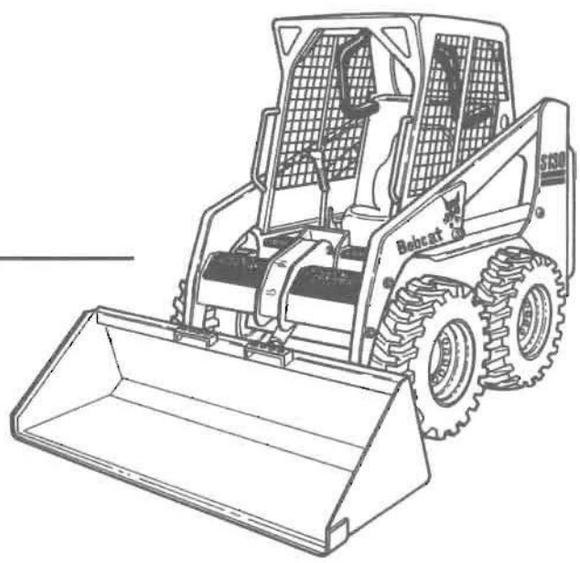
S130

Bobcat®

Service Manual

S/N 527311001 & Above
S/N 527411001 & Above



EQUIPPED WITH BOBCAT INTERLOCK CONTROL SYSTEM (BICS™)

An Ingersoll-Rand business

6903151 (1-05)

Printed in U.S.A.

© Bobcat Company 2005

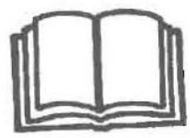
MAINTENANCE SAFETY

⚠ WARNING

Instructions are necessary before operating or servicing machine. Read and understand the Operation & Maintenance Manual, Operator's Handbook and signs (decals) on machine. Follow warnings and instructions in the manuals when making repairs, adjustments or servicing. Check for correct function after adjustments, repairs or service. Untrained operators and failure to follow instructions can cause injury or death. W-2003-0903

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

CORRECT



B-10731a

⚠ **Never service the Bobcat® Skid Steer Loader without instructions.**

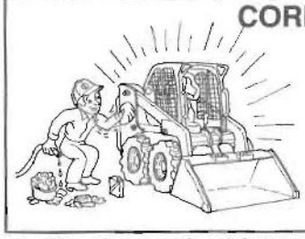
CORRECT



B-15590

⚠ **Use the correct procedure to lift or lower operator cab.**

CORRECT



B-15591

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

WRONG



B-15592

⚠ **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-15593

⚠ **Disconnecting or loosening any hydraulic tubeline, hose, fitting, component or a part failure can cause lift arms to drop. Do not go under lift arms when raised unless supported by an approved lift arm support device. Replace it if damaged.**

WRONG



B-15599

⚠ **Never work on loader with lift arms up unless lift arms are held by an approved lift arm support device. Replace if damaged.**

⚠ **Never modify equipment or add attachments not approved by Bobcat Company.**

WRONG



B-15600

⚠ **Stop, cool and clean engine of flammable materials before checking fluids.**

⚠ **Never service or adjust loader with the engine running unless instructed to do so in the manual.**

⚠ **Avoid contact with leaking hydraulic fluid or diesel fuel under pressure. It can penetrate the skin or eyes.**

⚠ **Never fill fuel tank with engine running, while smoking or when near open flame.**

WRONG



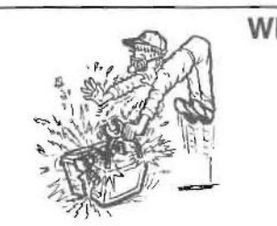
B-15601

⚠ **Keep body, jewelry and clothing away from moving parts, electrical contact, hot parts and exhaust.**

⚠ **Wear eye protection to guard from battery acid, compressed springs, fluids under pressure and flying debris when engines are running or tools are used. Use eye protection approved for type of welding.**

⚠ **Keep rear door closed except for service. Close and latch door before operating the loader.**

WRONG



B-6589

⚠ **Lead-acid batteries produce flammable and explosive gases.**

⚠ **Keep arcs, sparks, flames and lighted tobacco away from batteries.**

⚠ **Batteries contain acid which burns eyes or skin on contact. Wear protective clothing. If acid contacts body, flush well with water. For eye contact flush well and get immediate medical attention.**

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

MSW08-0504


Bobcat®

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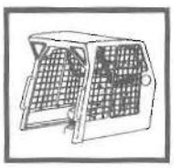
SPECIFICATIONS SPEC-01

FOREWORD

This manual is for the Bobcat loader mechanic. It provides necessary servicing and adjustment procedures for the Bobcat loader 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 loader has had service or repair:

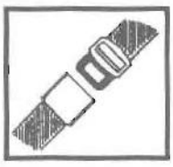
1. Check that the ROPS/FOPS (Including side screens) is in good condition and is not modified.



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



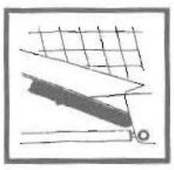
3. The seat belt must be correctly installed, functional and in good condition.



4. The seat bar must be correctly adjusted, clean and lubricated.



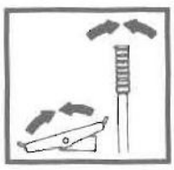
5. Check lift arm support device, replace if damaged.



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



7. Steering levers and foot pedals must return to neutral.



8. Check for correct function of the work lights



9. The parking brake must function correctly.



10. Enclosure door latches must open and close freely.



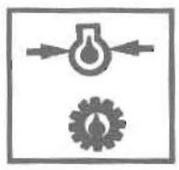
11. Bob-Tach wedges and linkages must function correctly and be in good condition.



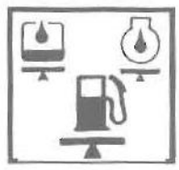
12. Safety treads must be in good condition.



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



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



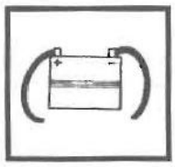
15. Inspect for fuel, oil or hydraulic fluid leaks.



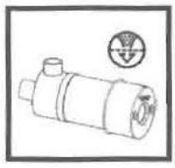
16. Lubricate the loader.



17. Check the condition of the battery and cables.



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



19. Check the electrical charging system.



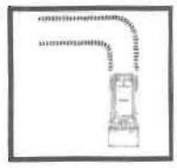
20. Check tires for wear and pressure.



21. Inspect for loose or broken parts or connections.



22. Operate the loader and check all functions.



23. Check for any field modification not completed.



24. Check for correct function of the Bobcat Interlock Control System (BICS™) before the machine is returned to the customer.



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



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.



Bobcat®

SAFETY INSTRUCTIONS

⚠ WARNING

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

W-2003-0903

⚠ 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 loader 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 loader gives operating information as well as routine maintenance and service procedures. It is a part of the loader and must stay with the machine when it is sold. Replacement Operation & Maintenance Manuals can be ordered from your Bobcat loader dealer.
- The loader 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 Bobcat loader dealer.
- The loader has a plastic Operator's Handbook fastened to the operator cab. 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 Bobcat dealer for more information on translated versions.
- The EMI Safety Manual (available in Spanish) delivered with the loader 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 Skid-Steer Loader Operator Training Course is available through your local dealer. This course is intended to provide rules and practices for correct operation of the Bobcat loader. The course is available in English and Spanish version.
- The Service Safety Training Course is available from your Bobcat dealer. This course provides information for safe and correct service procedures for Bobcat Skid-Steer loaders.
- The Bobcat Skid-Steer Loader Safety Video is available from your Bobcat Dealer.

⚠

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

SI05-0903

FIRE PREVENTION

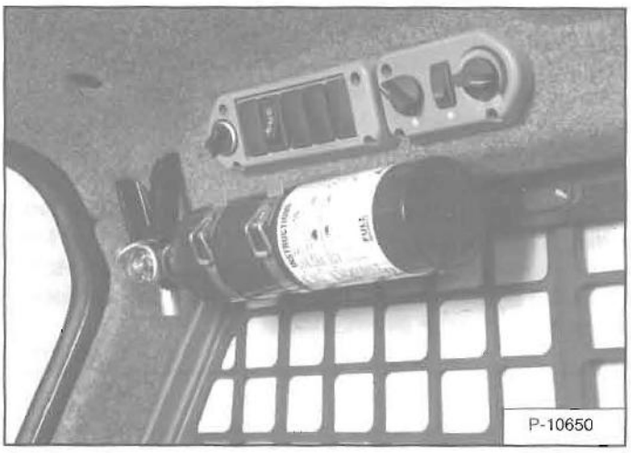
The loader has several components that are at high temperatures under normal operating conditions. The primary source of high temperatures is the engine and exhaust system. The electrical system, if damaged or incorrectly maintained, can be a source of arcs or sparks.

Flammable debris (leaves, straw, etc.) must be removed regularly. If flammable debris is allowed to accumulate, it will increase the fire hazard.The loader must be cleaned as often as necessary to avoid this accumulation. Flammable debris in the engine compartment is a fire hazard when the loader is parked with a hot engine.

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

- Do not use the Bobcat loader where exhaust, arcs, sparks or hot components can contact flammable material, explosive dust or gases.
- The 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. These starting aids can cause explosion and injure you or bystanders.
- Always clean the loader and disconnect the battery before doing ant welding. Cover rubber hoses, battery and all other flammable parts. Keep a fire extinguisher near the loader 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.
- Use the procedure in the Operation & Maintenance Manual for cleaning the spark arrestor muffler.

Figure 1



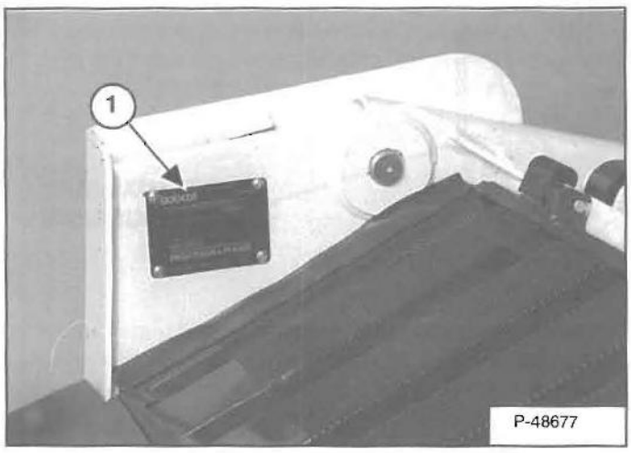
- Know where fire extinguishers and first aid kits are located and how to use them. Fire extinguishers are available from your Bobcat dealer. The fire extinguisher is available from your Bobcat dealer.The fire extinguisher can be installed in the location shown in **[Figure 1]**.

SERIAL NUMBER LOCATIONS

Always use the serial number of the loader 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.

Loader Serial Number

Figure 2



The loader serial number plate is located on the outside of the loader frame **[Figure 2]**.

Explanation of loader Serial Number:

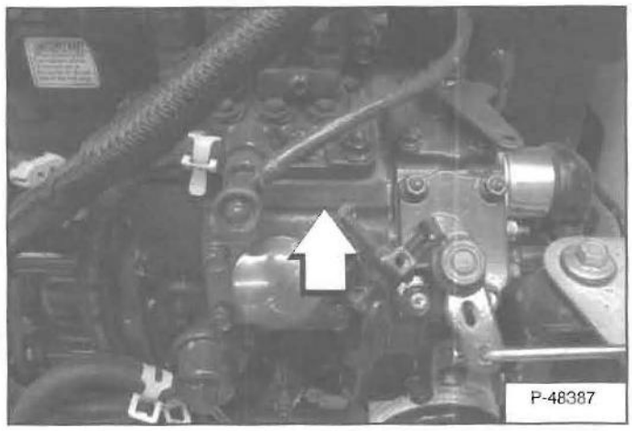
XXXX	XXXXX
Model 1.-Model/ Engine Combination	Model 2.-Production Sequence (Series)

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

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

Engine Serial Number

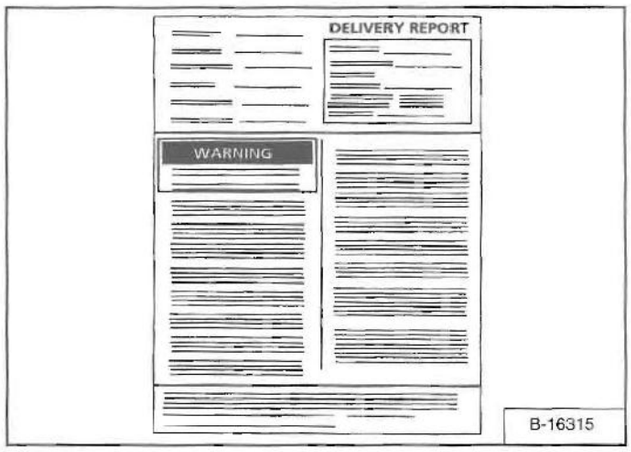
Figure 3



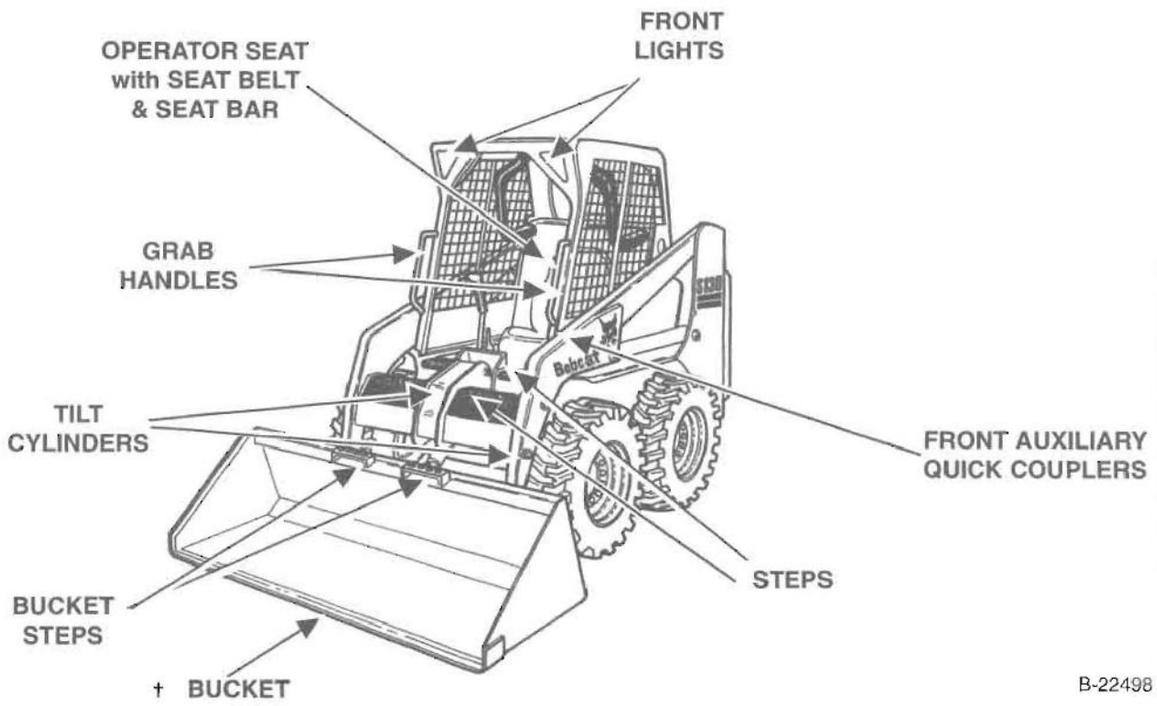
The engine serial number is in the location shown **[Figure 3]**.

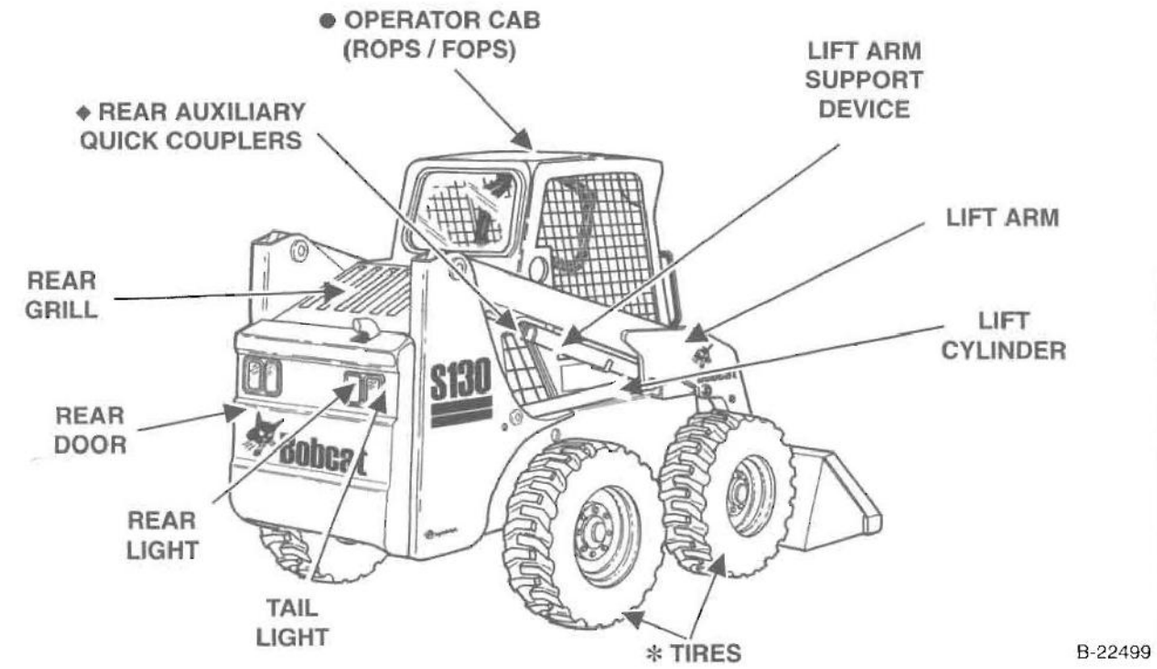
Delivery Report

Figure 4



The Delivery Report must be filled out by the dealer and signed by the owner or operator when the Bobcat loader is delivered. An explanation of the form must be given to the owner. Make sure it is filled out completely **[Figure 4]**.





◆ Optional or Field Accessory (Not Standard Equipment)
✻ TIRES - Tires shown may not be standard. The machine is factory equipped with standard tires. Other tires are available.
† Bucket - Several different buckets and other attachments are available for this machine.
● ROPS, FOPS - Roll Over Protective Structure, per SAE J1040 and ISO 3471, and Falling Object Protective Structure per ISO 3449, Level I. Level II is available.

SAFETY AND MAINTENANCE

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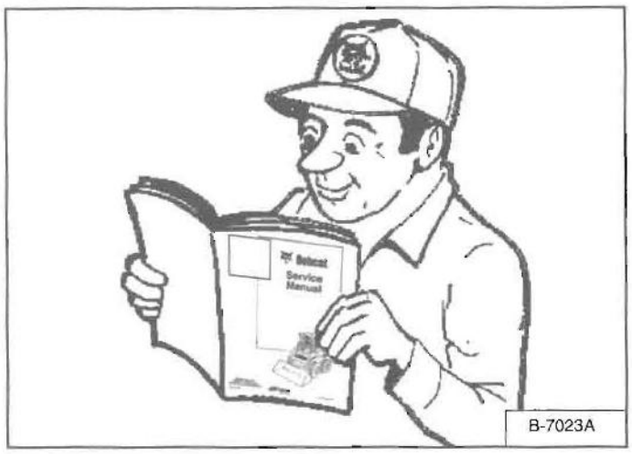
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TIGHTEN ALL HARDWARE PER SIZE TO GRADE 5 TORQUE (SEE STANDARD TORQUE SPECIFICATIONS FOR BOLTS, SECTION SPEC-01) UNLESS OTHERWISE SPECIFIED.

LIFTING AND BLOCKING THE LOADER

Procedure

Figure 10-10-1



⚠ WARNING

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

W-2003-0903

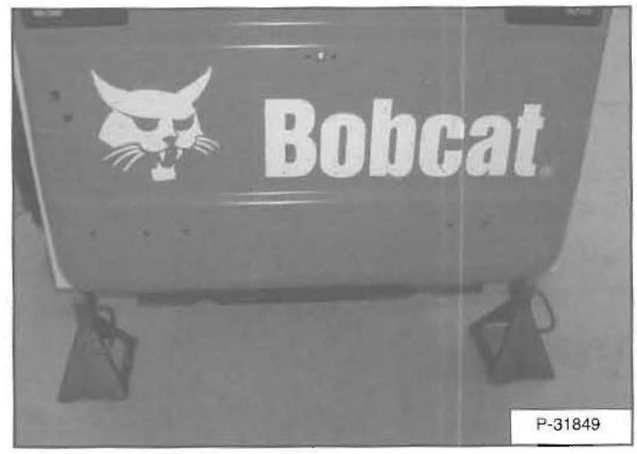
Always park the loader on a level surface.

⚠ WARNING

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

W-2017-0286

Figure 10-10-2



Put floor jack under the rear of the loader.

Lift the rear of the loader and install jack stands **[Figure 10-10-2]**.

Figure 10-10-3



Put the floor jack under the front of the loader **[Figure 10-10-3]**.

Lift the front of the loader and put jack stands under the axle tubes **[Figure 10-10-3]**.

NOTE: Make sure the jack stands do not touch the tires. Make sure tires clear floor or any obstacles.


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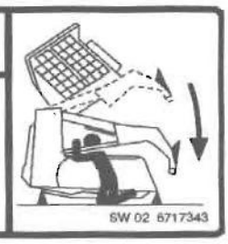
LIFT ARM SUPPORT DEVICE

Installing Lift Arm Support Device

⚠ DANGER

AVOID DEATH

- Disconnecting or loosening any hydraulic tubeline, hose, fitting, component or a part failure can cause lift arms to drop.
- Keep out of this area when lift arms are raised unless supported by an approved lift arm support. Replace if damaged. 57051



⚠ WARNING

Never work on a machine with the lift arms up unless the lift arms are secured by an approved lift arm support device. Failure to use an approved lift arm support device can allow the lift arms or attachment to fall and cause injury or death.

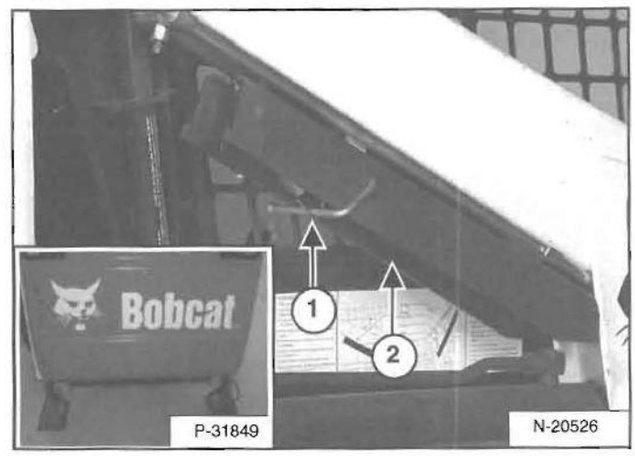
W-2059-0598

⚠ WARNING

Service lift arm support device if damaged or if parts are missing. Using a damaged lift arm support or with missing parts can cause lift arms to drop causing injury or death.

W-2271-1197

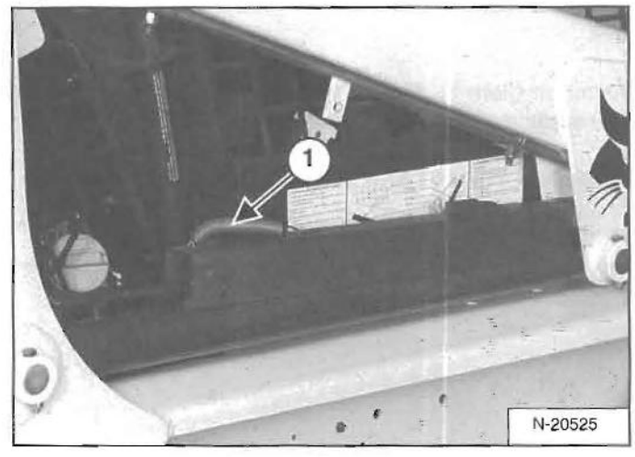
Figure 10-20-1



Put jack stands under the rear corners of the loader frame (Inset) **[Figure 10-20-1]**.

Disconnect the spring from the lift arm support device retaining pin (Item 1). Support the lift arm support device (Item 2) **[Figure 10-20-1]** with your hand and remove the retaining pin.

Figure 10-20-2

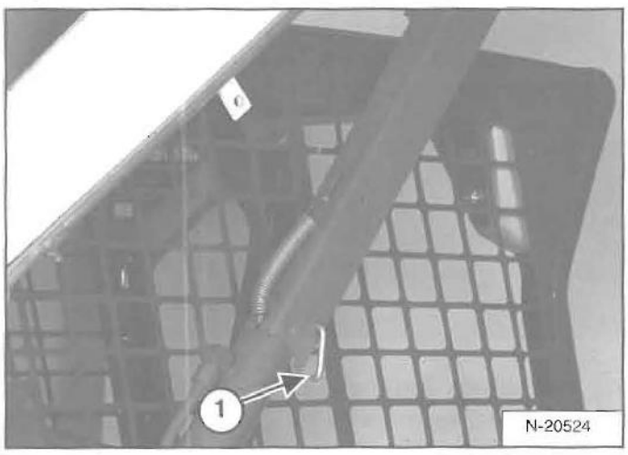


Lower the lift arm support device on top of the lift cylinder. Hook the free end of the spring (Item 1) **[Figure 10-20-2]** to the lift arm support device so there will be no interference with the support device engagement.

With the operator in the seat, seat belt fastened and seat bar lowered, start the engine.

Installing Lift Arm Support Device (Cont'd)

Figure 10-20-3



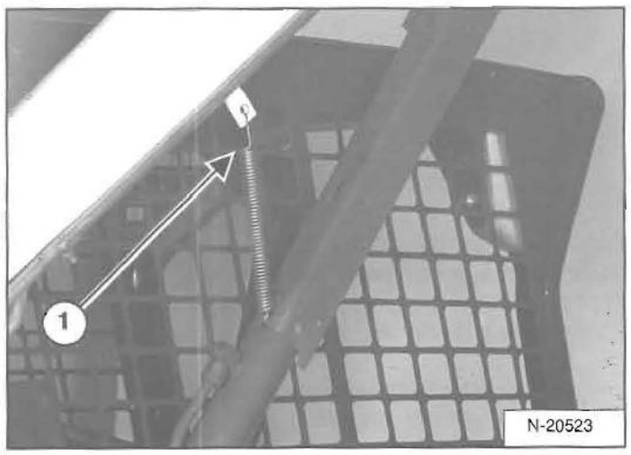
Raise the lift arms, until the lift arm support device drops onto the lift cylinder rod **[Figure 10-20-3]**.

Lower the lift arms slowly until the support device is held between the lift arm and the lift cylinder. Stop the engine. Raise the seat bar and move pedals until both pedals lock.

Install pin (Item 1) **[Figure 10-20-3]** into the rear of the lift arm support device below the cylinder rod.

Removing The Lift Arm Support Device

Figure 10-20-4



Remove the pin from the lift arm support device.

Connect the spring (Item 1) **[Figure 10-20-4]** from the lift arm support device to the bracket below the lift arms.

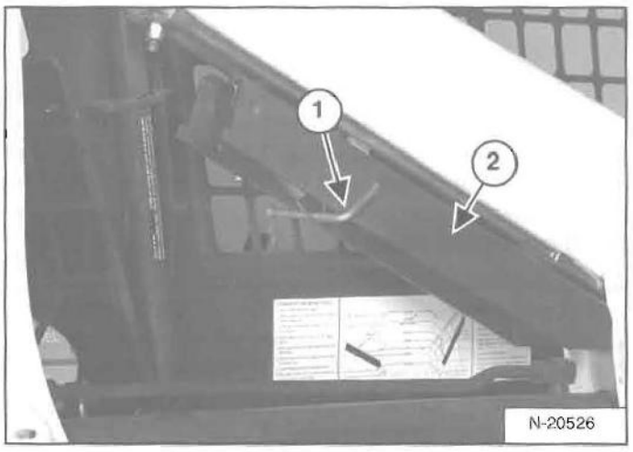
With the operator in the seat, seat belt fastened and seat bar lowered, start the engine.

Raise the lift arms a small amount and the spring will lift the support device off the lift cylinder rod. Lower the lift arms. Stop the engine.

Raise the seat bar and move pedals until both pedals lock.

Disconnect the spring from the bracket.

Figure 10-20-5



Raise the support device into storage position and insert pin (Item 1) through lift arm support device (Item 2) **[Figure 10-20-5]** and bracket. Connect spring to pin.

Remove jack stands.

OPERATOR CAB

Description

The Bobcat loader has an operator cab (ROPS and FOPS) as standard equipment to protect the operator from rollover and falling objects. Check with your dealer if the operator cab has been damaged. 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, Level I. Level II is available.

Level I - Protection from falling bricks, small concrete blocks, and hand tools encountered in operations such as highway maintenance, landscaping, and other construction site services.

Level II - Protection from falling trees, rocks; for machines involved in site clearing, overhead demolition or forestry.

Raising The Operator Cab

Always stop the engine before raising or lowering the cab.

Stop the loader on a level surface. Lower the lift arms. If the lift arms must be up while raising the operator cab, install the lift arm support device. (See LIFT ARM SUPPORT DEVICE Contents Page 10-01.)

Figure 10-30-1



Install jack stands under the rear of the loader frame **[Figure 10-30-1]**.



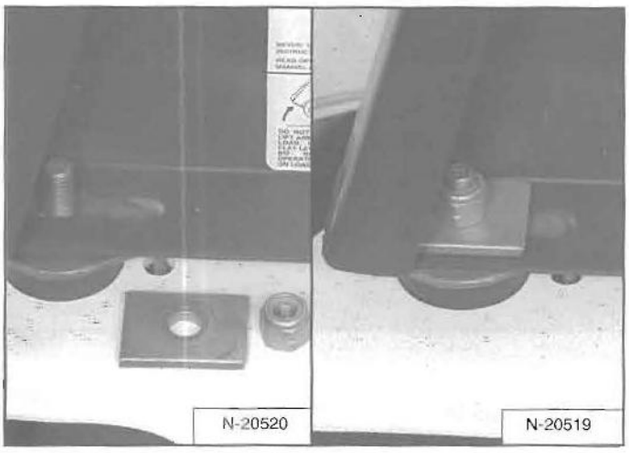
WARNING

Never modify operator cab by welding, grinding, drilling holes or adding attachments unless instructed to do so by Bobcat. Changes to the cab can cause loss of operator protection from rollover and falling objects, and result in injury or death.

W-2069-1299

Raising The Operator Cab (Cont'd)

Figure 10-30-2



Loosen the nut (both sides) at the front corners of the operator cab **[Figure 10-30-2]**.

Remove the nuts and plates **[Figure 10-30-2]** (both sides).

Figure 10-30-3



Lift on the grab handle and bottom of the operator cab slowly until the cab is all the way up and the latching mechanism engages **[Figure 10-30-3]**.

Lowering The Operator Cab

Figure 10-30-4



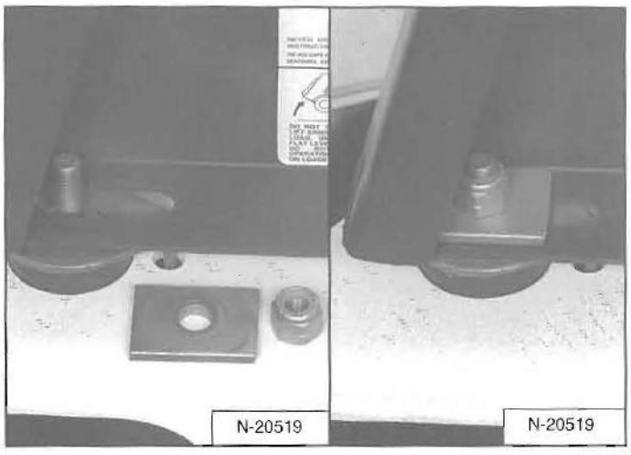
Always stop the engine before raising or lowering the cab.

NOTE: Make sure the seat bar is fully raised or lowered when lowering the cab. Always use the grab handles to lower the cab.

Pull down on the bottom of the operator cab until it stops at the latching mechanism **[Figure 10-30-4]**.

Release the latching mechanism (Inset) **[Figure 10-30-4]** and pull the cab all the way down.

Figure 10-30-5

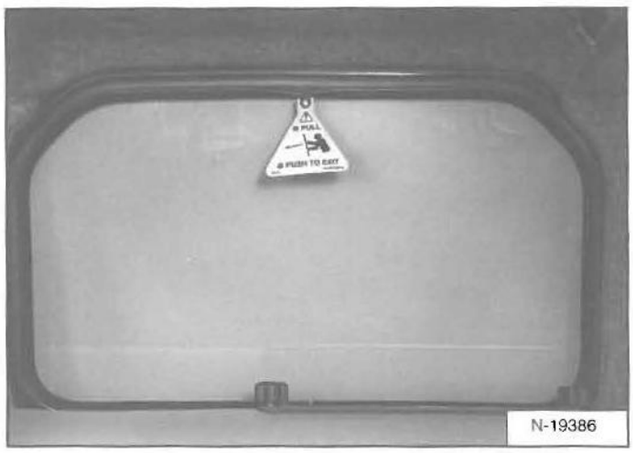


Install the plates and nuts **[Figure 10-30-5]** (both sides).

Tighten the nuts to 40-50 ft.-lbs. (54-68 Nm) torque.

Emergency Exit

Figure 10-30-6



The front opening on the operator cab and rear window provide exits.

Rear Window (If Equipped)

Pull on the tag on the top of the rear window to remove the rubber cord **[Figure 10-30-6]**.

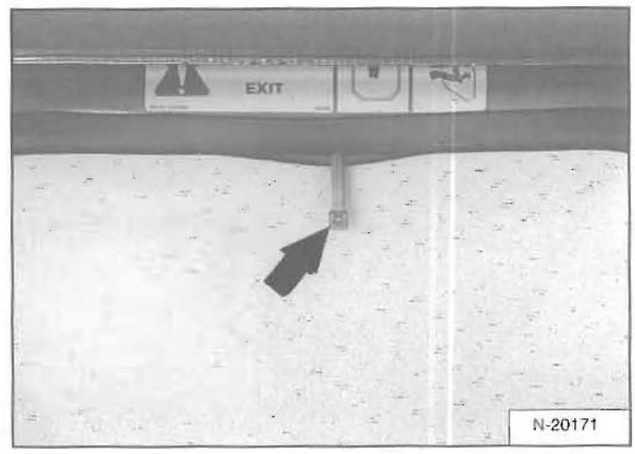
Figure 10-30-7



Push the rear window out of the rear of the operator cab.

Exit through the rear of the operator cab **[Figure 10-30-7]**.

Figure 10-30-8

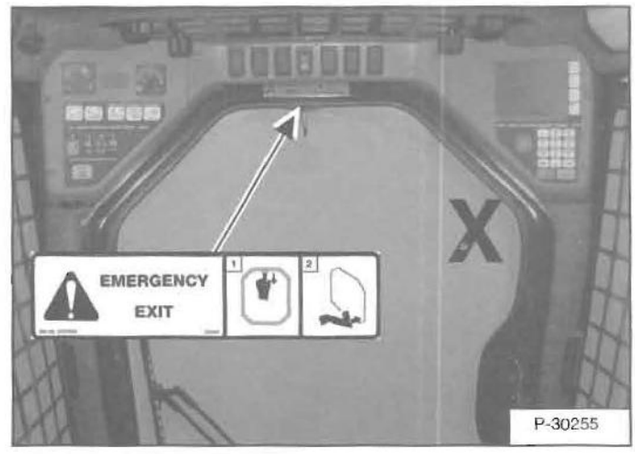


Front Door (If Equipped)

NOTE: When an Operator Cab Enclosure Kit is installed, the window of the front door can be used as an emergency exit. [Figure 10-30-8]

Pull the plastic loop at the top of the window in the front door to remove the rubber cord **[Figure 10-30-8]**.

Figure 10-30-9



Push the window out with your foot **[Figure 10-30-9]** at any corner of the window.

Exit through the front door.



Bobcat®

TRANSPORTING THE BOBCAT LOADER

Procedure

⚠ 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

Figure 10-40-1



Be sure the transport and towing vehicles are of adequate size and capacity (See SPECIFICATIONS Contents Page SPEC-01, for weight of loader.)

A loader with an empty bucket or no attachment must be loaded backward onto the transport vehicle **[Figure 10-40-1]**.

The rear of the trailer must be blocked or supported (Item 1) **[Figure 10-40-1]** when loading or unloading the loader to prevent the front end of the trailer from raising up.

Figure 10-40-2



Use the following procedure to fasten the Bobcat loader to the transport vehicle to prevent the loader from moving during sudden stops or when going up or down slopes **[Figure 10-40-2]**.

- Lower the bucket or attachment to the floor.
- Stop the engine.
- Engage the parking brake.
- Install chains at the front and rear loader tie down positions (Inset) **[Figure 10-40-2]**.
- Fasten each end of the chain to the transport vehicle.

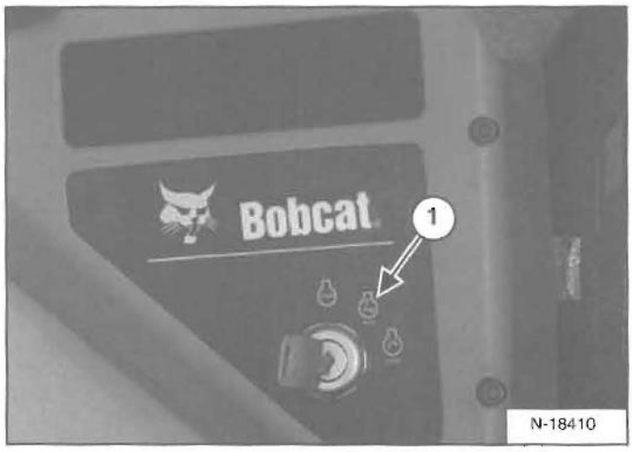


Bobcat®

TOWING THE LOADER

Procedure

Figure 10-50-1

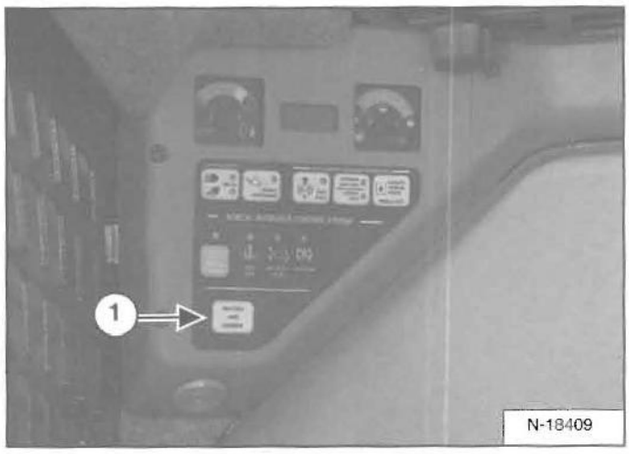


To prevent damage to the loaders hydrostatic system, the loader must be towed only a short distance at slow speed. (Example: Moving the loader onto a transport vehicle).

The towing chain (or cable) must be rated at 1 & 1/2 times the weight of the loader. (See *SPECIFICATIONS* Contents Page SPEC-01.)

- Turn the key switch to RUN (Item 1) **[Figure 10-50-1]** (*Standard Panel*) OR press the RUN/ENTER Button (*Deluxe Panel*).

Figure 10-50-2



- Press the TRACTION LOCK OVERRIDE Button (Item 1) **[Figure 10-50-2]**.
- Tow the Bobcat at 2 MPH (3,2 km/hr) or less for not more than 25 feet (7,6 meters).

If the electrical system is not functioning or the engine does not run part of the brake system must be disassembled to move the loader. (See *TRACTION LOCK Removal And Installation procedure* Contents Page 60-01.)


Bobcat®

REMOTE START

Procedure

Figure 10-60-1



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

MEL1563: Remote Start Tool Kit

The remote start (Item 1) **[Figure 10-60-1]** is required when the operator cab is in the raised position for service and the service technician needs to turn the key switch on or start the engine. Example: adjusting the steering linkage.

Figure 10-60-2

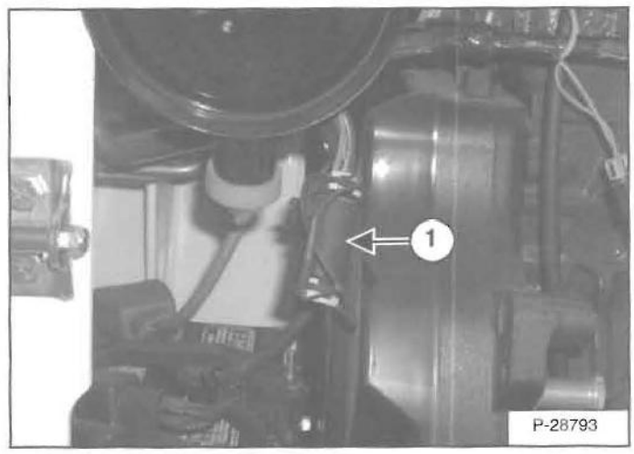
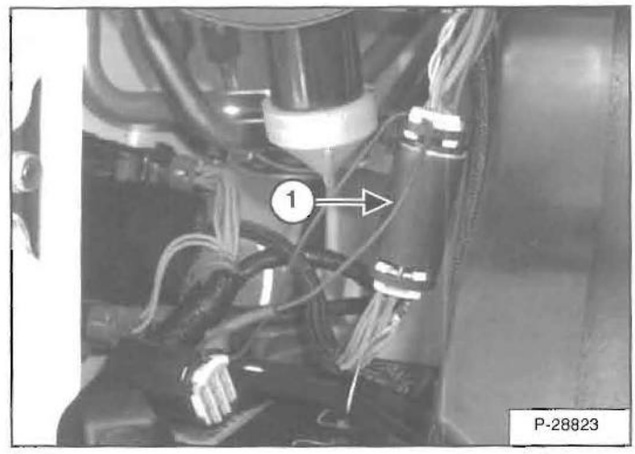


Figure 10-60-3



Lift and block the loader. (See Contents, Page 10-01.)

Raise the lift arms (if required by the procedure) and install an approved lift arm support device. (See Contents Page 10-01.)

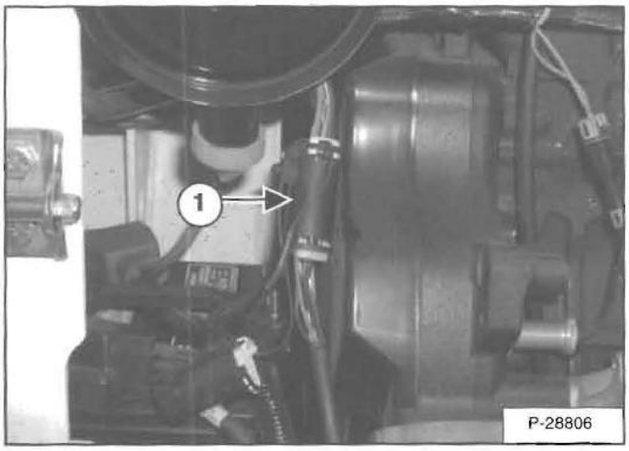
Raise the operator cab (if required by the procedure). (See Contents Page 10-01.)

Open the rear door of the loader.

Remove the plug (Item 1) **[Figure 10-60-2]** /or disconnect the attachment control harness (Item 1) **[Figure 10-60-3]** if connected.

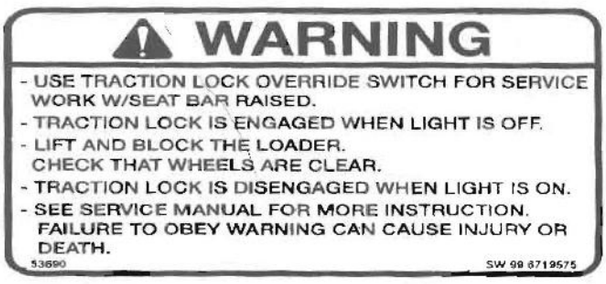
Procedure (Cont'd)

Figure 10-60-4



Connect the remote start tool to the engine harness connector (Item 1) **[Figure 10-60-4]**.

NOTE: The key switch on the right-hand side operator panel must be in the off position or the Remote Start Kit will not operate.



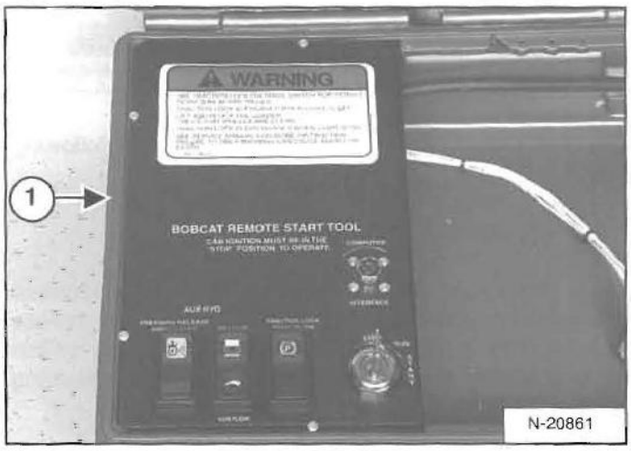
WARNING

AVOID INJURY OR DEATH

With the 7-pin connector plugged into the loader and Remote Start Key Switch in the OFF position, the loader can still be started from the operator panel inside the cab. Placing the key switch of the remote start tool in the run position disconnects the operator panel key switch from the start circuit. If the service technician will be working the engine area it is important to remove the operator panel keys.

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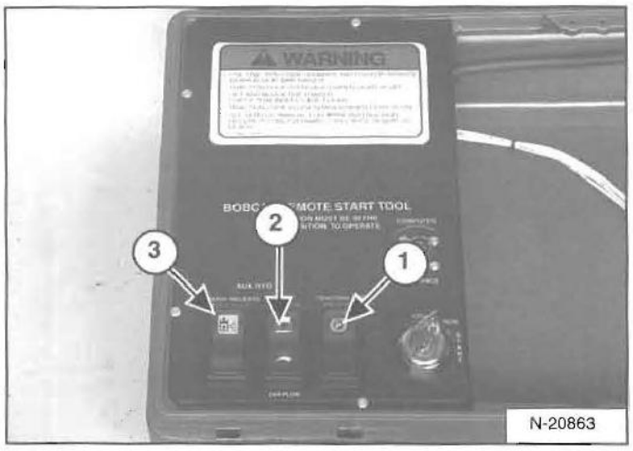
Figure 10-60-5



The remote start tool (Item 1) **[Figure 10-60-5]** has three rocker switches.

Procedure (Cont'd)

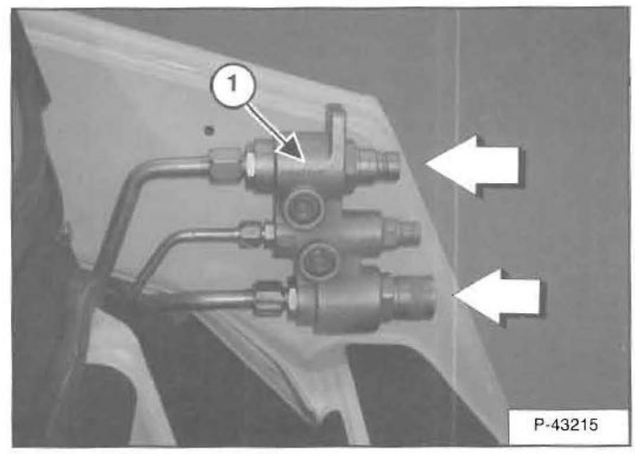
Figure 10-60-6



The traction lock switch (Item 1) **[Figure 10-60-6]** is used to turn traction lock on or off. Push the switch to the override position. The switch will illuminate to indicate traction lock OVERRIDE, in this position the wheels are able to turn.

The maximum flow/variable flow switch (Item 2) **[Figure 10-60-6]** is used to activate the auxiliary hydraulics. Pressing the switch once will activate variable flow. Pressing the switch again will activate maximum flow. The switch will illuminate to indicate which flow rate is active. Pressing the switch a third time will turn the flow OFF. The switch is used when checking pressures and flow rate.

Figure 10-60-7



The loader is equipped with the front auxiliary coupler block (Item 1) **[Figure 10-60-7]**, push the couplers towards the block and hold for five seconds to release the front auxiliary pressure.

To release the rear auxiliary coupler pressure and/or right hand front auxiliarys, use the pressure release button (Item 3) **[Figure 10-60-6]** on the remote start tool. Hold the button down for three seconds while the engine is running. The engine will shut off, the rear auxiliarys and the front right hand auxiliarys will relieve the pressure.


Bobcat®

SERVICE SCHEDULE

Chart

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

⚠ WARNING

Instructions are necessary before operating or servicing machine. Read and understand the Operation & Maintenance Manual, Operator's Handbook and signs (decals) on machine. Follow warnings and instructions in the manuals when making repairs, adjustments or servicing. Check for correct function after adjustments, repairs or service. Untrained operators and failure to follow instructions can cause injury or death.
W-2003-0903

SERVICE SCHEDULE		HOURS					
ITEM	SERVICE REQUIRED	8-10	50	100	■ 250	■ 500	■ 1000
Engine Oil	Check the oil level and add oil as needed.						
Engine Air Filter and Air System	Check display panel. Service only when required. Check for leaks and damaged components.						
Engine Cooling System	Clean debris from oil cooler, radiator & grill. Check coolant level COLDand add premixed coolant as needed.						
Tires	Check for damaged tires and correct air pressure. Inflate to MAXIMUM pressure shown on sidewall of tire.						
Seat Belt, Seat Bar, Control Interlocks and Seat Belt Retractors	Check the condition of seat belt. Check the seat bar and control interlocks for correct operation. Clean dirt and debris from moving parts. Clean or replace seat belt retractors as needed.						
Safety Signs and Safety Treads	Check for damaged signs (decals) and safety treads. Replace any signs or safety treads that are damaged or worn.						
Indicators & Lights	Check for correct operation of all indicators and lights.						
Operator Cab	Check the fastening bolts, washers and nuts. Check the condition of the cab.						
Lift Arms, Cylinders, Bob-Tach Pivot Pins and Wedges	Lubricate with multi-purpose lithium based grease.						
Fuel Filter	Remove the trapped water.						
Heater Filters	Clean or replace filters as needed during heating/cooling season.						
Bobcat Interlock Control System (BICS™)	Check the four (4) BICS™ indicator lights and functions are activated. See details in this Manual.						
Hydraulic Fluid, Hoses and Tubelines	Check fluid level and add as needed. Check for damage and leaks. Repair or replace as needed.						
Final Drive Trans. (Chaincase),	Check oil level. Check for correct operation. Repair or adjust as needed.						
Foot Pedals or Hand Controls and Steering Levers	Check for correct operation. Repair or adjust as needed.						
Wheel Nuts	Check for loose wheel nuts and tighten to correct torque. (See Section 10-170)	❑					
Parking Brake	Check operation.						
Spark Arrestor Muffler	Clean the spark chamber.						
Battery	Check cables, connections and electrolyte level. Add distilled water as needed.						
Steering Lever Pivots	Grease two fittings.						
Engine/Hydrostatic Drive Belt	Check for wear or damage. Adjust as needed.		*				
Fan Drive Gearbox	Check gear lube level. Add as needed.						
Alternator Belt	Check belt tension and adjust as needed.						
Engine Oil and Filter	Replace oil and filter. Use CD or better grade oil and Bobcat filter.		^				
Fuel Filter	Replace the filter element.						
Bobcat Interlock Control System (BICS™)	Check the function of the lift arm by-pass control						
Hydraulic Reservoir Breather Cap	Replace the reservoir breather cap.						
Hyd./Hydro. Filter	Replace the filter element.		●				
Hydraulic Reservoir	Replace the fluid						
Final Drive Trans. (Chaincase)	Replace the fluid						
Case Drain Filters	Replace the filters						

❑ **Check wheel nut torque every 8 hours for the first 24 hours.**
* **Inspect the new belt after first 50 hours.**
● **Replace filter element after the first 50 hours and when the transmission warning light comes ON.**
^ **First oil and filter change must occur at 50 hours; 250 hours thereafter.**
■ **Or every 12 months.**



Bobcat®

AIR CLEANER SERVICE

Checking

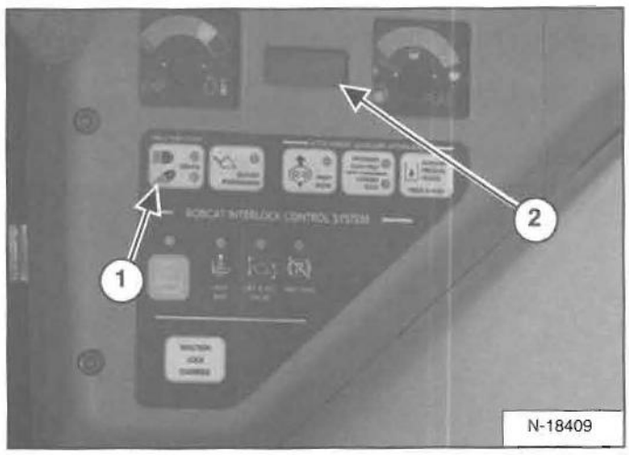
Figure 10-80-1



It is important to change the air filter element only when the Air Cleaner icon in the right panel is ON (Item 1) **[Figure 10-80-1]** and you hear three beeps from the alarm.

Replace the inner filter every third time the outer filter is replaced or as indicated. (See Contents Page 10-01.)

Figure 10-80-2



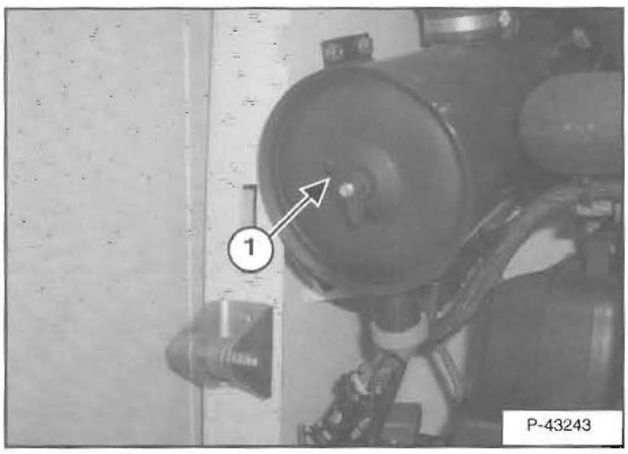
Press and hold the LIGHT Button (Item 1) **[Figure 10-80-2]** for two seconds.

If the filter element needs replacement, the CODE [**01-17**] **(Air Filter Plugged)** will show in the HOURMETER / CODE DISPLAY (Item 2) **[Figure 10-80-2]**.

Replacing Filter Element(s)

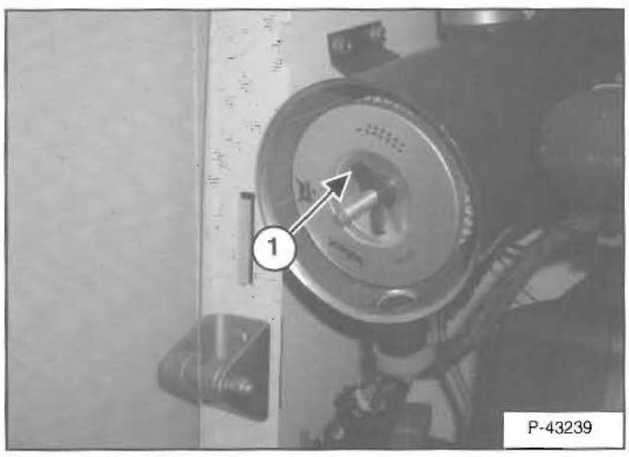
OUTER FILTER

Figure 10-80-3



Remove the wing nut (Item 1) **[Figure 10-80-3]** and remove the dust cover.

Figure 10-80-4



Remove the wing nut (Item 1) **[Figure 10-80-4]** from the outer filter element.

Figure 10-80-5



Remove the outer filter element **[Figure 10-80-5]**.

NOTE: Be sure all sealing surfaces are clean.

Install the new filter element and washer. Tighten the wing nut.

NOTE: Be sure sealing washer is in place on each wing nut [Figure 10-80-4].

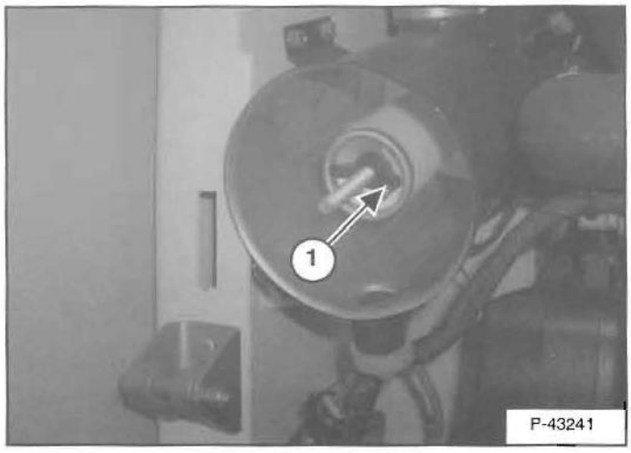
Install the dust cover and tighten the wing nut.

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

Replacing Filter Element(s) (Cont'd)

INNER FILTER

Figure 10-80-6

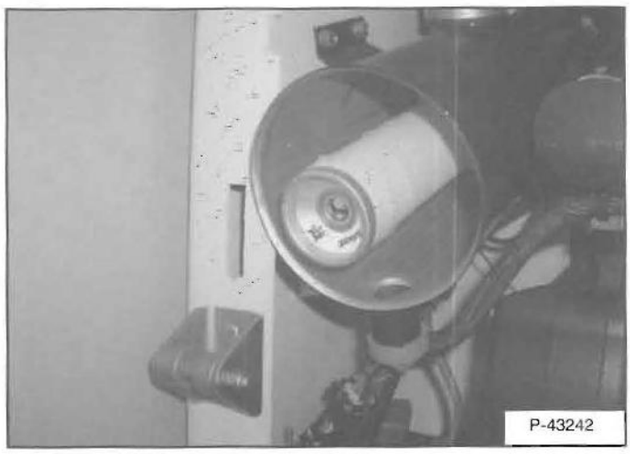


Only replace the inner filter element under the following conditions:

- Replace the inner filter element every *third* time the outer filter is replaced.
- After the outer element has been replaced, start the engine and run at full RPM. If the HOURMETER / CODE DISPLAY shows **[01-17] (Air Filter Plugged)**, replace the inner filter element.

Remove the inner filter wing nut (Item 1) **[Figure 10-80-6]**.

Figure 10-80-7



Remove the inner filter **[Figure 10-80-7]**.

Install a new filter and tighten the wing nut.



Bobcat®

Cleaning The Cooling System

⚠ WARNING

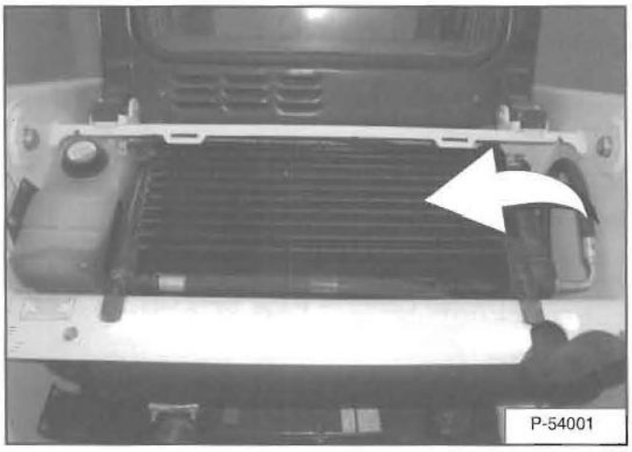
Wear safety glasses to prevent eye injury when any of the following conditions exist:

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

W-2019-1285

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

Figure 10-90-1



Open the rear door and remove the rear grill. (See Contents Page 50-01.)

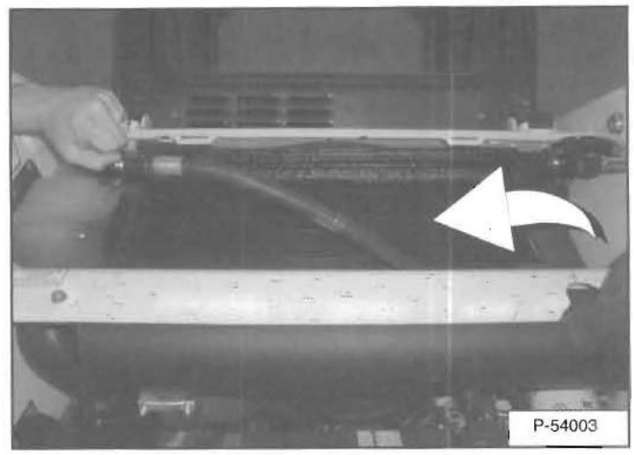
Use air pressure or water pressure to clean the top of the oil cooler **[Figure 10-90-1]**.

⚠ WARNING

Do not use your bare hands to remove debris from the oil cooler. Cooling fins are sharp and may cause injury.

W-2460-0303

Figure 10-90-2



Raise the oil cooler. Clean the top of the radiator **[Figure 10-90-2]**.

NOTE: Use low air pressure or low water pressure to clean the radiator or damage to the radiator fins may result.

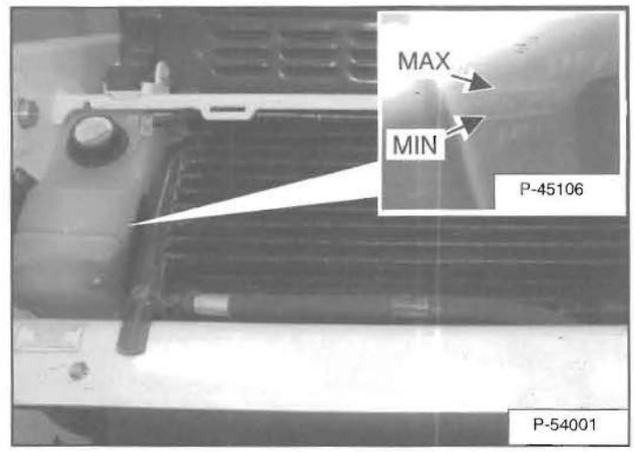
Lower the oil cooler.

Check cooling system for leaks.

Reinstall the rear grill and close the rear door.

Checking The Coolant Level

Figure 10-90-3



Open the rear door and raise the rear grill.

Check the coolant level **[Figure 10-90-3]**. The level marks are on the outside of the tank. Coolant level must be between the MIN and MAX marks on the coolant recovery tank when the engine is cold.

Close the rear door before operating the loader.

Checking The Coolant Level (Cont'd)

IMPORTANT

AVOID ENGINE DAMAGE

Always use the correct ratio of water to antifreeze.

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

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

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

I-2124-0497

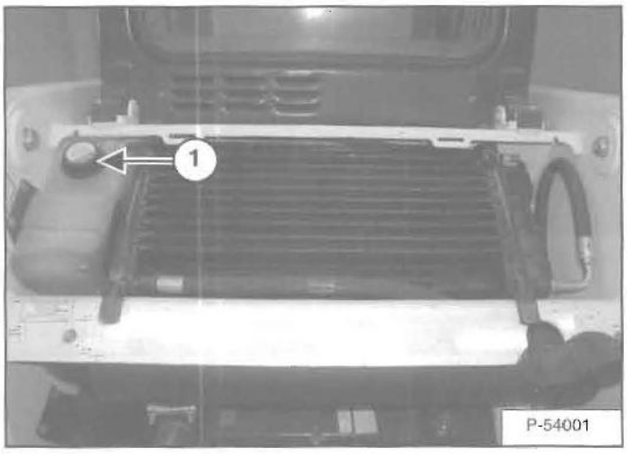
Replacing The Coolant

⚠ WARNING

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

W-2070-1285

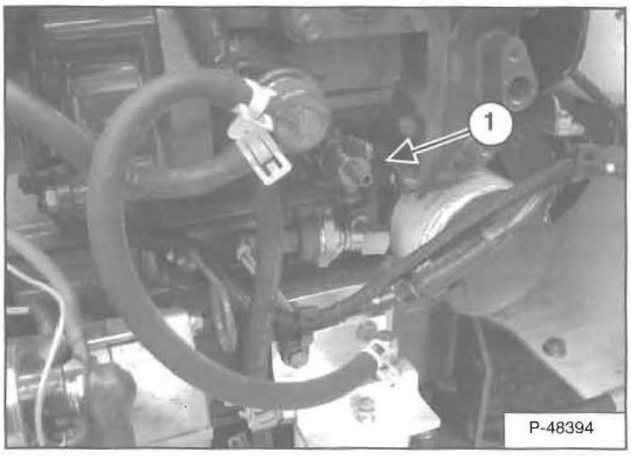
Figure 10-90-4



Open the rear door and remove the rear grill.

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

Figure 10-90-5



Connect a hose to the engine block drain valve (Item 1) **[Figure 10-90-5]**. Open the drain valve and drain the coolant into a container.

Drain coolant from recovery tank.

After all the coolant is removed, close the drain valve and remove the hose.

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

Mix the coolant in a separate container. (See *SPECIFICATIONS* Contents Page SPEC-01, for correct capacity.)

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

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

One gallon and one pint (4,3 L) of propylene 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 propylene glycol in your cooling system.

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

Replacing The Coolant (Cont'd)

Remove the cover from the coolant recovery tank. Fill the tank until it is between the MIN and MAX marks on the coolant recovery tank.

Run the engine until it is at operating temperature. Stop the engine. Check the coolant level in the recovery tank and radiator when cool. Add coolant as needed.

Reinstall the rear grill and close the rear door.

IMPORTANT

AVOID ENGINE DAMAGE

Always use the correct ratio of water to antifreeze.

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

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

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

I-2124-0497



Bobcat®

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 during cold temperatures:

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

Contact 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.

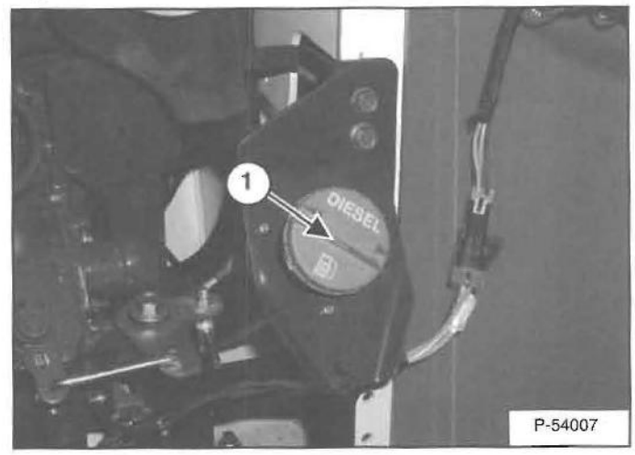
W-2063-0887

⚠ 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

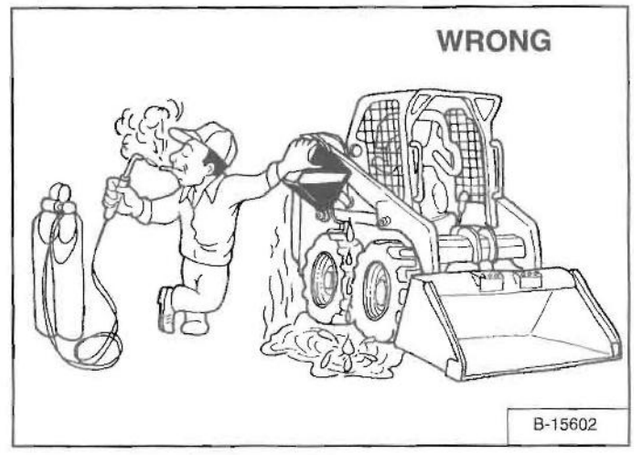
Figure 10-100-1



Open the rear door.

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

Figure 10-100-2

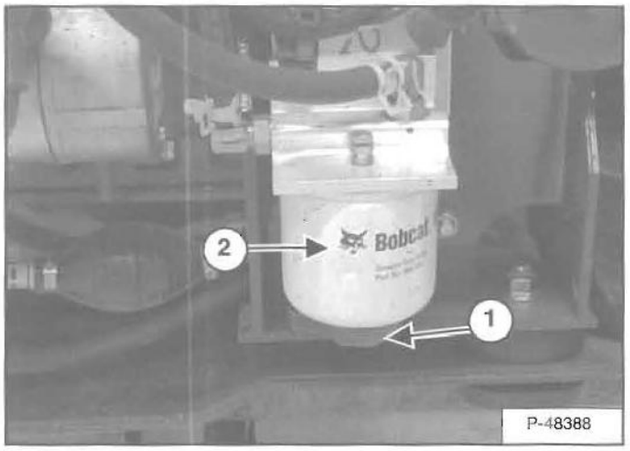


Use a clean, approved safety container to add fuel of the correct specifications. Add fuel only in an area that has free movement of air and no open flames or sparks. **NO SMOKING![Figure 10-100-2]**.

Install and tighten the fuel fill cap (Item 1) **[Figure 10-100-1]**.

Fuel Filter

Figure 10-100-3



Open the rear door.

(See the SERVICE SCHEDULE Contents Page 10-01,) for the service interval for removing water from, or replacing the fuel filter.

Loosen the drain (Item 1) **[Figure 10-100-3]** at the bottom of the filter element to remove water from the filter.

Remove the filter element (Item 2) **[Figure 10-100-3]**.

Clean the area around the filter housing. Put clean oil on the seal of the new filter element. Install the fuel filter, and hand tighten.

Remove the air from the fuel system. (See Removing Air From The Fuel System on Page 10-100- 2.)

Removing Air From The Fuel System

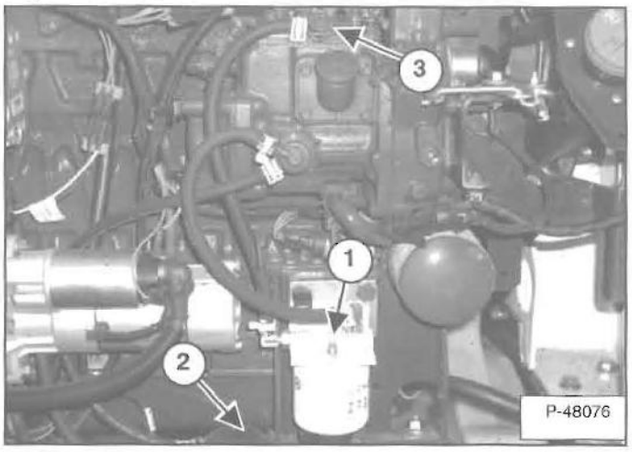
⚠ WARNING

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

After replacing the filter element or when the fuel tank has run out of fuel, the air must be removed from the fuel system before starting the engine.

Figure 10-100-4



Open the vent (Item 1) **[Figure 10-100-4]** on the fuel filter housing.

Squeeze the hand pump (priming bulb) (Item 2) **[Figure 10-100-4]** until fuel flows from the vent with no air bubbles.

Close the vent (Item 1) **[Figure 10-100-4]** on the fuel filter housing.

Open the vent (Item 3) **[Figure 10-100-4]** on the fuel injection pump.

Squeeze the hand pump (priming bulb) (Item 2) **[Figure 10-100-4]** until the pump feels solid.

Tighten the vent (Item 3) **[Figure 10-100-4]**.

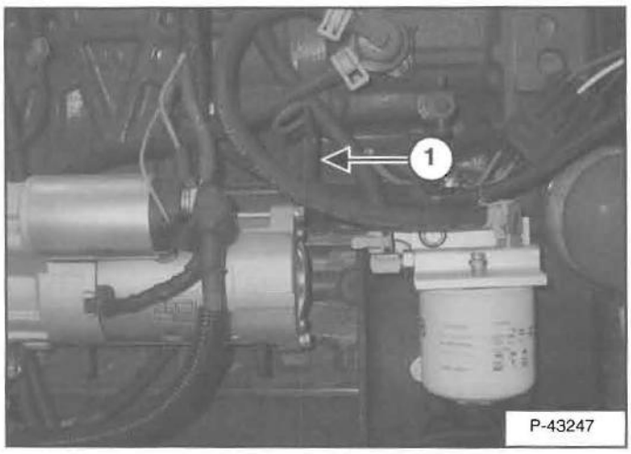
Start the engine.

It may be necessary to open the vent (Item 3) **[Figure 10-100-4]** briefly while the engine is running. Close the vent when the engine runs smoothly.

ENGINE LUBRICATION SYSTEM

Checking Engine Oil

Figure 10-110-1



Park the loader on level ground.

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

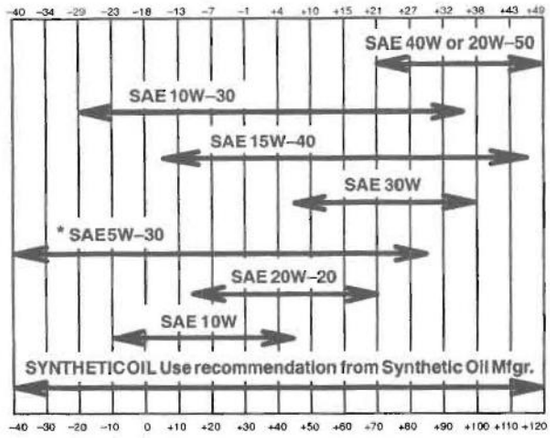
Open the rear door and remove the dipstick (Item 1) **[Figure 10-110-1]**.

Keep the oil level between the marks on the dipstick. **DO NOT OVERFILL.**

Use a good quality motor oil that meets API Service Classification of CD or better (See Oil Chart on Page 10-110-1.)

Oil Chart

RECOMMENDED SAE VISCOSITY NUMBER
(LUBRICATION OILS FOR DIESEL ENGINE CRANKCASE)

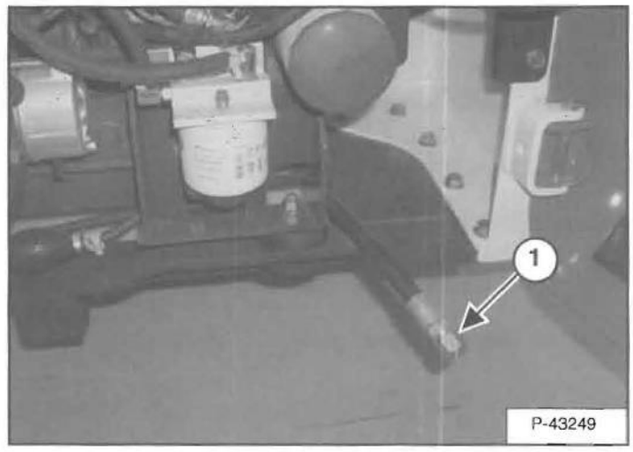


TEMPERATURE RANGE ANTICIPATED BEFORE NEXT OIL CHANGE (DIESEL ENGINES MUST USE API CLASSIFICATION CD, CF-4, CG4)

*Can be used **ONLY** when available with appropriate diesel rating

Replacing Oil And Filter

Figure 10-110-2



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

Run the engine until it is at operating temperature.

Park the loader on level ground and stop the engine.

Open the rear door.

Remove the drain plug (Item 1) **[Figure 10-110-2]**.

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

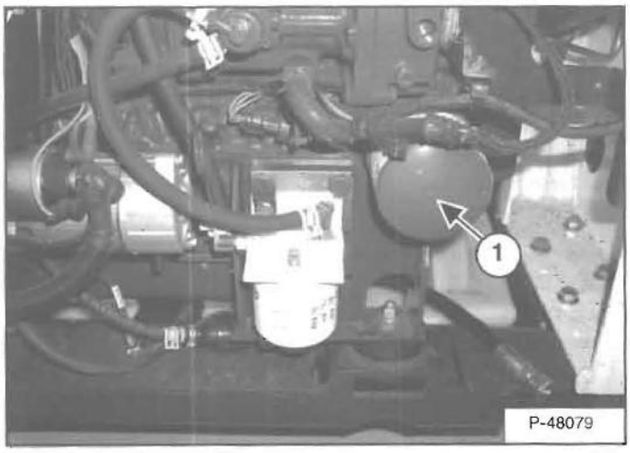
Replacing Oil And Filter (Cont'd)

⚠ 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 10-110-3



Remove the oil filter (Item 1) **[Figure 10-110-3]**.

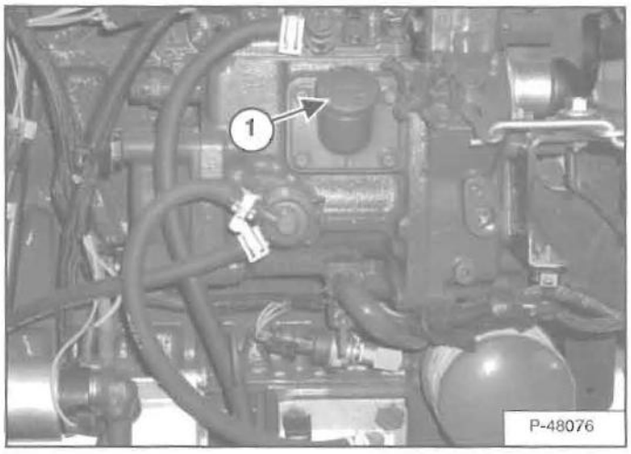
Clean the filter housing surface.

Put clean oil on the new oil filter gasket.

Install the filter and hand tighten.

Install and tighten the drain plug.

Figure 10-110-4



Remove the fill cap (Item 1) **[Figure 10-110-4]**.

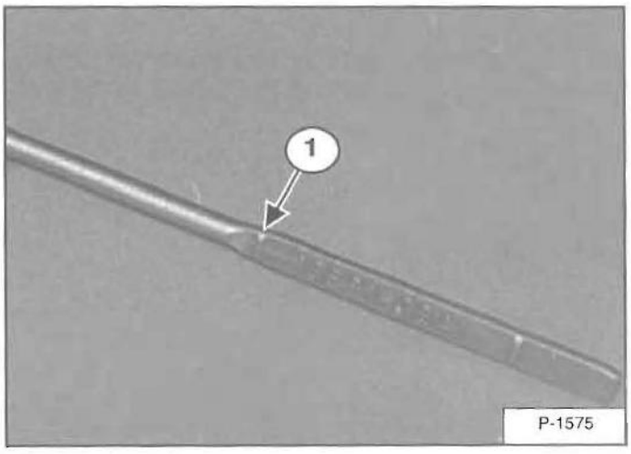
Put oil in the engine. (See SPECIFICATIONS Contents Page SPEC-01 for capacity.) **[Figure 10-110-4]** (See Oil Chart on Page 10-110-1.)

Start the engine and let it run for several minutes.

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

Remove the dipstick and check the oil level.

Figure 10-110-5



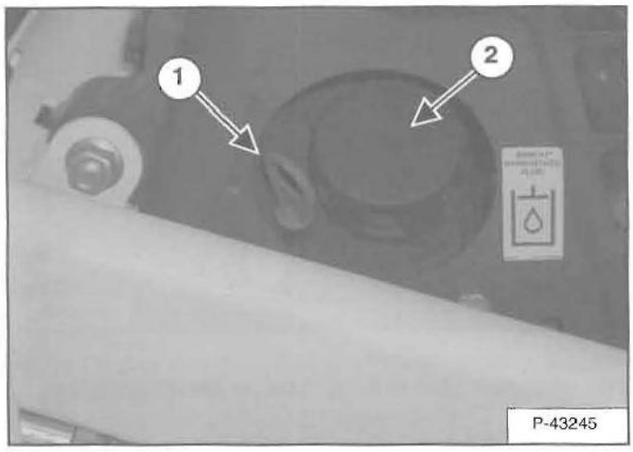
Add oil until it reaches the top mark (Item 1) **[Figure 10-110-5]** on the dipstick. **DO NOT OVERFILL.**

Install the dipstick and close the rear door.

HYDRAULIC/HYDROSTATIC SYSTEM

Checking And Adding Fluid

Figure 10-120-1



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

Stop the loader on a level surface,

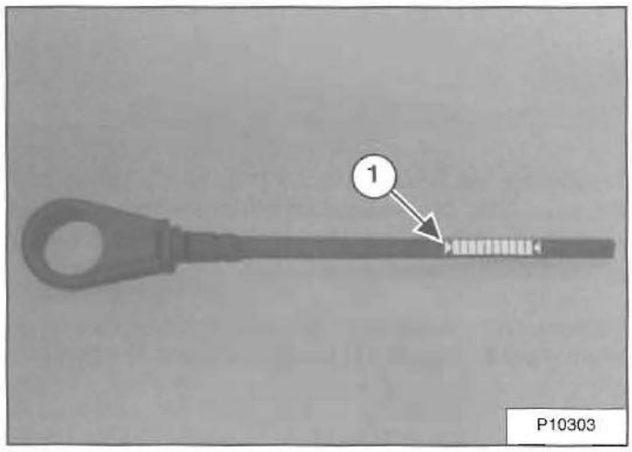
Lower the lift arms and tilt the Bob-Tach fully back.

Stop the engine.

Remove the dipstick (Item 1) **[Figure 10-120-1]** and check the fluid level.

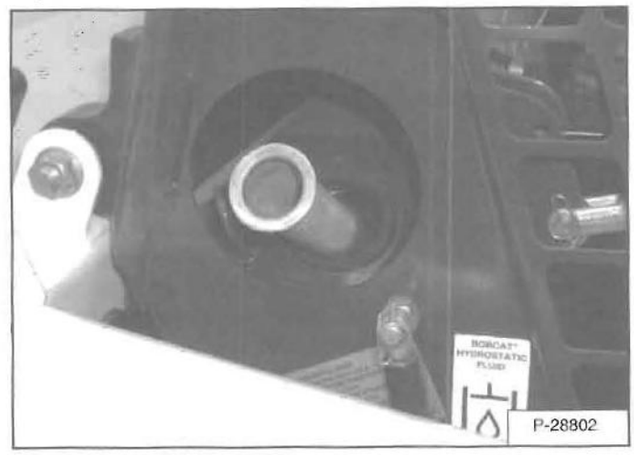
Remove the fill cap (Item 2) **[Figure 10-120-1]**.

Figure 10-120-2



Add the correct fluid to the reservoir until the fluid level is between the marks on the dipstick (Item 1) **[Figure 10-120-2]**. Do not fill above the top mark on the dipstick

Figure 10-120-3

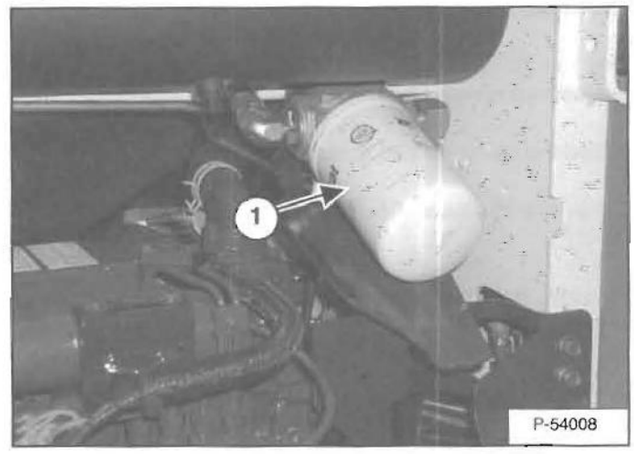


Remove the screen and clean with solvent as needed **[Figure 10-120-3]**.

Install the fill cap.

Replacing Hydraulic/Hydrostatic Filter

Figure 10-120-4



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

Open the rear door.

Remove the filter element (Item 1) **[Figure 10-120-4]**.

Clean the gasket sealing surface on the filter housing.

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

Install and hand tighten the filter element.

Close the rear door before operating the loader.

Start the engine, check for leaks and the proper fluid level in the reservoir.

Replacing Hydrostatic Motor Case Drain Filter(s)

⚠ 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

⚠ 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

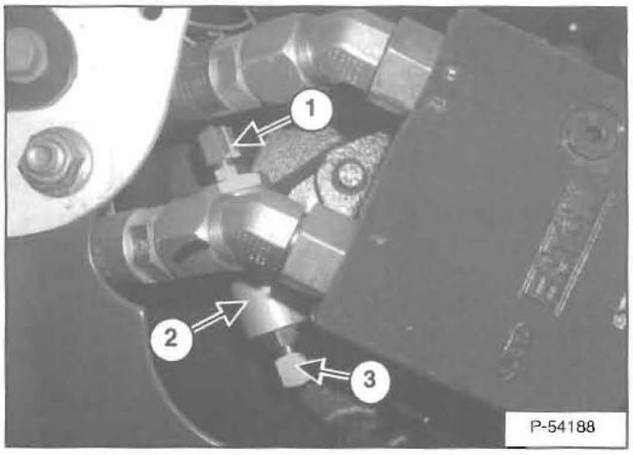
See the *SERVICE SCHEDULE* Contents Page 10-01, for the service interval.

Raise the operator cab. (See Contents Page 10-01.)

Drain the hydraulic fluid reservoir. (See Contents Page 10-01.)

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

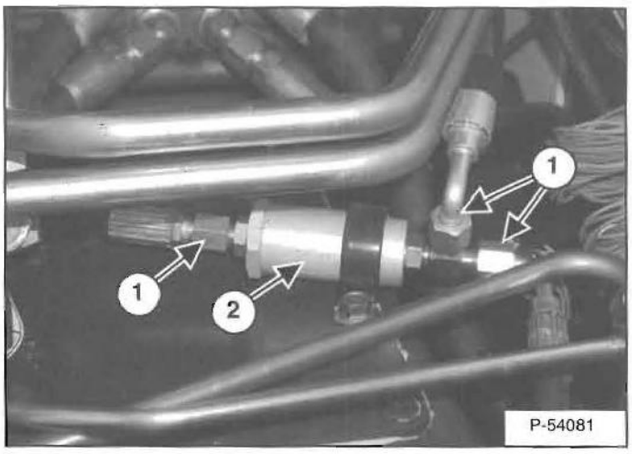
Figure 10-120-5



The case drain filter is located below the control valve.

Disconnect the hose (Item 1) from the case drain filter (Item 2) and remove filter from the fitting (Item 3) **[Figure 10-120-5]**. Use plugs and caps to prevent leakage and contamination.

Figure 10-120-6



Disconnect the hoses (Item 1) **[Figure 10-120-6]** from the case drain filter located on top of transmission. Use plugs and caps on the filter and case drain hoses to prevent leakage and contamination.

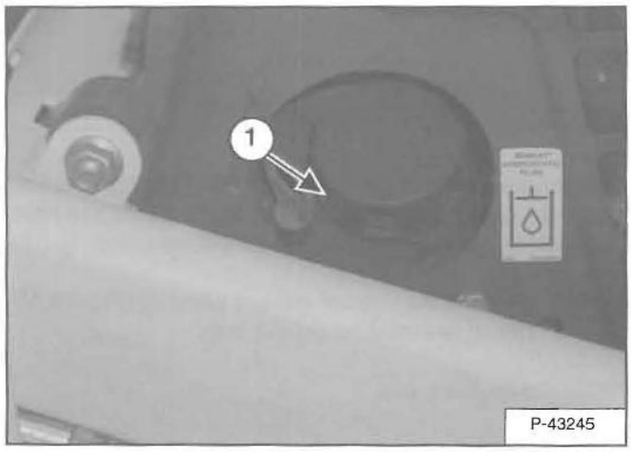
Remove and replace both hydrostatic motor case drain filters (item 2) **[Figure 10-120-5]** & **[Figure 10-120-6]**.

Replacing Hydraulic Fluid

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

The fluid must be replaced if it becomes contaminated or after major repairs. If the fluid is replaced, the hydrostatic filter and both case drain filters must be replaced.

Figure 10-120-7



Remove the reservoir fill cap (Item 1) **[Figure 10-120-7]**

Pump fluid from reservoir.

Raise the operator cab. (See Contents Page 10-01.)

Replace the hydraulic/hydrostatic filter element. (See Replacing Hydraulic/Hydrostatic Filter on Page 10-120-1.)

Replace both hydrostatic motor case drain filters. (See Replacing Hydrostatic Motor Case Drain Filter(s) on Page 10-120-2.)

Add the correct fluid to the reservoir until the fluid level is between the marks on the dipstick. DO NOT fill above the top mark on the dipstick.

⚠ 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

⚠ 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

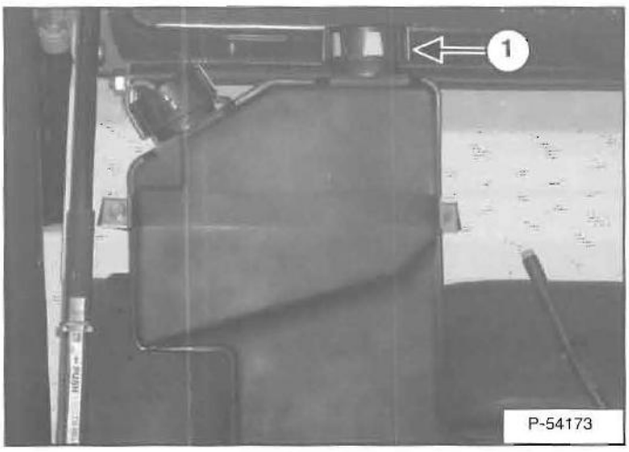
Lower the operator cab. (See Contents Page 10-01.)

Start the engine and operate the loader hydraulic controls. Stop the engine and check for leaks.

Check the fluid level in the reservoir and add as needed.

Breather Cap

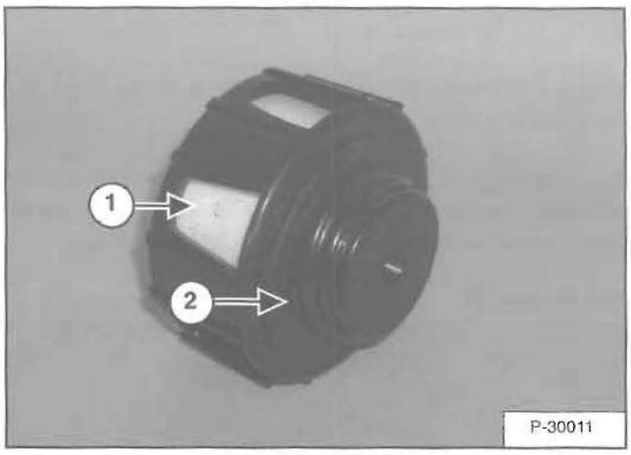
Figure 10-120-8



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

Remove the breather cap (Item 1) **[Figure 10-120-8]**.

Figure 10-120-9



Clean the filter (Item 1) **[Figure 10-120-9]** in the breather cap. Use solvent, or soap and water to clean the filter. Thoroughly dry with compressed air before using.

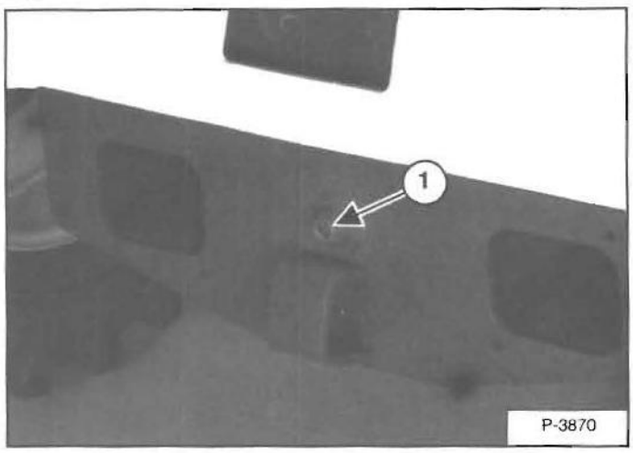
NOTE: Be sure the rubber gasket (Item 2) [Figure 10-120-9] is installed on the cap.

Install the breather cap.

FINAL DRIVE TRANSMISSION (CHAINCASE)

Checking And Adding Oil

Figure 10-130-1



The chaincase contains the final drive sprockets and chains and uses the same type of oil as the hydraulic/ hydrostatic system. (See *SPECIFICATIONS* Contents Page SPEC-01.)

To check the chaincase oil level, use the following procedure:

Drive the loader on a level surface. Stop the engine.

Remove the plug (Item 1) **[Figure 10-130-1]** from the front of the chaincase housing.

If oil can be reached with the tip of the your finger through the hole the oil level is correct.

If the level is low, add oil through the check plug hole until the oil flows from the hole. Install and tighten the plug.

Removing The Oil

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

Use a vacuum pum to extract the fluid from the chain case.

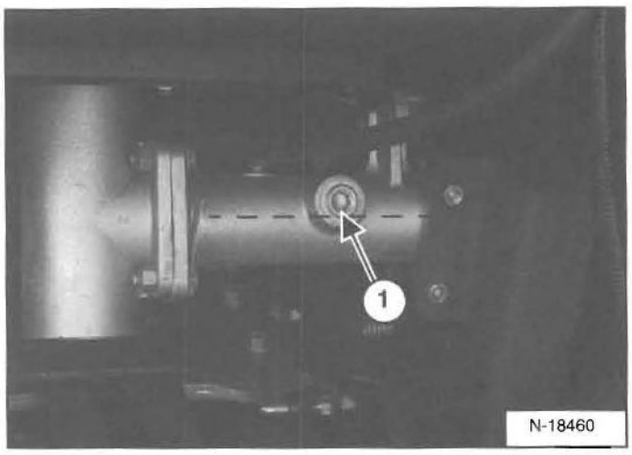


Bobcat®

FAN GEARBOX

Checking And Maintaining

Figure 10-140-1



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

Raise the operator cab. (See Contents Page 10-01).

Remove the plug (Item 1) **[Figure 10-140-1]** to check the lubricant level.

The lubricant level should be even or slightly below the top of the shaft.

If the level is low, add SAE 90W gear lubricant through the check plug hole until it reaches the desired level.

Install and tighten the plug.

Lower the operator cab. (See Contents Page 10-01.)

NOTE: To prevent over-filling, use a flashlite to visually inspect the level of lubricant, fill with small amounts until it is even or slightly below the top of the shaft.

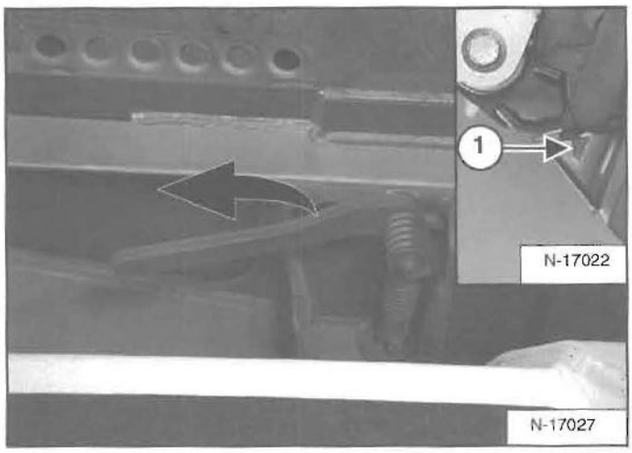


Bobcat®

BOB-TACH

Inspection And Maintenance

Figure 10-150-1



Move the Bob-Tach levers to engage the wedges **[Figure 10-150-1]**. The levers and wedges must move freely.

The wedges must extend through the holes in the attachment mounting frame (Item 1) **[Figure 10-150-1]**.

⚠ WARNING

Bob-Tach wedges must extend through the holes in attachment. Levers must be fully down and locked. Failure to secure wedges can allow attachment to come off and cause injury or death.

W-2102-0588

Figure 10-150-2

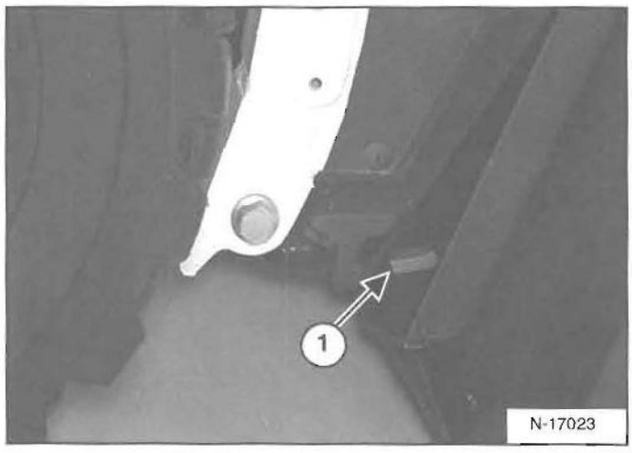
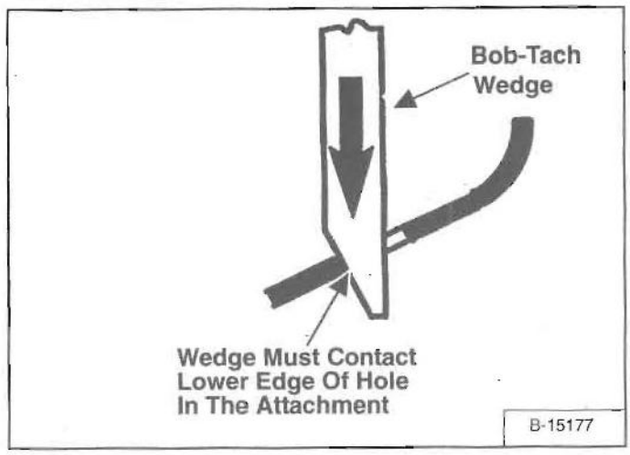


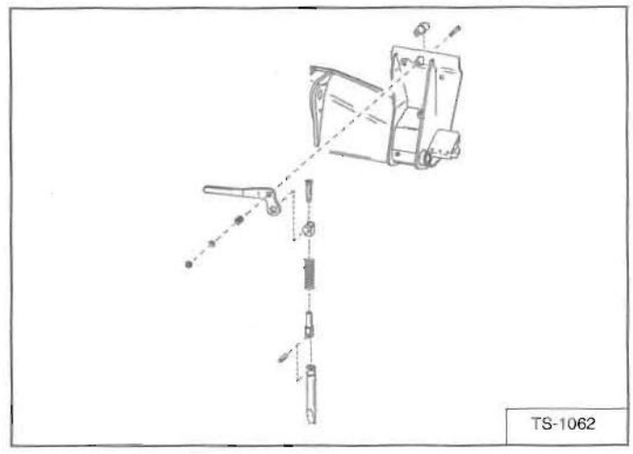
Figure 10-150-3



The spring loaded wedge (Item 1) **[Figure 10-150-1]** must contact the lower edge of the hole in the attachment (Item 1) **[Figure 10-150-2]** and **[Figure 10-150-3]**.

If the wedge does not contact the lower edge of the hole **[Figure 10-150-2]** and **[Figure 10-150-3]**, the attachment will be loose and can come off the Bob-Tach.

Figure 10-150-4



Inspect the mounting frame on the attachment and the Bob-Tach, linkages and wedges for excessive wear or damage **[Figure 10-150-4]**. Replace any parts that are damaged, bent, or missing. Keep all fasteners tight.

Look for cracked welds. Contact your Bobcat dealer for repair or replacement parts.

Lubricate the wedges. (See *SERVICE SCHEDULE* and *LUBRICATION OF THE BOBCAT LOADER* Contents Page 10-01.)



Bobcat®

POWER BOB-TACH

Inspection And Maintenance

Figure 10-151-1

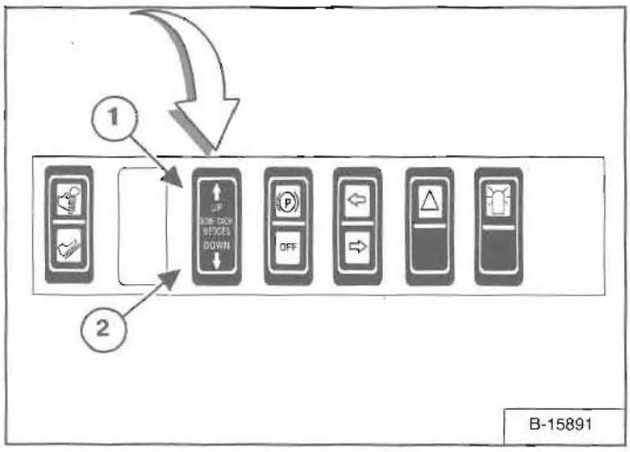
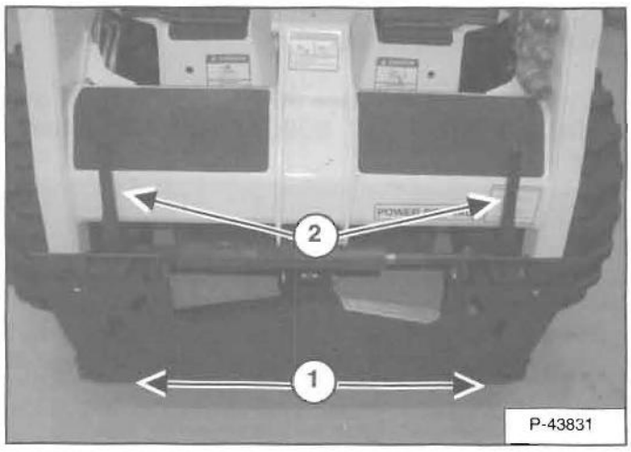
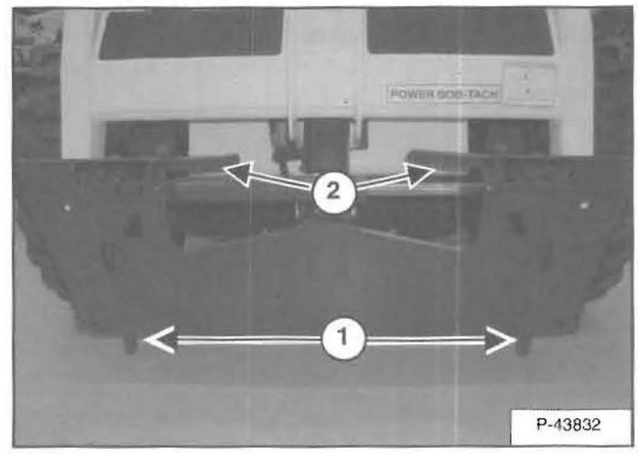


Figure 10-151-2



Push and hold the BOB-TACH "WEDGES UP" switch (Item 1) **[Figure 10-151-1]**, until the wedges (Item 1) and levers (Item 2) **[Figure 10-151-2]** are fully raised.

Figure 10-151-3



Push and hold the BOB-TACH "WEDGES DOWN" switch (Item 2) **[Figure 10-151-1]**, until the wedges (Item 1) and levers (Item 2) **[Figure 10-151-3]** are fully down.

The levers and wedges must move freely.

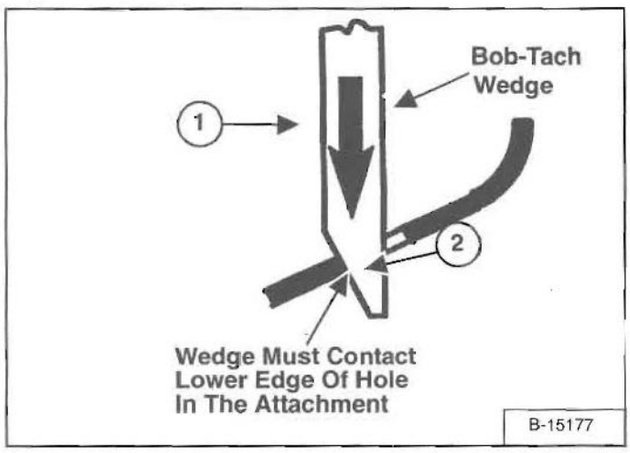
⚠ WARNING

Bob-Tach wedges must extend through the holes in attachment. Levers must be fully down and locked. Failure to secure wedges can allow attachment to come off and cause injury or death.

W-2102-0588

Inspection And Maintenance (Cont'd)

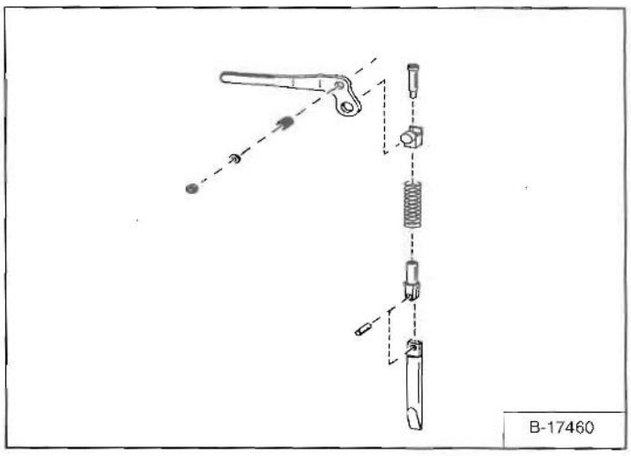
Figure 10-151-4



The spring loaded wedge (Item 1) must contact the lower edge of the hole in the attachment (Item 2) **[Figure 10-151-4]**.

If the wedge does not contact the lower edge of the hole **[Figure 10-151-4]**, the attachment will be loose and can come off the Bob-Tach.

Figure 10-151-5



Inspect the mounting frame on the attachment and the Bob-Tach, linkages and wedges for excessive wear or damage **[Figure 10-151-5]**. Replace any parts that are damaged, bent, or missing. Keep all fasteners tight.

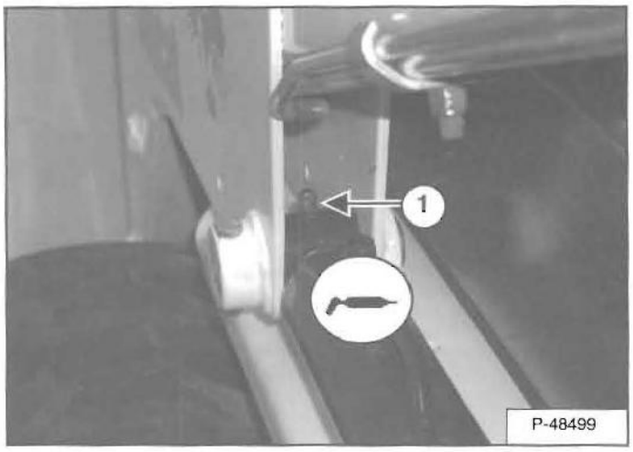
Look for cracked welds. Contact your Bobcat dealer for repair or replacement parts.

Lubricate the wedges. (See *SERVICE SCHEDULE* and *LUBRICATION OF THE BOBCAT LOADER* Contents Page 10-01.)

LUBRICATION OF THE BOBCAT LOADER

Procedure

Figure 10-160-1



Lubricate the loader as specified in the *SERVICE SCHEDULE* Contents Page 10-01 for the best performance of the loader.

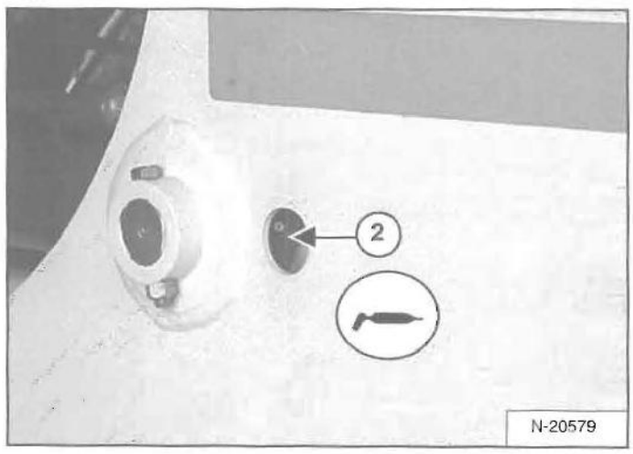
Record the operating hours each time you lubricate the Bobcat loader.

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

Lubricate the following locations on the loader:

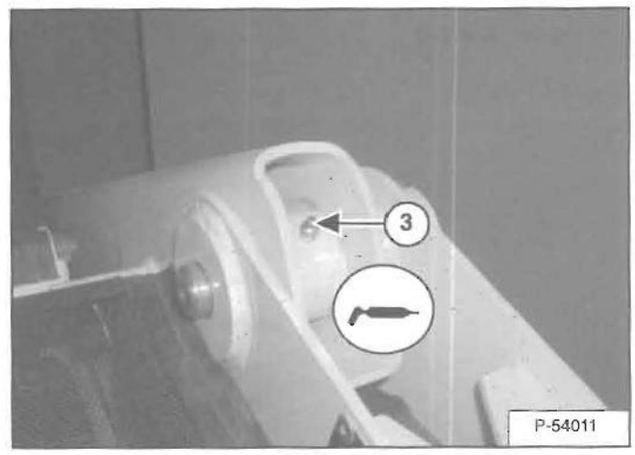
1. Rod End Lift Cylinder (Both Sides) **[Figure 10-160-1]**.

Figure 10-160-2



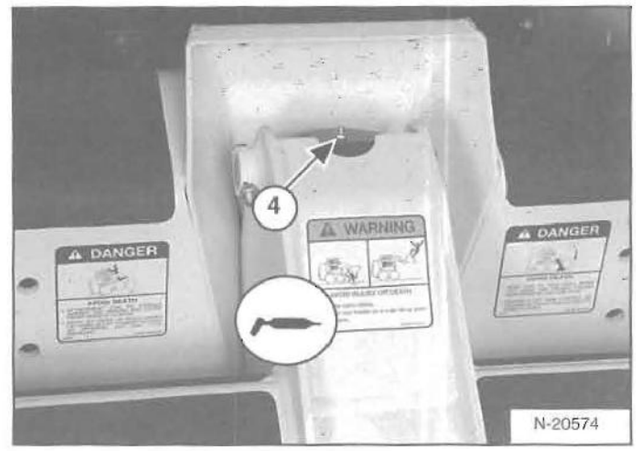
2. Base End Lift Cylinder (Both Sides) **[Figure 10-160-2]**.

Figure 10-160-3



3. Lift Arm Pivot Pin (Both Sides) **[Figure 10-160-3]**.

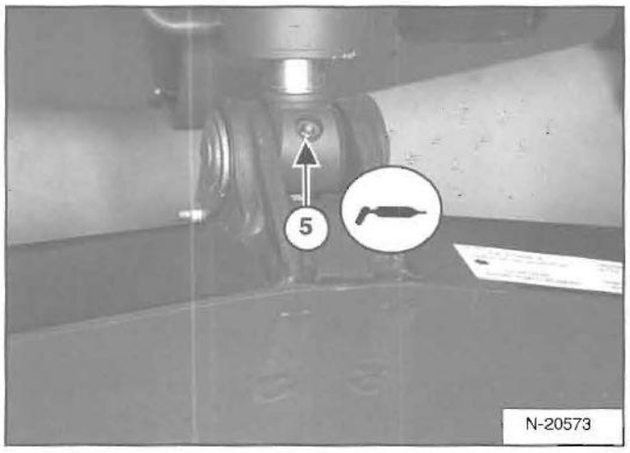
Figure 10-160-4



4. Base End Tilt Cylinder **[Figure 10-160-4]**.

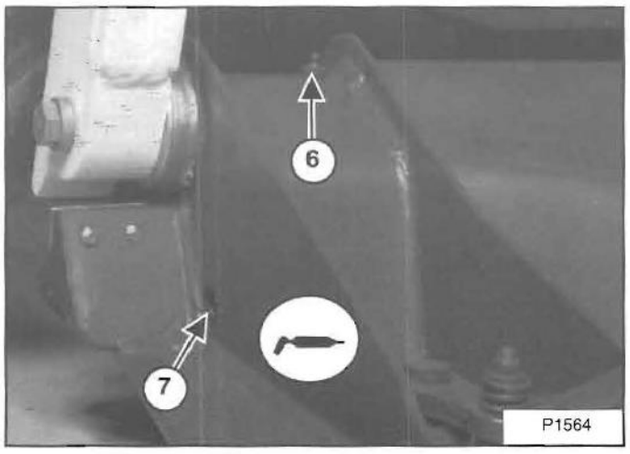
Procedure (Cont'd)

Figure 10-160-5



5. Rod End Tilt Cylinder **[Figure 10-160-5]**.

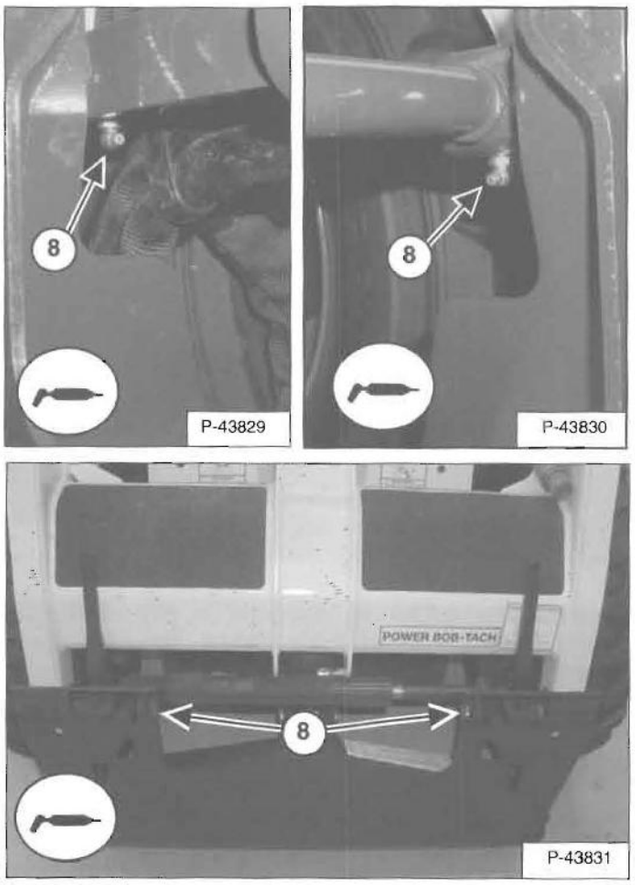
Figure 10-160-6



6. Bob-Tach Pivot Pin (Both Sides) **[Figure 10-160-6]**.

7. Bob-Tach Wedge (Both Sides) **[Figure 10-160-6]**.

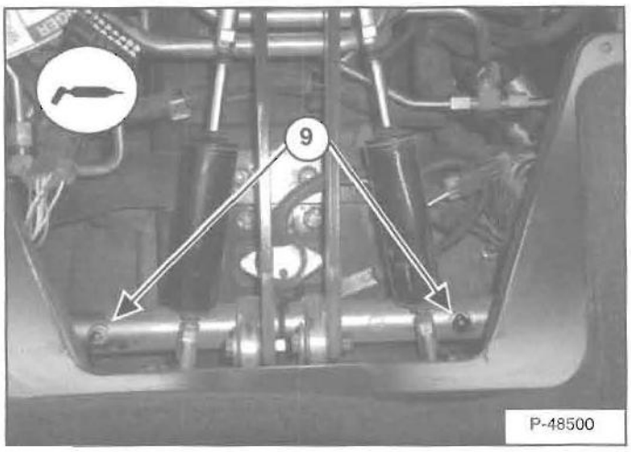
Figure 10-160-7



8. Power Bob-Tach Pivot Pins (If Equipped) **[Figure 10-160-7]**.

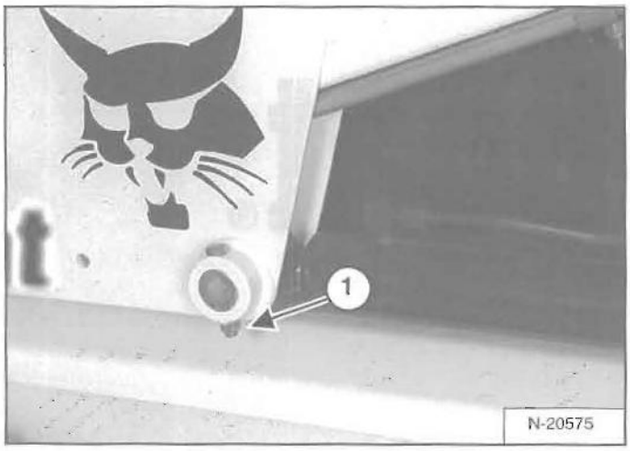
Procedure (Cont'd)

Figure 10-160-8



9. 250 Hours: Steering Lever Shaft (2) **[Figure 10-160-8]**.

Figure 10-160-9



All lift arm and cylinder pivots have a large pin held in position with a retainer bolt and lock nut (Item 1) **[Figure 10-160-9]**.

Check that the lock nuts are tightened to 25-28 ft.-lbs. (34-38 Nm) torque.

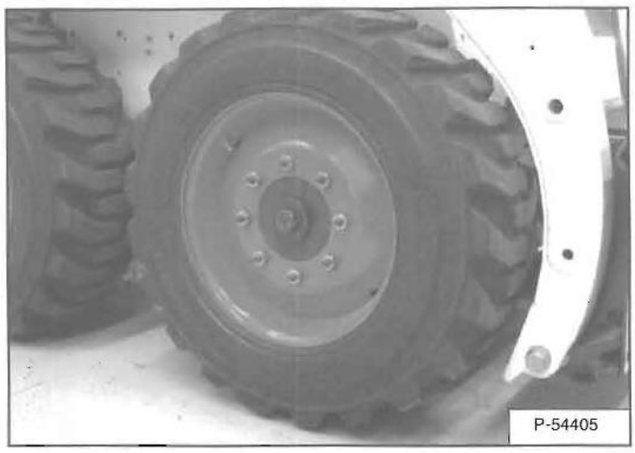


Bobcat®

TIRE MAINTENANCE

Wheel Nuts

Figure 10-170-1



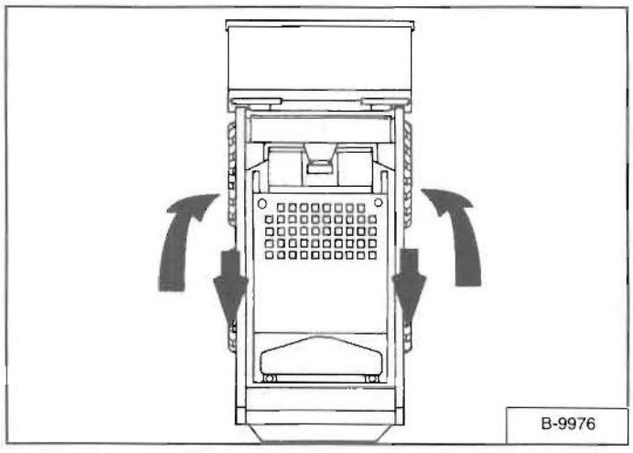
See the *SERVICE SCHEDULE* Contents Page 10-01, for the service interval to check the wheel nuts **[Figure 10-170-1]**.

When installing wheel nuts, tighten to 160 ft.-lbs. (217 Nm) torque.

When checking wheel nut torque, set the torque wrench to 140 ft.-lbs. (190 Nm) torque to prevent over-tightening.

Rotating

Figure 10-170-2



Check the tires regularly for wear, damage and pressure. (See *SPECIFICATIONS* Contents Page SPEC-01 for the correct tire pressure.)

Rear tires usually wear faster than front tires. To keep tire wear even, move the front tires to the rear and rear tires to the front **[Figure 10-170-2]**.

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

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

Mounting

Tires are to be repaired only by an authorized person using the proper procedures and safety equipment.

Tires and rims must always be checked for correct size before mounting. Check rim and tire bead for damage.

The rim flange must be cleaned and free of rust.

The tire bead and rim flange must be lubricated with a rubber lubricant before mounting the tire.

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

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

IMPORTANT

Inflate tires to the MAXIMUM pressure shown on the sidewall of the tire. DO NOT mix brands of tires used on the same loader.

I-2057-0794

⚠ WARNING

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

W-2078-1285

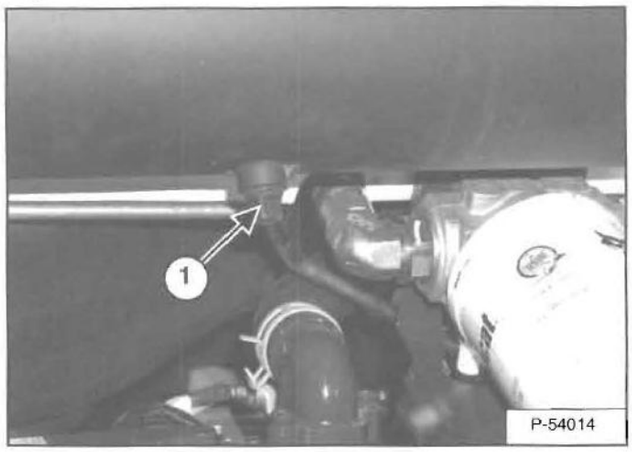


Bobcat®

SPARK ARRESTOR MUFFLER

Servicing

Figure 10-180-1



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

Do not operate the loader with a defective exhaust system.

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.

I-2022-0595

Stop the engine. Open the rear door.

Remove the plug (Item 1) **[Figure 10-180-1]** from the bottom of the muffler.

⚠ WARNING

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

W-2006-0284

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.

Close the rear door.

⚠ WARNING

When an engine is running in an enclosed area, fresh air must be added to avoid concentration of exhaust fumes. If the engine is stationary, vent the exhaust outside. Exhaust fumes contain odorless, invisible gases which can kill without warning.

W-2050-1285

⚠ WARNING

Stop engine and allow the muffler to cool before cleaning the spark chamber. Wear safety goggles. Failure to obey can cause serious injury.

W-2011-1285

⚠ WARNING

Never use machine in atmosphere with explosive dust or gases or where exhaust can contact flammable material. Failure to obey warnings can cause injury or death.

W-2068-1285



Bobcat®

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TIGHTEN ALL HARDWARE PER SIZE TO GRADE 5 TORQUE (SEE STANDARD TORQUE SPECIFICATIONS FOR BOLTS, SECTION SPEC-01) UNLESS OTHERWISE SPECIFIED.


Bobcat®

GLOSSARY OF HYDRAULIC/HYDROSTATIC SYMBOLS FOR LOADERS

SYMBOL DESCRIPTION

FLOW LINES and CONNECTIONS

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

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

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

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

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

CONNECTED JUNCTION OF OIL LINES (Flow Line Connection)

OIL LINES CROSSING (NOT Connected)

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

SYMBOL DESCRIPTION

BASIC and MISCELLANEOUS SYMBOLS

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

VARIABLE ADJUSTMENT RESTRICTION - Regulated or Variable Restriction

TEMPERATURE CONTROL - (indication of temperature)

TEMPERATURE INDICATOR - (temperature measurement - thermometer)

FILTER (strainer or screen) - For fluid conditioning

VENTED AND FILTERED RESERVOIR (reservoir open to atmosphere)

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

PRESSURE SENSOR - Varies electric signal with pressure

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

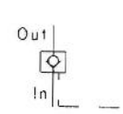
PRESSURE SWITCH - Switch activates when pressure reaches specified level

MUFFLER (silencer) - Reduces noise

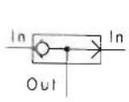
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MC 2340 (6-2-98)

(Bypass valve) - Opens if the inlet pressure is greater than the Outlet pressure plus the spring pressure

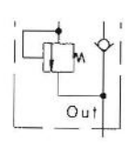


PILOT CONTROLLED NON-RETURN VALVE - It is possible to open the valve by pilot pressure

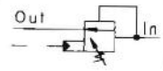


SHUTTLE VALVE - The inlet port connected to the higher pressure is automatically connected to the Outlet port while the other Inlet port is closed

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



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.

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



Bobcat®

GLOSSARY OF HYDRAULIC/HYDROSTATIC SYMBOLS FOR LOADERS

SYMBOL DESCRIPTION

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



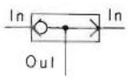
NON-RETURN VALVE (Check Valve) - Used as Replenishing Valve, Load Check Valve or Anticavitation Valve - Opens if the Inlet pressure is higher than the Outlet pressure. Often contains internal spring which has NO significant pressure value



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

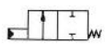
DIRECTIONAL CONTROL VALVE: Valve providing for the opening (fully or restricted) or the closing of one or more flow paths (represented by several squares)



TWO PORTS and CLOSED FLOW PATHS



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



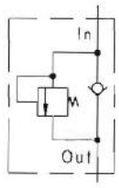
PILOT ACTIVATED DIRECTIONAL CONTROL VALVE (Two Position) - controlled by pressure (with return spring)

SYMBOL DESCRIPTION

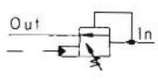
PRESSURE CONTROL VALVE: Valve ensuring the control of pressure



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

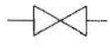


DUAL PRESSURE RELIEF VALVE - When the inlet pressure overcomes the opposing force of the spring, the valve opens permitting flow from the Outlet port. Pilot pressure provides a second pressure value.

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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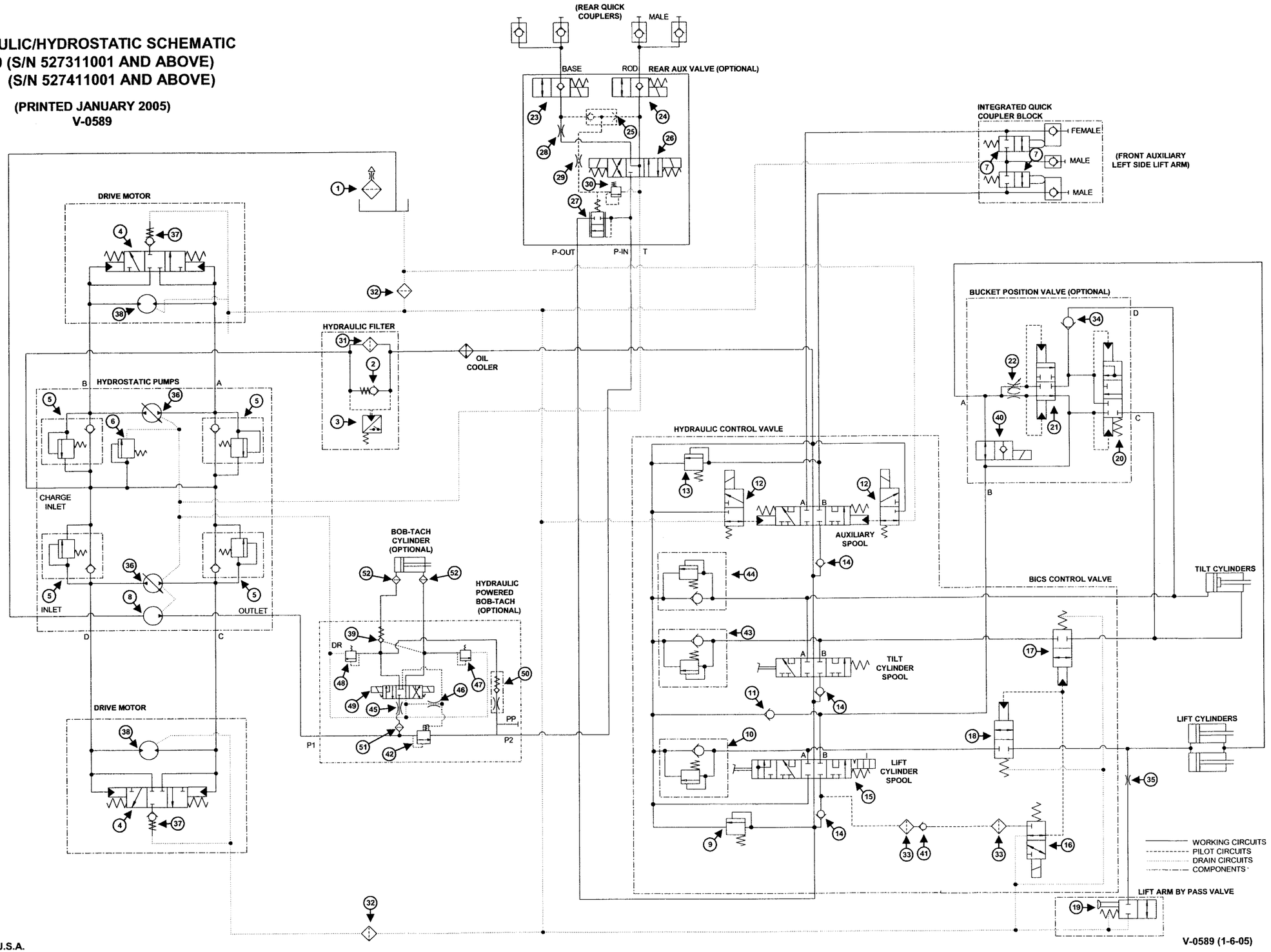
MC 2340-3 (6-2-98)



Bobcat®

HYDRAULIC/HYDROSTATIC SCHEMATIC
S130 (S/N 527311001 AND ABOVE)
(S/N 527411001 AND ABOVE)

(PRINTED JANUARY 2005)
V-0589



HYDRAULIC/HYDROSTATIC SCHEMATIC
S130 (S/N 527311001 AND ABOVE)
(S/N 527411001 AND ABOVE)

(PRINTED JANUARY 2005)
V-0589legend

LEGEND

1. RESERVOIR:
   Capacity . . . . . 14 Qts. (13,2 L)
2. SPRING LOADED FILTER BY-PASS VALVE: 45-55 PSI (3,1-3,8 Bar)
3. DIFFERENTIAL PRESSURE SWITCH:
   36-44 PSI (2,5-3,0 Bar)
   Normally Closed
4. DRIVE MOTOR SHUTTLE VALVE
5. RELIEF/REPLENISHING VALVE - HIGH PRESSURE: 5000 PSI (345 Bar)
6. RELIEF VALVE - CHARGE INLET:
   220-270 PSI (15,2-18,6 Bar)
   at High Engine Idle
   With 140 degrees F. (60 degrees C.) Fluid
7. FRONT AUXILIARY MANUAL PRESSURE BLEED-OFF VALVE
8. HYDRAULIC PUMP . . . . . Gear Type
   16.9 GPM (64 L/min.)
   at High Engine Idle
9. RELIEF VALVE - MAIN:
   2650-2750 PSI (182-189 Bar)
   at Front Quick Couplers
10. RELIEF/ANTICAVITATION VALVE - PORT: 3500 PSI (241 Bar)
11. ANTICAVITATION VALVE
12. SOLENOID ACTIVATED DIRECTIONAL CONTROL VALVE - AUXILIARY
13. RELIEF VALVE - PORT: . . . . . (Optional)
    3100 PSI (214 Bar)
14. LOAD CHECK VALVE
15. LIFT CYLINDER SPOOL - MADE TO RESTRICT FLOW DURING BOOM DOWN BUT NOT DURING BOOM UP
16. SOLENOID ACTIVATED DIRECTIONAL CONTROL VALVE - BICS CONTROL
17. PILOTED ACTIVATED DIRECTIONAL CONTROL VALVE - TILT CONTROL
18. PILOTED ACTIVATED DIRECTIONAL CONTROL VALVE - LIFT CONTROL
19. PULL BUTTON ACTIVATED DIRECTIONAL CONTROL VALVE - LIFT ARM BY-PASS
20. PILOTED ACTIVATED DIRECTIONAL CONTROL VALVE - UNLOADING SPOOL
21. PILOTED ACTIVATED DIRECTIONAL CONTROL VALVE - FLOW CONTROL SPOOL
22. FLOW DIVIDER ADJUSTMENT VALVE
23. SOLENOID ACTIVATED DIRECTIONAL CONTROL VALVE - BASE
24. SOLENOID ACTIVATED DIRECTIONAL CONTROL VALVE - ROD
25. LOAD SHUTTLE VALVE - BLEED OFF
26. SOLENOID ACTIVATED DIRECTIONAL CONTROL VALVE - TWO COIL
27. PILOT ACTIVATED DIRECTIONAL CONTROL VALVE - REAR AUXILIARY
28. RESTRICTOR - 0.140 inch (3,6 mm)
29. RESTRICTOR - 0.031 inch (0,8 mm)
30. RELIEF VALVE: 3300 PSI (228 Bar)
31. FILTER - HYDRAULIC (CANISTER)
32. FILTER - CASE DRAIN (SINTERED BRONZE)
33. FILTER - BICS CONTROL VALVE (SCREEN)
34. CHECK VALVE - BUCKET POSITION VALVE
35. RESTRICTION
36. VARIABLE CAPACITY DISPLACEMENT BIDIRECTIONAL HYDROSTATIC PUMP
37. SHUTTLE RELIEF VALVE
    (Not Adjustable - Factory Set)
    65 PSI (4,5 kPa)
38. FIXED CAPACITY DISPLACEMENT BIDIRECTIONAL HYDROSTATIC MOTOR
39. CHECK VALVE - With 80 PSI (5,5 Bar) Spring
40. SOLENOID ACTIVATED DIRECTIONAL CONTROL VALVE - BUCKET POSITION VALVE (ON/OFF)
41. CHECK VALVE - BICS CONTROL VALVE
42. PILOT ACTIVATED DIRECTIONAL CONTROL VALVE - HYDRAULIC POWERED BOB-TACH
43. RELIEF/ANTICAVITATION VALVE - PORT: 3500 PSI (241 Bar)
44. RELIEF/ANTICAVITATION VALVE - PORT (TILT BASE END)
    3500 PSI (241 Bar)
45. RESTRICTION - 0.089 inch (2,26 mm)
46. RESTRICTION - 0.025 inch (0,60 mm)
47. RELIEF VALVE: - 2000 PSI (138 Bar)
48. RELIEF VALVE - 1200 PSI (83 Bar)
49. SOLENOID ACTIVATED DIRECTIONAL CONTROL VALVE (2 Coil)
50. CHECK VALVE - With 300 PSI (20,7 Bar) Spring and 0.016 inch (0,40 mm) orifice
51. FILTER - INLET (Screen)
52. FILTER - (Screen) - Internal to Fittings

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

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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

Tighten Procedures

For tightening torques for hydraulic fittings, tubelines etc., - Hydraulic Connection Specifications. See Contents Page Section SPEC-01.

Troubleshooting Chart

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

⚠ WARNING

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, 5, 8
The transmission warning light comes ON when hydraulics are operating.	1, 3,
Slow hydraulic system action.	1, 3, 4, 6, 8
Hydraulic action is not smooth.	1, 4, 5, 6, 7
Lift arms go up slowly at full engine RPM.	1, 3, 4, 5, 6, 7, 8, 9
The lift arms or Bob-Tach will move when the pedal is in neutral position.	4
By-pass valve stuck.	12
By-pass valve stem bent or broke.	13

KEY TO CORRECT THE CAUSE
1. The fluid level is not correct.
2. The pedal linkage is disconnected.
3. The hydraulic pump has damage.
4. The pedal linkage is not adjusted correctly.
5. Relief valve is not at the correct pressure.
6. Suction leak on the inlet side of the hydraulic pump.
7. Fluid is cold. Wrong viscosity fluid. (See Section 80-01)
8. Using the loader for more than its rated capacity.
9. Internal leak in the lift cylinder(s).
10. External leak from the lift cylinder(s).
11. Damaged lift spool.
12. Rotate shaft.
13. Replace manual spool cartridge.

CYLINDER (LIFT)

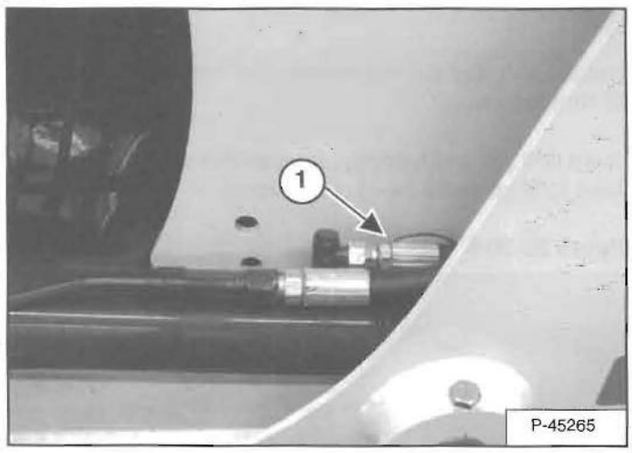
Checking

⚠ 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

Figure 20-20-1



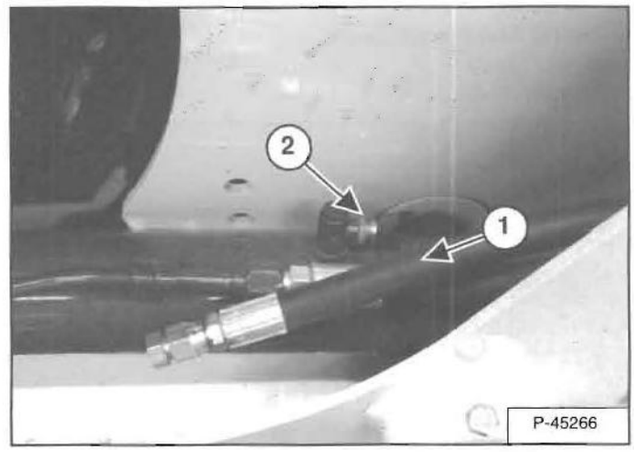
Lower the lift arms. Stop the engine. Pull up on the lift arm by-pass control and move the lift pedal to release the hydraulic pressure. Raise the seat bar.

Check only one cylinder at a time. Open the rear door.

Disconnect the negative ground cable from the battery.

Disconnect the hose (Item 1) **[Figure 20-20-1]** from the lift cylinder base end port.

Figure 20-20-2



Install a plug in the hose (Item 1) **[Figure 20-20-2]** and tighten.

Connect the negative ground cable to the battery.

Engage the parking brake. Lower the seat bar. Start the engine. Press the PRESS TO OPERATE BUTTON. Push the top (toe) of the lift pedal.

If there is any leakage from the base end cylinder port (Item 2) **[Figure 20-20-2]**, remove the lift cylinder for repair.

Repeat the procedure to check the other lift cylinder.

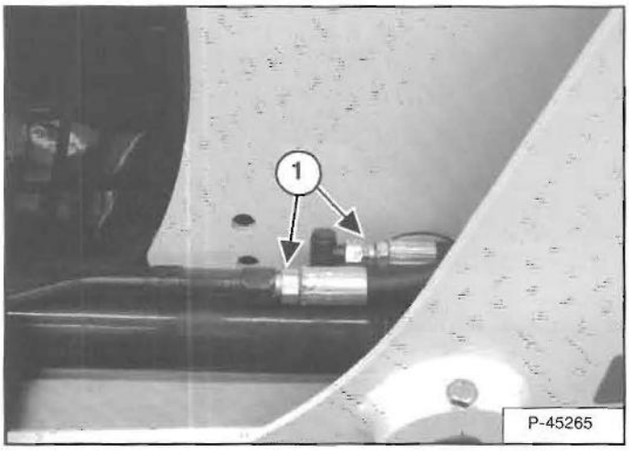
⚠ WARNING

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

Removal And Installation

Figure 20-20-3



Stop the engine. Pull up on the lift arm by-pass control to release the hydraulic pressure.

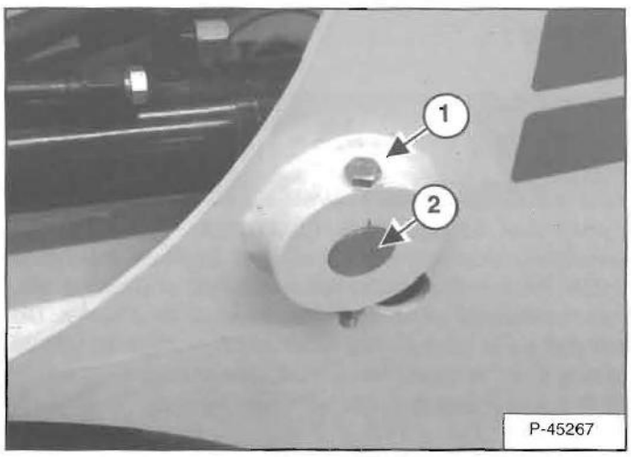
Open the rear door.

Disconnect the negative ground cable from the battery.

Disconnect the hoses (Item 1) **[Figure 20-20-3]** from the lift cylinder.

Install a plug in the hoses and tighten.

Figure 20-20-4

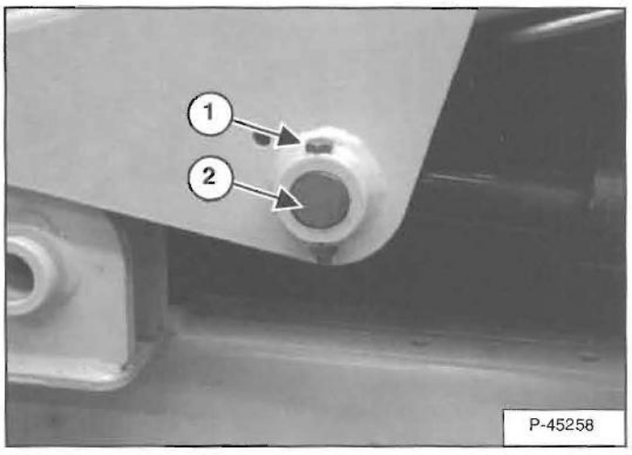


Remove the retainer bolt (Item 1) **[Figure 20-20-4]** and nut from the lift arm pin (both sides).

Installation: Tighten the bolt and nut to 25-28 ft.-lbs. (34-38 Nm) torque.

Use a drift pin and hammer, remove the cylinder pivot pin (Item 2) **[Figure 20-20-4]** (both sides).

Figure 20-20-5



Remove the retainer bolt (Item 1) **[Figure 20-20-5]** and nut from the lift cylinder rod end pivot pin (both sides).

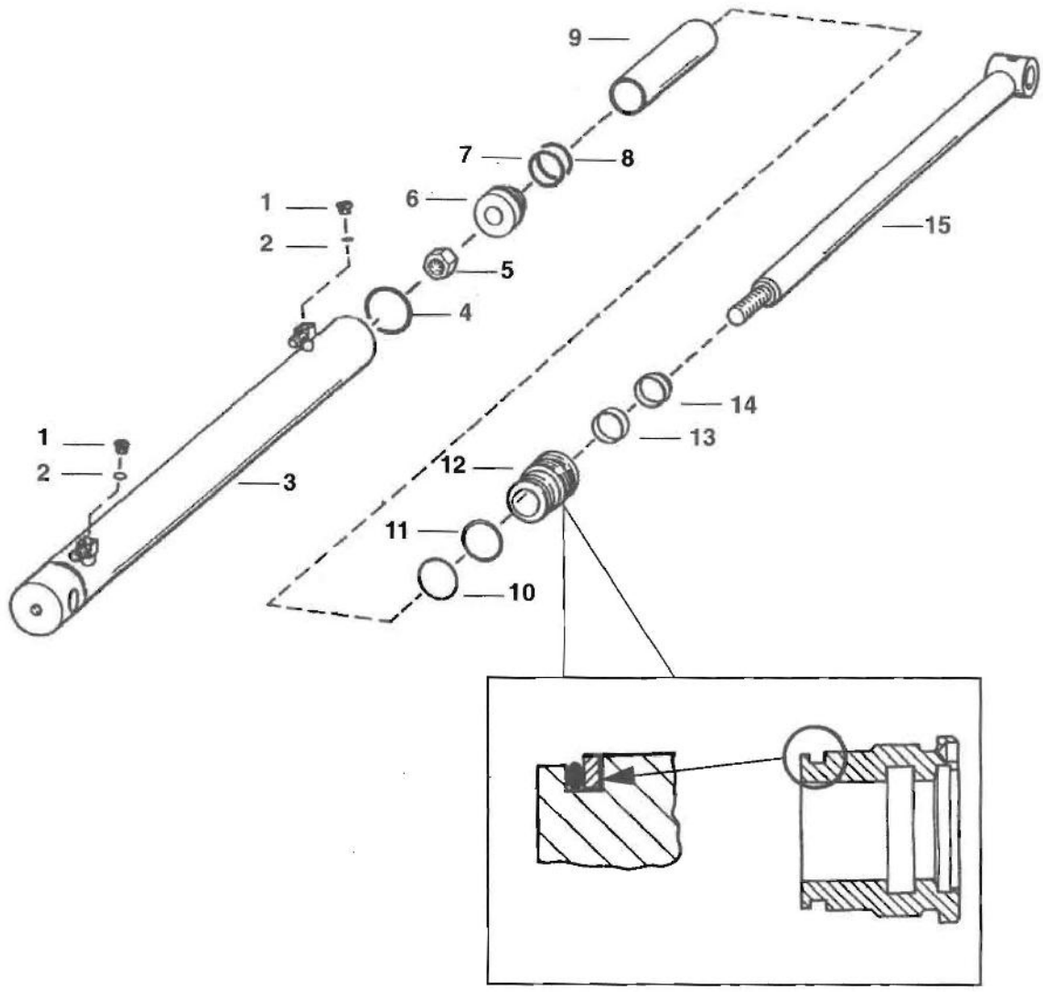
Installation: Tighten the bolt and nut to 25-28 ft.-lbs. (34-38 Nm) torque.

Use a drift pin and hammer, remove the cylinder pivot pin (Item 2) **[Figure 20-20-5]** (both sides).

Remove the lift cylinder. (both sides)

Identification

1. Plug
2. O-ring
3. Cylinder
4. O-ring
5. Nut
6. Piston
7. Seal
8. O-ring
9. Spacer
10. Seal
11. O-ring
12. Head
13. Rod Seal
14. Wiper Seal
15. Rod



Disassembly

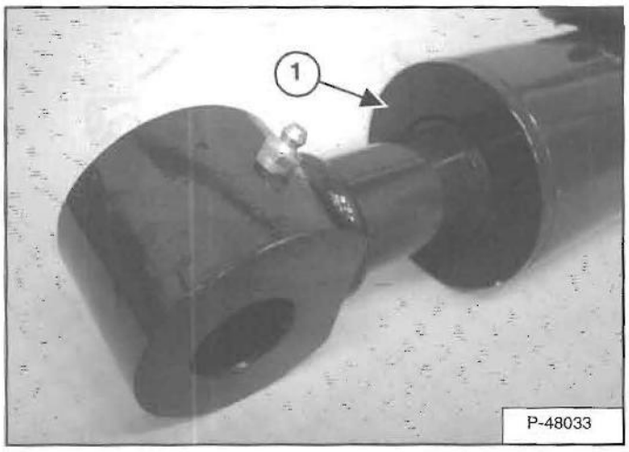
Use the following tools to disassemble the cylinder:

MEL1074 - O-ring Seal Hook
Spanner Wrench

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

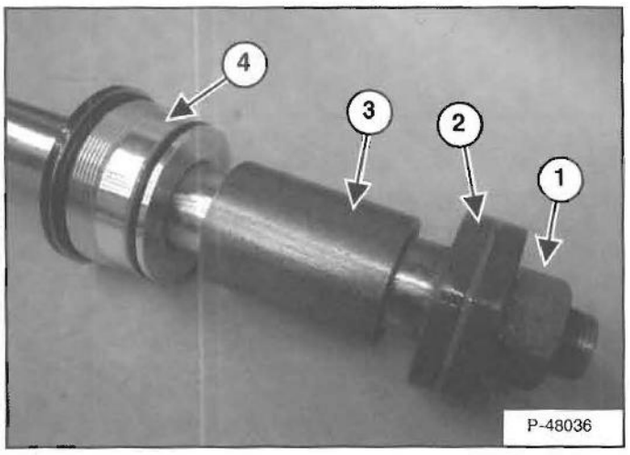
Put the base end of the cylinder in a vise.

Figure 20-20-6



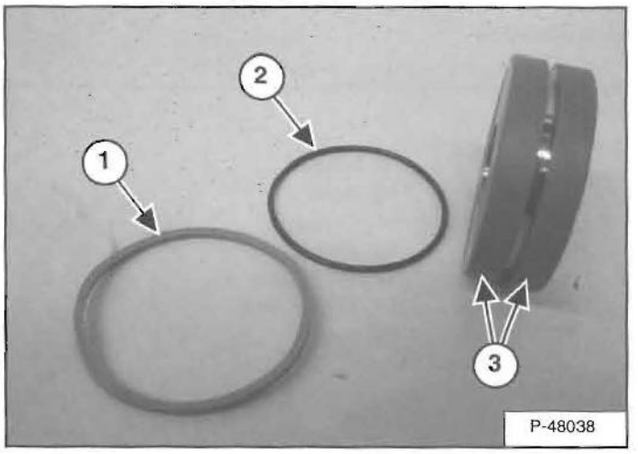
Use a spanner wrench to loosen the head (Item 1) **[Figure 20-20-6]** from the cylinder case.

Figure 20-20-7



Remove the nut (Item 1), piston (Item 2), spacer (Item 3) and head (Item 4) **[Figure 20-20-7]**.

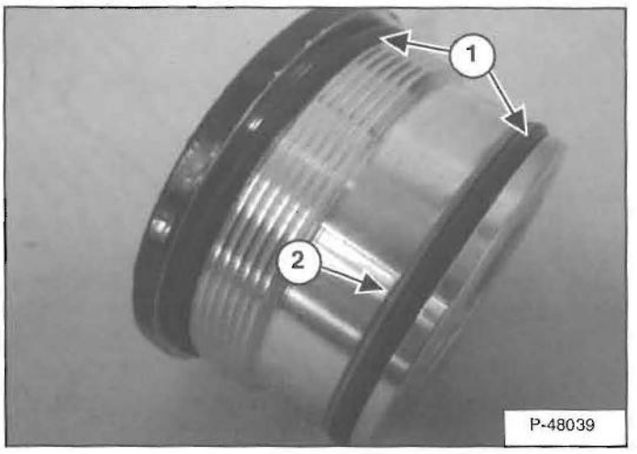
Figure 20-20-8



Remove the seal (Item 1) and O-ring (Item 2) **[Figure 20-20-8]** from the piston.

NOTE: If the fiber surface (Item 3) [Figure 20-20-8] on the piston head, becomes damaged, the complete piston head must be replaced.

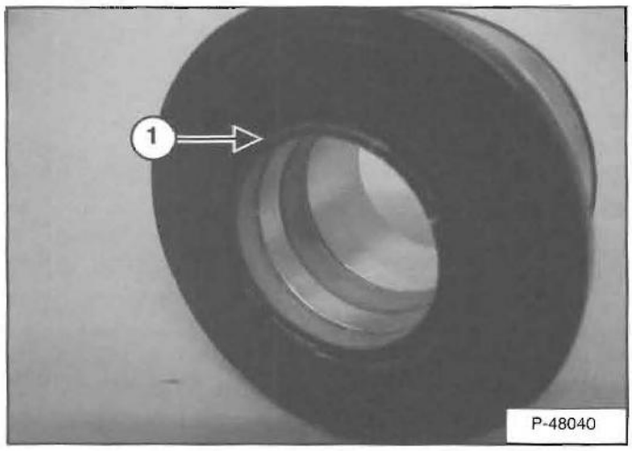
Figure 20-20-9



Remove the two O-rings (Item 1) and the back-up washer (Item 2) **[Figure 20-20-9]** from the cylinder head.

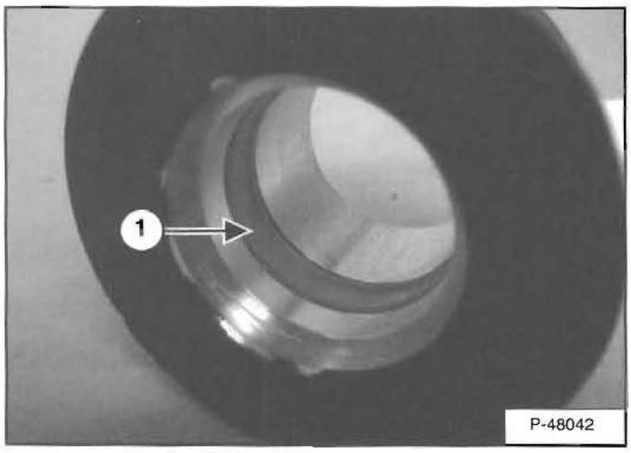
Disassembly (Cont'd)

Figure 20-20-10



Remove the wiper seal (Item 1) **[Figure 20-20-10]** from the cylinder head.

Figure 20-20-11



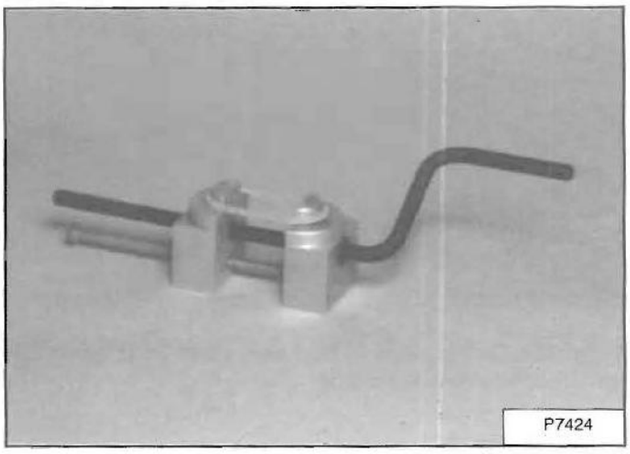
Remove the rod seal (Item 1) **[Figure 20-20-11]** from the cylinder head.

Assembly

Use the following tools to assemble the cylinder:

MEL1396 - Seal Installation Tool
MEL1033 - Rod Seal Installation Tool
Piston Ring Compressor
Spanner Wrench

Figure 20-20-12



Wash the cylinder parts in solvent and air dry them.

Inspect the cylinder parts for nicks, scratches or other damage. Replace any damaged parts.

Always install new O-rings and seals during assembly.

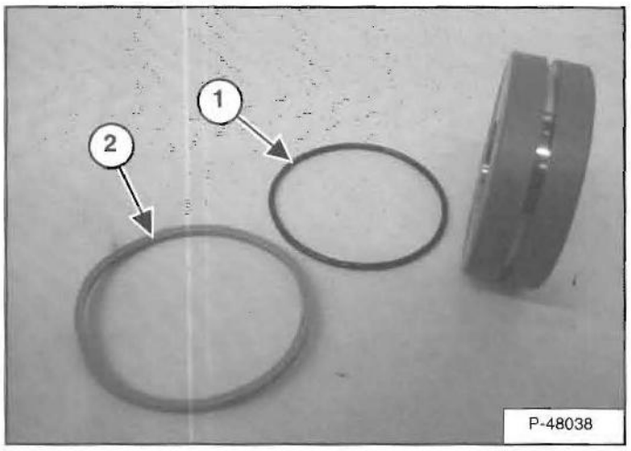
Lubricate all O-rings and seals with hydraulic oil during installation.

Install the new seal on the tool and slowly stretch it until it fits the piston **[Figure 20-20-12]**.

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

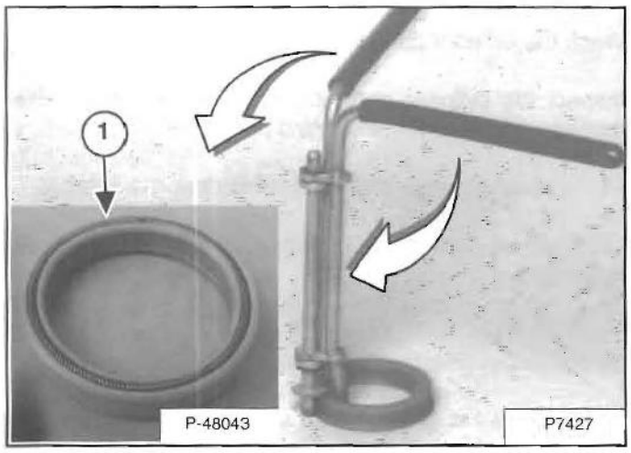
Assembly (Cont'd)

Figure 20-20-13



Install the O-ring (Item 1) and seal (Item 2) **[Figure 20-20-13]** on the cylinder piston.

Figure 20-20-14

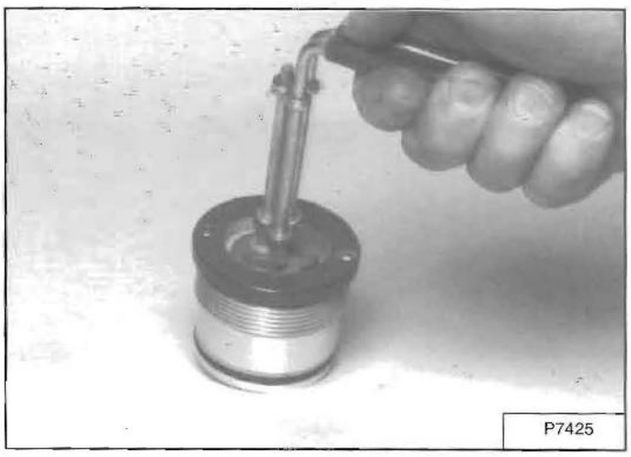


Install the rod seal on the rod seal tool **[Figure 20-20-14]**.

NOTE: During installation the spring side of the seal (Item 1) [Figure 20-20-14] must be installed toward the inside of the cylinder.

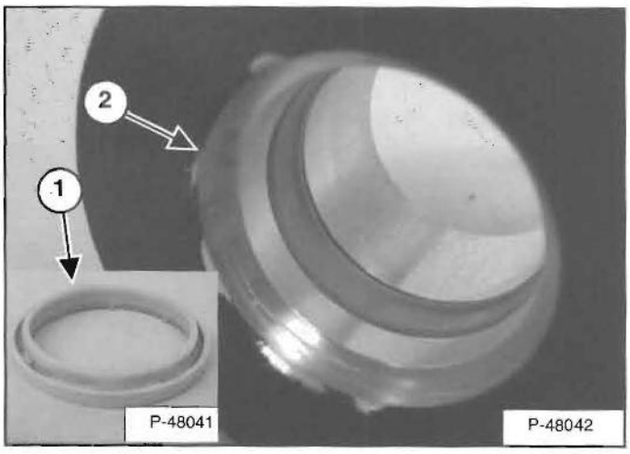
Rotate the handles to collapse the rod seal **[Figure 20-20-14]**.

Figure 20-20-15



Install the rod seal in the head **[Figure 20-20-15]**.

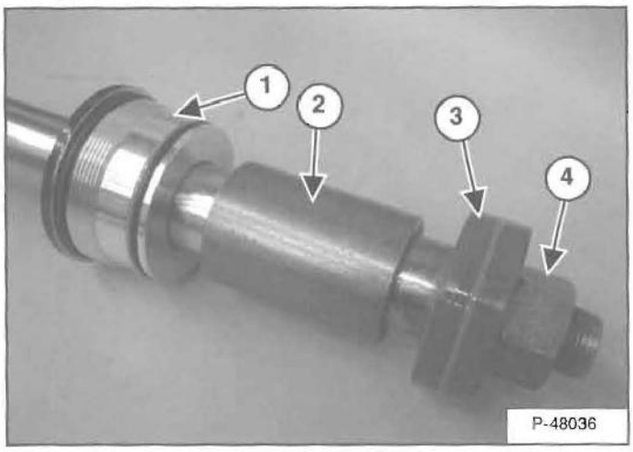
Figure 20-20-16



Install the wiper seal, with the wiper side of the seal (Item 1) toward the outside of the head (Item 2) **[Figure 20-20-16]**.

Assembly (Cont'd)

Figure 20-20-17

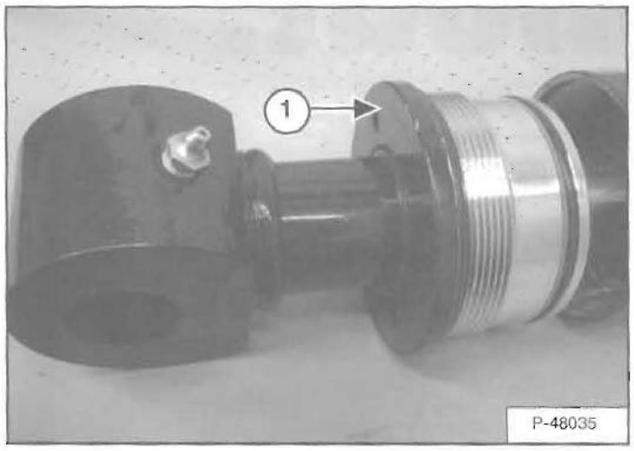


NOTE: Clean and dry the threads before installing the nut. Install the new nut from the kit.

Install the head (Item 1), spacer (Item 2) piston (Item 3), and nut (Item 4) **[Figure 20-20-17]**.

Tighten the nut (Item 4) **[Figure 20-20-17]** to 600 ft.-lbs. (814 Nm) torque.

Figure 20-20-18



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

Using a spanner wrench, tighten the head (Item 1) **[Figure 20-20-18]** until the head is flush with the end of the cylinder tube assembly.



Bobcat®

CYLINDER (TILT)

Checking

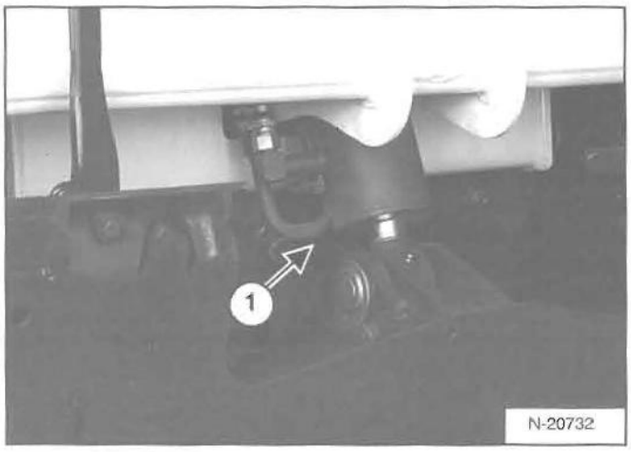
Remove the attachment. Roll the Bob-Tach fully back. Stop the engine. Raise the seat bar.

⚠ 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 20-21-1



Disconnect the hose (Item 1) **[Figure 20-21-1]** which goes to the base end of the tilt cylinder.

Install a cap on the fitting and tighten.

Engage the parking brake. Lower the seat bar.

Start the engine and push the Press to Operate button. Push the bottom (heel) of the tilt pedal.

If there is leakage from the open port, remove the tilt cylinder for repair.

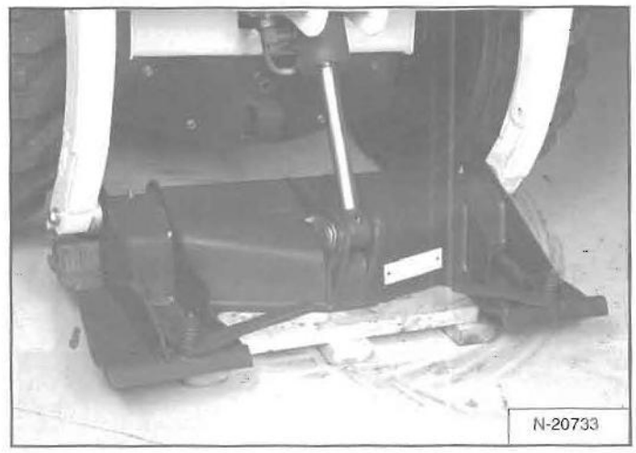
Removal And Installation

⚠ 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 20-21-2



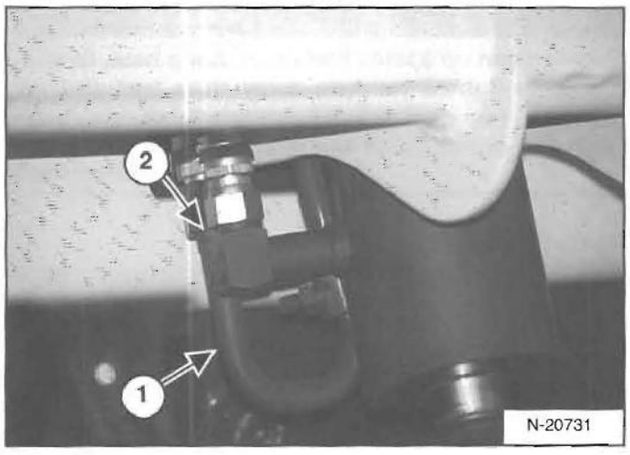
Remove the attachment. Roll the Bob-Tach forward and lower the lift arms.

Place the Bob-Tach flat on a pallet to allow the tilt cylinder base end pin enough clearance to be removed **[Figure 20-21-2]**.

Stop the engine. Move the tilt pedal to release the hydraulic pressure. Raise the seat bar.

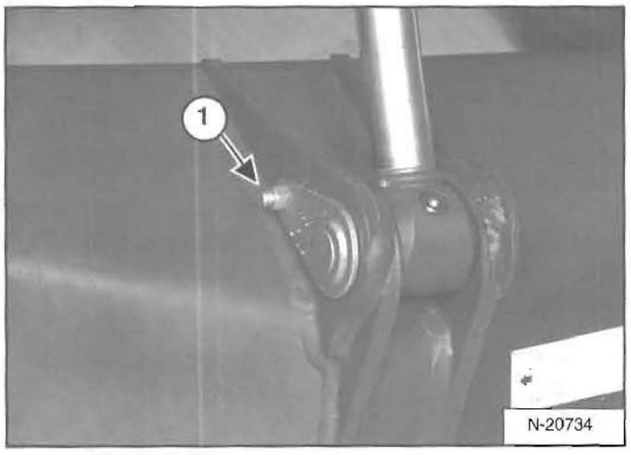
Removal And Installation (Cont'd)

Figure 20-21-3



Disconnect both hydraulic hoses (Items 1 & 2) **[Figure 20-21-3]**.

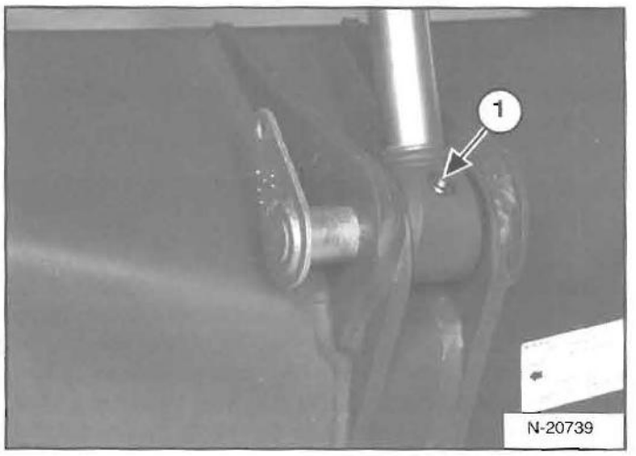
Figure 20-21-4



Remove the retainer nut (Item 1) **[Figure 20-21-4]** from the cylinder rod end pivot pin.

Installation: Tighten the retainer nut to 25-28 ft.-lbs. (34-38 Nm) torque.

Figure 20-21-5



Remove the grease fitting from the rod end pivot pin (Item 1) **[Figure 20-21-5]**.

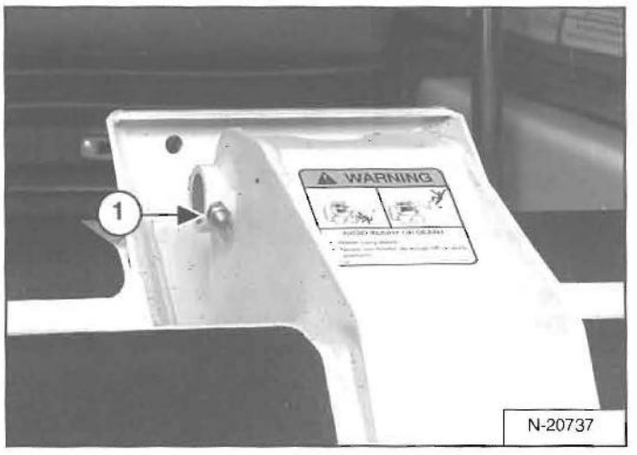
Remove the rod end pivot pin.

⚠ 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 20-21-6

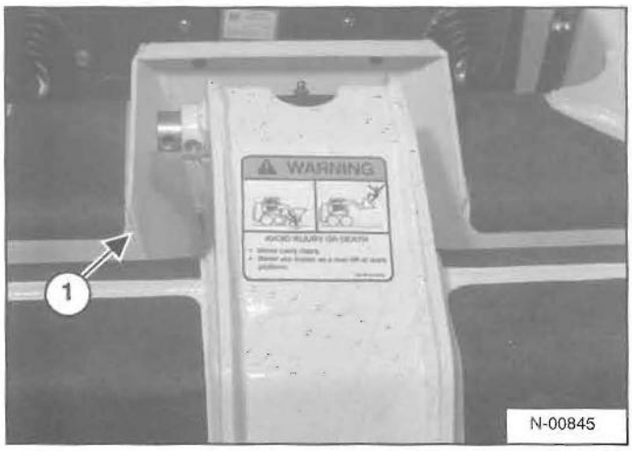


Remove the retainer nut (Item 1) **[Figure 20-21-6]** and bolt from the base end pivot pin.

Installation: Tighten the retainer nut and bolt to 25-28 ft.-lbs. (34-38 Nm) torque.

Removal And Installation (Cont'd)

Figure 20-21-7

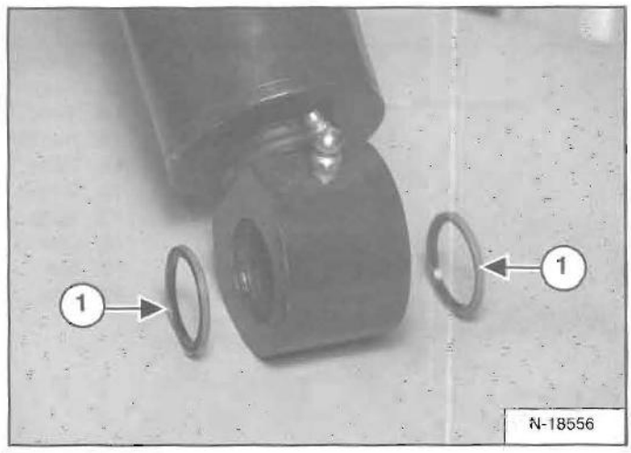


Remove the base end pivot pin (Item 1) **[Figure 20-21-7]**.

Remove the tilt cylinder from the loader.

Rod End Pivot Pin Bushing And Seal Replacement

Figure 20-21-8



Remove the old seal (both sides) from the end of the tilt cylinder **[Figure 20-21-8]**.

Apply a light coat of grease on the new seals (Item 1) **[Figure 20-21-8]**.

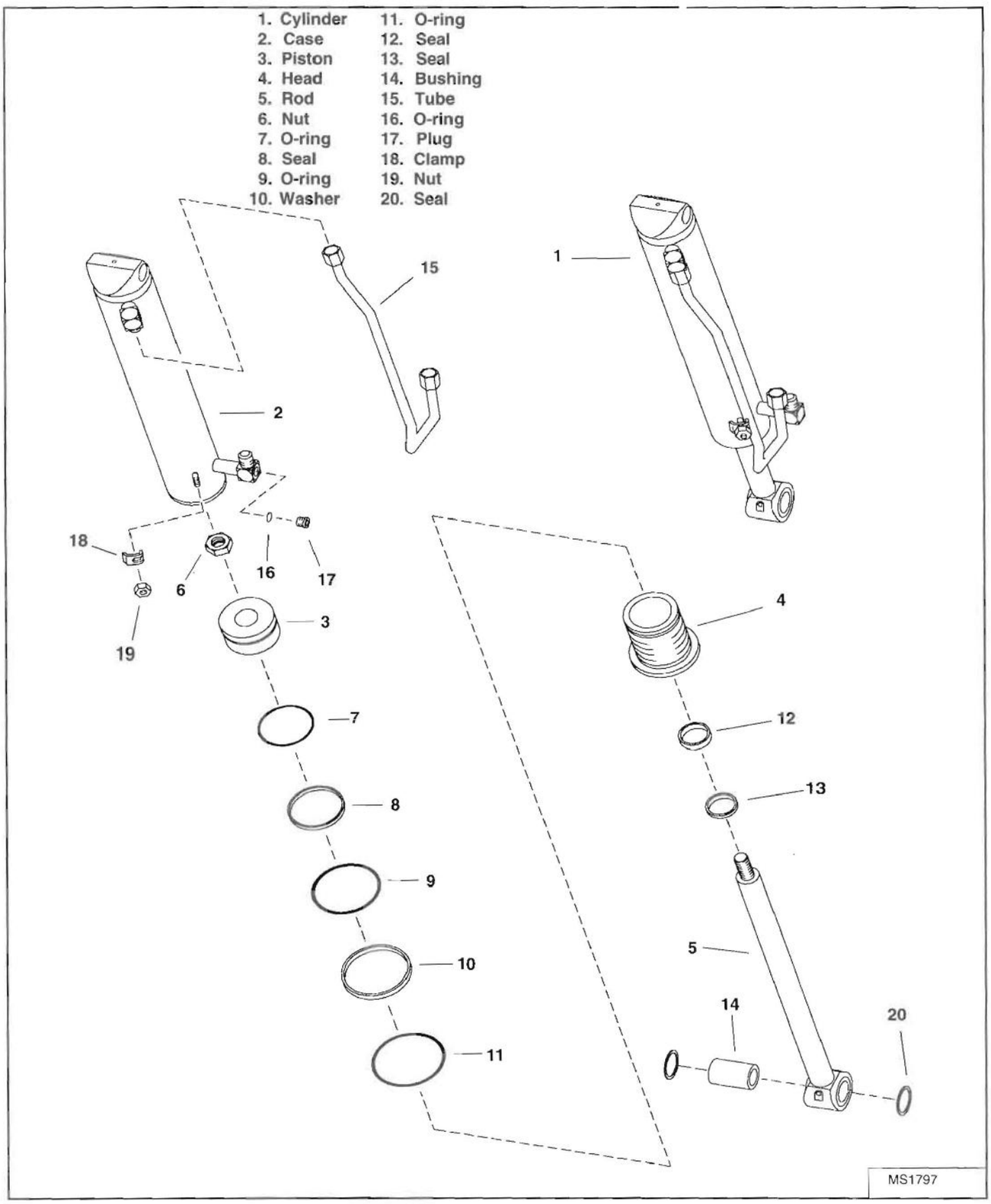
Install the new seals with the lip facing in **[Figure 20-21-8]**.

Install the rod end of the tilt cylinder into the Bob-Tach.

Be careful not to damage the new seals during installation.

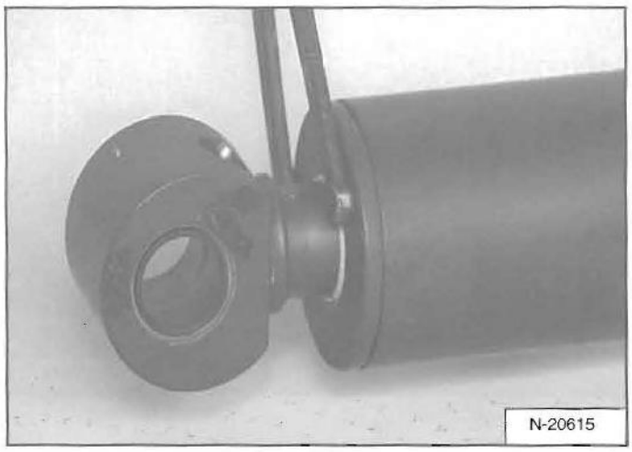
Reserve the removal procedure to install the tilt cylinder.

Identification



Disassembly

Figure 20-21-9



Use the following tools to disassemble the cylinder:

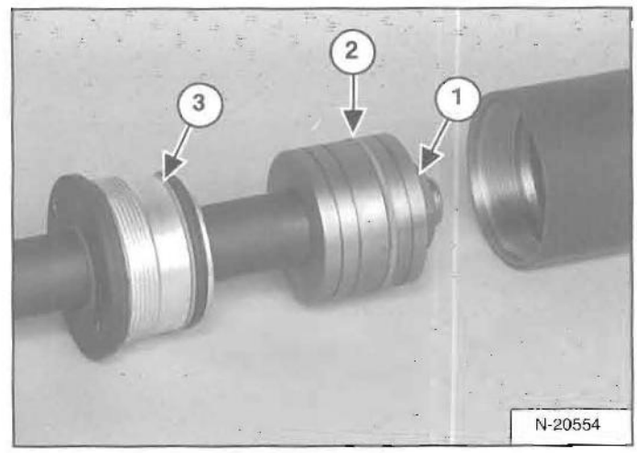
MEL1074 - O-ring Seal Hook
Spanner Wrench

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

Put the base end of the cylinder in a vise.

Use a spanner wrench to loosen the head **[Figure 20-21-9]**.

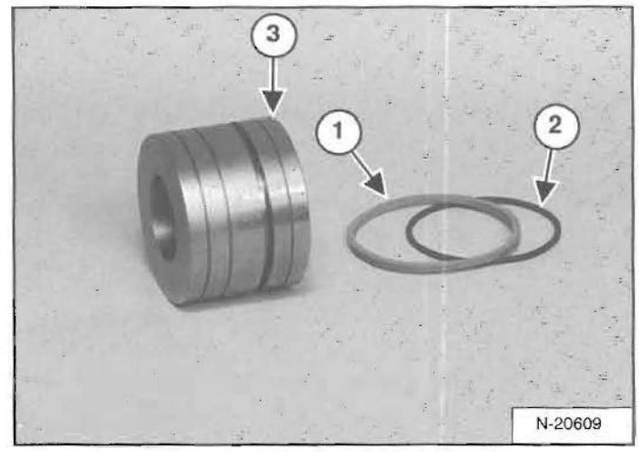
Figure 20-21-10



Remove the head and rod assembly from the cylinder **[Figure 20-21-10]**. Put the rod end in a vise.

Remove the nut (Item 1), piston (Item 2) and head (Item 3) **[Figure 20-21-10]**.

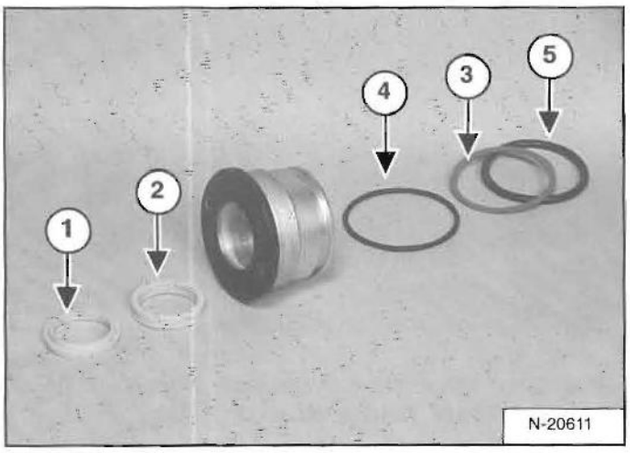
Figure 20-21-11



Piston: Remove the seal (Item 1), and O-ring (Item 2) from the piston (Item 3) **[Figure 20-21-11]**.

Disassembly (Cont'd)

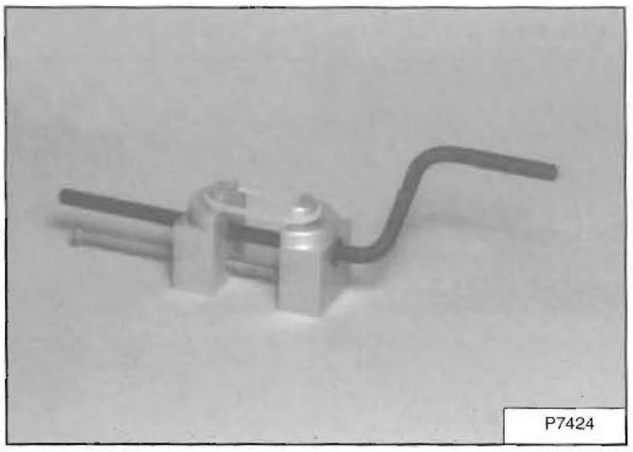
Figure 20-21-12



Remove the wiper seal (Item 1), and rod seal (Item 2), the back up washer (Item 3), the thin O-ring (Item 4) and the thick O-ring (Item 5) **[Figure 20-21-12]** from the head.

Assembly

Figure 20-21-13



Use the following tools to assembly the cylinder:

MEL1396 - Seal Installation Tool
MEL1033 - Rod Seal Installation Tool
Piston Ring Compressor
Spanner Wrench

Wash the cylinder parts in solvent and air dry them.

Inspect the cylinder parts for nicks, scratches or other damage. Replace any damaged parts.

Always install new O-rings and seals during assembly.

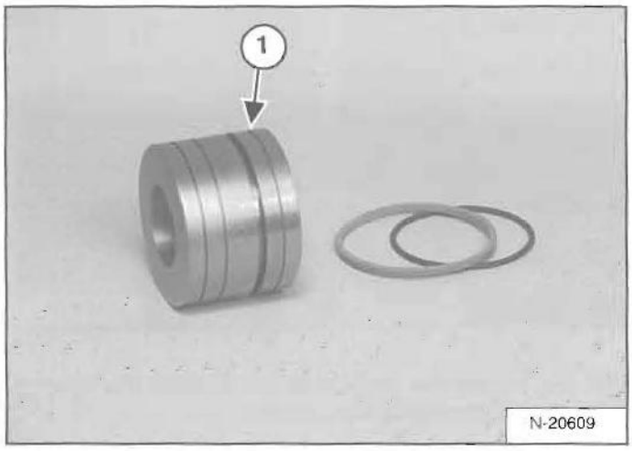
Lubricate all O-rings and seals with hydraulic oil during installation.

Install the new seal on the tool and slowly stretch it until it fits the piston **[Figure 20-21-13]**.

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

Assembly (Cont'd)

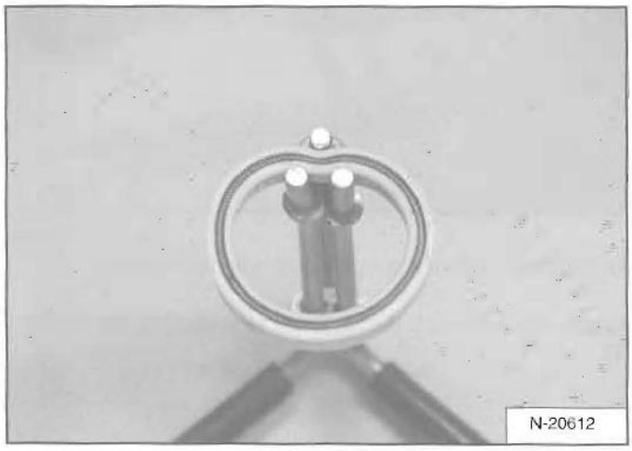
Figure 20-21-14



Install the O-ring and seal on the piston (Item 1) **[Figure 20-21-14]**.

Use a ring compressor to compress the seal to the correct size. Leave the piston in the compressor for about three minutes.

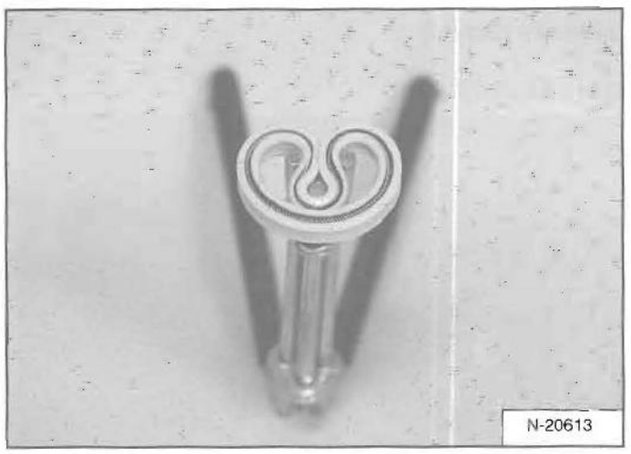
Figure 20-21-15



Install the rod seal on the rod seal tool **[Figure 20-21-15]**.

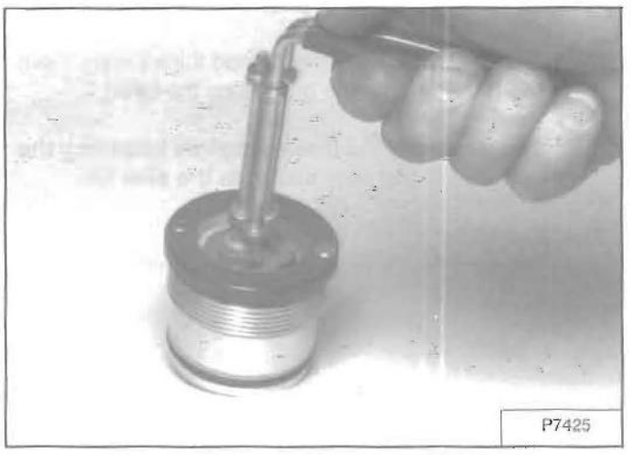
NOTE: During installation the O-ring side of the seal must be toward the inside of the cylinder.

Figure 20-21-16



Rotate the handles to collapse the rod seal **[Figure 20-21-16]**.

Figure 20-21-17

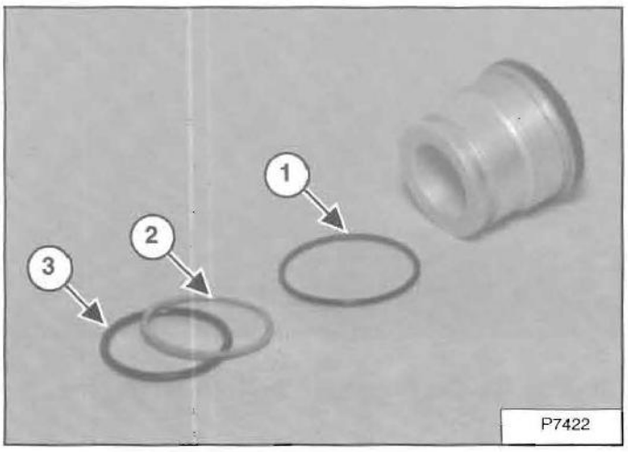


Install the rod seal in the head **[Figure 20-21-17]**.

Install the wiper seal with the wiper toward the outside of the head.

Assembly (Cont'd)

Figure 20-21-18

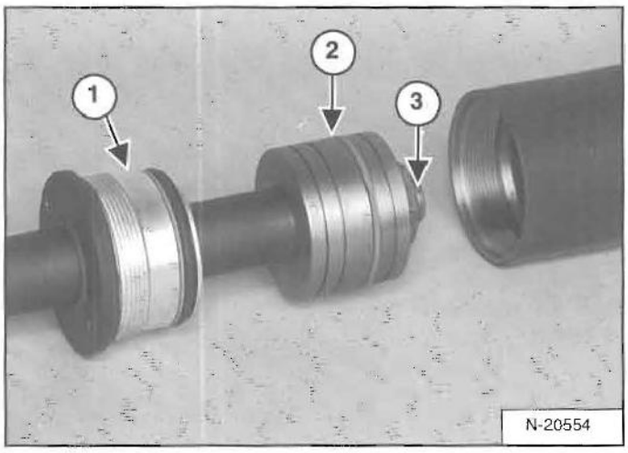


Install the thin O-ring (Item 1) **[Figure 20-21-18]**.

Install the back-up washer (Item 2) and thick O-ring (Item 3) **[Figure 20-21-18]** into the groove on the head.

NOTE: Clean and dry the threads before installing the nut. Install the new nut from the seal kit.

Figure 20-21-19

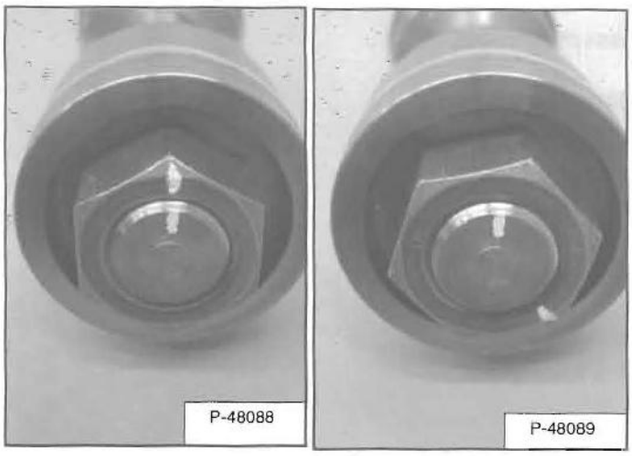


Install the head (Item 1), and the piston (Item 2) **[Figure 20-21-19]**. The small diameter of the piston goes into the cylinder tube first.

Grease the piston where the nut contacts the piston. Do not get grease on the threads. Install the new nut (Item 3) **[Figure 20-21-19]**.

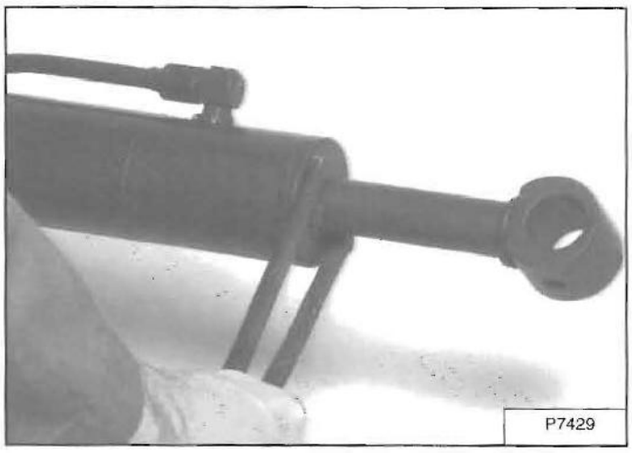
Tighten nut (Item 3) **[Figure 20-21-19]** to 100 ft.-lbs. (814 Nm) torque.

Figure 20-21-20



Mark the end of the shaft and nut. Tighten the nut an additional 135 degrees or 2-1/4 flats .

Figure 20-21-21



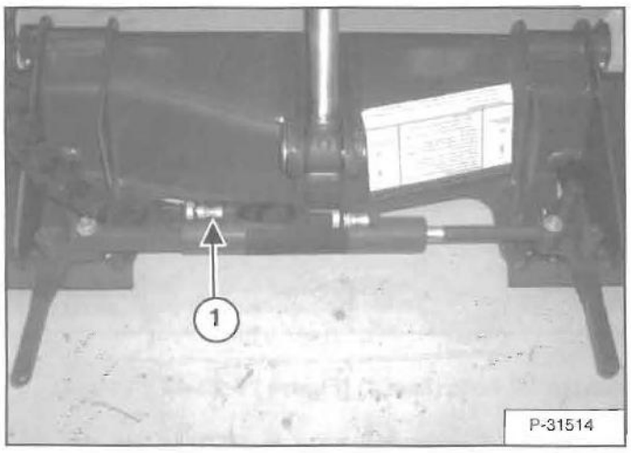
Put the base end of the hydraulic cylinder in a vise.

Tighten the head using a spanner wrench **[Figure 20-21-21]**.

CYLINDER (POWER BOB-TACH)

Checking

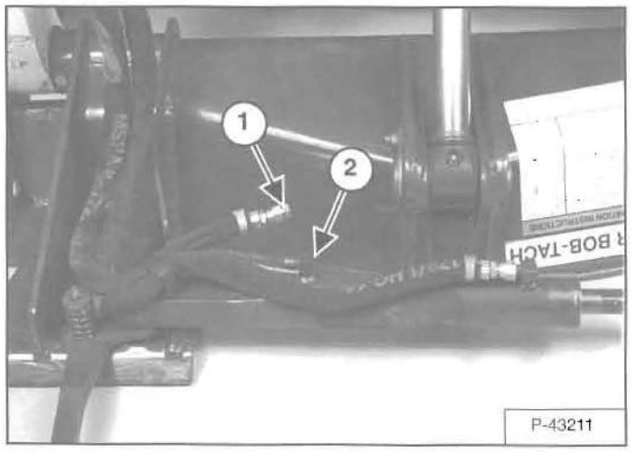
Figure 20-22-1



Tilt the Bob-Tach forward, so it is parallel to the floor **[Figure 20-22-1]**.

Disconnect the hose (Item 1) **[Figure 20-22-1]** from the power Bob-Tach cylinder base end port.

Figure 20-22-2



Install a plug in the hose (Item 1) **[Figure 20-22-2]** and tighten.

Engage the parking brake. Lower the seat bar. Start the engine.

Push and hold the BOB-TACH "WEDGES UP" Switch (Front Accessory Panel).

If there is any leakage from the base end cylinder port (Item 2) **[Figure 20-22-2]**, remove the lift cylinder for repair.

⚠ 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

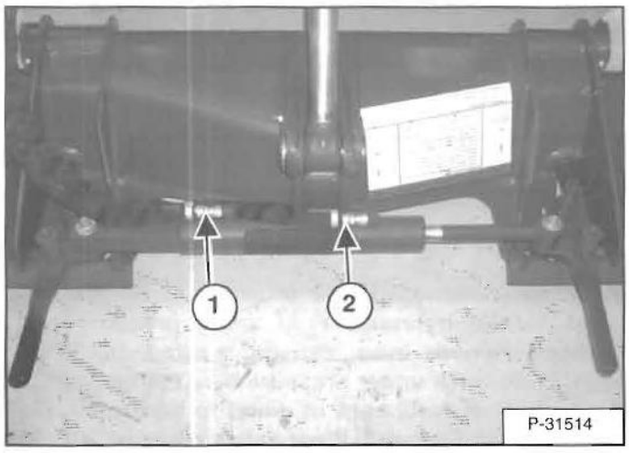
⚠ WARNING

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

Removal And Installation

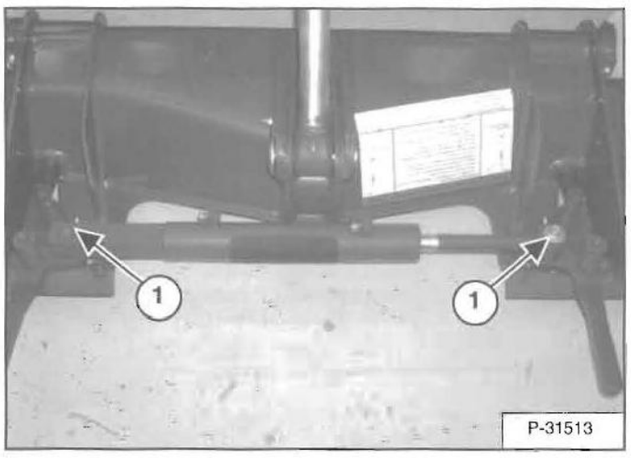
Figure 20-22-3



Disconnect the hoses (Items 1 & 2) **[Figure 20-22-3]** from the cylinder fittings.

Install plugs and cap in fittings.

Figure 20-22-4



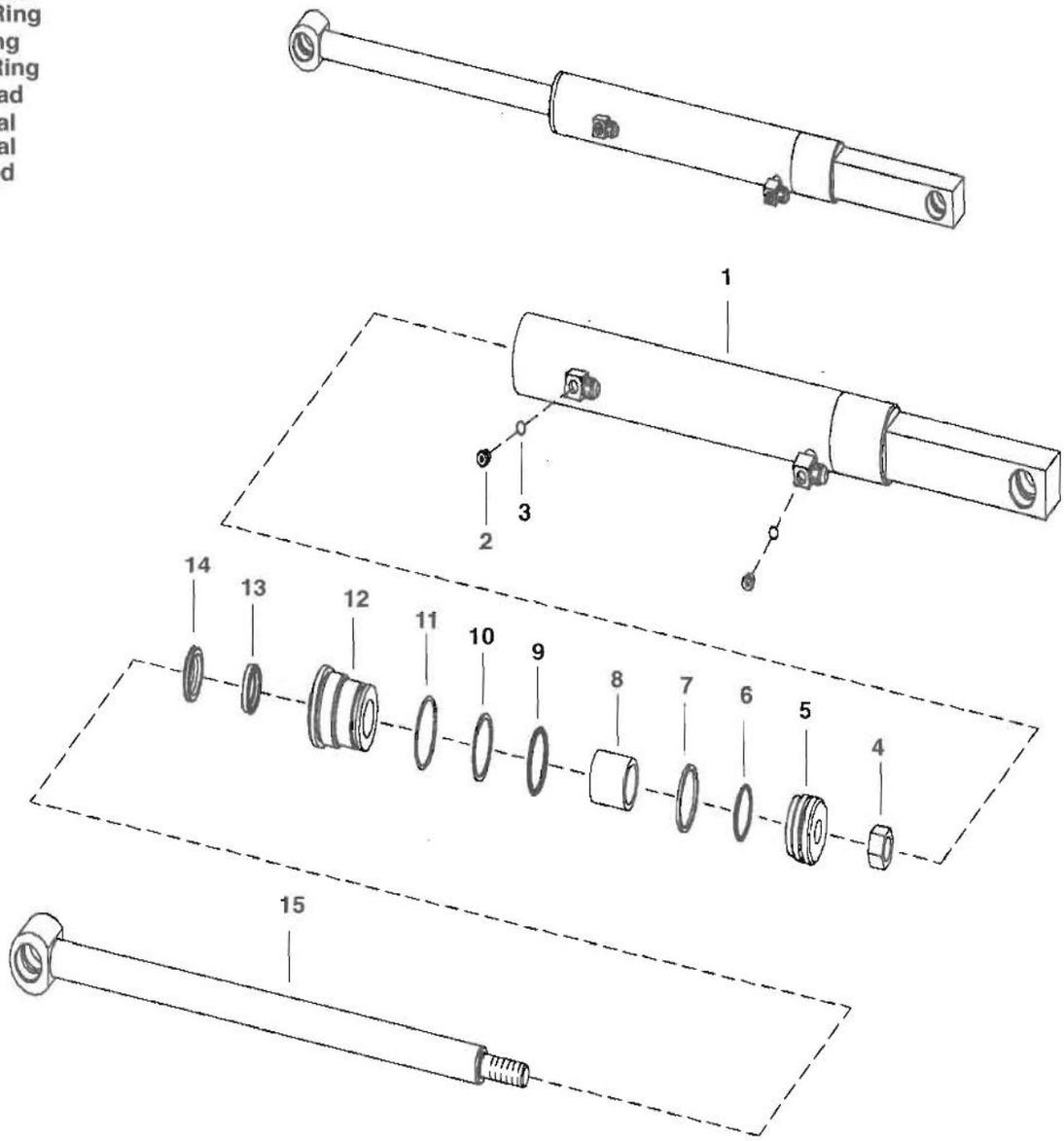
Remove the bolts (Item 1) **[Figure 20-22-4]**.

Installation: Tighten the bolts to 25-28 ft.-lbs. (34-38 Nm) torque.

Remove the washers and cylinder from the lever pivots.

Parts Identification

1. Cylinder
2. Plug
3. O-Ring
4. Nut
5. Piston
6. O-Ring
7. Ring
8. Spacer
9. O-Ring
10. Ring
11. O-Ring
12. Head
13. Seal
14. Seal
15. Rod



PE1064

Disassembly

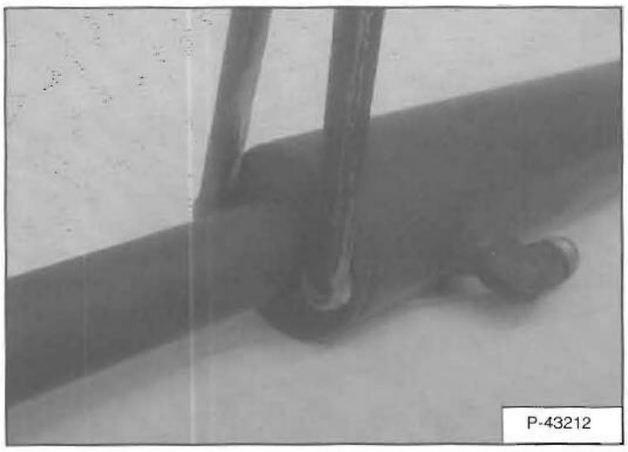
Use the following tools to disassemble the cylinder:

MEL 1074 - O-ring Seal Hook
Spanner Wrench

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

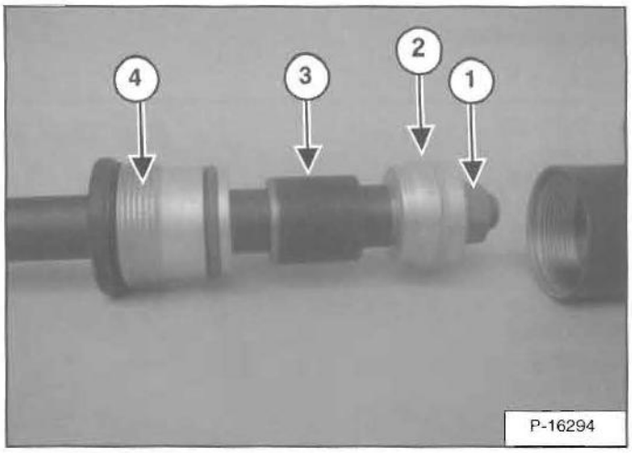
Put the base end of the cylinder in a vise.

Figure 20-22-5



Use a spanner wrench to loosen the head **[Figure 20-22-5]**.

Figure 20-22-6

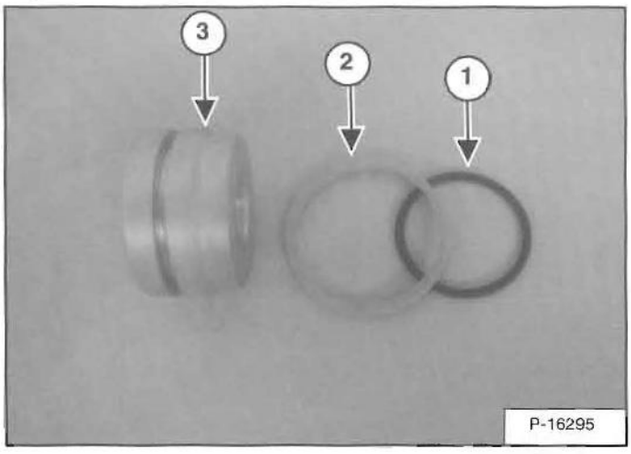


Remove the head and rod assembly from the cylinder **[Figure 20-22-6]**.

Put the rod end in a vise.

Remove the nut (Item 1), piston (Item 2), spacer (Item 3) and head (Item 4) **[Figure 20-22-6]** from the rod.

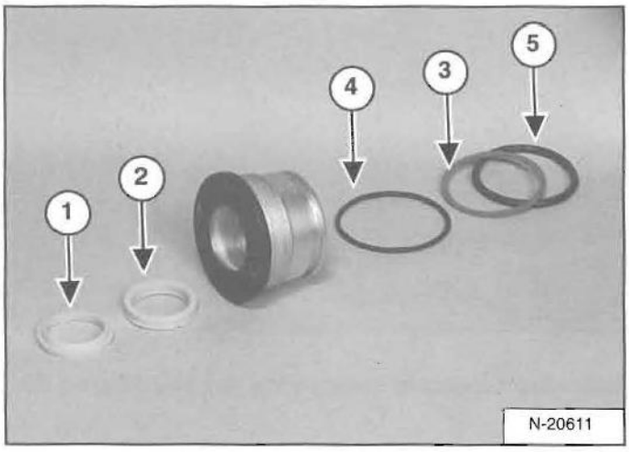
Figure 20-22-7



Piston: Remove the O-ring (Item 1), and seal (Item 2) from the piston (Item 3) **[Figure 20-22-7]**.

Disassembly (Cont'd)

Figure 20-22-8



Remove the wiper seal (Item 1), and rod seal (Item 2), the back-up washer (Item 3), the thin O-ring (Item 4) and the thick O-ring (Item 5) **[Figure 20-22-8]** from the head.

Assembly

Use the following tools to assemble the cylinder:

MEL 1396 - Seal Installation Tool
MEL 1033 - Rod Seal Installation Tool
Piston Ring Compressor
Spanner Wrench

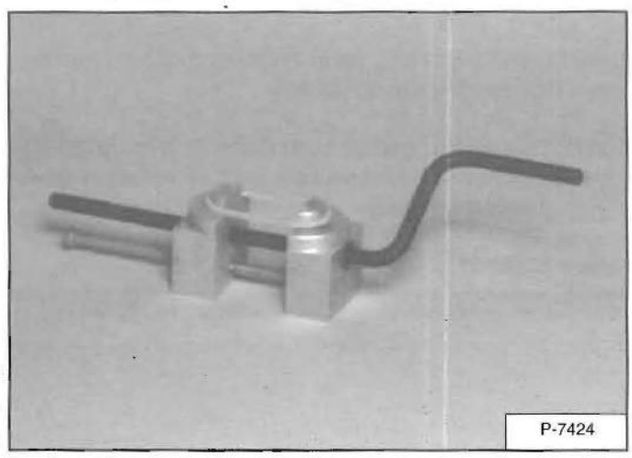
Wash the cylinder parts in solvent and air dry them.

Inspect the cylinder parts for nicks, scratches or other damage. Replace any damaged parts.

Always install new O-rings and seals during assembly.

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

Figure 20-22-9

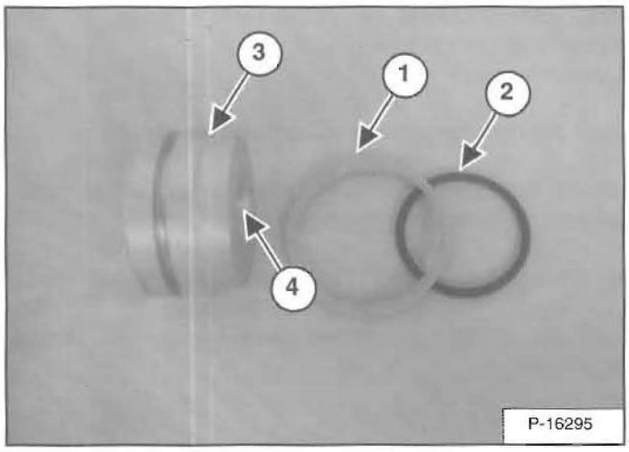


Install the new seal on the tool and slowly stretch it until it fits the piston **[Figure 20-22-9]**.

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

Assembly (Cont'd)

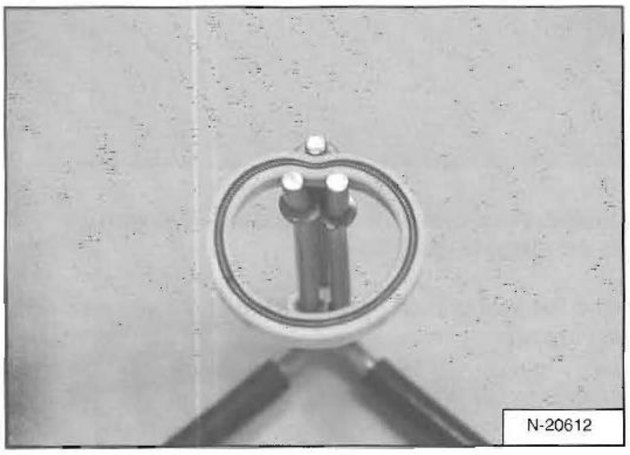
Figure 20-22-10



Piston: Install the O-ring (Item 1) and seal (Item 2) on the piston (Item 3) **[Figure 20-22-10]**.

NOTE: The piston center hole (Item 4) [Figure 20-22-10] has a bevel on one end. The bevel goes toward the rod.

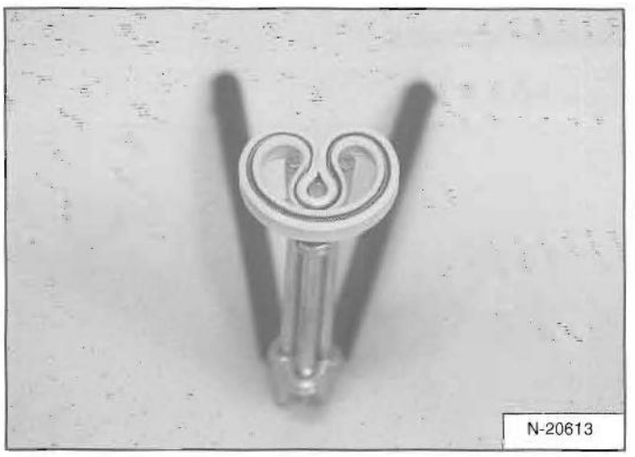
Figure 20-22-11



Install the rod seal on the rod seal tool **[Figure 20-22-11]**.

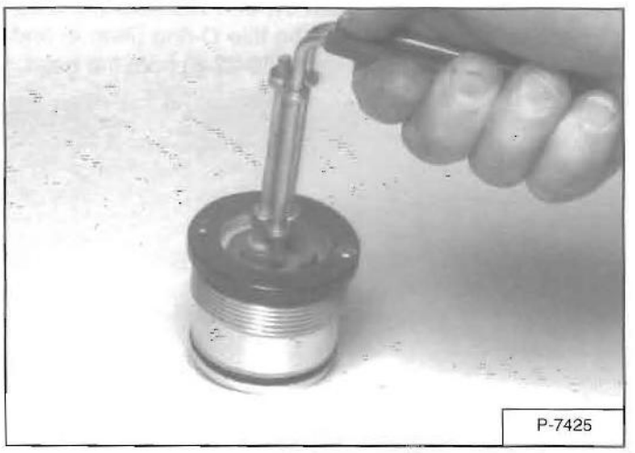
NOTE: During installation the O-ring side of the seal must be toward the inside of the cylinder.

Figure 20-22-12



Rotate the handles to collapse the rod seal **[Figure 20-22-12]**.

Figure 20-22-13

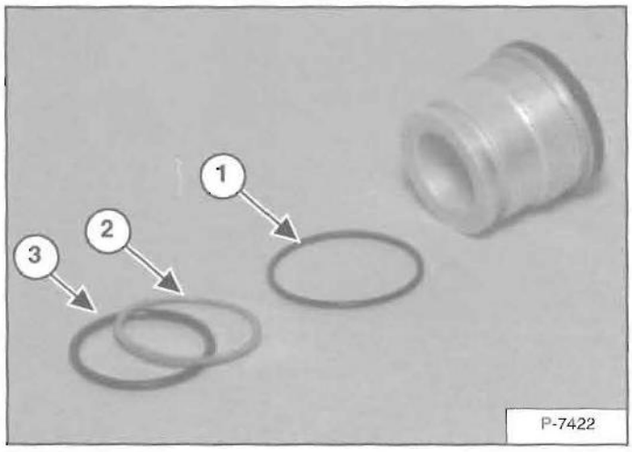


Install the rod seal in the head **[Figure 20-22-13]**.

Install the wiper seal with the wiper toward the outside of the head.

Assembly (Cont'd)

Figure 20-22-14

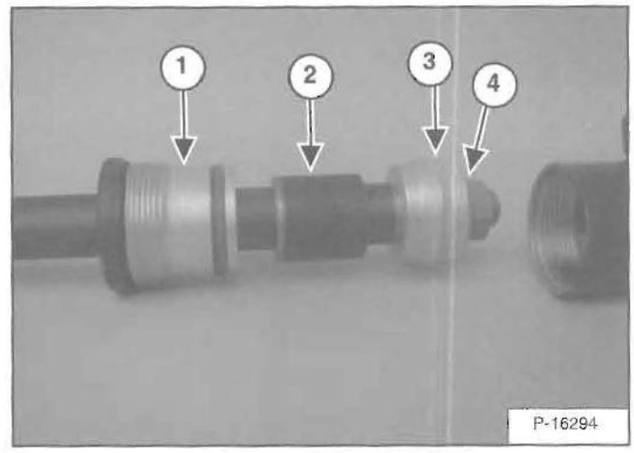


Install the thin O-ring (Item 1) **[Figure 20-22-14]**.

Install the back-up washer (Item 2) and thick O-ring (Item 3) **[Figure 20-22-14]** into the groove on the head.

NOTE: Clean and dry the threads before installing the nut. Install the new nut from the seal kit.

Figure 20-22-15



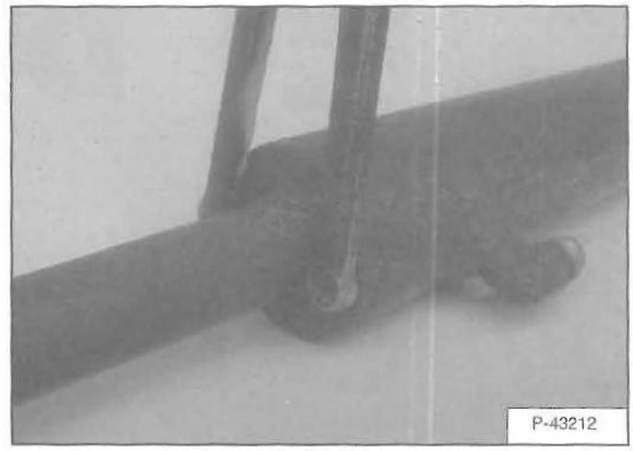
Install the head (Item 1), and spacer (Item 2) **[Figure 20-22-15]**.

Install the piston (Item 3) **[Figure 20-22-15]**.

Lift Cylinder: Grease the piston where the nut contacts the piston, do not get grease on the threads. Install the new nut (Item 4) **[Figure 20-22-15]**.

Tighten the nut to 90 ft.-lbs. (122 Nm) torque.

Figure 20-22-16



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

Tighten the head using a spanner wrench **[Figure 20-22-16]**.


Bobcat®

MAIN RELIEF VALVE

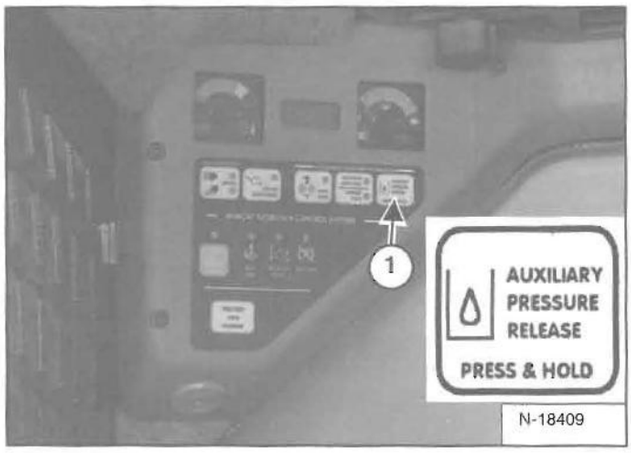
Checking

⚠ WARNING

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

W-2006-0284

Figure 20-30-1

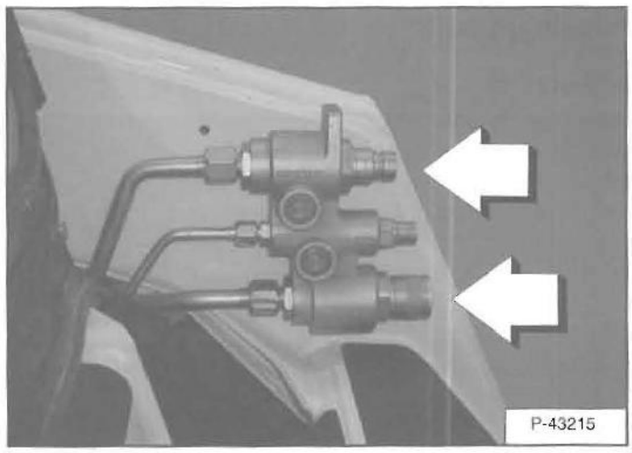


The tools listed will be needed to do the following procedure:

MEL10003 - Hydraulic Tester
MEL10006 - Hydraulic Test Kit

- Press the AUXILIARY PRESSURE RELEASE Button (Item 1) **[Figure 20-30-1]**. Hold it for two seconds. The engine will stop and release auxiliary hydraulic pressure for the rear auxiliarys only.

Figure 20-30-2



Pushing the the hydraulic couplers on the loader in, releases the hydraulic pressure for the front auxiliarys **[Figure 20-30-2]**. This happens while hoses are being pushed on to the couplers.

Lift and block the loader. (See Contents Page 10-01.)

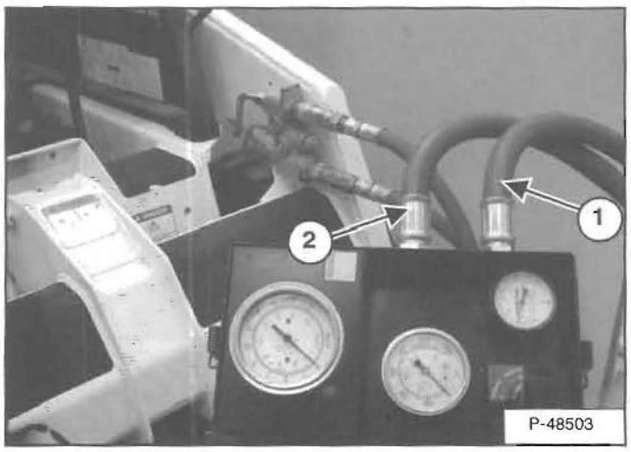
⚠ WARNING

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

Checking (Cont'd)

Figure 20-30-3



Connect the IN port (Item 1) **[Figure 20-30-3]** of the hydraulic tester to the bottom (female) quick coupler on the loader.

Connect the OUT port (Item 2) **[Figure 20-30-3]** of the hydraulic tester to the top (male) quick coupler on the loader.

IMPORTANT

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

I-2024-0284

Figure 20-30-4



Connect the remote start tool. (See Contents Page 10-01.)

Start the engine with the remote start tool.

Press the maximum flow/variable flow switch (Item 1) **[Figure 20-30-4]** twice to activate maximum flow. The switch will illuminate to indicate the maximum flow rate is active.

The correct pressure for the main relief is 2500-2700 PSI (17237-18615 kPa).

Press the auxiliary pressure release (Item 2) **[Figure 20-30-4]** and hold the switch for three seconds to release hydraulic pressure to the rear auxiliary couplers. Push the front hydraulic couplers in to release the pressure before servicing the main relief valve.

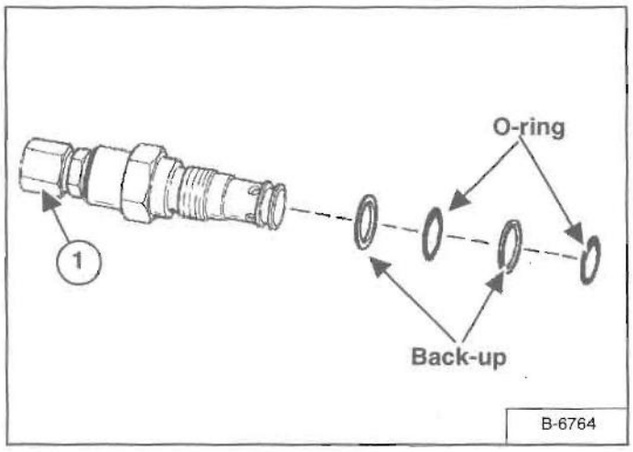
Adjustment

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 20-30-5



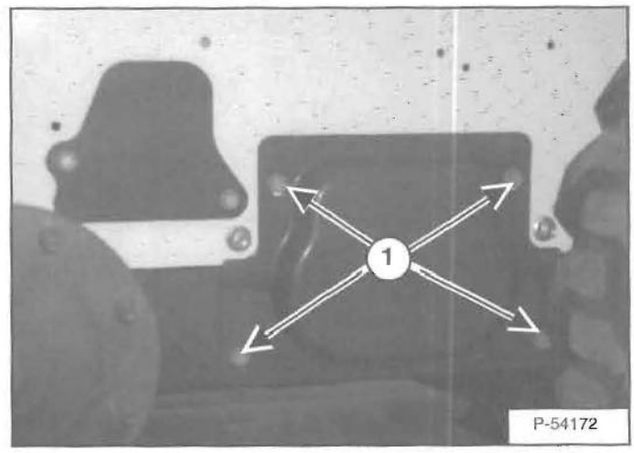
If the relief pressure is not correct, adjust the main relief valve. Remove the end cap (Item 1) **[Figure 20-30-5]**.

Turn the adjusting screw in or out until the pressure is correct.

NOTE: If the correct pressure can not be reached, replace the main relief valve. Check the pressure setting of the new relief valve. Release the pressure from the auxiliarys before removing the main relief valve for replacement.

Removal and Installation

Figure 20-30-6



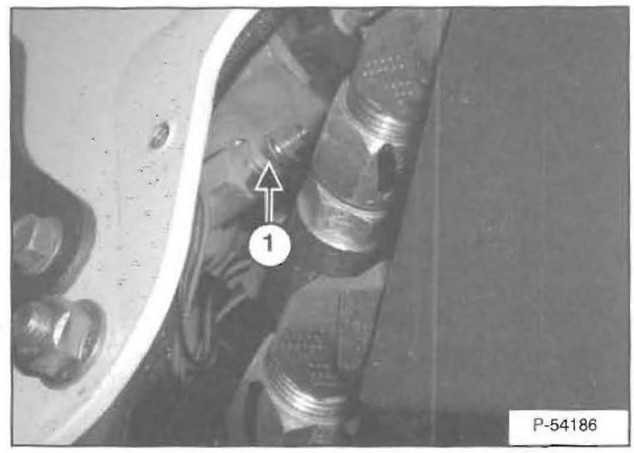
Remove the four motor cover mounting bolts (Item 1) **[Figure 20-30-6]**.

Clean the area around the control valve. Loosen and remove the main relief valve (Item 1) **[Figure 20-30-7]**.

Remove the O-rings and back-up washers **[Figure 20-30-5]**.

Clean the main relief valve in clean solvent. Use air pressure to dry the valve.

Figure 20-30-7



Install new O-rings and back-up washers. Install the main relief valve (Item 1) **[Figure 20-30-7]** and tighten. Check the pressure again. (See Contents Page 20-01.)

Installation: Tighten the main relief valve to 35-40 ft.-lbs. (47-54 Nm) torque.


Bobcat®

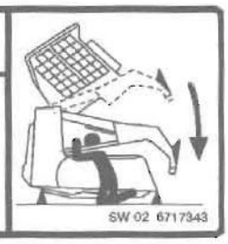
HYDRAULIC CONTROL VALVE (FOOT CONTROL)

Removal And Installation

⚠ DANGER

AVOID DEATH

- Disconnecting or loosening any hydraulic tubeline, hose, fitting, component or a part failure can cause lift arms to drop.
- Keep out of this area when lift arms are raised unless supported by an approved lift arm support. Replace if damaged. 57051



⚠ WARNING

Never work on a machine with the lift arms up unless the lift arms are secured by an approved lift arm support device. Failure to use an approved lift arm support device can allow the lift arms or attachment to fall and cause injury or death.

W-2059-0598

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

Lift and block the loader. (See Contents Page 10-01.)

Raise the lift arms and install an approved lift arm support device (See Contents Page 10-01.)

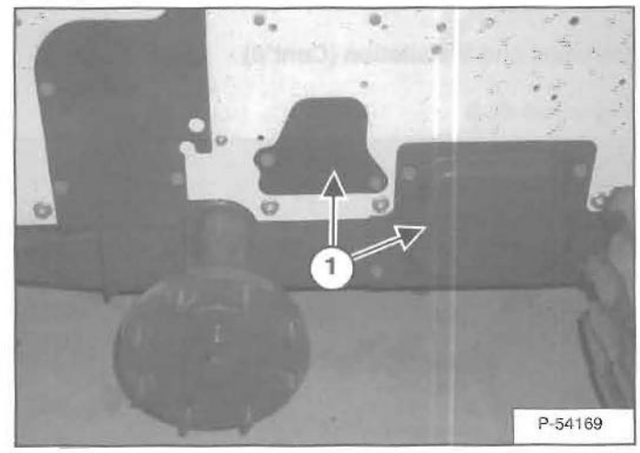
Raise the operator cab. (See Contents Page 10-01.)

Clean the area around the control valve.

Drain the hydraulic reservoir. (See Contents Page 10-01.)

Remove the control panel. (See Contents Page 50-01.)

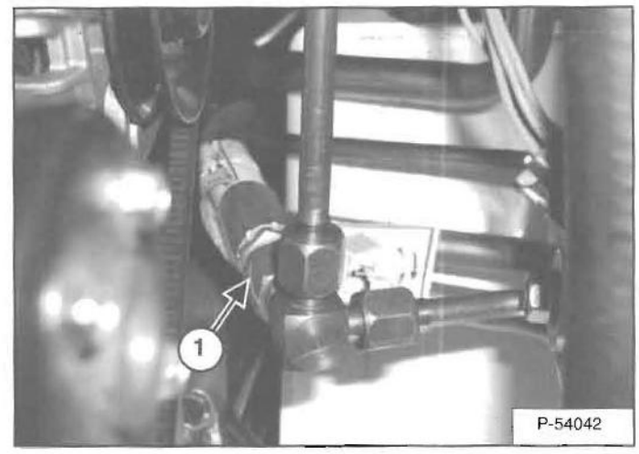
Figure 20-40-1



Remove the right rear tire.

Locate and remove the access covers (Item 1) **[Figure 20-40-1]** on the right side of the machine.

Figure 20-40-2



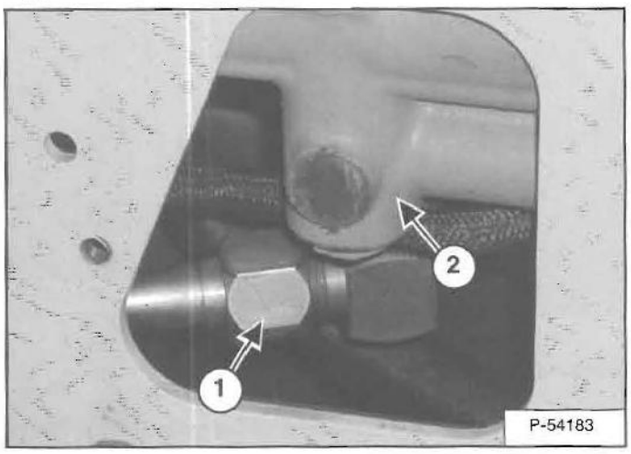
Mark all tubelines and hoses for correct installation.

The fixed end main valve hose (Item 1) **[Figure 20-40-2]** is connected to a fixed end fitting on the control valve. The hose is routed to the back upright where the hose is connected to a tee fitting that feeds the base end of both lift cylinders. The hose must be removed at the back tee fitting, located in the right side upright.

NOTE: Remember the hose routing for ease of control valve installation.

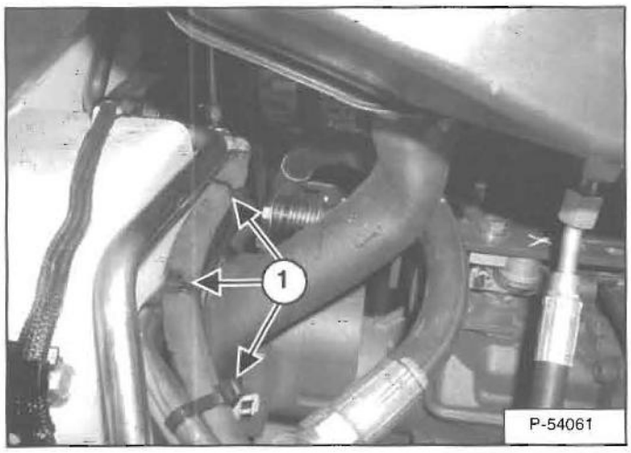
Removal and Installation (Cont'd)

Figure 20-40-3



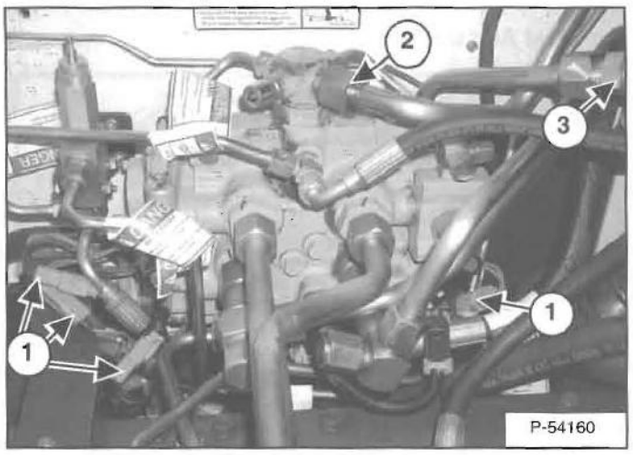
Disconnect the inlet tubeline (Item 1) from the control valve (Item 2) **[Figure 20-40-3]** through the access opening.

Figure 20-40-4



Remove the tie-straps (Item 1) **[Figure 20-40-4]** from the fixed end main valve hose.

Figure 20-40-5

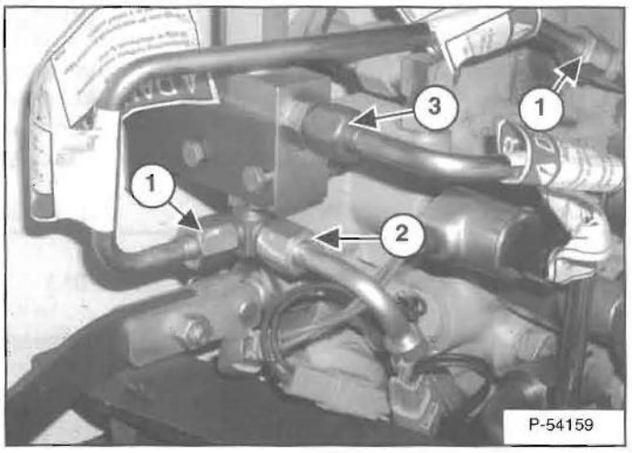


Mark and disconnect the four electric solenoid connectors for correct installation (Item 1) **[Figure 20-40-5]**.

Remove the outlet tubeline (Item 2) **[Figure 20-40-5]** from the control valve to the hydraulic oil cooler.

Disconnect and cap the supply hose (Item 3) **[Figure 20-40-5]**.

Figure 20-40-6



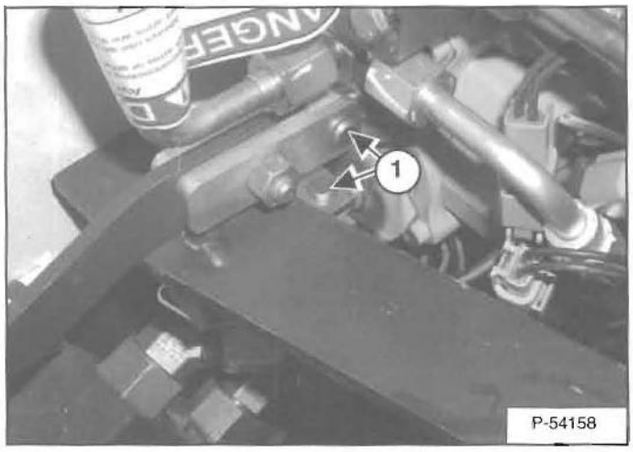
Disconnect and remove the tubeline (Item 1) **[Figure 20-40-6]** from the lift arm by-pass valve to the control valve.

Disconnect and cap the hose (Item 2) **[Figure 20-40-6]** from the lift arm by-pass valve to the drive motor case drain.

Disconnect and cap the lift arm by-pass tubeline (Item 3) **[Figure 20-40-6]** to the control valve drain.

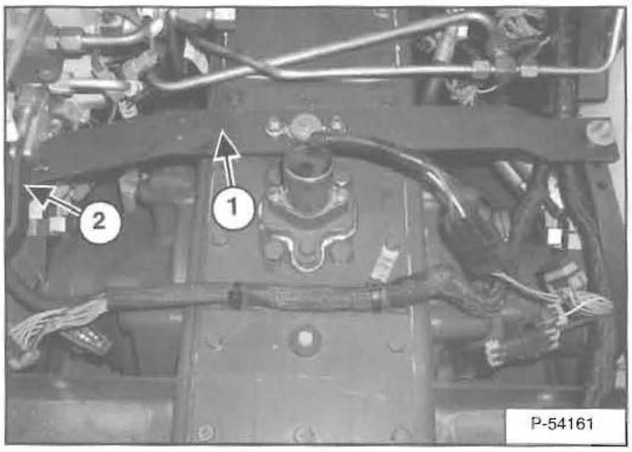
Removal And Installation (Cont'd)

Figure 20-40-7



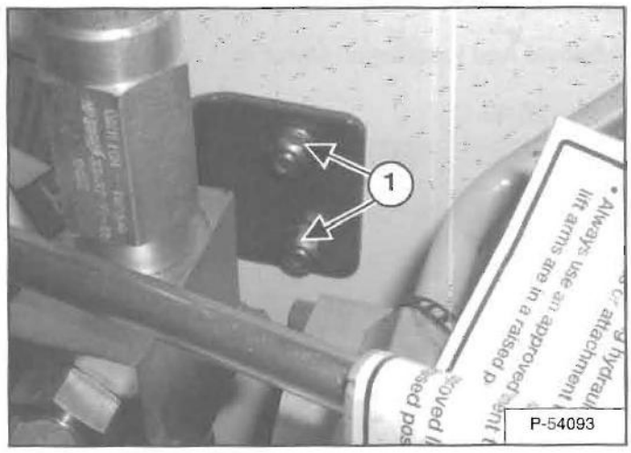
Remove the connector pins (Item 1) **[Figure 20-40-7]**.

Figure 20-40-8



Remove the control pedal cross bar linkage (Item 1) and tilt linkage (Item 2) **[Figure 20-40-8]**.

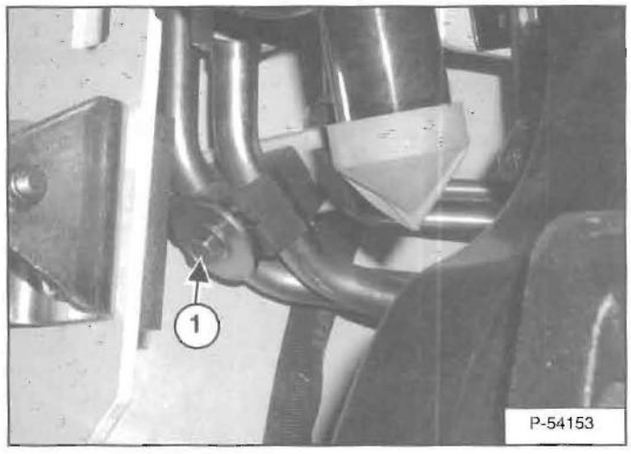
Figure 20-40-9



Remove the two lift arm by-pass valve mounting bolts (Item 1) **[Figure 20-40-9]**.

Remove the lift arm by-pass valve and mounting bracket.

