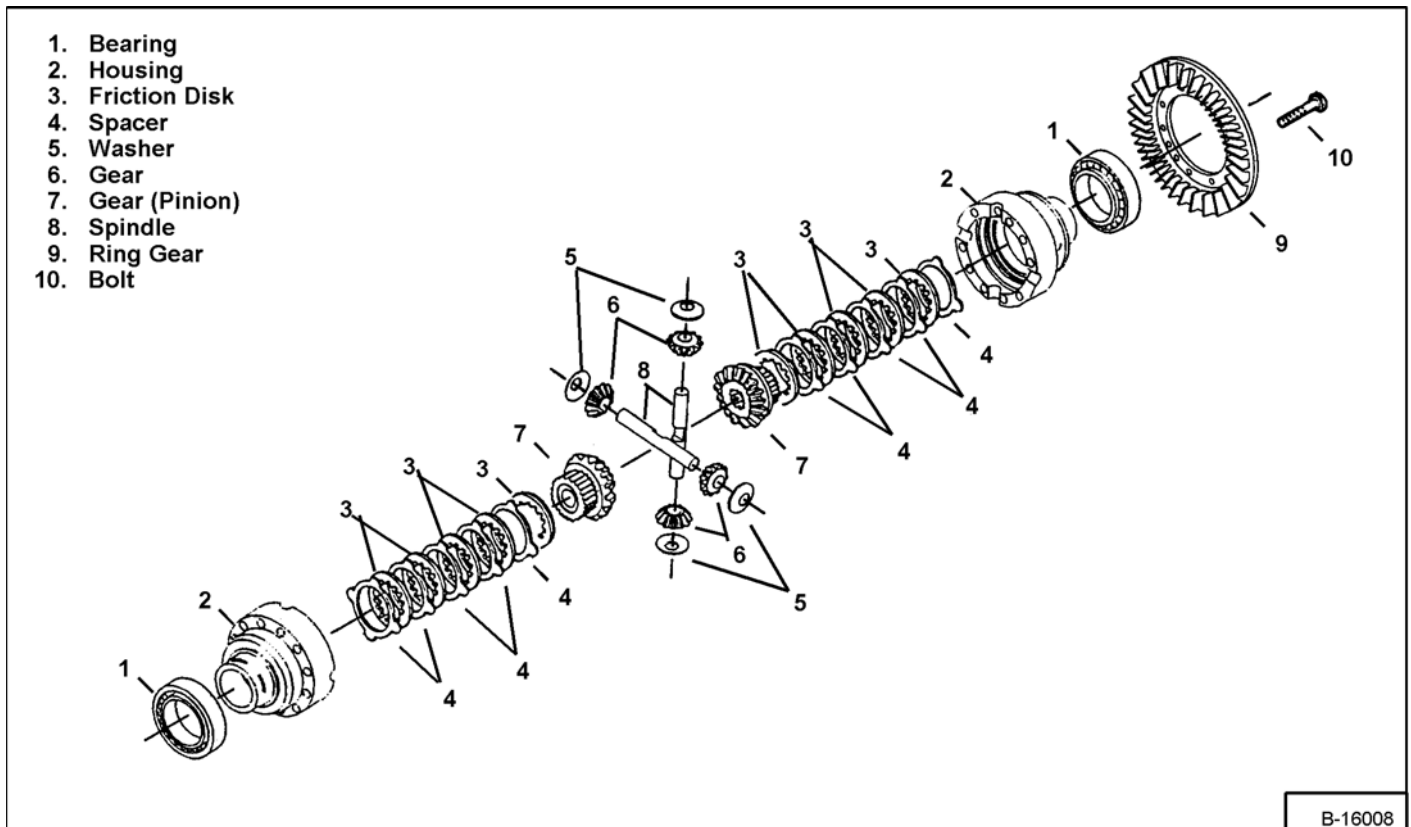
Figure 40-20-77



Inspect the internal and external splines on the coupler for damage or wear [Figure 40-20-77].

AXLE AND DIFFERENTIAL (FRONT) (CONT'D)

Differential Parts Identification



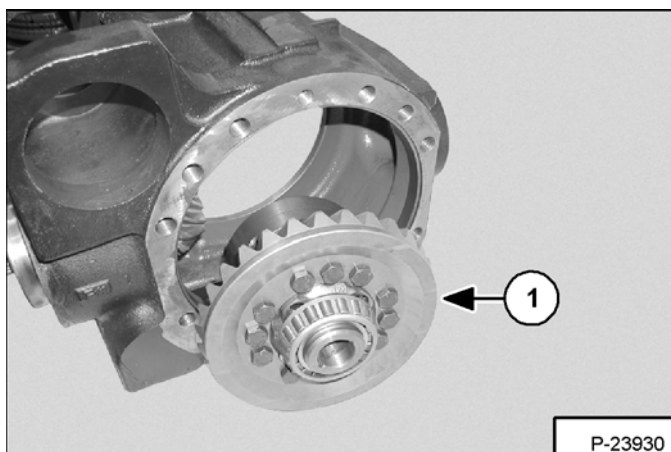
B-16008

Differential Disassembly

Clean the outside of the differential before disassembly.

Mark the outside of the differential for ease of assembly.

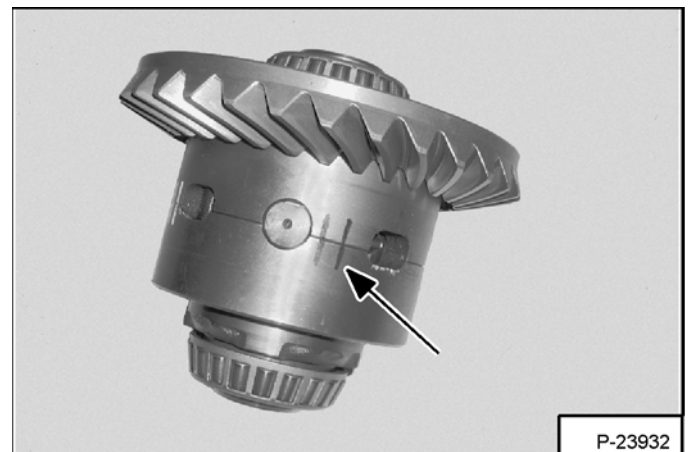
Figure 40-20-78



P-23930

Remove the differential assembly (Item 1) [Figure 40-20-78] from the axle housing.

Figure 40-20-79



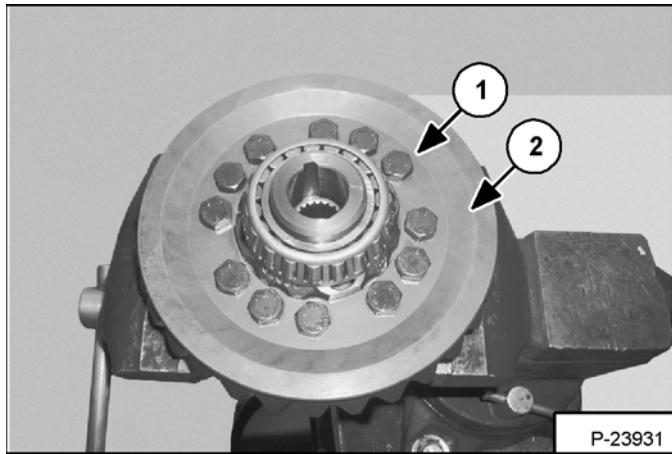
P-23932

Mark the housing for correct assembly [Figure 40-20-79].

AXLE AND DIFFERENTIAL (FRONT) (CONT'D)

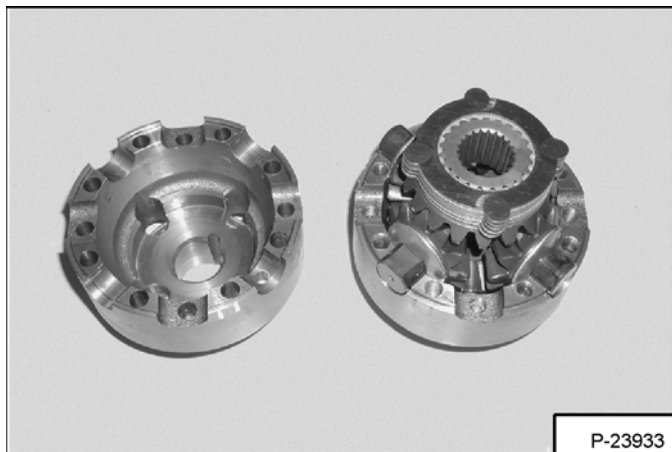
Differential Disassembly (Cont'd)

Figure 40-20-80



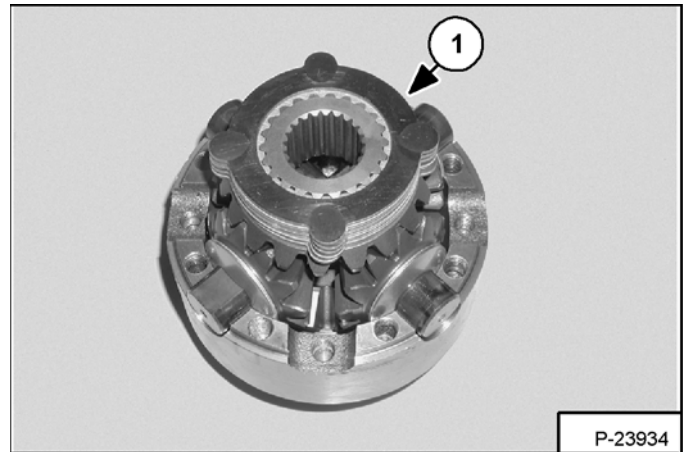
Support the differential assembly in a vise. Remove the twelve bolts (Item 1) and ring gear (Item 2) [Figure 40-20-80].

Figure 40-20-81



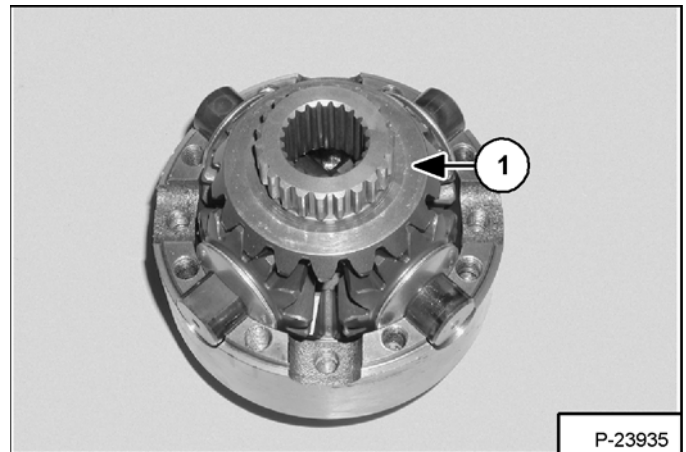
Separate the housings [Figure 40-20-81].

Figure 40-20-82



Remove the discs and spacers (Item 1) [Figure 40-20-82] from the pinion gear.

Figure 40-20-83

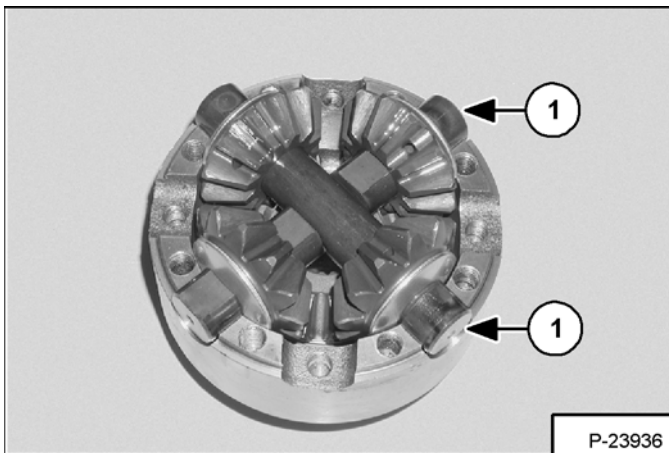


Remove the pinion gear (Item 1) [Figure 40-20-83].

AXLE AND DIFFERENTIAL (FRONT) (CONT'D)

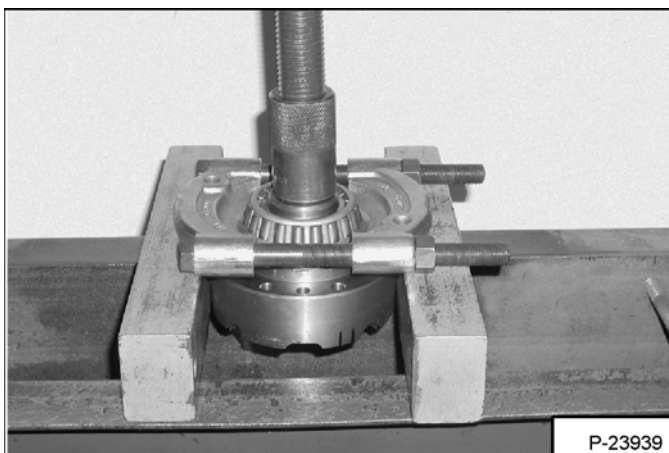
Differential Disassembly (Cont'd)

Figure 40-20-84



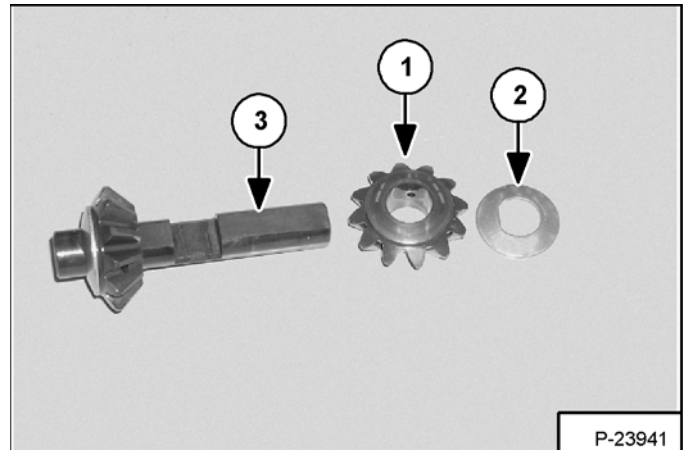
Remove the spindle/gear assemblies (Item 1) [Figure 40-20-84].

Figure 40-20-85



Remove the bearing from the housing [Figure 40-20-85].

Figure 40-20-86



Remove the gear (Item 1) and cup washer (Item 2) from the spindle (Item 3) [Figure 40-20-86].

AXLE AND DIFFERENTIAL (FRONT) (CONT'D)

Differential Inspection

Figure 40-20-87

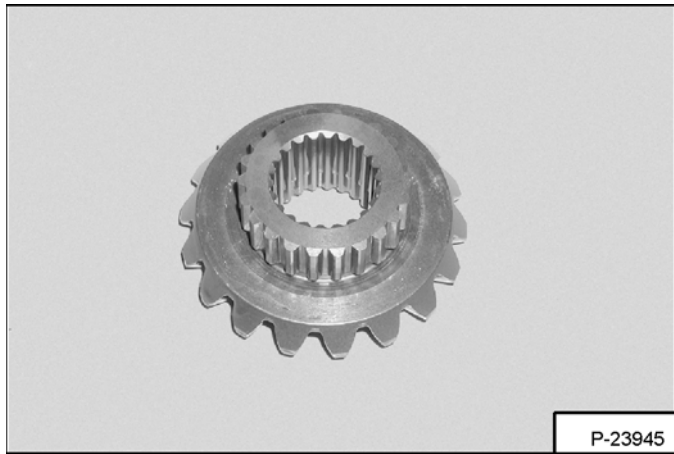
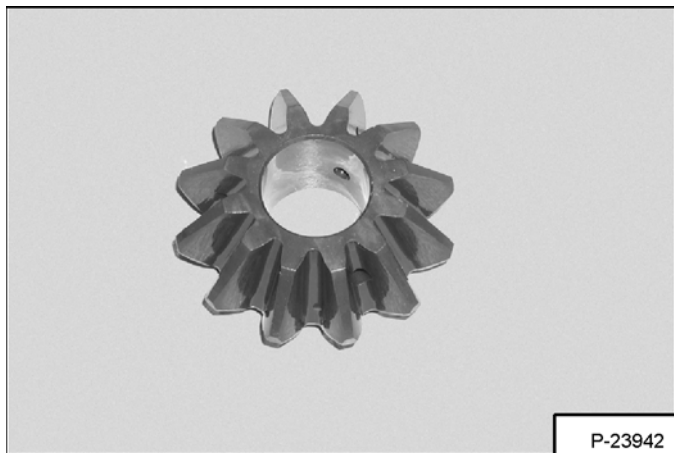


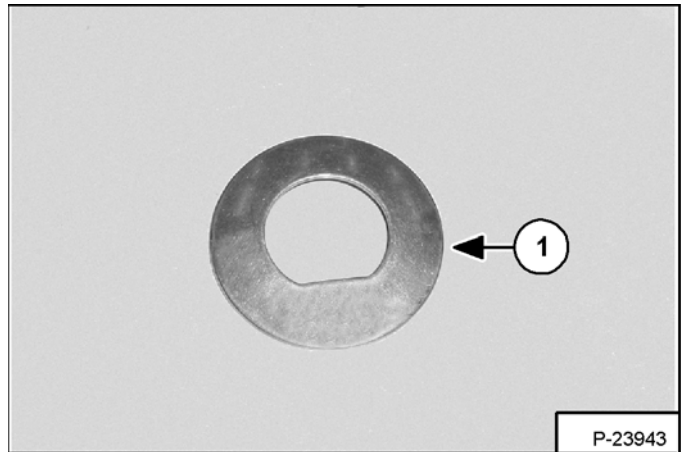
Figure 40-20-88



Inspect the pinion gears [Figure 40-20-87] & [Figure 40-20-88] for broken or damaged teeth.

If either gear is damaged, replace both gears.

Figure 40-20-89

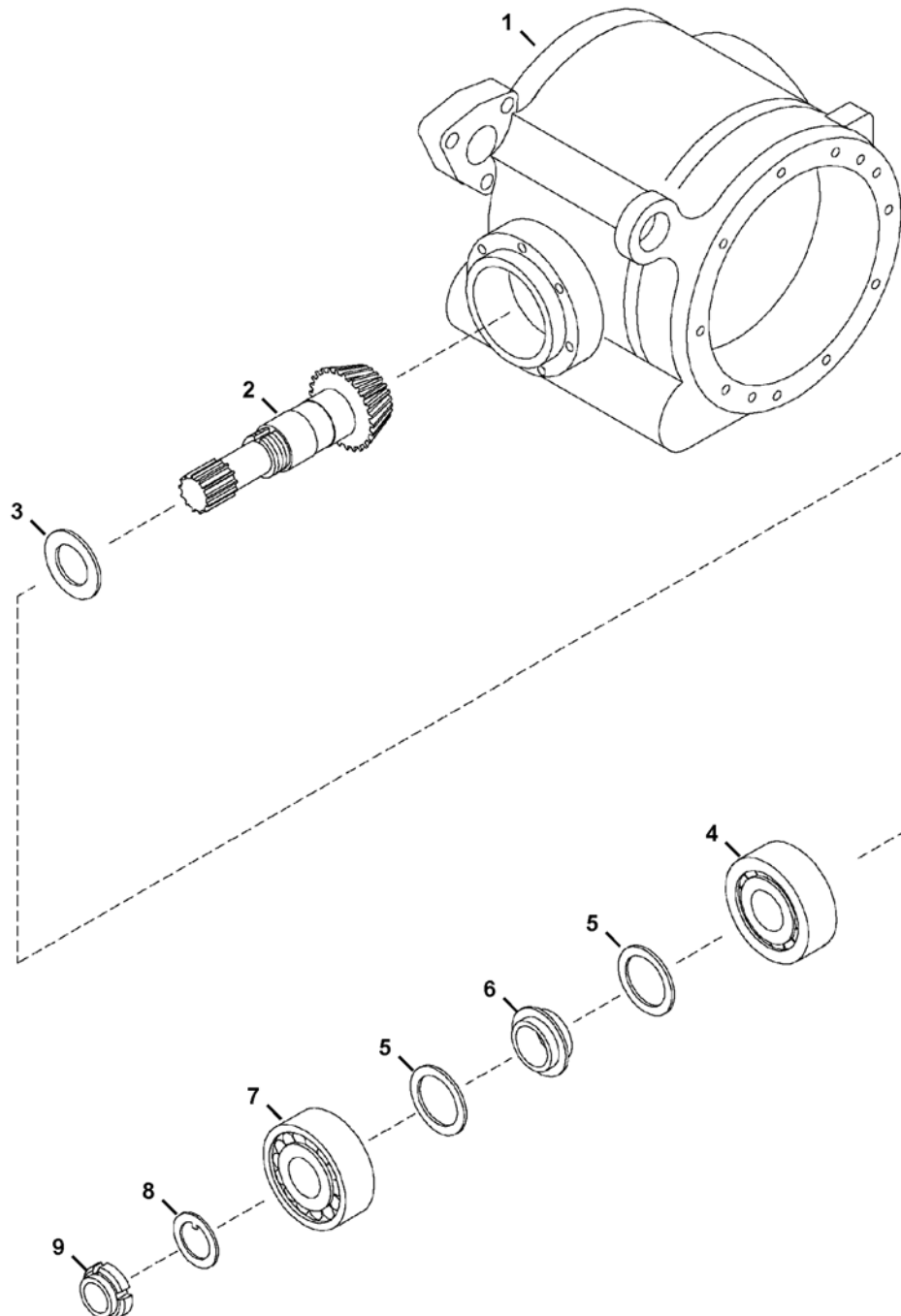


Inspect the cup washers (Item 1) [Figure 40-20-89] for damage or wear. Replace as needed.

AXLE AND DIFFERENTIAL (FRONT) (CONT'D)

Pinion Group Parts Identification

1. Housing
2. Pinion Shaft
3. Shim
4. Inner Bearing/Race
5. Washer
6. Spacer
7. Outer Bearing/Race
8. Lock Washer
9. Nut



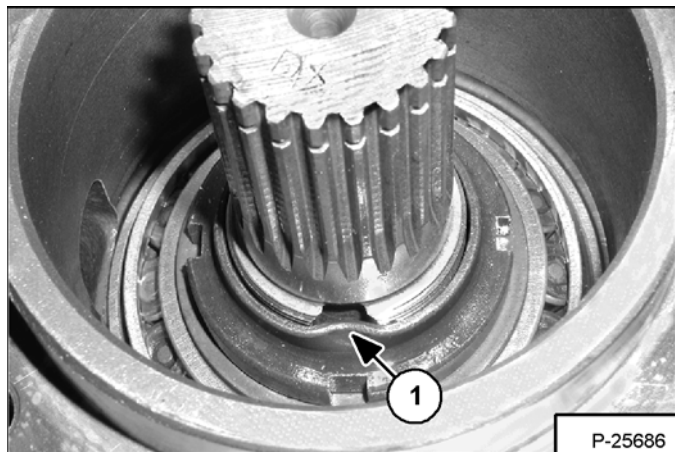
MS-01200

AXLE AND DIFFERENTIAL (FRONT) (CONT'D)

Pinion Group Disassembly

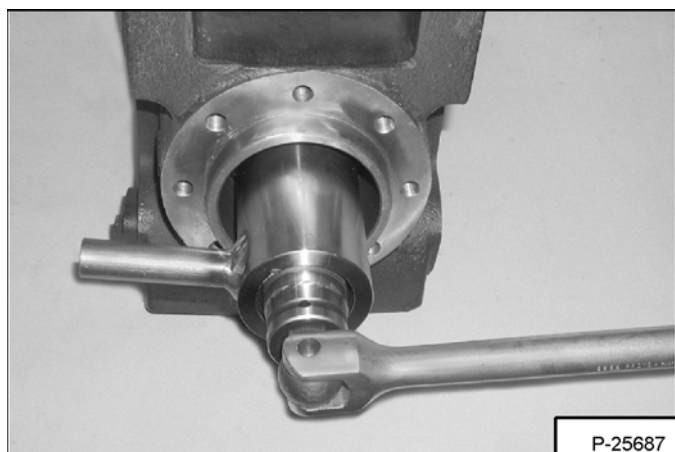
Clean the outside of the pinion group before disassembly.

Figure 40-20-90



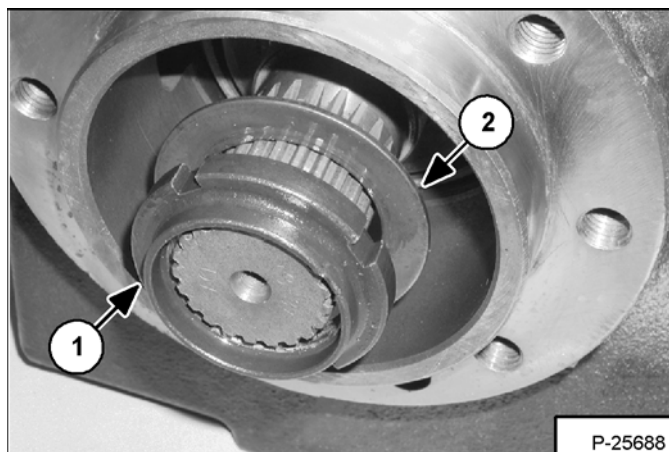
Pry up the peened notch (Item 1) [Figure 40-20-90] in the nut.

Figure 40-20-91



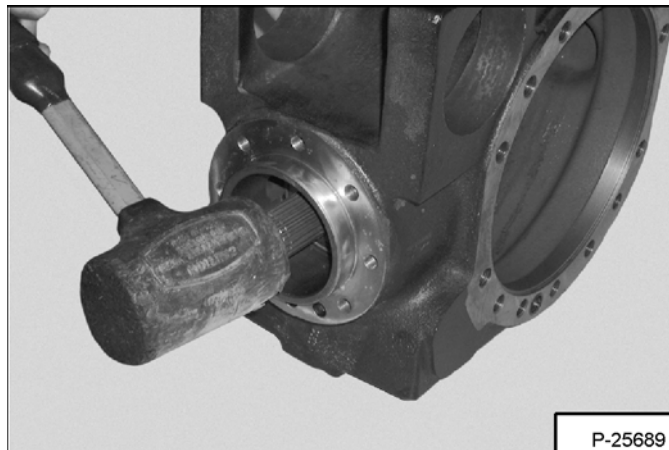
Loosen the nut using special tools CA119099 and CA715022 [Figure 40-20-91].

Figure 40-20-92



Remove the nut (Item 1) and washer (Item 2) [Figure 40-20-92].

Figure 40-20-93

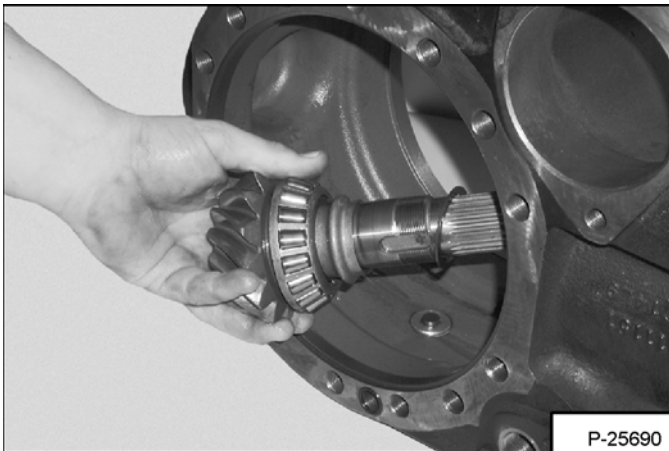


Free the pinion from the housing using a soft faced hammer [Figure 40-20-93].

AXLE AND DIFFERENTIAL (FRONT) (CONT'D)

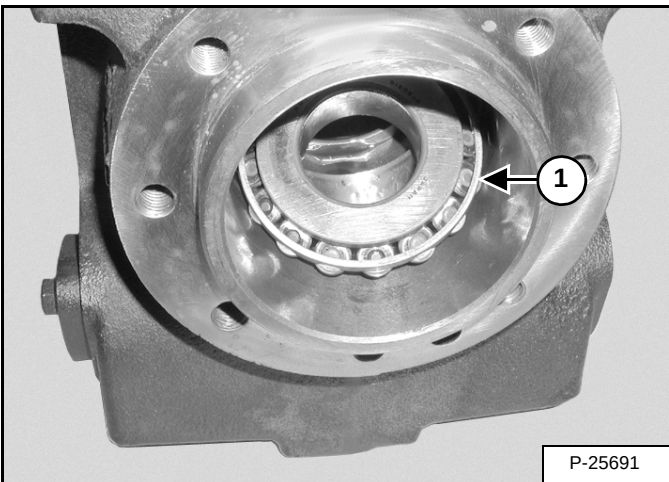
Pinion Group Disassembly (Cont'd)

Figure 40-20-94



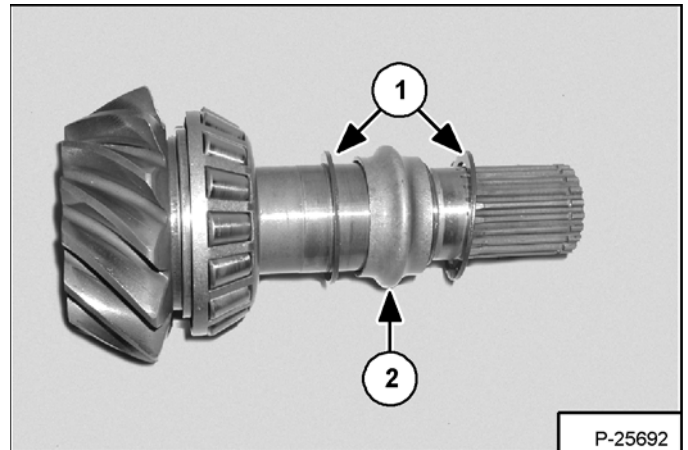
Remove the pinion shaft from the housing [Figure 40-20-94].

Figure 40-20-95



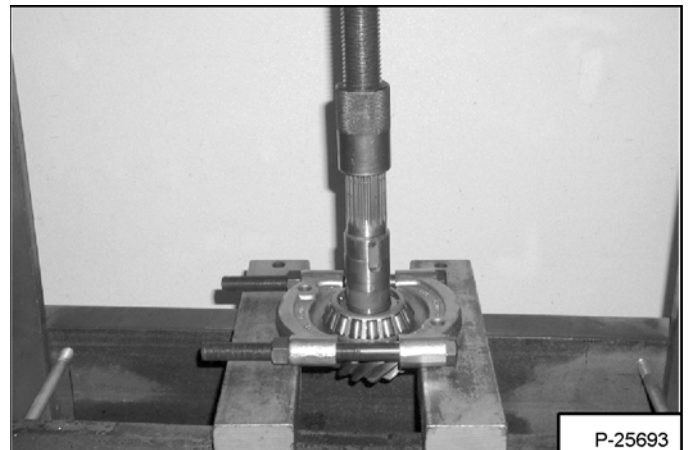
Remove the outer bearing (Item 1) [Figure 40-20-95].

Figure 40-20-96



Remove the two washers (Item 1) and spacer (Item 2) [Figure 40-20-96] from the pinion shaft.

Figure 40-20-97

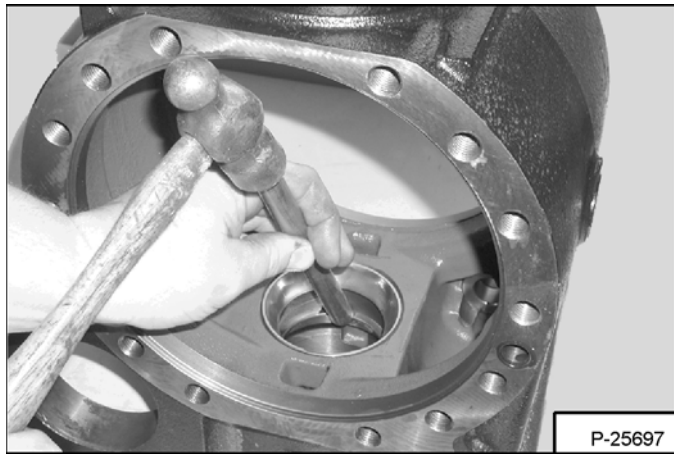


Remove the bearing from the pinion shaft [Figure 40-20-97].

AXLE AND DIFFERENTIAL (FRONT) (CONT'D)

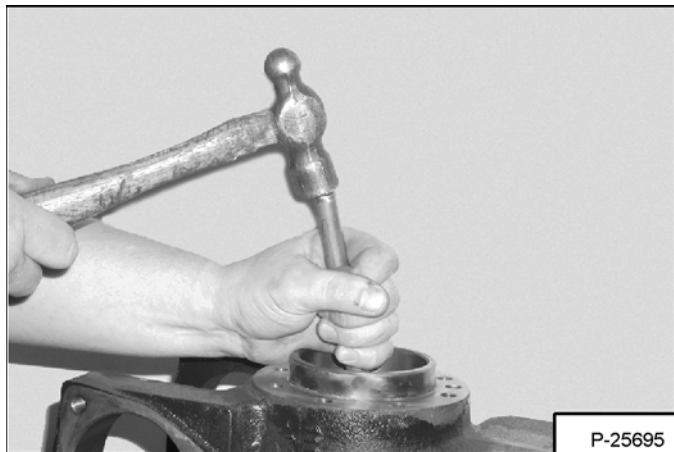
Pinion Group Disassembly (Cont'd)

Figure 40-20-98



Remove the outer race from the housing [Figure 40-20-98].

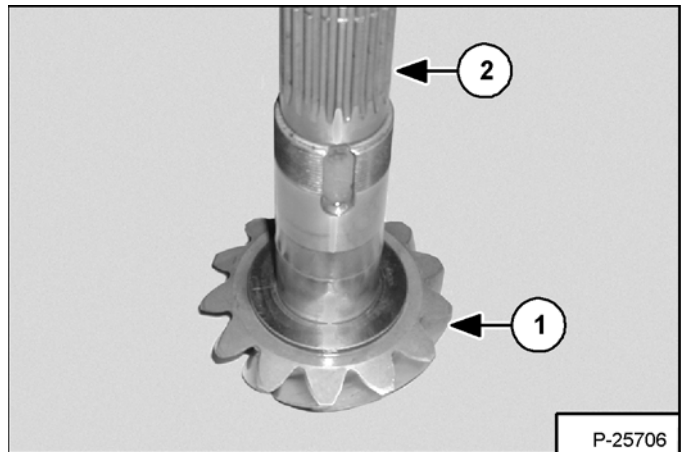
Figure 40-20-99



Remove the inner race from the housing [Figure 40-20-99].

Pinion Group Inspection

Figure 40-20-100



Inspect the pinion gear (Item 1) and shaft splines (Item 2) [Figure 40-20-100] for broken or damaged teeth.

AXLE AND DIFFERENTIAL (FRONT) (CONT'D)

Pinion Group Assembly

Clean all parts in solvent and dry with compressed air.

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

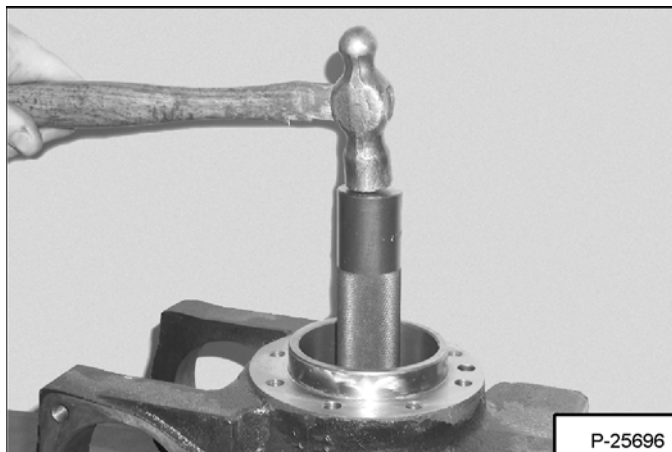
Always install new seals and O-rings. Lubricate all seals and O-rings with clean hydraulic fluid before installation.

IMPORTANT

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

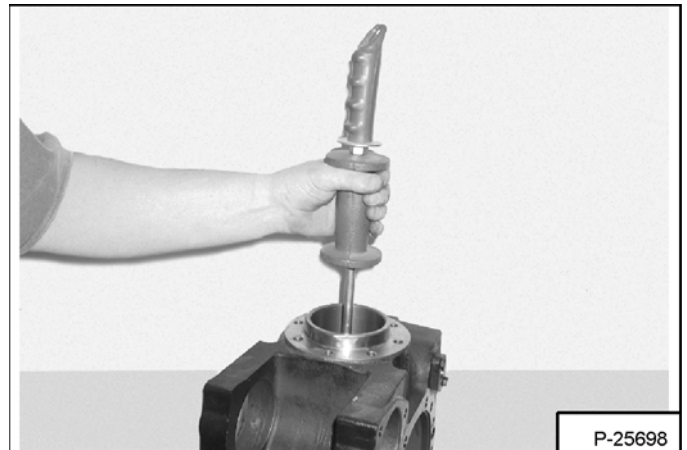
I-2003-0888

Figure 40-20-101



Install the outer race [Figure 40-20-101].

Figure 40-20-102



Install the inner race [Figure 40-20-102].

Figure 40-20-103

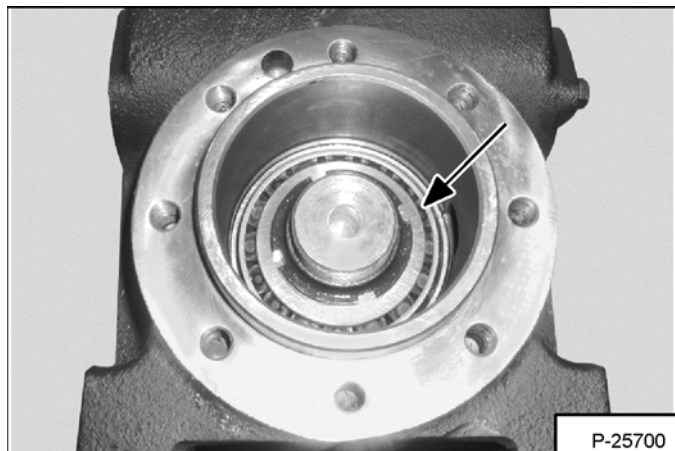


Install the bearing (Item 1) [Figure 40-20-103] onto the dummy pinion tool CA715040.

AXLE AND DIFFERENTIAL (FRONT) (CONT'D)

Pinion Group Assembly (Cont'd)

Figure 40-20-104



Install the dummy pinion and bearing into the center housing and install the outer bearing and lock nut [Figure 40-20-104].

Tighten the lock nut to eliminate any bearing end play. DO NOT overtighten the nut.

Figure 40-20-105

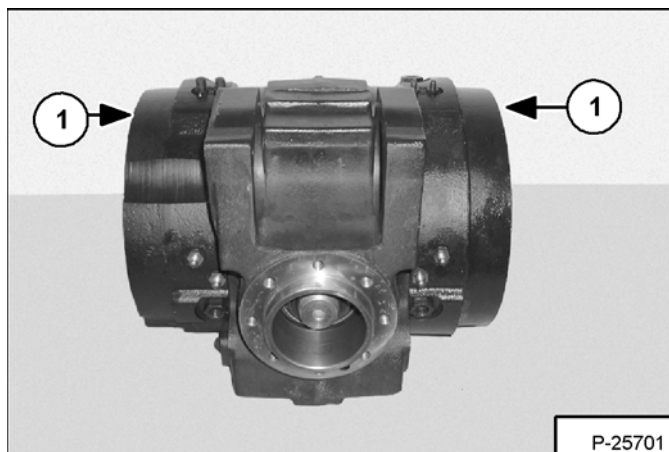
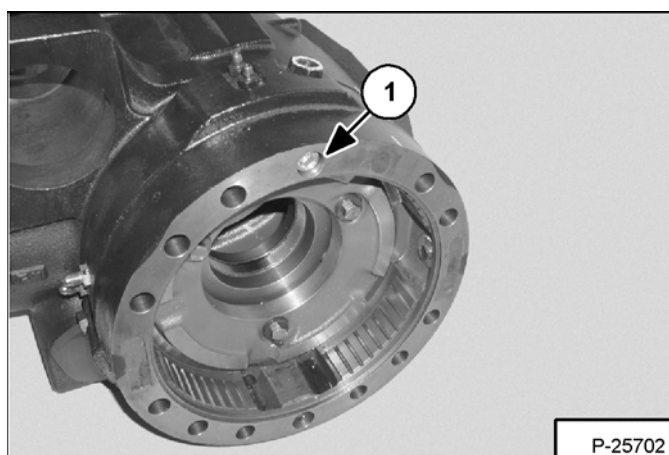
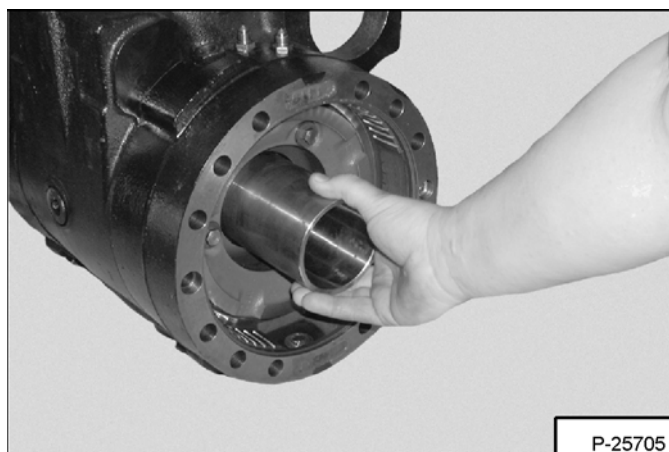


Figure 40-20-106



Install both brake housings (Item 1) [Figure 40-20-105] onto the center housing. Install and tighten the bolt (Item 1) [Figure 40-20-106].

Figure 40-20-107



Insert the dummy differential tool CA715041 into the brake housings [Figure 40-20-107].

AXLE AND DIFFERENTIAL (FRONT) (CONT'D)

Pinion Group Assembly (Cont'd)

Figure 40-20-108

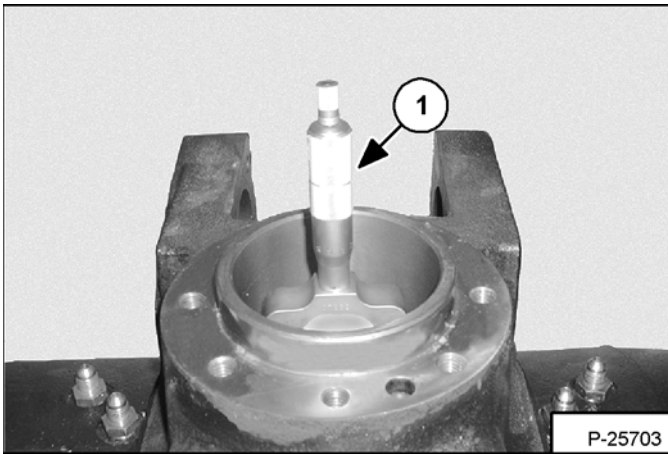
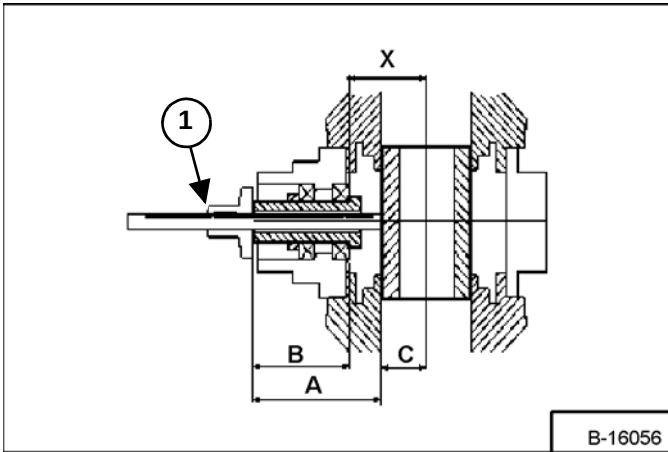


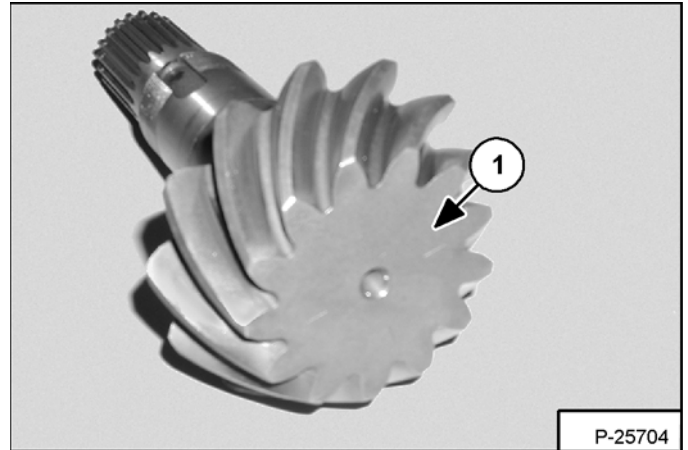
Figure 40-20-109



Using a depth gauge (Item 1) [Figure 40-20-108] & [Figure 40-20-109] measure thru the reference hole in the dummy pinion.

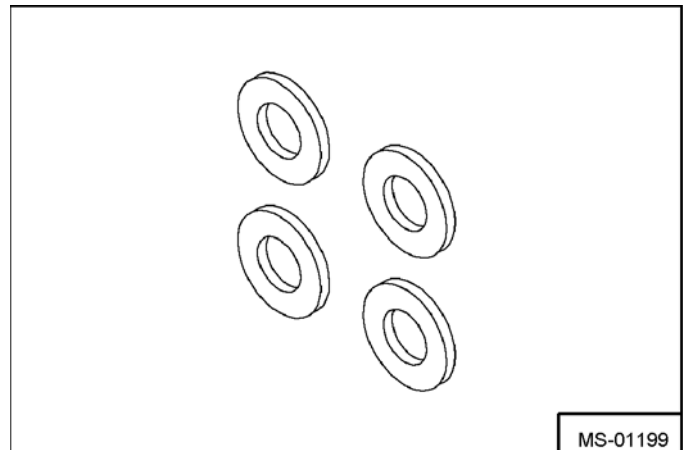
X = (distance to be measured)
 A = (measured value)
 B = (given value) = $100 \pm 0,01$ mm
 C = (given value) = 45 mm
 $(A + C) - B = X$

Figure 40-20-110



To determine the thickness of the shim to be installed between the pinion and bearing, subtract the value stamped on the end of the pinion (Item 1) [Figure 40-20-110] from the value X (above).

Figure 40-20-111



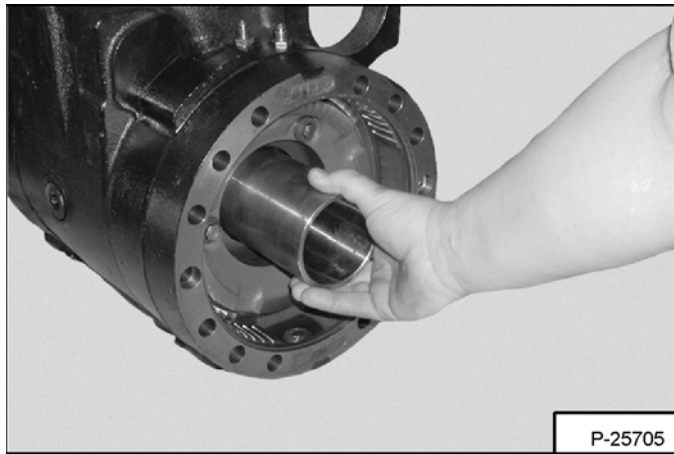
Select the shim [Figure 40-20-111] from the chart below:

SHIM THICKNESS RANGE										
Thick	2.5	2.6	2.7	2.8	2.9	3.0	3.1	3.2	3.3	3.4
Qty.	-	-	-	-	-	-	-	-	-	-

AXLE AND DIFFERENTIAL (FRONT) (CONT'D)

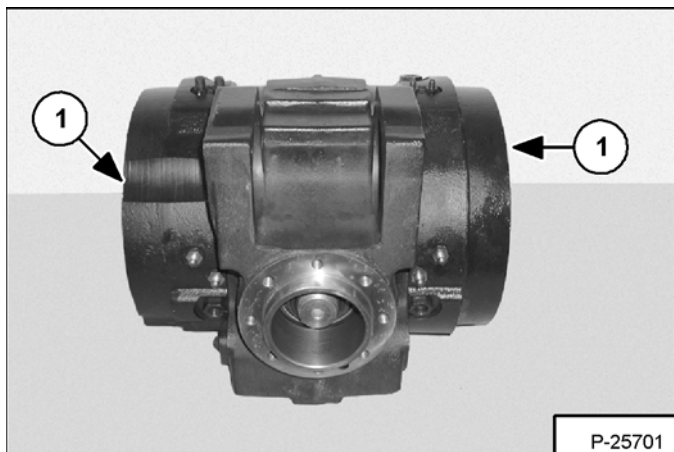
Pinion Group Assembly (Cont'd)

Figure 40-20-112



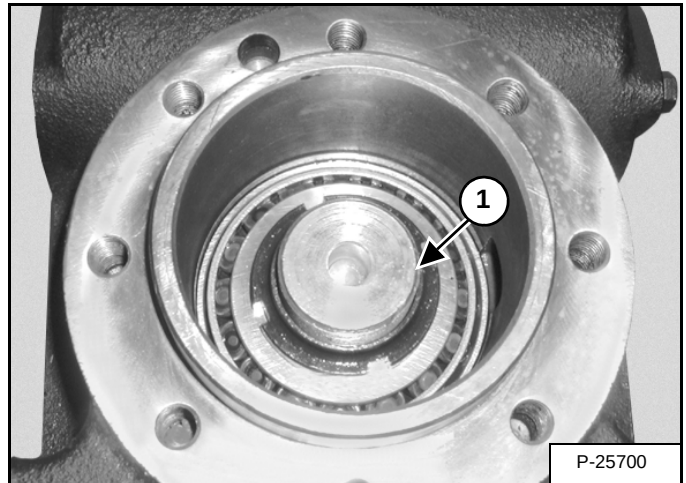
Remove the dummy differential tool [Figure 40-20-112].

Figure 40-20-113



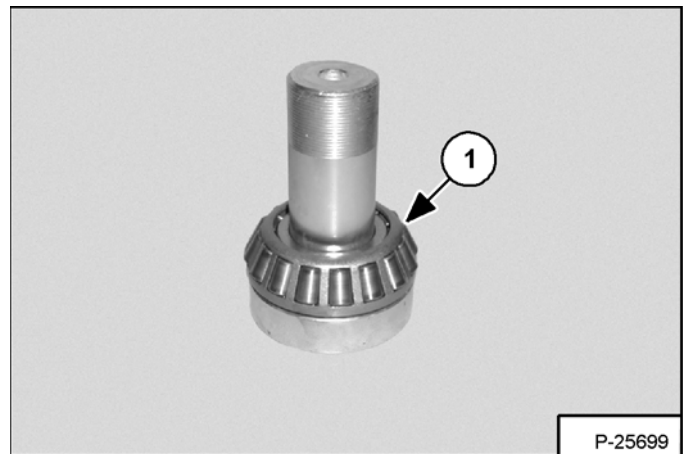
Remove both brake housings (Item 1) [Figure 40-20-113] from the center housing.

Figure 40-20-114



Remove the dummy pinion tool (Item 1) [Figure 40-20-114] from the center housing.

Figure 40-20-115

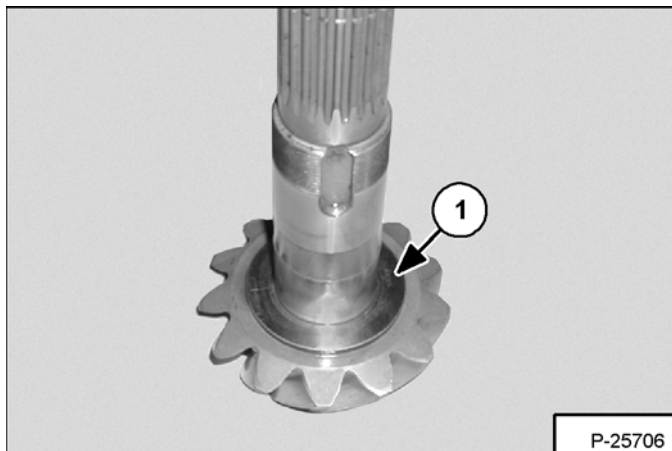


Remove the bearing (Item 1) [Figure 40-20-115] from the dummy pinion.

AXLE AND DIFFERENTIAL (FRONT) (CONT'D)

Pinion Group Assembly (Cont'd)

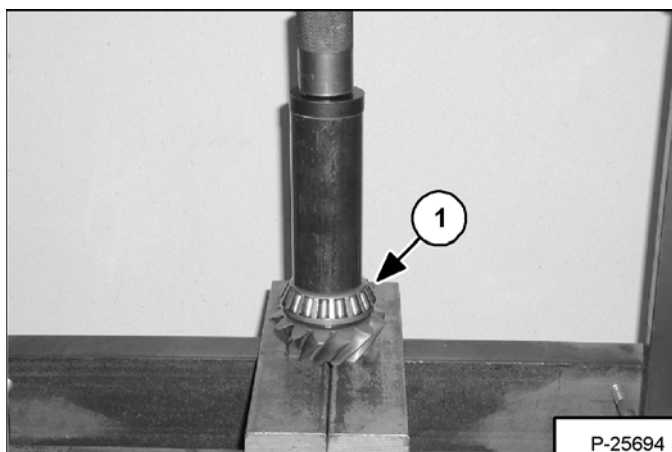
Figure 40-20-116



Install the shims selected (Item 1) [Figure 40-20-116] onto the pinion shaft.

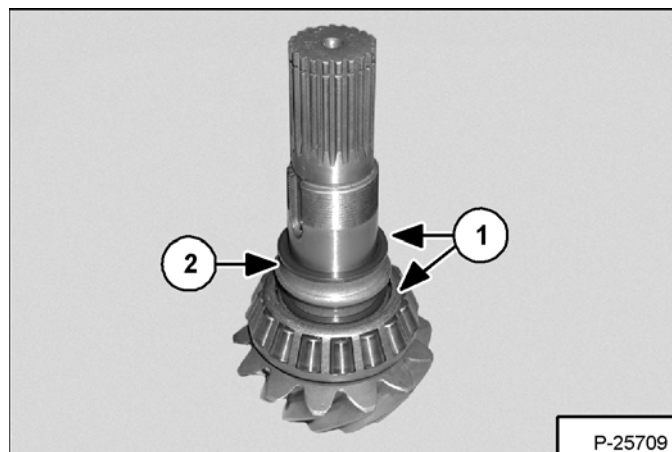
NOTE: The beveled edge must go towards the gear.

Figure 40-20-117



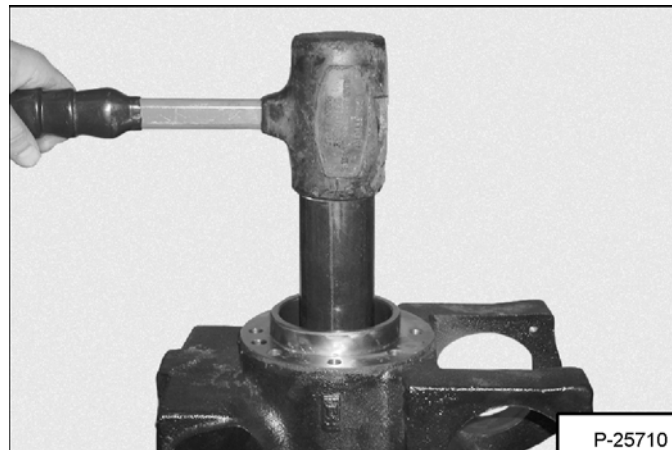
Install the bearing (Item 1) [Figure 40-20-117] onto the pinion shaft until it is fully seated.

Figure 40-20-118



Install the two washers (Item 1) and collapsible spacer (Item 2) [Figure 40-20-118] onto the shaft.

Figure 40-20-119



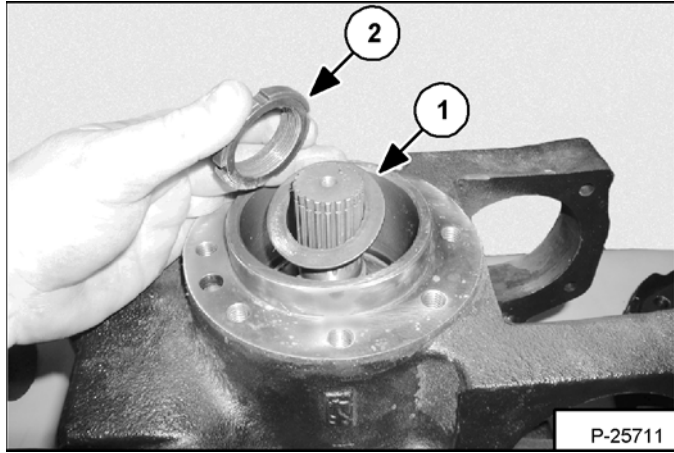
Install the pinion gear assembly into the center housing and install the outer bearing [Figure 40-20-119].

NOTE: Drive the outer bearing onto the shaft, have an assistant place a second hammer on the pinion head to absorb the impact.

AXLE AND DIFFERENTIAL (FRONT) (CONT'D)

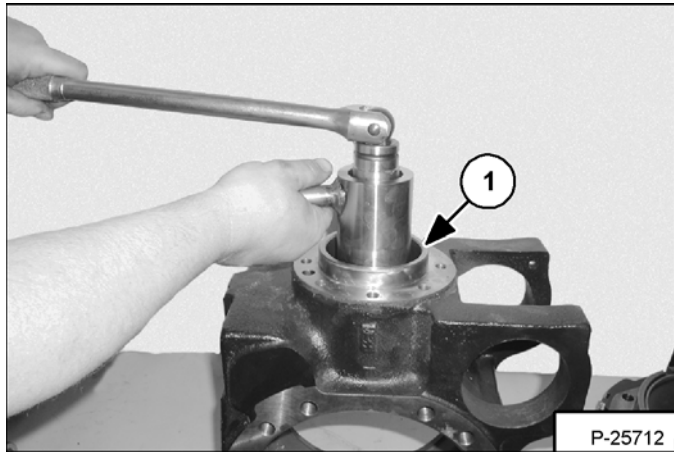
Pinion Group Assembly (Cont'd)

Figure 40-20-120



Install the backing washer (Item 1) and nut (Item 2) [Figure 40-20-120].

Figure 40-20-121

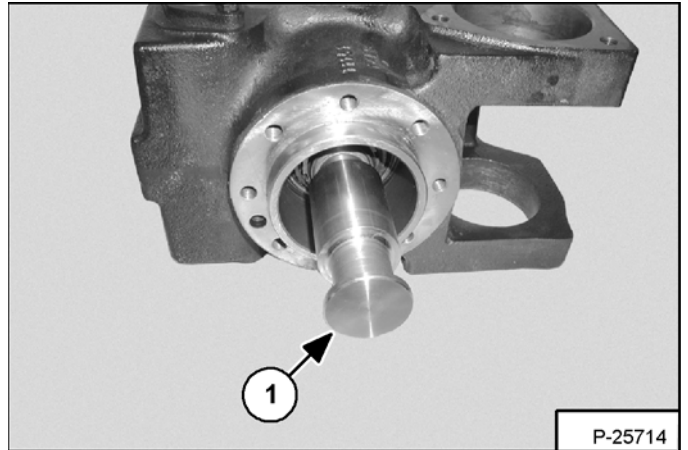


Tighten the nut using the special tools CA119099 and CA715022.

NOTE: The tightening torque is determined by measuring the force required to rotate the pinion (preload of bearings). (See [Figure 40-20-123].)

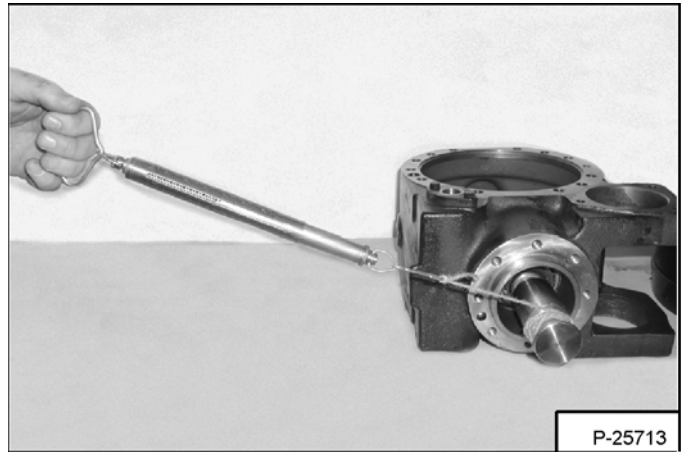
Tighten the nut in incremental steps. If overtightened (preload too high) the collapsed spacer must be replaced and the procedure repeated [Figure 40-20-121].

Figure 40-20-122



Install the special tool CA715116 (Item 1) [Figure 40-20-122] onto the pinion shaft.

Figure 40-20-123



Attach one end of a light rope to the special tool [Figure 40-20-123]. Make 2 or 3 complete wraps around the tool. Attach the spring scale perpendicular to the housing to measure the rolling torque on the bearings. Tighten (or loosen) the nut (Item 1) [Figure 40-20-121] until 2-3 lb (.9 - 1.4 Kg) of smooth and continuous rolling torque is measured on the spring scale.

AXLE AND DIFFERENTIAL (FRONT) (CONT'D)

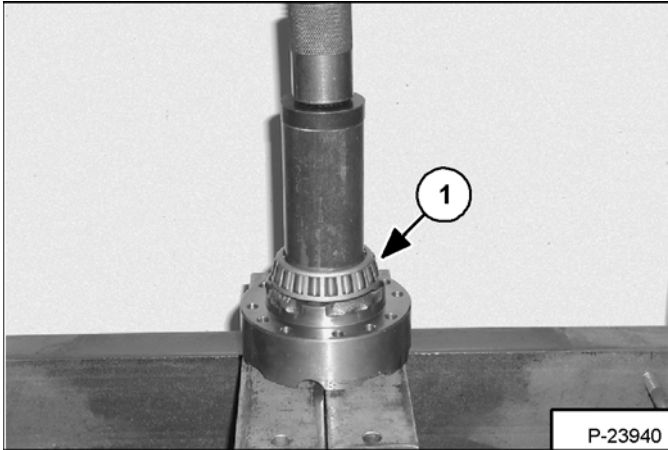
Differential Assembly

Clean all parts in solvent and dry with compressed air.

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

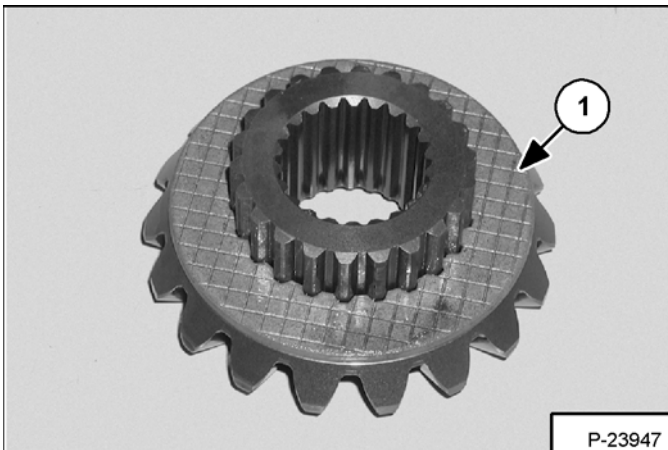
Always install new seals and O-rings. Lubricate all seals and O-rings with clean hydraulic fluid before installation.

Figure 40-20-124



Install the bearing (Item 1) [Figure 40-20-124] onto each housing.

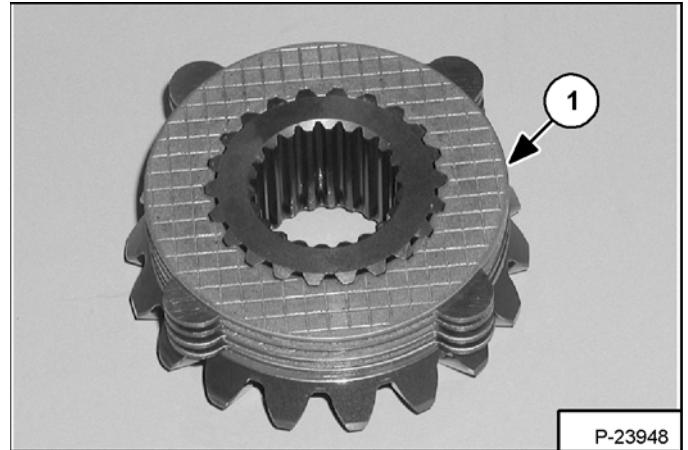
Figure 40-20-125



Install the disc (Item 1) [Figure 40-20-125] that is one half friction and the other half metal onto the gear splines.

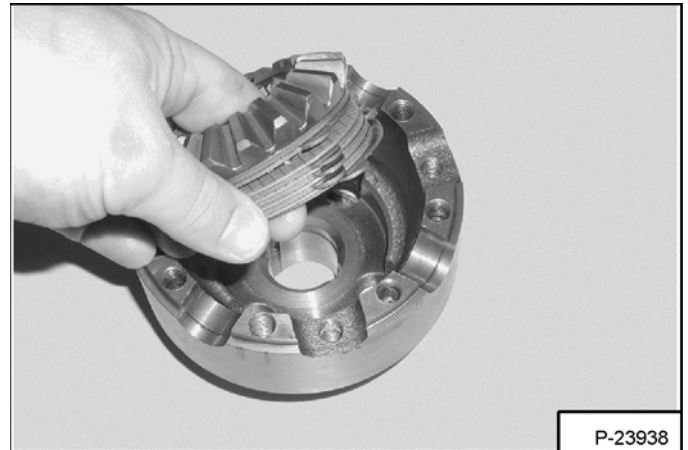
NOTE: The metal side must be next to the gear.

Figure 40-20-126



Install the remaining discs (Item 1) [Figure 40-20-126] onto the shaft, alternating between steel and friction.

Figure 40-20-127



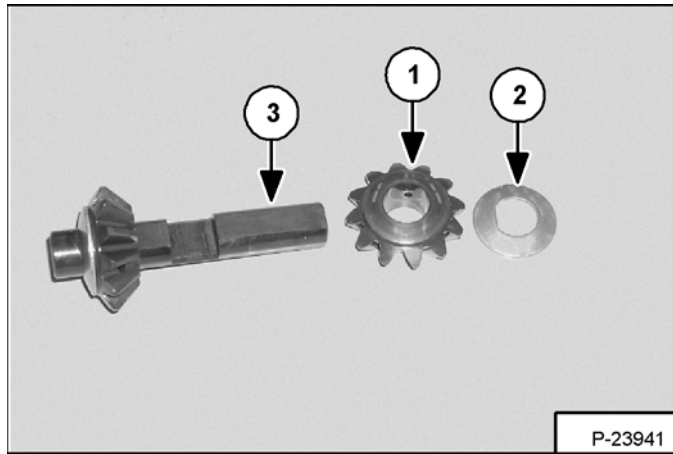
Install the gear/disc assembly into the housing [Figure 40-20-127].

NOTE: Make sure the disc remains in correct position.

AXLE AND DIFFERENTIAL (FRONT) (CONT'D)

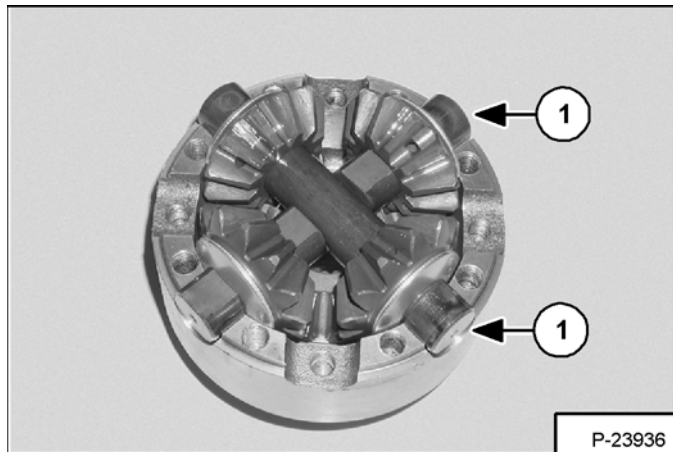
Differential Assembly (Cont'd)

Figure 40-20-128



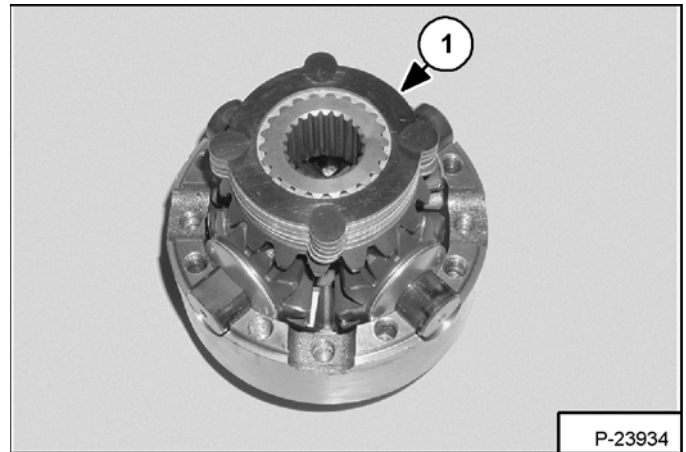
Install the gear (Item 1) and cup washer (Item 2) onto the spindle (Item 3) [Figure 40-20-128].

Figure 40-20-129



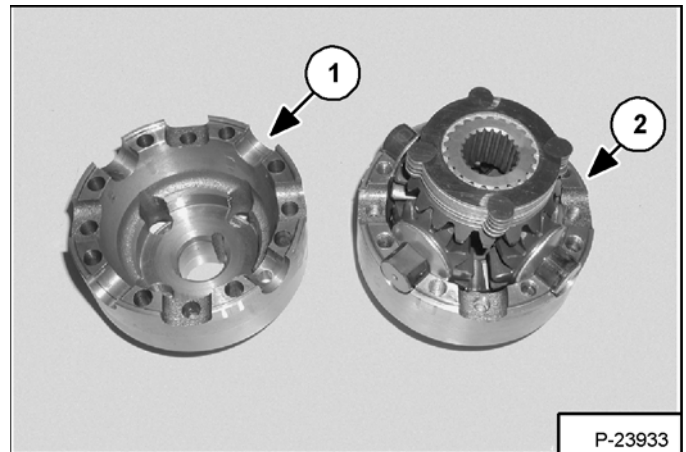
Install the spindle/gear assemblies (Item 1) [Figure 40-20-129] into the housing.

Figure 40-20-130



Set the gear/discs assembly (Item 1) [Figure 40-20-130] onto the spindle gears.

Figure 40-20-131

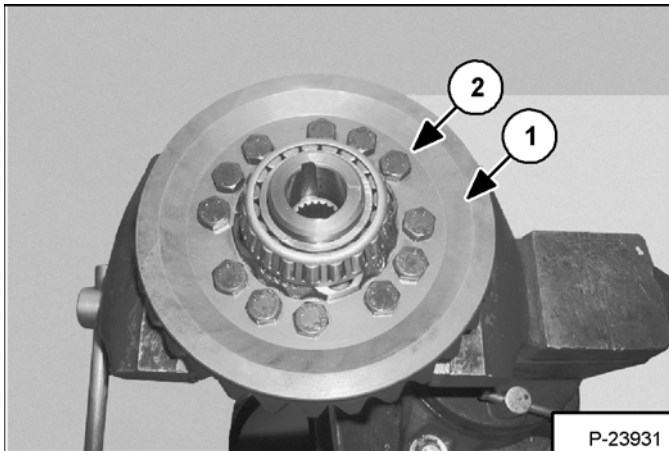


Install the housing (Item 1) onto the housing/gear assembly (Item 2) [Figure 40-20-131]. Make sure to align the reference marks made earlier.

AXLE AND DIFFERENTIAL (FRONT) (CONT'D)

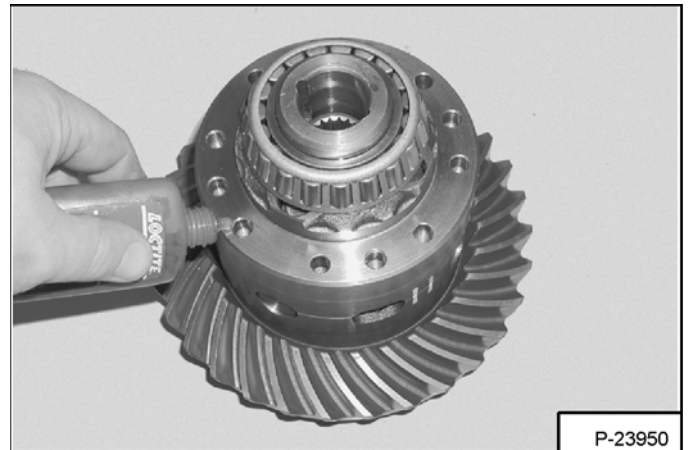
Differential Assembly (Cont'd)

Figure 40-20-132



Install the ring gear (Item 1) and twelve bolts (Item 2) **[Figure 40-20-132]**. Tighten the bolts to 58 ft.-lbs. (78 Nm) torque.

Figure 40-20-133



Apply LOCTITE #270 to the end of the mounting bolts **[Figure 40-20-133]**.

AXLE AND DIFFERENTIAL (FRONT) (CONT'D)

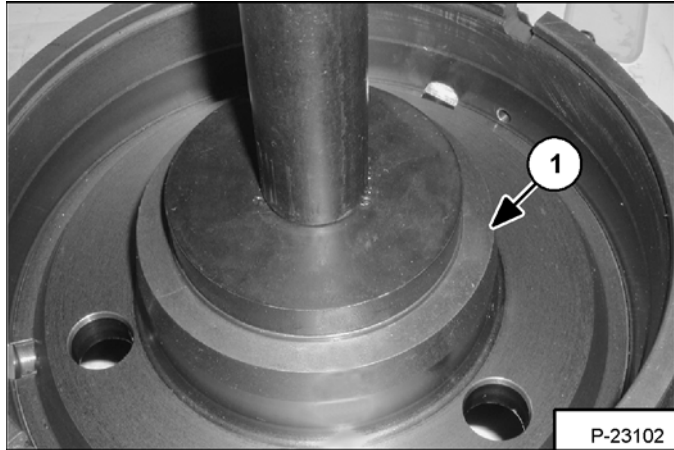
Brake Group Assembly

Clean all parts in solvent and dry with compressed air.

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

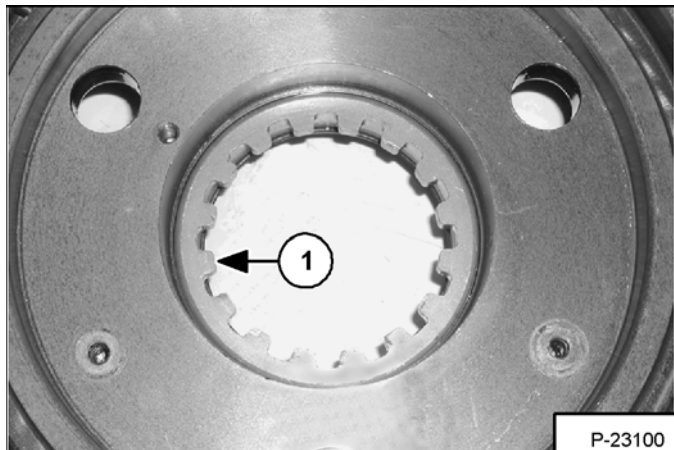
Always install new seals and O-rings. Lubricate all seals and O-rings with clean hydraulic fluid before installation.

Figure 40-20-134



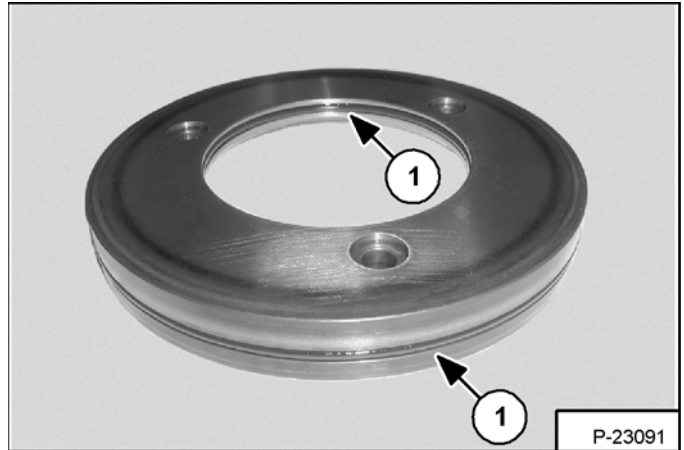
Install the bearing race into the housing until it is flush with center surface (Item 1) [Figure 40-20-134].

Figure 40-20-135



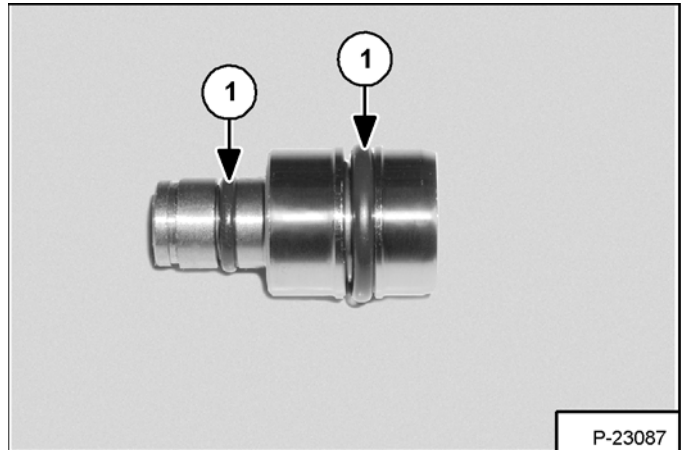
Install the internal adjusting nut (Item 1) [Figure 40-20-135] into the brake housing by rotating clockwise until it is tight against the bearing race.

Figure 40-20-136



Lightly lubricate and install two new O-rings (Item 1) [Figure 40-20-136] onto the brake plate.

Figure 40-20-137

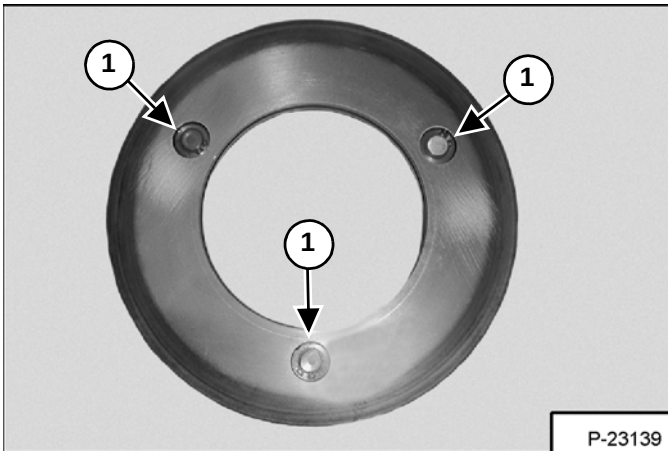


Lightly lubricate and install new O-rings (Item 1) [Figure 40-20-137] onto the pins.

AXLE AND DIFFERENTIAL (FRONT) (CONT'D)

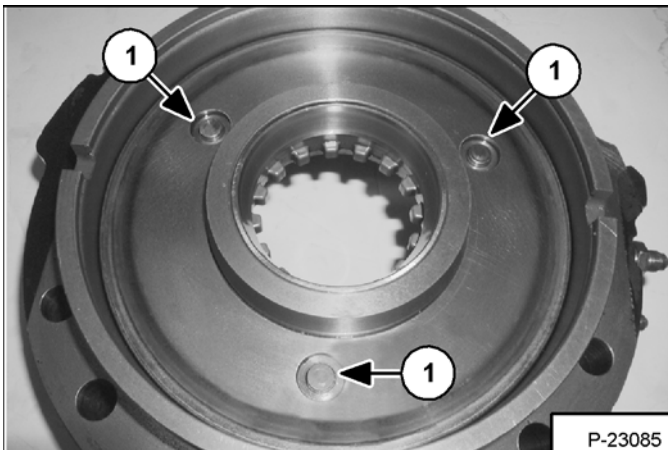
Brake Group Assembly (Cont'd)

Figure 40-20-138



Install the three pins into the brake plate and retain with the snap rings (Item 1) [Figure 40-20-138].

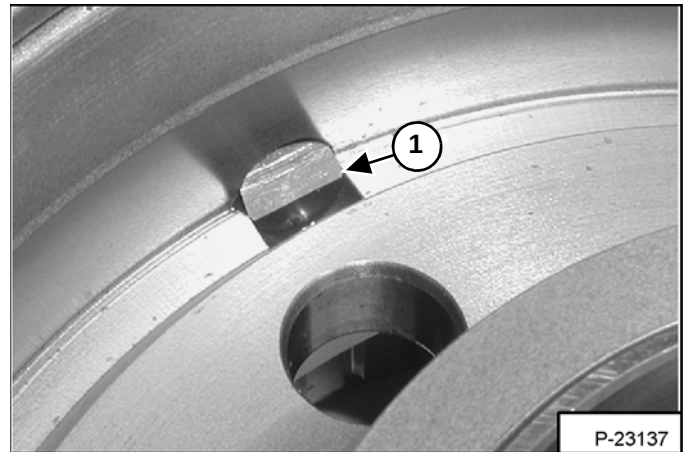
Figure 40-20-139



Align the holes in the brake housing with the pins (Item 1) [Figure 40-20-139] and install the brake plate into the brake housing until it is fully seated.

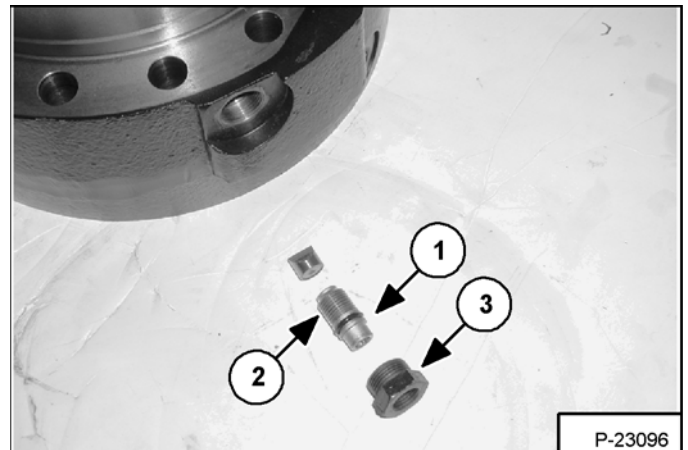
Turn the brake housing over.

Figure 40-20-140



Install the three wedges (Item 1) [Figure 40-20-140] into the brake housing as shown.

Figure 40-20-141



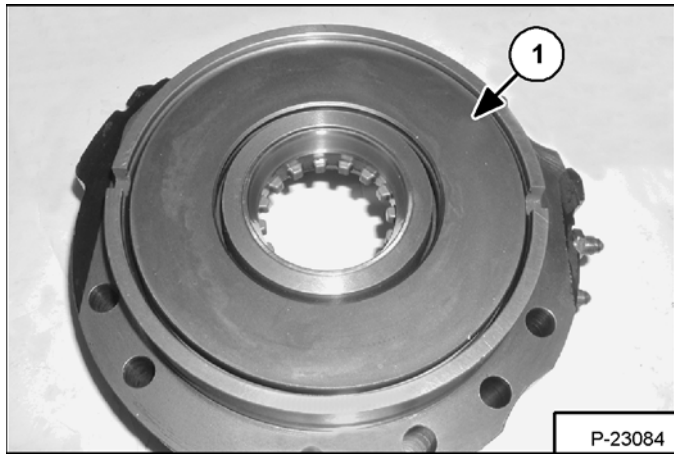
Lubricate and install a new O-ring (Item 1) [Figure 40-20-141] onto the adjusting screw.

Install the adjusting screw (Item 2) and jam nut (Item 3) [Figure 40-20-141] into the housing.

AXLE AND DIFFERENTIAL (FRONT) (CONT'D)

Brake Group Assembly (Cont'd)

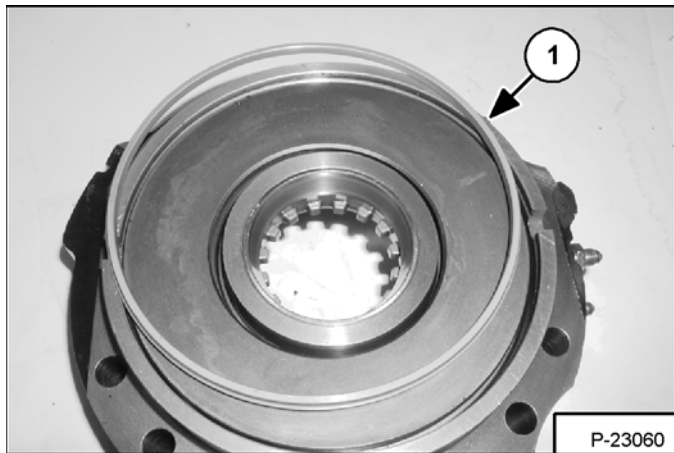
Figure 40-20-142



Install the Belleville springs (Item 1) [Figure 40-20-142] into the brake housing.

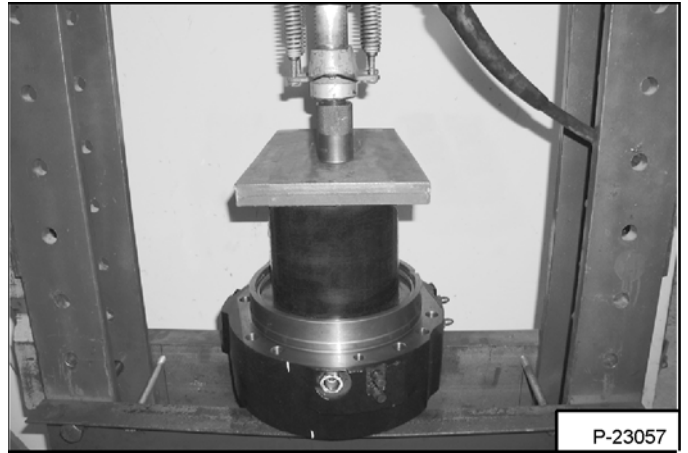
NOTE: The inner edges of the Belleville springs must touch for correct installation.

Figure 40-20-143



Temporarily place the spring retainer ring (Item 1) [Figure 40-20-143] on the Belleville springs.

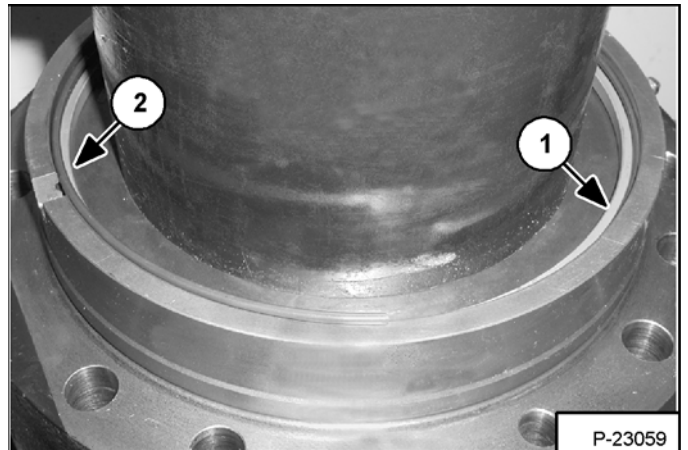
Figure 40-20-144



Using a 6-1/2 inch O.D. tube and suitable press, apply enough downward pressure on the Belleville springs allowing the split ring retainer to drop down [Figure 40-20-144].

NOTE: Make sure the Belleville springs are centered in the housing.

Figure 40-20-145



With the split ring retainer (Item 1) in the down position, install the split ring (Item 2) [Figure 40-20-145] into the groove in the brake housing.

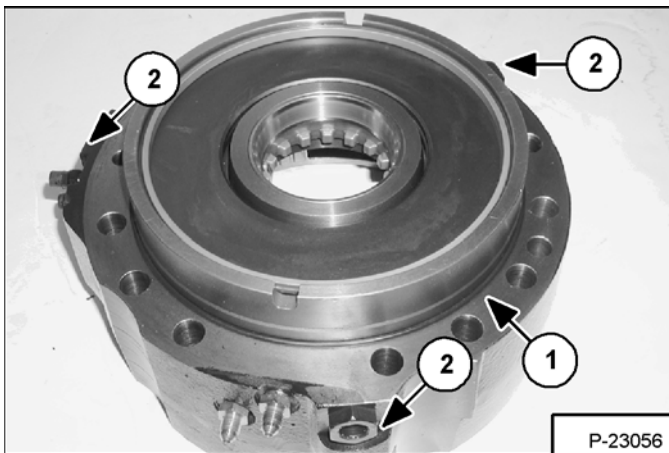
Carefully release press pressure making sure that the split ring is fully seating the housing groove and the retainer ring secures the split ring.

Remove the housing from the press.

AXLE AND DIFFERENTIAL (FRONT) (CONT'D)

Brake Group Assembly (Cont'd)

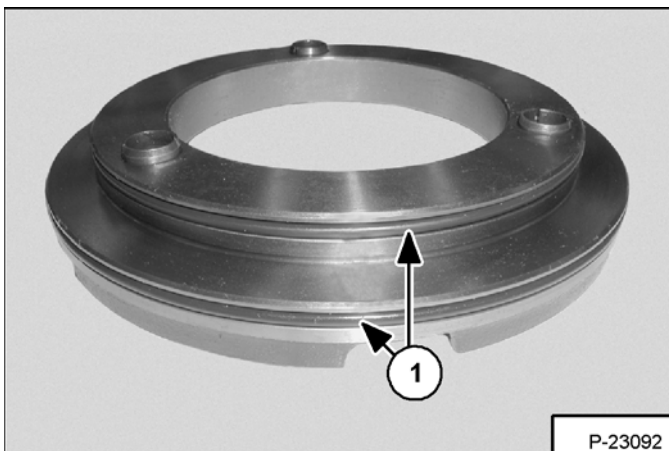
Figure 40-20-146



Install a new O-ring (Item 1) [Figure 40-20-146] on the housing.

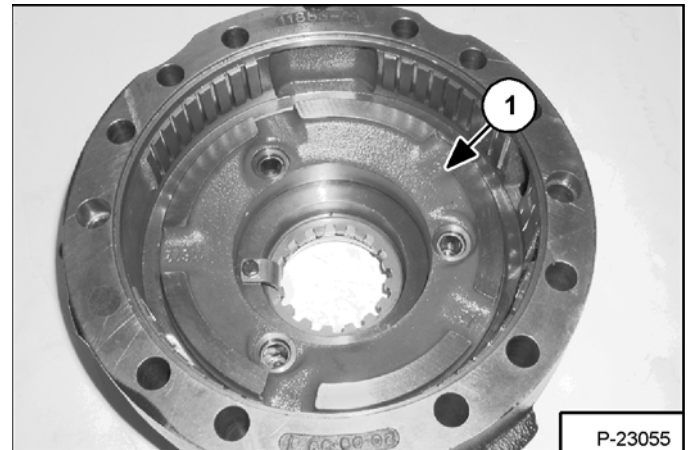
Turn the three brake adjusting screws (Item 2) [Figure 40-20-146] in (clockwise) equally.

Figure 40-20-147



Lightly lubricate and install two new O-rings (Item 1) [Figure 40-20-147] onto the piston.

Figure 40-20-148



Align the holes in the piston and the threaded holes in the housing and install the piston (Item 1) [Figure 40-20-148] into the housing.

Figure 40-20-149

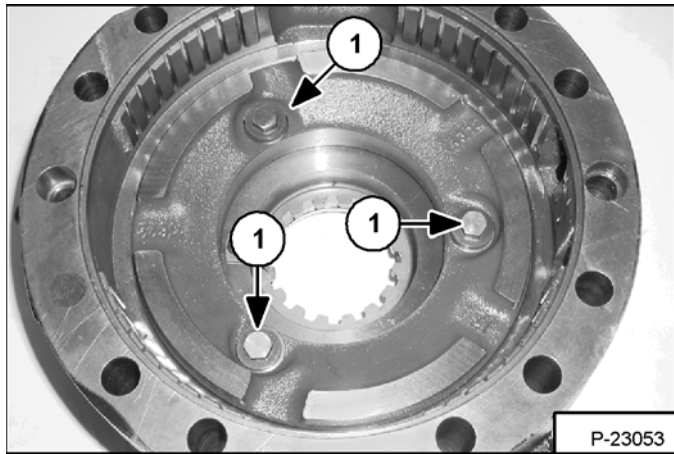


Be sure that the bolt assembly is in the arrangement shown [Figure 40-20-149].

AXLE AND DIFFERENTIAL (FRONT) (CONT'D)

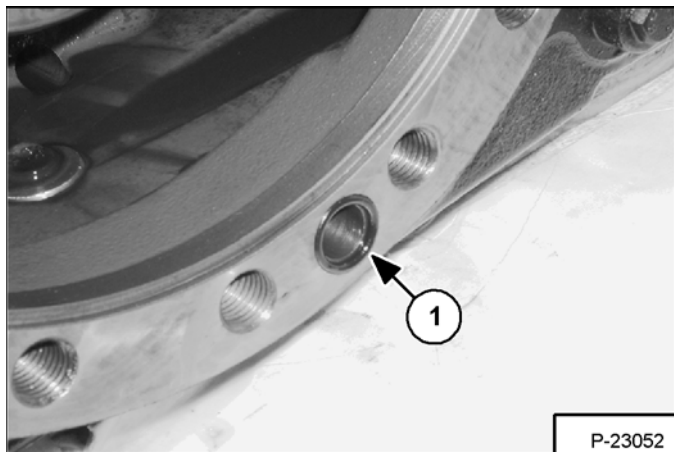
Brake Group Assembly (Cont'd)

Figure 40-20-150



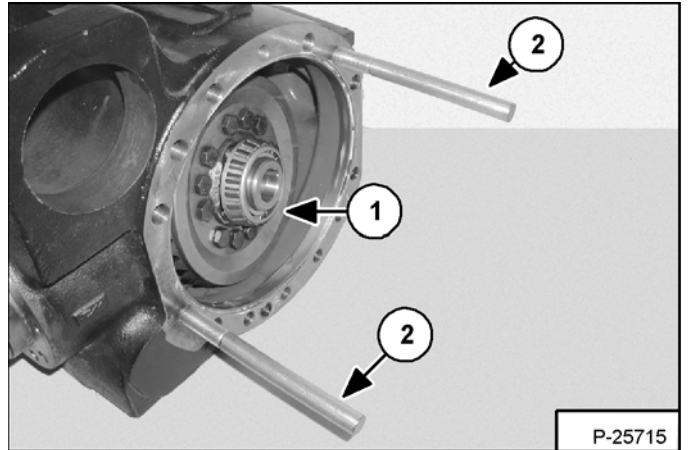
Install the bolt assembly (Item 1) [Figure 40-20-150] into the brake housing and tighten washer to 7 ft.-lbs. (10 Nm) torque.

Figure 40-20-151



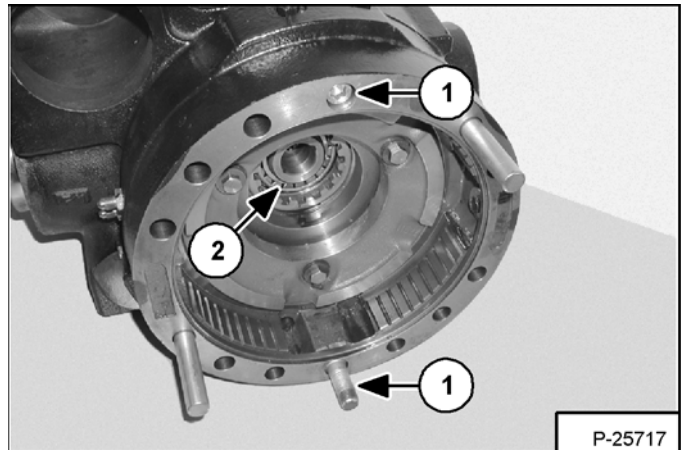
Install a new O-ring (Item 1) [Figure 40-20-151] onto the center housing.

Figure 40-20-152



Set the pinion assembly (Item 1) in the center housing as shown. Install the two guide bolts (Item 2) [Figure 40-20-152].

Figure 40-20-153



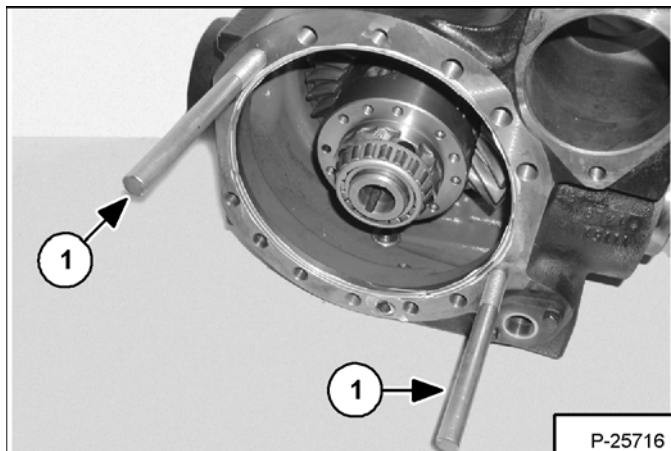
Install the brake housing and two bolts (Item 1) [Figure 40-20-153].

NOTE: Be sure the bearing (Item 2) [Figure 40-20-153] on the pinion gear is aligned with the brake housing race.

AXLE AND DIFFERENTIAL (FRONT) (CONT'D)

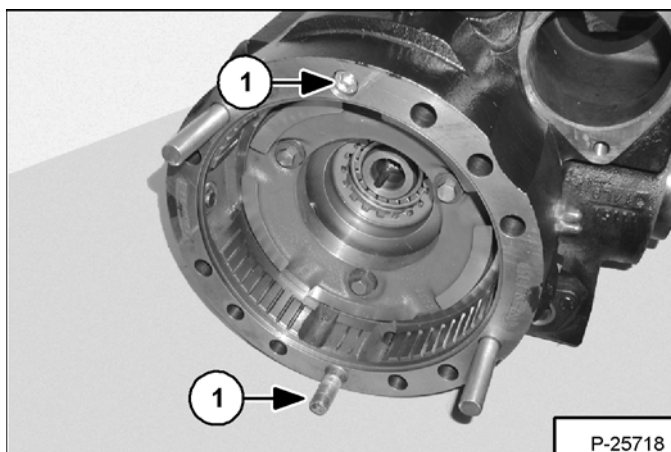
Brake Group Assembly (Cont'd)

Figure 40-20-154



Install the two guide bolts (Item 1) [Figure 40-20-154].

Figure 40-20-155

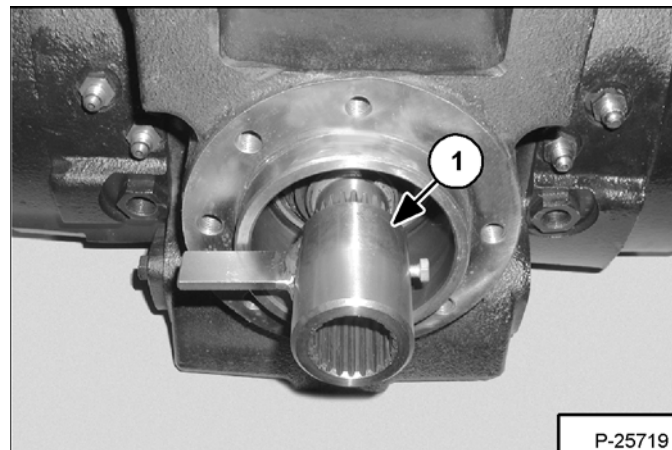


Install the brake housing and two bolts (Item 1) [Figure 40-20-155].

NOTE: Be sure the bearing on the pinion gear is aligned with the brake housing race.

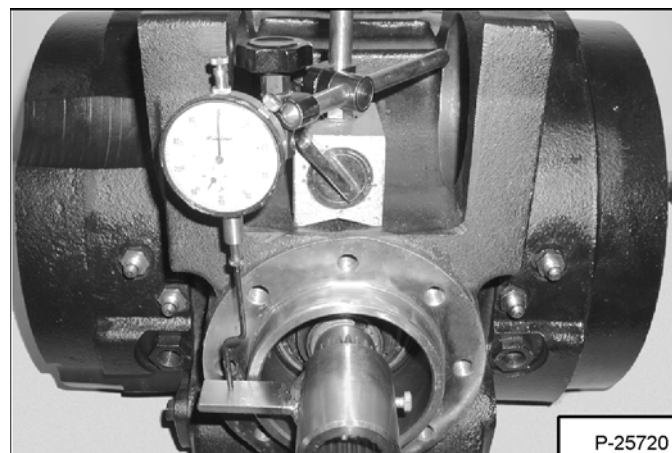
Tighten the upper bolt to 59 ft.-lbs. (80 Nm) and the bottom bolt to 88 ft.-lbs. (120 Nm) torque.

Figure 40-20-156



Install the tool CA715055 (Item 1) on the pinion shaft [Figure 40-20-156].

Figure 40-20-157



Using a dial gauge, move the pinion shaft back and forth and make a note of the backlash between the pinion and ring gear [Figure 40-20-157].

Check that the backlash is within the allowed margins of 0.007 - 0.009 inches (0.18 - 0.23 mm).

AXLE AND DIFFERENTIAL (FRONT) (CONT'D)

Brake Group Assembly (Cont'd)

Figure 40-20-158



Adjusting the lock nuts [Figure 40-20-158]:

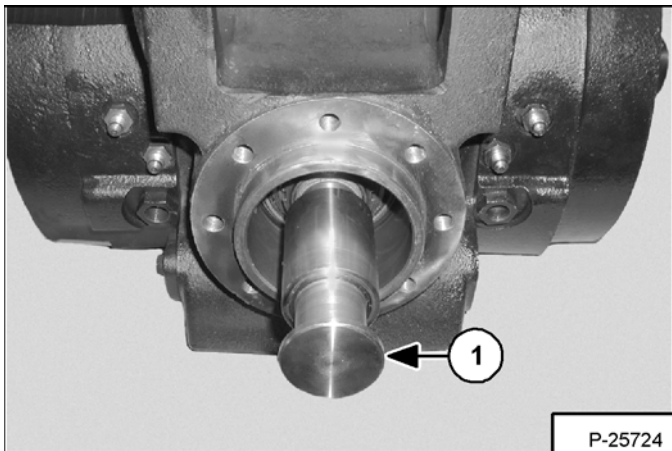
- If the backlash measured is under the permissible range, tighten the lock nut on the side opposite the crown wheel and unscrew the lock nut on the other side by the same amount.

- If the backlash is above the permissible range, tighten the lock nut on the side of the crown wheel and loosen the lock nut on the other side by the same amount.

Once the pinion and ring gear adjustment has been carried out, check that there is at least a minimal preload on the differential cage bearings. If necessary, repeat the steps if backlash is still outside the permissible ranges.

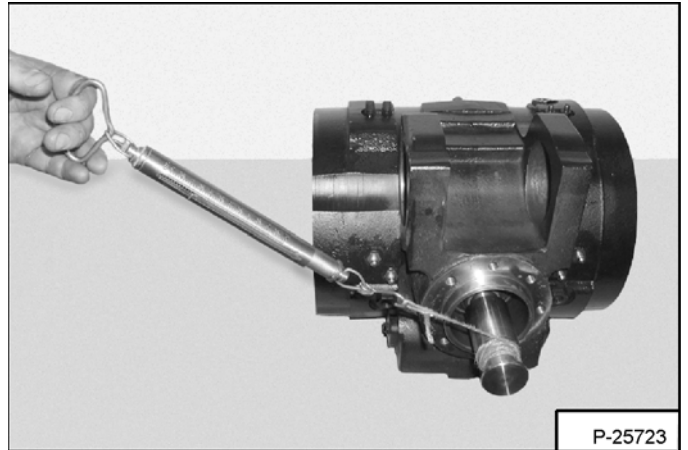
Once the pinion/ring gear backlash has been determined, the total preload of the pinion ring gear wheel bearings must be measured, to verify that it falls within the permissible limits.

Figure 40-20-159



Install the special tool CA715116 (Item 1) [Figure 40-20-159] onto the pinion shaft.

Figure 40-20-160

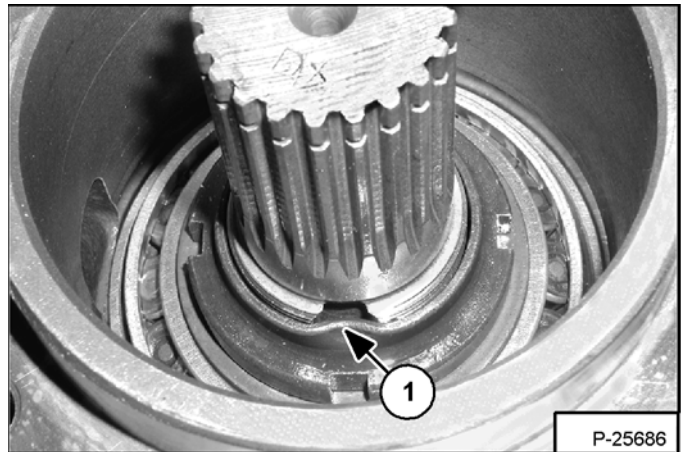


Attach one end of a light rope to the special tool and make 2 or 3 wraps around the tool. Attach the spring scale to the opposite end of the rope. Pull the scale perpendicular to the housing to measure the rolling torque on the bearings. The value is 2 - 3 lbs. (0.9 to 1.4 Kg) [Figure 40-20-160].

- If the total preload is under the permissible range, tighten the two lock nuts by same amount, retaining the value of the pinion ring gear backlash.

- If the total preload is above the permissible range, slacken the two lock nuts by the same amount, retaining the value of the pinion ring gear backlash.

Figure 40-20-161

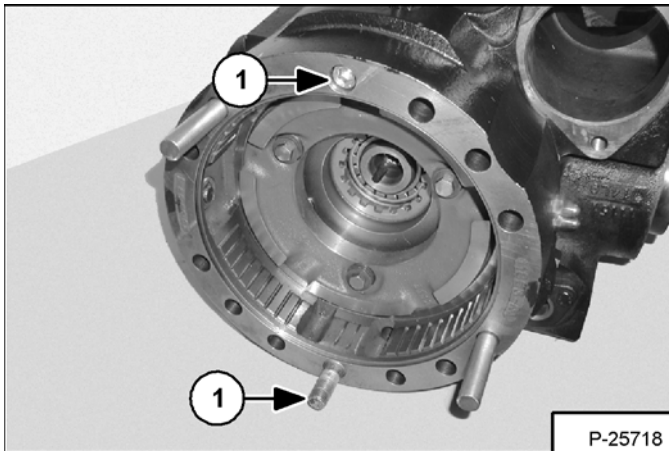


Stake the lock nut (Item 1) [Figure 40-20-161] on the pinion.

AXLE AND DIFFERENTIAL (FRONT) (CONT'D)

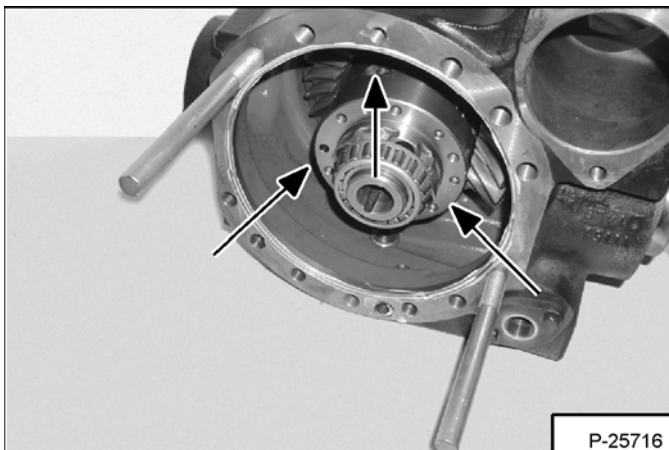
Brake Group Assembly (Cont'd)

Figure 40-20-162



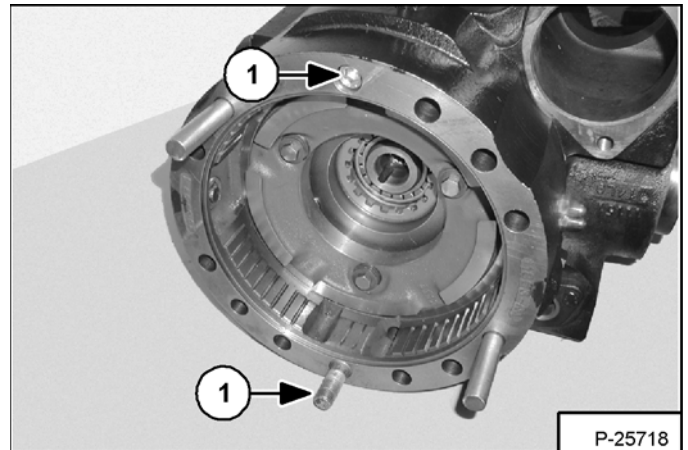
Temporarily remove the brake housing bolts (Item 1) [Figure 40-20-162] opposite from the ring gear. Remove the brake housing.

Figure 40-20-163



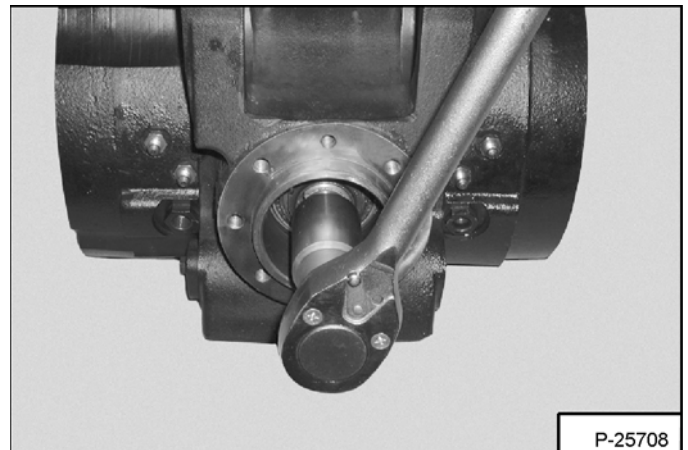
Use colored lead and brush to paint 3 or 4 teeth of the ring gear in three opposite places [Figure 40-20-163].

Figure 40-20-164



Temporarily install the brake housing and bolts (Item 1) [Figure 40-20-164].

Figure 40-20-165



Turn the pinion using the special tool CA715022 several turns [Figure 40-20-165].

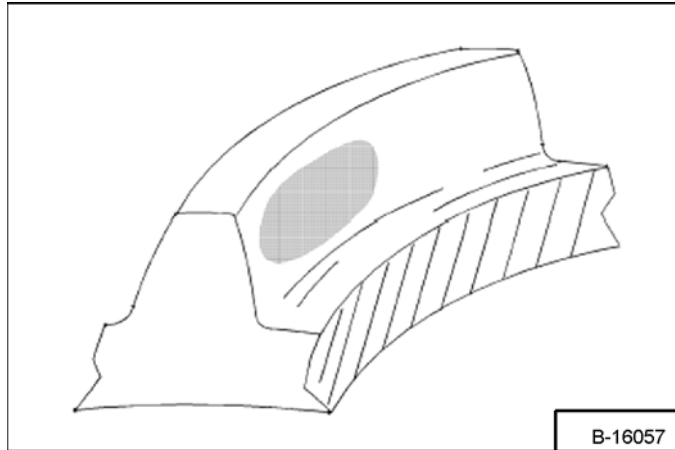
Remove the brake housing [Figure 40-20-162].

AXLE AND DIFFERENTIAL (FRONT) (CONT'D)

Brake Group Assembly (Cont'd)

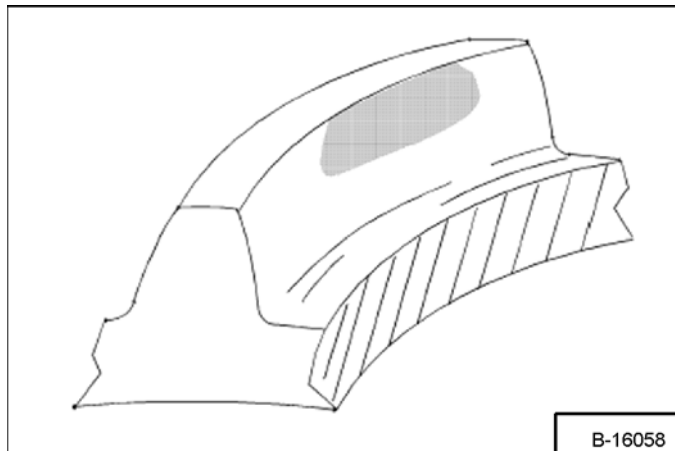
Check the wear pattern of the pinion/ring gear teeth.

Figure 40-20-166



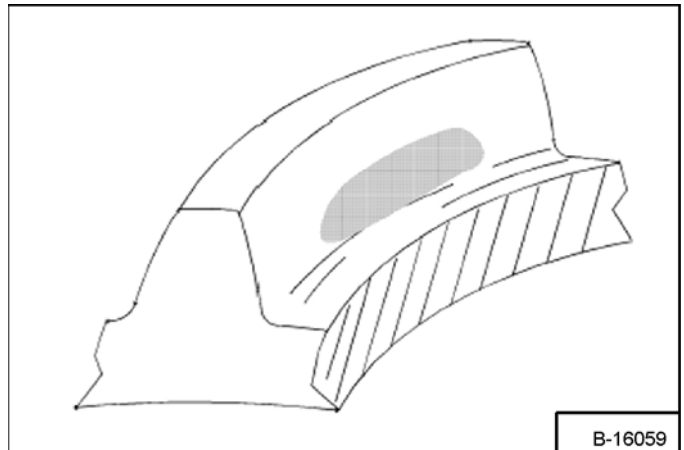
Correct Pattern - If pinion/ring gear has been properly adjusted, wear pattern (contact) should be shown [Figure 40-20-166].

Figure 40-20-167



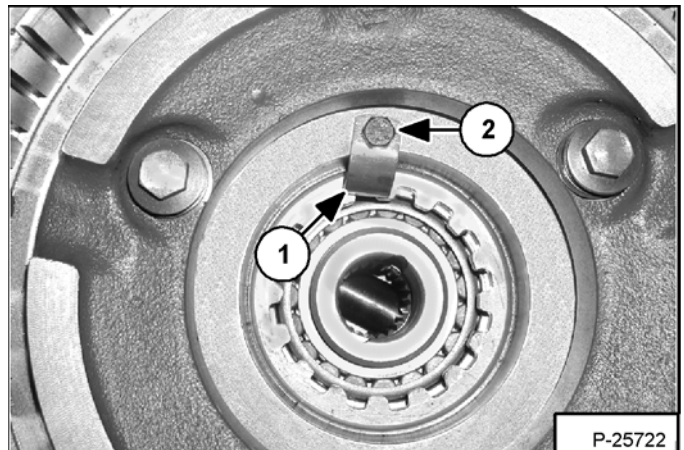
Excessive contact on tooth edge - adjust the backlash [Figure 40-20-167].

Figure 40-20-168



Excessive contact on flank of tooth - adjust the backlash [Figure 40-20-168].

Figure 40-20-169

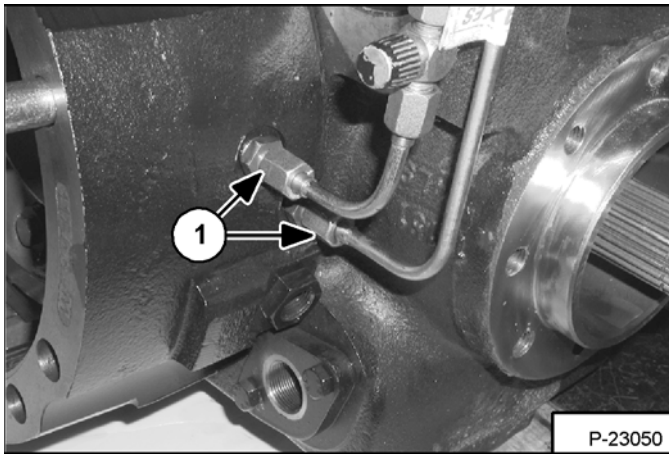


Once the wear pattern is correct, install the lock nut retainer (Item 1) and bolt (Item 2) [Figure 40-20-169] tighten the bolt to 10 ft.-lbs. (13 Nm) torque.

AXLE AND DIFFERENTIAL (FRONT) (CONT'D)

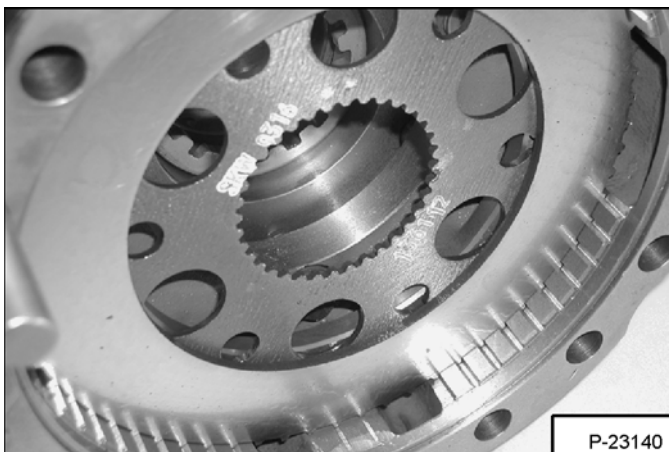
Brake Group Assembly (Cont'd)

Figure 40-20-170



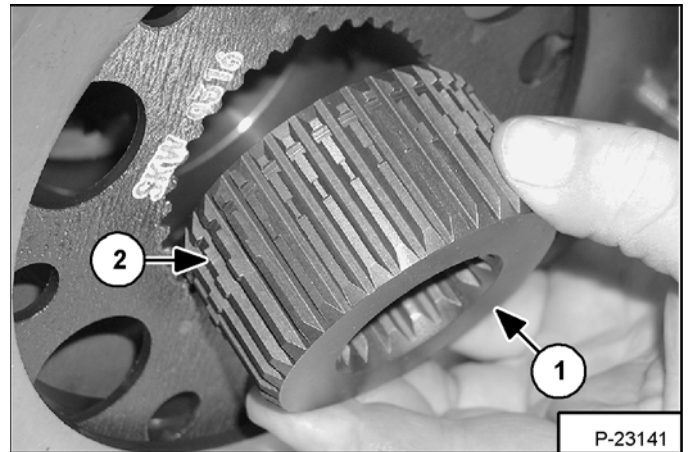
Install the two tubelines (Item 1) [Figure 40-20-170].

Figure 40-20-171



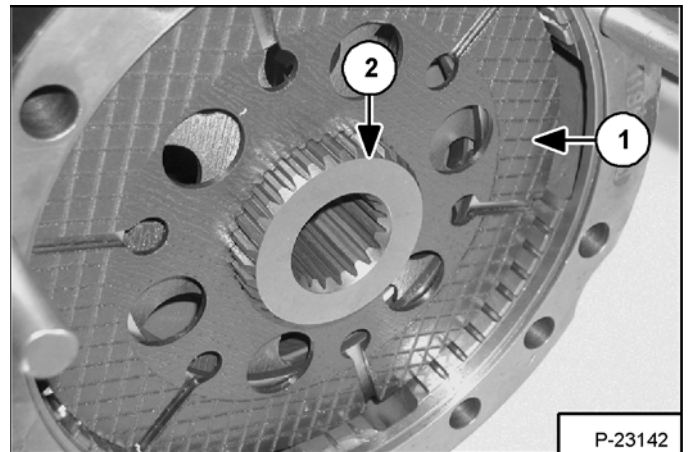
Install the thick spacer plate into the grooves in the brake housing followed by a friction plate and a thin spacer plate [Figure 40-20-71].

Figure 40-20-172



Install the coupler (Item 1) [Figure 40-20-172] in the friction plate.

Figure 40-20-173



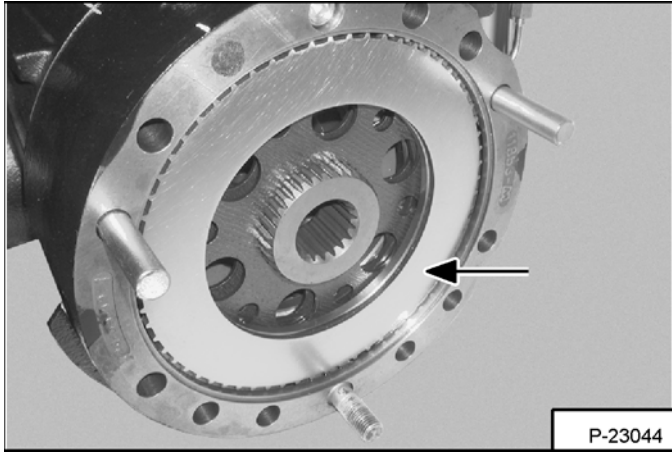
Note the position of the groove (Item 2) [Figure 40-20-173] in the coupler.

