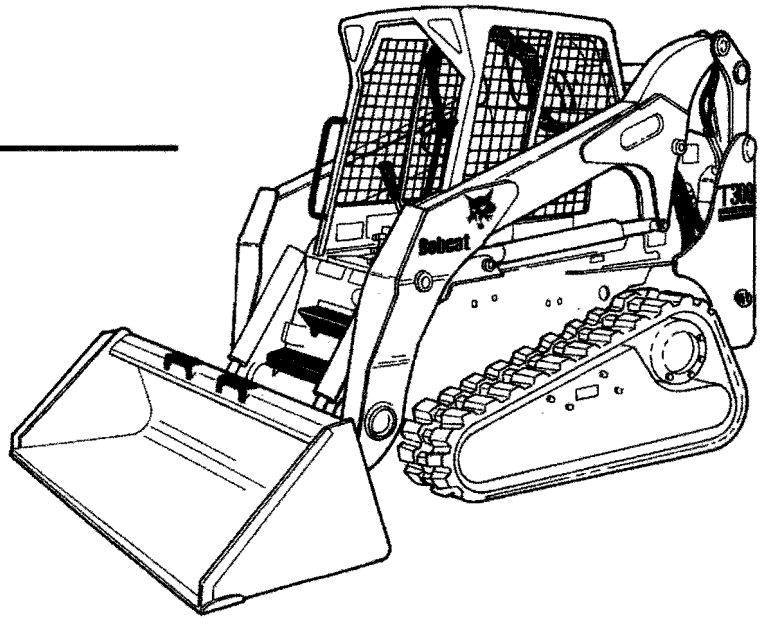
T300
TURBO

T300
TURBO HIGH FLOW

Bobcat®

Service Manual

S/N 525411001 & Above
S/N 525511001 & Above



EQUIPPED WITH BOBCAT INTERLOCK CONTROL SYSTEM (BICS™)

6902726 (10-03)

IR Bobcat.

Printed in U.S.A.

MAINTENANCE SAFETY

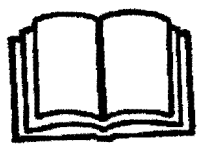
⚠ WARNING

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.

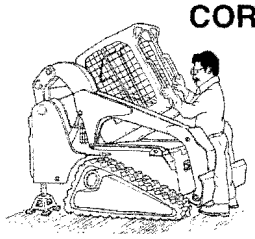
CORRECT



B-10731a

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

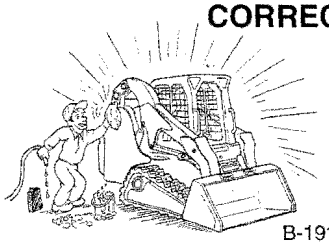
CORRECT



B-19110

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

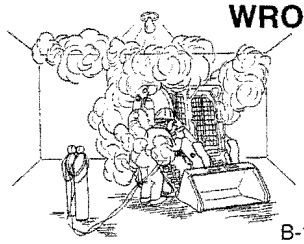
CORRECT



B-19109

⚠ Cleaning and maintenance are required daily.

WRONG



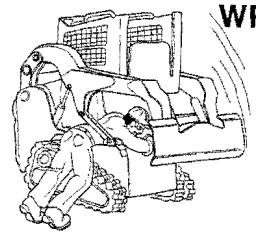
B-19108

⚠ Have good ventilation when welding or grinding painted parts.

⚠ Wear dust mask when grinding paintee parts. Toxic dust and gas can be produced.

⚠ Avoid exhaust fume leaks which can kill without warning. Exhaust system must be tightly sealed. Exhaust fumes can kill without warning.

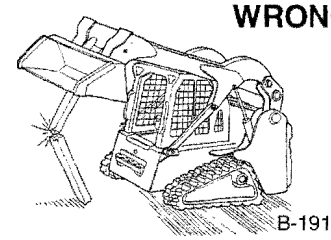
WRONG



B-19111

⚠ 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-19107

⚠ 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

WRONG

B-19106

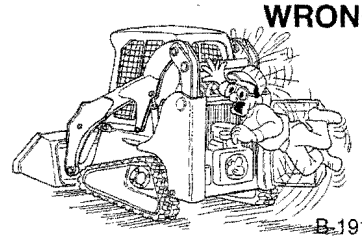
⚠ Stop, cool and clean engine of flammable materials before checking fluids.

⚠ 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-19105

⚠ 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.

MSW24-0903

Bobcat®

ALPHABETICAL INDEX

ALPHABETICAL INDEX (CONT'D)

ACS- ADVANCED CONTROL SYSTEM
AHC- ADVANCED HAND CONTROL SYSTEM
BICS™-BOBCAT INTERLOCK CONTROL SYSTEM

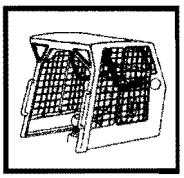
CONTENTS

FORWORD

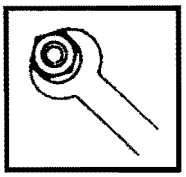
This manual is for the Bobcat loader mechanic. It provides necessary servicing and adjustment procedures for the Bobcat loader and its component parts and systems. Refer to the Operation & Maintenance Manual for operating instructions, Starting procedure, daily checks, etc.

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.

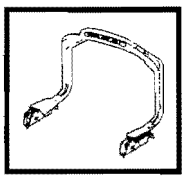


2. Check that ROPS mounting hardware is tightened and is Bobcat approved.

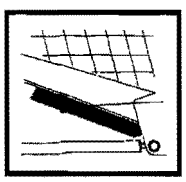


3. The seat belt must be correctly installed, functional and in good condition.

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

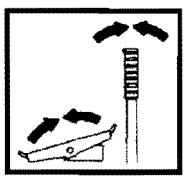


5. Check lift arm support device, replace if damaged.



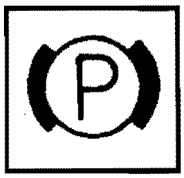
6. Machine signs must be legible and in the correct location.

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

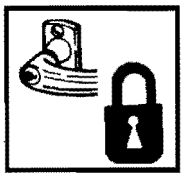


8. Check for correct function of the work lights

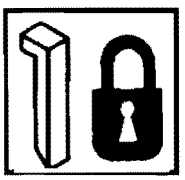
9. The parking brake must function correctly.



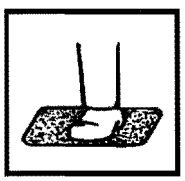
10. Enclosure door latches must open and close freely.



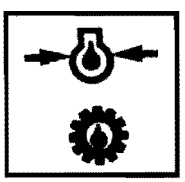
11. Bob-Tach wedges and linkages must function correctly and be in good condition.



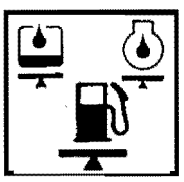
12. Safety treads must be in good condition.



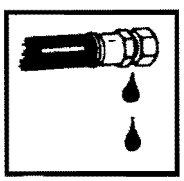
13. Check for correct function of indicator lamps (Optional on some models).



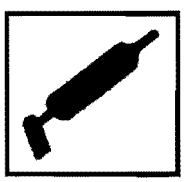
14. Check hydraulic fluid level, engine oil level and fuel supply.



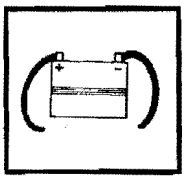
15. Inspect for fuel, oil or hydraulic fluid leaks.



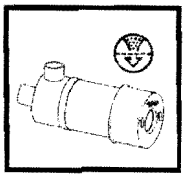
16. Lubricate the loader.



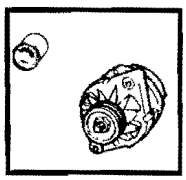
17. Check the condition of the battery and cables.



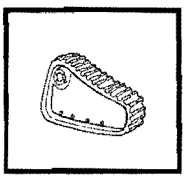
18. Inspect the air cleaner for damage or leaks. Check the condition of the element.



19. Check the electrical charging system.

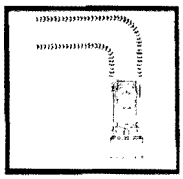


20. Check tracks for wear and tension.



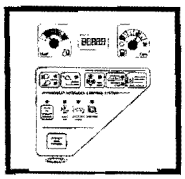
21. Inspect for loose or broken parts or connections.

22. Operate the loader and check all functions.

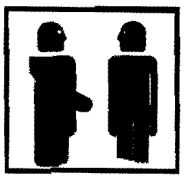


23. Check for any field modification not completed.

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



25. 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.

SI05-0299

FIRE PREVENTION

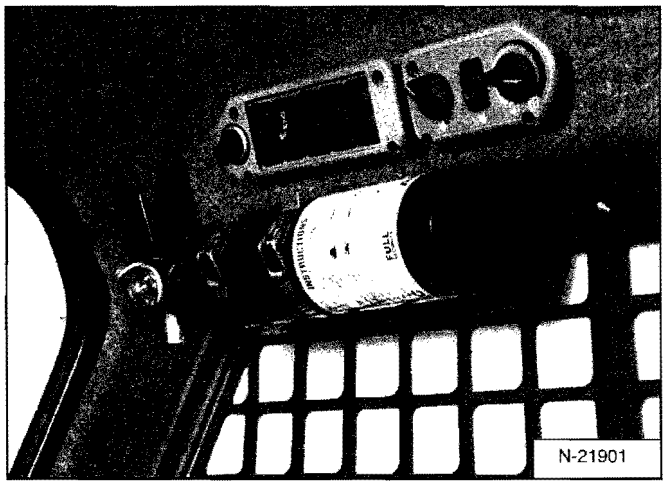
The loader has several components that are at high temperature under normal operating conditions. The primary source of high temperatures is the engine and exhaust system. The electrical system, if damaged or incorrectly maintained, can be a source of arcs or sparks.

Flammable debris (leaves, straw, etc.) must be removed regularly. If flammable debris is allowed to accumulate, it will increase 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 hazard 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 any 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.
- Know where fire extinguishers and first aid kits are located and how to use them.

Figure 1



A fire extinguisher is available for your Bobcat dealer. The fire extinguisher can be installed in the location shown in **[Figure 1]**

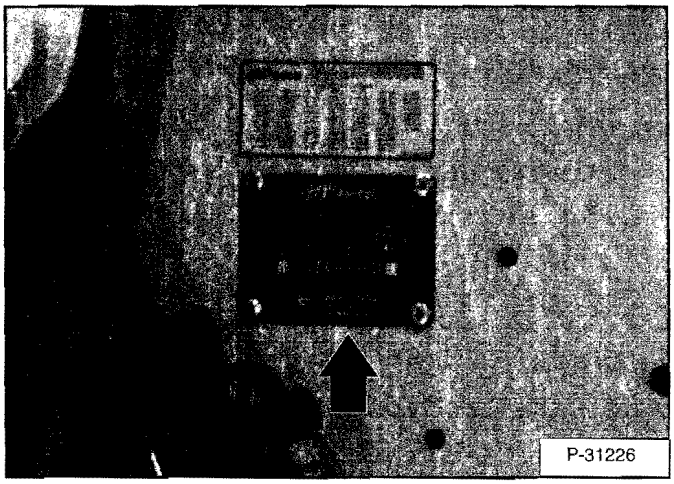
SI06-0301

SERIAL NUMBER LOCATION

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:

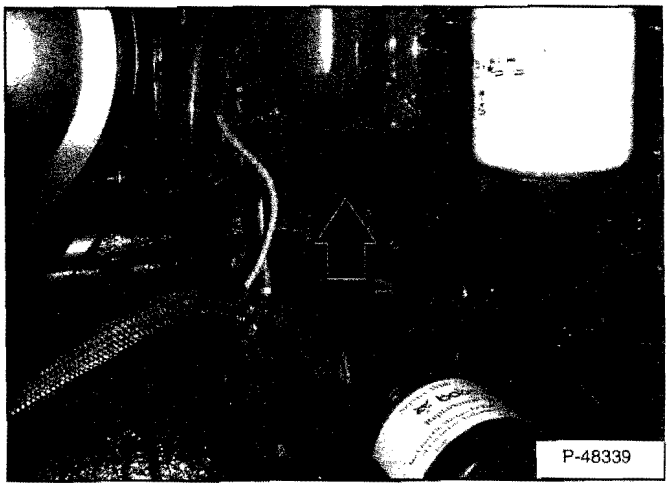
XXXX	XXXXX
Model 1.-Model/ Engine Combination	Model 2.-Production Sequence (Series)

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

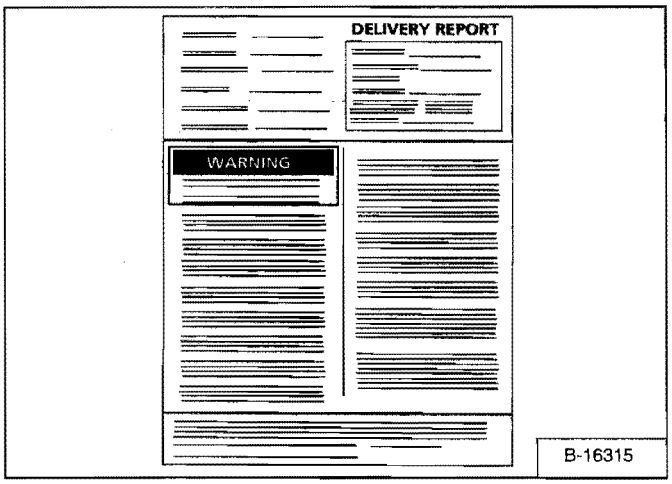
Figure 3



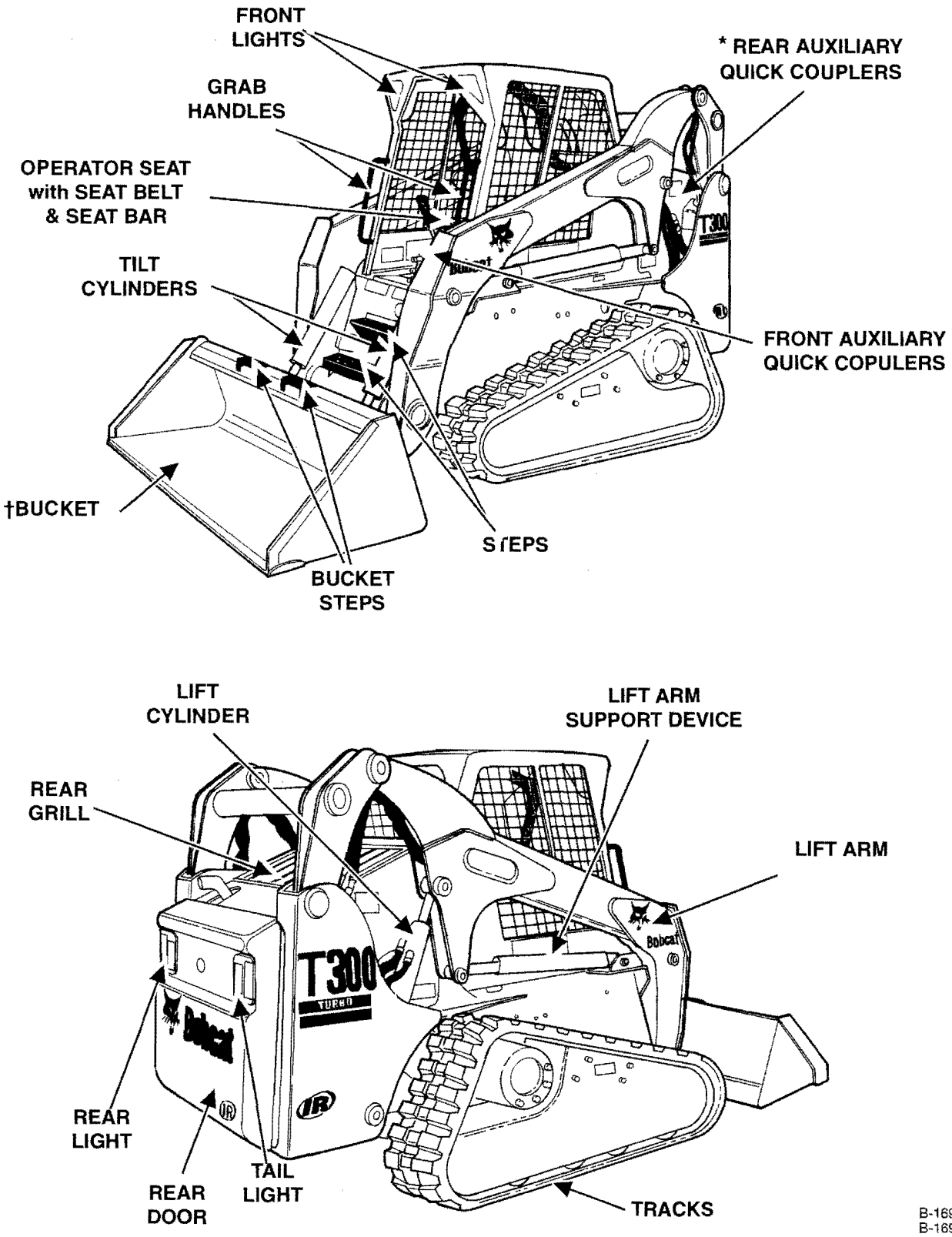
The engine serial number is located on the engine block **[Figure 3]**.

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]**.



* Option or Field Accessory

† Many buckets and other attachments are available.

Bobcat®

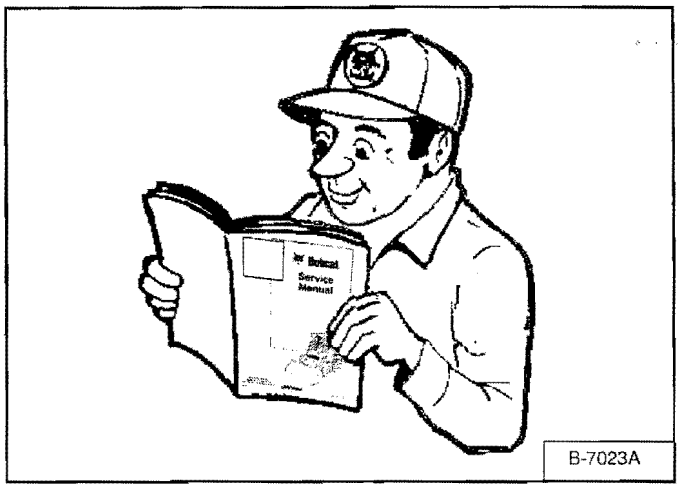
Continued On Next Page

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

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W-2003-0903

Read the Removal & Installation, Disassembly & Assembly, etc. completely to become familiar with the procedure before beginning **[Figure 10-10-1]**.

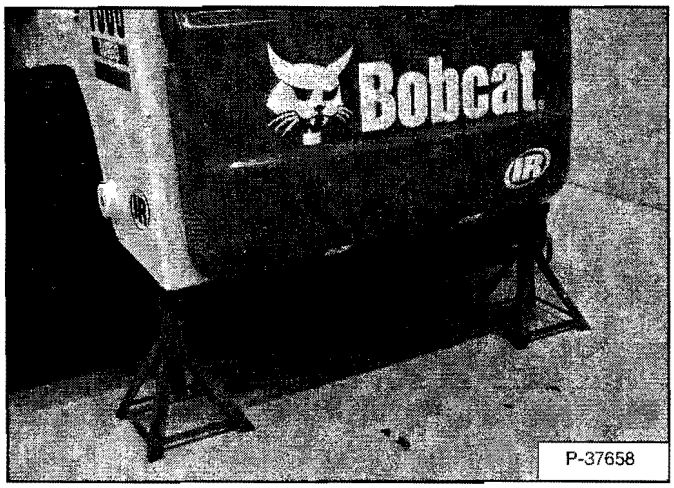
Always park the loader on a level surface.

⚠ WARNING

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

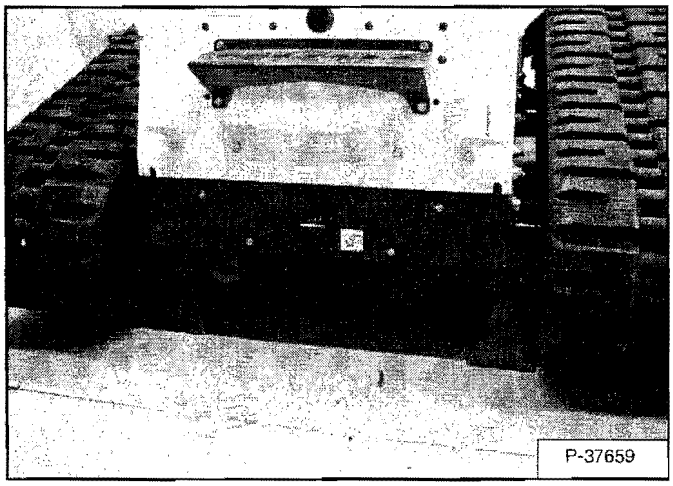
W-2017-0286

Figure 10-10-2



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

Figure 10-10-3



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

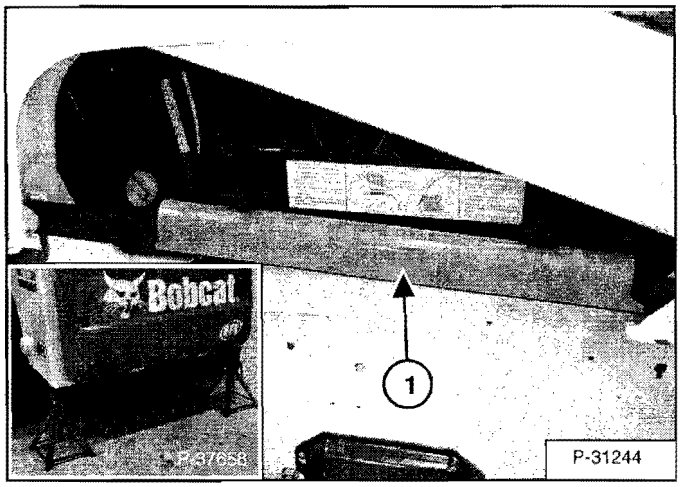
NOTE: Make sure the jackstands do not touch the tracks.


Bobcat®

LIFT ARM SUPPORT DEVICE

Installing The Lift Arm Support Device

Figure 10-20-1



⚠ WARNING

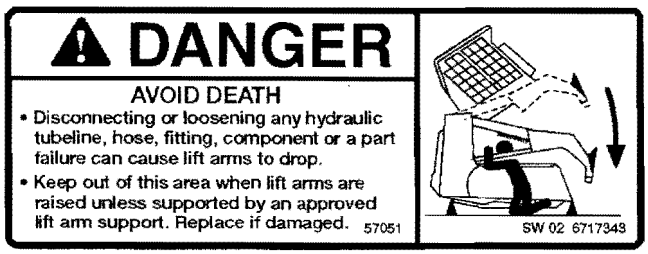
Never work on a machine with the lift arms up unless the lift arms are secured by an approved lift arm support device. Failure to use an approved lift arm support device can allow the lift arms or attachment to fall and cause injury or death.

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



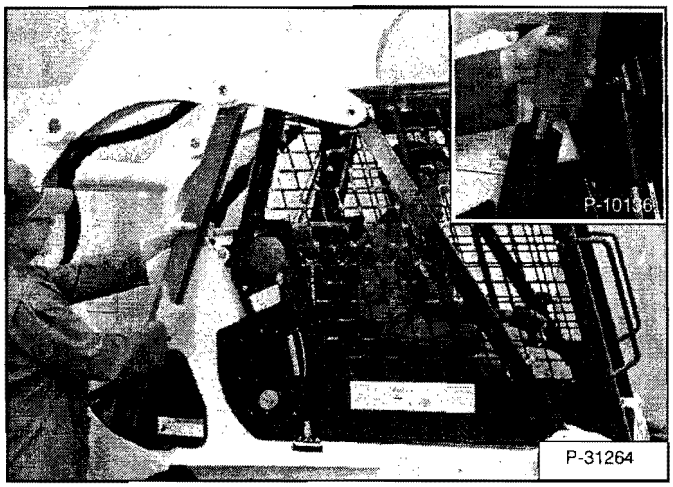
Put jackstands under the rear corners of the loader frame (Inset) **[Figure 10-20-1]**.

Remove the lift arm support device (Item 1) **[Figure 10-20-1]** from the storage position.

The operator must stay in the operator seat with the seat belt fastened and the seat bar lowered, until the lift arm support device is installed.

Start the engine and raise the lift arms all the way up.

Figure 10-20-2

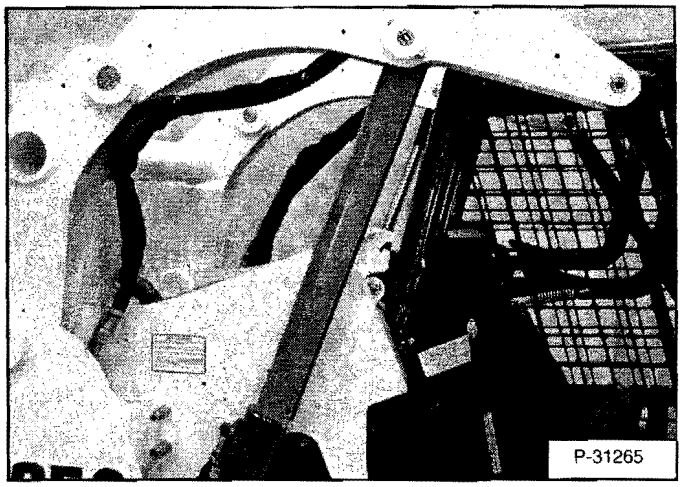


Have a second person install the lift arm support device over the rod of one of the lift cylinders **[Figure 10-20-2]**.

The lift arm support device must be tight against the cylinder rod. The tabs of the lift arm support device must be under the cylinder as shown (Inset) **[Figure 10-20-2]**.

Installing The Lift Arm Support Device (Cont'd)

Figure 10-20-3



Lower the lift arms slowly until the lift arm support device is held between the lift arms and lift cylinder **[Figure 10-20-3]**.

Removing The Lift Arm Support Device

The operator must be in the operator's seat, with the seat belt fastened and seat bar lowered, until the lift arm support device is removed and the lift arms are lowered all the way.

Start the engine, raise the lift arms all the way up.

Have a second person remove the lift arm support device.

Lower the lift arms all the way and stop the engine.

Return the lift arm support device to storage position and secure with clamping knobs.

Remove the jackstands.

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.

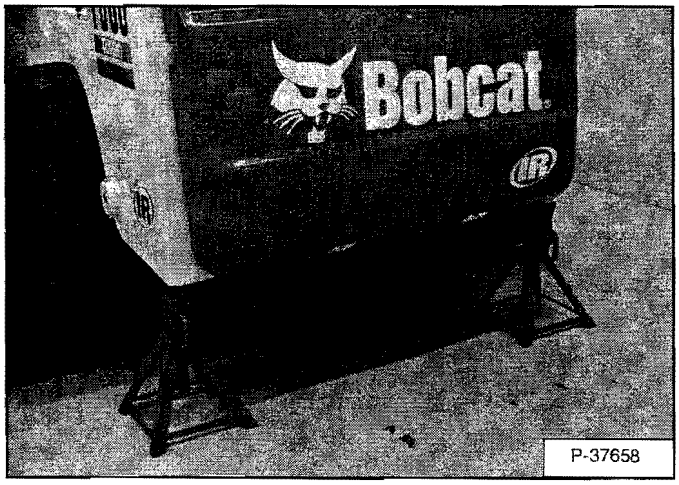
ROPS/FOPS - Roll Over Protective Structure per SAE J1040 and ISO 3471, and Falling Object Protective Structure per SAE J1043 and ISO 3449, Level I. Level II is available.

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

Figure 10-30-1

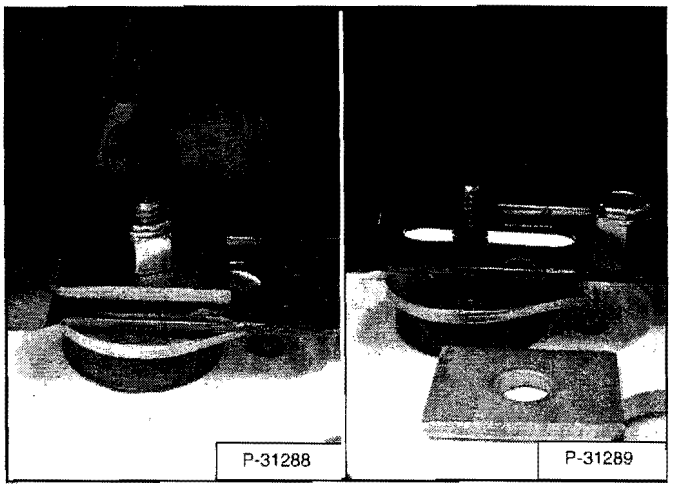


Always stop the engine before raising or lowering the cab.

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.)

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

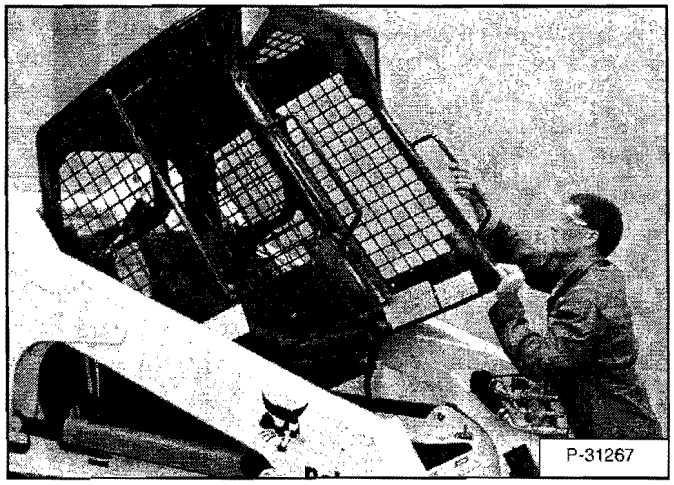
Figure 10-30-2



Loosen the nut (both sides) at the front corner 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]**.

Raising The Operator Cab (Cont'd)

Advanced Hand Control Only

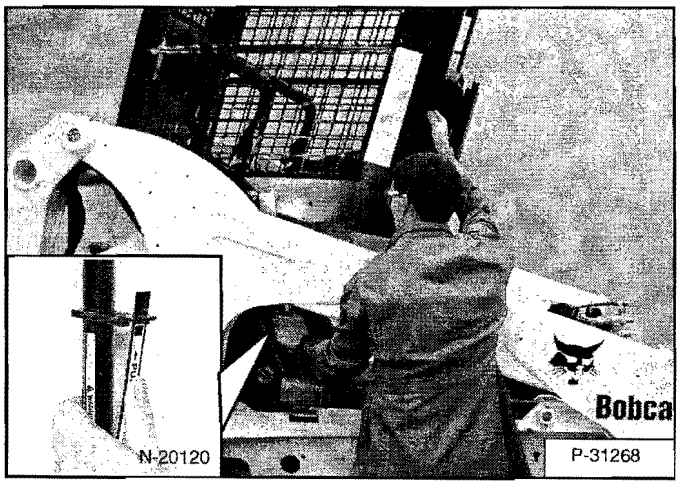
⚠ WARNING

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

Lowering The Operator Cab

Figure 10-30-4



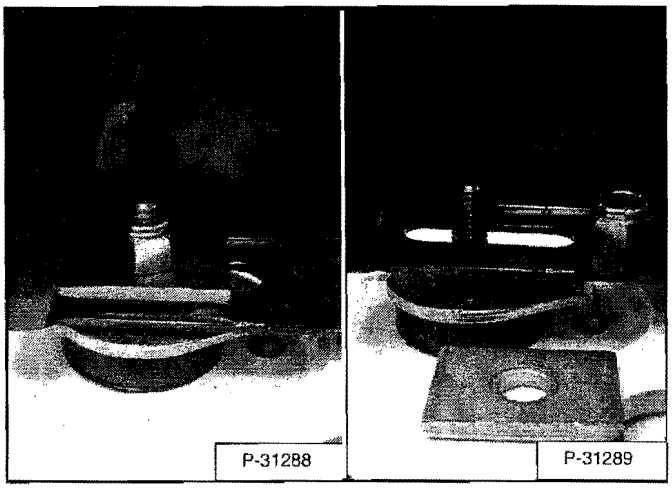
Always stop the engine before raising or lowering the cab.

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

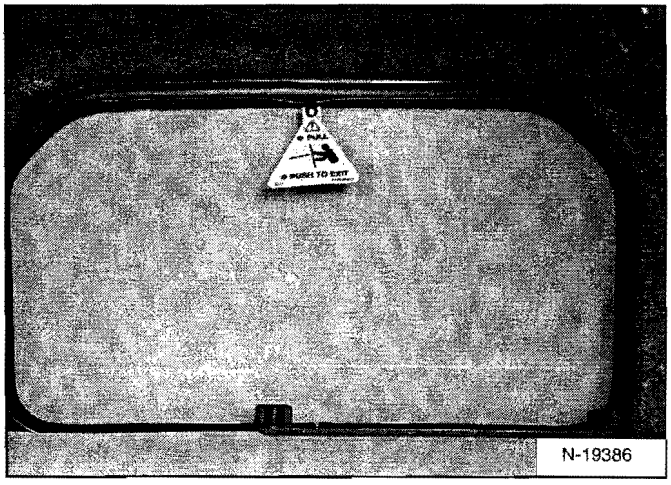


Install the plates and nuts **[Figure 10-30-5]** (both sides).

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

Emergency Exit

Figure 10-30-6



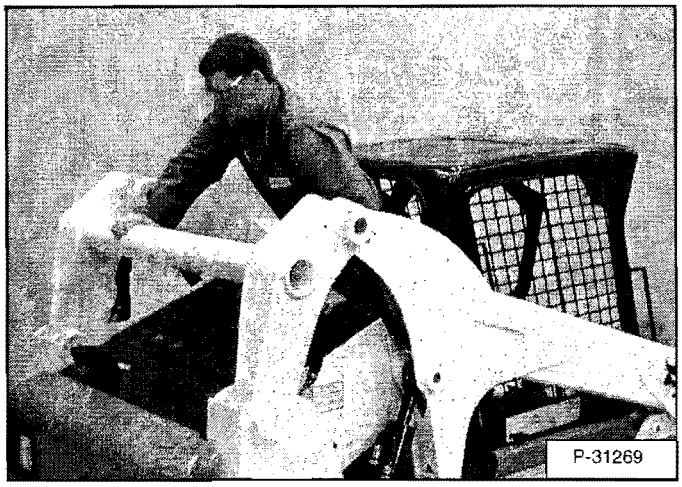
The front opening on the operator cab and rear window provide exits.

REAR WINDOW (If Equipped)

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

Emergency Exit (Cont'd)

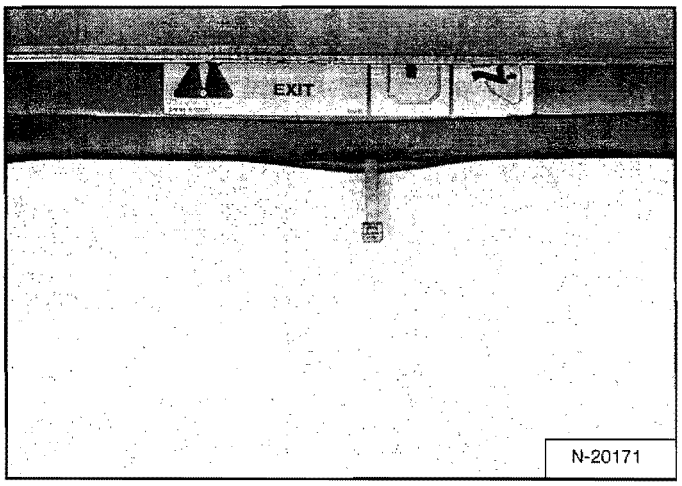
Figure 10-30-7



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



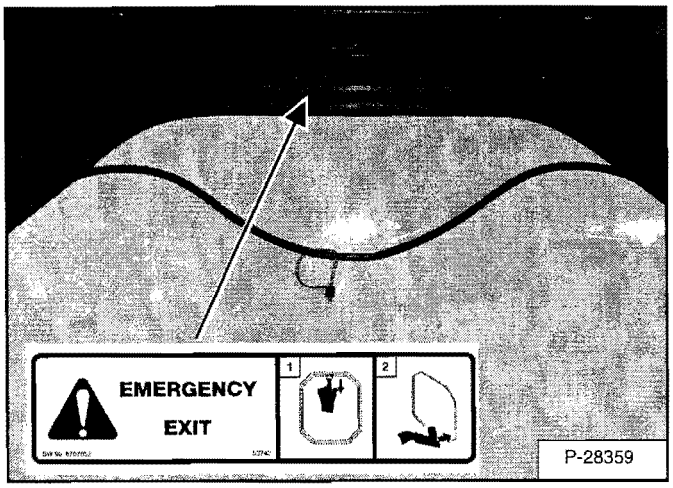
FRONT DOOR (If Equipped)

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].

NOTE: When the special applications kit is installed, the front door cannot be used for an emergency exit.

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.

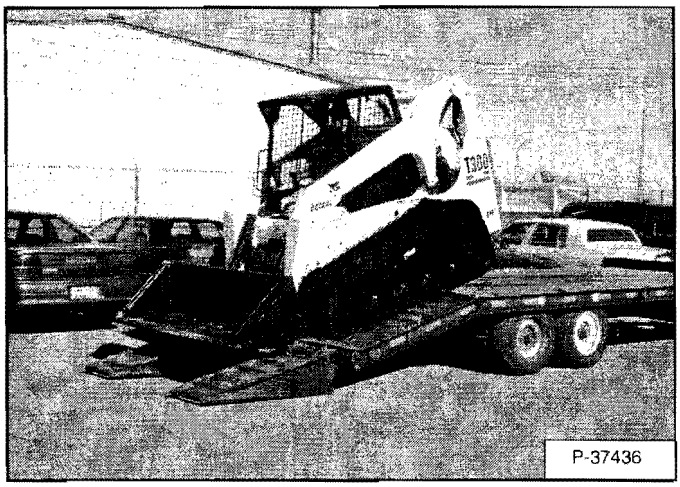
Exit through the front door.

Bobcat®

TRANSPORTING THE BOBCAT LOADER

Procedure

Figure 10-40-1



⚠ WARNING

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

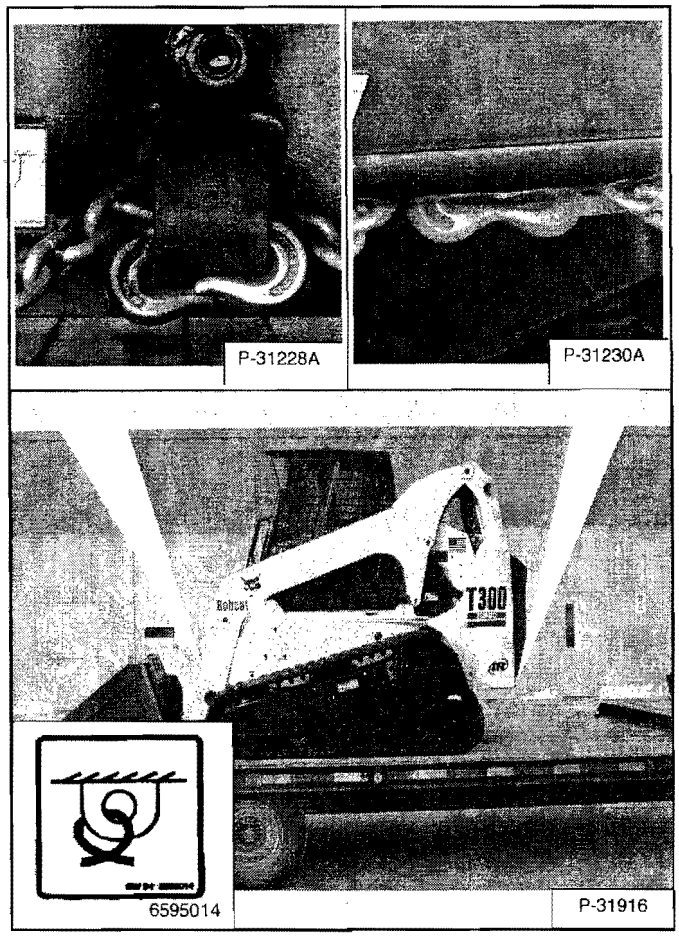
W-2058-0494

A loader with an empty bucket or no attachment must be loaded backward onto the transport vehicle **[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.).

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]**.

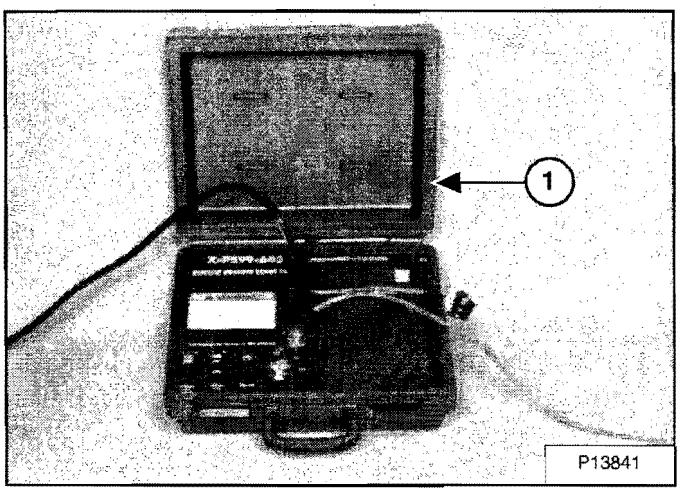
- Lower the bucket or attachment to the floor.
- Stop the engine.
- Engage the parking brake.
- Install chains at the front and rear loader tie down positions (Inset) **[Figure 10-40-2]**.
- Fasten each end of the chain to the transport vehicle.

Bobcat®

REMOTE START

Procedure For Loader W/O Attachments Control Harness

Figure 10-50-1



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

MEL1563 - Remote Start Tool Kit

The remote start (Item 1) **[Figure 10-50-1]** 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.

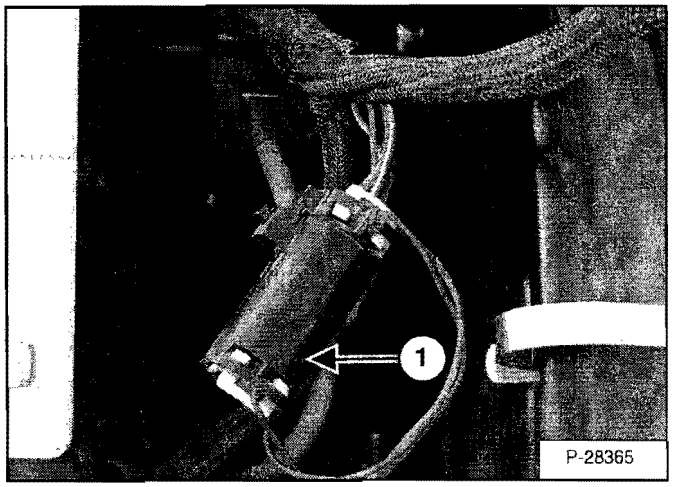
Lift and block the loader. (See Contents Page 10-01.)

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.

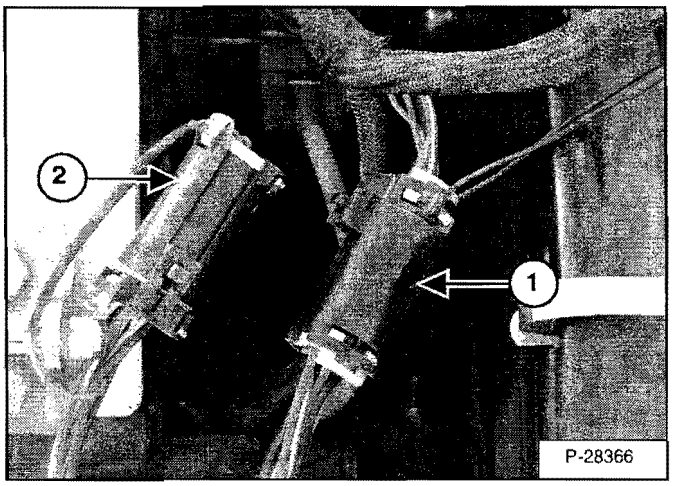
Figure 10-50-2



Remove the cap (Item 1) **[Figure 10-50-2]** from the loader harness.

When the remote start procedure is completed, replace the loader connector cap (Item 1) **[Figure 10-50-2]**.

Figure 10-50-3



Connect the remote start tool to the engine harness connector (Item 1) **[Figure 10-50-3]**.

The connector (Item 2) **[Figure 10-50-3]** from the remote start harness is not used in the remote start procedure and should remain capped.

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.

Procedure For Loader W/O Attachments Control Harness (Cont'd)

⚠ WARNING

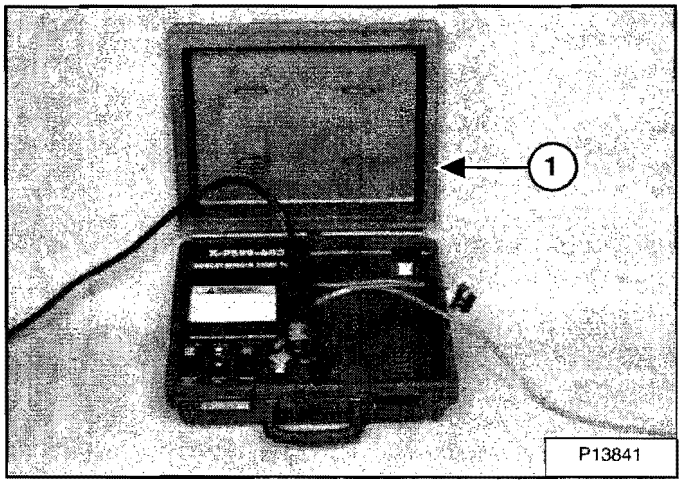
AVOID INJURY OR DEATH

With the 7-pin connector plugged into the loader and the 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 in the engine area it is important to remove the operator panel keys.

W-2357-0899

Procedure For Loader With Attachments Control Harness

Figure 10-50-4



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

MEL1563 - Remote Start Tool Kit

The remote start (Item 1) **[Figure 10-50-4]** 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.

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.

Figure 10-50-5

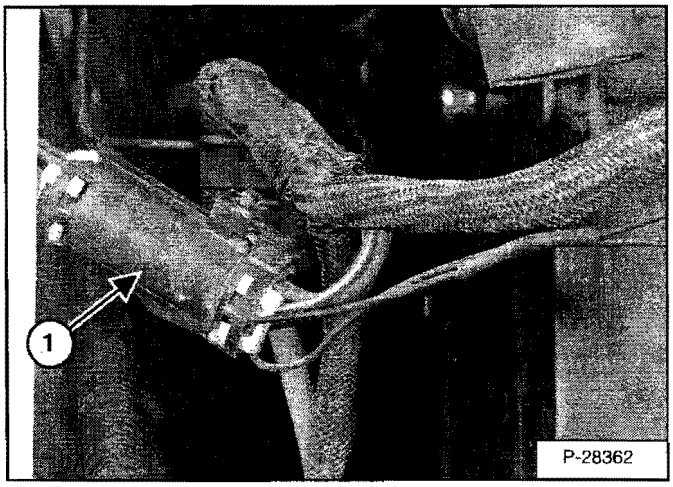
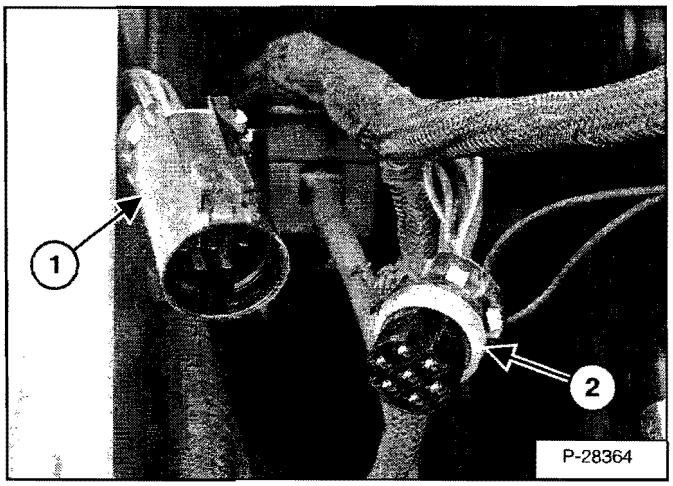


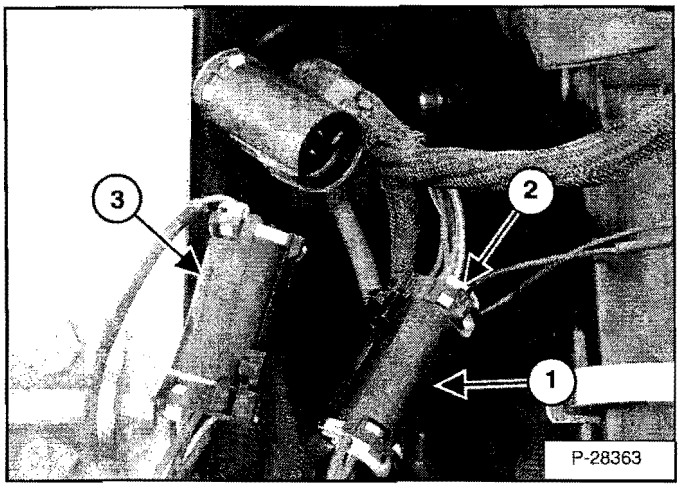
Figure 10-50-6



Disconnect the attachment control harness (Item 1) **[Figure 10-50-5]** & **[Figure 10-50-6]** from the loader harness (Item 2) **[Figure 10-50-6]**.

Procedure for Loader With Attachments Control Harness (Cont'd)

Figure 10-50-7



Connect the remote start tool (Item 1) **[Figure 10-50-7]** to the loader harness connector (Item 2) **[Figure 10-50-6]**.

The connector (Item 3) **[Figure 10-50-7]** on the remote start harness is not used in the remote start procedure and should remain capped.

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

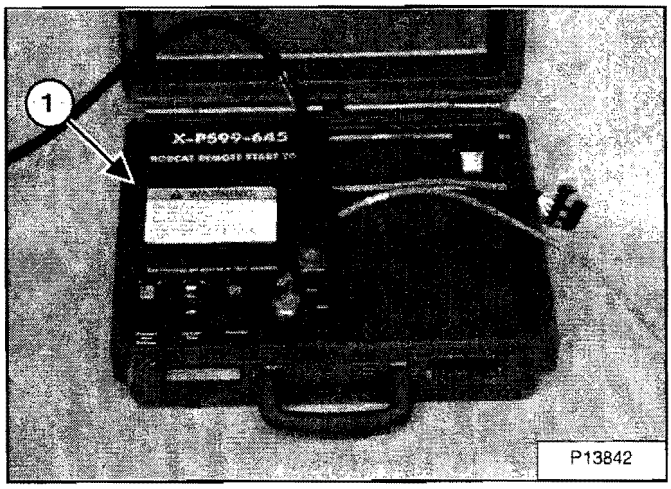
AVOID INJURY OR DEATH

With the 7-pin connector plugged into the loader and the 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 in the engine area it is important to remove the operator panel keys.

W-2357-0899

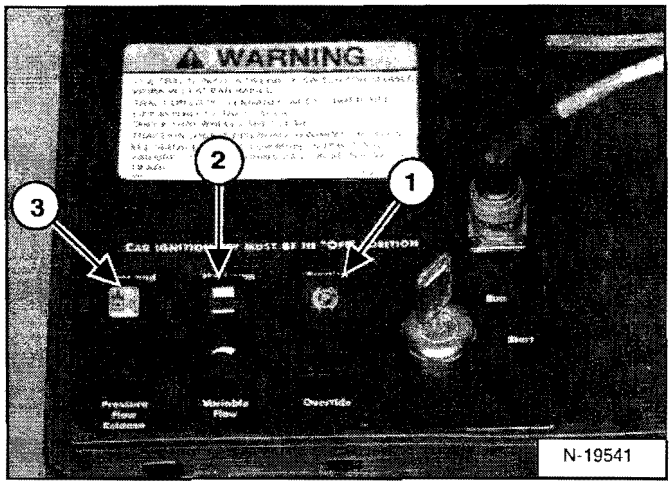
Procedure

Figure 10-50-8



The remote start tool (Item 1) **[Figure 10-50-8]** has three rocker switches.

Figure 10-50-9

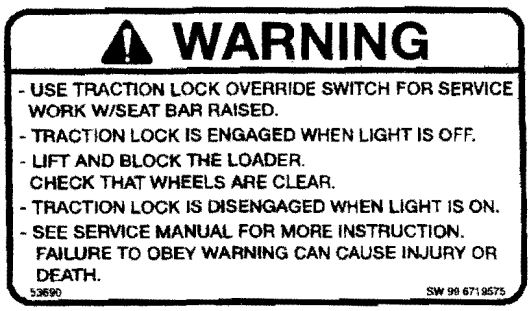


The traction lock switch (Item 1) **[Figure 10-50-9]** is used to turn traction lock on or off. Push the switch to the override position. The switch will illuminate to indicate traction lock OVERRIDE, in this position the wheels are able to turn.

The maximum flow/variable flow switch (Item 2) **[Figure 10-50-9]** 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.

The auxiliary pressure release (Item 3) **[Figure 10-50-9]** is used to release hydraulic pressure to the front and/or rear auxiliary couplers. To release pressure; push and hold the switch for three seconds.

Procedure (Cont'd)



NOTE: With the engine running; pushing and holding the pressure release switch this will cause the engine to stop in three seconds. To relieve the pressure; continue to press the switch after the engine has stopped.

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 as needed.Do not overfill.						
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 COLD and add premixed coolant as needed.						
Fuel Filter	Remove the trapped water.						
Lift Arms, Cylinders, Bob-Tach Pivot Pins and Wedges	Lubricate with multi-purpose lithium based grease.						
Seat Bar, Control Interlocks, Seat Belt, Seat Belt Retractors	Check the condition of seat belt. Clean or replace seat belt retractors as needed. Check the sear bar and control interlocks for correct operation. Clean dirt and debris from moving parts.						
Bobcat Interlock Control Systems (BICS™)	Check that four (4) BICS™ indicator lights and functions are activated. See details in this Manual.						
Safety Signs and Safety Treads	Check for damaged signs (decals) and safety treads. Replace any signs or safety treads that are damaged or worn.						
Operator Cab	Check the fastening bolts, washers and nuts. Check the condition of the cab.						
Indicators and Lights	Check for correct operation of all indicators and lights.						
Heater and A/C Filters	Clean or replace filters as needed during heating/cooling season.						
Hydraulic Fluid, Hoses and Tubelines	Check fluid level and add as needed. Check for damage and leaks. Repair or replace as needed.						
Foot Pedals or Hand Controls, and Steering Levers	Check for correct operation. Repair or adjust as needed.						
Parking Brake	Check operation.						
Tracks	Check for damaged tracks and correct tension. Adjust as needed.						
Battery	Check cables, connections and electrolyte level. Add distilled water as needed.						
Steering Shaft	Grease fittings.						
Engine/Hydro. Drive Belt	Check for wear or damage. Check idler arm stop.	*					
Alternator Belt	Check tension and adjust as needed.						
Air Conditioner Belt	Check belt for wear. Adjust or replace as needed.						
Bobcat Interlock Control System (BICS™)	Check the function of the lift arm by-pass control.						
Fuel Filter	Replace filter element.						
Fan Drive Gearbox	Check gear lube level.						
Hydraulic Reservoir Breather Cap	Replace the reservoir breather cap.						
Hyd./Hydro. Filter	● Replace the filter element.						
Engine Oil and Filter	Replace oil and filter. Use CD or better grade oil and Bobcat filter.		^		○		
Hydraulic Reservoir	Replace the fluid.						
Case Drain Filters	Replace the filters.						
Engine Valves	Adjust the engine valves.					#	
Hydrostatic Motor Carrier	Replace Oil with High Performance Synthetic Oil P/N 6682546						

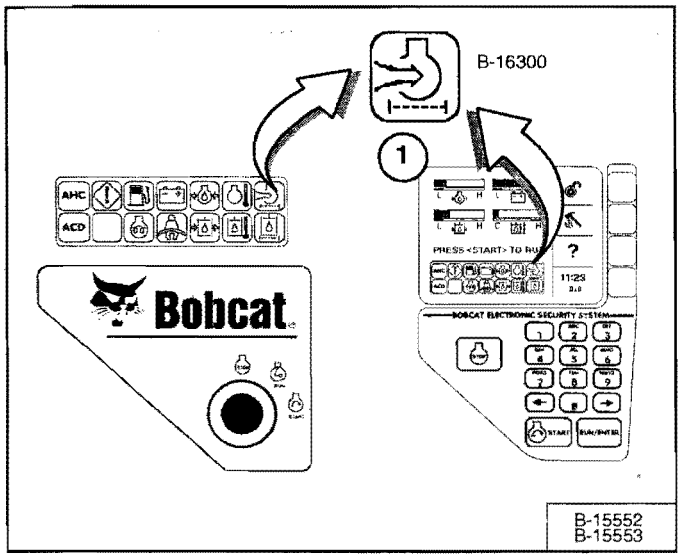
*** Inspect the new or replacement belt after first 50 hours of operation.**
● Also replace hydraulic/hydrostatic filter element when the transmission warning light comes ON.
^ First oil and filter change must occur at 50 hours; 500 hours thereafter.
○ When operating under severe conditions, change oil and filter every 250 hours.
 # After the first 500 hours on new engine, adjust engine valves; 1000 hours thereafter.
■ Or every 12 months.


Bobcat®

AIR CLEANER SERVICE

Replacing Filter Element

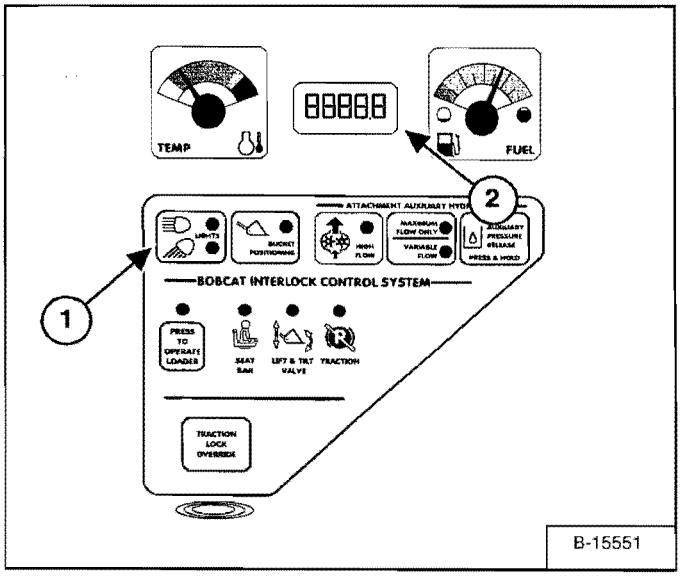
Figure 10-70-1



It is important to change the air filter element only when the Air Cleaner Icon in the right panel is ON (Item 1) **[Figure 10-70-1]** and you hear three beeps from the alarm.

Replace the inner filter every third time the outer filter is replaced or as indicated on See Replacing Filter Element (Cont'd) on Page 10-80-2.

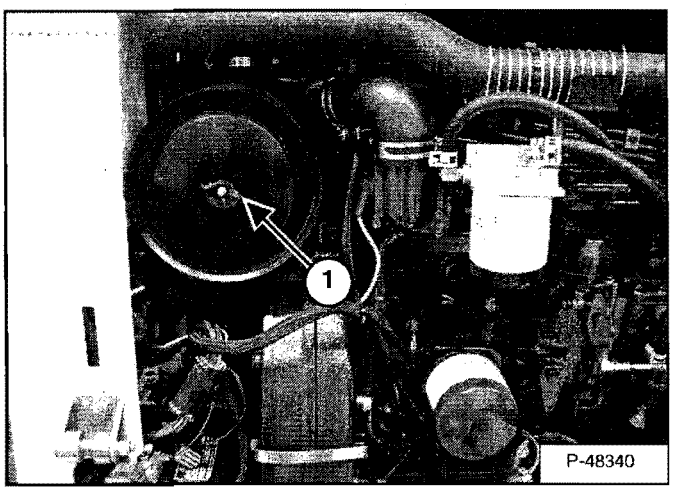
Figure 10-70-2



Press and hold the LIGHT Button (Item 1) **[Figure 10-70-2]** 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 10-70-2]**.

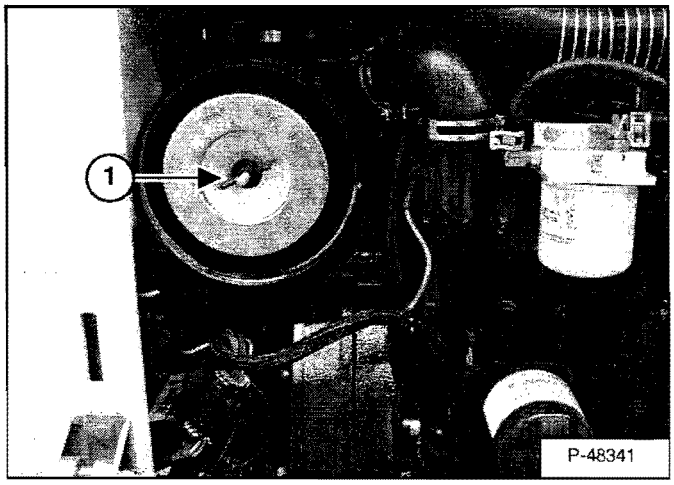
Figure 10-70-3



OUTER FILTER

Disengage the wing nut (Item 1) **[Figure 10-70-3]** and remove the dust cover.

Figure 10-70-4



Remove the wing nut (Item 1) **[Figure 10-70-4]** and remove the outer filter element.

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

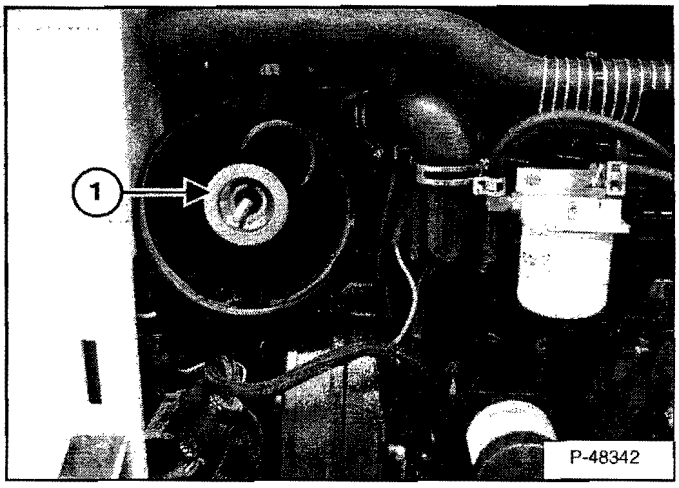
Install a new outer element, and install the wing nut.

Install the dust cover and install the outer wing nut.

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

Replacing Filter Element (Cont'd)

Figure 10-70-5



INNER FILTER

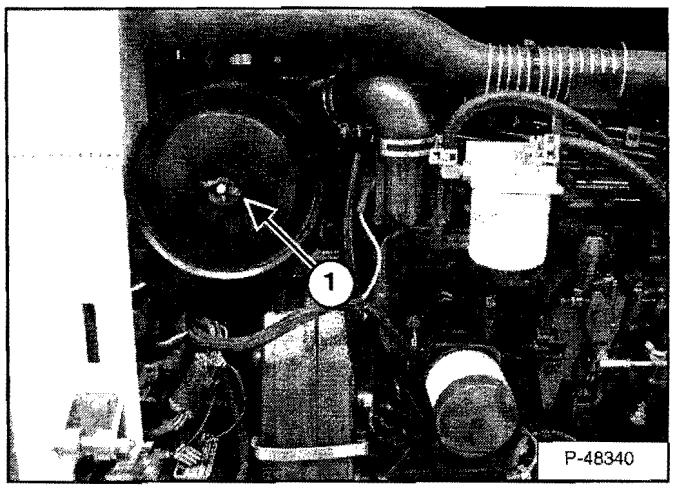
Only replace the inner filter element under the following conditions:

- 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 element (Item 1) **[Figure 10-70-5]**.

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

Figure 10-70-6

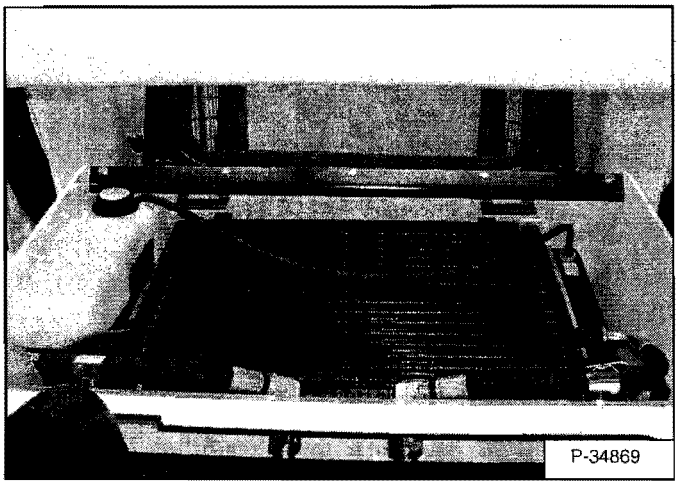


Install the new inner element.

Install the dust cover and wing nut (Item 1) **[Figure 10-70-6]**.

Cleaning Cooling System

Figure 10-80-1



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

⚠ WARNING

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

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

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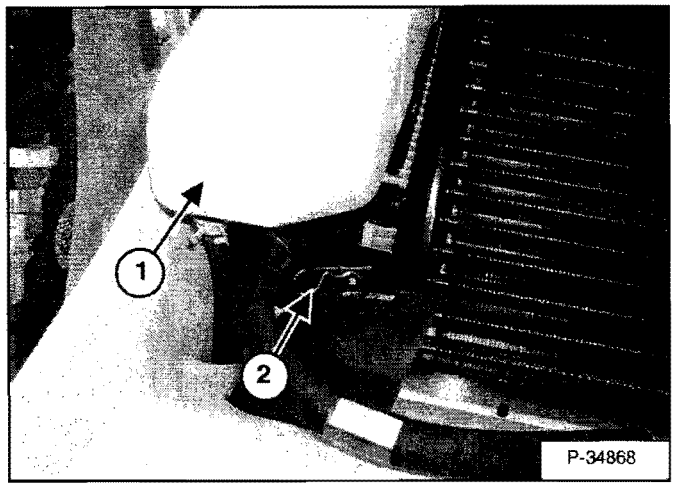
Remove the rear grill. (See Contents Page 50-01.)

Use air pressure or water pressure to clean the top of the oil cooler **[Figure 10-80-1]**.

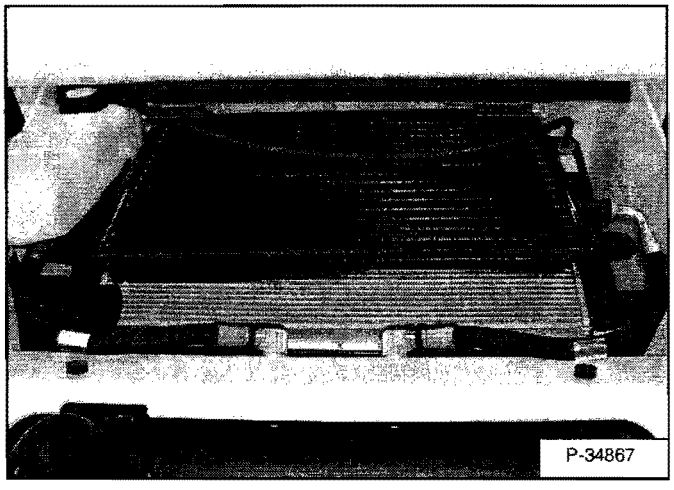
Figure 10-80-2



Lift the overflow tank (Item 1) **[Figure 10-80-2]** out of its mount bracket.

Remove the cotter pin (Item 2) **[Figure 10-80-2]** (both sides) from the oil cooler.

Figure 10-80-3

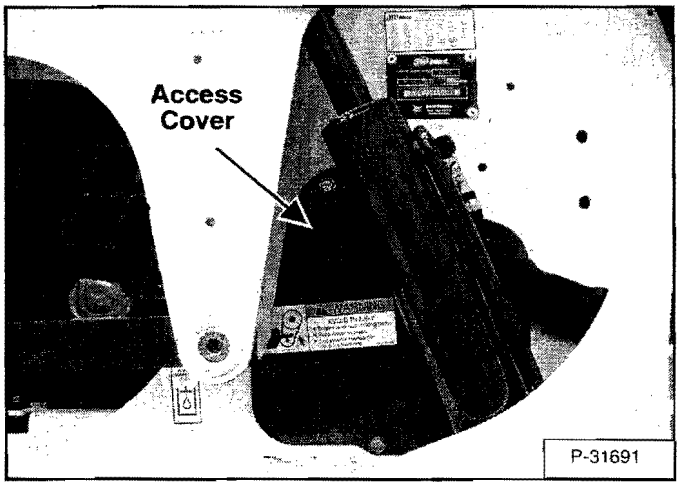


Raise the oil cooler **[Figure 10-80-3]**.

Use air pressure or water pressure to clean the top of the engine oil cooler.

Cleaning Cooling System (Cont'd)

Figure 10-80-4



NOTE: The access cover (both sides) must be in place to ensure proper air flow through the oil cooler which will ensure correct cooling for the engine/hydraulic system [Figure 10-80-4].

Fuel Specifications

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

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

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

We recommend an operator contact their fuel supplier for local recommendations.

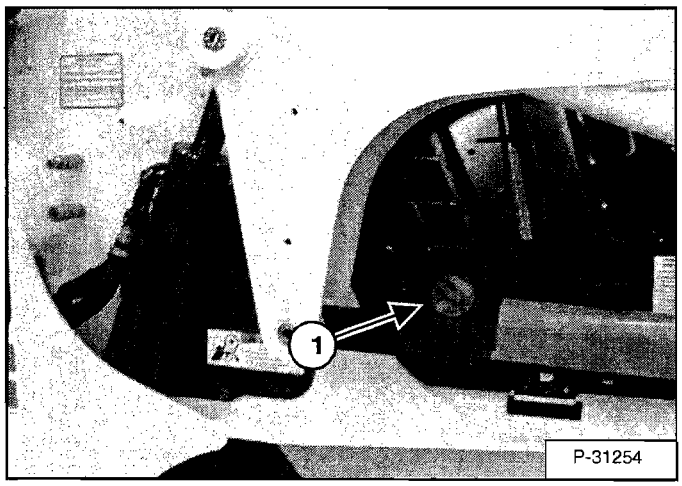
Filling The Fuel Tank

⚠ WARNING

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

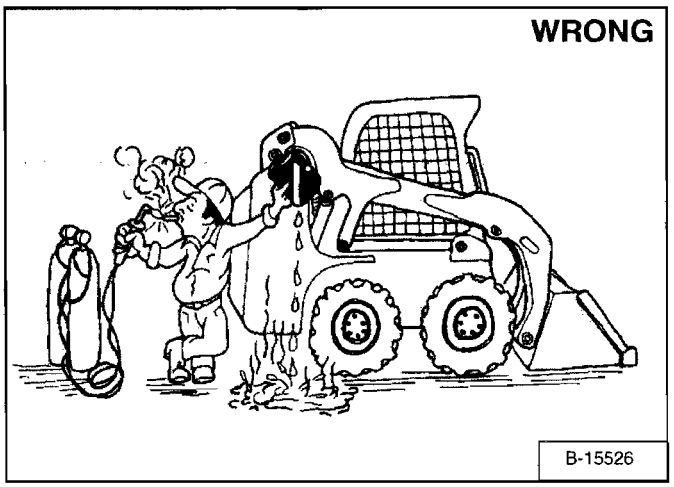
W-2063-0887

Figure 10-90-1



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

Figure 10-90-2

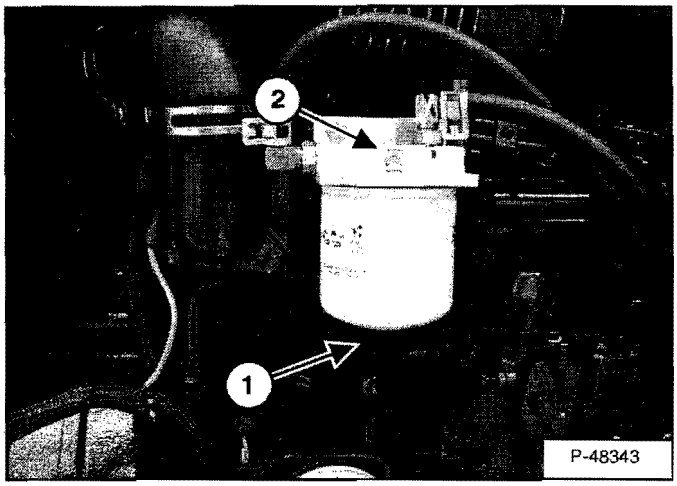


Use a clean, approved safety container to add fuel of the correct specifications. Add fuel only in an area that has free movement of air and no open flames or sparks. NO SMOKING! **[Figure 10-90-2]**.

Install and tighten the fuel fill cap **[Figure 10-90-1]**.

Fuel Filter

Figure 10-90-3



See the SERVICE SCHEDULE, Contents Page 10-01 for the recommended service interval when to remove the water from the fuel filter.

Loosen the drain (Item 1) **[Figure 10-90-3]** at the bottom of the filter element to drain any water from the filter.

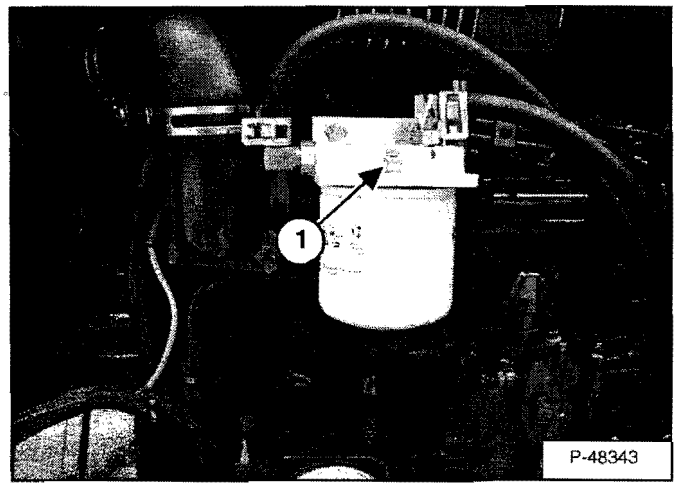
See the SERVICE SCHEDULE, Contents Page 10-01 for the recommended service interval when to replace the fuel filter.

To replace the fuel filter element, use a filter wrench to remove the filter element (Item 2) **[Figure 10-90-3]**.

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

Removing Air From The Fuel System

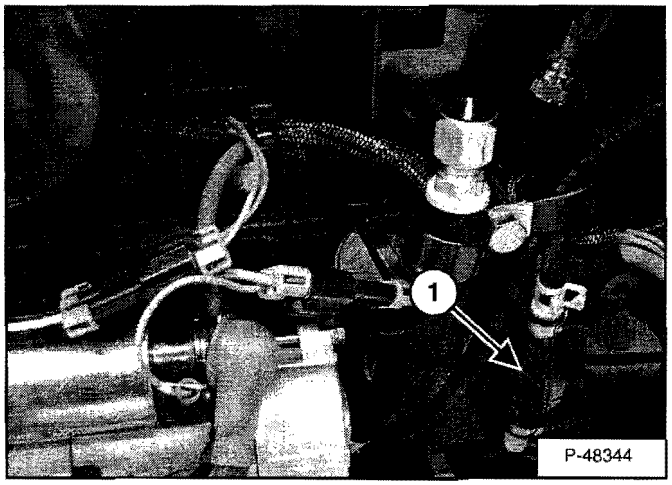
Figure 10-90-4



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

Loosen the air vent plug (Item 1) **[Figure 10-90-4]** at the top of the fuel filter.

Figure 10-90-5



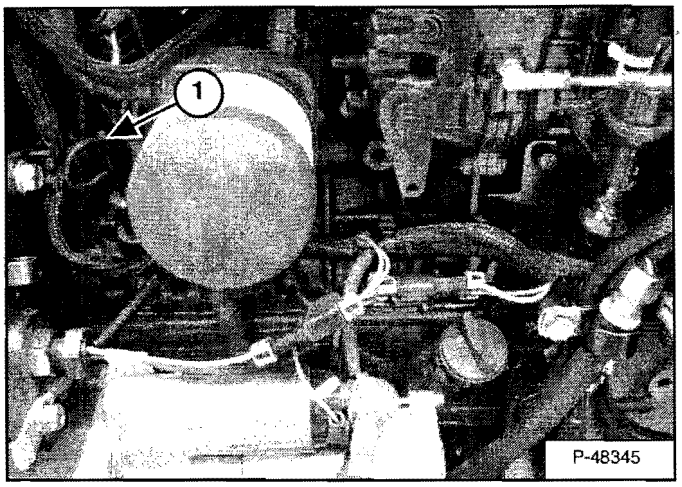
Operate the hand pump (priming bulb) (Item 1) **[Figure 10-90-5]** until the fuel flows from the air vent plug with out air bubbles.

Tighten the air vent plug.

ENGINE LUBRICATION SYSTEM

Checking Engine Oil

Figure 10-100-1



Check the engine oil level every day.

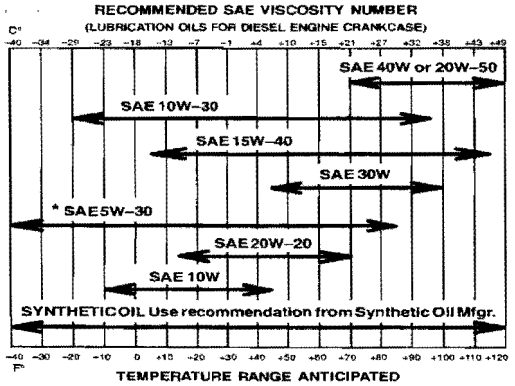
Before starting the engine for the work shift, open the rear door. Remove the dipstick (Item 1) **[Figure 10-100-1]**.

Keep the oil level between the marks on the dipstick.

Use a good quality motor oil that meets API Service Classification of CD, CE or better. (See Oil Chart below.)