Figure 20-40-10

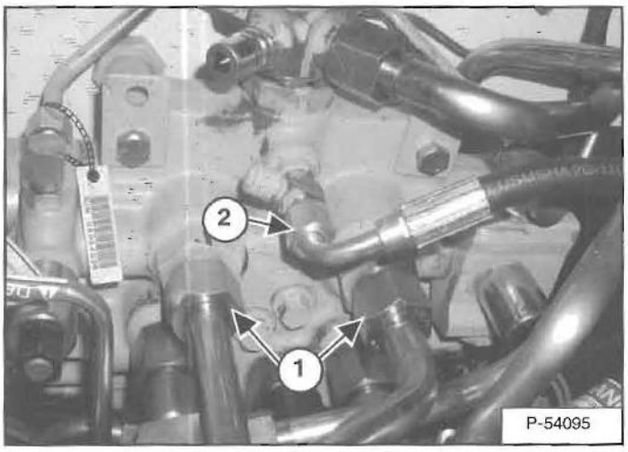


Remove tubeline clamp bolt (Item 1) **[Figure 20-40-10]** from the auxiliary tubelines in the left rear upright.

Installation: Tighten bolt to 15-20 ft.-lbs. (20-27 Nm) torque.

Removal And Installation (Cont'd)

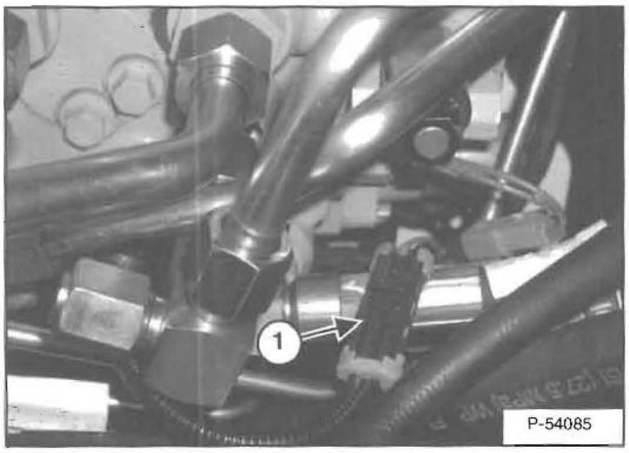
Figure 20-40-11



Remove and cap both tubelines (Item 1) **[Figure 20-40-11]** from the auxiliary section of the control valve.

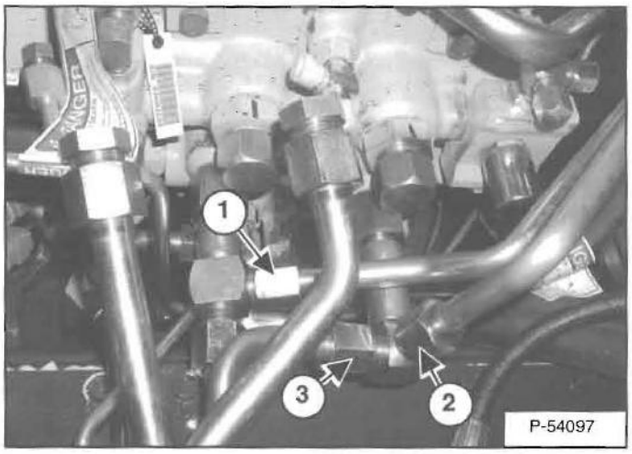
Disconnect and cap the drain hose (Item 2) **[Figure 20-40-11]** from the control valve.

Figure 20-40-12



Mark and disconnect the BICS™ electric solenoid connector (Item 1) **[Figure 20-40-12]**.

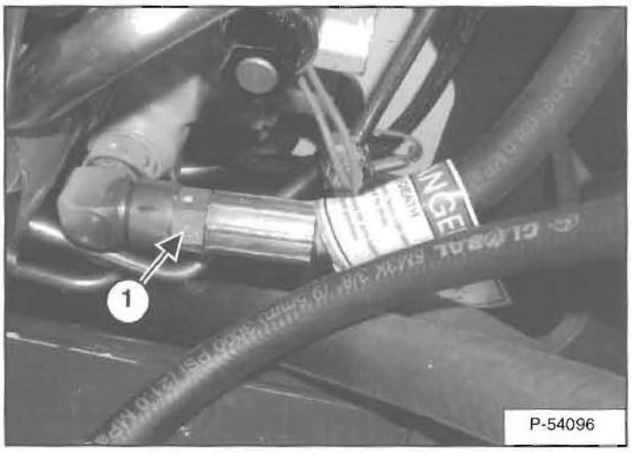
Figure 20-40-13



Disconnect and cap the tubelines (Item 1) and (Item 2) **[Figure 20-40-13]** from the tilt section of the control valve.

Disconnect and cap the tubeline (Item 3) **[Figure 20-40-13]** from the lift section of the control valve.

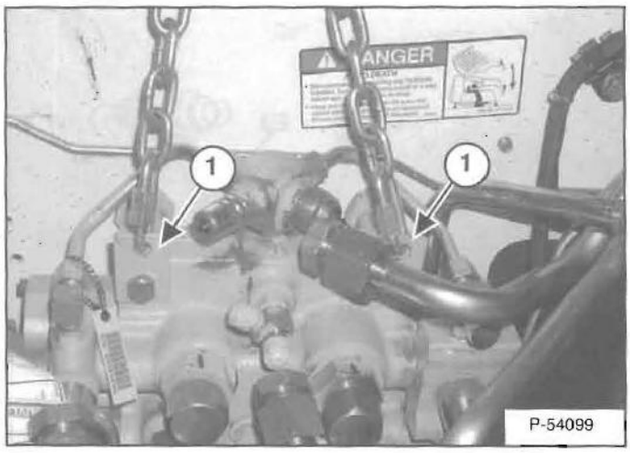
Figure 20-40-14



Remove the fixed-end main valve hose (Item 1) **[Figure 20-40-14]** from the main control valve fitting.

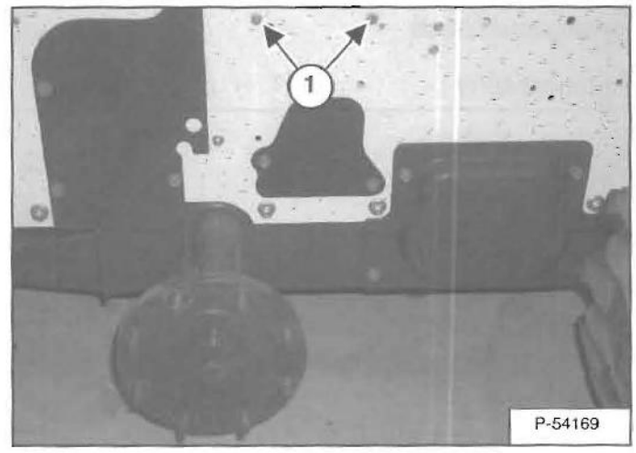
Removal And Installation (Cont'd)

Figure 20-40-15



Connect a hoist to the lifting brackets (Item 1) **[Figure 20-40-15]** on the control valve.

Figure 20-40-16



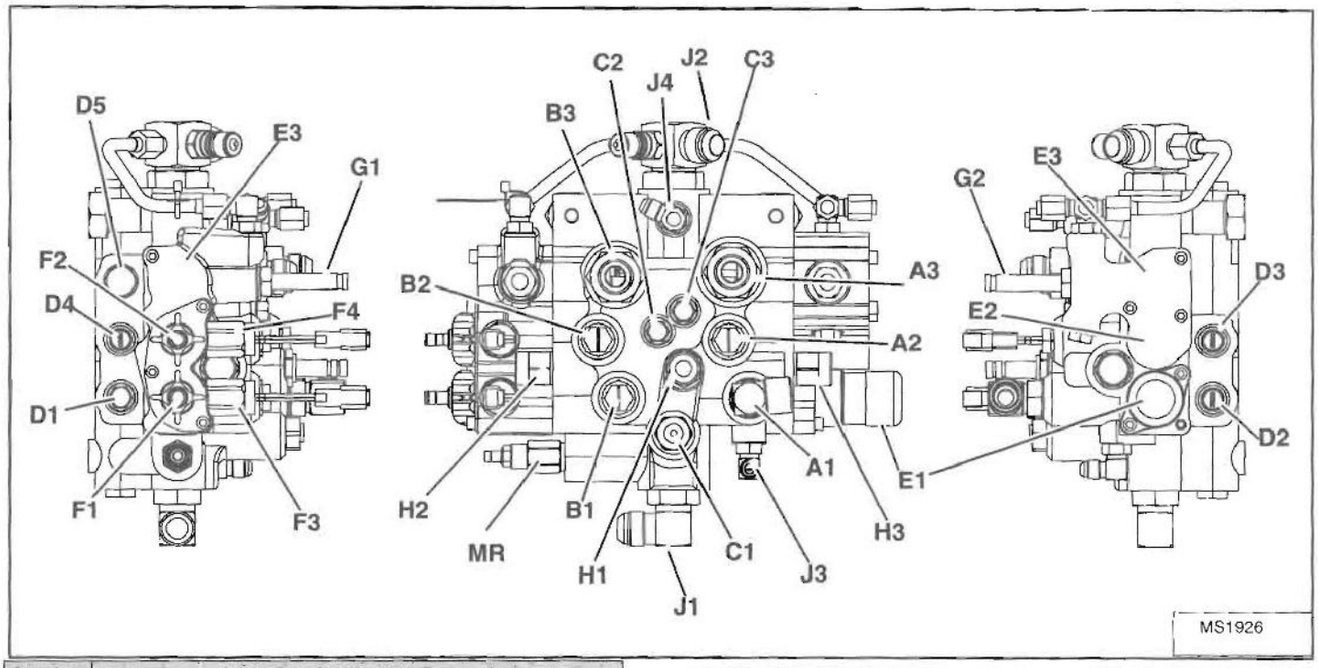
Remove the two mounting bolts (Item 1) **[Figure 20-40-16]** fastening the control valve the side of the loader.

Remove the control valve from the loader.

Reverse the procedure for installation.

Identification Chart

Figure 20-40-17



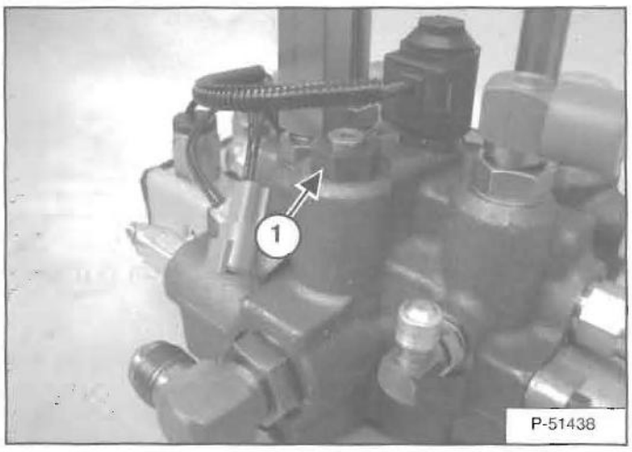
ITEM	S130 LOADER
A1	Lift Cylinder Base End
A2	Tilt Cylinder Base End
A3	Auxiliary Hydraulic Rod End
B1	Lift Cylinder Rod End
B2	Tilt Cylinder Rod End
B3	Auxiliary Hydraulics Base End
C1	Load Check/BICS™ Valve Lift
C2	Load Check Valve Tilt Function
C3	Load Check Valve Auxiliary Function
D1	Anti-Cavitation Valve Lift (Rod End)
D2	Port Relief/Anti-Cavitation Valve – 3500 PSI Lift (Base End)
D3	Port Relief/Anti-Cavitation Valve – 3500 PSI Tilt (Base End)
D4	Port Relief/Anti-Cavitation Valve – 3500 PSI Tilt (Rod End)
D5	Port Relief/Anti-Cavitation Valve (Auxiliary) 3100 PSI (Optional)

ITEM	S130 LOADER
E1	Lift Spool Detent
E2	Tilt Spool Centering Spring
E3	Auxiliary Spool/Centering Springs
F1	Lift Spool
F2	Tilt Spool
F3	Lift Spool Lock Solenoid
F4	Tilt Spool Lock Solenoid
G1	Auxiliary Solenoid Stem
G2	Auxiliary Solenoid Stem
H1	BICS™ Valve Solenoid
H2	BICS™ Lock Valve (Tilt)
H3	BICS™ Lock Valve (Lift)
J1	Inlet Fluid Flow (From Pump)
J2	Outlet Fluid Flow (Return to Tank)
J3	Lift Arm By-Pass Orifice
J4	Drain (Case)
MR	Main Relief Valve – 2700 PSI

BICS™ Valve, Lift Load Check Valve Removal And Installation

Remove the control valve from the loader.

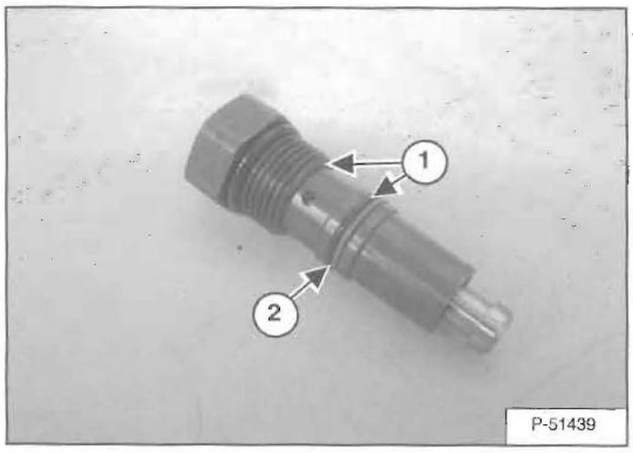
Figure 20-40-18



Remove the lift load check valve (Item 1) **[Figure 20-40-18]**.

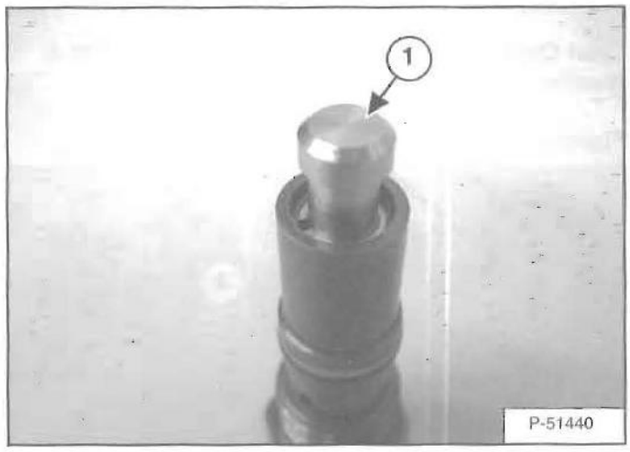
Installation: Lubricate the O-ring and tighten the valve to 55-65 ft.-lbs. (75-88 Nm) torque.

Figure 20-40-19



Remove and install new O-rings (Item 1) and back-up ring (Item 2) **[Figure 20-40-19]**.

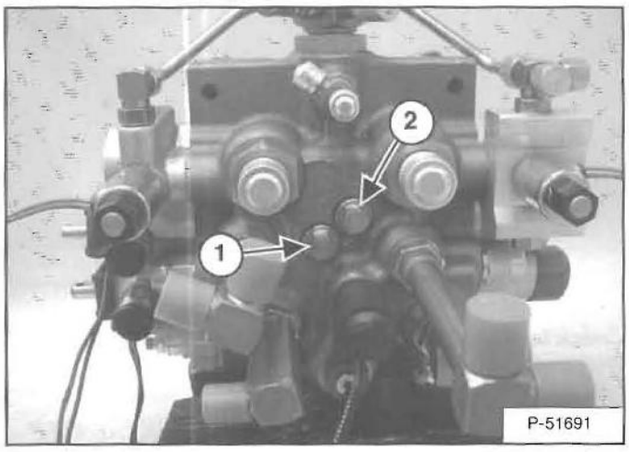
Figure 20-40-20



Check for free movement of the load check valve (Item 1) **[Figure 20-40-20]**.

Load Check Valve Removal And Installation (Tilt & Auxiliary)

Figure 20-40-21

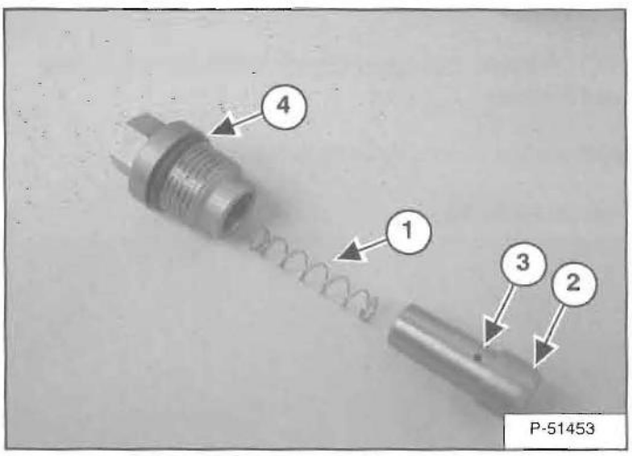


At the front side of the control valve locate the tilt section load check valve (Item 1) **[Figure 20-40-21]**.

At the front side of the control valve locate the auxiliary section load check valve (Item 2) **[Figure 20-40-21]**.

NOTE: The tilt and auxiliary load check valves are interchangeable.

Figure 20-40-22



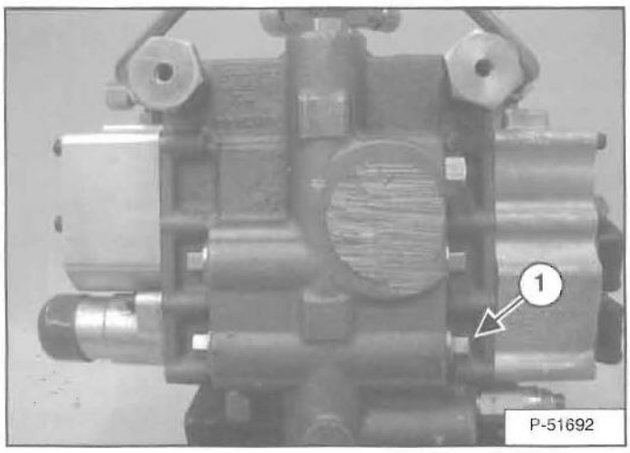
Remove the spring (Item 1) and poppet (Item 2) **[Figure 20-40-22]**.

Check the orifice (Item 3) **[Figure 20-40-22]** in the poppet to be sure it is not plugged.

Installation: Install a new O-ring (Item 4) on the plug and lightly lubricate with oil before installing. Tighten the plug to 38-45 ft.-lbs. (52-61 Nm) torque.

Anti-Cavitation Valve (Lift, Rod End)

Figure 20-40-23



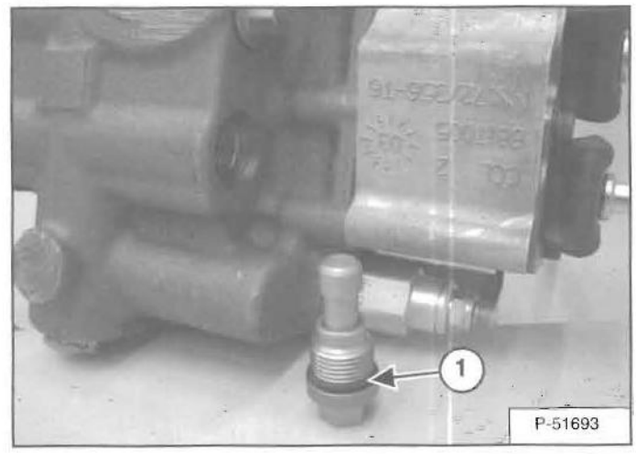
At the back side of the control valve, remove the lift section anti-cavitation valve (Item 1) **[Figure 20-40-23]**.

⚠ WARNING

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

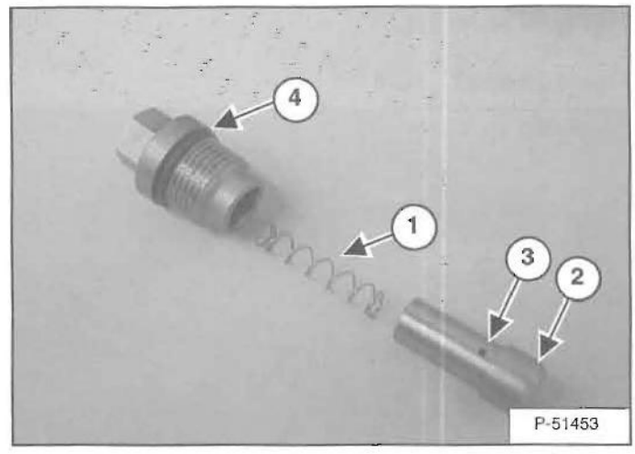
I-2003-0888

Figure 20-40-24



Installation: Always use new O-ring (Item 1) **[Figure 20-40-24]** on the anti-cavitation valve plug. Tighten the plug to 35-40 ft.-lbs. (47-54 Nm) torque.

Figure 20-40-25



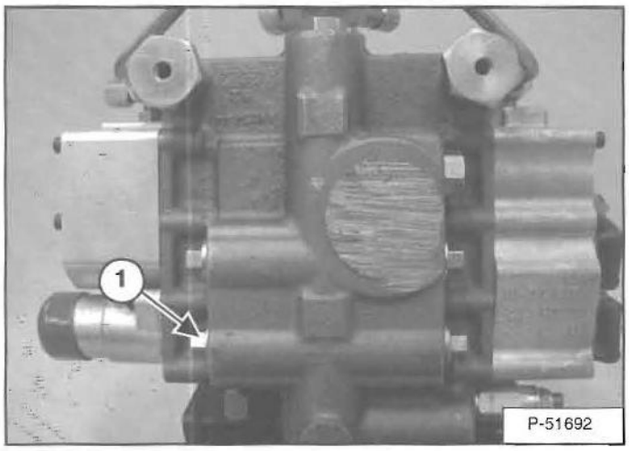
Remove the spring (Item 1) and poppet (Item 2) **[Figure 20-40-25]**.

Check the orifice (Item 3) **[Figure 20-40-25]** in the poppet to be sure it is not plugged.

Installation: Install a new O-ring (Item 4) on the plug and lightly lubricate with oil before installing. Tighten the plug to 38-45 ft.-lbs. (52-61 Nm) torque.

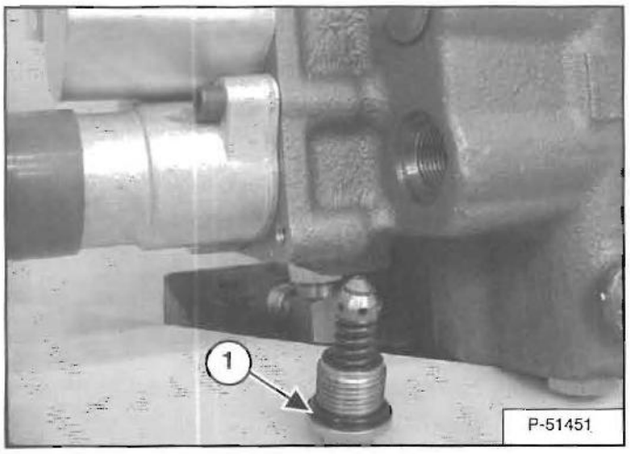
Port Relief/Anti-Cavitation Valve (Lift, Base End)

Figure 20-40-26



Loosen the lift circuit port relief/anti cavitation valve (Item 1) **[Figure 20-40-26]**.

Figure 20-40-27

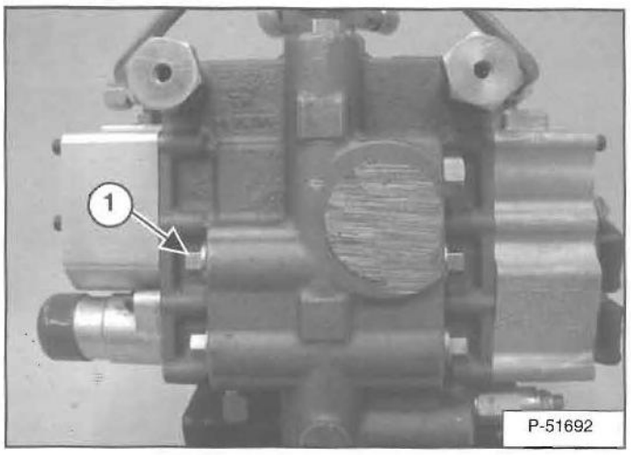


Replace the O-ring (Item 1) **[Figure 20-40-27]** before installation.

Installation: Tighten to 38-45 ft.-lbs. (52-61 Nm) torque.

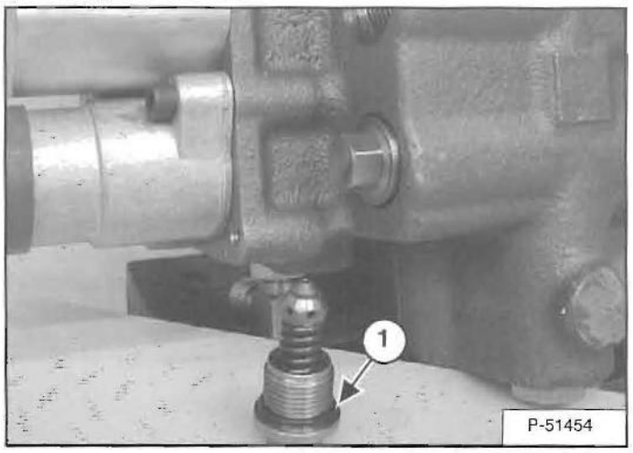
Port Relief/Anti-Cavitation Valve (Tilt, Base End)

Figure 20-40-28



Remove the tilt port relief/anti cavitation valve (Item 1) **[Figure 20-40-28]** from the base end of the tilt section.

Figure 20-40-29

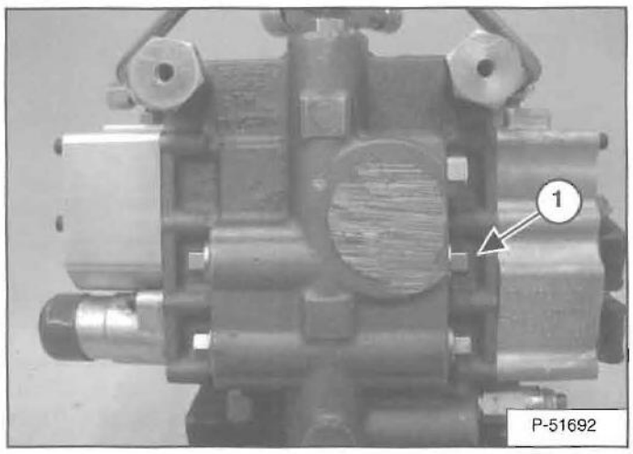


Replace the O-ring (Item 1) **[Figure 20-40-29]** before installation.

Installation: Tighten to 38-45 ft.-lbs. (52-61 Nm) torque.

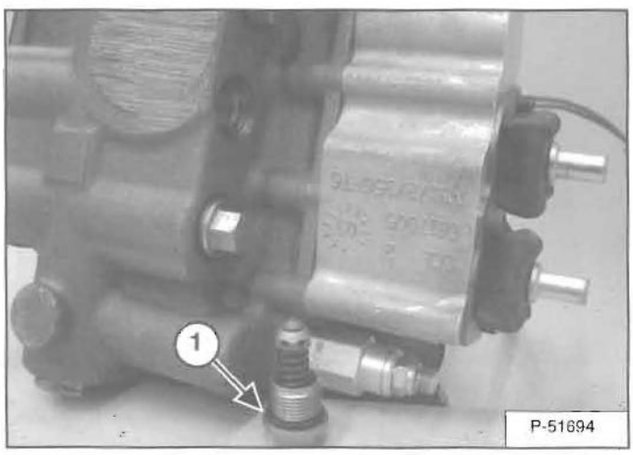
Port Relief/Anti-Cavitation Valve (Tilt, Rod End)

Figure 20-40-30



Remove the tilt port relief/anti cavitation valve (Item 1) **[Figure 20-40-30]** from the rod end of the tilt section.

Figure 20-40-31

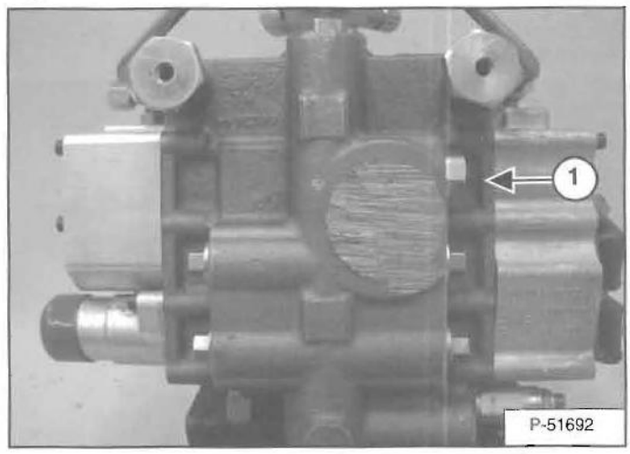


Replace the O-ring (Item 1) **[Figure 20-40-31]** before installation.

Installation: Tighten to 38-45 ft.-lbs. (52-61 Nm) torque.

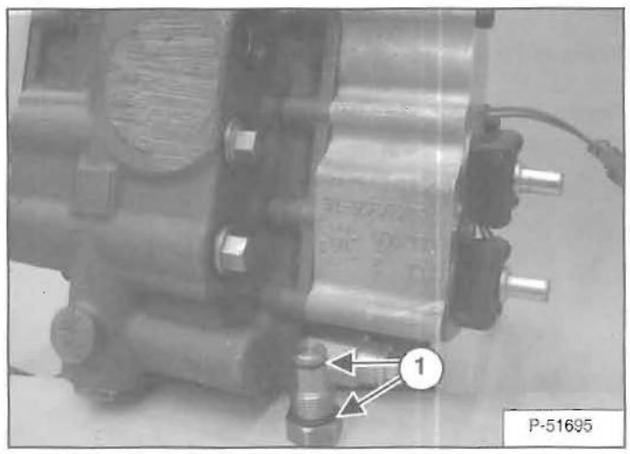
Port Relief Valve

Figure 20-40-32



Remove the port relief plug (Item 1) **[Figure 20-40-32]** from the auxiliary circuit of the control valve.

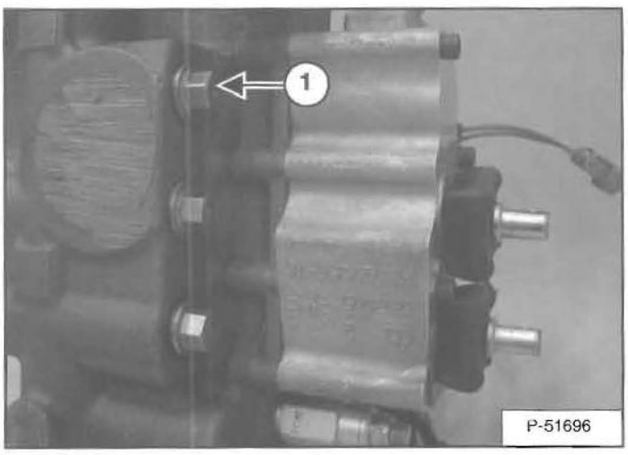
Figure 20-40-33



Installation: Always use new O-rings (Item 1) **[Figure 20-40-33]**. Tighten to 38-45 ft.-lbs. (52-61 Nm) torque.

Port Relief Valve (Cont'd)

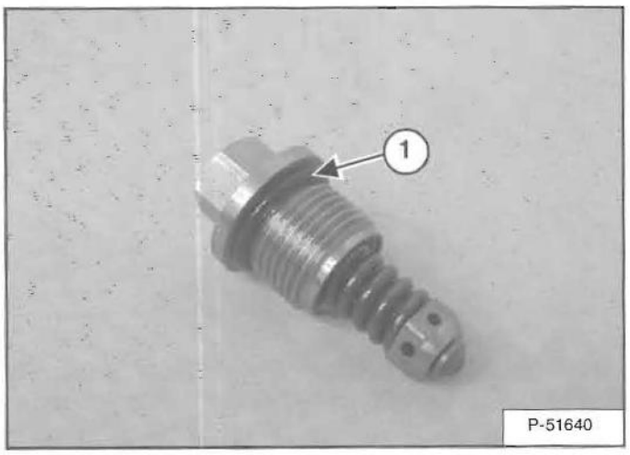
Figure 20-40-34



The control valve may be equipped with an optional auxiliary port relief valve (Item 1) **[Figure 20-40-34]**.

Remove the auxiliary port relief valve.

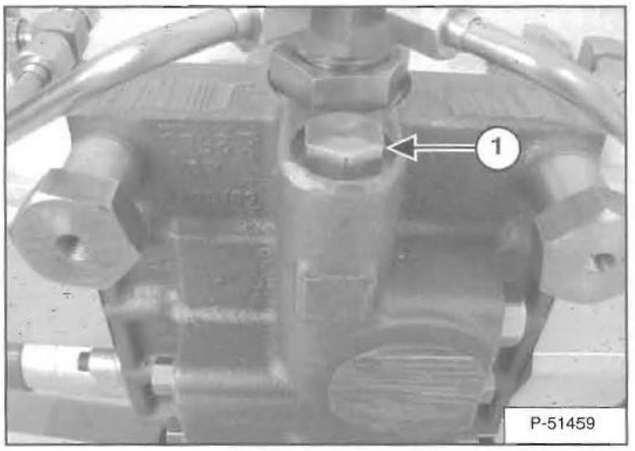
Figure 20-40-35



Installation: Always use new O-rings (Item 1) **[Figure 20-40-35]**. Tighten to 38-45 ft.-lbs. (52-61 Nm) torque.

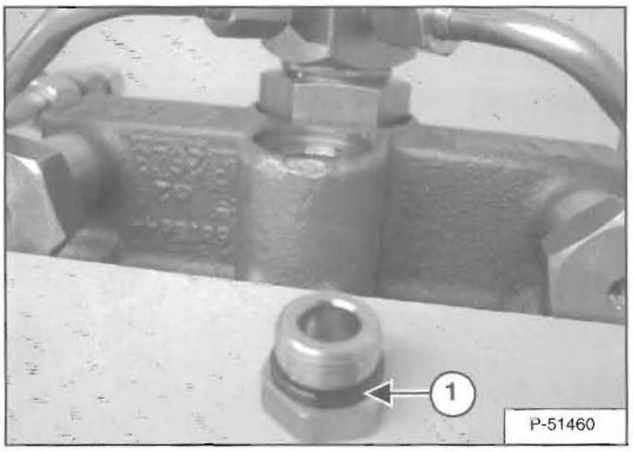
Plug Removal

Figure 20-40-36



At the top side of the control valve, remove the plug (Item 1) **[Figure 20-40-36]**.

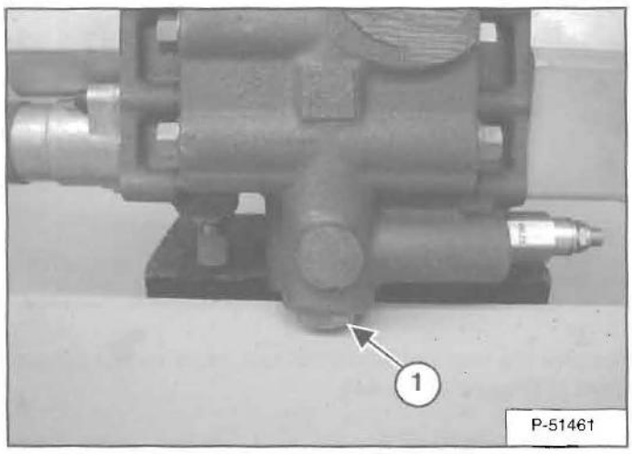
Figure 20-40-37



Installation: Always use new O-rings (Item 1) **[Figure 20-40-37]**. Tighten to 40 ft.-lbs. (54 Nm) torque.

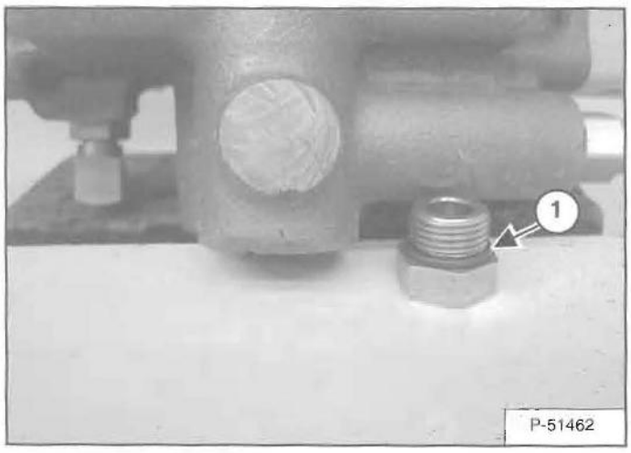
Plug Removal (Cont'd)

Figure 20-40-38



At the bottom side of the control valve remove the plug (Item 1) **[Figure 20-40-38]**.

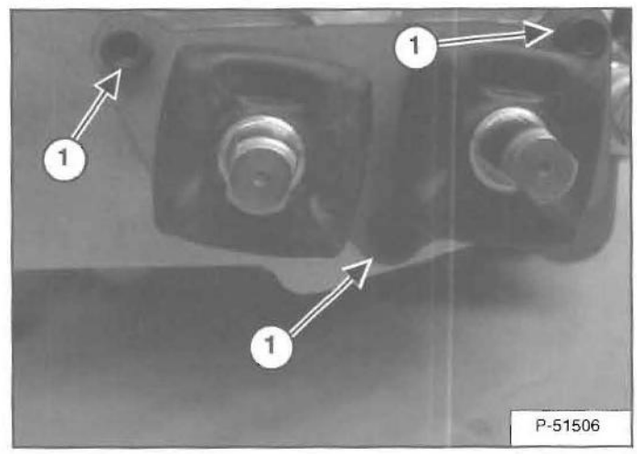
Figure 20-40-39



Installation: Always use new O-rings (Item 1) **[Figure 20-40-39]**. Tighten to 40 ft.-lbs. (54 Nm) torque.

Rubber Boot Removal and Installation

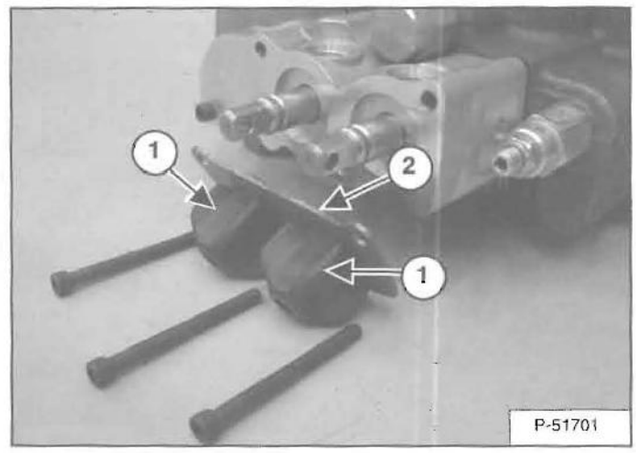
Figure 20-40-40



Remove the three screws (Item 1) **[Figure 20-40-40]** on the rubber boot retainer plate.

Installation: Tighten the screws to 90-100 in.-lbs. (10-11,3 Nm) torque.

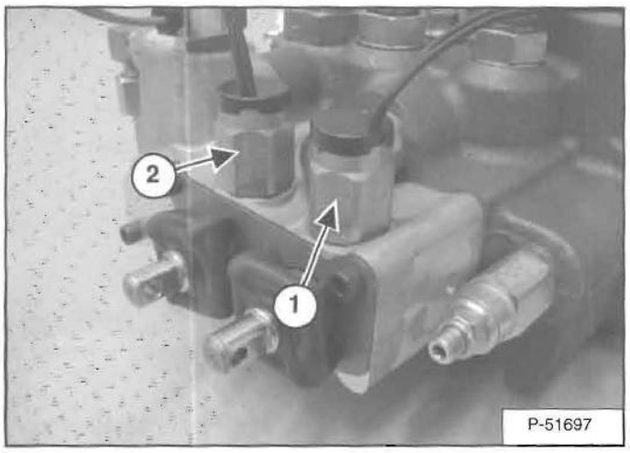
Figure 20-40-41



Remove the rubber boots (Item 1) from the retainer plate (Item 2) **[Figure 20-40-41]**.

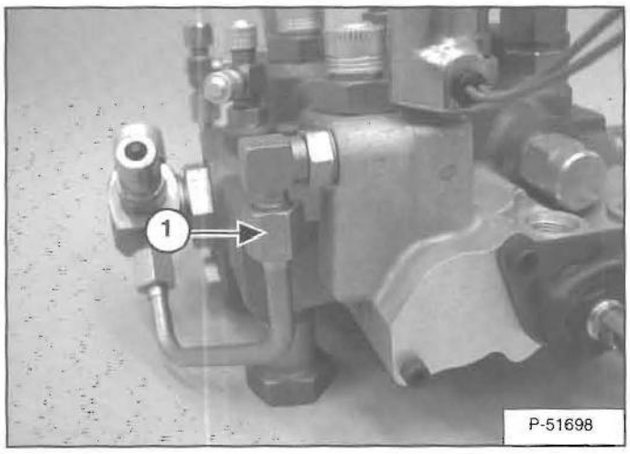
End Cap/Spool Lock Block Removal and Installation

Figure 20-40-42



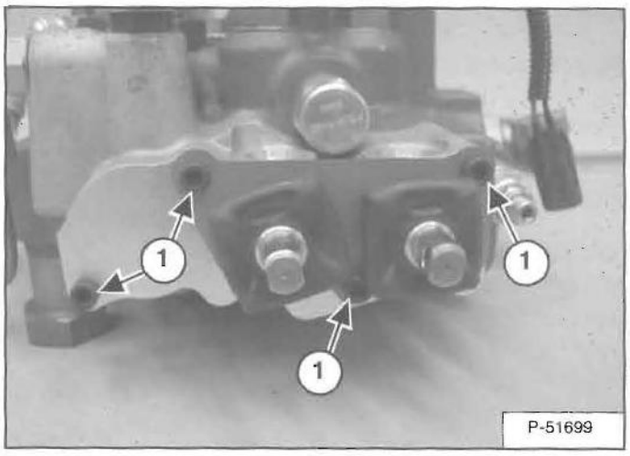
Remove the lift spool lock solenoid (Item 1) and the tilt spool lock solenoid (Item 2) **[Figure 20-40-42]** from the end cap/spool lock block.

Figure 20-40-43



Disconnect the tube line (Item 1) **[Figure 20-40-43]** from the end cap/spool lock block.

Figure 20-40-44

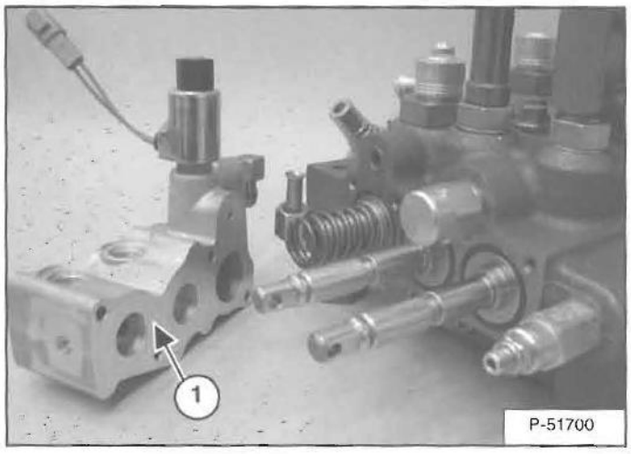


Remove the four end cap/spool lock block mount screws (Item 1) **[Figure 20-40-44]**.

Installation: Tighten the screws to 90-100 in.-lbs. (10-11,3 Nm) torque.

Remove the rubber boots and retainer plate from the lift and tilt spools.

Figure 20-40-45



Remove the end cap/spool lock block (Item 1) **[Figure 20-40-45]** from the control valve.

HYDRAULIC CONTROL VALVE (FOOT CONTROL) (CONT'D)

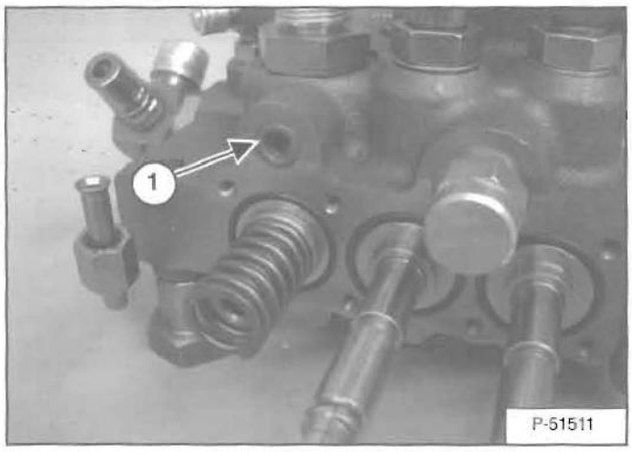
Lift Spool and Detent Removal and Installation

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

MEL1278 - Detent Tool
MEL1285 - Detent Spring Tool

Remove the end cap/spool lock block from the control valve.

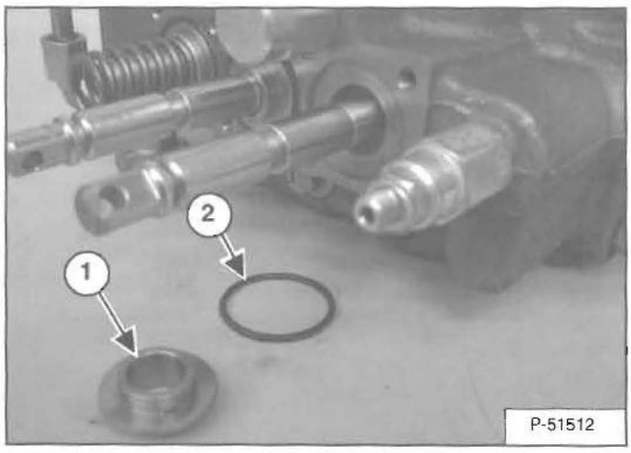
Figure 20-40-46



Remove the O-ring (Item 1) **[Figure 20-40-46]**.

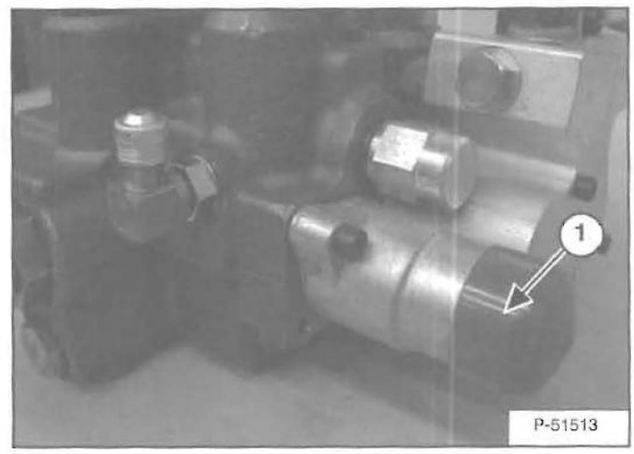
Installation: Replace the O-ring, and lubricate lightly with oil before installation of the end cap/spool lock block.

Figure 20-40-47



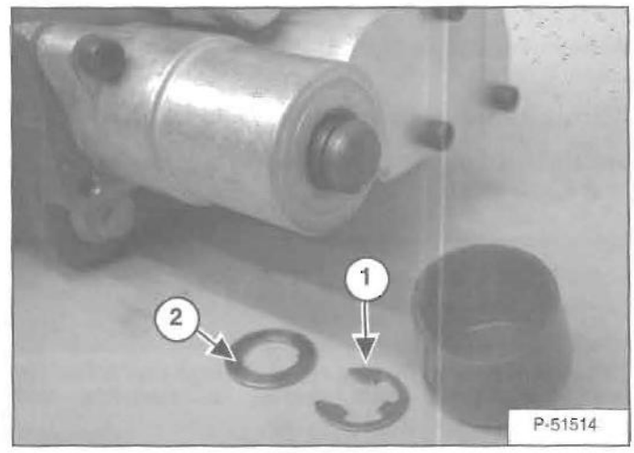
Remove the spacer (Item 1) and O-ring (Item 2) **[Figure 20-40-47]** from the lift spool.

Figure 20-40-48



Remove the end cap (Item 1) **[Figure 20-40-48]**.

Figure 20-40-49

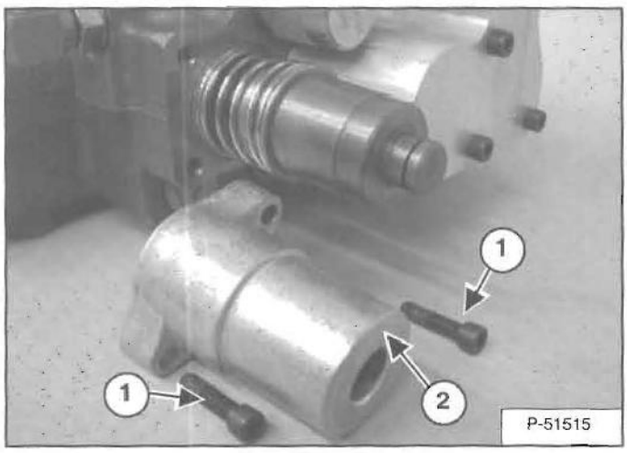


Use a screwdriver to remove the snap ring (Item 1) **[Figure 20-40-49]**.

Remove the washer (Item 2) **[Figure 20-40-49]**.

Lift Spool and Detent Removal and Installation (Cont'd)

Figure 20-40-50



Remove the screws (Item 1) **[Figure 20-40-50]** from the detent bonnet.

Remove the detent bonnet (Item 2) **[Figure 20-40-50]**.

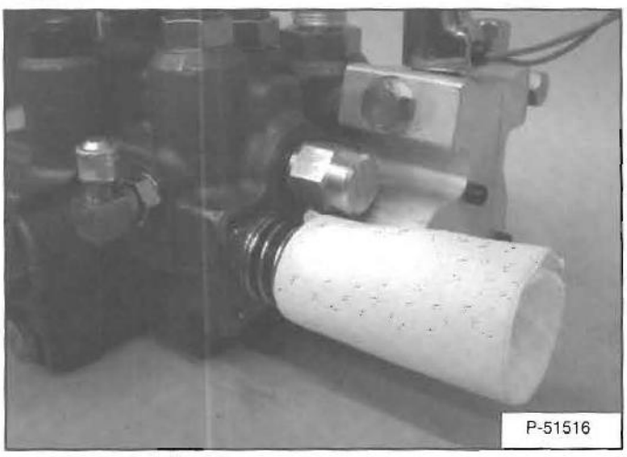
Installation: Lubricate the screws and tighten to 90-100 in.-lbs. (10-11,3 Nm) torque.

IMPORTANT

The detent assembly has small springs and balls. Do not lose these parts during disassembly and assembly.

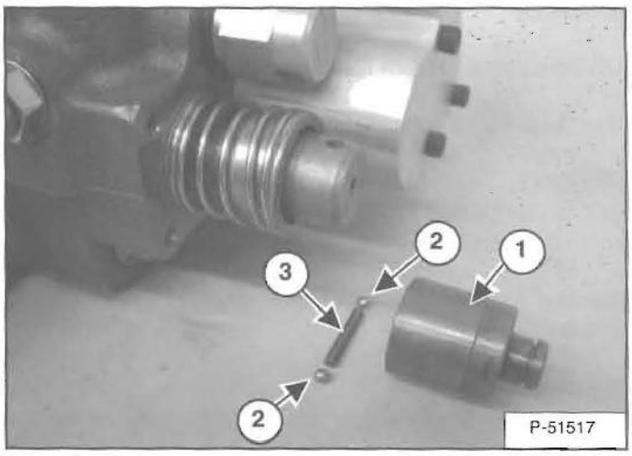
I-2012-0284

Figure 20-40-51



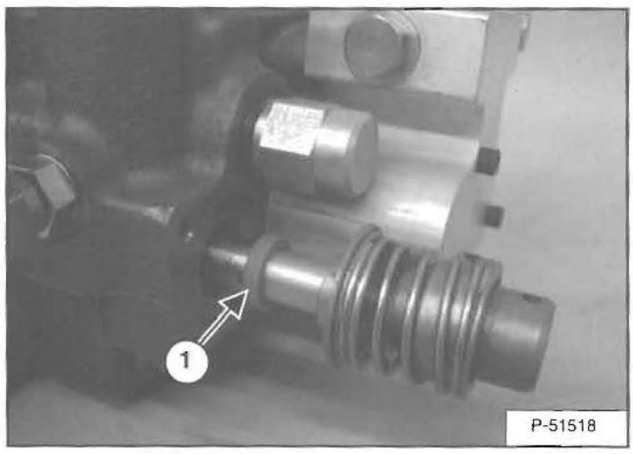
Put a rag around the detent assembly **[Figure 20-40-51]**. This will prevent the detent balls and spring from being lost when the detent sleeve is removed.

Figure 20-40-52



Remove the detent sleeve (Item 1), detent balls (Item 2) and spring (Item 3) **[Figure 20-40-52]**.

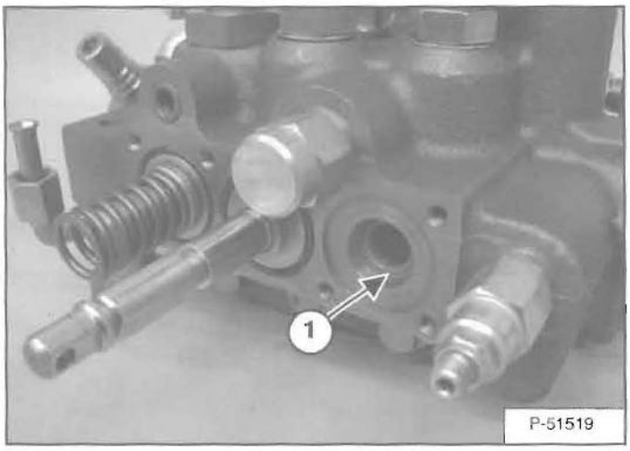
Figure 20-40-53



Remove the lift spool assembly and seal (Item 1) **[Figure 20-40-53]** from the control valve.

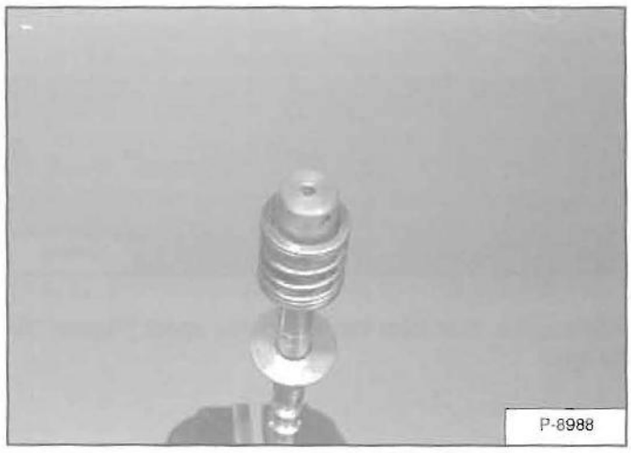
Lift Spool and Detent Removal and Installation (Cont'd)

Figure 20-40-54



Remove the lift spool seal (Item 1) **[Figure 20-40-54]** from the linkage end of the valve.

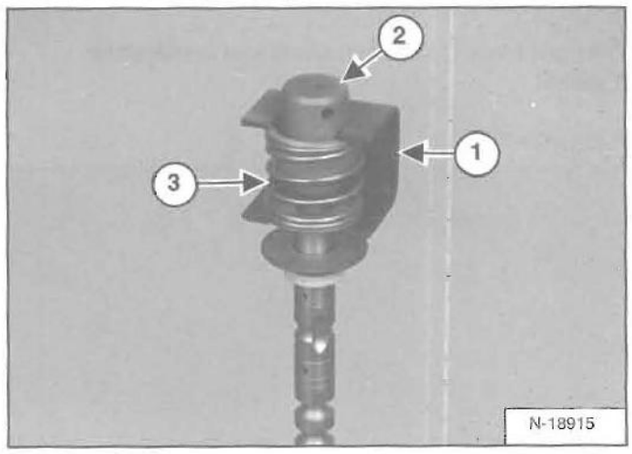
Figure 20-40-55



Clamp the linkage end of the spool in a vise **[Figure 20-40-55]**.

NOTE: Protect spool before clamping in vise.

Figure 20-40-56

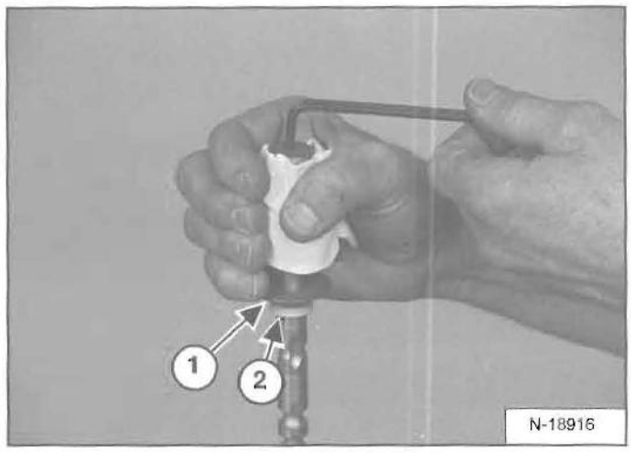


Install the spring tool (Item 1) **[Figure 20-40-56]** over the centering spring.

NOTE: Be careful when removing the detent adapter (Item 2) [Figure 20-40-56] from the centering spring, as it is under spring pressure.

NOTE: The centering spring (Item 3) [Figure 20-40-56] is white on all 700 series loaders.

Figure 20-40-57



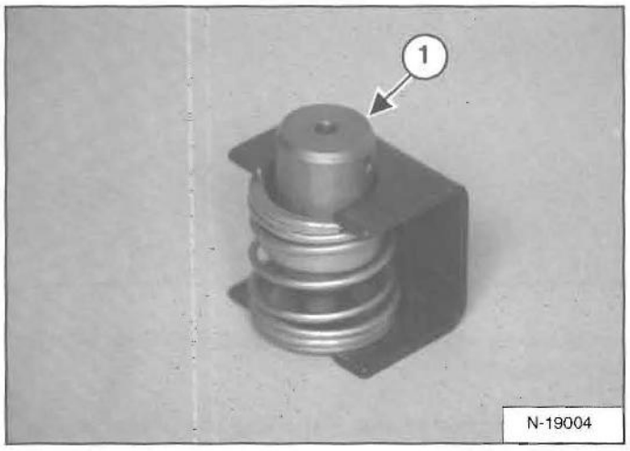
Put a rag around the detent assembly **[Figure 20-40-57]**. This will prevent the detent balls and spring from being lost when the detent adapter is removed.

Remove the detent adapter with an Alan wrench.

Remove the back-up washer (Item 1) and spool seal (Item 2) **[Figure 20-40-57]**.

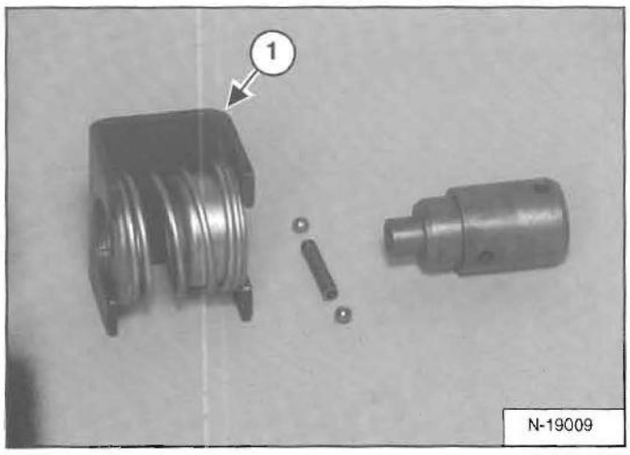
Lift Spool and Detent Removal and Installation (Cont'd)

Figure 20-40-58



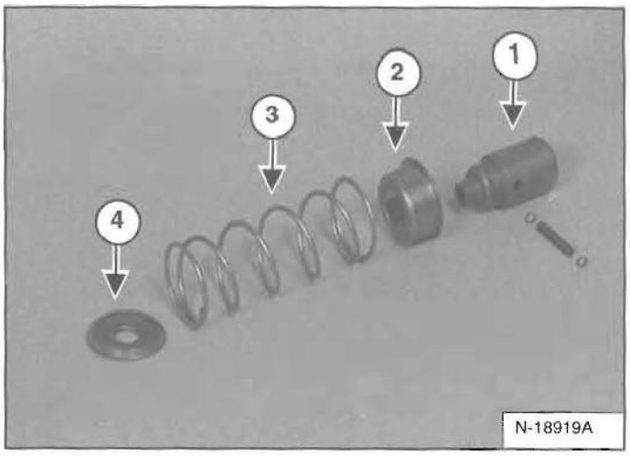
Remove the detent adapter (Item 1) **[Figure 20-40-58]** from the spring assembly.

Figure 20-40-59



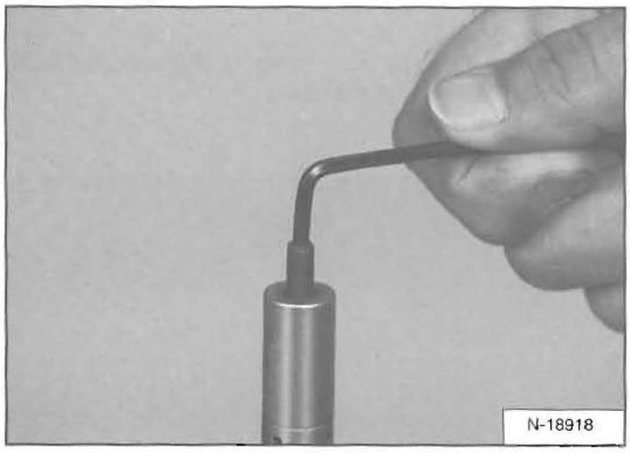
Remove spring tool (Item 1) **[Figure 20-40-59]** from the spring assembly.

Figure 20-40-60



Inspect the adapter (Item 1), collar (Item 2), spring (Item 3) and washer (Item 4) **[Figure 20-40-60]**.

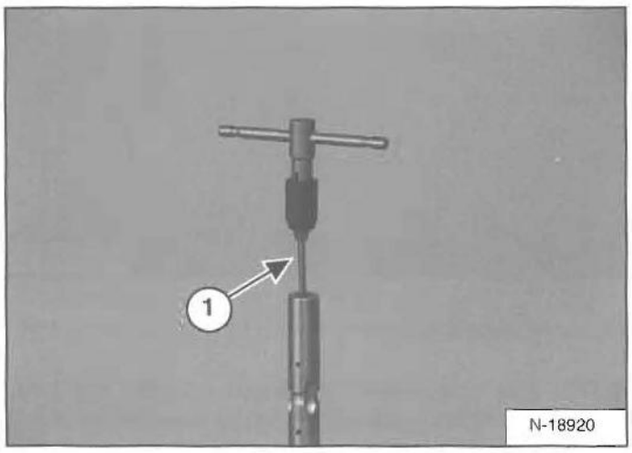
Figure 20-40-61



Remove the stud from the end of the spool **[Figure 20-40-61]**.

Lift Spool and Detent Removal and Installation (Cont'd)

Figure 20-40-62



Removal of the plastic plug:

Make a center point in the plug using a 1/16 inch drill.

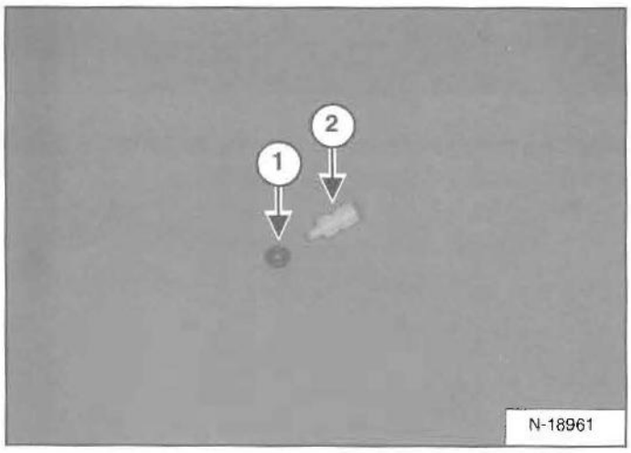
Drill a hole all the way through the plug using a 7/64 inch tap drill

Turn a 6-32 tap (Item 1) **[Figure 20-40-62]** into the plug. Pull the tap and plug out of the spool. Be careful, do not break the tap.

Clean all the debris from inside the spool bore.

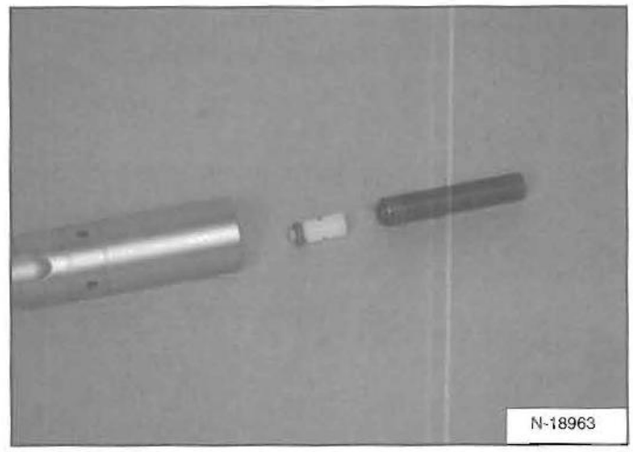
NOTE: DO NOT USE LOCTITE ON THE STUD THREADS.

Figure 20-40-63



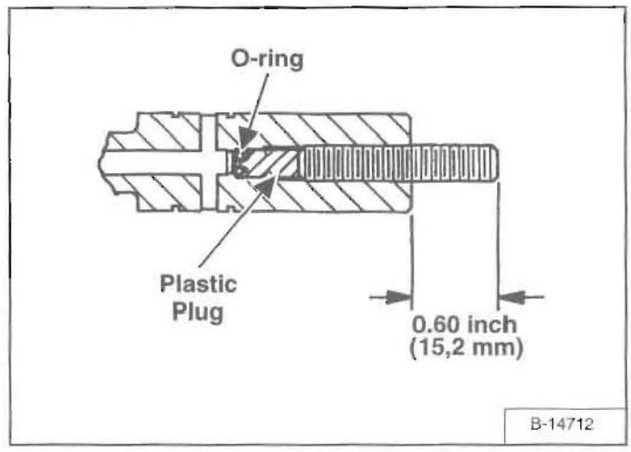
Install the O-ring (Item 1) over the nipple on the plastic plug (Item 2) **[Figure 20-40-63]**.

Figure 20-40-64



Install the plastic plug and O-ring in the spool **[Figure 20-40-64]**.

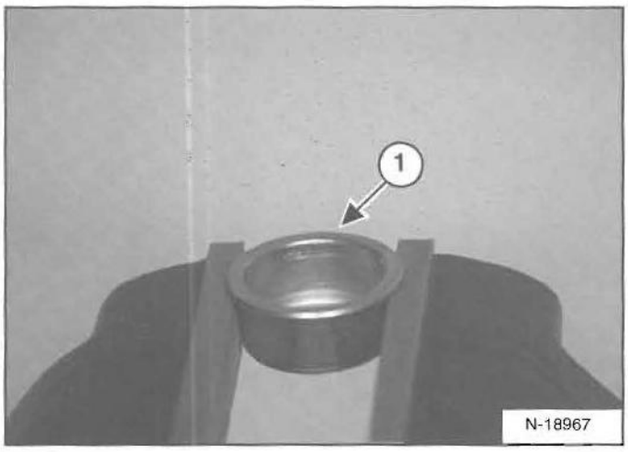
Figure 20-40-65



Install the stud and tighten until the other end of the stud is out about 0.600 inch (15,2 mm) from the spool **[Figure 20-40-65]**.

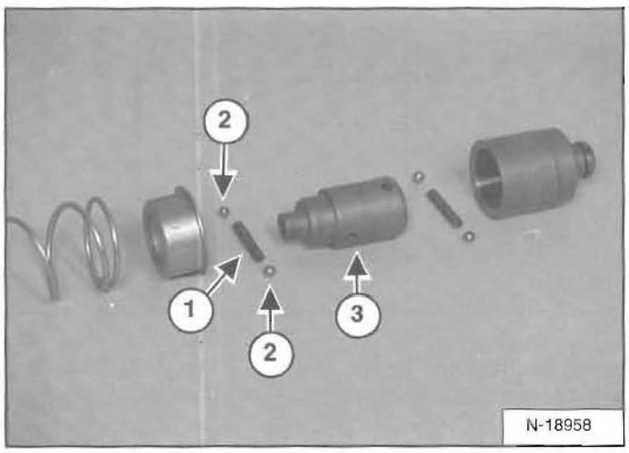
Lift Spool and Detent Removal and Installation (Cont'd)

Figure 20-40-66



Clamp the collar (Item 1) **[Figure 20-40-66]** in a vise.

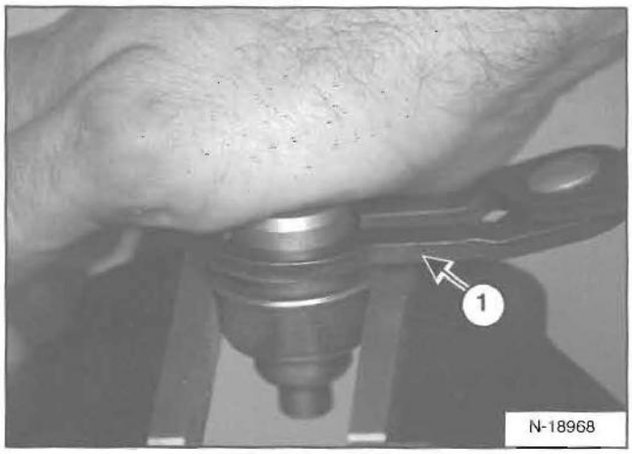
Figure 20-40-67



Apply grease on all the detent component surfaces before assembly **[Figure 20-40-67]**.

Install the spring (Item 1) and detent balls (Item 2) into the adapter (Item 3) **[Figure 20-40-67]** and compress with the detent pliers (Item 1) **[Figure 20-40-68]**.

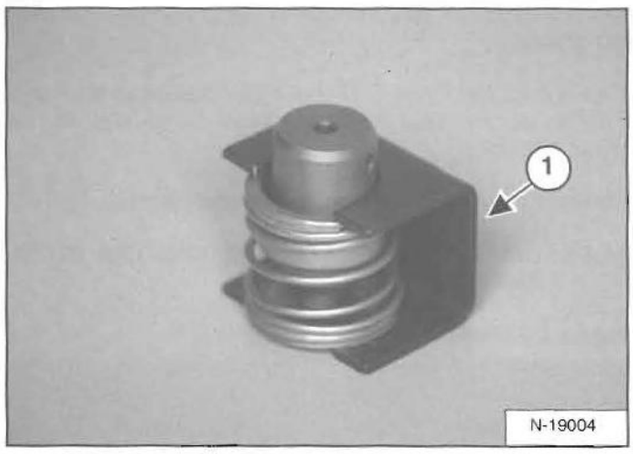
Figure 20-40-68



Install the detent adapter to the collar **[Figure 20-40-68]**.

NOTE: The collar and the detent adapter are held together by spring pressure when assembled to the lift spool not the detent balls. Hold the detent adapter and collar together to prevent the detent balls and spring from falling out.

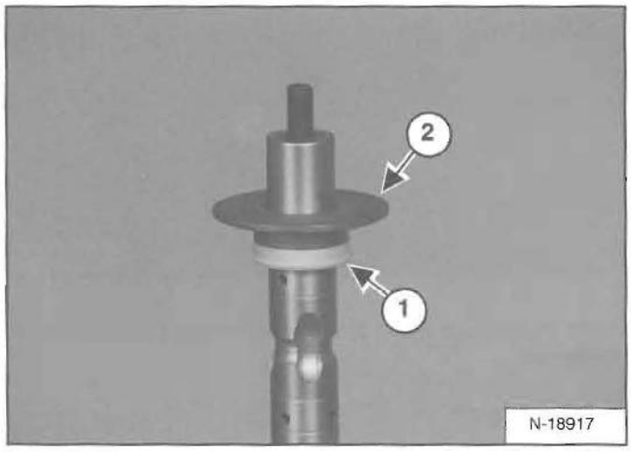
Figure 20-40-69



Install the spring tool (Item 1) **[Figure 20-40-69]** over the washer, spring, collar and detent adapter.

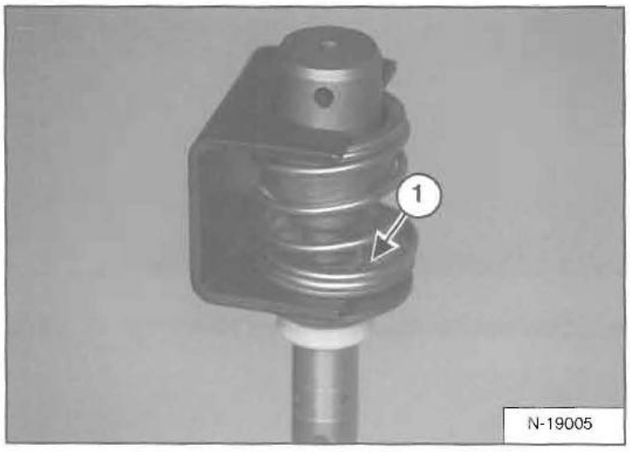
Lift Spool and Detent Removal and Installation (Cont'd)

Figure 20-40-70



Install the spool seal (Item 1) and back-up washer (Item 2) **[Figure 20-40-70]**.

Figure 20-40-71



Install the spring assembly to the lift spool hand tight **[Figure 20-40-71]**.

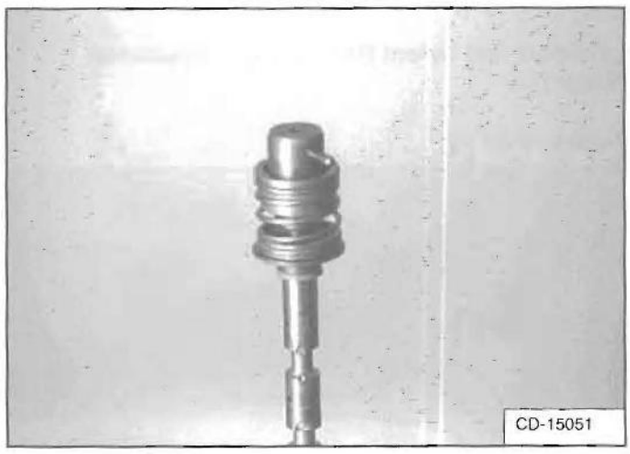
Remove the spring tool.

Check the alignment of the detent adapter and the washer.

Tighten the adapter to 90-100 in.-lbs. (10,2-11,3 Nm).

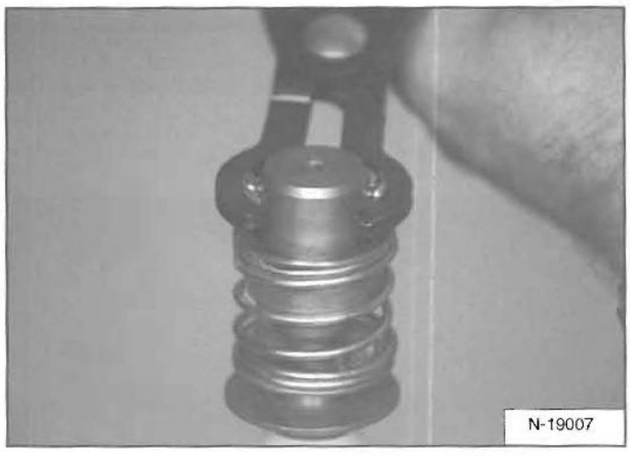
NOTE: The adapter must fit in the center of the washer (Item 1) [Figure 20-40-71].

Figure 20-40-72



Install the detent balls and spring **[Figure 20-40-72]**.

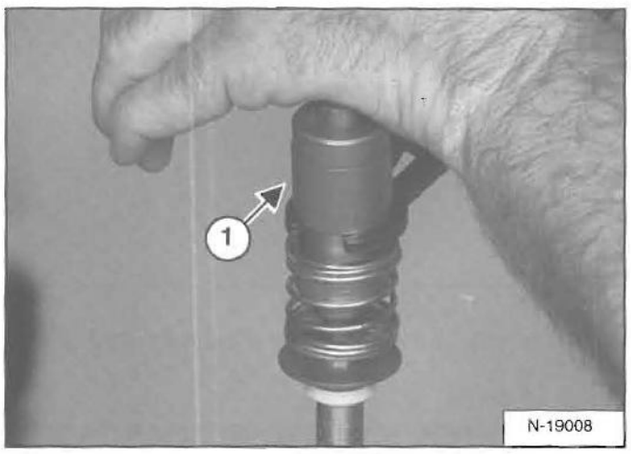
Figure 20-40-73



Hold the detent balls in place with the detent pliers **[Figure 20-40-73]**.

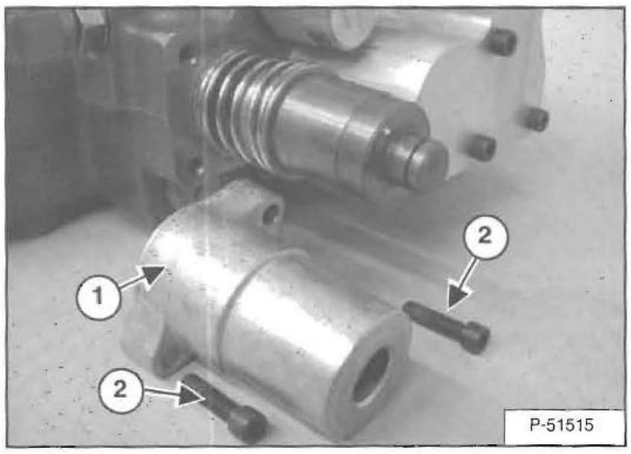
Lift Spool and Detent Removal and Installation (Cont'd)

Figure 20-40-74



Install the detent sleeve (Item 1) **[Figure 20-40-74]** to the detent adapter.

Figure 20-40-75



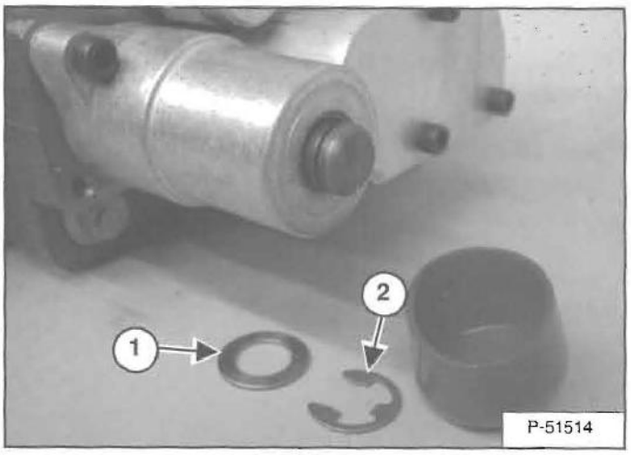
Install the lift spool assembly in the spool bore **[Figure 20-40-75]**.

Install the detent bonnet (Item 1) **[Figure 20-40-75]**.

Install the mounting screws (Item 2) **[Figure 20-40-75]**.

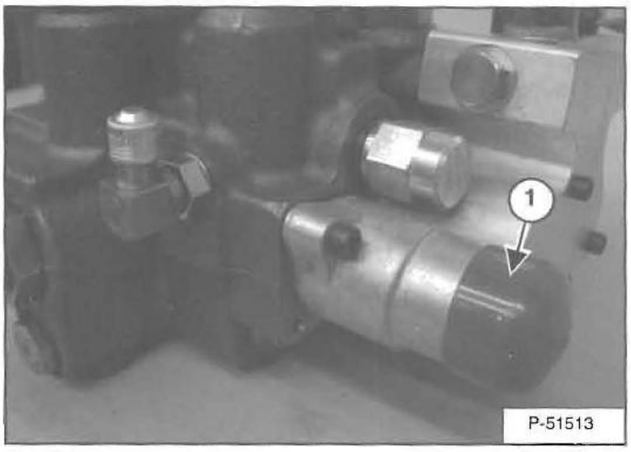
Installation: Lubricate the screws and tighten to 90-100 in.-lbs. (10-11,3 Nm) torque.

Figure 20-40-76



Install the washer (Item 1) and snap ring (Item 2) **[Figure 20-40-76]**.

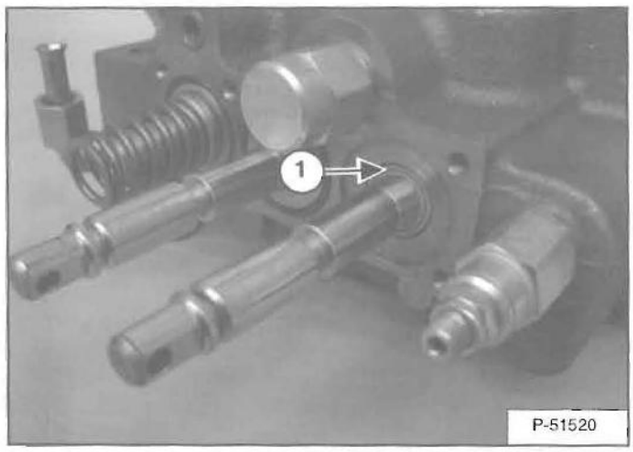
Figure 20-40-77



Install the end cap (Item 1) **[Figure 20-40-77]**.

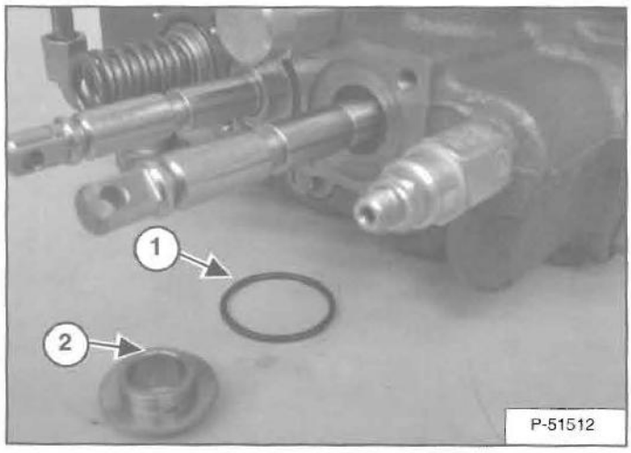
Lift Spool and Detent Removal and Installation (Cont'd)

Figure 20-40-78



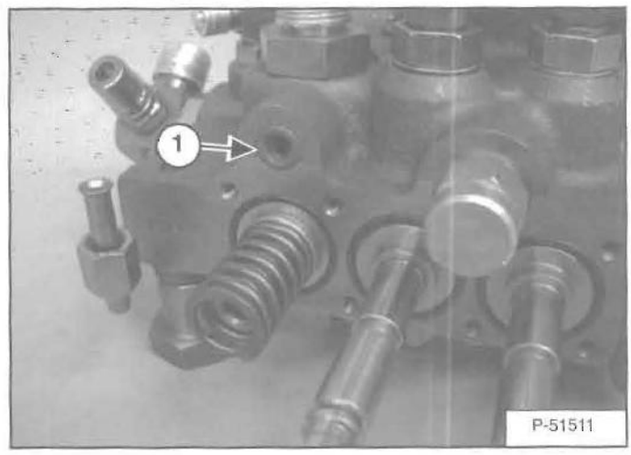
Install the spool seal (Item 1) **[Figure 20-40-78]** on the linkage end of the valve.

Figure 20-40-79



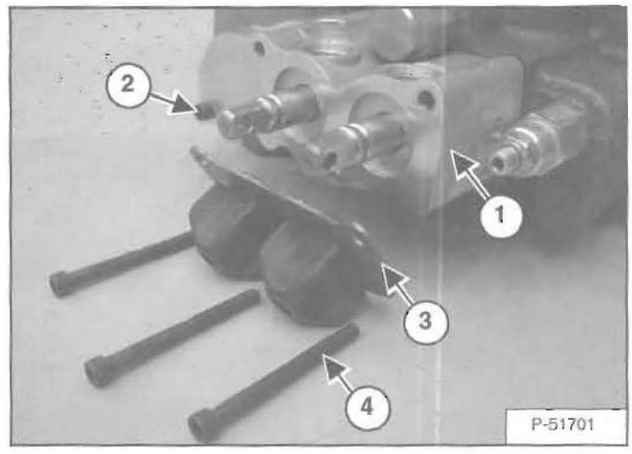
Install the O-ring (Item 1) and bushing (Item 2) **[Figure 20-40-79]** on the lift spool.

Figure 20-40-80



Install the O-ring (Item 1) **[Figure 20-40-80]** on the control valve.

Figure 20-40-81



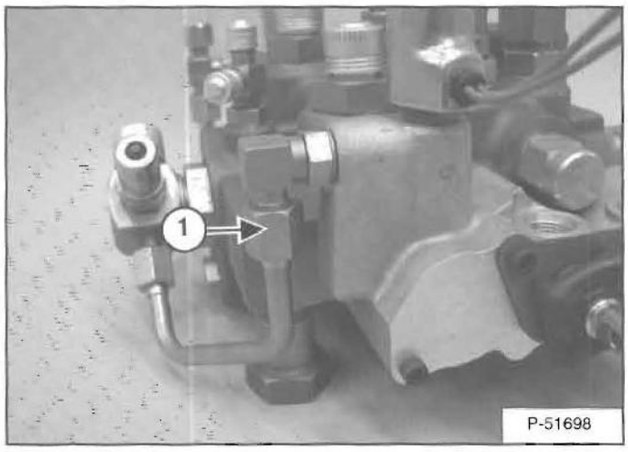
Install the end cap/spool lock block (Item 1) and the mount bolt (Item 2) **[Figure 20-40-81]**.

Install the lift and tilt spool rubber boots and mount plate (Item 3) and install the three mounting screws (Item 4) **[Figure 20-40-81]**.

Installation: Tighten the screws to 90-100 in.-lbs. (10-11,3 Nm) torque.

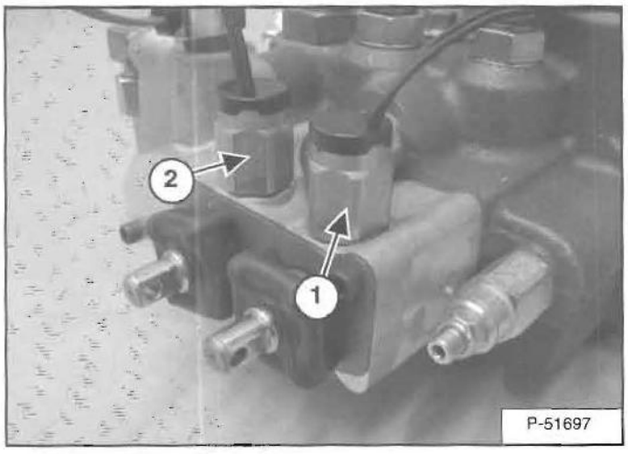
Lift Spool and Detent Removal and Installation (Cont'd)

Figure 20-40-82



Connect the tubeline (Item 1) **[Figure 20-40-82]**.

Figure 20-40-83



Use an Ohm meter to measure the lock solenoid coils resistance.

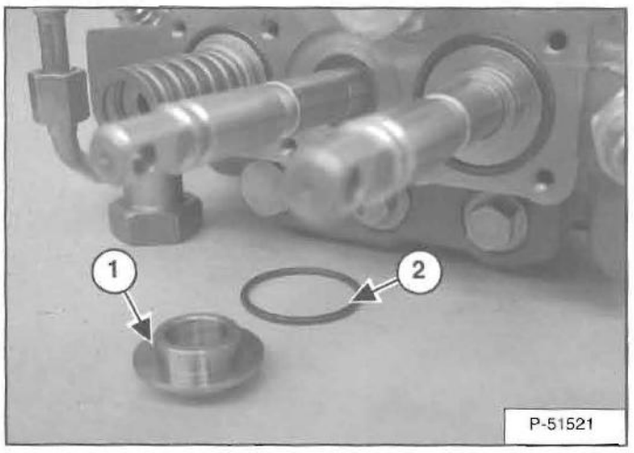
The correct resistance for the coil is **5.5 ± .28 Ohms**.

Installation: Install the lift spool (Item 1) and tilt spool (Item 2) **[Figure 20-40-83]** lock solenoids and tighten to 35-45 ft.-lbs. (52-61 Nm) torque.

Tilt Spool Removal and Installation

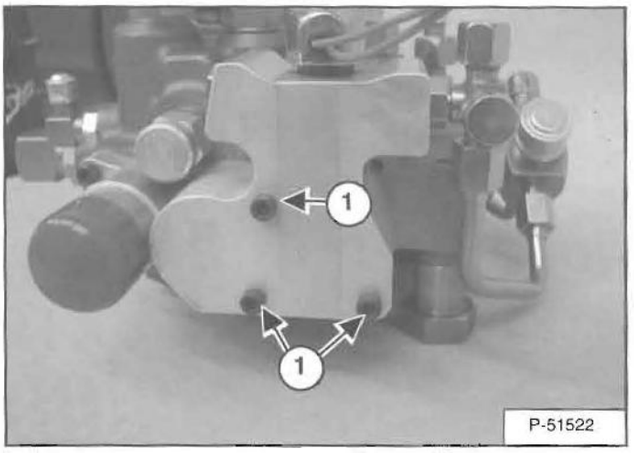
Remove the lift and tilt end cap/spool lock block. (See end cap/spool lock block removal and installation Page 20-40-13.)

Figure 20-40-84



Remove the spacer (Item 1) and O-ring (Item 2) **[Figure 20-40-84]** from the tilt spool.

Figure 20-40-85

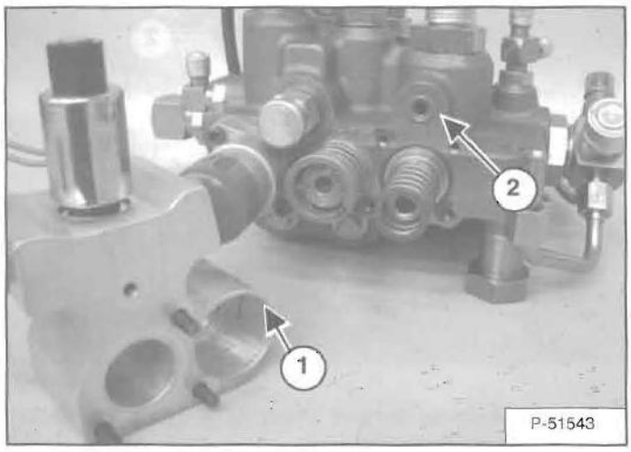


Remove the three screws (Item 1) **[Figure 20-40-85]** from the spool centering block.

Installation: Tighten the bolt to 90-100 in.-lbs. (10-11,3 Nm) torque.

Tilt Spool Removal And Installation (Cont'd)

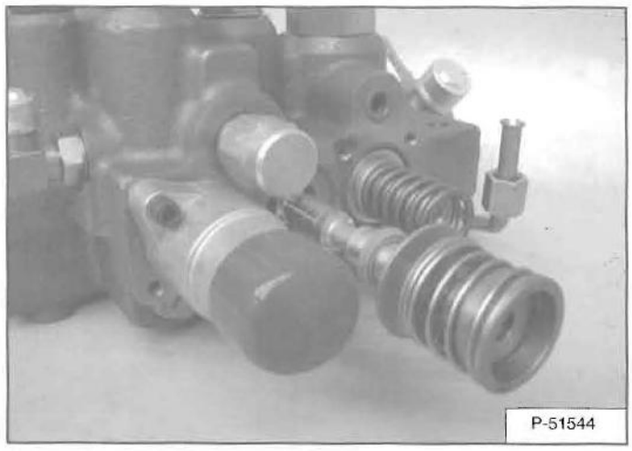
Figure 20-40-86



Remove the spool centering block (Item 1) **[Figure 20-40-86]** from the control valve.

Check and replace the O-ring (Item 2) **[Figure 20-40-86]** before replacing the spool centering block.

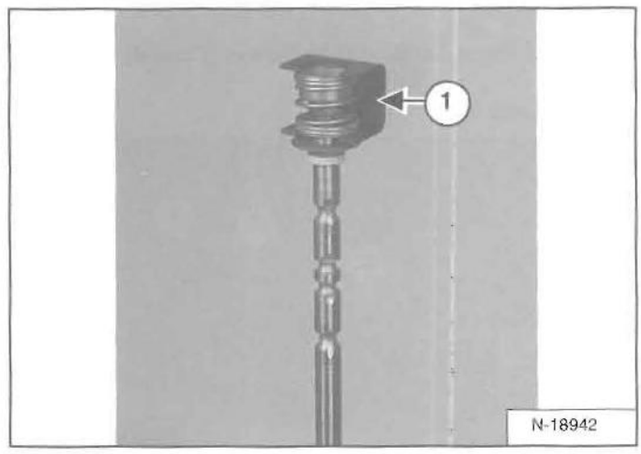
Figure 20-40-87



Remove the tilt spool, centering spring, back-up washer and spool seal **[Figure 20-40-87]**.

Assembly: Always use a new spool seal.

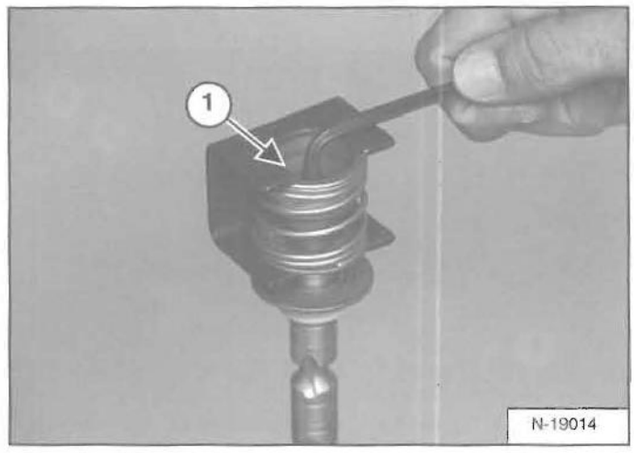
Figure 20-40-88



Put the linkage end of the spool in the vise **[Figure 20-40-88].**

Install the spool tool (Item 1) **[Figure 20-40-88]** over the centering spring.

Figure 20-40-89



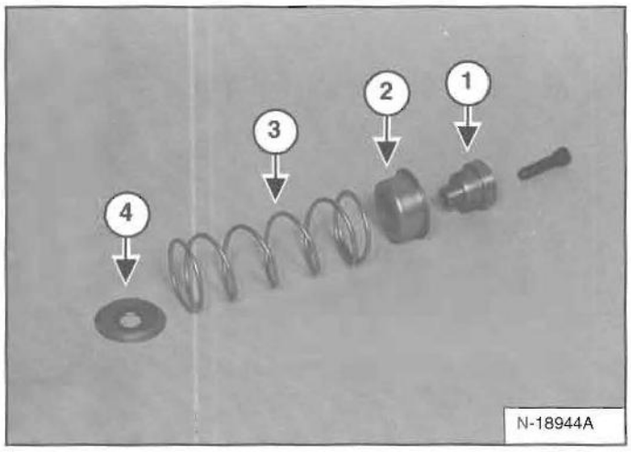
Remove the bolt (Item 1) **[Figure 20-40-89]** holding the centering spring to the spool.

Installation: Tighten the bolt to 90-100 in.-lbs. (10,2-11,3 Nm) torque.

Remove spring tool from the spring assembly.

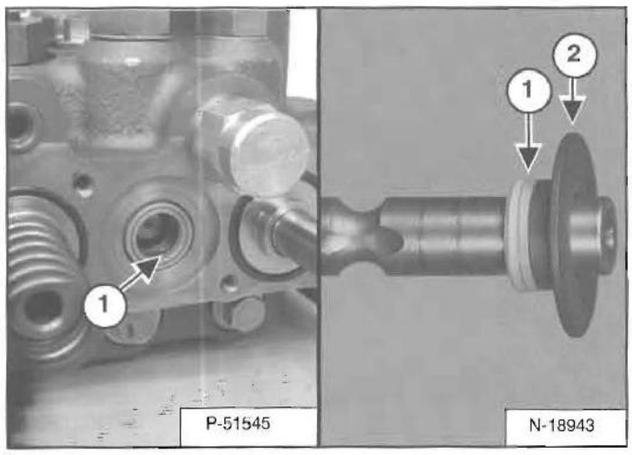
Tilt Spool Removal And Installation (Cont'd)

Figure 20-40-90



Inspect the adapter (Item 1), collar (Item 2), spring (Item 3) and washer (Item 4) **[Figure 20-40-90]**.

Figure 20-40-91

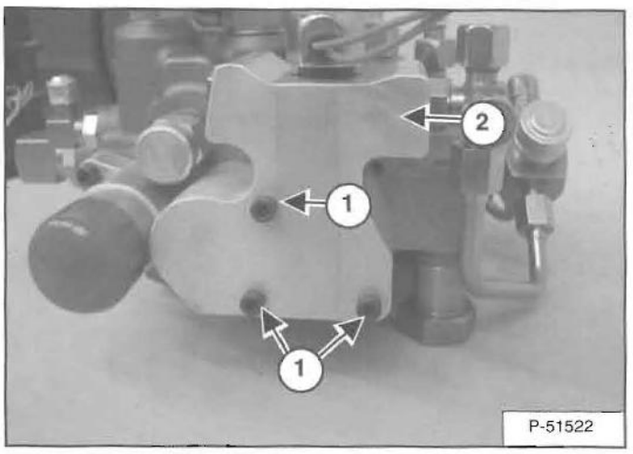


Remove the spool seal(s) (Item 1) **[Figure 20-40-91]** and the back-up washer (Item 2) **[Figure 20-40-91]**.

Assembly: Always use a new spool seal.

Auxiliary Spool Removal And Installation

Figure 20-40-92

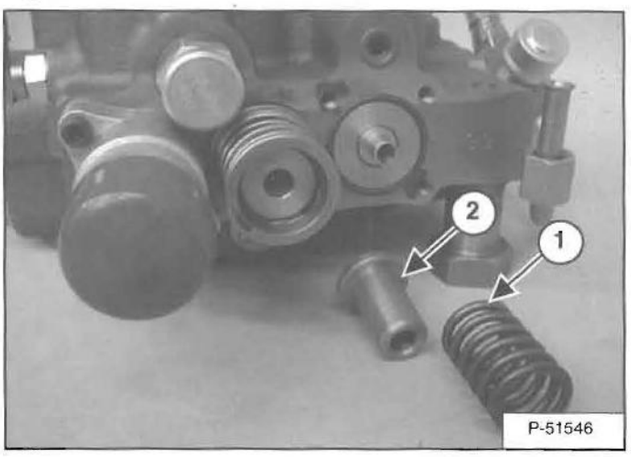


Remove the three screws (Item 1) **[Figure 20-40-92]** from the spool centering block.

Installation: Tighten the bolt to 90-100 in.-lbs. (10-11,3 Nm) torque.

Remove the spool centering block (Item 2) **[Figure 20-40-92]** from the control valve.

Figure 20-40-93

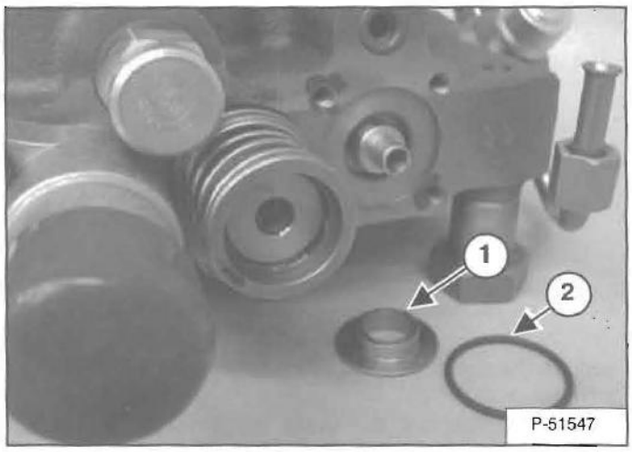


Remove the spring (Item 1) and center spring retainer (Item 2) **[Figure 20-40-93]** from the auxiliary spool.

Note: If the centering spring retainer (Item 2) [Figure 20-40-93] must be replaced, replace the retainer on the opposite end also.

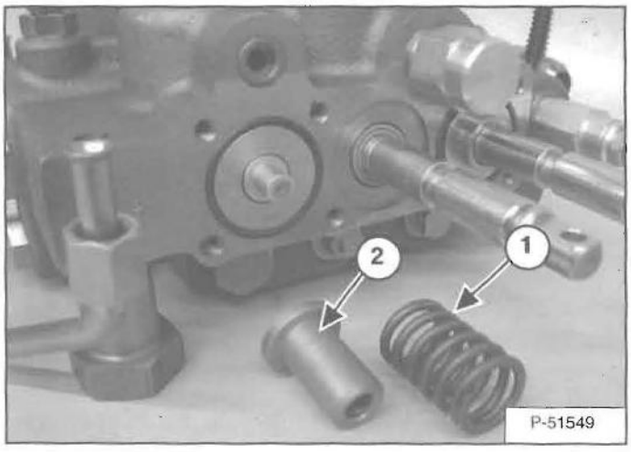
Auxiliary Spool Removal And Installation (Cont'd)

Figure 20-40-94



Remove the spacer (Item 1) and O-ring (Item 2) **[Figure 20-40-94]** from the auxiliary spool.

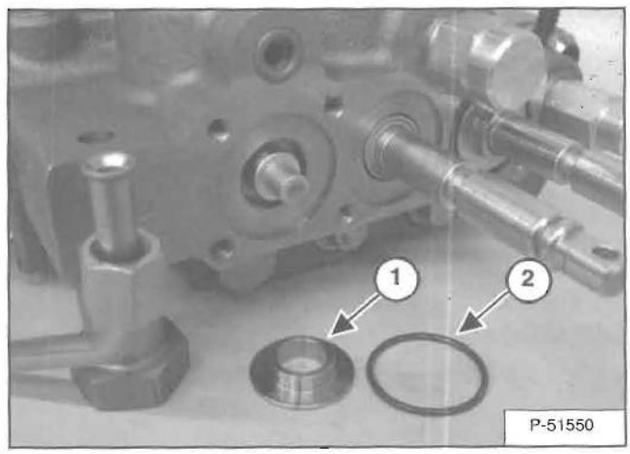
Figure 20-40-95



Remove the spring (Item 1) and center spring retainer (Item 2) **[Figure 20-40-95]** from the auxiliary spool.

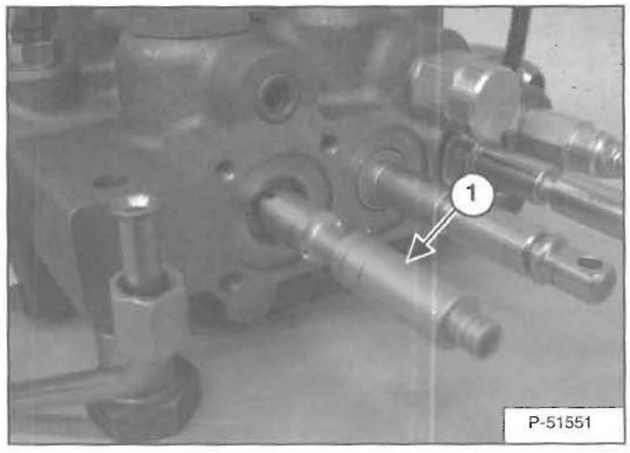
NOTE: If the centering spring retainer (Item 2) [Figure 20-40-95] must be replaced, replace the retainer on the opposite end also.

Figure 20-40-96



Remove the spacer (Item 1) and O-ring (Item 2) **[Figure 20-40-96]** from the auxiliary spool.

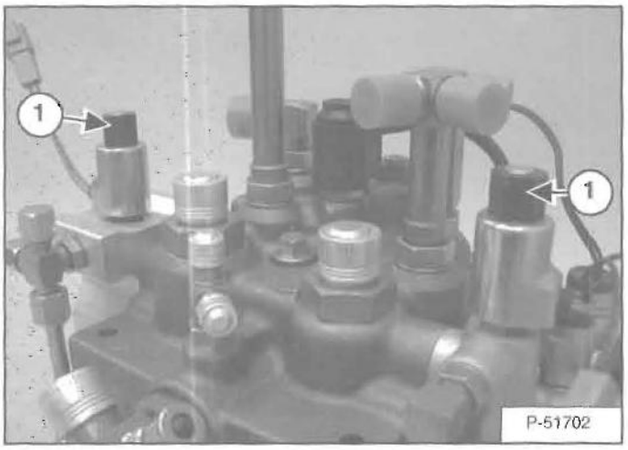
Figure 20-40-97



Remove the spool (Item 1) **[Figure 20-40-97]**.

Auxiliary Solenoid Disassembly and Assembly

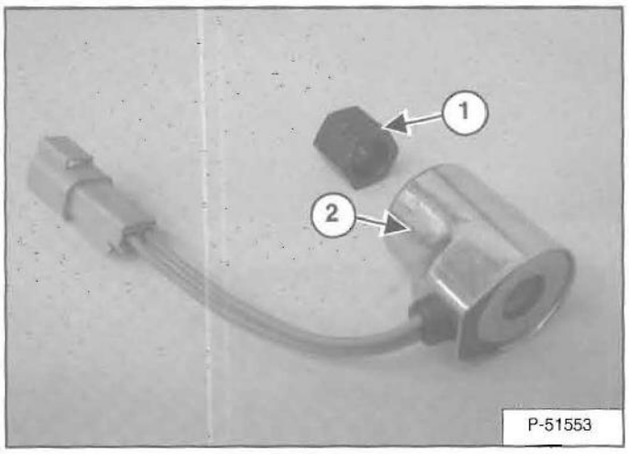
Figure 20-40-98



Remove the nut (Item 1) **[Figure 20-40-98]** from both solenoids.

Installation: Tighten the nut to 48-72 in.-lbs. (5-8 Nm) torque.

Figure 20-40-99

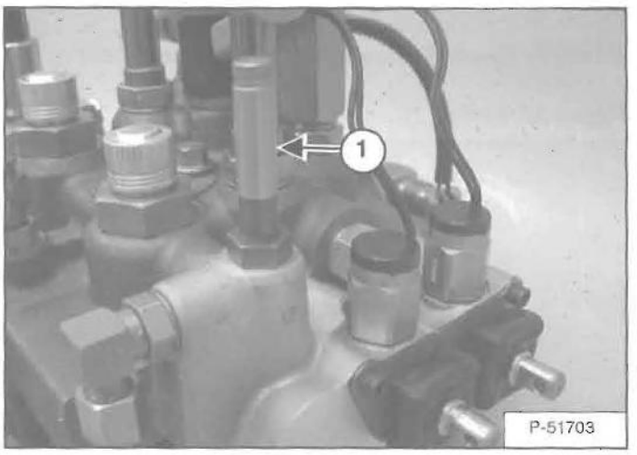


Remove the nut (Item 1) and solenoid coil (Item 2) **[Figure 20-40-99]**.

Use an Ohm meter to measure the solenoid coil resistance.

The correct resistance for the coil is **4.9 ± .25 Ohms**.

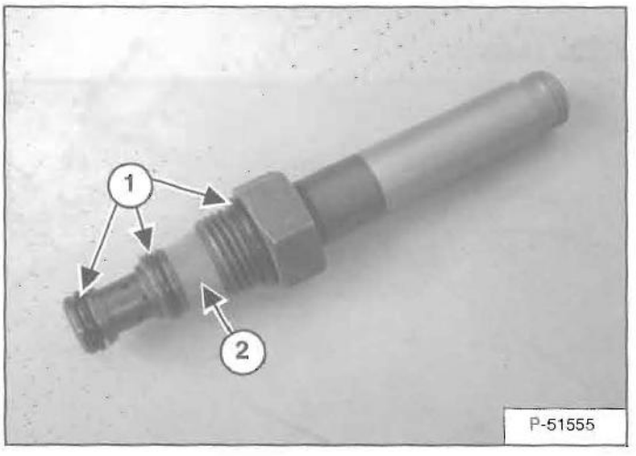
Figure 20-40-100



Remove the solenoid stem (Item 1) **[Figure 20-40-100]**.

Installation: Tighten the stem to 10-14 ft.-lbs. (14-19 Nm) torque.

Figure 20-40-101

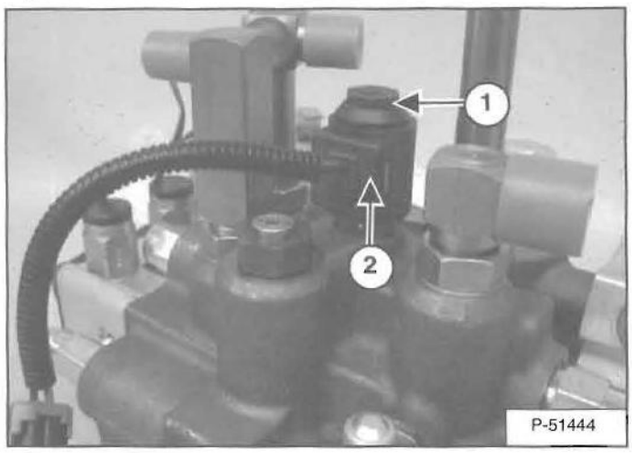


Remove the O-rings (Item 1) **[Figure 20-40-101]** from the solenoid stem.

Check and clean the screen (Item 2) **[Figure 20-40-101]**.

BICS™ Valve Solenoid Disassembly And Assembly

Figure 20-40-102

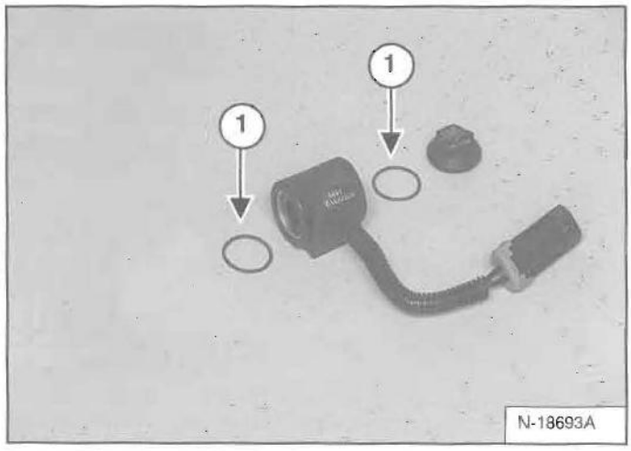


Remove the nut (Item 1) **[Figure 20-40-102]** from the solenoid stem.

Installation: Tighten the nut to 53 in.-lbs. (6 Nm) torque.

Remove the solenoid coil (Item 2) **[Figure 20-40-102]**.

Figure 20-40-103

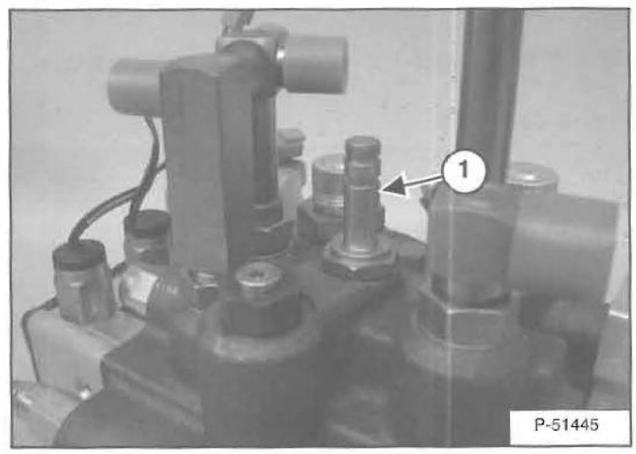


Remove the O-rings (Item 1) **[Figure 20-40-103]** from both ends of the solenoid coil.

Use an Ohm meter to measure the solenoid coil resistance.

The correct resistance for the coil is **9.79 ± .29 Ohms**.

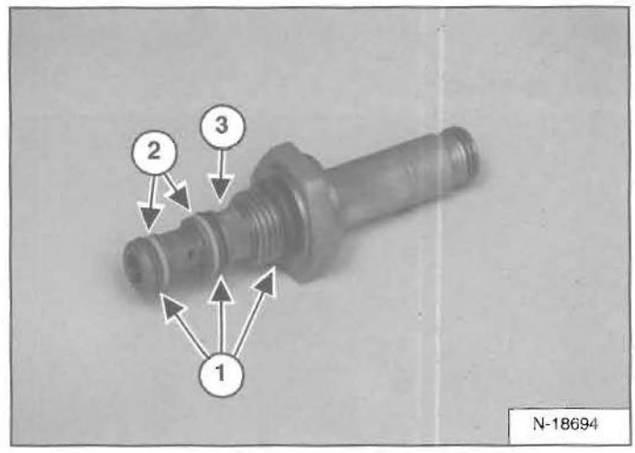
Figure 20-40-104



Remove the solenoid stem (Item 1) **[Figure 20-40-104]**.

Installation: Lubricate the O-rings and tighten the stem to 22-24 ft.-lbs. (27-33 Nm) torque.

Figure 20-40-105



Remove the O-rings (Item 1) and back-up rings (Item 2) **[Figure 20-40-105]** from the cartridge.

Clean all parts in solvent and dry with compressed air.

Inspect all parts for wear and replace any showing excessive wear.

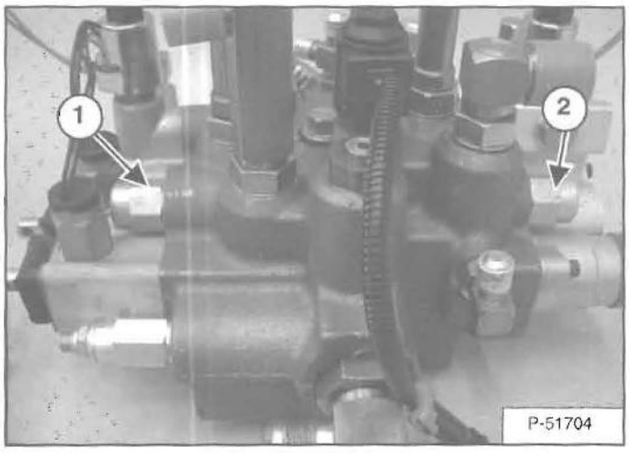
NOTE: The screen (Item 3) [Figure 20-40-105] may be cleaned with solvent. If it is torn or worn it needs to be replaced.

Use only new O-rings and apply oil to all O-rings and back-up rings before installation.

Install new O-rings (Item 1) **[Figure 20-40-103]** & **[Figure 20-40-105]** and new back-up rings (Item 2) **[Figure 20-40-105]** on the solenoid stem.

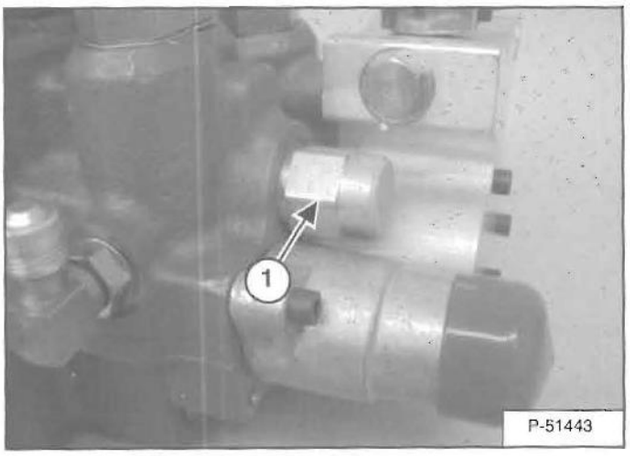
BICS™ Valve, Lock Valve Removal And Installation

Figure 20-40-106



Locate the two BICS™ lock valves, (Item 1) is for the tilt circuit and (Item 2) **[Figure 20-40-106]** is for the lift circuit.

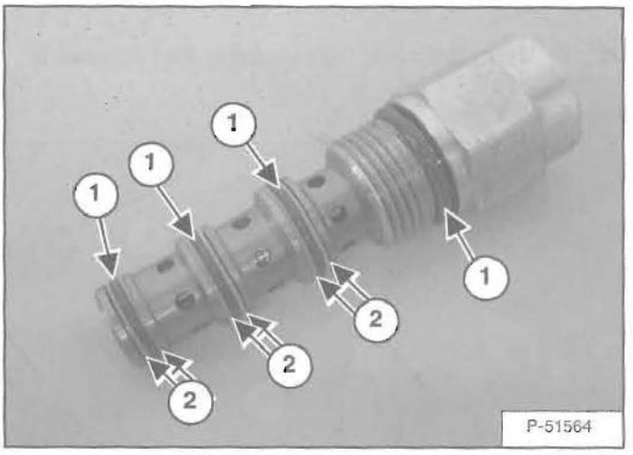
Figure 20-40-107



Remove the lift lock valve (Item 1) **[Figure 20-40-107]** from the back of the control valve.

Installation: Lightly lubricate the lock valve O-rings and tighten to 22-24 ft.-lbs. (27-33 Nm) torque.

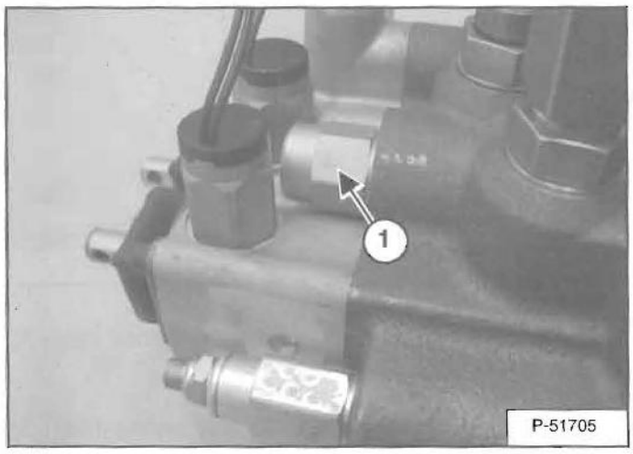
Figure 20-40-108



Remove the O-rings (Item 1) and back-up rings (Item 2) **[Figure 20-40-108]** from the lift lock valve, and replace with new.

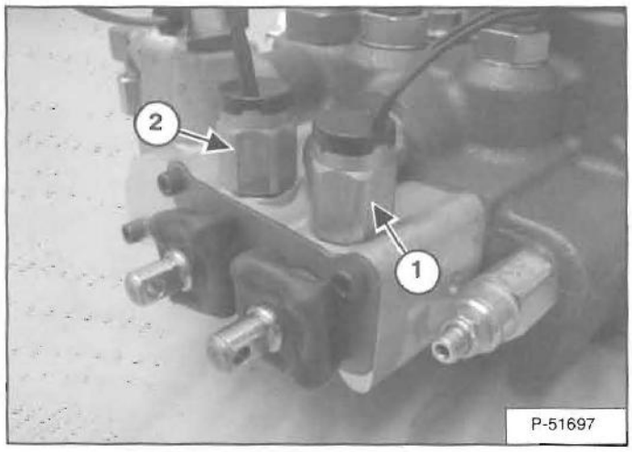
BICS™ Valve, Lock Valve Removal And Installation (Cont'd)

Figure 20-40-109



Locate the tilt circuit lock valve (Item 1) **[Figure 20-40-109]**.

Figure 20-40-110

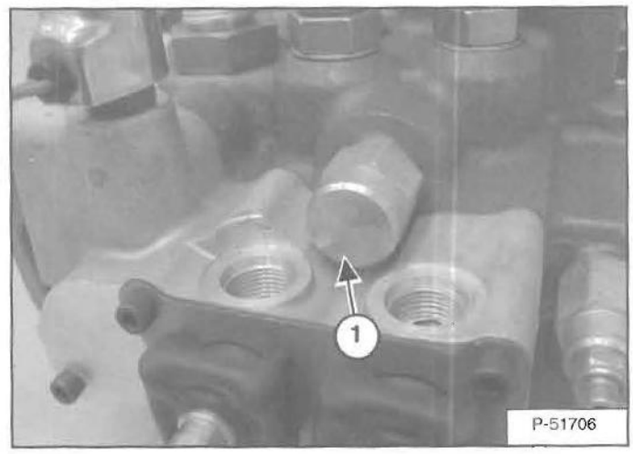


Remove the lift spool lock solenoid (Item 1) **[Figure 20-40-110]**.

Remove the tilt spool lock solenoid (Item 2) **[Figure 20-40-110]**.

Installation: Lubricate the O-rings and tighten the spool lock solenoids to 38-45 ft.-lbs. (52-61 Nm) torque.

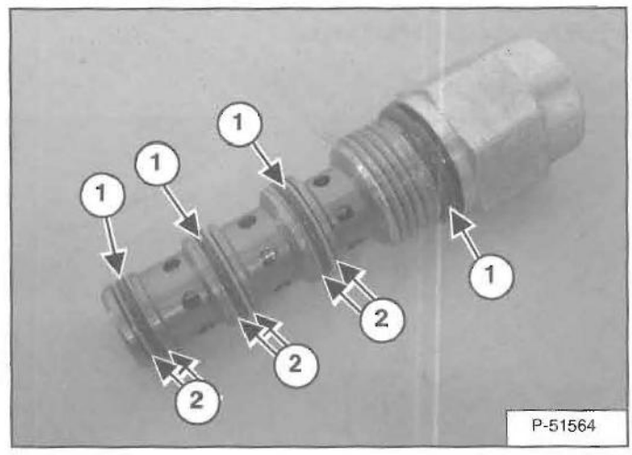
Figure 20-40-111



Remove the tilt lock valve (Item 1) **[Figure 20-40-111]** from the front of the control valve.

Installation: Lightly lubricate the lock valve o-rings and tighten to 20-24 ft.-lbs. (27-33 Nm) torque.

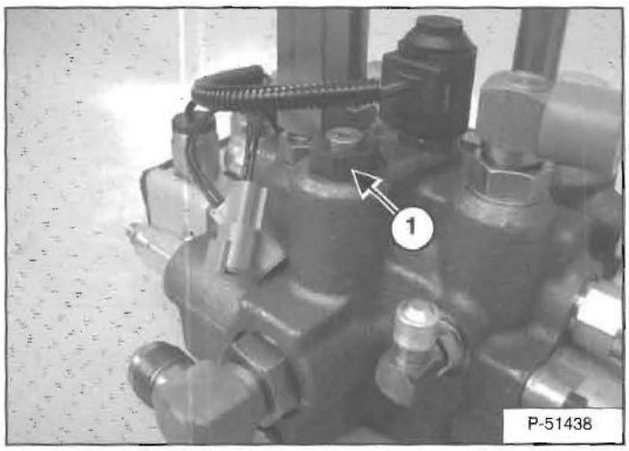
Figure 20-40-112



Remove the O-rings (Item 1) and back-up rings (Item 2) **[Figure 20-40-112]** from the tilt lock valve, and replace with new.

BICS™ Valve, Check Valve Removal And Installation

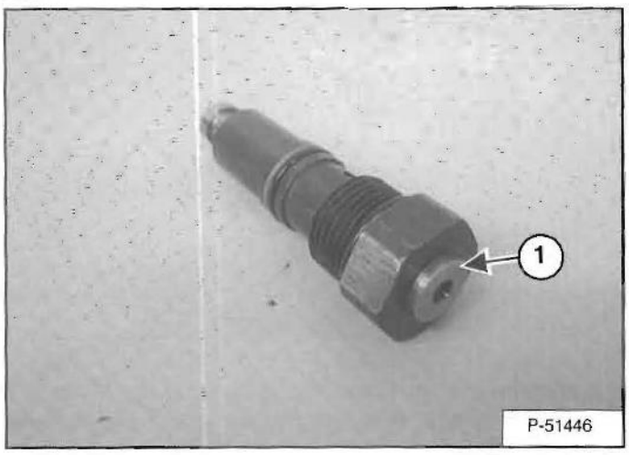
Figure 20-40-113



Remove the BICS™ valve (Item 1) **[Figure 20-40-113]**.

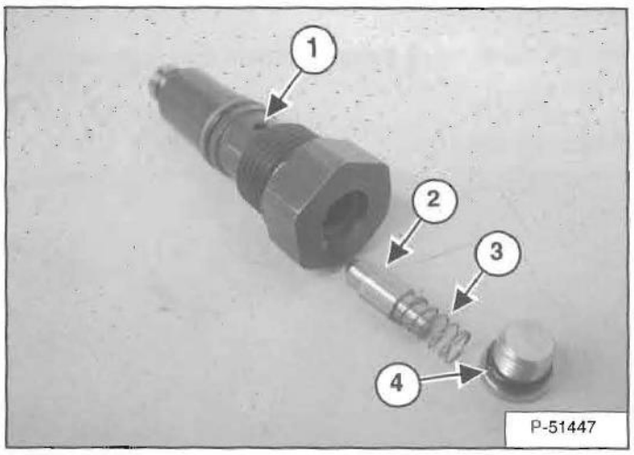
Installation: Lubricate the O-ring and tighten the valve to 55-65 ft.-lbs. (75-88 Nm) torque.

Figure 20-40-114



Remove the plug (Item 1) **[Figure 20-40-114]** from the top of the BICS™ valve.

Figure 20-40-115



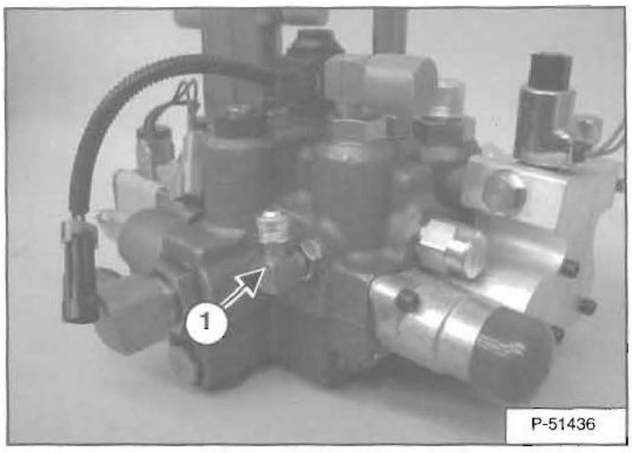
Check that there is no blockage in the orifice (Item 1) **[Figure 20-40-115]**.

Inspect the check valve (Item 2) and spring (Item 3) **[Figure 20-40-115]**.

Replace the O-ring (Item 4) **[Figure 20-40-115]** on the plug before installation.

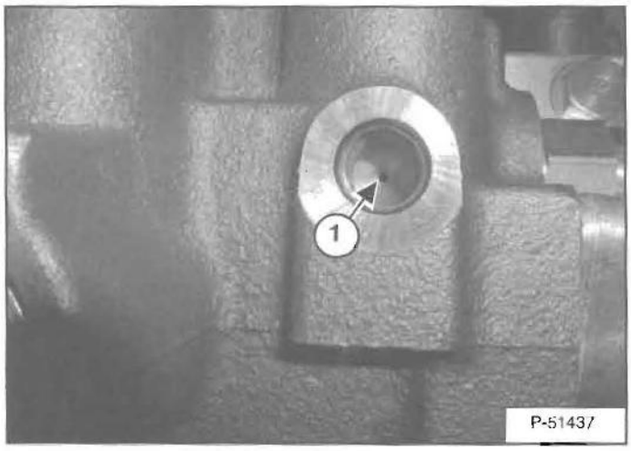
BICS™ Valve, Lift Arm By-Pass Orifice Disassembly And Assembly

Figure 20-40-116



Remove the fitting (Item 1) **[Figure 20-40-116]** from the valve.

Figure 20-40-117

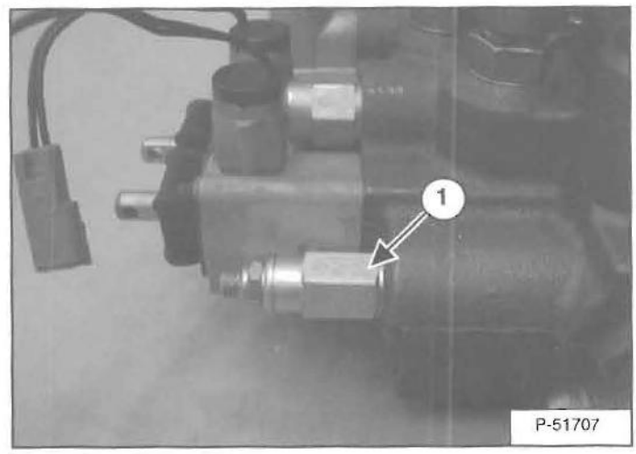


Check the lift arm by-pass orifice (Item 1) **[Figure 20-40-117]**.

NOTE: This orifice is not removable from the valve casting.

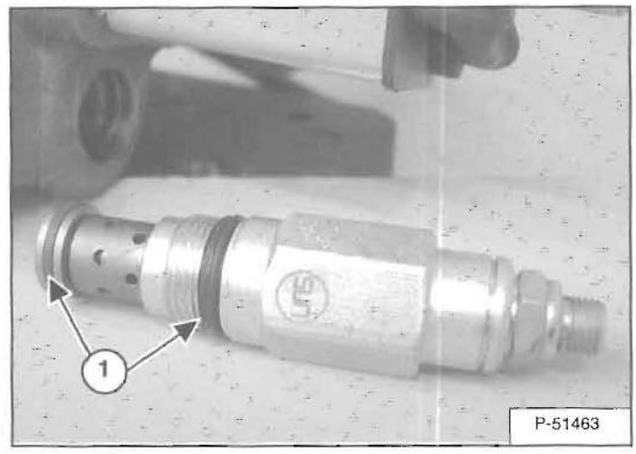
Main Relief Valve

Figure 20-40-118



Remove the main relief valve (Item 1) **[Figure 20-40-118]**.

Figure 20-40-119



Remove the O-rings from the main relief valve (Item 1) **[Figure 20-40-119]**.

Installation: Always use new O-rings. Tighten to 38-45 ft.-lbs. (52-61 Nm) torque.



Bobcat®

HYDRAULIC CONTROL VALVE (ADVANCED CONTROL SYSTEM) (ACS)

Removal And Installation



WARNING

Never work on a machine with the lift arms up unless the lift arms are secured by an approved lift arm support device. Failure to use an approved lift arm support device can allow the lift arms or attachment to fall and cause injury or death.

W-2059-0598

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

Lift and block the loader. (See Contents Page 10-01.)

Raise the lift arms and install an approved lift arm support device (See Contents Page 10-01.)

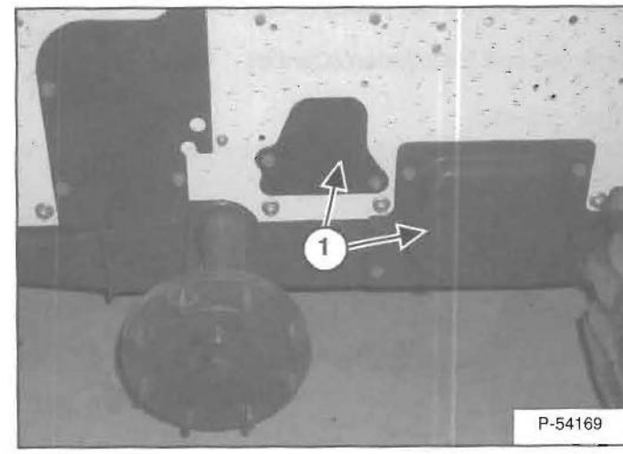
Raise the operator cab. (See Contents Page 10-01.)

Clean the area around the control valve.

Drain the hydraulic reservoir. (See Contents Page 10-01.)

Remove the control panel. (See Contents Page 50-01.)

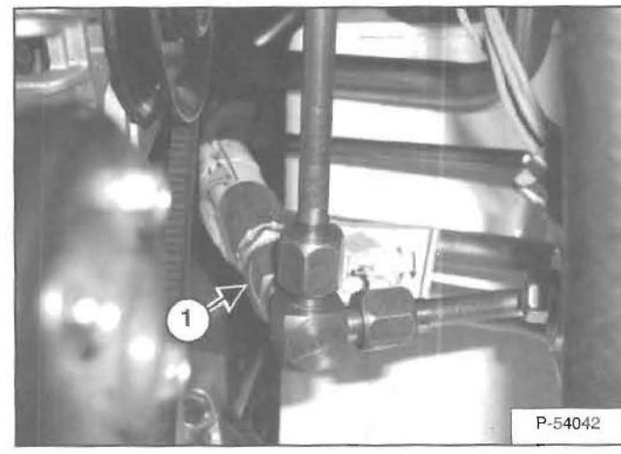
Figure 20-41-1



Remove the right rear tire.

Locate and remove the access covers (Item 1) **[Figure 20-41-1]** on the right side of the machine.

Figure 20-41-2



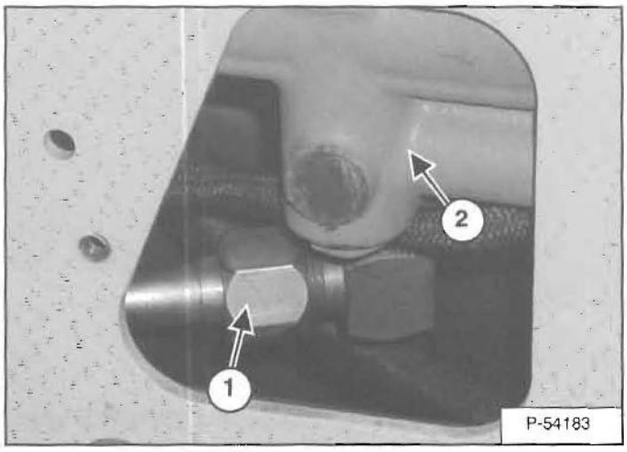
Mark all tubelines and hoses for correct installation.

The fixed end main valve hose (Item 1) **[Figure 20-41-2]** is connected to a fixed end fitting on the control valve. The hose is routed to the back upright where the hose is connected to a tee fitting that feeds the base end of both lift cylinders. The hose must be removed at the back tee fitting, located in the right side upright.

NOTE: Remember the hose routing for ease of control valve installation.

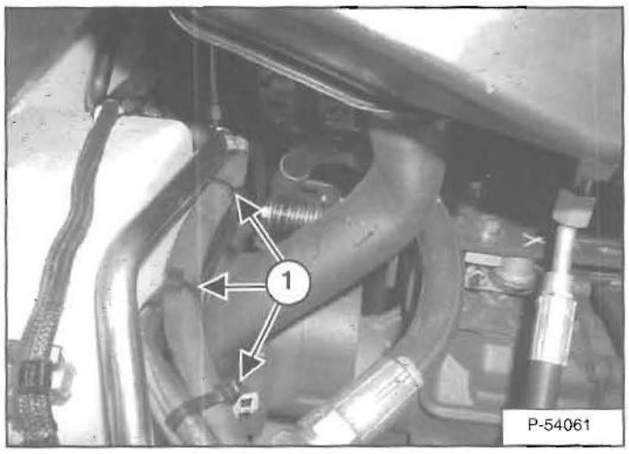
Removal and Installation (Cont'd)

Figure 20-41-3



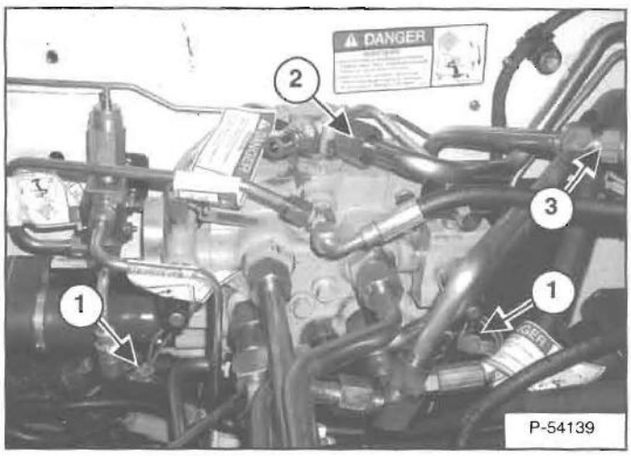
Disconnect the inlet tubeline (Item 1) from the control valve (Item 2) **[Figure 20-41-3]** through the access opening .

Figure 20-41-4



Remove the tie-straps (Item 1) **[Figure 20-41-4]** from the fixed end main valve hose.

Figure 20-41-5

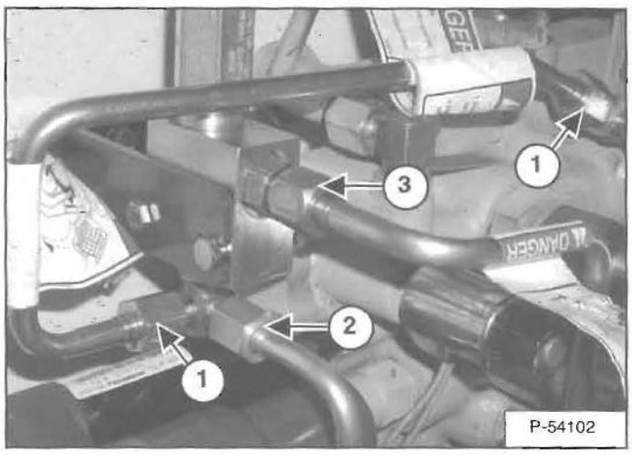


Mark and disconnect the two auxilliary electric solenoid connectors (Item 1) **[Figure 20-41-5]** for correct installation.

Remove the outlet tubeline (Item 2) **[Figure 20-41-5]** from the control valve to the hydraulic oil cooler.

Disconnect and cap the supply hose (Item 3) **[Figure 20-41-5]**.

Figure 20-41-6



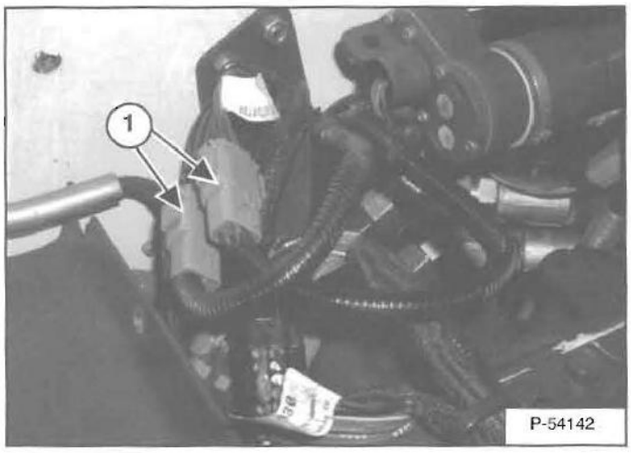
Disconnect and remove the tubeline (Item 1) **[Figure 20-41-6]** from the lift arm by-pass valve to the control valve.

Disconnect and cap the hose (Item 2) **[Figure 20-41-6]** from the lift arm by-pass valve to the drive motor case drain.

Disconnect and cap the lift arm by-pass tubeline (Item 3) **[Figure 20-41-6]**.

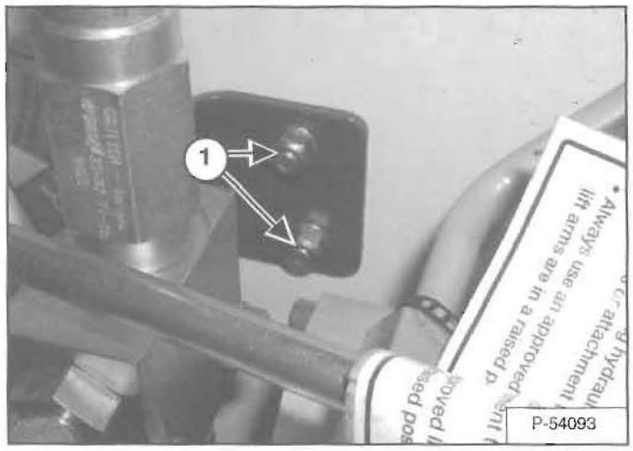
Removal And Installation (Cont'd)

Figure 20-41-7



Disconnect the connectors (Item 1) **[Figure 20-41-7]** from the lift and tilt actuators.

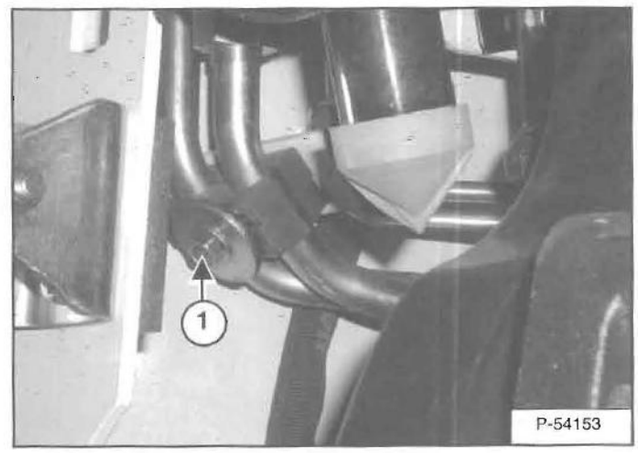
Figure 20-41-8



Remove the two lift arm by-pass valve mounting bolts (Item 1) **[Figure 20-41-8]**.

Remove the lift arm by-pass valve and mounting bracket.

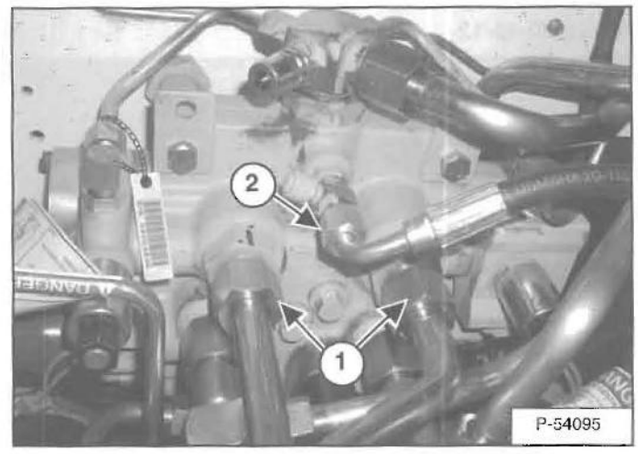
Figure 20-41-9



Remove tubeline clamp bolt (Item 1) **[Figure 20-41-9]** from the auxiliary tubelines in the left rear upright.

Installation: Tighten bolt to 15-20 ft.-lbs. (20-27 Nm) torque.

Figure 20-41-10



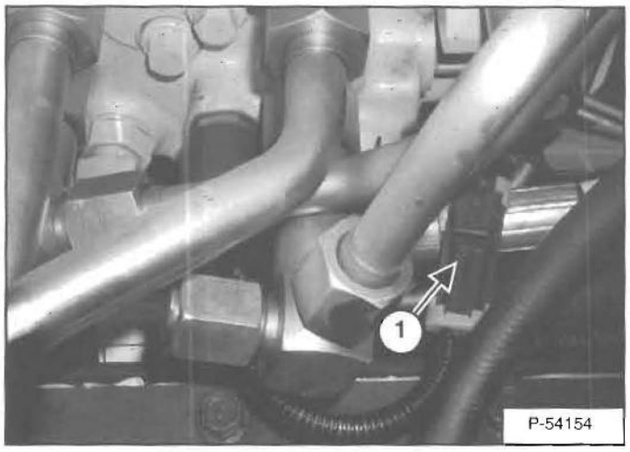
Remove and cap both tubelines (Item 1) **[Figure 20-41-10]** from the auxiliary section of the control valve.

Disconnect and cap the drain hose (Item 2) **[Figure 20-41-10]**.

HYDRAULIC CONTROL VALVE (ADVANCED CONTROL SYSTEM) (ACS) (CONT'D)

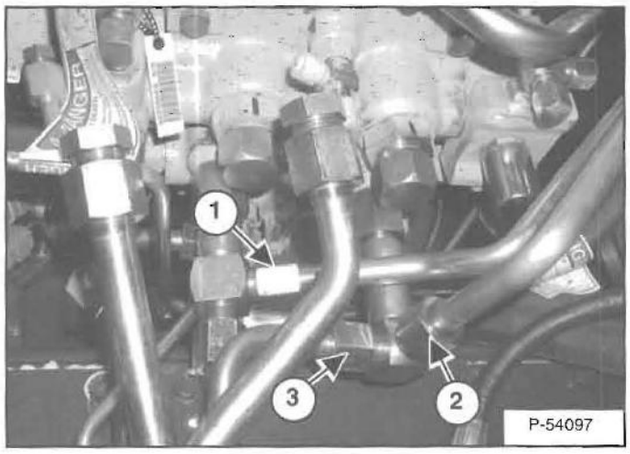
Removal And Installation (Cont'd)

Figure 20-41-11



Mark and disconnect the BICS™ electric solenoid connector (Item 1) **[Figure 20-41-11]**.

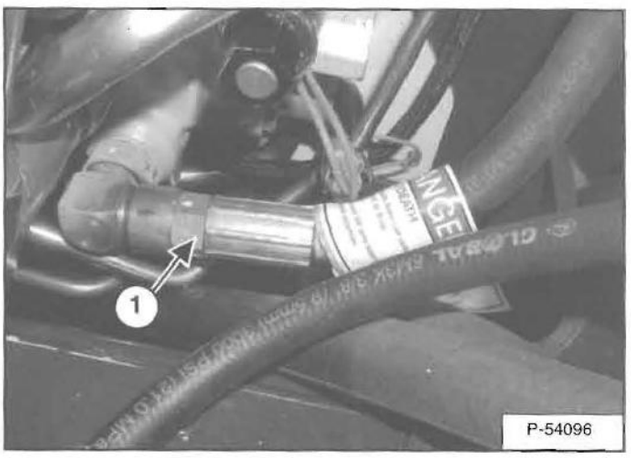
Figure 20-41-12



Disconnect and cap the tubelines (Item 1) and (Item 2) **[Figure 20-41-12]** from the tilt section of the control valve.

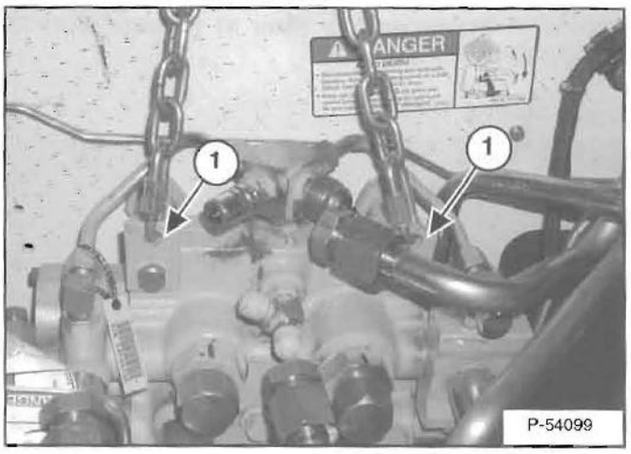
Disconnect and cap the tubeline (Item 3) **[Figure 20-41-12]** from the lift section of the control valve.

Figure 20-41-13



Remove the fixed-end main valve hose (Item 1) **[Figure 20-41-13]** from the main control valve fitting.

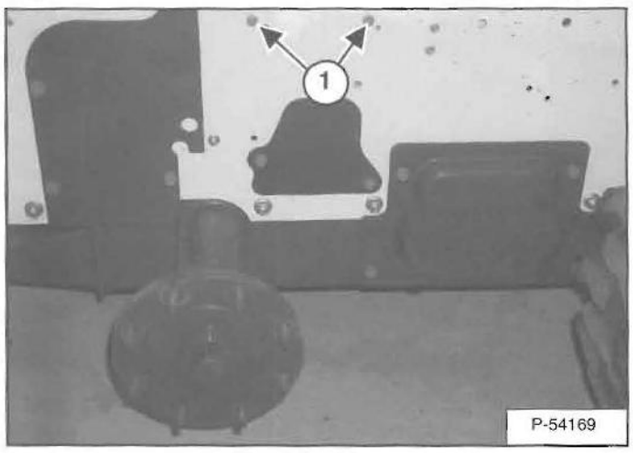
Figure 20-41-14



Connect a hoist to the lifting brackets (Item 1) **[Figure 20-41-14]** on the control valve.

Removal And Installation (Cont'd)

Figure 20-41-15



Remove the two mounting bolts (Item 1) **[Figure 20-41-15]** fastening the control valve to the side of the loader.

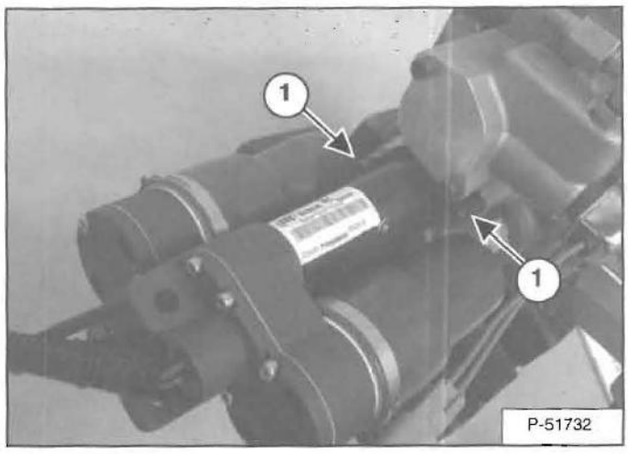
Remove the control valve from the loader.

Reverse procedure for installation.

Actuator Removal And Installation (Out of Loader)

Remove the control valve from the loader.

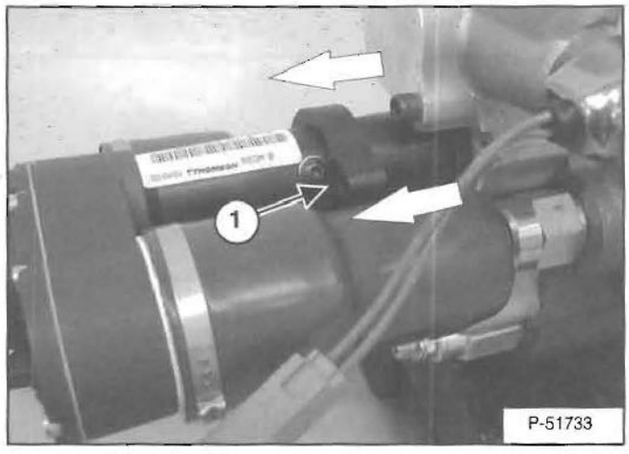
Figure 20-41-16



Remove the two mount bolts (Item 1) **[Figure 20-41-16]** from the tilt actuator.

Installation: Tighten the mounting bolts to 90-100 in.-lbs. (10,2-11,3 Nm) torque.

Figure 20-41-17

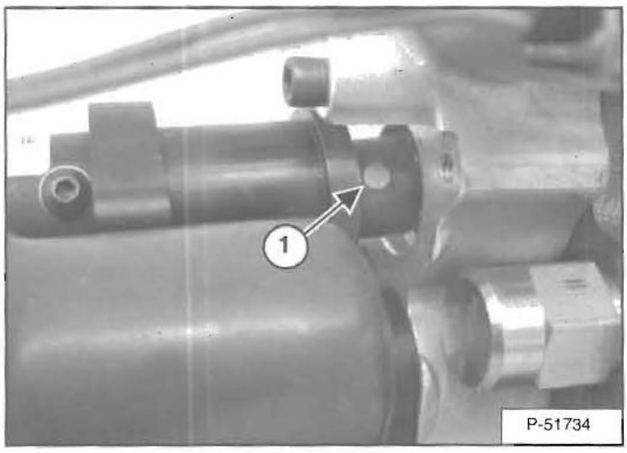


Slide the actuator mount bracket (Item 1) **[Figure 20-41-17]** away from the control valve.

Pull the actuator away from the control valve **[Figure 20-41-17]**.

Actuator Removal And Installation (Out of Loader) (Cont'd)

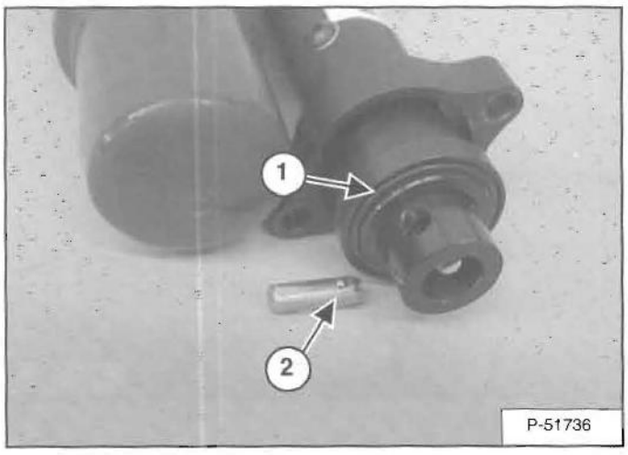
Figure 20-41-18



Using a drift pin and a hammer, remove the actuator linkage pin (Item 1) **[Figure 20-41-18]** from the actuator and the tilt spool.

Remove the actuator and linkage pin from the valve.

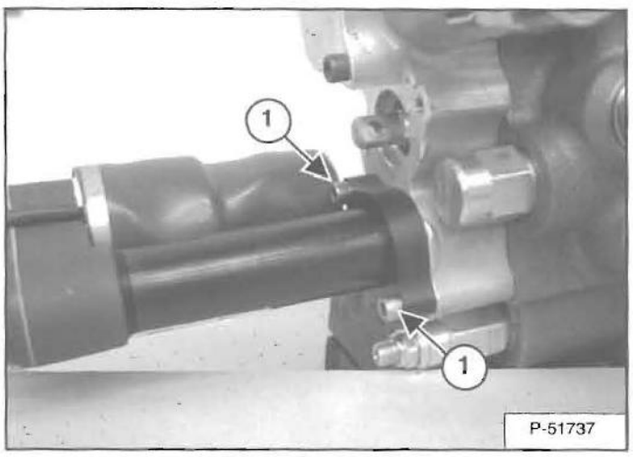
Figure 20-41-19



Inspect the O-ring (Item 1) **[Figure 20-41-19]** on the face of the actuator, and replace as needed.

Check the linkage pin (Item 2) **[Figure 20-41-19]** and replace as needed.

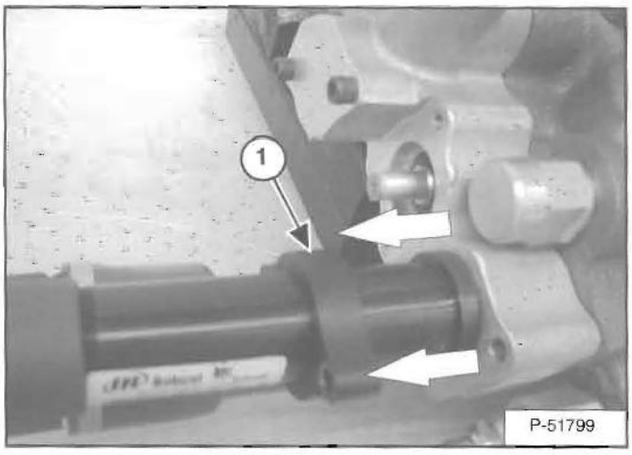
Figure 20-41-20



Remove the two mount bolts (Item 1) **[Figure 20-41-20]** from the lift actuator.

Installation: Tighten the mounting bolts to 90-100 in.-lbs. (10,2-11,3 Nm) torque.

Figure 20-41-21

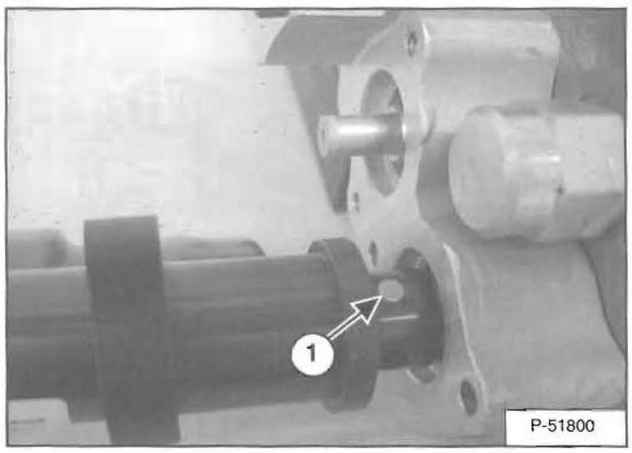


Slide the actuator mount bracket (Item 1) **[Figure 20-41-21]** away from the control valve.

Pull the actuator away from the control valve **[Figure 20-41-21]**.

Actuator Removal And Installation (Out of Loader) (Cont'd)

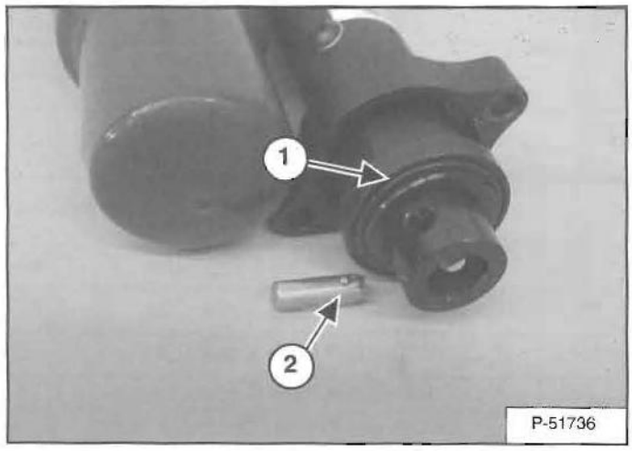
Figure 20-41-22



Using a drift pin and a hammer, remove the actuator linkage pin (Item 1) **[Figure 20-41-22]** from the actuator and the tilt spool.

Remove the actuator and linkage pin from the valve.

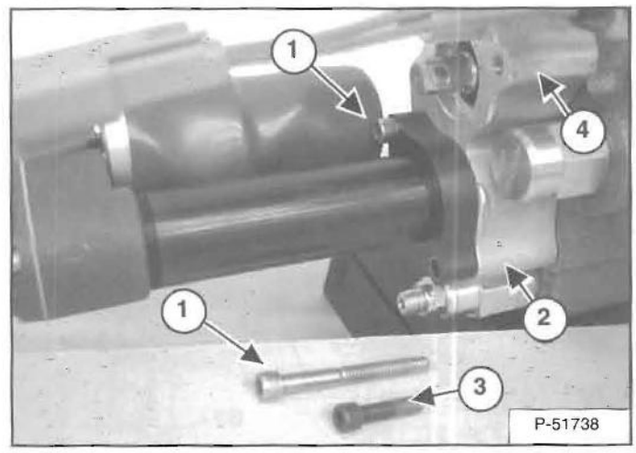
Figure 20-41-23



Inspect the O-ring (Item 1) **[Figure 20-41-23]** on the face of the actuator, and replace as needed.

Check the linkage pin (Item 2) **[Figure 20-41-23]** and replace as needed.

Figure 20-41-24

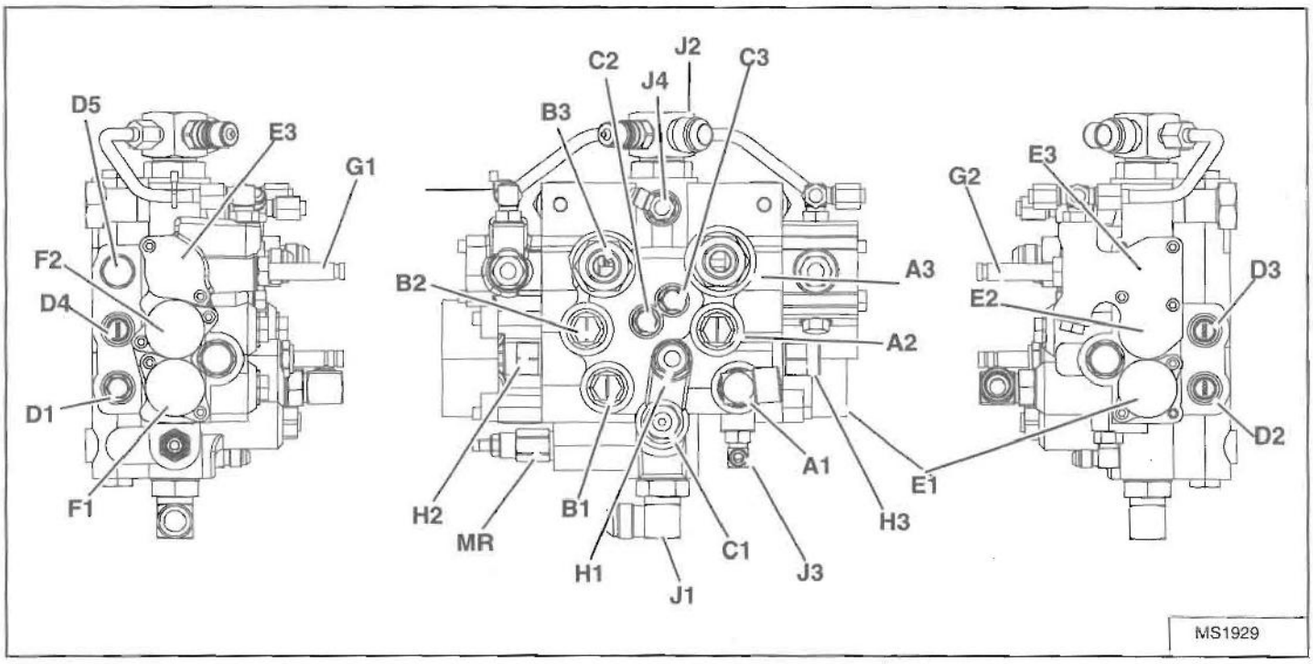


NOTE: The two longer bolts (Item 1) are used to mount the lift actuator and end cap (Item 2) [Figure 20-41-24] to the control valve.
The two shorter mount bolts (Item 3) are used to mount the tilt actuator to the end cap (Item 4) [Figure 20-41-24].

Installation: Tighten the mounting bolts to 90-100 in.-lbs. (10,2-11,3 Nm) torque (Item 1) **[Figure 20-41-24]**

Identification Chart (ACS)

Figure 20-41-25

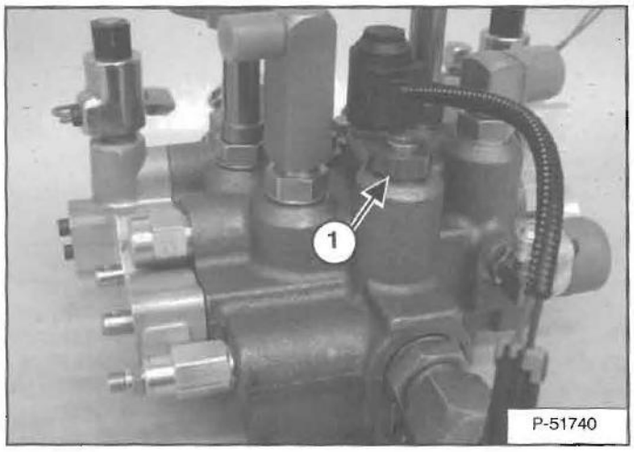


ITEM	S130 LOADER
A1	Lift Cylinder Base End
A2	Tilt Cylinder Base End
A3	Auxiliary Hydraulic Rod End
B1	Lift Cylinder Rod End
B2	Tilt Cylinder Rod End
B3	Auxiliary Hydraulics Base End
C1	Load Check/BICS™ Valve Lift
C2	Load Check Valve Tilt Function
C3	Load Check Valve Auxiliary Function
D1	Anti-Cavitation Valve Lift (Rod End)
D2	Port Relief/Anti-Cavitation Valve – 3500 PSI Lift (Base End)
D3	Port Relief/Anti-Cavitation Valve – 3500 PSI Tilt (Base End)
D4	Port Relief/Anti-Cavitation Valve – 3500 PSI Tilt (Rod End)
D5	Port Relief/Anti-Cavitation Valve (Auxiliary) 3100 PSI (Optional)

ITEM	S130 LOADER
E1	Lift Spool Centering Spring
E2	Tilt Spool Centering Spring
E3	Auxiliary Spool/Centering Springs
F1	LIft Spool
F2	Tilt Spool
G1	Auxiliary Solenoid Stem
G2	Auxiliary Solenoid Stem
H1	BICS™ Valve Solenoid
H2	BICS™ Lock Valve (Tilt)
H3	BICS™ Lock Valve (Lift)
J1	Inlet Fluid Flow (From Pump)
J2	Outlet Fluid Flow (Return to Tank)
J3	Lift Arm By-Pass Orifice
J4	Drain (Case)
MR	Main Relief Valve – 2700 PSI

BICS™ Valve, Lift Load Check Valve Removal And Installation

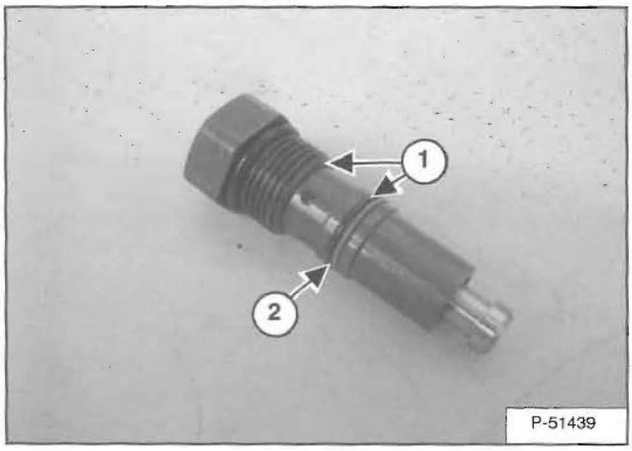
Figure 20-41-26



Remove the lift load check valve (Item 1) **[Figure 20-41-26]**.

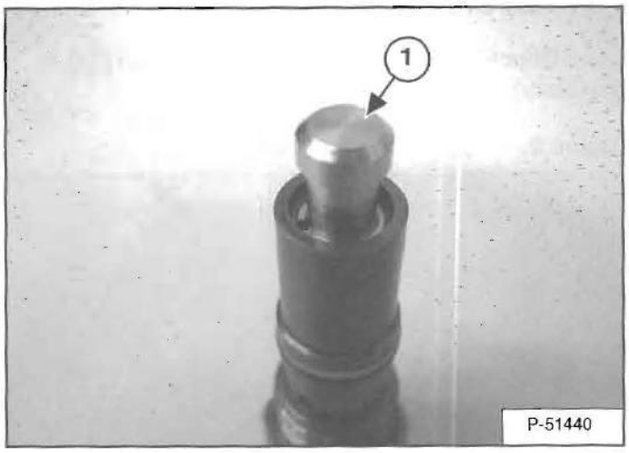
Installation: Lubricate the o-ring and tighten the valve to 55-65 ft.-lbs. (75-88 Nm) torque.

Figure 20-41-27



Remove and install new O-rings (Item 1) and back-up ring (Item 2) **[Figure 20-41-27]**.

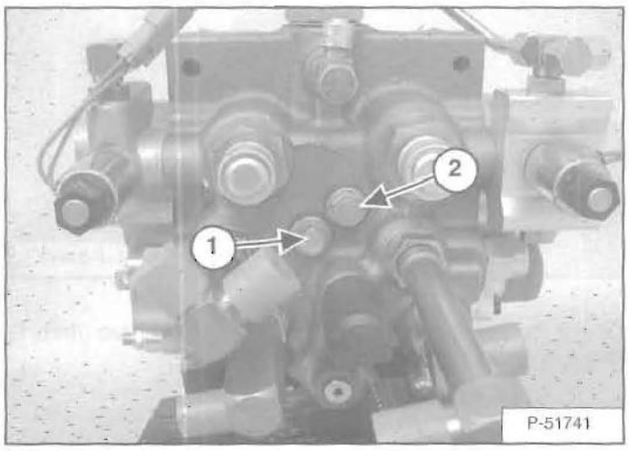
Figure 20-41-28



Check for free movement of the load check valve (Item 1) **[Figure 20-41-28]**.

Load Check Valve Removal And Installation (Tilt & Auxiliary)

Figure 20-41-29

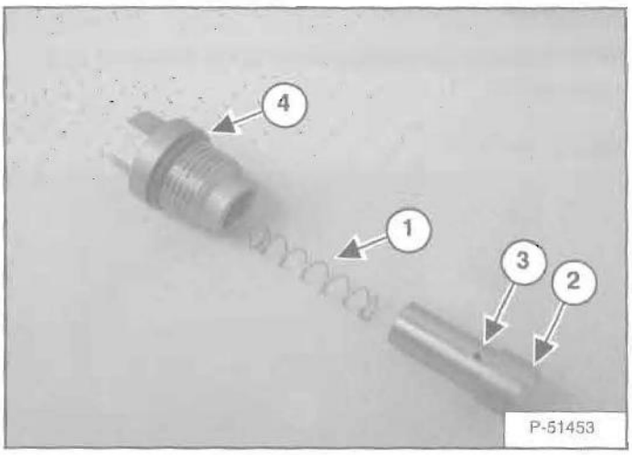


At the front side of the control valve locate the tilt section load check valve (Item 1) **[Figure 20-41-29]**.

At the front side of the control valve locate the auxiliary section load check valve (Item 2) **[Figure 20-41-29]**.

NOTE: The tilt and auxiliary load check valves are interchangeable.

Figure 20-41-30



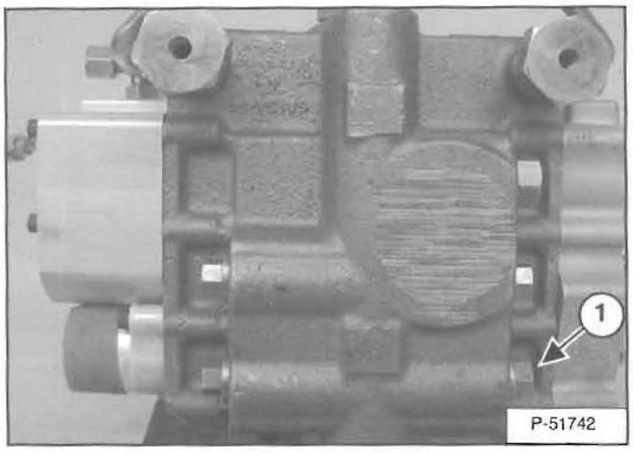
Remove the spring (Item 1) and poppet (Item 2) **[Figure 20-41-30]**.

Check the orifice (Item 3) **[Figure 20-41-30]** in the poppet to be sure it is not plugged.

Installation: Install a new O-ring (Item 4) on the plug and lightly lubricate with oil before installing. Tighten the plug to 38-45 ft.-lbs. (52-61 Nm) torque.

Anti-Cavitation Valve (Lift, Rod End)

Figure 20-41-31



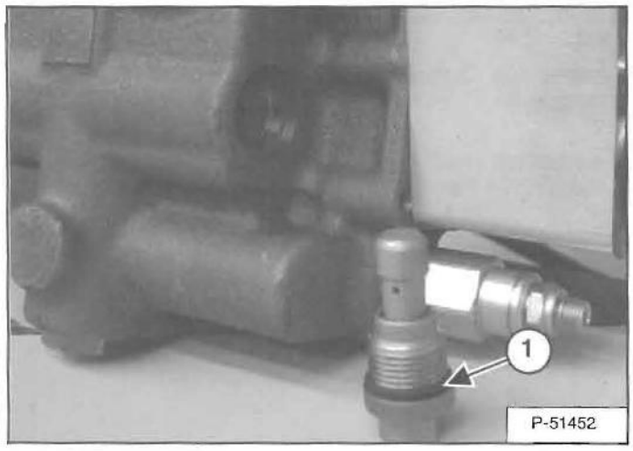
At the back side of the control valve, remove the lift section anti-cavitation valve (Item 1) **[Figure 20-41-31]**.

⚠ WARNING

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.

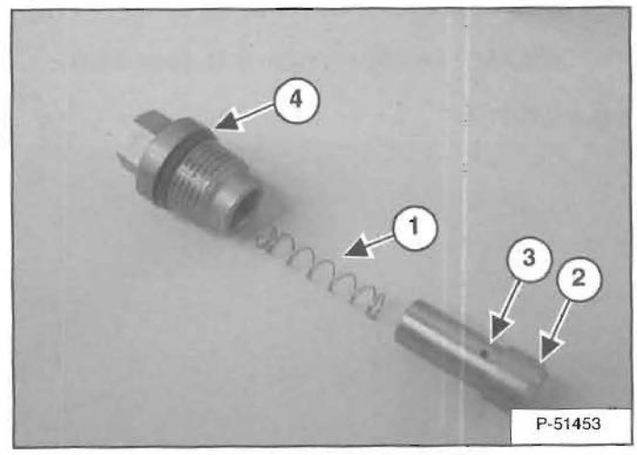
I-2003-0888

Figure 20-41-32



Always use new O-ring (Item 1) **[Figure 20-41-32]** on the anti-cavitation valve plug.

Figure 20-41-33



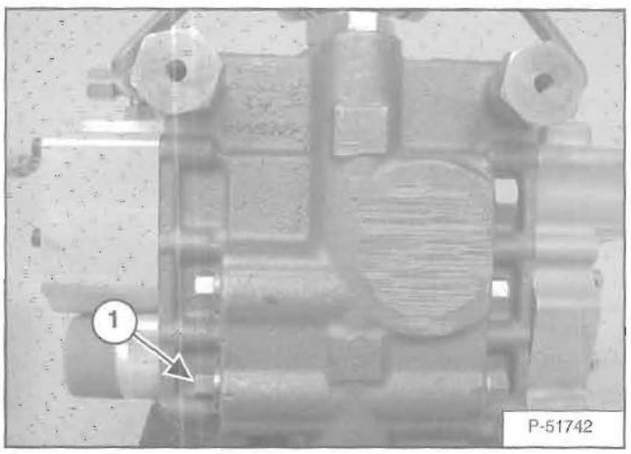
Remove the spring (Item 1) and poppet (Item 2) **[Figure 20-41-33]**.

Check the orifice (Item 3) **[Figure 20-41-33]** in the poppet to be sure it is not plugged.

Installation: Install a new O-ring (Item 4) on the plug and lightly lubricate with oil before installing. Tighten the plug to 38-45 ft.-lbs. (52-61 Nm) torque.

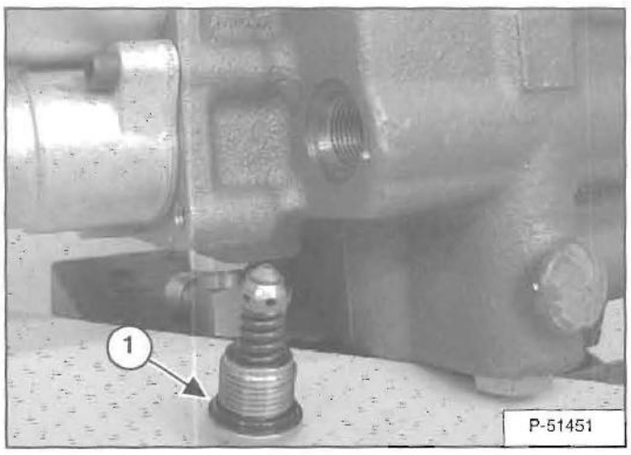
Port Relief/Anti-Cavitation Valve (Lift, Base End)

Figure 20-41-34



Loosen the lift circuit port relief/anti cavitation valve (Item 1) **[Figure 20-41-34]**.

Figure 20-41-35

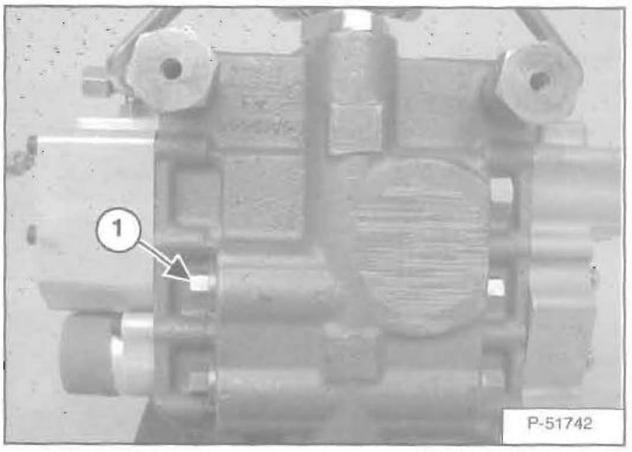


Replace the O-ring (Item 1) **[Figure 20-41-35]** before installation.

Installation: Lightly lubricate with oil and tighten to 38-45 ft.-lbs. (52-61 Nm) torque.

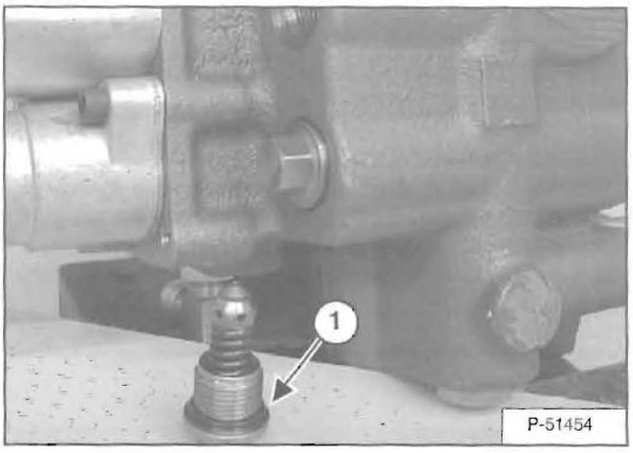
Port Relief/Anti-Cavitation Valve (Tilt, Base End)

Figure 20-41-36



Remove the tilt port relief/anti cavitation valve (Item 1) **[Figure 20-41-36]** from the base end of the tilt section.

Figure 20-41-37

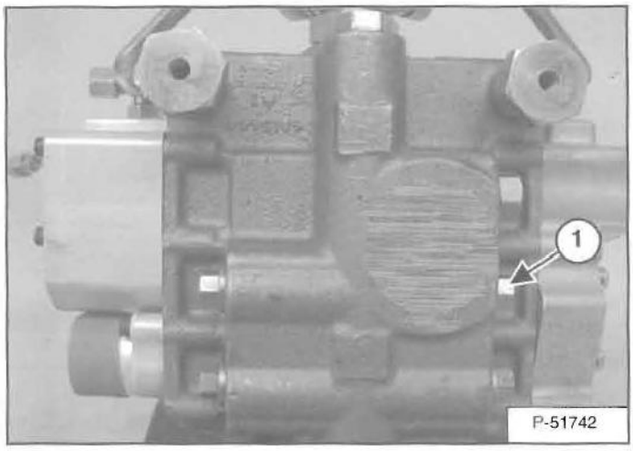


Replace the O-ring (Item 1) **[Figure 20-41-37]** before installation.

Installation: Lightly lubricate with oil and tighten to 38-45 ft.-lbs. (52-61 Nm) torque.

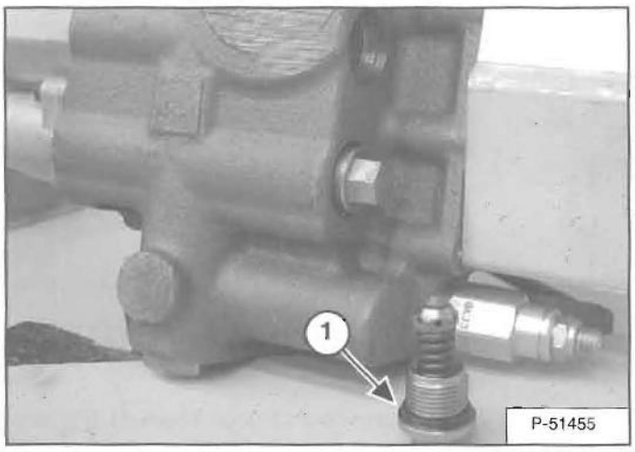
Port Relief/Anti-Cavitation Valve (Tilt, Rod End)

Figure 20-41-38



Remove the tilt port relief/anti cavitation valve (Item 1) **[Figure 20-41-38]** from the rod end of the tilt section.

Figure 20-41-39

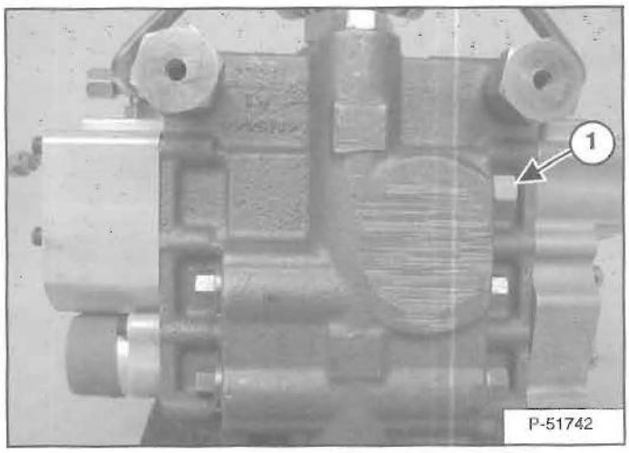


Replace the O-ring (Item 1) **[Figure 20-41-39]** before installation.

Installation: Lightly lubricate with oil and tighten to 38-45 ft.-lbs. (52-61 Nm) torque.

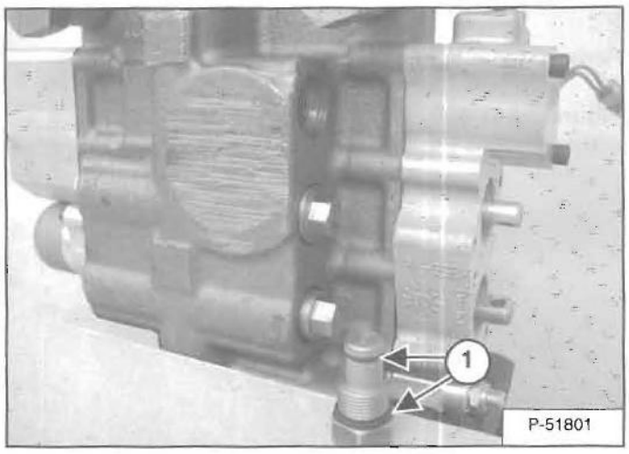
Port Relief Valve

Figure 20-41-40



Remove the port relief plug (Item 1) **[Figure 20-41-40]** from the auxiliary circuit of the control valve.

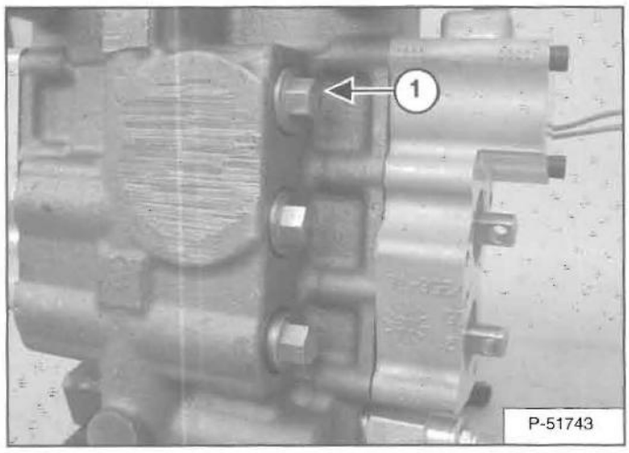
Figure 20-41-41



Installation: Always use new O-rings (Item 1) **[Figure 20-41-41]**. Lightly lubricate with oil and tighten to 38-45 ft.-lbs. (52-61 Nm) torque.

Port Relief Valve (Cont'd)

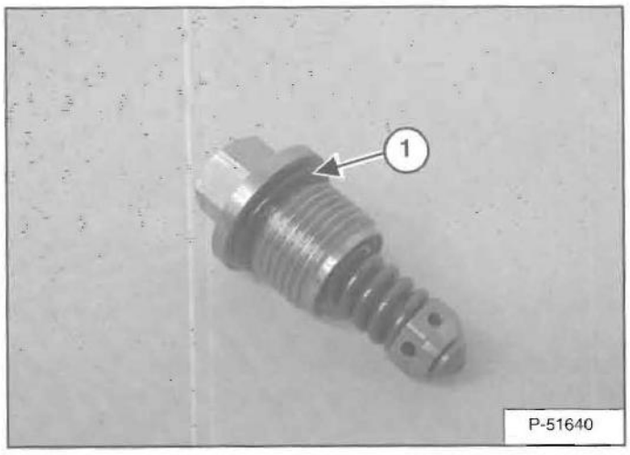
Figure 20-41-42



The control valve may be equipped with an optional auxiliary port relief valve (Item 1) **[Figure 20-41-42]**.

Remove the auxiliary port relief valve.

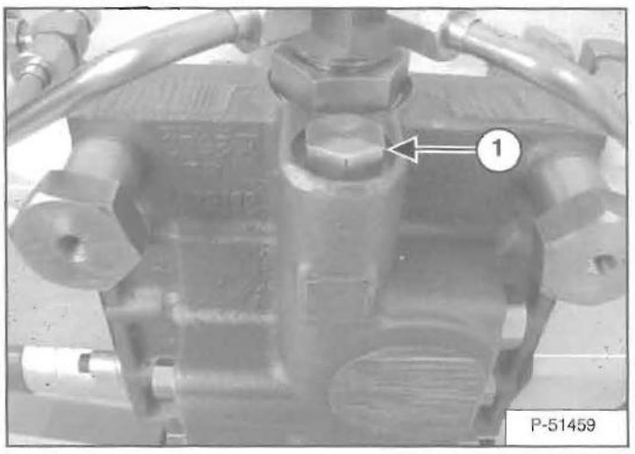
Figure 20-41-43



Installation: Always use new O-rings (Item 1) **[Figure 20-41-43]**. Lightly lubricate with oil and tighten to 38-45 ft.-lbs. (52-61 Nm) torque.

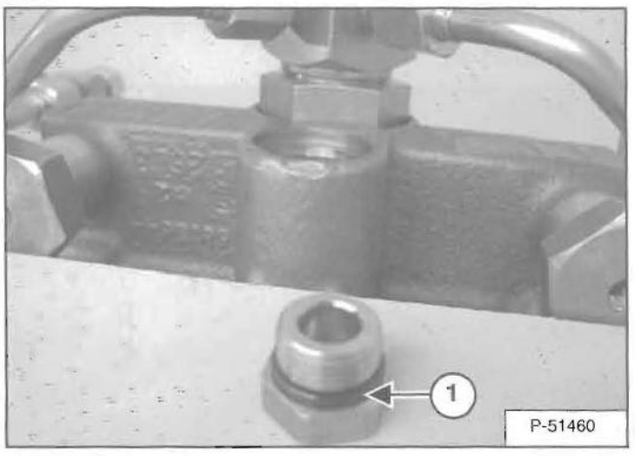
Plug Removal

Figure 20-41-44



At the top side of the control valve, remove the plug (Item 1) **[Figure 20-41-44]**.

Figure 20-41-45

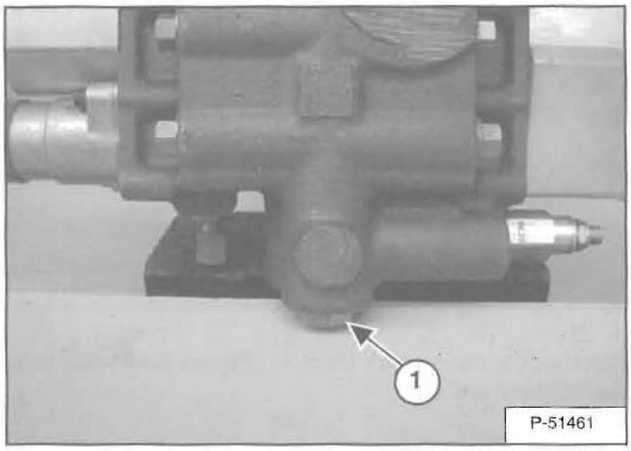


Installation: Always use new O-rings (Item 1) **[Figure 20-41-45]**. Tighten to 40 ft.-lbs. (54 Nm) torque.

HYDRAULIC CONTROL VALVE (ADVANCED CONTROL SYSTEM) (ACS) (CONT'D)

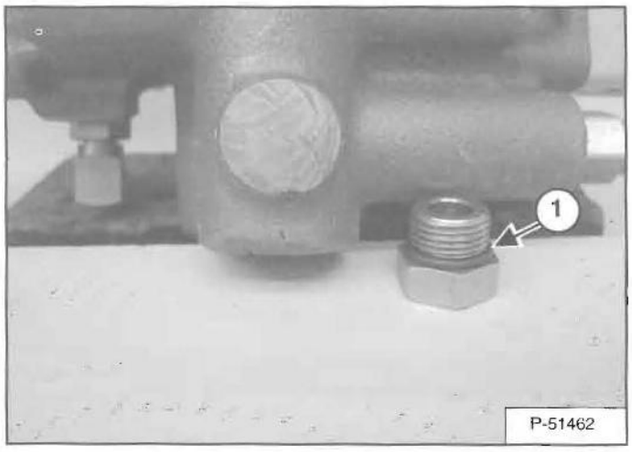
Plug Removal (Cont'd)

Figure 20-41-46



At the bottom side of the control valve remove the plug (Item 1) **[Figure 20-41-46]**.

Figure 20-41-47

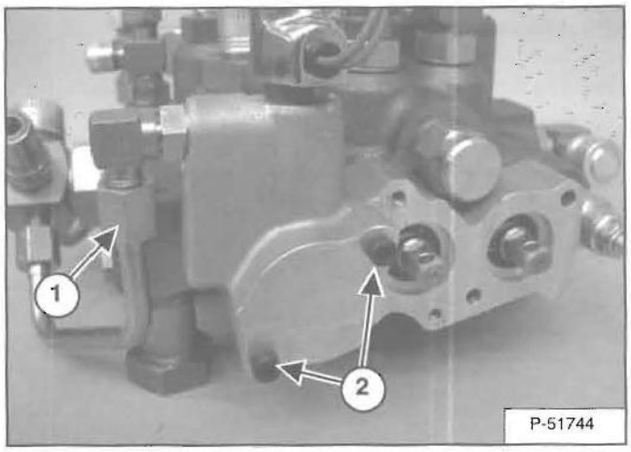


Installation: Always use new O-rings (Item 1) **[Figure 20-41-47]**. Tighten to 40 ft.-lbs. (54 Nm) torque.

End Cap Block Removal and Installation

Remove the lift and tilt actuators from the control valve. (See Page 20-41-5 for Actuator Removal and Installation.)

Figure 20-41-48

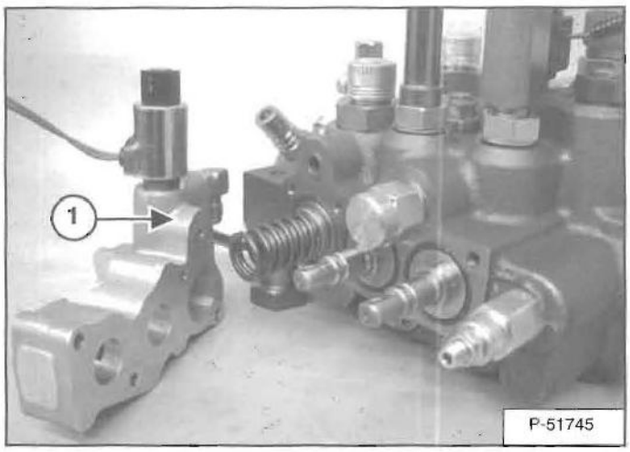


Disconnect the tube line (Item 1) **[Figure 20-41-48]** from the end cap block.

Remove the two end cap block mount screws (Item 2) **[Figure 20-41-48]**.

Installation: Tighten the screws to 90-100 in.-lbs. (10-11,3 Nm) torque.

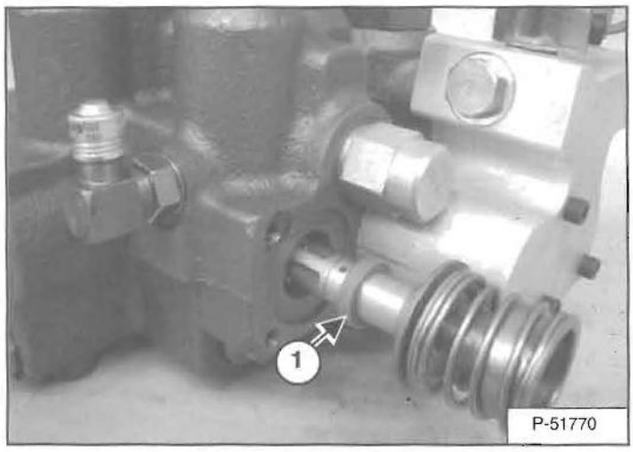
Figure 20-41-49



Remove the end cap block (Item 1) **[Figure 20-41-49]** from the control valve.

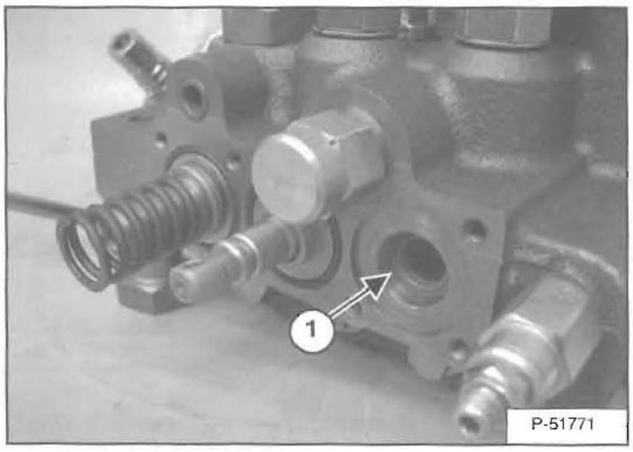
Lift Spool Removal and Installation (Cont'd)

Figure 20-41-54



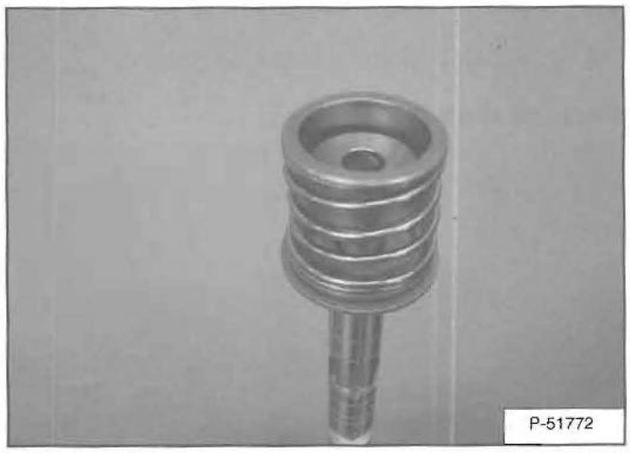
Remove the lift spool assembly and seal (Item 1) **[Figure 20-41-54]** from the control valve.

Figure 20-41-55



Remove the lift spool seal (Item 1) **[Figure 20-41-55]** from the linkage end of the valve.

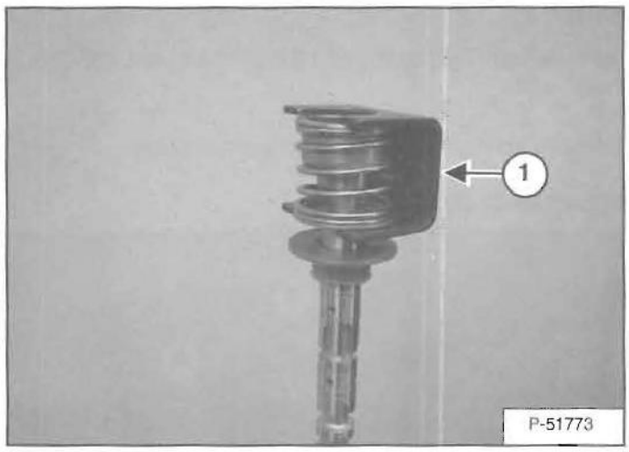
Figure 20-41-56



Clamp the linkage end of the spool in a vise **[Figure 20-41-56]**.

NOTE: Protect spool before clamping in vise.

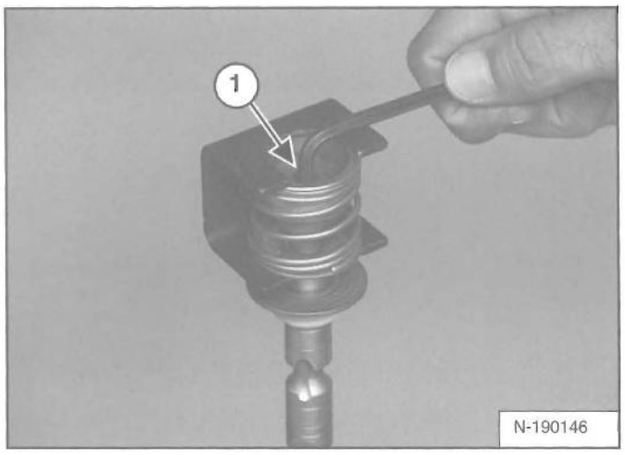
Figure 20-41-57



Install the spring tool (Item 1) **[Figure 20-41-57]** over the centering spring.

Lift Spool Removal and Installation (Cont'd)

Figure 20-41-58

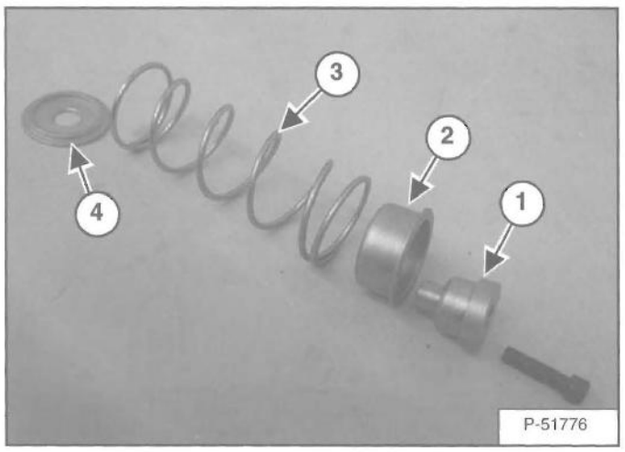


Remove the bolt (Item 1) **[Figure 20-41-58]** holding the centering spring to the spool.

Installation: Tighten the bolt to 90-100 in.-lbs. (10,2-11,3 Nm) torque.

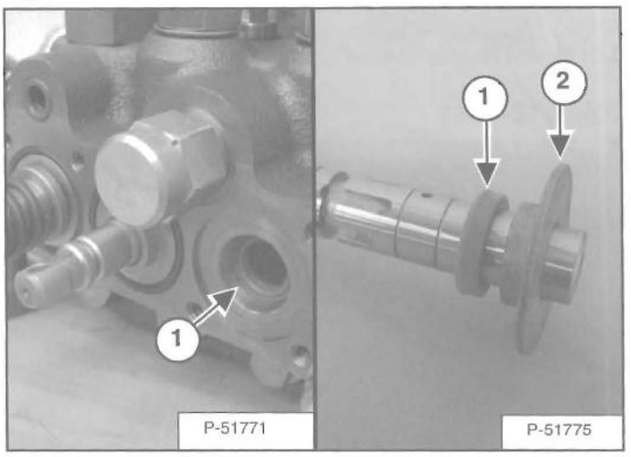
Remove spring tool from the spring assembly.

Figure 20-41-59



Inspect the adapter (Item 1), collar (Item 2), spring (Item 3) and washer (Item 4) **[Figure 20-41-59]**.

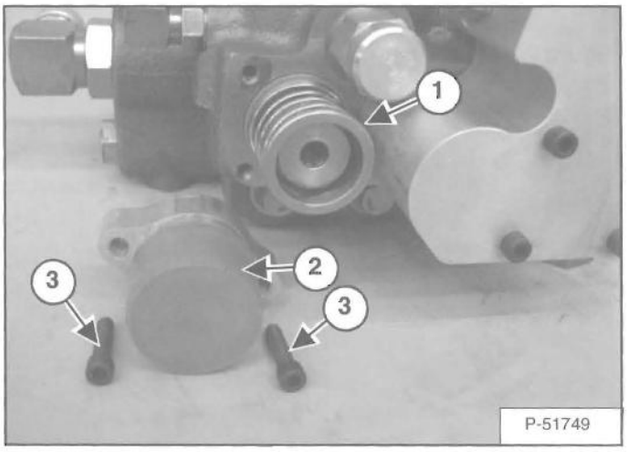
Figure 20-41-60



Remove the spool seal(s) (Item 1) and the back-up washer (Item 2) **[Figure 20-41-60]**.

Assembly: Always use a new spool seal.

Figure 20-41-61



Install the lift spool assembly (Item 1) **[Figure 20-41-61]** in the spool bore.

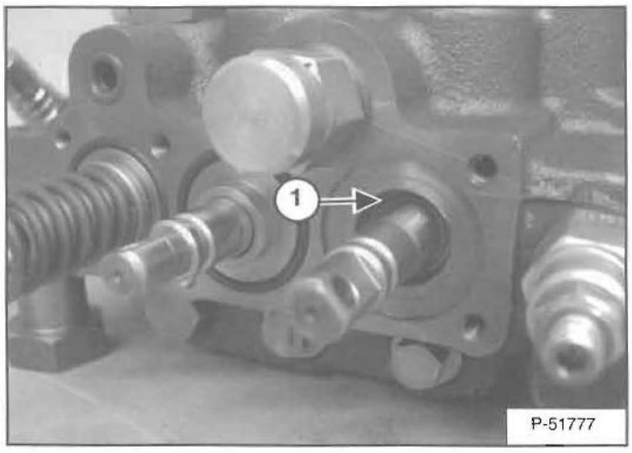
Install the end cap (Item 2) **[Figure 20-41-61]**.

Install the mounting screws (Item 3) **[Figure 20-41-61]**.

Installation: Lubricate the screws and tighten to 90-100 in.-lbs. (11 Nm) torque.

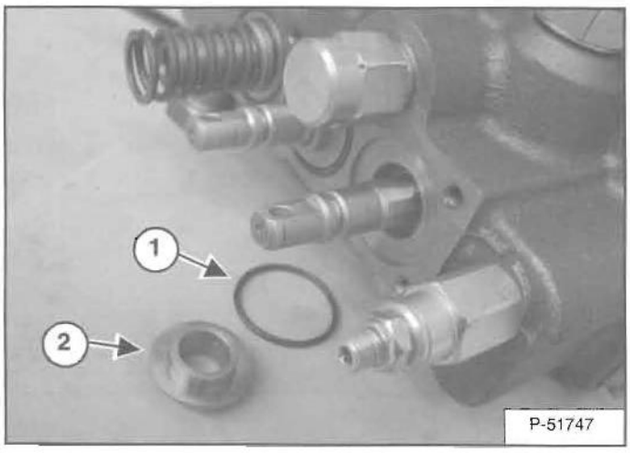
Lift Spool Removal and Installation (Cont'd)

Figure 20-41-62



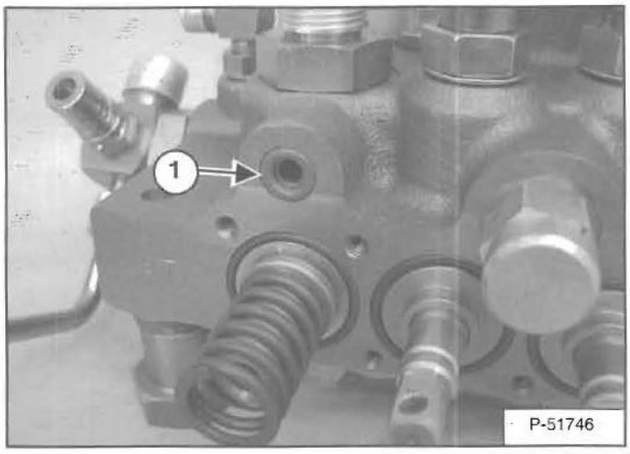
Install the spool seal (Item 1) **[Figure 20-41-62]** on the linkage end of the valve.

Figure 20-41-63



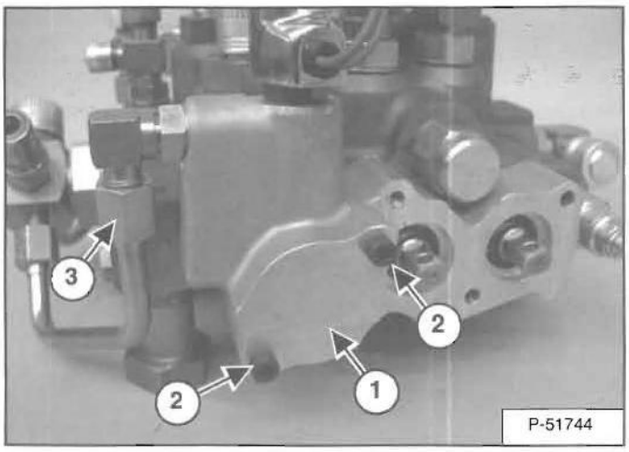
Install the O-ring (Item 1) and bushing (Item 2) **[Figure 20-41-63]** on the lift spool.

Figure 20-41-64



Install the O-ring (Item 1) **[Figure 20-41-64]** on the control valve.

Figure 20-41-65



Install the end cap block (Item 1) and the two mount bolts (Item 2) **[Figure 20-41-65]**.

Installation: Tighten the screws to 90-100 in.-lbs. (11 Nm) torque.

Connect the tube line (Item 3) **[Figure 20-41-65]** to the end cap block.

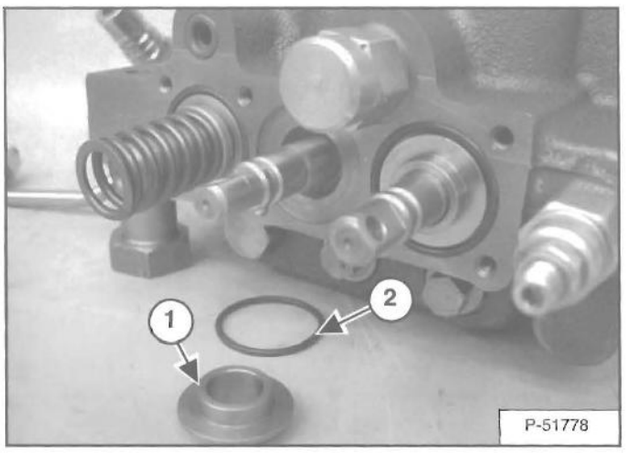
Install the lift and tilt actuators to the control valve.

HYDRAULIC CONTROL VALVE (ADVANCED CONTROL SYSTEM) (ACS) (CONT'D)

Tilt Spool Removal and Installation

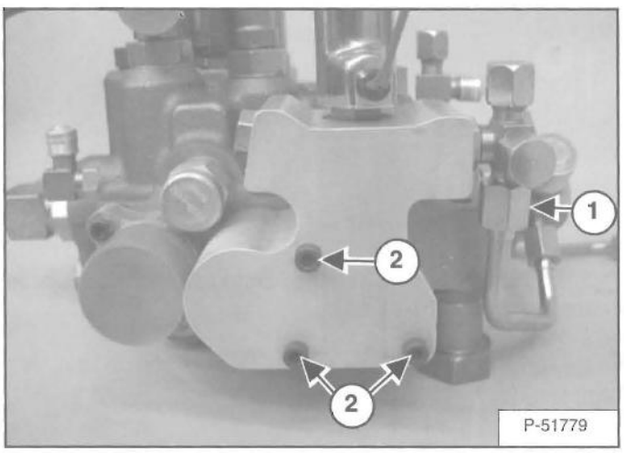
Remove the end cap block. (See End Cap Block Removal and Installation Page 20-41-15.)

Figure 20-41-66



Remove the spacer (Item 1) and O-ring (Item 2) **[Figure 20-41-66]** from the tilt spool.

Figure 20-41-67

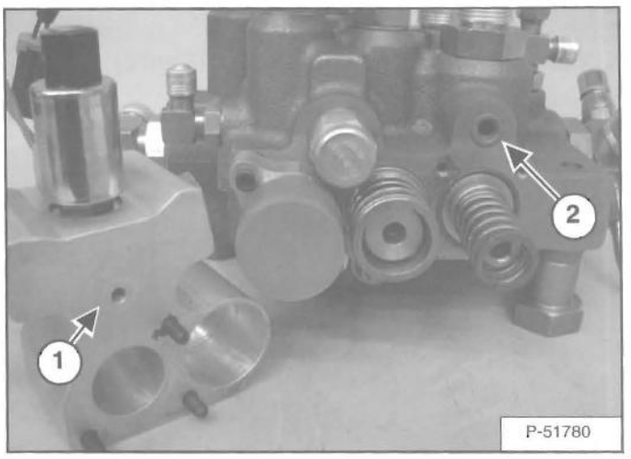


Disconnect the tubeline (Item 1) **[Figure 20-41-67]**.

Remove the three screws (Item 2) **[Figure 20-41-67]** from the spool centering block.

Installation: Tighten the bolt to 90-100 in.-lbs. (10-11,3 Nm) torque.

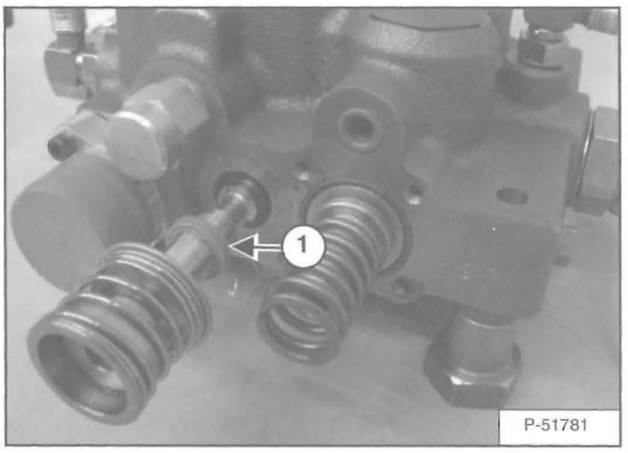
Figure 20-41-68



Remove the spool centering block (Item 1) **[Figure 20-41-68]** from the control valve.

Check and replace the O-ring (Item 2) **[Figure 20-41-68]** before replacing the spool centering block.

Figure 20-41-69

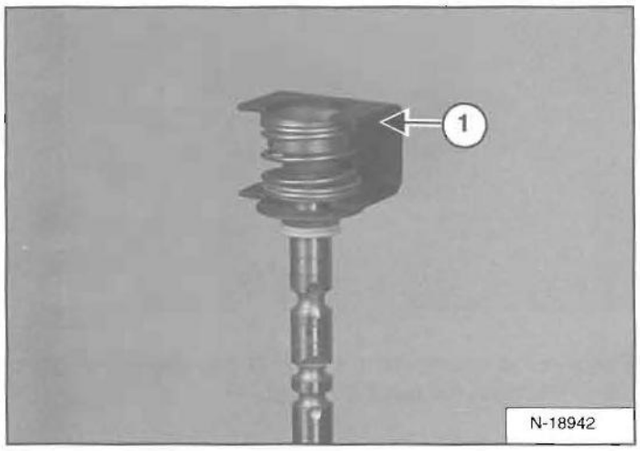


Remove the tilt spool, centering spring, back-up washer and spool seal (Item 1) **[Figure 20-41-69]**.

Assembly: Always use a new spool seal.

Tilt Spool Removal And Installation (Cont'd)

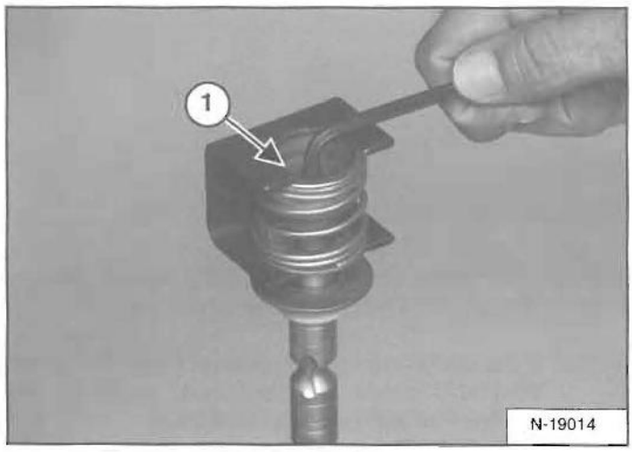
Figure 20-41-70



Put the linkage end of the spool in the vise **[Figure 20-41-70]**.

Install the spring tool (Item 1) **[Figure 20-41-70]** over the centering spring.

Figure 20-41-71

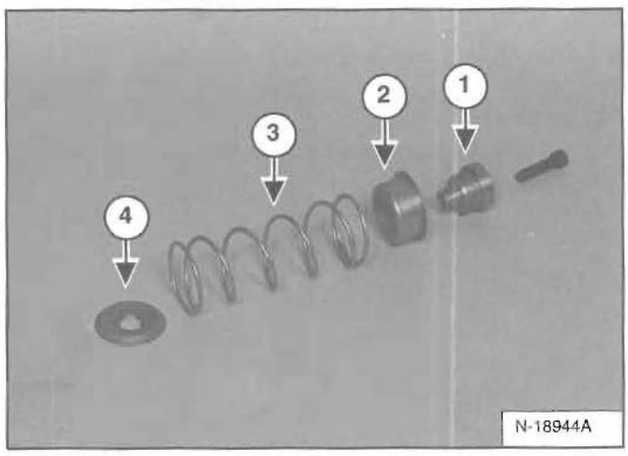


Remove the bolt (Item 1) **[Figure 20-41-71]** holding the centering spring to the spool.

Installation: Tighten the bolt to 90-100 in.-lbs. (10-11,3 Nm) torque.

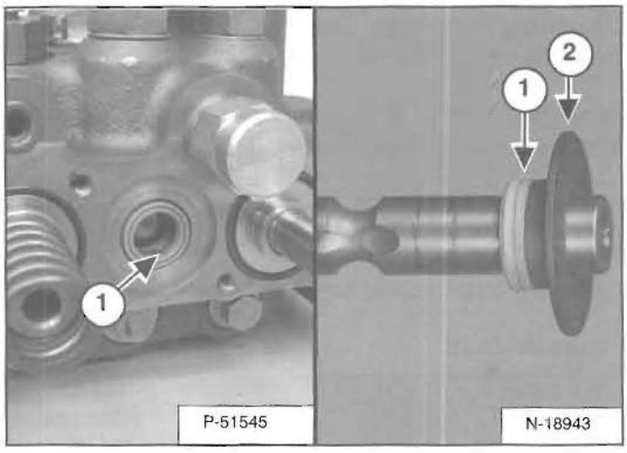
Remove spring tool from the spring assembly.

Figure 20-41-72



Inspect the adapter (Item 1), collar (Item 2), spring (Item 3) and washer (Item 4) **[Figure 20-41-72]**.

Figure 20-41-73

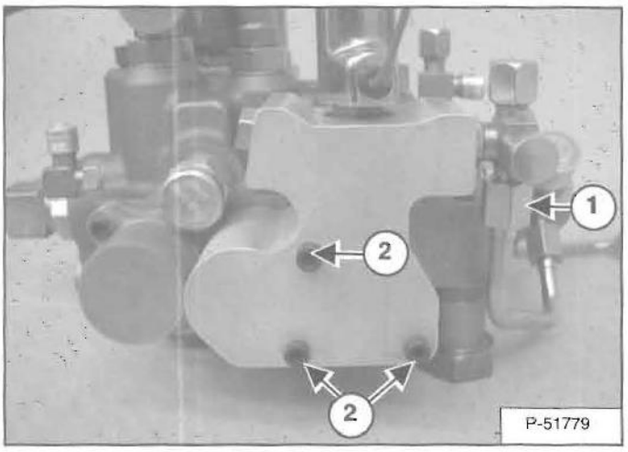


Remove the spool seal(s) (Item 1) and the back-up washer (Item 2) **[Figure 20-41-73]**.

Assembly: Always use a new spool seal.

Auxiliary Spool Removal And Installation

Figure 20-41-74



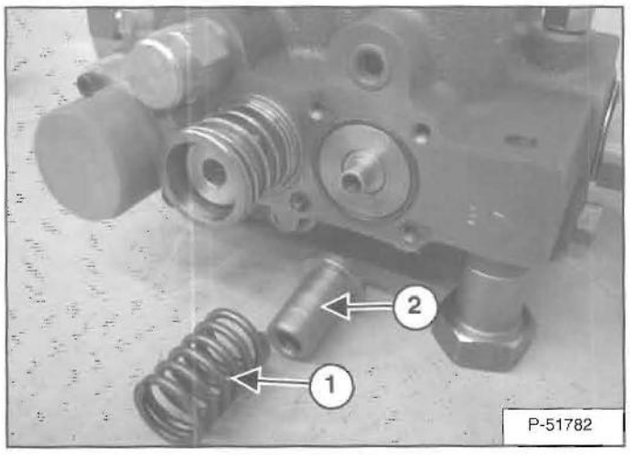
Disconnect the tubeline (Item 1) **[Figure 20-41-74]** from the spool centering block.

Remove the three screws (Item 2) **[Figure 20-41-74]** from the spool centering block.

Installation: Tighten the bolt to 90-100 in.-lbs. (11 Nm) torque.

Remove the spool centering block from the control valve.

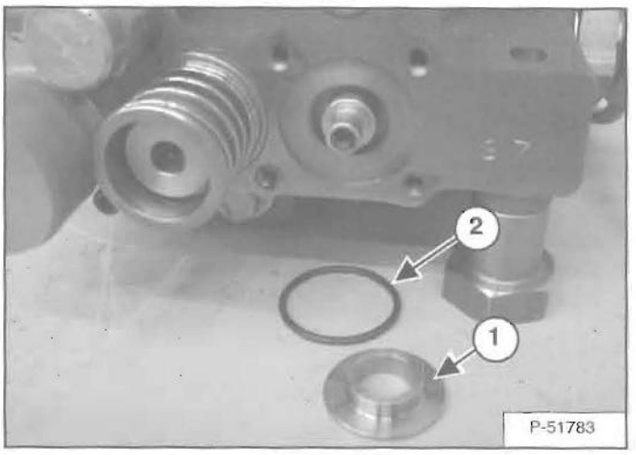
Figure 20-41-75



Remove the spring (Item 1) and center spring retainer (Item 2) **[Figure 20-41-75]** from the auxiliary spool.

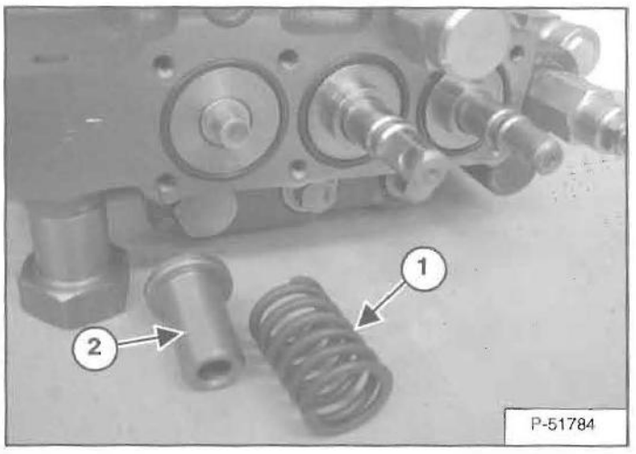
Note: If the centering spring retainer (Item 2) [Figure 20-41-75] must be replaced, replace the retainer on the opposite end also.

Figure 20-41-76



Remove the spacer (Item 1) and O-ring (Item 2) **[Figure 20-41-76]** from the auxiliary spool.

Figure 20-41-77

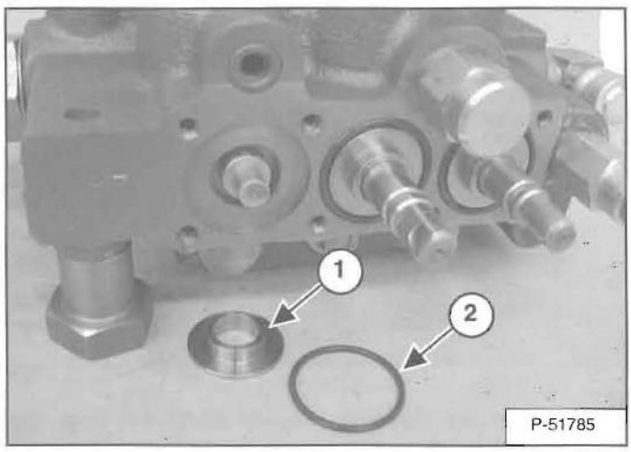


Remove the spring (Item 1) and center spring retainer (Item 2) **[Figure 20-41-77]** from the auxiliary spool.

NOTE: If the centering spring retainer (Item 2) [Figure 20-41-77] must be replaced, replace the retainer on the opposite end also.

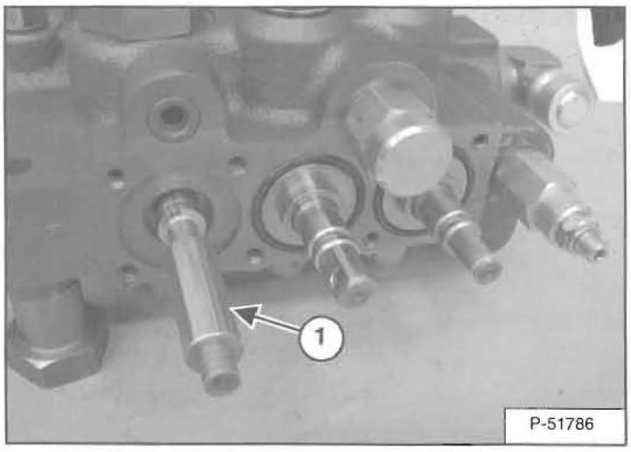
Auxiliary Spool Removal And Installation (Cont'd)

Figure 20-41-78



Remove the spacer (Item 1) and O-ring (Item 2) **[Figure 20-41-78]** from the auxiliary spool.

Figure 20-41-79



Remove the auxiliary spool (Item 1) **[Figure 20-41-79]**.

Auxiliary Solenoid Disassembly and Assembly

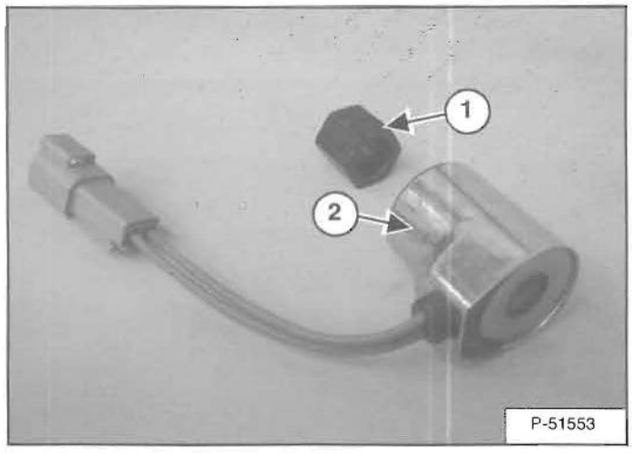
Figure 20-41-80



Remove the nut (Item 1) **[Figure 20-41-80]** from both solenoids.

Installation: Tighten the nut to 48-72 in.-lbs. (5-8 Nm) torque.

Figure 20-41-81



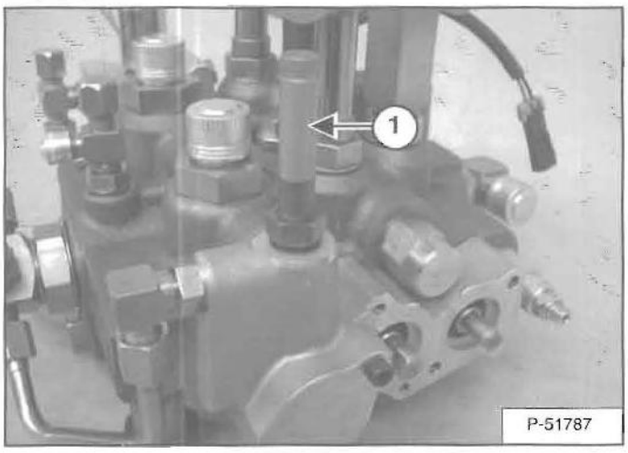
Remove the nut (Item 1) and solenoid coil (Item 2) **[Figure 20-41-81]**.

Use an Ohm meter to measure the solenoid coil resistance.

The correct resistance for the coil is **4.9 ± .25 Ohms**.

Auxiliary Solenoid Disassembly and Assembly (Cont'd)

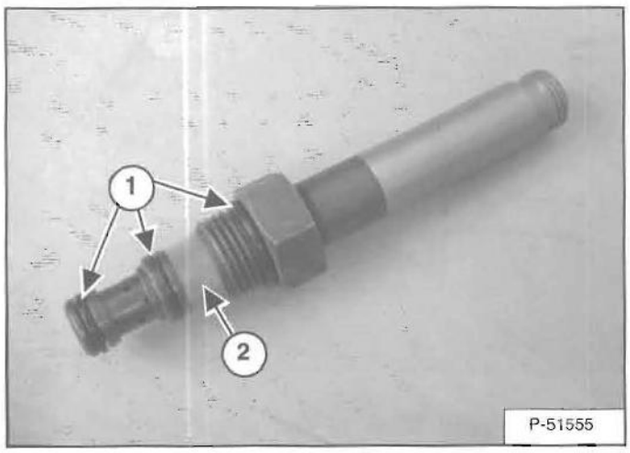
Figure 20-41-82



Remove the solenoid stem (Item 1) **[Figure 20-41-82]**.

Installation: Tighten the stem to 10-14 ft.-lbs. (14-19 Nm) torque.

Figure 20-41-83

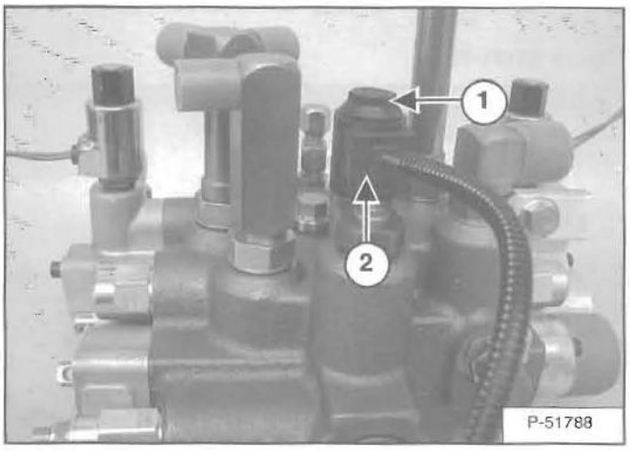


Remove the O-rings (Item 1) **[Figure 20-41-83]** from the solenoid stem.

Check and clean the screen (Item 2) **[Figure 20-41-83]**.

BICS™ Valve Solenoid Disassembly And Assembly

Figure 20-41-84

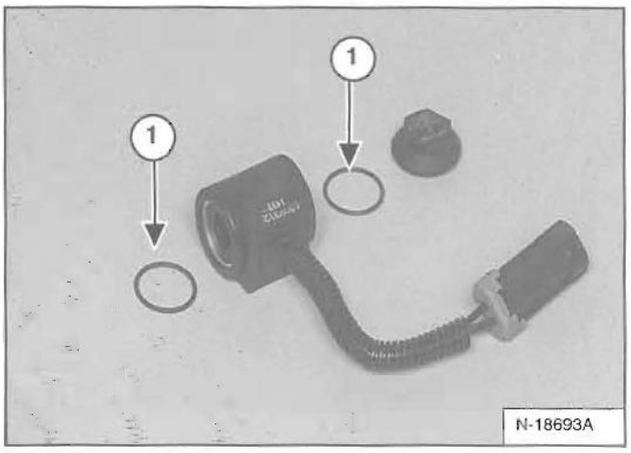


Remove the nut (Item 1) **[Figure 20-41-84]** from the solenoid stem.

Installation: Tighten the nut to 53 in.-lbs. (6 Nm) torque.

Remove the solenoid coil (Item 2) **[Figure 20-41-84]**.

Figure 20-41-85



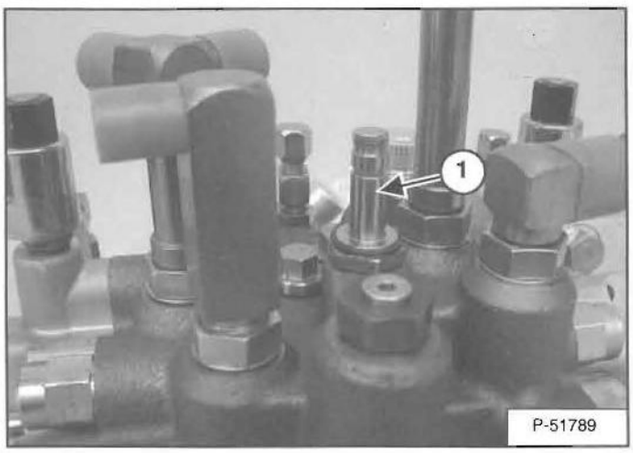
Remove the O-rings (Item 1) **[Figure 20-41-85]** from both ends of the solenoid coil.

Use an Ohm meter to measure the solenoid coil resistance.

The correct resistance for the coil is **9.79 ± .29 Ohms**.

BICS™ Valve Solenoid Disassembly And Assembly (Cont'd)

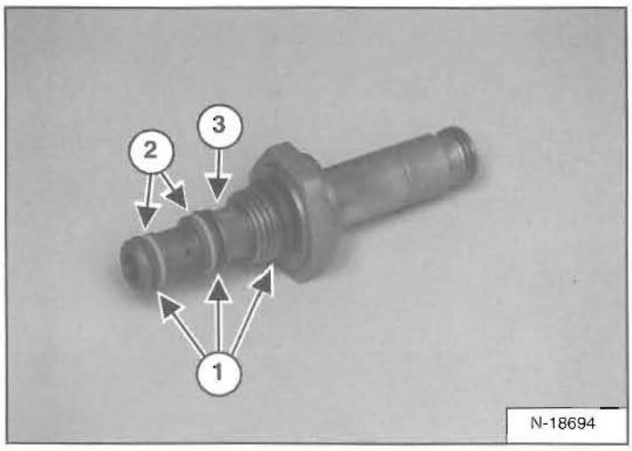
Figure 20-41-86



Remove the solenoid stem (Item 1) **[Figure 20-41-86]**.

Installation: Lubricate the O-rings and tighten the stem to 20-24 ft.-lbs. (27-33 Nm) torque.

Figure 20-41-87



Remove the O-rings (Item 1) and back-up rings (Item 2) **[Figure 20-41-87]** from the stem.

Clean all parts in solvent and dry with compressed air.

Inspect all parts for wear and replace any showing excessive wear.

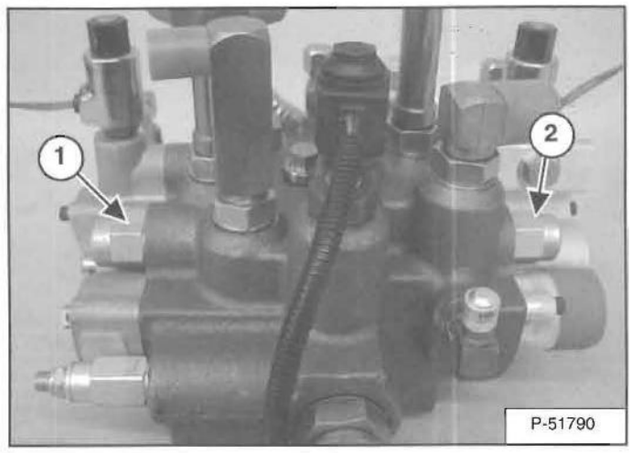
NOTE: The screen (Item 3) [Figure 20-41-87] may be cleaned with solvent. If it is torn or worn it needs to be replaced.

Use only new O-rings and apply oil to all O-rings and back-up rings before installation.

Install new O-rings (Item 1) **[Figure 20-41-85]** & **[Figure 20-41-87]** and new back-up rings (Item 2) **[Figure 20-41-87]** on the solenoid stem.

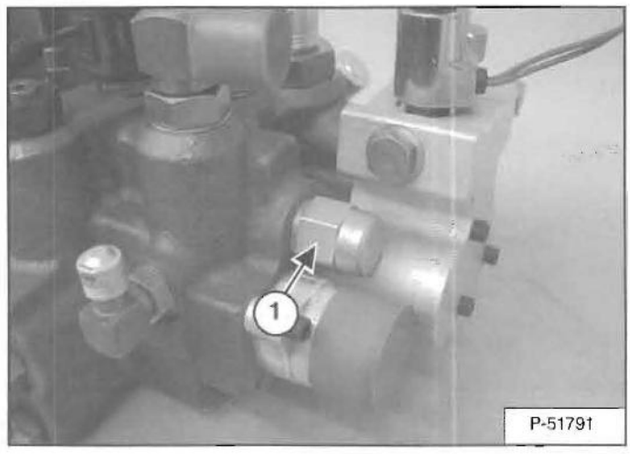
BICS™ Valve, Lock Valve Removal And Installation

Figure 20-41-88



Locate the two BICS™ lock valves, (Item 1) is for the tilt circuit and (Item 2) **[Figure 20-41-88]** is for the lift circuit.

Figure 20-41-89

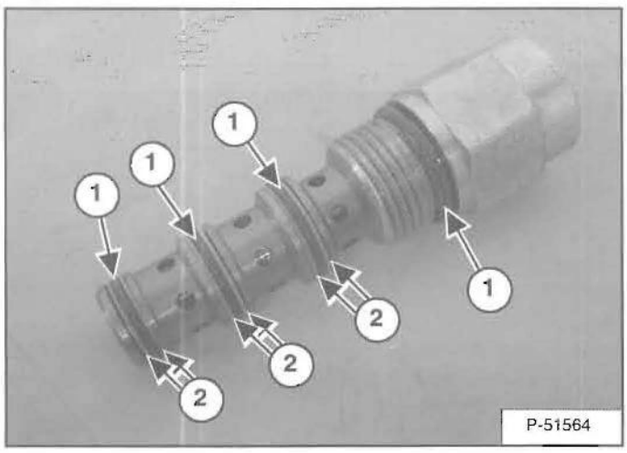


Remove the lift lock valve (Item 1) **[Figure 20-41-89]** from the back of the control valve.