Install the second friction plate (Item 1) onto the coupler (Item 2) [Figure 40-20-173].

AXLE AND DIFFERENTIAL (FRONT) (CONT'D)

Brake Group Assembly (Cont'd)

Figure 40-20-174



Install the second thick spacer plate followed by the thin spacer plate [Figure 40-20-174].

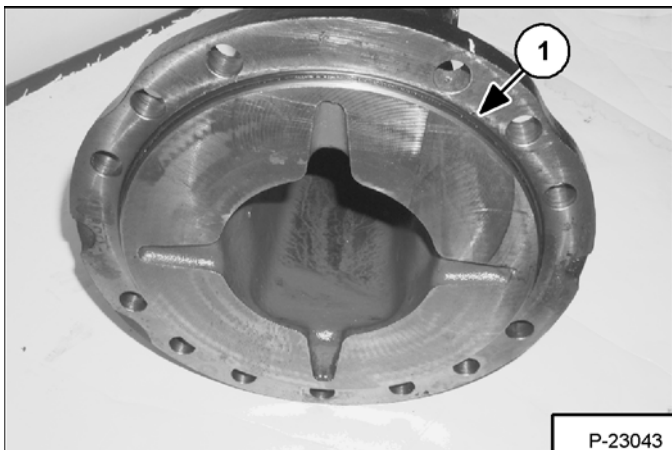
Axle Housing/Drive Axle Assembly

Clean all parts in solvent and dry with compressed air.

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

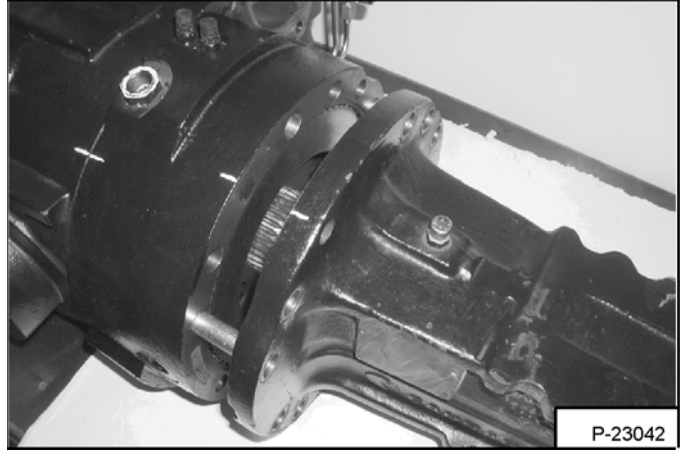
Always install new seals and O-rings. Lubricate all seals and O-rings with clean hydraulic fluid before installation.

Figure 40-20-175



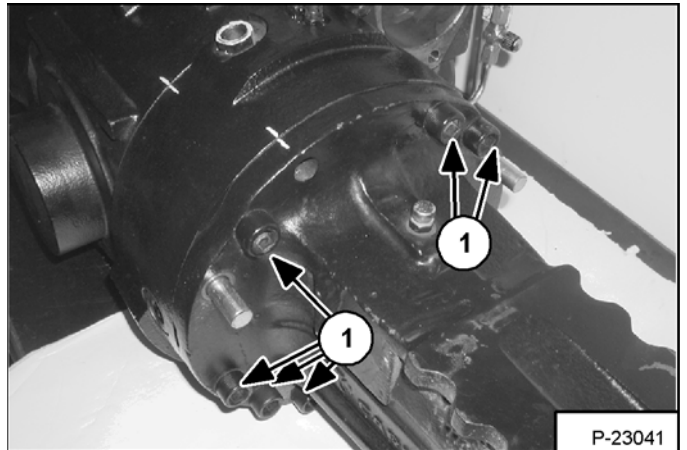
Install a new O-ring (Item 1) [Figure 40-20-175] on the axle housing.

Figure 40-20-176



Install the axle housing onto the brake housing by sliding on the alignment pins [Figure 40-20-176].

Figure 40-20-177

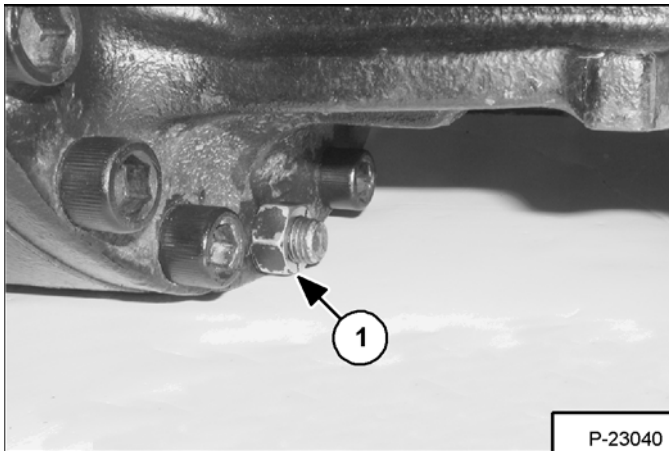


Install and tighten the mounting bolts (Item 1) [Figure 40-20-177].

AXLE AND DIFFERENTIAL (FRONT) (CONT'D)

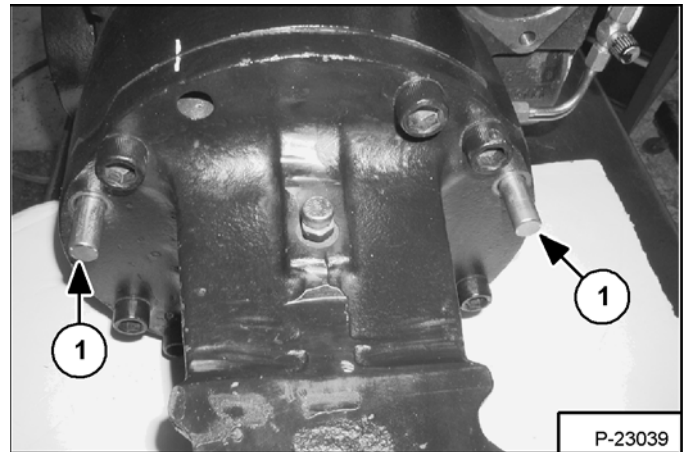
Axle Housing/Drive Axle Assembly (Cont'd)

Figure 40-20-178



Install the nut (Item 1) **[Figure 40-20-178]** to the stud on the bottom of the housing. Tighten to 140 ft.-lbs. (190 Nm) torque.

Figure 40-20-179

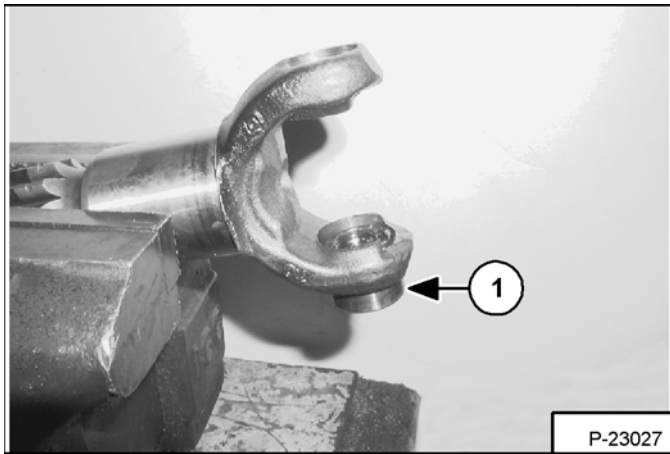


Remove the two alignment bolts (Item 1) **[Figure 40-20-179]**, install the two remaining bolts, tighten all bolts to 236 ft.-lbs. (320 Nm) torque.

AXLE AND DIFFERENTIAL (FRONT) (CONT'D)

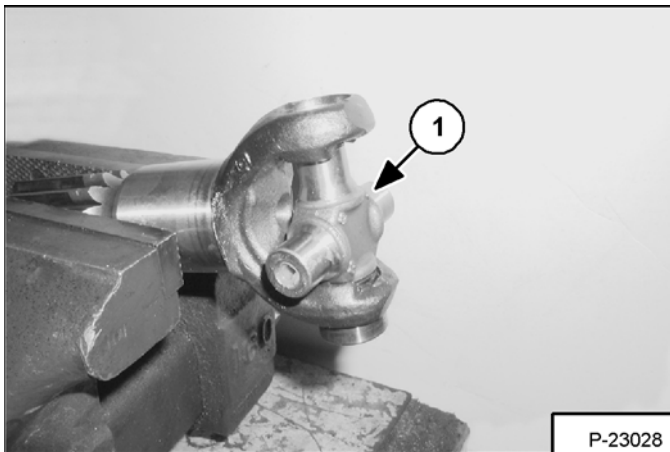
Axle Housing/Drive Axle Assembly (Cont'd)

Figure 40-20-180



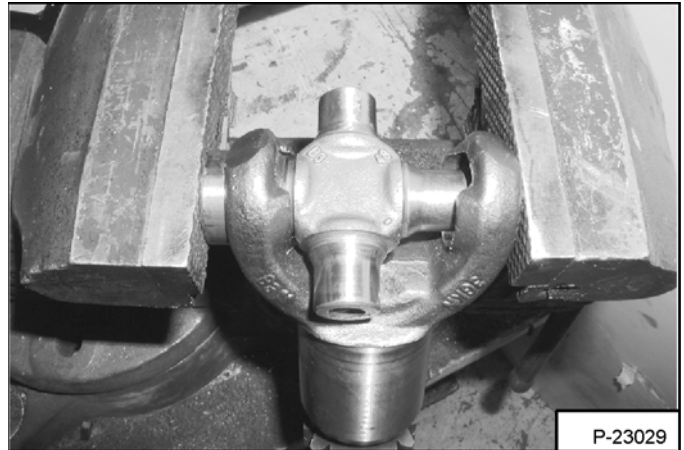
Partially install a new bearing cup (Item 1) [Figure 40-20-180] into the yoke.

Figure 40-20-181



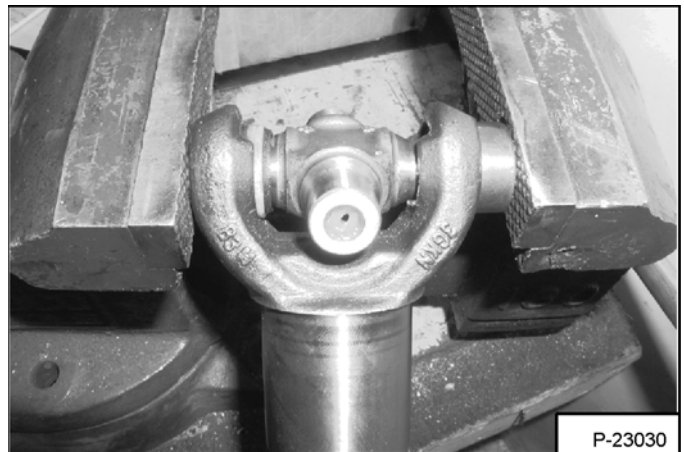
Install the cross (Item 1) [Figure 40-20-181] into the bearing cup.

Figure 40-20-182



Press the bearing cup into the yoke [Figure 40-20-182].

Figure 40-20-183



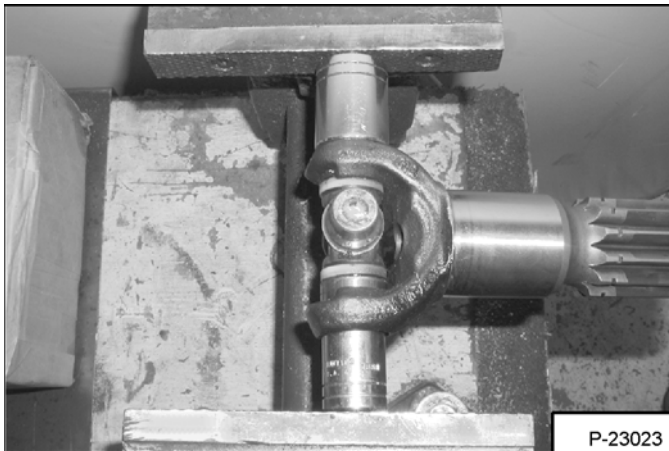
Install the second bearing cup into the yoke and press onto the cross [Figure 40-20-183].

NOTE: Use care not to lose or drop any needle bearings out of position.

AXLE AND DIFFERENTIAL (FRONT) (CONT'D)

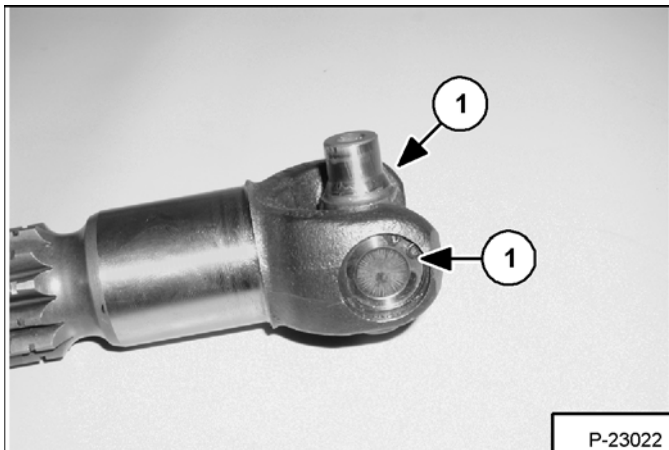
Axle Housing/Drive Axle Assembly (Cont'd)

Figure 40-20-184



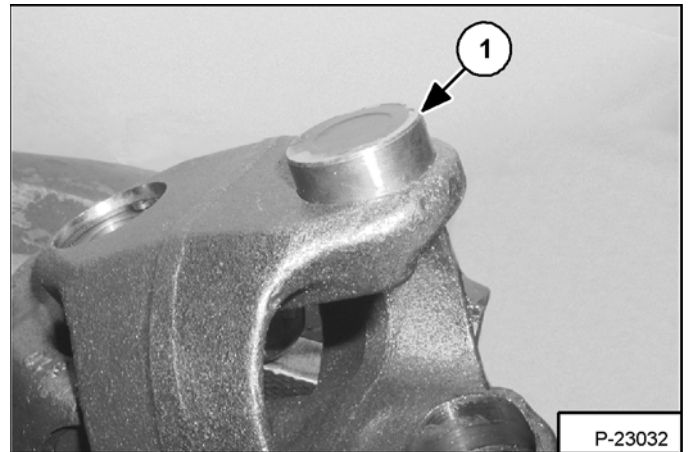
Fully press the two bearing cups into the drive shaft yoke [Figure 40-20-184].

Figure 40-20-185



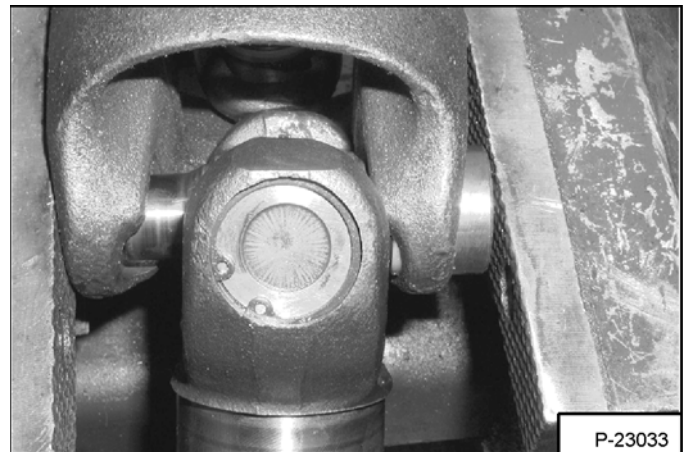
Install the two snap rings (Item 1) [Figure 40-20-185].

Figure 40-20-186



Partially install a new bearing cup (Item 1) [Figure 40-20-186] into the yoke.

Figure 40-20-187

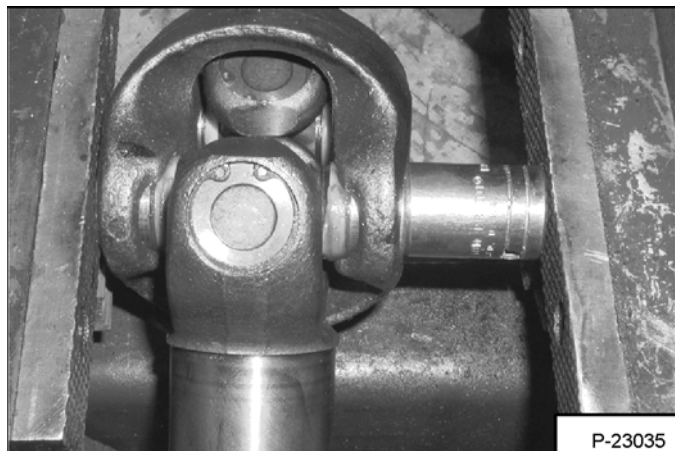


Install the cross/shaft assembly into the bearing cup [Figure 40-20-187].

AXLE AND DIFFERENTIAL (FRONT) (CONT'D)

Axle Housing/Drive Axle Assembly (Cont'd)

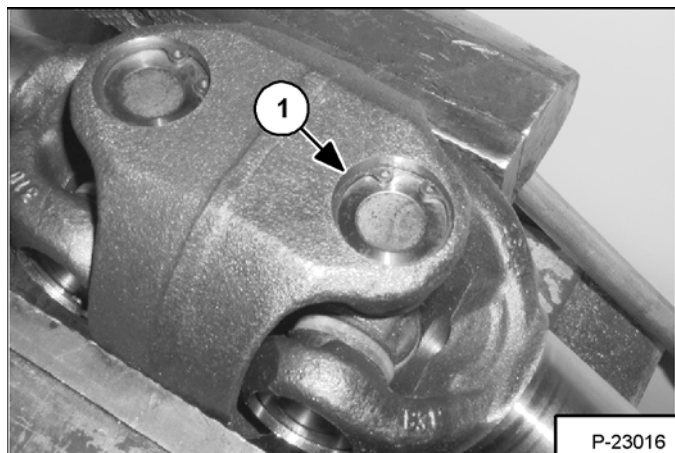
Figure 40-20-188



Install the second bearing cup into the yoke and press onto the cross [Figure 40-20-188].

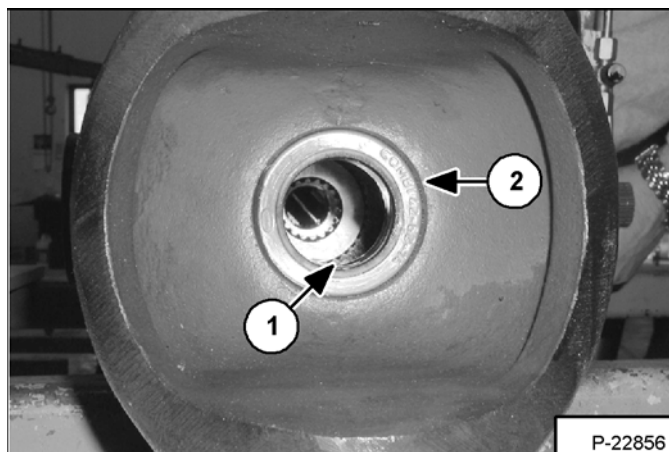
NOTE: Use care not to lose or drop any needle bearings out of position.

Figure 40-20-189



Make sure the bearing cups are fully seated and install both snap rings [Figure 40-20-189].

Figure 40-20-190



Install a new bushing (Item 1) and seal (Item 2) [Figure 40-20-190] into the axle housing.

Lightly lubricate the new seal and bushing.

Figure 40-20-191



Install the drive axle into the axle housing aligning the shaft with the splines.

NOTE: Use care not to damage the seal.

AXLE AND DIFFERENTIAL (FRONT) (CONT'D)

Steering Knuckle Assembly

Clean all parts in solvent and dry with compressed air.

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

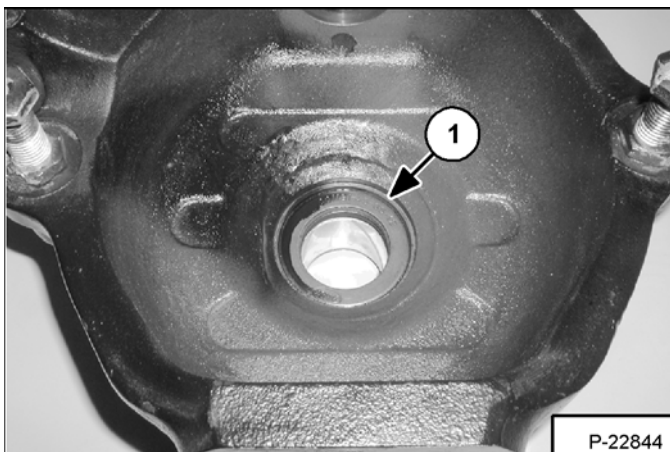
Always install new seals and O-rings. Lubricate all seals and O-rings with clean hydraulic fluid before installation.

Figure 40-20-192



Install the bushing (Item 1) [Figure 40-20-192] into the knuckle housing.

Figure 40-20-193



Install a new seal (Item 1) [Figure 40-20-193] into the knuckle housing.

Figure 40-20-194

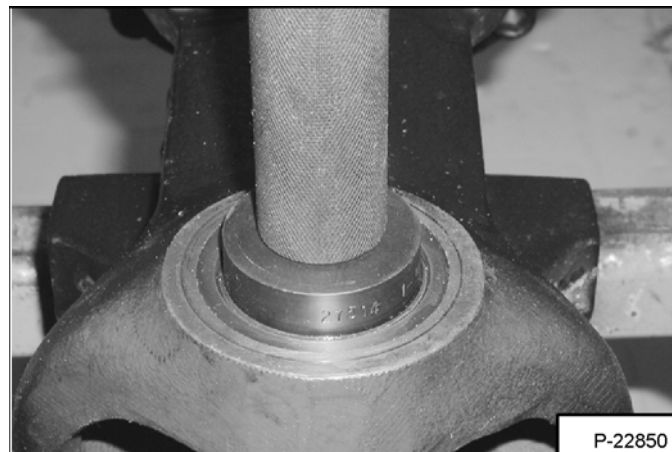


Figure 40-20-195



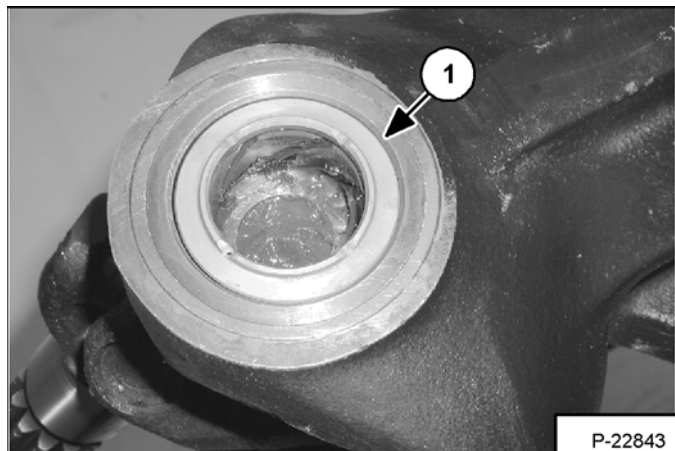
Install the bushings into the top and bottom of the axle [Figure 40-20-194] & [Figure 40-20-195].

NOTE: The cupped bushing goes on the bottom.

AXLE AND DIFFERENTIAL (FRONT) (CONT'D)

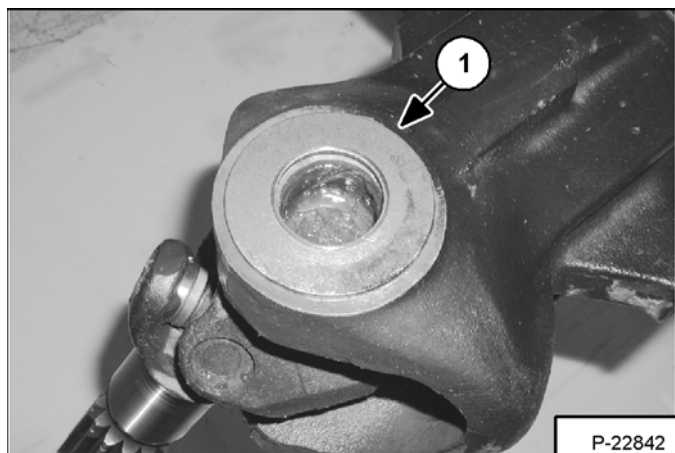
Steering Knuckle Assembly (Cont'd)

Figure 40-20-196



Install the spacer washer (Item 1) [Figure 40-20-196] on the top bushing.

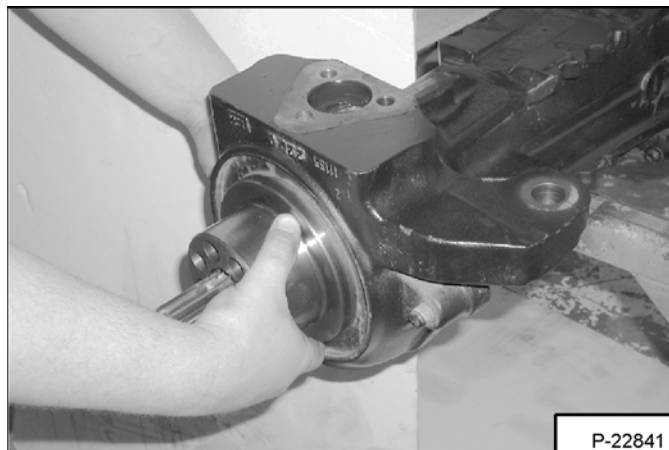
Figure 40-20-197



Install the Belleville washers (Item 1) [Figure 40-20-197] on the top and bottom bushing.

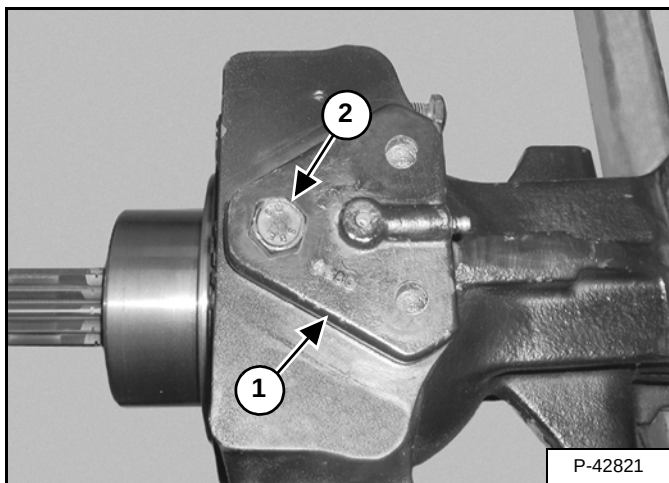
NOTE: The larger Belleville washer is on top.

Figure 40-20-198



Install the knuckle assembly onto the axle [Figure 40-20-198].

Figure 40-20-199

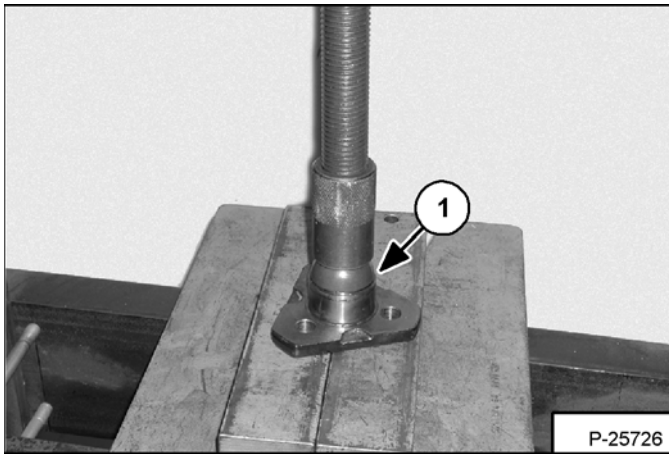


Install the upper king pin (Item 1) and bolt (Item 2) [Figure 40-20-199]. Tighten to 140 ft.-lbs. (190 Nm) torque.

AXLE AND DIFFERENTIAL (FRONT) (CONT'D)

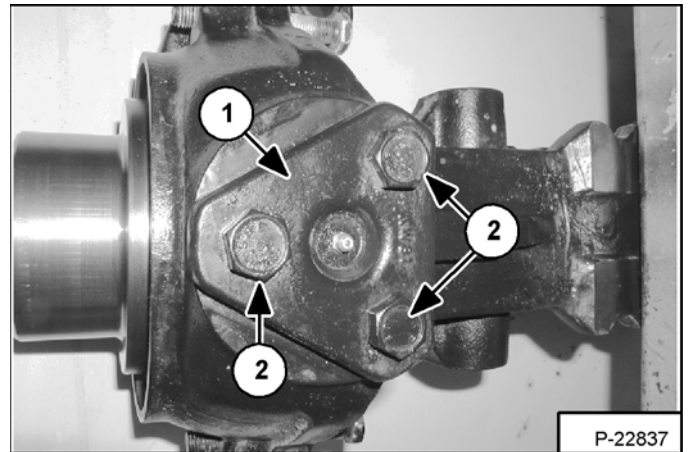
Steering Knuckle Assembly (Cont'd)

Figure 40-20-200



Place the lower king pin in a vise or press and install the ball bearing (Item 1) **[Figure 40-20-200]** onto the king pin shaft until it is fully seated.

Figure 40-20-201



Install the lower king pin (Item 1) and three bolts (Item 2) **[Figure 40-20-201]**. Tighten to 140 ft.-lbs. (190 Nm) torque.

Lubricate the upper and lower king pins.

AXLE AND DIFFERENTIAL (FRONT) (CONT'D)

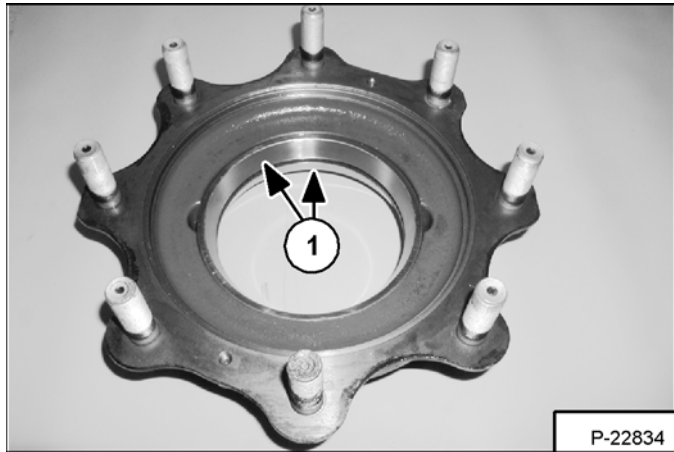
Wheel Hub Assembly

Clean all parts in solvent and dry with compressed air.

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

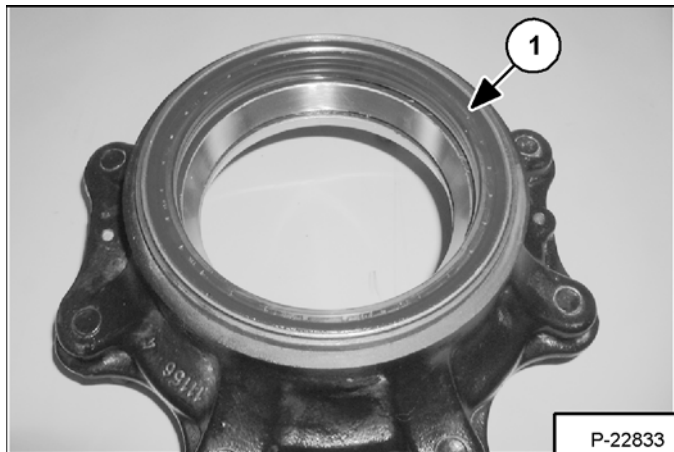
Always install new seals and O-rings. Lubricate all seals and O-rings with clean hydraulic fluid before installation.

Figure 40-20-202



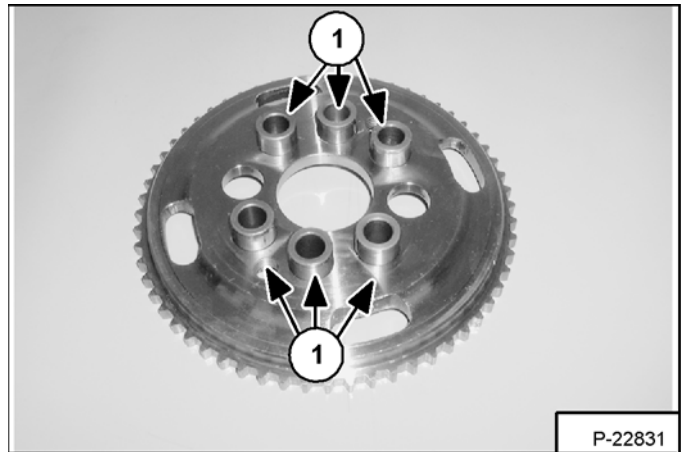
Install both bearing races (Item 1) [Figure 40-20-202] into the hub.

Figure 40-20-203



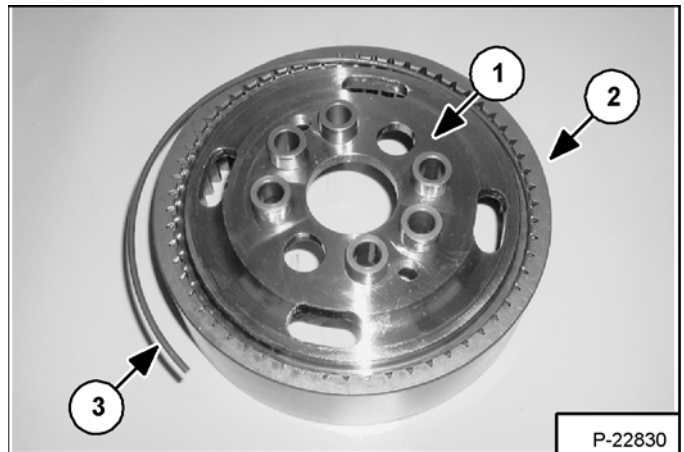
Lightly lubricate the seal (Item 1) [Figure 40-20-203] and install into the hub.

Figure 40-20-204



Install the six bushings (Item 1) [Figure 40-20-204] into the gear.

Figure 40-20-205



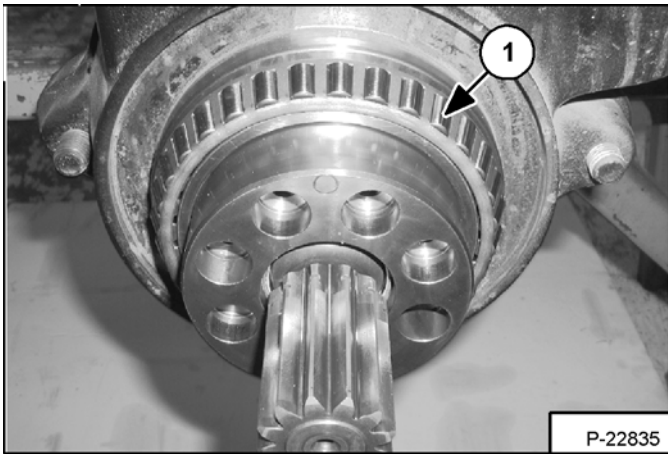
Install the gear (Item 1) into the ring gear (Item 2) [Figure 40-20-205].

Install the retainer ring (Item 3) [Figure 40-20-205] into the groove in the ring gear.

AXLE AND DIFFERENTIAL (FRONT) (CONT'D)

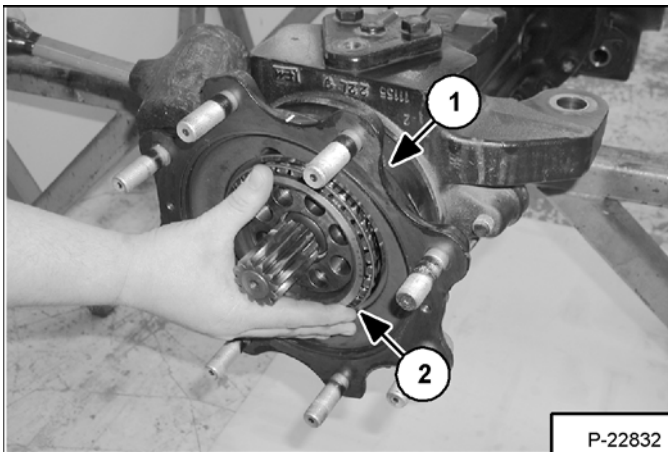
Wheel Hub Assembly (Cont'd)

Figure 40-20-206



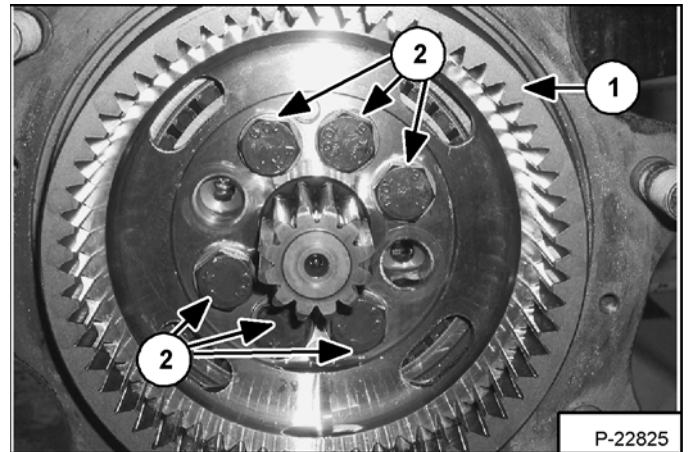
Install the inner bearing (Item 1) [Figure 40-20-206] onto the steering knuckle.

Figure 40-20-207



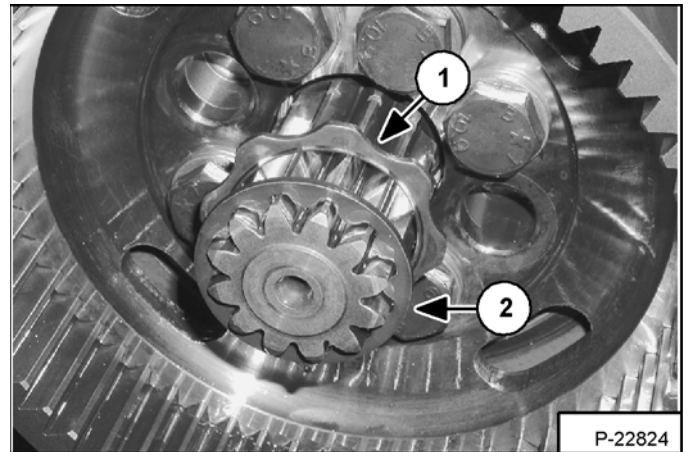
Install the hub assembly (Item 1) and outer bearing (Item 2) [Figure 40-20-207] onto the steering knuckle.

Figure 40-20-208



Install the ring gear assembly (Item 1) onto the steering knuckle. Install the six mounting bolts (Item 2) [Figure 40-20-208] and tighten to 88 ft.-lbs. (120 Nm) torque.

Figure 40-20-209

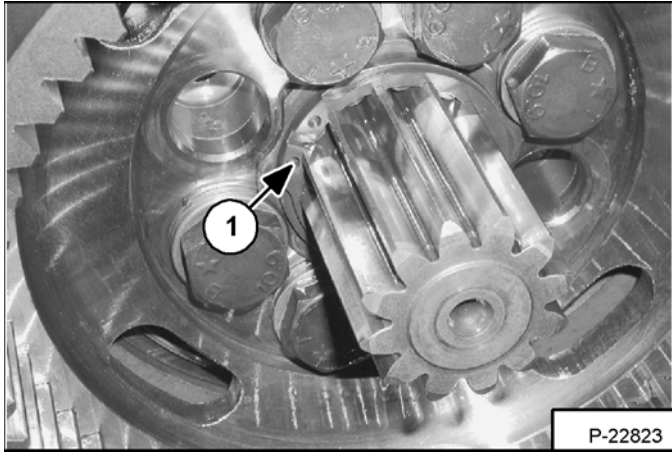


Install the spacer (Item 1) and thrust washer (Item 2) [Figure 40-20-209] on the axle shaft.

AXLE AND DIFFERENTIAL (FRONT) (CONT'D)

Wheel Hub Assembly (Cont'd)

Figure 40-20-210



Install the snap ring (Item 1) [Figure 40-20-210] onto the axle shaft.

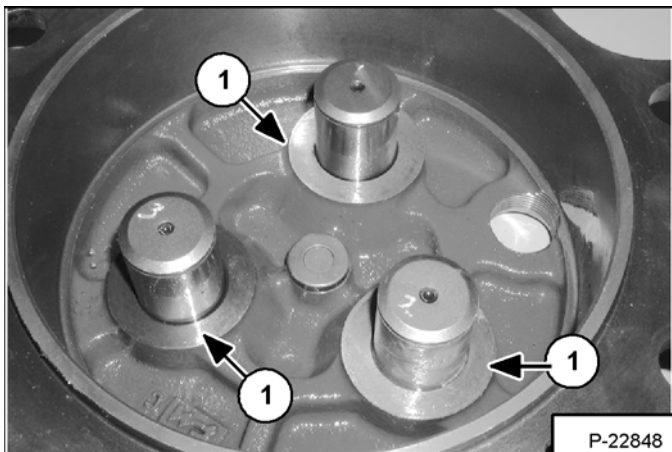
Planetary Carrier Assembly

Clean all parts in solvent and dry with compressed air.

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

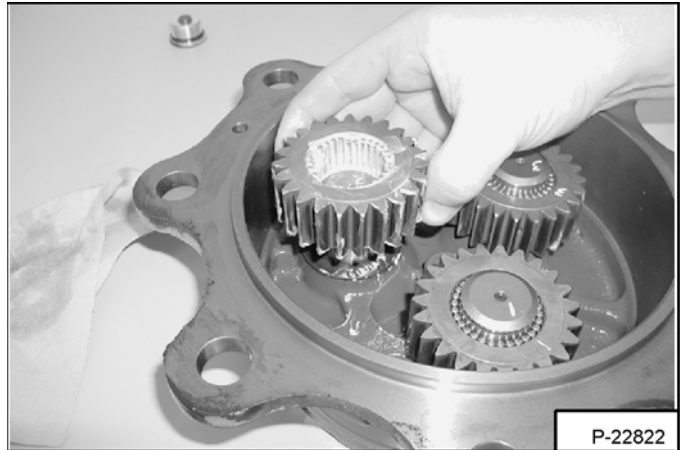
Always install new seals and O-rings. Lubricate all seals and O-rings with clean hydraulic fluid before installation.

Figure 40-20-211



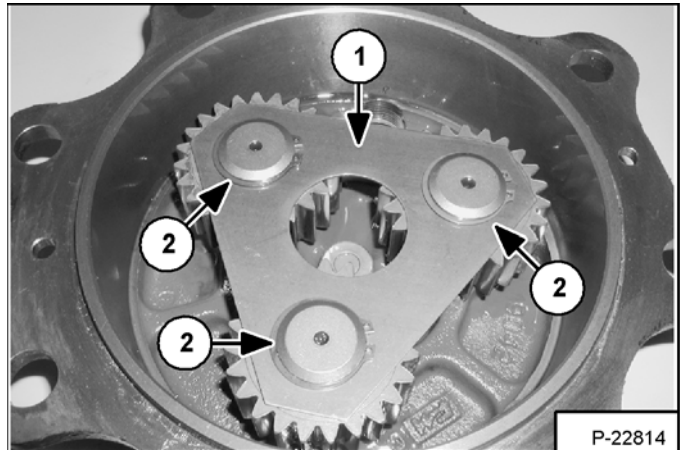
Install the thrust washers (Item 1) [Figure 40-20-11] onto the shafts.

Figure 40-20-212



Using grease to hold the needle bearings in position, install the gears onto the shaft [Figure 40-20-212].

Figure 40-20-213

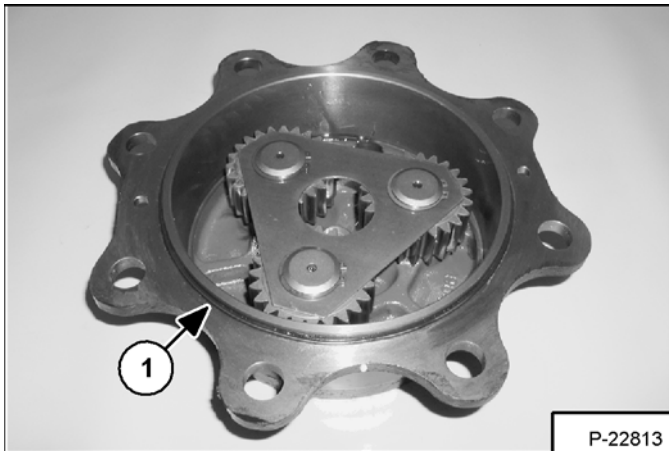


Install the thrust plate (Item 1) [Figure 40-20-213] and snap rings (Item 2) [Figure 40-20-213].

AXLE AND DIFFERENTIAL (FRONT) (CONT'D)

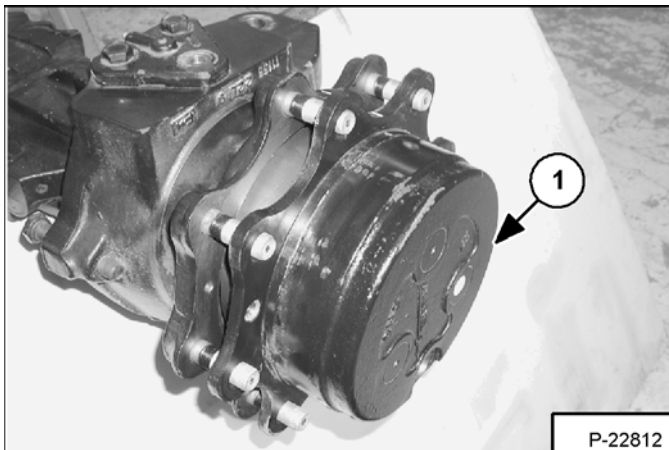
Planetary Carrier Assembly (Cont'd)

Figure 40-20-214



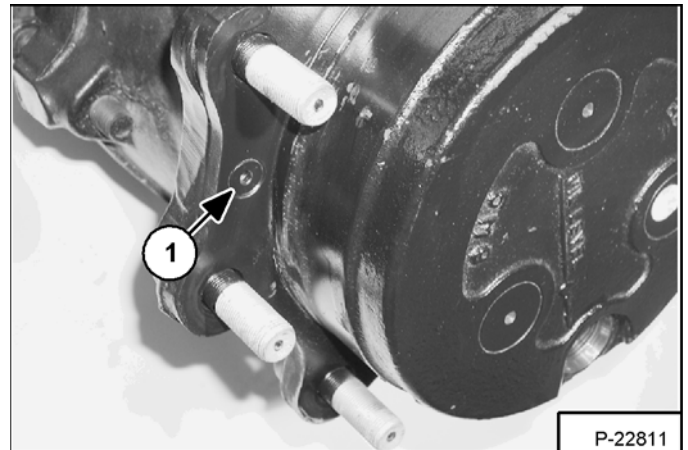
Install a new O-ring (Item 1) [Figure 40-20-214] onto the planetary carrier.

Figure 40-20-215



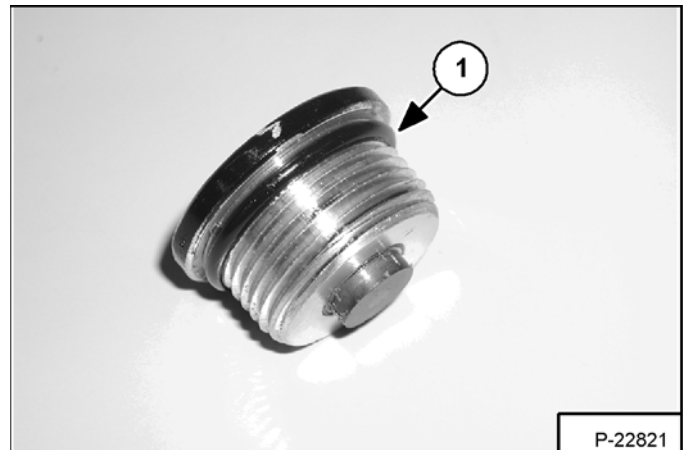
Install the planetary carrier (Item 1) [Figure 40-20-215].

Figure 40-20-216



Install the two screws (Item 1) [Figure 40-20-216] and tighten to 18 ft.-lbs. (25 Nm) torque.

Figure 40-20-217



Install a new O-ring (Item 1) [Figure 40-20-217] onto the drain plug.

(See Contents Page 10-01) for filling the axle assembly with fluid.

AXLE AND DIFFERENTIAL (REAR)

General Information

For photo clarity, the following axle procedures are done with the complete axle assembly removed from the machine, although the planetary carrier, wheel hub, steering knuckle and drive axle procedures may be done

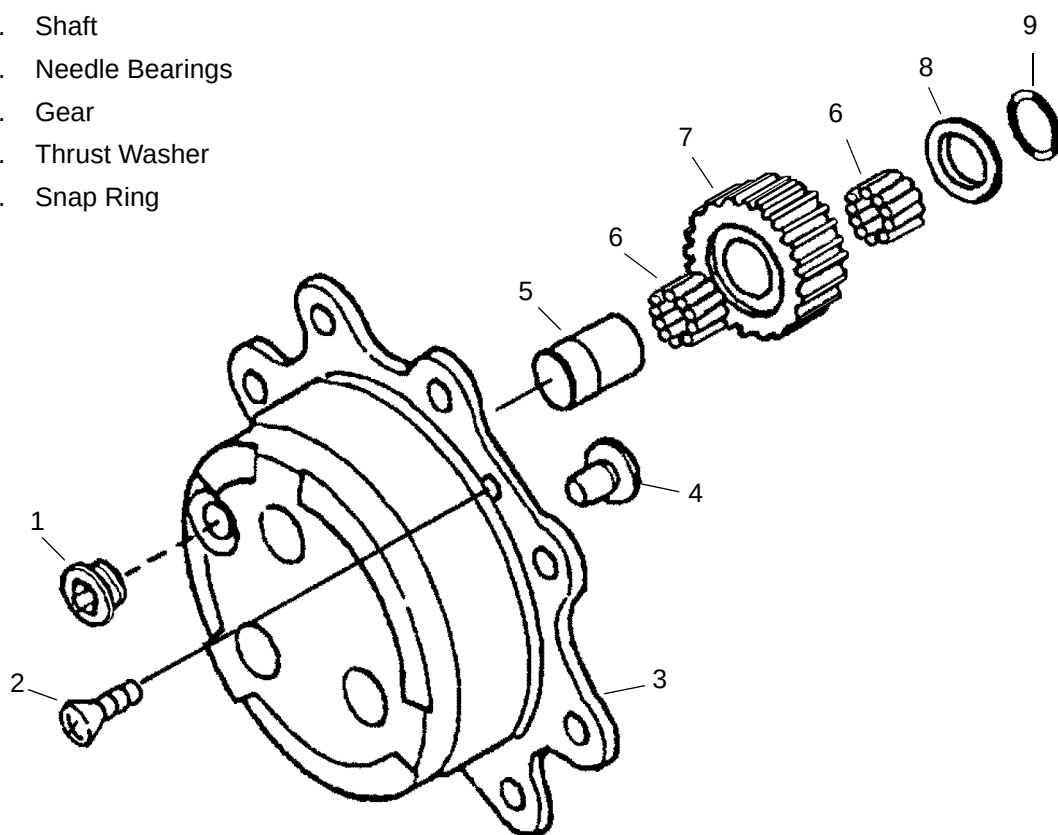
with the axle assembly installed in the machine. For complete axle repair, the following must be done.

Rear Axle removal. (See Content Page 40-01.)

Rear steering cylinder removal. (See Content Page 20-01.)

Planetary Carrier Parts Identification

1. Plug
2. Bolt
3. Planetary Carrier
4. Thrust Pin
5. Shaft
6. Needle Bearings
7. Gear
8. Thrust Washer
9. Snap Ring



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AXLE AND DIFFERENTIAL (REAR) (CONT'D)

Planetary Carrier Disassembly

Clean the outside of the planetary carrier before disassembly.

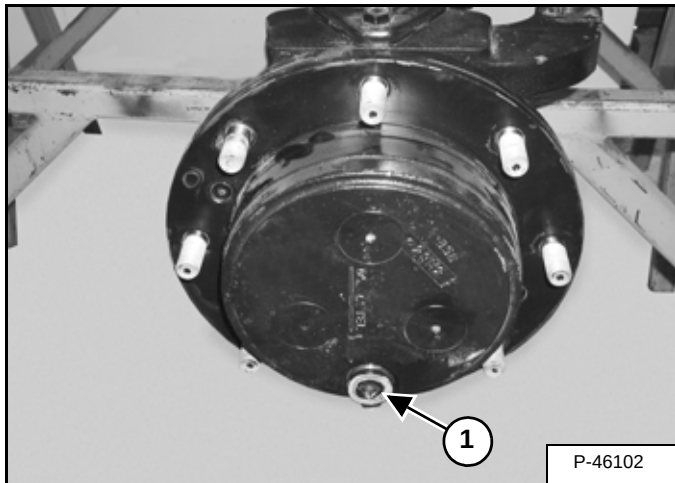
Mark the outside of the planetary carrier for ease of assembly.

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.

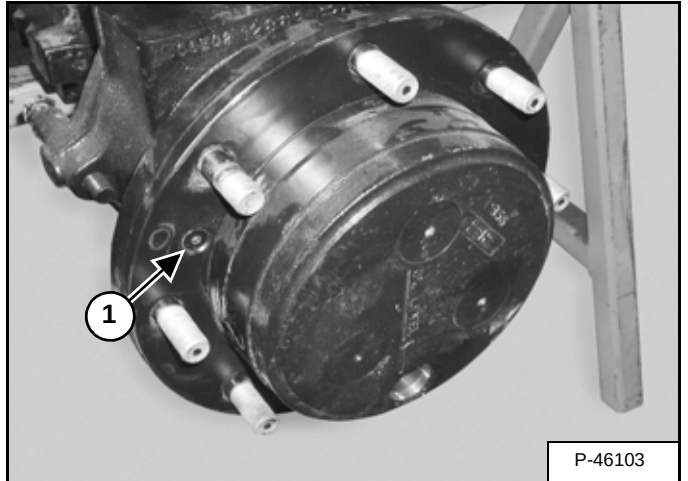
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Figure 40-21-1



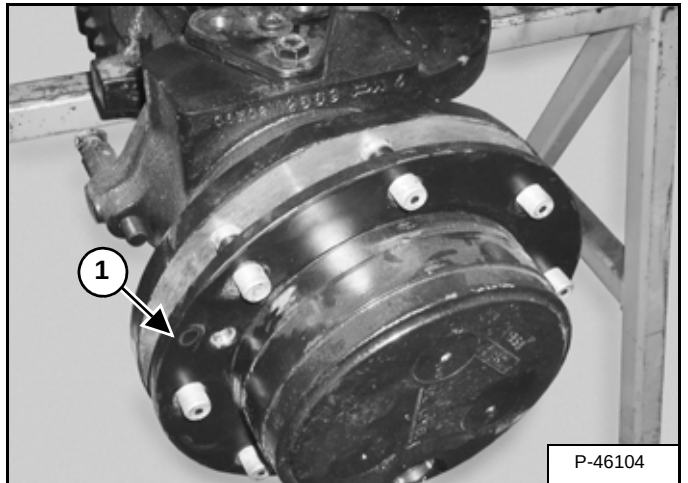
With the drain plug (Item 1) [Figure 40-21-1] in the position shown, place a drain pan under the hub, remove the plug and drain the oil from the planetary carrier. Dispose of the oil in an environmentally safe manner. (Both sides)

Figure 40-21-2



Remove the two screws (Item 1) [Figure 40-21-2] from the planetary carrier. (Both sides)

Figure 40-21-3

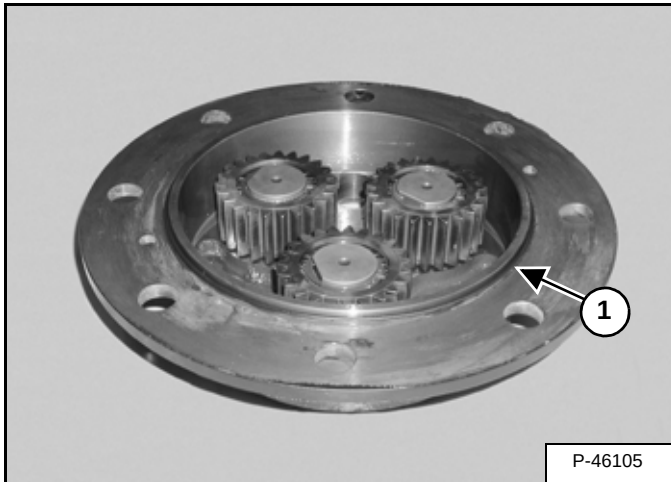


Remove the planetary carrier (Item 1) [Figure 40-21-3] from the axle. (Both sides)

AXLE AND DIFFERENTIAL (REAR) (CONT'D)

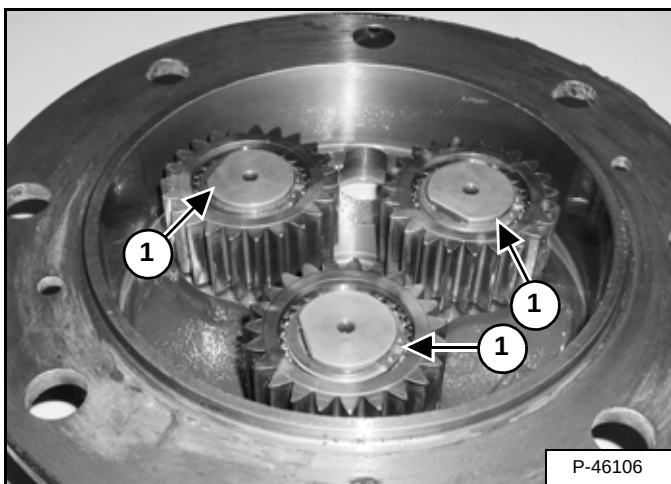
Planetary Carrier Disassembly (Cont'd)

Figure 40-21-4



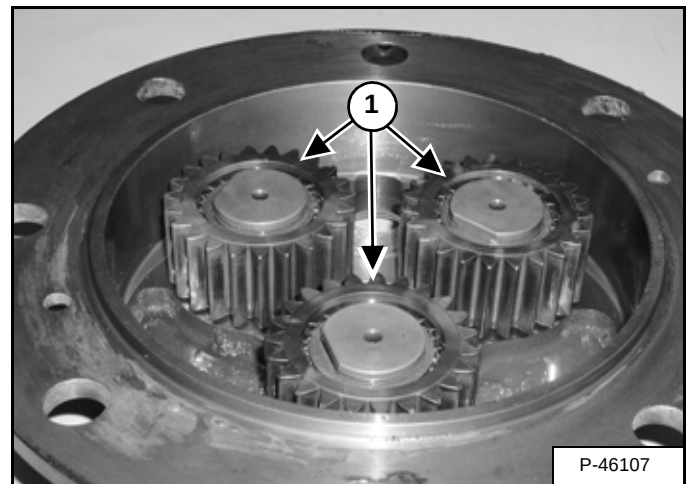
Remove and discard the O-ring (Item 1) [Figure 40-21-4] from the planetary carriers.

Figure 40-21-5



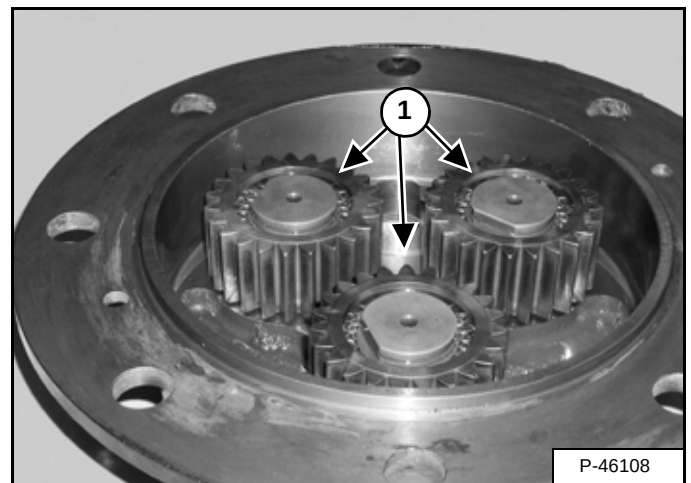
Remove the three snap rings (Item 1) [Figure 40-21-5].

Figure 40-21-6



Remove the thrust washers (Item 1) [Figure 40-21-6].

Figure 40-21-7



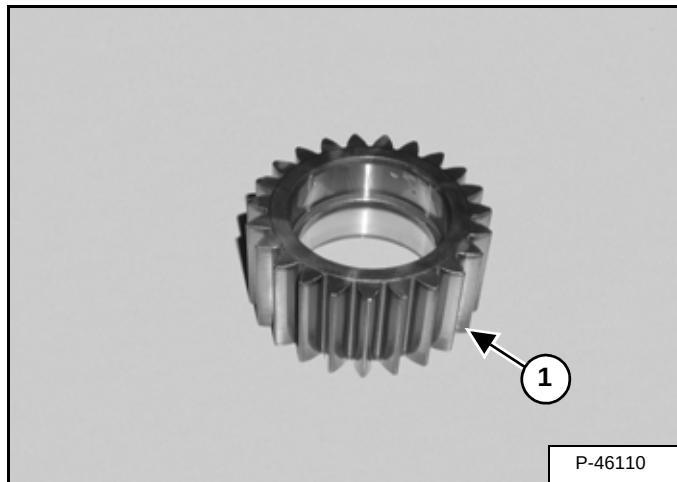
Remove the three gears (Item 1) [Figure 40-21-7] with needle bearings from each gear shaft.

NOTE: Mark the gear location for correct assembly.

AXLE AND DIFFERENTIAL (REAR) (CONT'D)

Planetary Carrier Inspection

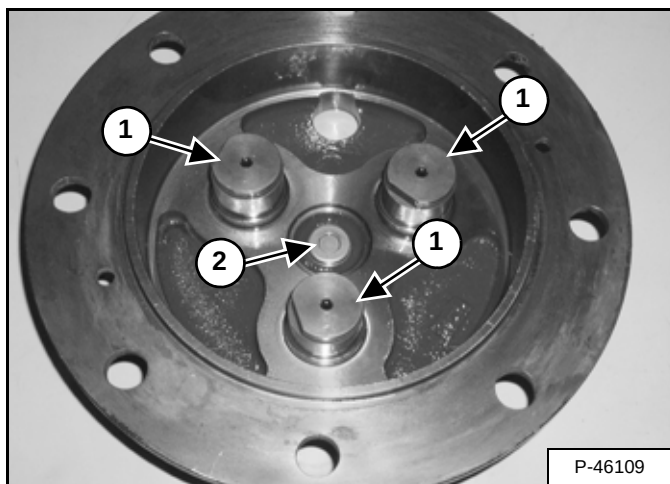
Figure 40-21-8



Inspect the planetary gears (Item 1) [Figure 40-21-8] for worn or cracked teeth.

If any of the planetary gears are damaged, replace all the planetary gears and drive axle end of the drive axle assembly. One damaged gear can cause a microscopic fatigue crack in mating teeth and cause premature failure after servicing.

Figure 40-21-9



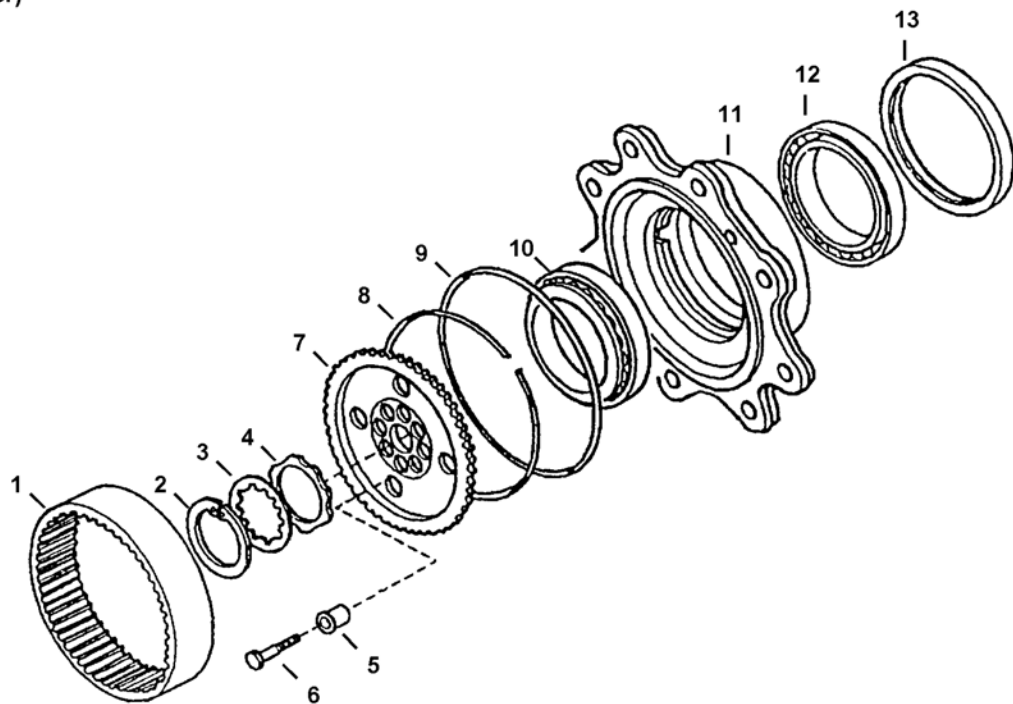
If any of the bearing shafts (Item 1) [Figure 40-21-9] are damaged, replace all bearing shafts.

If the thrust pin (Item 2) [Figure 40-21-9] is worn, replace the entire planetary carrier.

AXLE AND DIFFERENTIAL (REAR) (CONT'D)

Wheel Hub Parts Identification

1. Ring Gear
2. Snap Ring
3. Thrust Washer
4. Spacer
5. Bushing
6. Bolt
7. Gear
8. Retainer Ring
9. O-Ring
10. Bearing (outer)
11. Hub
12. Bearing (inner)
13. Seal

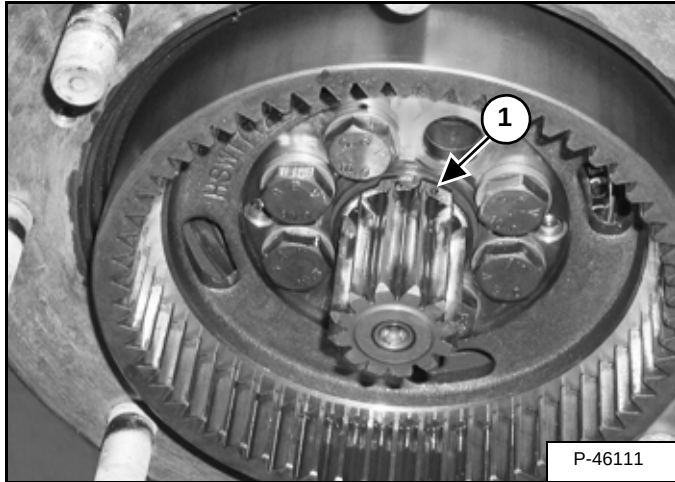


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AXLE AND DIFFERENTIAL (REAR) (CONT'D)

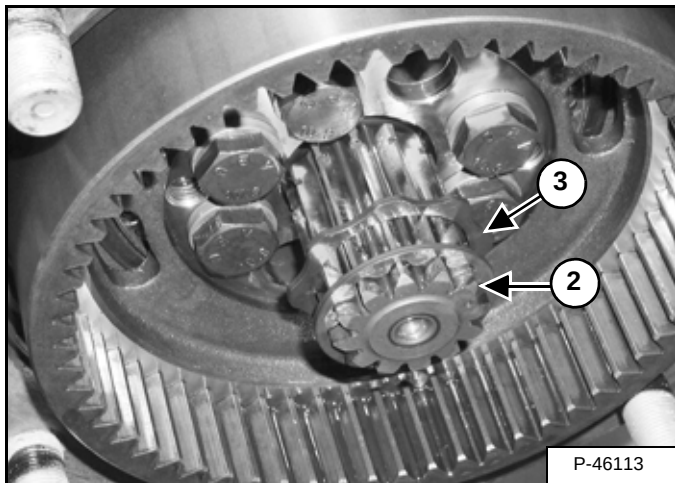
Wheel Hub Disassembly

Figure 40-21-10



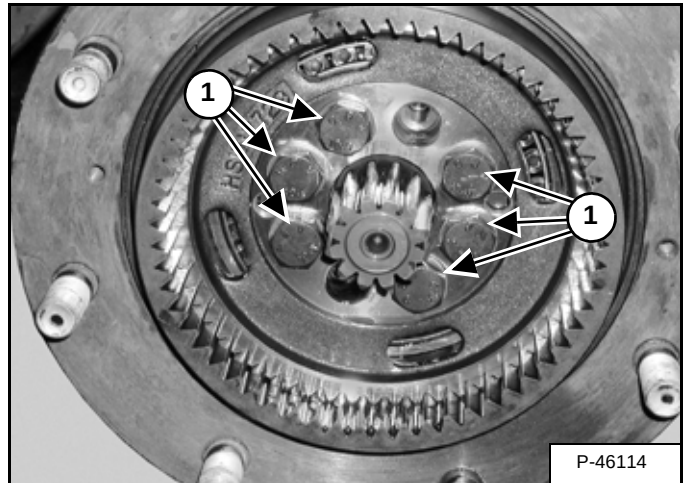
Remove the snap ring (Item 1) [Figure 40-21-10]. (Both sides)

Figure 40-21-11



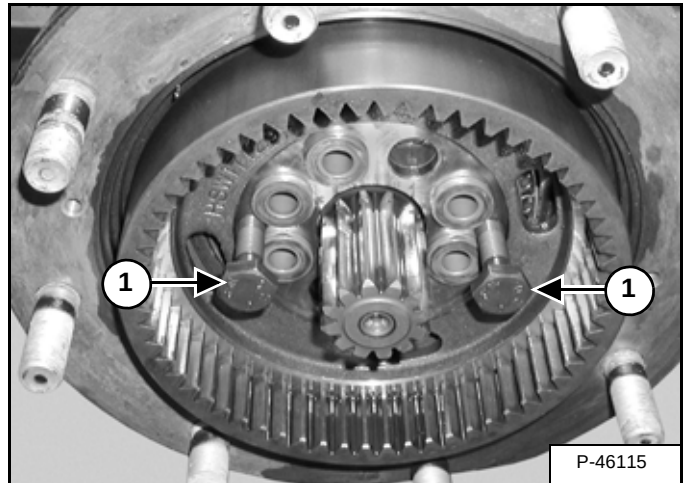
Remove the thrust washer (Item 1) and spacer (Item 2) [Figure 40-21-11]. (Both sides)

Figure 40-21-12



Remove the six ring gear mounting bolts (Item 1) [Figure 40-21-12]. (Both sides)

Figure 40-21-13

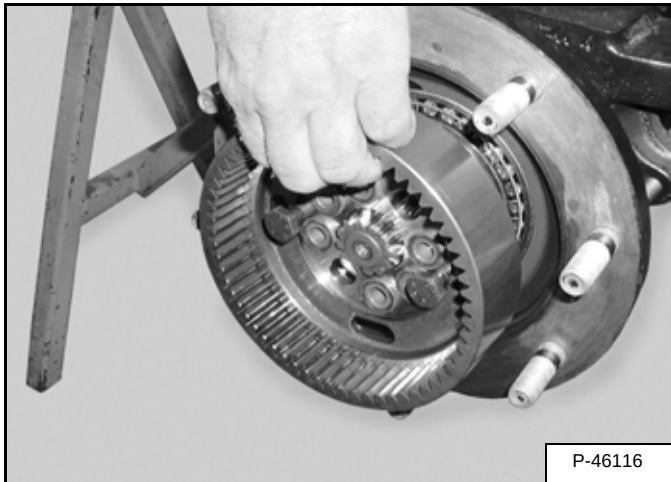


Install two bolts (Item 1) into the ring gear as shown, and tighten equally pushing the ring gear assembly (Item 2) [Figure 40-21-13] from the shaft. (Both sides)

AXLE AND DIFFERENTIAL (REAR) (CONT'D)

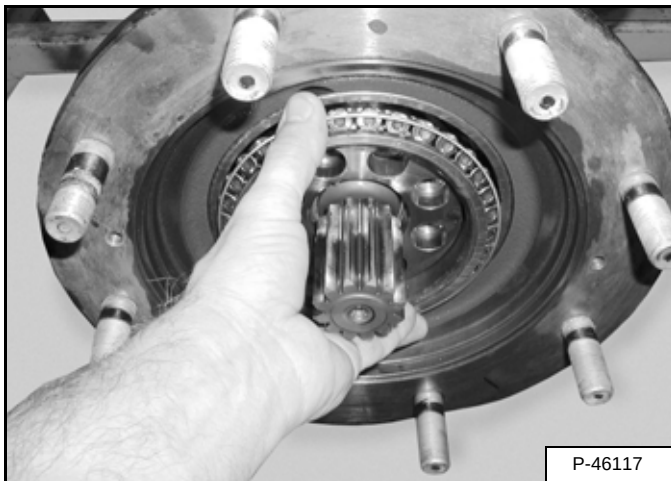
Wheel Hub Disassembly (Cont'd)

Figure 40-21-14



Remove the ring gear assembly [Figure 40-21-14]. (Both sides)

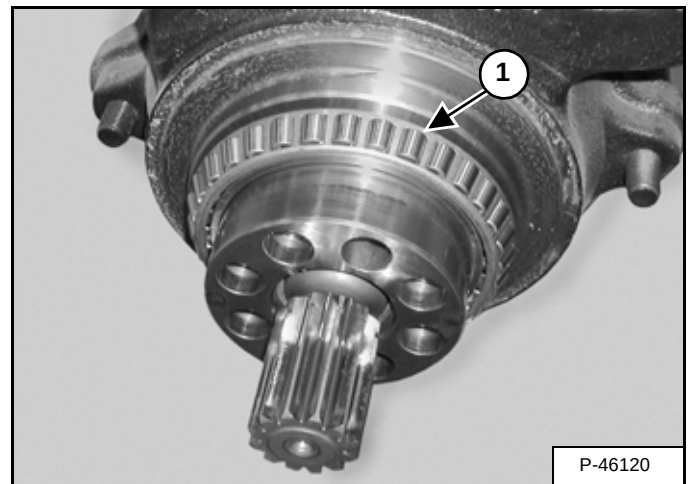
Figure 40-21-15



Remove the outer bearing and hub assembly from the axle [Figure 40-21-15]. (Both sides)

NOTE: Use care while removing, as assembly may remove easy.

Figure 40-21-16



Remove the inner bearing (Item 1) [Figure 40-21-16] from the swivel housing. (Both sides)

Figure 40-21-17

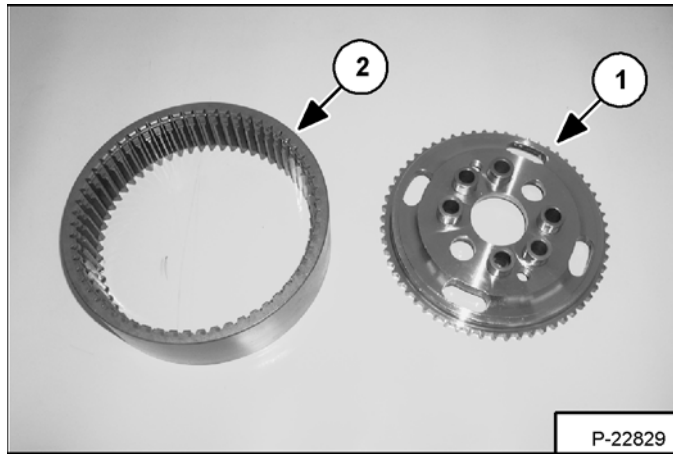


Remove the retainer ring (Item 1) [Figure 40-21-17] from the ring gear assembly.

AXLE AND DIFFERENTIAL (REAR) (CONT'D)

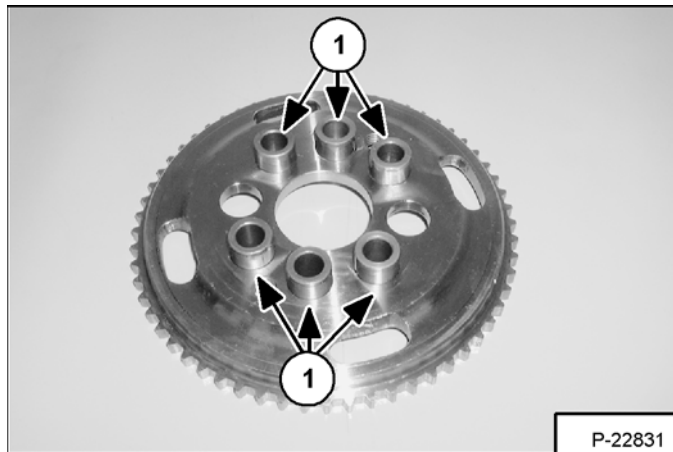
Wheel Hub Disassembly (Cont'd)

Figure 40-21-18



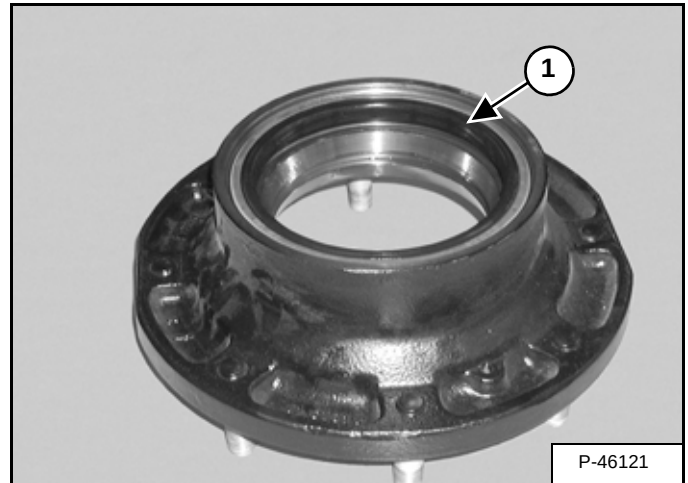
Remove the gear (Item 1) from the ring gear (Item 2) [Figure 40-21-18].

Figure 40-21-19



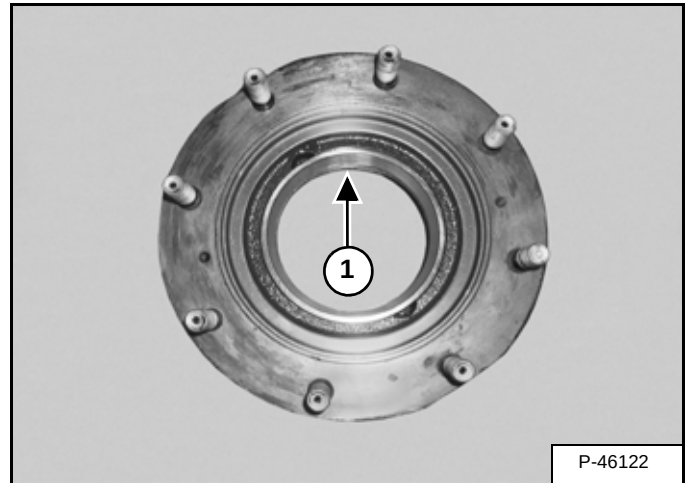
Remove the six bushings (Item 1) [Figure 40-21-19] from the gear if damaged or worn.

Figure 40-21-20



Remove the seal (Item 1) [Figure 40-21-20] from the hub.

Figure 40-21-21

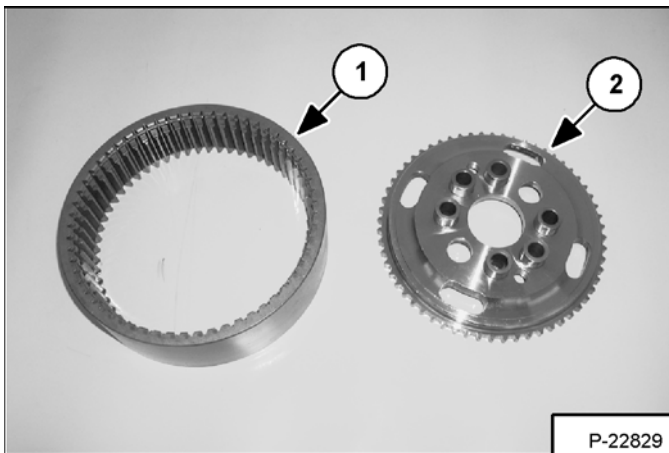


Using a brass drift remove both bearing races (Item 1) [Figure 40-21-21] from the hub.

AXLE AND DIFFERENTIAL (REAR) (CONT'D)

Wheel Hub Inspection

Figure 40-21-22

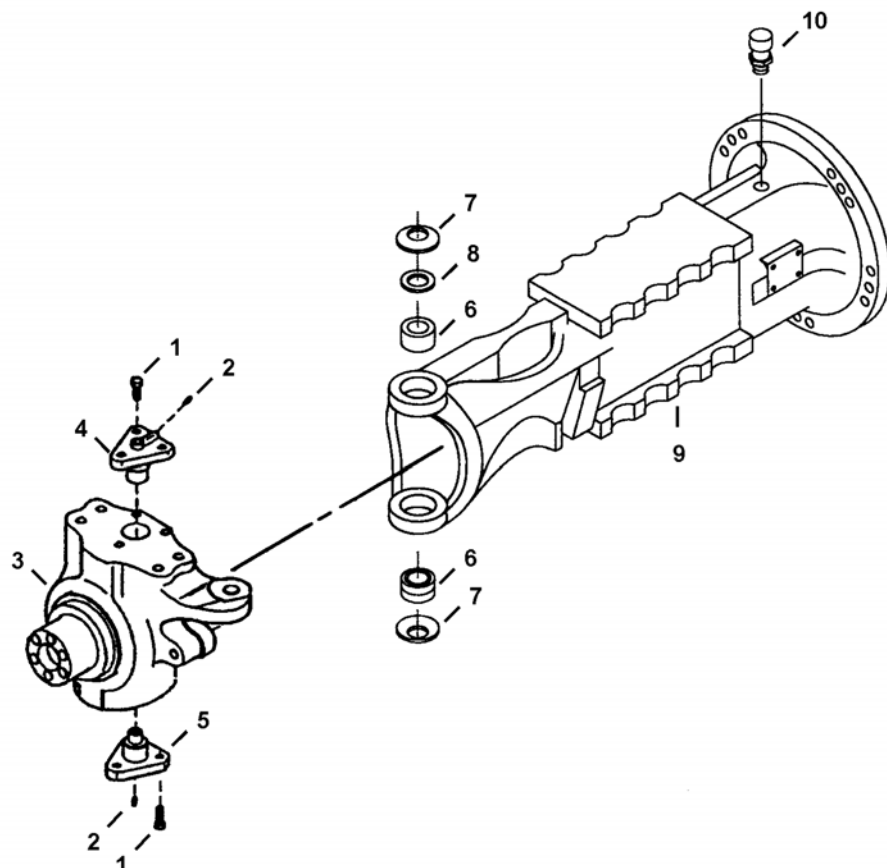


Inspect the ring gear (Item 1) and inner gear (Item 2) [Figure 40-21-22] for broken or damaged teeth.

If the ring gear or innergear are damaged, replace both parts.

Steering Knuckle Parts Identification

1. Bolt
2. Grease Fitting
3. Knuckle Housing
4. King Pin (upper)
5. King Pin (lower)
6. Bushing
7. Washer
8. Spacer Washer
9. Housing
10. Vent



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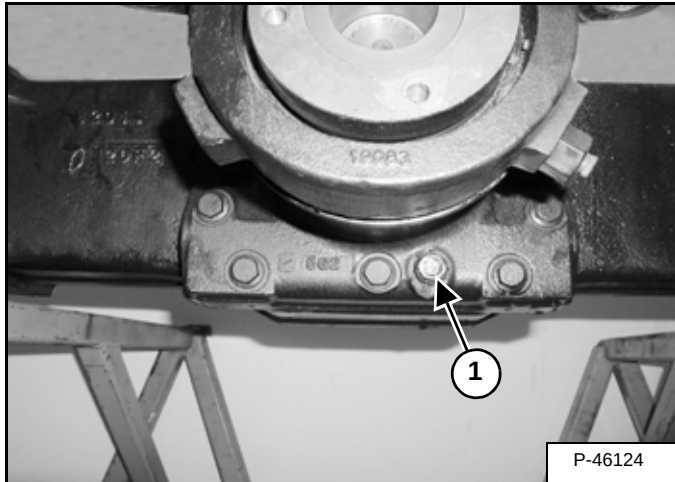
AXLE AND DIFFERENTIAL (REAR) (CONT'D)

Steering Knuckle Disassembly

Clean the outside of the steering knuckle before disassembly.

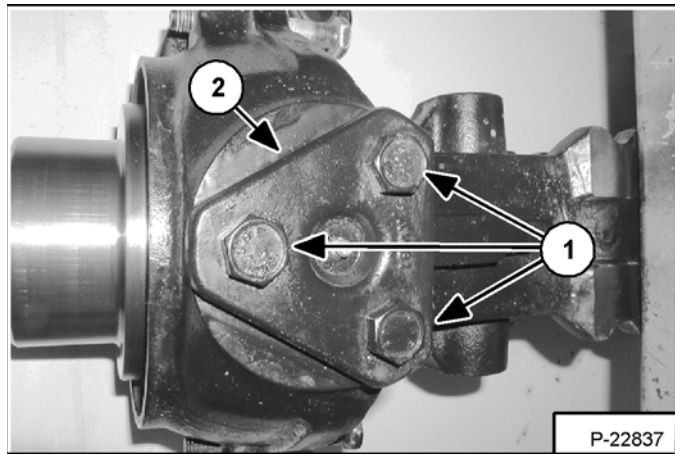
Mark the outside of the steering knuckle for ease of assembly.

Figure 40-21-23



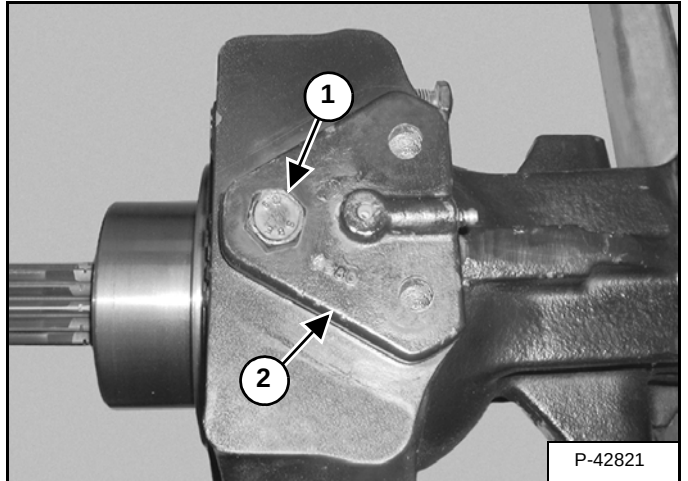
Remove the drain plug (Item 1) [Figure 40-21-23]. Drain the fluid into a pan.

Figure 40-21-24



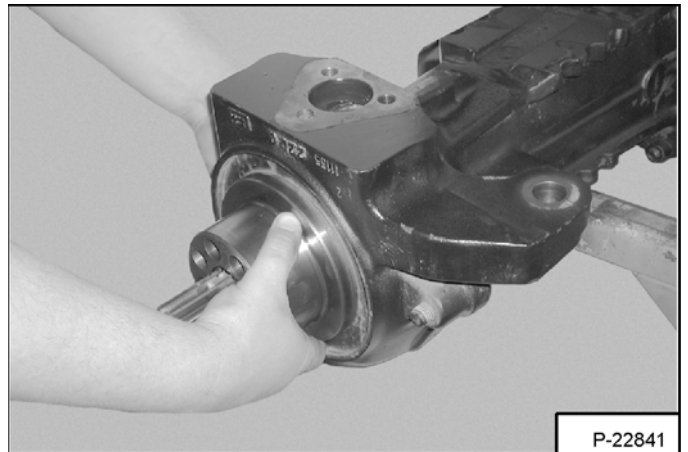
Remove the three bolts (Item 1) and king pin (Item 2) [Figure 40-21-24] from the bottom of the knuckle. (Both sides)

Figure 40-21-25



Remove the bolt (Item 1) and king pin (Item 2) [Figure 40-21-25] from the top of the knuckle. (Both sides)

Figure 40-21-26

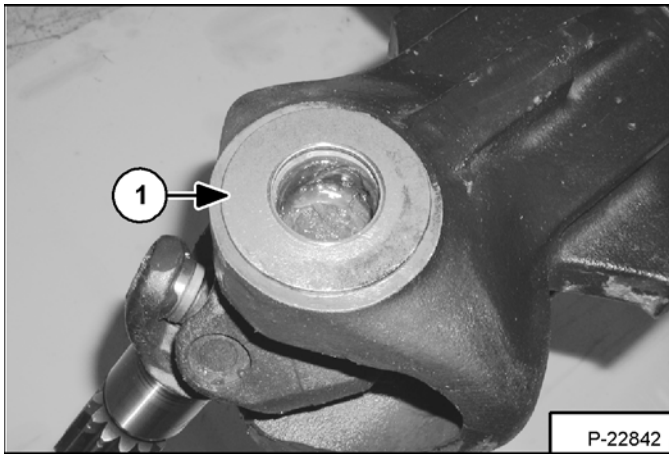


Lift and remove the knuckle assembly from the axle [Figure 40-21-26]. (Both sides)

AXLE AND DIFFERENTIAL (REAR) (CONT'D)

Steering Knuckle Disassembly (Cont'd)

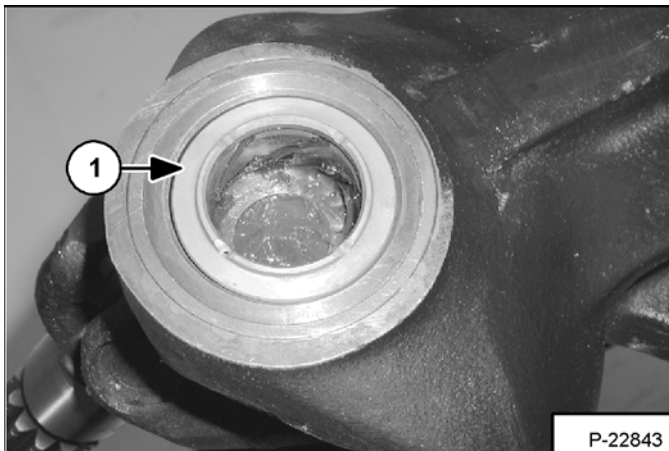
Figure 40-21-27



Remove the Belleville washers (Item 1) [Figure 40-21-27] from the top and bottom of the axle. (Both sides)

NOTE: The bottom Belleville washer is smaller than the top Belleville washer.

Figure 40-21-28



Remove the spacer washer (Item 1) [Figure 40-21-28] from the top of the axle. (Both sides)

Figure 40-21-29

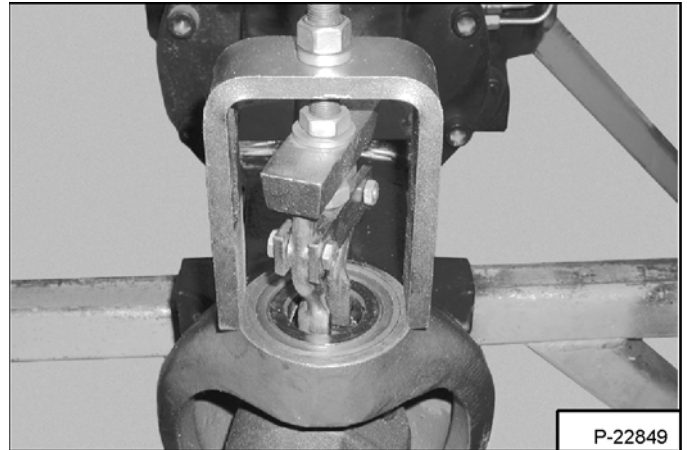
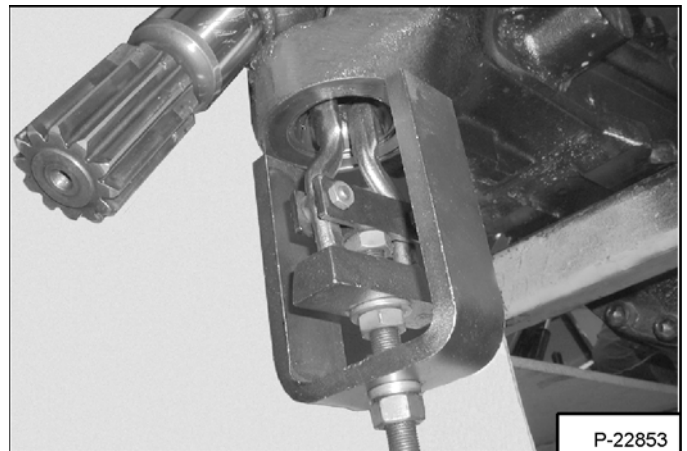
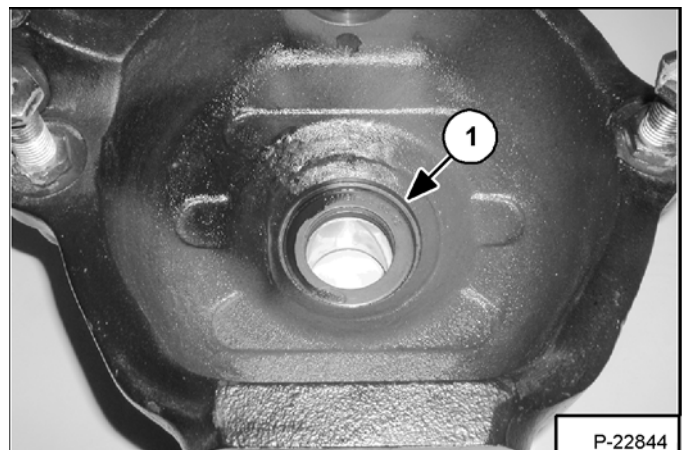


Figure 40-21-30



Using a puller, remove the top and bottom bushings from the axle [Figure 40-21-29] & [Figure 40-21-30]. (Both sides)

Figure 40-21-31

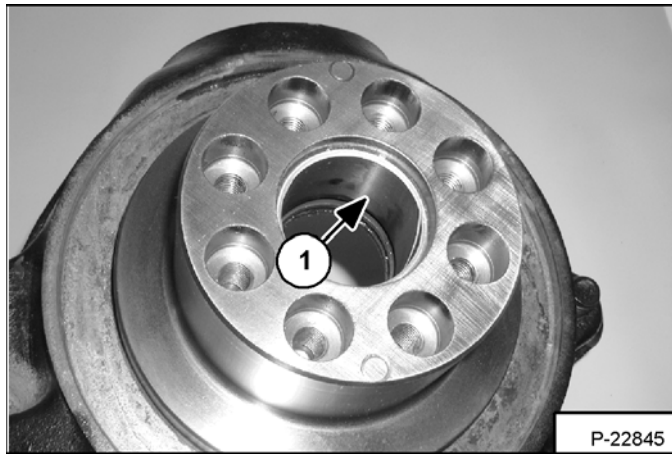


Remove the seal (Item 1) [Figure 40-21-31] from the knuckle assembly. (Both sides)

AXLE AND DIFFERENTIAL (REAR) (CONT'D)

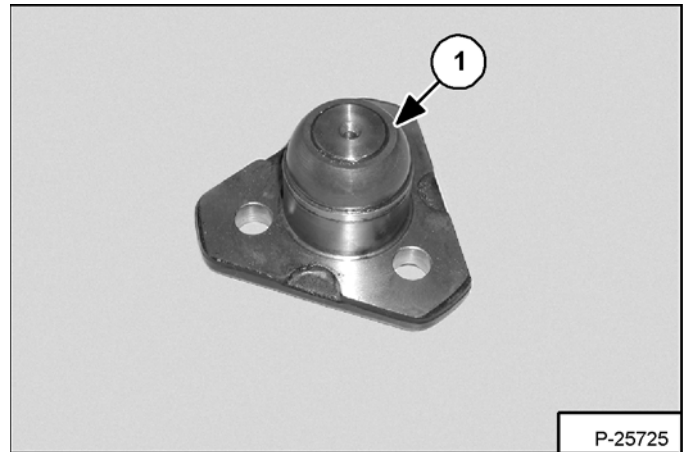
Steering Knuckle Disassembly (Cont'd)

Figure 40-21-32



Remove the bushing (Item 1) [Figure 40-21-32] from the knuckle assembly. (Both sides)

Figure 40-21-33

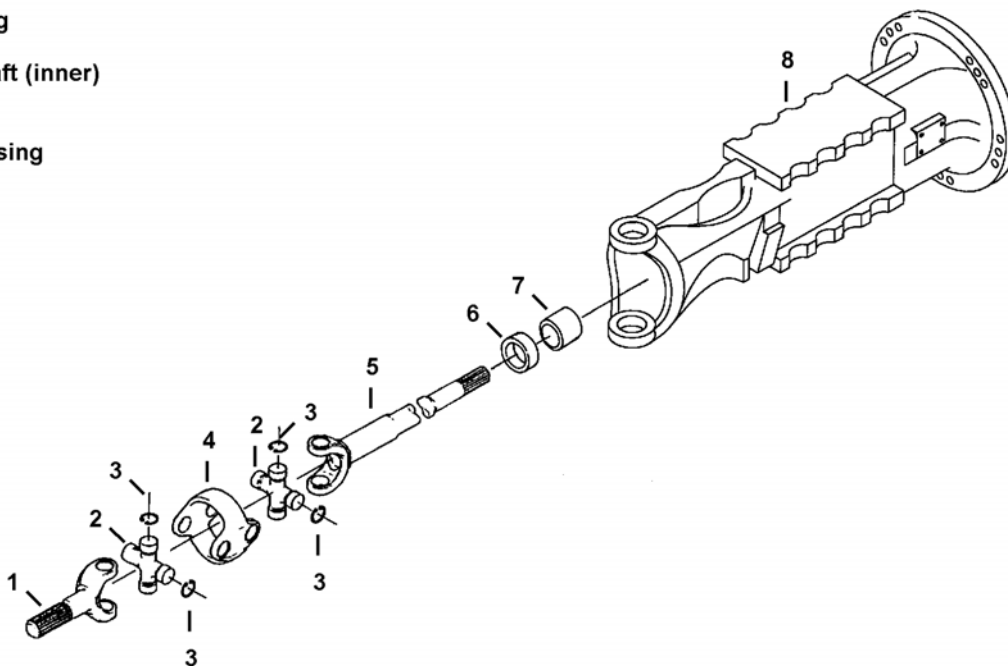


Remove the ball type bearing (Item 1) [Figure 40-21-33] from the lower king pins.

NOTE: Removal procedure will destroy the ball bearing.

Axle Housing/Drive Axle Parts Identification

1. Drive Shaft (outer)
2. Bearing
3. Snap Ring
4. Yoke
5. Drive Shaft (inner)
6. Seal
7. Bushing
8. Axle Housing



B-16007

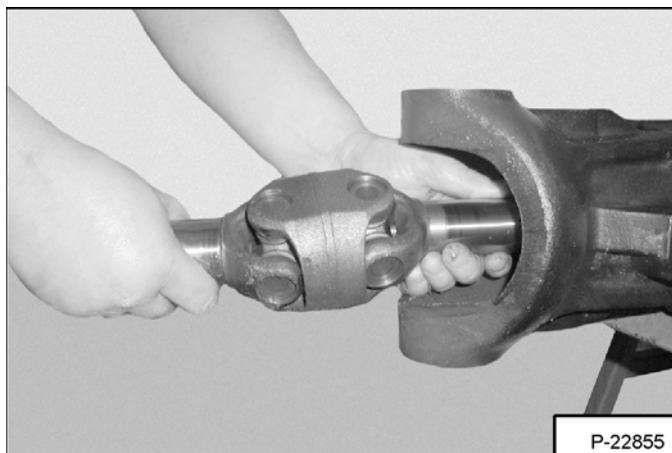
AXLE AND DIFFERENTIAL (REAR) (CONT'D)

Axle Housing/Drive Axle Disassembly

Clean the outside of the axle housing before disassembly.

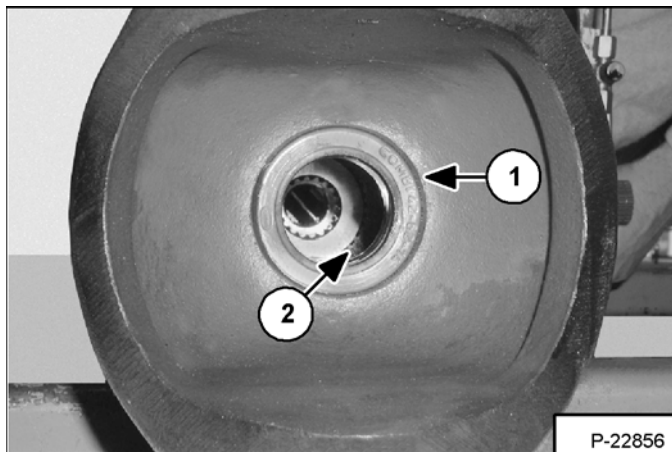
Mark the outside of the axle housing for ease of assembly.

Figure 40-21-34



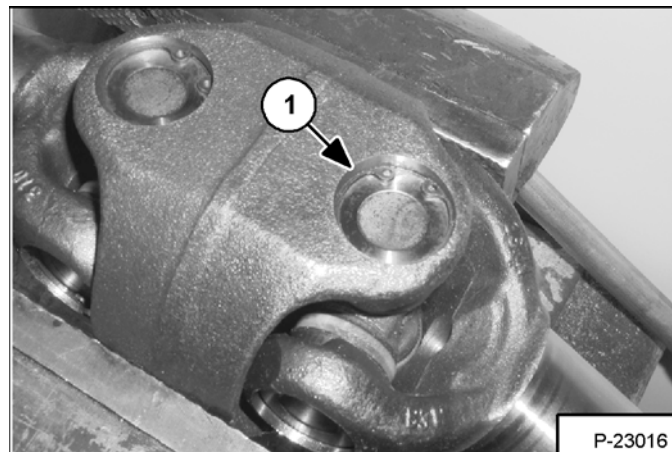
Remove the drive axle from the axle housing [Figure 40-21-34]. (Both sides)

Figure 40-21-35



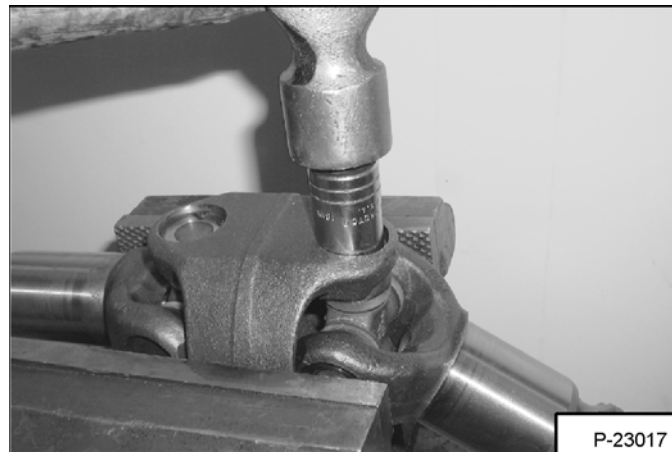
Remove the seal (Item 1) and bushing (Item 2) [Figure 40-21-35] from the axle end housing. (Both sides)

Figure 40-21-36



Remove the two snap rings (Item 1) [Figure 40-21-36] across from each other.

Figure 40-21-37



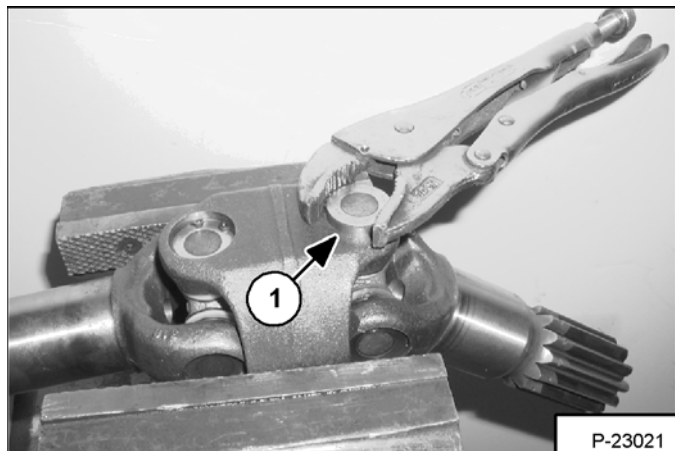
Drive the upper bearing cup down to push the opposite bearing cup partially through the yoke [Figure 40-21-37].

NOTE: The bottom bearing cup will not be completely removed.

AXLE AND DIFFERENTIAL (REAR) (CONT'D)

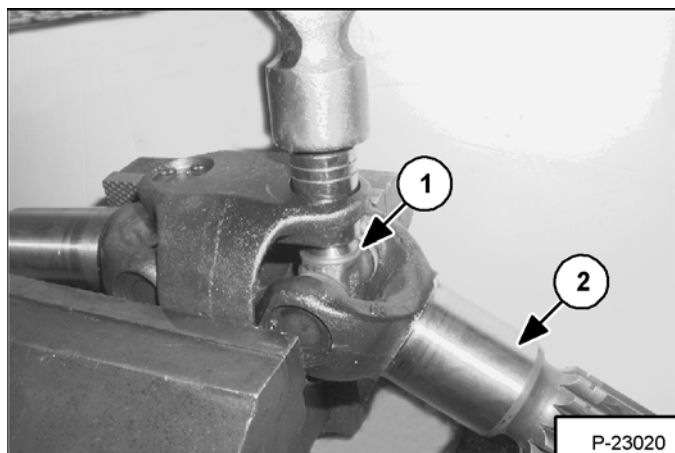
Axle Housing/Drive Axle Disassembly (Cont'd)

Figure 40-21-38



Turn the shaft over and remove the bearing cup (Item 1) [Figure 40-21-38].

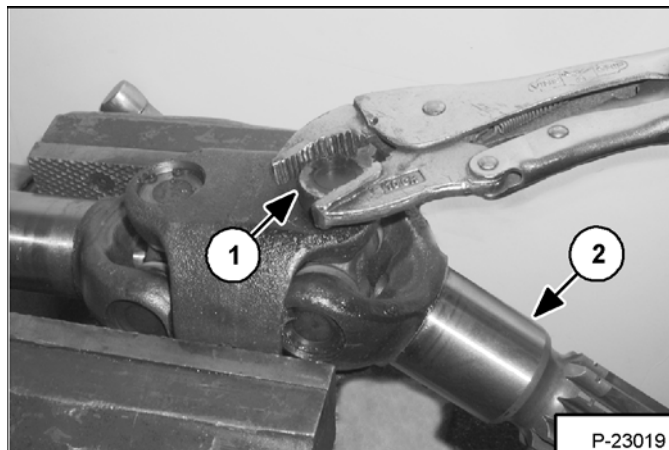
Figure 40-21-39



Drive the cross (Item 1) [Figure 40-21-39] down to push the opposite bearing cup through the yoke.

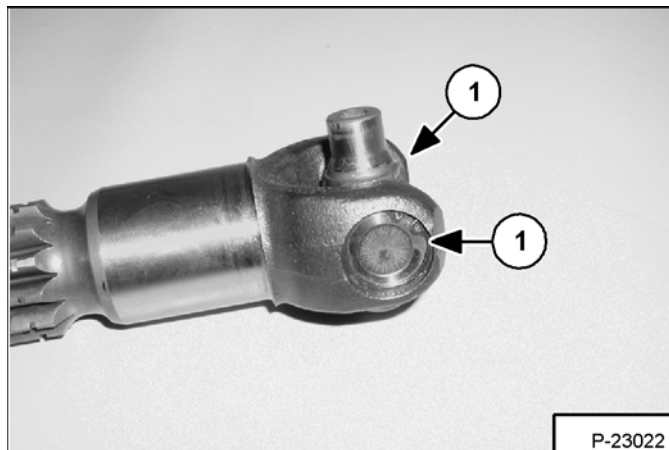
NOTE: Drive shaft end (Item 2) [Figure 40-21-39] may fall out of the yoke.

Figure 40-21-40



Turn the shaft over and remove the bearing cup (Item 1). Remove the drive shaft (Item 2) [Figure 40-21-40] from the yoke.

Figure 40-21-41

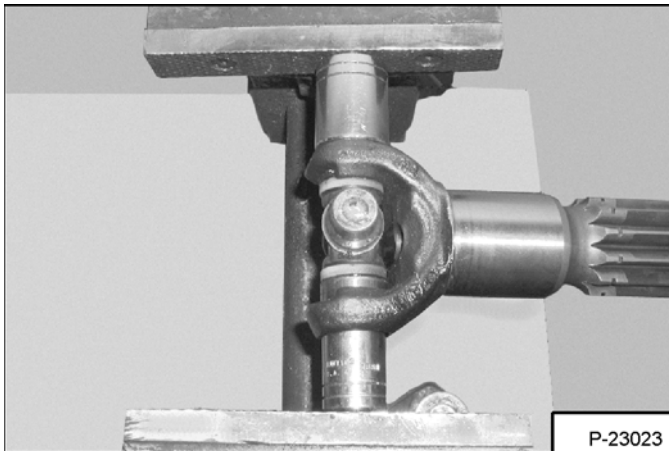


Remove the two snap rings (Item 1) [Figure 40-21-41] from the yoke.

AXLE AND DIFFERENTIAL (REAR) (CONT'D)

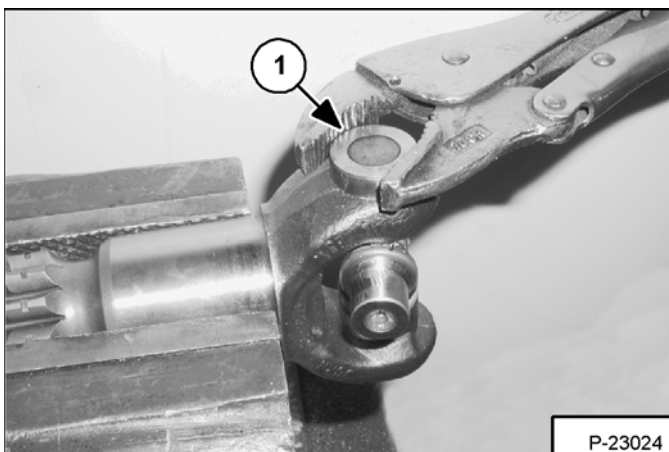
Axle Housing/Drive Axle Disassembly (Cont'd)

Figure 40-21-42



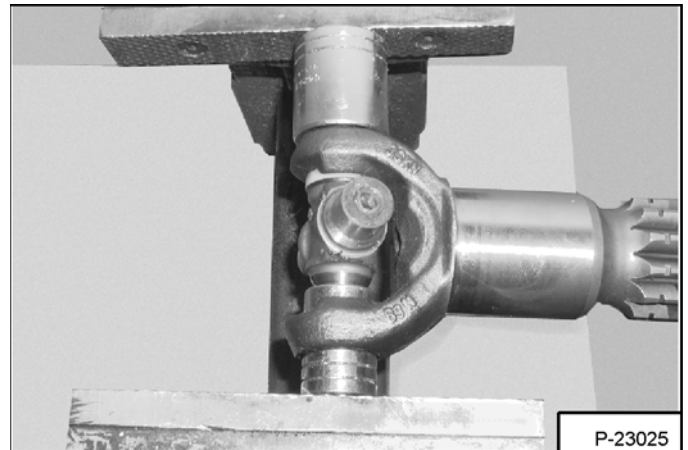
Using two different size sockets and a vice, press one bearing cup into the yoke while pushing the opposite bearing cup through the yoke [Figure 40-21-42].

Figure 40-21-43



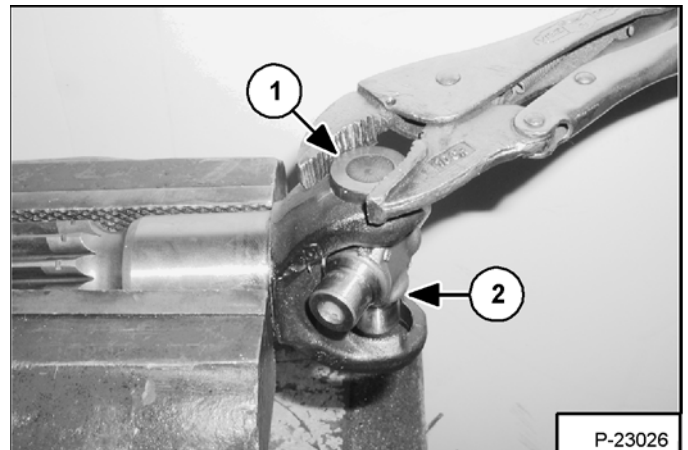
Remove the bearing cup (Item 1) [Figure 40-21-43].

Figure 40-21-44



Press the second bearing cup through the yoke [Figure 40-21-44].

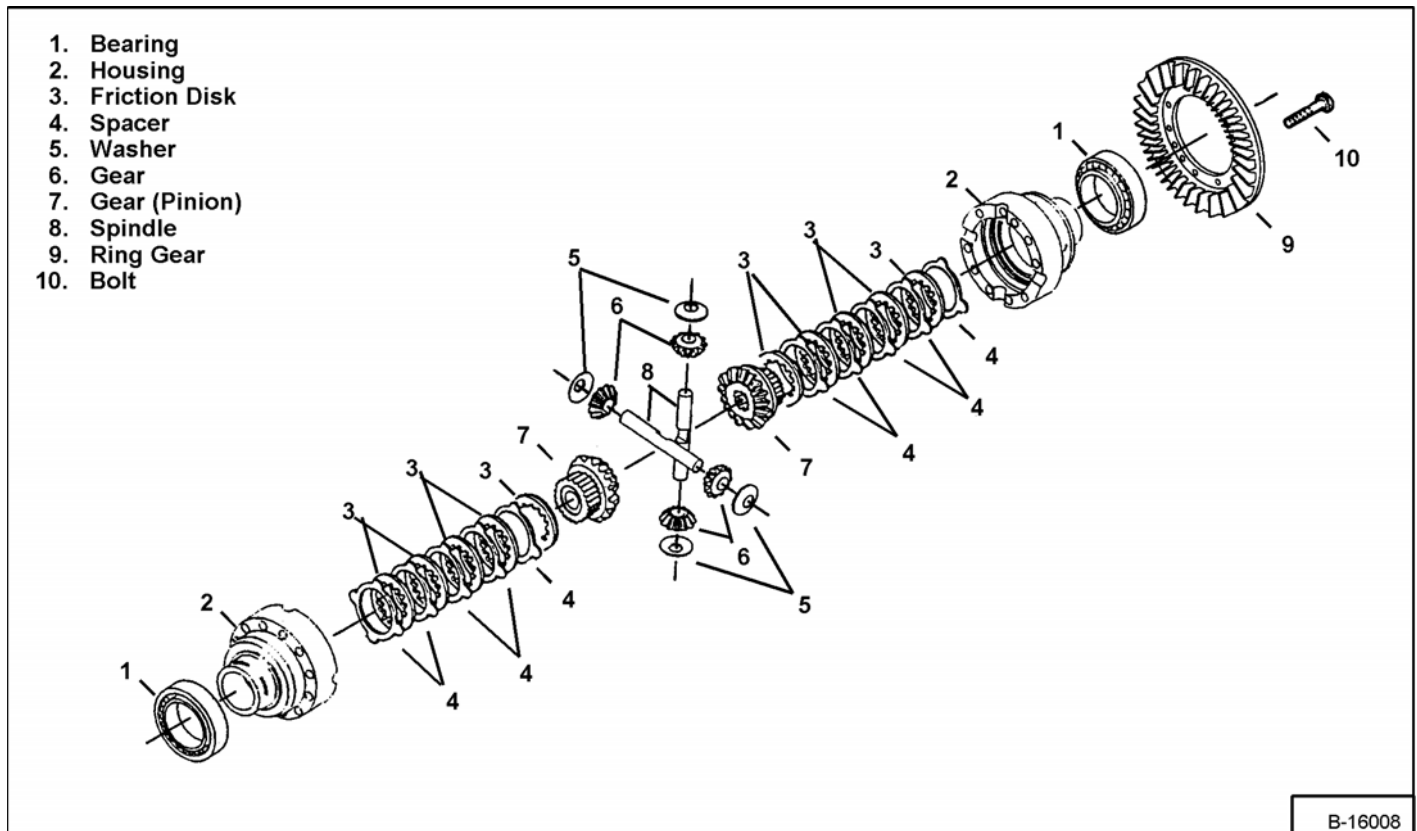
Figure 40-21-45



Remove the bearing cup (Item 1) and cross (Item 2) [Figure 40-21-45] from the yoke.

AXLE AND DIFFERENTIAL (REAR) (CONT'D)

Differential Parts Identification

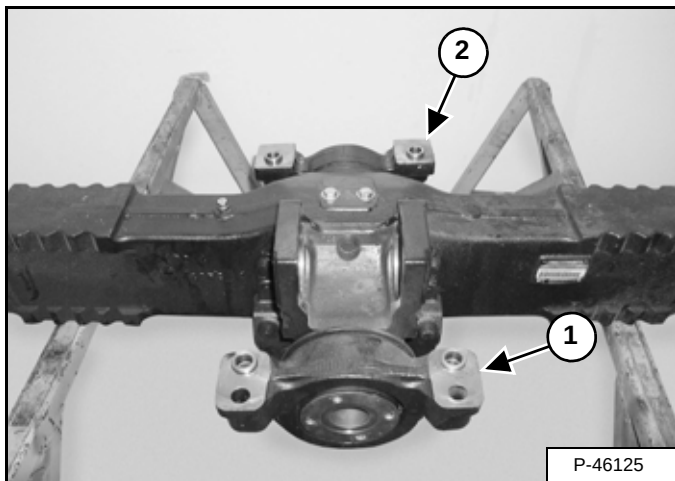


Differential Disassembly

Clean the outside of the differential before disassembly.

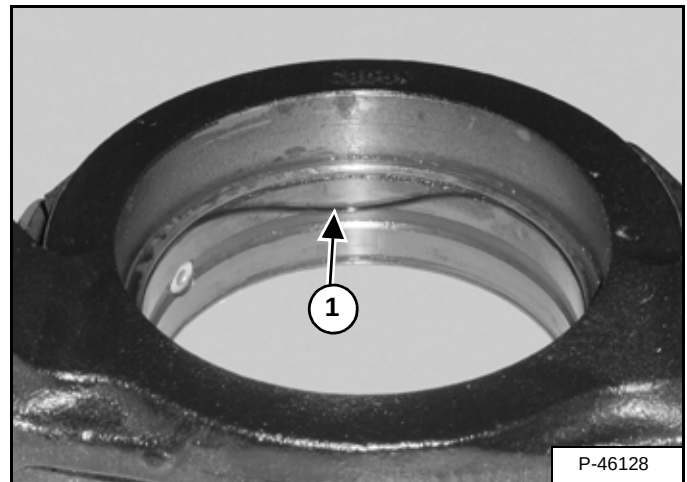
Mark the outside of the differential for ease of assembly.

Figure 40-21-46



Remove the front (Item 1) and rear (Item 2) [Figure 40-21-46] mount brackets.

Figure 40-21-47

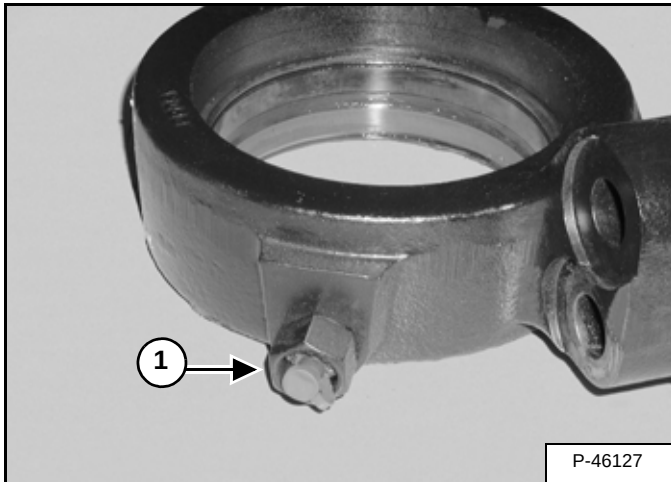


Remove the O-ring (Item 1) [Figure 40-21-47] from the front mount bracket.