Oil Chart

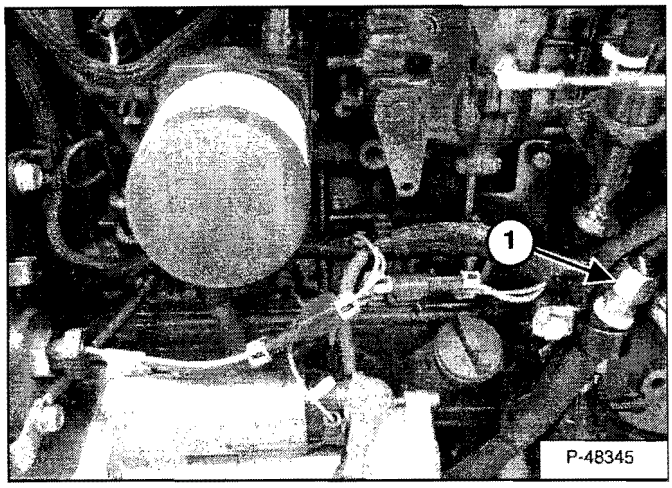
RECOMMENDED SAE VISCOSITY NUMBER
(LUBRICATION OILS FOR DIESEL ENGINE CRANKCASE)



TEMPERATURE RANGE ANTICIPATED
BEFORE NEXT OIL CHANGE (DIESEL ENGINES MUST USE
API CLASSIFICATION CD, CF4,CG4)
*Can be used **ONLY** when available with appropriate diesel rating.

Replacing Oil And Filter

Figure 10-100-2



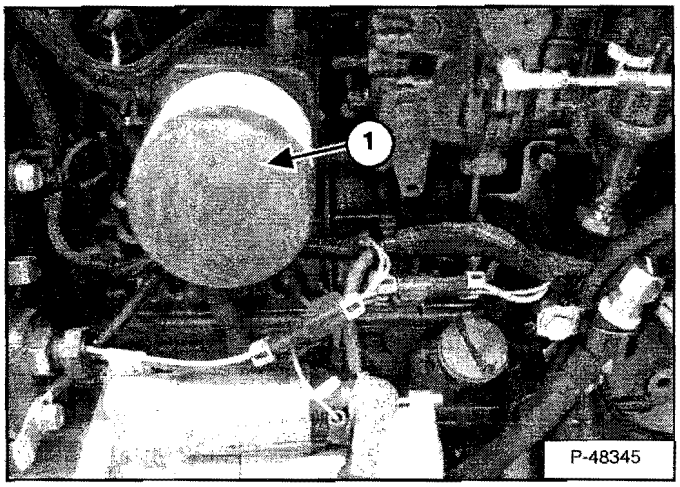
See the SERVICE SCHEDULE, Contents Page 10-01 for the service interval for replacing the engine oil and filter.

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

Open the rear door. Remove the drain hose (Item 1) **[Figure 10-100-2]** from its storage position. Remove the cap and drain the oil into container.

Replacing Oil And Filter (Cont'd)

Figure 10-100-3



⚠ WARNING

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

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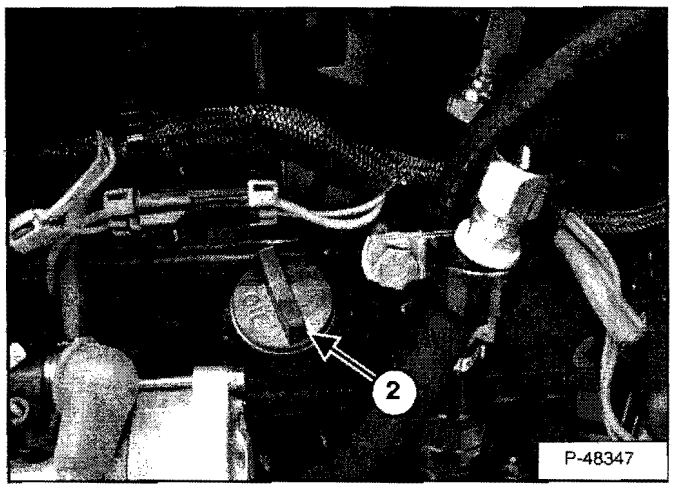
Remove the oil filter (Item 1) **[Figure 10-100-3]**.

Clean the filter housing surface. Put clean oil on the new oil filter gasket. Install the filter and hand tighten only.

Install and tighten the drain cap on the drain hose.

Figure 10-100-4



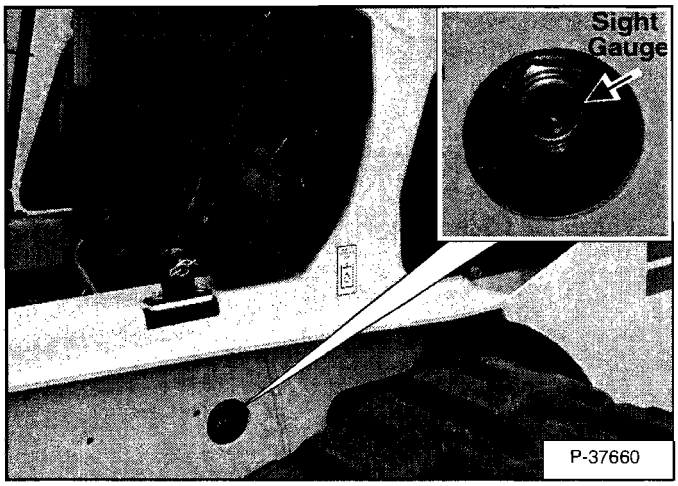
Remove the filler cap (Item 1) **[Figure 10-100-4]**.

Put 14 qts. (13,2 L) of oil in the engine.

Start the engine and let it run for several minutes. Stop the engine. Check for leaks and check the oil level. Add oil as needed if it is not at the top mark on the dipstick.

Checking And Adding Fluid

Figure 10-110-1



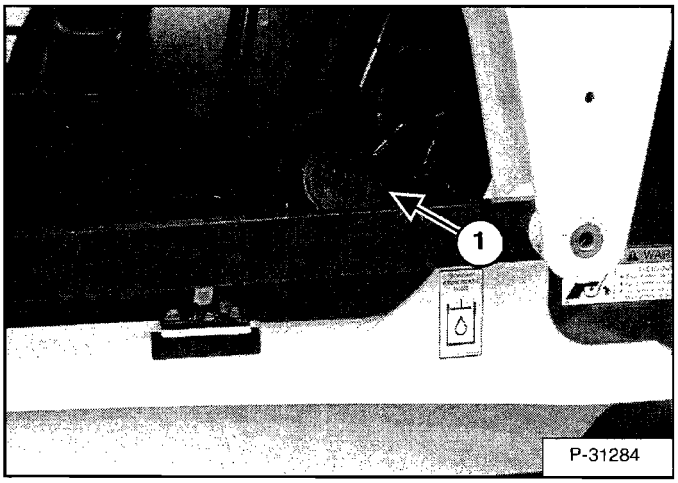
Use only recommended fluid in the hydraulic system. (See SPECIFICATIONS Contents Page SPEC-01.)

To check the reservoir, use the following procedure:

Put the Bobcat loader on a level surface. Lower the lift arms and tilt the Bob-Tach fully back. Stop the engine.

Check the fluid level at the sight gauge **[Figure 10-110-1]**. The fluid level must show in the sight gauge.

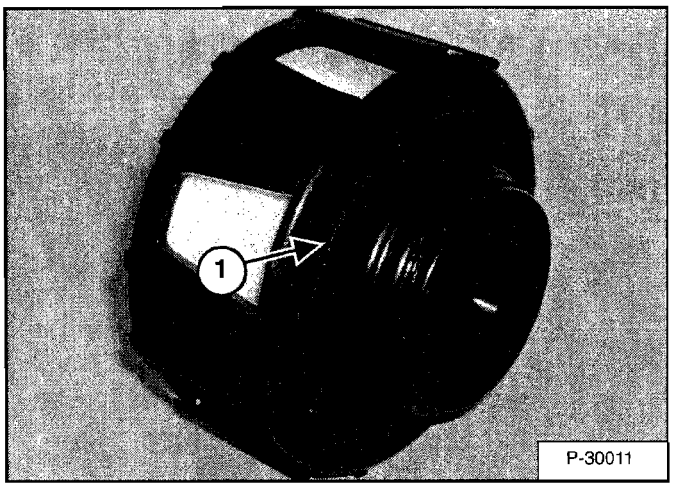
Figure 10-110-2



If fluid is needed, remove the fill cap (Item 1) **[Figure 10-110-2]**.

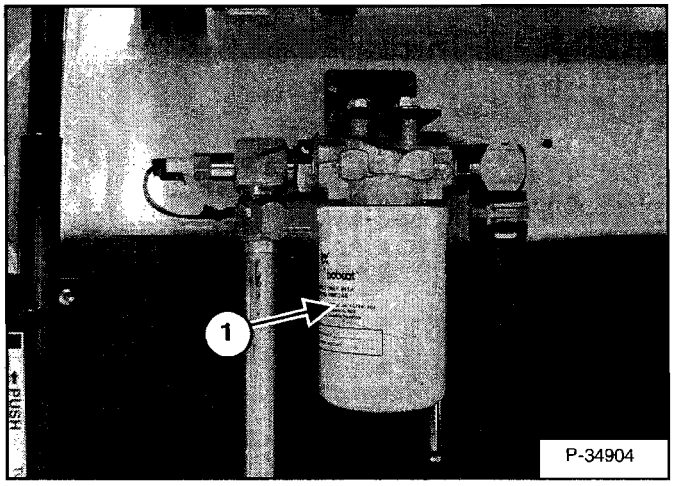
Add the fluid as needed to bring the level to the center of the sight gauge.

Figure 10-110-3



NOTE: Before installing the fill cap, make sure the rubber gasket (Item 1) [Figure 10-110-3] is installed on the fill cap.

Figure 10-110-4



Hydraulic/Hydrostatic Filter Replacement

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

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

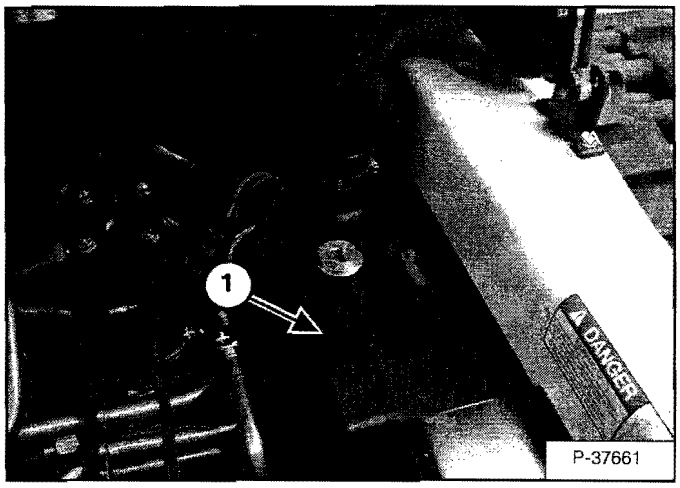
Use a filter wrench to remove the filter element (Item 1) **[Figure 10-110-4]**.

Clean the surface of the filter housing where the element seal contacts the housing. Put clean oil on the rubber seal of the filter elements.

Install and hand tighten the filter elements.

Replacing Hydraulic Fluid And Case Drain Filters

Figure 10-110-5



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

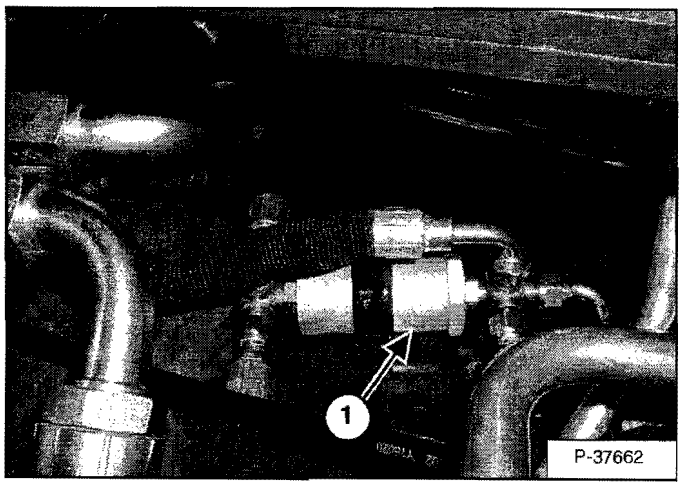
Replace the fluid if it becomes contaminated or after major repair.

Also clean the hydrostatic motor case drain filter thoroughly after a major repair.

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

Remove the plug (Item 1) **[Figure 10-110-5]** out of the top of the hydraulic reservoir with a lift pump, remove the fluid from the reservoir.

Figure 10-110-6



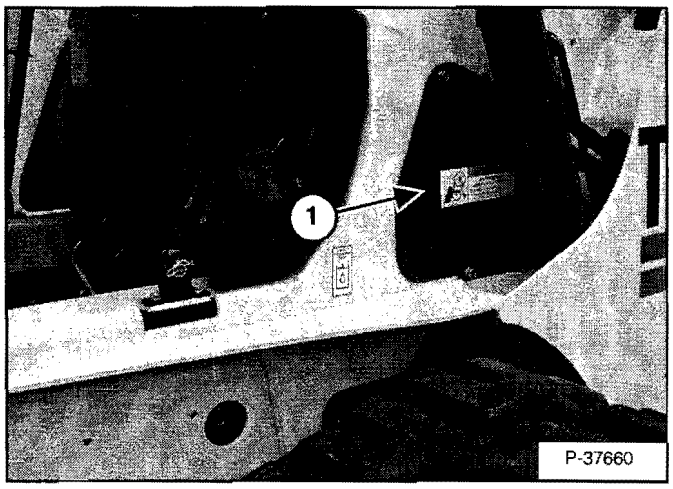
Disconnect the hoses from the hydrostatic motor case drain filter (Item 1) **[Figure 10-110-6]**.

Remove the case drain filter and clean thoroughly with clean solvent.

Install the case drain filter and tighten the hoses.

Install the plug in the reservoir drain hose and tighten. Install the motor cover.

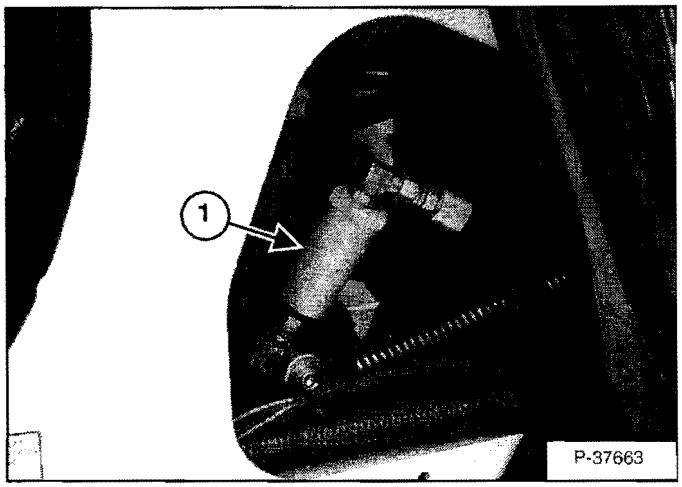
Figure 10-110-7



Remove the left side access panel (Item 1) **[Figure 10-110-7]**.

Replacing Hydraulic Fluid And Case Drain Filters (Cont'd)

Figure 10-110-8



Remove the hoses from the attachments case drain filter (Item 1) **[Figure 10-110-8]**. Remove and discard the filter.

Install a new filter, tighten the hose fittings and install the cover.

Add the correct fluid to the reservoir until the fluid level is at the center of the sight gauge. (See Checking And Adding Fluid on Page 10-110-1.)

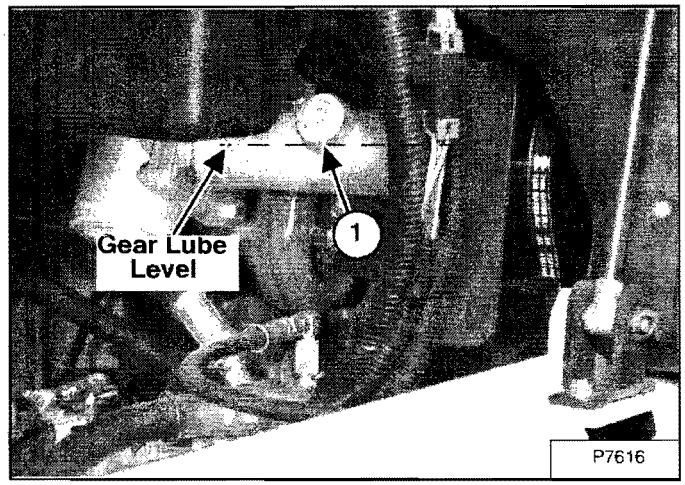
Lower the operator cab. Start the engine and operate the loader hydraulic controls. Stop the engine. Check for leaks. Check the fluid level in the reservoir and add as needed.


Bobcat®

FAN GEARBOX

Checking And Adding Oil

Figure 10-120-1



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

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

Remove the plug (Item 1) **[Figure 10-120-1]** to check the lubricant level.

When checking the gearbox lube level, make sure the level does not go above the center line of the shaft in the gearbox **[Figure 10-120-1]**. Use SAE 90W gear lube if the level is low.

Bobcat®

Inspection And Maintenance

⚠ 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.

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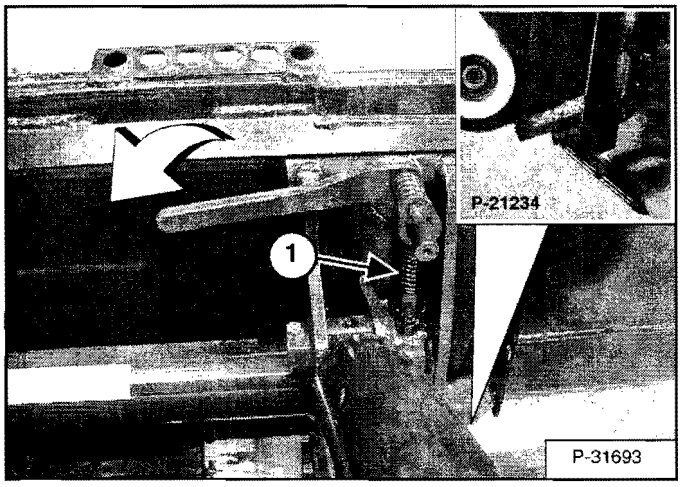
Figure 10-130-1



Move the Bob-Tach levers to engage the wedges **[Figure 10-130-1]**. The levers and wedges must move freely.

The wedges must extend through the holes in the attachment mounting frame (Inset) **[Figure 10-130-1]**.

Figure 10-130-2

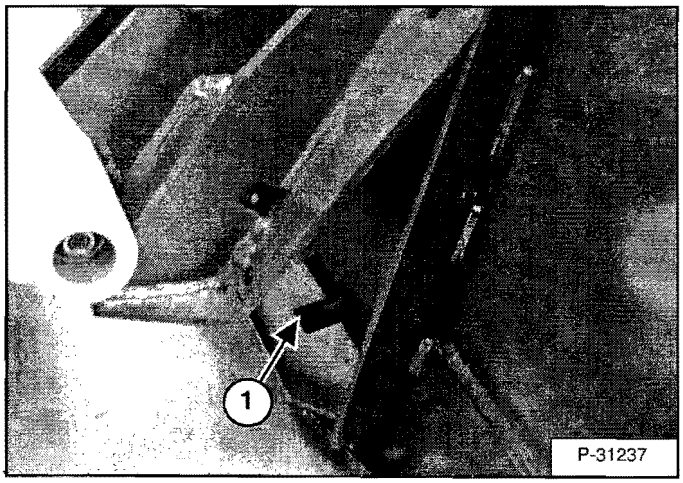
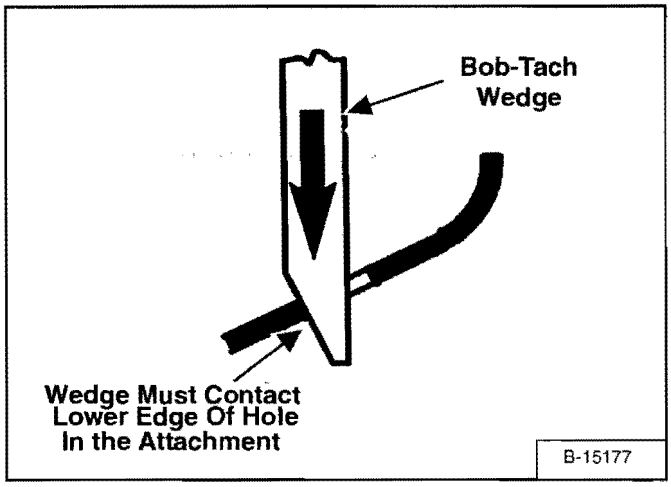


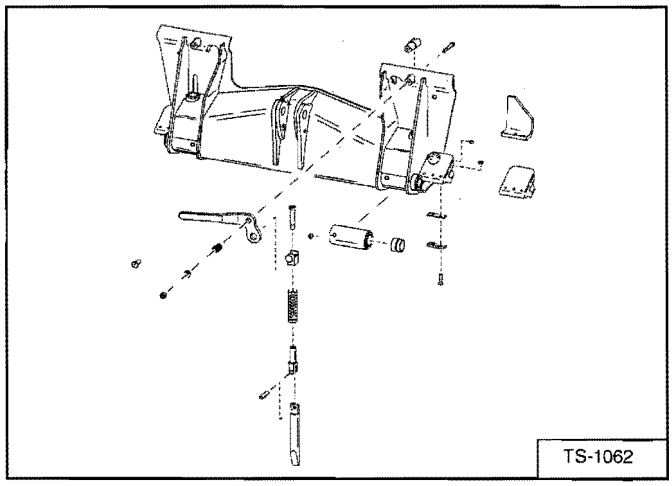
Figure 10-130-3



The spring loaded wedge (Item 1) **[Figure 10-130-1]** must contact the lower edge of the hole in the attachment (Item 1) **[Figure 10-130-2]** and **[Figure 10-130-3]**.

If the wedge does not contact the lower edge of the hole **[Figure 10-130-2]** and **[Figure 10-130-3]**, the attachment will be loose and can come off the Bob-Tach.

Figure 10-130-4



Inspect the mounting frame on the attachment and the Bob-Tach, linkages and wedges for excessive wear or damage **[Figure 10-130-4]**. 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.

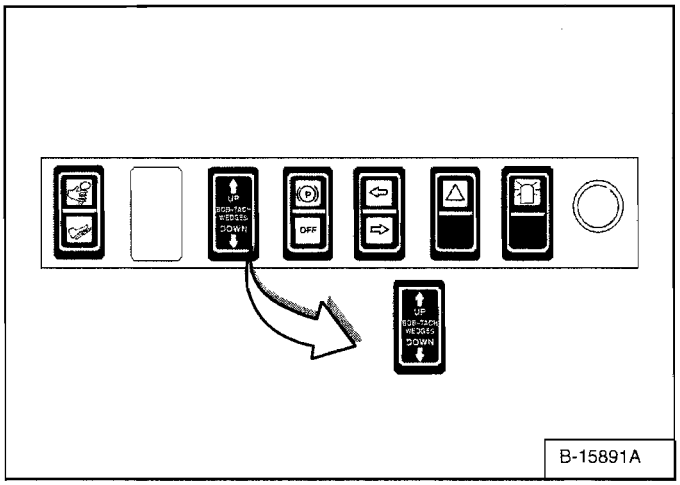
Lubricate the wedges (See SERVICE SCHEDULE, Contents Page 10-01 and LUBRICATION OF THE BOBCAT LOADER, Contents Page 10-01).


Bobcat®

POWER BOB-TACH

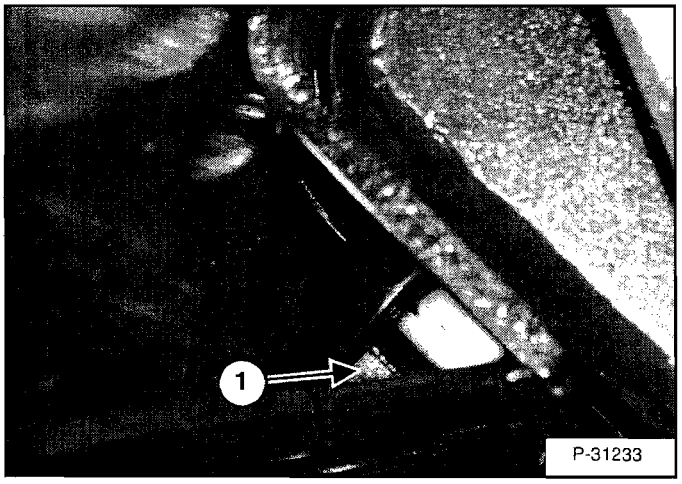
Inspection And Maintenance

Figure 10-131-1



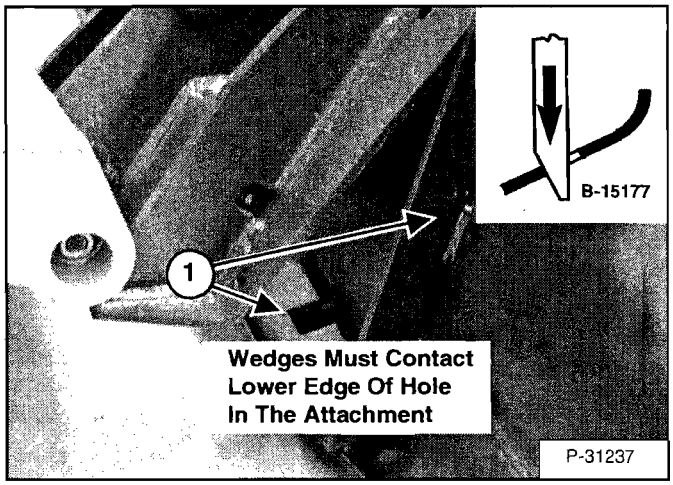
Push and hold the BOB-TACH "WEDGES UP" switch **[Figure 10-131-1]** until wedges are fully raised. Push and hold the BOB-TACH "WEDGES DOWN" switch **[Figure 10-131-1]** until the wedges are fully down. The wedges must move freely.

Figure 10-131-2



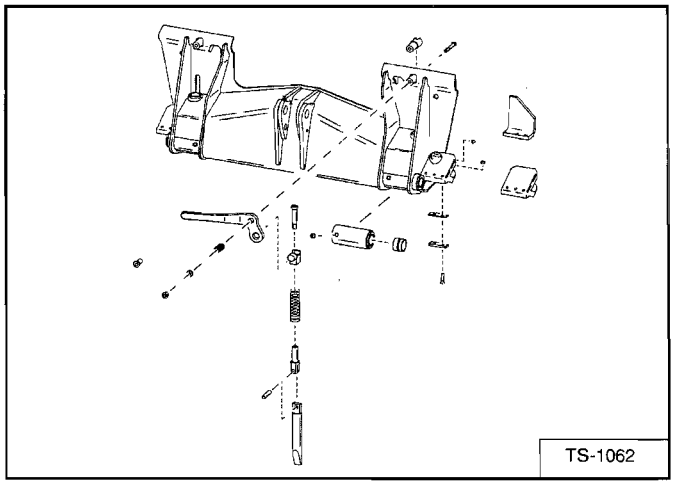
The wedges must extend through the holes in the attachment mounting frame (Item 1) **[Figure 10-131-2]** and must contact the lower edge of the hole in the attachment **[Figure 10-131-2]** and (Item 1) **[Figure 10-131-3]**.

Figure 10-131-3



If the wedge does not contact the lower edge of the hole (Item 1) **[Figure 10-131-3]**, the attachment will be loose and can come off the Bob-Tach.

Figure 10-131-4



Inspect the mounting frame on the attachment and the Bob-Tach, linkages and wedges for excessive wear or damage **[Figure 10-131-4]**. Replace any parts including decals and lever that are damaged, bent, or missing. Keep all fasteners tight. Inspect the hoses and fittings for leaks.

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

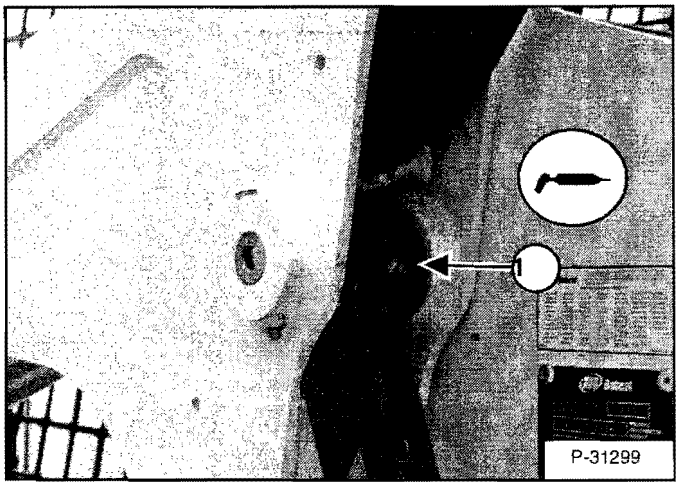
Lubricate the wedges. (See SERVICE SCHEDULE, Contents Page 10-01 and LUBRICATING THE BOBCAT LOADER, Contents Page 10-01.)

Bobcat®

LUBRICATING THE LOADER

Procedure

Figure 10-140-1



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

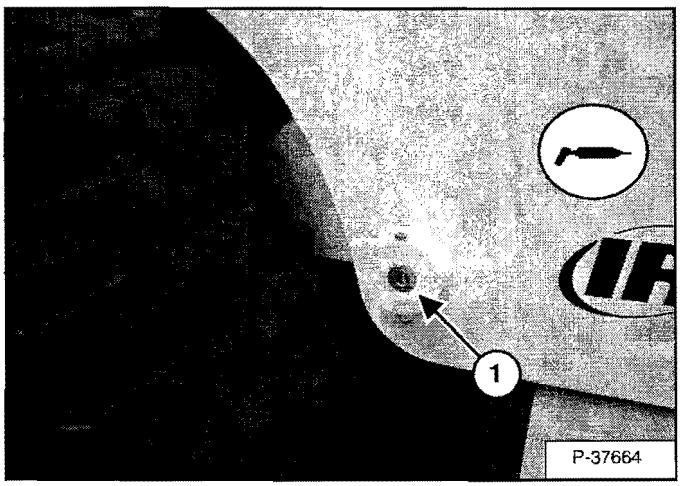
Record the operating hours each time you lubricate the Bobcat loader.

Always use a good quality lithium based multi-purpose grease when you lubricate the loader. Apply the lubricant until extra grease shows.

Lubricate the following locations on the loader:

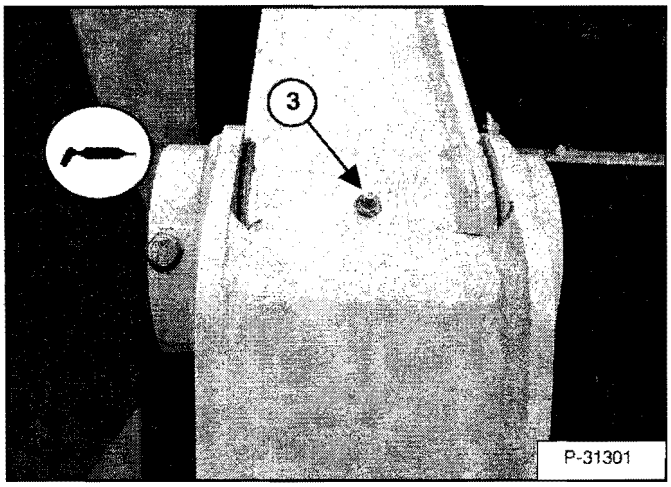
1. Rod End Lift Cylinder (Both Sides) **[Figure 10-140-1]**.

Figure 10-140-2



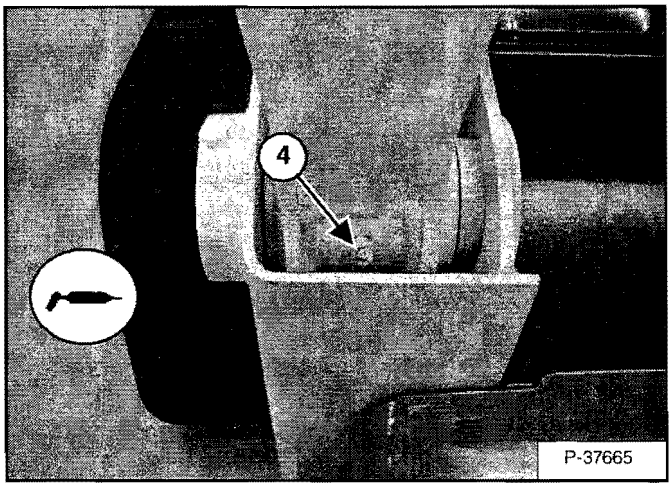
2. Base End Lift Cylinder (Both Sides) **[Figure 10-140-2]**.

Figure 10-140-3



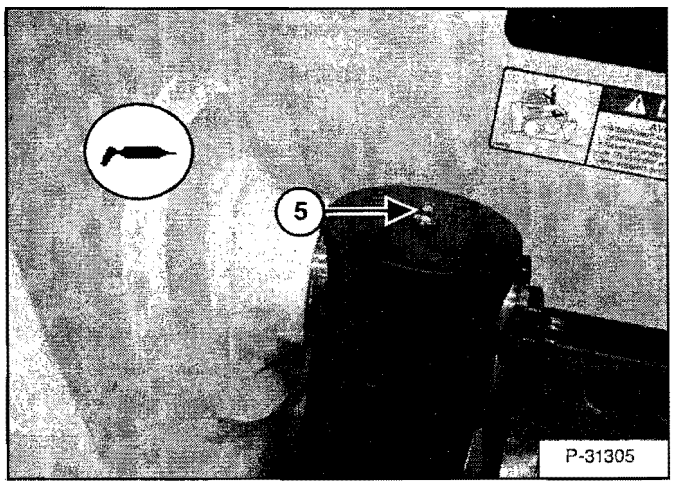
3. Lift Arm Pivot Pin (Both Sides) **[Figure 10-140-3]**.

Figure 10-140-4



4. Lift Arm Link Pivot (Both Sides) **[Figure 10-140-4]**.

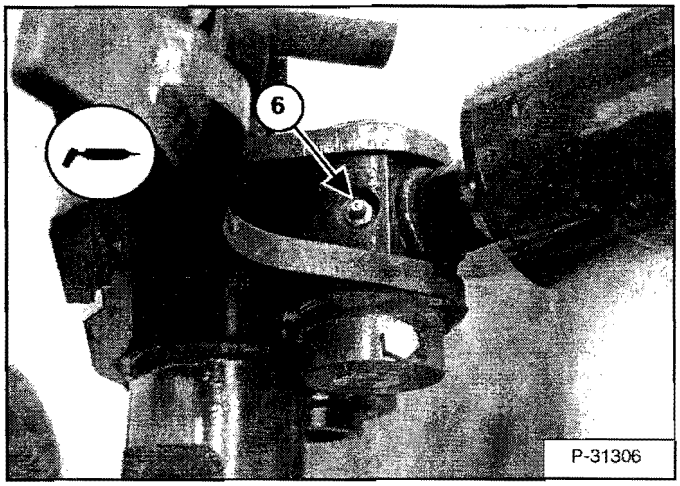
Figure 10-140-5



5. Base End Tilt Cylinder (Both Sides) **[Figure 10-140-5]**.

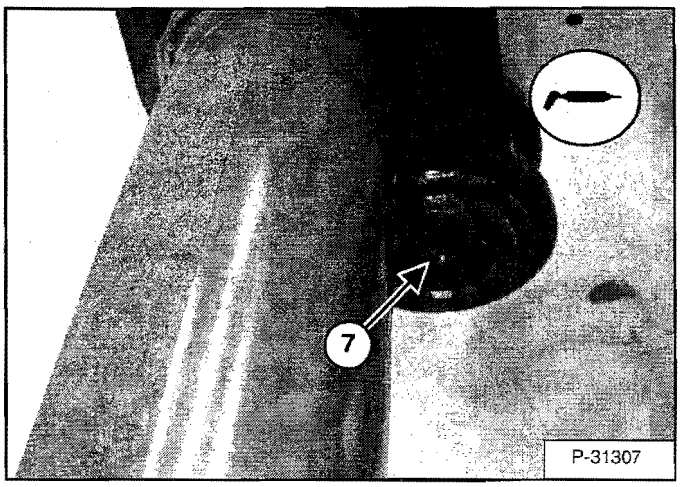
Procedure (Cont'd)

Figure 10-140-6



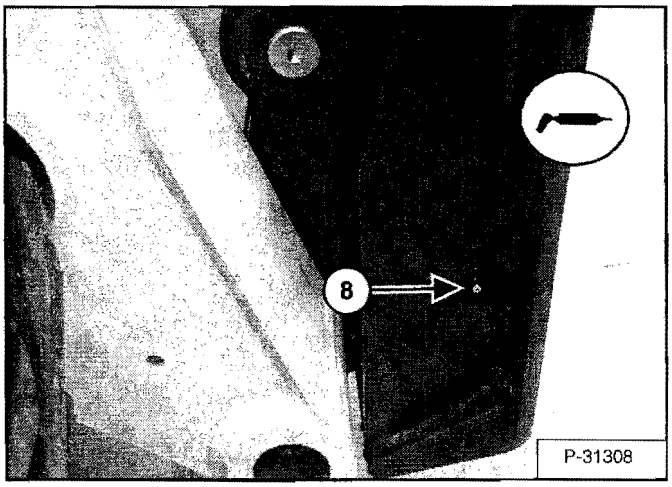
6. Rod End Tilt Cylinder (Both Sides) **[Figure 10-140-6]**.

Figure 10-140-7



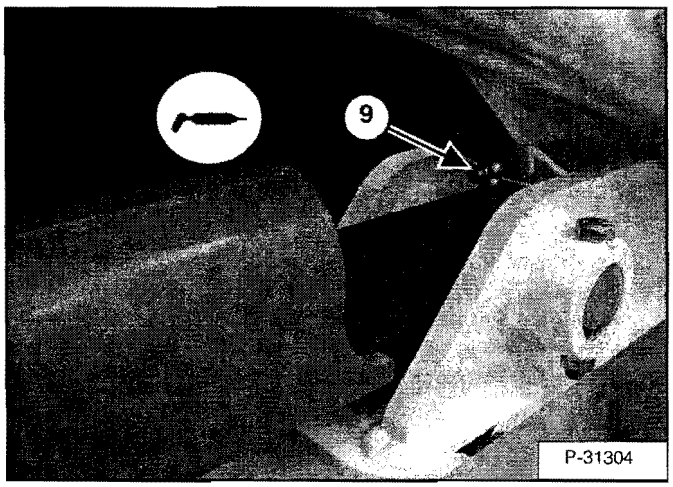
7. Bob-Tach Pivot Pin (Both Sides) **[Figure 10-140-7]**.

Figure 10-140-8



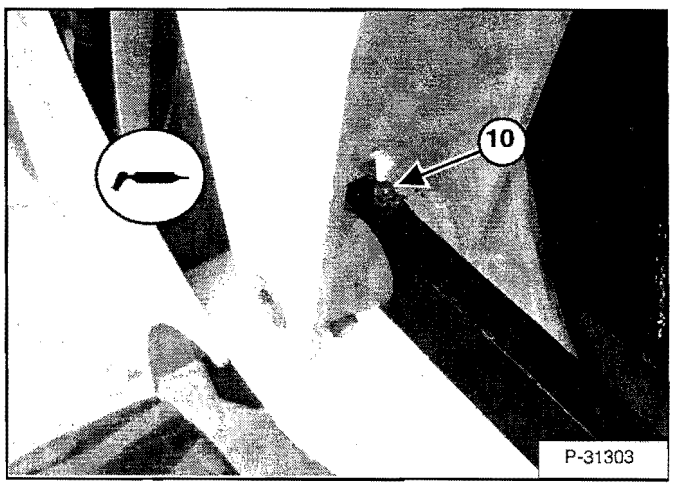
8. Bob-Tach Wedge (Both Sides) **[[Figure 10-140-8]**

Figure 10-140-9



9. Stabilizer Bar (Both Sides) **[Figure 10-140-9]**.

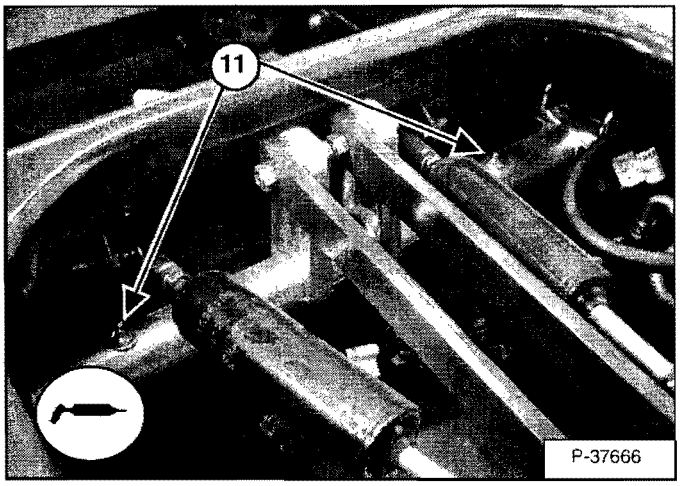
Figure 10-140-10



10. Stabilizer Bar (Both Sides) **[Figure 10-140-10]**.

Procedure (Cont'd)

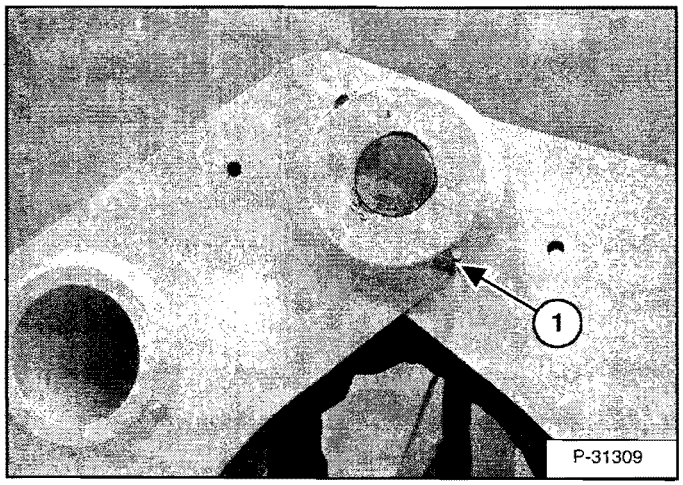
Figure 10-140-11



11. **250 Hours:** Steering Lever Shaft (three) **[Figure 10-140-11]**.

Pivot Pins

Figure 10-140-12



All lift arm and cylinder pivots have a large pin held in position with a retainer bolt and lock nut (Item 1) **[Figure 10-140-12]**.

Check that the lock nuts are tightened to 18-20 ft.-lbs. (24-27 Nm) torque.


Bobcat®

Continued On Next Page

HYDRAULIC SYSTEM (CONT'D)

Continued On Next Page

Continued On Next Page

HYDRAULIC SYSTEM (CONT'D)

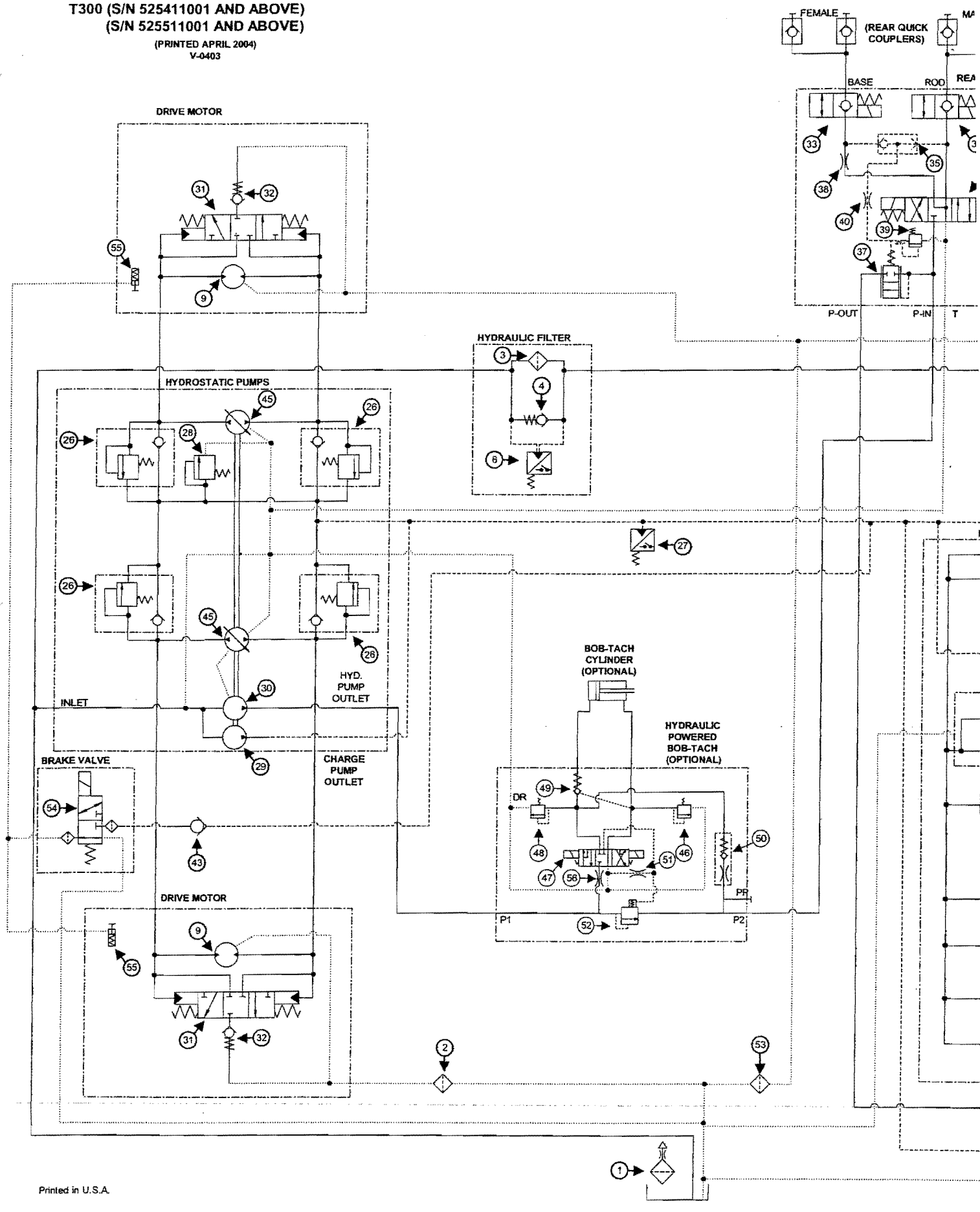
Continued On Next Page

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


Bobcat®

HYDRAULIC/HYDROSTATIC SCHEMATIC
T300 (S/N 525411001 AND ABOVE)
(S/N 525511001 AND ABOVE)

(PRINTED APRIL 2004)
V-0403



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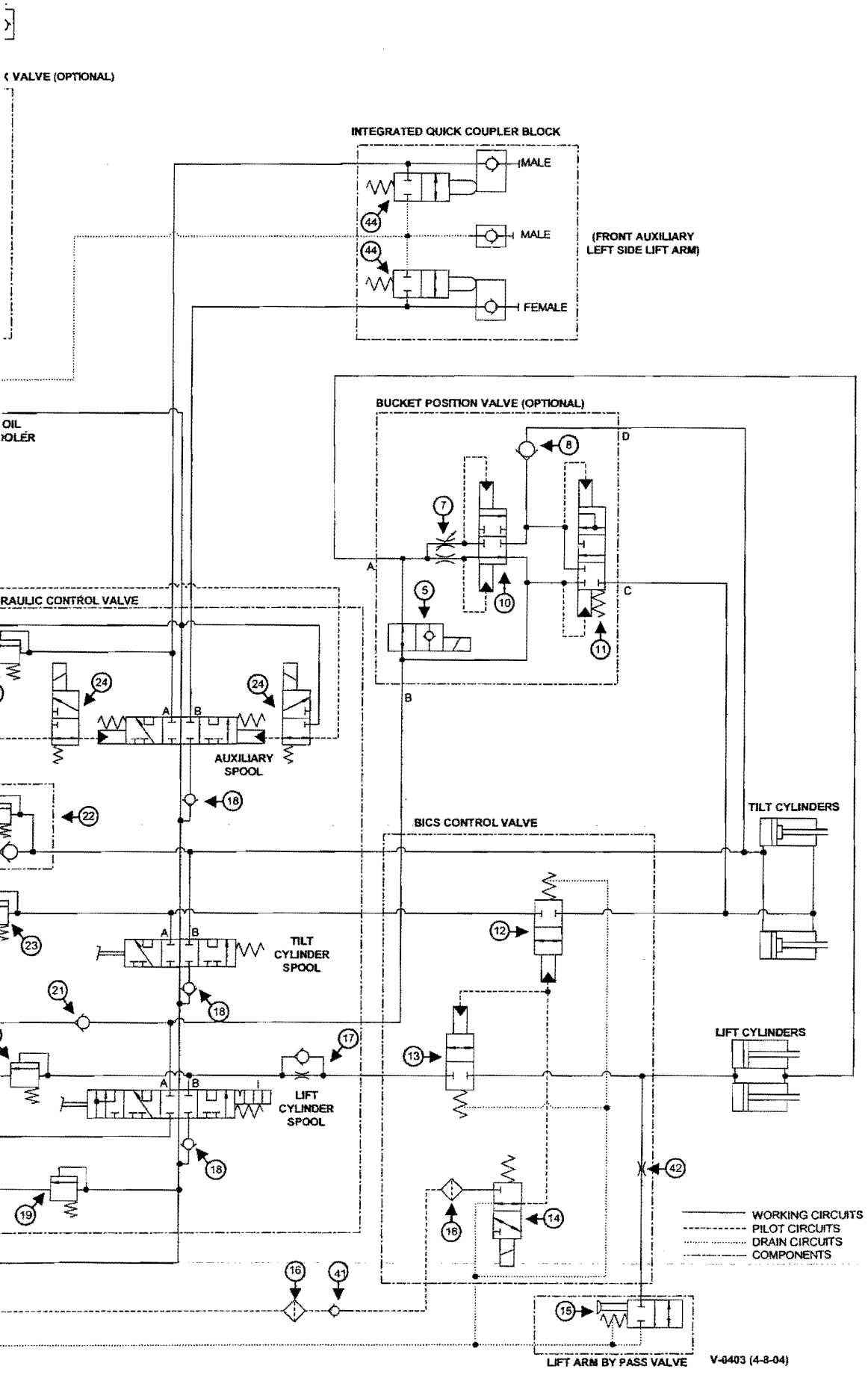
(VALVE (OPTIONAL)
INTEGRATED QUICK COUPLER BLOCK
MALE
MALE
FEMALE
(FRONT AUXILIARY
LEFT SIDE LIFT ARM)
BUCKET POSITION VALVE (OPTIONAL)
OIL
OLER
RAULIC CONTROL VALVE
AUXILIARY
SPOOL
BICS CONTROL VALVE
TILT CYLINDERS
TILT
CYLINDER
SPOOL
LIFT CYLINDERS
LIFT
CYLINDER
SPOOL
WORKING CIRCUITS
PILOT CIRCUITS
DRAIN CIRCUITS
COMPONENTS
LIFT ARM BY PASS VALVE
V-0403 (4-8-04)

HYDRAULIC/HYDROSTATIC SCH
WITH HIGH FLOW OPTIO
T300 (S/N 525411001 AND AB
(S/N 525511001 AND AB

(PRINTED APRIL 2004)
V-0404legend

LEGEND

1. RESERVOIR:
   Capacity . . . . . 21 Qts. (19.9 L)
2. FILTER - CASE DRAIN (90 Micron)
3. FILTER - HYDRAULIC (CANISTER)
4. SPRING LOADED FILTER BYPASS VALVE: 45-55 PSI (3,1-3,8 Bar)
5. SOLENOID ACTIVATED DIRECTIONAL CONTROL VALVE - BUCKET POSITION VALVE (ON/OFF)
6. DIFFERENTIAL PRESSURE SWITCH: 36-44 PSI (2,5-3,0 Bar)
7. FLOW DIVIDER ADJUSTMENT VALVE
8. CHECK VALVE - BUCKET POSITION VALVE
9. FIXED CAPACITY DISPLACEMENT BIDIRECTIONAL HYDROSTATIC MOTOR
10. PILOTED ACTIVATED DIRECTIONAL CONTROL VALVE - FLOW CONTROL SPOOL
11. PILOTED ACTIVATED DIRECTIONAL CONTROL VALVE - UNLOADING SPOOL
12. PILOTED ACTIVATED DIRECTIONAL CONTROL VALVE - TILT CONTROL
13. PILOTED ACTIVATED DIRECTIONAL CONTROL VALVE - LIFT CONTROL
14. SOLENOID ACTIVATED DIRECTIONAL CONTROL VALVE - BICS CONTROL
15. PULL BUTTON ACTIVATED DIRECTIONAL CONTROL VALVE - LIFT ARM BY PASS
16. FILTER - BICS CONTROL VALVE (SCREEN)
17. ONE WAY RESTRICTOR (ACS Valve Only)
18. LOAD CHECK VALVE
19. RELIEF VALVE - MAIN:
    at Front Quick Couplers
    3250-3350 PSI (224-231 Bar)
20. RELIEF VALVE - PORT:
    4000 PSI (276 Bar)
21. ANTICAVITATION VALVE
22. RELIEF/ANTICAVITATION VALVE - PORT (TILT BASE END)
    3500 PSI (241 Bar)
23. RELIEF VALVE - PORT:
    4000 PSI (276 Bar)
24. SOLENOID ACTIVATED DIRECTIONAL CONTROL VALVE - AUXILIARY
25. RELIEF VALVE - PORT: . . . . . (Optional)
    3500 PSI (241 Bar)
26. RELIEF/REPLENISHING VALVE - HIGH PRESSURE: 5000 PSI (345 Bar)
27. PRESSURE SWITCH
28. RELIEF VALVE - CHARGE:
    120 degrees F. (53 degrees C.)Fluid at high engine idle
    390 - 430 PSI (26,9 - 29,7 Bar)
29. CHARGE PUMP:
    14 2 GPM (53,8 L/min) at high engine idle
30. HYDRA
    21
31. DRIVE
32. SHUTT
33. SOLEN
    CONT
34. SOLEN
    CONT
35. LOAD S
36. PILOT A
    CONT
37. PILOT A
    CONT
38. ORIFIC
39. RELIEF
40. ORIFICE
41. CHECK
42. RESTRI
43. CHECK
44. FRONT
    PRESS
45. VARIAB
    BIDIRE

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EMATIC

)VE)
)VE)

_IC PUMP . . . . . Gear Type
GPM (80,3 L/min) at
high engine idle

IOTOR SHUTTLE VALVE

: RELIEF VALVE:
200 PSI (13,8 Bar)

ID ACTIVATED DIRECTIONAL
OL VALVE - Base

ID ACTIVATED DIRECTIONAL
OL VALVE - Rod

IUTTLE VALVE - BLEED OFF

CTIVATED DIRECTIONAL
OL VALVE - (Two Coil)

CTIVATED DIRECTIONAL
OL VALVE - REAR AUXILIARY

- With 0.140 inch (3,6 mm)

/ALVE - PORT:
3000 PSI (207 Bar)

- With 0.031 inch (0,79 mm)

/ALVE - BICS CONTROL VALVE

TION

/ALVE

UXILIARY MANUAL
JRE BLEED-OFF VALVE

E CAPACITY DISPLACEMENT
CTIONAL HYDROSTATIC PUMP

(46) RELIEF VALVE - 2000 PSI (138 Bar)

(47) SOLENOID ACTIVATED DIRECTIONAL CONTROL VALVE (TWO COIL)

(48) RELIEF VALVE - 1200 PSI (83 Bar)

(49) CHECK VALVE - With 80 PSI (5,5 Bar) Spring

(50) CHECK VALVE - With 300 PSI (20,7 Bar) Spring and 0.016 inch (0,40 mm) orifice

(51) ORIFICE - With 0.025 inch (0,64 mm)

(52) PILOT ACTIVATED DIRECTIONAL CONTROL VALVE - HYDRAULIC POWERED BOB-TACH

(53) FILTER - CASE DRAIN (ATTACHMENT)

(54) SOLENOID ACTIVATED DIRECTIONAL CONTROL VALVE - BRAKE

(55) HYDRAULIC BRAKE - SPRING APPLIED - PRESSURE RELEASE

(56) ORIFICE - With 0.089 inch (2,26 mm)

(57) AUXILIARY HYDRAULIC PUMP
10.5 GPM (39,7 L/min) at
high engine idle

(58) RELIEF VALVE - PORT:
3300 PSI (228 Bar)

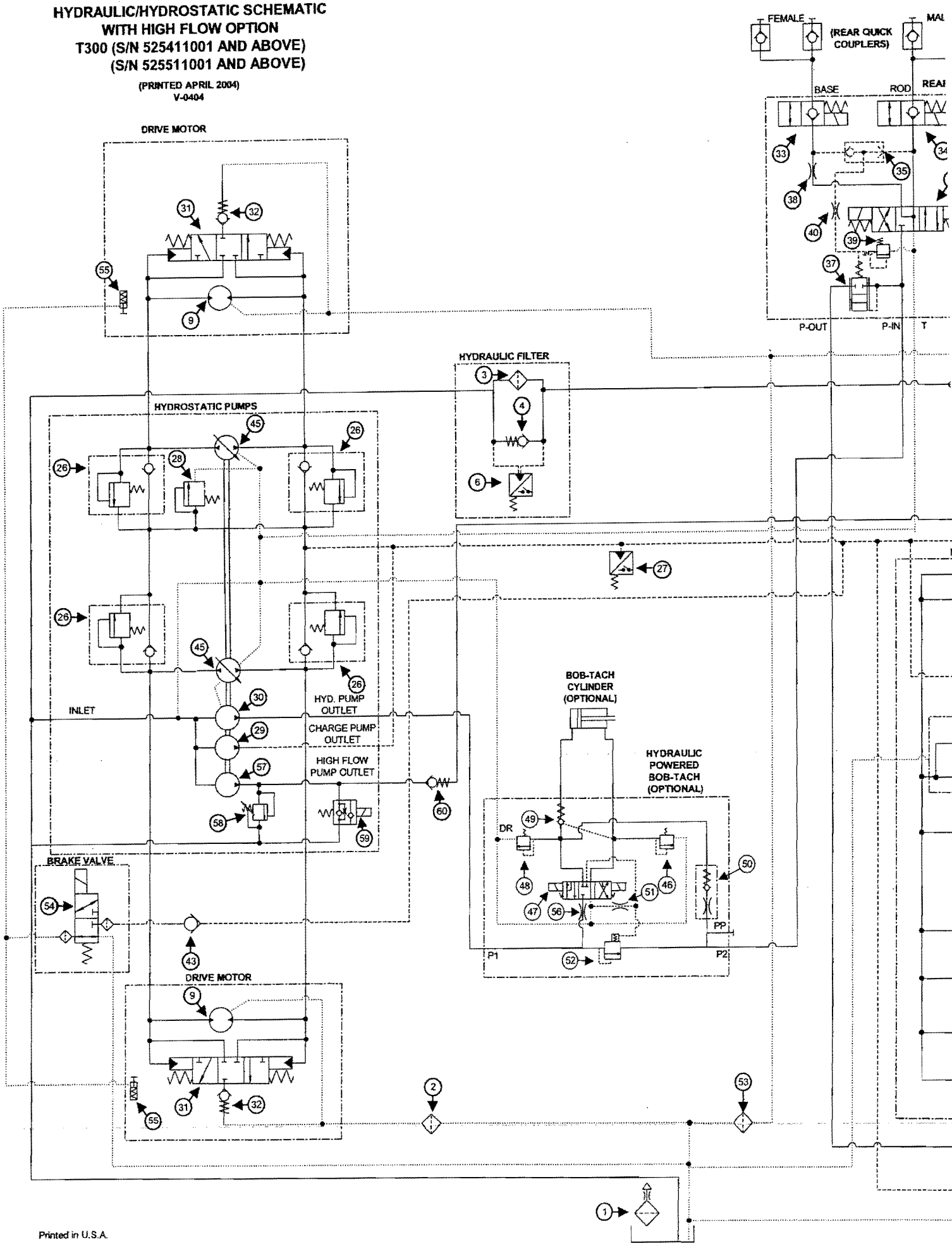
(59) DUMP VALVE - ON/OFF

(60) CHECK VALVE

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

HYDRAULIC/HYDROSTATIC SCHEMATIC
WITH HIGH FLOW OPTION
T300 (S/N 525411001 AND ABOVE)
(S/N 525511001 AND ABOVE)

(PRINTED APRIL 2004)
V-0404



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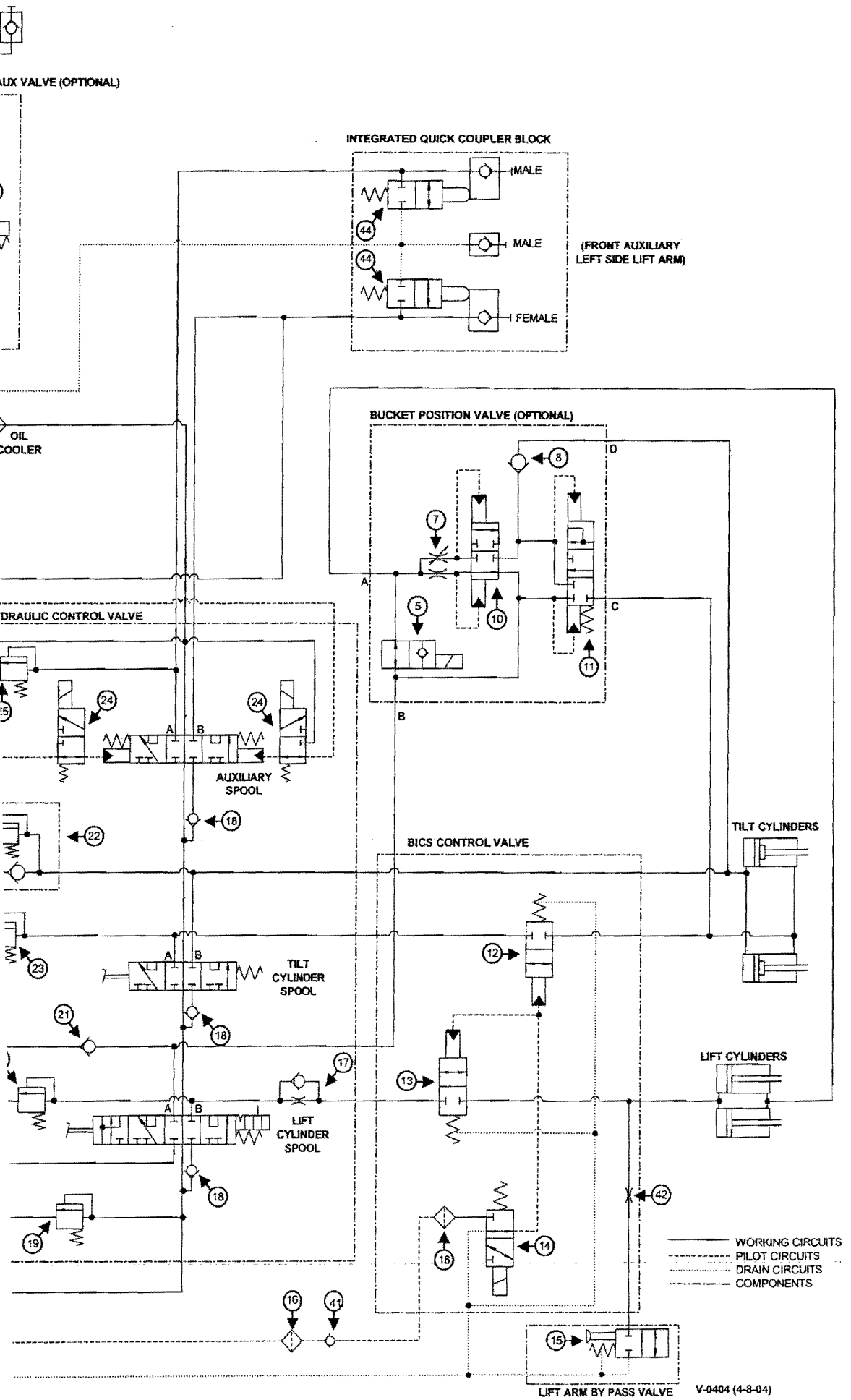

AUX VALVE (OPTIONAL)
INTEGRATED QUICK COUPLER BLOCK
MALE
MALE
FEMALE
(FRONT AUXILIARY LEFT SIDE LIFT ARM)
BUCKET POSITION VALVE (OPTIONAL)
OIL COOLER
DRAULIC CONTROL VALVE
AUXILIARY SPOOL
BICS CONTROL VALVE
TILT CYLINDERS
TILT CYLINDER SPOOL
LIFT CYLINDERS
LIFT CYLINDER SPOOL
WORKING CIRCUITS
PILOT CIRCUITS
DRAIN CIRCUITS
COMPONENTS
LIFT ARM BY PASS VALVE
V-0404 (4-8-04)

HYDRAULIC/HYDROSTATIC SC
WITH SJC OPTION
T300 (S/N 525411001 AND A
(S/N 525511001 AND A

(PRINTED APRIL 2004)
V-0405legend

LEGEND

1. RESERVOIR:
   Capacity . . . . . 21 Qts. (19.9 L)
2. FILTER - CASE DRAIN (90 Micron)
3. FILTER - HYDRAULIC (CANISTER)
4. SPRING LOADED FILTER BYPASS VALVE: 45-55 PSI (3,1-3,8 Bar)
5. SOLENOID ACTIVATED DIRECTIONAL CONTROL VALVE - BUCKET POSITION VALVE (ON/OFF)
6. DIFFERENTIAL PRESSURE SWITCH:
   36-44 PSI (2,5-3,0 Bar)
7. FLOW DIVIDER ADJUSTMENT VALVE
8. CHECK VALVE - BUCKET POSITION VALVE
9. FIXED CAPACITY DISPLACEMENT BIDIRECTIONAL HYDROSTATIC MOTOR
10. PILOTED ACTIVATED DIRECTIONAL CONTROL VALVE - FLOW CONTROL SPOOL
11. PILOTED ACTIVATED DIRECTIONAL CONTROL VALVE - UNLOADING SPOOL
12. PILOTED ACTIVATED DIRECTIONAL CONTROL VALVE - TILT CONTROL
13. PILOTED ACTIVATED DIRECTIONAL CONTROL VALVE - LIFT CONTROL
14. SOLENOID ACTIVATED DIRECTIONAL CONTROL VALVE - BICS CONTROL
15. PULL BUTTON ACTIVATED DIRECTIONAL CONTROL VALVE - LIFT ARM BY PASS
16. FILTER - BICS CONTROL VALVE (SCREEN)
17. ONE WAY RESTRICTOR (ACS Valve Only)
18. LOAD CHECK VALVE
19. RELIEF VALVE - MAIN:
    at Front Quick Couplers
    3250-3350 PSI (224-231 Bar)
20. RELIEF VALVE - PORT:
    4000 PSI (276 Bar)
21. ANTICAVITATION VALVE
22. RELIEF/ANTICAVITATION VALVE - PORT (TILT BASE END)
    3500 PSI (241 Bar)
23. RELIEF VALVE - PORT:
    4000 PSI (276 Bar)
24. SOLENOID ACTIVATED DIRECTIONAL CONTROL VALVE - AUXILIARY
25. RELIEF VALVE - PORT: . . . . . (Optional)
    3500 PSI (241 Bar)
26. RELIEF/REPLENISHING VALVE - HIGH PRESSURE: 5220 PSI (345 Bar)
27. PRESSURE SWITCH
28. RELIEF VALVE - CHARGE:
    120 degrees F. (53 degrees C.)Fluid
    at high engine idle
    340 - 360 PSI (23,5 - 24,8 Bar)
29. CHARGE PUMP:
    11.1 GPM (42 L/min) (for each pump) at high engine idle
30. HYDRAULIC PUMP . . . . . Gear Type
    20.7 GPM (78,4 L/min) at
    high engine idle
31. DRI\
32. SHUT
33. SOLE
    CON
34. SOLE
    CON
35. LOAD
36. PILOT
    CON
37. PILOT
    CON
38. ORIFI
39. RELIE
40. ORIFI
41. CHEC
42. RESTI
43. CHEC
44. FRONT
    PRES
45. VARIA
    BIDIR
46. RELIE
47. SOLEN
    CONT
48. RELIE
49. CHECK
    Spring

Printed in U.S.A.

HEMATIC

OVE)
OVE)

E MOTOR SHUTTLE VALVE

LE RELIEF VALVE:
200 PSI (13,8 Bar)

OID ACTIVATED DIRECTIONAL
ROL VALVE - Base

OID ACTIVATED DIRECTIONAL
ROL VALVE - Rod

SHUTTLE VALVE - BLEED OFF

ACTIVATED DIRECTIONAL
ROL VALVE - (Two Coil)

ACTIVATED DIRECTIONAL
ROL VALVE - REAR AUXILIARY

E - With 0.140 inch (3,6 mm)

VALVE - PORT:
3000 PSI (207 Bar)

E - With 0.031 inch (0,79 mm)

VALVE - BICS CONTROL VALVE

ICTION

VALVE

AUXILIARY MANUAL
SURE BLEED-OFF VALVE

LE CAPACITY DISPLACEMENT
ECTIONAL HYDROSTATIC PUMP

VALVE - 2000 PSI (138 Bar)

DID ACTIVATED DIRECTIONAL
ROL VALVE (TWO COIL)

VALVE - 1200 PSI (83 Bar)

VALVE - With 80 PSI (5,5 Bar)

(50) CHECK VALVE - With 300 PSI (20,7 Bar) Spring and 0.016 inch (0,40 mm) orifice

(51) ORIFICE - With 0.025 inch (0,64 mm)

(52) PILOT ACTIVATED DIRECTIONAL CONTROL VALVE - HYDRAULIC POWERED BOB-TACH

(53) FILTER - CASE DRAIN (ATTACHMENT)

(54) SOLENOID ACTIVATED DIRECTIONAL CONTROL VALVE - BRAKE

(55) HYDRAULIC BRAKE - SPRING APPLIED - PRESSURE RELEASE

(56) ORIFICE - With 0.089 inch (2,26 mm)

(57) DISPLACEMENT CONTROL VALVE

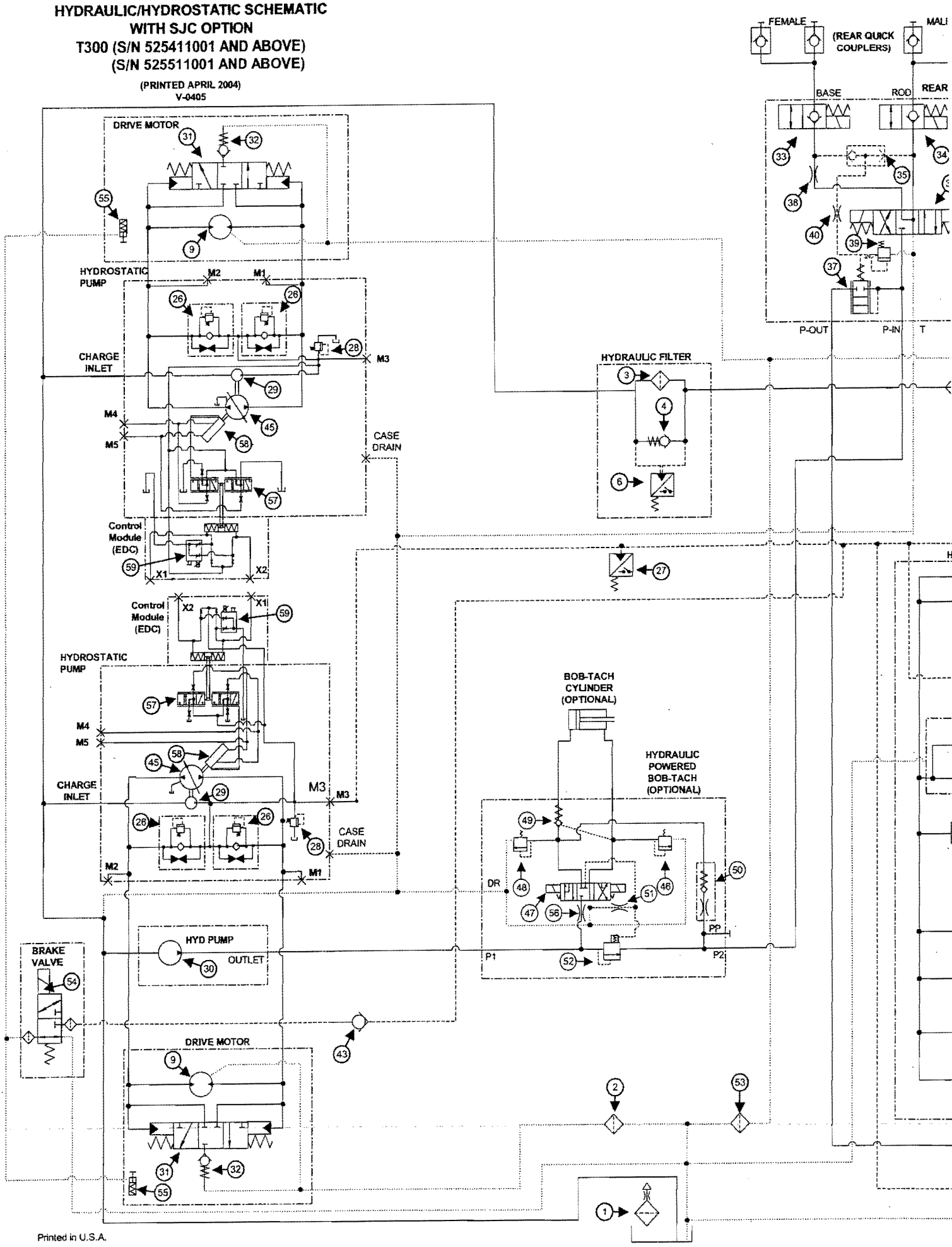
(58) PUMP SERVO

(59) PRESSURE CONTROL PILOT VALVE (2 COILS) 0 - 0.085 Ampere

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

HYDRAULIC/HYDROSTATIC SCHEMATIC
WITH SJC OPTION
T300 (S/N 525411001 AND ABOVE)
(S/N 525511001 AND ABOVE)

(PRINTED APRIL 2004)
V-0405



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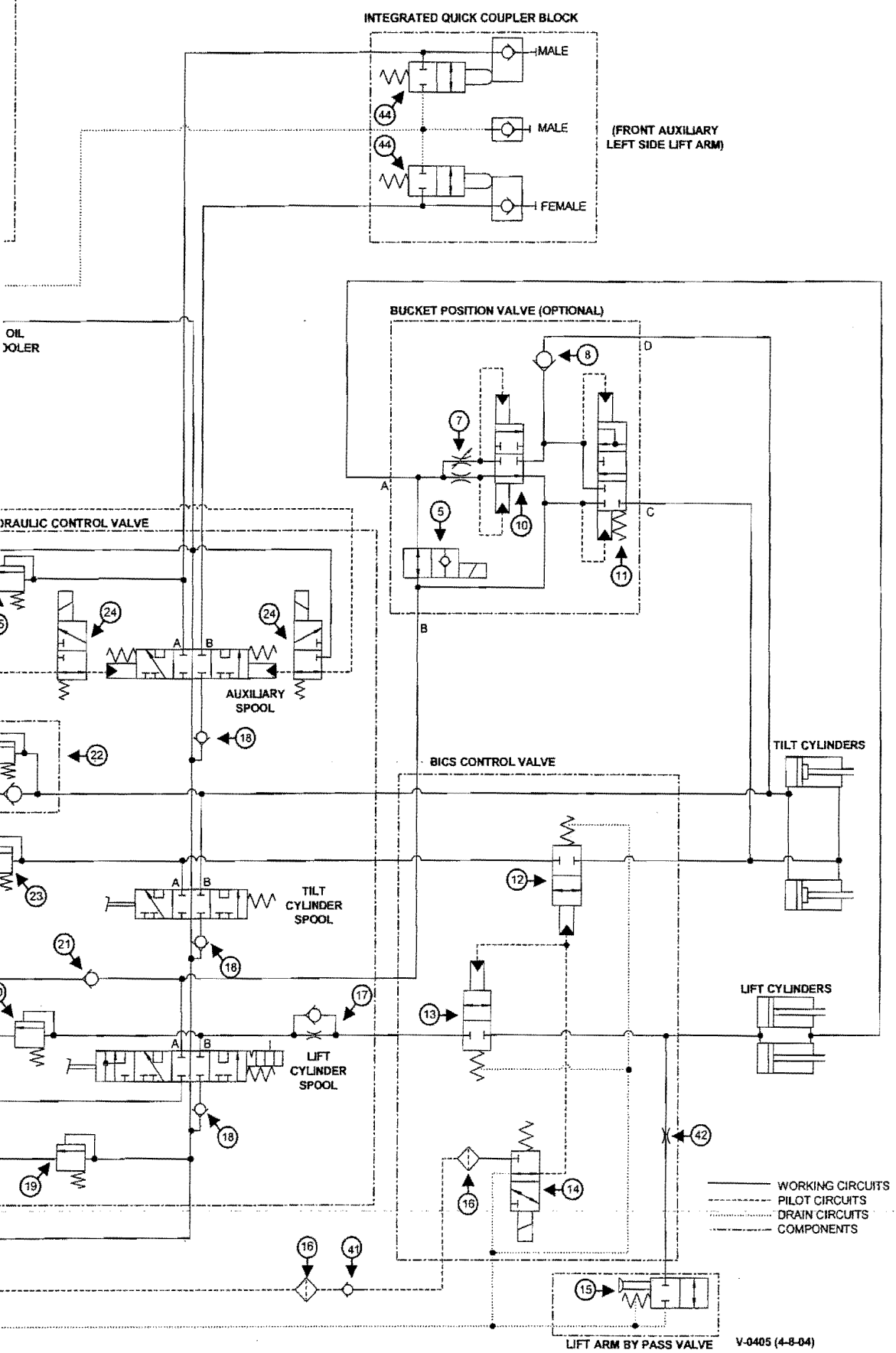
(VALVE (OPTIONAL)



V-0405 (4-8-04)

HYDRAULIC/HYDROSTATIC SC
WITH SJC AND HIGH FLOW
T300 (S/N 525411001 AND A
(S/N 525511001 AND A

(PRINTED APRIL 2004)
V-0406legend

LEGEND

1. RESERVOIR:
   Capacity . . . . . 21 Qts. (19.9 L)
2. FILTER - CASE DRAIN (90 Micron)
3. FILTER - HYDRAULIC (CANISTER)
4. SPRING LOADED FILTER BYPASS VALVE: 45-55 PSI (3,1-3,8 Bar)
5. SOLENOID ACTIVATED DIRECTIONAL CONTROL VALVE - BUCKET POSITION VALVE (ON/OFF)
6. DIFFERENTIAL PRESSURE SWITCH: 36-44 PSI (2,5-3,0 Bar)
7. FLOW DIVIDER ADJUSTMENT VALVE
8. CHECK VALVE - BUCKET POSITION VALVE

FIXED CAPACITY DISPLACEMENT BIDIRECTIONAL HYDROSTATIC MOTOR

10. PILOTED ACTIVATED DIRECTIONAL CONTROL VALVE - FLOW CONTROL SPOOL
11. PILOTED ACTIVATED DIRECTIONAL CONTROL VALVE - UNLOADING SPOOL
12. PILOTED ACTIVATED DIRECTIONAL CONTROL VALVE - TILT CONTROL
13. PILOTED ACTIVATED DIRECTIONAL CONTROL VALVE - LIFT CONTROL
14. SOLENOID ACTIVATED DIRECTIONAL CONTROL VALVE - BICS CONTROL
15. PULL BUTTON ACTIVATED DIRECTIONAL CONTROL VALVE - LIFT ARM BY PASS
16. FILTER - BICS CONTROL VALVE (SCREEN)
17. ONE WAY RESTRICTOR (ACS Valve Only)
18. LOAD CHECK VALVE
19. RELIEF VALVE - MAIN:
    at Front Quick Couplers
    3250-3350 PSI (224-231 Bar)
20. RELIEF VALVE - PORT:
    4000 PSI (276 Bar)
21. ANTICAVITATION VALVE
22. RELIEF/ANTICAVITATION VALVE - PORT (TILT BASE END)
    3500 PSI (241 Bar)
23. RELIEF VALVE - PORT:
    4000 PSI (276 Bar)
24. SOLENOID ACTIVATED DIRECTIONAL CONTROL VALVE - AUXILIARY
25. RELIEF VALVE - PORT: . . . . . (Optional)
    3500 PSI (241 Bar)
26. RELIEF/REPLENISHING VALVE - HIGH PRESSURE: 5220 PSI (345 Bar)
27. PRESSURE SWITCH
28. RELIEF VALVE - CHARGE:
    120 degrees F. (53 degrees C.)Fluid at high engine idle
    340 - 360 PSI (23,5 - 24,8 Bar)
29. CHARGE PUMP:
    11.1 GPM (42 L/min) (for each pump) at high engine idle
30. HYDRAULIC PUMP . . . . . Gear Type
    20.7 GPM (78,4 L/min) at high engine idle
31. DRI
32. SHUT
33. SOLE CON
34. SOLE CON
35. LOAD
36. PILOT CON
37. PILOT CON
38. ORIFI
39. RELIE
40. ORIFI
41. CHEC
42. RESTF
43. CHEC
44. FRONT PRES
45. VARIA BIDIR
46. RELIEF
47. SOLEN CONT
48. RELIEF
49. CHECK Spring

Printed in U.S.A.