Installation: Lightly lubricate the lock valve O-rings and tighten to 20-24 ft.-lbs. (27-33 Nm) torque.

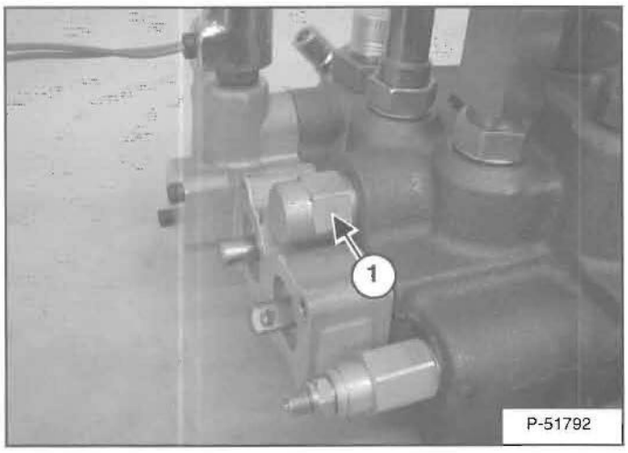
BICS™ Valve, Lock Valve Removal And Installation (Cont'd)

Figure 20-41-90



Remove the O-rings (Item 1) and back-up rings (Item 2) **[Figure 20-41-90]** from the lift lock valve, and replace with new.

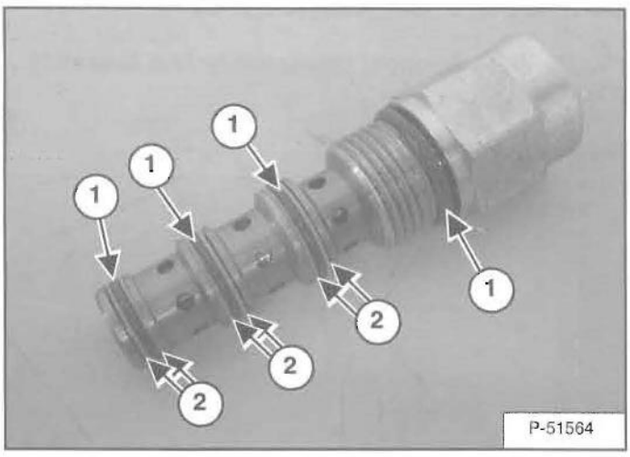
Figure 20-41-91



Remove the tilt lock valve (Item 1) **[Figure 20-41-91]** from the back of the control valve.

Installation: Lightly lubricate the lock valve O-rings and tighten to 20-24 ft.-lbs. (27-33 Nm) torque.

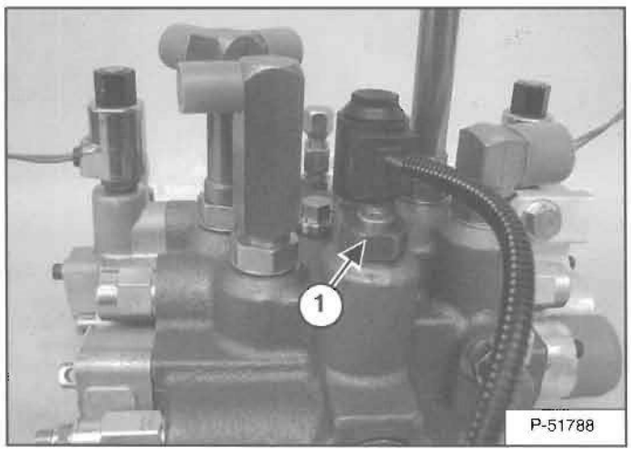
Figure 20-41-92



Remove the O-rings (Item 1) and back-up rings (Item 2) **[Figure 20-41-92]** from the tilt lock valve, and replace with new.

BICS™ Valve, Check Valve Removal And Installation

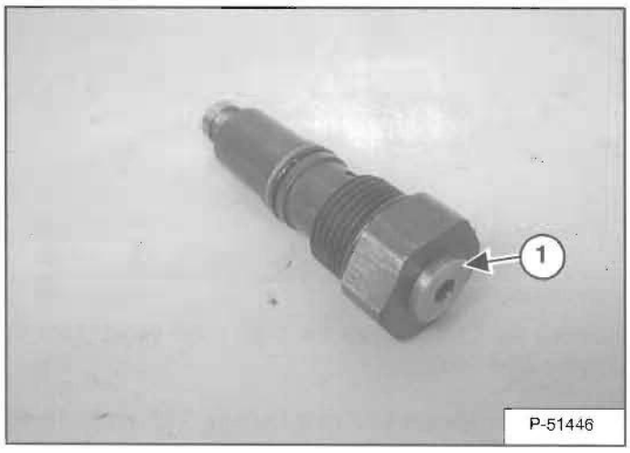
Figure 20-41-93



Remove the BICS™ valve (Item 1) **[Figure 20-41-93]**.

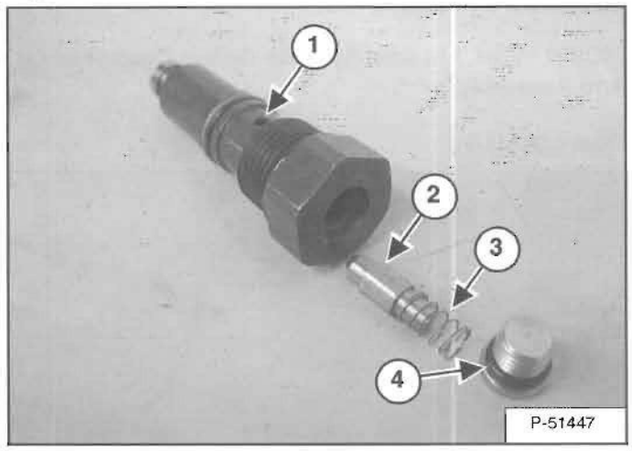
Installation: Lubricate the o-ring and tighten the valve to 55-65 ft.-lbs. (75-88 Nm) torque.

Figure 20-41-94



Remove the plug (Item 1) **[Figure 20-41-94]** from the top of the BICS™ valve.

Figure 20-41-95



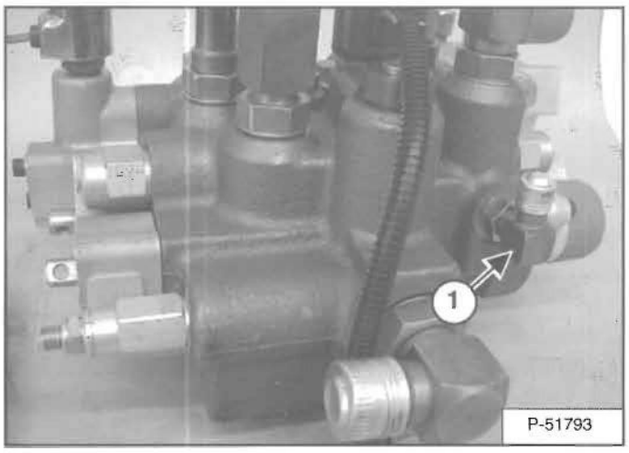
Check that there is no blockage in the orifice (Item 1) **[Figure 20-41-95]**.

Inspect the check valve (Item 2) and spring (Item 3) **[Figure 20-41-95]**.

Replace the O-ring (Item 4) **[Figure 20-41-95]** on the plug before installation.

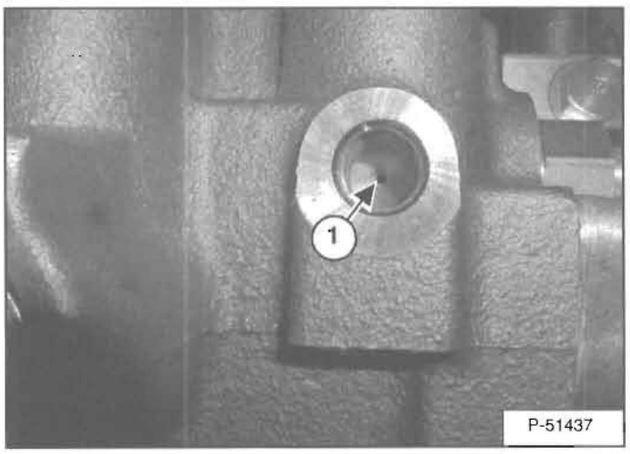
BICS™ Valve, Lift Arm By-Pass Orifice Disassembly And Assembly

Figure 20-41-96



Remove the fitting (Item 1) **[Figure 20-41-96]** from the valve.

Figure 20-41-97

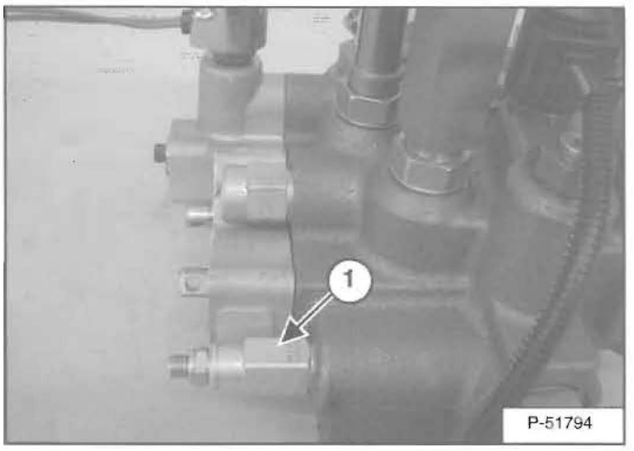


Check the lift arm by-pass orifice (Item 1) **[Figure 20-41-97]**.

NOTE: This orifice is not removable from the valve casting.

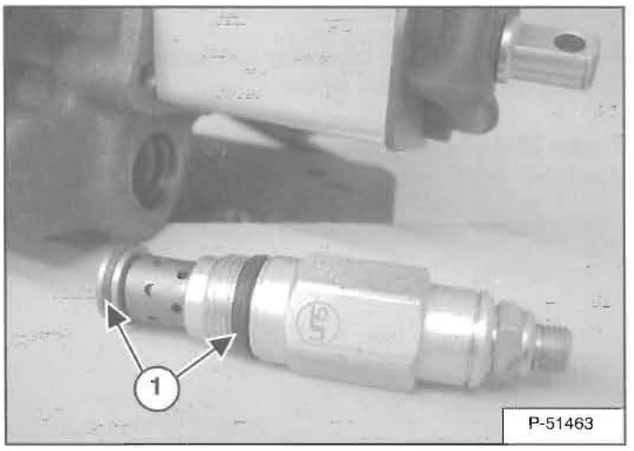
Main Relief Valve

Figure 20-41-98



Remove the main relief valve (Item 1) **[Figure 20-41-98]**.

Figure 20-41-99



Remove the O-rings from the main relief valve (Item 1) **[Figure 20-41-99]**.

Installation: Always use new O-rings. Tighten to 38-45 ft.-lbs. (52-61 Nm) torque.

LIFT ARM BY-PASS CONTROL VALVE

Inspecting

⚠ WARNING

Never work on a machine with the lift arms up unless the lift arms are secured by an approved lift arm support device. Failure to use an approved lift arm support device can allow the lift arms or attachment to fall and cause injury or death.

W-2059-0598

Raise the lift arms 6 feet (2 m) off the ground. Stop the engine. Turn the Lift Arm By-Pass Control Knob clockwise 1/4 turn. Then pull up and hold the Lift Arm By-Pass Control Knob while the lift arms slowly lower.

Removal And Installation

Install jackstands under the rear corners of the loader.

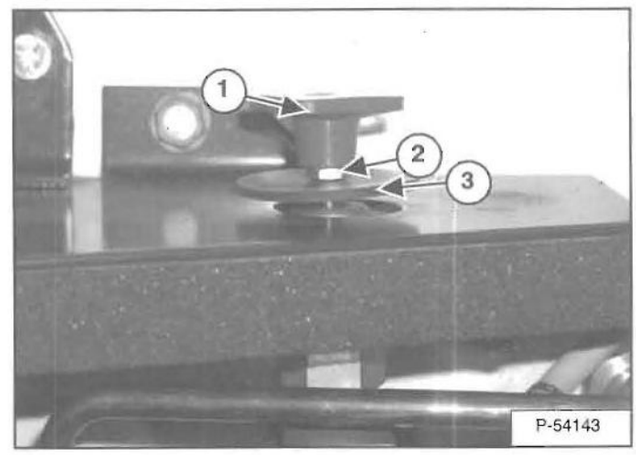
Raise the lift arms and install an approved lift arm support device. (See Contents Page 10-01.)



Raise the operator cab. (See Contents Page 10-01.)

The lift arm by-pass valve is located under the right side of the control panel.

Figure 20-50-1

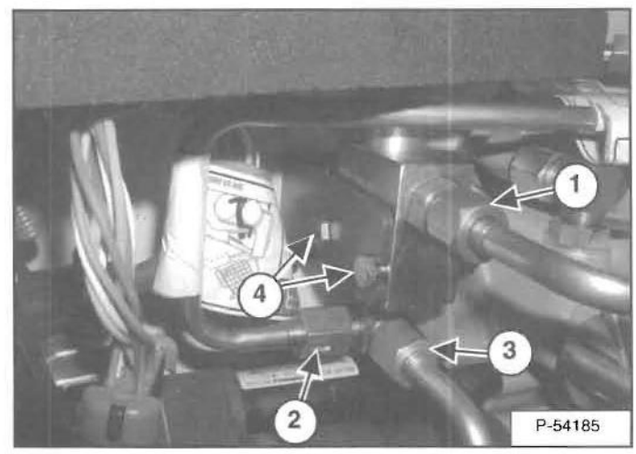


Hold the by-pass control knob (Item 1) and loosen the jam nut (Item 2) on the by-pass valve shaft **[Figure 20-50-1]**.

Remove the by-pass control knob and jam nut from the valve shaft.

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

Figure 20-50-2



Disconnect the two tubelines (Item 1) & (Item 2) **[Figure 20-50-2]** from the lift arm by-pass valve.

Disconnect the case drain hose (Item 3) **[Figure 20-50-2]**

Cap or plug all open hydraulic connections.

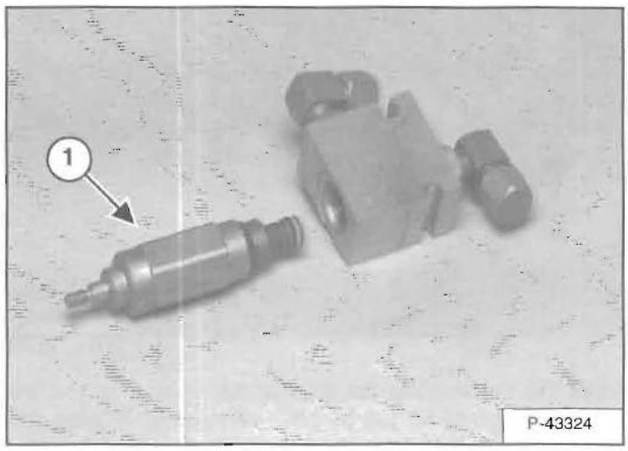
Remove the two mounting bolts (Item 4) **[Figure 20-50-2]**.

Installation: Tighten the mounting bolts to 180-200 in.-lbs. (21-23 Nm) torque.

Remove the lift arm by-pass valve.

Disassembly And Assembly

Figure 20-50-3



Remove the by-pass valve (Item 1) **[Figure 20-50-3]** from the valve block. Inspect the by-pass valve for damage and replace if necessary.

Installation: Tighten the valve to 33-37 ft.-lbs. (45-50 Nm) torque.

Inspect the hydraulic fittings on the valve block for damage and replace if necessary.

Check The Output Of The Hydraulic Pump Without Rear Auxiliary

⚠ 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

⚠ WARNING

Never work on a machine with the lift arms up unless the lift arms are secured by an approved lift arm support device. Failure to use an approved lift arm support device can allow the lift arms or attachment to fall and cause injury or death.

W-2059-0598

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

MEL1563 - Remote Start Tool
MEL10103 - Hydraulic Tester
MEL10106 - Hydraulic Test Kit

Lift and block the loader. (See Contents Page 10-01.)

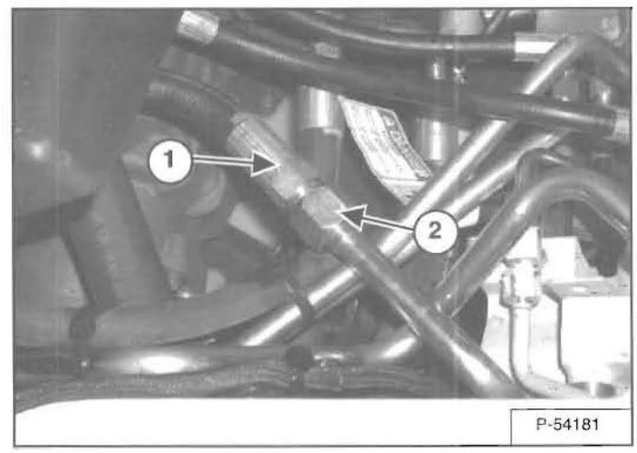
Raise the lift arms and install an approved lift arm support device. (See Contents Page 10-01.)

Raise the operator cab. (See Contents Page 10-01.)

Open the rear door of the loader.

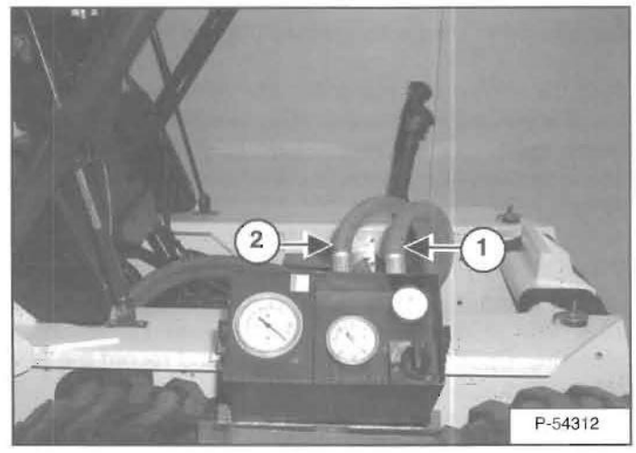
Connect the remote start tool. (See Contents Page 10-01.)

Figure 20-60-1



Disconnect the gear pump OUTLET hose (Item 1) from the control valve inlet tubeline (Item 2) **[Figure 20-60-1]**.

Figure 20-60-2



Place the hydraulic tester as shown in **[Figure 20-60-2]**.

Connect the INLET hose (Item 1) **[Figure 20-60-2]** from the tester to the OUTLET hose (Item 1) **[Figure 20-60-1]** of the pump. Connect the OUTLET hose (Item 2) **[Figure 20-60-2]** from the tester to the hose (Item 2) **[Figure 20-60-1]** which was disconnected from the pump.

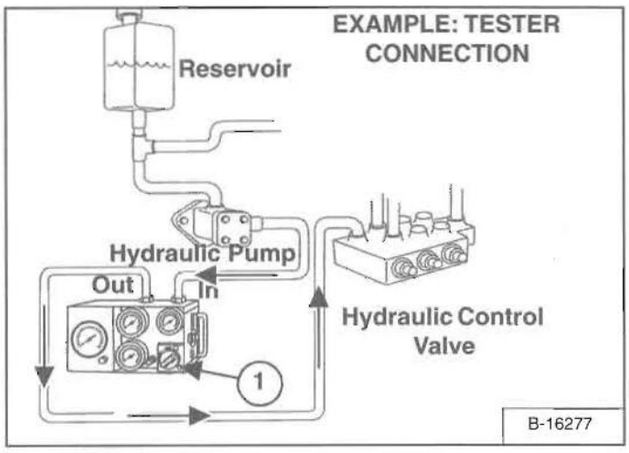
IMPORTANT

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

I-2024-0284

Check The Output Of The Hydraulic Pump Without Rear Auxiliary (Cont'd)

Figure 20-60-3



Sample tester connection shown **[Figure 20-60-3]**.

Start the engine and run at low idle RPM. 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 full RPM*.

Warm the fluid to 140°F. (60°C.) by turning the restrictor control (Item 1) **[Figure 20-60-3]** on the tester to about 1000 PSI (6895 kPa). DO NOT exceed system relief pressure. Open the restrictor control and record the free flow (GPM) at full RPM.

Turn the restrictor control (Item 1) **[Figure 20-60-3]** on the tester to the system relief pressure.

NOTE: Do not exceed system relief pressure, damage to the hydraulic system may occur if pressure is exceeded.

Record the flow (GPM) at system relief pressure. The high pressure flow must be at least 80% of free flow.

$$\%= \frac{\text{HIGH PRESSURE FLOW (GPM)}}{\text{FREE FLOW (GPM)}} \times 100$$

A low percentage may indicate a failed pump.

*Refer to *SPECIFICATIONS* Section SPEC-01 for system relief pressure and full RPM.

HYDRAULIC PUMP (CONT'D)

Check The Output Of The Hydraulic Pump With Rear Auxiliary

⚠ 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

⚠ WARNING

Never work on a machine with the lift arms up unless the lift arms are secured by an approved lift arm support device. Failure to use an approved lift arm support device can allow the lift arms or attachment to fall and cause injury or death.

W-2059-0598

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

MEL1563 - Remote Start Tool
MEL10103 - Hydraulic Tester
MEL10106 - Hydraulic Test Kit

Lift and block the loader. (See Contents Page 10-01.)

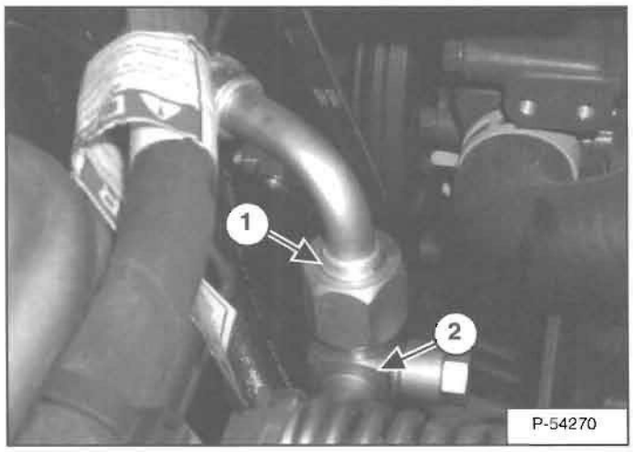
Raise the lift arms and install an approved lift arm support device. (See Contents Page 10-01.)

Raise the operator cab. (See Contents Page 10-01.)

Open the rear door of the loader.

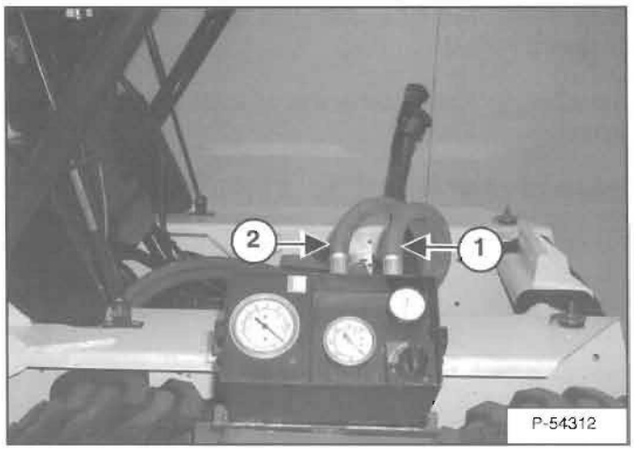
Connect the remote start tool. (See Contents Page 10-01.)

Figure 20-60-4



Disconnect the rear auxiliary inlet hose (Item 1) from the gear pump OUTLET fitting (Item 2) **[Figure 20-60-4]**.

Figure 20-60-5



Place the hydraulic tester as shown in **[Figure 20-60-5]**.

Connect the INLET hose (Item 1) **[Figure 20-60-5]** from the tester to the OUTLET fitting (Item 2) **[Figure 20-60-4]** of the pump. Connect the OUTLET hose (Item 2) **[Figure 20-60-5]** from the tester to the hose (Item 1) **[Figure 20-60-4]** which was disconnected from the pump.

IMPORTANT

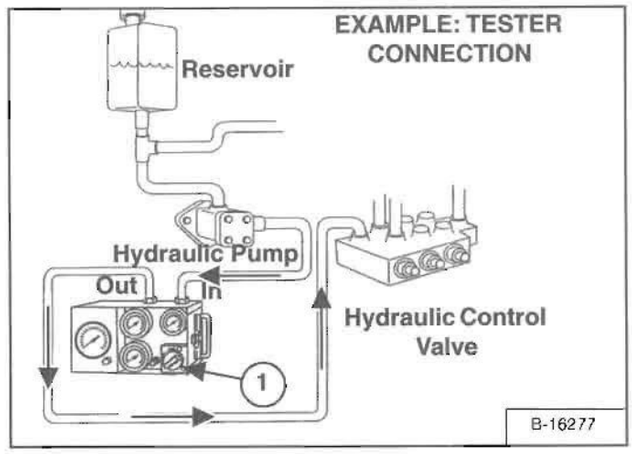
The hydraulic tester must be in the fully open position before you start the engine.

I-2024-0284

HYDRAULIC PUMP (CONT'D)

Check The Output Of The Hydraulic Pump With Rear Auxiliary (Cont'd)

Figure 20-60-6



Sample tester connection shown **[Figure 20-60-6]**.

Start the engine and run at low idle RPM. 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 full RPM*.

Warm the fluid to 140°F. (60°C.) by turning the restrictor control (Item 1) **[Figure 20-60-6]** on the tester to about 1000 PSI (6895 kPa). DO NOT exceed system relief pressure. Open the restrictor control and record the free flow (GPM) at full RPM.

Turn the restrictor control (Item 1) **[Figure 20-60-6]** on the tester to the system relief pressure.

NOTE: Do not exceed system relief pressure, damage to the hydraulic system may occur if pressure is exceeded.

Record the flow (GPM) at system relief pressure. The high pressure flow must be at least 80% of free flow.

$$\% = \frac{\text{HIGH PRESSURE FLOW (GPM)}}{\text{FREE FLOW (GPM)}} \times 100$$

A low percentage may indicate a failed pump.

*Refer to *SPECIFICATIONS* Section SPEC-01 for system relief pressure and full RPM.

Removal And Installation

⚠ DANGER

AVOID DEATH

- Disconnecting or loosening any hydraulic tubeline, hose, fitting, component or a part failure can cause lift arms to drop.
- Keep out of this area when lift arms are raised unless supported by an approved lift arm support. Replace if damaged. 57051



⚠ WARNING

Never work on a machine with the lift arms up unless the lift arms are secured by an approved lift arm support device. Failure to use an approved lift arm support device can allow the lift arms or attachment to fall and cause injury or death.

W-2059-0598

Raise the lift arms and install an approved lift arm support device. (See Contents Page 10-01.)

Stop the engine. Raise the seat bar.

Lift and block the loader. (See Contents Page 10-01.)

Raise the operator cab. (See Contents Page 10-01.)

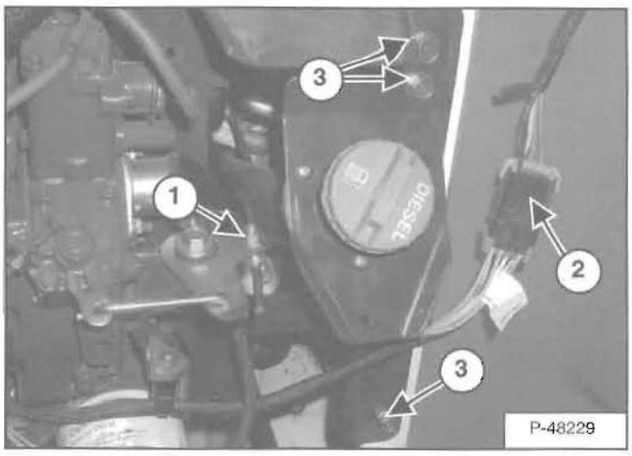
Drain the hydraulic fluid from the reservoir. (See Contents Page 20-01.)

Remove the hydraulic fluid reservoir from the loader. (See Contents Page 20-01.)

Open the rear door of the loader.

Remove the Power Bob-Tach block if so equipped. (See Contents Page 20-01.)

Figure 20-60-7

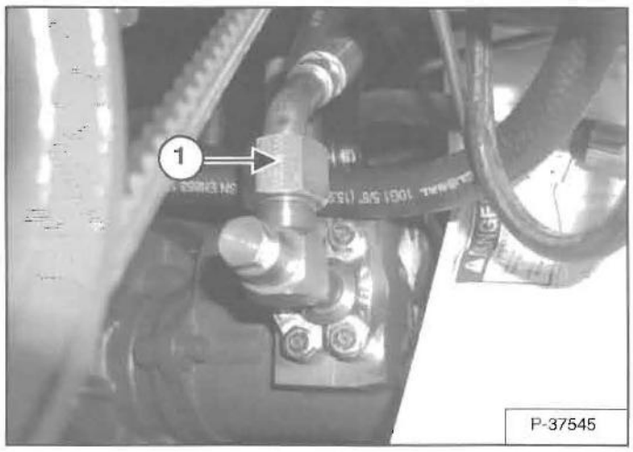


Remove the nut from the speed control linkage (Item 1) and unplug the rear lights electrical connector (Item 2) **[Figure 20-60-7]**.

Remove the fuel fill bracket mounting screws (Item 3) **[Figure 20-60-7]**.

Installation: Tighten screws to 15-20 ft.-lbs. (20-27 Nm) torque.

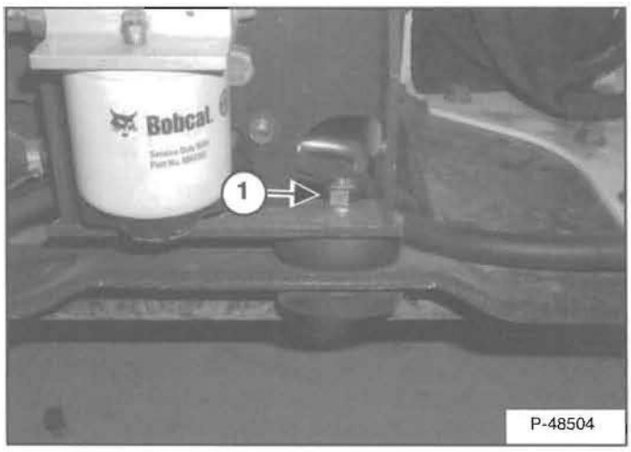
Figure 20-60-8



Disconnect and cap the outlet hose (Item 1) **[Figure 20-60-8]** from the back of the hydraulic pump.

Removal And Installation (Cont'd)

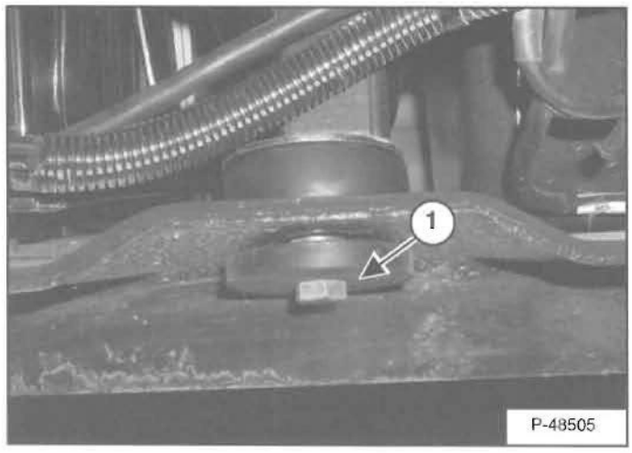
Figure 20-60-9



Remove the right rear engine mount (Item 1) **[Figure 20-60-9]**.

Installation: Tighten the engine mount bolt to 70 ft.-lbs. (95 Nm) torque.

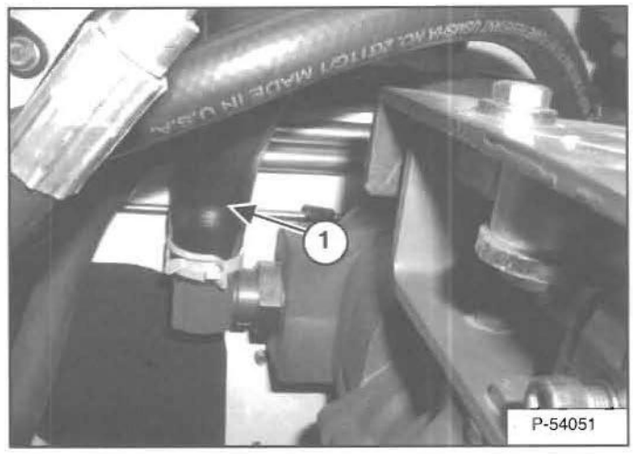
Figure 20-60-10



Remove the left rear engine mount (Item 1) **[Figure 20-60-10]**.

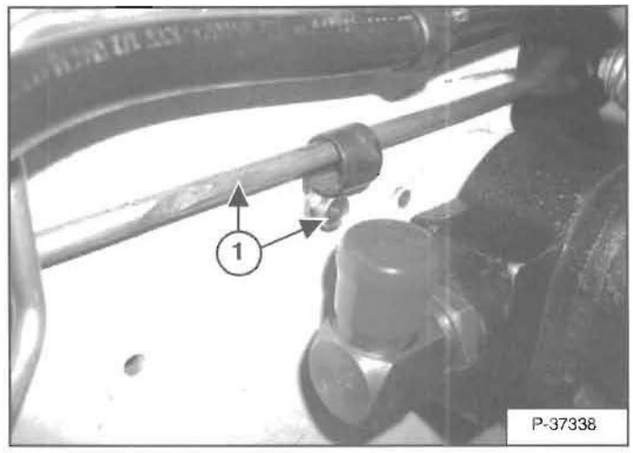
Installation: Tighten the engine mount bolt to 70 ft.-lbs. (95 Nm) torque.

Figure 20-60-11



Remove the inlet hose (Item 1) **[Figure 20-60-11]** from the front of the hydraulic pump.

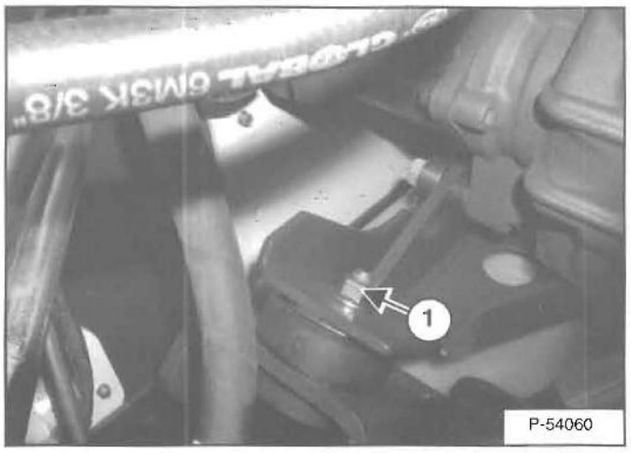
Figure 20-60-12



Remove the engine speed control rod and the rod guide (Item 1) **[Figure 20-60-12]**.

Removal And Installation (Cont'd)

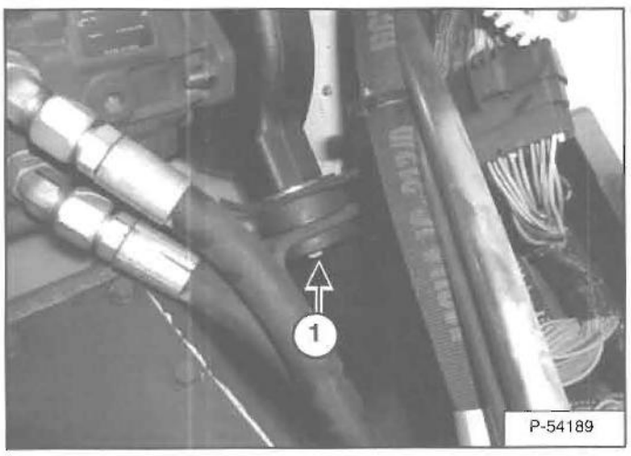
Figure 20-60-13



Remove the right front engine mount (Item 1) **[Figure 20-60-13]**.

Installation: Tighten the engine mount bolt to 70 ft.-lbs. (95 Nm) torque.

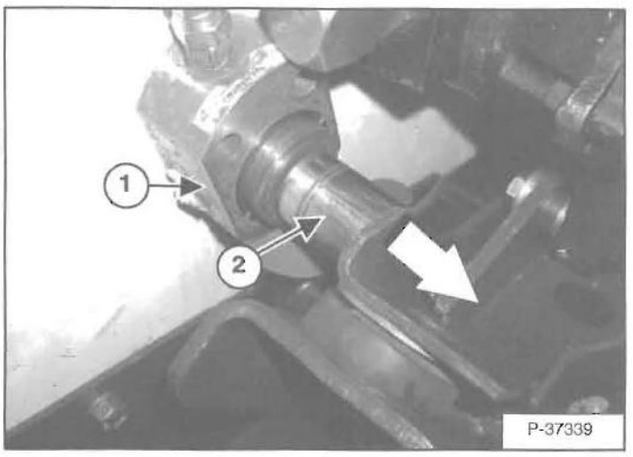
Figure 20-60-14



Loosen the left front engine mount (Item 1) **[Figure 20-60-14]** but do not remove.

Installation: Tighten the engine mount bolt to 70 ft.-lbs. (95 Nm) torque.

Figure 20-60-15

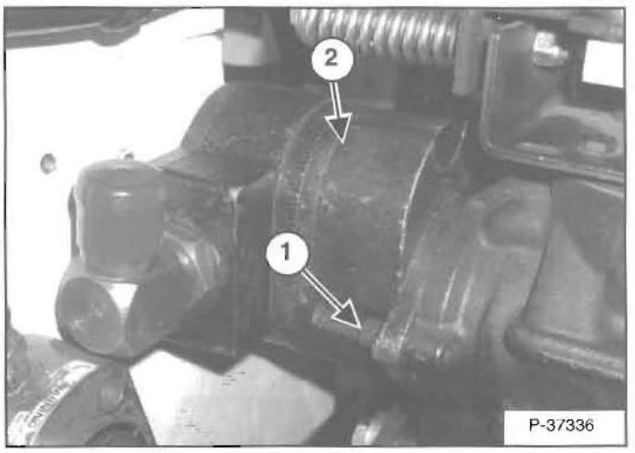


Use a port-a-power (Item 1) **[Figure 20-60-15]** to push the engine/hydrostatic pump assembly away from the mainframe.

NOTE: A shaft (Item 2) [Figure 20-60-15] with the dimensions of 1.5" diameter by 2.125" long will be needed to push the engine/hydrostatic pump assembly.

NOTE: Push the engine/hydrostatic pump assembly only as far as needed to remove the gear pump.

Figure 20-60-16



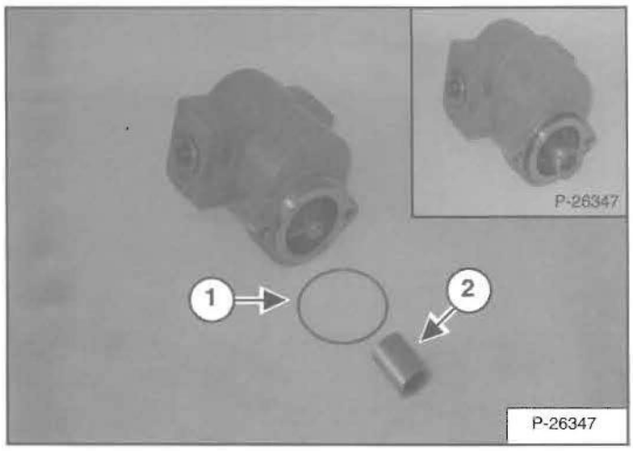
Remove the two mounting bolts (Item 1) **[Figure 20-60-16]** from the hydraulic pump.

Installation: Tighten the mounting bolts to 27-37 ft.-lbs. (37-50 Nm) torque.

Remove the hydraulic pump (Item 2) **[Figure 20-60-16]** from the loader.

Removal And Installation (Cont'd)

Figure 20-60-17



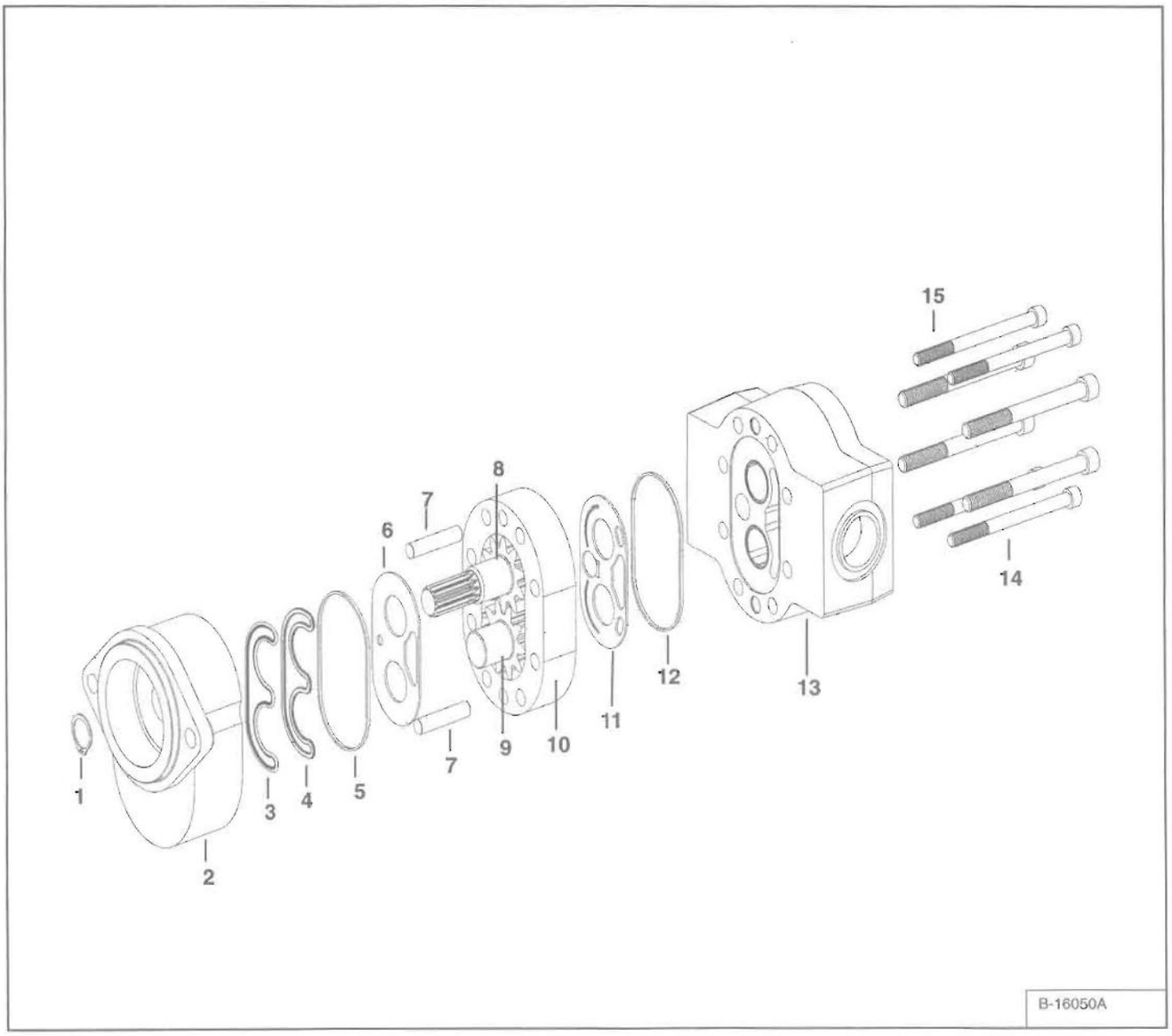
Remove the O-ring (Item 1) **[Figure 20-60-17]**.

Remove the coupler (Item 2) **[Figure 20-60-17]** from the hydraulic pump shaft.

Reverse the removal procedure to install the hydraulic pump.

Installation: Use a new O-ring (Item 1) **[Figure 20-60-17]** when installing the hydraulic pump.

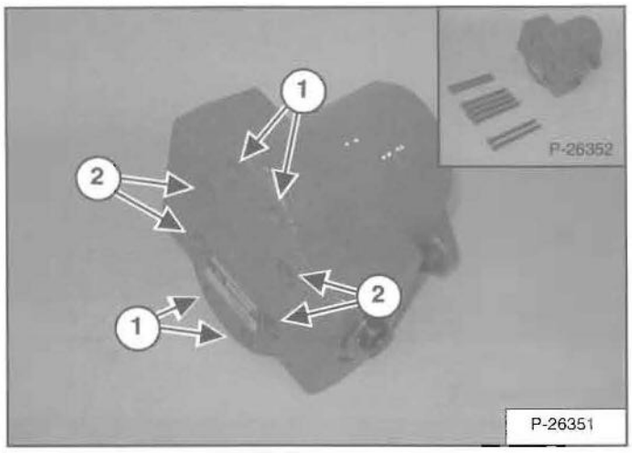
Identification



REF.	DESCRIPTION	REF.	DESCRIPTION
1	RETAINING RING	9	IDLER GEAR
2	PUMP END SECTION	10	PUMP SECTION
3	PRE-LOAD SEAL	11	WEAR PLATE
4	LOAD SEAL	12	SECTION SEAL
5	SECTION SEAL	13	PUMP END SECTION
6	WEAR PLATE	14	BOLT (4)
7	PINS	15	BOLT (4)
8	DRIVE GEAR		

Disassembly And Assembly

Figure 20-60-18



Mark the pump sections for correct assembly **[Figure 20-60-18]**.

Remove the four smaller pump housing bolts (Item 1) **[Figure 20-60-18]**.

Remove the four larger pump housing bolts (Item 2) **[Figure 20-60-18]**.

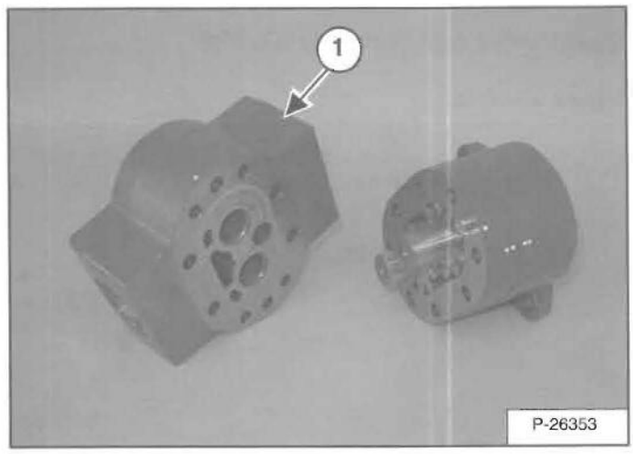
Installation: Tighten the four smaller bolts (Item 1) to 30 ft.-lbs. (40,7 Nm) torque. Tighten the four larger bolts (Item 2) **[Figure 20-60-18]** to 54 ft.-lbs. (73,2 Nm) torque.

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 20-60-19



Remove the pump end section (Item 1) **[Figure 20-60-19]**.

Disassembly And Assembly (Cont'd)

Figure 20-60-20

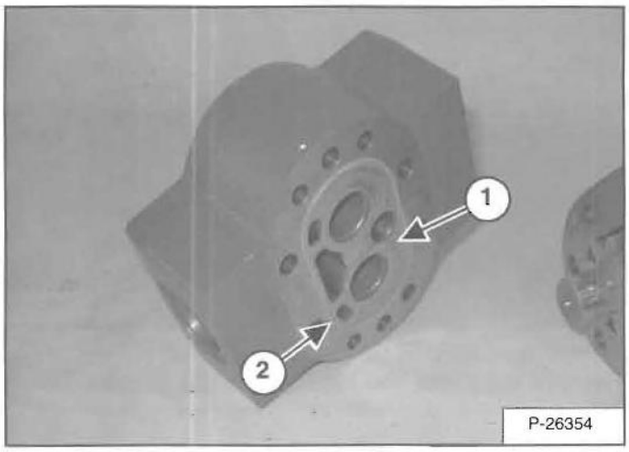
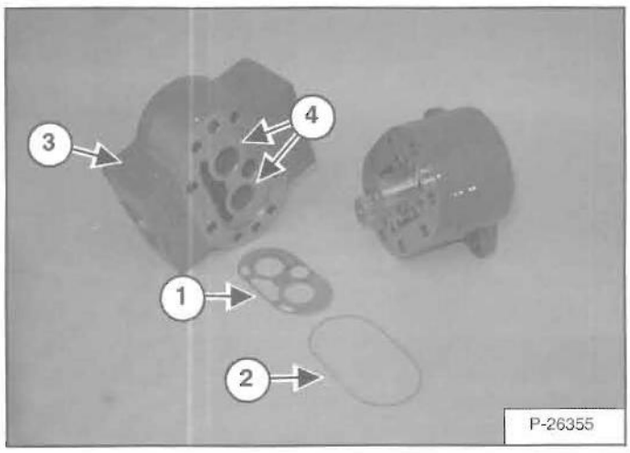


Figure 20-60-21



Remove the wear plate (Item 1) **[Figure 20-60-20]** & **[Figure 20-60-21]** and section seal (Item 2) **[Figure 20-60-20]** & **[Figure 20-60-21]** from the pump end section.

NOTE: Position wear plate (Item 1) [Figure 20-60-21] inlets and traps as shown with bronze side toward gears.

NOTE: Inspect the pump end section (Item 3) and bushings (Item 4) [Figure 20-60-21]. If excessive wear or damage is visible, the pump must be replaced.

Figure 20-60-22

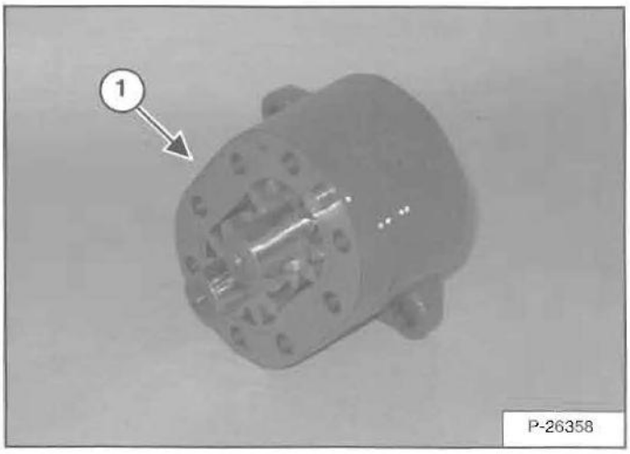
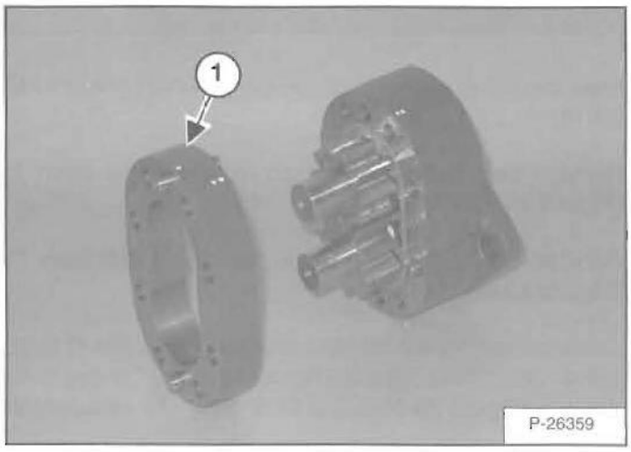


Figure 20-60-23



Remove the pump center section (Item 1) **[Figure 20-60-22]** & **[Figure 20-60-23]** from the pump end section.

NOTE: Inspect the pump center section (Item 1) [Figure 20-60-23]. If excessive wear or damage is visible, the pump must be replaced.

Disassembly And Assembly (Cont'd)

Figure 20-60-24

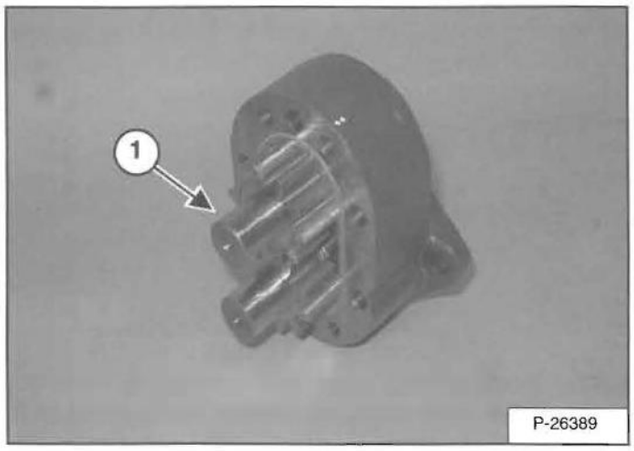
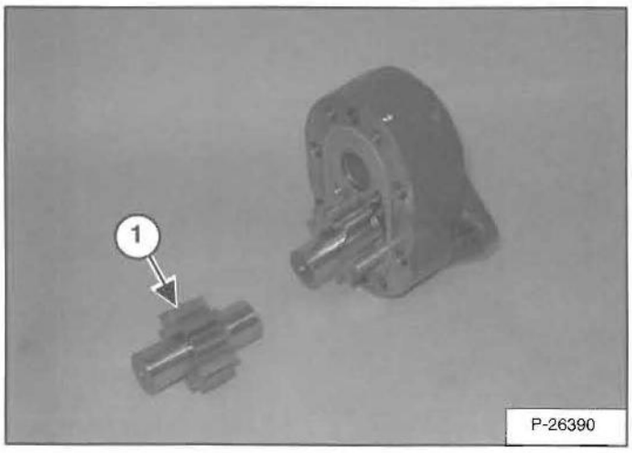


Figure 20-60-25



Remove the idler gear (Item 1) **[Figure 20-60-24]** & **[Figure 20-60-25]**.

NOTE: Inspect the idler gear (Item 1) [Figure 20-60-25]. If excessive wear or damage is visible, the pump must be replaced.

Figure 20-60-26

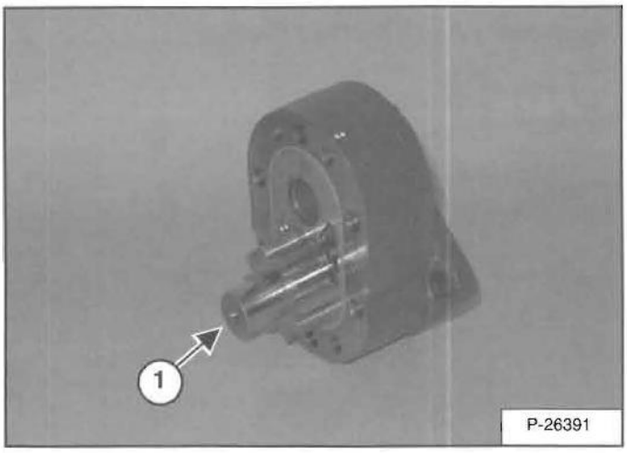
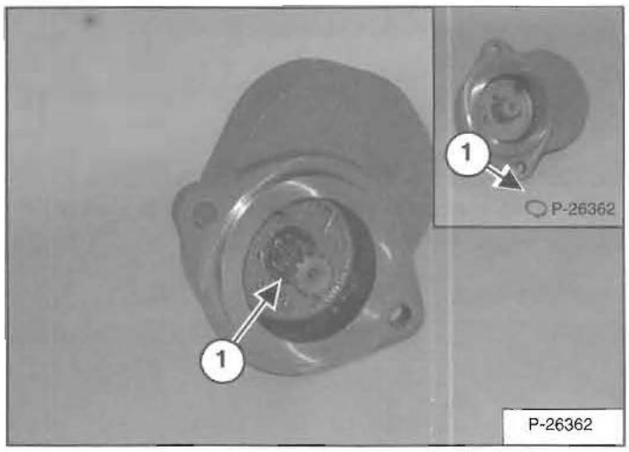


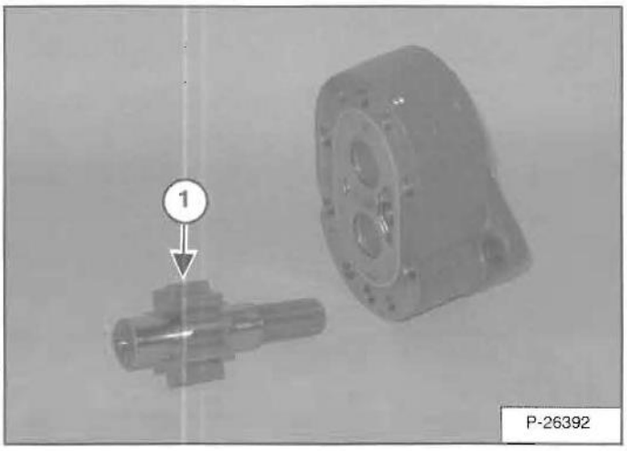
Figure 20-60-27



To remove the drive gear (Item 1) **[Figure 20-60-26]** from the pump end section, locate and remove the retaining ring (Item 1) **[Figure 20-60-27]** from the spline end of the drive gear.

Disassembly And Assembly (Cont'd)

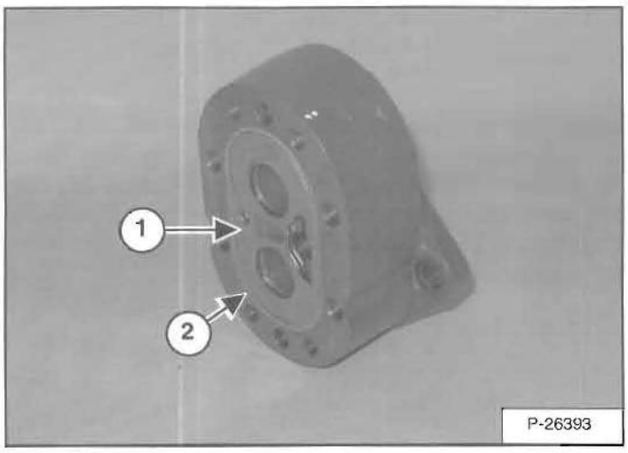
Figure 20-60-28



Remove the drive gear (Item 1) **[Figure 20-60-28]** from the pump end section.

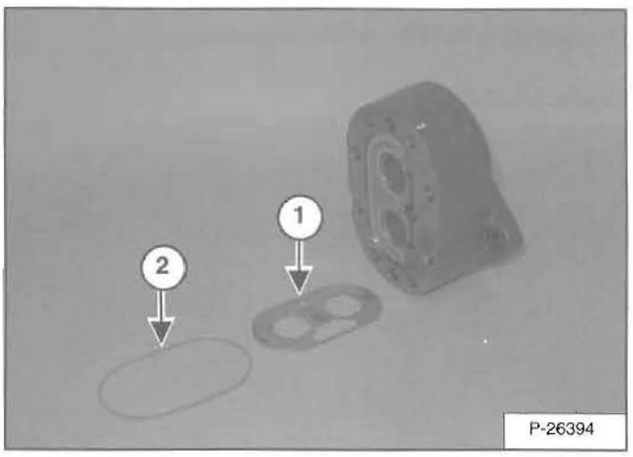
NOTE: Inspect the drive gear (Item 1) [Figure 20-60-28]. If excessive wear or damage is visible, the pump must be replaced.

Figure 20-60-29



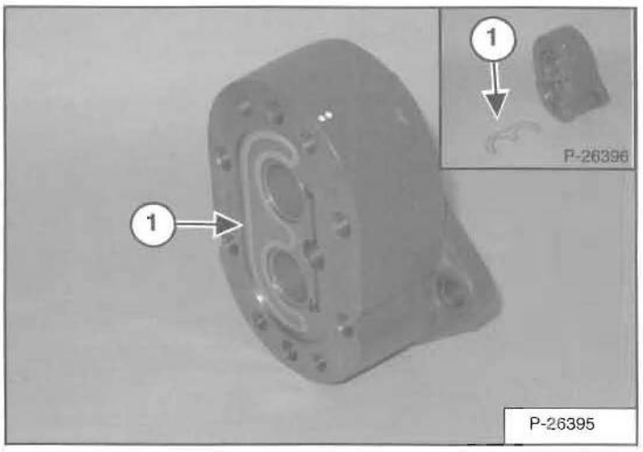
Remove the wear plate (Item 1) **[Figure 20-60-29]** & **[Figure 20-60-30]** and section seal (Item 2) **[Figure 20-60-29]** & **[Figure 20-60-30]** from the pump end section.

Figure 20-60-30



NOTE: Position wear plate (Item 1) [Figure 20-60-30] inlets and traps as shown with bronze side toward gears.

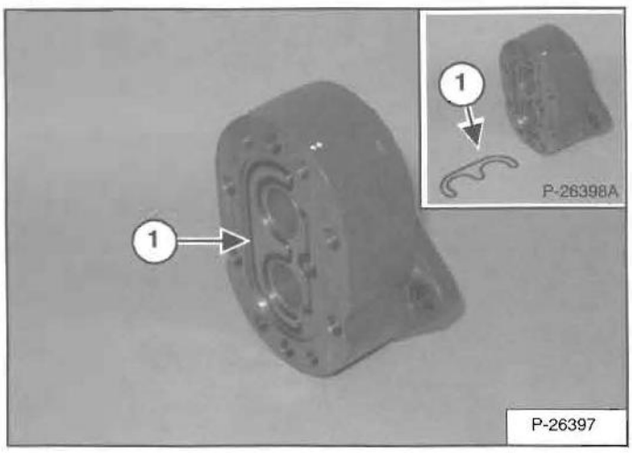
Figure 20-60-31



Remove the load seal (Item 1) **[Figure 20-60-31]**.

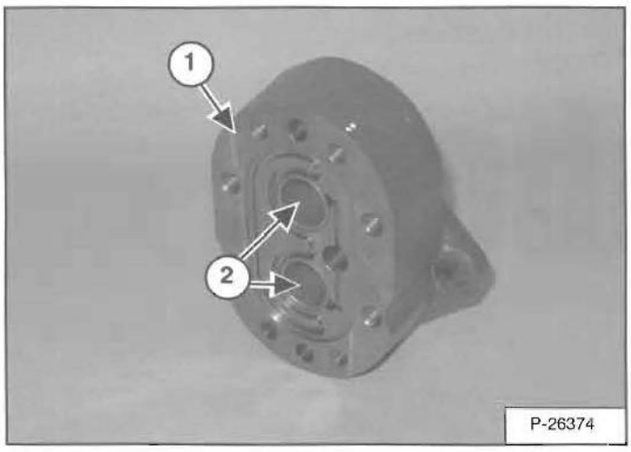
Disassembly And Assembly (Cont'd)

Figure 20-60-32



Remove the pre-load seal (Item 1) **[Figure 20-60-32]**.

Figure 20-60-33



NOTE: Inspect the pump end section (Item 1) and bushings (Item 2) [Figure 20-60-33]. If excessive wear or damage is visible, the pump must be replaced.

Reverse the disassembly procedure to assemble the hydraulic pump.



Bobcat®

HYDRAULIC/HYDROSTATIC FILTER

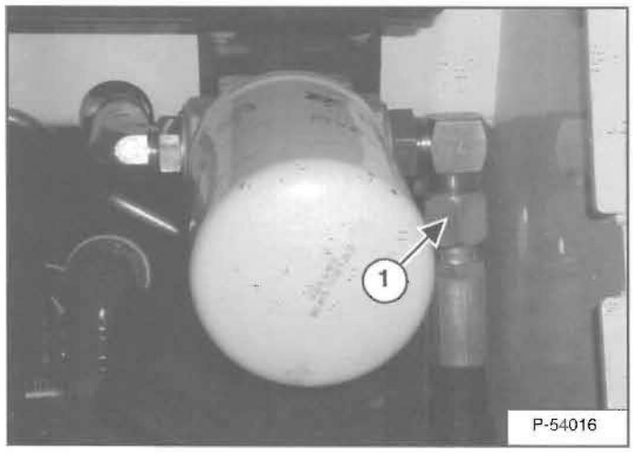
Housing Removal And Installation

IMPORTANT

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

I-2003-0888

Figure 20-70-1

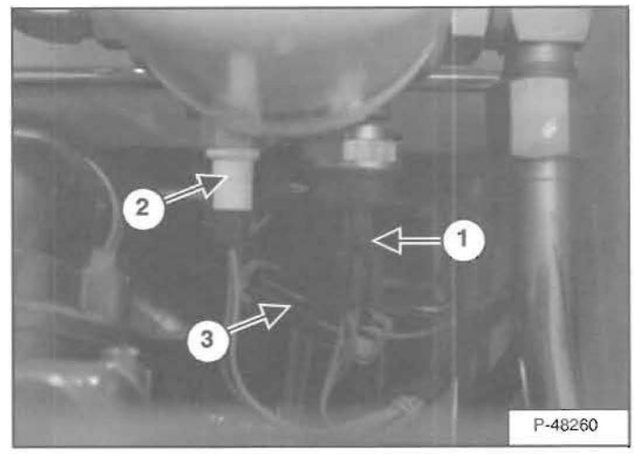


Stop the engine and open the rear door.

Drain the hydraulic fluid. (See Contents Page 10-01.)

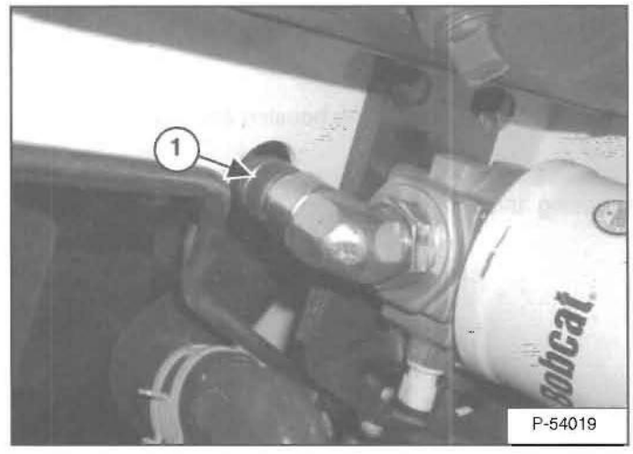
Disconnect the hose (Item 1) **[Figure 20-70-1]** from the filter housing.

Figure 20-70-2



Disconnect the charge pressure sender connector (Item 1), temperature sender connector (Item 2) and differential pressure switch connector (Item 3) **[Figure 20-70-2]** from the filter housing.

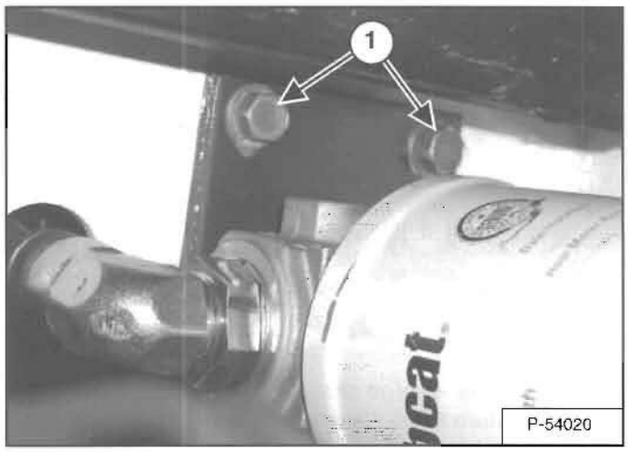
Figure 20-70-3



Using MEL 1558 tool disconnect the oil cooler tubeline (Item 1) **[Figure 20-70-3]** from the filter housing.

Housing Removal And Installation (Cont'd)

Figure 20-70-4



Remove the two mounting bolts (Item 1) **[Figure 20-70-4]** from the filter housing mounting bracket.

Installation: Tighten the mounting bolts to 15-20 ft.-lbs. (20-27 Nm) torque.

Remove the hydraulic filter housing and filter.

Reverse the removal procedure to install the filter housing and filter.

HYDRAULIC FLUID RESERVOIR

Removal And Installation

⚠ DANGER

AVOID DEATH

- Disconnecting or loosening any hydraulic tubeline, hose, fitting, component or a part failure can cause lift arms to drop.
- Keep out of this area when lift arms are raised unless supported by an approved lift arm support. Replace if damaged. 57051



SW 02 6717343

⚠ WARNING

Never work on a machine with the lift arms up unless the lift arms are secured by an approved lift arm support device. Failure to use an approved lift arm support device can allow the lift arms or attachment to fall and cause injury or death.

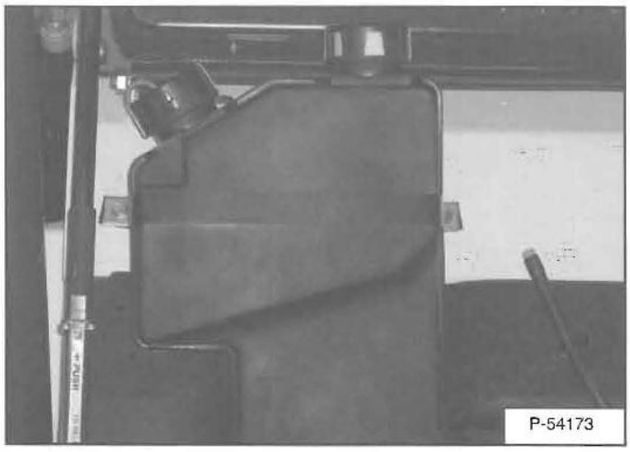
W-2059-0598

Start the engine. Raise the lift arms and install an approved lift arm support device. (See Contents Page 10-1.)

Stop the engine.

Raise the operator cab. (See Contents Page 10-01.)

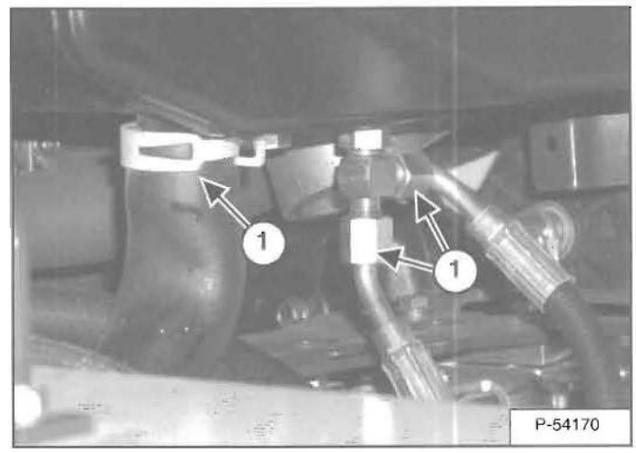
Figure 20-80-1



P-54173

Drain the hydraulic fluid reservoir **[Figure 20-80-1]**. (See Contents Page 20-01.)

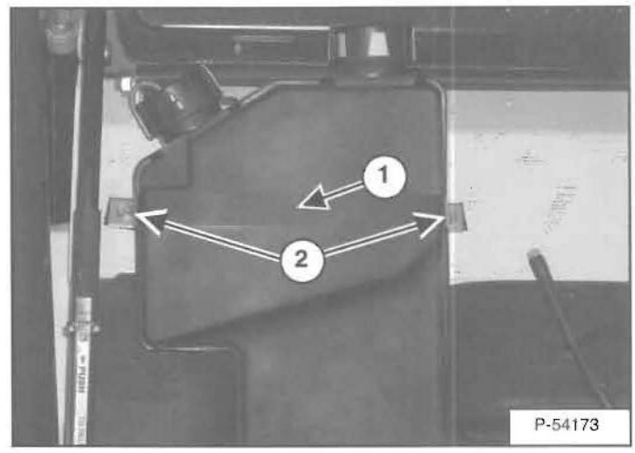
Figure 20-80-2



P-54170

Mark and disconnect the hoses (Item 1) **[Figure 20-80-2]** from the hydraulic fluid reservoir.

Figure 20-80-3



P-54173

Remove the hydraulic reservoir bracket (Item 1) by removing the two mounting bolts (Item 2) **[Figure 20-80-3]** .

Installation: Tighten the mounting bolts to 15-20 ft.-lbs. (20-27 Nm) torque.

Remove the reservoir.

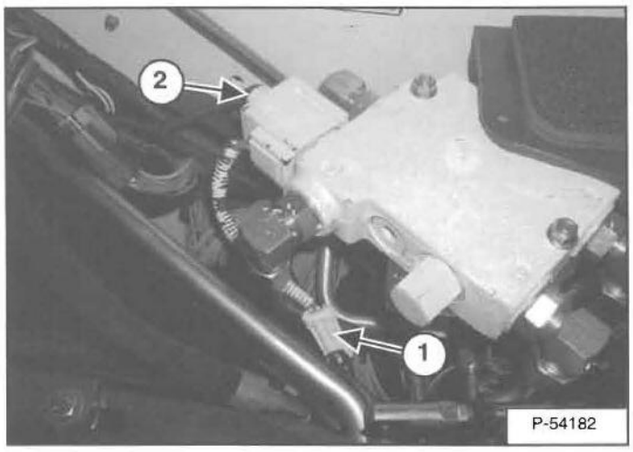


Bobcat®

BUCKET POSITION VALVE

Solenoid Removal And Installation

Figure 20-90-1



Raise the operator cab. (See Contents Page 10-01.)

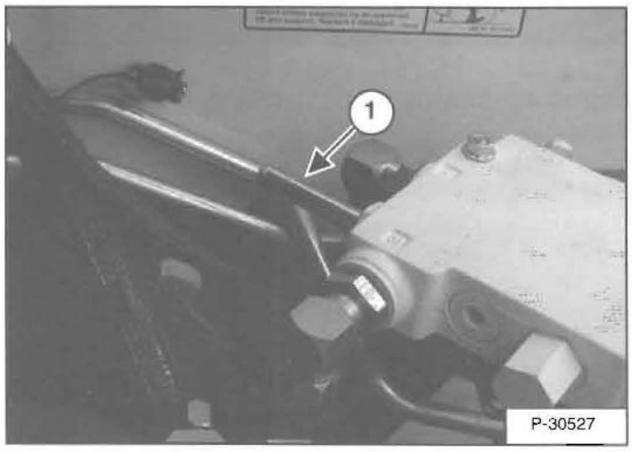
Remove the Bobcat controller mount from the frame. (See Contents Page 60-01.)

Disconnect the wire harness connector (Item 1) **[Figure 20-90-1]** from the bucket position shutoff solenoid.

Remove the solenoid nut (Item 2) **[Figure 20-90-1]**.

Installation: Tighten the solenoid nut to 60 in.-lbs. (6,78 Nm) torque.

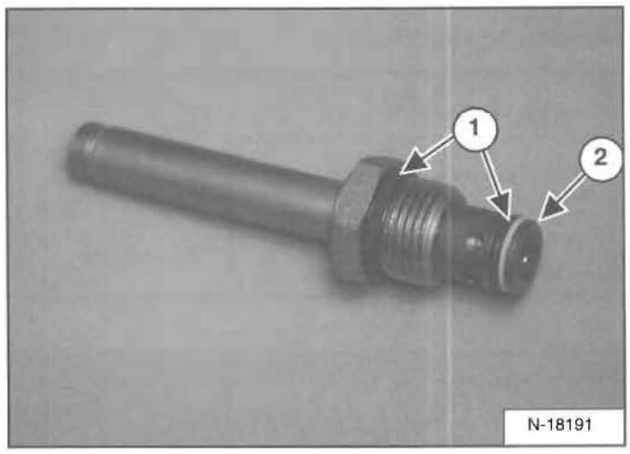
Figure 20-90-2



Remove the solenoid stem (Item 1) **[Figure 20-90-2]** from the bucket position valve.

Installation: Put oil on O-rings and back-up washers and tighten the solenoid stem to 30-35 ft.-lbs. (40,8-47,6 Nm) torque.

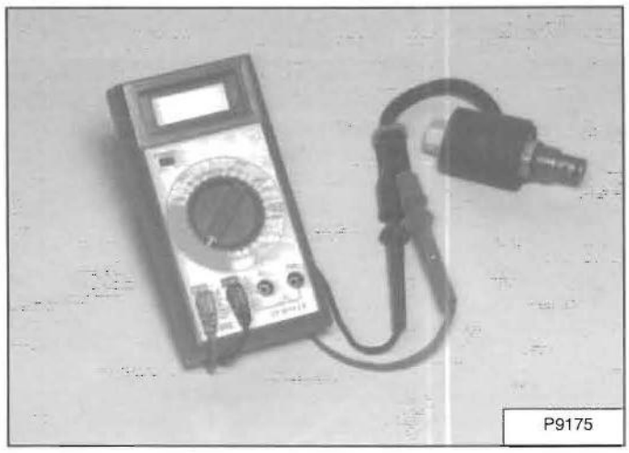
Figure 20-90-3



Inspect the solenoid stem and replace the O-rings (Item 1) and the back-up washer (Item 2) **[Figure 20-90-3]**.

Solenoid Testing

Figure 20-90-4



Use a test meter to measure coil resistance **[Figure 20-90-4]**. Coil wires do not have polarity. Correct resistance for the coil is 9.7 ohms ± 1 ohm @ 78° F.

Removal And Installation

⚠ DANGER

AVOID DEATH

- Disconnecting or loosening any hydraulic tubeline, hose, fitting, component or a part failure can cause lift arms to drop.
- Keep out of this area when lift arms are raised unless supported by an approved lift arm support. Replace if damaged. 57051



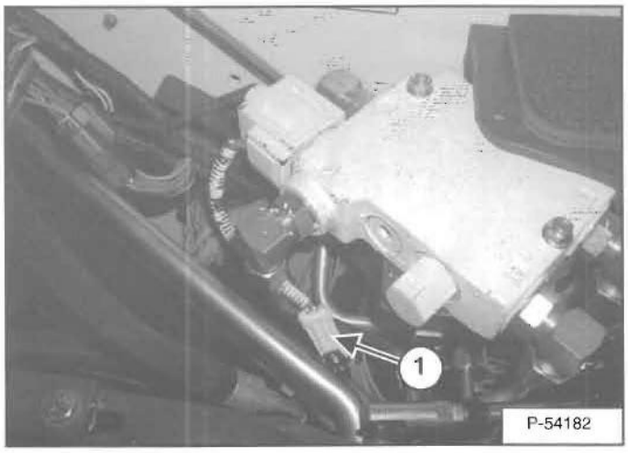
SW 02 6717343

⚠ WARNING

Never work on a machine with the lift arms up unless the lift arms are secured by an approved lift arm support device. Failure to use an approved lift arm support device can allow the lift arms or attachment to fall and cause injury or death.

W-2059-0598

Figure 20-90-5



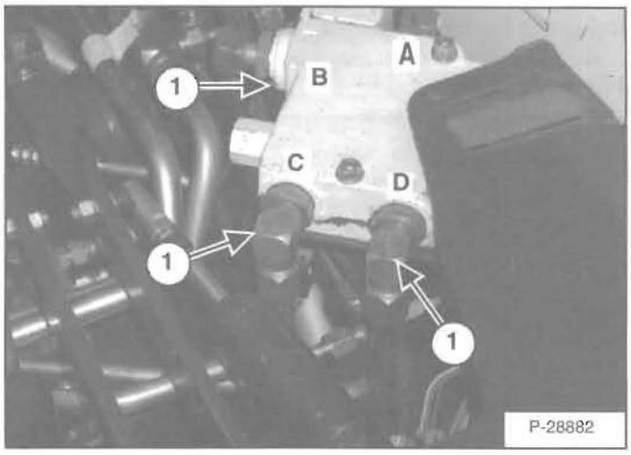
Start the engine. Raise the lift arms and install an approved lift arm support device. (See Contents Page 10-01.)

Stop the engine.

Raise the operator cab. (See Contents Page 10-01.)

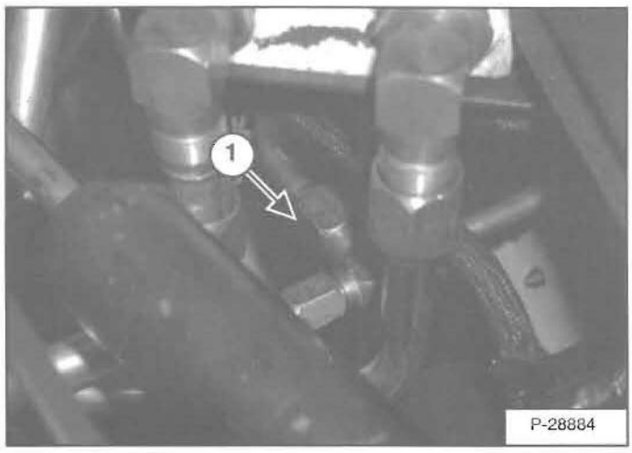
Disconnect solenoid connector harness (Item 1) **[Figure 20-90-5]**.

Figure 20-90-6



Disconnect tubelines (Item 1) **[Figure 20-90-6]** from the B, C, and D port.

Figure 20-90-7

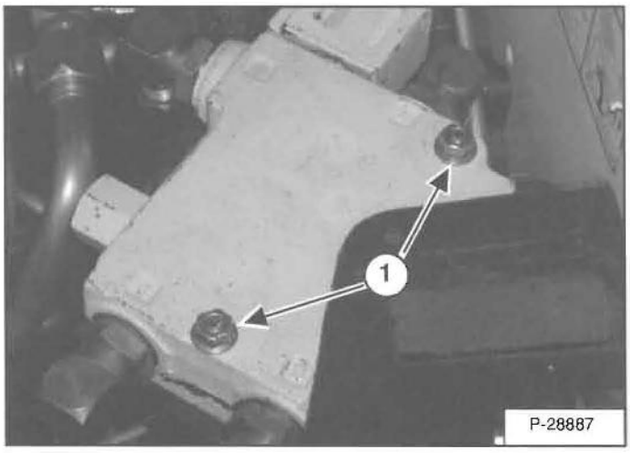


Disconnect tubeline (Item 1) **[Figure 20-90-7]** at tee fitting.

This line is connected to A port on bucket position valve.

Removal And Installation (Cont'd)

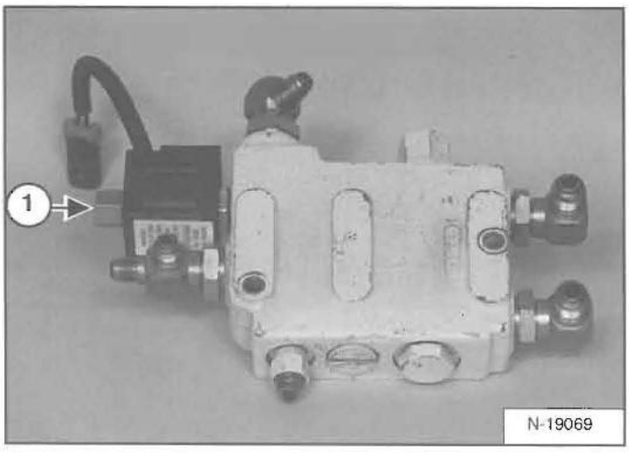
Figure 20-90-8



Remove bucket position valve mounting bolts (Item 1) **[Figure 20-90-8]**. Remove valve from loader.

Disassembly And Assembly

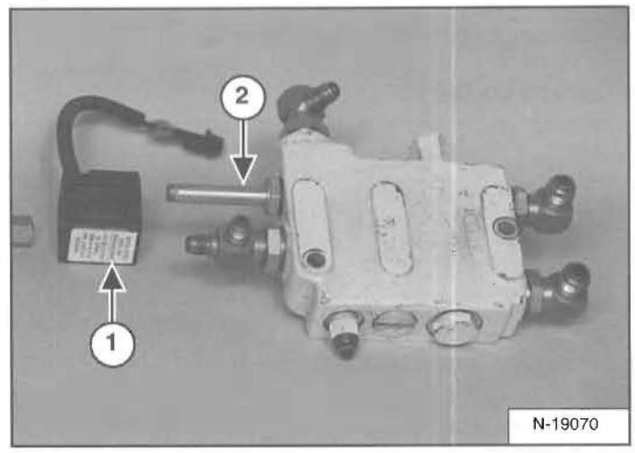
Figure 20-90-9



Remove the solenoid nut (Item 1) **[Figure 20-90-9]**.

Installation: Tighten the nut to 60 in.-lbs. (6,78 Nm) torque.

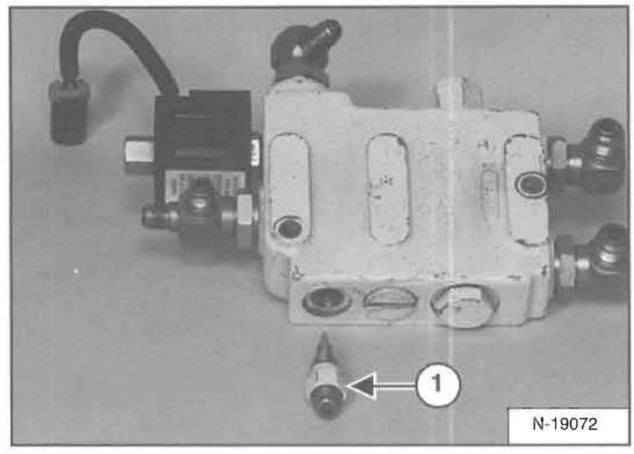
Figure 20-90-10



Remove the solenoid (Item 1) and the solenoid stem (Item 2) **[Figure 20-90-10]**.

Installation: Tighten the solenoid stem to 30-35 ft.-lbs. (40,8-47,6 Nm) torque.

Figure 20-90-11

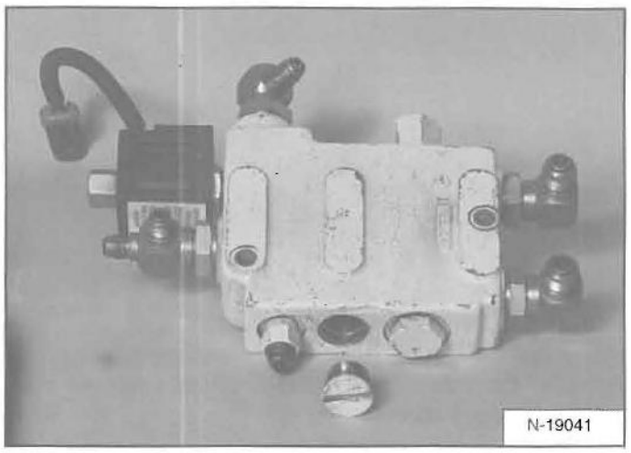


Remove the flow adjustment valve and O-ring (Item 1) **[Figure 20-90-11]**

NOTE: Always install new O-rings before any parts are installed into the valve. Check the parts for wear or damage and replace as needed.

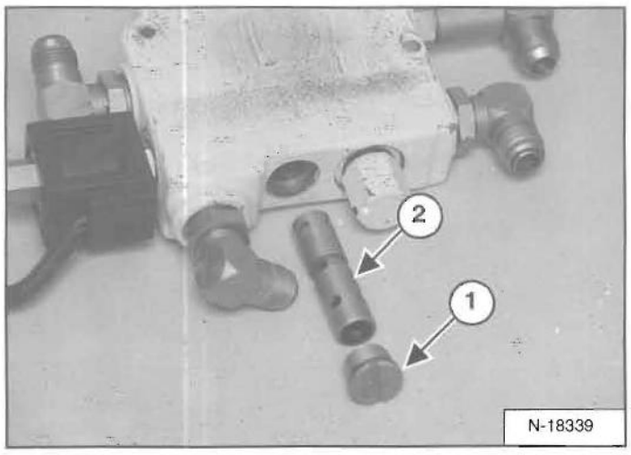
Disassembly And Assembly (Cont'd)

Figure 20-90-12



Remove the plug **[Figure 20-90-12]**.

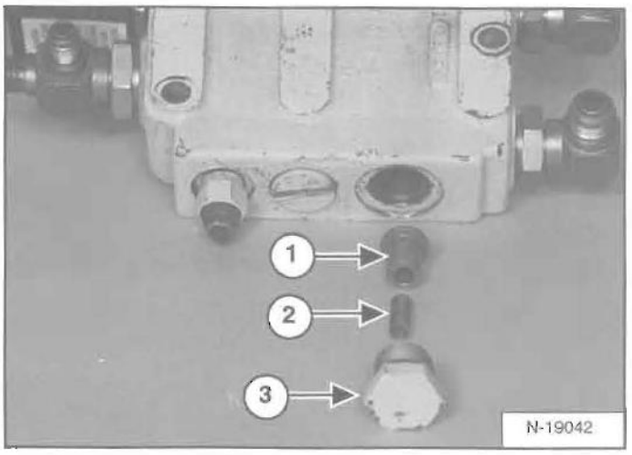
Figure 20-90-13



Remove the plug (Item 1), and flow control spool (Item 2) **[Figure 20-90-13]**.

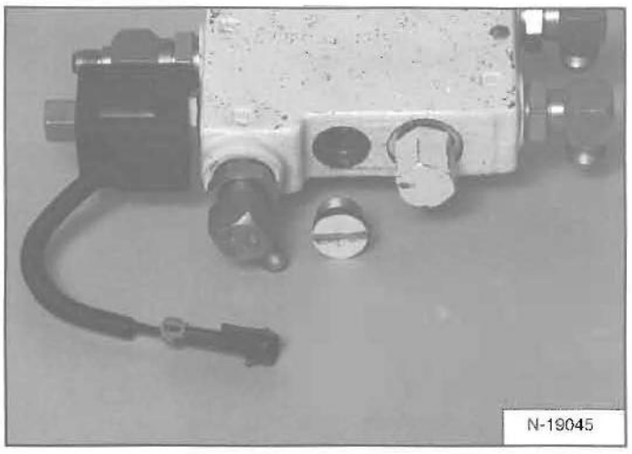
Check the flow control spool for wear, check the O-ring on the plug and replace as needed.

Figure 20-90-14



Remove the tilt cylinder check valve (Item 1) spring (Item 2) and plug (Item 3) **[Figure 20-90-14]**. Check for wear, check the O-ring and replace as needed.

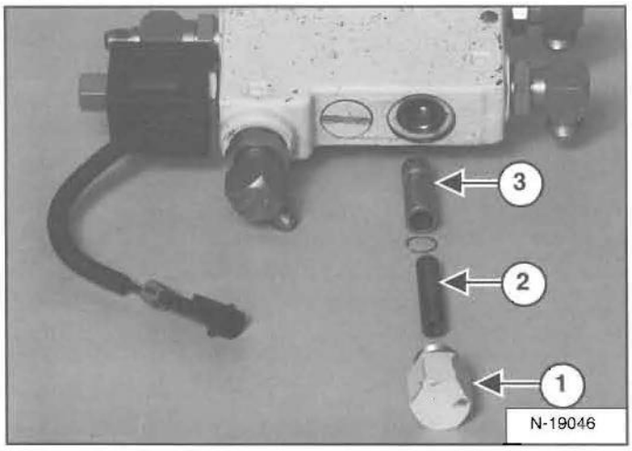
Figure 20-90-15



Remove the plug **[Figure 20-90-15]**.

Disassembly And Assembly (Cont'd)

Figure 20-90-16



Remove the plug (Item 1), spring (Item 2) and unloading spool (Item 3) **[Figure 20-90-16]**.

Check all parts and replace as needed. Install a new O-ring on the plug before installing.

Reverse the dissasembly procedure to assemble the bucket position valve.



Bobcat®

REAR AUXILIARY DIVERTER VALVE

Removal And Installation

⚠ WARNING

Never work on a machine with the lift arms up unless the lift arms are secured by an approved lift arm support device. Failure to use an approved lift arm support device can allow the lift arms or attachment to fall and cause injury or death.

W-2059-0598

⚠ DANGER

AVOID DEATH

- Disconnecting or loosening any hydraulic tubeline, hose, fitting, component or a part failure can cause lift arms to drop.
- Keep out of this area when lift arms are raised unless supported by an approved lift arm support. Replace if damaged. 57051



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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

Lift and block the loader. (See Contents Page 10-01.)

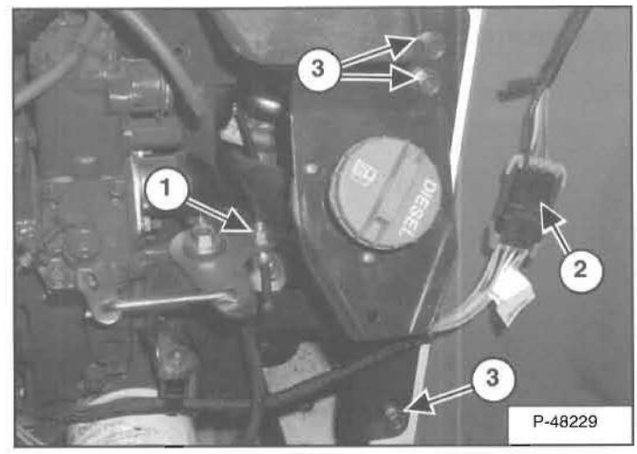
Raise the lift arms and install an approved lift arm support device. (See Contents Page 10-01.)

Raise the operator cab. (See Contents Page 10-01.)

Open the rear door. (See Contents Page 10-01.)

Drain the hydraulic reservoir. (See Contents Page 10-01.)

Figure 20-100-1

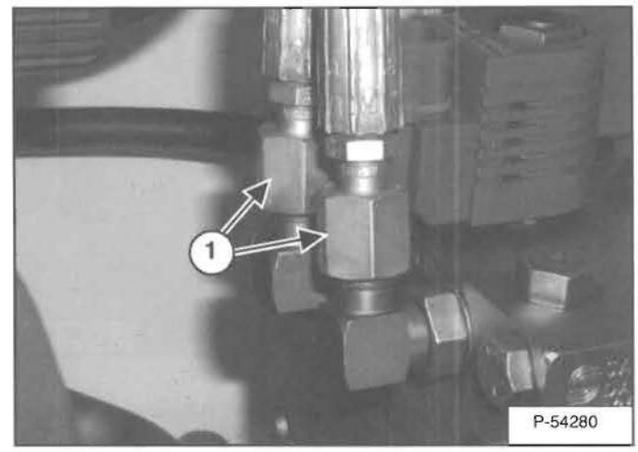


Remove the nut from the speed control linkage (Item 1) and unplug the rear lights electrical connector (Item 2) **[Figure 20-100-1]**.

Remove the fuel fill bracket mounting screws (Item 3) **[Figure 20-100-1]**

Installation: Tighten screws to 15-20 ft.-lbs. (20-27 Nm) torque.

Figure 20-100-2

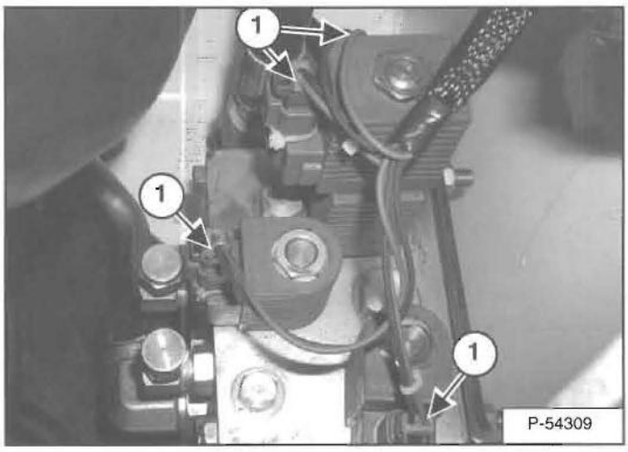


Remove the auxiliary coupler supply hoses (Item 1) **[Figure 20-100-2]** from the diverter block.

NOTE: Mark or tag all hoses and wires for proper orientation.

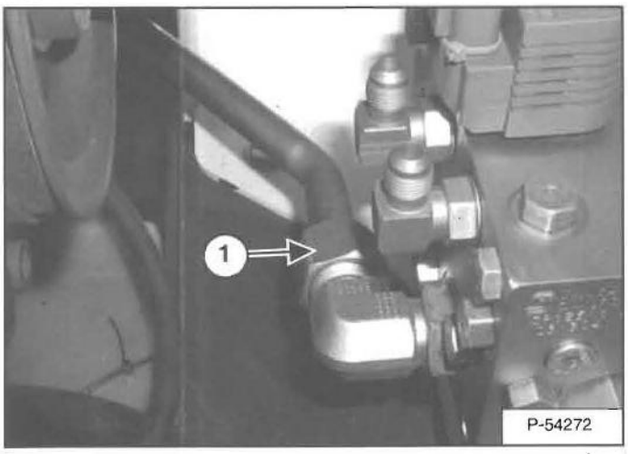
Removal And Installation (Cont'd)

Figure 20-100-3



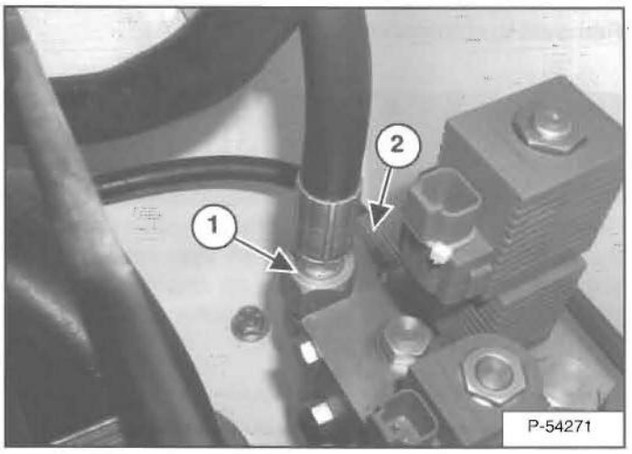
Disconnect the four solenoid connectors (Item 1) **[Figure 20-100-3]** from the rear auxiliary valve.

Figure 20-100-4



Disconnect the diverter valve outlet tubeline (Item 1) **[Figure 20-100-4]**.

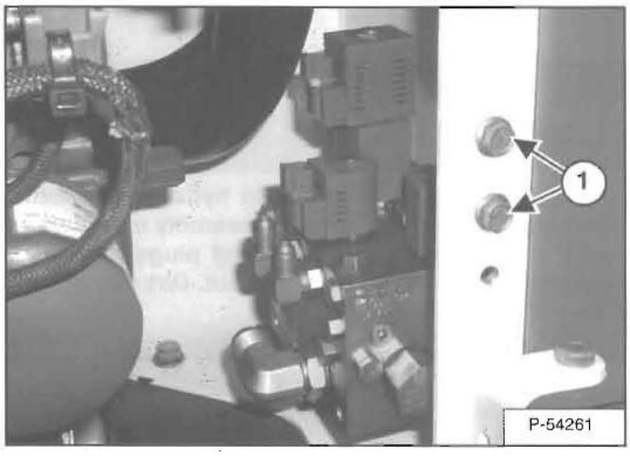
Figure 20-100-5



Remove the diverter valve supply hose (Item 1) **[Figure 20-100-5]**.

Remove the diverter valve drain hose (Item 2) **[Figure 20-100-5]** .

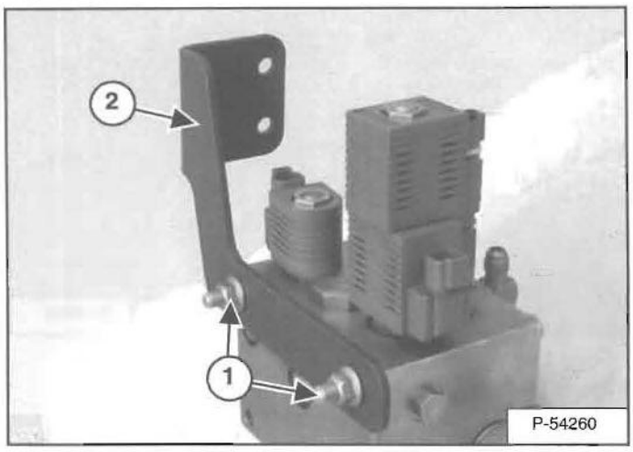
Figure 20-100-6



Remove the two mounting bolts (Item 1) **[Figure 20-100-6]**.

Disassembly And Assembly

Figure 20-100-7



Remove the two mount bolts (Item 1) from the diverter valve mount plate (Item 2) **[Figure 20-100-7]** and remove the mount plate.

IMPORTANT

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

I-2003-0888

Figure 20-100-8

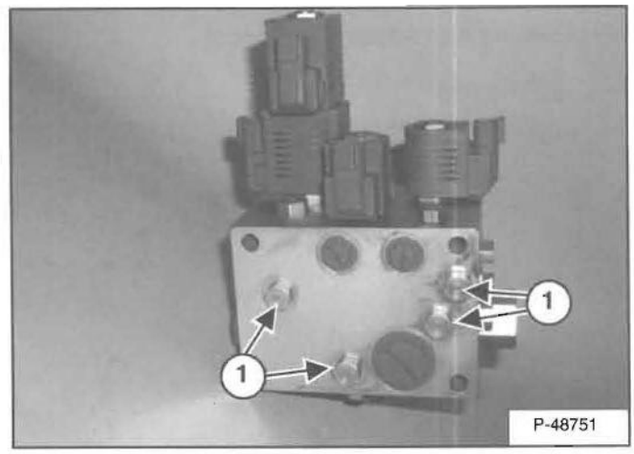
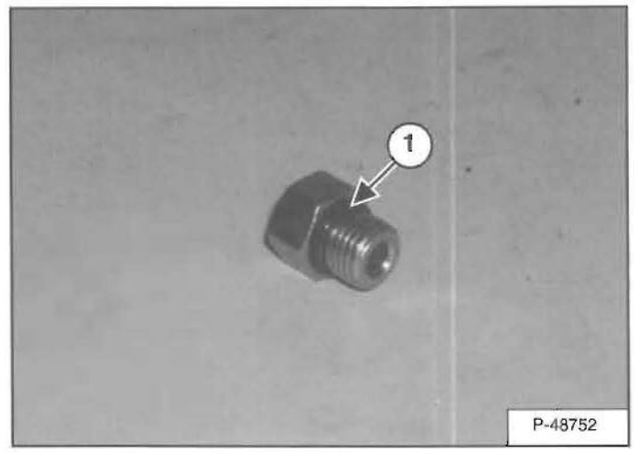


Figure 20-100-9



Clean the diverter valve to remove dirt before disassembly. Valve ports are labeled for correct assembly.

Several plugs (Item 1) **[Figure 20-100-8]** & **[Figure 20-100-9]** are located all over the diverter valve and can be removed for cleanout purposes..

Installation: Put oil on O-rings and back-up washers. Tighten to 10 ft.-lbs. (13,6 Nm) torque.

Disassembly And Assembly (Cont'd)

Figure 20-100-10

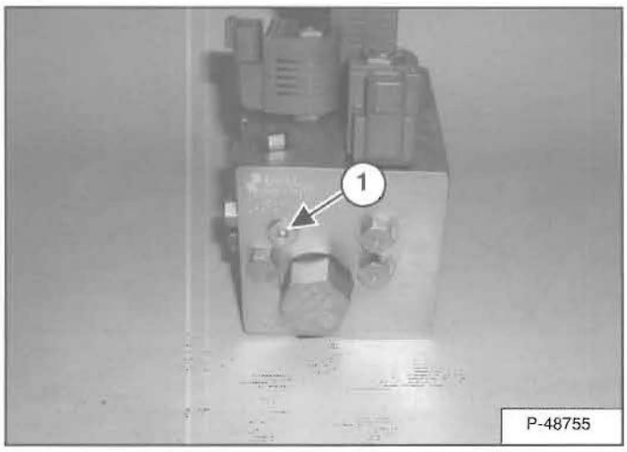
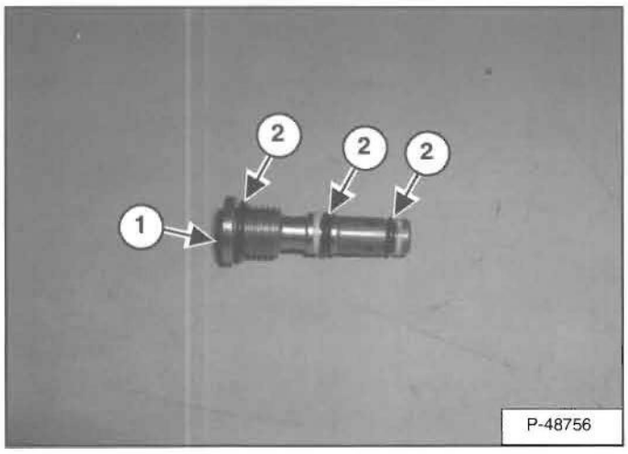


Figure 20-100-11



Remove the shuttle valve (Item 1) **[Figure 20-100-10]** & **[Figure 20-100-11]** from diverter valve and inspect the O-rings and back-up washers (Item 2) **[Figure 20-100-11]** for damage.

Installation: Put oil on the O-rings and back-up washers. Tighten to 10 -12 ft.-lbs. (14-16 Nm) torque.

Figure 20-100-12

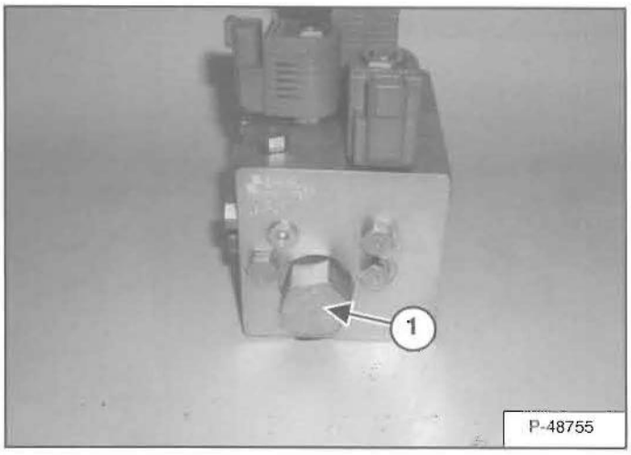
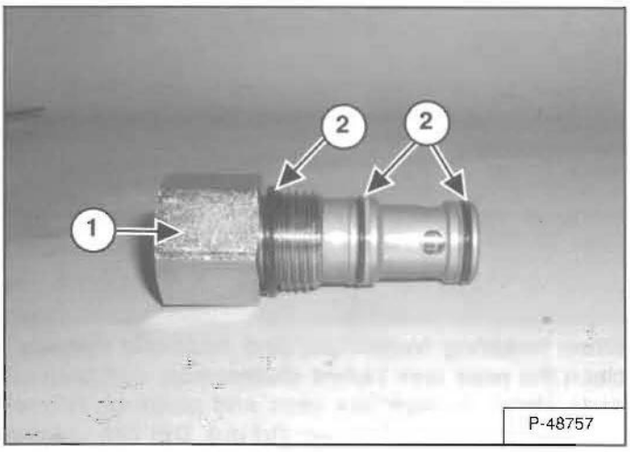


Figure 20-100-13



Remove the differential sensing valve (Item 1) **[Figure 20-100-12]** & **[Figure 20-100-13]** from the diverter valve and inspect the O-rings and back-up washers (Item 2) **[Figure 20-100-13]** for damage.

Installation: Put oil on O-ring and back-up washers. Tighten to 50-55 ft.-lbs. (68-75 Nm) torque.

Disassembly And Assembly (Cont'd)

Figure 20-100-14

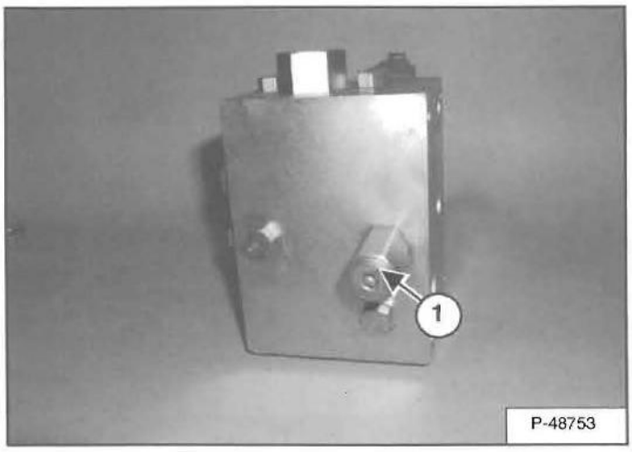
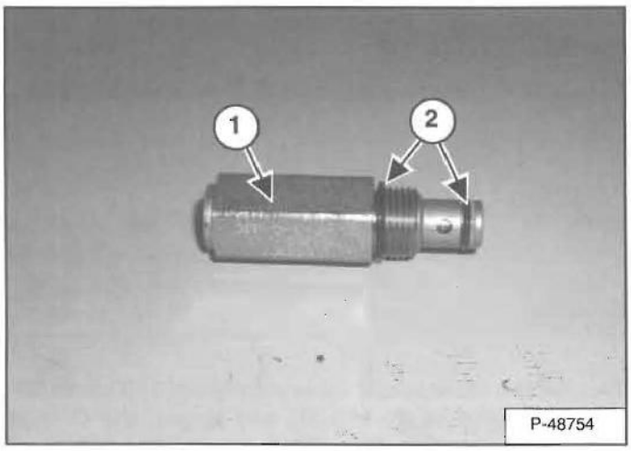


Figure 20-100-15



Remove the relief valve (Item 1) **[Figure 20-100-14]** & **[Figure 20-100-15]** from the diverter valve and inspect the O-rings and back-up washers (Item 2) **[Figure 20-100-15]** for damage.

Installation: Put oil on O-ring and back-up washers. Tighten to 20-25 ft.-lbs. (27-34 Nm) torque.

Figure 20-100-16

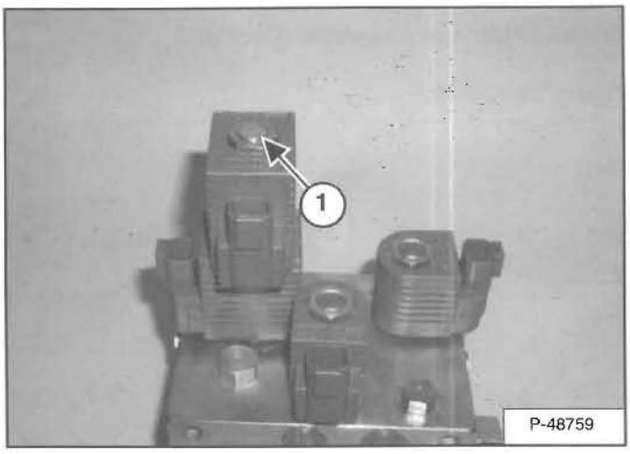
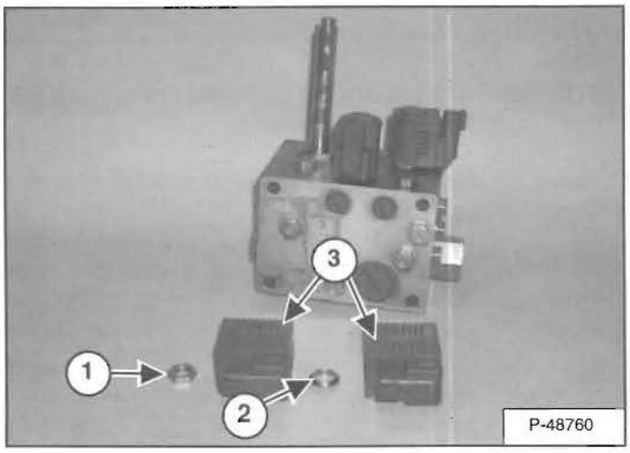


Figure 20-100-17



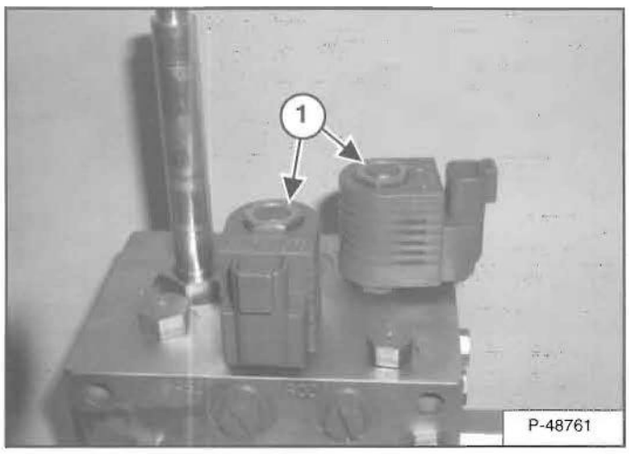
Remove the nut (Item 1) **[Figure 20-100-16]** & **[Figure 20-100-17]** from the solenoid valve stem.

Installation: Tighten the nut to 4-6 ft.-lbs. (5-8 Nm) torque.

Remove the spacer (Item 2) and solenoid valve coils (Item 3) **[Figure 20-100-17]**.

Disassembly And Assembly (Cont'd)

Figure 20-100-18



NOTE: Before removing the solenoid coils, mark the coils for proper alignment.

Remove the nuts (Item 1) **[Figure 20-100-18]** from the solenoid valve stems.

Installation: Tighten the nut to 4-6 ft.-lbs. (5-8 Nm) torque.

Figure 20-100-19

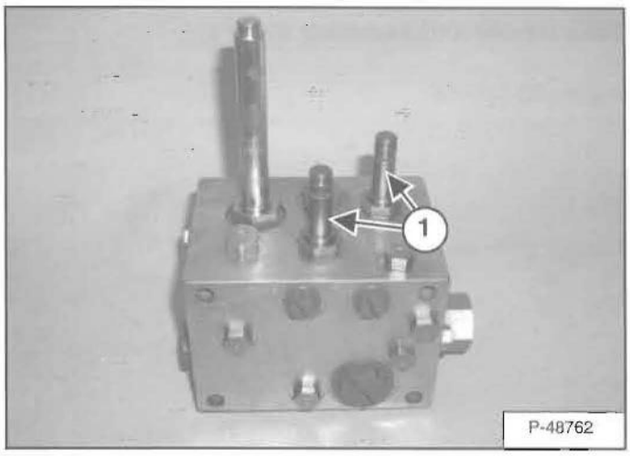
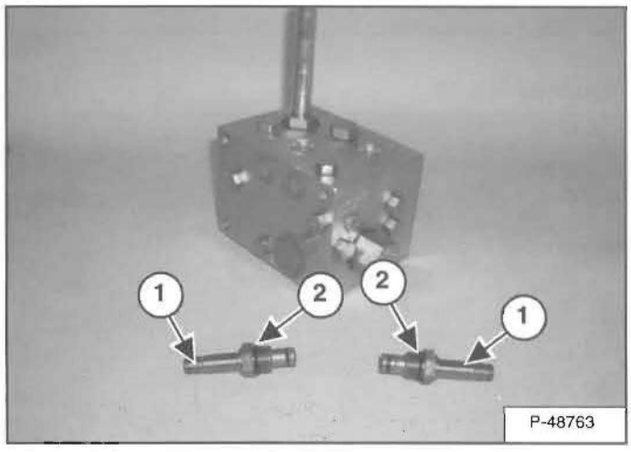


Figure 20-100-20



Remove the the solenoid valve stem (Item 1) **[Figure 20-100-19]** & **[Figure 20-100-20]** and inspect the O-rings and back-up washers (Item 2) **[Figure 20-100-20]**.

Installation: Put oil on the O-rings and back-up washers. Tighten to 20-25 ft.-lbs. (27,1-34 Nm) torque.

Disassembly And Assembly (Cont'd)

Figure 20-100-21

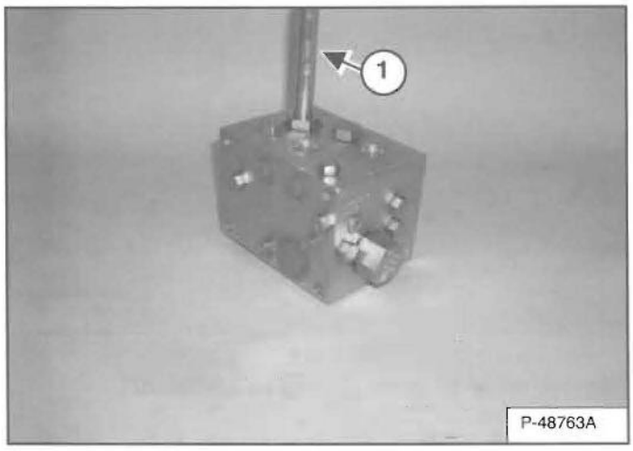
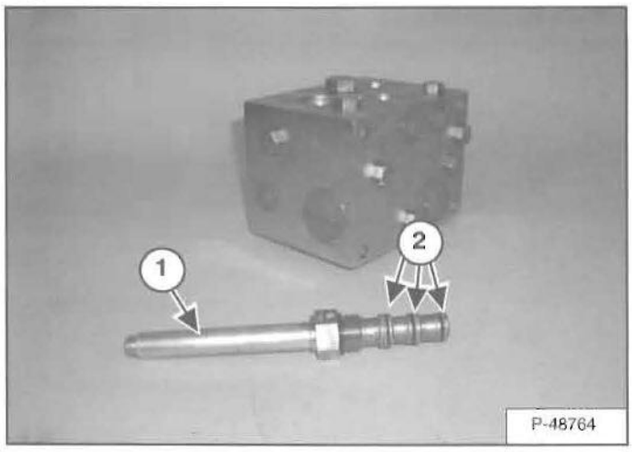


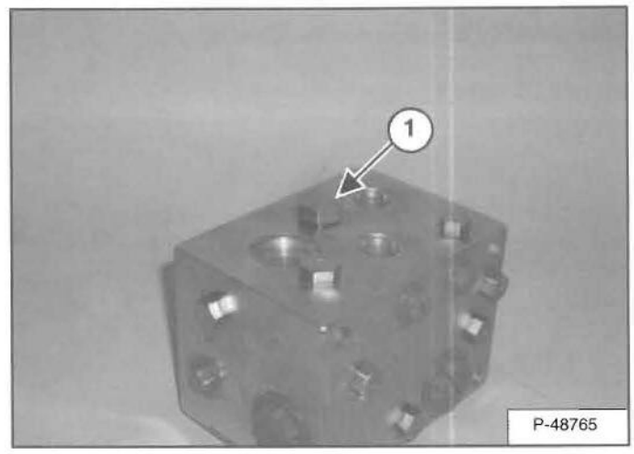
Figure 20-100-22



Remove the solenoid valve stem (Item 1) **[Figure 20-100-21]** & **[Figure 20-100-22]** and inspect the)-rings and back-up washers (Item 2) **[Figure 20-100-22]** for damage.

Installation: Put oil on the O-rings and back-up washers. Tighten to 30-35 ft.-lbs. (41-47 Nm) torque.

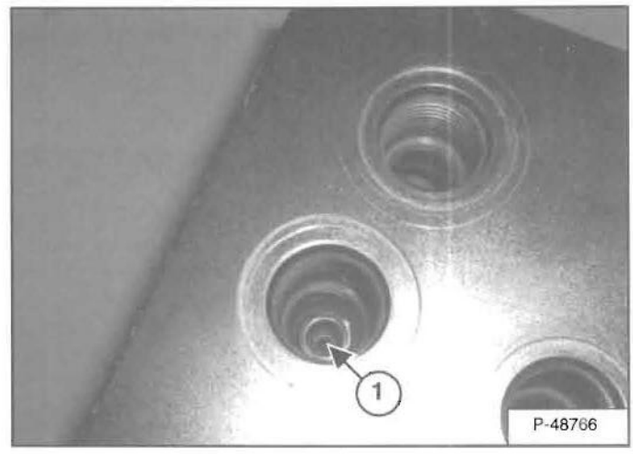
Figure 20-100-23



Remove the plug (Item 1) **[Figure 20-100-23]**.

Installation: Tighten the plug to to 38 ft.-lbs. (51,5 Nm) torque.

Figure 20-100-24

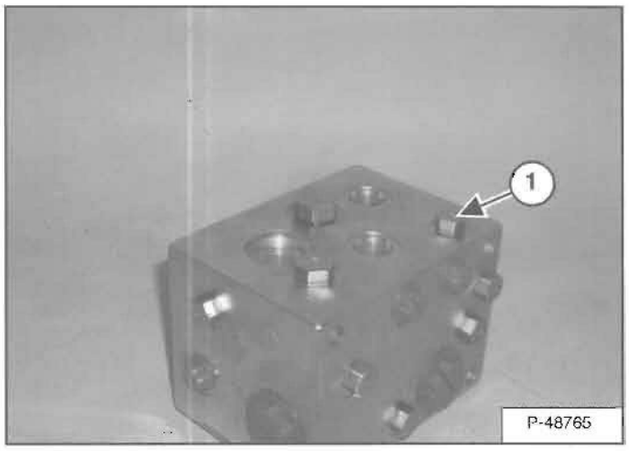


Remove and inspect the orifice (Item 1) **[Figure 20-100-24]** for dirt and debris.

Installation: Tighten the plug to 22 ft.-lbs. (29,8 Nm) torque.

Disassembly And Assembly (Cont'd)

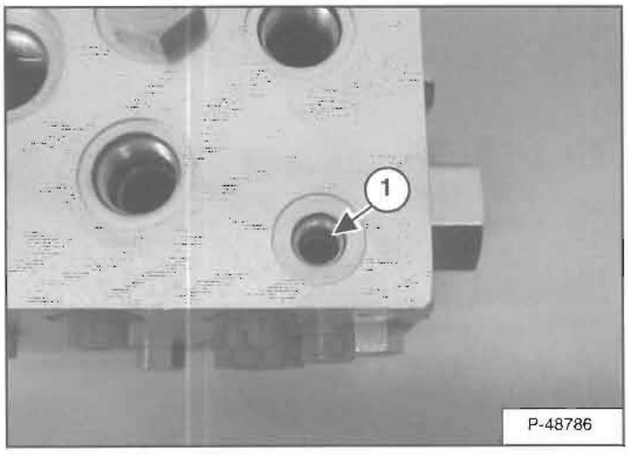
Figure 20-100-25



Remove the plug (Item 1) **[Figure 20-100-25]** for dirt and debris.

Installation: Tighten the plug to 10 ft.-lbs. (13,6 Nm) torque.

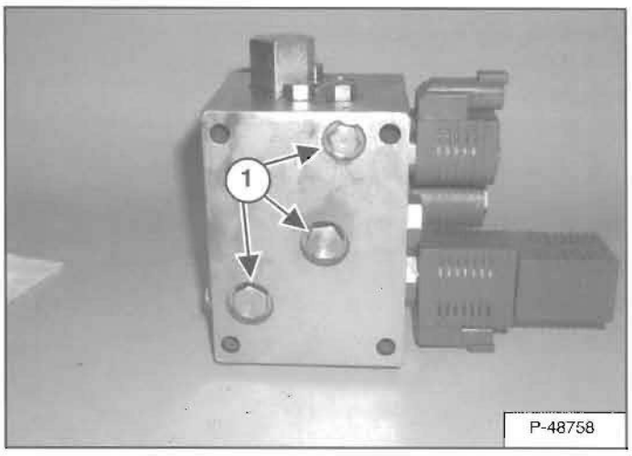
Figure 20-100-26



Remove the orifice (Item 1) **[Figure 20-100-26]** for dirt and debris.

Installation: Tighten the orifice to 3.3 ft.-lbs. (4,5 Nm) torque.

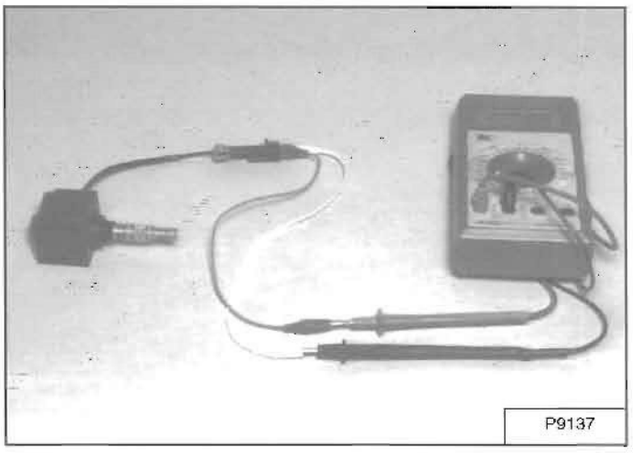
Figure 20-100-27



Remove the plugs (Item 1) **[Figure 20-100-27]**.

Installation: Tighten the plug to 14 ft.-lbs. (19 Nm) torque.

Figure 20-100-28



Use a test meter to measure coil resistance **[Figure 20-100-28]**. Coil wires do not have polarity. Correct resistance is 8.6-9.5 ohms @ 68 degrees fahrenheit.

Replace the test meter with 12 volt power. You can see and hear the spool shift.

Inspection

Inspect cartridges, check valves, solenoid valves and sealing washers for contamination or damage. Wash all parts in clean solvent. Use aeir pressure for drying them. Install new O-rings and back-up washers.

Inspect diverter valve cavities for contamination. Wash valve in clean solvent. Use air pressure to dry.

POWER BOB-TACH BLOCK

Removal And Installation

⚠ WARNING

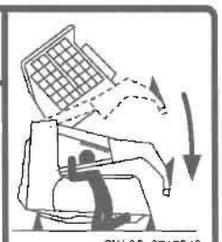
Never work on a machine with the lift arms up unless the lift arms are secured by an approved lift arm support device. Failure to use an approved lift arm support device can allow the lift arms or attachment to fall and cause injury or death.

W-2059-0598

⚠ DANGER

AVOID DEATH

- Disconnecting or loosening any hydraulic tubeline, hose, fitting, component or a part failure can cause lift arms to drop.
- Keep out of this area when lift arms are raised unless supported by an approved lift arm support. Replace if damaged. 57051



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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

Lift and block the loader. (See Contents Page 10-01.)

Raise the lift arms and install an approved lift arm support device. (See Contents Page 10-01.)

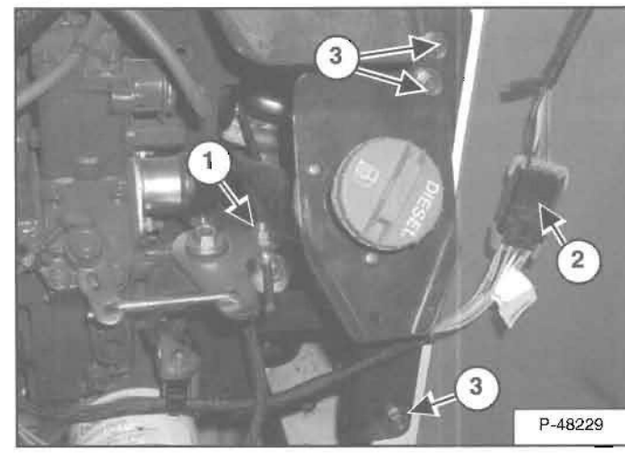
Raise the operator cab. (See Contents Page 10-01.)

Open the rear door. (See Contents Page 10-01.)

Drain the hydraulic reservoir. (See Contents Page 10-01.)

Remove the engine speed control lever. (See Contents Page 70-01.)

Figure 20-110-1



Remove the nut from the speed control linkage (Item 1) and unplug the rear lights electrical connector (Item 2) **[Figure 20-110-1]**.

Remove the fuel fill mounting screws (Item 3) **[Figure 20-110-1]**.

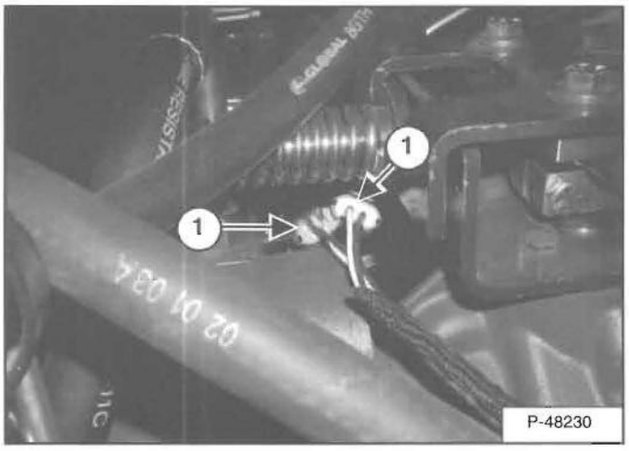
Installation: Tighten screws to 15-20 ft.-lbs. (20-27 Nm) torque.

Remove the belt shield.

POWER BOB-TACH BLOCK (CONT'D)

Removal And Installation (Cont'd)

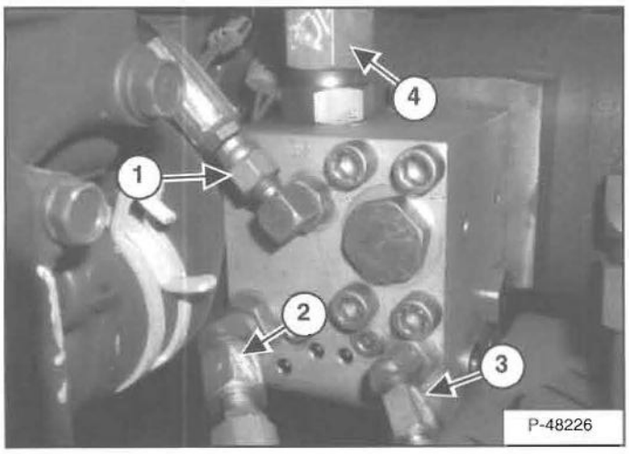
Figure 20-110-2



Disconnect the power Bob-Tach harness from the solenoid connectors (Item 1) **[Figure 20-110-2]** by the hydraulic pump.

Installation: The harness connectors are marked with Red or Black tie straps. Be sure the connectors with the same color are connected.

Figure 20-110-3



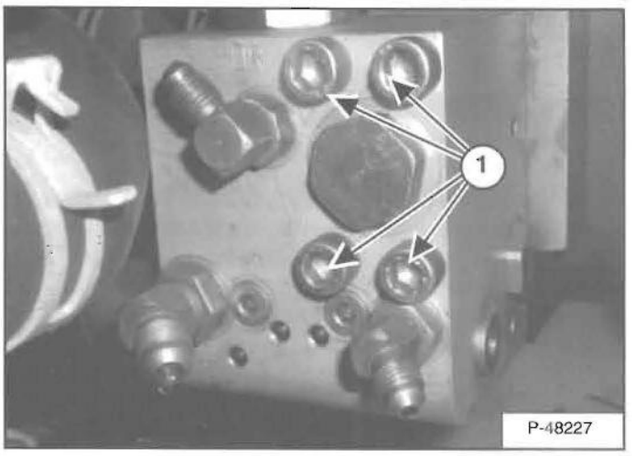
Disconnect the hose (Item 1) **[Figure 20-110-3]** from the "DR" port fitting on the block.

Disconnect the hose (Item 2) **[Figure 20-110-3]** from the power Bob-Tach cylinder rod end fitting on the block.

Disconnect the hose (Item 3) **[Figure 20-110-3]** from the power Bob-Tach cylinder base end fitting on the block.

Disconnect the outlet hose (Item 4) **[Figure 20-110-3]** from the fitting on top of the block.

Figure 20-110-4



Remove the four mounting bolts (Item 1) **[Figure 20-110-4]**.

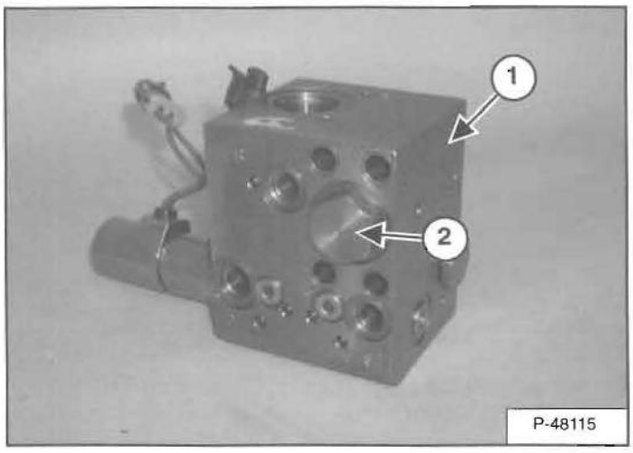
Installation: Tighten the mounting bolts to 25-28 ft.-lbs. (34-38 Nm) torque.

Remove the power Bob-Tach block.

NOTE: There is an O-ring in-between the power Bob-Tach block and the hydraulic pump. Inspect and replace as needed.

Disassembly And Assembly

Figure 20-110-5



Clean the block (Item 1) **[Figure 20-110-5]** to remove dirt before disassembly. Block ports are labeled for correct assembly.

Remove the plug (Item 2) **[Figure 20-110-5]**.

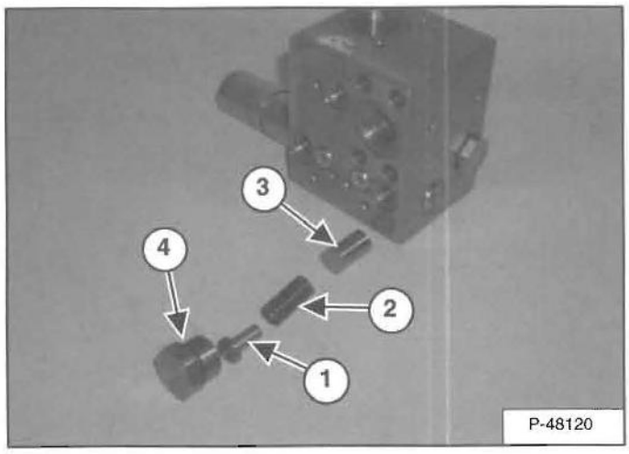
Installation: Tighten the plug to 25-30 ft.-lbs. (34-40,6 Nm) torque.

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

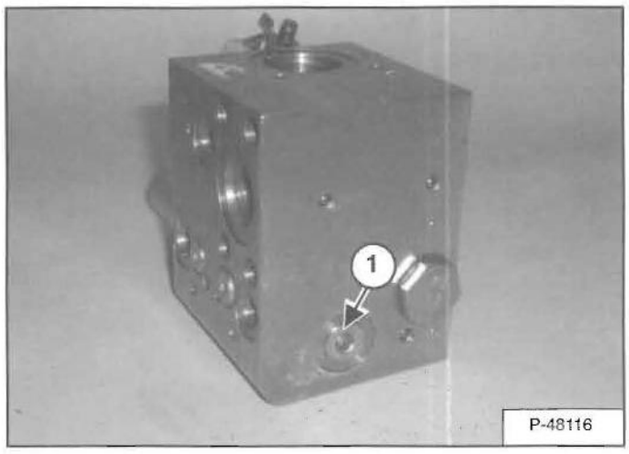
Figure 20-110-6



Remove the spring guide (Item 1), spring (Item 2) and the spool (Item 3) **[Figure 20-110-6]**.

Check the O-ring (Item 4) **[Figure 20-110-6]** on the plug and replace as needed.

Figure 20-110-7



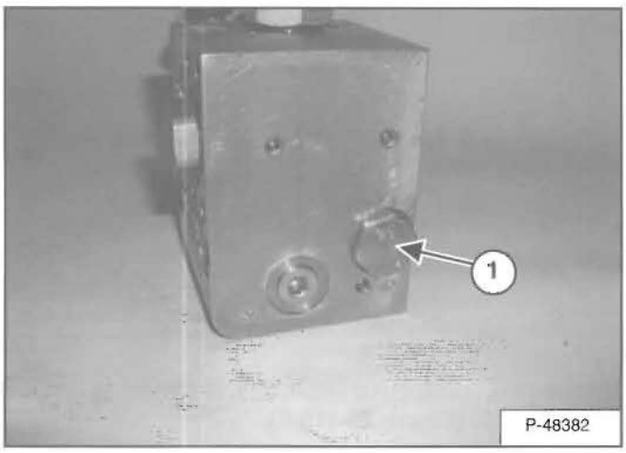
NOTE: This plug is a zero leak plug and should not be removed. If removed damage may occur and the plug and O-ring must be replaced.

Do not remove the plug (Item 1) **[Figure 20-110-7]**.

Installation: Tighten the plug to 12-14 ft.-lbs. (16,3-19 Nm) torque.

Disassembly And Assembly (Cont'd)

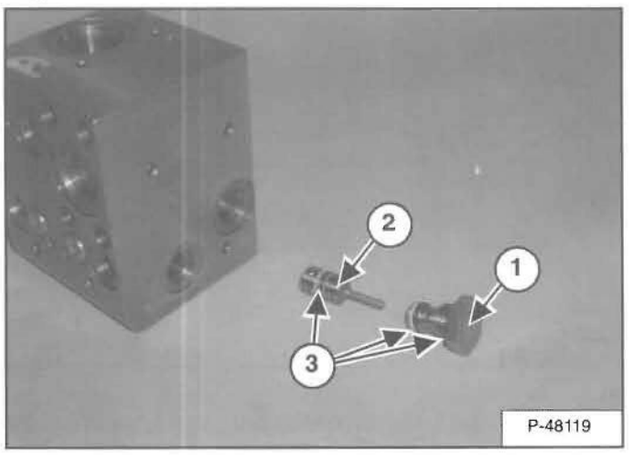
Figure 20-110-8



Remove the check valve (Item 1) **[Figure 20-110-8]**.

Installation: Oil the check valve and O-rings and tighten the check valve to to 20-25 ft.-lbs. (27,1-34 Nm) torque.

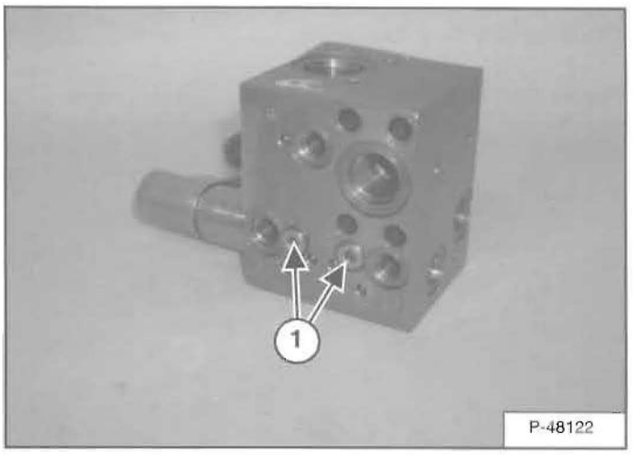
Figure 20-110-9



Inspect the check valve (Item 1) and piston assembly (Item 2) **[Figure 20-110-9]**.

Check the O-rings and back up washers (Item 3) **[Figure 20-110-9]** on the check valve and piston assembly and replace as needed.

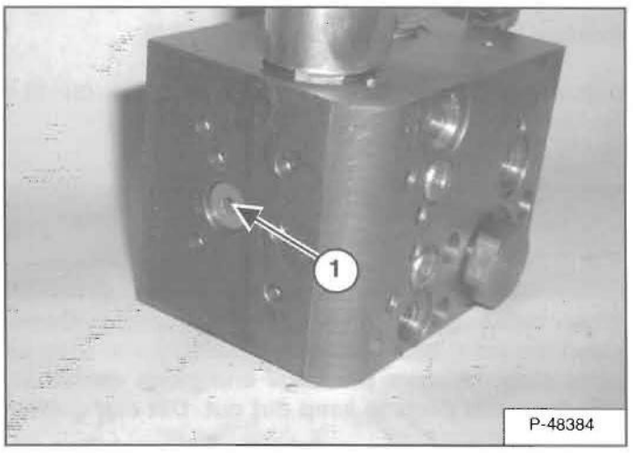
Figure 20-110-10



Do not remove the plugs (Item 1) **[Figure 20-110-10]**.

NOTE: Do not remove plugs. If the plugs are removed the internal pressure relieving spring setting will be altered.

Figure 20-110-11

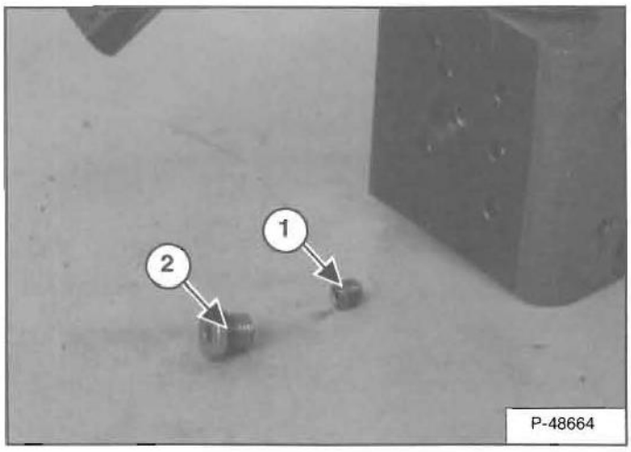


Remove the plug (Item 1) **[Figure 20-110-11]**, inspect the O-ring and replace as needed.

Installation: Tighten the plug (Item 1) **[Figure 20-110-11]** to 12-14 ft.-lbs. (16,3-19 Nm) torque.

Disassembly And Assembly (Cont'd)

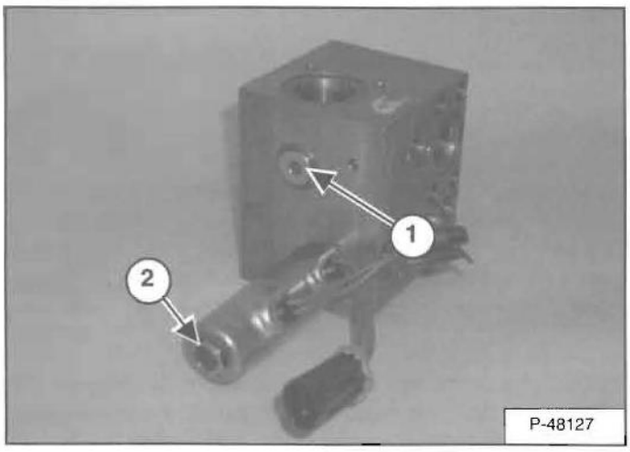
Figure 20-110-12



Remove the orifice screw (Item 1) located behind the plug (Item 2) **[Figure 20-110-11]**.

Installation: Tighten the orifice screw (Item 2) **[Figure 20-110-11]** to 6-8 ft.-lbs. (8,1-10,8 Nm) torque.

Figure 20-110-13



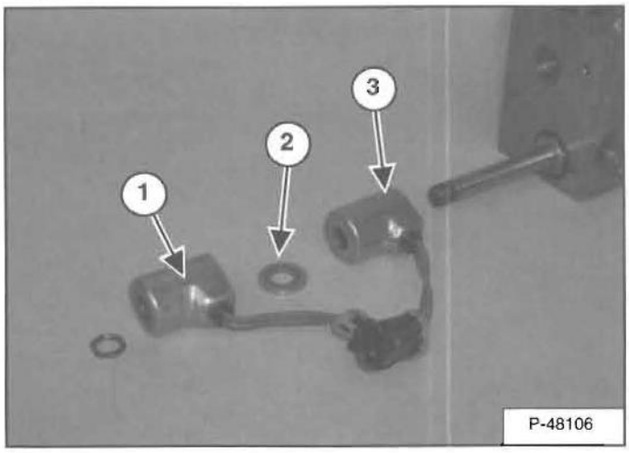
NOTE: This plug is a zero leak plug and should not be removed. If removed damage may occur and the plug and O-ring must be replaced.

Do not remove the plug (Item 1) **[Figure 20-110-13]**.

Remove the solenoid nut (Item 2) **[Figure 20-110-13]**.

Installation: Tighten the solenoid valve stem nut to 15-45 in.-lbs. (1,7-5,1 Nm) torque.

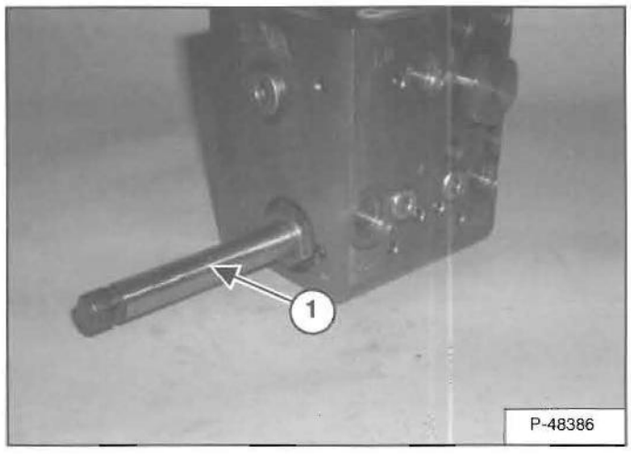
Figure 20-110-14



Remove the first solenoid coil (Item 1), spacer (Item 2) and the second solenoid coil (Item 3) **[Figure 20-110-14]**.

NOTE: Remember the solenoid coil orientation for ease of installation.

Figure 20-110-15

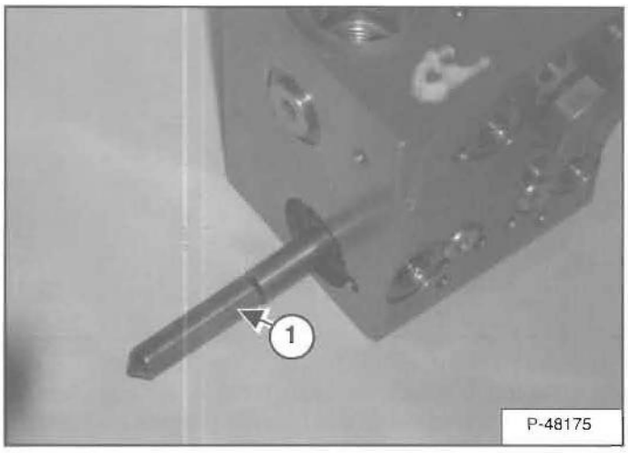


Remove the the solenoid stem (Item 1) **[Figure 20-110-15]**.

Installation: Tighten the solenoid stem to 20-25 ft.-lbs. (27,1-34 Nm) torque.

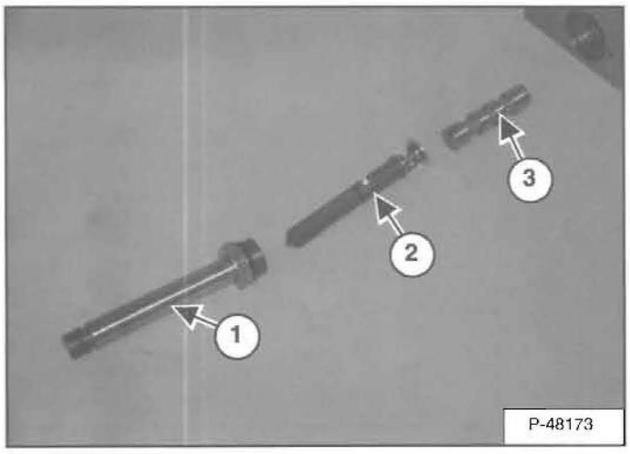
Disassembly And Assembly (Cont'd)

Figure 20-110-16



Remove the armature rod assembly (Item 1) **[Figure 20-110-16]**.

Figure 20-110-17

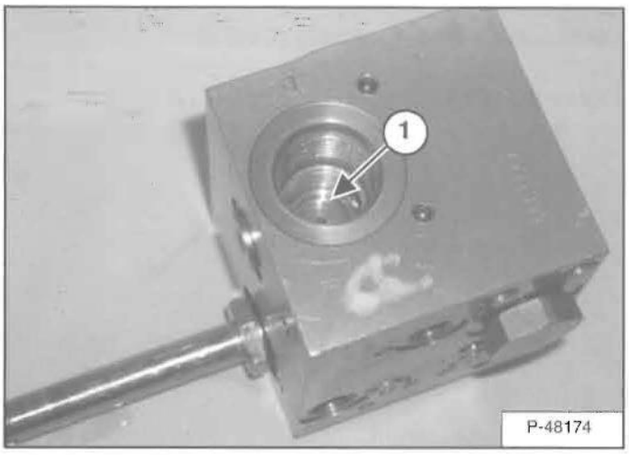


Inspect the solenoid stem (Item 1), armature assembly (Item 2) and the spool (Item 3) for damage **[Figure 20-110-17]**.

NOTE: If the solenoid stem is damaged (Item 1) check the armature assembly (Item 2) for damage.

The armature assembly (Item 2) and spool (Item 3) are non-serviceable parts. If they are damaged, order a new power Bob-Tach block assembly from Bobcat parts [Figure 20-110-17].

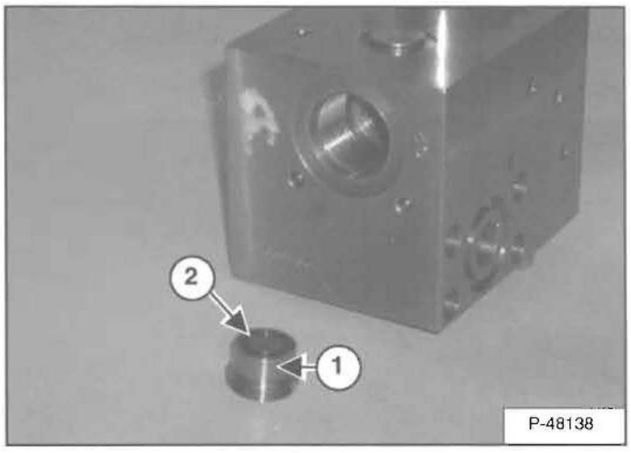
Figure 20-110-18



Remove the screened orifice plug (Item 1) **[Figure 20-110-18]**.

Installation: Tighten the screened orifice plug to 11-12 ft.-lbs. (14,9-16,3 Nm) torque.

Figure 20-110-19



Inspect the screened orifice plug (Item 1) **[Figure 20-110-19]** for damage replace as needed. If the screened orifice plug is blocked replace with a new plug.

Check the O-ring (Item 2) **[Figure 20-110-19]** and replace as needed.

FRONT AUXILIARY HYDRAULIC COUPLER BLOCK

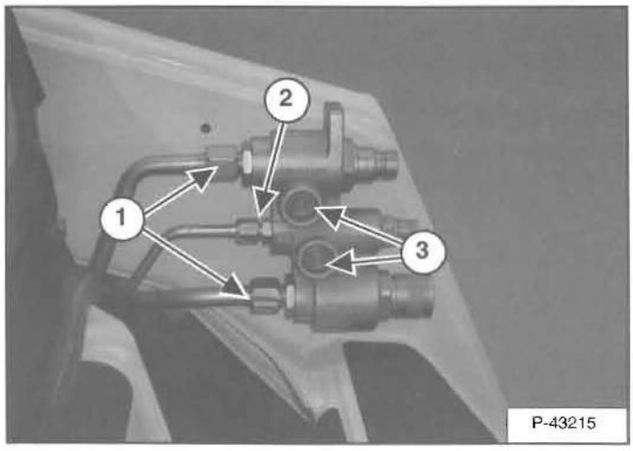
Removal and Installation

IMPORTANT

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

I-2003-0888

Figure 20-120-1



Disconnect the auxiliary tubelines (Item 1) and drain tubeline (Item 2) **[Figure 20-120-1]** from the coupler block.

Remove the two mounting bolts (Item 3) **[Figure 20-120-1]**.

Disassembly And Assembly

Figure 20-120-2

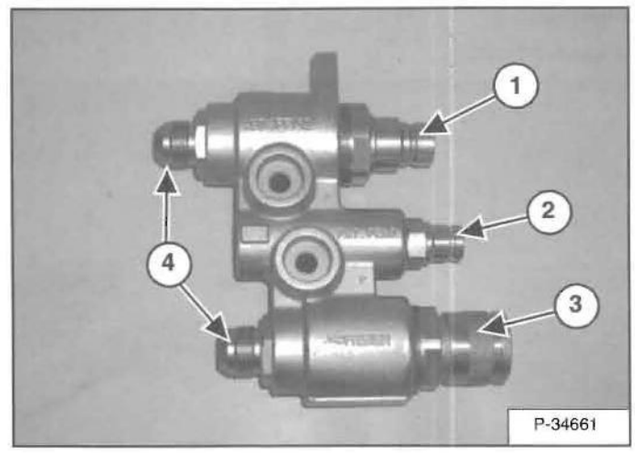
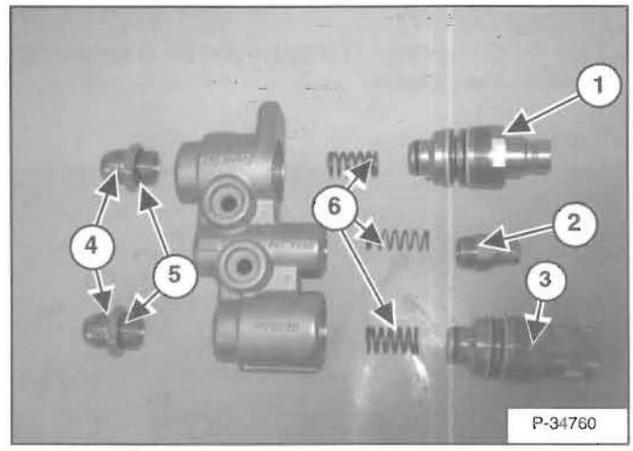


Figure 20-120-3



Remove the male coupler (Item 1) **[Figure 20-120-2]** & **[Figure 20-120-3]**.

Installation: Tighten the male coupler (Item 1) **[Figure 20-120-2]** & **[Figure 20-120-3]** to 59 ft.-lbs. (80 Nm)

Remove the drain coupler (Item 2) **[Figure 20-120-2]** & **[Figure 20-120-3]**.

Installation: Tighten the drain coupler (Item 2) **[Figure 20-120-2]** & **[Figure 20-120-3]** to 37 ft.-lbs. (50 Nm)

Remove the female coupler (Item 3) **[Figure 20-120-2]** & **[Figure 20-120-3]**.

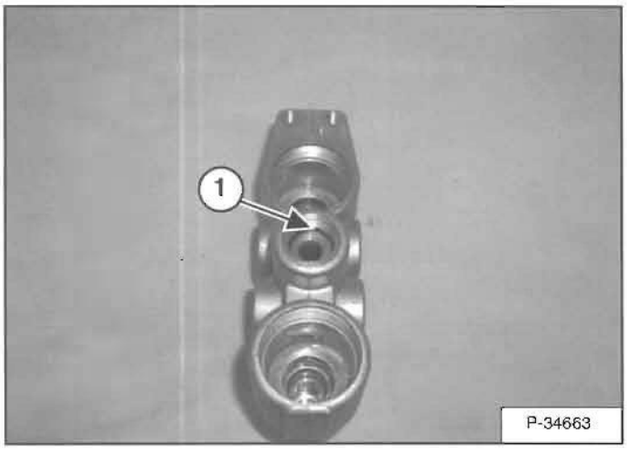
Installation: Tighten the female coupler (Item 3) **[Figure 20-120-2]** & **[Figure 20-120-3]** to 59 ft.-lbs. (80 Nm)

Remove the fittings (Item 4), check the O-rings (Item 5) **[Figure 20-120-3]** and replace as needed.

Remove the springs (Item 6) **[Figure 20-120-3]**.

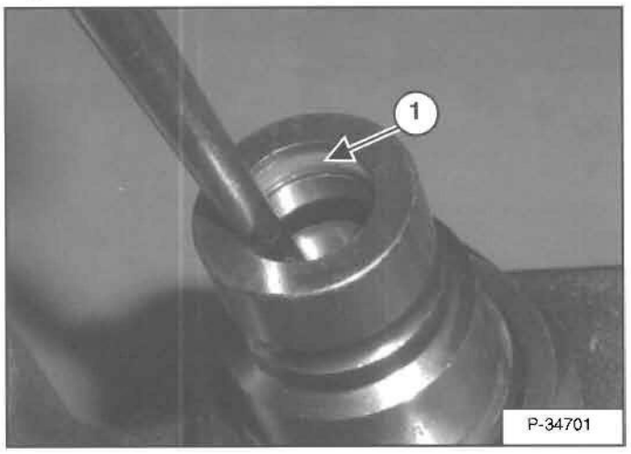
Disassembly And Assembly (Cont'd)

Figure 20-120-4



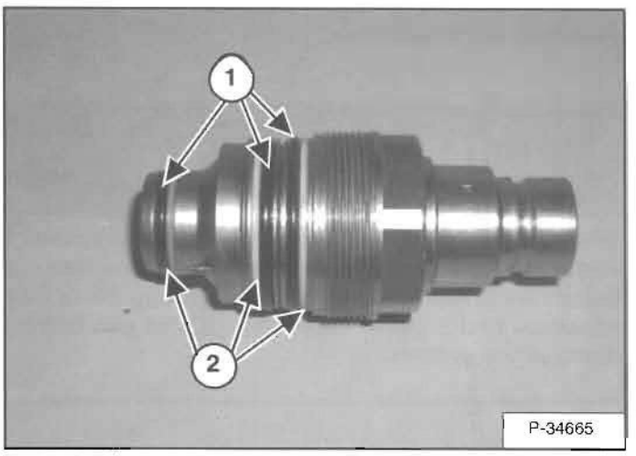
Check the O-ring (Item 1) **[Figure 20-120-4]** for damage and replace as needed.

Figure 20-120-5



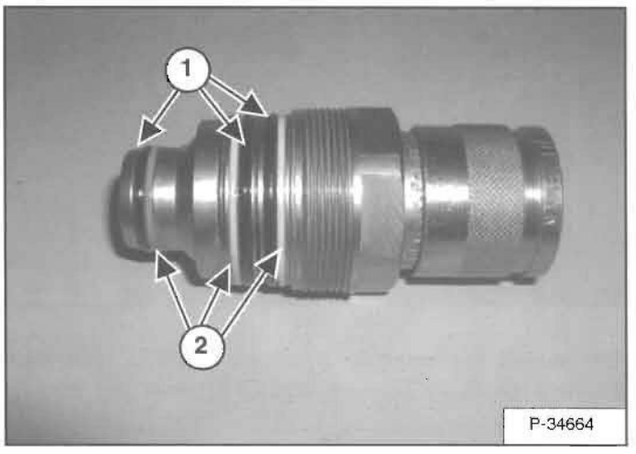
Press center of male couplers down and check the O-ring (Item 1) **[Figure 20-120-5]** for damage and replace as needed.

Figure 20-120-6



Check the O-rings (Item 1) backup O-rings (Item 2) **[Figure 20-120-6]** for damage and replace as needed.

Figure 20-120-7



Check the O-rings (Item 1) and backup O-rings (Item 2) **[Figure 20-120-7]** for damage and replace as needed.

HYDROSTATIC SYSTEM

CHARGE PRESSURE 30-30-1
- Adjusting 30-30-2
- Checking Charge Pressure 30-30-1
- Sender Removal And Installation. 30-30-1

DRIVE BELT 30-50-1
- Adjusting 30-50-1
- Drive Belt Replacement 30-50-2
- Shield Removal And Installation 30-50-1
- Tensioner Pulley Assembly 30-50-7
- Tensioner Pulley Disassembly 30-50-6
- Tensioner Pulley Parts Identification 30-50-5
- Tensioner Pulley Removal And Installation 30-50-4

HYDROSTATIC MOTOR. 30-20-1
- Assembly 30-20-9
- Carrier Assembly 30-20-21
- Carrier Disassembly. 30-20-20
- Carrier Parts Identification 30-20-19
- Carrier Removal And Installation 30-20-17
- Carrier Shaft Seal Replacement 30-20-15
- Disassembly. 30-20-4
- Parts Identification 30-20-3
- Removal And Installation 30-20-1

HYDROSTATIC PUMP 30-40-1
- Assembly 30-40-15
- Disassembly. 30-40-9
- Hydraulic Pump Removal And Installation. 30-40-8
- Parts Identification (Left Half). 30-40-6
- Parts Identification (Right Half) 30-40-4
- Pump Separation 30-40-8
- Removal And Installation 30-40-2
- Replenishing/High Pressure Relief Valve 30-40-1

HYDROSTATIC SYSTEM INFORMATION 30-10-1
- Replenishing Valve Function 30-10-2
- Troubleshooting Chart 30-10-1

OIL COOLER 30-60-1
- Removal and Installation 30-60-1

TIGHTEN ALL HARDWARE PER SIZE TO GRADE 5 TORQUE (SEE STANDARD TORQUE SPECIFICATIONS FOR BOLTS, SECTION SPEC 01) UNLESS OTHERWISE SPECIFIED.



Bobcat®

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 authorized Bobcat 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
No drive on one side, in one direction.	1, 2
No drive on one side in both directions.	2, 3, 4, 5
The loader does not move in a straight line.	2, 3, 5, 6, 7
The hydrostatic system is overheating.	8, 9, 10, 11
Hydraulic Service codes appear (Warnings, low charge pressure.)	8, 11, 12, 13

KEY TO CORRECT THE CAUSE
1. The hydrostatic pump replenishing valves not seating.
2. The steering linkage needs adjustment.
3. The hydrostatic pump has damage.
4. The final drive chains are broken.
5. The hydrostatic motor has damage.
6. The tires do not have the correct tire pressure.
7. The tires are not the same size.
8. The hydrostatic fluid is not at the correct level.
9. The oil cooler has a restriction.
10. The temperature sending switch is not operating correctly.
11. The loader is not being operated at the correct RPM.
12. The hydraulic charge pressure sender is defective.
13. Pump is defective or worn hydrostatics.

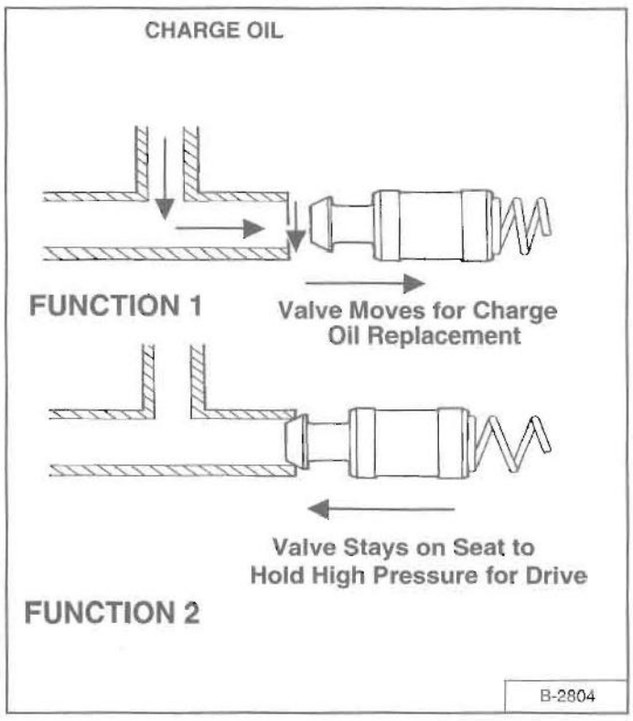
IMPORTANT

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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Replenishing Valve Function

Figure 30-10-1



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]**.

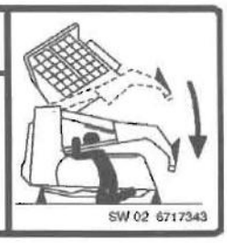
HYDROSTATIC MOTOR

Removal And Installation

⚠ DANGER

AVOID DEATH

- Disconnecting or loosening any hydraulic tubeline, hose, fitting, component or a part failure can cause lift arms to drop.
- Keep out of this area when lift arms are raised unless supported by an approved lift arm support. Replace if damaged. 57051



⚠ WARNING

Never work on a machine with the lift arms up unless the lift arms are secured by an approved lift arm support device. Failure to use an approved lift arm support device can allow the lift arms or attachment to fall and cause injury or death.

W-2059-0598

⚠ 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

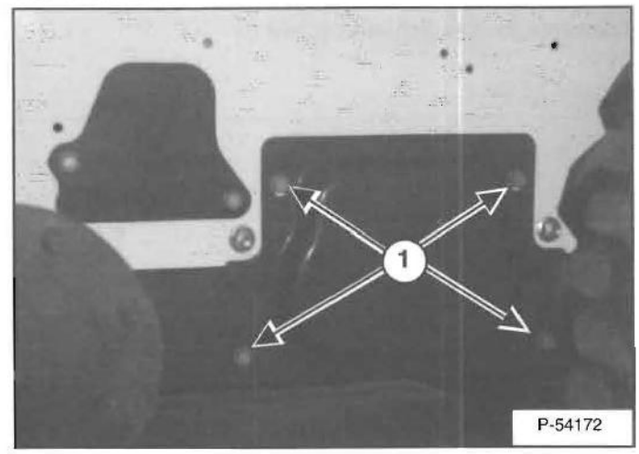
Raise the lift arms and install an approved lift arm support device. (See Contents Page 10-01.)

Lift and block the loader. (See Contents Page 10-01.)

Raise the operator cab. (See Contents Page 10-01.)

Remove the front and rear wheel/tire assemblies. (See Contents Page 10-01.)

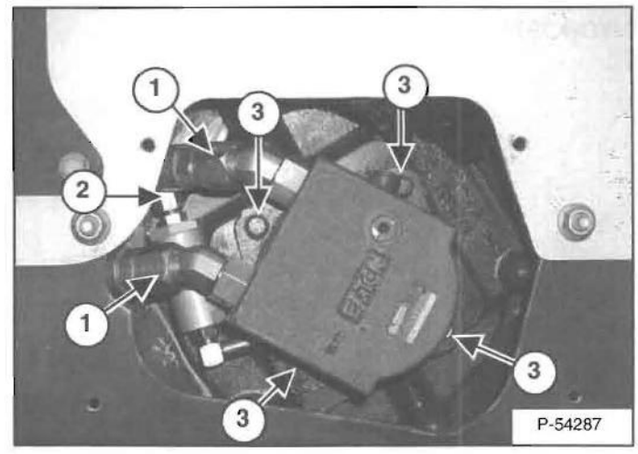
Figure 30-20-1



Remove the four motor cover mounting bolts (Item 1) **[Figure 30-20-1]**.

Installation: Tighten the drive motor cover mounting bolts to 15-20 ft.-lbs. (20-27 Nm) torque.

Figure 30-20-2



Mark the two hoses (Item 1) **[Figure 30-20-2]** before disconnecting them from the HYDROSTATIC MOTOR for correct installation.

Remove the two hoses (Item 1) **[Figure 30-20-2]** from the drive motor.

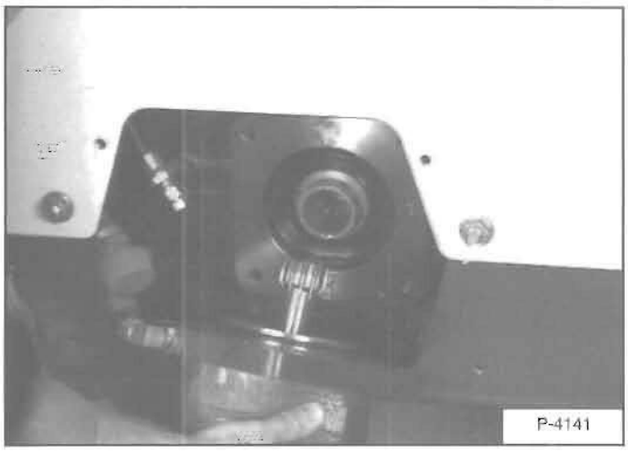
Remove the drain hose (Item 2) **[Figure 30-20-2]** from the case drain filter.

Remove the four drive motor mounting bolts (Item 3) **[Figure 30-20-2]**.

Installation: Tighten the drive motor mounting bolts to 90-100 ft.-lbs. (122-136 Nm) torque.

Removal And Installation (Cont'd)

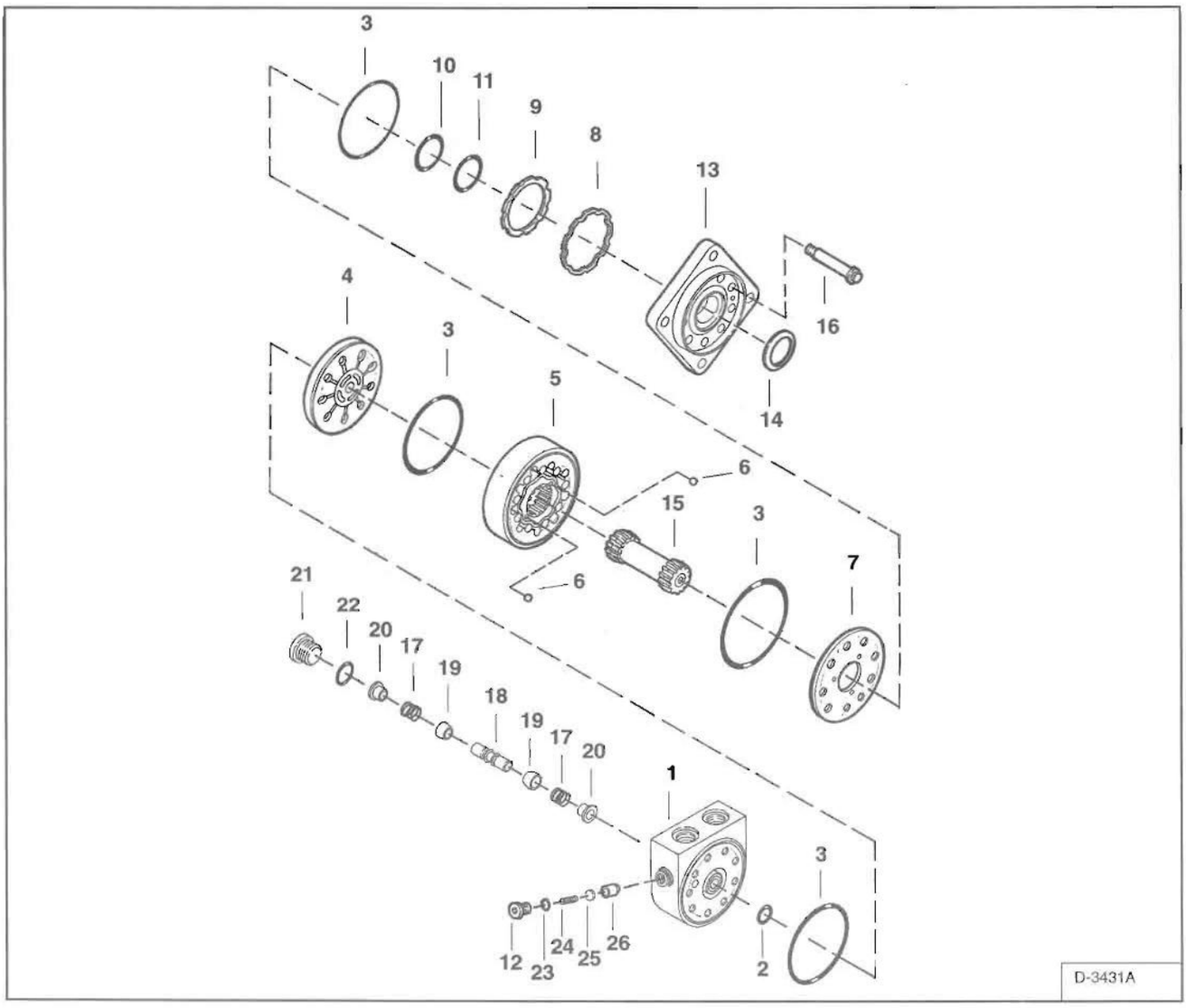
Figure 30-20-3



Remove the drive motor from the access hole in the loader frame **[Figure 30-20-3]**.

Reverse the removal procedure to install the HYDROSTATIC MOTOR.

Parts Identification



Ref.	Description
1.	HOUSING
2.	O-RING
3.	SEAL, square
4.	VALVE, plate
5.	GEROLER
6.	BALL
7.	PLATE, balance
8.	RING, back-up
9.	SEAL
10.	RING, back-up
11.	O-RING
12.	PLUG
13.	FLANGE, mounting
14.	SEAL, face

Ref.	Description
15.	SHAFT, drive
16.	BOLT
17.	SPRING
18.	PISTON
19.	POPPET
20.	SLEEVE
21.	PLUG
22.	O-RING
23.	O-RING
24.	SPRING
25.	SHIM
26.	POPPET

Disassembly

IMPORTANT

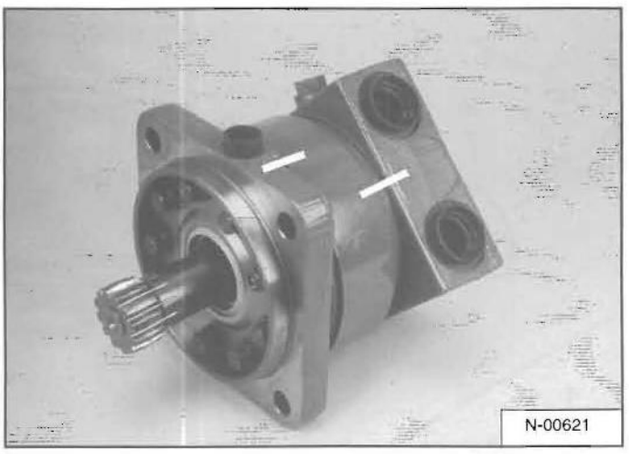
When repairing hydrostatic and hydraulic systems, clean the work area before disassembly and keep all parts clean. Always use caps and plugs on hoses, tubelines and ports to keep dirt out. Dirt can quickly damage the system.

I-2003-0888

Drain the oil from the motor.

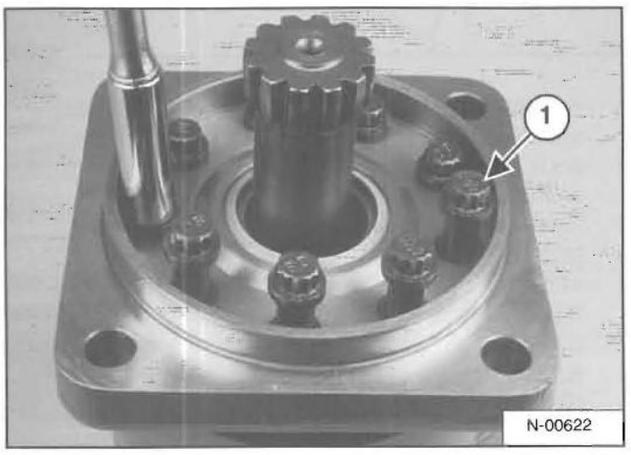
Seal all open ports and clean the motor with solvent.

Figure 30-20-4



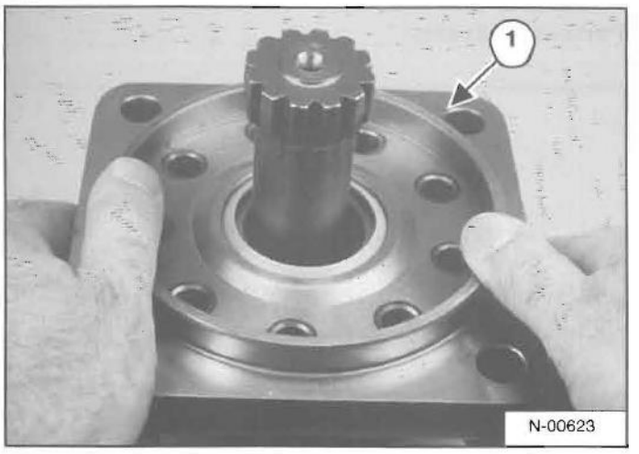
Put a mark across the sections of the motor for correct assembly **[Figure 30-20-4]**.

Figure 30-20-5



Remove the nine bolts (Item 1) **[Figure 30-20-5]** from the motor.

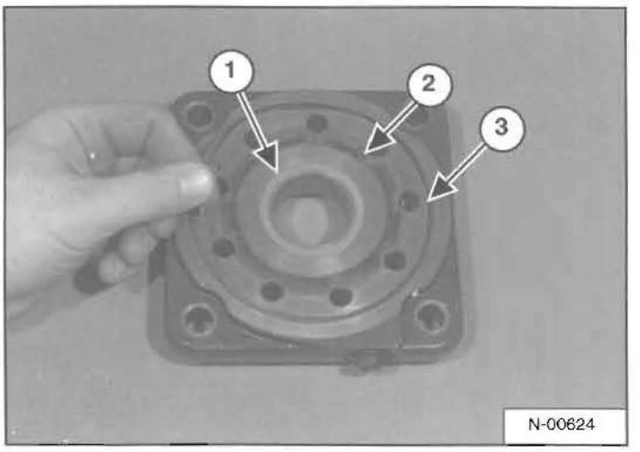
Figure 30-20-6



Lift and remove the mounting flange (Item 1) **[Figure 30-20-6]** from the motor.

NOTE: Do not scratch or damage the surfaces of the motor sections. Always put them on a soft surface.

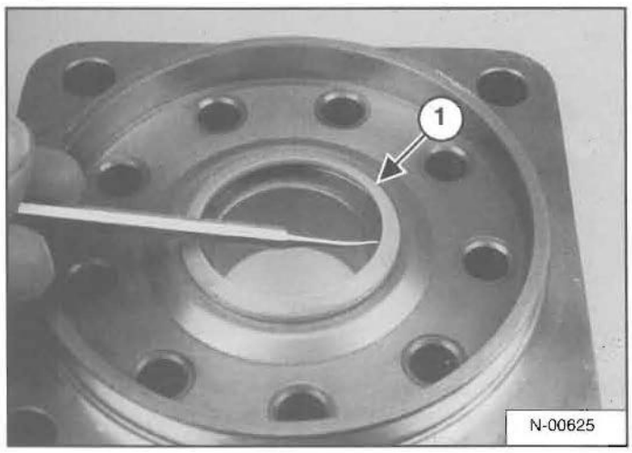
Figure 30-20-7



Turn the mounting flange over and remove the O-ring and back-up ring (Item 1), the seal and back-up ring (Item 2), and the square-cut seal (Item 3) **[Figure 30-20-7]**.

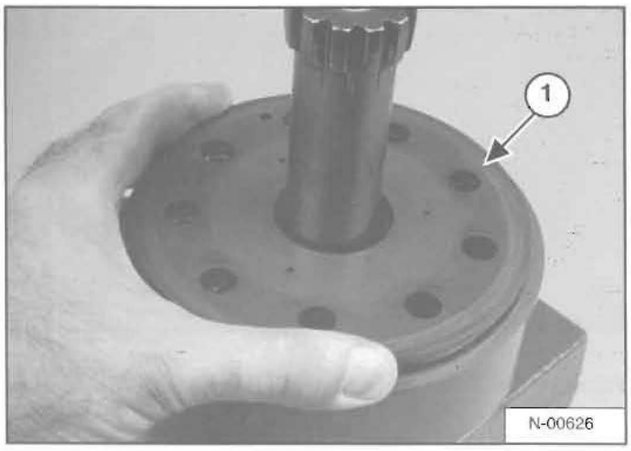
Disassembly (Cont'd)

Figure 30-20-8



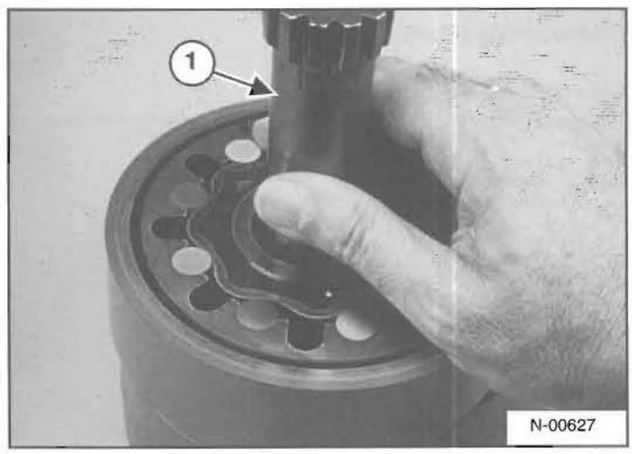
Turn the mounting flange backover and remove the seal (Item 1) **[Figure 30-20-8]** from the mounting flange.

Figure 30-20-9



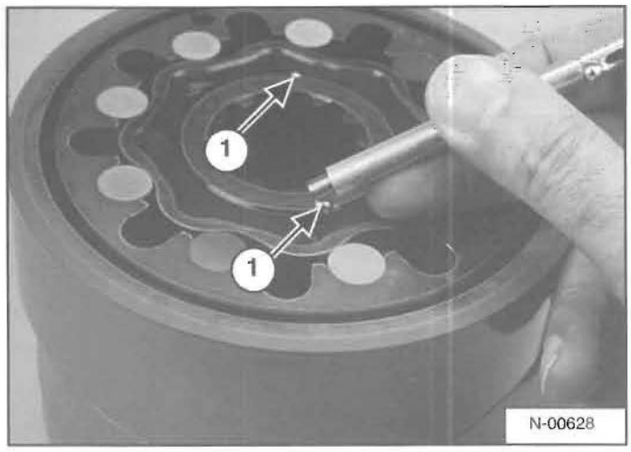
Remove the balance plate (Item 1) **[Figure 30-20-9]** from the gerolor assembly.

Figure 30-20-10



Remove the main drive (Item 1) **[Figure 30-20-10]** from the gerolor assembly.

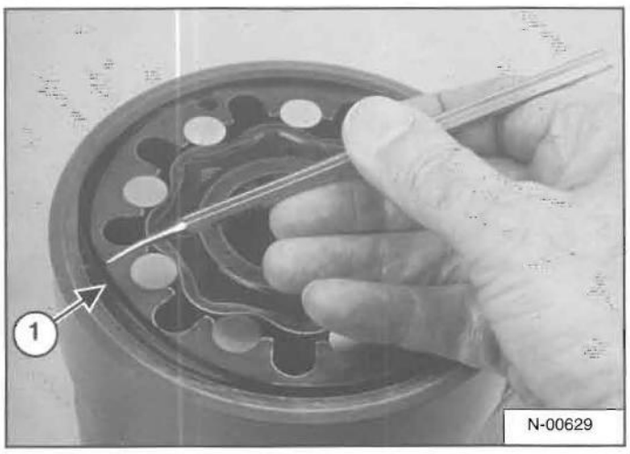
Figure 30-20-11



Remove the two check balls (Item 1) **[Figure 30-20-11]** from the gerolor.

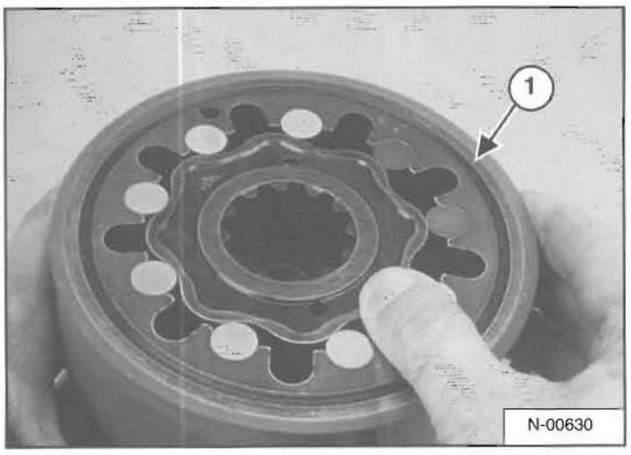
Disassembly (Cont'd)

Figure 30-20-12



Remove the square cut seal (Item 1) **[Figure 30-20-12]** from the gerolor.

Figure 30-20-13

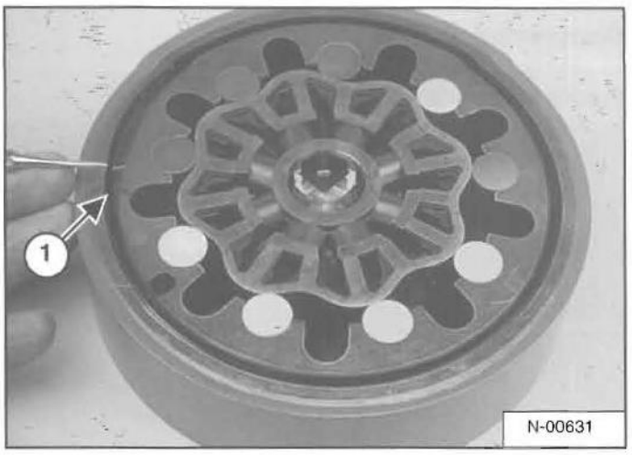


Remove the gerolor assembly (Item 1) **[Figure 30-20-13]**.

NOTE: Care should be taken to keep the gerolor assembly together.

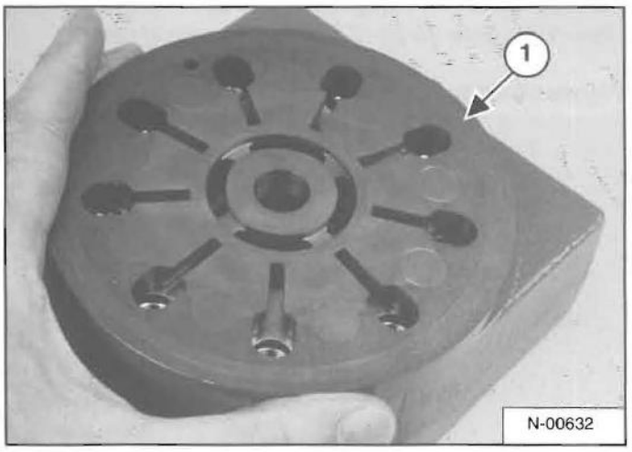
NOTE: If rollers are removed, put them back in their original bore with the correct orientation.

Figure 30-20-14



Carefully turn the gerolor assembly over and remove the square cut seal (Item 1) **[Figure 30-20-14]**.

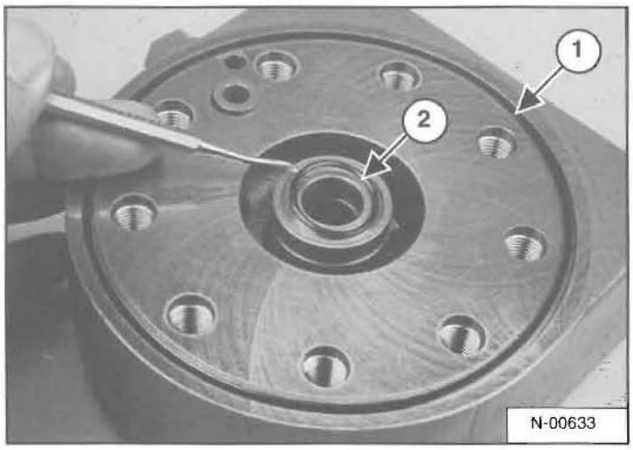
Figure 30-20-15



Remove the valve plate (Item 1) **[Figure 30-20-15]** from the end cap.

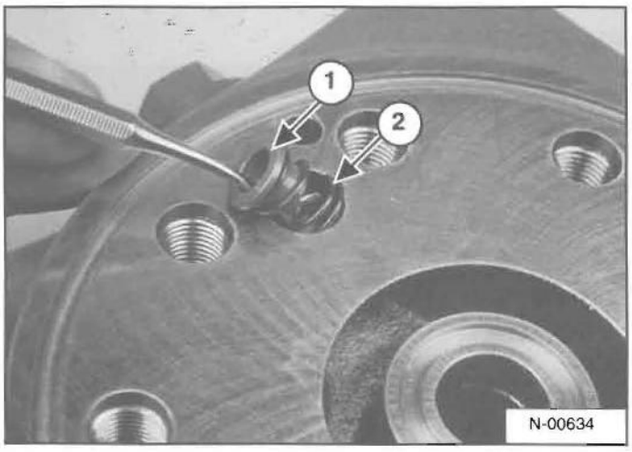
Disassembly (Cont'd)

Figure 30-20-16



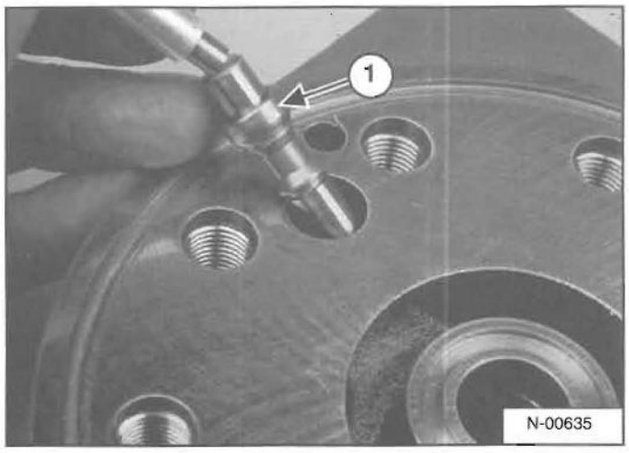
Remove the square cut seal (Item 1) and small O-ring (Item 2) **[Figure 30-20-16]** from the end cap.

Figure 30-20-17



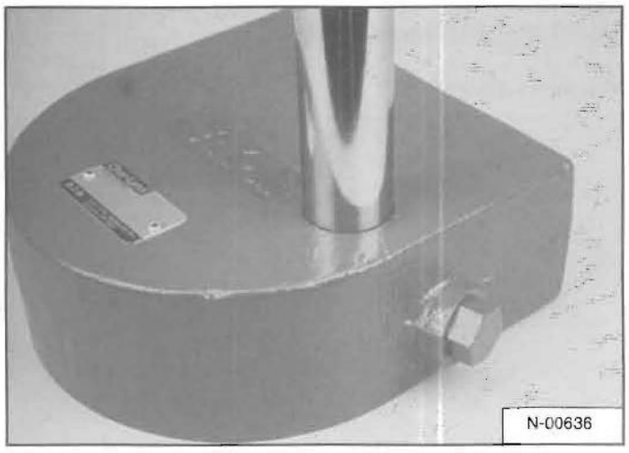
Remove the spring seat (Item 1) and spring (Item 2) **[Figure 30-20-17]**.

Figure 30-20-18



Remove the poppet and shuttle valve (Item 1) **[Figure 30-20-18]**.

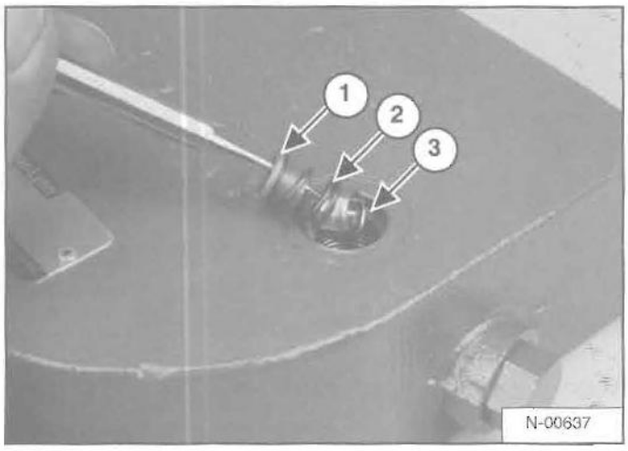
Figure 30-20-19



Turn the end cover over and remove the shuttle valve plug from the end cover **[Figure 30-20-19]**.

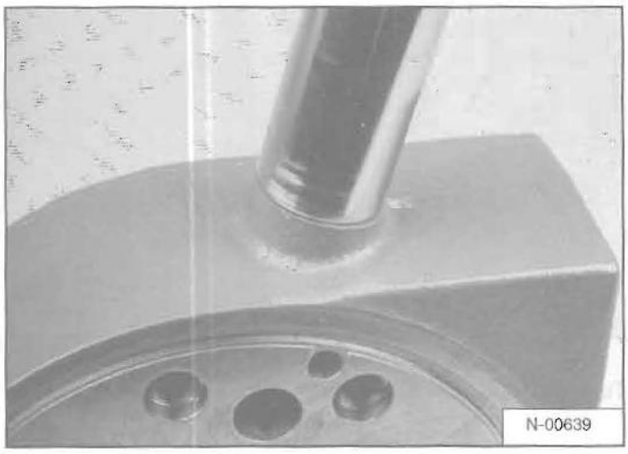
Disassembly (Cont'd)

Figure 30-20-20



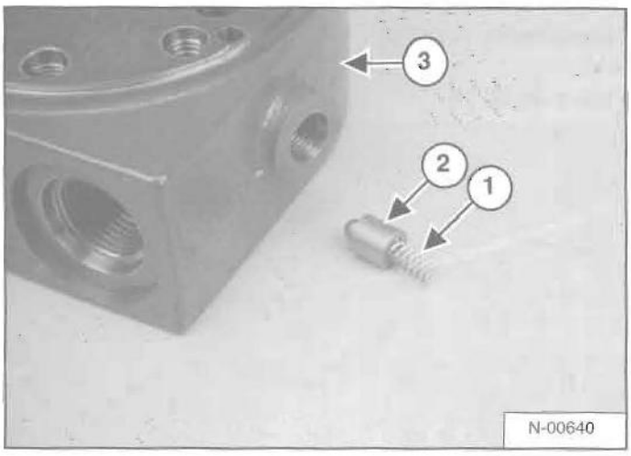
Remove the spring sleeve (Item 1), spring (Item 2) and poppet (Item 3) **[Figure 30-20-20]**.

Figure 30-20-21



Remove the low pressure relief valve plug from the side of the end cover **[Figure 30-20-21]**.

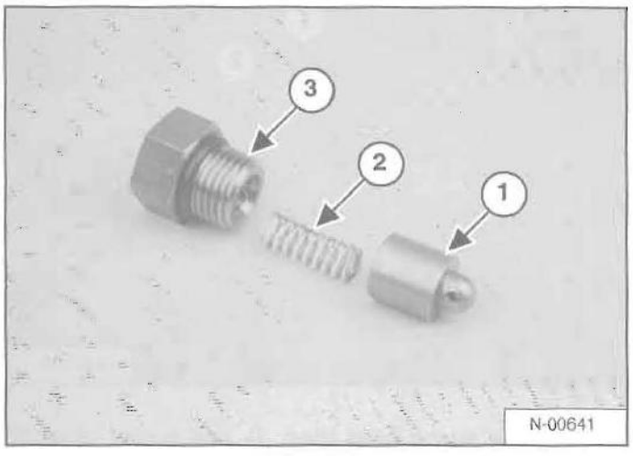
Figure 30-20-22



Remove the spring (Item 1) and poppet (Item 2) from the end cover (Item 3) **[Figure 30-20-22]**.

NOTE: The relief pressure is factory set and must not be changed. Shims may or may not have been used at the factory for setting the pressure. If shims are present, make sure they are reinstalled during assembly.

Figure 30-20-23



The low pressure relief valve is made up of the poppet (Item 1), the spring (Item 2) and the plug assembly (Item 3) **[Figure 30-20-23]**.

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

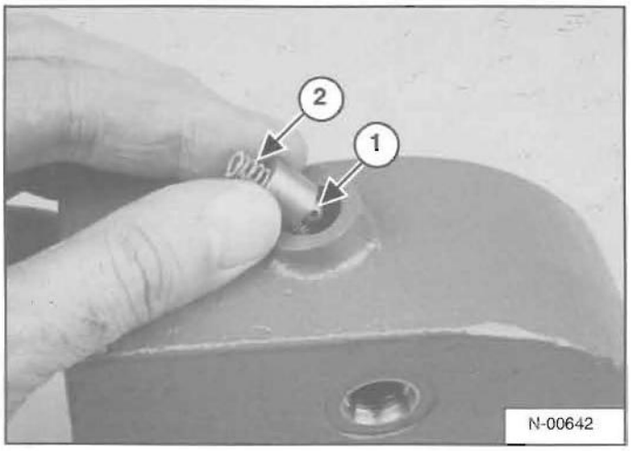
Prior to assembly:

Clean all parts with solvent and dry with compressed air.

Put grease on O-rings.

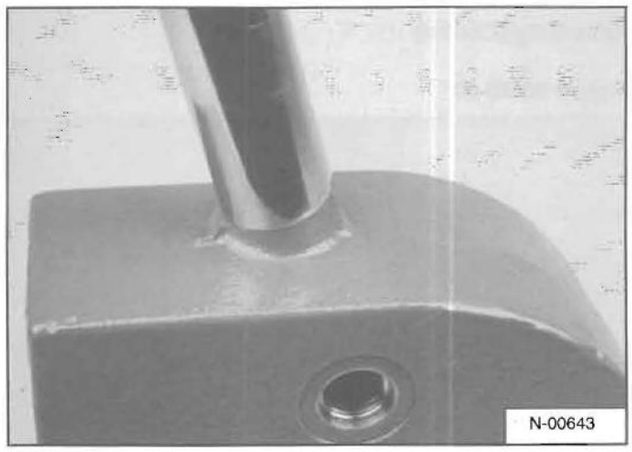
Lubricate parts with oil.

Figure 30-20-24



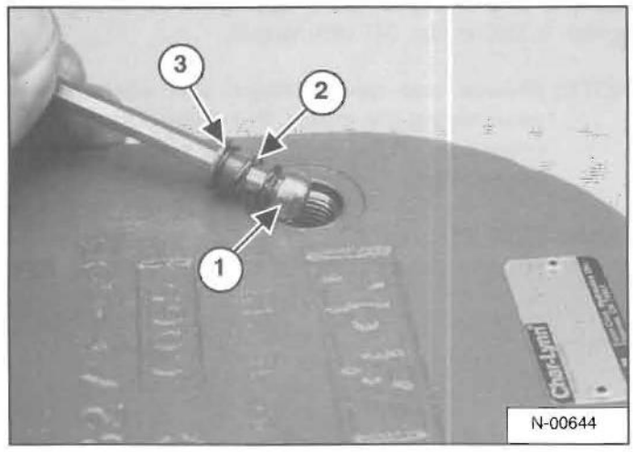
Install the poppet (Item 1) and spring (Item 2) **[Figure 30-20-24]** in the low pressure relief port in the end cover.

Figure 30-20-25



Install the new O-ring on the plug and tighten to 300 in.-lbs. (34 Nm) torque **[Figure 30-20-25]**.

Figure 30-20-26

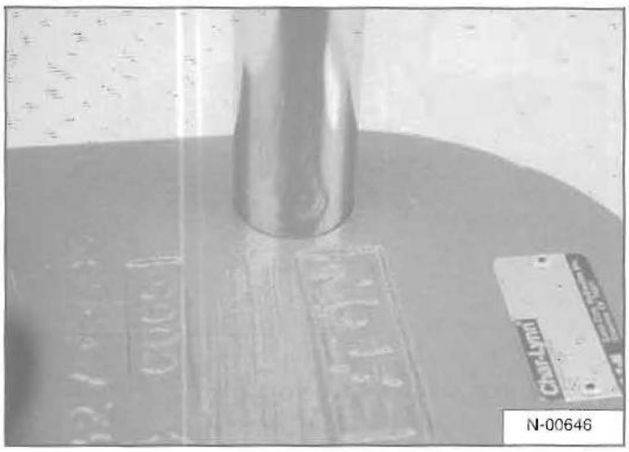


Install the poppet (Item 1), the spring (Item 2) and the spring sleeve (Item 3) **[Figure 30-20-26]** in the end cover.

NOTE: The tapered end of the poppet must face towards the shuttle valve.

Assembly (Cont'd)

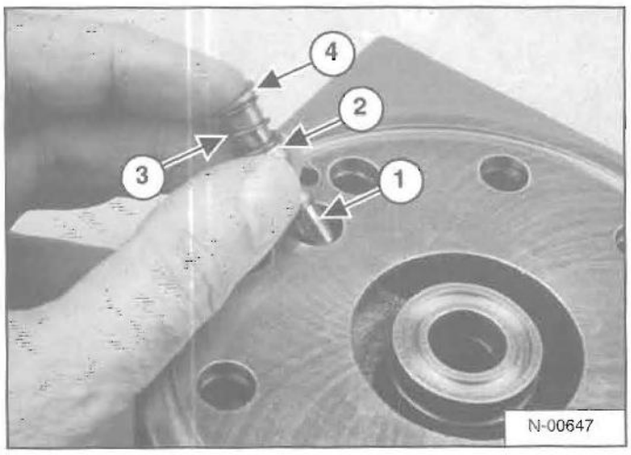
Figure 30-20-27



Install a new O-ring on the plug **[Figure 30-20-27]** and tighten to 260 in.-lbs. (41 Nm) torque.

NOTE: Always use new O-rings and seals when assembling the motor. Put a small amount of grease on all the O-rings and seals for easier installation.

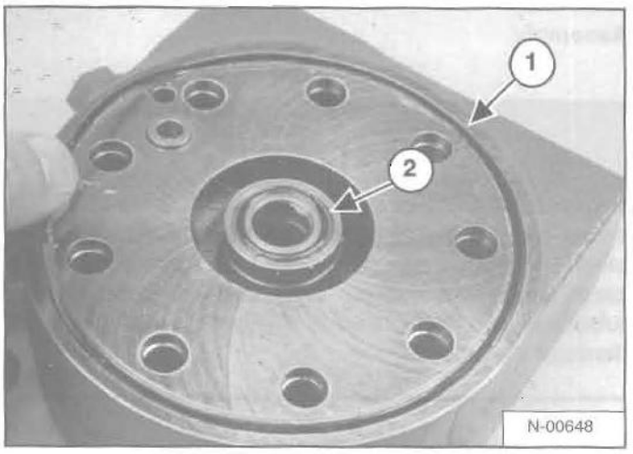
Figure 30-20-28



Install the shuttle valve (Item 1), poppet (Item 2), spring (Item 3) and spring sleeve (Item 4) **[Figure 30-20-28]** in the port hole in the end cap.

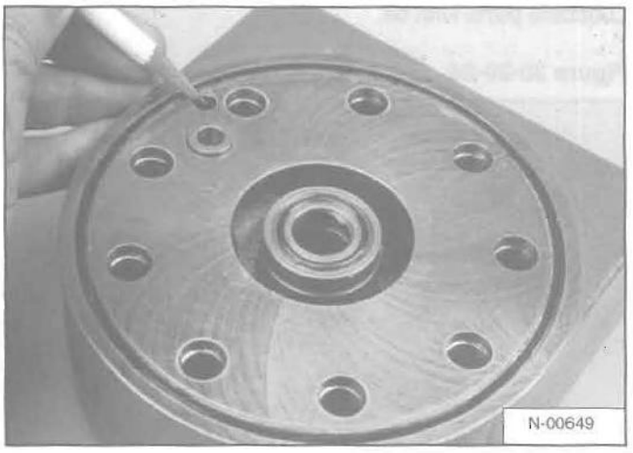
NOTE: The tapered end of the poppet must face towards the shuttle valve.

Figure 30-20-29



Install the square cut seal (Item 1) and small O-ring (Item 2) **[Figure 30-20-29]** in the end cover.

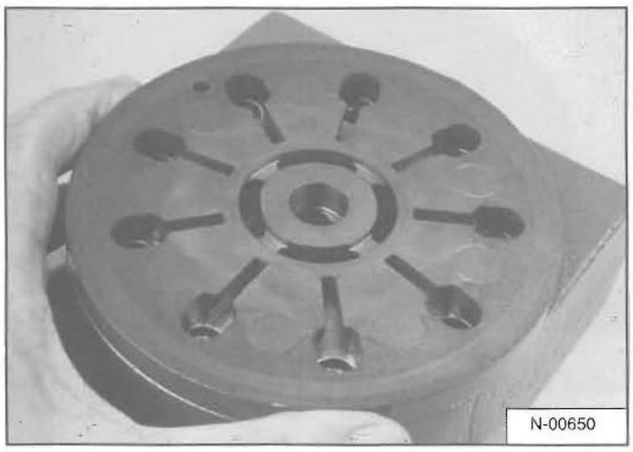
Figure 30-20-30



Mark the case drain port location on the outside of the end cover for ease of assembly **[Figure 30-20-30]**.

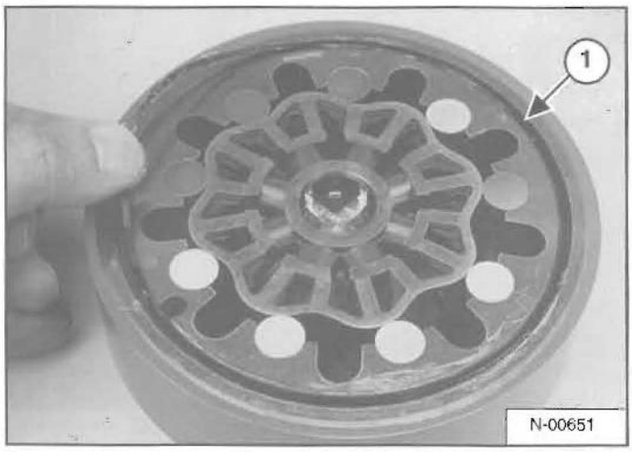
Assembly (Cont'd)

Figure 30-20-31



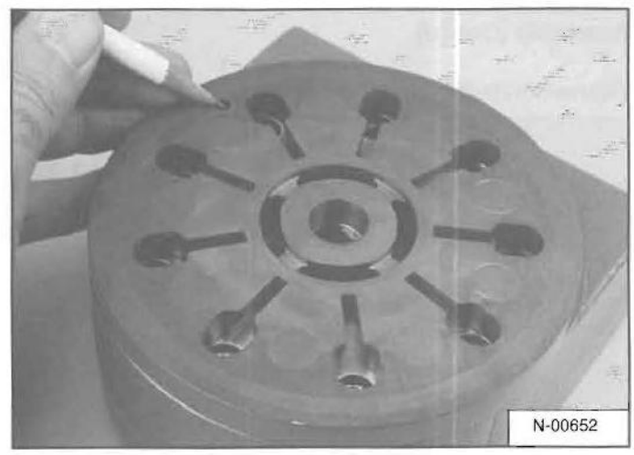
Align the case drain ports in the valve plate with the case drain port in the end cover **[Figure 30-20-31]**.

Figure 30-20-32



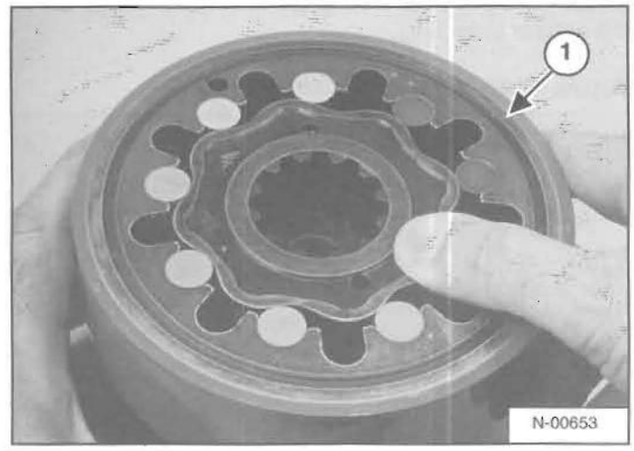
Install the large square cut seal (Item 1) **[Figure 30-20-32]** in gerolor assembly.

Figure 30-20-33



Mark the case drain port location on the outside edge of the valve plate as shown **[Figure 30-20-33]**.

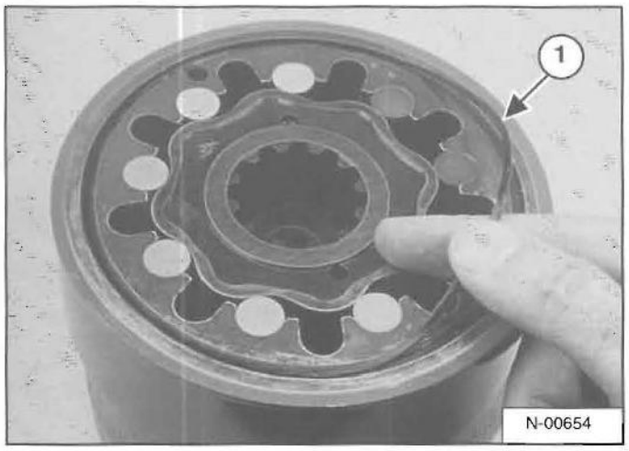
Figure 30-20-34



Install the gerolor assembly (Item 1) **[Figure 30-20-34]** by aligning the case drain hole with the case drain hole in the valve plate.

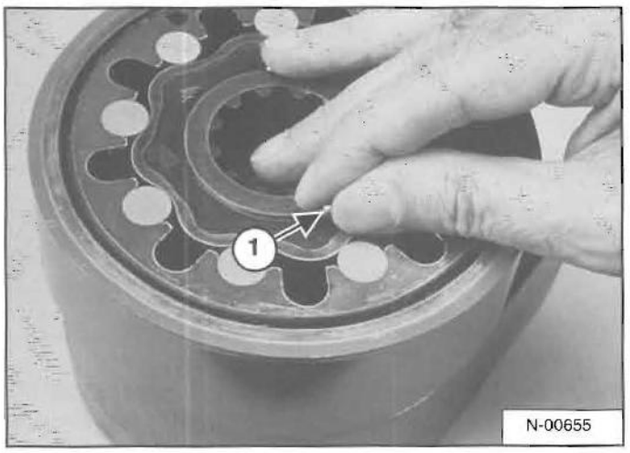
Assembly (Cont'd)

Figure 30-20-35



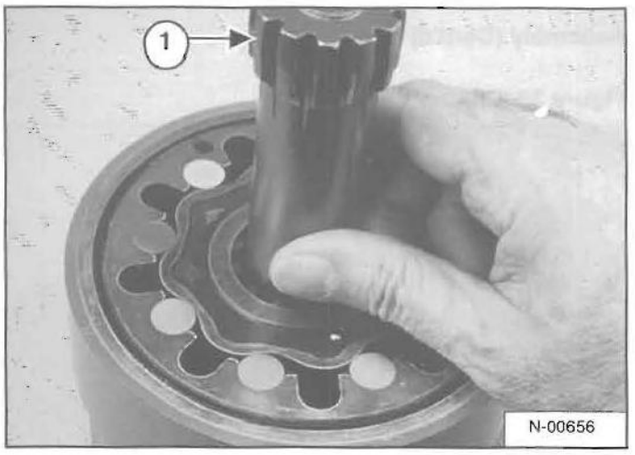
Install the square cut seal (Item 1) **[Figure 30-20-35]** in the gerolor outer ring.

Figure 30-20-36



Install the two check balls (Item 1) **[Figure 30-20-36]** in their bores in the gerolor star.

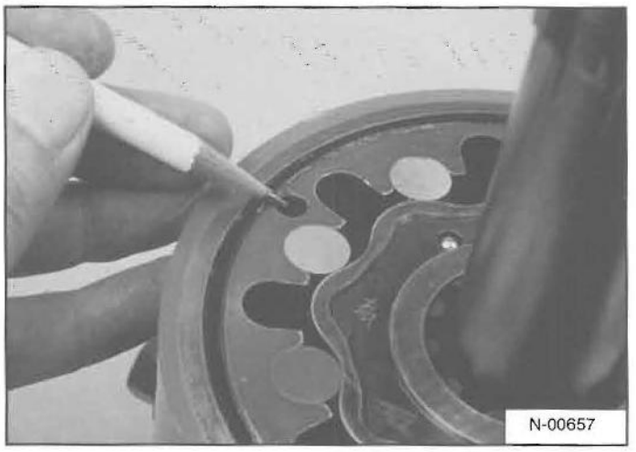
Figure 30-20-37



Install the main drive (Item 1) **[Figure 30-20-37]** in the gerolor (as shown).

NOTE: Whenever the main drive is not symmetrical, the smallest end of the main drive must be installed into the gerolor star.

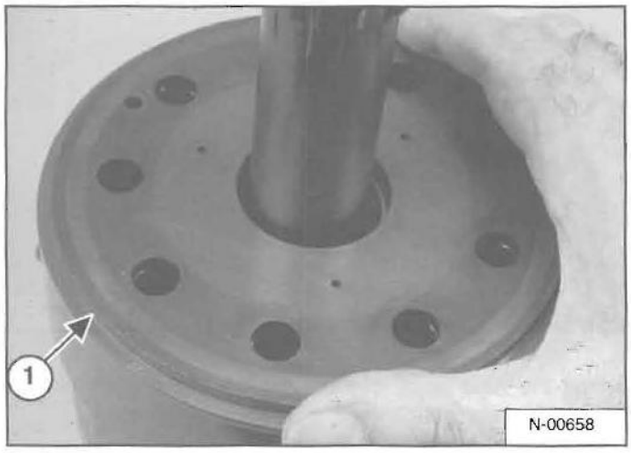
Figure 30-20-38



Mark the case drain hole on the outer ring of the gerolor (as shown) **[Figure 30-20-38]**.

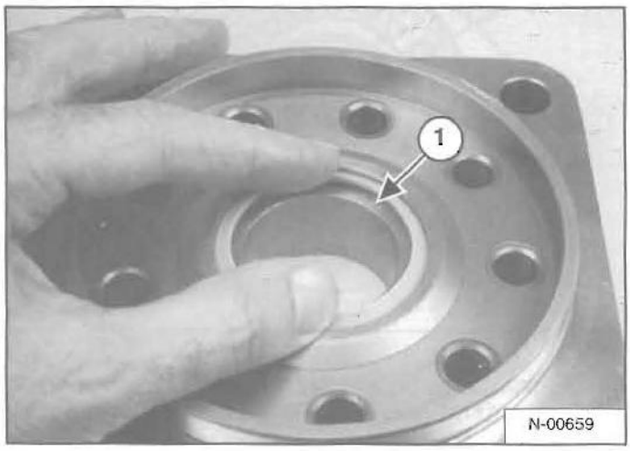
Assembly (Cont'd)

Figure 30-20-39



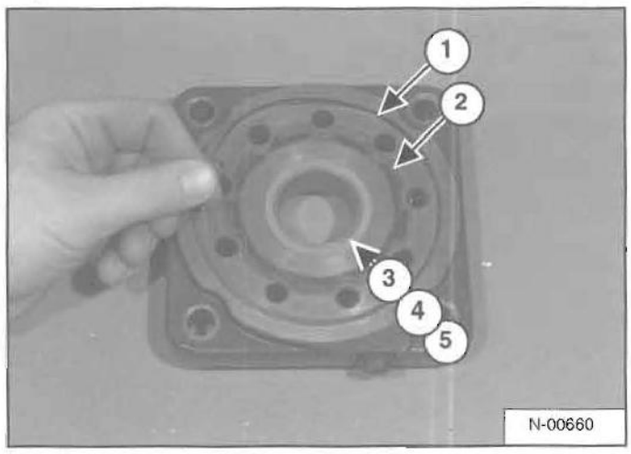
Align the case drain holes and install the balance plate (Item 1) **[Figure 30-20-39]** on the gerolor assembly.

Figure 30-20-40



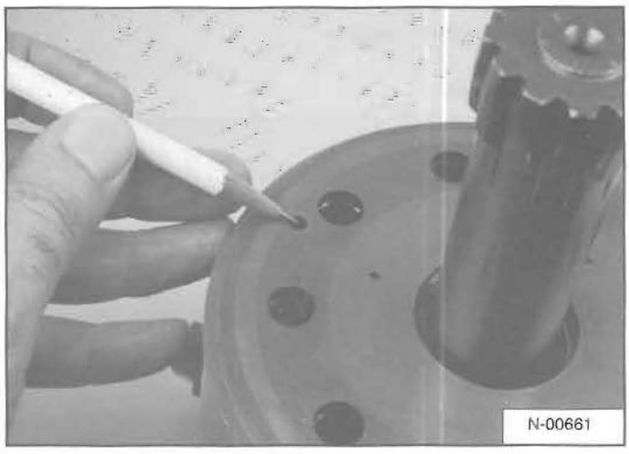
Install the seal (Item 1) **[Figure 30-20-40]** (as shown).

Figure 30-20-41



Install the square cut seal (Item 1), seal (Item 2), back-up seal (Item 3), seal (Item 4) and back-up ring (Item 5) **[Figure 30-20-41]** in the mounting flange.

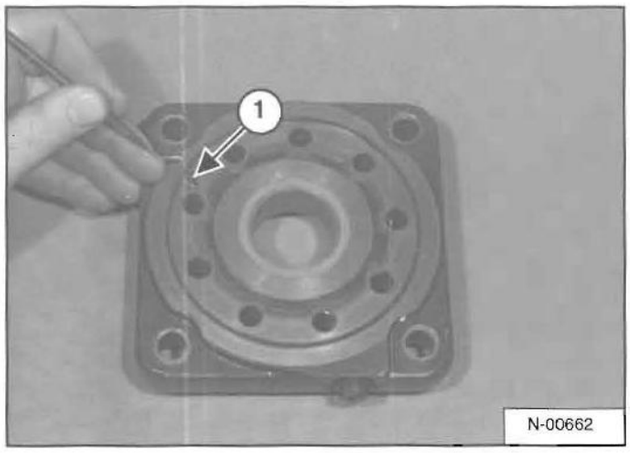
Figure 30-20-42



Mark the case drain holes on the side of the balance plate **[Figure 30-20-42]**.

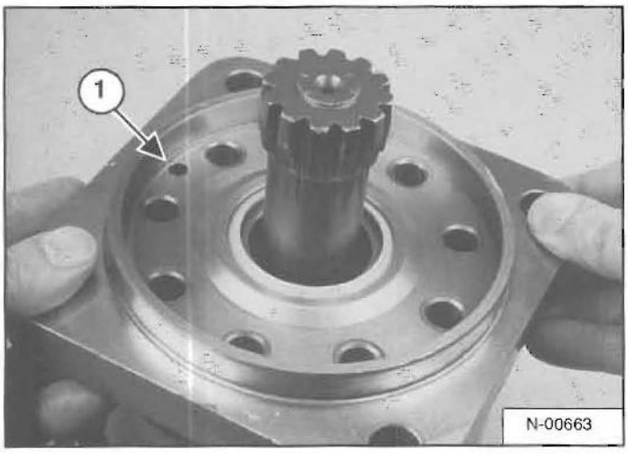
Assembly (Cont'd)

Figure 30-20-43



Align the case drain port (Item 1) **[Figure 30-20-43]** in the mounting flange with the case drain port in the balance plate (as shown).

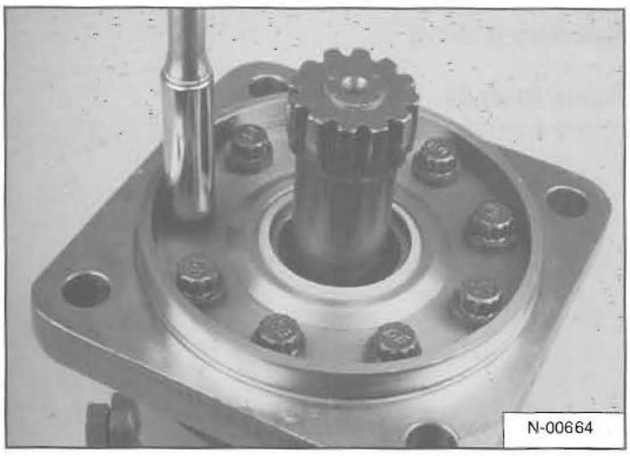
Figure 30-20-44



Align the case drain port (Item 1) **[Figure 30-20-44]** and install the mounting flange on the balance plate.

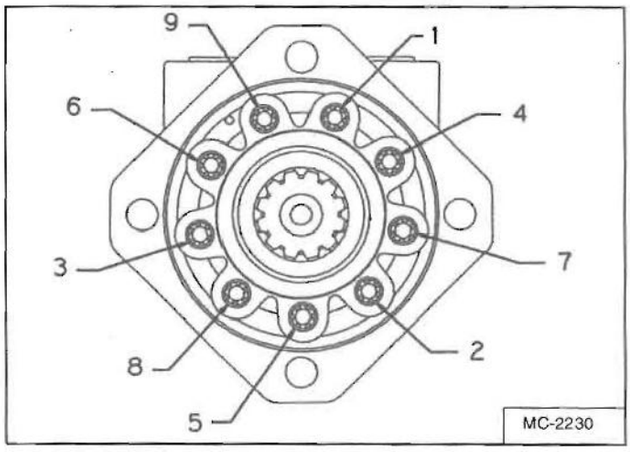
Be careful not to displace the seals and back-up rings.

Figure 30-20-45



Install the nine bolts into the motor. Make sure all the parts are in correct alignment **[Figure 30-20-45]**.

Figure 30-20-46



1. Tighten all the bolts in the sequence shown to 45-55 ft.-lbs. (61-75 Nm) torque **[Figure 30-20-46]**.

2. Tighten all the bolts in the sequence shown to 55-65 ft.-lbs. (75 -88 Nm) torque **[Figure 30-20-46]**. Make sure the bolts rotate during the final torque sequence.

NOTE: To prevent damage to the balance plate, never lift or support the motor by the center shaft.

Carrier Shaft Seal Replacement

⚠ WARNING

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

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

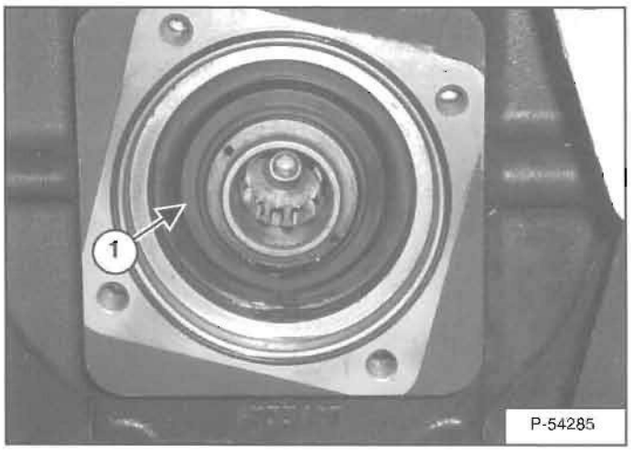
W-2019-1285

The tool listed is necessary for the following procedure:

MEL1420 - Carrier Seal Tool

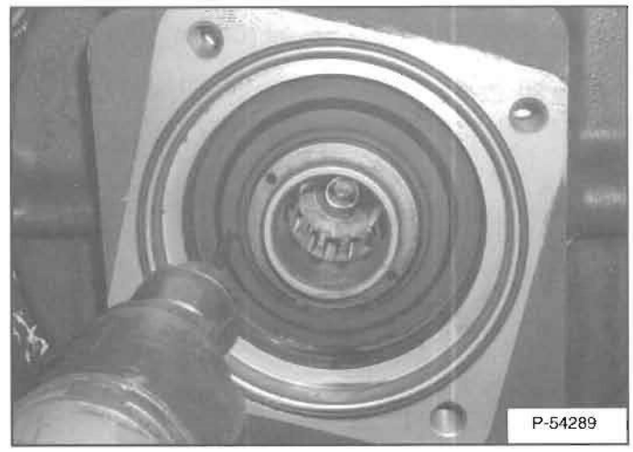
Remove the hydrostatic motor. (See Contents Page 30-01.)

Figure 30-20-47



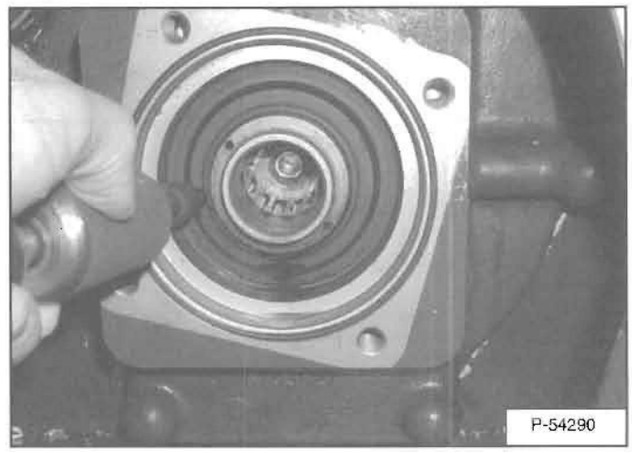
The motor carrier seal (Item 1) **[Figure 30-20-47]** is located on the outside of the motor carrier shaft.

Figure 30-20-48



Drill a.125 inch (3 mm) hole in the motor carrier seal **[Figure 30-20-48]**.

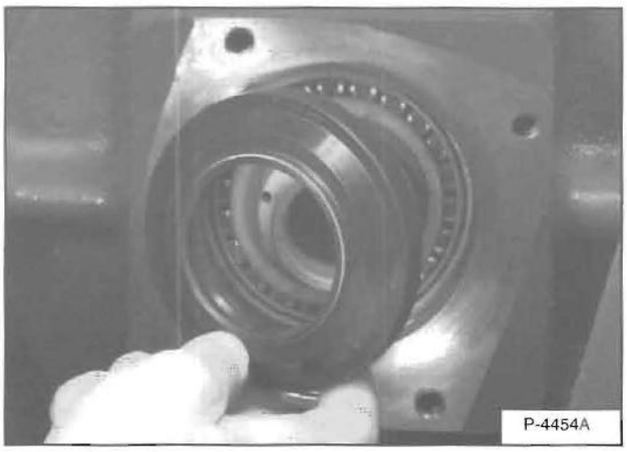
Figure 30-20-49



Use a slide hammer to remove the seal from the motor carrier shaft **[Figure 30-20-49]**.

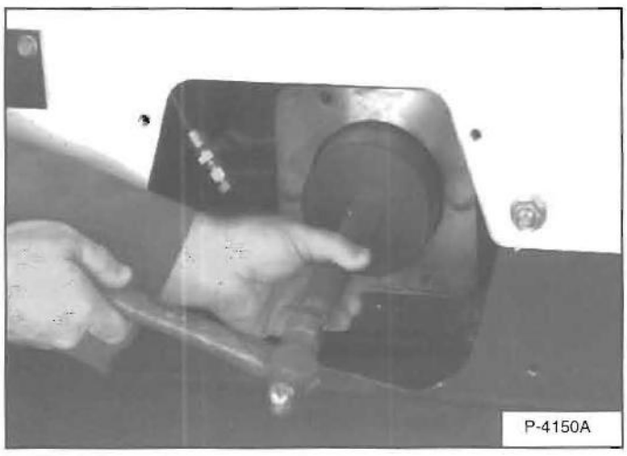
Carrier Shaft Seal Replacement (Cont'd)

Figure 30-20-50



Installation: Install a new seal over the motor carrier shaft **[Figure 30-20-50]**.

Figure 30-20-51



Installation: Install MEL1420 Carrier Seal Tool over the carrier seal **[Figure 30-20-51]**.

Hit the tool with a hammer until the seal is fully seated on the carrier shaft **[Figure 30-20-51]**.

Figure 30-20-52

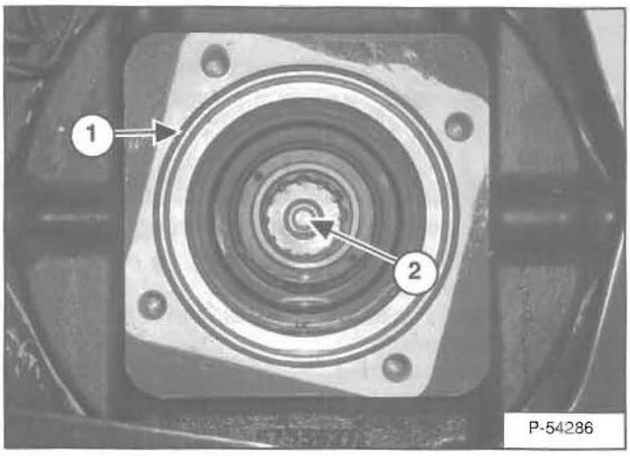


Photo **[Figure 30-20-52]** shows the motor carrier seal correctly installed.

Inspect the O-ring (Item 1) **[Figure 30-20-52]** and replace if needed.

NOTE: Before reinstalling the hydrostatic motor, check the plug (Item 2) [Figure 30-20-52] located in the center of the carrier shaft for tightness. If the plug becomes loosened, case drain lubrication oil from the hydrostatic motor can leak into the chaincase.

Carrier Removal And Installation

⚠ WARNING

Never work on a machine with the lift arms up unless the lift arms are secured by an approved lift arm support device. Failure to use an approved lift arm support device can allow the lift arms or attachment to fall and cause injury or death.

W-2059-0598

Raise the loader lift arms and install an approved lift arm support device. (See Contents Page 10-01.)

Lift and block the loader. (See Contents Page 10-01.)

Raise the loader operator cab. (See Contents Page 10-01.)

Drain the fluid from the chaincase. (See Contents Page 40-01.)

Remove the engine speed control. (See Contents Page 70-01.)

Remove the control panel. (See Contents Page 50-01.)

Remove the lift arm by-pass control valve. (See Contents Page 20-01.)

Remove the control valve. (See Contents Page 20-01.)

Remove the traction lock assembly. (See Contents Page 60-01.)

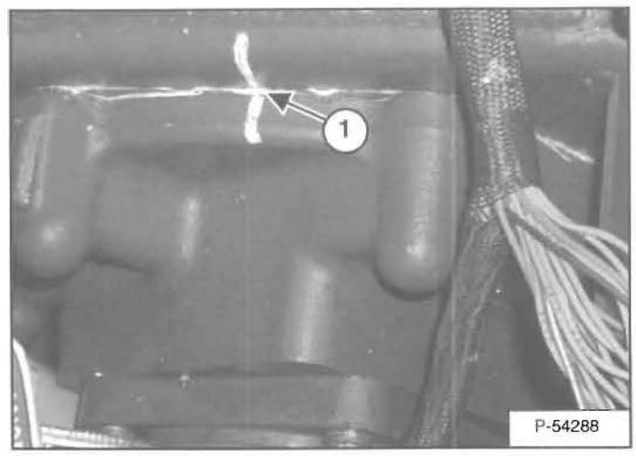
Remove the center chaincase cover. (See Contents Page 40-01.)

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

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

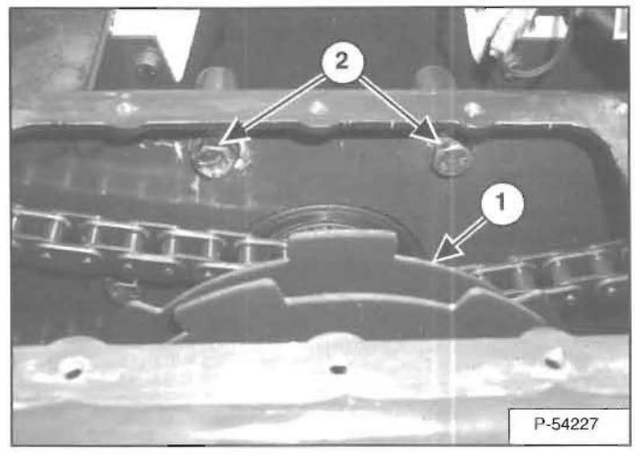
Remove the hydrostatic motor. (See Contents Page 30-01.)

Figure 30-20-53



Place a mark (Item 1) **[Figure 30-20-53]** on the carrier and transmission for proper assembly.

Figure 30-20-54



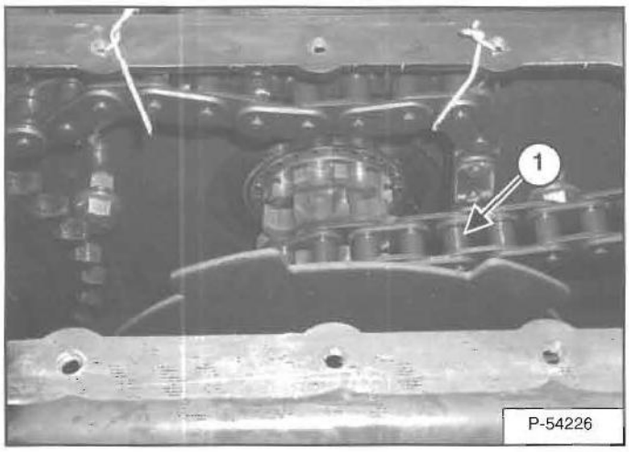
Remove the parking brake disc (Item 1) **[Figure 30-20-54]**. (See Contents Page 40-01.)

Remove the six motor carrier mounting bolts (Item 2) **[Figure 30-20-54]** from the inside of the chaincase.

Installation: Tighten the motor carrier mounting bolts to 125-140 ft.-lbs. (170-190 Nm) torque.

Carrier Removal And Installation (Cont'd)

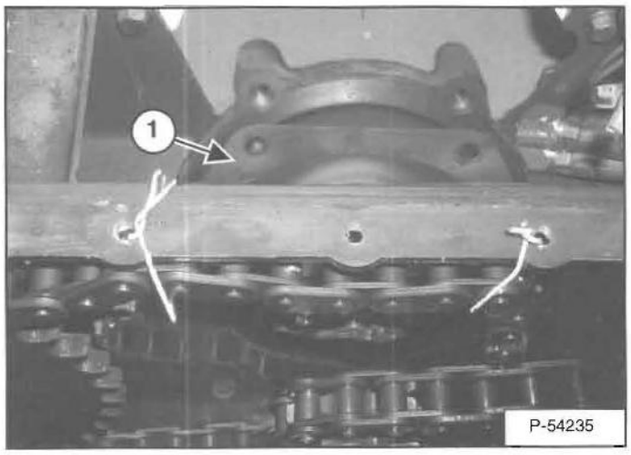
Figure 30-20-55



For ease of removal, fasten the front drive chain (previously removed) to the chaincase as shown **[Figure 30-20-55]**.

Tip the end of the sprocket toward the rear of the loader and remove the rear drive chain (Item 1) **[Figure 30-20-55]** from the sprocket.

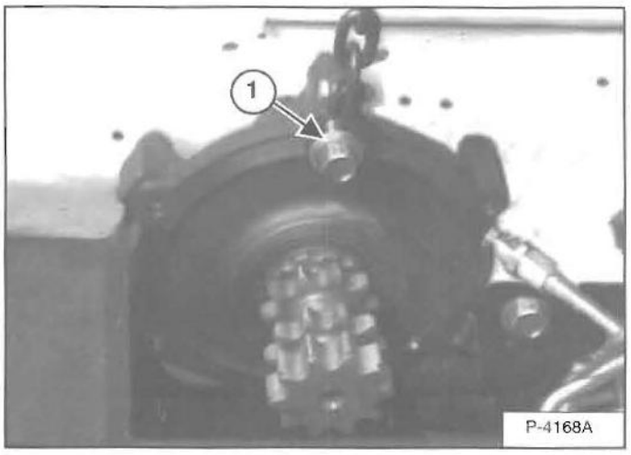
Figure 30-20-56



Slide the motor carrier out of the chaincase **[Figure 30-20-56]**.

Installation: Check the motor carrier gasket (Item 1) **[Figure 30-20-56]** for wear or damage and replace if necessary.