AXLE AND DIFFERENTIAL (REAR) (CONT'D)

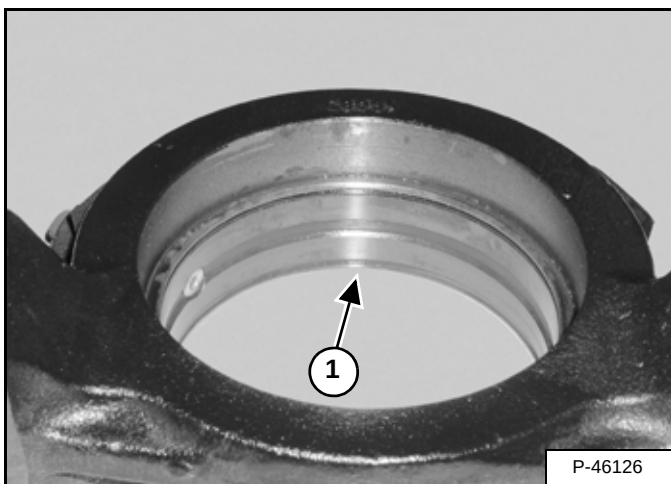
Differential Disassembly (Cont'd)

Figure 40-21-48



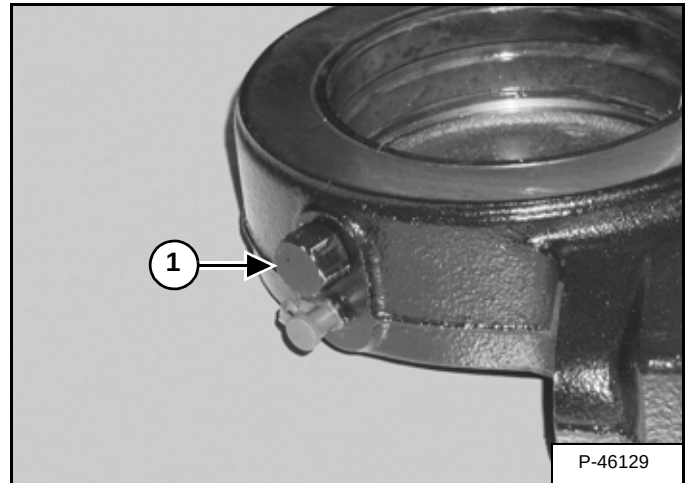
Loosen the retainer (Item 1) [Figure 40-21-48] on the front mount bracket.

Figure 40-21-49



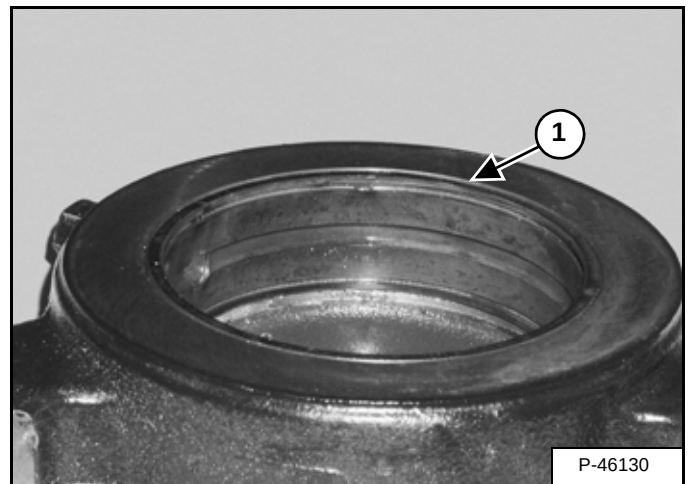
Remove the bushing (Item 1) [Figure 40-21-49] from the front mount bracket.

Figure 40-21-50



Loosen the retainer (Item 1) [Figure 40-21-50] on the rear mount bracket.

Figure 40-21-51

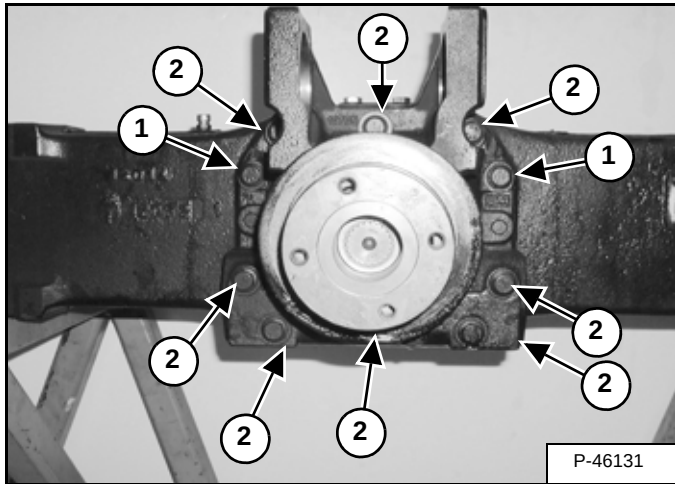


Remove the bushing (Item 1) [Figure 40-21-51] from the rear mount bracket.

AXLE AND DIFFERENTIAL (REAR) (CONT'D)

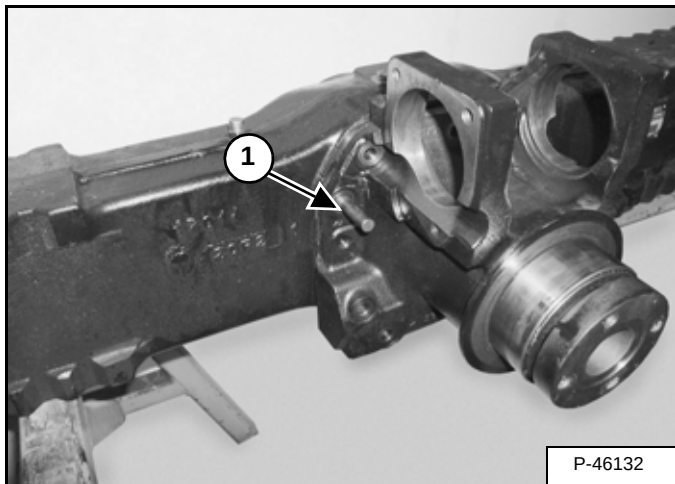
Differential Disassembly (Cont'd)

Figure 40-21-52



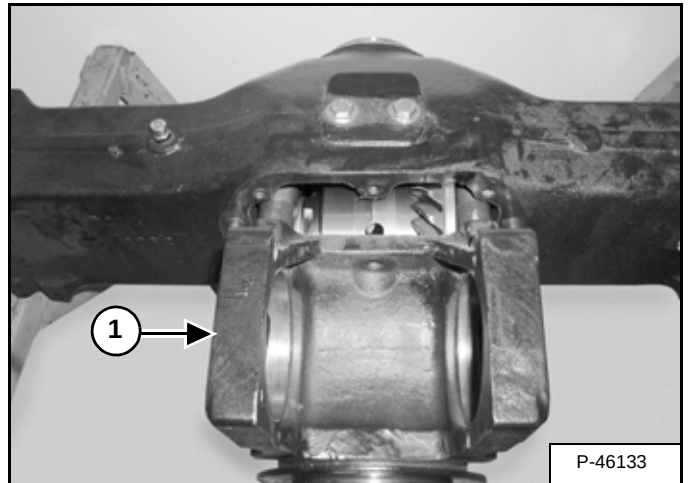
Remove the bolts (Item 1) & (Item 2) [Figure 40-21-52].

Figure 40-21-53



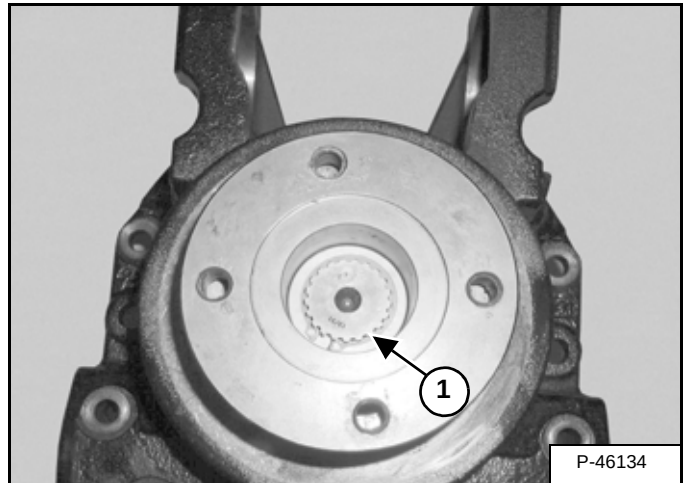
Install studs (Item 1) [Figure 40-21-53] in the bolt holes (Item 1) [Figure 40-21-52].

Figure 40-21-54



Remove the differential assembly (Item 1) [Figure 40-21-54].

Figure 40-21-55

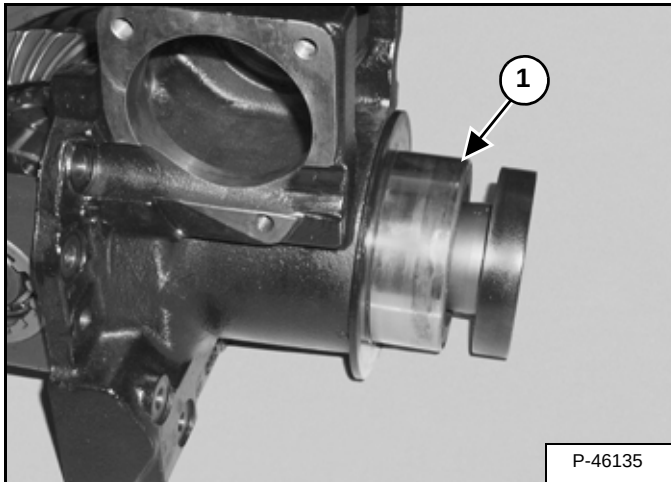


Remove the snap ring (Item 1) [Figure 40-21-55] from the drive coupler.

AXLE AND DIFFERENTIAL (REAR) (CONT'D)

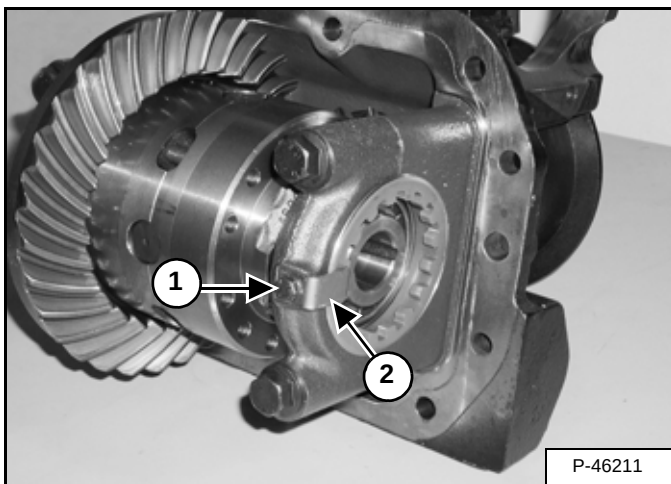
Differential Disassembly (Cont'd)

Figure 40-21-56



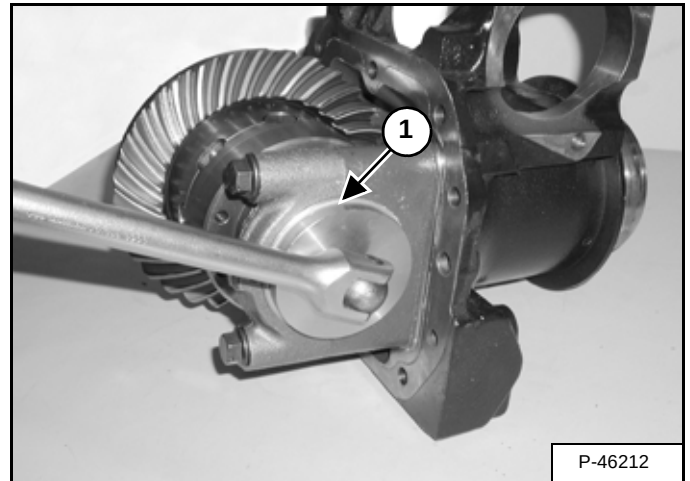
Remove the drive coupler (Item 1) [Figure 40-21-56].

Figure 40-21-57



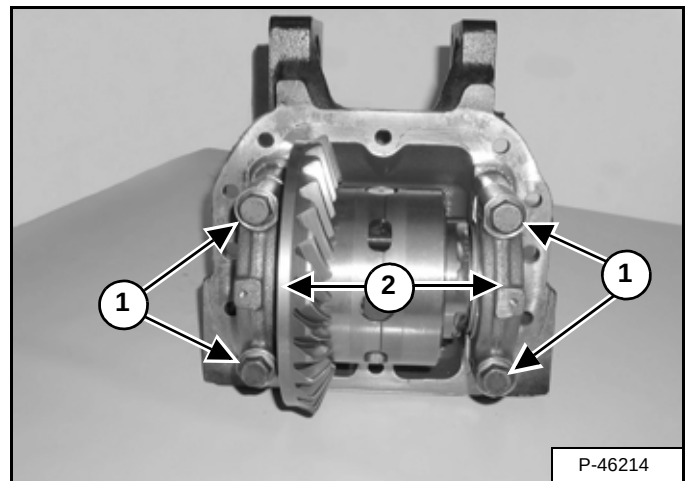
Remove the bolt (Item 1) and retainer (Item 2) [Figure 40-21-57]. (Both sides)

Figure 40-21-58



Remove the internal nut (Item 1) [Figure 40-21-58] from the housing by rotating counterclockwise using special tool CA119030. (Both sides)

Figure 40-21-59

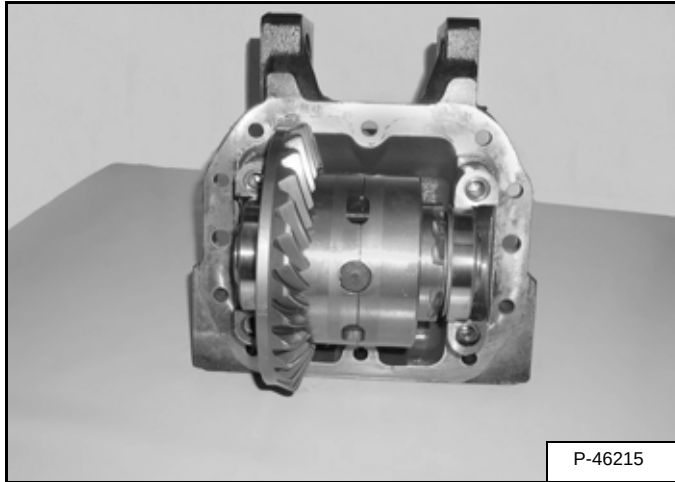


Remove the four bolts (Item 1) and remove the yokes (Item 2) [Figure 40-21-59].

AXLE AND DIFFERENTIAL (REAR) (CONT'D)

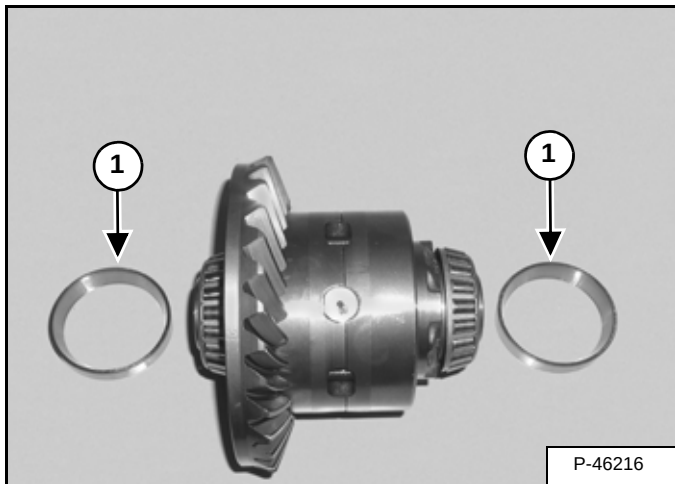
Differential Disassembly (Cont'd)

Figure 40-21-60



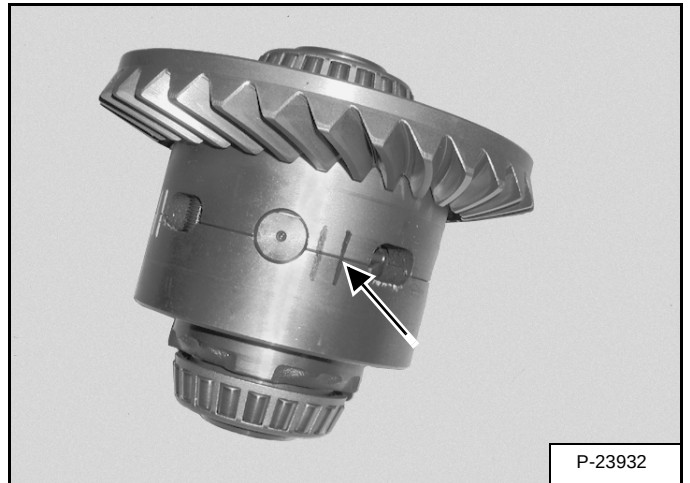
Remove the ring gear assembly [Figure 40-21-60].

Figure 40-21-61



Remove the bearing races (Item 1) [Figure 40-21-61].

Figure 40-21-62

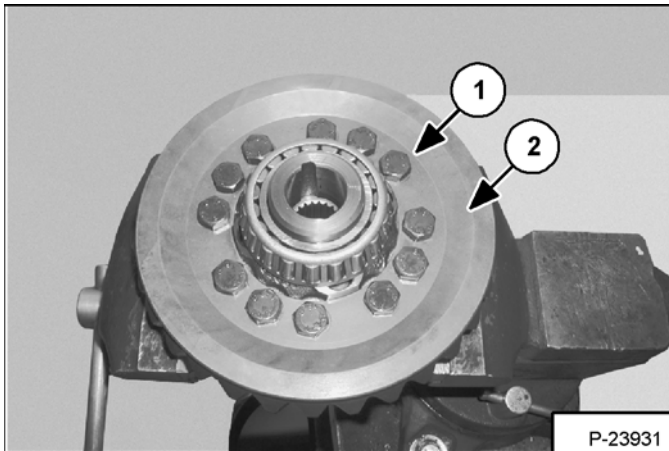


Mark the housing for correct assembly [Figure 40-21-62].

AXLE AND DIFFERENTIAL (REAR) (CONT'D)

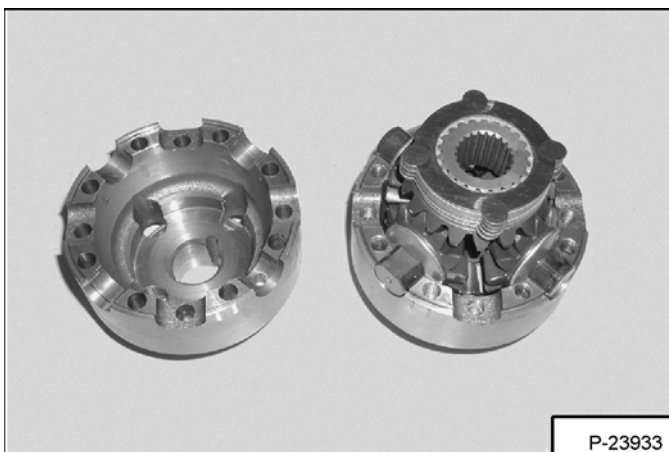
Differential Disassembly (Cont'd)

Figure 40-21-63



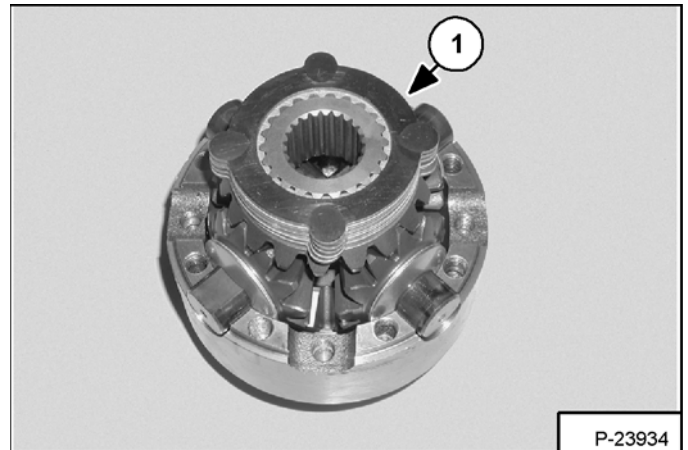
Support the differential assembly in a vise. Remove the twelve bolts (Item 1) and ring gear (Item 2) [Figure 40-21-63].

Figure 40-21-64



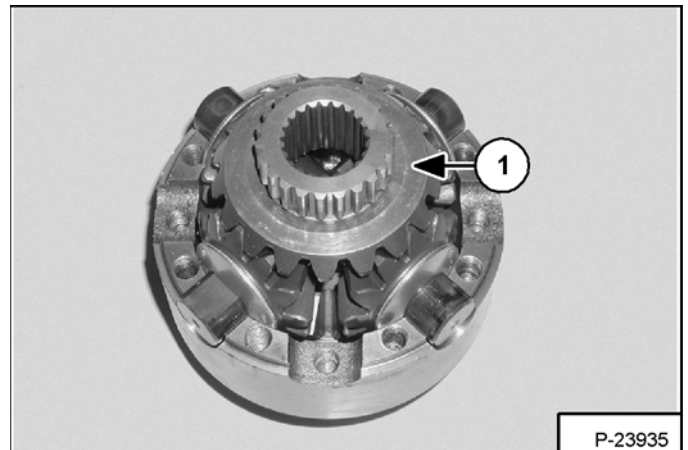
Separate the housings [Figure 40-21-64].

Figure 40-21-65



Remove the discs and spacers (Item 1) [Figure 40-21-65] from the pinion gear.

Figure 40-21-66

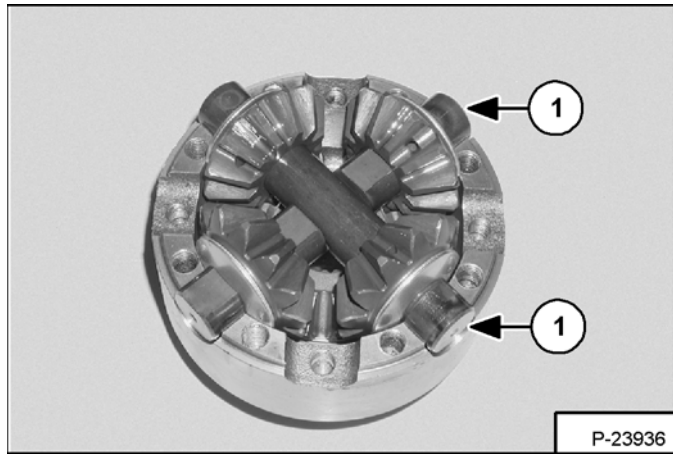


Remove the pinion gear (Item 1) [Figure 40-21-66].

AXLE AND DIFFERENTIAL (REAR) (CONT'D)

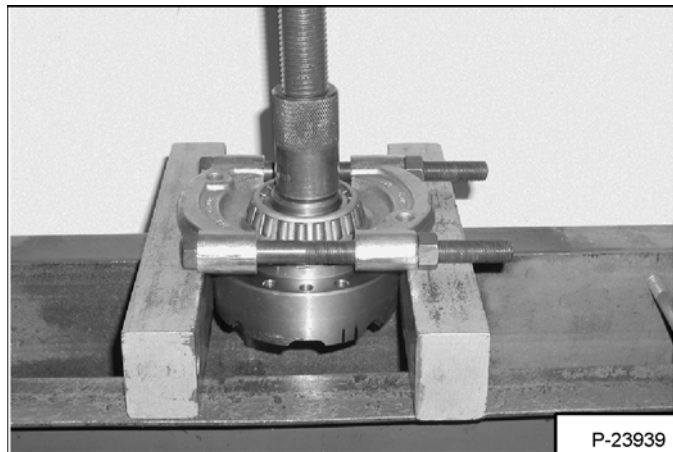
Differential Disassembly (Cont'd)

Figure 40-21-67



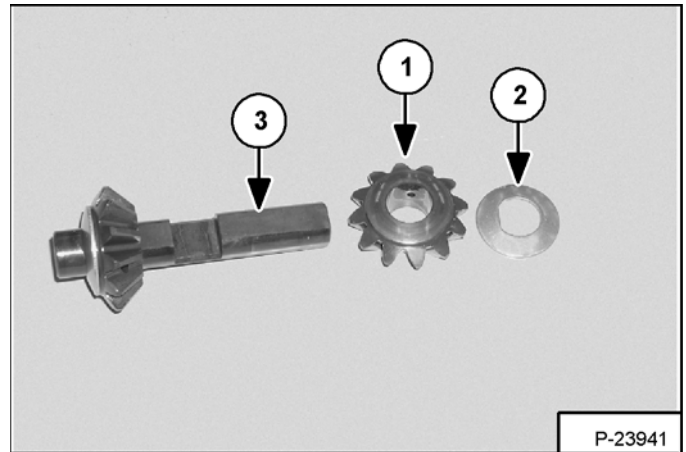
Remove the spindle/gear assemblies (Item 1) [Figure 40-21-67].

Figure 40-21-68



Remove the bearing from the housing [Figure 40-21-68].

Figure 40-21-69



Remove the gear (Item 1) and cup washer (Item 2) from the spindle (Item 3) [Figure 40-21-69].

AXLE AND DIFFERENTIAL (REAR) (CONT'D)

Differential Inspection

Figure 40-21-70

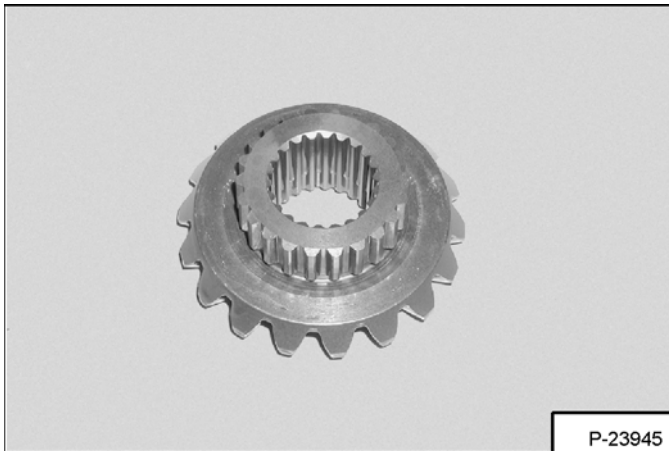
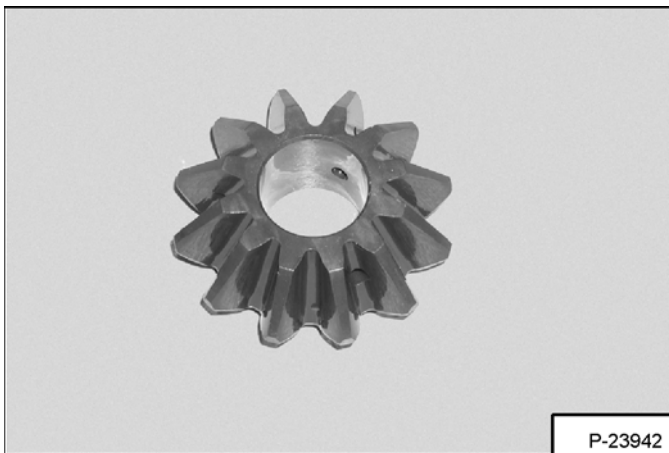


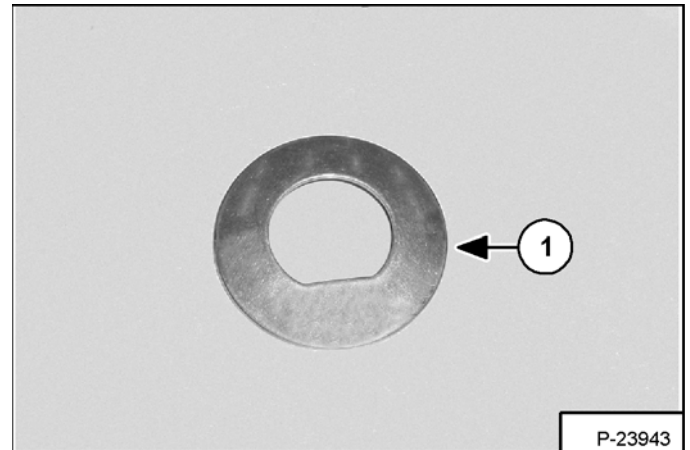
Figure 40-21-71



Inspect the pinion gear [Figure 40-21-70] & [Figure 40-21-71] for broken or damaged teeth.

If either gear is damaged, replace both gears.

Figure 40-21-72

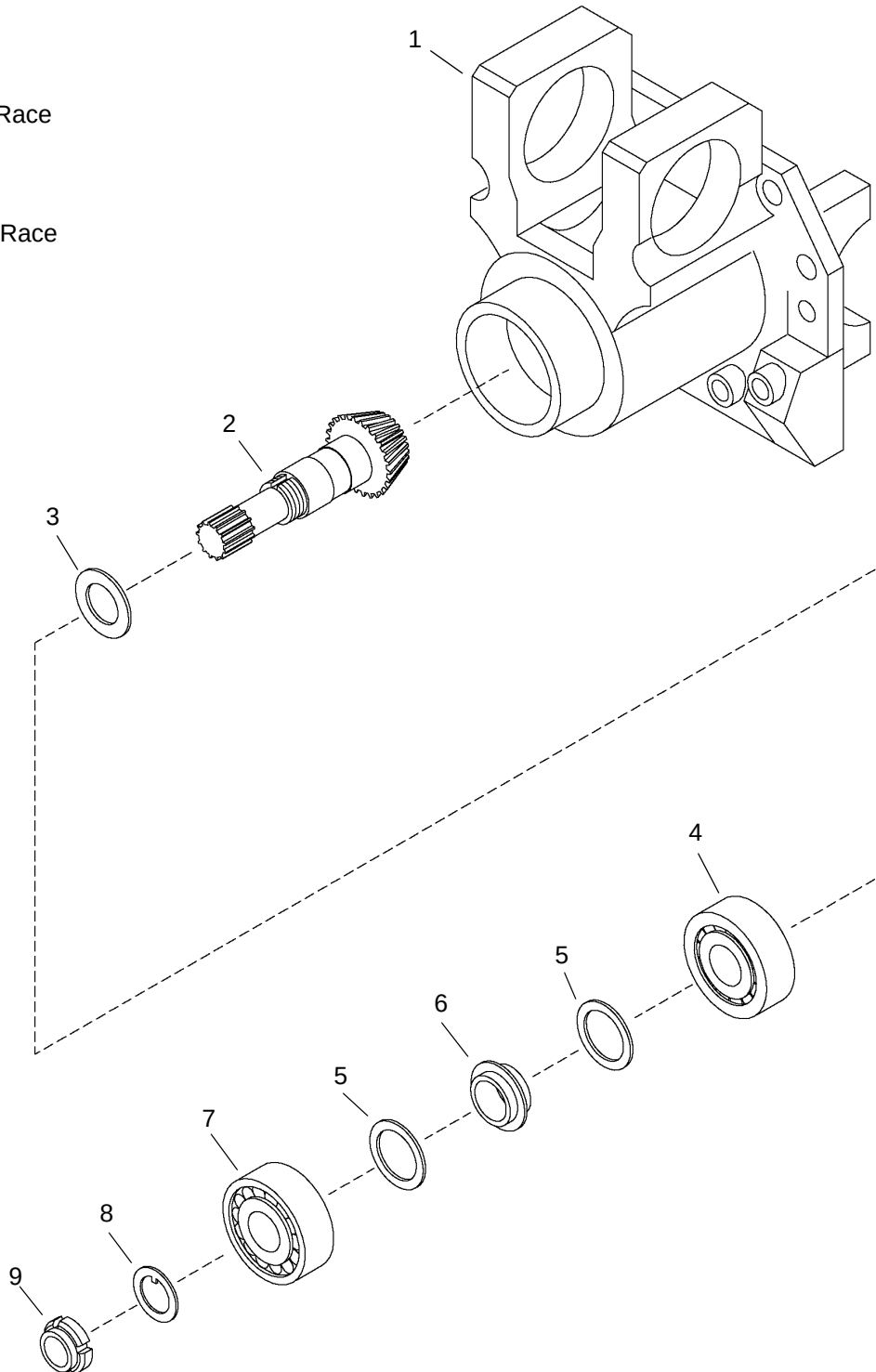


Inspect the cup washers (Item 1) [Figure 40-21-72] for damage or wear. Replace as needed.

AXLE AND DIFFERENTIAL (REAR) (CONT'D)

Pinion Group Parts Identification

1. Housing
2. Pinion Shaft
3. Shim
4. Inner Bearing/Race
5. Washer
6. Spacer
7. Outer Bearing/Race
8. Lock Washer
9. Nut



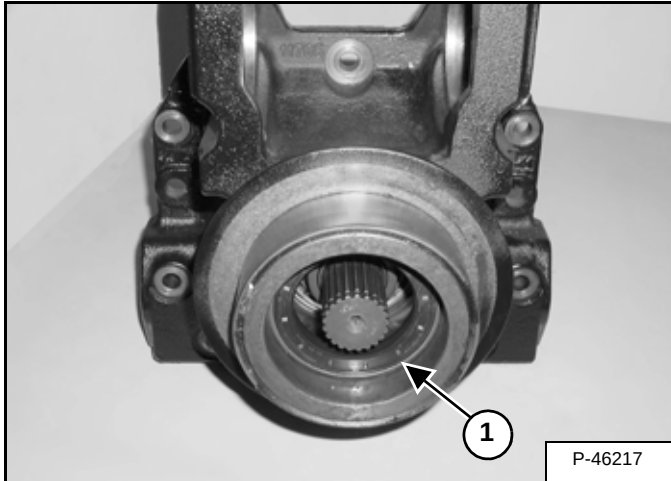
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AXLE AND DIFFERENTIAL (REAR) (CONT'D)

Pinion Group Disassembly

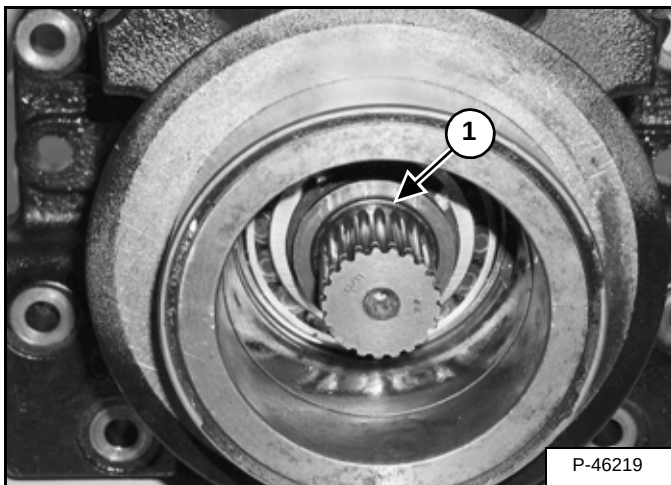
Clean the outside of the pinion group before disassembly.

Figure 40-21-73



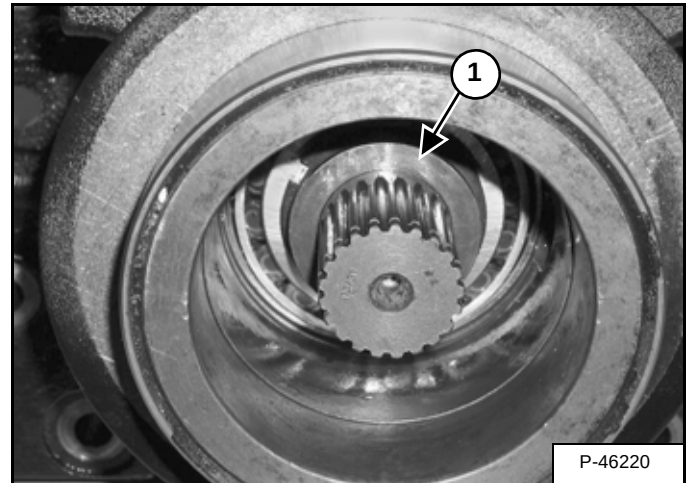
Remove the seal (Item 1) [Figure 40-21-73].

Figure 40-21-74



Remove the O-ring (Item 1) [Figure 40-21-74].

Figure 40-21-75

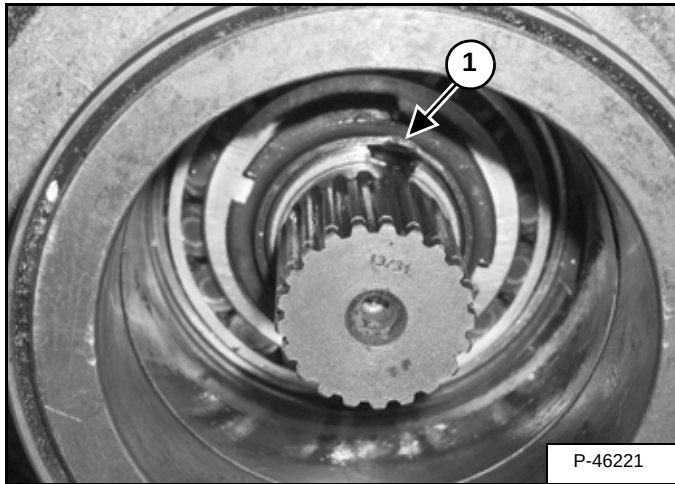


Remove the washer (Item 1) [Figure 40-21-75].

AXLE AND DIFFERENTIAL (REAR) (CONT'D)

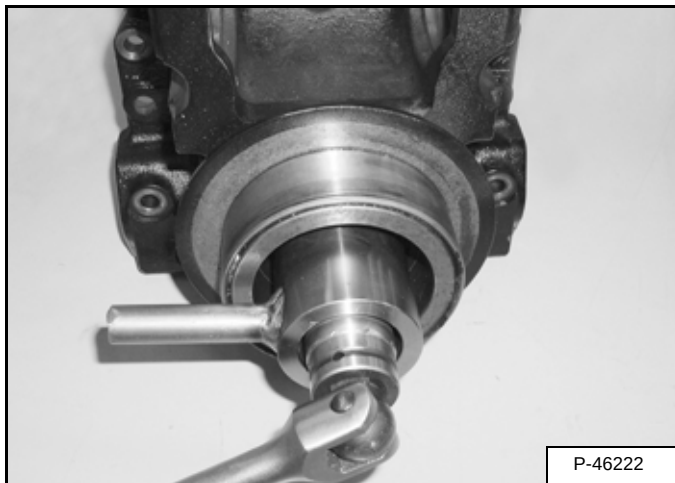
Pinion Group Disassembly (Cont'd)

Figure 40-21-76



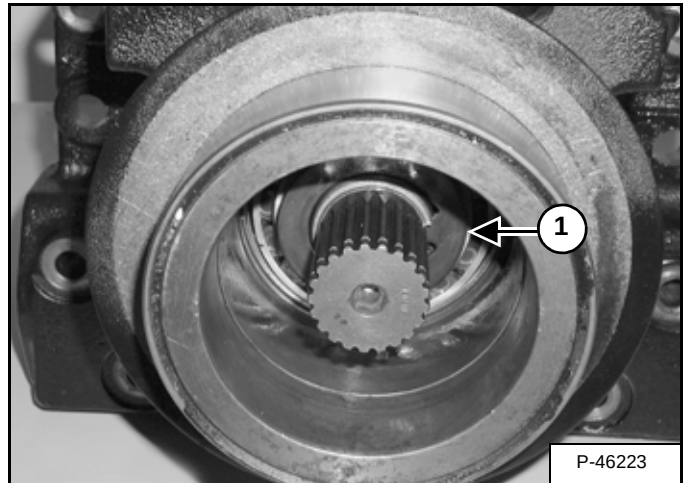
Straighten the peened notch (Item 1) [Figure 40-21-76] in the nut.

Figure 40-21-77



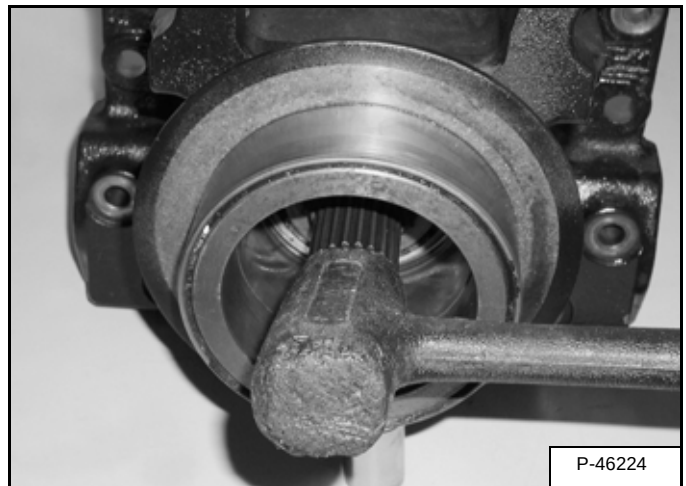
Loosen the nut using special tools CA119099 and CA715022 [Figure 40-21-77] and remove the nut.

Figure 40-21-78



Remove the washer (Item 1) [Figure 40-21-78].

Figure 40-21-79

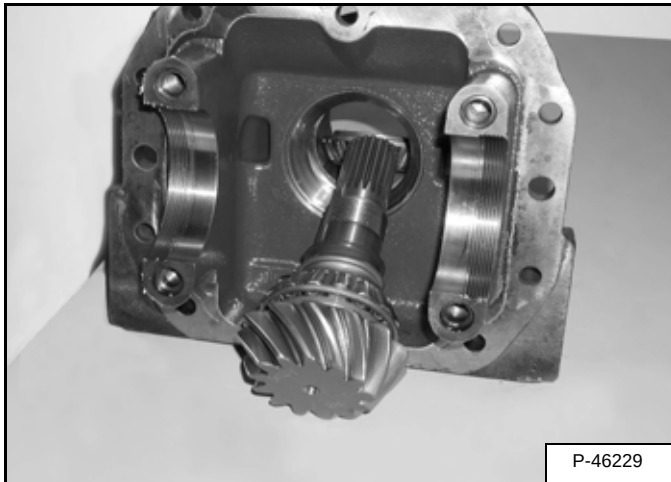


Free the pinion from the housing using a soft faced hammer [Figure 40-21-79].

AXLE AND DIFFERENTIAL (REAR) (CONT'D)

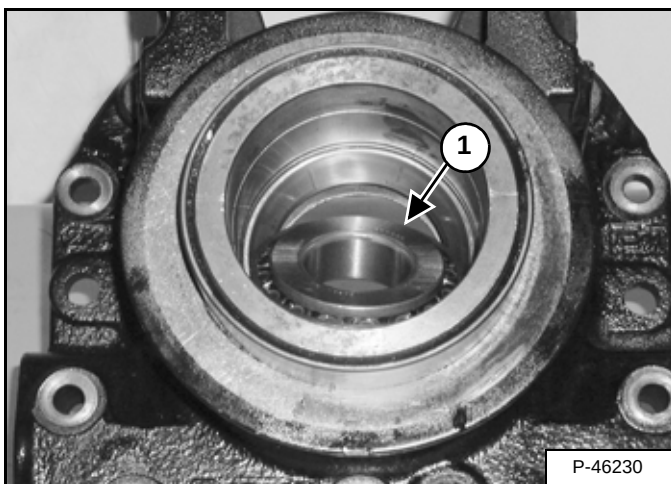
Pinion Group Disassembly (Cont'd)

Figure 40-21-80



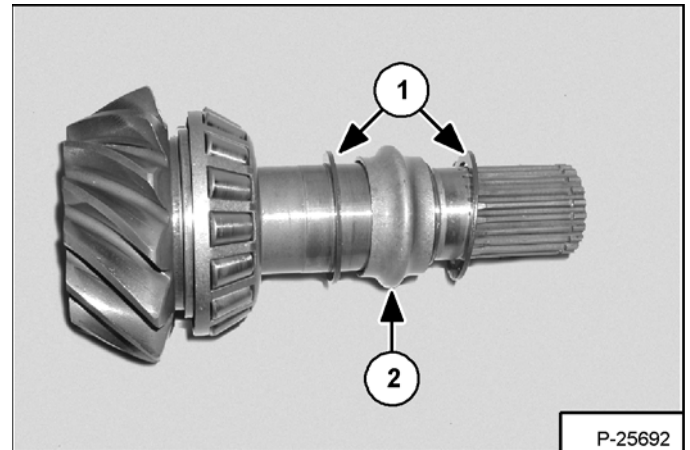
Remove the pinion shaft from the housing [Figure 40-21-80].

Figure 40-21-81



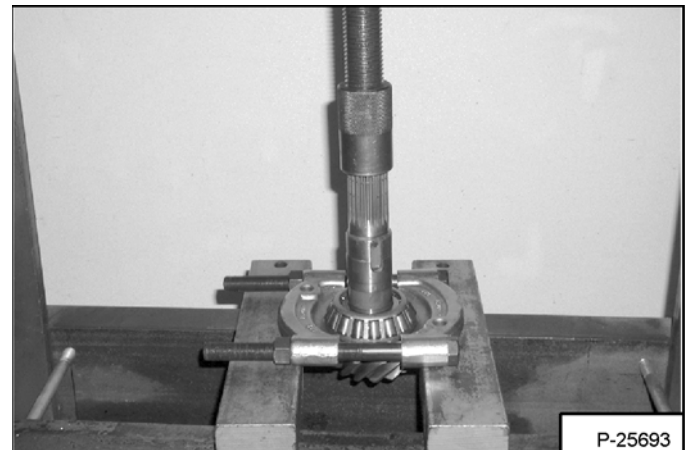
Remove the outer bearing (Item 1) [Figure 40-21-81].

Figure 40-21-82



Remove the two washers (Item 1) and spacer (Item 2) [Figure 40-21-82] from the pinion shaft.

Figure 40-21-83

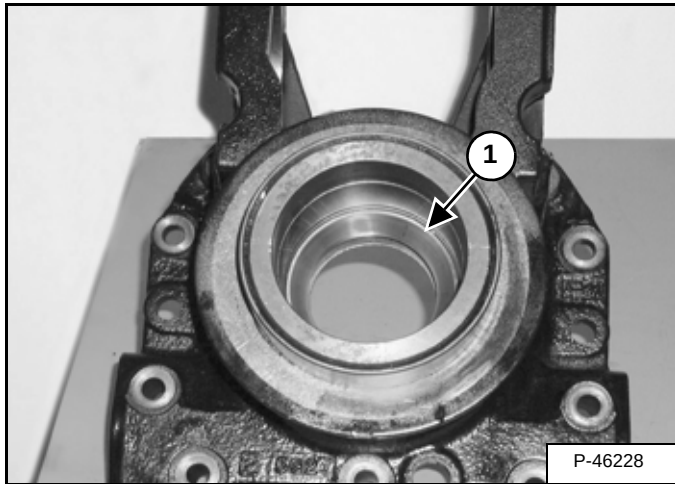


Remove the bearing from the pinion shaft [Figure 40-21-83].

AXLE AND DIFFERENTIAL (REAR) (CONT'D)

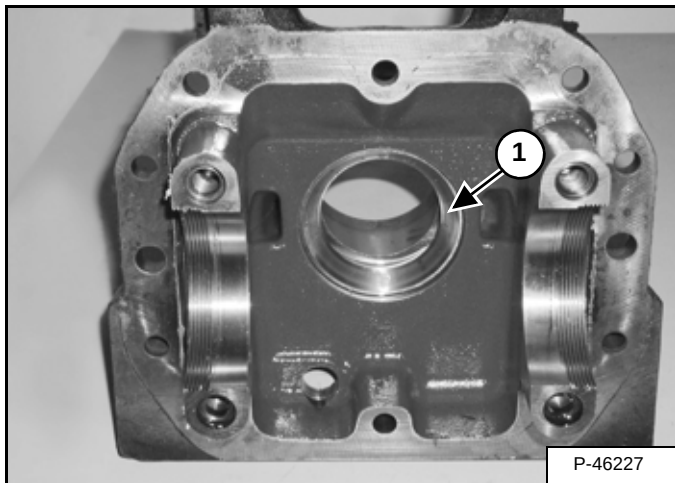
Pinion Group Disassembly (Cont'd)

Figure 40-21-84



Remove the outer race from the housing [Figure 40-21-84].

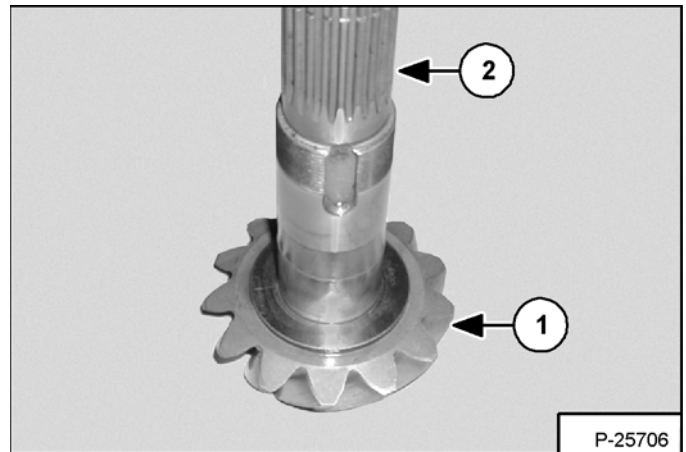
Figure 40-21-85



Remove the inner race from the housing [Figure 40-21-84].

Pinion Group Inspection

Figure 40-21-86



Inspect the pinion gear (Item 1) and shaft splines (Item 2) [Figure 40-21-86] for broken or damaged teeth.

AXLE AND DIFFERENTIAL (REAR) (CONT'D)

Pinion Group 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.

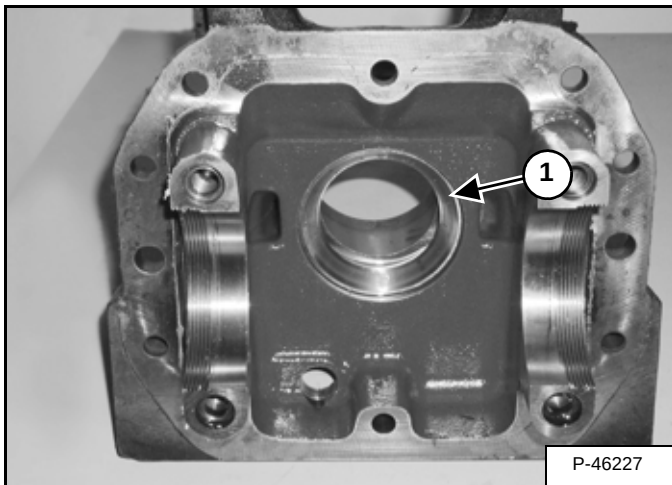
IMPORTANT

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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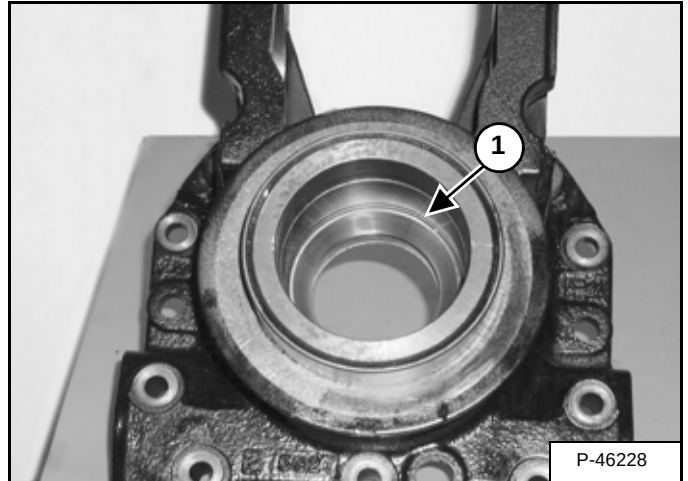
Prior to assembly, clean and lightly oil all parts.

Figure 40-21-87



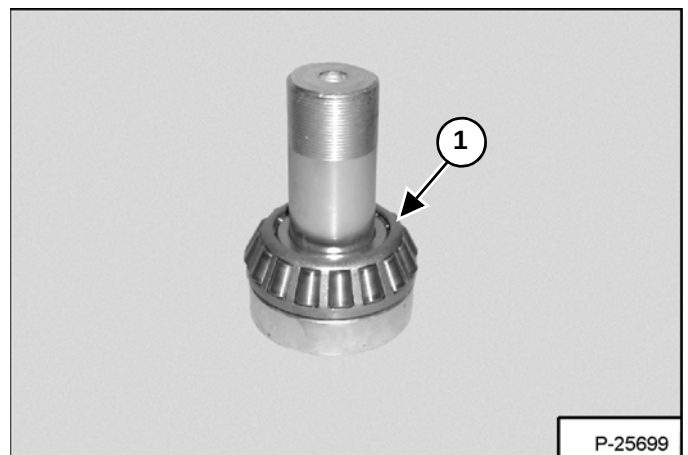
Install the inner race [Figure 40-21-87].

Figure 40-21-88



Install the outer race [Figure 40-21-88].

Figure 40-21-89

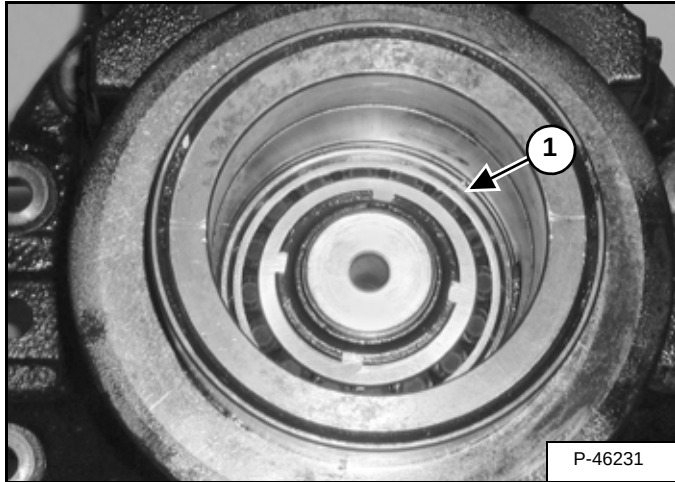


Install the bearing (Item 1) [Figure 40-21-89] onto the dummy pinion tool CA715040.

AXLE AND DIFFERENTIAL (REAR) (CONT'D)

Pinion Group Assembly (Cont'd)

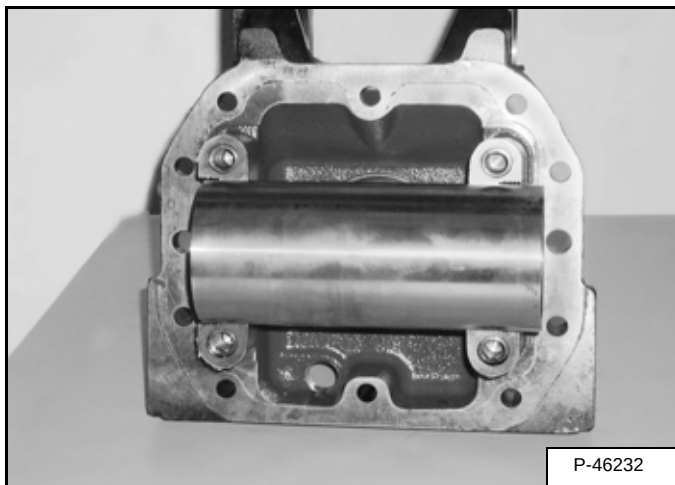
Figure 40-21-90



Install the dummy pinion and bearing into the center housing and install the outer bearing and lock nut (Item 1) [Figure 40-21-90].

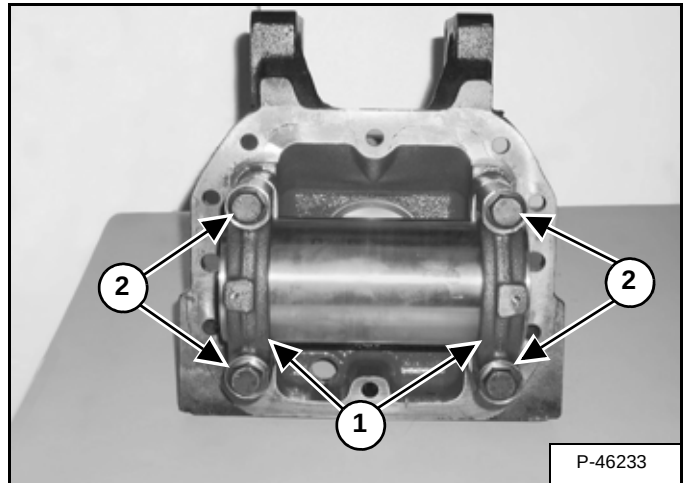
Tighten the lock nut to eliminate any bearing end play. DO NOT overtighten the nut.

Figure 40-21-91



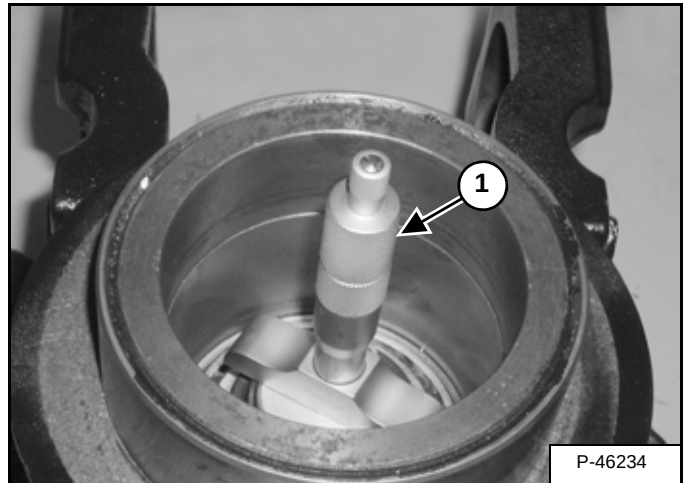
Insert the dummy differential tool CA715041 into the housing [Figure 40-21-91].

Figure 40-21-92



Install the yokes (Item 1) and bolts (Item 2) [Figure 40-21-92]. Tighten the bolts.

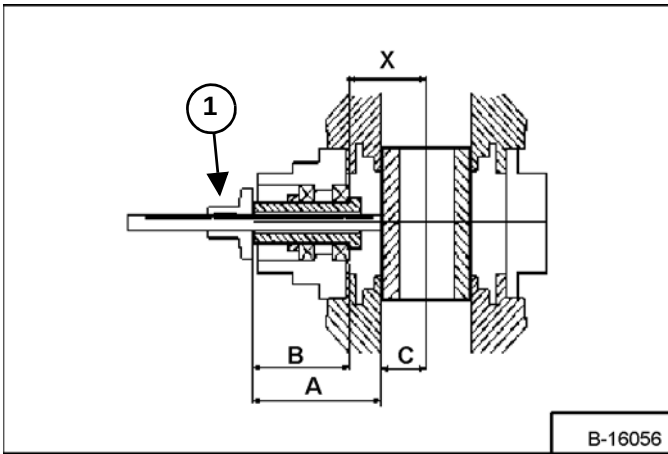
Figure 40-21-93



AXLE AND DIFFERENTIAL (REAR) (CONT'D)

Pinion Group Assembly (Cont'd)

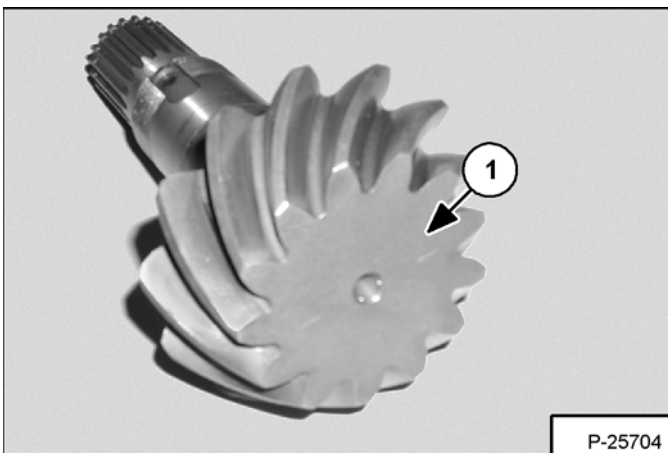
Figure 40-21-94



Using a depth gauge (Item 1) [Figure 40-21-93] & [Figure 40-21-94] measure thru the reference hole in the dummy pinion.

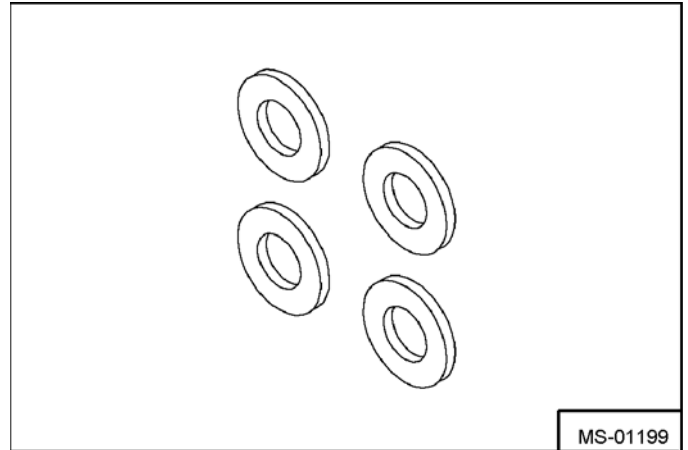
X = (distance to be measured)
 A = (measured value)
 B = (given value) = $100 \pm 0,01$ mm
 C = (given value) = 45 mm
 $(A + C) - B = X$

Figure 40-21-95



To determine the thickness of the shim to be installed between the pinion and bearing, subtract the value stamped on the end of the pinion (Item 1) [Figure 40-21-95] from the value X.

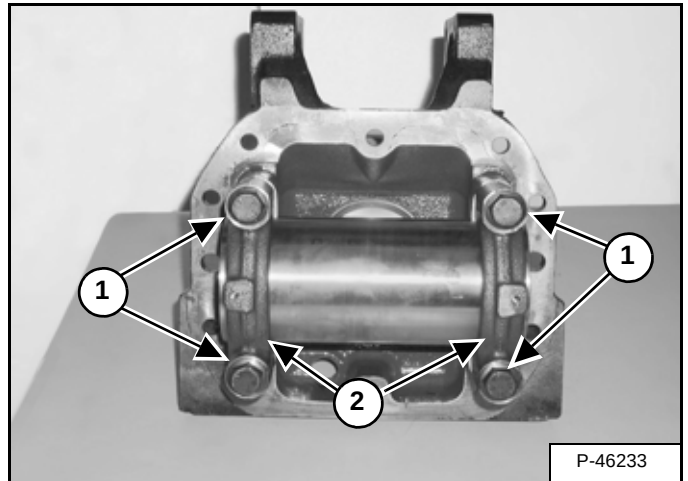
Figure 40-21-96



Select the correct shim [Figure 40-21-96] from the chart below:

SHIM THICKNESS RANGE										
Thick	2.5	2.6	2.7	2.8	2.9	3.0	3.1	3.2	3.3	3.4
Qty.	-	-	-	-	-	-	-	-	-	-

Figure 40-21-97

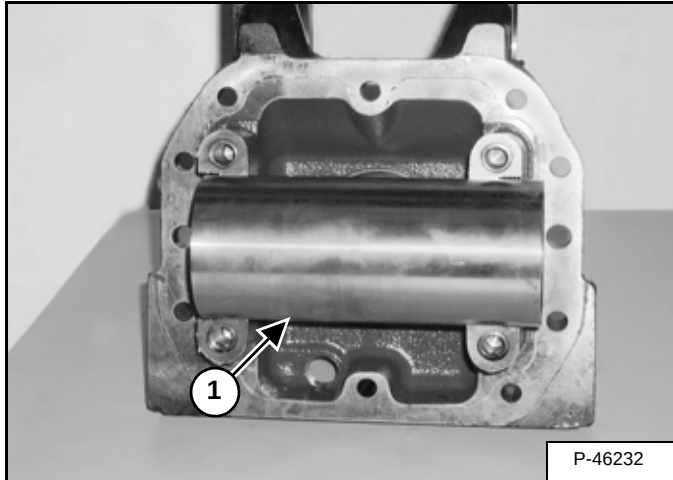


Remove the bolts (Item 1) and yokes (Item 2) [Figure 40-21-97].

AXLE AND DIFFERENTIAL (REAR) (CONT'D)

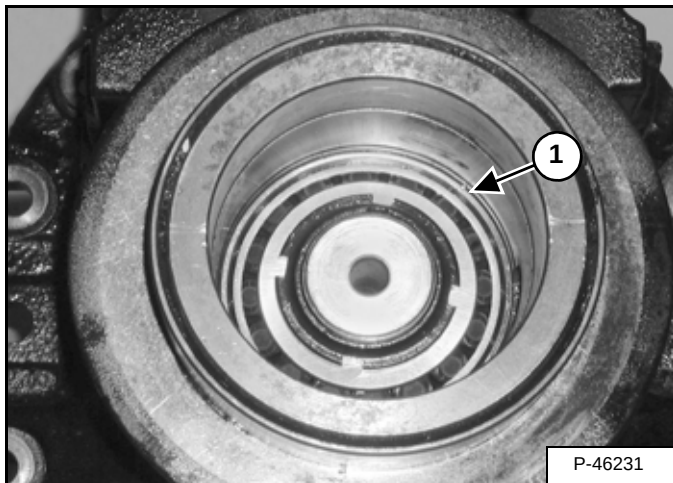
Pinion Group Assembly (Cont'd)

Figure 40-21-98



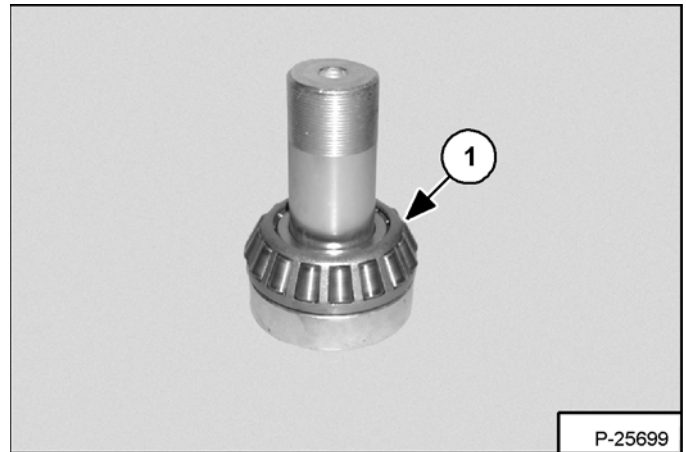
Remove the dummy differential tool (Item 1) [Figure 40-21-98] from the housing.

Figure 40-21-99



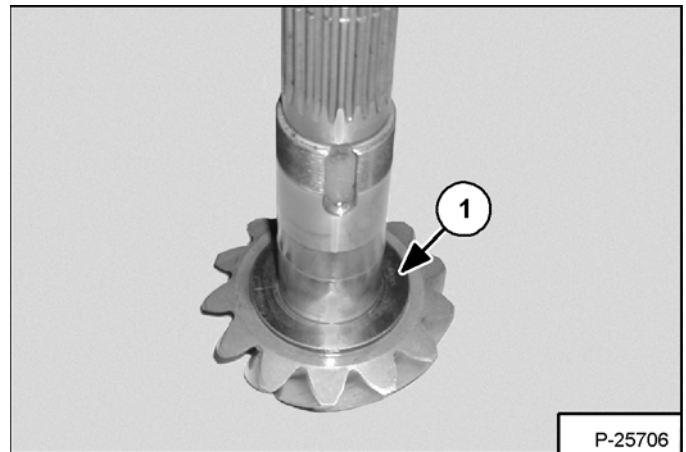
Remove the dummy pinion tool (Item 1) [Figure 40-21-99] from the center housing.

Figure 40-21-100



Remove the bearing (Item 1) [Figure 40-21-100] from the dummy pinion.

Figure 40-21-101



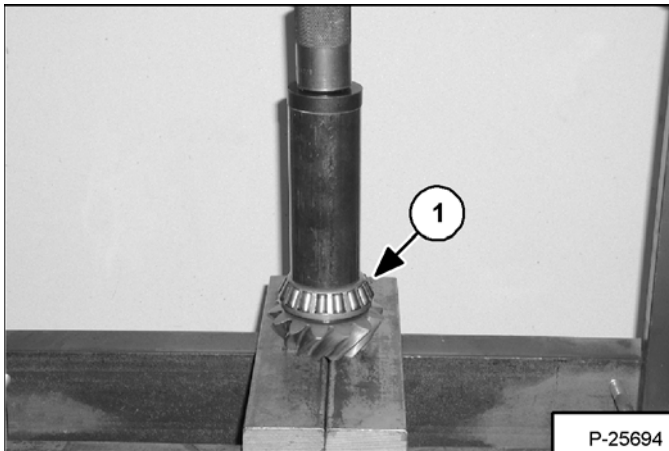
Install the shims selected (Item 1) [Figure 40-21-101] onto the pinion shaft.

NOTE: The beveled edge must go towards the gear.

AXLE AND DIFFERENTIAL (REAR) (CONT'D)

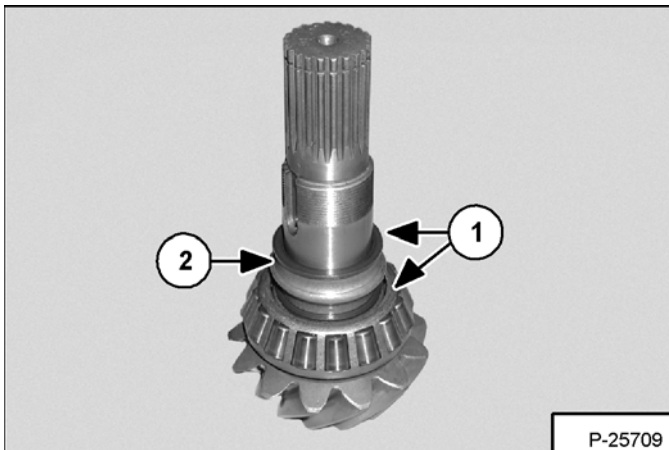
Pinion Group Assembly (Cont'd)

Figure 40-21-102



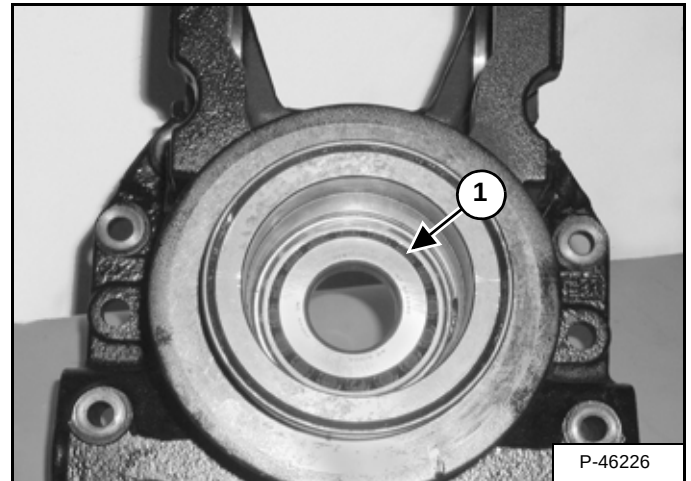
Install the bearing (Item 1) [Figure 40-21-102] onto the pinion shaft until it is fully seated.

Figure 40-21-103



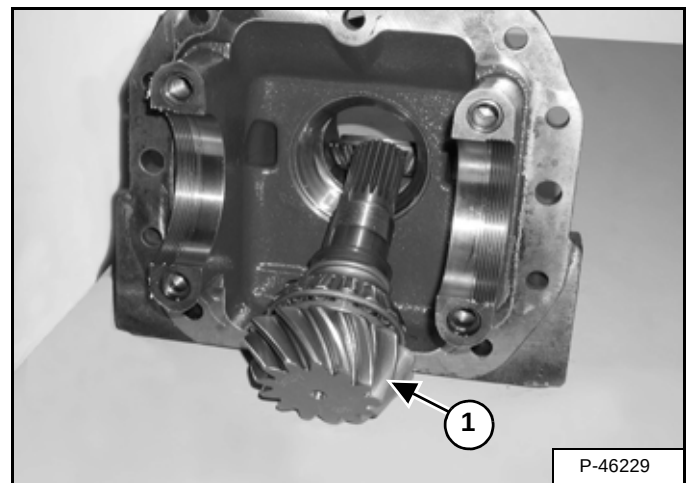
Install the two washers (Item 1) and collapsible spacer (Item 2) [Figure 40-21-103] onto the shaft.

Figure 40-21-104



Install the outer bearing (Item 1) [Figure 40-21-104].

Figure 40-21-105

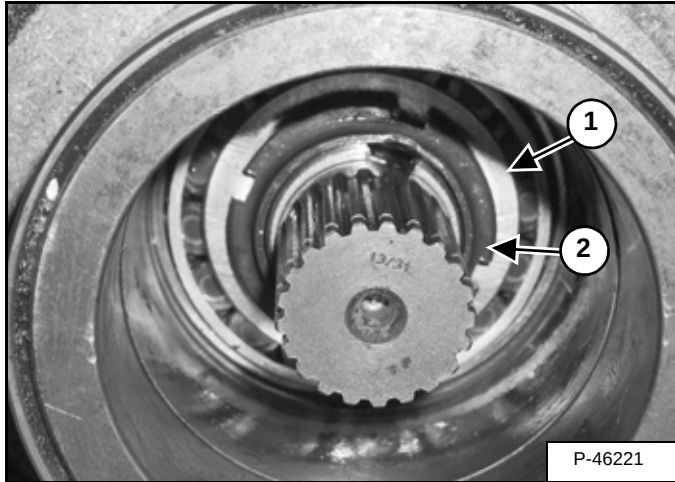


Install the pinion assembly (Item 1) [Figure 40-21-105].

AXLE AND DIFFERENTIAL (REAR) (CONT'D)

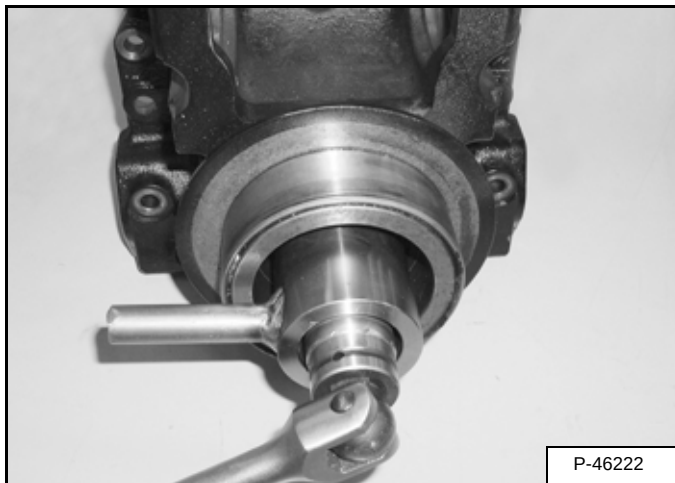
Pinion Group Assembly (Cont'd)

Figure 40-21-106



Install the backing washer (Item 1) and nut (Item 2) [Figure 40-21-106].

Figure 40-21-107

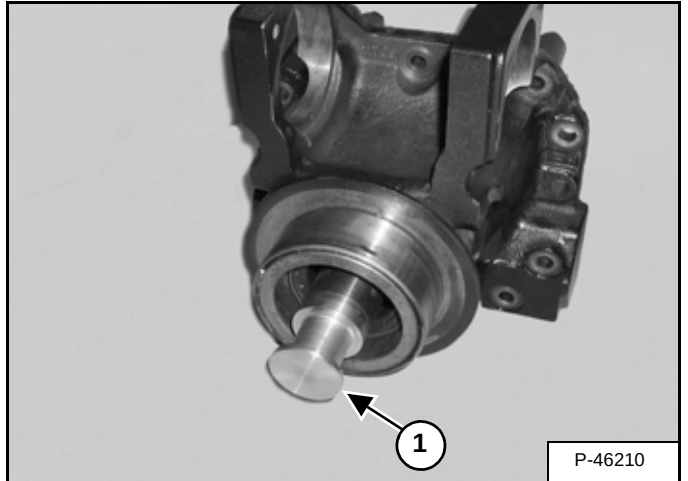


Gradually tighten the nut (See Figure 108 & 109 for the proper procedure) using the special tools CA119099 and CA715022 (Item 1) [Figure 40-21-107].

NOTE: The tightening torque is determined by measuring the force required to rotate the pinion (preload of bearings).

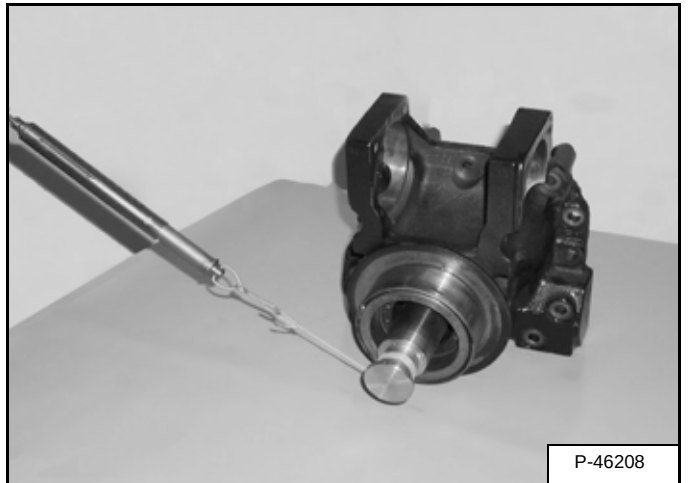
SEE Figure 108 & 109. Tighten the nut in incremental steps. If overtightened (preload too high) the collapsible spacer (Item 2) [Figure 40-21-103] must be replaced and the procedure repeated [Figure 40-21-107].

Figure 40-21-108



Install the special tool CA715116 (Item 1) [Figure 40-21-108] onto the pinion shaft.

Figure 40-21-109



Attach one end of a light rope to the special tool [Figure 40-21-109]. Make 2 or 3 complete wraps around the tool. Attach the spring scale perpendicular to the housing to measure the rolling torque on the bearings. Tighten (or loosen) the nut (Item 1) [Figure 40-21-106] until 2-3 lb (.9 - 1.4 Kg) of smooth and continuous rolling torque is measured on the spring scale.

AXLE AND DIFFERENTIAL (REAR) (CONT'D)

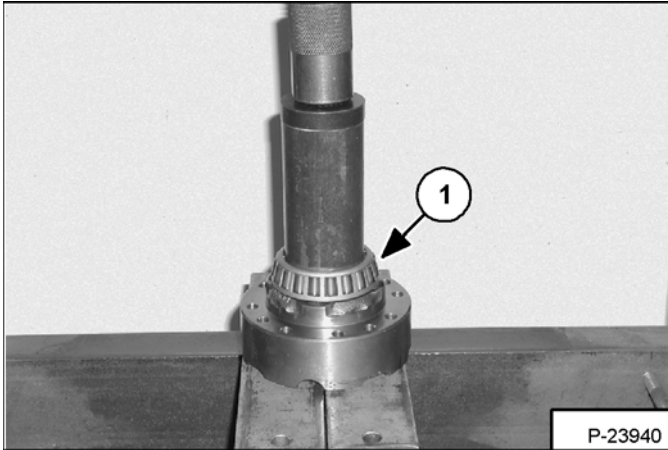
Differential Assembly

Clean all parts in solvent and dry with compressed air.

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

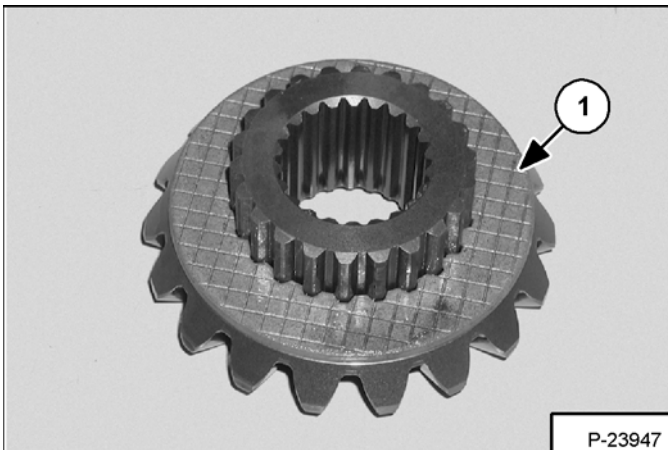
Always install new seals and O-rings. Lubricate all seals and O-rings with clean hydraulic fluid before installation.

Figure 40-21-110



Install the bearing (Item 1) [Figure 40-21-110] onto each housing.

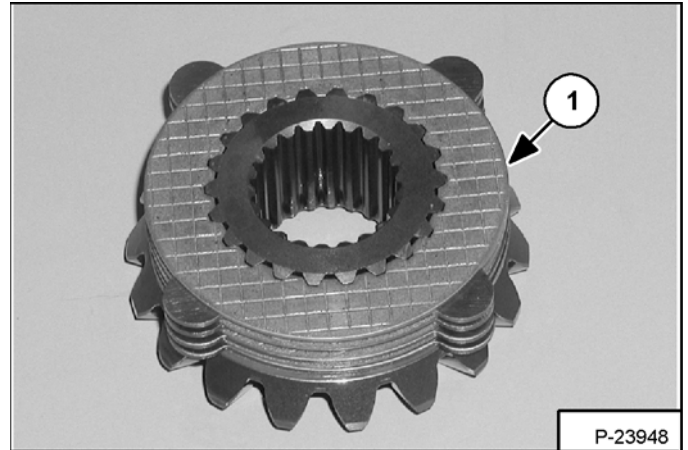
Figure 40-21-111



Install the disc (Item 1) [Figure 40-21-111] that is one half friction and the other half metal onto the gear splines.

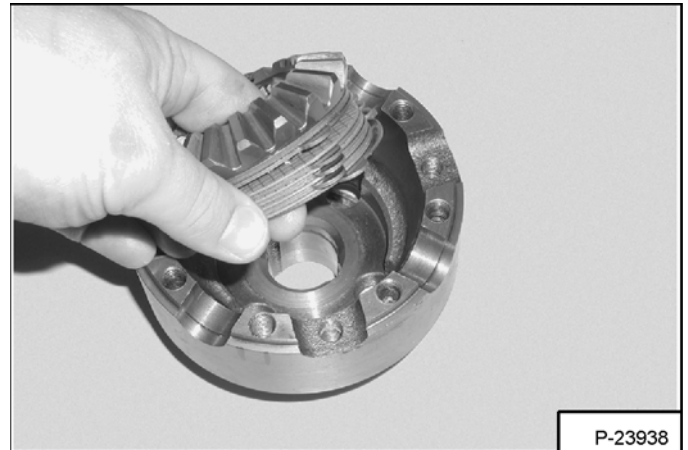
NOTE: The metal side must be next to the gear.

Figure 40-21-112



Install the remaining discs (Item 1) [Figure 40-21-112] onto the shaft, alternating between steel and friction.

Figure 40-21-113



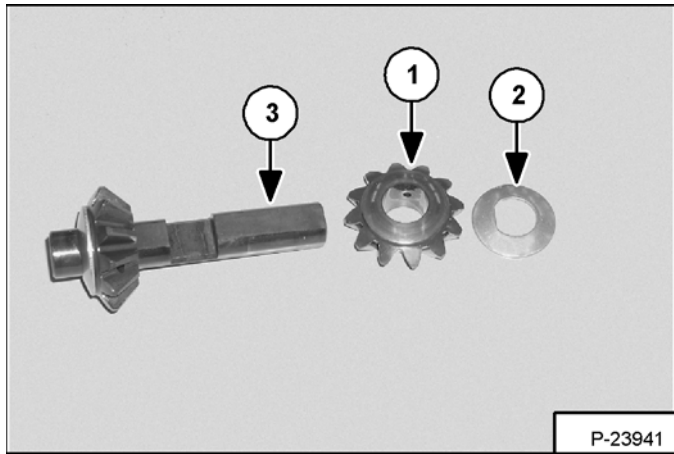
Install the gear/disc assembly into the housing [Figure 40-21-113].

NOTE: Make sure the disc remains in correct position.

AXLE AND DIFFERENTIAL (REAR) (CONT'D)

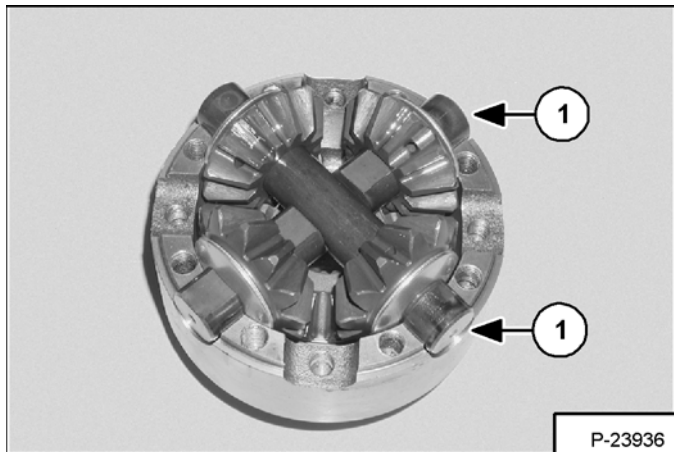
Differential Assembly (Cont'd)

Figure 40-21-114



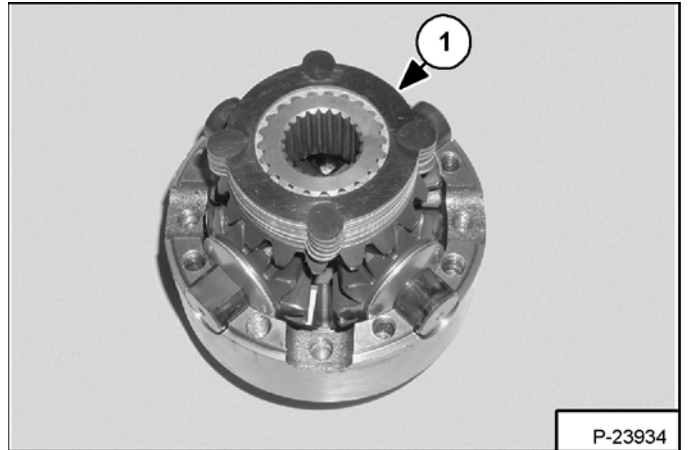
Install the gear (Item 1) cup washer (Item 2) onto the spindle (Item 3) [Figure 40-21-114].

Figure 40-21-115



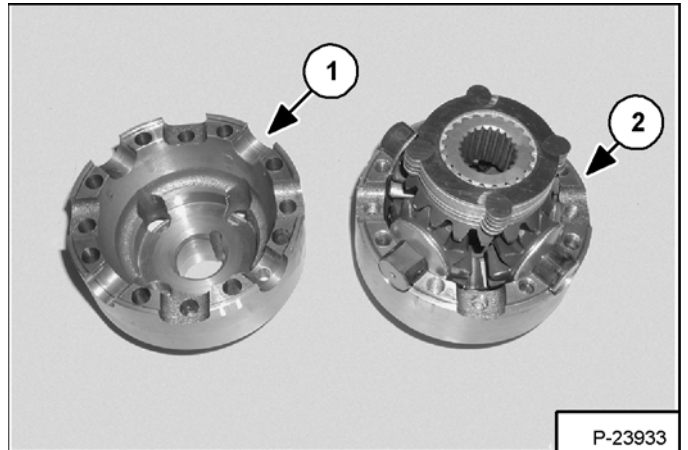
Install the spindle/gear assemblies (Item 1) [Figure 40-21-115] into the housing.

Figure 40-21-116



Set the gear/discs assembly (Item 1) [Figure 40-21-116] onto the spindle gears.

Figure 40-21-117

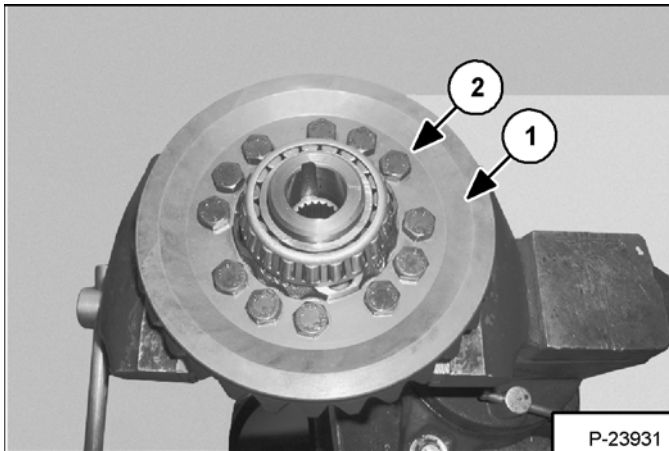


Install the housing (Item 1) onto the housing/gear assembly (Item 2) [Figure 40-21-117]. Make sure to align the reference marks made earlier.

AXLE AND DIFFERENTIAL (REAR) (CONT'D)

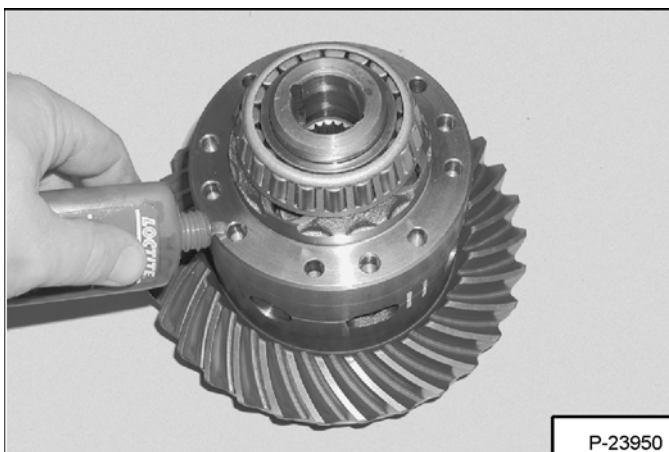
Differential Assembly (Cont'd)

Figure 40-21-118



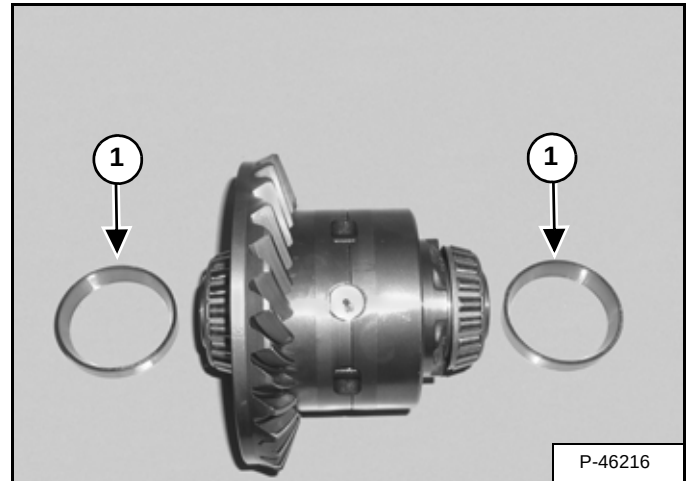
Install the ring gear (Item 1) and twelve bolts (Item 2) [Figure 40-21-118]. Tighten the bolts to 58 ft.-lbs. (78 Nm) torque.

Figure 40-21-119



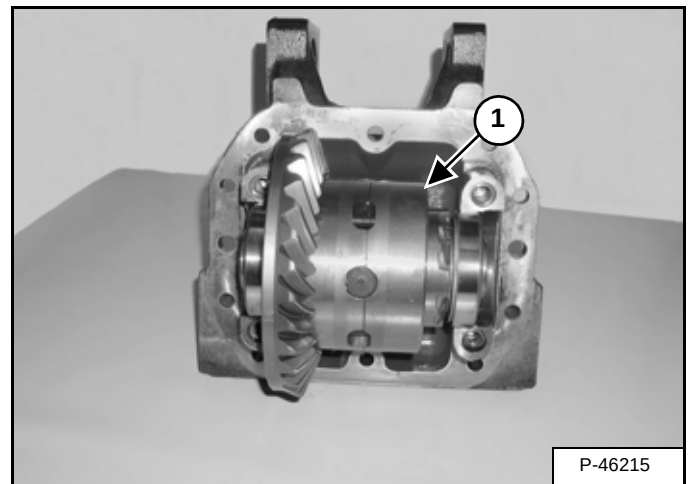
Apply LOCTITE #270 to the end of the mounting bolts [Figure 40-21-119].

Figure 40-21-120



Install the bearing races (Item 1) [Figure 40-21-120] on the bearings.

Figure 40-21-121

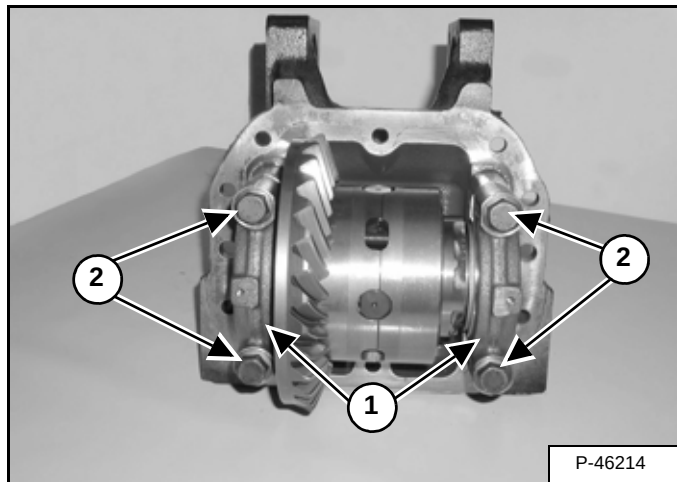


Install the differential assembly (Item 1) [Figure 40-21-121] in the housing.

AXLE AND DIFFERENTIAL (REAR) (CONT'D)

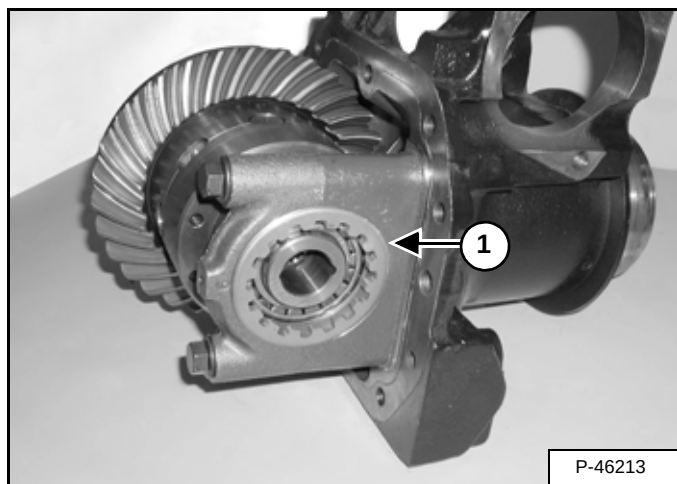
Differential Assembly (Cont'd)

Figure 40-21-122



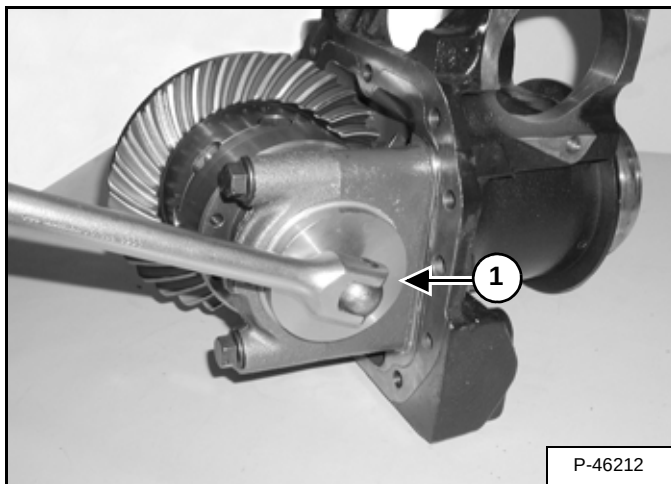
Install the yokes (Item 1) with the four bolts (Item 2) [Figure 40-21-122].

Figure 40-21-123



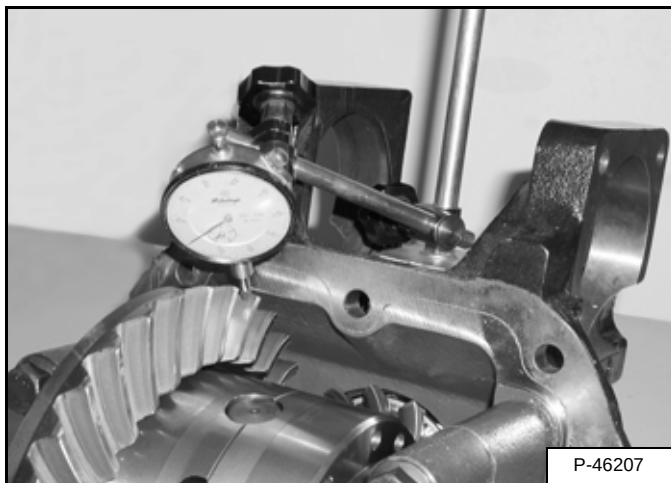
Install the internal nut (Item 1) [Figure 40-21-123]. (Both sides)

Figure 40-21-124



Tighten the internal nut (Item 1) [Figure 40-21-123] using special tool CA119030 (Item 1) [Figure 40-21-124]. (Both sides)

Figure 40-21-125



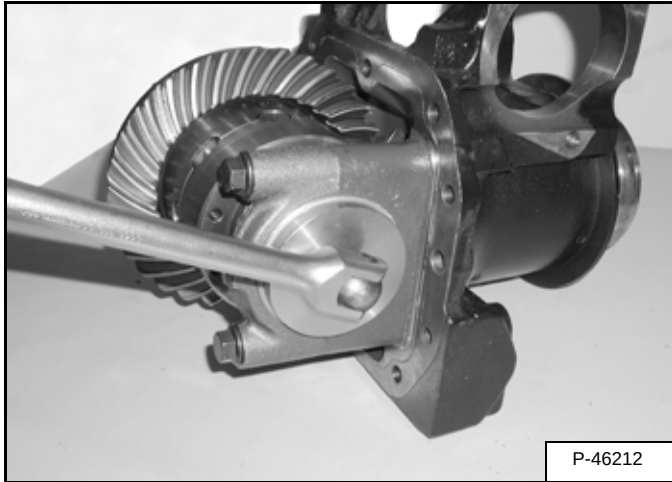
Using a dial gauge, move the ring gear back and forth and make a note of the backlash between the pinion and ring gear [Figure 40-21-125].

Check that the backlash is within the permissible range of 0.007 - 0.009 inches (0.18 - 0.23 mm).

AXLE AND DIFFERENTIAL (REAR) (CONT'D)

Differential Assembly (Cont'd)

Figure 40-21-126

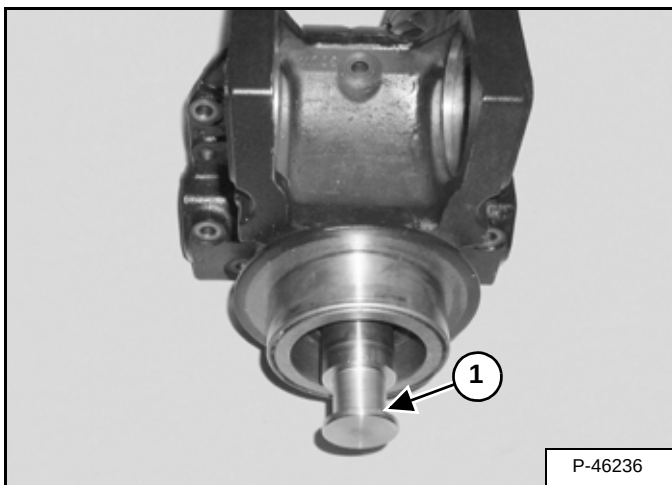


Adjusting the lock nuts [Figure 40-21-126]:

- If the backlash measured is under the permissible range, tighten the lock nut on the side opposite the crown wheel and unscrew the lock nut on the other side by the same amount.
 - If the backlash is above the permissible range, tighten the lock nut on the side of the crown wheel and loosen the lock nut on the other side by the same amount.
- Once the pinion and ring gear adjustment has been carried out, check that there is at least a minimal preload on the differential cage bearings. If necessary, repeat the steps if backlash is still outside the permissible range.

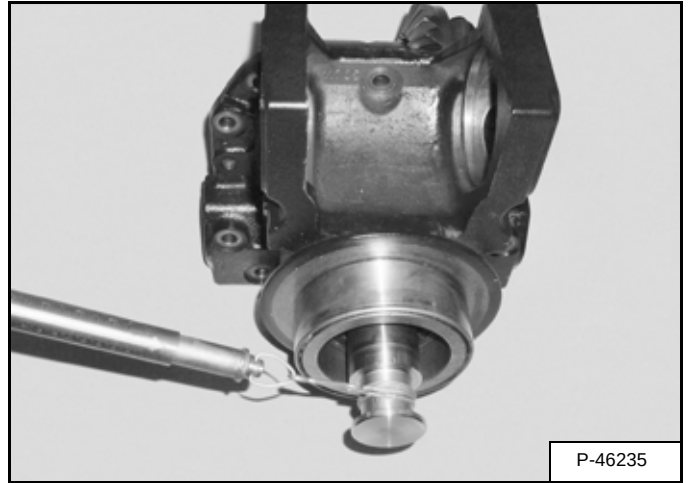
Once the pinion/ring gear backlash has been determined, the total preload of the pinion ring gear wheel bearings must be measured, to verify that it falls within the permissible range.

Figure 40-21-127



Install the special tool CA715116 (Item 1) [Figure 40-21-127] onto the pinion shaft.

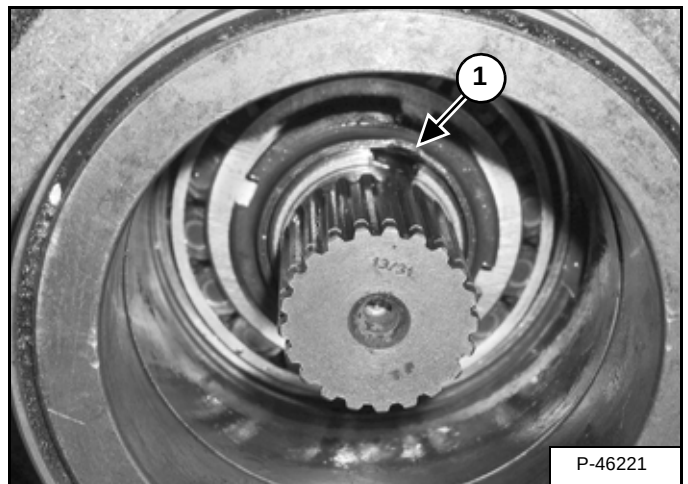
Figure 40-21-128



Attach one end of a light rope to the special tool and make 2 or 3 wraps around the tool. Attach the spring scale to the opposite end of the rope. Pull the scale perpendicular to the housing to measure the rolling torque on the bearings. The value is 2 - 3 lbs. (0.9 to 1.4 Kg) [Figure 40-21-128].

- If the total preload is under the permissible range, tighten the two lock nuts by same amount, retaining the value of the pinion ring gear backlash. -If the total preload is above the permissible range, slacken the two lock nuts by the same amount, retaining the value of the pinion ring gear backlash.

Figure 40-21-129

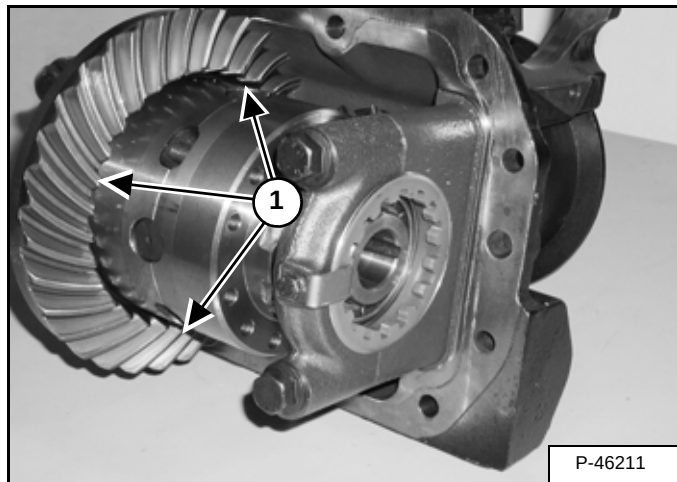


Stake the lock nut (Item 1) [Figure 40-21-129] on the pinion.

AXLE AND DIFFERENTIAL (REAR) (CONT'D)

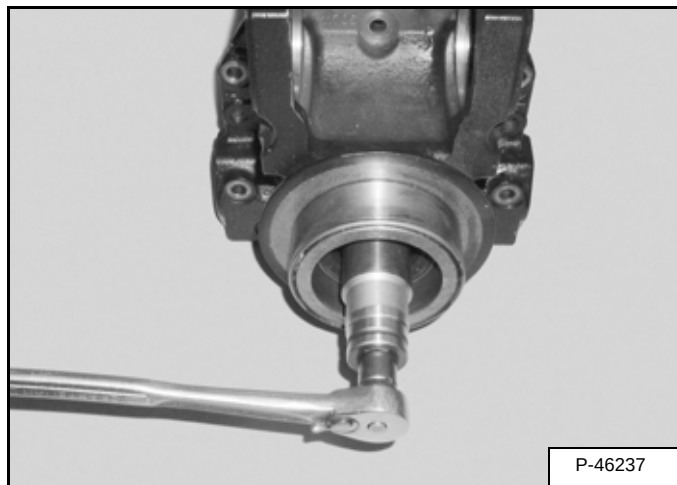
Differential Assembly (Cont'd)

Figure 40-21-130



Use colored lead and brush to paint 3 or 4 teeth of the ring gear in three opposite places (Item 1) **[Figure 40-21-130]**.

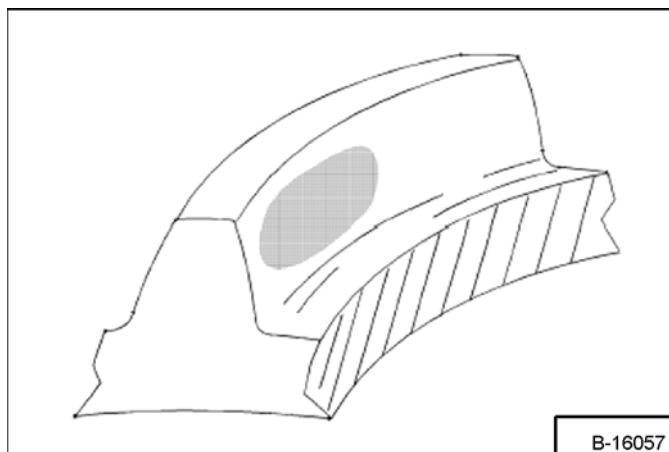
Figure 40-21-131



Turn the pinion using the special tool CA715022 several turns **[Figure 40-21-131]**.

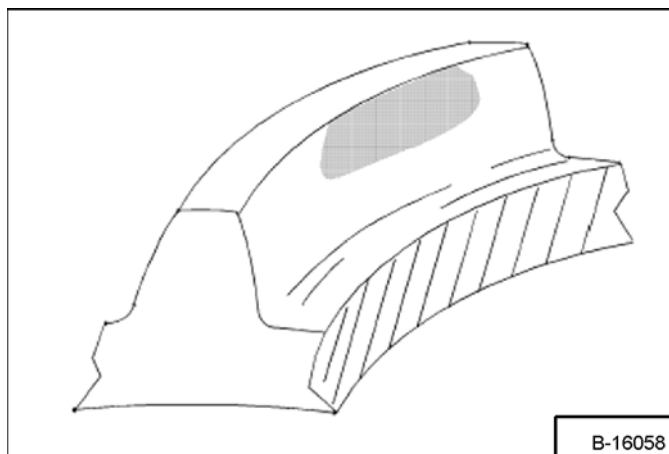
Check the wear pattern of the pinion/ring gear teeth.

Figure 40-21-132



Correct Pattern - If pinion/ring gear has been properly adjusted, wear pattern (contact) should be as shown **[Figure 40-21-132]**.

Figure 40-21-133

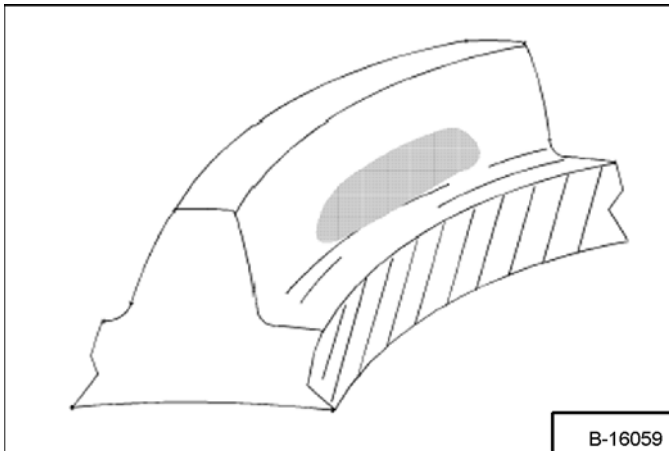


Excessive contact on tooth edge - adjust the backlash **[Figure 40-21-133]**.

AXLE AND DIFFERENTIAL (REAR) (CONT'D)

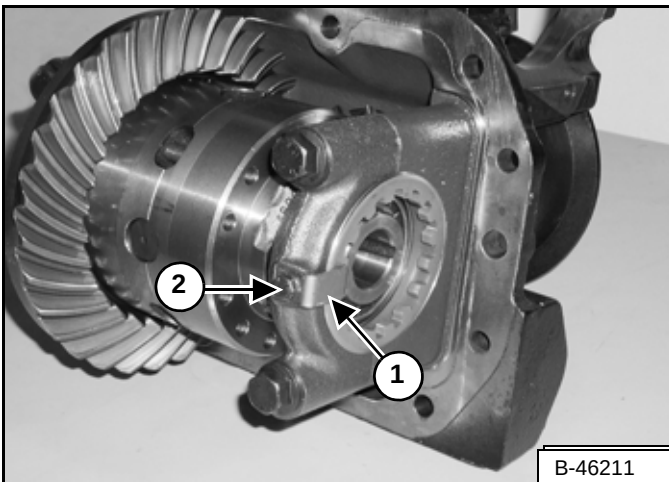
Differential Assembly (Cont'd)

Figure 40-21-134



Excessive contact on flank of tooth - adjust the backlash [Figure 40-21-134].

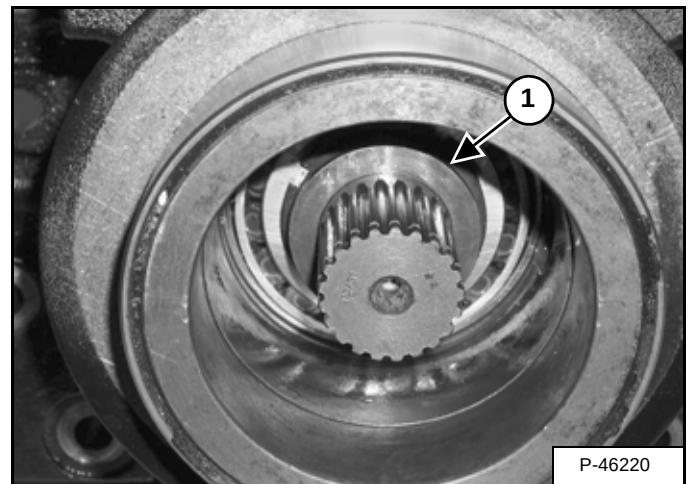
Figure 40-21-135



Once the wear pattern is correct install the lock nut retainer (Item 1) and bolt (Item 2) [Figure 40-21-135].

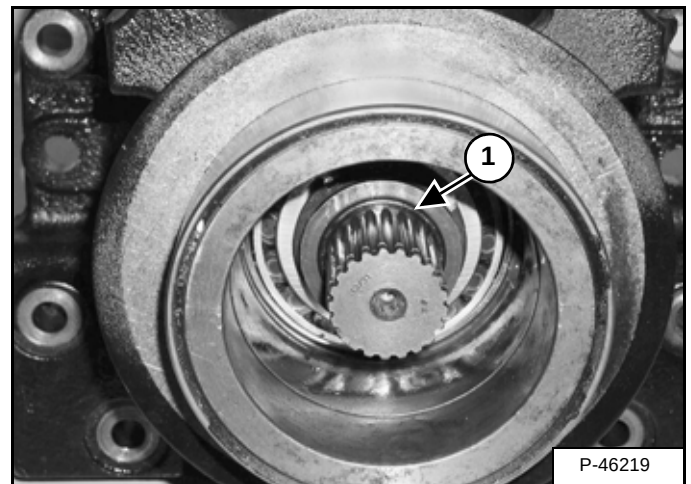
Tighten the bolt to 10 ft.-lbs. (13 Nm) torque. (Both sides)

Figure 40-21-136



Install the washer (Item 1) [Figure 40-21-136] in the housing.

Figure 40-21-137

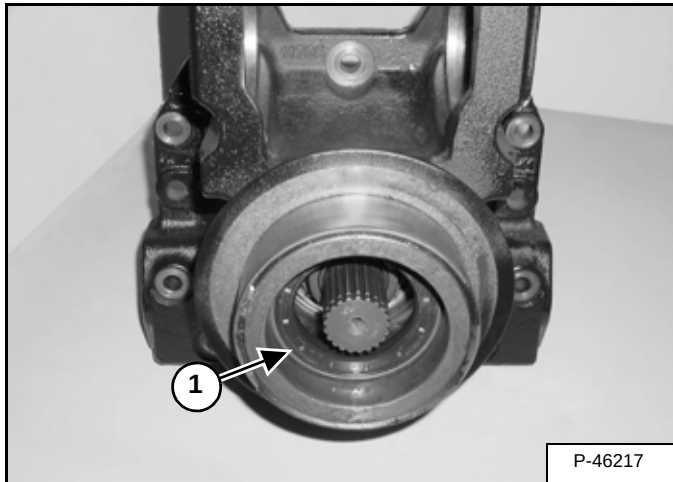


Install the O-ring (Item 1) [Figure 40-21-137].

AXLE AND DIFFERENTIAL (REAR) (CONT'D)

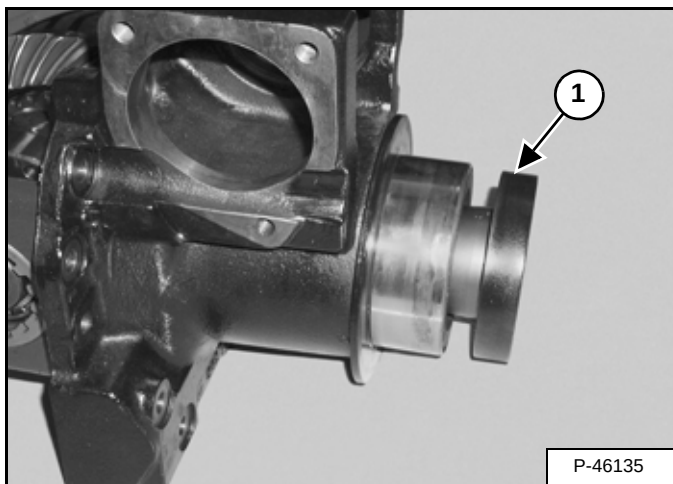
Differential Assembly (Cont'd)

Figure 40-21-138



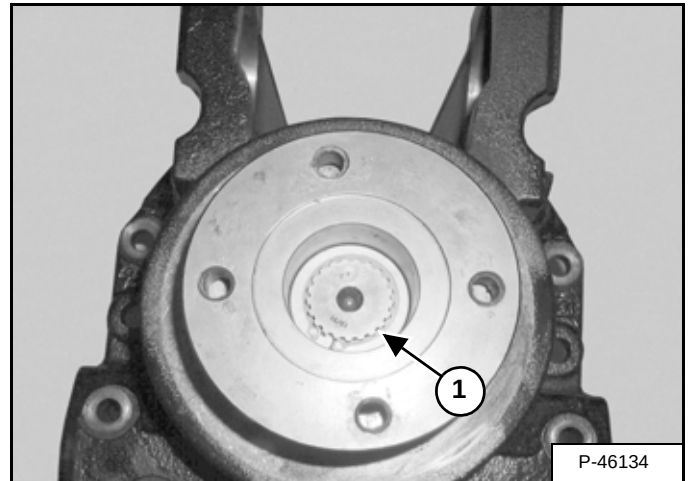
Install the seal (Item 1) [Figure 40-21-138].

Figure 40-21-139



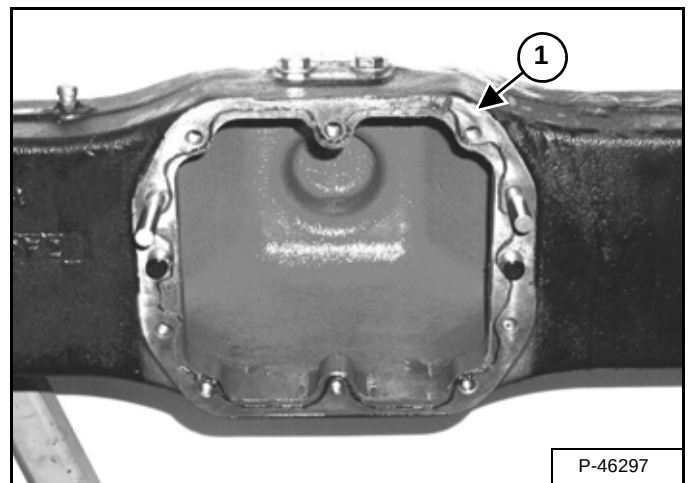
Install the drive coupler (Item 1) [Figure 40-21-139].

Figure 40-21-140



Install the snap ring (Item 1) [Figure 40-21-140].

Figure 40-21-141

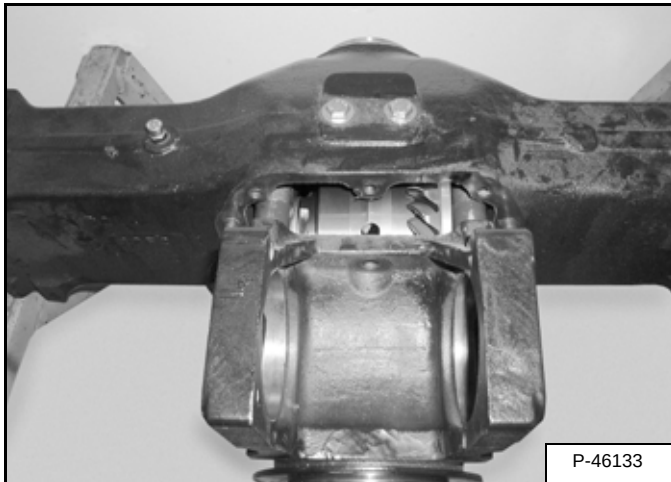


Apply a 3 mm bead of LOCTITE 510 Gasket Eliminator (or equivalent) to the axle housing (Item 1) [Figure 40-21-141] in the pattern shown.

AXLE AND DIFFERENTIAL (REAR) (CONT'D)

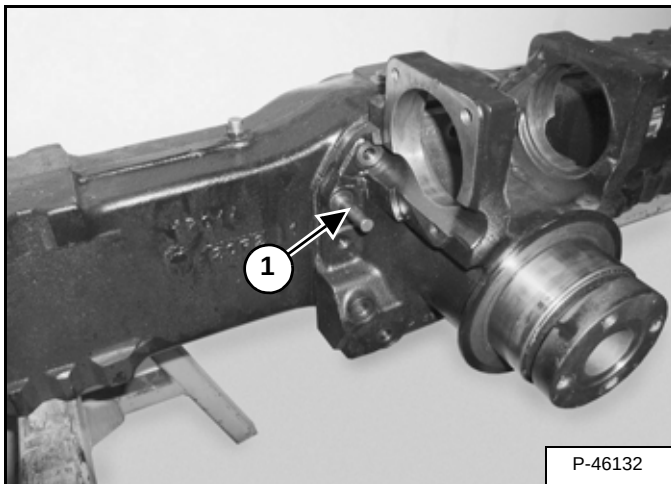
Differential Assembly (Cont'd)

Figure 40-21-142



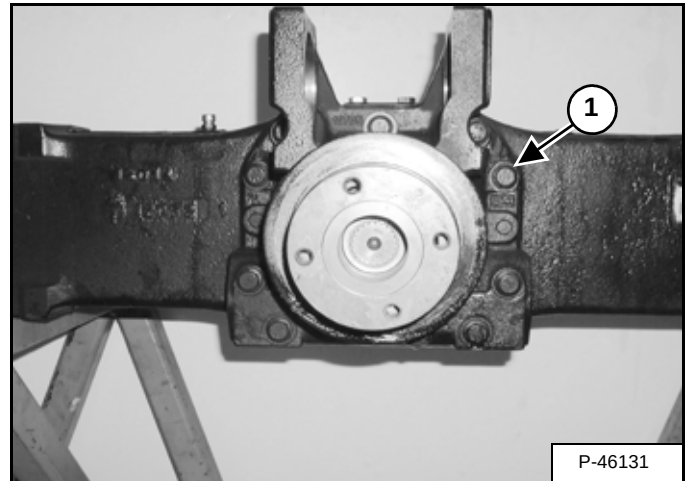
Install the differential assembly [Figure 40-21-142].