EMATIC
'TION
)VE)
OVE)

MOTOR SHUTTLE VALVE

E RELIEF VALVE:
200 PSI (13,8 Bar)

)ID ACTIVATED DIRECTIONAL
ROL VALVE - Base

)ID ACTIVATED DIRECTIONAL
ROL VALVE - Rod

HUTTLE VALVE - BLEED OFF

CTIVATED DIRECTIONAL
ROL VALVE - (Two Coil)

CTIVATED DIRECTIONAL
ROL VALVE - REAR AUXILIARY

- With 0.140 inch (3,6 mm)

VALVE - PORT:
3000 PSI (207 Bar)

- With 0.031 inch (0,79 mm)

VALVE - BICS CONTROL VALVE

CTION

VALVE

AUXILIARY MANUAL
URE BLEED-OFF VALVE

LE CAPACITY DISPLACEMENT
CTIONAL HYDROSTATIC PUMP

VALVE - 2000 PSI (138 Bar)

)ID ACTIVATED DIRECTIONAL
ROL VALVE (TWO COIL)
VALVE - 1200 PSI (83 Bar)

VALVE - With 80 PSI (5,5 Bar)

(50) CHECK VALVE - With 300 PSI (20,7 Bar) Spring and 0.016 inch (0,40 mm) orifice

(51) ORIFICE - With 0.025 inch (0,64 mm)

(52) PILOT ACTIVATED DIRECTIONAL CONTROL VALVE - HYDRAULIC POWERED BOB-TACH

(53) FILTER - CASE DRAIN (ATTACHMENT)

(54) SOLENOID ACTIVATED DIRECTIONAL CONTROL VALVE - BRAKE

(55) HYDRAULIC BRAKE - SPRING APPLIED - PRESSURE RELEASE

(56) ORIFICE - With 0.089 inch (2,26 mm)

(57) DISPLACEMENT CONTROL VALVE

(58) PUMP SERVO

(59) PRESSURE CONTROL PILOT VALVE (2 COILS) 0 - 0.085 Ampere

(60) AUXILIARY HYDRAULIC PUMP 10.5 GPM (39,7 L/min) at high engine idle

(61) RELIEF VALVE - PORT:
3300 PSI (228 Bar)

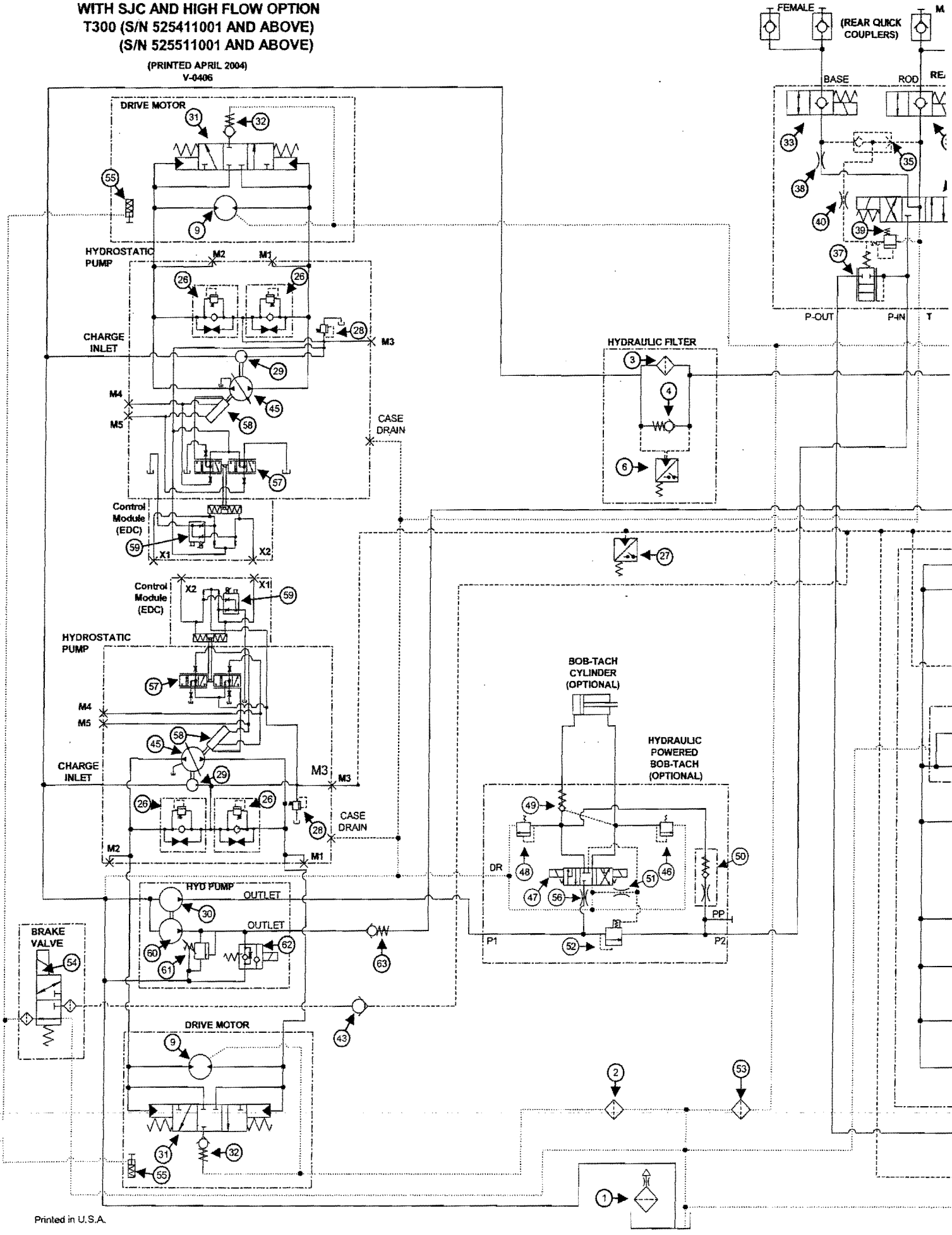
(62) DUMP VALVE - ON/OFF

(63) CHECK VALVE

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

HYDRAULIC/HYDROSTATIC SCHEMATIC
WITH SJC AND HIGH FLOW OPTION
T300 (S/N 525411001 AND ABOVE)
(S/N 525511001 AND ABOVE)

(PRINTED APRIL 2004)
V-0406



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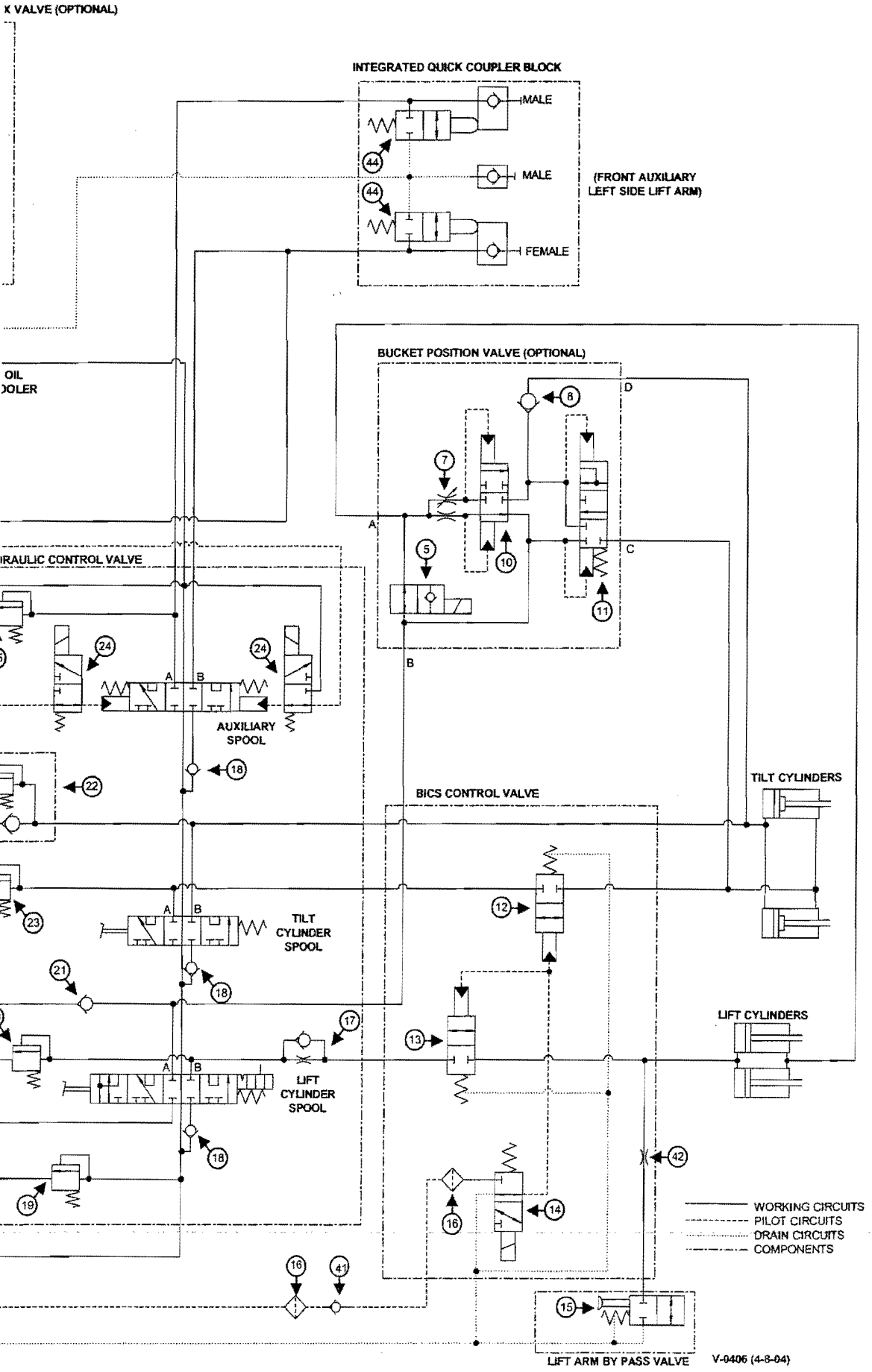
K VALVE (OPTIONAL)
INTEGRATED QUICK COUPLER BLOCK
MALE
MALE
FEMALE
(FRONT AUXILIARY
LEFT SIDE LIFT ARM)
OIL
OOLER
BUCKET POSITION VALVE (OPTIONAL)
RAULIC CONTROL VALVE
AUXILIARY
SPOOL
BICS CONTROL VALVE
TILT CYLINDERS
TILT
CYLINDER
SPOOL
LIFT CYLINDERS
LIFT
CYLINDER
SPOOL
WORKING CIRCUITS
PILOT CIRCUITS
DRAIN CIRCUITS
COMPONENTS
LIFT ARM BY PASS VALVE
V-0406 (4-8-04)

HYDRAULIC/HYDROSTATIC SC
T300 (S/N 525411001 AND AI
(S/N 525511001 AND AI

(PRINTED APRIL 2004)
V-0403legend

LEGEND

1. RESERVOIR:
   Capacity . . . . . 21 Qts. (19.9 L)
2. FILTER - CASE DRAIN (90 Micron)
3. FILTER - HYDRAULIC (CANISTER)
4. SPRING LOADED FILTER BYPASS VALVE: 45-55 PSI (3,1-3,8 Bar)
5. PILOT ACTIVATED DIRECTIONAL CONTROL VALVE - HYDRAULIC POWERED BOB-TACH
6. DIFFERENTIAL PRESSURE SWITCH: 36-44 PSI (2,5-3,0 Bar)
7. FLOW DIVIDER ADJUSTMENT VALVE
8. CHECK VALVE - BUCKET POSITION VALVE
9. FIXED CAPACITY DISPLACEMENT BIDIRECTIONAL HYDROSTATIC MOTOR
10. PILOTED ACTIVATED DIRECTIONAL CONTROL VALVE - FLOW CONTROL SPOOL
11. PILOTED ACTIVATED DIRECTIONAL CONTROL VALVE - UNLOADING SPOOL
12. PILOTED ACTIVATED DIRECTIONAL CONTROL VALVE - TILT CONTROL
13. PILOTED ACTIVATED DIRECTIONAL CONTROL VALVE - LIFT CONTROL
14. SOLENOID ACTIVATED DIRECTIONAL CONTROL VALVE - BICS CONTROL
15. PULL BUTTON ACTIVATED DIRECTIONAL CONTROL VALVE - LIFT ARM BY PASS
16. FILTER - BICS CONTROL VALVE (SCREEN)
17. ONE WAY RESTRICTOR (ACS Valve Only)
18. LOAD CHECK VALVE
19. RELIEF VALVE - MAIN:
    at Front Quick Couplers
    3250-3350 PSI (224-231 Bar)
20. RELIEF VALVE - PORT:
    4000 PSI (276 Bar)
21. ANTICAVITATION VALVE
22. RELIEF/ANTICAVITATION VALVE - PORT (TILT BASE END)
    3500 PSI (241 Bar)
23. RELIEF VALVE - PORT:
    4000 PSI (276 Bar)
24. SOLENOID ACTIVATED DIRECTIONAL CONTROL VALVE - AUXILIARY
25. RELIEF VALVE - PORT: . . . . . (Optional)
    3500 PSI (241 Bar)
26. RELIEF/REPLENISHING VALVE - HIGH PRESSURE: 5000 PSI (345 Bar)
27. PRESSURE SWITCH
28. RELIEF VALVE - CHARGE:
    120 degrees F. (53 degrees C.)Fluid
    at high engine idle
    390 - 430 PSI (26,9 - 29,7 Bar)
29. CHARGE PUMP:
    14.2 GPM (53,8 L/min) at
    high engine idle
30. HYDR
    2
31. DRIV
32. SHUT
33. SOLEN
    CONT
34. SOLEN
    CONT
35. LOAD
36. PILOT
    CONT
37. PILOT
    CONT
38. ORIFIC
39. RELIEF
40. ORIFIC
41. CHECK
42. RESTR
43. CHECK
44. FRONT
    PRES
45. VARIAB
    BIDIR

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IEMATIC
OVE)
OVE)

ULIC PUMP . . . . . Gear Type
2 GPM (80,3 L/min) at
high engine idle

MOTOR SHUTTLE VALVE

LE RELIEF VALVE:
200 PSI (13,8 Bar)

OID ACTIVATED DIRECTIONAL
ROL VALVE - Base

OID ACTIVATED DIRECTIONAL
ROL VALVE - Rod

HUTTLE VALVE - BLEED OFF

ACTIVATED DIRECTIONAL
ROL VALVE - (Two Coil)

ACTIVATED DIRECTIONAL
ROL VALVE - REAR AUXILIARY

E - With 0.140 inch (3,6 mm)

VALVE - PORT:
3000 PSI (207 Bar)

E - With 0.031 inch (0,79 mm)

VALVE - BICS CONTROL VALVE

CTION

VALVE

AUXILIARY MANUAL
URE BLEED-OFF VALVE

LE CAPACITY DISPLACEMENT
CTIONAL HYDROSTATIC PUMP

(46) RELIEF VALVE - 2000 PSI (138 Bar)

(47) SOLENOID ACTIVATED DIRECTIONAL CONTROL VALVE (TWO COIL)

(48) RELIEF VALVE - 1200 PSI (83 Bar)

(49) CHECK VALVE - With 80 PSI (5,5 Bar) Spring

(50) CHECK VALVE - With 300 PSI (20,7 Bar) Spring and 0.016 inch (0,40 mm) orifice

(51) ORIFICE - With 0.025 inch (0,64 mm)

(52) SOLENOID ACTIVATED DIRECTIONAL CONTROL VALVE - BUCKET POSITION VALVE (ON/OFF)

(53) FILTER - CASE DRAIN (ATTACHMENT)

(54) SOLENOID ACTIVATED DIRECTIONAL CONTROL VALVE - BRAKE

(55) HYDRAULIC BRAKE - SPRING APPLIED - PRESSURE RELEASE

(56) ORIFICE - With 0.089 inch (2,26 mm)

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

Troubleshooting

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

If the service code appears in the left instrument panel, refer to the Electrical Service Manual for the probable cause.

⚠ 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, 6, 7, 8, 9
The lift arms or Bob-Tach will move when the pedal is in neutral position.	4
The lift arms come down with the pedal in the neutral position.	4, 9, 10, 11
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 SPEC-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.

Tightening Procedure

IMPORTANT

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

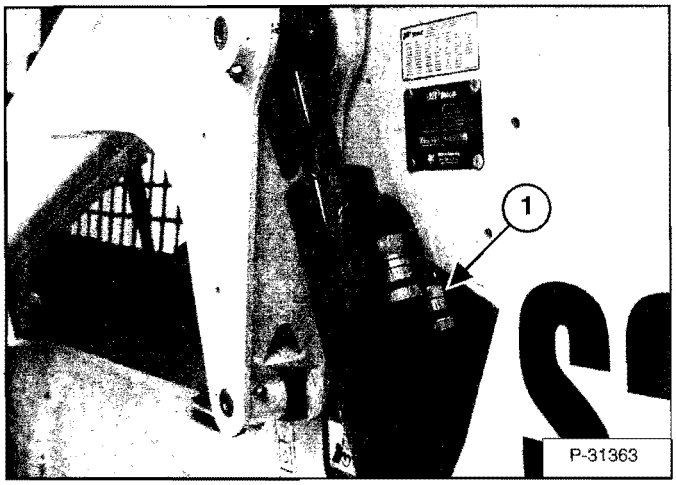
I-2003-0888

For Tightening Torques For Hydraulic Fittings, Tubelines, etc., See Section SPEC-01 - Hydraulic Connection Specifications.

CYLINDER (LIFT)

Checking

Figure 20-20-1



Lower the lift arms. Stop the engine. Raise the seat bar.

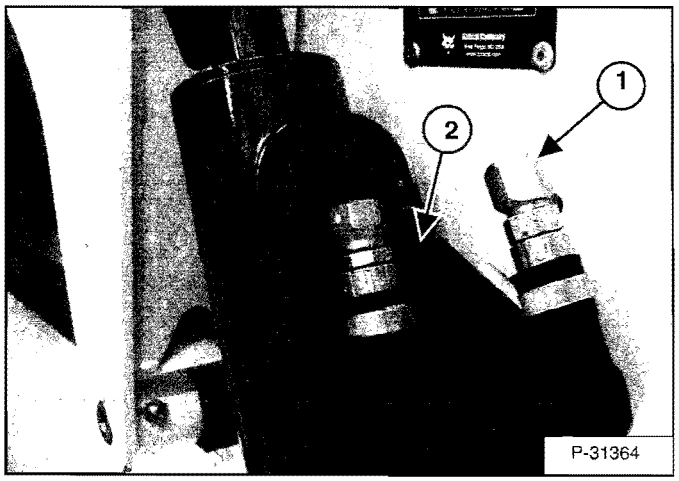
⚠ WARNING

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 possibly death if proper medical treatment by a physician familiar with this injury is not received immediately.

W-2145-0290

Check only one cylinder at a time. Disconnect the hose (Item 1) **[Figure 20-20-1]** which goes to the base end of the lift cylinder.

Figure 20-20-2



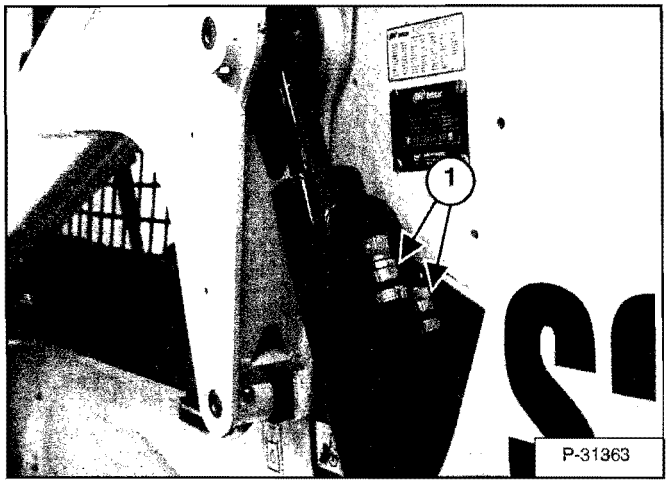
Install a cap (Item 1) **[Figure 20-20-2]** in the hose and tighten.

Engage the parking brake. Lower the seat bar. Start the engine and push the top (toe) of the lift pedal.

If there is any leakage from the fitting on the cylinder (Item 2) **[Figure 20-20-2]**. Remove the lift cylinder for repair. Repeat the procedure to check the other lift cylinder.

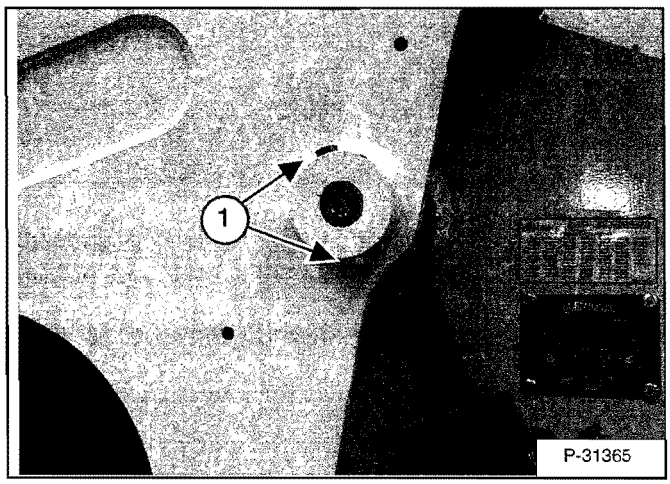
Removal And Installation

Figure 20-20-3



Disconnect both hydraulic hoses from the cylinder (Item 1) **[Figure 20-20-3]**. Cap and plug the fittings and hoses.

Figure 20-20-4

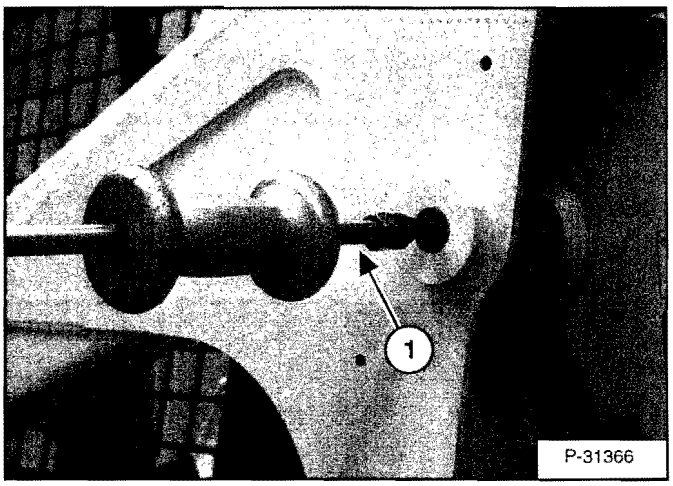


Remove the retaining bolt and nut (Item 1) **[Figure 20-20-4]** from the retaining pin on the rod end of the lift cylinder.

Installation: Tighten the retainer bolt and nut to 18-20 ft.-lbs. (24-27 Nm) torque.

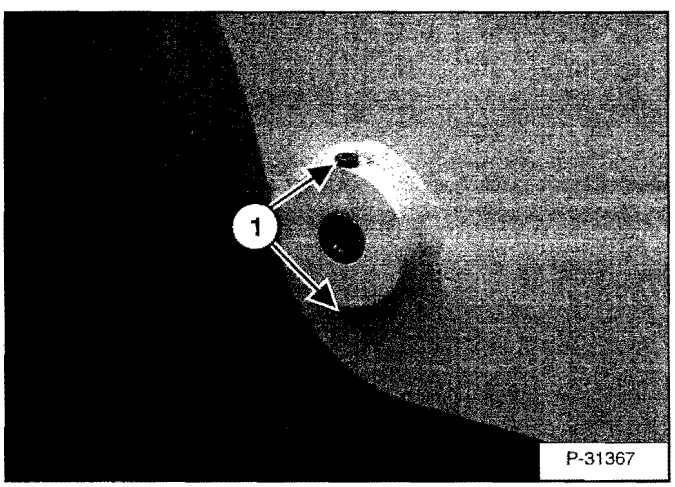
Removal And Installation (Cont'd)

Figure 20-20-5



Install a slide hammer (Item 1) **[Figure 20-20-5]** and remove the retaining pin from the rod end of the cylinder.

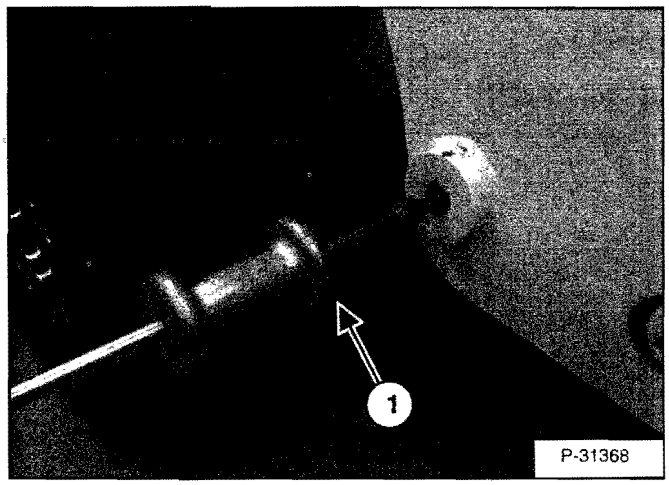
Figure 20-20-6



Remove the retaining bolt and nut (Item 1) **[Figure 20-20-6]** from the pivot pin at the base end of the lift cylinder.

Installation: Tighten the retainer bolt and nut to 18-20 ft.-lbs. (24-27 Nm) torque.

Figure 20-20-7



Install a slide hammer (Item 1) **[Figure 20-20-7]** and remove the base end pivot pin.

Remove the lift cylinder.

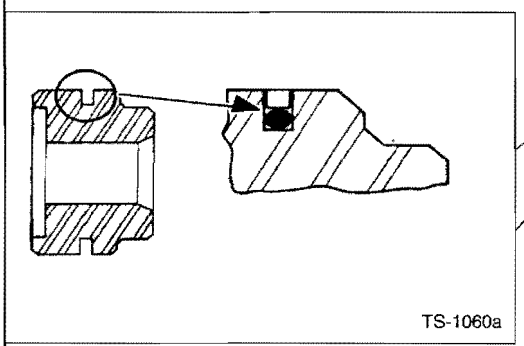
⚠ WARNING

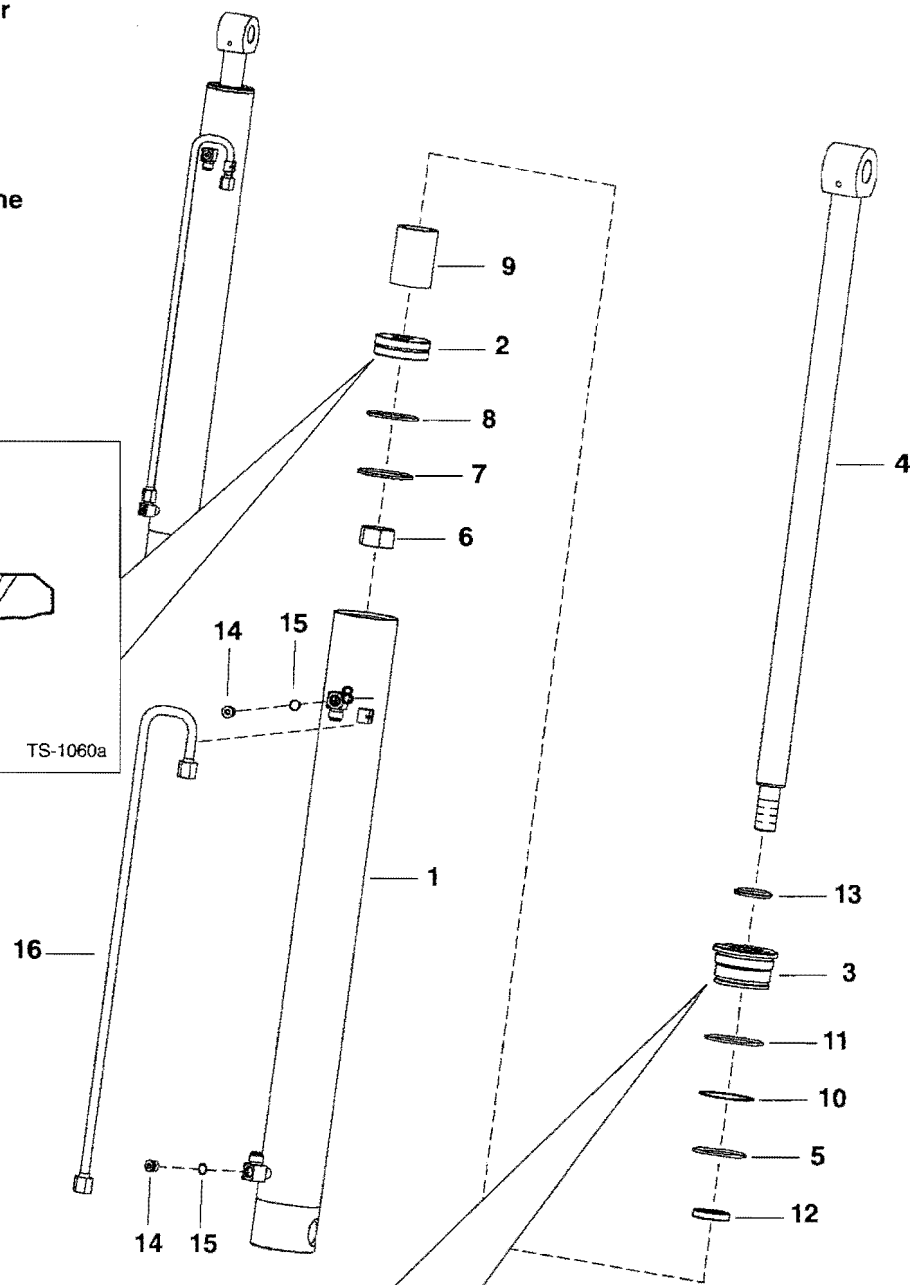
Always clean up spilled fuel or oil. Keep heat, flames, sparks or lighted tobacco away from fuel and oil. Failure to use care around combustibles can cause explosion or fire which can result in injury or death.

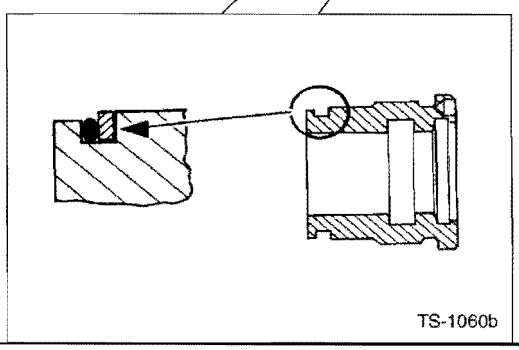
W-2103-1285

Parts Identification

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







PE1519A

Disassembly

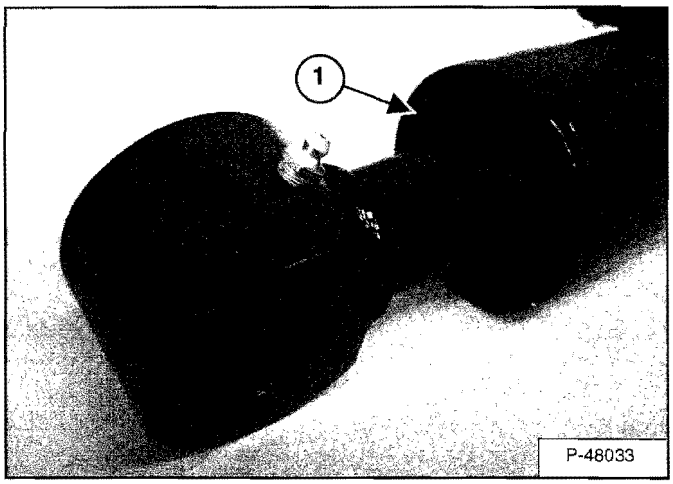
Use the following tools to disassemble the cylinder:

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.

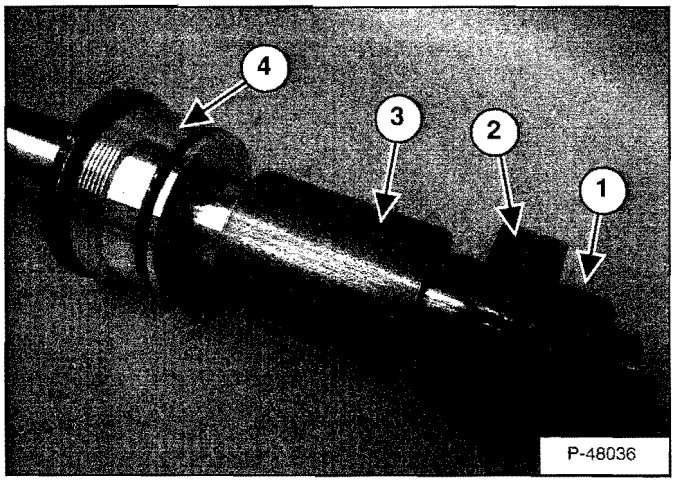
Put the base end of the cylinder in a vise.

Figure 20-20-8



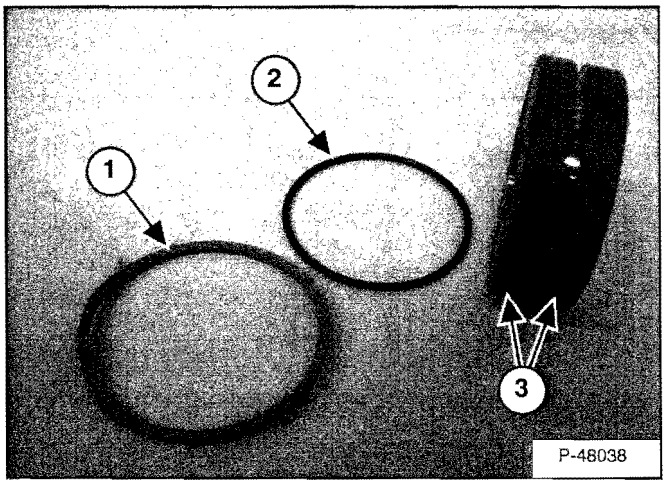
Use a spanner wrench to loosen the head (Item 1) **[Figure 20-20-8]** from the cylinder case.

Figure 20-20-9



Remove the nut (Item 1), piston (Item 2), spacer (Item 3) and head (Item 4) **[Figure 20-20-9]**.

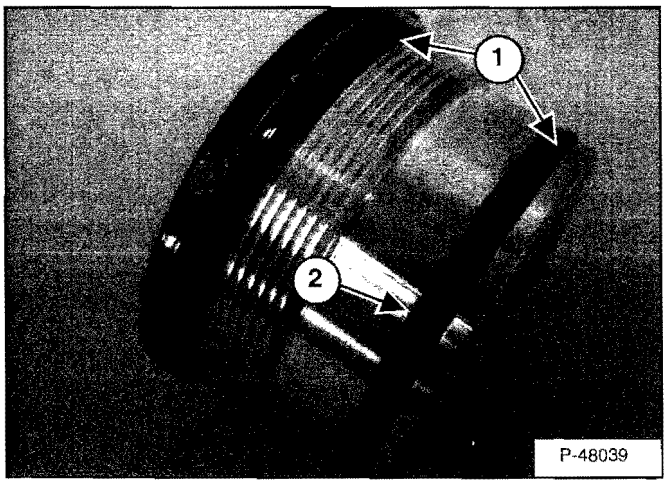
Figure 20-20-10



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

NOTE: If the fiber surface (Item 3) [Figure 20-20-10] on the piston head, becomes damaged, the complete piston head must be replaced.

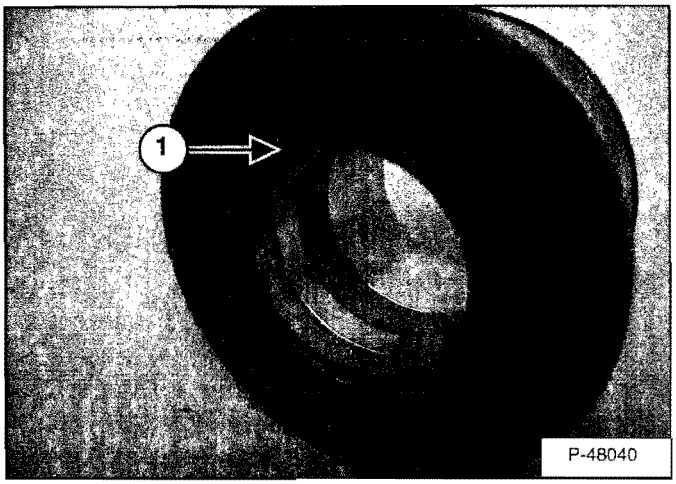
Figure 20-20-11



Remove the two O-rings (Item 1) and the back-up washer (Item 2) **[Figure 20-20-11]** from the cylinder head.

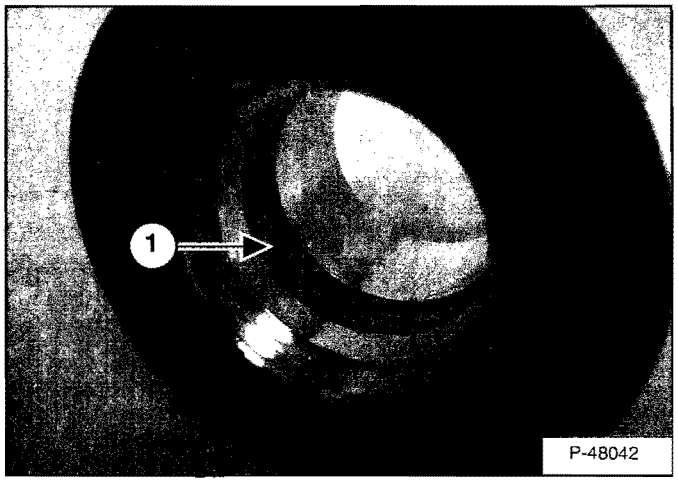
Disassembly (Cont'd)

Figure 20-20-12



Remove the wiper seal (Item 1) **[Figure 20-20-12]** from the cylinder head.

Figure 20-20-13



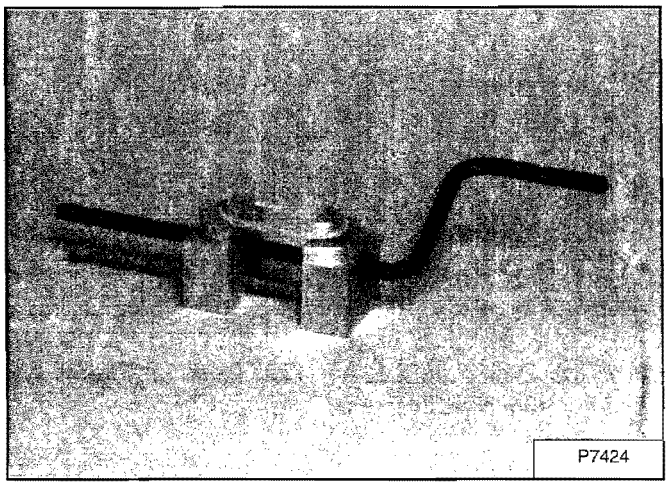
Remove the rod seal (Item 1) **[Figure 20-20-13]** from the cylinder head.

Assembly

Use the following tools to assemble the cylinder:

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

Figure 20-20-14



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.

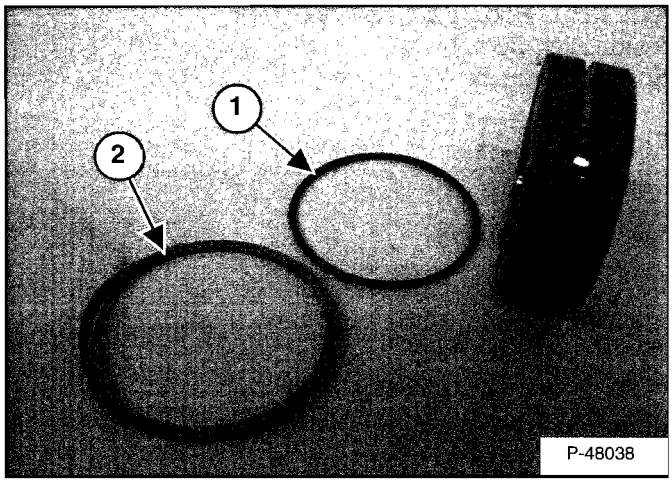
Lubricate all O-rings and seals with hydraulic oil during installation.

Install the new seal on the tool and slowly stretch it until it fits the piston **[Figure 20-20-14]**.

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

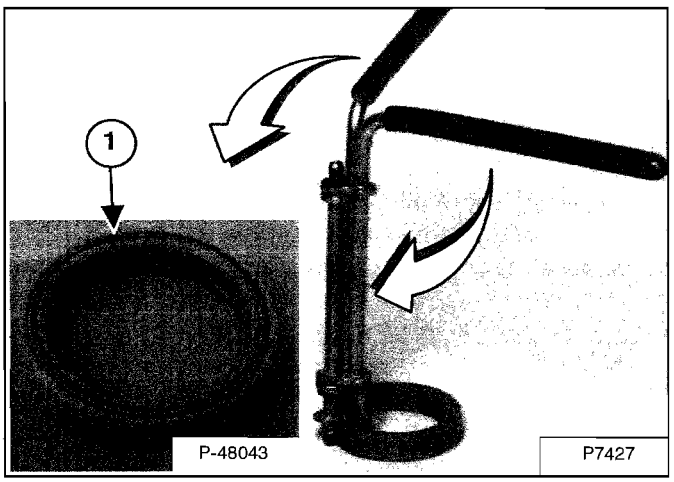
Assembly (Cont'd)

Figure 20-20-15



Install the O-ring (Item 1) and seal (Item 2) **[Figure 20-20-15]** on the cylinder piston.

Figure 20-20-16

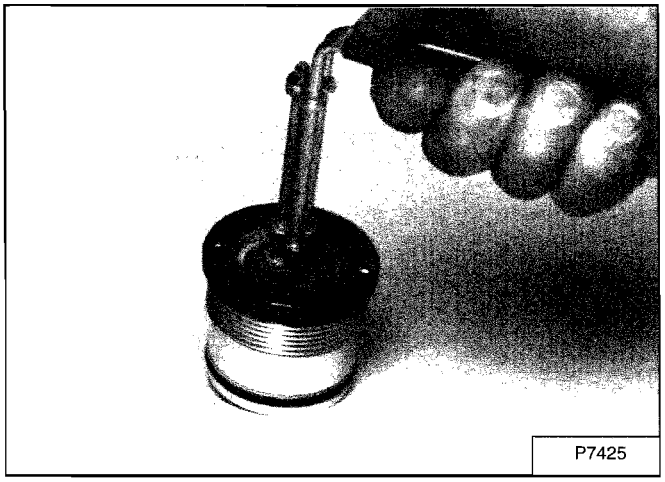


Install the rod seal on the rod seal tool **[Figure 20-20-16]**.

NOTE: During installation the spring side of the seal (Item 1) [Figure 20-20-16] must be installed toward the inside of the cylinder.

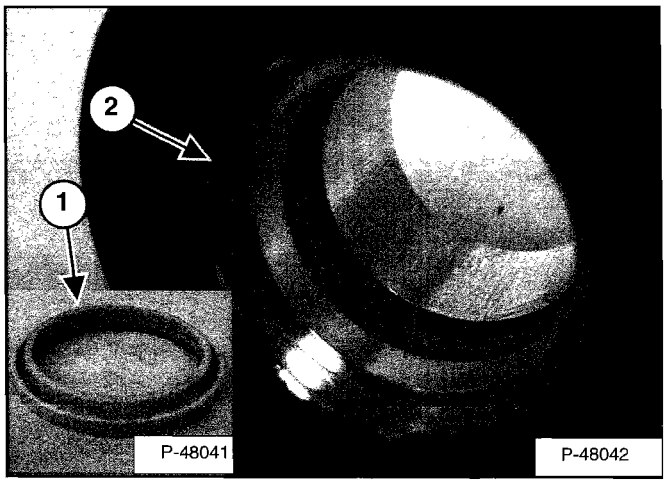
Rotate the handles to collapse the rod seal **[Figure 20-20-16]**.

Figure 20-20-17



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

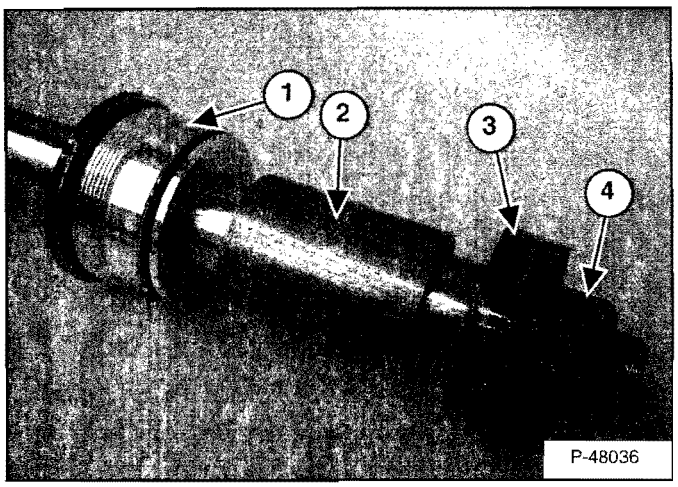
Figure 20-20-18



Install the wiper seal, with the wiper side of the seal (Item 1) toward the outside of the head (Item 2) **[Figure 20-20-18]**.

Assembly (Cont'd)

Figure 20-20-19

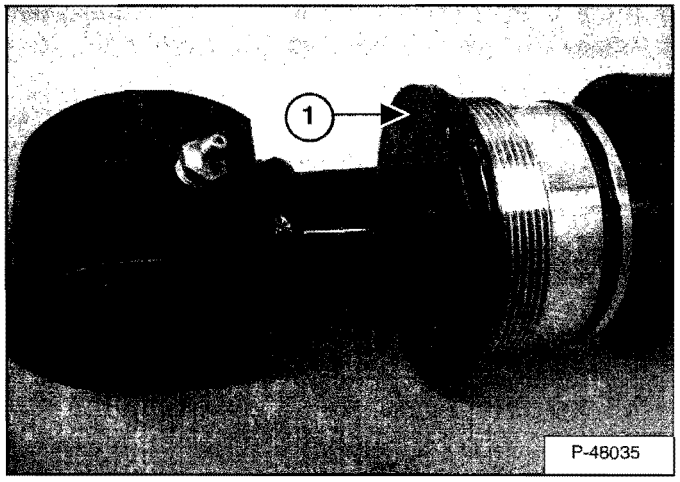


NOTE: Clean and dry the threads before installing the nut. Install the new nut from the kit.

Install the head (Item 1), spacer (Item 2) piston (Item 3), and nut (Item 4) **[Figure 20-20-19]**.

Tighten the nut (Item 4) **[Figure 20-20-19]** to 600 ft.-lbs. (814 Nm) torque.

Figure 20-20-20



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

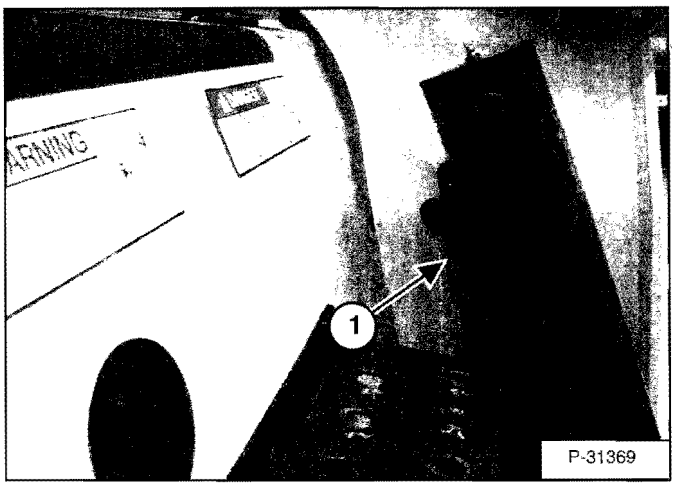
Using a spanner wrench, tighten the head (Item 1) **[Figure 20-20-20]** until the head is flush with the end of the cylinder tube assembly.

Bobcat®

CYLINDER (TILT)

Checking

Figure 20-21-1



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

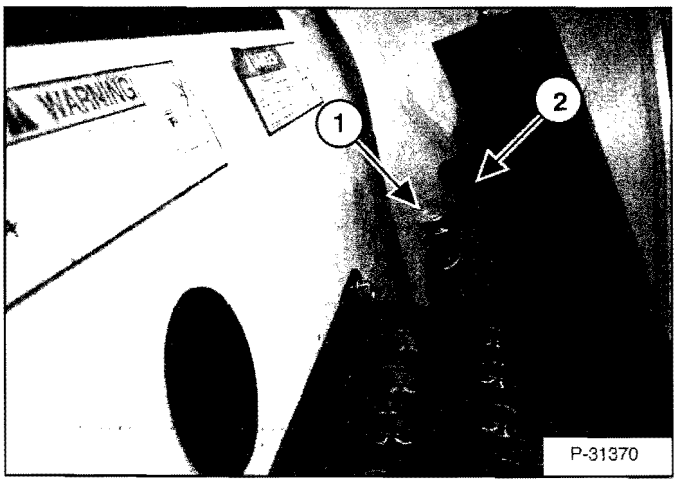
⚠ WARNING

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 possibly death if proper medical treatment by a physician familiar with this injury is not received immediately.

W-2145-0290

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

Figure 20-21-2



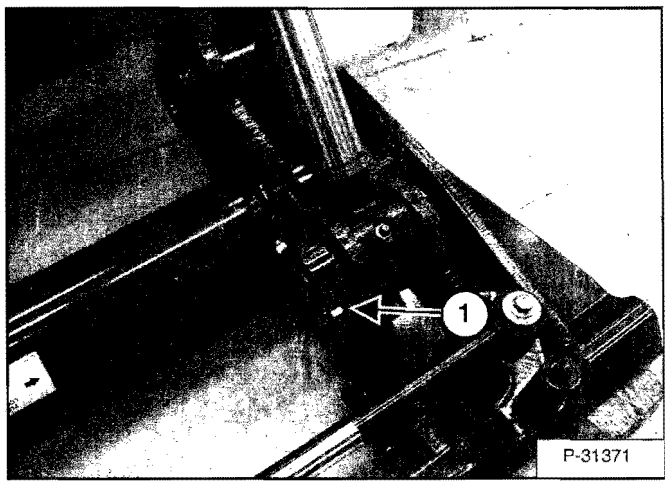
Install a cap (Item 1) **[Figure 20-21-2]** in the hydraulic hose and tighten.

Engage the parking brake. Lower the seat bar. Start the engine and push the bottom (heel) of the tilt pedal. If there is leakage from the open port on the cylinder (Item 2) **[Figure 20-21-2]**, remove the tilt cylinder for repair.

Repeat procedure to check the other tilt cylinder.

Removal And Installation

Figure 20-21-3



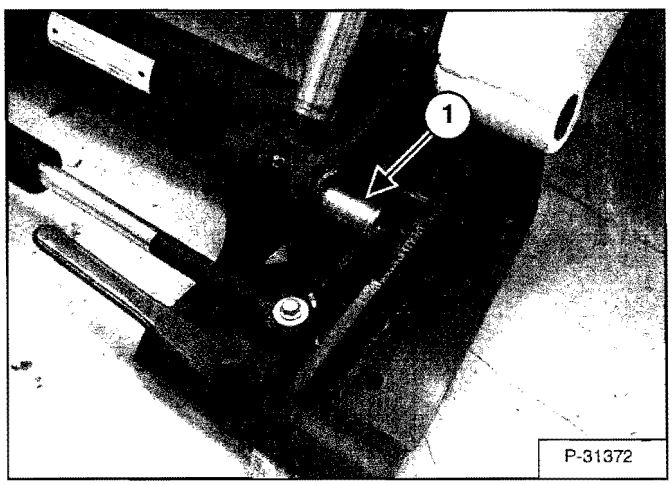
Remove the attachment from the Bob-Tach. Roll the Bob-Tach forward

Stop the engine. Raise the seat bar.

Remove the retainer bolt and nut (Item 1) **[Figure 20-21-3]** from the rod end pivot pin.

Installation: Tighten the retainer nut to 18-20 ft.-lbs. (24-27 Nm) torque.

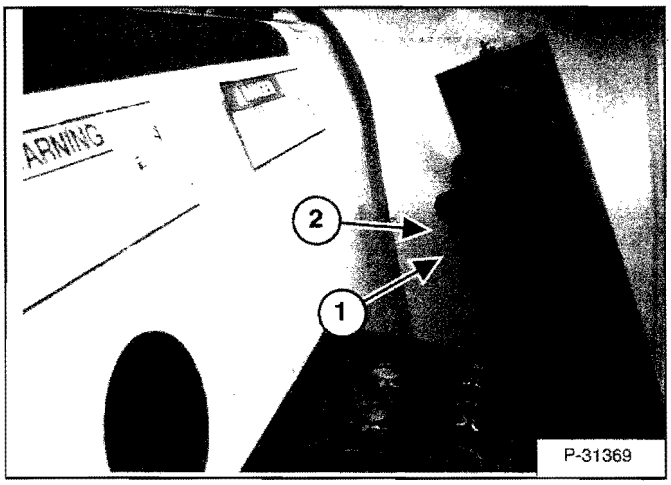
Figure 20-21-4



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

Removal And Installation (Cont'd)

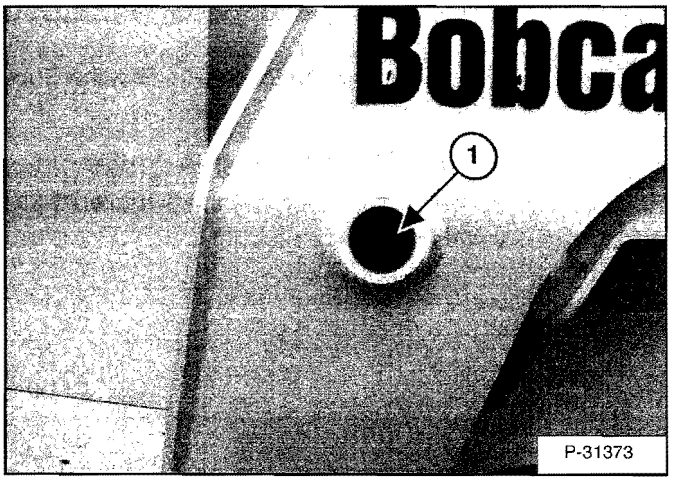
Figure 20-21-5



Disconnect the two hydraulic hoses (Items 1 & 2) **[Figure 20-21-5]** from the tilt cylinder.

Cap the hoses and plug the fittings on the cylinder.

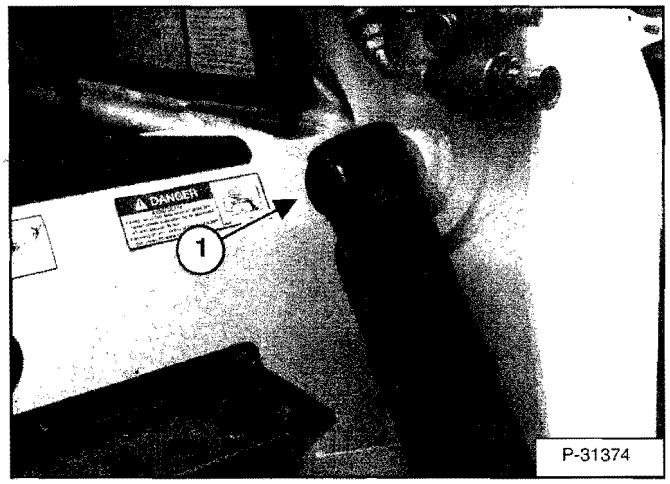
Figure 20-21-6



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

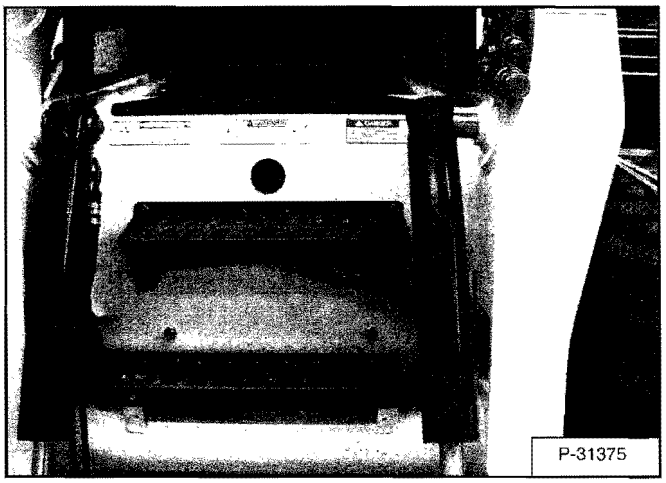
Installation: Tighten the retainer nut to 190 ft.-lbs. (257,6 Nm) torque.

Figure 20-21-7



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

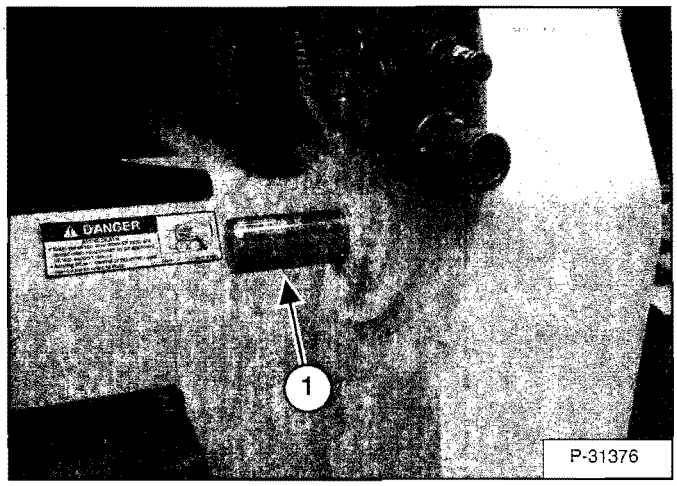
Figure 20-21-8



Slide the cylinder from the base pin and remove the tilt cylinder from the loader **[Figure 20-21-8]**.

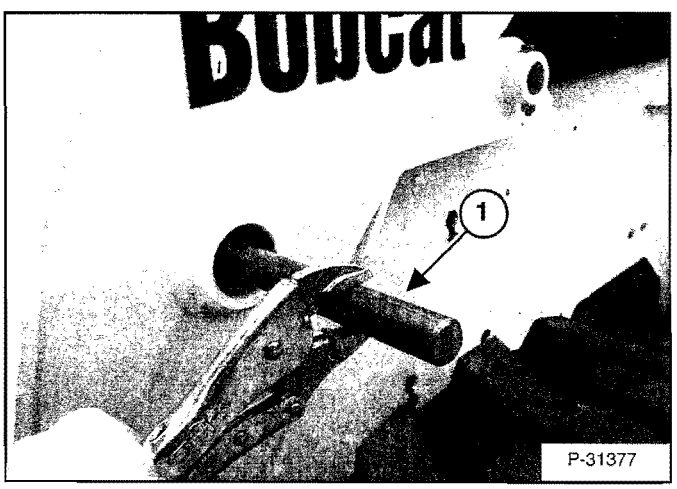
Base Pin Removal And Installation

Figure 20-21-9



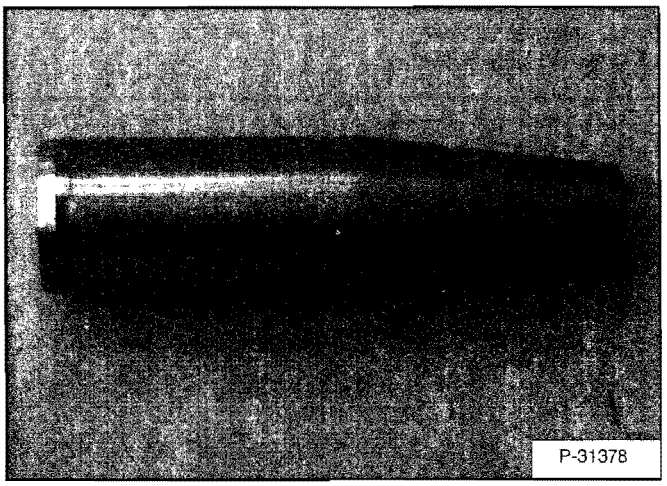
Remove the tilt cylinder from the cylinder base pin (Item 1) **[Figure 20-21-9]**. (See Removal And Installation on Page 20-21-1.)

Figure 20-21-10



Use a 7/8" (.875 mm) shaft (Item 1) **[Figure 20-21-10]** and a hammer to remove the tilt cylinder base pin from the lift arms.

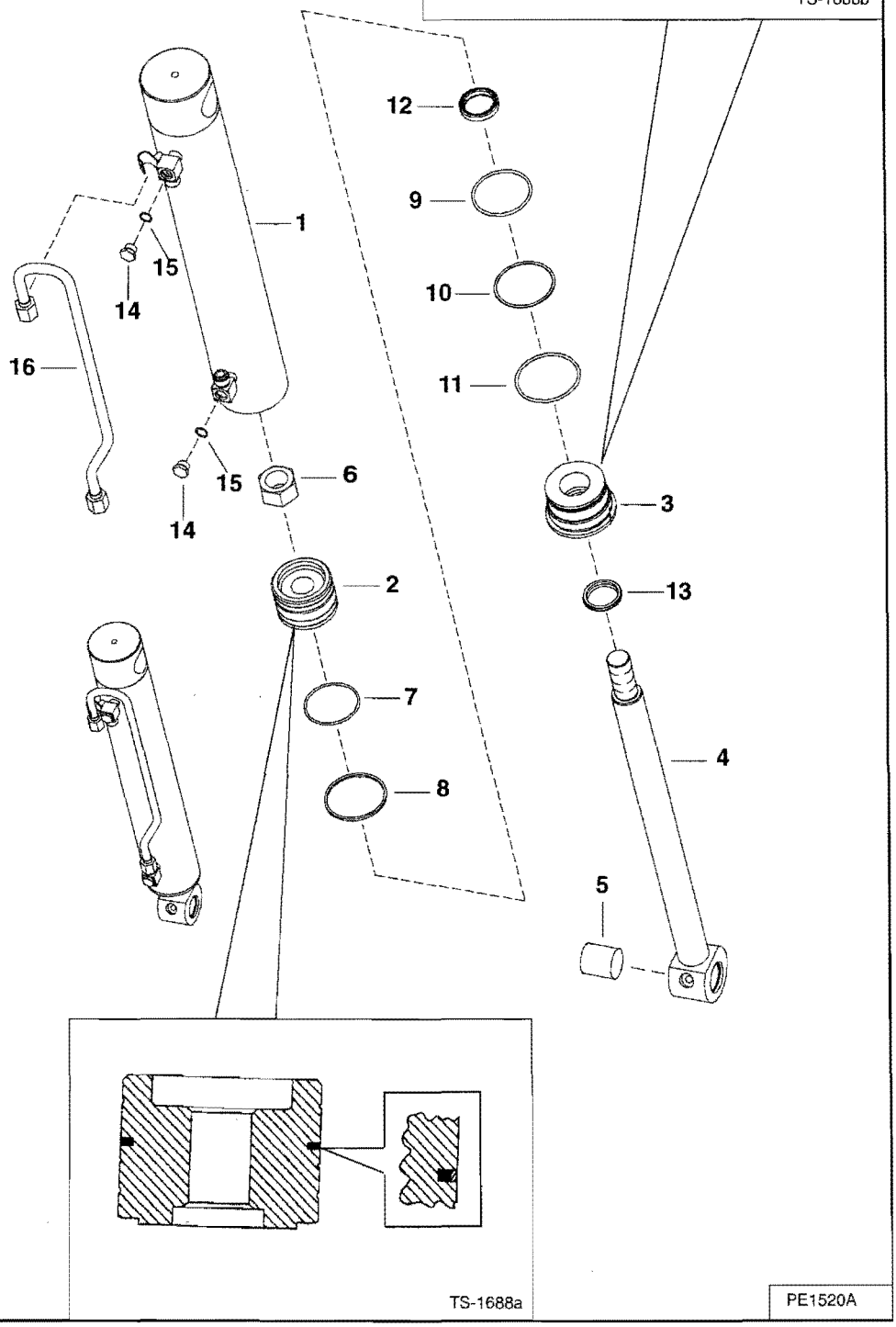
Figure 20-21-11



Check pivot pin and replace as needed **[Figure 20-21-11]**.

Parts Identification

1. Case
2. Piston
3. Head
4. Rod
5. Bushing
6. Nut
7. O-ring
8. Seal
9. O-ring
10. Washer
11. O-ring
12. Seal
13. Seal
14. Plug
15. O-ring
16. Tubeline



Disassembly

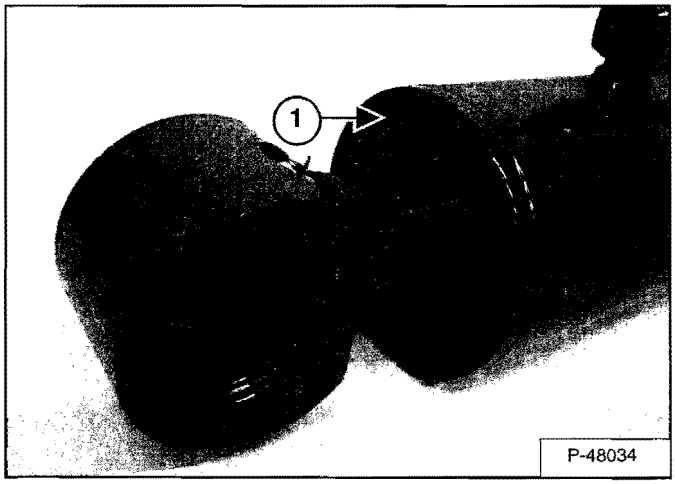
Use the following tools to disassemble the cylinder:

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.

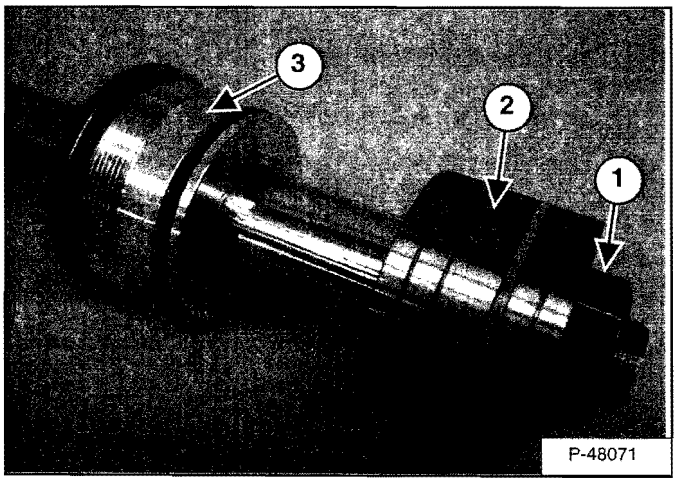
Put the base end of the cylinder in a vise.

Figure 20-21-12



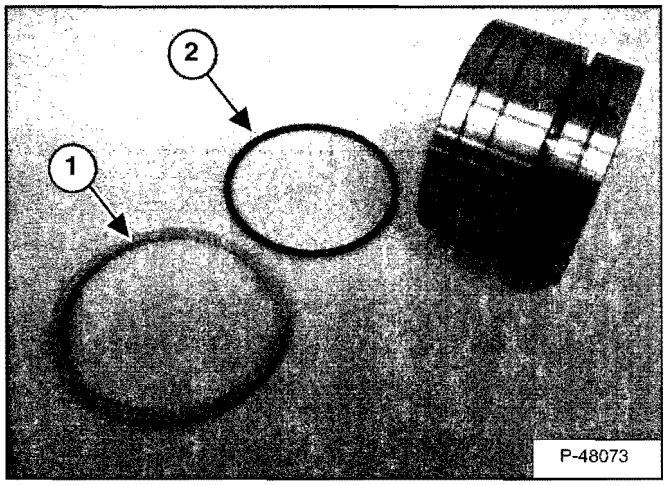
Use a spanner wrench to loosen the head (Item 1) **[Figure 20-21-12]** from the cylinder case.

Figure 20-21-13



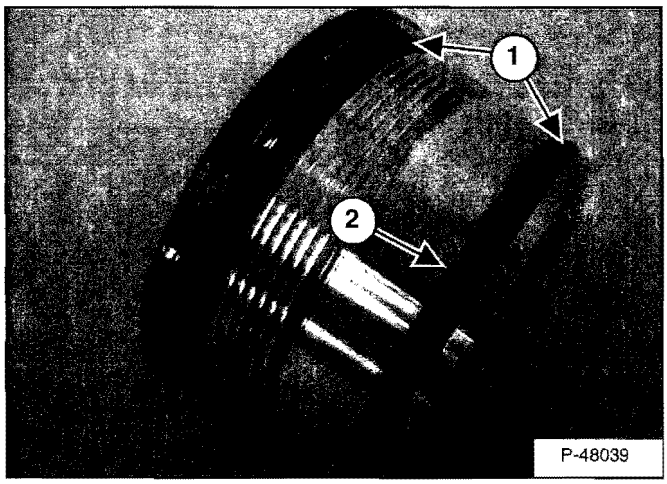
Remove the nut (Item 1), piston (Item 2) and head (Item 3) **[Figure 20-21-13]**.

Figure 20-21-14



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

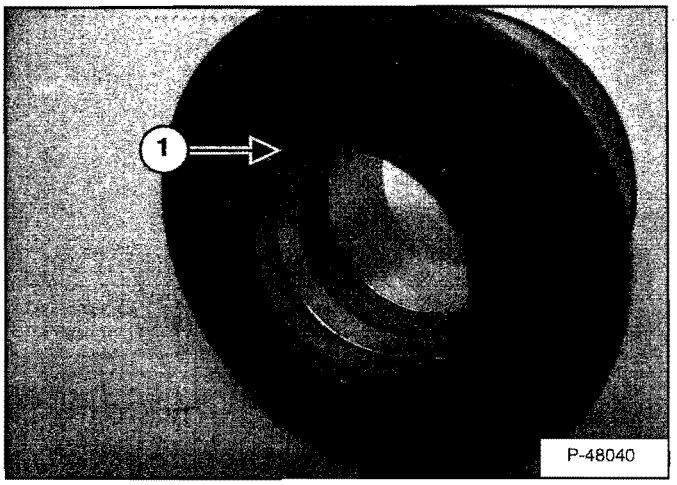
Figure 20-21-15



Remove the two O-rings (Item 1) and the back-up washer (Item 2) **[Figure 20-21-15]** from the cylinder head.

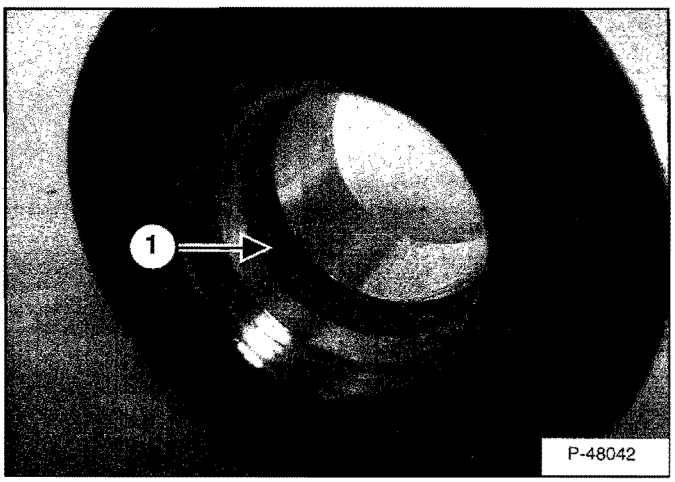
Disassembly (Cont'd)

Figure 20-21-16



Remove the wiper seal (Item 1) **[Figure 20-21-16]** from the cylinder head.

Figure 20-21-17



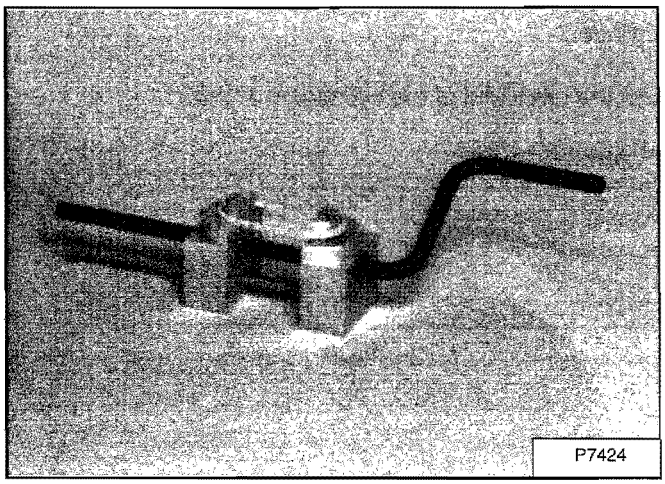
Remove the rod seal (Item 1) **[Figure 20-21-17]** from the cylinder head.

Assembly

Use the following tools to assemble the cylinder:

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

Figure 20-21-18



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.

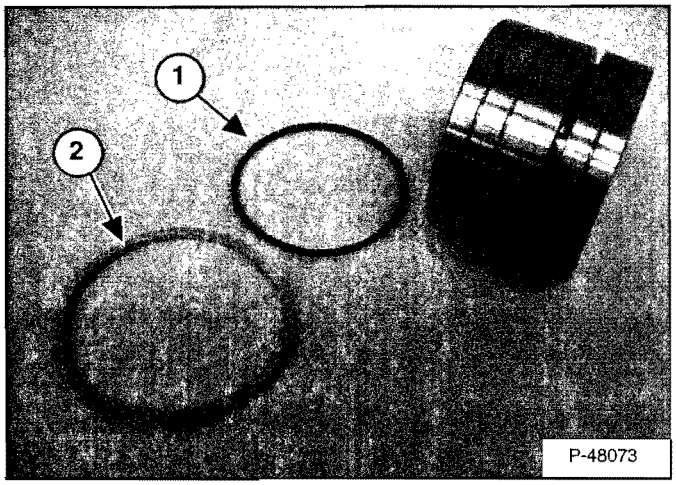
Lubricate all O-rings and seals with hydraulic oil during installation.

Install the new seal on the tool and slowly stretch it until it fits the piston **[Figure 20-21-18]**.

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

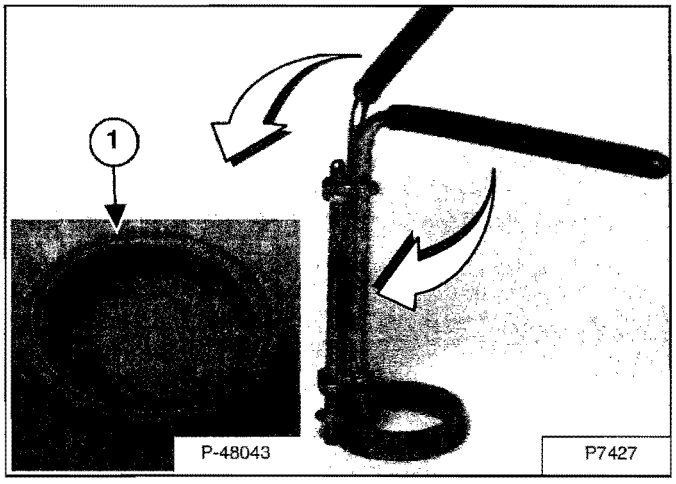
Assembly (Cont'd)

Figure 20-21-19



Install the O-ring (Item 1) and seal (Item 2) **[Figure 20-21-19]** on the cylinder piston.