Figure 30-20-57

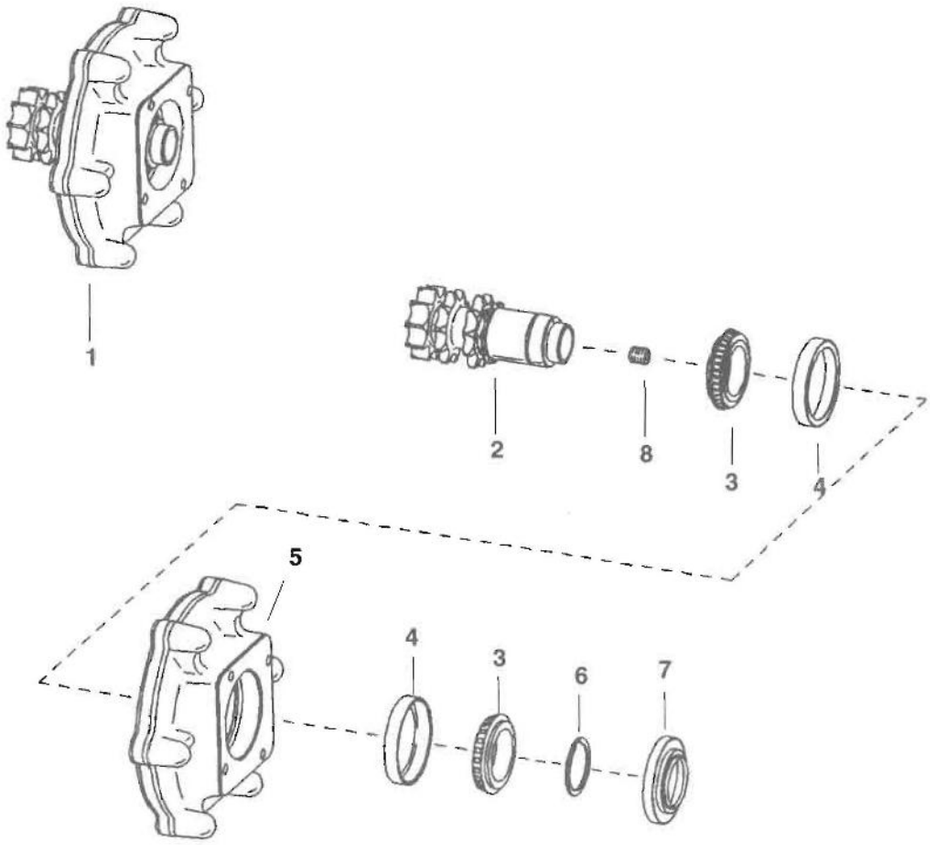


Use one of the motor carrier mounting bolts (Item 1) **[Figure 30-20-57]** and install partially into one mounting hole on the carrier.

Fasten a chain hoist to the bolt on the motor carrier and remove the carrier from the loader.

Reverse the removal procedure to install the motor carrier.

Carrier Parts Identification

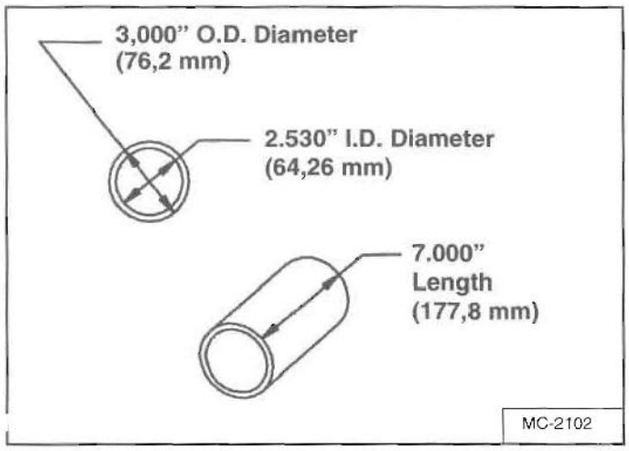


1. Mount Assy.
2. Shaft
3. Bearing
4. Race
5. Housing
6. Snap Ring
7. Seal
8. Plug

MC-1937

Carrier Disassembly

Figure 30-20-58

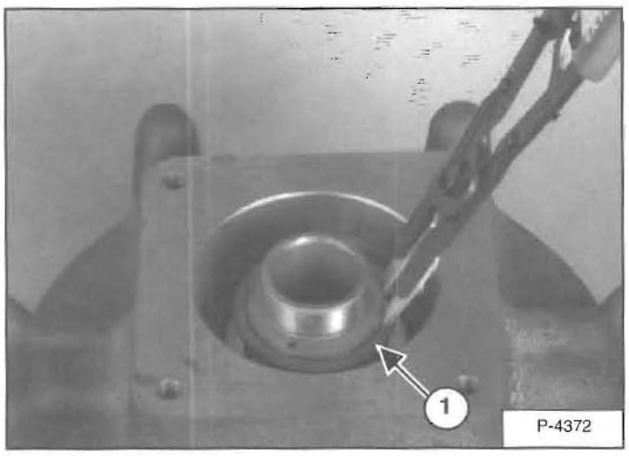


It is necessary to locate or fabricate a press tool for this procedure. Refer to photo **[Figure 30-20-58]** for the correct dimensions of the tool needed.

A hydraulic press, slide hammer with puller end and snap ring pliers are also recommended for this procedure.

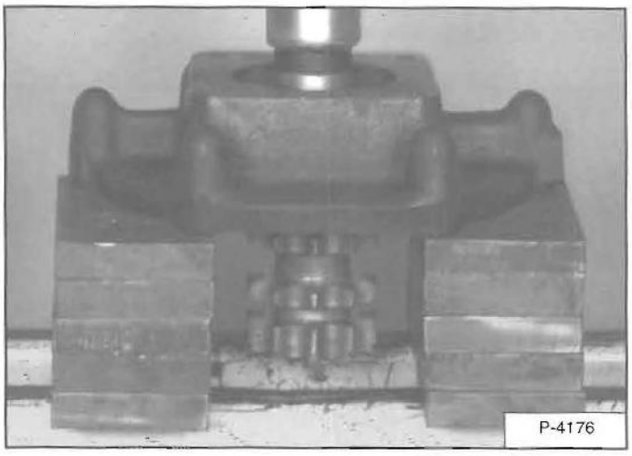
Remove the motor carrier shaft seal. (Refer to Disassembly on Page 30-20-4).

Figure 30-20-59



Remove the snap ring (Item 1) **[Figure 30-20-59]** from the motor carrier shaft using the snap ring pliers.

Figure 30-20-60

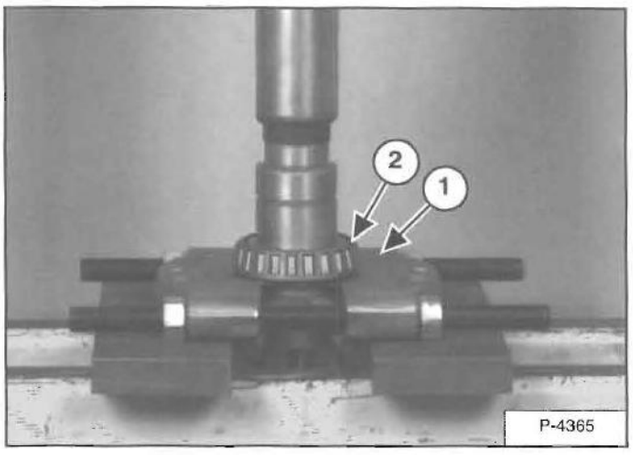


Put the motor carrier in the hydraulic press as shown **[Figure 30-20-60]**.

Use 2-1/4 inch driver tool and press the sprocket shaft out of the motor carrier housing **[Figure 30-20-60]**.

NOTE: The outer bearing will now be free from the sprocket shaft.

Figure 30-20-61

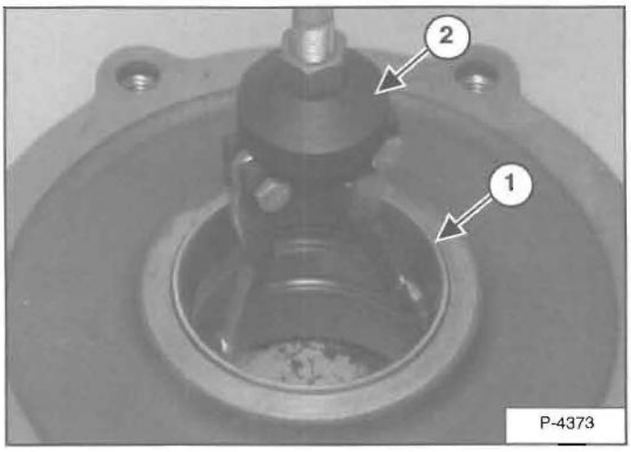


Remove the housing from the press and install a bearing puller (Item 1) **[Figure 30-20-61]** on the sprocket shaft.

Put the assembly in the hydraulic press. Use the same tool driver and remove the bearing (Item 2) **[Figure 30-20-61]** from the shaft.

Carrier Disassembly (Cont'd)

Figure 30-20-62

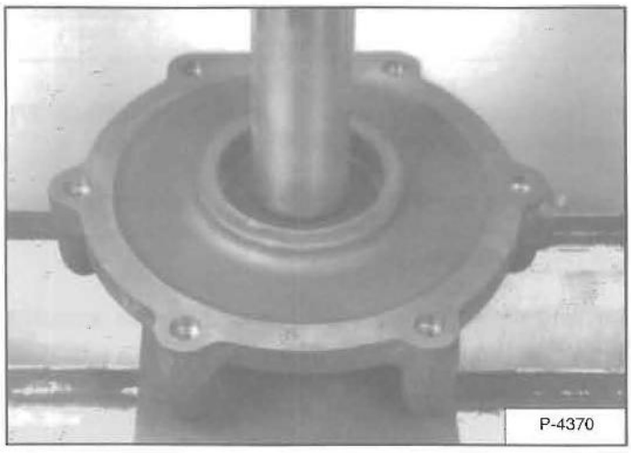


Fasten the carrier motor housing to the work surface securely with the inner bearing race (Item 1) **[Figure 30-20-62]** facing up.

Install the slide hammer with puller end (Item 2) **[Figure 30-20-62]** on the bottom side of the bearing race.

Remove the bearing race from the carrier housing **[Figure 30-20-62]**.

Figure 30-20-63



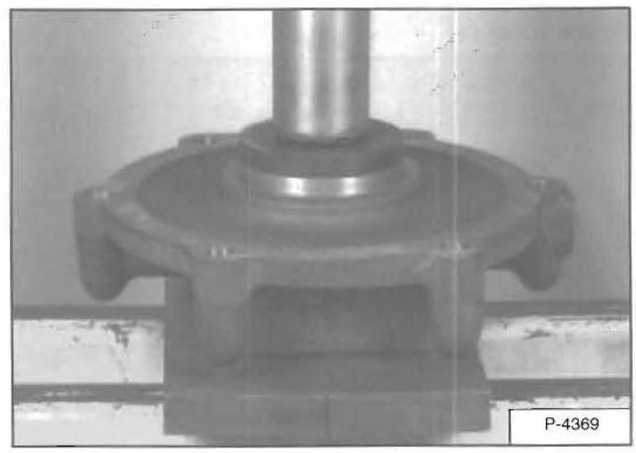
Put the motor carrier housing in the hydraulic press as shown **[Figure 30-20-63]**.

Use a 3-7/8 inch driver tool and press the outer bearing race from the housing.

Check all parts for wear and damage. Replace the bearing race when new bearings are to be installed.

Carrier Assembly

Figure 30-20-64

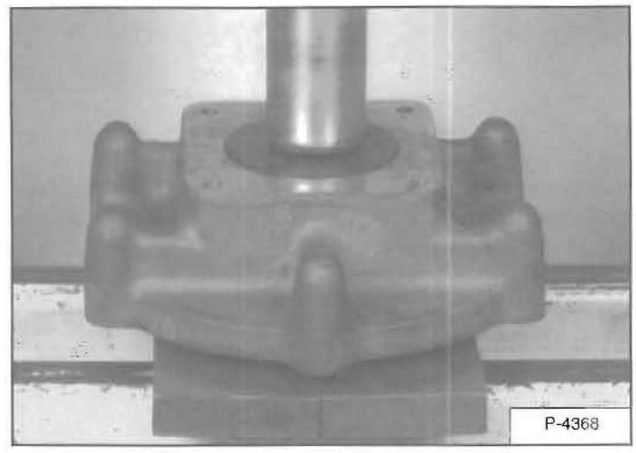


Put the motor carrier housing in the press as shown **[Figure 30-20-64]**.

Use 4-5/16 inch driver tool and press the new inner bearing race into the motor carrier housing **[Figure 30-20-64]**.

Press the bearing race in until it is fully seated in the carrier housing.

Figure 30-20-65



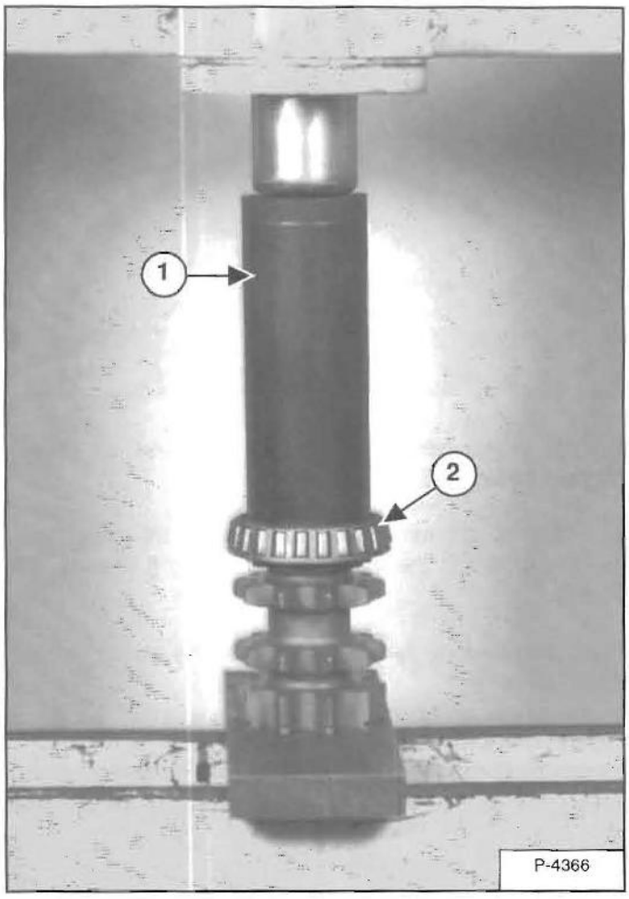
Turn the motor carrier housing over as shown **[Figure 30-20-65]**.

Use 4-5/16 inch driver tool and press the new outer bearing race into the motor carrier housing **[Figure 30-20-65]**.

Press the bearing race in until it is fully seated in the carrier housing.

Carrier Assembly (Cont'd)

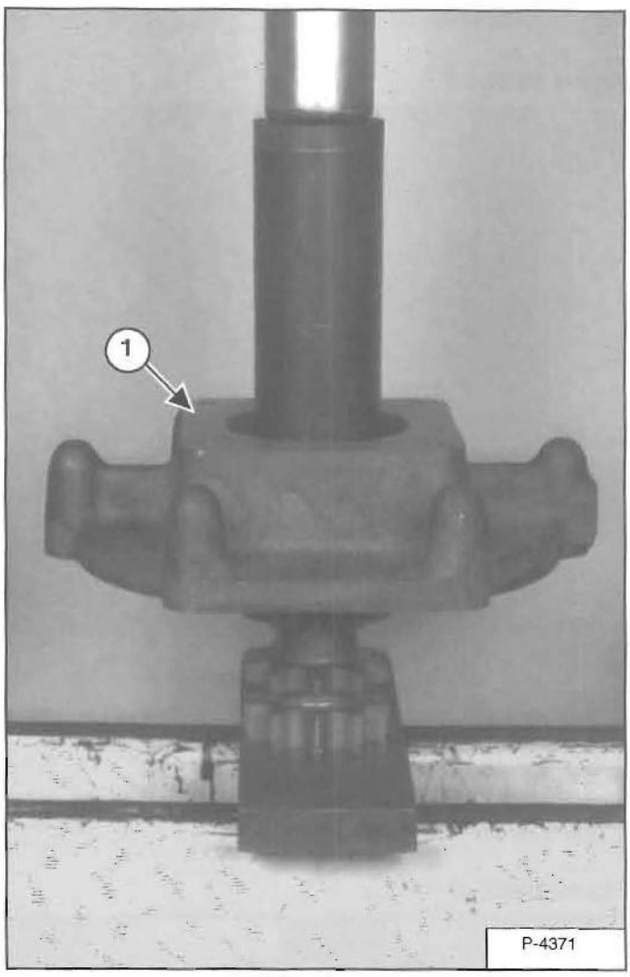
Figure 30-20-66



Use the fabricated press tool (Item 1) and 3.0 inch driver tool, install the new inner bearing (Item 2) **[Figure 30-20-66]** on the sprocket shaft as shown.

Remove the press and drive tools from the sprocket shaft.

Figure 30-20-67



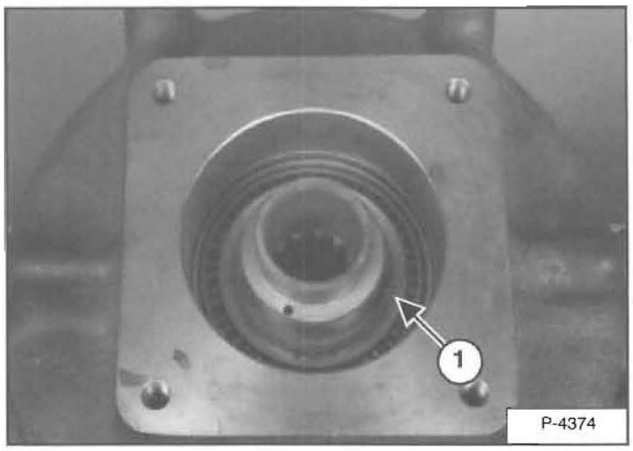
Put the motor carrier housing (Item 1) **[Figure 30-20-67]** over the sprocket shaft as shown.

Put the outer bearing over the end of the sprocket shaft and press the bearing on with the press tool and driver tool **[Figure 30-20-67]**.

Remove the press and driver tools from the sprocket shaft.

Carrier Assembly (Cont'd)

Figure 30-20-68



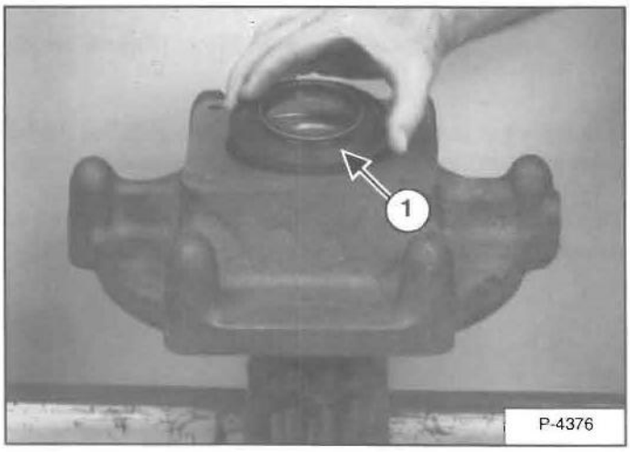
Put the snap ring (Item 1) **[Figure 30-20-68]** over the end of the sprocket shaft.

NOTE: Use the snap ring pliers to spread the snap ring so it will fit over the sprocket shaft.

Using the press and driver tools, press the snap ring (Item 1) **[Figure 30-20-68]** over the sprocket.

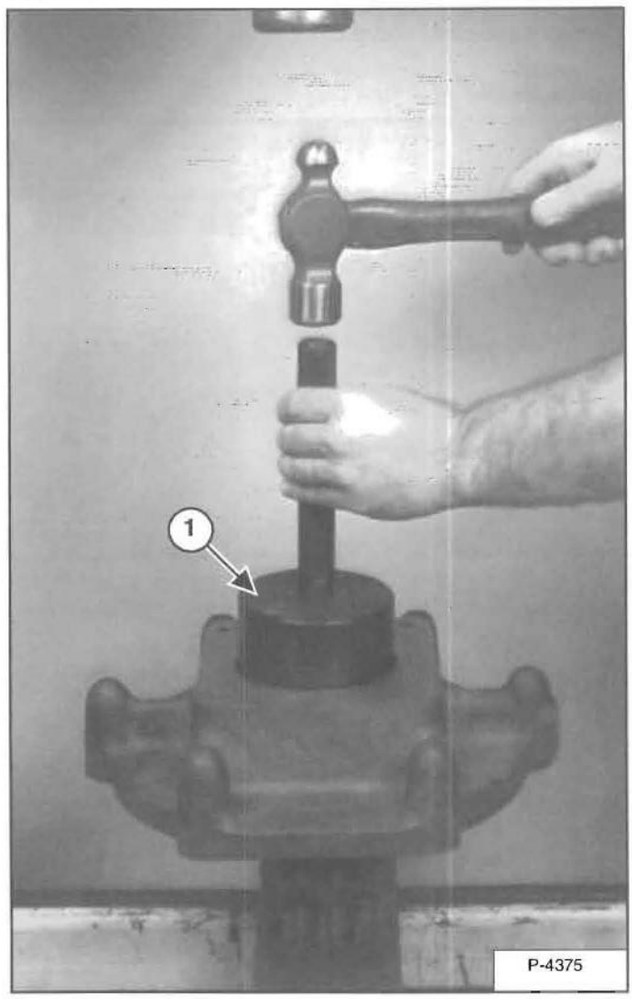
Press the snap ring on until it snaps into the groove on the shaft.

Figure 30-20-69



Put a new shaft seal (Item 1) **[Figure 30-20-69]** on the sprocket shaft.

Figure 30-20-70



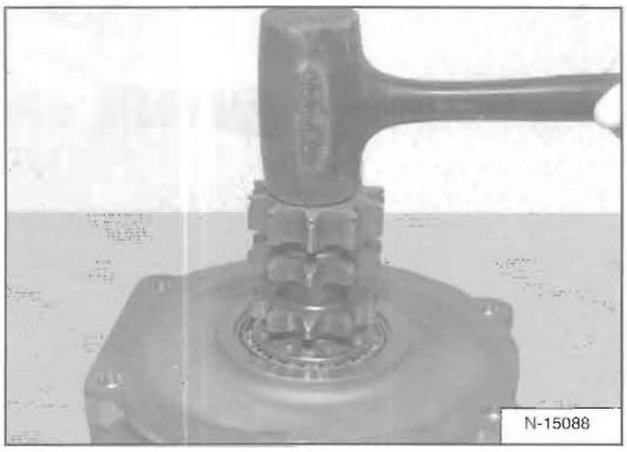
Use MEL1420 Carrier Seal Tool (Item 1) **[Figure 30-20-70]** and install the shaft seal.

Hit the tool with a hammer until the seal is fully seated on the carrier shaft **[Figure 30-20-70]**.

Refer to Carrier Shaft Seal Replacement on Page 30-20-15 for complete shaft seal installation procedure.

Carrier Assembly (Cont'd)

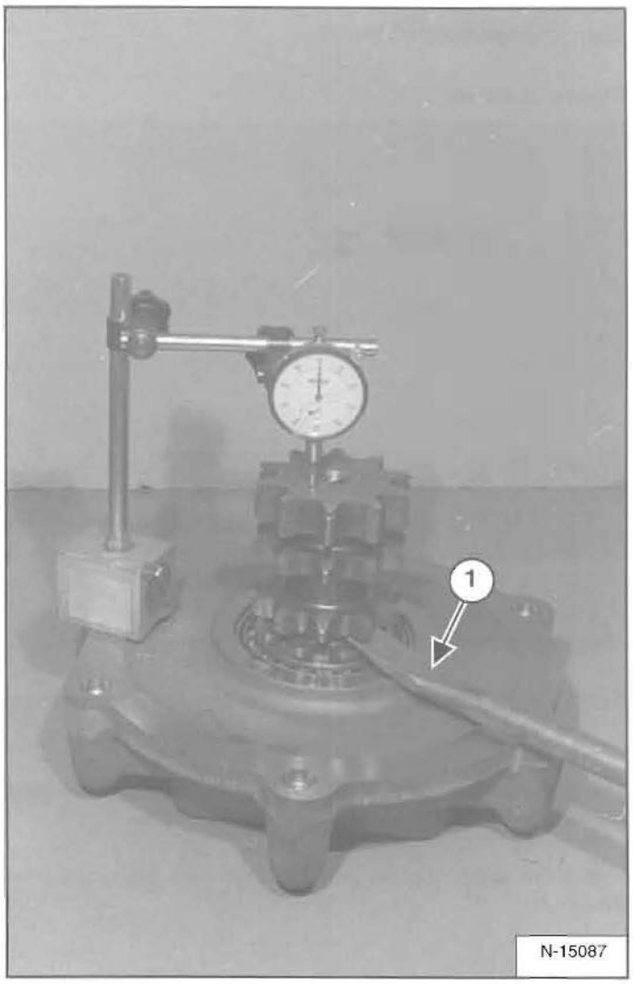
Figure 30-20-71



Check the end play of the motor carrier as follows:

Use a rubber mallet **[Figure 30-20-71]**, tap down on the cluster shaft.

Figure 30-20-72



Install a dial indicator as shown in Photo **[Figure 30-20-72]**.

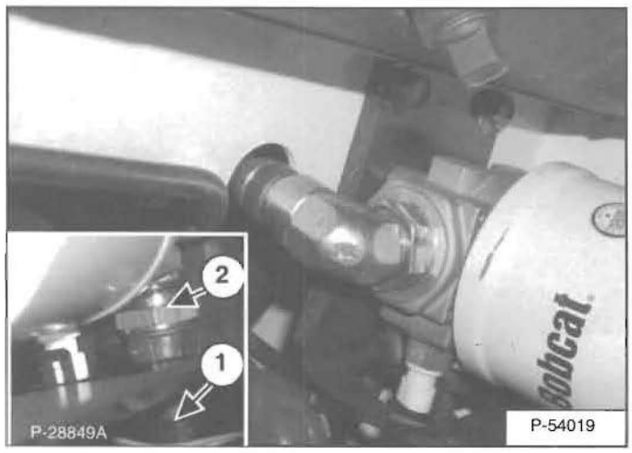
Use a pry bar (Item 1) **[Figure 30-20-72]** to lift the carrier shaft and read the end play on the dial indicator.

The carrier shaft must turn freely with end play not to exceed 0.007 inch (0,17 mm).

CHARGE PRESSURE

Sender Removal And Installation

Figure 30-30-1



Open the rear door.

Disconnect the wires (Item 1) **[Figure 30-30-1]** from the charge pressure sender.

Remove the charge pressure sender (Item 2) **[Figure 30-30-1]** from the fitting.

Installation: Tighten the sender to 7.4-8.1 ft.-lbs. (10-11 Nm) torque.

Checking Charge Pressure

⚠ 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

Lift and block the loader. (See Contents Page 10-01.)

Open the rear door.

Disconnect the wires (Item 1) **[Figure 30-30-1]** from the charge pressure sender.

Remove the charge pressure sender (Item 2) **[Figure 30-30-1]** from the fitting.

Installation: Tighten the sender to 7.4-8.1 ft.-lbs. (10-11 Nm) torque.

Install a gauge where the charge pressure sender was removed.

Start the engine.

The gauge must read as follows:

220-270 PSI (1517-1862 kPa) with approximately 140° F (49° C) fluid @ High Engine Idle.

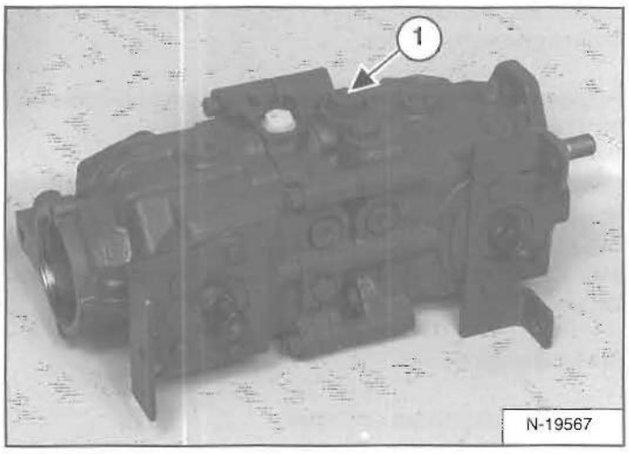
Adjusting

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 30-30-2



If the charge pressure is not correct loosen the charge relief valve plug (Item 1) **[Figure 30-30-2]**.

Assemble: Always use a new O-ring. Tighten the plug to 30-50 ft.-lbs. (41-68 Nm) torque.

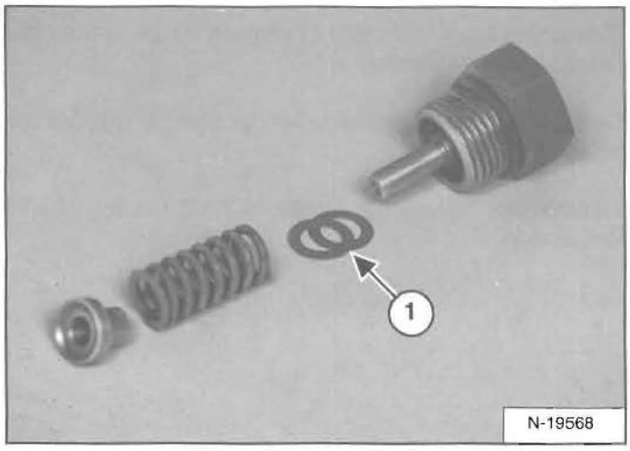
Figure 30-30-3



Remove the plug, spring and poppet **[Figure 30-30-3]**.

Check the poppet and spring for wear or damage.

Figure 30-30-4



There are several different thickness of shims (Item 1) **[Figure 30-30-4]** and they are used to adjust the charge pressure.

NOTE: 0.010 inch (0,254 mm) is 8 PSI (55.16 kPa) increase in pressure.

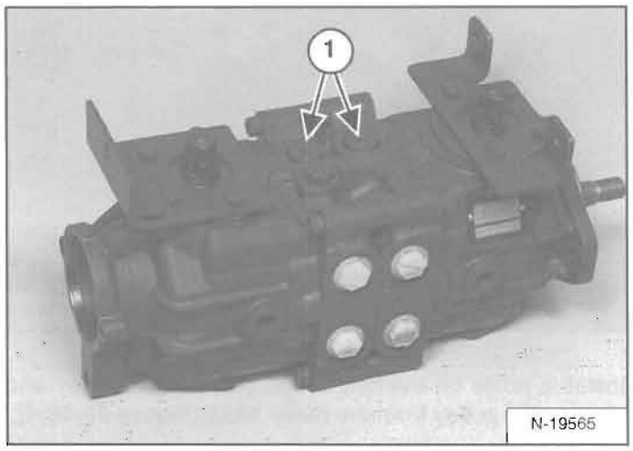
The charge pressure should be set at:

220-270 PSI (1517-1862 kPa) with approximately 140° F (49° C) fluid @ High Engine Idle.

HYDROSTATIC PUMP

Replenishing/High Pressure Relief Valve

Figure 30-40-1

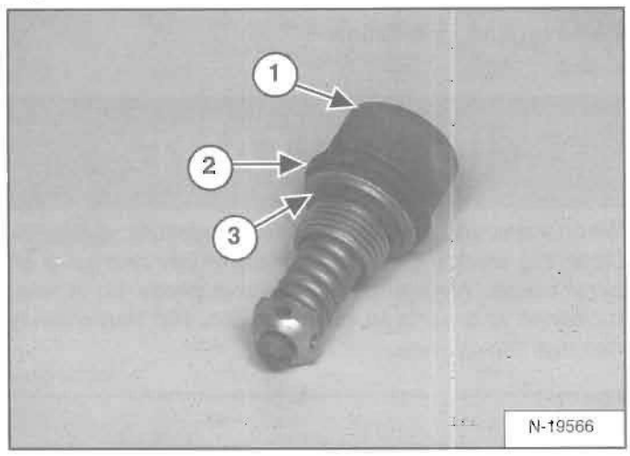


There are four replenishing/high pressure relief valves (Item 1) **[Figure 30-40-1]** in the hydrostatic pump assembly. Two are located at the top of the pumps and two at the bottom of the pumps.

See Contents Page 30-01 for valve function.

NOTE: The two top valves are for the reverse drive loop and the two bottom valves are for the forward drive loop.

Figure 30-40-2



Remove the high pressure relief valve (Item 1) **[Figure 30-40-2]** from the pump.

Assemble: Tighten the plug to 30-50 ft.-lbs. (41-68 Nm) torque.

Check for damage and replace as needed.

Check the O-rings (Items 2 & 3) **[Figure 30-40-2]** for damage and replace as needed.

If the high pressure relief valve must be replaced, it must be replaced as a complete unit.

The pressure setting for a new high pressure relief valve is 5000 PSI (34475 kPa).

Removal And Installation

IMPORTANT

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

I-2003-0888

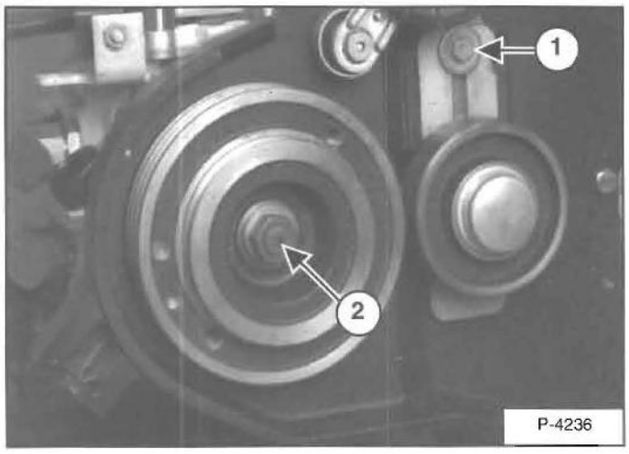
⚠ WARNING

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

Remove the engine/hydrostatic pump assembly from the loader. (See Contents Page 30-01.)

Figure 30-40-3

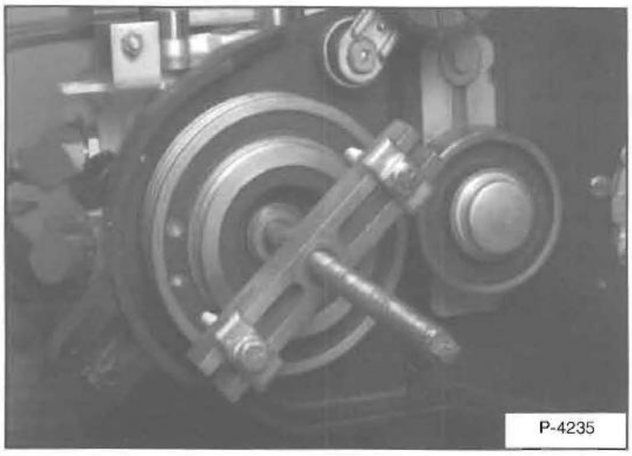


Loosen the drive belt tensioner (Item 1) **[Figure 30-40-3]** and remove the drive belt.

Remove the hydrostatic pump drive pulley mounting nut (Item 2) **[Figure 30-40-3]** and washer.

Installation: Tighten the pump pulley mounting nut to 175-200 ft.-lbs. (237-271 Nm) torque.

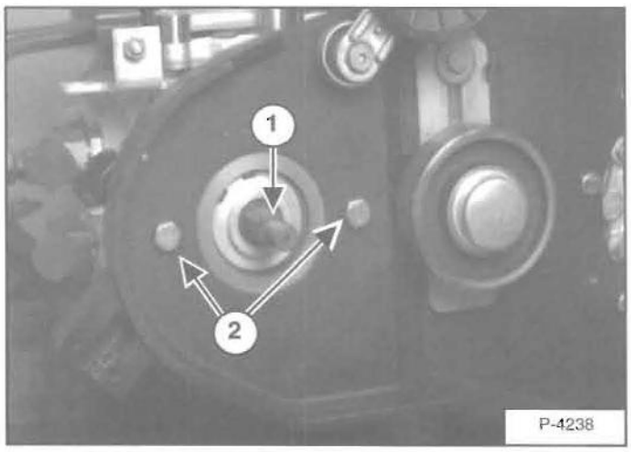
Figure 30-40-4



Install a puller on the hydrostatic pump drive pulley and remove the pulley from the pump shaft **[Figure 30-40-4]**.

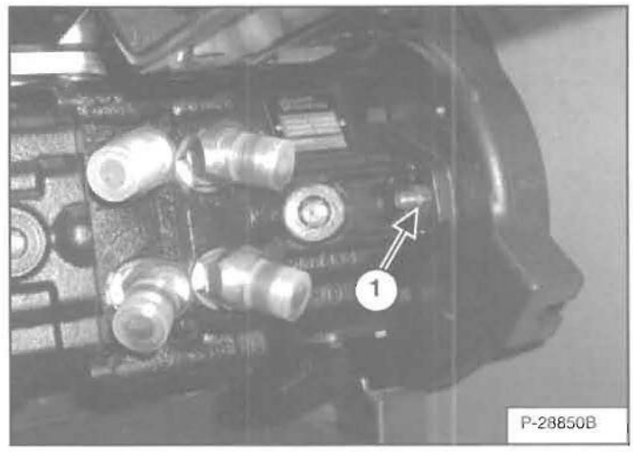
Removal And Installation (Cont'd)

Figure 30-40-5



Installation: Install the key in the hydrostatic pump shaft (Item 1) **[Figure 30-40-5]** before installing the pump drive pulley.

Figure 30-40-6



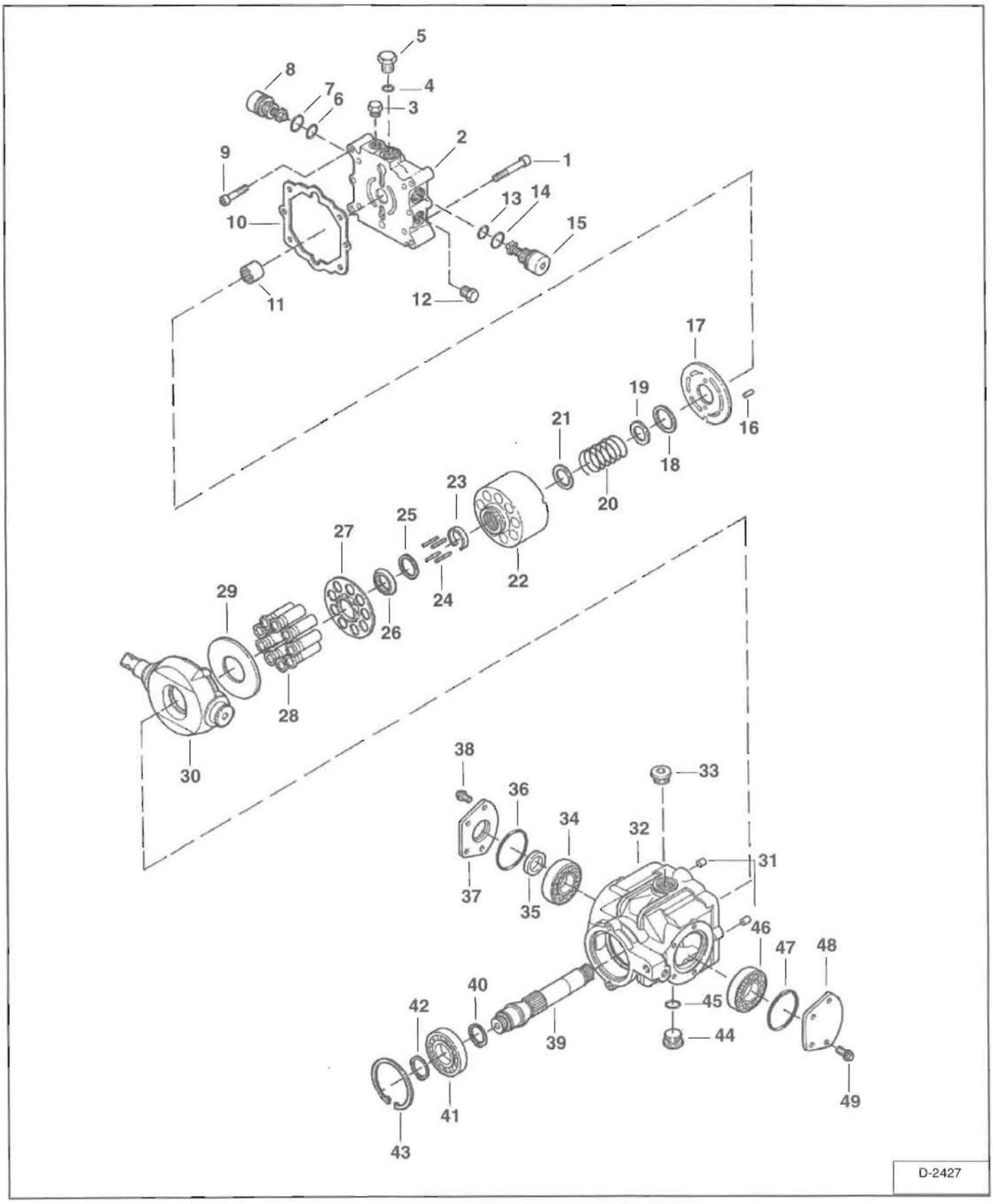
Hold the nut (Item 1) **[Figure 30-40-6]** on the two hydrostatic pump mounting bolts (Item 2) **[Figure 30-40-5]**.

Remove the two hydrostatic pump mounting bolts (Item 2) **[Figure 30-40-5]** from the pump and drive belt housing.

Installation: Tighten the pump mounting bolts to 65-70 ft.-lbs. (88-95 Nm) torque.

Reverse the removal procedure to install the hydrostatic pump assembly.

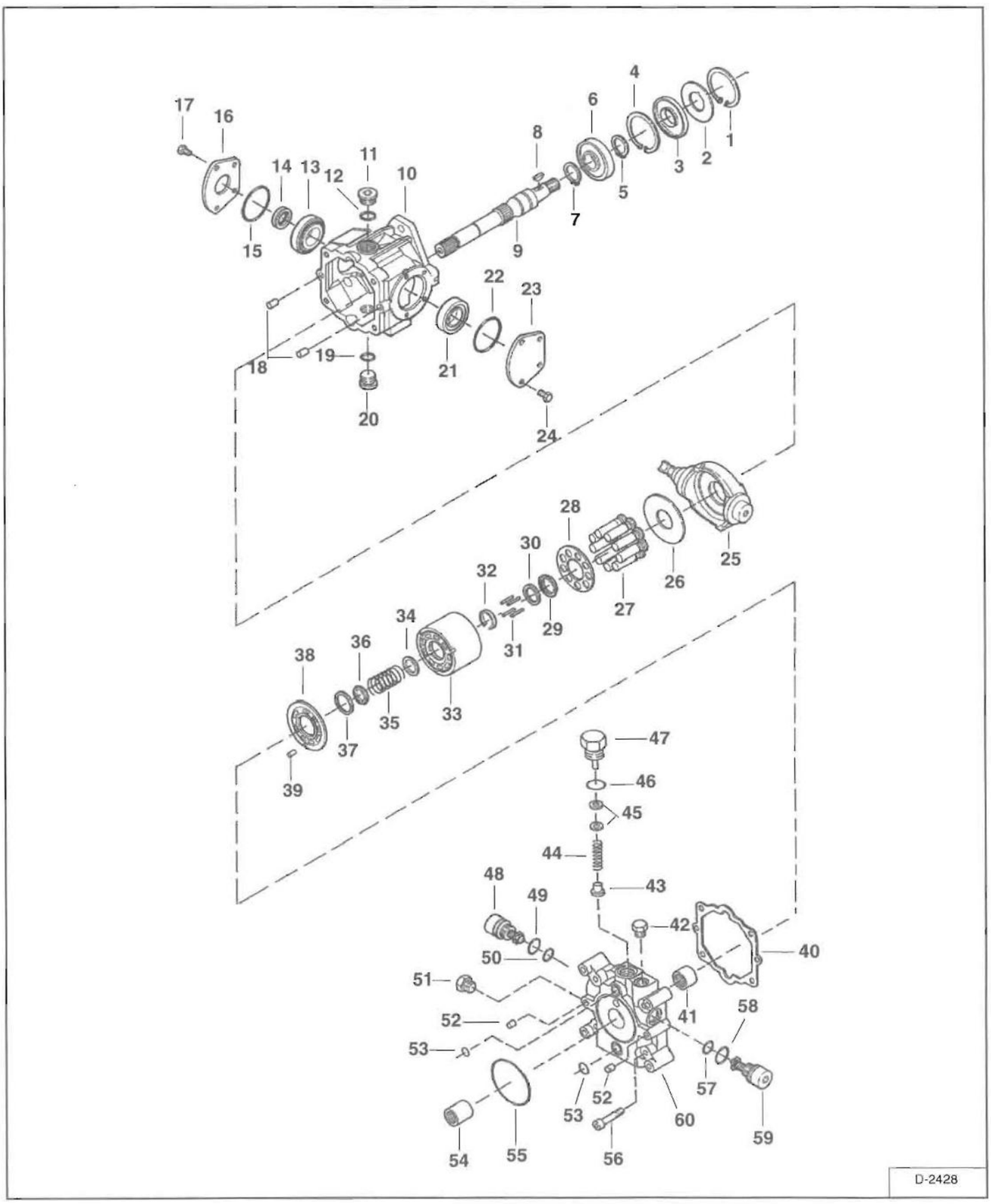
Parts Identification (Right Half)



Parts Identification (Right Half) (Cont'd)

Ref.	Description
1.	BOLT
2.	END CAP
3.	PLUG
4.	O-RING
5.	PLUG
6.	O-RING
7.	O-RING
8.	RELIEF VALVE
9.	BOLT
10.	GASKET
11.	BEARING
12.	PLUG
13.	O-RING
14.	O-RING
15.	RELIEF VALVE
16.	PIN
17.	VALVE PLATE
18.	RETAINER
19.	WASHER
20.	SPRING
21.	WASHER
22.	BLOCK
23.	RETAINER
24.	PIN
25.	WASHER
26.	RETAINER
27.	RETAINER
28.	PISTON ASSEMBLY
29.	PLATE
30.	SWASH PLATE
31.	PIN
32.	HOUSING
33.	PLUG
34.	BEARING
35.	SEAL
36.	O-RING
37.	COVER
38.	BOLT
39.	SHAFT
40.	SNAP RING
41.	BEARING
42.	SNAP RING
43.	SNAP RING
44.	PLUG
45.	O-RING
46.	BEARING
47.	O-RING
48.	PLATE
49	BOLT

Parts Identification (Left Half)

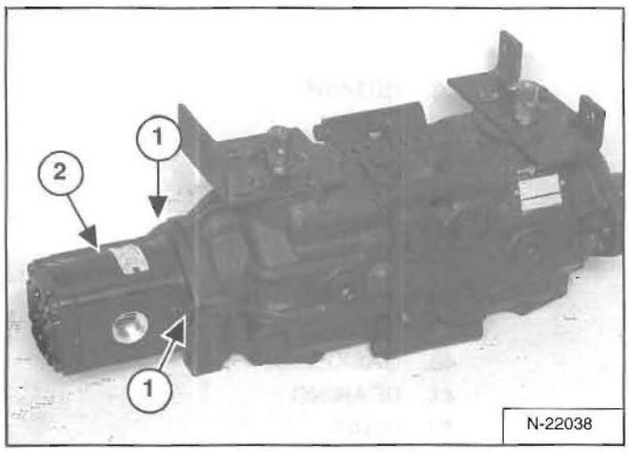


Parts Identification (Left Half) (Cont'd)

Ref.	Description
1.	SNAP RING
2.	WASHER
3.	SEAL
4.	SNAP RING
5.	SNAP RING
6.	BEARING
7.	SNAP RING
8.	KEY
9.	SHAFT
10.	HOUSING
11.	PLUG
12.	O-RING
13.	BEARING
14.	SEAL
15.	O-RING
16.	COVER
17.	BOLT
18.	PIN
19.	O-RING
20.	PLUG
21.	BEARING
22.	O-RING
23.	PLATE
24.	BOLT
25.	SWASH PLATE
26.	WEAR PLATE
27.	PISTON ASSEMBLY
28.	PISTON RETAINER
29.	RETAINER
30.	WASHER
31.	PIN
32.	RETAINER
33.	BLOCK
34.	WASHER
35.	SPRING
36.	WASHER
37.	WASHER
38.	VALVE PLATE
39.	PIN
40.	GASKET
41.	BEARING
42.	PLUG
43.	POPPET
44.	SPRING
45.	SHIM
46.	O-RING
47.	PLUG
48.	RELIEF VALVE
49.	O-RING
50.	O-RING
51.	PLUG
52.	PIN
53.	O-RING
54.	COUPLER
55.	O-RING
56.	BOLT
57.	O-RING
58.	O-RING
59.	RELIEF VALVE
60.	END CAP

Hydraulic Pump Removal And Installation

Figure 30-40-7

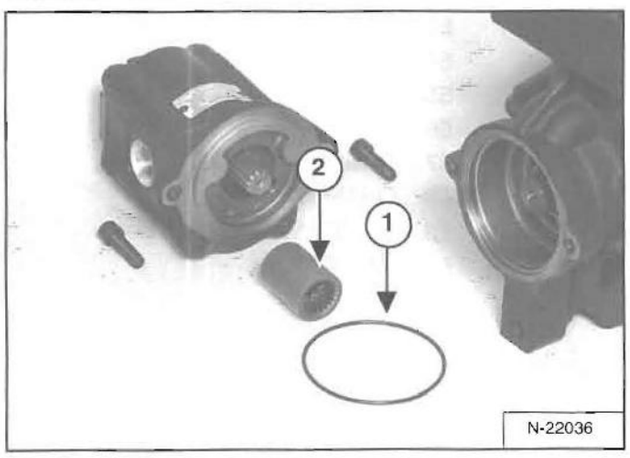


Remove the pump mounting bolts (Item 1) **[Figure 30-40-7]** (both sides).

Installation: Tighten the mounting bolts to 27-37 ft.-lbs. (37-50 Nm) torque.

Remove the hydraulic pump (Item 2) **[Figure 30-40-7]** from the hydrostatic pumps.

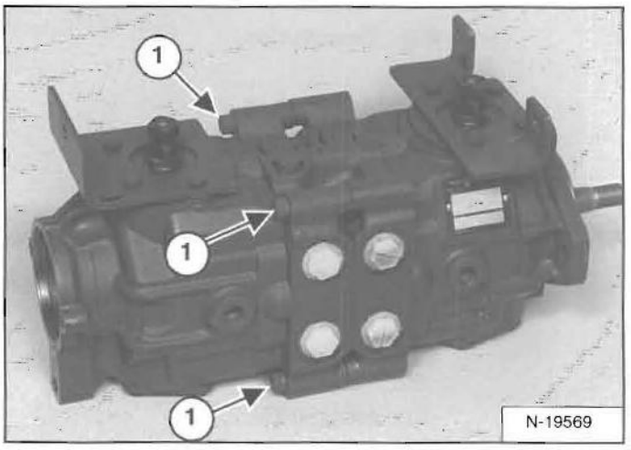
Figure 30-40-8



Remove the O-ring (Item 1) and coupler (Item 2) **[Figure 30-40-8]** with the hydraulic pump.

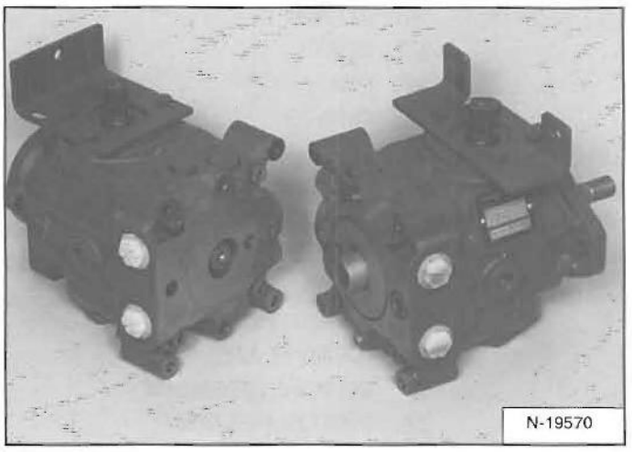
Pump Separation

Figure 30-40-9



Remove the four mounting bolts (Item 1) **[Figure 30-40-9]**.

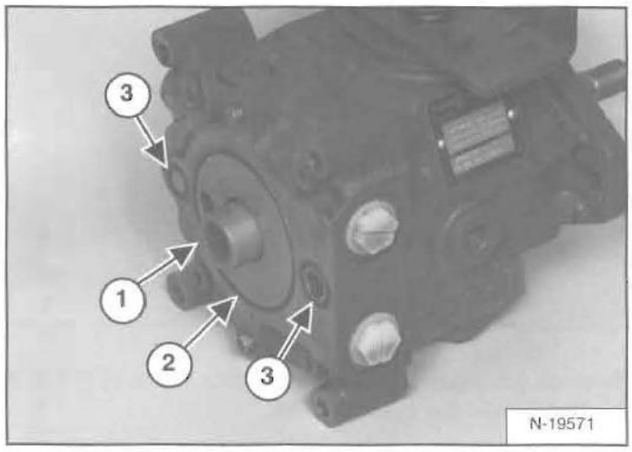
Figure 30-40-10



Separate the two hydrostatic pumps **[Figure 30-40-10]**.

Pump Separation (Cont'd)

Figure 30-40-11



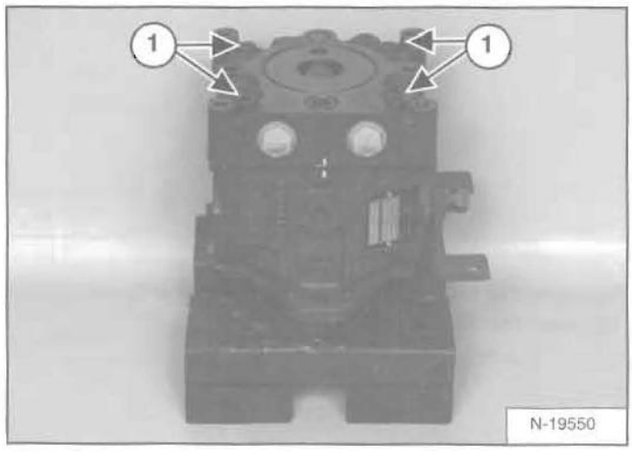
Remove the pump coupler (Item 1) **[Figure 30-40-11]**.

Remove the large O-ring (Item 2) **[Figure 30-40-11]**.

Remove the two small O-rings (Item 3) **[Figure 30-40-11]**.

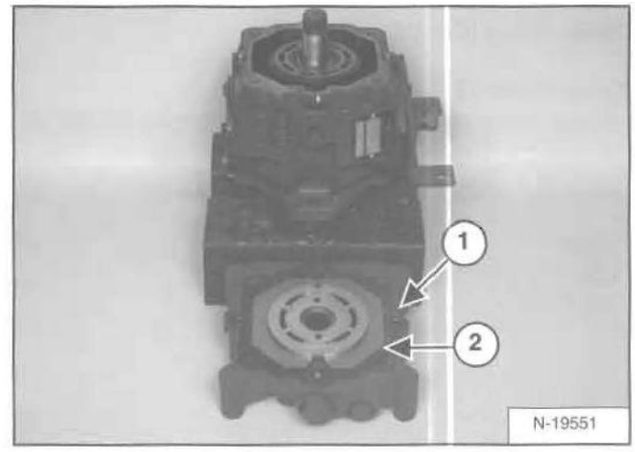
Disassembly

Figure 30-40-12



Remove the four bolts (Item 1) **[Figure 30-40-12]** from the pump housing end cap.

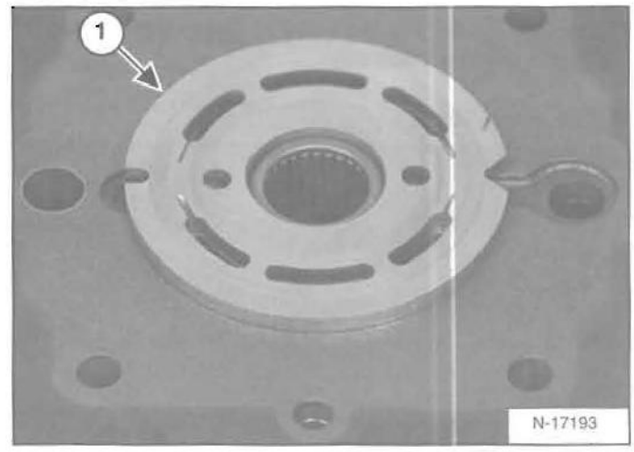
Figure 30-40-13



Remove the pump housing end cap (Item 1) **[Figure 30-40-13]**.

Remove the gasket (Item 2) **[Figure 30-40-13]**.

Figure 30-40-14

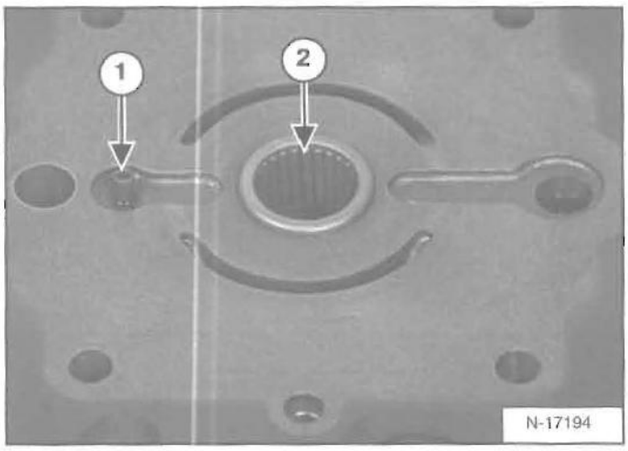


Remove the valve plate (Item 1) **[Figure 30-40-14]**.

Check the valve plate for wear. (Both Sides.)

Disassembly (Cont'd)

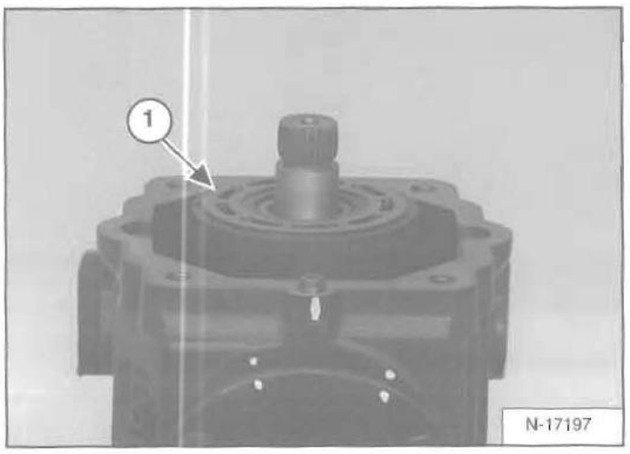
Figure 30-40-15



Check the valve plate locating pin (Item 1) **[Figure 30-40-15]** for wear and replace if needed.

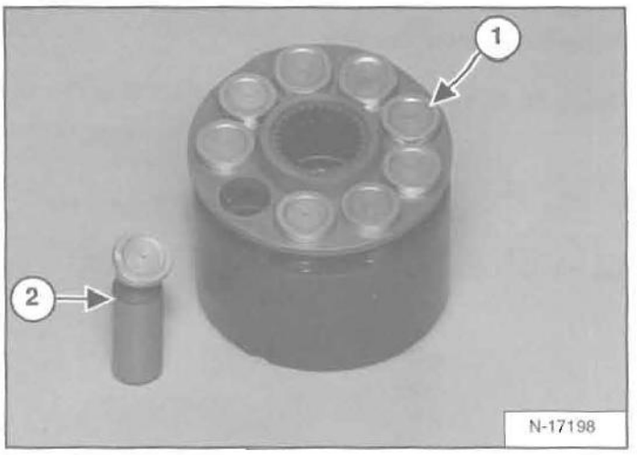
Check the needle bearing (Item 2) **[Figure 30-40-15]** for wear and replace if needed.

Figure 30-40-16



Remove the rotating group (Item 1) **[Figure 30-40-16]** from the pump.

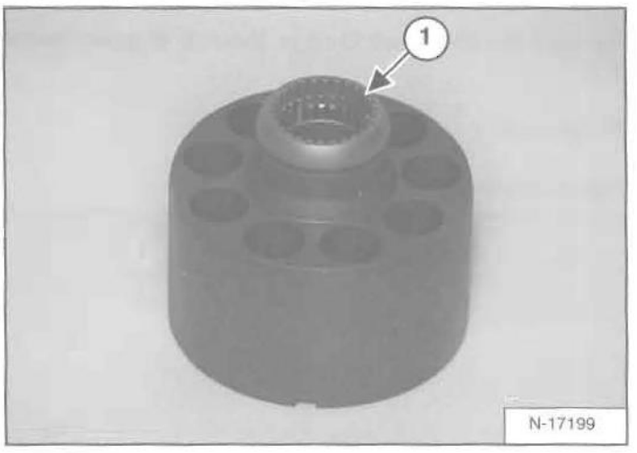
Figure 30-40-17



Remove the slipper guide and pistons (Item 1) **[Figure 30-40-17]** from the cylinder block.

Check all the pistons (Item 2) **[Figure 30-40-17]** for wear and replace the rotating group as needed.

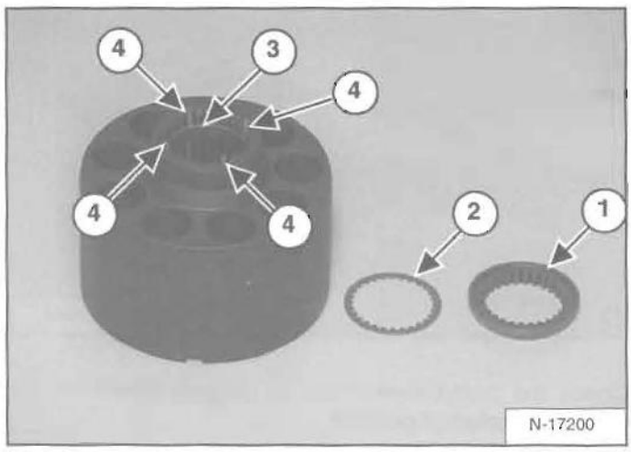
Figure 30-40-18



Remove the ball guide retainer (Item 1) **[Figure 30-40-18]** from the cylinder block.

Disassembly (Cont'd)

Figure 30-40-19



Check the ball guide retainer (Item 1) and washer (Item 2) **[Figure 30-40-19]** for wear and replace as needed.

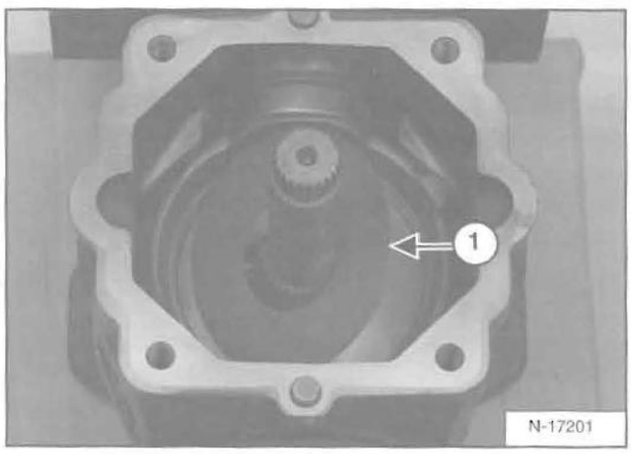
Remove the pin retainer (Item 3) **[Figure 30-40-19]**.

Remove the four pins (Item 4) **[Figure 30-40-19]** from the cylinder block.

Check the cylinder block for wear and replace as needed.

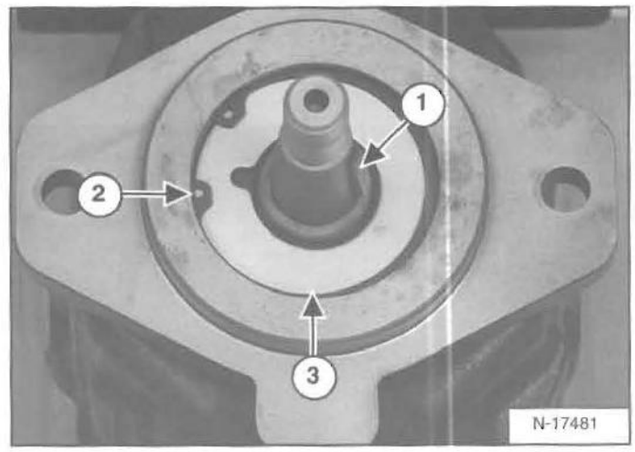
Check pins (Item 4) **[Figure 30-40-19]** to see if they are all the same length.

Figure 30-40-20



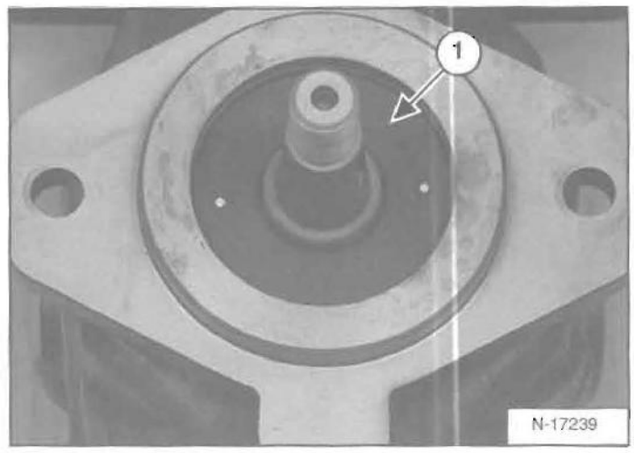
Remove the thrust plate (Item 1) **[Figure 30-40-20]** from the pump housing.

Figure 30-40-21



Remove the driveshaft key (Item 1), snap ring (Item 2) and support washer (Item 3) **[Figure 30-40-21]** from the drive shaft end of the pump.

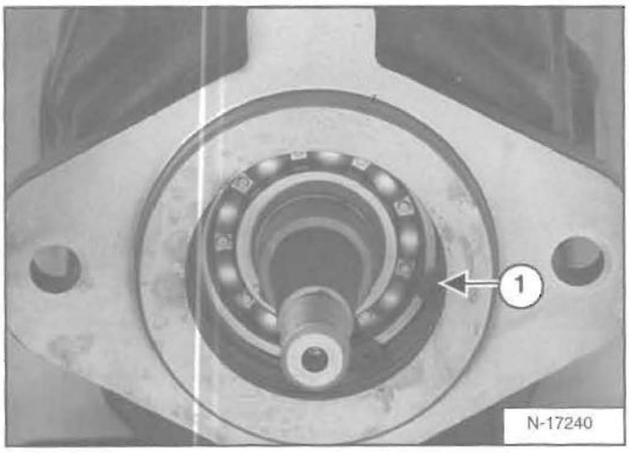
Figure 30-40-22



Use a seal puller and remove the seal (Item 1) **[Figure 30-40-22]** from the pump housing.

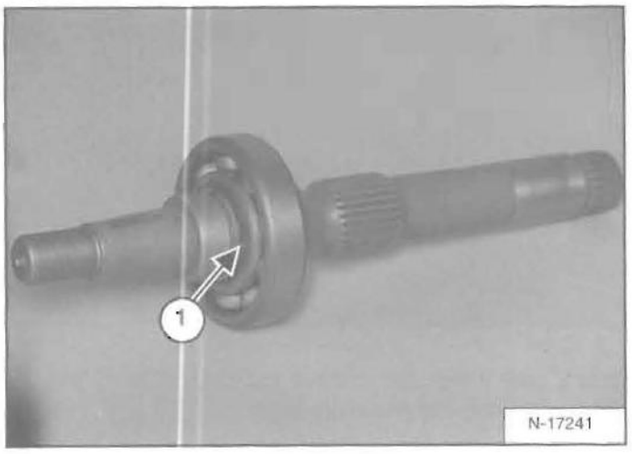
Disassembly (Cont'd)

Figure 30-40-23



Remove the snap ring (Item 1) **[Figure 30-40-23]** from the pump housing and remove the driveshaft and bearing from the housing.

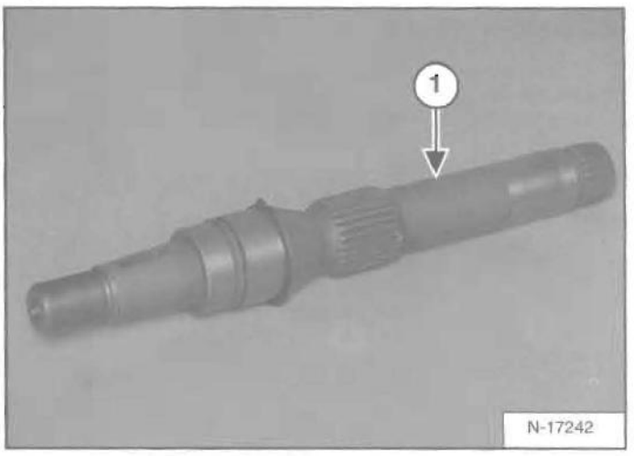
Figure 30-40-24



Remove the snap ring (Item 1) **[Figure 30-40-24]** from the driveshaft and remove the bearing.

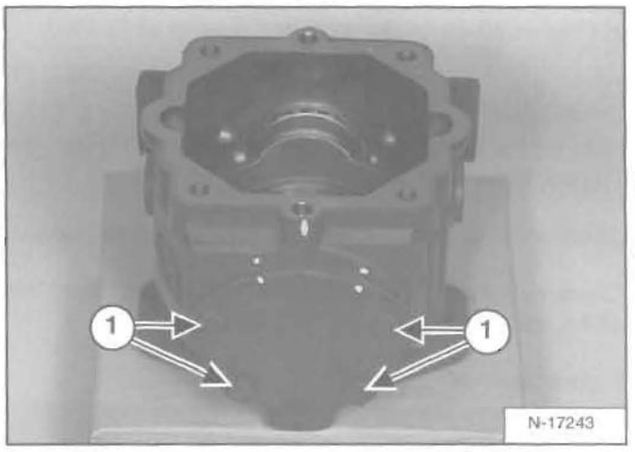
Check the bearing for wear and replace if worn.

Figure 30-40-25



Check the pump shaft (Item 1) **[Figure 30-40-25]** for wear and replace if needed.

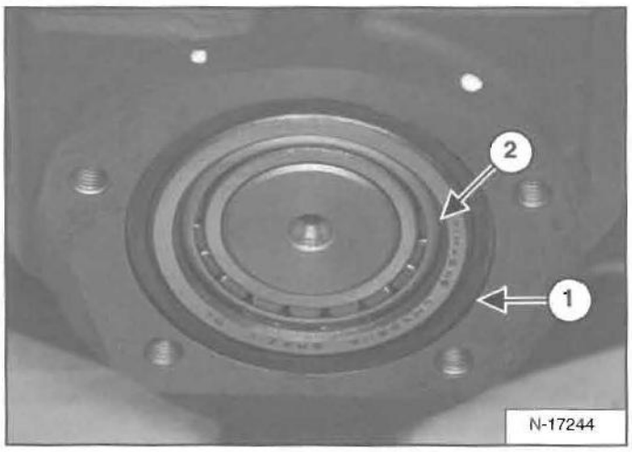
Figure 30-40-26



Remove the four mount bolts (Item 1) **[Figure 30-40-26]** from the lower trunnion cover. Remove the cover.

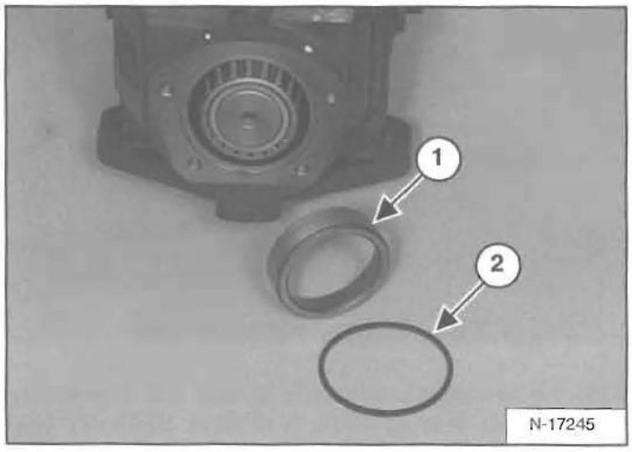
Disassembly (Cont'd)

Figure 30-40-27



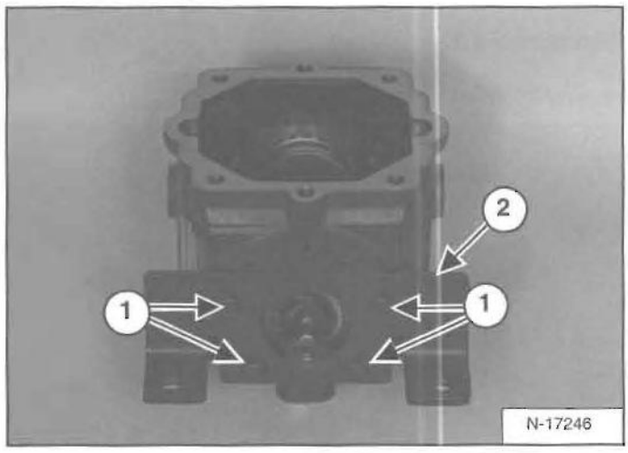
Remove the O-ring (Item 1) and bearing race (Item 2) **[Figure 30-40-27]** from the pump housing.

Figure 30-40-28



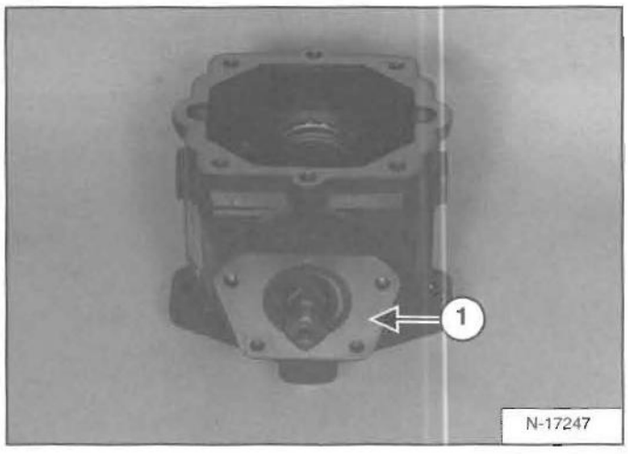
Check the bearing race (Item 1) and O-ring (Item 2) **[Figure 30-40-28]** for wear and replace as needed.

Figure 30-40-29



Remove the four mount bolts (Item 1) from the pump housing and remove the steering bracket (Item 2) **[Figure 30-40-29]**.

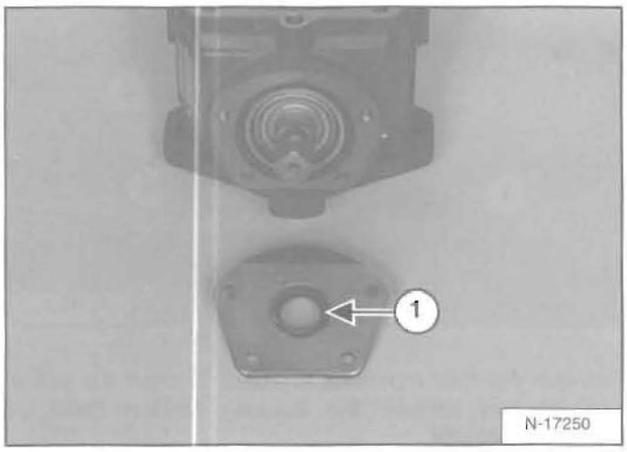
Figure 30-40-30



Remove the upper trunnion cover (Item 1) **[Figure 30-40-30]**.

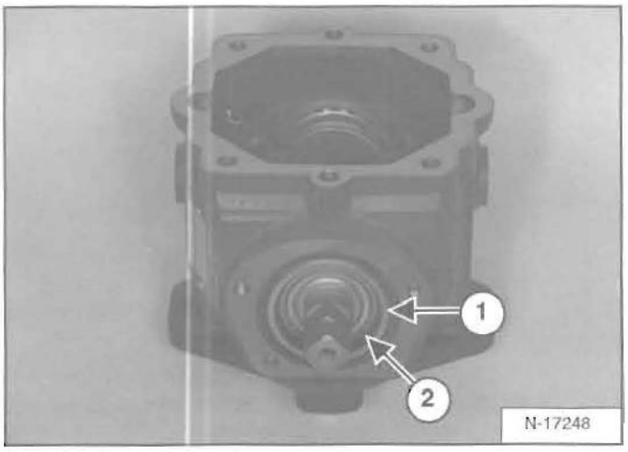
Disassembly (Cont'd)

Figure 30-40-31



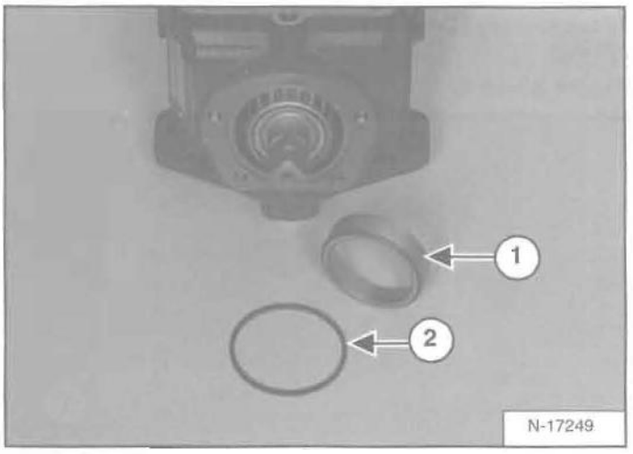
Inspect the seal (Item 1) **[Figure 30-40-31]** in the upper trunnion cover and replace if needed.

Figure 30-40-32



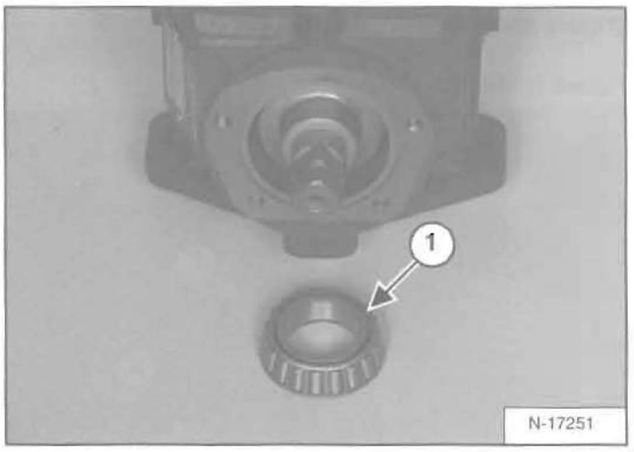
Remove the O-ring (Item 1) and bearing race (Item 2) **[Figure 30-40-32]** from the pump housing.

Figure 30-40-33



Inspect the bearing race (Item 1) and O-ring (Item 2) **[Figure 30-40-33]** and replace as needed.

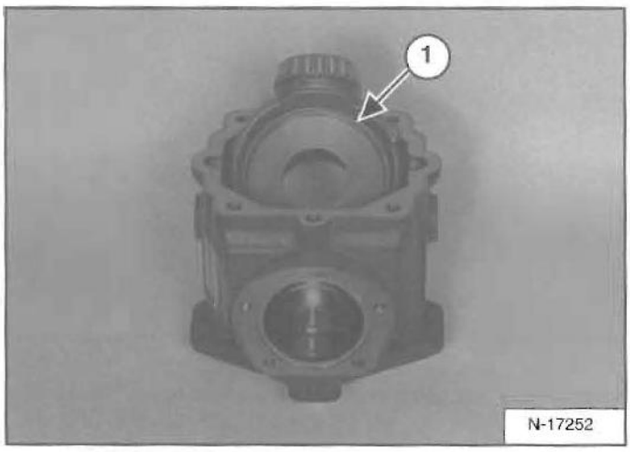
Figure 30-40-34



Slide the swashplate from side to side and remove the tapered roller bearing (Item 1) **[Figure 30-40-34]** from the swashplate shaft.

Disassembly (Cont'd)

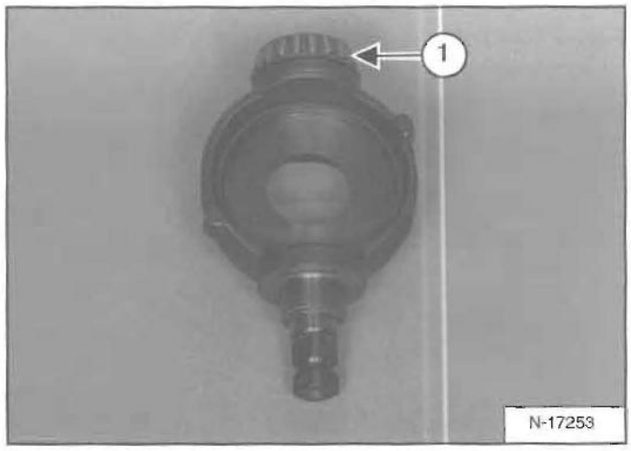
Figure 30-40-35



Tilt the swashplate (Item 1) **[Figure 30-40-35]** and remove the swashplate and lower bearing from the pump housing.

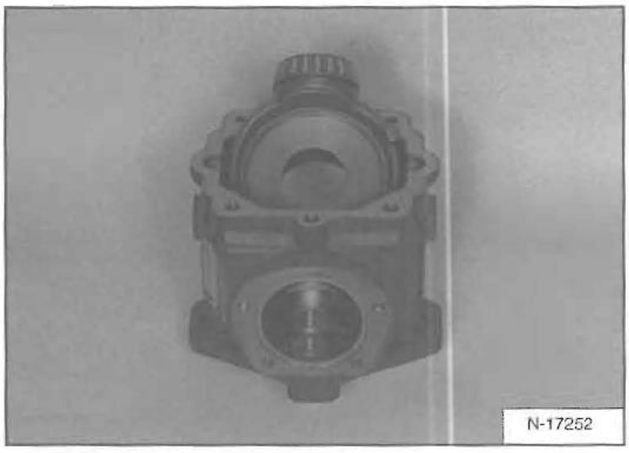
Assembly

Figure 30-40-36



Install the lower bearing (Item 1) **[Figure 30-40-36]** on the swashplate.

Figure 30-40-37



Install the swashplate and bearing into the pump housing **[Figure 30-40-37]**.

Assembly (Cont'd)

Figure 30-40-38

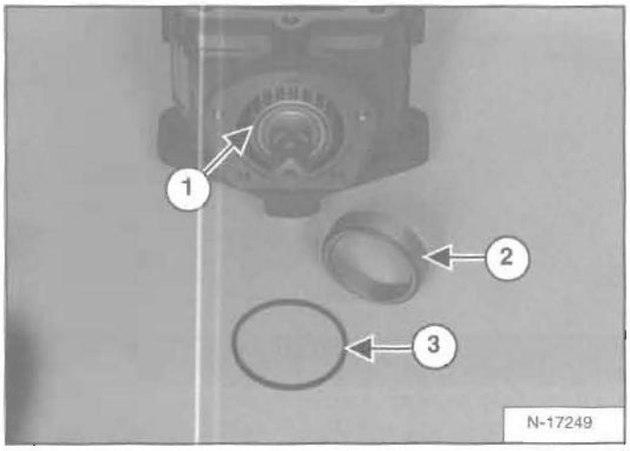
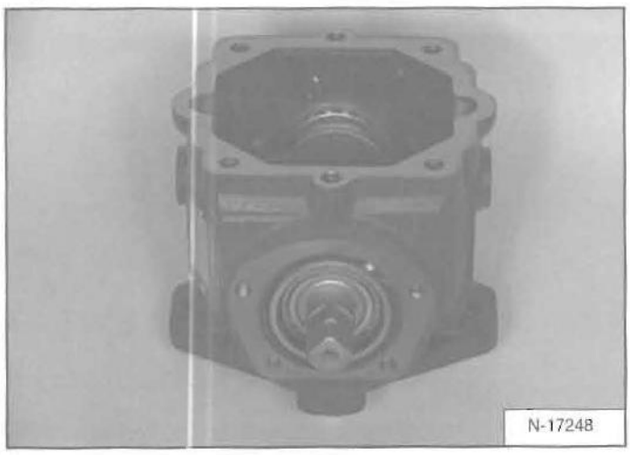


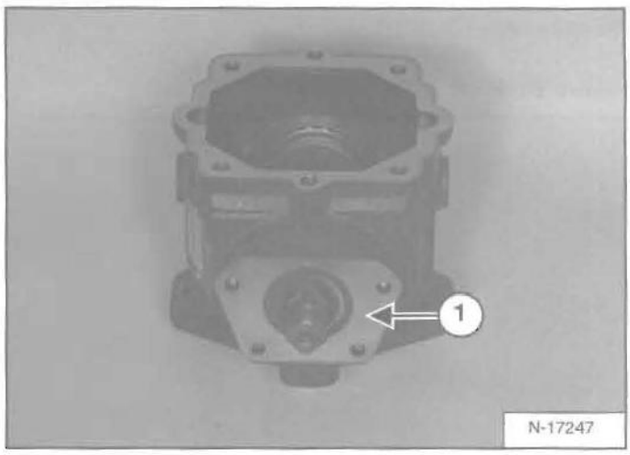
Figure 30-40-39



Install the tapered bearing (Item 1) **[Figure 30-40-38]** on the swashplate shaft.

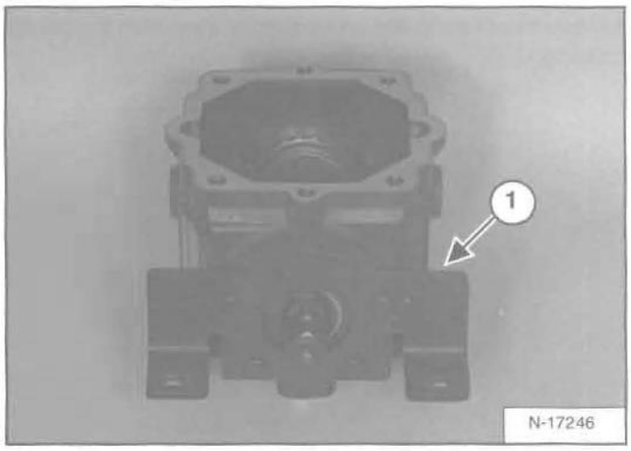
Install the bearing race (Item 2) and O-ring (Item 3) **[Figure 30-40-38]** as shown in **[Figure 30-40-39]**.

Figure 30-40-40



Install the upper trunnion seal (Item 1) **[Figure 30-40-40]** and cover.

Figure 30-40-41



Install the steering bracket (Item 1) **[Figure 30-40-41]** and the four mounting bolts and tighten to 18-22 ft.-lbs. (24-30 Nm) torque.

Assembly (Cont'd)

Figure 30-40-42

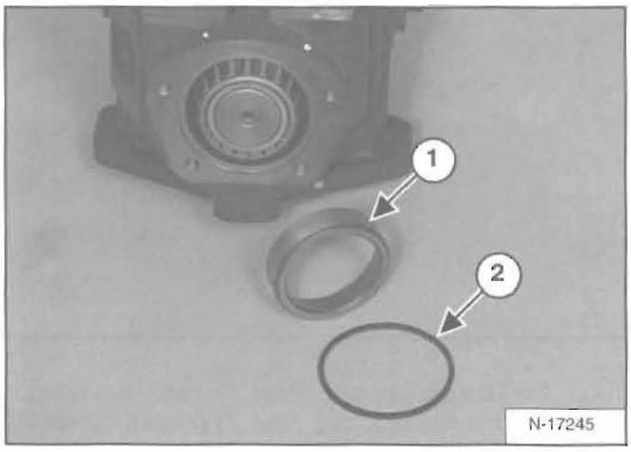
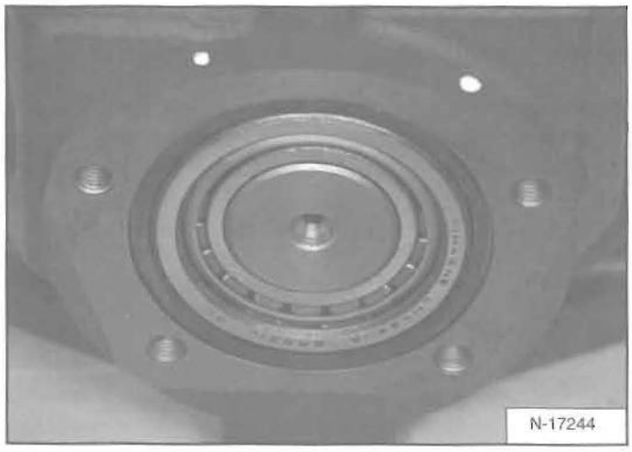
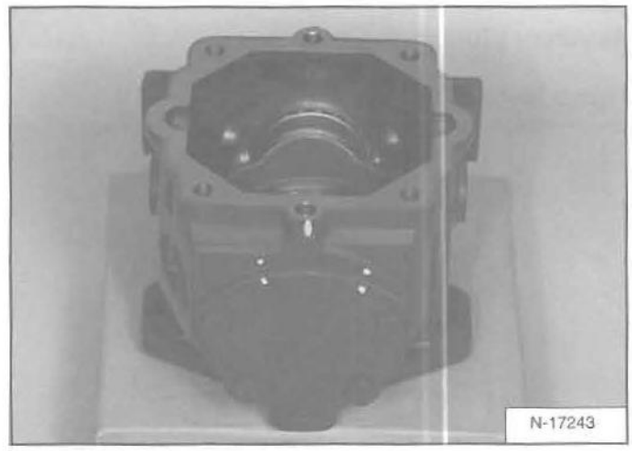


Figure 30-40-43



Install the bearing race (Item 1) and O-ring (Item 2) **[Figure 30-40-42]** at the lower trunnion as shown in **[Figure 30-40-43]**.

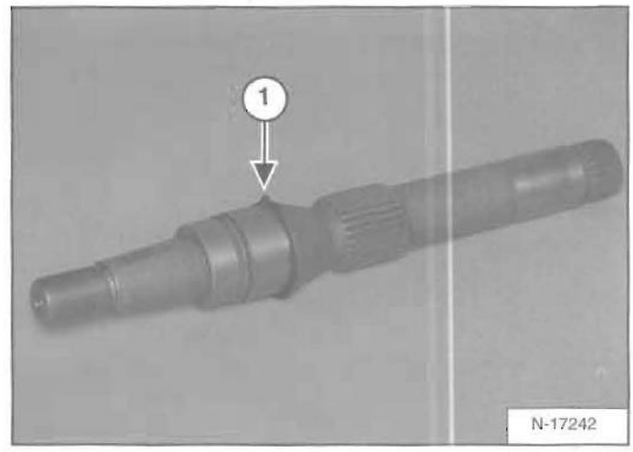
Figure 30-40-44



Align the marks on the lower trunnion cover and pump housing as shown in **[Figure 30-40-44]**.

Install the four mounting bolts and tighten to 18-22 ft.-lbs. (24-30 Nm) torque.

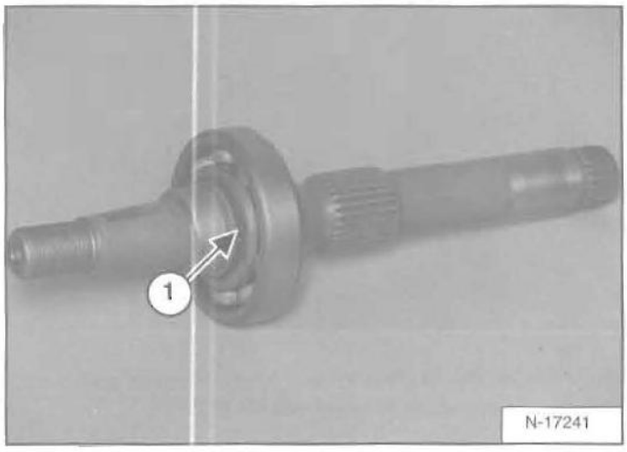
Figure 30-40-45



Install the snap ring (Item 1) **[Figure 30-40-45]** on the pump shaft.

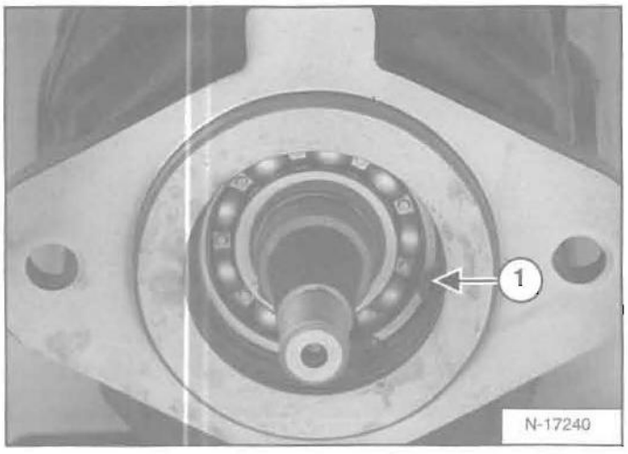
Assembly (Cont'd)

Figure 30-40-46



Install the bearing and snap ring (Item 1) **[Figure 30-40-46]** on the pump shaft.

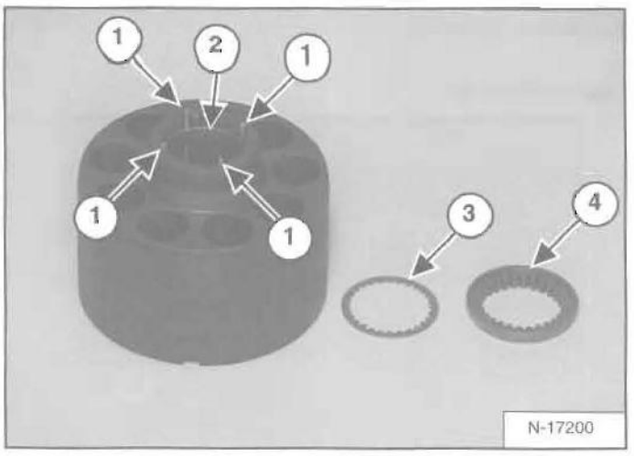
Figure 30-40-47



Install the pump shaft into the pump housing **[Figure 30-40-47]**.

Install the snap ring (Item 1) **[Figure 30-40-47]**.

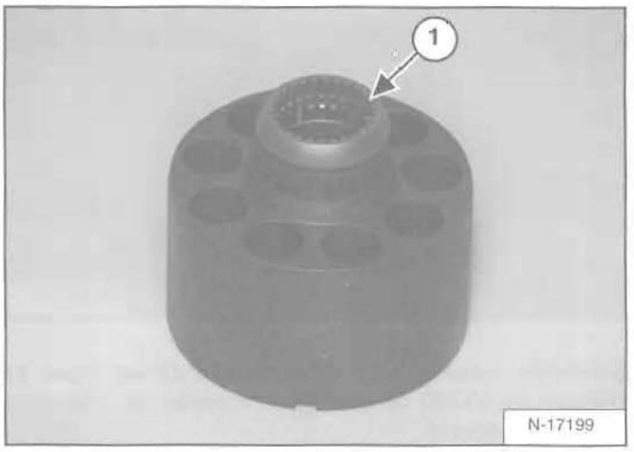
Figure 30-40-48



Install the four slipper pins (Item 1) into the cylinder block. Use the retaining ring (Item 2) **[Figure 30-40-48]** to hold the pins in place.

Apply a small amount of grease to the washer (Item 3) and install into the ball guide retainer (Item 4) **[Figure 30-40-48]**.

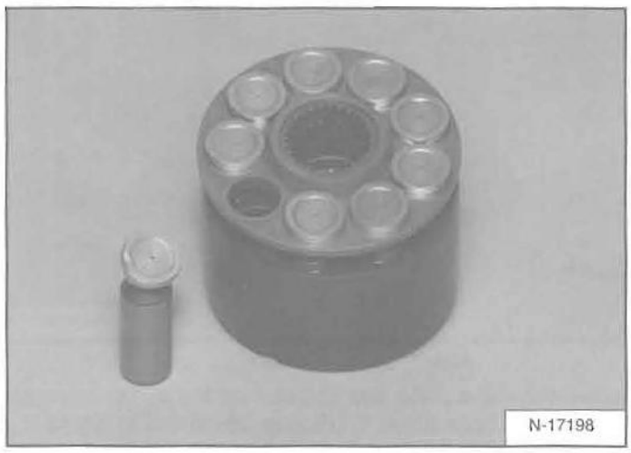
Figure 30-40-49



Install the ball guide retainer and washer (Item 1) **[Figure 30-40-49]** onto the slipper holddown pins.

Assembly (Cont'd)

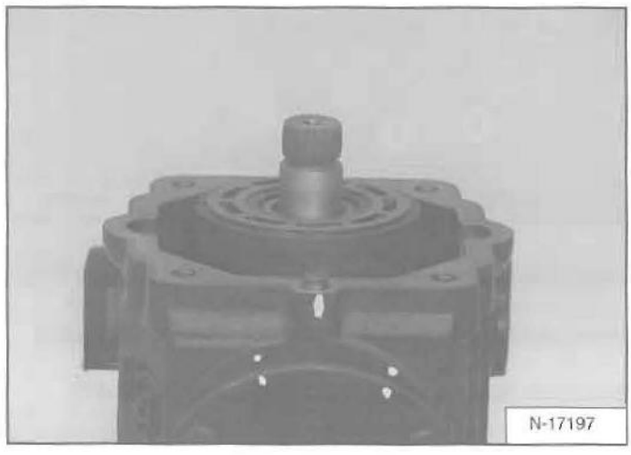
Figure 30-40-50



Assemble the piston assemblies into the slipper guide. Lubricate the pistons and cylinder block bores and insert the piston assemblies into the cylinder bores **[Figure 30-40-50]**.

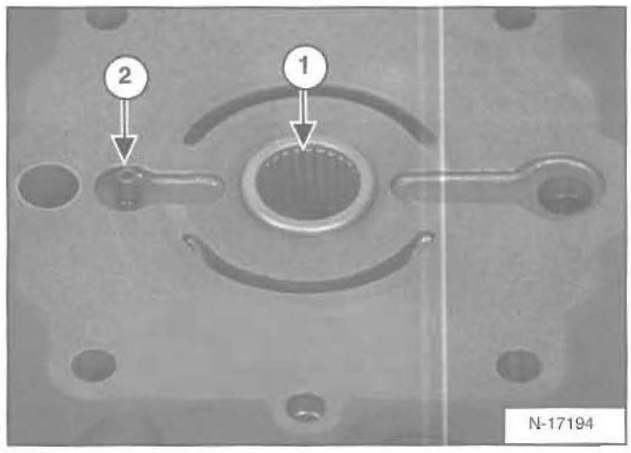
Lay the pump housing on its side and install the cylinder block, piston assembly into the housing.

Figure 30-40-51



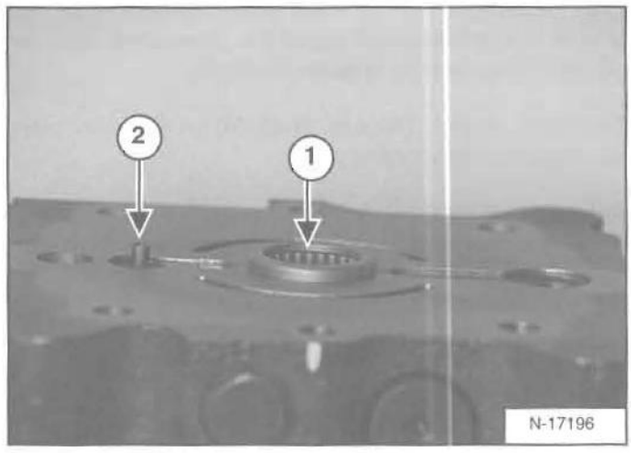
Place the pump on a work surface with the end cap opening up **[Figure 30-40-51]**.

Figure 30-40-52



Replace the needle bearing (Item 1) and valve plate locating pin (Item 2) **[Figure 30-40-52]** in the pump.

Figure 30-40-53

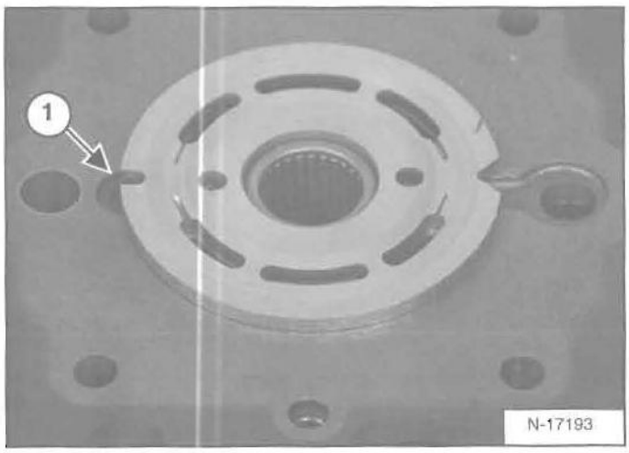


The bearing cage (Item 1) **[Figure 30-40-53]** will protrude from 0.08-0.10 inch (2,0-2,5 mm) from the surface of the pump.

The valve plate locating spring pin (Item 2) **[Figure 30-40-53]** will protrude from 0.165-0.185 inch (4,19-4,70 mm) from the surface of the charge pump.

Assembly (Cont'd)

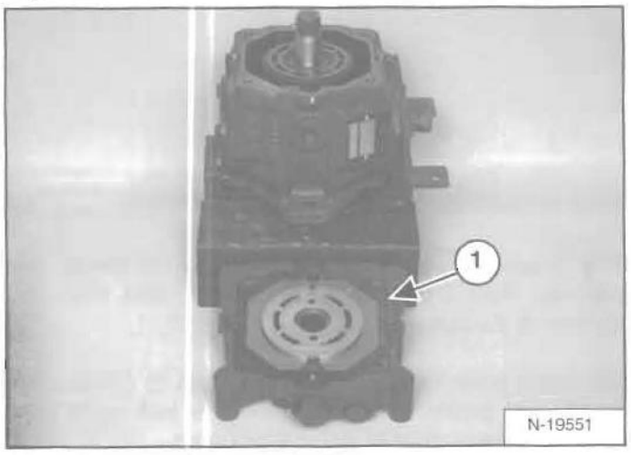
Figure 30-40-54



Coat the backside of the valve plate with petroleum jelly to hold it in position and install the valve plate onto the pump, bronze face up **[Figure 30-40-54]**.

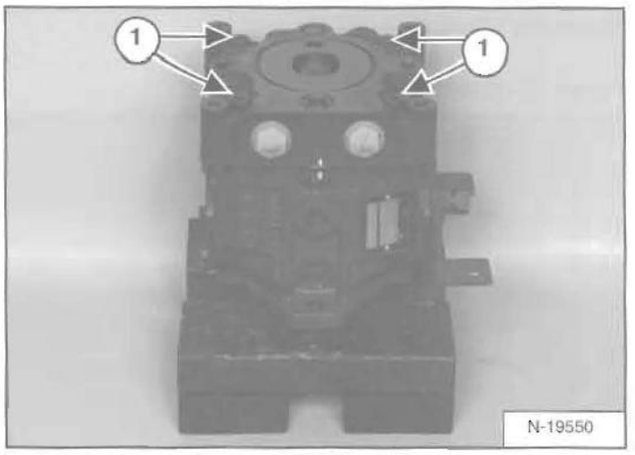
The notch (Item 1) **[Figure 30-40-54]** on the valve plate must engage the locating pin.

Figure 30-40-55



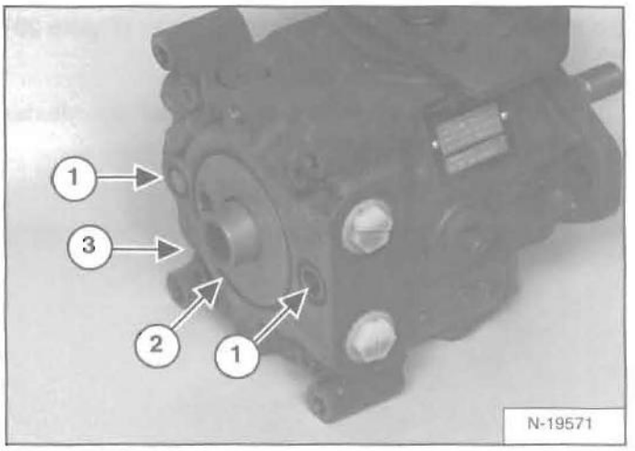
Coat a new end cap gasket (Item 1) **[Figure 30-40-55]** with petroleum jelly and install onto the end cap.

Figure 30-40-56



Install the valve plate and end cap on the pump housing. Tighten the bolts (Item 1) **[Figure 30-40-56]** to 35-45 ft.-lbs. (47-61 Nm) torque.

Figure 30-40-57



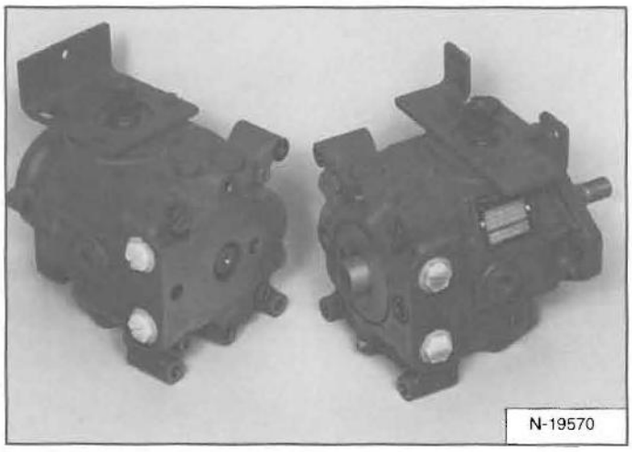
Install the two small O-rings (Item 1) **[Figure 30-40-57]**.

Install the large new O-ring (Item 2) **[Figure 30-40-57]**.

Install the pump coupler (Item 3) **[Figure 30-40-57]**.

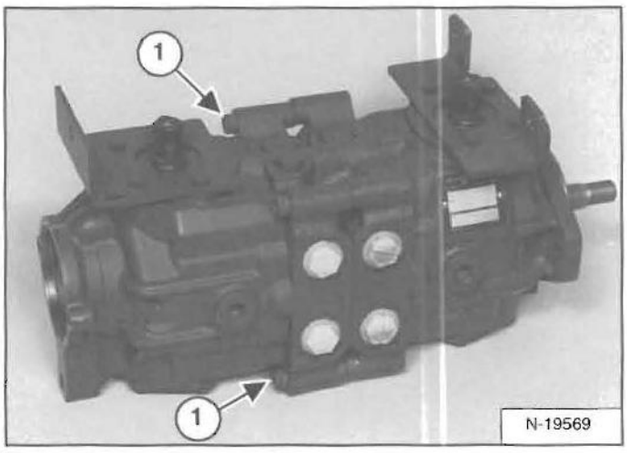
Assembly (Cont'd)

Figure 30-40-58



Install the two pumps together **[Figure 30-40-58]**.

Figure 30-40-59



Tighten the four bolts (Item 1) **[Figure 30-40-59]** to 35-45 ft.-lbs. (47-61 Nm) torque.

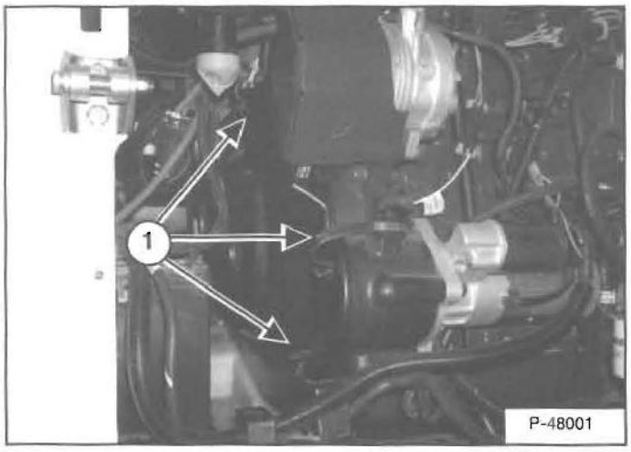


Bobcat®

DRIVE BELT

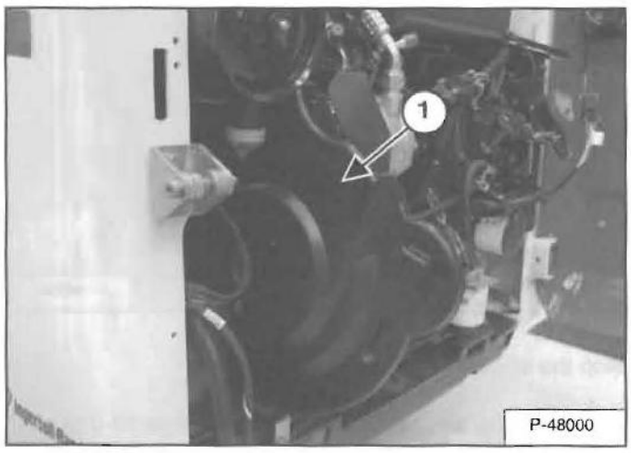
Shield Removal And Installation

Figure 30-50-1



Remove the three drive belt shield mounting clips (Item 1) **[Figure 30-50-1]**.

Figure 30-50-2



Remove the belt shield (Item 1) **[Figure 30-50-2]**

Adjusting

To adjust the drive belt between the flywheel and the hydrostatic pump pulley, use the following procedure:

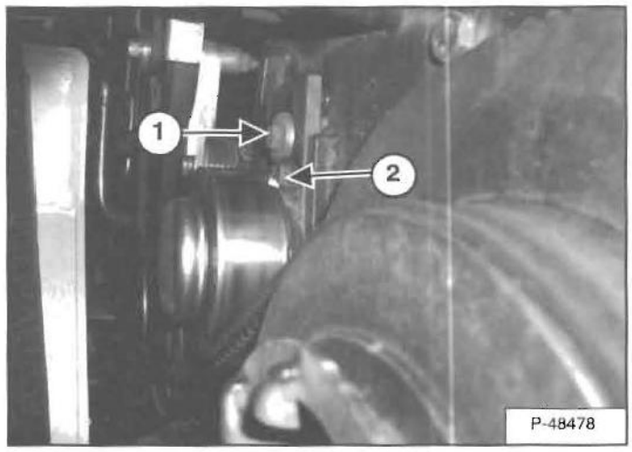
Stop the engine. Open the rear door.

Disconnect the negative (-) battery cable.

Remove the belt shield. (See Shield Removal And Installation on Page 30-50-1.)

The pulley tensioner is located between the flywheel and pump pulley.

Figure 30-50-3

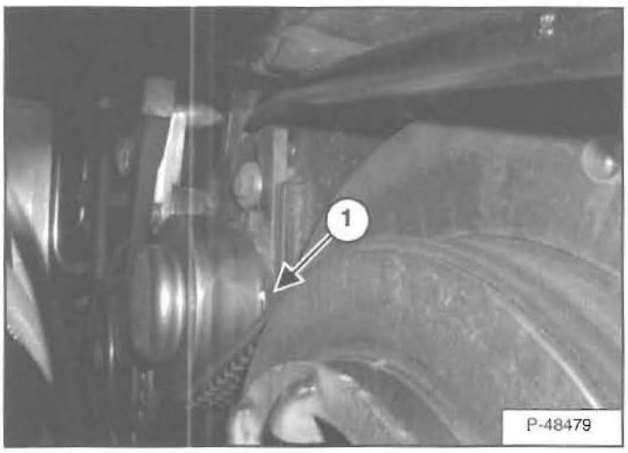


Loosen the bolt (Item 1) **[Figure 30-50-3]** on the spring loaded drive idler.

NOTE: The pointer (Item 2) [Figure 30-50-3] will be at the 1 o'clock position when the idler is not under spring tension.

Adjusting (Cont'd)

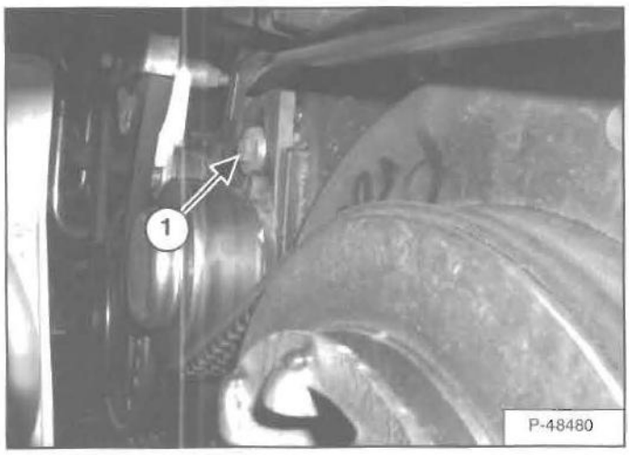
Figure 30-50-4



Using the Belt Tensioner Bar (MEL1405) or a pry bar, push the idler assembly against the belt. The pointer (Item 1) **[Figure 30-50-4]** will be at the 3 o'clock position when the idler stop is bottomed out. *Do not pry directly on the pulley, pry on the tensioner bracket the pulley is mounted on.*

NOTE: If the pointer does not move when prying on the tensioner mounting bracket, manually move the arrow towards the 3 o'clock position with a screwdriver while putting tension on the bracket to help get it started.

Figure 30-50-5



Raise the idler assembly slightly so that the pulley is operating on spring tension and not against the stop.

Tighten the mounting bolt (Item 1) **[Figure 30-50-5]** to 25-28 ft.-lbs. (34-38 Nm) torque.

NOTE: Do not set the idler against the travel stop in the 3 o'clock position.

Run the engine for a few minutes.

Stop the engine and recheck the pointer position.

Readjust if necessary.

After the idler has been in service, readjust when the pointer reaches the 1 o'clock position.

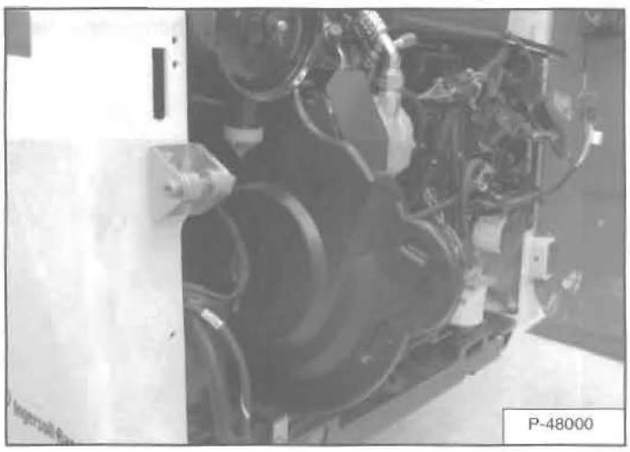
Install the belt shield using the fasteners.

Reconnect the negative (-) battery cable.

Close the rear door.

Drive Belt Replacement

Figure 30-50-6



Stop the engine. Open the rear door.

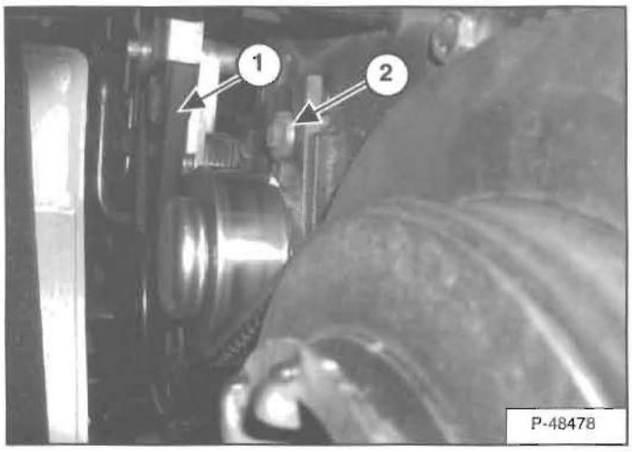
Raise the operator cab. (See Contents Page 10-01.)

Remove the negative (-) cable from the battery. The battery may be removed for additional working clearance. (See Contents Page 60-01.)

Remove the belt shield **[Figure 30-50-6]**. (See Shield Removal And Installation on Page 30-50-1.)

Drive Belt Replacement (Cont'd)

Figure 30-50-7

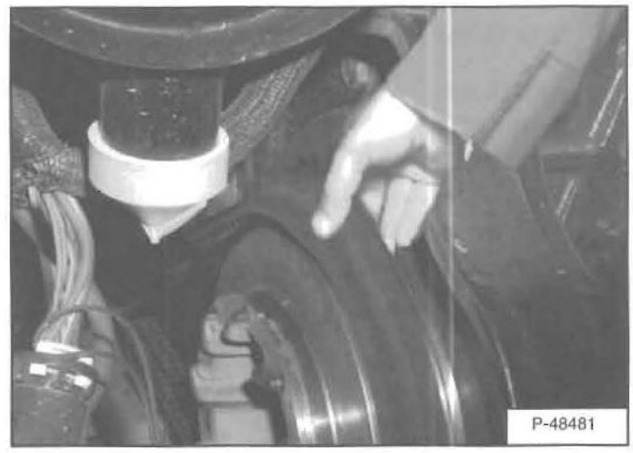


Remove the fan drive belt (Item 1) **[Figure 30-50-7]**.

The belt tensioner is located between the flywheel and pump pulley. Loosen and remove the bolt (Item 2) **[Figure 30-50-7]** from the belt tensioner.

Remove the belt tensioner assembly.

Figure 30-50-8



Remove the drive belt from the pump pulley and flywheel. Remove the drive belt from the loader **[Figure 30-50-8]**.

Install the new drive belt. Install the belt tensioner assembly.

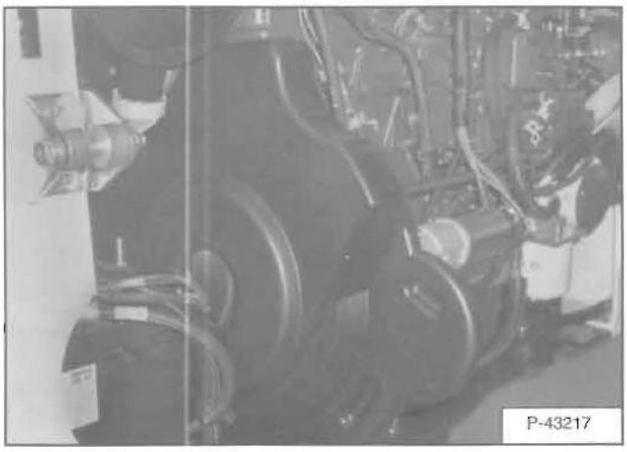
Install the fan drive belt.

Adjust the drive belt. (See Contents Page 30-01.)

Reinstall belt shield and connect the negative (-) cable to the battery.

Tensioner Pulley Removal And Installation

Figure 30-50-9

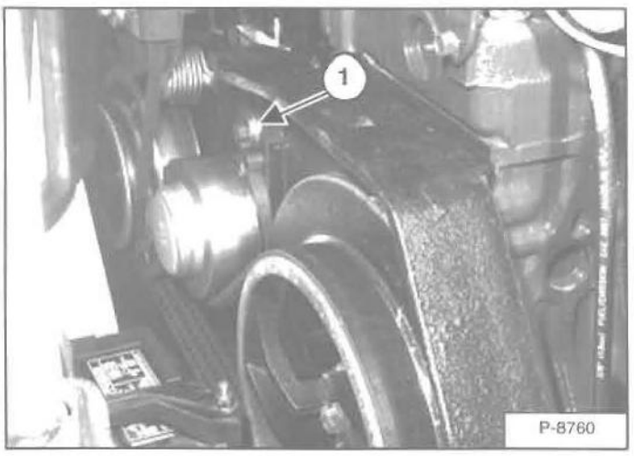


Stop the engine. Open rear door.

Remove the negative (-) cable from the battery. the battery may be removed for additional working clearance. (See Contents Page 60-01.)

Remove the belt shield **[Figure 30-50-9]**. (See Shield Removal And Installation on Page 30-50-1.)

Figure 30-50-10



Loosen and remove the tensioner pulley mounting bolt (Item 1) **[Figure 30-50-10]**.

Installation: Tighten the bolt to 25-28 ft.-lbs. (34-38 Nm) torque.

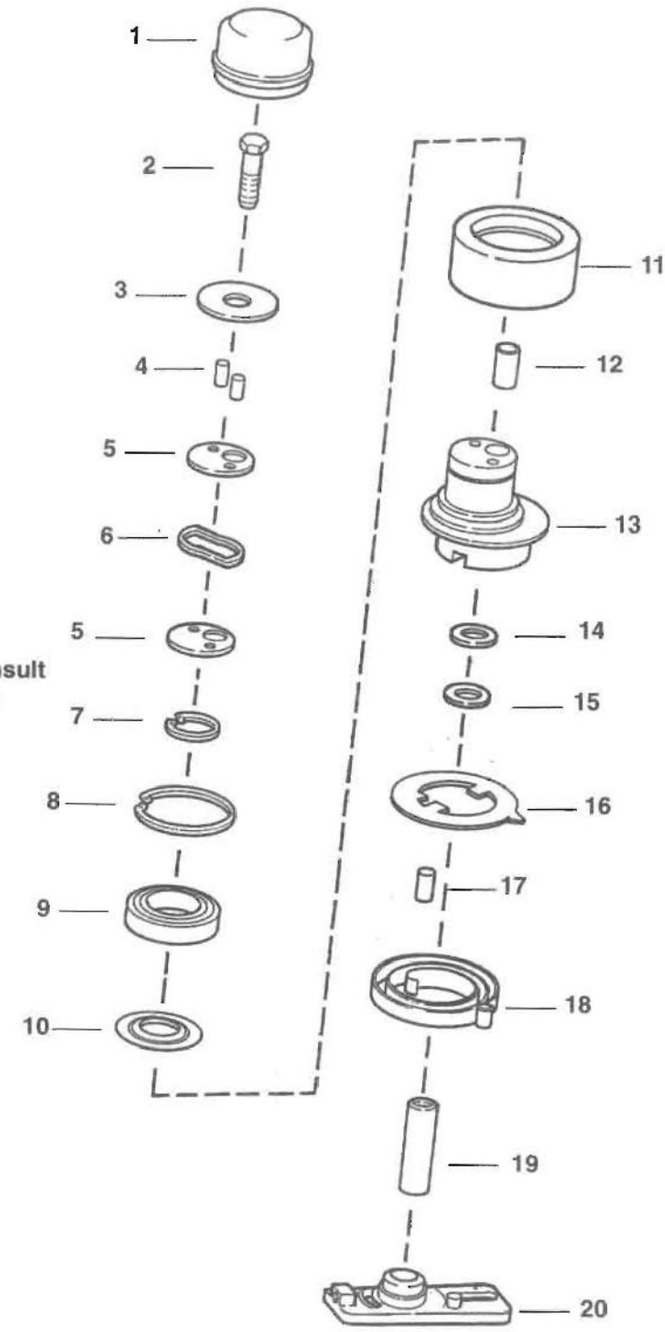
Remove the belt tensioner pulley from the housing.

Reverse the removal procedure to install the drive belt tensioner.

Tensioner Pulley Parts Identification

1. Cover
2. Bolt
3. Washer
4. Pins
5. Washer
6. Spring
7. Snap Ring
8. Snap Ring
9. Bearing
10. Dust Shield
11. Pulley
12. Bushing
13. Hub
14. Washer
15. Seal
16. Arrow Indicator Plate
17. Locating Pin
18. Spring
19. Shaft
20. Bracket

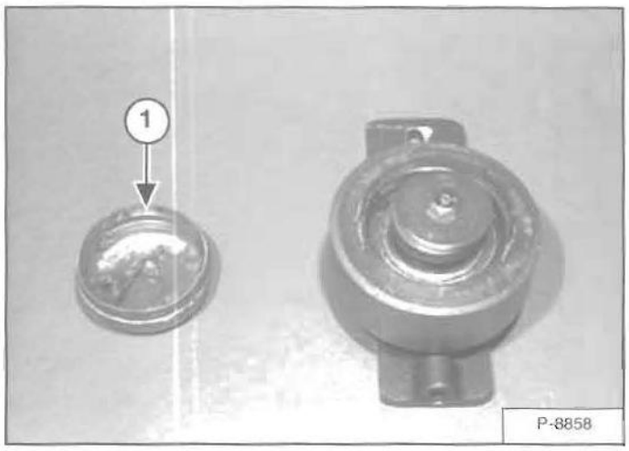
NOTE: Drive idler parts are not available individually. Consult parts catalog for available sub-assemblies.



E-2296

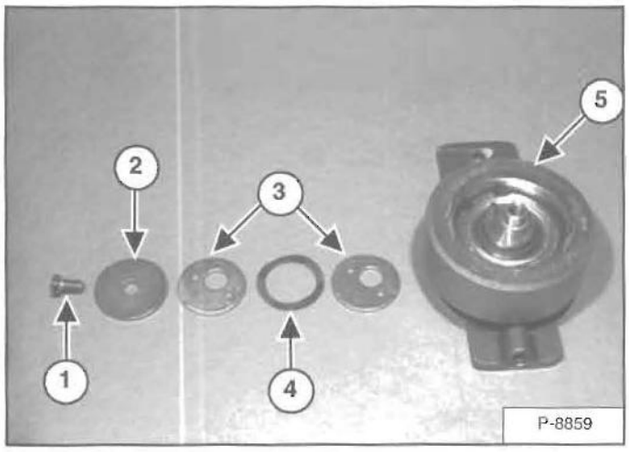
Tensioner Pulley Disassembly

Figure 30-50-11



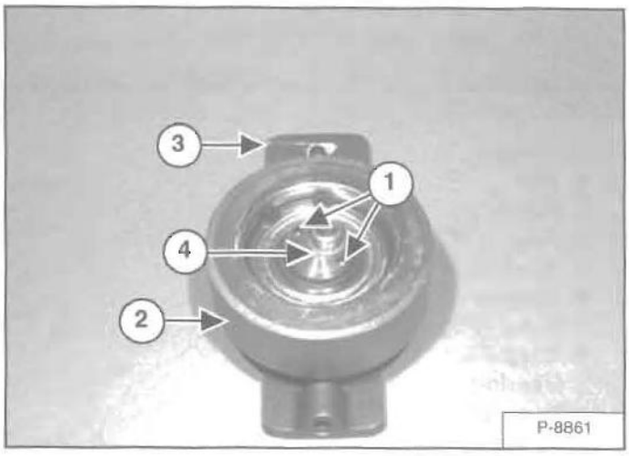
Remove the grease cover (Item 1) **[Figure 30-50-11]**.

Figure 30-50-12



Remove the bolt (Item 1), the flat washer (Item 2), the retainer washer (Item 3), the spring washer (Item 4) and the second retainer washer (Item 3) from the pulley assembly (Item 5) **[Figure 30-50-12]**.

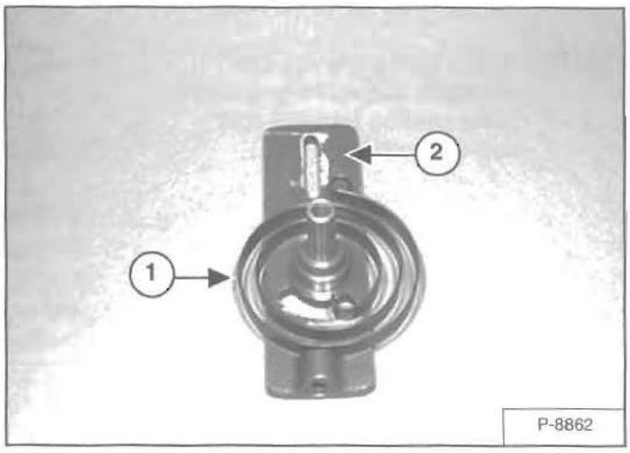
Figure 30-50-13



Remove the two pins (Item 1) from the hub assembly (Item 2) **[Figure 30-50-13]** only if they have been damaged.

Remove the bracket assembly (Item 3) by tapping on the shaft (Item 4) **[Figure 30-50-13]** with a plastic hammer.

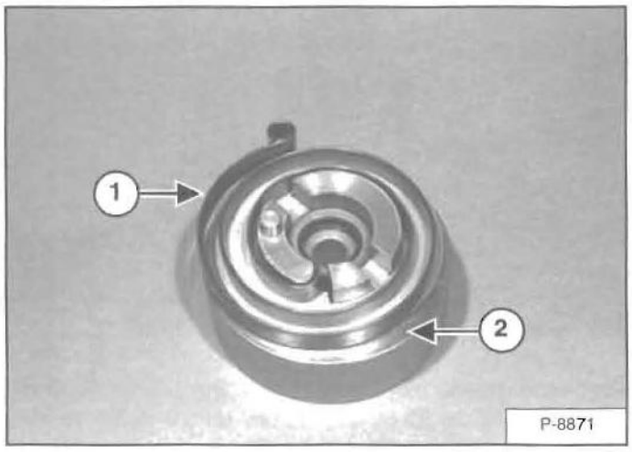
Figure 30-50-14



Remove the spring (Item 1) from the bracket (Item 2) **[Figure 30-50-14]**.

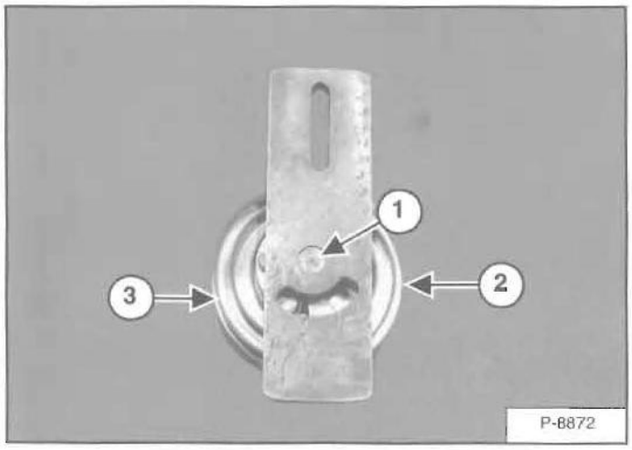
Tensioner Pulley Assembly

Figure 30-50-15



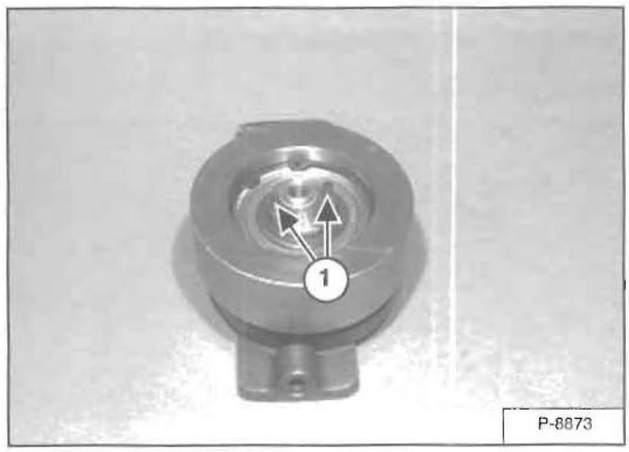
Install the spring (Item 1) on the pulley (Item 2) **[Figure 30-50-15]** as shown.

Figure 30-50-16



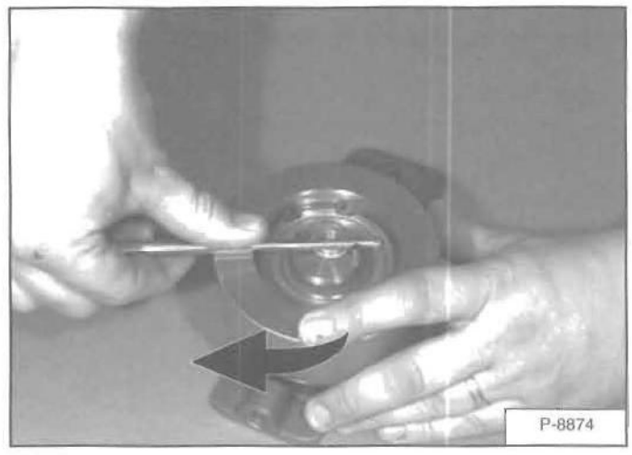
Install the shaft from the bracket assembly (Item 1) into the pulley assembly (Item 2) and align the spring (Item 3) **[Figure 30-50-16]** over the alignment pin on the bracket.

Figure 30-50-17



Turn the pulley assembly over and install the two pins (Item 1) **[Figure 30-50-17]** into the hub.

Figure 30-50-18

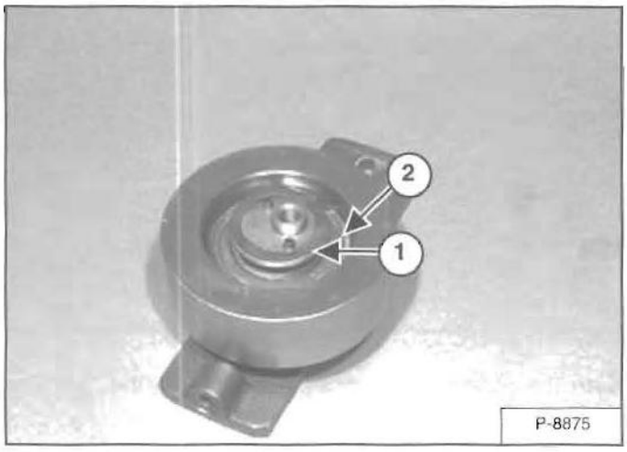


Install a punch as shown and turn clockwise while applying down pressure on the pulley.

Turn until the pulley snaps down into place; this procedure winds the spring and retains the end of the spring in proper location **[Figure 30-50-18]**.

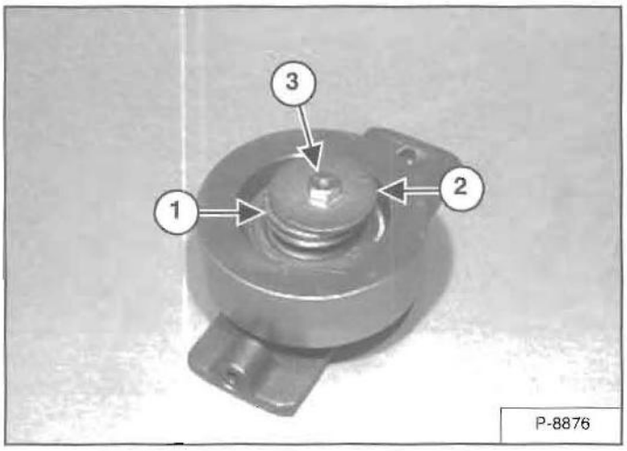
Tensioner Pulley Assembly (Cont'd)

Figure 30-50-19



Install the first retainer washer (Item 1) and spring washer (Item 2) **[Figure 30-50-19]** over the roll pins.

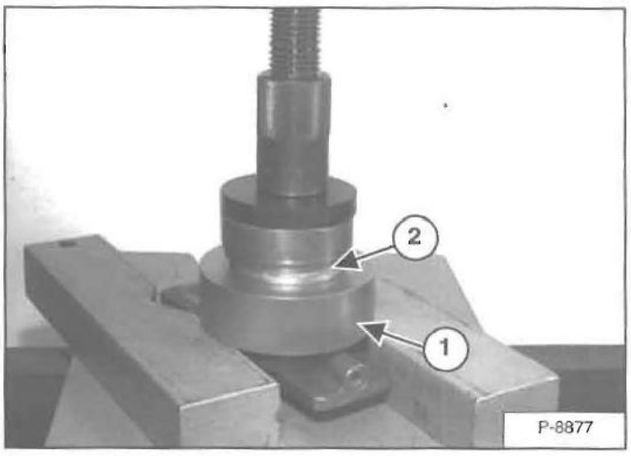
Figure 30-50-20



Install the second retainer washer (Item 1), the washer (Item 2) and the bolt (Item 3) **[Figure 30-50-20].** Tighten the bolt to 28-32 ft.-lbs. (38-45 Nm) torque.

Fill the grease cap 1/4 full (approximately 1/2-3/4 oz.) of grease.

Figure 30-50-21



Press the grease cap (Item 1) onto the pulley assembly (Item 2) **[Figure 30-50-21]**. Press on the outer formed edge of the grease cap.

NOTE: When pressing the grease cap onto the pulley assembly, do not press down on the arrow indicator plate. Support the hub assembly so that it contacts only the hub and not the arrow indicator plate.

OIL COOLER

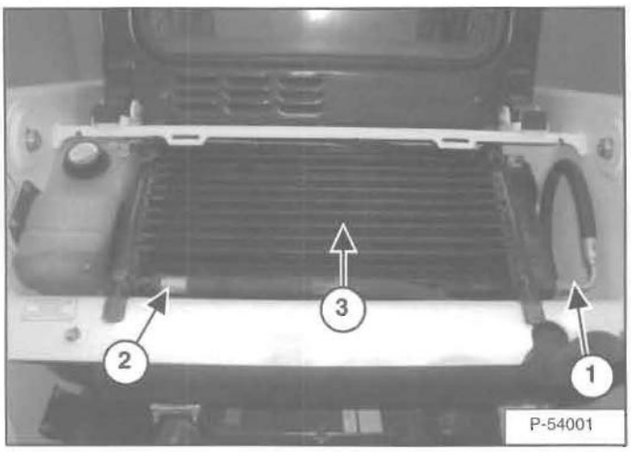
Removal and Installation

IMPORTANT

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

I-2003-0888

Figure 30-60-1



Open the rear door of the loader.

Remove the rear grill from the loader. (See Contents Page 50-01.)

Disconnect the inlet and outlet hoses (Items 1 & 2) from the oil cooler (Item 3) **[Figure 30-60-1]**.

Figure 30-60-2

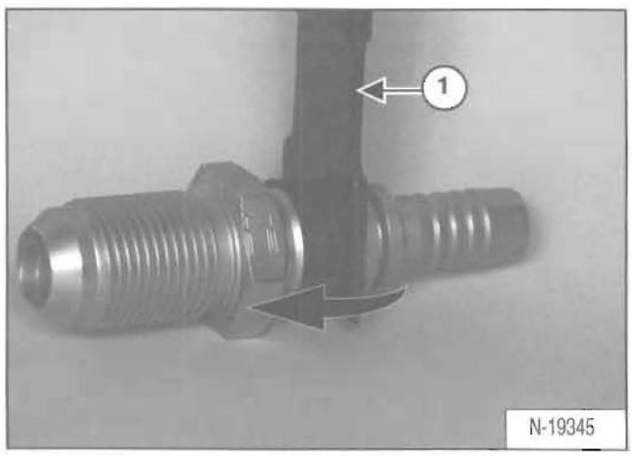
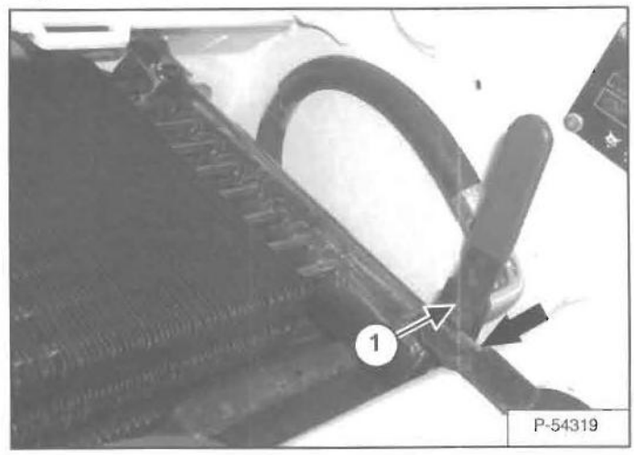
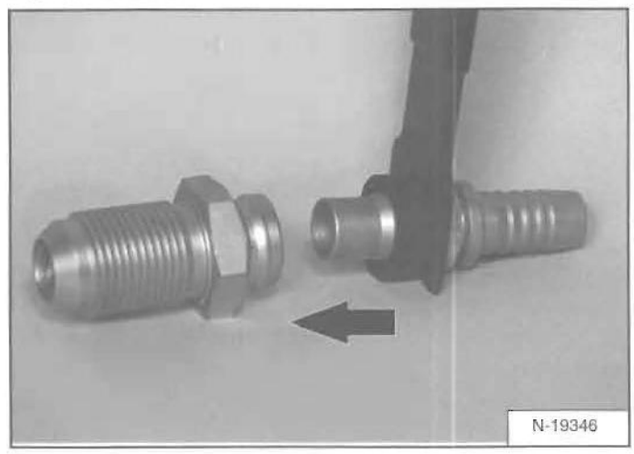


Figure 30-60-3



Install tool MEL1558 (Item 1) **[Figure 30-60-2]** to outside of rubber sleeve (Item 1) **[Figure 30-60-3]**.

Figure 30-60-4



Slide the rubber sleeve in toward the radiator. The connector will release **[Figure 30-60-3]** & **[Figure 30-60-4]**.

NOTE: When installing the cooler hoses, the fittings should make a clicking sound when pushed together.

Lift up the oil cooler and remove the cooler from the loader.

Reverse the removal procedure to install the oil cooler.



Bobcat®

DRIVE SYSTEM

BRAKE 40-10-1
Disc Removal And Installation 40-10-1
Switch Operated Parking Brake 40-10-2

CHAINCASE 40-30-1
Center Cover Removal And Installation 40-30-2
Checking And Adding Oil 40-30-1
Front Cover Removal And Installation 40-30-2
Rear Cover Removal And Installation 40-30-3
Removing The Oil 40-30-1

DRIVE COMPONENTS 40-20-1
Axle Seal Removal And Installation 40-20-1
Axle Sprocket And Bearings Removal And Installation 40-20-3
Chain Removal And Installation 40-20-8

TIGHTEN ALL HARDWARE PER SIZE TO GRADE 5 TORQUE (SEE STANDARD TORQUE SPECIFICATIONS FOR BOLTS, SECTION SPEC-01) UNLESS OTHERWISE SPECIFIED.


Bobcat®

BRAKE

Disc Removal And Installation

⚠ WARNING

Never work on a machine with the lift arms up unless the lift arms are secured by an approved lift arm support device. Failure to use an approved lift arm support device can allow the lift arms or attachment to fall and cause injury or death.

W-2059-0598

Raise the loader lift arms and install an approved lift arm support device. (See Contents Page 10-01.)

Raise the loader operator cab. (See Contents Page 10-01.)

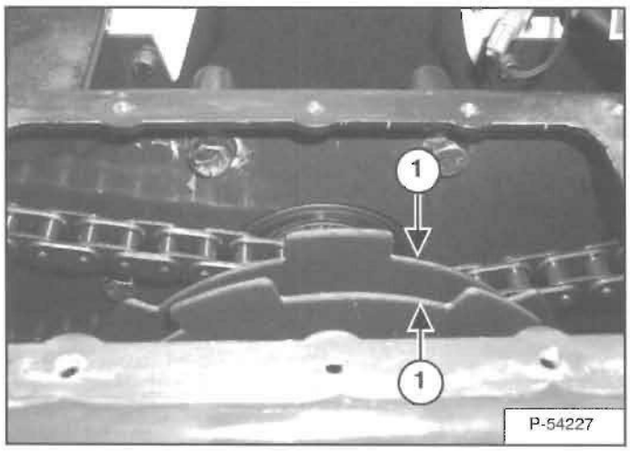
Disconnect and remove the engine speed control. (See Contents Page 70-01.)

Remove the control panel from the loader. (See Contents Page 50-01.)

Remove the center chaincase cover. (See Contents Page 40-01.)

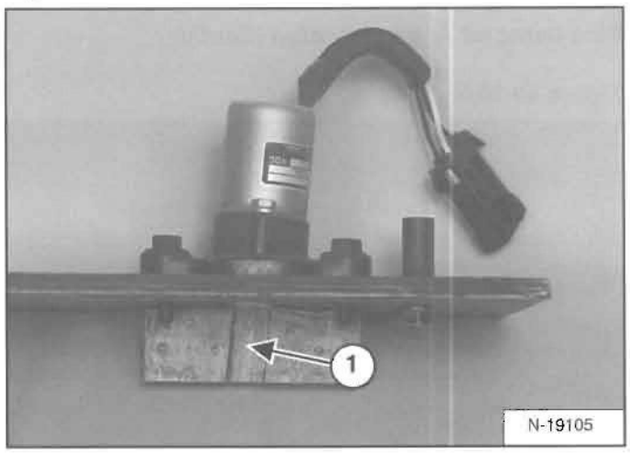
Remove the traction lock assembly. (See Contents Page 60-01.)

Figure 40-10-1



The parking brake discs (Item 1) **[Figure 40-10-1]** are located beneath the center chaincase cover.

Figure 40-10-2

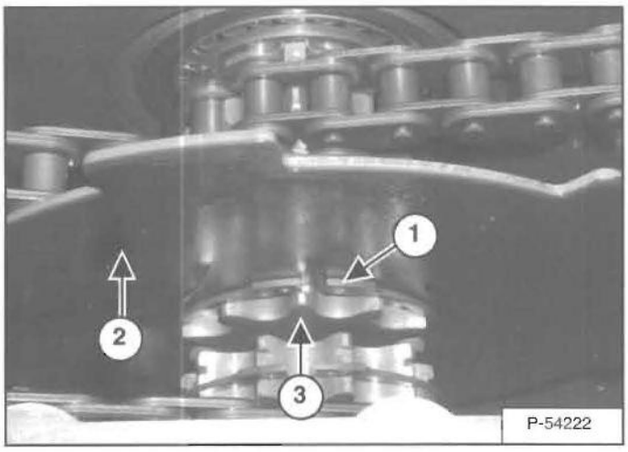


Inspect the traction lock guides (Item 1) **[Figure 40-10-2]** and the brake disc for damage or wear and replace as necessary.

A snap ring pliers with 90° tips are necessary for removing the parking brake disc.

Disc Removal And Installation (Cont'd)

Figure 40-10-3



Remove the snap ring (Item 1) from the end of the sprocket (Item 2) **[Figure 40-10-3]** on the hydrostatic motor carrier.

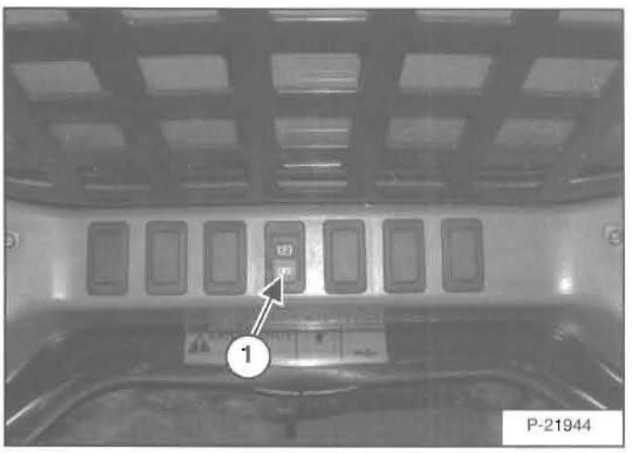
Slide the disc (Item 3) off the sprocket **[Figure 40-10-3]** and remove the disc.

Reverse the removal procedure to install the disc in the loader.

Refer to Page 60-01 for the traction lock inspection procedure.

Switch Operated Parking Brake

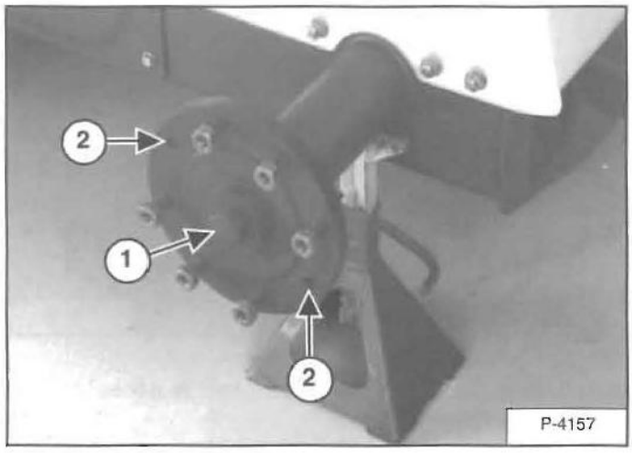
Figure 40-10-4



The parking brake switch (Item 1) **[Figure 40-10-4]** is in the front overhead panel. (See Page 60-01 Instrument Panel For Front Accessory Panel Removal.)

Axle Seal Removal And Installation

Figure 40-20-1



The tools listed are needed for the following procedure:

Axle Hub Puller Tool

MEL1399 - Seal Driver Tool

MEL1242 - Power Ram (may be used if desired)

To loosen the axle hub mounting bolt (Item 1) **[Figure 40-20-1]**, use the following procedure:

Before lifting and blocking the loader, loosen the hub mounting bolt (Item 1) **[Figure 40-20-1]**.

NOTE: If the axle and bearings are being replaced, also loosen the sprocket mounting bolt inside the chaincase before lifting and blocking the loader. (See Axle Sprocket And Bearings Removal And Installation on Page 40-20-3.)

Lift and block the loader. (See Contents Page 10-01.)

Remove the front tire/wheel assembly.

Installation: Tighten the wheel mounting nuts to 105-115 ft.-lbs. (142-156 Nm) torque.

Remove the hub mounting bolt (Item 1) **[Figure 40-20-1]** and washer from the axle.

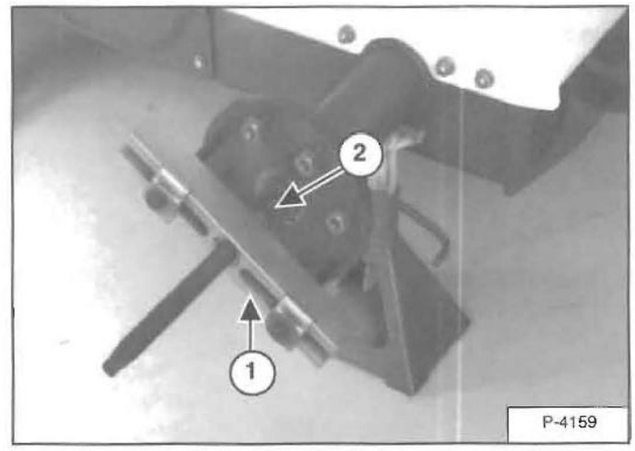
Installation: Tighten the hub mounting bolt to 725-800 ft.-lbs. (983-1084 Nm) torque.

Remove two of the wheel mounting studs (Item 2) **[Figure 40-20-1]**.

Use a wheel mounting nut on each stud and remove the two studs with a hammer.

Installation: Support the flange of the axle hub and install the two studs with a hammer. A hydraulic press can also be used to install the studs.

Figure 40-20-2



Install the puller tool (Item 1) **[Figure 40-20-2]** on the axle hub.

A driver tool (Item 2) **[Figure 40-20-2]** can be used for centering the threaded rod of the puller.

⚠ WARNING

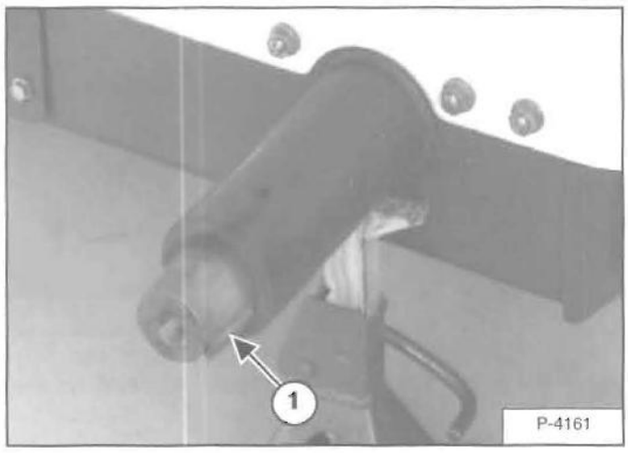
NEVER STAND IN-LINE OF THE HUB WHEN REMOVING A HUB FROM AN AXLE. The hub has a tapered fit on the axle end and can come off the axle with great force and cause serious injury.

W-2186-0395

Use a wrench with the puller and remove the axle hub from the axle tube. A spacer and a power ram can be used between the axle and the tool if available, instead of the wrench, threaded rod and driver tool.

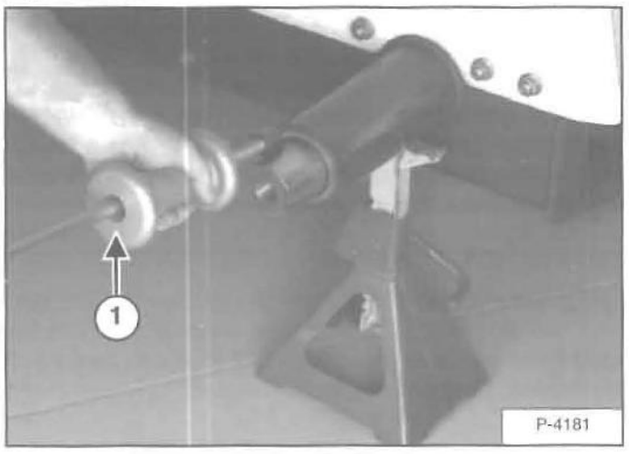
Axle Seal Removal And Installation (Cont'd)

Figure 40-20-3



Remove the key (Item 1) **[Figure 40-20-3]** from the axle.

Figure 40-20-4

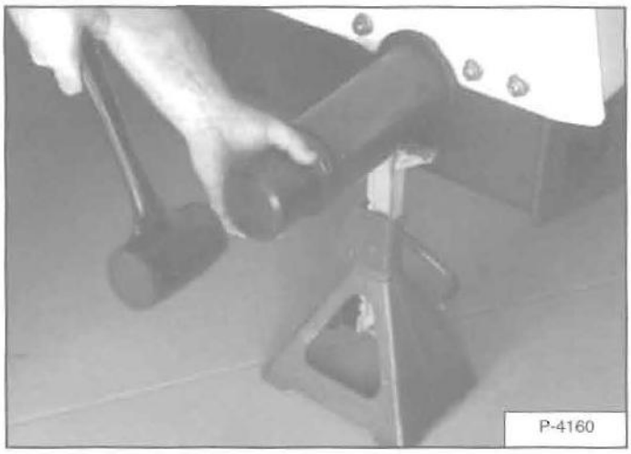


Drill a small hole in the axle seal.

Install a slide hammer (Item 1) **[Figure 40-20-4]** with a screw tip end in the axle seal.

Remove the axle seal.

Figure 40-20-5



Installation: MEL1399 seal driver tool is necessary for the following procedure:

Clean the seal area and inspect the shaft for wear.

NOTE: If the shaft is damaged or worn, an axle repair sleeve kit is available from Bobcat Parts and Sales.

Place the new axle seal over the axle and into the axle tube.

Install MEL1399 seal driver tool over the axle and put against the axle seal **[Figure 40-20-5]**.

Hit the seal driver tool with a hammer until the tool is flush with the edge of the axle tube **[Figure 40-20-5]**.

Reverse removal procedure to install the axle hub and wheel assembly.

Axle Sprocket And Bearings Removal And Installation

The tools listed are needed for the following procedure:

MEL1242 - Power Ram
MEL1202B - Axle Bearing Service Set

NOTE: The procedure shown is for removing the front axle, bearings and sprocket. This procedure can also be used for the rear axle, bearings and sprocket. (See Page 40-01 for Rear Chaincase Cover Removal.)

⚠ WARNING

Never work on a machine with the lift arms up unless the lift arms are secured by an approved lift arm support device. Failure to use an approved lift arm support device can allow the lift arms or attachment to fall and cause injury or death.

W-2059-0598

Raise the lift arms and install an approved lift arm support device. (See Contents Page 10-01.)

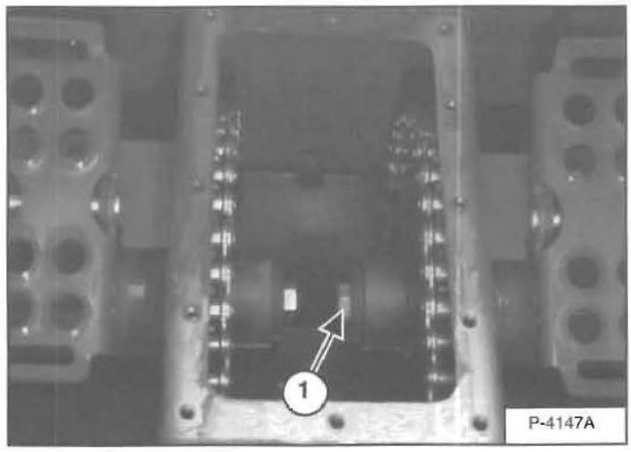
Lift and block the loader. (See Contents Page 10-01.)

Raise the operator cab. (See Contents Page 10-01.)

Remove the control panel. (See Contents Page 50-01).

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

Figure 40-20-6



Loosen the axle sprocket mounting bolt (Item 1) **[Figure 40-20-6]**.

Lift and block the loader. (See Contents Page 10-01.)

Remove the fluid from the chaincase. (See Contents Page 40-01.)

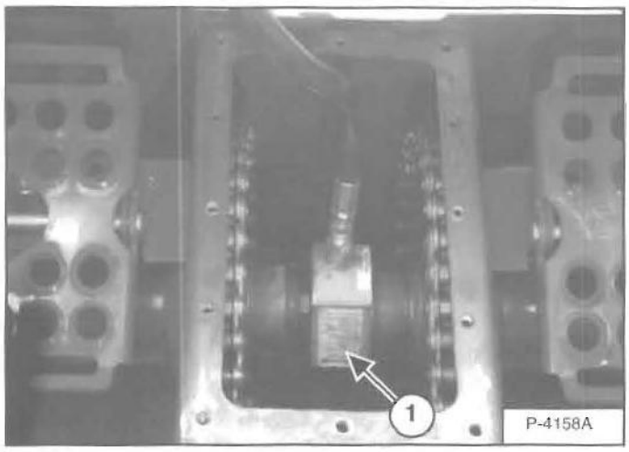
Remove the axle hub. (See Contents Page 40-01.)

Remove the sprocket mounting bolt (Item 1) **[Figure 40-20-6]**.

Installation: Tighten the sprocket mounting bolt to 300-330 ft.-lbs. (407-447 Nm) torque.

Axle Sprocket And Bearings Removal And Installation (Cont'd)

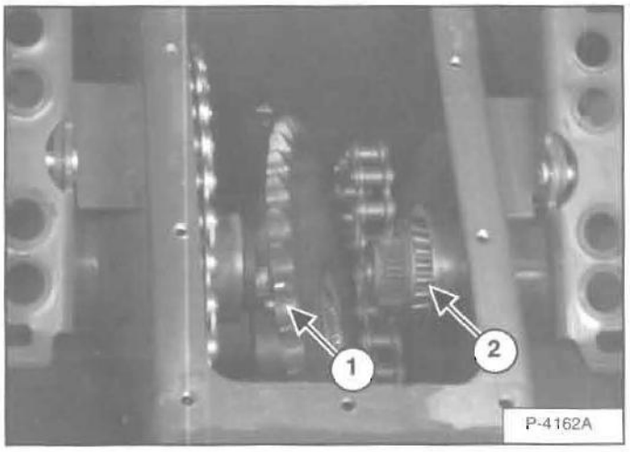
Figure 40-20-7



Install the MEL1242 power ram (Item 1) **[Figure 40-20-7]** between the two sprockets.

Put a spacer between the power ram and axle. Push the axle out to the end of the power ram stroke. Add another spacer and push the axle again. Repeat this procedure until the axle is free from the sprocket and inner bearing.

Figure 40-20-8

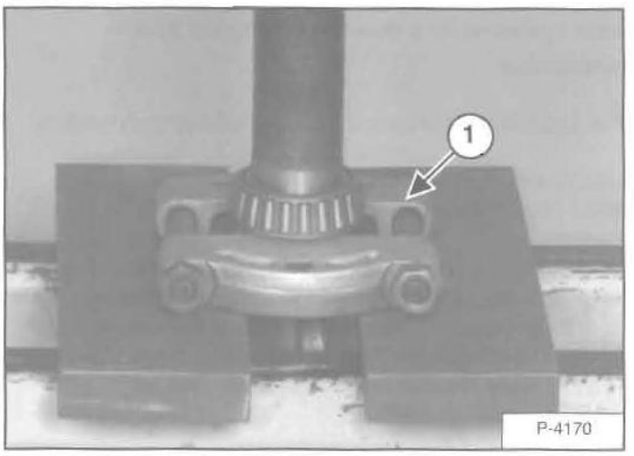


Remove the drive chain from the sprocket (Item 1) **[Figure 40-20-8]** and remove the sprocket from the chaincase.

Installation: Pack both axle bearings with grease before installing them.

Remove the inner bearing (Item 2) **[Figure 40-20-8]** and remove the axle from the axle tube. (See Contents Page 40-01 for outer bearing removal from the axle.)

Figure 40-20-9



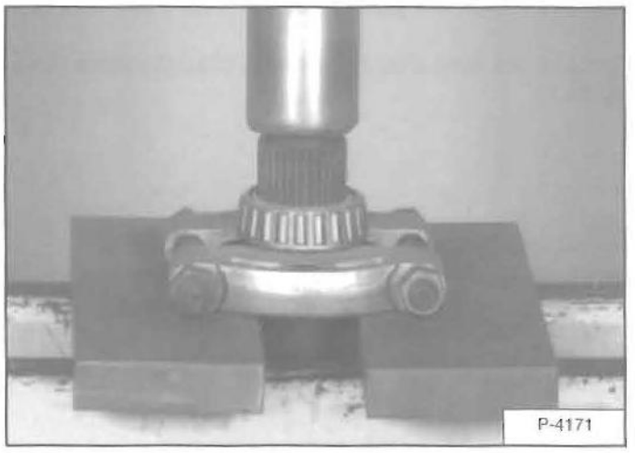
A bearing puller (Item 1) **[Figure 40-20-9]** is needed for the following procedure:

Put the axle/outer bearing assembly in the bearing puller as shown and put in the hydraulic press **[Figure 40-20-9]**.

Be sure the bearing puller makes good contact with the inner race of the bearing and press the bearing off the mounting surface of the axle.

Be sure to hold onto the axle during removal as it will slide freely along the axle shaft after removal from the bearing mounting surface and until the bearing contacts the spline on the shaft.

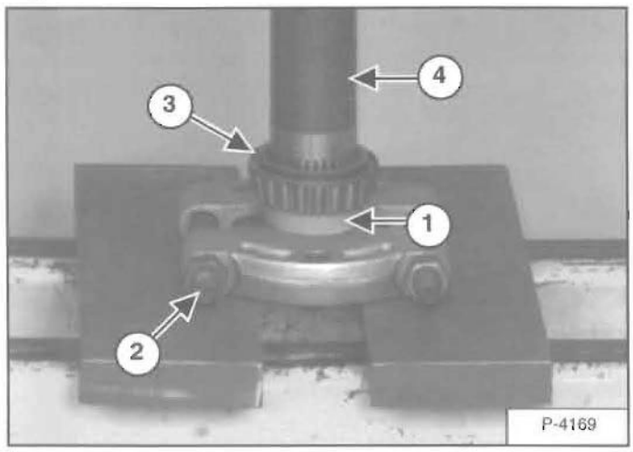
Figure 40-20-10



Press the splined end of the axle free from the bearing **[Figure 40-20-10]**.

Axle Sprocket And Bearings Removal And Installation (Cont'd)

Figure 40-20-11



Installation: A piece of round tubing (Item 1) **[Figure 40-20-11]** is needed to install the bearing on the axle shaft. The tubing needs to measure approximately 0.500 inch (12,7 mm) to 1.0 inch (25,4 mm) in length. The inside diameter of the tubing should not be under 2.100 inches (53,3 mm) and the outside diameter should not be over 2.400 inches (60 mm),

A bearing puller (Item 2) **[Figure 40-20-11]** is also needed to install the bearing on the axle.

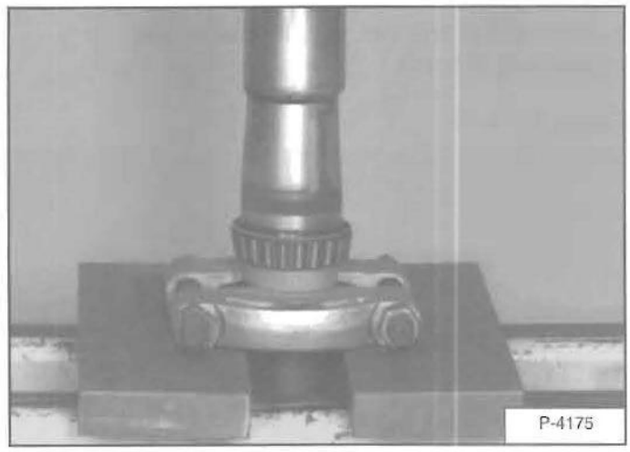
Put the tubing (Item 1) on the bearing puller (Item 2) **[Figure 40-20-11]**.

Put the bearing (Item 3) **[Figure 40-20-11]** on the tube as shown.

Put the spline end of the axle shaft (Item 4) **[Figure 40-20-11]** in the bearing and press the bearing onto the axle.

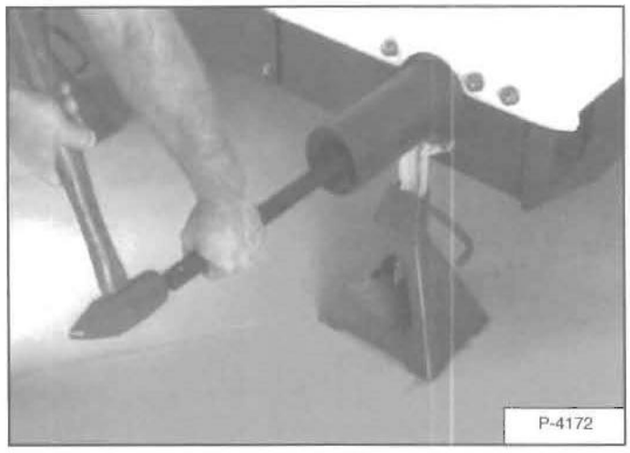
Be sure to hold onto the axle during installation, as it will slide freely along the axle shaft after the spline end has passed through the bearing and until it reaches the bearing mounting surface on the axle.

Figure 40-20-12



When the bearing reaches the bearing mounting surface, continue the installation until the bearing is fully seated **[Figure 40-20-12]**.

Figure 40-20-13



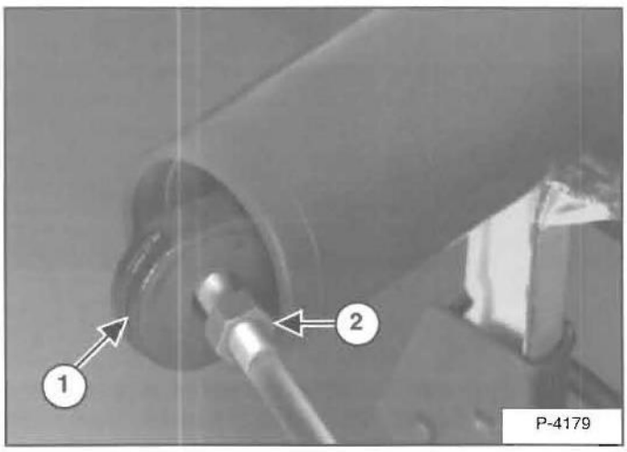
Use the tools provided in the MEL1202B Axle Bearing Service Set for bearing cup removal and installation. A slide hammer is also necessary for this procedure.

Use the long rod and bearing cup tool to remove the inner bearing cup **[Figure 40-20-13]**.

Hit the long rod with a hammer to remove the bearing cup from the axle tube **[Figure 40-20-13]**.

Axle Sprocket And Bearings Removal And Installation (Cont'd)

Figure 40-20-14

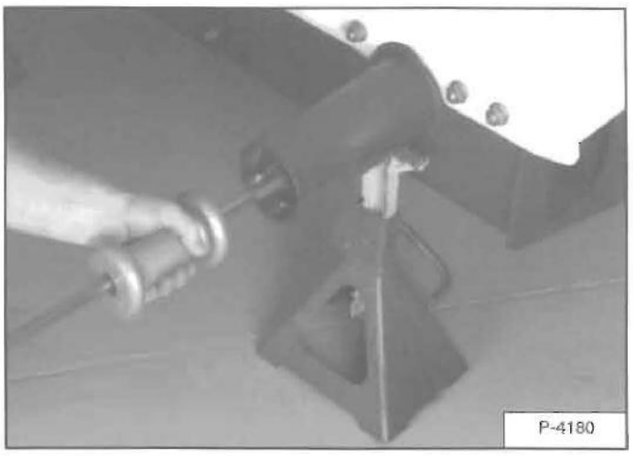


To remove the outer bearing cup, place the bearing cup tool (Item 1) **[Figure 40-20-14]** on the slide hammer.

Leave the bearing cup tool loose until the tool is installed inside the tube **[Figure 40-20-14]**.

After the bearing cup tool is inside the axle tube, pull the tool against the bearing cup and tighten the nut (Item 2) **[Figure 40-20-14]** on the tool.

Figure 40-20-15



Use the slide hammer and remove the bearing cup from the axle tube **[Figure 40-20-15]**.

Axle Sprocket And Bearings Removal And Installation (Cont'd)

Figure 40-20-16

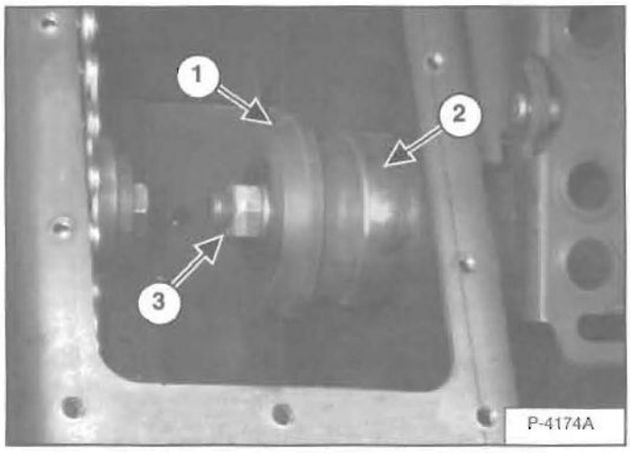
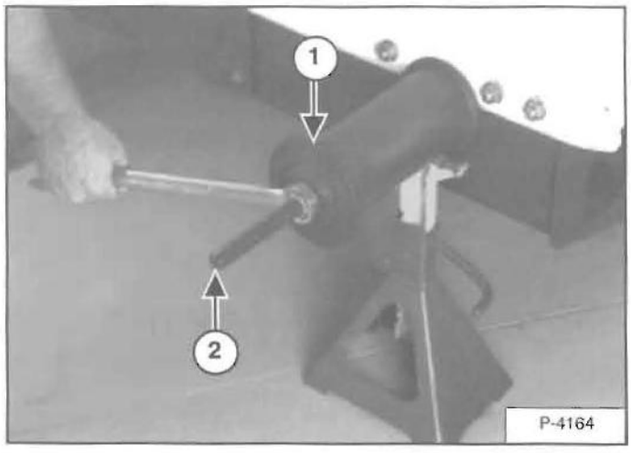


Figure 40-20-17



Use the bearing cup installation tools (Item 1) **[Figure 40-20-16]** and (Item 1) **[Figure 40-20-17]** and the long threaded rod (Item 2) **[Figure 40-20-17]** from the service set to install the inner and outer bearing cups.

Put the inner bearing cup in the axle tube (Item 2) **[Figure 40-20-16]**.

Put the installation tool (Item 1) **[Figure 40-20-16]** in the axle tube.

Install the long threaded rod (Item 2) **[Figure 40-20-17]** into the axle tube and through the installation tool (Item 1) **[Figure 40-20-16]**.

Secure the tool to the threaded rod with a nut (Item 3) **[Figure 40-20-16]**.

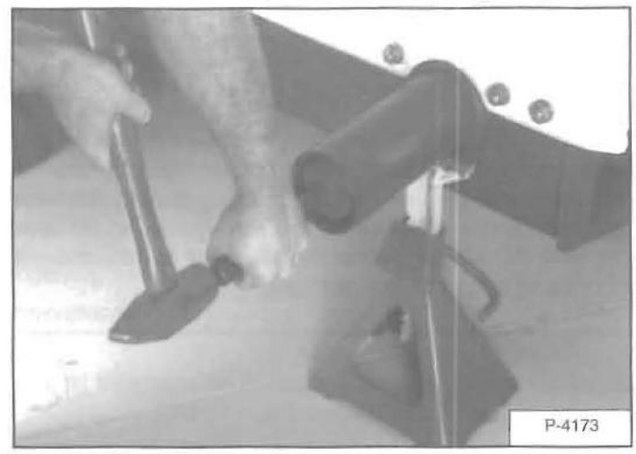
Put the installation tool (Item 1) **[Figure 40-20-17]** in the axle tube with the threaded rod through the hole in the tool.

Secure the tool to the threaded rod with a nut **[Figure 40-20-17]**.

Hold the inside nut (Item 3) **[Figure 40-20-16]** with a wrench and tighten the outside nut as shown in photo **[Figure 40-20-17]**.

Tighten the nut until the bearing cup is seated.

Figure 40-20-18



To install the outer bearing cup, use the short rod and the bearing cup tool used for removing the bearing cups.

Put the bearing cup tool on the short rod.

Put the bearing cup in the axle tube and put the tool into the tube over the bearing cup **[Figure 40-20-18]**.

Hit the short rod with a hammer until the bearing cup is seated inside the axle tube.

Chain Removal And Installation

⚠ WARNING

DO NOT exceed the recommended torque of 130 ft.-lbs. (176 Nm). The tool may fail under too much torque. Put cloth around the tool to protect yourself from flying debris.

W-2233-0296

⚠ WARNING

Never work on a machine with the lift arms up unless the lift arms are secured by an approved lift arm support device. Failure to use an approved lift arm support device can allow the lift arms or attachment to fall and cause injury or death.

W-2059-0598

Raise the loader lift arms and install an approved lift arm support device. (See Contents Page 10-01.)

Lift and block the loader. (See Contents Page 10-01.)

Raise the loader operator cab. (See Contents Page 10-01.)

Drain the fluid from the chaincase. (See Contents Page 40-01.)

Remove the engine speed control. (See Contents Page 70-01.)

Remove the control panel. (See Contents Page 50-01.)

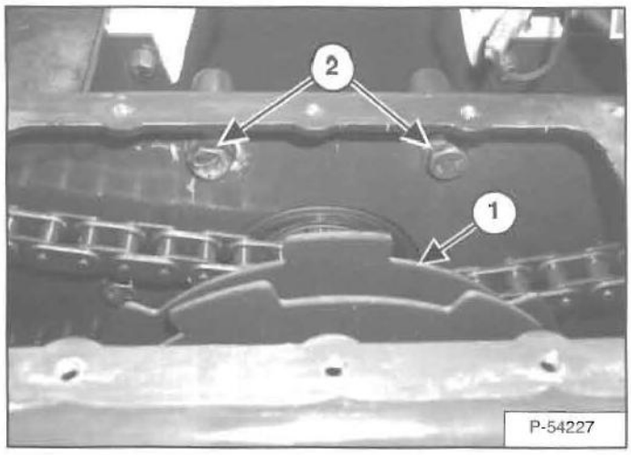
Remove the traction lock assembly. (See Contents Page 60-01.)

Remove the center chaincase cover. (See Contents Page 40-01.)

Remove the front (or rear) chaincase cover. (See Contents Page 40-01.)

Remove the front (or rear) axle and sprocket. (See Contents Page 40-01.)

Figure 40-20-19

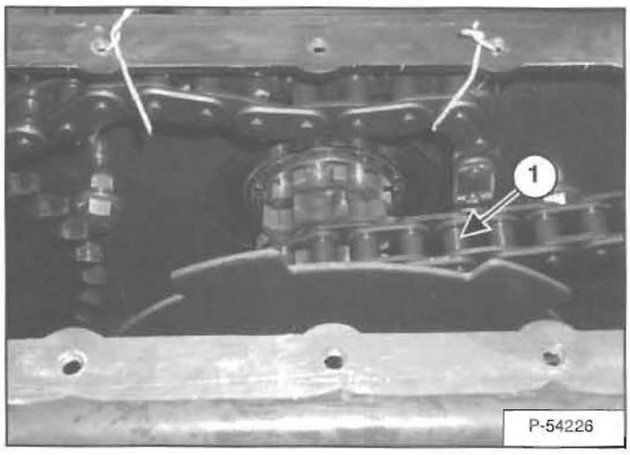


Remove the parking brake disc (Item 1) **[Figure 40-20-19]**. (See Contents Page 40-01.)

Remove the six carrier mounting bolts (Item 2) **[Figure 40-20-19]** from inside the chaincase.

Installation: Tighten the motor carrier mounting bolts to 125-140 ft.-lbs. (170-190 Nm) torque.

Figure 40-20-20



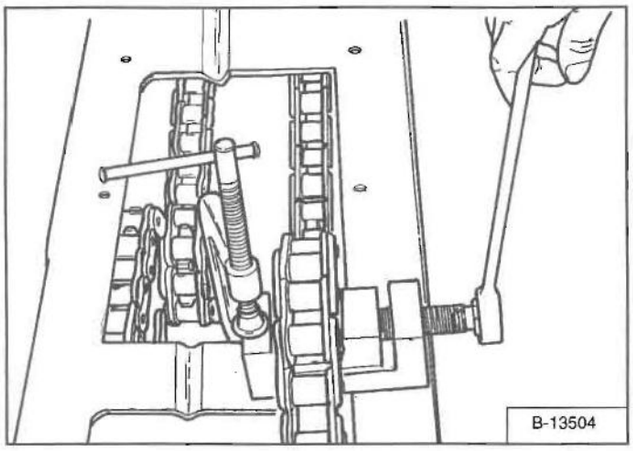
Tip the end of the sprocket on the motor carrier toward the rear of the loader and remove the rear drive chain from the sprocket.

NOTE: It may be necessary to tie the front drive chain up as shown in photo [Figure 40-20-20], so the carrier/motor assembly can be moved enough to free the rear drive chain (Item 1) [Figure 40-20-20] from the sprocket.

Remove the front drive chain from the chaincase.

Chain Removal And Installation (Cont'd)

Figure 40-20-21



The tool listed is needed for the following procedure:

MEL1037 - Chain Link Tool

Installation: If a new chain is installed, a connector link must be used to connect the chain together.

Use MEL1037 Chain Link Tool and #80 chain adapter.

Secure the tool and place the connector link in the tool as shown **[Figure 40-20-21]**.

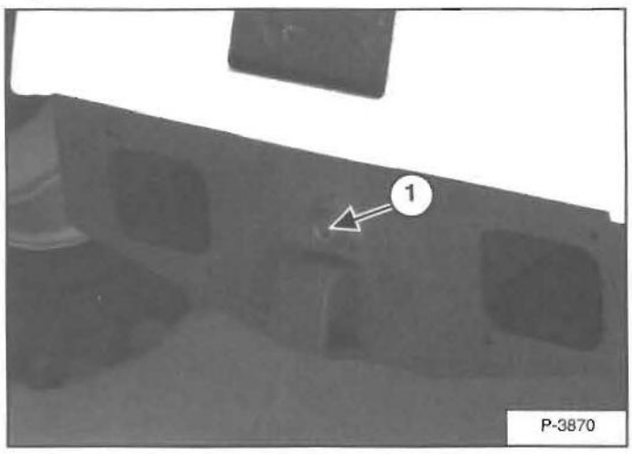
Turn the threaded rod of the tool and press the connector link together on the chain **[Figure 40-20-21]**. Tighten the threaded rod of the chain link tool to 130 ft.-lbs. (176 Nm) torque.


Bobcat®

CHAINCASE

Checking And Adding Oil

Figure 40-30-1



The chain case contains the final drive sprockets and chains and uses the same type of oil as the hydraulic/ hydrostatic system. (See SPECIFICATIONS Section Page SPEC-01.)

To check the chain case oil level, use the following procedure:

Drive the loader on a level surface. Stop the engine.

Remove the plug (Item 1) **[Figure 40-30-1]** from the front of the chain case housing.

If oil can be reached with the tip of the your finger through the hole the oil level is correct.

If the level is low, add oil through the check plug hole until the oil flows from the hole. Install and tighten the plug.

Removing The Oil

Remove the front chain case cover. (See Page 40-30-2).

Use a vacuum pump to extract the fluid from the chain case.

Front Cover Removal And Installation



WARNING

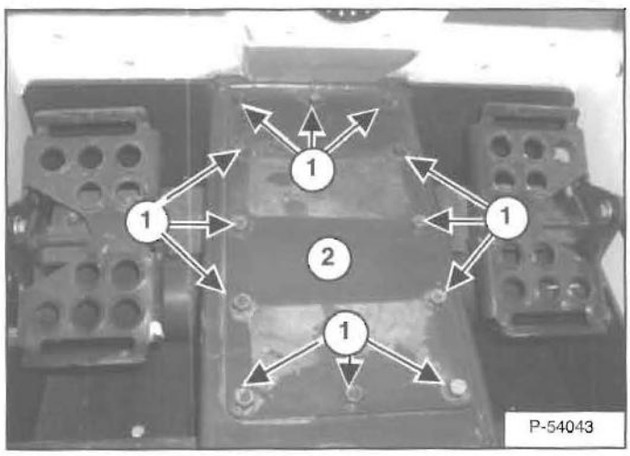
Never work on a machine with the lift arms up unless the lift arms are secured by an approved lift arm support device. Failure to use an approved lift arm support device can allow the lift arms or attachment to fall and cause injury or death.

W-2059-0598

Raise the loader lift arms and install an approved lift arm support device. (See Contents Page 10-01.)

Raise the loader operator cab. (See Contents Page 10-01.)

Figure 40-30-2



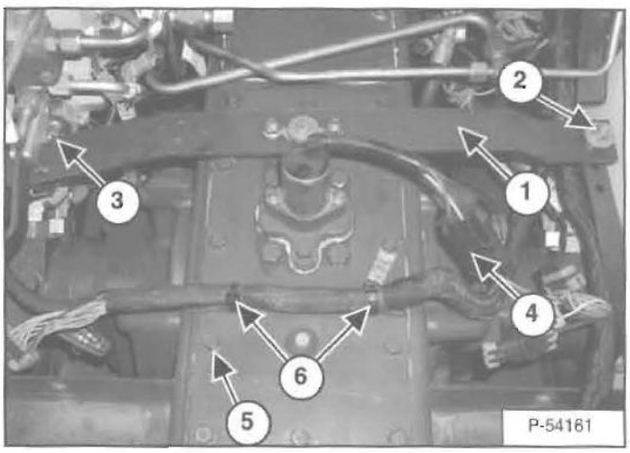
Remove the twelve front chain case cover mounting bolts (Item 1) **[Figure 40-30-2]**.

Remove the front chain case cover (Item 2) **[Figure 40-30-2]** from the loader.

Installation: Tighten the mounting bolts to 15-20 ft.-lbs. (20-27 Nm) torque. The front chain case cover (Item 2) **[Figure 40-30-2]** has a gasket installed between the cover and the chain case. Install new gasket if necessary. Polyurethane sealant can be used on the screw threads and gasket to stop oil leakage.

Center Cover Removal And Installation

Figure 40-30-3



Disconnect and remove the engine speed control from the control panel. (See Contents Page 70-01.)

Remove the control panel from the loader. (See Contents Page 50-01.)

Disconnect the lift control cross bar (Item 1) from the lift pedal linkage (Item 2) and the lift spool on the main control valve (Item 3) **[Figure 40-30-3]**.

Disconnect the electrical connector (Item 4) **[Figure 40-30-3]** from the parking brake solenoid.

Remove the lift control cross bar (Item 1) **[Figure 40-30-3]**.

Remove the twelve center chain case cover mounting bolts (Item 1) **[Figure 40-30-3]** and (Item 5) **[Figure 40-30-4]**.

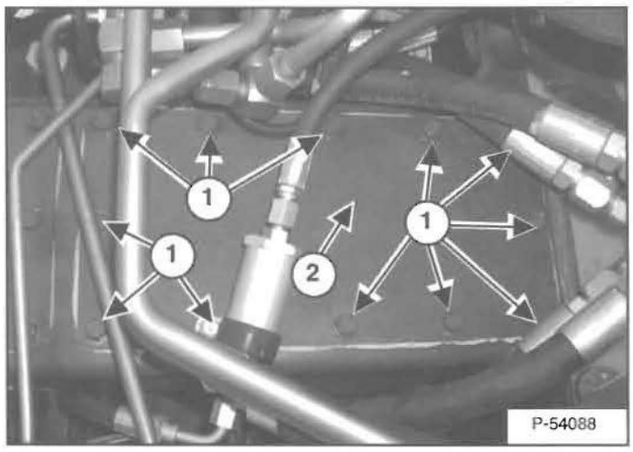
Remove the tie straps (Item 6) **[Figure 40-30-3]** securing harness to cover.

Remove the center chain case cover from the loader.

Installation: Tighten the mounting bolts to 15-20 ft.-lbs. (20-27 Nm) torque. The center chain case cover has a gasket installed between the cover and the chain case. Install new gasket if necessary. Polyurethane sealant can be used on the screw threads and gasket to stop oil leakage.

Rear Cover Removal And Installation

Figure 40-30-4



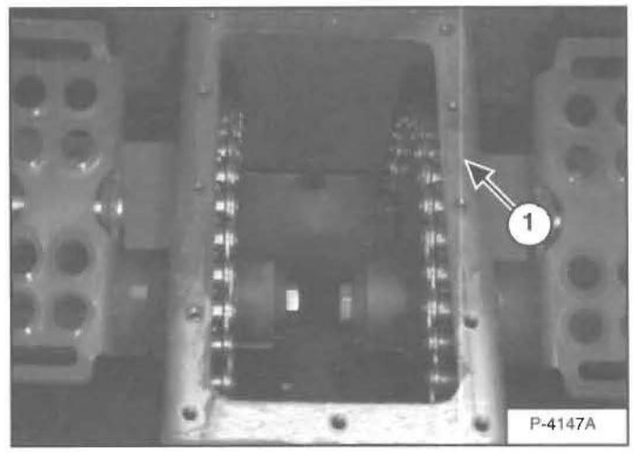
Disconnect the front steering linkage bars from the rear linkage bars. (See Contents Page 50-01.)

Move the linkage bars to allow adequate space to remove the rear chain case cover.

Remove the twelve rear chain case cover mounting bolts (Item 1) **[Figure 40-30-4]**.

Remove the rear chain case cover (Item 2) **[Figure 40-30-4]** from the loader.

Figure 40-30-5



Installation: Tighten the mounting bolts to 15-20 ft.-lbs. (20-27 Nm) torque. The rear chain case cover (Item 2) **[Figure 40-30-4]** has a gasket installed between the cover and the chain case (Item 1) **[Figure 40-30-5]**. Install a new gasket if necessary. Polyurethane sealant can be used on the screw threads and gasket to stop oil leakage.



Bobcat®

MAIN FRAME

BOB-TACH 50-40-1
Bob-Tach Lever And Wedge 50-40-3
Bob-Tach Stops 50-40-4
Removal And Installation 50-40-1

CONTROL HANDLE 50-110-1
Control Lever Removal And Installation. 50-110-1
Control Rubber Boot Replacement 50-110-1

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Control Handle Disassembly and Assembly 50-111-5
Control Handle Removal and Installation. 50-111-4
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Control Lever Removal and Installation 50-111-5
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Removal And Installation 50-90-1
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TIGHTEN ALL HARDWARE PER SIZE TO GRADE 5 TORQUE (SEE STANDARD TORQUE SPECIFICATIONS FOR BOLTS, SECTION SPEC-01) UNLESS OTHERWISE SPECIFIED.

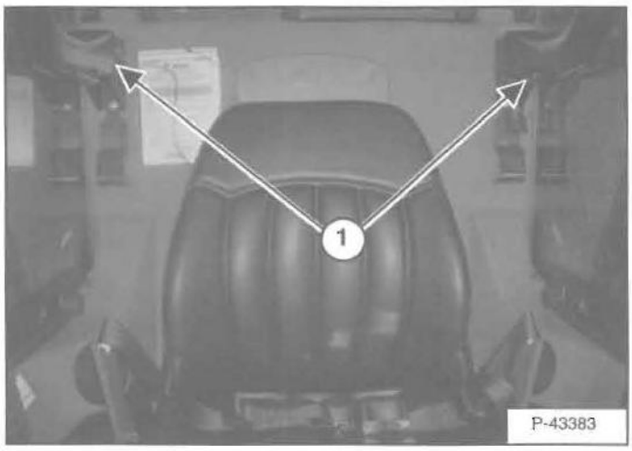


Bobcat®

SEAT BAR

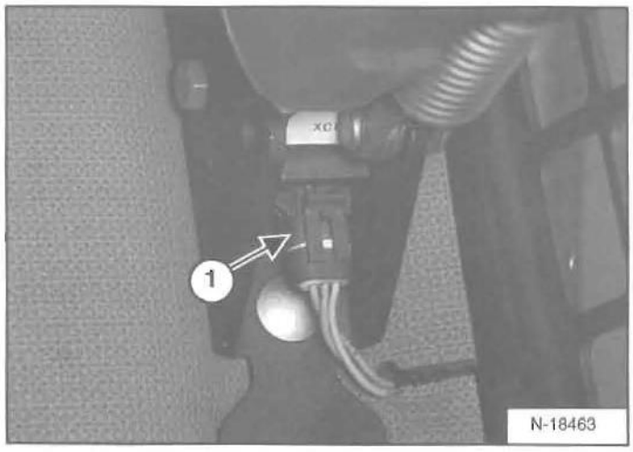
Removal And Installation

Figure 50-10-1



Raise the seat bar (Item 1) **[Figure 50-10-1]**.

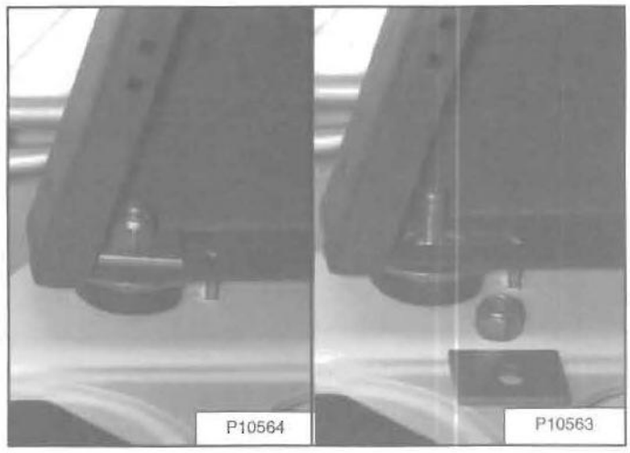
Figure 50-10-2



Disconnect the seat bar sensor (Item 1) **[Figure 50-10-2]** from the cab harness.

Lower the seat bar.

Figure 50-10-3



Loosen the nut (both sides) at the front corners of the operator cab **[Figure 50-10-3]**.

Remove the nuts and plates (both sides) **[Figure 50-10-3]**.

Installation: Tighten the nuts to 40-50 ft.-lbs. (54-68 Nm) torque.

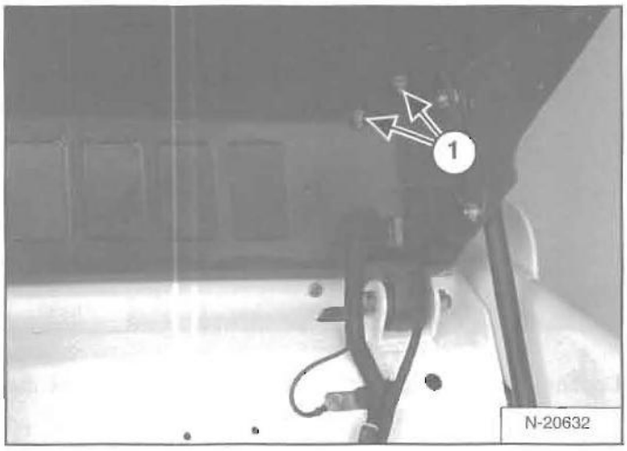
Figure 50-10-4



Lift on the grab handle and bottom of the operator cab slowly until the cab is all the way up and the latching mechanism engages **[Figure 50-10-4]**.

Removal And Installation (Cont'd)

Figure 50-10-5

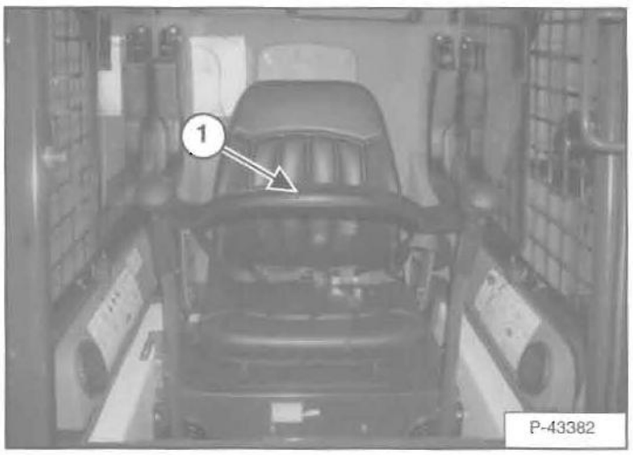


Remove the seat bar mounting nuts (Item 1) **[Figure 50-10-5]** (both sides).

Installation: Tighten the nuts to 28 ft.-lbs. (38 Nm) torque.

Lower the operator cab. (See Contents Page 10-01.)

Figure 50-10-6

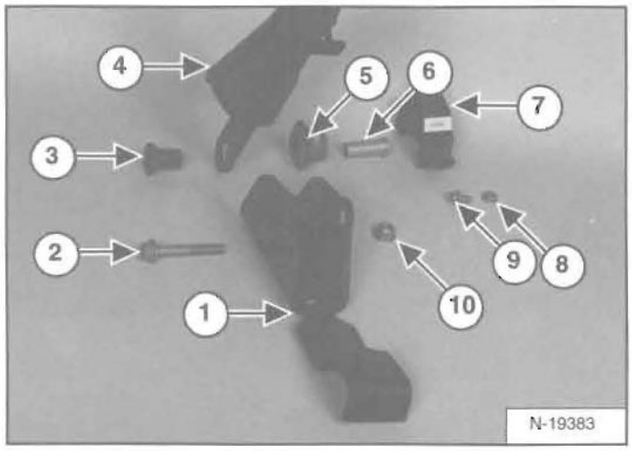


Remove the seat bar (Item 1) **[Figure 50-10-6]** from the operator cab.

Reverse the above procedure to install the seat bar into the operator cab.

Assembling Components

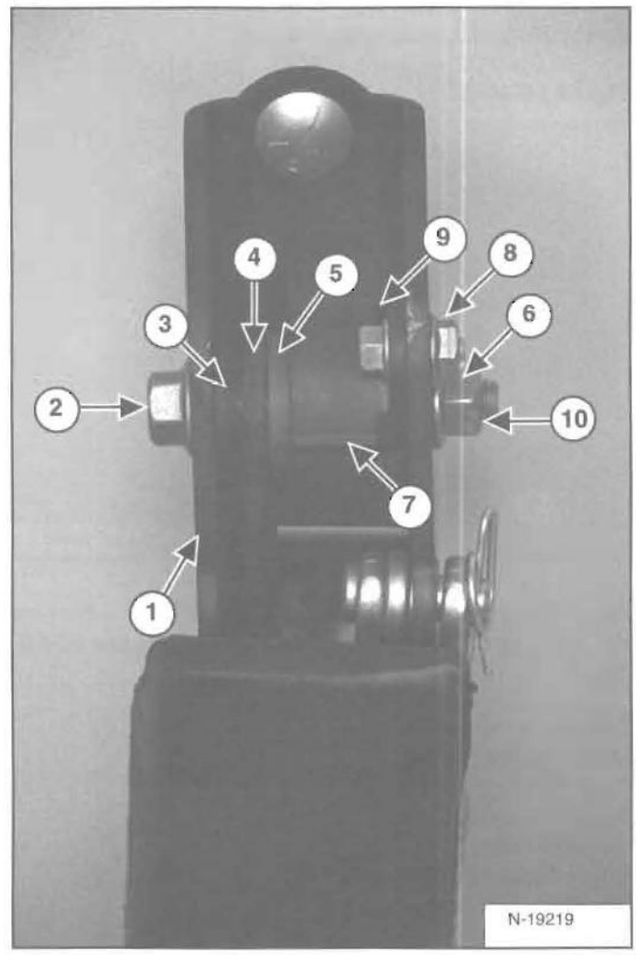
Figure 50-10-7



Assemble the parts as shown for the left side of the seat bar pivot assembly **[Figure 50-10-7]** & **[Figure 50-10-8]**.

Seat Bar Mount (Item 1)
Mounting Bolt (Item 2)
Keyed Plastic Bushing (Item 3)
Seat Bar (Item 4)
Magnetic Bushing Assembly (Item 5)
Pivot Bushing (Item 6)
Sensor Bracket (Item 7)
Sensor Mounting Nut (Item 8)
Sensor Mounting Bolt (Item 9)
Mounting Nut (Item 10)

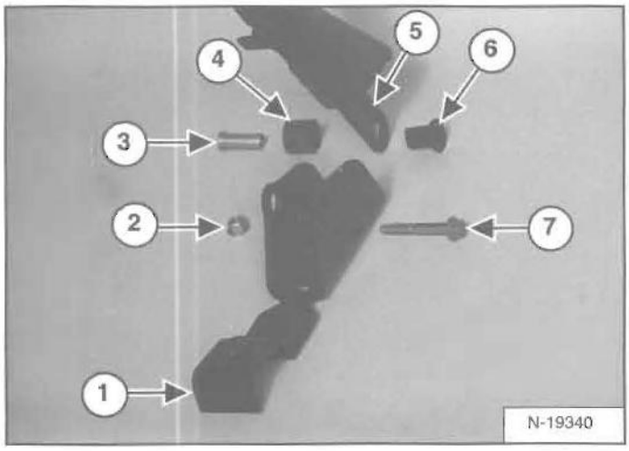
Figure 50-10-8



Installation: Tighten the mounting bolt (Item 2) **[Figure 50-10-7]** & **[Figure 50-10-8]** to 50-70 in.-lbs. (5,6-7,9 Nm) torque.

Assembling Components (Cont'd)

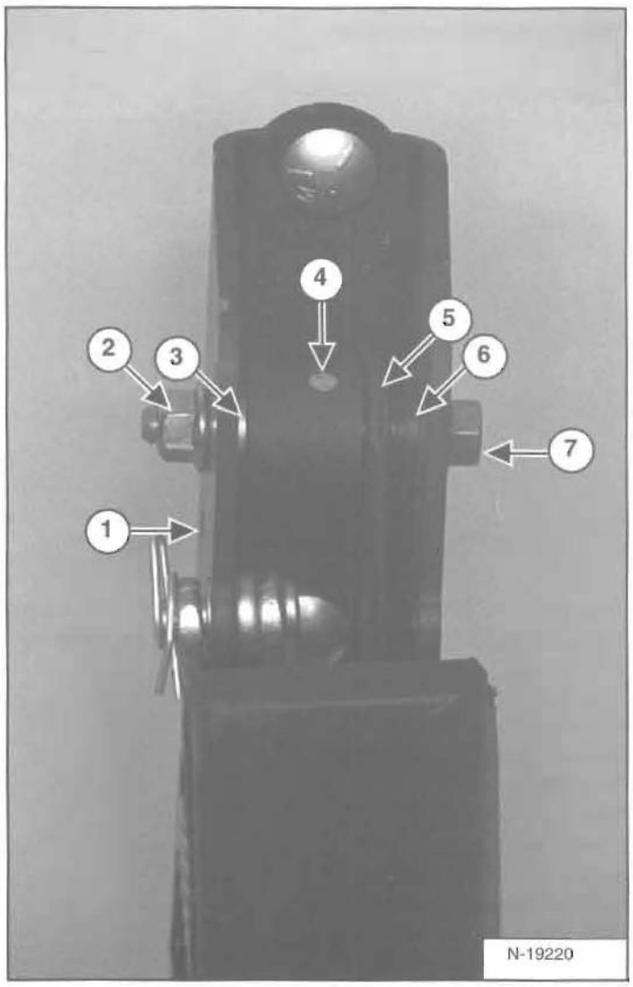
Figure 50-10-9



Assemble the parts as shown for the right side of the seat bar pivot assembly **[Figure 50-10-9]** & **[Figure 50-10-10]**.

Seat Bar Mount (Item 1)
Mounting Nut (Item 2)
Pivot Bushing (Item 3)
Spacer Bushing (Item 4)
Seat Bar (Item 5)
Keyed Plastic Bushing (Item 6)
Mounting Bolt (Item 7)

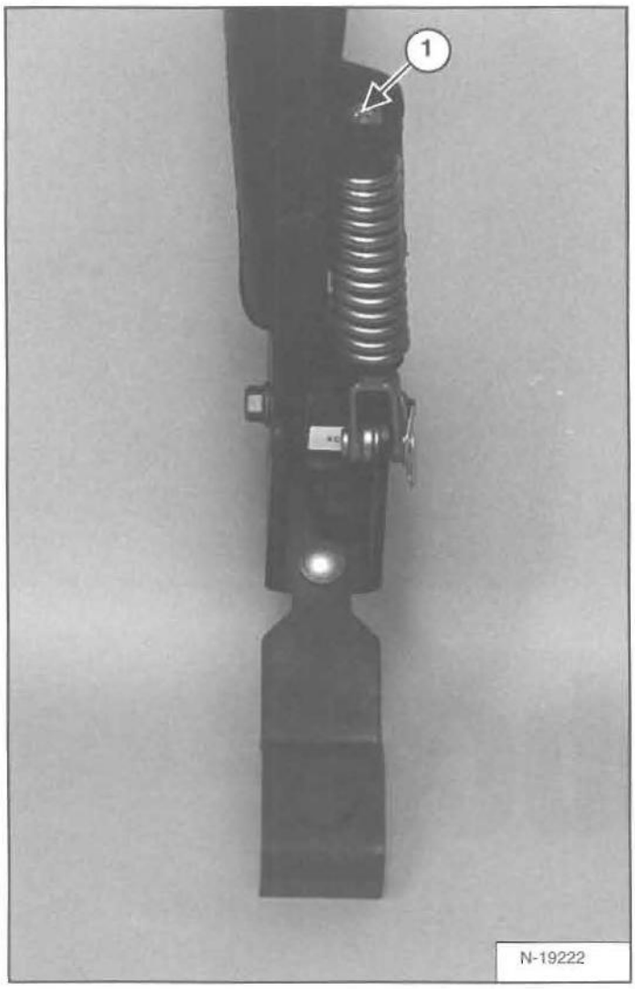
Figure 50-10-10



Installation: Tighten the mounting bolt (Item 7) **[Figure 50-10-9]** & **[Figure 50-10-10]** to 50-70 in.-lbs. (5,6-7,9 Nm) torque.

Compression Spring Disassembly And Assembly

Figure 50-10-11

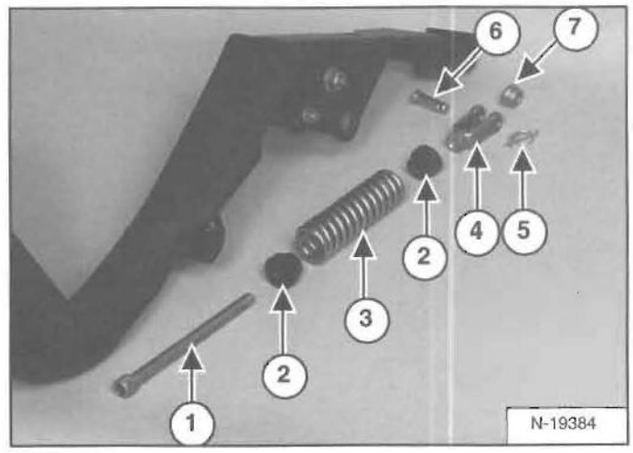


Turn the bolt (Item 1) **[Figure 50-10-11]** & **[Figure 50-10-12]** out of the clevis.

Assembly: Apply LOCTITE #242 adhesive to the bolt threads. Adjust the compression spring by turning the bolt in past the end of the clevis three turns.

NOTE: For procedures requiring the use of LOCTITE #242 adhesive, thoroughly clean and dry affected parts before the application of LOCTITE #242.

Figure 50-10-12



Disassemble and assemble the seat bar compression spring and parts as shown in Fig. **[Figure 50-10-12]**.

Bolt (Item 1)
Bushing (Item 2)
Spring (Item 3)
Clevis (Item 4)
Retaining Pin (Item 5)
Pin (Item 6)
Bushing (Item 7)


Bobcat®

Gas Cylinder Removal And Installation

⚠ WARNING

Cylinder contains high pressure gas. Do not open. Opening cylinder can release rod and cause injury or death.

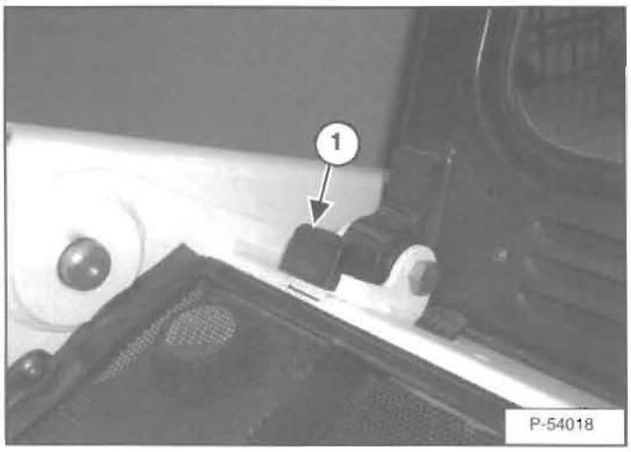
W-2113-0288

⚠ WARNING

Never work on a machine with the lift arms up unless the lift arms are secured by an approved lift arm support device. Failure to use an approved lift arm support device can allow the lift arms or attachment to fall and cause injury or death.

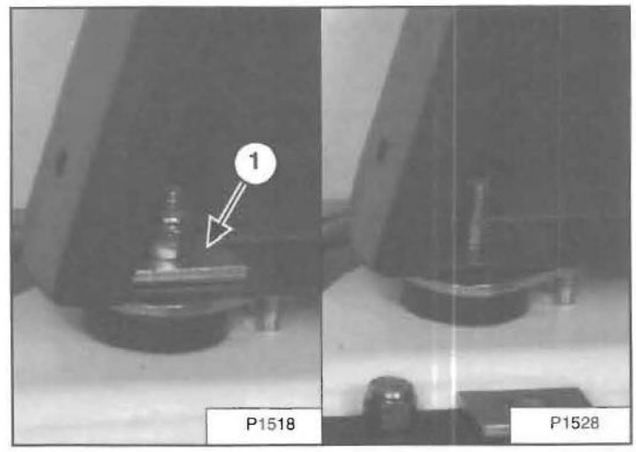
W-2059-0598

Figure 50-20-1



Remove the operator cab stop (Item 1) (both sides) **[Figure 50-20-1]**.

Figure 50-20-2



Remove the cab nut and holddown plate (Item 1) **[Figure 50-20-2]** (both sides).

Installation: Tighten the nut to 40-50 ft.-lbs. (54-68 Nm) torque.

Figure 50-20-3



Install a strap (Item 1) **[Figure 50-20-3]** to the cab handles to prevent the cab from falling forward.

Raise the operator cab (See Contents Page 10-01), to release the tension on the gas cylinder.

Gas Cylinder Removal And Installation (Cont'd)

Figure 50-20-4

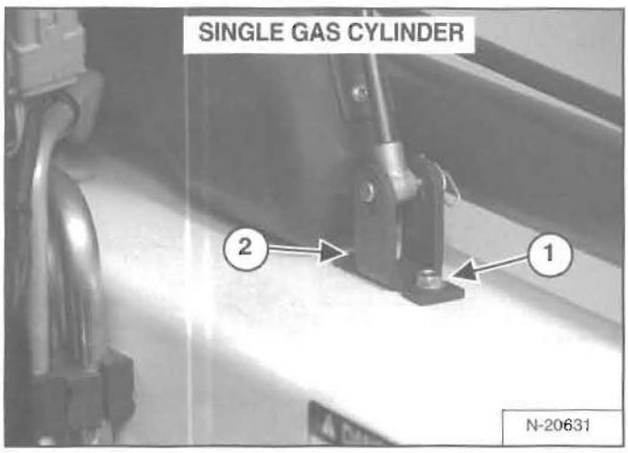
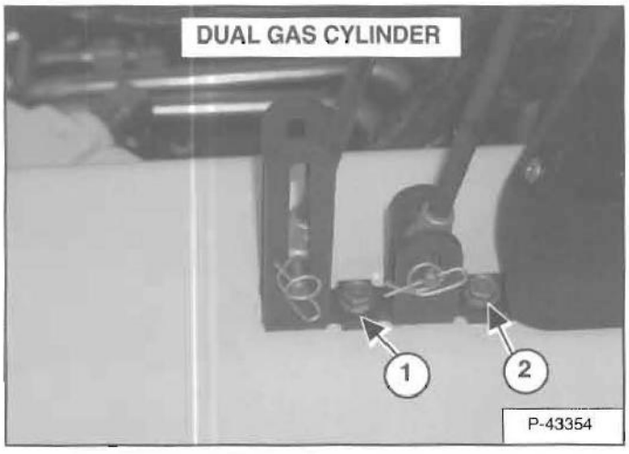
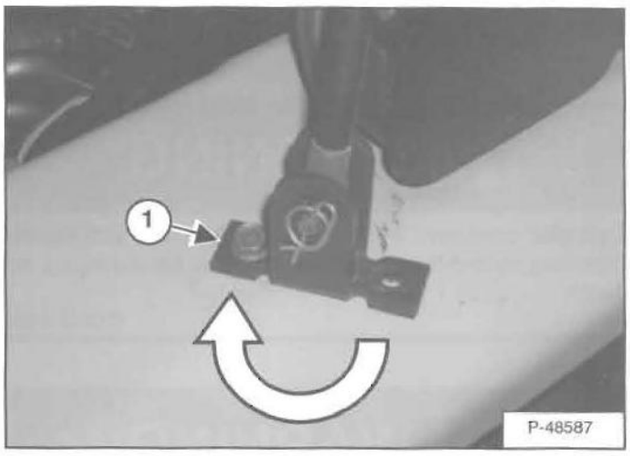


Figure 50-20-5



Loosen the front screw (Item 1) and remove the rear screw (Item 2) **[Figure 50-20-4]** and **[Figure 50-20-5]** from the gas cylinder mounting bracket.

Figure 50-20-6



Rotate the mounting bracket forward to relieve any remaining tension on the gas cylinder(s) **[Figure 50-20-6]**.

Remove the front screw (Item 1) **[Figure 50-20-6]** from the gas cylinder mounting bracket.

Installation: Tighten the screws to 100-130 in.-lbs. (11,3-14,7 Nm) torque.

Gas Cylinder Removal And Installation (Cont'd)

Figure 50-20-7

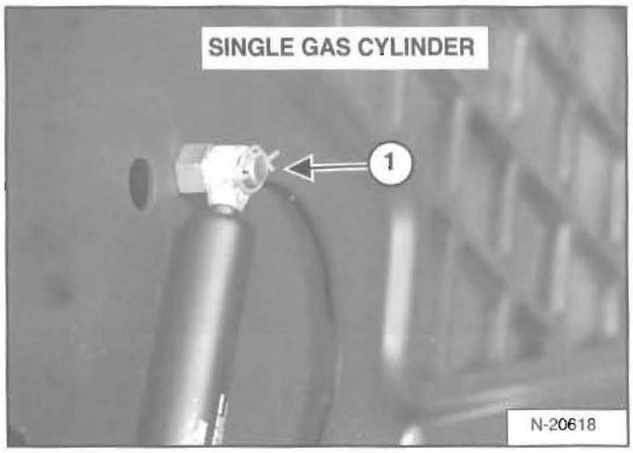
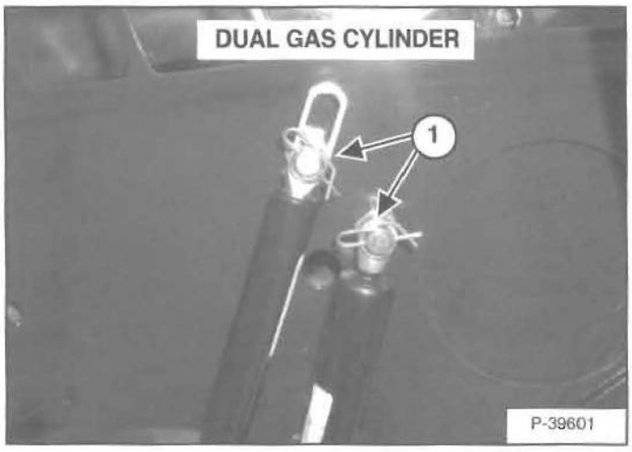


Figure 50-20-8



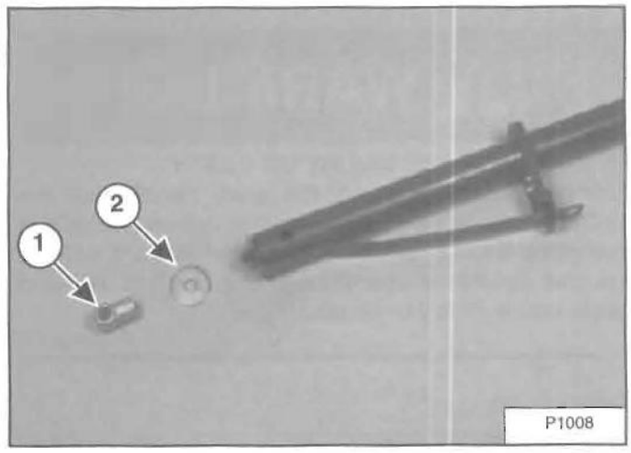
Remove the retaining pin(s) (Item 1) **[Figure 50-20-7]** and **[Figure 50-20-8]** from the top pivot pin(s).

Remove the cylinder(s) from the retaining pin(s).

Reverse the removal procedure to install the gas cylinder(s).

Gas Cylinder Disassembly

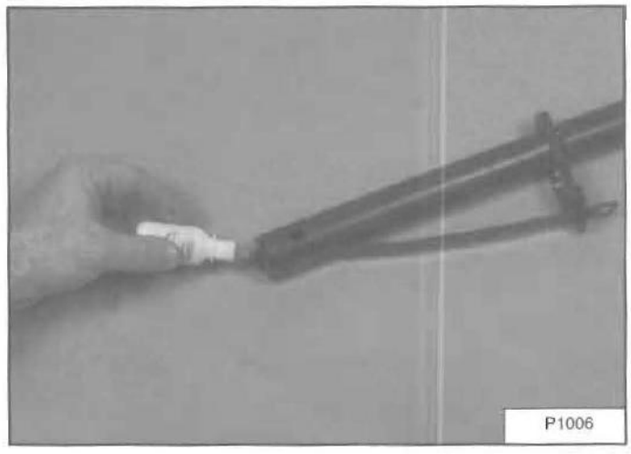
Figure 50-20-9



Remove the clevis (Item 1) and washer (Item 2) **[Figure 50-20-9]** from the end of the gas cylinder.

Remove the gas cylinder from the outer housing.

Figure 50-20-10



Assembly: Install a replacement cylinder inside the cylinder housing.

Apply a small amount of LOCTITE 242 on the threads of the cylinder rod **[Figure 50-20-10]**.

Reinstall the washer and clevis on the cylinder rod.

Removal And Installation

⚠ WARNING

AVOID INJURY OR DEATH

Attach a chain hoist to the grab handles of the operator cab before removing the operator cab gas cylinders. If the operator cab is tilted forward without the gas cylinders operational, the cab will fall and could cause injury or death.

W-2245-0796

Figure 50-20-11

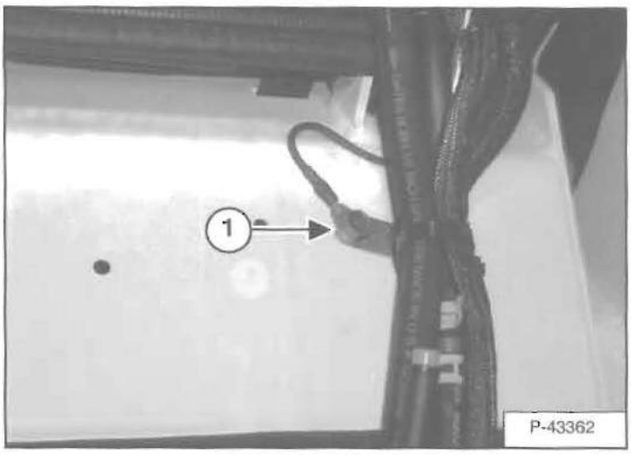


Remove the operator cab gas cylinder(s). (See Gas Cylinder Removal And Installation on Page 50-20-1.)

Remove the heater unit from the cab (if equipped). (See Contents Page 80-01.)

Use the hoist connected to the operator cab grab handles to lower or (raise) the operator cab when the gas cylinders are disconnected **[Figure 50-20-11]**.

Figure 50-20-12



Remove screw (Item 1) **[Figure 50-20-12]** from the cab ground.

Remove any sta-straps connected to the harness **[Figure 50-20-12]**.

Removal And Installation (Cont'd)

Figure 50-20-13

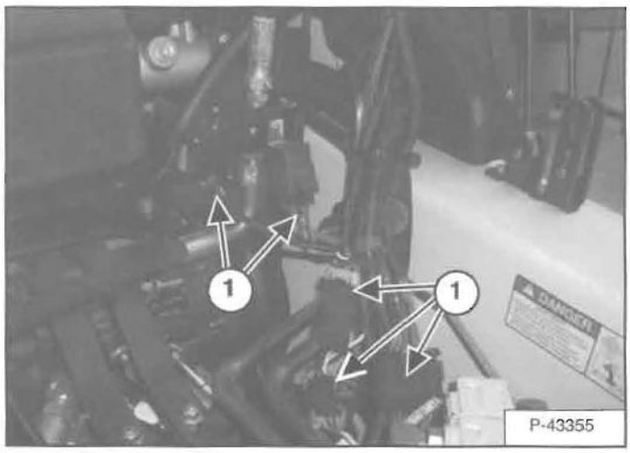


Figure 50-20-14

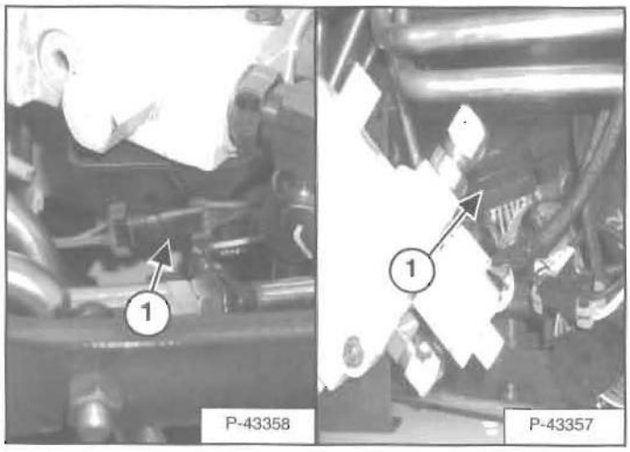
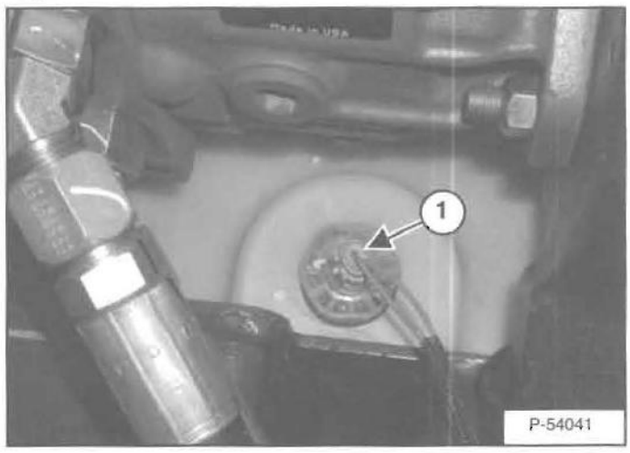


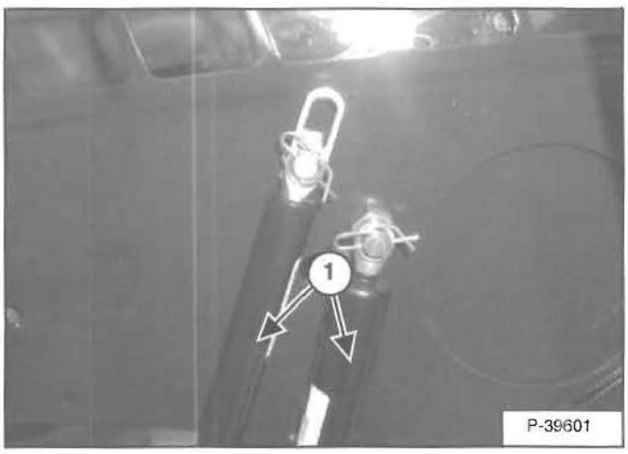
Figure 50-20-15



Disconnect all harness(s) (Item 1) **[Figure 50-20-13] [Figure 50-20-14] [Figure 50-20-15]** that connect the mainframe to the cab. The number of connectors will vary depending on the options equipped on your loader.

Removal And Installation (Cont'd)

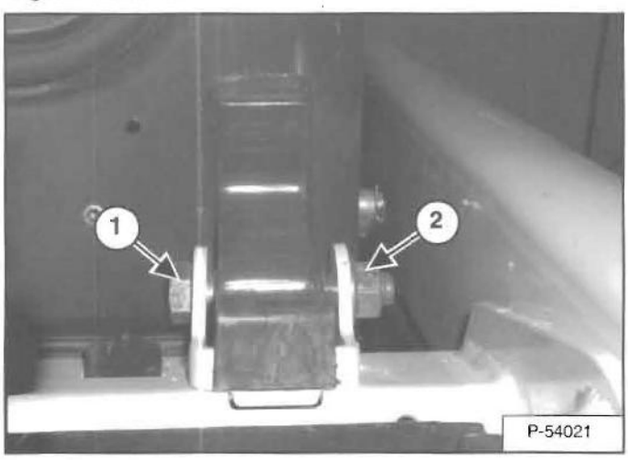
Figure 50-20-16



Remove the operator cab gas cylinder(s) (Item 1) **[Figure 50-20-16].** (See Gas Cylinder Removal And Installation on Page 50-20-1.)

Lower the cab.

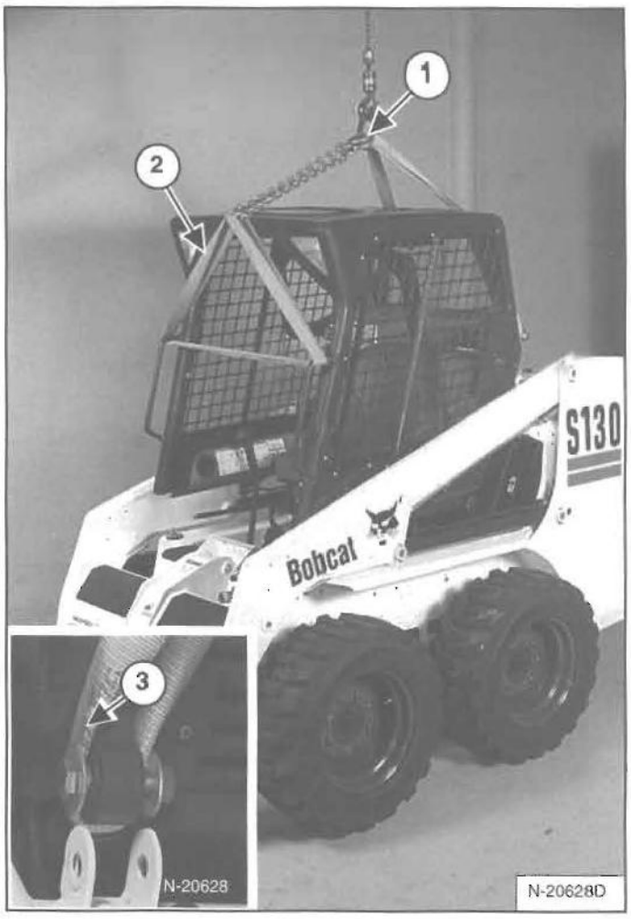
Figure 50-20-17



Remove the rear mounting bolts (Item 1) and nuts (Item 2) **[Figure 50-20-17]** (both sides) from the operator cab.

Installation: Tighten the bolt and nut to 25-35 ft.-lbs. (34-47 Nm) torque.

Figure 50-20-18



Connect the slings (Items 1, 2 and 3) **[Figure 50-20-18]** to a chain hoist.

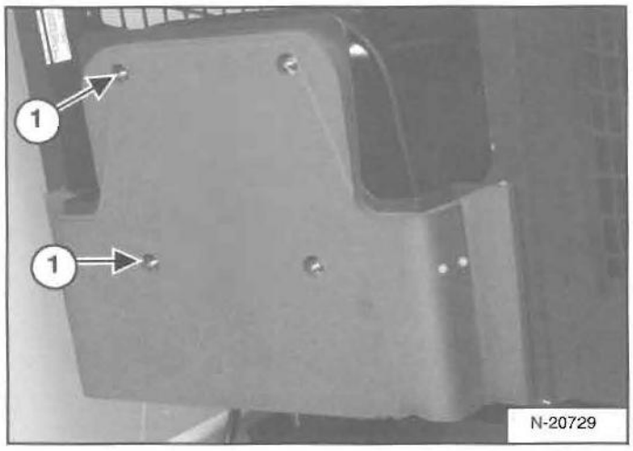
Remove the operator cab from the loader.

Reverse the above procedure to install the operator cab.

OPERATOR SEAT

Removal And Installation

Figure 50-30-1



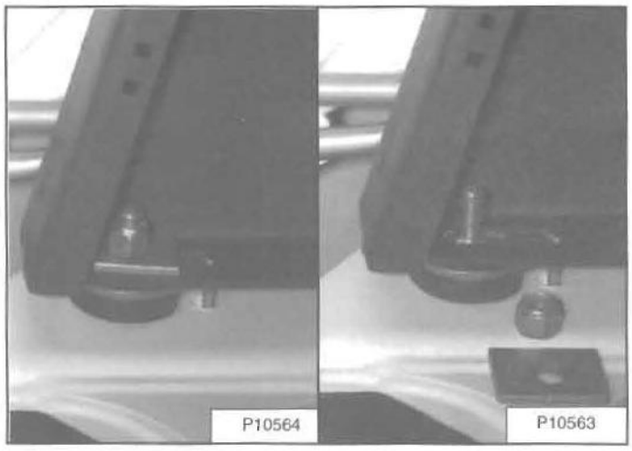
Raise the operator cab. (See Contents Page 10-01.)

Remove the four seat mounting nuts (Item 1) **[Figure 50-30-1]** and washers from the operator seat mounting studs.

Installation: Tighten the mounting nuts to 20 ft.-lbs. (27 Nm) torque.

NOTE: Ensure the washers are installed.

Figure 50-30-2



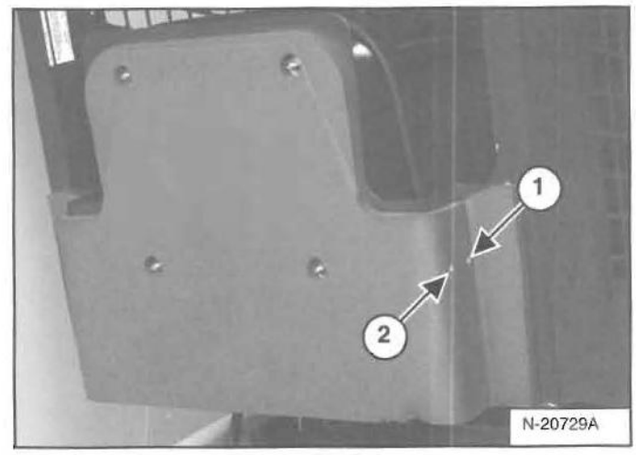
Lower the cab and install one of the mounting washers and nuts **[Figure 50-30-2]**.

NOTE: With the seat removed the cab will raise.

Reverse the removal procedure to install the operator seat.

Seat Belt Removal And Installation

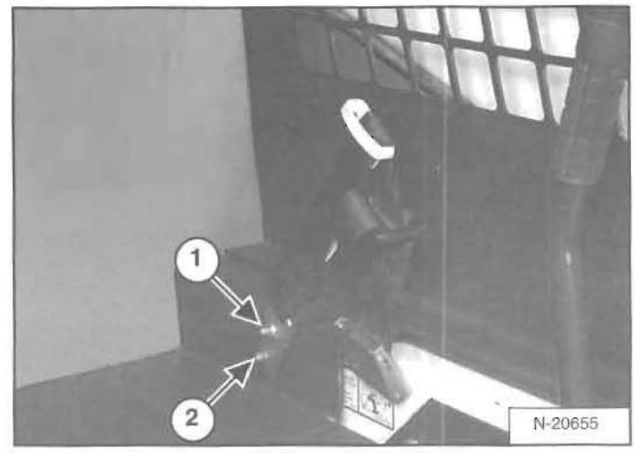
Figure 50-30-3



Raise the operator cab. (See Contents Page 10-01.)

Locate the seat belt bolts under seat pan insulation (Items 1 & 2) **[Figure 50-30-3]** and peel back or cut insulation to gain access to the head.

Figure 50-30-4



Remove the two nuts (Items 1 & 2) **[Figure 50-30-4]**.

Installation: Tighten nut (Item 1) to 54 ft.-lbs. (73 Nm) torque. Tighten nut (Item 2) **[Figure 50-30-4]** to 34 ft.-lbs. (46 Nm) torque.

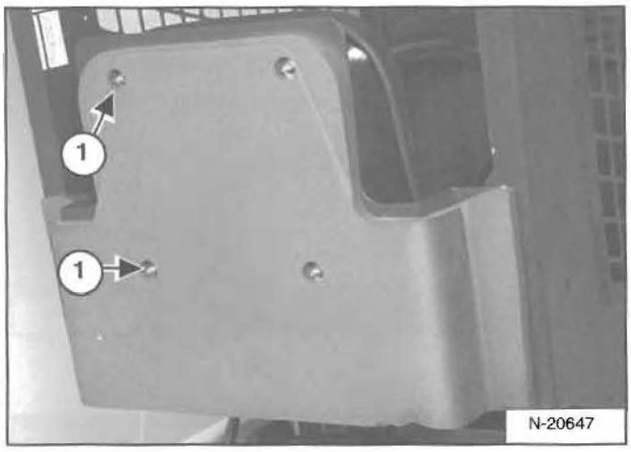
Repeat for other half of seat belt and guide.


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OPERATOR SEAT (SUSPENSION)

Removal And Installation

Figure 50-31-1

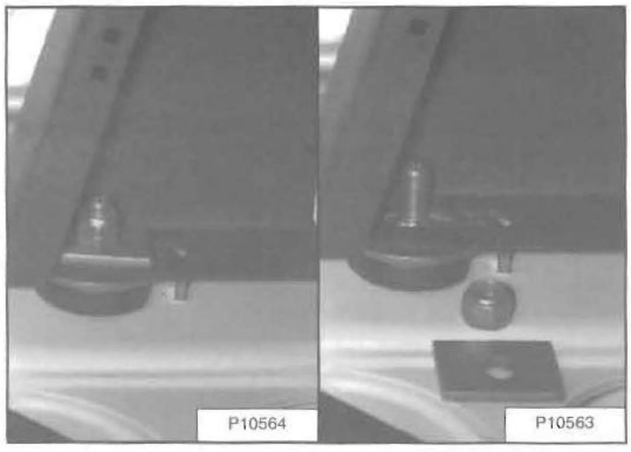


Raise the operator cab. (See Contents, Page 10-01.)

Remove the four seat mounting nuts (Item 1) **[Figure 50-31-1]** and washers from the operator seat mounting studs.

Installation: Tighten the mounting nuts to 20 ft.-lbs. (27 Nm) torque.

Figure 50-31-2

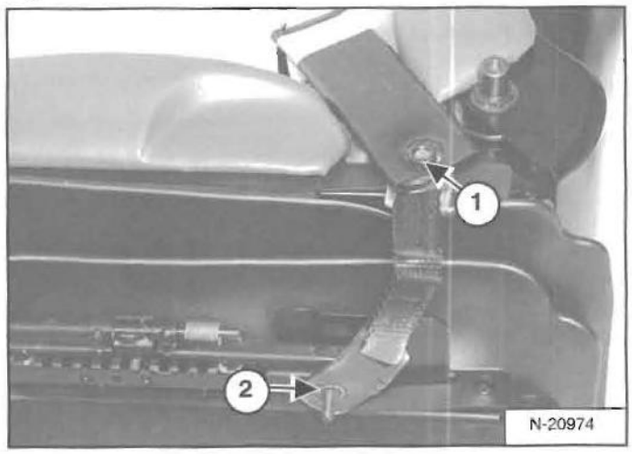


Lower the cab and install one of the mounting washer and nut **[Figure 50-31-2]**.

NOTE: With the seat removed the cab will raise.

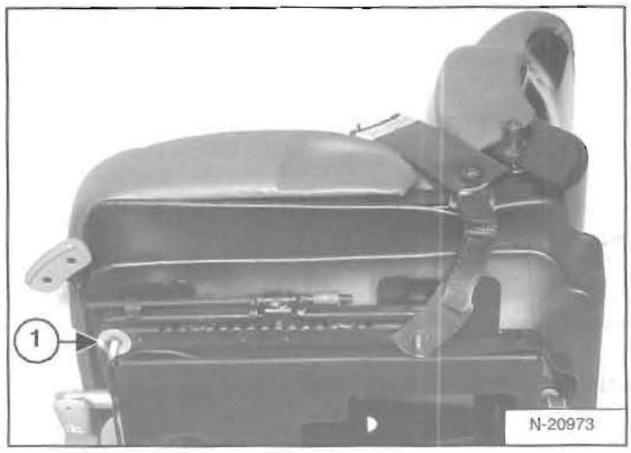
Reverse the removal procedure to install the operator seat.

Figure 50-31-3



NOTE: Assure seat tethers are securely fastened to seatbelt studs (Item 1) and seat rail studs (Item 2) [Figure 50-31-3].