Figure 40-21-143



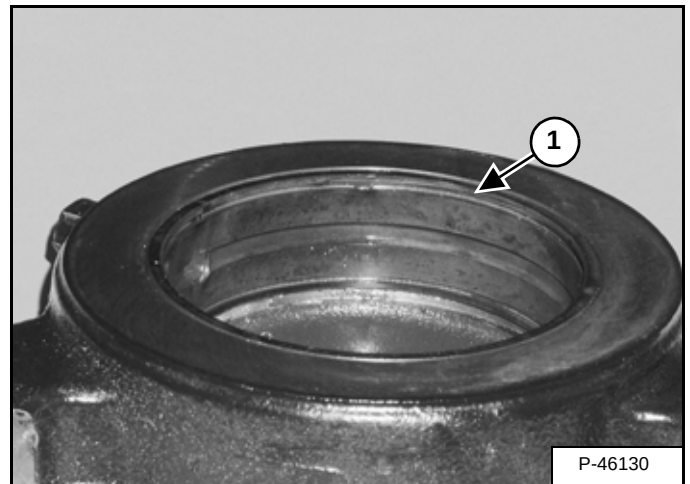
Remove the alignment studs (Item 1) [Figure 40-21-143].

Figure 40-21-144



Install the ten bolts (Item 1) [Figure 40-21-144] .

Figure 40-21-145

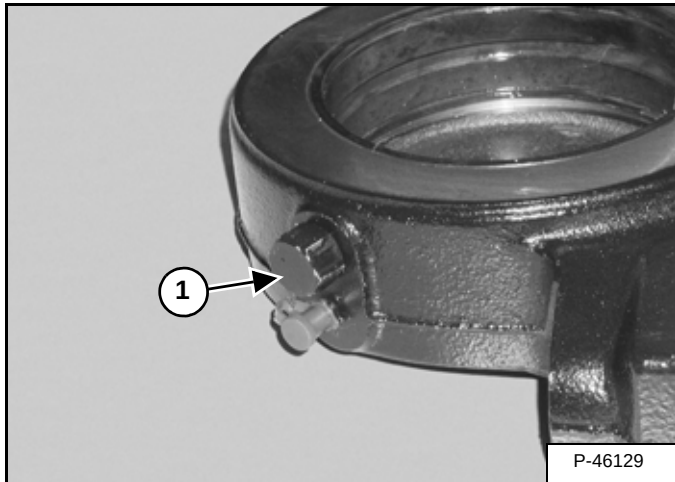


Install the bushing (Item 1) [Figure 40-21-145] in the rear mount bracket.

AXLE AND DIFFERENTIAL (REAR) (CONT'D)

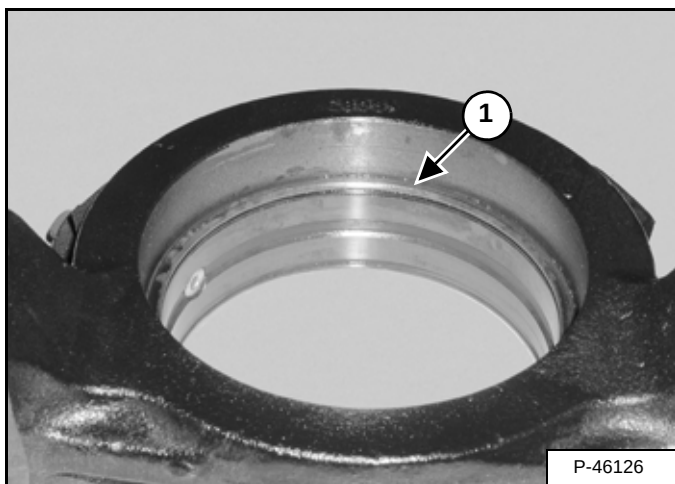
Differential Assembly (Cont'd)

Figure 40-21-146



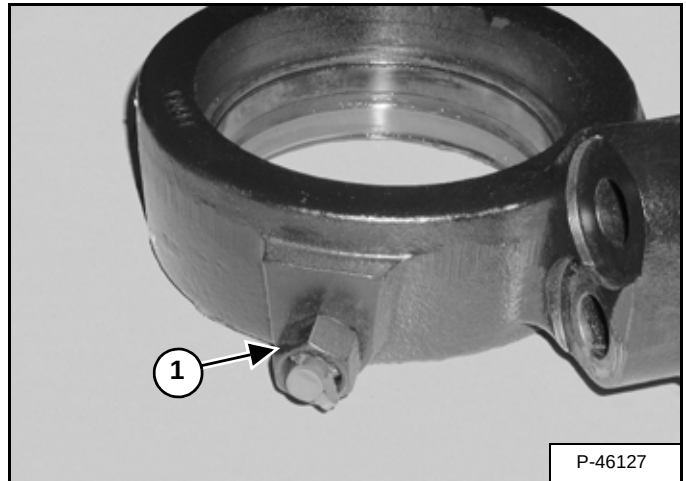
Tighten the retainer (Item 1) [Figure 40-21-146] on the rear mount bracket.

Figure 40-21-147



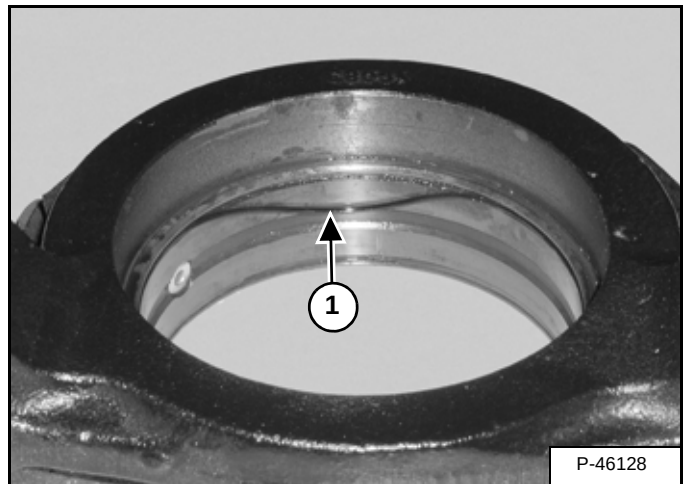
Install the bushing (Item 1) [Figure 40-21-147] in the front mount bracket.

Figure 40-21-148



Tighten the retainer (Item 1) [Figure 40-21-148].

Figure 40-21-149

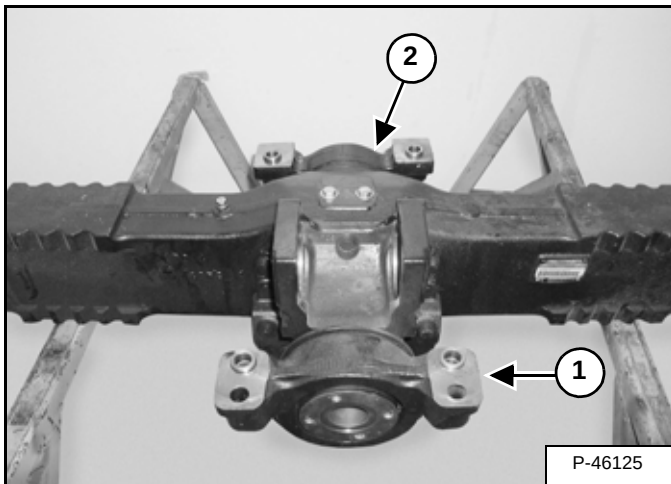


Install the O-ring (Item 1) [Figure 40-21-149] in the front mount bracket.

AXLE AND DIFFERENTIAL (REAR) (CONT'D)

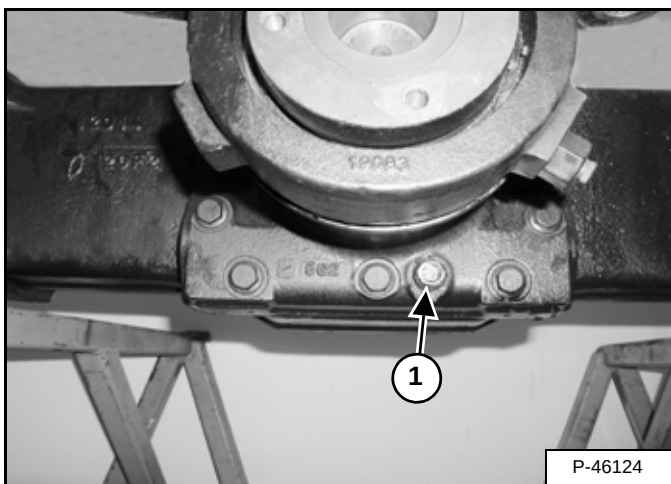
Differential Assembly (Cont'd)

Figure 40-21-150



Install the front (Item 1) and rear (Item 2) **[Figure 40-21-150]** mount brackets on the axle housing.

Figure 40-21-151



Install the plug (Item 1 **[Figure 40-21-151]**) in the axle housing.

AXLE AND DIFFERENTIAL (REAR) (CONT'D)

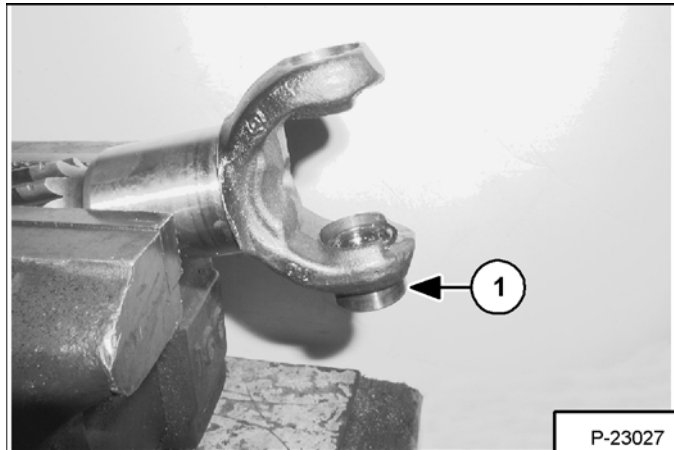
Axle Housing/Drive Axle Assembly

Clean all parts in solvent and dry with compressed air.

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

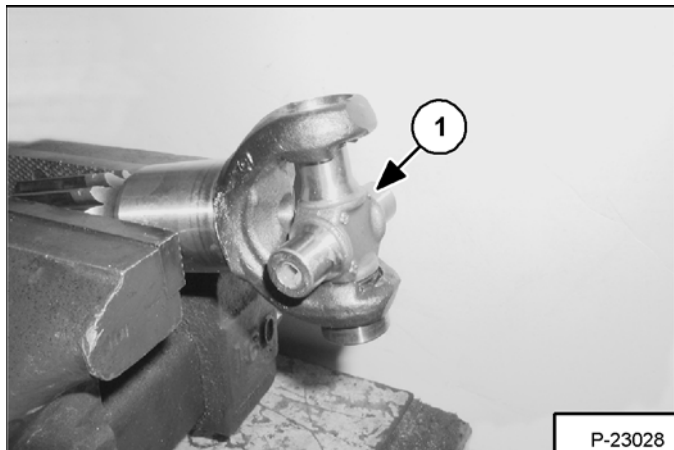
Always install new seals and O-rings. Lubricate all seals and O-rings with clean hydraulic fluid before installation.

Figure 40-21-152



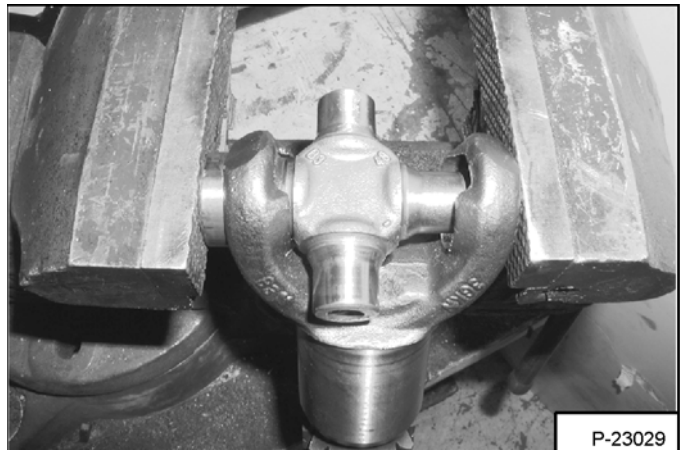
Partially install a new bearing cup (Item 1) [Figure 40-21-152] into the yoke.

Figure 40-21-153



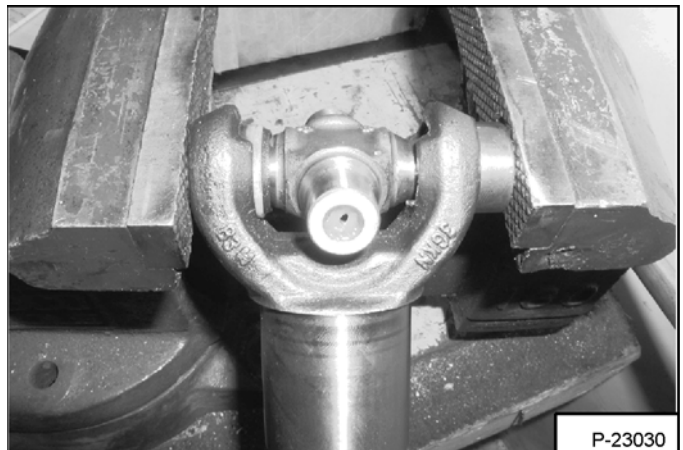
Install the cross (Item 1) [Figure 40-21-153] into the bearing cup.

Figure 40-21-154



Press the bearing cup into the yoke [Figure 40-21-154].

Figure 40-21-155



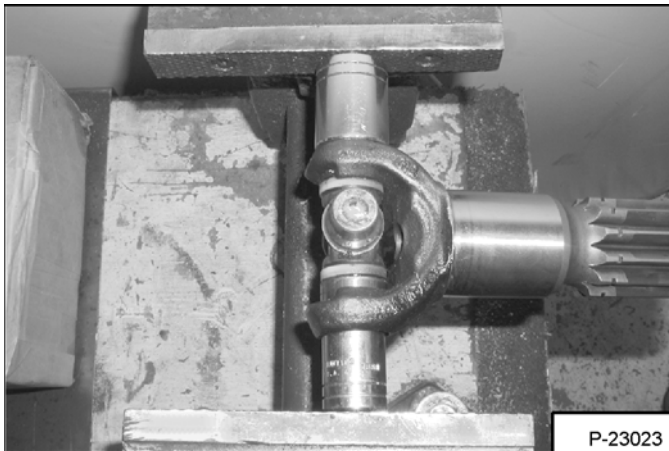
Install the second bearing cup into the yoke and press onto the cross [Figure 40-21-155].

NOTE: Use care not to lose or drop any needle bearings out of position.

AXLE AND DIFFERENTIAL (REAR) (CONT'D)

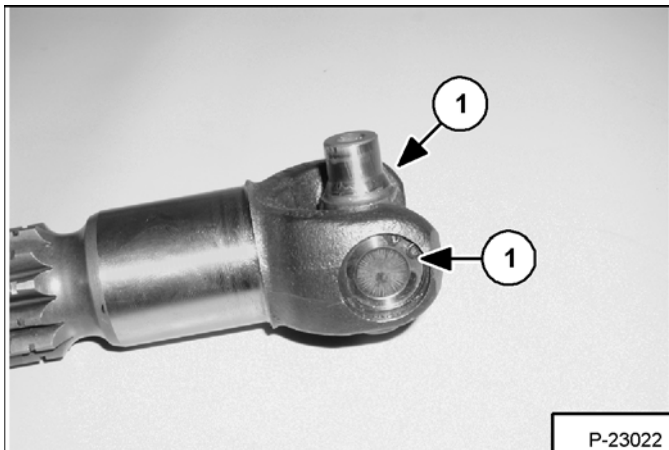
Axle Housing/Drive Axle Assembly (Cont'd)

Figure 40-21-156



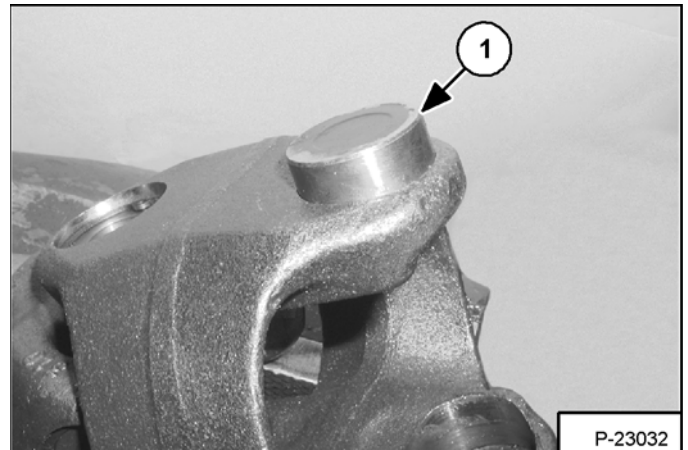
Fully press the two bearing cups into the drive shaft yoke [Figure 40-21-156].

Figure 40-21-157



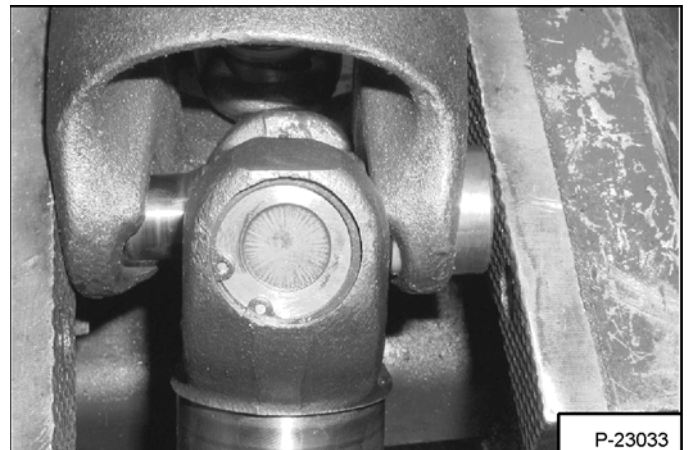
Install the two snap rings (Item 1) [Figure 40-21-157].

Figure 40-21-158



Partially install a new bearing cup (Item 1) [Figure 40-21-158] into the yoke.

Figure 40-21-159

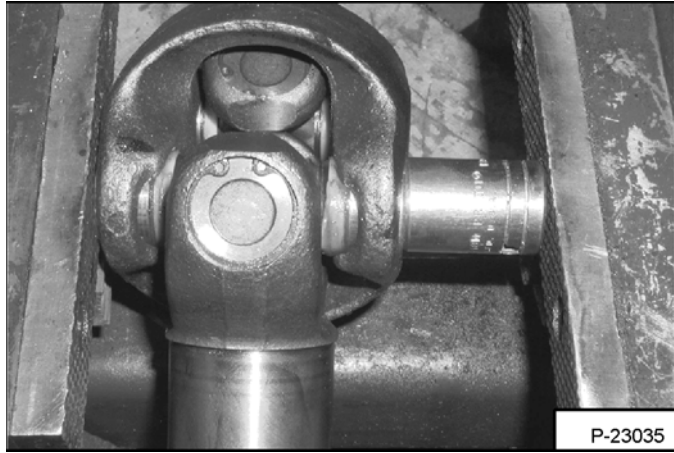


Install the cross/shaft assembly into the bearing cup [Figure 40-21-159].

AXLE AND DIFFERENTIAL (REAR) (CONT'D)

Axle Housing/Drive Axle Assembly (Cont'd)

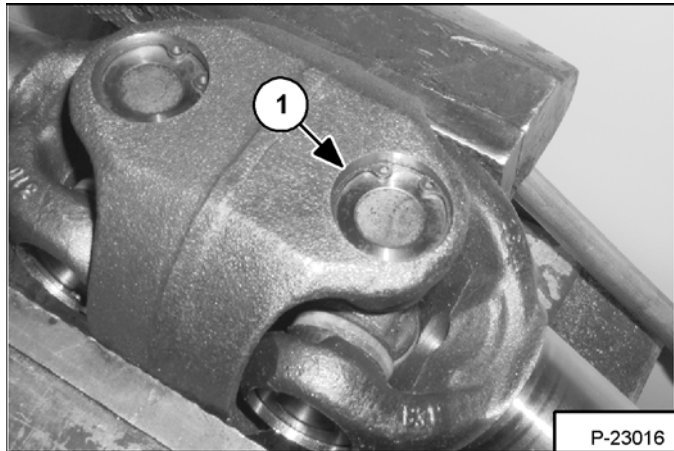
Figure 40-21-160



Install the second bearing cup into the yoke and press onto the cross [Figure 40-21-160].

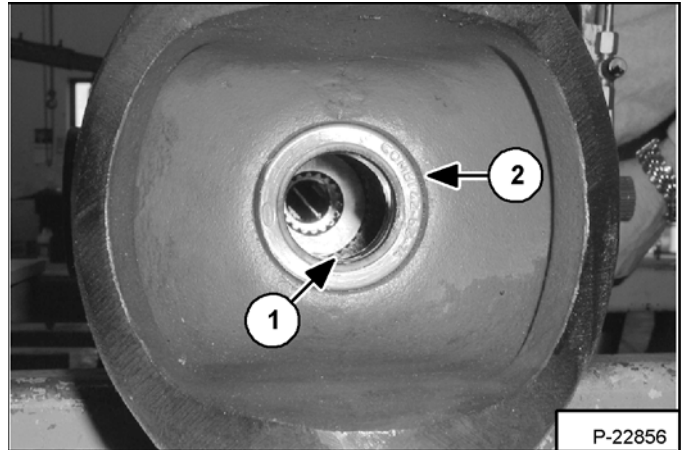
NOTE: Use care not to lose or drop any needle bearings out of position.

Figure 40-21-161



Make sure the bearing cups are fully seated and install both snap rings (Item 1) [Figure 40-21-161].

Figure 40-21-162



Install a new bushing (Item 1) and seal (Item 2) [Figure 40-21-162] into the axle housing.

Lightly lubricate the new seal and bushing.

Figure 40-21-163



Install the drive axle into the axle housing aligning the shaft with the splines [Figure 40-21-163].

NOTE: Use care not to damage the seal.

AXLE AND DIFFERENTIAL (REAR) (CONT'D)

Steering Knuckle Assembly

Clean all parts in solvent and dry with compressed air.

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

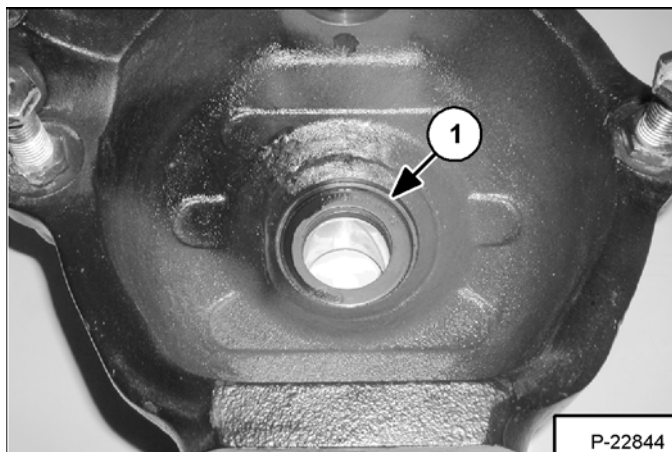
Always install new seals and O-rings. Lubricate all seals and O-rings with clean hydraulic fluid before installation.

Figure 40-21-164



Install the bushing (Item 1) [Figure 40-21-164] into the knuckle housing.

Figure 40-21-165



Install a new seal (Item 1) [Figure 40-21-165] into the knuckle housing.

Figure 40-21-166

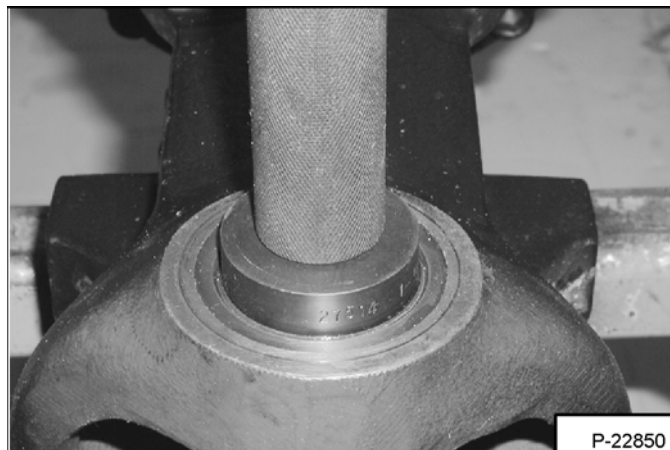


Figure 40-21-167



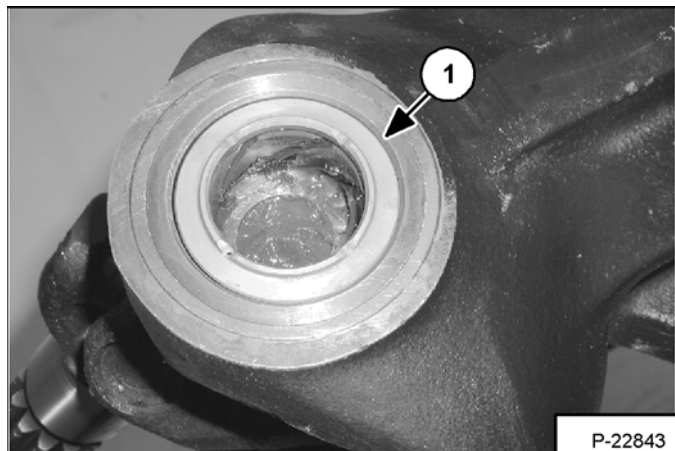
Install the bushings into the top and bottom of the axle [Figure 40-21-166] & [Figure 40-21-167].

NOTE: The cupped bushing goes on the bottom.

AXLE AND DIFFERENTIAL (REAR) (CONT'D)

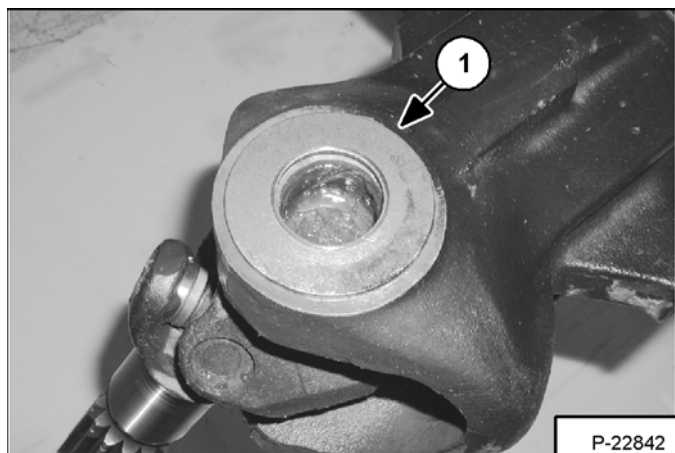
Steering Knuckle Assembly (Cont'd)

Figure 40-21-168



Install the spacer washer (Item 1) [Figure 40-21-168] on the top bushing.

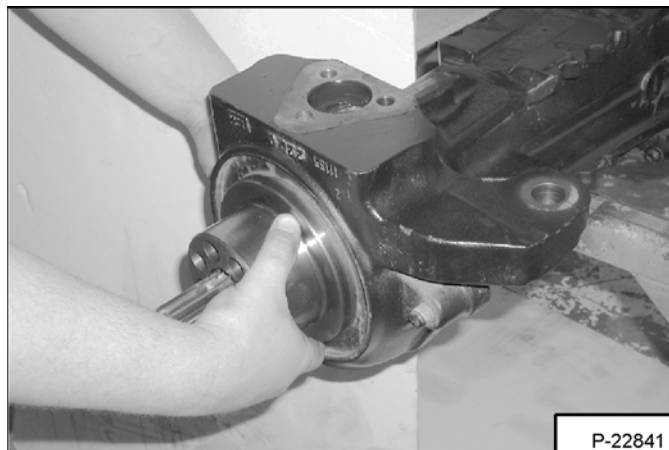
Figure 40-21-169



Install the Belleville washers (Item 1) [Figure 40-21-169] on the top and bottom bushing.

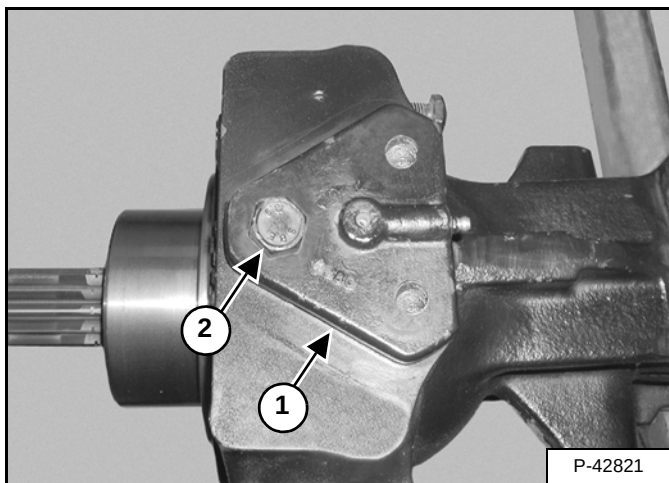
NOTE: The larger Belleville washer is on top.

Figure 40-21-170



Install the knuckle assembly onto the axle [Figure 40-21-170]. (Both sides)

Figure 40-21-171

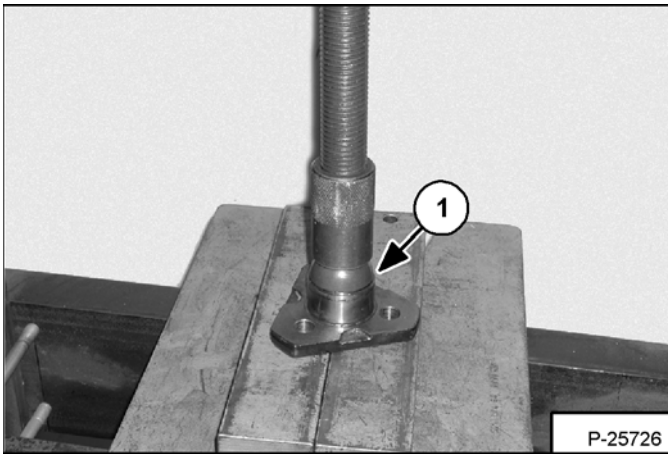


Install the upper king pin (Item 1) and bolt (Item 2) [Figure 40-21-171]. Tighten to 140 ft.-lbs. (190 Nm) torque. (Both sides)

AXLE AND DIFFERENTIAL (REAR) (CONT'D)

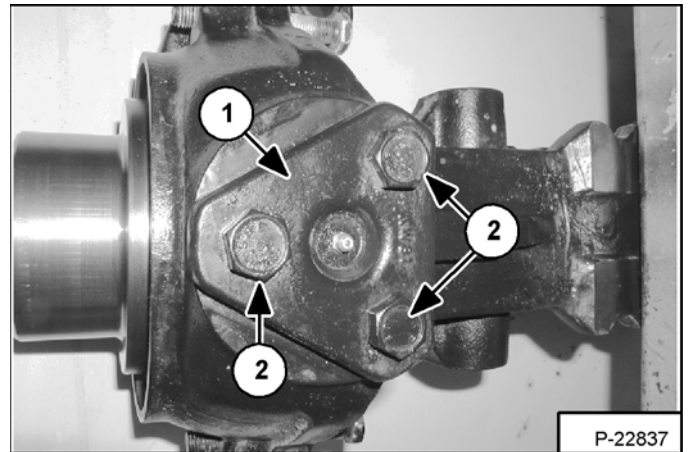
Steering Knuckle Assembly (Cont'd)

Figure 40-21-172



Place the lower king pin in a vise or press and install the ball bearing (Item 1) **[Figure 40-21-172]** onto the king pin shaft until it is fully seated.

Figure 40-21-173



Install the lower king pin (Item 1) and three bolts (Item 2) **[Figure 40-21-173]**. Tighten to 140 ft.-lbs. (190 Nm) torque. (Both sides)

Lubricate the upper and lower king pins.

AXLE AND DIFFERENTIAL (REAR) (CONT'D)

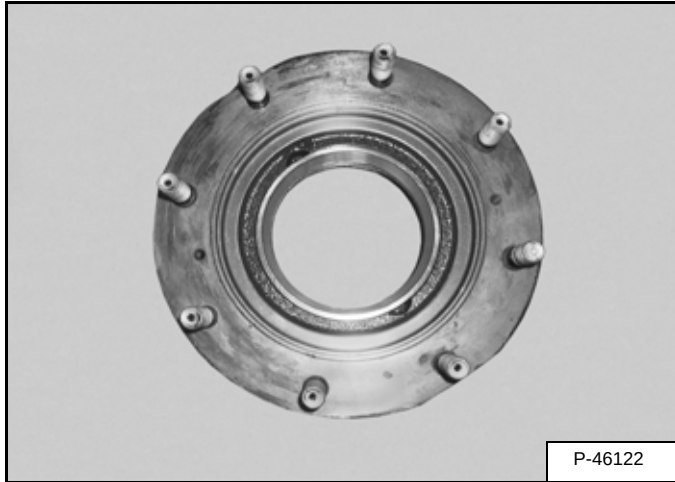
Wheel Hub Assembly

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 40-21-174



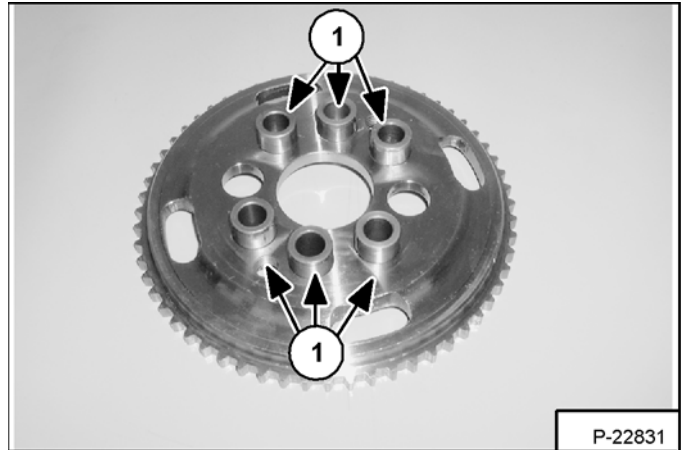
Install both bearing races (Item 1) [Figure 40-21-174] into the hub.

Figure 40-21-175



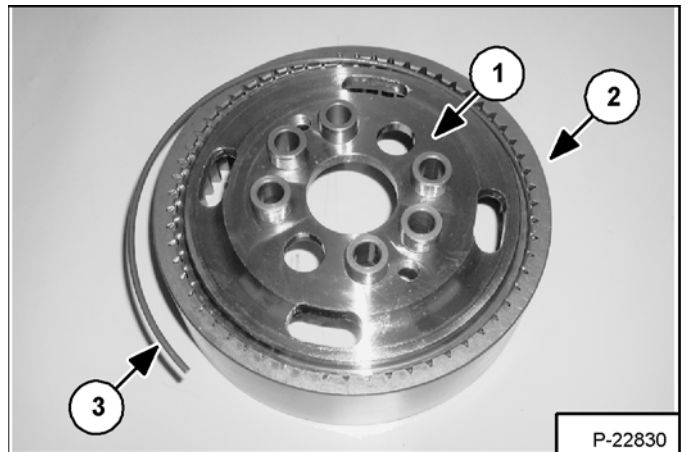
Lightly lubricate the seal (Item 1) [Figure 40-21-175] and install into the hub.

Figure 40-21-176



Install the six bushings (Item 1) [Figure 40-21-176] into the gear.

Figure 40-21-177



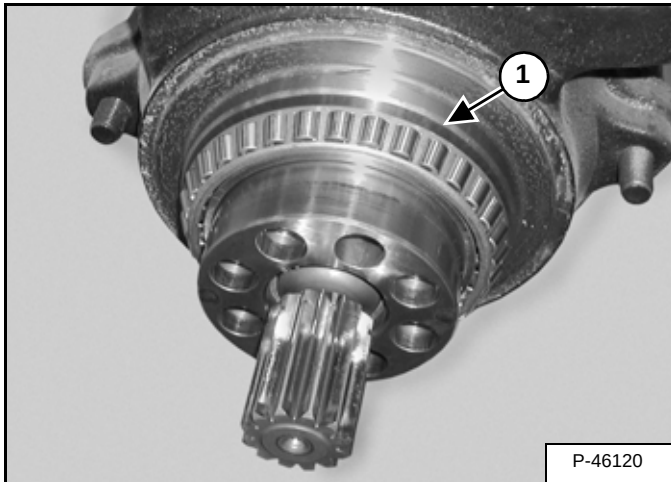
Install the gear (Item 1) into the ring gear (Item 2) [Figure 40-21-177].

Install the retainer ring (Item 3) [Figure 40-21-177] into the groove in the ring gear.

AXLE AND DIFFERENTIAL (REAR) (CONT'D)

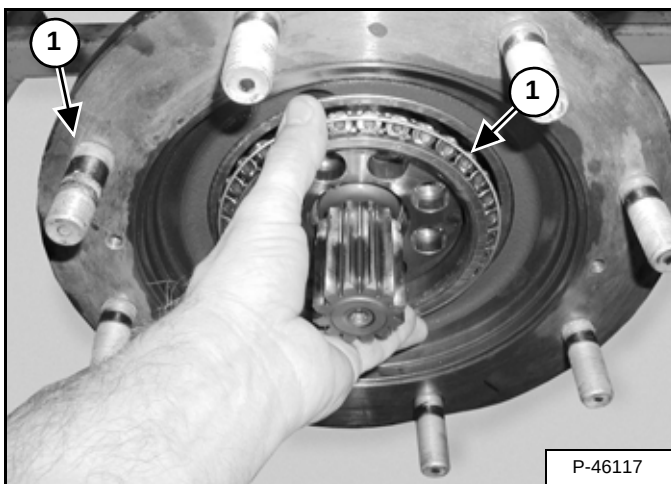
Wheel Hub Assembly (Cont'd)

Figure 40-21-178



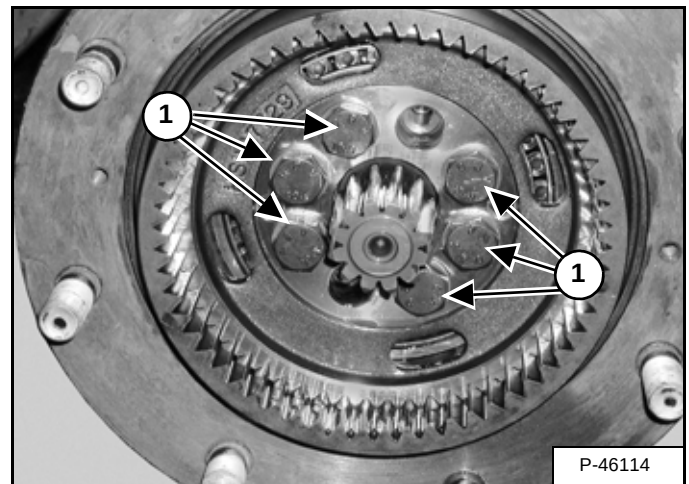
Install the inner bearing (Item 1) [Figure 40-21-178] onto the steering knuckle. (Both sides)

Figure 40-21-179



Install the hub assembly (Item 1) and outer bearing (Item 2) [Figure 40-21-179] onto the steering knuckle. (Both sides)

Figure 40-21-180



Install the ring gear assembly (Item 1) onto the steering knuckle. Install the six mounting bolts (Item 2) [Figure 40-21-180] and tighten to 88 ft.-lbs. (120 Nm) torque. (Both sides)

Figure 40-21-181

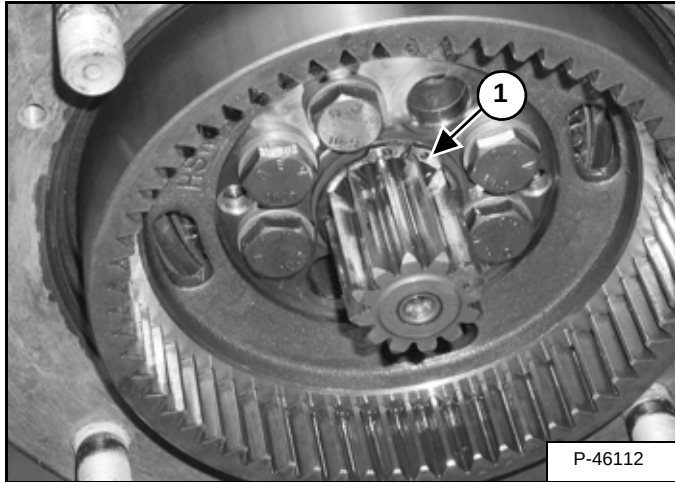


Install the spacer (Item 1) and thrust washer (Item 2) [Figure 40-21-181] on the axle shaft. (Both sides)

AXLE AND DIFFERENTIAL (REAR) (CONT'D)

Wheel Hub Assembly (Cont'd)

Figure 40-21-182



Install the snap ring (Item 1) [Figure 40-21-182] onto the axle shaft.

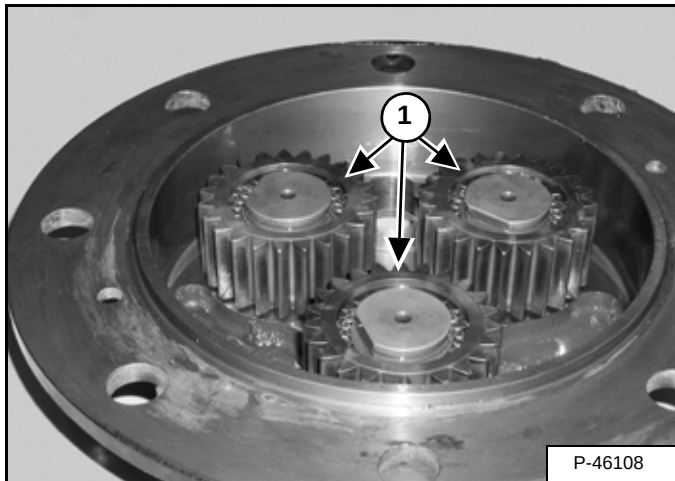
Planetary Carrier Assembly

Clean all parts in solvent and dry with compressed air.

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

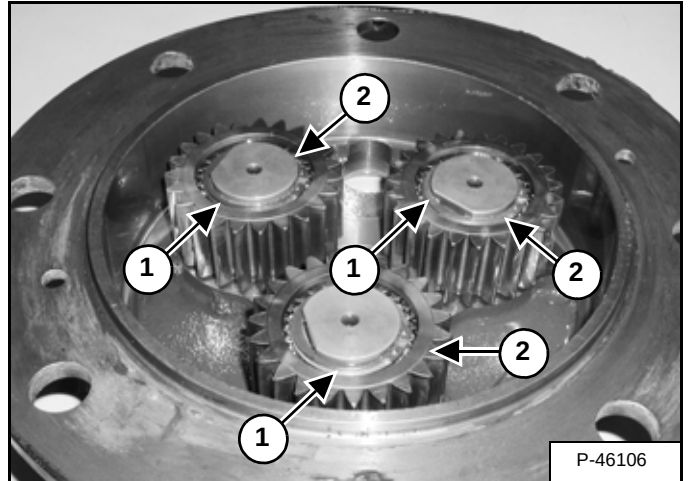
Always install new seals and O-rings. Lubricate all seals and O-rings with clean hydraulic fluid before installation.

Figure 40-21-183



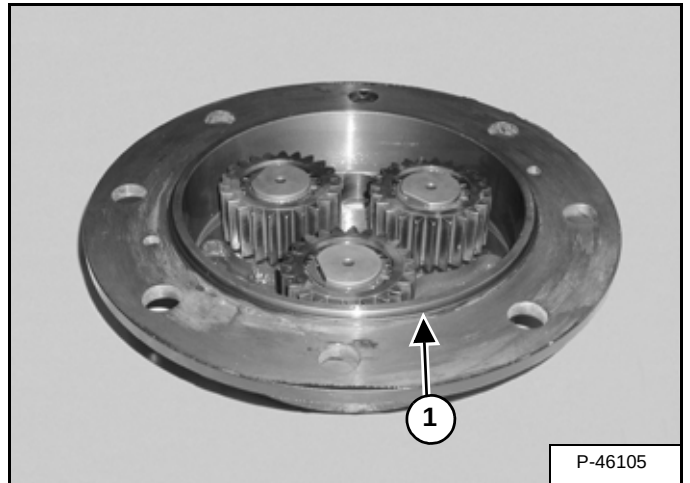
Using grease to hold the needle bearings in position, install the gears onto the shaft [Figure 40-21-183].

Figure 40-21-184



Install the thrust washers (Item 1) and snap rings (Item 2) [Figure 40-21-184].

Figure 40-21-185

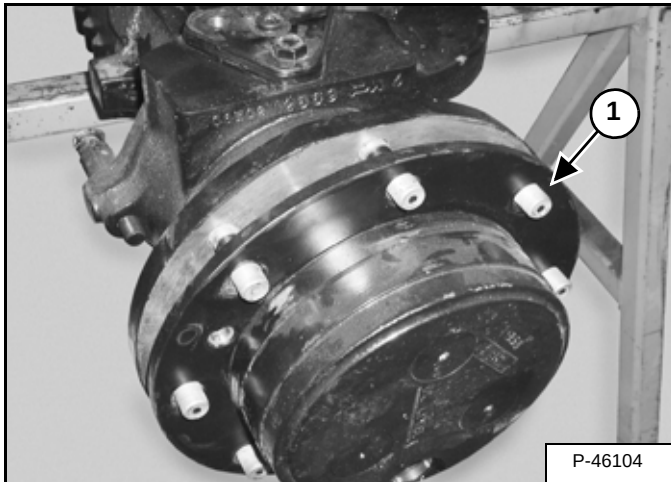


Install a new O-ring (Item 1) [Figure 40-21-185] onto the planetary carrier.

AXLE AND DIFFERENTIAL (REAR) (CONT'D)

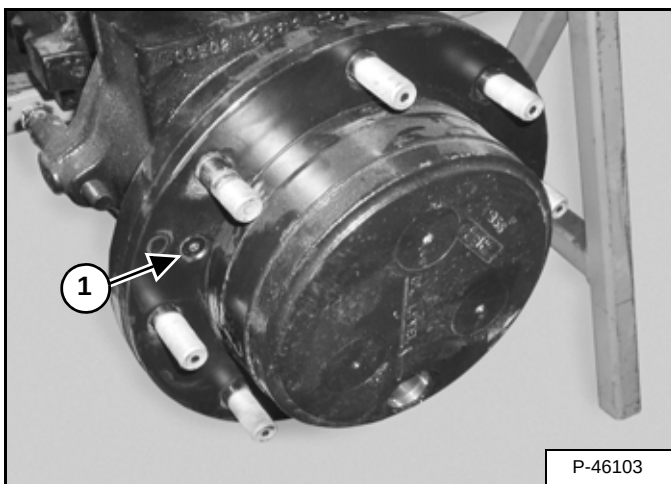
Planetary Carrier Assembly (Cont'd)

Figure 40-21-186



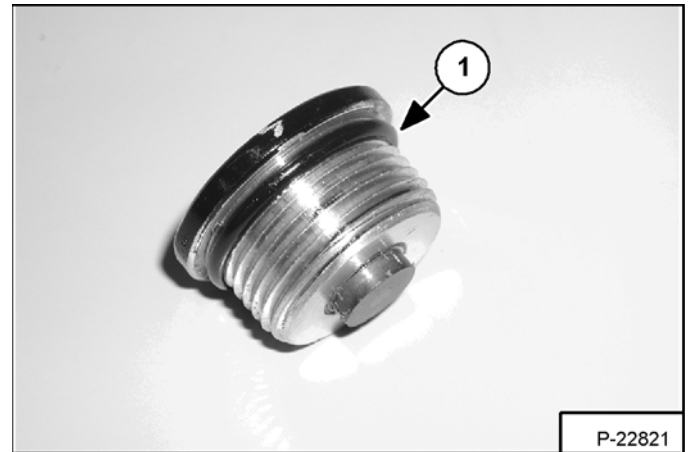
Install the planetary carrier (Item 1) **[Figure 40-21-186]**. (Both sides)

Figure 40-21-187



Install the two screws (Item 1) **[Figure 40-21-187]** and tighten to 18 ft.-lbs. (25 Nm) torque. (Both sides)

Figure 40-21-188



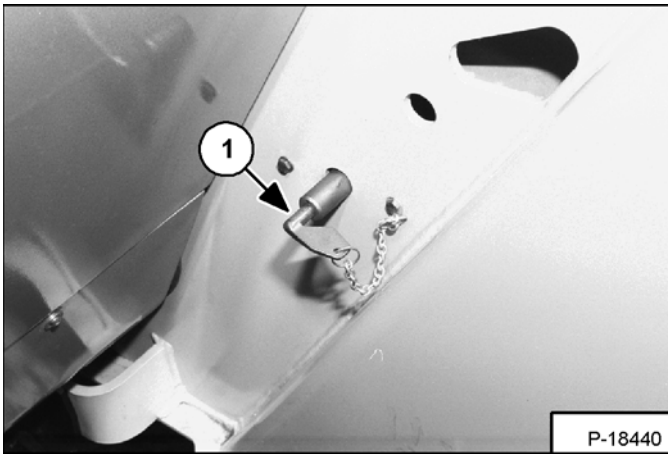
Install a new O-ring (Item 1) **[Figure 40-21-188]** onto the drain plug.

See Content Page 10-01 for filling the axle assembly and planetary carriers with fluid.

FRONT AXLE

Removal

Figure 40-30-1

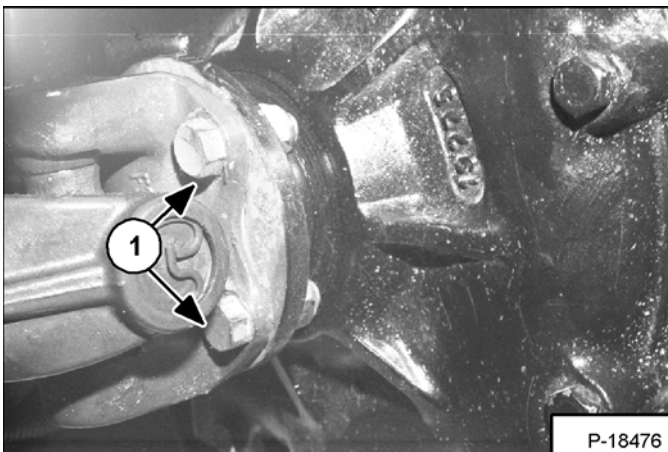


Fully retract the telescoping boom and raise enough to allow the front axle to be removed from under the frame.

Rotate the battery disconnect switch (Item 1) [Figure 40-30-1] to the right, to disconnect the power supply from the battery.

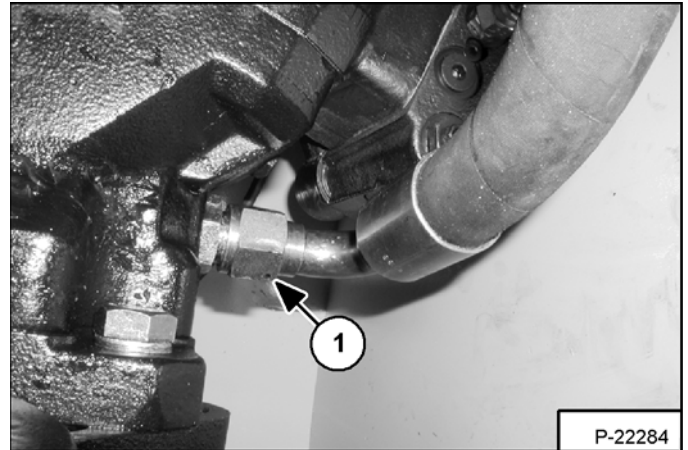
Drain the hydraulic reservoir. (See Content Page 10-01.)

Figure 40-30-2



Remove the four driveshaft mounting bolts (Item 1) [Figure 40-30-2]. Lower the driveshaft.

Figure 40-30-3



Remove the hose (Item 1) [Figure 40-30-3] from the right side of the drive motor.

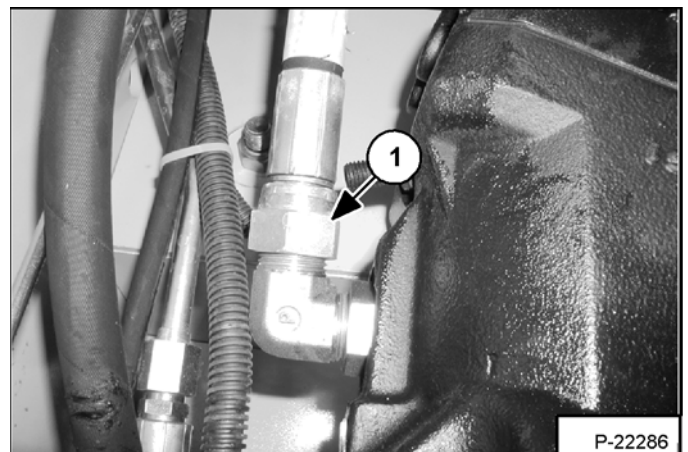
NOTE: Mark all hoses for correct installation.

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 40-30-4

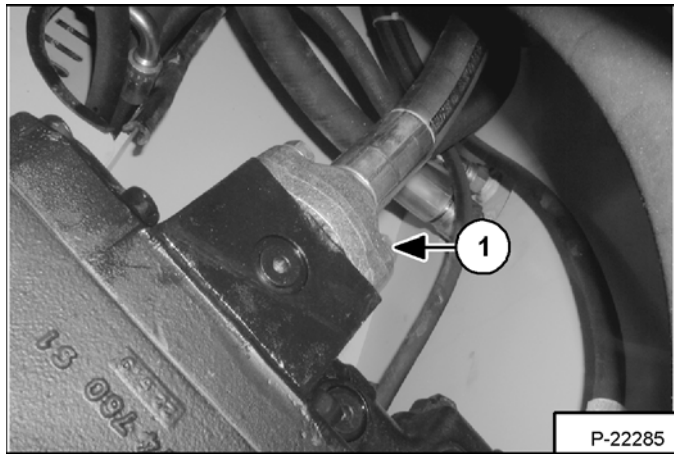


Remove the hose (Item 1) [Figure 40-30-4] from the left side of the drive motor.

FRONT AXLE (CONT'D)

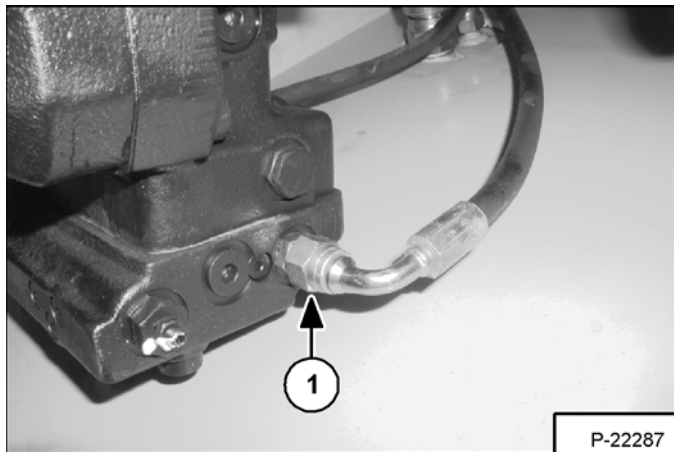
Removal (Cont'd)

Figure 40-30-5



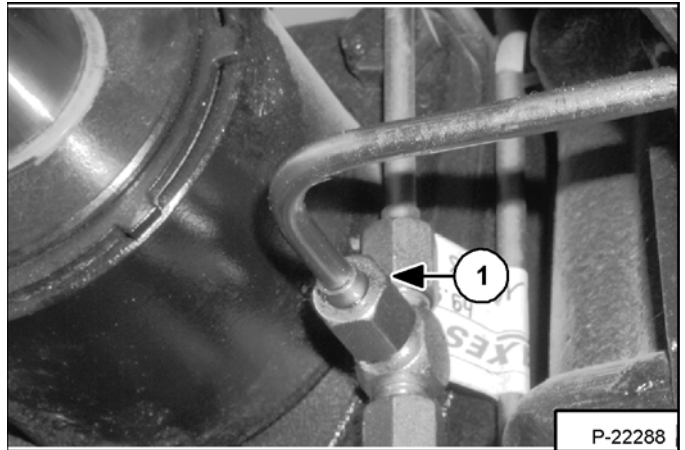
Remove the lower four bolt flange hose (Item 1) [Figure 40-30-5].

Figure 40-30-6



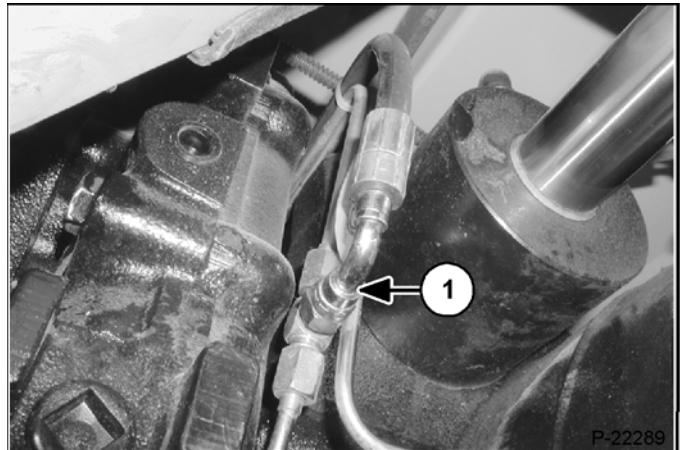
Remove the hose (Item 1) [Figure 40-30-6] from the drive motor.

Figure 40-30-7



Remove the brake tube line (Item 1) [Figure 40-30-7] from the left side of the axle.

Figure 40-30-8

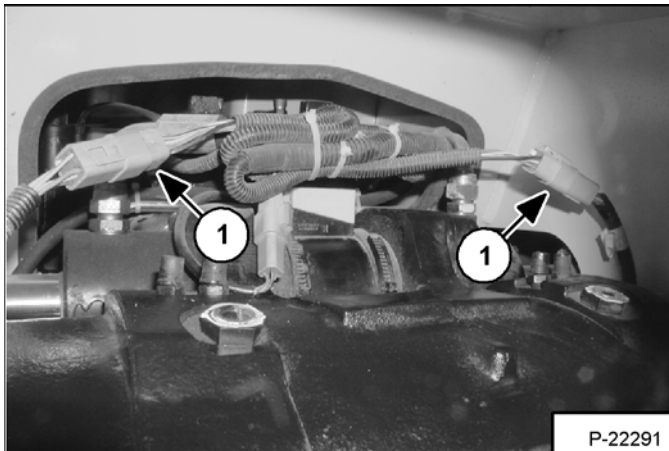


Remove the brake hose (Item 1) [Figure 40-30-8] from the right side of the axle.

FRONT AXLE (CONT'D)

Removal (Cont'd)

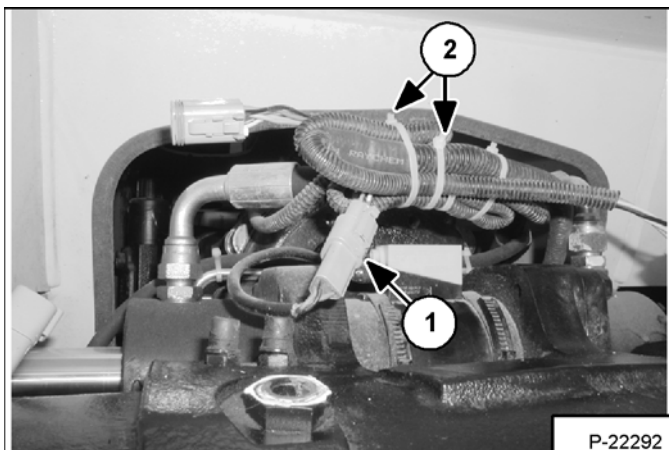
Figure 40-30-9



Unplug the two head light electrical connectors (Item 1) [Figure 40-30-9] from the main harness.

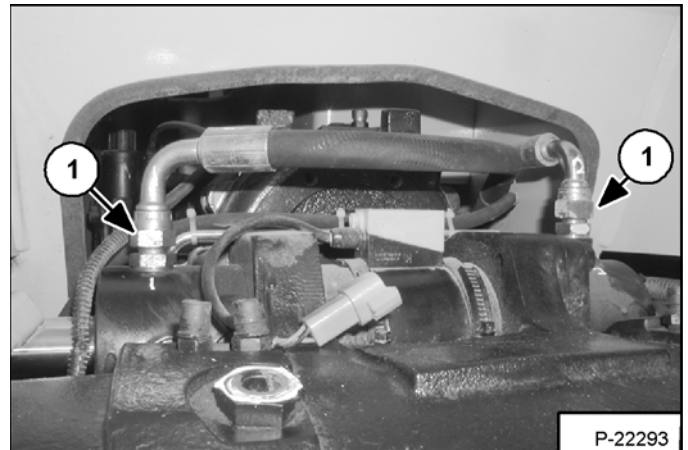
NOTE: Mark all connectors for correct assembly.

Figure 40-30-10



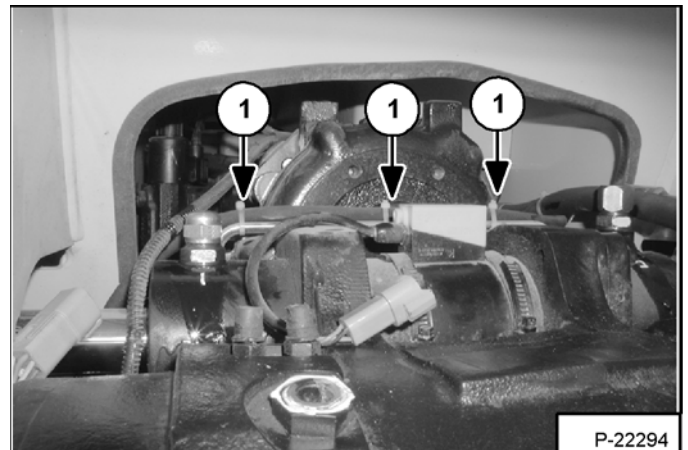
Unplug the electrical connector (Item 1) and remove the tie straps (Item 2) [Figure 40-30-10].

Figure 40-30-11



Remove the two hoses (Item 1) [Figure 40-30-11] from the steering cylinder.

Figure 40-30-12



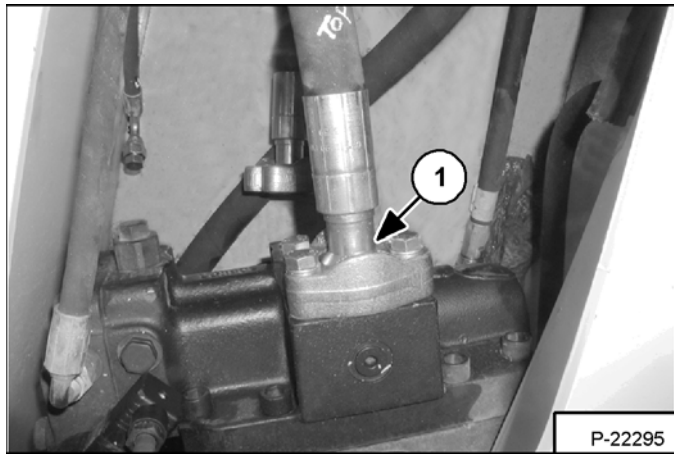
Remove the tie straps (Item 1) [Figure 40-30-12] from the brake hose and tube line.

Reposition all hoses and wires to the left side.

FRONT AXLE (CONT'D)

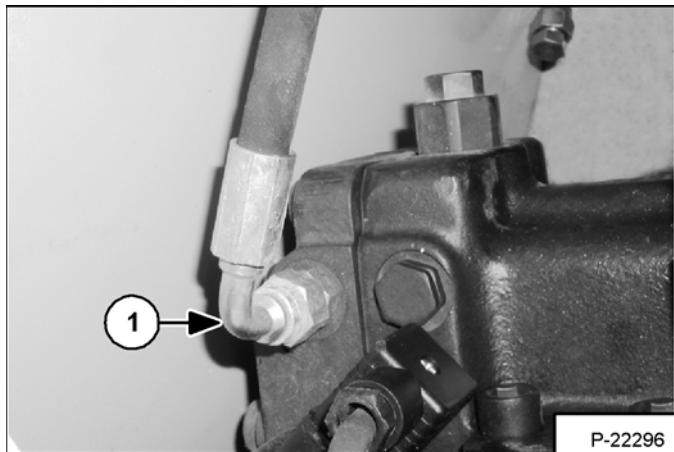
Removal (Cont'd)

Figure 40-30-13



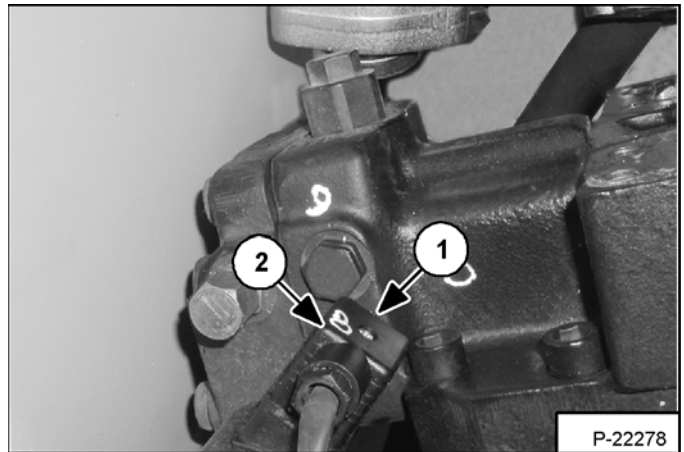
Remove the upper four bolt flange hose (Item 1) [Figure 40-30-13].

Figure 40-30-14



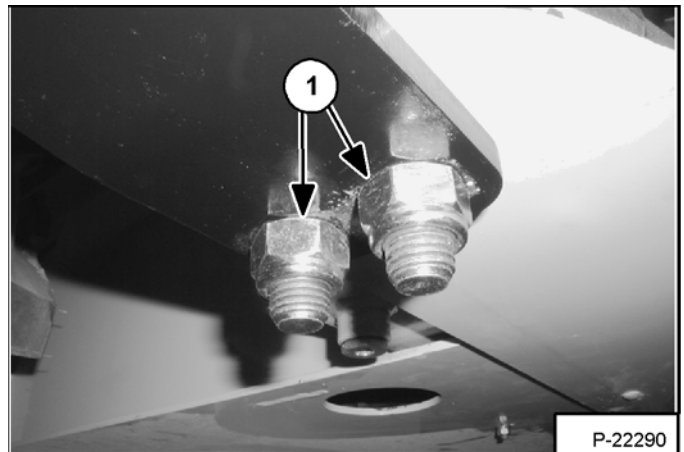
Remove the hose (Item 1) [Figure 40-30-14] from the drive motor.

Figure 40-30-15



Remove the electrical plug retainer bolt (Item 1). Remove the electrical plug (Item 2) [Figure 40-30-15].

Figure 40-30-16

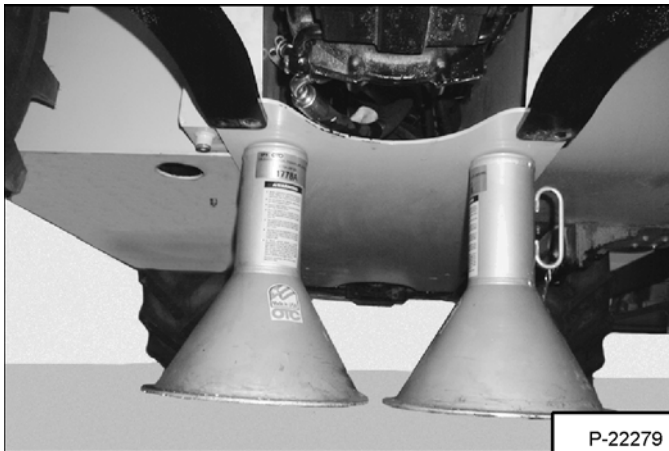


Remove the two mounting plate bolts (Item 1) [Figure 40-30-16] from both sides.

FRONT AXLE (CONT'D)

Removal (Cont'd)

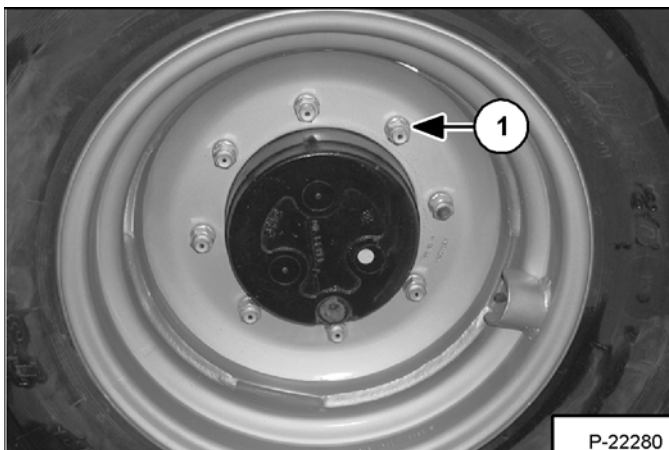
Figure 40-30-17



Lift the front of the machine and place jack stands under the frame as shown [Figure 40-30-17].

Place a block in front and behind the rear wheel.

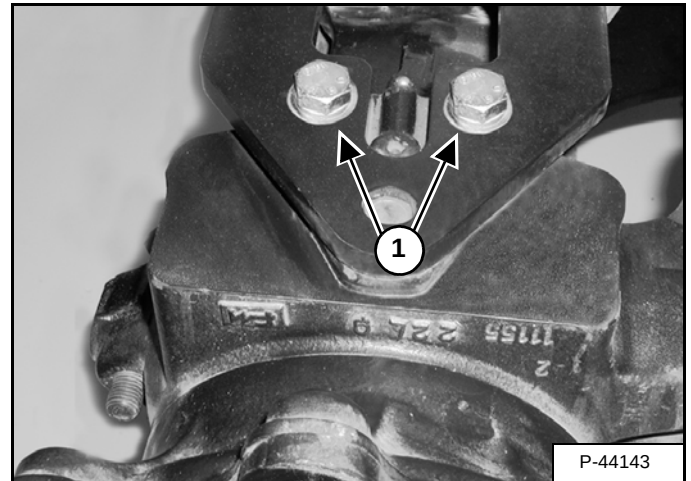
Figure 40-30-18



Remove the eight lug nuts and washers (Item 1) [Figure 40-30-18] from each front tire.

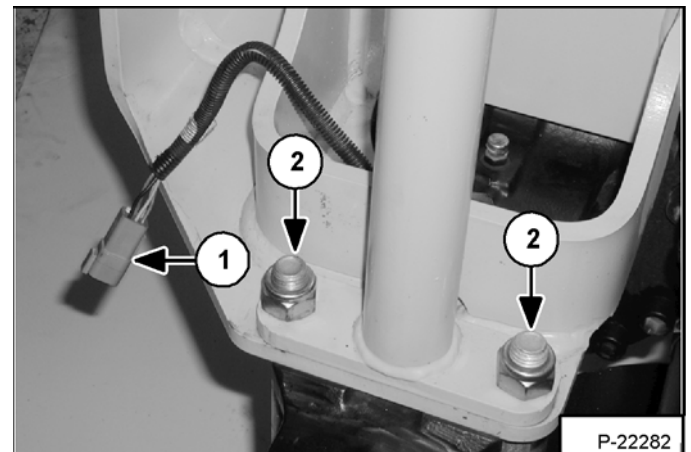
Remove both front tires.

Figure 40-30-19



Remove the two bolts (Item 1) [Figure 40-30-19] and remove the front fenders.

Figure 40-30-20

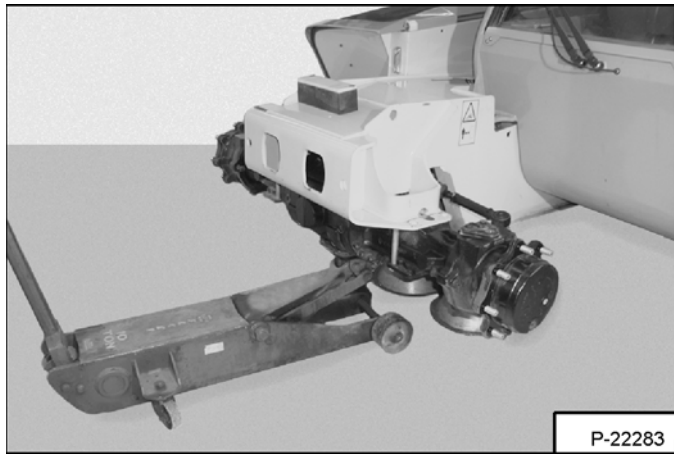


Re-route the head light harness (Item 1) out from under the frame. Remove the two light bar mounting bolts (Item 2) [Figure 40-30-20] and remove the light bar.

FRONT AXLE (CONT'D)

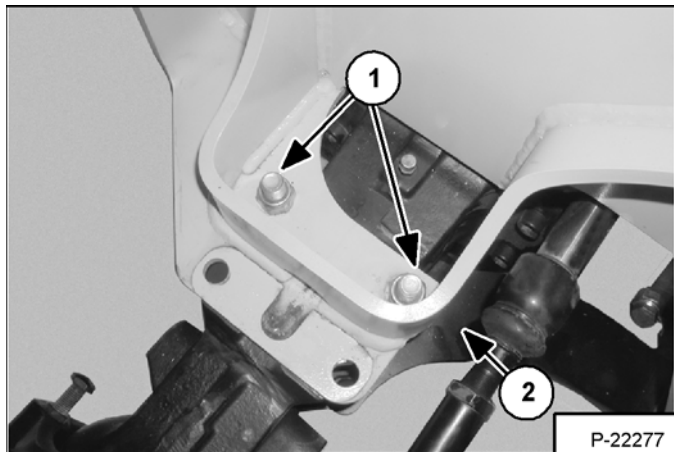
Removal (Cont'd)

Figure 40-30-21



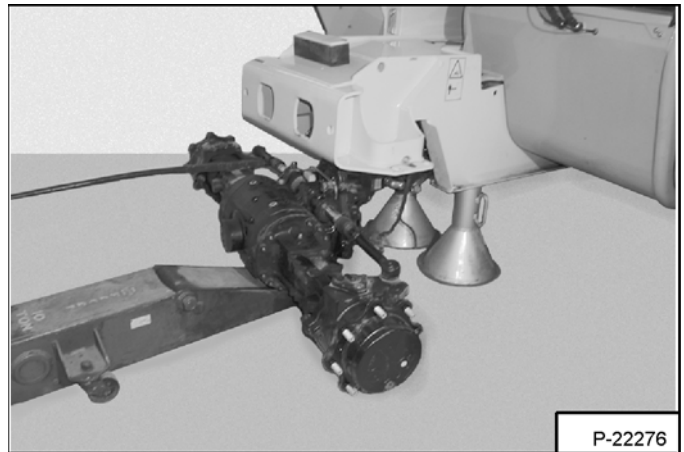
Using a floor jack, apply upward pressure to lift and support the front axle [Figure 40-30-21].

Figure 40-30-22



Remove the two axle mounting bolts (Item 1) and mounting plates (Item 2) [Figure 40-30-22] from each side of the axle.

Figure 40-30-23

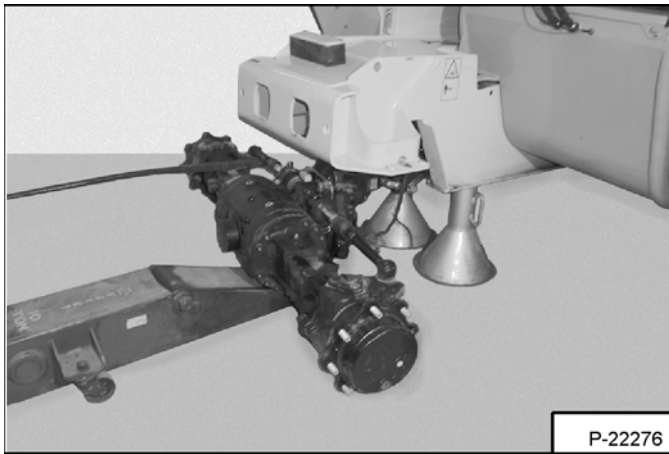


Have an assistant balance the axle on the floor jack and lower the floor jack slowly. Roll the axle out from under the frame [Figure 40-30-23].

FRONT AXLE (CONT'D)

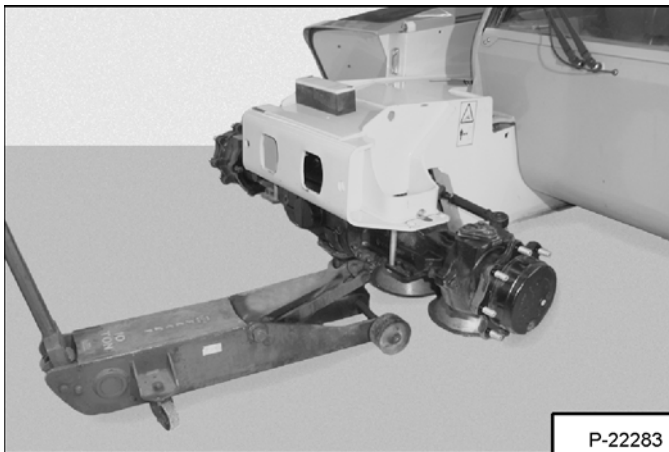
Installation

Figure 40-30-24



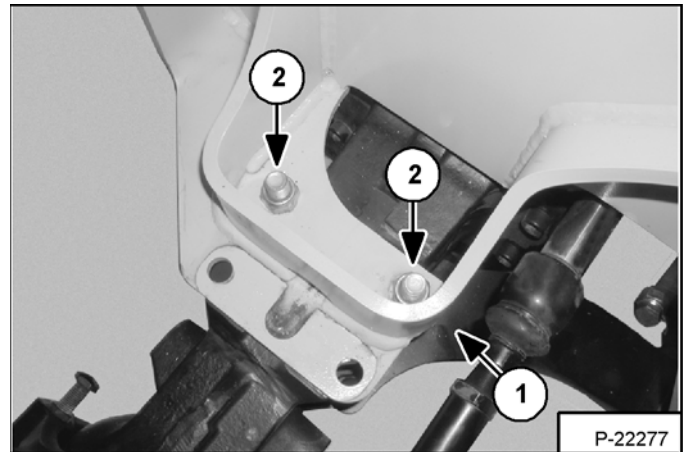
Have an assistant balance the axle on the floor jack and roll the axle under the frame [Figure 40-30-24].

Figure 40-30-25



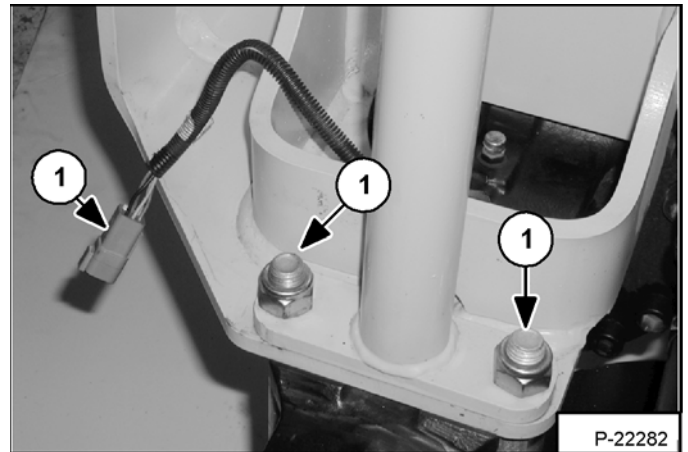
Raise the floor jack, lifting the axle upward and into position [Figure 40-30-25].

Figure 40-30-26



Install the bottom plate (Item 1) and mounting bolts and nuts (Item 2) [Figure 40-30-26]. Tighten to 275-300 ft.-lbs. (370-410 Nm) torque.

Figure 40-30-27

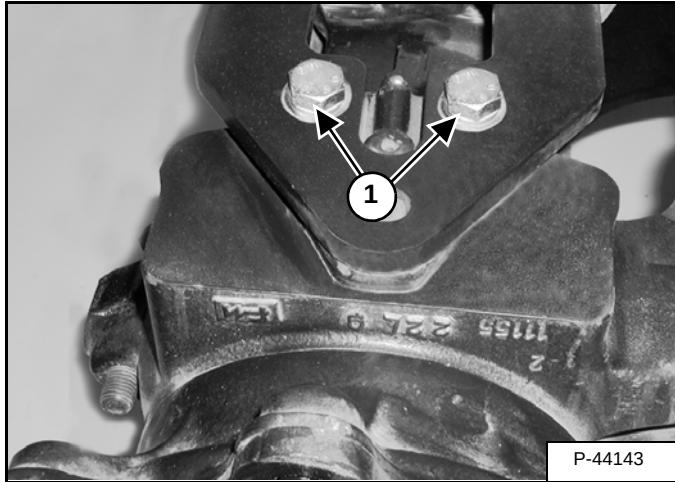


Route the head light harness (Item 1) through the bracket and under the frame. Install the two mounting bolts and nuts (Item 2) [Figure 40-30-27] and tighten to 275-300 ft.-lbs. (370-410 Nm) torque.

FRONT AXLE (CONT'D)

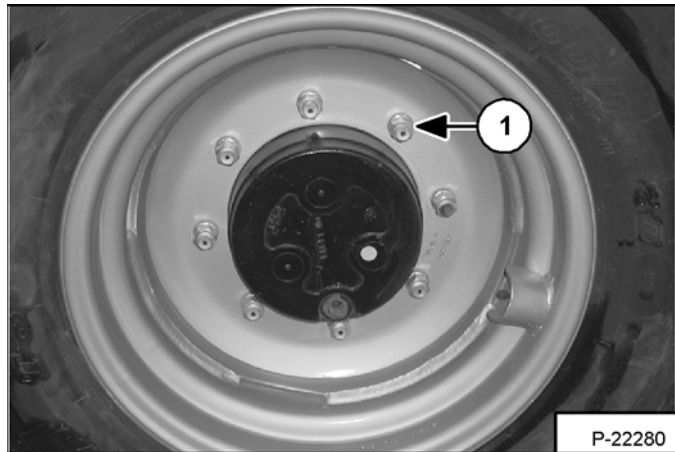
Installation (Cont'd)

Figure 40-30-28



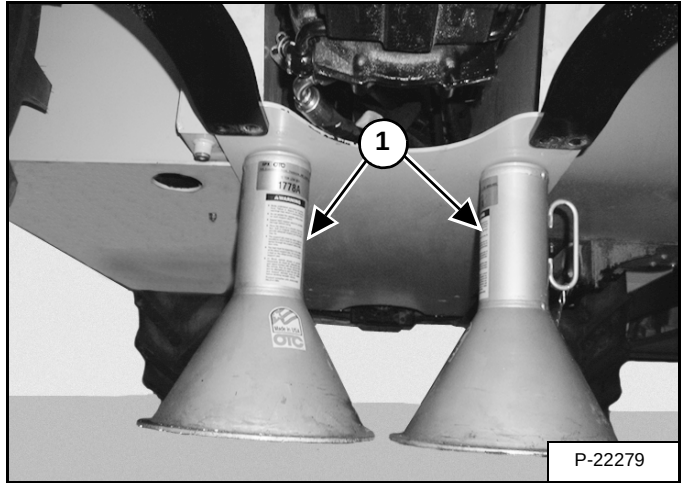
Install the front fenders using two bolts (Item 1) [Figure 40-30-28]. Tighten to 90-100 ft.-lbs. (125-140 Nm) torque.

Figure 40-30-29



Install both front tires, tighten the nuts (Item 1) [Figure 40-30-29] to 221 ft.-lbs. (300 Nm) torque.

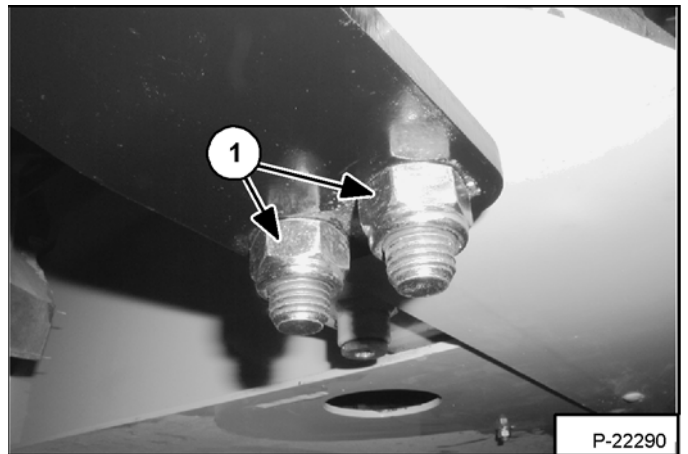
Figure 40-30-30



Raise the machine and remove the two jack stands (Item 1) [Figure 40-30-30].

Lower the jack.

Figure 40-30-31

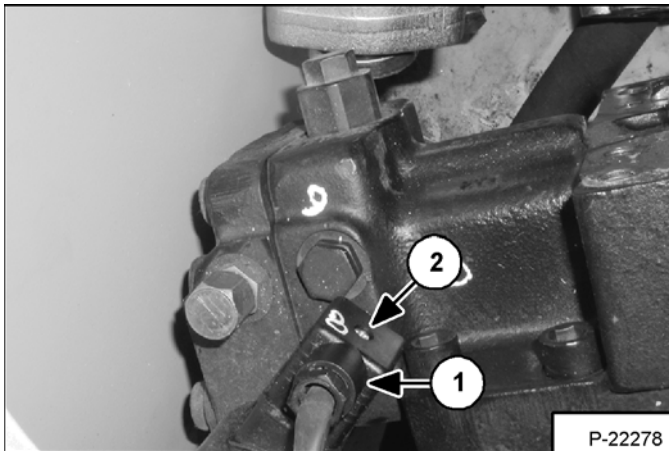


Install the two bottom plate mounting bolts (Item 1) [Figure 40-30-31]. Tighten to 275-300 ft.-lbs. (370-410 Nm) torque.

FRONT AXLE (CONT'D)

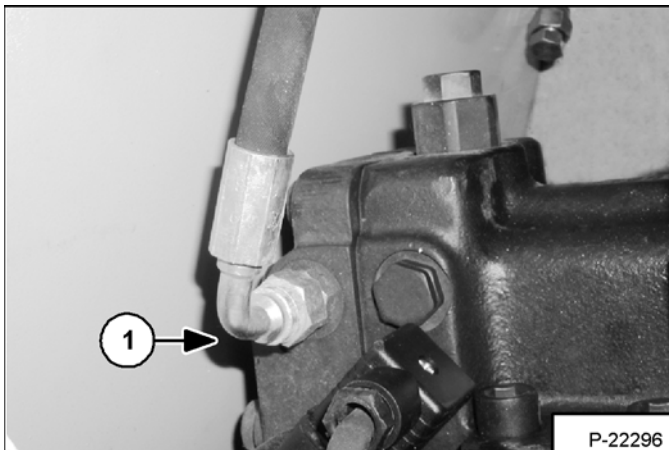
Installation (Cont'd)

Figure 40-30-32



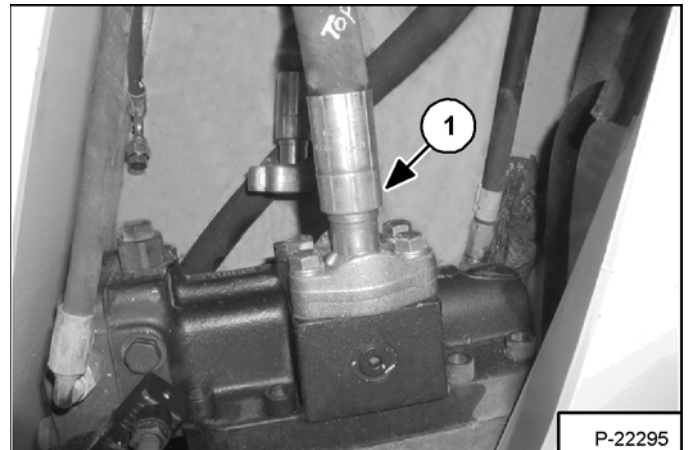
Plug the electrical plug (Item 1) into the axle and install the retainer bolt (Item 2) [Figure 40-30-32].

Figure 40-30-33



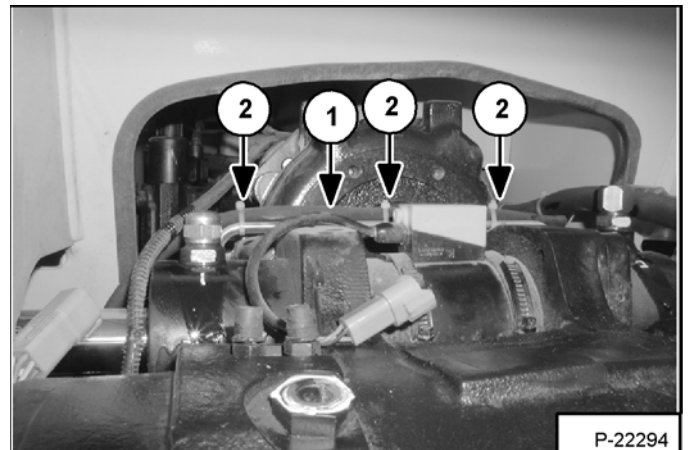
Install the hose (Item 1) [Figure 40-30-33].

Figure 40-30-34



Install the upper four bolt flange hose (Item 1) [Figure 40-30-34] to the drive motor.

Figure 40-30-35

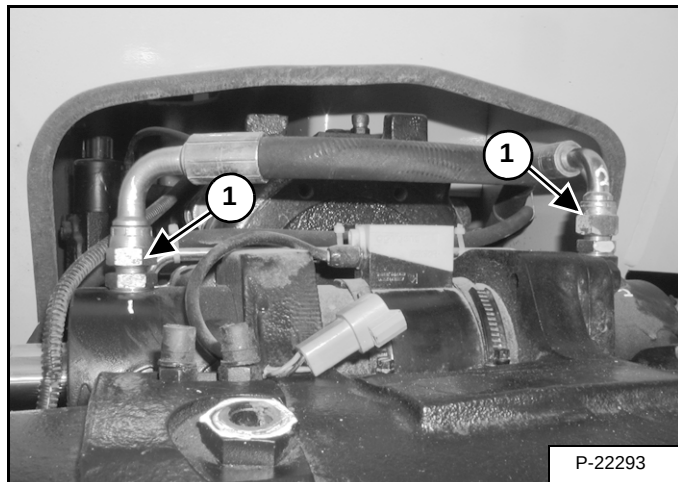


Route the brake hose (Item 1) next to the tube line and install tie straps (Item 2) [Figure 40-30-35].

FRONT AXLE (CONT'D)

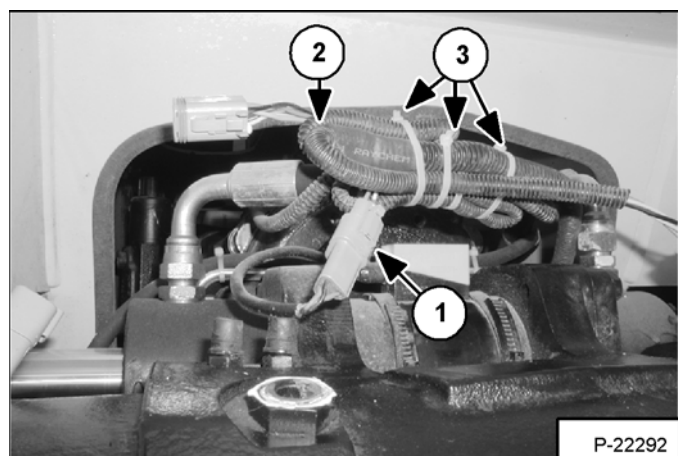
Installation (Cont'd)

Figure 40-30-36



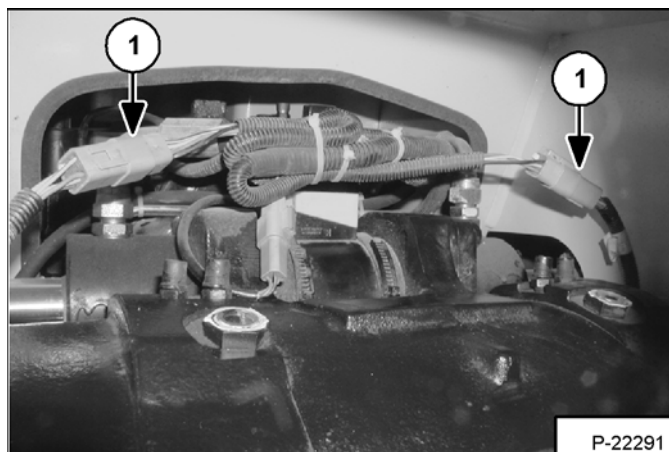
Install the two steering hoses (Item 1) [Figure 40-30-36] on the steering cylinder.

Figure 40-30-37



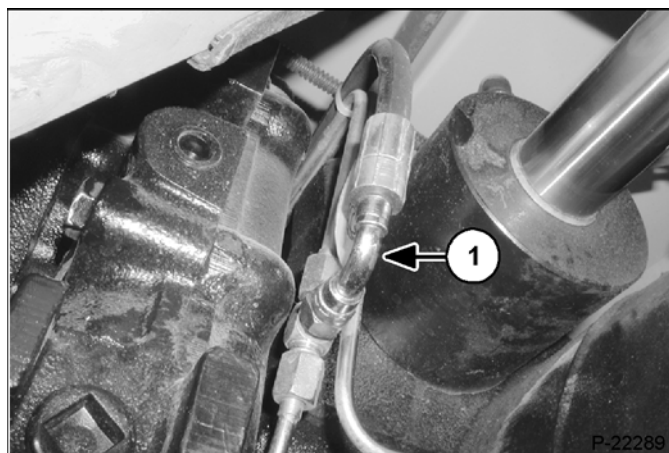
Plug the electrical connector (Item 1) into the axle solenoid. Secure the electrical harness (Item 2) to the steering hoses with tie straps (Item 3) [Figure 40-30-37].

Figure 40-30-38



Plug in the two head light electrical connectors (Item 1) [Figure 40-30-38].

Figure 40-30-39

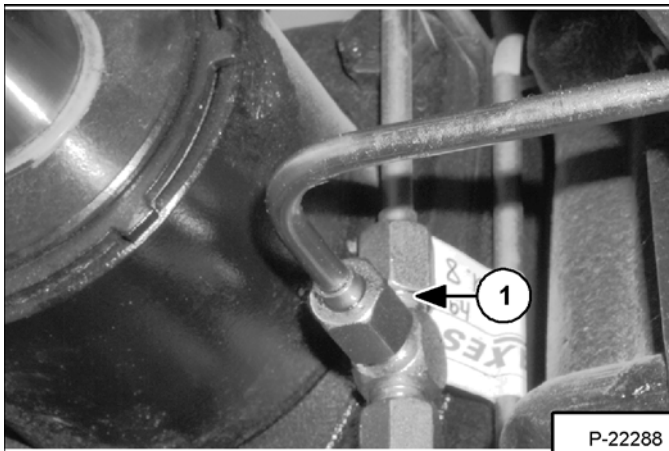


Install the brake hose (Item 1) [Figure 40-30-39] to the right side of the axle.

FRONT AXLE (CONT'D)

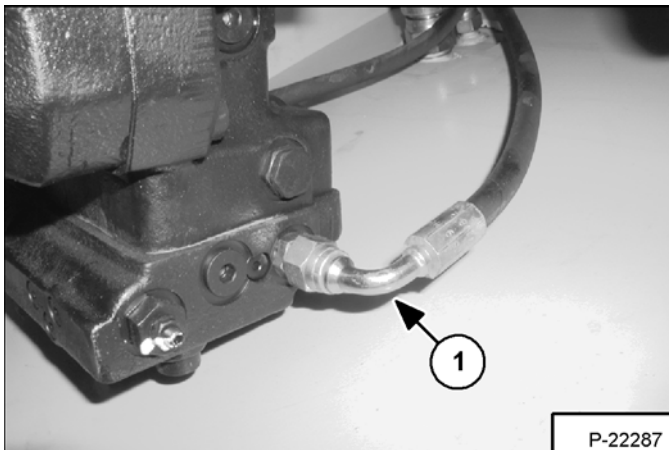
Installation (Cont'd)

Figure 40-30-40



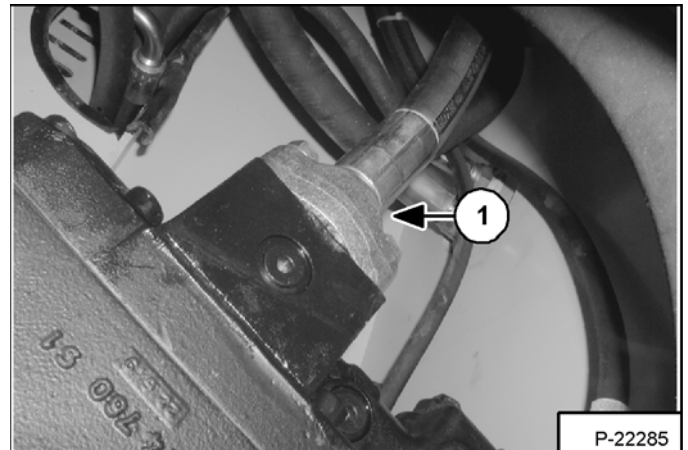
Install the brake tube line (Item 1) [Figure 40-30-40] to the left side of the axle.

Figure 40-30-41



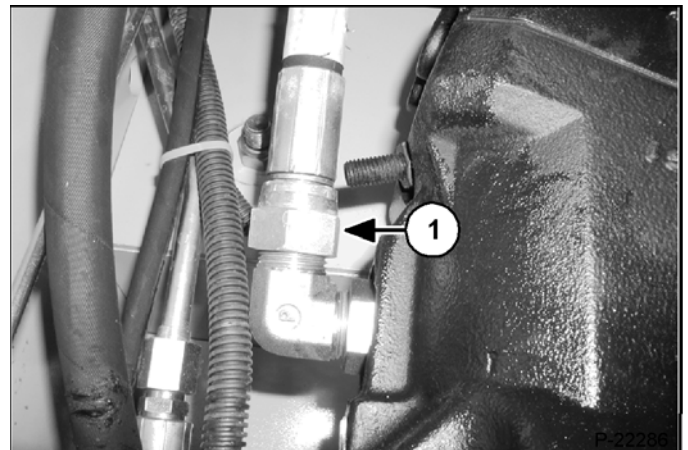
Install the hose (Item 1) [Figure 40-30-41] to the drive motor.

Figure 40-30-42



Install the lower four bolt flange hose (Item 1) [Figure 40-30-42].

Figure 40-30-43

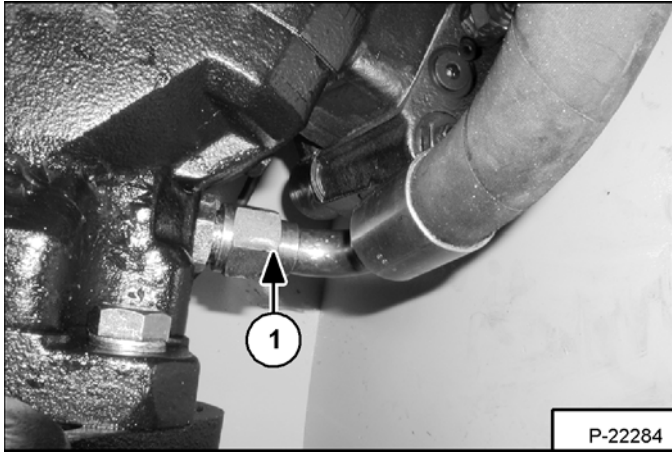


Install the hose (Item 1) [Figure 40-30-43] to the left side of the drive motor.

FRONT AXLE (CONT'D)

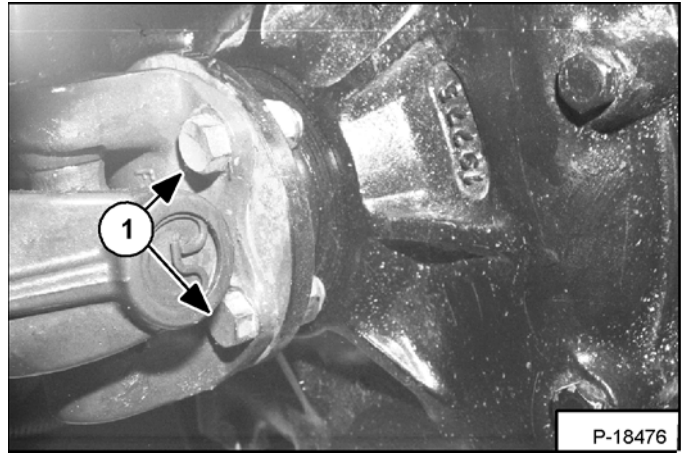
Installation (Cont'd)

Figure 40-30-44



Install the hose (Item 1) [Figure 40-30-44] to the right side of the drive motor.

Figure 40-30-45



Install the drive shaft using the four mounting bolts (Item 1) [Figure 40-30-45].

Fill the hydraulic reservoir.

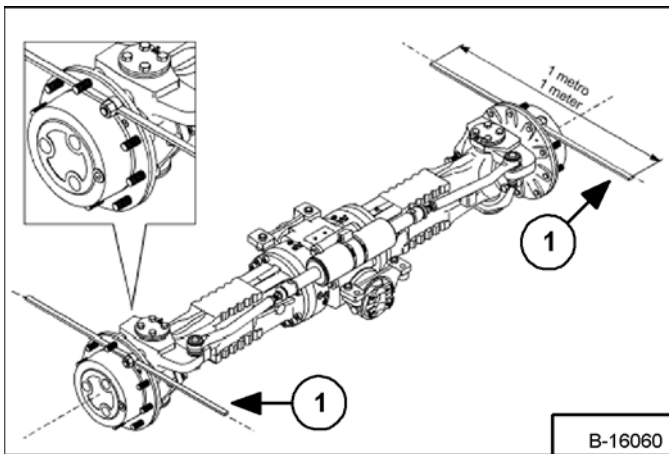
AXLE TOE-IN

Adjustment

The axle is removed from the machine for photo clarity, but this procedure may be completed with the axle installed in the machine.

Turn the steering wheel until the steering cylinder rod is positioned in the center. Measure the exposed part of the cylinder rod on each side of the cylinder housing making sure they are the same length.

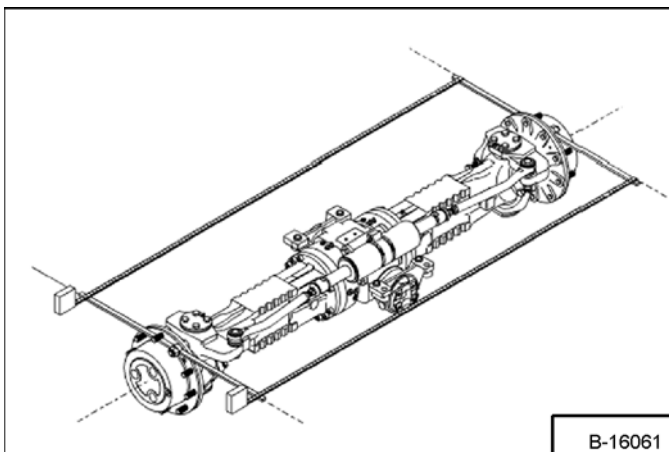
Figure 40-40-1



Install two identical, straight bars (Item 1) [Figure 40-40-1] onto the wheel hub and secure them using lug nuts.

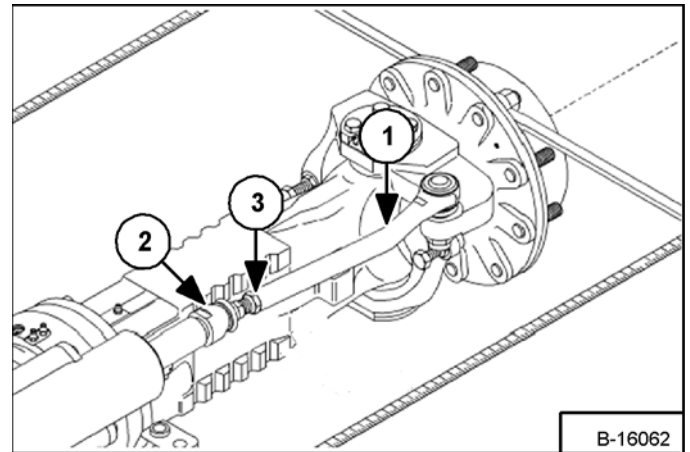
NOTE: The two bars must be perpendicular to the ground.

Figure 40-40-2



Measure the distance between the ends of the two bars [Figure 40-40-2]. The measurement must be equal.

Figure 40-40-3



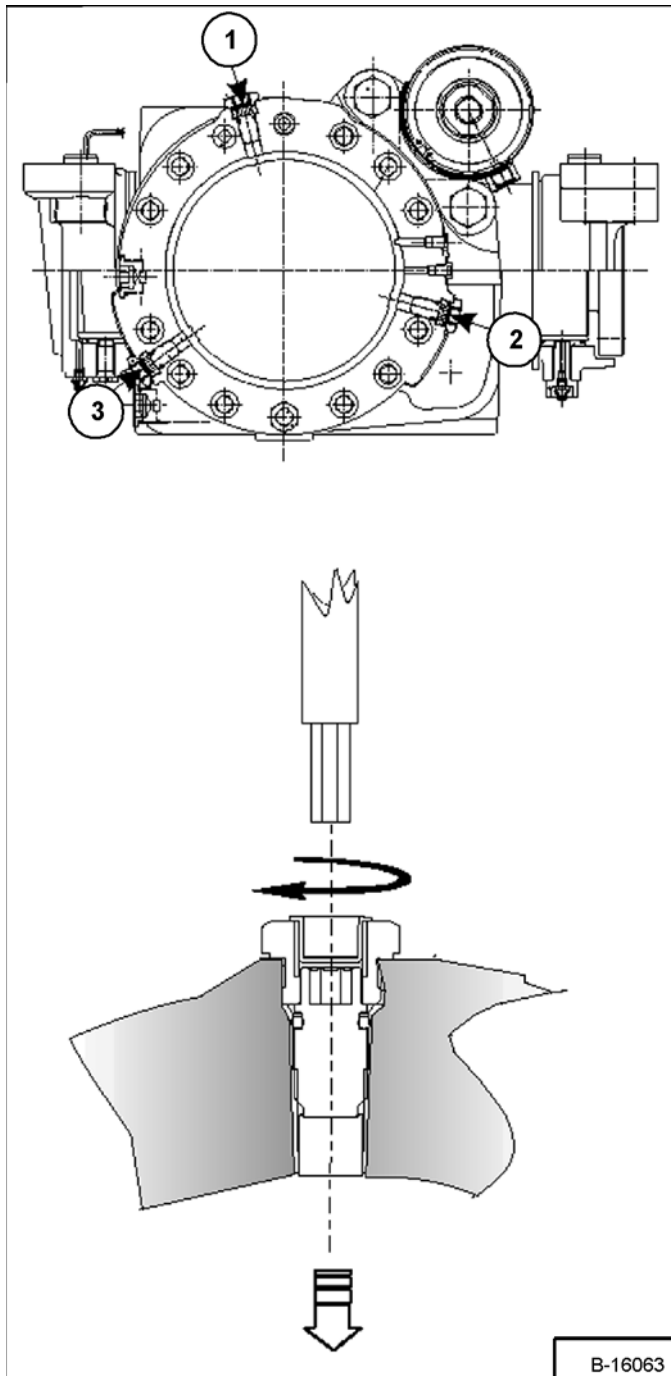
If measurement is not the same, adjust both tie rod ends (Item 1) by loosening or tightening the track rods (Item 2) [Figure 40-40-3] of both tie rods until the measurement is the same.

Tighten the nut (Item 3) [Figure 40-40-3] to 221 ft.-lbs. (300 Nm) torque.

PARKING BRAKE

Releasing The Brake For Towing

Figure 40-50-1

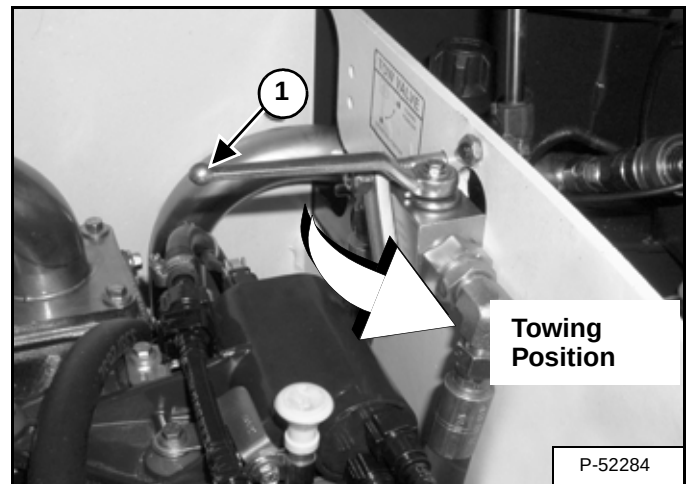


Block all four wheels to prevent the machine from moving once the parking brake is disabled.

Locate the six brake release bolts (three per side) on the front axle.

Alternately turn the brake release bolts (Item 1, 2 & 3) [Figure 40-50-1] "IN" (clockwise) 1/2 turn each until you feel resistance. Continue to turn each release bolt in equally 1/2 turn for a total of approximately 5 complete turns.

Figure 40-50-2



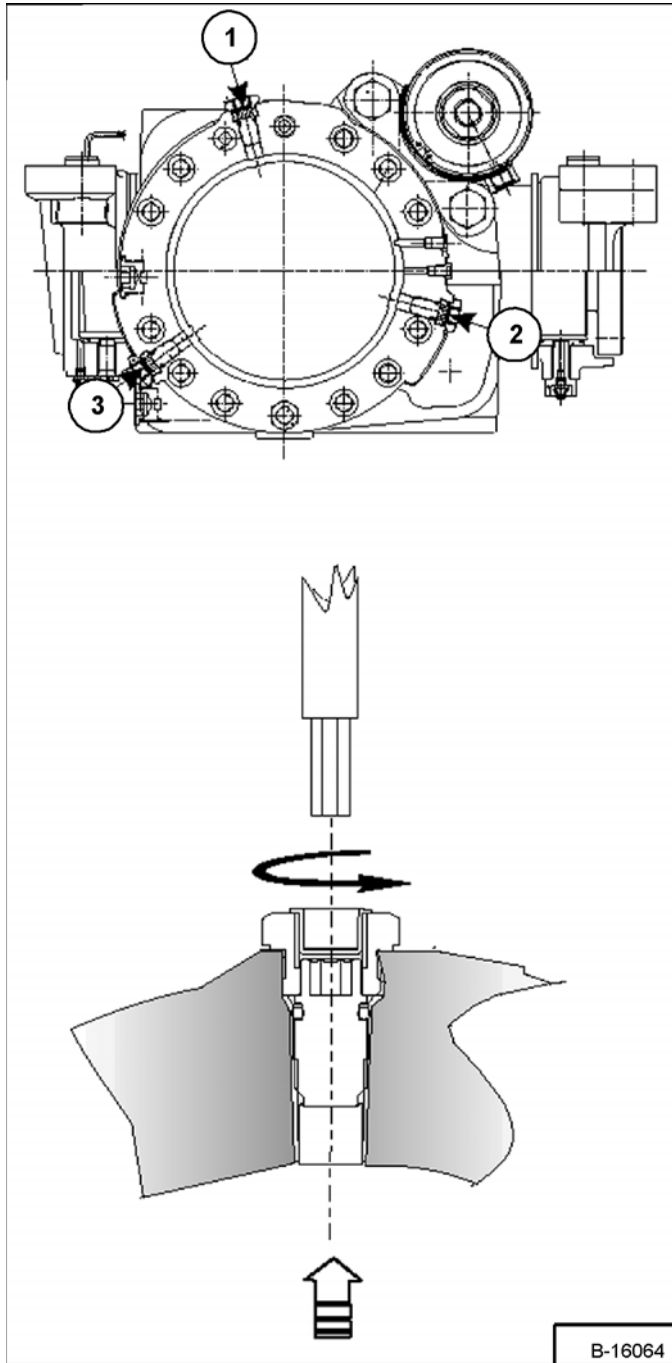
Locate the tow valve (Item 1) [Figure 40-50-2], turn counterclockwise 90° to the towing position.

The machine is now ready to be towed.

PARKING BRAKE (CONT'D)

Re-Activating The Brake

Figure 40-50-3

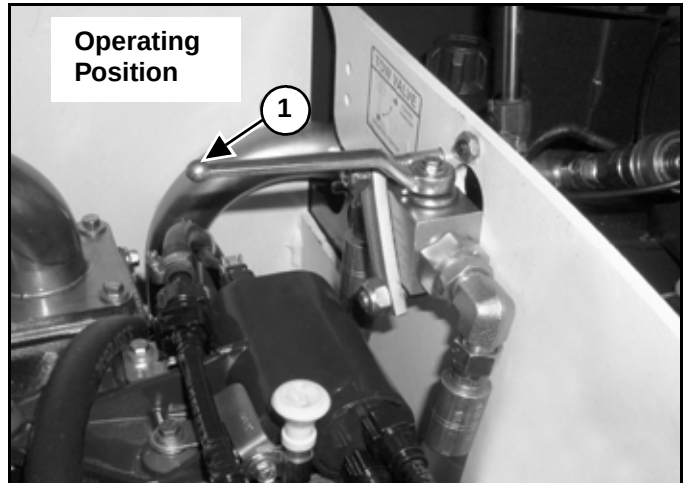


Block all four wheels to prevent the machine from moving.

Locate the six brake release bolts (three per side) on the front axle.

Alternately turn the brake release bolts (Item 1, 2 & 3) **[Figure 40-50-3]** "OUT" (counterclockwise) 1/2 turn until the torque drops off sharply. Continue to turn each release bolt out equally 1/2 turn until the brake release bolt presses against the bolt housing. After the brake release bolt is touching the bolt housing turn each brake release bolt "IN" (clockwise) a 1/4 turn.

Figure 40-50-4



Locate the tow valve (Item 1) **[Figure 40-50-4]** under the hood, turn clockwise 90° to the run position.

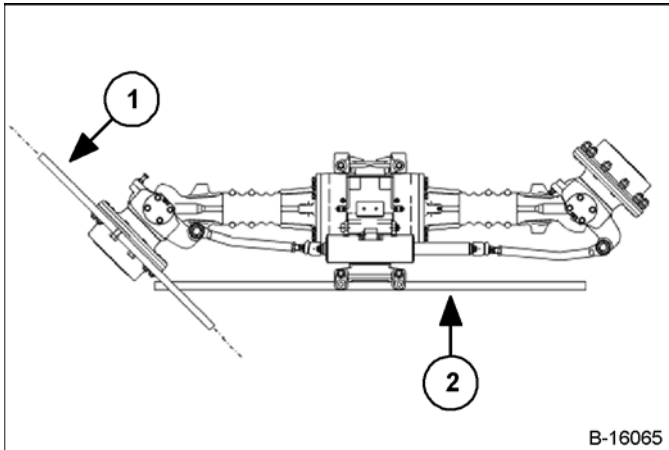
The parking brake is now re-activated.

STEERING ANGLE ADJUSTMENT

Adjustment

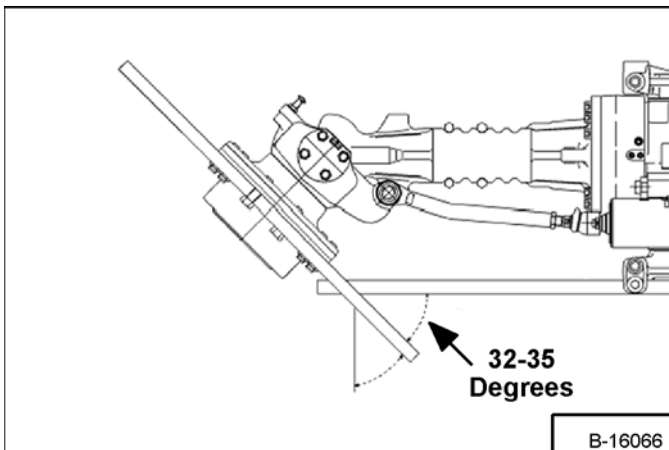
The axle is removed from the machine for photo clarity, but this procedure may be completed with the axle installed in the machine.

Figure 40-60-1



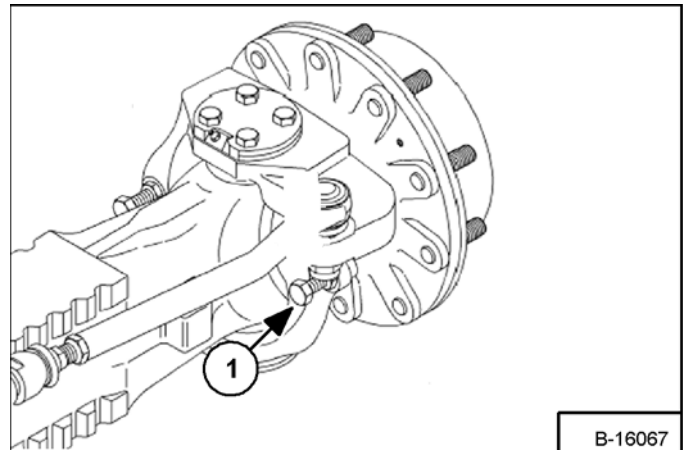
Install a straight bar (Item 1) onto the wheel hub and secure using lug nuts. Turn the steering wheel completely to one side. Place a straight bar (Item 2) [Figure 40-60-1] on the pinion shaft.

Figure 40-60-2



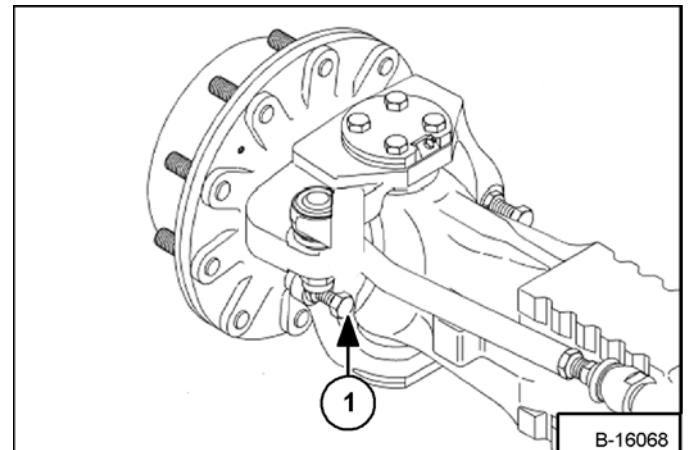
Use an angle gauge, to obtain a reading of 32-35 degrees [Figure 40-60-2].

Figure 40-60-3



Adjust the stop (Item 1) [Figure 40-60-3] as needed. Tighten the lock nut to 110 ft.-lbs. (150 Nm) torque.

Figure 40-60-4

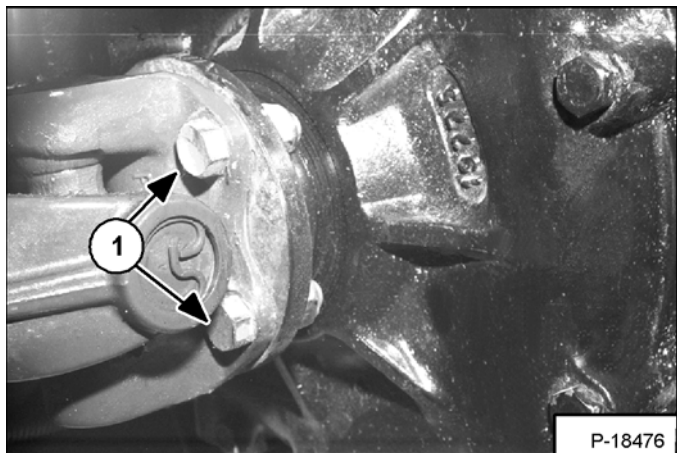


Turn the steering wheel completely to the other side [Figure 40-60-4] and repeat above procedure.