Figure 20-21-20

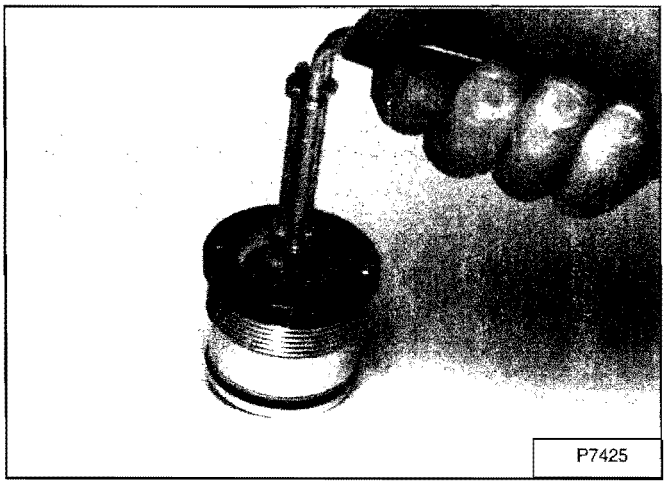


Install the rod seal on the rod seal tool **[Figure 20-21-20]**.

NOTE: During installation the spring side of the seal (Item 1) [Figure 20-21-20] must be installed toward the inside of the cylinder.

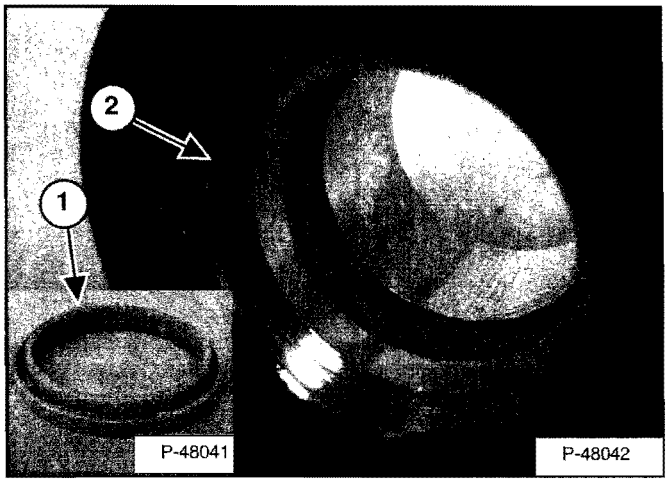
Rotate the handles to collapse the rod seal **[Figure 20-21-20]**.

Figure 20-21-21



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

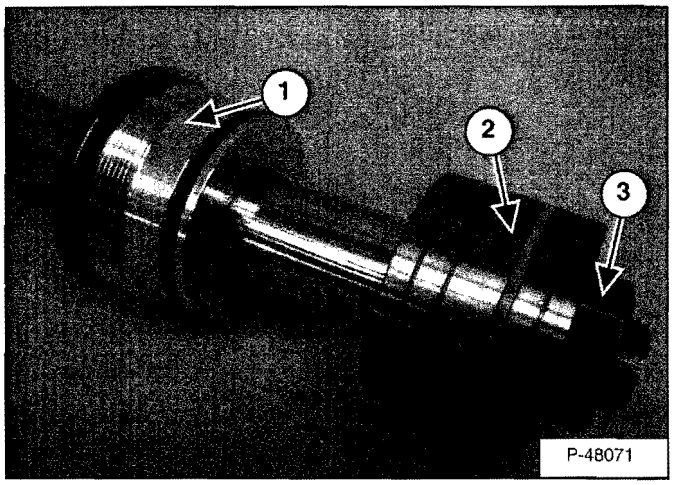
Figure 20-21-22



Install the wiper seal, with the wiper side of the seal (Item 1) toward the outside of the head (Item 2) **[Figure 20-21-22]**.

Assembly (Cont'd)

Figure 20-21-23

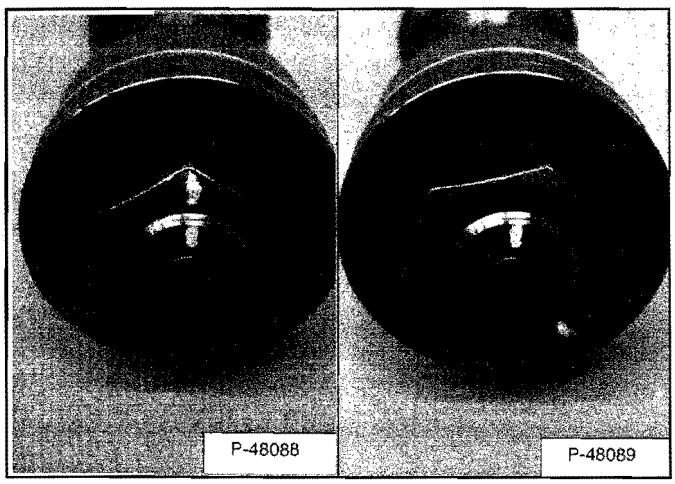


NOTE: Clean and dry the threads before installing the nut. Install the new nut from the kit.

Install the head (Item 1), piston (Item 2) and nut (Item 3) **[Figure 20-21-23]**.

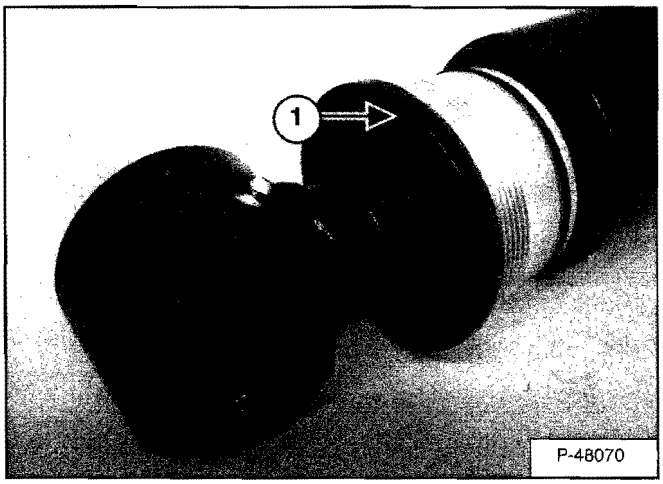
Tighten the nut (Item 3) **[Figure 20-21-23]** to 100 ft.-lbs. (136 Nm) torque.

Figure 20-21-24



Mark the end of the shaft and nut **[Figure 20-21-24]**. Tighten the nut an additional 135 degrees or 2-1/4 flats **[Figure 20-21-24]**.

Figure 20-21-25



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

Using a spanner wrench, tighten the head (Item 1) **[Figure 20-21-25]** until the head is flush with the end of the cylinder tube assembly.

CYLINDER (POWER BOB-TACH)

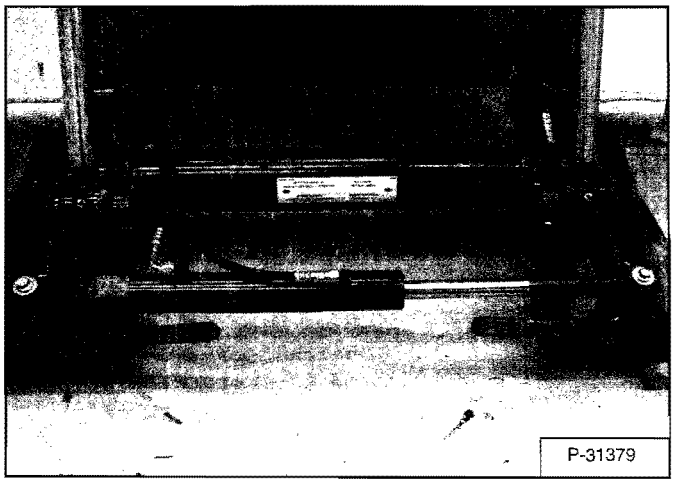
Checking

⚠ 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 or cardboard or wood to find leaks. Do not use your bare hand. Wear safety goggles. If fluid enters skin or eyes, get immediate medical attention from a physician familiar with this injury.

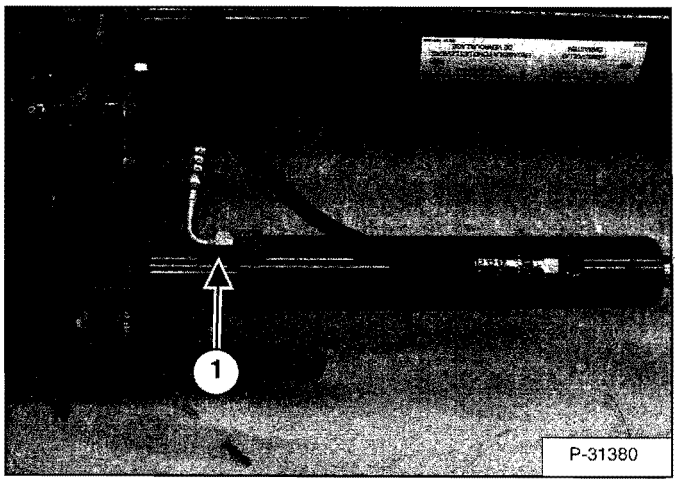
W-2072-0496

Figure 20-22-1



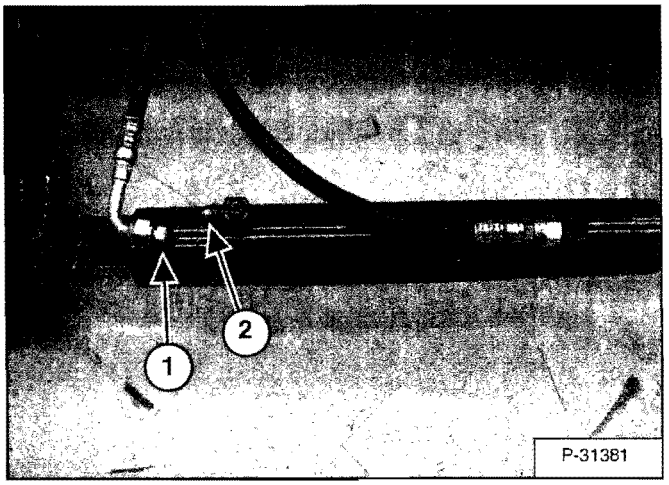
Tilt the Bob-Tach forward, so it is parallel to the floor **[Figure 20-22-1]**.

Figure 20-22-2



Disconnect the hose (Item 1) **[Figure 20-22-2]** from the power Bob-Tach cylinder base end port.

Figure 20-22-3



Install a plug in the hose (Item 1) **[Figure 20-22-3]** 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 20-22-3]**, remove the lift cylinder for repair.

⚠ WARNING

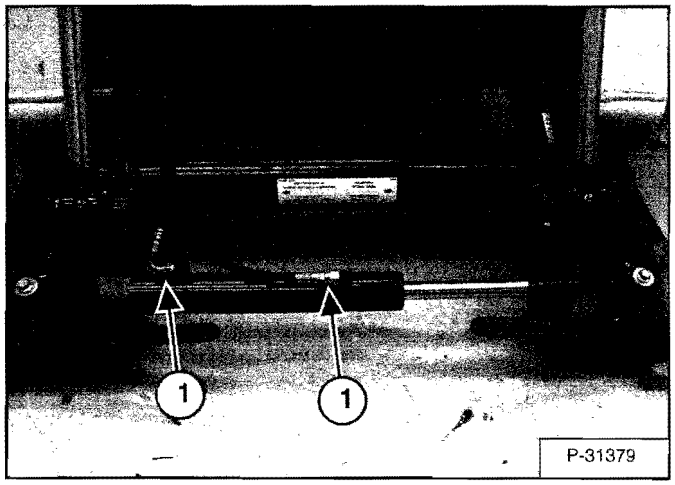
Always clean up spilled fuel or oil. Keep heat, flames, sparks or lighted tobacco away from fuel and oil. Failure to use care around combustibles can cause explosion or fire which can result in injury or death.

W-2103-1285

CYLINDER (POWER BOB-TACH)

Removal And Installation

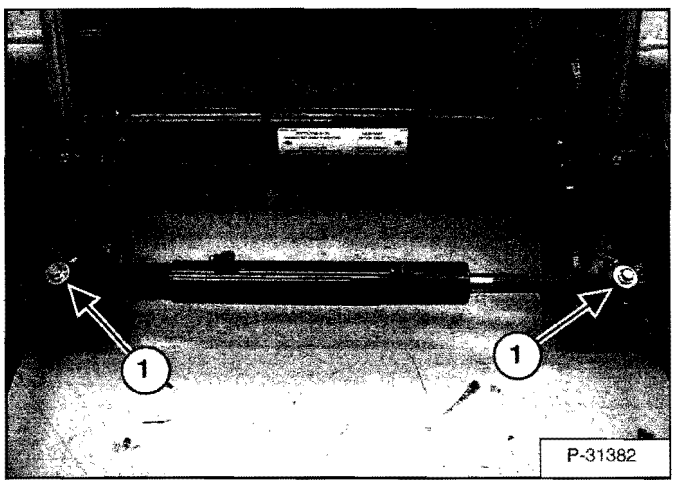
Figure 20-22-4



Disconnect the hoses from the rod and base end cylinder fitting (Item 1) **[Figure 20-22-4]**.

Install plugs in the hoses and cap on fittings.

Figure 20-22-5



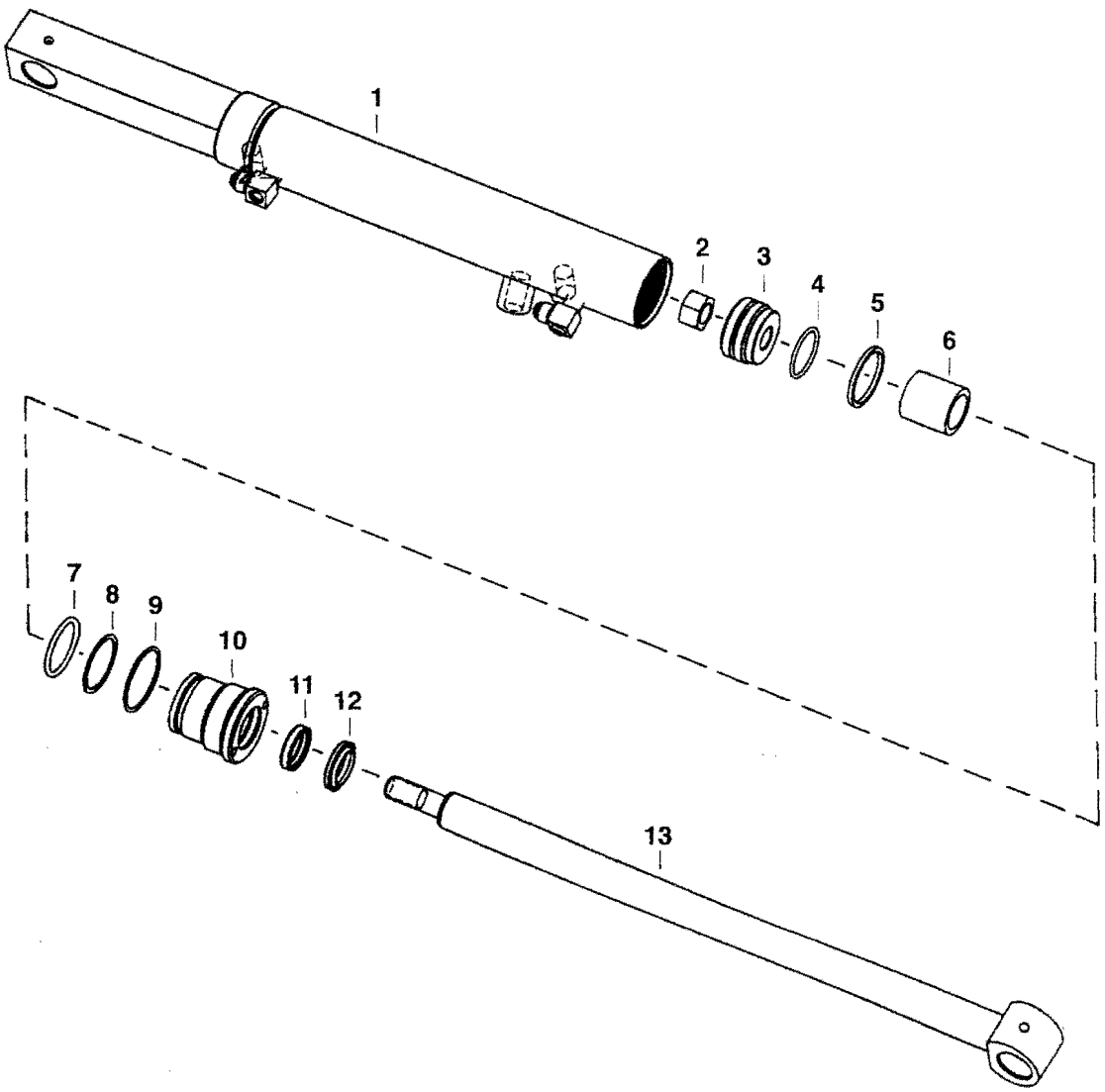
Remove the bolts and washers (Item 1) **[Figure 20-22-5]**.

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

Remove the cylinder from the lever pivots.

Parts Identification

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



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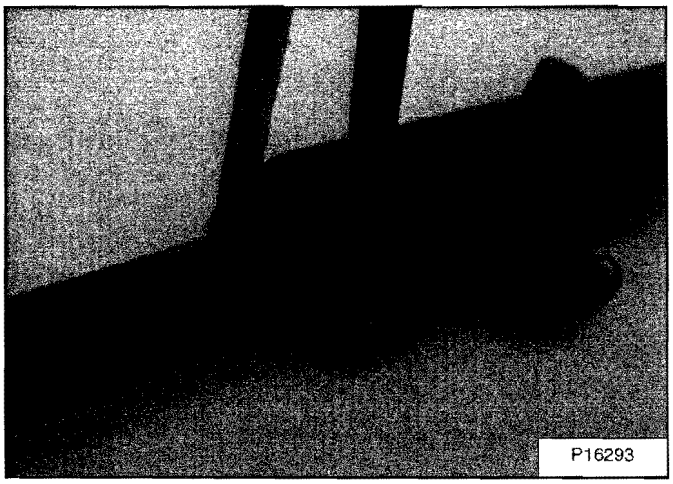
Disassembly

Figure 20-22-6



Use the following tools to disassemble the cylinder:

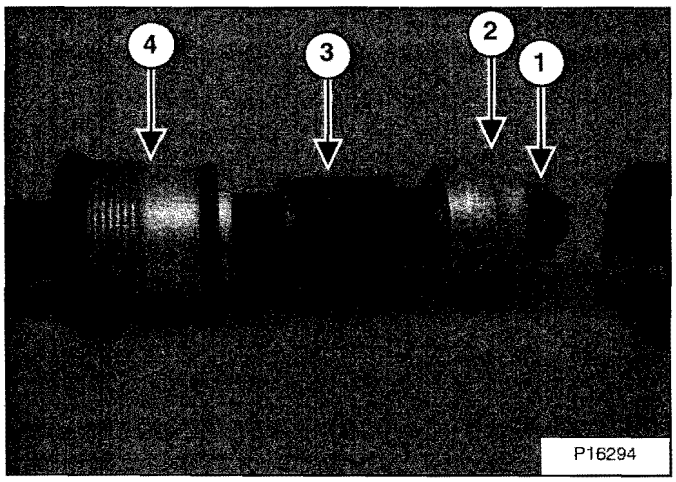
MEL1074 - O-ring Seal Hook
Spanner Wrench

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 20-22-6]**.

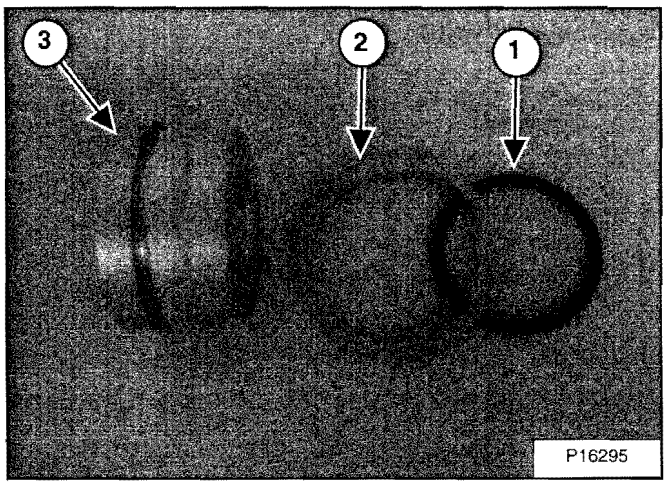
Figure 20-22-7



Remove the head and rod assembly from the cylinder **[Figure 20-22-7]**. Put the rod end in a vise.

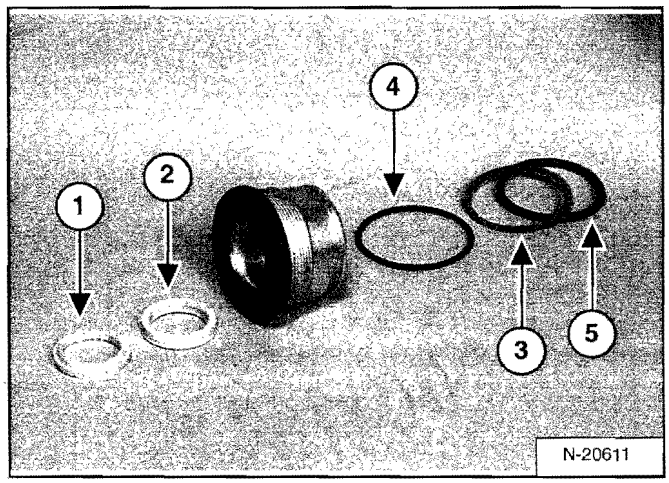
Remove the nut (Item 1), piston (Item 2), spacer (Item 3), and head (Item 4) **[Figure 20-22-7]** from the rod.

Figure 20-22-8



Piston: Remove the O-ring (Item 1), and seal (Item 2) from the piston (Item 3) **[Figure 20-22-8]**.

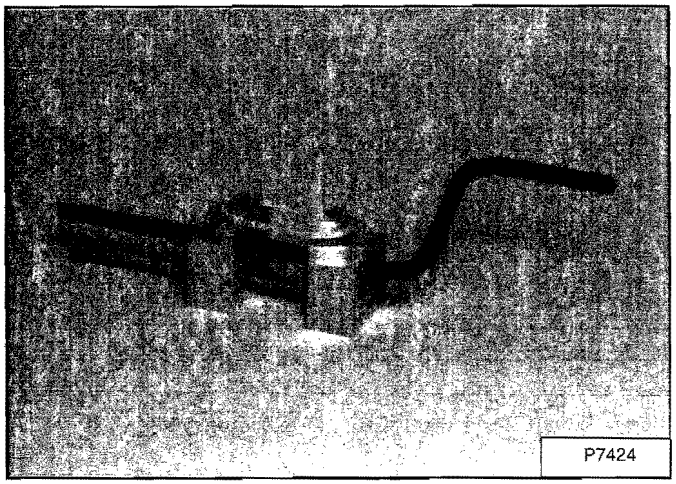
Figure 20-22-9



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 20-22-9]** from the head.

Assembly

Figure 20-22-10



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.

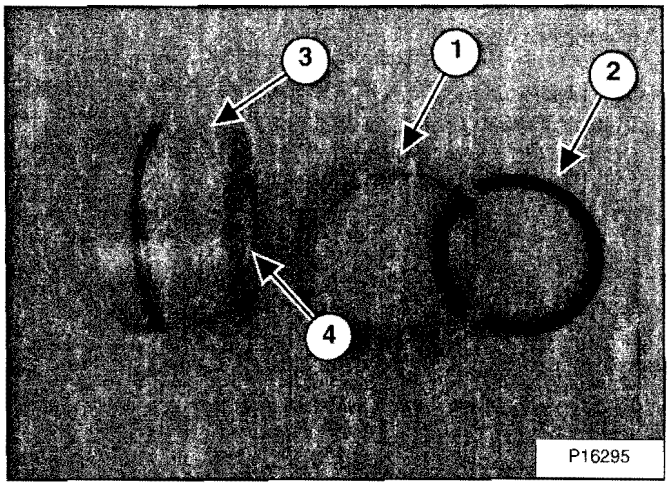
Always install new O-rings and seals during assembly.

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 20-22-10]**.

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

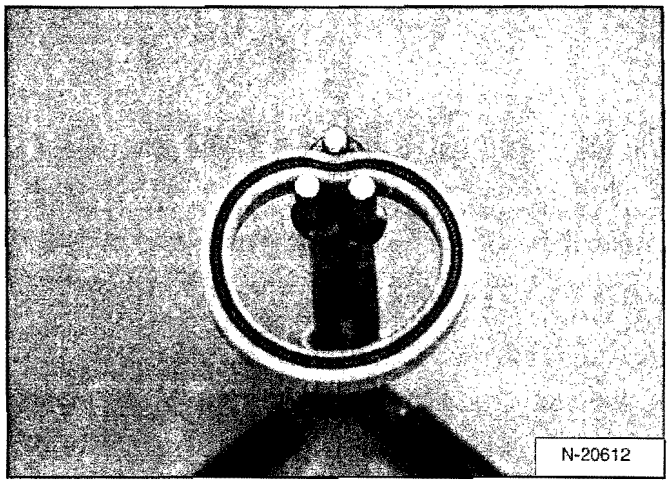
Figure 20-22-11



Piston: Install the O-ring (Item 1) and seal (Item 2) on the piston (Item 3) **[Figure 20-22-11]**.

NOTE: The piston center hole (Item 4) [Figure 20-22-11] has a bevel on one end. The bevel goes toward the rod.

Figure 20-22-12

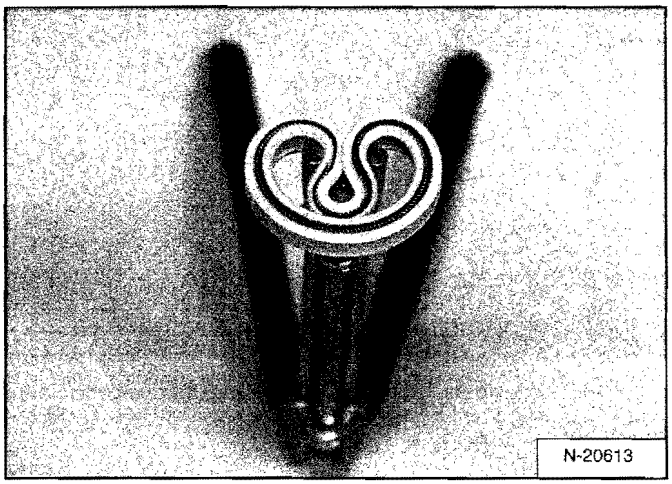


Install the rod seal on the rod seal tool **[Figure 20-22-12]**.

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

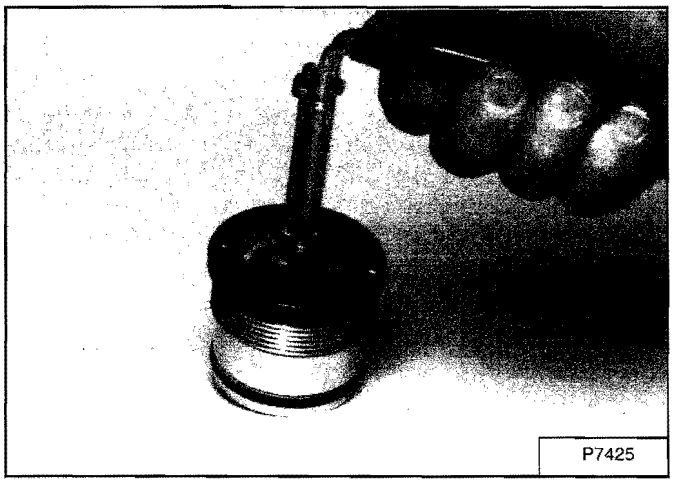
Assembly (Cont'd)

Figure 20-22-13



Rotate the handles to collapse the rod seal **[Figure 20-22-13]**.

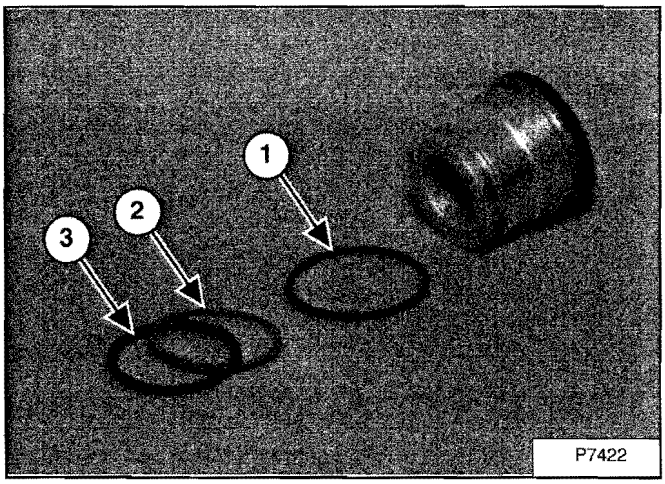
Figure 20-22-14



Install the rod seal in the head **[Figure 20-22-14]**.

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

Figure 20-22-15

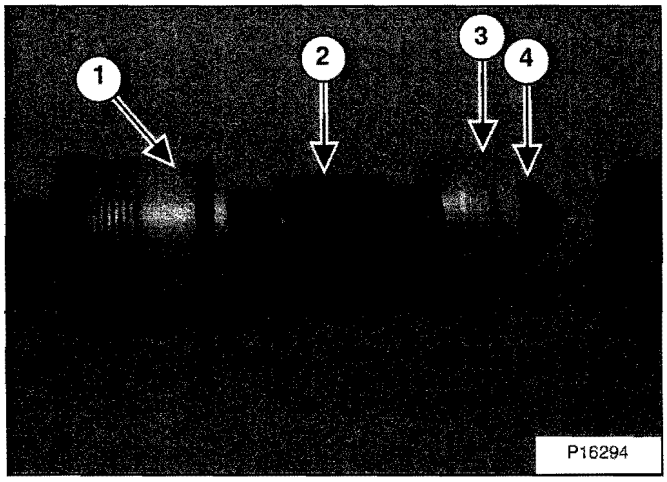


Install the thin O-ring (Item 1) **[Figure 20-22-15]**.

Install the back-up washer (Item 2) and thick O-ring (Item 3) **[Figure 20-22-15]** 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 20-22-16



Install the head (Item 1), and spacer (Item 2) **[Figure 20-22-16]**.

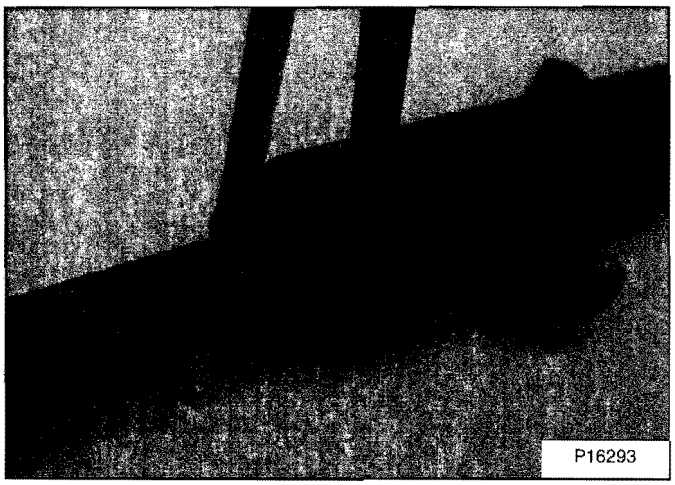
Install the piston (Item 3) **[Figure 20-22-16]**.

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 20-22-16]**.

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

Assembly (Cont'd)

Figure 20-22-17



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

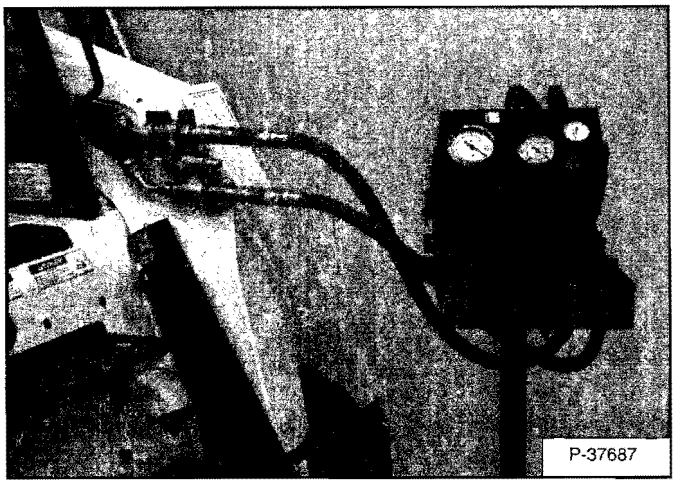
Tighten the head using a spanner wrench **[Figure 20-22-17]**.

Bobcat®

MAIN RELIEF VALVE (FOOT CONTROL)

Checking The Main Relief Valve At Front Aux. Hyd.

Figure 20-30-1



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

MEL10003 - Hydraulic Tester
MEL10006 - Hydraulic Test Kit

Turn the key switch to the OFF position, as the engine stops running, turn the key switch all the way to the left to release the hydraulic pressure at the front auxiliary quick couplers.

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

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

IMPORTANT

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

I-2024-0284

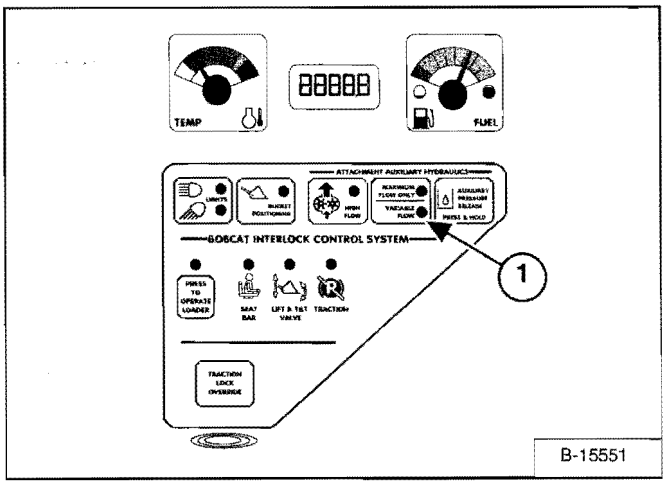
⚠ WARNING

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

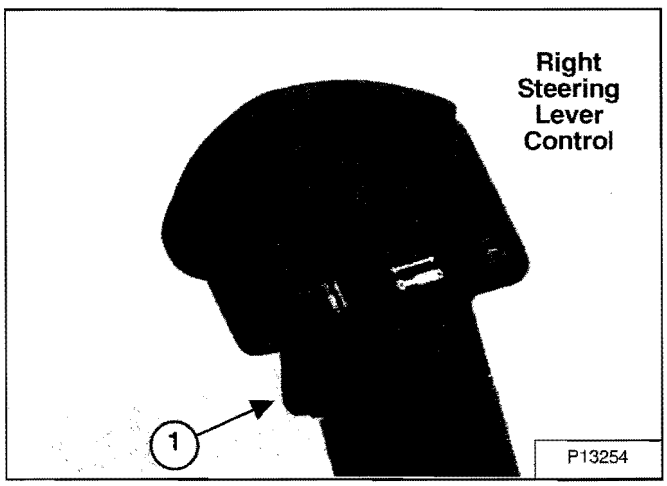
Connect the OUT port of the hydraulic tester to the male quick coupler on the loader **[Figure 20-30-1]**.

Figure 20-30-2



Start the engine and run at low engine idle RPM. Push the mode switch (Item 1) (on the instrument panel) two times to engage the front auxiliary hydraulics, the light (Item 2) **[Figure 20-30-2]** will come ON.

Figure 20-30-3



Press the front switch (Item 1) **[Figure 20-30-3]** for fluid flow to the quick couplers.

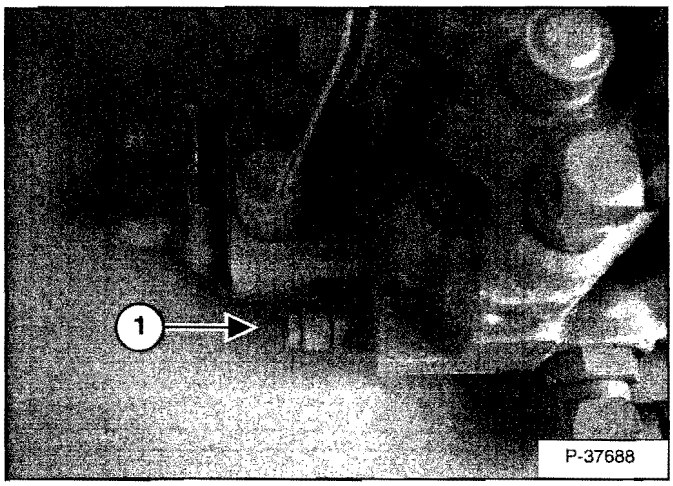
Watch the flow meter on the hydraulic tester to make sure the flow is correct. Increase the engine speed to full RPM.

Record the GPM and refer to the hydraulic schematic for the correct GPM for the model and serial number of your loader. Turn the restrictor control, on the tester, until the main relief valve opens. The correct pressure for the main relief is **3300 PSI (22753 kPa)**.

MAIN RELIEF VALVE (FOOT CONTROL) (CONT'D)

Removal And Installation

Figure 20-30-4



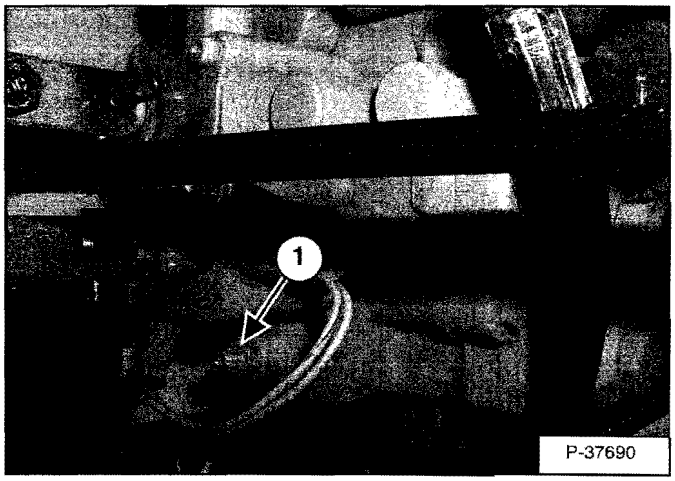
Raise the operator cab. (See Contents Page 10-01.)

The main relief valve (Item 1) **[Figure 20-30-4]** is located at the lower front of the control valve.

Remove the right motor cover.

Clean the area around the control valve.

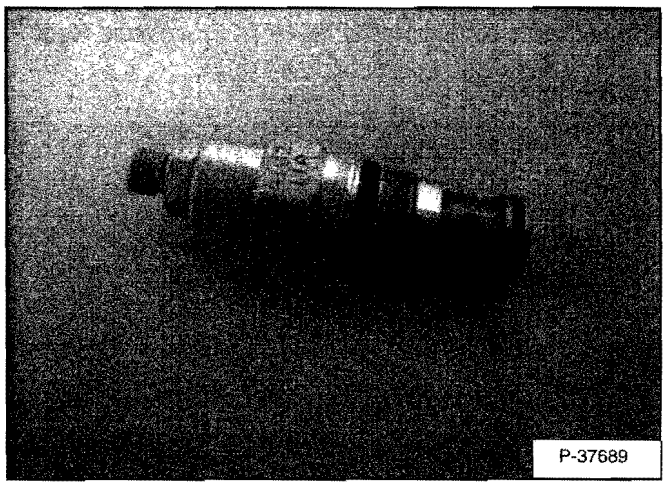
Figure 20-30-5



Loosen and remove the main relief valve (Item 1) **[Figure 20-30-5]**.

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

Figure 20-30-6



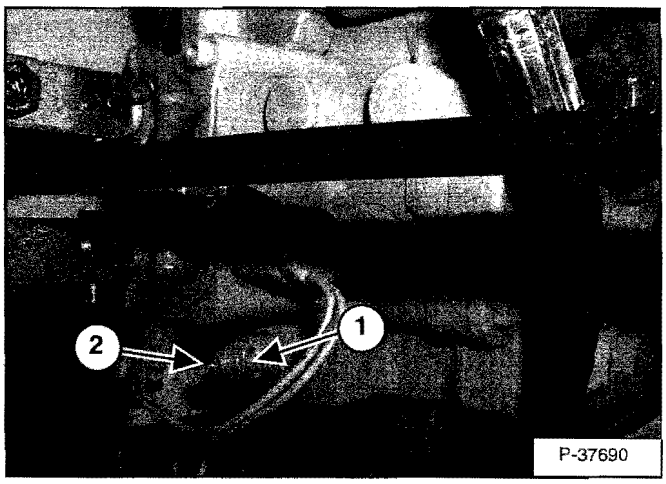
Remove the O-rings and back-up washers from the main relief valve **[Figure 20-30-6]**.

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

Install new O-rings and back-up washers. Install the main relief valve and tighten **[Figure 20-30-4]**. Check the pressure again. (See Checking The Main Relief Valve At Front Aux. Hyd. on Page 20-30-1.)

Adjustment

Figure 20-30-7



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

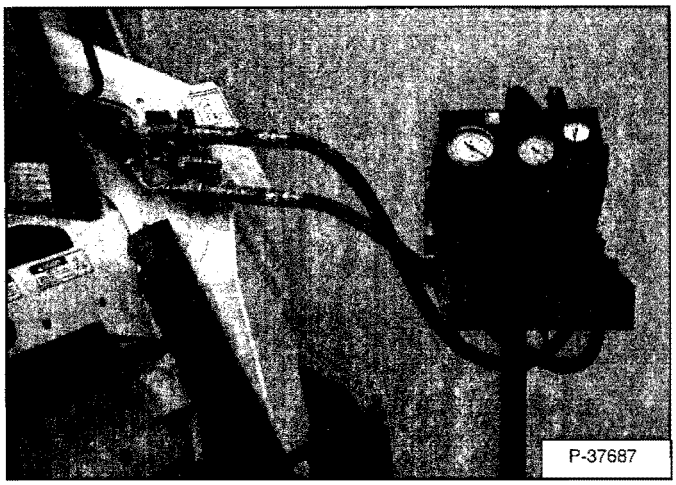
Turn the adjusting screw (Item 2) **[Figure 20-30-7]** in or out until the pressure is correct. Turning screw in will increase pressure.

NOTE: If the correct pressure can not be reached, replace the main relief valve. Check the pressure setting of the new relief valve.

MAIN RELIEF VALVE (ACS)

Checking The Main Relief Valve At Front Aux. Hyd.

Figure 20-31-1



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

MEL10003 - Hydraulic Tester
MEL10006 - Hydraulic Test Kit

Turn the key switch to the OFF position, as the engine stops running, turn the key switch all the way to the left to release the hydraulic pressure at the front auxiliary quick couplers.

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

Connect the IN port of the hydraulic tester to the female quick coupler on the loader **[Figure 20-31-1]**.

Connect the OUT port of the hydraulic tester to the male quick coupler on the loader **[Figure 20-31-1]**.

IMPORTANT

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

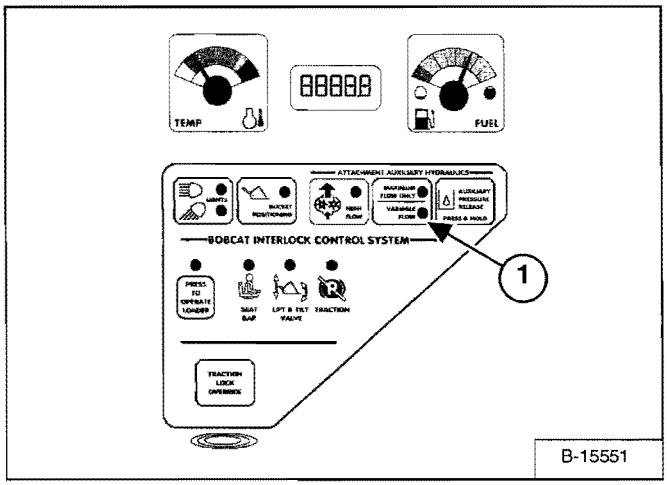
I-2024-0284

⚠ 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.

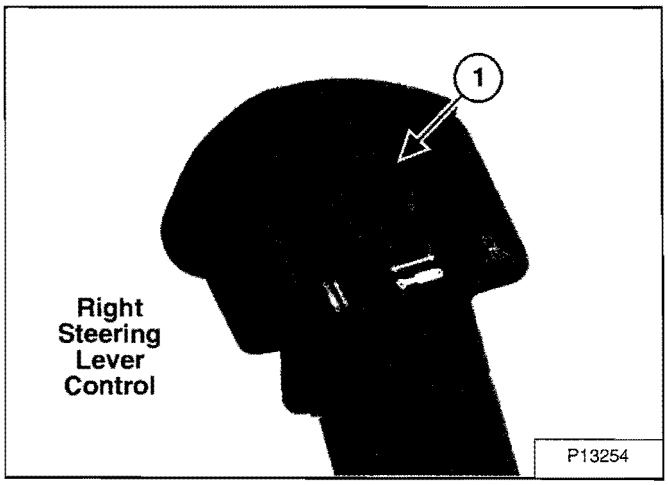
W-2017-0286

Figure 20-31-2



Start the engine and run at low engine idle RPM. Push the mode switch (Item 1) (on the instrument panel) two times to engage the front auxiliary hydraulics, the light (Item 2) **[Figure 20-31-2]** will come ON.

Figure 20-31-3



Press the front switch (Item 1) **[Figure 20-31-3]** for fluid flow to the quick couplers.

Watch the flow meter on the hydraulic tester to make sure the flow is correct. Increase the engine speed to full RPM.

MAIN RELIEF VALVE (ACS) (CONT'D)

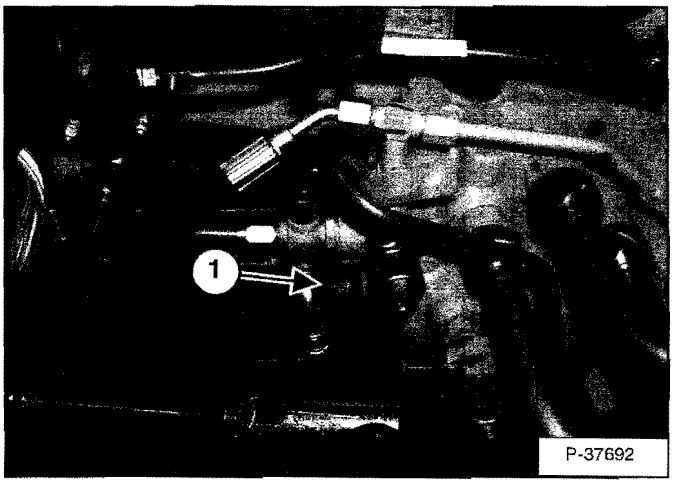
Checking The Main Relief Valve At Front Aux. Hyd. (Cont'd)

Record the GPM and refer to the hydraulic schematic for the correct GPM for the model and serial number of your loader. Turn the restrictor control, on the tester, until the main relief valve opens. The correct pressure for the main relief is **3300 PSI (22753 kPa).**

If the relief pressure is not correct, stop the engine. Adjust or replace the main relief valve. (See Adjustment on Page 20-31-3.)

Removal And Installation

Figure 20-31-4

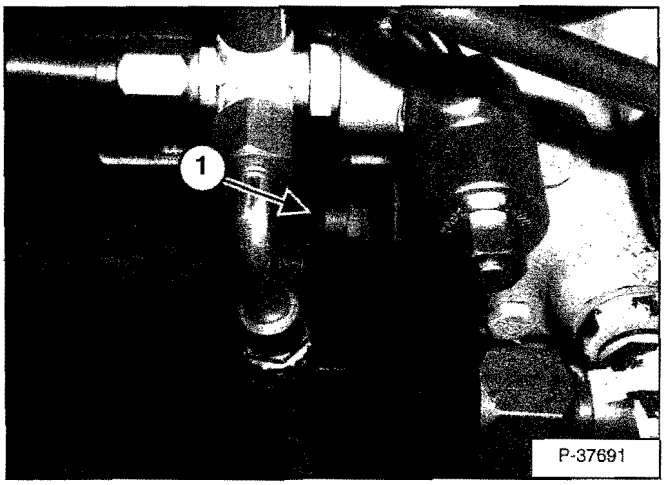


Raise the operator cab. (See Contents Page 10-01.)

The main relief valve (Item 1) **[Figure 20-31-4]** is located at the lower front of the control valve.

Clean the area around the control valve.

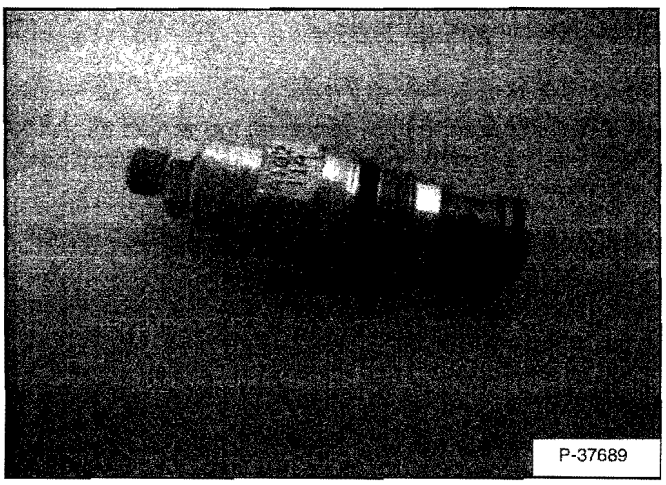
Figure 20-31-5



Loosen and remove the main relief valve (Item 1) **[Figure 20-31-5]**.

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

Figure 20-31-6



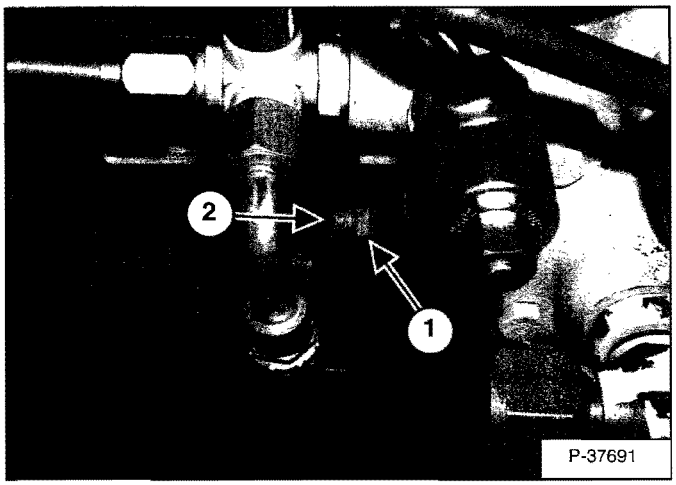
Remove the O-rings and back-up washers from the main relief valve **[Figure 20-31-6]**.

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

Install new O-rings and back-up washers. Install the main relief valve and tighten **[Figure 20-31-6]**. Check the pressure again. (See Checking The Main Relief Valve At Front Aux. Hyd. on Page 20-31-1.)

Adjustment

Figure 20-31-7



If the pressure is not correct, loosen the lock nut (Item 1) **[Figure 20-31-7]** and adjust the main relief valve.

Turn the adjusting screw (Item 2) **[Figure 20-31-7]** in or out until the pressure is correct. Turning screw in will increase pressure.

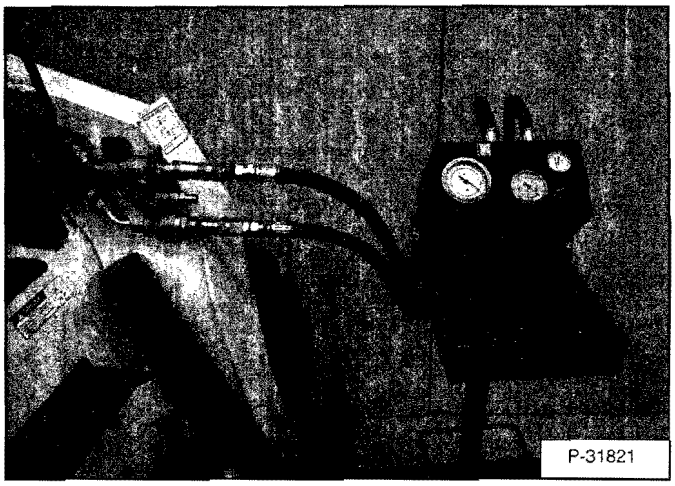
NOTE: If the correct pressure can not be reached, replace the main relief valve. Check the pressure setting of the new relief valve.

Bobcat®

MAIN RELIEF VALVE (SELECTABLE JOYSTICK CONTROL) (SJC)

Checking The Main Relief Valve At Front Auxiliary Hydraulics

Figure 20-32-1



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

MEL10003 - Hydraulic Tester
MEL10006 - Hydraulic Test Kit

Turn the key switch to the OFF position, as the engine stops running, turn the key switch all the way to the left to release the hydraulic pressure at the front auxiliary quick couplers.

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

Connect the IN port of the hydraulic tester to the female quick coupler on the loader **[Figure 20-32-1]**.

Connect the OUT port of the hydraulic tester to the male quick coupler on the loader **[Figure 20-32-1]**.

⚠ WARNING

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

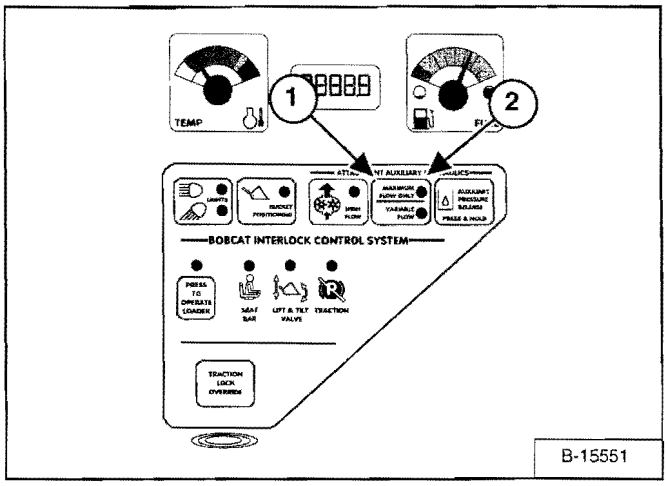
I-2024-0284

⚠ 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

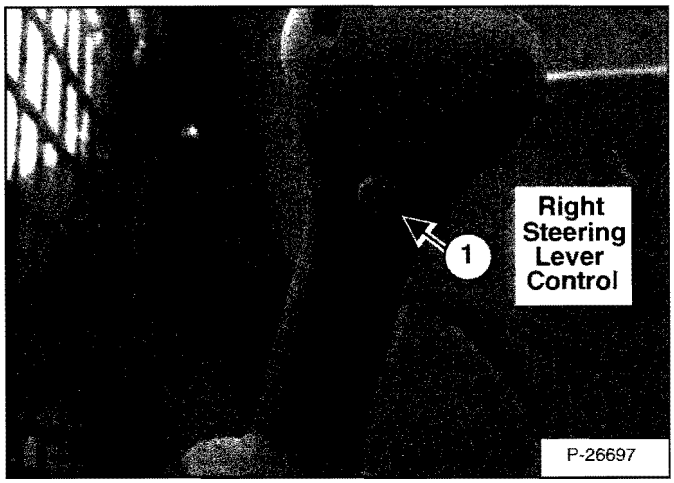
Figure 20-32-2



Start the engine and run at low engine idle RPM. Push the mode switch (Item 1) (on the instrument panel) two times to engage the front auxiliary hydraulics, the light (Item 2) **[Figure 20-32-2]** will come ON.

Checking The Main Relief Valve At Front Auxiliary Hydraulics (Cont'd)

Figure 20-32-3



Push the button (Item 1) **[Figure 20-32-3]** for fluid flow to the quick couplers.

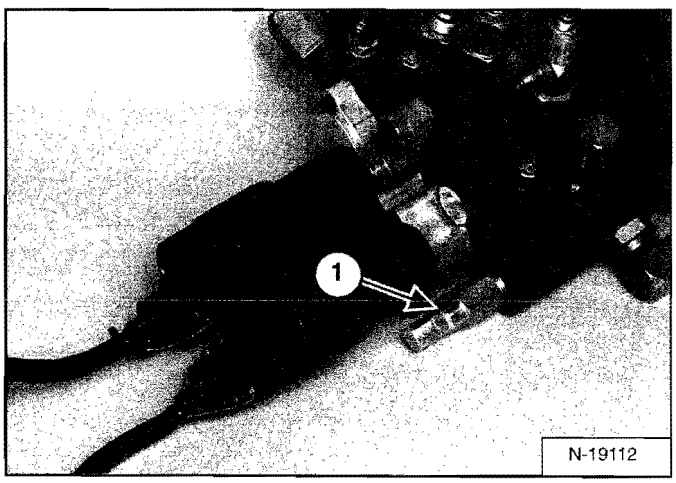
Watch the flow meter on the hydraulic tester to make sure the flow is correct. Increase the engine speed to full RPM.

There should be 21.0 GPM (79,5 L/min.) free flow. Turn the restrictor control, on the tester, until the main relief valve opens. The correct pressure for the main relief is **3250-3350 PSI (22408-23097 kPa)**.

If the relief pressure is not correct, stop the engine. Adjust or replace the main relief valve. (See Checking The Main Relief Valve At Front Auxiliary Hydraulics on Page 20-30-1.)

Removal and Installation

Figure 20-32-4



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

IMPORTANT

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

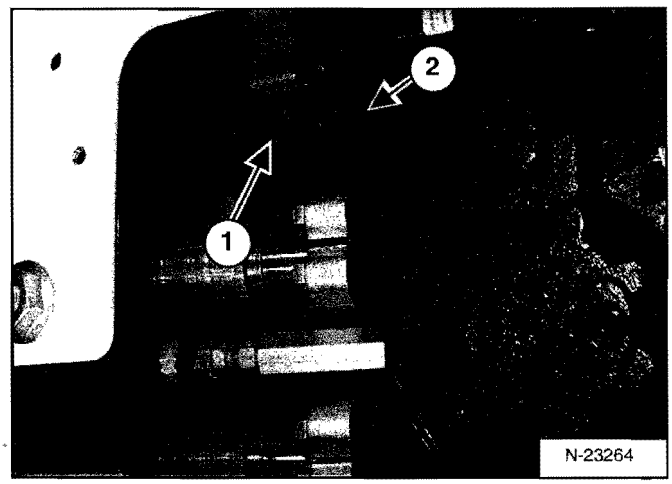
I-2003-0284

The main relief valve (Item 1) **[Figure 20-32-4]** is located at the lower front of the control valve.

Remove the right motor cover.

Clean the area around the control valve.

Figure 20-32-5

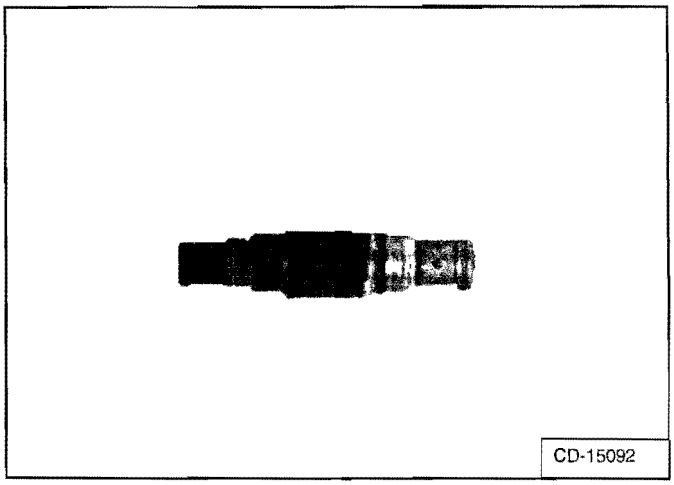


Loosen and remove the main relief valve (Item 1)**[Figure 20-32-5]**.

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

Removal and Installation (Cont'd)

Figure 20-32-6



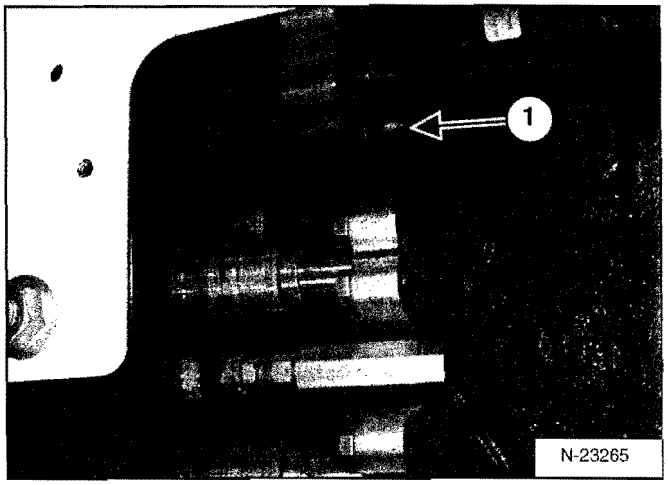
Remove the O-rings and back-up washers from the main relief valve **[Figure 20-32-6]**.

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

Install new O-rings and back-up washers. Install the main relief valve and tighten **[Figure 20-32-4]**. Check the pressure again. (See Removal and Installation on Page 20-30-2.)

Adjustment

Figure 20-32-7



If the pressure is not correct, adjust the main relief valve. Remove the end cap (Item 2) **[Figure 20-32-5]** .

Turn the adjusting screw (Item 1) **[Figure 20-32-7]** in or out until the pressure is correct. Turning screw in will increase pressure.

NOTE: If the correct pressure can not be reached, replace the main relief valve. Check the pressure setting of the new relief valve.

Bobcat®

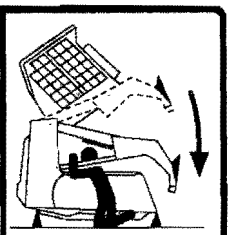
HYDRAULIC CONTROL VALVE (FOOT CONTROL)

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

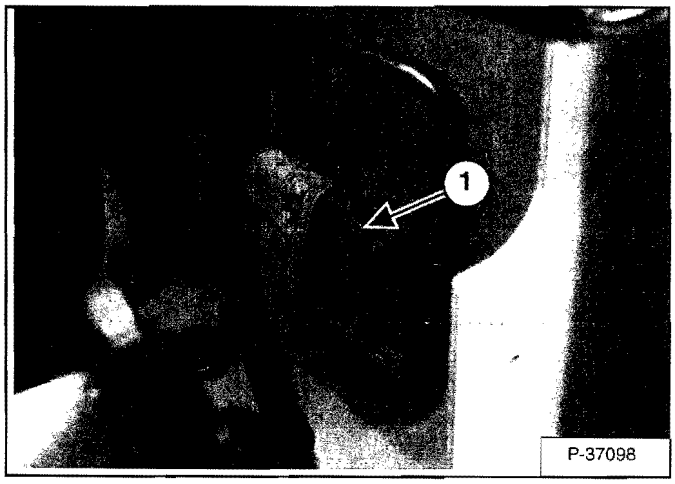


⚠ WARNING

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

Figure 20-40-1



Raise the lift arms and install an approved lift arm support device.

Stop the engine. Raise the seat bar.

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

Drain the hydraulic reservoir. (See Contents Page 20-01.)

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

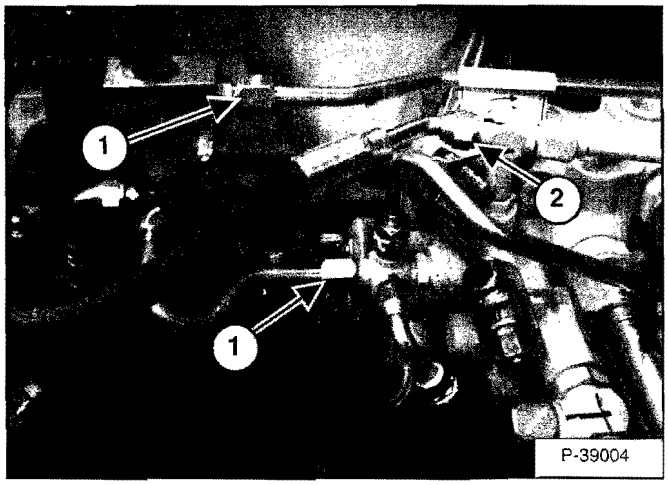
Clean area around control valve.

Open rear door.

The fixed end main valve hose assembly (Item 1) **[Figure 20-40-1]** is connected to a fixed end fitting on the control valve. The hose is routed to the upright where the hose is connected to a fitting that feeds the base end of both lift cylinders. The hose can only be removed by first removing it from the tee fitting located at the rear of the loader.

Cap and plug the hose and fitting.

Figure 20-40-2



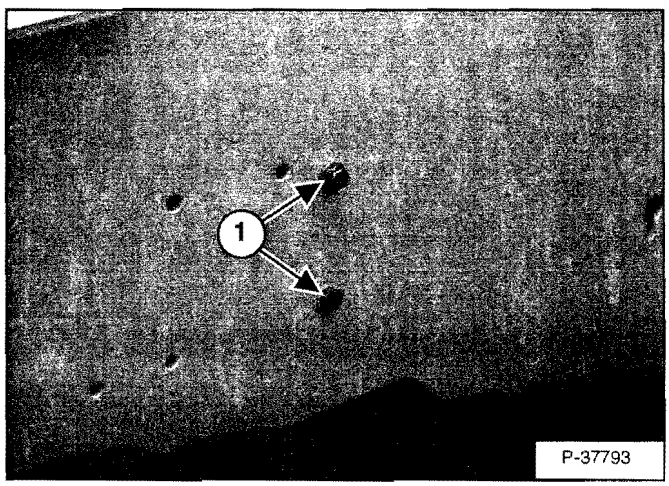
Mark the hoses and tubelines for proper installation.

Disconnect the two tubelines (Item 1) **[Figure 20-40-2]** from the lift arm by-pass valve.

Disconnect the hydraulic hose (Item 2) **[Figure 20-40-2]** from the control valve.

Cap and plug tubelines, hose and fittings.

Figure 20-40-3



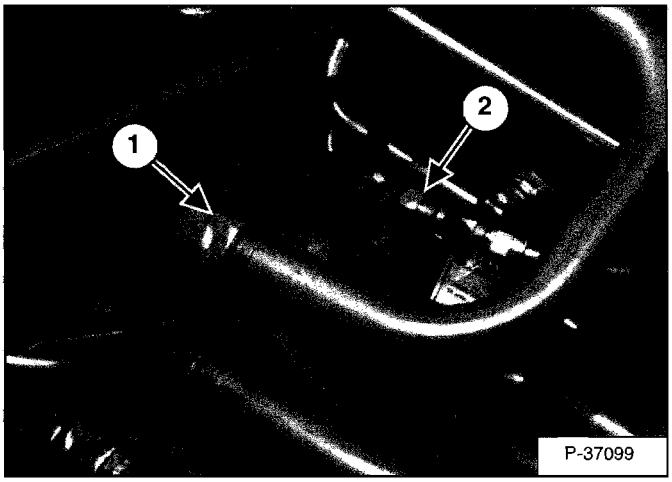
At the right fender, remove the two mounting bolts and nuts (Item 1) **[Figure 20-40-3]** from the lift arm by-pass/brake valve mount.

Move the lift arm by-pass valve/brake valve and hoses toward the front of the loader to allow clearance for the control valve removal.

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

Removal And Installation (Cont'd)

Figure 20-40-4

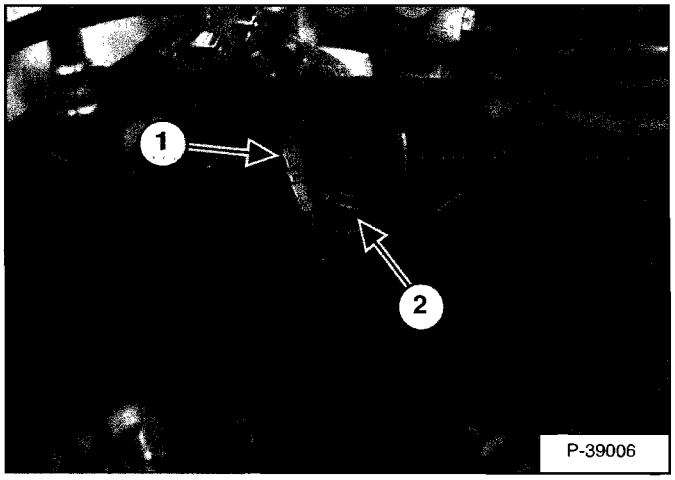


Disconnect the tubeline (Item 1) **[Figure 20-40-4]** that goes from the control valve to the hydraulic cooler.

Disconnect the charge pressure sender (Item 2) **[Figure 20-40-4]** from the control valve.

Cap and plug the tubelines and fittings.

Figure 20-40-5

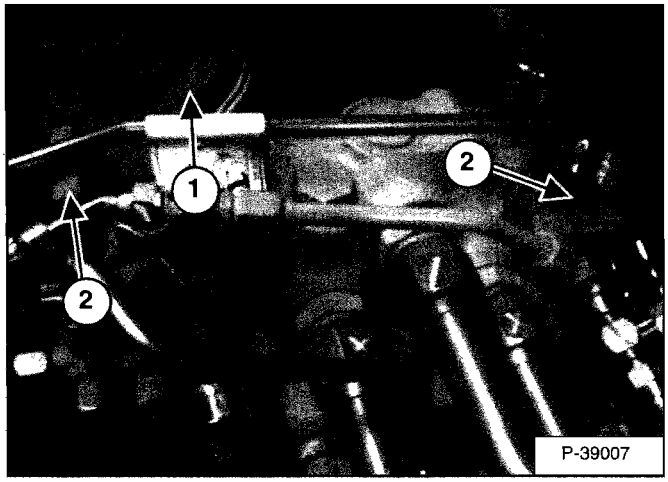


Mark the wire connectors for proper installation.

Disconnect the wire harness connector (Item 1) **[Figure 20-40-5]** from the lift lock solenoid.

Disconnect the wire harness connector (Item 2) **[Figure 20-40-5]** from the BICS valve solenoid.

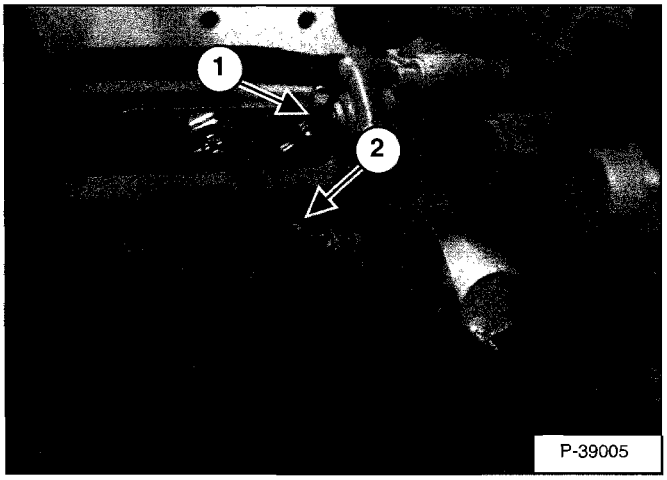
Figure 20-40-6



Disconnect the harness connector (Item 1) **[Figure 20-40-6]** from the tilt lock valve solenoid connector.

Disconnect the harness connector (Item 2) **[Figure 20-40-6]** from the two auxiliary valve solenoids.

Figure 20-40-7



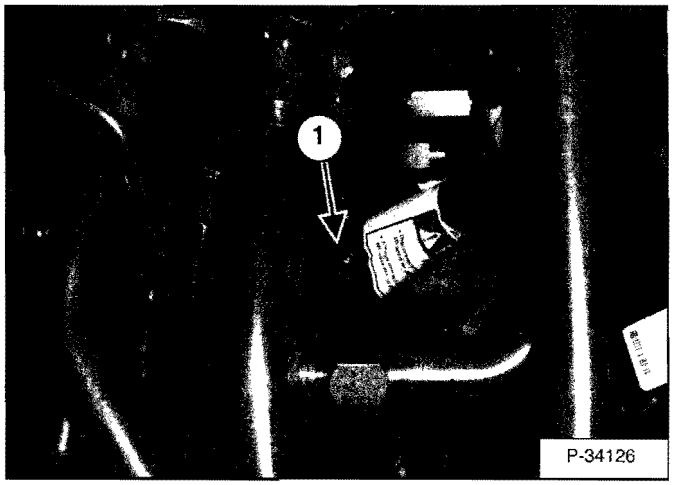
Disconnect foot control linkage (Item 1) **[Figure 20-40-7]** from the tilt spool on the control valve.

Disconnect foot control linkage (Item 2) **[Figure 20-40-7]** from the lift spool on the control valve.

Move the control linkages to allow clearance for the control valve removal.

Removal And Installation (Cont'd)

Figure 20-40-8

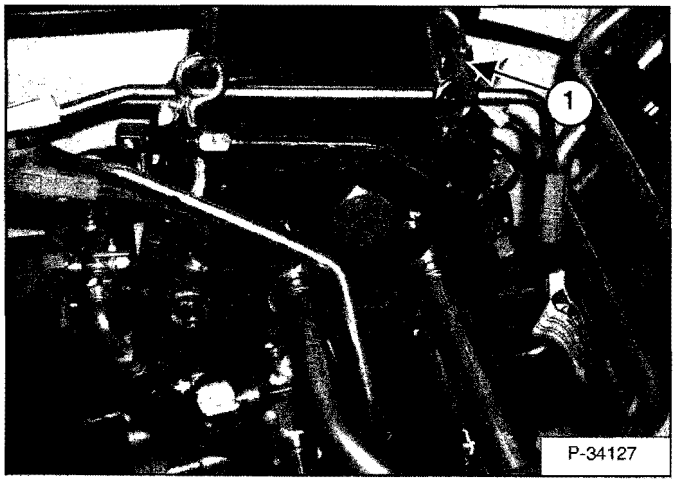


Loosen the fixed end main valve hose assembly (Item 1) **[Figure 20-40-8]** from the control valve.

The hose can be removed from the control valve by rotating the hose assembly.

Cap the hose and plug the fitting.

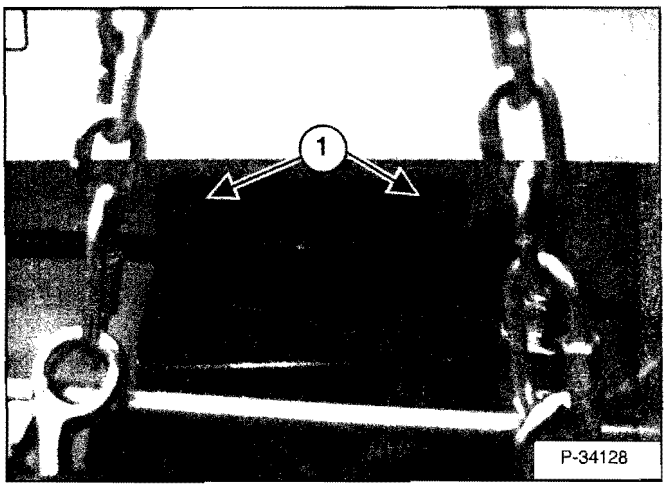
Figure 20-40-9



Install a chain hoist (Item 1) **[Figure 20-40-9]** to the control valve, and support the control valve.

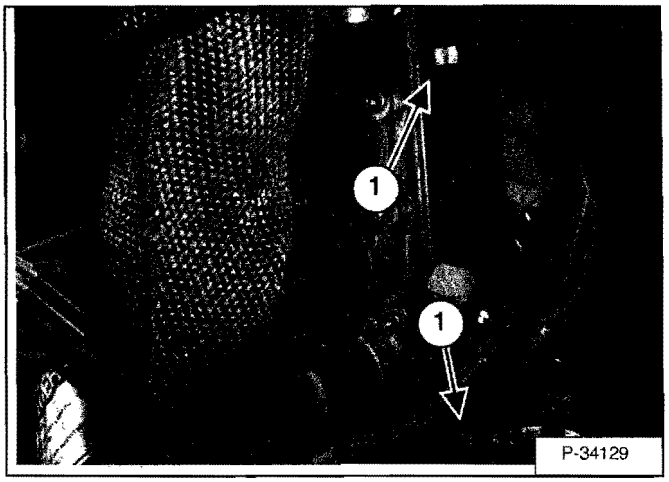
Loosen all the tubeline fittings connected to the control valve.

Figure 20-40-10



Remove the two control valve mount bracket mount bolts (Item 1) **[Figure 20-40-10]**.

Figure 20-40-11

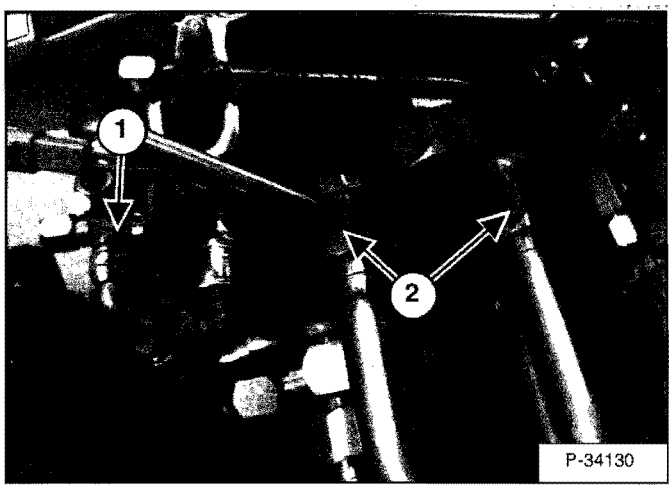


Remove the two control valve mount bolts (Item 1) **[Figure 20-40-11]** from the mounting plate.

Remove the control valve mount bracket from the loader.