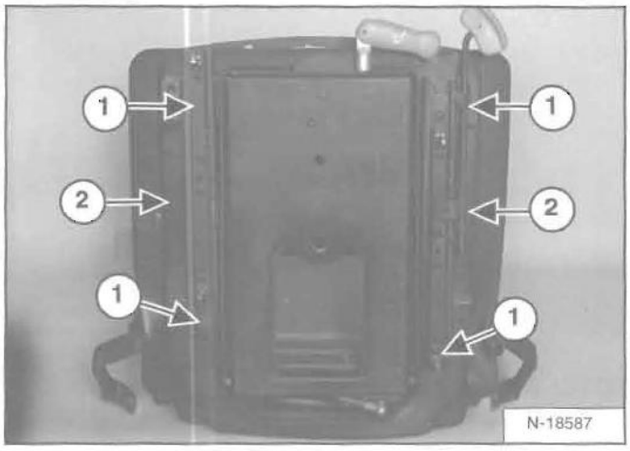
Figure 50-31-4



NOTE: Verify the front two seat rail studs have washers attached (Item 1) [Figure 50-31-4].

Slide Rail Removal And Installation

Figure 50-31-5



Raise the operator cab. (See Contents, Page 10-01.)

Remove the operator seat. (See Removal And Installation on Page 50-30-1.)

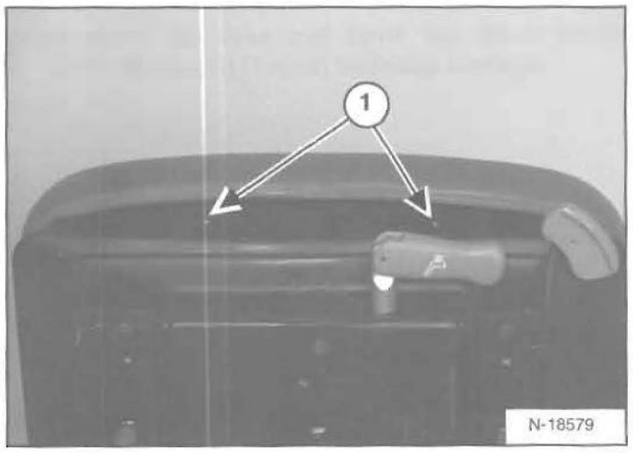
Remove the two slide rail mounting bolts (Item 1) from each slide rail (Item 2) **[Figure 50-31-5]**.

Remove the slide rail (Item 2) **[Figure 50-31-5]** from the bottom of the seat frame.

Reverse the removal procedure to install the operator seat slide rail.

Cushion Removal And Installation

Figure 50-31-6



Press the two buttons (Item 1) **[Figure 50-31-6]** & **[Figure 50-31-7]** and lift the seat cushion.

Figure 50-31-7

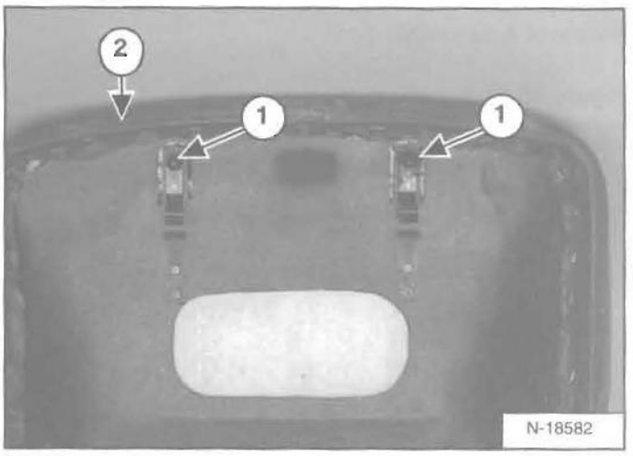
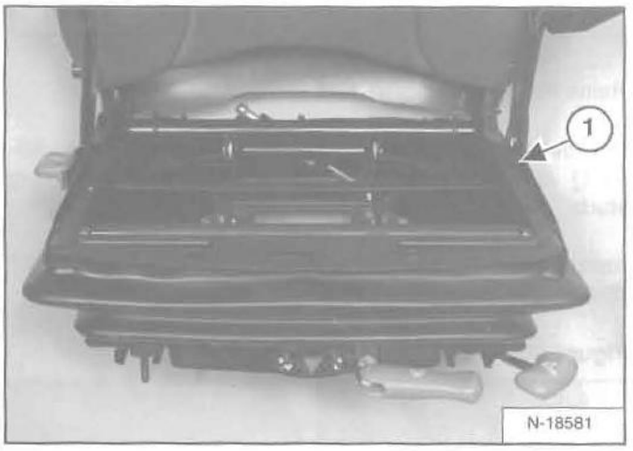


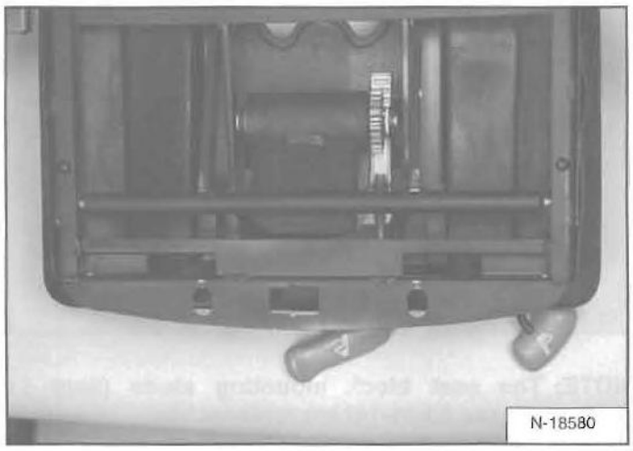
Figure 50-31-8



Remove the cushion (Item 2) **[Figure 50-31-7]** from the seat frame (Item 1) **[Figure 50-31-8]**.

Cushion Removal And Installation (Cont'd)

Figure 50-31-9

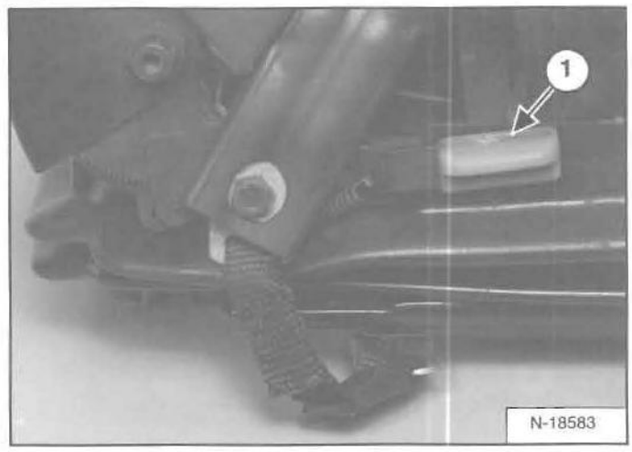


Inspect the seat ride adjustment **[Figure 50-31-9]**.

Reverse the removal procedure to install the operator seat back.

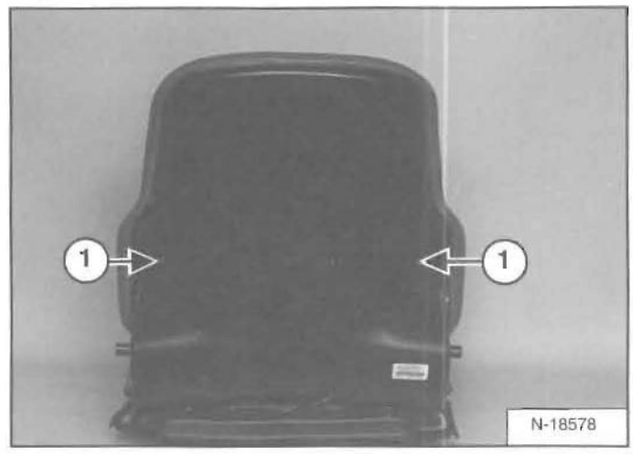
Back Removal And Installation

Figure 50-31-10



Pull the seat back adjustment lever (Item 1) **[Figure 50-31-10]** and tilt the seat back all the way forward.

Figure 50-31-11



Remove the two mounting screws (Item 1) **[Figure 50-31-11]** from the seat back and remove the back.

Reverse the removal procedure to install the operator seat back.

Shock Removal And Installation

Figure 50-31-12

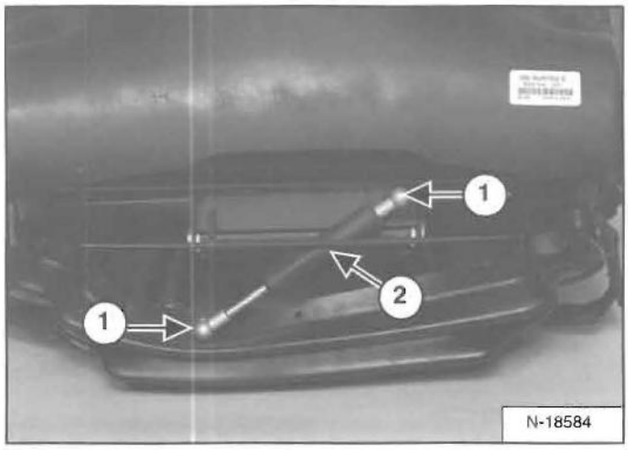
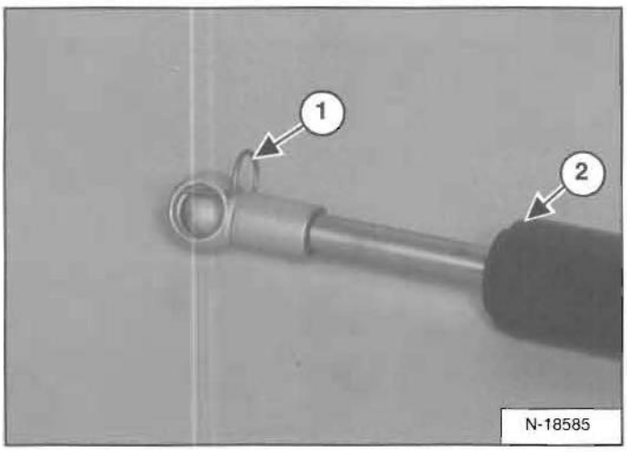


Figure 50-31-13



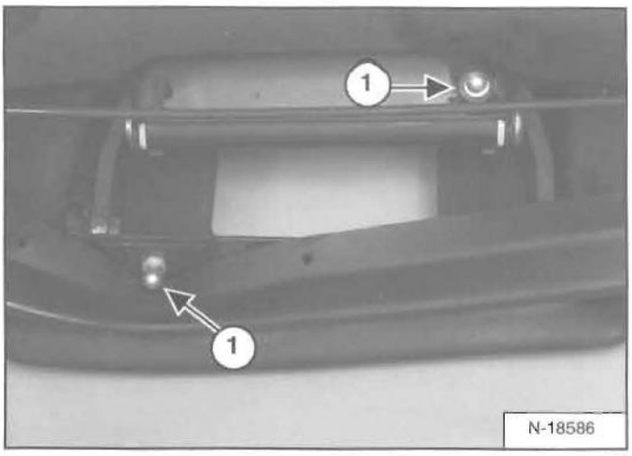
Raise the operator cab. (See Contents, Page 10-01.)

Remove the operator seat. (See Removal And Installation on Page 50-30-1.)

Remove the seat shock retaining pin (Item 1) **[Figure 50-31-12]** & **[Figure 50-31-13]** (Both ends.)

Remove the seat shock (Item 2) **[Figure 50-31-12]** & **[Figure 50-31-13]**.

Figure 50-31-14



NOTE: The seat block mounting studs (Item 1) [Figure 50-31-14] are replaceable.

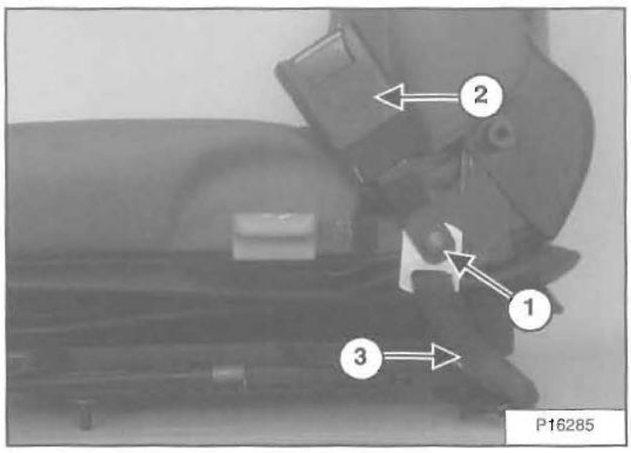
Reverse the removal procedure to install the operator seat shock.

3-Point Seat Belt Removal And Installation

Raise the operator cab. (See Contents, Page 10-01.)

Remove the operator seat. (See Removal And Installation on Page 50-30-1.)

Figure 50-31-15

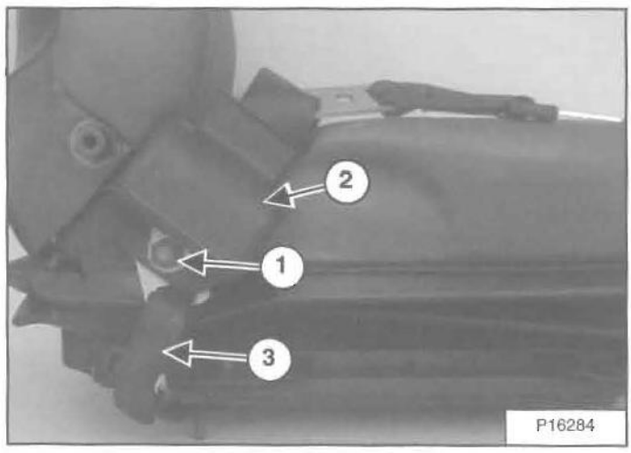


Remove the mounting nut (Item 1) **[Figure 50-31-15]**

Remove the end release buckle (Item 2) **[Figure 50-31-15]**

Installation: Be sure tether strap (Item 3) **[Figure 50-31-15]** is on the seat belt stud behind the end release buckle.

Figure 50-31-16

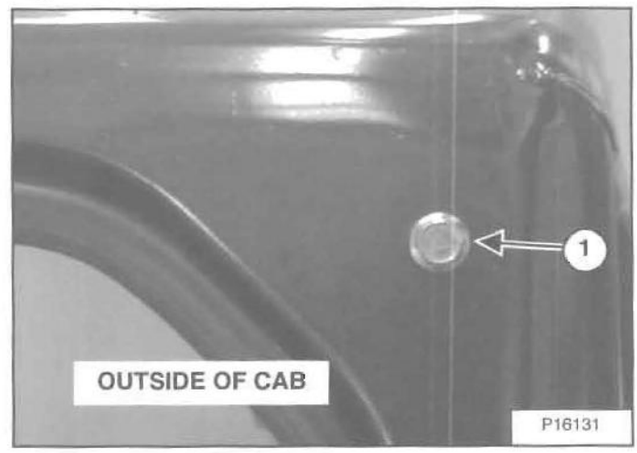


Remove the mounting nut (Item 1) **[Figure 50-31-16]**

Remove the seat belt retractor (Item 2) **[Figure 50-31-16]**

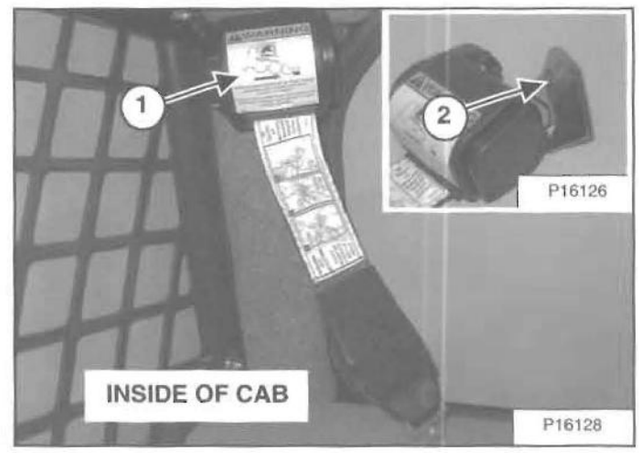
Installation: Be sure tether strap (Item 3) **[Figure 50-31-16]** is on the seat belt stud behind the seat belt retractor.

Figure 50-31-17



Remove the mounting bolt (Item 1) **[Figure 50-31-17]**

Figure 50-31-18



Remove the shoulder harness retractor (Item 1) **[Figure 50-31-18]**

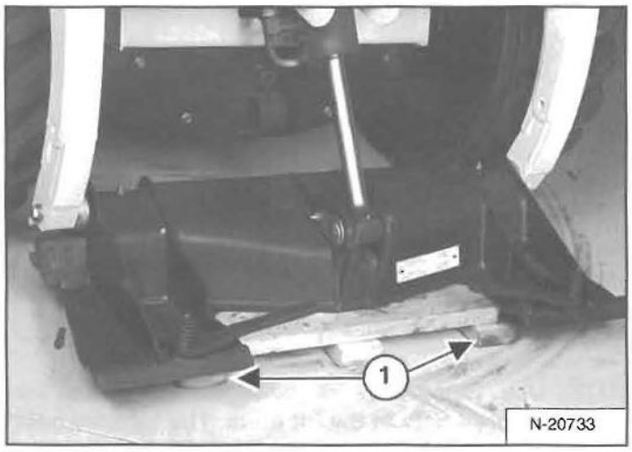
Installation: Line up the bolt (Item 1) **[Figure 50-31-17]** with the mounting bracket (Item 2) **[Figure 50-31-18]** on the inside of the cab.


Bobcat®

BOB-TACH

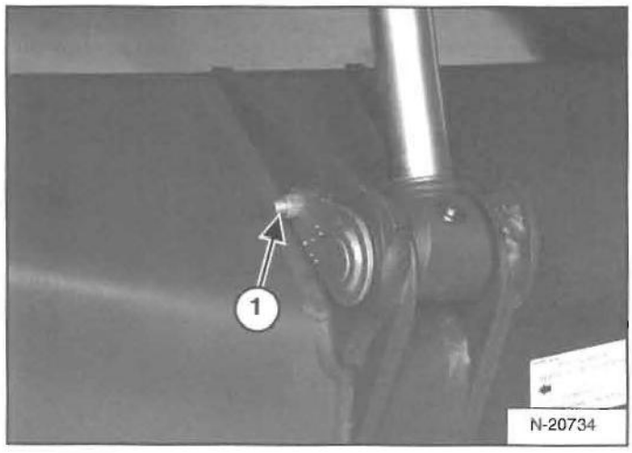
Removal And Installation

Figure 50-40-1



Tilt the Bob-Tach forward, so it is parallel to the floor. Put blocks (Item 1) **[Figure 50-40-1]** approximately 3 inches thick under each side of the Bob-Tach. Lower the Bob-Tach onto the blocks.

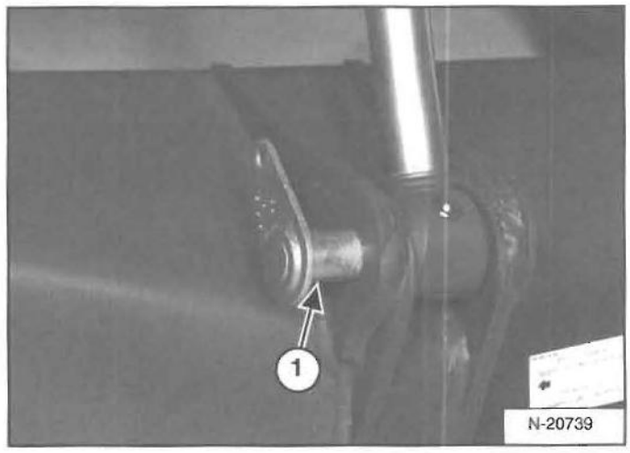
Figure 50-40-2



Remove the retainer bolt (Item 1) **[Figure 50-40-2]** from the pivot pin.

Installation: Tighten the retainer bolt to 25-28 ft.-lbs. (34-38 Nm) torque.

Figure 50-40-3

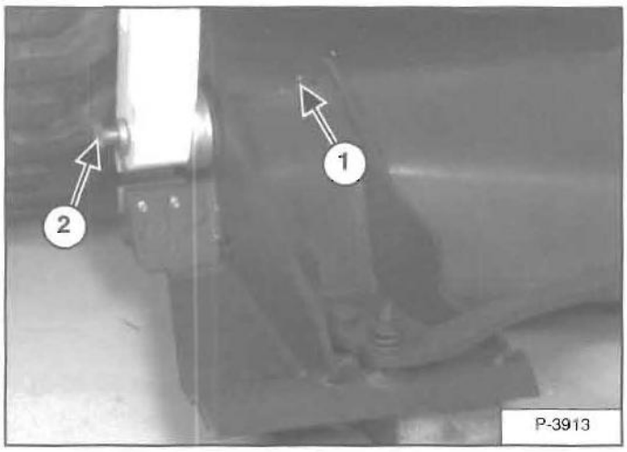


Remove the rod end pivot pin (Item 1) **[Figure 50-40-3]**.

Remove the tilt cylinder rod end.

Removal And Installation (Cont'd)

Figure 50-40-4



NOTE: Removal procedure is shown for the right side. Left side procedure is the same.

Remove the grease fitting (Item 1) **[Figure 50-40-4]** from the Bob-Tach frame for the pivot pin (both sides).

NOTE: The grease fitting (Item 1) [Figure 50-40-4] must be removed to prevent the pivot pin from being locked in the Bob-Tach frame.

Loosen the bolt (Item 2) **[Figure 50-40-4]** at the Bob-Tach pivot pin.

Strike the head of the bolt (Item 2) **[Figure 50-40-4]** to push the pivot pin into the Bob-Tach frame.

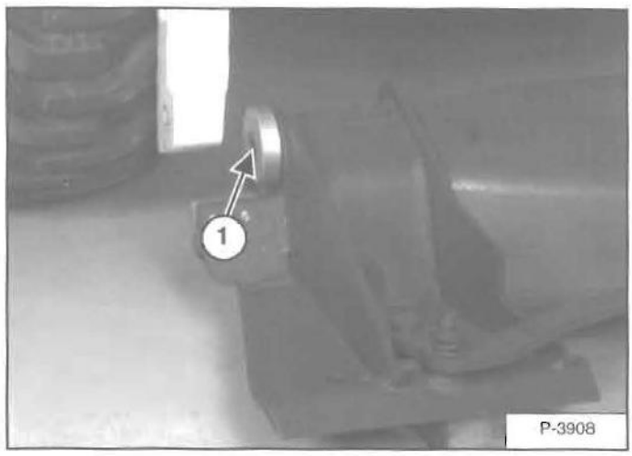
Remove the bolt (Item 2) **[Figure 50-40-4]**.

Installation:

Use a punch to push the pivot pin all the way into the Bob-Tach frame.

Installation: A longer bolt will be needed to temporarily reach through the lift arms into the pivot pins to seat them into the lift arms. Once seated, reinstall the original bolts. Tighten the bolts to 190 ft.-lbs. (258 Nm) torque.

Figure 50-40-5

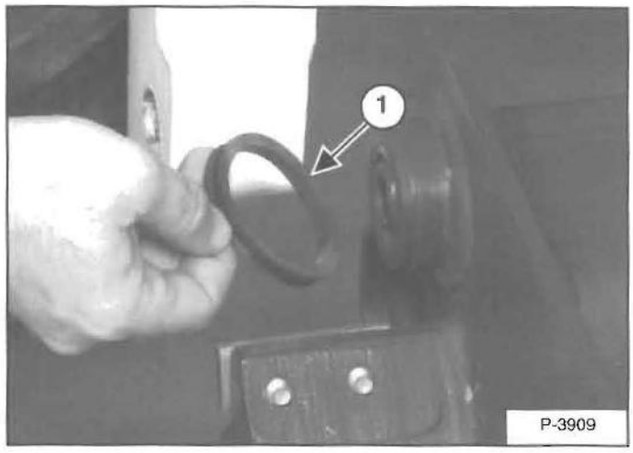


NOTE: Use tapered ream MEL1233 to clean the tapered hole in the lift arms. The tapered hole must be clean and free of debris to provide a good contact surface for the pivot pin.

Slowly back the loader away to remove the Bob-Tach frame **[Figure 50-40-5]**.

Remove the seal dust cup (Item 1) **[Figure 50-40-5]**.

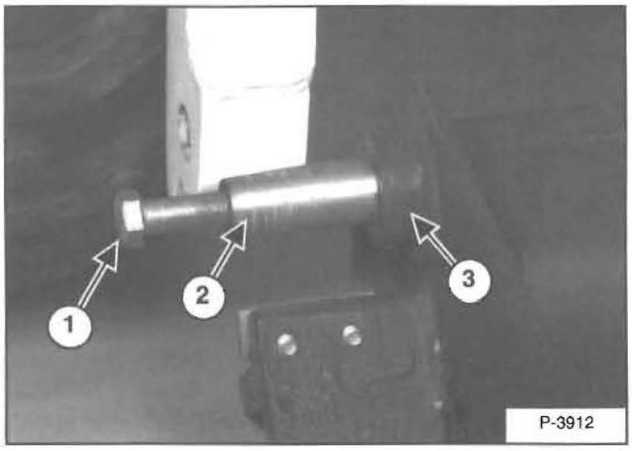
Figure 50-40-6



Remove the rubber seal (Item 1) **[Figure 50-40-6]**.

Removal And Installation (Cont'd)

Figure 50-40-7



Install the Bob-Tach mounting bolt (Item 1) into the pivot pin (Item 2) **[Figure 50-40-7]**. Remove the pivot pin from the Bob-Tach frame.

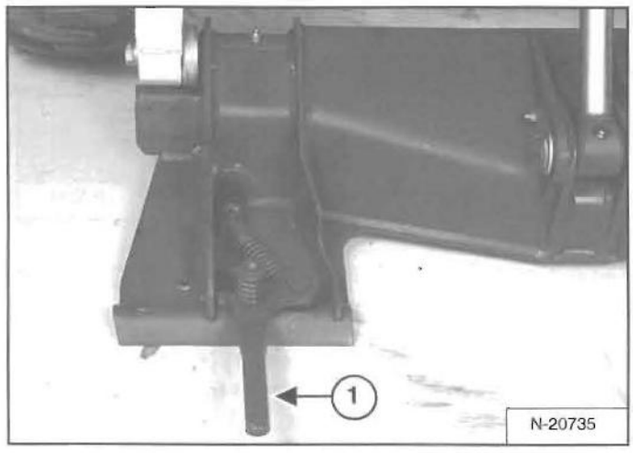
Check for wear and damage. Replace the pivot pins as needed.

Installation: Push the pivot pin (Item 2) into the Bob-Tach frame. Position the end of the pin flush with the end of the Bob-Tach bushing (Item 3) **[Figure 50-40-7]**.

Installation: Reverse the removal procedure to install the Bob-Tach.

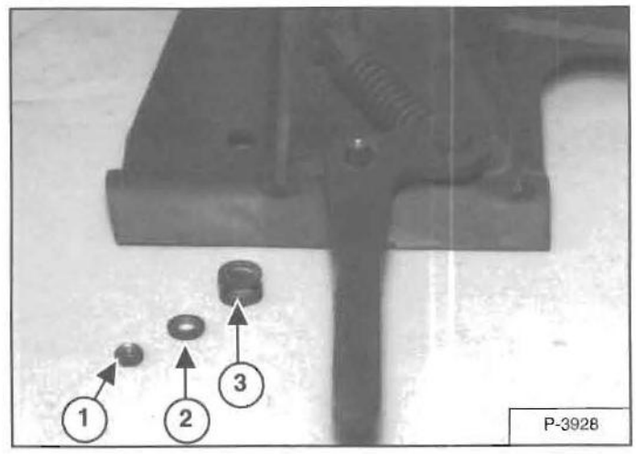
Bob-Tach Lever And Wedge

Figure 50-40-8



Use the following procedure to remove and install the Bob-Tach lever (Item 1) **[Figure 50-40-8]**, spring and wedge.

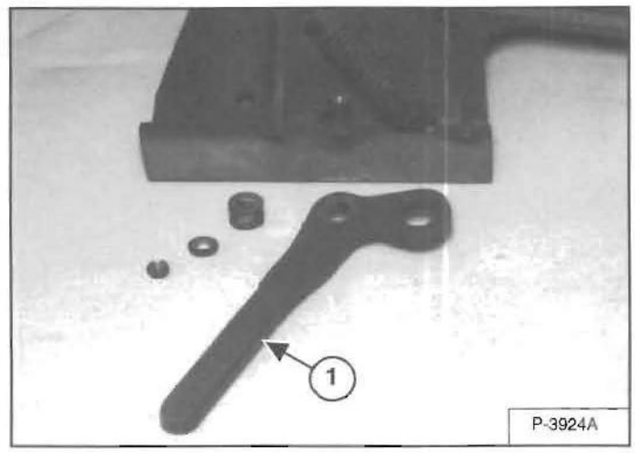
Figure 50-40-9



Remove the lever mounting bolt and nut (Item 1), washer (Item 2) and spring (Item 3) **[Figure 50-40-9]**.

Installation: Tighten the nut to 25-28 ft.-lbs. (34-38 Nm) torque.

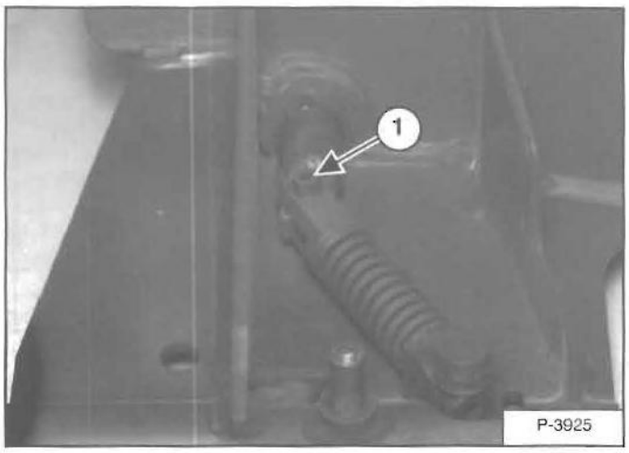
Figure 50-40-10



Remove the Bob-Tach lever (Item 1) **[Figure 50-40-10]**.

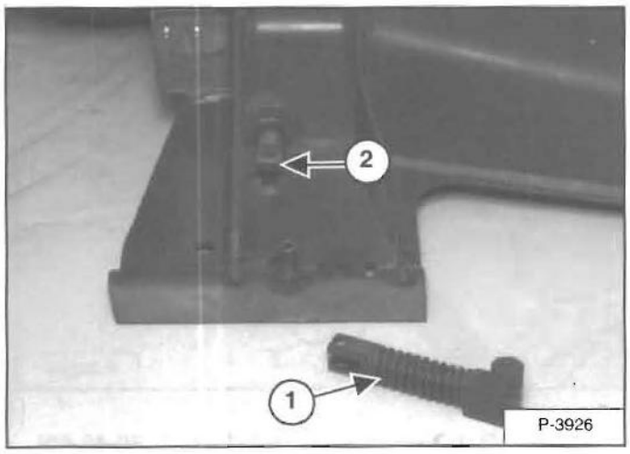
Bob-Tach Lever And Wedge (Cont'd)

Figure 50-40-11



Use a punch and hammer, remove the roll pin (Item 1) **[Figure 50-40-11]** from the Bob-Tach wedge and spring, bolt and clevis assembly.

Figure 50-40-12

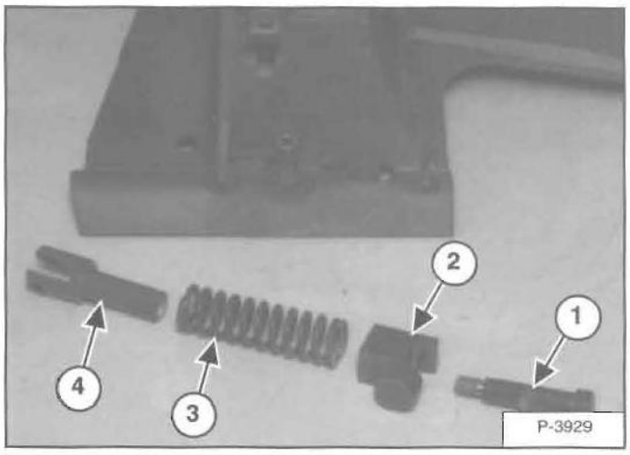


Remove the spring, bolt and clevis assembly (Item 1) **[Figure 50-40-12]**.

Remove the wedge (Item 2) **[Figure 50-40-12]** from the Bob-Tach frame.

Always replace bent or broken wedges.

Figure 50-40-13



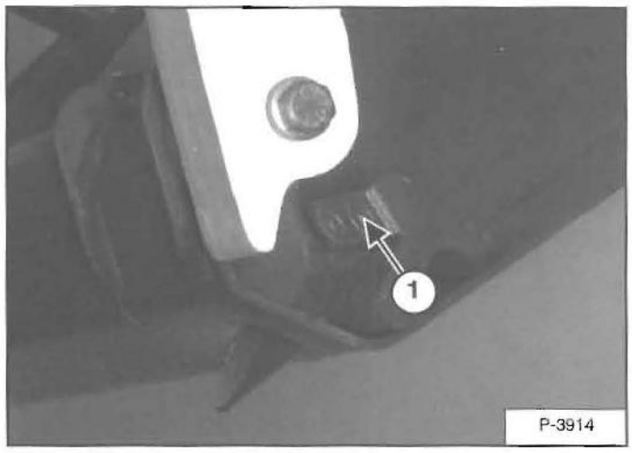
If the bolt (Item 1), handle pivot (Item 2), spring (Item 3) or clevis (Item 4) are damaged, put the assembly in the vise. Loosen and remove the bolt (Item 1) **[Figure 50-40-13]** with a 5/16 inch allen wrench.

Replace the worn or damaged parts as needed.

Installation: Reverse the removal procedure to install the Bob-Tach Lever and Wedge.

Bob-Tach Stops

Figure 50-40-14



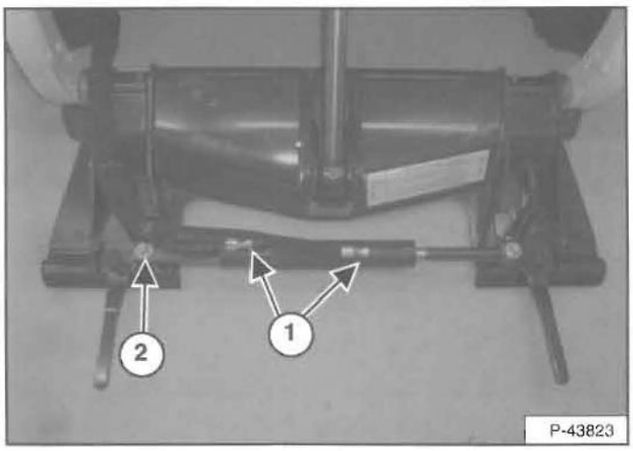
Remove and replace the Bob-Tach stop (Item 1) **[Figure 50-40-14]** (both sides) if worn or damaged.

NOTE: The Bob-Tach stop (Item 1) [Figure 50-40-14] must contact the lift arm at the same time the tilt cylinder reaches full extension. Use available shims to adjust the Bob-Tach stop and tilt cylinder sequence as closely as possible.

POWER BOB-TACH

Removal And Installation

Figure 50-41-1



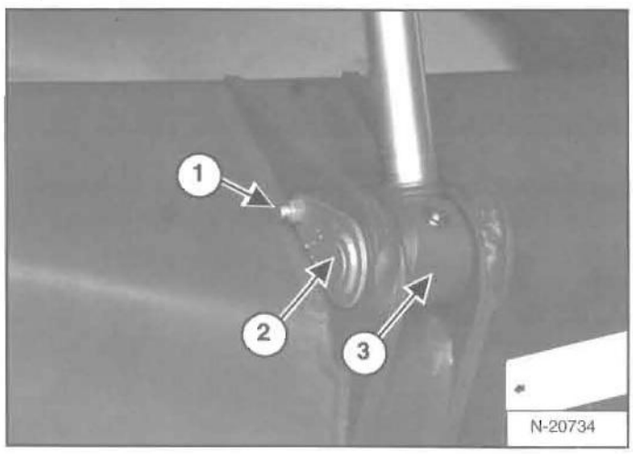
Tilt the Bob-Tach forward, so it is parallel to the floor. Put blocks (approximately 3 inches) under each side of the Bob-Tach **[Figure 50-41-1]**.

Lower the Bob-Tach onto the blocks.

Remove the hoses on the cylinder fittings (Item 1) **[Figure 50-41-1]**.

Remove the hose clamp on the hoses and use the bolt (Item 2) **[Figure 50-41-1]** on the Bob-Tach lever to secure the clamp.

Figure 50-41-2



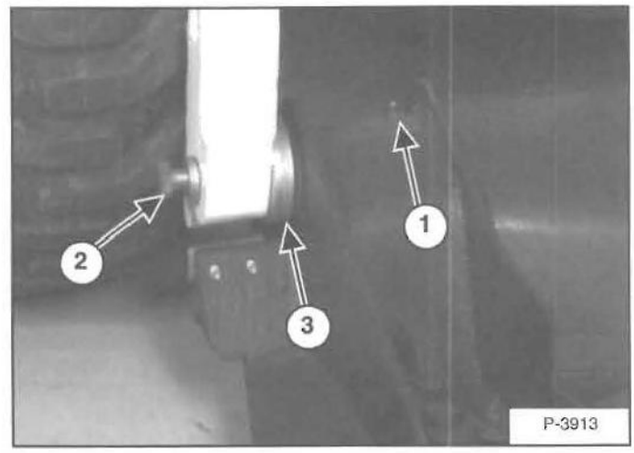
Remove the retainer bolt (Item 1) **[Figure 50-41-2]** and nut from the tilt cylinder rod end pin.

Installation: Tighten the retainer bolt and nut to 25-28 ft.-lbs. (34-38 Nm) torque.

Remove the pivot pin (Item 2) **[Figure 50-41-2]** from the tilt cylinder rod end.

Remove the tilt cylinder rod end (Item 3) **[Figure 50-41-2]** from the Bob-Tach.

Figure 50-41-3



Remove the grease fitting (Item 1) **[Figure 50-41-3]** (Both sides). This will allow grease to come out in the next step. Not letting grease escape will prevent the pin from going into the Bob-Tach far enough to remove the Bob-Tach from the lift arms.

Loosen the bolt (Item 2) **[Figure 50-41-3]** at the Bob-Tach pivot pin. (Both sides)

Strike the head of the bolt (Item 2) **[Figure 50-41-3]** to push the pivot pin into the Bob-Tach frame. (Both sides)

Remove the bolt. (Both sides)

Installation: A longer bolt will be needed to temporarily reach through the lift arms into the pins to seat them into the lift arms. Once seated, reinstall the original bolts. Tighten the bolts to 190 ft.-lbs. (258 Nm) torque.

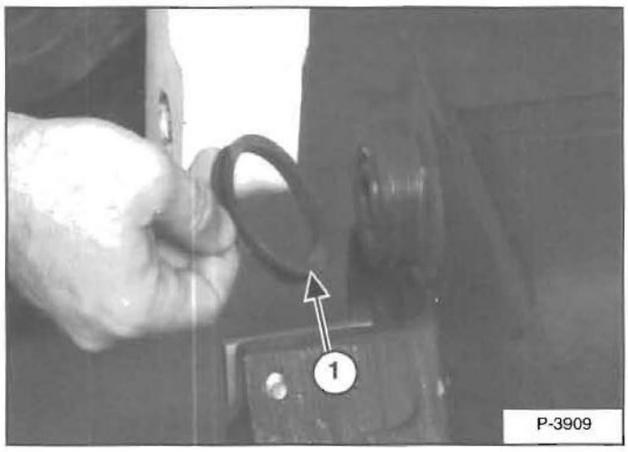
Use a punch to push the pivot pins all the way inside the Bob-Tach frame.

Remove the Bob-Tach from the lift arms.

Remove the dust cup (Item 3) **[Figure 50-41-3]** (Both sides) when the Bob-Tach is free from the loader.

Removal And Installation (Cont'd)

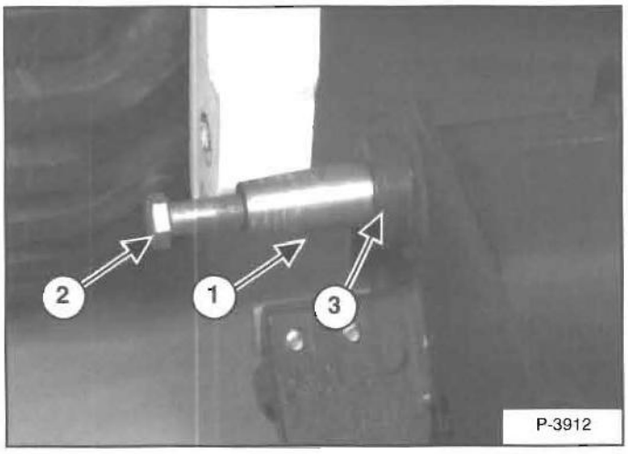
Figure 50-41-4



Remove the rubber seal (Item 1) **[Figure 50-41-4]** (Both sides).

Installation: Use a new seal when assembling.

Figure 50-41-5



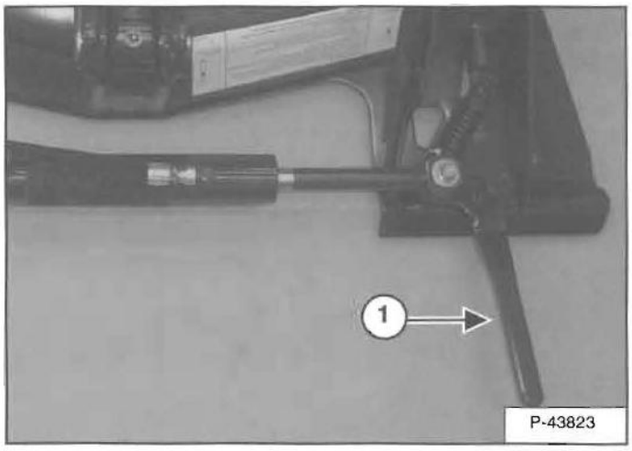
Remove the Bob-Tach pivot pin (Item 1). (Both sides) Thread the bolt (Item 2) **[Figure 50-41-5]** into the pivot pins and pull.

Check for wear and damage on the pins and the Bob-Tach bushings (Item 3) **[Figure 50-41-5]**. Replace as needed.

Installation: Reverse the removal procedure to install the Bob-Tach.

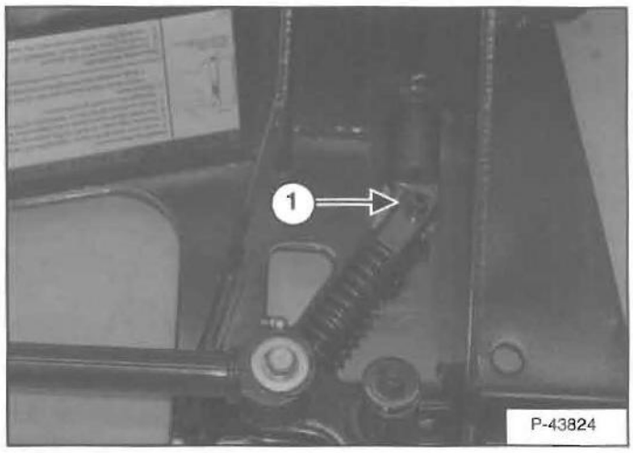
Power Bob-Tach Lever And Wedge

Figure 50-41-6



Use the following procedure to remove and install the Bob-Tach lever (Item 1) **[Figure 50-41-6]**, spring and wedge.

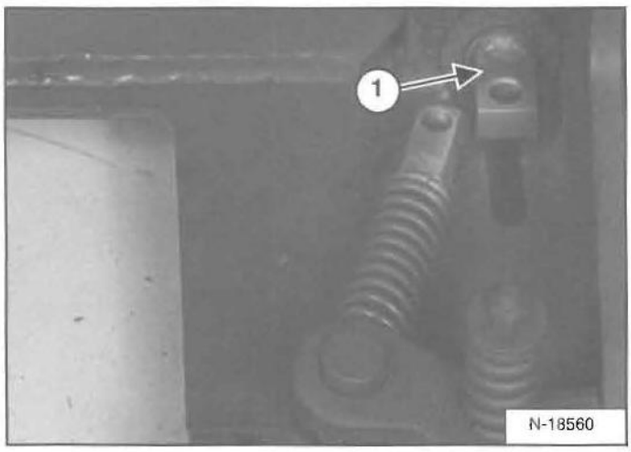
Figure 50-41-7



Use a punch and hammer, remove the roll pin (Item 1) **[Figure 50-41-7]** from the Bob-Tach Wedge and spring clevis.

Power Bob-Tach Lever And Wedge (Cont'd)

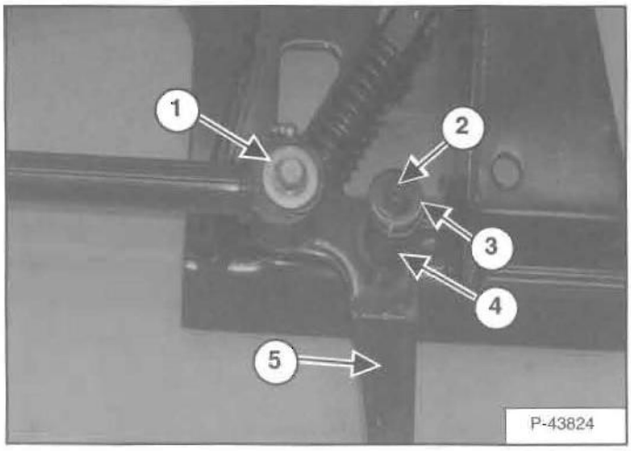
Figure 50-41-8



Remove the Wedge (Item 1) **[Figure 50-41-8]**.

Always replace bent or broken wedges.

Figure 50-41-9



Remove the washer and bolt (Item 1) **[Figure 50-41-9]**.

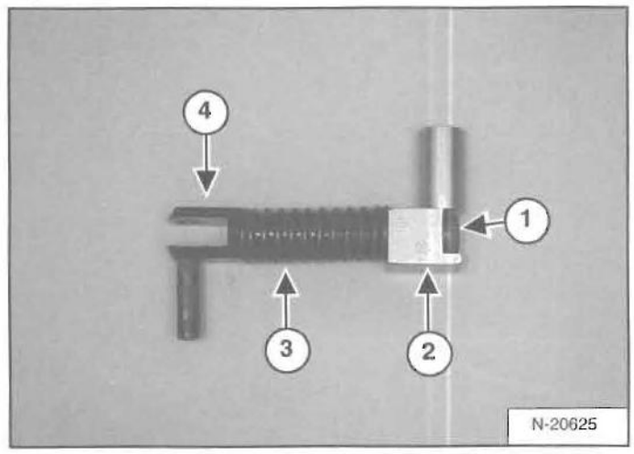
Installation: Tighten the bolts to 25-28 ft.-lbs. (34-38 Nm) torque.

Remove the cylinder off the lever pivots. Position the rod end to the left with the grease fitting holes to the bottom **[Figure 50-41-9]**.

Remove the lever mounting nut (Item 2), washer (Item 3), spring (Item 4) and lever (Item 5) **[Figure 50-41-9]**.

Installation: Tighten the nut to 25-28 ft.-lbs. (34-38 Nm) torque.

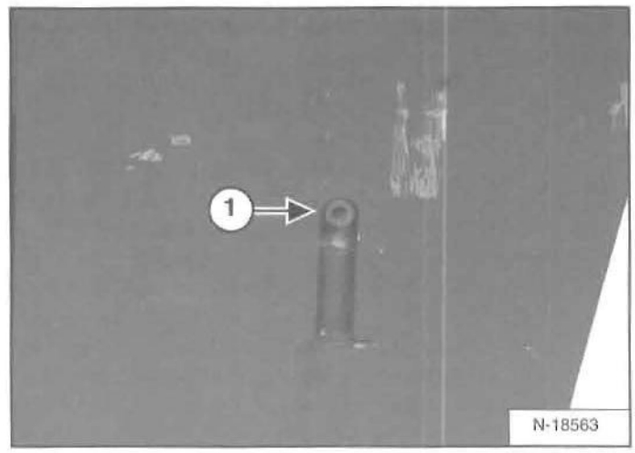
Figure 50-41-10



If the bolt (Item 1), handle pivot (Item 2), spring (Item 3) or clevis (Item 4) **[Figure 50-41-10]** are damaged, put the assembly in a vise.

Remove the bolt and replace the damaged parts as needed.

Figure 50-41-11



Use a punch and hammer to drive the roll pin (Item 1) **[Figure 50-41-11]** flush with the face of the Bob-Tach.

Installation: Reverse the removal procedure to install the Power Bob-Tach lever and wedge.



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LIFT ARM

Removal And Installation

Figure 50-50-1



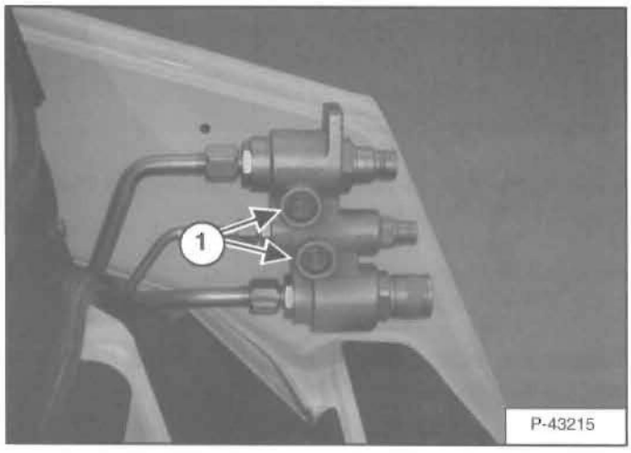
Roll the Bob-Tach fully forward. Stop the engine.

Remove the Bob-Tach frame from the lift arms. (See Contents Page 50-01.)

Install jackstands under the rear of the loader **[Figure 50-50-1]**.

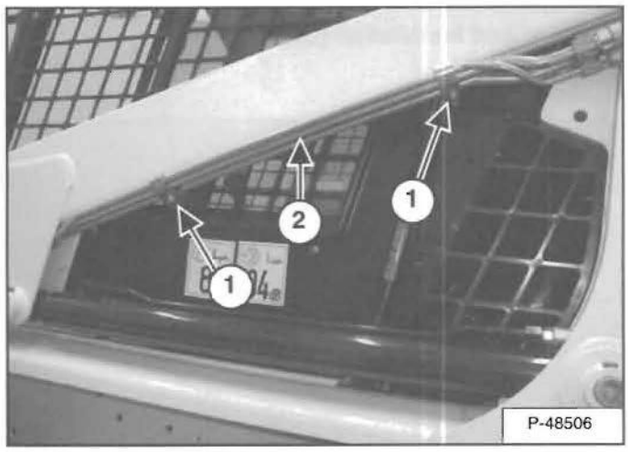
Left Side

Figure 50-50-2



Remove the front auxiliary block mounting bolts (Item 1) **[Figure 50-50-2]**.

Figure 50-50-3

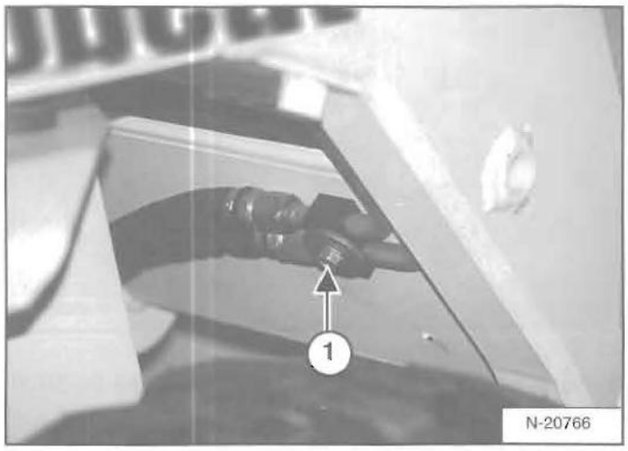


Remove the tubeline clamps (Item 1) **[Figure 50-50-3]** under the lift arms.

Pull the tubelines (Item 2) **[Figure 50-50-3]** down .

Removal And Installation (Cont'd)

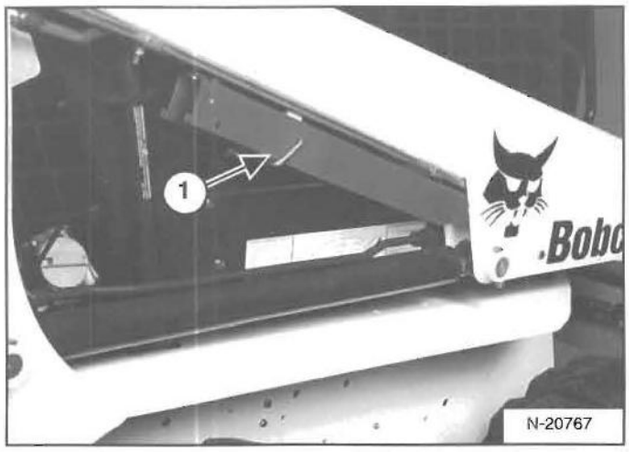
Figure 50-50-4



Right Side

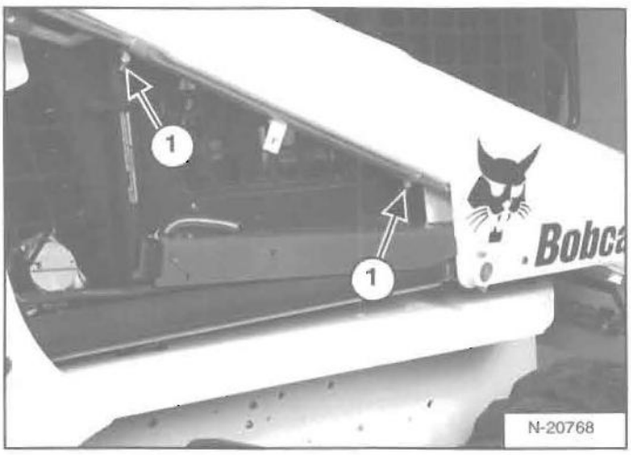
Remove the mounting bolt (Item 1) **[Figure 50-50-4]** from the tilt tubeline clamp.

Figure 50-50-5



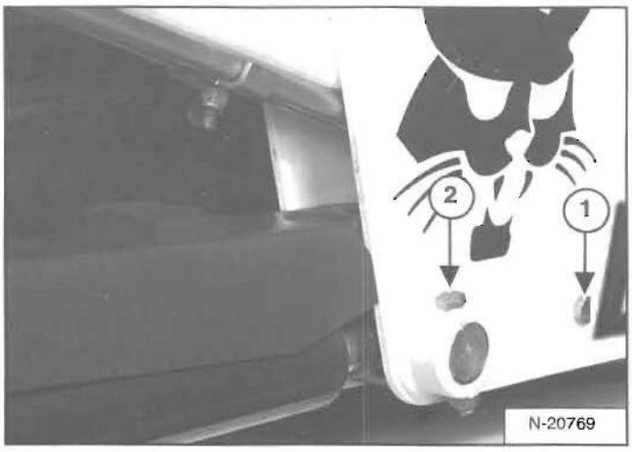
Remove the lift arm support device (Item 1) **[Figure 50-50-5]**.

Figure 50-50-6



Remove the tubeline clamps (Item 1) **[Figure 50-50-6]** under the lift arms.

Figure 50-50-7



Remove the lift arm support device mounting bolt (Item 1) **[Figure 50-50-7]** spacer and nut.

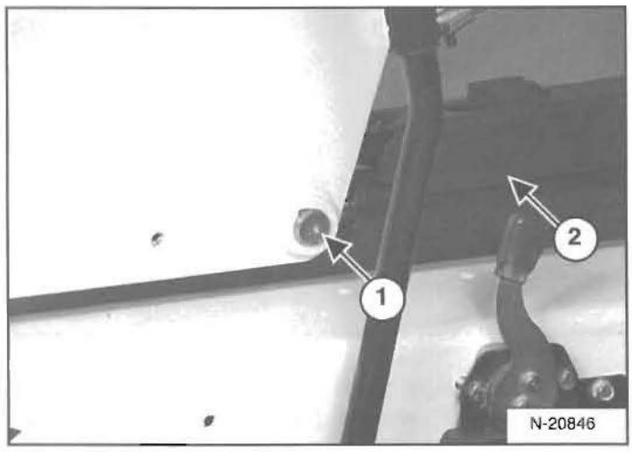
Installation: Tighten the mounting bolt and nut to 25-28 ft.-lbs. (34-38 Nm) torque.

Remove the retainer bolt (Item 2) **[Figure 50-50-7]** and nut from the lift cylinder rod end pivot pin.

Installation: Tighten the mounting bolt and nut to 25-28 ft.-lbs. (34-38 Nm) torque.

Removal And Installation (Cont'd)

Figure 50-50-8



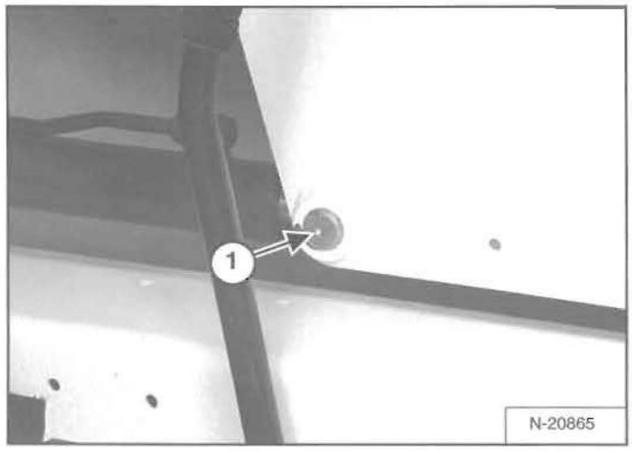
Raise the operator cab. (See Contents Page 10-01.)

Remove the right side lift cylinder pivot pin (Item 1) **[Figure 50-50-8]**.

NOTE: Put a piece of cardboard under the rod end of the lift cylinders to protect the fender from scratches.

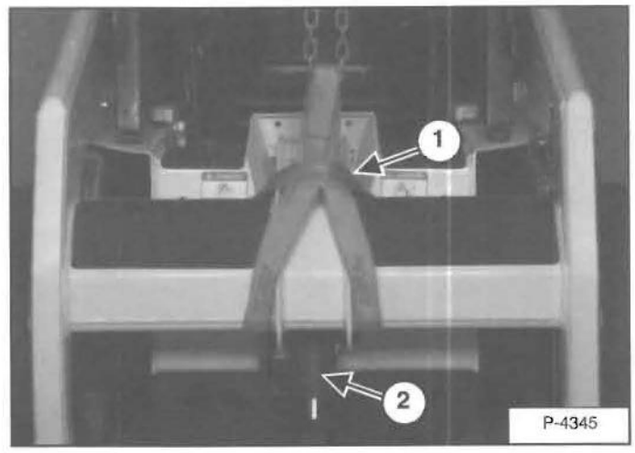
Remove the lift arm support device (Item 2) **[Figure 50-50-8]**.

Figure 50-50-9



Remove the left side lift cylinder pivot pin (Item 1) **[Figure 50-50-9]**.

Figure 50-50-10



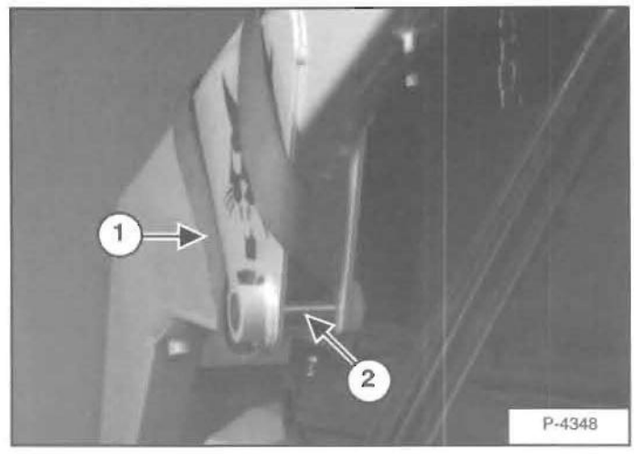
Wrap one of the 7 ft. lifting straps around the lift arm crossmember as shown **[Figure 50-50-10]**.

Both loops of the lifting strap should be supported by the chain hoist **[Figure 50-50-10]**.

Use a chain hoist and lifting strap to raise the lift arms enough to remove the tilt cylinder base end pivot pin (Item 1) **[Figure 50-50-10]**.

Remove the tilt cylinder (Item 2) **[Figure 50-50-10]** from the lift arm crossmember and put on the blocking.

Figure 50-50-11



Put the middle of the second lifting strap (Item 1) **[Figure 50-50-11]** up into the lift arm as shown.

Install the lift cylinder pivot pin (Item 2) **[Figure 50-50-11]** and secure the pin with the mounting bolt and nut.

Wrap both ends of the strap around the top of the lift arm and down the back of the lift arm **[Figure 50-50-11]**.

Removal And Installation (Cont'd)

Figure 50-50-12



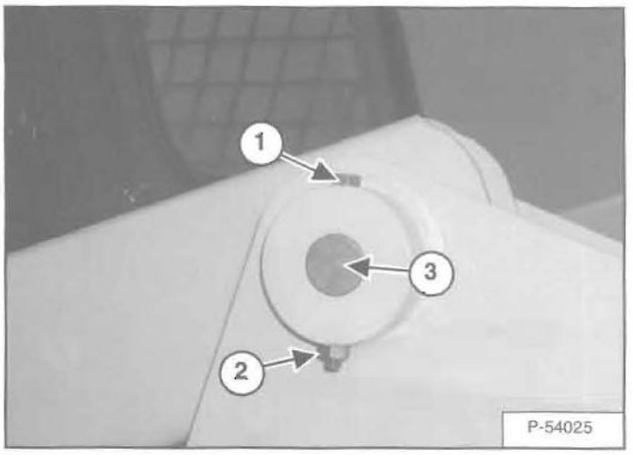
Continue to wrap the lifting strap around the lift arm a second time **[Figure 50-50-12]**.

Fasten both loops of the lifting strap to a second chain attached to the chain hoist.

Use the wrapping procedure on the third strap which should be installed on the right side lift arm.

Use the chain hoist and lower the lift arms so they rest on the blocking.

Figure 50-50-13



Remove the upright pivot pin mounting bolt (Item 1) **[Figure 50-50-13]** and nut (Item 2) **[Figure 50-50-13]**. (Both sides.)

Installation: Tighten the pivot pin mounting bolt and nut to 25-28 ft.-lbs. (34-38 Nm) torque.

Remove the upright pivot pin (Item 3) **[Figure 50-50-13]**. (Both sides.)

Removal And Installation (Cont'd)

Figure 50-50-14



Raise the lift arms with the chain hoist so the lift arms are free from the loader **[Figure 50-50-14]**.

Figure 50-50-15



Pull the lift arms away from the loader **[Figure 50-50-15]**.

Lower the lift arms slowly and put on the floor.

Reverse the removal procedure to install the lift arms on the loader.

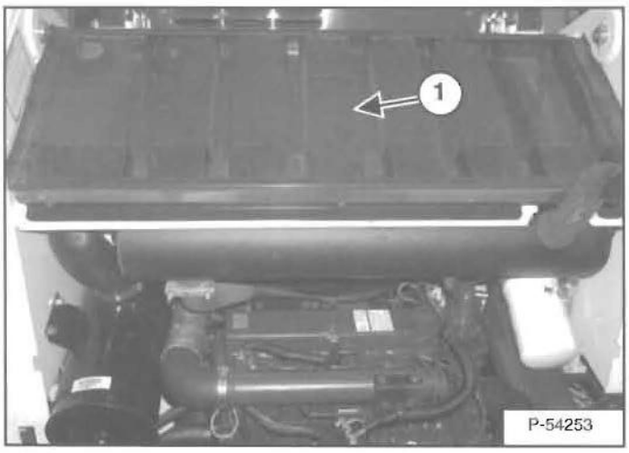


Bobcat®

REAR GRILL

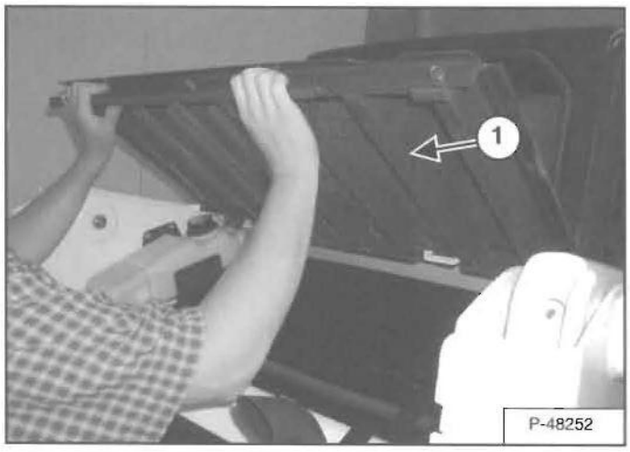
Removal And Installation

Figure 50-60-1



Open the rear door.

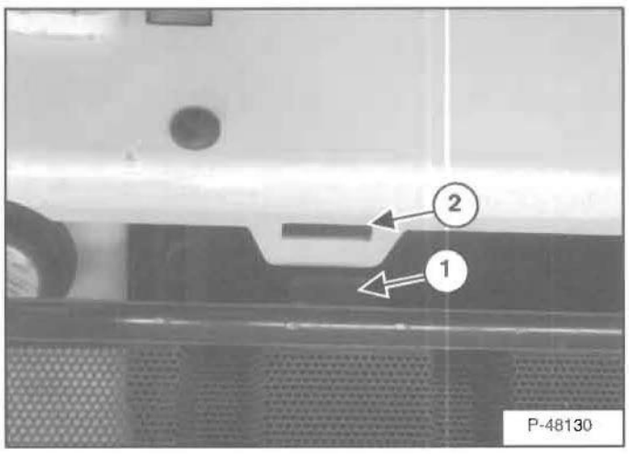
Figure 50-60-2



Lift up on the rear grill (Item 1) **[Figure 50-60-1]** and **[Figure 50-60-2]**.

Lift the grill away from the loader.

Figure 50-60-3



Installation: Line up the tab (Item 1) on the grill with the slot (Item 2) **[Figure 50-60-3]** on the loader mainframe. Insert the tab fully and then push down.

Reverse the removal procedure to install the grill.

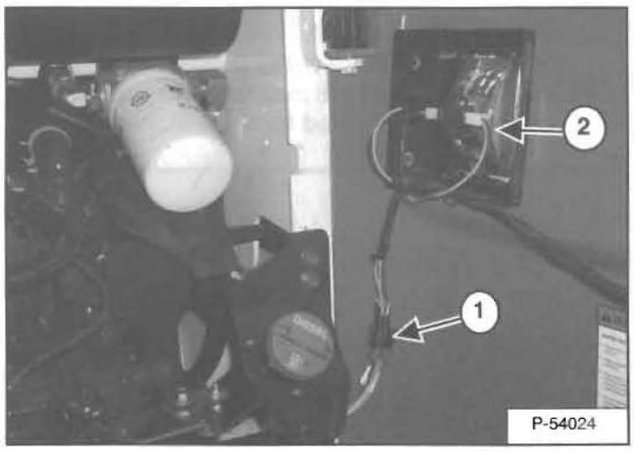


Bobcat®

REAR DOOR

Removal And Installation

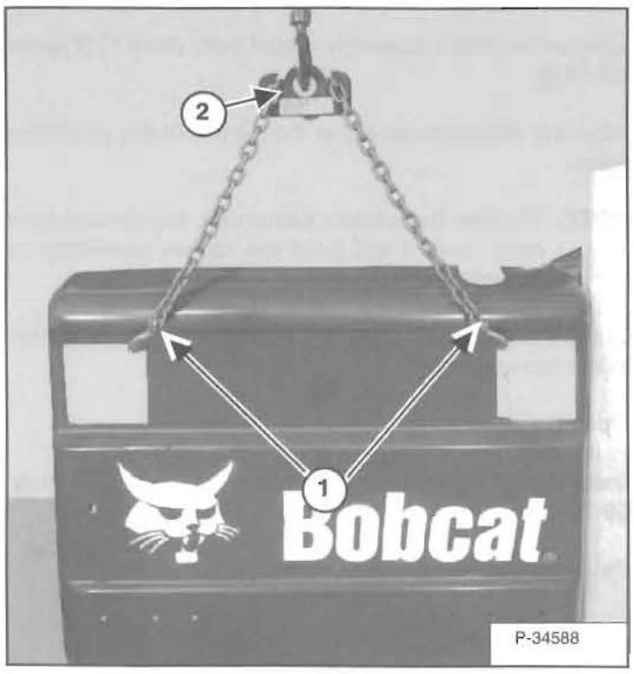
Figure 50-70-1



Disconnect the light harness connector (Item 1) **[Figure 50-70-1]** from the engine harness.

Remove both rear lights (Item 2) **[Figure 50-70-1]** from the door. (See Contents Page 60-01.)

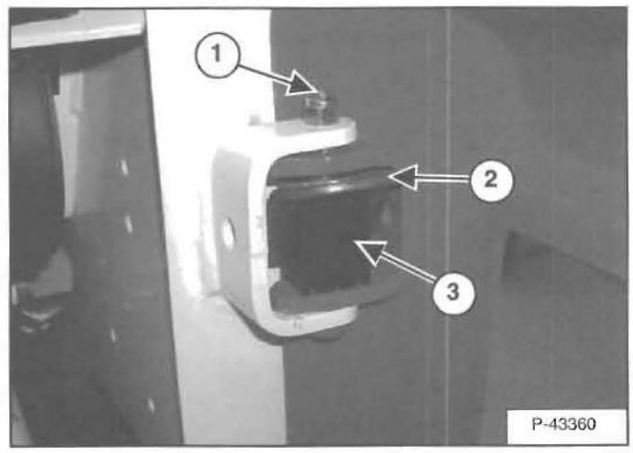
Figure 50-70-2



Secure the chain hooks (Item 1) **[Figure 50-70-2]** to the door as shown.

Connect a chain hoist (Item 2) **[Figure 50-70-2]** to the lifting chain.

Figure 50-70-3



Remove the top and bottom door hinge mounting bolts (Item 1) **[Figure 50-70-3]** and nuts.

NOTE: Install the door stop (Item 2) and the door stop retainer (Item 3) [Figure 50-70-3] in the top hinge as shown.

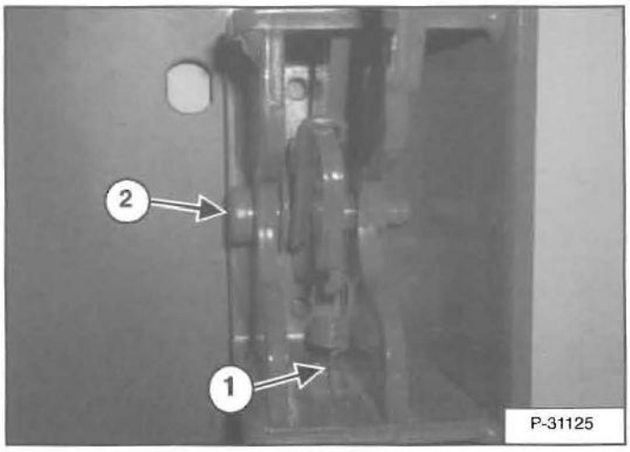
Installation: Tighten the mounting bolts and nuts to 25-28 ft.-lbs. (34-38 Nm) torque.

Lift the door away from the loader frame and put the door flat on the floor.

Installation: Reverse the removal procedure to install the rear door.

Latch Removal And Installation

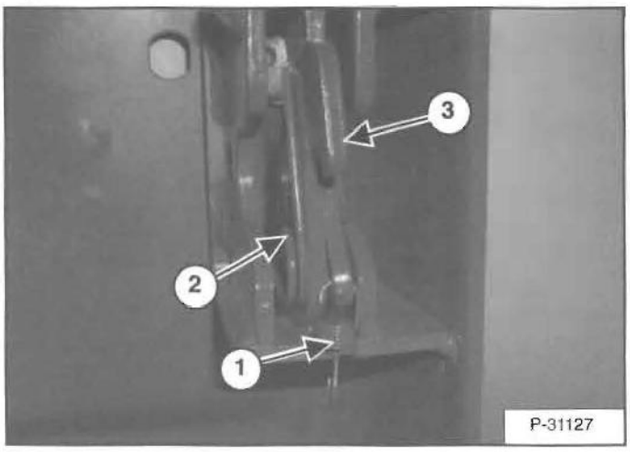
Figure 50-70-7



Disconnect the spring (Item 1) **[Figure 50-70-7]** from the rear door.

Remove the bolt and nut (Item 2) **[Figure 50-70-7]** from the latch.

Figure 50-70-8

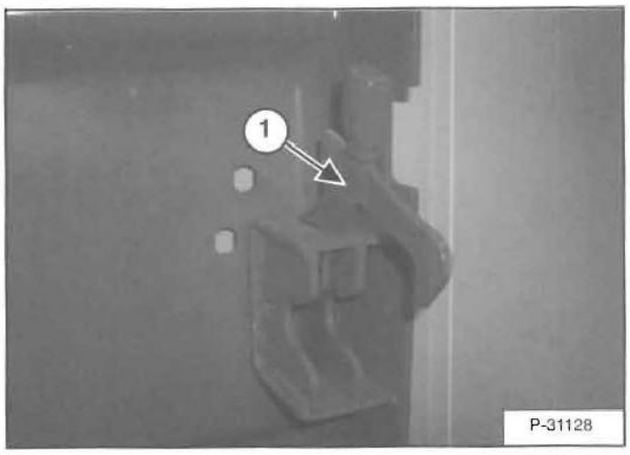


Remove the spring (Item 1) **[Figure 50-70-8]** from the door handle.

Remove the spring (Item 2) **[Figure 50-70-8]** from the door latch.

Remove the door latch (Item 3) **[Figure 50-70-8]** from the door handle.

Figure 50-70-9



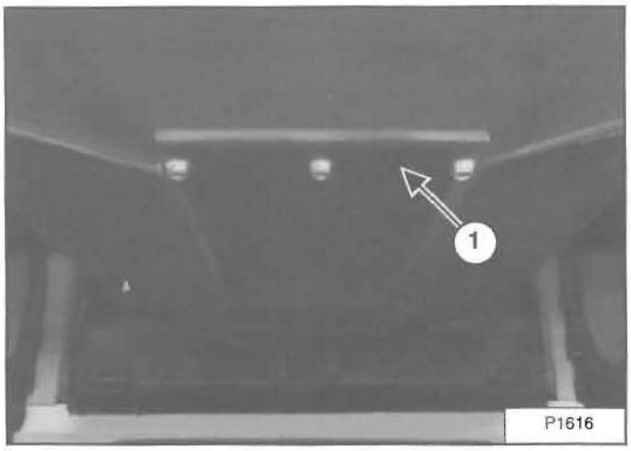
Remove the door handle (Item 1) **[Figure 50-70-9]** from the rear door.


Bobcat®

FUEL TANK

Removal And Installation

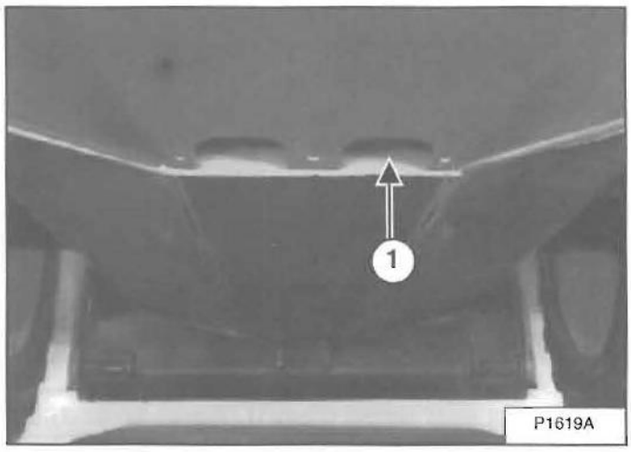
Figure 50-80-1



Remove the cover (Item 1) **[Figure 50-80-1]** which is installed over the fuel drain near the rear of the chaincase.

Installation: Tighten the cover mounting bolts to 15-20 ft.-lbs. (20-27 Nm) torque.

Figure 50-80-2

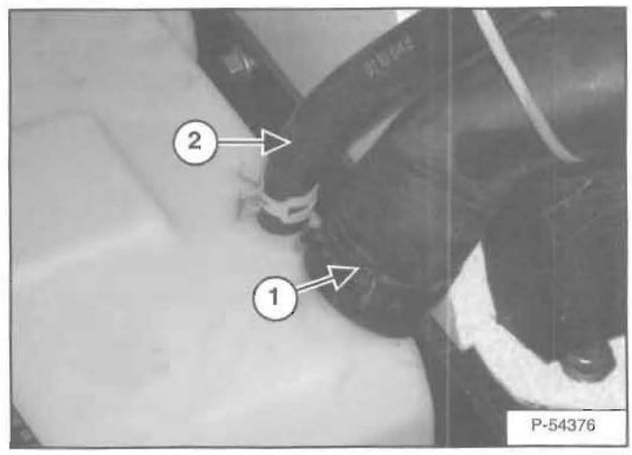


Drain the fuel from the tank through the fuel drain (Item 1) **[Figure 50-80-2]**.

Open the rear door of the loader.

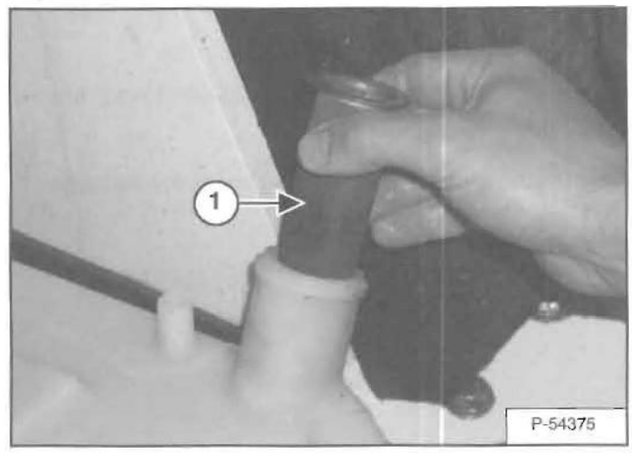
Remove the engine/hydrostatic pump assembly from the loader. (See Contents Page 70-01.)

Figure 50-80-3



Disconnect the fuel fill hose (Item 1) and the vent hose (Item 2) **[Figure 50-80-3]** from the fuel tank.

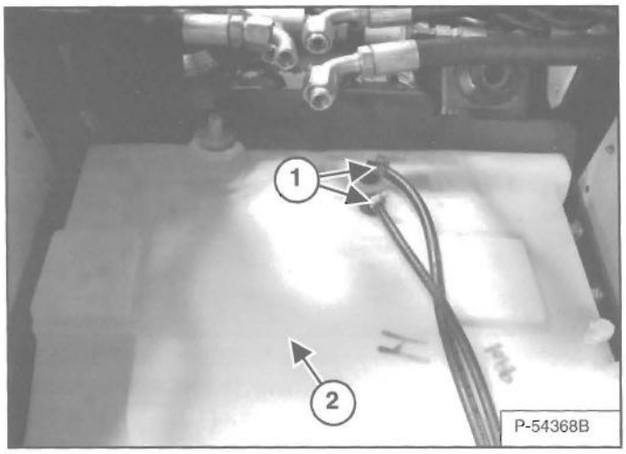
Figure 50-80-4



Remove the fuel inlet screen (Item 1) **[Figure 50-80-4]**. Clean and dry the screen. Check the screen for damage and replace if necessary.

Removal And Installation (Cont'd)

Figure 50-80-5



Remove the fuel supply and return hoses (Item 1) **[Figure 50-80-5]**.

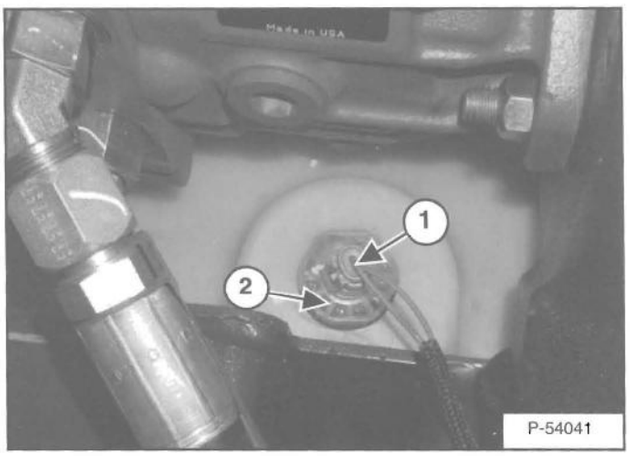
Lift the fuel tank (Item 2) **[Figure 50-80-5]** and remove from the loader.

Reverse the removal procedure to install the fuel tank.

Fuel Level Sender

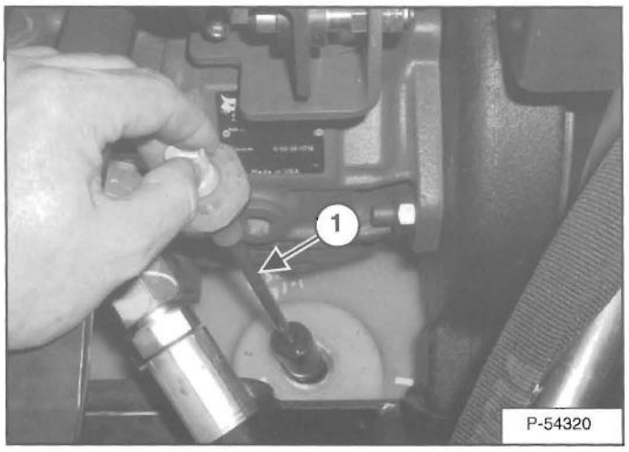
Raise the loader operator cab . (See Contents Page 10-01.)

Figure 50-80-6



Disconnect the harness (Item 1) and loosen the fuel level sender (Item 2) **[Figure 50-80-6]** with a wrench.

Figure 50-80-7



Turn the fuel level sender (Item 1) **[Figure 50-80-7]** out and remove it from the fuel tank. Check the fuel level sender for damage and replace if necessary.

Installation: Tighten the fuel level sender to 50-60 in.-lbs. (5,7-6,8 Nm) torque.

CONTROL PEDALS

Removal And Installation

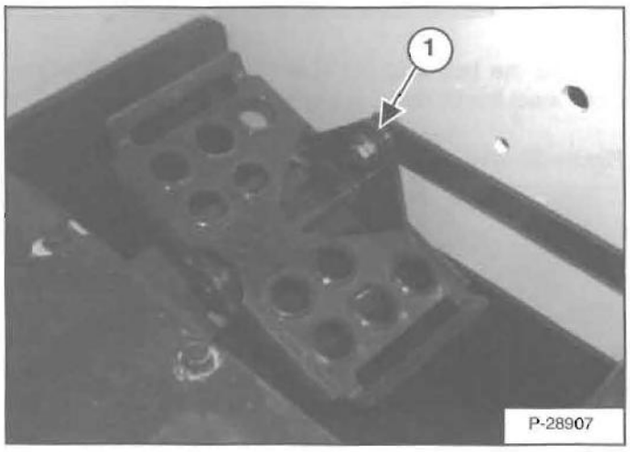
⚠ WARNING

AVOID INJURY OR DEATH

Adjust locking tabs on control linkage so that lift and tilt control pedals or (Mechanical Hand Controls) are locked in neutral when the seat bar is up.

W-2104-0199

Figure 50-90-1

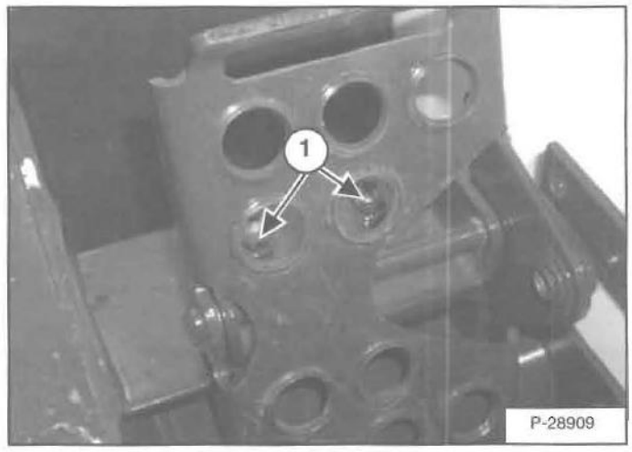


Remove the bolt (Item 1) **[Figure 50-90-1]** and nut from the pedal linkage.

Installation: Tighten the bolt and nut to 25-28 ft.-lbs. (34-38 Nm) torque.

Check the rubber bushing in the pedal for wear and replace as needed.

Figure 50-90-2



Remove the two mounting bolts (Item 1) **[Figure 50-90-2]** from the pedal mounting bracket.

Remove the pedal assembly from the loader.

Pedal Adjustment

After installing the pedal, adjust the pedal so that there is clearance under the rear of the pedal. The valve spool must travel full stroke without the pedal hitting the floor panel.

Crossbar Linkage Removal And Installation

⚠ DANGER

AVOID DEATH

- Disconnecting or loosening any hydraulic tubeline, hose, fitting, component or a part failure can cause lift arms to drop.
- Keep out of this area when lift arms are raised unless supported by an approved lift arm support. Replace if damaged. 57051

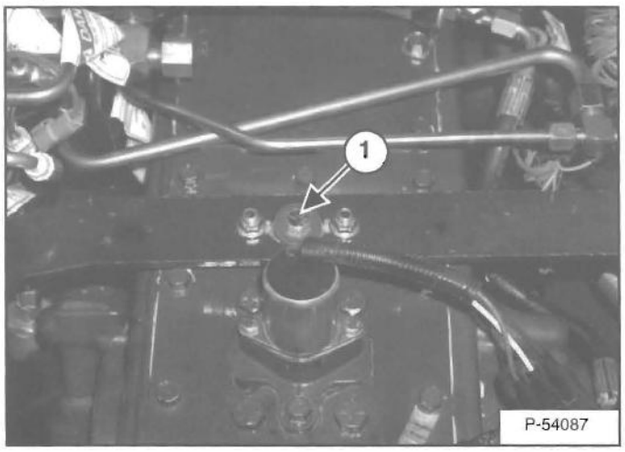


⚠ WARNING

Never work on a machine with the lift arms up unless the lift arms are secured by an approved lift arm support device. Failure to use an approved lift arm support device can allow the lift arms or attachment to fall and cause injury or death.

W-2059-0598

Figure 50-90-3

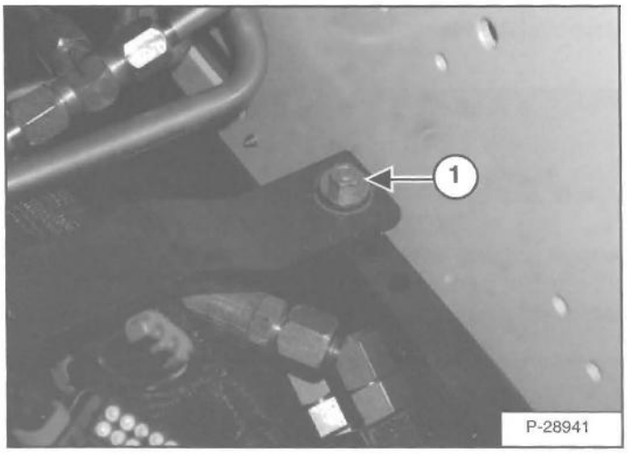


Raise the lift arms and install an approved lift arm support device. (See Contents Page 10-01.)

Raise the operator cab. (See Contents Page 10-01.)

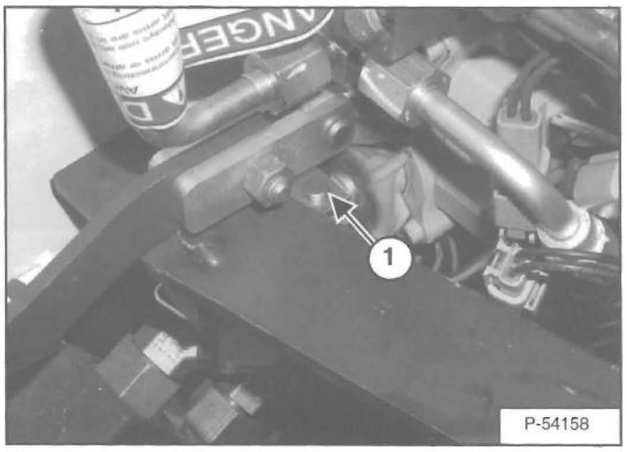
Remove the crossbar pivot bolt (Item 1) **[Figure 50-90-3]**.

Figure 50-90-4



Remove the bolt and nut (Item 1) **[Figure 50-90-4]** to disconnect the lift pedal linkage from crossbar.

Figure 50-90-5

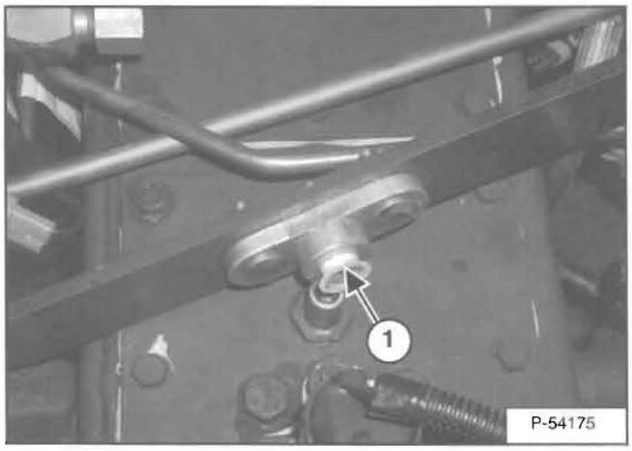


Remove the hairpin clip and cross-pin from the control valve lift spool (Item 1) **[Figure 50-90-5]**.

Disconnect the crossbar from the control valve.

Crossbar Linkage Removal And Installation (Cont'd)

Figure 50-90-6

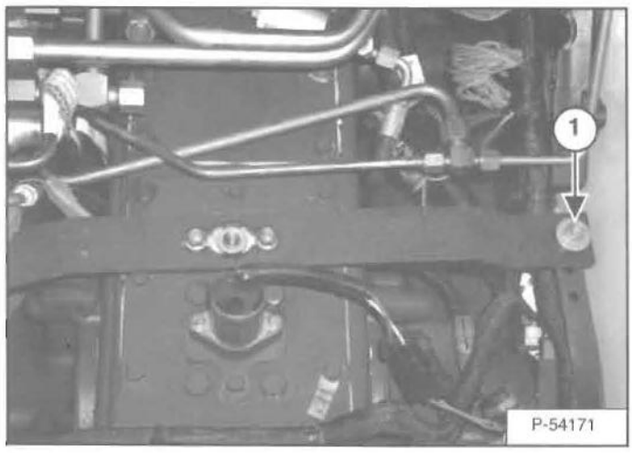


Remove the crossmember from the pivot **[Figure 50-90-6]**.

Installation: Check the nylon bushing (Item 1) **[Figure 50-90-6]** for wear and replace as needed.

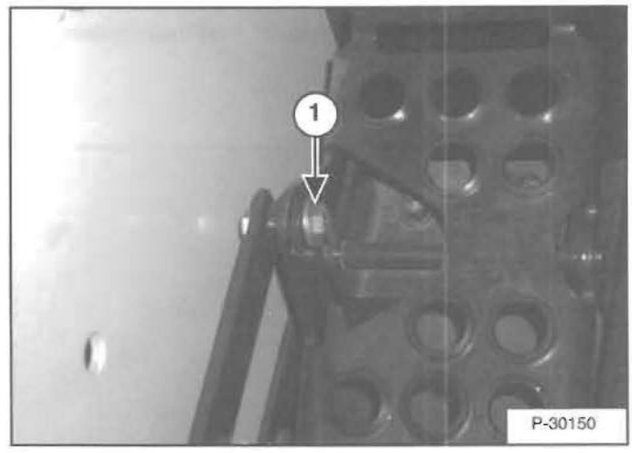
Lift Foot Pedal Linkage Removal And Installation

Figure 50-90-7



Remove the bolt, washer and nut (Item 1) **[Figure 50-90-7]** to disconnect the lift foot pedal linkage from the crossbar linkage.

Figure 50-90-8

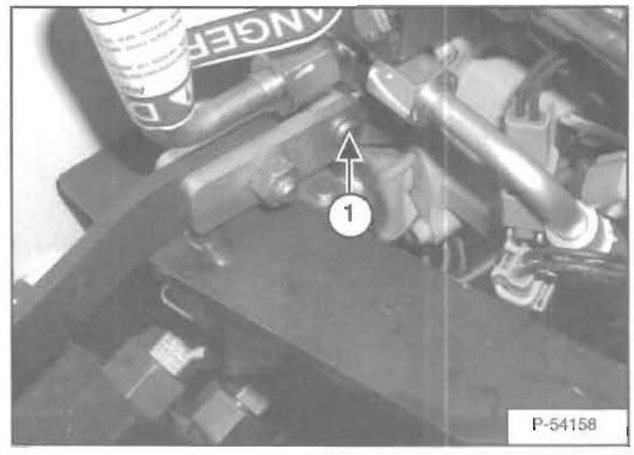


Remove the bolt (Item 1) **[Figure 50-90-8]** and nut from the pedal linkage.

Installation: Tighten the bolt and nut to 25-28 ft.-lbs. (34-38 Nm) torque.

Tilt Foot Pedal Linkage Removal And Installation

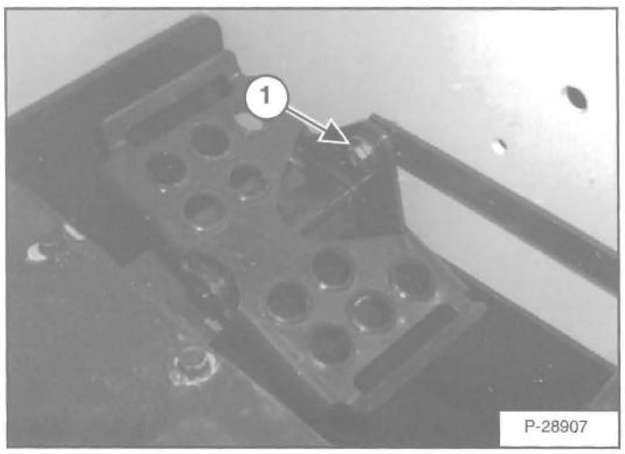
Figure 50-90-9



Remove the hairpin clip and cross-pin (Item 1) **[Figure 50-90-9]** to disconnect the tilt foot pedal linkage from the control valve.

Tilt Foot Pedal Linkage Removal And Installation (Cont'd)

Figure 50-90-10



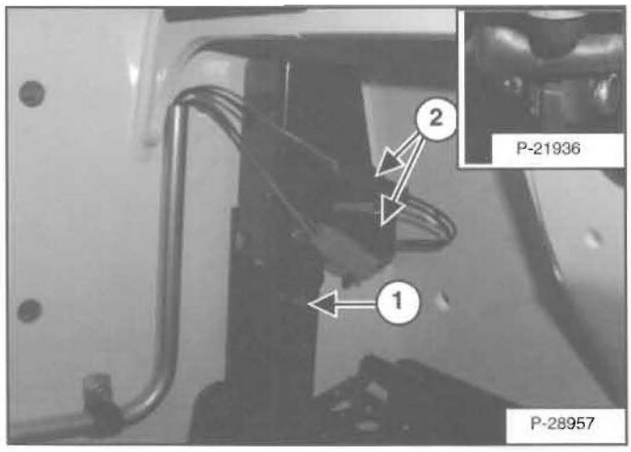
Remove the bolt (Item 1) **[Figure 50-90-10]** and nut from the pedal linkage.

Installation: Tighten the bolt and nut to 25-28 ft.-lbs. (34-38 Nm) torque.

CONTROL PEDALS (ACS)

Foot Sensor Removal And Installation

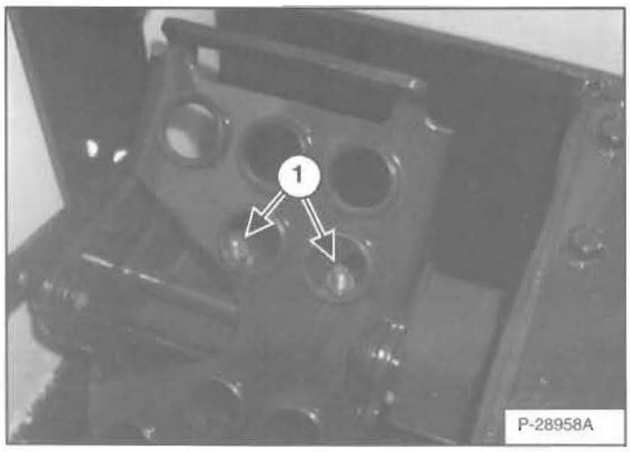
Figure 50-91-1



Pull the pin (Item 1) **[Figure 50-91-1]** holding the foot pedal linkage to the sensor.

Disconnect the two connectors (Item 2) **[Figure 50-91-1]** from the sensor and lock solenoid.

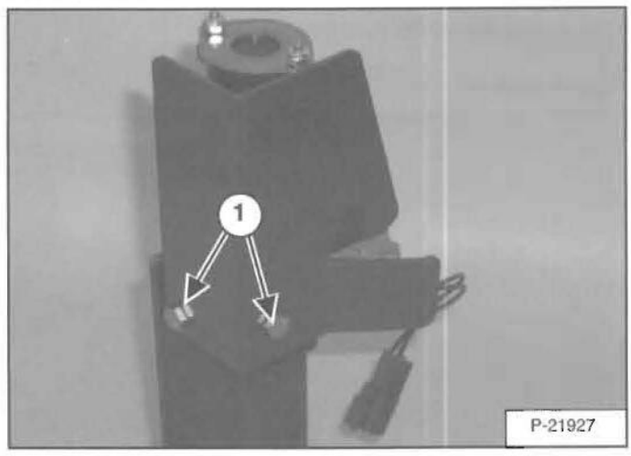
Figure 50-91-2



Tilt the foot pedal up and remove the two nuts (Item 1) **[Figure 50-91-2]**.

Remove the foot pedal and sensor assembly from the loader.

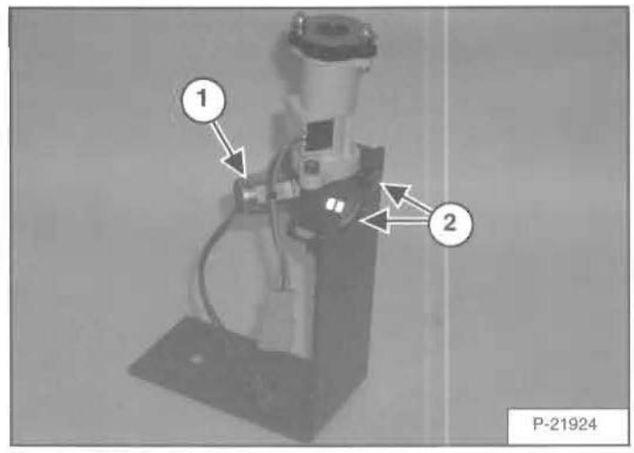
Figure 50-91-3



Remove the two bolts (Item 1) **[Figure 50-91-3]** from the foot sensor shield.

Installation: Tighten the bolts to 80-90 in.-lbs. (9,0-10,2 Nm) torque.

Figure 50-91-4



Remove foot lock solenoid (Item 1) **[Figure 50-91-4]**.

Installation: Apply a drop of oil to the solenoid threads and tighten the solenoid to 35-40 ft.-lbs. (47-54 Nm) lubed torque.

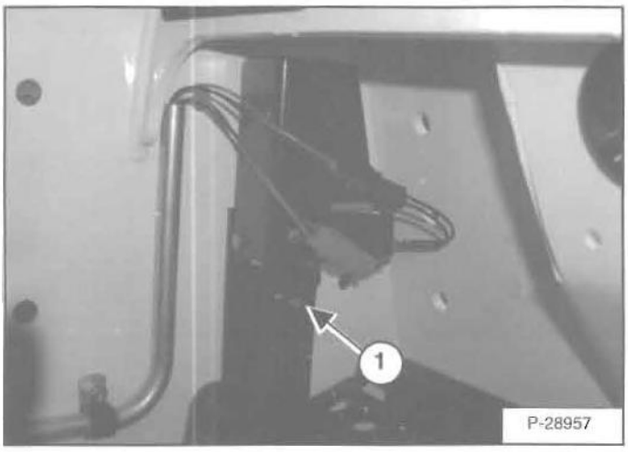
Remove the two bolts (Item 2) **[Figure 50-91-4]** from the bracket and sensor assembly.

Installation: Tighten the bolts to 25-28 ft.-lbs. (34-38 Nm) torque.

Remove the sensor assembly.

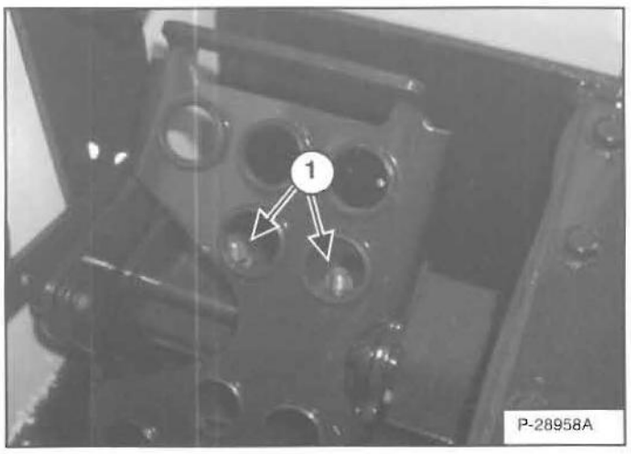
Foot Pedal Removal And Installation

Figure 50-91-5



Remove the pin (Item 1) **[Figure 50-91-5]** holding the linkage to the sensor.

Figure 50-91-6

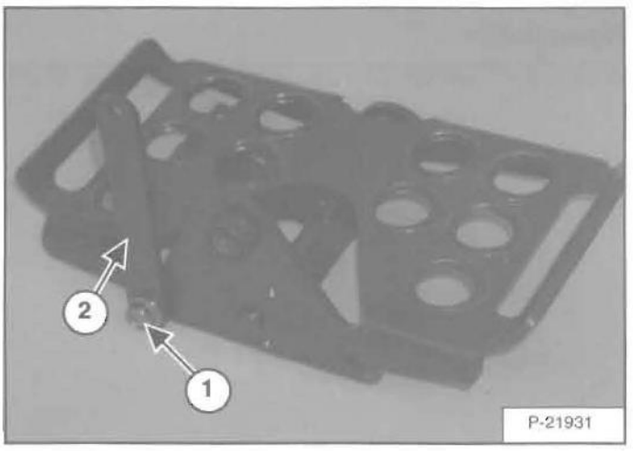


Tip the foot pedal up and remove the two nuts (Item 1) **[Figure 50-91-6]**.

Remove the foot pedal assembly.

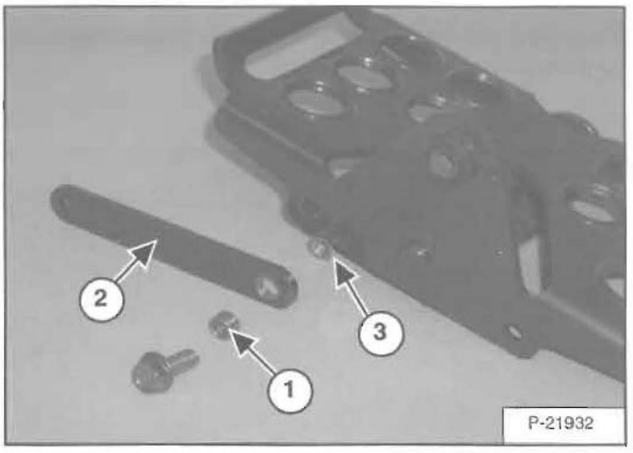
Foot Pedal Linkage Disassembly And Assembly

Figure 50-91-7



Remove the bolt (Item 1) holding the linkage (Item 2) **[Figure 50-91-7]** to the side of the foot pedal.

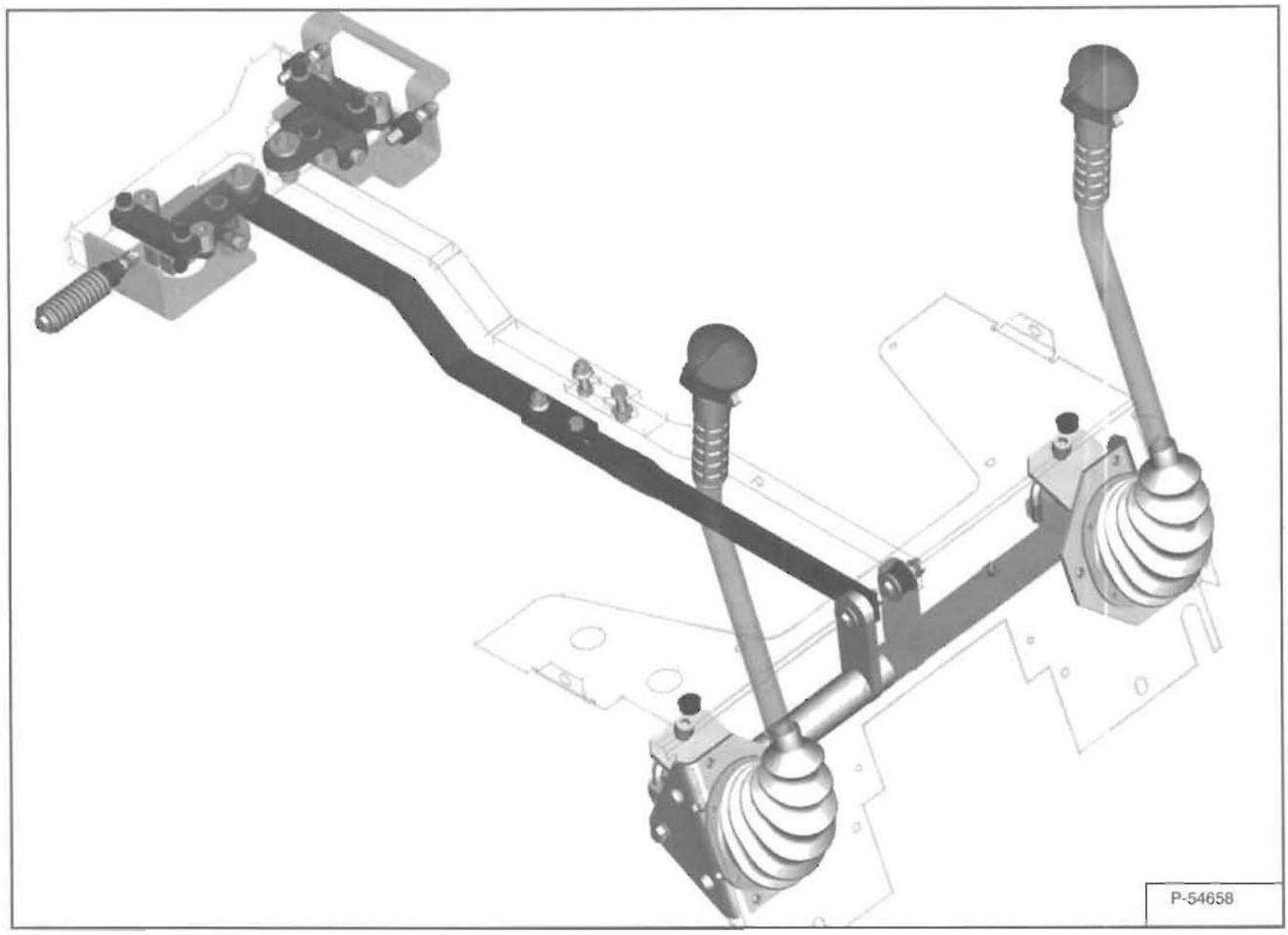
Figure 50-91-8



Remove the spacer (Item 1), linkage (Item 2), and nut (Item 3) **[Figure 50-91-8]** from the foot pedal.

Figure 50-100-1

Description



The steering system **[Figure 50-100-1]** consists of independent steering levers the operator uses to provide steering input to the loader.

The steering levers are attached to pivoting bellcranks that pivot on a steering shaft and plastic bushings. The bellcranks have grease fittings.

The forward travel is adjusted by drift adjustment bolts.

The bellcranks are attached to steering linkage bars with rubber torsion bushings pressed into the bellcranks. Bellcranks mount to the control panel.

Steering linkage bars are a two-piece design. Steering linkage bars are adjustable in length for "full travel adjustment".

Steering linkage bars attach to the pintle arms where a rubber torsion bushing is pressed into the pintle arms.

Pintle arms are of a two-piece design that allow easy adjustment of the neutral or "creep".

The steering system returns the levers to their starting position by means of the centering spring and the returning force of the torsion bushings.

NOTE: Torsion bushings need to be replaced if torn or rotating in the housing. Loosen torsion bushing bolts slightly before adjustments are made. Do not fully tighten torsion bushing bolts again until all steering adjustments have been made first.

Sequence of steering adjustments:

1. Set neutral of pintle arms, "creep"
2. Set linkage travel at steering linkage bars
3. Set drift at drift adjustment bolts

Removal and Installation

DANGER

AVOID DEATH

- Disconnecting or loosening any hydraulic tubeline, hose, fitting, component or a part failure can cause lift arms to drop.
- Keep out of this area when lift arms are raised unless supported by an approved lift arm support. Replace if damaged. 57051



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WARNING

Never work on a machine with the lift arms up unless the lift arms are secured by an approved lift arm support device. Failure to use an approved lift arm support device can allow the lift arms or attachment to fall and cause injury or death.

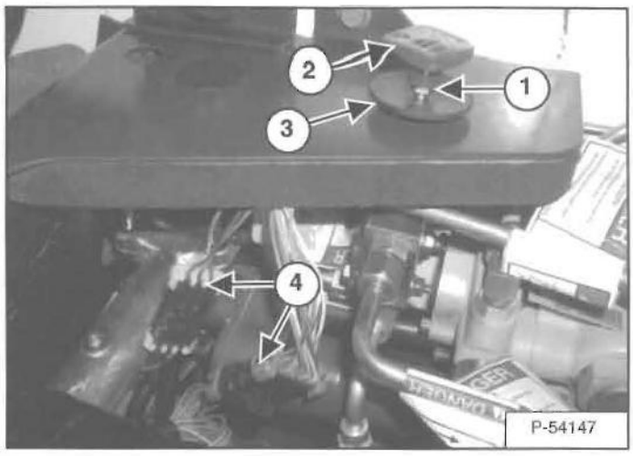
W-2059-0598

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 50-100-2



Raise the lift arms and install an approved lift arm support device. (See Contents Page 10-01.)

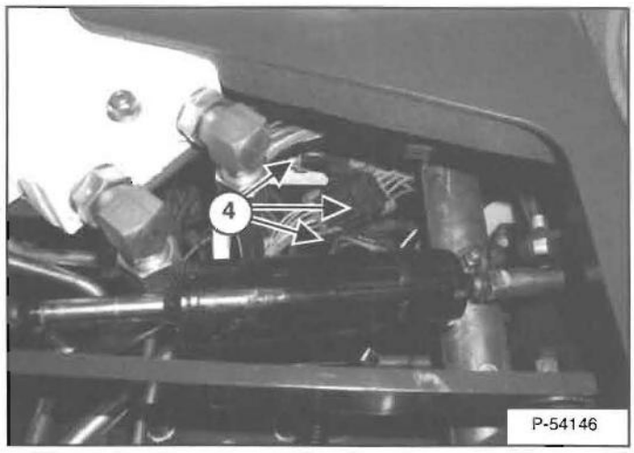
Raise the operator cab. (See Contents Page 10-01.)

Remove the engine speed control. (See Contents Page 70-01.)

Loosen the jam nut (Item 1) from the by-pass control knob (Item 2) **[Figure 50-100-2]**.

Remove the control knob (Item 2), jam nut (Item 1) and rubber washer (Item 3) **[Figure 50-100-3]**.

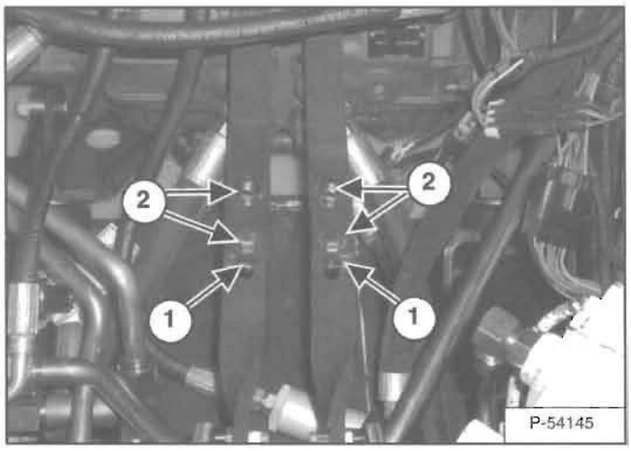
Figure 50-100-3



Disconnect the control harness connectors (Item 4) **[Figure 50-100-2]** & **[Figure 50-100-3]** from the control levers.

Removal and Installation (Cont'd)

Figure 50-100-4

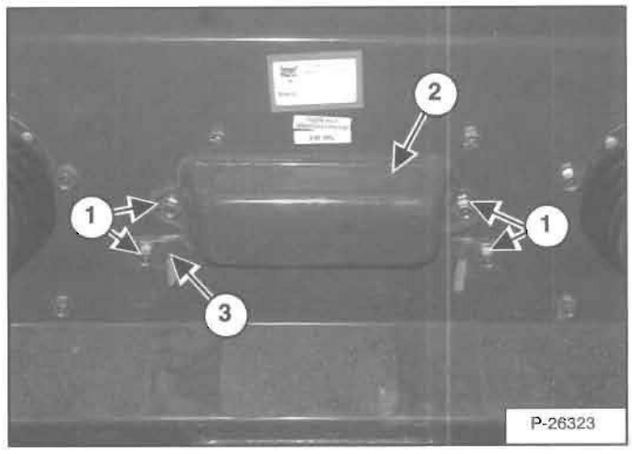


Scribe a mark across the top of the steering linkage bars (Item 1) **[Figure 50-100-4]** which are connected to the steering shaft on the control panel.

Remove the four steering linkage mounting bolts (Item 2) **[Figure 50-100-4]**.

Installation: Align the marks on the steering linkage bars. Tighten the steering linkage mounting bolts to 35-40 ft.-lbs. (47,5-54,2 Nm) torque.

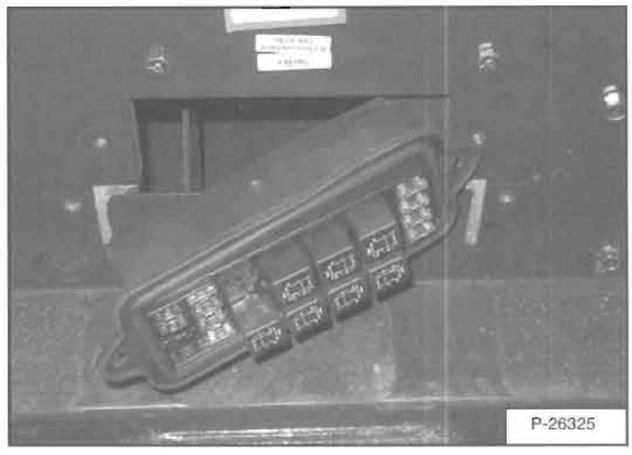
Figure 50-100-5



Remove the fuse/relay mounting bolts (Item 1) **[Figure 50-100-5]**.

Remove the fuse/relay cover (Item 2) and fuse/relay block retaining bracket (Item 3) **[Figure 50-100-5]**.

Figure 50-100-6



Remove the fuse/relay block **[Figure 50-100-6]**.

Removal and Installation (Cont'd)

Figure 50-100-7

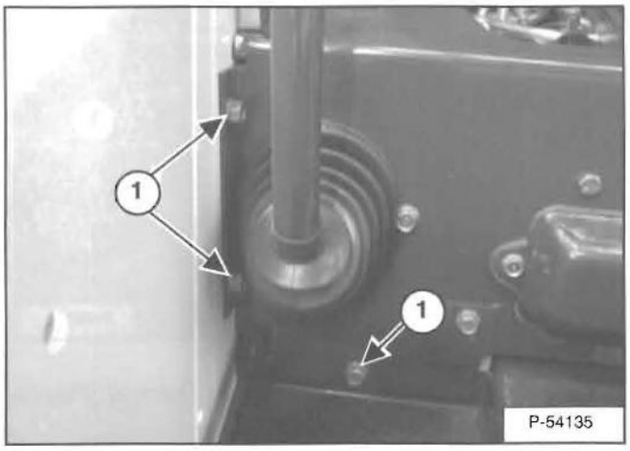


Figure 50-100-8

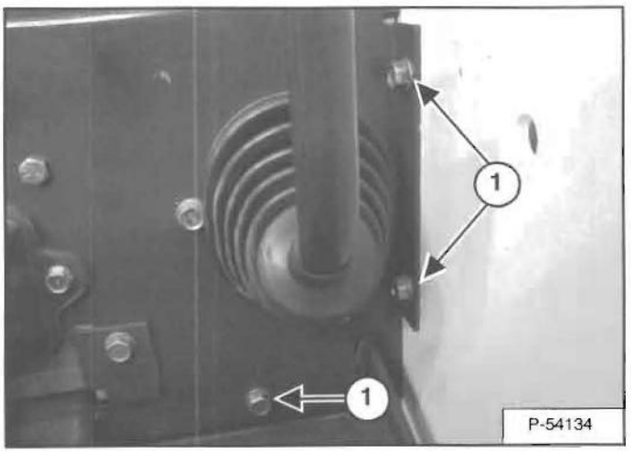
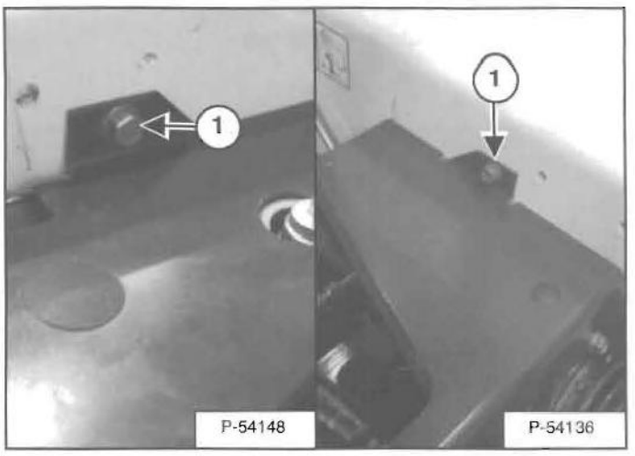


Figure 50-100-9



Remove the control panel mounting bolts (Item 1) **[Figure 50-100-7]**, **[Figure 50-100-8]** & **[Figure 50-100-9]** from both sides of the control panel.

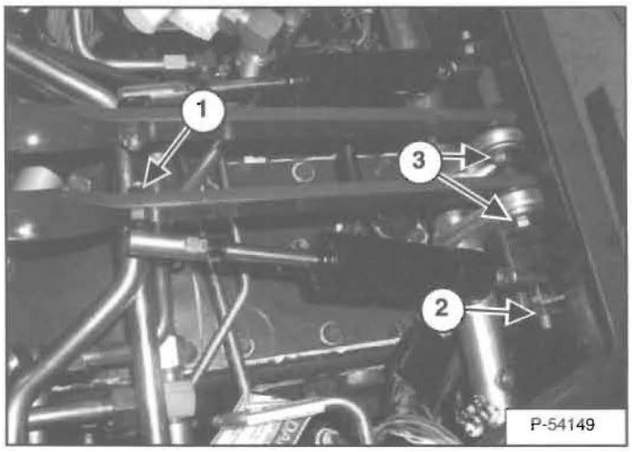
Installation: Tighten the control panel mounting bolts to 15-20 ft.-lbs. (20-27 Nm) torque.

Remove the control panel from the loader.

Reverse the removal procedure to install the control panel.

Shock Removal And Installation

Figure 50-100-10



Remove the mounting nut (Item 1) **[Figure 50-100-10]** from the end of the shock connected to the steering linkage.

Remove the mounting nut (Item 2) **[Figure 50-100-10]** from the other end of the shock connected to the bracket on the control panel.

Installation: Tighten the mounting bolts to 25-28 ft.-lbs. (34-38 Nm) torque.

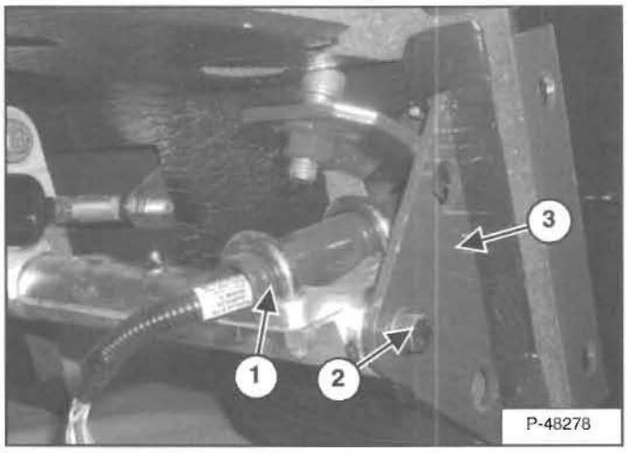
Shaft Removal And Installation

NOTE: The steering shaft can be removed without removing the control panel from the loader. Photo [Figure 50-100-11] shows the control panel removed for clarity purpose only.

Remove the steering linkage mounting bolts (Item 3) **[Figure 50-100-10]**.

Remove the steering shock mounting nuts (Item 2) **[Figure 50-100-10]**.

Figure 50-100-11



Remove Control Handle Lever (Item 1) **[Figure 50-100-11]**. (See Contents Page 50-01.)

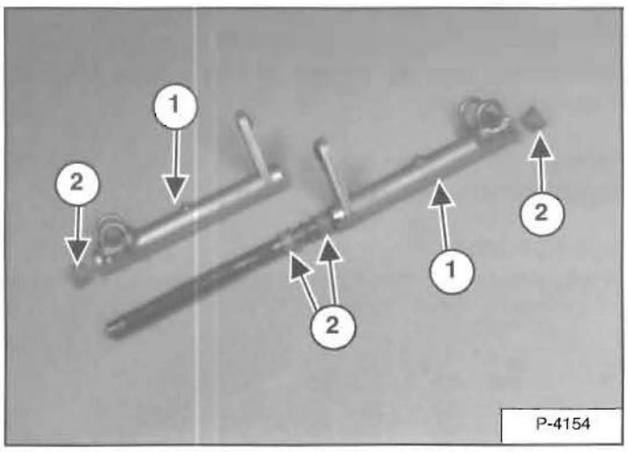
Remove the steering shaft pivot bolt (Item 2) **[Figure 50-100-11]** from both sides of the control panel.

Installation: Tighten the pivot bolts to 25-28 ft.-lbs. (34-38 Nm) torque.

Remove the steering shaft from the control panel.

Shaft Disassembly And Assembly

Figure 50-100-12

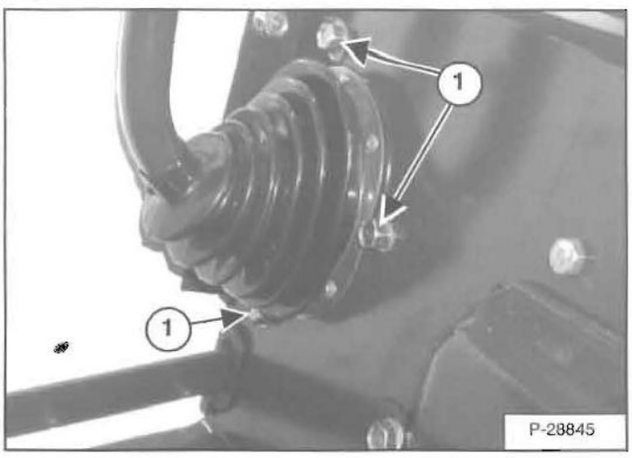


Disassemble the right and left steering bellcranks (Item 1) from the cross shaft assembly **[Figure 50-100-12]**.

Assembly: Install new nylon bushings (Item 2) **[Figure 50-100-12]** as needed when assembling the steering shaft. Be sure to apply grease on the cross shaft before installing the right and left bellcranks.

NOTE: The bellcranks should pivot freely on the cross shaft when assembled correctly.

Figure 50-100-13



To remove the steering shaft mounting bracket (Item 3) **[Figure 50-100-11]**, remove the three mounting bolts (Item 1) **[Figure 50-100-13]** from the front of the control panel.

Remove the steering shaft mounting bracket.

Installation: Tighten the mounting bolts to 15-20 ft.-lbs. (20-27 Nm) torque.

Linkage Removal And Installation

⚠ WARNING

Never work on a machine with the lift arms up unless the lift arms are secured by an approved lift arm support device. Failure to use an approved lift arm support device can allow the lift arms or attachment to fall and cause injury or death.

W-2059-0598

⚠ WARNING

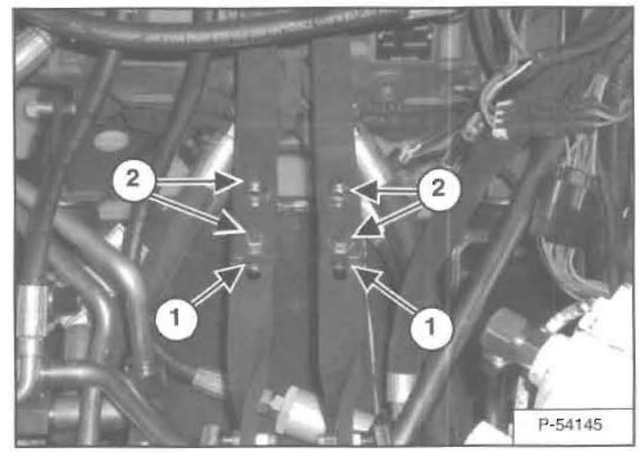
Put jackstands under the front axles and rear corners of the frame before running the engine for service. Failure to use jackstands can allow the machine to fall or move and cause injury or death.

W-2017-0286

Raise the lift arms and install an approved lift arm support device. (See Contents Page 10-01.)

Lift and block the loader. (See Contents Page 10-01.)

Figure 50-100-14



Scribe a mark across the top of the steering linkage bars (Item 1) **[Figure 50-100-14]** which are connected to the steering shaft on the control panel.

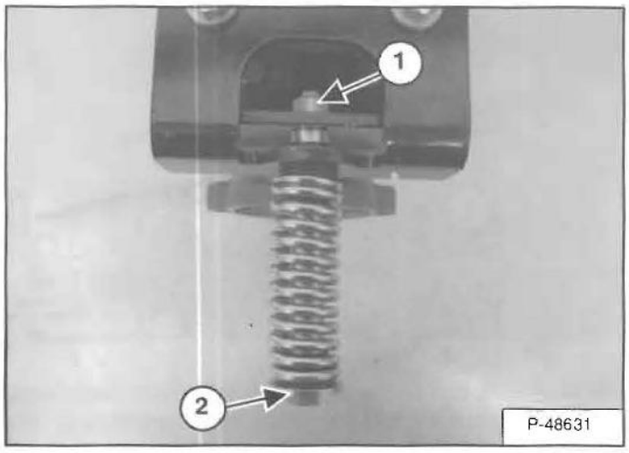
Remove the four steering linkage mounting bolts (Item 2) **[Figure 50-100-14]**.

Installation: Align the marks on the steering linkage bars. Tighten the steering linkage mounting bolts to 35-40 ft.-lbs. (47,5-54,2 Nm) torque.

NOTE: After removal and installation of the linkage, the linkage neutral adjustment procedure must be performed. See Page 50-100-13 for Linkage Neutral Adjustment procedure.

Linkage Removal And Installation (Cont'd)

Figure 50-100-15

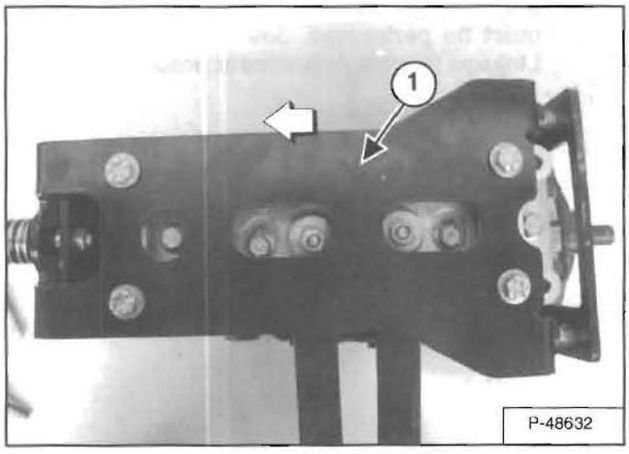


Remove the nut (Item 1) from the end of the centering spring shoulder bolt (Item 2) **[Figure 50-100-15]**.

Remove the bolt/spring assembly.

Installation: Tighten the centering spring bolt and a **NEW** lock nut to 25-28 ft.-lbs. (34-38 Nm) torque.

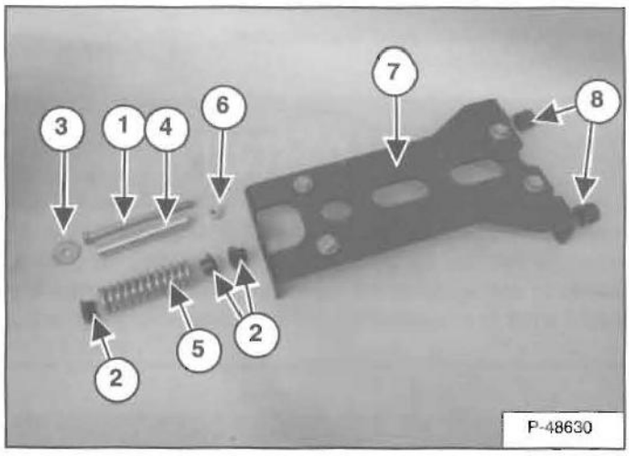
Figure 50-100-16



Slide the centering plate (Item 1) **[Figure 50-100-16]** to the right to remove it from the hydrostatic pumps.

NOTE: Directions are shown and stated as if you were sitting in the operators seat.

Figure 50-100-17

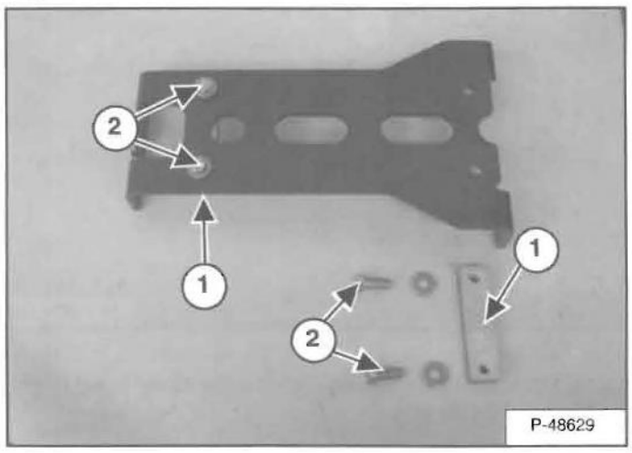


The centering plate/centering spring assembly consists of the following parts:

ITEM	DESCRIPTION
1	Bolt
2	Bushings
3	Washer
4	Bushing Spacer
5	Spring
6	Lock Nut
7	Centering Plate
8	Guide Bushings

Linkage Removal And Installation (Cont'd)

Figure 50-100-18



Check the wear on the centering blocks (Item 1) **[Figure 50-100-18]**.

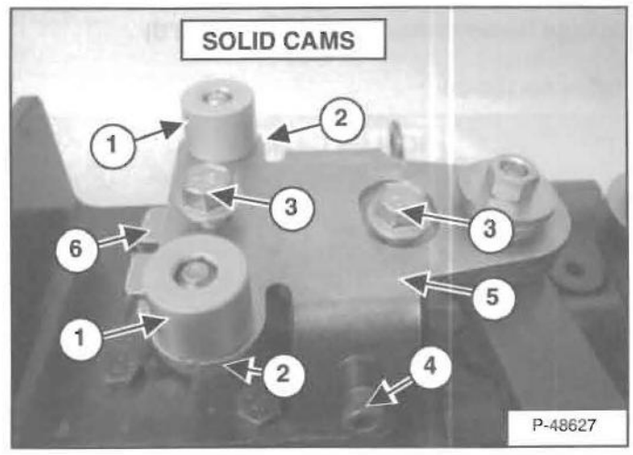
If the centering blocks need replacement, remove the bolts (Item 2) **[Figure 50-100-18]**. Remove the centering blocks.

Installation: Tighten the centering block bolts to 35-40 ft.-lbs. (47,5-54,2 Nm) torque.

NOTE: The washers go between the bolts and the centering plate.

NOTE: If the centering blocks are worn, they can be removed and rotated 180 degrees and reinstalled. If the solid cams are worn, they can be loosened and rotated 90 degrees and reinstalled.

Figure 50-100-19



If the surface of any of the four solid pintle cams (Item 1) are worn, loosen the bolt (Item 2) and rotate the cams 1/4 turn **[Figure 50-100-19]**.

Remove the bolts and washers (Item 3) **[Figure 50-100-19]** from the pintle.

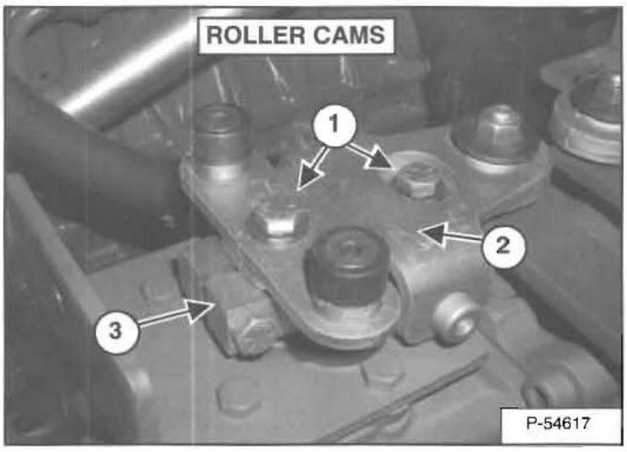
Installation: Tighten the bolts to 35-40 ft.-lbs. (47,5-54,2 Nm) torque.

Loosen the creep adjustment bolt (Item 4) **[Figure 50-100-19]**.

Remove the pintle arm (Item 5) from the pintle base (Item 6) **[Figure 50-100-19]**.

Linkage Removal And Installation (Cont'd)

Figure 50-100-20

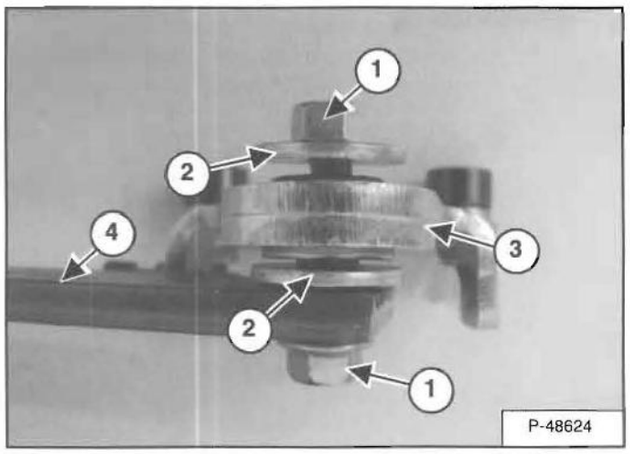


Remove the bolts and washers (Item 1) **[Figure 50-100-20]** from the pintle.

Installation: Tighten the bolts to 35-40 ft.-lbs. (47,5-54,2 Nm) torque.

Remove the pintle arm (Item 2) from the pintle base (Item 3) **[Figure 50-100-20]**.

Figure 50-100-21

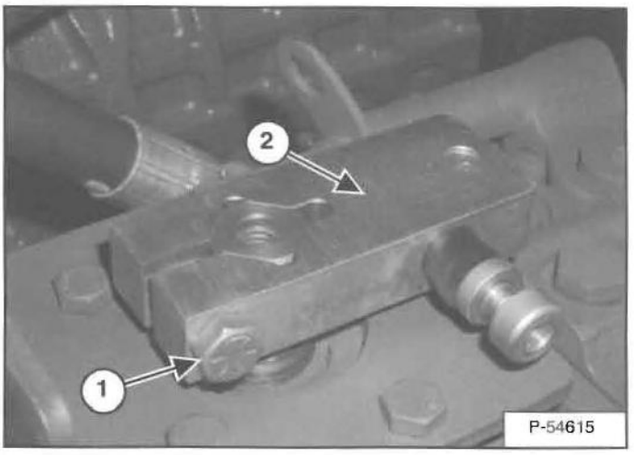


Remove the bolt and nut (Item 1) **[Figure 50-100-21]**.

Inspect the washers (Item 2), pintle arm (Item 3) and the steering linkage bar (Item 4) for damage and replace as needed **[Figure 50-100-21]**.

NOTE: The washers (Item 2) [Figure 50-100-21] are hardened, and should only be replaced through Bobcat Parts.

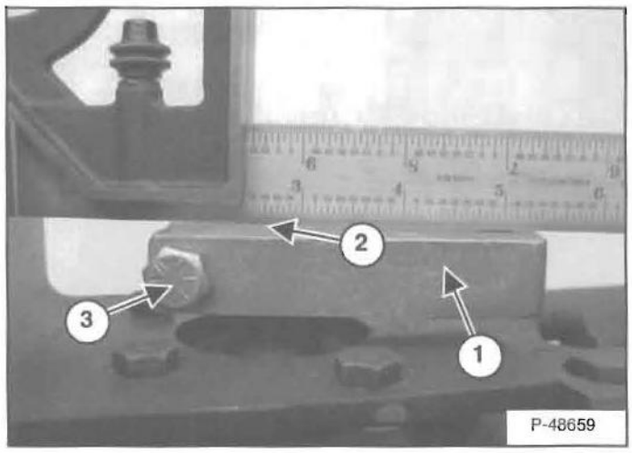
Figure 50-100-22



Loosen the bolt (Item 1) and remove the pintle base (Item 2) **[Figure 50-100-22]**.

Linkage Removal And Installation (Cont'd)

Figure 50-100-23



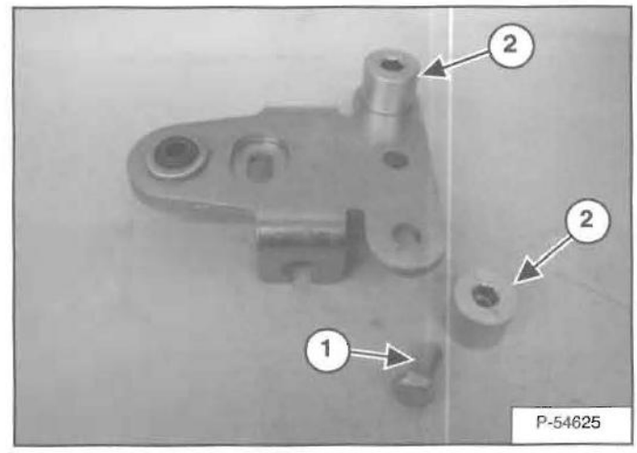
NOTE: When installing the pintle base (Item 1) onto the pump shaft, the cutouts on the pump shaft will not line up with the bolt (Item 3) [Figure 50-100-23].

Installation: Install the pintle base (Item 1) onto the pump shaft (Item 2) **[Figure 50-100-23]**. The top of the pintle base should be level with the top of the pump shaft. Tighten the bolt to 35-40 ft.-lbs. (47,5-54,2 Nm) torque.

NOTE: After installing the linkage onto the hydrostatic pumps the linkage neutral adjustment procedure must be performed. See Page 50-100-13 for Linkage Neutral Adjustment procedure.

Pintle Arm Disassembly and Assembly

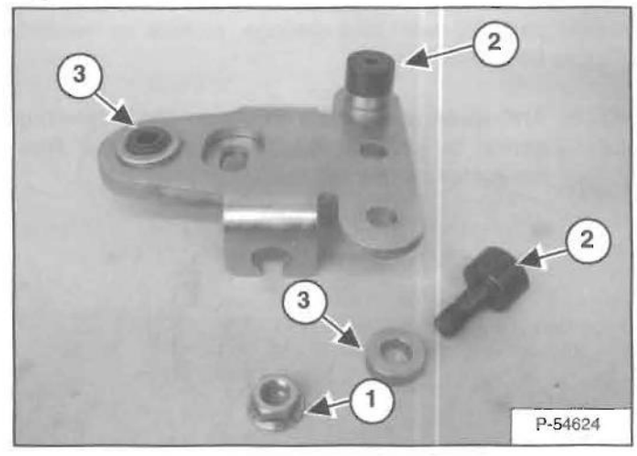
Figure 50-100-24



Remove the bolt (Item 1) from the pintle solid cams (Item 2) **[Figure 50-100-24]** and inspect the pintle solid cams for damage or excessive wear.

Installation: Tighten the bolts to 35-40 ft.-lbs. (47,5-54,2 Nm) torque.

Figure 50-100-25



NOTE: The pintle roller cams (Item 2) [Figure 50-100-25] are used on ACS loaders only.

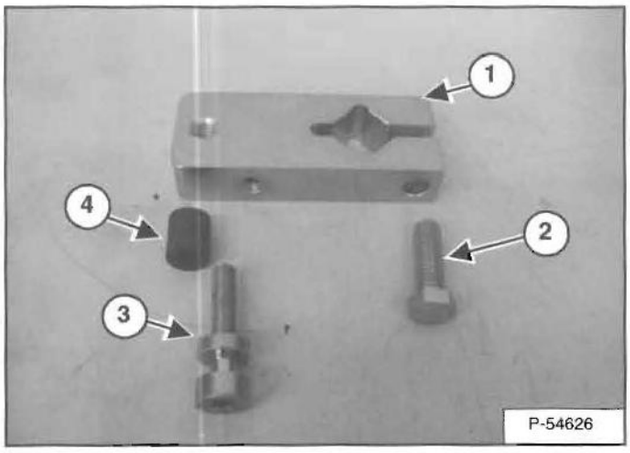
Remove the nut (Item 1) from the pintle roller cams (Item 2) and inspect the pintle roller cams and washers (Item 3) for damage **[Figure 50-100-25]**.

Inspect the torsion bushing (Item 3) **[Figure 50-100-25]** for damage and replace as needed.

Installation: Tighten the nuts to 35-40 ft.-lbs. (47,5-54,2 Nm) torque.

Pintle Arm Disassembly and Assembly (Cont'd)

Figure 50-100-26



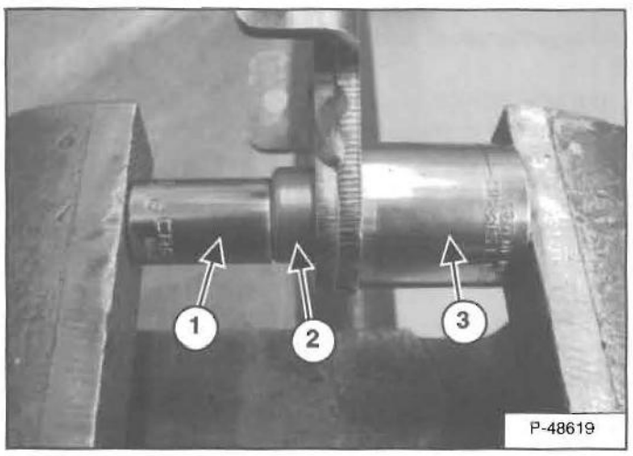
Remove the base pintle (Item 1) **[Figure 50-100-26]** from the pump shaft.

Remove the retaining bolt (Item 2), adjusting screw (Item 3) and neoprene dampener (Item 4) **[Figure 50-100-26]** from the base pintle.

Inspect parts for wear and damage, replace as needed **[Figure 50-100-26]**.

NOTE: Anti-sieze should be used on the adjusting screw to prevent corrosion and allow free movement while adjusting.

Figure 50-100-27



Using a bushing driver (Item 1) remove the torsion bushing (Item 2) by pressing the bushing through the pintle arm into an oversized socket (Item 3) to catch the torsion bushing **[Figure 50-100-27]**.

Installation: Install the torsion bushing (Item 2) **[Figure 50-100-27]** into the pintle arm using the same procedure as the removal.

NOTE: When the torsion bushing is installed, the amount of bushing on each side of the pintle arm should be the same.

Linkage Neutral Adjustment

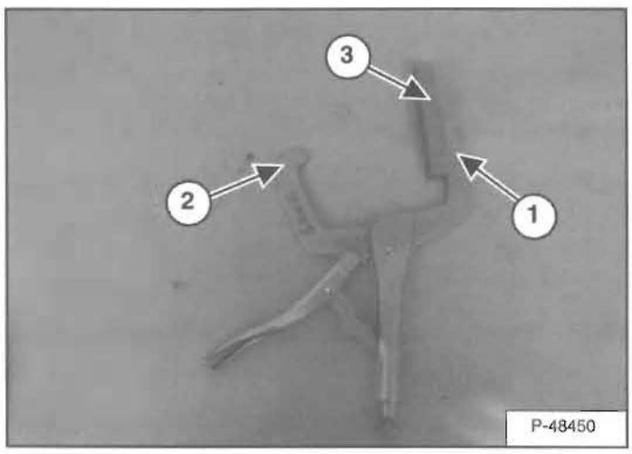
The following tool listed will be needed to do the following procedure:

MEL1563 - Remote Start Tool Kit

Connect the remote start tool to the engine harness. (See Contents Page 10-01.)

Lift and block the loader. (See Contents Page 10-01.)

Figure 50-100-28



Tool that may assist in the neutral adjustment **[Figure 50-100-28]**.

To make this tool use a locking grip C-Clamp and grind one edge flat (Item 1) and grind the other edge (Item 2) **[Figure 50-100-28]** to a small rounded edge.

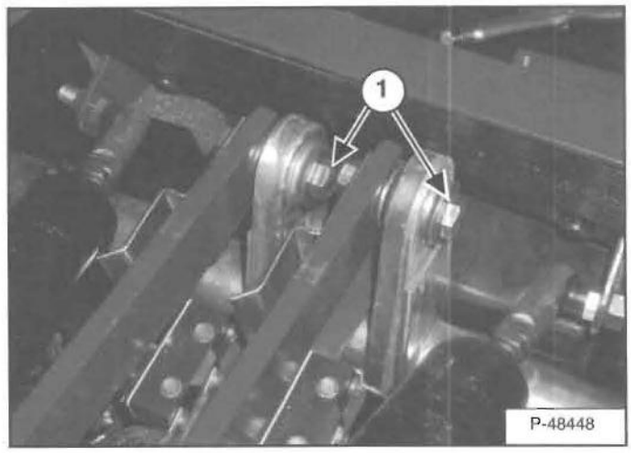
A steering centering block (Item 3) **[Figure 50-100-28]** is also needed. The centering block can be placed as shown and welded to the C-clamp if desired.

⚠ 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.

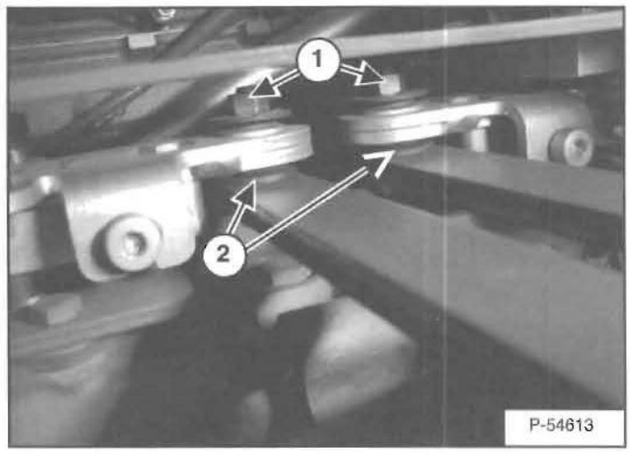
W-2017-0286

Figure 50-100-29



Loosen the bolt/nut (Item 1) **[Figure 50-100-29]** only until the tension is released from the torsion bushing.

Figure 50-100-30

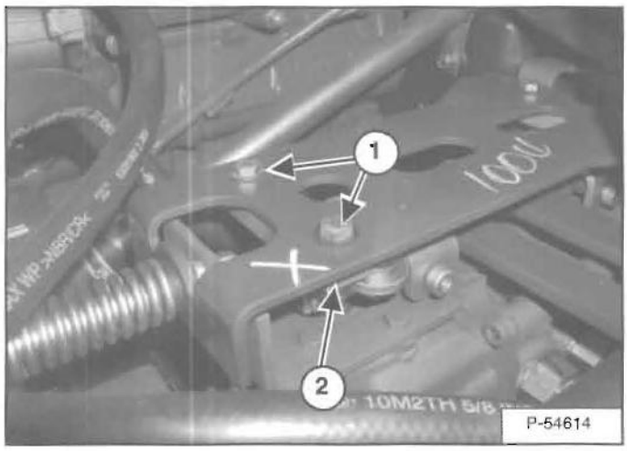


Loosen the nut (Item 1) only until the tension is released from the torsion bushing (Item 2) **[Figure 50-100-30]**.

NOTE: The bolt must be loose enough to allow the torsion bushing (Item 2) [Figure 50-100-30] to turn freely between the torsion bushing and the steering linkage bar.

Linkage Neutral Adjustment (Cont'd)

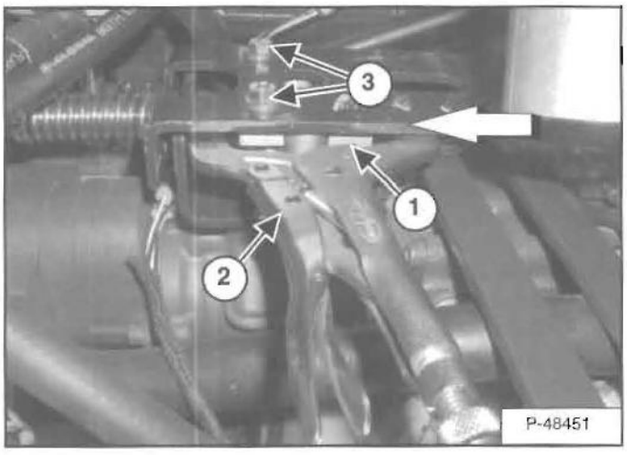
Figure 50-100-31



Loosen the two bolts (Item 1) holding the right centering block. Move the right hand centering block (Item 2) **[Figure 50-100-31]** until both pintle cams contact the centering block.

NOTE: The left centering block is not adjustable. By adjusting the right centering block the left centering block will also become aligned properly.

Figure 50-100-32

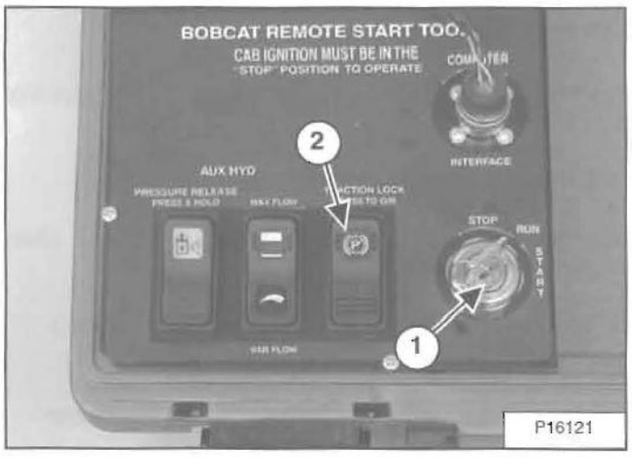


A modified locking grip C-Clamp and steering block shown in **[Figure 50-100-28]** may be used to help in aligning the centering blocks.

Install the centering block (Item 1) on the inside of the pintle cams and the C-Clamp (Item 2) **[Figure 50-100-32]** around both centering blocks.

Lock the C-Clamp in place.

Figure 50-100-33



Using the remote start tool, turn the key (Item 1) **[Figure 50-100-33]** to the run position.

Move the traction lock override switch (Item 2) **[Figure 50-100-33]** so the traction function is unlocked. (The traction lock override switch light will be ON.) On a standard loader the wedge brake will unlock.

NOTE: When the engine is started, the wheels/tracks may begin to move.

NOTE: In loaders equipped with manual steering and hydraulic brake, the steering levers may have to be moved during engine start-up to reduce the amount of creep. This reduction in creep will allow time for the engine to run and build up hydraulic charge pressure, which will release the hydraulic brake.

Using the remote start tool, turn the key (Item 1) **[Figure 50-100-33]** and start the engine and run at low idle.

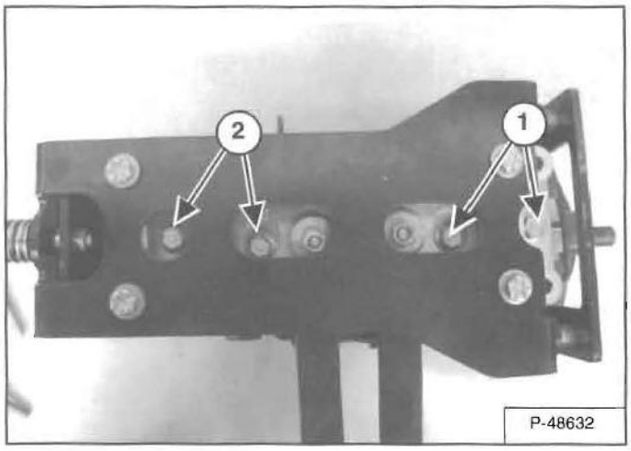
Tighten bolts (Item 3) **[Figure 50-100-32]** to 35-40 ft.-lbs. (47,5-54,2 Nm).

NOTE: Check for slack between centering blocks and pintle cams. If there is excessive slack repeat above steps [Figure 50-100-31] & [Figure 50-100-32].

Linkage Neutral Adjustment (Cont'd)

Start the neutral adjustment procedure with the left pump first and complete the neutral adjustment for the left pump before adjusting the right pump.

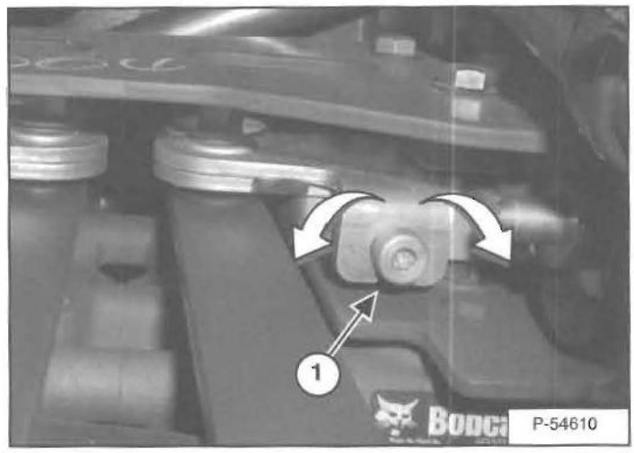
Figure 50-100-34



Loosen the left pump pintle adjustment lock bolts (Item 1). (The right pump pintle adjustment lock bolts are (Item 2) **[Figure 50-100-34]**.) Loosen the bolts enough to allow free movement between the pintle arm and the pintle base.

NOTE: If the bolts are too loose or too tight, the neutral adjustment may be affected.

Figure 50-100-35



Move the engine speed control to high idle.

NOTE: The neutral range (dead-band) will vary between the hydrostatic pumps.

NOTE: This procedure is shown for neutral adjustment on the left side of the loader. The procedure is the same for the right side neutral adjustment.

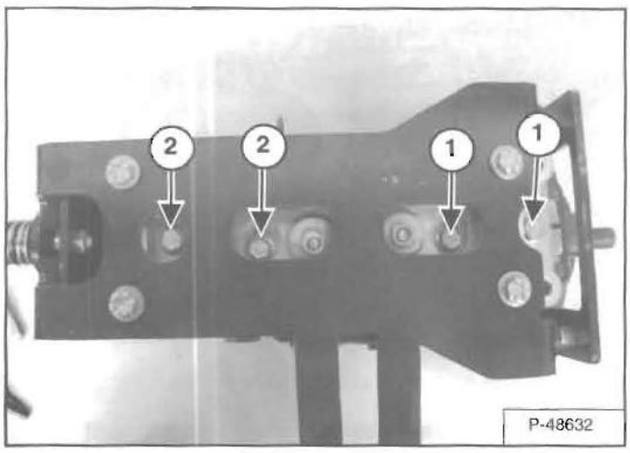
Turn the adjustment screw (Item 1) **[Figure 50-100-35]** counterclockwise until forward creep is seen.

Turn the adjustment screw (Item 1) **[Figure 50-100-35]** counterclockwise to a point between forward and reverse where there is **zero** creep.

Stroke the left steering lever to forward and allow the lever to return to neutral. Stroke the left steering lever to reverse and allow the lever to return to neutral. Check that there is zero creep when the lever returns from either direction, on the left side. Turn the adjustment screw (if necessary) until zero creep is obtained.

Linkage Neutral Adjustment (Cont'd)

Figure 50-100-36



Torque the left pump pintle adjustment lock bolts (Item **1**) **[Figure 50-100-36]** to 35-40 ft.-lbs. (47,5-54,2 Nm).

Repeat the adjustment procedure for the right pump.

Torque the right pump pintle adjustment lock bolts (Item 2) **[Figure 50-100-36]** to 35-40 ft.-lbs. (47,5-54,2 Nm).

Test both levers by moving them backward and forward and letting them return to neutral by the return spring force.

If the levers do not return to neutral and the wheels/ tracks do not come to a complete stop, repeat the adjustment procedure again.

Stop the engine.

Remove one pintle adjustment bolt (Item 1) **[Figure 50-100-36]** at a time and apply loctite 242 or equivalent thread locker to the bolt and re-install the bolt. Torque the bolt to 35-40 ft.-lbs. (47,5-54,2 Nm). Repeat for the three remaining pintle adjustment lock bolts.

NOTE: To maintain proper adjustment setting, remove and reinstall only one bolt at a time. New bolts can be installed with pre applied loctite.

Remove the loader remote start tool.

NOTE: After the neutral adjustment is completed on both pumps, the linkage travel adjustment MUST be completed. (See Page 50-100-17.)

Linkage Travel Adjustment

NOTE: When the linkage travel adjustment procedure is being done as part of the loader neutral adjustment procedure, check the torsion bushings at the pump and at the bell cranks to be sure they are not binding or too loose, which will affect the procedure.

⚠ WARNING

Never work on a machine with the lift arms up unless the lift arms are secured by an approved lift arm support device. Failure to use an approved lift arm support device can allow the lift arms or attachment to fall and cause injury or death.

W-2059-0598

Raise the lift arms and install an approved lift arm support device. (See Contents Page 10-01.)

⚠ 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.

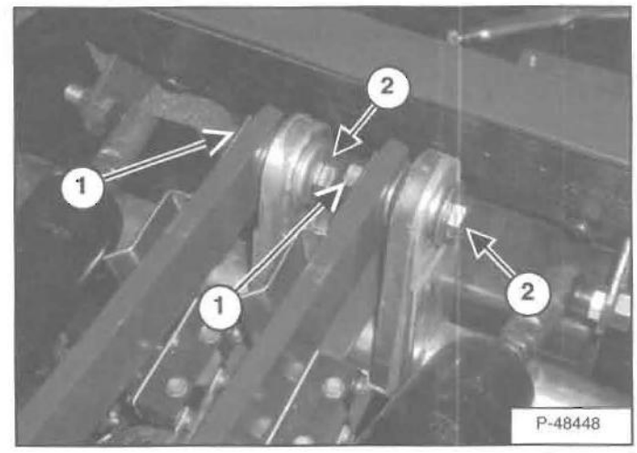
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Lift and block the loader. (See Contents Page 10-01.)

Raise the operator cab. (See Contents Page 10-01.)

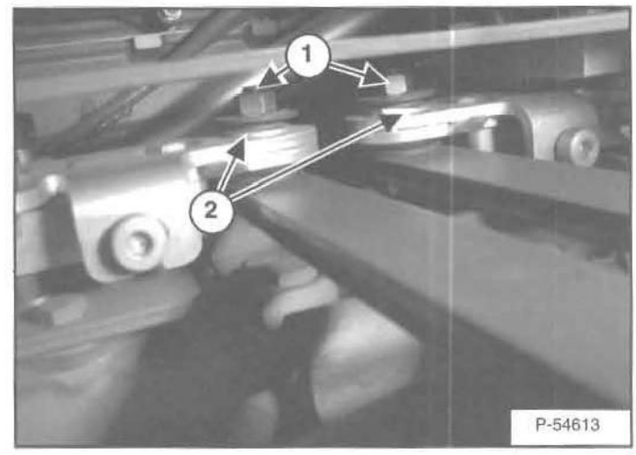
Pre-load tension in the torsion bushings must be removed before adjusting the steering linkage.

Figure 50-100-37



Loosen the nut (Item 1) 3 to 4 turns, then loosen the bolt (Item 2). The bolt (Item 2) **[Figure 50-100-37]** must be loosened enough to allow the torsion bushing to turn freely between the steering bellcrank and the linkage bar.

Figure 50-100-38

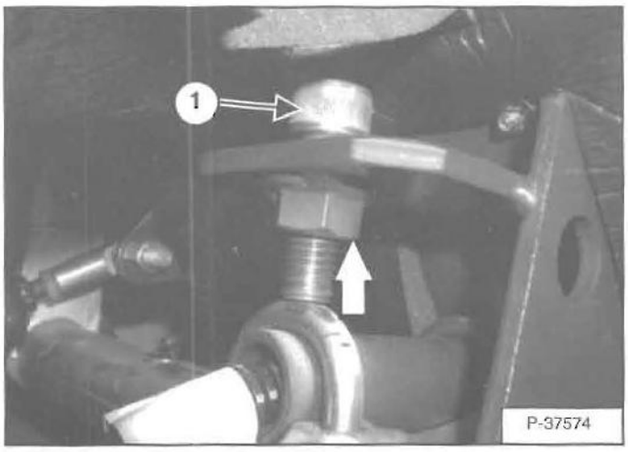


Loosen the nut (Item 1) only until the tension is released from the torsion bushing (Item 2) **[Figure 50-100-38]**.

The bolt must be loose enough to allow the torsion bushing (Item 2) **[Figure 50-100-38]** to turn freely between the torsion bushing and the linkage bar.

Linkage Travel Adjustment (Cont'd)

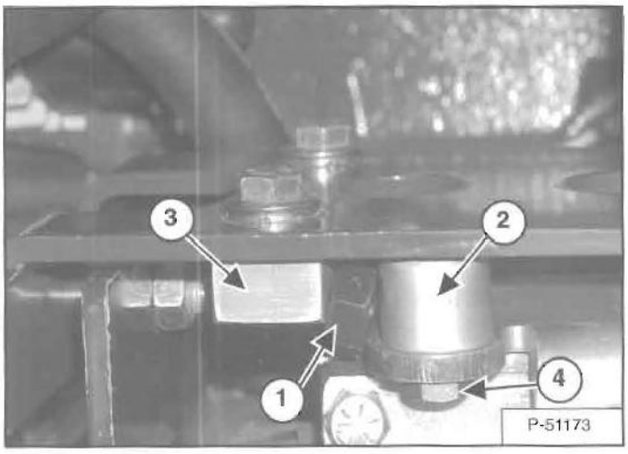
Figure 50-100-39



Remove access plug from the top of the control panel.

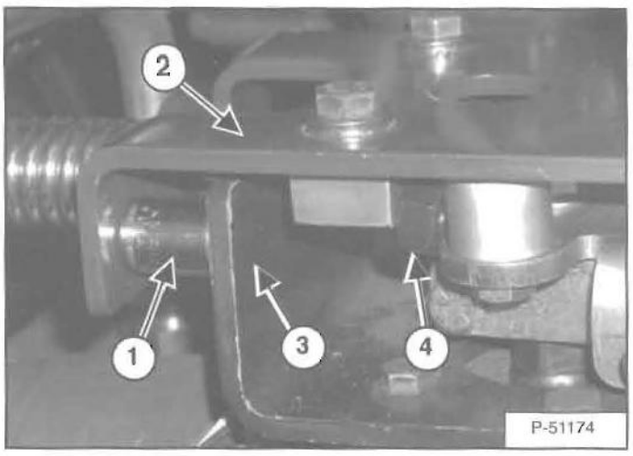
Turn the control lever drift adjustment bolts (Item 1) **[Figure 50-100-39]** (one on each control lever) out until it is flush with the bottom of the nut.

Figure 50-100-40



Move the right side steering lever to the rear and install a 3/8 inch (10 mm) thick spacer (Item 1) between the pintle arm cam (Item 2) and the centering block (Item 3) **[Figure 50-100-40]**.

Figure 50-100-41

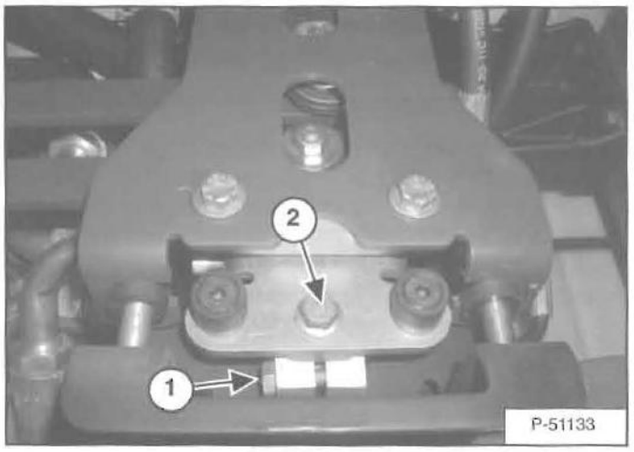


Move the right side steering lever forward and install a 15/16 inch (24 mm) thick spacer (Item 1) between the center plate (Item 2) and the mounting plate (Item 3) **[Figure 50-100-41]**.

This will allow the pintle arms to move freely while adjusting the steering linkage for full forward travel speed.

Remove the 3/8 inch (10 mm) thick spacer (Item 4) **[Figure 50-100-41]**.

Figure 50-100-42

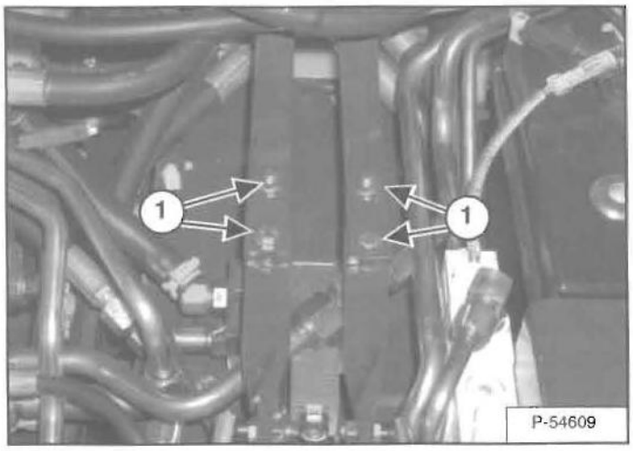


Before adjusting the linkage, check that the base pintle arm mounting bolt (Item 1) and both of the upper pintle mount bolts (Item 2) **[Figure 50-100-42]** and tighten to 35-40 ft.-lbs. (48-54 Nm) torque. There should be no play between the pintle arm and the square pump shaft.

Also check that the cam mounting nuts or bolts (Item 4) **[Figure 50-100-40]** are tight, 35-40 ft.-lbs. (48-54 Nm) torque .

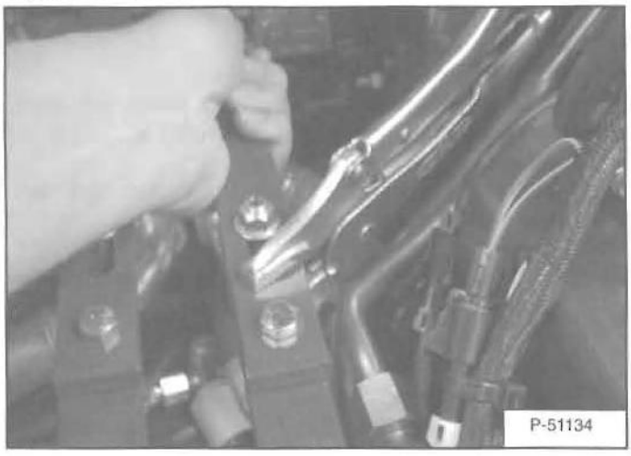
Linkage Travel Adjustment (Cont'd)

Figure 50-100-43



Loosen the two bolts and nuts (Item 1) **[Figure 50-100-43]** on each steering linkage bar.

Figure 50-100-44



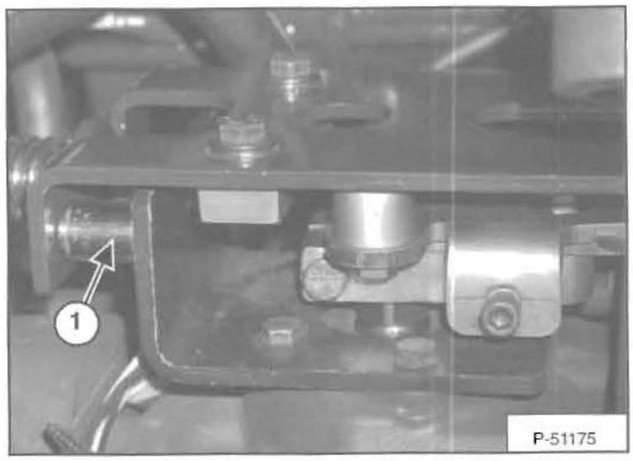
Move the left control lever to the full forward position, then pull forward on the left rear linkage bar until the pintle arm is rotated to the front as far as possible **[Figure 50-100-44]**. Use a locking plier, clamp the two linkage bars together.

Installation: Tighten the nuts and bolts to 35-40 ft.-lbs. (47,5-54,2 Nm) torque.

Check the lever movement to make sure that the pintle arm and the control lever are both at full stroke at the same time. This will allow for maximum forward speed.

Repeat the linkage travel adjustment procedure for the right side linkage.

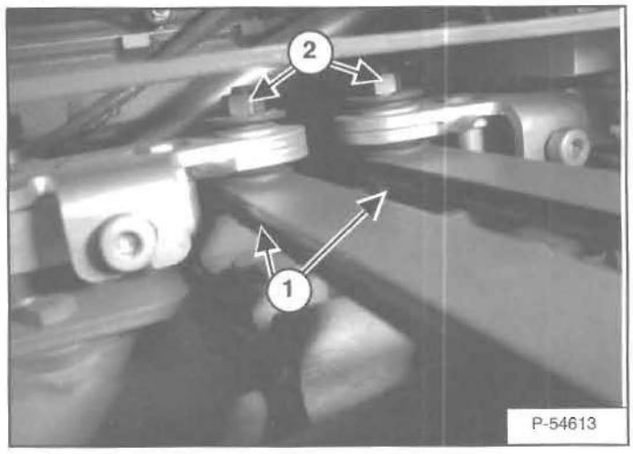
Figure 50-100-45



Remove the spacer (Item 1) **[Figure 50-100-45]**.

Disconnect the remote start tool. (See Contents Page 10-01.)

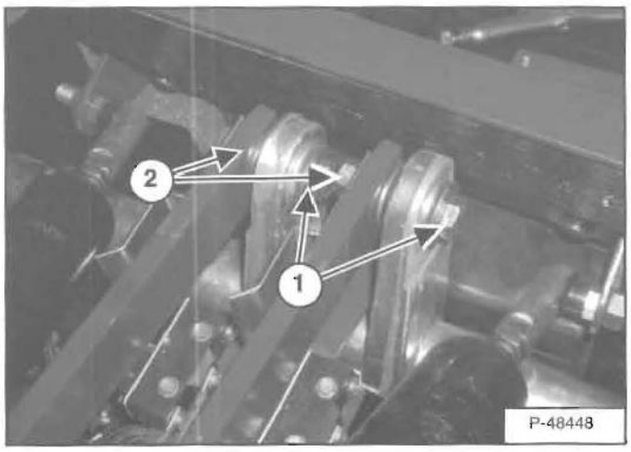
Figure 50-100-46



Tighten the two bolts (Item 1) and nuts (Item 2) to 35-40 ft.-lbs. (47,5-54,2 Nm) **[Figure 50-100-46]**.

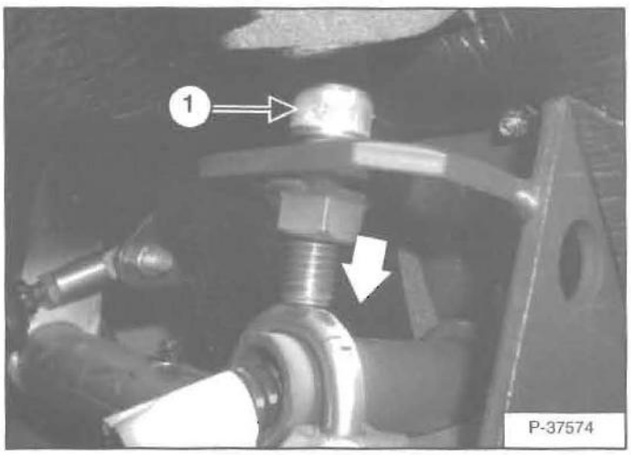
Linkage Travel Adjustment (Cont'd)

Figure 50-100-47



Tighten the two bolts and nuts (Items 1 & 2) **[Figure 50-100-47]** to 35-40 ft.-lbs. (47,5-54,2 Nm) torque at the steering bell cranks.

Figure 50-100-48



Push the control lever to full stroke and turn drift adjustment bolt (Item 1) **[Figure 50-100-48]** in until it touches the U-bolt holding the control lever.

Repeat steps on the other control lever.

Drive the loader forward and check for drift.

The traditional benchmark for drift is less than 10 ft. of "drift" in 100 ft. of travel distance.

If the drift is excessive to the left, turn the right adjustment bolt (Item 1) **[Figure 50-100-48]** in.

If the drift is excessive to the right, turn the left adjustment bolt in.

NOTE: When using the drift adjustment bolts, only adjust one bolt for each test drive.

In addition, only move each bolt a maximum of one turn for each test drive. This will help prevent over-correction and excessive reduction in travel speed.

Drift adjustment is for forward travel only.

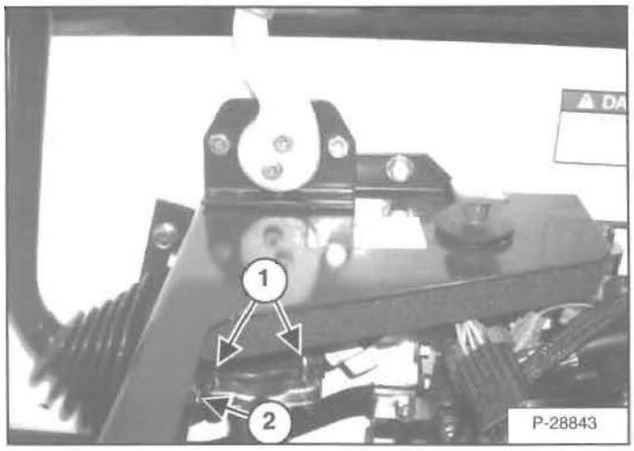
Adjust the drift to an acceptable level.

Re-install the plug in the drift bolt access hole after adjustment.

CONTROL HANDLE

Control Lever Removal And Installation

Figure 50-110-1



Disconnect the electrical connectors from the control lever **[Figure 50-110-1]**.

Remove the nuts from the two U-bolts (Item 1) **[Figure 50-110-1]** used to mount the control lever.

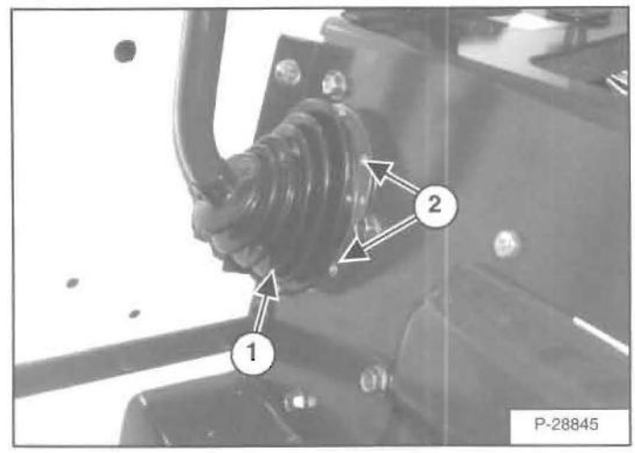
Remove the U-bolts from the control lever mount.

Remove the control lever (Item 2) **[Figure 50-110-1]** by sliding the lever through the rubber boot (Item 1) **[Figure 50-110-2]** on the front of the control panel.

Installation: Tighten the u-bolts so the lever can not be moved right or left when seated in the operator seat. Be sure the control lever does not interfere with the operator cab when lowering or raising the cab.

Control Rubber Boot Replacement

Figure 50-110-2



To replace the rubber boot (Item 1) **[Figure 50-110-2]** on the control panel, remove the control lever (See Control Lever Removal And Installation on Page 50-110-1.)

Drill out the four rivets (Item 2) **[Figure 50-110-2]** located on the flange of the rubber boot and remove the old boot.

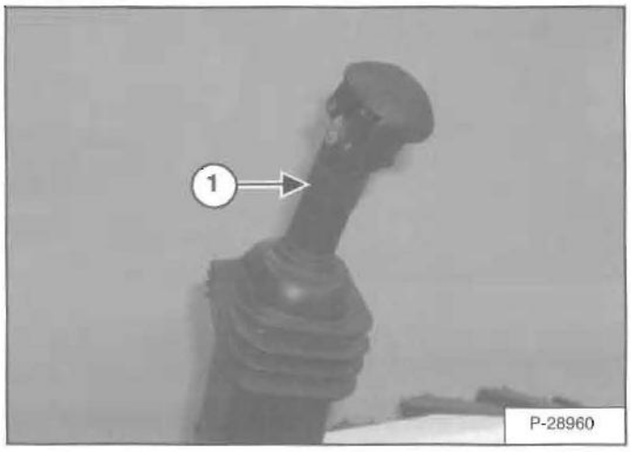
Install the new boot and reinstall the control lever.


Bobcat®

CONTROL HANDLE (ADVANCED CONTROL SYSTEM) (ACS) SELECTABLE HAND/FOOT CONTROL

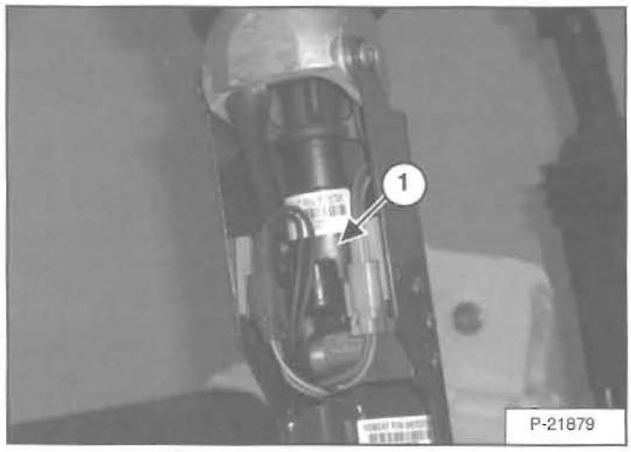
Components Identification

Figure 50-111-1



Control Handle (Item 1) **[Figure 50-111-1]**.

Figure 50-111-2

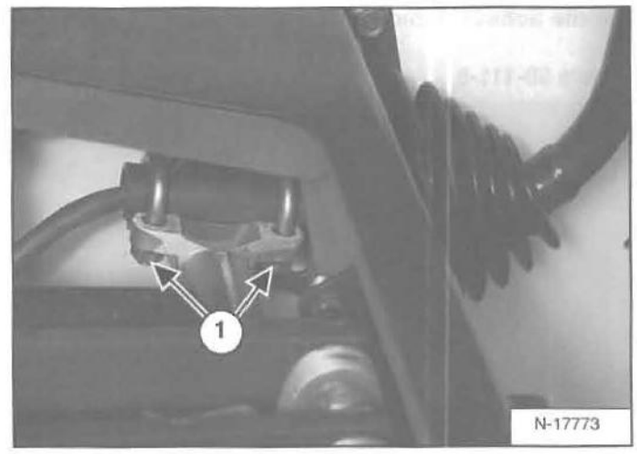


Handle Sensor (Item 1) **[Figure 50-111-2]**.

NOTE: The calibration procedure must be followed when replacing handle sensor, foot pedal sensor, actuator or ACS Controller. (See Contents Page 60-01.)

Handle Sensor Removal And Installation

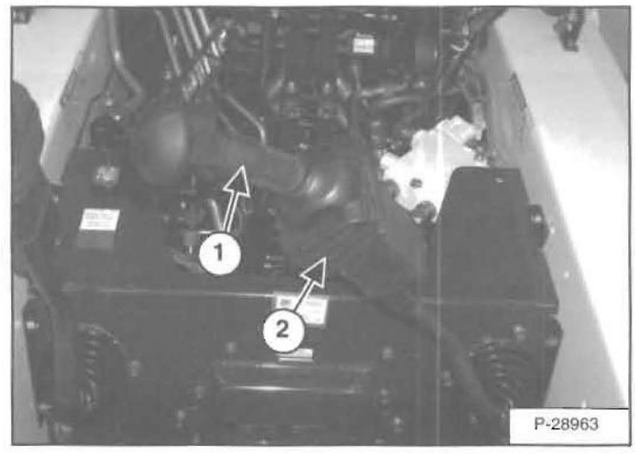
Figure 50-111-3



Loosen the nuts (Item 1) **[Figure 50-111-3]**.

Installation: Tighten the u-bolts so the lever can not be moved right or left when seated in the operator seat. Be sure the control lever does not interfere with the operator cab when lowering or raising the cab.

Figure 50-111-4



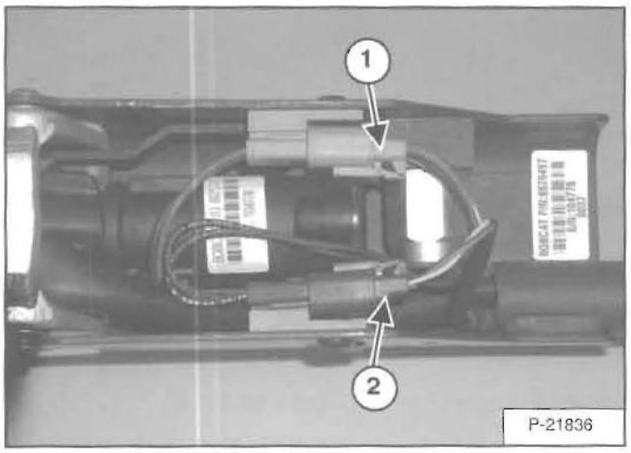
Tilt the control handle (Item 1) **[Figure 50-111-4]** to the center of the loader.

Lift the boot cover (Item 2) **[Figure 50-111-4]**.

CONTROL HANDLE (ADVANCED CONTROL SYSTEM) (ACS) SELECTABLE HAND/FOOT CONTROL (CONT'D)

Handle Sensor Removal And Installation (Cont'd)

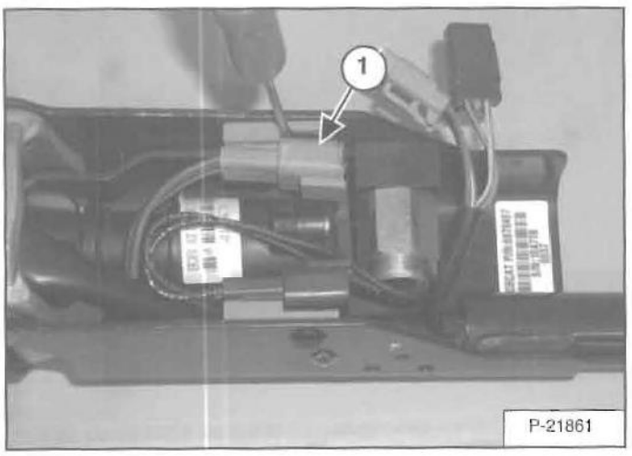
Figure 50-111-5



Disconnect the harness connector (Item 1) **[Figure 50-111-5]** from the handle sensor connector.

Disconnect the harness connector (Item 2) **[Figure 50-111-5]** from the handle lock solenoid connector.

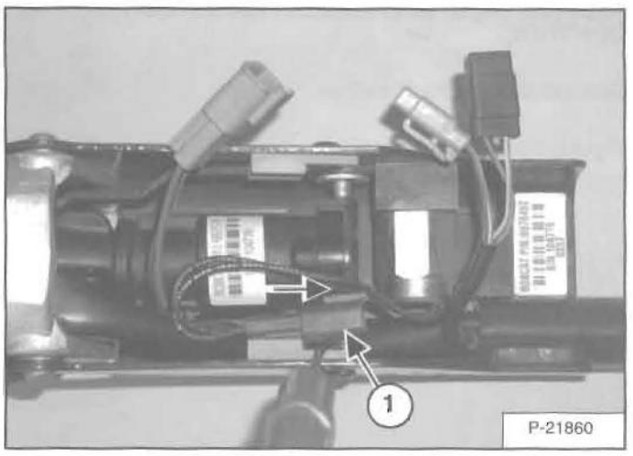
Figure 50-111-6



Remove the handle sensor connector (Item 1) **[Figure 50-111-6]** from the clip.

NOTE: Pry out with a small screw driver and push the connector down.

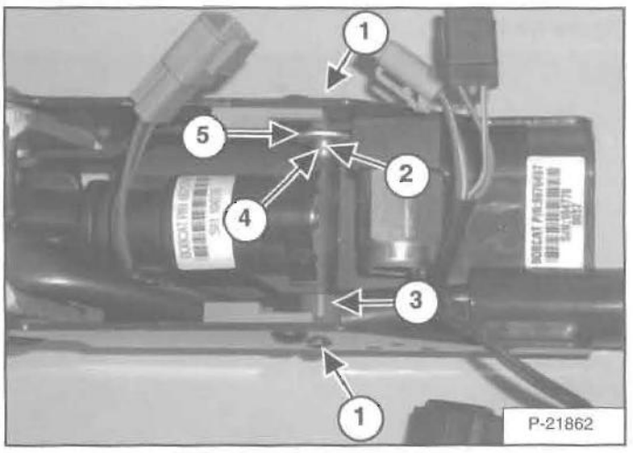
Figure 50-111-7



Remove the handle lock solenoid connector (Item 1) **[Figure 50-111-7]** from the clip.

NOTE: Pry out with a small screw driver and push the connector down.

Figure 50-111-8



Remove one of the two mounting screws (Item 1) **[Figure 50-111-8]** from the handle sensor.

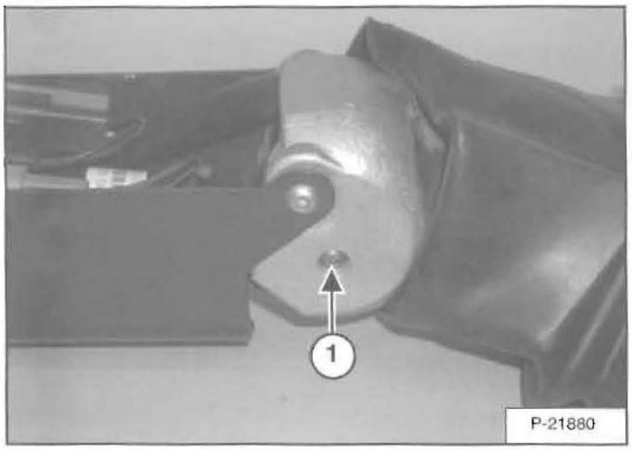
Installation: Tighten screws to 32-38 in.-lbs. (3,6-4,3 Nm) torque.

While removing the mounting pin (Item 2) from the handle sensor, remove the one plastic spacer (Item 3), the spring (Item 4) and washer (Item 5) **[Figure 50-111-8]**.

CONTROL HANDLE (ADVANCED CONTROL SYSTEM) (ACS) SELECTABLE HAND/FOOT CONTROL (CONT'D)

Handle Sensor Removal And Installation (Cont'd)

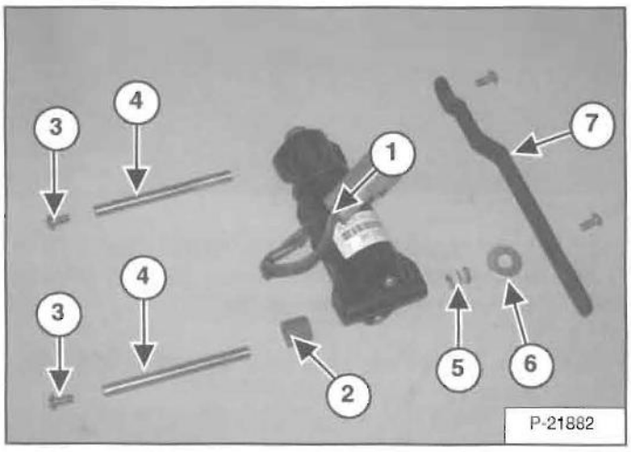
Figure 50-111-9



Remove one of the two mounting screws (Item 1) **[Figure 50-111-9]** from the handle sensor.

Installation: Tighten bolt to 32-38 in.-lbs. (3,6-4,3 Nm) torque.

Figure 50-111-10



Remove the handle sensor (Item 1) **[Figure 50-111-10]** from the handle assembly.

NOTE: The handle sensor (Item 1) [Figure 50-111-10] can only be replaced as a complete assembly.

Check the spacer (Item 2) and screws (Item 3), mounting pin (Item 4), spring (Item 5), washer (Item 6), stop strap (Item 7) **[Figure 50-111-10]** and replace as needed.

Figure 50-111-11

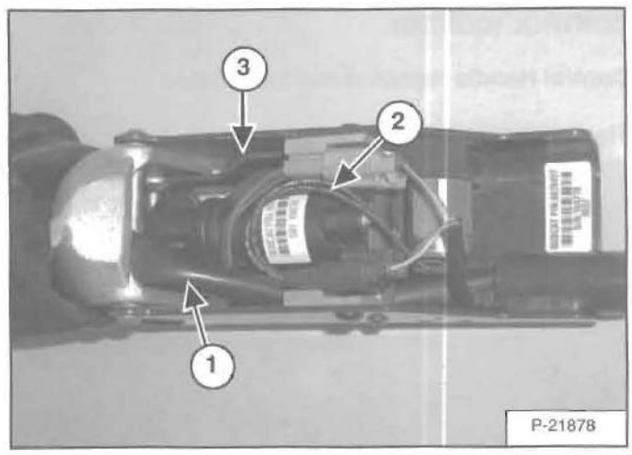
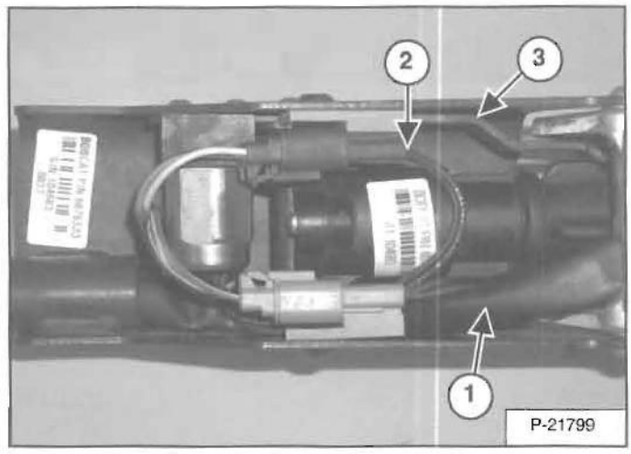


Figure 50-111-12



Installation: When installing the handle sensor into the control handle, check the routing of the switch handle wire harness (Item 1) **[Figure 50-111-11]** & **[Figure 50-111-12]** to assure proper return of the control handle to neutral and minimize harness movement.

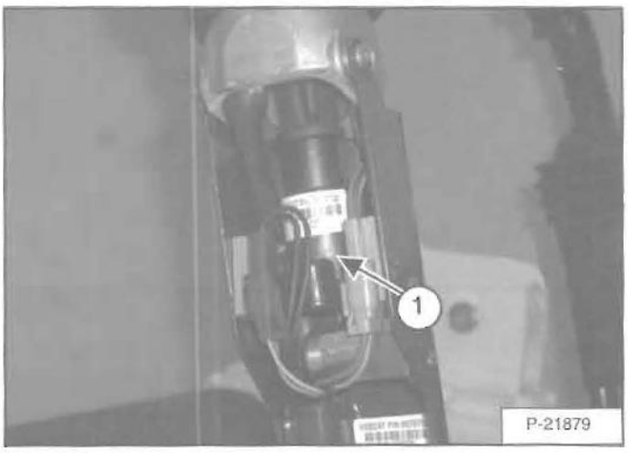
NOTE: Route wires (Item 2) [Figure 50-111-11] & [Figure 50-111-12] as shown away from stop strap (Item 3) [Figure 50-111-11] & [Figure 50-111-12] to avoid wire damage.

NOTE: The calibration procedure must be followed when replacing handle sensor, foot pedal sensor, actuator or ACS Controller. (See Contents Page 60-01.)

CONTROL HANDLE (ADVANCED CONTROL SYSTEM) (ACS) SELECTABLE HAND/FOOT CONTROL (CONT'D)

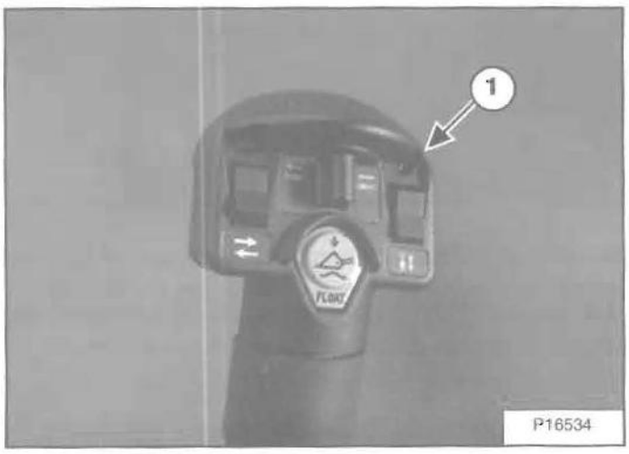
Control Handle Removal and Installation

Figure 50-111-13



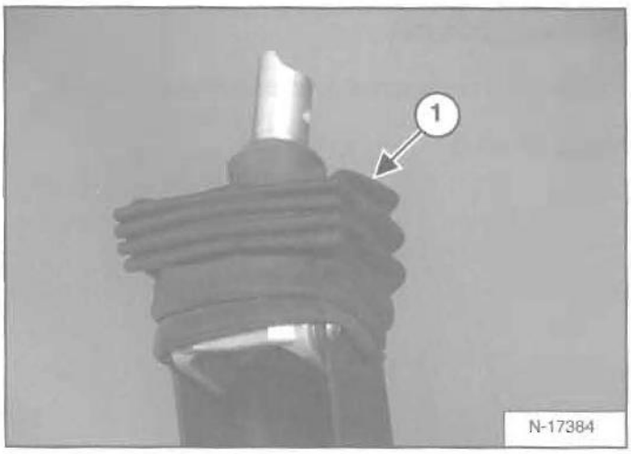
Remove the handle sensor (Item 1) **[Figure 50-111-13]**. (See Contents Page 50-01.)

Figure 50-111-14



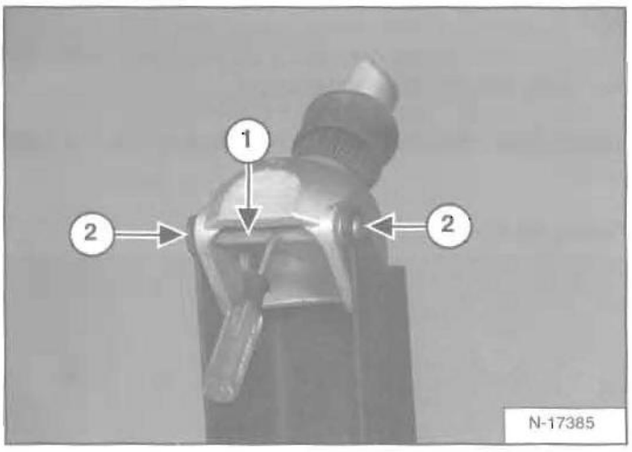
Remove the switch handle (Item 1) **[Figure 50-111-14]**. (See Contents Page 60-01.)

Figure 50-111-15



Remove the rubber handle cover (Item 1) **[Figure 50-111-15]** from the handle.

Figure 50-111-16



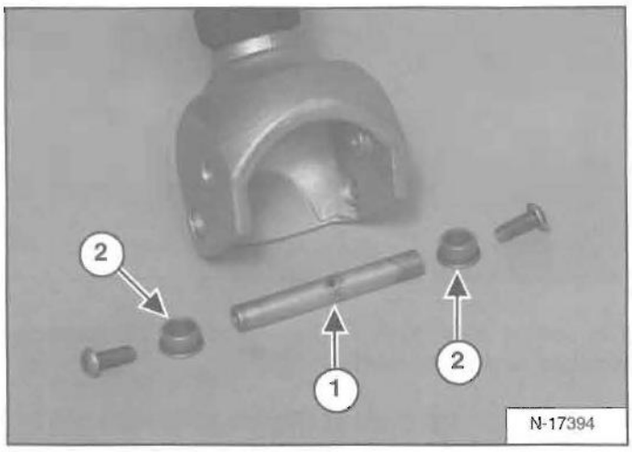
Using a small screwdriver, hold the handle spacer (Item 1) and remove the allen head screws (Item 2) **[Figure 50-111-16]** from the handle assembly.

Installation: Tighten the allen head screws to 35 in.-lbs. (4 Nm) torque.

CONTROL HANDLE (ADVANCED CONTROL SYSTEM) (ACS) SELECTABLE HAND/FOOT CONTROL (CONT'D)

Control Handle Disassembly and Assembly

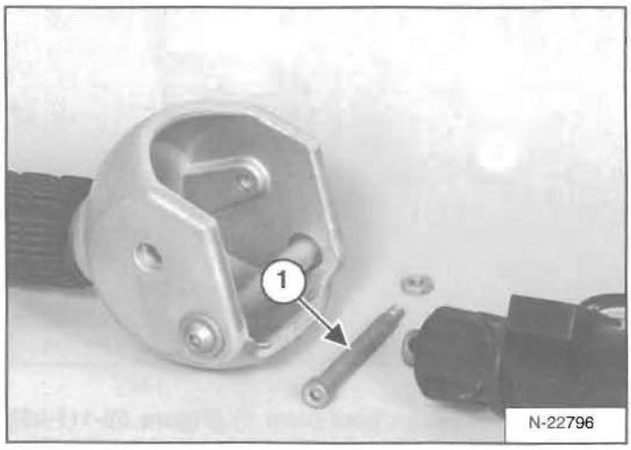
Figure 50-111-17



Remove the handle sleeve (Item 1) and bushings (Item 2) **[Figure 50-111-17]** from the handle.

Check all parts for wear and replace as needed.

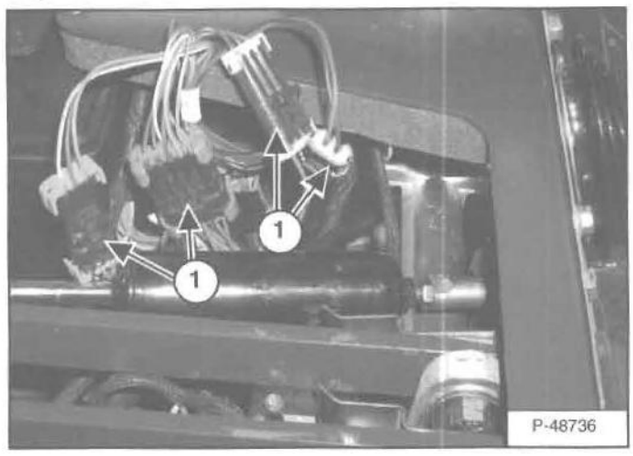
Figure 50-111-18



Check the mounting bolt (Item 1) **[Figure 50-111-18]** that connects the handle to the handle sensor for wear, replace as needed.

Control Lever Removal and Installation

Figure 50-111-19



Disconnect the electrical connectors (Item 1) **[Figure 50-111-19]** from the control lever switch handle.

Remove the electrical connectors from the control lever switch handle. (See Contents Page 60-01.)

Installation: The connectors are color coded, match the colors on the connectors when assembling.

CONTROL HANDLE (ADVANCED CONTROL SYSTEM) (ACS) SELECTABLE HAND/FOOT CONTROL (CONT'D)

Control Lever Removal and Installation (Cont'd)

Figure 50-111-20

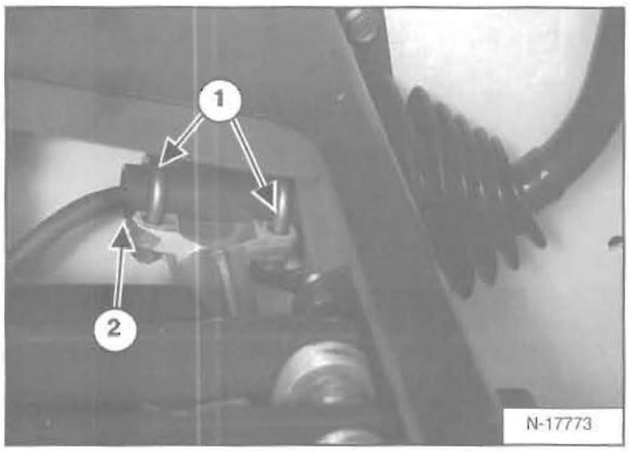
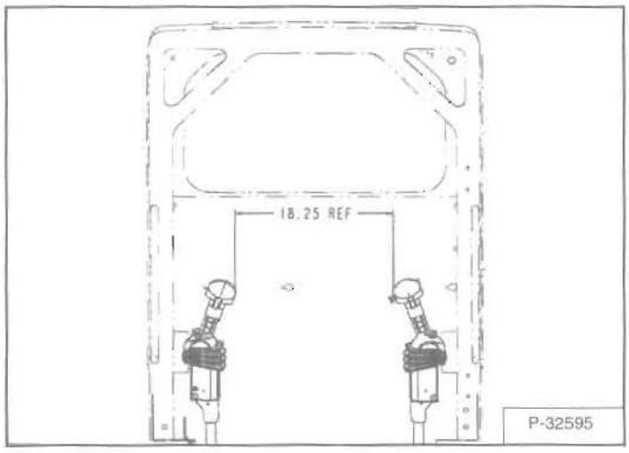


Figure 50-111-21

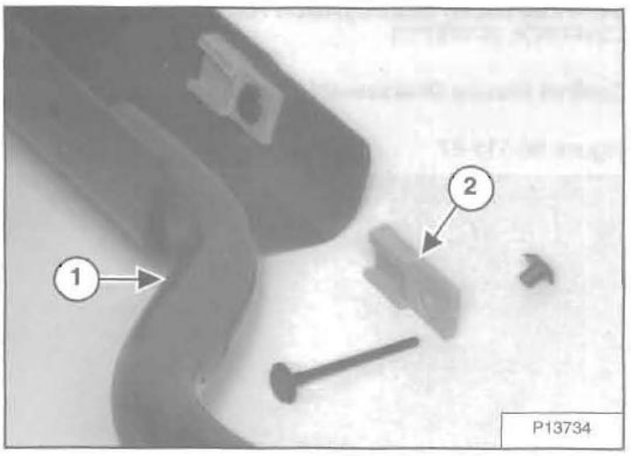


Loosen the nuts on the two u-bolts (Item 1) **[Figure 50-111-20]**.

Installation: Tighten the u-bolts so the lever can not be moved right or left when seated in the operator seat. Control lever end (Item 2) **[Figure 50-111-20]** should be flush with bellcrank. Be sure the control lever does not interfere with the operator cab when lowering or raising the cab. The distance between handles should be 18.25 inches **[Figure 50-111-21]**.

Remove the control lever from the cross shaft and control panel.

Figure 50-111-22

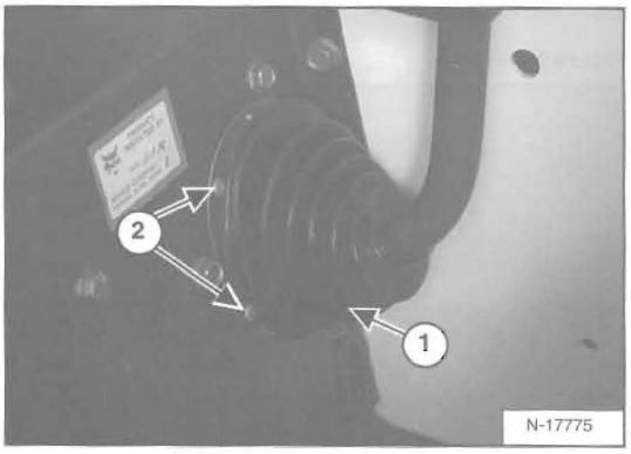


The control lever (Item 1) **[Figure 50-111-22]** must be replaced as a complete unit.

The connector clip (Item 2) **[Figure 50-111-22]** can be replaced separately from the control lever.

Control Lever Boot

Figure 50-111-23



To replace the rubber boot (Item 1) **[Figure 50-111-23]** on the control panel, remove the control lever. (See Contents Page 50-01.)

Drill out the four rivets (Item 2) **[Figure 50-111-23]** located on the flange of the rubber boot and remove the old boot.

Install the new boot and reinstall the control lever. (See Contents Page 50-01.)

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TIGHTEN ALL HARDWARE PER SIZE TO GRADE 5 TORQUE (SEE STANDARD TORQUE SPECIFICATIONS FOR BOLTS, SECTION SPEC-01) UNLESS OTHERWISE SPECIFIED.

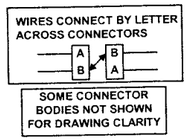

Bobcat®

WIRING SCHEMATIC
OPTIONS
S130 (S/N 527311001 AND ABOVE)
(S/N 527411001 AND ABOVE)

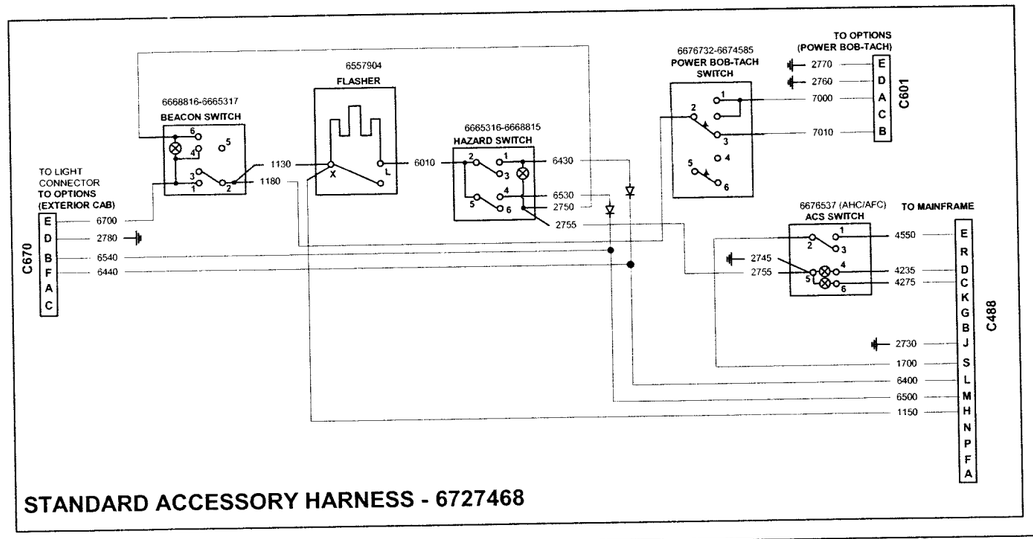
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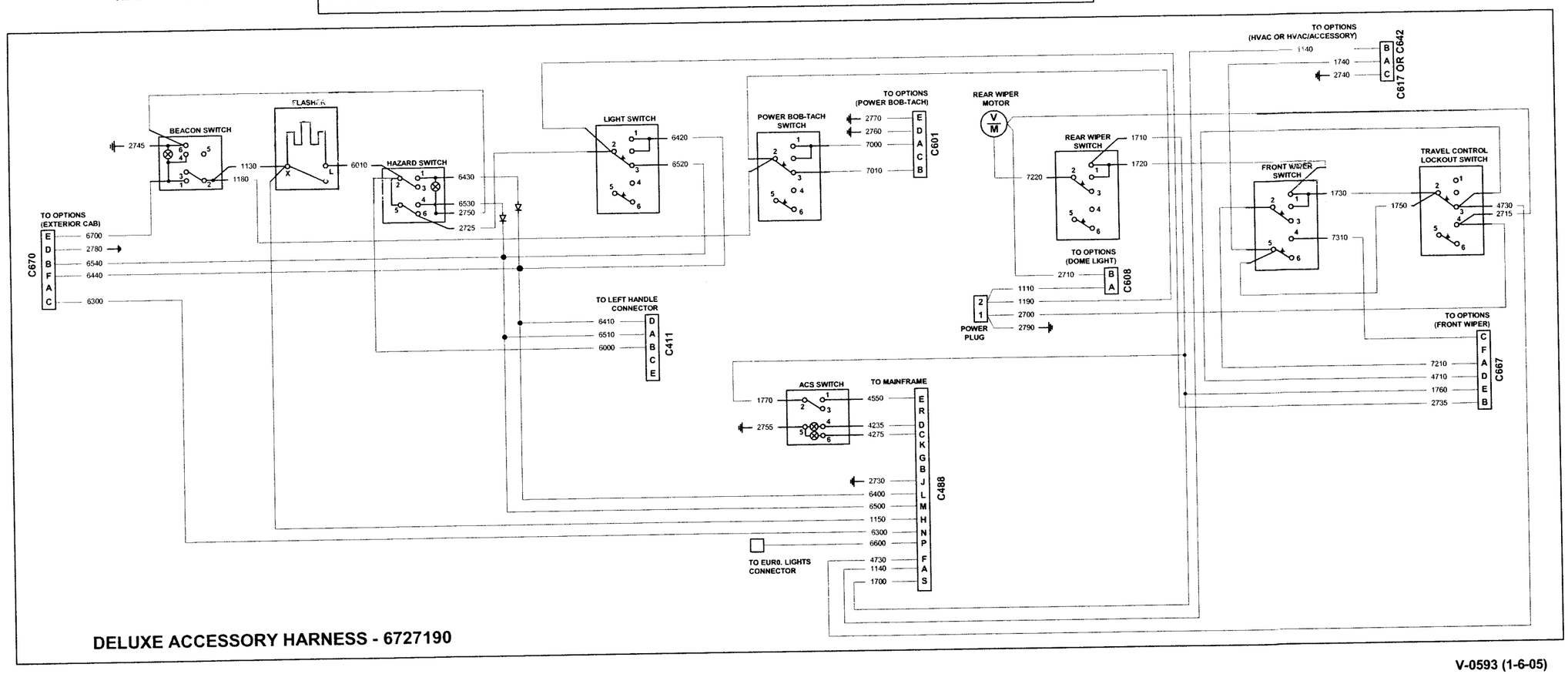
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RNG = ORANGE
BLK = BLACK
LBL = LIGHT BLUE
DBL = DARK BLUE
LGN = LIGHT GREEN
DGN = DARK GREEN
YEL = YELLOW
PNK = PINK
WHT = WHITE
BRN = BROWN
TAN = TAN
PUR = PURPLE
GRY = GRAY



BATTERY FEED 1000-1999 RED, RED/WHT, RNG
GROUND 2000-2999 BLK
MONITORING 3000-3999 LBL
HYDRAULIC 4000-4999 LGN
ATTACHMENT CONTROLS 5000-5999 YEL
LIGHTS 6000-6999 PNK
ACCESSORIES 7000-7999 WHT
ENGINE 8000-8999 TAN
COMMUNICATION 9000-9999 PUR



STANDARD ACCESSORY HARNESS - 6727468



DELUXE ACCESSORY HARNESS - 6727190

V-0593 (1-6-05)

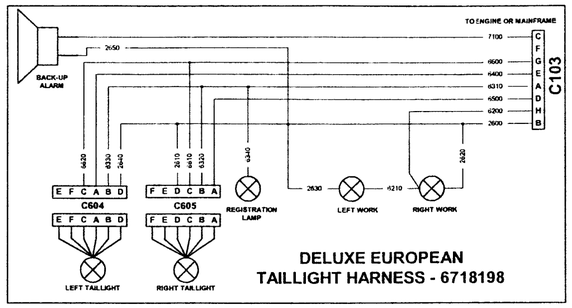
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WIRING SCHEMATIC

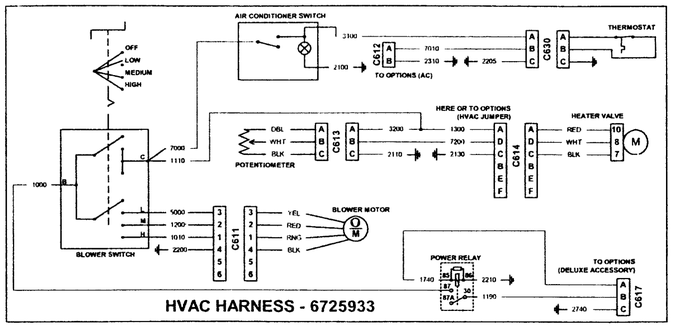
OPTIONS

S130 (S/N 527311001 AND ABOVE)
(S/N 527411001 AND ABOVE)

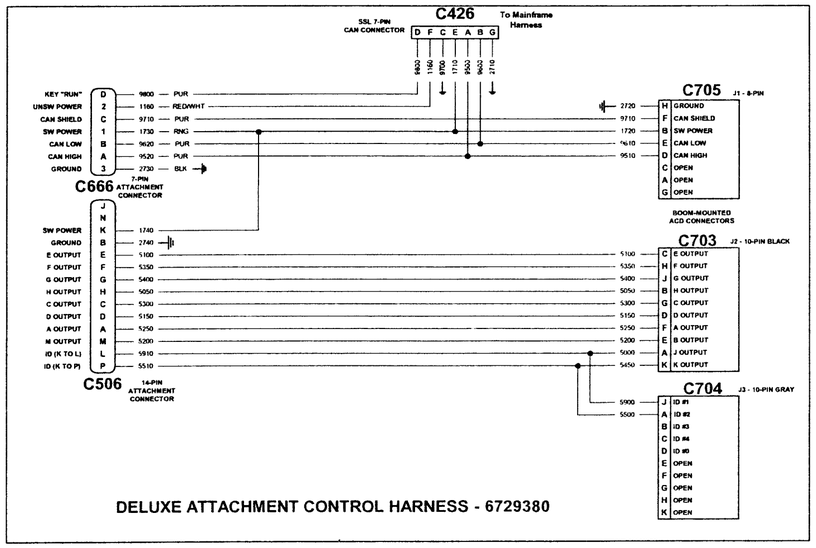
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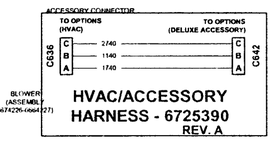
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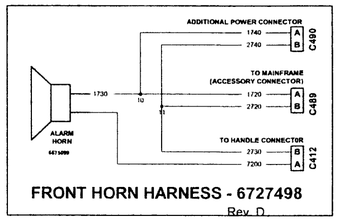
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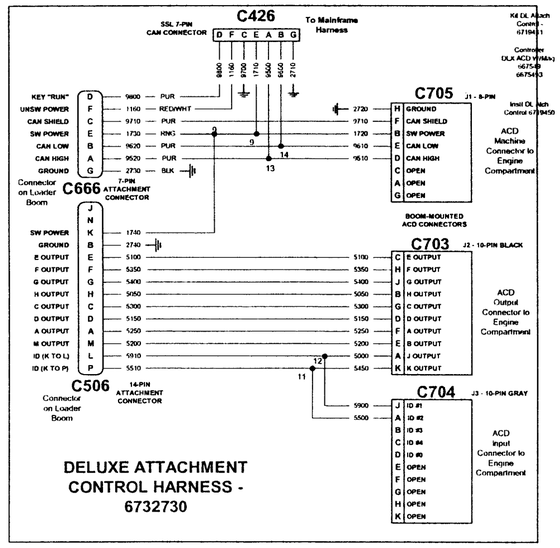
DELUXE ATTACHMENT CONTROL HARNESS - 6729380



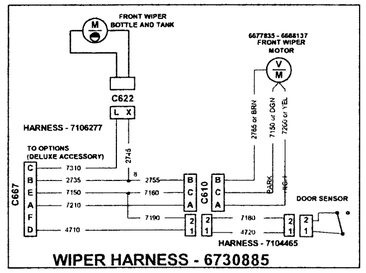
HVAC/ACCESSORY HARNESS - 6725390 REV. A



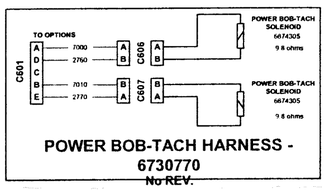
FRONT HORN HARNESS - 6727498
Rev. D



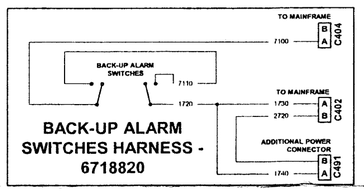
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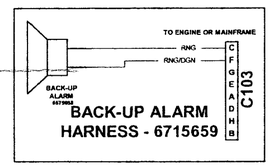
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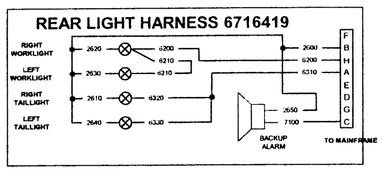
POWER BOB-TACH HARNESS - 6730770
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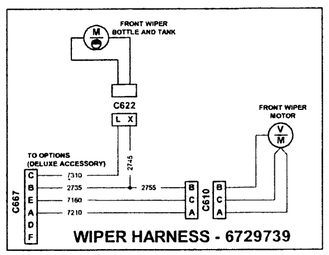


BACK-UP ALARM SWITCHES HARNESS - 6718820

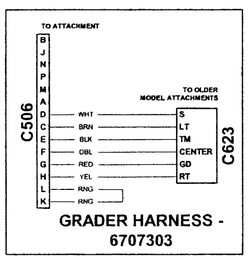


BACK-UP ALARM HARNESS - 6715659

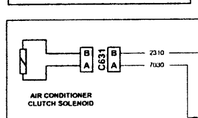




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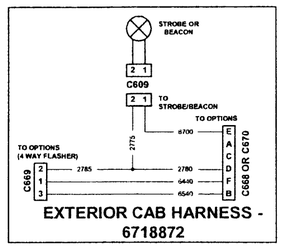


GRADER HARNESS - 6707303

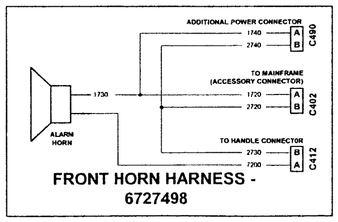


DOME LIGHT

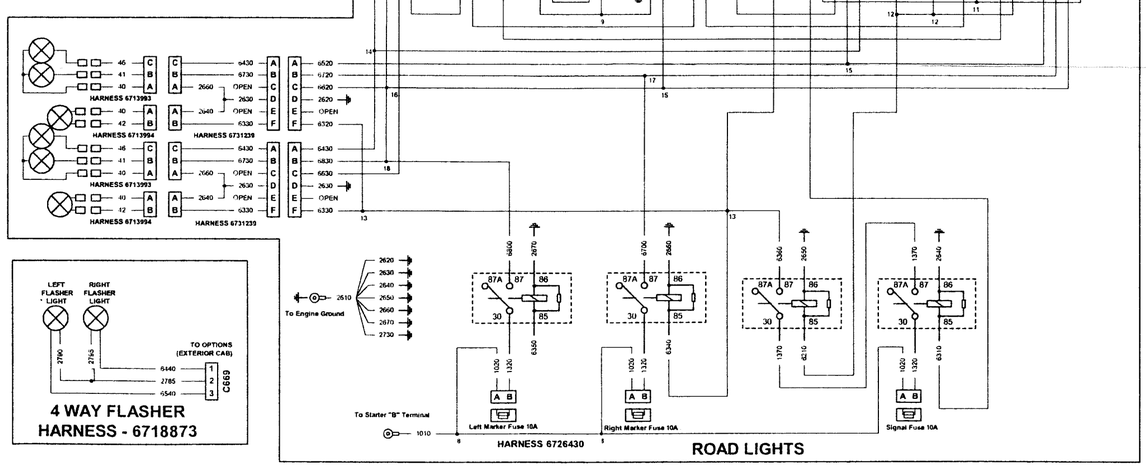
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EXTERIOR CAB HARNESS - 6718872

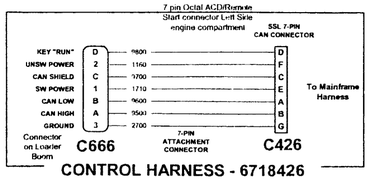


FRONT HORN HARNESS - 6727498



ROAD LIGHTS

4 WAY FLASHER HARNESS - 6718873



CONTROL HARNESS - 6718426

RED = RED
RNG = ORANGE
BLK = BLACK
LBL = LIGHT BLUE
DBL = DARK BLUE
LGN = LIGHT GREEN
DGN = DARK GREEN
YEL = YELLOW
PNK = PINK
WHT = WHITE
BRN = BROWN
TAN = TAN
PUR = PURPLE
GRY = GRAY

WIRES CONNECT BY LETTER ACROSS CONNECTORS

SOME CONNECTOR BODIES NOT SHOWN FOR DRAWING CLARITY

BATTERY FEED 1000-1999 RED, RED/WHT, RNG
GROUND 2000-2999 BLK
MONITORING 3000-3999 LBL
HYDRAULIC 4000-4999 LGN
ATTACHMENT CONTROLS 5000-5999 YEL
LIGHTS 6000-6999 PNK
ACCESSORIES 7000-7999 WHT
ENGINE 8000-8999 TAN
COMMUNICATION 9000-9999 PUR

WIRING SCHEMATIC
(With ACS Option)

S130 (S/N 527311001 AND ABOVE)
(S/N 527411001 AND ABOVE)
(PRINTED JANUARY 2005)
V-0591

WIRES CONNECT BY LETTER ACROSS CONNECTORS

SOME CONNECTOR BODIES NOT SHOWN FOR DRAWING CLARITY

RED = RED
RNG = ORANGE
BLK = BLACK
LBL = LIGHT BLUE
DBL = DARK BLUE
LGN = LIGHT GREEN
DGN = DARK GREEN
YEL = YELLOW
PNK = PINK
WHT = WHITE
BRN = BROWN
TAN = TAN
PUR = PURPLE
GRY = GRAY

RELAY GROUNDS 2000-2060 ARE CONNECTED IN SERIES

UNSWITCHED POWER 1000-1999 RED
FUSED, UNSWITCHED POWER 1000-1999 RED/WHT
SWITCHED POWER 1000-1999 RNG
GROUND 2000-2999 BLK
MONITORING 3000-3999 LBL
HYDRAULIC 4000-4999 LGN
ATTACHMENT CONTROLS 5000-5999 YEL
LIGHTS 6000-6999 PNK
ACCESSORIES 7000-7999 WHT
ENGINE 8000-8999 TAN
COMMUNICATION 9000-9999 PUR

MAINFRAME HARNESS 7103113

ENGINE HARNESS 7101311

REAR AUX HARNESS 7102338

DIFFERENTIAL SWITCH HARNESS 6728626

CAB 6727178

ACS HARNESS 6733430

FUSE / RELAY CENTER

RELAY GROUNDS 2000-2060 ARE CONNECTED IN SERIES

FUSE 5 30A (TRACTION) · FUSE 6 30A (FUEL PULL) · FUSE 7 30A · FUSE 8 25A (LIGHTER)
FUSE 1 15A (RIGHT F) · FUSE 2 15A (TR & RR LT) · FUSE 3 15A (REAR LT) · FUSE 4 15A (LIGHTER)
FRONT & MARKER LIGHT · REAR LIGHT · SWITCH POWER · GLOW PLUG · FUEL PULL · TRACTION PULL · STARTER
FUSE 9 25A (SWITCHED) · FUSE 10 25A (ATTACHMENT) · FUSE 11 25A (ALT & KITS) · FUSE 12 25A (ACC)

Printed in U.S.A.

V-0591 (1-6-05)

WIRING SCHEMATIC
(Without ACS Option)

S130 (S/N 527311001 AND ABOVE)
(S/N 527411001 AND ABOVE)
(PRINTED JANUARY 2005)
V-0590

WIRES CONNECT BY LETTER ACROSS CONNECTORS

SOME CONNECTOR BODIES NOT SHOWN FOR DRAWING CLARITY

RED = RED
RNG = ORANGE
BLK = BLACK
LBL = LIGHT BLUE
DBL = DARK BLUE
LGN = LIGHT GREEN
DGN = DARK GREEN
YEL = YELLOW
PNK = PINK
WHT = WHITE
BRN = BROWN
TAN = TAN
PUR = PURPLE
GRY = GRAY

RELAY GROUNDS 2000-2060 ARE CONNECTED IN SERIES

GROUNDS

UNSWITCHED POWER 1000-1999 RED
FUSED UNSWITCHED POWER 1000-1999 RED/WHT
SWITCHED POWER 1000-1999 RNG
GROUND 2000-2999 BLK
MONITORING 3000-3999 LBL
HYDRAULIC 4000-4999 LGN
ATTACHMENT CONTROLS 5000-5999 YEL
LIGHTS 6000-6999 PNK
ACCESSORIES 7000-7999 WHT
ENGINE 8000-8999 TAN
COMMUNICATION 9000-9999 PUR

REAR AUX. HARNESS 7102338

LOCK VALVE C416 · LOCK VALVE C417 · REAR ROD C413 · REAR BASE C414

YELLOW TIE STRAP · GREEN TIE STRAP · BROWN TIE STRAP · WHITE TIE STRAP

C362

BUCKET POSITIONING C423 — 9.6 ohm 12V
LIFT SPOOL LOCK (NOT Used With AHC or ACS) C422 — 7.7 ohm PWM
TILT SPOOL LOCK (NOT Used With AHC or ACS) C421 — 7.7 ohm PWM
BICS HYDRAULIC LOCK C420 — 9.6 ohm 12V
FRONT ROD C418 — 3.3 ohm PWM
FRONT BASE C419 — 3.3 ohm PWM
SPEED SENSOR C106
HYDRAULIC TEMPERATURE SENDER 500-3000 ohm C108
SEE C113
SEE J1
AIR FILTER SWITCH
FUEL SENDER 30-270 ohm C405 C406

HYDRAULIC CHARGE PRESSURE SENDER 0.5 - 7.5 V C105
HYDRAULIC OIL FILTER (DIFFERENTIAL) SWITCH C112
DIFFERENTIAL SWITCH HARNESS 6728626
ENGINE OIL PRESSURE SENDER 0.5-7.5 V C107
SEE J2

J1 P01 · J2 P05

ENGINE HARNESS 7101311

ENGINE COOLANT SENDER 500-3000 ohm C104
SEE J2-8
SUPPLY 1020
ALTERNATOR C110
EXCITATION
STARTER C113
BATTERY CABLE
FUEL SHUTOFF C102
6736515
C109
C101

MAINFRAME HARNESS 7103113

TO OPTIONS (ACCESSORY CONNECTOR) C103
TO OPTIONS (BACKUP ALARM SWITCH) C104
TO OPTIONS (ACCESSORY CONNECTOR) C488
TO OPTIONS (ACCESSORY CONNECTOR) C489
SEE CAB CONNECTOR C407
GLOW PLUGS 1.0 ohm each
Traction Lock C423 — HOLD 10.9 ohm · PULL 11.3 ohm

(ALTERNATOR & KITS) FUSE 11 25A
(ATTACHMENT) FUSE 10 25A
(HEATER) FUSE 1 25A
SWITCHED POWER
MARKER LIGHT
REAR LIGHT
GLOW PLUG
STARTER
FUEL PULL
TRACTION LOCK
FUSE 2 15A
FUSE 3 15A
FUSE 6 30A
FUSE 5 30A
ISO/PUMP/EN FUSE 9 25A
FUSE 9 25A (UNSWITCHED POWER)
FUSE 12 25A (ACS)

RELAY GROUNDS 2000-2060 ARE CONNECTED IN SERIES

FUSE / RELAY CENTER

(ACS CONNECTOR) C492

C426 ACD & REMOTE START CONNECTOR
TO OPTIONS (ATTACHMENT CONTROL)

FUSE 5 30A · FUSE 1 25A HEATER · FUSE 6 30A FUEL PULL · FUSE 2 15A HTR & MIR LT · FUSE 7 · FUSE 3 15A MARK LT · FUSE 8 · FUSE 4 25A COMPRESSOR · FUSE 9 25A WINDSHIELD · FUSE 10 25A ATTACHMENT · FUSE 11 25A ALT & KITS · FUSE 12 25A ALT
FRONT & MARKER LIGHT · REAR LIGHT · SWITCH POWER · GLOW PLUG · FUEL PULL · TRACTION PULL · STARTER

Printed In U.S.A.

BATTERY · 100A

CAB 6727178

LEFT PANEL · RIGHT PANEL · BUZZER · MAIN FRAME · SEAT BAR · FRONT WORKLIGHTS · RIGHT · LEFT

C408 · C407 SEE FUSE/RELAY CENTER (EUROPEAN LIGHTING)

C410 LEFT HANDLE · C409 RIGHT HANDLE

C411 TO OPTIONS (ACCESSORY CONNECTOR) · C412 TO OPTIONS (ACCESSORY CONNECTOR)

TURN SIGNAL · HORN

V-0590 (1-6-05)

Troubleshooting Chart

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

⚠ WARNING

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

W-2003-0903

PROBLEM	CAUSE
Battery will not take a 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 solenoid is damaged.
9. Check the fuses.

Description

Figure 60-10-1

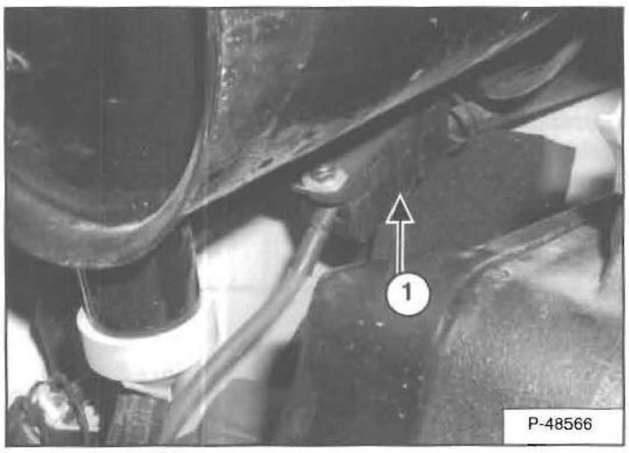
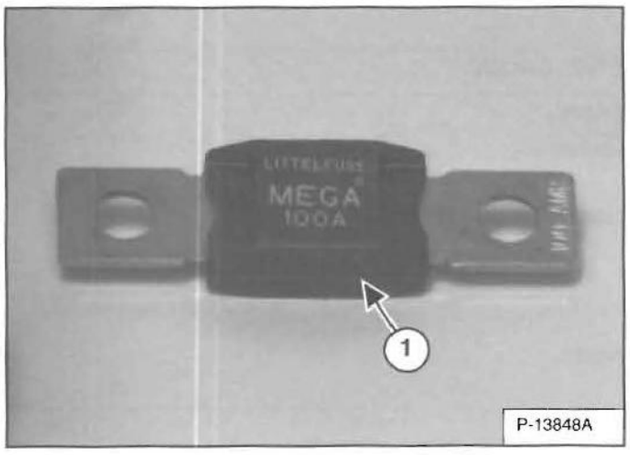
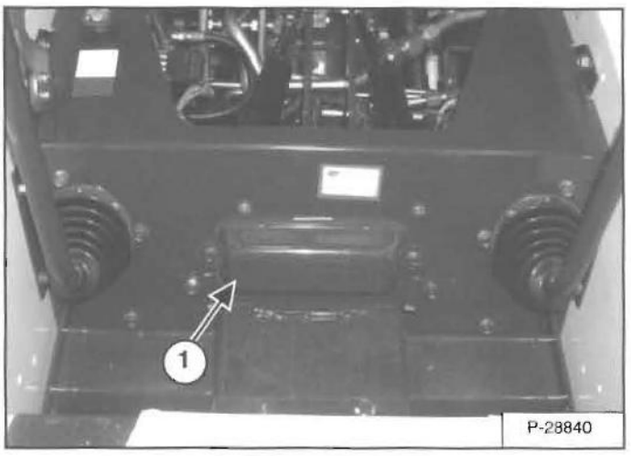


Figure 60-10-2



The Loader has a 12 volt, negative ground alternator charging system. The electrical system is protected by a 100 amp master fuse (Item 1) **[Figure 60-10-1]** &**[Figure 60-10-2]** to protect against serious system overloads that could lead to burned up harness or loader damage. This fuse is located in the left-hand side engine compartment. just forward of the engine harness connector.

Figure 60-10-3



The electrical system is also protected by fuses and relays under the fuse panel cover (Item 1) **[Figure 60-10-3]** located in the cab on the steering control panel.

The fuse panel cover (Item 1) **[Figure 60-10-3]** has a decal inside to show the location and amp ratings.

IMPORTANT

Do Not use silicone base sprays and/or sealants on harness connectors or components.