DRIVESHAFT

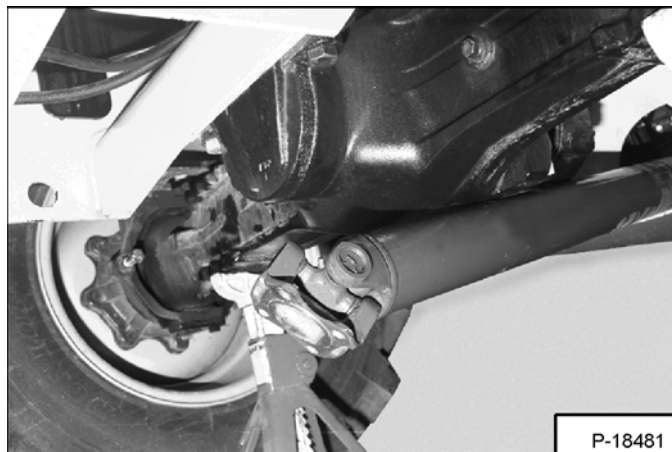
Removal And Installation

Figure 40-70-1



Remove the four drive shaft mounting bolts (Item 1) [Figure 40-70-1] from each end of the drive shaft.

Figure 40-70-2



Remove the drive shaft out the rear of the machine [Figure 40-70-2]

SERVICE BRAKE

Description

There are two bleed screws located on each side of the front axle differential housing.

Air trapped in the brake lines may cause a spongy feel and/or delayed activation of the service brake.

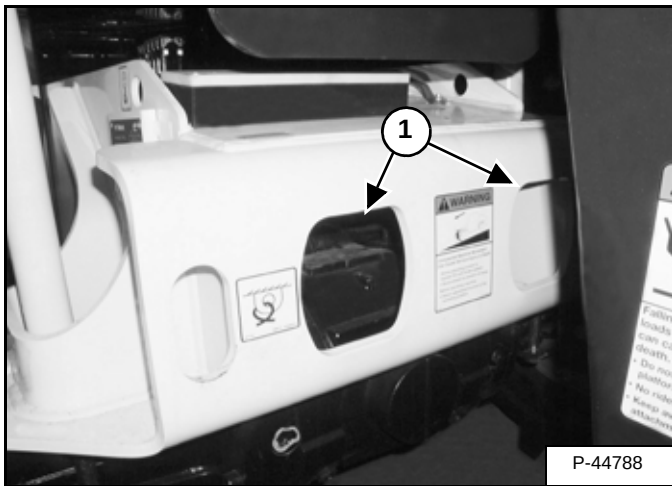
Use the following procedure to remove air from the brake circuit.

Bleeding The Brake Circuit

Lift and block the machine. (See Contents Page 10-01.)

NOTE: Position the jackstands to allow starting the machine and driving the wheels.

Figure 40-80-1



The bleed screws are accessible through the holes (Item 1) [Figure 40-80-1] in the main frame.

Figure 40-80-2

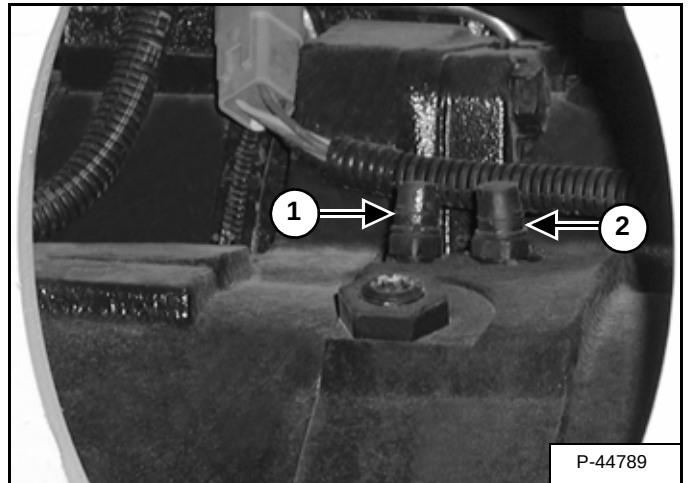
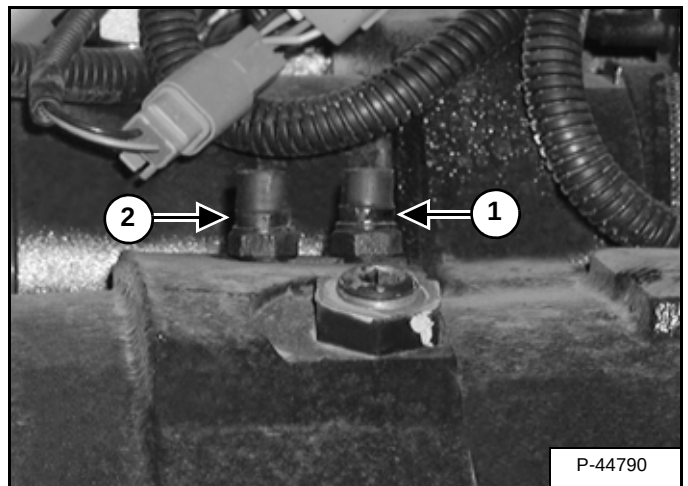


Figure 40-80-3



Remove the caps and loosen the four bleed screws (Item 1) and (Item 2) [Figure 40-80-2] [Figure 40-80-3].

WARNING: Hydraulic fluid will be forced from the bleed screws during the following procedure:

With the aid of an assistant, start the engine, lower the restraint bar and apply the service brake until a continuous stream of clean hydraulic fluid, with no air, flows from the inside bleed screws (Item 1) [Figure 40-80-2] and [Figure 40-80-3]. Stop the engine and tighten the two inside bleed screws.

Start the machine, engage the hydrostat and turn the wheels until a continuous stream of clean hydraulic fluid, with no air, flows from the outside bleed screws (Item 2) [2] and [3]. Stop the engine and tighten the two outside bleed screws.

Lower the machine and test for proper brake operation.

REAR AXLE

Removal

Position the machine on the work surface.

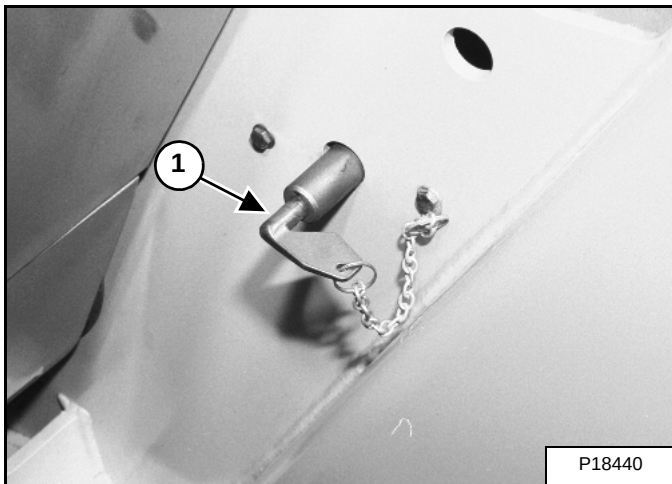
Relieve hydraulic pressure.

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

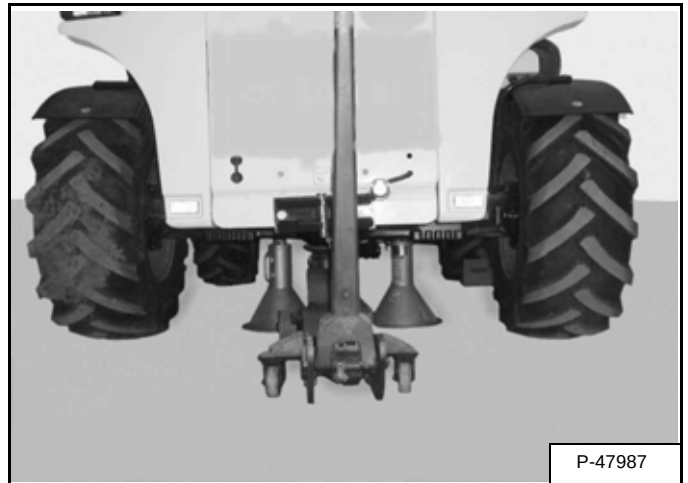
Figure 40-90-1



Rotate the battery disconnect switch (Item 1) [Figure 40-90-1] to the right, to disconnect the power supply from the battery.

Drain the hydraulic reservoir. (See Content Page 10-01.)

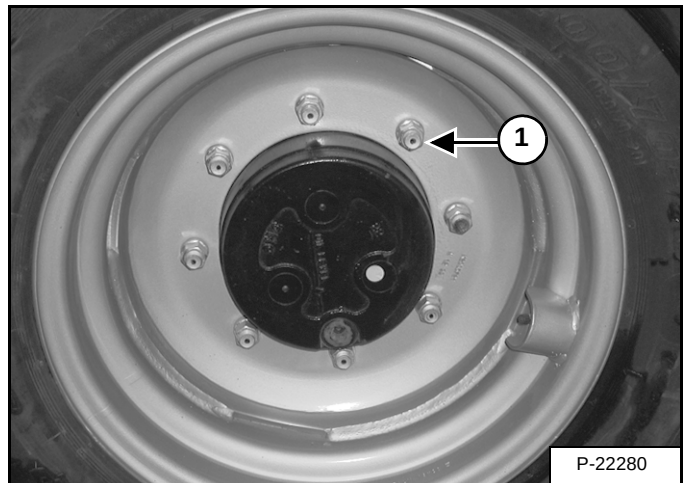
Figure 40-90-2



Lift the rear of the machine and place jackstands under the frame as shown.

Place a block in front and behind the front wheel [Figure 40-90-2].

Figure 40-90-3



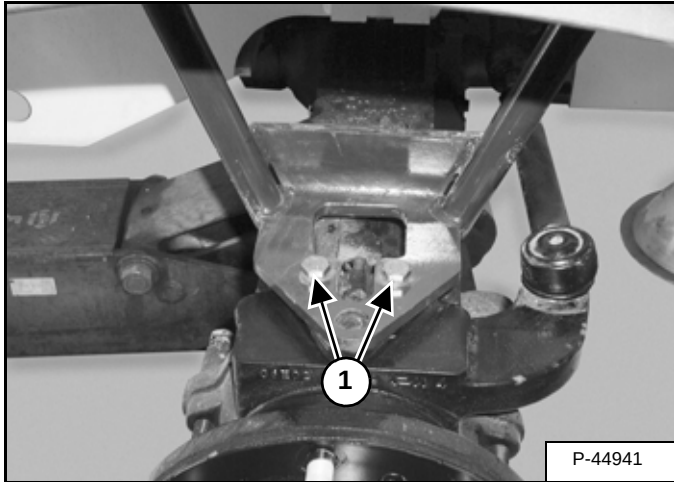
Remove the eight lug nuts and washers (Item 1) [Figure 40-90-3] from each rear tire.

Remove both rear tires.

REAR AXLE (CONT'D)

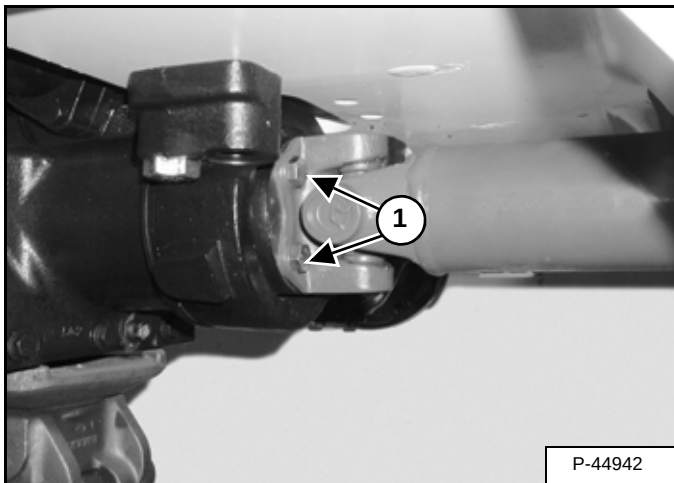
Removal (Cont'd)

Figure 40-90-4



Remove the two bolts (Item 1) [Figure 40-90-4] and remove the rear fenders.

Figure 40-90-5



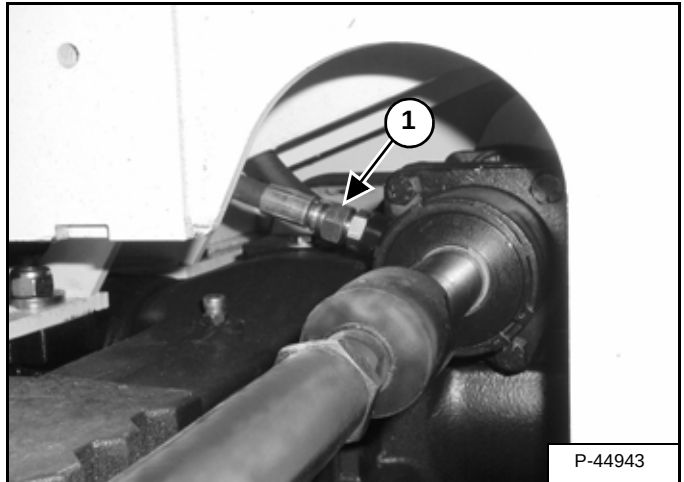
Remove the four bolts (Item 1) [Figure 40-90-5] and nuts from the driveshaft.

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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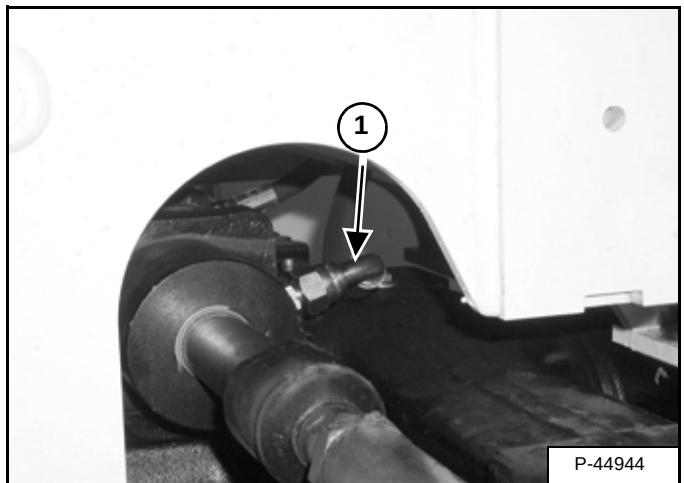
Figure 40-90-6



Remove the hose (Item 1) [Figure 40-90-6] from the steering cylinder.

NOTE: Mark all hoses for correct installation.

Figure 40-90-7

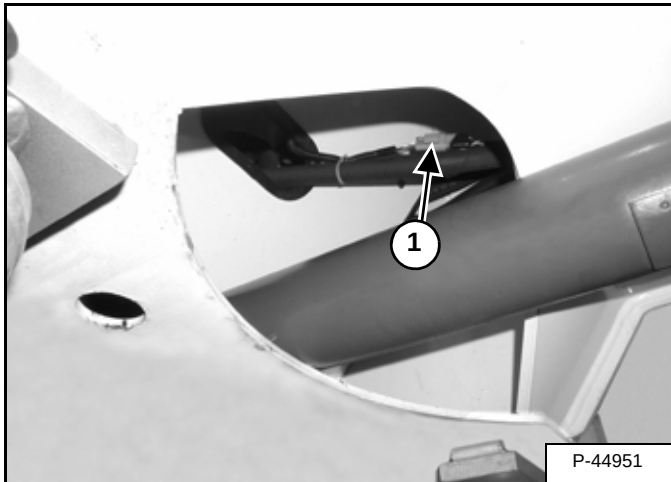


Remove the hose (Item 1) [Figure 40-90-7] from the steering cylinder.

REAR AXLE (CONT'D)

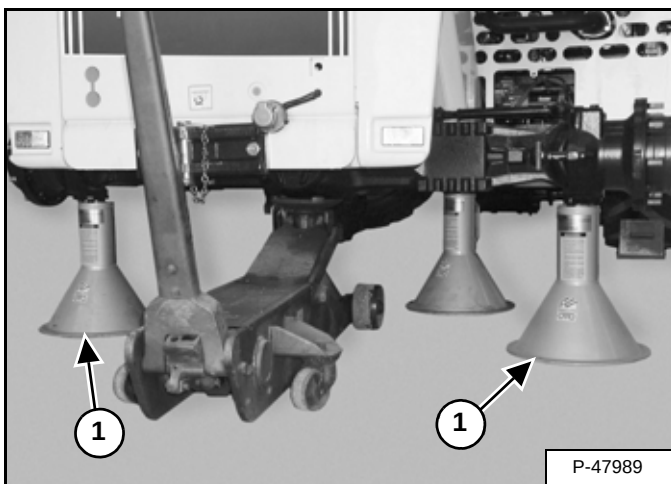
Removal (Cont'd)

Figure 40-90-8



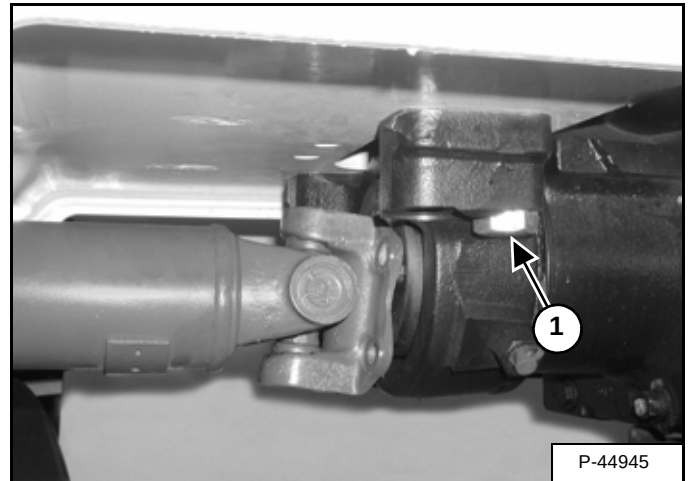
Disconnect the electrical connector (Item 1) [Figure 40-90-8].

Figure 40-90-9



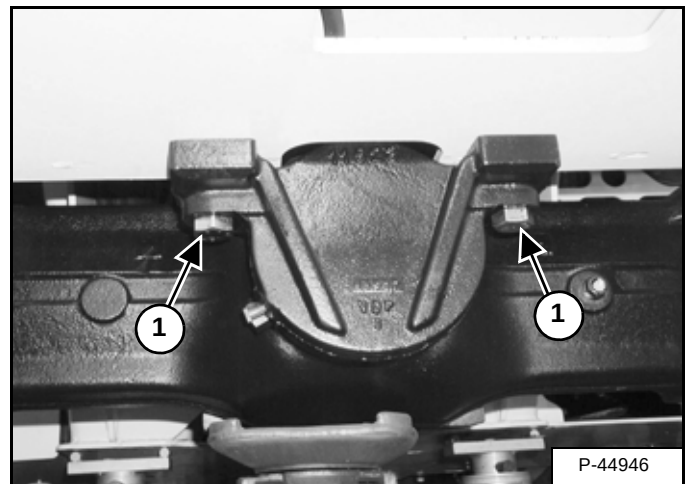
Install two jackstands (Item 1) [Figure 40-90-9] under the axle.

Figure 40-90-10



Remove the two bolts (Item 1) [Figure 40-90-10] from the front mount bracket.

Figure 40-90-11

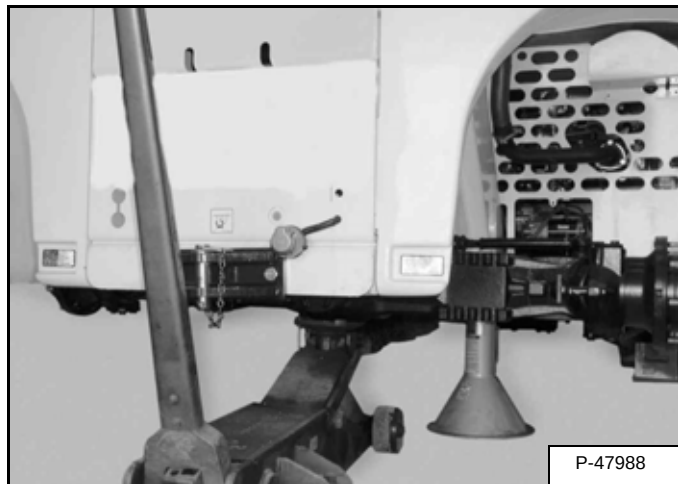


Remove the two bolts (Item 1) [Figure 40-90-11] from the rear mount bracket.

REAR AXLE (CONT'D)

Removal (Cont'd)

Figure 40-90-12

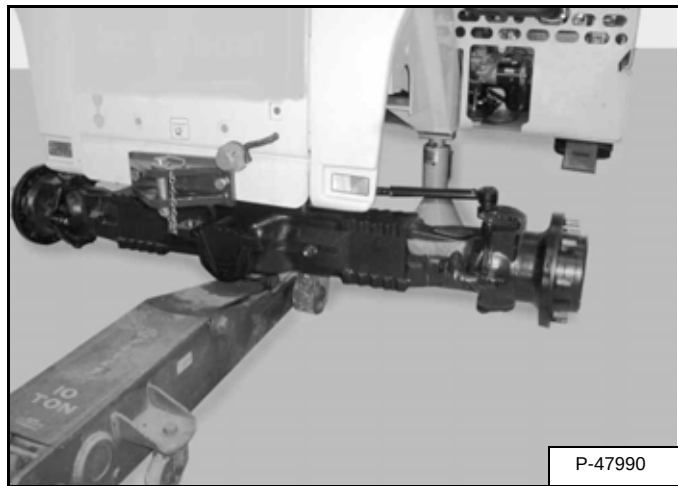


Remove the jackstands from the axle.

Have an assistant balance the axle on the floor jack and lower the floor jack slowly. Roll the axle out from under the frame [Figure 40-90-12].

Installation

Figure 40-90-13



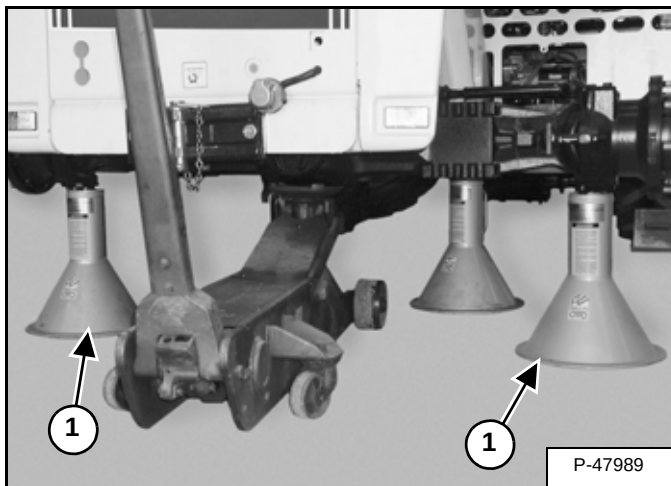
Have an assistant balance the axle on the floor jack and roll the axle under the frame [Figure 40-90-13].

Figure 40-90-14



Raise the floor jack, lifting the axle upward and into position [Figure 40-90-14].

Figure 40-90-15

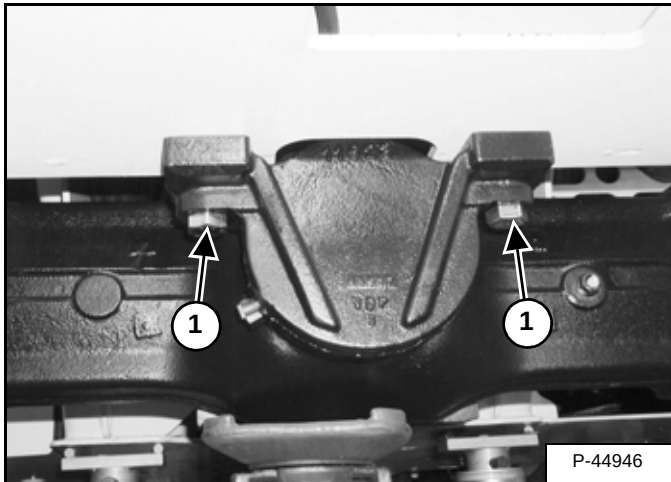


Install jackstands (Item 1) [Figure 40-90-15] under the axle.

REAR AXLE (CONT'D)

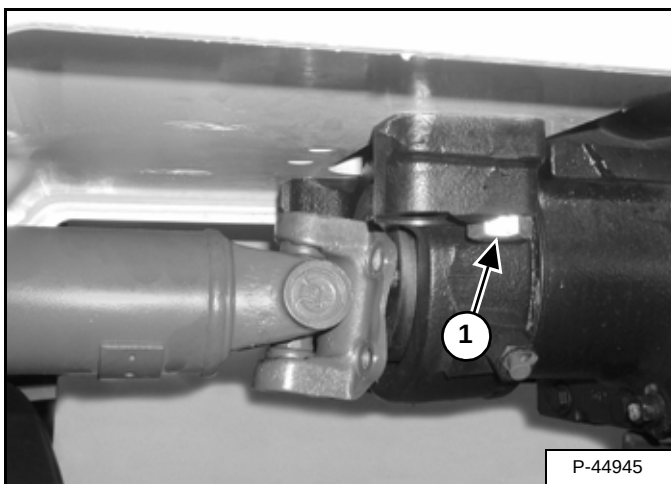
Installation (Cont'd)

Figure 40-90-16



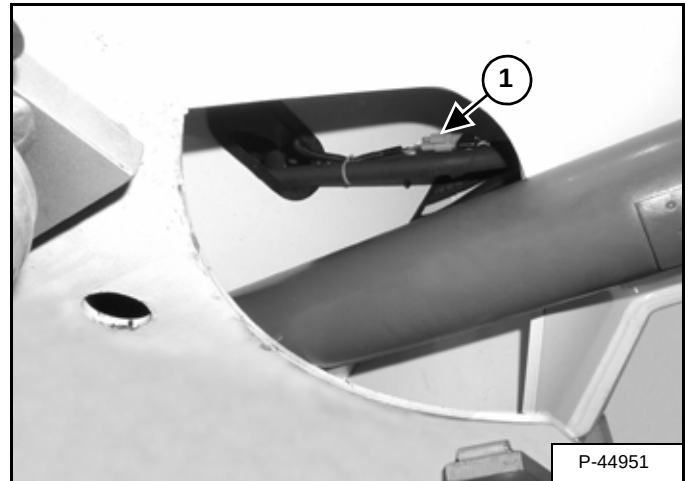
Install the two bolts (Item 1) [Figure 40-90-16] in the rear mount bracket.

Figure 40-90-17



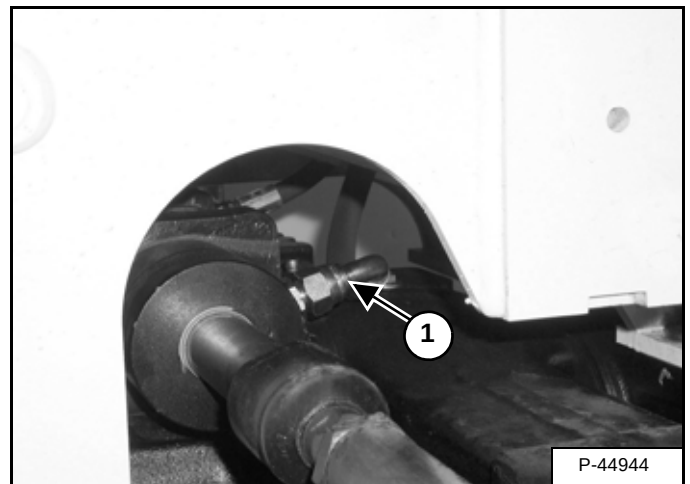
Install the two bolts (Item 1) [Figure 40-90-17] in the front mounting bracket.

Figure 40-90-18



Plug the wire connector (Item 1) [Figure 40-90-18] into the wire harness.

Figure 40-90-19

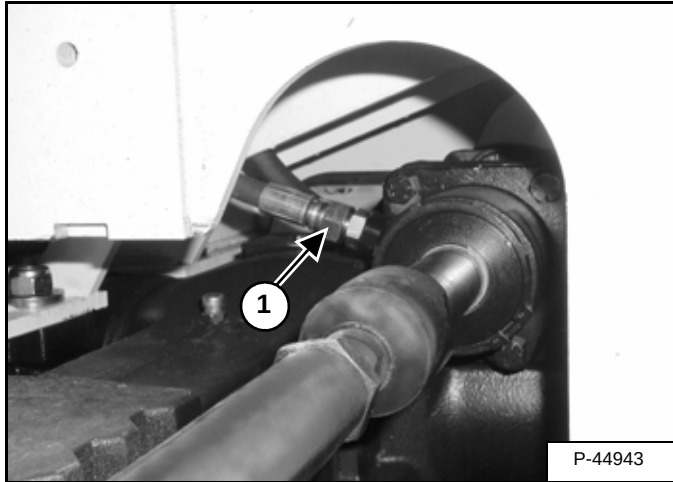


Install the hose (Item 1) [Figure 40-90-19] on the steering cylinder.

REAR AXLE (CONT'D)

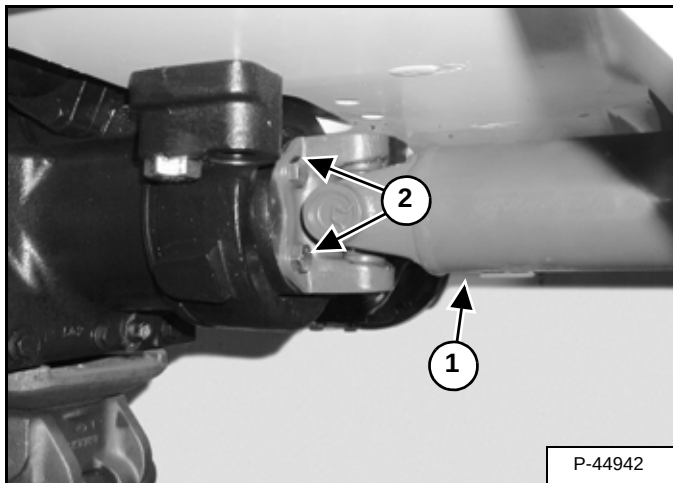
Installation (Cont'd)

Figure 40-90-20



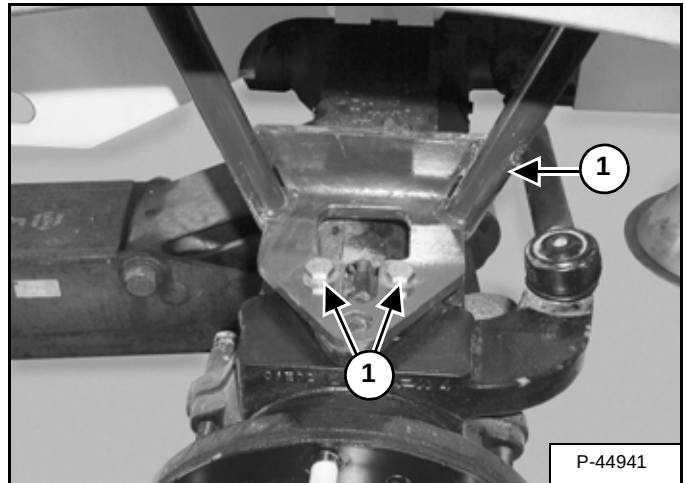
Install the hose (Item 1) [Figure 40-90-20] on the steering cylinder

Figure 40-90-21



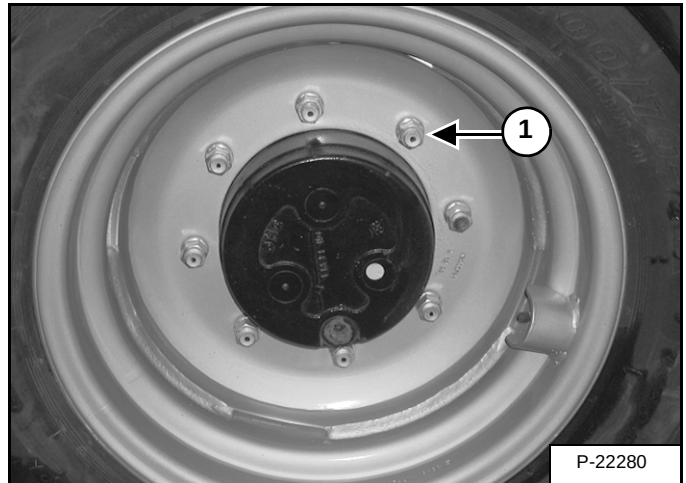
Install the driveshaft (Item 1) with four bolts (Item 2) [Figure 40-90-21]. Tighten the bolts to 87 ft.-lbs. (118 Nm) torque.

Figure 40-90-22



Install the rear fenders (Item 1) with two bolts (Item 2) [Figure 40-90-22].

Figure 40-90-23



Install the rear tires with eight nuts (Item 1) [Figure 40-90-23] and washers.

Tighten the nuts to 221 ft.-lbs. (300 Nm) torque.

REAR AXLE (CONT'D)

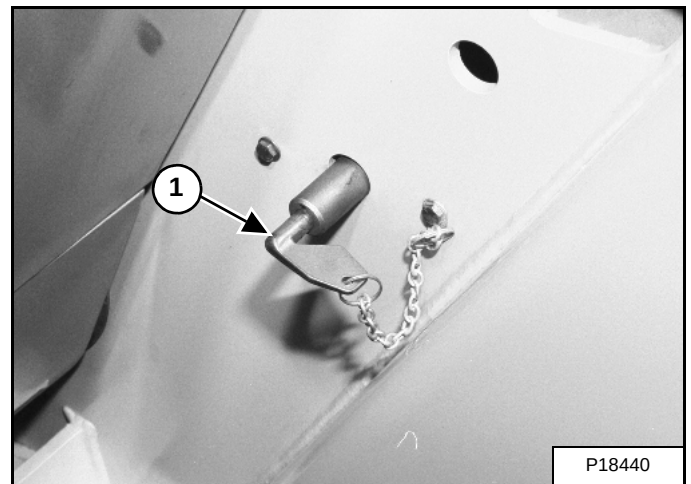
Installation (Cont'd)

Figure 40-90-24



Raise the machine and remove the jackstands. Lower the machine and remove the blocks from the front tire [Figure 40-90-24].

Figure 40-90-25



Rotate the battery disconnect switch (Item 1) [Figure 40-90-25] to the left, to restore the power supply from the battery.

Fill the hydraulic reservoir. (See Contents, Page 10-01.)

MAIN FRAME

BOOM ASSEMBLY	50-30-1
Removal And Installation	50-30-1
CANOPY	50-11-1
Removal and Installation	50-11-1
DASH COVER/STEERING COLUMN COVER	50-130-1
Removal And Installation	50-130-1
ENGINE COVER	50-70-1
Not Available At Time Of Printing.	50-70-1
FENDER	50-110-1
Removal And Installation	50-110-1
FUEL TANK	50-80-1
Not Available At Time Of Printing.	50-80-1
INNER BOOM	50-40-1
Installation	50-40-3
Removal	50-40-1
JOYSTICK PANEL	50-120-1
Removal And Installation	50-120-1
OPERATOR CAB	50-10-1
OPERATOR SEAT	50-20-1
Removal And Installation	50-20-1
QUICK TACH.	50-90-1
Removal And Installation	50-90-1
REAR WEIGHTS	50-100-1
Not Available At Time Of Printing.	50-100-1
WEAR PADS (FRONT)	50-50-1
Removal And Installation	50-50-1
WEAR PADS (REAR)	50-60-1
Installation	50-60-1
Removal	50-60-1

MAIN FRAME

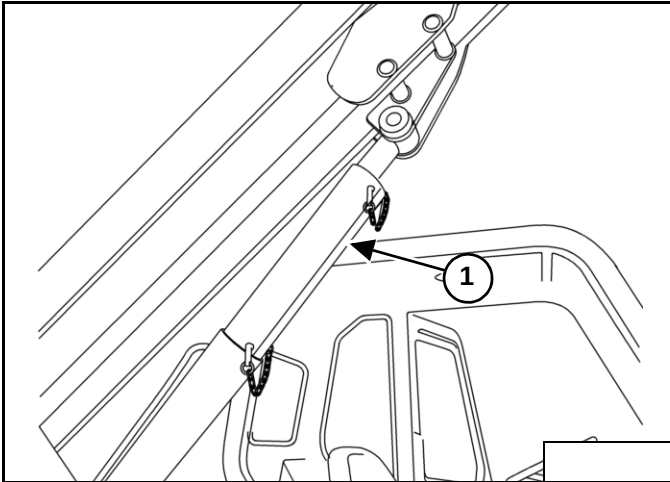
OPERATOR CAB

Not Available At Time Of Printing

CANOPY

Removal and Installation

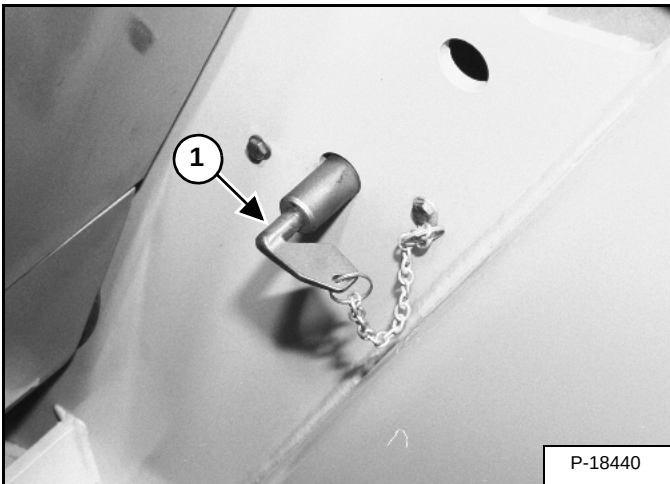
Figure 50-11-1



Raise the boom and install the boom stop (Item 1) [Figure 50-11-1].

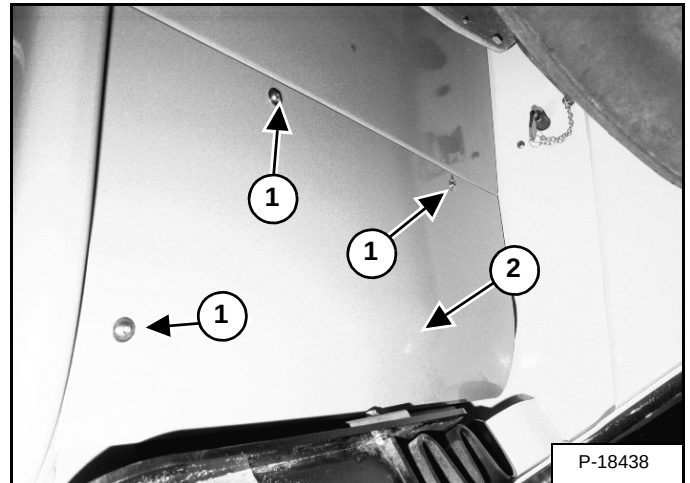
Relieve hydraulic pressure.

Figure 50-11-2



Rotate the battery disconnect switch (Item 1) [Figure 50-11-2] to the right, to disconnect the power supply from the battery.

Figure 50-11-3



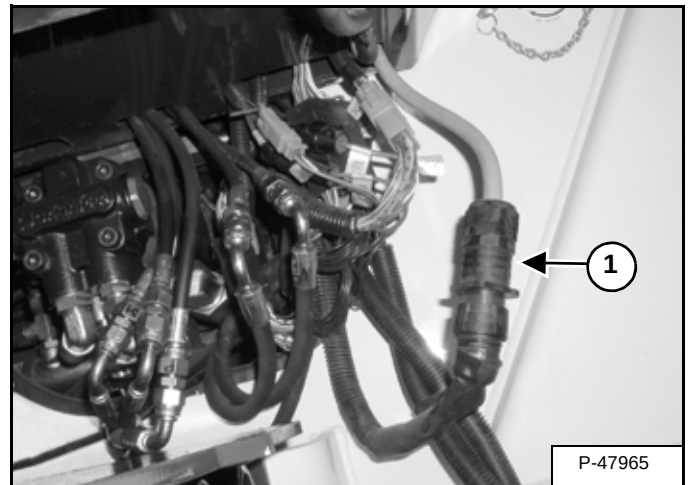
Remove the three screws (Item 1) from the access cover (Item 2) [Figure 50-11-3] located on the back of the canopy.

Remove the access cover.

Remove the battery. (See Contents Page 60-01.)

NOTE: Mark all hoses and electrical connectors for correct installation.

Figure 50-11-4

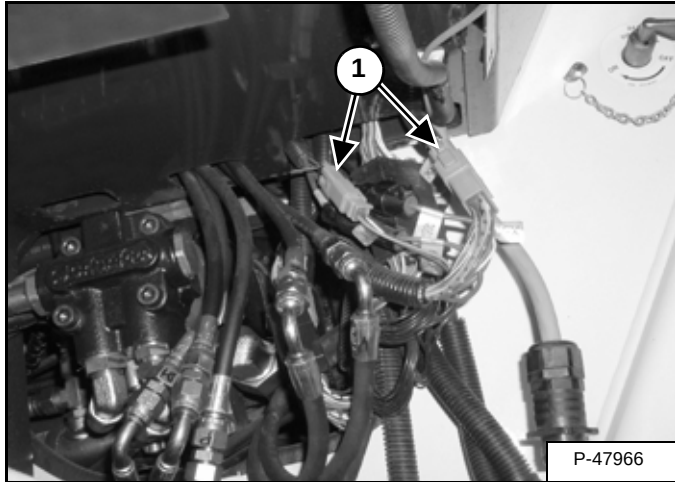


Unplug the two electrical connectors (Item 1) [Figure 50-11-4].

CANOPY (CONT'D)

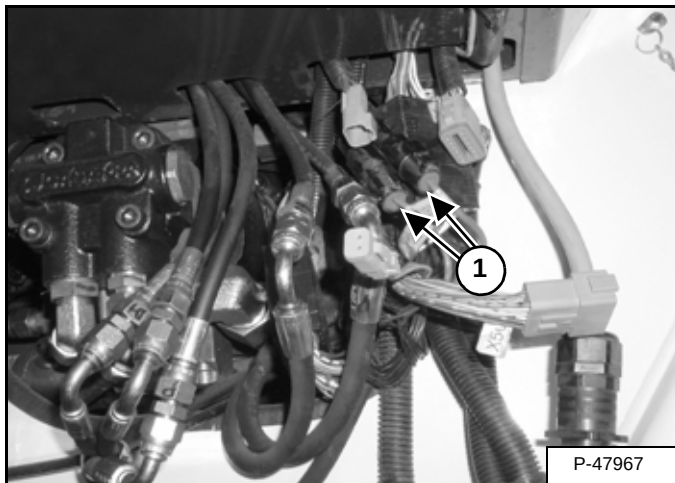
Removal and Installation (Cont'd)

Figure 50-11-5



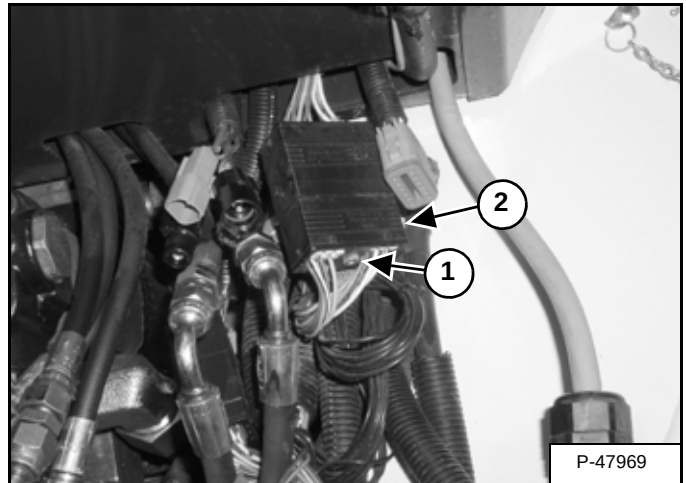
Disconnect the two electrical connectors (Item 1) [Figure 50-11-5].

Figure 50-11-6



Disconnect the two electrical connectors (Item 1) [Figure 50-11-6].

Figure 50-11-7



Loosen the screw (Item 1) disconnect the electrical connector (Item 2) [Figure 50-11-7].

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

IMPORTANT

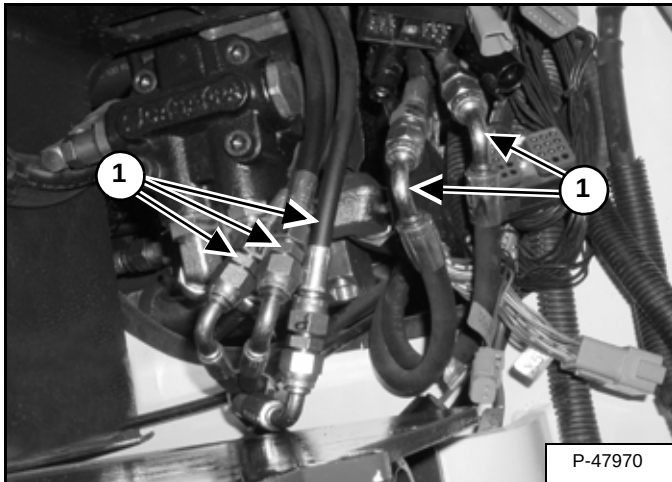
When making repairs on hydraulic system, clean the work area before disassemble and keep all parts clean. Always use caps and plugs on hoses, tubelines and ports to keep dirt out. Dirt can quickly damage the system.

I-2056-0793

CANOPY (CONT'D)

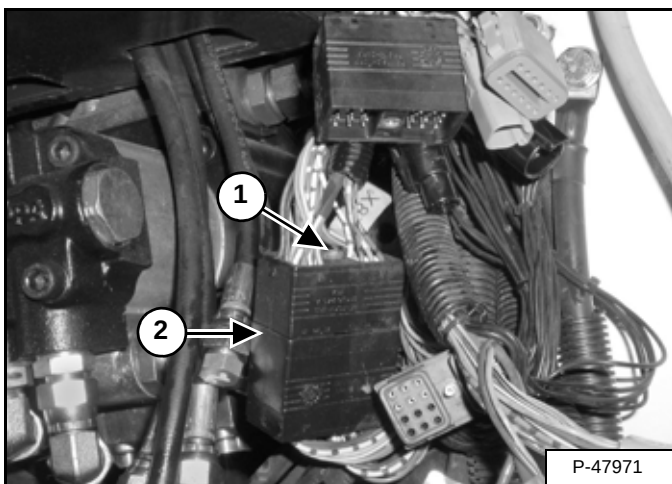
Removal and Installation (Cont'd)

Figure 50-11-8



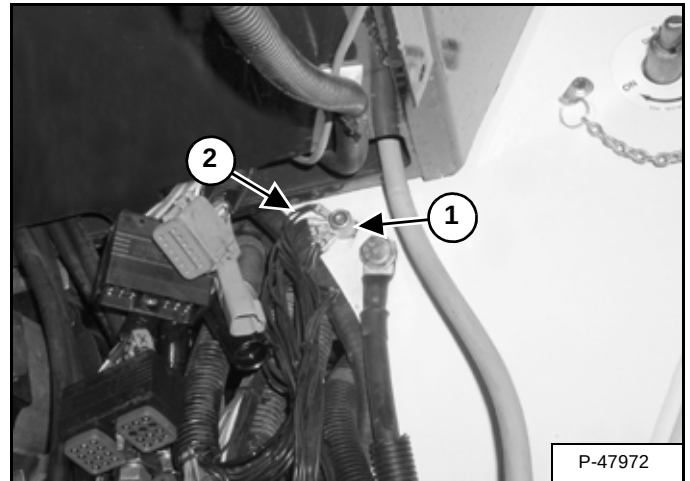
Remove the five hydraulic hoses (Item 1) [Figure 50-11-8].

Figure 50-11-9



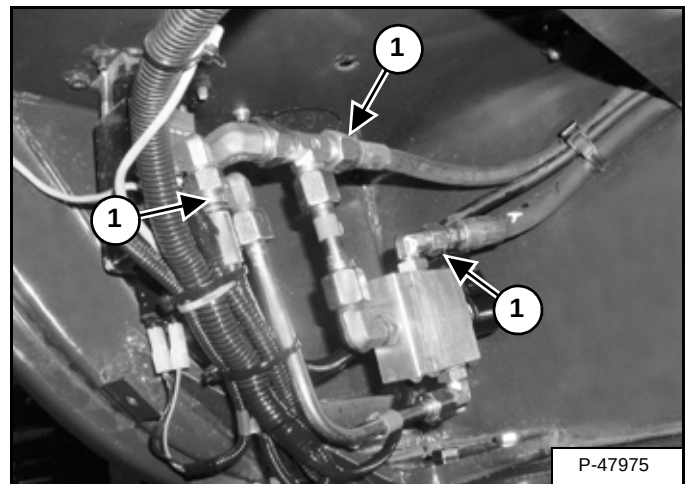
Loosen the screw (Item 1) and disconnect the electrical connector (Item 2) [Figure 50-11-9].

Figure 50-11-10



Remove the nut (Item 1) and ground wires (Item 2) [Figure 50-11-10].

Figure 50-11-11



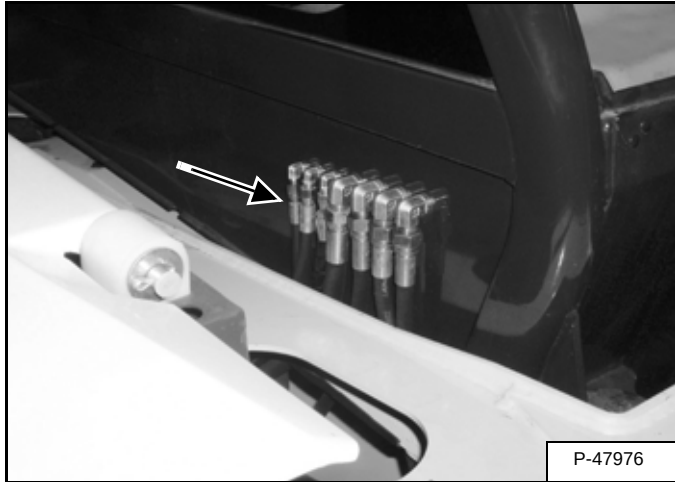
Remove the three hoses (Item 1) [Figure 50-11-11]

Remove any necessary nylon ties.

CANOPY (CONT'D)

Removal and Installation (Cont'd)

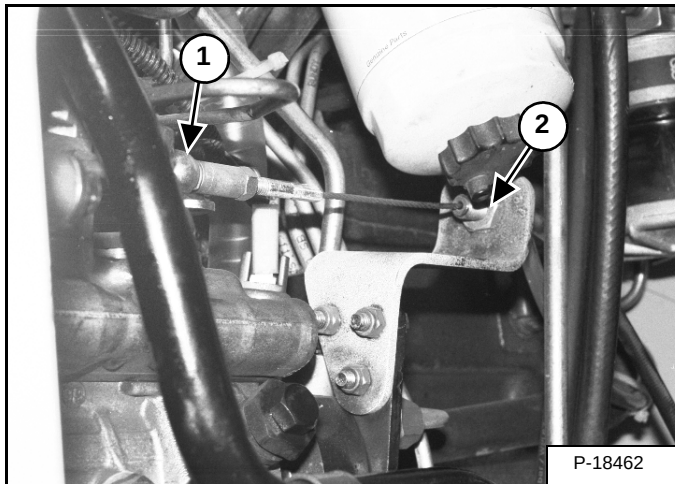
Figure 50-11-12



Remove the seven hoses on the right side of the canopy [Figure 50-11-12].

Open the engine cover.

Figure 50-11-13



Remove the engine speed control cable (Item 1) [Figure 50-11-13] from the linkage.

Remove the engine speed control cable from the mounting bracket (Item 2) [Figure 50-11-13].

Remove any necessary nylon ties, carefully remove the speed control cable from the engine compartment.

NOTE: Adjust the engine speed control cable during installation. (See Contents Page 70-01.)

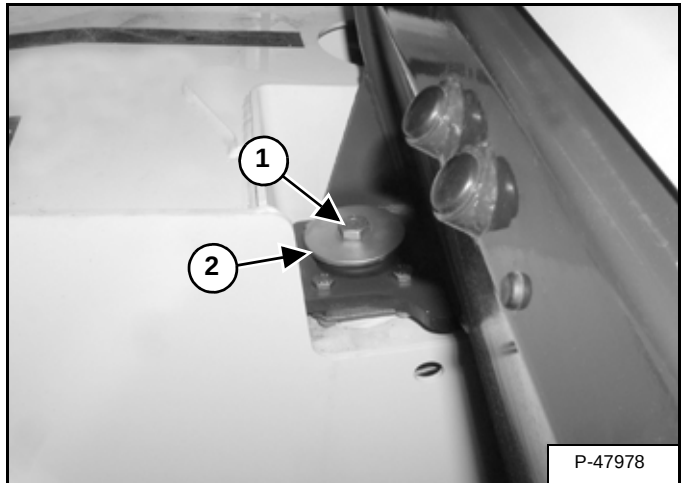
Close the engine cover.

Figure 50-11-14



Install a hoist to lift and support the canopy [Figure 50-11-14].

Figure 50-11-15

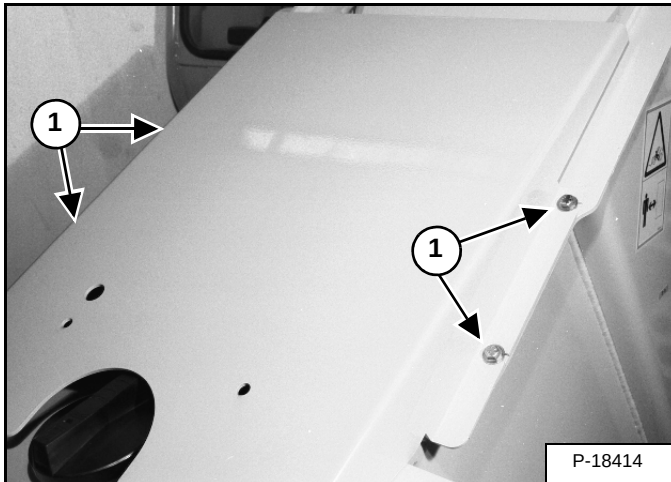


Remove the canopy mount bolt (Item 1) and washer (Item 2) [Figure 50-11-15] from the front of the cab.

CANOPY (CONT'D)

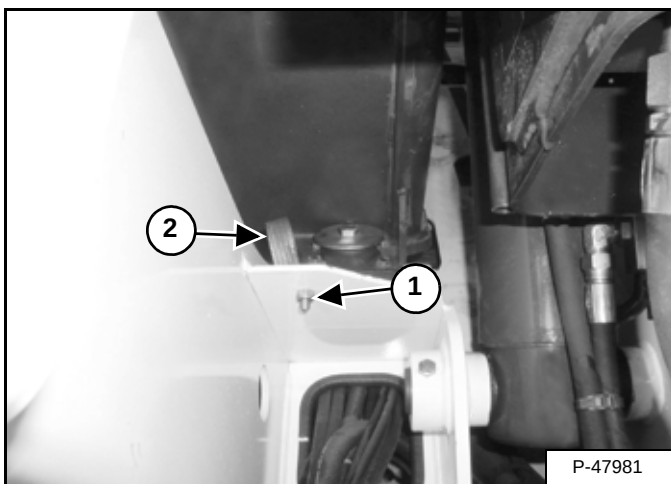
Removal and Installation (Cont'd)

Figure 50-11-16



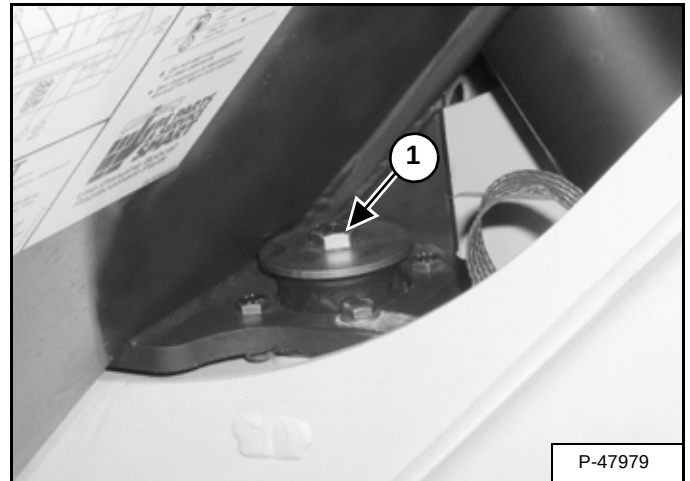
Remove the four bolts (Item 1) and rear cover (Item 2) [Figure 50-11-16].

Figure 50-11-17



Remove the nut (Item 1), and bolt. Remove the grounding strap (Item 2) [Figure 50-11-17].

Figure 50-11-18



Loosen the rear mounting bolt (Item 1) [Figure 50-11-18] remove the nut.

NOTE: The bolt cannot be removed from the mount.

CANOPY (CONT'D)

Removal and Installation (Cont'd)

Figure 50-11-19

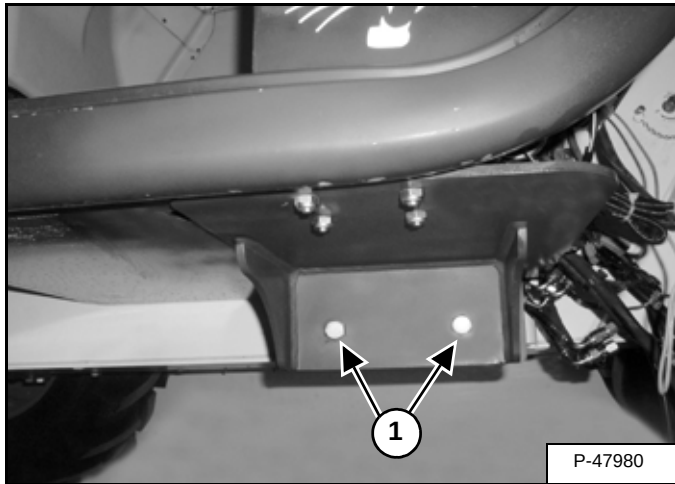
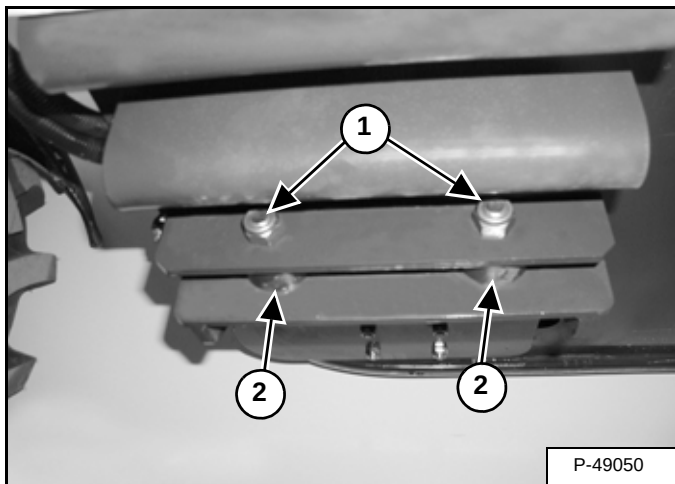


Figure 50-11-20



Remove the bolts (Item 1) [Figure 50-11-19] nuts (Item 1) and rubber cushions (Item 2) [Figure 50-11-20].

Figure 50-11-21



Lift and remove the canopy [Figure 50-11-21].

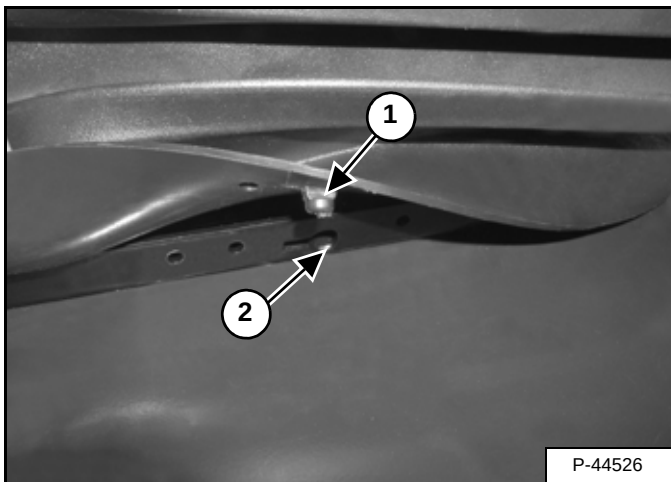
OPERATOR SEAT

Removal And Installation

Figure 50-20-1



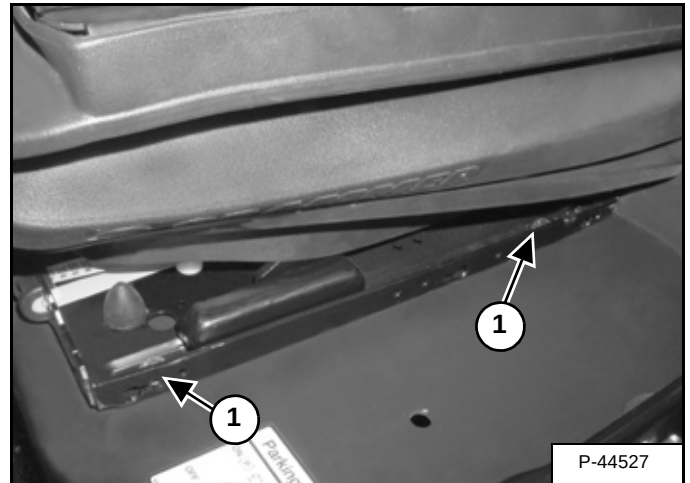
Figure 50-20-2



Raise the seat mount cover (Item 1) [Figure 50-20-1] by sliding the bottom edge of the seat mount cover to the right to remove the cover retainers (Item 1) from the seat frame (Item 2) [Figure 50-20-2].

NOTE: There are several retainers molded into the bottom edge of the cover.

Figure 50-20-3



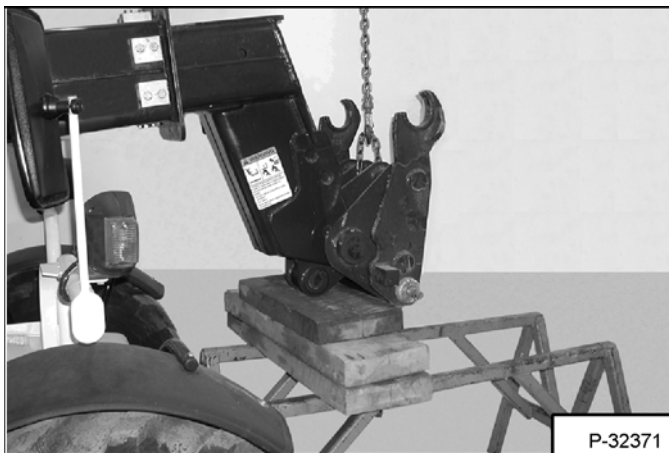
Remove the two seat mount bolts (Item 1) [Figure 50-20-3] from both sides.

Remove the seat.

BOOM ASSEMBLY

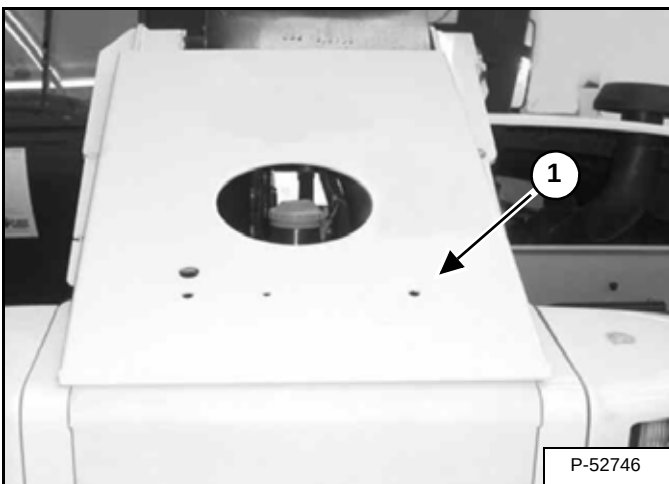
Removal And Installation

Figure 50-30-1



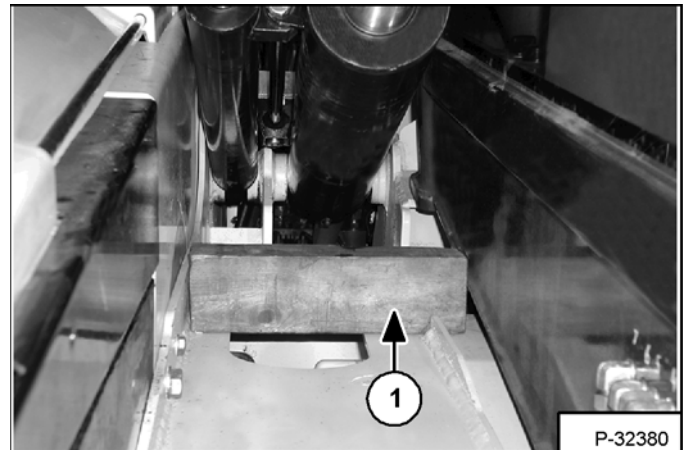
Lower the boom onto adequate stands or blocks as shown [Figure 50-30-1].

Figure 50-30-2



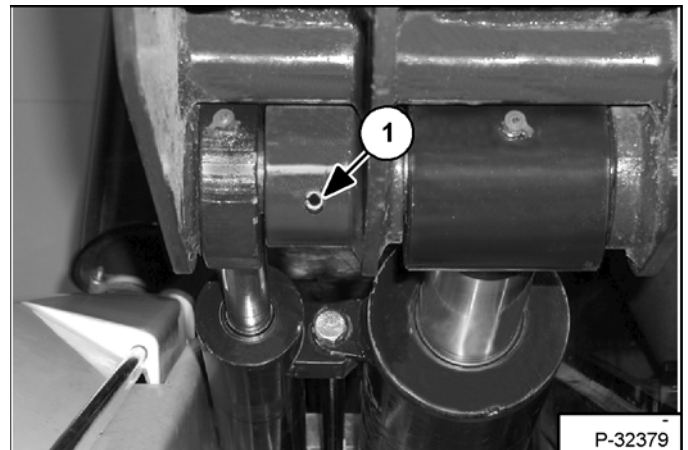
Remove the rear cover (Item 1) [Figure 50-30-2] from the machine.

Figure 50-30-3



Place a wood block (Item 1) [Figure 50-30-3] under the lift cylinder/bucket positioning cylinder.

Figure 50-30-4

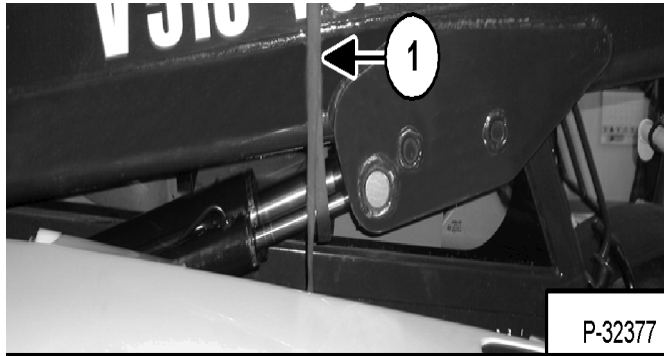


Remove the pivot pin retainer pin (Item 1) [Figure 50-30-4] from the lift cylinder/bucket positioning cylinder.

BOOM ASSEMBLY (CONT'D)

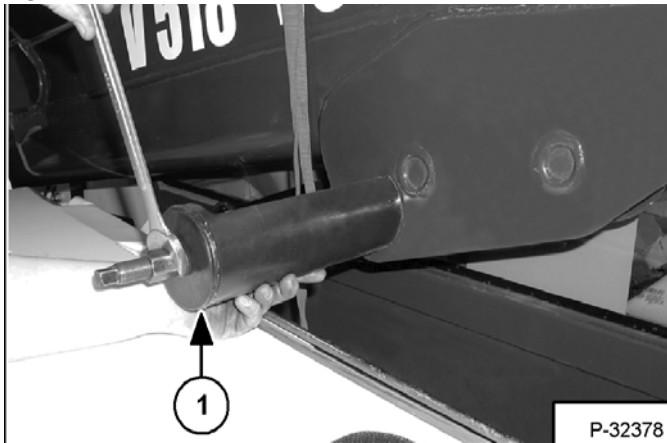
Removal And Installation (Cont'd)

Figure 50-30-5



Support both cylinders using a cinch strap (Item 1) [Figure 50-30-5].

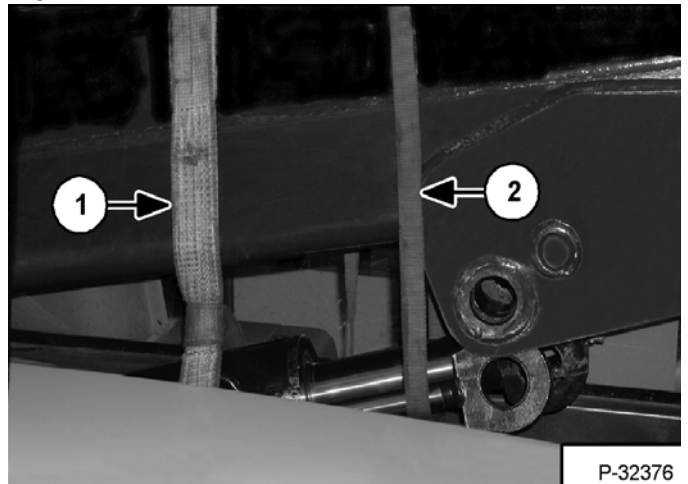
Figure 50-30-6



Remove the lift cylinder pivot pin using a pin removal tool (Item 1) [Figure 50-30-6].

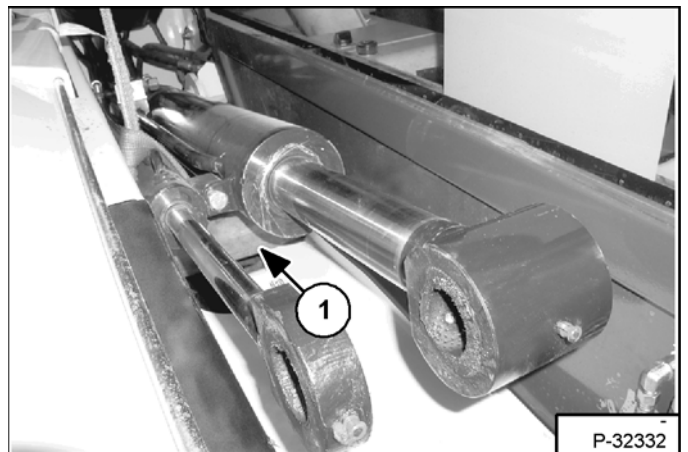
NOTE: See Content, Page 20-01 Lift Cylinder Removal And Installation for more information.

Figure 50-30-7



Lift and support the cylinders using a hoist and lifting strap (Item 1). Remove the cinch strap (Item 2) [Figure 50-30-7].

Figure 50-30-8



Lower both cylinders onto a wood block (Item 1) [Figure 50-30-8].

BOOM ASSEMBLY (CONT'D)

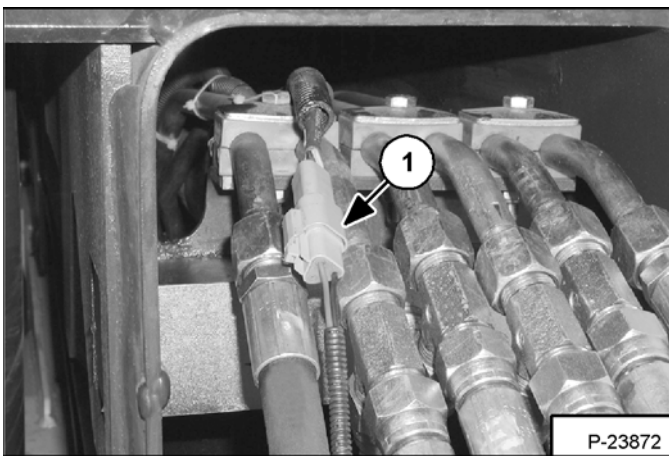
Removal And Installation (Cont'd)

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.

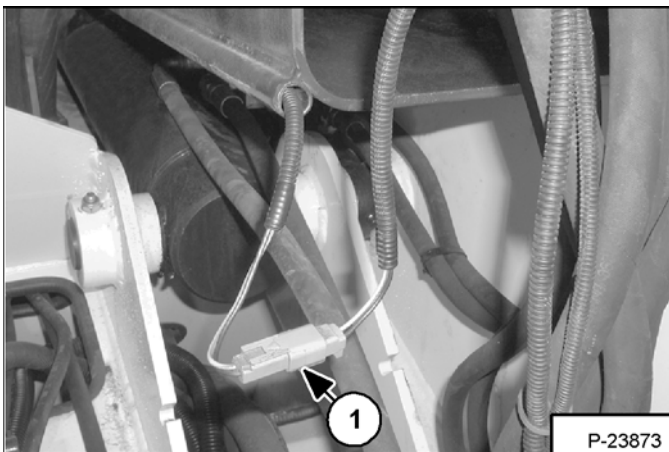
I-2003-0888

Figure 50-30-9



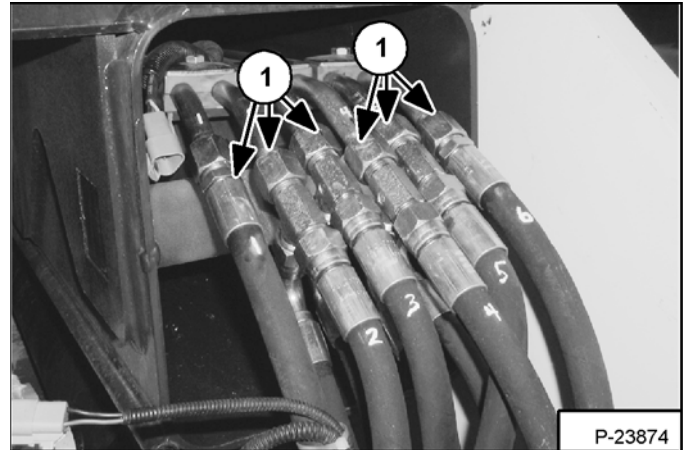
Disconnect the secondary auxiliary harness connector (Item 1) [Figure 50-30-9].

Figure 50-30-10



Disconnect the light harness connector (Item 1) [Figure 50-30-10].

Figure 50-30-11



Disconnect the six hydraulic hoses (Item 1) [Figure 50-30-11] from the tubelines.

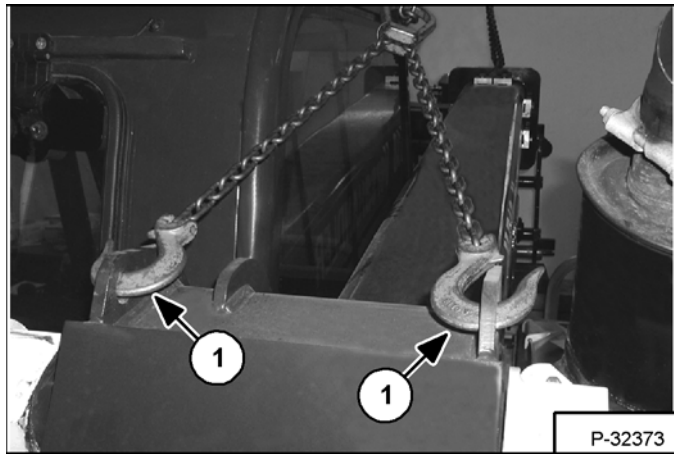
NOTE: Mark the hoses for correct installation.

Install a lifting chain on the front of the boom.

BOOM ASSEMBLY (CONT'D)

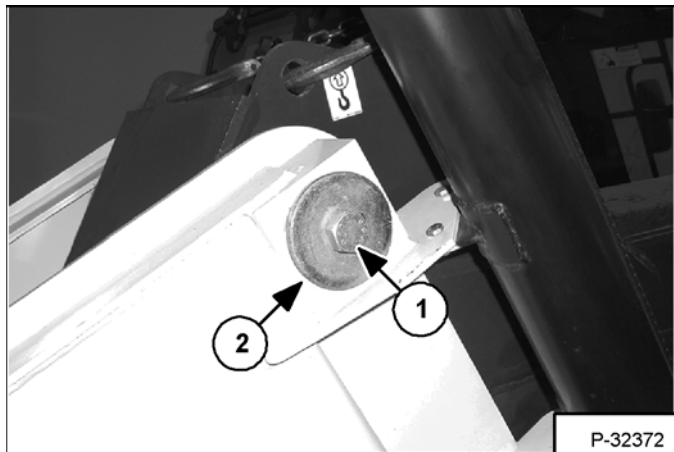
Removal And Installation (Cont'd)

Figure 50-30-12



Install a lifting chain (Item 1) [Figure 50-30-13] at the rear of the boom.

Figure 50-30-13



Remove the bolt (Item 1) and washer (Item 2) [Figure 50-30-14] from the boom pin.

Figure 50-30-14



Remove the boom pin [Figure 50-30-15].

Figure 50-30-15

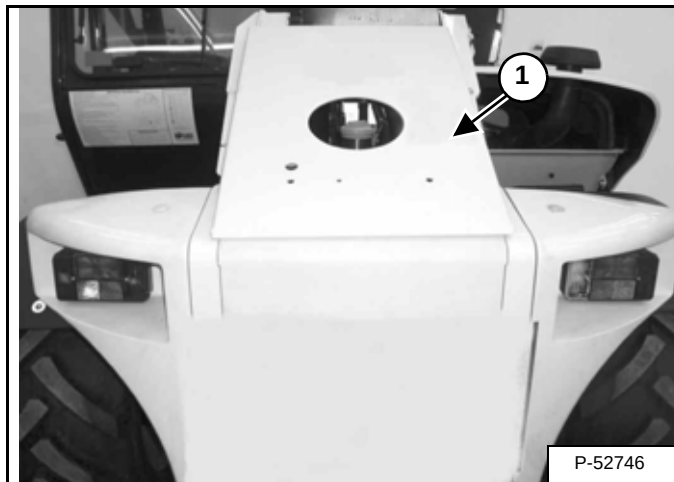


Lift and remove the boom assembly [Figure 50-30-16].

INNER BOOM

Removal

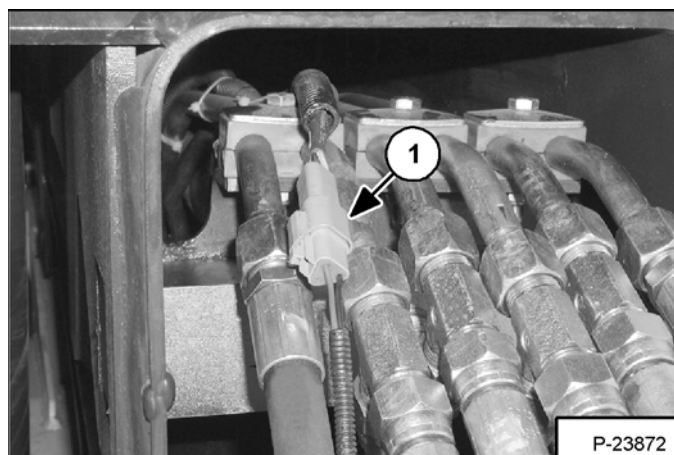
Figure 50-40-1



Remove the rear cover (Item 1) [Figure 50-40-1].

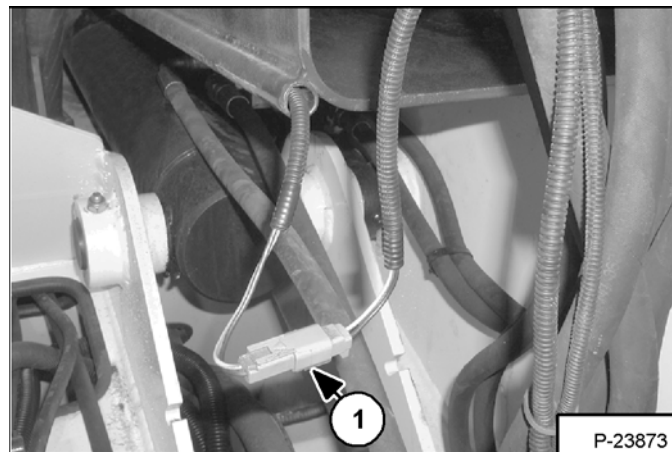
Remove the front wear pads. (See Content Page 50-01.)

Figure 50-40-2



Disconnect the secondary auxiliary harness connector (Item 1) [Figure 50-40-2] (if equipped).

Figure 50-40-3



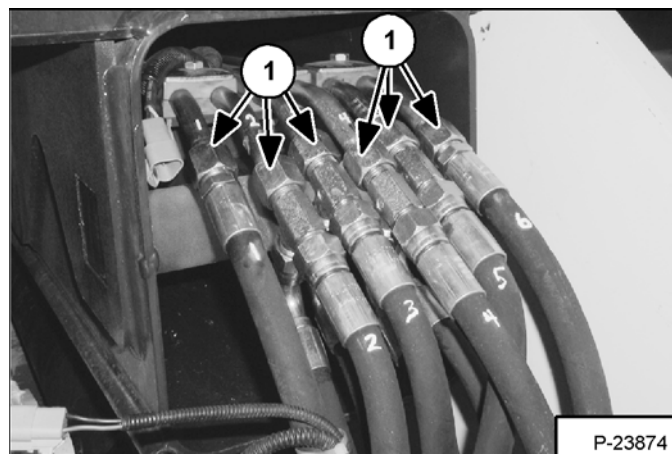
Disconnect the light harness connector (Item 1) [Figure 50-40-3].

IMPORTANT

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

I-2003-0888

Figure 50-40-4



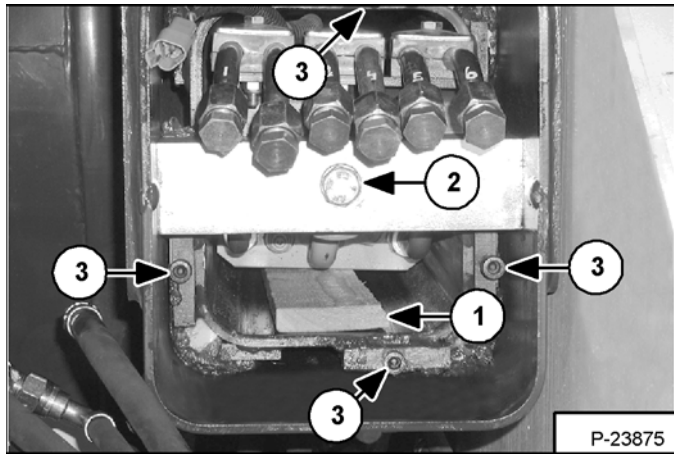
Remove the six hydraulic hoses (Item 1) [Figure 50-40-4] from the tubelines.

NOTE: Mark the hoses for correct installation.

INNER BOOM (CONT'D)

Removal (Cont'd)

Figure 50-40-5



Place a wood block (Item 1) under the cylinder for support. Remove the bolt (Item 2) **[Figure 50-40-5]** from the cylinder.

Loosen the rear wear pad adjusting bolts (Item 3) **[Figure 50-40-5]**.

Figure 50-40-6

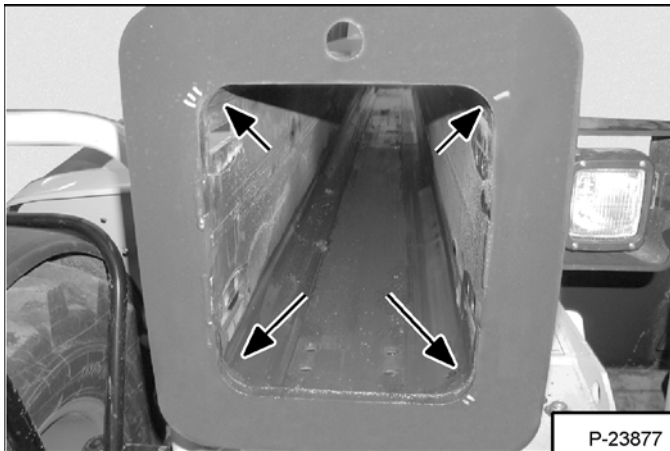


Begin sliding the inner boom from the main boom. Before the inner boom is completely removed, position a hoist and lifting strap on the inner boom. Carefully continue to remove the inner boom completely **[Figure 50-40-6]**.

INNER BOOM (CONT'D)

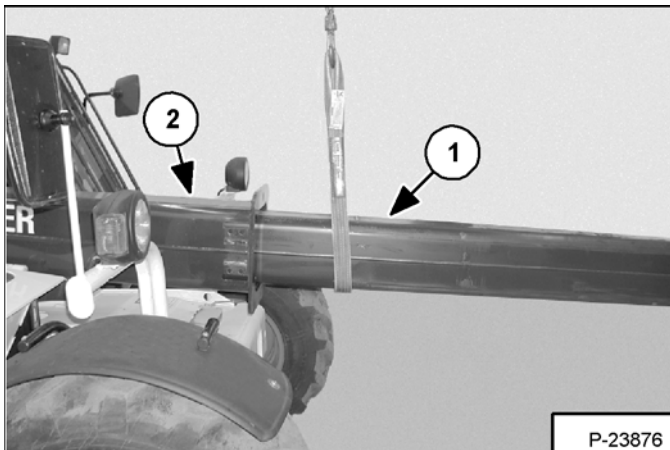
Installation

Figure 50-40-7



Apply grease to the inside top and bottom corners of the main boom [Figure 50-40-7].

Figure 50-40-8

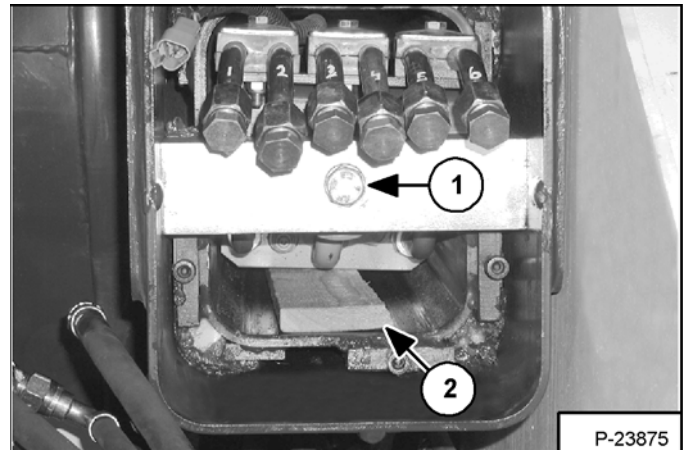


Install the end of the inner boom (Item 1) into the main boom (Item 2) [Figure 50-40-8] approximately 2 ft. (610 mm).

Install the front wear pads. (See Content Page 50-01.)

Remove the lifting strap and slide the inner boom fully into the main boom.

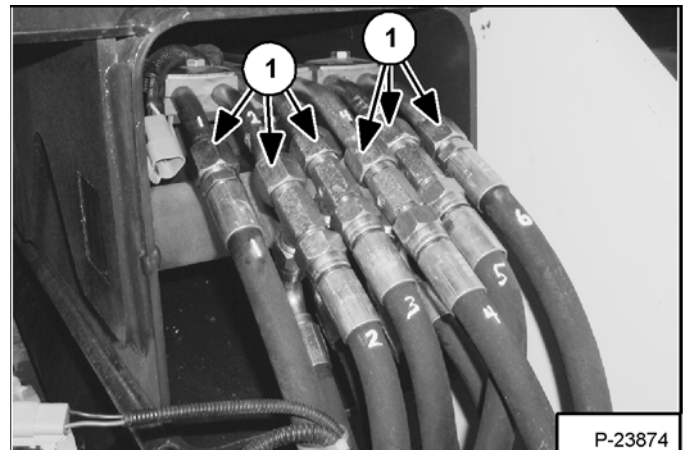
Figure 50-40-9



Install the bolt (Item 1) [Figure 50-40-9] through the support pin and into the cylinder. Tighten the bolt to 221 ft.-lbs. (300 Nm) torque.

Remove the wood block (Item 2) [Figure 50-40-9].

Figure 50-40-10

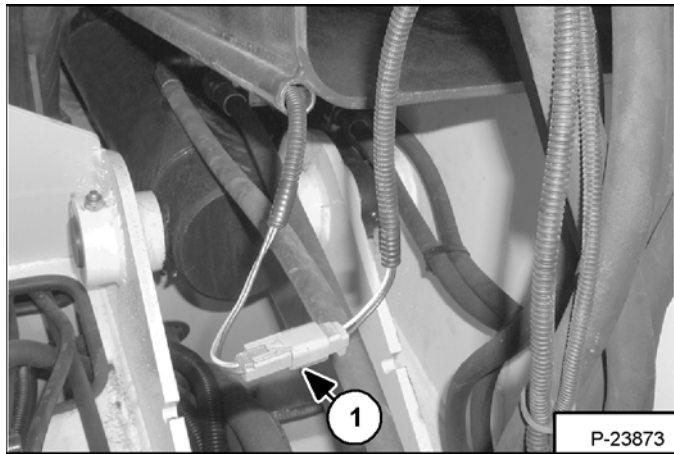


Install the six hoses (Item 1) [Figure 50-40-10] on the tubelines.

INNER BOOM (CONT'D)

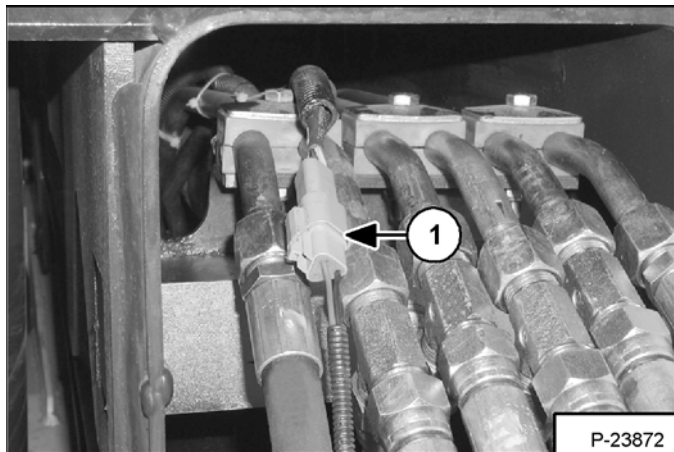
Installation (Cont'd)

Figure 50-40-11



Reconnect the light harness connector (Item 1) [Figure 50-40-11].

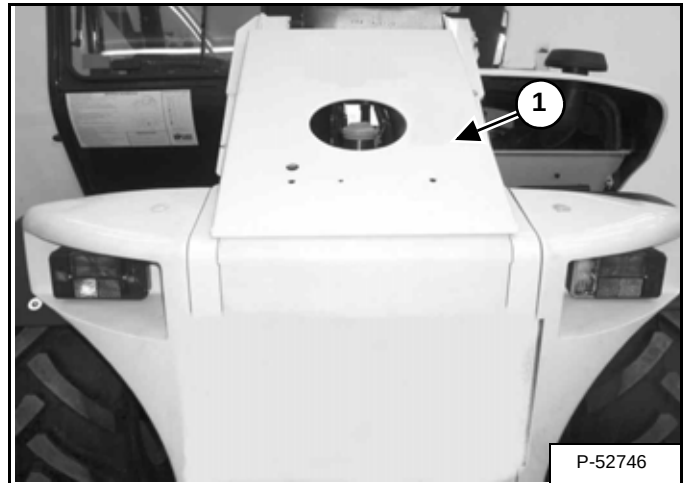
Figure 50-40-12



Reconnect the front auxiliary harness connector (Item 1) [Figure 50-40-12].

Adjust the wear pads. (See Content Page 50-01.)

Figure 50-40-13

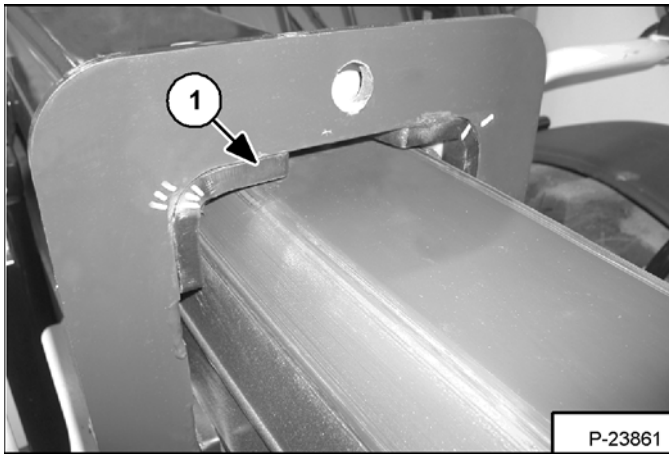


Install the rear cover (Item 1) [Figure 50-40-13].

WEAR PADS (FRONT)

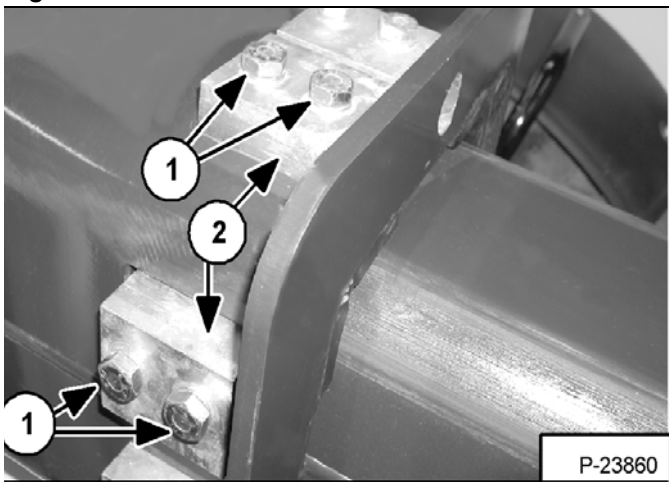
Removal And Installation

Figure 50-50-1



Extend the inner boom approximately 2 ft. (610 mm) and mark the location of the inner supports and wear pads (Item 1) [Figure 50-50-1].

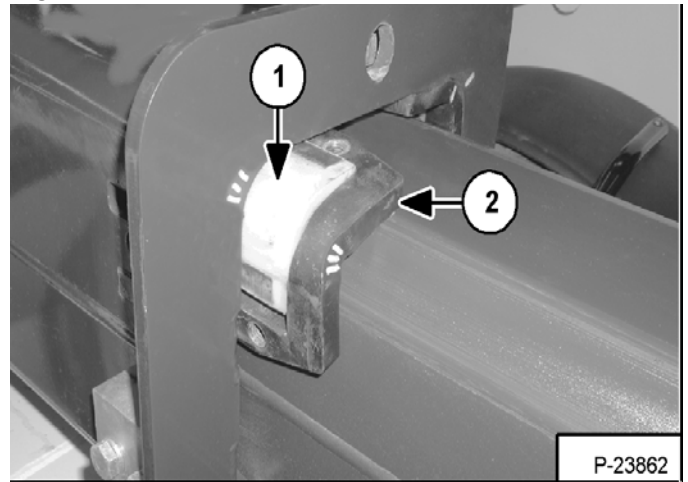
Figure 50-50-2



Remove the four bolts (Item 1) [Figure 50-50-2] and two blocks (Item 2) [Figure 50-50-2] from the boom.

Installation: Tighten the bolts to 43 ft.-lbs. (58 Nm).

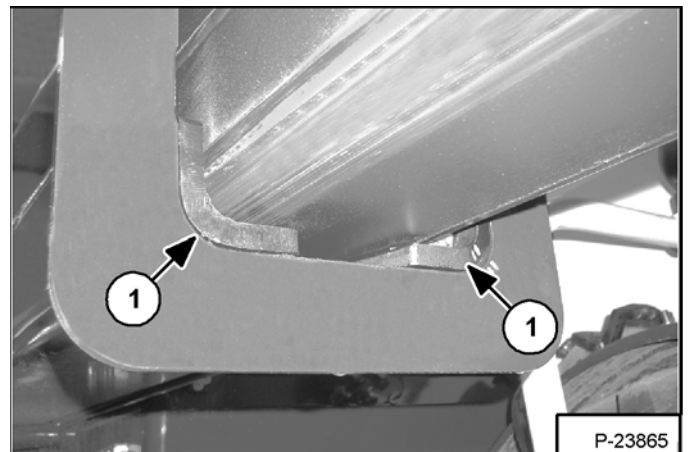
Figure 50-50-3



Remove the wear pad (Item 1) [Figure 50-50-3] and inner support (Item 2) [Figure 50-50-3].

With both upper wear pads removed, use a hoist and lifting strap at the end of the boom, apply upwards pressure, lifting the inner boom off the bottom wear pads.

Figure 50-50-4



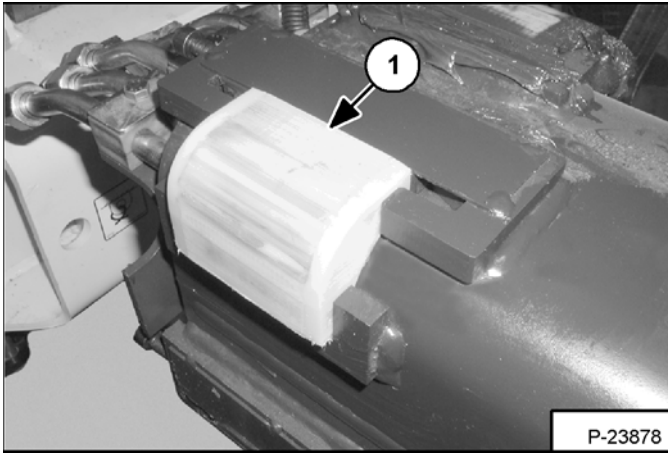
Remove the bottom wear pads (Item 1) [Figure 50-50-4].

WEAR PADS (REAR)

Removal

Remove the inner boom. (See Content Page 50-01.)

Figure 50-60-1

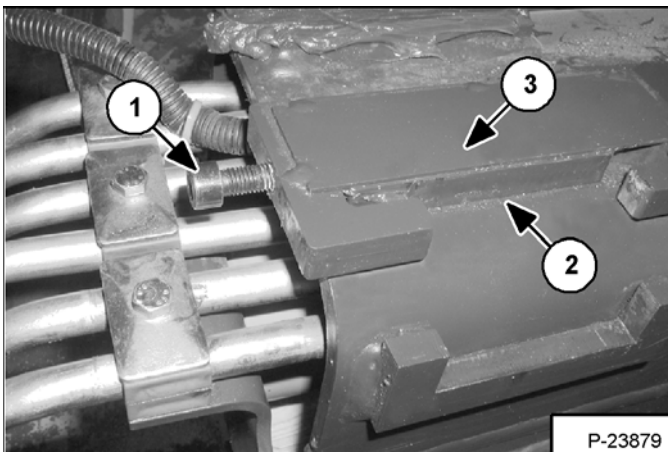


With the inner boom supported, remove the wear pad (Item 1) [Figure 50-60-1].

NOTE: Grease was removed for photo clarity.

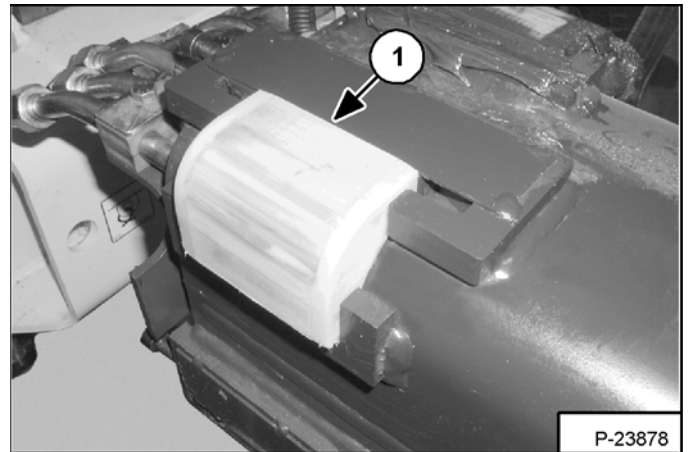
Installation

Figure 50-60-2



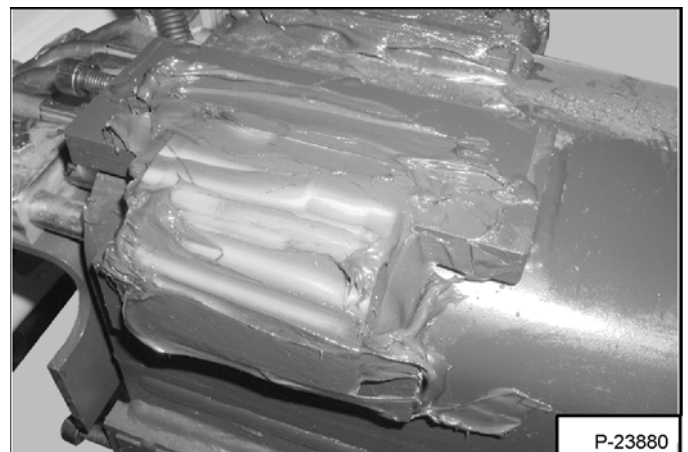
Loosen the adjustment screw (Item 1) until the adjusting plate (Item 2) is flush with the wear pad retainer (Item 3) [Figure 50-60-2].

Figure 50-60-3



Install the new wear pad (Item 1) [Figure 50-60-3].

Figure 50-60-4



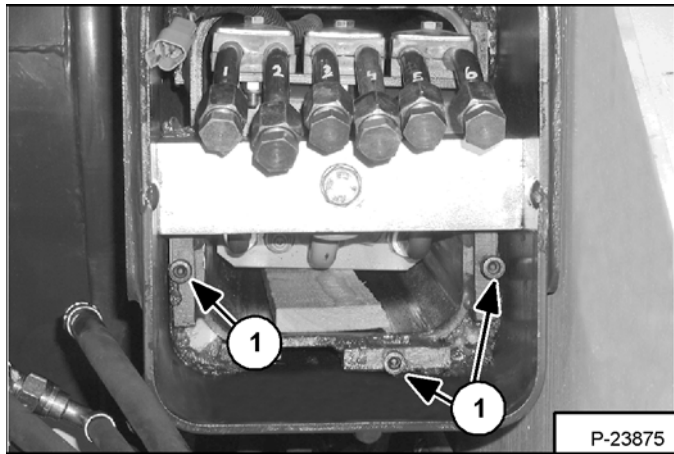
Apply grease to the wear pads [Figure 50-60-4].

Install the inner boom. (See Content Page 50-01.) DO NOT hook up hoses at this time.

WEAR PADS (REAR) (CONT'D)

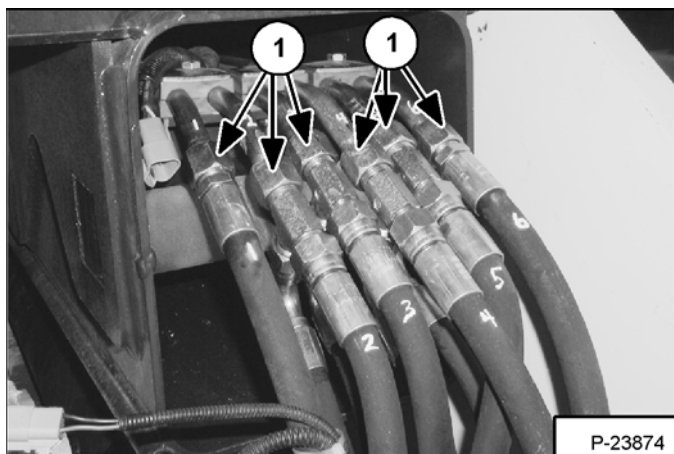
Installation (Cont'd)

Figure 50-60-5



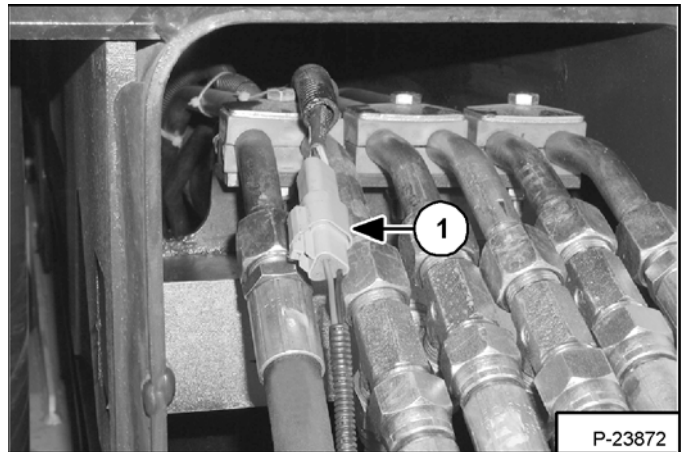
Turn the adjusting bolts (Item 1) [Figure 50-60-5] equally, centering the inner boom inside the main boom. Tighten the adjusting bolts to 29 ft.-lbs. (39 Nm) torque.

Figure 50-60-6



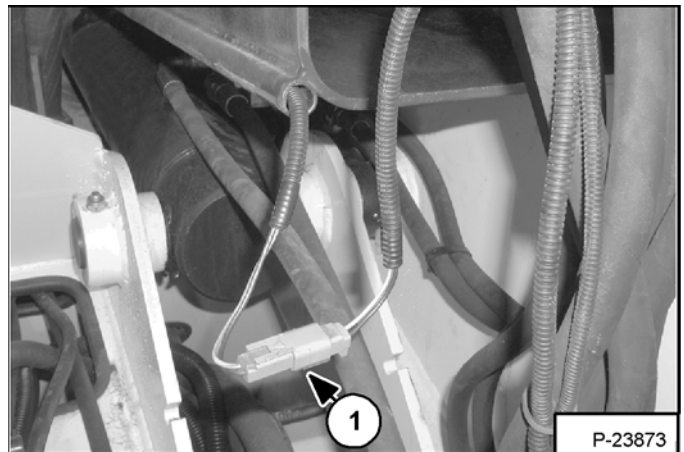
Install the hoses (Item 1) [Figure 50-60-6] on the tubelines.

Figure 50-60-7



Connect the secondary auxiliary harness (Item 1) [Figure 50-60-7].

Figure 50-60-8



Connect the light harness connector (Item 1) [Figure 50-60-8].

Install the rear cover.

ENGINE COVER

Not Available At Time Of Printing

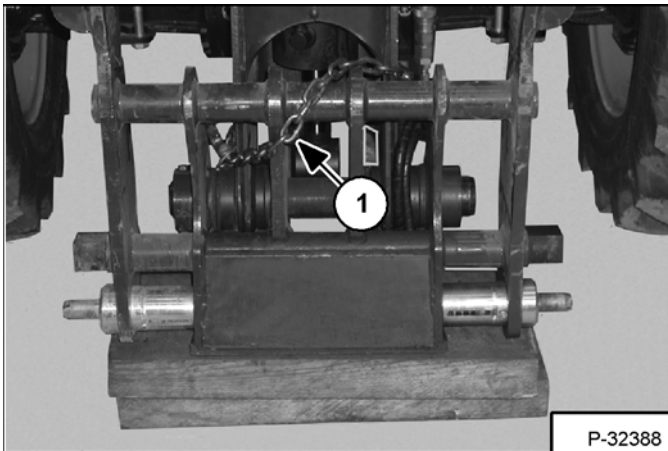
FUEL TANK

Not Available At Time Of Printing

QUICK TACH

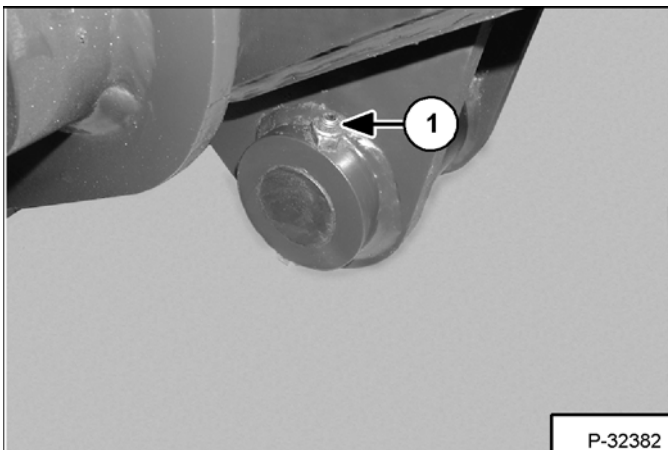
Removal And Installation

Figure 50-90-1



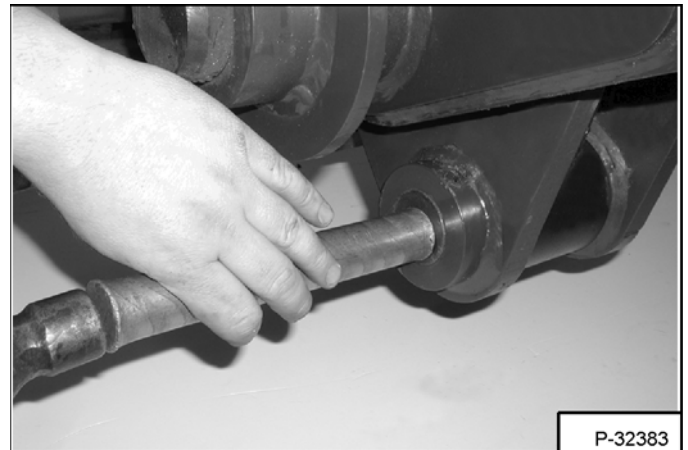
Lower the boom onto a wood block and put a chain (Item 1) [Figure 50-90-1] around the quick tach and boom to keep the quick tach from rotating forward.

Figure 50-90-2



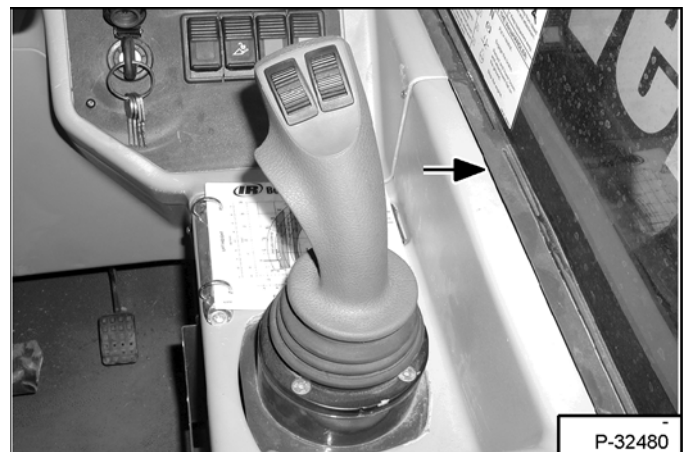
Remove the pivot pin retainer bolt (Item 1) [Figure 50-90-2].

Figure 50-90-3



Remove the pivot pin [Figure 50-90-3].

Figure 50-90-4



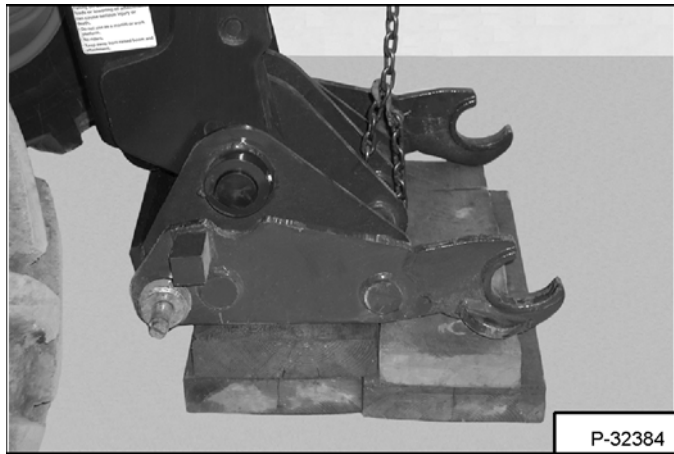
Start the engine, lower the restraint bar and retract the tilt cylinder by moving the joystick to the right.

Stop the engine.

QUICK TACH (CONT'D)

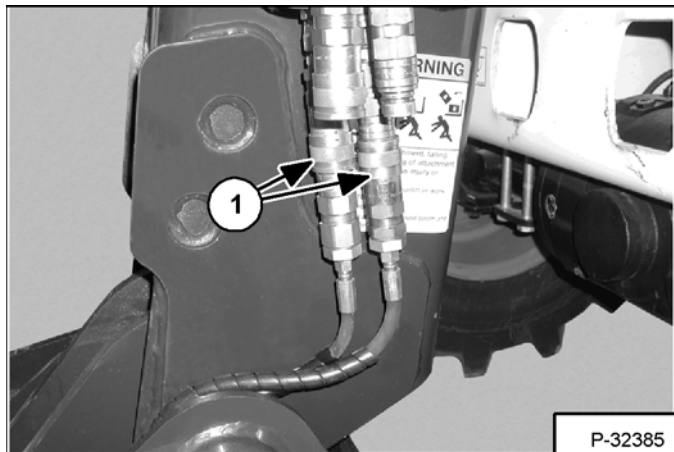
Removal And Installation (Cont'd)

Figure 50-90-5



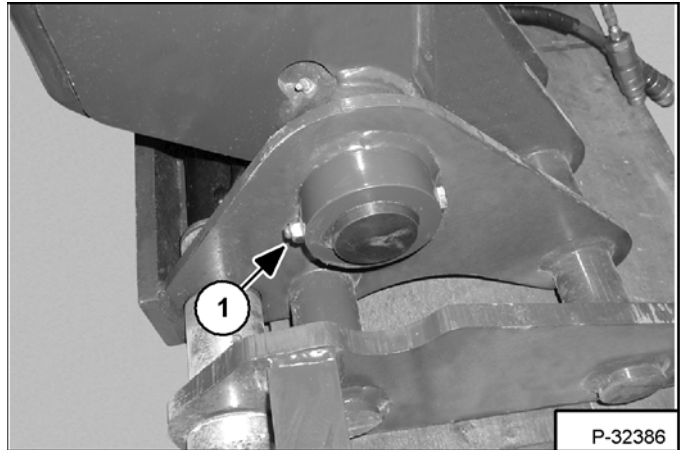
Using a hoist, lower the quick tach onto the wood blocks [Figure 50-90-5].

Figure 50-90-6



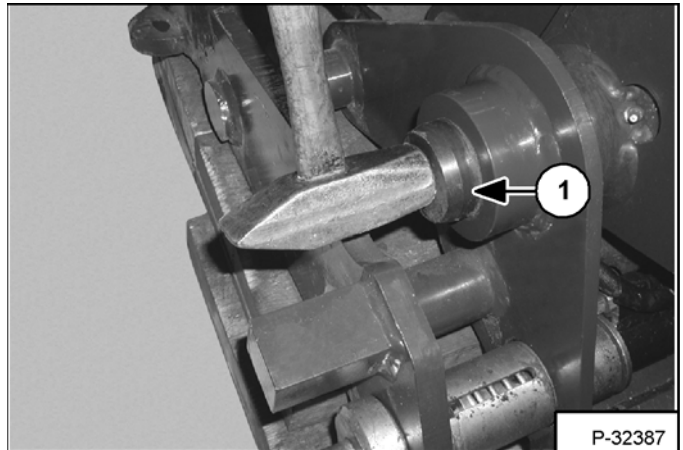
Disconnect the secondary auxiliary couplers (Item 1) [Figure 50-90-6].

Figure 50-90-7



Remove the quick tach pivot pin retainer bolt (Item 1) [Figure 50-90-7].

Figure 50-90-8



Remove the quick tach pivot pin (Item 1) [Figure 50-90-8].

Start the engine, lower the restraint bar, raise the boom and remove the quick tach.

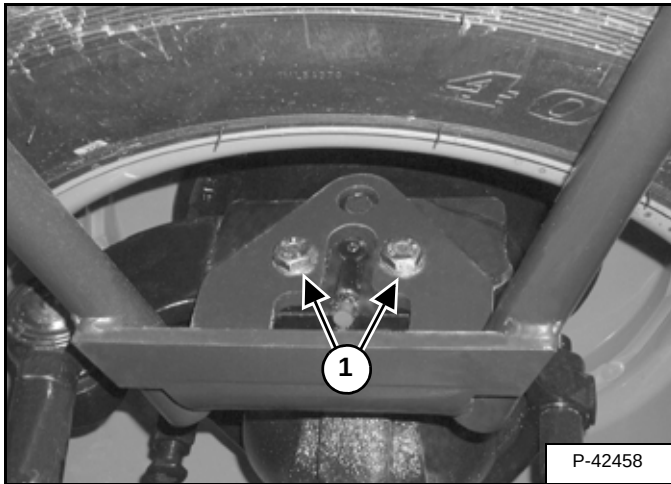
REAR WEIGHTS

Not Available At Time Of Printing

FENDER

Removal And Installation

Figure 50-110-1



Remove the two fender mount bolts (Item 1) [Figure 50-110-1]. Remove the fender.

Installation: Tighten the bolts to 90-100 ft.-lbs. (125-140 Nm) torque.

JOYSTICK PANEL

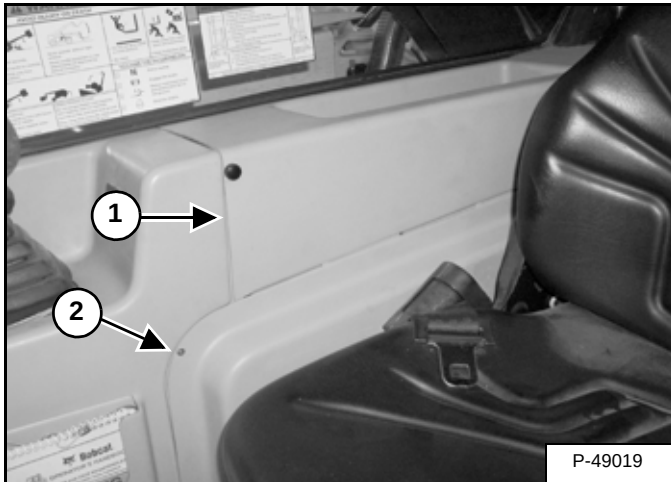
Removal And Installation

Remove the instrument panel. (See Content Page 60-01.)

Remove the switch panel. (See Content Page 60-01.)

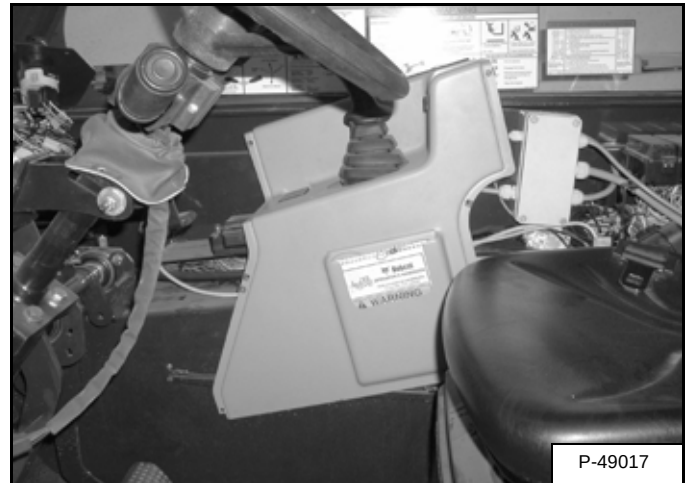
Remove the dash cover/steering column cover. (See Content Page 50-01.)

Figure 50-120-1



Remove the fuse box cover (Item 1) and side cover (Item 2) [Figure 50-120-1].

Figure 50-120-2



Remove the joystick panel.

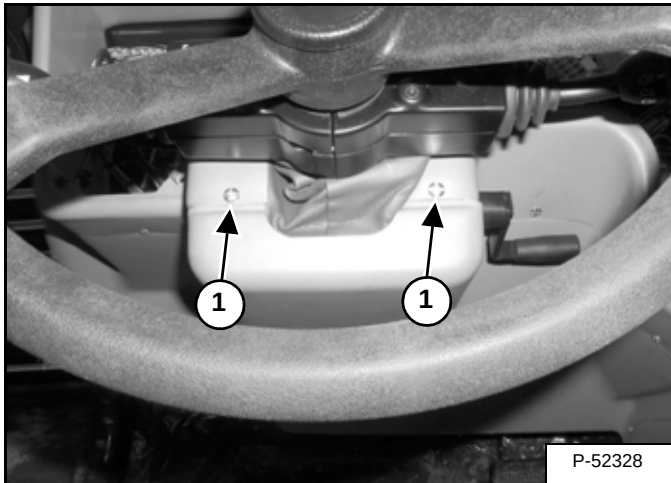
DASH COVER/STEERING COLUMN COVER

Removal And Installation

Remove the instrument panel. (See Content Page 60-01.)