Removal And Installation (Cont'd)

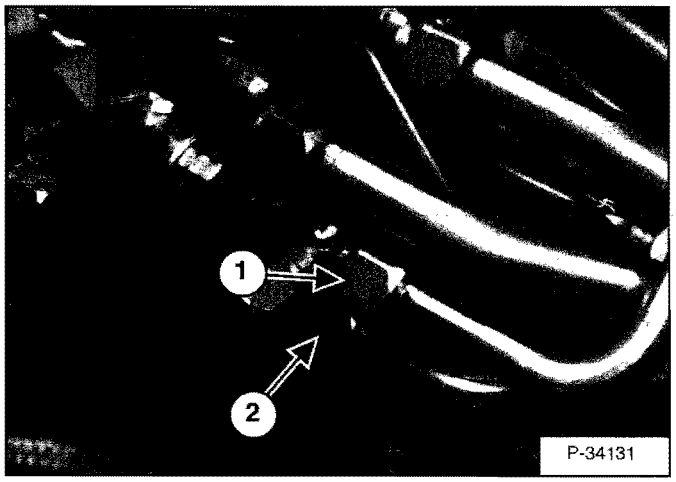
Figure 20-40-12



Disconnect the case drain hose (Item 1) **[Figure 20-40-12]** and cap the fitting and plug the hose.

Disconnect the two auxiliary tubelines (Item 2) **[Figure 20-40-12]** from the control valve.

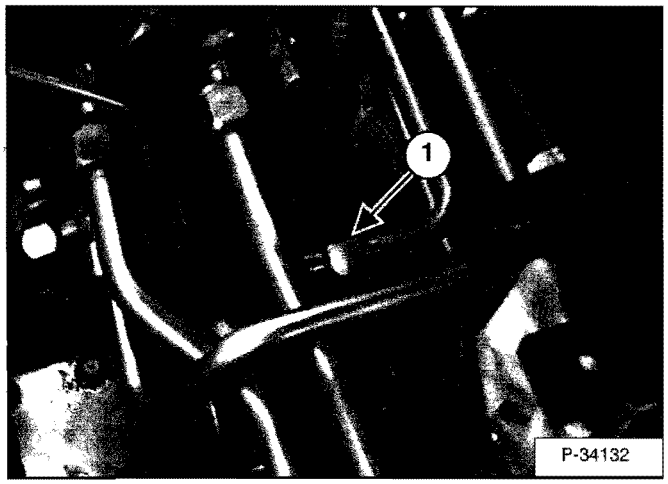
Figure 20-40-13



Disconnect the tilt tubeline (Item 1) **[Figure 20-40-13]** from the control valve.

Disconnect the lift tubeline (Item 2) **[Figure 20-40-13]** from the control valve.

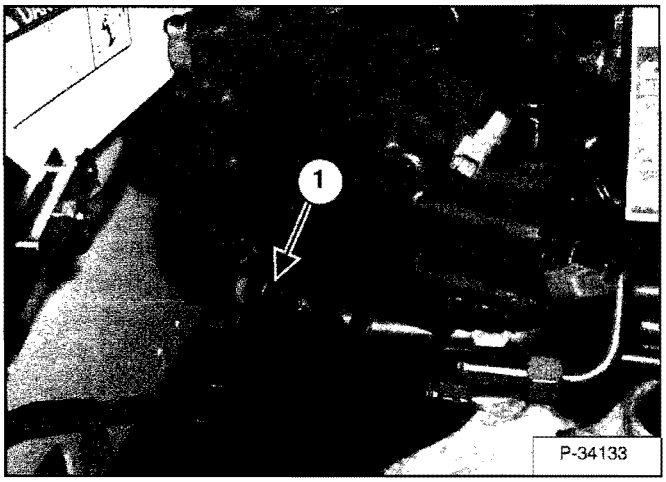
Figure 20-40-14



Disconnect the tilt tubeline (Item 1) **[Figure 20-40-14]** from the control valve.

Cap and plug the tubeline and fitting.

Figure 20-40-15



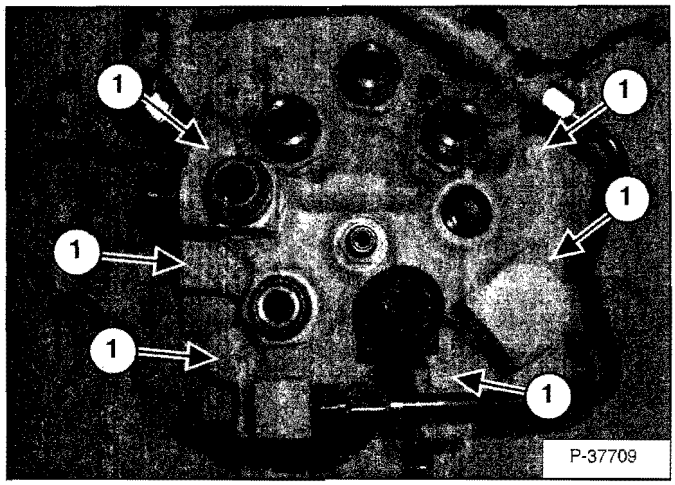
With the chain hoist lift the control valve up and clear of the tubelines **[Figure 20-40-15]**.

Disconnect the hydraulic hose (Item 1) **[Figure 20-40-15]** that comes from the back of the gear pump to the bottom of the control valve.

Remove the control valve from the loader.

BICS™ Valve, Removal And Installation

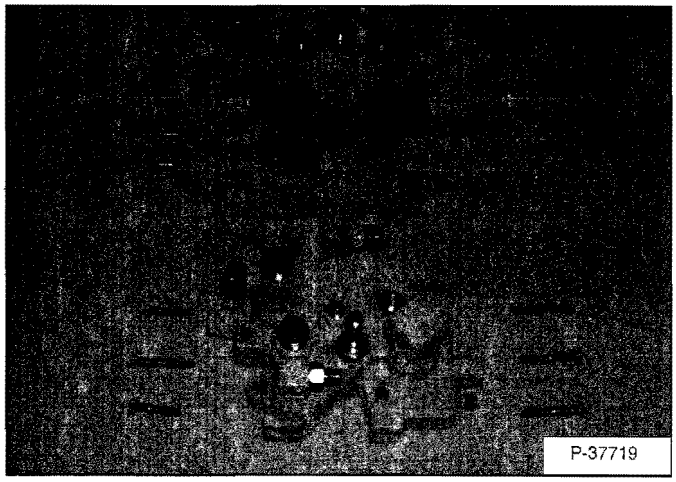
Figure 20-40-16



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

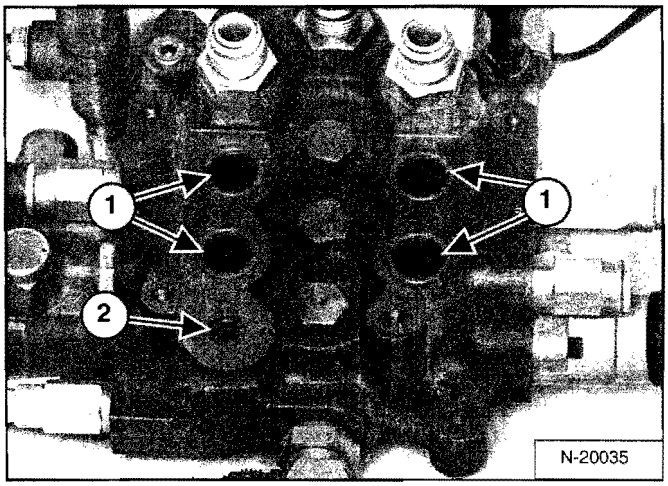
To remove the BICS™ valve from the control valve, loosen and remove the six mounting bolts (Item 1) **[Figure 20-40-16]**.

Figure 20-40-17



Remove the BICS™ valve assembly from the top of the control valve **[Figure 20-40-17]**.

Figure 20-40-18

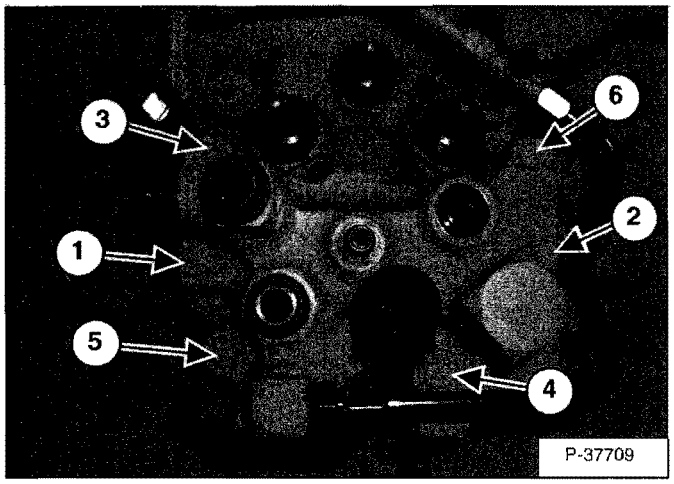


Remove the four large O-rings (Item 1) and the small O-ring (Item 2) **[Figure 20-40-18]** from the top of the control valve.

Install the four large O-rings (Item 1) and the small O-ring (Item 2) **[Figure 20-40-18]** on the top of the control valve.

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

Figure 20-40-19



Install the six mounting bolts **[Figure 20-40-19]**.

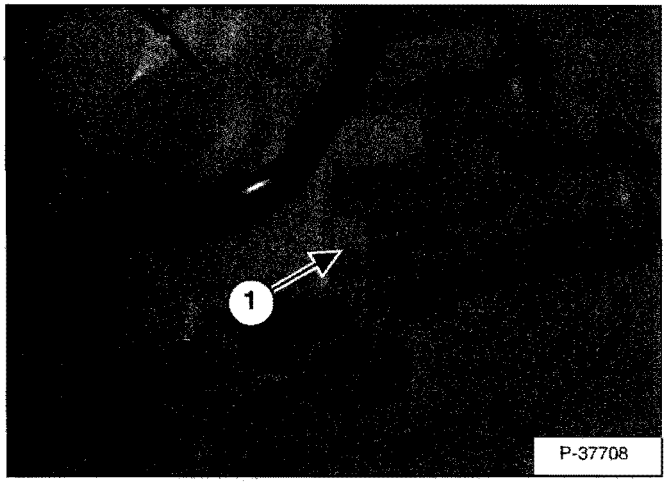
The chart below lists the correct torque specifications and tightening sequence when reinstalling the BICS] valve assembly to the control valve. Thoroughly clean and dry bolts and threads in valve. Use liquid adhesive LOCTITE #242 or equivalent.

Step	Torque	Sequence
1	110-130 in.-lbs. (12,4-14,7 Nm)	1, 2, 3, 4, 5 & 6
2	190-210 in.-lbs. (21,5-23,7 Nm)	
3	190-210 in.-lbs. (21,5-23,7 Nm)	

*Torque must be 190-210 in.-lbs. (21,5-23,7 Nm) for every bolt or repeat step 3.

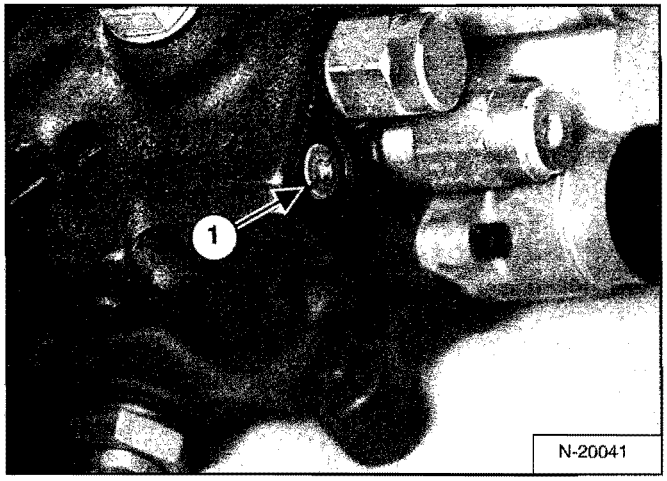
BICS™ Valve, Lift Arm By-Pass Orifice Removal And Installation

Figure 20-40-20



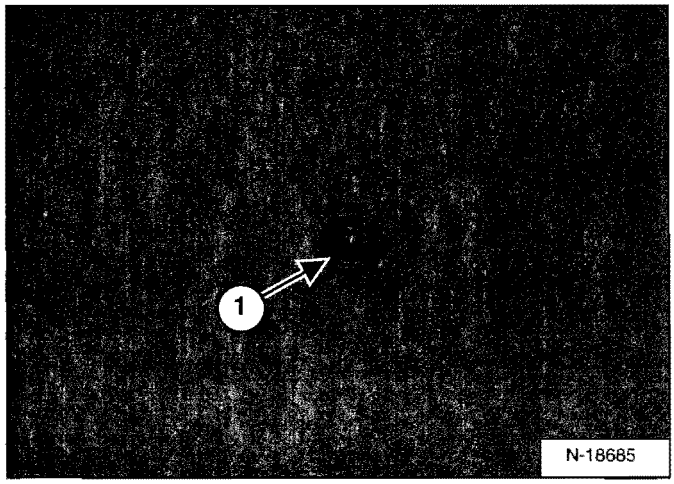
Remove the fitting (Item 1) **[Figure 20-40-20]** from the valve.

Figure 20-40-21



BICS™ Valve, Lift Arm By-Pass Orifice Removal And Installation (Cont'd)

Figure 20-40-22



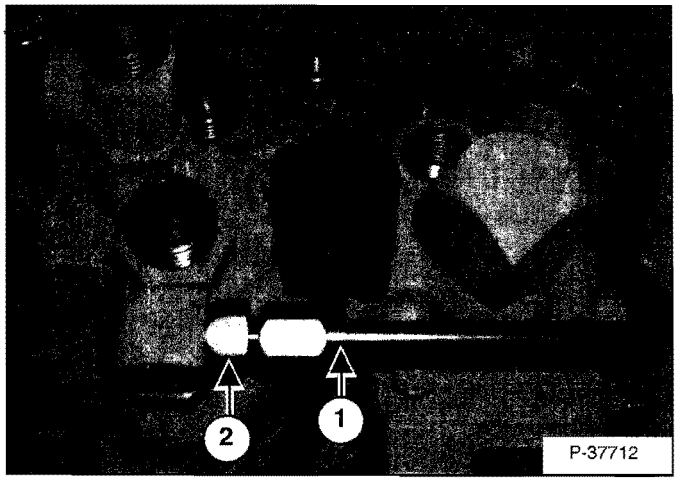
Using a flat blade screw driver, remove the lift arm by-pass orifice (Item 1) **[Figure 20-40-21]** & **[Figure 20-40-22]**.

Orifice size is 0.078 inch.

Reverse the removal procedure to install the lift arm by-pass orifice.

BICS™ Valve, Check Valve Removal And Installation

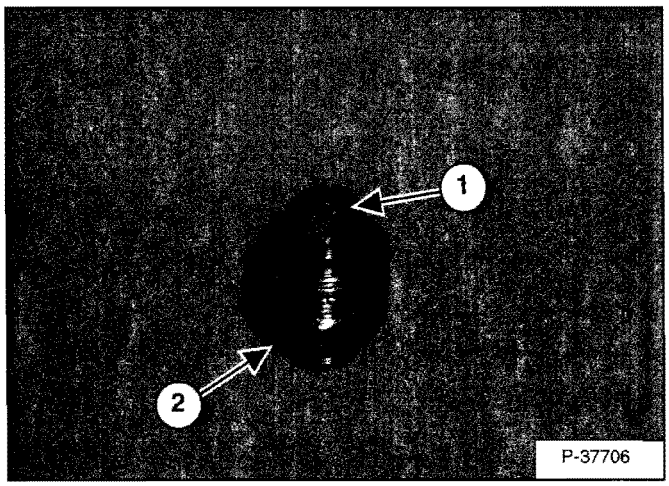
Figure 20-40-23



Remove the tubeline (Item 1) and the check valve (Item 2) **[Figure 20-40-23]**.

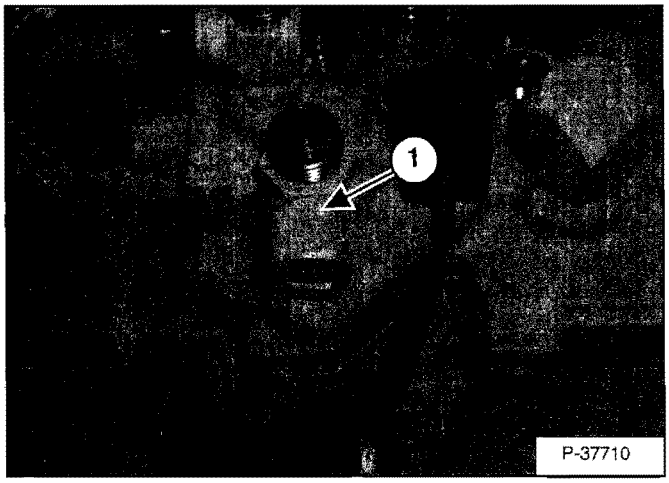
Installation: Tighten the valve to 20 ft.-lbs. (27 Nm) torque.

Figure 20-40-24



Clean and inspect the screen (Item 1) and replace the O-ring (Item 2) **[Figure 20-40-24]** on the check valve.

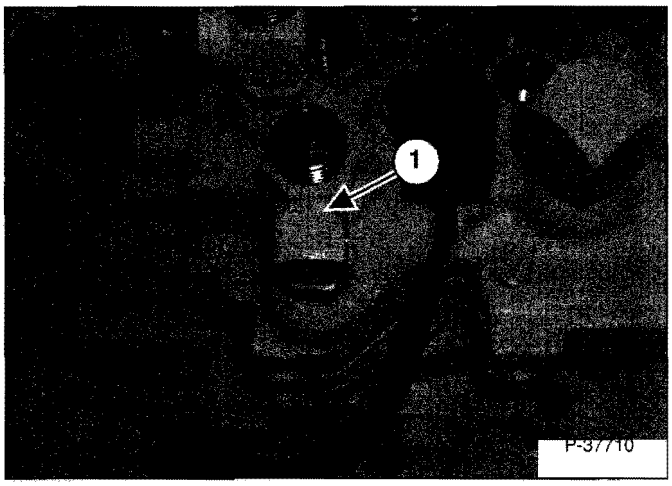
Figure 20-40-25



Remove the 90 degree fitting (Item 1) **[Figure 20-40-25]** from the control valve.

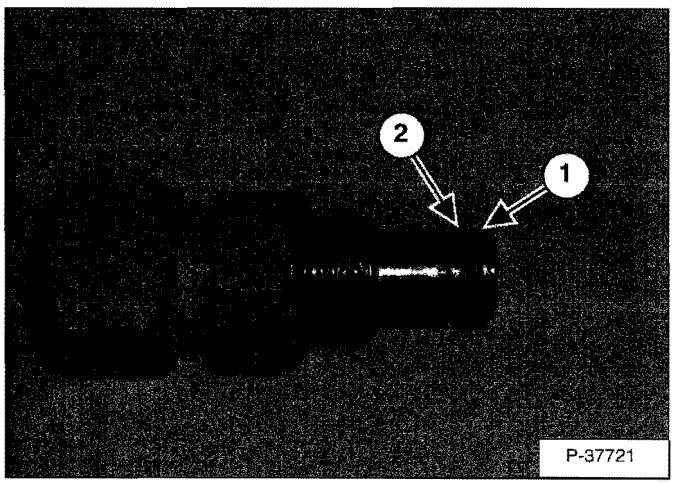
BICS™ Valve, Check Valve Removal And Installation (Cont'd)

Figure 20-40-26



Remove the 90 degree fitting (Item 1) **[Figure 20-40-26]** from the control valve.

Figure 20-40-27



Remove the O-ring (Item 1) and back-up ring (Item 2) **[Figure 20-40-27]** from the check valve, replace as needed.

BICS™ Valve, Lock Valve Removal And Installation

Figure 20-40-28

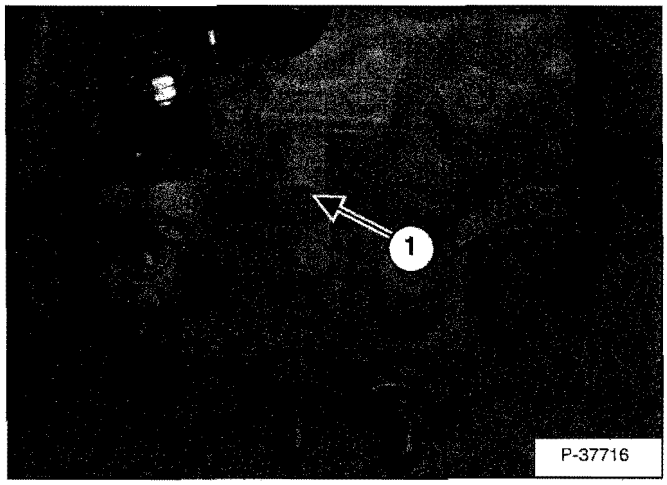
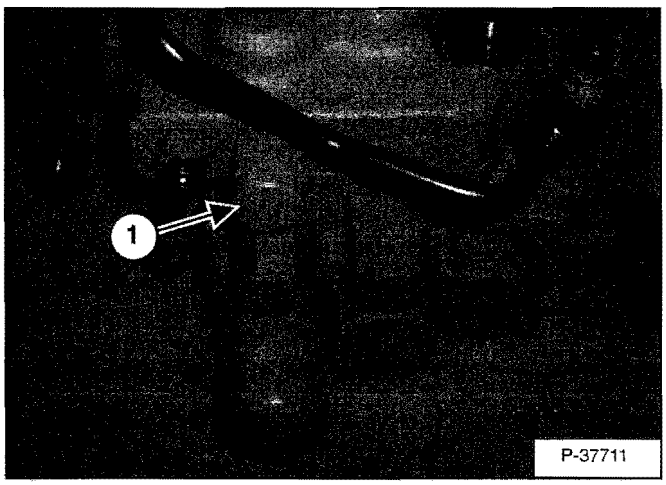


Figure 20-40-29

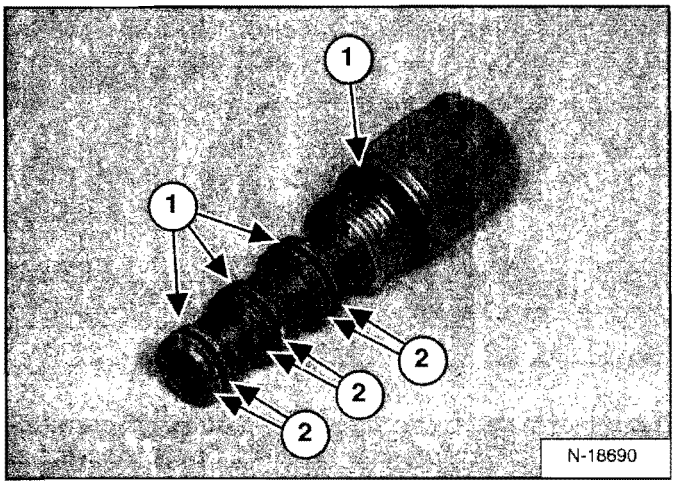


Remove the lock valves (Item 1) **[Figure 20-40-28]** & **[Figure 20-40-29]** from the BICS™ valve.

Installation: Tighten the lock valves to 25 ft.-lbs. (34 Nm) torque.

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

Figure 20-40-30



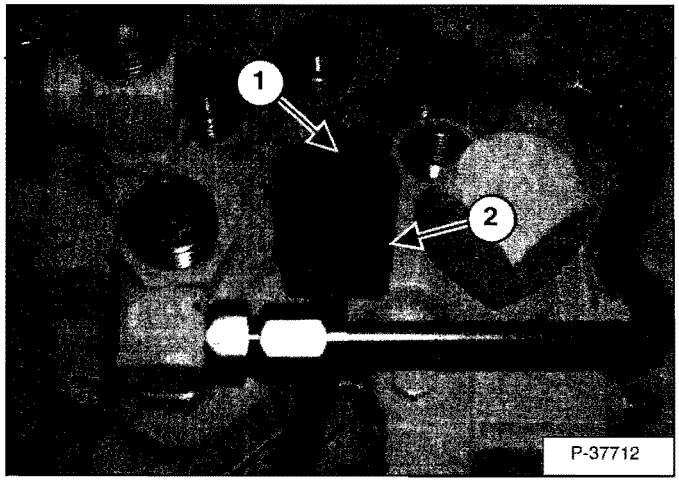
Remove the O-rings (Item 1) and back-up rings (Item 2) **[Figure 20-40-30]** from both the tilt and lift lock valves.

Install new O-rings (Item 1) and back-up rings (Item 2) **[Figure 20-40-30]** on the tilt and lift lock valves.

Reverse the removal procedure to install the lock valve.

BICS™ Valve, Solenoid Removal And Installation

Figure 20-40-31



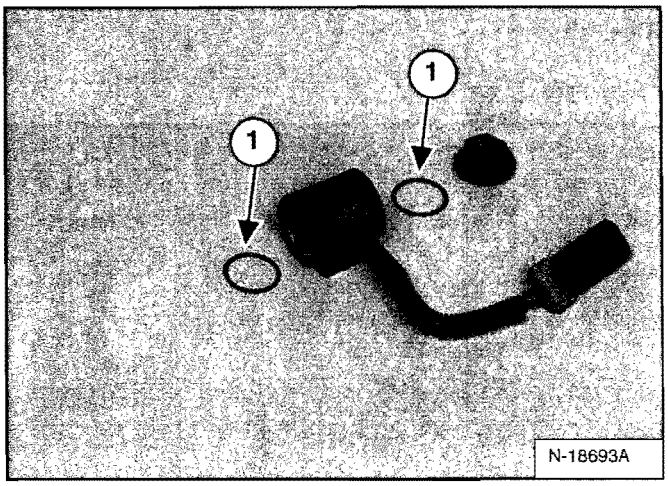
Remove the mounting nut (Item 1) **[Figure 20-40-31]** from the solenoid cartridge.

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

Remove the solenoid (Item 2) **[Figure 20-40-31]**.

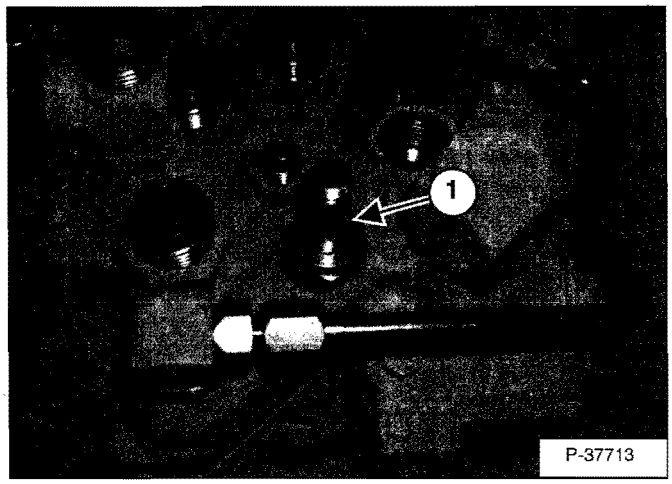
NOTE: The solenoid resistance is (8-10 ohms).

Figure 20-40-32



Remove the O-rings (Item 1) **[Figure 20-40-32]** from both ends of the solenoid.

Figure 20-40-33

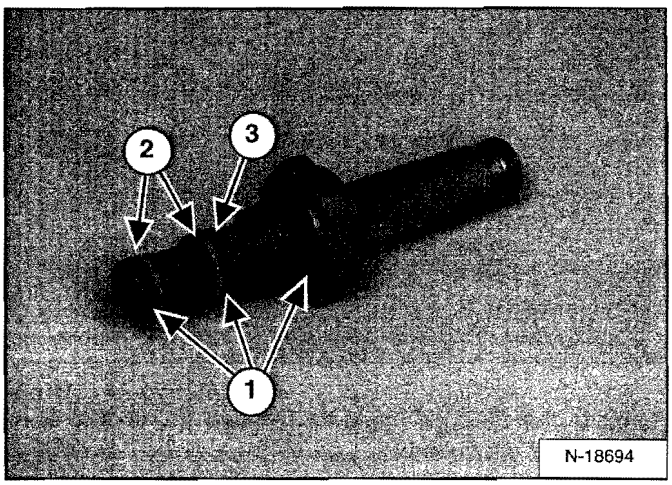


Remove the solenoid stem (Item 1) **[Figure 20-40-33]**.

Installation: Tighten the solenoid stem to 20 ft.-lbs. (27 Nm) torque.

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

Figure 20-40-34



Remove the O-rings (Item 1) and back-up washers (Item 2) **[Figure 20-40-34]** on the stem.

Clean all parts in solvent and dry with compressed air.

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

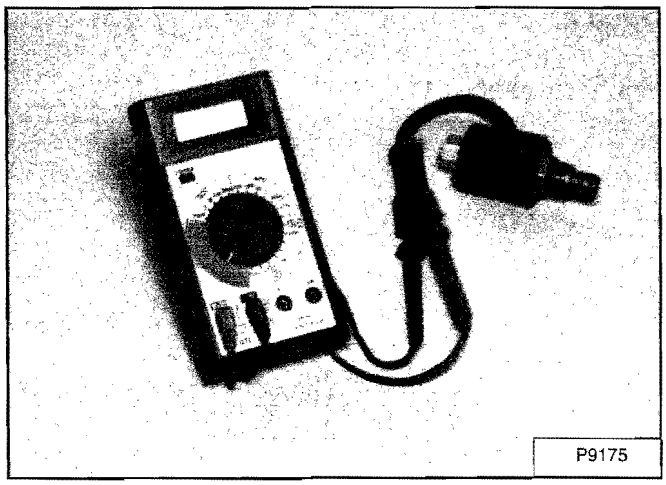
NOTE: The screen (Item 3) [Figure 20-40-34] may be cleaned with solvent. If it is torn or worn replace the solenoid stem.

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

Install new O-rings and new back-up washers on the solenoid stem.

BICS™ Valve, Solenoid Testing

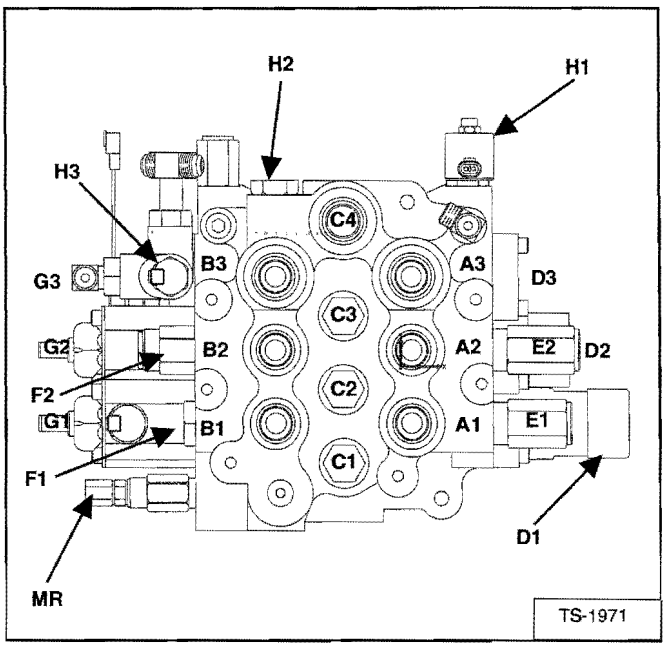
Figure 20-40-35



Use a test meter to measure coil resistance **[Figure 20-40-35]**. Coil wires do not have polarity. Correct resistance for the auxiliary pressure relief (small) coil is 7-10 ohm and the other coils 5-8 ohms.

Replace the test meter with 12 volt power. You can see and hear the spool shift.

Figure 20-40-36



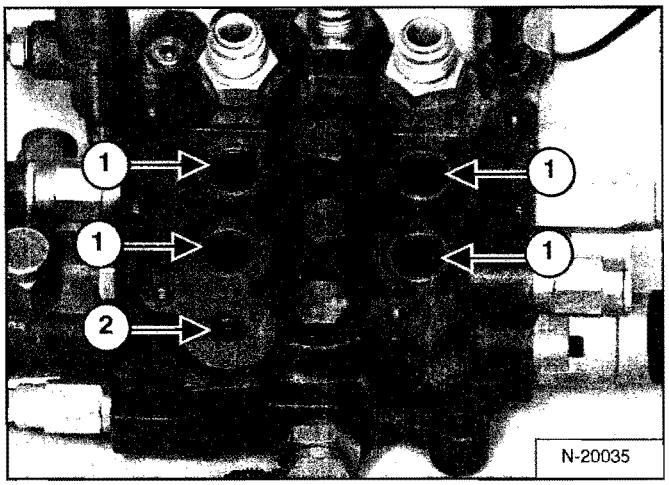
BICS™ Valve, Solenoid Testing (Cont'd)

Identification Chart

Item	T300 Loader
A1	Lift Cylinder Base End/Restrictor
A2	Tilt Cylinder Base End
A3	Auxiliary Hydraulics
B1	Lift Cylinder Rod End
B2	Tilt Cylinder Rod End
B3	Auxiliary Hydraulics
C1	Load Check Valve/Lift Function
C2	Load Check Valve/Tilt Function
C3	Orificed Load Check Valve/Auxiliary Function
C4	Outlet Fluid Flow
D1	Lift Spool Detent
D2	Tilt Spool Centering Spring
D3	Auxiliary Spool/Centering Springs
E1	Port Relief Valve - 4000 PSI
E2	Anti-Cavitation/Port Relief Valve - 3500 PSI
F1	Anti-Cavitation Valve
F2	Port Relief Valve - 4000 PSI
G1	Lift Spool End
G2	Tilt Spool End
G3	Auxiliary Spool/Centering Springs
H1	Auxiliary Electric Solenoid
H2	Plug/Port Relief (Optional) - 3500 PSI
H3	Auxiliary Electric Solenoid
MR	Main Relief Valve - 3300 PSI

Load Check Valve

Figure 20-40-37



Remove the BICS valve assembly from the control valve. (See BICS™ Valve, Removal And Installation on Page 20-40-5.)

Remove the four large O-rings (Item 1) and small O-ring (Item 2) **[Figure 20-40-37]**. Always replace these O-rings before installing the BICS valve assembly.

IMPORTANT

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

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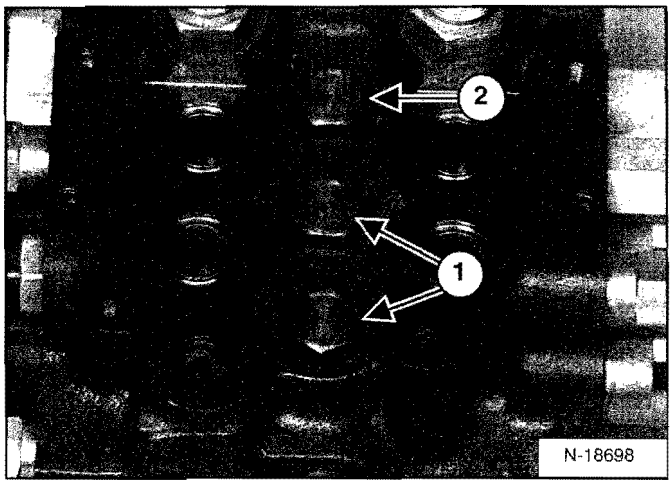
Mark each valve section, spool and related parts so that they will be returned to its original valve section during assembly.

Use bolts to fasten the control valve to a work bench for easier disassembly and assembly procedures.

Load Check Valve (Cont'd)

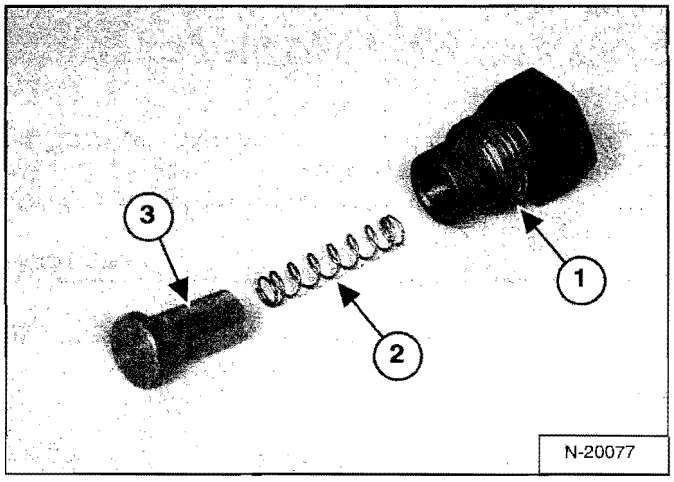
Figure 20-40-38



Loosen the load check plugs (Item 1) **[Figure 20-40-38]** from the lift and tilt sections of the control valve.

Installation: Always use new O-ring. tighten the plug to 35-40 ft.-lbs. (47-54 Nm) torque.

Figure 20-40-39



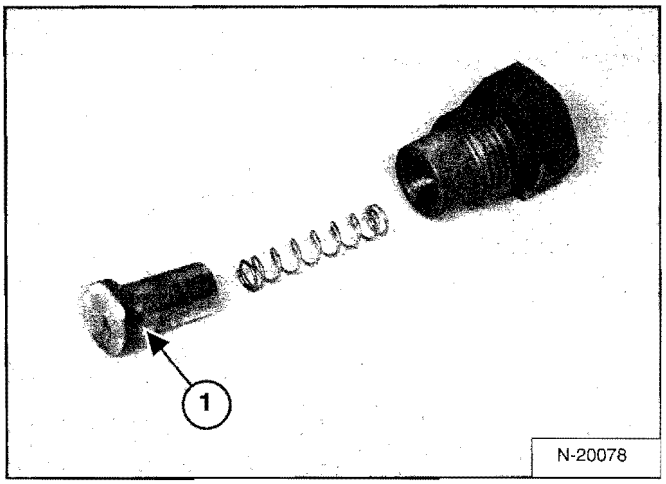
Remove the load check plugs (Item 1) **[Figure 20-40-39]**.

Remove the spring (Item 2) and poppet (Item 3) **[Figure 20-40-39]**.

NOTE: Both load checks poppets, plugs and springs are the same for the lift and tilt.

Loosen the load check plug (Item 2) **[Figure 20-40-38]** from the auxiliary section of the control valve.

Figure 20-40-40

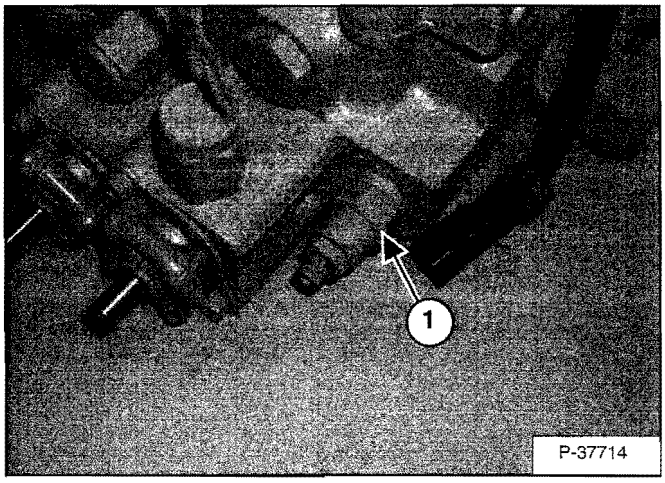


The auxiliary section uses a load check poppet with an orifice (Item 1) **[Figure 20-40-40]**.

NOTE: For correct port locations and valve component (See Identification Chart on Page 20-40-11.).

Main Relief Valve

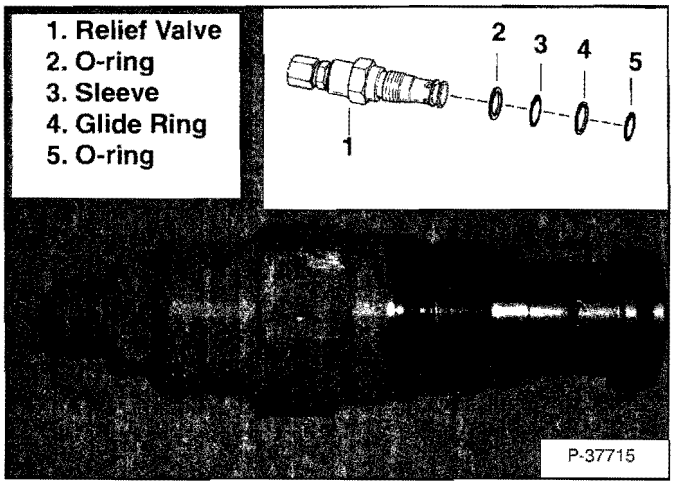
Figure 20-40-41



Loosen and remove the main relief valve (Item 1) **[Figure 20-40-41]**.

Main Relief Valve (Cont'd)

Figure 20-40-42

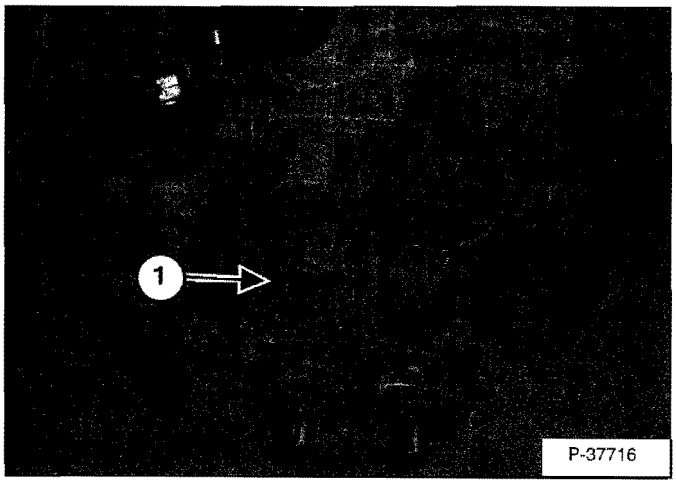


Remove the O-rings, sleeve, and glide ring from the main relief valve [**Figure 20-40-42**].

Installation: Always use new O-rings. sleeve, and glide ring. Tighten to 35-40 ft.-lbs. (47-54 Nm) torque.

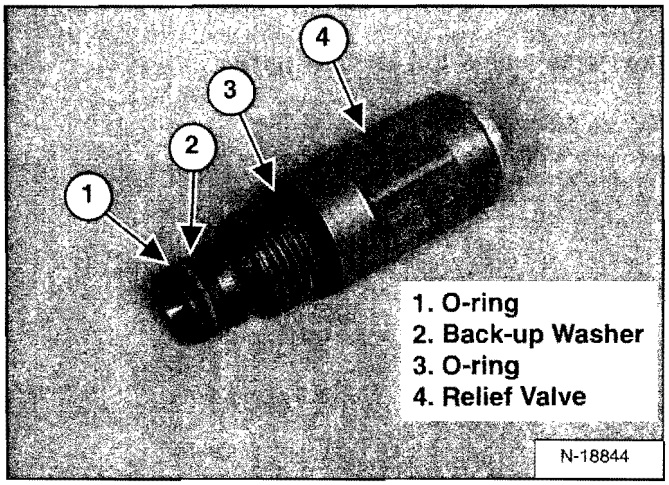
Port Relief Valve, Tilt Spool

Figure 20-40-43



Remove the port relief valve (Item 1) [**Figure 20-40-43**] from the control valve tilt section.

Figure 20-40-44

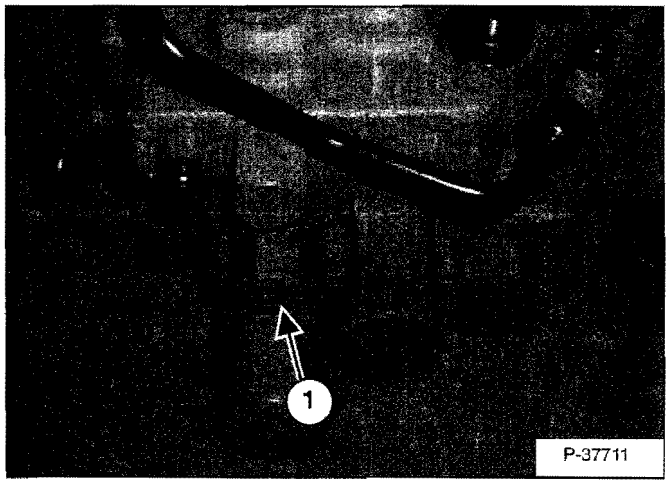


Remove the O-rings and back-up washer from the port relief valve [**Figure 20-40-44**].

Installation: Always use new O-rings and back-up washers. Tighten to 35-40 ft.-lbs. (47-54 Nm) torque.

Port Relief Valve, Lift Spool

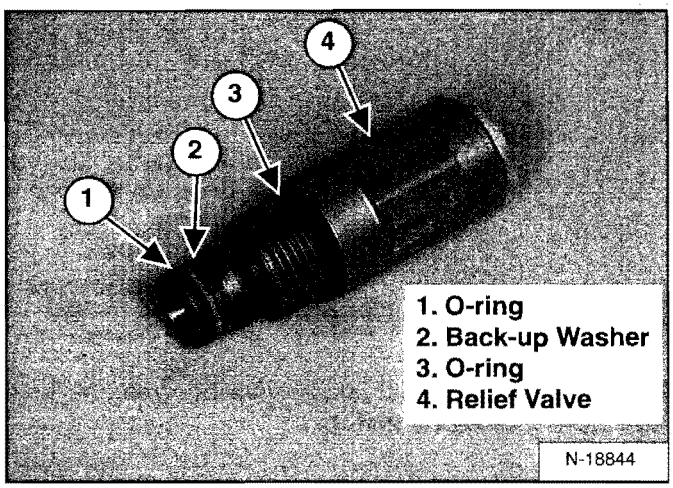
Figure 20-40-45



Remove the port relief valve (Item 1) [**Figure 20-40-45**] from the control valve lift section.

Port Relief Valve, Lift Spool (Cont'd)

Figure 20-40-46

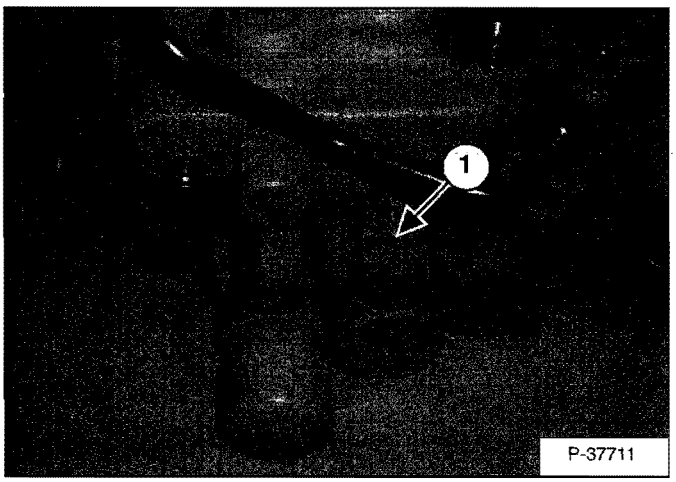


Remove the O-rings and back-up washer from the port relief valve **[Figure 20-40-46]**.

Installation: Always use new O-rings and back-up washers. Tighten to 35-40 ft.-lbs. (47-54 Nm) torque.

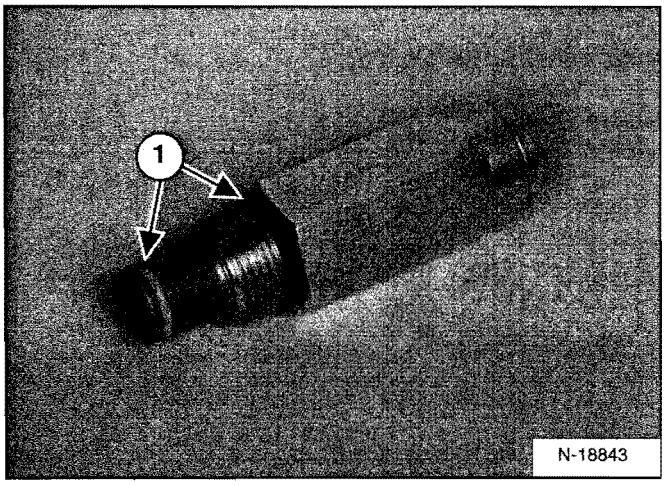
Anti-Cavitation Valve/Port Relief Valve, Tilt Spool

Figure 20-40-47



Remove the anti-cavitation/port relief valve (Item 1) **[Figure 20-40-47]** from the control valve tilt section.

Figure 20-40-48

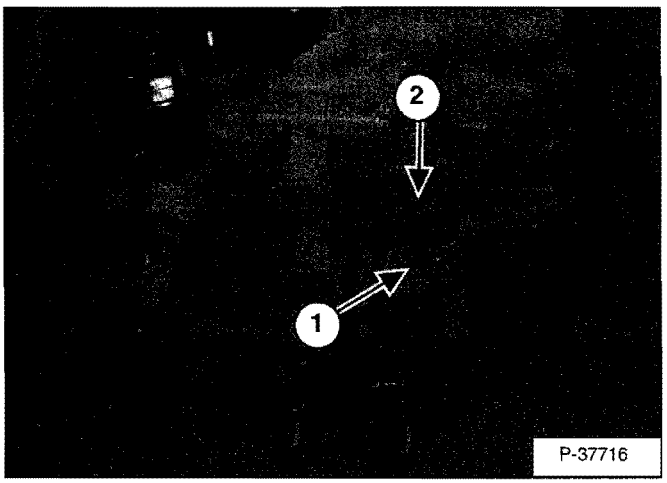


Remove the O-rings (Item 1) **[Figure 20-40-48]** from the anti-cavitation/port relief valve.

Installation: Always use new O-rings and back-up washers. Tighten to 35-40 ft.-lbs. (47-54 Nm) torque.

Anti-Cavitation Valve, Lift Spool

Figure 20-40-49

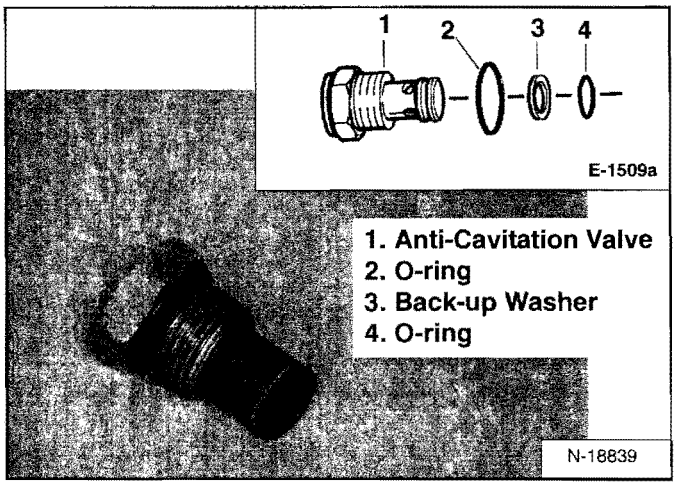


Remove the lift lock solenoid (Item 1) **[Figure 20-40-49]**.

Remove the anti-cavitation valve (Item 2) **[Figure 20-40-49]** from the control valve lift section.

Anti-Cavitation Valve, Lift Spool (Cont'd)

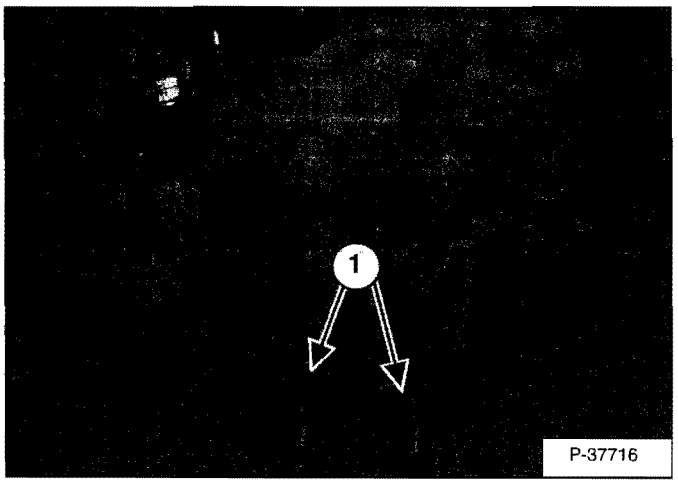
Figure 20-40-50



Remove the O-rings and back-up washer from the anti-cavitation valve **[Figure 20-40-50]**.

Rubber Boot

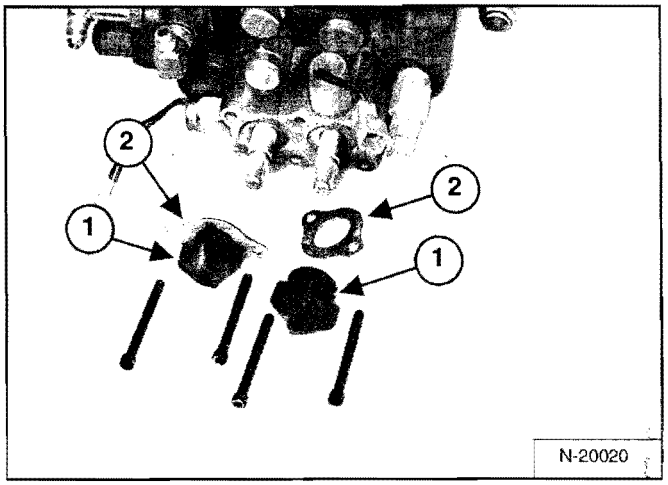
Figure 20-40-51



Remove the two screws (Item 1) **[Figure 20-40-51]** on the rubber boot retainer.

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

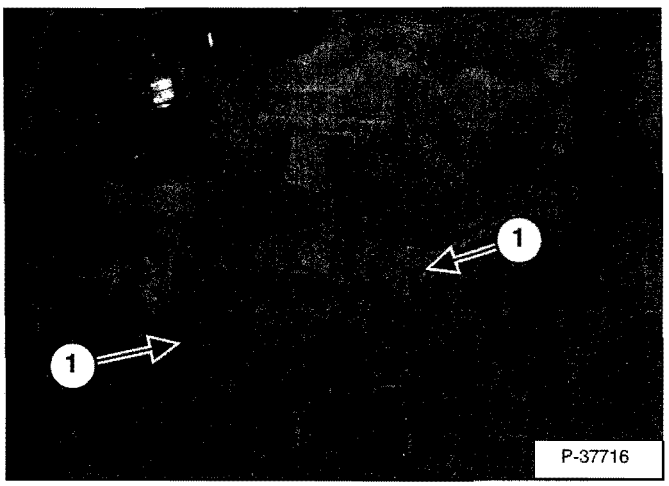
Figure 20-40-52



Remove the rubber boot (Item 1) **[Figure 20-40-52]** and retainer (Item 2) **[Figure 20-40-52]**.

Lift And Tilt Lock Block

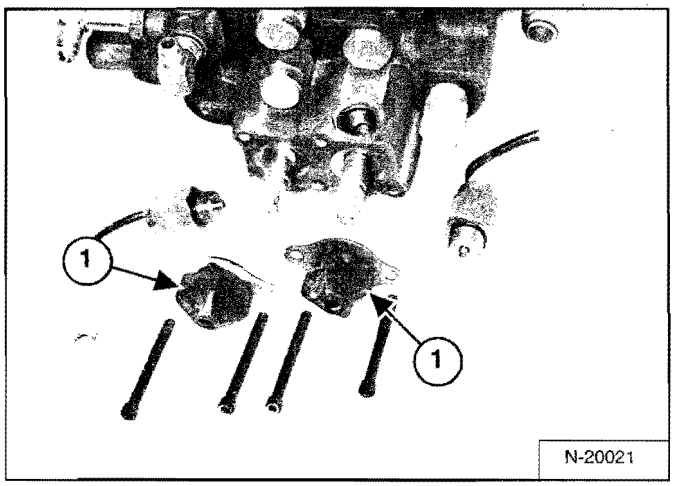
Figure 20-40-53



Remove the lock solenoids (Item 1) **[Figure 20-40-53]** from the lift and tilt lock block.

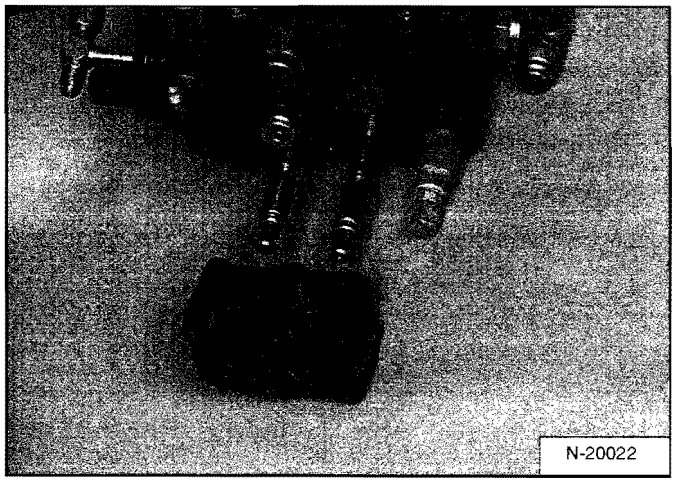
Lift And Tilt Lock Block (Cont'd)

Figure 20-40-54



Remove the rubber Boot (Item 1) **[Figure 20-40-54]**. (See Rubber Boot on Page 20-40-15.)

Figure 20-40-55

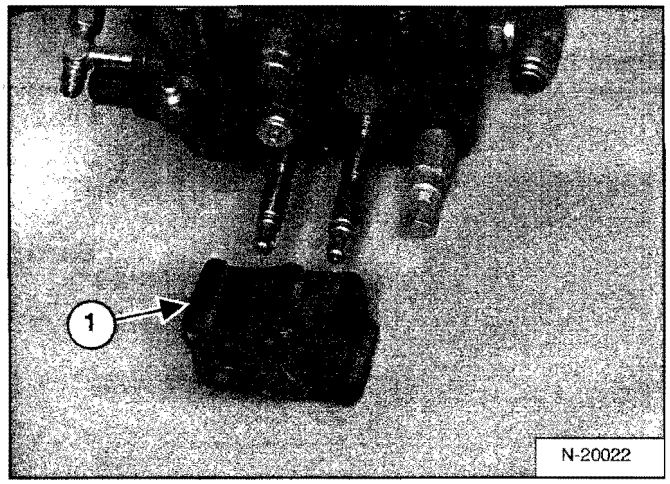


Remove the lift and tilt lock block **[Figure 20-40-55]**.

NOTE: The lock block must be clean and oil free. (Oil can cause the solenoids not to function properly.)

Lift Spool And Detent Removal

Figure 20-40-56

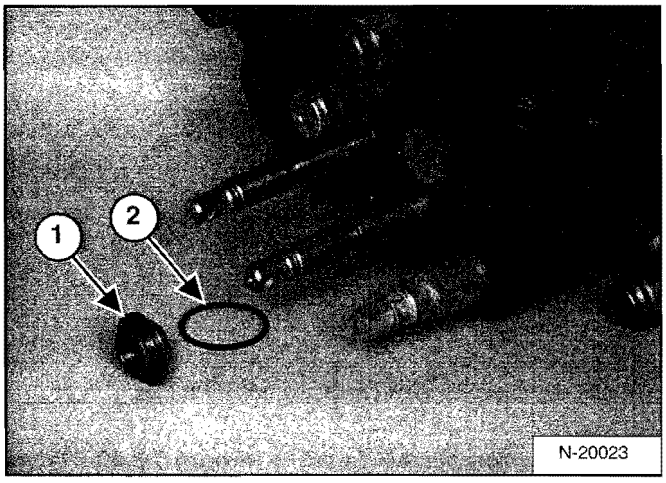


The tool listed will be needed to do the following procedure:

MEL1278 - Detent Tool
MEL1285 - Detent Spring Tool

Remove the lift and tilt lock block (Item 1) **[Figure 20-40-56]** from the control valve. (See Lift And Tilt Lock Block on Page 20-40-15.)

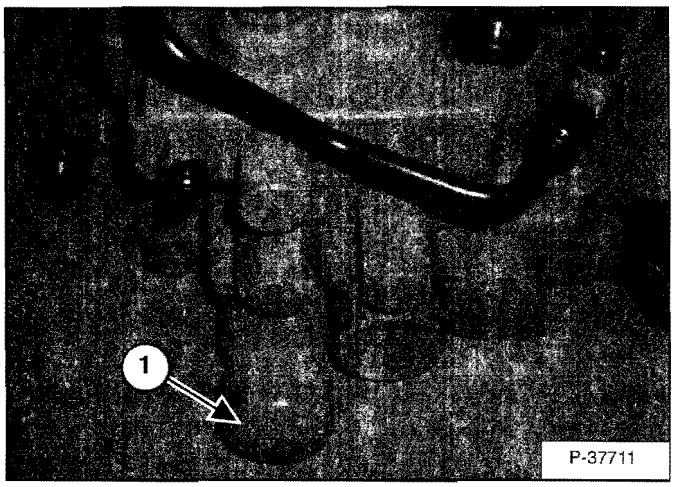
Figure 20-40-57



Remove the bushing (Item 1) and O-ring (Item 2) **[Figure 20-40-57]** from the lift spool.

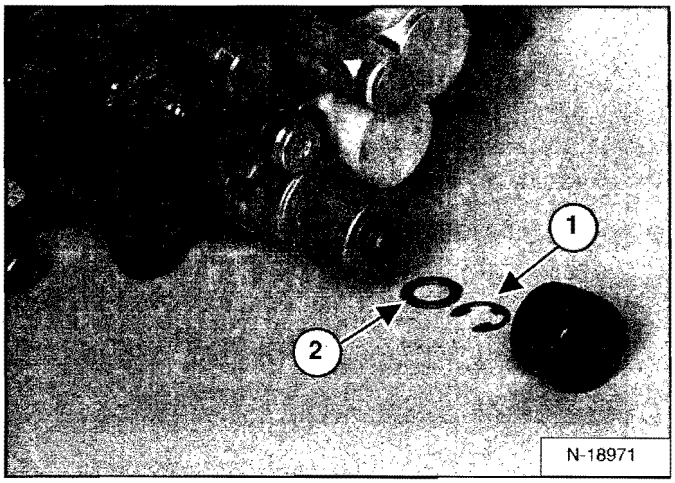
Lift Spool And Detent Removal (Cont'd)

Figure 20-40-58



Remove the end cap (Item 1) **[Figure 20-40-58]**.

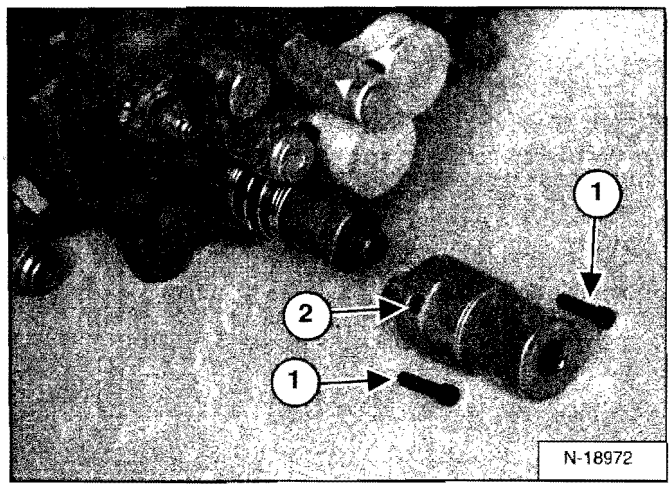
Figure 20-40-59



Use a screwdriver to remove the snap ring (Item 1) **[Figure 20-40-59]**.

Remove the washer (Item 2) **[Figure 20-40-59]**.

Figure 20-40-60



Remove the screws (Item 1) **[Figure 20-40-60]** from the detent bonnet.

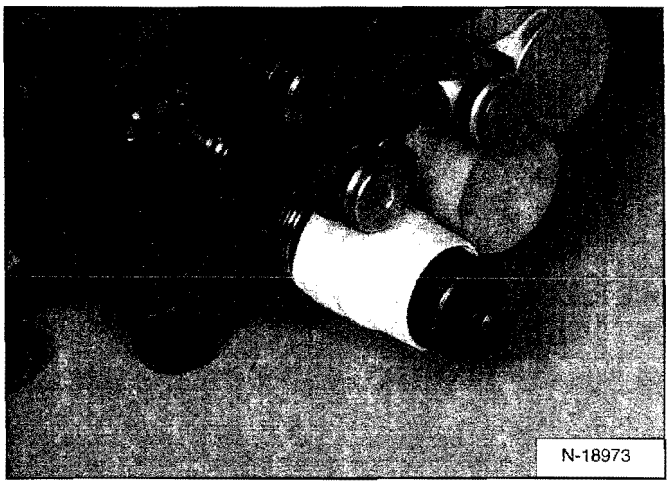
Remove the detent bonnet (Item 2) **[Figure 20-40-60]**.

IMPORTANT

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

I-2012-0284

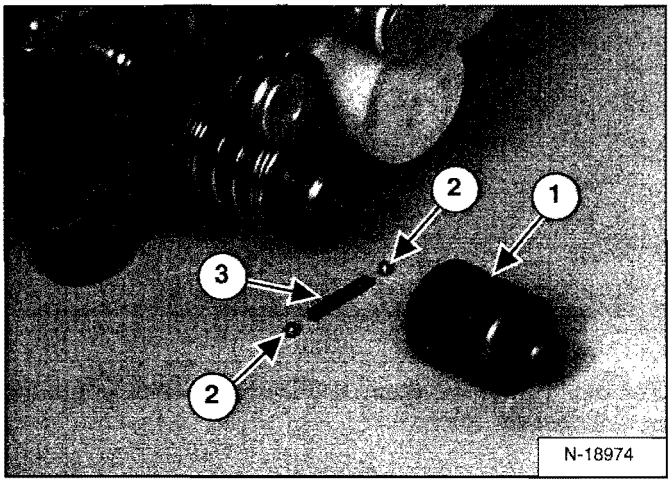
Figure 20-40-61



Put a rag around the detent assembly **[Figure 20-40-61]**. This will prevent the detent balls and spring from being lost when the detent sleeve is removed.

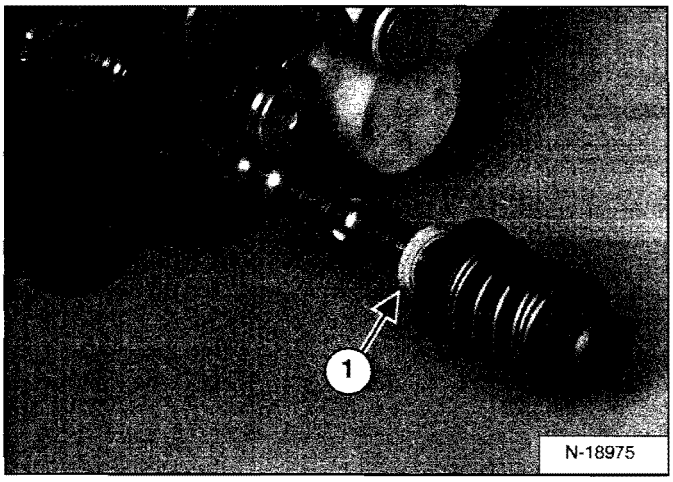
Lift Spool And Detent Removal (Cont'd)

Figure 20-40-62



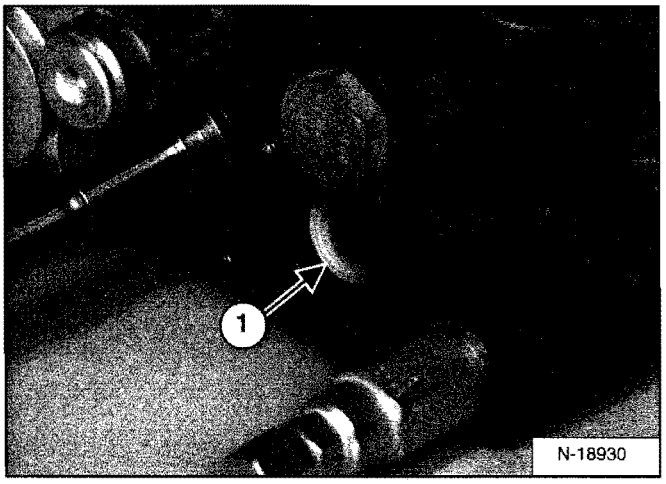
Remove the detent sleeve (Item 1), detent balls (Item 2) and spring (Item 3) **[Figure 20-40-62]**.

Figure 20-40-63



Remove the spool assembly and seal (Item 1) **[Figure 20-40-63]** from the control valve.

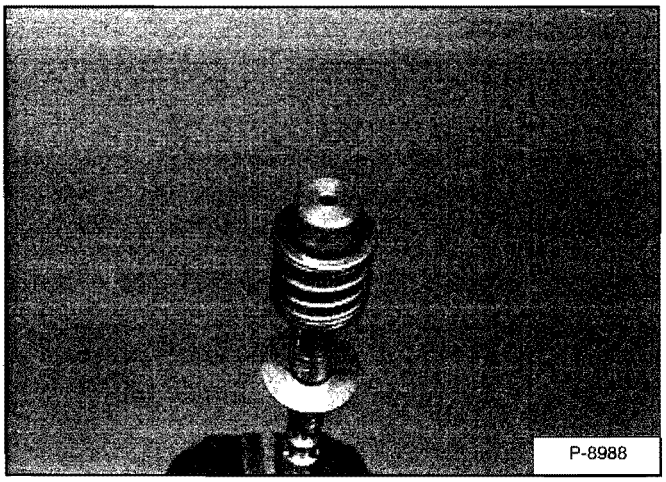
Figure 20-40-64



Remove the spool seal (Item 1) **[Figure 20-40-64]** from the linkage end of the valve.

Lift Spool And Detent Disassembly

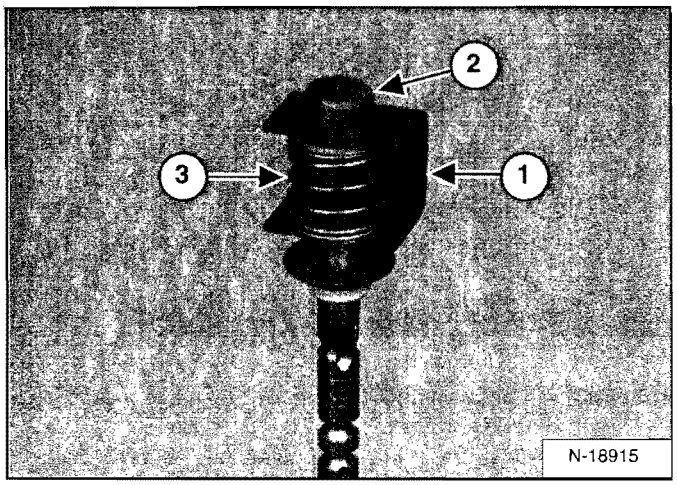
Figure 20-40-65



Clamp the linkage end of the spool in a vise **[Figure 20-40-65]**.

Lift Spool And Detent Disassembly (Cont'd)

Figure 20-40-66

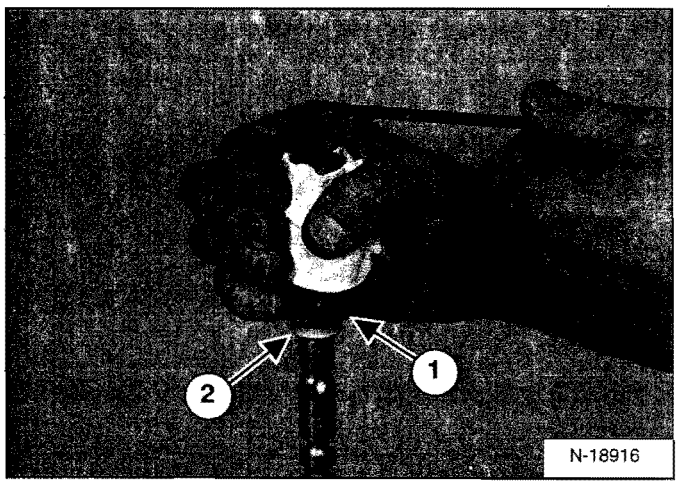


Install the spring tool (Item 1) **[Figure 20-40-66]** over the centering spring.

NOTE: Be careful when removing the detent adapter (Item 2) [Figure 20-40-66] from the centering spring, as it is under spring pressure.

NOTE: The centering spring (Item 3) [Figure 20-40-66] is orange on all 800 series loaders.

Figure 20-40-67

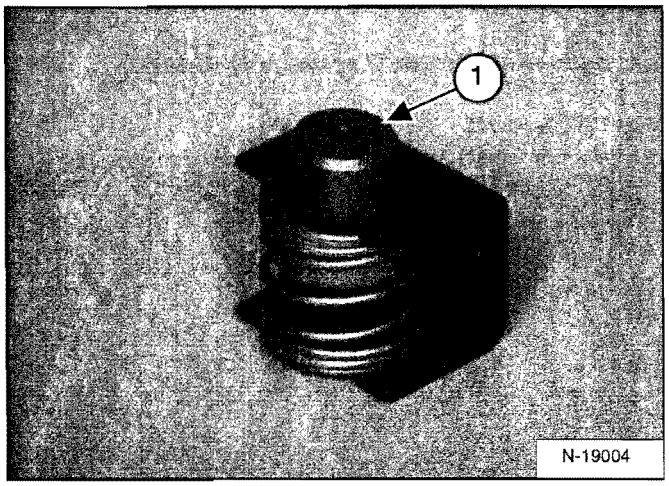


Put a rag around the detent assembly **[Figure 20-40-67]**. This will prevent the detent balls and spring from being lost when the detent adapter is removed.

Remove the detent adapter with an Alan wrench.

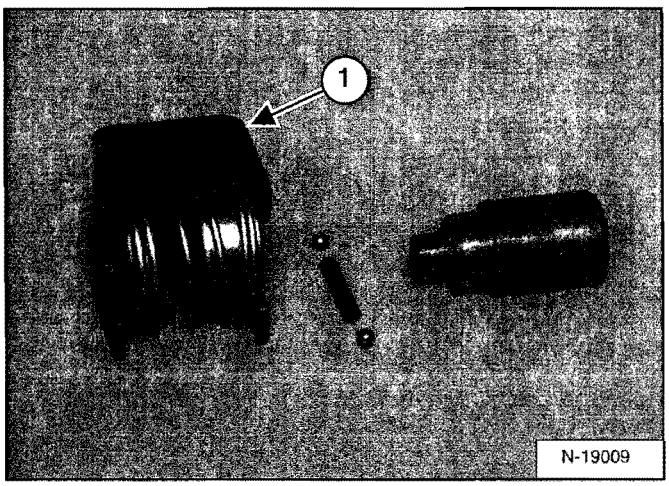
Remove the back-up washer (Item 1) and spool seal (Item 2) **[Figure 20-40-67]**.

Figure 20-40-68



Remove the detent adapter (Item 1) **[Figure 20-40-68]** from the spring assembly.

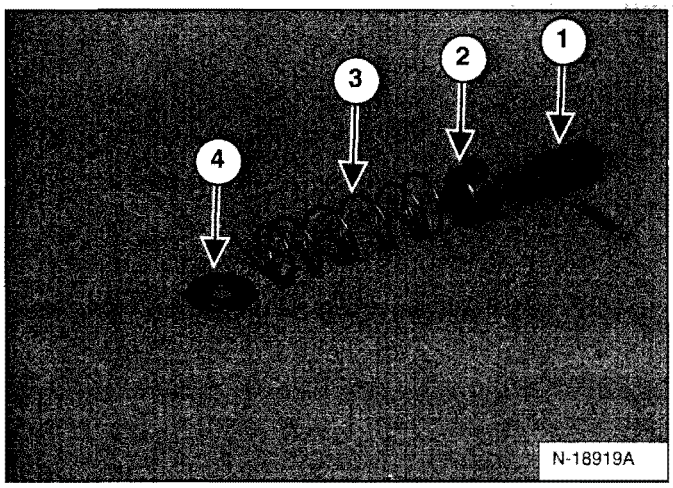
Figure 20-40-69



Remove spring tool (Item 1) **[Figure 20-40-69]** from the spring assembly.

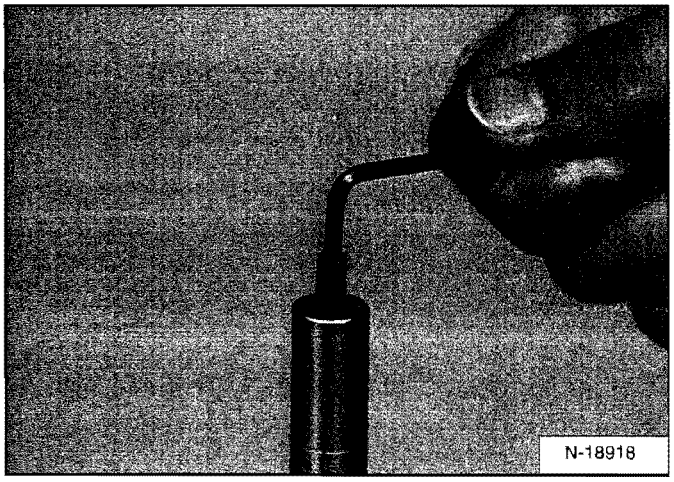
Lift Spool And Detent Disassembly (Cont'd)

Figure 20-40-70



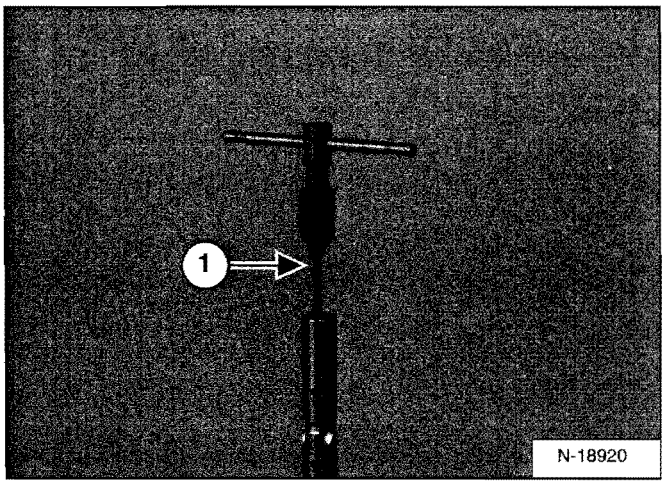
Inspect the adapter (Item 1), collar (Item 2), spring (Item 3), and washer (Item 4) **[Figure 20-40-70]**.

Figure 20-40-71



Remove the stud from the end of the spool **[Figure 20-40-71]**.