I-2123-0397

Relay Switch Location

Figure 60-10-4



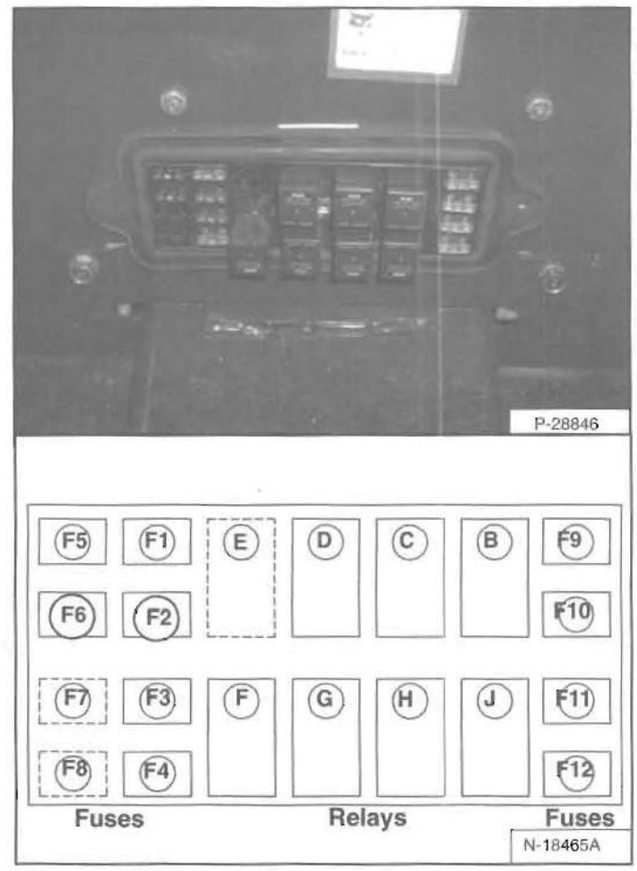
Remove the cover (Item 1) **[Figure 60-10-4]** to check or replace the relays.

The location is shown in **[Figure 60-10-4]** & **[Figure 60-10-5]**.

Ref	Description
B	Switch Power
C	Rear Lights
D	Front & Marker Lights
E	*Not Used*
F	Glow Plugs
G	Fuel Shutoff
H	Traction
J	Starter

Fuse Location

Figure 60-10-5



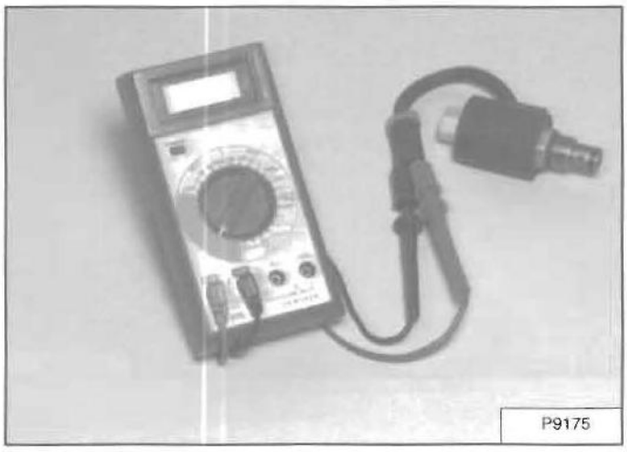
Remove the cover (Item 1) **[Figure 60-10-4]** to check or replace the fuses.

The location and sizes are shown in **[Figure 60-10-4]** & **[Figure 60-10-5]** .

Ref	Description	Amp.
F1	Heater	25
F2	Front & Marker Lights	15
F3	Rear Lights	15
F4	Bobcat Controller	25
F5	Traction	30
F6	Fuel Shutoff	30
F7	*Not Used*	--
F8	*Not Used*	--
F9	Unswitched Attach.	25
F10	Switched Attach.	25
F11	Alternator & Kits	25
F12	ACS Power	25

Solenoid Test

Figure 60-10-6



Use an Ohm meter to measure coil resistance **[Figure 60-10-6]**.

Coil wires do not have polarity.

Correct resistance for the auxiliary, lift and tilt lock coils is 7.7 ohms ±1 ohm @ 76° F.

The other coils (BICS and bucket positioning) is 9.7 ohms ±1 ohm @ 76° F.

BATTERY

Removal And Installation

⚠ WARNING

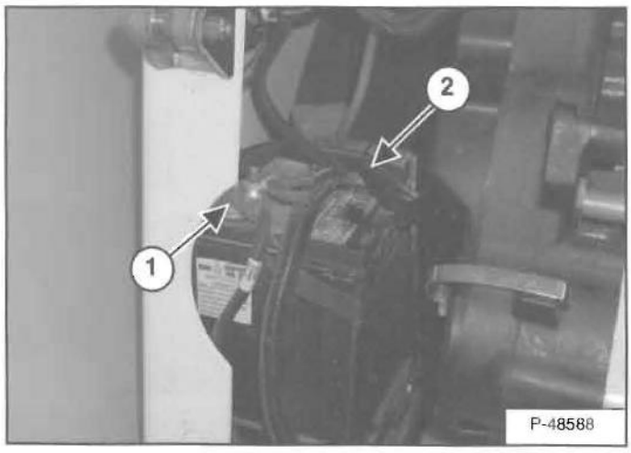
Batteries contain acid which burns eyes and skin on contact. Wear goggles, protective clothing and rubber gloves to keep acid off body.

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

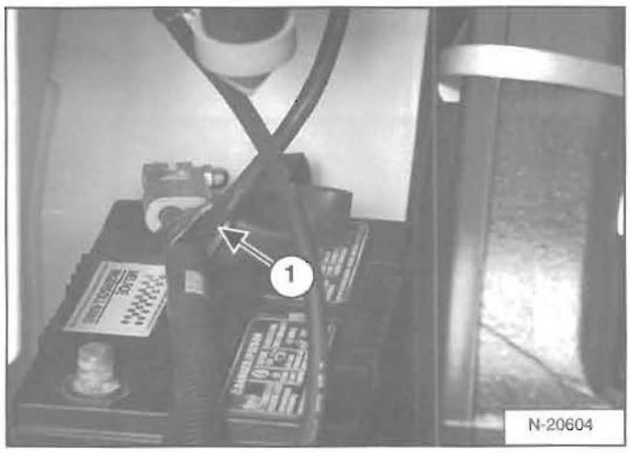


Open the rear door.

Disconnect the negative (-) battery cable (Item 1) **[Figure 60-20-1]**.

Remove the battery hold down clamp (Item 2) **[Figure 60-20-1]**.

Figure 60-20-2



Disconnect the positive (+) battery cable (Item 1) **[Figure 60-20-2]**.

Remove the battery from the loader.

Removal And Installation (Cont'd)

Figure 60-20-3

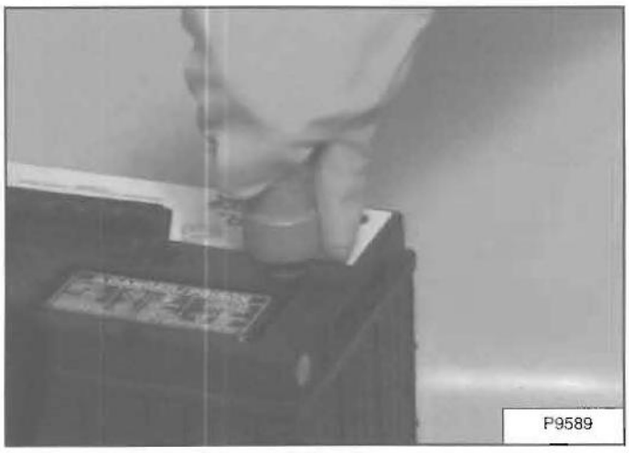
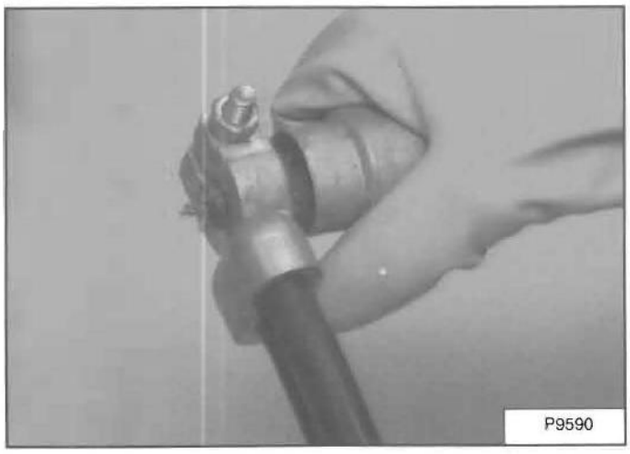


Figure 60-20-4



Always clean the terminals and cable ends when installing a new battery **[Figure 60-20-3]** & **[Figure 60-20-4]**.

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.

Install the battery holddown clamp.

Servicing

⚠ WARNING

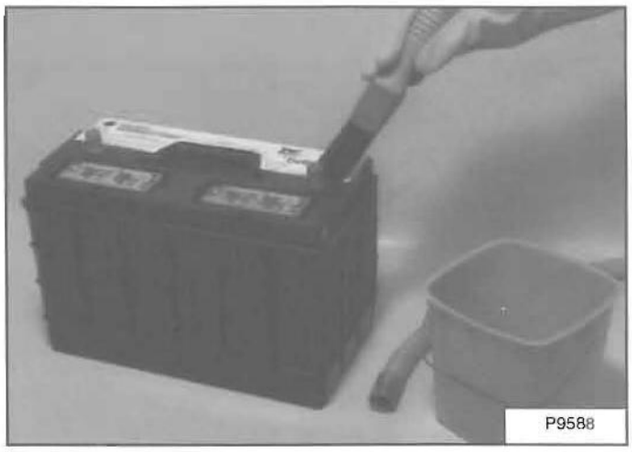
Batteries contain acid which burns eyes and skin on contact. Wear goggles, protective clothing and rubber gloves to keep acid off body.

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 60-20-5



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 60-20-5]**.

Clean the terminals and cable ends as shown in figure **[Figure 60-20-3]** and **[Figure 60-20-4]**.

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.

Using A Booster Battery (Jump Starting)

⚠ WARNING

Batteries contain acid which burns eyes and skin on contact. Wear goggles, protective clothing and rubber gloves to keep acid off body.

In case of acid contact, wash immediately with water. In case of eye contact get prompt medical attention and wash eye with clean, cool water for at least 15 minutes.

If electrolyte is taken internally drink large quantities of water or milk! DO NOT induce vomiting. Get prompt medical attention.

W-2065-1296

⚠ WARNING

Keep arcs, sparks flames and lighted tobacco away from batteries. When *jumping* from booster battery make final connection (negative) at engine frame.

Do not jump start or charge a frozen or damaged battery. Warm battery to 60°F (16°C) before connecting to a charger. Unplug charger before connecting or disconnecting cables to battery. Never lean over battery while boosting, testing or charging.

Battery gas can explode and cause serious injury.

W-2066-1296

IMPORTANT

Damage to the alternator can occur if:

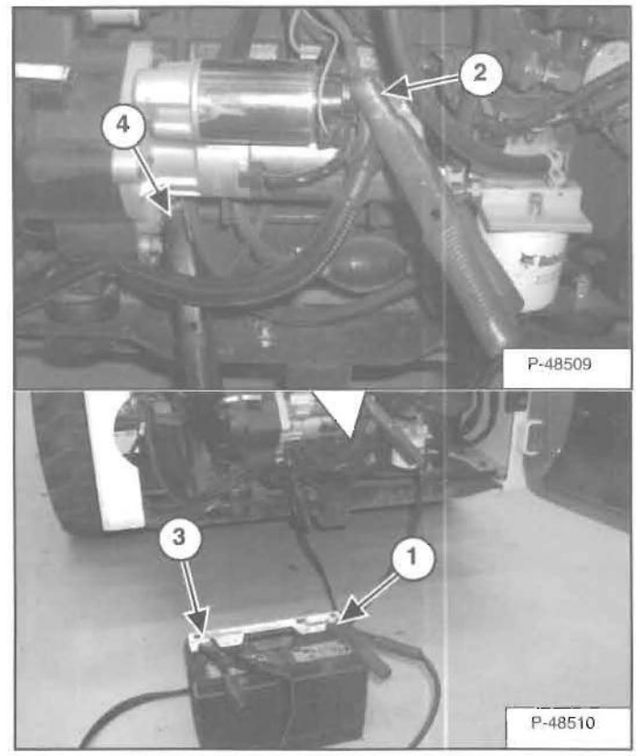
- **Engine is operated with battery cables disconnected.**
- **Battery cables are connected when using a fast charger or when welding on the loader. (Remove both cables from the battery.)**
- **Extra battery cables (booster cables) are connected wrong.**

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 (*Standard Panel*) OR the STOP Button must be pressed (*Deluxe Panel*). The booster battery must be 12 volt.

Figure 60-20-6



Connect the end of the first cable (Item 1) to the positive (+) terminal of the booster battery. Connect the other end of the same cable (Item 2) **[Figure 60-20-6]** to the positive terminal on the loader starter.

Connect the end of the second cable (Item 3) to the negative (-) terminal of the booster battery. Connect the other end of the same cable (Item 4) **[Figure 60-20-6]** to the engine.

Keep cables away from moving parts. Start the engine.

After the engine has started, remove the ground (-) cable (Item 4) **[Figure 60-20-6]** first.

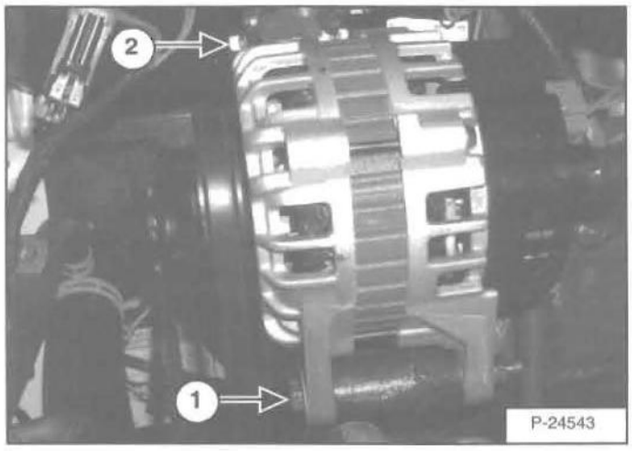
Remove the cable from the positive terminal (Item 2) **[Figure 60-20-6]**.



Bobcat®

Adjusting The Alternator Belt

Figure 60-30-1



Stop the engine.

Raise the operator cab. (See Contents Page 10-01.)

Loosen the alternator mounting bolt (Item 1) **[Figure 60-30-1]**.

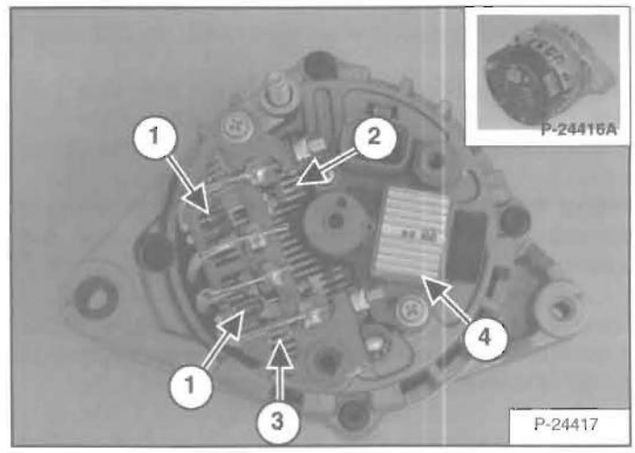
Loosen the adjustment bolt (Item 2) **[Figure 60-30-1]**.

Move the alternator until the belt has 5/16 inch (8,0 mm) movement at the middle of the belt span with 15 lbs. (66 N) of force.

Tighten the adjustment bolt and mounting bolt.

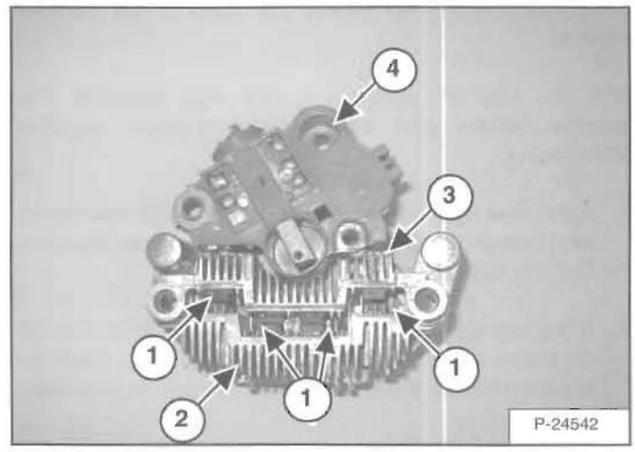
Lower the operator cab. (See Contents Page 10-01.)

Figure 60-30-2



The black cover has been removed to show alternator rectifier/regulator assembly. The alternator contains field coil diodes (low current) (Item 1) **[Figure 60-30-2]**, grounded heat sink (Item 2) **[Figure 60-30-2]** & **[Figure 60-30-3]**, B+ power heat sink (Item 3) **[Figure 60-30-2]** & **[Figure 60-30-3]**, regulator (Item 4) **[Figure 60-30-2]** & **[Figure 60-30-3]**, and four pair of large power diodes (Item 1) **[Figure 60-30-3]** on the underside of the rectifier.

Figure 60-30-3



NOTE: The rectifier/regulator assembly has been removed from the alternator and flipped over for component identification [Figure 60-30-3].

Charging System Check

If the charging system malfunctions check the following:

Check the condition and tension of the alternator belt. (See Contents Page 60-01.) Replace the belt if it is worn or deteriorated.

Inspect the alternator wiring harness and connectors at alternator. Harness and connectors must be clean and tight.

Check the fuse for the alternator in the fuse panel. If fuse is burned, find the cause and repair/replace. If fuse is in doubt, remove it and check for continuity.

Check the electrolyte level in the battery. Add distilled water as needed. (Does not apply to maintenance free batteries.)

Verify the charge of the battery. Make sure battery is fully charged.

Disconnect the battery cables (negative first, then positive). Inspect the cable clamps and battery posts for corrosion. Remove acid or corrosion from the battery and cables with a sodium bicarbonate and water solution. Put grease on the cable ends and battery terminals to prevent corrosion. Reconnect the cable to the positive terminal.

With the key off, connect a test light between the negative battery post and the disconnected negative cable clamp.

1. If the test light does not light up, reattach the clamp and proceed to alternator voltage test. (See Charging System Check on Page 60-30-2.)

2. If the test light lights up, there is a short (drain) in the electrical system of the loader. The short must be repaired before the charging system can be checked.

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

⚠ WARNING

Batteries contain acid which burns eyes and skin on contact. Wear goggles, protective clothing and rubber gloves to keep acid off body.

In case of acid contact, wash immediately with water. In case of eye contact get prompt medical attention and wash eye with clean, cool water for at least 15 minutes.

If electrolyte is taken internally drink large quantities of water or milk! DO NOT induce vomiting. Get prompt medical attention.

W-2065-1296

⚠ WARNING

Keep arcs, sparks flames and lighted tobacco away from batteries. When *jumping* from booster battery make final connection (negative) at engine frame.

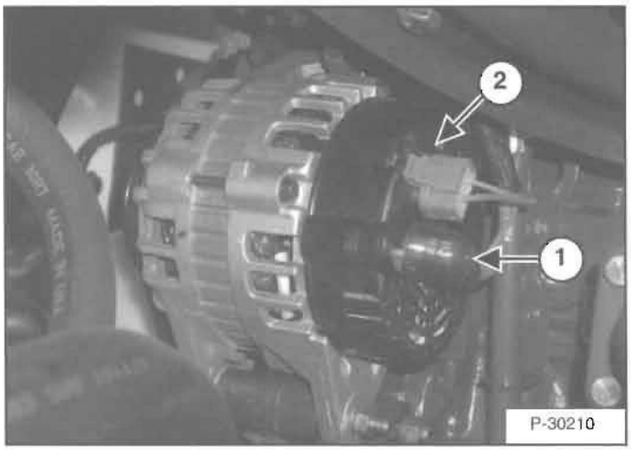
Do not jump start or charge a frozen or damaged battery. Warm battery to 60°F (16°C) before connecting to a charger. Unplug charger before connecting or disconnecting cables to battery. Never lean over battery while boosting, testing or charging.

Battery gas can explode and cause serious injury.

W-2066-1296

Charging System Check (Cont'd)

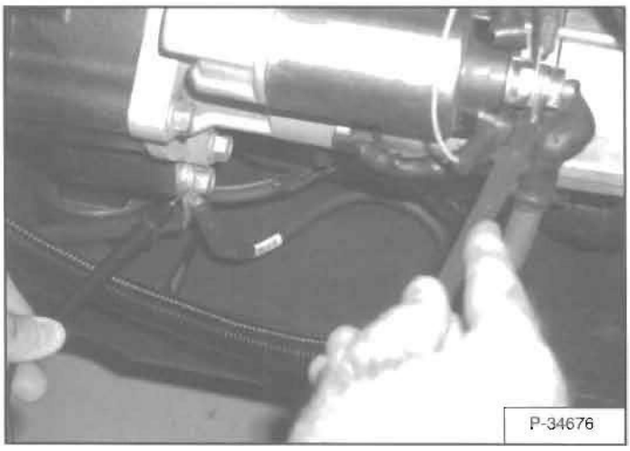
Figure 60-30-4



3. Disconnect the alternator B+ terminal (Item 1) and L & S terminal connector (Item 2) **[Figure 60-30-4]** and if the test light goes out, the alternator is faulty. If the test light stays on, find the short in the system and repair it.

Alternator Voltage Test

Figure 60-30-5



Open tailgate. (See Contents Page 10-01.)

Connect the remote start tool to the loader. (See Contents Page 10-01.)

Turn the engine on with the remote start tool and run at idle. With a voltmeter, check the voltage between the B+ terminal and ground at the starter **[Figure 60-30-5]**.

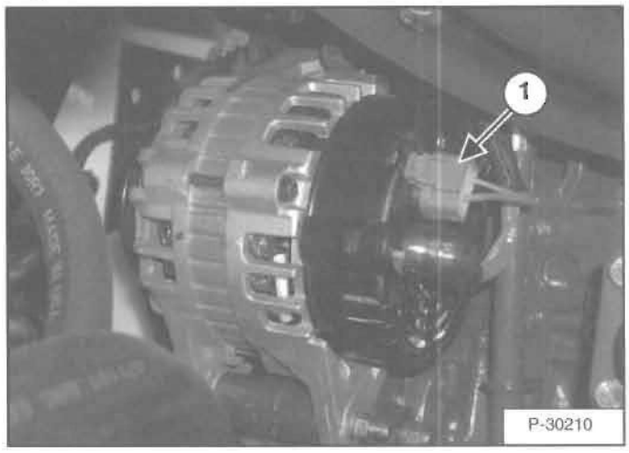
The voltage must be higher than 13.5 volts but lower than 14.7 volts at 70° F (Alternator Temperature).

If the voltage is higher that 14.7 volts, proceed to the following high voltage test.

If the voltage is lower than 13.5 volts, run the engine at high idle and recheck voltage. If voltage is still below 13.5 volts, proceed with the following low voltage test.

Low Voltage Test

Figure 60-30-6

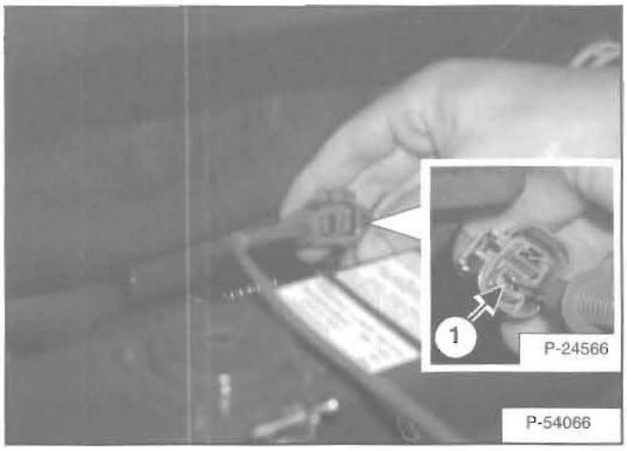


Turn engine OFF and disconnect the L & S terminal connector (Item 1) **[Figure 60-30-6]** from the alternator.

Turn the remote start tool key to the ON position.

Low Voltage Test (Cont'd)

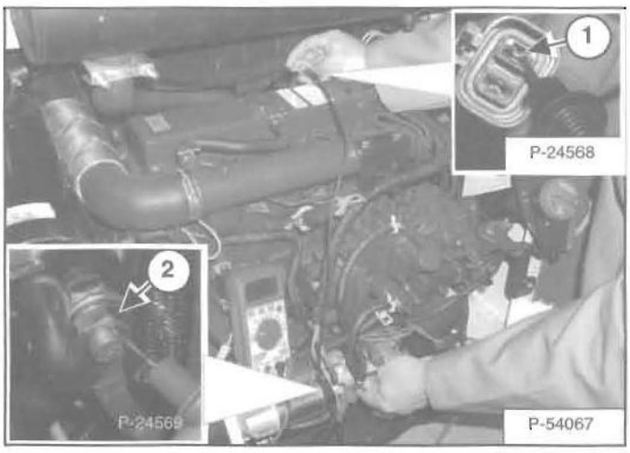
Figure 60-30-7



Check the voltage across the "L" terminal (Item 1) **[Figure 60-30-7]** and ground. The voltage should be what the battery voltage is. If not, check wire harness, relay and fuses. If the wire harness, relay and fuses are ok then remove alternator for replacement or repair. To repair, (See Removal And Installation on Page 60-30-5.)

High Voltage Test

Figure 60-30-8



Turn engine OFF and remove the L & S Terminal connector (Item 1) **[Figure 60-30-6]** off the alternator.

Check the continuity between the "S" terminal (Item 1) and the positive (+) terminal on the battery or starter terminal (Item 2) **[Figure 60-30-8]**. There should be continuity. If no continuity, replace wire harness.

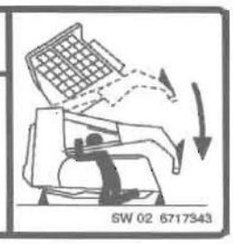
If voltage is still above 14.7 volts at 70°F (Alternator Temperature), then remove alternator for replacement or repair. To repair, (See Removal And Installation on Page 60-30-5.)

Removal And Installation

DANGER

AVOID DEATH

- Disconnecting or loosening any hydraulic tubeline, hose, fitting, component or a part failure can cause lift arms to drop.
- Keep out of this area when lift arms are raised unless supported by an approved lift arm support. Replace if damaged. 57051



WARNING

Never work on a machine with the lift arms up unless the lift arms are secured by an approved lift arm support device. Failure to use an approved lift arm support device can allow the lift arms or attachment to fall and cause injury or death.

W-2059-0598

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

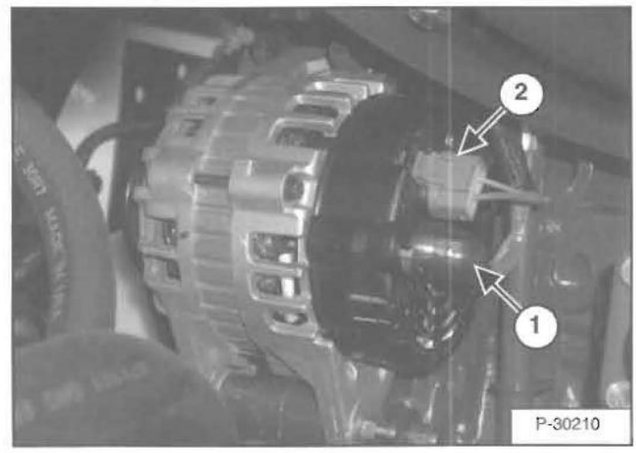
Place jackstands under the rear corners of the loader.

Raise the lift arms and install an approved lift arm support device. (See Contents Page 10-01.)

Raise the operator cab. (See Contents Page 10-01.)

Disconnect the negative (-) cable from the battery.

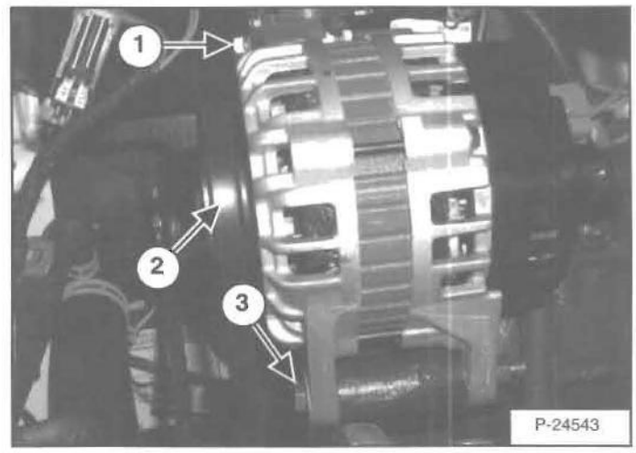
Figure 60-30-9



Disconnect the red wire (Item 1) **[Figure 60-30-9]** from the alternator which comes from the battery.

Disconnect the wiring harness connector (Item 2) **[Figure 60-30-9]** from the alternator.

Figure 60-30-10



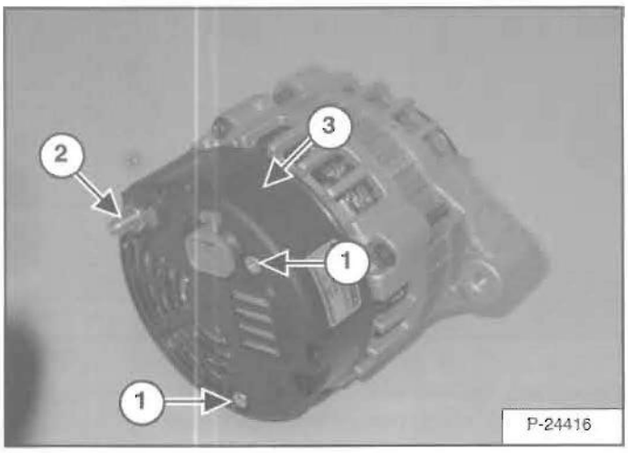
Remove the adjustment bolt (Item 1) **[Figure 60-30-10]** from the mounting bracket.

Remove the alternator belt (Item 2) **[Figure 60-30-10]** from the alternator pulley.

Remove the mounting bolt (Item 3) **[Figure 60-30-10]**.

Rectifier Continuity (Diode) Test

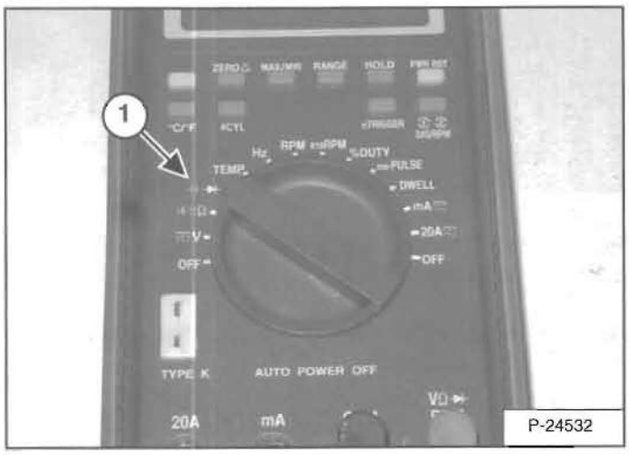
Figure 60-30-11



Remove the two screws (Item 1), nut/washer (Item 2) and the plastic cover (Item 3) **[Figure 60-30-11]** from the alternator.

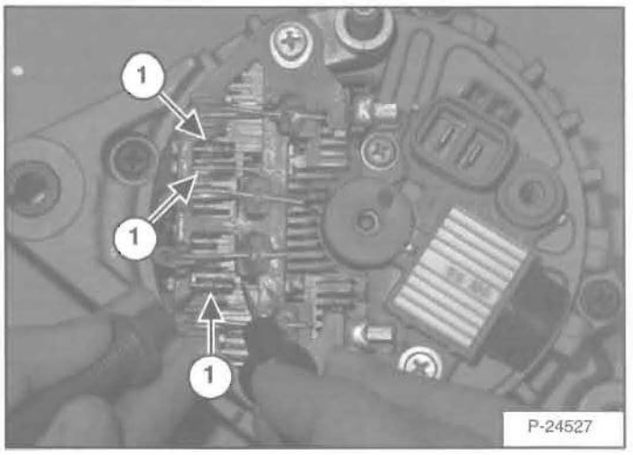
NOTE: In the diode tests there should be continuity in one direction only. Meter readings should be different when probes are reversed. If the diode being tested shows no continuity or continuity in both directions, replace the rectifier assembly.

Figure 60-30-12



NOTE: Use the diode function (Item 1) [Figure 60-30-12] on the multimeter.

Figure 60-30-13

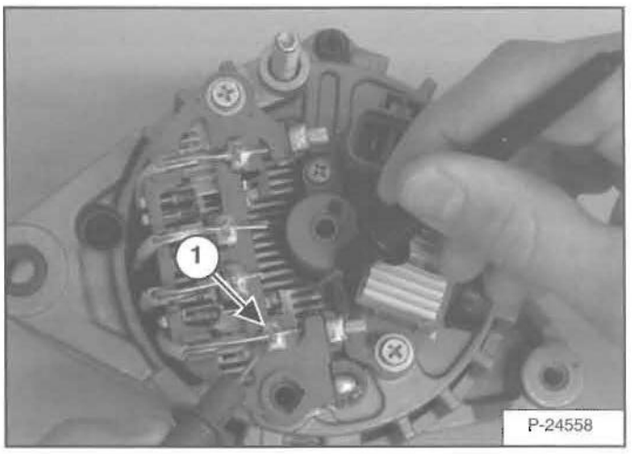


Touch the probes to the terminals (Item 1) **[Figure 60-30-13]** of each diode and read the meter.

Reverse the probes to check the diode in the other direction.

Meter readings should be different when probes are reversed.

Figure 60-30-14



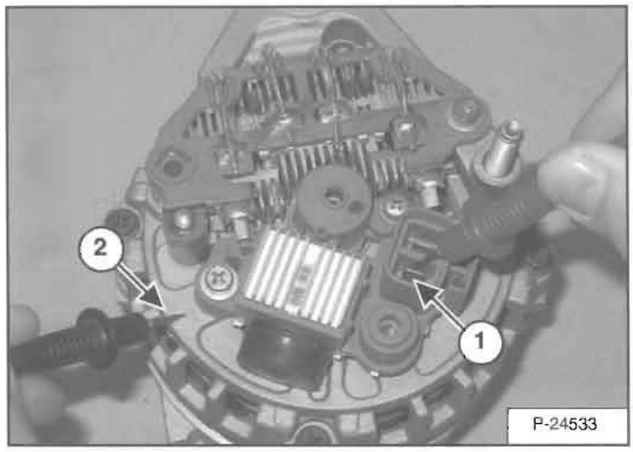
Touch one probe to the diode (Item 1) **[Figure 60-30-14]** and the other probe to each heat sink and read the meter.

Reverse the probes to check the diode in the other direction.

Meter readings should be different when probes are reversed.

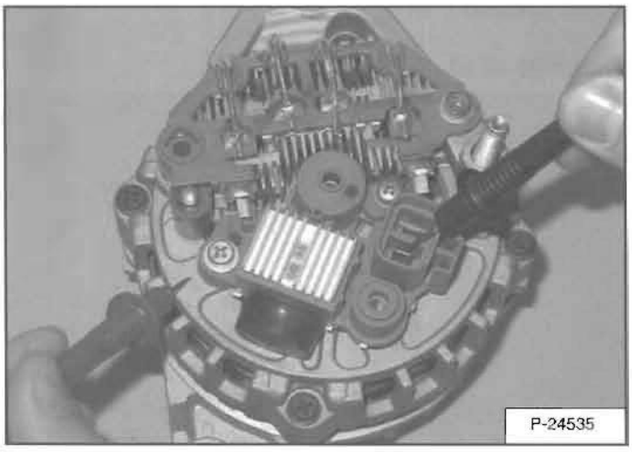
Alternator Regulator Test

Figure 60-30-15



Touch one probe to the "L" terminal (Item 1) and the other probe to the ground (Item 2) **[Figure 60-30-15]**.

Figure 60-30-16

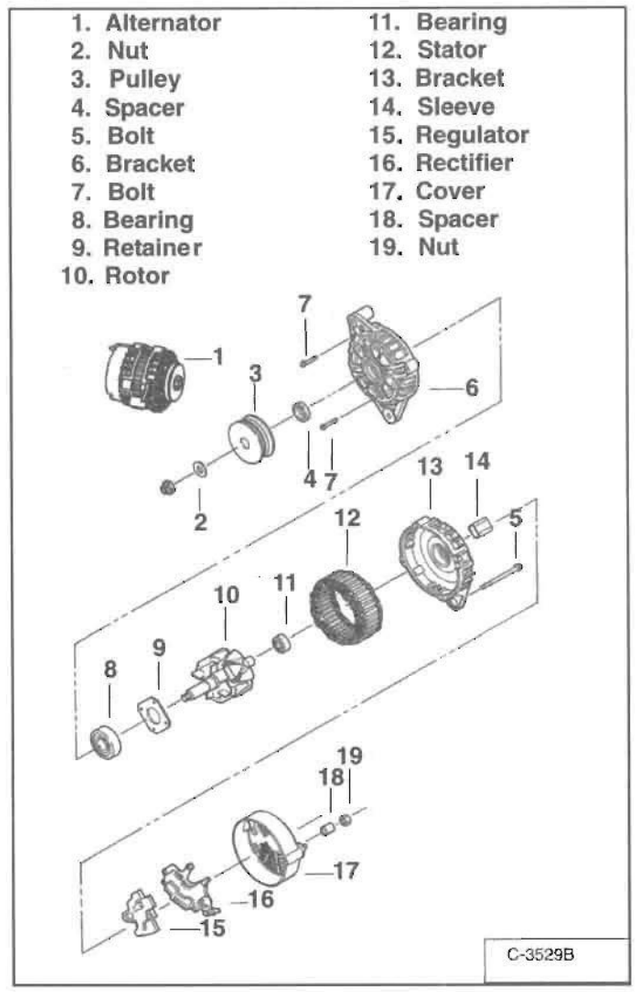


Reverse the probes to check in the other direction **[Figure 60-30-16]**.

There should be continuity in one direction only. Meter readings should be different when probes are reversed. If there is no continuity or continuity in both directions, replace regulator.

Disassembly

Figure 60-30-17



Disassemble the alternator **[Figure 60-30-17]**.

Remove the regulator cover.

Remove the four bolts holding halves together.

Pry the halves apart (use a press if needed).

Use a soft jaw vise to hold rotor while removing pulley nut.

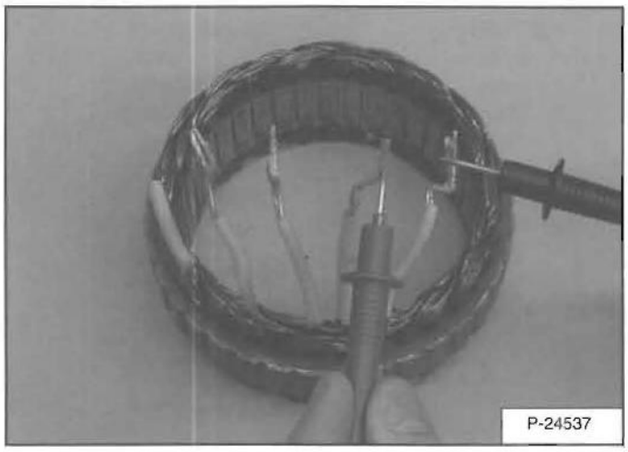
Remove front case half from the rotor using a plastic hammer or press.

Unsolder the stator leads from the rectifier. Remove the stator.

Unsolder the two leads between the rectifier and regulator. Remove the regulator from rectifier.

Stator Continuity Test

Figure 60-30-18



Use an ohmmeter to test the stator.

Touch the probes to two of the bare stator wires **[Figure 60-30-18]**.

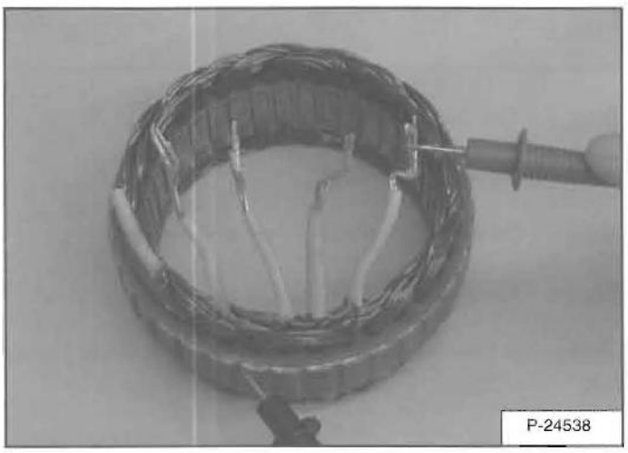
Move one of the probes to the third wire.

The readings should be the same.

If there is no continuity, replace the stator.

Stator Ground Test

Figure 60-30-19



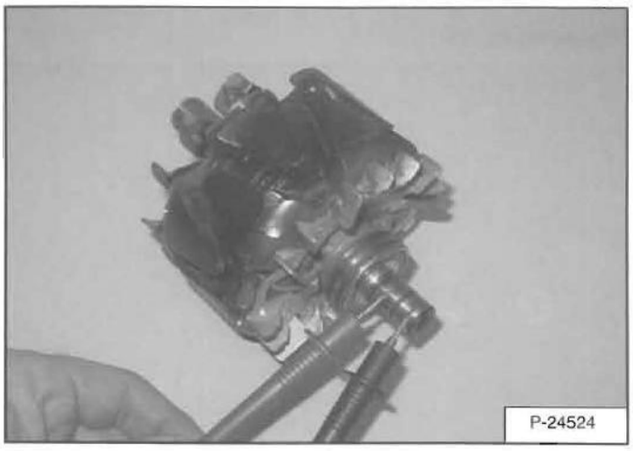
Touch one probe to a bare stator lead and the other probe to the bare metal surface of the stator **[Figure 60-30-19]**.

There should be no continuity.

Replace the stator if there is continuity.

Rotor Continuity Test

Figure 60-30-20



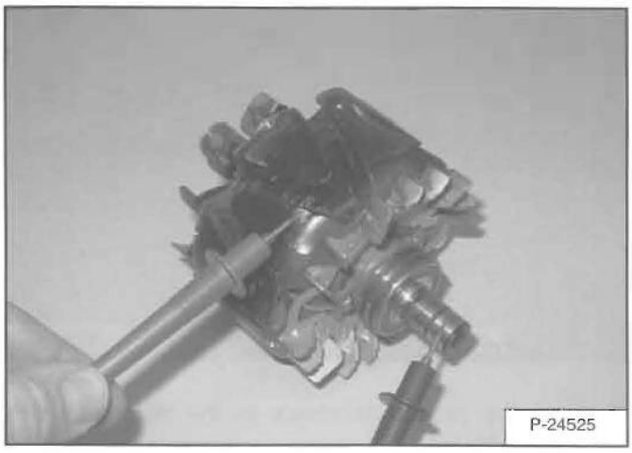
Touch the probes to the slip rings **[Figure 60-30-20]**.

The ohmmeter should read between 3.0-4.0 ohms.

If there is no continuity replace the rotor.

Rotor Ground Test

Figure 60-30-21



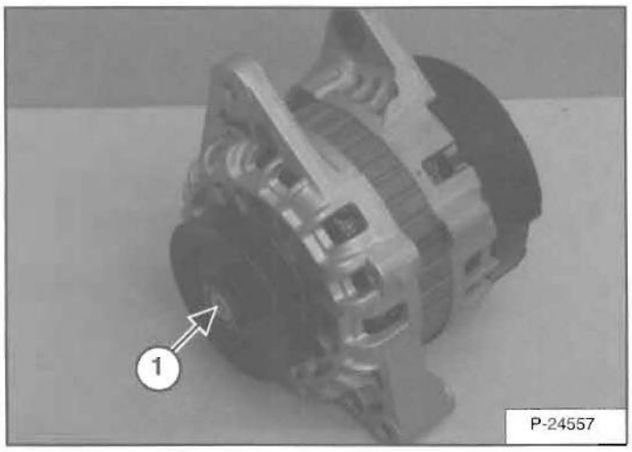
Touch one probe to one of the slip rings and the other probe to the rotor shaft **[Figure 60-30-21]**.

There should be no continuity.

Replace the rotor if there is continuity.

Assembly

Figure 60-30-22



Reverse the order of disassembly.

Do not assemble the rear case half.

Place the rotor in soft jaws when tightening the shaft nut (Item 1) **[Figure 60-30-22]**. Tighten to 72 ± 14.5 ft.-lbs. (98 ± 20 Nm) torque.

Install the rear case half and the remaining parts.

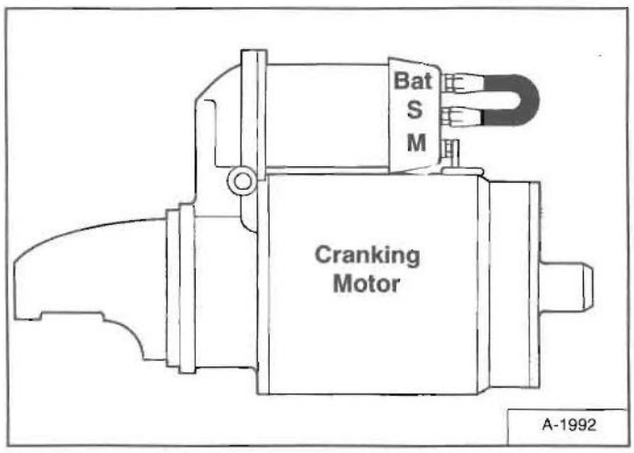


Bobcat®

STARTER

Checking

Figure 60-40-1



The key switch must be in the OFF position.

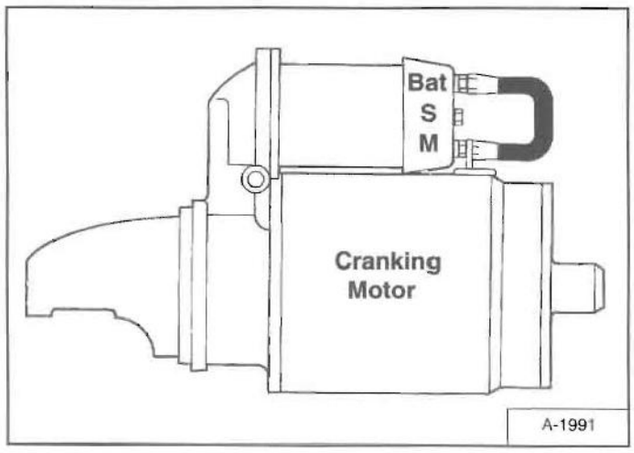
The battery must be at full charge.

The cable connections on the battery must be clean and tight.

Connect a jumper wire between S terminal and BAT terminal **[Figure 60-40-1]**.

If the starter turns but does not turn the engine, the starter drive has a defect.

Figure 60-40-2

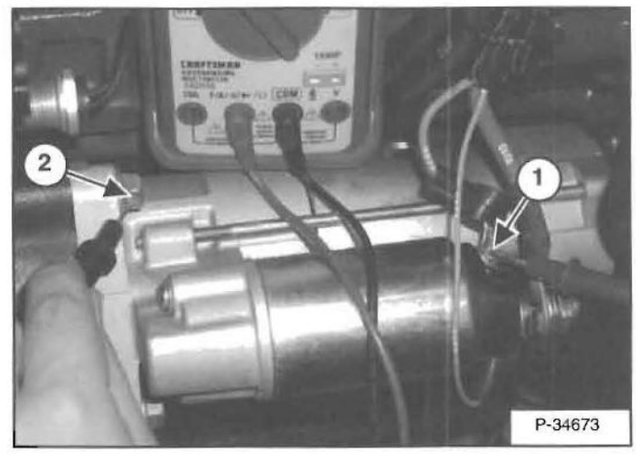


Connect a jumper wire **(of at least 4 gauge in size)** between the M terminal and the BAT terminal **[Figure 60-40-2]**.

If the starter turns, the defect is in the solenoid.

If the starter does not turn, the starter is defective.

Figure 60-40-3

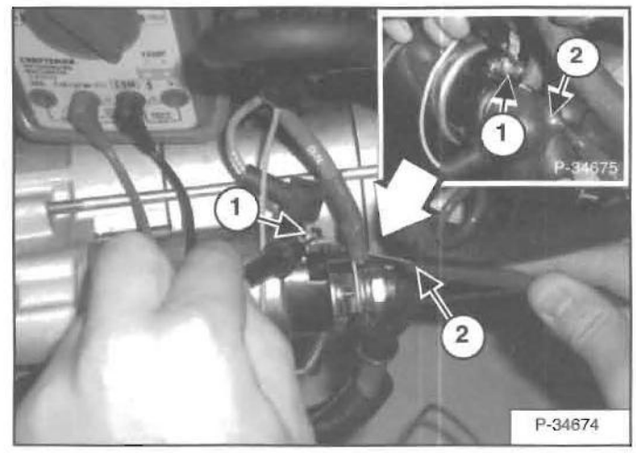


Disconnect the negative cable from the battery. (See Contents Page 60-01.)

Disconnect the S terminal on the starter (Item 1) **[Figure 60-40-3]**.

Hold-In Test: Use circuit tester, touch one probe to the S terminal (Item 1) and one probe to the mounting bolt (Item 2) **[Figure 60-40-3]** on the magnetic switch (solenoid). If there is no continuity replace the magnetic switch (solenoid).

Figure 60-40-4



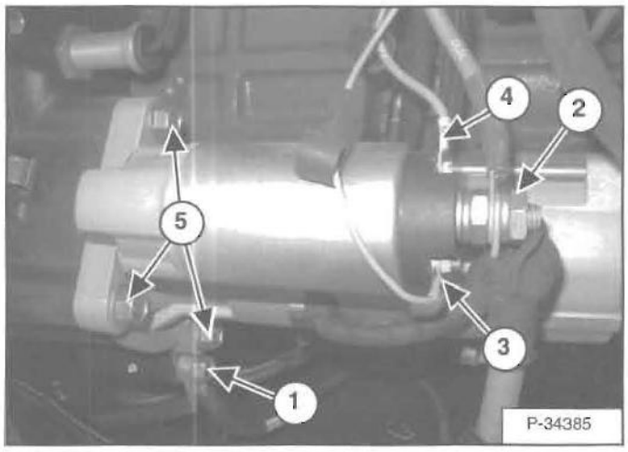
Disconnect the negative cable from the battery. (See Contents Page 60-01.)

Disconnect the S terminal on the starter (Item 1) **[Figure 60-40-4]**.

Pull-In Test: Use circuit tester, touch one probe to the S terminal (Item 1) and one probe to the starter motor terminal (Item 2) **[Figure 60-40-4]**. If there is no continuity replace the magnetic switch (solenoid).

Removal And Installation

Figure 60-40-5



Stop the engine and open the rear door.

Remove the negative (-) and positive (+) cables from the battery.

Disconnect the ground wire (Item 1) **[Figure 60-40-5]** from the starter.

Disconnect the engine harness power wire and positive (+) battery cable from the starter solenoid terminal (Item 2) **[Figure 60-40-5]**.

Installation: Tighten the nut to 10.8-12.3 ft.-lbs. (14,7-16,7 Nm) torque.

Disconnect the tan wire (Item 3) **[Figure 60-40-5]** from the R terminal on the starter solenoid.

Disconnect the brown wire (Item 4) **[Figure 60-40-5]** from the S terminal on the starter solenoid.

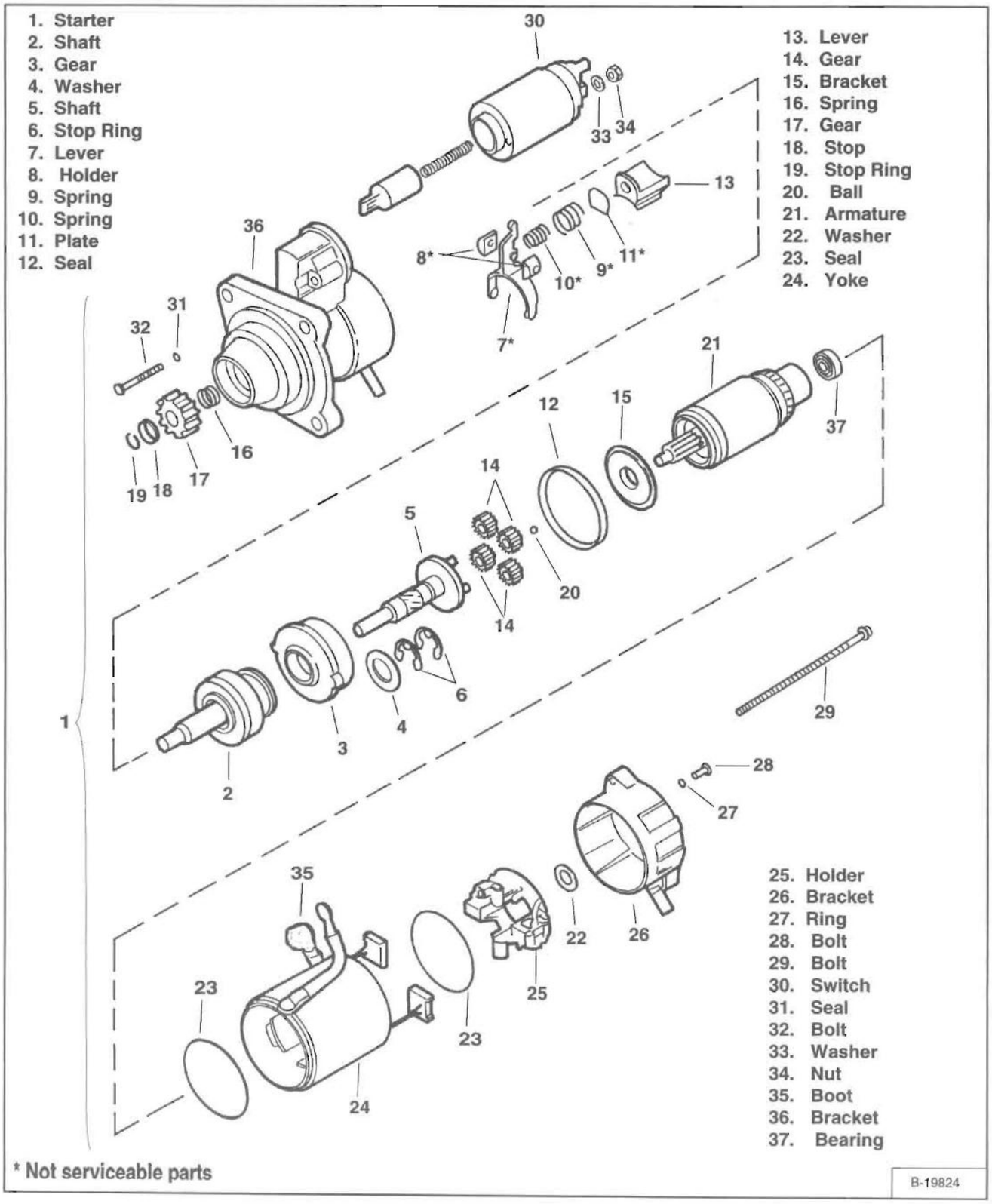
Remove the mounting bolts (Item 5) **[Figure 60-40-5]** from the starter.

Remove the starter from the engine.

Installation: Tighten the three mounting bolts to 25-28 ft.-lbs. (34-38 Nm) torque.

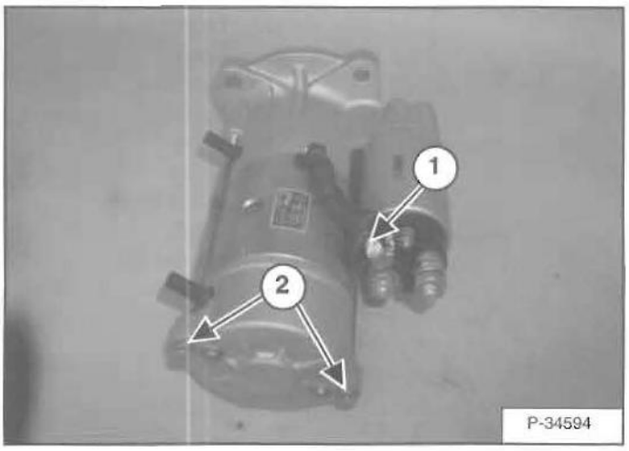
Reverse the removal procedure to install the starter.

Parts Identification



Disassembly and Assembly

Figure 60-40-6

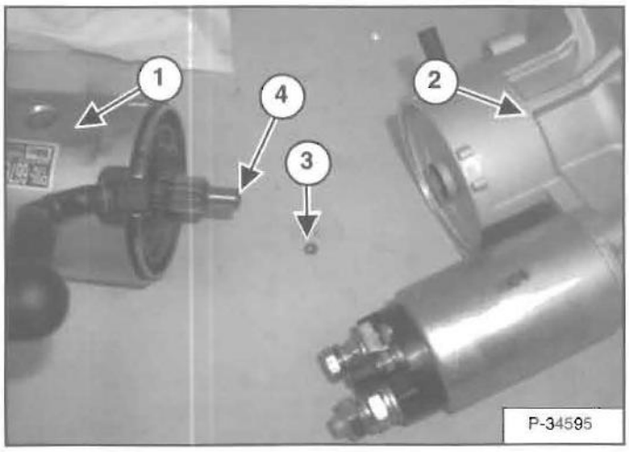


Remove the cable (Item 1) **[Figure 60-40-6]** from the magnetic switch.

Remove the bolts (Item 2) **[Figure 60-40-6]**.

Installation: Tighten the bolts to 63-129 in.lbs. (7,1-14,6 Nm) torque.

Figure 60-40-7

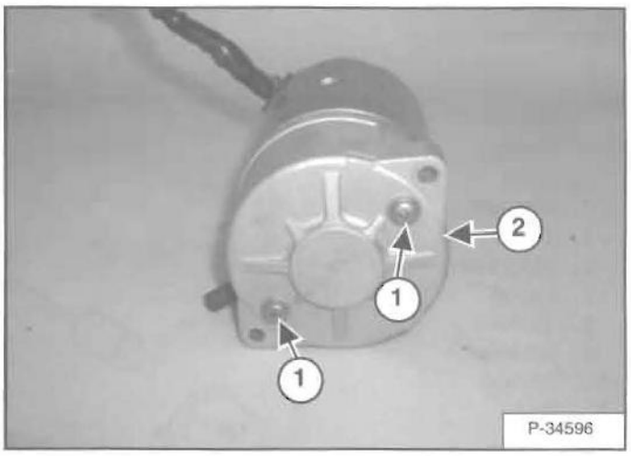


Remove the armature, yoke, brush holder and rear bracket assemblies (Item **1**) from the front assembly (Item 2) **[Figure 60-40-7]**.

NOTE: When separating the parts there will be a steel ball (Item 3) located at the end of the armature shaft (Item 4) [Figure 60-40-7].

Installation: Apply grease to the steel ball (Item 3) and install into the end of the armature shaft (Item 4) **[Figure 60-40-7]** .

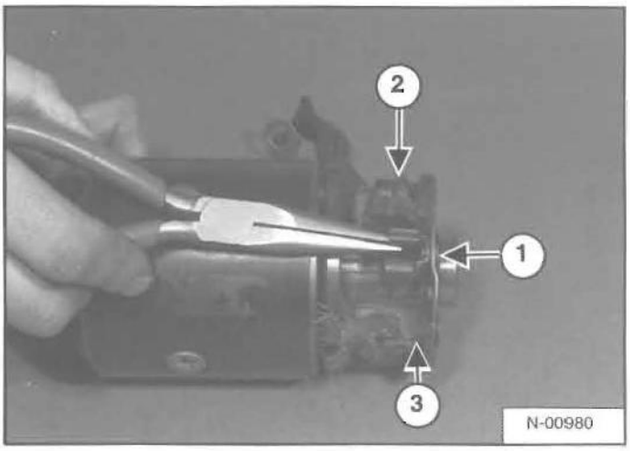
Figure 60-40-8



Remove the bolts (Item 1) from the brush cover (Item 2) **[Figure 60-40-8]**.

Remove the cover (Item 2) **[Figure 60-40-8]**.

Figure 60-40-9



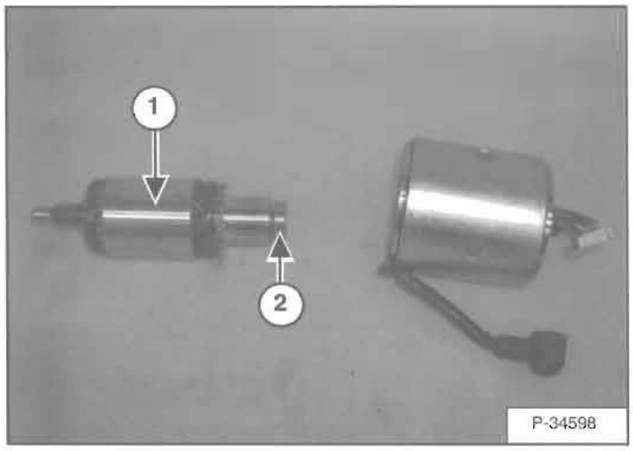
Using a needle nose pliers, pull the brush springs (Item 1) back and remove the brushes (Item 2) **[Figure 60-40-9]**.

NOTE: The brushes are non-replaceable. If the brushes are worn order a new brush holder (for the negative brushes) and yolk (for the positive brushes).

Remove the brush holder (Item 3) **[Figure 60-40-9]** from the end of the armature.

Disassembly and Assembly (Cont'd)

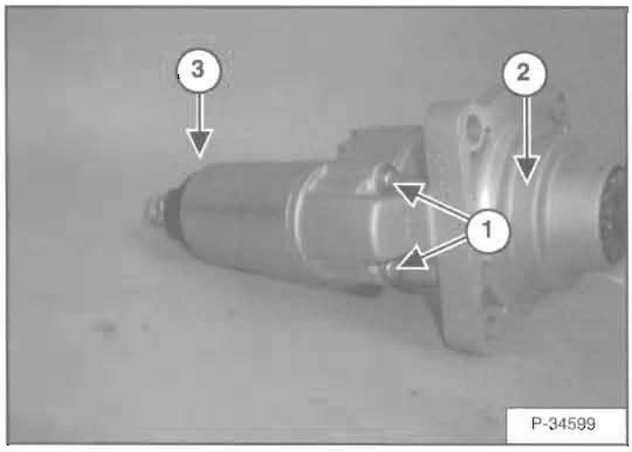
Figure 60-40-10



Remove the armature (Item 1) **[Figure 60-40-10]** from the frame.

Remove the bearing (Item 2) **[Figure 60-40-10]** from the end of the armature.

Figure 60-40-11

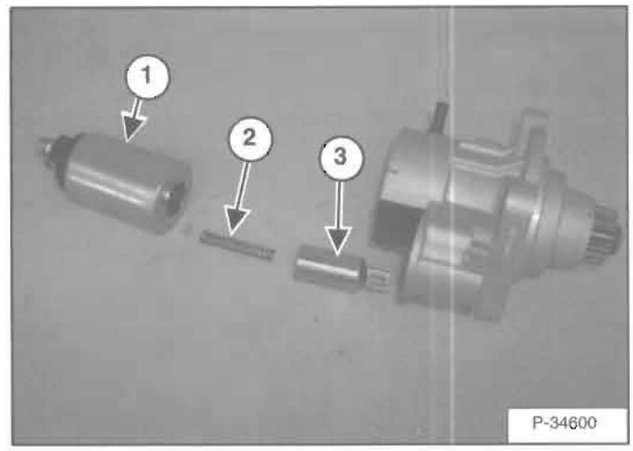


Remove the bolts (Item 1) **[Figure 60-40-11]** from the magnetic switch.

Installation: Tighten bolts to 34-69 in.-lbs. (3,8-7,8 Nm) torque.

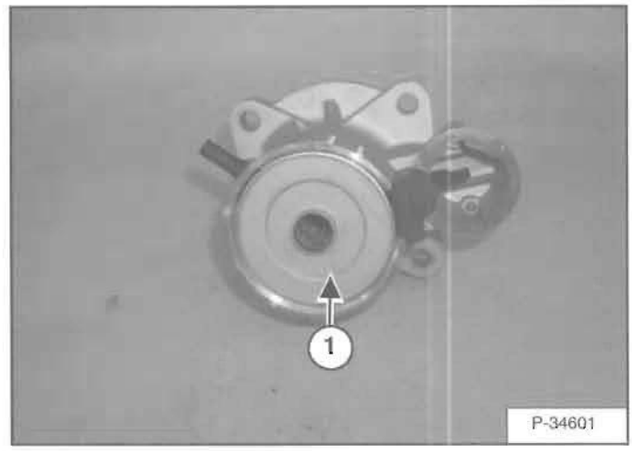
Remove the front assembly (Item 2) from the magnetic switch (Item 3) **[Figure 60-40-11]**.

Figure 60-40-12



Inspect the magnetic switch (Item 1), the spring (Item 2),and the plunger (Item 3) **[Figure 60-40-12]** for wear and replace as needed.

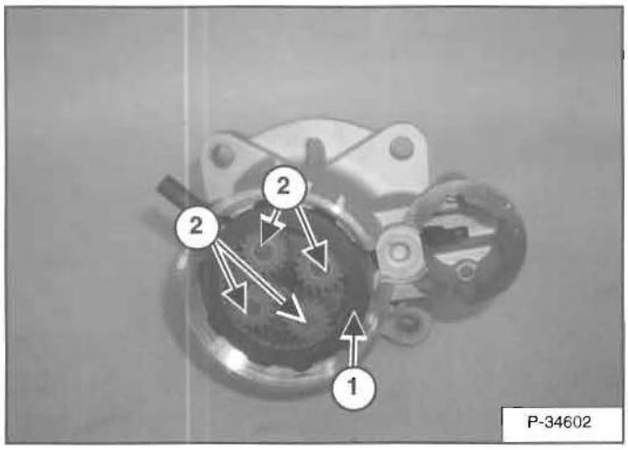
Figure 60-40-13



Remove the center bracket (Item 1) **[Figure 60-40-13]**

Disassembly and Assembly (Cont'd)

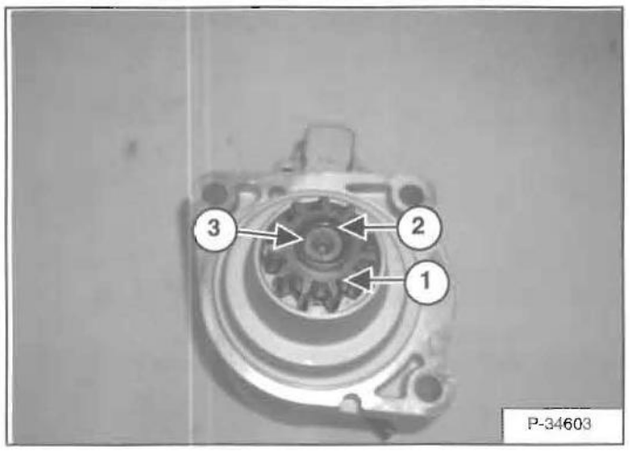
Figure 60-40-14



Remove the rubber retainer (Item 1) **[Figure 60-40-14]**.

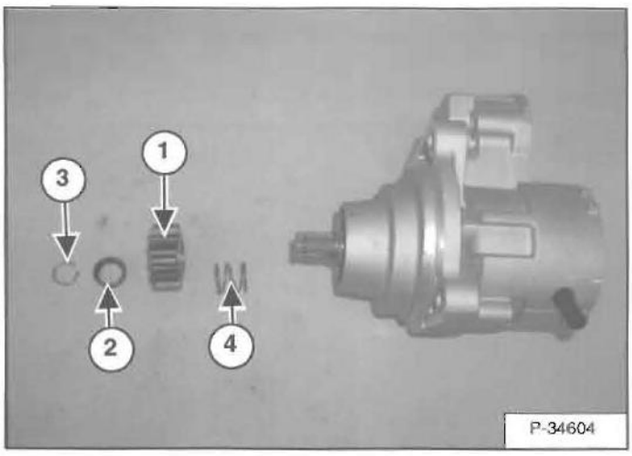
Remove the planetary gears (Item 2) **[Figure 60-40-14]** and inspect for damage.

Figure 60-40-15



Press down on the pinion (Item 1) **[Figure 60-40-15]** & **[Figure 60-40-16]** and retainer (Item 2) **[Figure 60-40-15]** & **[Figure 60-40-16]**.

Figure 60-40-16



Remove the snap ring (Item 3) **[Figure 60-40-15]** & **[Figure 60-40-16]**

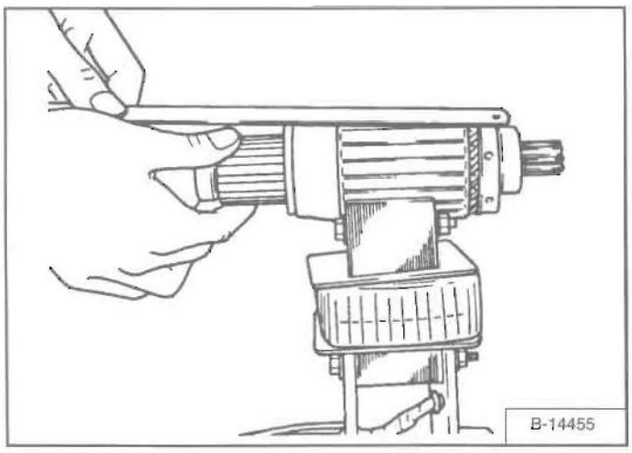
Remove the retainer (Item 2) **[Figure 60-40-15]** & **[Figure 60-40-16]** and pinion (Item 1) **[Figure 60-40-15]** & **[Figure 60-40-16]**.

Remove the spring (Item 4) **[Figure 60-40-16]**.

Installation: Inspect all parts for wear and replace as needed.

Inspection And Repair

Figure 60-40-17

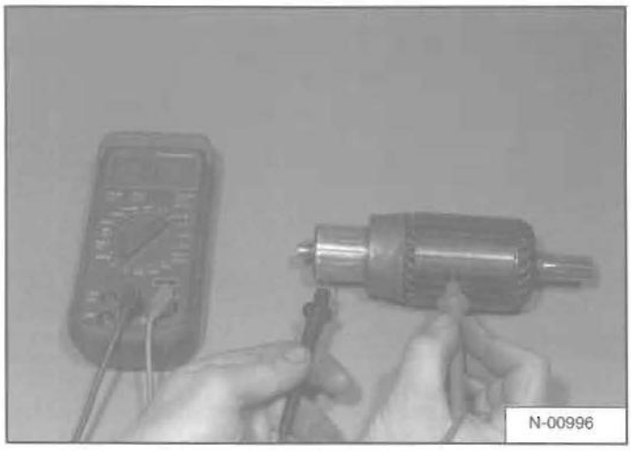


Inspect the brush cover for discoloration, indication the starter has been overheated.

Inspect the pinion teeth for wear and damage.

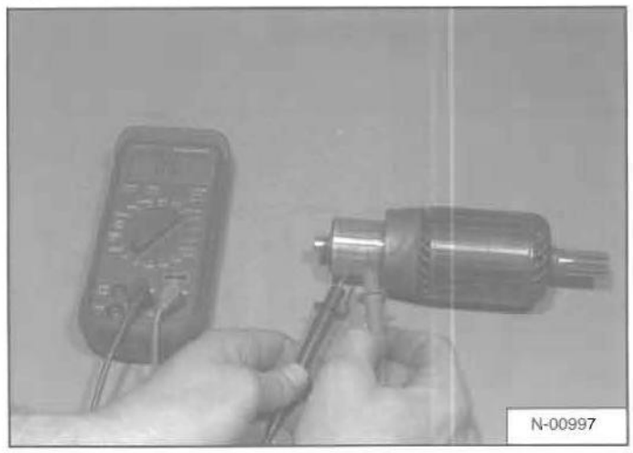
Armature Short-Circuit Test: Use a growler tester, put the armature on the growler and hold a hack saw blade against the armature core while slowly rotating the armature **[Figure 60-40-17]**. A short circuited armature causes the blade to vibrate and be attracted to the core. An armature which is short-circuited must be replaced.

Figure 60-40-18



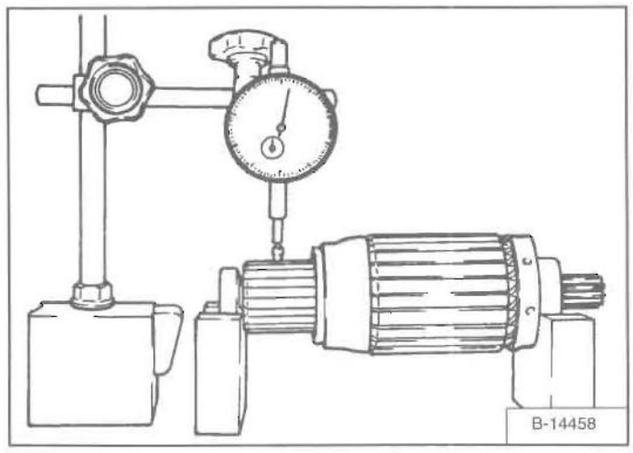
Armature Winding Ground Test: Use a circuit tester, touch one probe to a commutator segment and the other probe to the armature core **[Figure 60-40-18]**. There should be no continuity. If there is continuity, the armature is grounded and must be replaced.

Figure 60-40-19



Armature Winding Continuity Test: Use a circuit tester, touch the probes to two commutator segments **[Figure 60-40-19]**. There should be continuity at any point. If there is no continuity, the winding is open-circuited, replace the armature.

Figure 60-40-20



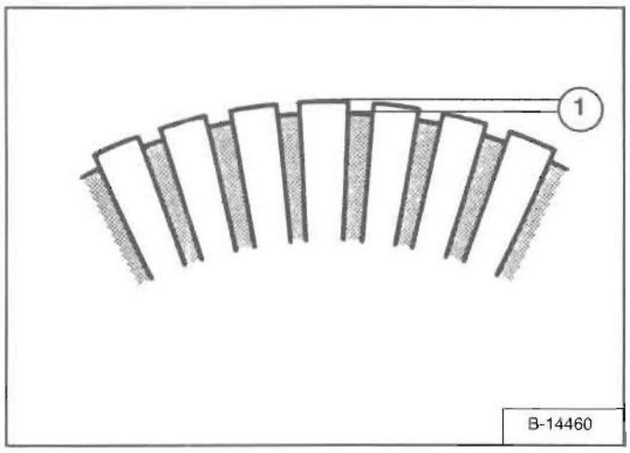
Commutator Run-Out Test: check the commutator run-out as shown in **[Figure 60-40-20]**.

Service Limit - 0.003 inch (0,07 mm)

If the commutator exceeds the service limit, repair as needed.

Inspection And Repair (Cont'd)

Figure 60-40-21



Measure the segment mica depth (Item 1) **[Figure 60-40-21]**.

Service Limit - 0.012 inch (0,3 mm)

If it is worn, replace the armature.

Check the commutator surface for burned spots which usually indicates an open-circuit, and correct it using #400 sand paper.

Figure 60-40-22



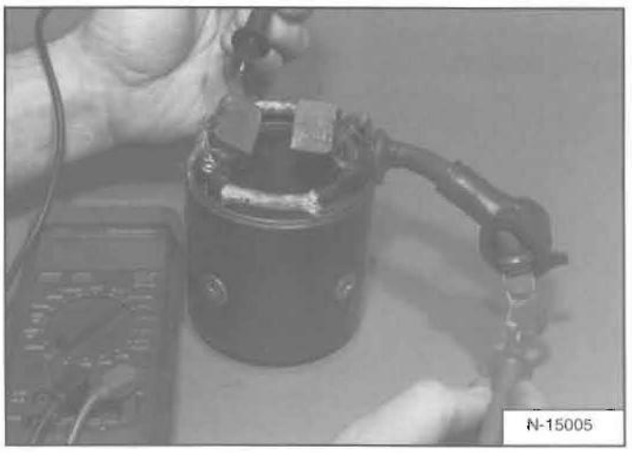
Check the field windings for wear and damage.

Check all the connections for clean and tight solder joints.

Fieid Winding Ground Test: Use a circuit tester, touch one probe to the field winding end of the brush and the other probe to the surface of the frame **[Figure 60-40-22]**. There should be no continuity. If there is continuity, the field windings are grounded.

Replace the frame.

Figure 60-40-23

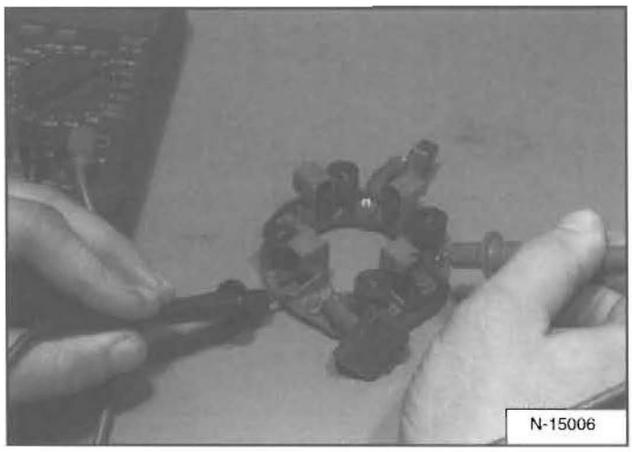


Field Windings Continuity Test: Use a circuit tester, touch one probe to the wire and the other probe to the brush **[Figure 60-40-23]**. There should be continuity. If there is no continuity, the field windings are open-circuited.

Replace the frame.

Inspection and Repair (Cont'd)

Figure 60-40-24



Inspect the brushes for wear and damage.

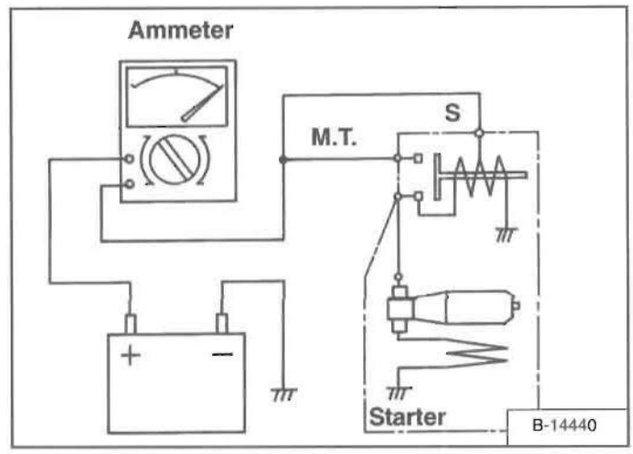
Replace the brush holder and yoke if the brushes need replacement.

Check brush spring, for damage or rust. Replace as needed.

Brush Holder Insulation Test: Use a circuit tester, touch one probe to the positive brush holder plate and the other probe to the holder plate **[Figure 60-40-24]**. There should be no continuity. If there is continuity, replace or repair.

No Load Test

Figure 60-40-25



The following test should be done after reassembling the starter:

Clamp the starter in a vise. Using a 12 volt battery and ammeter, connect the positive wire of the battery, and the ammeter to the terminal **[Figure 60-40-25]**. Connect the negative wire to the starter body. Using a jumper wire, connect the S terminal to the main terminal.

The starter should show smooth and steady rotation immediately after the pinion is engaged, it should draw less than the specified current.

Service Limit - 1150 Amp. Maximum @ Stall Condition

Clean all parts and apply high temperature grease to the armature bearing, return spring, steel ball, over running clutch, and idler gear rollers.



Bobcat®

INSTRUMENT PANEL

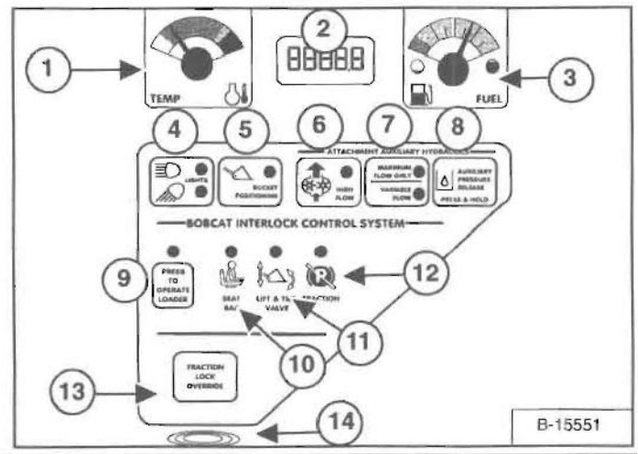
Left Panel

The left instrument panel is the same for both Standard and the Deluxe Instrument Panels **[Figure 60-50-1]**.

The table below shows the DESCRIPTION and FUNCTION / OPERATION for each of the components of the left panel.

Press and hold LIGHTS Button (Item 4) for two seconds to view SERVICE CODES in the HOURMETER/CODE DISPLAY (Item 2) **[Figure 60-50-1]**. If more than one SERVICE CODE is present, the codes will scroll on the HOURMETER/CODE DISPLAY.

Figure 60-50-1



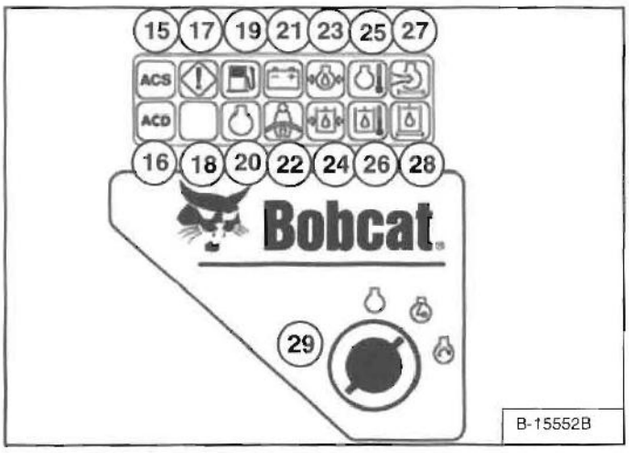
REF. NO	Description	Function / Operation
1	TEMPERATURE GAUGE	Shows the engine coolant temperature.
2	HOURMETER / CODE DISPLAY / GLOW PLUG COUNTDOWN	HOURMETER- Records operating hours of loader. CODE DISPLAY- Displays numeric SERVICE CODES* relating to the loader monitoring system. COUNTDOWN- Glow Plug time remaining.
3	FUEL GAUGE	Shows the amount of fuel in the tank.
4	LIGHTS / HOLD FOR CODES	LIGHTS- Press once for FRONT LIGHTS. Press a second time for FRONT AND REAR lights. Press a third time to turn all lights off. HOLD FOR CODES- Press and hold two seconds for display of SERVICE CODES*(Item 2). (CODES* show only when there is an error found by loader monitoring system).
5	BUCKET POSITIONING (Option)	Press to engage the BUCKET POSITIONING function. Press again to disengage. Press and hold 2 seconds to view SHTDN (SHUTDOWN followed by the version of software installed in the loader) feature in HOURMETER/CODE DISPLAY.
	ATTACHMENT AUXILIARY HYDRAULICS	
6	HIGH FLOW (Option)	Press to engage the HIGH FLOW auxiliary hydraulics.Press again to disengage.
7	MAXIMUM FLOW / VARIABLE FLOW	Press once to engage the VARIABLE FLOW auxiliary hydraulics. Press a second time to engage MAXIMUM FLOW. Press a third time to disengage all auxiliary hydraulics. VARIABLE FLOW allows for slow-to-fast movement of auxiliary functions (The farther you move the switch, the faster the movement of the auxiliary functions.) MAXIMUM FLOW allows for only fast movement.
8	AUXILIARY PRESSURE RELEASE	Press and hold for two seconds.The engine will stop. Hydraulic pressure will be released in the rear auxiliary (if so equipped) or right side front auxiliary circuit (if so equipped).

* See *ELECTRICAL SYSTEM SUPPLEMENT* for futher description of SERVICE CODES.

INSTRUMENT PANEL (CONT'D)

Right Panel (Standard) (With Key Switch)

Figure 60-50-2



The right instrument panel shown **[Figure 60-50-2]** is the Standard Panel.

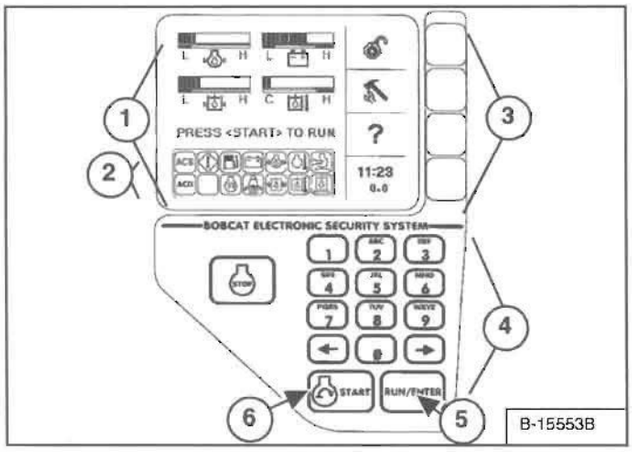
The table below shows the Icons and other components of the Right Standard Panel

* These functions are monitored and have SERVICE CODES associated with them. See DIAGNOSTIC SERVICE CODES page 60-01 for descriptions of SERVICE CODES.

REF.	FUNCTION	OPT. OR STD.	ICON/ LIGHT	ALARM	CODE	CONDITION	DESCRIPTION
ACS 15	Advanced Control System (ACS)	Opt.	ON	3 Beeps	*	Error	Error with Advanced Controls System (ACS)
ACD 16	Attachment Control Device (ACD)	Std.	FLASHING	3 Beeps	*	Error	Error with Attachment Control Device (ACD)
17	General Warning	Std. Std. Std.	ON ON FLASHING	3 Beeps 3 Beeps Continuous	* * *	Error WARNING SHUTDOWN	Error with one or more engine or hydraulic functions. Engine speed high or in shutdown. Engine speed very high. Engine will stop in 10 seconds.
18	NOT USED						
19	Fuel Level	Std. Std.	ON FLASHING	3 Beeps 3 Beeps	* *	Error WARNING	Fuel level sender system fault. Fuel level low.
20	Glow Plugs	Std. Std.	ON FLAHSING	--- 3 Beeps	- *	--- Error	Glow plugs are energized. Error with glow plugs
21	System Voltage	Std.	ON	3 Beeps	*	WARNING	Voltage low, high or very high.
22	Seat Belt	Std.	ON	---	-	---	Light stays on for 45 seconds to remind operator to fasten seat belt.
23	Engine Oil Pressure	Std. Std. Std.	ON ON FLASHING	3 Beeps 3 Beeps Continuous	* * *	Error WARNING SHUTDOWN	Engine Oil Pressure sender out of range. Engine oil level low. Engine oil pressure very low. Engine will shutdown in 10 seconds.
24	Hydrostatic Charge Pressure	Std. Std. Std.	ON ON FLASHING	3 Beeps 3 Beeps Continuous	* * *	Error WARNING SHUTDOWN	Hydraulic oil pressure sender out of range. Hydraulic oil pressure low. Hydraulic charge pressure very low. Engine will stop in 10 seconds.
25	Engine Coolant Temperature	Std. Std. Std.	ON ON FLASHING	3 Beeps 3 Beeps Continuous	* * *	Error WARNING SHUTDOWN	Engine coolant sender out of range Engine coolant temperature high. Engine coolant temperature very high. Engine will stop in 10 seconds.
26	Hydraulic Oil Temperature	Std. Std. Std.	ON ON FLASHING	3 Beeps 3 Beeps Continuous	* * *	Error WARNING SHUTDOWN	Hydraulic oil temperature out of range. Hydraulic oil temperature high. Hydraulic oil temperature very high. Engine will stop in 10 seconds.
27	Engine Air Filter	Std. Std.	ON FLASHING	3 Beeps 3 Beeps	* *	Error WARNING	Air filter with high restriction. Air filter switch not connected.
28	Hydraulic Filter	Std. Std.	ON FLASHING	3 Beeps 3 Beeps	* *	Error WARNING	Hydraulic filter with high restriction. Hydraulic filter switch not connected.
29	Key Switch	-	-	-	-	-	Used to start and stop the engine.

Right Panel - (Deluxe) (With Keyless Start)

Figure 60-50-3



1. *Display Panel*: The Display Panel is where all system setup, monitoring, troubleshooting, and error conditions are displayed.

2. *Function Icons*: The lower left area of the *Deluxe Panel* has the same Icons as the *Standard Panel* (See Right Panel (Standard) (With Key Switch) on Page 60-50-2.). These Icons are only visible when the monitoring system has detected an error.

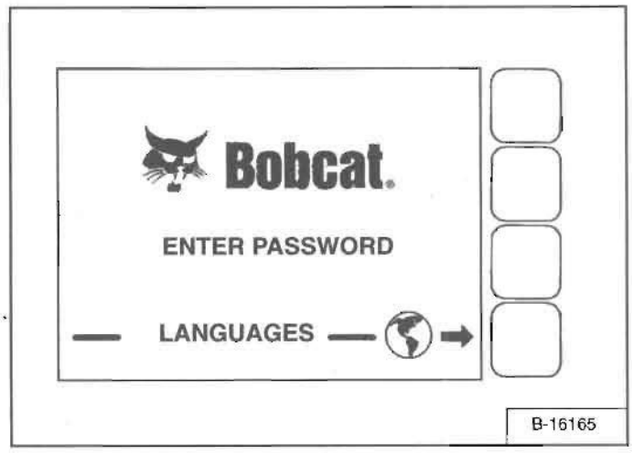
3. *Selection Buttons*: The four Selection Buttons allow you to select items from the Display Panel and scroll through screens.

4. *Keypad*: The numeric keypad (Item 4) **[Figure 60-50-3]** has two functions:

   (a) To enter a number code (password) to allow starting the engine (Keyless Start).

   (b) To enter a number as directed for further use of the Display Panel.

Figure 60-50-4



The first screen you will see on your new loader will be as shown in **[Figure 60-50-4]**.

When this screen is on the display you can enter the password and start the engine or change the Display Panel setup features.

NOTE: Your new loader (with *Deluxe Instrument Panel*) will have a Owner *Password*. Your dealer will provide you with this password. Change the password to one that you will easily remember to prevent unauthorized use of your loader. (See *ELECTRICAL SYSTEM SUPPLEMENT*.) Keep your password in a safe place for future needs.

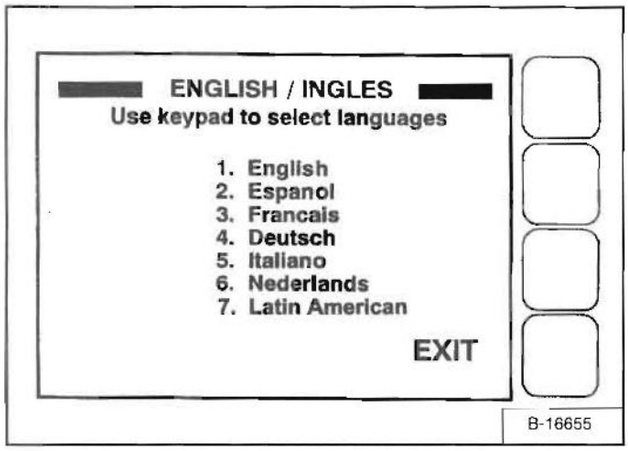
Start Engine: Use the Keypad to enter the numbers (letters) of your password and press the RUN / ENTER key (Item 5) **[Figure 60-50-3]**.

Press and hold the START Button (Item 6) **[Figure 60-50-3]** until the engine starts.

Change Language: Press the Selection Button at the end of the arrow **[Figure 60-50-4]** to go to the next screen.

Right Panel- (Deluxe) (With Keyless Start) (Cont'd)

Figure 60-50-5



Use the Keypad to select the number of the language [**Figure 60-50-5**].

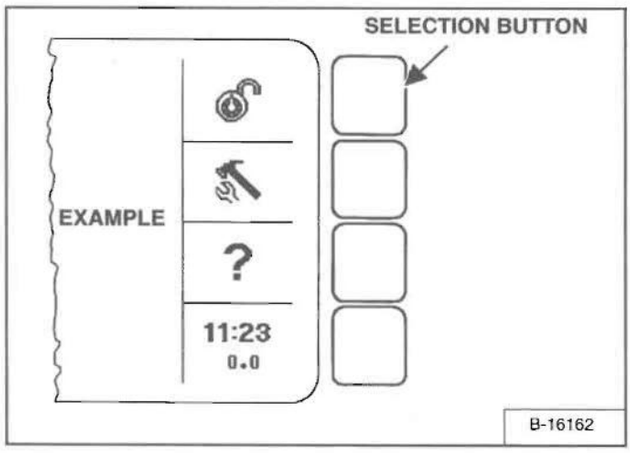
Press EXIT. The screen will return to [**Figure 60-50-4**]. You can then enter the password and start the engine.

NOTE: Pressing the Exit key will go to the previous screen and you can continue pressing until you get to the initial (home) screen. SHORTCUT: Press the "0" (zero) key to get to the home screen immediately.

Right Panel Setup Display Options (Deluxe)

Icon Identification

Figure 60-50-6



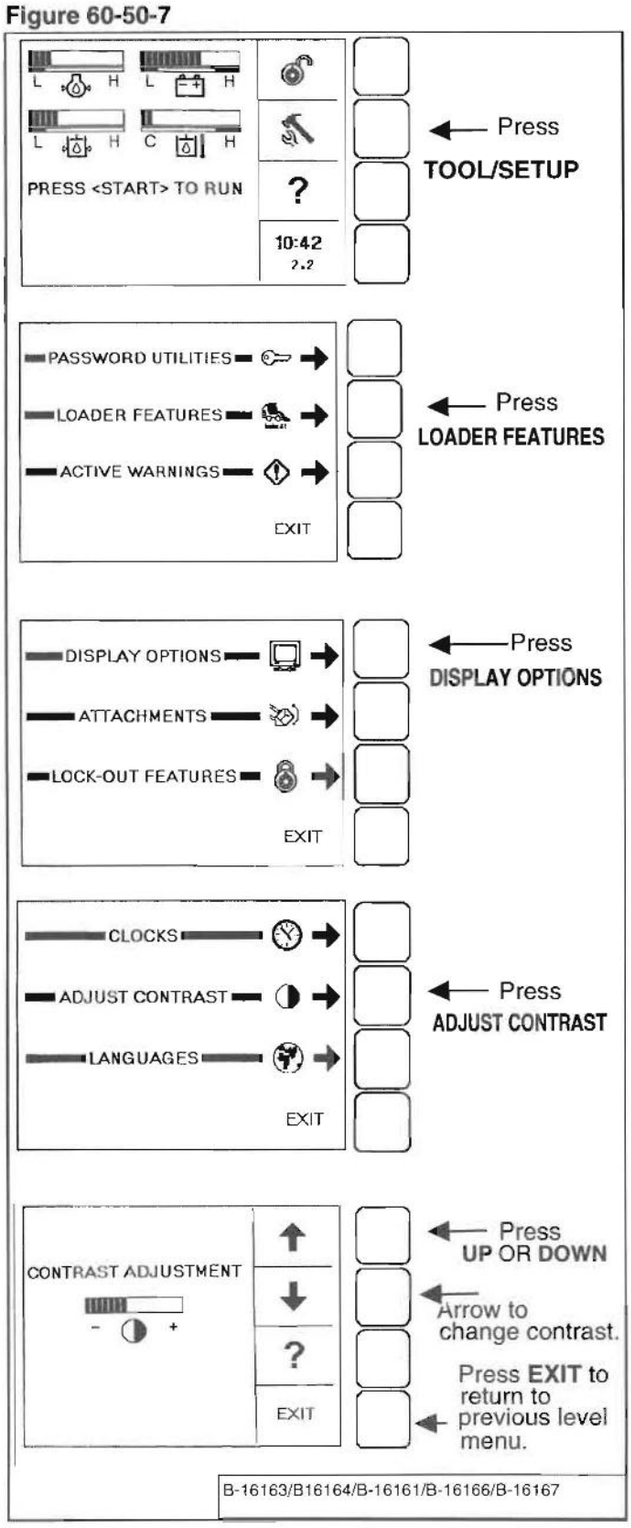
Make selection by pressing SELECTION BUTTON opposite the Icon **[Figure 60-50-6]**.

ICON	DESCRIPTION
 	**LOCK/UNLOCK:** Allows machine to be locked/unlocked. You must lock machine to activate security system. When system is unlocked, the user can press RUN/ENTER then press START to begin operation. A valid password will need to be entered at startup to run a locked machine.
	**TOOL/SETUP:** Access system options. Use to set clock, check system warnings, select language, set passwords, etc.
?	**HELP:** Access help on current menu item.
EXIT	**EXIT** returns you to previous level menu.
11:23 0.0	**CLOCK/JOB CLOCK:** Press to clear or lock job clock; TOOL/SETUP to set time.
⬆ ⬇	**UP ARROW:** Goes backward one screen. **DOWN ARROW:** Goes forward one screen.
⇧ ⇩	**OUTLINE ARROWS:** No screen available (backward/forward).
➡	**SELECTION ARROW:** Use to select menu item.
NEXT	Goes to the NEXT screen in series. EXAMPLE: the next Active Warning screen.
INFO	Goes to more information about an attachment.
YES/NO	Answer yes/no to current setup question.
CLEAR	Removes previously installed password.
SET	Set accepts current installed password.

Right Panel Setup Display Options (Deluxe) (Cont'd)

Deluxe Panel Setup - *Display Options*

Figure 60-50-7



All new machines with Deluxe Instrumentation arrive at Bobcat Dealerships with the panel in locked mode. This means that a password must be used to start the engine **[Figure 60-50-7]**.

Passwords

For security purposes, your dealer may change the password and also set it in the locked mode. Your dealer will provide you with the password.

Owner Password:

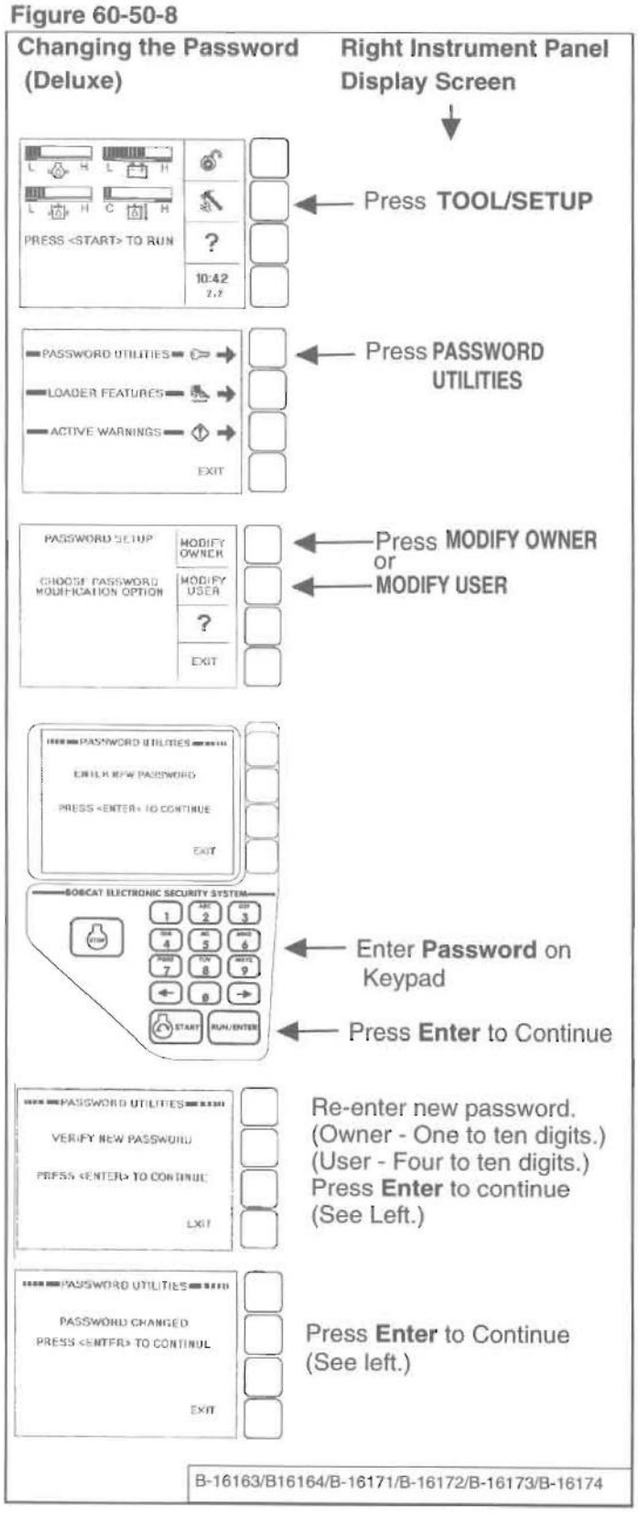
Allows for full use of the loader and to setup the Deluxe Panel. Owner can select a password to allow starting & operating the loader and modify the setup of the Deluxe Panel. Owner should change the password as soon as possible for security of the loader.

User Password:

Allows starting and operating the loader; cannot change password or any of the other setup features.

Right Panel Setup Display Options (Deluxe) (Cont'd)

Figure 60-50-8



Clocks

TOOL/SETUP **[Figure 60-50-8]**

LOADER FEATURES.
DISPLAY OPTIONS
CLOCKS
SET CLOCK
Use the keypad to set time.
Press RUN/ENTER to set clock.
Press EXIT to return to previous level menu.

RESET JOB CLOCK (Password required)
Press CLEAR to reset job clock to zero.
Press LOCK/UNLOCK to unlock.
Enter Password and press RUN/ENTER.

Languages

LOADER FEATURES.
TOOL/SETUP
DISPLAY OPTIONS
LANGUAGES
Select the language, press RUN/ENTER.
Press EXIT to return to previous level menu.

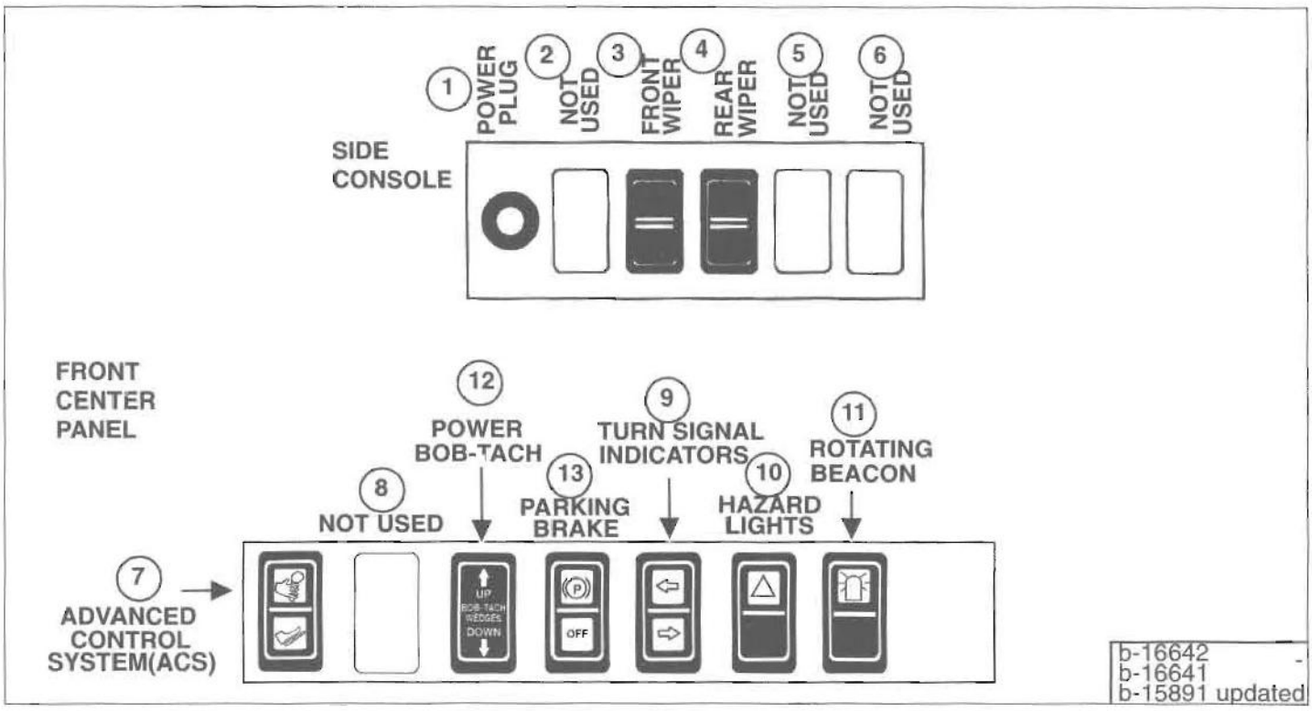
Vitals (Monitor engine, hydraulic/hydrostatic, electrical functions when engine is running.)

TOOL/SETUP
LOADER FEATURES.
VITALS
Press SELECTION ARROW to select METRIC or ENGLISH (M/E) readouts

You can monitor real-time readouts of:
- Engine Oil Pressure
- Engine Coolant Temperature
- Hydraulic Charge Pressure
- System Voltage
- Engine Speed

The Display Panel is easy to use. Continue to set your own preferences for running/monitoring your Bobcat loader.

Option and Field Accessory Panels



Side Console

Ref. No.	Description	Function / Operation
1	POWER PLUG	Provides a 12V receptacle for accessories.
2	NOT USED	---
3	FRONT WIPER	Press the top of the switch to start the front wiper (press and hold for wiper fluid). Press the bottom of the switch to stop the wiper.
4	REAR WIPER	Press the bottom of the switch to start the rear wiper. Press the top of the switch to provide washer fluid to clean the rear window.
5	NOT USED	---
6	NOT USED	---

Front Center Panel

7	ADVANCED CONTROL SYSTEM (ACS)	Press the top to select Hand Controls; bottom to select Foot Controls.
8	NOT USED	---
9	TURN SIGNAL INDICATORS	Indicates left or right TURN SIGNALS are ON.
10	HAZARD LIGHTS	Press the left side to turn the HAZARD LIGHTS ON; right side to turn OFF.
11	ROTATING BEACON	Press the left side to turn the ROTATING BEACON ON; right side to turn OFF.
12	POWER BOB-TACH	Press and hold the top side to disengage the Bob-Tach wedges. Press and hold the down side to engage the wedges into the mounting frame holes.
13	PARKING BRAKE	Press the top to engage the PARKING BRAKE; bottom to disengage.

Removal And Installation

Figure 60-50-9

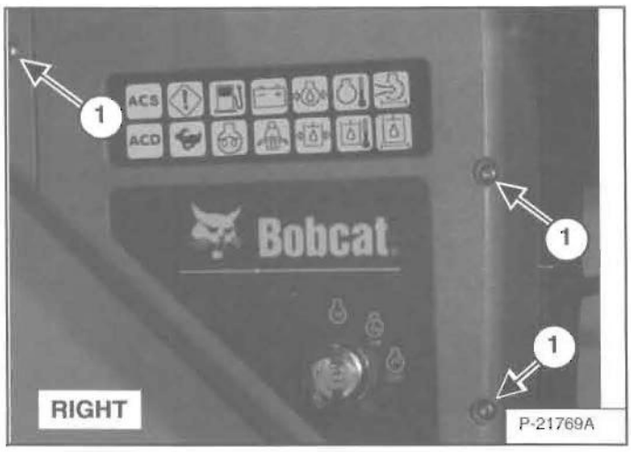
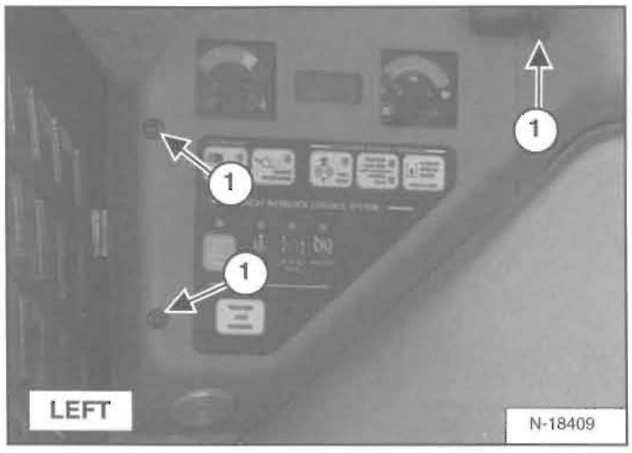


Figure 60-50-10



Remove the front light. (See Contents, Page 60-01.)

Remove the three mounting bolts (Item 1) **[Figure 60-50-9]** or **[Figure 60-50-10]**.

Installation: Be careful to not overtighten the instrument panel mounting bolts to prevent stripping of the threaded holes in the panels.

Figure 60-50-11

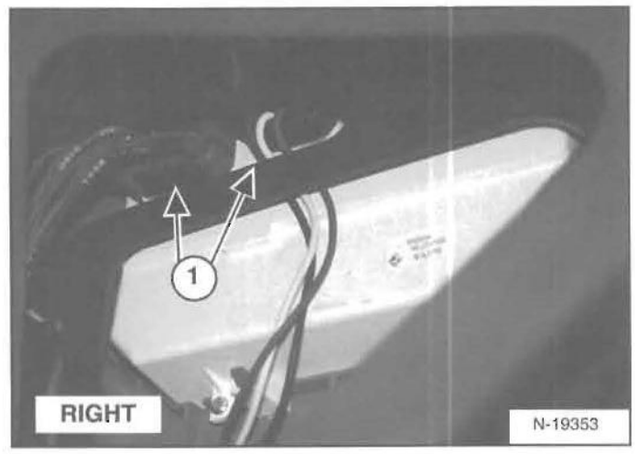
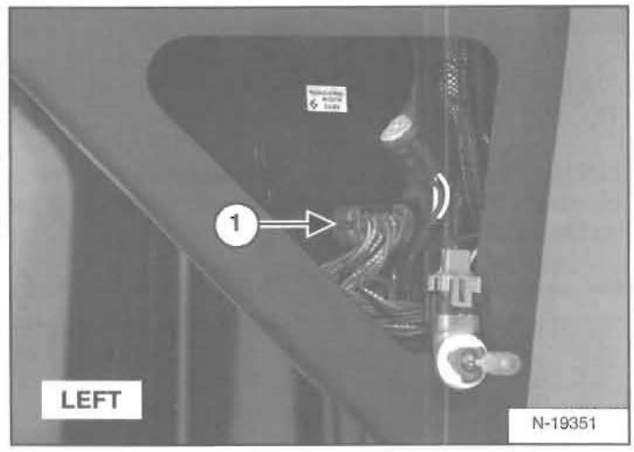


Figure 60-50-12



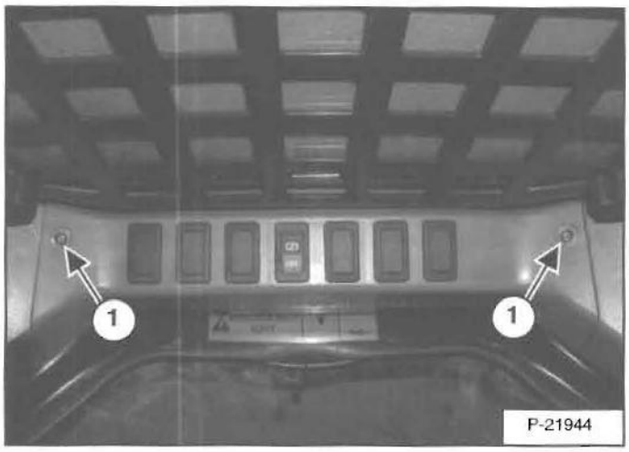
Pull the left instrument panel down and disconnect the wire harness connectors (Item 1) **[Figure 60-50-11]** or **[Figure 60-50-12]** from the panel.

Remove the panel.

Reverse the removal procedure to install the instrument panel.

Front Accessory Panel Removal And Installation

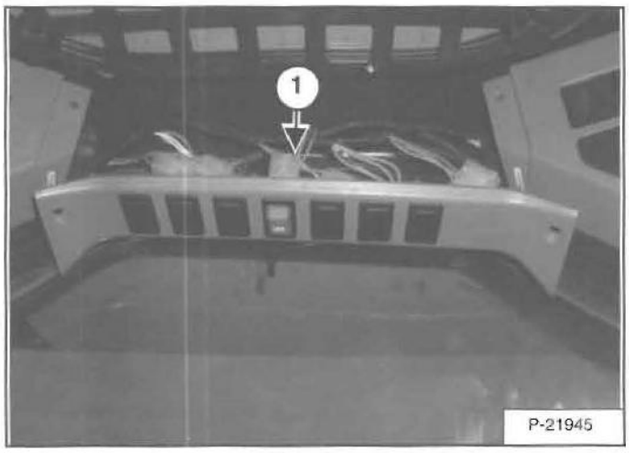
Figure 60-50-13



Remove the two mounting bolts (Item 1) **[Figure 60-50-13]**.

Installation: Be careful to not overtighten the front accessory panel mounting bolts to prevent damage to the plastic panel.

Figure 60-50-14



Pull the front accessory panel down and disconnect the wire harness connector(s) (Item 1) **[Figure 60-50-14]** from the switches.

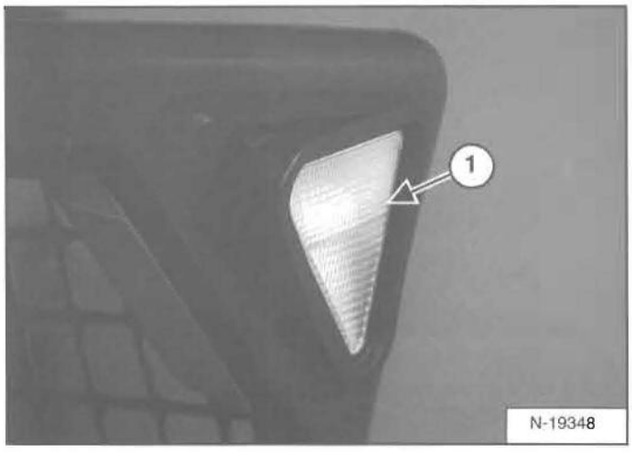
Remove the panel.

Reverse the removal procedure to install the front accessory panel.

LIGHTS

Front Removal And Installation

Figure 60-60-1

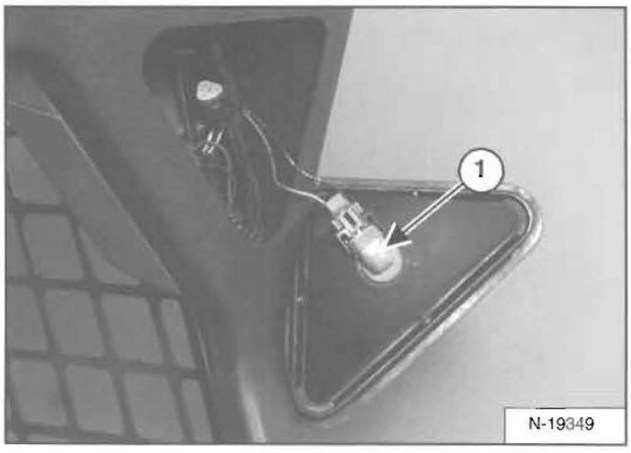


Open the rear door.

Disconnect the negative(-) cable from the battery. (See Contents Page 60-01).

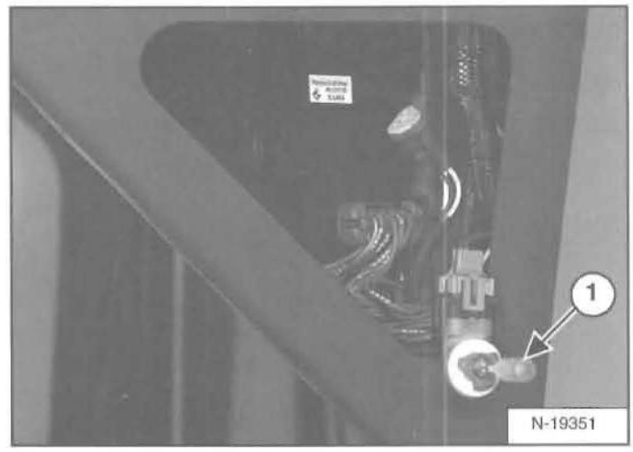
Remove the light housing (Item 1) **[Figure 60-60-1]** from the operator cab.

Figure 60-60-2



Remove the bulb assembly (Item 1) **[Figure 60-60-2]** from the light housing by turning bulb assembly a 1/4 turn.

Figure 60-60-3

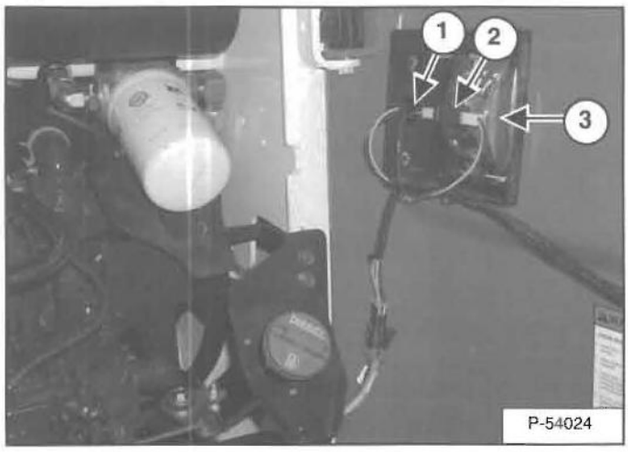


Remove the bulb (Item 1) **[Figure 60-60-3]** from the socket.

Reverse the above procedure to install the bulb.

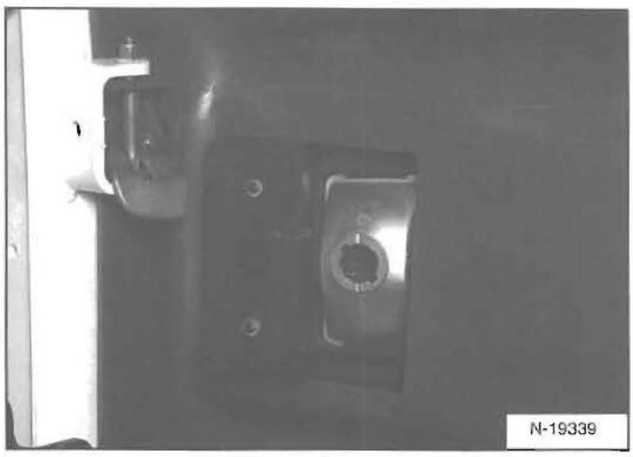
Rear Removal And Installation

Figure 60-60-4



Remove the bulb assembly (Items 1 & 2) from the light housing (Item 3) **[Figure 60-60-4]** by turning bulb assembly a 1/4 turn.

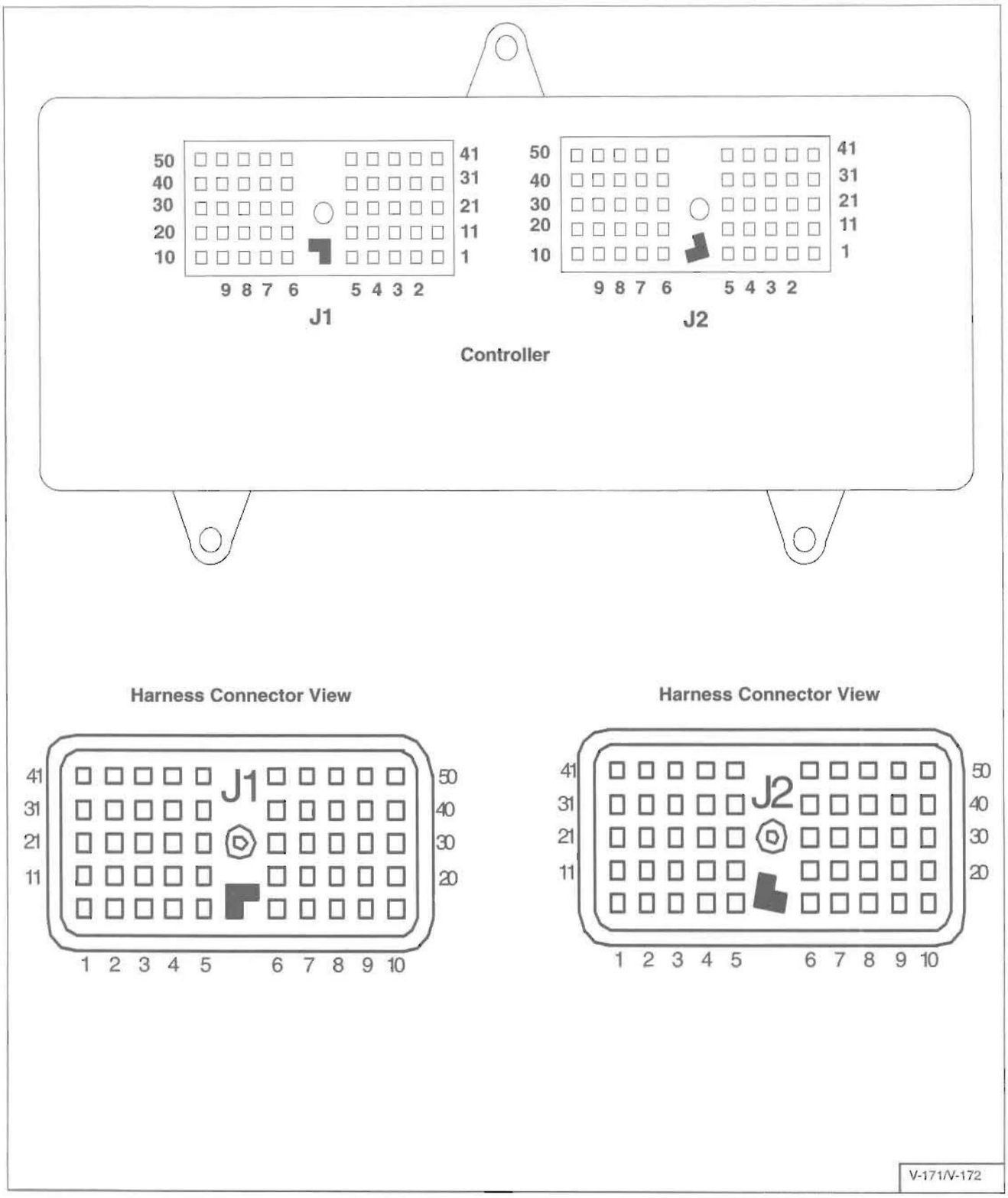
Figure 60-60-5



Using care press the rear light and housing from the door **[Figure 60-60-5]**.

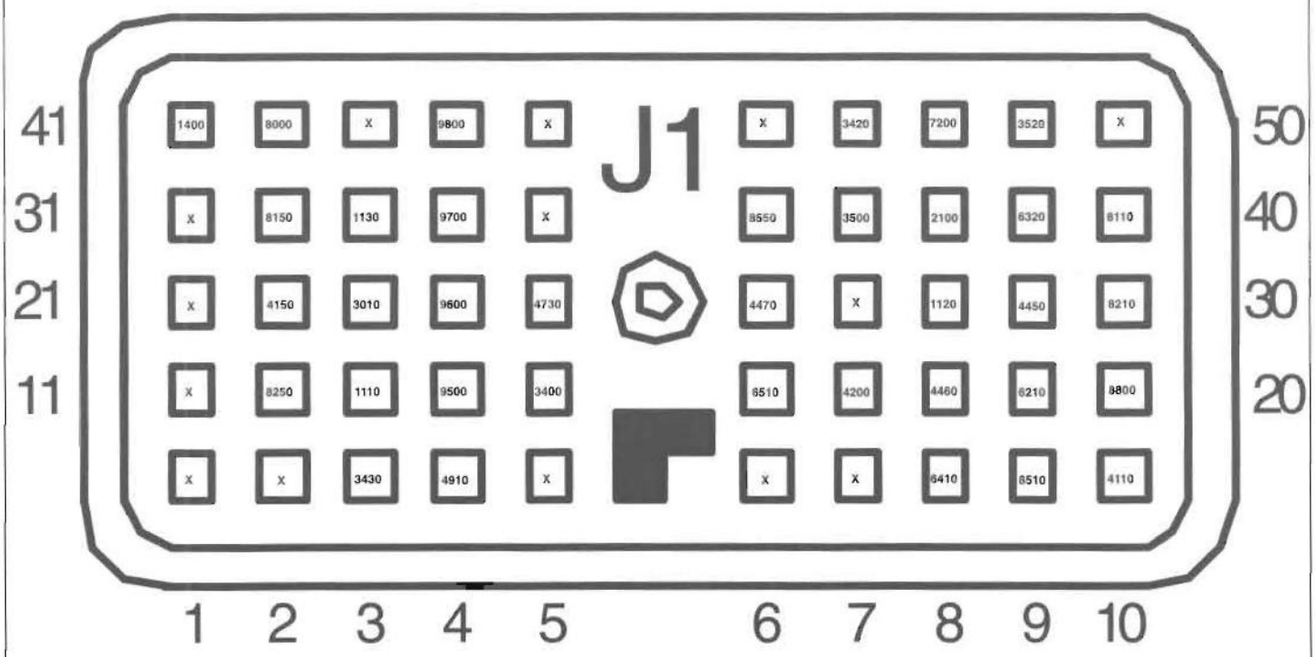
Reverse this procedure for installation.

Identification Chart

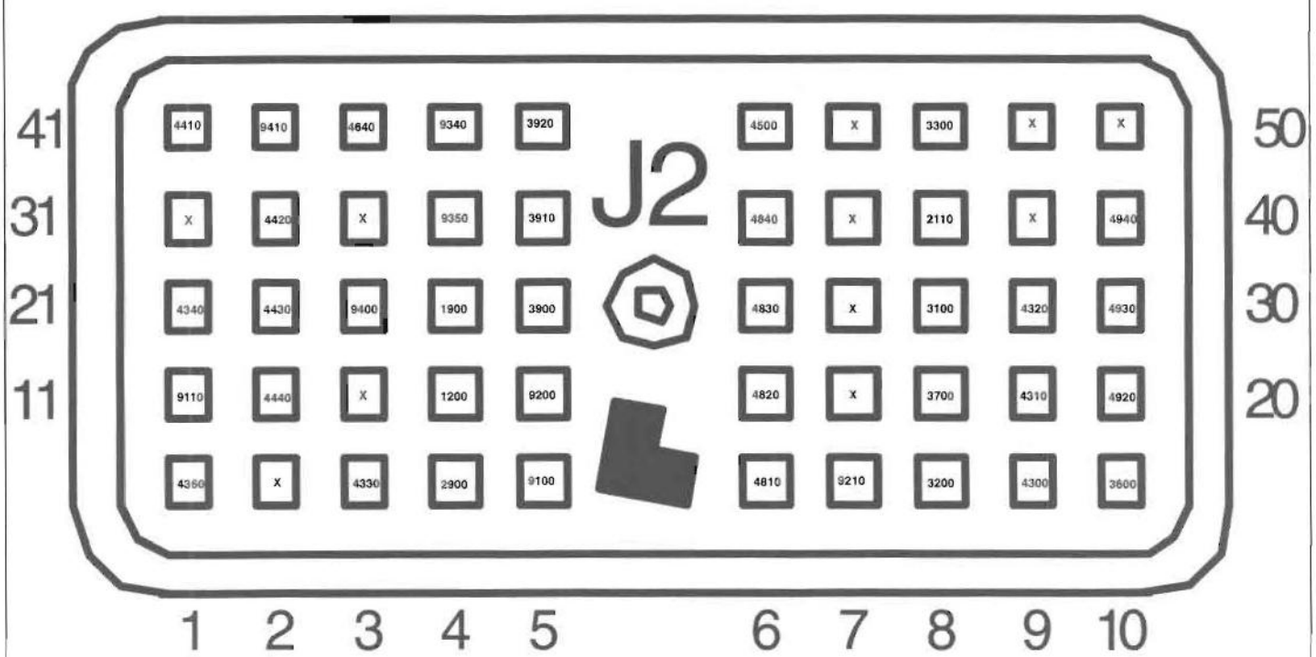


Identification Chart (Cont'd)

Harness Connector View



Harness Connector View



V-172

Removal And Installation

⚠ WARNING

Never work on a machine with the lift arms up unless the lift arms are secured by an approved lift arm support device. Failure to use an approved lift arm support device can allow the lift arms or attachment to fall and cause injury or death.

W-2059-0598

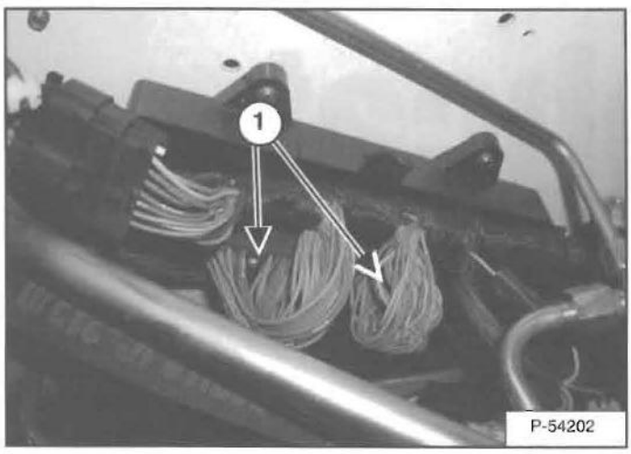
Lift and block the rear of the loader. (See Contents Page 10-01.)

Raise the lift arms and install an approved lift arm support device. (See Contents Page 10-01.)

Stop the engine. Raise the seat bar.

Raise the operator cab. (See Contents Page 10-01.)

Figure 60-70-1

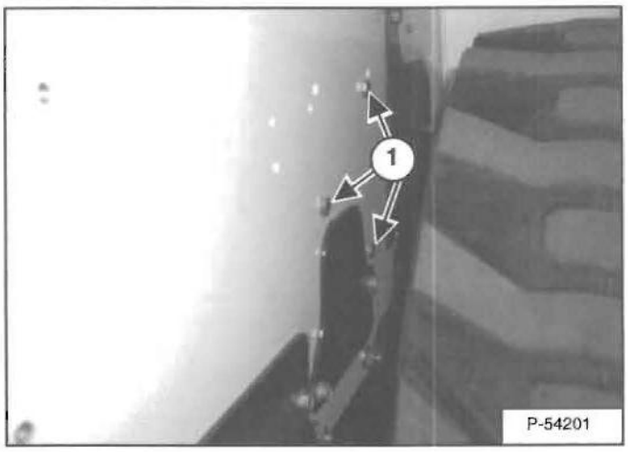


Loosen the connector mounting bolts (Item 1) **[Figure 60-70-1]** from the bobcat controller.

Remove the connectors.

NOTE: The connectors are keyed and will only plug in one way.

Figure 60-70-2



Remove the three mount bolts (Item 1) **[Figure 60-70-2]** securing the controller to the frame.

Remove the system controller.

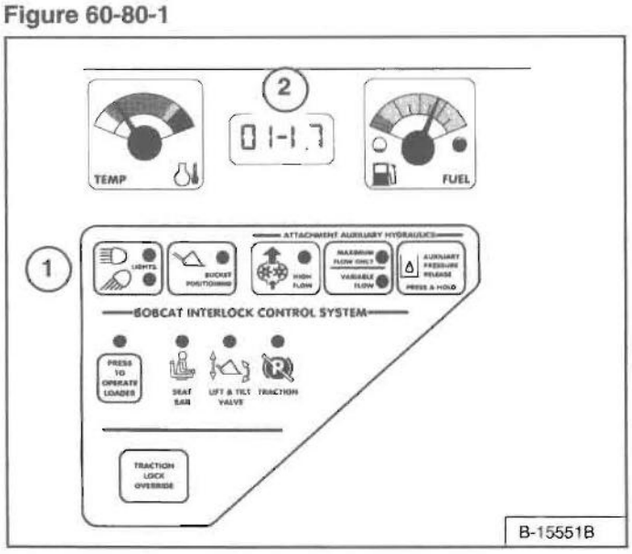
Installation: Tighten the bolts to 12.5-14 ft.-lbs. (17-19 Nm) torque.



Bobcat®

Display

Figure 60-80-1



The left instrument panel is the same for both the Standard and Deluxe Instrumentation **[Figure 60-80-1]**.

NOTE: Corroded or loose grounds can cause multiple service codes and/or abnormal symptoms. All dash lights flashing, buzzer going off, headlights and taillights flashing, could indicate a bad ground. The same symptoms could apply if the voltage is low, such as loose or corroded battery cables. If you observe these symptoms, check grounds and positive leads first.

Press and hold LIGHTS Button (Item 1) for two seconds to view SERVICE CODES in the HOURMETER/CODE DISPLAY (Item 2) **[Figure 60-80-1]**. If more than one SERVICE CODE is present, the codes will scroll on the HOURMETER/CODE DISPLAY.

The following

REPLY One or both instrument panel(s) not communicating with the controller.

INPUT The controller not communicating with the left instrument panel.

CODE The controller is asking for a password. (Deluxe instrument panel only.)

ERROR The wrong password was entered. (Deluxe instrument panel only.)

Number Codes List

CODE		CODE	
01-16	Air filter not connected	11-05	Seat bar sensor short to battery
01-17	Air filter plugged	11-06	Seat bar sensor short to ground
02-16	Hydraulic charge filter not connected	12-21	Front auxiliary PWM switch out of range high
02-17	Hydraulic charge filter plugged	12-22	Front auxiliary PWM switch out of range low
		12-23	Front auxiliary PWM switch not in neutral
03-09	Battery voltage low		
03-10	Battery voltage high	13-05	Fuel shut-off hold solenoid short to battery
03-11	Battery voltage extremely high	13-06	Fuel shut-off hold solenoid short to ground
03-14	Battery voltage extremely low	13-07	Fuel shut-off solenoid open circuit
03-22	Battery voltage out of range low		
		14-02	Fuel shut-off pull solenoid error ON
04-09	Engine oil pressure low	14-03	Fuel shut-off pull solenoid error OFF
04-14	Engine oil pressure extremely low		
04-15	Engine oil pressure shutdown level	15-02	Traction lock pull solenoid error ON
04-21	Engine oil pressure out of range high	15-03	Traction lock pull solenoid error OFF
04-22	Engine oil pressure out of range low		
		16-05	Traction lock hold solenoid short to battery
05-09	Hydraulic charge pressure low	16-06	Traction lock hold solenoid short to ground
05-14	Hydraulic charge pressure extremely low	16-07	Traction lock hold solenoid open circuit
05-15	Hydraulic charge pressure shutdown level		
05-21	Hydraulic charge pressure out of range high	17-05	Hydraulic lock valve solenoid short to battery
05-22	Hydraulic charge pressure of range low	17-06	Hydraulic lock valve solenoid short to ground
		17-07	Hydraulic lock valve solenoid open circuit
06-10	Engine speed high		
06-11	Engine speed extremely high	18-05	Spool Lock Solenoid short to battery
06-13	Engine speed no signal	18-06	Spool Lock Solenoid short to ground
06-15	Engine speed shutdown level	18-07	Spool Lock Solenoid open circuit
06-18	Engine speed out of range		
		19-02	Bucket position solenoid error ON
07-10	Hydraulic oil temperature high	19-03	Bucket position solenoid error OFF
07-11	Hydraulic oil temperature extremely high		
07-15	Hydraulic oil temperature shutdown level	20-02	Two-speed solenoid error ON
07-21	Hydraulic oil temperature out of range high	20-03	Two-speed solenoid error OFF
07-22	Hydraulic oil temperature out of range low		
		21-02	Glow plug error ON
08-10	Engine coolant temperature high	21-03	Glow plug error OFF
08-11	Engine coolant temperature extremely high		
08-15	Engine coolant temperature shutdown level	22-02	Starter error ON
08-21	Engine coolant temperature out of range high	22-03	Starter error OFF
08-22	Engine coolant temperature out of range low		
		23-02	Rear base solenoid error ON
09-09	Fuel level low	23-03	Rear base solenoid error OFF
09-21	Fuel level out of range high		
09-22	Fuel level out of range low	24-02	Rear rod solenoid error ON
		24-03	Rear rod solenoid error OFF

Number Codes List (Cont'd)

CODE		CODE	
25-02	Rear auxiliary relief solenoid error ON	32-61	Handle lock short to ground
25-03	Rear auxiliary relief solenoid error Off	32-62	Handle lock short to battery
		32-63	Pedal lock short to ground
26-02	Front base solenoid error ON	32-64	Pedal lock short to battery
26-03	Front base solenoid error OFF	32-65	Sensor supply voltage out of range
		32-66	Battery voltage out of range
27-02	Front rod solenoid error ON	32-67	Switch flipped while operating
27-03	Front rod solenoid error OFF	32-68	Lift handle information error
		32-69	Control pattern switch flipped while operating
28-02	Diverter solenoid error ON	32-70	Right drive handle short to ground
28-03	Diverter solenoid error OFF	32-71	Right drive handle short to battery
29-02	High flow solenoid error ON	33-23	Main Controller (Bobcat Controller) not programmed
29-03	High flow solenoid error OFF		
		34-04	Deluxe panel no communication to Bobcat controller
30-28	Controller Memory failure		
		35-02	Two-speed fan error ON
31-28	Interrupted power failure	35-03	Two-speed fan error OFF
32-04	ACS not communicating with Bobcat Controller	36-48	ACD multiple controllers present
32-23	ACS Not calibrated		
32-31	Tilt actuator fault	37-02	Two-speed secondary error ON
32-32	Tilt actuator wiring fault	37-03	Two-speed secondary error OFF
32-33	Tilt handle wiring fault		
32-34	Tilt actuator not in neutral		
32-35	Tilt handle/pedal not in neutral		
32-36	Lift actuator fault		
32-37	Lift actuator wiring fault		
32-38	Lift handle wiring fault		
32-39	Lift actuator not in neutral		
32-40	Lift handle/pedal not in neutral		
32-41	No communication		
32-49	Lift actuator short to ground		
32-50	Tilt actuator short to ground		
32-51	Lift actuator short to battery		
32-52	Tilt actuator short to battery		
32-53	Lift handle/pedal short to ground		
32-54	Tilt handle/pedal short to ground		
32-55	Lift handle/pedal short to battery		
32-56	Tilt handle/pedal short to battery		
32-57	Lift actuator reduced performance		
32-58	Tilt actuator reduced performance		
32-59	Lift actuator wrong direction		
32-60	Tilt actuator wrong direction		

Number Codes List (Cont'd)

CODE		CODE	
38-04	No communication from joystick controller	38-53	Left forward drive solenoid error OFF
38-05	Left joystick X axis not in neutral	38-54	Left reverse drive solenoid error OFF
38-06	Right joystick X axis not in neutral	38-55	Right forward drive solenoid error OFF
38-07	Left joystick Y axis not in neutral	38-56	Right reverse drive solenoid error OFF
38-08	Right joystick Y axis not in neutral	38-57	Front right extend steering solenoid error OFF
38-09	Control pattern switch - Short to Battery or Ground	38-58	Front right retract steering solenoid error OFF
38-11	Lift actuator not in neutral	38-59	Front left extend steering solenoid error OFF
38-12	Tilt actuator not in neutral	38-60	Front left retract steering solenoid error OFF
38-13	Lift actuator fault	38-61	Rear right extend steering solenoid error OFF
38-14	Tilt actuator fault	38-62	Rear right retract steering solenoid error OFF
38-15	Right wheel speed fault	38-63	Rear left extend steering solenoid error OFF
38-16	Left wheel speed fault	38-64	Rear left retract steering solenoid error OFF
38-17	Tilt actuator reduced performance	38-65	Steering pressure solenoid error OFF
38-18	Lift actuator reduced performance	38-66	Back-up alarm error OFF
38-19	Left joystick X axis out of range high	38-67	No communication from Bobcat controller
38-20	Right joystick X axis out of range low	38-68	Wheel angles (alignment) not calibrated
38-21	Left joystick Y axis out of range high	38-69	Lift & tilt actuators not calibrated
38-22	Right joystick Y axis out of range high	38-70	Interrupted power
38-23	Front right steering sensor out of range high	38-71	Battery out of range
38-24	Front left steering sensor out of range high	38-72	Drive pump not calibrated
38-25	Rear right steering sensor out of range high	38-73	Steering mode / drive mode switch flipped while operating
38-26	Rear left steering sensor out of range high	38-74	Uncommanded right wheel speed error ON
38-27	Lift actuator out of range high	38-75	Uncommanded left wheel speed error ON
38-28	Tilt actuator out of range high	38-76	Undercurrent steer pressure solenoid
38-29	Left joystick X axis out of range low	38-77	Undercurrent front right extend steer solenoid
38-30	Right joystick X axis out of range low	38-78	Undercurrent front right retract steer solenoid
38-31	Left joystick Y axis out of range low	38-79	Undercurrent front left extend steer solenoid
38-32	Right joystick Y axis out of range low	38-80	Undercurrent front left retract steer solenoid
38-33	Front right steering sensor out of range low	38-81	Undercurrent rear right extend steer solenoid
38-34	Front left steering sensor out of range low	38-82	Undercurrent rear right retract steer solenoid
38-35	Rear right steering sensor out of range low	38-83	Undercurrent rear left extend steer solenoid
38-36	Rear left steering sensor out of range low	38-84	Undercurrent rear left retract steer solenoid
38-37	5 volt sensor supply 1 out of range low	38-85	5 Volt sensor supply 1 out of range high
38-38	5 volt sensor supply 2 out of range low	38-86	5 Volt sensor supply 2 out of range high
38-39	Lift actuator short to ground / out of range low	38-87	Front right wheel blocked (steering mechanical failure)
38-40	Tilt actuator short to ground / out of range low	38-88	Front left wheel blocked (steering mechanical failure)
38-41	Tilt actuator wrong direction	38-89	Rear right wheel blocked (steering mechanical failure)
38-42	Lift actuator wrong direction	38-90	Rear left steering error
38-43	Left forward drive solenoid error ON	38-91	Right speed sensor missing pulses
38-44	Left reverse drive solenoid error ON	38-92	Left speed sensor missing pulses
38-45	Right forward drive solenoid error ON	38-93	Unresponsive right speed sensor
38-46	Right reverse drive solenoid error ON	38-94	Unresponsive left speed sensor
38-47	Front right steering solenoid error ON	38-98	Controller in drive calibration mode
38-48	Front left steering solenoid error ON	38-99	Controller in wheel position calibration mode.
38-49	Rear right steering solenoid error ON		
38-50	Rear left steering solenoid error ON		
38-51	Steering pressure solenoid error ON		
38-52	Back-up alarm error ON		

Number Codes List (Cont'd)

CODE		CODE	
39-04	Left joystick no communication to Bobcat controller	85-02	ACD output 'F' error ON
		85-03	ACD output 'F' error OFF
40-04	Right joystick no communication to Bobcat controller		
		86-02	ACD output 'G' error ON
44-02	Horn error ON	86-03	ACD output 'G' error OFF
44-03	Horn error OFF		
		87-02	ACD output 'H' error ON
45-02	Right blinker error ON	87-03	ACD output 'H' error OFF
45-03	Right blinker error OFF		
		90-02	Service tool output 'C' error ON
46-02	Left blinker error ON	90-03	Service tool output 'C' error OFF
46-03	Left blinker error OFF		
		91-02	Service tool output 'D' error ON
47-21	8 volt sensor supply out of range high	91-03	Service tool output 'D' error OFF
47-22	8 volt sensor supply out of range low		
		92-02	Service tool output 'E' error ON
48-02	Front light relay error ON	92-03	Service tool output 'E' error OFF
48-03	Front light relay error OFF		
		93-02	Service tool output 'F' error ON
49-02	Rear light relay error ON	93-03	Service tool output 'F' error OFF
49-03	Rear light relay error OFF		
60-21	Rear auxiliary control out of range high		
60-22	Rear auxiliary control out of range low		
60-23	Rear auxiliary control not returning to neutral		
64-02	Switched power relay error ON		
64-03	Switched power relay error OFF		
74-72	Bobcat controller in boot code		
74-73	Left hand panel system RX error		
80-02	ACD output 'A' error ON		
80-03	ACD output 'A' error OFF		
81-02	ACD output 'B' error ON		
81-03	ACD output 'B' error OFF		
82-02	ACD output 'C' error ON		
82-03	ACD output 'C' error OFF		
83-02	ACD output 'D' error ON		
83-03	ACD output 'D' error OFF		
84-02	ACD output 'E' error ON		
84-03	ACD output 'E' error OFF		

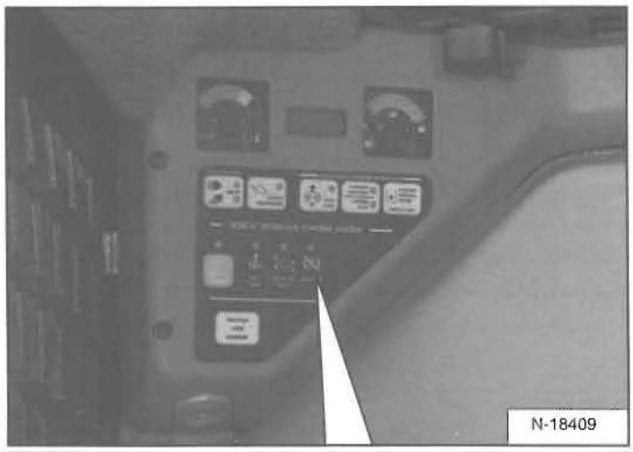


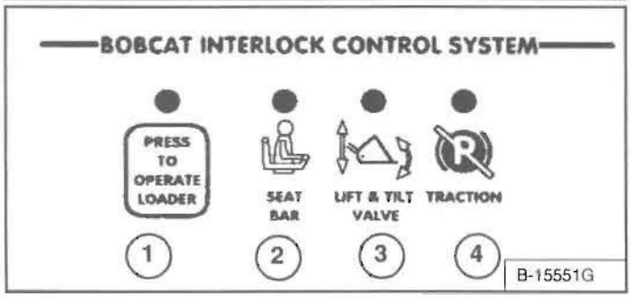
Bobcat®

BICS™ SYSTEM

Inspecting The BICS™ Controller (Engine STOPPED - Key ON)

Figure 60-90-1





⚠ WARNING

AVOID INJURY OR DEATH

The Bobcat Interlock Control System (BICS™) must deactivate the lift, tilt and traction drive functions. If it does not, contact your dealer for service. DO NOT modify the system.

W-2151-0394

1. Sit in the operator's seat. Turn key ON (*Standard Panel*), press RUN / ENTER Button (*Deluxe Panel*, lower the Seat Bar and disengage the parking brake pedal. Press the PRESS TO OPERATE LOADER Button. Three BICS™ lights (Items 1, 2, & 3) [PRESS TO OPERATE LOADER, SEAT BAR, and LIFT & TILT VALVE] on left instrument panel should be ON **[Figure 60-90-1]**.

2. Raise the Seat Bar fully. All four BICS™ lights (Items 1, 2, 3, & 4) [PRESS TO OPERATE LOADER, SEAT BAR, LIFT & TILT VALVE and TRACTION*] on left instrument panel should be OFF **[Figure 60-90-1]**

NOTE: Record what lights are blinking (if any) and number of light flashes. See Troubleshooting Guide on Page 60-90-3.

Inspecting Deactivation Of The Auxiliary Hydraulics System (Engine STOPPED - Key ON)

3. Sit in the operator's seat, lower the Seat Bar, and press the PRESS TO OPERATE LOADER Button. Press the auxiliary hydraulics FLOW Button. The auxiliary FLOW Button light will come ON. Raise the Seat Bar. The light should be OFF.

Inspecting The Seat Bar Sensor (Engine RUNNING)

4. Sit in the operator's seat, lower the seat bar, engage the parking brake pedal and fasten the seat belt.

5. Start the engine and operate at low idle. Press the PRESS TO OPERATE LOADER Button. While raising the lift arms, raise the Seat Bar fully. The lift arms should stop. Repeat using the tilt function.

Inspecting The Traction Lock (Engine RUNNING)

6. Fasten the seat belt, disengage the parking brake pedal, press the PRESS TO OPERATE LOADER Button and raise the Seat Bar fully. Move the steering levers slowly forward and backward. The TRACTION lock should be engaged. Lower the Seat Bar. Press the PRESS TO OPERATE LOADER Button.

7. Engage the parking brake pedal and move the control levers slowly forward and backward. The TRACTION lock should be engaged.

NOTE: * The TRACTION light on the left instrument panel will remain OFF until the engine is started, the PRESS TO OPERATE LOADER Button is pressed and the parking brake is disengaged.

Inspecting The Lift Arm By-Pass Control

8. Raise the lift arms 6 feet (2 meters) off the ground. Stop the engine.

Turn the lift arm by-pass control knob clockwise 1/4 turn. Pull up and hold the lift arm by-pass control knob until the lift arms slowly lower.

Troubleshooting Chart

The following troubleshooting guide is provided for assistance in locating and correcting BICS™ system problems. It is recommended that these procedures be done by authorized Bobcat 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	SOLUTION#
All indicator lights flashing.	5
One of the indicator lights flashing.	1
Intermittent indicator lights.	2, 3, 4

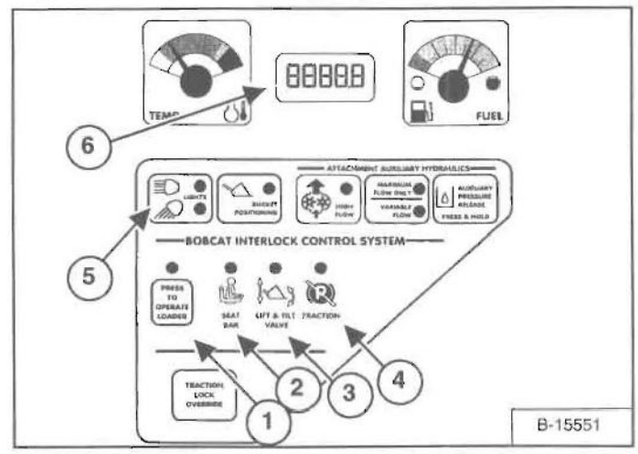
SOLUTION SUGGESTIONS
1. Refer to BICS™ troubleshooting guide.(See Page 60-90-3)
2. Check wire connections on Bobcat controller to make sure connectors are locked into place.
3. Check pins in connectors for pins pushed back or bent.
4. Use seatbar sensor tester MEL1428 to isolate problem between sensor and controller and wiring.
5. Possible low or high voltage.

Troubleshooting Guide

The following chart shows the effects which can happen to the loader, and the probable causes when the BICS™ Instrument Panel lights are off. See **[Figure 60-90-2]** for location of BICS™ lights and Icons. Have service procedures performed ONLY BY QUALIFIED BOBCAT SERVICE PERSONNEL.

Press and hold LIGHTS Button (Item 5) for two seconds to view SERVICE CODES in the HOURMETER / CODE DISPLAY (Item 6) **[Figure 60-90-2]**. If more than one SERVICE CODE is present, the codes will scroll on the HOURMETER / CODE DISPLAY.

Figure 60-90-2



Indicator Light	Light ON	Light OFF	Effect on Operation of Loader When Light is OFF	SERVICE CODES Means System Error (See Your Bobcat Dealer for Service)		
				No. of Flashes	Service Code	Causes
① PRESS TO OPERATE LOADER	PRESS TO OPERATE LOADER Button is pressed.	PRESS TO OPERATE LOADER Button is not pressed.	Lift, tilt and traction functions will not operate.	----	----	----
② SEAT BAR	Seat Bar is down.	Seat Bar is up.	Lift and tilt functions will not operate.	2	11-05	Seat Bar sensor circuit shorted to battery voltage*.
				3	11-06	Seat Bar sensor circuit shorted to ground.
③ LIFT & TILT VALVE	Control valve can be used.	Control valve cannot be used.	Lift, tilt and traction functions will not operate.	1	17-07	Valve output circuit is open.
				2	17-05	Valve output circuit shorted to battery voltage*.
				3	17-06	Valve output circuit shorted to ground.
				3	17-06	Controller not grounded or intermittent ground.
④ TRACTION	Loader can be moved forward & backward	Loader cannot be moved forward and backward.	Loader cannot be moved forward and backward.	1	16-07	Traction lock hold solenoid circuit is open.
				2	16-05	Traction lock hold solenoid circuit shorted to battery voltage*.
				3	16-06	Traction lock hold solenoid circuit shorted to ground.
				5	15-02	Traction lock pull solenoid circuit is shorted to battery voltage* - ERROR ON (Should be OFF).
				6	15-03	Traction lock pull solenoid circuit ERROR OFF (Should be ON).
SEAT BAR LIFT & TILT VALVE TRACTION				Continuous Flashing	03-09 03-10	System voltage low System voltage high

NOTES:

Multiple SERVICE CODES and/or Abnormal Symptoms can be caused by corroded or loose ground. Check grounds and both battery connections.

ERROR OFF = shorted to ground or bad fuse, faulty wiring, faulty open relay, no voltage from relay to controller.
ERROR ON = shorted to battery voltage, faulty wiring, faulty closed relay.

*Normal BICS operating voltage is less than the electrical system voltage.



Bobcat®

SEAT BAR SENSOR

Troubleshooting Chart

The following troubleshooting chart is provided for assistance in locating and correcting BICS system problems. It is recommended that these procedures be done by authorized Bobcat 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	SOLUTION #
Indicator light does not come ON when seat bar is lowered.	1, 2, 3, 4, 5

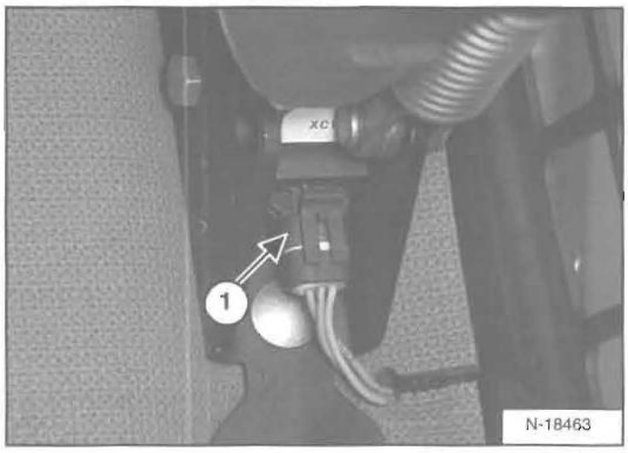
SOLUTION SUGGESTIONS

1. Check sensor wire connection.
2. Use the BICS™ sensor tester MEL 1428 with seat bar adapter MEL1567 to check sensor and controller.
3. Check for loose hardware.
4. Check keyed bushing to make sure magnet collar rotates with seat bar.
5. Check magnet collar magnets for contamination such as metal particles.

SEAT BAR SENSOR (CONT'D)

Test

Figure 60-100-1

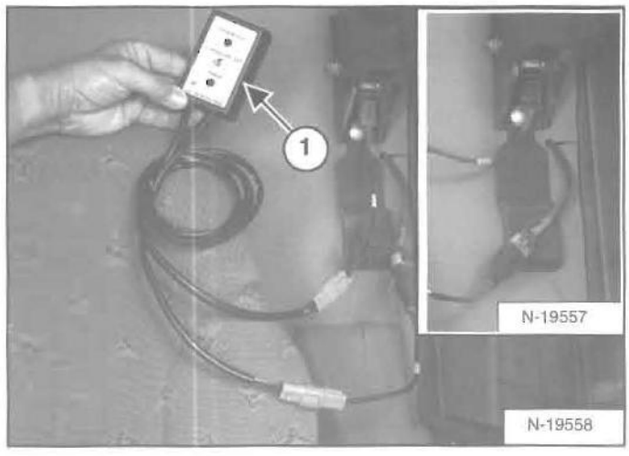


Use Sensor Tester (MEL1428) and seat bar sensor tester adatper (MEL1567) for the following procedure:

Connect the seat bar adapter sensor leads (MEL1567) to the sensor tester.

Disconnect the seat bar sensor connector (Item 1) **[Figure 60-100-1]**.

Figure 60-100-2

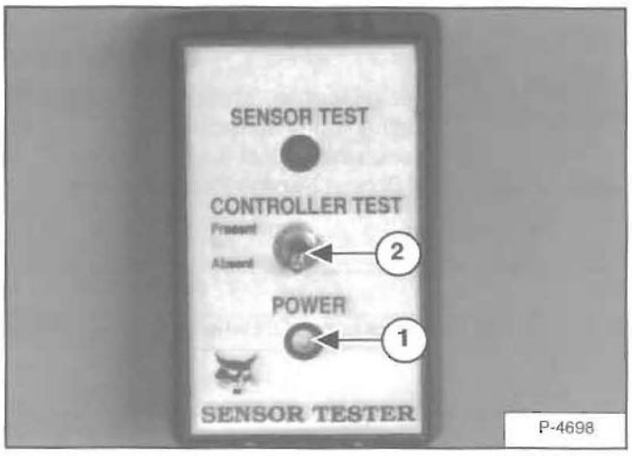


Connect the Sensor Tester (Item 1) inline, to the seat bar sensor connectors. See inset **[Figure 60-100-2]**.

Turn the key to the ON position. **DO NOT START THE ENGINE.**

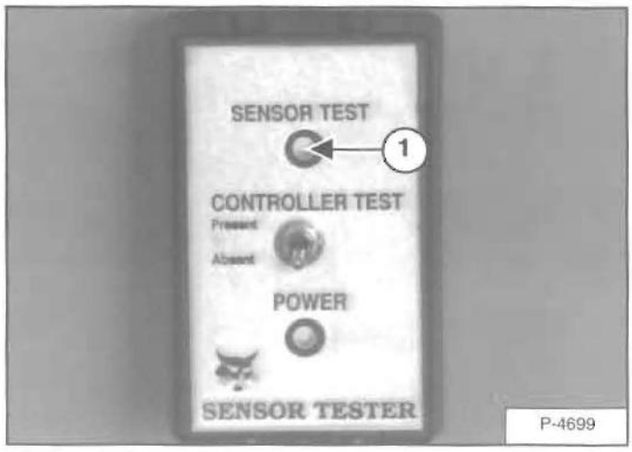
The toggle switch (Item 2) **[Figure 60-100-3]** can be in either the ***Absent*** or ***Present*** position.

Figure 60-100-3



If there is no power light (Item 1) **[Figure 60-100-3]** on the sensor tester, check the tester or wiring harness.

Figure 60-100-4



Lower the seat bar. The Sensor Test light (Item 1) **[Figure 60-100-4]** should illuminate.

Raise the seat bar. The Sensor Test light (Item 1) **[Figure 60-100-4]** should go off.

If the above test fails, there is a problem with the seat bar sensor.

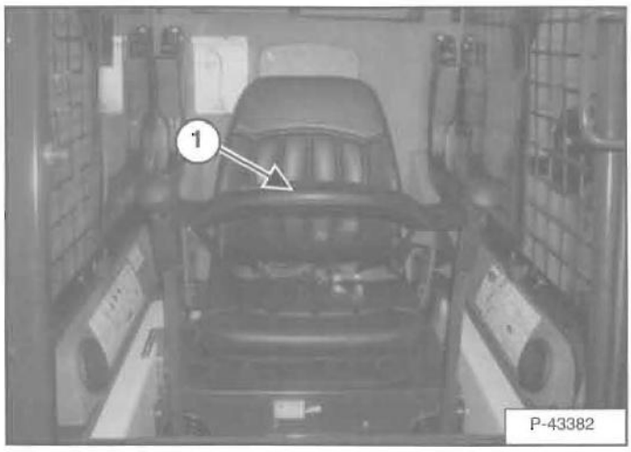
Disconnect the Sensor Tester.

Replace the Seat Bar Sensor. (See Removal And Installation on Page 60-100-3.)

If the above test passes, run the seat bar sensor BICS circuit test. (See BICS™ Circuit Test on Page 60-100-4.)

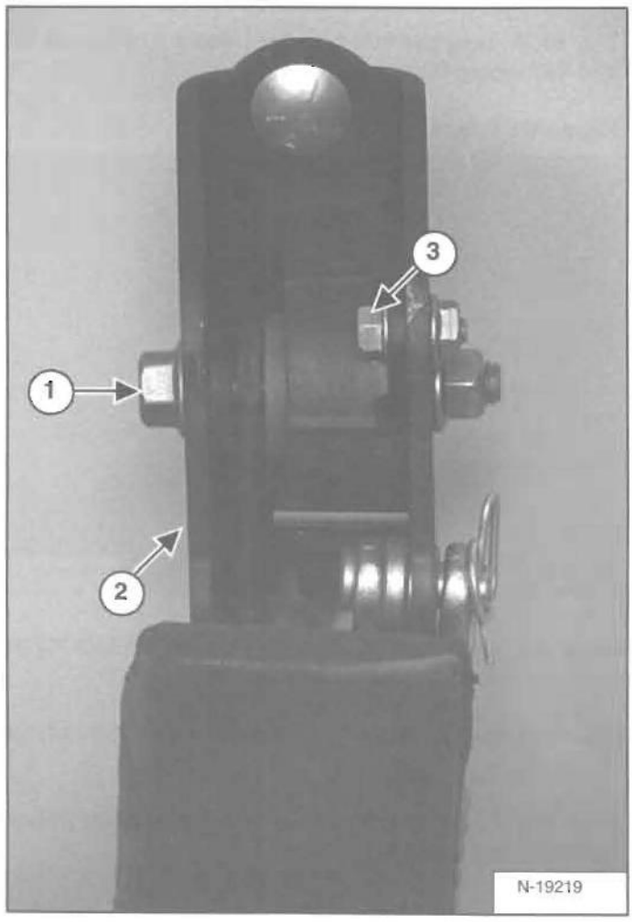
Removal And Installation

Figure 60-100-5



Remove the seat bar (Item 1) **[Figure 60-100-5]** from the loader. (See Contents Page 50-01.)

Figure 60-100-6



Remove the mounting bolt (Item 1) from the seat bar mount (Item 2) **[Figure 60-100-6]**.

Installation: Tighten the mounting bolt to 50-70 in.-lbs. (5,6-7,9 Nm) torque.

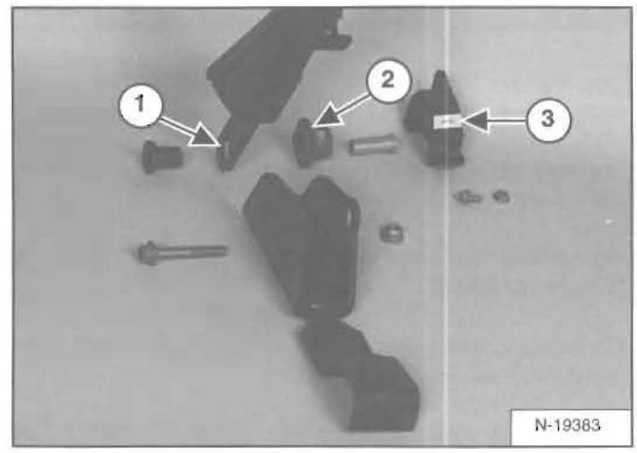
Remove the sensor mounting bolt (Item 3) **[Figure 60-100-6]** and nut.

IMPORTANT

Be careful to not overtighten the sensor mounting bolt and nut to prevent breakage of the sensor.

I-2088-1095

Figure 60-100-7



Remove the keyed plastic bushing (Item 1), magnetic bushing assembly (Item 2) and sensor bracket (Item 3) **[Figure 60-100-7]**.

Installation: Be sure the tabs on the pivot bushing are positioned in the slotted hole (Item 1) **[Figure 60-100-7]** of the seat bar.

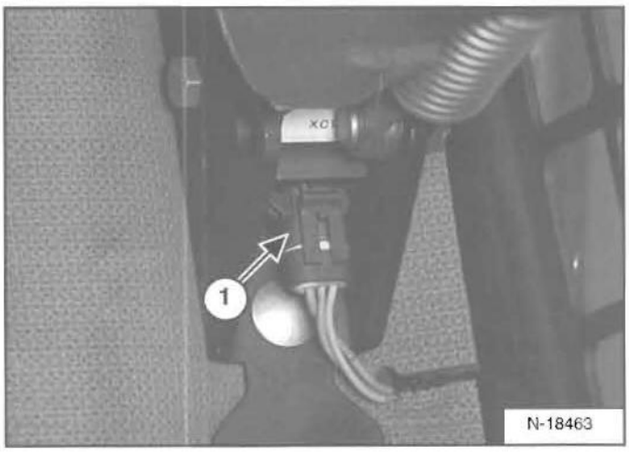
Inspect all parts for damage and wear and replace if necessary.

Reverse the removal procedure to install the seat bar sensor.

SEAT BAR SENSOR (CONT'D)

BICS™ Circuit Test

Figure 60-100-8



Use Sensor Testers (MEL1428) and seat bar sensor tester adapter (MEL1567) for the following procedure:

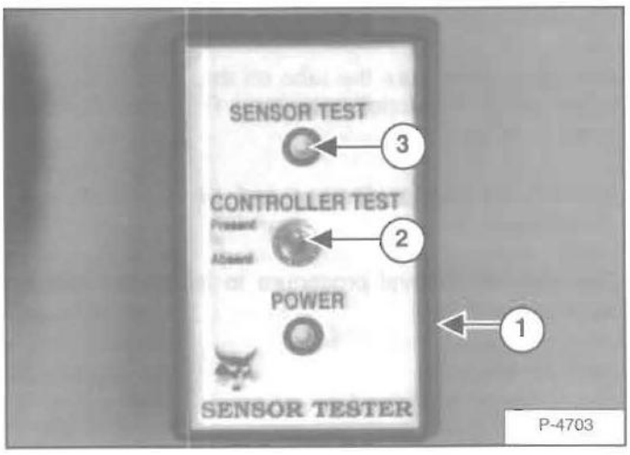
Connect the seat bar sensor tester adapter MEL1567 to the sensor tester.

Disconnect the seat bar sensor connector (Item 1) **[Figure 60-100-8]**.

Connect Sensor Tester (Item 1) **[Figure 60-100-9]** inline to the seat bar sensor connectors.

Turn the key to the ON position. **DO NOT START THE ENGINE.**

Figure 60-100-9

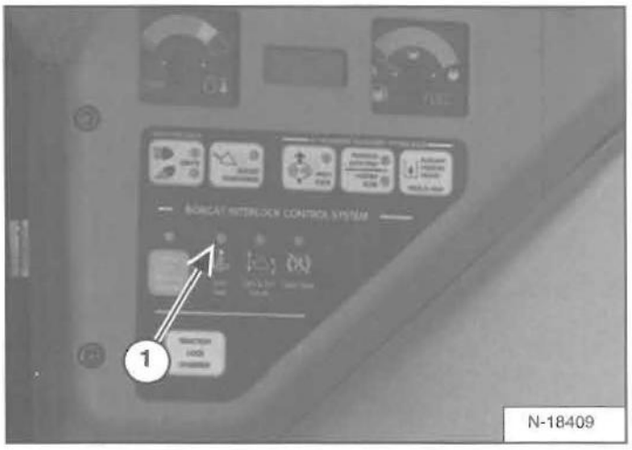


If there is no power light on the sensor tester, check the tester or wiring harness.

When the power light is illuminated, move the toggle switch (Item 2) **[Figure 60-100-9]** on the sensor tester to the ***Present*** position.

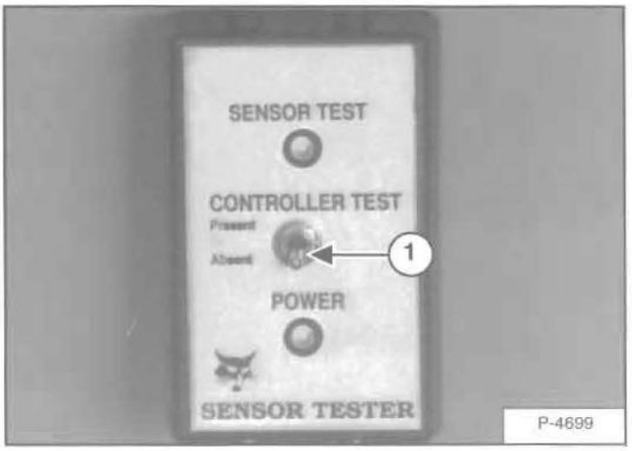
NOTE: The sensor test light (Item 3) [Figure 60-100-9] is only activated by the seat bar. It will be off with the seat bar up or on with the seat bar down.

Figure 60-100-10



The BICS seat bar indicator light (Item 1) **[Figure 60-100-10]** should illuminate.

Figure 60-100-11



Move the toggle switch (Item 1) **[Figure 60-100-11]** on the sensor tester to the ***Absent*** position.

The Seat Bar light (Item 1) **[Figure 60-100-10]** should go off.

If the above test fails, there is a problem with the Bobcat controller or the wiring harness.

TRACTION LOCK

Troubleshooting Chart

The following troubleshooting chart is provided for assistance in locating and correcting BICS system problems. It is recommended that these procedures be done by authorized Bobcat 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	SOLUTION #
Traction lock stays engaged.	1, 2, 3, 4, 5, 6, 7
Intermittent activation of traction lock.	8, 9, 10

SOLUTION SUGGESTIONS

1. Make sure brake pedal is not engaged.
2. Maneuver loader to allow brake discs to move and remove pressure on the brake wedge so it can retract.
3. If all lights indicate the brake should be released, but it doesn't, check the brake 25 amp fuse.
4. When checking fuse, also check other fuses. Check the fuse block for correct orientation and location of fuses. (See Electrical System Information Page 60-01.)
5. To test the solenoid, the pull coil should be.4 to.5 ohms and the hold coil 10.5 to 11.0 ohms.
6. Check brake solenoid and cover mounting hardware for the correct torque.
7. Remove brake cover and check wedges for binding in the wedge guides.
8. Check wire connections for loose connector body.
9. Check for loose or bent pins in connectors.
10. Check for loose spade connectors in fuse holder.

Inspecting

Fasten the seat belt, disengage the parking brake pedal, press the green *PRESS TO OPERATE* Button and raise the Seat Bar fully. Move the steering levers slowly forward and backward. The Traction lock should be engaged. Lower the Seat Bar. Press the green *PRESS TO OPERATE* Button.

Engage the parking brake pedal and move the steering levers slowly forward and backward. The Traction lock should be engaged.

Solenoid Removal And Installation

⚠ WARNING

AVOID INJURY OR DEATH

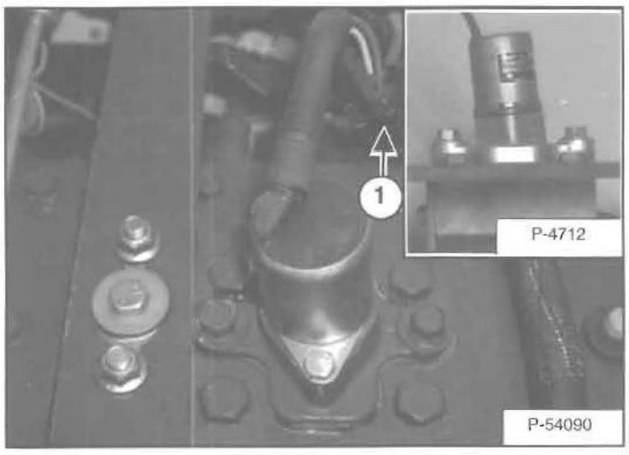
Do not modify the electrical wiring connected to the traction lock solenoid or any part of the traction lock system. The traction lock provides the locking function of the parking brake. Service work on the traction lock system should only be performed by a qualified technician. Use only genuine Bobcat Company parts if repair is necessary.

W-2165-0100

Raise the loader operator cab. (See Contents Page 10-01.)

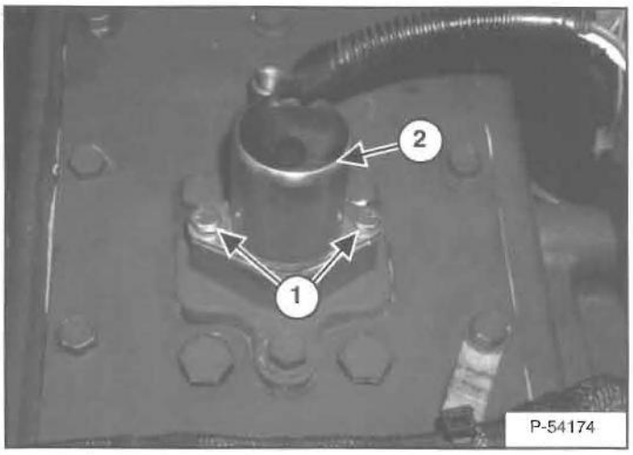
NOTE: The loader control panel is removed for clarity purpose only. The traction lock can be removed without removing the control panel.

Figure 60-110-1



Disconnect the electric solenoid connector (Item 1) **[Figure 60-110-1]** from the main harness.

Figure 60-110-2

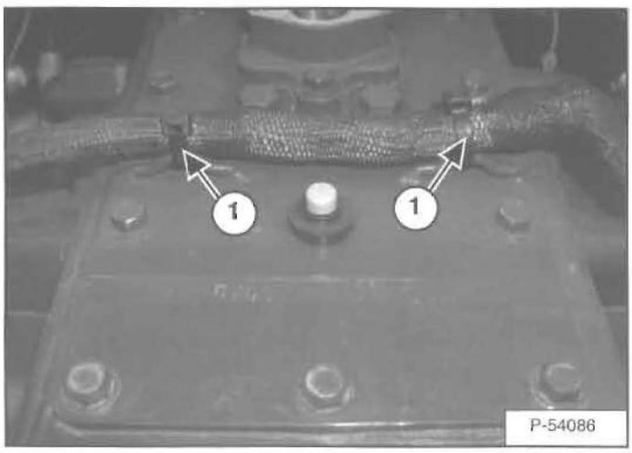


Remove the two mounting bolts (Item 1) **[Figure 60-110-2]** from the electric solenoid mounting bracket.

Installation: Tighten the mounting bolts to 80-90 in.-lbs. (9-10 Nm) torque.

Remove the electric solenoid (Item 2) **[Figure 60-110-2]** from the chaincase cover.

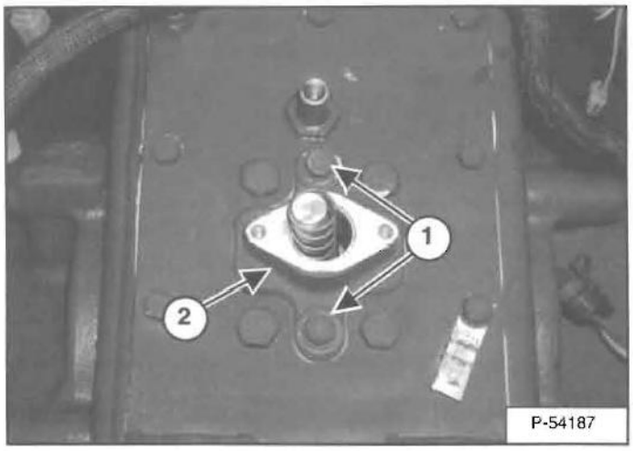
Figure 60-110-3



Remove the two tie straps (Item 1) **[Figure 60-110-3]** securing harness to cover and move the harness out of the way.

Solenoid Removal And Installation (Cont'd)

Figure 60-110-4

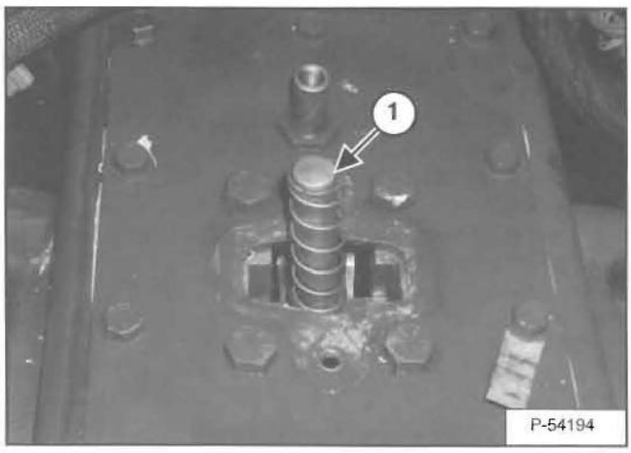


Remove the two mounting bolts (Item 1) and remove the bracket (Item 2) **[Figure 60-110-4]** from the chaincase cover.

Installation: Tighten the mounting bolts to 25-28 ft.-lbs. (34-38 Nm) torque.

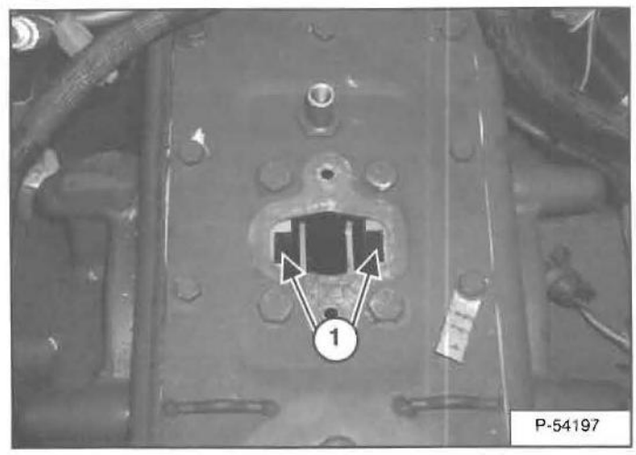
Be sure the solenoid mounting bracket is installed in the same position. The solenoid mounting surface has a slight angle which tips the top of the solenoid toward the rear of the loader when installed correctly. See inset photo **[Figure 60-110-1]**.

Figure 60-110-5



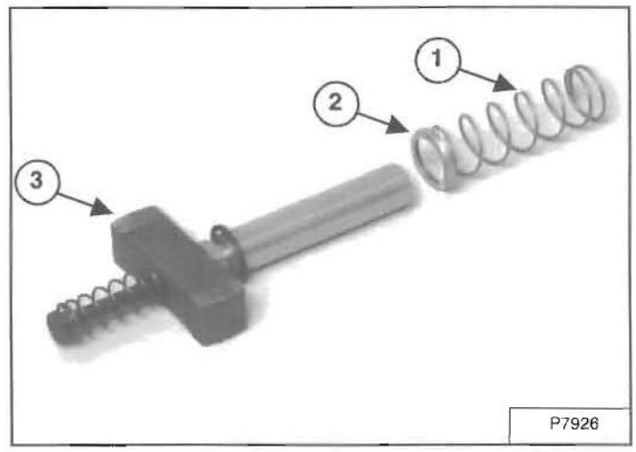
Remove the traction lock assembly (Item 1) **[Figure 60-110-5]** from the chaincase.

Figure 60-110-6



Inspect the guides (Item 1) **[Figure 60-110-6]** for wear or damage. Replace if necessary .

Figure 60-110-7



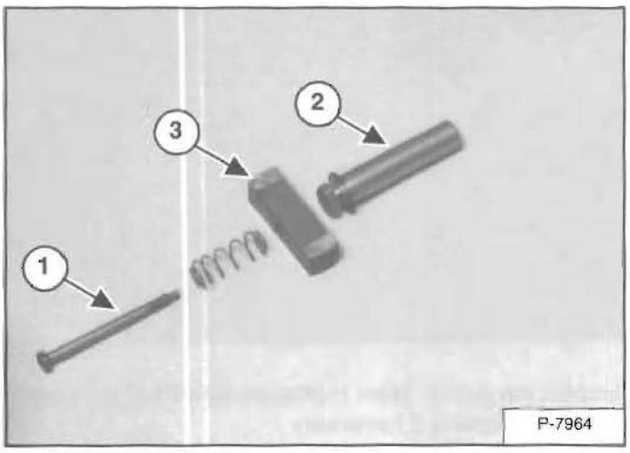
Remove and inspect the compression spring (Item 1) and spring cap washer (Item 2) **[Figure 60-110-7]** for wear or damage. Replace if necessary. The spring may also stay with the shaft when the electric solenoid and bracket are removed from the chaincase.

Installation: Install the compression spring (Item 1) **[Figure 60-110-7]** on the collar located on the electric solenoid.

Remove the traction lock assembly (Item 3) **[Figure 60-110-7]** from the chaincase.

Solenoid Removal And Installation (Cont'd)

Figure 60-110-8



Remove the shaft mounting bolt (Item 1), spring from the assembly shaft (Item 2). Remove the wedge (Item 3) **[Figure 60-110-8]** and inspect all parts for damage or wear. Replace if necessary.

Installation: Thoroughly clean and dry the shaft mounting bolt (Item 1), the shaft (Item 2) and wedge (Item 3) **[Figure 60-110-8]**. Use LOCTITE #242 when assembling these parts to the traction lock assembly.

IMPORTANT

Failure to use LOCTITE may allow the traction lock assembly to loosen up which can cause damage to the traction lock system.

I-2090-1095

Guide Removal

The part number listed will be needed to do the following procedure:

P/N 6633583 - Polyurethane

⚠ WARNING

Never work on a machine with the lift arms up unless the lift arms are secured by an approved lift arm support device. Failure to use an approved lift arm support device can allow the lift arms or attachment to fall and cause injury or death.

W-2059-0598

Raise the loader lift arms and install an approved lift arm support device. (See Contents Page 10-01.)

Raise the loader operator cab. (See Contents Page 10-01.)

Disconnect and remove the engine speed control. (See Contents Page 70-01.)

Remove the control panel from the loader. (See Contents Page 50-01.)

Remove the traction lock solenoid assembly. (See Solenoid Removal And Installation on Page 60-110-2.)

⚠ WARNING

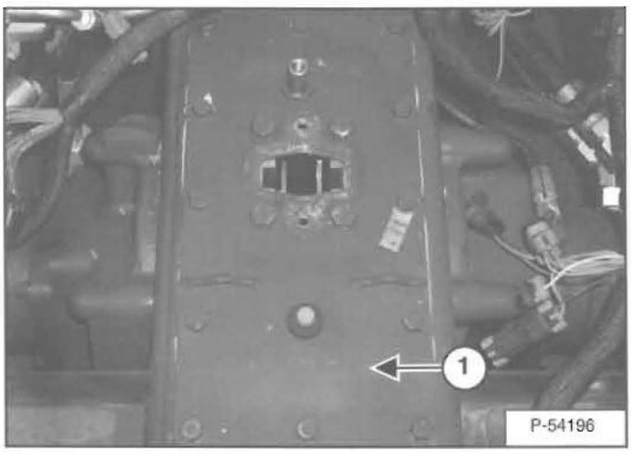
AVOID INJURY OR DEATH

Do not modify the electrical wiring connected to the traction lock solenoid or any part of the traction lock system. The traction lock provides the locking function of the parking brake. Service work on the traction lock system should only be performed by a qualified technician. Use only genuine Bobcat Company parts if repair is necessary.

W-2165-0100

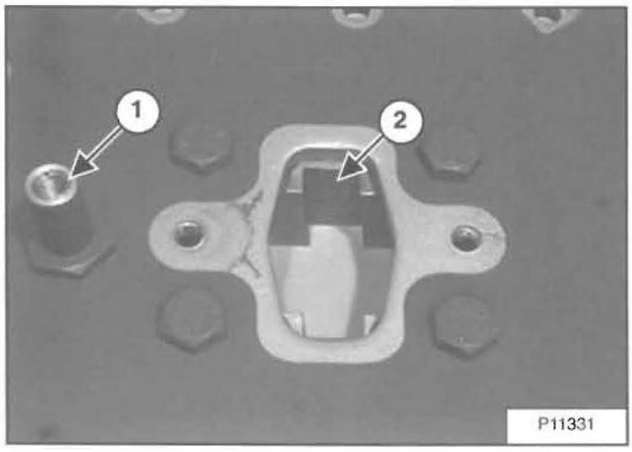
Guide Removal (Cont'd)

Figure 60-110-9



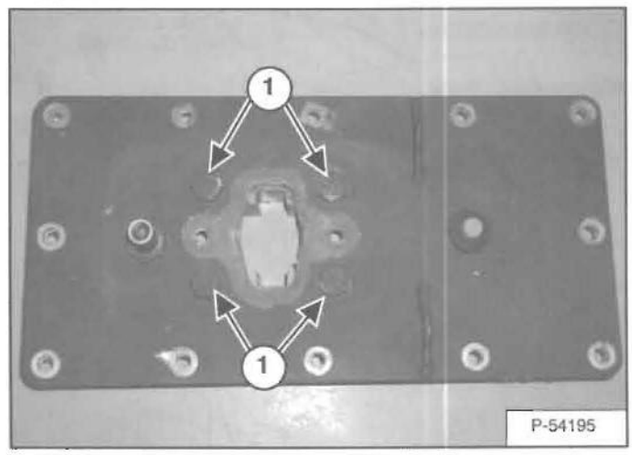
Remove the center chaincase cover (Item 1) **[Figure 60-110-9]**. (See Contents Page 40-01.)

Figure 60-110-10



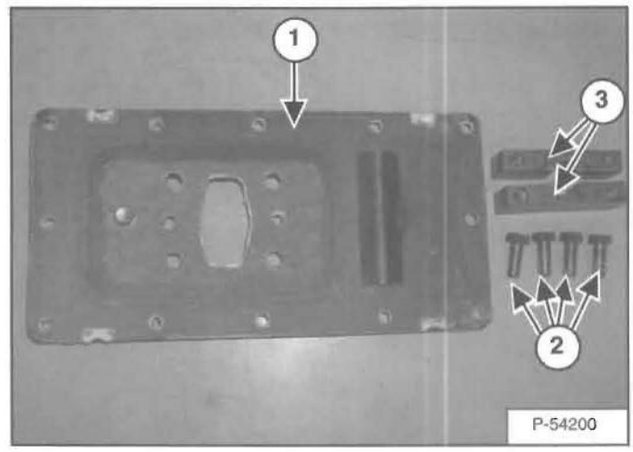
NOTE: Bolt (Item 1) is on the rear of the chaincase cover, notice the direction of the groove (Item 2) [Figure 60-110-10] in the traction lock guides.

Figure 60-110-11



To remove the traction lock guides remove the four bolts (Item 1) **[Figure 60-110-11]**.

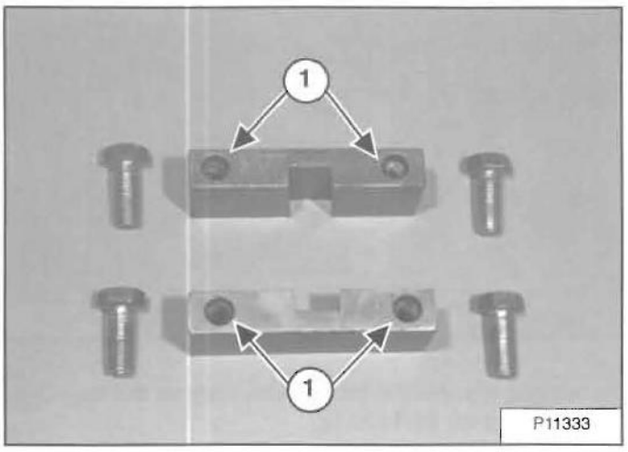
Figure 60-110-12



Thoroughly clean the polyurethane from the chaincase cover (Item 1), bolts (Item 2) and traction lock guides (Item 3) **[Figure 60-110-12]** and dry.

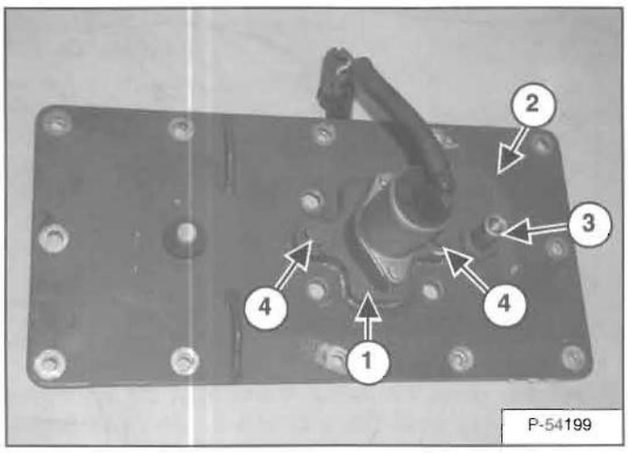
Guide Installation

Figure 60-110-13



Apply a bead of polyurethane sealer (Item 1) **[Figure 60-110-13]** around the bolt holes on the blocks.

Figure 60-110-14

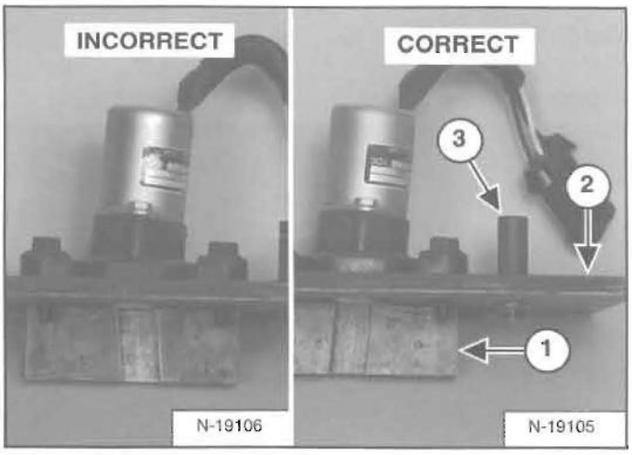


Install the electric solenoid/bracket assembly (Item 1) to the center chaincase cover (Item 2) **[Figure 60-110-14]**.

NOTE: Bolt (Item 3) [Figure 60-110-14] & [Figure 60-110-15] represents the rear of the chaincase cover.

Install and tighten the two bolts (Item 4) **[Figure 60-110-14]**.

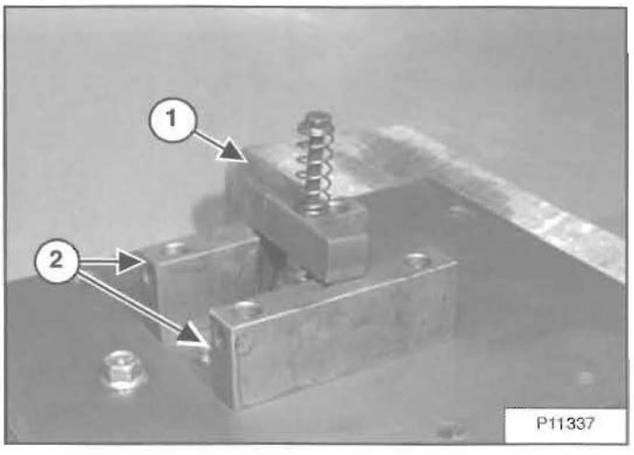
Figure 60-110-15



Install the traction lock guides (Item 1) to the chaincase cover (Item 2) **[Figure 60-110-15]** using the four bolts (removed earlier).

Do not tighten at this time.

Figure 60-110-16



Install the traction wedge assembly (Item 1) into the solenoid and traction lock guides (Item 2) **[Figure 60-110-16]**.

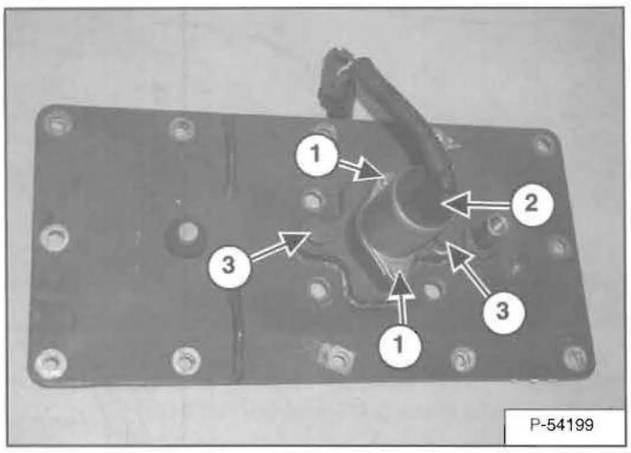
After the bolts have been tightened recheck to make sure the shaft assembly is moving freely in the guides.

Remove the wedge assembly (Item 1) **[Figure 60-110-16]**.

NOTE: The wedge assembly must slide freely in the grooves of the guides. Tighten the four guide bolts to 90-100 ft.-lbs. (123-135 Nm) torque.

Guide Installation (Cont'd)

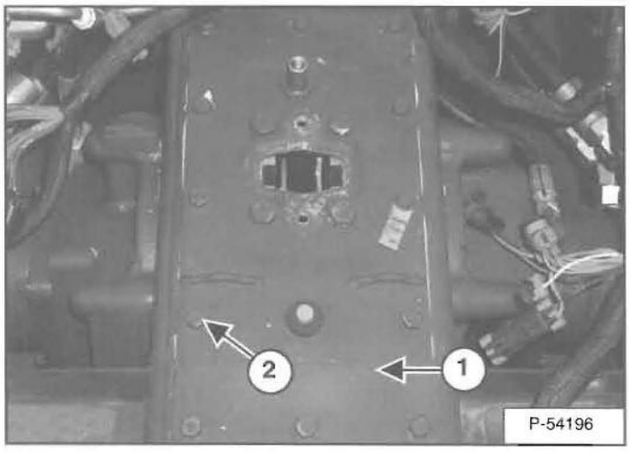
Figure 60-110-17



Remove the two bolts (Item 1) and remove the electric solenoid (Item 2) **[Figure 60-110-17]** from the solenoid mounting bracket assembly.

Remove the two bolts (Item 3) **[Figure 60-110-17]** and remove the solenoid mounting bracket assembly from the center chaincase cover.

Figure 60-110-18

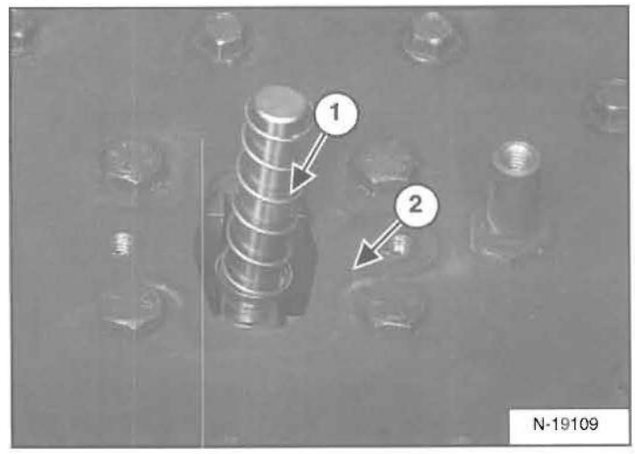


Install the chaincase cover (Item 1) using the twelve mounting bolts (Item 2) **[Figure 60-110-18]**.

Tighten to 15-20 ft.-lbs. (20-27 Nm) torque.

NOTE: Thoroughly clean and dry the bolts and apply polyurethane sealant to the bolt threads. Install a new gasket between the chaincase cover and the chaincase.

Figure 60-110-19

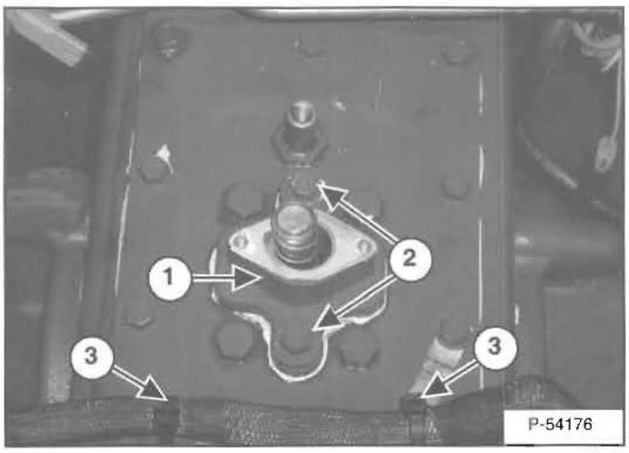


Install the wedge assembly (Item 1) **[Figure 60-110-19]** into the grooves in the traction lock guides making sure that there is no binding.

Install the gasket (Item 2) **[Figure 60-110-19]**.

Guide Installation (Cont'd)

Figure 60-110-20

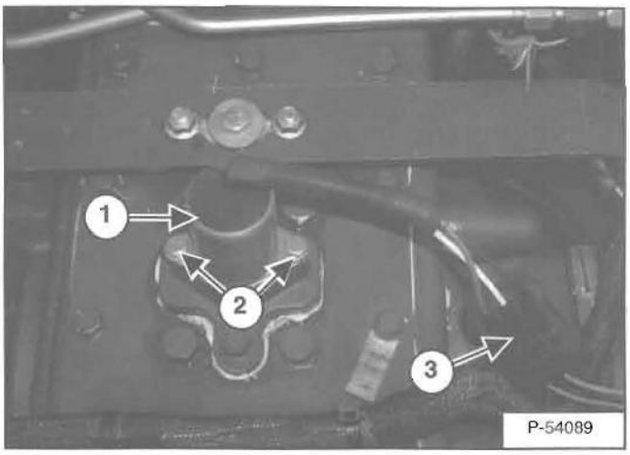


Install the solenoid mounting bracket assembly (Item 1) on the chaincase cover using the two bolts (Item 2) **[Figure 60-110-20]**.

Using tiestraps (Item 3) **[Figure 60-110-20]** secure harness to cover.

Installation: Tighten to 25-28 ft.-lbs. (34-38 Nm) torque

Figure 60-110-21



Install the electric solenoid (Item 1) and install the two mounting bolts (Item 2) **[Figure 60-110-21]**.

Connect the electric solenoid connector (Item 3) **[Figure 60-110-21]** to the main harness.

Installation: Tighten the mounting bolts to 80-90 in.-lbs. (9-10 Nm) torque.

NOTE: Be sure the solenoid mounting bracket is installed in the same position. The solenoid mounting surface has a slight angle which tips the top of the solenoid toward the rear of the loader when installed correctly.

Install the cross bar if equipped.(See Contents Page 50-01.)

Install the control panel. (See Contents Page 50-01.)

Install the engine speed control. (See Contents Page 70-01.)

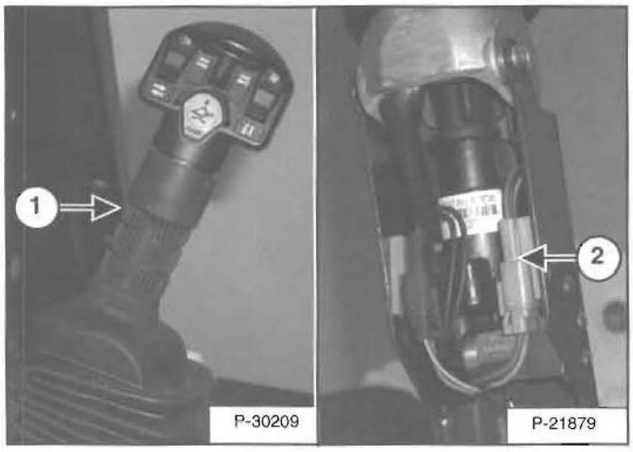
Lower operator cab. (See Contents Page 10-01.)

Perform the BICS™ inspection procedure. (See Contents Page 60-01.)

ADVANCED CONTROL SYSTEM (ACS) SELECTABLE HAND/FOOT CONTROL

Components Identification

Figure 60-120-1



The Advanced Control System (ACS) is a selectable foot/hand control system.

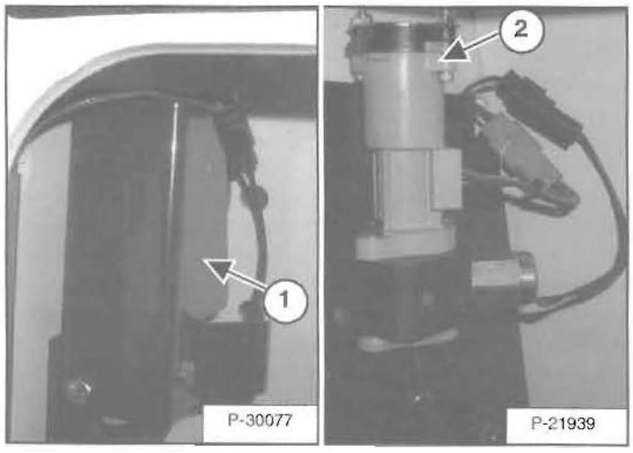
The ACS system allows the operator to quickly switch between foot and hand control modes.

Control Handle (Item 1) **[Figure 60-120-1]**.

Handle sensor (Item 2) **[Figure 60-120-1]**.

NOTE: The calibration procedure must be followed when replacing handle sensor, foot pedal sensor, actuator or ACS Controller. (See Calibration Of The ACS System on Page 60-120-14.)

Figure 60-120-2

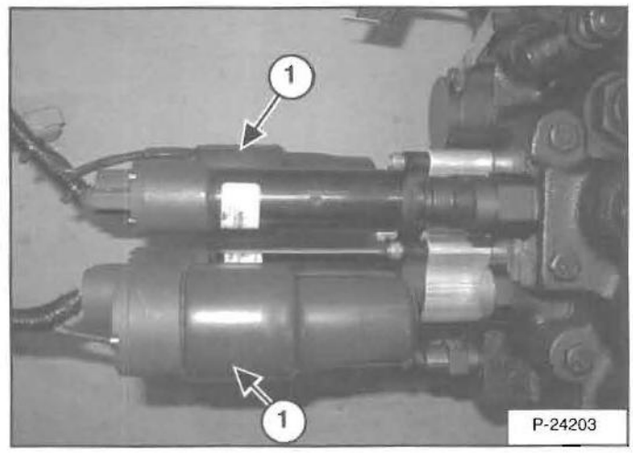


Foot control/sensor assembly (Item 1) **[Figure 60-120-2]**.

Foot sensor (Item 2) **[Figure 60-120-2]**.

NOTE: The calibration procedure must be followed when replacing handle sensor, foot pedal sensor, actuator or ACS Controller. (See Calibration Of The ACS System on Page 60-120-14.)

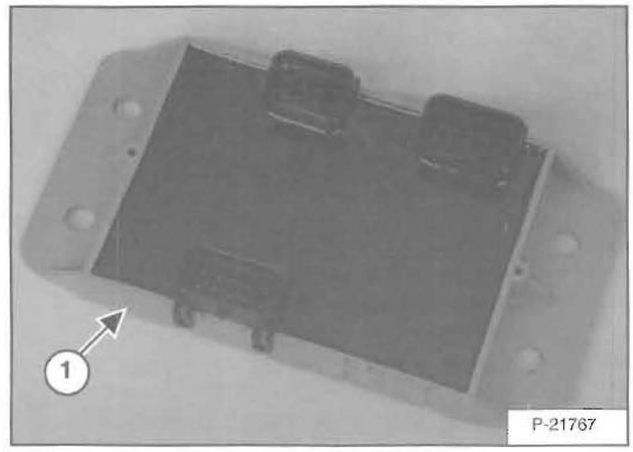
Figure 60-120-3



Control Valve Actuators (Item 1)**[Figure 60-120-3]**.

NOTE: The calibration procedure must be followed when replacing handle sensor, foot pedal sensor, actuator or ACS Controller. (See Calibration Of The ACS System on Page 60-120-14.)

Figure 60-120-4



ACS Controller (Item 1) **[Figure 60-120-4]**.

NOTE: The calibration procedure must be followed when replacing handle sensor, foot pedal sensor, actuator or ACS Controller. (See Calibration Of The ACS System on Page 60-120-14.)

Components Identification (Cont'd)

Figure 60-120-5



ACS error indicator (Item 1) **[Figure 60-120-5]**.

NOTE: The ACS icon will illuminate when an error occurs. The error is stored as a service code. (See Diagnostics Contents Page 60-01.)

ADVANCED CONTROL SYSTEM (ACS) SELECTABLE HAND/FOOT CONTROL (CONT'D)

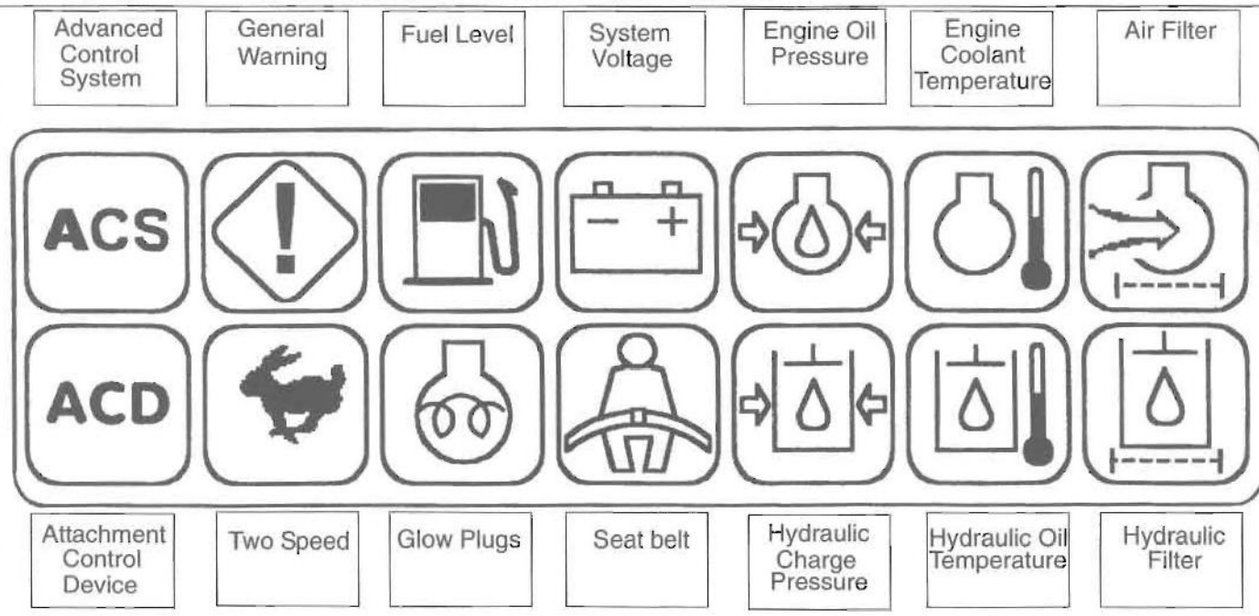
Troubleshooting Guide

The Advanced Control System (ACS) has a built-in diagnostic function which uses an icon on the right instrument panel to indicate the condition of the ACS SYSTEM. The system also records the alarm condition as a service code.

The control module continually checks the system in the order listed. The checks start with the lift handle sensor and then the lift actuator. If no problems are present, it will then check the tilt handle sensor and the tilt actuator. The system will stop its check at the first problem and then luminate the icon.

The system starts its diagnostics and calibration when the ignition key is turned on.

The following list shows the probable causes when the icon is luminated.



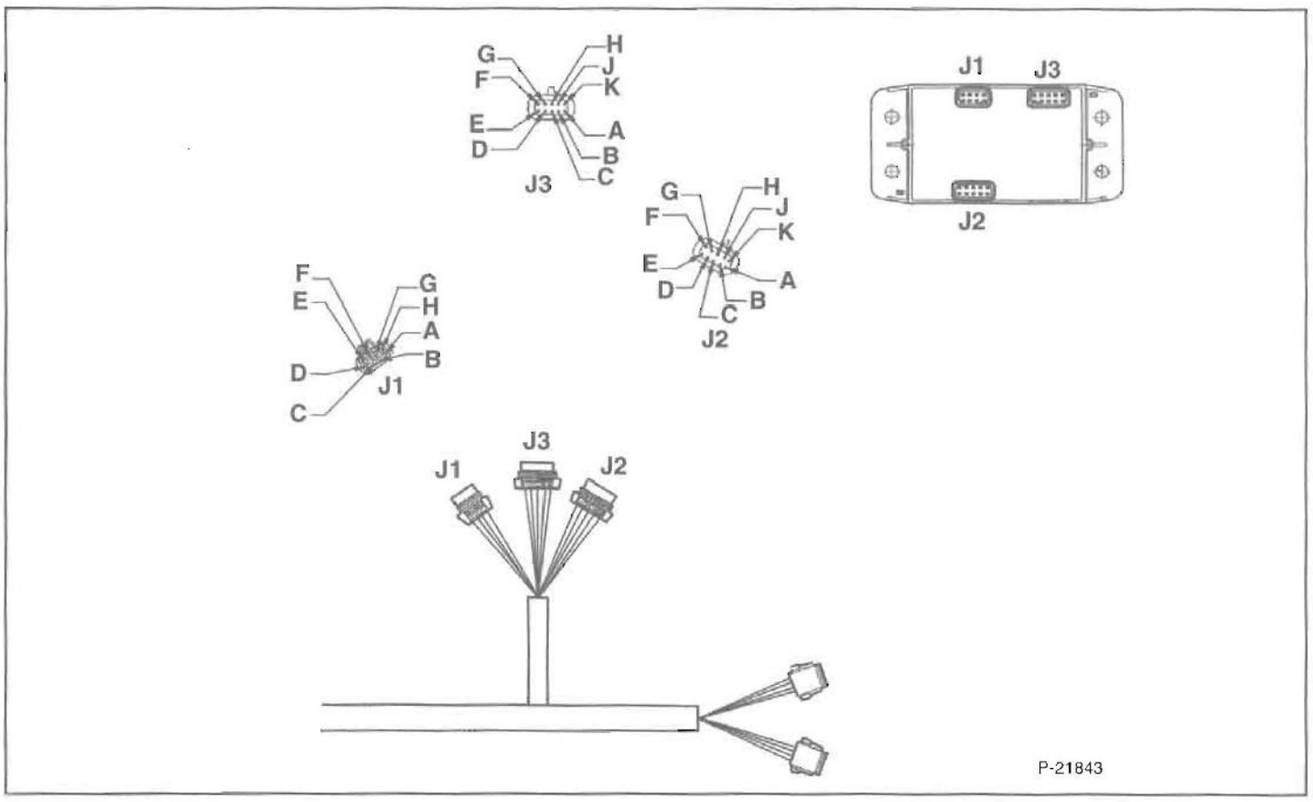
ACS

Advanced Control System

Errors - **lights** solid with 3 beeps
32-04 - **ACS** in error
32-23 - **ACS** not calibrated
32-31 - **Tilt** actuator fault
32-34 - **Tilt** actuator not in neutral
32-35 - **Tilt** handle/pedal not in neutral
32-36 - **Lift** actuator fault
32-39 - **Lift** actuator not in neutral
32-40 - **Lift** handle/ pedal not in neutral
32-49 - **Lift** actuator short to ground
32-50 - **Tilt** actuator short to ground
32-51 - **Lift** actuator short to battery
32-52 - **Tilt** actuator short to battery
32-53 - **Lift** handle/pedal short to ground
32-54 - **Tilt** handle/pedal short to ground
32-55 - **Lift** handle/pedal short to battery
32-56 - **Tilt** handle/pedal short to battery
32-57 - **Lift** actuator reduced performance
32-58 - **Tilt** actuator reduced performance
32-59 - **Lift** actuator wrong direction
32-60 - **Tilt** actuator wrong direction
32-61 - **Handle** lock short to ground
32-62 - **Handle** lock short to battery
32-63 - **Pedal** lock short to ground
32-64 - **Pedal** lock short to battery
32-65 - **Sensor** supply voltage out of range
32-66 - **Battery** voltage out of range
32-67 - **Switch** flipped while operating

To see what error occurred, check the service code on the left instrument panel. (See Diagnostics Contents Page 60-01.)

Controller, Connector And Wire Identification

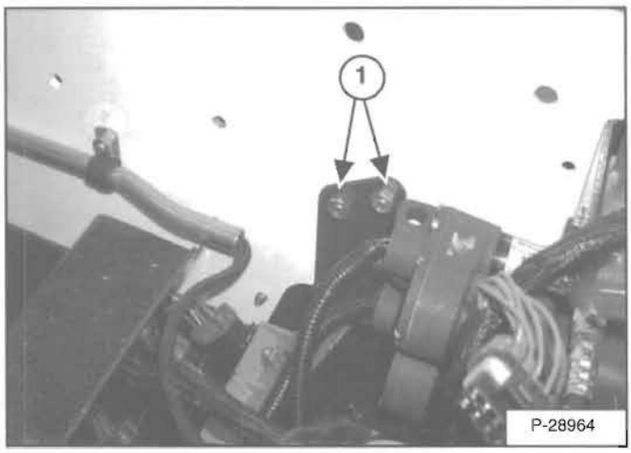


P/N	PIN	DESCRIPTION
J1		CONNECTOR, METRI-PACK
Orange	A	5V HALL EFFECT SUPPLY
Orange	B	SWITCHED AHC POWER
Green	C	HAND/FOOT INPUT
Purple	D	CAN SIGNAL HIGH AHC
Purple	E	CAN SIGNAL LOW AHC
Purple	F	CAN SHIELD AHC
Black	G	AHC GROUND
Black	H	AHC GROUND
J2		CONNECTOR, METRI-PACK
	A	OPEN
	B	OPEN
	C	OPEN
	D	OPEN
Green	E	TILT SPOOL SIGNAL
Green	F	LIFT HANDLE SIGNAL
Green	G	TILT HANDLE SIGNAL
Green	H	LIFT SPOOL SIGNAL
Green	J	LIFT PEDAL SIGNAL
Green	K	TILT PEDAL SIGNAL

P/N	PIN	DESCRIPTION
J3		CONNECTOR, METRI-PACK
Red	A	TILT ACTUATOR FORWARD
Red/White	B	UNSWITCHED AHC POWER
Red/White	C	UNSWITCHED AHC POWER
Black	D	LIFT ACTUATOR REVERSE
Green	E	HANDLE LOCK POWER
Red	F	LIFT ACTUATOR FORWARD
Green	G	PEDAL LOCK POWER
Black	H	AHC GROUND
Black	J	AHC GROUND
Black	K	TILT ACTUATOR REVERSE

ACS Controller Removal And Installation

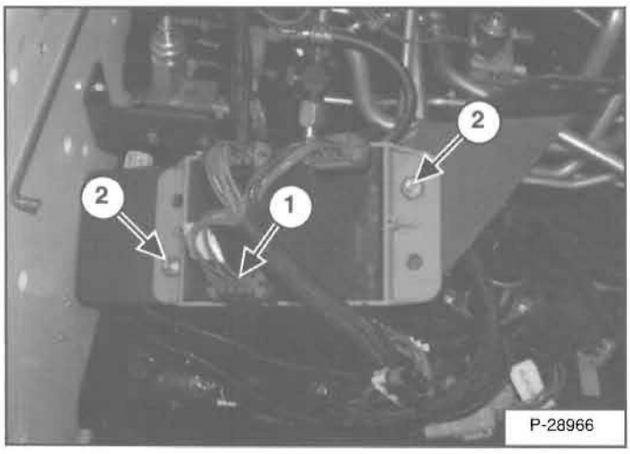
Figure 60-120-6



Remove control Panel. (See Contents Page 50-01.)

Remove the two mounting bolts (Item 1) **[Figure 60-120-6]** from the controller mounting bracket.

Figure 60-120-7



Lift controller out from mounting location. Disconnect the wiring harness connectors (Item 1) **[Figure 60-120-7]** from the controller.

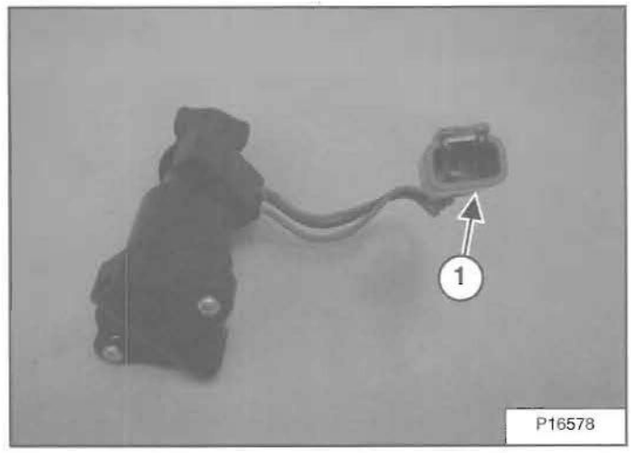
Remove two mounting bolts (Item 2) **[Figure 60-120-7]** to remove controller from bracket.

Remove the controller from the loader.

NOTE: The calibration procedure must be followed when replacing handle sensor, foot pedal sensor, actuator or ACS Controller. (See Calibration Of The ACS System on Page 60-120-14.)

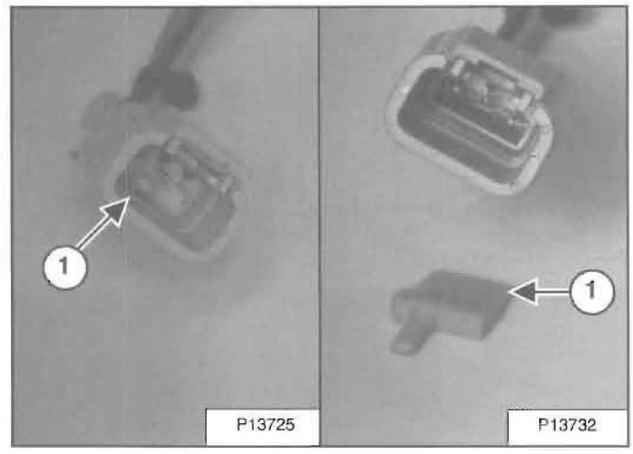
Handle Sensor Connector

Figure 60-120-8



The wire connector (Item 1) **[Figure 60-120-8]** can be removed from the handle sensor wires, use the following procedure.

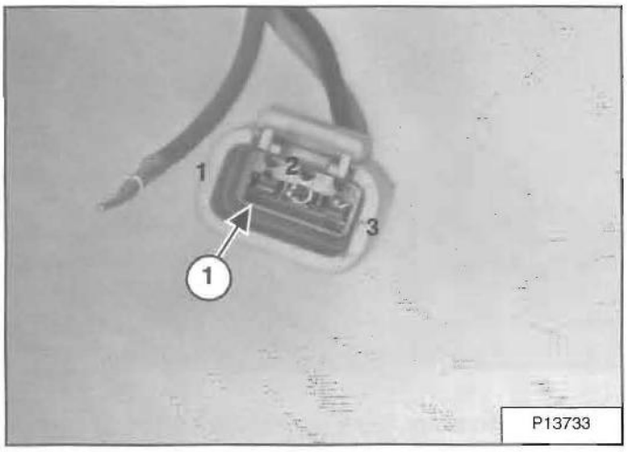
Figure 60-120-9



Remove the wedge (Item 1) **[Figure 60-120-9]** from the connector.

Handle Sensor Connector (Cont'd)

Figure 60-120-10



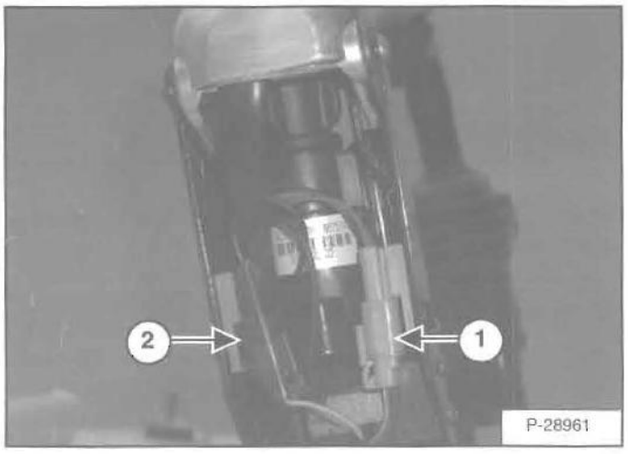
With a pointed tool, lift the tab (Item 1) **[Figure 60-120-10]** and pull the wire from the connector.

Installation: Install the wires into the connector as listed below **[Figure 60-120-10]**:

1-Terminal - Red
2-Terminal - Black
3-Terminal - Green

Switch Handle Removal

Figure 60-120-11

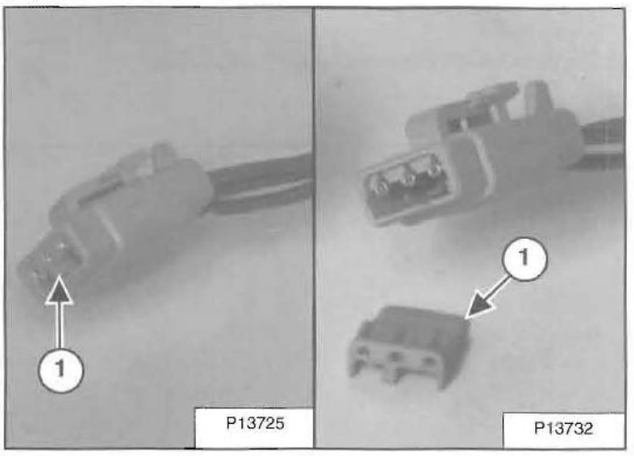


NOTE: Switch handle can be removed and installed while in loader.

Disconnect the harness connector (Item 1) **[Figure 60-120-11]** from the handle sensor connector.

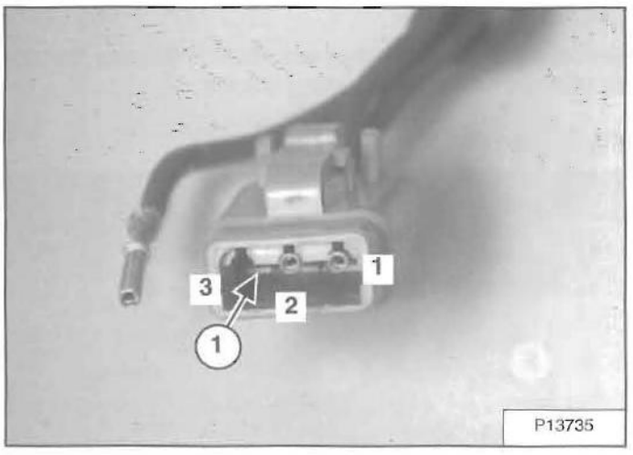
Disconnect the harness connector (Item 2) **[Figure 60-120-11]** from the handle lock solenoid connector.

Figure 60-120-12



Remove the wedge (Item 1) **[Figure 60-120-12]** from the harness connector (Gray) that connects to the handle sensor connector.

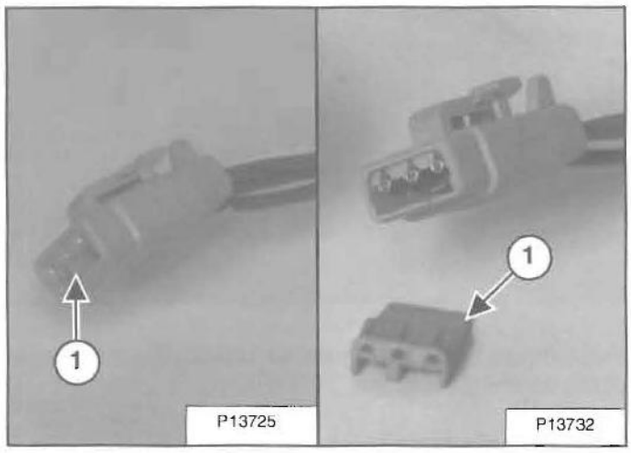
Figure 60-120-13



Using a pointed tool, press down on the tab (Item 1) **[Figure 60-120-13]** and pull the wire from the connector.

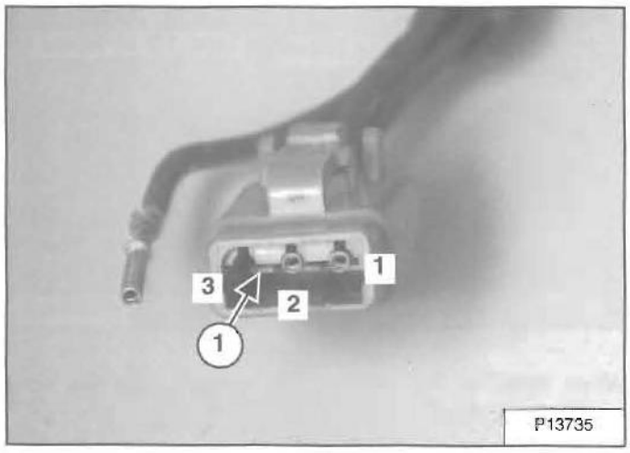
Switch Handle Removal (Cont'd)

Figure 60-120-14



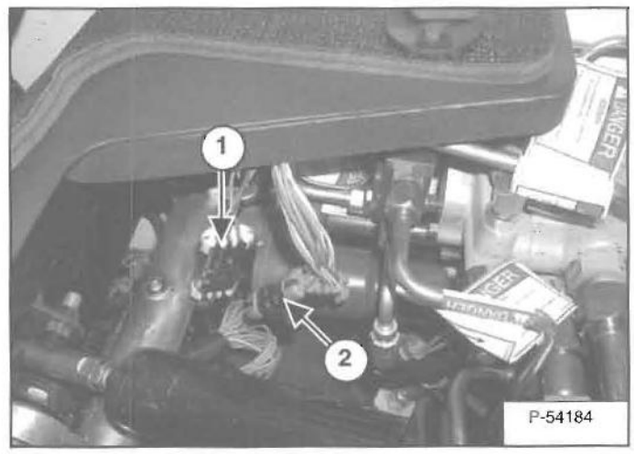
Remove the wedge (Item 1) **[Figure 60-120-14]** from the harness connector (Black) that connects to the handle lock solenoid connector.

Figure 60-120-15



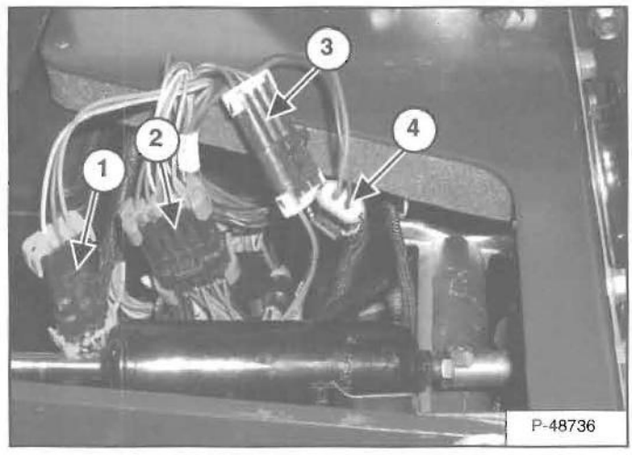
Use a pointed tool, press down on the tab (Item 1) **[Figure 60-120-15]** and pull the wire from the connector.

Figure 60-120-16



Disconnect the right switch handle connectors (Items 1 & 2) **[Figure 60-120-16]** from the loader wiring harness connectors.

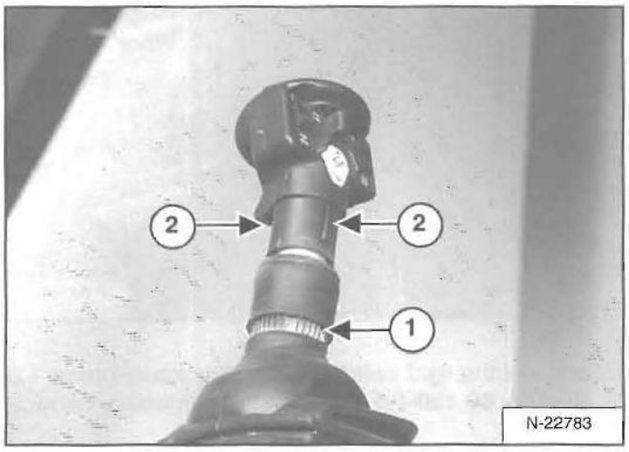
Figure 60-120-17



Disconnect the left switch handle connectors (Items 1, 2, 3 & 4) **[Figure 60-120-17]** from the loader wiring harness connectors.

Switch Handle Removal (Cont'd)

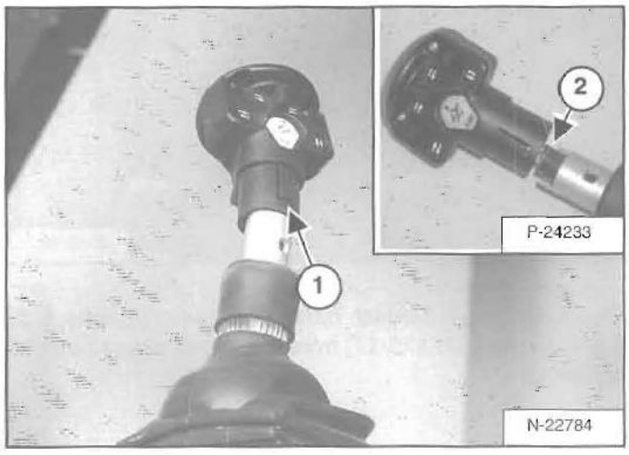
Figure 60-120-18



Roll the pistol grip handle cover (Item 1) **[Figure 60-120-18]** down.

Using a small screwdriver, lift the handle tabs (Item 2) **[Figure 60-120-18]** and slightly rotate the switch handle.

Figure 60-120-19

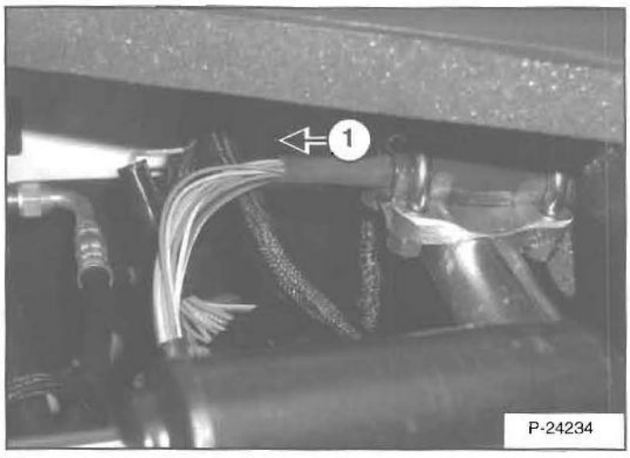


Pull the switch handle and wiring harness assembly (Item 1) **[Figure 60-120-19]** from the control lever.

Cut the wires (Item 2) **[Figure 60-120-19]** below the switch handle and remove switch handle.

NOTE: Only cut the wires if the switch handle is bad and needs replacement. If the switch handle is good and just needs to be removed for control handle or lever replacement, then remove the connectors on the end of the harness and pull switch handle up out of lever tube.

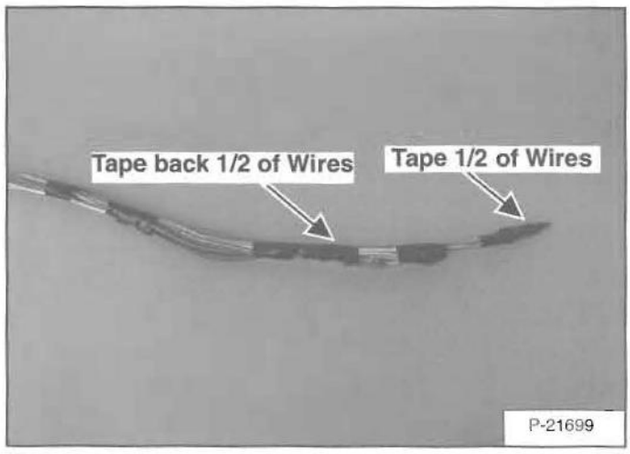
Figure 60-120-20



Pull harness (Item 1) **[Figure 60-120-20]** out the bottom of the control lever tube.

Switch Handle Installation

Figure 60-120-21



When installing the new switch handle, tape the wire terminals together.

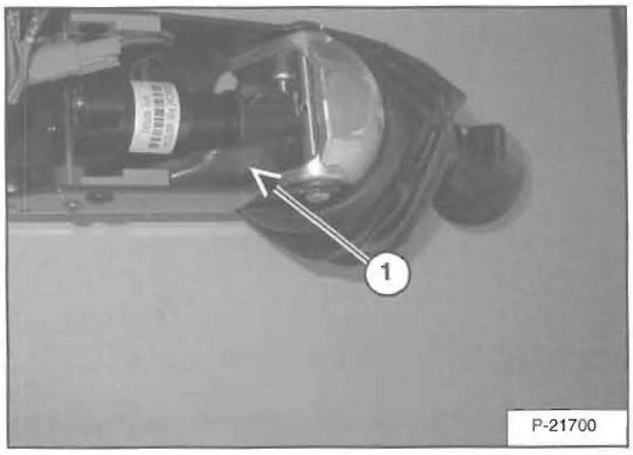
The switch handle comes with a 6 inch piece of heat shrink tube side on the end of the wires. Remove the heat shrink tube from the end of the wires before routing through handle and control lever tube.

NOTE: Leave all the other heat shrink tube on the wires for protection.

Tape half of the wires back and half forward **[Figure 60-120-21]** to keep the harness small enough to route through the control lever tube.

Switch Handle Installation (Cont'd)

Figure 60-120-22

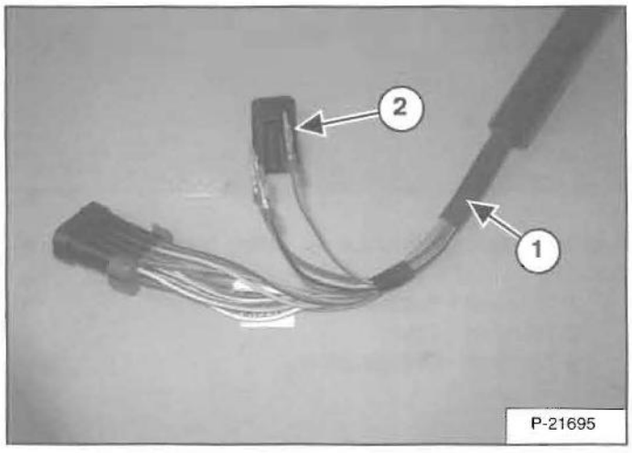


Install the new switch handle and wires from the top of the control lever.

Route wire (Item 1) **[Figure 60-120-22]** through the casting, along side the handle sensor and into the control lever tube.

NOTE: Do not pull the wire harness tight, allow a small amount of slack or slight bend at the handle pivot area. Verify the control handle returns to neutral position.

Figure 60-120-23



Remove tape from wires for installation and install the 6 inches of heat shrink tube (Item 1) **[Figure 60-120-23]** approximately 3 inches into the control lever. Apply heat to the exposed heat shrink tube.