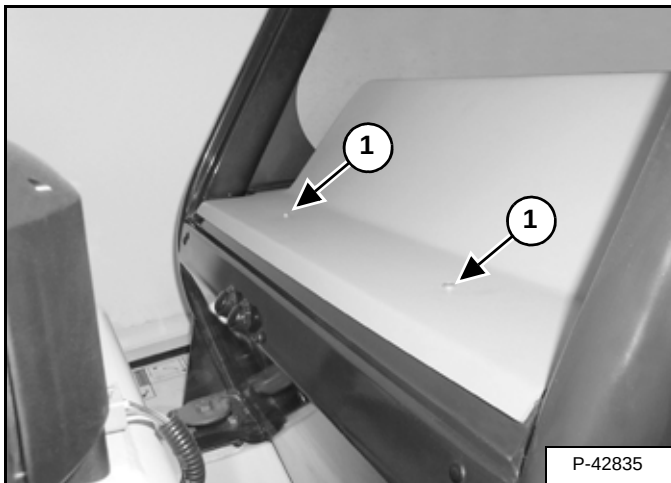
Remove the switch panel. (See Content Page 60-01.)

Figure 50-130-1



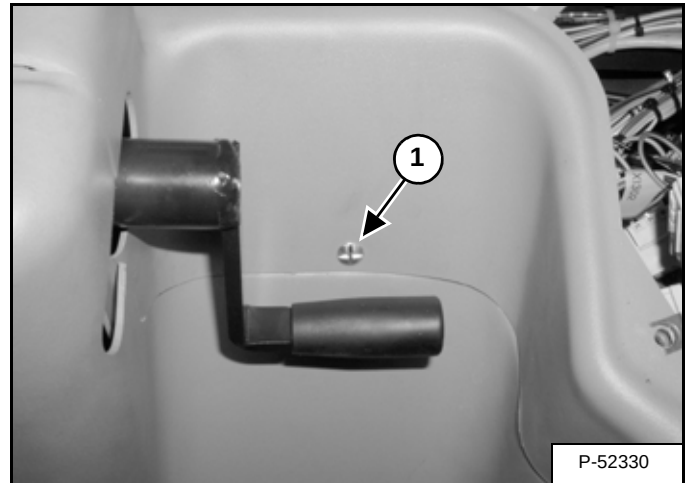
Remove the two screws (Item 1) [Figure 50-130-1] from the center of the dash cover.

Figure 50-130-2



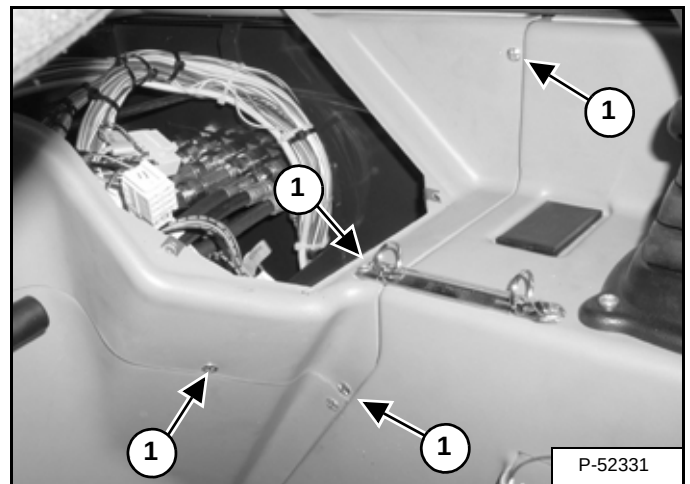
Remove the two dash cover mounting screws (Item 1) [Figure 50-130-2].

Figure 50-130-3



Remove the screw (Item 1) [Figure 50-130-3] from the right side of the dash.

Figure 50-130-4

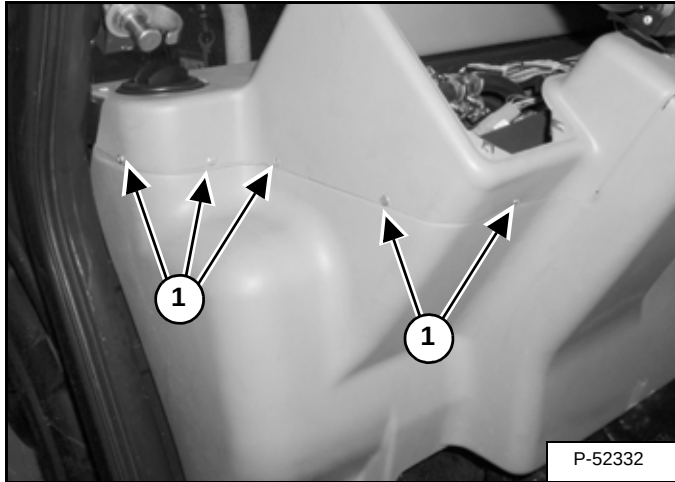


Remove the four screws (Item 1) [Figure 50-130-4] from the right side of the dash cover.

DASH COVER/STEERING COLUMN COVER (CONT'D)

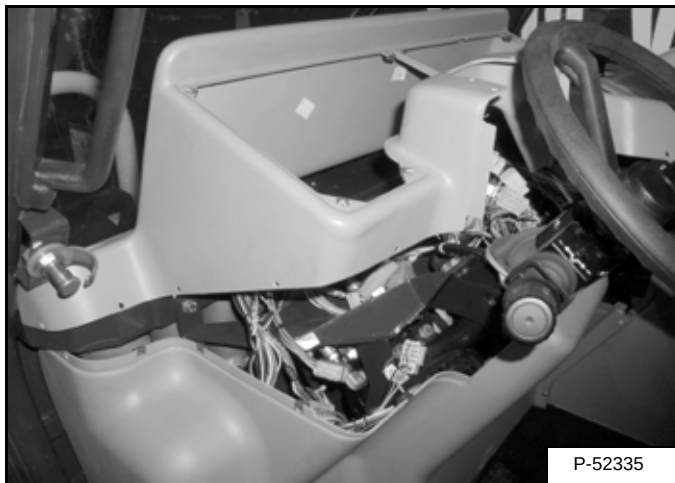
Removal And Installation (Cont'd)

Figure 50-130-5



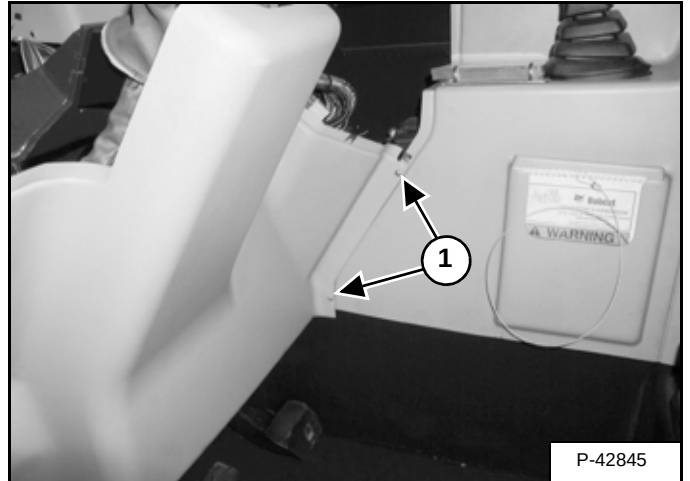
Remove the five screws (Item 1) [Figure 50-130-5] from the left side of the dash cover.

Figure 50-130-6



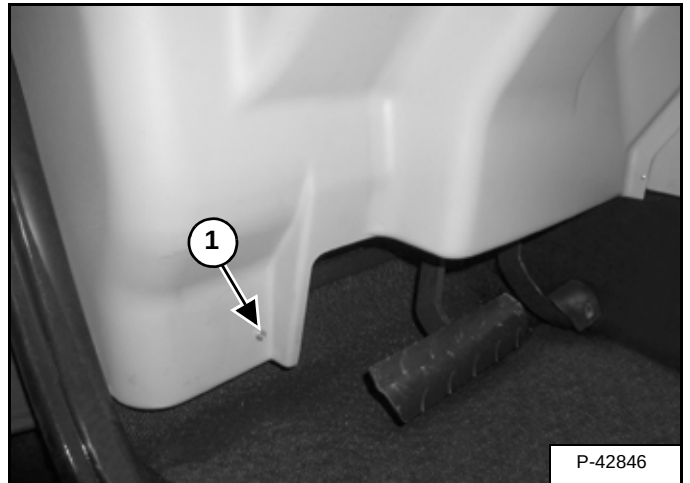
Lift and remove the dash cover [Figure 50-130-6].

Figure 50-130-7



Remove the two screws (Item 1) [Figure 50-130-7] from the right side of the column cover.

Figure 50-130-8

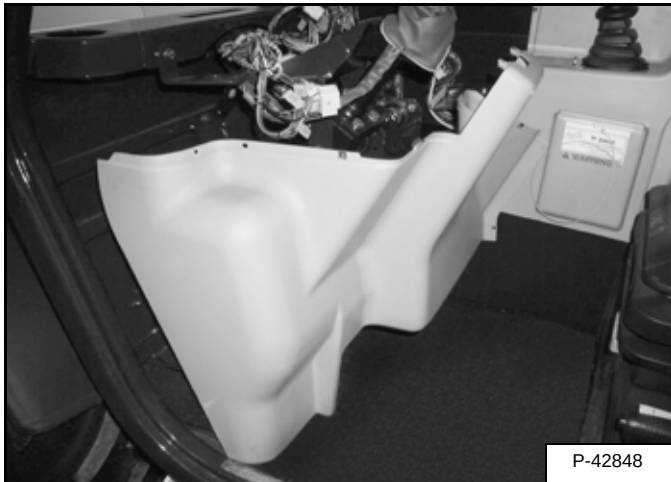


Remove the screw (Item 1) [Figure 50-130-8] from the left side of the column cover.

DASH COVER/STEERING COLUMN COVER (CONT'D)

Removal And Installation (Cont'd)

Figure 50-130-9



Remove the steering column cover [Figure 50-130-9].

6. ELECTRICS

6.1 Introduction :

The telescopic handlers are equipped with a 12 V electrical circuit. The negative is through the chassis.

The battery is a 12 V, 105 Ah and 720 A.

The generator is a 14.2 V and 70 A alternator with integrated regulator.

The starter is a 12 V, 2.8 kW.

The main devices fitted on the machine are :

- main switch
- centralised fuses, diodes and relais case
- hydrostatic transmission control case
- longitudinal load status indicator control case
- central column with integrated instrument panel including indicators, switches and control lamps
- right hand side panel with switches and control lamps

Harnesses are connected together with multipin connectors. These connectors are waterproof ones when located out of the driver's cab. All cables are identified by a color.

6.2- How to read the Schematic :

The schematics are several pages documents :

- the first pages is the schematic itself.
- The last 2 pages gives the situation of the components in the machine and shows the dispatching of the harnesses and their connectors.

Each component is represented by a symbol.

Cables color :

Each cable is represented and given :

- a number which is not physically written on the cable
- a color which is the real color of the cable in the harnesses on the machine

Example : 84A - H-R, where :

- 84A is the number
- H-R is its color

The color can be single or double. If single there is only one letter, if double there are 2 letters. In case of 2 colors, they can be combined on the length or on the width of the cable :

- if combined on the length, it will be written H-R :



- if combined on the width, it will be written H/R :



The colors code is the following :

A	LIGHT BLUE	M	BROWN
B	WHITE	N	BLACK
C	ORANGE	R	RED
G	YELLOW	S	PINK
H	GREY	V	GREEN
L	DARK BLUE	Z	PURPLE

84A - H-R is cable Nr 84A with combined colors in the length grey and red.

Connectors :

each cable connection in a connector is represented by the following symbol



where

- X51 is the connector Nr
- 6 is the number of the line in the connector

Interrupted lines :

some cable need to appear on several different pages because the components they connect are located on several different pages.

Cables which have to appear on all pages :

These are represented at the top and at the bottom of each page. They are the positive from battery (head of page), the positive after key switch (head of page) and the negative (bottom of page). For these cables, there is no particular symbol.

Cables which have to appear only on 2 pages :

These are the cables connecting 2 components located in 2 different pages. Example with cable Nr 40A - R with one end in page 2/6 and the other on page 3/6 :

- at the end of the cable on page 2/6 you find the following symbol indicating that the other end is located in section D-2 on page 3/6



- at the end of the cable on page 3/6 you find the following symbol indicating that the other end is located in section C-2 on page 2/6

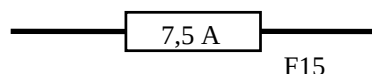


Solenoids :

each solenoid of each solenoid valve is given an identification : EV8, for example. The same identification also appears on the hydraulic schematic.

Fuses :

each fuse is represented by the following symbol :



where 7,5 A is its capacity and F15 its location in the fuse case

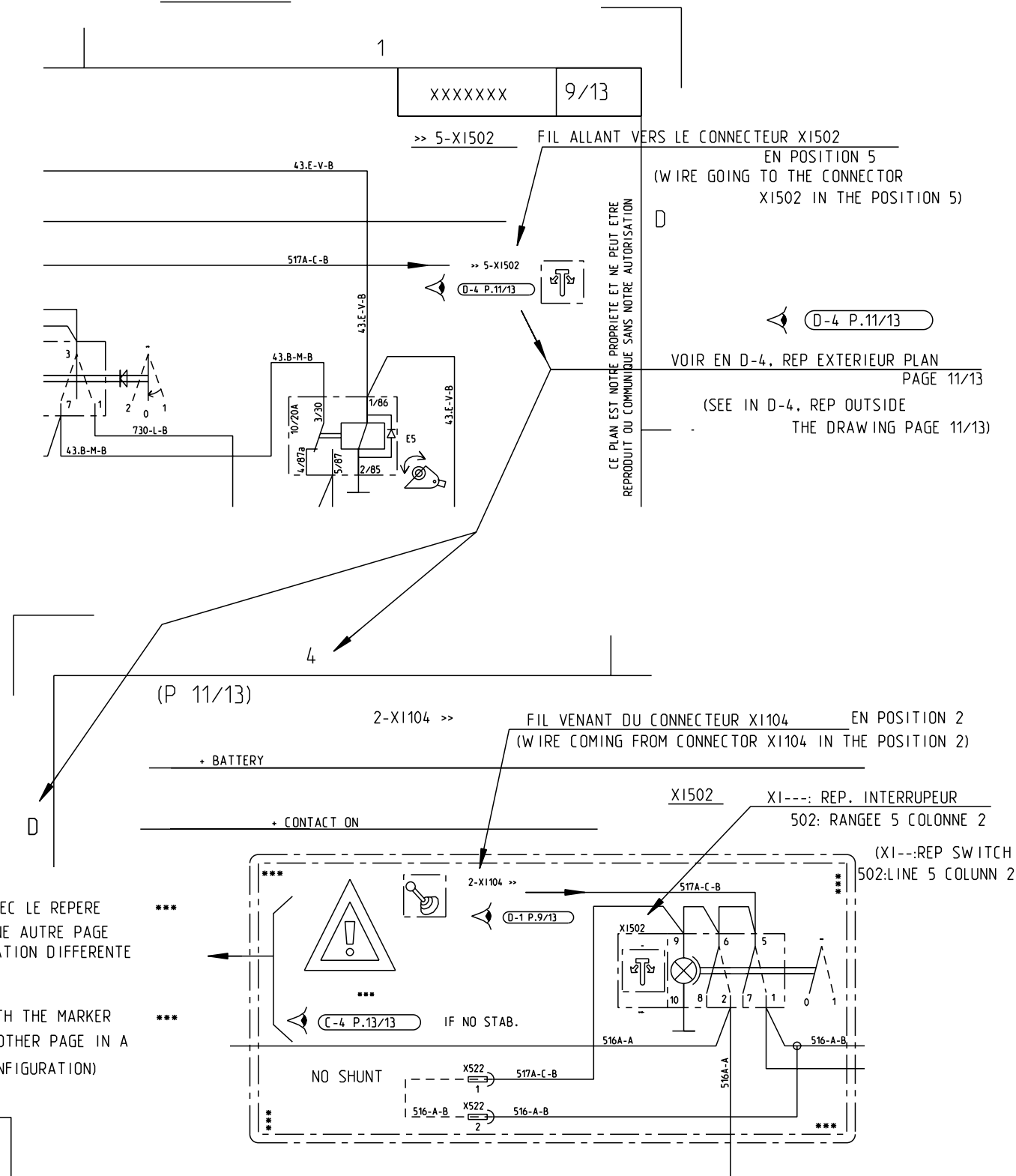
LEGEND

Projet NG25	MODEL	N° Serie (Serial Nr)
	T2556(Tier2)	S/N 363011001 et suivant (and above)
	T2566(Tier2)	S/N 363111001 et suivant (and above)
	MF8925(Tier2)	S/N 363411001 et suivant (and above)
	MF8926(Tier2)	S/N 363511001 et suivant (and above)

EX: B-N BLANC (WHITE) NOIR (BLACK) EX: B/N BLANC (WHITE) NOIR (BLACK)				49.A-V-N : FIL N°49.A VERT-NOIR (49.A-V-N : WIRE N° 49.A GREEN-BLACK) 62-N : FIL N°62 NOIR (62-N : WIRE N° 62 BLACK) 68.0-R : FIL N°68.0 ROUGE (68.0-R : WIRE N° 68.0 RED)
A	BLEU CIEL (LIGHT BLUE)	M	MARRON (BROWN)	X88 4 88-N? DU CONNECTEUR (88-N° CONNECTOR) 4:POSITION DU FIL (4:WIRE POSITION)
B	BLANC (WHITE)	N	NOIR (BLACK)	
C	ORANGE (ORANGE)	R	ROUGE (RED)	
G	JAUNE (YELLOW)	S	ROSE (PINK)	
H	GRIS (GREY)	V	VERT (GREEN)	
L	BLEU FONCE (DARK BLUE)	Z	VIOLET (PURPLE)	

ATTENTION LE CADRE AVEC LE REPERE
EST AUSSI SUR UNE AUTRE PAGE
DANS UNE CONFIGURATION DIFFERENTE

(WARNING: THE BOX WITH THE MARKER
IS ALSO ON AN OTHER PAGE IN A
DIFFERENTE CONFIGURATION)

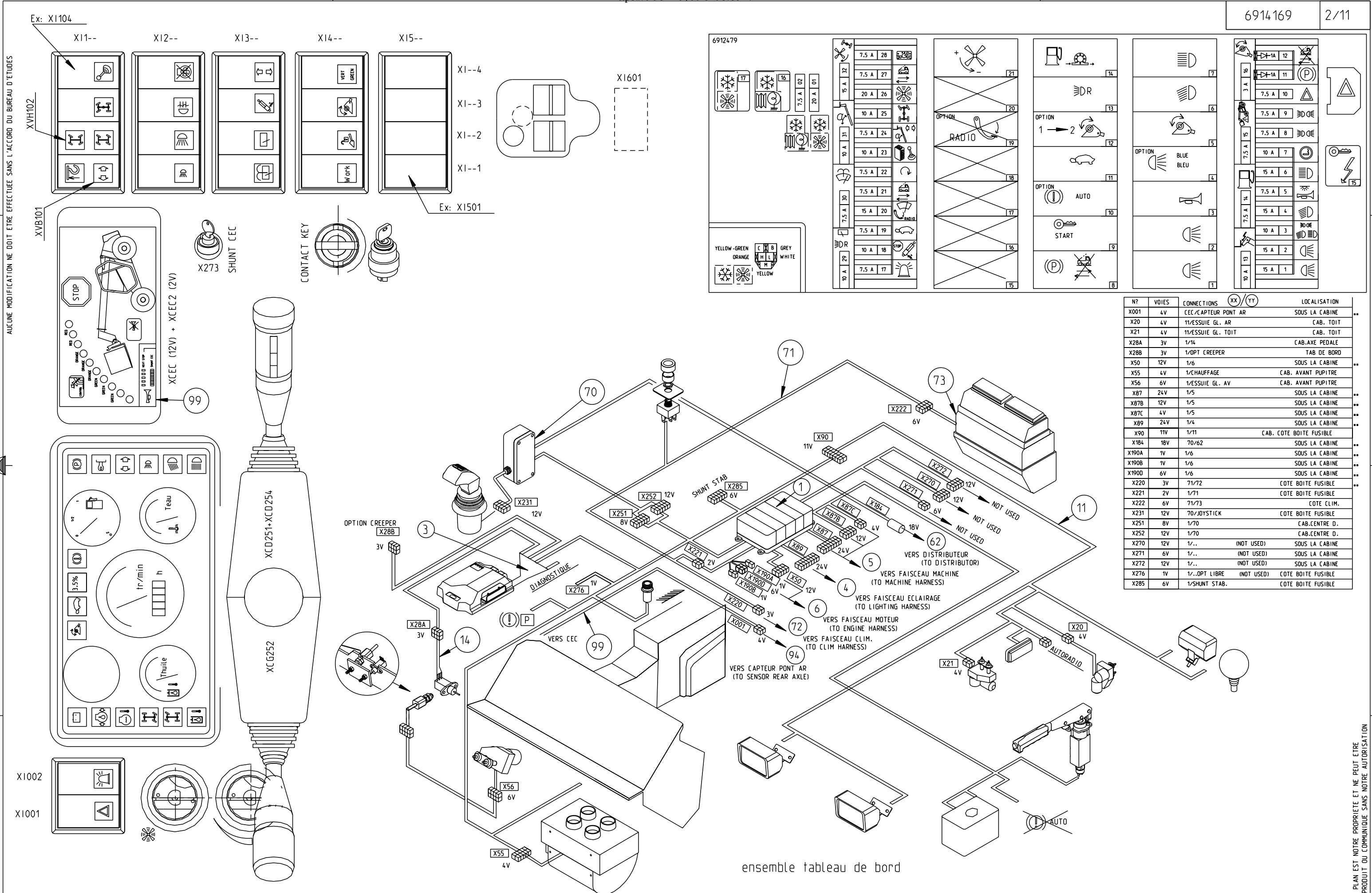


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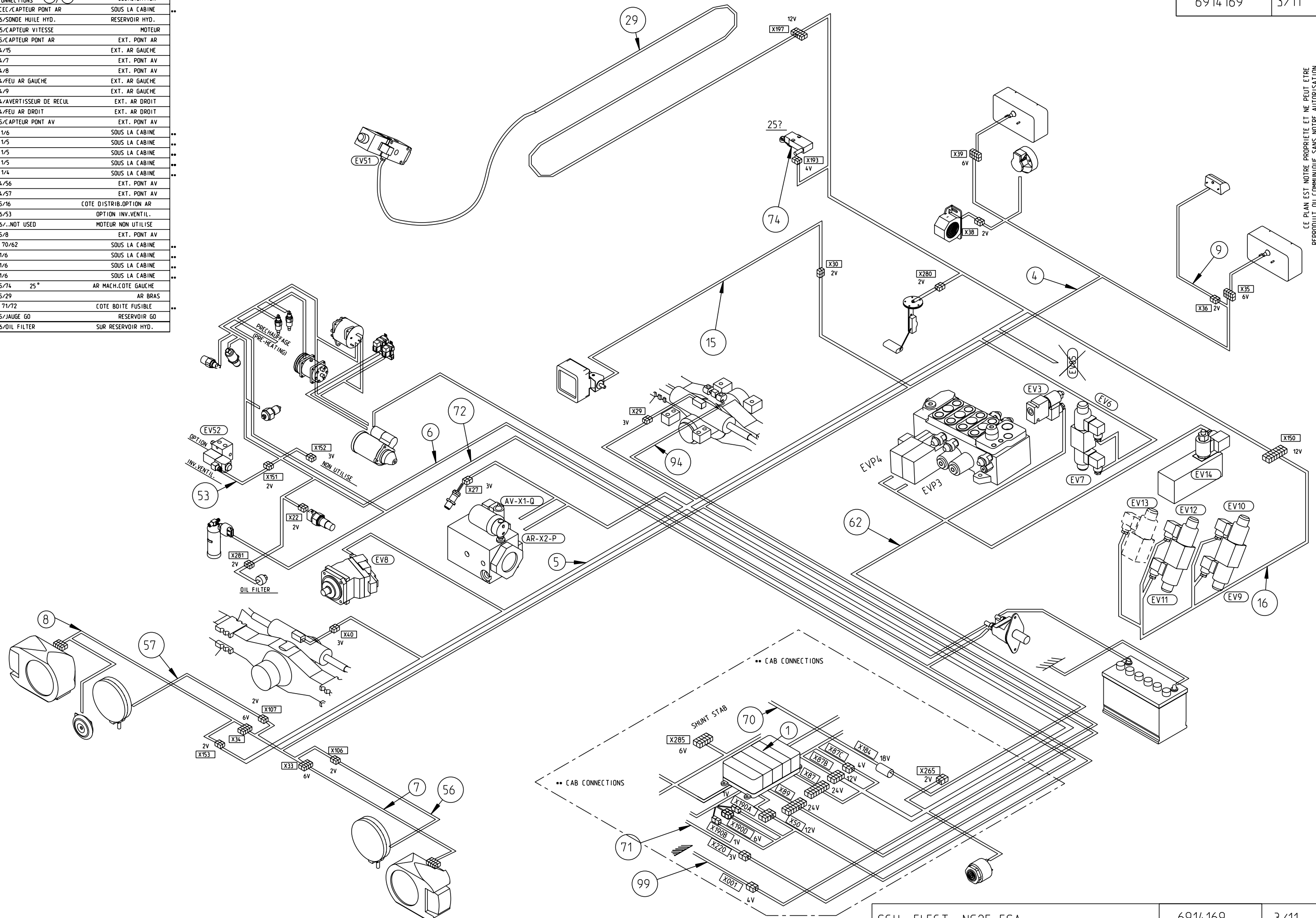


N°	VOIES	CONNECTIONS	LOCALISATION
X001	4V	CEC/CAPTEUR PONT AR	SOUS LA CABINE
X22	2V	6/SONDE HUILE HYD.	RESERVOIR HYD.
X27	3V	5/CAPTEUR VITESSE	MOTEUR
X29	3V	5/CAPTEUR PONT AR	EXT. PONT AR
X30	2V	4/15	EXT. AR GAUCHE
X33	6V	4/7	EXT. PONT AV
X34	6V	4/8	EXT. PONT AV
X35	6V	4/FEU AR GAUCHE	EXT. AR GAUCHE
X36	2V	4/9	EXT. AR GAUCHE
X38	2V	4/AVERTISSEUR DE RECUL	EXT. AR DROIT
X39	6V	4/FEU AR DROIT	EXT. AR DROIT
X40	3V	5/CAPTEUR PONT AV	EXT. PONT AV
X50	12V	1/6	SOUS LA CABINE
X87	24V	1/5	SOUS LA CABINE
X87B	12V	1/5	SOUS LA CABINE
X87C	4V	1/5	SOUS LA CABINE
X89	24V	1/4	SOUS LA CABINE
X106	2V	4/56	EXT. PONT AV
X107	2V	4/57	EXT. PONT AV
X150	12V	5/16	COTE DISTRIB.OPTION AR
X151	2V	6/53	OPTION INV.VENTIL.
X152	3V	6/.NOT USED	MOTEUR NON UTILISE
X153	2V	5/8	EXT. PONT AV
X184	18V	70/62	SOUS LA CABINE
X190A	1V	1/6	SOUS LA CABINE
X190B	1V	1/6	SOUS LA CABINE
X190D	6V	1/6	SOUS LA CABINE
X193	4V	5/74 25°	AR MACH.COTE GAUCHE
X197	12V	5/29	AR BRAS
X220	3V	71/72	COTE BOITE FUSIBLE
X280	2V	5/JAUGE GO	RESERVOIR GO
X281	2V	6/OIL FILTER	SUR RESERVOIR HYD.

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CE PLAN EST NOTRE PROPRIÉTÉ ET NE PEUT ÊTRE
REPRODUIT OU COMMUNIQUÉ SANS NOTRE AUTORISATION



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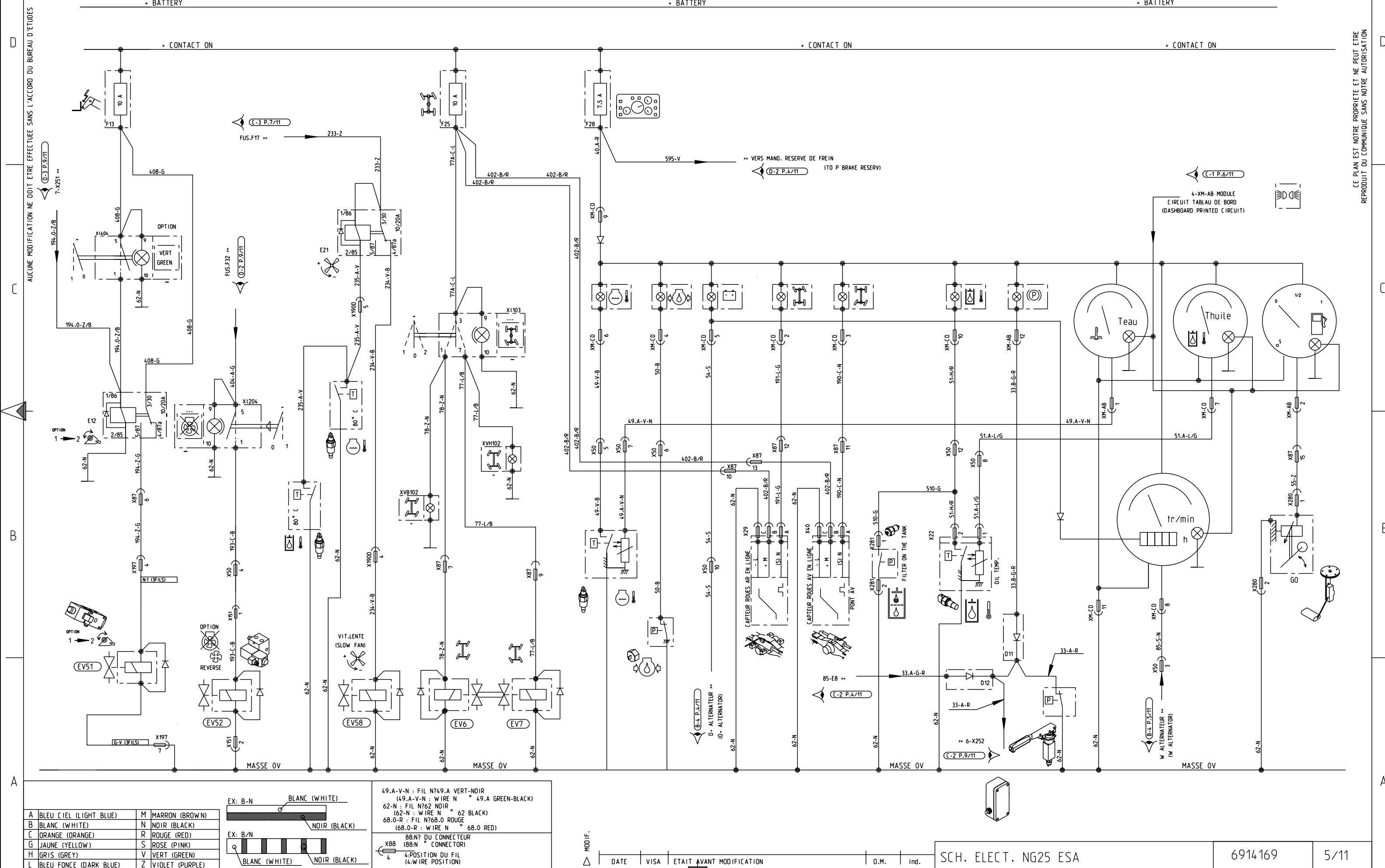
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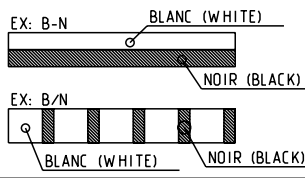
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A BLEU CIEL (LIGHT BLUE)	M MARRON (BROWN)
B BLANC (WHITE)	N NOIR (BLACK)
C ORANGE (ORANGE)	R ROUGE (RED)
G JAUNE (YELLOW)	S ROSE (PINK)
H GRIS (GREY)	V VERT (GREEN)
L BLEU FONCE (DARK BLUE)	Z VIOLET (PURPLE)



49.A-V-N : FIL N°49.A VERT-NOIR
(49.A-V-N : WIRE N ° 49.A GREEN-BLACK)
62-N : FIL N°62 NOIR
(62-N : WIRE N ° 62 BLACK)
68.0-R : FIL N°68.0 ROUGE
(68.0-R : WIRE N ° 68.0 RED)

88-N? DU CONNECTEUR
(88-N ? CONNECTOR)

4-POSITION DU FIL
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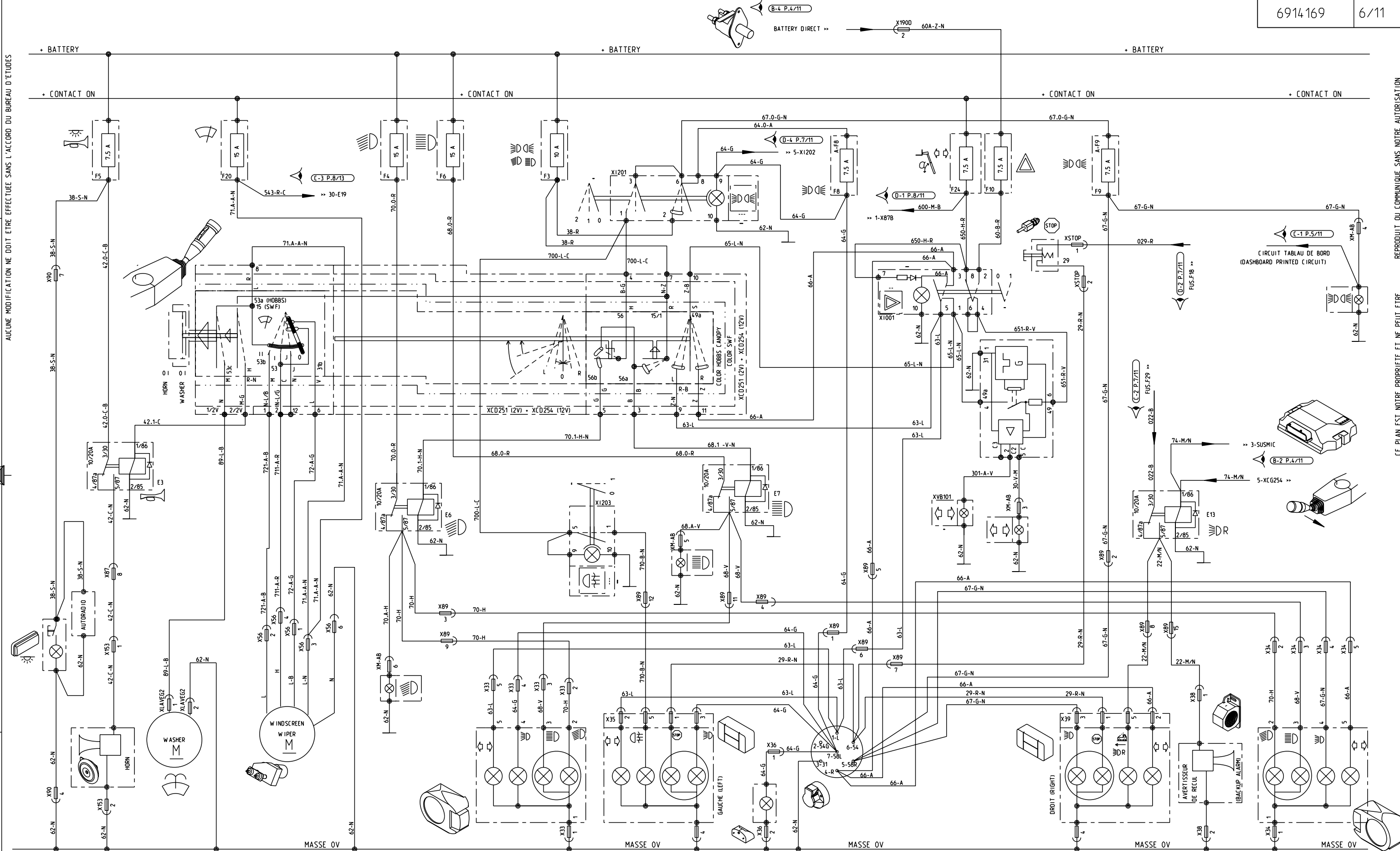
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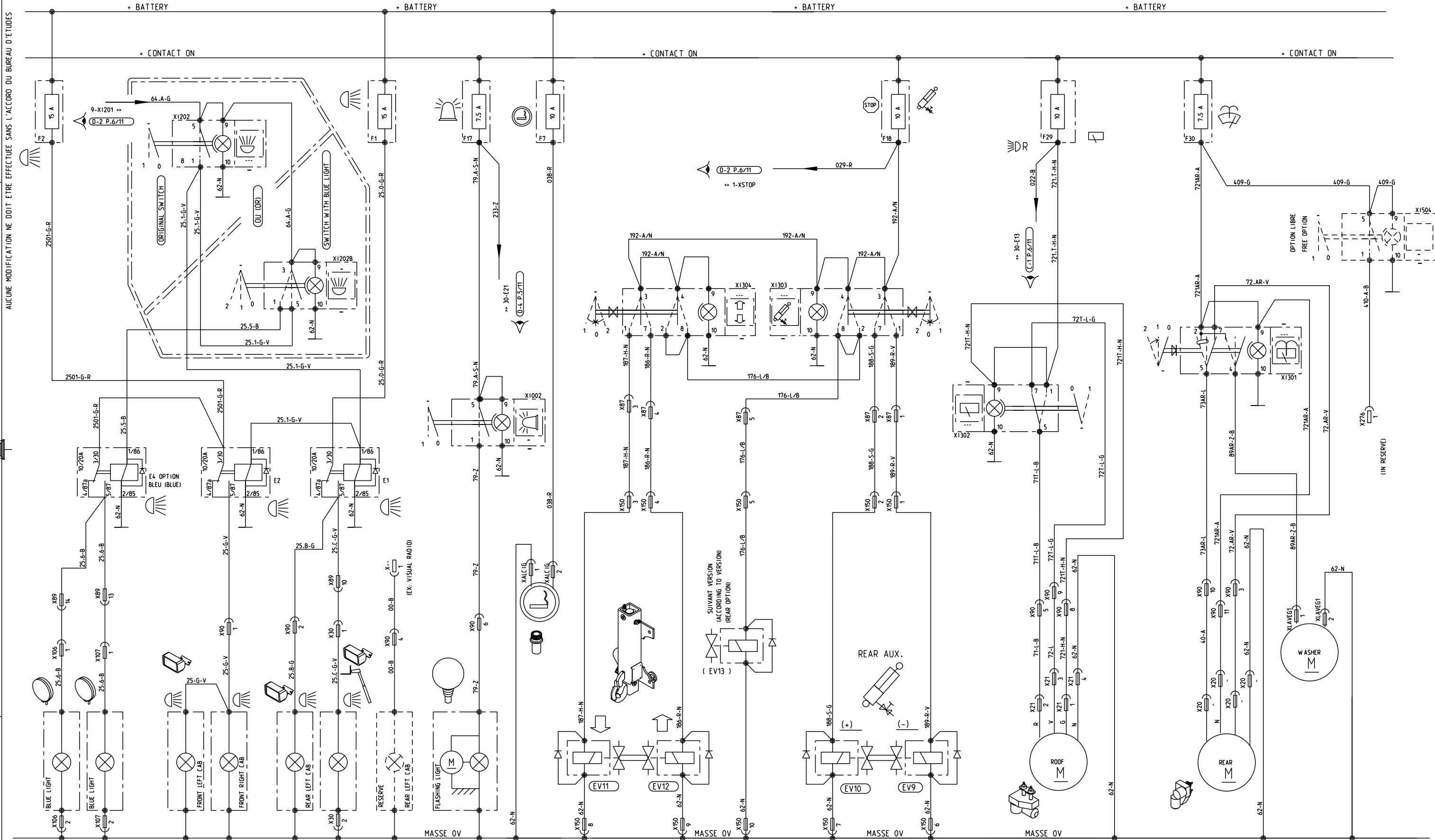
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REPRODUIT OU COMMUNIQUE SANS NOTRE AUTORISATION
CE PLAN EST NOTRE PROPRIETE ET NE PEUT ETRE





A	BLEU CIEL (LIGHT BLUE)	M	MARRON (BROWN)
B	BLANC (WHITE)	N	NOIR (BLACK)
C	ORANGE (ORANGE)	R	ROUGE (RED)
G	JAUNE (YELLOW)	S	ROSE (PINK)
H	GRIS (GREY)	V	VERT (GREEN)
L	BLEU FONCE (DARK BLUE)	Z	VIOLET (PURPLE)

EX: B-N



BLANC (WHITE)

NOIR (BLACK)

EX: B/N



BLANC (WHITE)

NOIR (BLACK)

49.A-V-N : FIL N?49.A VERT-NOIR
(49.A-V-N : WIRE N ° 49.A GREEN-BLACK)
62-N : FIL N?62 NOIR
(62-N : WIRE N ° 62 BLACK)
68.0-R : FIL N?68.0 ROUGE
(68.0-R : WIRE N ° 68.0 RED)

88-N? DU CONNECTEUR
(88-N ° CONNECTOR)

 4-POSITION DU FIL
(4-WIRE POSITION)

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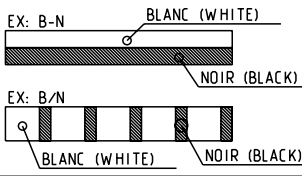
/11

AUCUNE MODIFICATION NE DOIT ETRE EFFECTUEE SANS L'ACCORD DU BUREAU D'ETUDES

REPRODUIT OU COMMUNIQUE SANS NOTRE AUTORISATION

A

A	BLEU CIEL (LIGHT BLUE)	M	MARRON (BROWN)
B	BLANC (WHITE)	N	NOIR (BLACK)
C	ORANGE (ORANGE)	R	ROUGE (RED)
G	JAUNE (YELLOW)	S	ROSE (PINK)
H	GRIS (GREY)	V	VERT (GREEN)
L	BLEU FONCE (DARK BLUE)	Z	VIOLET (PURPLE)



49.A-V-N : FIL N°749.A VERT-NOIR
(49.A-V-N : WIRE N ° 49.A GREEN-BLACK)
62-N : FIL N°62 NOIR
(62-N : WIRE N ° 62 BLACK)
68.0-R : FIL N°68.0 ROUGE
(68.0-R : WIRE N ° 68.0 RED)

88-N? DU CONNEXEUR
(88-N ? CONNECTOR)
4-POSITION DU FIL
(4-WIRE POSITION)

MODIF.

DATE VISA ETAIT AVANT MODIFICATION

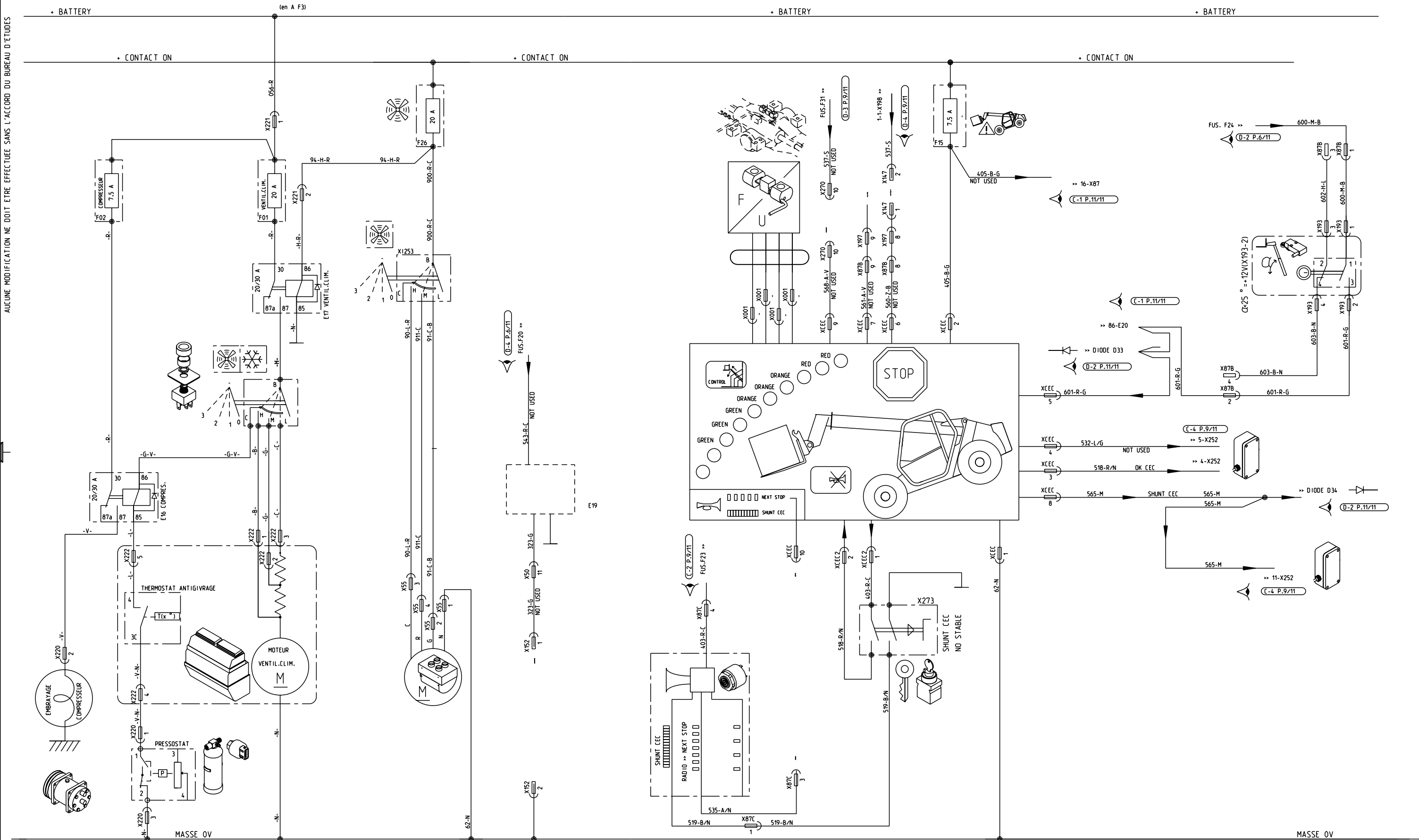
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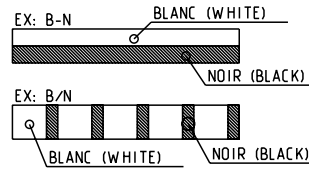
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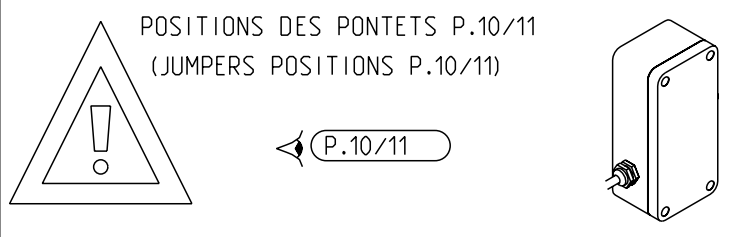
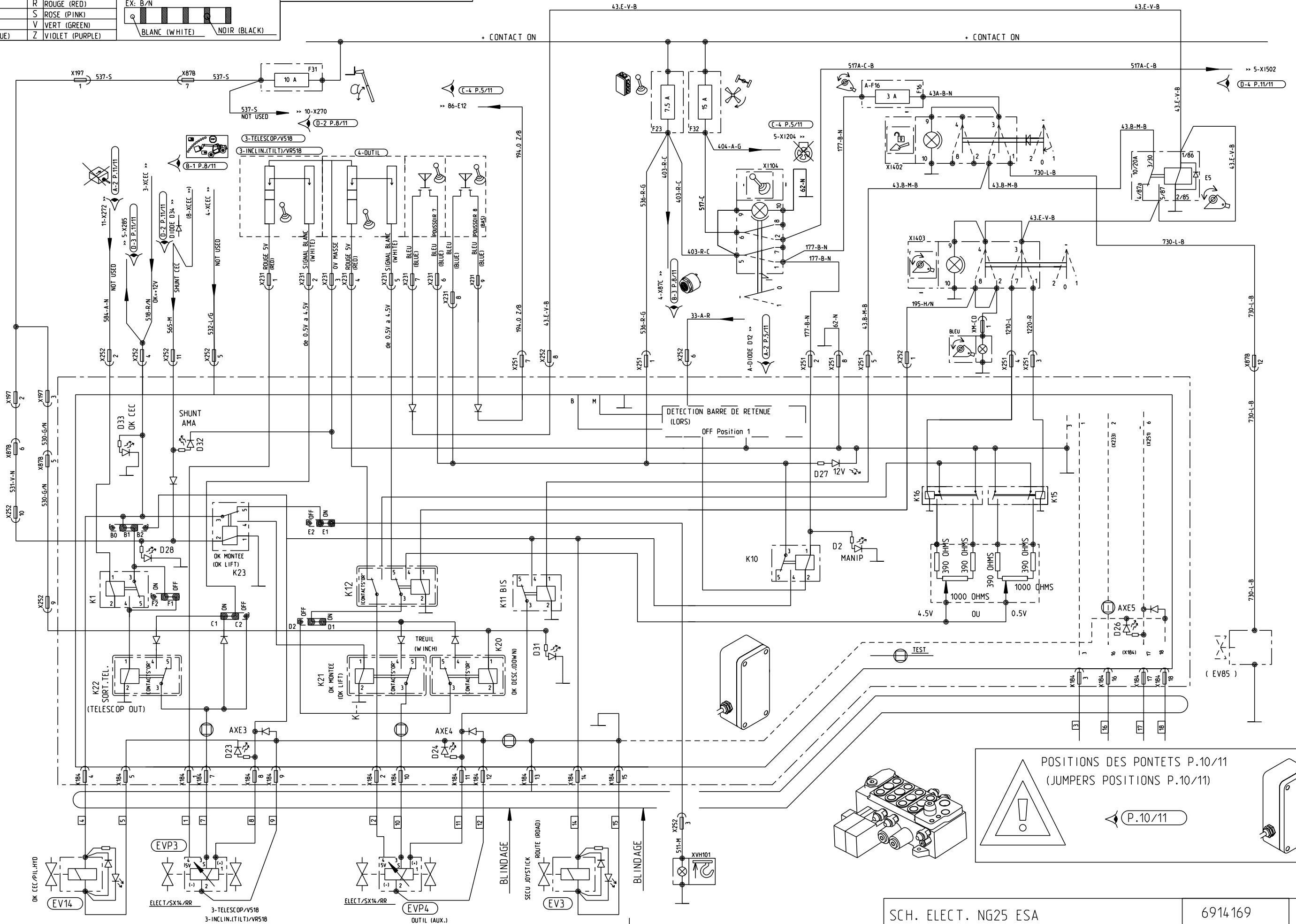


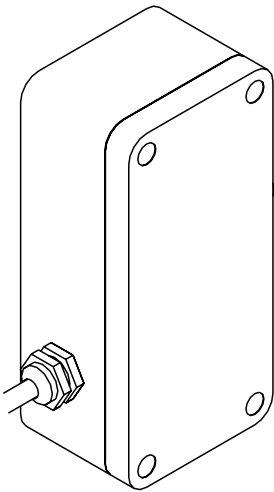
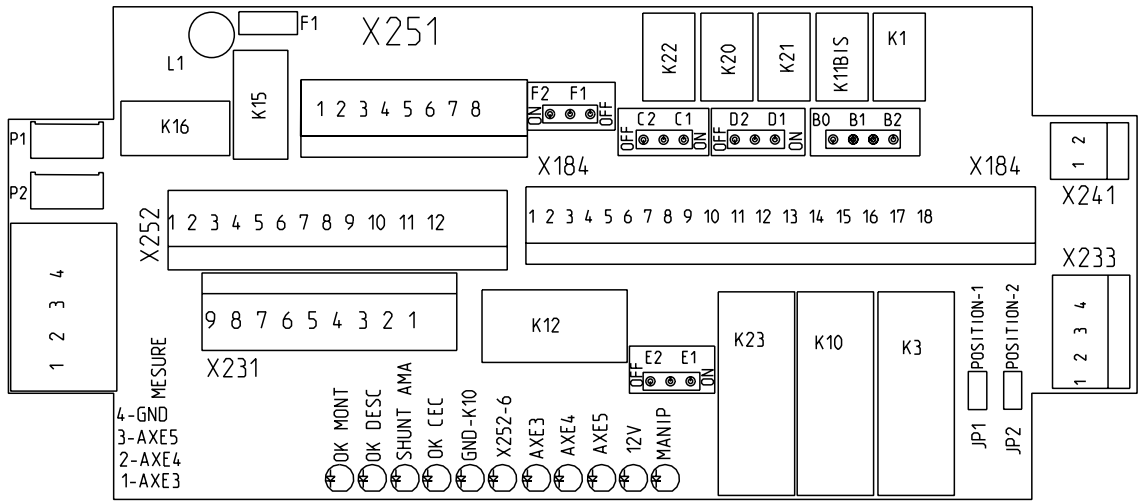
A	BLEU CIEL (LIGHT BLUE)	M	MARRON (BROWN)
B	BLANC (WHITE)	N	NOIR (BLACK)
C	ORANGE (ORANGE)	R	ROUGE (RED)
G	JAUNE (YELLOW)	S	ROSE (PINK)
H	GRIS (GREY)	V	VERT (GREEN)
L	BLEU FONCE (DARK BLUE)	Z	VIOLET (PURPLE)



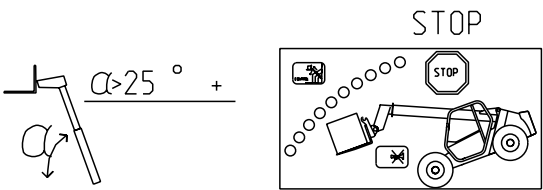
49.A-V-N : FIL N°49.A VERT-NOIR
(49.A-V-N : WIRE N° 49.A GREEN-BLACK)
62-N : FIL N°62 NOIR
(62-N : WIRE N° 62 BLACK)
68.0-R : FIL N°68.0 ROUGE
(68.0-R : WIRE N° 68.0 RED)

88-N? DU CONNECTEUR
(88-N : CONNECTOR)
4-POSITION DU FIL
(4-WIRE POSITION)





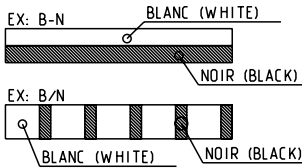
SECUITES OFF >> PONTETS EN B2 + C2 + D2 + E2 + F1
(JUMPERS)



SECURITE AMA ON >> PONTETS EN B1 + C1+ D1 + E2 + F1
(JUMPERS)



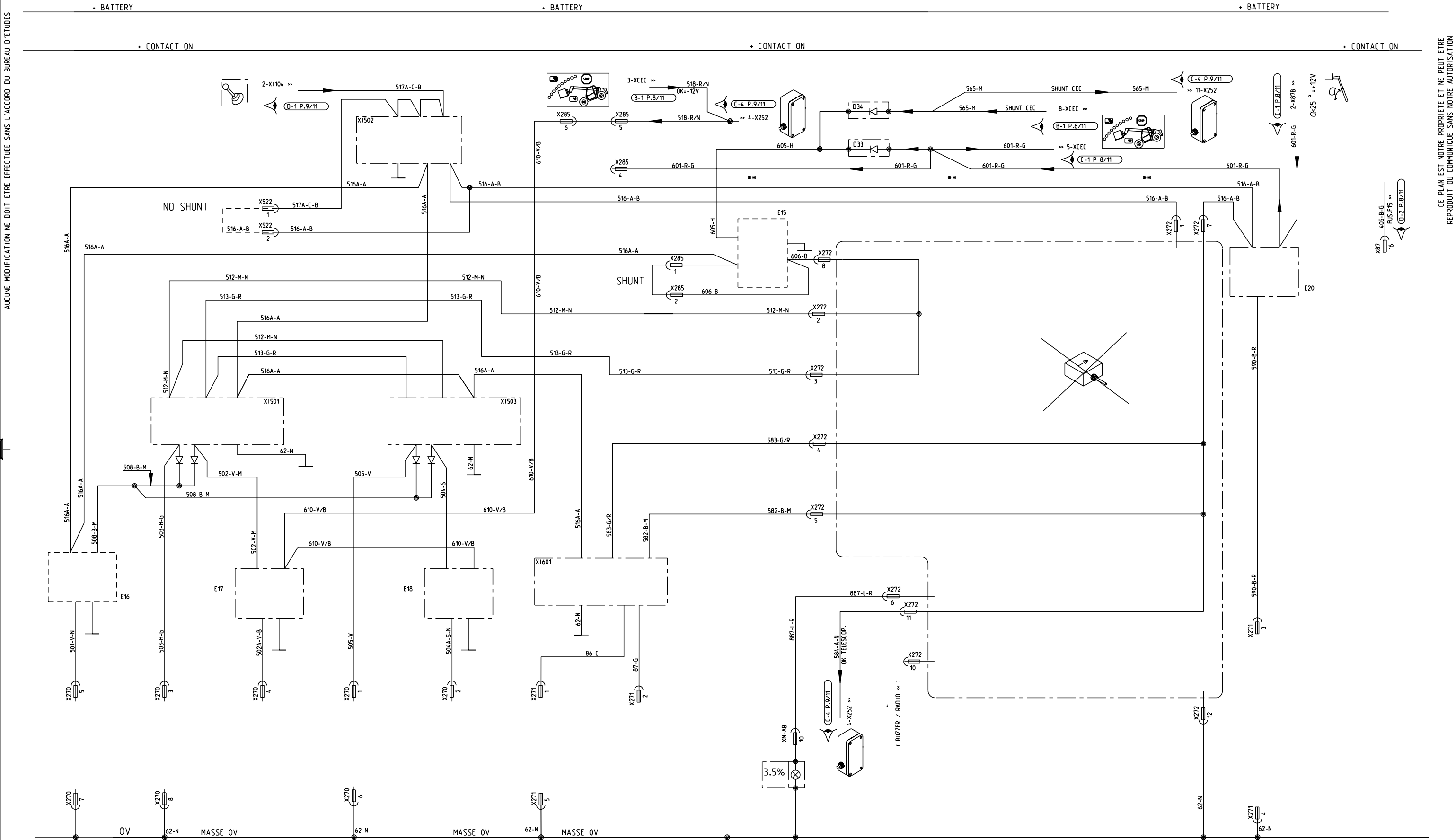
A	BLEU CIEL (LIGHT BLUE)	M	MARRON (BROWN)
B	BLANC (WHITE)	N	NOIR (BLACK)
C	ORANGE (ORANGE)	R	ROUGE (RED)
G	JAUNE (YELLOW)	S	ROSE (PINK)
H	GRIS (GREY)	V	VERT (GREEN)
L	BLEU FONCE (DARK BLUE)	Z	VIOLET (PURPLE)



49.A-V-N : FIL N749.A VERT-NOIR
(49.A-V-N : WIRE N ° 49.A GREEN-BLACK)
62-N : FIL N762 NOIR
(62-N : WIRE N ° 62 BLACK)
68.O-R : FIL N768.O ROUGE
(68.O-R : WIRE N ° 68.O RED)
88.N? DU CONNECTEUR
(88.N ° CONNECTOR)
X88
4:POSITION DU FIL
(4:WIRE POSITION)

AUCUNE MODIFICATION NE DOIT ETRE EFFECTUEE SANS L'ACCORD DU BUREAU D'ETUDES

CE PLAN EST NOTRE PROPRIETE ET NE PEUT ETRE REPRODUIT OU COMMUNIQUE SANS NOTRE AUTORISATION



A BLEU CIEL (LIGHT BLUE)		M MARRON (BROWN)	
B BLANC (WHITE)		N NOIR (BLACK)	
C ORANGE (ORANGE)		R ROUGE (RED)	
G JAUNE (YELLOW)		S ROSE (PINK)	
H GRIS (GREY)		V VERT (GREEN)	
L BLEU FONCE (DARK BLUE)		Z VIOLET (PURPLE)	

EX: B-N	BLANC (WHITE)
EX: B/N	NOIR (BLACK)
EX: B/N	BLANC (WHITE)
EX: B/N	NOIR (BLACK)

49.A-V-N : FIL N°49.A VERT-NOIR
(49.A-V-N : WIRE N ° 49.A GREEN-BLACK)
62-N : FIL N°62 NOIR
(62-N : WIRE N ° 62 BLACK)
68.O-R : FIL N°68.O ROUGE
(68.O-R : WIRE N ° 68.O RED)

88-N? DU CONNECTEUR
(88-N ? CONNECTOR)
4-POSITION DU FIL
(4-WIRE POSITION)

MOD IF. DATE VISA ETAIT AVANT MODIFICATION

SCH. ELECT. NG25 ESA

7.2 Table of Errors

System errors					
GPI Error No.	Checked signal from	Type of Error	Error LED flash code	DIA 1 Error No.	Error caused by
1	sensor supply voltage	4	— • • •	01	sensor voltage out of range
2 - 16	not used				
Sensor errors					
GPI Error No.	Checked signal from	Type of Error	Error LED flash code	DIA 1 Error No.	Error caused by
1	default parameter checksum	3	-----	17	checksum mismatch
2	inch parameter checksum			18	included default checksum
3	inch/brake potentiometer	7 5 6	— — • •	19	no pedal setup done value too low value too high
4	engine speed pickup	6	• • — •	20	engine speed missed when starting engine
5	propel current	1 2	— • — •	21	short cut open circuit
6	F-N-R switch	4	• — — •	22	short cut between forward and reverse
7	engine speed pickup	6	— — — •	23	engine speed interrupted
8	hydro motor propel current	1 2	• • • —	24	short cut open circuit
9	creep drive parameter checksum			25	included default checksum
10	creep drive potentiometer	5 6	— • • —	26	value too low value too high
11	motor speed pickup	6	• • — —	27	motor speed interrupted
12 - 32	not used				
-	wrong kernel	-	• — • —		kernel software < 2.5
-	wrong hardware	-	— — • —		hardware is not S1X-11 G2 AMP

SUSMIC TESTING

Date : 13/01/05

Tools needed : a multimeter

Feeding for control box & commands: Tension $\Rightarrow$ Voltmeter

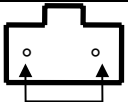
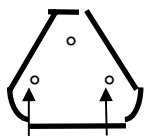
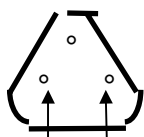
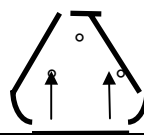
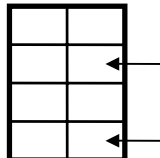
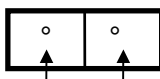
Groundconnection: Continuity $\Rightarrow$ ohmmeter

Sensors: Resistance $\Rightarrow$ ohmmeter
Signal $\Rightarrow$ voltmeter

Drive solenoids: Resistance $\Rightarrow$ ohmmeter

Harness: Continuity $\Rightarrow$ ohmmeter

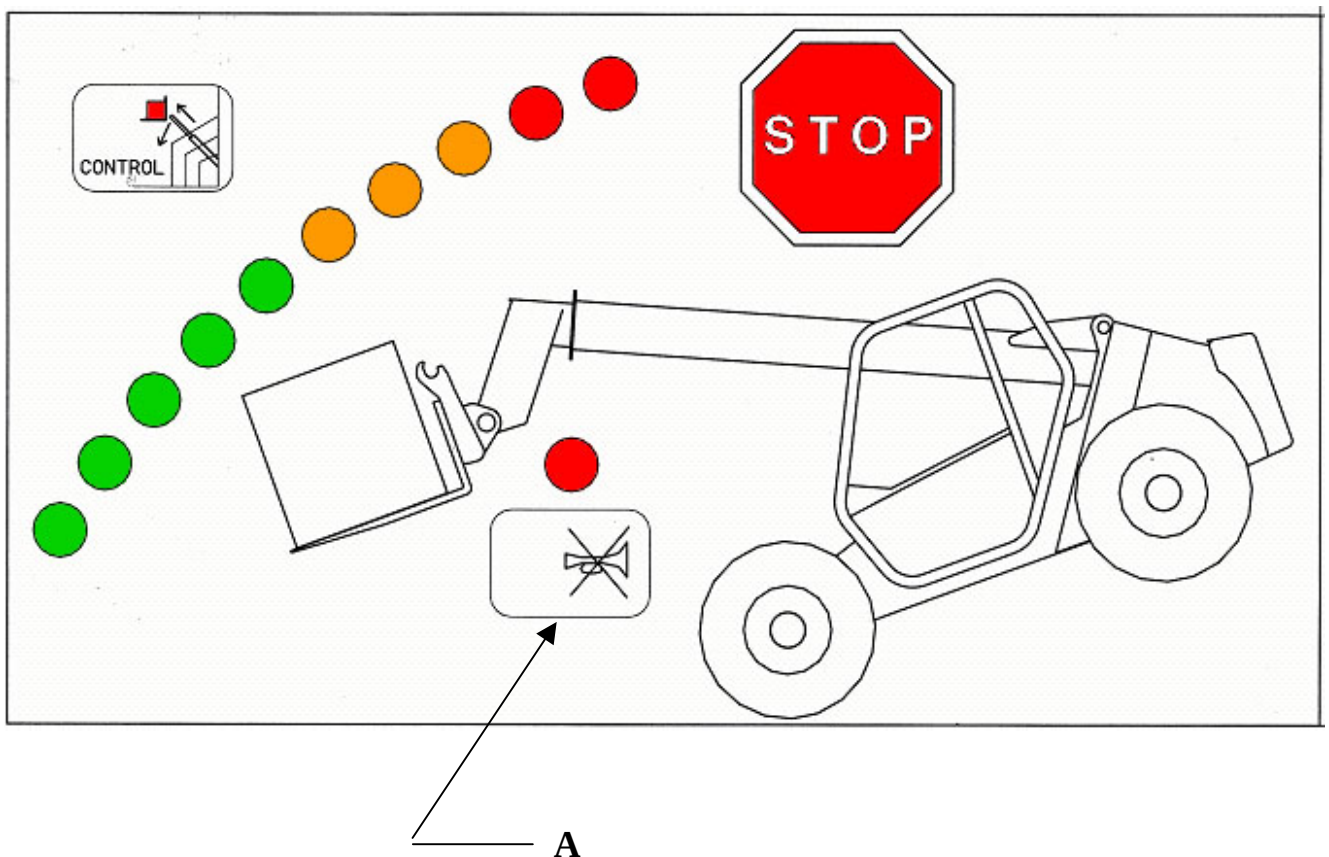
Control box: If previous checks were all correct, the box has failed.

FUNCTION	CONTROL	CONNECTOR N°	VALUES
Feeding	voltage	1 - 10 - 12	$\approx 12,4 \text{ v}$
Ground	continuity	2 - 3	0Ω
Engine rpm sensor	resistance	4 $\Leftrightarrow$ 11 	$\approx 138 \Omega$ model w.counternut $\approx 1040 \Omega$ model direct fit
Inching potentiometer	resistance	13 $\Leftrightarrow$ 28 green red 	≈ 5.6 to $6.2 \text{ k}\Omega$ at rest ≈ 260 to 900Ω pedal fully stroked
Inching potentiometer	resistance	28 $\Leftrightarrow$ 5 red yellow 	≈ 400 to 900Ω at rest ≈ 5.6 to 6.2Ω pedal fully stroked
Inching potentiometer	resistance	13 $\Leftrightarrow$ 5 green yellow 	≈ 5.2 to $6.3 \text{ k}\Omega$ at rest or pedal fully stroked
Switch work mode	continuity	23 $\Leftrightarrow$ 25 	0Ω or infinit when flipping
Lever FWD – REV	voltage	FWD : 9 $\Leftrightarrow$ REV : 27 $\Leftrightarrow$	$\approx 12,4 \text{ v}$
FWD & REV Solenoids	resistance	FWD : 21 $\Leftrightarrow$ 19 REV : 20 $\Leftrightarrow$ 19 	$\approx 5,8$ to 6.7Ω
Coil on drive motor	Resistance Current	EV8 situated on the hydrostatic motor	$4,8 \Omega$ $2,6 \text{ A}$

ISL CALIBRATION (Simplified procedure)

- Turn off ignition. Push button **A** and hold it.
- While holding button A pushed in, start the machine. Hold it for another 20 seconds. Release button **A** when the green LED's light up.
- With the machine unloaded, boom telescoped in, lift the boom till end of stroke. Push button **A** for 20 seconds.
- Take a load that can make the machine tip over, lift it up 30 centimeters above the ground and telescope out till the rear wheels have no contact anymore with the ground. Push button **A** for 20 seconds.
- Check if the LED's come on in the right order and if the system works ok.

For more details please refer to the complete procedure.



During any intervention or repair, please respect the safety guidelines written in the operator manual.

ELECTRICAL SYSTEM AND ANALYSIS

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BATTERY	60-20-1
Removal And Installation	60-20-1
Servicing	60-20-2
Using A Booster Battery (Jump Starting)	60-20-3
BRAKE LIGHT SWITCH	60-100-1
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Removal And Installation	60-130-1

Continued On Next Page

ELECTRICAL SYSTEM AND ANALYSIS (CONT'D)

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Calibrate Inch Pedal	60-160-5
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ELECTRICAL SYSTEM & ANALYSIS

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Removal And Installation	60-120-1
TRAVEL/SIGNAL LEVER	60-70-1
Removal And Installation	60-70-1

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 Massey Ferguson 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

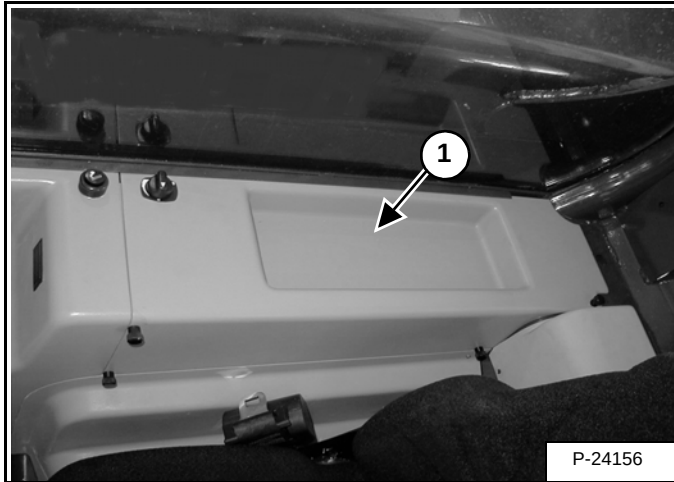
PROBLEM	CAUSE
Battery will not take charge.	1, 2, 3, 4, 5
Alternator will not charge..	1, 2, 5
Starter will not turn the engine.	2, 3, 4, 6, 7, 8, 9

KEY TO CORRECT THE CAUSE
1. Alternator 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.

ELECTRICAL SYSTEM INFORMATION (CONT'D)

Description

Figure 60-10-1

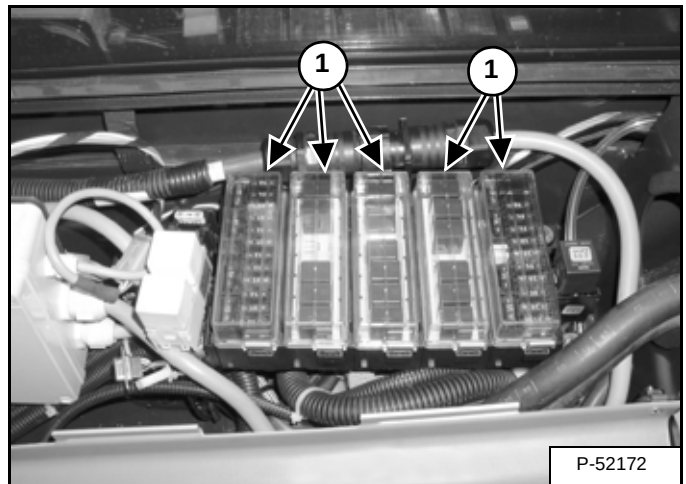


The Telehandler has a 12 volt, negative ground alternator charging system. The electrical system is protected by fuses located in the cab in the right console (Item 1) **[Figure 60-10-1]**.

The fuses will protect the electrical system when there is an electrical overload. The reason of the overload must be found before starting the engine again.

Fuses, Diodes & Relays

Figure 60-10-2



The electrical system is protected by fuses, diodes and relays.

Remove the console cover (Item 1) **[Figure 60-10-1]**.

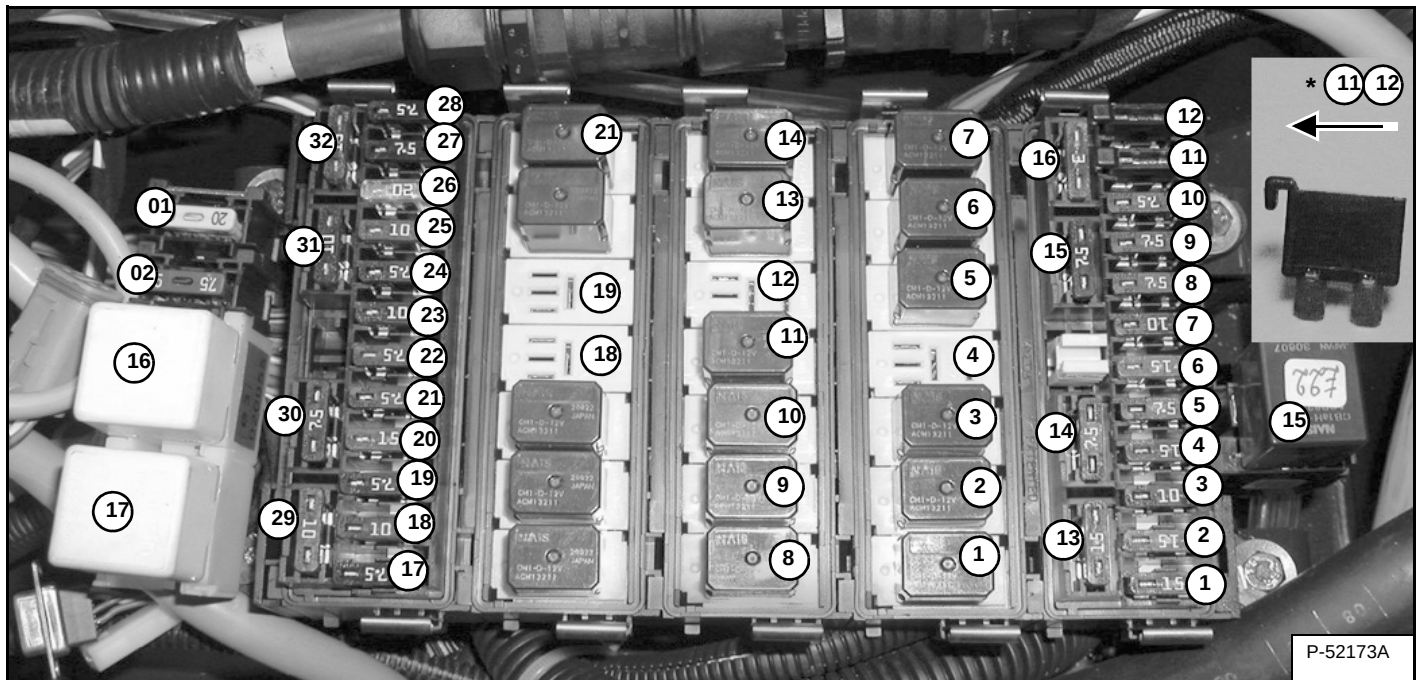
Remove the cover(s) from the rows of fuses/relays/diodes (Item 1) **[Figure 60-10-2]** to check or replace fuses, diodes or relays.

Two relays and two fuses are located in the rear of the engine compartment. See page 60-10-4.

ELECTRICAL SYSTEM (CONT'D)

Fuses, Diodes & Relays (Cont'd)

Figure 60-10-3



The location and description are shown below and [Figure 60-10-3]

FUSES & DIODES

Ref	Description.	Amps	Ref.	Description	Amps	Ref	Description
1	Rear Work Lights	15	21	Travel Controller	7.5	1	Rear Work Lights
2	Front Work Lights	15	22	Fuel Pump	7.5	2	Front Work Lights
3	Headlights	10	23	Joystick	7.5	3	Horn
4	Low Beam Headlights	15	24	Direction Signal	7.5	4	NOT USED
5	Horn & Cab Light	7.5	25	Steering Mode Valve	10	5	Front Auxiliary Hydraulic
6	High Beam Headlights	15	26	◆ Heater Fan	20	6	Low Beam Headlights
7	12V Accessory Plug	10	27	Travel Direction	7.5	7	High Beam Headlights
8	Left Park Lights	7.5	28	Control Panel	7.5	8	Transmission/Parking Brake
9	Right Park Lights	7.5	29	Top Wiper & Rear Travel Light	10	9	Neutral Start
10	Hazard Lights	7.5	30	◆ Rear Wiper, Rear & Top Washer	7.5	10	Brake Control System
11	Parking Brake	D*	31	Spare Fuse	10	11	Low Travel Speed
12	Transmission/Parking Brake	D*	32	Reverse Cooling Fan (Option)	7.5	12	Option
13	2nd Auxiliary Hyd	10	01	Air Cond. Compressor	7.5	13	Backup Lights/Backup Alarm
14	Fuel	7.5	02	Air Cond. Fan	20	14	Fuel Pump
15		7.5				15	Switched Power Relay
16	Front Auxiliary Hyd	3				16	◆ Air Condition Compressor
17	Rotating Beacon	7.5				17	◆ Air Conditioner Fan
18	Brake Lights	10				18	Not Used
19	Low Travel Speed	7.5				19	Radio (Optional)
20	◆ Front Wiper	15				21	Two speed engine fan

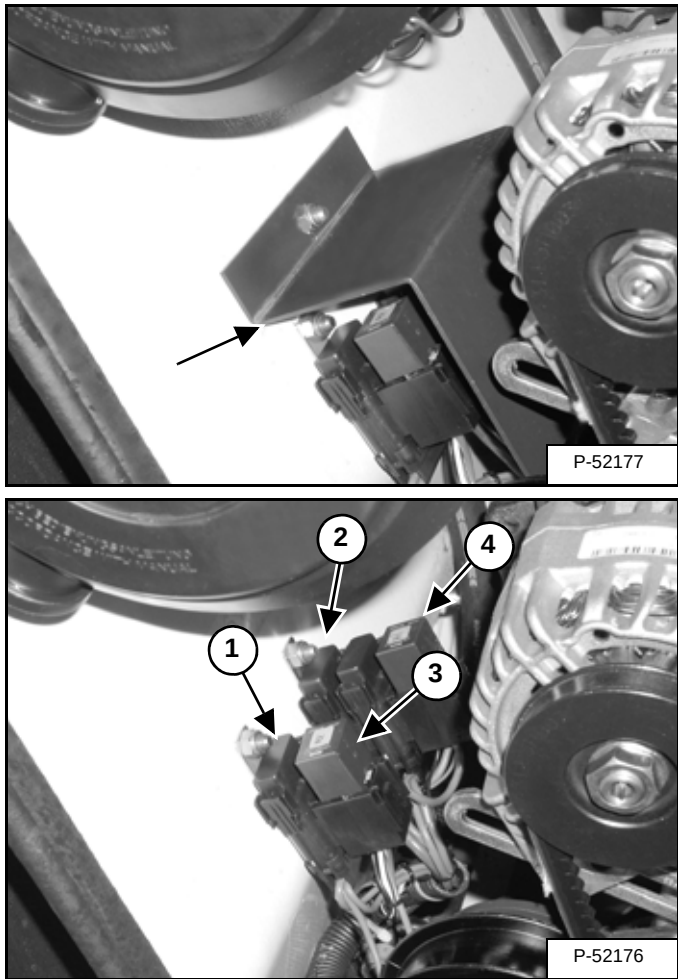
*D - Diodes (Items 11 & 12) inserted with the tab toward the front of the machine (Inset) [Figure 60-10-3].

◆ - Not used on Canopy models.

ELECTRICAL SYSTEM INFORMATION (CONT'D)

Fuses, Diodes & Relays (Cont'd)

Figure 60-10-4



Remove the access panel at the rear of the engine compartment. The relay/fuse receptacles are located under the air conditioning compressor [Figure 60-10-4].

FUSES

Ref.	Description	Amps
1	Unswitched Power Fuse	40
2	Switched Power Fuse	50

RELAYS

Ref.	Description
3	Starting Motor Relay
4	Preheat Relay

BATTERY

Removal And Installation

! WARNING

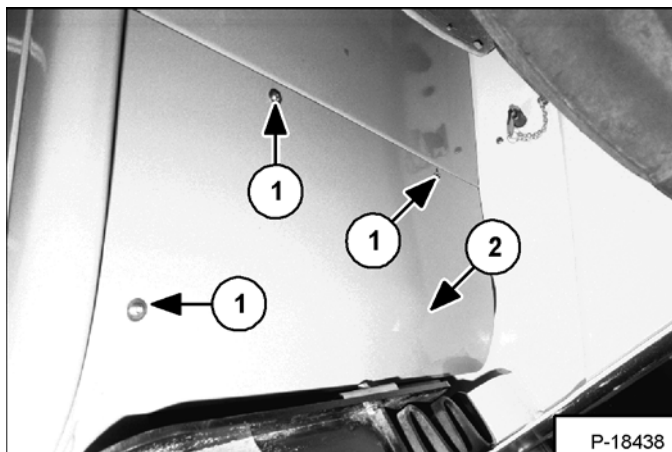
Batteries contain acid which burns eyes and skin on contact. Wear goggles, protective clothing and rubber gloves to keep acid off body. In case of acid contact, wash immediately with water.

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.

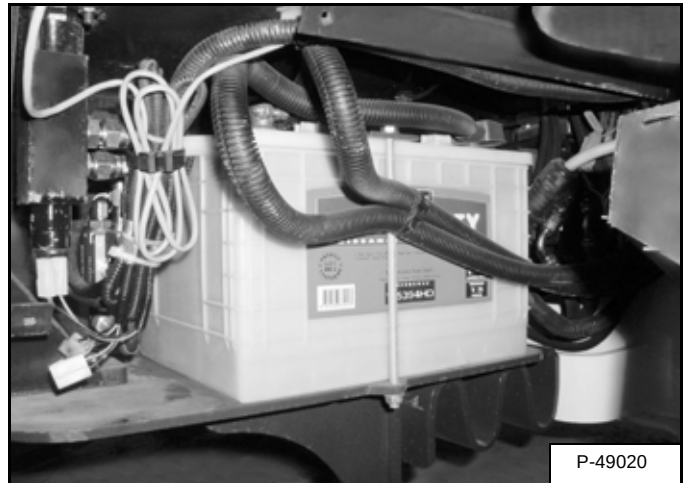
W-2065-1296

Figure 60-20-1



Remove the three bolts (Item 1) from the battery access door (Item 2) [Figure 60-20-1].

Figure 60-20-2



Remove the tie strap (Item 1) and bolt (Item 2) [Figure 60-20-2].

Figure 60-20-3



Always disconnect the negative cable (Item 1) [Figure 60-20-3] first to prevent sparks.

Remove the positive battery cable (Item 2) [Figure 60-20-3].

Remove the battery.

BATTERY (CONT'D)

Servicing

! 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

Figure 60-20-4

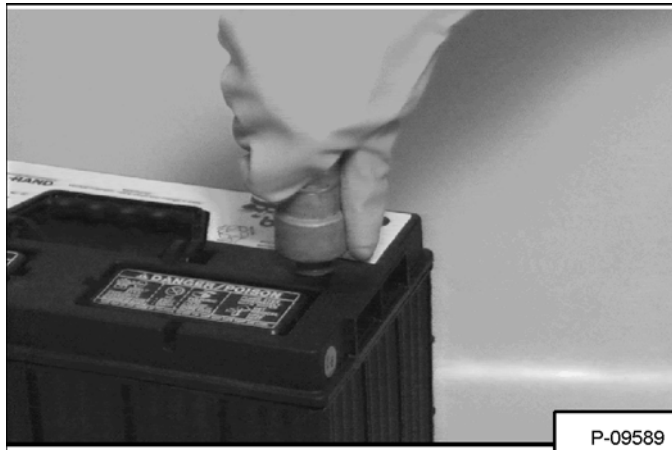
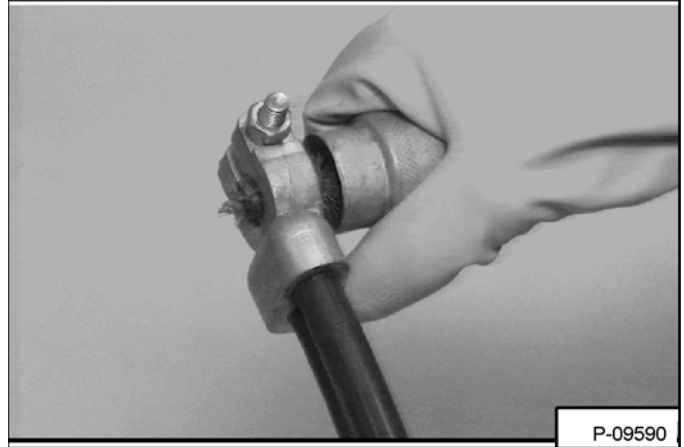


Figure 60-20-5

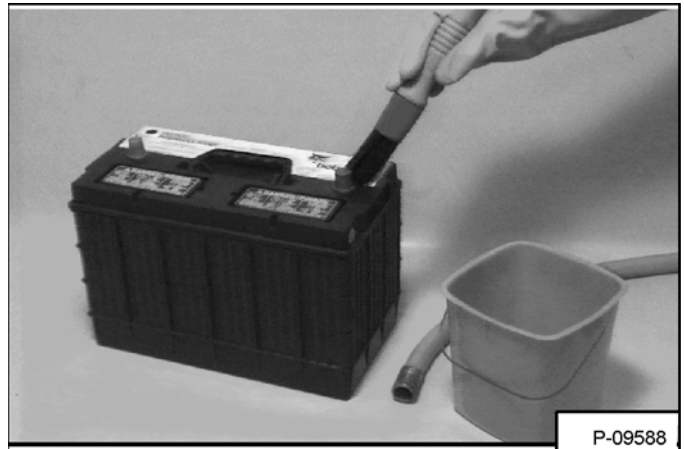


Always clean the terminals and cable ends when installing a new battery [Figure 60-20-4] and [Figure 60-20-5].

When installing the battery in the loader, do not touch any metal parts with the battery terminal posts.

Connect and tighten the battery cables. Connect the negative (-) cable last to prevent sparks.

Figure 60-20-6



The battery cables must be clean and the connections tight. Remove acid or corrosion from the battery and cables with a sodium bicarbonate (baking soda) and water solution [Figure 60-20-6].

Check the electrolyte level in the battery. Add distilled water as needed.

Put Battery Saver (P/N 6664458) or grease on the battery terminals and cable ends to prevent corrosion.

BATTERY (CONT'D)

Using A Booster Battery (Jump Starting)

! 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.

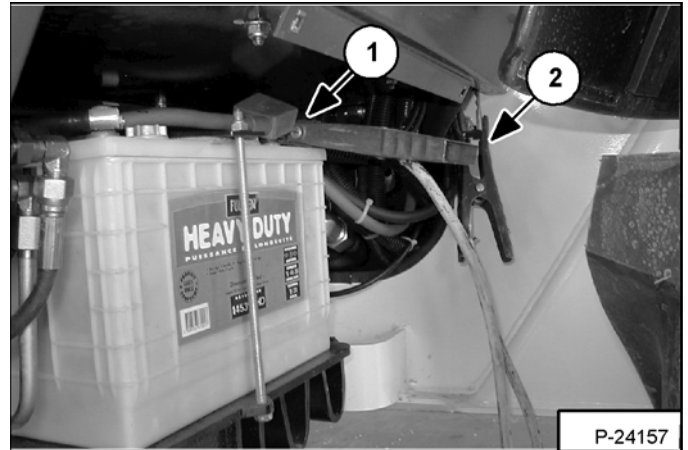
I-2023-1285

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.

The key switch must be OFF. The booster battery must be 12 volt.

NOTE: The battery compartment is located in front of the left rear tire, on the back side of the cab.

Figure 60-20-7



Connect the 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 60-20-7] on the Telehandler battery.

Connect the end of the second cable to the negative (-) terminal of the booster battery. Connect the other end of the same cable to the Telehandler where the negative cable connects to the frame (Item 2) [Figure 60-20-7].

Keep cables away from moving parts. Start the engine.

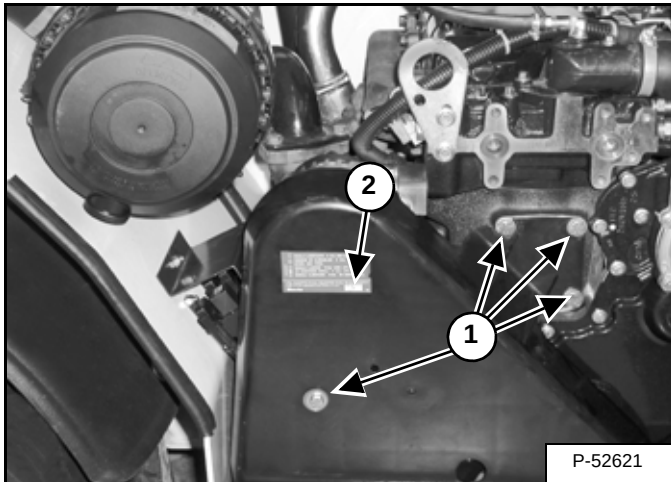
After the engine has started, remove the ground (-) cable (Item 2) [Figure 60-20-7] first.

Remove the cable from the positive terminal (Item 1) [Figure 60-20-7].

ALTERNATOR

Removal And Installation

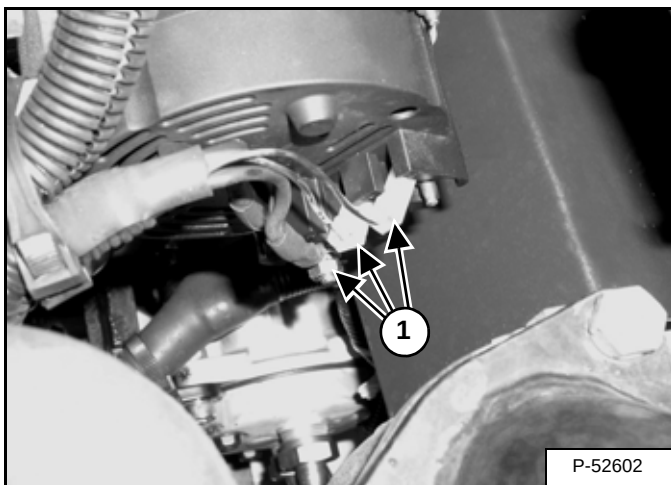
Figure 60-30-1



Open the engine cover.

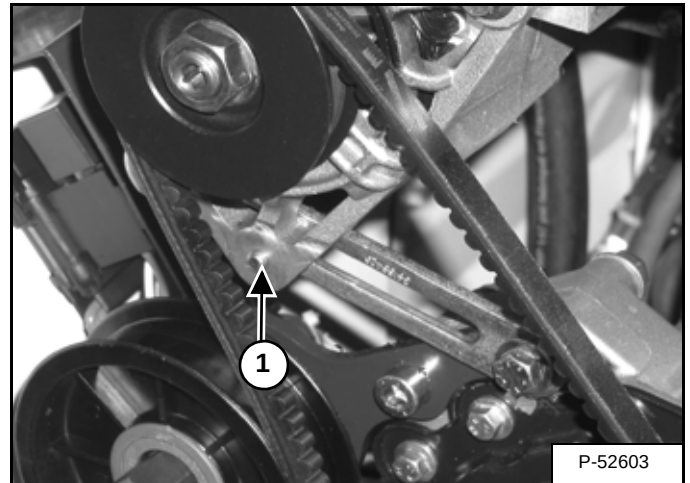
Remove the four bolts (Item 1) and belt shield (Item 2) [Figure 60-30-1].

Figure 60-30-2



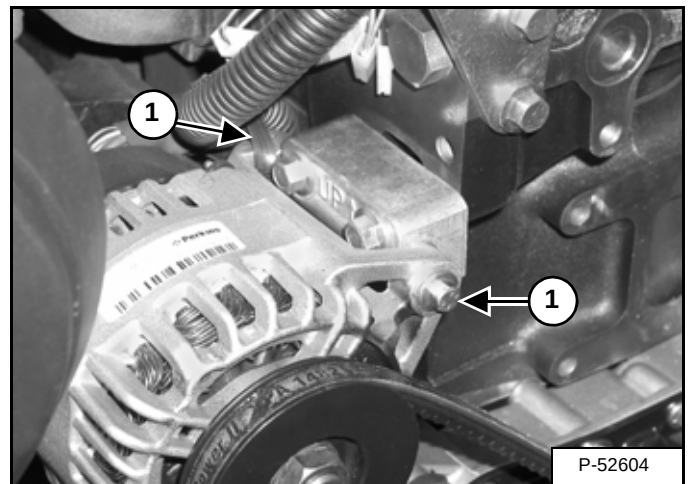
Remove the three connectors (Item 1) [Figure 60-30-2] from the back of the alternator.

Figure 60-30-3



Loosen and remove the alternator adjusting bolt (Item 1) [Figure 60-30-3].

Figure 60-30-4



Loosen and remove both mounting bolts (Item 1) [Figure 60-30-4].

Remove the alternator.

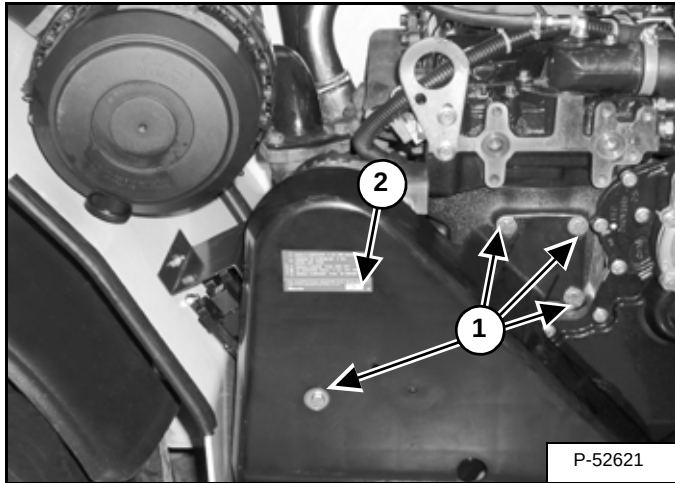
ALTERNATOR (CONT'D)

Adjusting The Alternator Belt

Stop the engine.

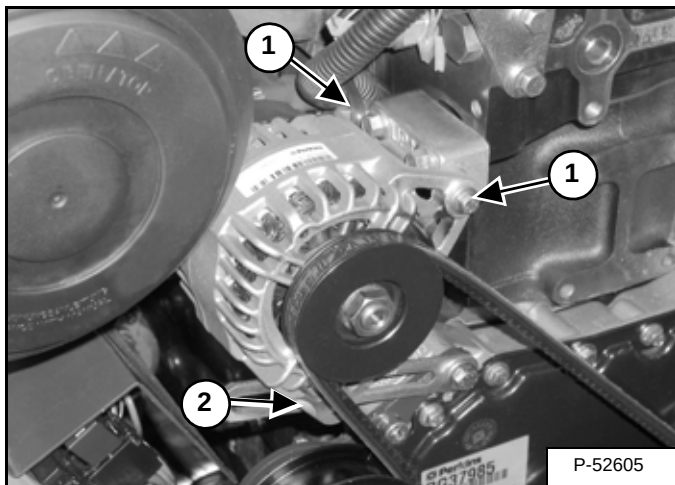
Open the engine cover.

Figure 60-30-5



Remove the two bolts (Item 1) and the belt shield (Item 2) [Figure 60-30-5].

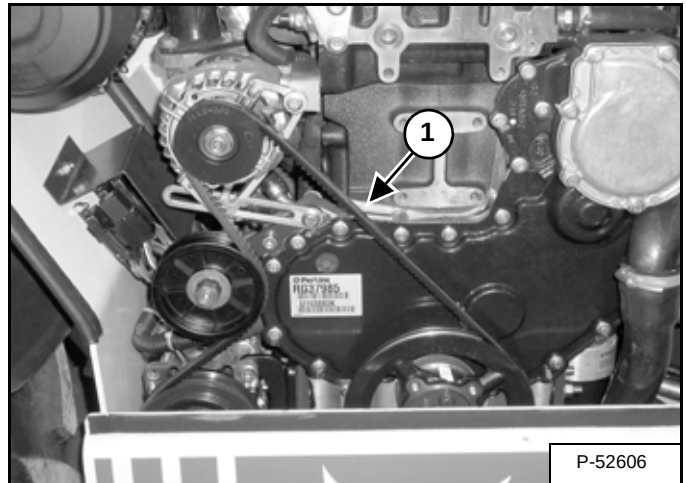
Figure 60-30-6



Loosen the two alternator mounting bolts (Item 1) [Figure 60-30-6].

Loosen the adjustment bolt (Item 2) [Figure 60-30-6].

Figure 60-30-7



Move the alternator until the belt has 5/16 inch (8,0 mm) movement at the middle of the belt span (Item 1) [Figure 60-30-7] with 15 lbs. (20 Nm) of force.

Tighten the adjustment and mounting bolts.

Install the belt shield.

Close the engine cover

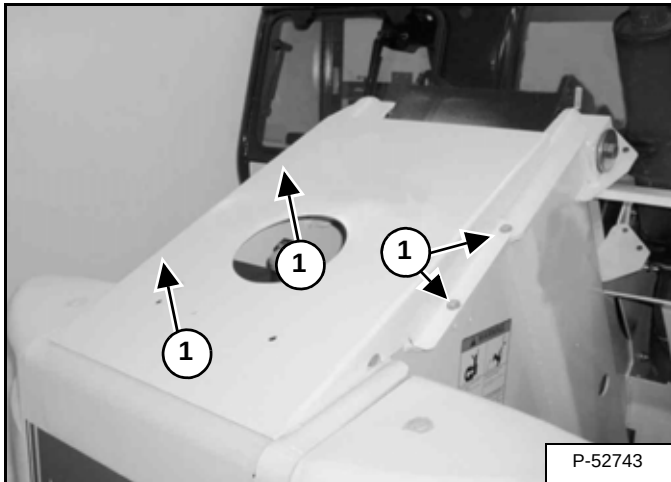
STARTER

Not Available At Time Of Printing

LIGHTS

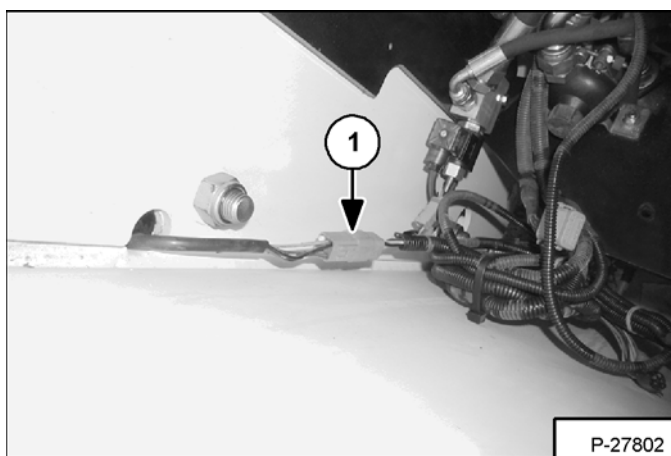
Rear Light Removal And Installation

Figure 60-60-1



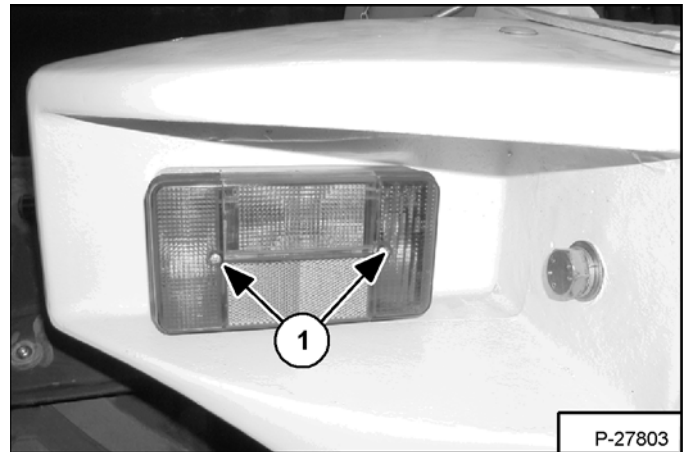
Remove the four rear cover mounting bolts (Item 1) [Figure 60-60-1]. Remove the cover.

Figure 60-60-2



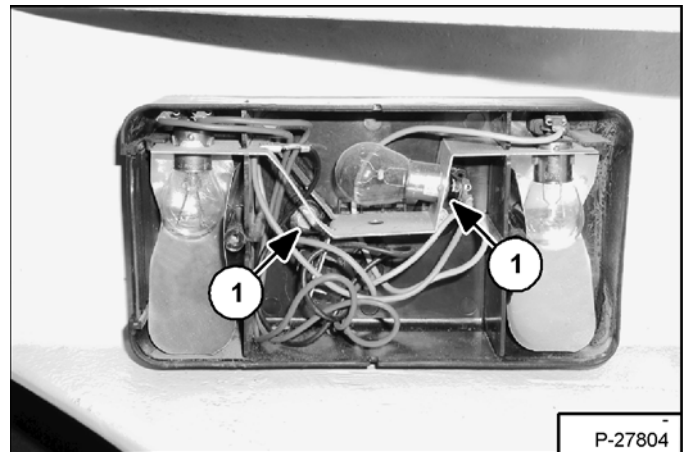
Disconnect the light harness connector (Item 1) [Figure 60-60-2] from the main harness.

Figure 60-60-3



Remove the two lens retainer screws (Item 1) [Figure 60-60-3].

Figure 60-60-4



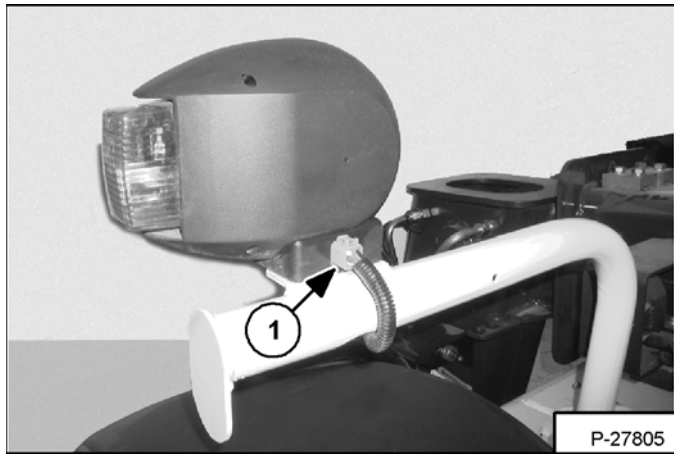
Remove the two light mounting bolts (Item 1) [Figure 60-60-4].

Remove the light assembly.

LIGHTS (CONT'D)

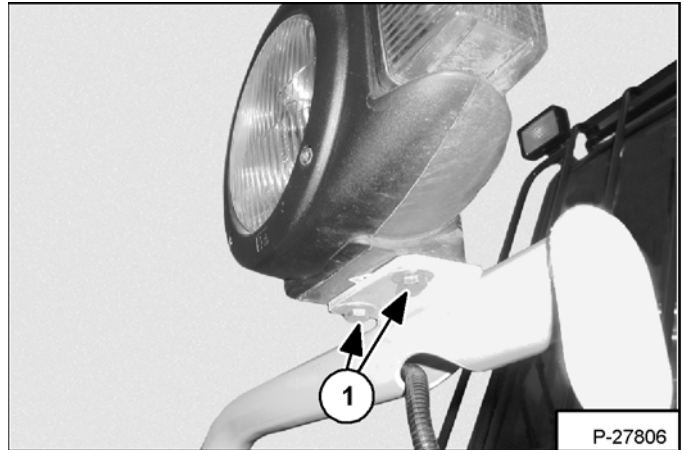
Front Light Removal And Installation

Figure 60-60-5



Disconnect the light harness connector (Item 1) [Figure 60-60-5] from the light.

Figure 60-60-6



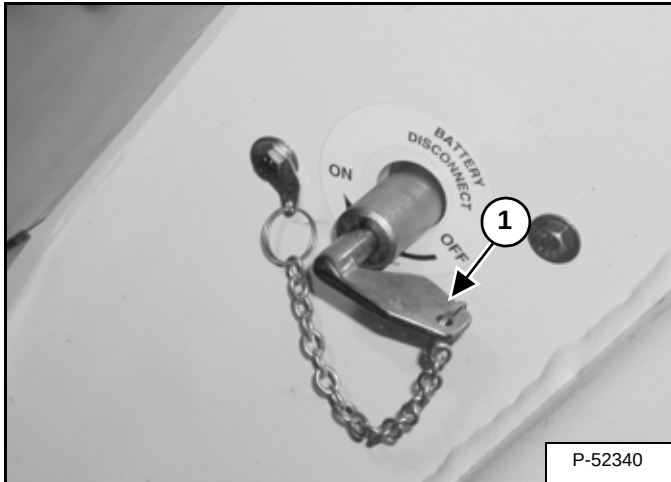
Remove the two bolts (Item 1) [Figure 60-60-6] and remove the light.

TRAVEL/SIGNAL LEVER

Removal And Installation

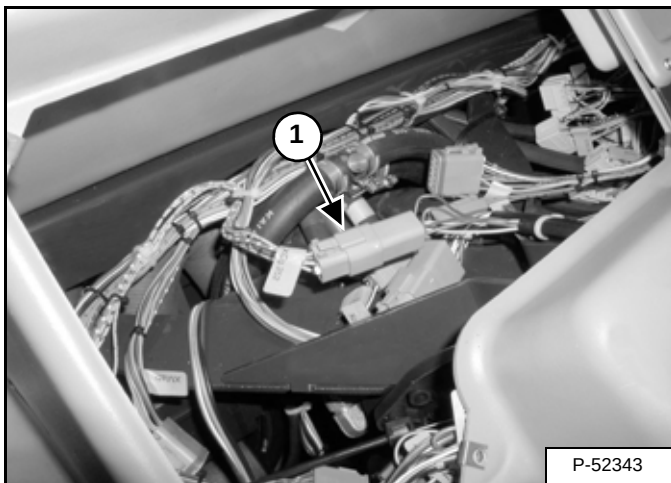
Remove the instrument panel. (See Contents page 60-01.)

Figure 60-60-1



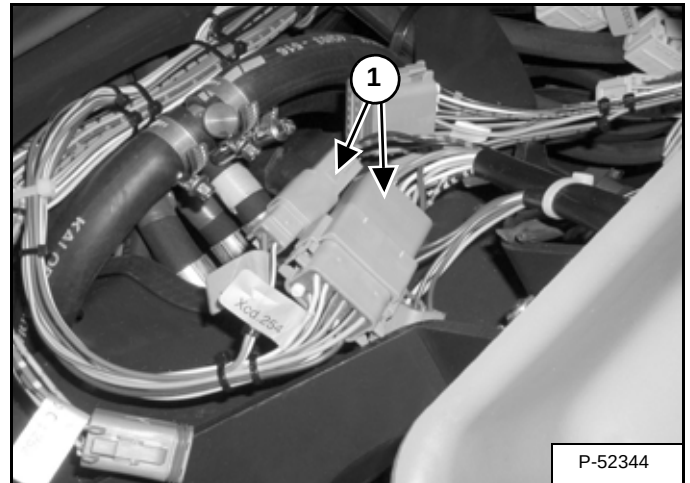
Rotate the battery disconnect switch (Item 1) **[Figure 60-60-1]** to the right, to disconnect the power supply from the battery.

Figure 60-70-2



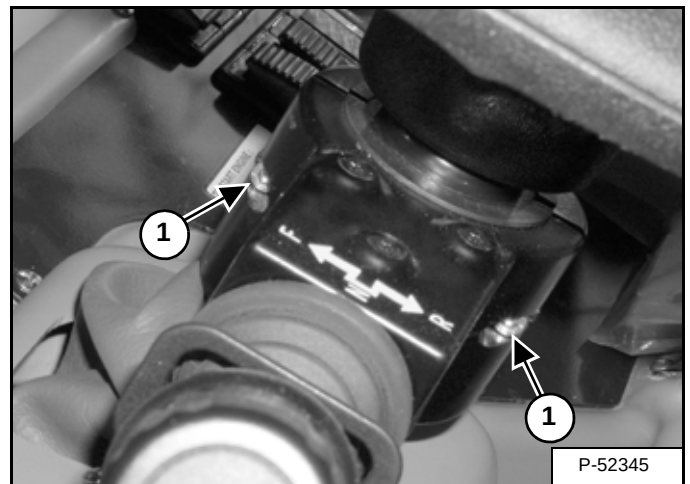
Disconnect the travel control wire harness connector (Item 1) **[Figure 60-70-2]**.

Figure 60-70-3



Disconnect the two signal control wire connectors (Item 1) **[Figure 60-70-3]**.

Figure 60-70-4

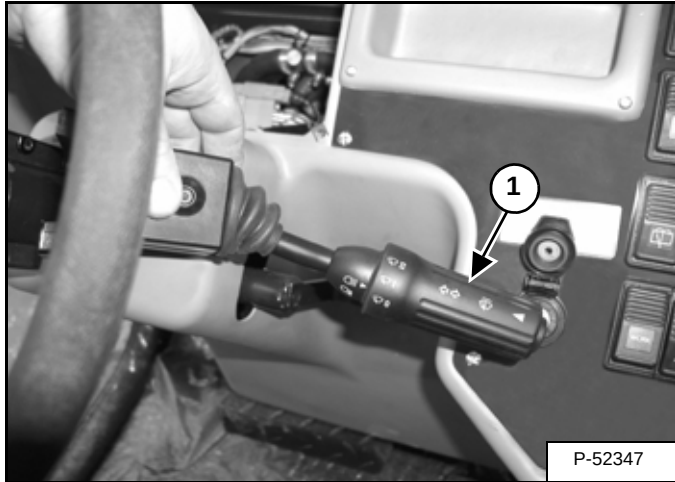


Remove the two screws (Item 1) **[Figure 60-70-4]** from the travel/signal levers.

TRAVEL/SIGNAL LEVER (CONT'D)

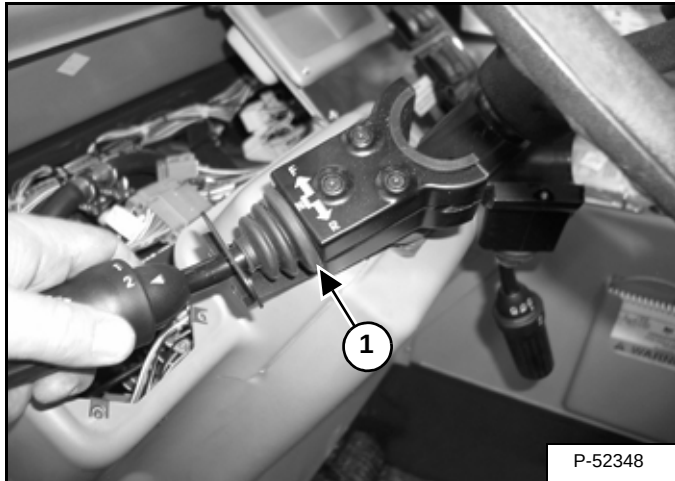
Removal And Installation (Cont'd)

Figure 60-70-5



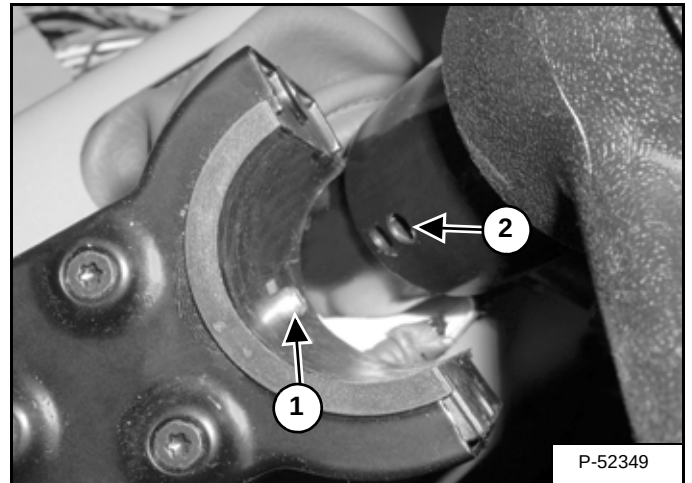
Remove the signal lever (Item 1) [Figure 60-70-5].

Figure 60-70-6



Remove the travel lever (Item 1) [Figure 60-70-6].

Figure 60-70-7



Installation: Align the pin (Item 1) in the travel lever with the top hole (Item 2) [Figure 60-70-7] in the steering column.

INSTRUMENT PANEL

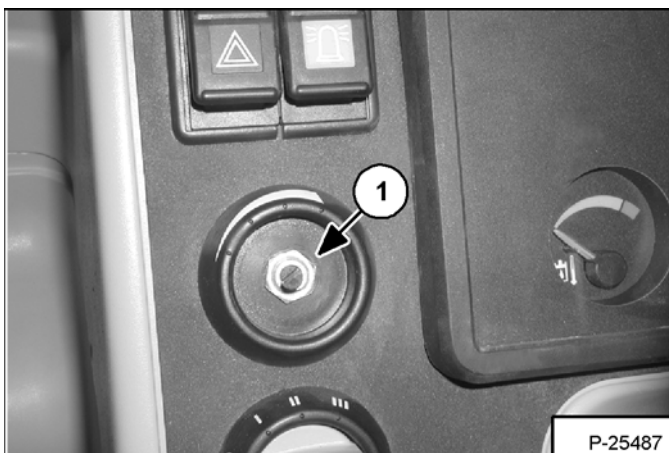
Removal And Installation

Figure 60-80-1



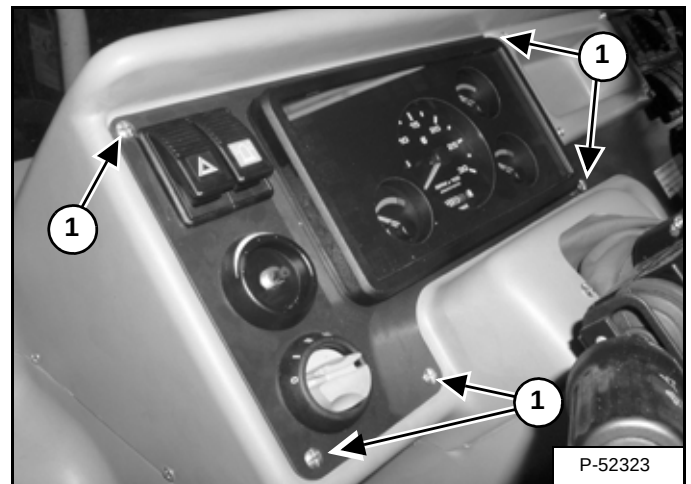
Remove the temperature control knob (Item 1) [Figure 60-80-1]. (If Equipped)

Figure 60-80-2



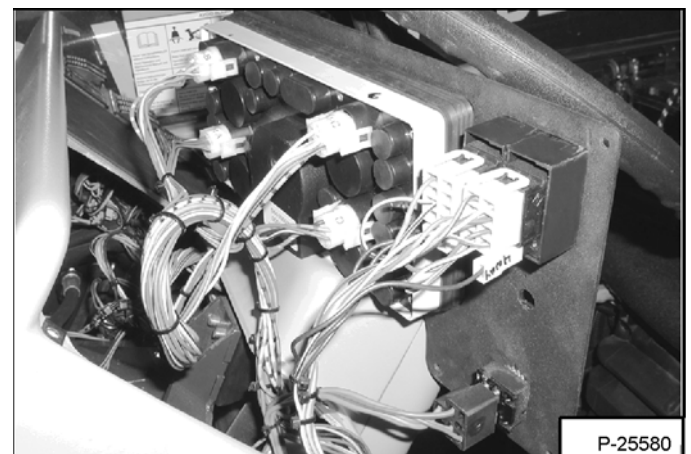
Remove the nut (Item 1) [Figure 60-80-2] letting the temperature controller fall inward.

Figure 60-80-3



Remove the five instrument panel mounting bolts (Item 1) [Figure 60-80-3].

Figure 60-80-4



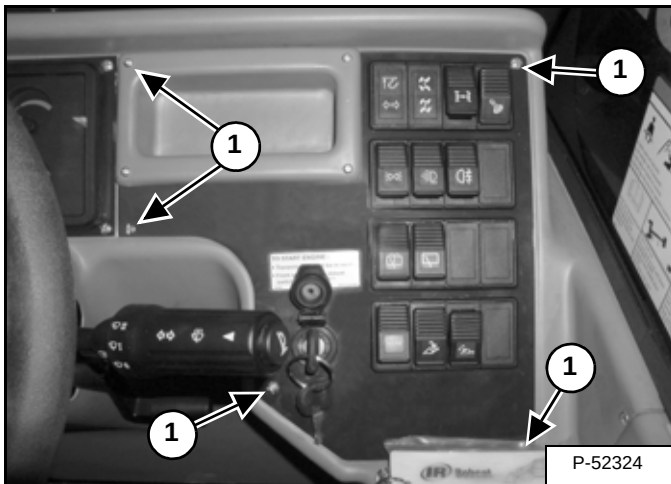
Tilt the instrument panel forward and unplug all connectors [Figure 60-80-4]. Remove the instrument panel.

NOTE: Mark the connectors for correct installation.

SWITCH PANEL

Removal And Installation

Figure 60-90-1



Remove the five screws (Item 1) [Figure 60-90-1].

Figure 60-90-2



Unplug the harness connectors from the back of the switch panel [Figure 60-90-2].

NOTE: Mark all connectors for ease of installation.

Figure 60-90-3

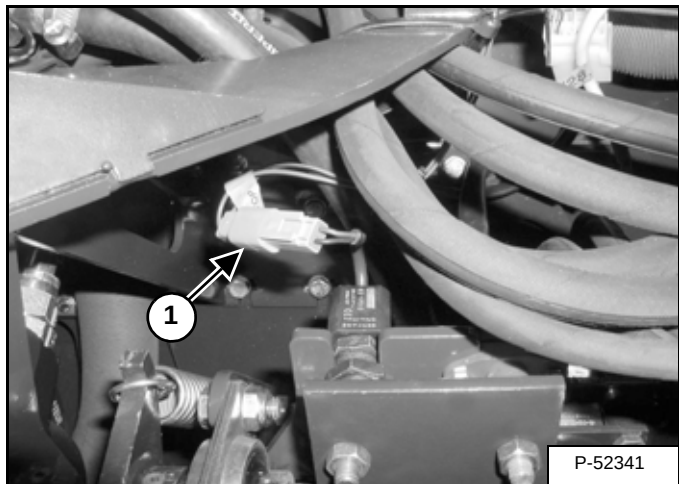


Remove the switch panel [Figure 60-90-3].

BRAKE LIGHT SWITCH

Removal And Installation

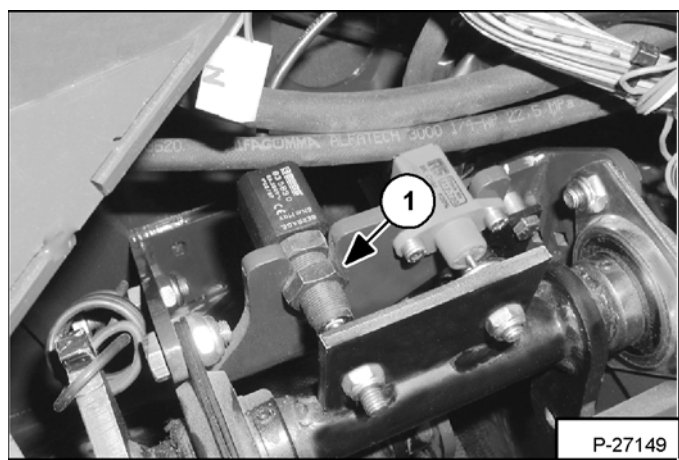
Figure 60-100-1



Remove the dash cover/column cover. (See Content Page 50-01.)

Unplug the switch connector (Item 1) [Figure 60-100-1] from the wiring harness.