Figure 20-40-72



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

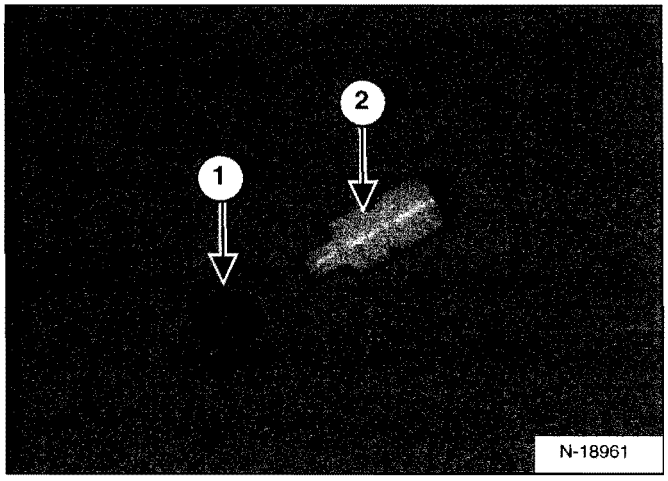
Turn a 6-32 tap (Item 1) **[Figure 20-40-72]** into the plug. Pull the tap and plug out of the spool. Be careful, do not break the tap.

Clean all the debris from inside the spool bore.

NOTE: DO NOT USE LOCTITE ON THE STUD THREADS.

Lift Spool And Detent Assembly

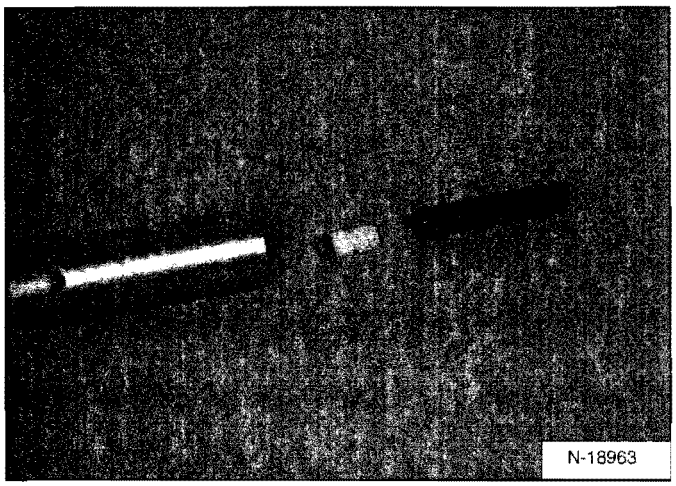
Figure 20-40-73



Install the O-ring (Item 1) over the nipple on the plastic plug (Item 2) **[Figure 20-40-73]**.

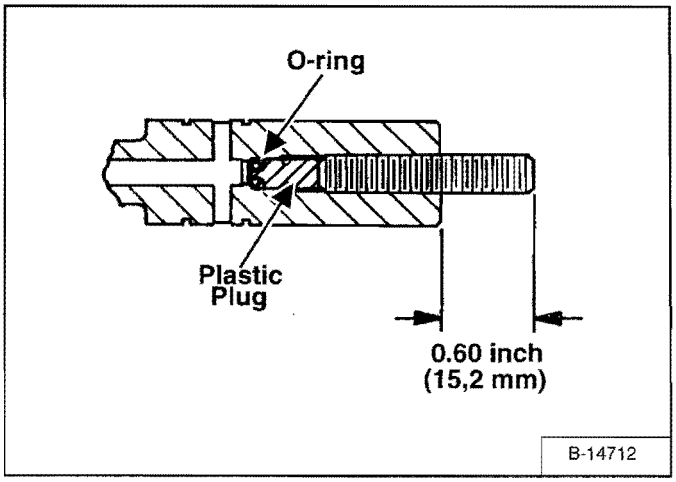
Lift Spool And Detent Assembly (Cont'd)

Figure 20-40-74



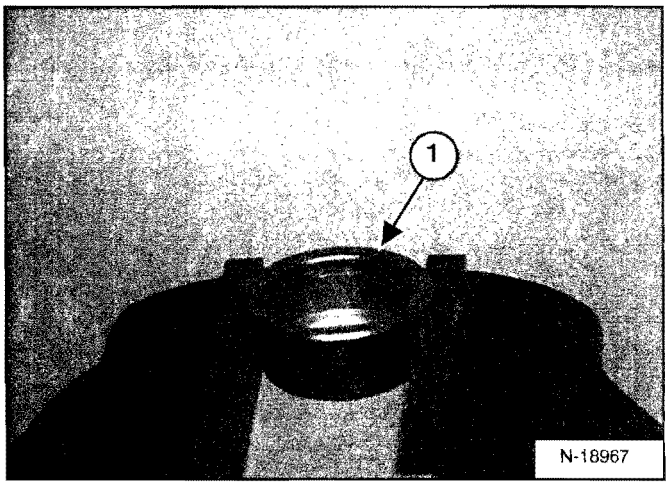
Install the plastic plug and O-ring in the spool **[Figure 20-40-74]**.

Figure 20-40-75



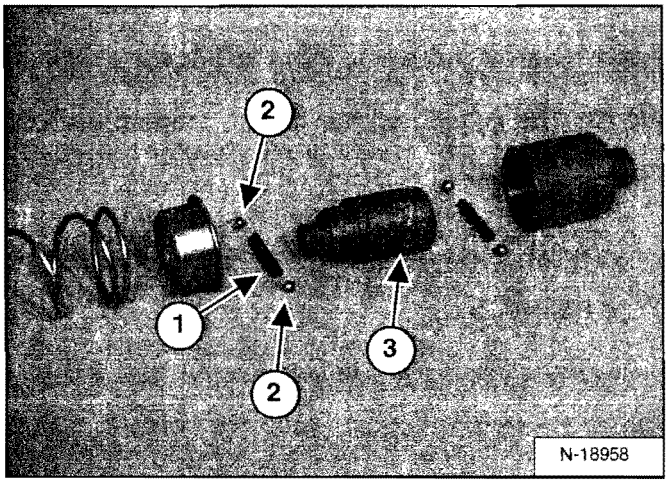
Install the stud and tighten until the other end of the stud is out about 0.600 inch (15,2 mm) from the spool **[Figure 20-40-75]**.

Figure 20-40-76



Clamp the collar (Item 1) **[Figure 20-40-76]** in a vice.

Figure 20-40-77

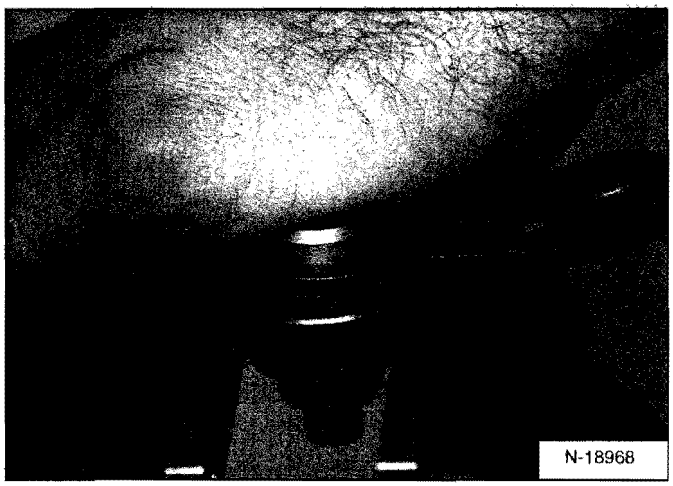


Apply grease on all the detent component surfaces before assembly **[Figure 20-40-77]**.

Install the spring (Item 1) and detent balls (Item 2) into the adapter (Item 3) **[Figure 20-40-77]** and compress with the detent pliers (Item 1) **[Figure 20-40-78]**.

Lift Spool And Detent Assembly (Cont'd)

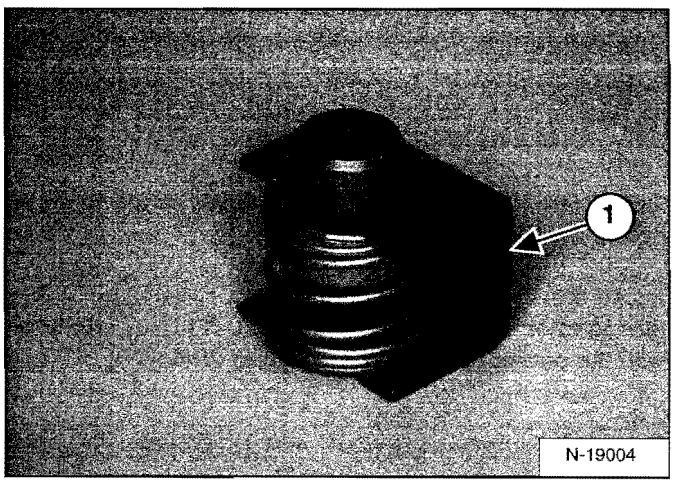
Figure 20-40-78



Install the detent adapter to the collar **[Figure 20-40-78]**.

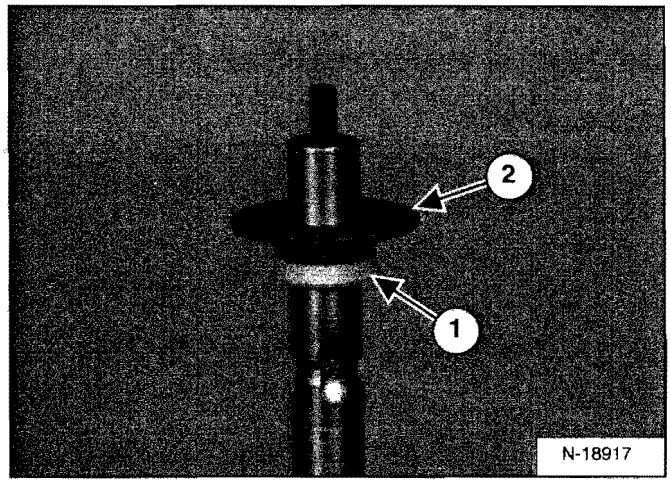
NOTE: The collar and the detent adapter are held together by spring pressure when assembled to the lift spool not the detent balls. Hold the detent adapter and collar together to prevent the detent balls and spring from falling out.

Figure 20-40-79



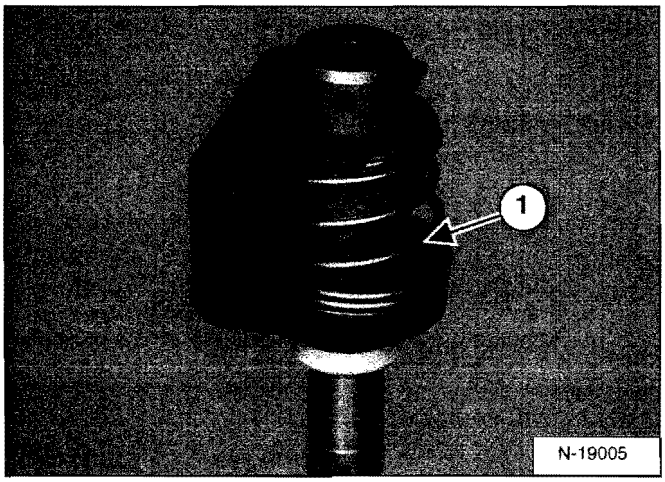
Install the spring tool (Item 1) **[Figure 20-40-79]** over the washer, spring, collar and detent adapter.

Figure 20-40-80



Install the spool seal (Item 1) and back-up washer (Item 2) **[Figure 20-40-80]**.

Figure 20-40-81



Install the spring assembly to the lift spool hand tight **[Figure 20-40-81]**.

Remove the spring tool.

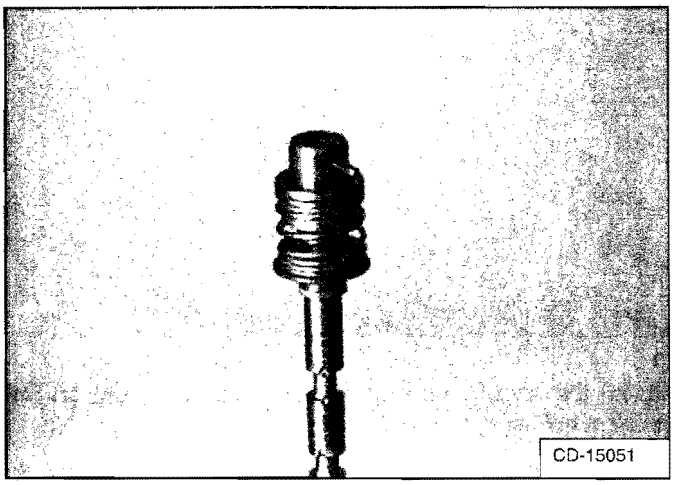
Check the alignment of the detent adapter and the washer.

NOTE: The adapter must fit in the center of the washer (Item 1) [Figure 20-40-81].

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

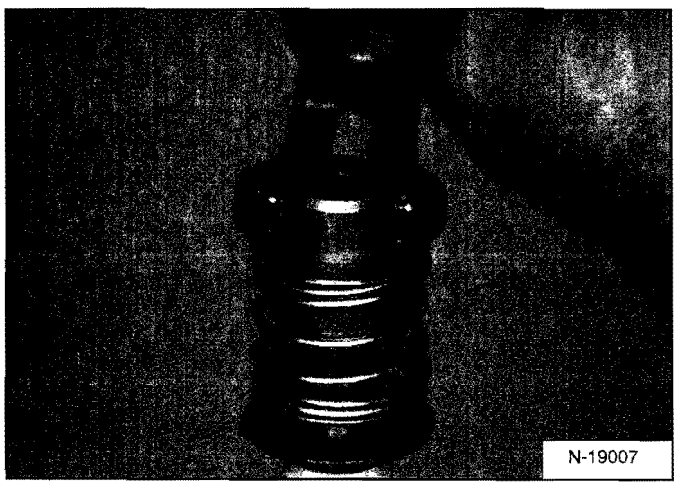
Lift Spool And Detent Assembly (Cont'd)

Figure 20-40-82



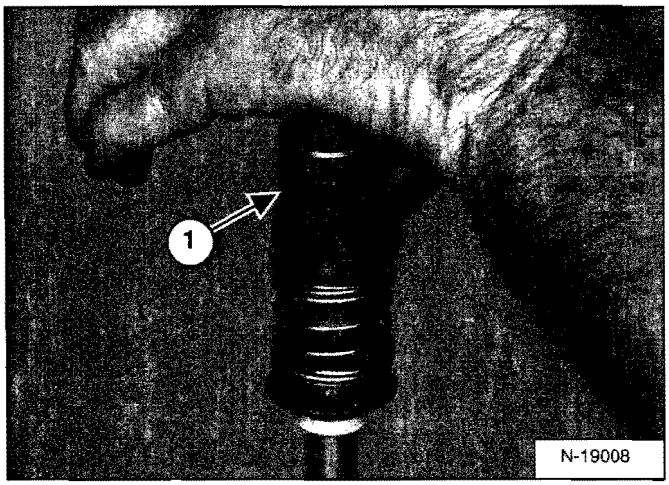
Install the detent balls and spring **[Figure 20-40-82]**.

Figure 20-40-83



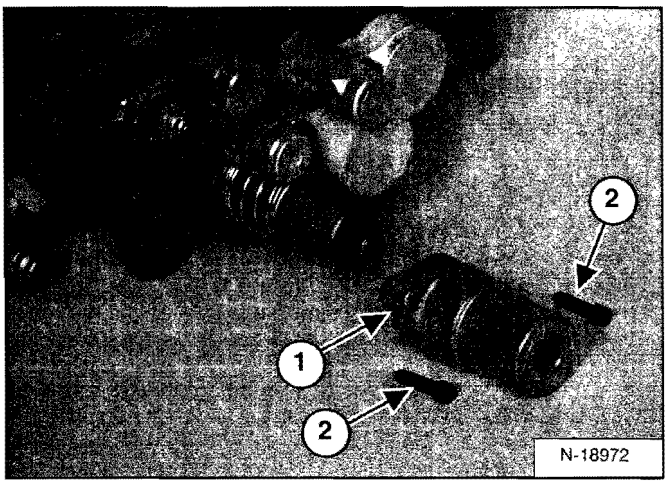
Hold the detent balls in place with the detent pliers **[Figure 20-40-83]**.

Figure 20-40-84



Install the detent sleeve (Item 1) **[Figure 20-40-84]** to the detent adapter.

Figure 20-40-85



Install the lift spool assembly in the spool bore **[Figure 20-40-85]**.

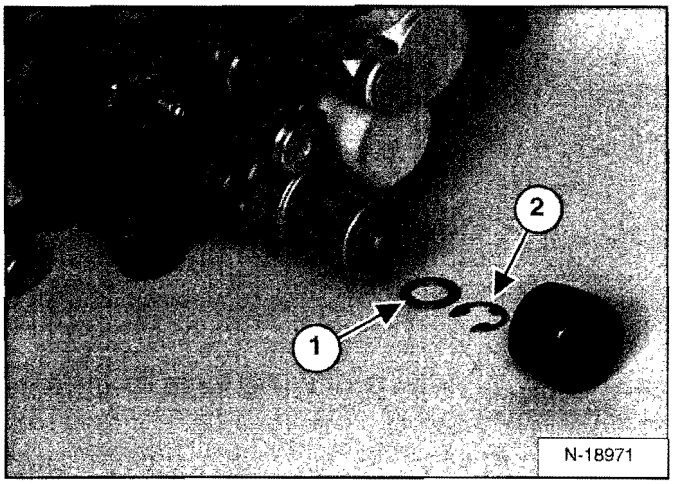
Install the detent bonnet (Item 1) **[Figure 20-40-85]**.

Install the mounting screws (Item 2) **[Figure 20-40-85]**.

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

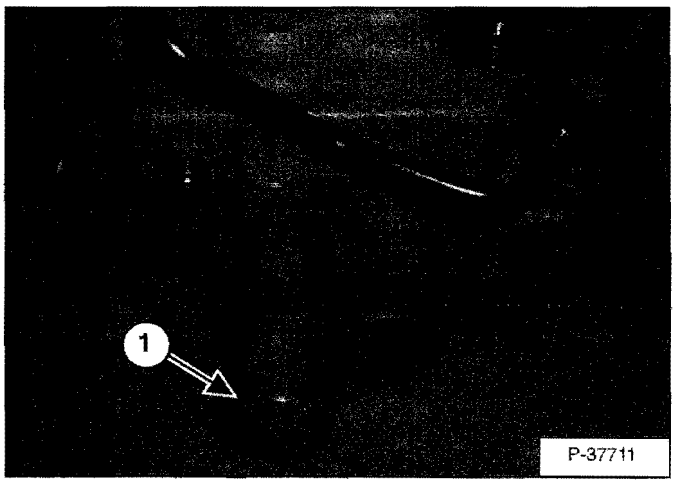
Lift Spool And Detent Installation

Figure 20-40-86



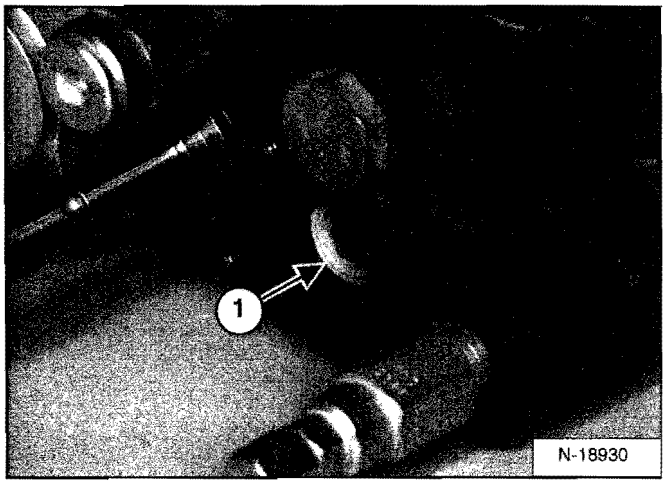
Install the washer (Item 1) and snap ring (Item 2) **[Figure 20-40-86]**.

Figure 20-40-87



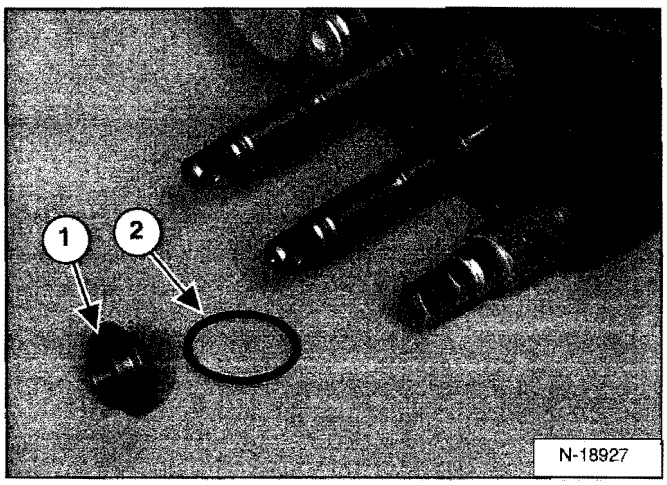
Install the end cap (Item 1) **[Figure 20-40-87]**.

Figure 20-40-88



Install the spool seal (Item 1) **[Figure 20-40-88]** on the linkage end of the valve.

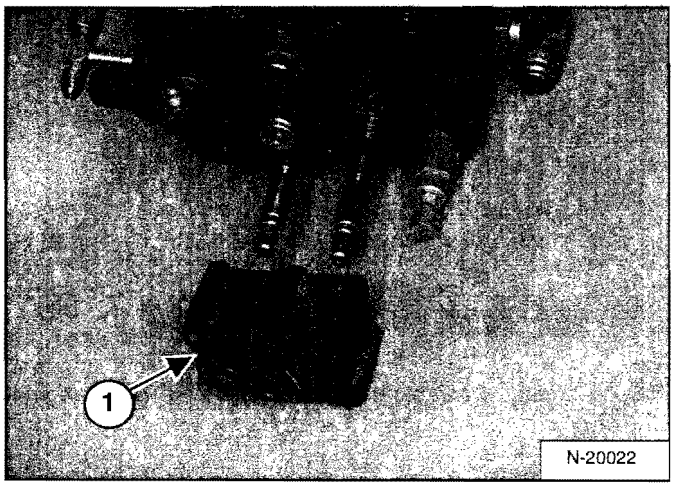
Figure 20-40-89



Install the bushing (Item 1) and O-ring (Item 2) **[Figure 20-40-89]** on the linkage end of the lift spool.

Lift Spool And Detent Installation (Cont'd)

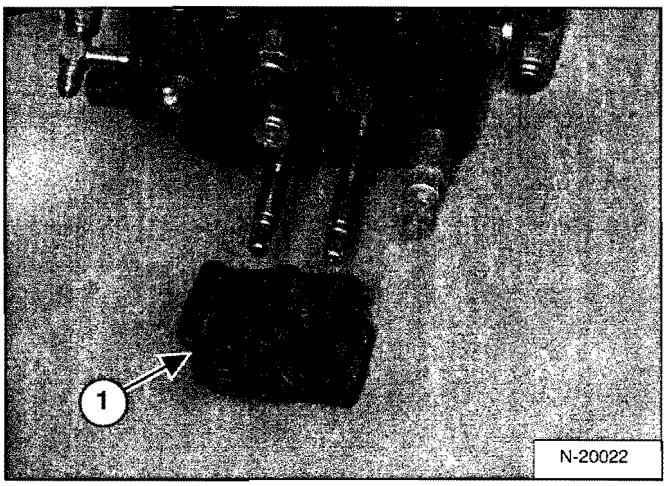
Figure 20-40-90



Install the lift and tilt lock block (Item 1) **[Figure 20-40-90]**. (See Lift And Tilt Lock Block on Page 20-40-15.)

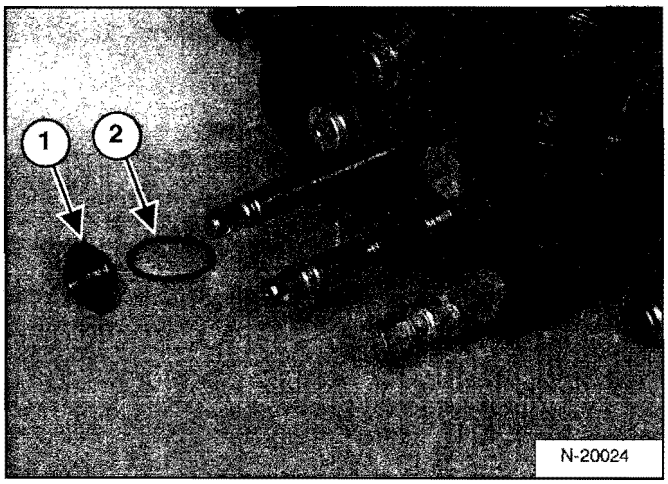
Tilt Spool Removal And Installation

Figure 20-40-91



Remove the lift and tilt lock block (Item 1) **[Figure 20-40-91]** from the control valve. (See Lift And Tilt Lock Block on Page 20-40-15.)

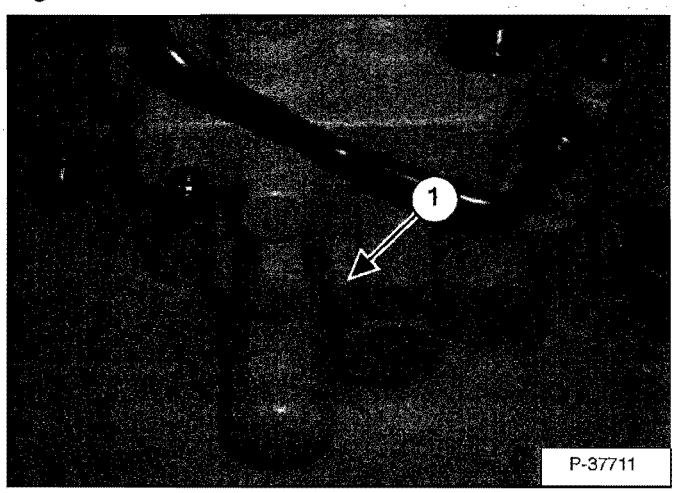
Figure 20-40-92



Remove the bushing (Item 1) and O-ring (Item 2) **[Figure 20-40-92]** from the tilt spool.

Tilt Spool Removal And Installation (Cont'd)

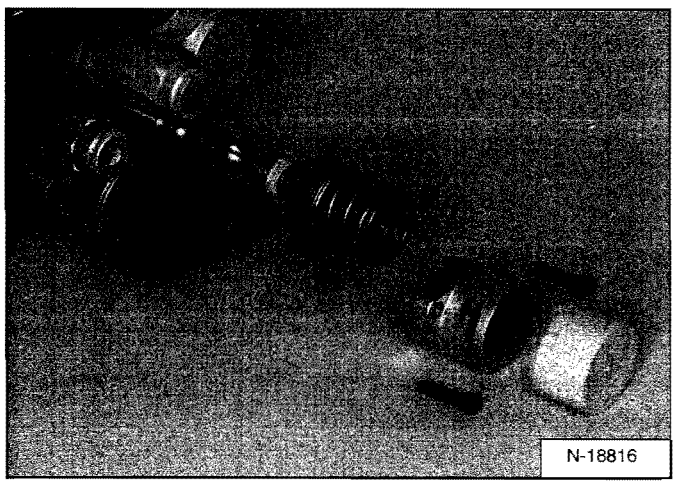
Figure 20-40-93



Remove the screws (Item 1) **[Figure 20-40-93]** from the end cap.

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

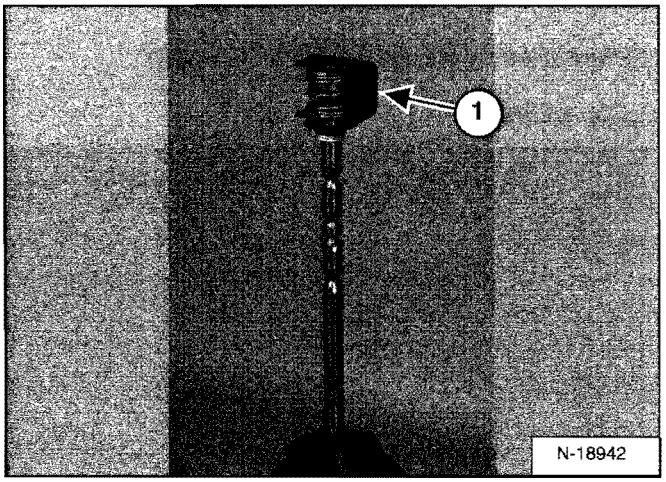
Figure 20-40-94



Remove the spool, centering spring, back-up washer and spool seal **[Figure 20-40-94]**.

Assembly: Always use a new spool seal.

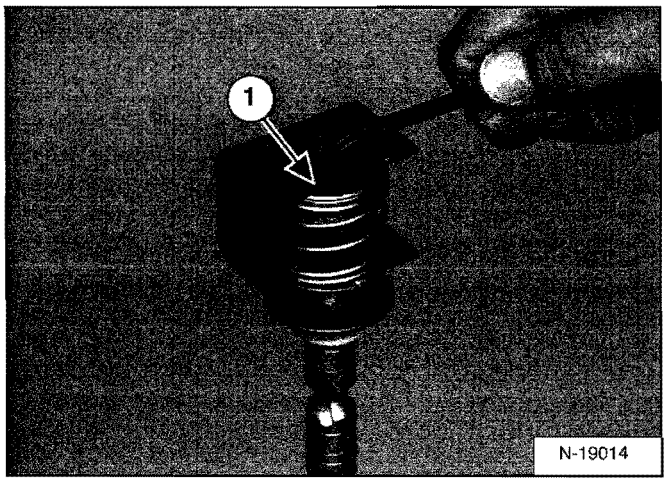
Figure 20-40-95



Put the linkage end of the spool in the vice **[Figure 20-40-95]**.

Install the spool tool (Item 1) **[Figure 20-40-95]** over the centering spring.

Figure 20-40-96



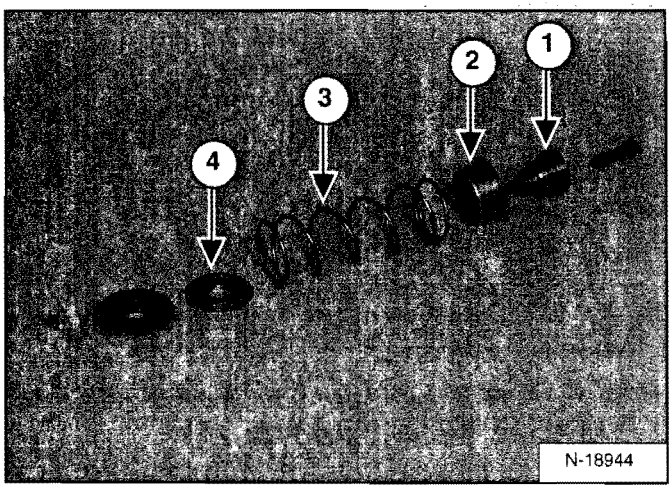
Remove the bolt (Item 1) **[Figure 20-40-96]** holding the centering spring to the spool.

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

Remove spring tool from the spring assembly.

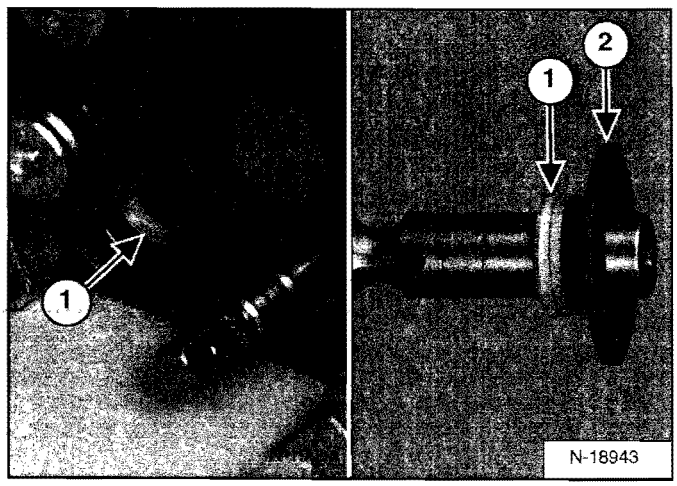
Tilt Spool Removal And Installation (Cont'd)

Figure 20-40-97



Inspect the adapter (Item 1), collar (Item 2), spring (Item 3) and washer (Item 4) **[Figure 20-40-97]**.

Figure 20-40-98

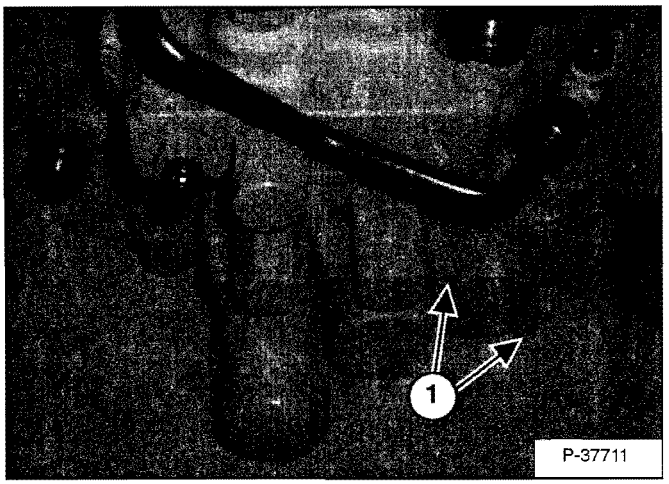


Remove the spool seal(s) (Item 1) and the back-up washer (Item 2) **[Figure 20-40-98]**.

Assembly: Always use a new spool seal.

Auxiliary Spool Removal And Installation

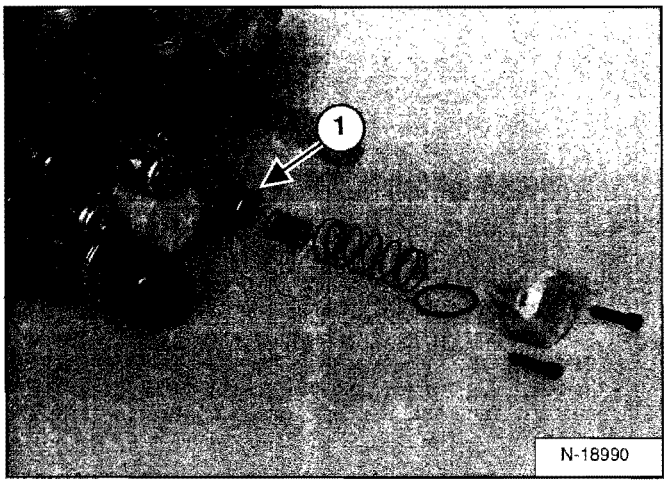
Figure 20-40-99



Remove the screws (Item 1) **[Figure 20-40-99]** from the end cap.

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

Figure 20-40-100



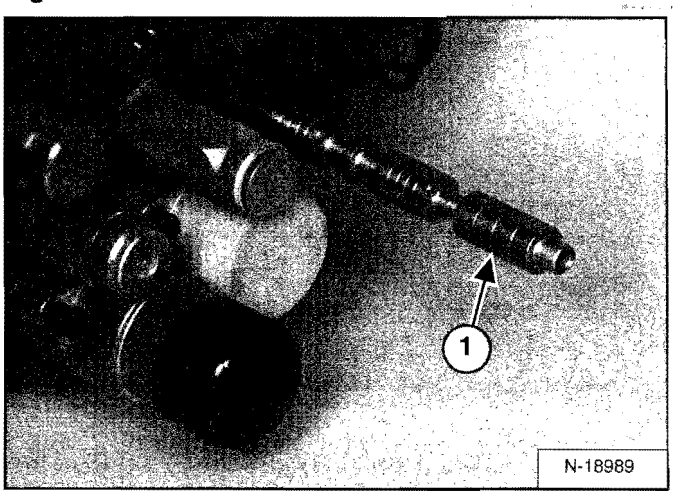
Remove the end cap, O-ring, springs and centering spring retainer **[Figure 20-40-100]**.

NOTE: If the centering spring retainer (Item 1) [Figure 20-40-100] must be replaced, replace the retainer on the opposite end also.

Assembly: Always use a new spool seal.

Auxiliary Spool Removal And Installation (Cont'd)

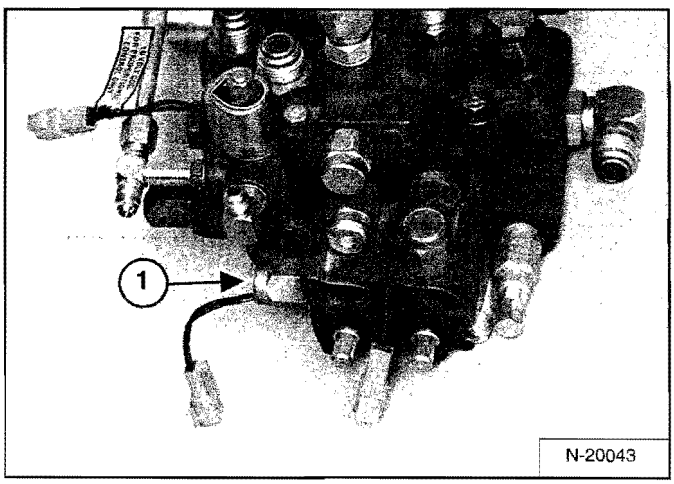
Figure 20-40-101



Remove the spool (Item 1) **[Figure 20-40-101]**.

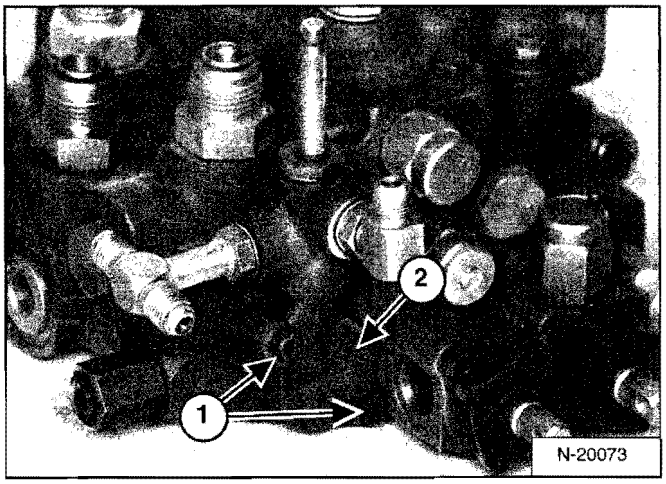
Assembly: Put grease on all the centering spring component parts.

Figure 20-40-102



Remove the lock solenoid (Item 1) **[Figure 20-40-102]** from the tilt lock block.

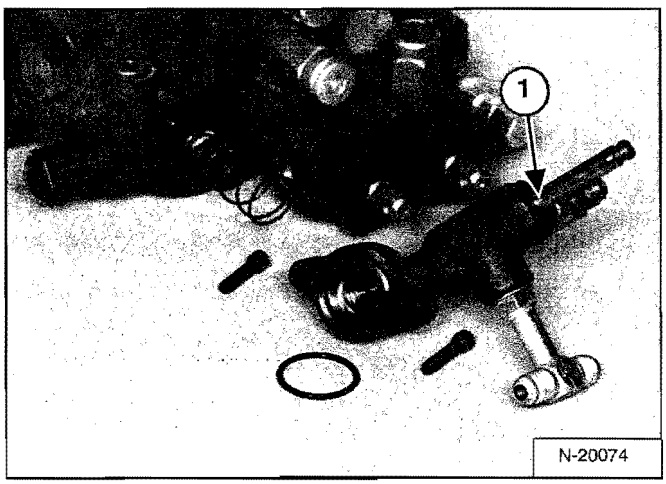
Figure 20-40-103



Remove the screws (Item 1) from the auxiliary bleed block (Item 2) **[Figure 20-40-103]**.

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

Figure 20-40-104

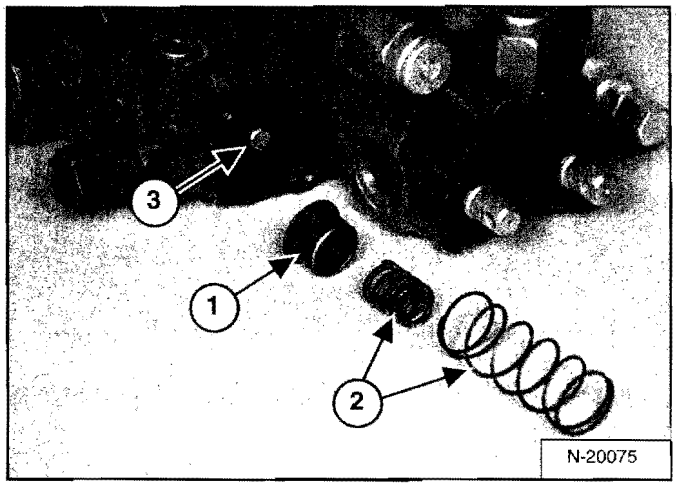


Remove the auxiliary bleed block (Item 1) **[Figure 20-40-104]** and O-ring.

Assembly: Always use a new O-ring.

Auxiliary Spool Removal And Installation (Cont'd)

Figure 20-40-105



Remove the centering spring retainer (Item 1) and springs (Item 2) **[Figure 20-40-105]**.

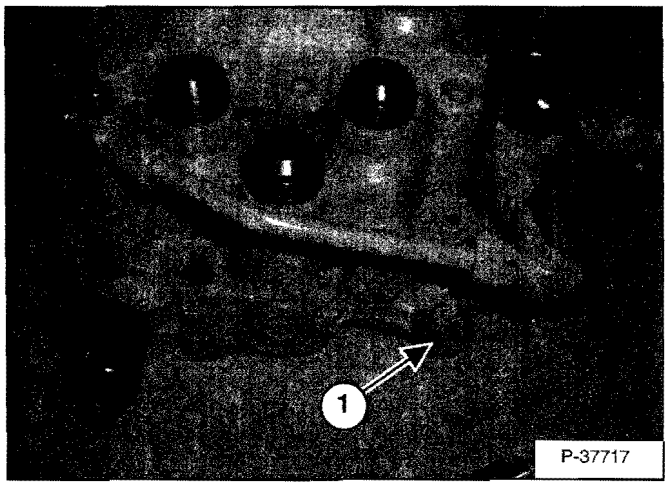
Remove the spool (Item 3) **[Figure 20-40-105]**.

Assembly: Put grease on all the centering spring component parts.

NOTE: If the centering spring retainer (Item 1) [Figure 20-40-105] must be replaced, replace the retainer on the opposite end also.

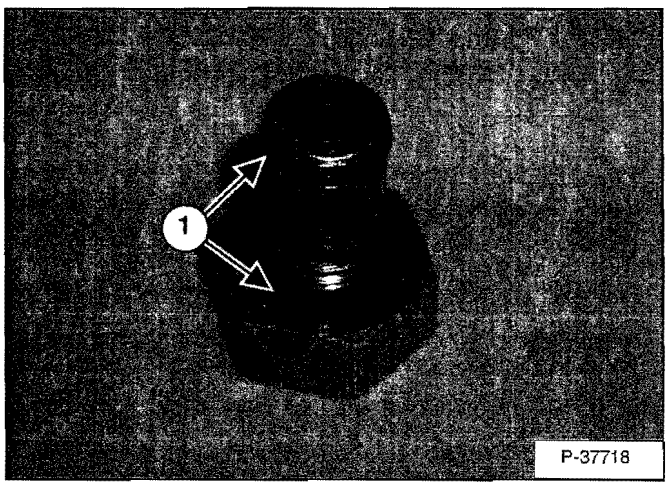
Auxiliary Plug Removal And Installation

Figure 20-40-106



Remove the plug (Item 1) **[Figure 20-40-106]** auxiliary section of the control valve.

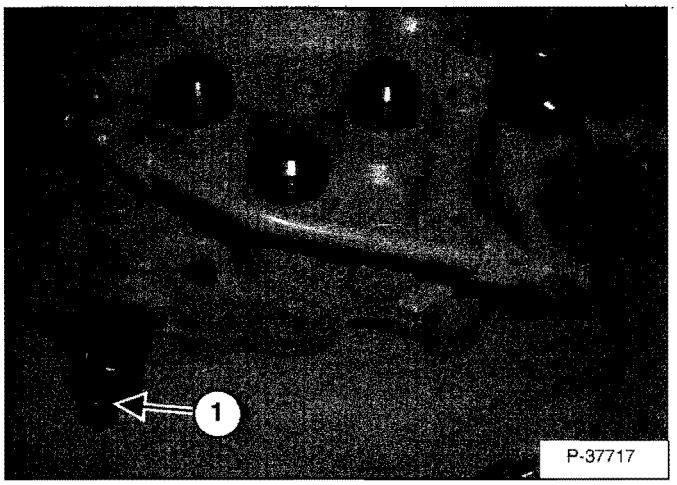
Figure 20-40-107



Replace the O-rings (Item1) **[Figure 20-40-107]**.

Auxiliary Electric Solenoid Disassembly

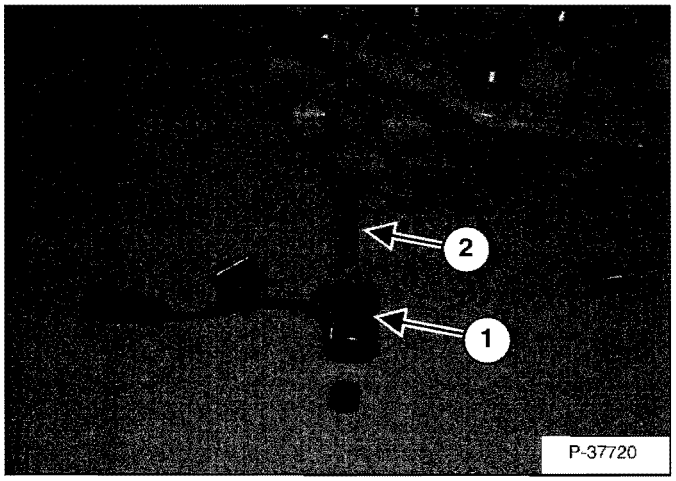
Figure 20-40-108



Remove the nut (Item 1) **[Figure 20-40-108]** from both solenoids.

Installation: Tighten the nut to 8-12 ft.-lbs. (11-16 Nm) torque.

Figure 20-40-109

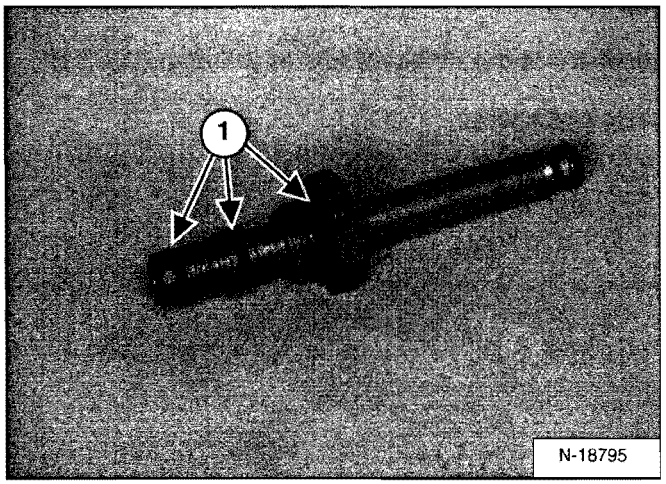


Remove the coil (Item 1) **[Figure 20-40-109]** from the stem.

Remove the stem (Item 2) **[Figure 20-40-109]** from the valve.

Installation: Tighten the stem to 8-12 ft.-lbs. (11-16 Nm) torque.

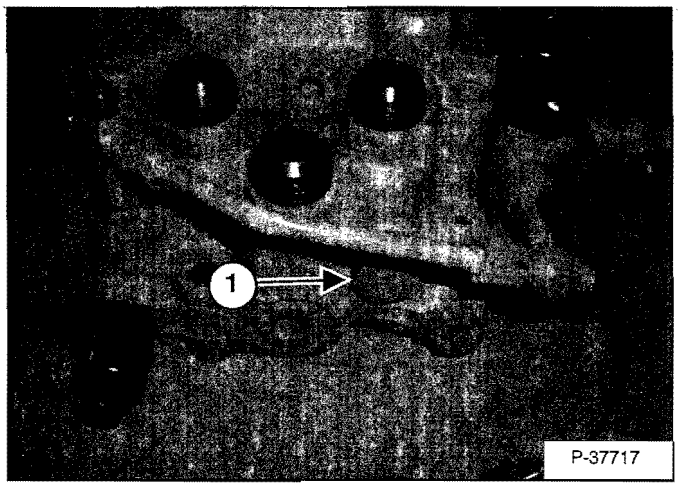
Figure 20-40-110



Remove the O-rings (Item 1) **[Figure 20-40-110]** from the solenoid stem.

Port-Auxiliary Section Removal And Installation

Figure 20-40-111



Remove the plug (Item 1) **[Figure 20-40-111]** or optional port relief valve from the control valve.

NOTE: Optional port relief (Item 1) [Figure 20-40-111] is 3500 PSI (24129 kPa).

Figure 20-40-112

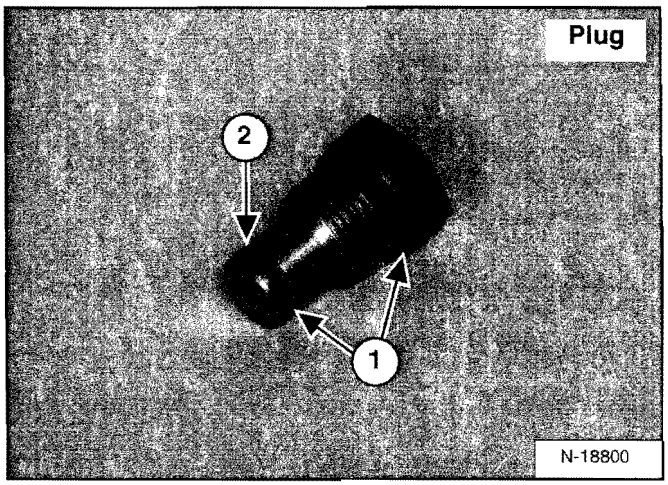
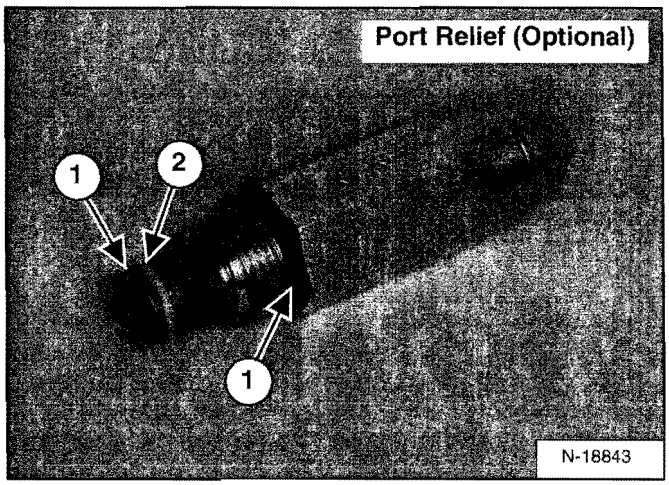


Figure 20-40-113



Remove the O-rings (Item 1) **[Figure 20-40-112]** & **[Figure 20-40-113]** and back-up ring (Item 2) **[Figure 20-40-112]** & **[Figure 20-40-113]** from the plug or relief valve.

Cleaning And Inspection

Clean all components with clean solvent and dry with compressed air.

Check the spools for wear or scratches.

Check that the spools are not loose in their bore.

Check that the centering springs are not broken.

Check that the load check valve seats are not worn.

Check the load check poppets for damage.

Check the rubber boots and retainers.

Replace the parts as needed.

Use new O-rings and back-up rings.

Apply oil to all new O-rings and back-up rings before installation.

HYDRAULIC CONTROL VALVE (ADVANCED CONTROL SYSTEM) (ACS)

Actuator Removal And Installation (In Loader)

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

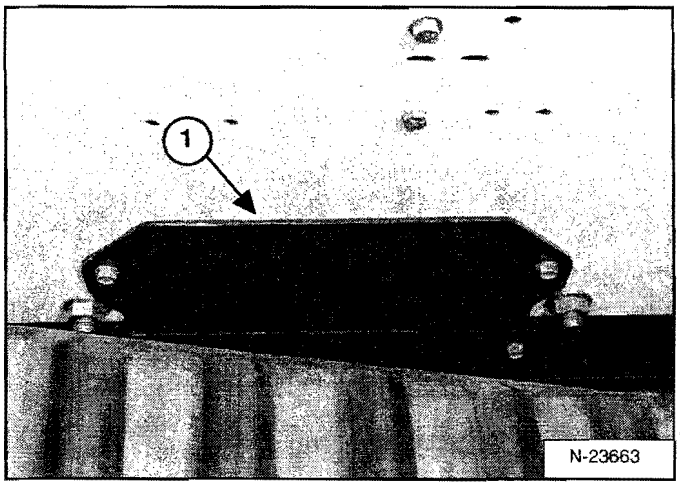
⚠ WARNING

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

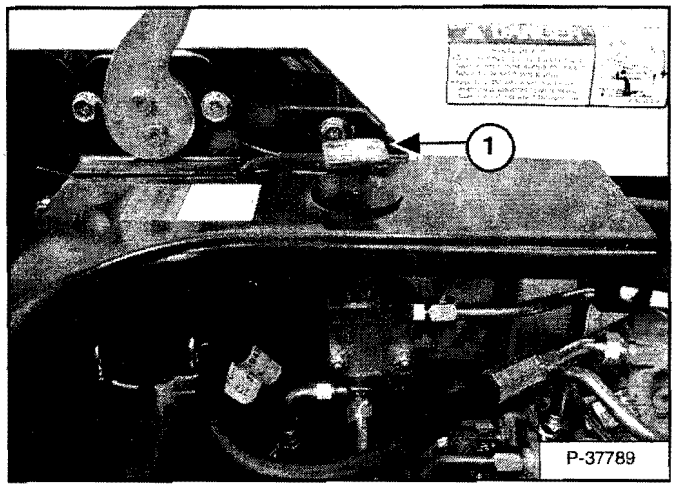
Stop the engine. Raise the seat bar.

Figure 20-41-1



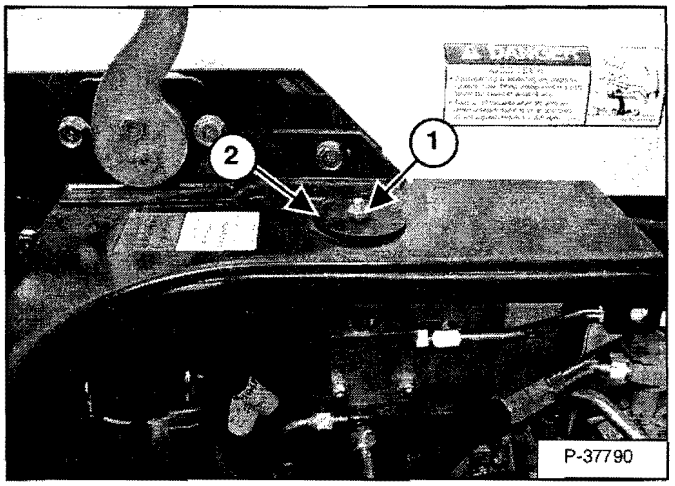
Remove the access cover (Item 1) **[Figure 20-41-1]** from the right side of the loader frame.

Figure 20-41-2



Remove the by-pass control knob (Item 1) **[Figure 20-41-2]** from the lift arm by-pass valve.

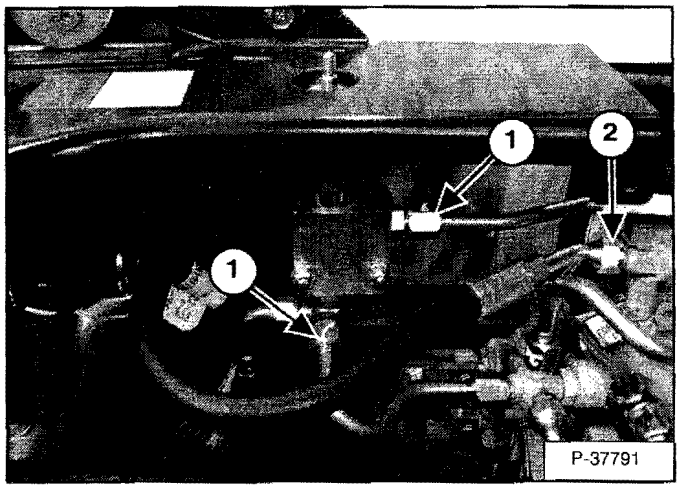
Figure 20-41-3



Remove the jam nut (Item 1) and the rubber washer (Item 2) **[Figure 20-41-3]** from the lift arm by-pass valve.

Actuator Removal And Installation (In Loader) (Cont'd)

Figure 20-41-4

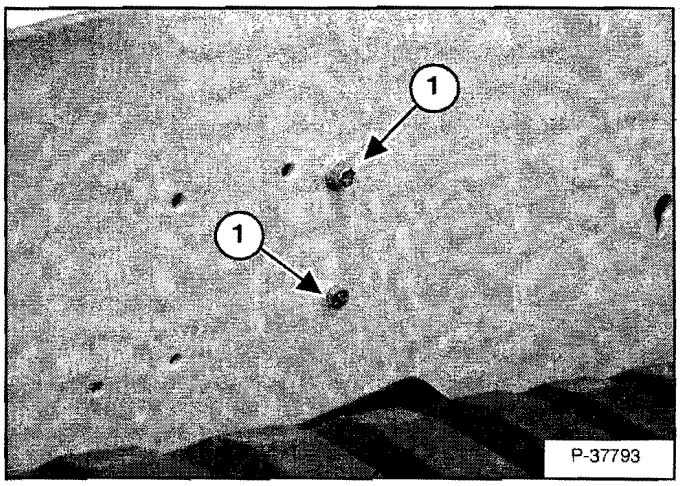


Disconnect the two tubelines (Item 1) **[Figure 20-41-4]** from the lift arm by-pass valve.

Disconnect the hydraulic hose (Item 2) **[Figure 20-41-4]** from the control valve.

Cap and plug the fittings and hose.

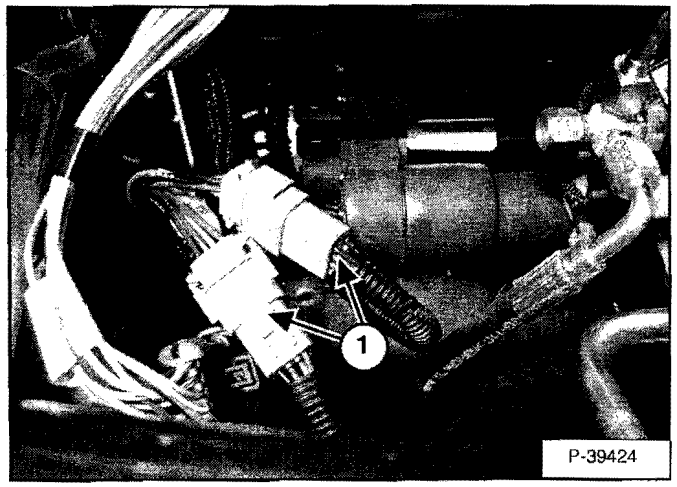
Figure 20-41-5



Remove the two mount bolts (Item 1) **[Figure 20-41-5]** from the lift arm by-pass valve/brake valve mounting bracket.

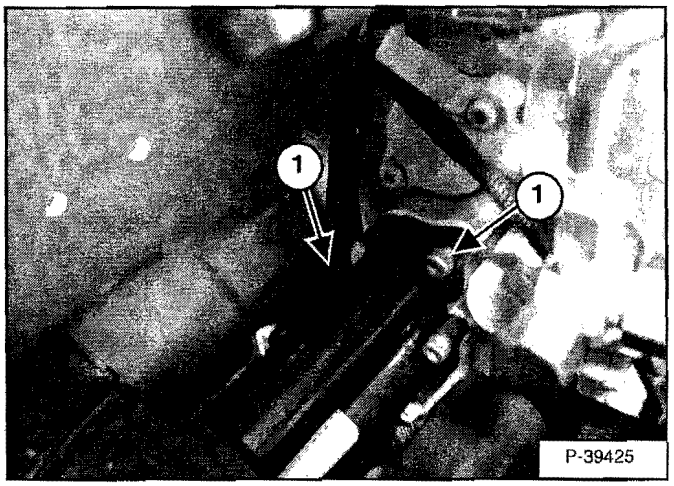
Move the lift arm by-pass valve/brake valve down into the fender to allow room for the actuator removal.

Figure 20-41-6



Disconnect the actuator wire connectors (Item 1) **[Figure 20-41-6]** from the actuators.

Figure 20-41-7

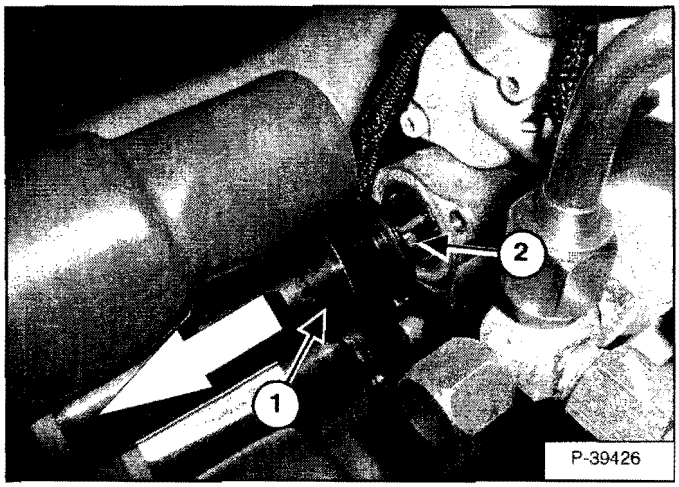


Remove the two actuator mount bolts (Item 1) **[Figure 20-41-7]**from the top actuator.

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

Actuator Removal And Installation (In Loader) (Cont'd)

Figure 20-41-8

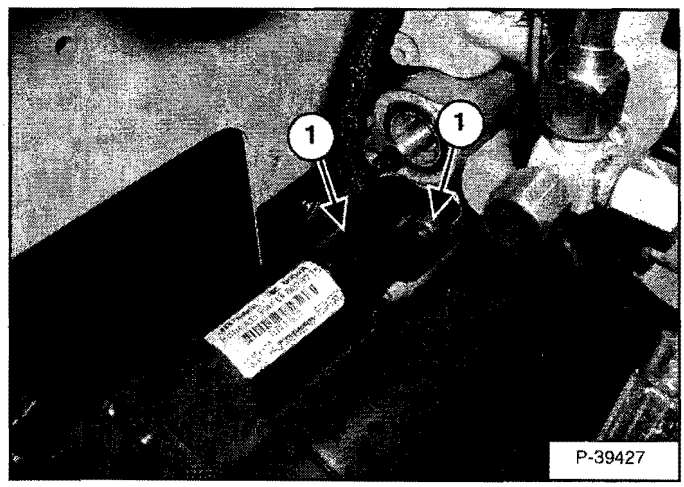


Slide the actuator (Item 1) **[Figure 20-41-8]** away from the control valve.

With a punch, remove the actuator pin (Item 2) **[Figure 20-41-8]** from the actuator and spool.

Remove the upper actuator from the loader.

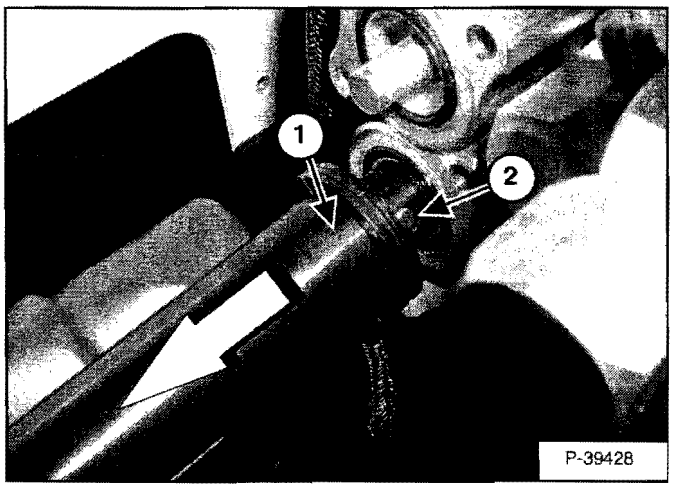
Figure 20-41-9



Remove the two actuator mount bolts (Item 1) **[Figure 20-41-9]** from the bottom actuator.

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

Figure 20-41-10



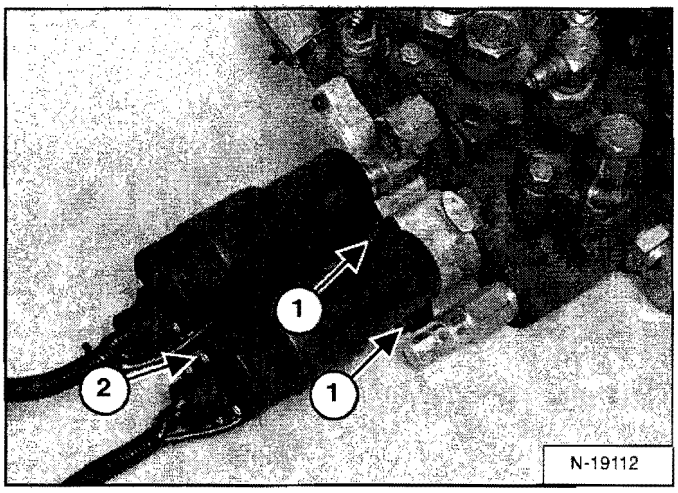
Slide the actuator (Item 1) **[Figure 20-41-10]** away from the control valve.

With a punch, remove the actuator pin (Item 2) **[Figure 20-41-10]** from the actuator and spool.

Remove the bottom actuator from the loader.

Actuator Removal And Installation (Out Of Loader)

Figure 20-41-11

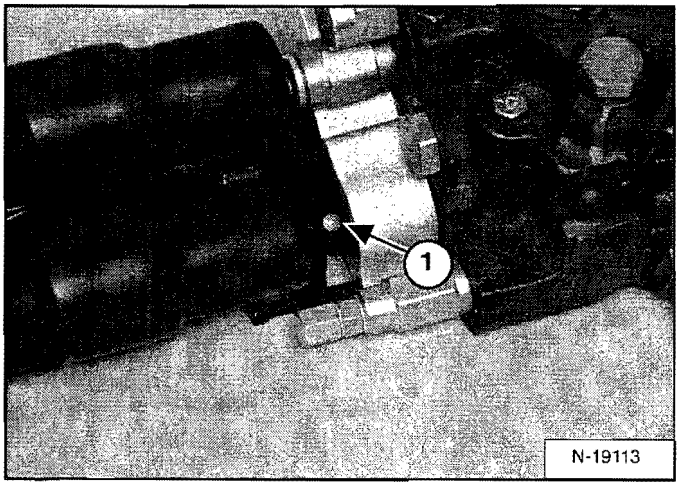


Remove the two screws (Item 1) **[Figure 20-41-11]** on the actuator retainer.

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

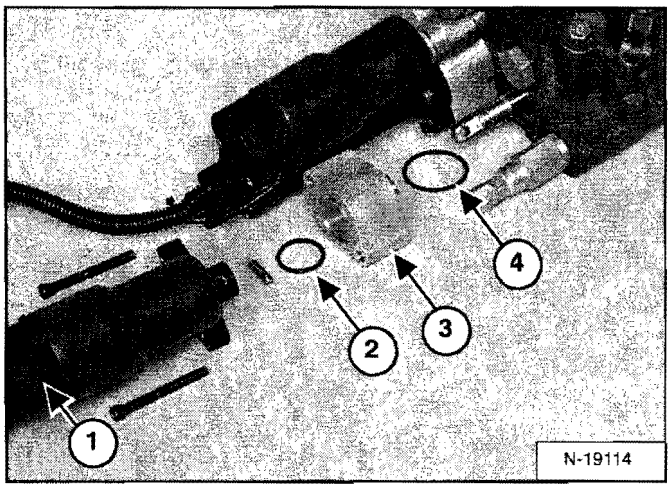
Pull the actuator (Item 2) **[Figure 20-41-11]** away from the control valve.

Figure 20-41-12



Use a drift pin and hammer to remove the actuator pin (Item 1) **[Figure 20-41-12]** from the actuator and the lift or tilt spool.

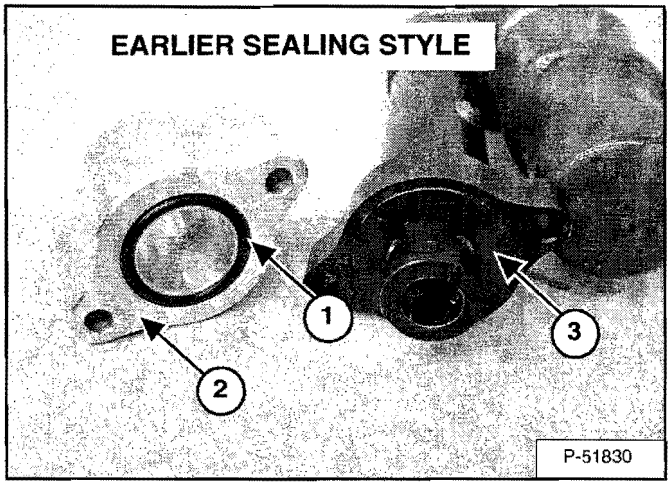
Figure 20-41-13



Remove the actuator (Item 1), the O-ring (Item 2), the spacer block (Item 3) and O-ring (Item 4) **[Figure 20-41-13]**.

NOTE: There are two types of sealing designs used on the actuators and the actuator mounts.

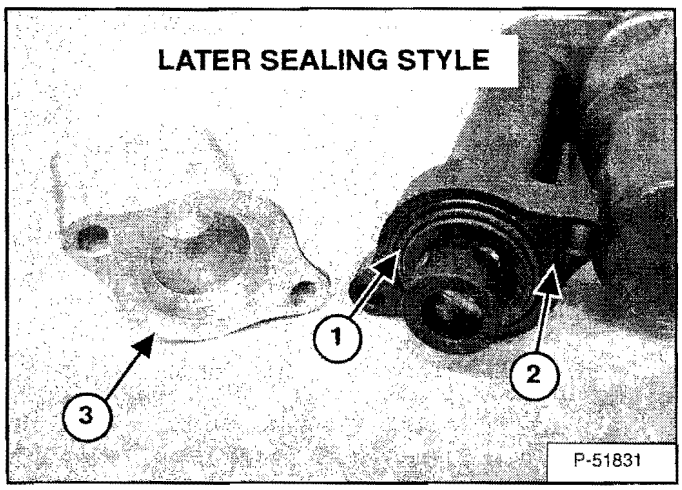
Figure 20-41-14



The earlier style has the O-ring (Item 1) in the actuator mount (Item 2). The actuator sealing face (Item 3) **[Figure 20-41-14]** has a flat face and no O-ring.

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

Figure 20-41-15



The later style has the O-ring (Item 1) in the actuator sealing face (Item 2). The actuator mount (Item 3) **[Figure 20-41-15]** has no O-ring.

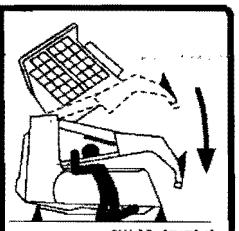
NOTE: The later style actuator can replace the earlier style actuator as long as the actuator mount is changed to the later style actuator mount.

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

Raise the lift arms and install an approved lift arm support device.

Stop the engine. Raise the seat bar.

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

Drain the hydraulic reservoir. (See Contents Page 20-01.)

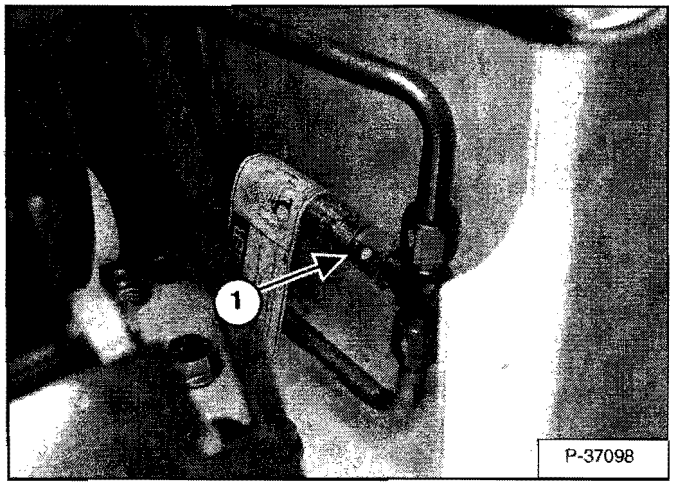
Remove the control panel. (See Contents Page 50-01.)

Remove the control valve actuators. (See Actuator Removal And Installation (In Loader) on Page 20-41-1.)

Clean area around control valve.

Open rear door.

Figure 20-41-16

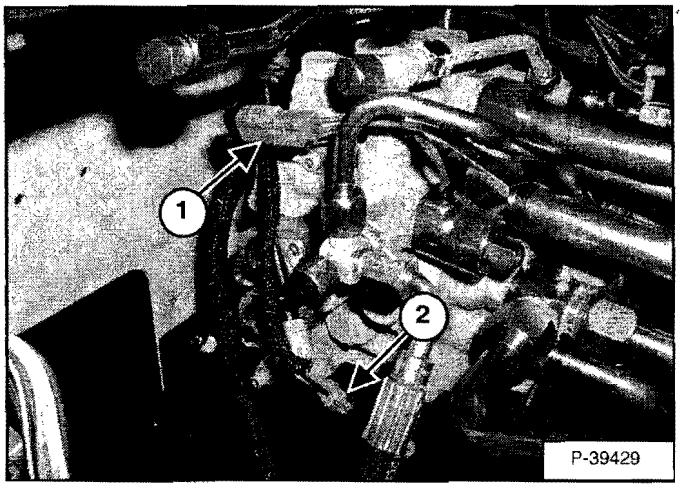


The fixed end main valve hose assembly (Item 1) **[Figure 20-41-16]** is connected to a fixed end fitting on the control valve. The hose is routed to the right side upright where the hose is connected to a tee fitting that feeds the base end of both lift cylinders. The hose can only be removed by first removing it from the tee fitting located at the rear of the loader.

Cap and plug the hose and fitting.

Removal And Installation (Cont'd)

Figure 20-41-17

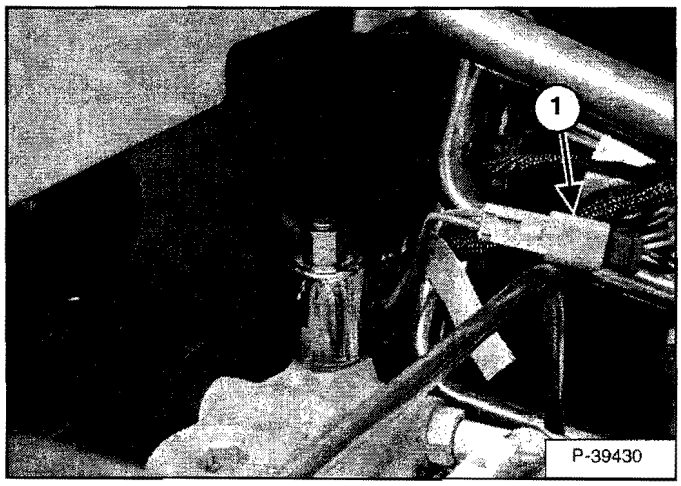


Mark the wire connectors for proper installation.

Disconnect the electrical connector (Item 1) **[Figure 20-41-17]** from the auxiliary spool solenoid.

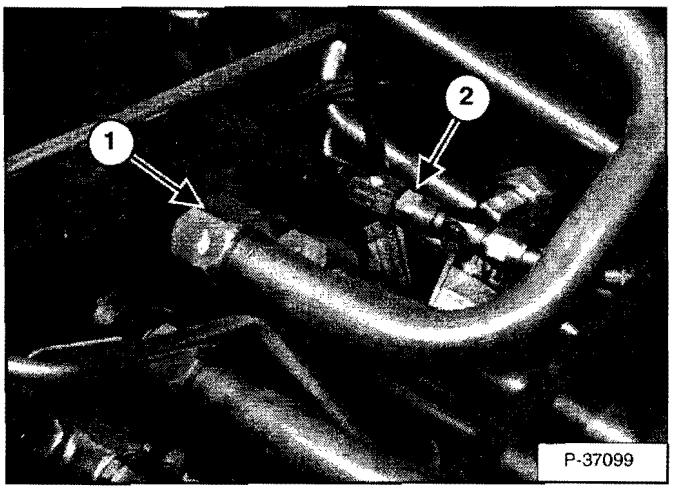
Disconnect the electrical connector (Item 2) **[Figure 20-41-17]** from the BICS valve solenoid.

Figure 20-41-18



Disconnect the electrical connector (Item 1) **[Figure 20-41-18]** from the auxiliary spool solenoid.

Figure 20-41-19

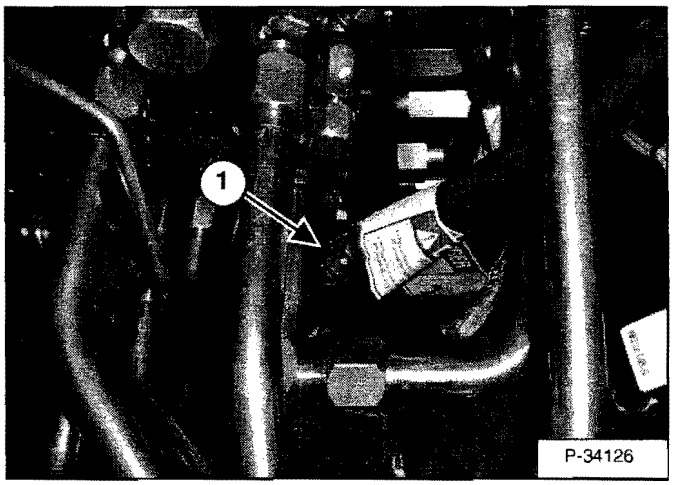


Disconnect the tubeline (Item 1) **[Figure 20-41-19]** that goes from the control valve to the hydraulic cooler.

Disconnect the charge pressure sender (Item 2) **[Figure 20-41-19]** from the control valve.

Cap and plug the tubelines and fittings.