Inspect the wire terminal tabs (Item 2) **[Figure 60-120-23]** and re-bend tabs if necessary.

Install the wires into the connectors as listed below:

Right Switch Handle

Ten-Pin Connector
- A-Terminal - Orange
- B-Terminal - White
- C-Terminal - White/Black
- D-Terminal - White/Red
- E-Terminal - Dk. Green
- F-Terminal - White/Lt. Green
- G-Terminal - Yellow/Red
- H-Terminal - Lt. Green
- J-Terminal - Yellow
- K-Terminal - Orange/ Black

Three-Pin Connector
- A-Terminal - Red/White
- B-Terminal - Black/White
- C-Terminal - Purple/White

Left Switch Handle

Ten-Pin Connector
- A-Terminal - Orange
- B-Terminal - Dk. Blue
- C-Terminal - White
- D-Terminal - Purple
- E-Terminal - Yellow/Red
- F-Terminal - Tan
- G-Terminal - Pink
- H-Terminal - Orange/Black
- J-Terminal - Blank
- K-Terminal - Blank

Three-Pin Connector
- A-Terminal - Red/White
- B-Terminal - Black/White
- C-Terminal - Purple/White

Two-Pin Connector
- A-Terminal - Black
- B-Terminal - Red

Five-Pin Connector
- A-Terminal - Dk. Green
- B-Terminal - Brown
- C-Terminal - Blank
- D-Terminal - Yellow
- E-Terminal - Blank

Switch Handle Installation (Cont'd)

Figure 60-120-24

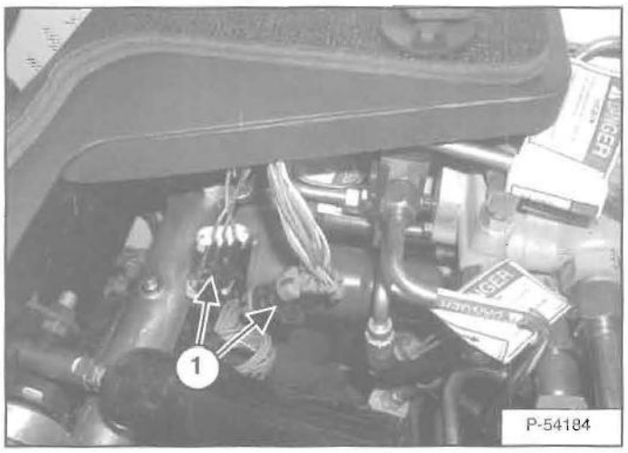
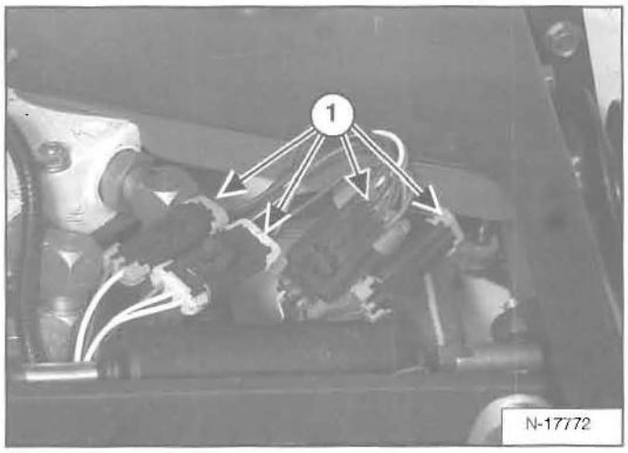


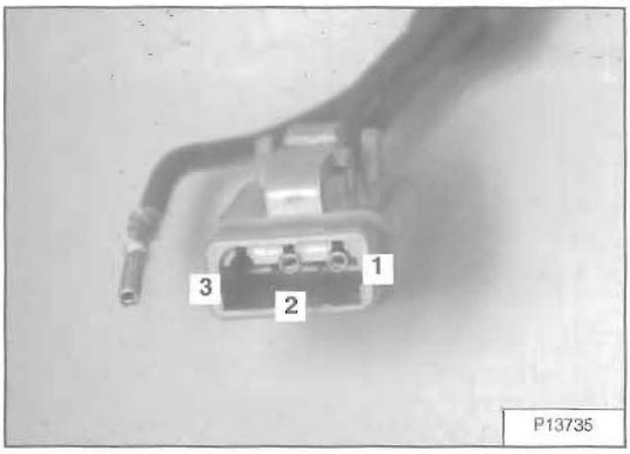
Figure 60-120-25



Connect the handle harness connectors (Item 1) **[Figure 60-120-24]** & **[Figure 60-120-25]** to the loader harness connectors.

Install the wires into the connector as listed below:

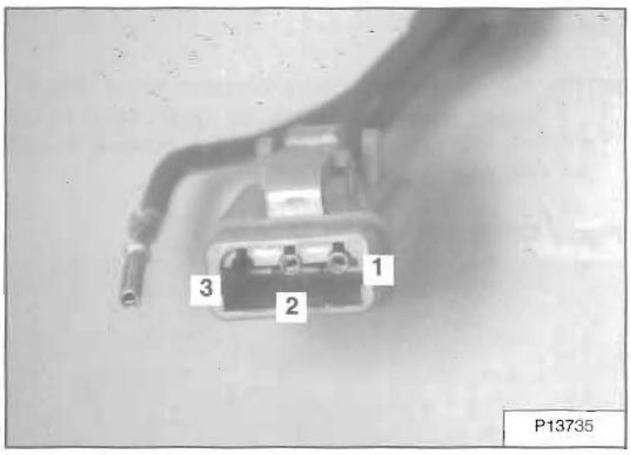
Figure 60-120-26



Left and Right Control Lever Switch Handle **[Figure 60-120-26]**

1-Terminal - Red/White
2-Terminal - Black/White
3-Terminal - Purple/White

Figure 60-120-27

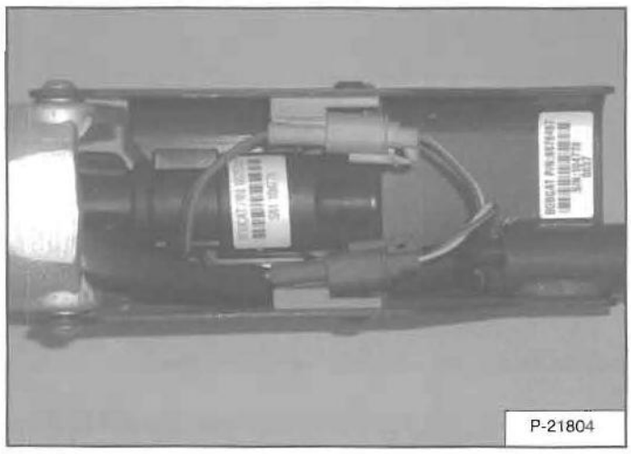


Left and Right Control Lever Switch Handle **[Figure 60-120-27]**

1-Terminal - Yellow/Red
2-Terminal - Open
3-Terminal - Orange/Black

Switch Handle Installation (Cont'd)

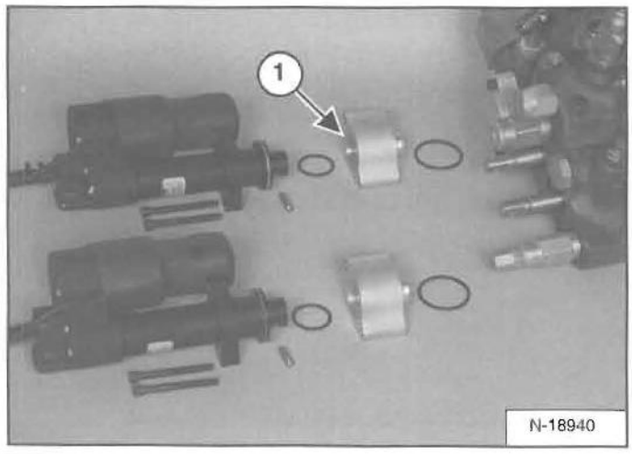
Figure 60-120-28



Connect the handle harness connectors to the sensor and lock solenoid connectors **[Figure 60-120-28]**.

Actuators Disassembly And Assembly

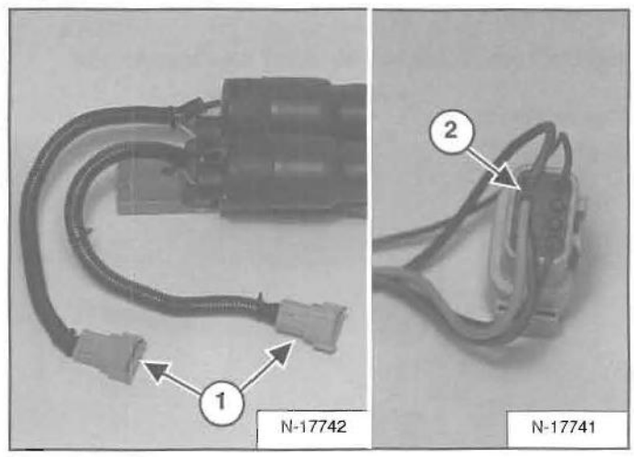
Figure 60-120-29



Remove the actuator from the hydraulic control valve. (See Contents Page 20-01.)

Check the mounting block (Item 1) **[Figure 60-120-29]** and bolts for wear and replace as needed.

Figure 60-120-30



Check the actuator wiring harness connector (Item 1) **[Figure 60-120-30]** and replace if broken.

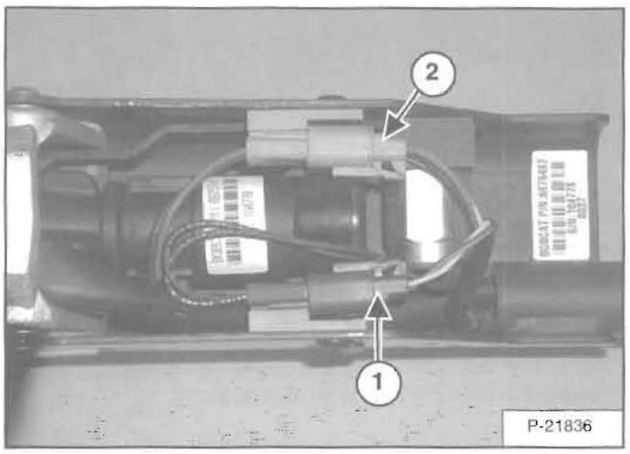
Installation: Install the wires into the connector as listed below. The terminal numbers are written on the back of the connector (Item 2) **[Figure 60-120-30]**.

Lift and Tilt Actuator

1 - Terminal - Black/Green - Larger diameter wire (16 gauge)
2 - Terminal - Green - Larger diameter wire (16 gauge)
3 - Terminal - Red/Green - Larger diameter wire (16 gauge)
4 - Terminal - Open
5 - Terminal - Red - Smaller diameter wire (18 gauge)
6 - Terminal - Open
7 - Terminal - Open
8 - Black - Smaller diameter wire (18 gauge)

Handle Lock Solenoid Removal And Installation

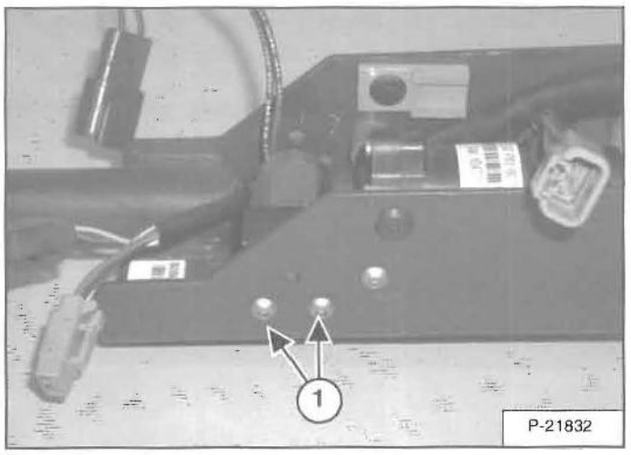
Figure 60-120-31



Disconnect the harness connector (Item 1) **[Figure 60-120-31]** from the handle sensor connector.

Disconnect the harness connector (Item 2) **[Figure 60-120-31]** from the handle lock solenoid connector.

Figure 60-120-32



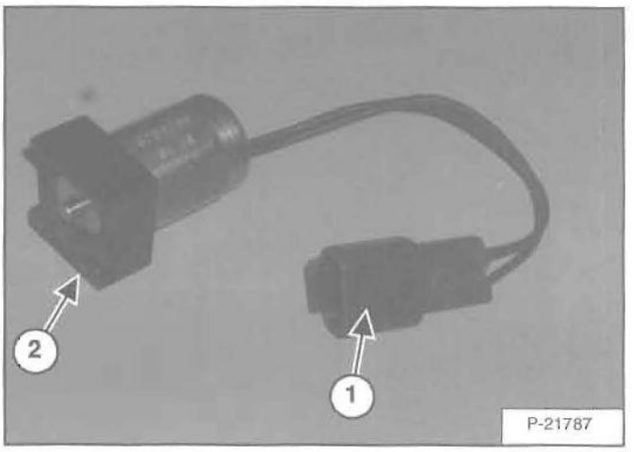
Remove the two screws (Item 1) **[Figure 60-120-32]** holding the handle lock solenoid to the handle.

Installation: Tighten the screws to 32-38 in.-lbs. (3,6-4,3 Nm) torque.

Remove handle lock solenoid assembly from handle.

Handle Lock Solenoid Disassembly And Assembly

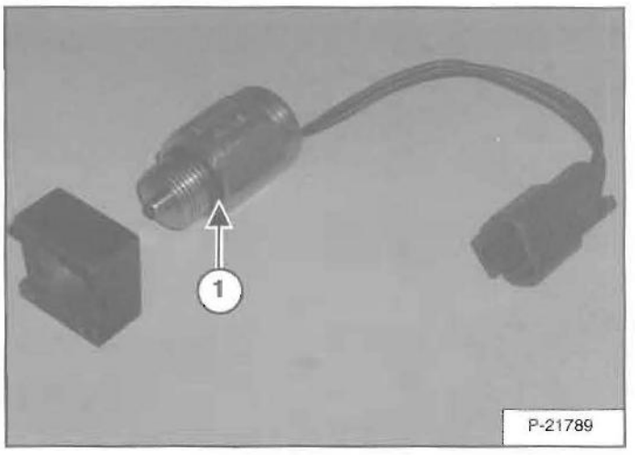
Figure 60-120-33



Remove solenoid (Item 1) from the solenoid mount (Item 2) **[Figure 60-120-33]**.

Installation: Apply a drop of oil to the solenoid threads and tighten solenoid to 35-40 ft.-lbs.(47-54 Nm) lubed torque.

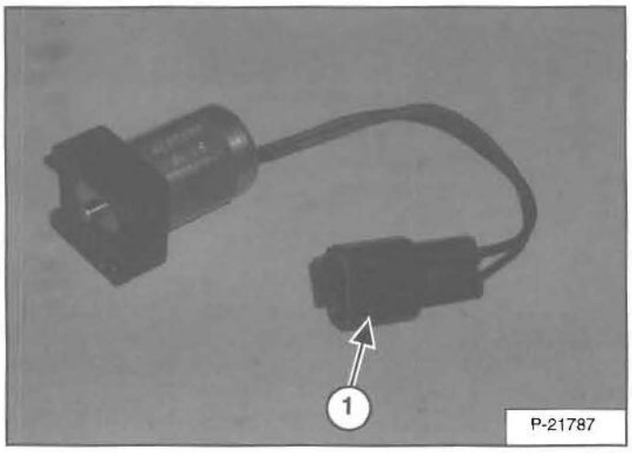
Figure 60-120-34



Check the O-ring (Item 1) **[Figure 60-120-34]** for damage. Replace as necessary.

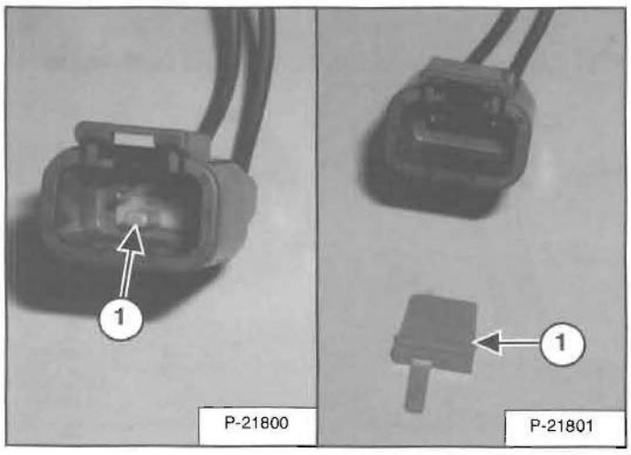
Handle Lock Solenoid Connector

Figure 60-120-35



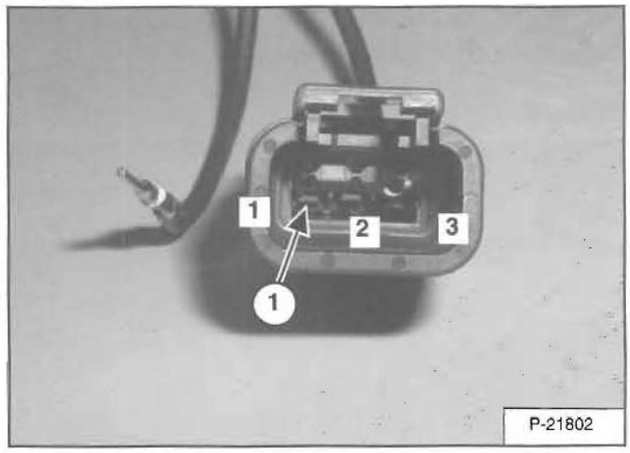
The wire connector (Item 1) **[Figure 60-120-35]** can be removed from the solenoid, use the following procedure.

Figure 60-120-36



Remove the wedge (Item 1) **[Figure 60-120-36]** from the connector.

Figure 60-120-37



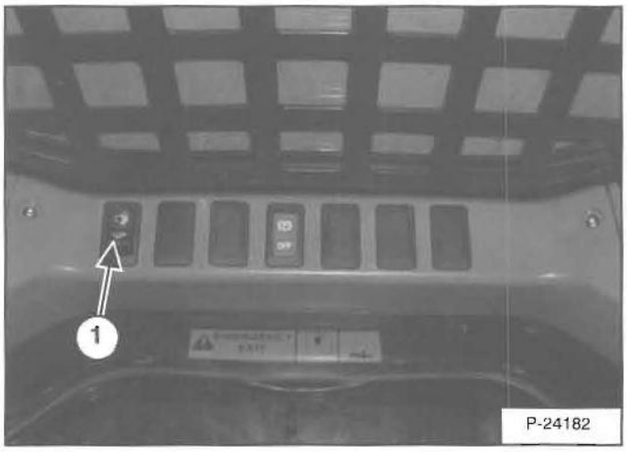
With a pointed tool, lift the tab (Item 1) **[Figure 60-120-37]** and pull the wire from the connector.

Installation: Install the wires into the connector as listed below **[Figure 60-120-37]**.

1 - Terminal - Black
2 - Terminal - Open
3 - Terminal - Black

Calibration Of The ACS System

Figure 60-120-38



The new controller uses a calibration sequence to optimize the control system. The optimizing ensures full spool stroke (full flow) while preventing over stroke (Loading) of the actuator.

NOTE: This calibration procedure must be followed when replacing a handle sensor, foot pedal sensor, actuator or ACS controller. Failure to calibrate after component replacement may result in poor performance or reduced life of actuator(s).

Switchable Hand/Foot Controls Calibration Procedure

Switch the rocker switch (Item 1) **[Figure 60-120-38]** to the hand control mode.

Figure 60-120-39

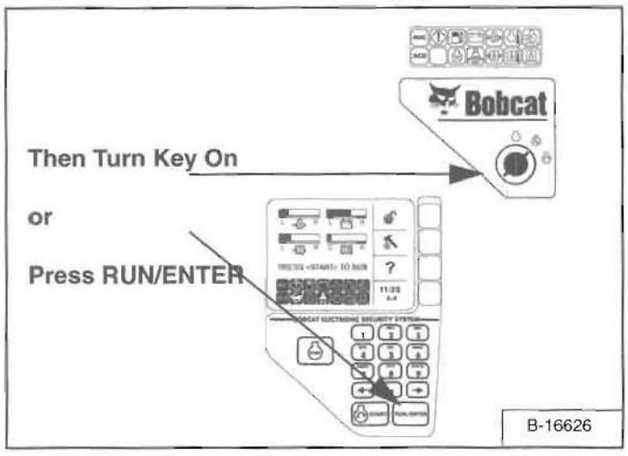
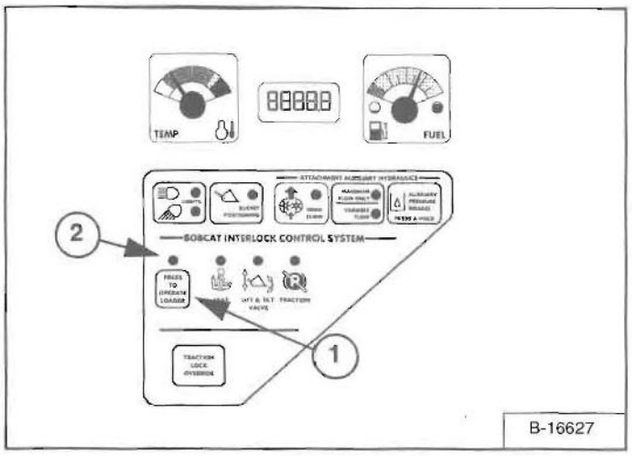


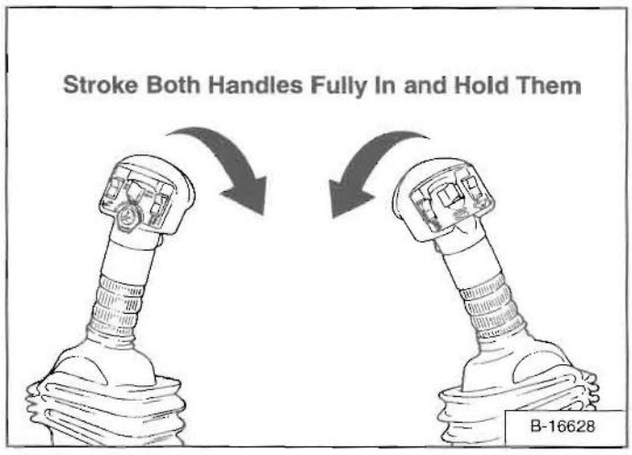
Figure 60-120-40



With the seat bar down, turn the ignition key on (keyless panel choose RUN/ENTER) **[Figure 60-120-39]** and push the PRESS TO OPERATE button (Item 1) **[Figure 60-120-40]** to unlock the hand controls.

NOTE: Do not start the engine.

Figure 60-120-41



Fully stroke both control handles in toward the center of the cab and hold the handles there **[Figure 60-120-41]**.

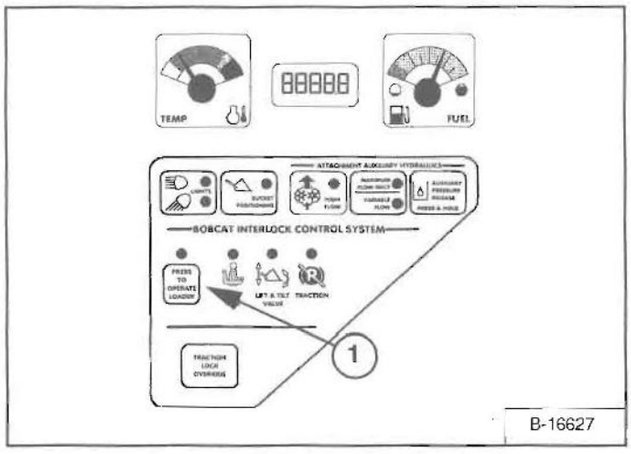
Lift the seat bar high enough for the PRESS TO OPERATE light (Item 2) **[Figure 60-120-40]** to go **OFF**.

Lower the seat bar.

ADVANCED CONTROL SYSTEM (ACS) SELECTABLE HAND/FOOT CONTROL (CONT'D)

Switchable Hand/Foot Controls Calibration Procedure (Cont'd)

Figure 60-120-42



Push the PRESS TO OPERATE button (Item 1) **[Figure 60-120-42]** to begin the calibration.

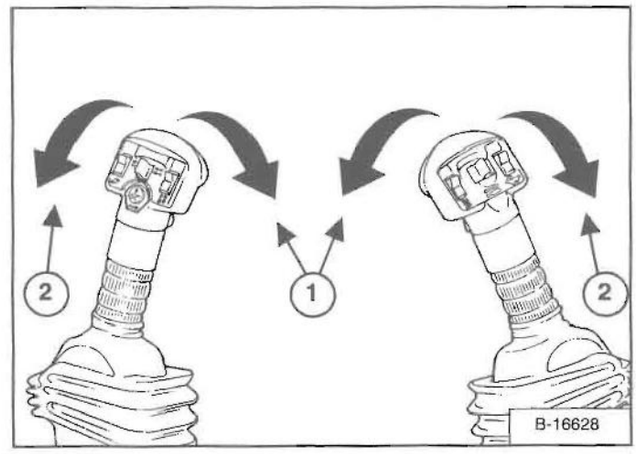
NOTE: The ACS icon will light up and if you listen closely the cycling of the actuators can be heard. The ACS icon will stay lit until the ignition key is cycled or the loader is started and a function is operated.

NOTE: During the calibration cycle, the system will beep three times. The calibration process generates two codes 32-35 (tilt handle not calibrated) and 32-40 (lift handle not calibrated). Ignore these two codes, this is normal during the calibration procedure.

Release the control handles.

NOTE: The remaining portion of the procedure must be performed in twenty seconds or less. If not, the handles and pedals will lock and the procedure must be started over from the beginning.

Figure 60-120-43

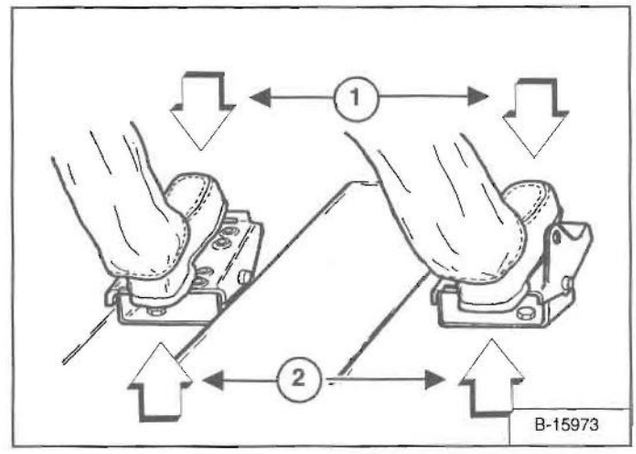


Fully stroke both control handles in toward the center of the cab and hold the handles there for one second (Item 1) **[Figure 60-120-43]**.

Fully move both handles out toward the cab side screens and hold for one second (Item 2) **[Figure 60-120-43]**.

Allow both handles to return to neutral.

Figure 60-120-44



Fully press the toe of the lift and tilt pedals (Item 1) **[Figure 60-120-44]** down and hold for one second.

Fully press the heel of the lift and tilt pedals (Item 2) **[Figure 60-120-44]** down and hold for one second.

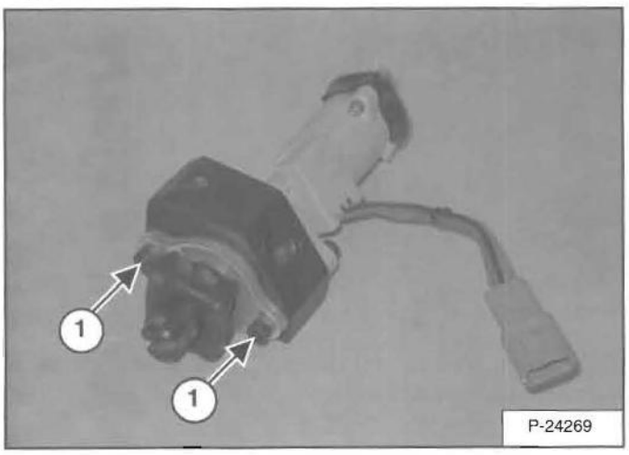
Allow both pedals to return to neutral.

At the end of the twenty second time frame, the handles and pedals will lock.

Calibration is complete.

Foot Sensor Disassembly And Assembly

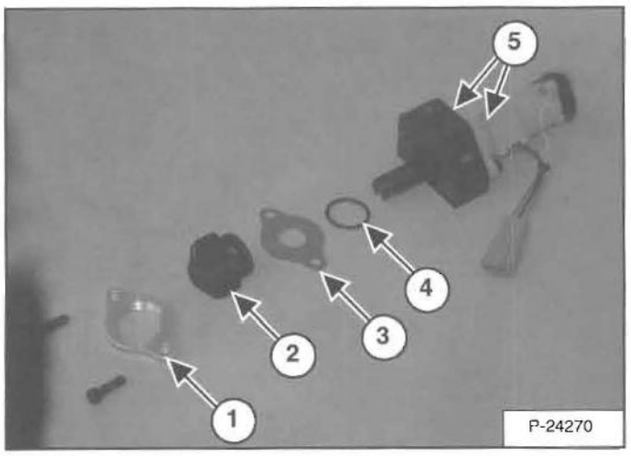
Figure 60-120-45



Remove the two bolts (Item 1) **[Figure 60-120-45]** from the end of the foot sensor.

Installation: Tighten the bolts to 90 in.-lbs. (10,2 Nm) torque. Apply LOCTITE 242 to the threads.

Figure 60-120-46

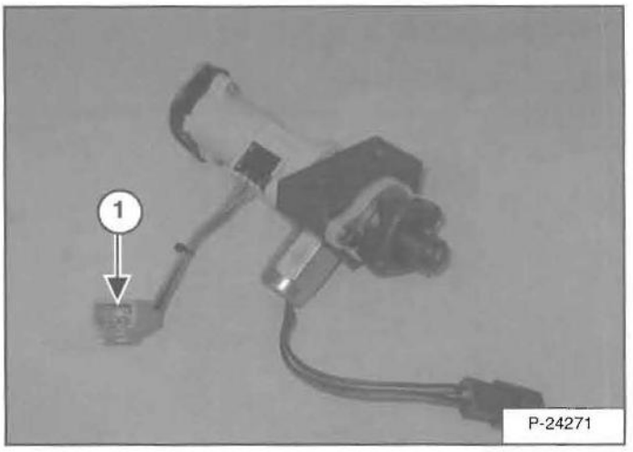


Remove the boot retainer (Item 1), boot (Item 2), spool stop plate (Item 3), O-ring (Item 4) **[Figure 60-120-46]**.

NOTE: Do not disassemble the sensor assembly (Item 5) [Figure 60-120-46]. The sensor assembly is a calibrated assembly and cannot be serviced. Order through Bobcat Parts.

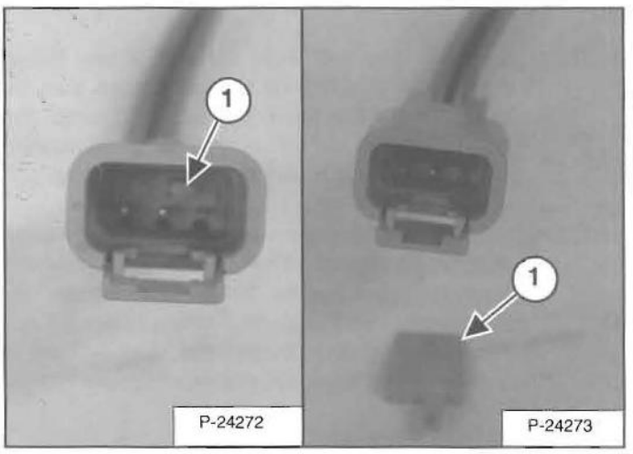
Foot Sensor Connector

Figure 60-120-47



The wire connector (Item 1) **[Figure 60-120-47]** can be removed from the sensor wires, use the following procedure.

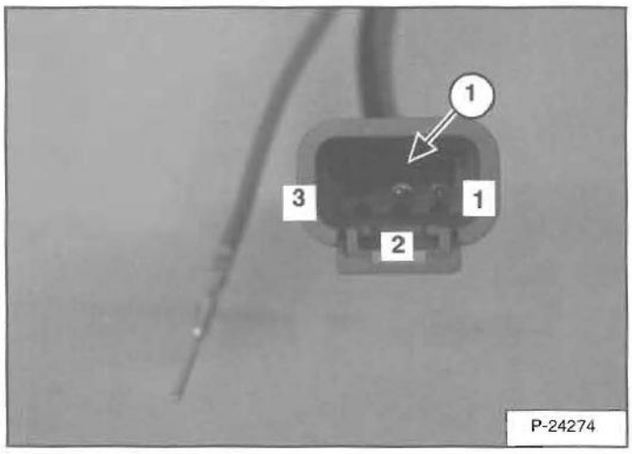
Figure 60-120-48



Remove the wedge (Item 1) **[Figure 60-120-48]** from the connector.

Foot Sensor Connector (Cont'd)

Figure 60-120-49



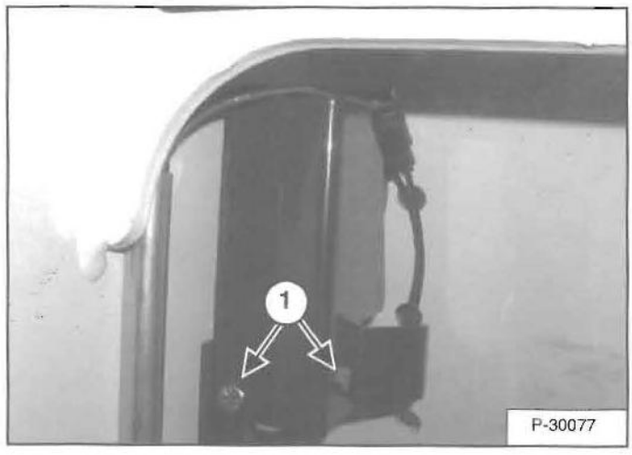
With a pointed tool, lift the tab (Item 1) **[Figure 60-120-49]** and pull the wire from the connector.

Installation: Install the wires into the connector as listed below **[Figure 60-120-49]**:

1 - Terminal - Red
2 - Terminal - Black
3 - Terminal - Green

Foot Lock Solenoid Removal And Installation

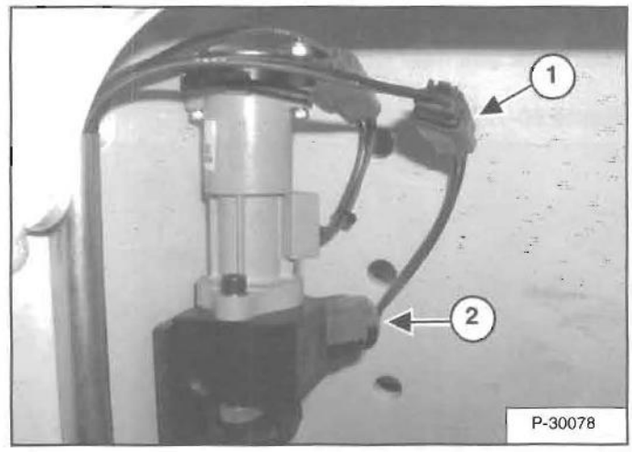
Figure 60-120-50



Remove the two bolts (Item 1) **[Figure 60-120-50]** from the foot sensor shield.

Installation: Tighten the bolts to 80-90 in.-lbs. (9,0-10,2 Nm) torque.

Figure 60-120-51

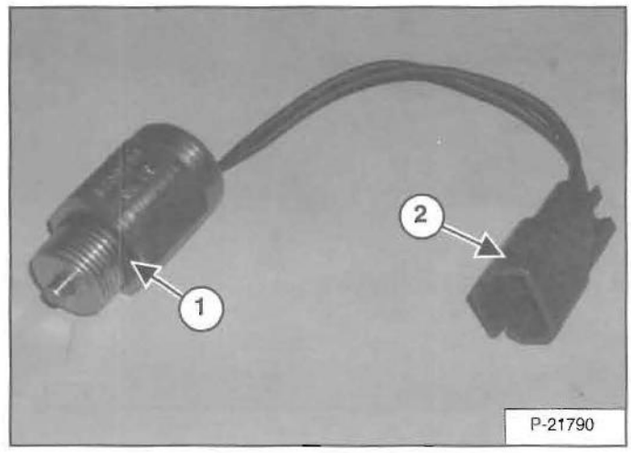


Disconnect the foot lock solenoid connector (Item 1) **[Figure 60-120-51]** from the harness.

Remove foot lock solenoid (Item 2) **[Figure 60-120-51]**.

Installation: Apply a drop of oil on the solenoid threads and tighten the solenoid to 35-40 ft.-lbs. (47-54 Nm) lubed torque.

Figure 60-120-52



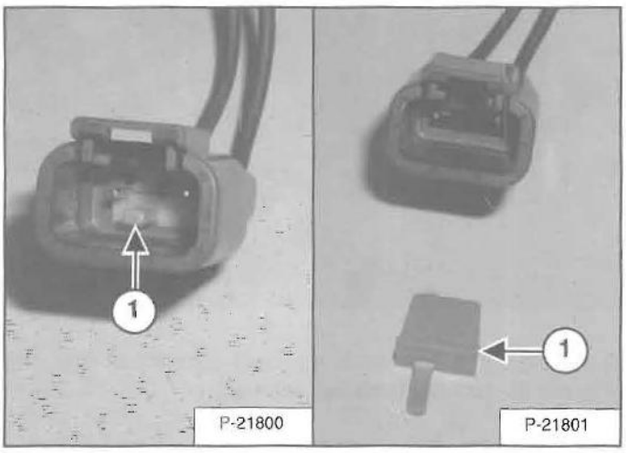
Check the O-ring (Item 1) **[Figure 60-120-52]** for damage. Replace as necessary.

Foot Lock Solenoid Connector

The wire connector (Item 2) **[Figure 60-120-52]** can be removed from the solenoid wires, use the following procedure.

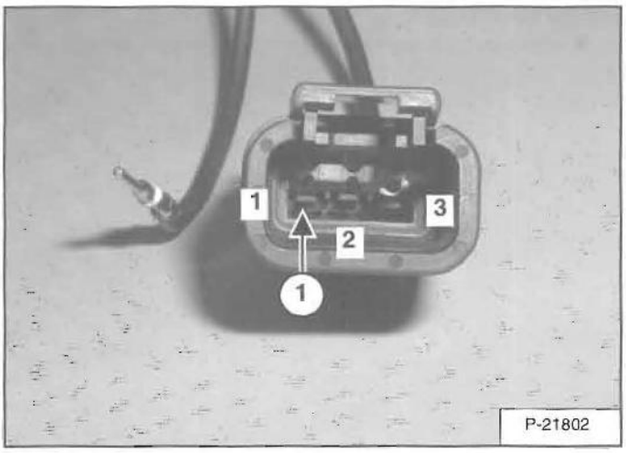
Foot Lock Solenoid Connector (Cont'd)

Figure 60-120-53



Remove the wedge (Item 1) **[Figure 60-120-53]** from the connector.

Figure 60-120-54



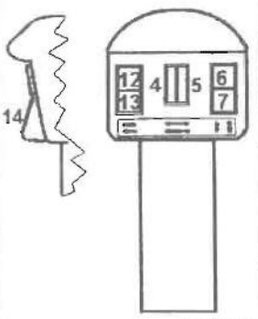
With a pointed tool, lift the tab (Item 1) **[Figure 60-120-54]** and pull the wire from the connector.

Installation: Install the wires into the connector as listed below **[Figure 60-120-54]**:

1 - Terminal - Black
2 - Terminal - Open
3 - Terminal - Black

Controls Identification Chart

Left Side Control Handle Switches

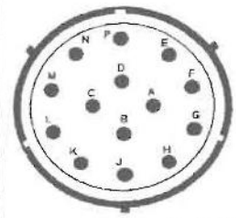


B-16447

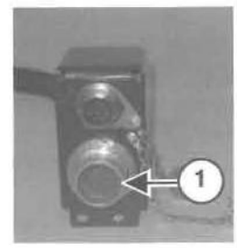
Switch Number	Solenoid Number Activated			Attachment Harness Terminal Activated
		RH	HFH	
1	1	1	1, 8	K
2	2	2	2	K
*3	1	1	1, 8	K
4	2	2, 3	6, 7	K, A, D
5	1	1, 3	5, 7	K, A, C
6	1	1, 3	5, 7	K, E
7	1	1, 3	5, 7	K, F
8	1	1, 3	5, 7	K, G
9	1	1, 3	5, 7	K, H
10, 11, 12, 13, 14	-	--	--	K

Attachment Harness Connector

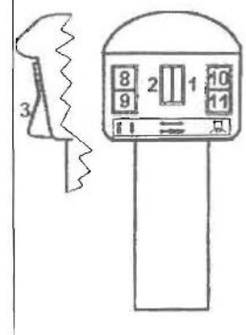
Fourteen Pin Connector Viewed from front (pin side of connector) of loader.



B-16449



Right Side Control Handle Switches



B-16448

NOTE: All diagnostics must be done at the fourteen pin connector (Item 1).

On earlier versions, the switch (Item 2) must be in the fourteen pin position. The current Version ACD (Attachment Control Device) without switch, automatically recognizes the use of the seven or fourteen pin connector when connected.

The ACD (Attachment Control Device) Icon, located in the right instrument panel on the loader cab, must be illuminated continuously.

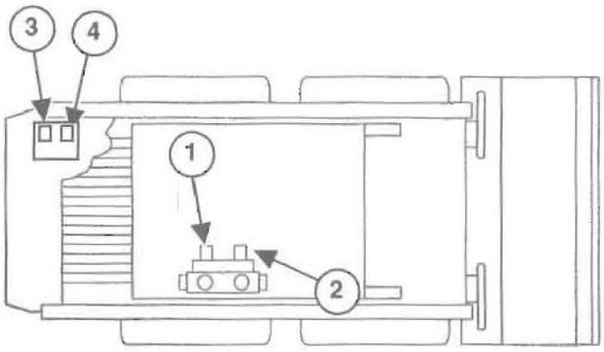
If the ACD light flashes, check for diagnostic service codes. See the Electrical System Service Manual for the proper procedure.

RH - Loaders with Rear Hydraulics Option.

*** If harness terminals K & L are jumped together, switches 4 thru 9 will function the same as switch 1 & 2.**

*** Terminal K is activated with Key switch ON.**

Controls Identification Chart (Cont'd)



MC-1494

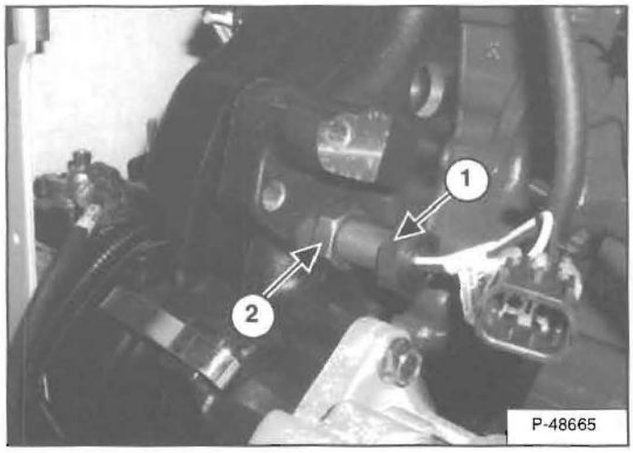
Solenoid Number	Hyeraulic Coupler	Wiring Color
1	Front Female	Dk. Green Red
2	Front Male	Dk. Green/ Lt. Green
3	Diverter (Rear Couplers)	Yellow
4	Bleed-Rear Male & Female	Dk. Green/ Yellow

NOTE: The key switch fully left position activates solenoids number 1 and 4.

FLYWHEEL RPM SENSOR

Adjustment

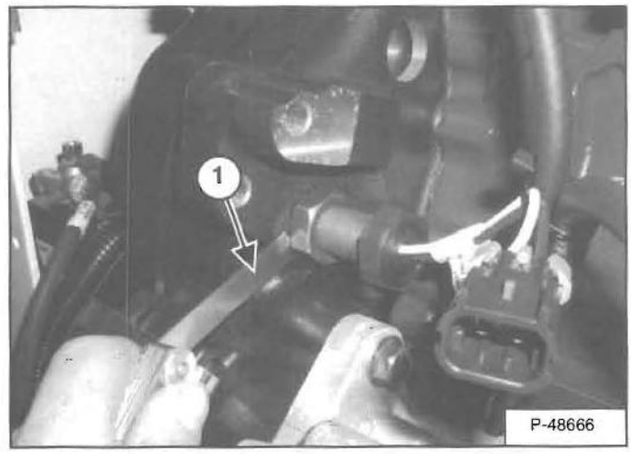
Figure 60-140-1



When reinstalling the RPM sensor, turn the rpm sensor (Item 1) **[Figure 60-140-1]** in until it makes contact with the engine flywheel.

Turn the jam nut (Item 2) **[Figure 60-140-1]** until it contacts the flywheel housing. The jam nut should not be tightened, it needs to turn with the RPM sensor when the sensor is turned back out for adjustment.

Figure 60-140-2



Turn the RPM sensor and the jam nut out from the flywheel. Set a clearance of .050 inch (1,27 mm) between the jam nut and the housing with a feeler gauge (Item 1) **[Figure 60-140-2]**.

NOTE: New RPM sensors have a plastic tip which is used as a gauge during installation. The plastic tip is designed to come off after the engine is started.



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60-140-2

S130 Bobcat Loader
Service Manual

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Chart 70-10-1

TIGHTEN ALL HARDWARE PER SIZE TO GRADE 5 TORQUE (SEE STANDARD TORQUE SPECIFICATIONS FOR BOLTS, SECTION SPEC-01) UNLESS OTHERWISE SPECIFIED.

TROUBLESHOOTING

Chart

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

PROBLEM	CAUSE
Slow cranking speed.	1, 2, 3,54
Engine will not start.	2, 5, 6, 7, 8, 9, 11,12,13,14,15,16,19,27,28,29
Difficult to start.	1, 2, 5, 7, 8, 9, 10, 11, 12, 13, 15, 16, 17, 18, 19, 20, 25, 27, 28, 29,54
No power for engine.	8, 9, 10, 11, 12, 13, 15, 16, 17, 18, 20, 21, 22, 23, 27, 28, 29
Engine is mis-firing.	8, 9, 11, 12, 13, 15, 16, 17, 21, 22, 24, 25, 26, 28
Too much fuel consumption.	10, 12, 13, 15, 16, 17, 19, 20, 21, 23, 24, 25, 27, 28, 29
Black exhaust.	10, 12, 13, 15, 16,17,19,20,21,23,24,25,27,28,29
Blue/white exhaust.	4, 10, 15, 16, 17, 21, 23, 27, 29, 30, 50
Low oil pressure.	4, 31, 32, 33, 34, 35, 37, 38, 39, 52
Engine knocking.	13, 15, 16, 19, 22, 24, 25, 27, 29, 31, 40, 41, 53
Engine running rough.	7, 8, 9, 10, 11, 12, 13, 17, 18, 22, 24, 25, 26, 29, 40, 53
Vibration.	12, 13, 17, 21, 22, 25, 26, 29, 40, 42, 43
High oil pressure warning.	4, 33, 36
Overheating.	10, 12, 13, 15, 16, 20, 21, 40, 44, 45, 46, 47, 48, 51
Too much crankcase pressure.	22, 27, 29, 30, 40, 49
Poor compression.	10, 16, 21, 24, 25, 27, 28, 29, 30, 41, 53
Start and stop.	9, 10, 11

Chart (Cont'd)

KEY TO CORRECT THE CAUSE	
1. Alternator belt is loose or damaged.	28. Worn valve and seats.
2. Bad electrical connections.	29. Broken or worn piston rings.
3. Faulty starter motor.	30. Worn valve stems or guides.
4. Incorrect grade of oil.	31. Worn or damaged bearings.
5. Low cranking speed.	32. Not enough oil in the crankcase.
6. Fuel tank empty.	33. Switch/sensor is defective.
7. Faulty stop control operation.	34. Oil pump worn.
8. Plugged fuel line.	35. Relief valve is sticking open.
9. Plugged fuel filter.	36. Relief valve is sticking closed.
10. Restriction in the air cleaner.	37. Broken relief valve spring.
11. Air in the fuel system.	38. Faulty suction hose.
12. Faulty fuel injection pump.	39. Plugged oil filter.
13. Faulty fuel injectors.	40. Piston seizure.
14. Broken injection pump drive.	41. Incorrect piston height.
15. Incorrect injection pump timing.	42. Faulty engine mounting.
16. Incorrect valve timing.	43. Incorrect flywheel alignment.
17. Poor compression.	44. Faulty thermostat.
18. Plugged fuel tank vent.	45. Restriction in water jacket.
19. Incorrect grade of fuel.	46. Loose alternator belt.
20. Exhaust pipe restriction.	47. Plugged radiator.
21. Cylinder head gasket leaking.	48. Faulty water pump.
22. Overheating.	49. Plugged breather hose.
23. Cold running.	50. Damaged valve stem deflectors.
24. Incorrect tappet adjustment.	51. Coolant level too low.
25. Sticking valves.	52. Plugged oil pump pipe strainer.
26. Incorrect fuel lines.	53. Broken valve spring.
27. Worn cylinder bores.	54. Damaged Battery

ENGINE SPEED CONTROL

Removal And Installation



WARNING

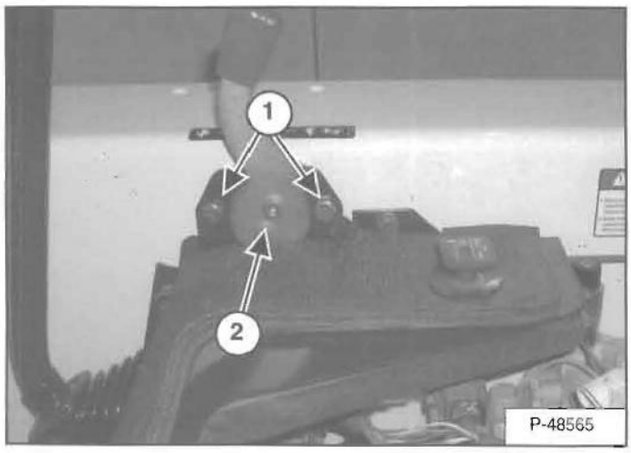
Never work on a machine with the lift arms up unless the lift arms are secured by an approved lift arm support device. Failure to use an approved lift arm support device can allow the lift arms or attachment to fall and cause injury or death.

W-2059-0598

Raise the lift arms and install an approved lift arm device. (See Contents Page 10-01.)

Raise the operator cab. (See Contents Page 10-01.)

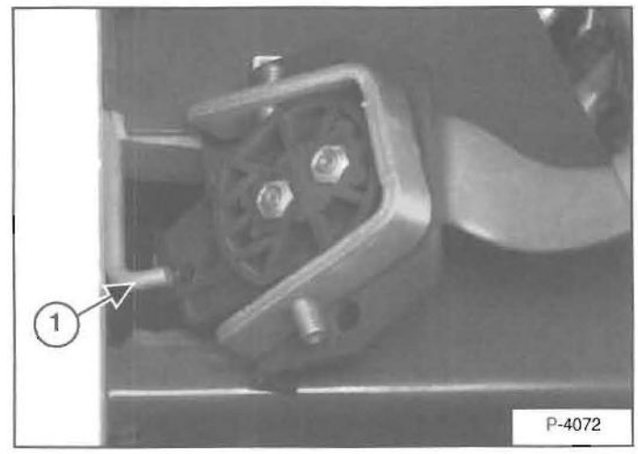
Figure 70-20-1



Remove the two mounting bolts (Item 1) **[Figure 70-20-1]** and nuts from the speed control mounting bracket.

Installation: Tighten the mounting bolts and nuts evenly until the speed control lever moves back and forth at a comfortable tension.

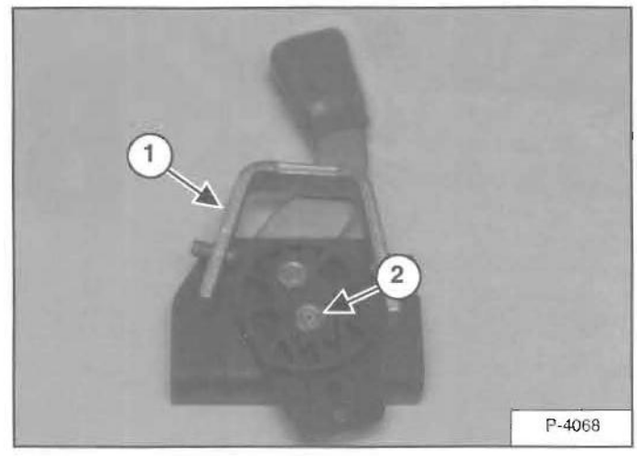
Figure 70-20-2



Pull the speed control away from the loader frame and disconnect the speed control rod (Item 1) **[Figure 70-20-2]** from the control.

Installation: Be sure to install the control rod in the bottom hole of the speed control.

Figure 70-20-3



Installation: Install the stop bracket (Item 1) **[Figure 70-20-3]** in the same location. It is necessary for the front and rear stop on the bracket to be located correctly.

Reverse the removal procedure to install the engine speed control.

Disassembly

Loosen the two control lever mounting bolts (Item 2) **[Figure 70-20-1]** and remove the mounting nuts (Item 2) **[Figure 70-20-3]**.

Assembly: Do not lubricate the engine speed control.

Replace any worn or damaged parts if necessary.



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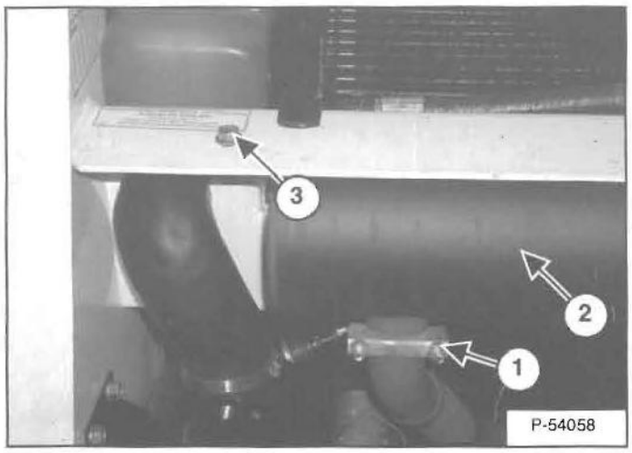
MUFFLER

Removal And Installation

Stop the engine and open the rear door.

Remove the rear grill. (See Contents Page 50-01.)

Figure 70-30-1

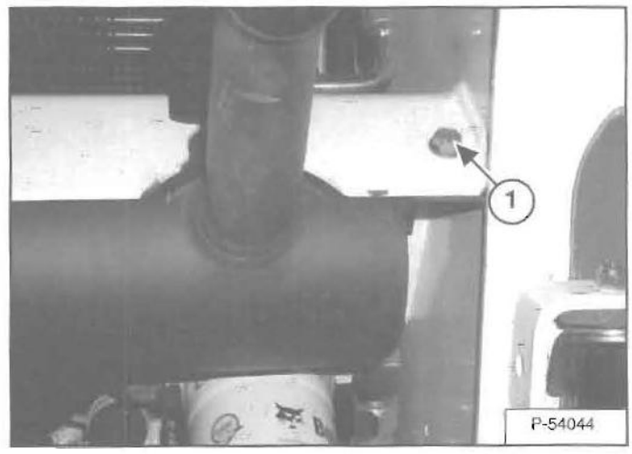


Remove the exhaust pipe clamp (Item 1) from the muffler (Item 2) **[Figure 70-30-1]**.

Disconnect the exhaust pipe from the muffler.

Remove the left side mounting bolt (Item 3) **[Figure 70-30-1]** from the muffler.

Figure 70-30-2



Remove the right side mounting bolt (Item 1) **[Figure 70-30-2]** from the muffler.

Installation: Tighten the muffler mounting bolts to 25-28 ft.-lbs. (34-38 Nm) torque.

Remove the muffler from the loader.

Reverse the removal procedure to install the engine muffler.

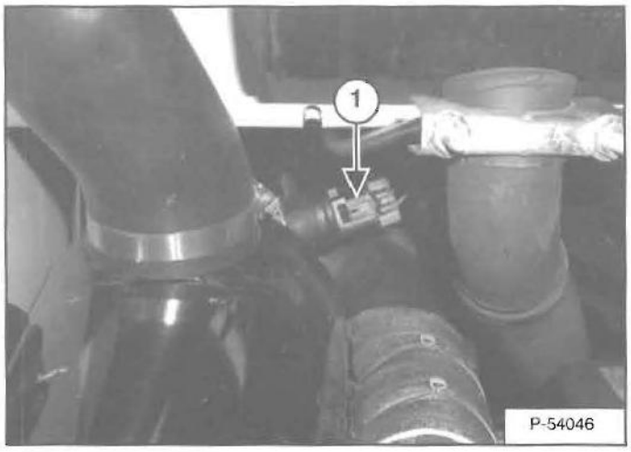


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AIR CLEANER

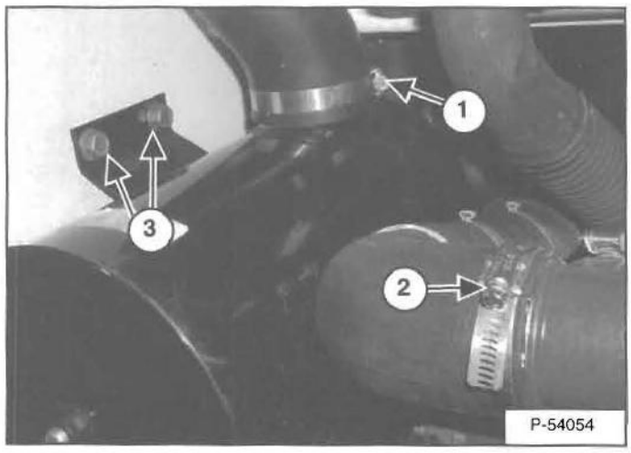
Removal And Installation

Figure 70-40-1



Disconnect the wire harness connector (Item 1) **[Figure 70-40-1]** from the air cleaner sensor on the air cleaner.

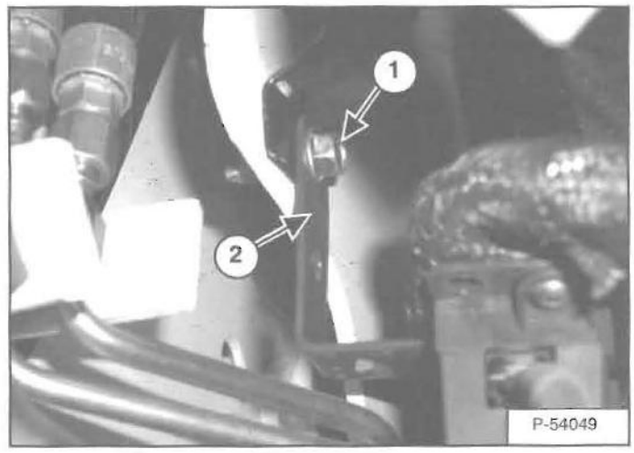
Figure 70-40-2



Loosen the hose clamp (Item 1) **[Figure 70-40-2]** on the air cleaner hose.

Loosen the clamp (Item 2) **[Figure 70-40-2]** from the hose on the engine manifold.

Figure 70-40-3



Remove the lower mounting bolt (Item 1) and engine harness mounting bracket (Item 2) **[Figure 70-40-3]** from the air cleaner.

Remove the two upper mounting bolts (Item 3) **[Figure 70-40-2]** from the top mount of the air cleaner.

Installation: Tighten the three mounting bolts to 15-20 ft.-lbs. (20-27 Nm) torque.

Remove the air cleaner from the engine compartment.

Reverse the removal procedure to install the air cleaner.



Bobcat®

RADIATOR

Removal And Installation

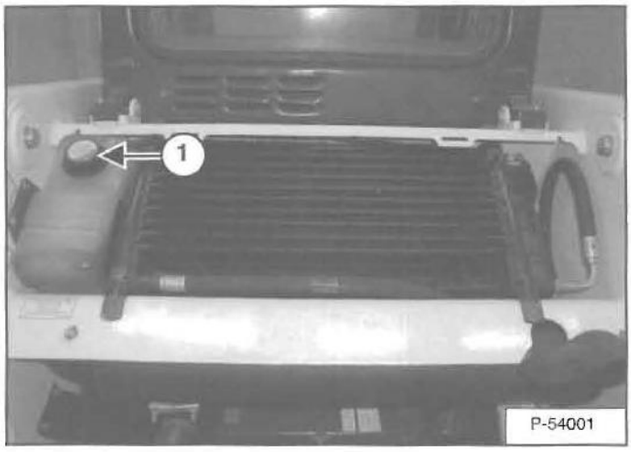
Stop the engine and open the rear door.

⚠ WARNING

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

W-2070-1285

Figure 70-50-1

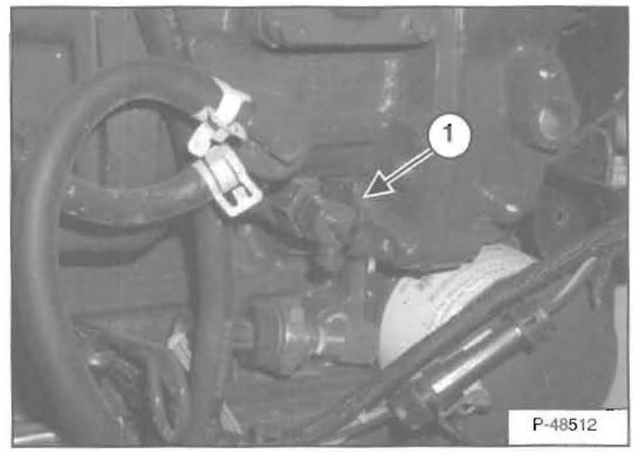


Loosen the radiator cap (Item 1) **[Figure 70-50-1]** from the pressurized expansion tank.

Remove the rear grill. (See Contents Page 50-01.)

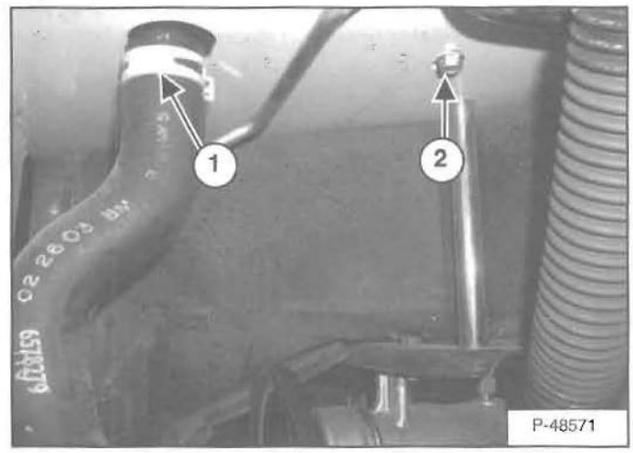
Remove the oil cooler. (See Contents Page 30-01.)

Figure 70-50-2



Open the drain valve (Item 1) **[Figure 70-50-2]** on the engine block and drain the coolant into a container.

Figure 70-50-3

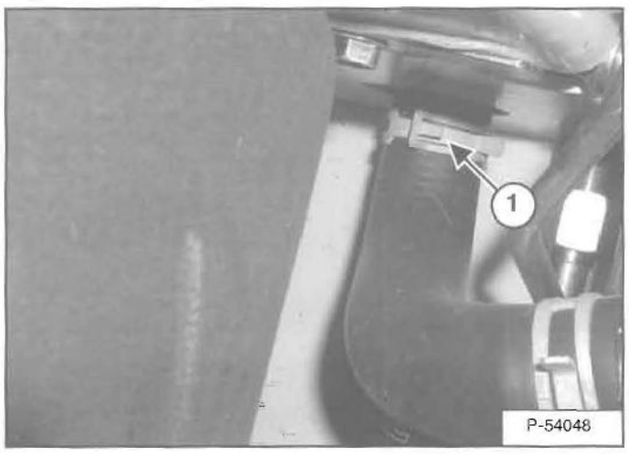


Loosen the hose clamp (Item 1) **[Figure 70-50-3]** from the left side radiator hose and disconnect the hose from the radiator.

Remove the radiator mounting bolt (Item 2) **[Figure 70-50-3]**.

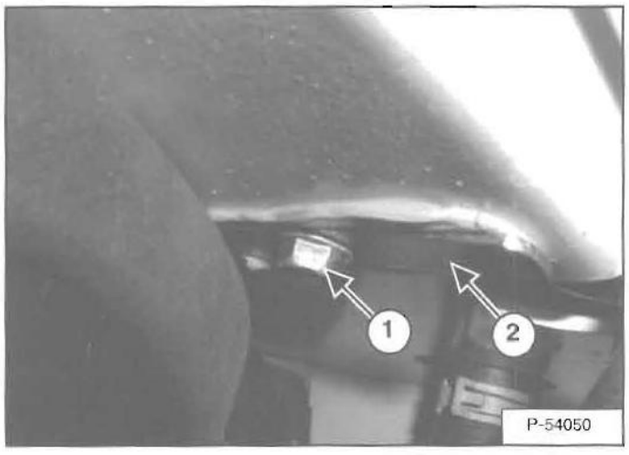
Removal And Installation (Cont'd)

Figure 70-50-4



Loosen the hose clamp (Item 1) **[Figure 70-50-4]** from the right side radiator hose and disconnect the hose from the radiator.

Figure 70-50-5



Remove the right side radiator mounting bolt (Item 1) and block off plate (Item 2) **[Figure 70-50-5]**.

Installation: Torque the radiator bolts to 11-13 ft.-lbs. (15-17 Nm) torque. Use sealant on the block off plate and bolt.

Figure 70-50-6

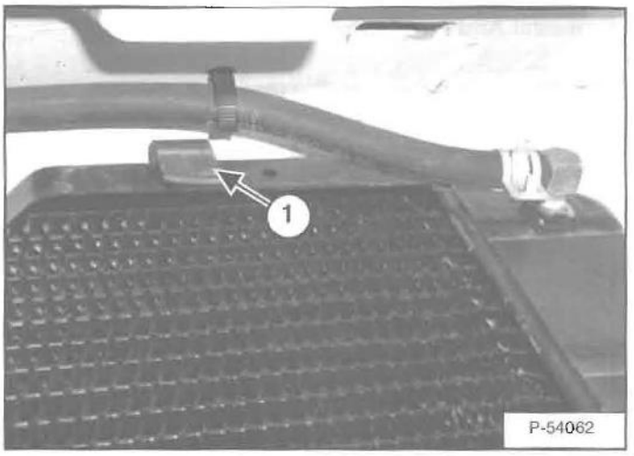
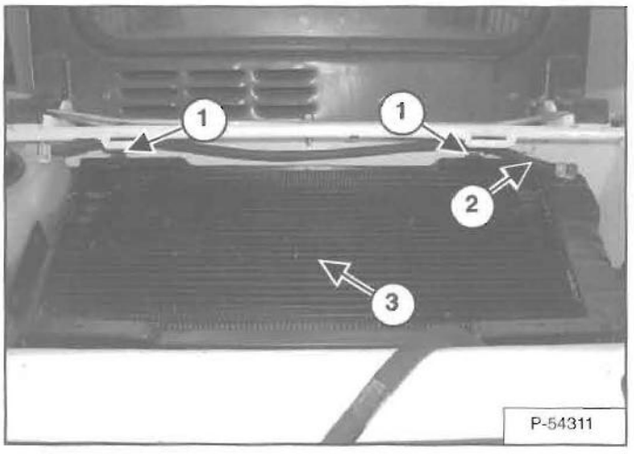


Figure 70-50-7



Remove the two rubber stops (Item 1) **[Figure 70-50-6]** & **[Figure 70-50-7]** from the top of the radiator.

Remove the overflow hose (Item 2) **[Figure 70-50-7]** from the radiator.

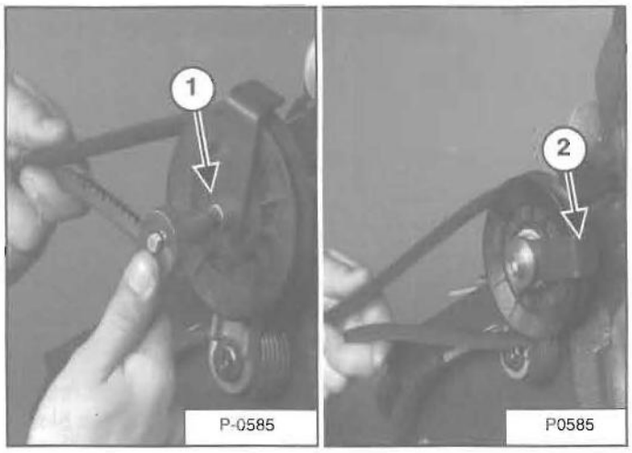
Lift the radiator (Item 3) **[Figure 70-50-7]** up and remove it from the loader.

Reverse the above procedure to install the radiator.

COOLING FAN

Drive Tension Pulley Removal And Installation

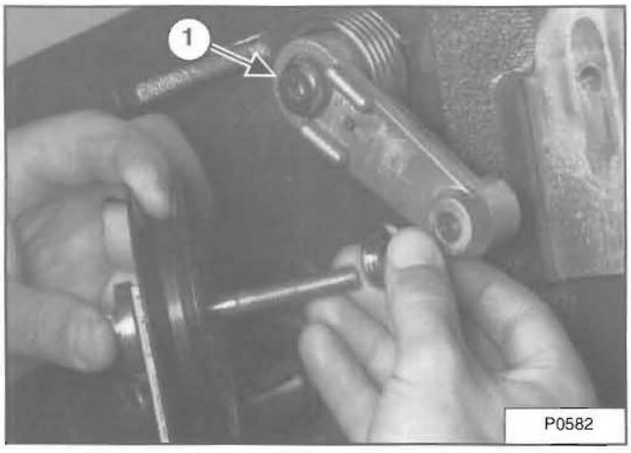
Figure 70-60-1



Loosen the idler pulley bolt (Item 1) **[Figure 70-60-1]**.

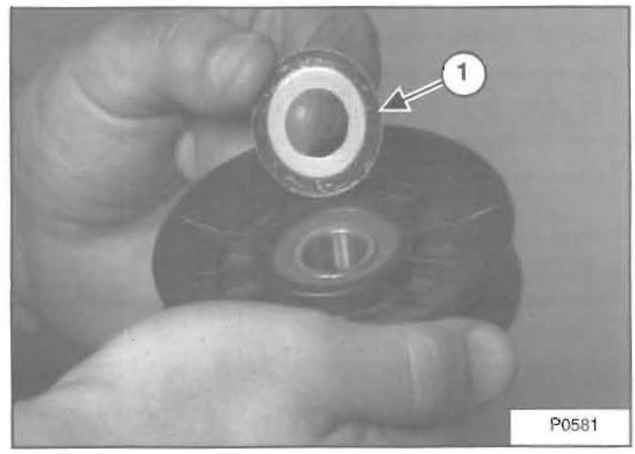
Installation: Install the retainer bracket (Item 2) **[Figure 70-60-1]** for the fan belt at the 3 o'clock position.

Figure 70-60-2



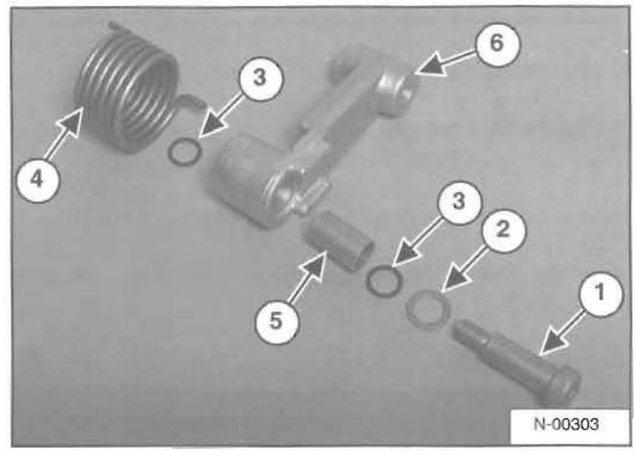
Remove the spacers, bolt and washer from the arm **[Figure 70-60-2]**.

Figure 70-60-3



Installation: Put a small amount of grease around the outside edge (Item 1) **[Figure 70-60-3]** on the grease rings.

Figure 70-60-4



Remove the bolt (Item 1) **[Figure 70-60-2]** & **[Figure 70-60-4]** from the idler pulley pivot arm (Item 6) **[Figure 70-60-4]**.

Remove the thrust washer (Item 2), O-rings (Item 3) and spring (Item 4) **[Figure 70-60-4]**.

Check all parts for damage or wear and replace them as needed.

NOTE: When making any repairs, replace the bushing (Item 5) [Figure 70-60-4] with a new bushing, if worn. Clean all parts and assemble dry. Do not lubricate.

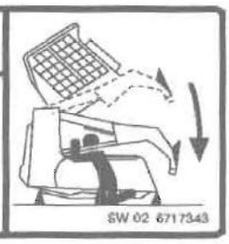
Installation: Reverse the removal procedure to install the tension pulley.

Gearbox/Blower Housing Removal And Installation

⚠ DANGER

AVOID DEATH

- Disconnecting or loosening any hydraulic tubeline, hose, fitting, component or a part failure can cause lift arms to drop.
- Keep out of this area when lift arms are raised unless supported by an approved lift arm support. Replace if damaged. 57051



⚠ WARNING

Never work on a machine with the lift arms up unless the lift arms are secured by an approved lift arm support device. Failure to use an approved lift arm support device can allow the lift arms or attachment to fall and cause injury or death.

W-2059-0598

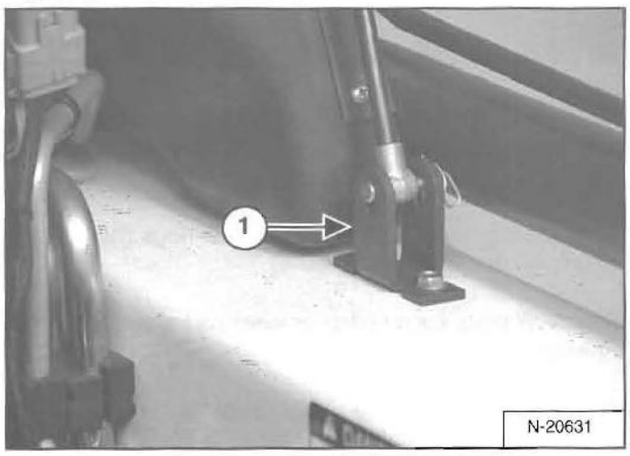
Put jackstands under the rear corners of the loader.

Raise the lift arms and install an approved lift arm device. (See Contents Page 10-01.)

Raise the operator cab. (See Contents Page 10-01.)

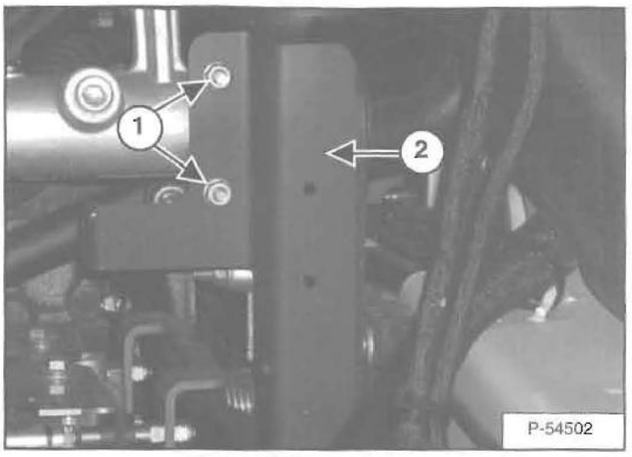
Remove the hydraulic fluid reservoir. (See Contents Page 20-01.)

Figure 70-60-5



Remove the left gas cylinder mounting bracket (Item 1) **[Figure 70-60-5]**. (See Contents Page 50-01.)

Figure 70-60-6

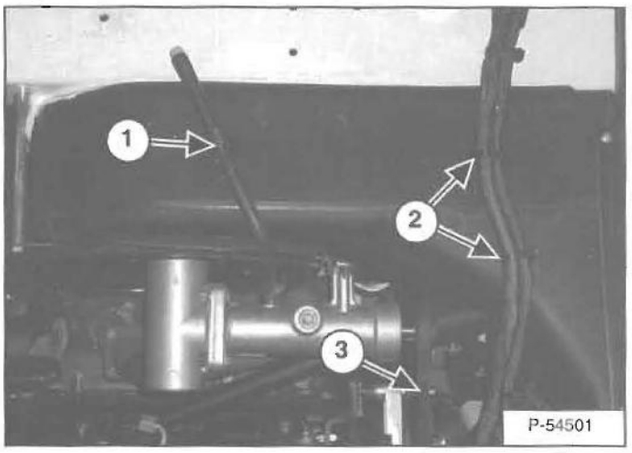


Remove the nuts (Item 1) from the u-bolt which mounts the fan belt shield (Item 2) **[Figure 70-60-6]** to the blower fan.

Remove the fan belt shield (Item 2) **[Figure 70-60-6]** from the blower fan.

Installation: The shield must not touch the fan belt. Torque the nuts to 15-17 ft.-lbs. (21-23 Nm).

Figure 70-60-7



Disconnect the breather hose (Item 1) **[Figure 70-60-7]** from the blower housing.

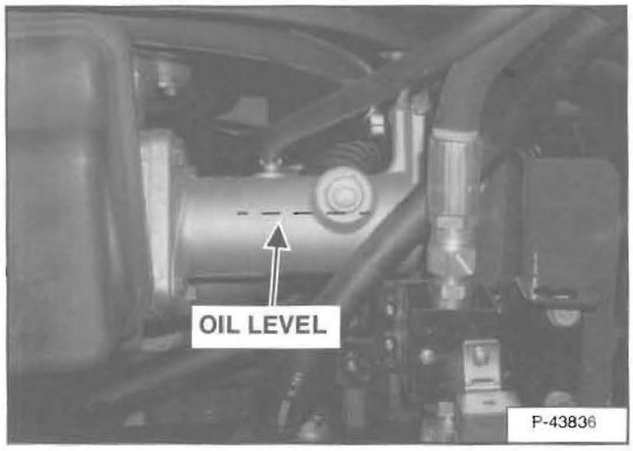
Installation: Make sure the breather hose is unrestricted when routing.

Disconnect the harness (Item 2) **[Figure 70-60-7]** from the blower housing.

Remove the fan drive belt (Item 3) **[Figure 70-60-7]** from the pulley on the blower fan.

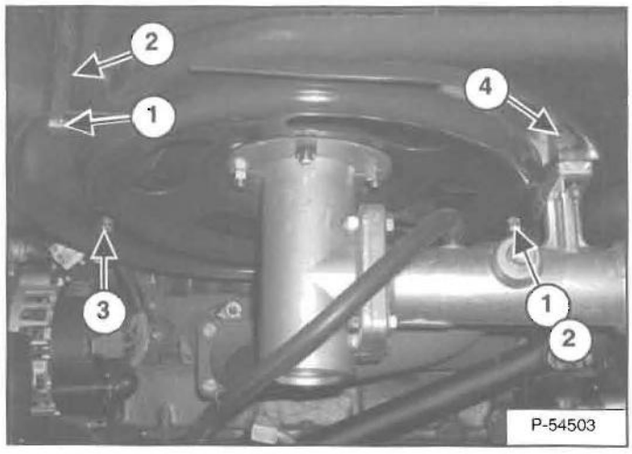
Gearbox/Blower Housing Removal And Installation (Cont'd)

Figure 70-60-8



NOTE: When checking the fan gearbox oil level, be sure the level does not go above the top of the shaft in the gearbox [Figure 70-60-8]. Use a light colored 90W gear lube if the level is low.

Figure 70-60-9

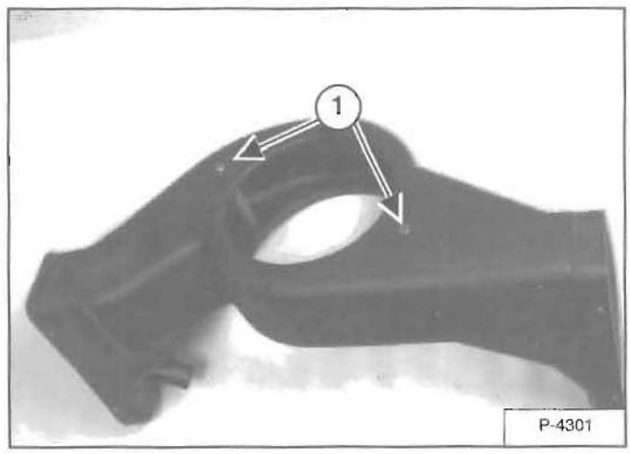


Remove the two mounting bolts (Item 1) and the two spacer tubes (Item 2) **[Figure 70-60-9]** from the blower fan.

Remove the rear mounting bolt (Item 3) **[Figure 70-60-9]**.

Remove the front mounting bolt (Item 4) **[Figure 70-60-9]**.

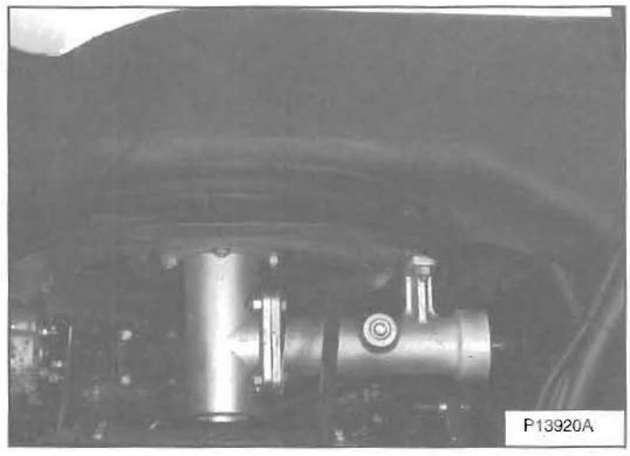
Figure 70-60-10



NOTE: Mounting bolts (Items 3 & 4) [Figure 70-60-9] use wave washer (Item 1) [Figure 70-60-10] to prevent tubes and bolts from falling out of the housing during installation.

Installation: Tighten the four mounting bolts to 25-28 ft.-lbs. (34-38 Nm) torque.

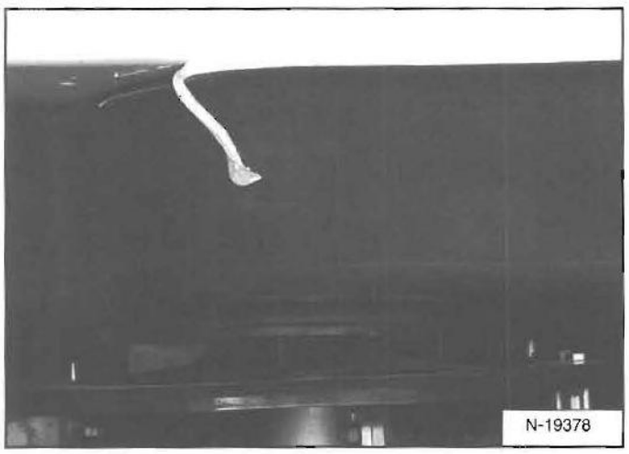
Figure 70-60-11



Lower the blower fan from the housing until it rests on the steering linkage plate **[Figure 70-60-11]**.

Gearbox/Blower Housing Removal And Installation (Cont'd)

Figure 70-60-12



Remove the strip of sealant along the top of the blower housing **[Figure 70-60-12]**.

Installation: Use R.T.V. sealant to reseal the blower housing.

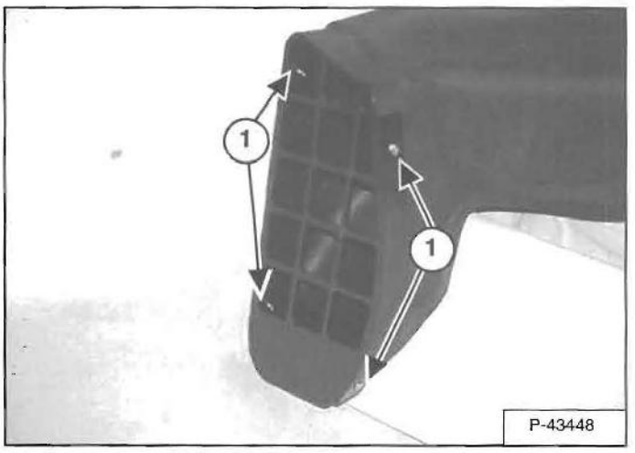
Loosen the electrical harnesses from the main frame of the loader and the blower housing.

Installation: Attach the electrical harness to the main frame. Attach the electrical harness to the blower housing with cable ties to prevent damage to the harness

Slide the blower fan and housing forward and remove both from the loader.

Blower Housing Grill Removal And Installation

Figure 70-60-13

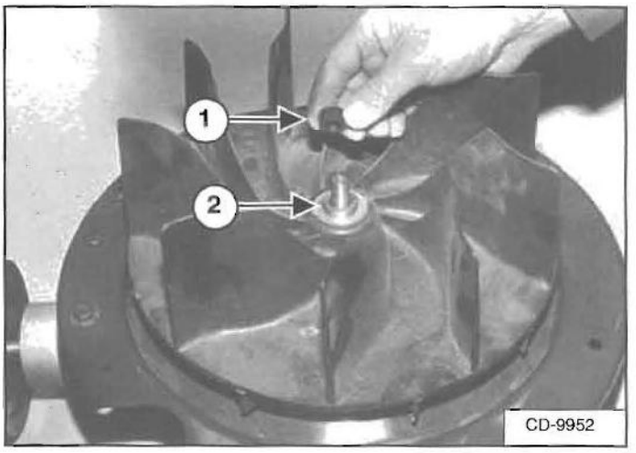


To replace the blower housing grill, remove the four mounting screws (Item 1) **[Figure 70-60-13]** from the grill.

Install the new grill and replace the mounting screws.

Blower Disassembly And Assembly

Figure 70-60-14



Remove the lock nut (Item 1) and spacer (Item 2) **[Figure 70-60-14]**.

Installation: Tighten the nut to 45-55 ft.-lbs. (61-75 Nm) torque.

Blower Disassembly And Assembly (Cont'd)

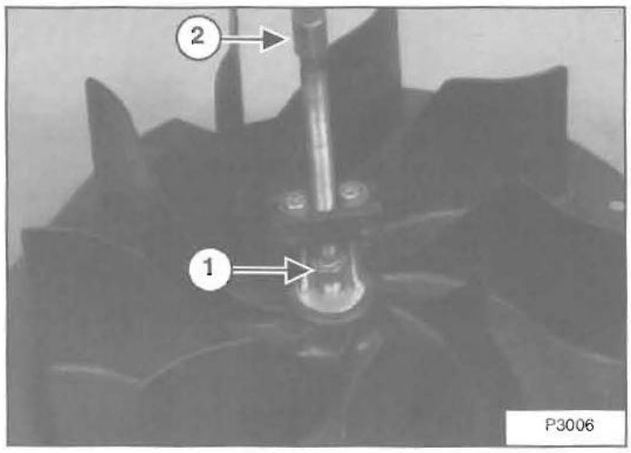
⚠ WARNING

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

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

W-2019-1285

Figure 70-60-15



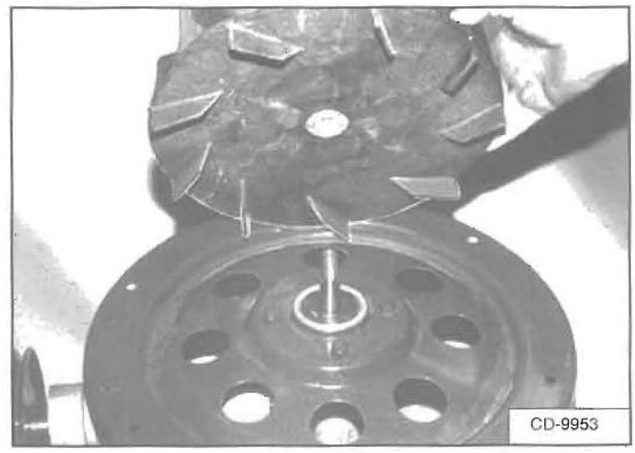
Use the following procedure to remove the fan from the shaft.

Install the nut (Item 1) **[Figure 70-60-15]** on the tapered shaft to protect the shaft and threads.

Install the puller on the fan as shown **[Figure 70-60-15]**.

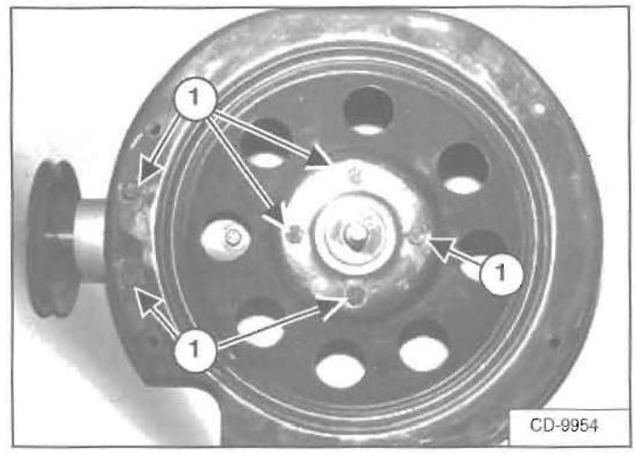
As the center bolt (Item 2) **[Figure 70-60-15]** is tightened, periodically strike the bolt head to loosen the fan from the shaft.

Figure 70-60-16



Remove the fan from the tapered shaft **[Figure 70-60-16]**.

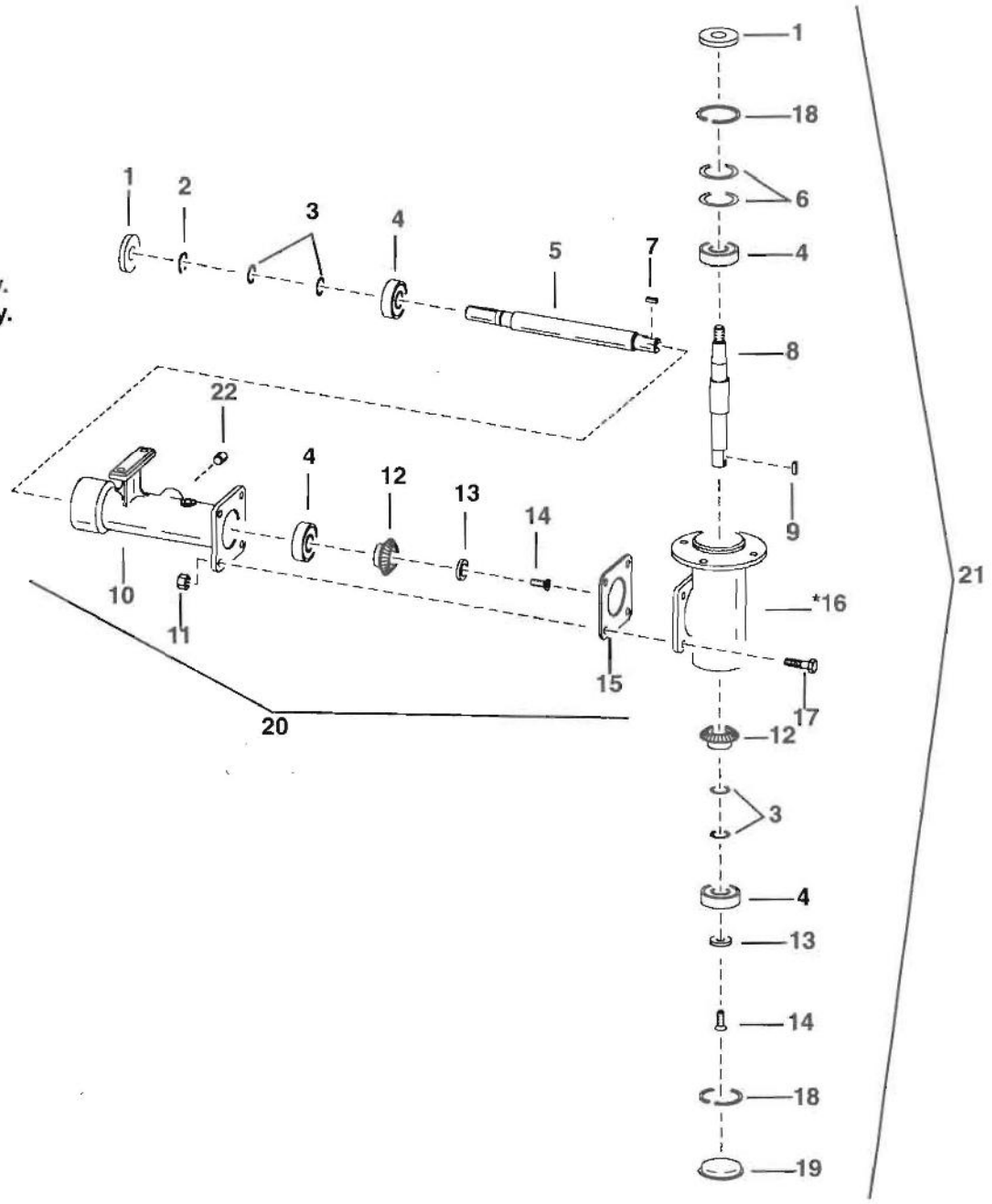
Figure 70-60-17



To remove the blower housing mounting plate, remove the six bolts (Item 1) **[Figure 70-60-17]**.

Gearbox Parts Identification

1. Seal
2. Snap Ring (Small)
3. Shims (1.0 inch O.D.)
4. Bearing
5. Shaft (Long)
6. Shims (2.0 inch O.D.)
7. Long Key
8. Shaft (Short)
9. Short Key
10. Long Housing
11. Nut
12. Gear
13. Washer
14. Screw
15. Square Shim
*16. Short Housing
17. Bolt
18. Snap Ring (Large)
19. Cap
20. Long Housing Assy.
21. Short Housing Assy.
22. Fill Plug



* Individual Part not available. (See Note Page 70-60-7.)

TS-1002A

Gearbox Disassembly

NOTE: When repairing the gearbox order the following as needed.

1. Complete Assembly
2. Long Housing Assembly
3. Long Housing
4. Short Housing Assembly (See Note Below)
5. Internal Parts

NOTE: The short housing is only available as an assembly. (See Gearbox Parts Identification on Page 70-60-6.) (Order parts from Bobcat Parts Sales.)

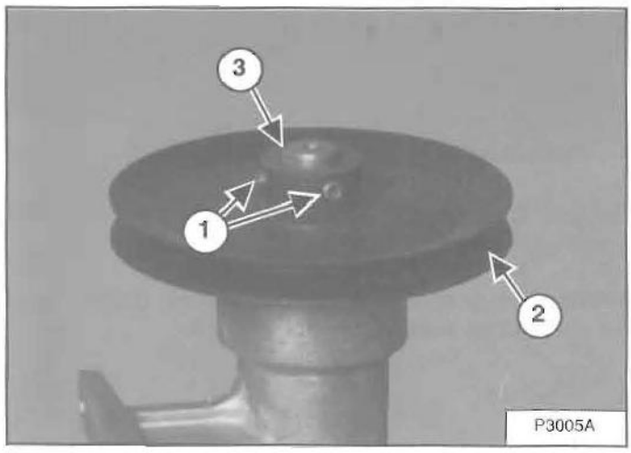
NOTE: Be sure to count the number and thickness of shims during disassembly. Install the shims in the original location during assembly.

NOTE: Always replace seals during assembly. Replace the parts in the gearbox as needed.

Remove the fan and blower housing mounting plate. (See Gearbox/Blower Housing Removal And Installation on Page 70-60-2.)

Long Housing

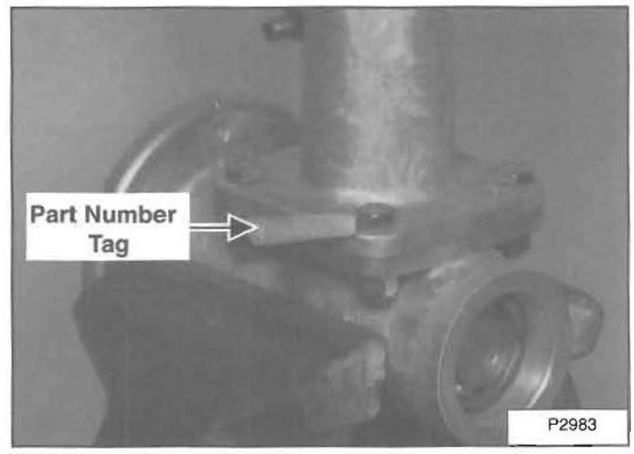
Figure 70-60-18



Loosen the set screws (Item 1) and remove the pulley (Item 2) **[Figure 70-60-18]**.

Remove the long key (Item 3) **[Figure 70-60-18]**.

Figure 70-60-19



Remove the four mounting bolts and the part number tag **[Figure 70-60-19]**.

Remove the oil from the gearbox.

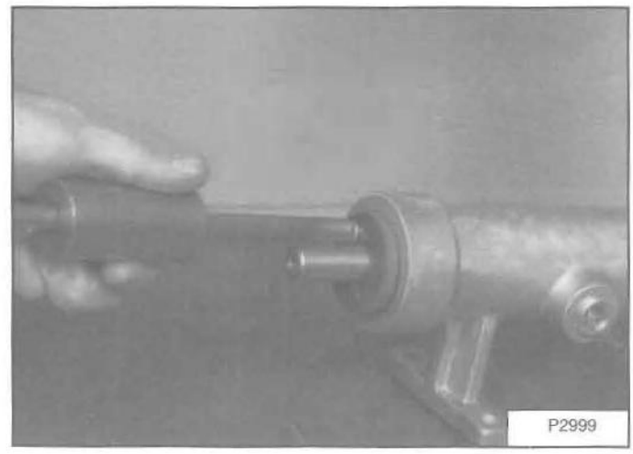
⚠ WARNING

AVOID INJURY OR DEATH

Wear safety goggles to prevent eye injury when drilling or grinding.

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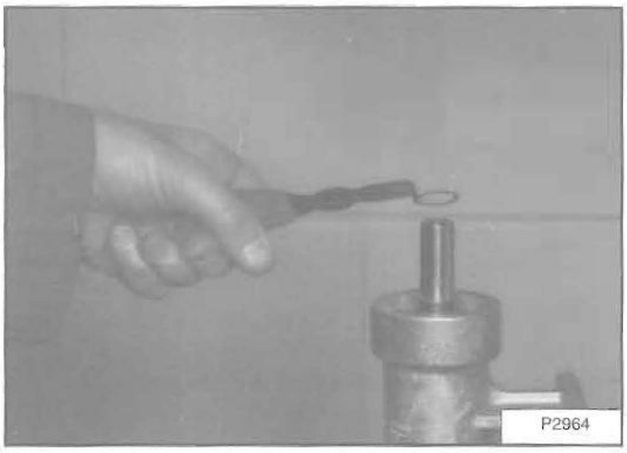
Figure 70-60-20



Drill an 1/8 inch (3 mm) hole in the seal. Use a slide hammer tool to remove the seal **[Figure 70-60-20]**.

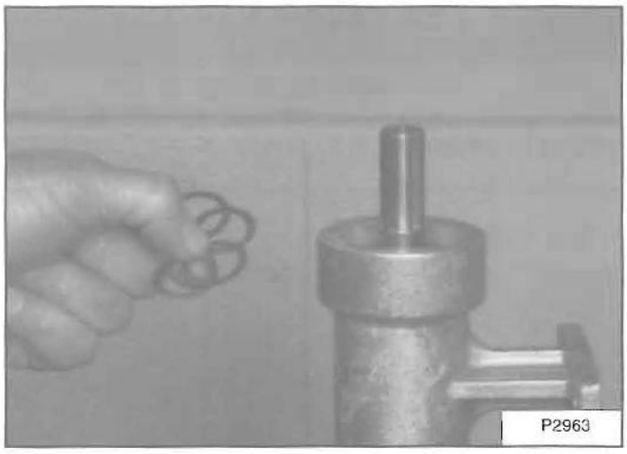
Gearbox Disassembly (Cont'd)

Figure 70-60-21



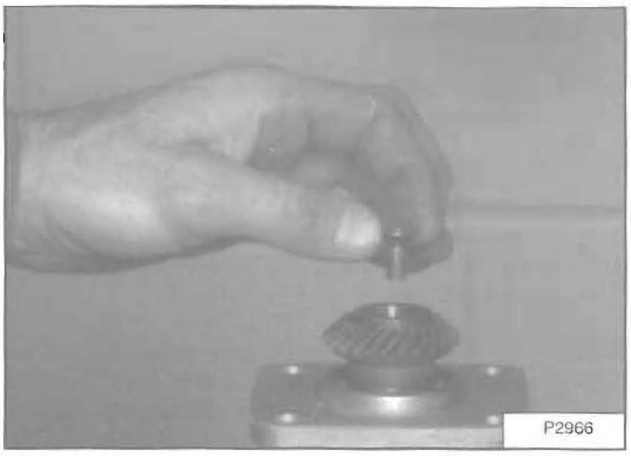
Remove the small snap ring **[Figure 70-60-21]**.

Figure 70-60-22



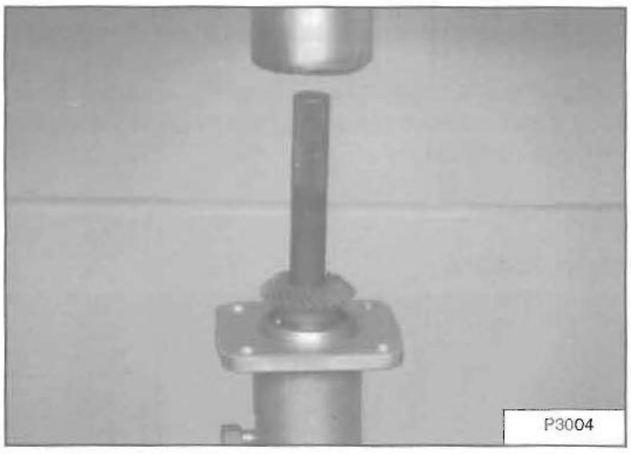
Remove the small shims **[Figure 70-60-22]**.

Figure 70-60-23



Remove the screw and washer from the shaft **[Figure 70-60-23]**.

Figure 70-60-24

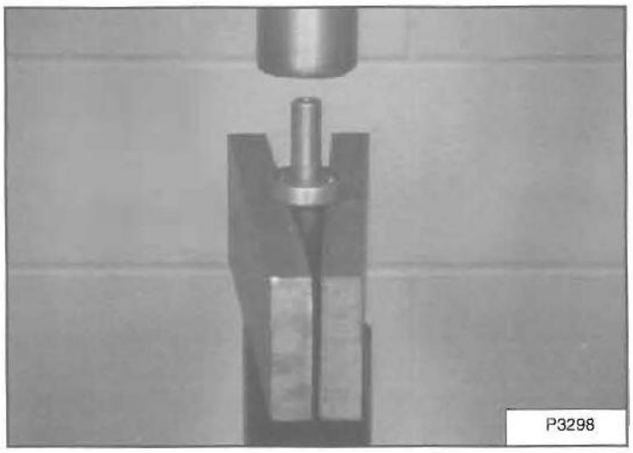


Support the lower flange and press the shaft from the bearing **[Figure 70-60-24]**.

NOTE: The gear and the other bearing (pulley end) will be removed with the shaft.

Gearbox Disassembly (Cont'd)

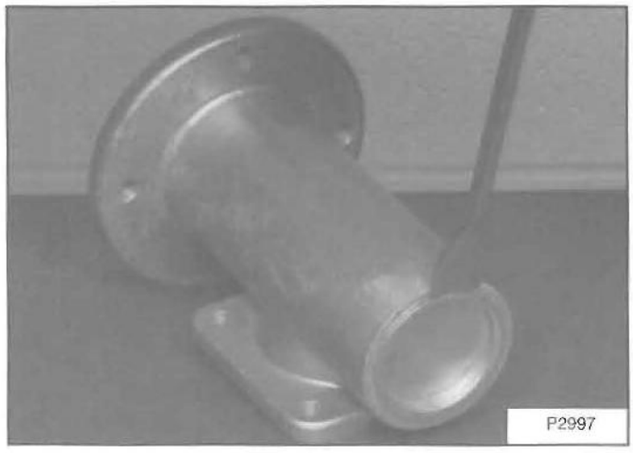
Figure 70-60-25



Support the bearing and press the shaft from the bearing **[Figure 70-60-25]**.

Short Housing

Figure 70-60-26



Remove the end cap **[Figure 70-60-26]**.

Use care not to damage the housing.

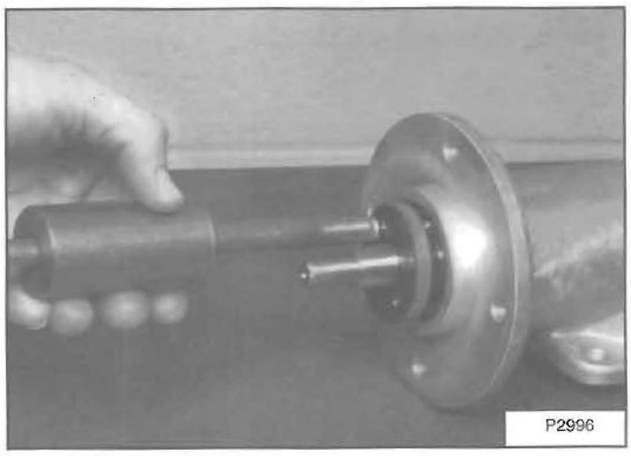
⚠ WARNING

AVOID INJURY OR DEATH

Wear safety goggles to prevent eye injury when drilling or grinding.

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Figure 70-60-27



Drill an 1/8 inch (3 mm) hole in the seal. Use a slide hammer tool to remove the seal **[Figure 70-60-27]**.

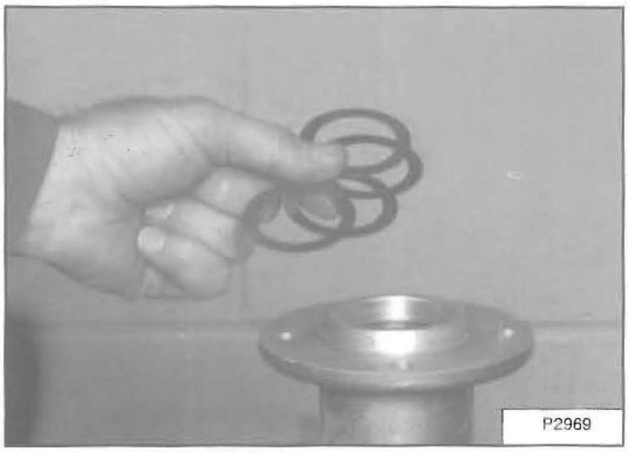
Figure 70-60-28



Remove the large snap ring from the flange end of the housing **[Figure 70-60-28]**.

Gearbox Disassembly (Cont'd)

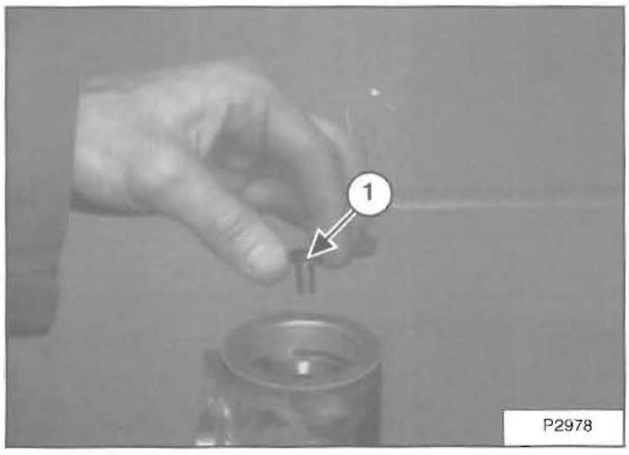
Figure 70-60-29



Remove the large shims from the housing **[Figure 70-60-29]**.

NOTE: Use the same size and thickness of shims during assembly.

Figure 70-60-30



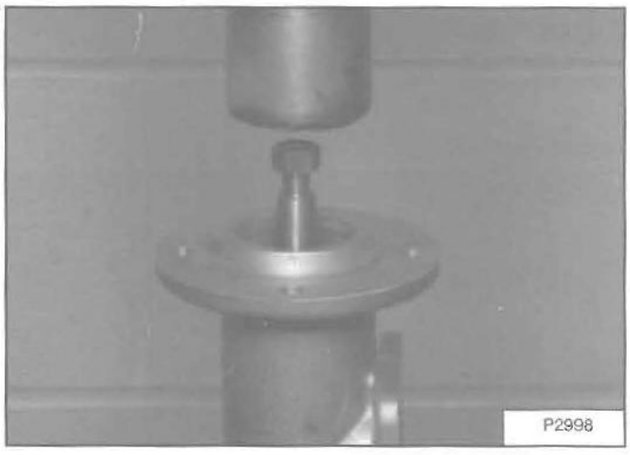
Remove the screw and washer (Item 1) **[Figure 70-60-30]** from the shaft.

Figure 70-60-31



Remove the snap ring from the cap end of the housing **[Figure 70-60-31]**.

Figure 70-60-32

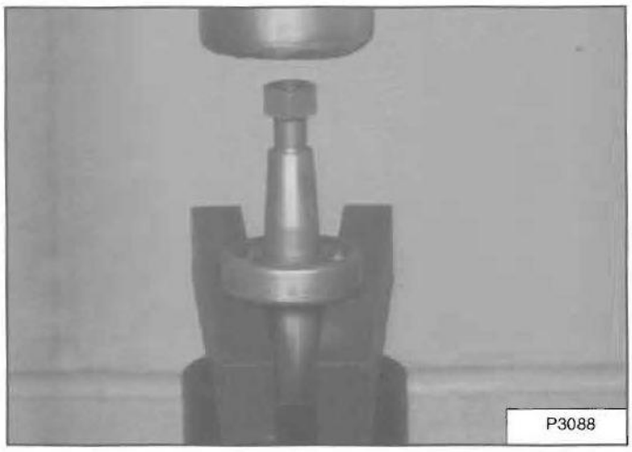


Press the shaft from the housing **[Figure 70-60-32]**.

NOTE: Both bearings may come out of the housing with the shaft. If one bearing remains in the housing use a non metal object to tap the bearing from the housing.

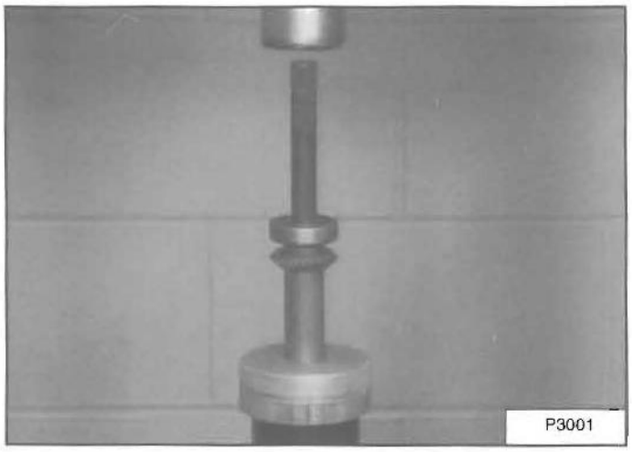
Gearbox Disassembly (Cont'd)

Figure 70-60-33



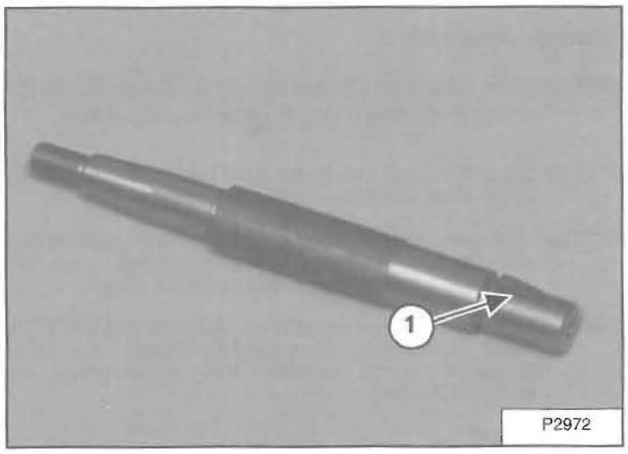
Press the bearing from the tapered end of the shaft **[Figure 70-60-33]**.

Figure 70-60-34



Press the bearing, shims and gear from the shaft **[Figure 70-60-34]**.

Figure 70-60-35



Remove the key from the shaft **[Figure 70-60-35]**.

Gearbox Assembly

NOTE: (See Gearbox Disassembly on Page 70-60-7.) when ordering parts for the Fan Gearbox.

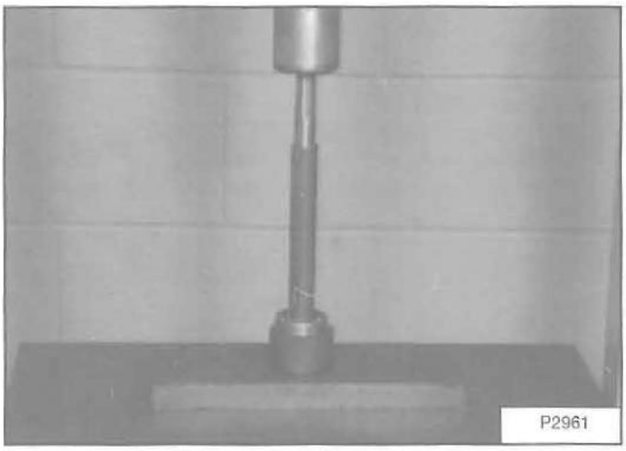
NOTE: Do not install the seals and cap in the housing until after the backlash has been checked.

NOTE: Use care when pressing the bearings into the aluminum housing. The housing can be damaged if too much pressure is used.

NOTE: For procedures requiring the use of LOCTITE #242 adhesive, thoroughly clean and dry affected parts before the application of LOCTITE #242.

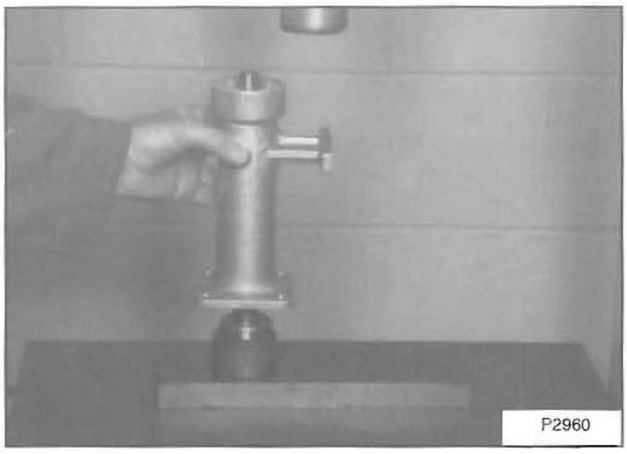
Long Housing

Figure 70-60-36



Press a bearing on the short keyed end of the long shaft **[Figure 70-60-36]**.

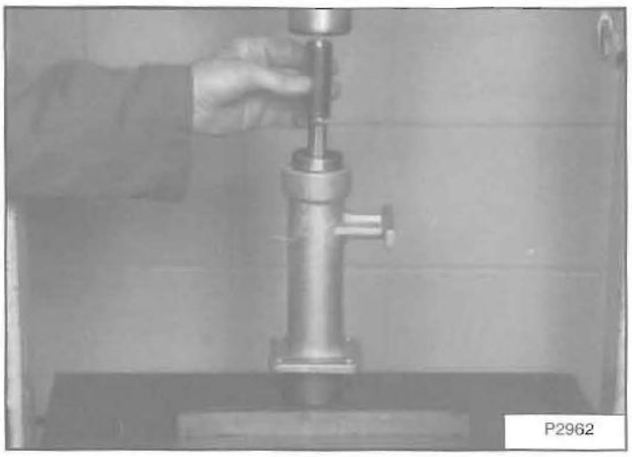
Figure 70-60-37



Install the long housing on the shaft **[Figure 70-60-37]**.

Be sure the bearing is seated in the bore at the lower end of the housing.

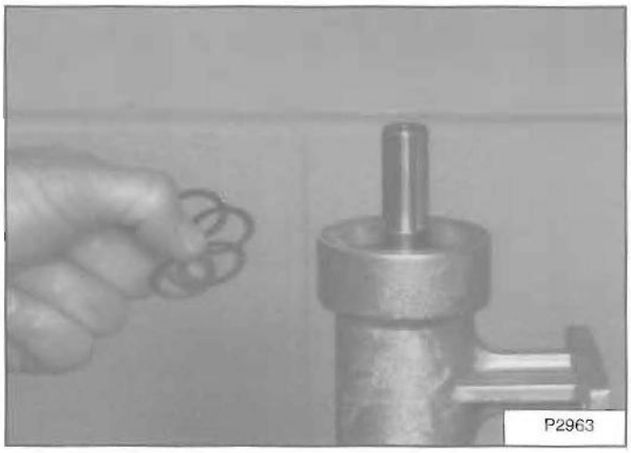
Figure 70-60-38



Install a bearing on the long keyed end of the shaft **[Figure 70-60-38]**.

Support the lower bearing and press the other bearing in the housing until the bearings seat in the housing **[Figure 70-60-38]**.

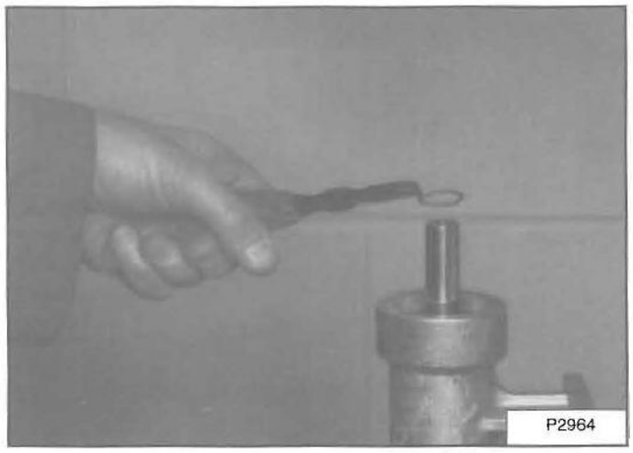
Figure 70-60-39



Install on the bearing, the same number and size shims that were removed during disassembly **[Figure 70-60-39]**.

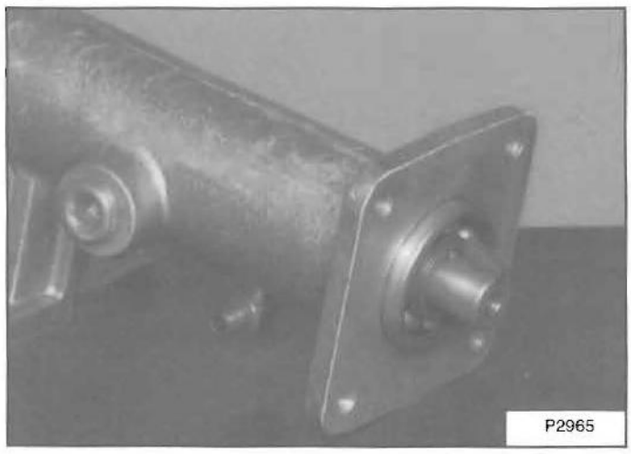
Gearbox Assembly (Cont'd)

Figure 70-60-40



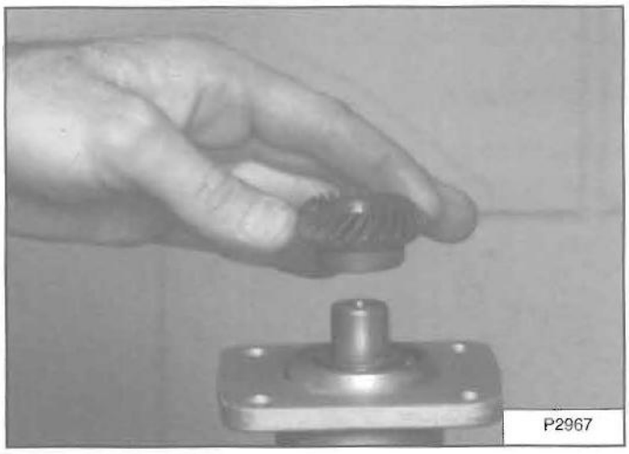
Install the small snap ring in the groove above the shims **[Figure 70-60-40]**.

Figure 70-60-41



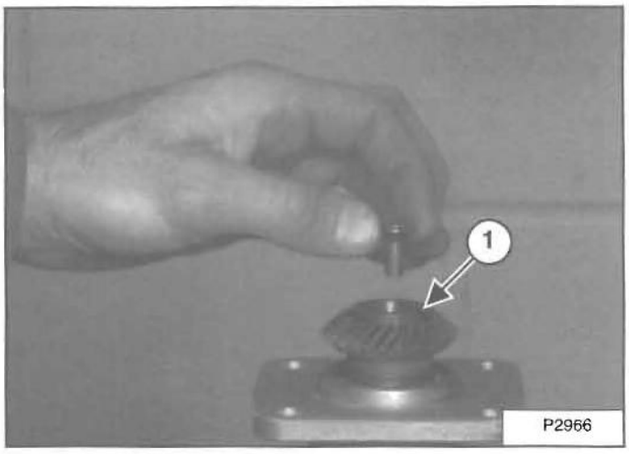
Install the gear key in the flange end of the shaft **[Figure 70-60-41]**.

Figure 70-60-42



Align the key and gear. While supporting the bearing on the other end, press the gear on the shaft until it seats against the bearing **[Figure 70-60-42]**.

Figure 70-60-43



Install the washer (Item 1) **[Figure 70-60-43]**.

Put liquid threadlocker (LOCTITE #242) on the screw threads. Install and tighten the screw **[Figure 70-60-43]**.

Gearbox Assembly (Cont'd)

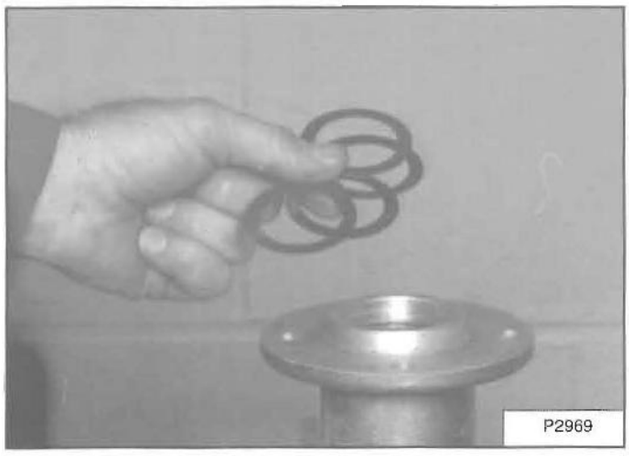
Short Housing

Figure 70-60-44



Install a bearing in the flanged end of the housing **[Figure 70-60-44]**.

Figure 70-60-45



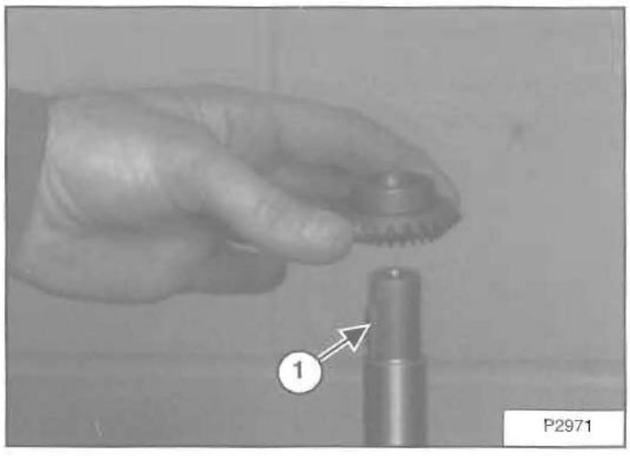
Install the large shims on the bearing (flanged end) **[Figure 70-60-45]**

Figure 70-60-46



Install the large snap ring in the groove above the shims **[Figure 70-60-46]**.

Figure 70-60-47

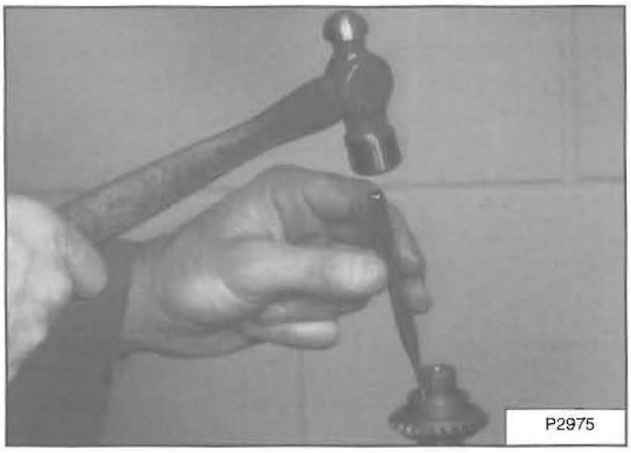


Install the short key (Item 1) **[Figure 70-60-47]**.

Align and press the gear on the shaft (teeth toward the tapered end of the shaft) **[Figure 70-60-47]**.

Gearbox Assembly (Cont'd)

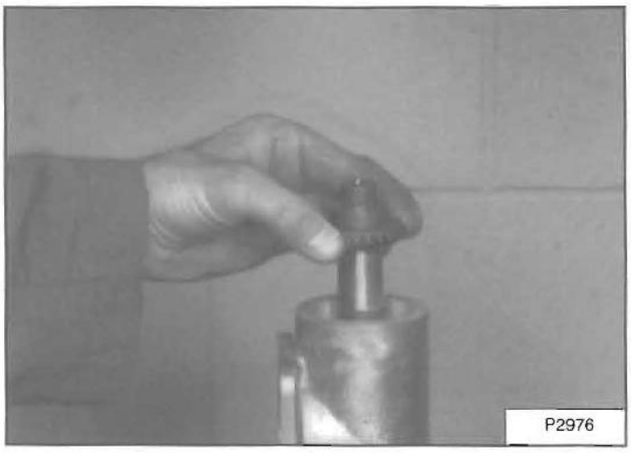
Figure 70-60-48



After the gear is seated, drive the key down inside the gear key way **[Figure 70-60-48]**.

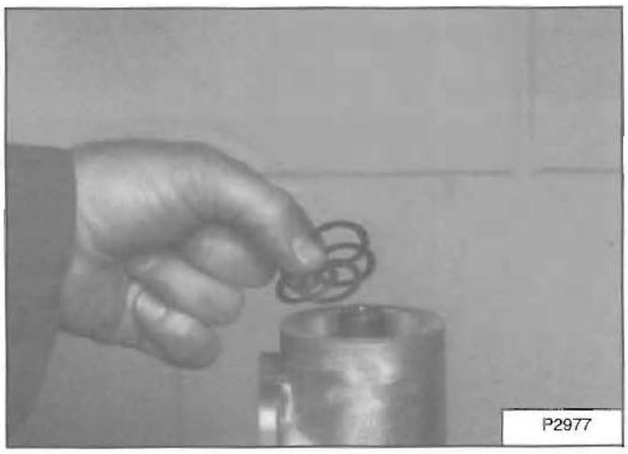
NOTE: This will prevent damage to the shims when the bearing is installed later.

Figure 70-60-49



Install the shaft in the housing, tapered end in the bearing at the round flange end of the housing **[Figure 70-60-49]**.

Figure 70-60-50



Install on the shaft, the same number and size shims that were removed during disassembly **[Figure 70-60-50]**.

Figure 70-60-51



Install a bearing on the gear end of the shaft **[Figure 70-60-51]**.

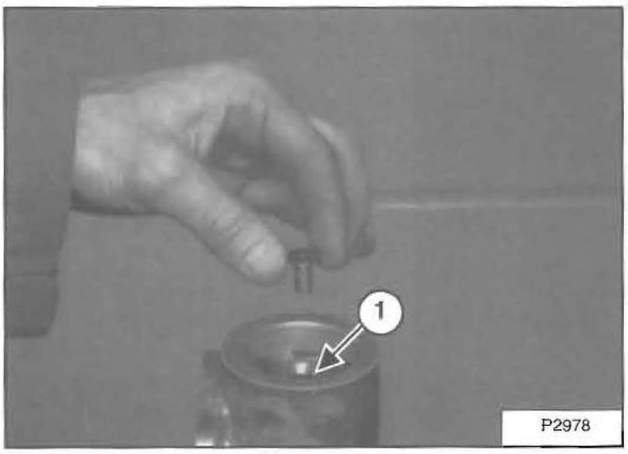
Gearbox Assembly (Cont'd)

Figure 70-60-52



Install the snap ring in the groove above the bearing **[Figure 70-60-52]**.

Figure 70-60-53



Install the washer (Item 1) on the shaft. Put liquid theadlocker (LOCTITE #242) on the screw threads and install the screw **[Figure 70-60-53]**.

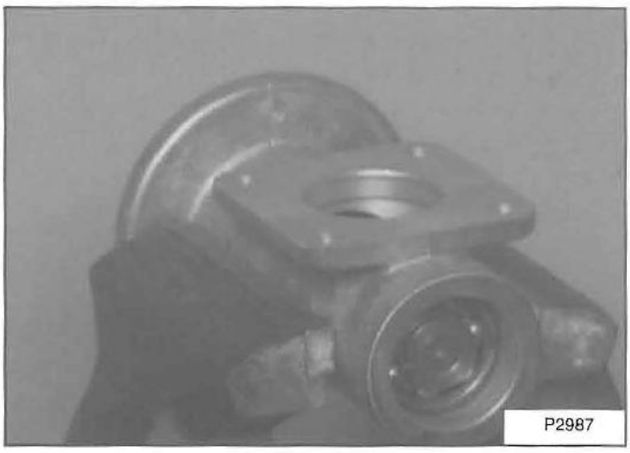
Gearbox Checking Backlash

NOTE: For procedures requiring the use of LOCTITE #518 adhesive, thoroughly clean and dry affected parts before the application of LOCTITE #518. LOCTITE #518 is a gasket eliminator that cures to a flexible seal between the mounting surfaces.

The backlash tolerance between the gears should be 0.005-0.008 inch (0,127-0,203 mm).

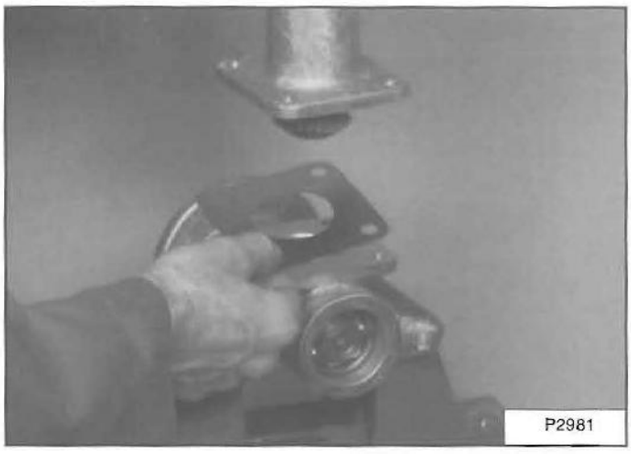
To check the gear backlash use the following procedure:

Figure 70-60-54



Put the short housing in a vise, square flange facing up as shown **[Figure 70-60-54]**.

Figure 70-60-55



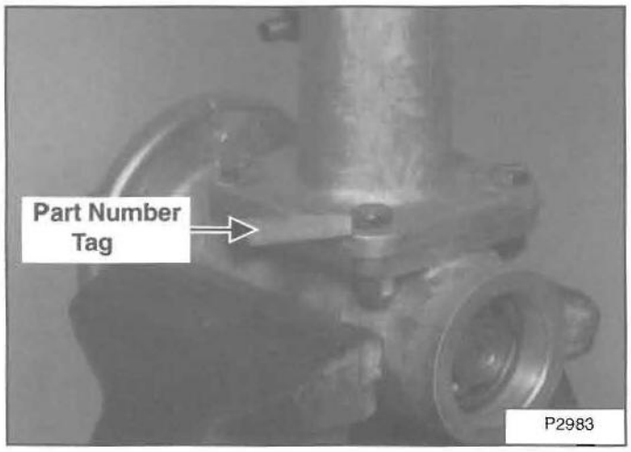
Install the same size and number of square shims (if present during disassembly) between the two housings **[Figure 70-60-55]**.

Set the long housing on the short housing with the sealant

NOTE: If square shims are used, put a small amount of (LOCTITE #518) on both sides of all shims.

Gearbox Checking Backlash (Cont'd)

Figure 70-60-56

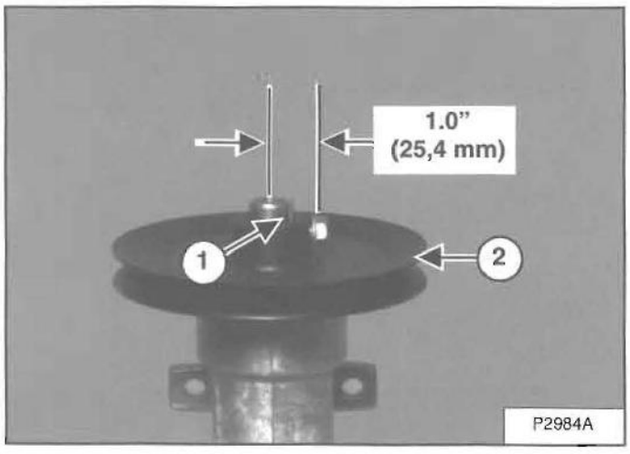


Install the four mounting bolts through the flange holes **[Figure 70-60-56]**.

Install the part number tag **[Figure 70-60-56]**.

Install and tighten the nuts to 25-28 ft.-lbs. (34-38 Nm) torque.

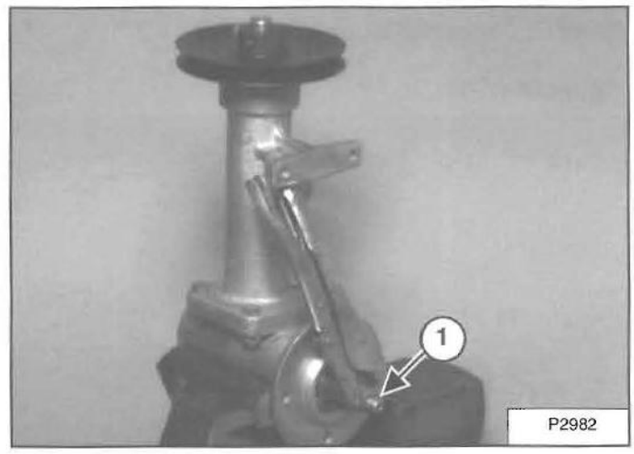
Figure 70-60-57



Install the long key (Item 1) and the pulley (Item 2) **[Figure 70-60-57]**.

Install a bolt in the set screw hole to maintain a 1.0 inch (25,4 mm) distance from the shaft center to the bolt head (to be used with a dial indicator) **[Figure 70-60-57]**.

Figure 70-60-58

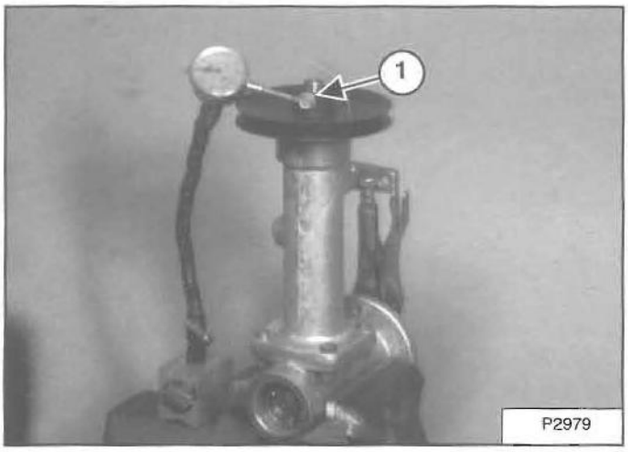


Put the fan nut (Item 1) **[Figure 70-60-58]** on the shaft and tighten snugly.

Install a locking pliers on the fan nut and support the handle against the long housing **[Figure 70-60-58]**.

Gearbox Checking Backlash (Cont'd)

Figure 70-60-59



Using a magnetic based dial indicator mounted on a bench vise, touch the dial stem on the bolt (Item 1) **[Figure 70-60-59]**.

Hold the locking pliers against the long housing and rotate the pulley back and forth to read the dial gauge **[Figure 70-60-59]**.

If the backlash is GREATER than 0.008 inch (0,203 mm), do the following:

1. Remove a square shim(s) (if present) between the two housings.

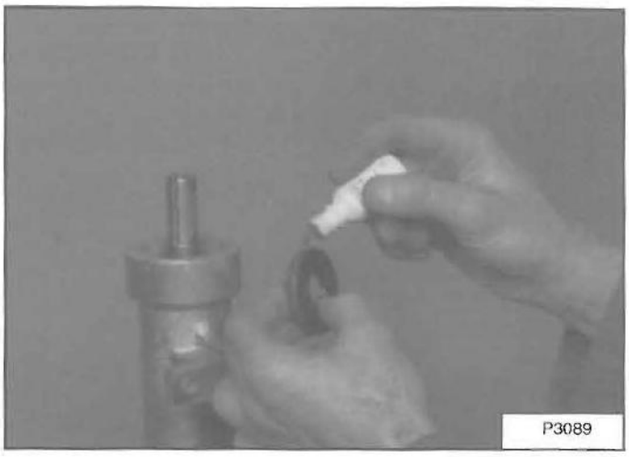
2. Remove a large shim(s) from the tapered end of the short shaft and add a small shim (s) of the same thickness between the bearing and the gear on the screw end of the shaft.

If the backlash is LESS than 0.005 inch (0,127 mm) do the following:

1. Add a square shim(s) between the two housings.

2. Remove a small shim(s) between the bearing and the gear on the screw end of the short shaft and add a large shim(s) of the same thickness between the snap ring and the bearing on the tapered end of the shaft.

Figure 70-60-60



When the backlash is correct, install the seals, cap and gear oil as follows:

Remove the bolts from the flanges and separate the two housings.

Put liquid adhesive (LOCTITE #242) on the outside diameter of the seal(s) **[Figure 70-60-60]**.

Gearbox Checking Backlash (Cont'd)

Figure 70-60-61

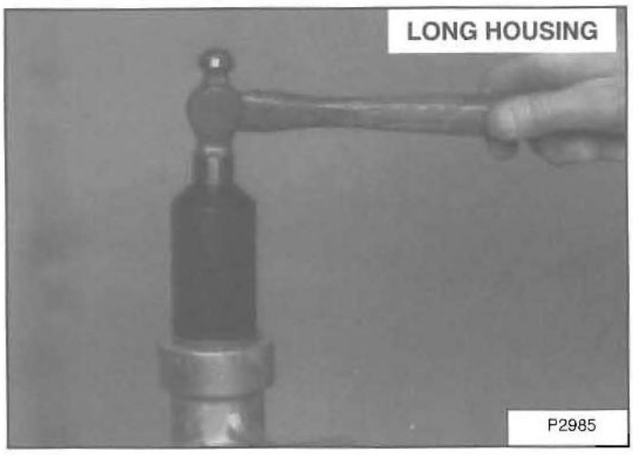
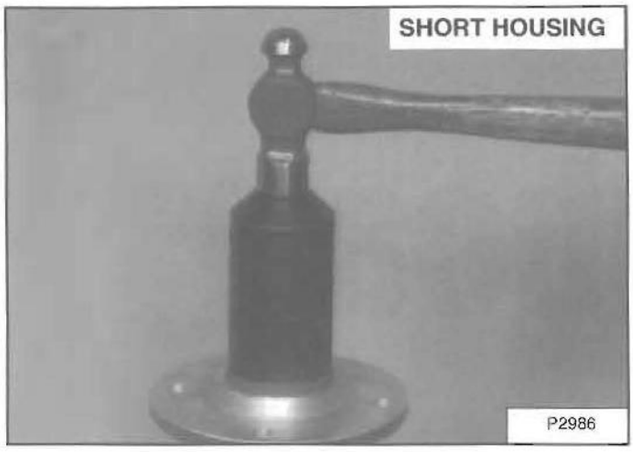


Figure 70-60-62



Install the seal(s) flush with the housing surface **[Figure 70-60-61]** & **[Figure 70-60-62]**.

Clean any oil from the flange surface.

Install the long housing on the short housing flange.

Install the four bolts and part number tag.

Install and tighten the nuts to 25-28 ft.-lbs. (34-38 Nm) torque.

NOTE: When filling the fan gearbox with oil, be sure the level does not go above the top of the shaft in the gearbox. Use a light colored 90W gear lube.



Bobcat®

Compression Checking

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

MEL10630 - Engine Compression Kit
MEL1631 - Compression Adapter

The engine must be at operating temperature.

Remove all the glow plugs. (See Glow Plugs Removal And Installation on Page 70-70-2.)

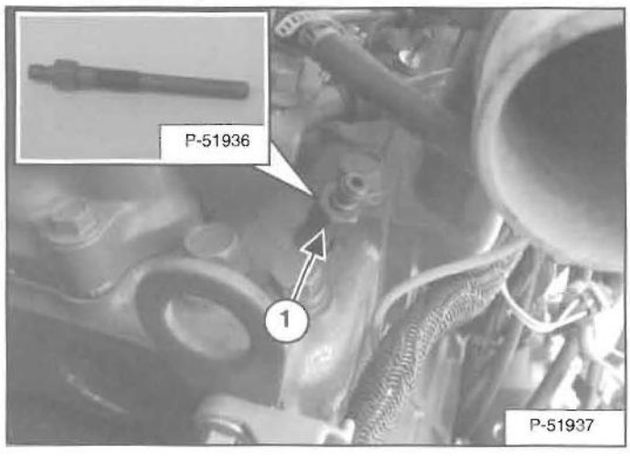
Remove the muffler. (See Contents, Page 70-01).

Figure 70-70-1



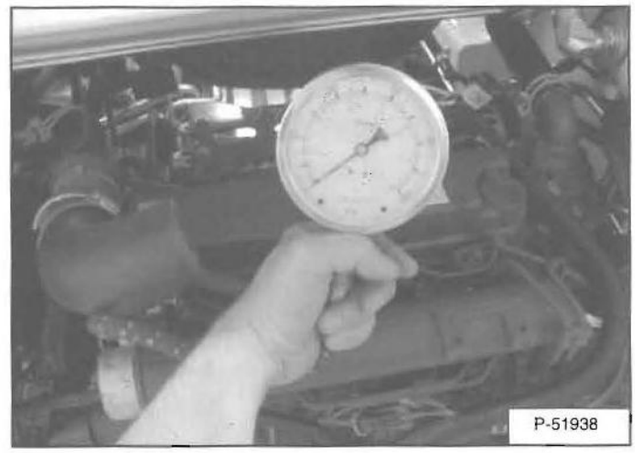
Disconnect the air cleaner inlet hose (Item 1) **[Figure 70-70-1]** from the intake manifold.

Figure 70-70-2



Install the correct compression adapter (Item 1) **[Figure 70-70-2]** into the cylinder head.

Figure 70-70-3



Connect the compression gauge to the adapter **[Figure 70-70-3]**.

Make sure the engine speed control is pulled back completely (engine idle).

Disconnect the fuel stop solenoid.

Crank the engine with the starter cranking rpm.

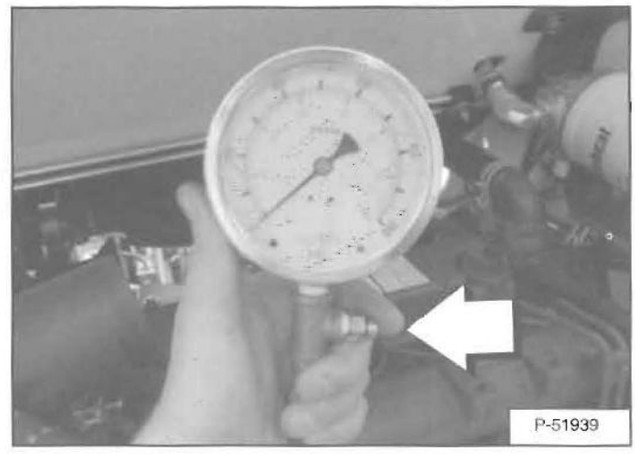
If the measurement is below the allowable limit, check the cylinder, piston ring, top clearance, valve and cylinder head.

Compression Pressure should be 427-469 psi (2940-3240 kPa)

Allowable Limit (minimum) is 341 psi (2350 kPa)

No more than 10% variance among cylinders.

Figure 70-70-4

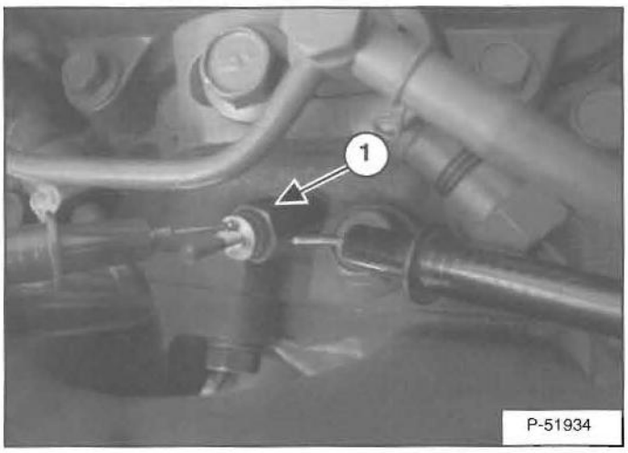


Push the button on the compression gauge to release pressure **[Figure 70-70-4]**.

Connect the fuel stop solenoid.

Glow Plugs Checking

Figure 70-70-5



Disconnect the glow plug cables and leads.

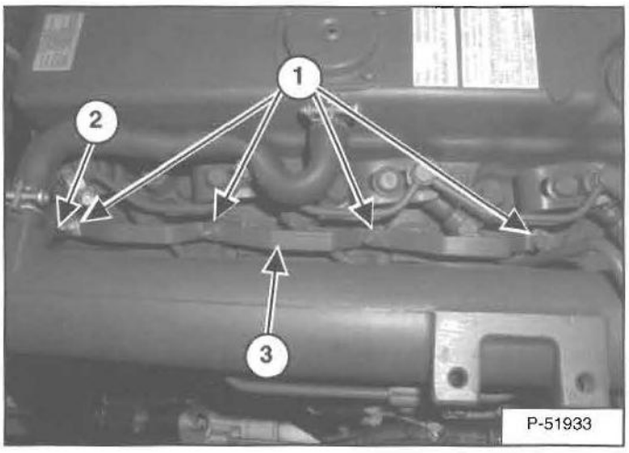
Touch one probe to the end of the glow plug and the other probe to the body of glow plug (Item 1) **[Figure 70-70-5]**.

The reading must be between 1 and 2 ohms **[Figure 70-70-5]**. If the resistance is infinite, the coil of the glow plug is broken.

Repeat the procedure for each glow plug.

Glow Plugs Removal And Installation

Figure 70-70-6



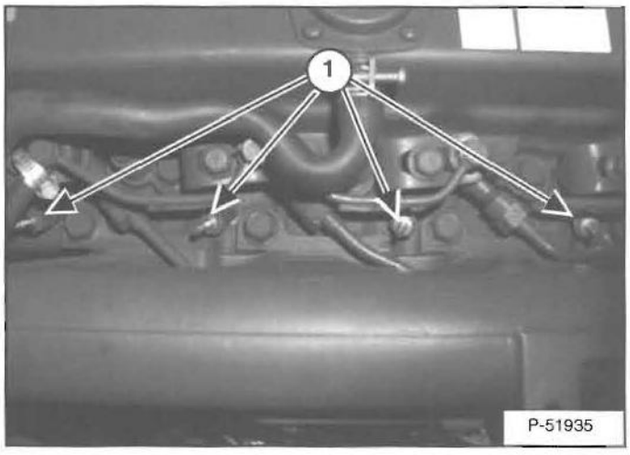
Disconnect the negative (-) cable from the battery.

Remove the nut (Item 1) **[Figure 70-70-6]** from the top of each glow plug.

Disconnect the engine harness wire (Item 2) **[Figure 70-70-6]** from the glow plug.

Remove the glow plug connecting strap (Item 3) **[Figure 70-70-6]**.

Figure 70-70-7



Loosen and remove the glow plug (Item 1) **[Figure 70-70-7]**.

Installation: Tighten the glow plug to 14.5-18.1 ft.-lbs. (19,6-24,5 Nm) torque.

Glow Plugs Removal And Installation (Cont'd)

Figure 70-70-8

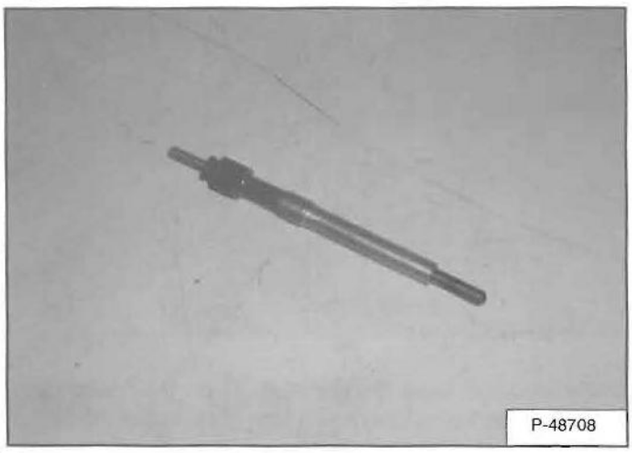
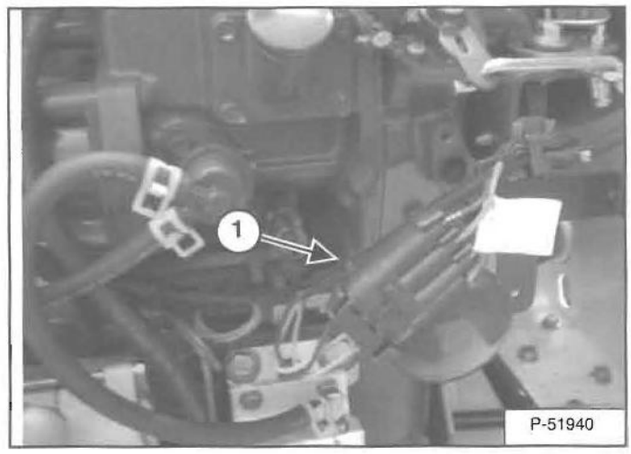


Photo **[Figure 70-70-8]** shows the glow plug assembly removed from the engine. Inspect the glow plugs and replace when necessary.

Fuel Shut-Off Solenoid, Checking

Figure 70-70-9

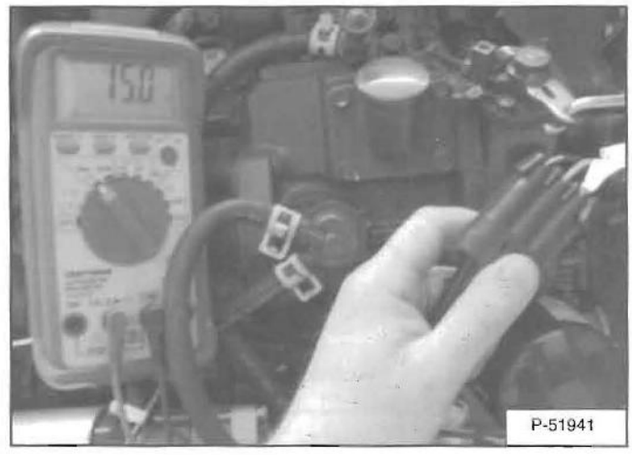


Stop the engine and open the rear door **[Figure 70-70-9]**.

Disconnect the connector (Item 1) **[Figure 70-70-9]** from the fuel shut-off solenoid.

Use an Ohm meter to check the fuel shut-off solenoid.

Figure 70-70-10



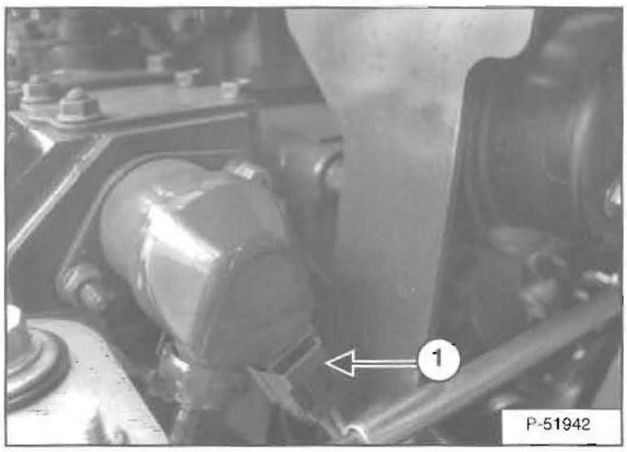
The reading between electrical connector terminal C and terminal A must be approximately 15.6 ohms **[Figure 70-70-10]**.

The reading between electrical connector terminal C and terminal B must be approximately .35-.40 ohms.

Fuel Shut-Off Solenoid Removal And Installation

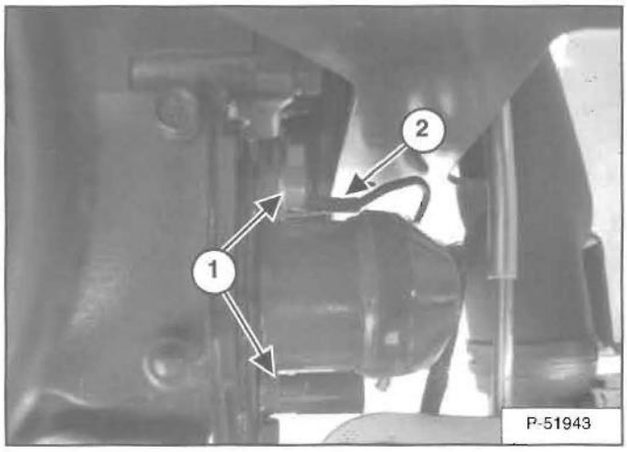
Stop the engine and open the rear door.

Figure 70-70-11



Disconnect the connector (Item 1) **[Figure 70-70-11]**.

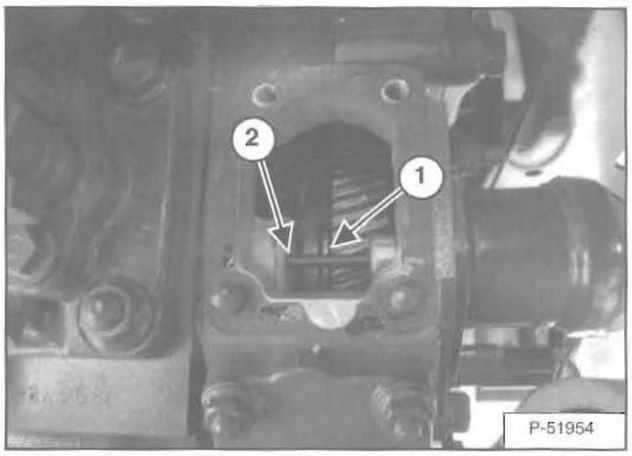
Figure 70-70-12



Remove the mounting nuts (Item 1) **[Figure 70-70-12]** for the fuel shut-off solenoid.

NOTE: There is a ground strap (Item 2) [Figure 70-70-12] that is needed for the fuel shut-off solenoid to function correctly. A good ground is essential for correct operation of the fuel shut-off solenoid.

Figure 70-70-13

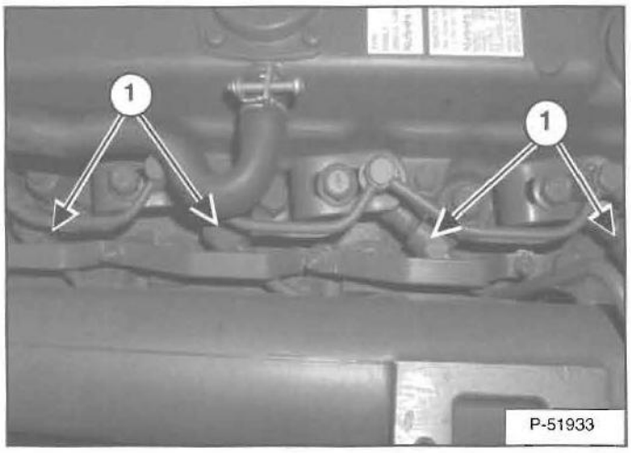


Installation: Ensure the pin (Item 1) on the fuel shut-off solenoid sits inside the hole (Item 2) **[Figure 70-70-13]** on the stop solenoid guide.

Reverse the above procedure to install the fuel shut-off solenoid.

Fuel Injection Pump Removal And Installation

Figure 70-70-14



Clean the area around the injection pump thoroughly.

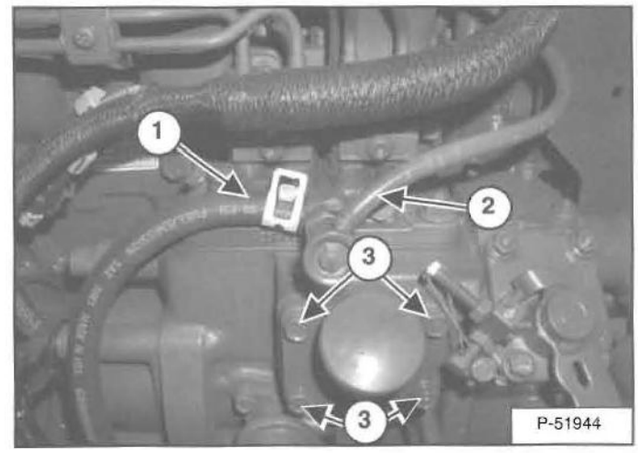
Disconnect the high pressure fuel lines (Item 1) **[Figure 70-70-14]** from the fuel injectors.

IMPORTANT

Do not bend the high pressure fuel injection tubes when removing or installing them.

I-2029-0289

Figure 70-70-15

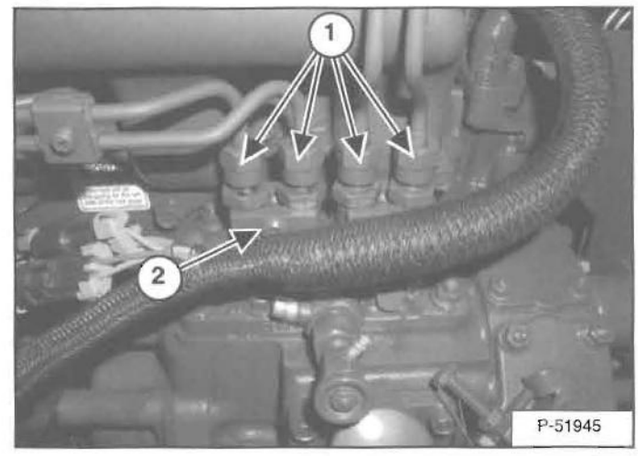


Disconnect the fuel inlet hose (Item 1) and the fuel return hose (Item 2) from the injection pump vent **[Figure 70-70-15]**.

Cap the inlets on the injection pump vent where the hoses were removed **[Figure 70-70-15]**.

Remove the four oil fill tube bolts (Item 3) **[Figure 70-70-15]**.

Figure 70-70-16

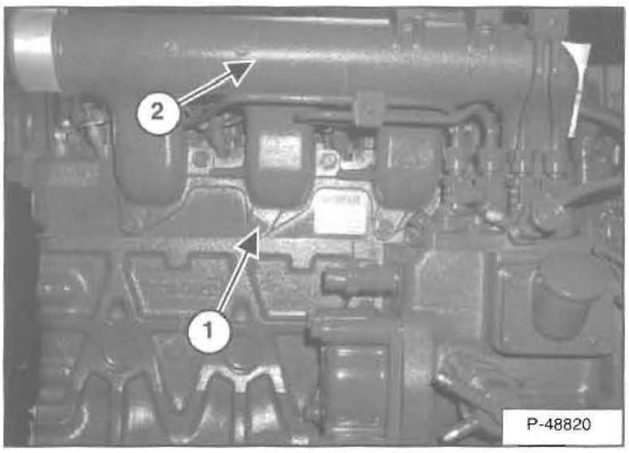


Remove the high pressure fuel lines (Item 1) **[Figure 70-70-16]** from the injection pump.

Note: Do not loosen the clamp screws (Item 2) [Figure 70-70-16] on the injection pump. This is to be done only when the entire injection pump is sent out to be serviced.

Fuel Injection Pump Removal And Installation (Cont'd)

Figure 70-70-17



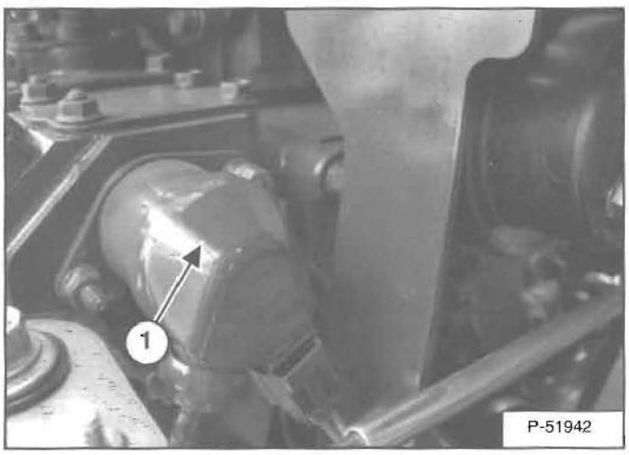
Remove the mounting bolts (Item 1) from the intake manifold (Item 2) **[Figure 70-70-17]**.

Installation: Tighten the mounting bolts to 16-20 ft.-lbs. (22-27 Nm) torque.

Remove the intake manifold from the engine. (See Contents Page 70-01).

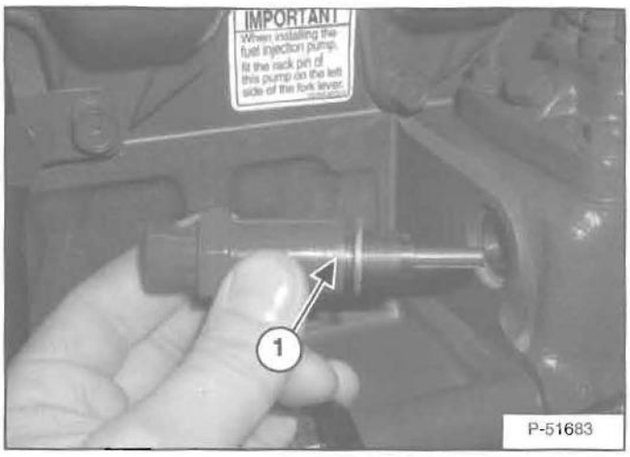
Installation: Replace the manifold gasket if it is worn or damaged.

Figure 70-70-18



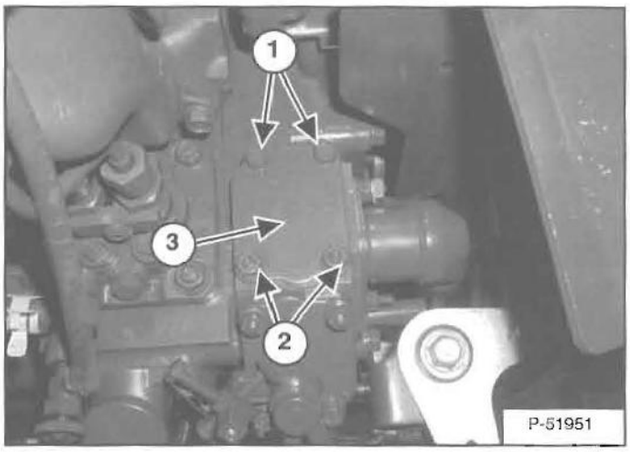
Remove the fuel shut-off solenoid (Item 1) **[Figure 70-70-18]**. (See Fuel Shut-Off Solenoid Removal And Installation on Page 70-70-4.)

Figure 70-70-19



Remove the high-idling body (Item 1) **[Figure 70-70-19]** from the engine block.

Figure 70-70-20

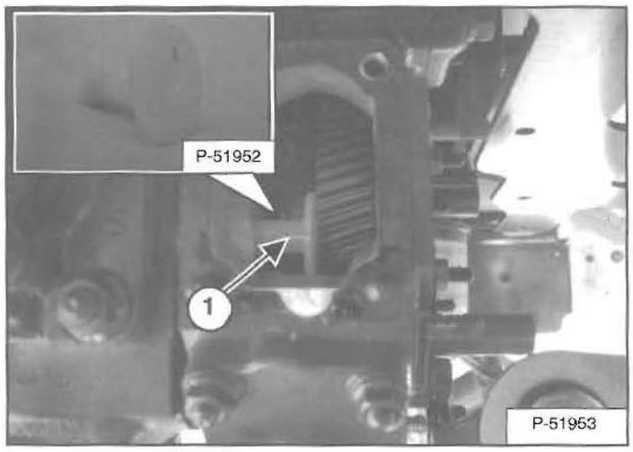


Remove the cover plate bolts (Item 1) and nuts (Item 2) **[Figure 70-70-20]**.

Remove the cover plate (Item 3) **[Figure 70-70-20]**.

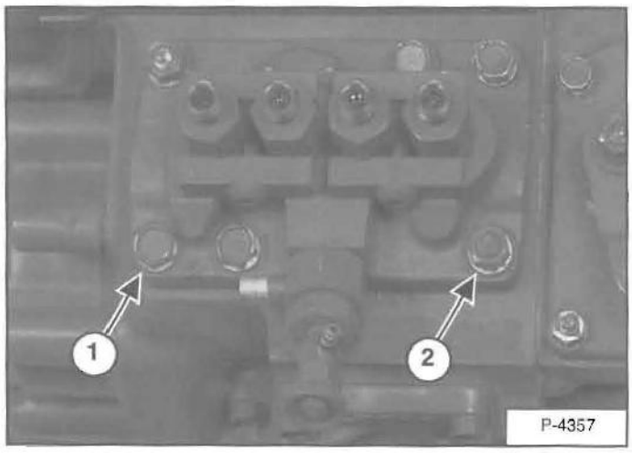
Fuel Injection Pump Removal And Installation (Cont'd)

Figure 70-70-21



Remove the stop solenoid guide (Item 1) **[Figure 70-70-21]**.

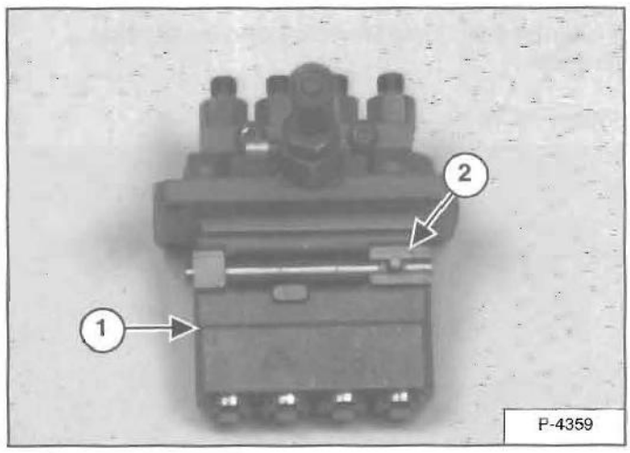
Figure 70-70-22



Remove the four mounting bolts (Item 1) and two nuts (Item 2) **[Figure 70-70-22]** from the injection pump.

Installation: Tighten the mounting bolts to 16-20 ft.-lbs. (22-27 Nm) torque.

Figure 70-70-23



Remove the injection pump (Item 1) **[Figure 70-70-23]** and shim(s) from the engine.

NOTE: The pin (Item 2) [Figure 70-70-23] located on the control rack, needs to be installed correctly during installation. See the following procedure for correct installation.

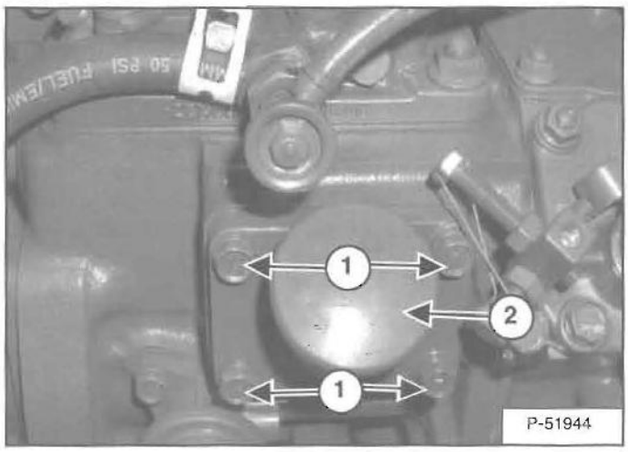
IMPORTANT

Do not attempt to maintain or adjust unless you are trained and have the correct equipment.

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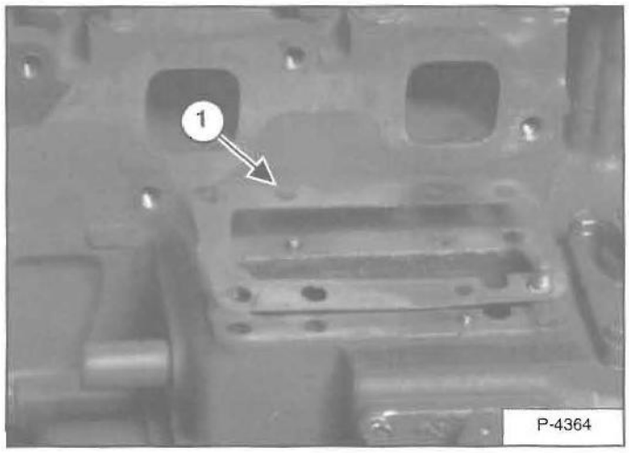
Fuel Injection Pump Removal And Installation (Cont'd)

Figure 70-70-24



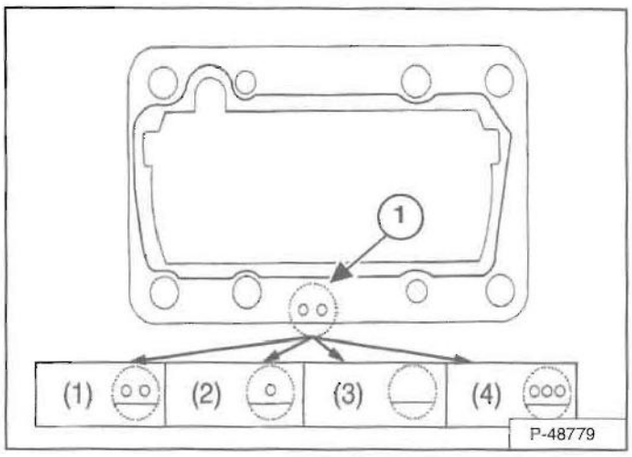
Installation: Remove the bolts (Item 1) that secure the fill cover (Item 2) **[Figure 70-70-24]** from the injection pump chamber.

Figure 70-70-25



Install the shim(s) (Item 1) **[Figure 70-70-25]** on the injection pump mounting surface. For information on the number of shims used. (See Timing The Injection Pump on Page 70-70-9.)

Figure 70-70-26



The size of shims are identified by a symbol (Item 1) **[Figure 70-70-26]** on the shims.

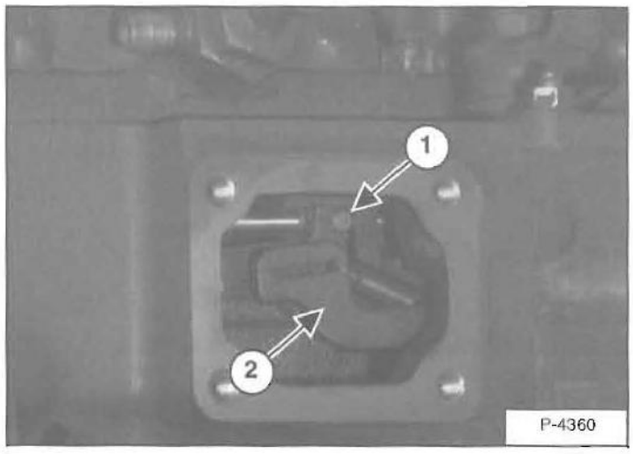
(1) Two holes means .0008 in (.20 mm) shim.

(2) One hole means .0010 in (.25 mm) shim.

(3) Without hole means .0012 in (.30 mm) shim.

(4) Three holes means .0014 in (.35 mm) shim.

Figure 70-70-27



Install the injection pump in the engine.

Put the pin (Item 1) on the control rack in the slot of the fork lever (Item 2) **[Figure 70-70-27]** located inside the injection pump chamber.

Fuel Injection Pump Removal And Installation (Cont'd)

IMPORTANT

If the pin is not correctly installed in the fork lever, the engine will run over maximum speed, resulting in serious damage to the engine.

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Timing The Injection Pump

IMPORTANT

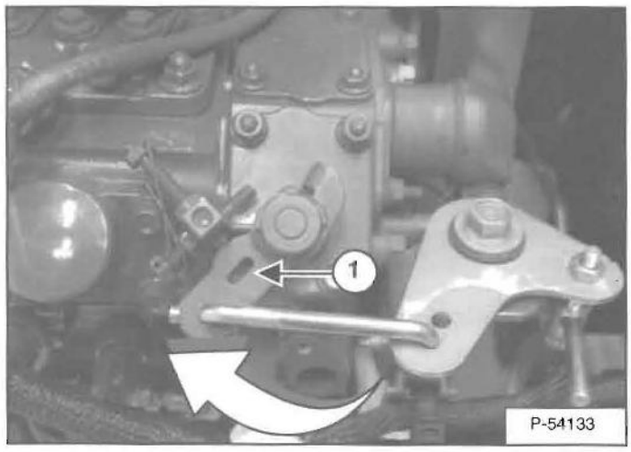
Do not attempt to maintain or adjust unless you are trained and have the correct equipment.

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Timing the injection pump is done by changing the number of shims between the injection pump and the injection pump mounting surface.

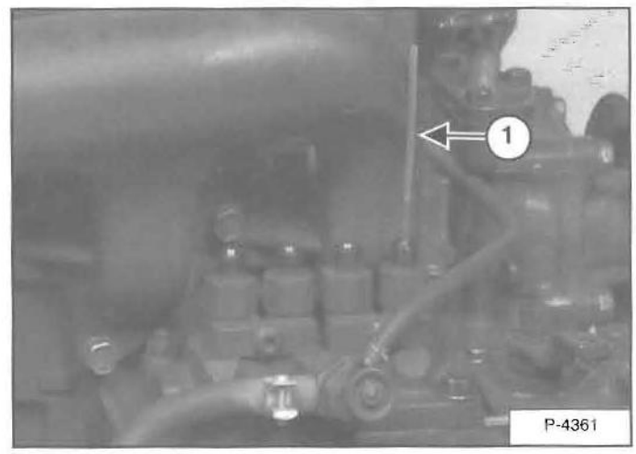
Disconnect the number one cylinder high pressure line from the injection pump.

Figure 70-70-28



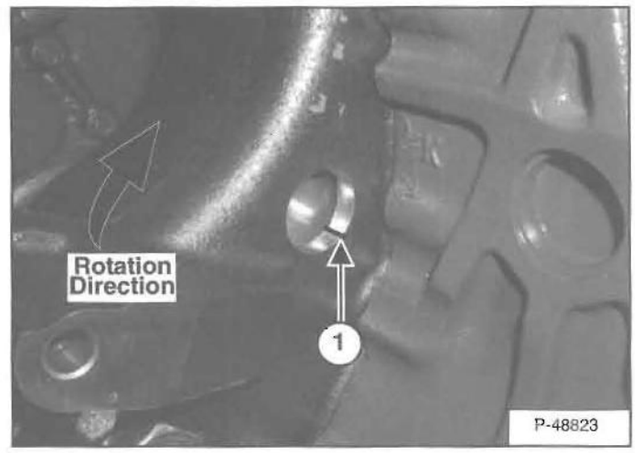
Turn the fuel supply lever (Item 1) **[Figure 70-70-28]** to the ON position.

Figure 70-70-29



Install a short plastic tube (Item 1) **[Figure 70-70-29]** in the number one cylinder port of the injection pump. The tube should fit securely in the port and point upward.

Figure 70-70-30



Rotate the engine in the direction shown **[Figure 70-70-30]**.

Continue rotation until flywheel timing mark lines up with the mark in the window (Item 1) **[Figure 70-70-30]**.

Timing The Injection Pump (Cont'd)

NOTE: The flywheel has three timing marks.

The first mark to appear in the window with the rotation is 9.25° which is used for loaders with the Kubota V2003T engine.

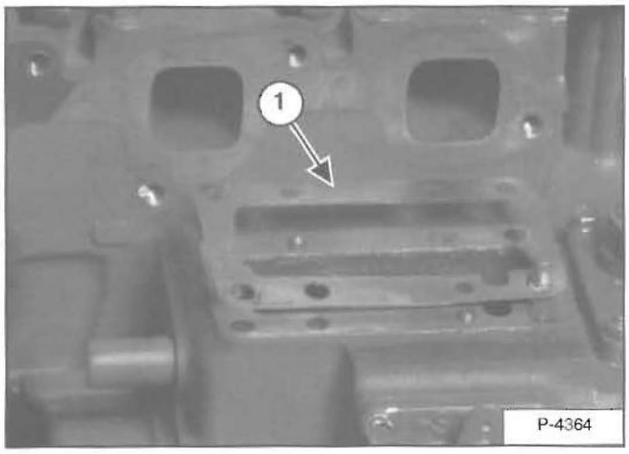
The second mark to appear in the window is 8.2° which is used for loaders with the Kubota V2203 engine.

The third mark to appear in the window is 6.75° which is used for loaders with the Kubota V2403T engine.

Rotate slowly until fuel just starts to flow upward into the plastic tube.

At this instant, the 8.2° BTDC timing mark on the flywheel should be aligned with the mark in the window (Item 1) **[Figure 70-70-30].**

Figure 70-70-31



Add or subtract shim(s) (Item 1) **[Figure 70-70-31]** as needed to adjust the fuel delivery timing.

NOTE: Adding or removing one shim will vary the timing by 1.5°. Adding shims retards timing.

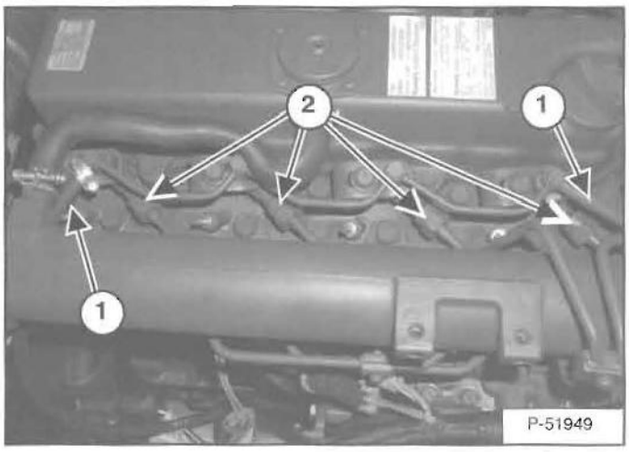
Fuel Injector Removal And Installation

⚠ WARNING

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

W-2072-0496

Figure 70-70-32



The following are some problems caused by faulty injectors:

-Engine is hard to start or will not start
-Rough engine operation and idle
-Engine will not have full power
-Excessive exhaust smoke

Disconnect the fuel return hoses (Item 1) **[Figure 70-70-32]** from the injectors.

Disconnect the high pressure fuel lines (Item 2) **[Figure 70-70-32]** from the fuel injectors and from the injection pump.

Remove the high pressure fuel lines from the engine.

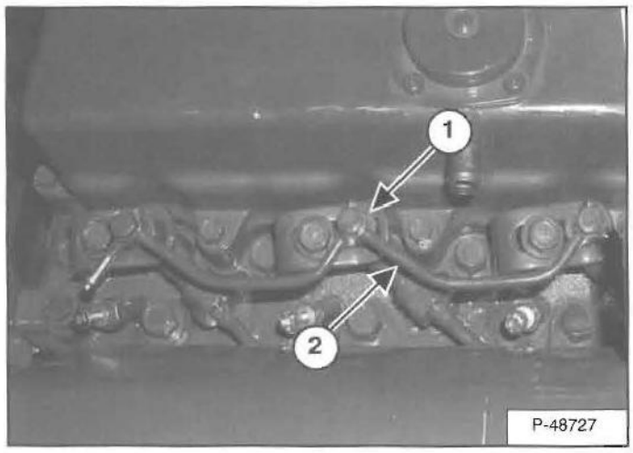
Fuel Injector Removal And Installation (Cont'd)

IMPORTANT

Do not bend the high pressure fuel injection tubes when removing or installing them.

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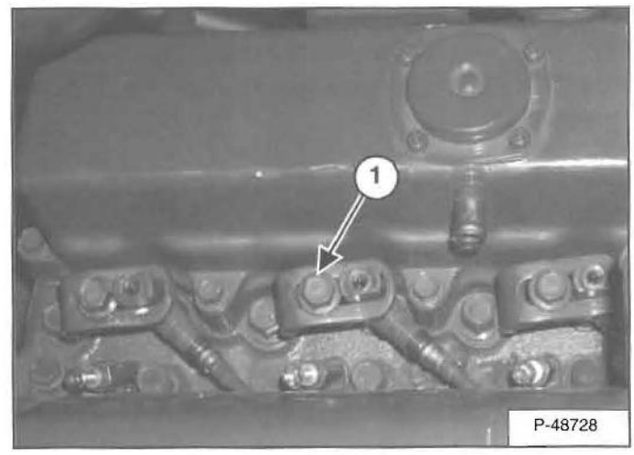
Figure 70-70-33



Remove the four retainer bolts (Item 1) from the top of the fuel injectors **[Figure 70-70-33]**.

Remove the fuel return tube (Item 2) **[Figure 70-70-33]** from the fuel injectors.

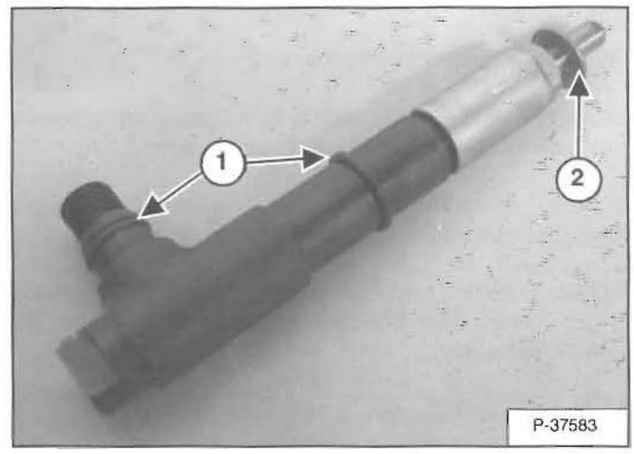
Figure 70-70-34



Remove the injector nozzle holder bolt (Item 1) **[Figure 70-70-34]** from the cylinder head.

Pull on the injector nozzle to remove the injector nozzle from the cylinder head.

Figure 70-70-35



[Figure 70-70-35] shows the injector nozzle removed from the cylinder. Inspect the injector and replace if necessary.

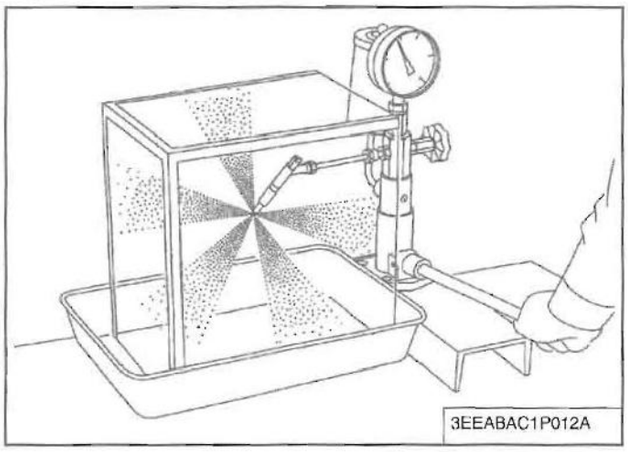
Check and replace the injector nozzle O-rings (Item 1) and the nozzle washer (Item 2) before installing new or used injectors. **[Figure 70-70-35]**.

Checking Nozzle Injection Pressure

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

OEM1064 - Injector Nozzle Tester

Figure 70-70-36



Set the injection nozzle to the nozzle tester.

Slowly move the tester handle to measure the pressure at which fuel begins jetting out from the nozzle.

If the measurement is not within the factory specifications, replace the injection nozzle assembly.

NOTE: Injection nozzle gasket must be replaced when the injection nozzle is removed for checking.

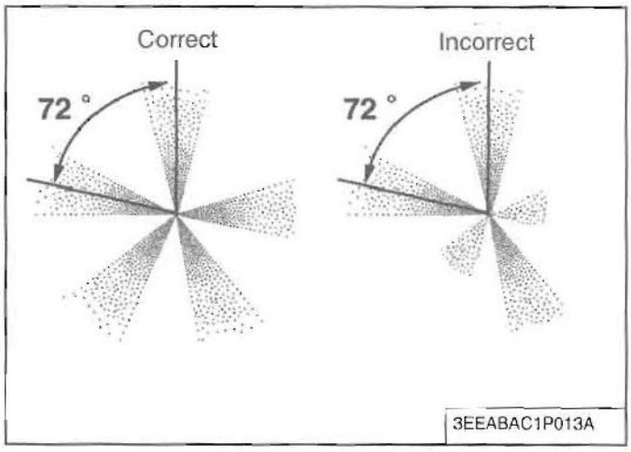
Injection pressure	Factory spec.	18.6 to 20.1 MPa 190 to 205 kgf/cm² 2702 to 2916 PSI

Nozzle Spraying Condition

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

OEM1064 - Injector Nozzle Tester

Figure 70-70-37



Set the injection nozzle to a nozzle tester, and check the nozzle spraying condition.

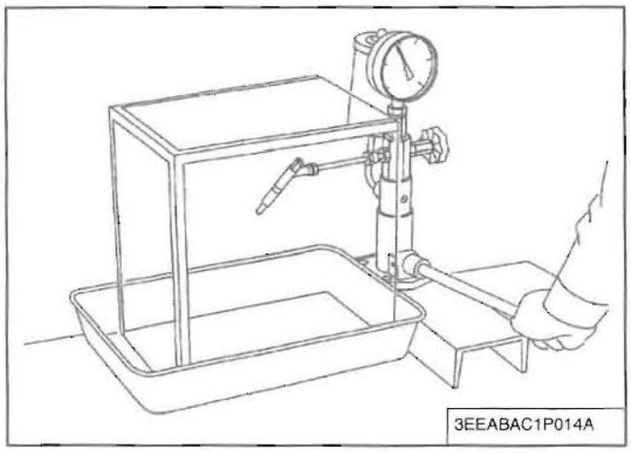
If the spraying condition is defective, replace the injection nozzle assembly.

Valve Seat Tightness

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

OEM1064 - Injector Nozzle Tester

Figure 70-70-38



Set the injection nozzle to a nozzle tester.

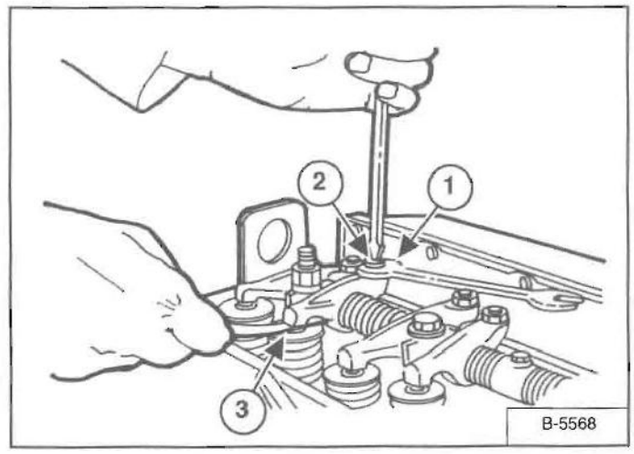
Raise the fuel pressure, and keep at 16.67 MPa (170 kgf/cm², 2418 PSI) for 10 seconds.

If any fuel leak is found, replace the injection nozzle assembly.

Valve seat tightness	Factory spec.	No fuel leak at 16.67 MPa 170 kgf/cm² 2418 PSI

Valve Clearance Adjustment

Figure 70-70-39



Adjust the valve clearance as follows:

Loosen the lock nut (Item 1) **[Figure 70-70-39]**.

Turn the adjustment screw (Item 2) **[Figure 70-70-39]** until the correct clearance is obtained.

NOTE: The clearance is measured between the rocker arm and valve stem tip (Item 3) [Figure 70-70-39].

Valve Clearance Adjustment (Cont'd)

Figure 70-70-40

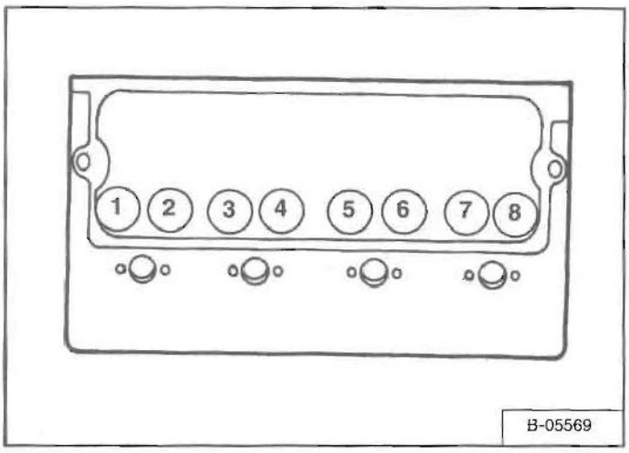


Figure 70-70-41

Cylinder Number	1		2		3		4	
Valve Number	1	2	3	4	5	6	7	8
Valve I=Intake E=Exhaust	I	E	I	E	I	E	I	E

Adjust the valve clearance as follows:

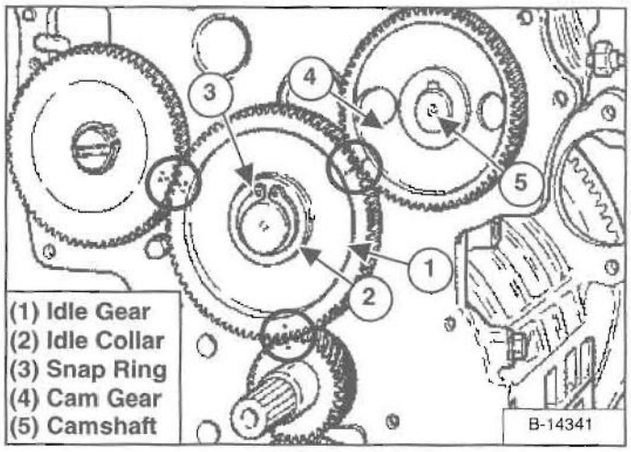
0.0071 -0.0087 inch (0,18 - 0,22 mm) Intake & Exhaust

Use the following sequence to set the valves **[Figure 70-70-40]** & **[Figure 70-70-41]**:

1. With the rocker arm rocking (valves 7 & 8) on No. 4 cylinder set clearance at No. 1 cylinder (valves 1 & 2).
2. With the rocker arm rocking (valves 3 & 4) on No. 2 cylinder set clearance at No. 3 cylinder (valves 5 & 6).
3. With the rocker arm rocking (valves 1 & 2) on No. 1 cylinder set clearance at No. 4 cylinder (valves 7 & 8).
4. With the rocker arm rocking (valves 5 & 6) on No. 3 cylinder set clearance at No. 2 cylinder (valves 3 & 4).

Valve Timing, Checking

Figure 70-70-42



Stop the engine and open the rear door.

Remove the engine. (See Contents Page 70-01.)

Remove the timing gearcase cover. (See Contents Page 70-01.)

Make sure the timing marks (circled areas) **[Figure 70-70-42]** are in correct alignment .

Removal And Installation

DANGER

AVOID DEATH

- Disconnecting or loosening any hydraulic tubeline, hose, fitting, component or a part failure can cause lift arms to drop.
- Keep out of this area when lift arms are raised unless supported by an approved lift arm support. Replace if damaged. 57051



SW 02 6717343

WARNING

Never work on a machine with the lift arms up unless the lift arms are secured by an approved lift arm support device. Failure to use an approved lift arm support device can allow the lift arms or attachment to fall and cause injury or death.

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Put jackstands under the rear corners of the loader.

Raise the lift arms and install an approved lift arm support device. (See Contents Page 10-01.)

Raise the operator cab. (See Contents,Page 10-01.)

Drain the hydraulic reservoir. (See Contents Page 20-01.)

Remove the hydraulic filter housing from the mainframe. (See Contents Page 20-01.)

Disconnect the steering linkage. (See Contents Page 50-01.)

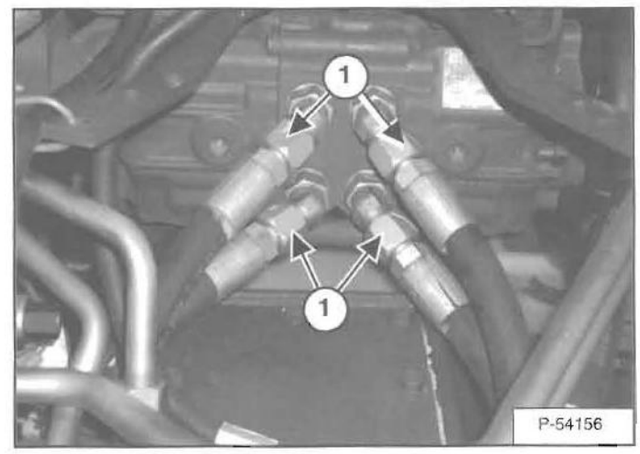
Remove the battery from the loader. (See Contents Page 60-01.)

Drain the engine coolant from the cooling system. (See Contents Page 70-01.)

Remove the air cleaner. (See Contents Page 70-01.)

Remove the muffler. (See Contents Page 70-01.)

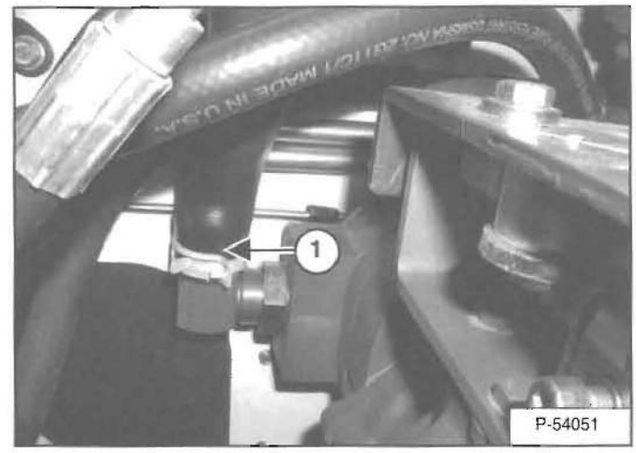
Figure 70-80-1



Mark the four drive motor hoses (Item 1) **[Figure 70-80-1]** for correct installation.

Disconnect the four drive motor hoses (Item 1) **[Figure 70-80-1]** from the hydrostatic pump.

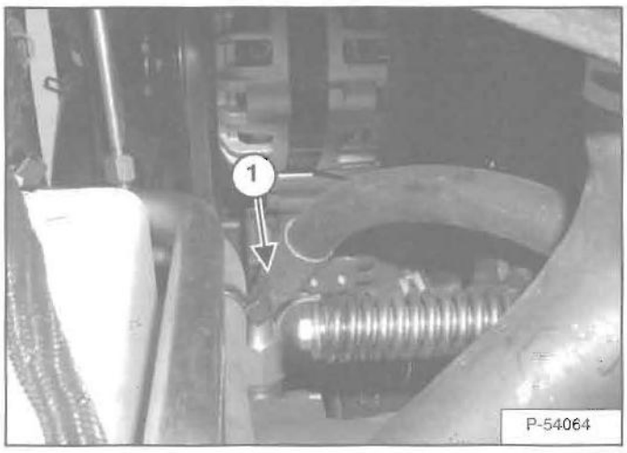
Figure 70-80-2



Disconnect the INLET hose (Item 1) **[Figure 70-80-2]** from the fitting on the hydraulic pump.

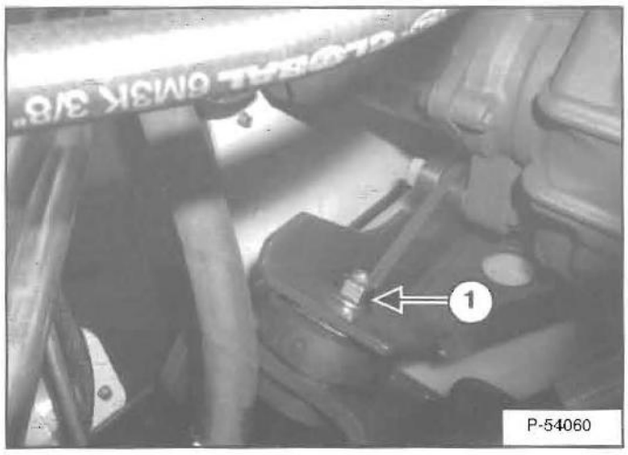
Removal And Installation (Cont'd)

Figure 70-80-3



Disconnect the outlet hose (Item 1) **[Figure 70-80-3]** to the main control valve, from the fitting on the hydraulic pump.

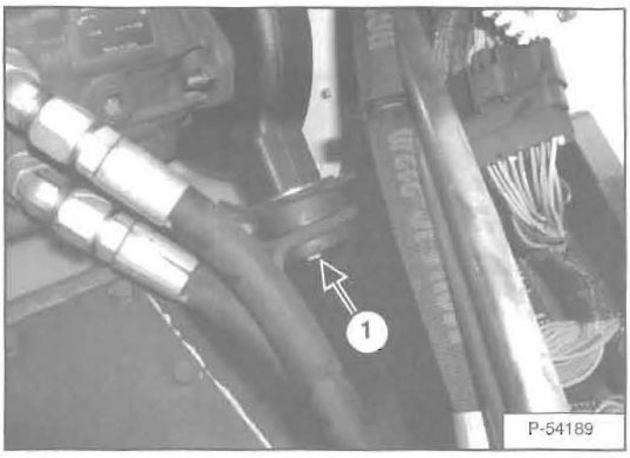
Figure 70-80-4



Remove the mounting bolt and nut (Item 1) **[Figure 70-80-4]** from the right front engine mount.

Installation: Tighten the mounting bolts to 70 ft.-lbs. (95 Nm) torque.

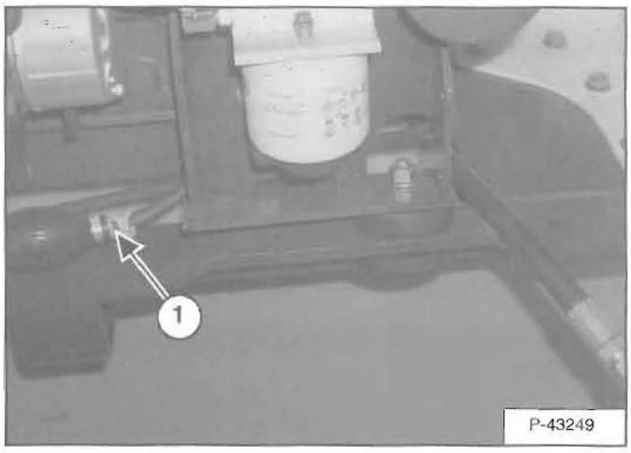
Figure 70-80-5



Remove the mounting bolt (Item 1) **[Figure 70-80-5]** and nut from the left front engine mount.

Installation: Tighten the mounting bolts to 70 ft.-lbs. (95 Nm) torque.

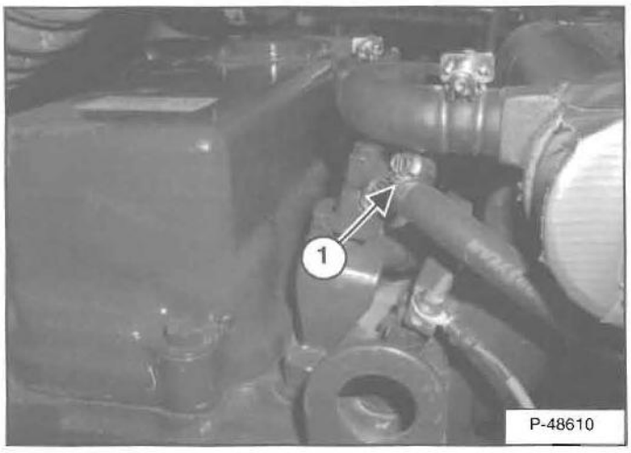
Figure 70-80-6



Disconnect the hand pump (Item 1) **[Figure 70-80-6]** from the fuel line connected to the fuel tank. Cap the fuel lines.

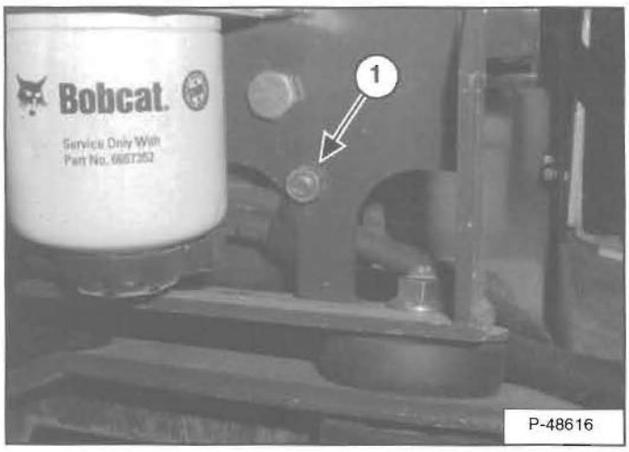
Removal And Installation (Cont'd)

Figure 70-80-7



Disconnect and plug the fuel return hose (Item 1) **[Figure 70-80-7]** from the injector.

Figure 70-80-8



Unbolt the fuel supply and return lines (Item 1) **[Figure 70-80-8]** from the engine mount.

Figure 70-80-9

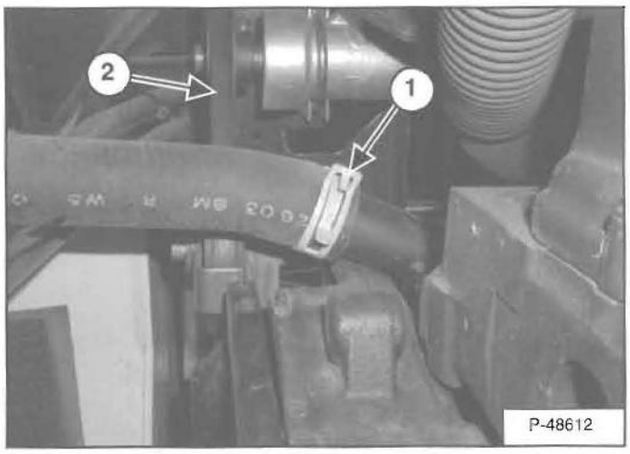
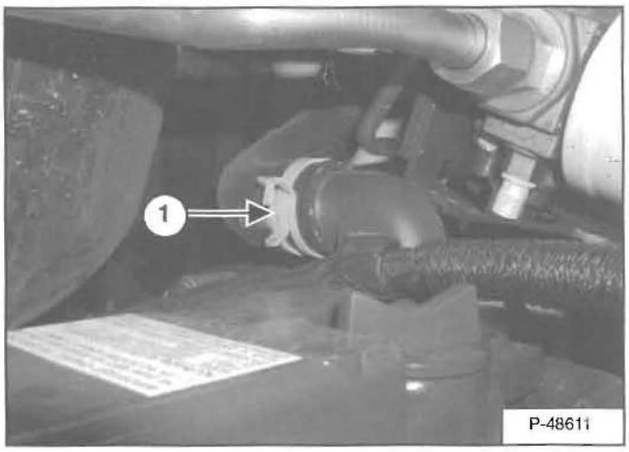


Figure 70-80-10

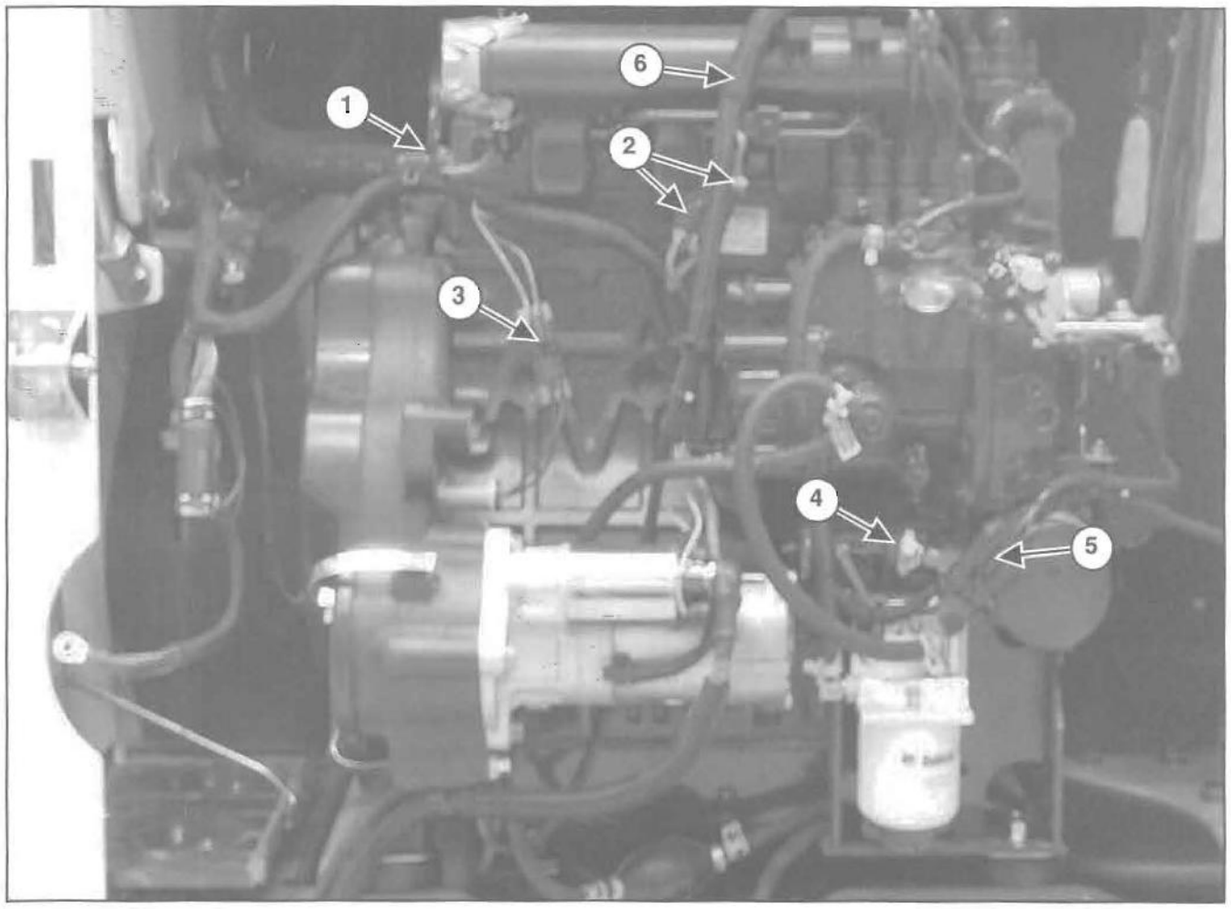


Disconnect the radiator hoses (Item 1) **[Figure 70-80-9]** & **[Figure 70-80-10]** from the engine.

Remove the belt from the cooling fan (Item 2) **[Figure 70-80-9]**.

Removal And Installation (Cont'd)

Figure 70-80-11



Disconnect the electrical connectors from the mainframe electrical harness:

(Item 1) glow plugs **[Figure 70-80-11]**

(Item 2) engine electrical harness connectors (2) **[Figure 70-80-11]**

(Item 3) flywheel rpm sensor **[Figure 70-80-11]**

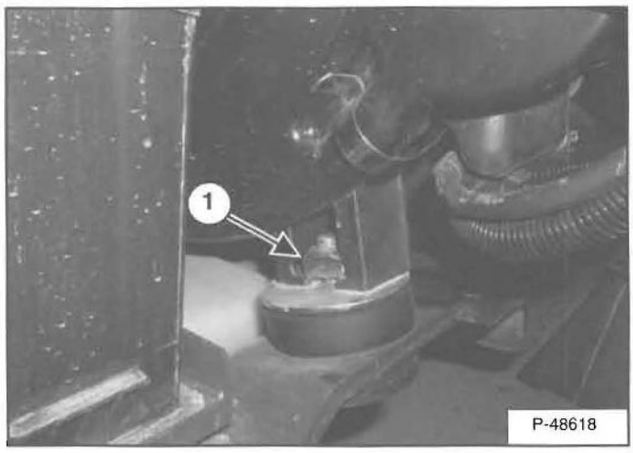
(Item 4) engine oil pressure sensor **[Figure 70-80-11]**

(Item 5) fuel shut-off solenoid **[Figure 70-80-11]**

Note: The engine electrical harness (Item 6) [Figure 70-80-11] can remain on the engine while removing the engine from the loader.

Removal And Installation (Cont'd)

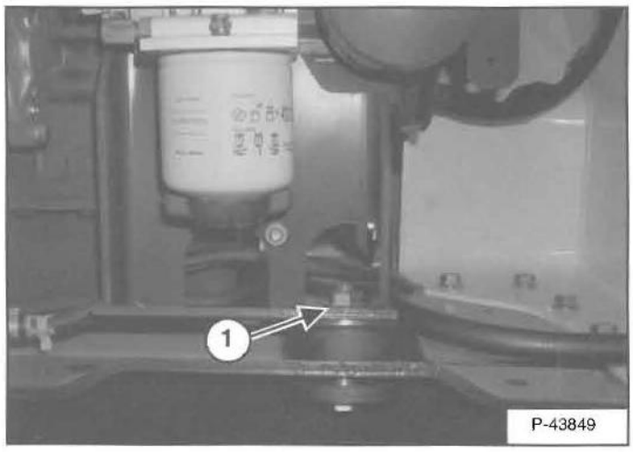
Figure 70-80-12



Remove the mounting bolt and nut (Item 1) **[Figure 70-80-12]** from the left rear engine mount.

Installation: Tighten the mounting bolt to 70 ft.-lbs. (95 Nm) torque.

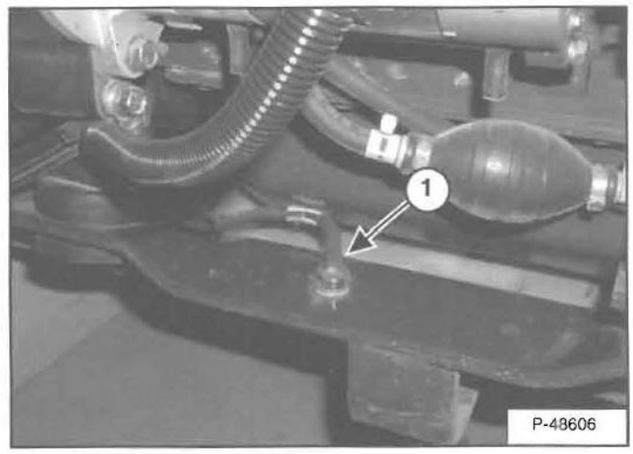
Figure 70-80-13



Remove the mounting bolt and nut (Item 1) **[Figure 70-80-13]** from the right rear engine mount.

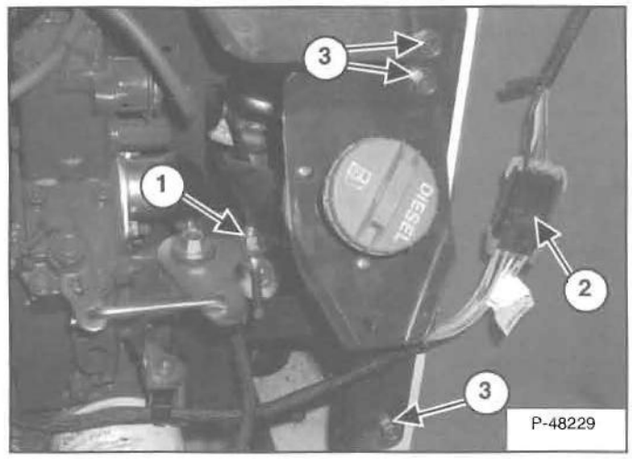
Installation: Tighten the mounting bolt to 70 ft.-lbs. (95 Nm) torque.

Figure 70-80-14



Disconnect the ground cable (Item 1) **[Figure 70-80-14]** from the loader frame.

Figure 70-80-15



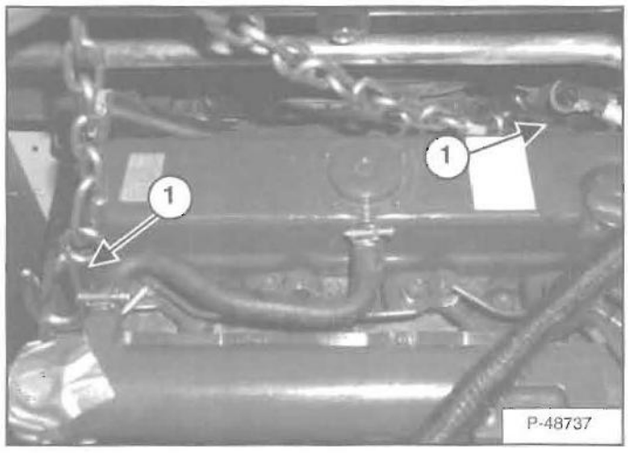
Remove the nut from the speed control linkage (Item 1) and unplug the rear lights electrical connector (Item 2) **[Figure 70-80-15]**.

Remove the fuel fill bracket mounting screws (Item 3) **[Figure 70-80-15]**.

Installation: Tighten the mounting bolts to 15-20 ft.-lbs. (20-27 Nm) torque.

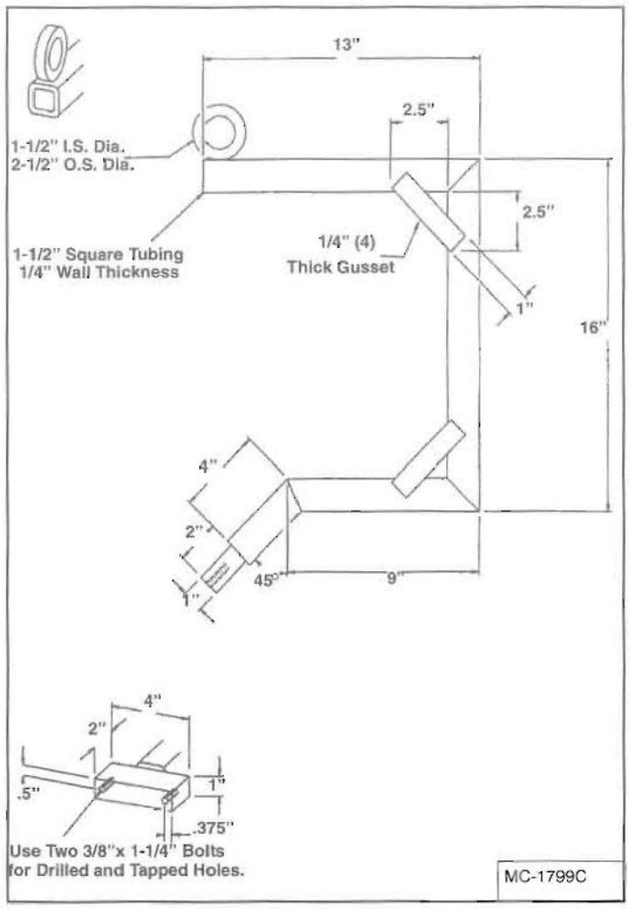
Removal And Installation (Cont'd)

Figure 70-80-16



Fasten securely a chain to each of the lifting brackets (Item 1) **[Figure 70-80-16]** on the engine .

Figure 70-80-17



A tool needs to fabricated to be used in the removal procedure. This tool allows the engine/hydrostatic pump assembly to be lifted evenly for easier removal. Use the dimensions shown in **[Figure 70-80-17]** to make the engine removal tool.

Figure 70-80-18



Install the chain hoist on the eyelet (Item 1) **[Figure 70-80-18]** of the removal tool.

Fasten a chain to other end of the removal tool with two bolts as shown in **[Figure 70-80-18]**.

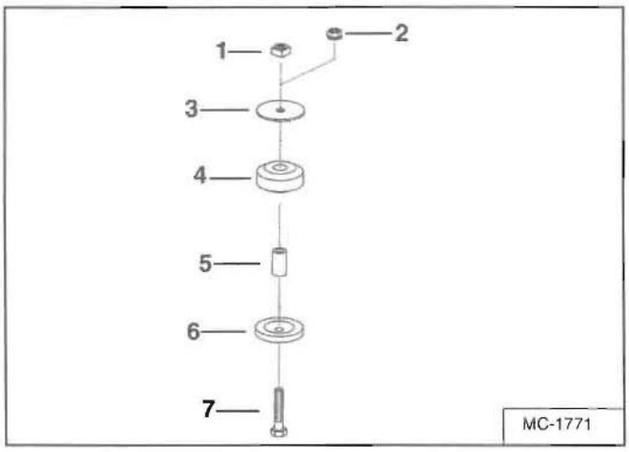
NOTE: You may need to adjust the chain which fastens to the engine a couple of times to reach the correct lifting position.

Remove the engine/hydrostatic pump assembly from the loader.

Reverse the removal procedure to install the engine.

Engine Mount Replacement

Figure 70-80-19



Use the following procedure to install new engine mounts:

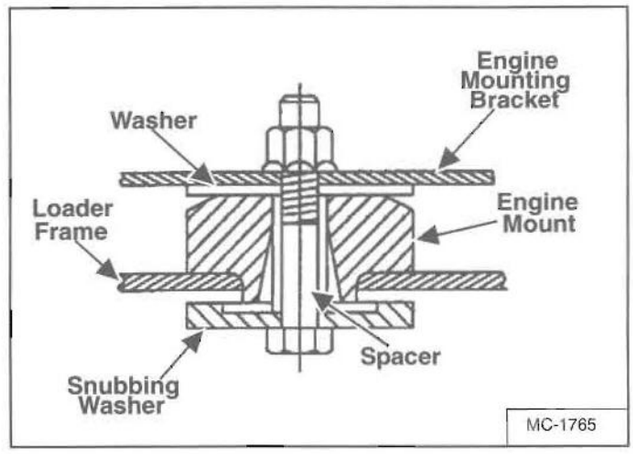
Remove the existing mount from the engine. Refer to engine removal and installation for engine mount locations.

Replace all four engine mounts two front and two rear.

Use the parts shown to install the new engine mounts **[Figure 70-80-19]**:

Square Nut - (Item 1) - Used on left side engine mounts
Hex Nut - (Item 2) - Used on right side engine mounts
Mount Washer - (Item 3)
Engine Mount - (Item 4)
Tube Spacer - (Item 5)
Snubbing Washer - (Item 6)
Mounting Bolt - (Item 7)

Figure 70-80-20



Install the new engine mount as shown in the cut away side view **[Figure 70-80-20]**.

Tighten the mounting bolts to 70 ft.-lbs. (95 Nm) torque.



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FLYWHEEL AND HOUSING

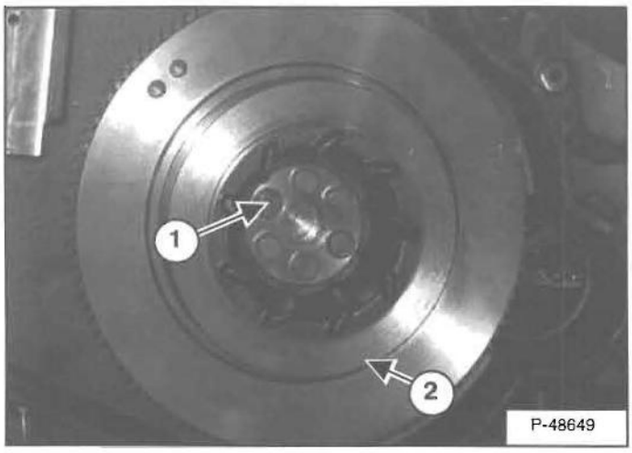
Flywheel Removal And Installation

Remove the drive belt shield. (See Contents Page 30-01 for drive belt replacement procedure.)

Remove the drive belt. (See Contents Page 30-01 for drive belt replacement procedure.)

Remove the drive belt tension pulley. (See Contents Page 30-01 for drive belt tension pulley removal.)

Figure 70-90-1



Remove the six mounting bolts (Item 1) from the engine flywheel (Item 2) **[Figure 70-90-1]**.

Installation: Apply engine oil to the threads and seats before tightening. Tighten to 72-80 ft.-lbs. (98-108Nm) torque.

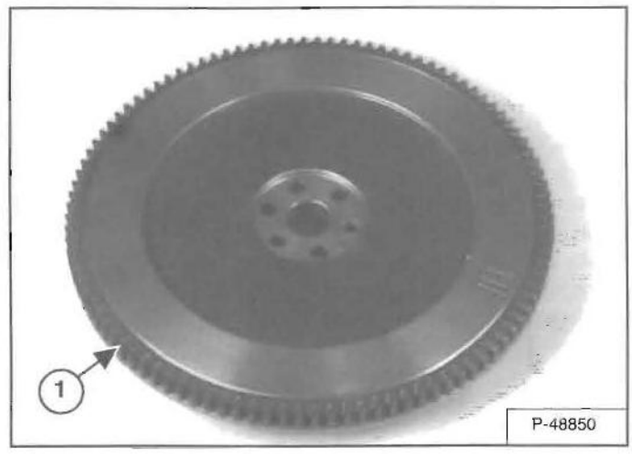
Remove the flywheel from the engine.

Installation: Be sure to align the hole in the flywheel with the pin located on the crankshaft.

Reverse the removal procedure to install the flywheel.

Ring Gear Removal And Installation

Figure 70-90-2



The ring gear (Item 1) **[Figure 70-90-2]** on the flywheel is an interference fit. Heat the ring gear enough to expand the gear. Hit the ring gear evenly around the gear to remove it from the flywheel.

Clean the outer surface of the flywheel thoroughly so the new ring gear will fit smoothly onto the flywheel.

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

Fit the ring on the flywheel and be sure the gear is seated correctly.

Housing Removal And Installation

Remove the drive belt shield. (See Contents Page 30-01 for drive belt replacement procedure.)

Remove the engine/hydrostatic pump package from the loader. (See Contents Page 70-01.)

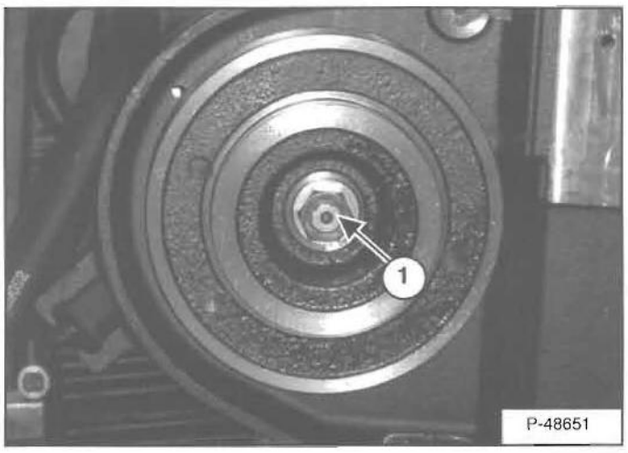
Remove the drive belt. (See Contents Page 30-01 for drive belt replacement procedure.)

Remove the drive belt tension pulley. (See Contents Page 30-01 for drive belt tension pulley removal.)

Remove the starter. (See Contents Page 60-01.)

Remove the flywheel. (See Page 70-90-1.)

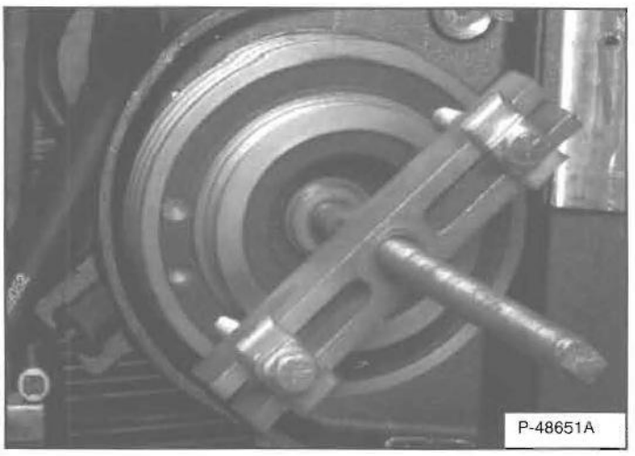
Figure 70-90-3



Remove the hydrostatic pump drive pulley mounting nut (Item 1) **[Figure 70-90-3]** and washer.

Installation: Tighten the mounting nut to 175-200 ft.-lbs. (237-271 Nm) torque.

Figure 70-90-4

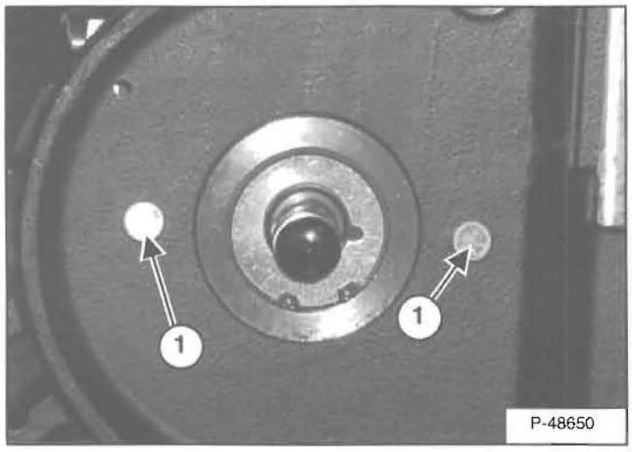


Install a puller in the drive pulley and remove the pulley from the hydrostatic pump shaft **[Figure 70-90-4]**.

Installation: Install the pulley key in the shaft before installing the drive pulley.

Housing Removal And Installation (Cont'd)

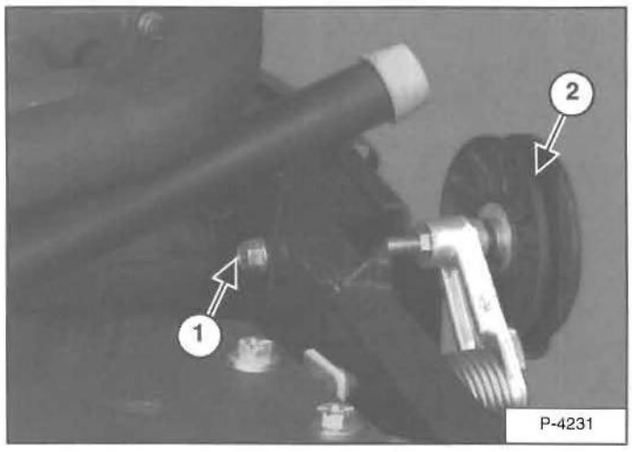
Figure 70-90-5



Remove the two mounting bolts (Item 1) **[Figure 70-90-5]** from the drive belt housing which mount the hydrostatic pump to the housing.

Installation: Tighten the mounting bolts to 65-70 ft.-lbs. (88-95 Nm) torque.

Figure 70-90-6

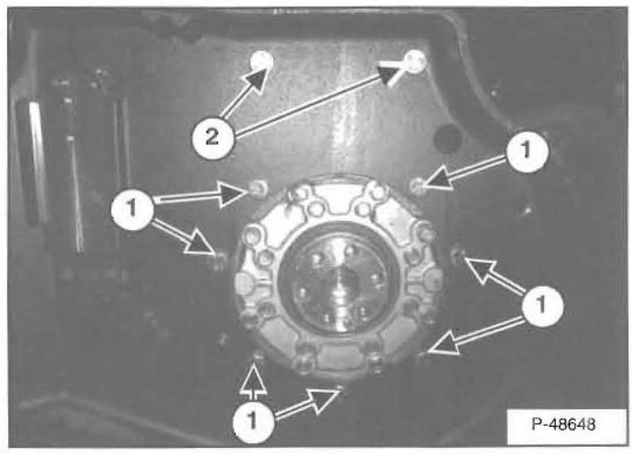


Remove the mounting bolt (Item 1) **[Figure 70-90-6]** from engine coolant tubeline mounting bracket which is attached to the belt shield housing.

Installation: Tighten the mounting bolt to 25-28 ft.-lbs. (34-38 Nm) torque.

Remove the blower fan drive belt tensioner assembly (Item 2) **[Figure 70-90-6]** from the housing.

Figure 70-90-7



Remove the seven mounting bolts (Item 1) **[Figure 70-90-7]** which fasten the housing on the engine.

Installation: Tighten the mounting bolts to 35-40 ft.-lbs. (48-54 Nm) torque.

Remove the bolt (Item 2) **[Figure 70-90-7]** which fasten the two drain hoses to the housing.

Installation: Tighten the mounting bolts to 60-65 ft.-lbs. (82-88 Nm) torque.

Remove the housing.

Reverse the removal procedure to install the housing.

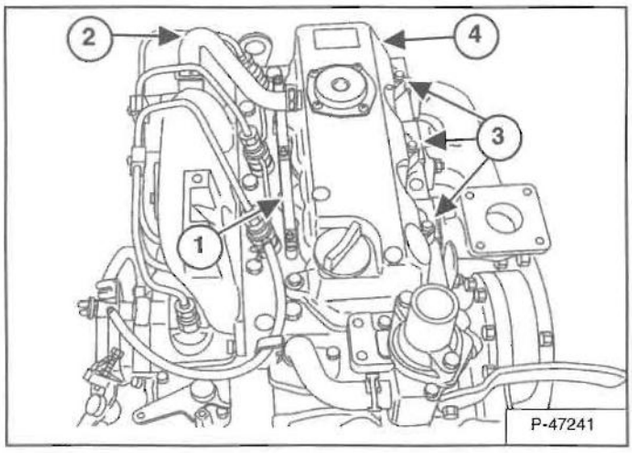


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RECONDITIONING THE ENGINE

Cylinder Head Removal And Installation

Figure 70-100-1



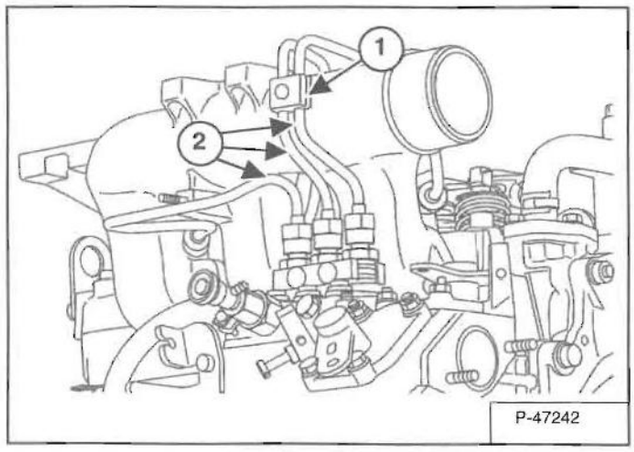
Remove the glow plug lead (Item 1), breather hose (Item 2), and valve cover bolts (Item 3) **[Figure 70-100-1]**.

Remove the valve cover (Item 4) **[Figure 70-100-1]** and gasket.

Installation: Tighten the valve cover bolts to 5-8 ft.-lbs. (7-11 Nm).

NOTE: Tighten valve cover bolts starting from the center and working towards the ends. Otherwise, valve cover damage may occur.

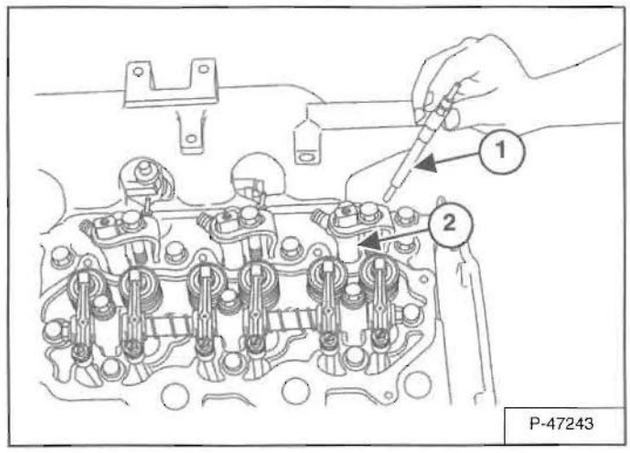
Figure 70-100-2



Loosen the bolts on the clamps (Item 1) and remove the injection tubes (Item 2) **[Figure 70-100-2]**.

Remove the overflow tube assembly.

Figure 70-100-3

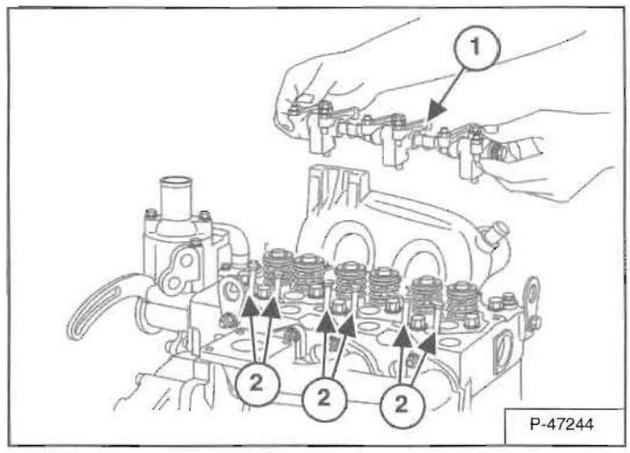


Remove the glow plugs (Item 1) and fuel injector holder assemblies (Item 2) **[Figure 70-100-3]**.