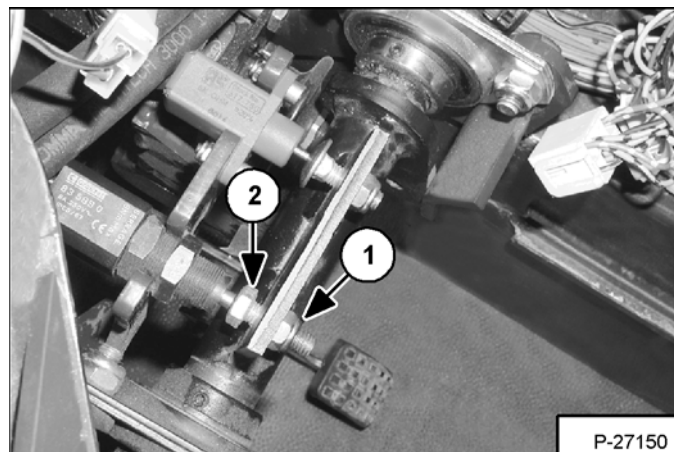
Figure 60-100-2



Loosen the nut (Item 1) [Figure 60-100-2]. Remove the switch.

Adjustment

Figure 60-100-3



Remove the dash cover/column cover. (See Content Page 50-01.)

Loosen the nut (Item 1) [Figure 60-100-3].

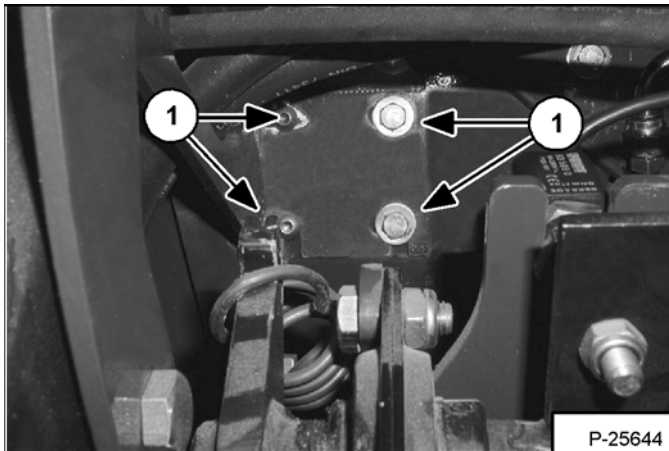
With the brake pedal at rest, turn the adjustment bolt (Item 2) [Figure 60-100-3] until it touches the brake light switch plug.

Tighten the nut (Item 1) [Figure 60-100-3].

FRONT WIPER MOTOR

Removal And Installation

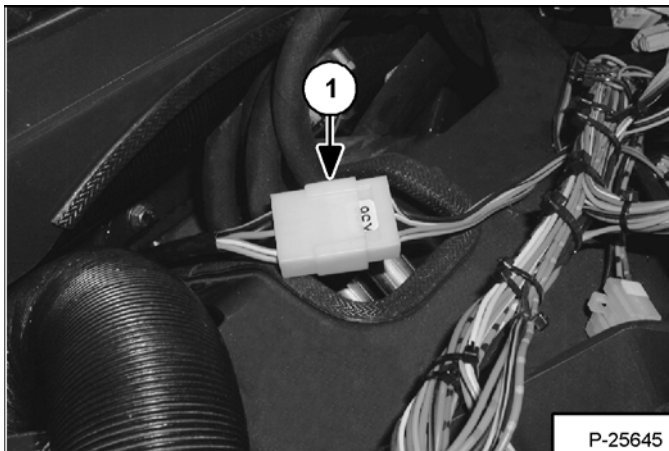
Figure 60-110-1



Remove the dash cover/steering column cover. (See Content Page 50-01.)

Remove the four lower mounting bracket bolts (Item 1) [Figure 60-110-1].

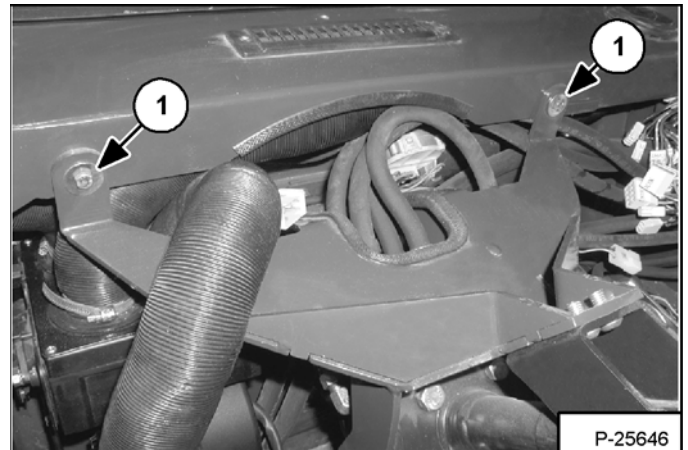
Figure 60-110-2



Disconnect the front wiper connector (Item 1) [Figure 60-110-2] from the main harness.

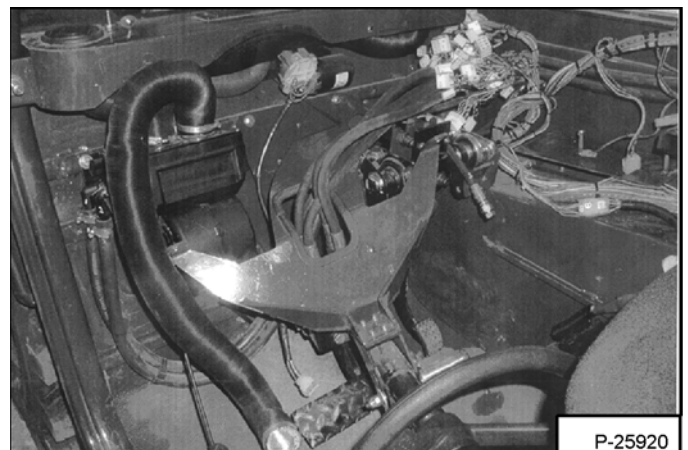
Reposition the main wire harness to the right side of the cab.

Figure 60-110-3



Remove the two mounting bracket bolts (Item 1) [Figure 60-110-3].

Figure 60-110-4

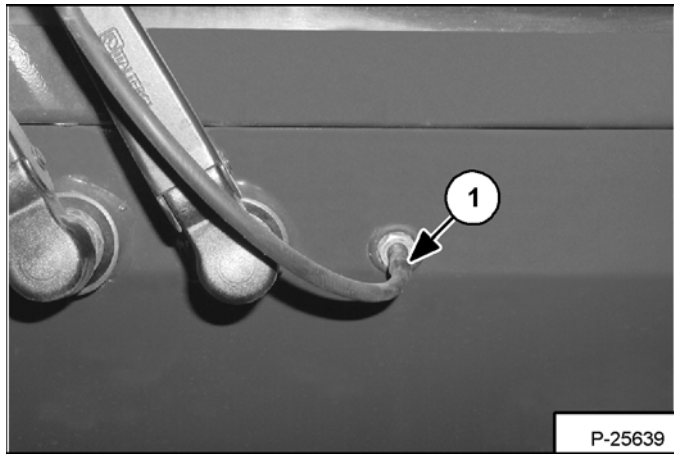


Reposition the steering column assembly (as shown).

FRONT WIPER MOTOR (CONT'D)

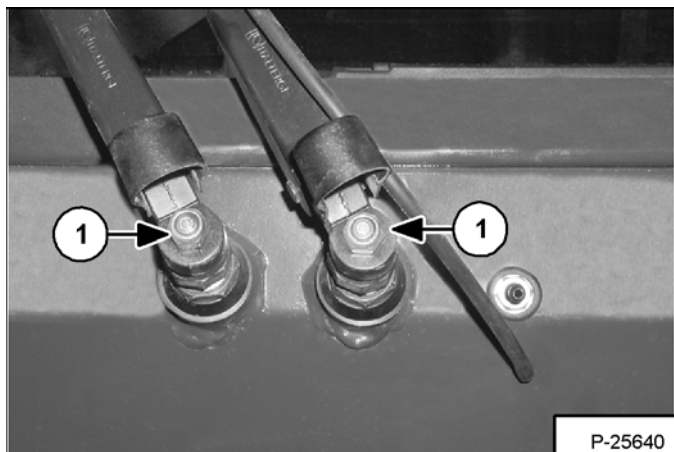
Removal and Installation (Cont'd)

Figure 60-110-5



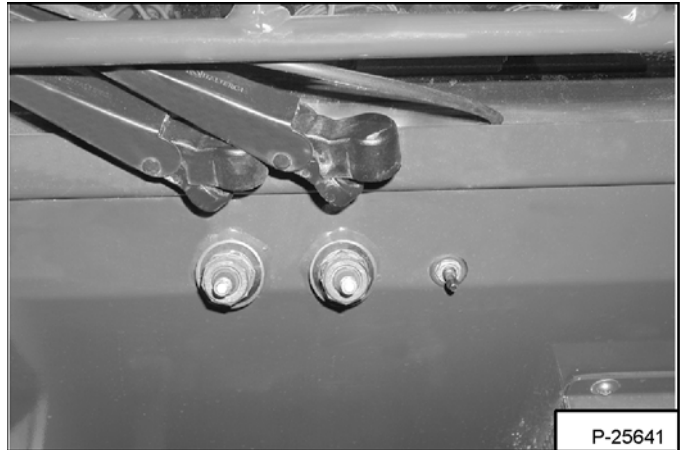
Remove the spray tube (Item 1) [Figure 60-110-5].

Figure 60-110-6



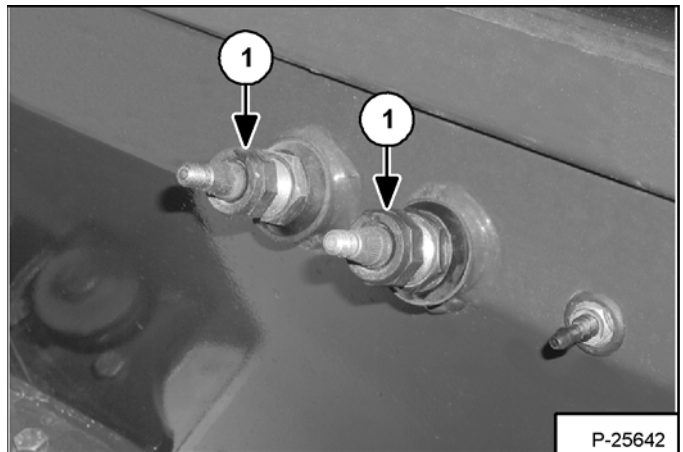
Flip open the wiper covers and remove the two nuts (Item 1) [Figure 60-110-6].

Figure 60-110-7



Remove the wiper arms from the wiper motor shafts [Figure 60-110-7].

Figure 60-110-8

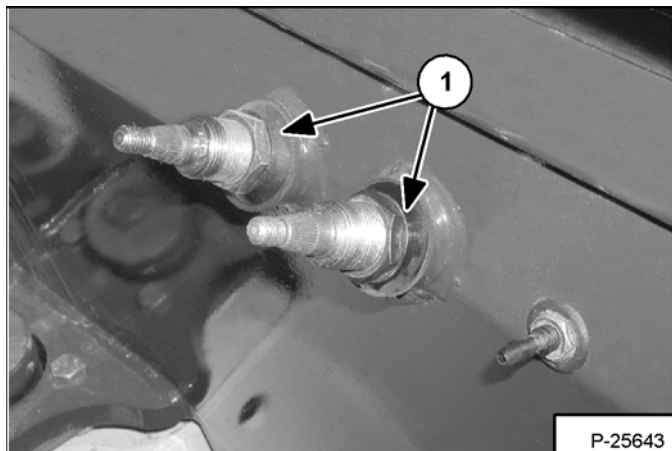


Remove both outer nuts (Item 1) [Figure 60-110-8].

FRONT WIPER MOTOR (CONT'D)

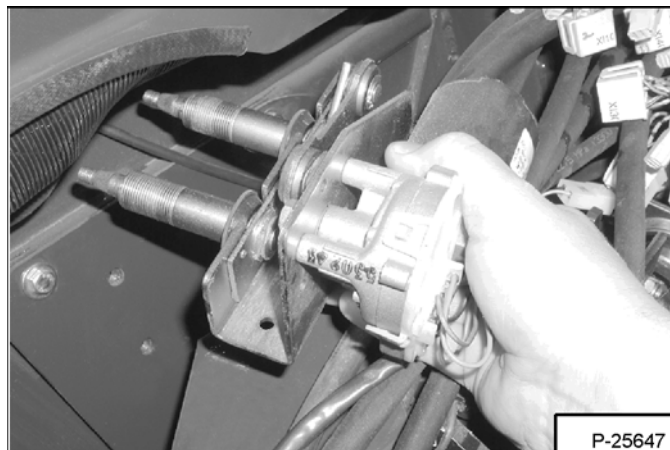
Removal And Installation (Cont'd)

Figure 60-110-9



Remove both inner nuts and washers (Item 1) [Figure 60-110-9].

Figure 60-110-10

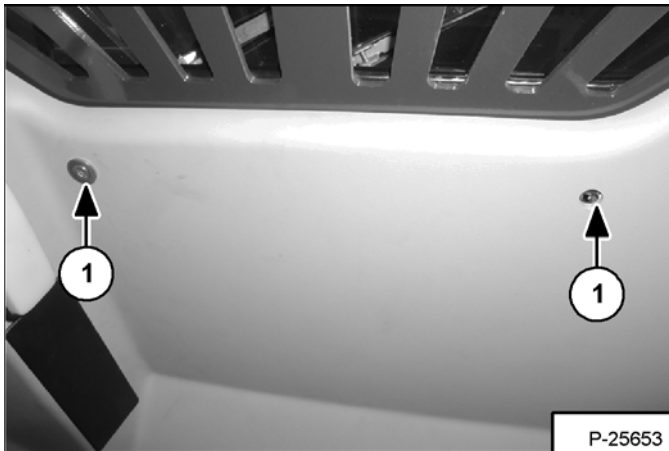


Remove the wiper motor from inside the cab [Figure 60-110-10].

TOP WIPER MOTOR

Removal And Installation

Figure 60-120-1



Remove the two screws (Item 1) [Figure 60-120-1] from the upper panel.

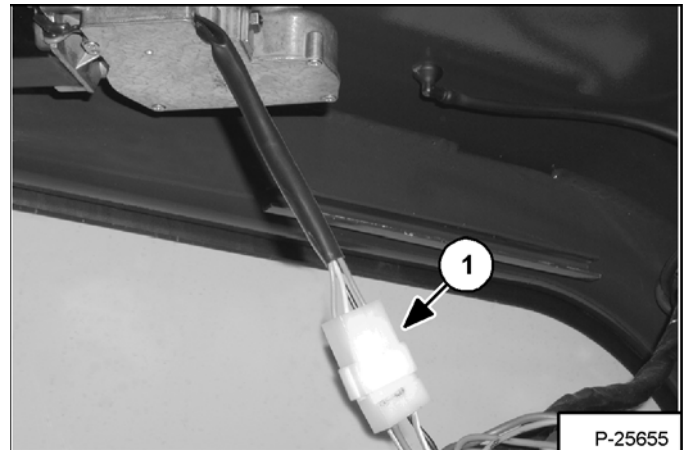
Figure 60-120-2



Slide the upper panel forward on the support rails [Figure 60-120-2].

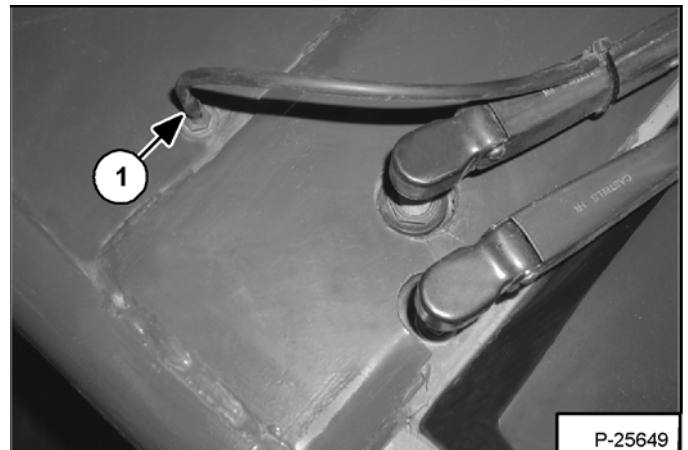
Lower the panel.

Figure 60-120-3



Disconnect the wiper motor connector (Item 1) [Figure 60-120-3] from the harness.

Figure 60-120-4

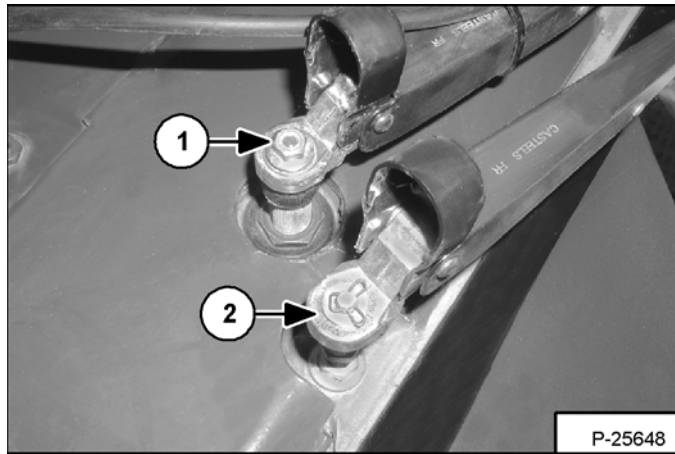


Remove the washer tube (Item 1) [Figure 60-120-4].

TOP WIPER MOTOR (CONT'D)

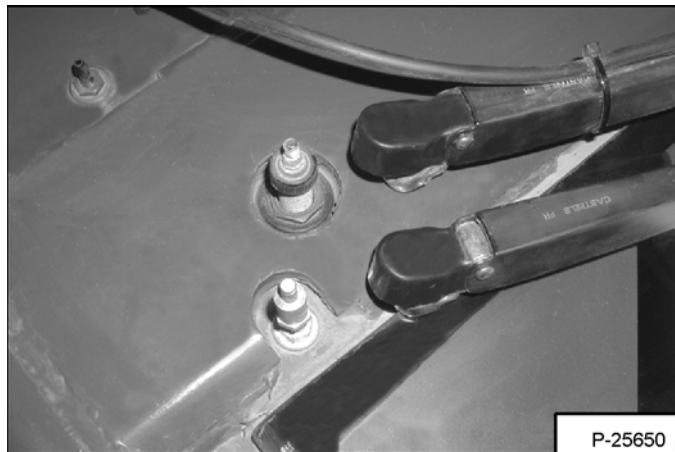
Removal And Installation (Cont'd)

Figure 60-120-5



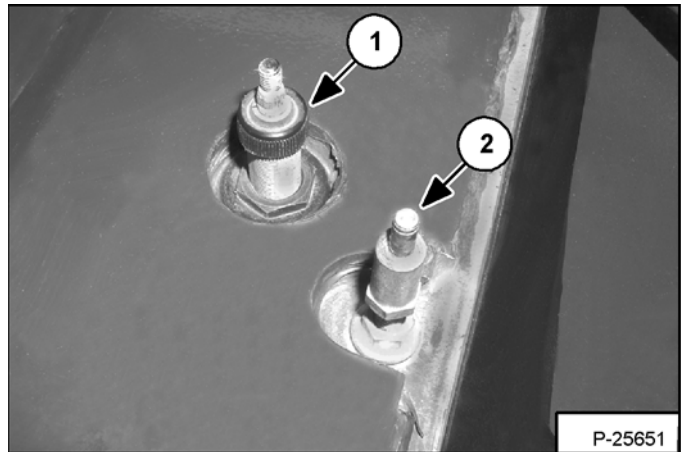
Flip open the wiper covers and remove the nut (Item 1) and clip (Item 2) [Figure 60-120-5].

Figure 60-120-6



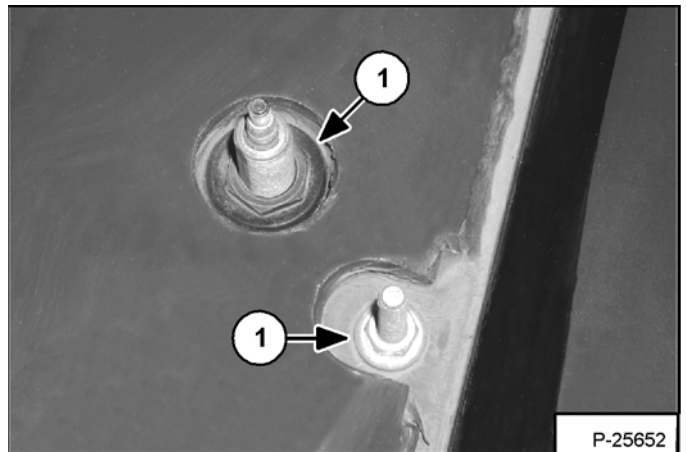
Remove the wiper arms from the wiper shafts [Figure 60-120-6].

Figure 60-120-7



Remove the plastic nut (Item 1) and extension post (Item 2) [Figure 60-120-7].

Figure 60-120-8



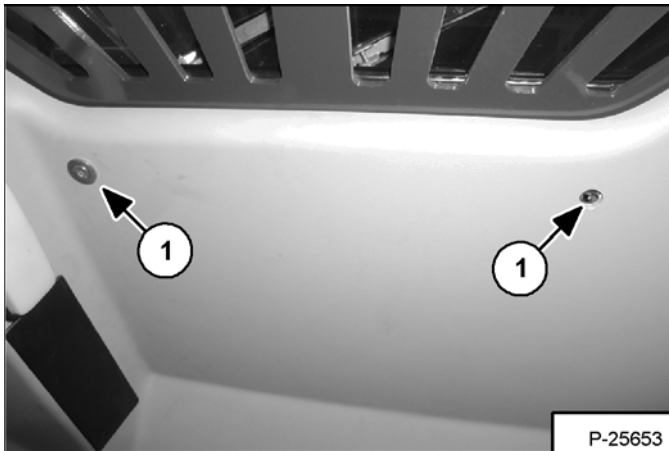
While supporting the wiper motor inside the cab, have an assistant remove the two nuts (Item 1) [Figure 60-120-8].

Remove the wiper motor.

REAR WIPER MOTOR

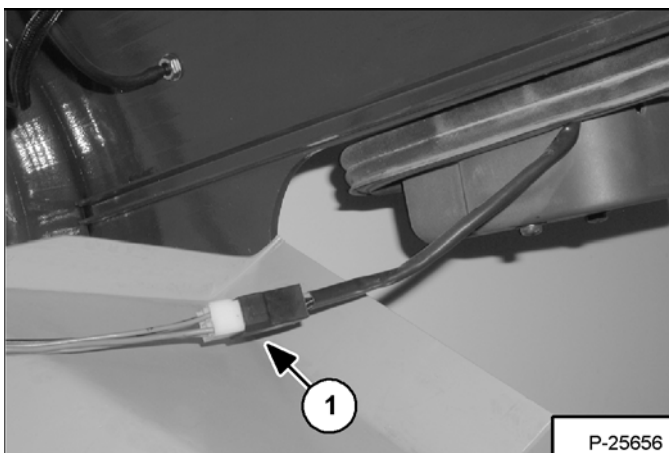
Removal And Installation

Figure 60-130-1



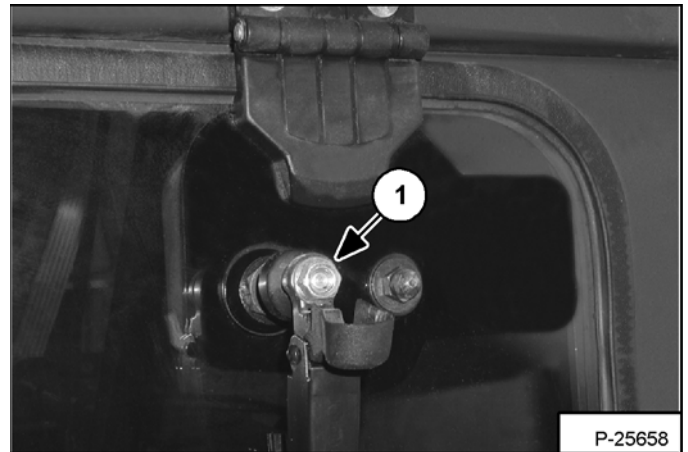
Remove the two screws (Item 1) [Figure 60-130-1] from the upper panel and slide the upper panel forward.

Figure 60-130-2



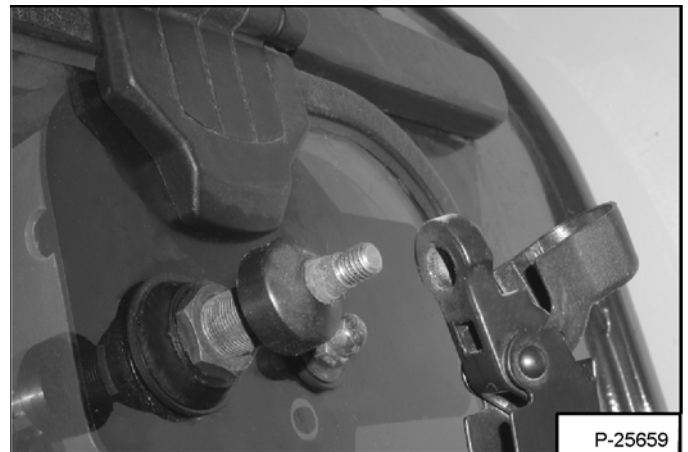
Disconnect the rear wiper motor connector (Item 1) [Figure 60-130-2] from the harness.

Figure 60-130-3



Flip open the wiper cover and remove the nut (Item 1) [Figure 60-130-3].

Figure 60-130-4



Remove the wiper arm [Figure 60-130-4].

REAR WIPER MOTOR (CONT'D)

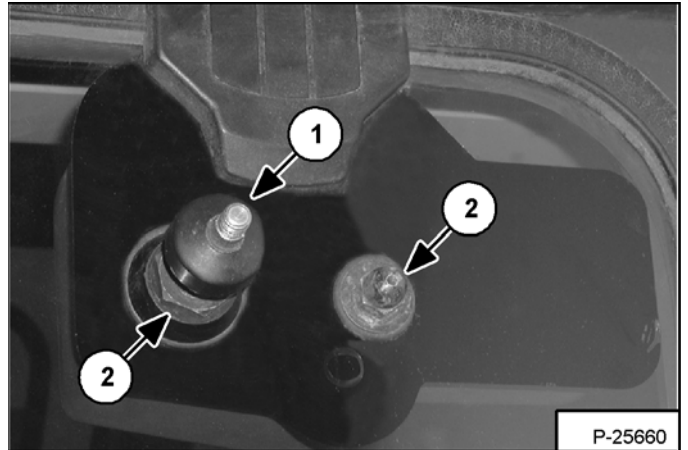
Removal And Installation (Cont'd)

Figure 60-130-5



Have an assistant support the wiper motor [Figure 60-130-5].

Figure 60-130-6



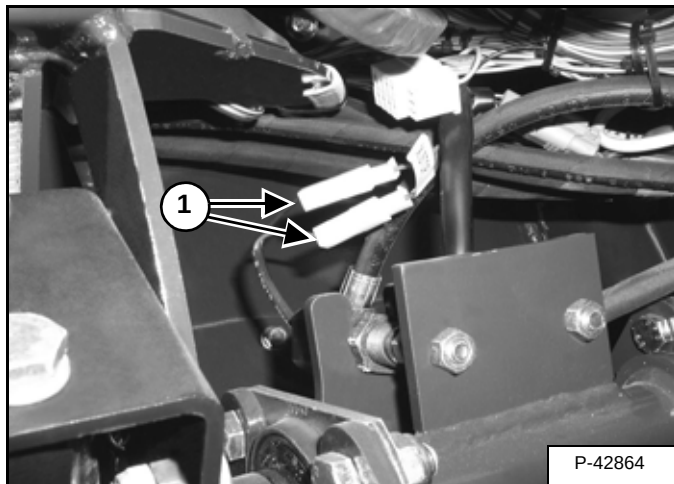
Remove the plastic cover (Item 1) and two nuts (Item 2) [Figure 60-130-6].

Remove the wiper motor.

PEDAL ASSEMBLY

Removal And Installation

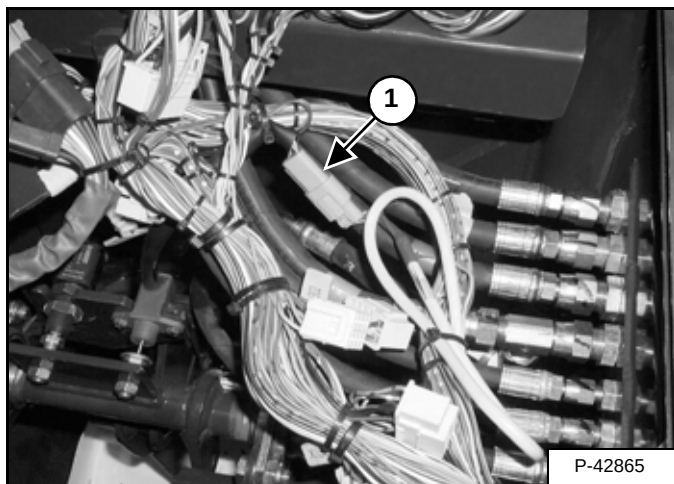
Figure 60-140-1



Remove the dash cover/column cover. (See Content Page 50-01.)

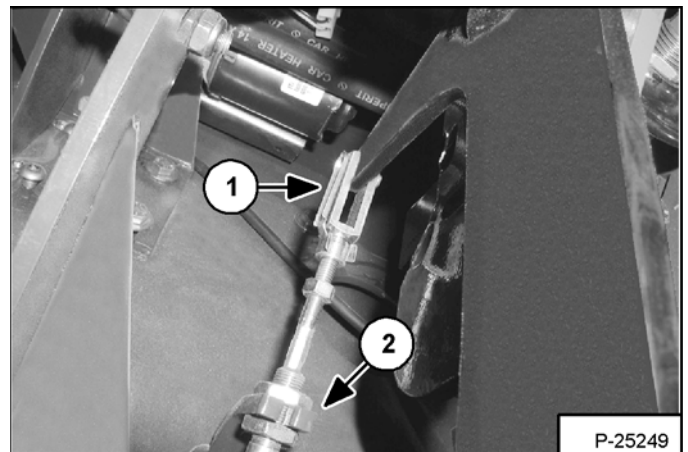
Disconnect the two connectors (Item 1) [Figure 60-140-1] from the brake light switch.

Figure 60-140-2



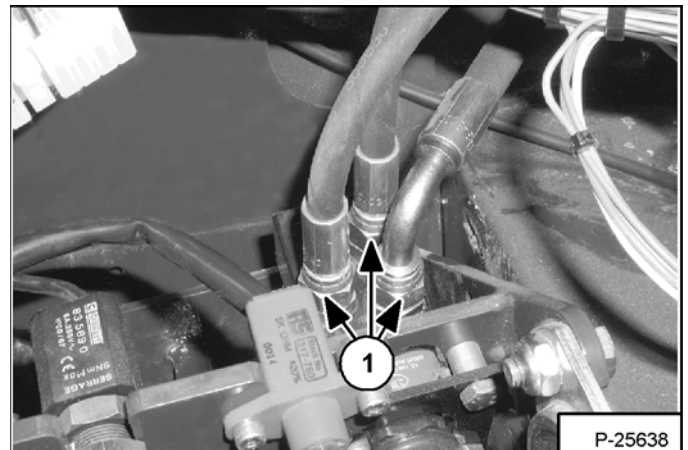
Disconnect the connector (Item 1) [Figure 60-140-2] from the inching switch.

Figure 60-140-3



Remove the accelerator cable (Item 1) from the pedal and mounting bracket (Item 2) [Figure 60-140-3].

Figure 60-140-4



Remove the three hoses (Item 1) [Figure 60-140-4] from the brake valve.

NOTE: Mark hoses for correct installation.

IMPORTANT

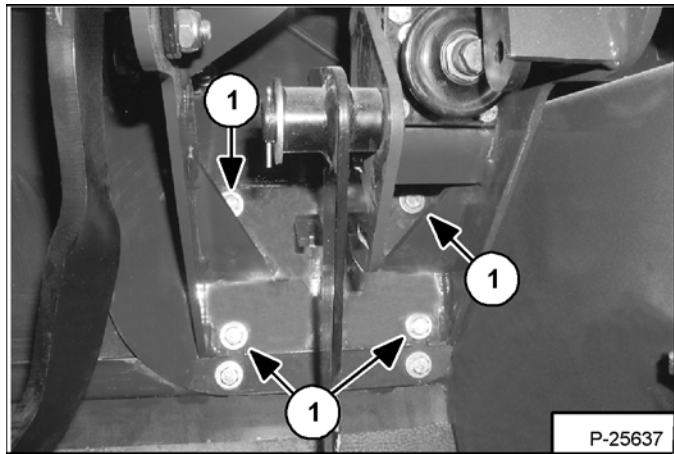
When repairing hydrostatic and hydraulic systems, clean the work area before disassembly and keep all parts clean. Always use caps and plugs on hoses, tubelines and ports to keep dirt out. Dirt can quickly damage the system.

I-2003-0888

PEDAL ASSEMBLY (CONT'D)

Removal and Installation (Cont'd)

Figure 60-140-5

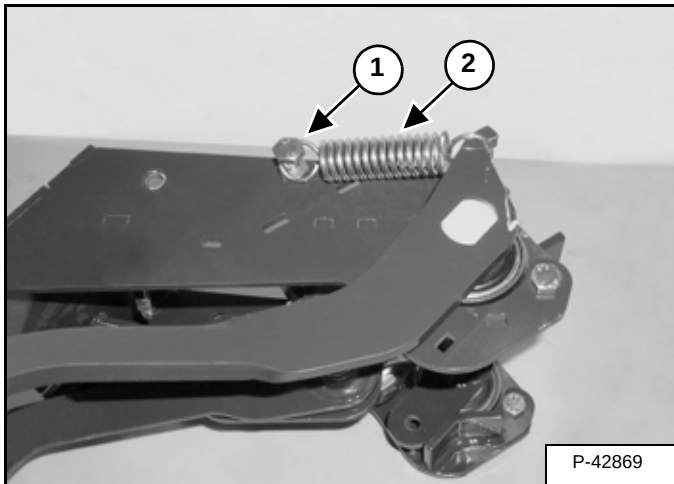


Remove the mounting bolts (Item 1) [Figure 60-140-5].

Remove the pedal assembly.

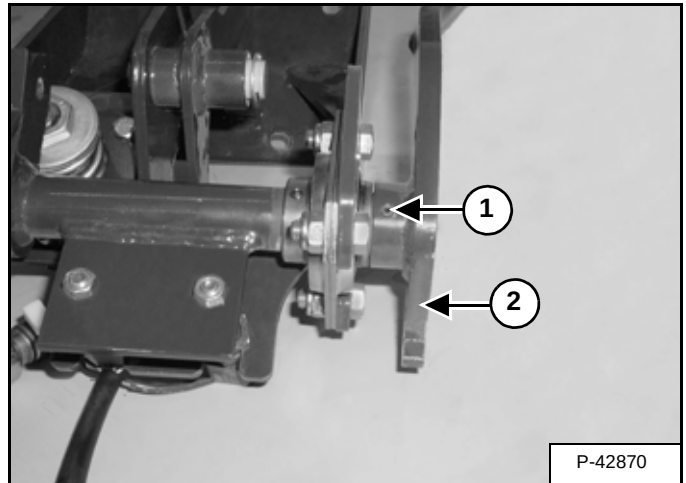
Disassembly And Assembly

Figure 60-140-6



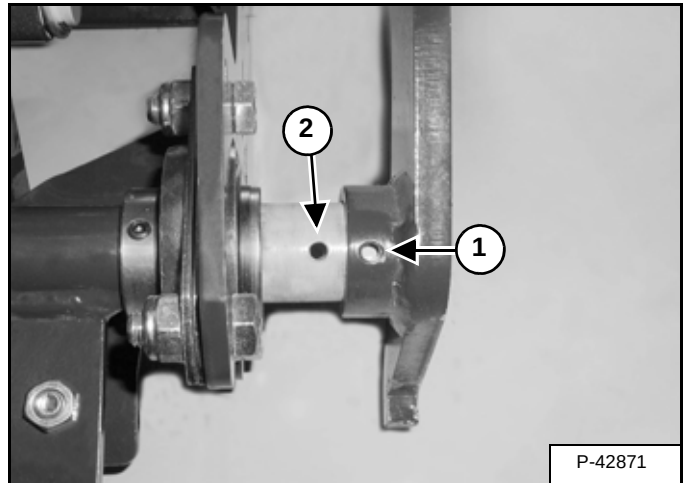
Remove the bolt (Item 1) and spring (Item 2) [Figure 60-140-6].

Figure 60-140-7



Remove the roll pin (Item 1) and pedal (Item 2) [Figure 60-140-7].

Figure 60-140-8

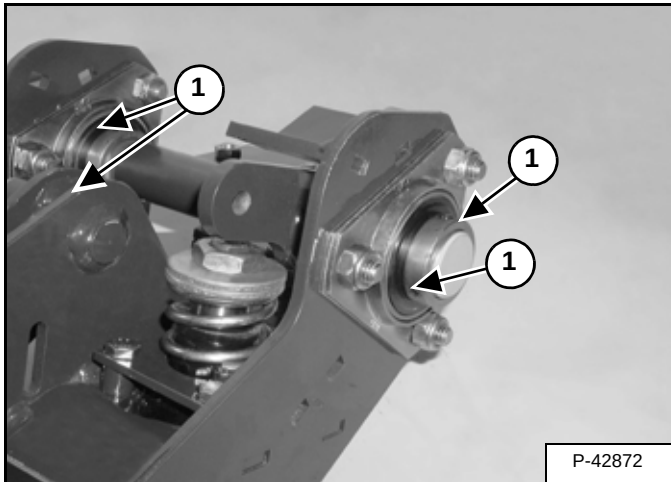


Installation: Align the hole (Item 1) in the pedal with the hole (Item 2) [Figure 60-140-8] in the shaft.

PEDAL ASSEMBLY (CONT'D)

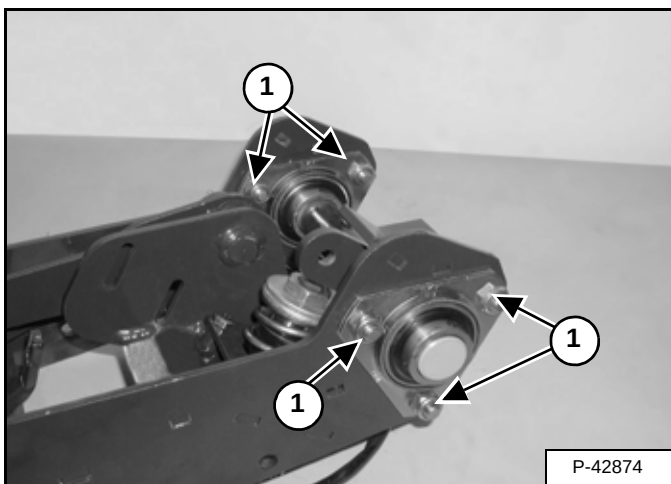
Disassembly And Assembly (Cont'd)

Figure 60-140-9



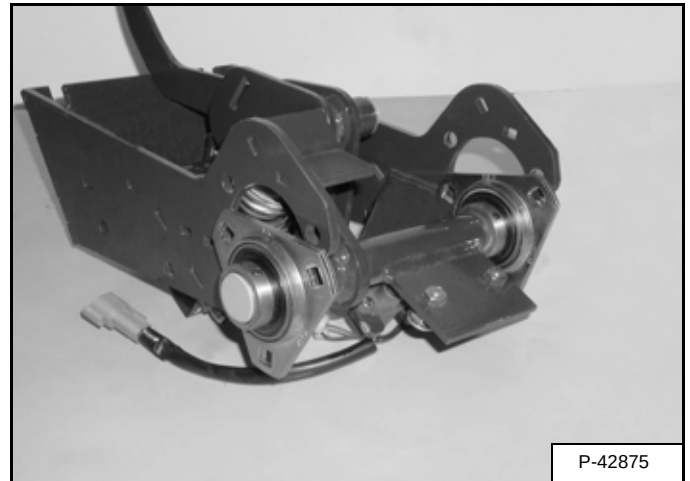
Loosen the two set screws (Item 1) [Figure 60-140-9] on the two bearings.

Figure 60-140-10



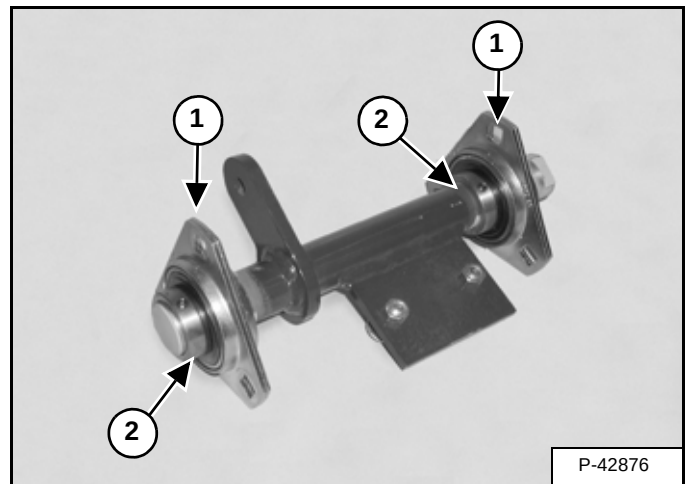
Remove the three bolts (Item 1) [Figure 60-140-10] from both bearing flanges.

Figure 60-140-11



Remove the shaft and bearing assembly [Figure 60-140-11].

Figure 60-140-12

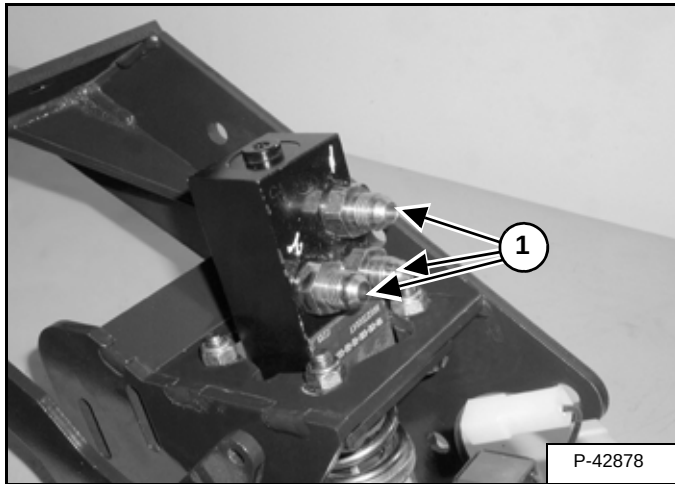


Remove the flanges (Item 1) and bearings (Item 2) [Figure 60-140-12].

PEDAL ASSEMBLY (CONT'D)

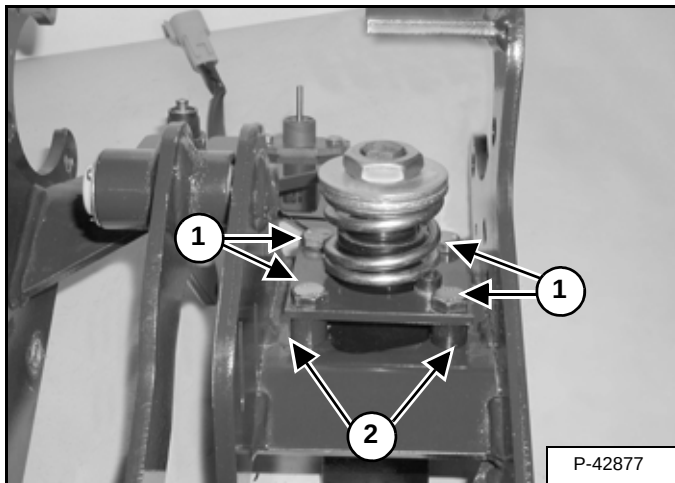
Disassembly And Assembly (Cont'd)

Figure 60-140-13



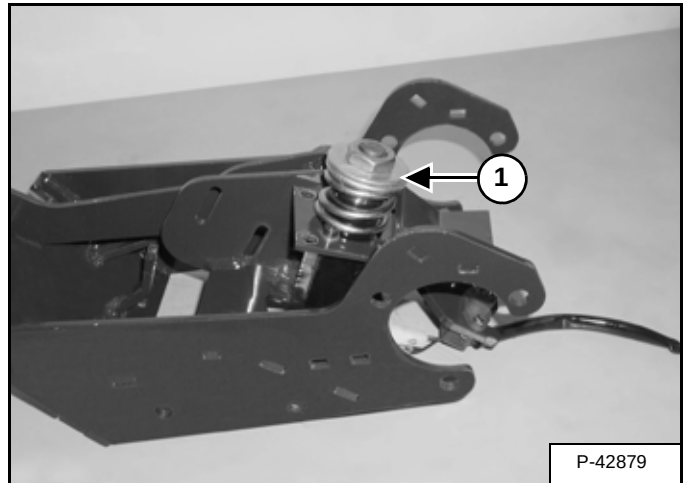
Remove the three fittings (Item 1) [Figure 60-140-13] from the brake valve.

Figure 60-140-14



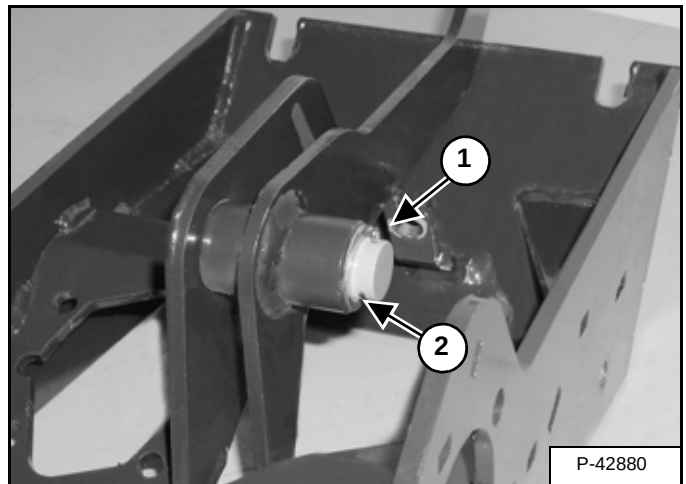
Remove the four bolts (Item 1) spacers (Item 2) [Figure 60-140-14] and nuts from the brake valve.

Figure 60-140-15



Remove the brake valve (Item 1) [Figure 60-140-15].

Figure 60-140-16

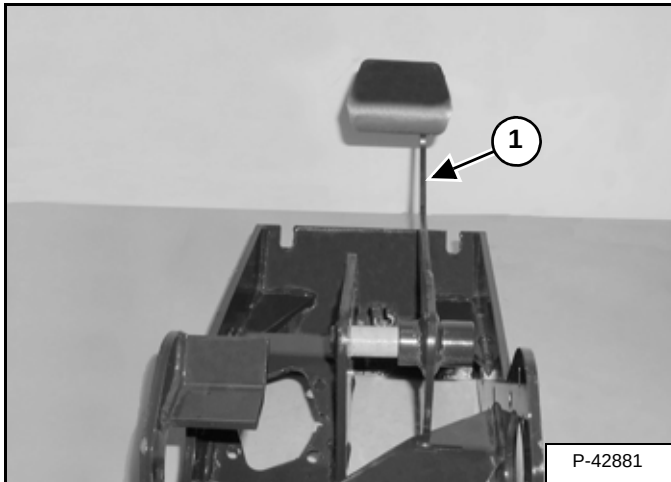


Remove the retainer pin (Item 1) and washer (Item 2) [Figure 60-140-16].

PEDAL ASSEMBLY (CONT'D)

Disassembly And Assembly (Cont'd)

Figure 60-140-17

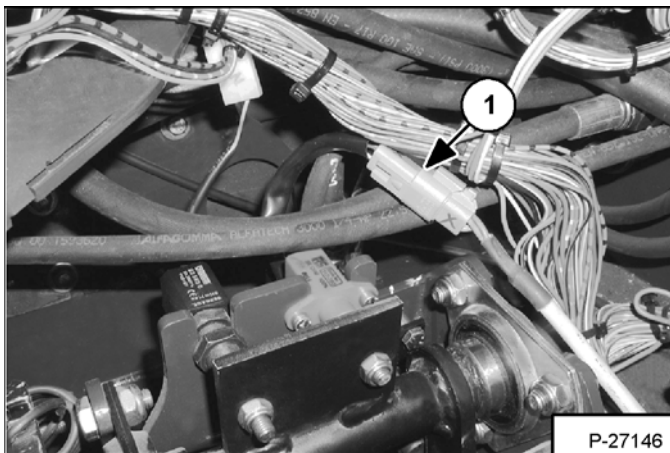


Remove the pedal (Item 1) [Figure 60-140-17].

INCHING SWITCH

Removal And Installation

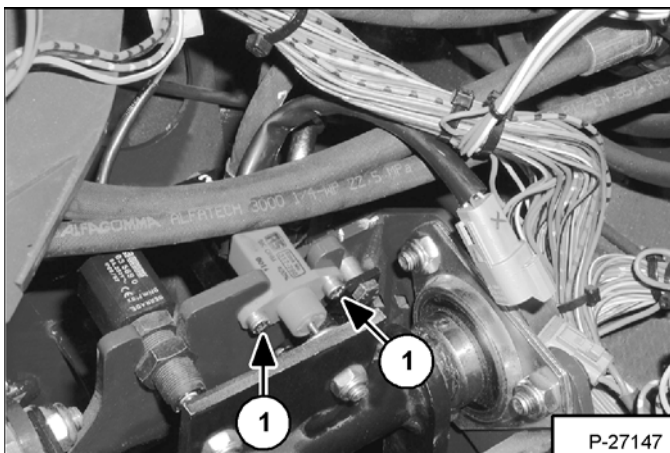
Figure 60-150-1



Remove the dash cover/column cover. (See Content Page 50-01.)

Remove the tie strap (Item 1) and unplug the switch connector (Item 2) [Figure 60-150-1] from the harness.

Figure 60-150-2



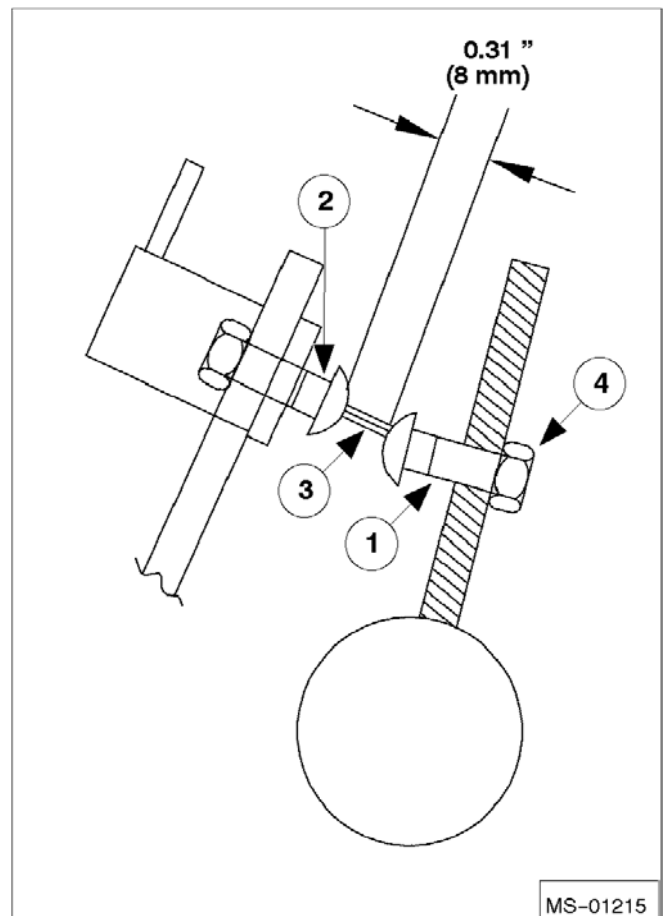
Remove the two mounting bolts and nuts (Item 1) [Figure 60-150-2].

Installation: Be sure the switch is on the front side of the mounting bracket.

Remove the switch.

Adjustment

Figure 60-150-3



Remove the dash cover/column cover. (See Content Page 50-01.)

With the brake pedal in the rest position, turn the adjustment bolt (Item 1) so that it is 0.31 in. (8 mm) away from the switch body (Item 2) [Figure 60-150-3].

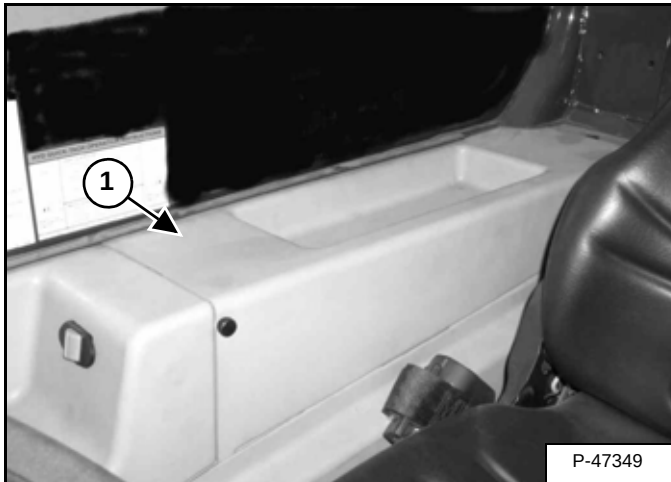
Check that the potentiometer rod (Item 3) [Figure 60-150-3] is in contact with the center of the adjusting bolt.

When adjustment is complete, tighten the nut (Item 4) [Figure 60-150-3] without turning the adjusting bolt.

SERVICE SOFTWARE

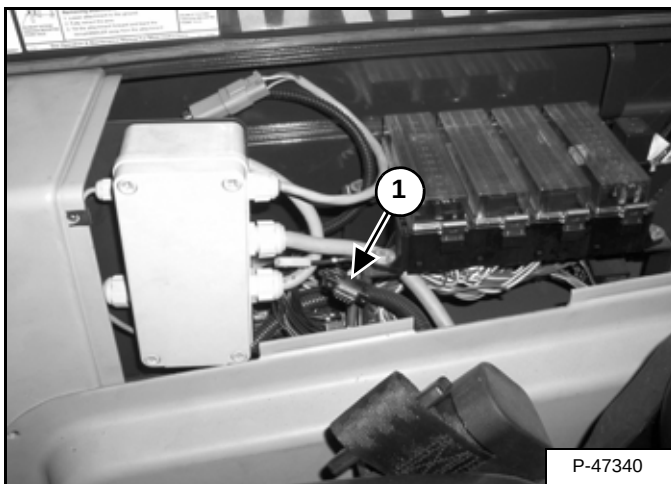
Connecting The Laptop Computer

Figure 60-160-1



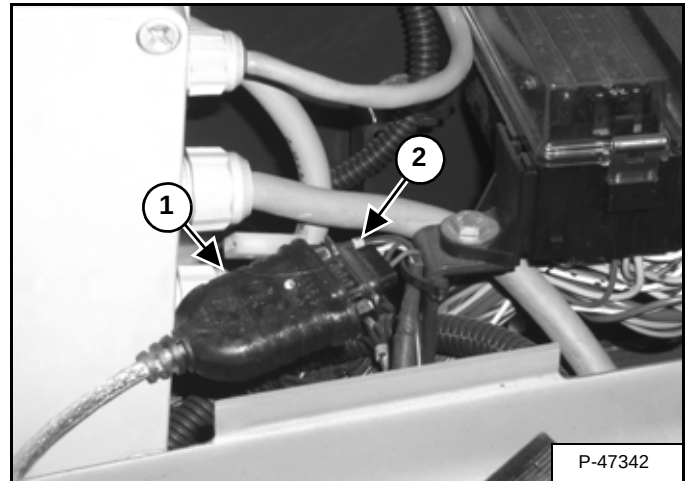
Remove the console cover (Item 1) [Figure 60-160-1].

Figure 60-160-2



Locate the nine pin connector (Item 1) [Figure 60-160-2].

Figure 60-160-3



Plug the connector (Item 1) from the laptop computer into the nine pin connector (Item 2) [Figure 60-160-3].

Figure 60-160-4

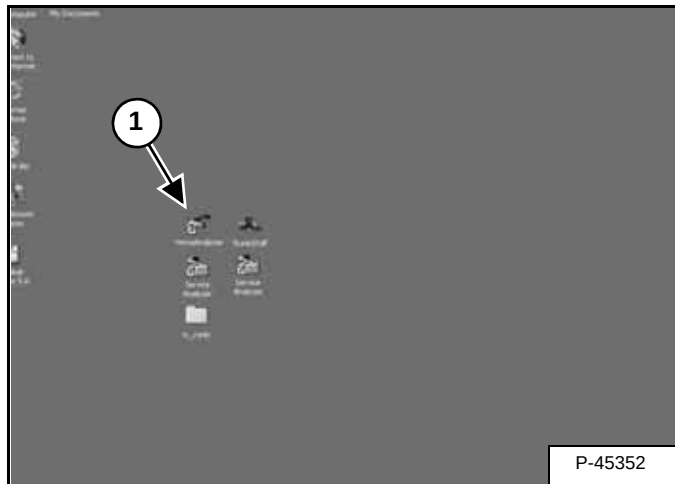


Open the laptop and begin [Figure 60-160-4].

SERVICE SOFTWARE (CONT'D)

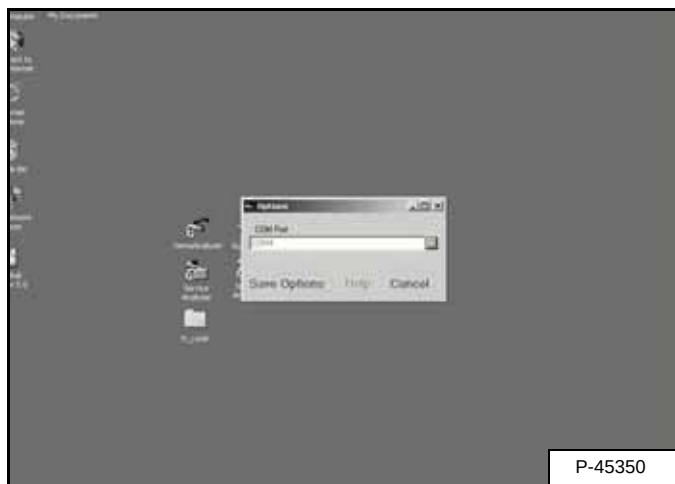
Entering The Service Software

Figure 60-160-5



Click the Telehandler icon (Item 1) [Figure 60-160-5] to enter the program.

Figure 60-160-6



The option screen will appear when entering the Telehandler service analyzer [Figure 60-160-6]. The com port can be changed, if com port 1 is already being used.

Figure 60-160-7



This is the Main Screen of the Telehandler analyzer program [Figure 60-160-7].

Figure 60-160-8

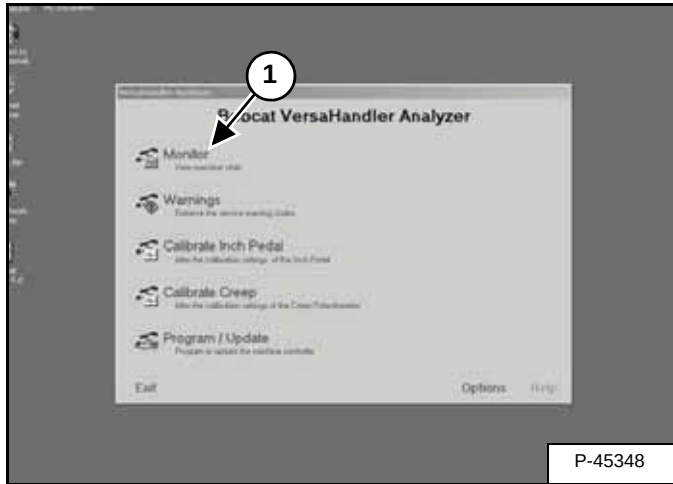


The options icon will take you to the options screen [Figure 60-160-8]. The com port can be changed, if com port 1 is already being used.

SERVICE SOFTWARE (CONT'D)

Monitor Screen

Figure 60-160-9



Select the Monitor icon (Item 1) [Figure 60-160-9].

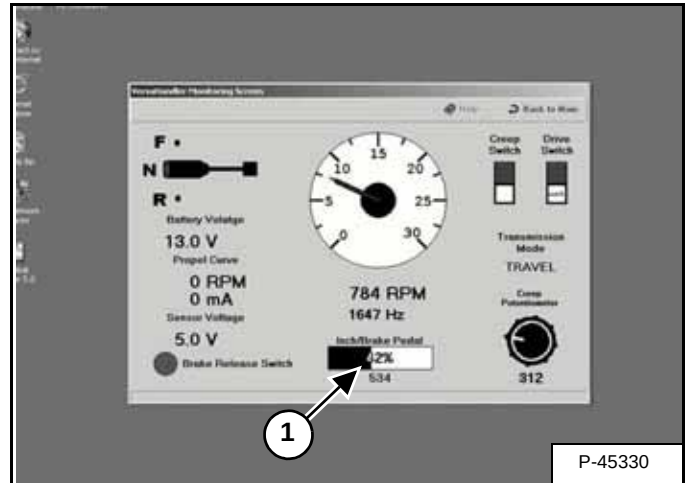
Figure 60-160-10



The Monitor screen displays the engine RPM, travel control position, battery voltage, propel curve, sensor voltage, brake release switch, inch/brake pedal, creep potentiometer (if so equipped), transmission mode, drive switch and creep switch [Figure 60-160-10].

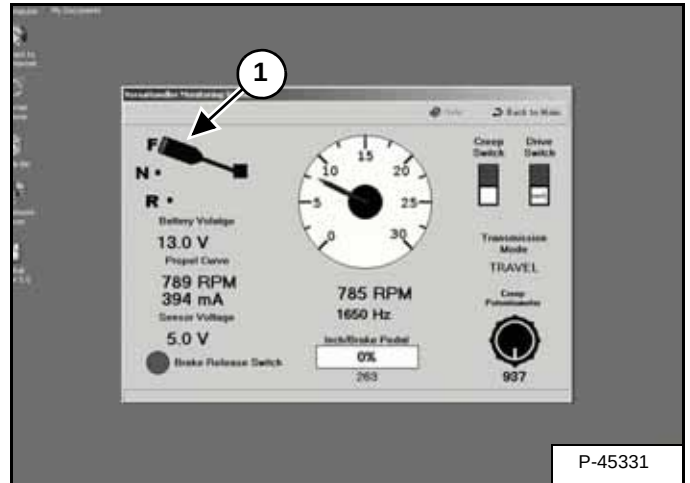
If one of the icons does not change when the function is operated, the circuit is not operating properly or the susmic controller has a malfunction.

Figure 60-160-11



The Inch/Brake pedal graph (Item 1) [Figure 60-160-11] should move as the pedal is pressed down.

Figure 60-160-12

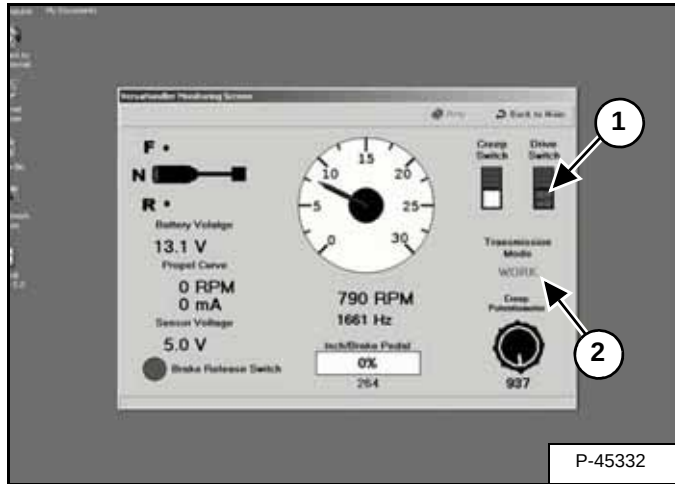


The travel control position lever (Item 1) [Figure 60-160-12] should move as the lever in the Telehandler is moved.

SERVICE SOFTWARE (CONT'D)

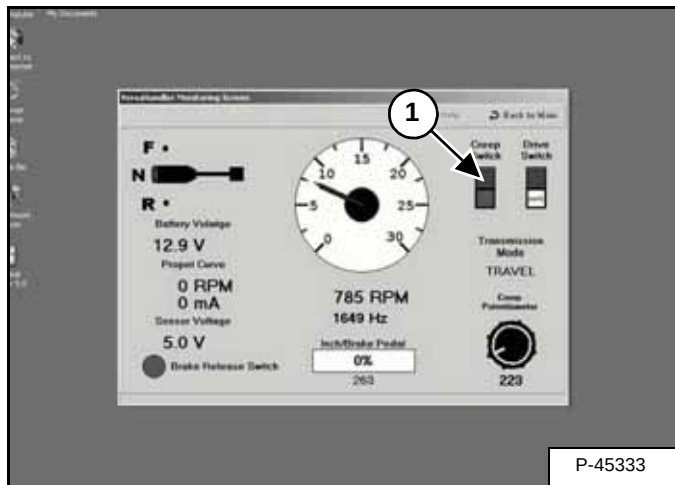
Monitor Screen (Cont'd)

Figure 60-160-13



The Work Switch is turned on, the icon (Item 1) will turn on and the Transmission mode will change to work (Item 2) [Figure 60-160-13].

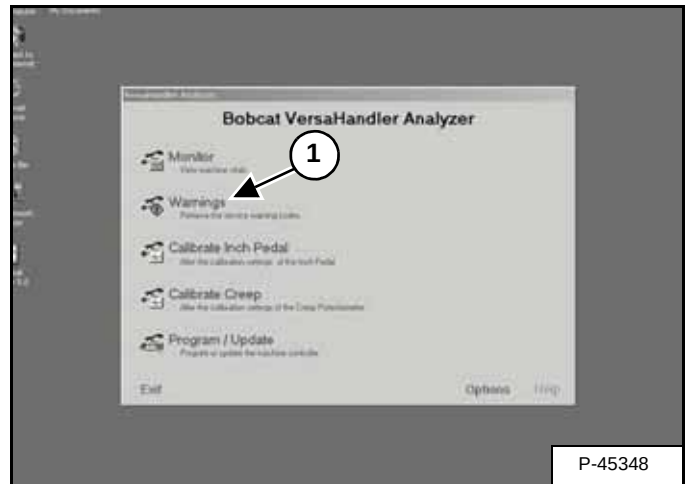
Figure 60-160-14



With the Creep Switch turned on, the icon (Item 1) [Figure 60-160-14] will turn on. The creep potentiometer icon will change as the creep adjustment is turned.

Warnings Screen

Figure 60-160-15



Select on the warning icon (Item 1) [Figure 60-160-15].

Figure 60-160-16



The warning screen will show codes and problem with the controller [Figure 60-160-16].

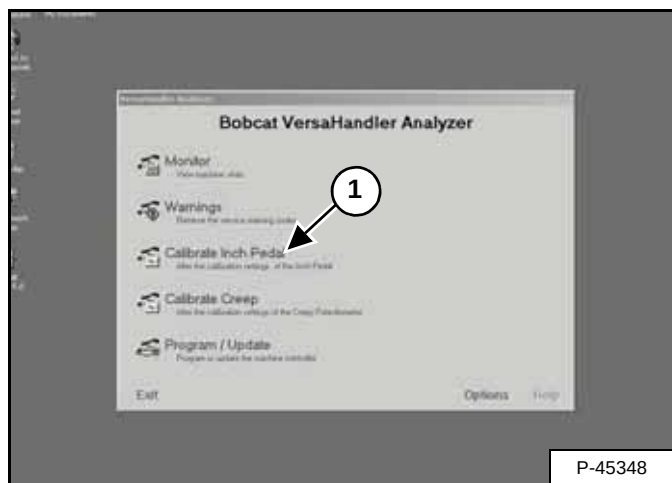
SERVICE SOFTWARE (CONT'D)

Warnings Screen (Cont'd)

Error #	Description
01	Sensor supply voltage-sensor voltage out of range
17	Software did not load properly-Restart program and reload software
18	Inch pedal calibration failed-recalibrate the inch pedal
19	Inch/brake potentiometer-no pedal setup done, value too low, value too high
20	Engine speed pickup-engine speed missed when starting engine
21	Propel current-short cut, open circuit
22	F-N-R switch-short cut between forward and reverse
23	Engine speed pickup-engine speed interrupted
24	Hydro motor propel current-short cut, open circuit
25	Creep drive calibration failed-recalibrate the creep drive potentiometer
26	Creep drive potentiometer-value too low, value too high
27	Motor speed pickup-motor speed interrupted

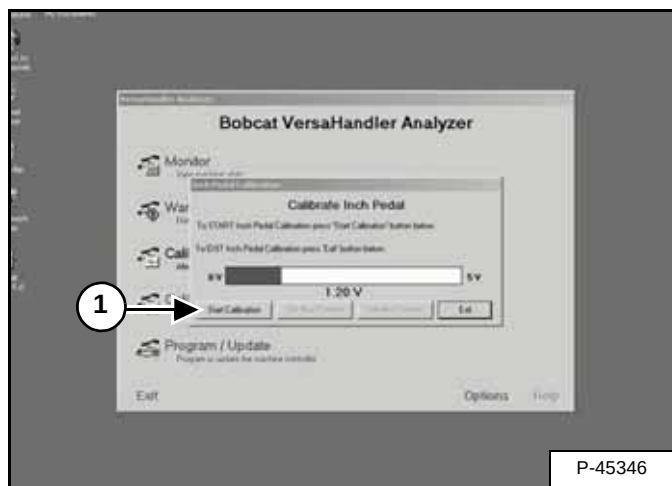
Calibrate Inch Pedal

Figure 60-160-17



Select the calibrate inch pedal icon (Item 1) [Figure 60-160-17].

Figure 60-160-18

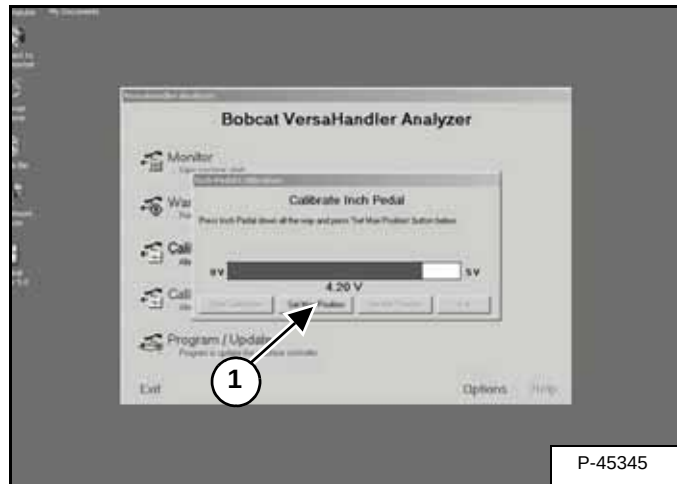


Click on the Start Calibration (Item 1) [Figure 60-160-18].

SERVICE SOFTWARE (CONT'D)

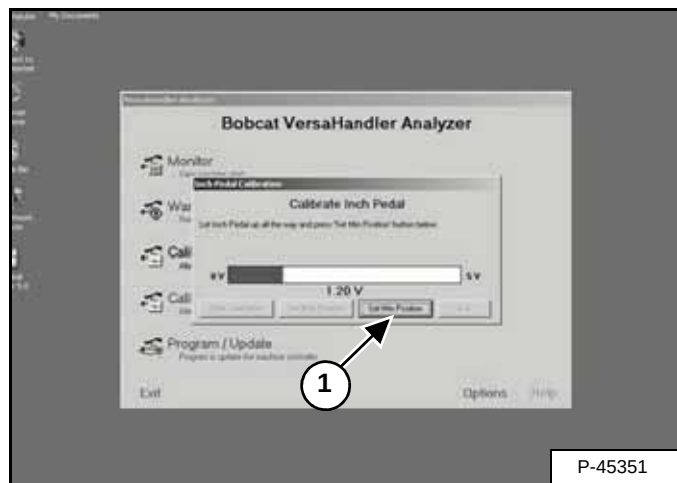
Calibrate Inch Pedal (Cont'd)

Figure 60-160-19



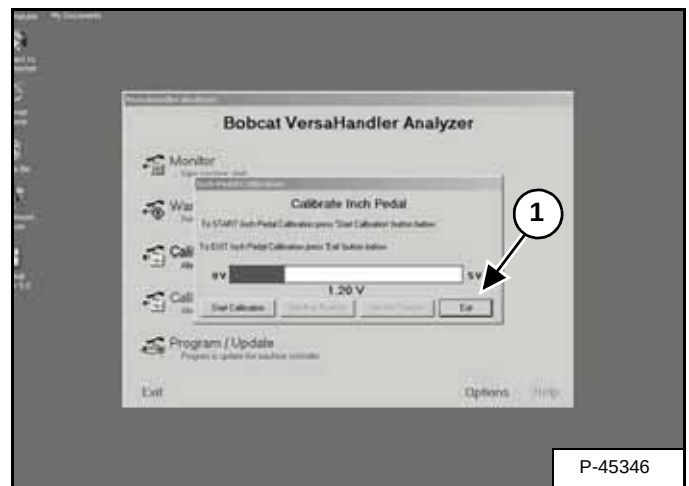
Press the brake pedal down approximately 1/2 the stroke and click on the set max position icon (Item 1) [Figure 60-160-19].

Figure 60-160-20



Release the brake pedal and click on the set min position icon (Item 1) [Figure 60-160-20].

Figure 60-160-21



Click the exit (Item 1) [Figure 60-160-21] to get out of the calibrate inch pedal.

ENGINE SERVICE

NOT YET AVAILABLE

Please refer to the Engine TEC CD -
Workshop Service Manual 1104

ENGINE
SERVICE

Please refer to the Engine TEC CD -
Workshop Service Manual 1104

ENGINE SPEED CONTROL

Not Available At Time Of Printing

**Please refer to the Engine TEC CD -
Workshop Service Manual 1104**

Please refer to the Engine TEC CD -
Workshop Service Manual 1104

MUFFLER

Not Available At Time Of Printing

**Please refer to the Engine TEC CD -
Workshop Service Manual 1104**

**Please refer to the Engine TEC CD -
Workshop Service Manual 1104**

AIR CLEANER

Not Available At Time Of Printing

**Please refer to the Engine TEC CD -
Workshop Service Manual 1104**

**Please refer to the Engine TEC CD -
Workshop Service Manual 1104**

RADIATOR

Not Available At Time Of Printing

**Please refer to the Engine TEC CD -
Workshop Service Manual 1104**

**Please refer to the Engine TEC CD -
Workshop Service Manual 1104**

ENGINE AND ENGINE MOUNTS

Not Available At Time Of Printing

**Please refer to the Engine TEC CD -
Workshop Service Manual 1104**

**Please refer to the Engine TEC CD -
Workshop Service Manual 1104**

ENGINE COMPONENTS AND TESTING

Not Available At Time Of Printing

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Workshop Service Manual 1104**

**Please refer to the Engine TEC CD -
Workshop Service Manual 1104**

ENGINE/HYDROSTAT ASSEMBLY

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Workshop Service Manual 1104**

**Please refer to the Engine TEC CD -
Workshop Service Manual 1104**

FLYWHEEL AND HOUSING

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Workshop Service Manual 1104**

**Please refer to the Engine TEC CD -
Workshop Service Manual 1104**

RECONDITIONING THE ENGINE

Not Available At Time Of Printing

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Workshop Service Manual 1104**

Please refer to the Engine TEC CD -
Workshop Service Manual 1104

HEATING, VENTILATION, AIR CONDITIONING

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HVAC

Continued On Next Page

HEATING, VENTILATION, AIR CONDITIONING (CONT'D)

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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) "Chart" on page 80-10-2 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) "Chart" on page 80-10-2.

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.

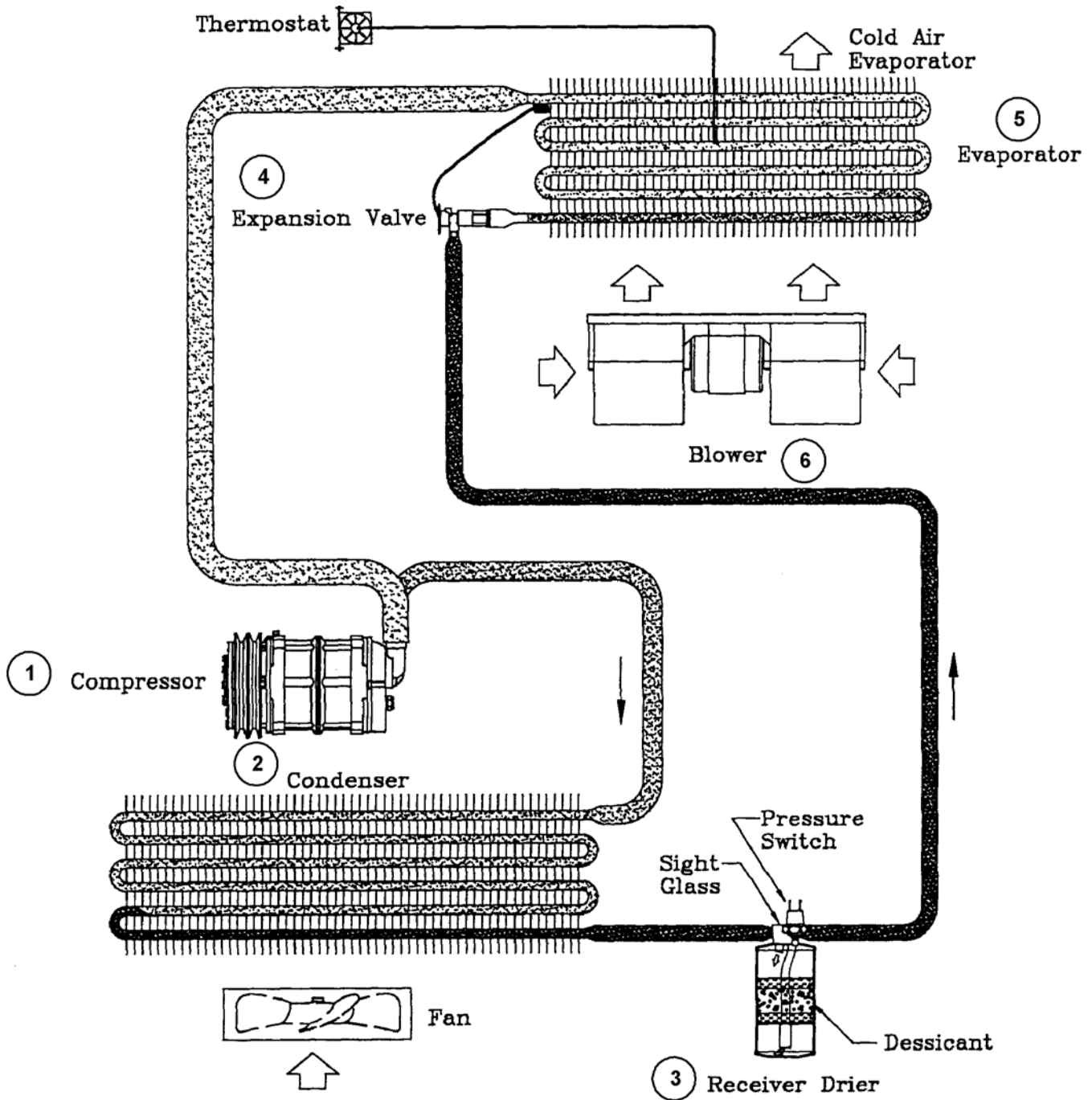
The liquid refrigerant moves on to the receiver/drier (Item 3) "Chart" on page 80-10-2 where impurities such as moisture and dirt are filtered out. The receiver/drier also serves as the storage tank for the liquid refrigerant. The liquid refrigerant (still under high pressure) flows to the expansion valve (Item 4) "Chart" on page 80-10-2.

The expansion valve meters the amount of refrigerant into the evaporator coil (Item 5) "Chart" on page 80-10-2. 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 (blower) (Item 6) "Chart" on page 80-10-2. 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.

AIR CONDITIONING SYSTEM FLOW (CONT'D)

Chart



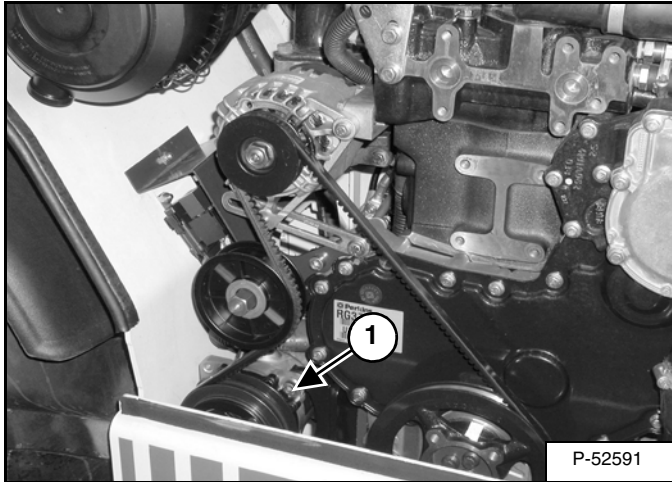
Status Of R134a

	High Pressure Gas		Low Pressure Liquid
	High Pressure Liquid		Low Pressure Gas

COMPONENTS

Identification

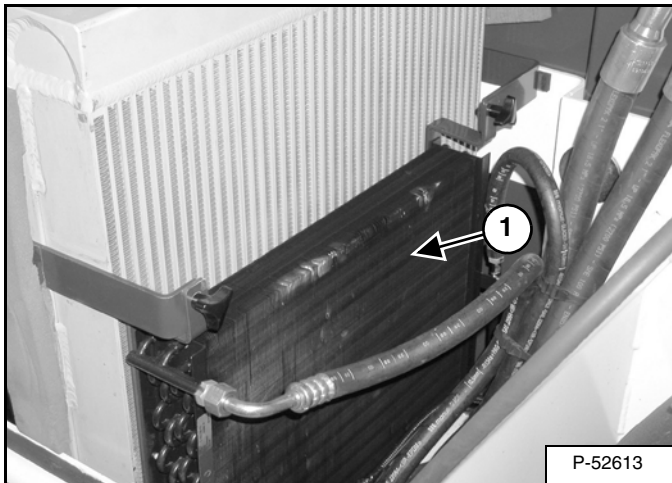
Figure 80-20-1



Compressor: The compressor (Item 1) [Figure 80-20-1] 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.

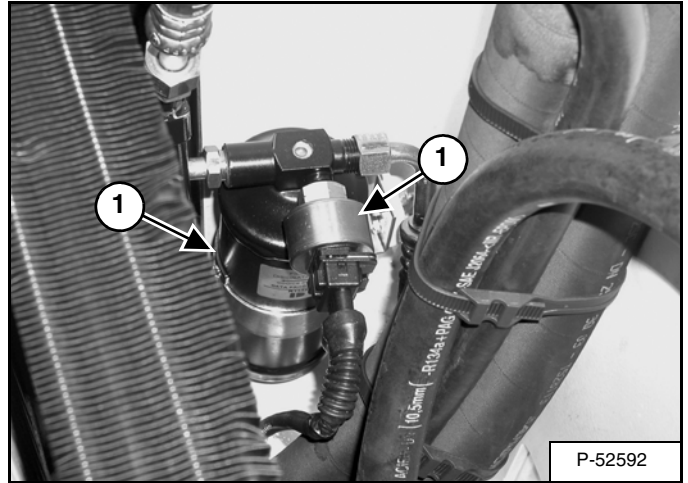
NOTE: The A/C System (compressor) is recommended to be turned on for at least 5 minutes weekly throughout the year to lubricate the internal components.

Figure 80-20-2



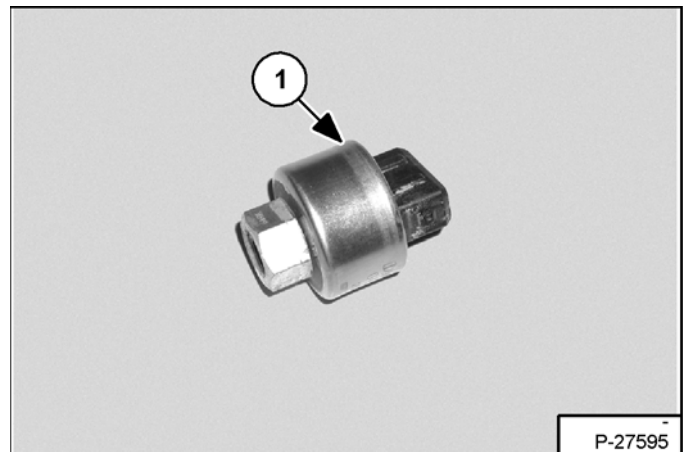
Condenser: The condenser (Item 1) [Figure 80-20-2] is the unit that receives the high pressure, high temperature refrigerant vapor from the compressor and condenses it into a high temperature liquid.

Figure 80-20-3



Receiver/Drier: The receiver/drier (Item 1) [Figure 80-20-3] 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.

Figure 80-20-4

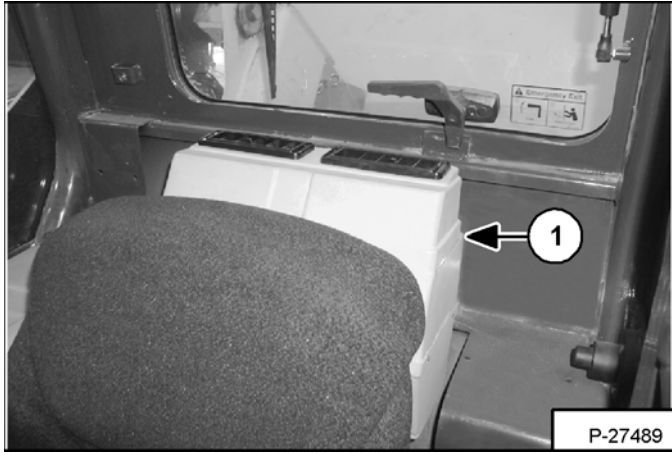


Pressure Switch: The pressure switch (Item 1) [Figure 80-20-4] is located on the receiver/drier assembly (Item 2) [Figure 80-20-3]. It will disengage the compressor clutch if the pressure readings are too low or too high, which indicates loss of refrigerant.

COMPONENTS (CONT'D)

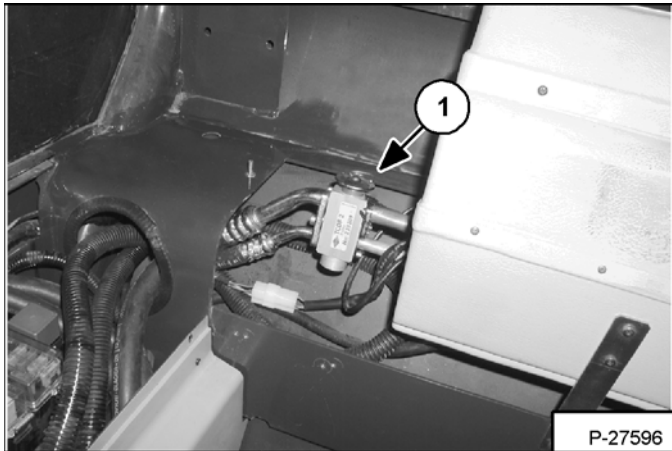
Identification (Cont'd)

Figure 80-20-5



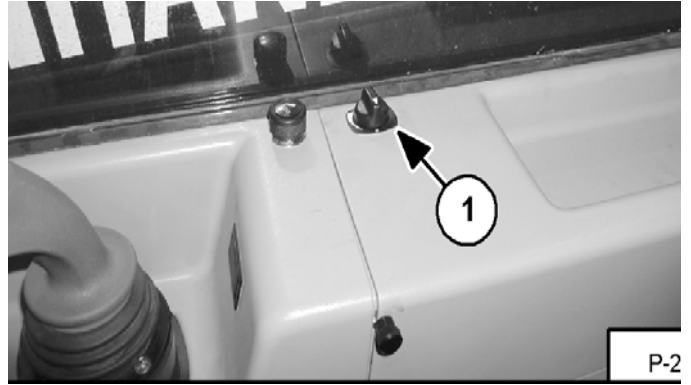
Evaporator Unit: The evaporator unit (Item 1) [Figure 80-20-5] is located behind the operator seat inside the cab. The unit delivers the cold air for the A/C into the cab. The unit also contains the blower fan, evaporator coil and thermostat which are not serviceable.

Figure 80-20-6



Expansion Valve: The expansion valve (Item 1) [Figure 80-20-6] controls the amount of refrigerant entering the evaporator coil.

Figure 80-20-7



Blower Fan Switch: This is a three position switch (Item 1) [Figure 80-20-7]. When the blower fan switch is in the OFF position the A/C will not engage.

SAFETY

Safety Equipment

! 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

! WARNING

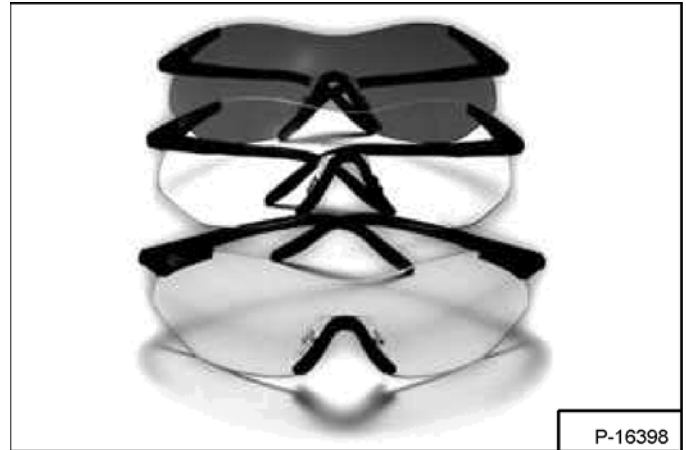
HFC 134A refrigerant can be dangerous if not properly handled. Liquid 134A may cause blindness if it contacts the eyes and may cause serious frostbite if it contacts the skin.

- 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 80-30-1



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.

In addition to exercising caution in your work, **DO WEAR SAFETY GLASSES OR A FACE SHIELD [Figure 80-30-1]** when you are using R-134a or 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.

Figure 80-30-2

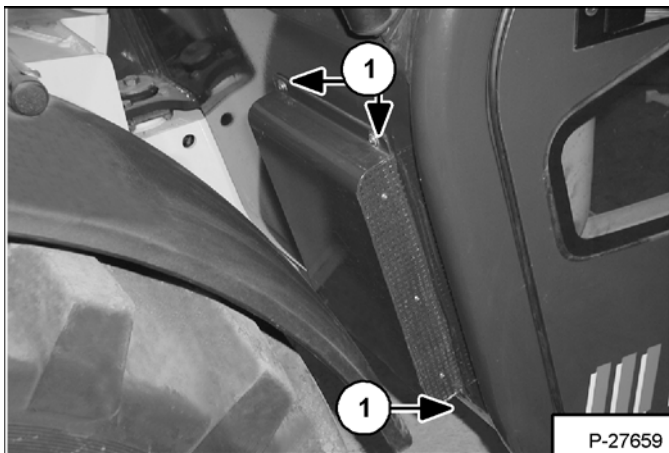


R-134a inside a canister or in an A/C system is a liquid under pressure. When it escapes or releases into the air, **ITS TEMPERATURE DROPS TO 21.6 F DEGREES "INSTANTLY"**. If it spills on your skin or in your eyes you should flood the area with cool water and **SEEK MEDICAL ATTENTION FAST!** It is a good idea to wear gloves [Figure 80-30-2] to prevent frost bite if you should get refrigerant on your hands.

REGULAR MAINTENANCE

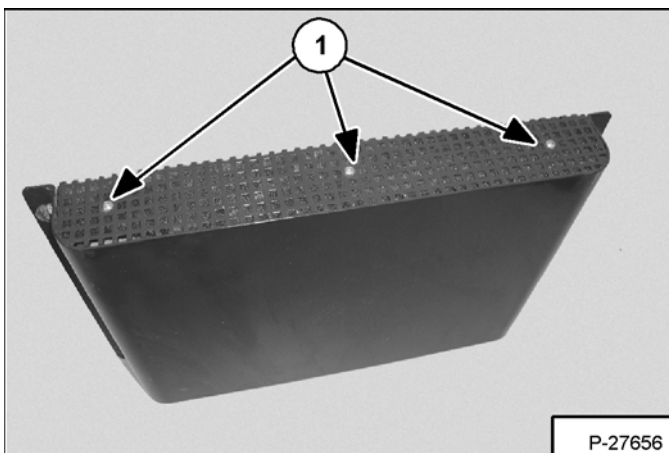
Filter Element Removal And Installation

Figure 80-40-1



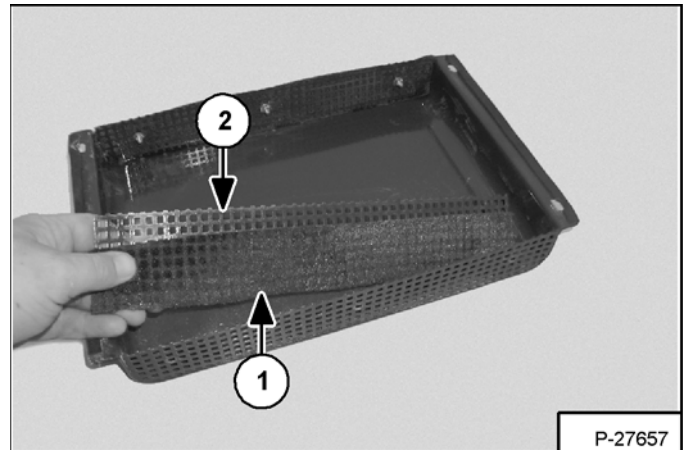
Remove the four mount bolts (Item 1) [Figure 80-40-1] from the fresh air filter cover at the front of the cab.

Figure 80-40-2



Remove the three filter mount bolts (Item 1) [Figure 80-40-2].

Figure 80-40-3



Remove the filter (Item 1) and backup screen (Item 2) [Figure 80-40-3].

Figure 80-40-4



The fresh air filter [Figure 80-40-4] is made of open cell foam and should be cleaned with water. A mild detergent may also be used.

REGULAR MAINTENANCE (CONT'D)

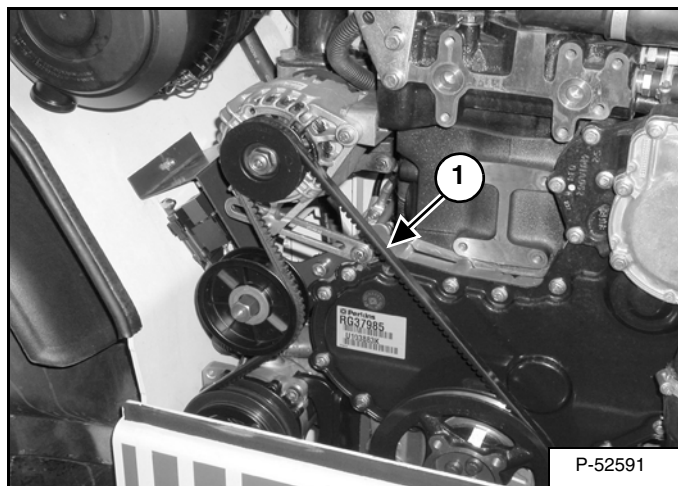
Compressor Drive Belt Inspection

It is a good rule to regularly inspect (weekly) the compressor drive belt for tension and wear.

Open the engine cover.

Remove the drive belt cover.

Figure 80-40-5



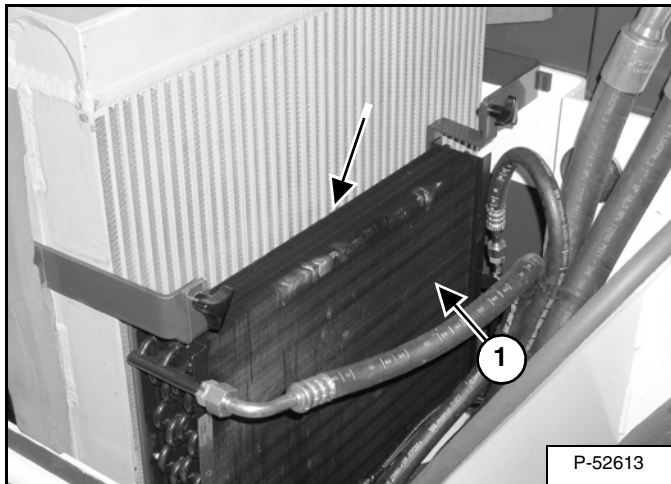
Check the tension on the compressor belt (Item 1) [Figure 80-40-5].

Cleaning The Condenser

Open the engine cover.

Temporarily remove the air cleaner. (See Page 70-01.)

Figure 80-40-6



Clean the condenser (Item 1) [Figure 80-40-6] using water or air pressure.

NOTE: Clean between the oil cooler and condenser.

BASIC TROUBLESHOOTING

Poor A/C Performance

Start the Telehandler, engage the parking brake. Engage the A/C system with the blower fan on high. Run the Telehandler at full RPM for approximately 15 minutes, with the cab door closed.

Figure 80-50-1

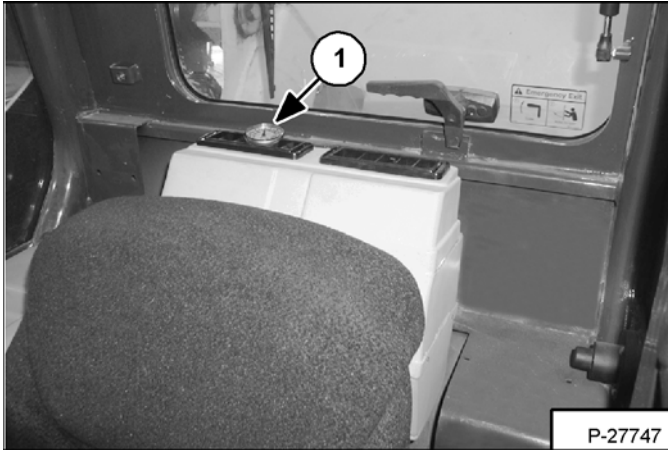
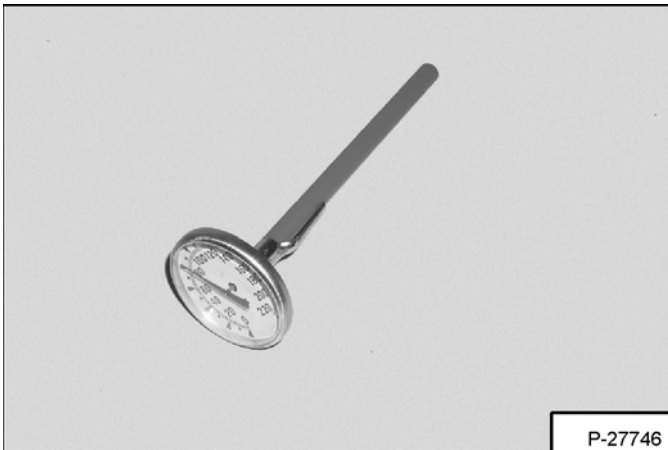


Figure 80-50-2



Check the temperature at the louvers (Item 1) [Figure 80-50-1] with a thermometer [Figure 80-50-2].

The louver temperature should be between 36-53°F (2.2-11,6° C) depending on the amount of humidity in the air.

If the louver temperature is too high. (See System Troubleshooting Chart Contents Page 80-01.)

Check the blower fan for proper operation or noise, and replace if necessary. (See Contents Page 80-01.)

Check the belt tension on the A/C compressor. (See Contents Page 80-01.)

Check the A/C condenser for dirt or mud, and clean if necessary. (See Contents Page 80-01.)

Inspect the sight glass located on the receiver/drier for air bubbles. (See Contents Page 80-01.)

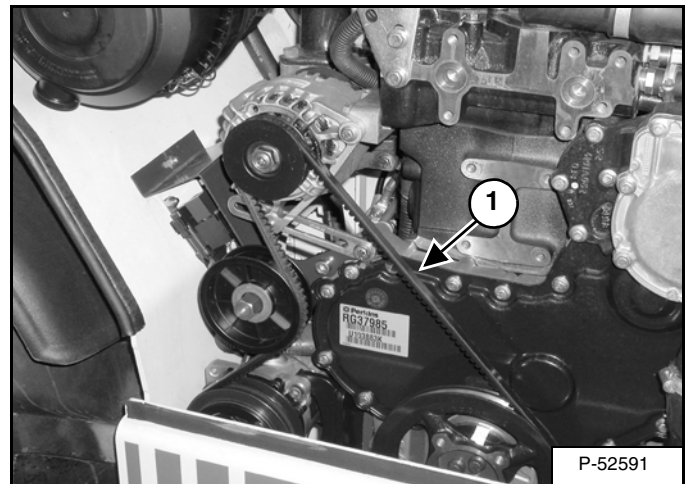
Compressor Drive Belt Inspection

Regularly inspect (weekly) the compressor drive belt for wear.

Open the engine cover.

Remove the belt cover.

Figure 80-50-3

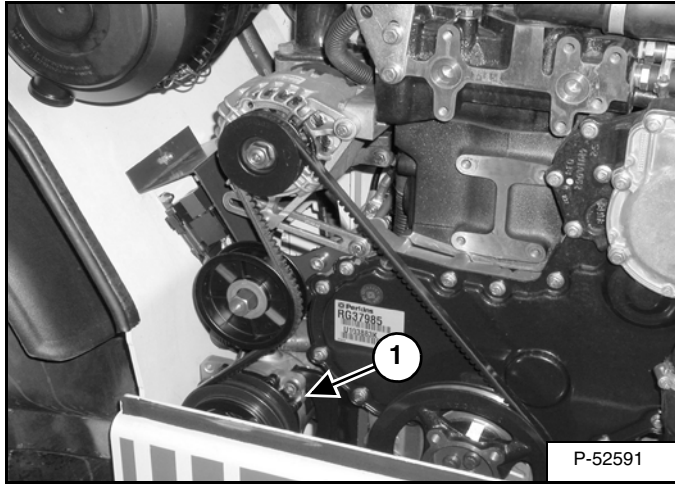


Check the tension on the compressor belt (Item 1) [Figure 80-50-3].

BASIC TROUBLESHOOTING (CONT'D)

Checking The Electrical System

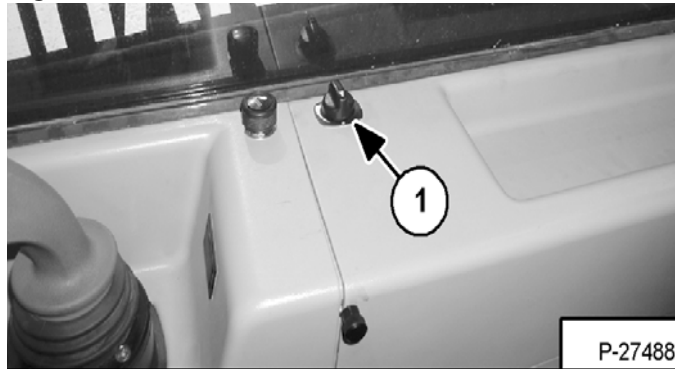
Figure 80-50-4



Check to see if the compressor clutch (Item 1) [Figure 80-50-4] is engaging.

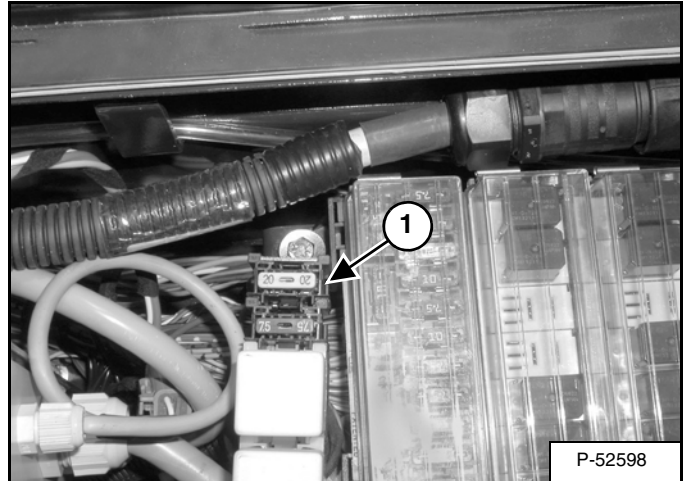
Turn the ignition key switch to the RUN position without starting the machine.

Figure 80-50-5



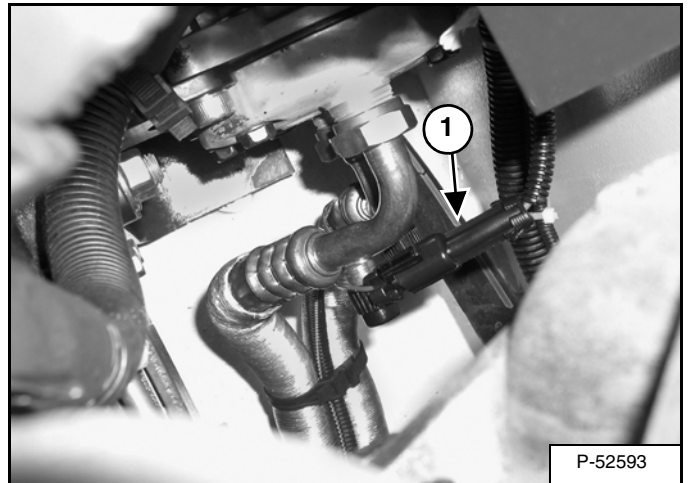
Turn the blower fan switch (Item 1) [Figure 80-50-5] to the first on position, the compressor clutch should make a click sound, which indicates the clutch is engaging.

Figure 80-50-6



If the compressor clutch does not engage, check the fuse (Item 1) [Figure 80-50-6]. Replace the fuse if needed.

Figure 80-50-7

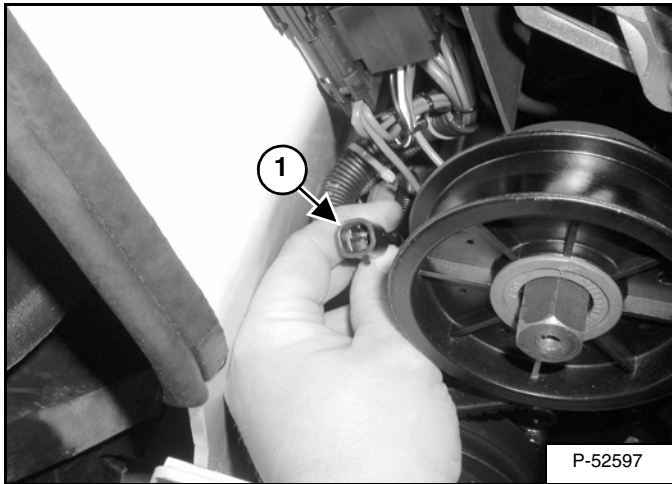


Unplug the connector (Item 1) [Figure 80-50-7] from the compressor.

BASIC TROUBLESHOOTING (CONT'D)

Checking The Electrical System (Cont'd)

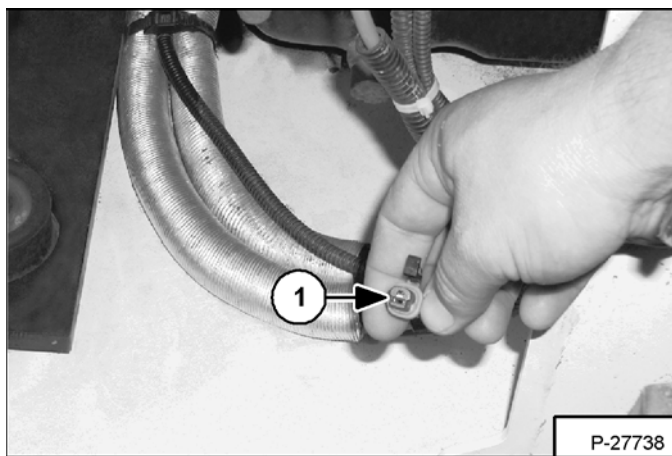
Figure 80-50-8



With a multimeter check the resistance to the compressor clutch connector (Item 1) [Figure 80-50-8].

If there is no resistance value replace the compressor clutch. (See Contents Page 80-01.)

Figure 80-50-9

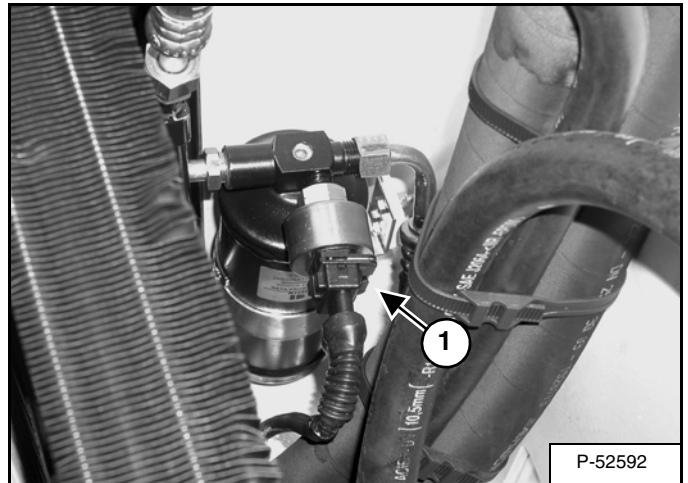


With a multimeter, check the voltage to the compressor clutch at the main harness (Item 1) [Figure 80-50-9].

If there is no power at the clutch, check the wiring harness for broken wires.

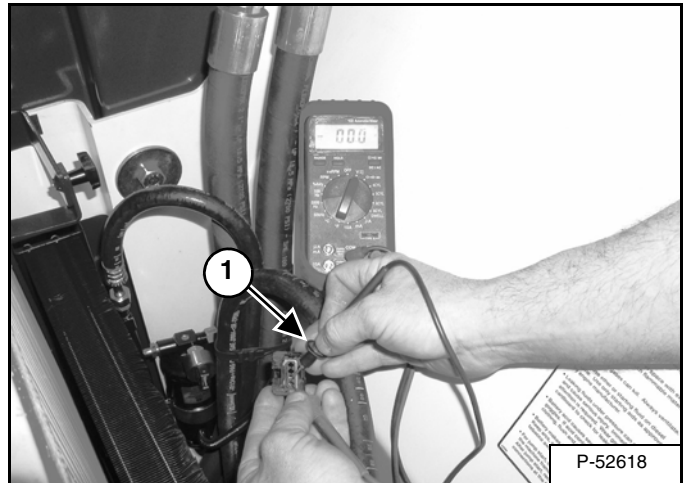
If there is no power at the clutch, reconnect the wiring harness to the compressor clutch.

Figure 80-50-10



Disconnect the machine harness (Item 1) [Figure 80-50-10] from the pressure switch.

Figure 80-50-11



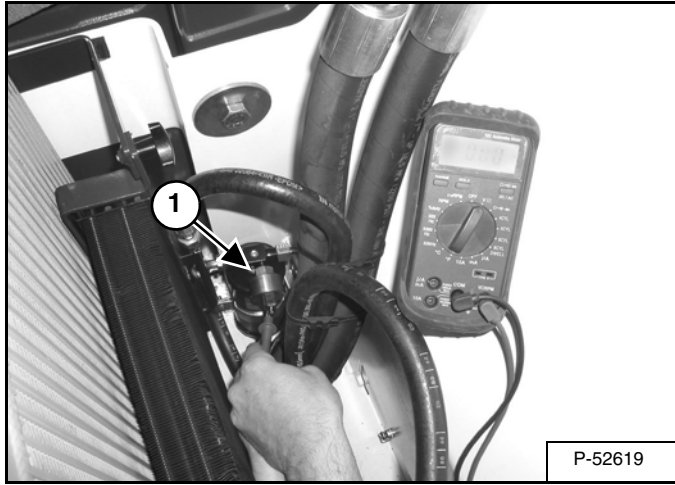
With the key switch to the run position (engine off) and the blower fan switch on the first position. Use a multimeter to check the main harness (Item 1) [Figure 80-50-11] for voltage.

There should be 12 volts. If there is no voltage, check the harness for broken wires.

BASIC TROUBLESHOOTING (CONT'D)

Checking The Electrical System (Cont'd)

Figure 80-50-12



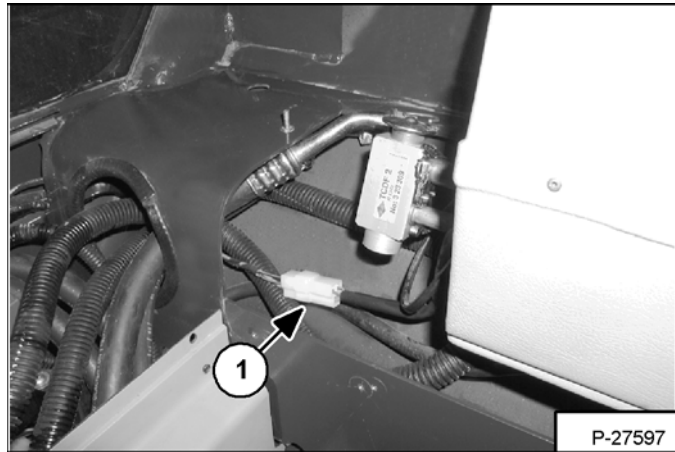
If there is voltage at the harness, check the resistance at the pressure switch (Item 1) [Figure 80-50-12].

If there is no resistance value, check for a low refrigerant level. (See Contents Page 80-01.)

If good resistance value is observed, the pressure switch is good.

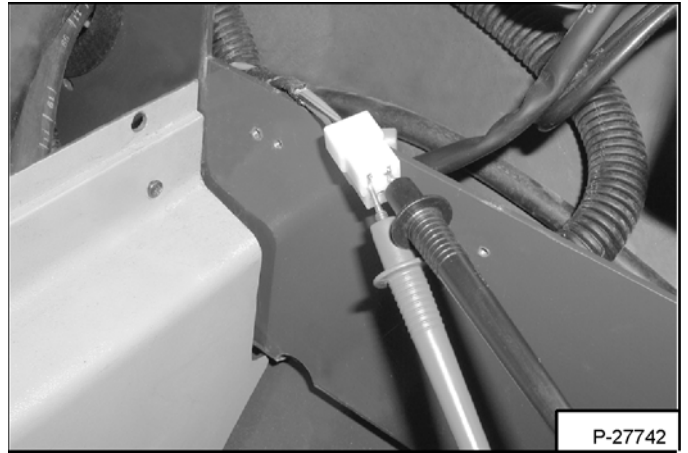
Reconnect the main harness to the pressure switch.

Figure 80-50-13



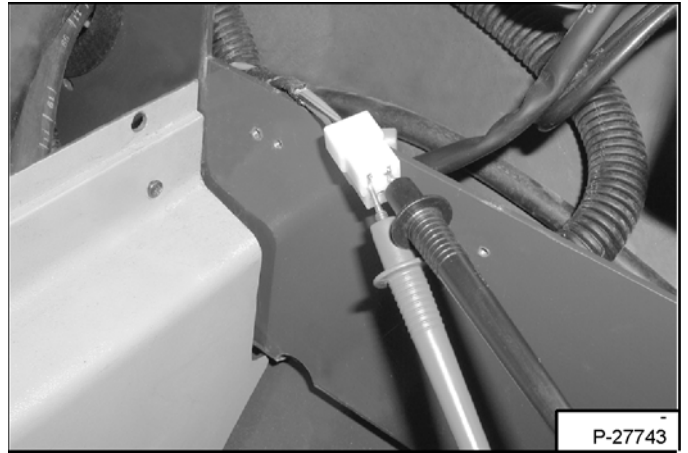
Disconnect the thermostat wiring connector (Item 1) [Figure 80-50-13] from the main harness.

Figure 80-50-14



Check the main harness (Item 1) [Figure 80-50-14] for voltage. The voltage should be 12 volts. If there is no voltage, check the harness for broken wires.

Figure 80-50-15



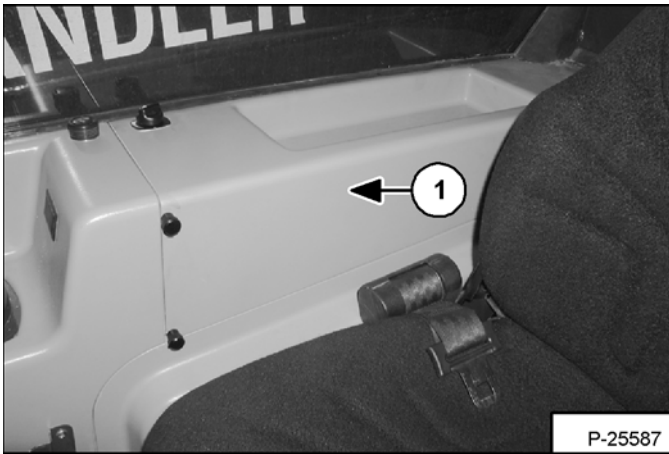
If there is voltage at the wiring harness, check the thermostat wire (green) for resistance. The resistance value should be 10 ohms at 68° F (20 ° C) [Figure 80-50-15].

If there is no resistance, replace the entire blower fan unit.

BASIC TROUBLESHOOTING (CONT'D)

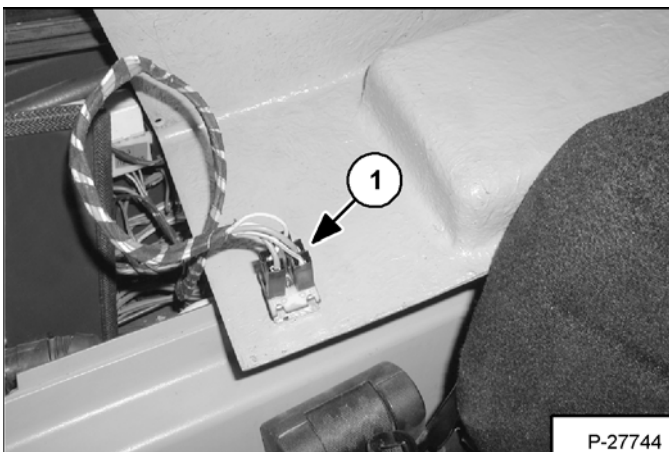
Checking The Electrical System (Cont'd)

Figure 80-50-16



Remove the fuse box cover (Item 1) [Figure 80-50-16].

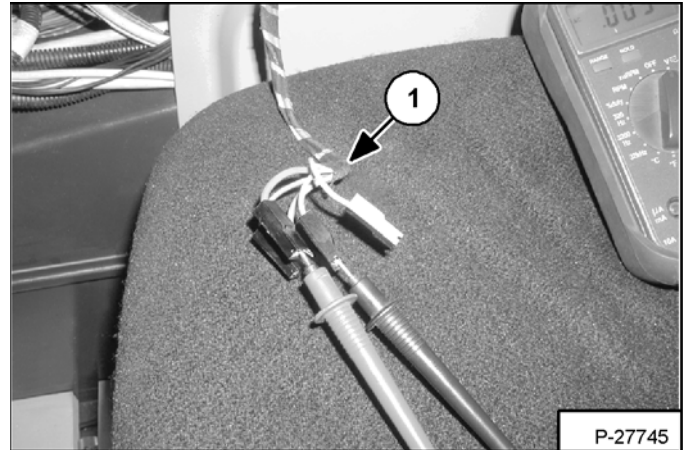
Figure 80-50-17



Disconnect the main wire harness connectors (Item 1) [Figure 80-50-17] from the switch.

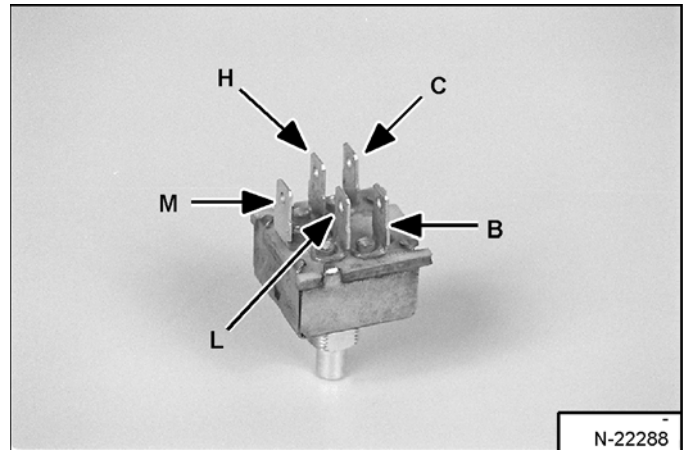
NOTE: Mark the wires for correct assembly.

Figure 80-50-18



Check the main harness (Item 1) [Figure 80-50-18] for voltage. The voltage should be 12 volts if there is no voltage check the harness for broken wires.

Figure 80-50-19



If there is voltage at the main harness check the blower fan switch [Figure 80-50-19] 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 the **B** terminal. And also between the **C** terminal and the **L** terminal frame [Figure 80-50-19].