Figure 20-41-20



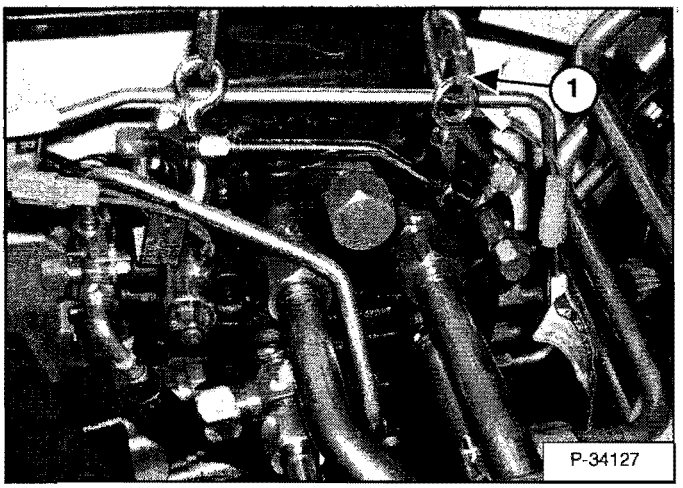
Loosen the fixed end main valve hose assembly (Item 1) **[Figure 20-41-20]** from the control valve.

The hose can be removed from the control valve by rotating the hose assembly.

Cap the hose and plug the fitting.

Removal And Installation (Cont'd)

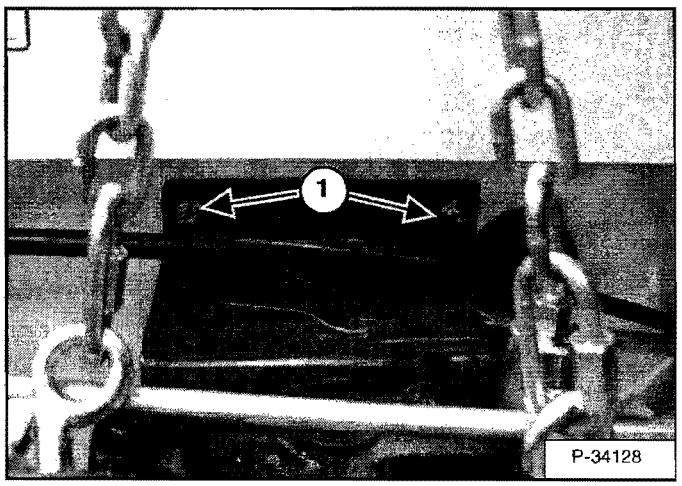
Figure 20-41-21



Install a chain hoist (Item 1) **[Figure 20-41-21]** to the control valve, and support the control valve.

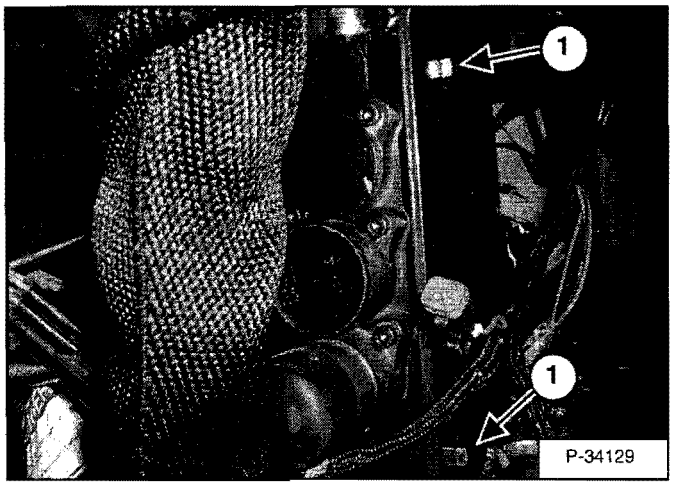
Loosen all the tubeline fittings connected to the control valve.

Figure 20-41-22



Remove the two control valve mount bracket mounting bolts (Item 1) **[Figure 20-41-22]**.

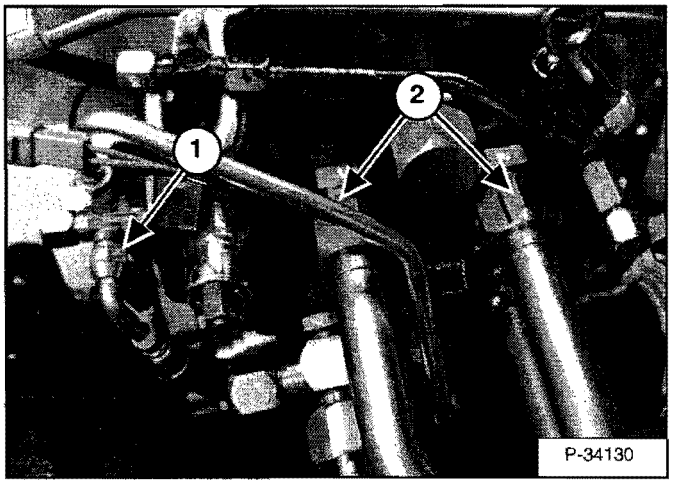
Figure 20-41-23



Remove the two control valve mount bolts (Item 1) **[Figure 20-41-23]** from the mounting plate.

Remove the control valve mount bracket from the loader.

Figure 20-41-24



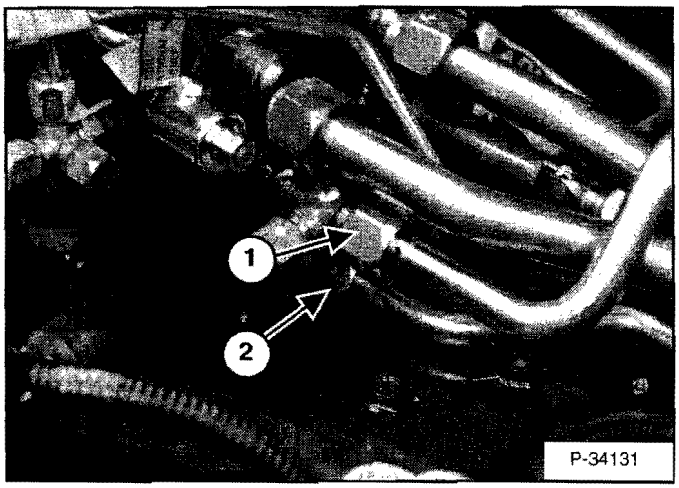
Disconnect the case drain hose (Item 1) **[Figure 20-41-24]** and cap the fitting and plug the hose.

Disconnect the two tubelines (Item 2) **[Figure 20-41-24]** from the auxiliary section of the control valve.

Cap the fittings and plug the tubelines.

Removal And Installation (Cont'd)

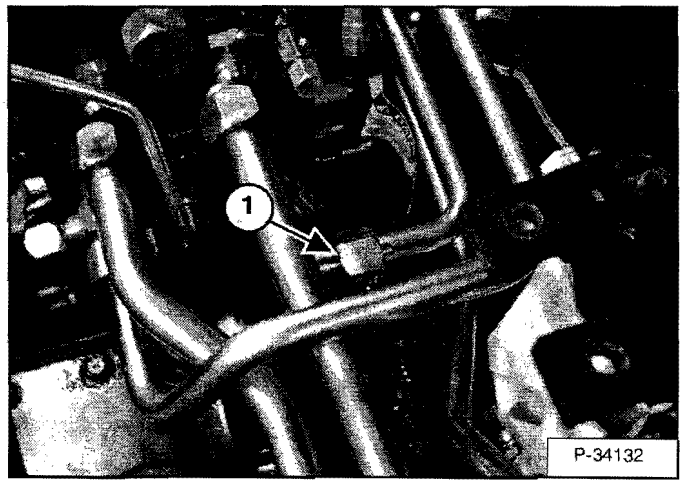
Figure 20-41-25



Disconnect the tilt tubeline (Item 1) **[Figure 20-41-25]** from the control valve.

Disconnect the lift tubeline (Item 2) **[Figure 20-41-25]** from the control valve.

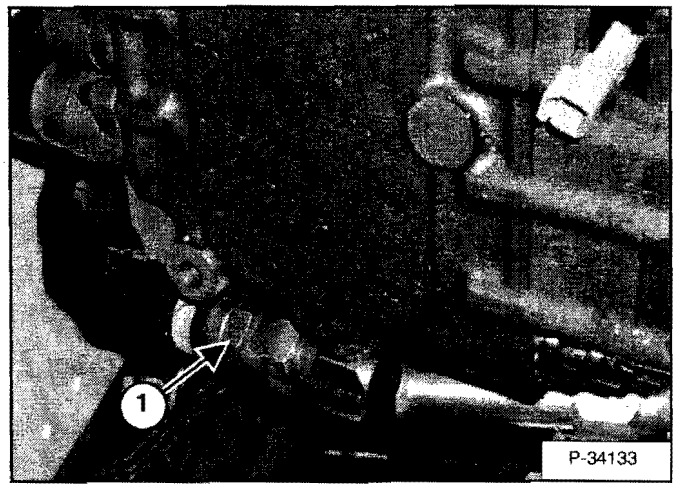
Figure 20-41-26



Disconnect the tilt tubeline (Item 1) **[Figure 20-41-26]** at the tee fitting.

Cap and plug the tubeline and fitting.

Figure 20-41-27



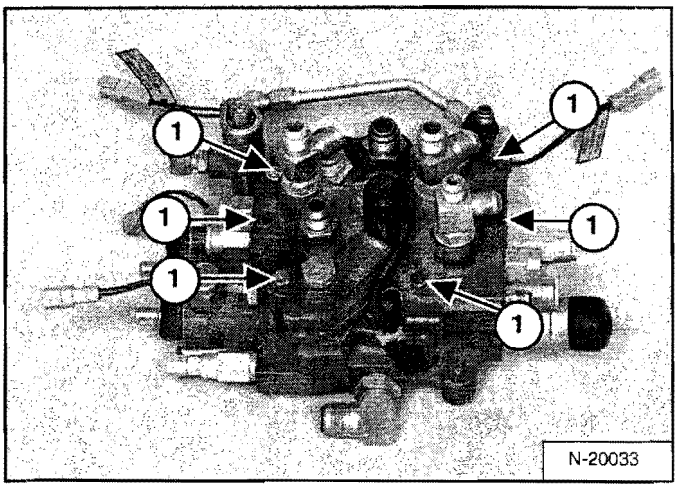
With a chain hoist, lift the control valve up and clear of the tubelines **[Figure 20-41-27]**.

Disconnect the hydraulic hose (Item 1) **[Figure 20-41-27]** that comes from the back of the gear pump to the bottom of the control valve.

Remove the control valve from the loader.

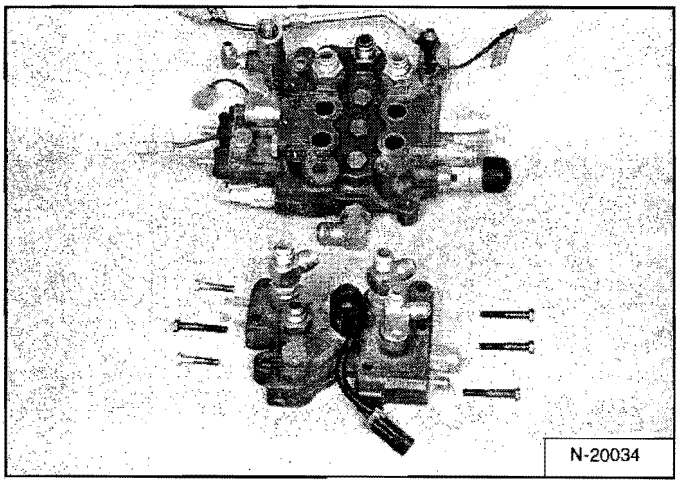
BICS™ Valve, Removal And Installation

Figure 20-41-28



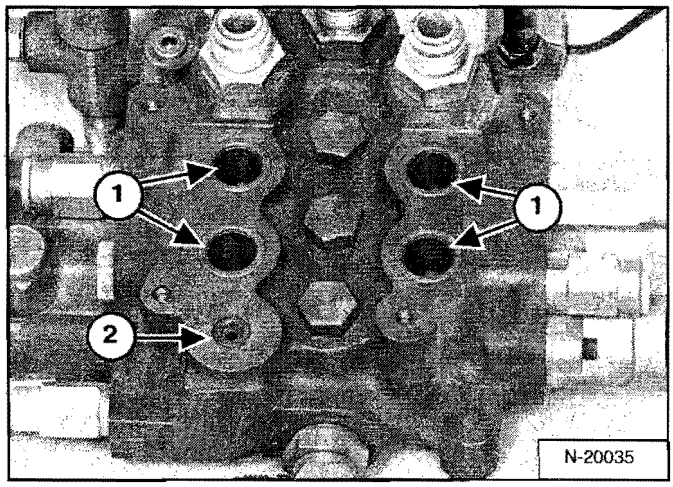
To remove the BICS™ valve from the control valve, loosen and remove the six mounting bolts (Item 1) **[Figure 20-41-28]**.

Figure 20-41-29



Remove the BICS™ valve assembly from the top of the control valve **[Figure 20-41-29]**.

Figure 20-41-30

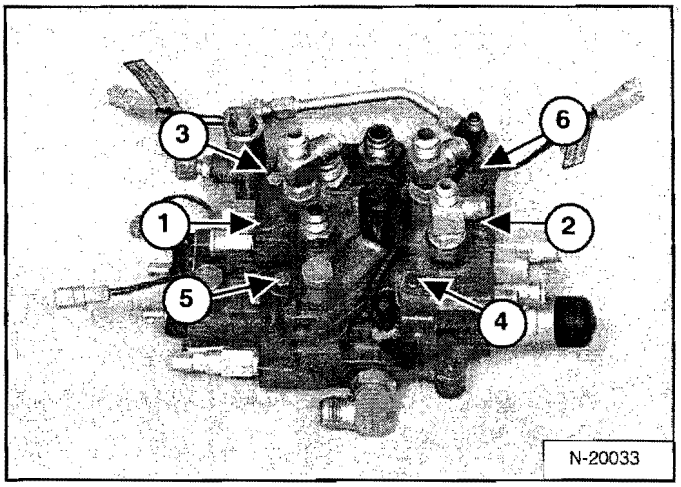


Remove the four large O-rings (Item 1) and the small O-ring (Item 2) **[Figure 20-41-30]** from the top of the control valve.

Installation: Install the four large O-rings (Item 1) and the small O-ring (Item 2) **[Figure 20-41-30]** on the top of the control valve.

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

Figure 20-41-31



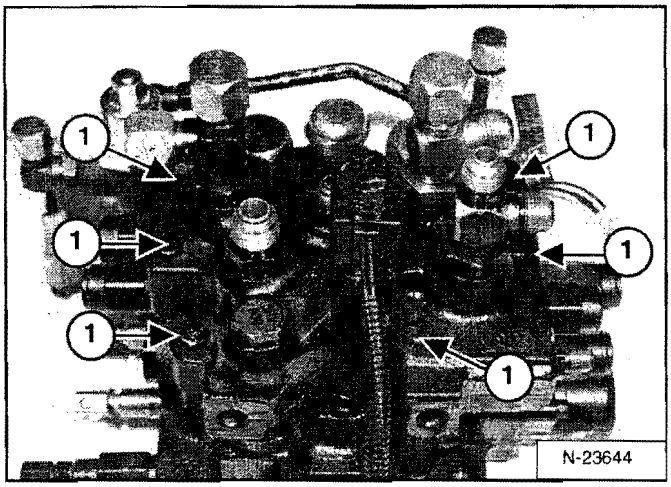
Install the six mounting bolts **[Figure 20-41-31]**.

The chart below lists the correct torque specifications and tightening sequence when reinstalling the BICS™ valve assembly to the control valve. Thoroughly clean and dry bolts and threads in valve. Use liquid adhesive LOCTITE #242 or equivalent.

Step	Torque	Sequence
1	110-130 in.-lbs. (12,4-14,7 Nm)	1, 2, 3, 4, 5 & 6
2	190-210 in.-lbs. (21,5-23,7 Nm)	
3*	190-210 in. lbs. (21,5-23,7 Nm)	

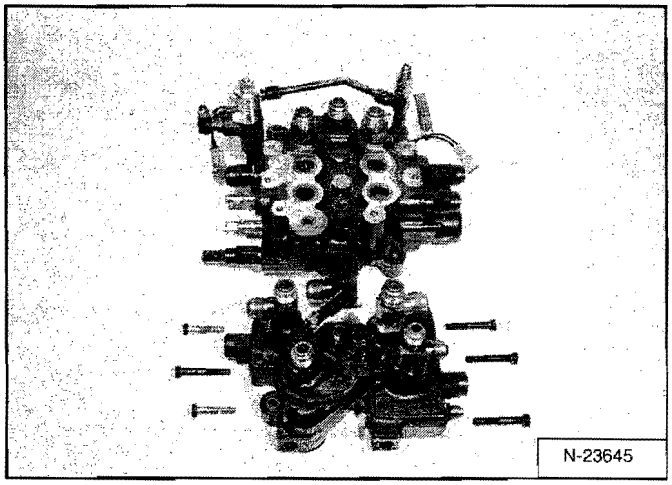
*Torque must be 190-210 in.-lbs. (21,5-23,7 Nm) for every bolt or repeat step 3.

Figure 20-41-32



To remove the BICS™ valve from the control valve, loosen and remove the six mounting bolts (Item 1) **[Figure 20-41-32]**.

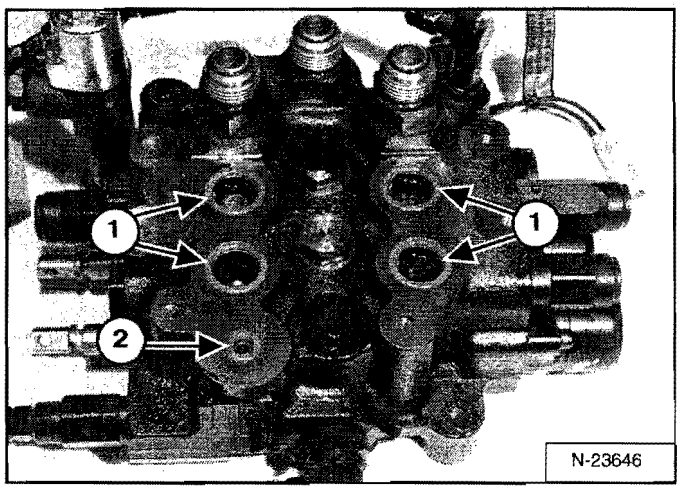
Figure 20-41-33



Remove the BICS™ valve assembly from the top of the control valve **[Figure 20-41-33]**.

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

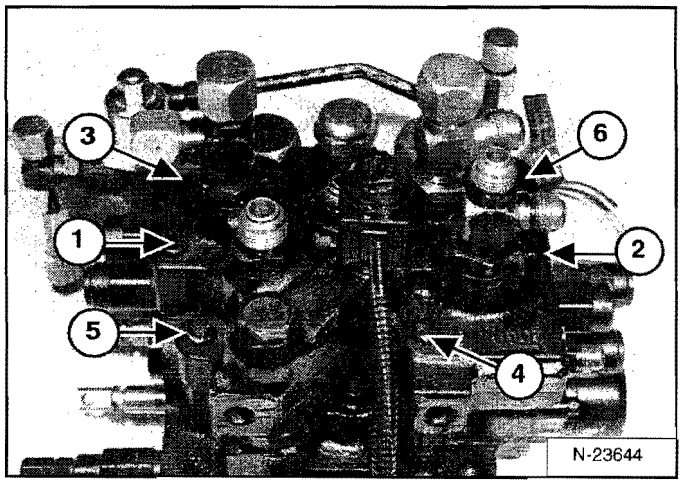
Figure 20-41-34



Remove the four large O-rings (Item 1) and the small O-ring (Item 2) **[Figure 20-41-34]** from the top of the control valve.

Install the four large O-rings (Item 1) and the small O-ring (Item 2) **[Figure 20-41-34]** on the top of the control valve.

Figure 20-41-35



Install the six mounting bolts **[Figure 20-41-35]**.

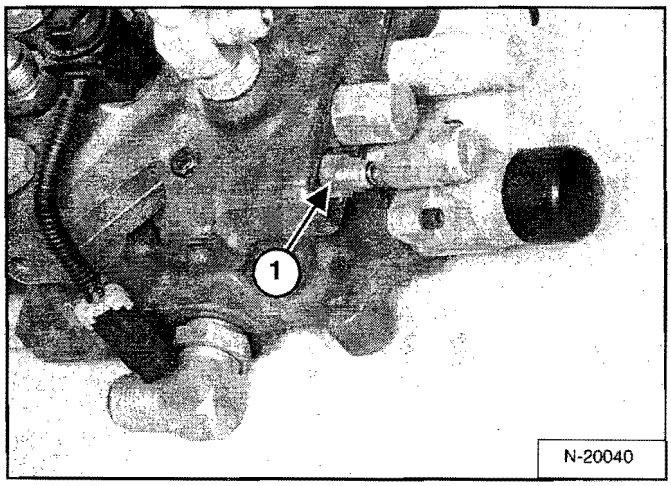
The chart below lists the correct torque specifications and tightening sequence when reinstalling the BICS™ valve assembly to the control valve. Thoroughly clean and dry bolts and threads in valve. Use liquid adhesive LOCTITE #242 or equivalent.

Step	Torque	Sequence
1	110-130 in.-lbs. (12,4-14,7 Nm)	1, 2, 3, 4, 5 & 6
2	190-210 in.-lbs. (21,5-23,7 Nm)	
3*	190-210 in. lbs. (21,5-23,7 Nm)	

*Torque must be 190-210 in.-lbs. (21,5-23,7 Nm) for every bolt or repeat step 3.

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

Figure 20-41-36



Remove the fitting (Item 1) **[Figure 20-41-36]** from the valve.

BICS™ Valve, Lift Arm By-Pass Orifice Disassembly And Assembly (Cont'd)

Figure 20-41-37

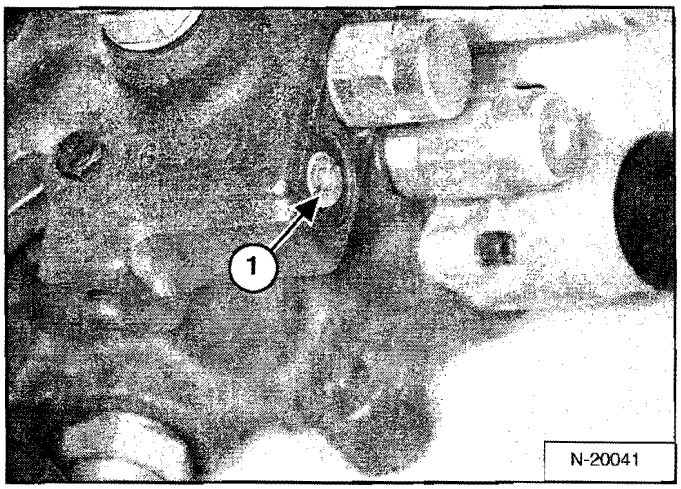
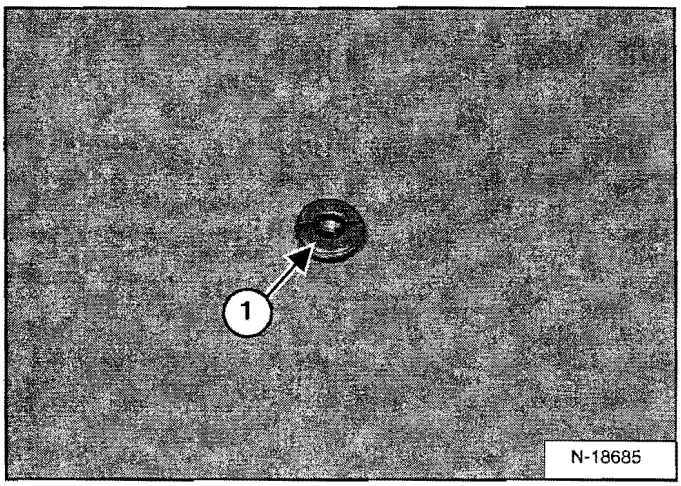


Figure 20-41-38



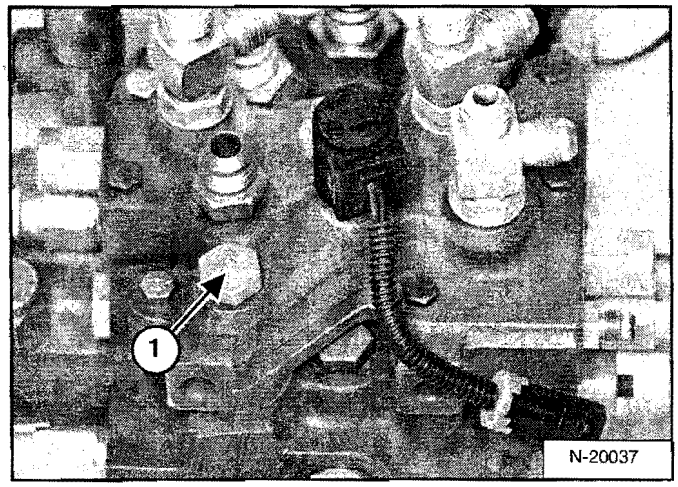
Using a flat blade screw driver, remove the lift arm by-pass orifice (Item 1) **[Figure 20-41-37]** & **[Figure 20-41-38]**.

Orifice size is 0.078 inch.

Reverse the removal procedure to install the lift arm by-pass orifice.

BICS™ Valve, Check Valve Disassembly And Assembly

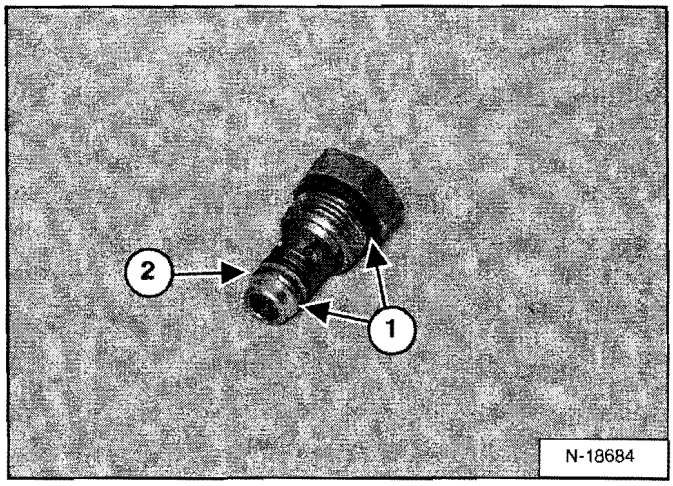
Figure 20-41-39



Remove the check valve (Item 1) **[Figure 20-41-39]**.

Installation: Tighten the valve to 20 ft.-lbs. (27 Nm) torque.

Figure 20-41-40



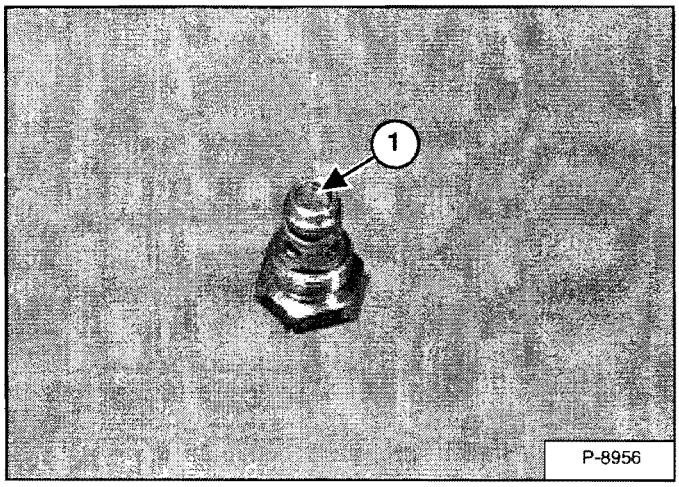
Remove the O-rings (Item 1) and back-up ring (Item 2) **[Figure 20-41-40]** from the check valve.

Install new O-rings and back-up ring on the check valve.

The check valve has a rating of 5-10 PSI.

BICS™ Valve, Check Valve Disassembly And Assembly (Cont'd)

Figure 20-41-41



Clean and inspect the screen (Item 1) **[Figure 20-41-41]** on the end of the valve.

BICS™ Valve, Lock Valve Disassembly And Assembly

Figure 20-41-42

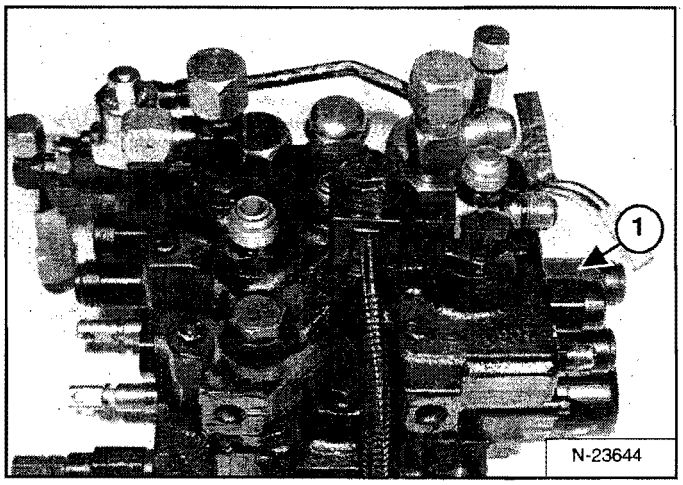


Figure 20-41-43

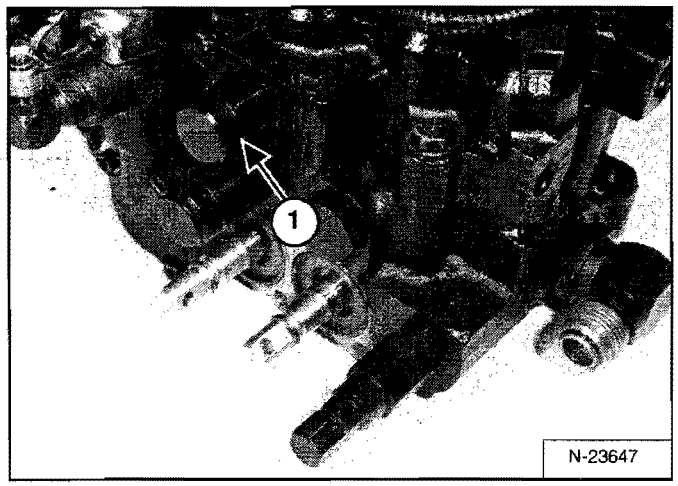
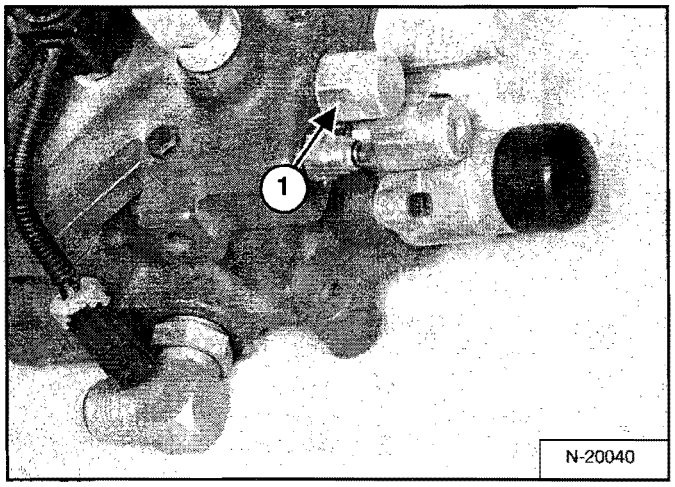


Figure 20-41-44

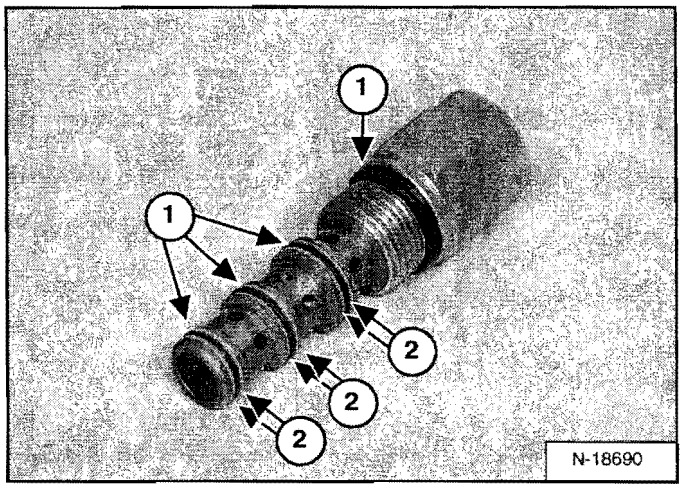


Remove the lock valves (Item 1) **[Figure 20-41-42]**, **[Figure 20-41-43]** & **[Figure 20-41-44]** from the BICS™ valve.

Installation: Tighten the lock valves to 25 ft.-lbs. (34 Nm) torque.

BICS™ Valve, Lock Valve Disassembly And Assembly (Cont'd)

Figure 20-41-45



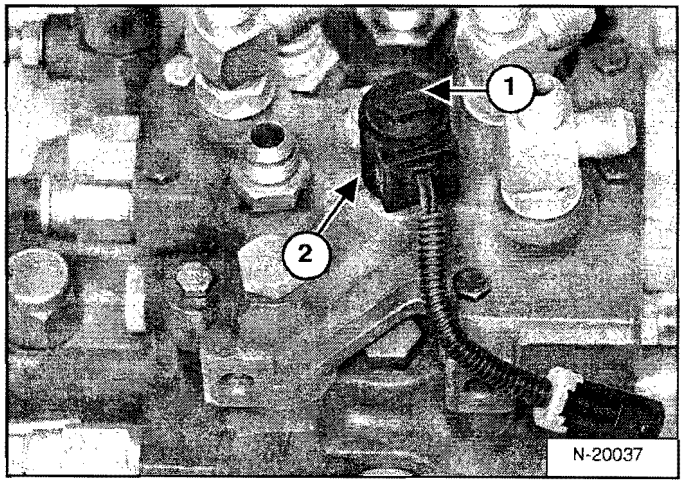
Remove the O-rings (Item 1) and back-up rings (Item 2) **[Figure 20-41-45]** from both the tilt and lift lock valves.

Install new O-rings (Item 1) and back-up rings (Item 2) **[Figure 20-41-45]** on the tilt and lift lock valves.

Reverse the removal procedure to install the lock valve.

BICS™ Valve, Solenoid Disassembly And Assembly

Figure 20-41-46



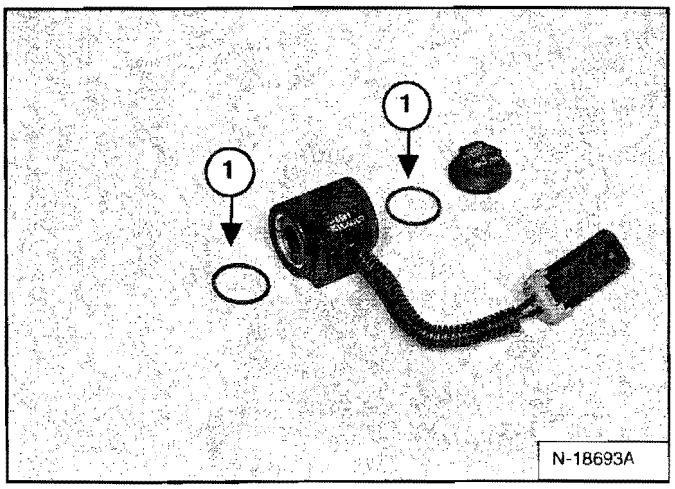
Remove the mounting nut (Item 1) **[Figure 20-41-46]** from the solenoid cartridge.

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

Remove the solenoid (Item 2) **[Figure 20-41-46]**.

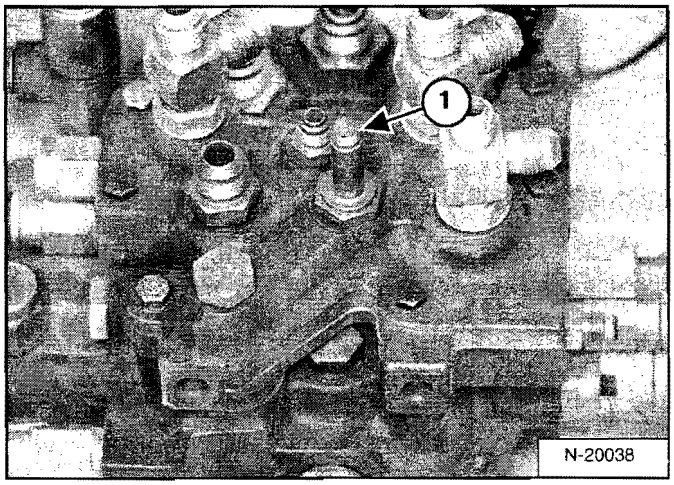
NOTE: The solenoid resistance is (8-10 ohms).

Figure 20-41-47



Remove the O-rings (Item 1) **[Figure 20-41-47]** from both ends of the solenoid.

Figure 20-41-48

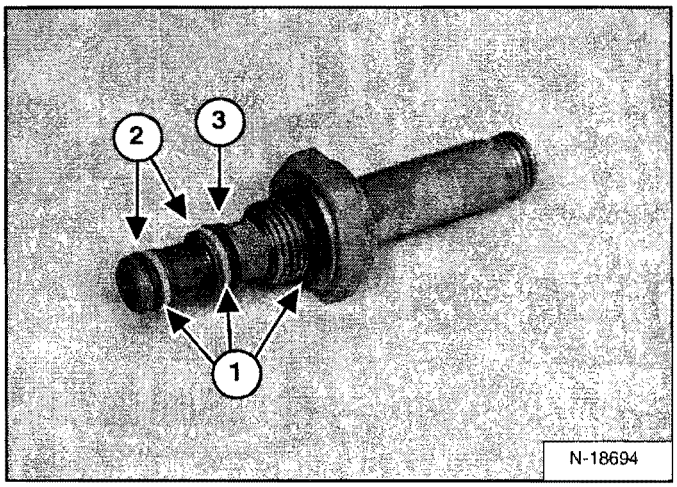


Remove the solenoid stem (Item 1) **[Figure 20-41-48]**.

Installation: Tighten the solenoid stem to 20 ft.-lbs. (27 Nm) torque.

BICS™ Valve, Solenoid Disassembly And Assembly (Cont'd)

Figure 20-41-49



Remove the O-rings (Item 1) and back-up washers (Item 2) **[Figure 20-41-49]** on the stem.

Clean all parts in solvent and dry with compressed air.

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

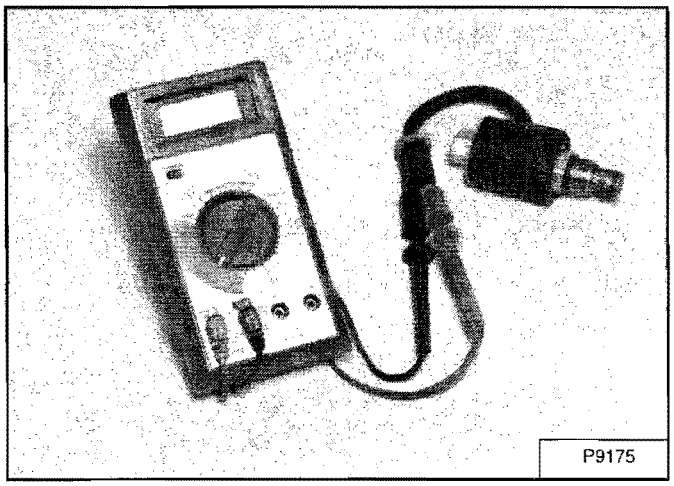
NOTE: The screen (Item 3) [Figure 20-41-49] may be cleaned with solvent. If it is torn or worn replace the solenoid stem.

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

Install new O-rings and new back-up washers on the solenoid stem.

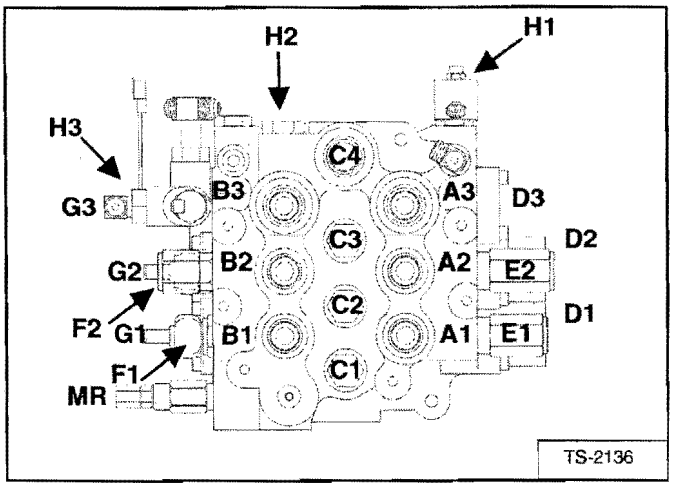
BICS™ Valve, Solenoid Testing

Figure 20-41-50



Use a test meter to measure coil resistance **[Figure 20-41-50]**. Coil wires do not have polarity. Correct resistance for the auxiliary pressure relief (small) coil is 7-10 ohm and the other coils 5-8 ohms.

Replace the test meter with 12 volt power. You can see and hear the spool shift.

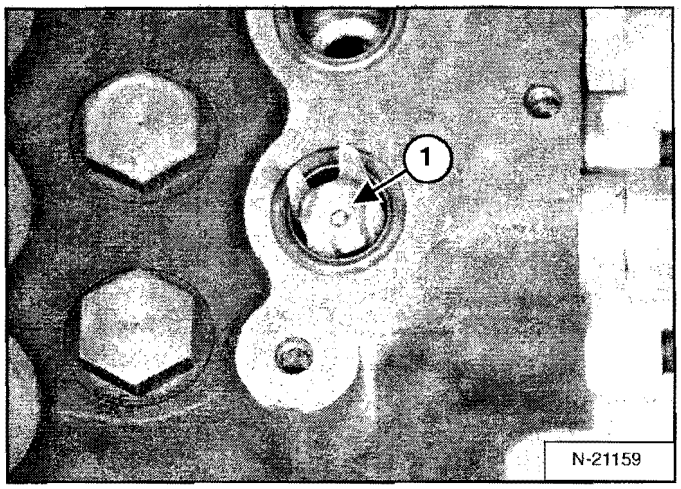


Identification Chart

ITEM	T300 Loader ACS Hand Control
A1	Lift Cylinder Base End/Restrictor
A2	Tilt Cylinder Base End
A3	Auxiliary Hydraulics
B1	Lift Cylinder Rod End
B2	Tilt Cylinder Rod End
B3	Auxiliary Hydraulics
C1	Load Check Valve/Lift Function
C2	Load Check Valve/Tilt Function
C3	Orificed Load Check Valve/Auxiliary Function
C4	Outlet Fluid Flow
D1	Lift Spool Centering Spring
D2	Tilt Spool Centering Spring
D3	Auxiliary Spool/Centering Springs
E1	Port Relief Valve – 4000 PSI
E2	Anti–Cavitation/Port Relief Valve – 3500 PSI
F1	Anti-Cavitation Valve
F2	Port Relief Valve – 4000 PSI
G1	Lift Spool End
G2	Tilt Spool End
G3	Auxiliary Spool/Centering Springs
H1	Auxiliary Electric Solenoid
H2	Plug/Port Relief (Optional) – 3500 PSI
H3	Auxiliary Electric Solenoid
MR	Main Relief Valve – 3300 PSI

Lift Base End Restrictor

Figure 20-41-51

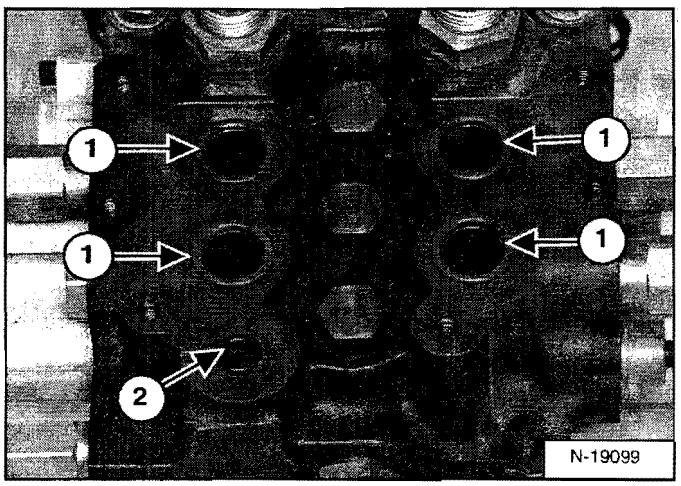


Remove the BICS™ valve assembly from the control valve. (See BICS™ Valve, Removal And Installation on Page 20-41-10.)

Remove the restrictor (Item 1) **[Figure 20-41-51]** from the lift section base end port.

Load Check Valve

Figure 20-41-52



Remove the BICS™ valve assembly from the control valve. (See BICS™ Valve, Removal And Installation on Page 20-41-10.)

Remove the four large O-rings (Item 1) and small O-ring (Item 2) **[Figure 20-41-52]**. Always replace these O-rings before installing the BICS™ valve assembly.

IMPORTANT

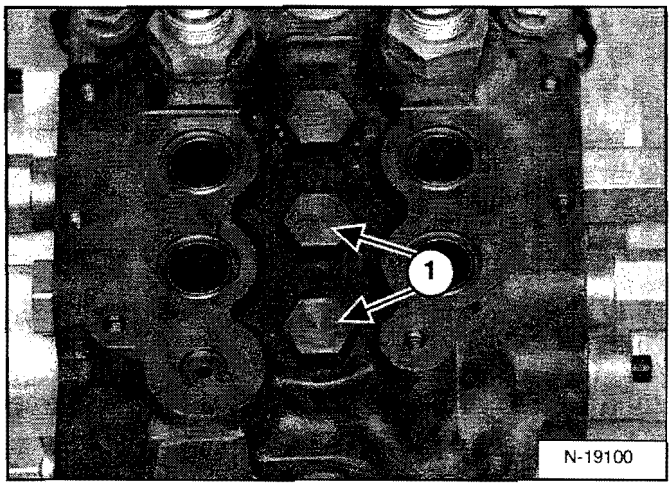
When repairing hydrostatic and hydraulic systems, clean the work area before disassembly and keep all parts clean. Always use caps and plugs on hoses, tubelines and ports to keep dirt out. Dirt can quickly damage the system.

I-2003-0888

Mark each valve section, spool and related parts so that they will be returned to their original valve section during assembly.

Use bolts to fasten the control valve to a work bench for easier disassembly and assembly procedures.

Figure 20-41-53

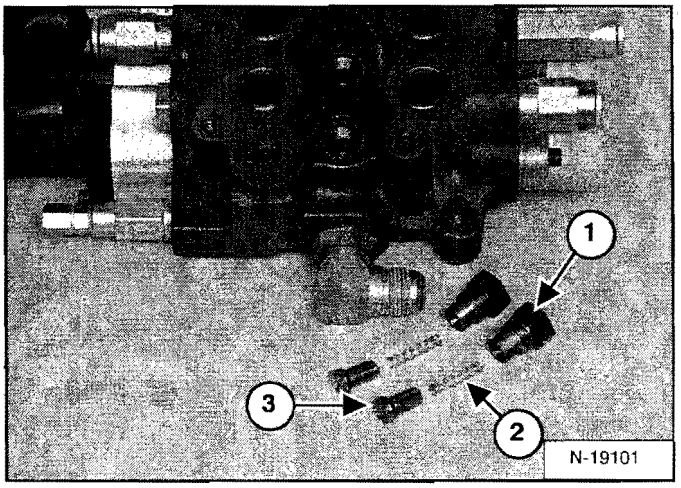


Loosen the load check valve plugs (Item 1) **[Figure 20-41-53]**.

Installation: Always use new O-ring. Tighten the plug to 35-40 ft.-lbs. (47-54 Nm) torque.

Load Check Valve (Cont'd)

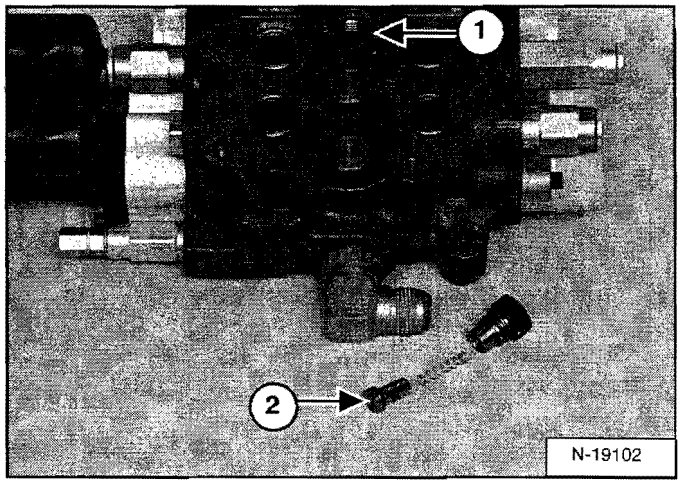
Figure 20-41-54



Remove the load check plugs (Item 1) **[Figure 20-41-54]**.

Remove the spring (Item 2) and poppet (Item 3) **[Figure 20-41-54]**.

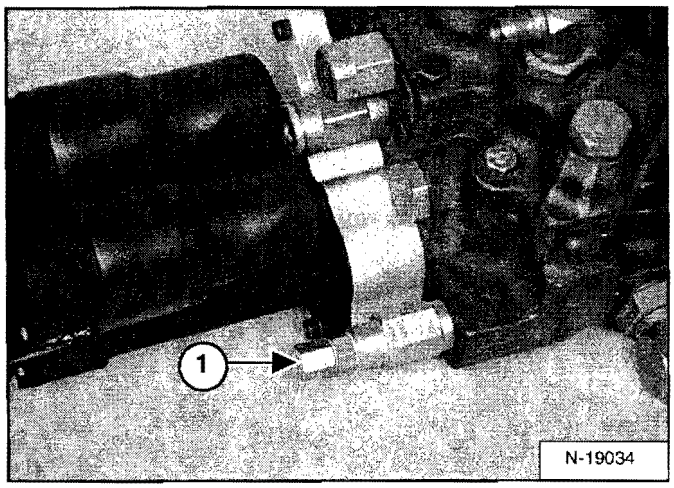
Figure 20-41-55



The auxiliary section (Item 1) uses an orifice load check poppet (Item 2) **[Figure 20-41-55]**.

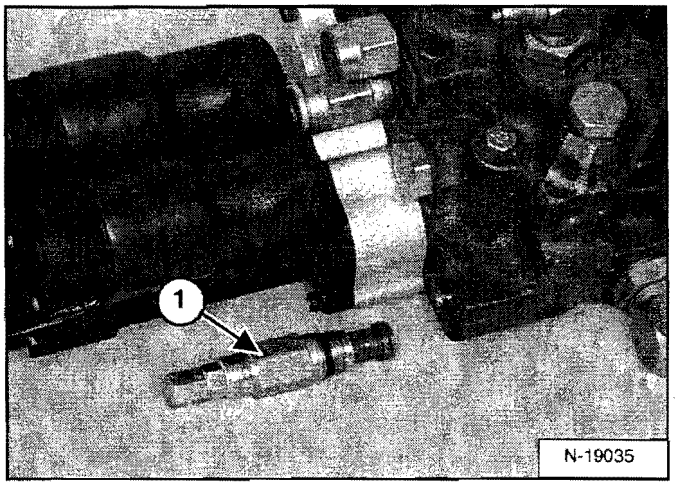
Main Relief Valve

Figure 20-41-56



Loosen the main relief valve (Item 1) **[Figure 20-41-56]**.

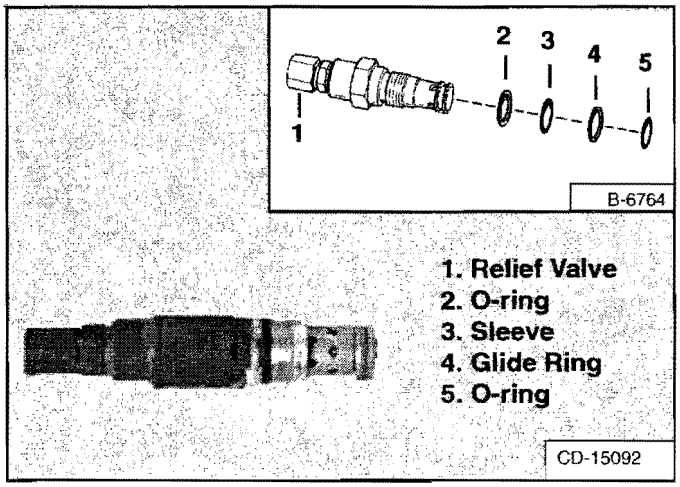
Figure 20-41-57



Remove the main relief valve (Item 1) **[Figure 20-41-57]**.

Main Relief Valve (Cont'd)

Figure 20-41-58



Remove the O-rings, sleeve, and glide ring from the main relief valve **[Figure 20-41-58]**.

Installation: Always use new O-rings, sleeve, and glide ring. Tighten to 35-40 ft.-lbs. (47-54 Nm) torque.

Port Relief Valve

Figure 20-41-59

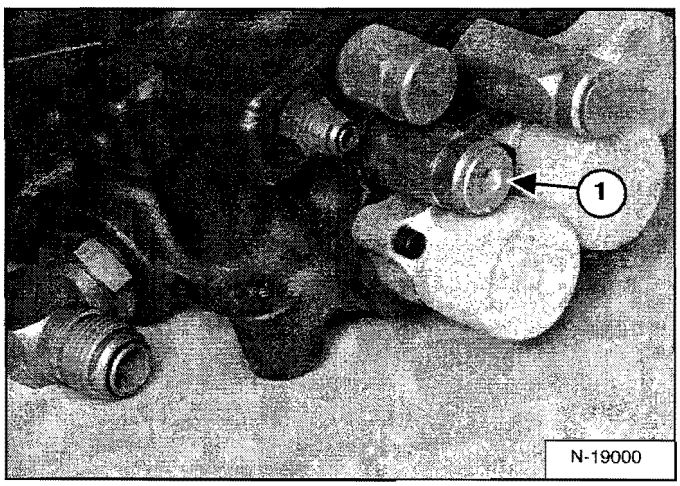
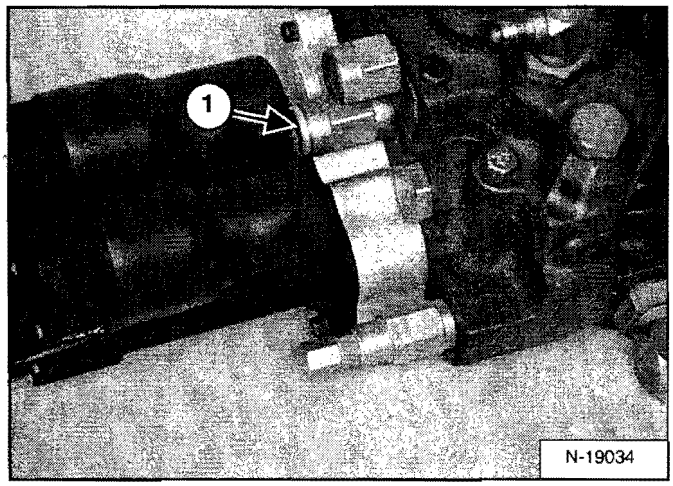


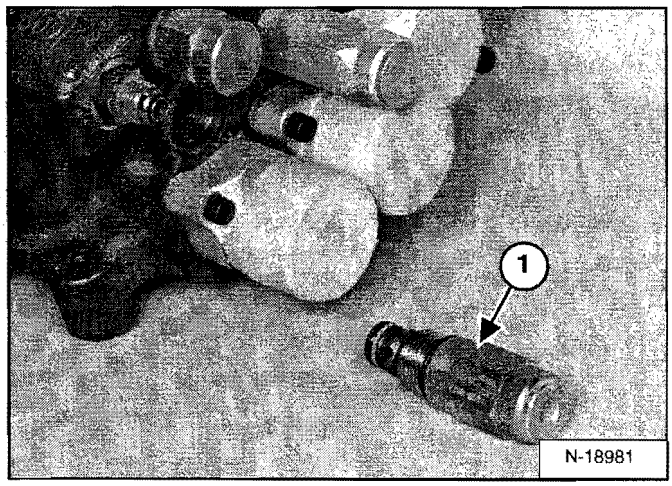
Figure 20-41-60



Loosen the port relief valve (Item 1) **[Figure 20-41-59]** & **[Figure 20-41-60]** (Port E1 or F2). (See Identification Chart on Page 20-41-17.)

Installation: Always use new O-rings and back-up washers. Tighten to 35-40 ft.-lbs. (47-54 Nm) torque.

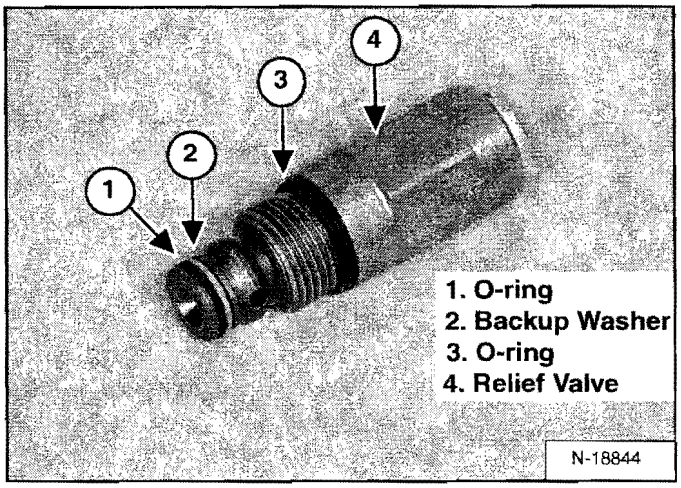
Figure 20-41-61



Remove the port relief valve (Item 1) **[Figure 20-41-61]**.

Port Relief Valve (Cont'd)

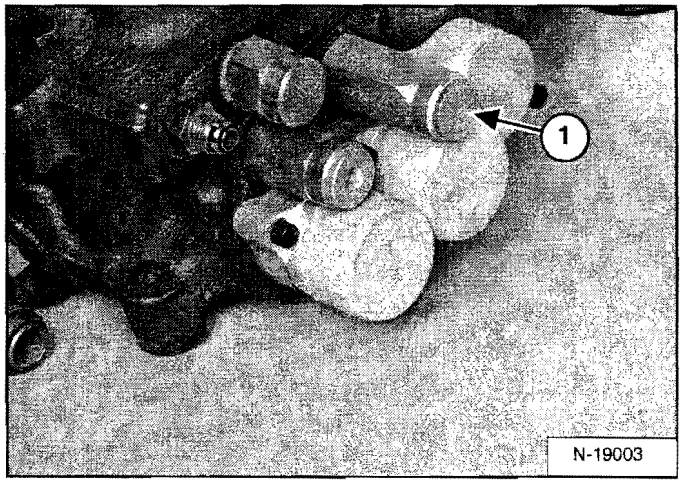
Figure 20-41-62



Remove the O-rings and back-up washer from the port relief valve **[Figure 20-41-62]**.

Anti-Cavitation Valve/Port Relief Valve

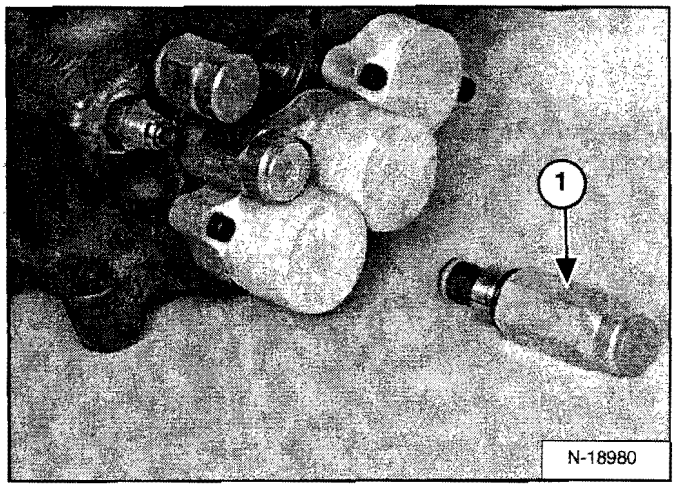
Figure 20-41-63



Loosen the anti-cavitation valve (Item 1) **[Figure 20-41-63]**.

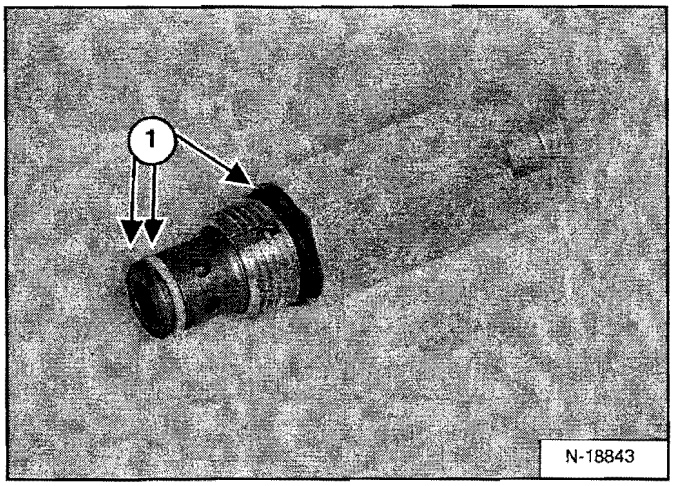
Installation: Always use new O-rings and back-up washers. Tighten to 35-40 ft.-lbs. (47-54 Nm) torque.

Figure 20-41-64



Remove the anti-cavitation/port relief valve (Item 1) **[Figure 20-41-64]** from the control valve for the tilt section.

Figure 20-41-65



Remove the O-rings (Item 1) **[Figure 20-41-65]** from the anti-cavitation/port relief valve.

Anti-Cavitation Valve

Figure 20-41-66

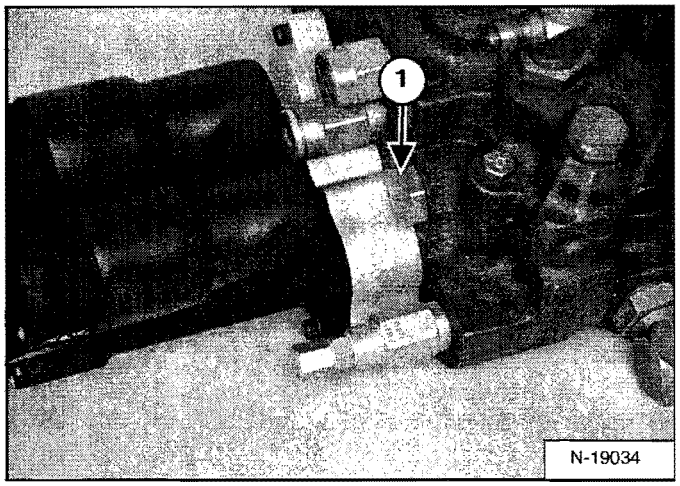
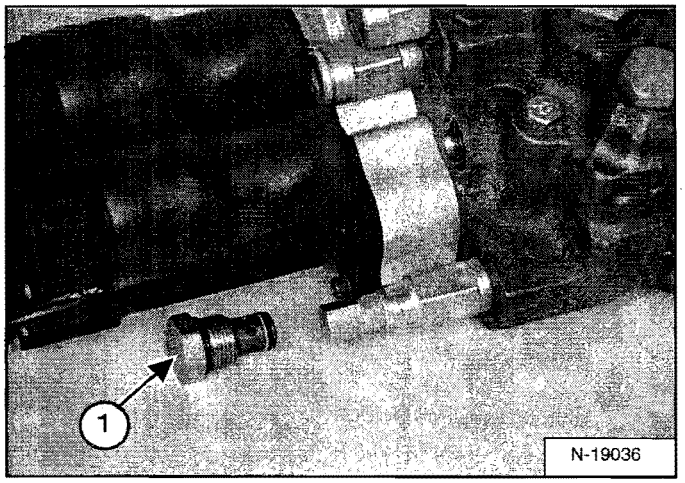
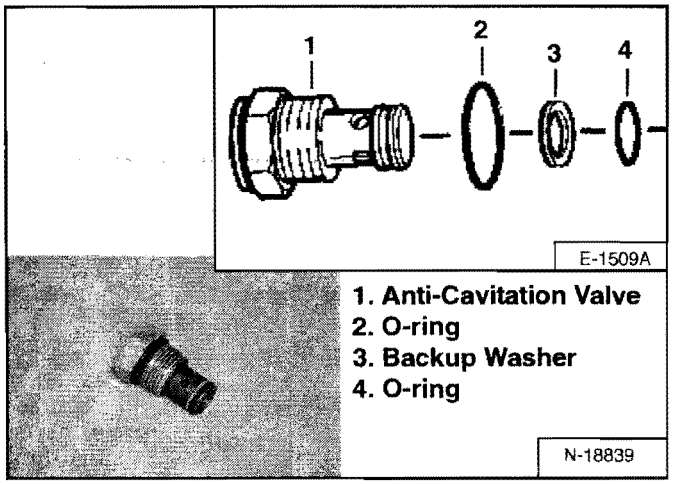


Figure 20-41-67



Remove the anti-cavitation valve (Item 1) **[Figure 20-41-66]** & **[Figure 20-41-67]** from the control valve.

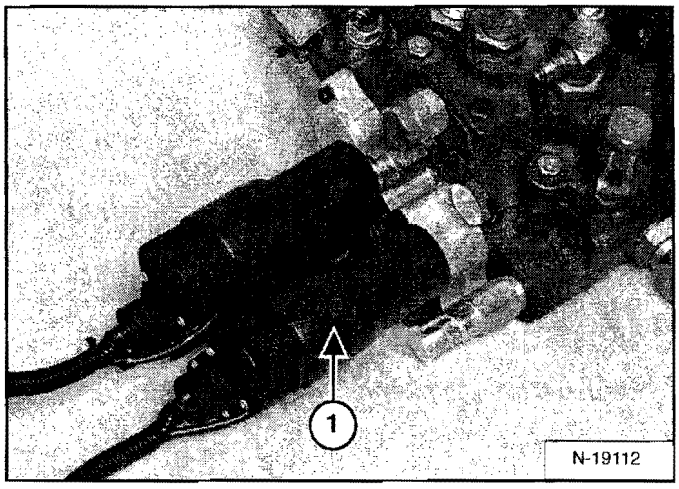
Figure 20-41-68



Remove the O-rings and back-up washer from the anti-cavitation valve **[Figure 20-41-68]**.

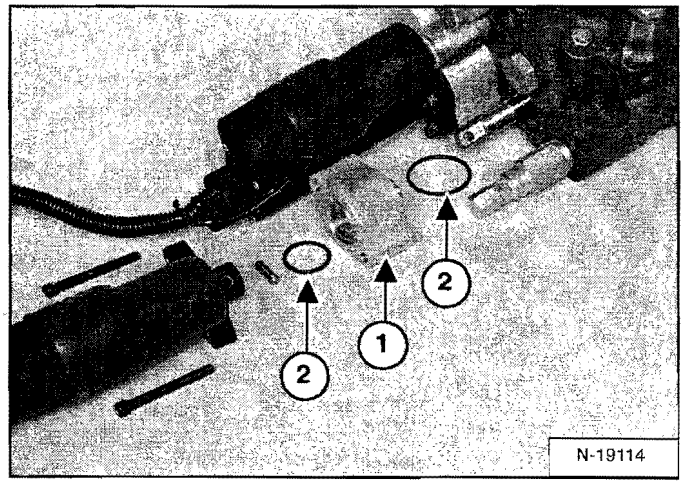
Lift Spool Removal

Figure 20-41-69



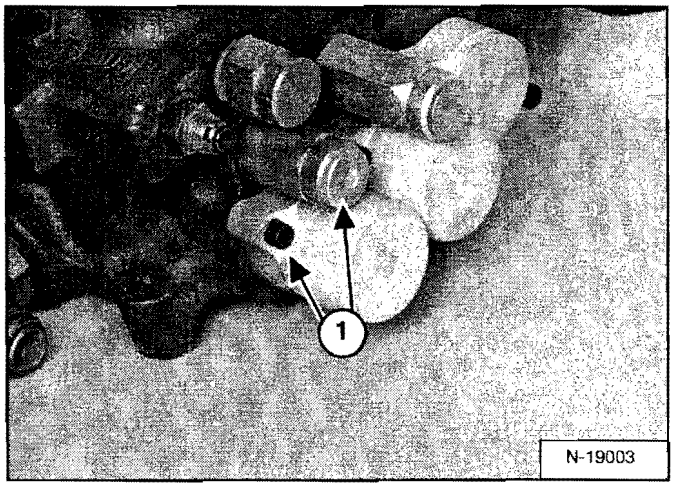
Remove the actuator (Item 1) **[Figure 20-41-69]** from the control valve.

Figure 20-41-70



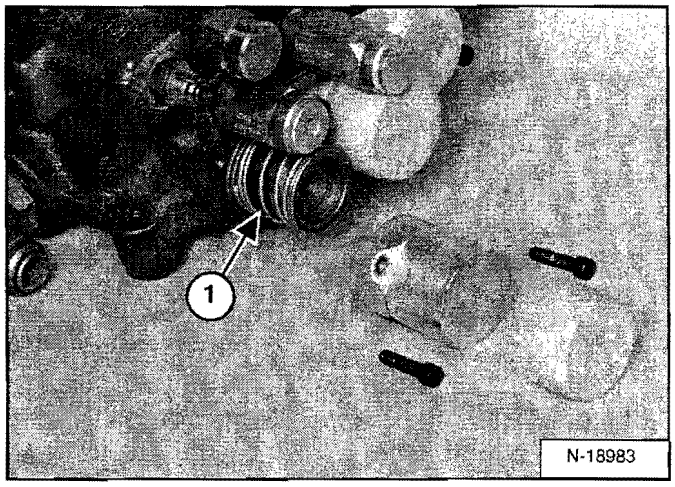
Remove the spacer (Item 1) and O-ring (Item 2) **[Figure 20-41-70]** from the lift spool.

Figure 20-41-71



Remove the screws (Item 1) **[Figure 20-41-71]** from the cap.

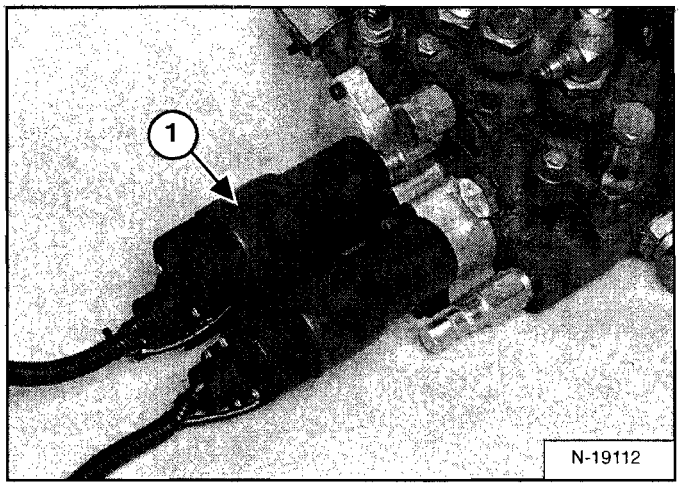
Figure 20-41-72



Remove the spool assembly (Item 1) **[Figure 20-41-72]** and seal from the control valve.

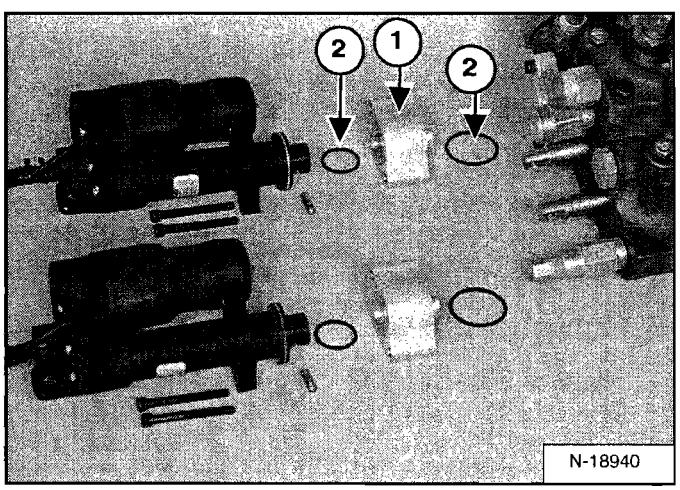
Lift Spool Removal And Installation

Figure 20-41-73



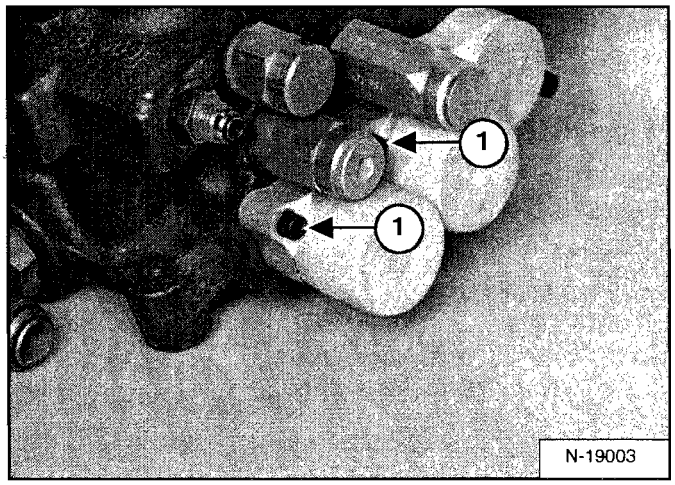
Remove the actuators (Item 1) **[Figure 20-41-73]** from the control valve.

Figure 20-41-74



Remove the spacer (Item 1) and O-ring (Item 2) **[Figure 20-41-74]** from the tilt spool.

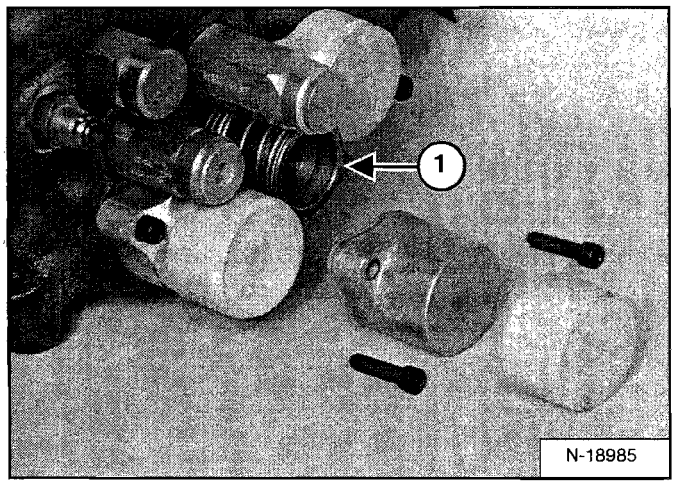
Figure 20-41-75



Remove the screws (Item 1) **[Figure 20-41-75]** from the end cap.

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

Figure 20-41-76

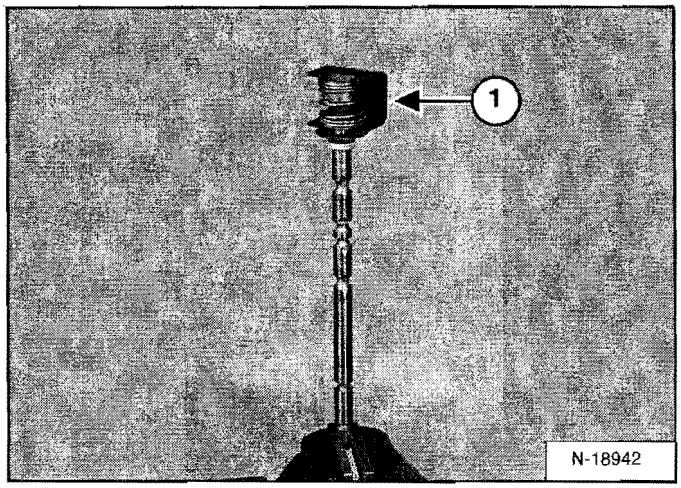


Remove the spool assembly (Item 1) **[Figure 20-41-76]** and seal from the control valve.

Assembly: Always use a new spool seal.

Lift and Tilt Spool Disassembly And Assembly

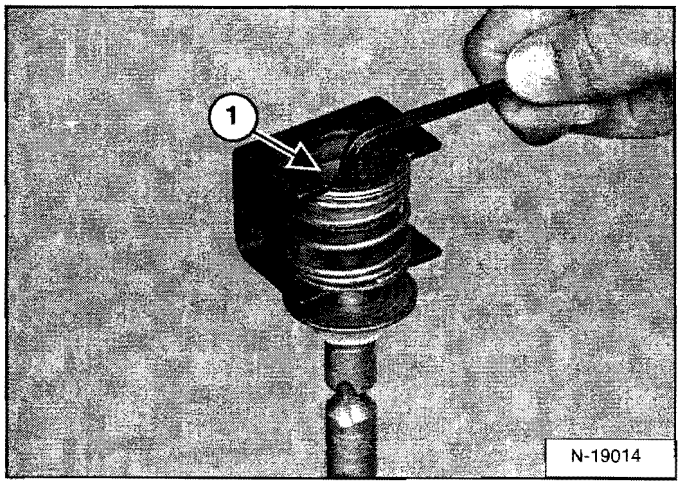
Figure 20-41-77



Put the linkage end of the spool in the vise **[Figure 20-41-77]**.

Install the spool tool (Item 1) **[Figure 20-41-77]** over the centering spring.

Figure 20-41-78

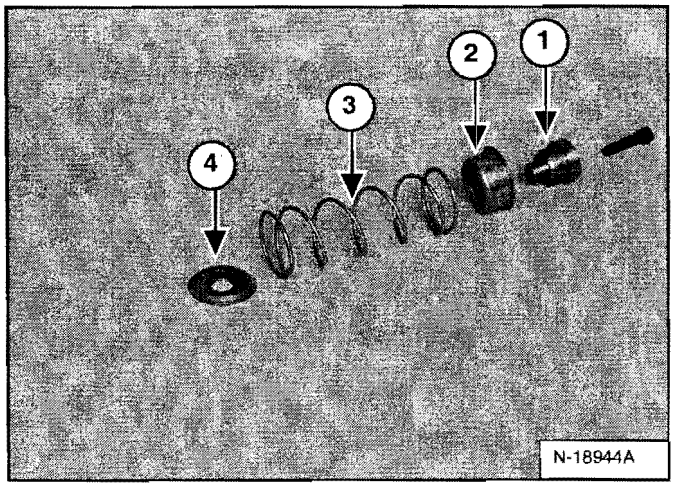


Remove the bolt (Item 1) **[Figure 20-41-78]** holding the centering spring to the spool.

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

Remove spring tool from the spring assembly.