Installation: Tighten the glow plugs to 15-18 ft.-lbs. (19.6-24.5 Nm) torque.

Tighten the injector holders to 19-22 ft.-lbs. (25.5-29.4 Nm) torque.

Figure 70-100-4



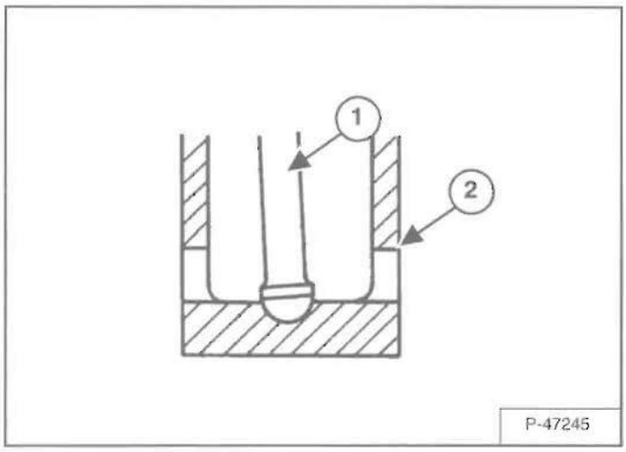
Remove the rocker arm bolts and remove the rocker arm assembly (Item 1) **[Figure 70-100-4]**.

Installation: Tighten the bolts to 17-20 ft.-lbs. (23.5 - 27.5 Nm) torque.

Remove the pushrods (Item 2) **[Figure 70-100-4]**.

Cylinder Head Removal And Installation (Cont'd)

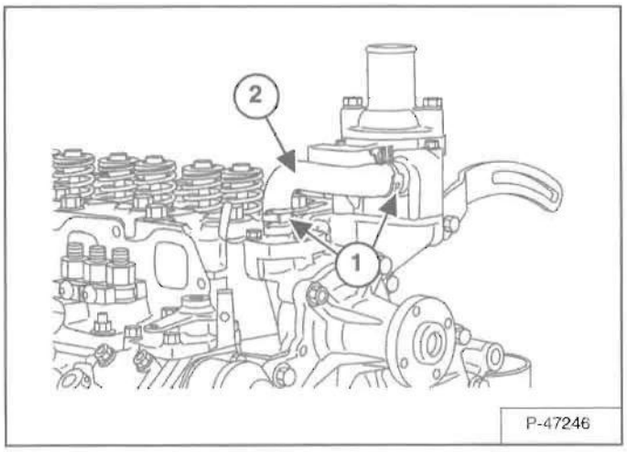
Figure 70-100-5



Installation: The push rod (Item 1) must be seated in the tappet (Item 2) **[Figure 70-100-5]** correctly or the push rods will be damaged.

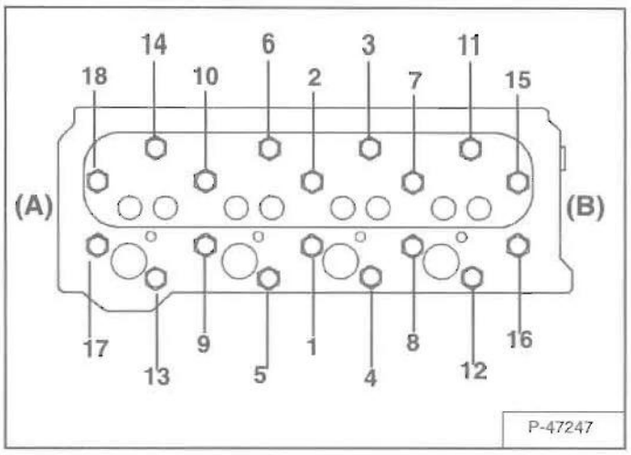
After installing the rocker arm assembly and push rods, the valve lash must be adjusted. (See Valve Tappets on Page 70-100-20.).

Figure 70-100-6



Remove the clamps (Item 1) and remove the hose (Item 2) **[Figure 70-100-6]**.

Figure 70-100-7



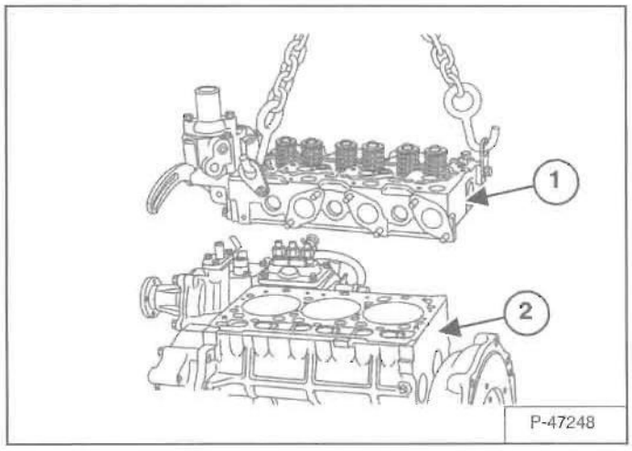
Remove the cylinder head bolts in order of #18 to #1 **[Figure 70-100-7]**.

NOTE: (A) is the gearcase side, (B) is the flywheel side.

Installation: Put oil on the bolt threads. Tighten the bolts in the correct sequence in order of #1-#18 to 68-72 ft.-lbs. (93-98 Nm).

NOTE: Re-tighten the cylinder head bolts in the correct sequence after the engine has been run for 30 minutes.

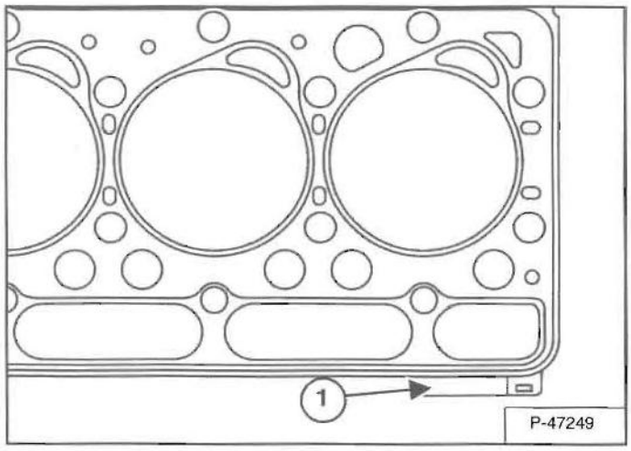
Figure 70-100-8



Remove the cylinder head (Item 1) and gasket (Item 2) **[Figure 70-100-8]**.

Cylinder Head Removal And Installation (Cont'd)

Figure 70-100-9

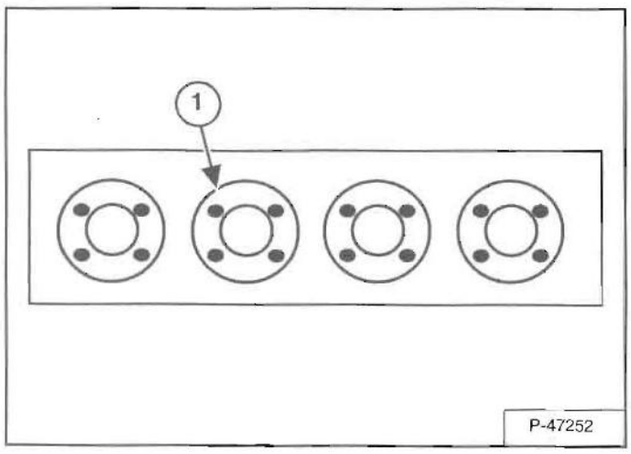


When replacing just the gasket, use a new gasket that has the same mark (Item 1) **[Figure 70-100-9]** as the original gasket.

When replacing the gasket after an engine rebuild, the piston protrusion must be measured.

(See Cylinder Head Top Clearance on Page 70-100-5.)

Figure 70-100-10



Measure and record the protrusion of each piston in the four places shown (Item 1) **[Figure 70-100-10]**. Find the average of each piston, then find the combined average of the four pistons.

Figure 70-100-11

Gasket Size (Number)	Piston Protrusion
15	0.475 to 0.525 mm 0.0187 to 0.0207 in.
20	0.525 to 0.575 mm 0.0207 to 0.0226 in.
25	0.575 to 0.625 mm 0.0226 to 0.0246 in.
30	0.625 to 0.067 mm 0.0246 to 0.0266 in.
35	0.675 to 0.725 mm 0.0266 to 0.0285 in.

Select the correct gasket size (thickness) from the chart **[Figure 70-100-11]**.

Find the measurement of the highest piston protrusion and the lowest piston protrusion (recorded earlier) for each piston.

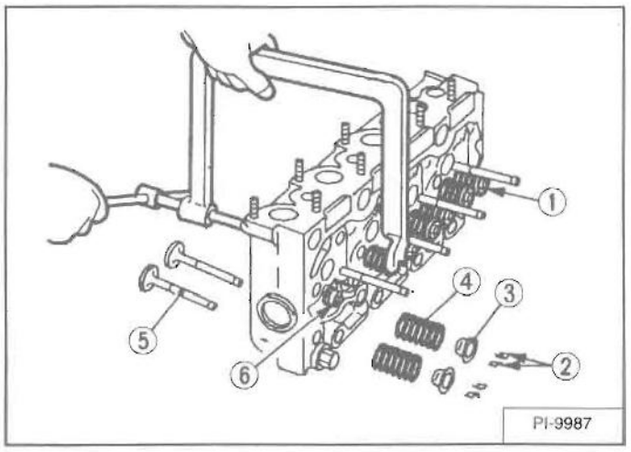
If the highest measurement exceeds the piston protrusion of the selected gasket, use the gasket which is one size larger. If the measurement exceeds gasket size 35, the engine must be disassembled, clearances checked, and reassembled.

If the measurement is two sizes smaller than the selected gasket or smaller than gasket size 15, the engine must be disassembled, clearances checked, and reassembled.

After the gasket and cylinder head have been installed, turn the crankshaft by hand to be sure there is no interference between the piston, cylinder, and valves.

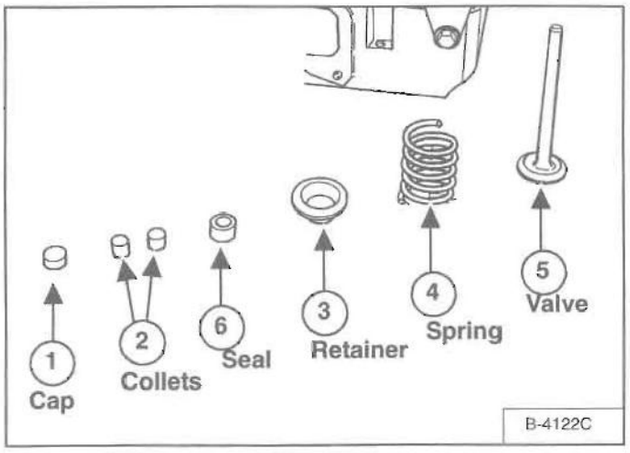
Cylinder Head Disassembly And Assembly

Figure 70-100-12



Use a valve spring compressor to compress the valve spring **[Figure 70-100-12]**.

Figure 70-100-13

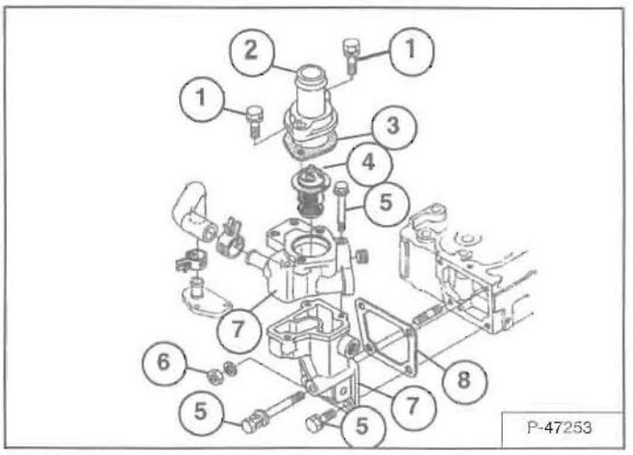


Remove the valve cap (Item 1) and valve spring collet (Item 2) **[Figure 70-100-12]** & **[Figure 70-100-13]**.

Remove the valve spring retainer (Item 3) and the spring (Item 4) **[Figure 70-100-12]** & **[Figure 70-100-13]**.

Remove the seal (Item 6) and the valve (Item 5) **[Figure 70-100-12]** & **[Figure 70-100-13]**.

Figure 70-100-14



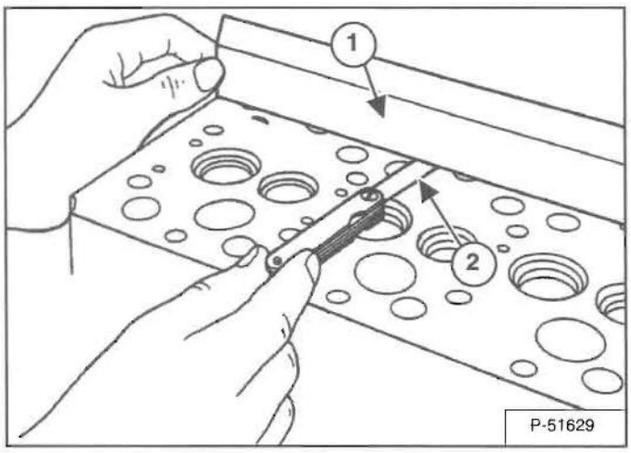
Remove the bolts (Item 1), housing (Item 2), gasket (Item 3) and thermostat (Item 4) **[Figure 70-100-14]**.

Remove bolts (Item 5), nut (Item 6), top and bottom housing (Item 7), and gasket (Item 8) from the cylinder head **[Figure 70-100-14]**.

Cylinder Head Servicing

Clean the surface of the cylinder head.

Figure 70-100-15

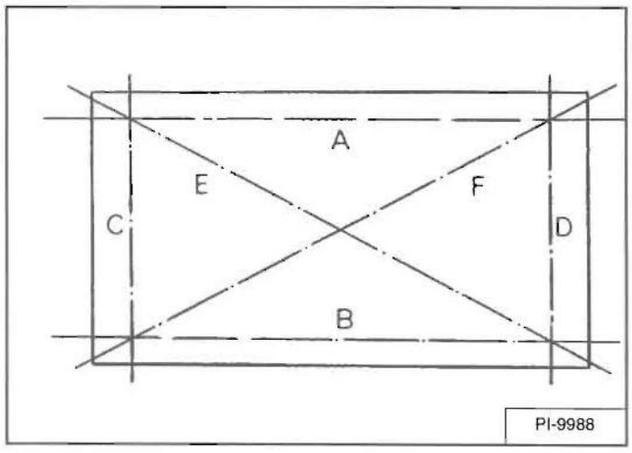


Put a straight edge (Item 1) **[Figure 70-100-15]** on the cylinder head.

NOTE: Do not put the straight edge across combustion chambers.

Put a feeler gauge (Item 2) **[Figure 70-100-15]** between the straight edge and the surface of the cylinder head.

Figure 70-100-16

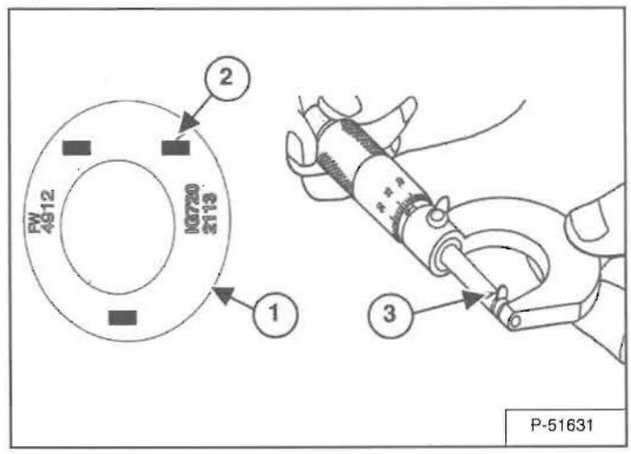


Put the straight edge on the cylinder head's four sides and two diagonal as shown in figure **[Figure 70-100-16]**.

The maximum distortion of the head surface is ± 0.002 inch (± 0,05 mm). If the measurement exceeds the specification, replace the cylinder head.

Cylinder Head Top Clearance

Figure 70-100-17



Install the cylinder head gasket. Put the piston (Item 1) **[Figure 70-100-17]** being checked at T.D.C.

Put 3 pieces of 0.06 inch (1,5 mm) diameter solder (Item 2) **[Figure 70-100-17]** on the top of the piston. Use grease to hold them in position.

NOTE: Put the solder in position so they do not touch the valves.

Turn the piston to bottom dead center.

Install the cylinder head and tighten to the correct torque in the correct sequence. (See Cylinder Head Removal And Installation on Page 70-100-1.)

Turn the crankshaft until the piston exceeds T.D.C. Remove the cylinder head.

Remove the solder wire (Item 3) **[Figure 70-100-17]** and measure it.

If the measurement exceeds the specifications, check the oil clearance of the crank pin journal or the piston pin.

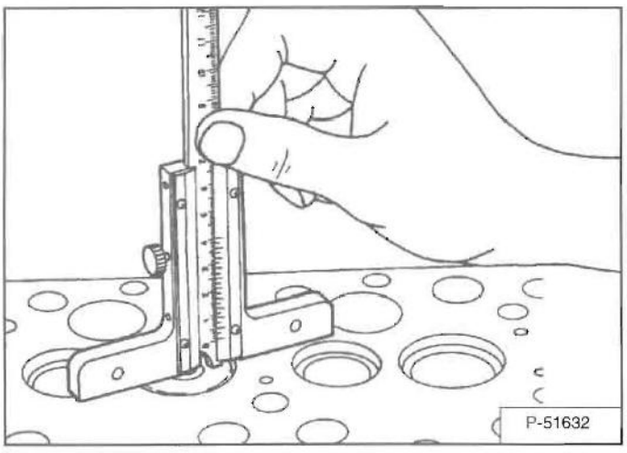
Top Clearance	0.0236-0.0276 inch (0,60-0,70 mm)

Valve Guide Checking

Remove the valve and spring from the cylinder head. (See Cylinder Head Disassembly And Assembly on Page 70-100-4.)

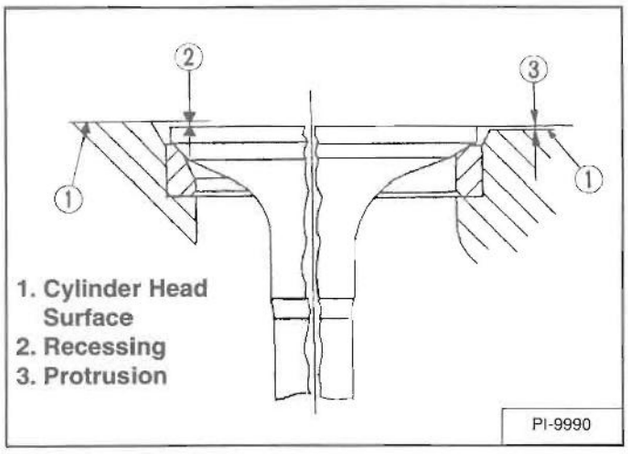
Clean the valve seat and combustion chamber.

Figure 70-100-18



Install the valve into the guide. Measure the valve recessing or protrusion with a depth gauge **[Figure 70-100-18]**.

Figure 70-100-19

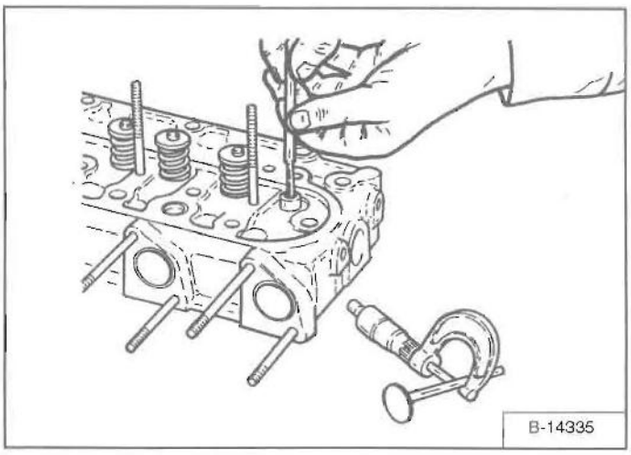


If the measurement exceeds the allowable limit, replace the valve or cylinder head **[Figure 70-100-19]**.

Protrusion	0.002 inch (0,5 mm)
Recessing	0.006 inch (0,15 mm)
Allowable Limit (Recessing)	0.016 inch (0,4 mm)

Remove the carbon from the valve guide.

Figure 70-100-20



Measure the valve stem O.D. **[Figure 70-100-20]**.

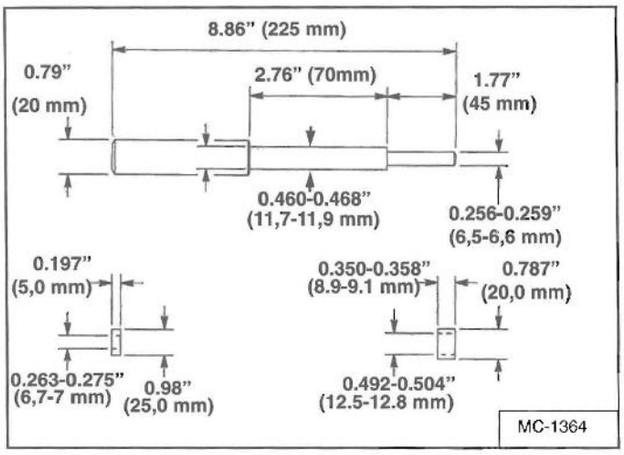
Measure the valve guide I.D. **[Figure 70-100-20]**.

Calculate the clearance. If the clearance exceeds the allowable limit, replace the valve and/or valve guide.

Valve Guide I.D.	0.3156-0.3161 inch (8,015-8,03 mm)
Valve Stem O.D.	0.3134-0.3140 inch (7,96-7,98 mm)
Clearance Between Valve Stem and Guide	0.0016-0.0028 inch (0,04-0,07 mm)
Allowable Limit	0.004 inch (0,1 mm)

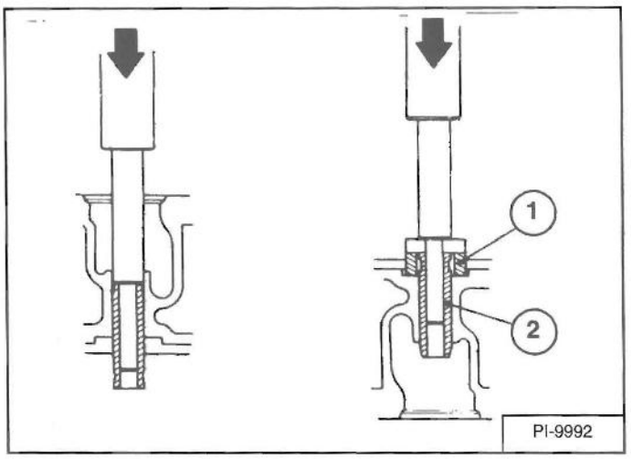
Valve Guide Checking (Cont'd)

Figure 70-100-21



To remove and replace the valve guide, make the driver tool as shown in figure **[Figure 70-100-21]**.

Figure 70-100-22



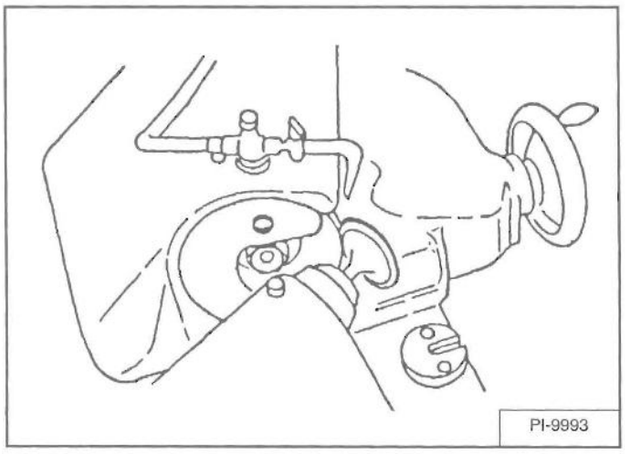
Press the used valve guide out of the cylinder head using the special driver tool **[Figure 70-100-22]**.

Put oil on the outside diameter of the new valve guide. Press the new valve guide into the cylinder head from the top side. Use the special driver tools (Items 1 & 2) **[Figure 70-100-22]**, press the new guide until the tool contacts the cylinder head.

Ream the valve guide to the correct specifications.

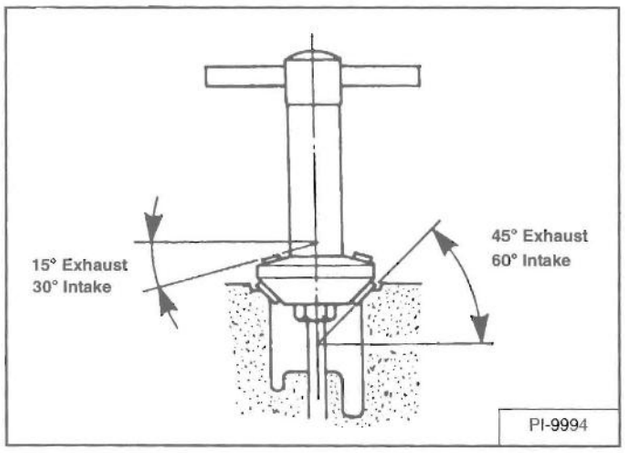
Reconditioning The Valve And Valve Seat

Figure 70-100-23



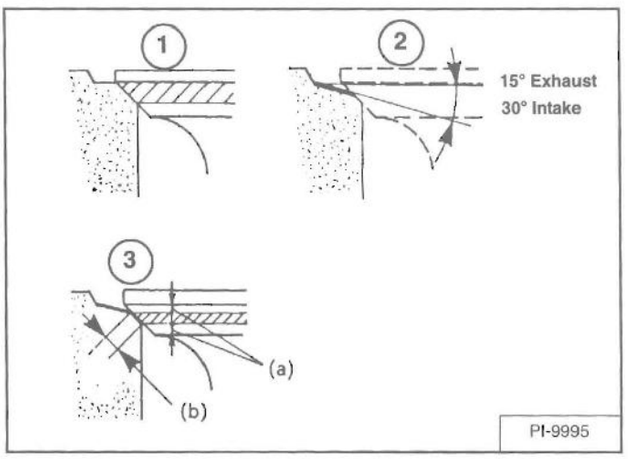
Grind the valve face to the correct angle using a valve refacer **[Figure 70-100-23]**.

Figure 70-100-24



Grind the valve seat surface in the cylinder head to the correct angle **[Figure 70-100-24]**.

Figure 70-100-25



Check the seat surface and valve face (Item 1) **[Figure 70-100-25]**.

(a) identical dimensions above and below the valve seat

If the seat surface (b) is too wide, use a 30 degree cutter (Item 2) on the intake, and a 15 degree cutter on the exhaust to get the correct width (Item 3) **[Figure 70-100-25]**.

Valve Seat Width

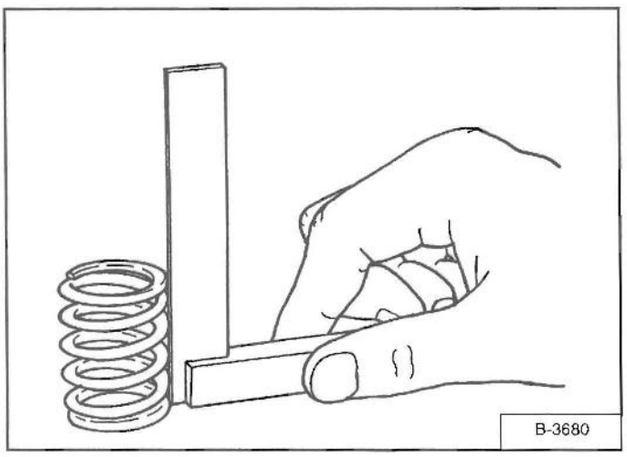
Intake	0.0835 inch (2,12 mm)
Exhaust	0.0835 inch (2,12 mm)

Valve Seat & Valve Face Angle

Intake	60°
Exhaust	45°

Valve Spring

Figure 70-100-26



Measure the length of the valve spring. If the measurement is less than the allowable limit, replace the spring **[Figure 70-100-26]**.

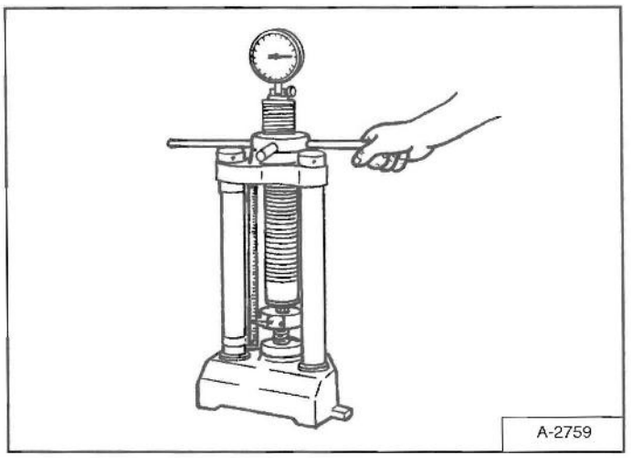
Free Length	1.642-1.661 inch (41,7-42,2 mm)
Allowable Limit	1.622 inch (41,2 mm)

Put the spring on a flat surface, place a square on the side of the spring **[Figure 70-100-26]**.

Rotate the spring and measure the maximum tilt. If the measurement excess the allowable limit, replace the spring.

Tilt Allowable Limit	0.04 inch (1,0 mm)

Figure 70-100-27



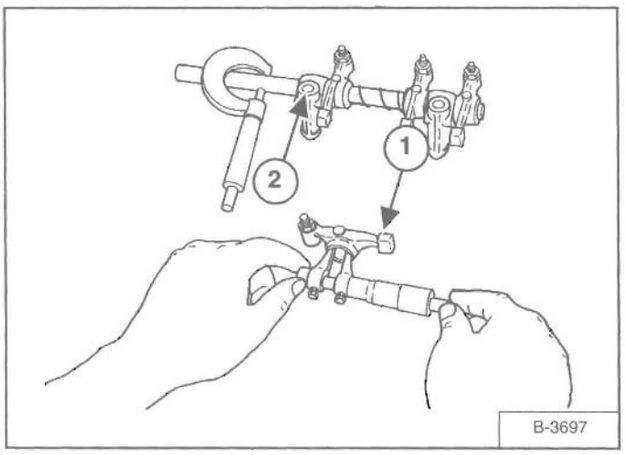
Put the spring on a tester and compress to specified length **[Figure 70-100-27]**.

Read the compressed load on the gauge. If the measurement exceeds allowable limit, replace the spring.

Setting Length	1.378 inch (35,0 mm)
Setting Load	26.4 lbs. (117,6 N)
Allowable Limit	22.5 lbs. (100,0 N)

Rocker Arm And Shaft Checking

Figure 70-100-28



Measure the rocker arm I.D. (Item 1) **[Figure 70-100-28]** with an inside micrometer.

Measure the rocker arm shaft O.D. (Item 2) **[Figure 70-100-28]** with an outside micrometer.

If the clearance exceeds the allowable limit, replace the bushing.

If the clearance still exceeds the allowable limit after the bushing is replaced, replace the rocker arm shaft.

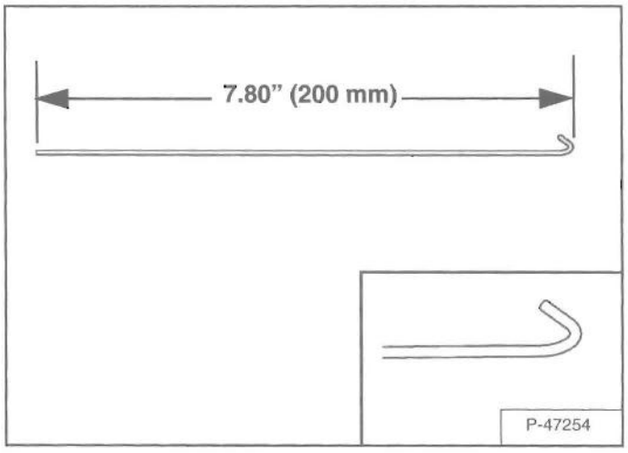
Oil Clearance Between Rocker Arm & Shaft	0.0006-0.0018 inch (0,016-0,045 mm)
Allowable Limit	0.004 inch (0,10 mm)
Rocker Arm Shaft O.D.	0.5501-0.5506 inch (13,973-13,984 mm)
Rocker Arm I.D.	0.5512-0.5519 inch (14,000-14,018 mm)

Timing Gearcase Cover Removal And Installation

Remove the fuel injection pump. (See Contents, Page 70-01.)

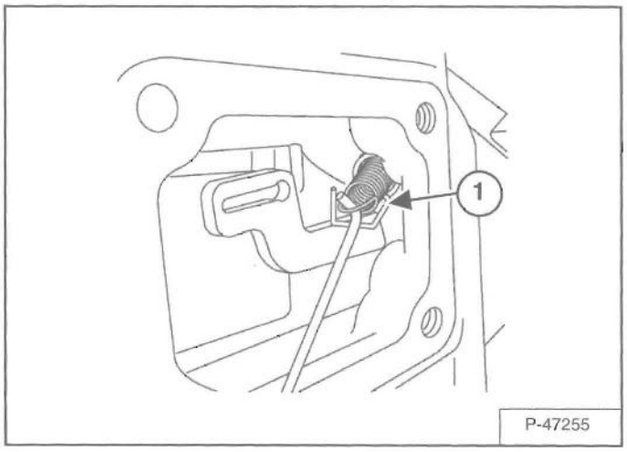
Remove the cylinder head, rocker arms and push rods. (See Cylinder Head Removal And Installation on Page 70-100-1.)

Figure 70-100-29



Bend a hook on the end of a 7.80 inch (200 mm) long, 0.050 inch (1.2 mm) diameter hard wire **[Figure 70-100-29]**.

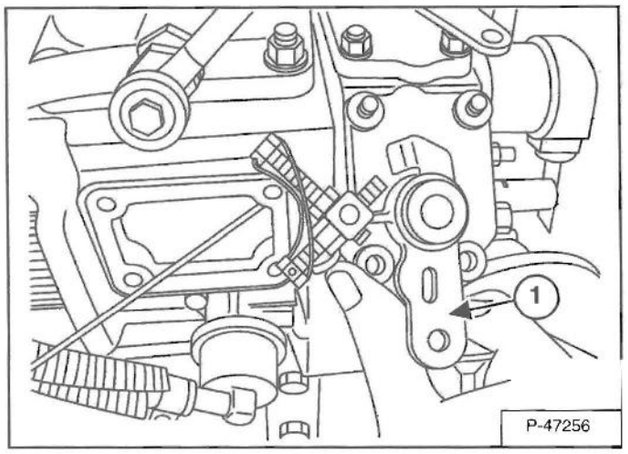
Figure 70-100-30



Disconnect the two governor springs (Item 1) **[Figure 70-100-30]**.

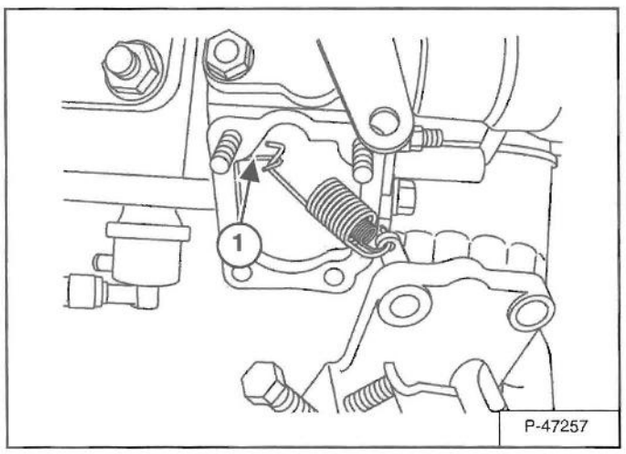
Timing Gearcase Cover Removal And Installation (Cont'd)

Figure 70-100-31



Remove the speed control plate (Item 1) **[Figure 70-100-31]**.

Figure 70-100-32



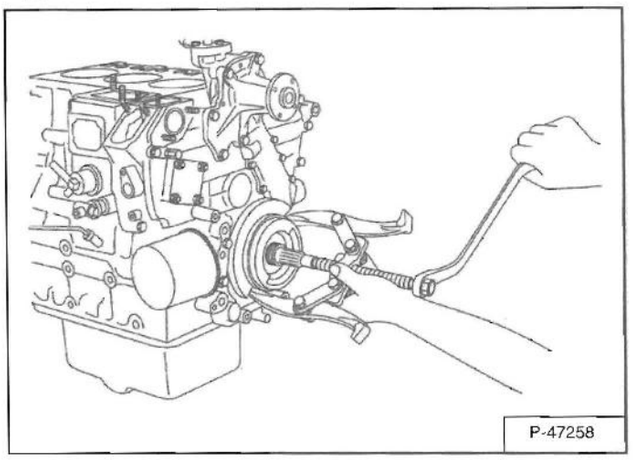
Remove the wire (Item 1) **[Figure 70-100-32]** from the springs.

Installation: Do not drop the governor springs into the gear case.

Remove the crankshaft pulley nut.

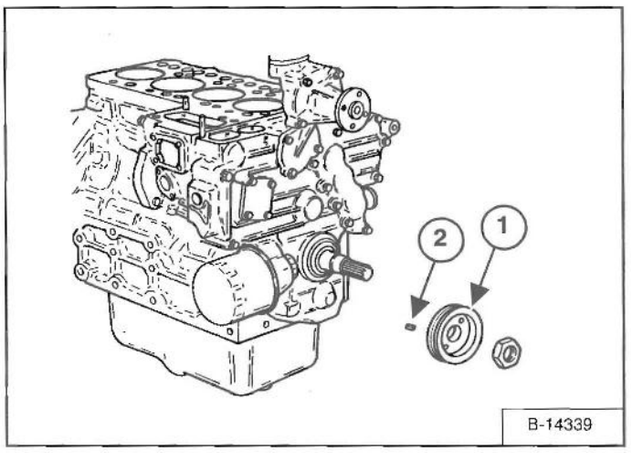
Installation: Tighten the nut to 101-116 ft.-lbs. (137-157 Nm) torque.

Figure 70-100-33



Use a puller and remove the crankshaft pulley. **[Figure 70-100-33]**.

Figure 70-100-34



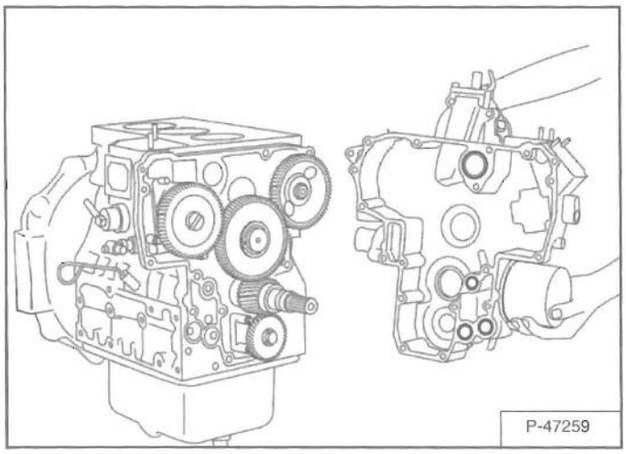
Remove the crankshaft pulley (Item 1) and key (Item 2) **[Figure 70-100-34]**.

Remove the bolts from the timing gearcase cover.

Installation: Tighten the bolts to 13-15 ft.-lbs. (18-20 nm) torque.

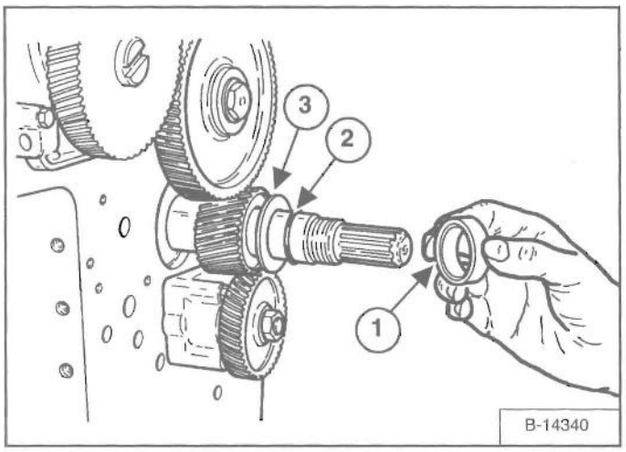
Timing Gearcase Cover Removal And Installation (Cont'd)

Figure 70-100-35



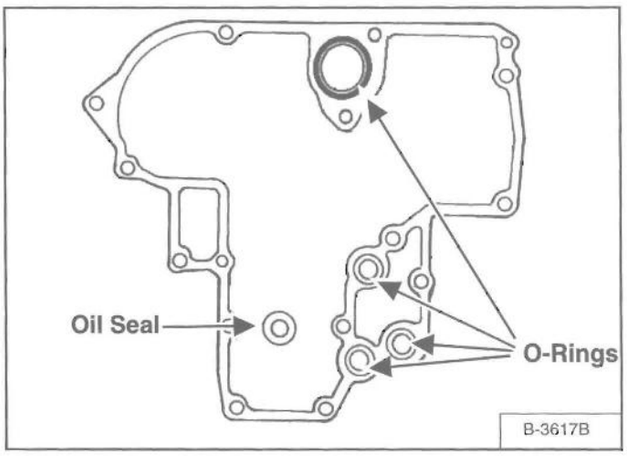
Remove the timing gearcase cover **[Figure 70-100-35]**.

Figure 70-100-36



Remove the crankshaft collar (Item 1), O-ring (Item 2) and oil slinger (Item 3) **[Figure 70-100-36]**.

Figure 70-100-37



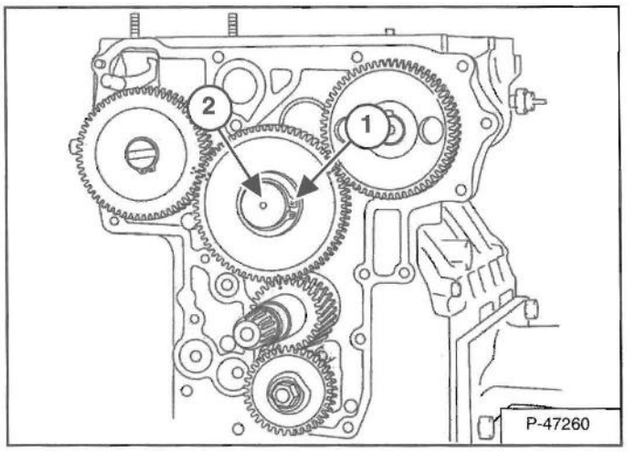
Installation: Install new O-rings and oil seal into the timing gearcase cover **[Figure 70-100-37]**. Lubricate the oil seal.

Before installing the gear case gasket, apply a non-drying adhesive.

Idler Gear And Camshaft Removal And Installation

Remove the timing gearcase cover. (See Timing Gearcase Cover Removal And Installation on Page 70-100-10.)

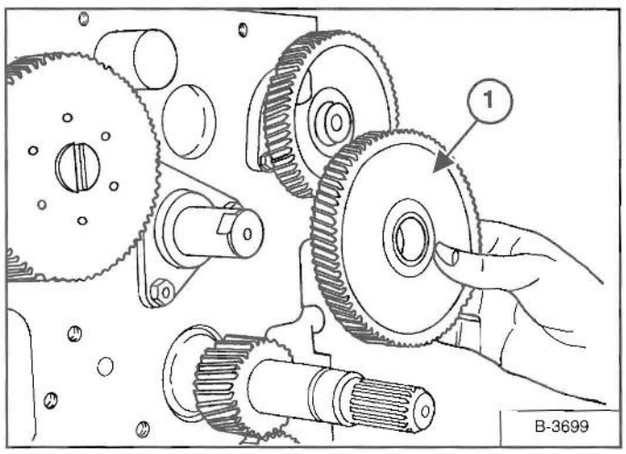
Figure 70-100-38



Remove the snap ring (Item 1) and collar from the idler gear shaft (Item 2) **[Figure 70-100-38]**.

Installation: Make sure the timing marks are in correct alignment when installing the timing gears **[Figure 70-100-38]**.

Figure 70-100-39

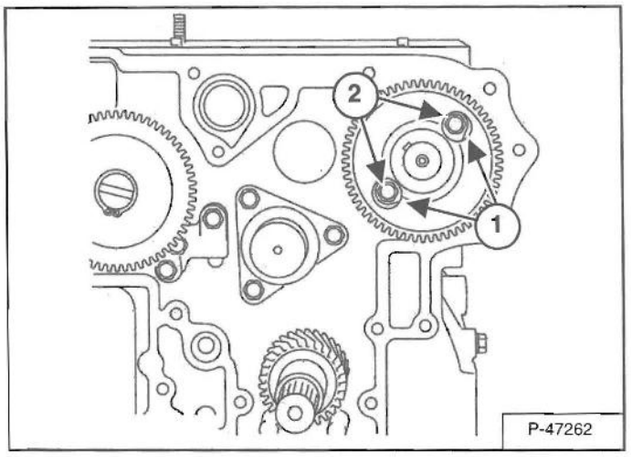


Remove the idler gear (Item 1) **[Figure 70-100-39]**.

Installation: Check the idler gear end play. If the clearance exceeds the allowable limit, replace the gear collar.

Idler Gear End Play	0.0047-0.0189" (0.12-0.48 mm)
Allowable Limit	0.035" (0,9 mm)

Figure 70-100-40

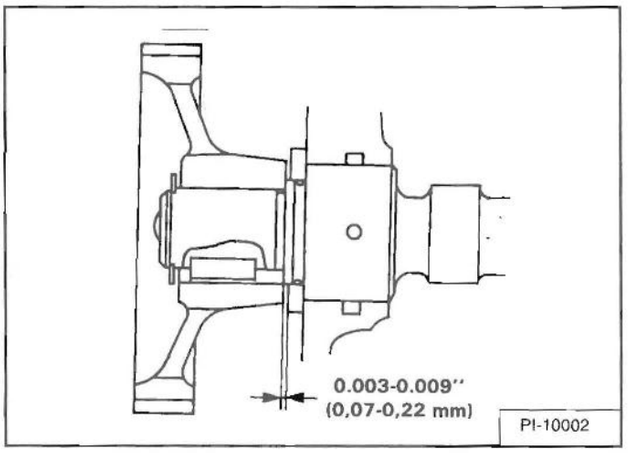


Align the holes (Item 1) on the camshaft gear with the camshaft retainer plate bolts (Item 2) **[Figure 70-100-40]**. Remove the bolts.

Installation: Tighten the camshaft retainer bolts to 17-20 ft.-lbs. (23-27 Nm) torque.

Remove the camshaft from the engine block.

Figure 70-100-41

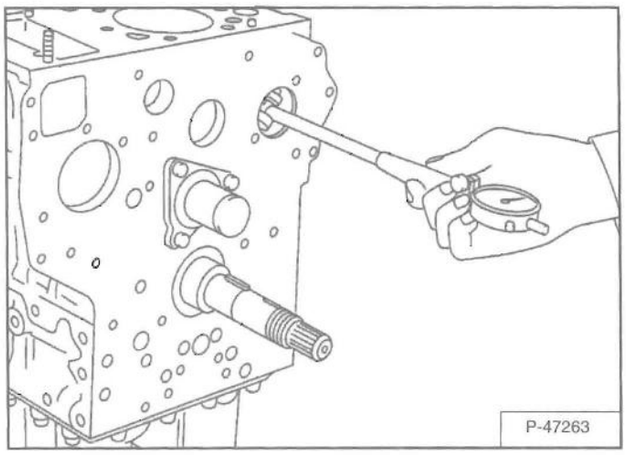


Installation: Check the camshaft end play. If clearance exceeds the allowable limit, replace the camshaft retainer plate **[Figure 70-100-41]**.

Camshaft End Play	0.003-0.009 inch (0,07-0,22 mm)
Allowable Limit	0.012 inch (0,3 mm)

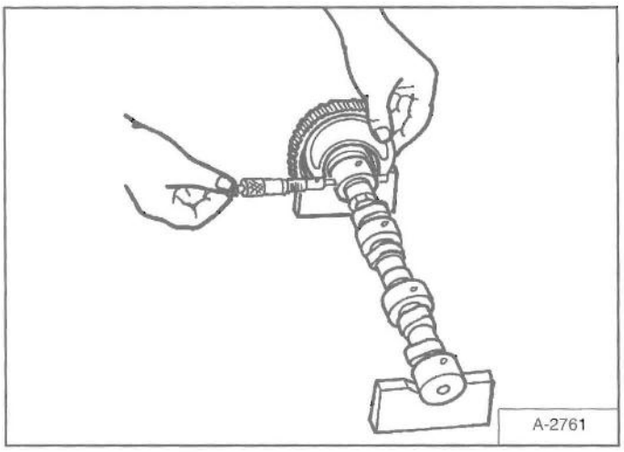
Camshaft Servicing

Figure 70-100-42



Measure the cylinder block bore in the engine block **[Figure 70-100-42]**.

Figure 70-100-43

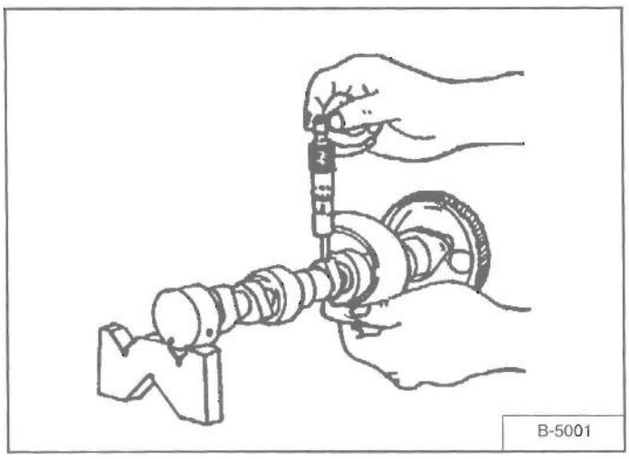


Measure the camshaft journal **[Figure 70-100-43]**.

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

Cylinder Block Bore I.D.	1.575-1.576 inch (40,0-40,03 mm)
Journal O.D.	1.572-1.573 inch (39,93-39,95 mm)
Oil Clearance of Camshaft Journal	0.002-0.004 inch (0,05-0,09 mm)
Allowable Limit	0.006 inch (0,15 mm)

Figure 70-100-44

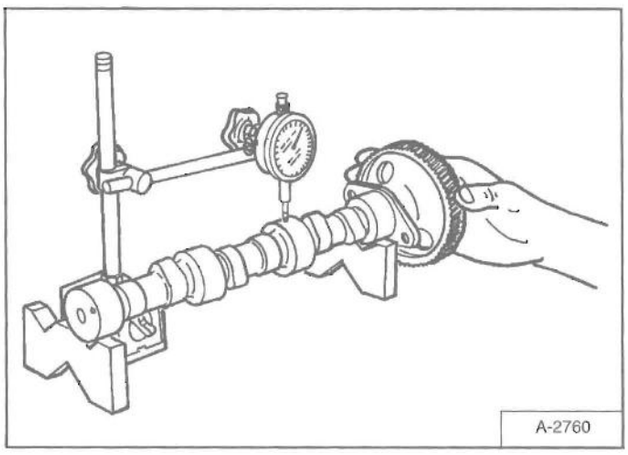


Measure the cam lobes at their highest point **[Figure 70-100-44]**.

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

Cam Lobe Height	1.335 inch (33,9 mm)
Allowable Limit	1.332 inch (33,85 mm)

Figure 70-100-45



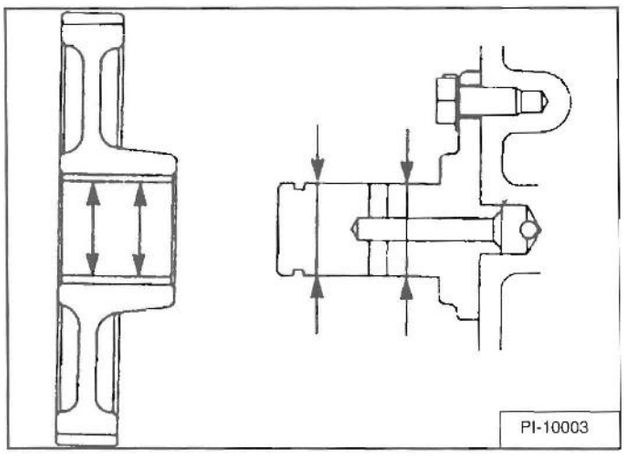
Put the camshaft in V-blocks. Install a dial indicator **[Figure 70-100-45]**.

Turn the camshaft at a slow rate. If the misalignment exceeds the allowable limit, replace the camshaft.

Camshaft Alignment Allowable Limit	0.0004 inch (0,01 mm)

Idler Gear And Shaft Servicing

Figure 70-100-46



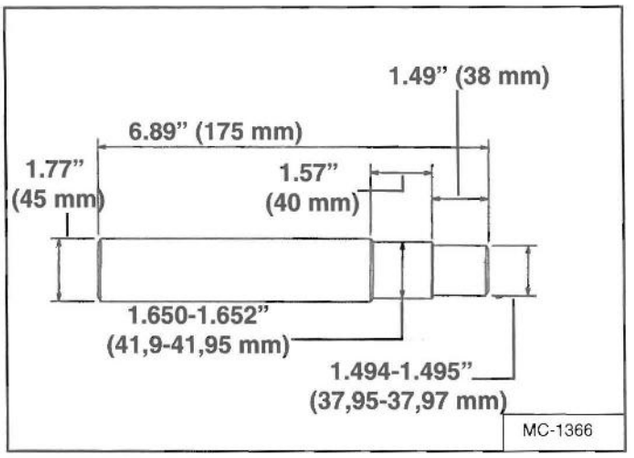
Measure the O.D. of the idler gear shaft **[Figure 70-100-46]**.

Measure the I.D. of the idler gear bushing **[Figure 70-100-46]**.

If the clearance exceeds the allowable limit, replace the bushing.

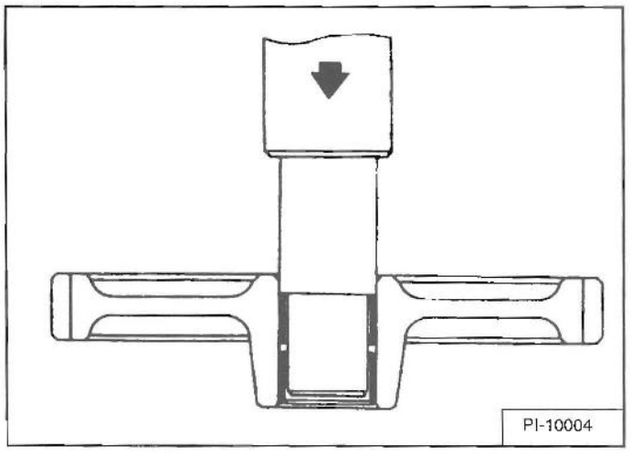
Idler Gear Shaft O.D.	1.494-1.495 inch (37,96-37,98 mm)
Idler Gear Bushing I.D.	1.496-1.497 inch (38,0-38,03 mm)
Clearance Between Idler Shaft & Gear Bushing	0.001-0.003 inch (0,025-0,07 mm)
Allowable Limit	0.004 inch (0,1 mm)

Figure 70-100-47



To replace the idler gear bushing, make a driver tool as shown in figure **[Figure 70-100-47]**.

Figure 70-100-48

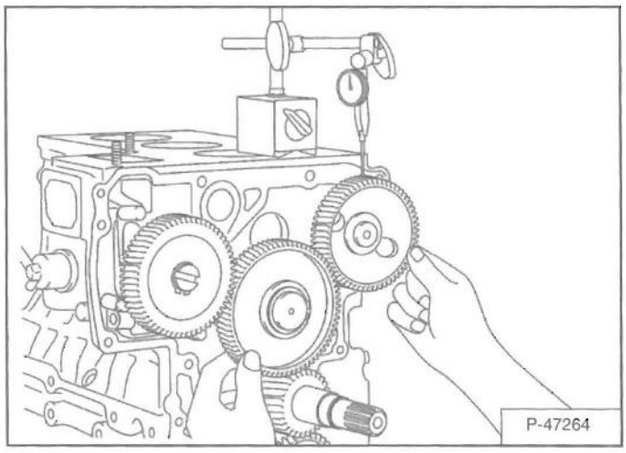


Use a press and special driver tool, to remove the old bushing and install the new bushing **[Figure 70-100-48]**.

Timing Gears Checking Backlash

When the gears are installed, check the backlash of the gears.

Figure 70-100-49



Install a dial indicator **[Figure 70-100-49]**.

Hold one gear while turning the other gear **[Figure 70-100-49]**.

If the backlash exceeds the allowable limit, check the oil clearance of the shaft and gear. If the oil clearance is correct, replace the gear.

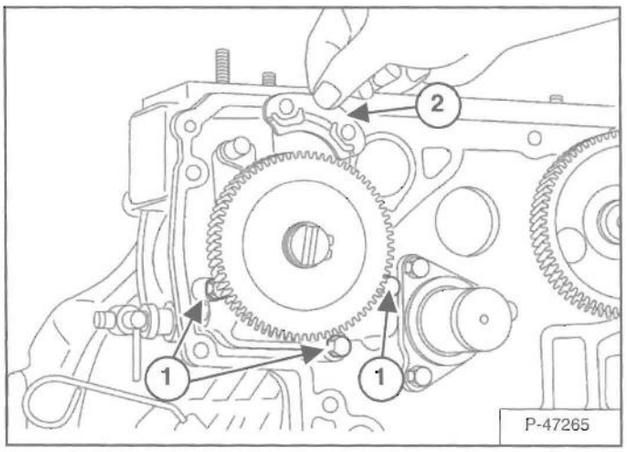
Crank Gear & Idler Gear	0.002-0.004 inch (0,042-0,10)
Allowable Limit	0.006 inch (0,15 mm)
Cam Gear & Idler Gear	0.002-0.005 inch (0,042-0,12 mm)
Allowable Limit	0.006 inch (0,15 mm)
Injection Pump Gear & Idler Gear	0.002-0.005 inch (0,042-0,115 mm)
Allowable Limit	0.006 inch (0,15 mm)
Oil Pump Gear & Crankgear	0.002-0.004 inch (0,042-0,109 mm)
Allowable Limit	0.006 inch (0,15 mm)

Fuel Camshaft Removal And Installation

Remove the timing gearcase cover. (See Timing Gearcase Cover Removal And Installation on Page 70-100-10.)

Remove the idler gear. (See Idler Gear And Camshaft Removal And Installation on Page 70-100-13.)

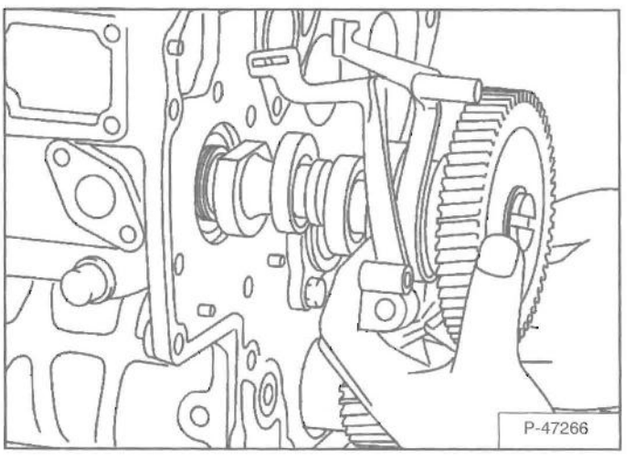
Figure 70-100-50



Remove the three bolts (Item 1) **[Figure 70-100-50]**.

Remove the two bolts and fuel camshaft retainer plate (Item 2) **[Figure 70-100-50]**.

Figure 70-100-51

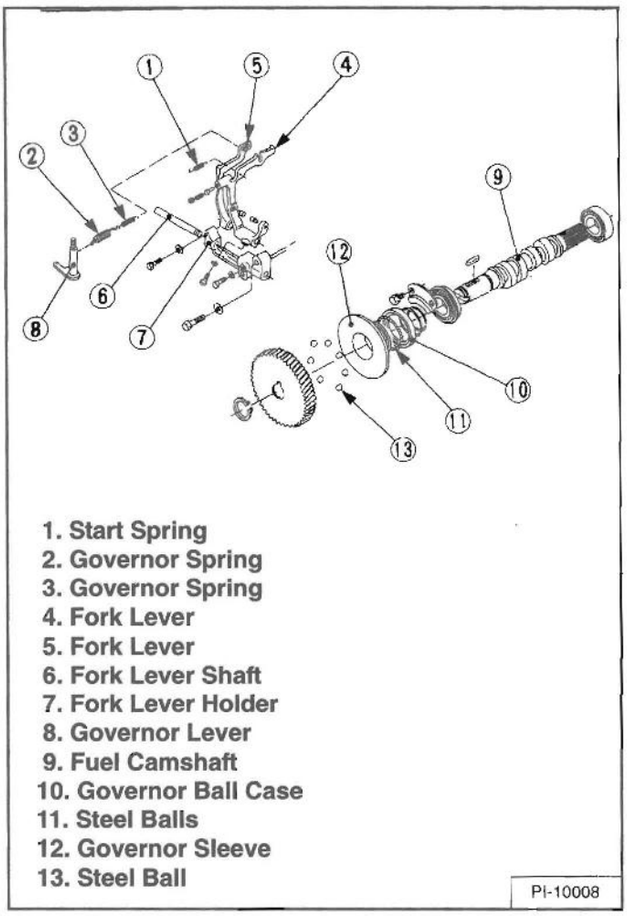


Remove the fuel camshaft and fork lever assembly at the same time **[Figure 70-100-51]**.

Fuel Camshaft Governor

The governor serves to keep the engine speed constant by automatically adjusting the amount of fuel supplied to the engine according to changes in the load.

Figure 70-100-52



1. Start Spring
2. Governor Spring
3. Governor Spring
4. Fork Lever
5. Fork Lever
6. Fork Lever Shaft
7. Fork Lever Holder
8. Governor Lever
9. Fuel Camshaft
10. Governor Ball Case
11. Steel Balls
12. Governor Sleeve
13. Steel Ball

PI-10008

Disassemble and assemble the governor and fuel camshaft as shown in figure **[Figure 70-100-52]**.

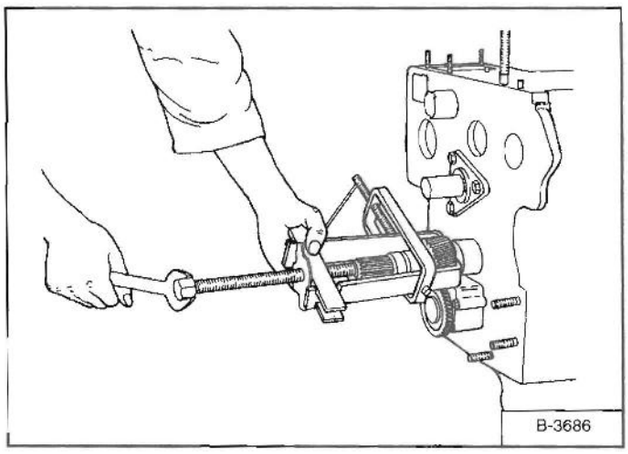
Check all the parts for wear or damage and replace as needed.

Crankshaft Gear Removal And Installation

Remove the timing gearcase cover. (See Timing Gearcase Cover Removal And Installation on Page 70-100-10.)

Remove the idler gear. (See Idler Gear And Camshaft Removal And Installation on Page 70-100-13.)

Figure 70-100-53



B-3686

Remove the crankshaft gear with a puller **[Figure 70-100-53]**.

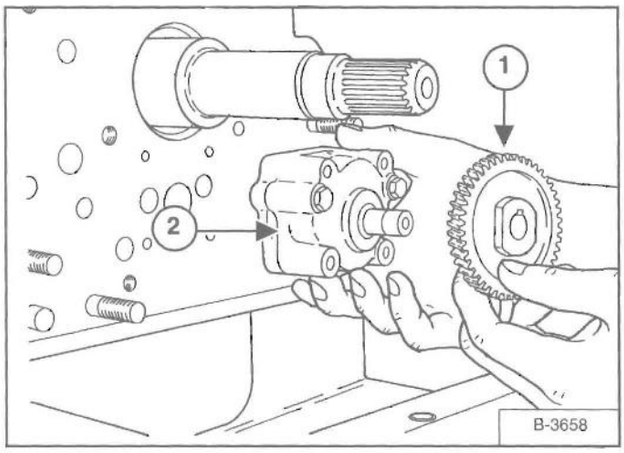
Remove the crankshaft key.

Oil Pump Removal And Installation

Remove the timing gearcase cover. (See Timing Gearcase Cover Removal And Installation on Page 70-100-10.)

Remove the crankshaft gear.

Figure 70-100-54



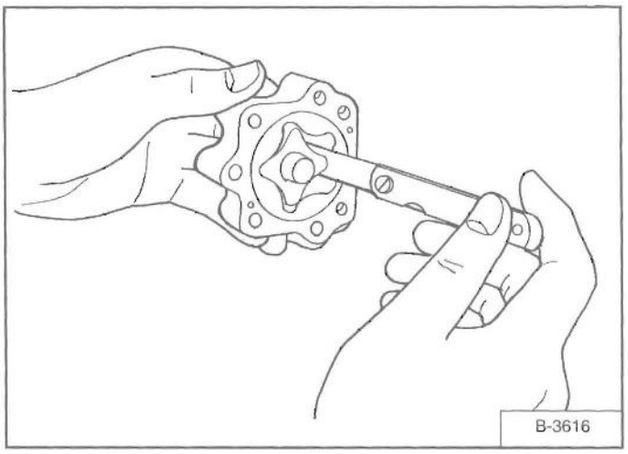
Remove the nut from the oil pump shaft. Use a puller to remove the oil pump gear (Item 1) **[Figure 70-100-54]**.

Remove the oil pump mounting bolts. Remove the oil pump (Item 2) **[Figure 70-100-54]**.

Installation: Tighten the oil pump mounting bolts to 60-72 in.-lbs. (6,9-8,1 Nm) torque.

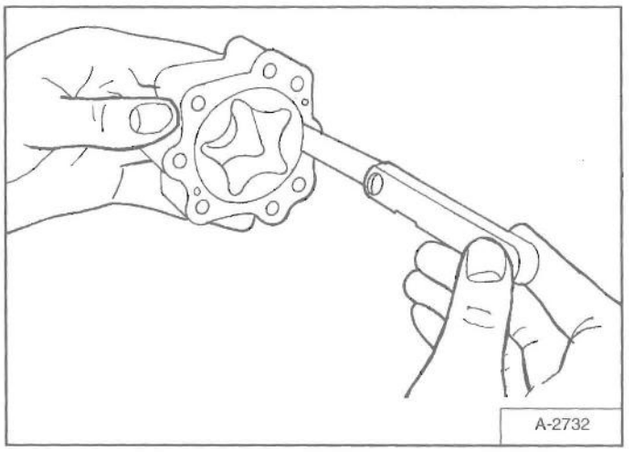
Oil Pump Service

Figure 70-100-55



Measure the clearance between the lobes of the inner rotor and outer rotor **[Figure 70-100-55]**.

Figure 70-100-56



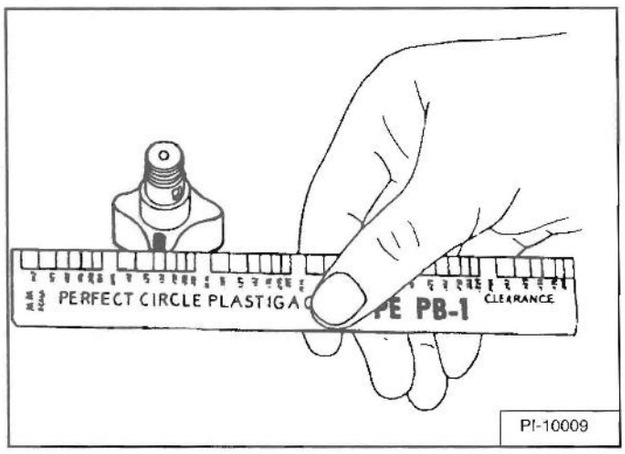
Measure the clearance between the outer rotor and pump body **[Figure 70-100-56]**.

If the clearance exceeds the allowable limit, replace the oil pump.

Clearance Between Inner & Outer Rotor
0.0012-0.006 inch
(0,03-0,14 mm)
Clearance Between Outer Rotor & Body
0.004-0.008 inch
(0,11-0,19 mm)

Oil Pump Service (Cont'd)

Figure 70-100-57



Put a piece of press gauge on the rotor face **[Figure 70-100-57]**.

Install the cover and tighten the bolts.

Remove the cover carefully. Measure the width of the press gauge **[Figure 70-100-57]**.

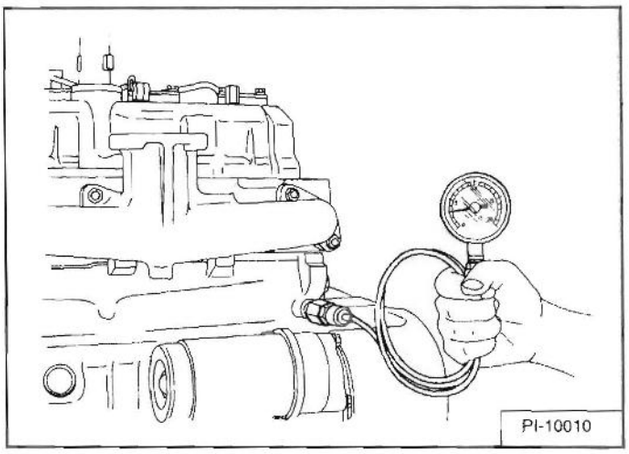
If the clearance exceeds the allowable limit replace the oil pump.

End Clearance	0.004-0.006 inch (0,11-0,15 mm)

Checking Engine Oil Pressure

Remove the oil pressure sender.

Figure 70-100-58



Install a pressure gauge **[Figure 70-100-58]**.

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

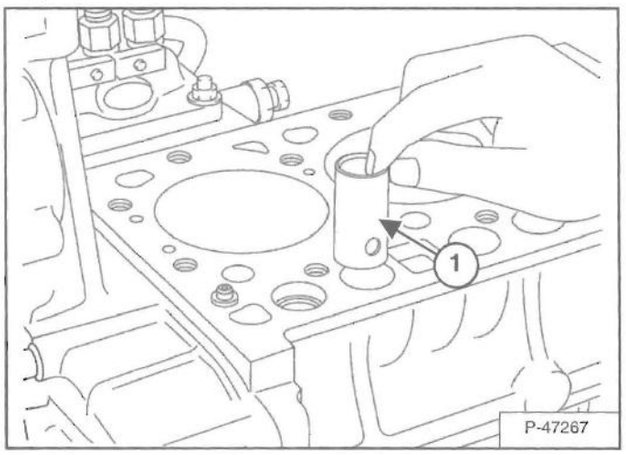
If the oil pressure is less than the allowable limit, check the following items:

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

At Idle Speed Allowable Limit	7 PSI (0.50 Bar)
At Rated Speed	43-64 PSI (2.94-4.41 Bar)
Allowable Limit	36 PSI (2.48 Bar)

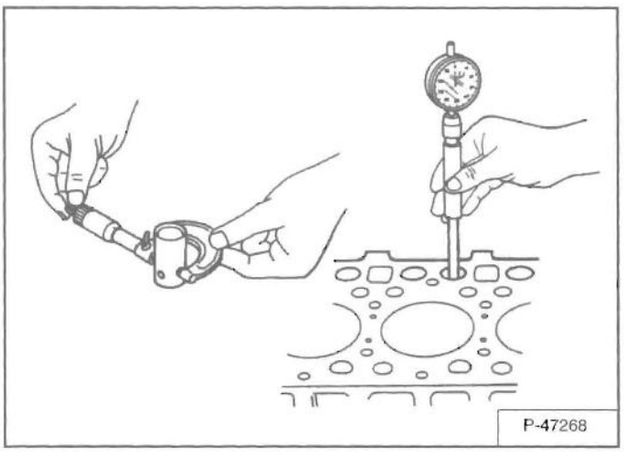
Valve Tappets

Figure 70-100-59



Remove the valve tappets (Item 1) **[Figure 70-100-59]**.

Figure 70-100-60



Measure the O.D. of the tappet **[Figure 70-100-60]**.

Measure the ID of the tappet bore **[Figure 70-100-60]**.

If the clearance exceeds the allowable limit, replace the tappets.

Tappet OD	0.943-0.944 inch (23,96-23,98mm)
Tappet Bore ID	0.945-0.946 inch (24-24,02 mm)
Clearance Between Tappet and Tappet Bore	0.0008-0.0024 inch (0,02-0,06 mm)
Allowable limit	0.003 inch (0,07 mm)

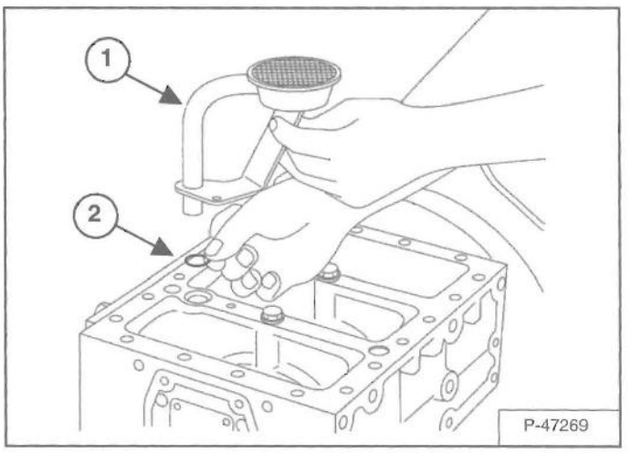
Piston And Connecting Rod Removal And Installation

Remove the cylinder head. (See Cylinder Head Removal And Installation on Page 70-100-1.)

Remove the top edge from the cylinder bore with a ridge reamer.

Remove the oil pan.

Figure 70-100-61



Remove the oil pump strainer (Item 1) and O-ring (Item 2) **[Figure 70-100-61]** by tapping the edge of the strainer with a soft faced hammer.

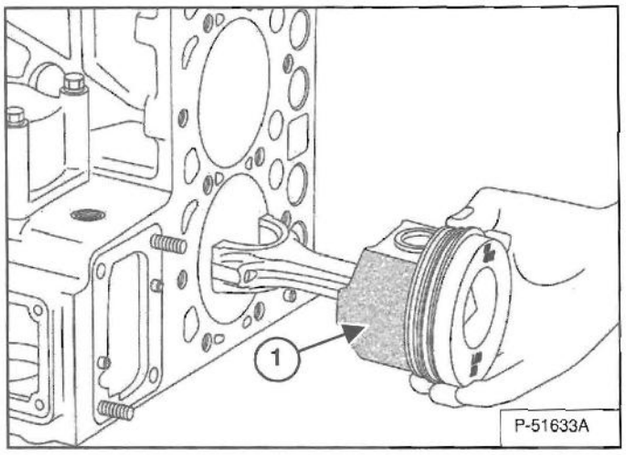
Turn the flywheel and put a pair of connecting rods at bottom dead center.

Remove the connecting rod bolts.

Installation: Tighten the connecting rod bolts to 33-36 ft.-lbs. (44-49 Nm) torque.

Piston And Connecting Rod Removal And Installation (Cont'd)

Figure 70-100-62



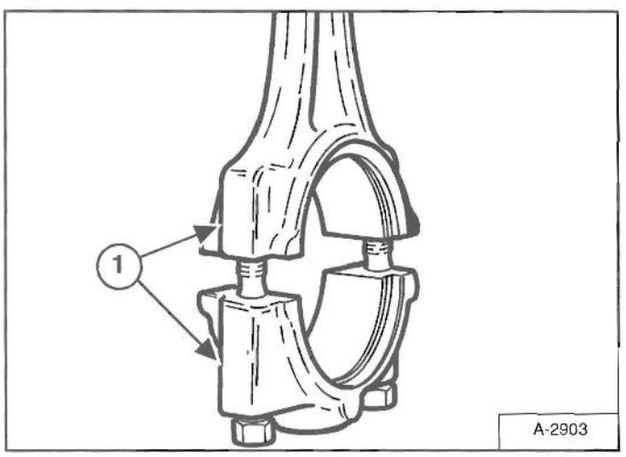
Remove the rod cap and bearing **[Figure 70-100-62]**.

Use a hammer handle and push the piston/connecting rod assembly out of the cylinder bore **[Figure 70-100-62]**.

NOTE: Make sure the pistons are marked so they will be returned to the same cylinder bore.

Installation: Do not damage the piston skirt (Item 1) **[Figure 70-100-62]** when installing piston assembly.

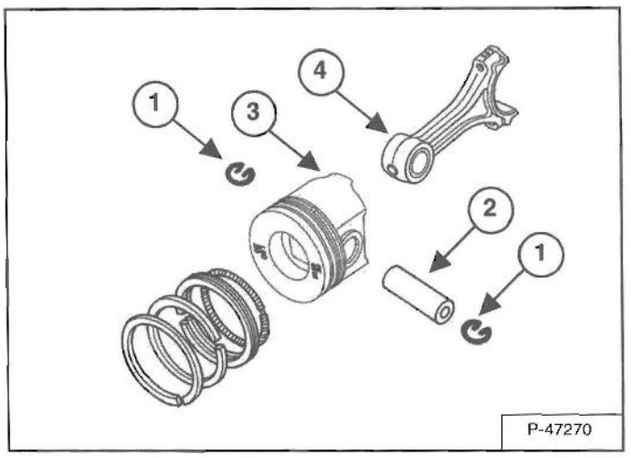
Figure 70-100-63



Installation: Make sure the marks on the connecting rod and bearing are aligned when installing the bearing cap **[Figure 70-100-63]**.

Repeat the procedure to remove the other piston/ connecting rod assemblies from the engine block.

Figure 70-100-64

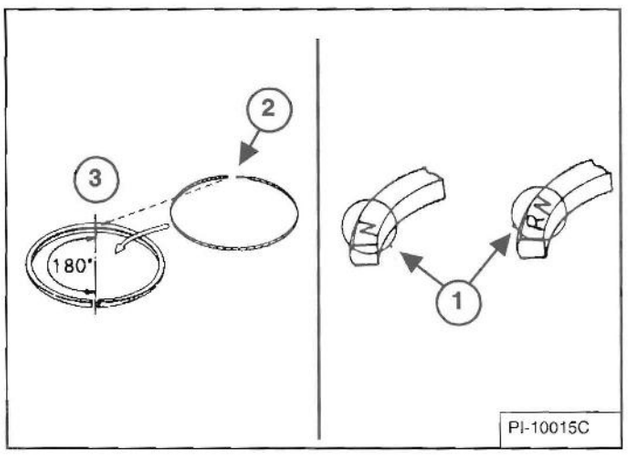


Remove the piston rings **[Figure 70-100-64]**.

Remove the snap ring (Item 1) and piston pin (Item 2) **[Figure 70-100-64]**.

Separate the piston (Item 3) from the connecting rod (Item 4) **[Figure 70-100-64]**.

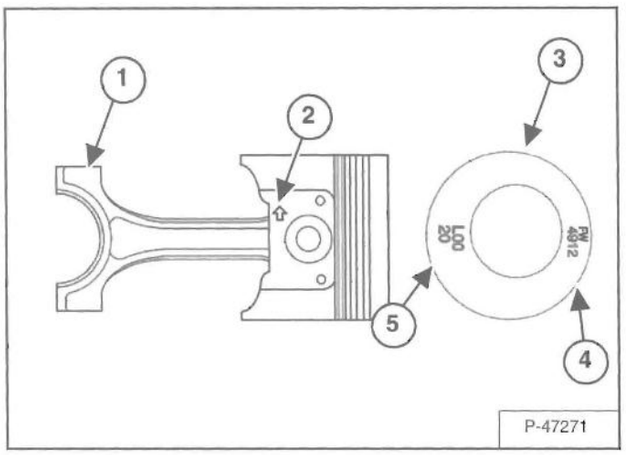
Figure 70-100-65



Installation: When installing new rings, assemble the ring so the mark (Item 1) near the gap faces the top of the piston. When installing the oil ring, place the expander joint (Item 2) on the opposite side of the oil ring gap (Item 3) **[Figure 70-100-65]**.

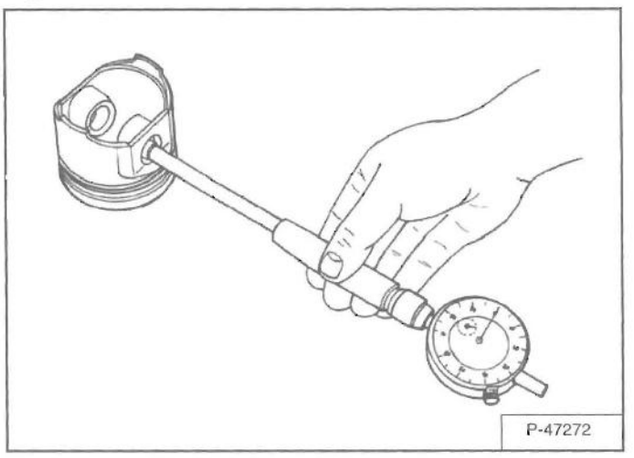
Piston And Connecting Rod Removal And Installation (Cont'd)

Figure 70-100-66



Installation: When reassembling, align the marks (Item 1) on the connecting rod and piston (Item 2). Heat the piston in clean engine oil to 176° F. (80° C.) and tap the piston pin into position. Place the piston rings so that there are gaps every 120° (Items 3, 4 & 5) **[Figure 70-100-66]** with no gap facing the piston pin in the cylinder.

Figure 70-100-67

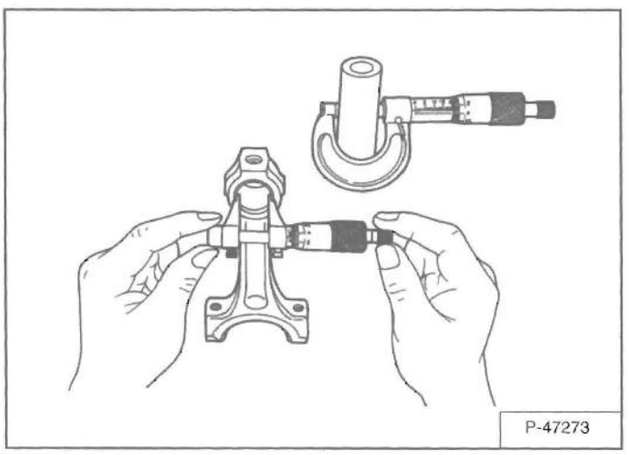


Measure the I.D. of the piston pin bore in both horizontal and vertical directions **[Figure 70-100-67]**.

If the measurement exceeds the allowable limit, replace the piston.

Piston Bore I.D.	0.98425-0.9876 inch (25,000-25,013 mm)
Allowable Limit	0.9862 inch (25,05 mm)

Figure 70-100-68



Measure the O.D. of the piston pin (Item 1) **[Figure 70-100-68]**.

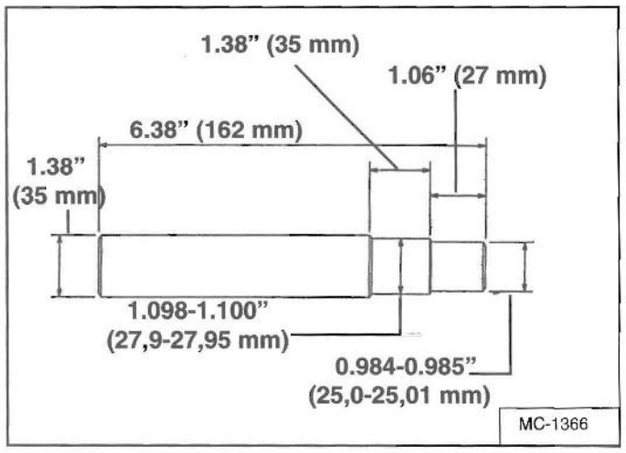
Measure the I.D. of the connecting rod small end (Item 2) **[Figure 70-100-68]**.

Piston And Connecting Rod Servicing (Cont'd)

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

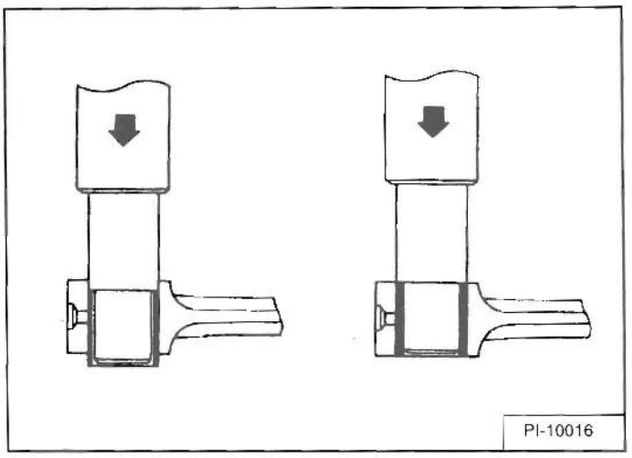
Piston Pin O.D.	0.984-0.985 inch (25,0-25,011 mm)
Bushing I.D.	0.985-0.986 inch (25,03-25,04 mm)
Oil Clearance Between Piston Pin & Bushing	0.0006-0.0015 inch (0,014-0,038 mm)
Allowable Limit	0.006 inch (0,15 mm)

Figure 70-100-69



To replace the connecting rod small end bushing, make a driver tool as shown in figure **[Figure 70-100-69]**.

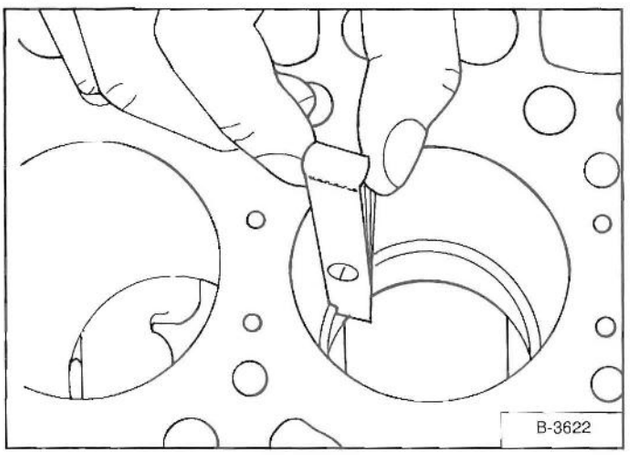
Figure 70-100-70



Use a press and special driver tool to remove the small end bushing **[Figure 70-100-70]**.

Installation: Clean the small end bushing and bore. Put oil on the bushing and press into the connecting rod until it is flush **[Figure 70-100-70]**.

Figure 70-100-71



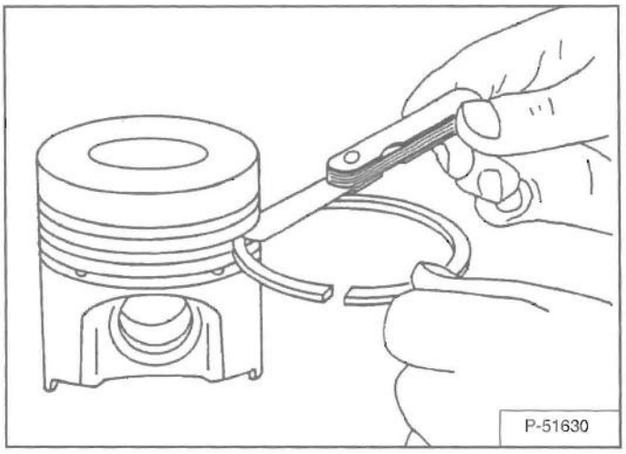
Install a piston ring into the lower part of the cylinder bore. Measure the ring gap with a feeler gauge **[Figure 70-100-71]**.

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

Top Ring Gap	0.0079-0.0138 inch (0,20-0,35 mm)
Oil Ring Gap	0.0079-0.0157 inch (0,20-0,40 mm)
Allowable Limit	0.0492 inch (1,25 mm)
Second Ring Gap	0.0138-0.0197 inch (0.35-0,50 mm)

Piston And Connecting Rod Servicing (Cont'd)

Figure 70-100-72



Remove the carbon from the ring grooves. Measure the clearance between the ring and groove with a feeler gauge **[Figure 70-100-72]**.

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

Top Ring	0.0020-0.0035 inch (0,050-0,090 mm)
Second Ring	0.0020-0.0035 inch (0,050-0,090 mm)
Allowable Limit	0.0079 inch (0,2 mm)
Oil Ring	0.0012-0.0028 inch (0,030-0,070 mm)
Allowable Limit	0.0059 inch (0,15 mm)

Connecting Rod Alignment

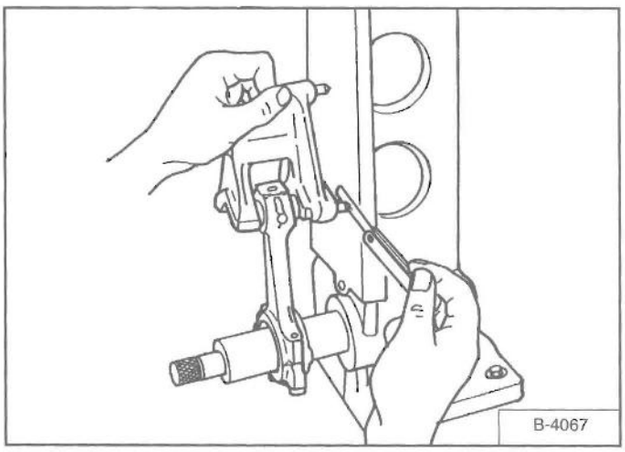
NOTE: The small end bushing is the basis of this check, check the bushing for wear before doing this check.

Install the piston pin into the connecting rod.

Install the connecting rod on an alignment tool.

Put the gauge over the piston pin and move it against the face plate.

Figure 70-100-73



If the gauge does not fit squarely against the face plate, measure the space between the gauge and face plate **[Figure 70-100-73]**.

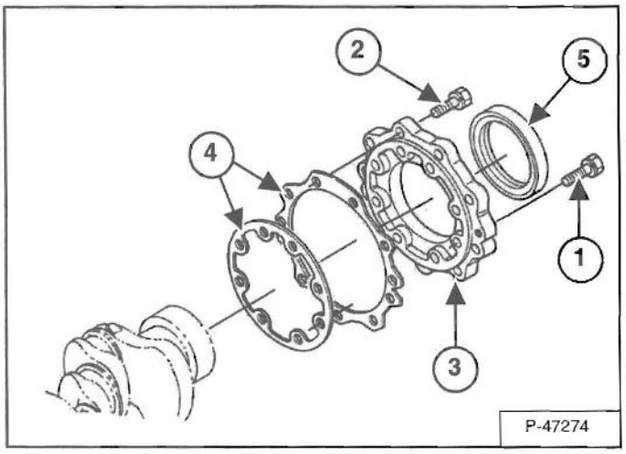
If the measurement exceeds the allowable limit, replace the connecting rod.

Rod Alignment	0.002 inch (0,05 mm)

Crankshaft And Bearings Removal And Installation

Remove the piston and connecting rod assemblies. (See Piston And Connecting Rod Removal And Installation on Page 70-100-20.)

Figure 70-100-74



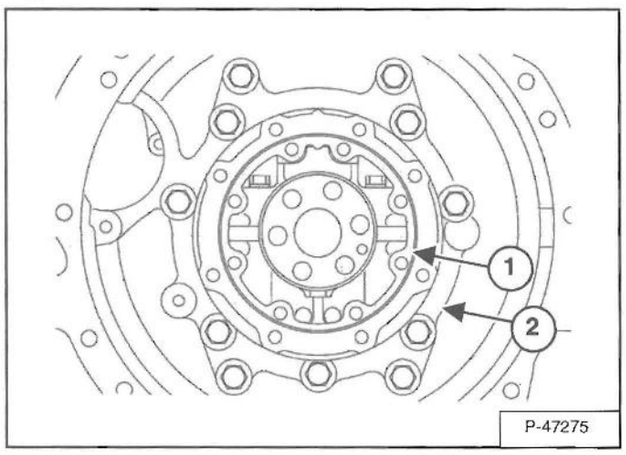
Mark and remove the inside screws (Item 1) first, then remove the outside screws (Item 2) **[Figure 70-100-74]**.

NOTE: The inside bolts are different length than the outside bolts.

Install two screws in the bearing case cover and remove the cover (Item 3) **[Figure 70-100-74]**.

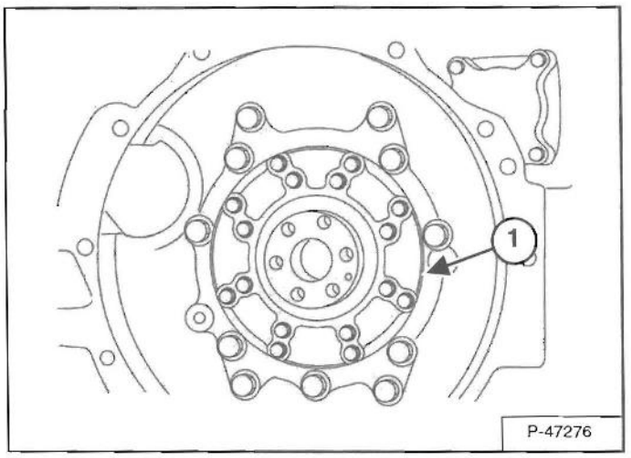
Remove the two gaskets (Item 4) and oil seal (Item 5) **[Figure 70-100-74]** from the cover.

Figure 70-100-75



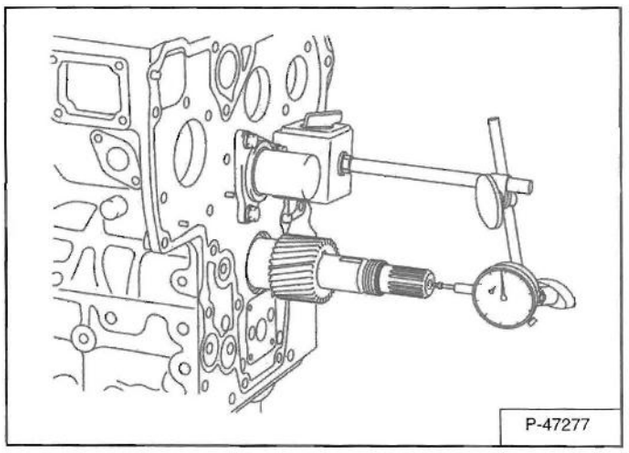
Installation: Install the gaskets (Item 1) & (Item 2) **[Figure 70-100-75]** as shown.

Figure 70-100-76



Install the bearing case cover (Item 1) **[Figure 70-100-76]** with the casting mark in the upward position. Tighten the bolts to 17-20 ft.-lbs. (23.5-27.5 Nm) torque.

Figure 70-100-77



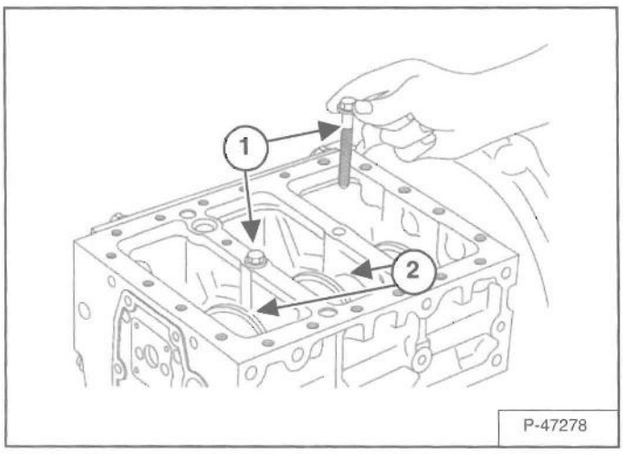
Before removing the crankshaft/main bearings, check the end play. Install a dial indicator. Move the crankshaft **[Figure 70-100-77]** to the flywheel side, zero the dial indicator. Measure the end play by pulling the crankshaft toward the gear case side.

If the measurement exceeds the allowable limit, replace the thrust washers **[Figure 70-100-77]**.

End Play	0.0059-0.0138 inch (0,15-0,35 mm)
Allowable Limit	0.0197 inch (0,5 mm)

Crankshaft And Bearings Removal And Installation (Cont'd)

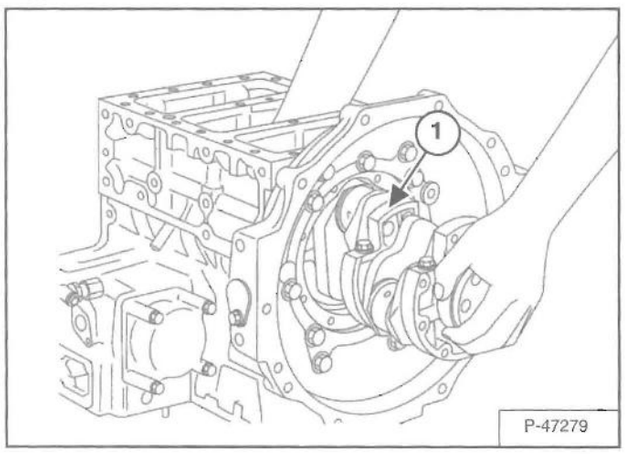
Figure 70-100-78



Remove the main bearing case bolt (Item 1) **[Figure 70-100-78]**.

Installation: Align the bearing case hole (Item 2) **[Figure 70-100-78]** with the hole in the block. Put oil on the bolt threads and tighten to 51-54 ft.-lbs. (69-73 Nm) torque.

Figure 70-100-79

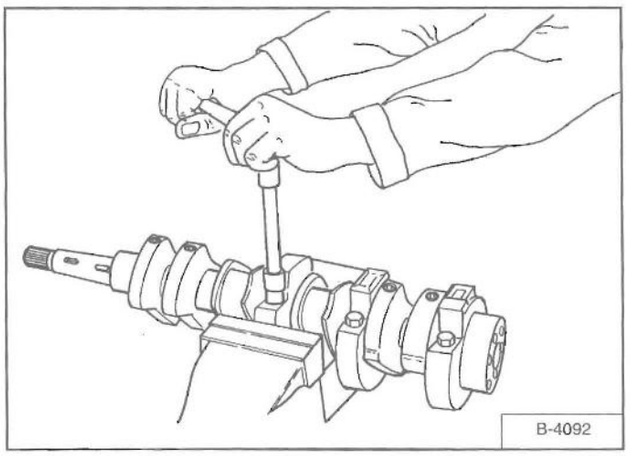


Remove the crankshaft/main bearing assembly from the engine block **[Figure 70-100-79]**.

NOTE: Turn the crankshaft as needed to allow the crank pin journals to pass through the cut out (Item 1) [Figure 70-100-79] of the engine block.

Mark the bearing case halves for correct installation.

Figure 70-100-80

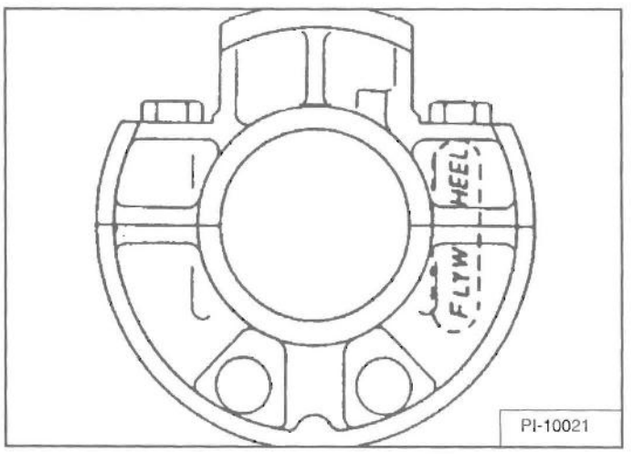


Remove the two bearing case bolts **[Figure 70-100-80]**.

Remove the bearing case and bearing.

Installation: Tighten the bearing case bolts to 34-38 ft.-lbs. (46-51 Nm) torque.

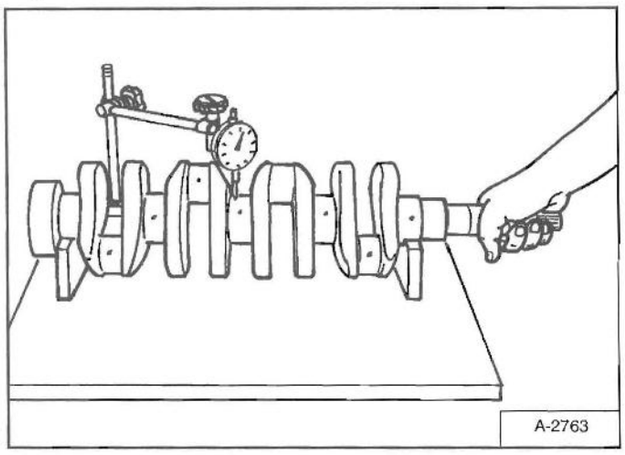
Figure 70-100-81



Installation: When installing the main bearing case assemblies, face the mark FLYWHEEL to the flywheel side of the engine block **[Figure 70-100-81]**. The thrust washers oil grooves must face outward.

Crankshaft And Bearings, Servicing

Figure 70-100-82



Put the crankshaft on V-blocks. Install a dial indicator on the center journal **[Figure 70-100-82]**.

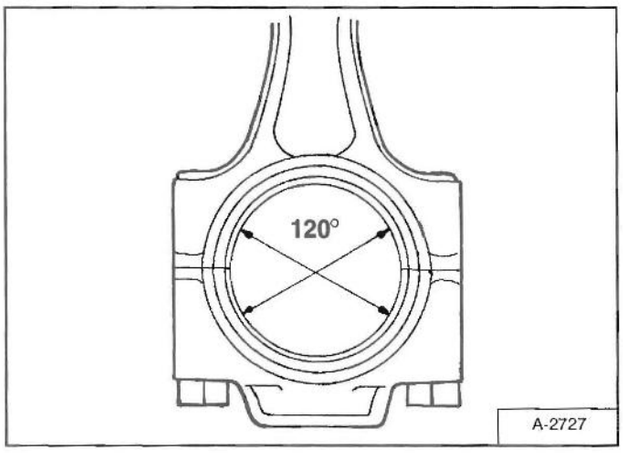
Turn the crankshaft at a slow rate to obtain the misalignment (one half of the alignment measurement).

If the misalignment exceeds the allowable limit, replace the crankshaft.

Alignment	0.00079 inch (0,02 mm)

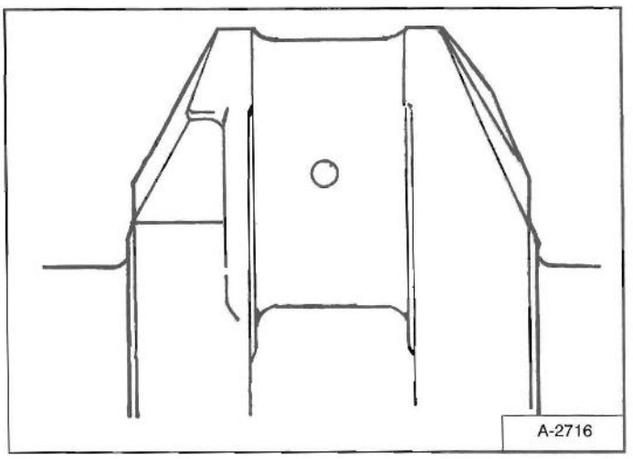
Tighten the connecting rod bolts to 33-36 ft.-lbs. (45-49 Nm) torque.

Figure 70-100-83



Measure the crankpin bearing I.D. **[Figure 70-100-83]**.

Figure 70-100-84



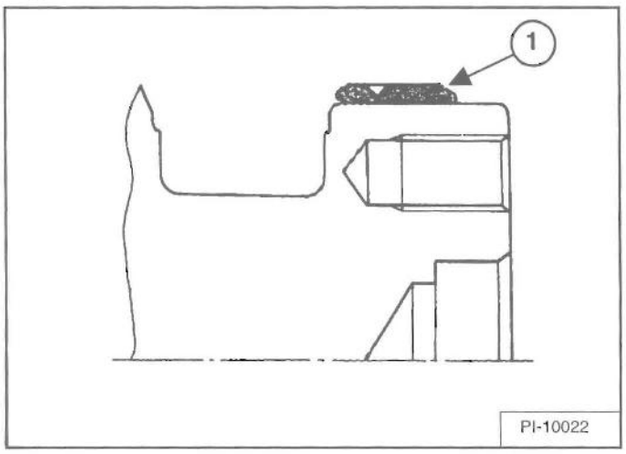
Measure the crankpin O.D. **[Figure 70-100-84]**.

Calculate the oil clearance.

Crankpin Bearing I.D.	1.8504-1.8522 inch (47,000-47,046 mm)
Crankpin O.D.	1.8488-1.849 inch (49,96-46,98 mm)
Oil Clearance	0.00098-0.00343 inch (0,025-0,087 mm)
Allowable limit	0.0079 inch (0,2 mm)

Crankshaft And Bearings, Servicing (Cont'd)

Figure 70-100-85



Check the wear on the crankshaft sleeve **[Figure 70-100-85]**.

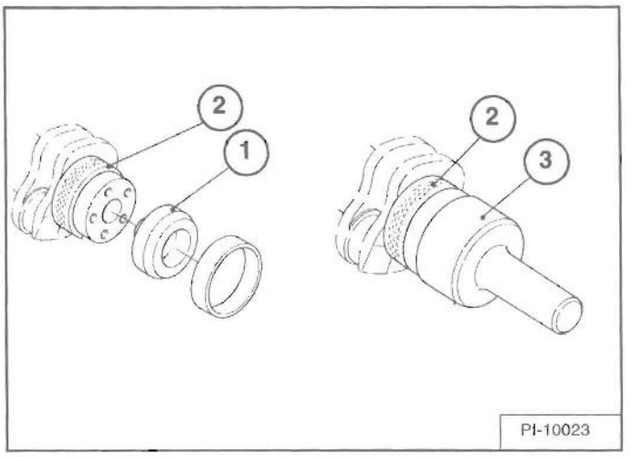
If the wear exceeds the allowable limit or the seal leaks oil, replace the sleeve.

Wear of Sleeve	0.004 inch (0,1 mm)

The special tool set will be needed to replace the crankshaft sleeve.

Remove the sleeve.

Figure 70-100-86

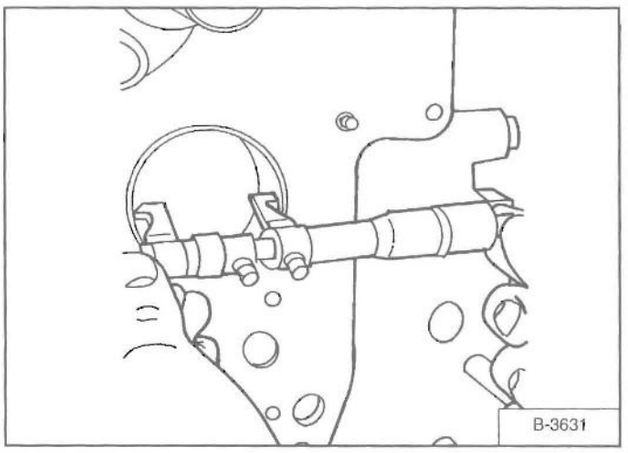


Install the sleeve guide (Item 1) and stop (Item 2) **[Figure 70-100-86]**.

Heat the sleeve to approximately 300° F (150° C). Install the sleeve on the crankshaft using the special driver tool (Item 3) **[Figure 70-100-86]**.

NOTE: The sleeve is installed with the larger chamfered surface to the front of the crankshaft (Item 1) [Figure 70-100-85 on Page 28].

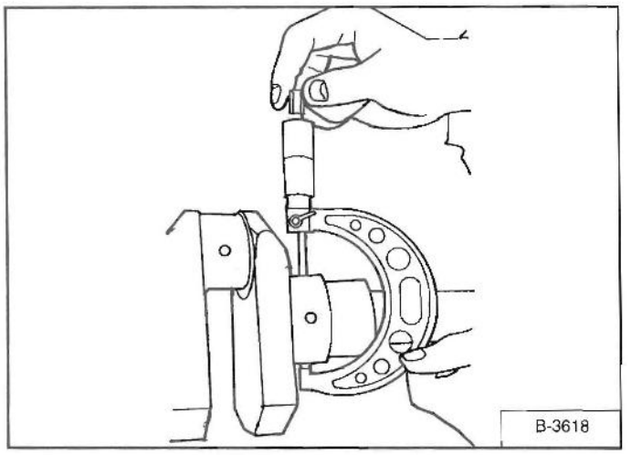
Figure 70-100-87



Measure the I.D. of the No. 1 crankshaft bearing **[Figure 70-100-87]**.

Crankshaft And Bearings, Servicing (Cont'd)

Figure 70-100-88



Measure the O.D. of the crankshaft journal **[Figure 70-100-88]**.

Calculate the oil clearance.

If the clearance exceeds the allowable limit, replace the crankshaft bearing.

Bearing 1:

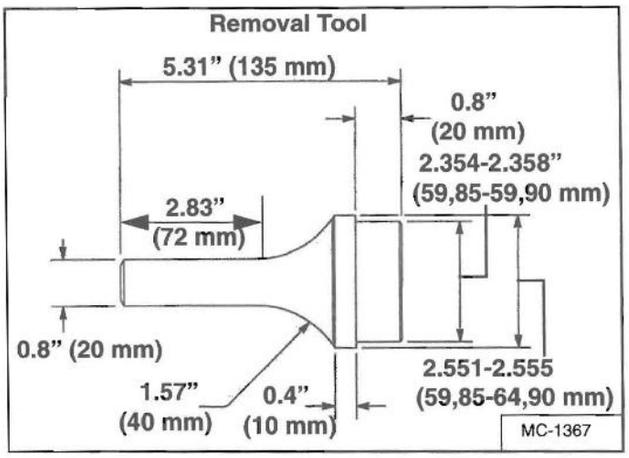
Bearing I.D.	2.361-2.364 inch (59,98-60,04 mm)
Journal O.D.	2.359-2.360 inch (59,92-59,94 mm)
Oil Clearance	0.002-0.004 inch (0,040-0,118 mm)
Allowable Limit	0.0079 inch (0,2 mm)

Bearing 2:

Bearing I.D.	2.361-2.363 inch (59,98-60,02 mm)
Journal O.D.	2.359-2.360 inch (59,92-59,94 mm)
Oil Clearance	0.0016-0.0041 inch (0,04-0,104 mm)
Allowable Limit	0.008 inch (0,2 mm)

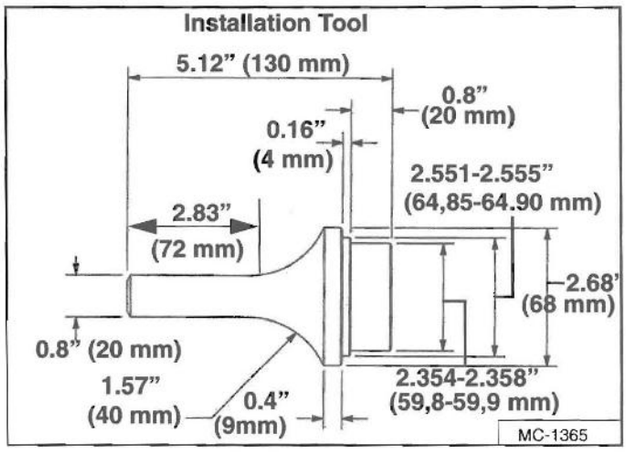
NOTE: Make sure you use the correct size bearing when installing. Oversize bearings are generally marked.

Figure 70-100-89



To remove the front bearing make the tool as shown in figure **[Figure 70-100-89]**.

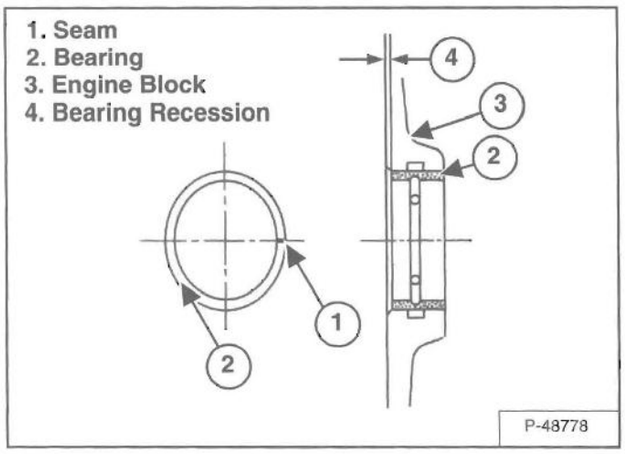
Figure 70-100-90



To install the front bearing make the tool as shown in figure **[Figure 70-100-90]**.

Crankshaft And Bearings, Servicing (Cont'd)

Figure 70-100-91



Remove the front bearing with the special removal tool **[Figure 70-100-89]**.

Installation: Clean the new bearing (Item 2) and bore, apply oil to the bearing and bore. Install the new bearing with the seam (Item 1) **[Figure 70-100-91]** towards the exhaust manifold side, using the installation driver tool.

Check the depth of the bearing (Item 4) **[Figure 70-100-91]** from the face of the engine block. This will ensure proper bearing alignment with the crankshaft.

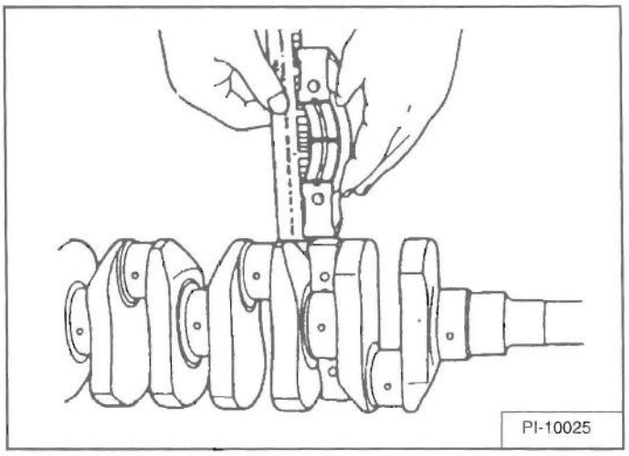
Bearing Number **1** Recession	0.1654-0.1772 inch (4,2-4,5 mm)

Clean the crankshaft journal and bearing. Put a strip of press gauge on the center journal.

Install the main bearing case halves and tighten the bolts. Remove the bearing case halves.

NOTE: DO NOT turn the crankshaft with the press gauge installed. Incorrect measurements will be obtained.

Figure 70-100-92



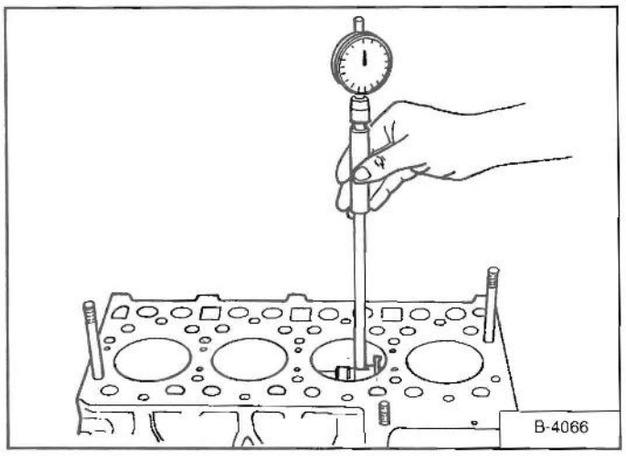
Measure the flattened press gauge **[Figure 70-100-92]**.

If the clearance exceeds the allowable limit, replace the crankshaft bearing.

Crankshaft Journal O.D.	2.3591-2.3598 inch (59,92-59,94 mm)
Bearing I.D.	2.3614-2.3632 inch (59,98-60,025 mm)
Oil Clearance	0.0016-0.0041 inch (0,040-0,104 mm)
Allowable Limit	0.0079 inch (0,2 mm)

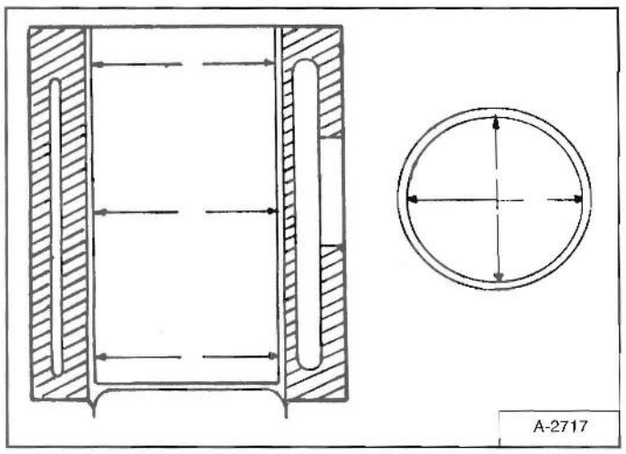
Cylinder Bore, Checking

Figure 70-100-93



Use a gauge to check the inside measurement of the cylinder bore **[Figure 70-100-93]**.

Figure 70-100-94



Measure the six points as shown in figure **[Figure 70-100-94]** to find the maximum wear.

The specification is:

3.4252-3.4261 inch (87,0-87,022 mm)

The wear limit is: +0.0059 inch (+0,15 mm).

If the cylinder bore is not within specifications, re-bore the cylinder for oversize piston.

NOTE: Make sure you use the correct oversize pistons and rings.

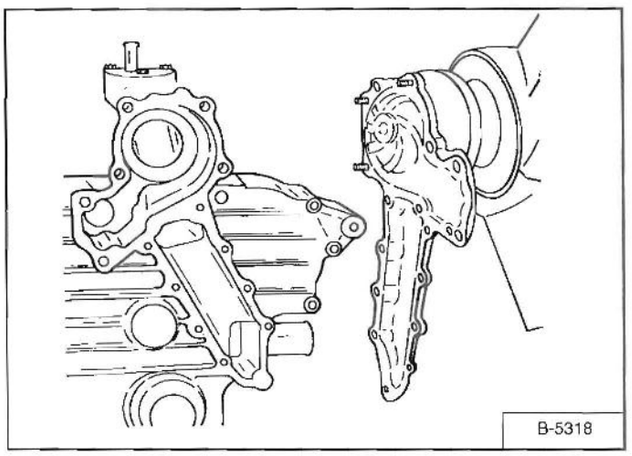
Water Pump Removal And Installation

Drain the cooling system.

Remove the alternator belt.

Remove the water pump bolts.

Figure 70-100-95

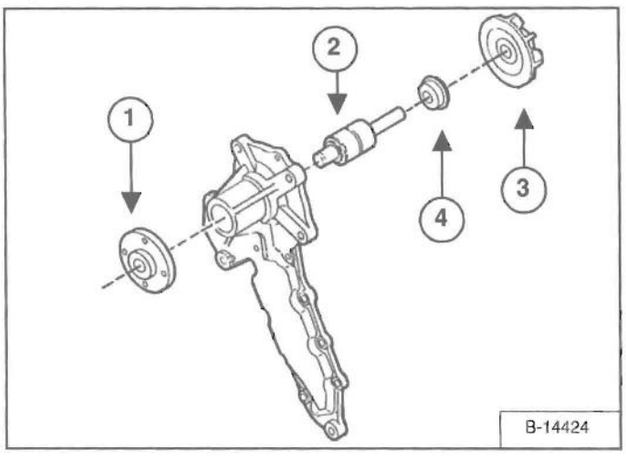


Remove the water pump **[Figure 70-100-95]**.

Installation: Always use a new gasket when installing the water pump.

Water Pump Disassembly And Assembly

Figure 70-100-96



Remove the flange (Item 1) **[Figure 70-100-96]**.

Press the shaft (Item 2) and impeller (Item 3) **[Figure 70-100-96]** out the impeller side of the water pump.

Remove the impeller (Item 3) **[Figure 70-100-96]** from the shaft.

Remove the seal (Item 4) **[Figure 70-100-96]**.

Install a new seal (Item 4) **[Figure 70-100-96]** when assembling the water pump.

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HEATER UNIT. 80-50-1
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TIGHTEN ALL HARDWARE PER SIZE TO GRADE 5 TORQUE (SEE STANDARD TORQUE SPECIFICATIONS FOR BOLTS, SECTION SPEC-01) UNLESS OTHERWISE SPECIFIED.

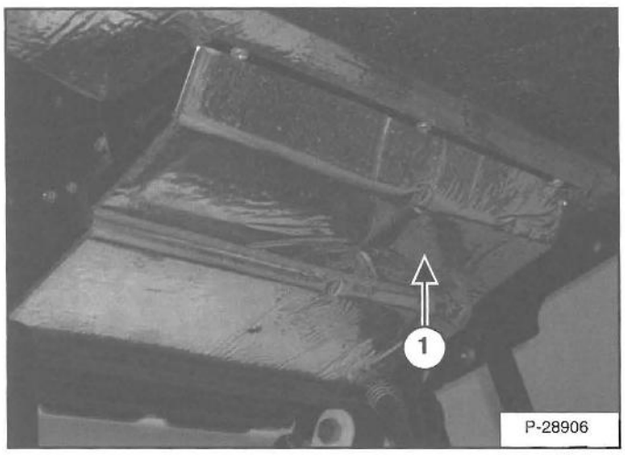


Bobcat®

COMPONENTS

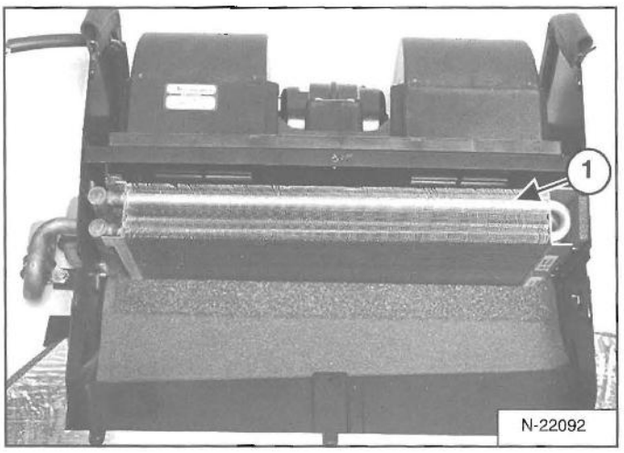
Identification

Figure 80-10-1



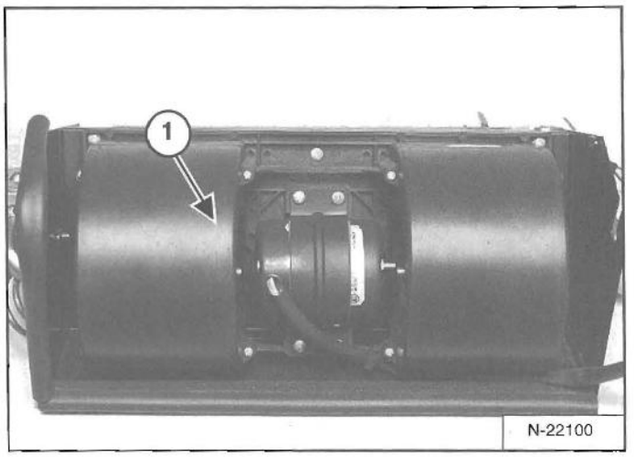
Heater Unit: The heater (Item 1) **[Figure 80-10-1]** is located behind the loader cab. The unit delivers the warm air for heat into the cab. The unit contains the blower and heater coil.

Figure 80-10-2



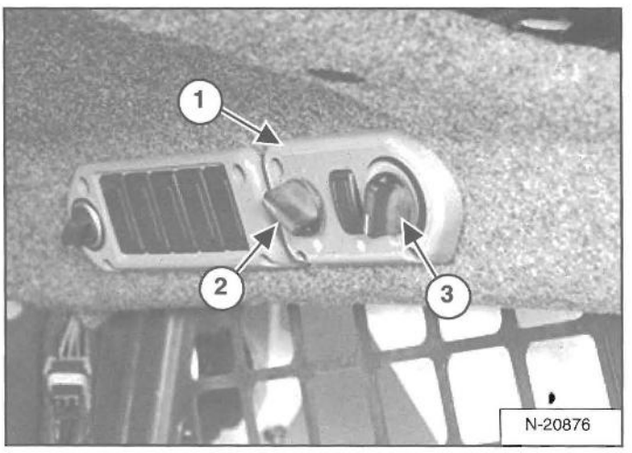
Heater Coil: The heater coil (Item 1) **[Figure 80-10-2]** supplies the warm air into the cab by passing air through the coil.

Figure 80-10-3



Heater Blower: The blower (Item 1) **[Figure 80-10-3]** is used to push air through the heater and into the cab.

Figure 80-10-4



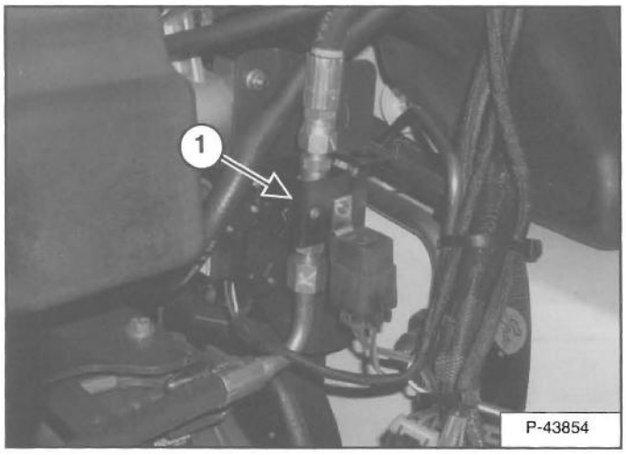
Control Panel: The panel (Item 1) **[Figure 80-10-4]** has two separate components.

Fan Switch: This is a four position rotary switch (Item 2) **[Figure 80-10-4]**. When the fan switch is in the off position the heat valve will operate, as it is controlled by the ignition power.

Potentiometer: The potentiometer (Item 3) **[Figure 80-10-4]** controls the Heater Valve (Item 1) **[Figure 80-10-5]**from fully Off to fully On. This can be used for defrost of the windows and temperature control.

Identification (Cont'd)

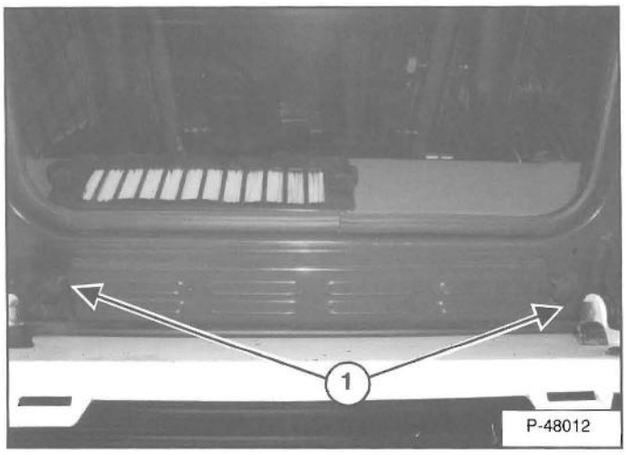
Figure 80-10-5



Heater Valve: The heater valve (Item 1) **[Figure 80-10-5]** is used to control the amount of engine coolant that flows to the heater coil.

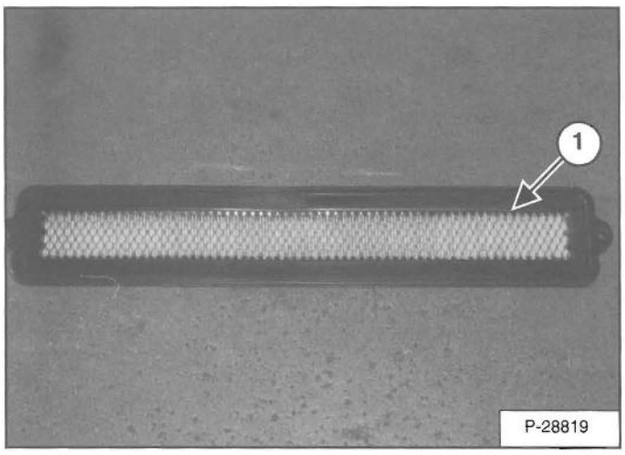
Filter Elements Removal And Installation

Figure 80-20-1



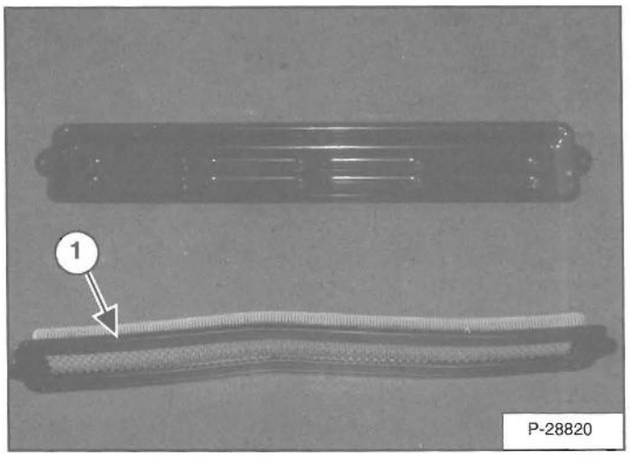
Remove the two mount bolts (Item 1) **[Figure 80-20-1]** from the fresh air filter cover at the rear of the loader cab.

Figure 80-20-2



Remove the filter cover and filter (Item 1) **[Figure 80-20-2]** from the loader.

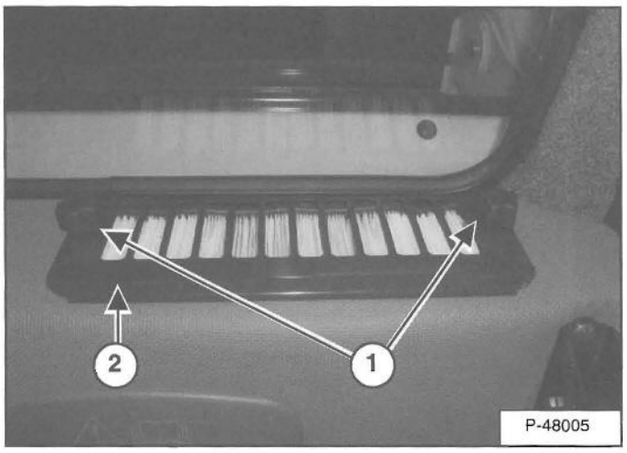
Figure 80-20-3



Remove the filter (Item 1) **[Figure 80-20-3]** from the cover.

The fresh air filter must be cleaned sometimes as often as twice a day, depending on the operating environment. The filter can be cleaned by removing and shaking it. A small amount of air pressure can be used to clean the filter. However the fresh air filter should be changed at least 2-4 times per year in normal conditions. In extremely dusty conditions the fresh air filter may need to be changed weekly.

Figure 80-20-4

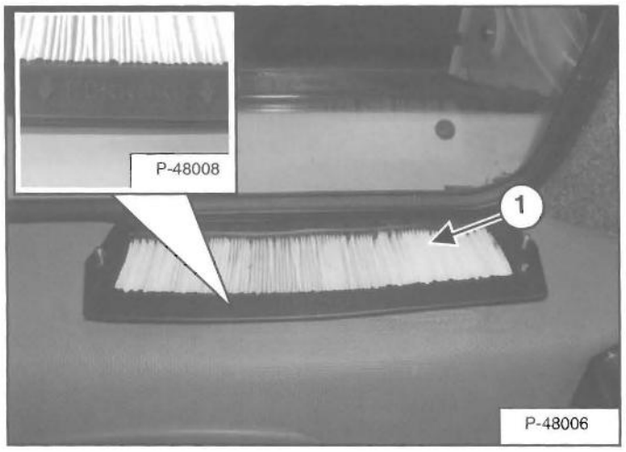


Remove the two retaining knobs (Item 1) **[Figure 80-20-4]** from the recirculating air filter cover, at the back of the cab.

Remove the retaining cover (Item 2) **[Figure 80-20-4]** from the loader cab.

Filter Elements Removal And Installation (Cont'd)

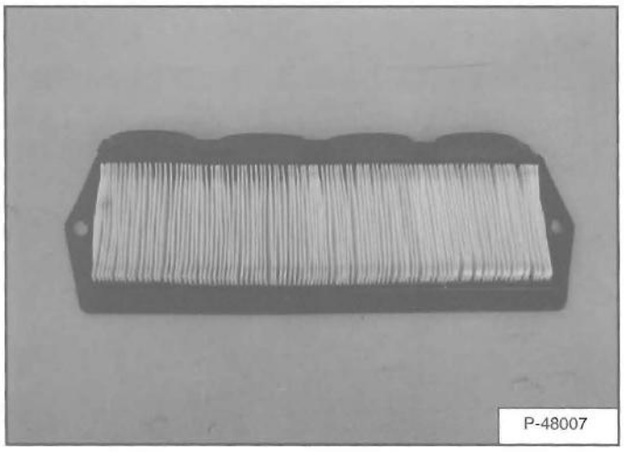
Figure 80-20-5



Remove the recirculating air filter (Item 1) **[Figure 80-20-5]** from the rear of the cab.

Installation: Make sure the arrows (Inset) **[Figure 80-20-5]** on the filter are facing the front of the loader.

Figure 80-20-6



The recirculating air filter **[Figure 80-20-6]** is made of a paper filtering media with a rubber seal. A small amount of air can be used to clean the filter. It does not require cleaning as frequently as the fresh air intake filter.

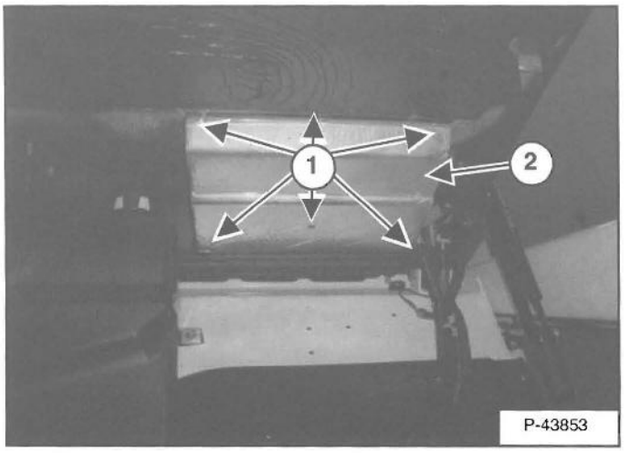
Reverse the removal procedure to install the filter element.

Cleaning The Heater Coil

Raise the lift arms and install an approved lift arm support device. (See Contents Page 10-01.)

Raise the operator cab. (See Contents Page 10-01.)

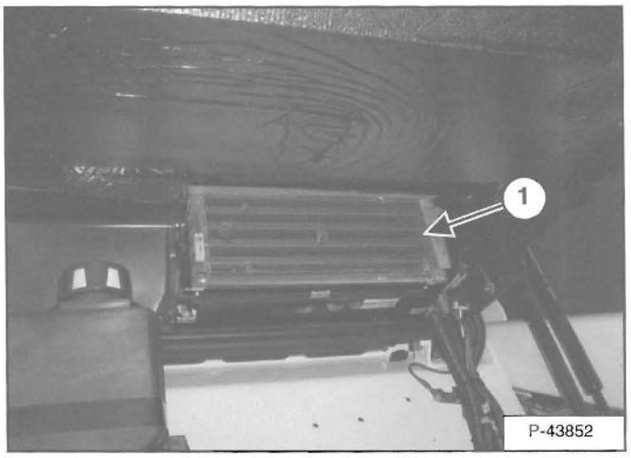
Figure 80-30-1



Loosen the six mounting screws for the rear cover (Item 1) **[Figure 80-30-1]**. The screws do not need to be completely removed, they are secured on the back with plastic retaining washers.

Remove the cover (Item 2) **[Figure 80-30-1]**.

Figure 80-30-2

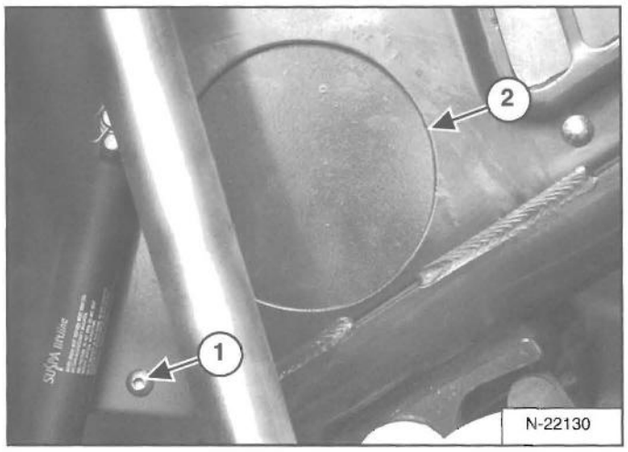


The heater coil (Item 1) **[Figure 80-30-2]**, can now be cleaned with low pressure water or air. High pressure may damage the fins of the heater.

Checking The Electrical System

NOTE: The key must be put in the ON position when checking for power in circuits.

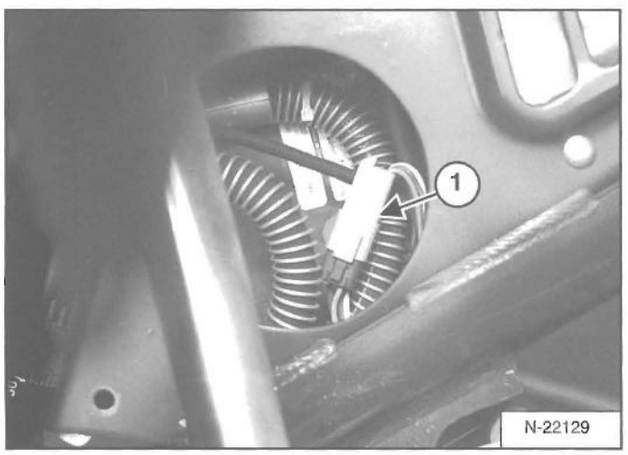
Figure 80-30-3



Remove the mount bolt (Item 1) **[Figure 80-30-3]** from the left side cab access cover.

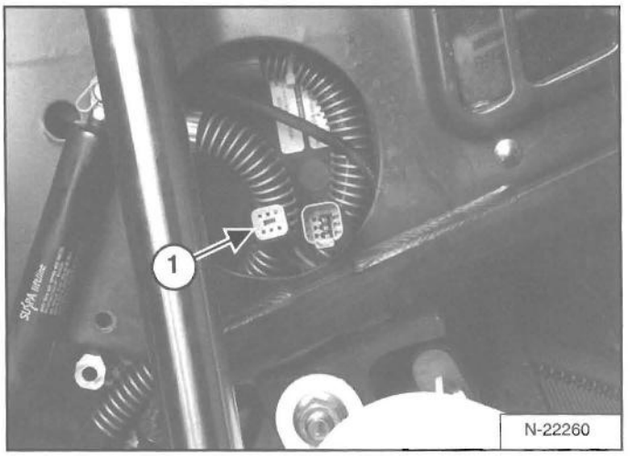
Remove the access cover (Item 2) **[Figure 80-30-3]** from the loader.

Figure 80-30-4



Disconnect the blower fan wiring connector (Item 1) **[Figure 80-30-4]** from the loader wiring harness.

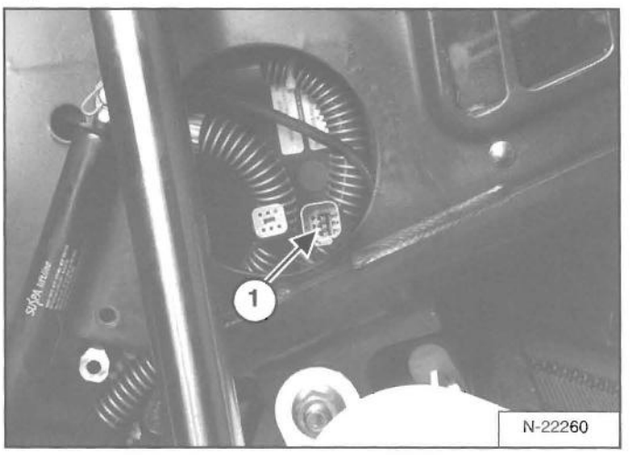
Figure 80-30-5



Check the loader harness (Item 1) **[Figure 80-30-5]** for voltage. The voltage should be 12 volts.

If there is no voltage at the wiring harness, check the harness for broken wires or blown fuse.

Figure 80-30-6



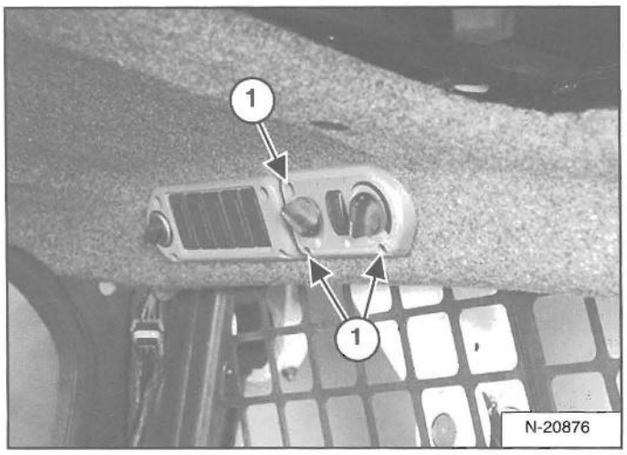
If there is voltage at the wiring harness, check the resistance to the blower fan at the blower fan wiring connector (Item 1) **[Figure 80-30-6]**.

If there is no resistance value replace the blower fan. (See Contents Page 80-01)

If there is a resistance value check the climate controls at the control panel inside the loader cab.

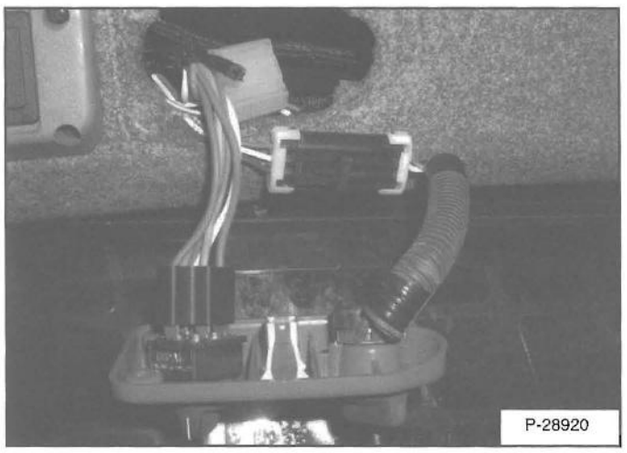
Checking The Electrical System (Cont'd)

Figure 80-30-7



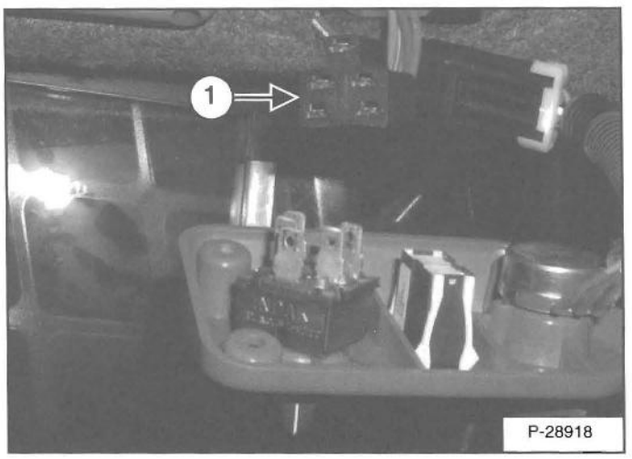
Remove the three mount screws (Item 1) **[Figure 80-30-7]** from the cab control panel.

Figure 80-30-8



Remove the control panel and wiring harness from the cab **[Figure 80-30-8]**.

Figure 80-30-9



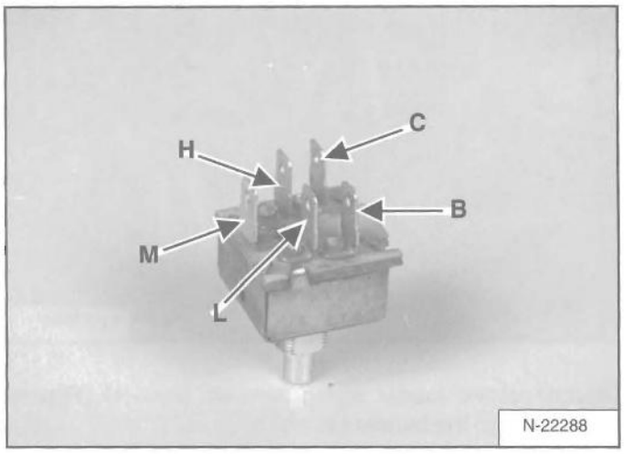
Disconnect the loader wiring harness (Item 1) **[Figure 80-30-9]** from the blower switch.

Check the loader harness for voltage. The voltage should be 12 volts.

If there is no voltage at the wiring harness, check the harness for broken wires or blown fuse.

Checking The Electrical System (Cont'd)

Figure 80-30-10



If there is voltage at the wiring harness, check the blower switch **[Figure 80-30-10]** for resistance.

With the switch in the **OFF** position, there should be resistance between **L** terminal and the **H** terminal frame.

With the switch in the **1** position, there should be resistance between **C** terminal and the **B** terminal, between the **C** terminal and the **L** terminal and also between the **B** terminal and the **L** terminal frame **[Figure 80-30-10]**.

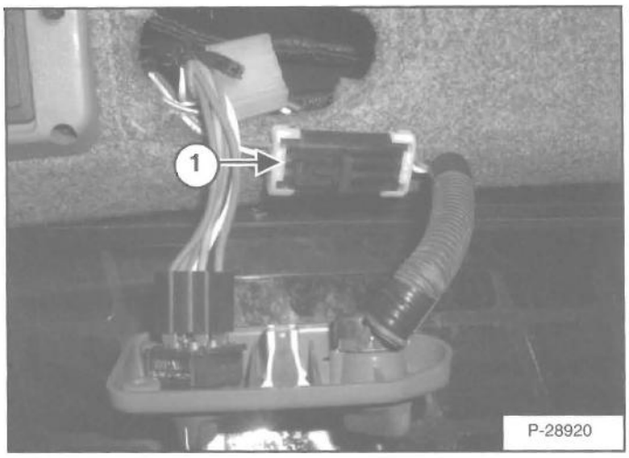
With the switch in the **2** position, there should be resistance between **C** terminal and the **B** terminal, between the **C** terminal and the **M** terminal and also between the **B** and the **M** terminal frame **[Figure 80-30-10]**.

With the switch in the **3** position, there should be resistance between **C** terminal and the **B** terminal, between the **C** terminal and the **H** terminal and also between the **B** terminal and the **H** terminal frame **[Figure 80-30-10]**.

If any of the above resistance tests fail, replace the blower switch.

If the above resistance tests are good, check the potentionmeter.

Figure 80-30-11

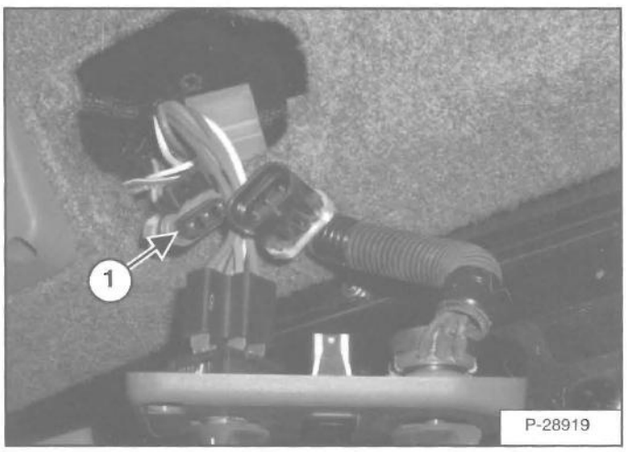


The potentiometer will affect the operation of the heater.

If heater valve does not open, or close, check the potentiometer.

At the loader cab, disconnect the loader harness (Item 1) **[Figure 80-30-11]** from the potentiometer.

Figure 80-30-12

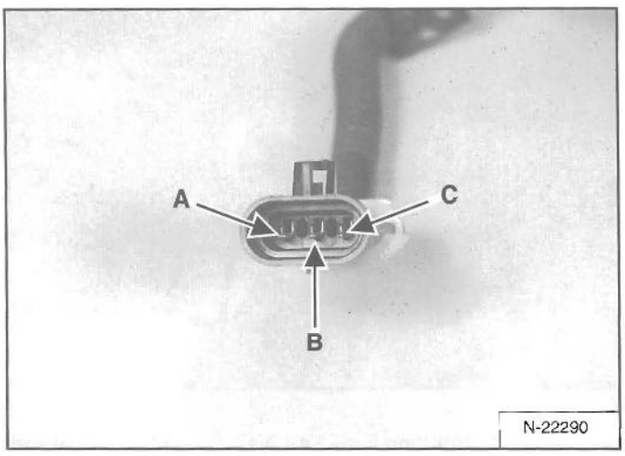


Check the loader harness (Item 1) **[Figure 80-30-12]** for voltage. The voltage should be 12 volts.

If there is no voltage at the wiring harness, check the harness for broken wires or blown fuse.

Checking The Electrical System (Cont'd)

Figure 80-30-13

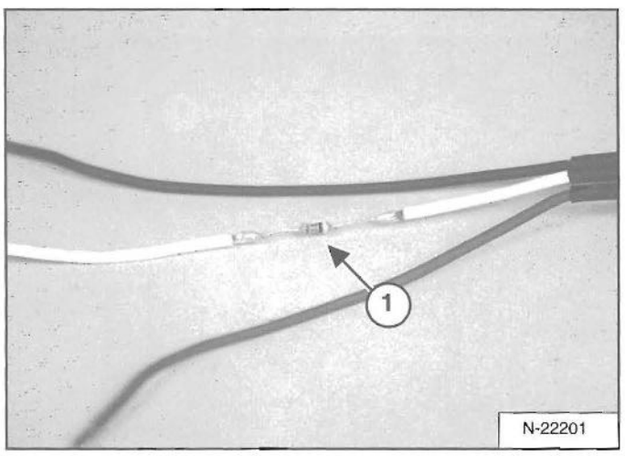


If there is voltage at the wiring harness, check the potentiometer **[Figure 80-30-13]** for resistance.

The resistance should be 10 K Ohm's between wire terminal **A** and wire terminal **C** frame **[Figure 80-30-13]**.

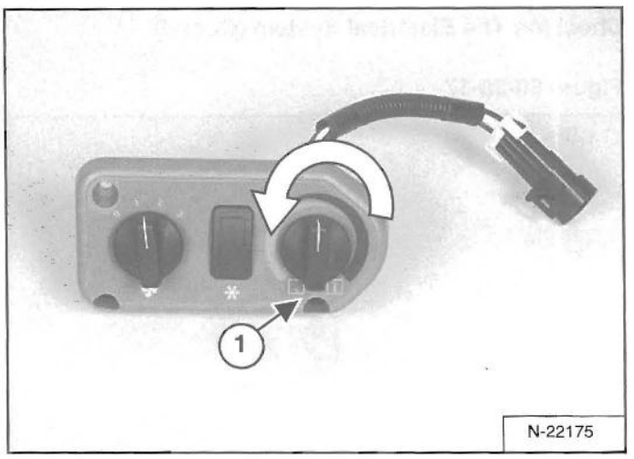
If no resistance is found replace the potentiometer.

Figure 80-30-14



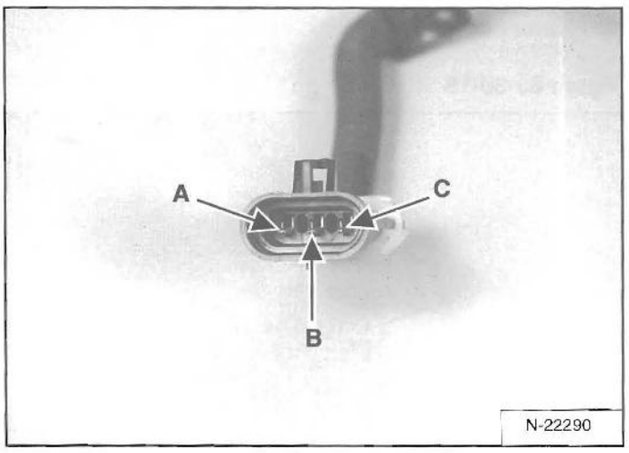
The white wire **B**, (Item 1) **[Figure 80-30-14]**, on the potentiometer, is a resistor wire.

Figure 80-30-15



To check the resistance of the white wire, turn the potentiometer control (Item 1) **[Figure 80-30-15]** to the full A/C position.

Figure 80-30-16

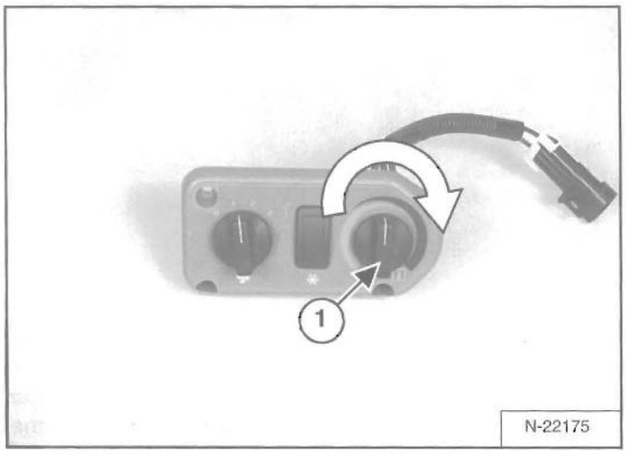


The resistance between the wire terminal **A** and wire terminal **B** frame **[Figure 80-30-16]** should be approximately 49 K Ohm's.

Check the resistance between the wire terminal **C** and wire terminal **B** frame **[Figure 80-30-16]** should be approximately 39 K Ohm's.

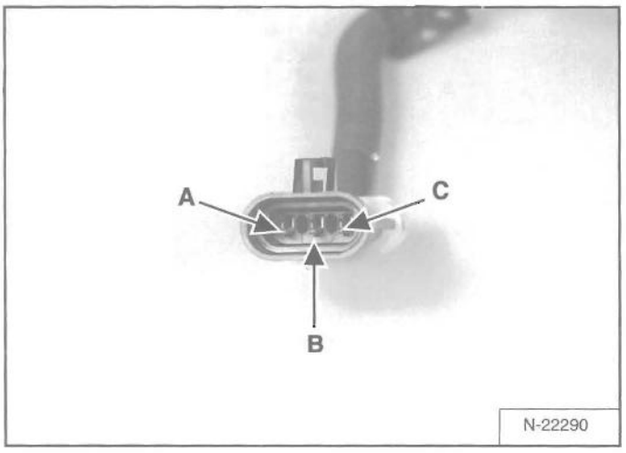
Checking The Electrical System (Cont'd)

Figure 80-30-17



To check the resistance of the white wire, turn the potentiometer control (Item 1) **[Figure 80-30-17]** to the full Heater position.

Figure 80-30-18



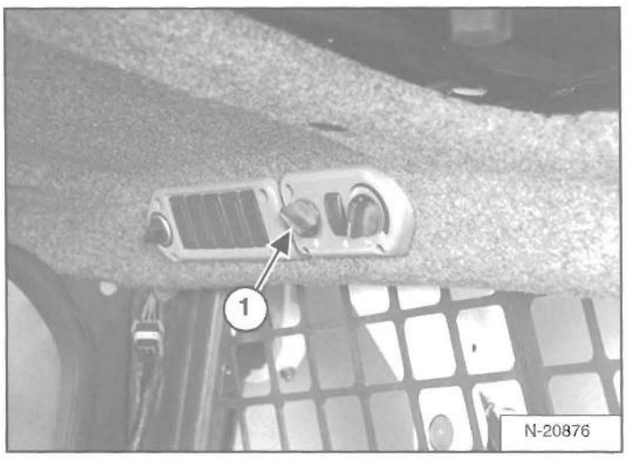
Check the resistance between the wire terminal **A** and wire terminal **B** frame **[Figure 80-30-18]** should be approximately 39 K Ohm's.

Check the resistance between the wire terminal **C** and wire terminal **B** frame **[Figure 80-30-18]** should be approximately 49 K Ohm's.

If the resistance is not found replace the potentiometer.

Engine Coolant By-Passing The Heater Valve

Figure 80-30-19



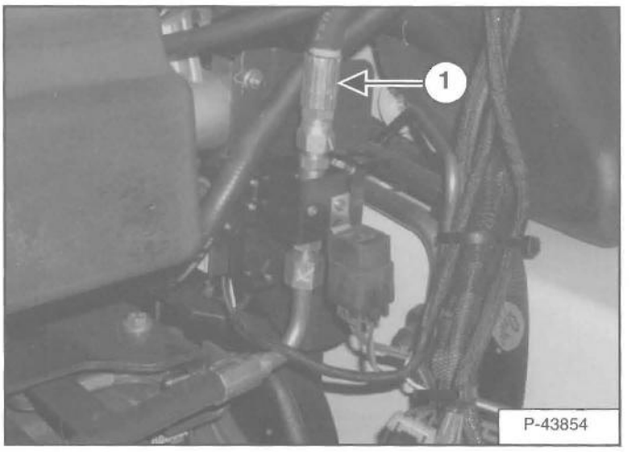
Raise the lift arms and install an approved lift arm support device. (See Contents Page 10-01.)

Turn the fan switch (Item 1) **[Figure 80-30-19]** to the High Speed position, with the loader ignition switch OFF.

Raise the operator cab. (See Contents Page 10-01.)

Connect the remote start tool to the loader. (See Contents Page 10-01.)

Figure 80-30-20



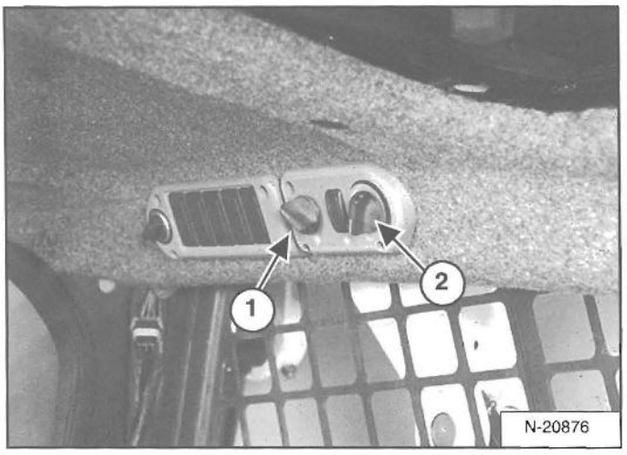
Start the loader and run at high idle, for ten minutes.

Check the heater hose (Item 1) **[Figure 80-30-20]** for temperature.

If the hose is hot, the heater valve is leaking by, and needs to be replaced.

Heater Valve Not Opening Or Closing

Figure 80-30-21



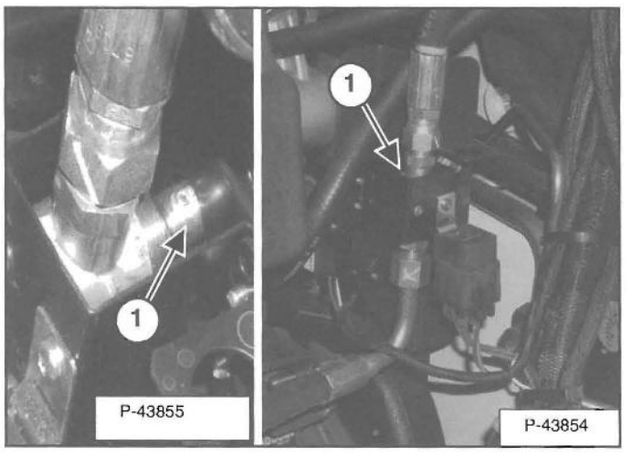
Raise the lift arms and install an approved lift arm support device. (See Contents Page 10-01.)

Turn the fan switch (Item 1) to position **1**. Turn the temperature control (Item 2) **[Figure 80-30-21]** to the High cold position, with the loader ignition switch OFF.

Raise the operator cab. (See Contents Page 10-01.)

Connect the remote start tool to the loader. (See Contents Page 10-01.)

Figure 80-30-22



Place the remote start tool on the left fender of the loader, so the heater valve can be clearly seen. Watch the valve shaft (Item 1) **[Figure 80-30-22]**, as the key of the remote start tool is turned to the ON position without starting the loader. The heater valve should rotate. Place a mark on the loader shaft.

Turn the key of the remote start tool to the OFF position and remove the remote start tool from fender.

Lower operator cab.

Turn the temperature control (Item 2) **[Figure 80-30-21]** to the High Heater position, with the loader ignition switch OFF.

Raise the operator cab.

Place the remote start tool on the left fender of the loader, so the heater valve can be clearly seen. Watch the valve shaft (Item 1) **[Figure 80-30-22]**, as the key of the remote start is turned to the ON position without starting the loader. The heater valve should rotate.

If it does not rotate, check the potentiometer for proper function. (See Contents,Page 80-01.)

Replace the heater valve. (See Contents Page 80-01.)



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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 malfuntion.	Check the lead wires from the motor with a circuit tester.	Replace Motor.
4. Resistor malfuntion.	Check resistor using a circuit tester.	Replace Resistor.
5. Fan motor switch malfunction.	Check power into and out of the fan switch.	Replace Fan Switch.

Blower motor operators normally, but air flow is insufficient

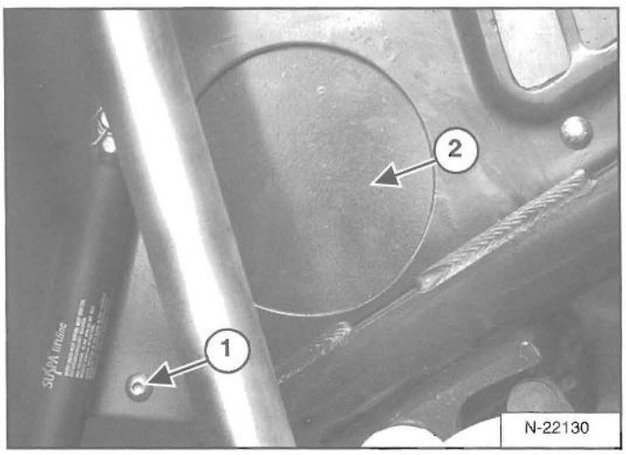
POSSIBLE CAUSE	INSPECTION	SOLUTION
1. Air leak.	Check to make sure air hoses are properly hooked to Louvers, and air ducts.	Repair or adjust.


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HEATER UNIT

Removal And Installation

Figure 80-50-1



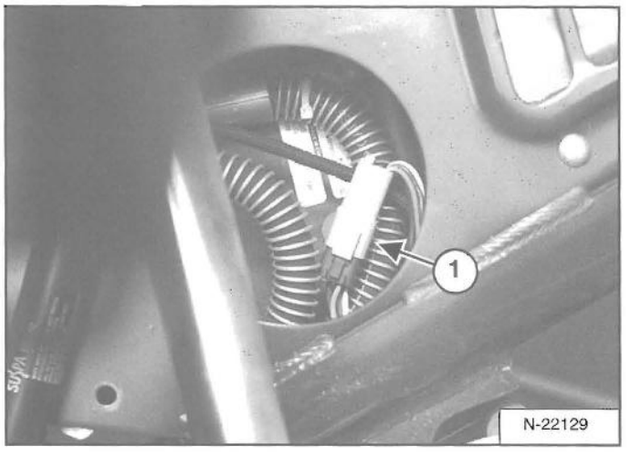
Raise the lift arms and install an approved lift arm support device. (See Contents Page 10-01.)

Raise the operator cab. (See Contents Page 10-01.)

Remove the mount bolt (Item 1) **[Figure 80-50-1]** from the left side cab access cover.

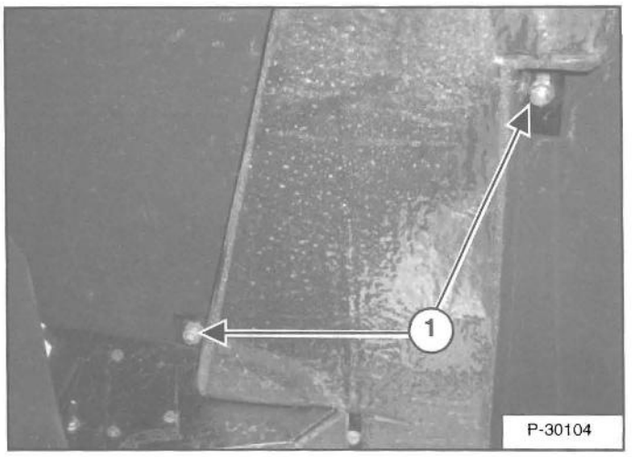
Remove the access cover (Item 2) **[Figure 80-50-1]** from the loader.

Figure 80-50-2



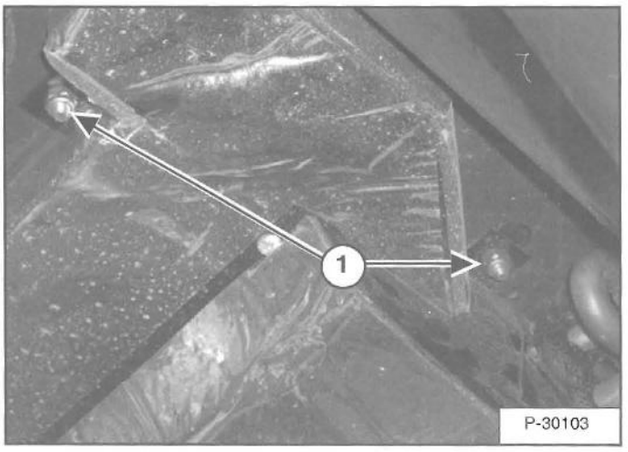
Disconnect the blower fan wiring connector (Item 1) **[Figure 80-50-2]** from the loader wiring harness.

Figure 80-50-3



Remove the two mounting nuts (Item 1) **[Figure 80-50-3]**.

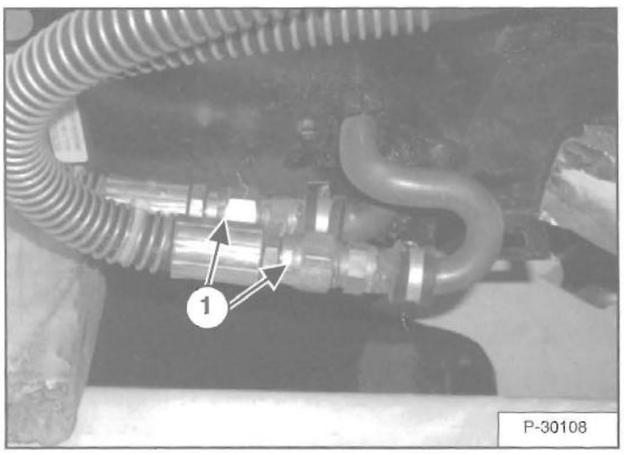
Figure 80-50-4



Remove the two mounting nuts (Item 1) **[Figure 80-50-4]**.

Removal And Installation (Cont'd)

Figure 80-50-5



Remove the heater unit from the rear of the cab. Support heater unit by placing blocks across the frame **[Figure 80-50-5]**.

Remove the heater hoses (Item 1) **[Figure 80-50-5]** from the heater coil.

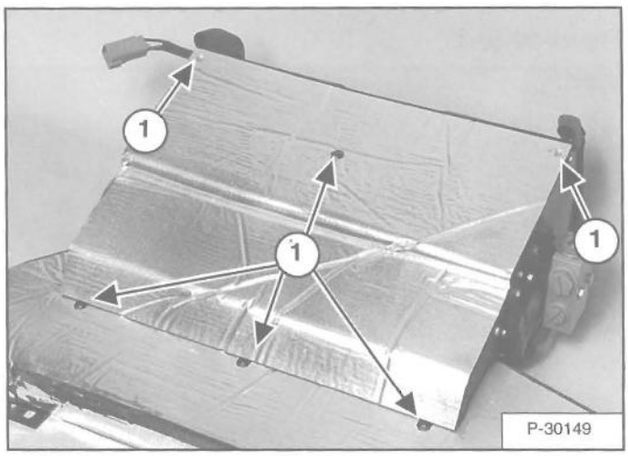
Installation: Tighten the heater hoses to 22 ft.-lbs. (29,8 Nm) torque.

Remove the heater unit from the loader.

Reverse the removal procedure to install the heater unit.

Disassembly And Assembly

Figure 80-50-6



Remove the six mount bolts (Item 1) **[Figure 80-50-6]** from the heater unit rear cover.

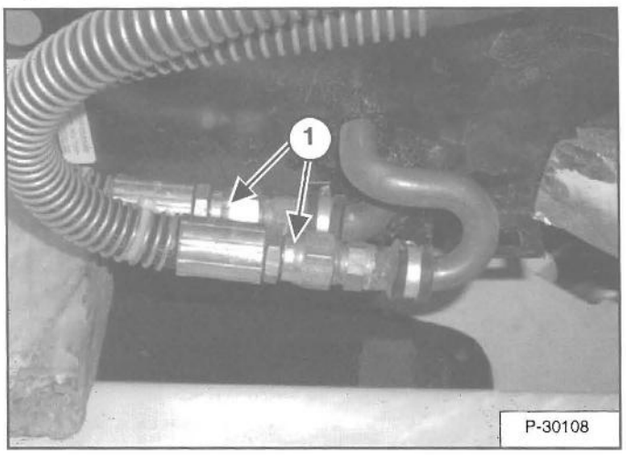
Remove the rear cover from the unit.

Reverse the disassembly procedure to assemble the heater unit.

HEATER COIL

Removal And Installation

Figure 80-60-1



Raise the lift arms and install an approved lift arm support device. (See Contents Page 10-01.)

Raise the operator cab. (See Contents Page 10-01.)

Remove the heater unit from the back of the cab. (See Contents Page 80-01.)

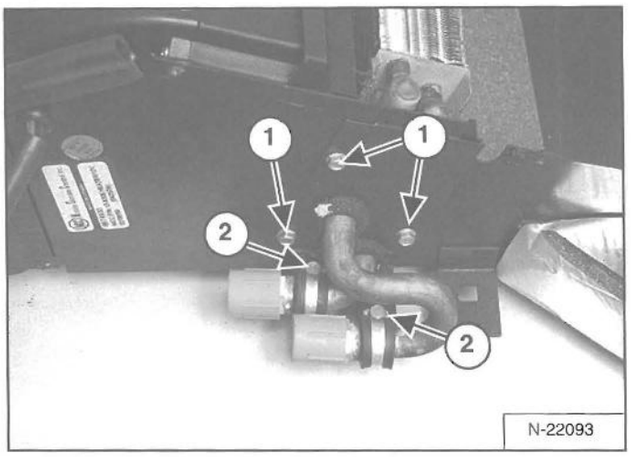
Mark the heater hoses (Item 1) **[Figure 80-60-1]** for proper installation.

Remove the two heater hoses from the heater coil.

Cap the hoses and the heater coil with hydraulic caps and plugs to prevent coolant loss from the system.

Installation: Tighten the two heater hose fittings to 22 ft.-lbs. (29,8 Nm) torque.

Figure 80-60-2

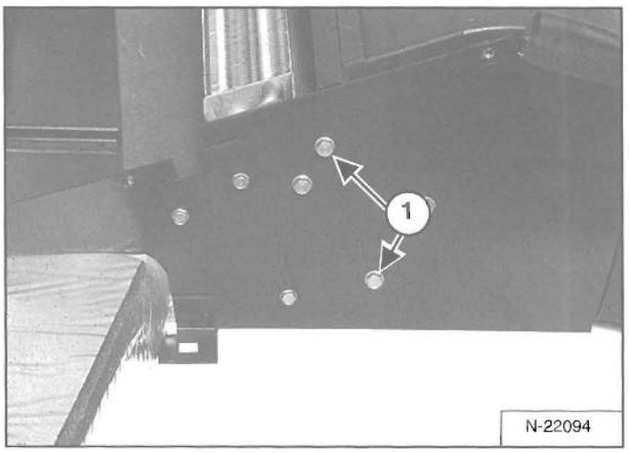


Remove the rear cover from the heater unit. (See Contents Page 80-01.)

Remove the three mount bolts (Item 1) **[Figure 80-60-2]** and remove the mount plate from the end of the unit.

Remove the two mount bolts (Item 2) **[Figure 80-60-2]** that support the heater coil tubelines to the unit.

Figure 80-60-3



Remove the two mount bolts (Item 1) **[Figure 80-60-3]** from the heater coil.

Remove the heater coil from the unit.

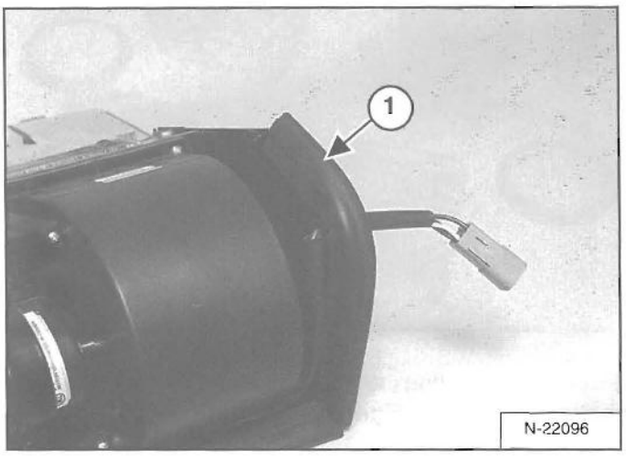
Reverse the removal procedure to install the heater coil.



Bobcat®

Removal And Installation

Figure 80-70-1



Raise the lift arms and install an approved lift arm support device. (See Contents Page 10-01.)

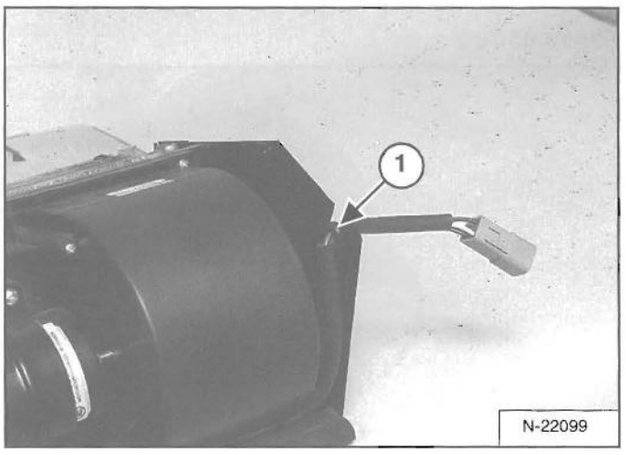
Raise the operator cab. (See Contents Page 10-01.)

Remove the heater unit from the back of the cab. (See Contents, Page 80-01.)

NOTE: The heater fan assembly can be removed from the heater unit without disconnecting the heater plumbing. The unit is removed here for photo clarity.

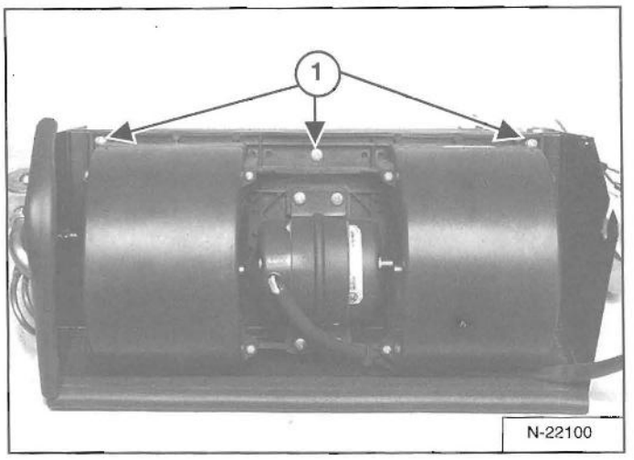
Remove the grommet (Item 1) **[Figure 80-70-1]** from the side of the evaporator/heater unit.

Figure 80-70-2



Remove the blower fan wiring harness and grommet (Item 1) **[Figure 80-70-2]** from the unit.

Figure 80-70-3



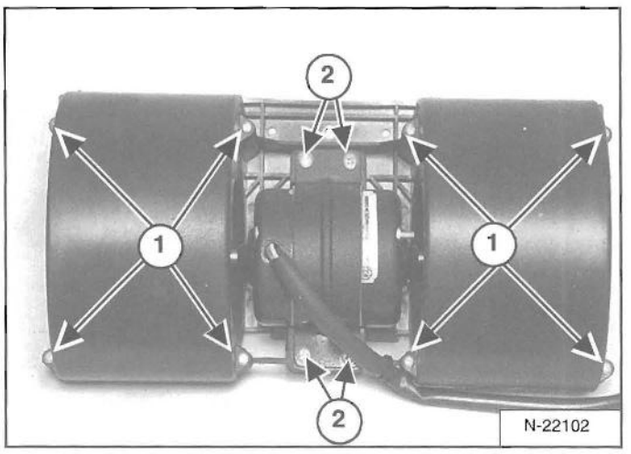
Remove the three mount bolts (Item 1) **[Figure 80-70-3]** from the blower fan housing.

Remove the blower fan housing from the heater unit.

Reverse the removal procedure to install the heater fan.

Disassembly And Assembly

Figure 80-70-4



Remove the eight mount bolts (Item 1) **[Figure 80-70-4]** from the blower wheel cover.

Remove the blower wheel cover from the fan housings.

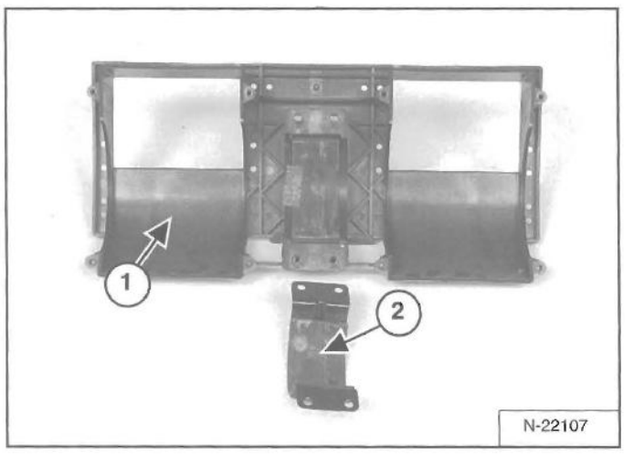
Remove the four mount bolts (Item 2) **[Figure 80-70-4]** from the fan motor mount.

Remove the fan motor mount.

Remove the fan motor assembly from the housing.

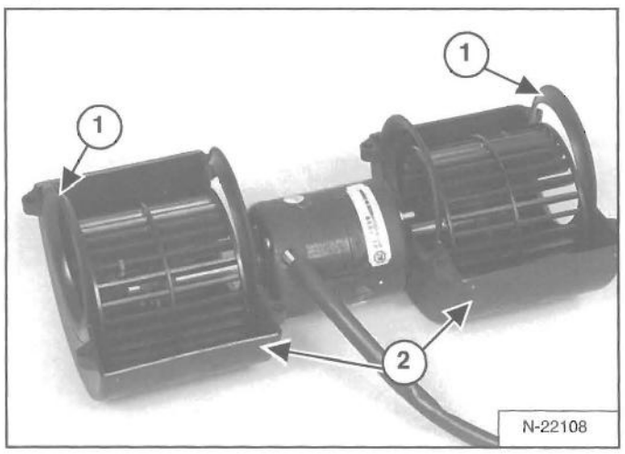
Disassembly And Assembly (Cont'd)

Figure 80-70-5



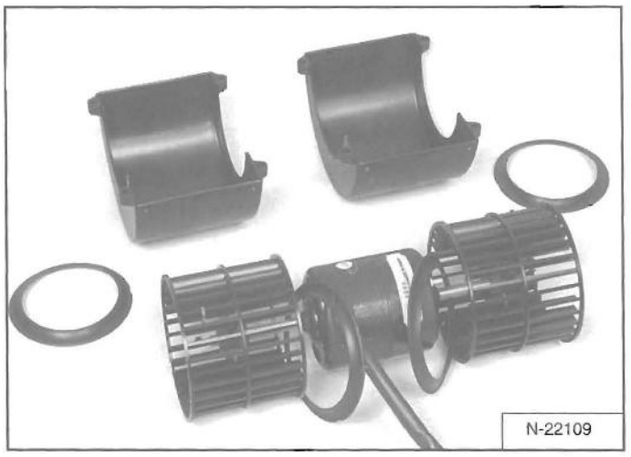
Check the blower housing (Item 1) and fan motor mount (Item 2) **[Figure 80-70-5]** for wear and replace as needed.

Figure 80-70-6



Remove the outside rings (Item 1) and fan wheel covers (Item 2) **[Figure 80-70-6]** from the fan motor and blower wheels.

Figure 80-70-7



Inspect the end rings and fan wheel covers for wear and replace as needed **[Figure 80-70-7]**.

Figure 80-70-8

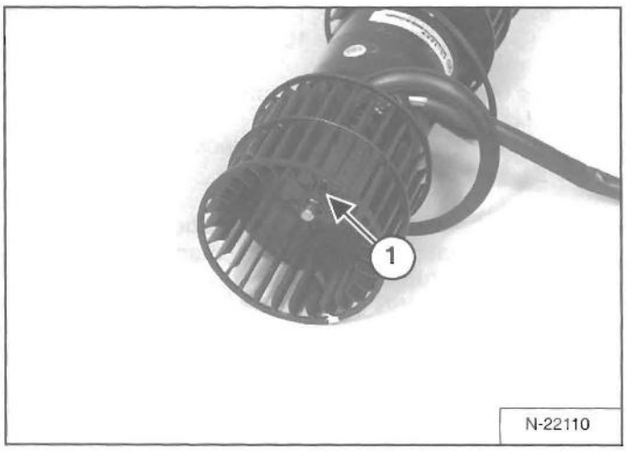
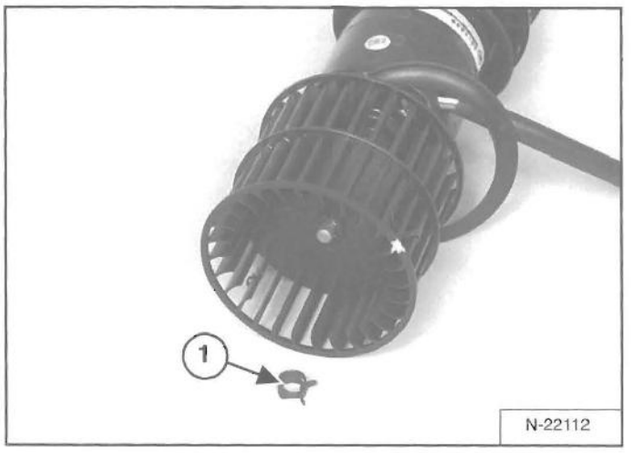


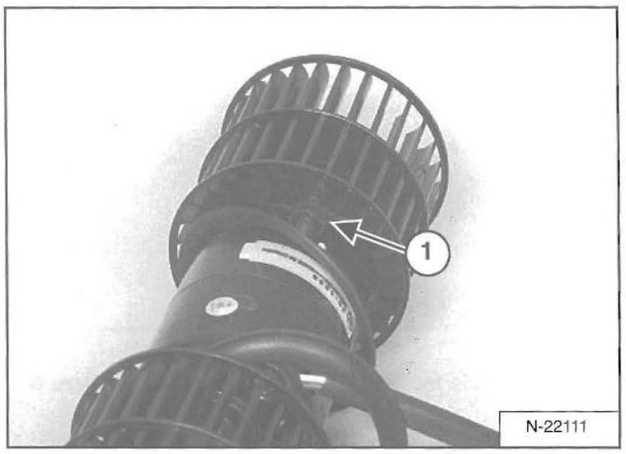
Figure 80-70-9



Remove the outside blower wheel clamp (Item 1) **[Figure 80-70-8]** & **[Figure 80-70-9]** from the blower wheel.

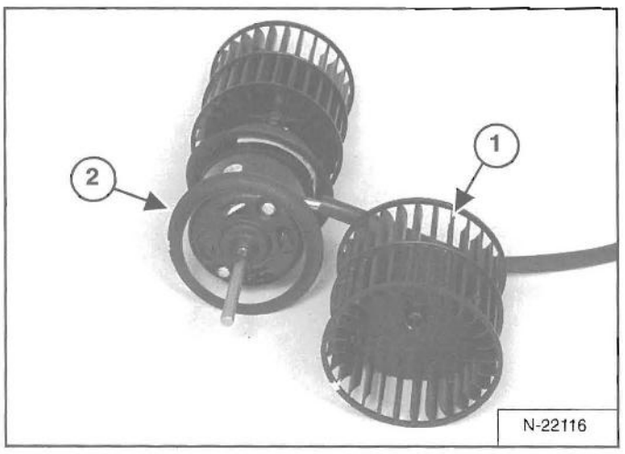
Disassembly And Assembly (Cont'd)

Figure 80-70-10



Remove the inside blower wheel clamp (Item 1) **[Figure 80-70-10]** from the blower wheel.

Figure 80-70-11



NOTE: Before removing blower wheels, mark their orientation to ensure they are assembled back on the correct side and the fins are facing the same direction.

Remove the blower wheel (Item 1) and inside ring (Item 2) **[Figure 80-70-11]** from the blower fan motor shaft.

Repeat the procedure for the other blower wheel.

Wire Connector Removal and Installation

Figure 80-70-12

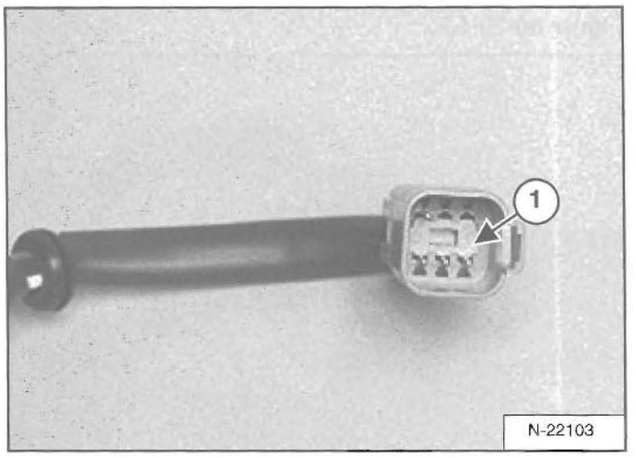
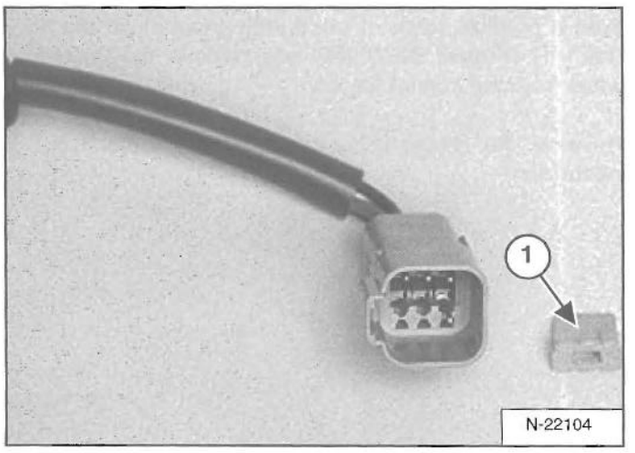


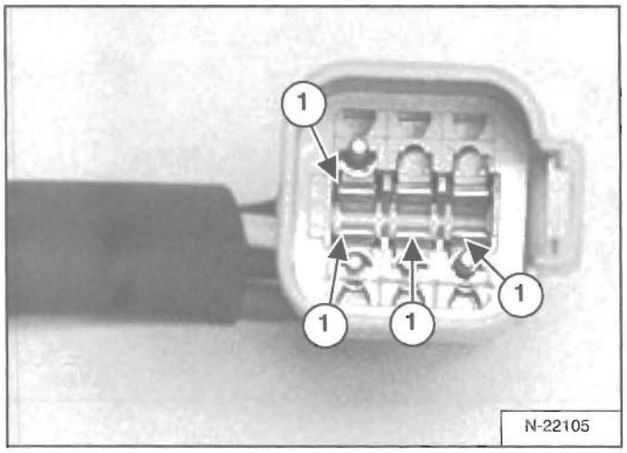
Figure 80-70-13



Remove the plastic wedge (Item 1) **[Figure 80-70-12]** & **[Figure 80-70-13]** from the center of the blower fan motor wiring connector.

Wire Connector Removal and Installation (Cont'd)

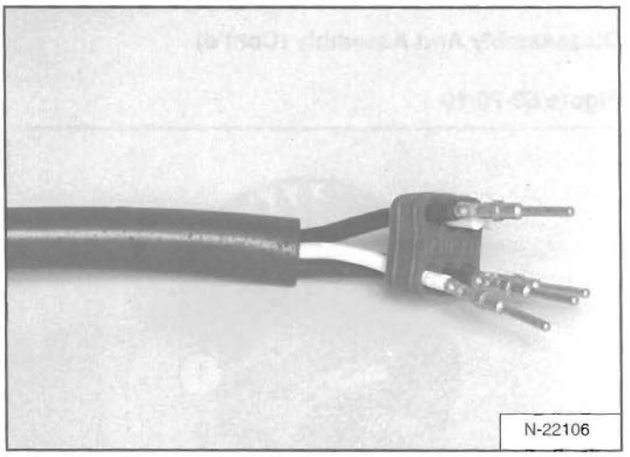
Figure 80-70-14



With a pointed screw driver lightly press in on the tabs (Item 1) **[Figure 80-70-14]** and remove the individual wires from the connector.

Reverse the disassembly procedure to assemble the heater fan.

Figure 80-70-15



The wiring code for the blower fan connector **[Figure 80-70-15]** is:

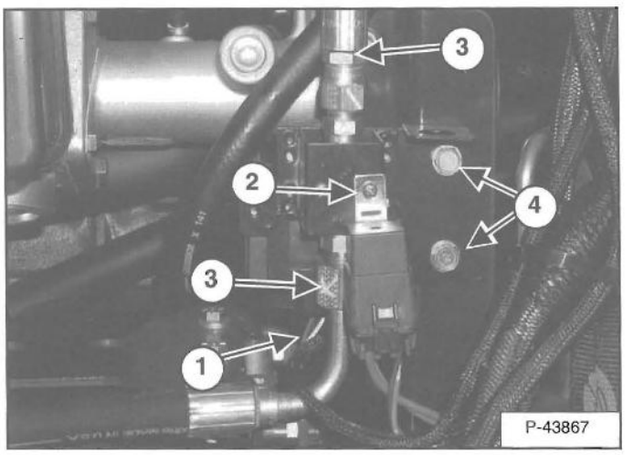
Number on Connector	Wire Color
1	Orange
2	Red
3	Yellow
4	Black
5	Open
6	Open

Reverse the removal procedure to install the wire connector.

HEATER VALVE

Removal and Installation

Figure 80-80-1



Disconnect the loader wiring harness (Item 1) **[Figure 80-80-1]** from the heater valve.

Remove the relay mounting screw (Item 2) **[Figure 80-80-1]** from the heater valve. Remove the relay, and replace the screw.

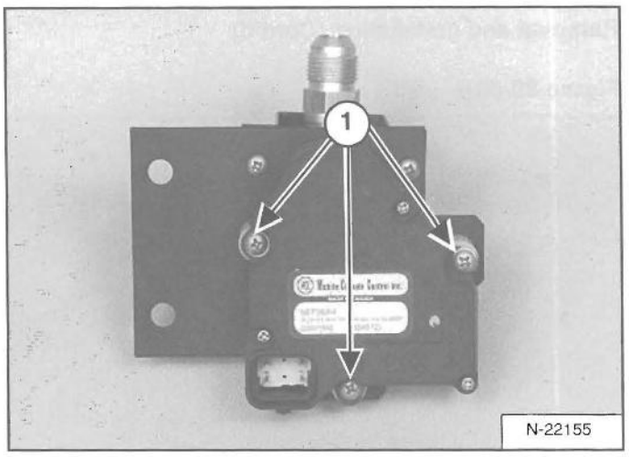
Remove the two coolant hoses (Item 3) **[Figure 80-80-1]** from the heater valve.

Cap the hoses and the heater valve with caps and plugs to prevent coolant loss from the system.

Remove the two mount bolts (Item 4) **[Figure 80-80-1]** from the heater valve mount bracket.

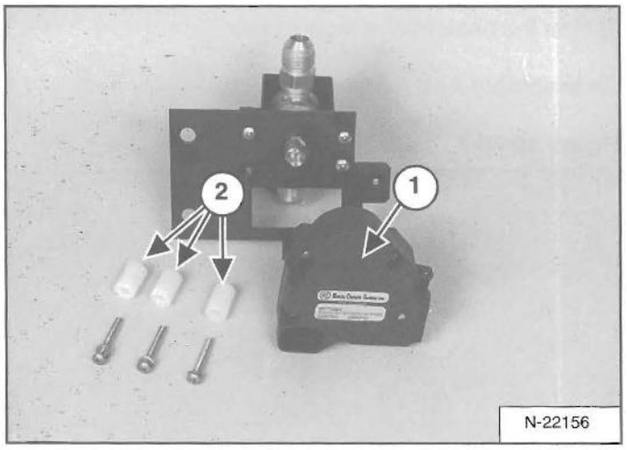
Remove the heater valve and mount bracket from the loader.

Figure 80-80-2



Remove the three mount bolts (Item 1) **[Figure 80-80-2]** from the heater valve actuator.

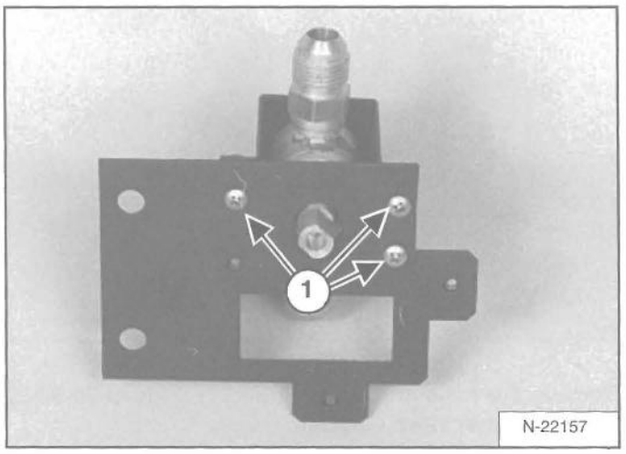
Figure 80-80-3



Remove the actuator (Item 1) and the three mounting spacers (Item 2) **[Figure 80-80-3]** from the heater valve mount plate.

Removal and Installation (Cont'd)

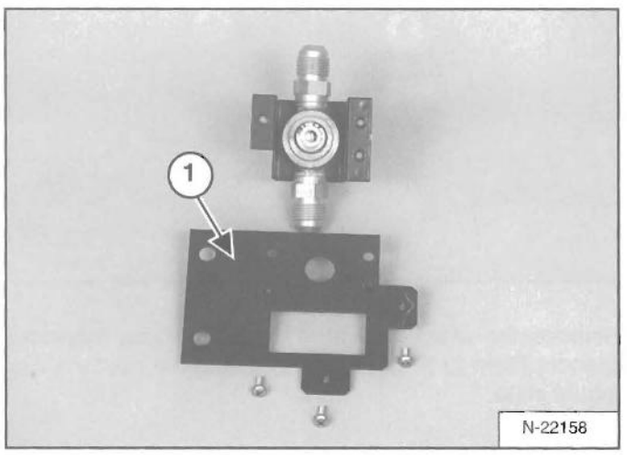
Figure 80-80-4



Remove the three mounting bolts (Item 1) **[Figure 80-80-4]** from the heater valve mount plate.

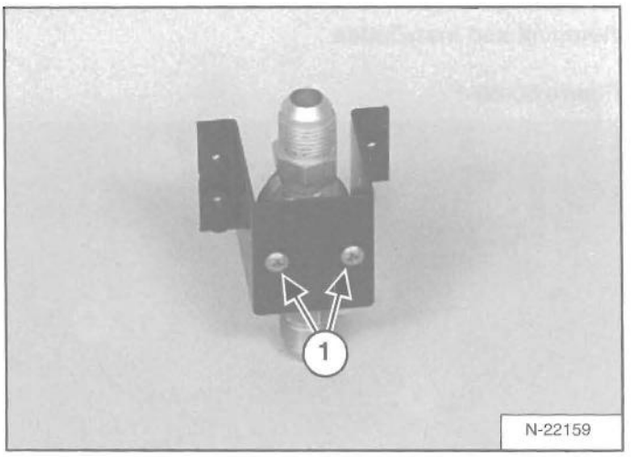
Disassembly And Assembly

Figure 80-80-5



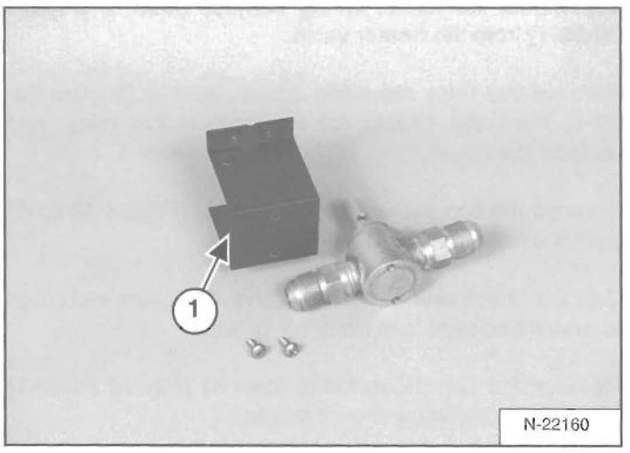
Remove the mount plate (Item 1) **[Figure 80-80-5]** from the heater valve bracket.

Figure 80-80-6



Remove the two mounting bolts (Item 1) **[Figure 80-80-6]** from the heater valve.

Figure 80-80-7



Remove the heater valve mount bracket (Item 1) **[Figure 80-80-7]** from the heater valve.

Replace the parts as needed.

SPECIFICATIONS

CONVERSIONS SPEC-60-1
Decimal And Millimeter Equivalents SPEC-60-1
U.S. To Metric Conversion SPEC-60-1

ENGINE SPECIFICATIONS SPEC-20-1
Camshaft SPEC-20-2
Connecting Rod SPEC-20-3
Crankshaft SPEC-20-4
Cylinders SPEC-20-3
Cylinder Head SPEC-20-1
Fuel Injection Nozzles SPEC-20-1
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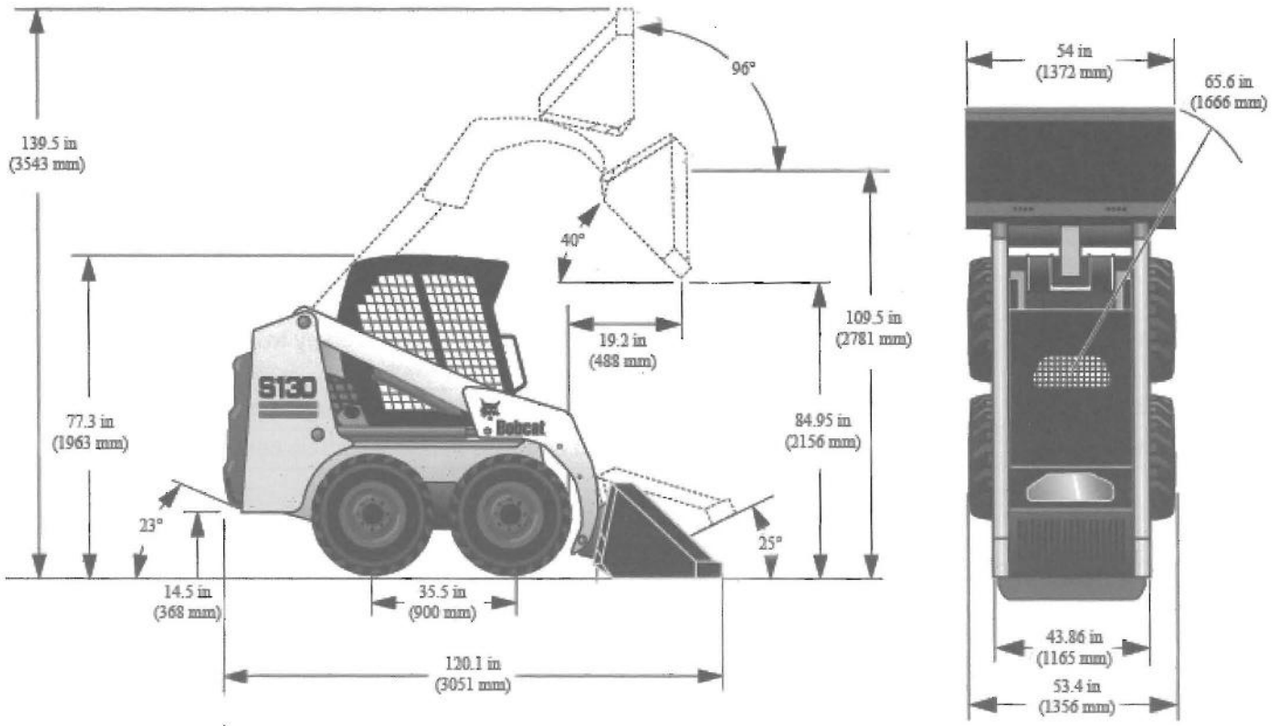
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+LOADER SPECIFICATIONS (S130)

Machine Dimensions

- Dimensions are given for loader equipped with standard tires and C/I bucket and may vary with other bucket types. All dimensions are shown in inches. Respective metric dimensions are given in millimeters enclosed by parentheses.
- Where applicable, specification conform to SAE or ISO standards and are subject to change without notice.



B-24432
B-24433

TIRE DESCRIPTION	WIDTH (OVER TIRES)	WHEEL TREAD
10-16.5 TIRES or (WITH INSET RIMS)	60.3in. (1531mm) or 54.0in (1372mm)	50.3in. (1278mm) or 44in. (1118mm)
31.5x13-16.5 Tires	60.0 in. (1524 mm)	46.3in. (1176 mm)

BUCKET WIDTH	WIDTH (OVER BUCKET)
54"	55.0in. (1398mm)
62"	62.0in. (1575mm)

* Recommended Pressure-Inflate tires to MAXIMUM pressure shown on the side wall of the tire. DO NOT mix brands of tires used on the same loader.

Changes of structure or weight distribution of the loader can cause changes in control and steering response and can cause failure of the loader parts.

LOADER SPECIFICATIONS (S130) (CONT'D)

Performance

Rated Operating Capacity (SAE)	1300 lbs. (590 kg)
Tipping Load (SAE Rating)	2744 lbs. (1245 kg)
Operating Weight	5063 lbs. (2297 kg)
SAE Breakout Force - Lift	2550 lbs. (11343 N)
- Tilt	3150 lbs. (14012 N)
Axel Torque	4900 ft.-lbs. (6644 Nm)
Travel Speed	0-7.3 MPH (11,7 km/hr.)

Controls

Vehicle Steering	Direction and speed controlled by two hand levers.
Loader Hydraulics	
Lift and Tilt	Controlled by separate foot pedals or Advanced Control System (ACS) (Opt).
Front Auxiliary (Std.)	Controlled by electrical switch on RH steering lever.
Rear Auxiliary (Option)	Controlled by electrical switch on LH steering lever.
Engine	Hand lever engine speed, Key-type start switch, function error shutdown.
Starting Aid	Glow Plug-Automatically activated by Std. or Deluxe instrumentation.
Service Brake	Two independent hydrostatic systems controlled by two hand operated steering levers.
Secondary Brake	One of the hydrostatic transmissions.
Parking Brake	Machanical disc, hand operated rocker switch on center instrument panel.

Engine

Make/Model	KUBOTA V2203-M-DI-E2B-BC-3
Fuel/Cooling	Diesel/Liquid
Horsepower @ 2800 RPM (SAE)	**Net:** 46 HP (34,3 kW) **Gross:** 49 HP (36,5 kW)
Torque @ 1700 RPM (SAE)	**Net:** 104 ft.-lbs. (141 Nm) **Gross:** 111 ft.-lbs. (150 Nm)
Number of Cylinders	Four
Displacement	134.0 cu. in. (2195 cu. cm.)
Bore/Stroke	3.425 / 3.638 (87,0 / 92,4)
Lubrication	Gear Pump Pressure System W/Filter
Crankcase Ventilation	Closed
Air Cleaner	Dry replaceable cartridge w/seperate safety element
Ignition	Diesel-Compression
Maximum Governed RPM	3000 RPM
Low Idle	1075-1225 RPM
High Idle	2860-3000 RPM

LOADER SPECIFICATIONS (S130) (CONT'D)

Hydraulic System

Pumps	Engine driven, Gear type
Pump Capacity	16.9 GPM (64 L/min.) @ 3135 Pump RPM @ 91% efficiency
System Relief at Quick Couplers	2650-2750 PSI (18272-18961 kPa)
Filter	Full flow replaceable, 3 micron synthetic media element
Hydraulic Cylinders	Doubleacting; Tilt cylinder has cushioning feature on dump & rollback
Bore Diameter: Lift Cylinder (2)	2.00 (50,8)
Tilt Cylinder (1)	3.50 (88,9)
Rod Diameter: Lift Cylinder (2)	1.25 (31,8)
Tilt Cylinder (1)	1.50 (38,1)
Stroke: Lift Cylinder (2)	26.57 (668,5)
Tilt Cylinder (1)	14.50 (368,3)
Control Valve	3-spool, open center type w/float detent on lift and electrically controlled auxiliary spool.
Fluid Lines	SAE standard tubelines, hoses and fittings.
Fluid Type	Use Bobcat Hydraulic Fluid (P/N 6903117 - 2, 2-1/2 Gal.).
Hydraulic Function Time:	
Raise Lift Arms	2.6 Seconds
Lower Lift Arms	1.9 Seconds
Bucket Dump	2.2 Seconds
Bucket Rollback	1.8 Seconds

Electrical

Alternator	Belt driven, 90 amp. ventilated
Battery	12 volt, 600 cold cranking amps. @ 0°F. (-18°C); 115 minute reserve capacity at 25 amps.
Starter (Valeo)	12 volt; Gear Reduction Type; 4.02 HP (3,0 kW)
Instrumentation	**Gauges:** Hourmeter, Fuel, Engine Temperature. **Warning lights:** Engine Coolant Temperature, Engine Oil Pressure, Hydraulic Oil Temperature & Charge Pressure, Hydraulic Filter, Engine Air Filter, Seat Belt, Fuel Level, General Warning, System Voltage. **Indicators:** Attachment Control Device (ACD), Advanced Hand Controls (AHC) or Advanced Control System (ACS), BICS Functions, glow plugs, Headlights, Bucket Positioning, Attachment Auxiliary Hydraulics modes **Optional Deluxe Instrumentation:** * Same gauges and warning lights as standard Instrumentation. *Additional bar-type gauges for: Engine Oil Pressure, System Voltage, Hydrostatic Charge Pressure and Hydraulic Oil Temperature. *Additional Features Incl.: Keyless Start with password capability, Digital Clock, Attachments, Attachments Information, Digital Tachometer, High Flow & Two-Speed Lockouts, Multi-Language Display, Help Screens, Diagnostic Capability & Engine/Hydraulic Systems Shutdown Function.

LOADER SPECIFICATIONS (S130) (CONT'D)

Drive System

Main Drive	Hydrostatic 4 wheel drive
Transmission	Infinitely variable tandem hydrostatic piston pumps, driving 2 fully reversing hydrostatic motors.
Final Drive	#80 HS endless roller chain & sprockets in sealed chaincase with oil lubrication.
Total Engine to Wheel Reduction	33:1
Axle Size	2.00 (50,8)
Wheel Bolts	(8) 9/16"

Capacities

Cooling System W/O Heater	12 qts. (11,4 L)
With Heater	12.6 qts. (11,9 L)
Fuel	13.3 gals. (50,3 L)
Engine Oil W/Filter	9.5 qts. (9,0 L)
Hydraulic Reservoir	14 qts.(13,0 L)
Hydraulic/Hydrostatic System W/Reservoir	6 gals. (22,7 L)
Chaincase Reservoir	8 gals. (30,0 L)

Tires

Standard Duty	10.00-16.5, 8 ply rating
Heavy Duty	10.00-16.5, 10 ply rating
Severe Duty	10.00-16.5, 10 ply rating
Flotation	31.5x13-16.5
Solid	10.00-16.5 Poly Foam Filled, 10 ply rating
Recommended Pressure	Inflate tires to MAXIMUM pressure shown on the side wall of the tire. DO NOT mix brands of tires used on the same loader.

ENGINE SPECIFICATIONS

All dimensions are given in inches. Respective metric dimensions are given in millimeters enclosed by parentheses.

Fuel Injection Nozzles

Opening Pressure	2702-2916 PSI (18600-20100 kPa)
Fuel Tightness Nozzle Seat	Dry Nozzle at 2418 PSI (16672 kPa) for 10 seconds

Fuel Injection Pump

Injection Timing	6.2-8.2 degrees B.T.D.C.
High Idle	2860-3000 RPM
Low Idle	1075-1225 RPM

Cylinder Head

Cylinder Head Surface Distortion	0.002 (0,05) Max.
Thickness of Gasket (Used)	0.0453-0.0492 (1,15-1,25)
(New)	0.0512-0.0551 (1,3-1,4)
Top Clearance (Piston to Head)	0.0236-0.0276 (0,60-0,70)
Compression	427-469 PSI (2940-3240 kPa)
Allowable Limit	340 PSI (2350 kPa)
Difference Between Cylinders	10%

Valves

Valve Seat Width (Intake & Exhaust)	0.084 (2,12)
Valve Seat Angle	Intake 60 degrees, Exhaust 45 degrees
O.D. of Valve Stems	0.3134-0.3140 (7,96-7,98)
I.D. of Valve Guides	0.3156-0.3161 (8,015-8,03)
Clearance Between Valve Stem & Guide	0.0016-0.0028 (0,04-0,07)
Allowable Limit	0.004 (0,1)
Valve Clearance (Cold)	0.0071-0.0087 (0,18-0,22)
Valve Recessing (Protrusion)	0.002 (0,05)
(Recess)	0.006 (0,15)

All dimensions are given in inches. Respective metric dimensions are given in millimeters enclosed by parentheses.

Valve Springs

Free Length	1.642-1.661 (41,7-42,2)
Allowable Limit	1.622 (41,2)
Fitted Length	1.378 (35,0)
Compress to Fitted Length	26.4 lbs. (117,6 N)
Allowable Limit	22.5 lbs. (100,0 N)

Valve Timing

Intake Valve (Open)	9 degrees B.T.D.C.
(Close)	45 degrees A.T.D.C.
Exhaust Valve (Open)	50 degrees B.T.D.C.
(Close)	12 degrees A.T.D.C.

Rocker Arms

O.D. of Rocker Arm Shaft	0.5501-0.5506 (13,973-13,984)
I.D. of Rocker Arm Bushings	0.5512-0.5519 (14,0-14,018)
Clearance Between Rocker Arm & Bushing	0.0006-0.0018 (0,016-0,045)
Allowable Limit	0.0039 (0,10)

Camshaft

Journal O.D.	1.5722-1.5728 (39,934-39,95)
Bearing I.D.	1.5748-1.5758 (40,0-40,025)
Oil Clearance	0.002-0.0036 (0,05-0,091)
Allowable Limit	0.006 (0,15)
Alignment Allowable Limit	0.0004 (0,01)
Cam Lobe Height	1.3346 (33,90)
Allowable Limit	1.3327 (33,85)
End Clearance	0.0028-0.0087 (0,07-0,22)
Allowable Limit	0.012 (0,3)

Tappet

Clearance Between Tappet & Guide	0.0008-0.0024 (0,02-0,062)
Tappet O.D.	0.9433-0.9441 (23,959-23,98)
Tappet Guide I.D.	0.9449-0.9457 (24,0-24,021)

All dimensions are given in inches. Respective metric dimensions are given in millimeters enclosed by parentheses.

Cylinders

Cylinder Bore I.D.	3.4252-3.4261 (87,00-87,022)
Allowable Limit	+0.0059 (+0,15)

Piston Rings

Ring Gap (Top Ring)	0.0079-0.0138 (0,20-0,35)
Limit Permitted	0.0492 (1,25)
Ring Gap (2nd Ring)	0.0138-0.0197 (0,35-0,50)
Limit Permitted	0.0492 (1,25)
Ring Gap (Oil Ring)	0.079-0.0157 (0,20-0,40)
Limit Permitted	0.0492 (1,25)
Side Clearance of Ring Groove:	
Top Ring	0.0037-0.0047 (0,093-0,12)
Second Ring	0.0037-0.0047 (0,094-0,12)
Oil Ring	0.0008-0.002 (0,02-0,052)

Pistons

Piston Pin Bore	0.9843-0.9848 (25,0-25.013)
Limit Permitted	0.9862 (25,05)

Connecting Rod

Piston Pin O.D.	0.9843-0.9847 (25,002-25,011)
Small End Bushing I.D.	0.9852-0.9858 (25,025-25,04)
Clearance Between Piston Pin & Small End Bushing	0.0006-0.0015 (0,014-0,038)
Allowable Limit	0.0059 (0,15 mm)
Connecting Rod Alignment Allowable Limit	0.002 (0,05)

Oil Pump

Oil Pressure Rated RPM	43-64 PSI (294-441 kPa)
Limit Permitted	36 PSI (248 kPa)
Idle Speed	14 PSI (98 kPa)
Limit Permitted	7 PSI (49 kPa)
Clearance Between Inner Rotor & Outer Rotor	0.0012-0.0055 (0,03-0,14)
Outer Rotor & Pump Body	0.0043-0.0075 (0,11-0,19)
End Clearance Between Inner Rotor & Cover	0.0041-0.0059 (0,105-0,15)
Limit Permitted	0.0079 (0,20)

All dimensions are given in inches. Respective metric dimensions are given in millimeters enclosed by parentheses.

Crankshaft

Crankshaft Alignment Limit Permitted	0.00079 (0,02)
Oil Clearance Between Journal & Bearing #1	0.0016-0.0046 (0,04-0,118)
Limit Permitted	0.0079 (0,2)
Journal O.D. #1	2.3591-2.3598 (59,921-59,94)
Bearing I.D. #1	2.3614-2.3637 (59,98-60,04)
Oil Clearance Between Journal & Bearing #2	0.0016-0.0041 (0,04-0,104)
Limit Permitted	0.0079 (0,2)
Journal O.D. #2	2.3591-2.3598 (59,92-59,94)
Bearing I.D. #2	2.3614-2.3632 (59,98-60,02)
Oil Clearance Between Crank Pin & Bearing	0.0009-0.0034 (0,025-0,087)
Limit Permitted	0.008 (0,2)
Crank Pin O.D.	1.8488-1.8494 (46,96-46,97)
Crank Pin Bearing I.D.	1.8504-1.8522 (47,0-47,046)
Crankshaft Side Clearance	0.0059-0.0122 (0,15-0,31)
Limit Permitted	0.0197 (0,5)

Timing Gear

Timing Gear Backlash:	
Crank Gear-Idle Gear	0.0016-0.0044 (0,042-0,112)
Idle Gear-Cam Gear	0.0016-0.0045 (0,042-0,115)
Idle Gear-Injection Pump Gear	0.0016-0.0045 (0,042-0,115)
Crank Gear-Oil Pump Gear	0.0016-0.0043 (0,042-0,109)
Limit Permitted	0.006 (0,15)
Clearance Between Idle Gear Shaft & Idle Gear Bushing	0.001-0.0026 (0,025-0,066)
Limit Permitted	0.004 (0,10)
Idle Gear Side Clearance Idle Gear	0.005-0.019 (0,12-0,48)

Thermostat

Valve Opening Temperature	177-182°F (80-84°C)
Valve Fully Open	203°F (95°C)

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	2000-2200 (2720-2980)	3450-3800 (4680-5150)
	1.750	2500-2750 (3390-3730)	4300-4900 (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 NOM. DIA	PROPERTY CLASS					
	8.8		10.9		12.9	
-	NM	LBF-FT	NM	LBF-FT	NM	LBF-FT
M4	3,5-2,5	2.5-2.0	4,2-3,8	3.1-2.8	5,3-4,7	3.9-3.5
M5	6,5-5,5	5.0-4.0	8,4-7,6	6.2-5.6	9,5-8,5	7.0-6.2
M6	10,5-9,5	7.5-7.0	13,7-12,3	10.1-9.1	15,8-14,2	11.6-10.4
M7	17-15	12.5-11.0	22-20	16.2-14.7	26,3-23,7	19.5-17.5
M8	26-24	19-18	32,6-29,4	24.0-21.7	39-35	28.5-25.5
M10	47-43	35-32	63-57	46.5-42.0	79-71	58.5-52.5
M12	85-75	60-55	115-105	85-78	137-123	110-91
M14	140-125	100-90	180-160	133-118	210-190	155-140
M16	210-190	155-140	285-255	210-188	330-300	245-225
M18	290-260	215-190	385-345	285-255	460-420	340-310
M20	410-370	300-275	550-490	405-360	650-590	490-440
M22	550-500	400-370	740-760	545-560	880-800	650-590
M24	700-640	520-470	950-850	700-625	1120-1000	830-730
M27	1030-930	760-680	1370-1230	1000-900	1630-1470	1200-1100
M30	1400-1260	1030-930	1900-1700	1400-1250	2200-2000	1600-1500
M33	1900-1720	1400-1270	2500-2300	1850-1700	3100-2700	2300-2000
M36	2450-2200	1800-1620	3200-2900	2400-2200	3900-3500	3900-2600

NOTE: Use the torque value for the part having the lesser property class when a fastener and nut are used together but have a different property class.

Torque For Kubota 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 1.25	36-50 ft.-lbs. (49-68 Nm)	58-80 ft.-lbs. (79-108 Nm)	116-137 ft.-lbs. (157-186 Nm)

HYDRAULIC CONNECTION SPECIFICATIONS

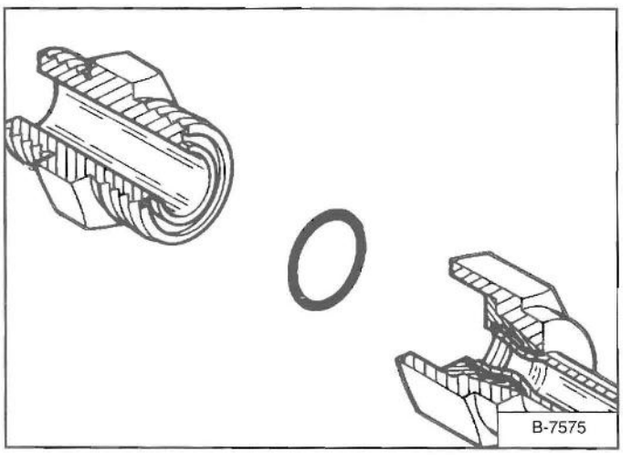
O-ring Face Seal Connection

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-40-1



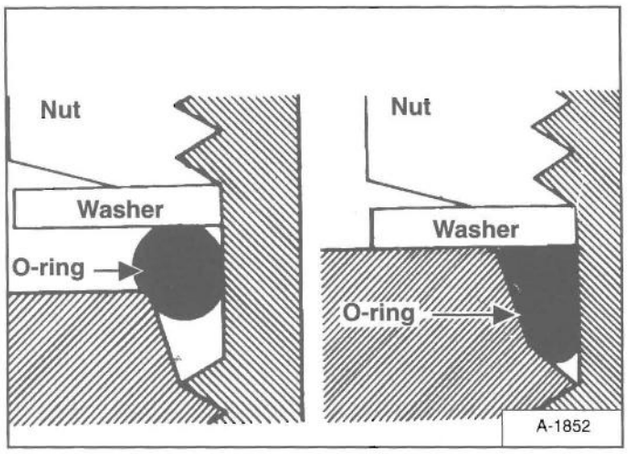
When the fitting is tightened, you can *feel* when the fitting is tight to eliminate leakage caused by under or over torqued fittings. Use vaseline petroleum jelly to hold the O-ring in position until the fittings are assembled **[Figure SPEC-40-1]**.

Figure SPEC- 40-2

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

Straight Thread O-ring Fitting

Figure SPEC- 40-3



Lubricate the O-ring before installing the fitting. Loosen the jam nut and install the fitting. Tighten the jam nut until the washer is tight against the surface **[Figure SPEC-40-3]**.

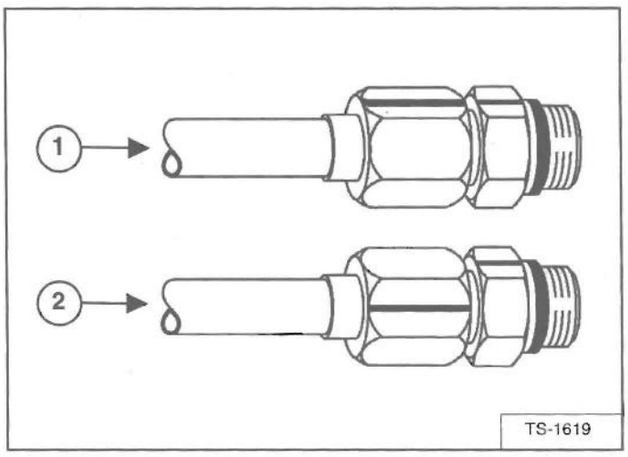
Tubelines And Hoses

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.

Figure SPEC- 40-4



Use the following procedure to tighten the flare fitting:

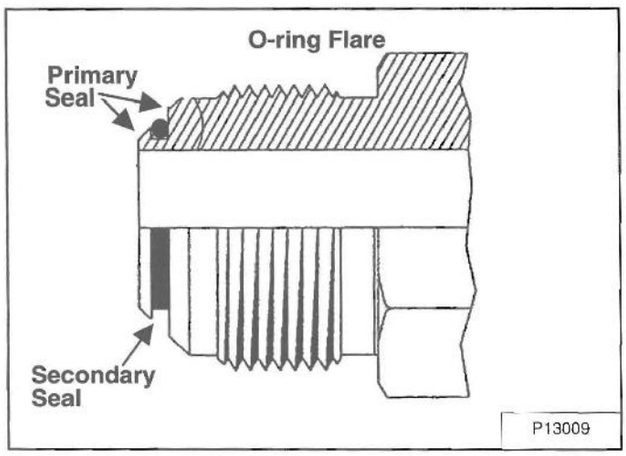
Tighten the nut until it makes contact with the seat. Make a mark across the *flats* of both the male and female parts of the connection (Item 1) **[Figure SPEC- 40-4]**.

Use the chart below to find the correct tightness needed (Item 2) **[Figure SPEC- 40-4]**. If the fitting leaks after tightening, disconnect it and inspect the seat area for damage.

Flare Fitting Tightening Torque		
Tubeline Outside Diameter	**Thread Size**	**TORQUE Ft.-Lbs. (Nm)**
1/4"	7/16" - 20	13 (18)
5/16"	1/2" - 20	17 (23)
3/8"	9/16" - 18	22 (30)
1/2"	3/4" - 16	40 (54)
5/8"	7/8" - 14	60 (54)
3/4"	1-1/16" - 12	84 (114)
7/8"	1-3/16" - 12	98 (133)
1"	1-5/16" - 12	118 (160)
1-1/4"	1-5/8" - 12	154 (209)
1-1/2"	1-7/8" - 12	163 (221)
2"	2-1/2" - 12	252 (342)

O-ring Flare Fitting

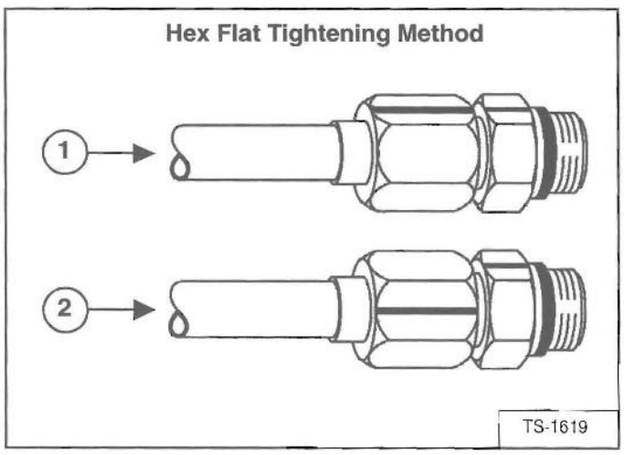
Figure SPEC- 40-5



The flare is the primary seal, the O-ring is the secondary seal and helps absorb vibration and pressure pulses at the connection **[Figure SPEC- 40-5]**.

If necessary, the O-ring-flare fitting can be used without an O-ring.

Figure SPEC-40-6



Use the following procedure to tighten the O-ring flare fitting.

Tighten the nut until it contacts with the seat. Make a mark across the flats of both the male and female parts of the connection (Item 1) **[Figure SPEC-40-6]**.

Use the chart below to find the correct tightness needed (Item 2) **[Figure SPEC-40-6]**. If the fitting leaks after tightening, disconnect it and inspect the seat area for damage.

O-Ring Flare Fitting Tightening Torque		
Tubeline Outside Diameter	**Thread Size**	**TORQUE Ft.-Lbs. (Nm)**
1/4"	7/16" - 20	13 (18)
5/16"	1/2" - 20	17 (23)
3/8"	9/16" - 18	22 (30)
1/2"	3/4" - 16	40 (54)
5/8"	7/8" - 14	60 (54)
3/4"	1-1/16" - 12	84 (114)
7/8"	1-3/16" - 12	98 (133)
1"	1-5/16" - 12	118 (160)
1-1/4"	1-5/8" - 12	154 (209)
1-1/2"	1-7/8" - 12	163 (221)
2"	2-1/2" - 12	252 (342)

*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.

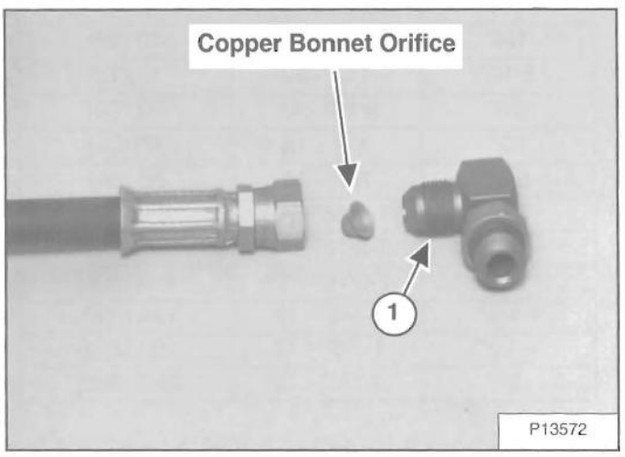
**If using the hex flat tightening method to tighten a new fitting to a new hose/tubeline.

**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.

O-ring Flare Fitting (Cont'd)

Figure SPEC- 40-7



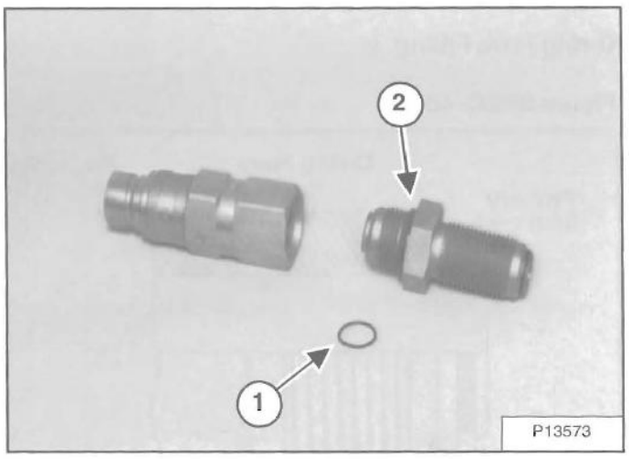
NOTE: O-ring flare fittings are not recommended in all applications. Use the standard flare fittings in these applications.

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- 40-7]** as shown.

When a O-ring flare fitting is used as a straight thread port adapter the O-ring flare face is not used to seal. The O-ring may come off the fitting and enter the system.

Figure SPEC- 40-8

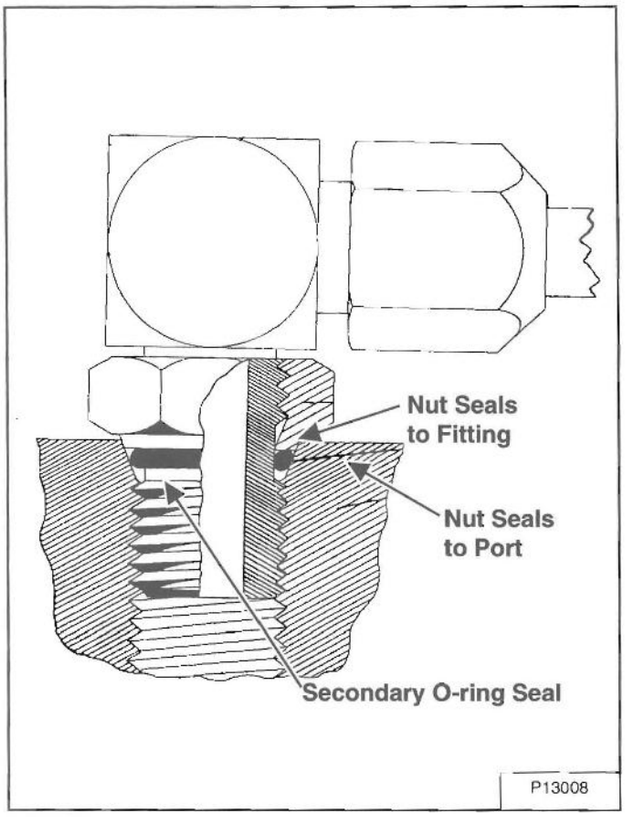


Always remove the O-ring (Item 1) from the flare face as shown.[Figure SPEC- 40-8]

An O-ring (Item 2) **[Figure SPEC- 40-8]** is added to the flat boss of the fitting to seal the connection in this application.

Port Seal Fitting

Figure SPEC- 40-9



The nut is the primary seal, the O-ring is the secondary seal and helps absorb vibration and pressure pulses at the connection **[Figure SPEC- 40-9]**.

The hex portion of the nut does not contact the surface of the component when the nut is tight.

Port Seal and O-ring Boss Tightening Torque	
Thread Size	**Torque Ft.-Lbs. (Nm)**
7/16"	13 (18)
9/16" - 18	22 (30)
3/4" - 16	40 (54)
7/8" - 14	60 (81)
1-1/16" - 12	84 (114)
1-3/16" - 12	98 (133)
1-5-16" - 12	118 (160)
1-7/16" - 12	154 (209)
1-5/8" - 12	163 (221)

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.



Bobcat®

HYDRAULIC FLUID SPECIFICATIONS

Specifications

Use Bobcat hydraulic fluid (P/N 6903117 -2, 2-1/2 Gal.), (P/N 6903118 - 5 Gal.), (P/N 6903119 - 55 Gal.).

DO NOT use automatic transmission fluids in the loader 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 loader must be kept in a warm building. Extra warm-up time must be used each time the loader 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 transmission pump (indicated by TRANS light ON) can cause transmission 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



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CONVERSIONS

Decimal And Millimeter Equivalents

FRACTIONS	DECIMALS	MM
1/64	0.015625	0.397
1/32	0.03125	0.794
3/64	0.046875	1.191
1/16	0.0625	1.588
5/64	0.078125	1.984
3/32	0.09375	2.381
7/64	0.109375	2.778
1/8	0.1250	3.175
9/64	0.140625	3.572
5/32	0.15625	3.969
11/64	0.171875	4.366
3/16	0.1876	4.762
13/64	0.203125	5.159
7/32	0.21875	5.556
15/64	0.234375	5.953
1/4	0.2500	6.350
17/64	0.265625	6.747
9/32	0.28125	7.144
19/64	0.296875	7.541
5/16	0.3125	7.938
21/64	0.328125	8.334
11/32	0.34375	8.731
23/64	0.359375	9.128
3/8	0.3750	9.525
25/64	0.390625	9.922
13/32	0.40625	10.319
27/64	0.421875	10.716
7/16	0.4375	11.112
29/64	0.453125	11.509
15/32	0.46875	11.906
31/64	0.484375	12.303
1/2	0.5000	12.700

1 mm = 0.03937"

FRACTIONS	DECIMALS	MM
33/64	0.515625	13.097
17/32	0.53125	13.494
35/64	0.546875	13.891
9/16	0.5625	14.288
37/64	0.578125	14.684
19/32	0.59375	15.081
39/64	0.609375	15.478
5/8	0.6250	15.875
41/64	0.640625	16.272
21/32	0.65625	16.669
43/64	0.671875	17.066
11/16	0.6875	17.462
45/64	0.703125	17.859
23/32	0.71875	18.256
47/64	0.734375	18.653
3/4	0.7500	19.050
49/64	0.765625	19.447
25/32	0.78125	19.844
51/64	0.796875	20.241
13/16	0.8125	20.638
53/64	0.828125	21.034
27/32	0.84375	21.431
55/64	0.859375	21.828
7/8	0.8750	22.225
57/64	0.890625	22.622
29/32	0.90625	23.019
59/64	0.921875	23.416
15/16	0.9375	23.812
61/64	0.953125	24.209
31/32	0.96875	24.606
63/64	0.984375	25.003
1	1.000	25.400

0.001 = 0.0254 mm

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	Pounds/Sq. In.	Kilopascal	6.895
WORK	Foot–Pounds	Newton–Meter	1.356
LIQUID VOLUME	Quarts	Liters	0.9463
	Gallons	Liters	3.785
LIQUID FLOW	Gallons/Minute	Liters/Minute	3.785
TEMPERATURE	Fahrenheit	Celsius	1.Subtract 32° 2. Multiply by 5/9



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SPEC-60-2

S130 Bobcat Loader
Service Manual