With the switch in the **2** position, there should be resistance between **C** terminal and the **B** terminal. And also between the **C** terminal and the **M** terminal frame [Figure 80-50-19].

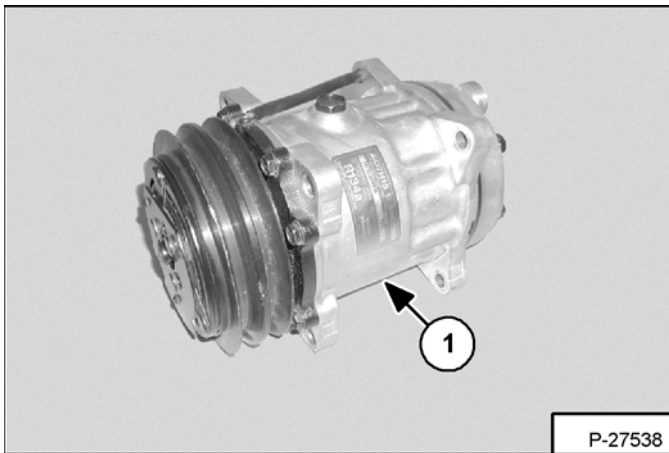
With the switch in the **3** position, there should be resistance between **C** terminal and the **B** terminal. And also between the **C** terminal and the **H** terminal frame [Figure 80-50-19].

If any of the above resistance tests fail, replace the blower fan switch.

GENERAL AIR CONDITIONING SERVICE GUIDELINES

Compressor Oil

Figure 80-60-1



The compressor (Item 1) [Figure 80-60-1] is factory filled with 150-170 cc's of PAG oil (Poly Alkylene 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 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.

Compressor Oil Check

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

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 Contents Page 80-01.)

Open the cab door and windows.

Run the blower fan at maximum speed.

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

Remove the compressor from the machine. (See Contents Page 80-01.)

GENERAL AIR CONDITIONING SERVICE GUIDELINES (CONT'D)

Compressor Oil Check (Cont'd)

Figure 80-60-2

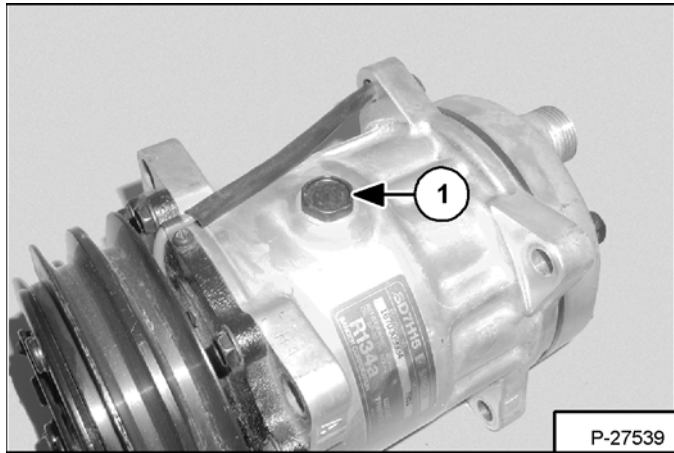
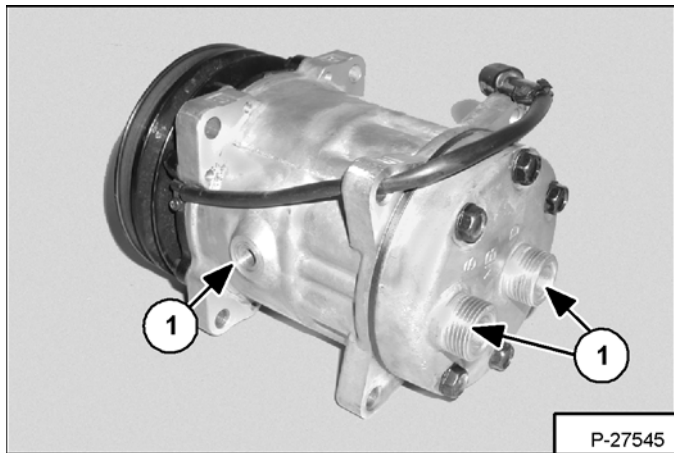


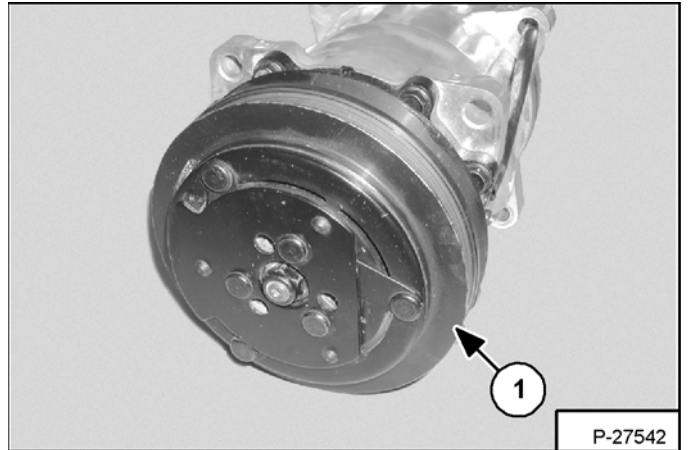
Figure 80-60-3



Remove the oil drain plug (Item 1) [Figure 80-60-2] and drain the oil through the connectors and the oil drain hole (Item 1) [Figure 80-60-3].

Installation: Tighten the oil drain plug to 9.4-10.8 ft.-lbs. (13-15 Nm) torque.

Figure 80-60-4



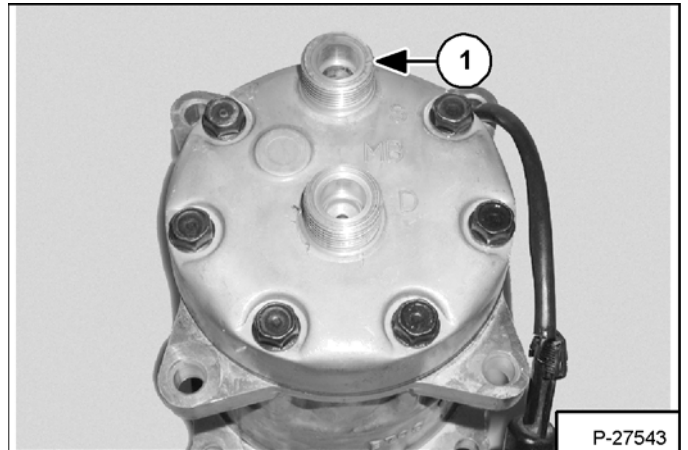
NOTE: After draining the oil through the drain hole and the connectors, extract the remaining oil through the discharge-side connector by rotating the drive pulley (Item 1) [Figure 80-60-4] several times by hand.

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.

Figure 80-60-5



Add new compressor oil through the suction side connector (Item 1) [Figure 80-60-5].

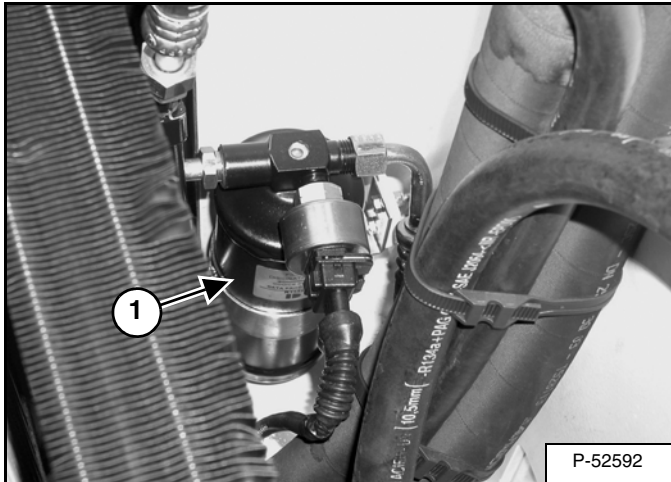
Installation: Add 150-170 cc's of PAG oil.

NOTE: The suction port on the compressor is marked with an S and is the large port on the compressor.

GENERAL AIR CONDITIONING SERVICE GUIDELINES (CONT'D)

Component Replacement And Refrigeration Leaks

Figure 80-60-6



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 80-60-6]** must be changed.

Never leave hose fittings, compressor fittings or components uncapped while working on the A/C system.

SYSTEM TROUBLESHOOTING CHART

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 Evaporator/Blower Unit.
4. 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. Defective thermo. switch (frozen evaporator).	Check thermostat using a circuit tester.	Replace Evaporator/Blower unit.

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 coil.	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.

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 than 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.	Replace Evaporator/Blower unit.
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.

SYSTEM TROUBLESHOOTING CHART (CONT'D)

Gauge Pressure Related Troubleshooting (Cont'd)

POSSIBLE CAUSE	INSPECTION	SOLUTION
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.
System pressures Equal		
1. Clutch not operating	See magnetic clutch related topics above.	
2. Compressor not pumping.	Equal high and low pressures.	Replace compressor.

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 CONDENSER 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
165	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.

AIR CONDITIONING SERVICE

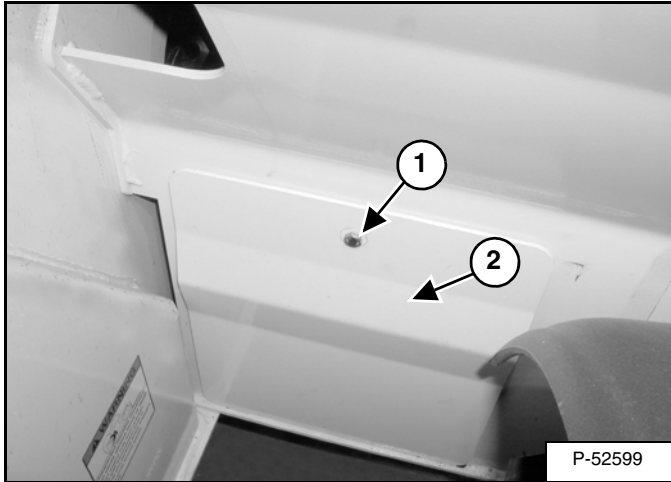
Chart

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:			

SYSTEM CHARGING AND RECLAMATION

Reclamation Procedure

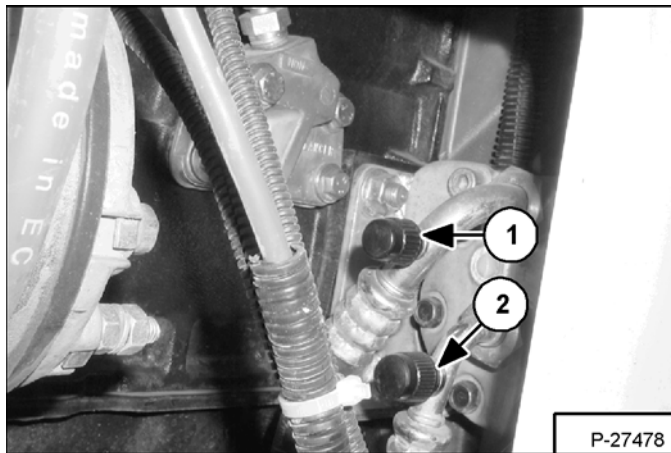
Figure 80-100-1



Open the engine cover.

Remove the access cover mounting bolt (Item 1).
Remove the access cover (Item 2) [Figure 80-100-1].

Figure 80-100-2



Locate the low pressure port (Item 1) and high pressure port (Item 2) [Figure 80-100-2] on the back side of the compressor.

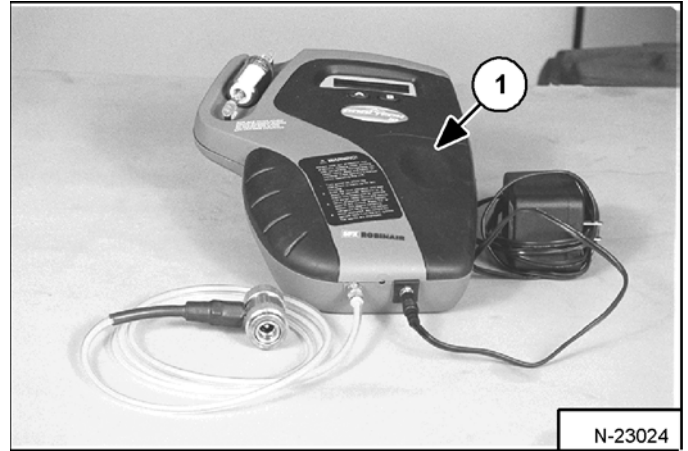
WARNING

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 test is run with the engine OFF, and the A/C switch in the OFF position.

Figure 80-100-3



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 80-100-3] 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.

Remove the protective cap and connect the refrigerant identifier to the low pressure hose (Item 1) [Figure 80-100-2].

Connect the refrigerant identifier to its power source.

SYSTEM CHARGING AND RECLAMATION (CONT'D)

Reclamation Procedure (Cont'd)

Figure 80-100-4



Follow the steps displayed on the refrigerant identifier screen [Figure 80-100-4].

Allow 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 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 80-100-5



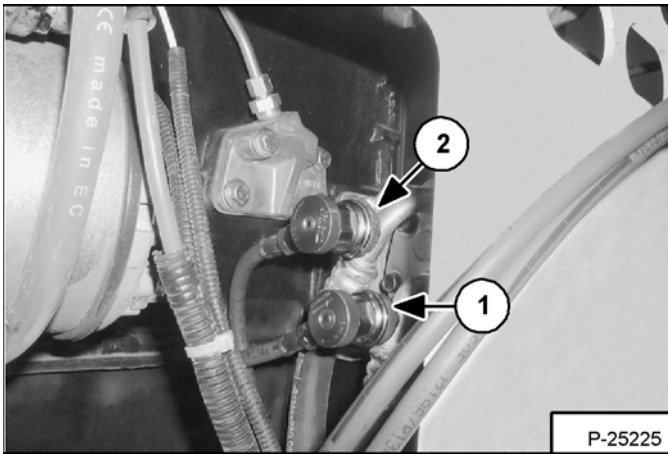
Use an approved recovery/charging unit [Figure 80-100-5] to evacuate the system.

Connect the reclaimer to the A/C charge ports.

SYSTEM CHARGING AND RECLAMATION (CONT'D)

Reclamation Procedure (Cont'd)

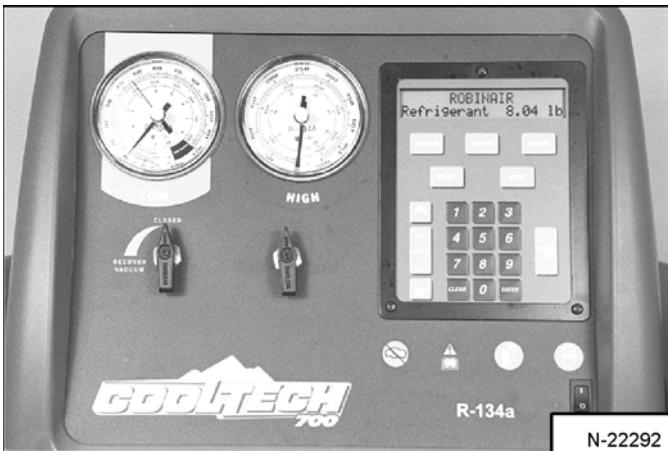
Figure 80-100-6



Connect the Red hose (Item 1) [Figure 80-100-6] to the high pressure port and open the valve.

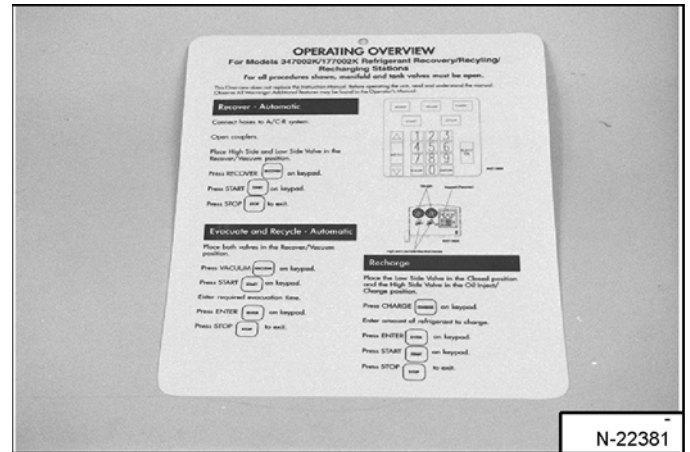
Connect the Blue hose (Item 2) [Figure 80-100-6] to the low pressure port and open the valve.

Figure 80-100-7



Turn the reclaimer unit [Figure 80-100-7] to the ON position and follow the on screen instructions.

Figure 80-100-8



NOTE: The reclaimer unit, has a complete step by step set of instructions [Figure 80-100-8] to follow for reclamation and recharging of the A/C system. a trained technician should follow these instructions as they may very slightly depending on the model and brand of reclaimer used.

SYSTEM CHARGING AND RECLAMATION (CONT'D)

Charging Procedure With A Manifold Gauge Set

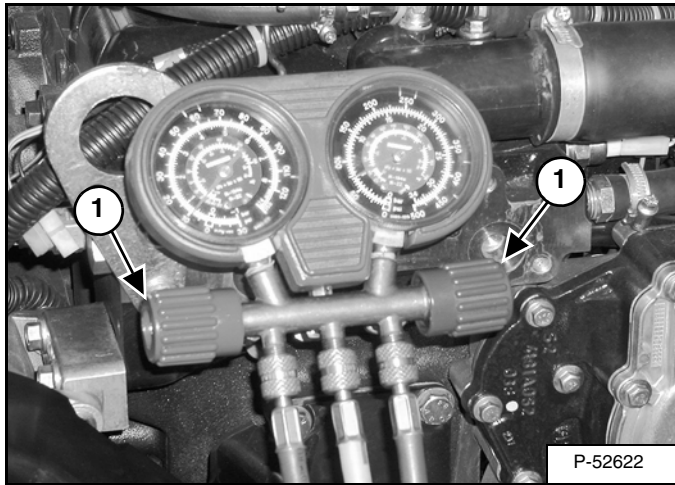
Open the hood.

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 80-100-9

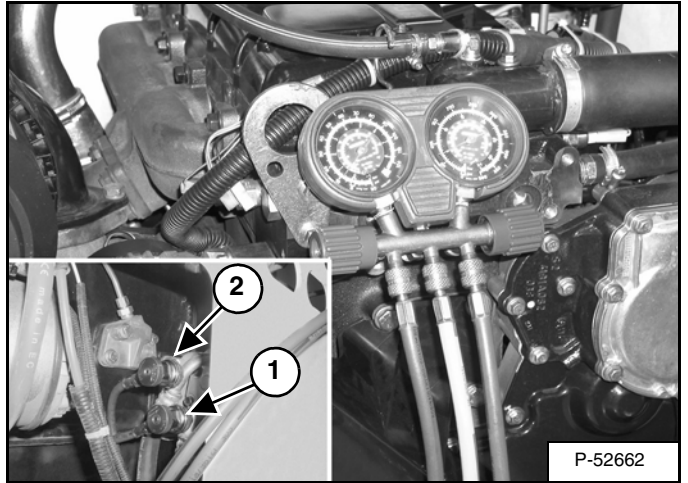


Check to see that the hand valves (Item 1) [Figure 80-100-9] are closed on the manifold gauge set.

If there is any refrigerant in the A/C system, it must be recovered by an approved A/C reclamation procedure. (See page 80-01.)

Connect the gauges to the A/C charge ports.

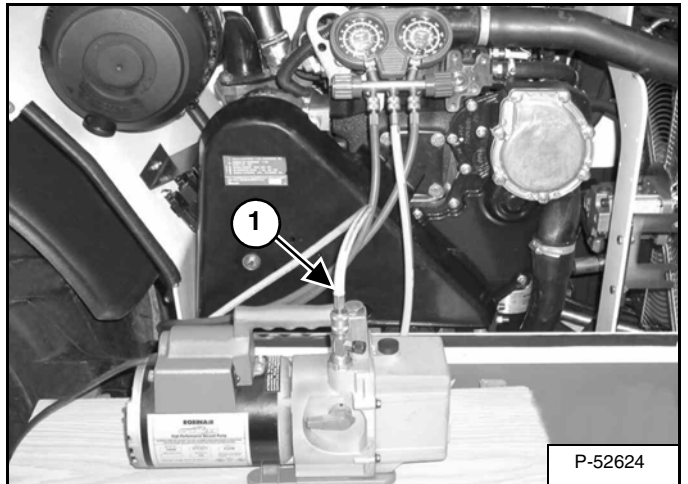
Figure 80-100-10



Connect the Red hose (Item 1) [Figure 80-100-10] to the high pressure port and open the valve.

Connect the Blue hose (Item 2) [Figure 80-100-10] to the low pressure port and open the valve.

Figure 80-100-11

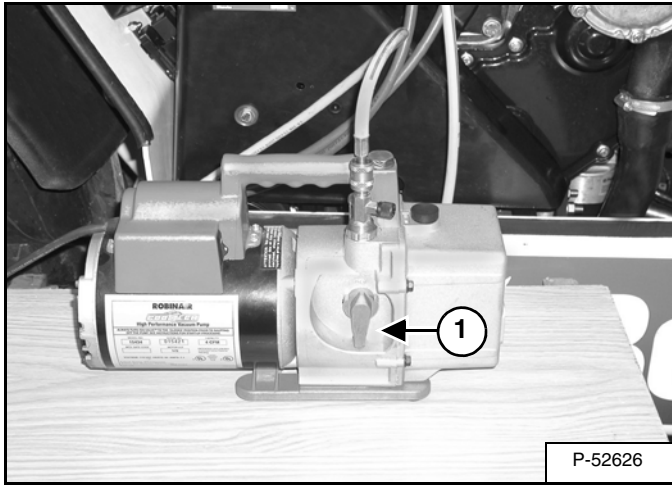


Connect the Yellow hose (Item 1) [Figure 80-100-11] to the vacuum pump.

SYSTEM CHARGING AND RECLAMATION (CONT'D)

Charging Procedure With A Manifold Gauge Set (Cont'd)

Figure 80-100-12



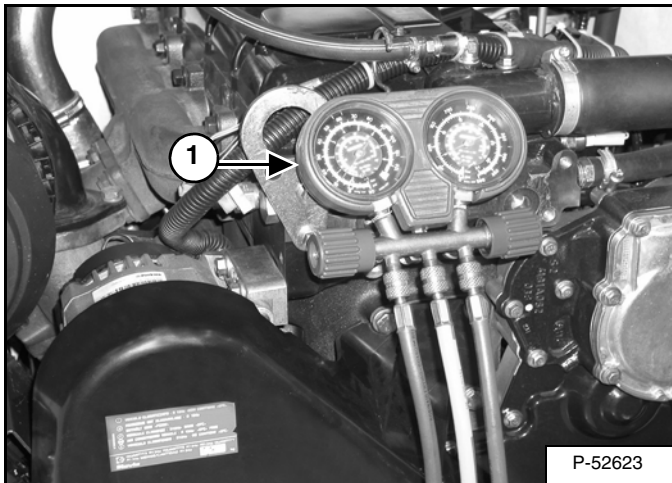
Start the vacuum pump and open ISO-valve (Item 1) [Figure 80-100-12] on the vacuum pump.

Run the vacuum pump for at least 5-10 minutes to insure that a vacuum has been pulled on the system.

Close the ISO-valve (Item 1) [Figure 80-100-12] (which isolates the vacuum pump from the A/C system) and turn OFF the vacuum pump.

Charging Procedure

Figure 80-100-13

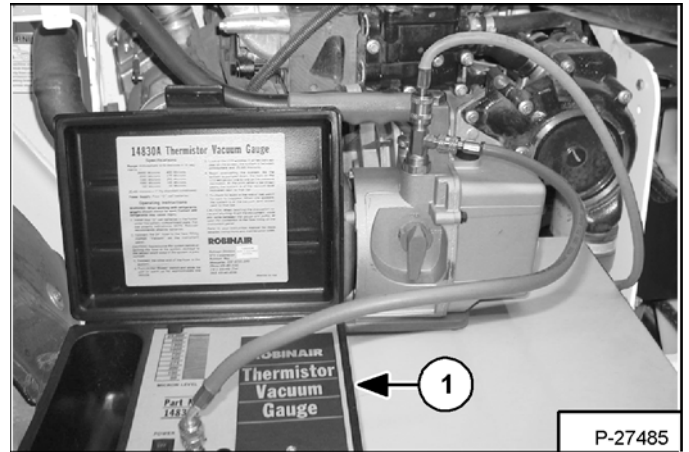


Note vacuum pressure indicated on the low pressure (Blue) gauge (Item 1) [Figure 80-100-13]. Let stand for 5-10 minutes and recheck the pressure for changes.

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 80-100-14



A thermistor vacuum gauge (Item 1) [Figure 80-100-14] 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 80-100-14].

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 insure that all the moisture is boiled out of the system.

Stop the vacuum pump and close the ISO-valve on the vacuum pump.

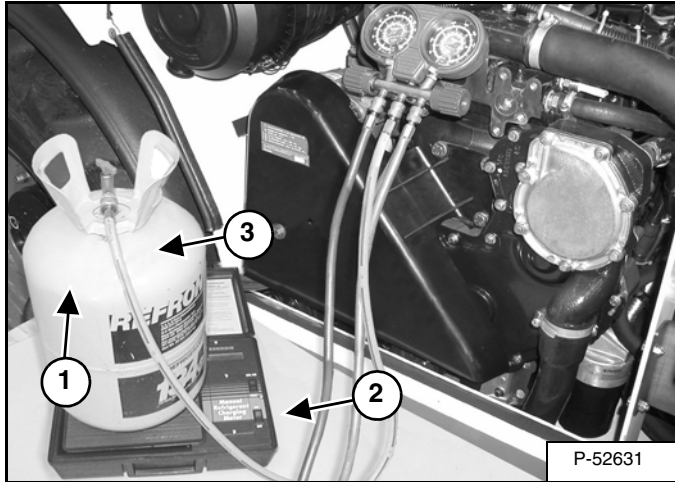
Close both hand valves on the manifold gauge set and remove the yellow hose from the vacuum pump that goes to the manifold gauge set.

Remove the vacuum pump and thermistor vacuum gauge.

SYSTEM CHARGING AND RECLAMATION (CONT'D)

Charging Procedure (Cont'd)

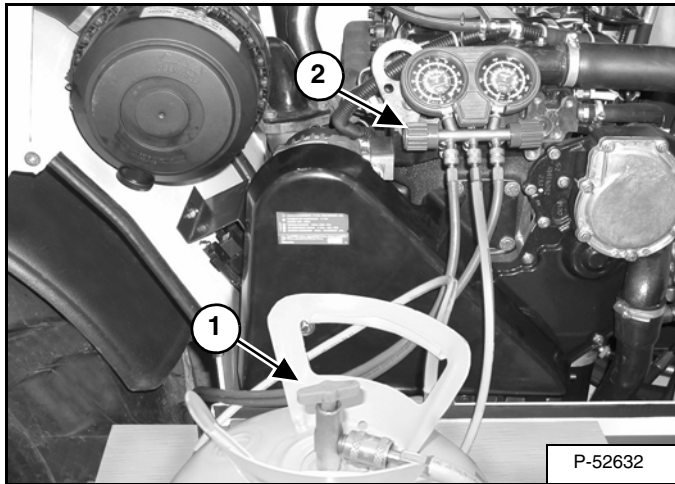
Figure 80-100-15



Place a refrigerant container with R134a (Item 1) on a charging scale (Item 2) [Figure 80-100-15] and zero out the scale.

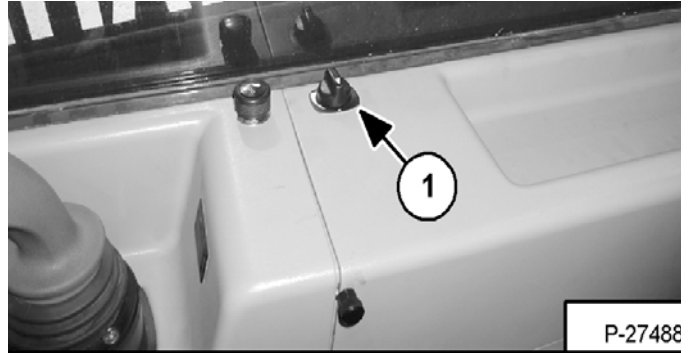
Connect the yellow hose (Item 3) [Figure 80-100-15] from the manifold gauge set to the valve on the refrigerant tank.

Figure 80-100-16



Open the valve on the refrigerant container (Item 1) and open the low pressure hand valve (Blue) (Item 2) [Figure 80-100-16] on the manifold gauge set. Allow the vacuum to pull in the refrigerant until the pressure stabilizes.

Figure 80-100-17



Turn the A/C fan switch (Item 1) [Figure 80-100-17] to HIGH position.

Start the machine, and run at medium speed.

Watch the scale and run system until the predetermined amount of refrigerant is added to the A/C system.

The A/C system holds 1.76 lbs (0,800 Kg) of refrigerant.

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 machine.

Install access cover.

Close the engine cover.

COMPRESSOR

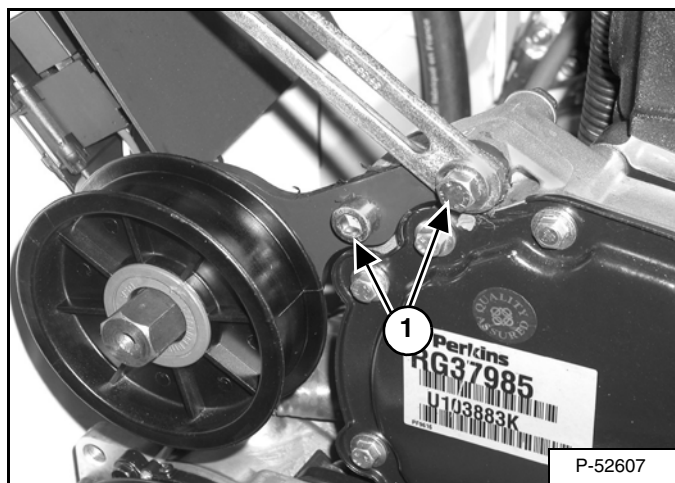
Removal And Installation

Evacuate the A/C system. (See Contents Page 80-01.)

Remove the alternator. (See Contents Page 60-01.)

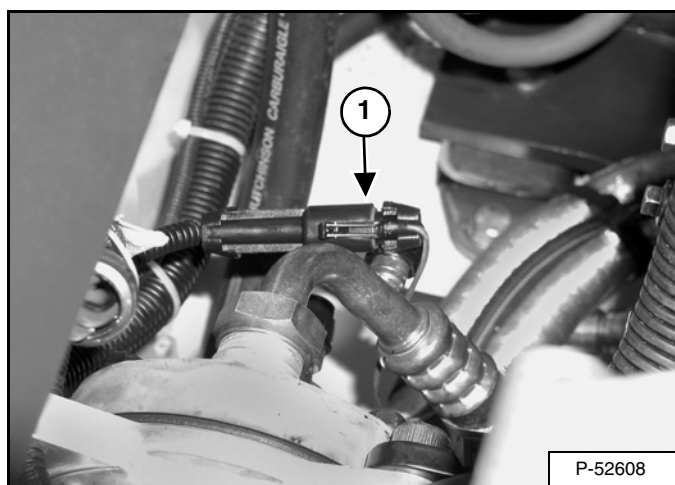
Remove the compressor belt.

Figure 80-110-1



Remove the two tensioner pulley mount belts (Item 1) [Figure 80-110-1]. Remove the pulley assembly.

Figure 80-110-2



Unplug the connector (Item 1) [Figure 80-110-2] from the compressor.

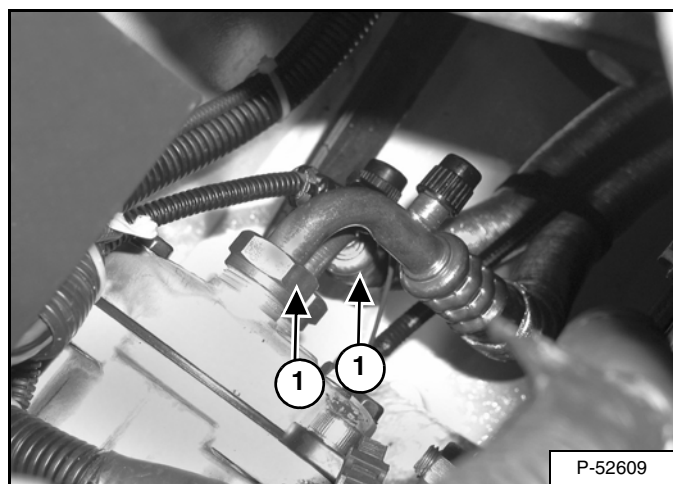
Mark the compressor hoses for correct installation.

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 80-110-3

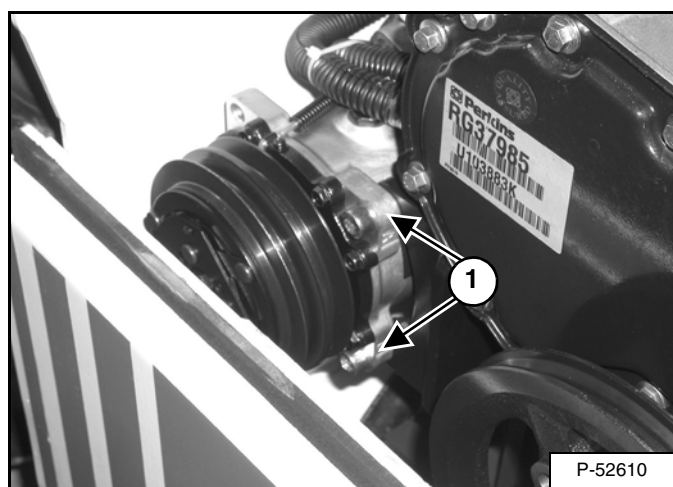


Remove the compressor hoses (Item 1) [Figure 80-110-3].

Installation: Tighten the hoses to 22 ft.-lbs. (29,8 Nm) torque.

Cap and plug the hoses and fittings with the proper A/C caps and plugs.

Figure 80-110-4



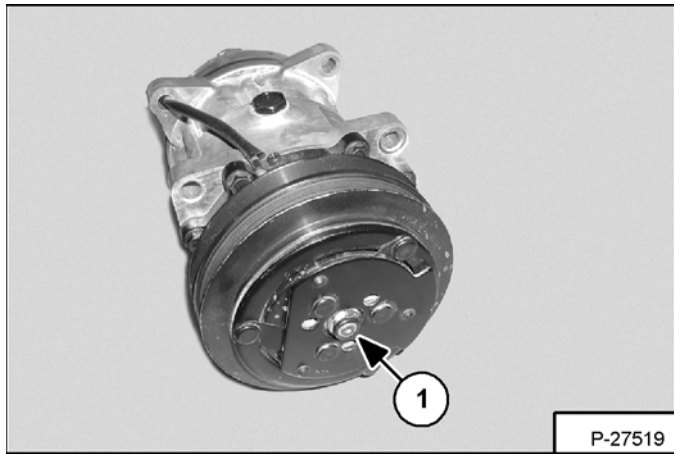
Remove the mount bolts (Item 1) [Figure 80-110-4].

Remove the compressor.

COMPRESSOR (CONT'D)

Compressor Clutch Disassembly And Assembly

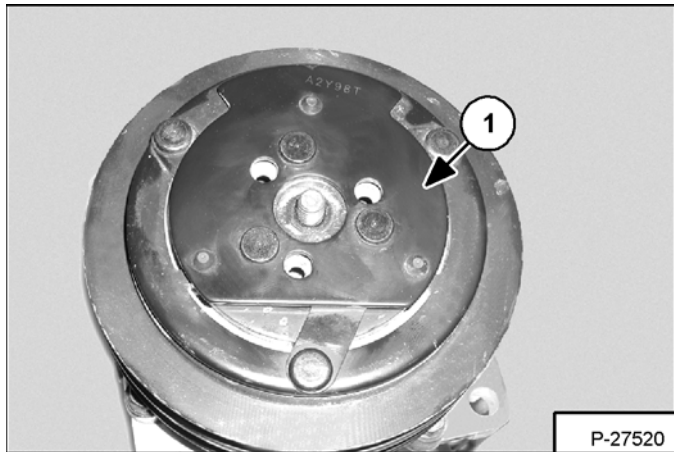
Figure 80-110-5



Remove the center armature nut (Item 1) [Figure 80-110-5].

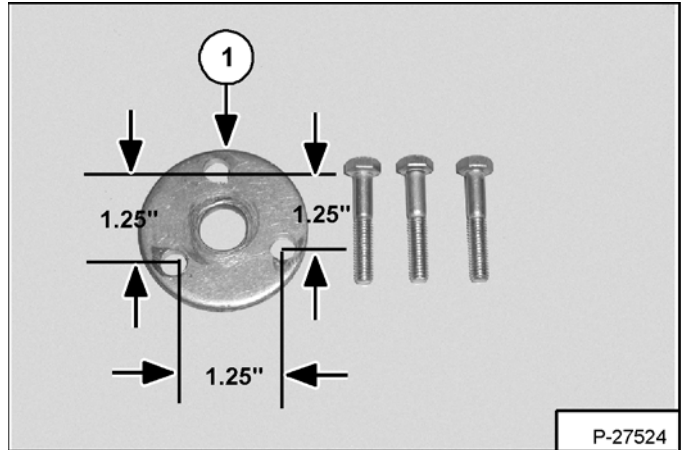
Assembly: Tighten the armature nut to 8 ft.-lbs. (12 Nm).

Figure 80-110-6



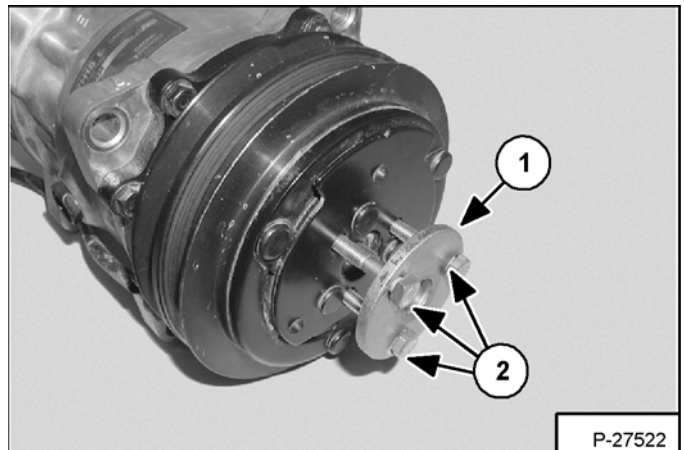
To remove the armature plate (Item 1) [Figure 80-110-6] from the clutch face you must make an armature plate puller.

Figure 80-110-7



The armature plate puller (Item 1) [Figure 80-110-7] can be constructed by drilling three 0.315 inch (8 mm) holes in a flat circular plate, located 1.25 inches (31,75 mm) apart.

Figure 80-110-8

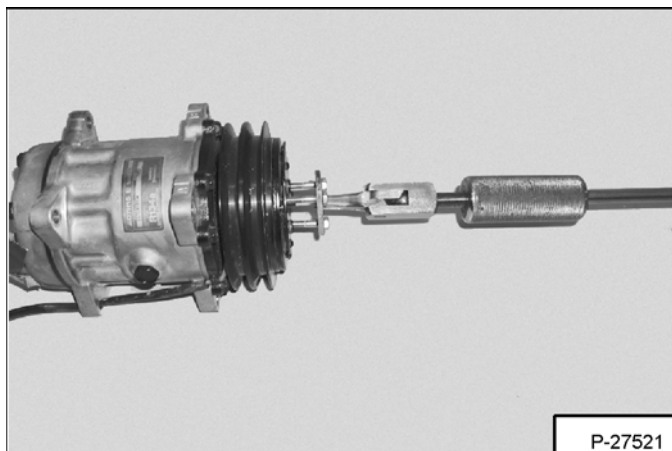


Attach the armature puller plate (Item 1) to the armature plate using the three bolts (Item 2) [Figure 80-110-8].

COMPRESSOR (CONT'D)

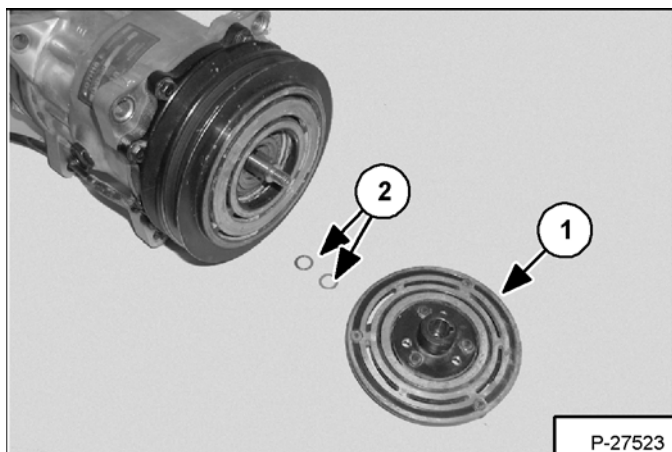
Compressor Clutch Disassembly And Assembly (Cont'd)

Figure 80-110-9



Attach a slide hammer puller to the armature puller tool [Figure 80-110-9].

Figure 80-110-10



Remove the armature plate (Item 1) [Figure 80-110-10] from the compressor clutch.

Remove the shims (Item 2) [Figure 80-110-10] from the armature shaft or armature plate.

Assembly: Insure that the clutch has the correct clearance by adding the shims (Item 2) [Figure 80-110-10].

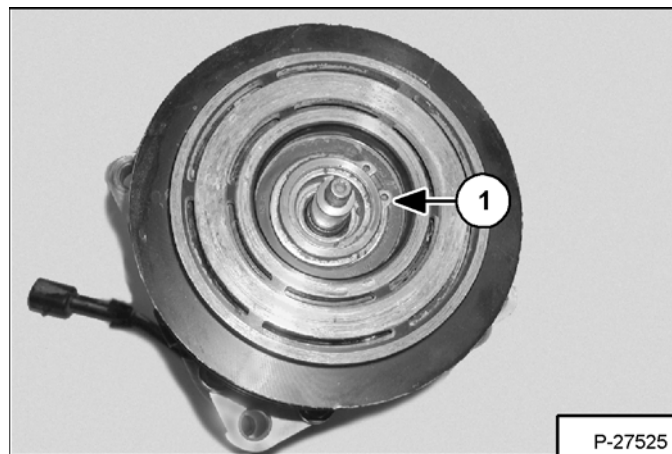
The specified clearance for the clutch is 0.01-0.02 in. (0.3-0.6 mm) adjusting shims are available in the following thicknesses.

0.0039 in. (0.1 mm)

0.0118 in. (0.3 mm)

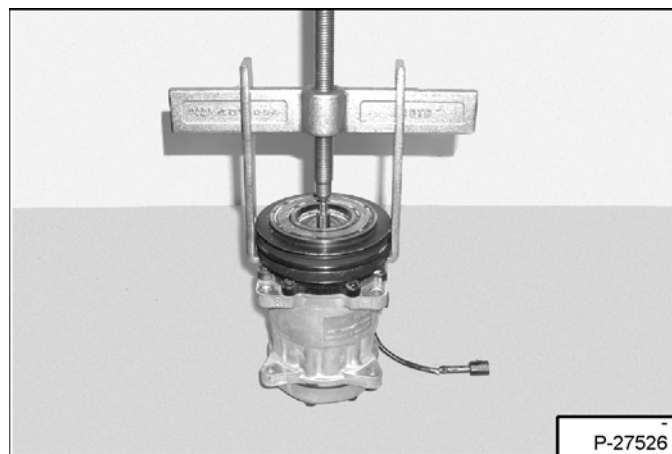
0.0197 in. (0.5 mm)

Figure 80-110-11



Remove the snap ring (Item 1) [Figure 80-110-11] from the pulley assembly.

Figure 80-110-12

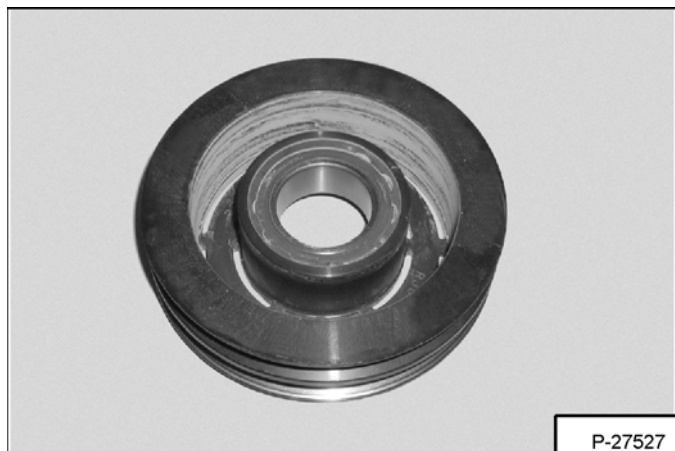


Remove the pulley from the compressor [Figure 80-110-12].

COMPRESSOR (CONT'D)

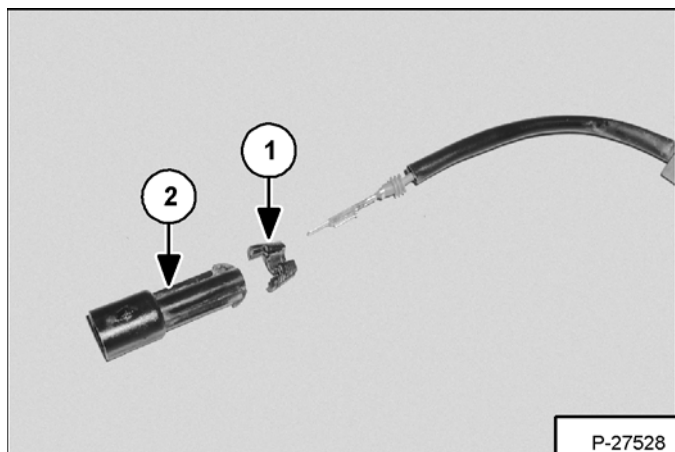
Compressor Clutch Disassembly And Assembly (Cont'd)

Figure 80-110-13



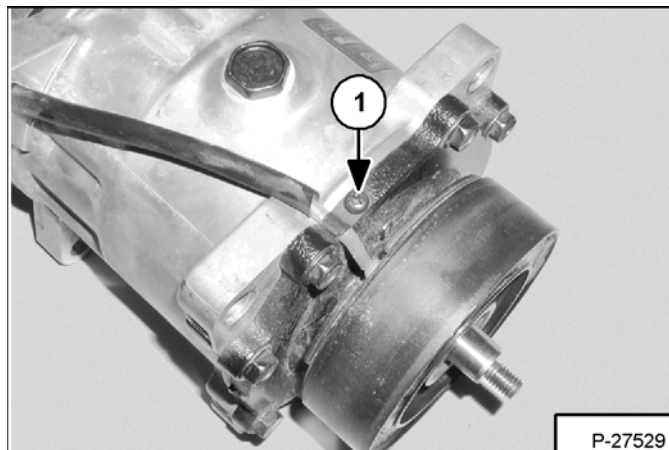
The pulley assembly and bearing [Figure 80-110-13] must be replaced as a complete unit.

Figure 80-110-14



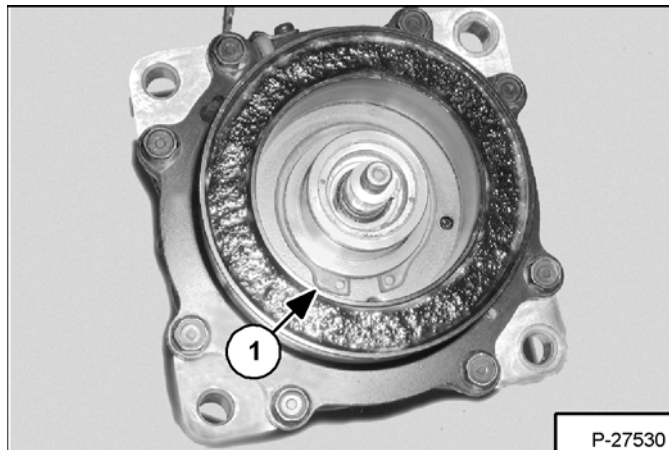
Remove the lock (Item 1) and connector (Item 2) [Figure 80-110-14] from the compressor harness.

Figure 80-110-15



Remove the harness retainer screw assembly (Item 1) [Figure 80-110-15].

Figure 80-110-16

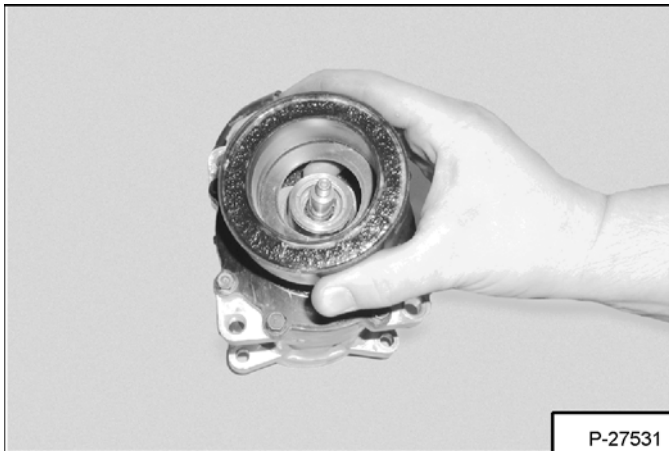


Remove the snap ring (Item 1) [Figure 80-110-16] from the coil.

COMPRESSOR (CONT'D)

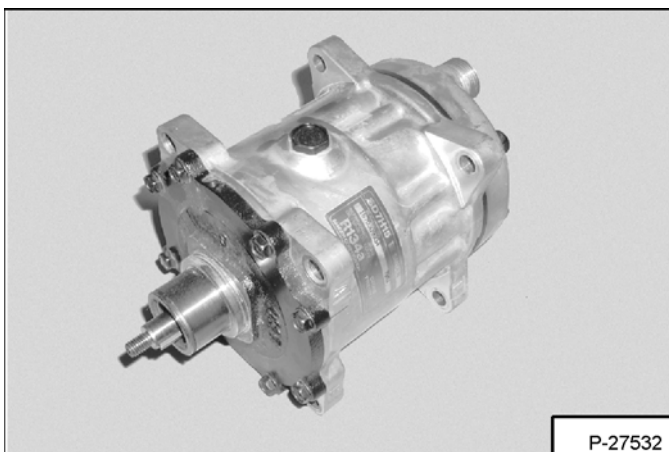
Compressor Clutch Disassembly And Assembly (Cont'd)

Figure 80-110-17



Remove the coil from the compressor **[Figure 80-110-17]**.

Figure 80-110-18



The compressor **[Figure 80-110-18]** must be replaced as a complete unit.

CONDENSER

Removal And Installation

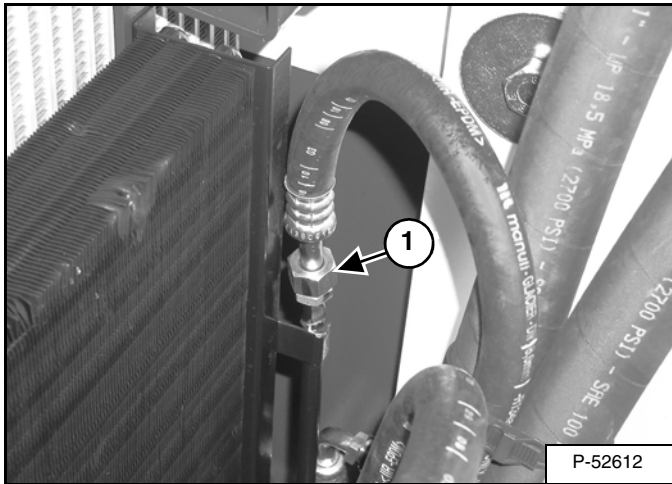
Remove the refrigerant from the A/C system. (See Contents Page 80-01.)

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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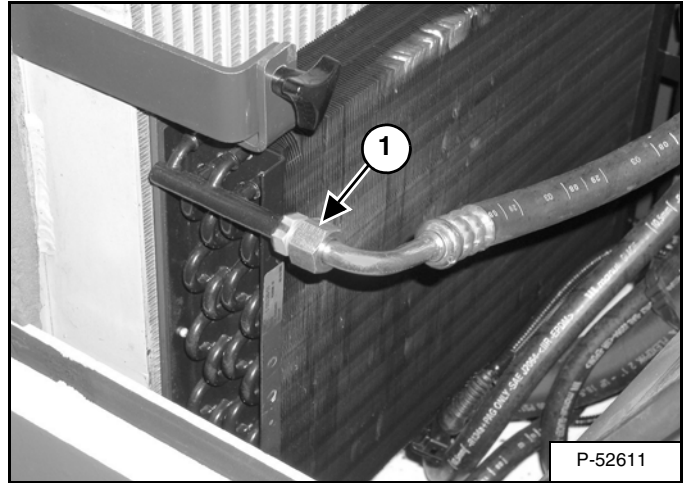
Figure 80-120-1



Remove the hose (Item 1) [Figure 80-120-1] from the condenser.

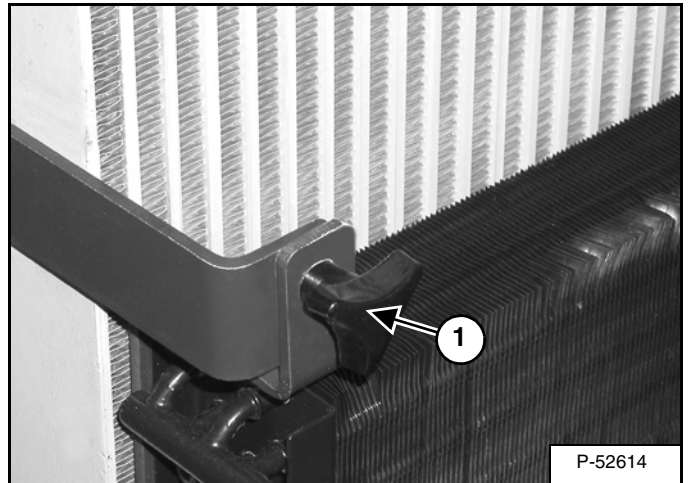
NOTE: Install caps and plugs on all fittings.

Figure 80-120-2



Remove the A/C hose (Item 1) [Figure 80-120-2] from the condenser.

Figure 80-120-3



Remove the two nuts (Item 1) [Figure 80-120-3] from each side of the condenser.

Tilt the condenser forward and remove.

RECEIVER/DRIER

Removal And Installation

Open the engine cover.

Remove the refrigerant from the A/C system. (See Contents Page 80-01.)

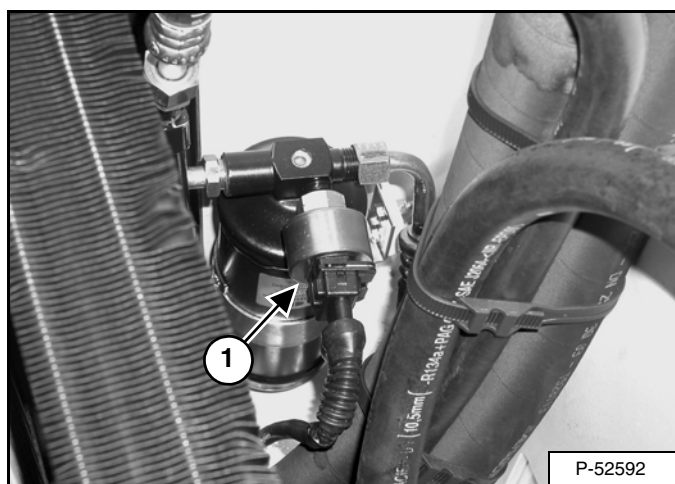
Remove the air cleaner. (See Contents Page 70-01.)

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.

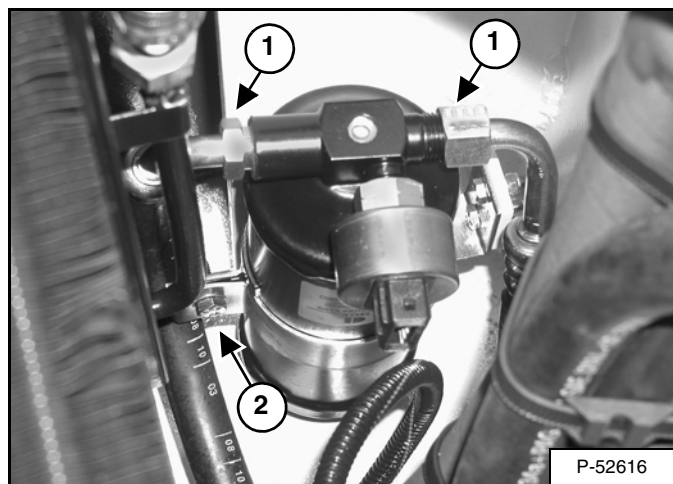
W-2371-0500

Figure 80-130-1



Unplug the connector (Item 1) [Figure 80-130-1] from the pressure switch.

Figure 80-130-2



Remove the two hoses (Item 1) [Figure 80-130-2] from the Receiver/Drier.

NOTE: Mark the hoses for correct installation.

NOTE: Install caps and plugs on all fittings.

Loosen the bolt (Item 2) [Figure 80-130-2] on the mounting bracket.

PRESSURE SWITCH

Removal And Installation

Open the engine cover.

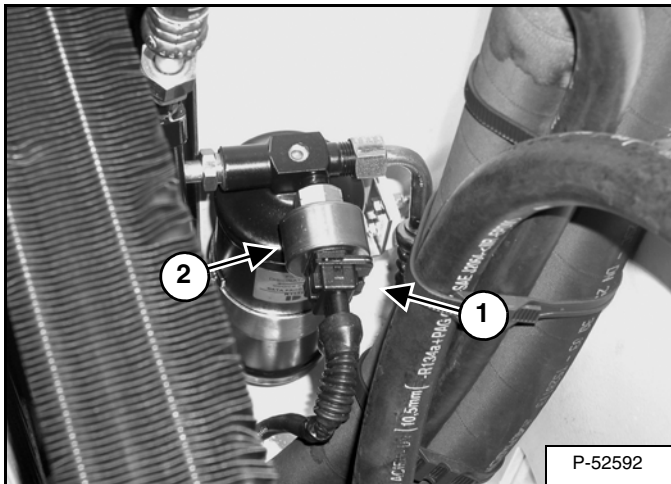
Remove the refrigerant from the A/C system. (See Contents Page 80-01.)

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.

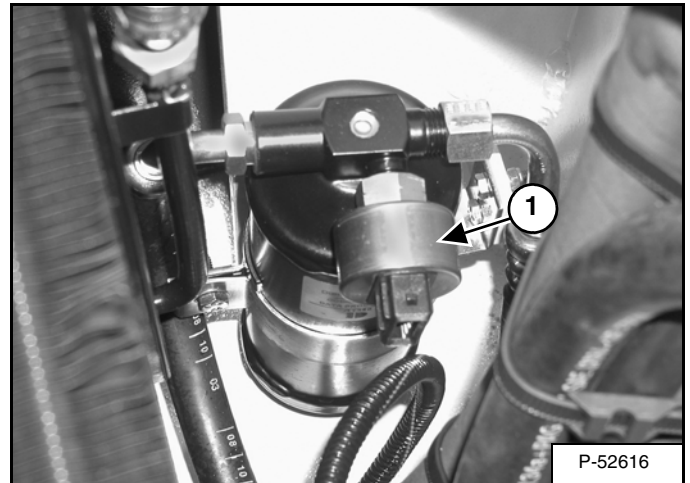
W-2371-0500

Figure 80-140-1



Unplug the connector (Item 1) from the pressure switch (Item 2) [Figure 80-140-1].

Figure 80-140-2



Remove the pressure switch (Item 1) [Figure 80-140-2] from the Receiver/Drier assembly.

EVAPORATOR/BLOWER UNIT

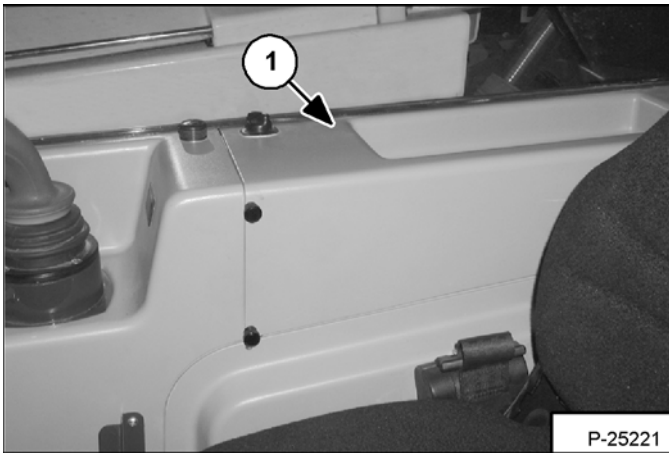
Removal And Installation

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

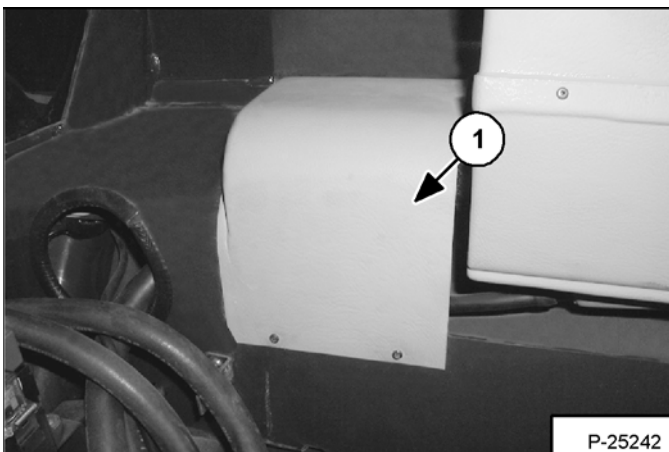
Figure 80-150-3



Remove the refrigerant from the A/C system. (See Content Page 80-01.)

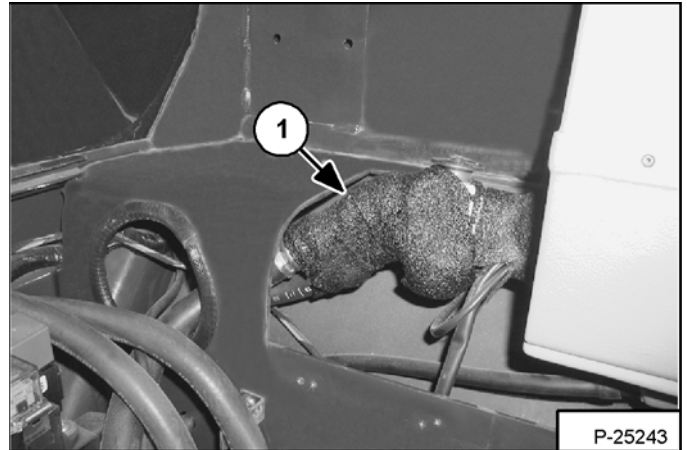
Remove the fuse box cover (Item 1) [Figure 80-150-3].

Figure 80-150-4



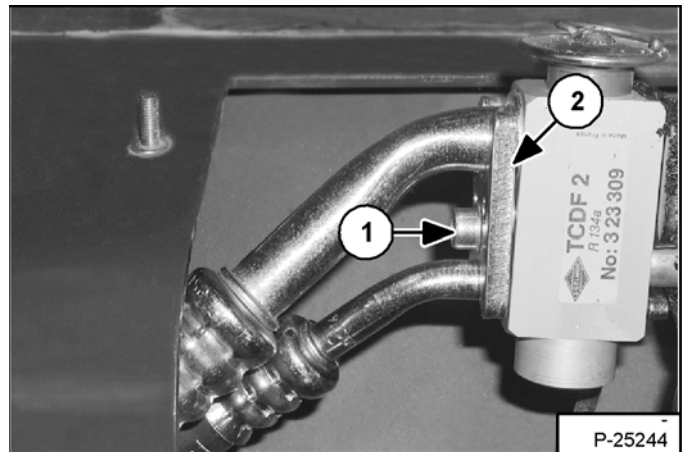
Remove the rear panel (Item 1) [Figure 80-150-4].

Figure 80-150-5



Temporarily remove the covering (Item 1) [Figure 80-150-5] from the A/C hoses and expansion valve.

Figure 80-150-6



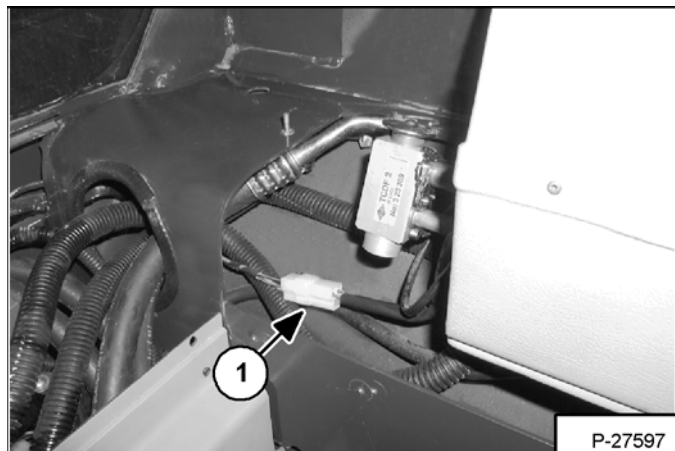
Remove the bolt (Item 1) and plate (Item 2) [Figure 80-150-6]. Remove both A/C hoses.

NOTE: Plug the A/C hoses to avoid contamination.

EVAPORATOR/BLOWER UNIT (CONT'D)

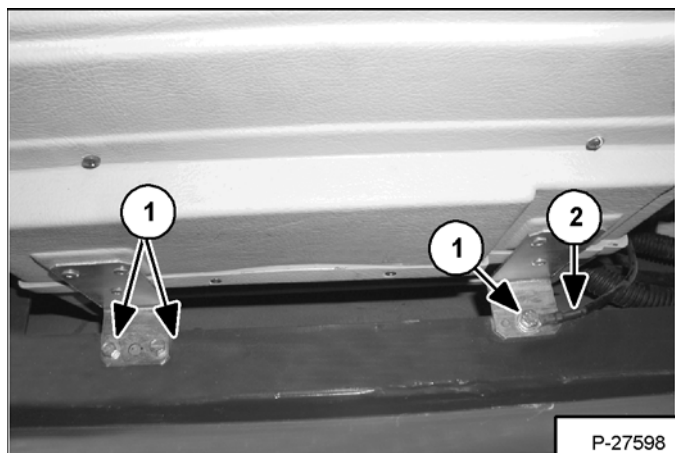
Removal And Installation (Cont'd)

Figure 80-150-1



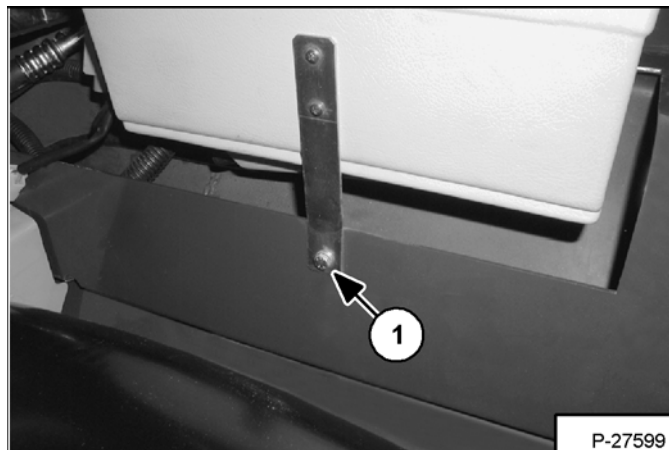
Disconnect the thermostat wiring connector (Item 1) [Figure 80-150-1].

Figure 80-150-2



Remove the three mount bolts (Item 1) and ground wire (Item 2) [Figure 80-150-2] from the back of the evaporator unit.

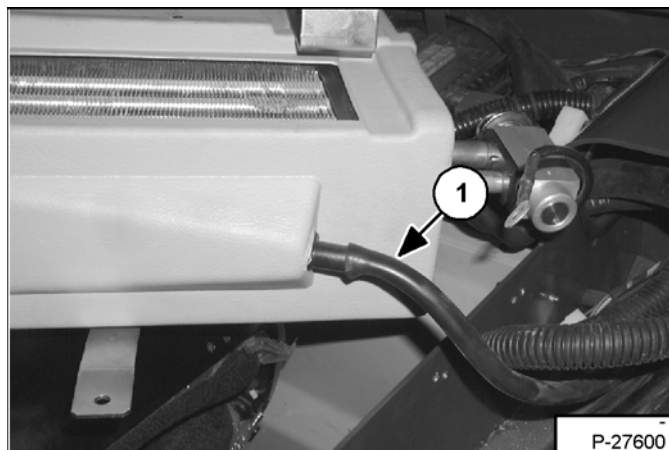
Figure 80-150-3



Remove the front mounting bolt (Item 1) [Figure 80-150-3].

Lay the evaporator/blower unit on the seat.

Figure 80-150-4



Remove the drain hose (Item 1) [Figure 80-150-4].

Remove the evaporator/blower unit from the machine.

EXPANSION VALVE

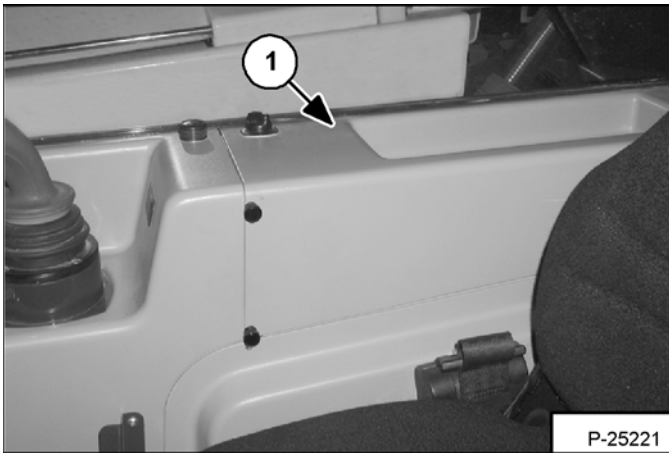
Removal And Installation

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

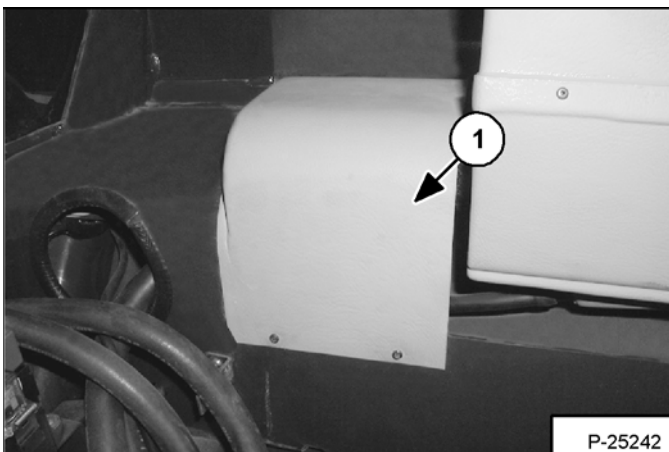
Figure 80-160-1



Remove the refrigerant from the A/C system. (See Content Page 80-01.)

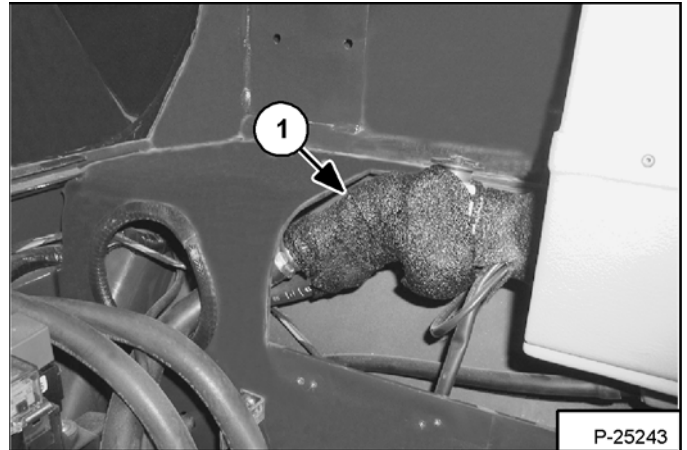
Remove the fuse box cover (Item 1) [Figure 80-160-1].

Figure 80-160-2



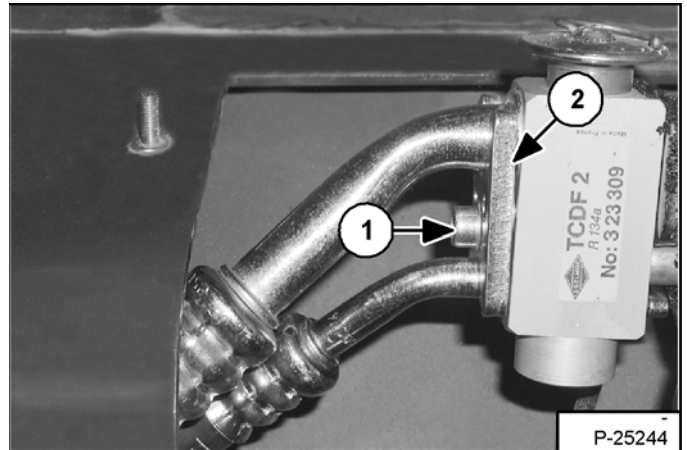
Remove the rear panel (Item 1) [Figure 80-160-2].

Figure 80-160-3



Temporarily remove the covering (Item 1) [Figure 80-160-3] from the A/C hoses and expansion valve.

Figure 80-160-4



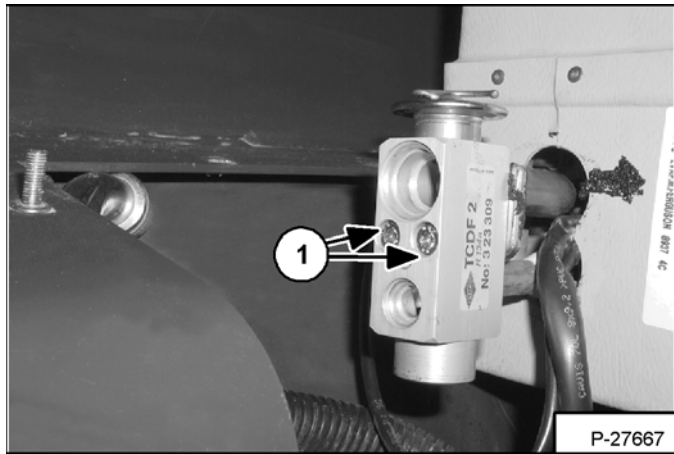
Remove the bolt (Item 1) and plate (Item 2) [Figure 80-160-4]. Remove both A/C hoses.

NOTE: Plug the A/C hoses to avoid contamination.

EXPANSION VALVE (CONT'D)

Removal And Installation (Cont'd)

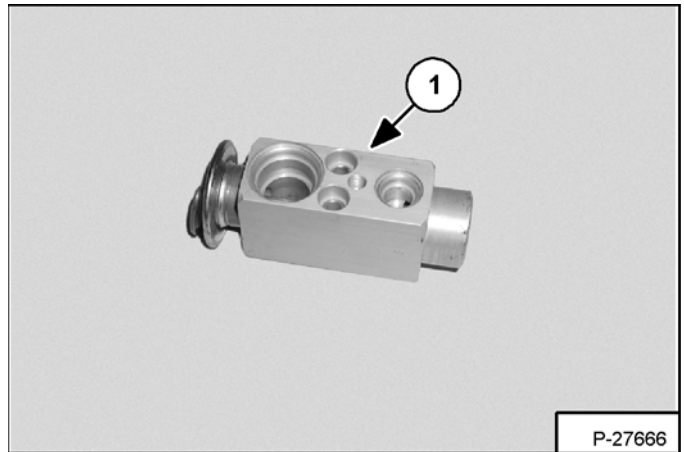
Figure 80-160-5



Remove the two mount bolts (Item 1) [Figure 80-160-5].

Remove the expansion valve.

Figure 80-160-6



The expansion valve (Item 1) [Figure 80-160-6] is replaced as a complete unit.

HEATER ASSEMBLY

Removal And Installation

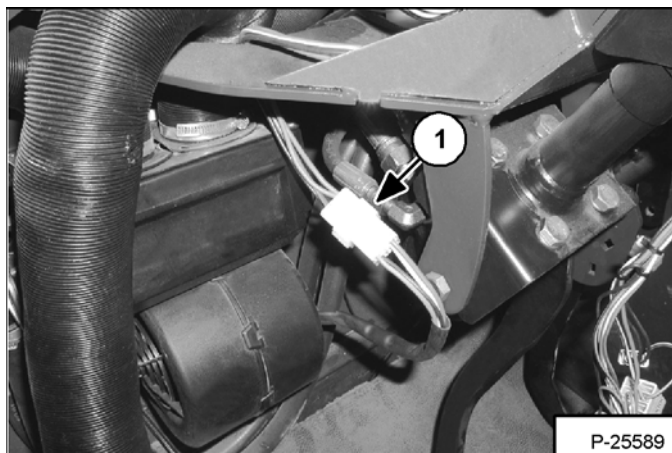
Remove the travel/signal levers. (See Content Page 60-01.)

Remove the instrument panel. (See Content Page 60-01.)

Remove the switch panel. (See Content Page 60-01.)

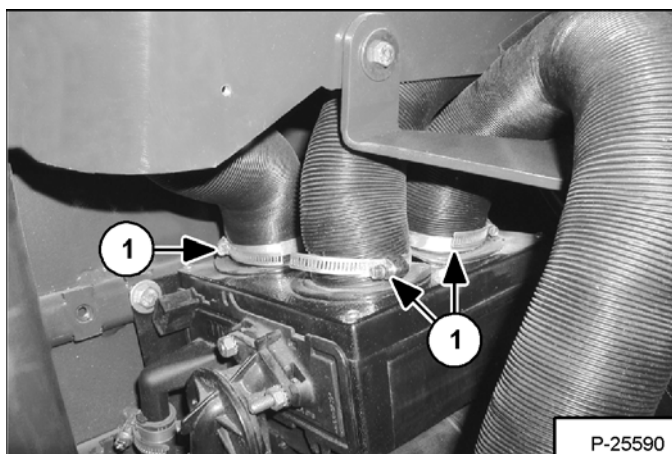
Remove the dash cover/steering column cover. (See Content Page 50-01.)

Figure 80-170-1



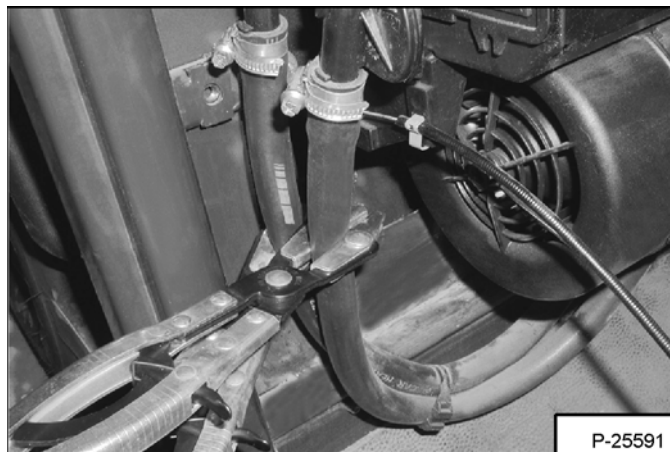
Disconnect the harness connector (Item 1) [Figure 80-170-1].

Figure 80-170-2



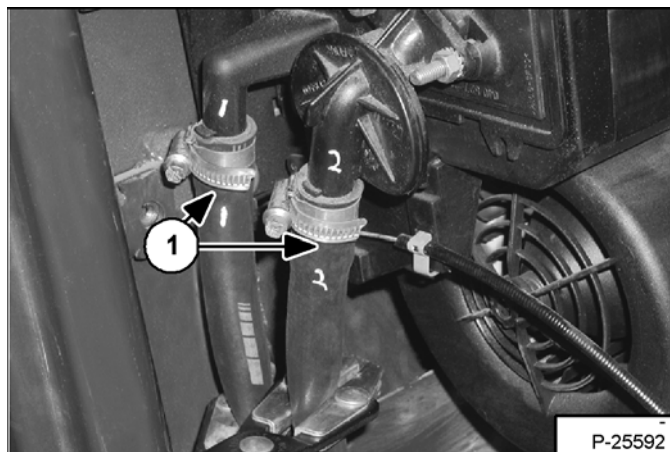
Remove the vent hoses (Item 1) [Figure 80-170-2] from the top of the assembly.

Figure 80-170-3



Clamp the heater hoses [Figure 80-170-3].

Figure 80-170-4



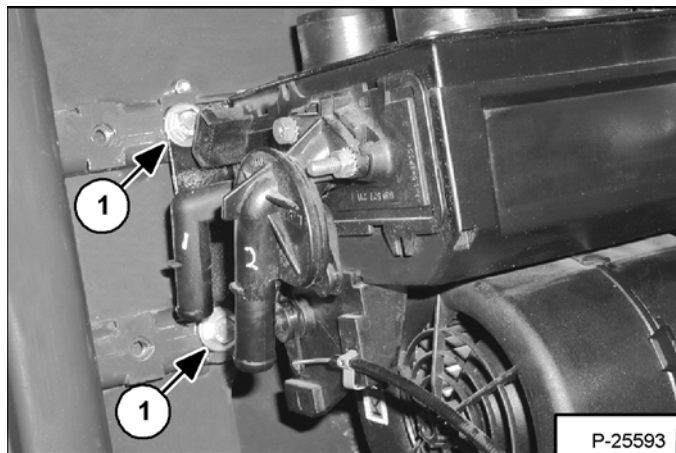
Remove the heater hoses (Item 1) [Figure 80-170-4] from the heater assembly.

NOTE: Mark the hoses for correct installation.

HEATER ASSEMBLY (CONT'D)

Removal And Installation (Cont'd)

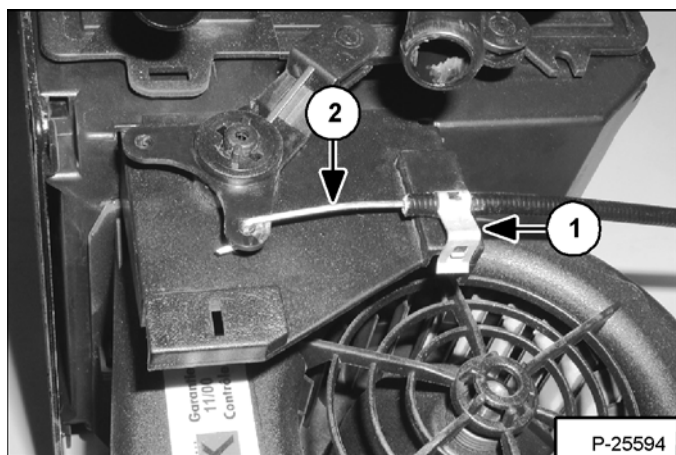
Figure 80-170-5



Remove the mounting bolts (Item 1) [Figure 80-170-5] and remove the heater assembly.

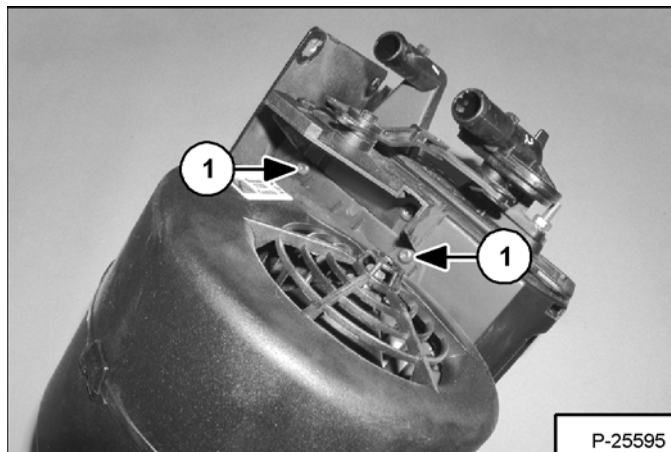
Fan Removal And Installation

Figure 80-170-6



Carefully remove the clip (Item 1) and cable (Item 2) [Figure 80-170-6].

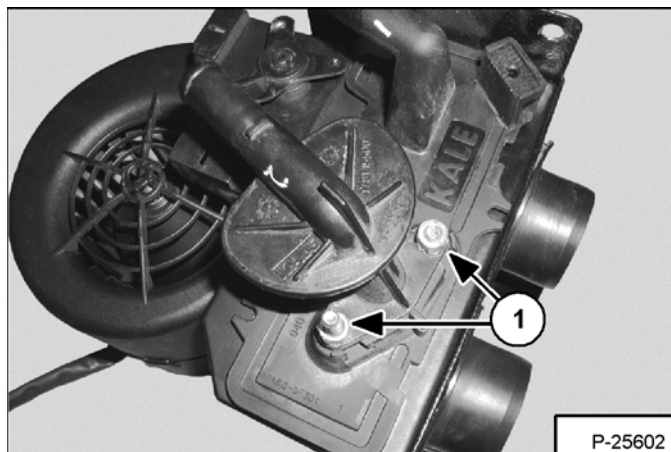
Figure 80-170-7



Remove the blower fan mounting bolts (Item 1) [Figure 80-170-7] and remove the blower fan.

Core Removal And Installation

Figure 80-170-8

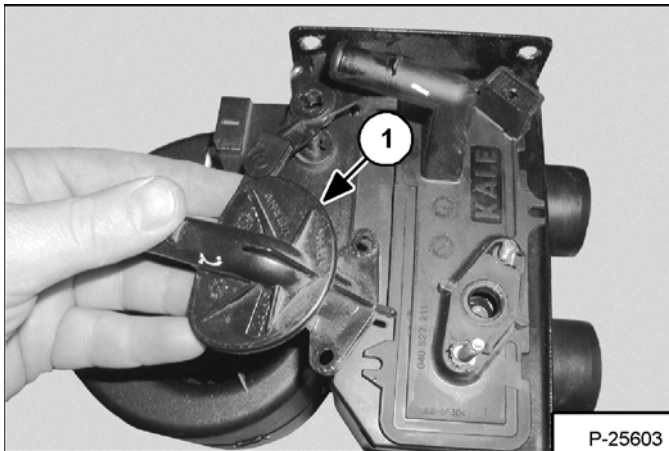


Remove the two flange mounting nuts (Item 1) [Figure 80-170-8].

HEATER ASSEMBLY (CONT'D)

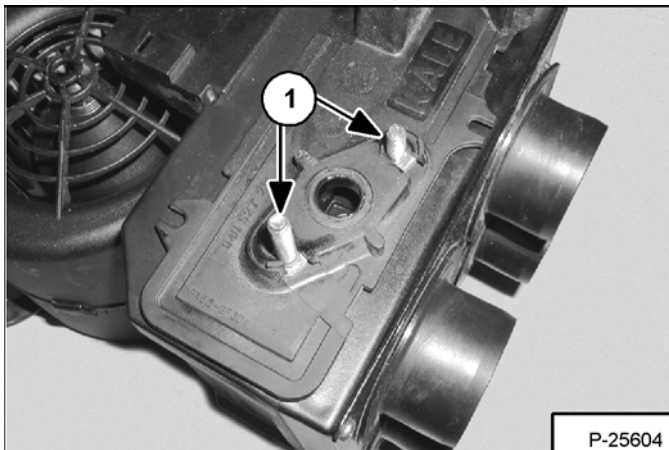
Core Removal And Installation (Cont'd)

Figure 80-170-9



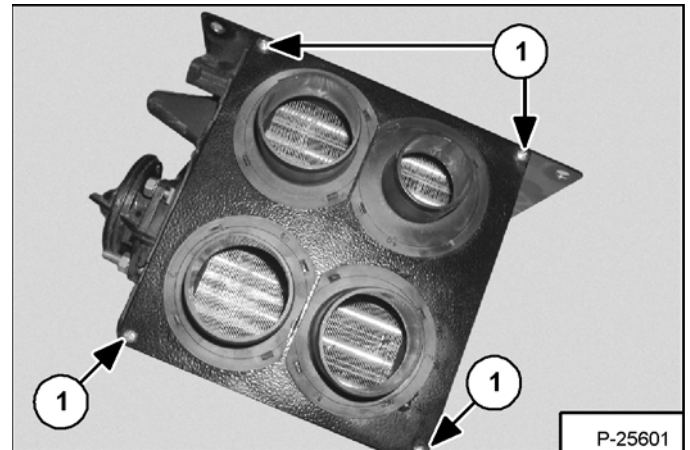
Remove the flange/linkage assembly (Item 1) [Figure 80-170-9] from assembly.

Figure 80-170-10



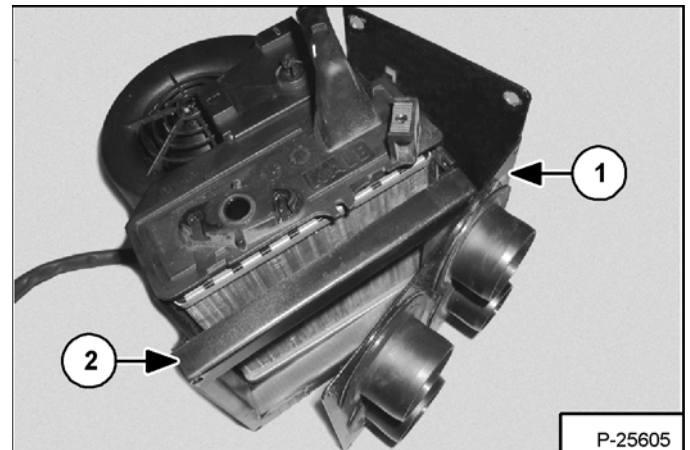
Remove the two bolts (Item 1) [Figure 80-170-10] and save for later use.

Figure 80-170-11



Remove the four screws (Item 1) [Figure 80-170-11] from the vent bracket.

Figure 80-170-12

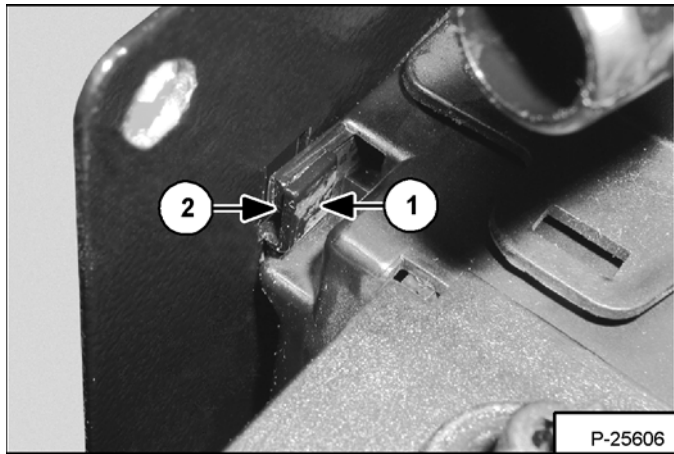


Remove the end bracket (Item 1) and spacer (Item 2) [Figure 80-170-12] from the assembly.

HEATER ASSEMBLY (CONT'D)

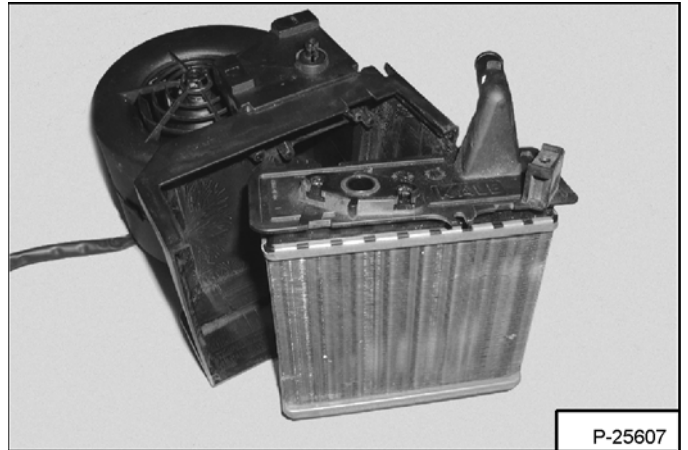
Core Removal And Installation (Cont'd)

Figure 80-170-13



Be sure to separate the bracket (Item 1) and tab (Item 2) [Figure 80-170-13].

Figure 80-170-14



Slide the core from the housing [Figure 80-170-14].

SPECIFICATIONS

CONVERSIONS	SPEC-70-1
Decimal And Millimeter Equivalents	SPEC-70-1
U.S. To Metric Conversion	SPEC-70-2
ENGINE SPECIFICATIONS	SPEC-20-1
Not Available At Time Of Printing	SPEC-20-1
HYDRAULIC/HYDROSTATIC FLUID SPECIFICATIONS	SPEC-60-1
Specifications	SPEC-60-1
HYDRAULIC CONNECTION SPECIFICATIONS	SPEC-50-1
Flare Fitting	SPEC-50-2
O-ring Face Seal Connection	SPEC-50-1
O-ring Flare Fitting	SPEC-50-3
Port Seal Fitting	SPEC-50-5
Straight Thread O-ring Fitting	SPEC-50-1
Tubelines And Hoses	SPEC-50-1
MACHINE TORQUE SPECIFICATIONS	SPEC-30-1
Specifications	SPEC-30-1
TORQUE SPECIFICATIONS FOR BOLTS	SPEC-40-1
Torque For General Metric Bolts	SPEC-40-2
Torque for General SAE Bolts	SPEC-40-1
VERSAHANDLER SPECIFICATIONS	SPEC-10-1
Capacities	SPEC-10-3
Controls	SPEC-10-2
Dimensional Specifications	SPEC-10-1
Drive System	SPEC-10-2
Electrical System	SPEC-10-3
Engine	SPEC-10-2
Hydraulic System	SPEC-10-3
Instrument Panel	SPEC-10-3
Performance Specifications	SPEC-10-2
Tires	SPEC-10-3

SPECIFICATIONS

TELESCOPIC HANDLER SPECIFICATIONS



WARNING

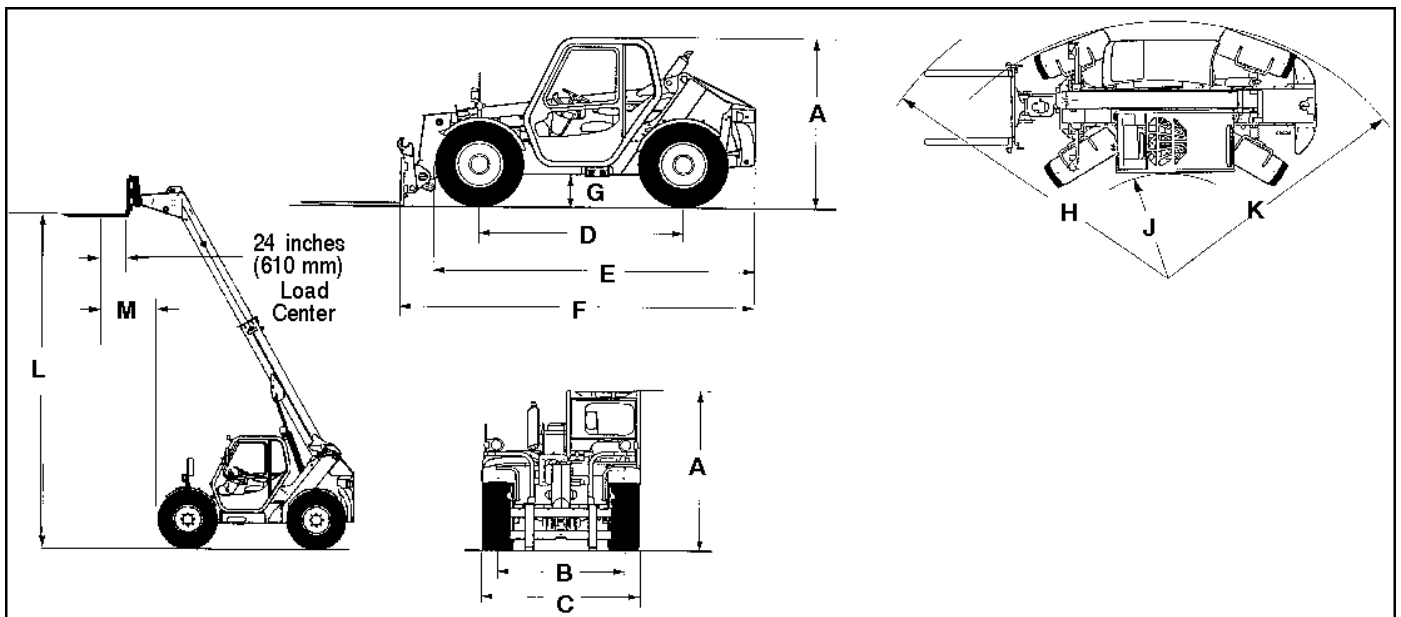
Each attachment and each TELESCOPIC HANDLER have different Load Capacity Charts. For example: An 84 inch bucket used on a 8925/26 will have its own chart; that same 84 inch bucket when used on a 8937 will have a different chart. Be sure you use the correct chart for your attachment and TELESCOPIC HANDLER combination.

W-2395-0301

Dimensions are given for machine equipped with standard tires and may vary with other tire types.

- All dimensions are shown in inches. Respective metric dimensions are given in millimeters enclosed by parentheses.
- Where applicable, specifications conform to SAE, ASME or ISO standards and are subject to change without notice.

Dimensional Specifications



	8925/26
A	82.6 inches (2097 mm)
B	62.2 inches (1580 mm)
C	78.1 inches (1984 mm)
D	98.4 inches (2499 mm)
E	153.9 inches (3909 mm)
F	178.5 inches (4554 mm)
G	15.2 inches (385 mm)
H	184.8 inches (4694 mm)
J	58.0 inches (1473 mm)
K	147.4 inches (3744 mm)
L	217.7 inches (5530 mm)
M	42.0 inches (1067 mm)

TELESCOPIC HANDLER SPECIFICATIONS (CONT'D)

Performance Specifications

Operating Weight	10846 lbs. (4920 kg)
Maximum Rated Capacity	*5000 lbs. (2268 kg)
*Rated Load Capacity can change depending on which approved attachment is used	

- Where applicable, specifications conform to SAE, ASME or ISO standards and are subject to change without notice.

Engine

Make/Model	PERKINS 1104C-44T (Turbo-charged)
Fuel/Cooling	Diesel/Liquid
Horsepower (SAE Net)	100 HP (74,5 kW)
Number of Cylinders	Four
Lubrication	Pressure System W/Filter
Air Cleaner	Dry replaceable cartridge w/safety element

Controls

Steering	Steering Wheel w/ 3 Mode Sel-ctions (Front-Wheel, All-Wheel, Crab)
Hydraulics	Joystick w/ switches
Auxiliary Hydraulics	Electric Switches on Joystick
Parking Brake	Hand Operated Lever

Drive System

Main Drive	Hydrostatic 4 wheel drive
Transmission	Infinitely variable hydrostatic piston pump, driving 1 fully reversing hydrostatic motor
Final Drive	Front Differential with reduction gear box, Rear Differential, Planetary Axles with Oil Lubrication.

Travel Speed	
Low Range	0-4.4 mph (7.1 km/hr)
High Range	0-18.7 mph (30,1 km/hr)

TELESCOPIC HANDLER SPECIFICATIONS (CONT'D)

Tyres

Standard Tyres	Dunlop T37 400/70x20-44 PSI (3 Bar)
Optional Tyres	Titan Lift Rigger II 400/70-20-58 PSI (4 Bar)
	Continental Traction Farmer 15.0/55-17-51 PSI (3.5 Bar)

Capacities

		Type
Fuel Tank	31.7 gals. (120 L)	Diesel #2 or #1
Hyd./Hydros. System	22 gals. (83 L)	6563328
Eng. Cooling System	18 qts. (17 L)	Antifreeze mixture (Ethylene Glycol)
Engine Oil Change w/Filter	9 qts (8,5 L)	See Oil Chart
Front Axle	11.1 qts (10,5 L)	100032-06A
Rear Axle	11qts. (10 L)	100032-06A
Front Reduction Gearbox	0.85 qts. (0,8 L)	100032-06A

Hydraulic System

Hydraulic Pump	Engine driven, 22 GPM (83 L/min)
Hydraulic Pressure	3626 PSI (250 BAR)
Auxiliary Flow	

Electrical System

Alternator	12-Volt, 100 amp open frame with internal regulator
Battery	12 Volt - 900 CCA @ 0° F (-18° C)

Instrument Panel

Full compliment of instrumentation for engine, hydraulic and machine functions.

ENGINE SPECIFICATIONS

Not Available At Time Of Printing

**Please refer to the Engine TEC CD -
Workshop Service Manual 1104**

**Please refer to the Engine TEC CD -
Workshop Service Manual 1104**

MACHINE TORQUE SPECIFICATIONS**Specifications****AXLE**

	FT.-LBS.	NM
Axle To Frame Mounting Bolts	275-300	370-410
Brake Housing Hex Bolt	59	80
Brake Housing Spring Bolts	7	10
Brake Housing Stud	88	120
Differential Lock Retainer Bolt	10	13
Fender Mount Bolt	90-100	125-140
Housing Bolt	236	320
Housing Nut	140	190
King Pin Mount Bolts	140	190
Pinion Ring Gear Bolts	10	13
Planetary Cover Bolts	18	25
Planetary Gear Mount Bolts	88	120
Steering Cylinder Bolts	88	120
Tie Rod Jam Nut	185	250
Tie Rod Nut	160	220
Tie Rod Swivel End	300	406
Turn Stop Adjust Jam Nut	110	150
Wheel Nuts	221	300

BOOM

	FT.-LBS.	NM
Extension Cylinder Base End	133	180
Extension Cylinder Rod End	188-210	255-285
Wear Pads Front	43	58
Wear Pads Rear	29	39

DRIVE BOX

	FT.-LBS.	NM
Cover Bolts	44	60
Inner Housing Bolts	88	120
Mounting Flange Bolts	44	60

DRIVE MOTOR

	FT.-LBS.	NM
End Cap Bolts	85	115
Mounting Bolts	155	210
Mounting Plate Bolts	46	63

MACHINE TORQUE SPECIFICATIONS (CONT'D)

Specifications (Cont'd)

ENGINE

	FT.-LBS.	NM
A/C Compressor Mount Bolts	88	120
Alternator Mount Bolts	45	54
Starter Mount Bolts	45	54

HYDRAULIC PUMP

	FT.-LBS.	NM
Filter Head	90	122
Flange Adapter	90	122
Guide Post Bolts	17	23
Mounting Bolts	78	106
Retaining Plate	10	13
Servo End Cap	10	13
Side Cover Bolts	24	32

TORQUE SPECIFICATIONS FOR BOLTS**Torque for General SAE Bolts**

The following table shows standard torque specifications for bolts with zinc phosphate coating. Bolts purchased from Melroe 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 (5830-6500)
	2.000	3800-4200 (5150-5700)	6500-7200 (8800-9800)

TORQUE SPECIFICATIONS FOR BOLTS (CONT'D)

Torque For General Metric Bolts

THREAD SIZE (DIA. X PITCH)	MATERIAL		
	HEAD MARK 4	HEAD MARK 7	HEAD MARK 10
M 5 x 0.8		3-4 ft.-lbs. (4-5 Nm)	
M 6 x 1.0		6-7 ft.-lbs. (8-9 Nm)	6-9 ft.-lbs. (8-12 Nm)
M 8 x 1.25	6-9 ft.-lbs. (8-12 Nm)	11-16 ft.-lbs. (15-22 Nm)	18-25 ft.-lbs. (24-34 Nm)
M 10 x 1.25	13-18 ft.-lbs. (18-24 Nm)	22-30 ft.-lbs. (30-41 Nm)	36-50 ft.-lbs. (49-68 Nm)
M 12 x 1.25	22-30 ft.-lbs. (30-41 Nm)	40-54 ft.-lbs. (54-73 Nm)	69-87 ft.-lbs. (94-118 Nm)
M 14 x 1.5	36-50 ft.-lbs. (49-68 Nm)	58-80 ft.-lbs. (79-108 Nm)	116-137 ft.-lbs. (157-186 Nm)

HYDRAULIC CONNECTION SPECIFICATIONS

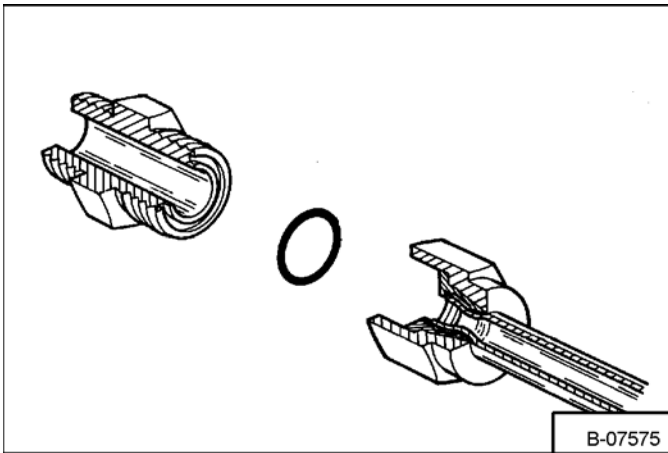
O-ring Face Seal Connection

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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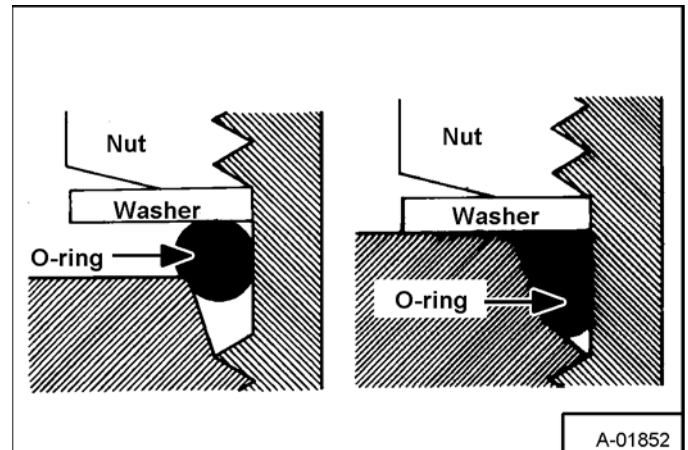
Figure Spec-50-1



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-50-1].

Straight Thread O-ring Fitting

Figure Spec-50-2



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-50-2].

Tubelines And Hoses

Replace any tubelines that are bent or flattened. They will restrict flow, which will slow hydraulic action and cause heat.

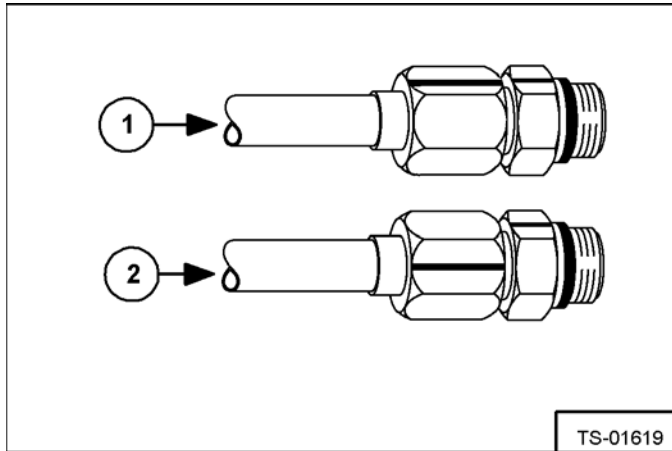
Replace hoses which show signs of wear, damage or weather cracked rubber.

Always use two wrenches when loosening and tightening hose or tubeline fittings.

HYDRAULIC CONNECTION SPECIFICATIONS (CONT'D)

Flare Fitting

Figure Spec-50-3



Use the following procedure to tighten the flare fitting:

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-50-3].

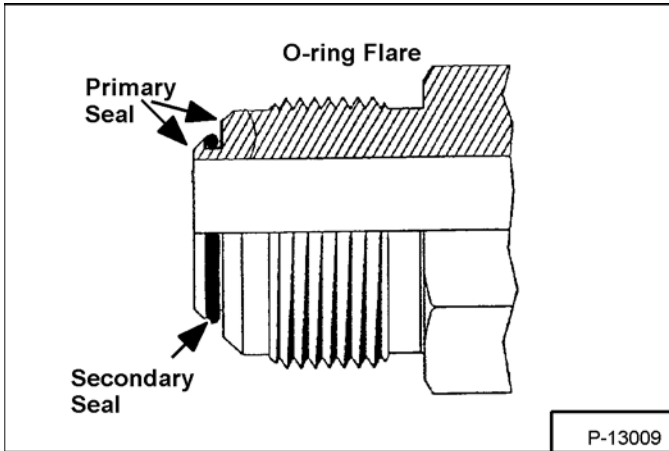
Use the chart below to find the correct tightness needed (Item 2) [Figure Spec-50-3]. If the fitting leaks after tightening, disconnect it and inspect the seat area for damage.

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

HYDRAULIC CONNECTION SPECIFICATIONS (CONT'D)

O-ring Flare Fitting

Figure Spec-50-4

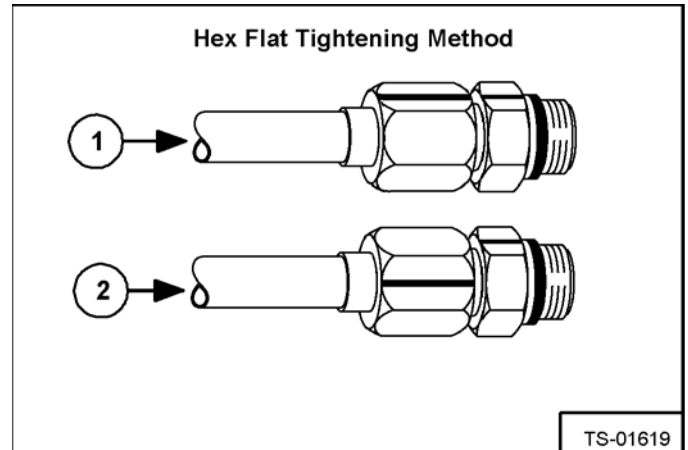


The flare is the primary seal, the O-ring is the secondary seal and helps absorb vibration and pressure pulses at the connection [Figure Spec-50-4].

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-50-5



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-50-5].

Use the chart below to find the correct tightness needed (Item 2) [Figure Spec-50-5]. If the fitting leaks after tightening, disconnect it and inspect the seat area for damage.

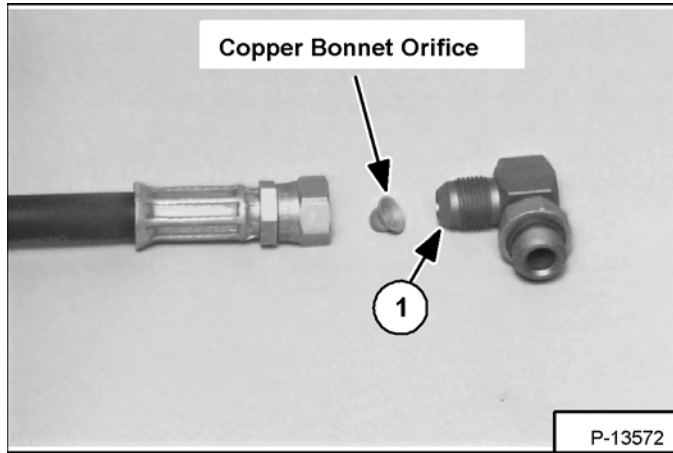
FLARE FITTING TIGHTENING TORQUE					
WRENCH SIZE	TUBELINE OUTSIDE DIAMETER	THREAD SIZE	* TORQUE FT.-LBS. (NM)	** NEW ROTATE NO. OF HEX FLATS	*** RE-ASSEMBLY ROTATE NO. OF HEX FLATS
5/8"	5/16"	1/2" - 20	17 (23)	2-1/2	1
11/16"	3/8"	9/16" - 18	22 (30)	2	1
7/8"	1/2"	3/4" - 16	40 (54)	2	1
1"	5/8"	7/8" - 14	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

*	If a torque wrench is used to tighten a new fitting to a used hose/tubeline.
*	If a torque wrench is used to tighten a used fitting to a new 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 new fitting to a new hose/tubeline.
**	If using the hex flat tightening method to tighten a new fitting to a used hose/tubeline.
***	If using the hex flat tightening method to tighten a used fitting to a new hose/tubeline.

HYDRAULIC CONNECTION SPECIFICATIONS (CONT'D)

O-ring Flare Fitting (Cont'd)

Figure Spec-50-6



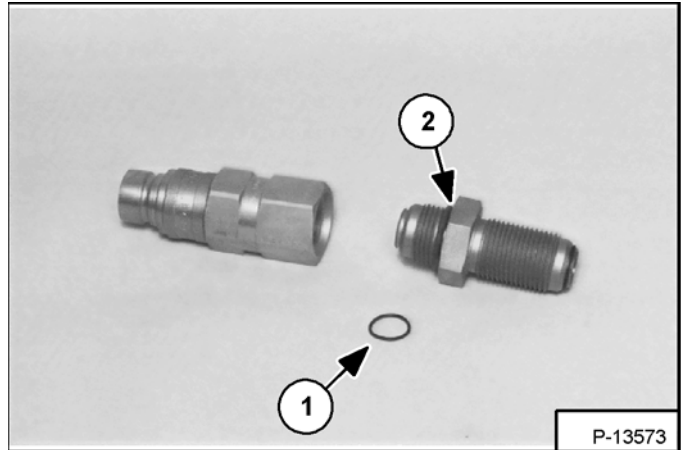
NOTE: O-ring flare fittings are not recommended in all applications. Use the standard flare fittings in these applications.

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.

Use a standard flare fitting (Item 1) [Figure Spec-50-6] 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-50-7



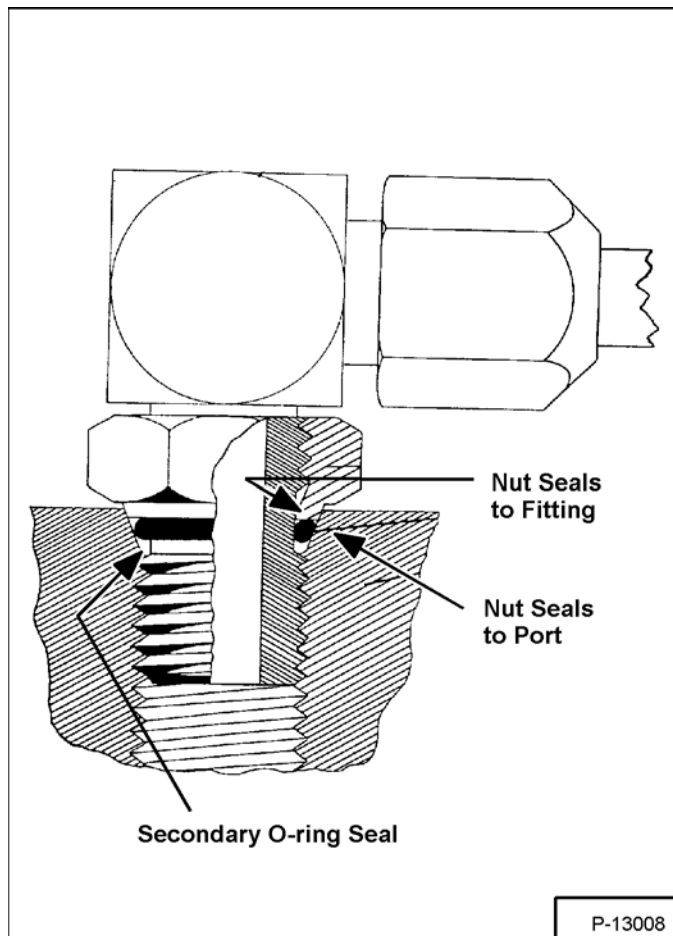
Always remove the O-ring (Item 1) [Figure Spec-50-7] from the flare face as shown.

An O-ring (Item 2) [Figure Spec-50-7] is added to the flat boss of the fitting to seal the connection in this application.

HYDRAULIC CONNECTION SPECIFICATIONS (CONT'D)

Port Seal Fitting

Figure Spec-50-8



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-50-8].

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.

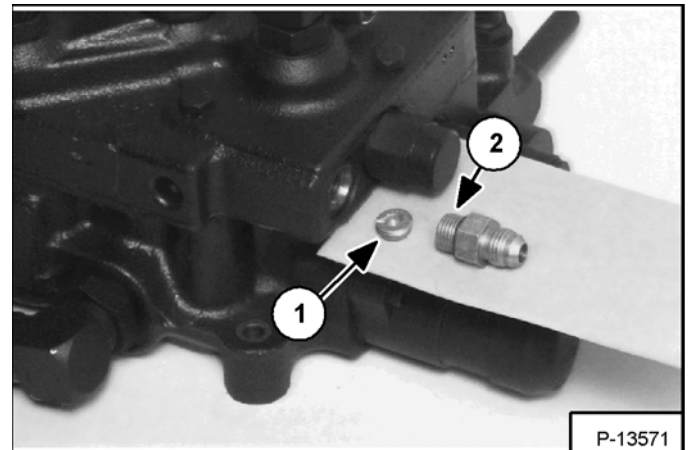
Tighten the nut with a wrench no more than one hex flat maximum.

Do not over tighten the port seal fitting.

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-50-9



Do not use port seal fittings when a thread in orifice (Item 1) [Figure Spec-50-9] 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-50-9] as shown.

PORT SEAL AND O-RING BOSS TIGHTENING TORQUE		
FITTING NUT WRENCH SIZE	THREAD SIZE	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)

HYDRAULIC/HYDROSTATIC FLUID SPECIFICATIONS

Specifications

Use Massey Ferguson axle fluid, for the drive box, planetaries and axle housing.

Use Massey Ferguson hydraulic/hydrostatic transmission fluid. If this fluid is not available, use 10W-30 or 10W-40 SAE Motor Oil (5W-30 for 0°F [-18°C] and Below).

DO NOT use automatic transmission fluids in the Telehandler or permanent damage to the transmission will result.

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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When temperatures below zero degree F (-18°C) are common, the machine must be kept in a warm building. Extra warm-up time must be used each time the machine is started during cold temperature conditions. Cold fluid will not flow easily and it makes action on the hydraulic function slower. Loss of fluid flow to the hydrostatic pump can cause hydraulic/hydrostatic system 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 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.

W-2027-1285

CONVERSIONS

Decimal And Millimeter Equivalents

FRACTIONS	DECIMALS	MM	FRACTIONS	DECIMALS	MM
1/64	0.015625	0.397	33/64	0.515625	13.097
1/32	0.03125	0.794	17/32	0.53125	13.494
3/64	0.046875	1.191	35/64	0.546875	13.891
1/16	0.0625	1.588	9/16	0.5625	14.288
5/64	0.078125	1.984	37/64	0.578125	14.684
3/32	0.09375	2.381	19/32	0.59375	15.081
7/64	0.109375	2.778	39/64	0.609375	15.478
1/8	0.1250	3.175	5/8	0.6250	15.875
9/64	0.140625	3.572	41/64	0.640625	16.272
5/32	0.15625	3.969	21/32	0.65625	16.669
11/64	0.171875	4.366	43/64	0.671875	17.066
3/16	0.1876	4.762	11/16	0.6875	17.462
13/64	0.203125	5.159	45/64	0.703125	17.859
7/32	0.21875	5.556	23/32	0.71875	18.256
15/64	0.234375	5.953	47/64	0.734375	18.653
1/4	0.2500	6.350	3/4	0.7500	19.050
17/64	0.265625	6.747	49/64	0.765625	19.447
9/32	0.28125	7.144	25/32	0.78125	19.844
19/64	0.296875	7.541	51/64	0.796875	20.241
5/16	0.3125	7.938	13/16	0.8125	20.638
21/64	0.328125	8.334	53/64	0.828125	21.034
11/32	0.34375	8.731	27/32	0.84375	21.431
23/64	0.359375	9.128	55/64	0.859375	21.828
3/8	0.3750	9.525	7/8	0.8750	22.225
25/64	0.390625	9.922	57/64	0.890625	22.622
13/32	0.40625	10.319	29/32	0.90625	23.019
27/64	0.421875	10.716	59/64	0.921875	23.416
7/16	0.4375	11.112	15/16	0.9375	23.812
29/64	0.453125	11.509	61/64	0.953125	24.209
15/32	0.46875	11.906	31/32	0.96875	24.606
31/64	0.484375	12.303	63/64	0.984375	25.003
1/2	0.5000	12.700	1	1.000	25.400
1 mm = 0.03937"	0.001" = 0.0254 mm				

CONVERSION (CONT'D)**U.S. To Metric Conversion**

	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	Bar	Pounds/Square Inch	14.5
WORK	Foot-Pounds	Newton-Metre	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