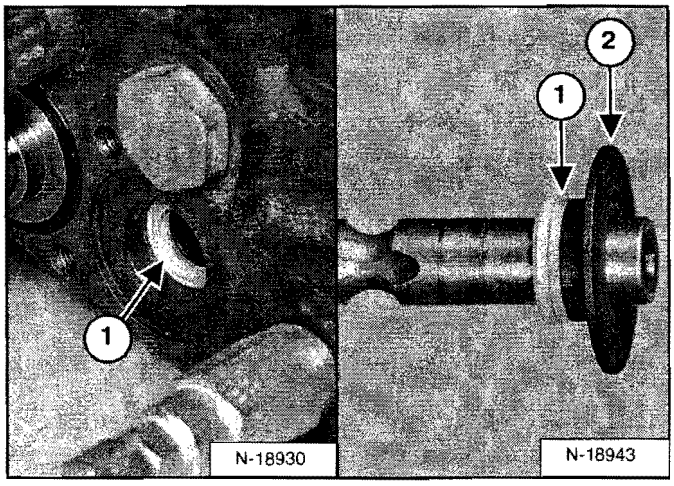
Figure 20-41-79



NOTE: The center spring (Item 3) [Figure 20-41-79] is orange on all 800 Series and T200 loaders.

Inspect the adapter (Item 1), collar (Item 2), spring (Item 3), and washer (Item 4) **[Figure 20-41-79]**.

Figure 20-41-80

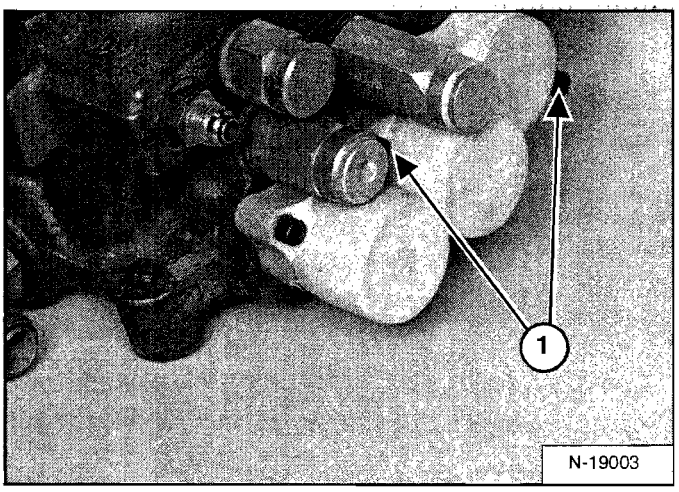


Remove the spool seal (s) (Item 1) **[Figure 20-41-80]** and the back-up washer (Item 2) **[Figure 20-41-80]**.

Assembly: Always use a new spool seal.

Auxiliary Spool Removal And Installation

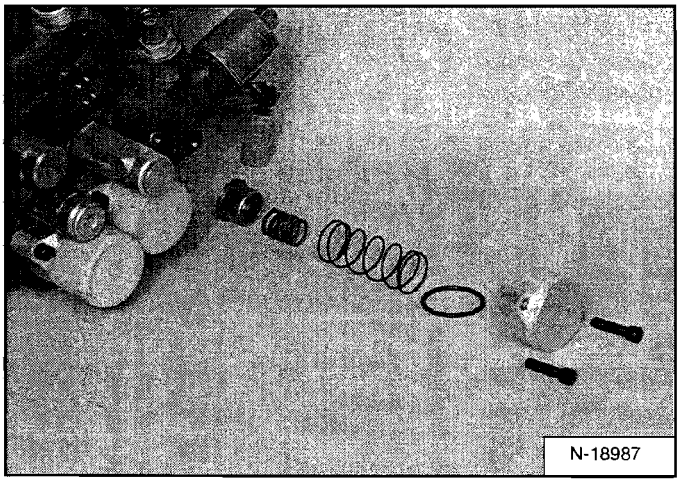
Figure 20-41-81



Remove the screws (Item 1) **[Figure 20-41-81]** from the end cap (both sides).

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

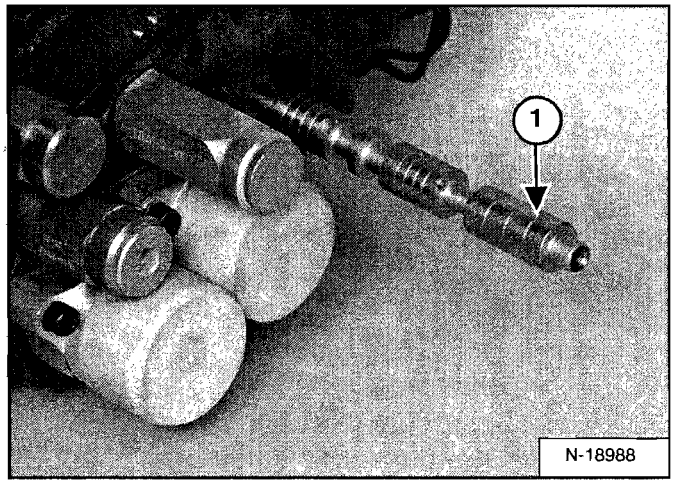
Figure 20-41-82



Remove the end cap, O-ring, springs and washer (both sides) **[Figure 20-41-82]**.

Assembly: Always use a new spool seal.

Figure 20-41-83

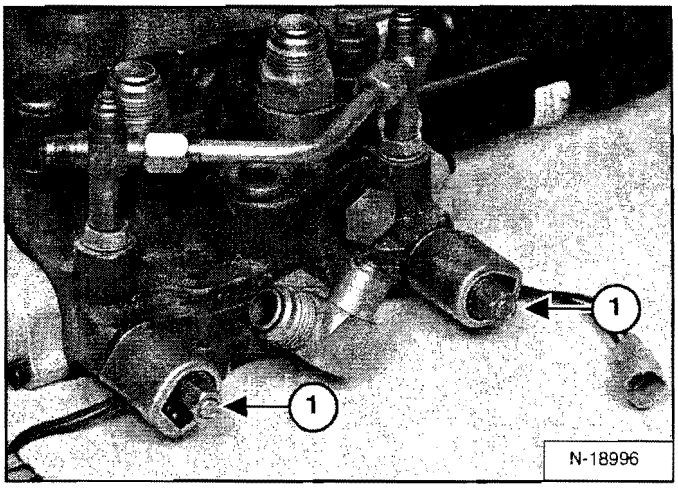


Remove the spool (Item 1) **[Figure 20-41-83]**.

Assembly: Put grease on all the centering spring component parts.

Auxiliary Electric Solenoid Disassembly

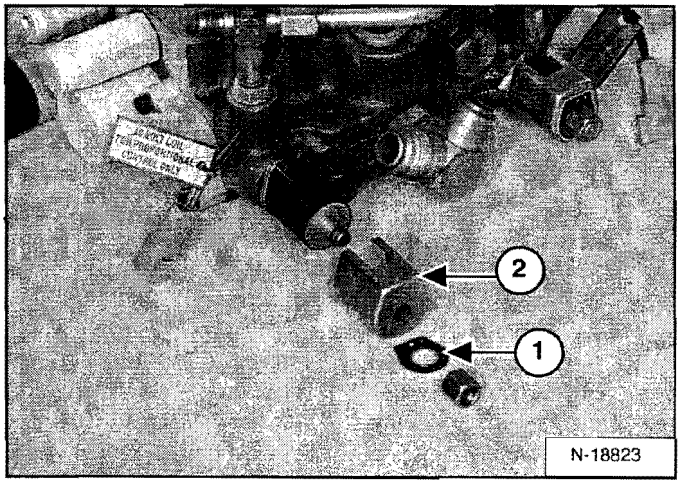
Figure 20-41-84



Remove the nut (Item 1) **[Figure 20-41-84]** from both solenoids.

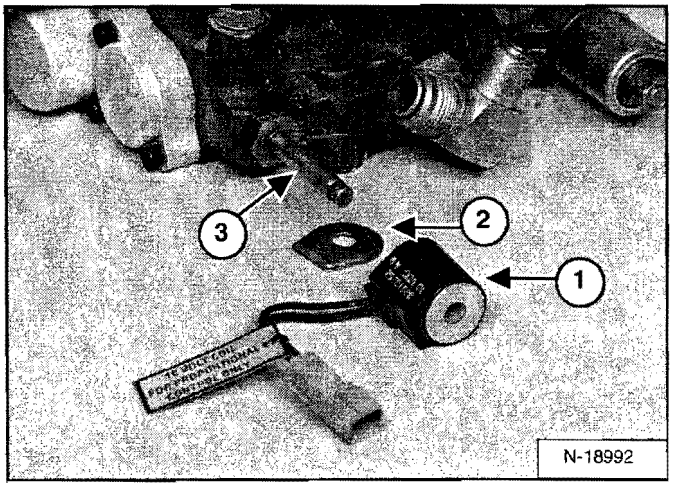
Installation: Tighten the nut to 8-12 ft.-lbs. (11-16 Nm) torque.

Figure 20-41-85



Remove the end plate (Item 1) and housing (Item 2) **[Figure 20-41-85]**.

Figure 20-41-86

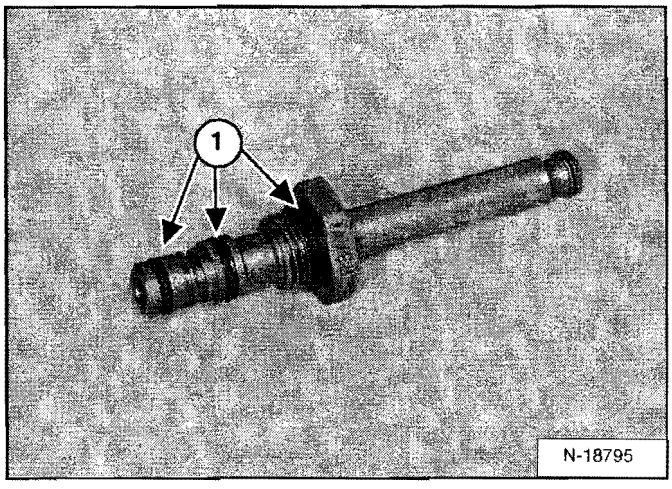


Remove the coil (Item 1) and end plate (Item 2) **[Figure 20-41-86]**.

Remove the solenoid valve (Item 3) **[Figure 20-41-86]**.

Installation: Tighten valve to 8-12 ft.-lbs. (11-16 Nm) torque.

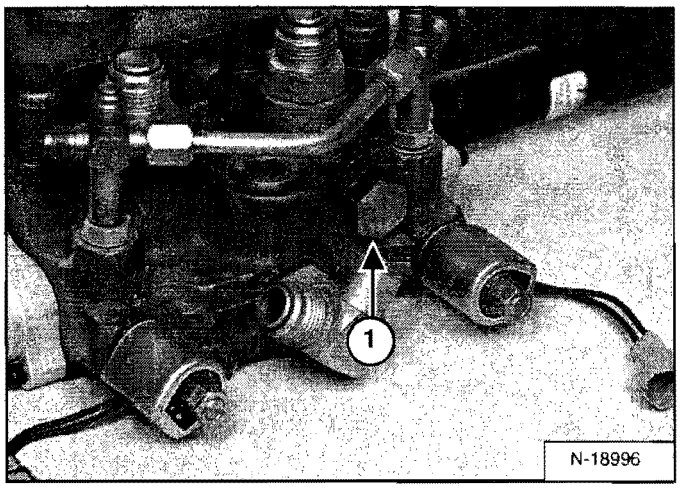
Figure 20-41-87



Remove the O-rings (Item 1) **[Figure 20-41-87]** from the solenoid valves.

Port-Auxiliary Section Disassembly

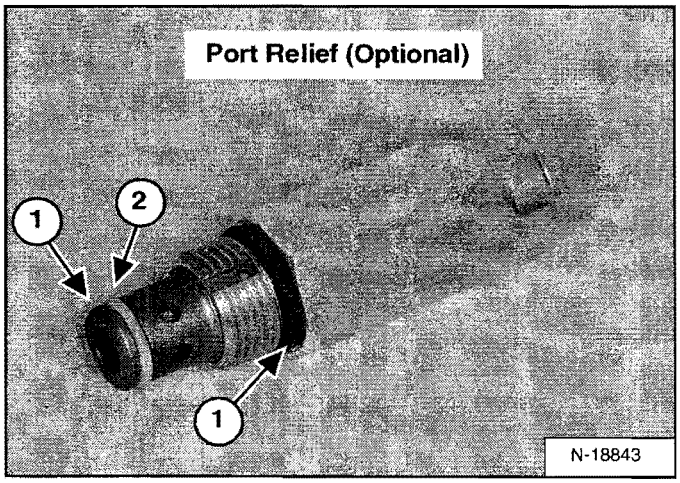
Figure 20-41-88



Remove the plug (Item 1) **[Figure 20-41-88]** or optional port relief valve from the control valve.

NOTE: Optional port relief (Item 1) [Figure 20-41-88] is either 2500 PSI or 3000 PSI depending on the option used.

Figure 20-41-89



Remove the O-rings (Item 1) and back-up ring (Item 2) **[Figure 20-41-89]** from the plug.

Cleaning And Inspection

Clean all components with clean solvent and dry with compressed air.

Check the spools for wear or scratches.

Check that the spools are not loose in their bore.

Check that the centering springs are not broken.

Check that the load check valve seats are not worn.

Check the load check poppets for damage.

Check the rubber boots and retainers

Replace the parts as needed.

Use new O-rings and back-up rings.

Apply oil to all new O-rings and back-up rings before installation.

HYDRAULIC CONTROL VALVE (SELECTABLE JOYSTICK CONTROL) (SJC)

Actuator Removal And Installation (In Loader)

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

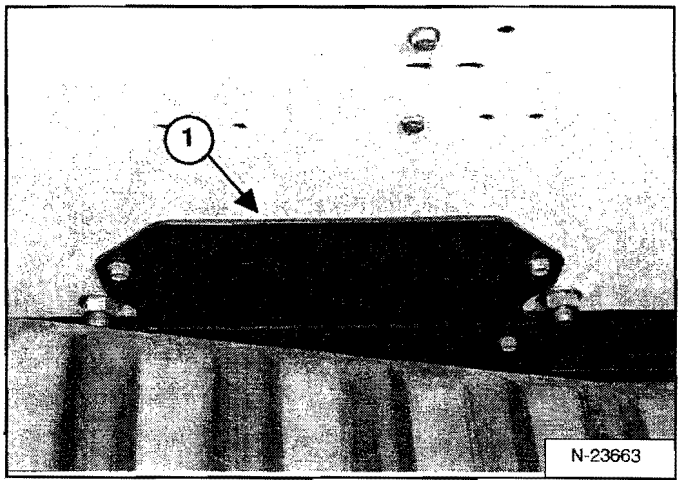
⚠ WARNING

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

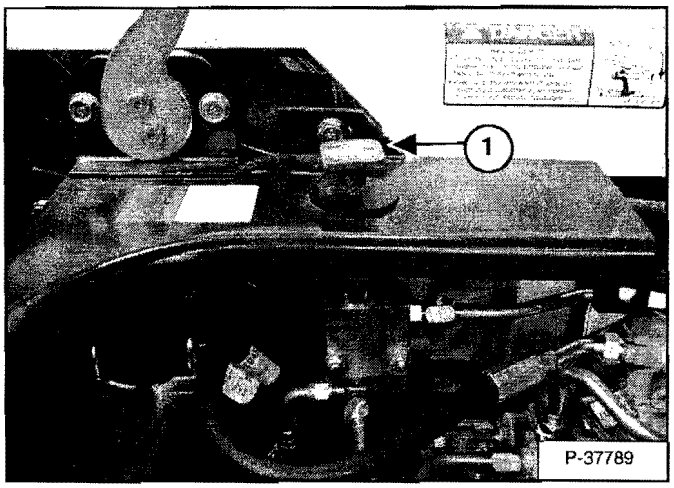
Stop the engine. Raise the seat bar.

Figure 20-42-1



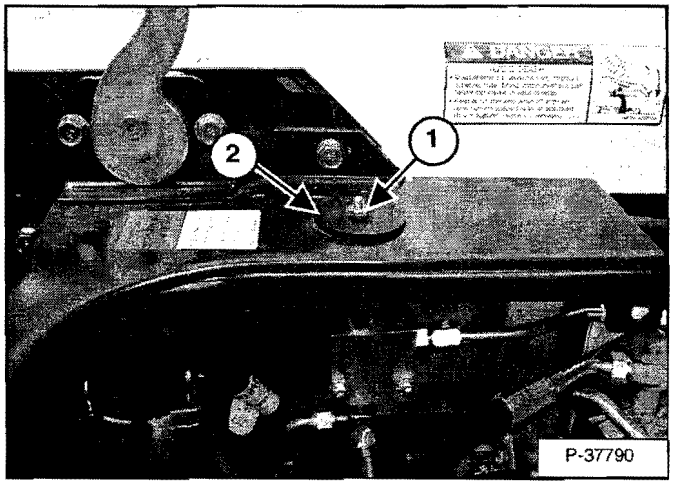
Remove the access cover (Item 1) **[Figure 20-42-1]** from the right side of the loader frame.

Figure 20-42-2



Remove the by-pass control knob (Item 1) **[Figure 20-42-2]** from the lift arm by-pass valve.

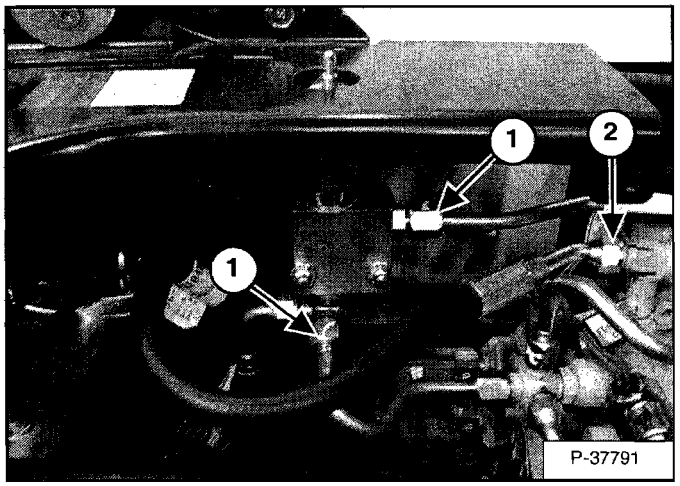
Figure 20-42-3



Remove the jam nut (Item 1) and the rubber washer (Item 2) **[Figure 20-42-3]** from the lift arm by-pass valve.

Actuator Removal And Installation (In Loader) (Cont'd)

Figure 20-42-4

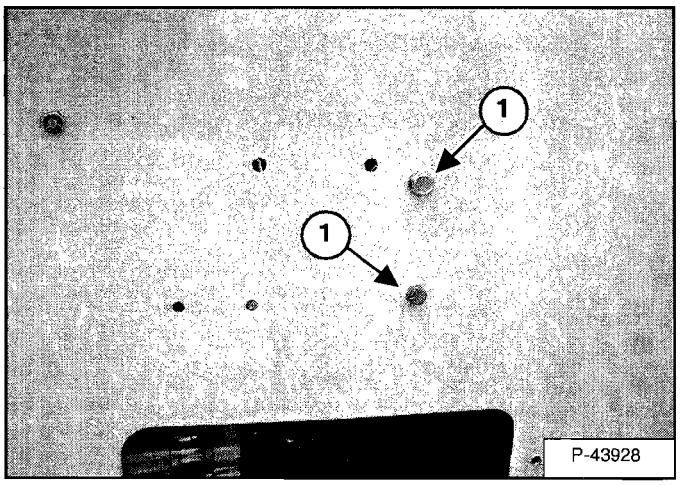


Disconnect the two tubelines (Item 1) **[Figure 20-42-4]** from the lift arm by-pass valve.

Disconnect the hydraulic hose (Item 2) **[Figure 20-42-4]** from the control valve.

Cap and plug the fittings and hose.

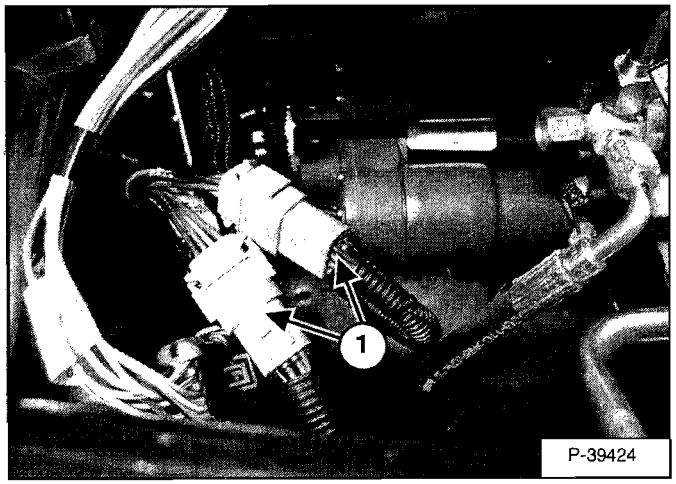
Figure 20-42-5



Remove the two mount bolts (Item 1) **[Figure 20-42-5]** from the lift arm by-pass valve/brake valve mounting bracket.

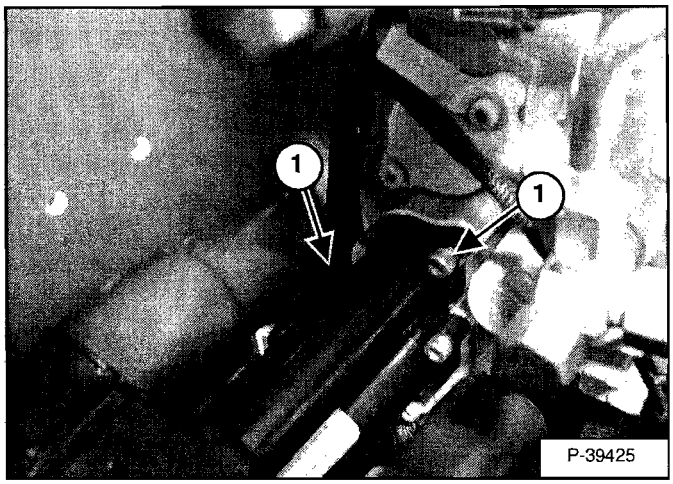
Move the lift arm by-pass valve/brake valve down into the fender to allow room for the actuator removal.

Figure 20-42-6



Disconnect the actuator wire connectors (Item 1) **[Figure 20-42-6]** from the actuators.

Figure 20-42-7

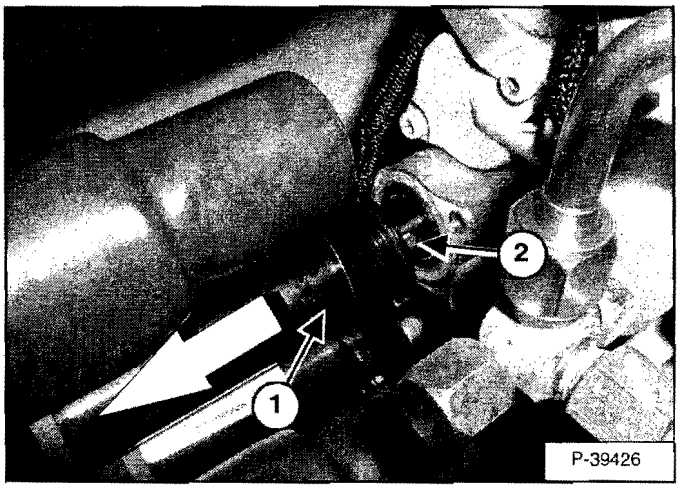


Remove the two actuator mount bolts (Item 1) **[Figure 20-42-7]**from the top actuator.

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

Actuator Removal And Installation (In Loader) (Cont'd)

Figure 20-42-8

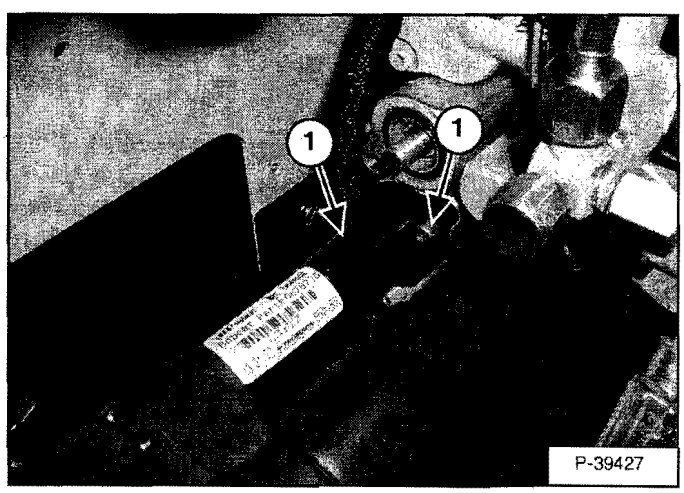


Slide the actuator (Item 1) **[Figure 20-42-8]** away from the control valve.

With a punch, remove the actuator pin (Item 2) **[Figure 20-42-8]** from the actuator and spool.

Remove the upper actuator from the loader.

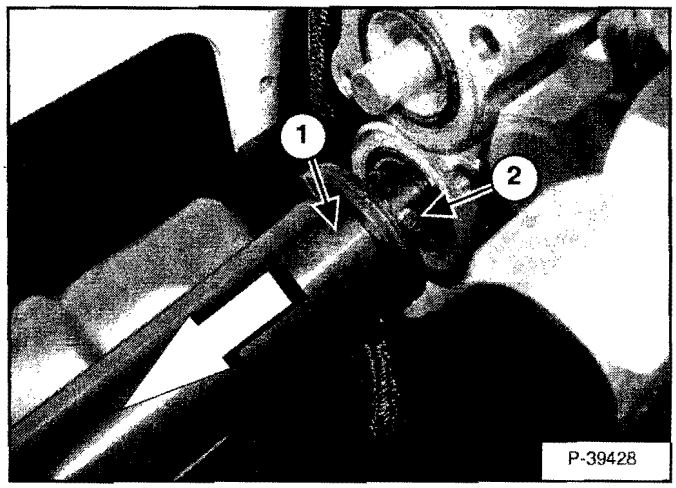
Figure 20-42-9



Remove the two actuator mount bolts (Item 1) **[Figure 20-42-9]** from the bottom actuator.

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

Figure 20-42-10



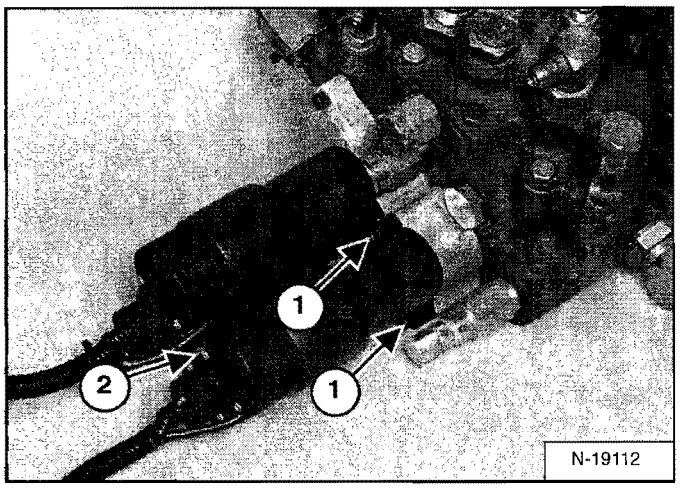
Slide the actuator (Item 1) **[Figure 20-42-10]** away from the control valve.

With a punch, remove the actuator pin (Item 2) **[Figure 20-42-10]** from the actuator and spool.

Remove the bottom actuator from the loader.

Actuator Removal And Installation (Out Of Loader)

Figure 20-42-11

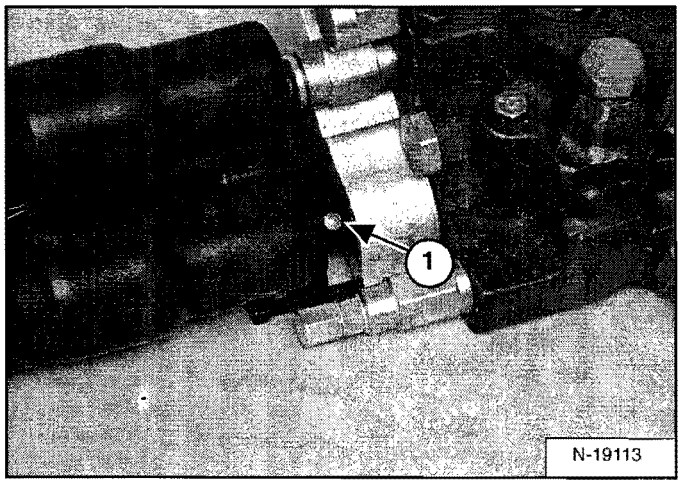


Remove the two screws (Item 1) **[Figure 20-42-11]** on the actuator retainer.

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

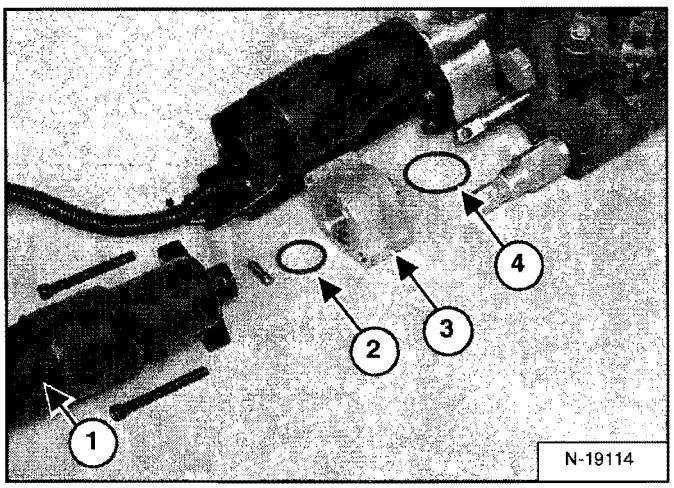
Pull the actuator (Item 2) **[Figure 20-42-11]** away from the control valve.

Figure 20-42-12



Use a drift pin and hammer to remove the actuator pin (Item 1) **[Figure 20-42-12]** from the actuator and the lift or tilt spool.

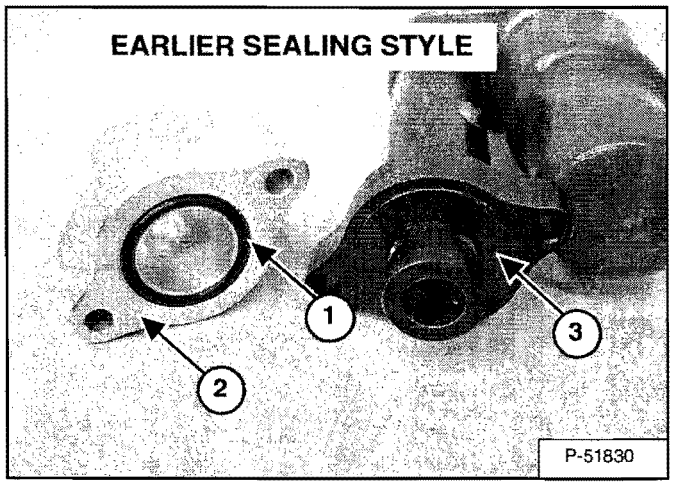
Figure 20-42-13



Remove the actuator (Item 1), the O-ring (Item 2), the spacer block (Item 3) and O-ring (Item 4) **[Figure 20-42-13]**.

NOTE: There are two types of sealing designs used on the actuators and the actuator mounts.

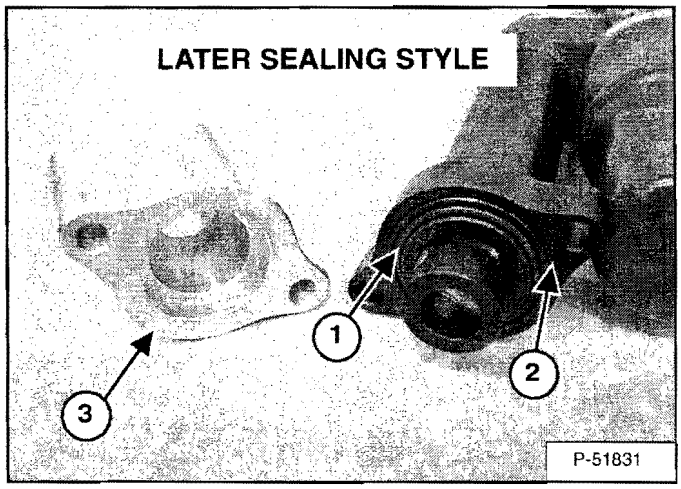
Figure 20-42-14



The earlier style has the O-ring (Item 1) in the actuator mount (Item 2). The actuator sealing face (Item 3) **[Figure 20-42-14]** has a flat face and no O-ring.

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

Figure 20-42-15



The later style has the O-ring (Item 1) in the actuator sealing face (Item 2). The actuator mount (Item 3) **[Figure 20-42-15]** has no O-ring.

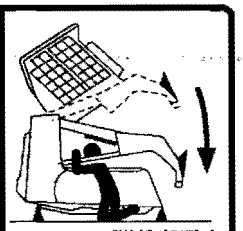
NOTE: The later style actuator can replace the earlier style actuator as long as the actuator mount is changed to the later style actuator mount.

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

Raise the lift arms and install an approved lift arm support device.

Stop the engine. Raise the seat bar.

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

Drain the hydraulic reservoir. (See Contents Page 20-01.)

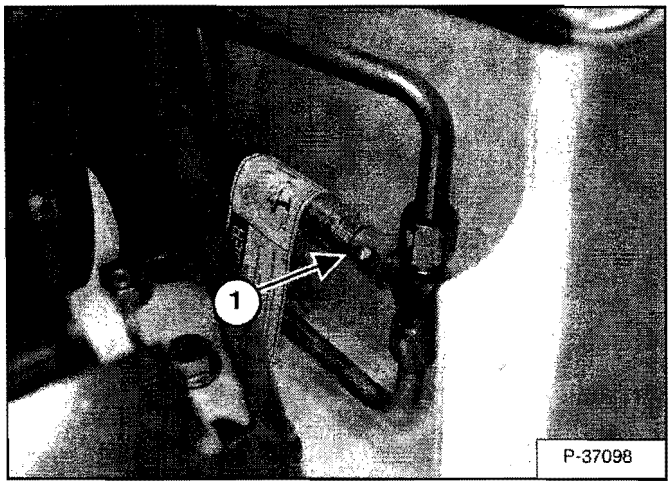
Remove the control panel. (See Contents Page 50-01.)

Remove the control valve actuators. (See Actuator Removal And Installation (In Loader) on Page 20-41-1.)

Clean area around control valve.

Open rear door.

Figure 20-42-16

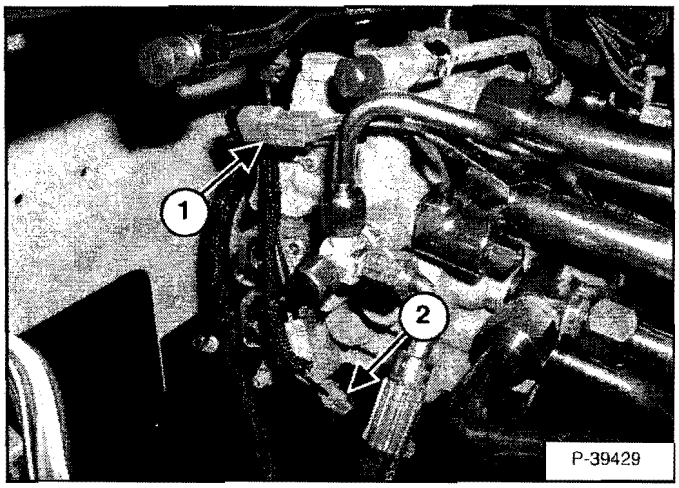


The fixed end main valve hose assembly (Item 1) **[Figure 20-42-16]** is connected to a fixed end fitting on the control valve. The hose is routed to the right side upright where the hose is connected to a tee fitting that feeds the base end of both lift cylinders. The hose can only be removed by first removing it from the tee fitting located at the rear of the loader.

Cap and plug the hose and fitting.

Removal And Installation (Cont'd)

Figure 20-42-17

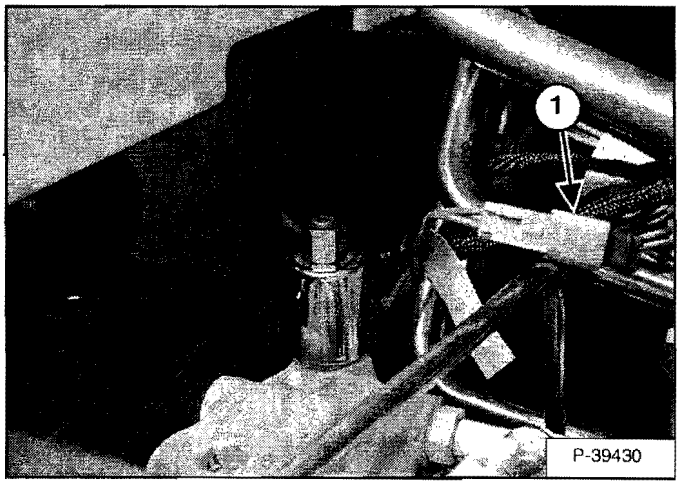


Mark the wire connectors for proper installation.

Disconnect the electrical connector (Item 1) **[Figure 20-42-17]** from the auxiliary spool solenoid.

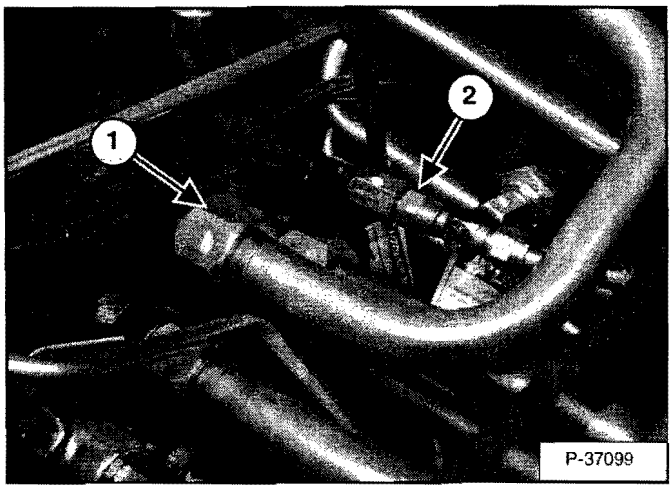
Disconnect the electrical connector (Item 2) **[Figure 20-42-17]** from the BICS valve solenoid.

Figure 20-42-18



Disconnect the electrical connector (Item 1) **[Figure 20-42-18]** from the auxiliary spool solenoid.

Figure 20-42-19

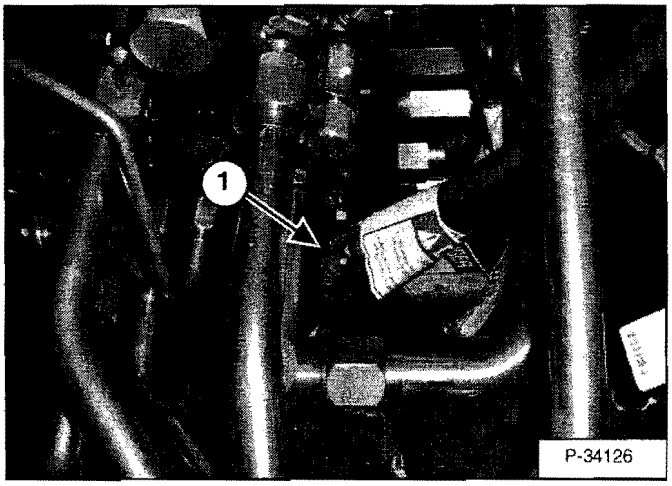


Disconnect the tubeline (Item 1) **[Figure 20-42-19]** that goes from the control valve to the hydraulic cooler.

Disconnect the charge pressure sender (Item 2) **[Figure 20-42-19]** from the control valve.

Cap and plug the tubelines and fittings.

Figure 20-42-20



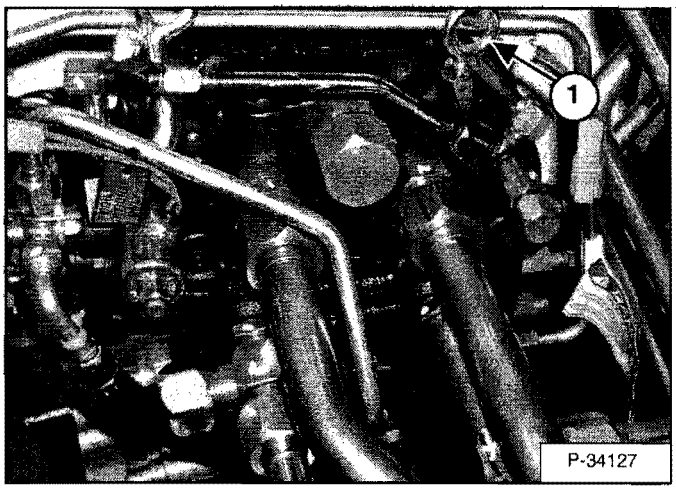
Loosen the fixed end main valve hose assembly (Item 1) **[Figure 20-42-20]** from the control valve.

The hose can be removed from the control valve by rotating the hose assembly.

Cap the hose and plug the fitting.

Removal And Installation (Cont'd)

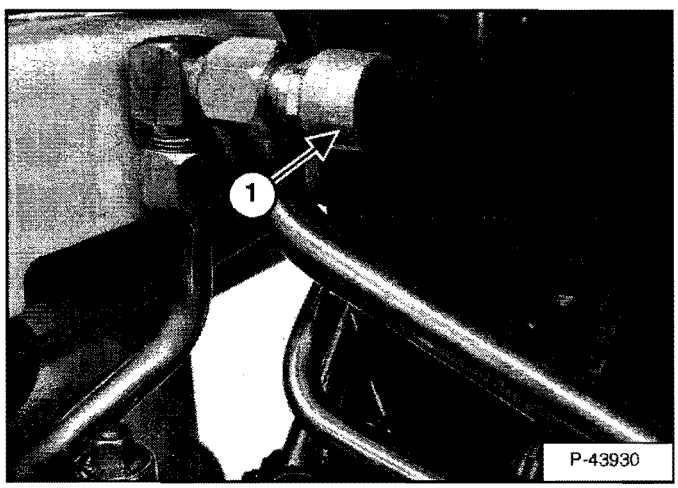
Figure 20-42-21



Install a chain hoist (Item 1) **[Figure 20-42-21]** to the control valve, and support the control valve.

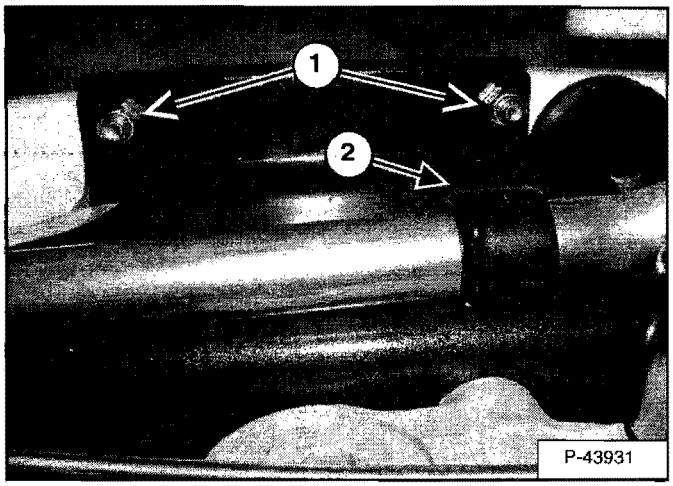
Loosen all the tubeline fittings connected to the control valve.

Figure 20-42-22



Disconnect the hydraulic hose (Item 1) **[Figure 20-42-22]** that comes from the back of the gear pump to the tubeline at the top of the control valve.

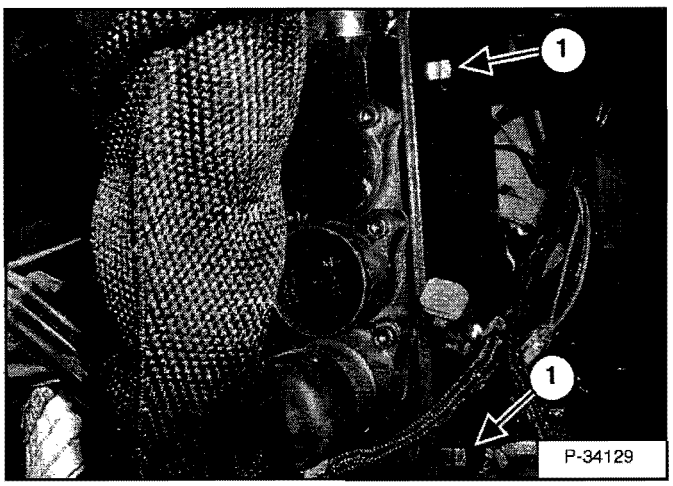
Figure 20-42-23



Remove the two control valve mount bracket mounting bolts (Item 1) **[Figure 20-42-23]**.

Remove the tubeline clamp mount bolt (Item 2) **[Figure 20-42-23]**.

Figure 20-42-24

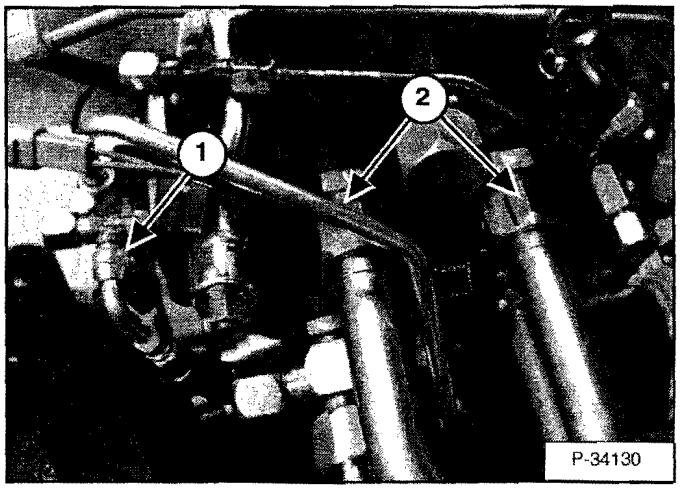


Remove the two control valve mount bolts (Item 1) **[Figure 20-42-24]** from the mounting plate, at the back side of the control valve.

Remove the control valve mount bracket from the loader.

Removal And Installation (Cont'd)

Figure 20-42-25

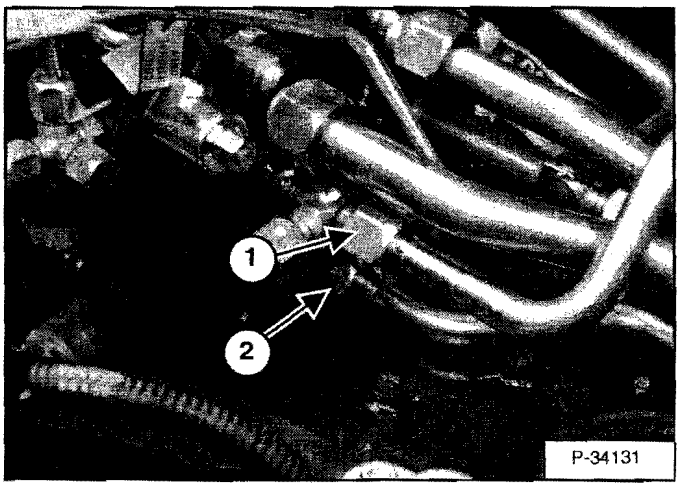


Disconnect the case drain hose (Item 1) **[Figure 20-42-25]** and cap the fitting and plug the hose.

Disconnect the two tubelines (Item 2) **[Figure 20-42-25]** from the auxiliary section of the control valve.

Cap the fittings and plug the tubelines.

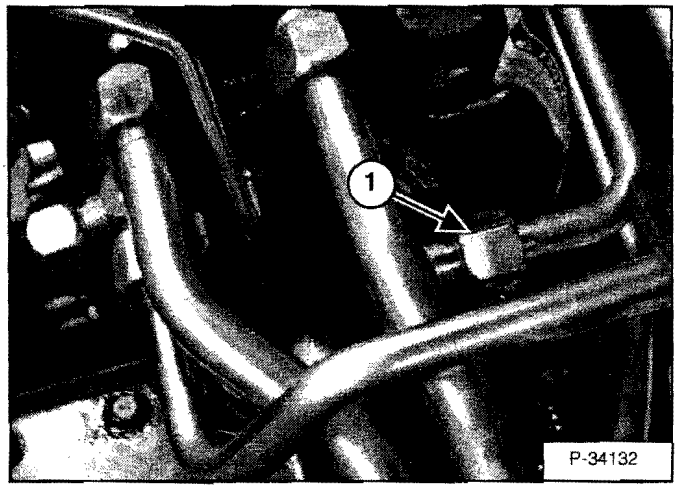
Figure 20-42-26



Disconnect the tilt tubeline (Item 1) **[Figure 20-42-26]** from the control valve.

Disconnect the lift tubeline (Item 2) **[Figure 20-42-26]** from the control valve.

Figure 20-42-27



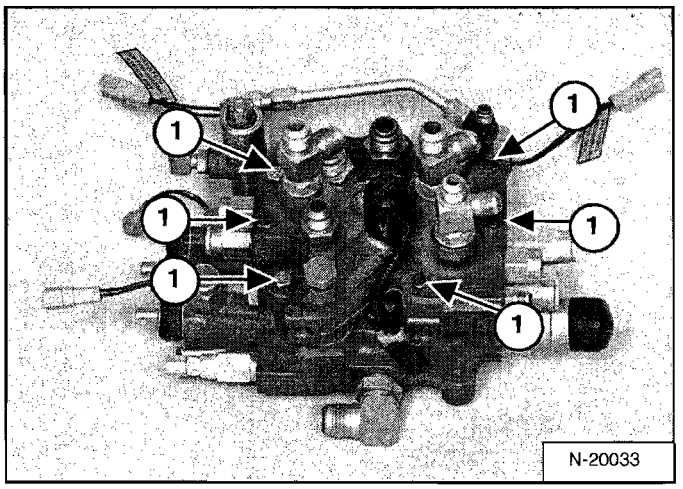
Disconnect the tilt tubeline (Item 1) **[Figure 20-42-27]** at the tee fitting.

Cap and plug the tubeline and fitting.

Remove the control valve from the loader.

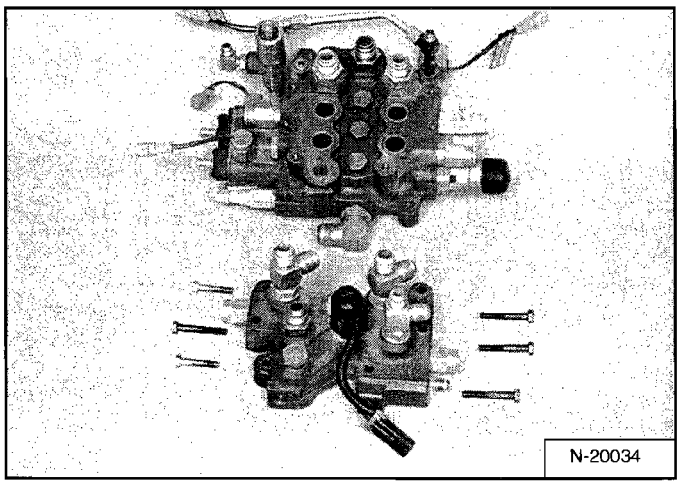
BICS™ Valve, Removal And Installation

Figure 20-42-28



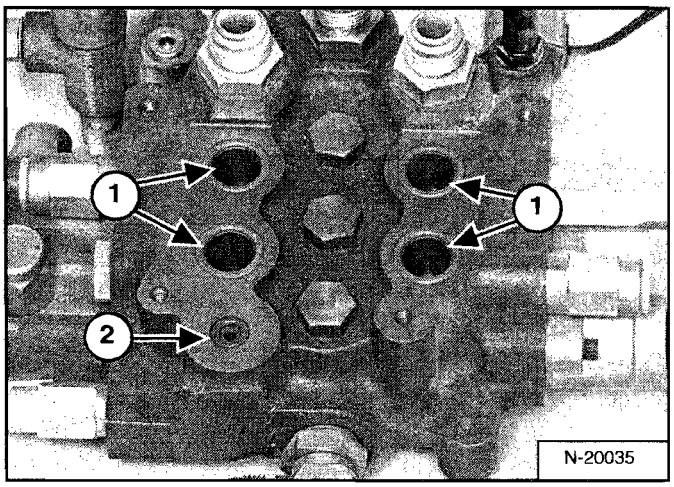
To remove the BICS™ valve from the control valve, loosen and remove the six mounting bolts (Item 1) **[Figure 20-42-28]**.

Figure 20-42-29



Remove the BICS™ valve assembly from the top of the control valve **[Figure 20-42-29]**.

Figure 20-42-30

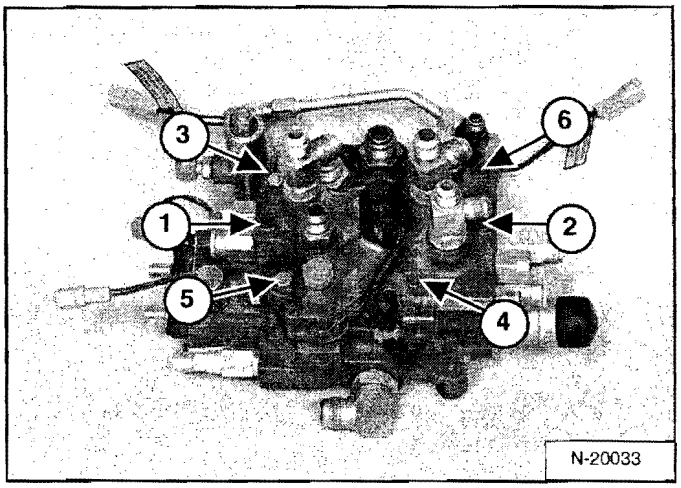


Remove the four large O-rings (Item 1) and the small O-ring (Item 2) **[Figure 20-42-30]** from the top of the control valve.

Installation: Install the four large O-rings (Item 1) and the small O-ring (Item 2) **[Figure 20-42-30]** on the top of the control valve.

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

Figure 20-42-31



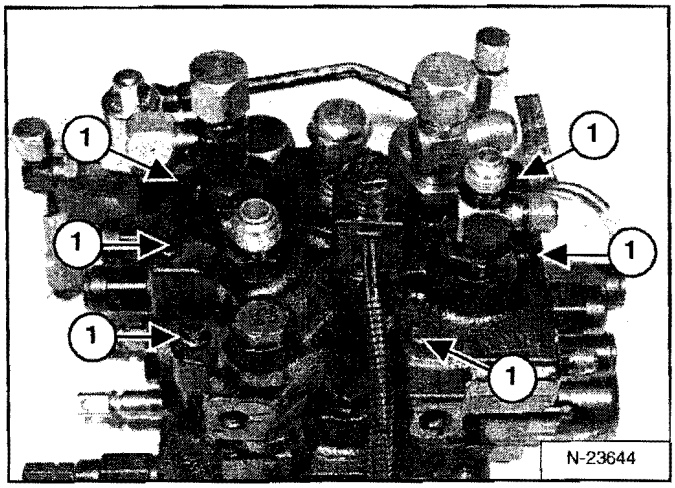
Install the six mounting bolts **[Figure 20-42-31]**.

The chart below lists the correct torque specifications and tightening sequence when reinstalling the BICS™ valve assembly to the control valve. Thoroughly clean and dry bolts and threads in valve. Use liquid adhesive LOCTITE #242 or equivalent.

Step	Torque	Sequence
1	110-130 in.-lbs. (12,4-14,7 Nm)	1, 2, 3, 4, 5 & 6
2	190-210 in.-lbs. (21,5-23,7 Nm)	
3*	190-210 in. lbs. (21,5-23,7 Nm)	

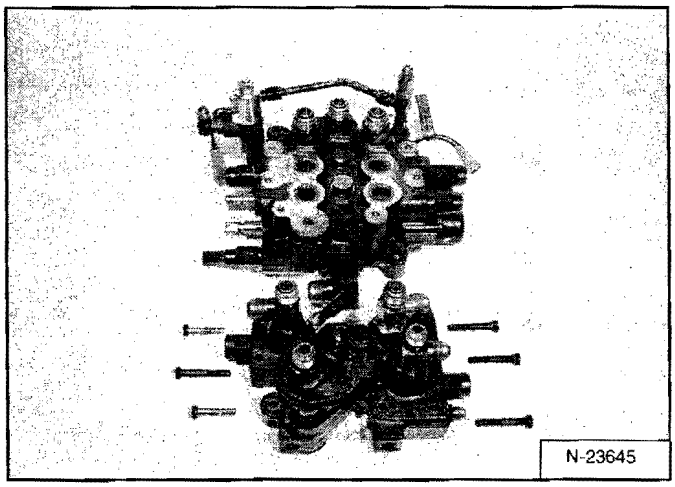
*Torque must be 190-210 in.-lbs. (21,5-23,7 Nm) for every bolt or repeat step 3.

Figure 20-42-32



To remove the BICS™ valve from the control valve, loosen and remove the six mounting bolts (Item 1) **[Figure 20-42-32]**.

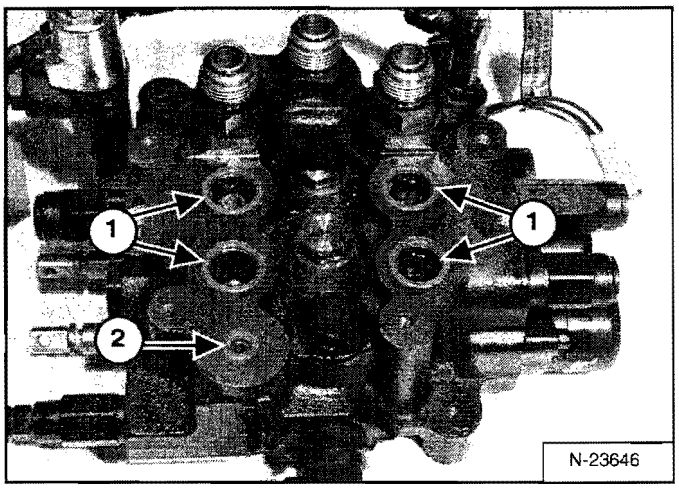
Figure 20-42-33



Remove the BICS™ valve assembly from the top of the control valve **[Figure 20-42-33]**.

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

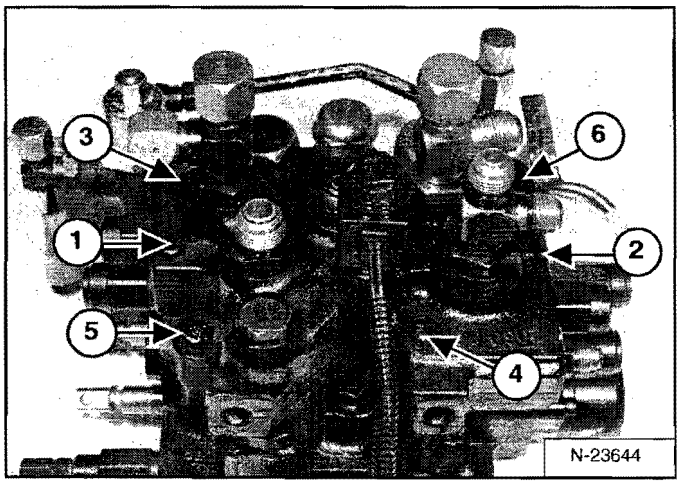
Figure 20-42-34



Remove the four large O-rings (Item 1) and the small O-ring (Item 2) **[Figure 20-42-34]** from the top of the control valve.

Install the four large O-rings (Item 1) and the small O-ring (Item 2) **[Figure 20-42-34]** on the top of the control valve.

Figure 20-42-35



Install the six mounting bolts **[Figure 20-42-35]**.

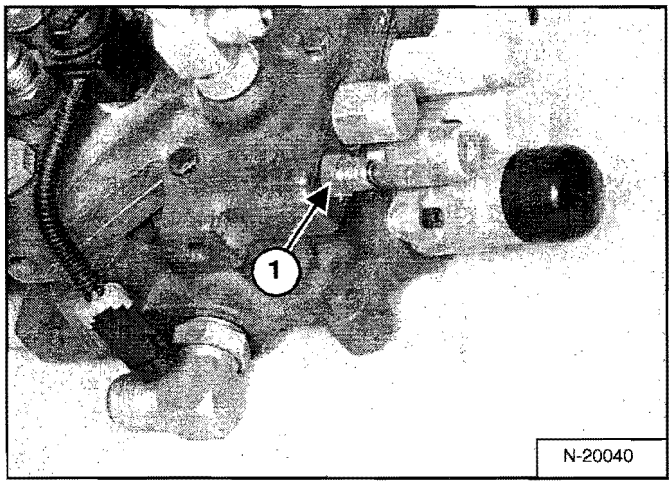
The chart below lists the correct torque specifications and tightening sequence when reinstalling the BICS™ valve assembly to the control valve. Thoroughly clean and dry bolts and threads in valve. Use liquid adhesive LOCTITE #242 or equivalent.

Step	Torque	Sequence
1	110-130 in.-lbs. (12,4-14,7 Nm)	1, 2, 3, 4, 5 & 6
2	190-210 in.-lbs. (21,5-23,7 Nm)	
3*	190-210 in. lbs. (21,5-23,7 Nm)	

*Torque must be 190-210 in.-lbs. (21,5-23,7 Nm) for every bolt or repeat step 3.

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

Figure 20-42-36



Remove the fitting (Item 1) **[Figure 20-42-36]** from the valve.

BICS™ Valve, Lift Arm By-Pass Orifice Disassembly And Assembly (Cont'd)

Figure 20-42-37

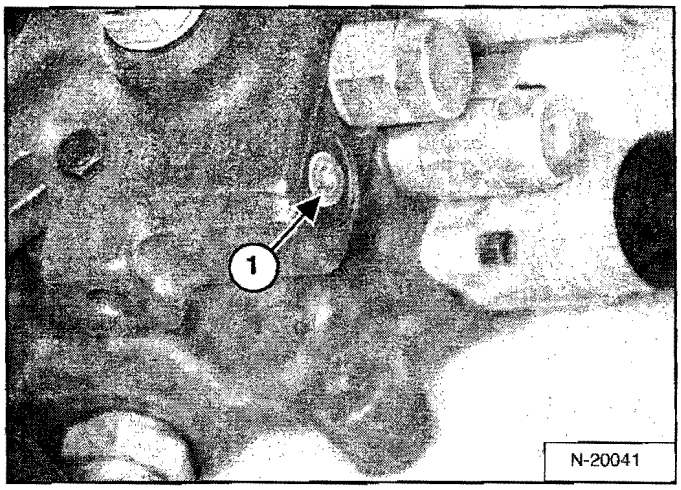
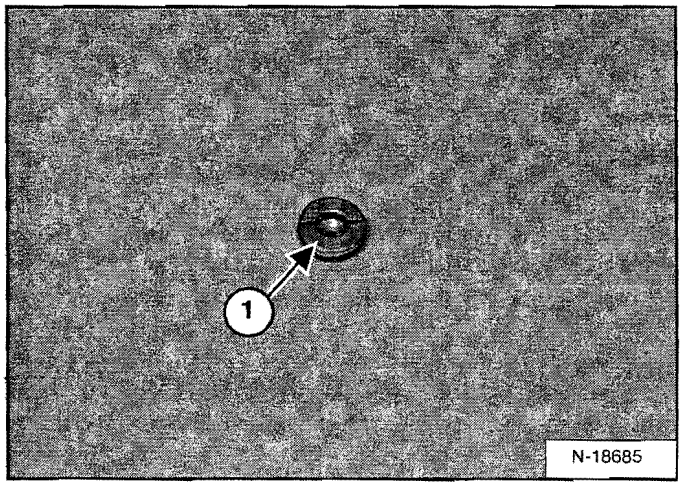


Figure 20-42-38



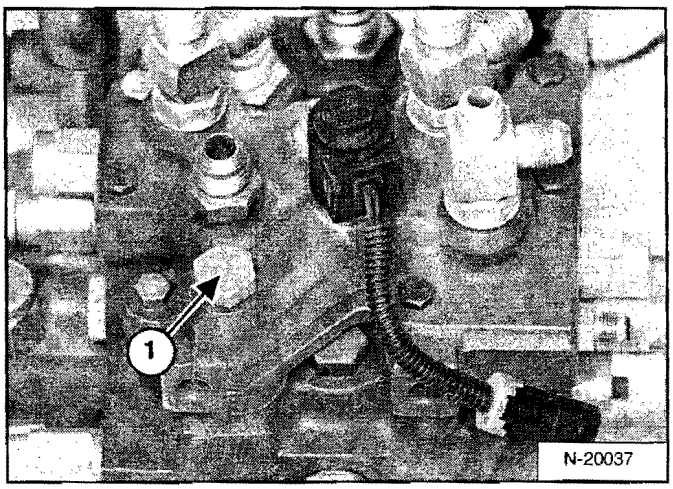
Using a flat blade screw driver, remove the lift arm by-pass orifice (Item 1) **[Figure 20-42-37]** & **[Figure 20-42-38]**.

Orifice size is 0.078 inch.

Reverse the removal procedure to install the lift arm by-pass orifice.

BICS™ Valve, Check Valve Disassembly And Assembly

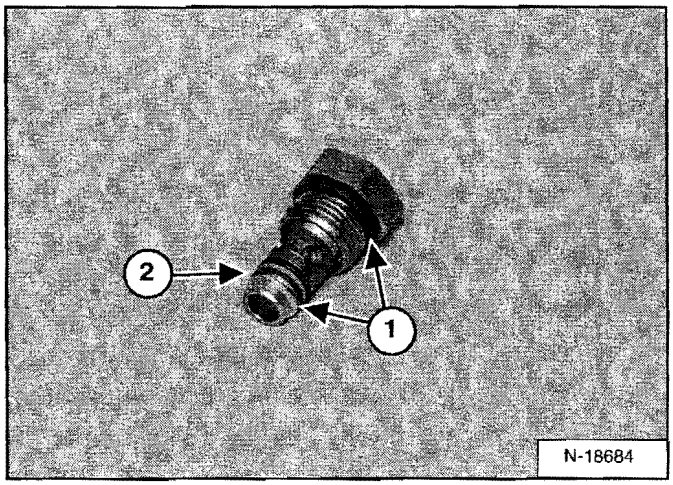
Figure 20-42-39



Remove the check valve (Item 1) **[Figure 20-42-39]**.

Installation: Tighten the valve to 20 ft.-lbs. (27 Nm) torque.

Figure 20-42-40



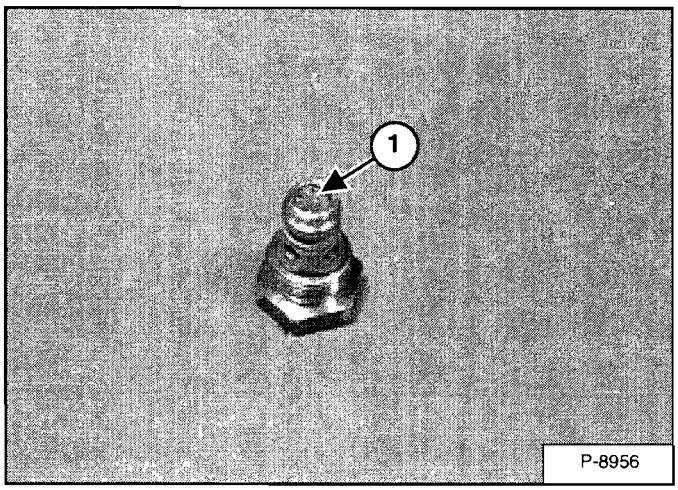
Remove the O-rings (Item 1) and back-up ring (Item 2) **[Figure 20-42-40]** from the check valve.

Install new O-rings and back-up ring on the check valve.

The check valve has a rating of 5-10 PSI.

BICS™ Valve, Check Valve Disassembly And Assembly (Cont'd)

Figure 20-42-41



Clean and inspect the screen (Item 1) **[Figure 20-42-41]** on the end of the valve.

BICS™ Valve, Lock Valve Disassembly And Assembly

Figure 20-42-42

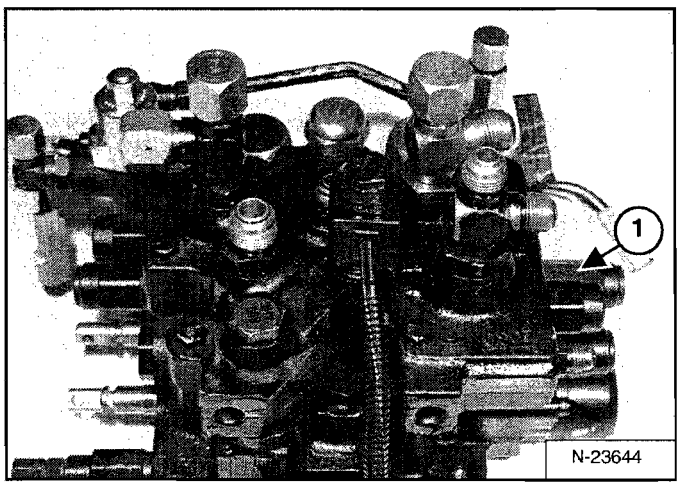


Figure 20-42-43

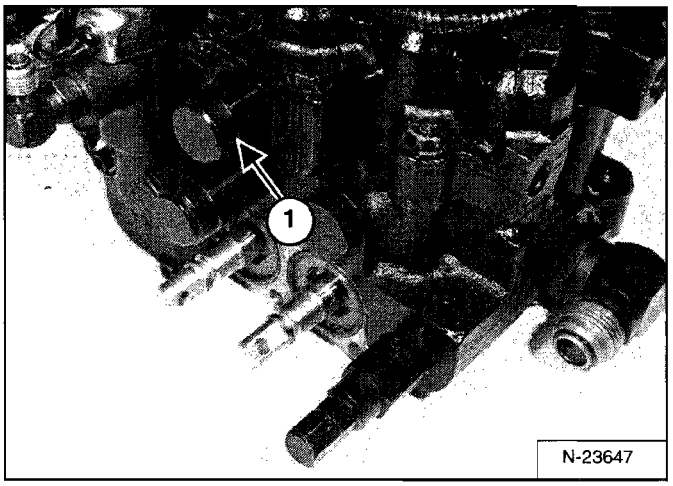
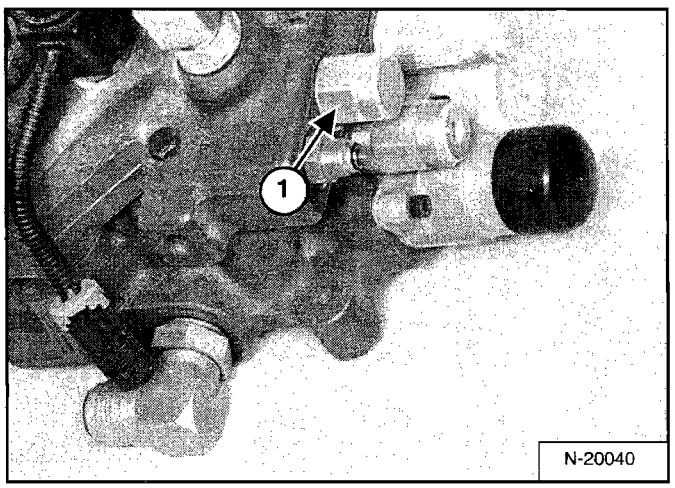


Figure 20-42-44

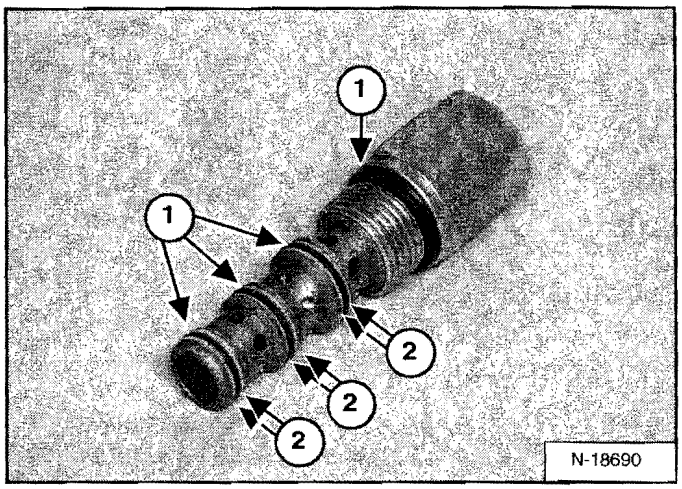


Remove the lock valves (Item 1) **[Figure 20-42-42]**, **[Figure 20-42-43]** & **[Figure 20-42-44]** from the BICS™ valve.

Installation: Tighten the lock valves to 25 ft.-lbs. (34 Nm) torque.

BICS™ Valve, Lock Valve Disassembly And Assembly (Cont'd)

Figure 20-42-45



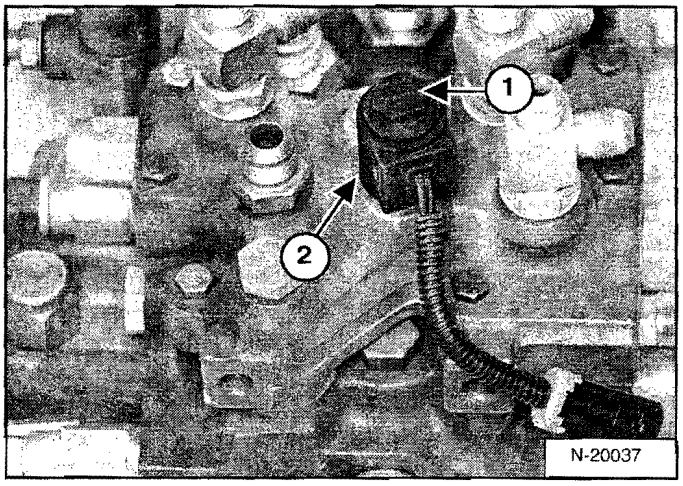
Remove the O-rings (Item 1) and back-up rings (Item 2) **[Figure 20-42-45]** from both the tilt and lift lock valves.

Install new O-rings (Item 1) and back-up rings (Item 2) **[Figure 20-42-45]** on the tilt and lift lock valves.

Reverse the removal procedure to install the lock valve.

BICS™ Valve, Solenoid Disassembly And Assembly

Figure 20-42-46



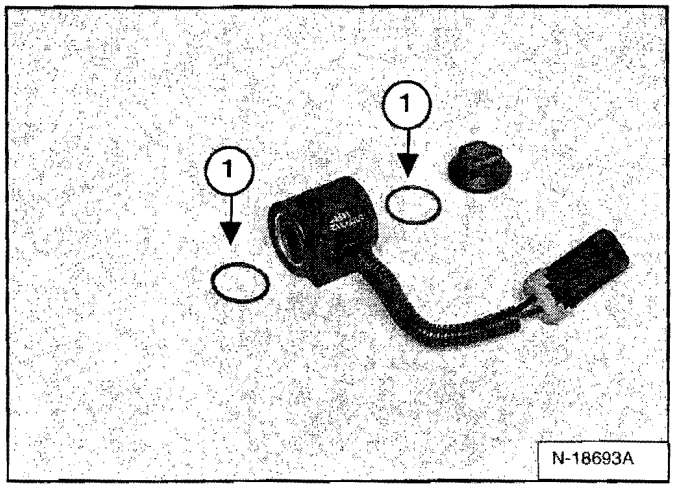
Remove the mounting nut (Item 1) **[Figure 20-42-46]** from the solenoid cartridge.

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

Remove the solenoid (Item 2) **[Figure 20-42-46]**.

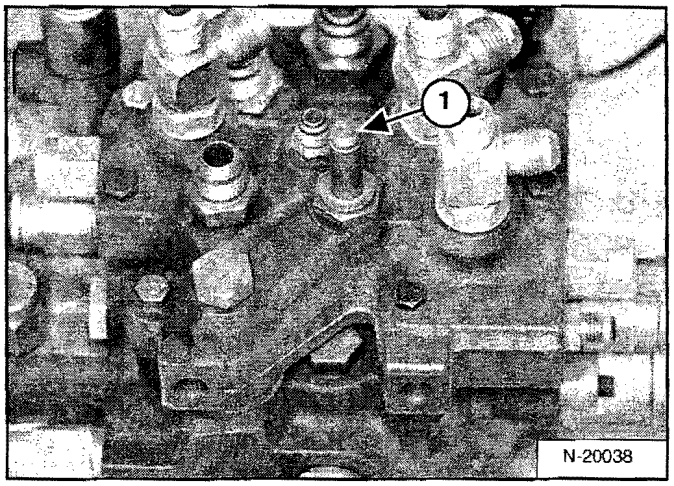
NOTE: The solenoid resistance is (8-10 ohms).

Figure 20-42-47



Remove the O-rings (Item 1) **[Figure 20-42-47]** from both ends of the solenoid.

Figure 20-42-48

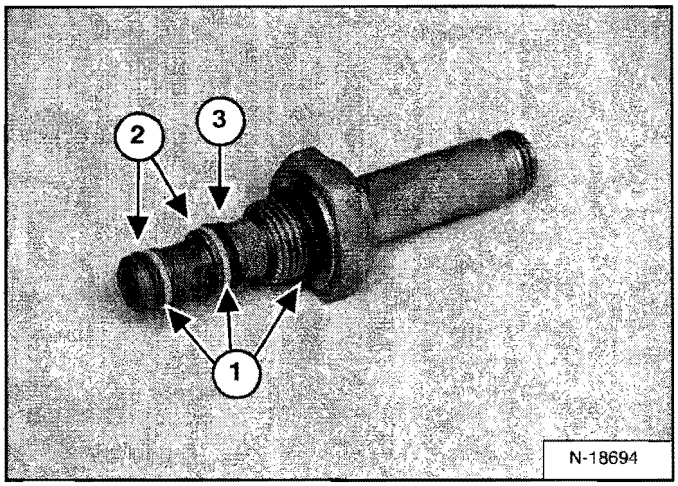


Remove the solenoid stem (Item 1) **[Figure 20-42-48]**.

Installation: Tighten the solenoid stem to 20 ft.-lbs. (27 Nm) torque.

BICS™ Valve, Solenoid Disassembly And Assembly (Cont'd)

Figure 20-42-49



Remove the O-rings (Item 1) and back-up washers (Item 2) **[Figure 20-42-49]** on the stem.

Clean all parts in solvent and dry with compressed air.

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

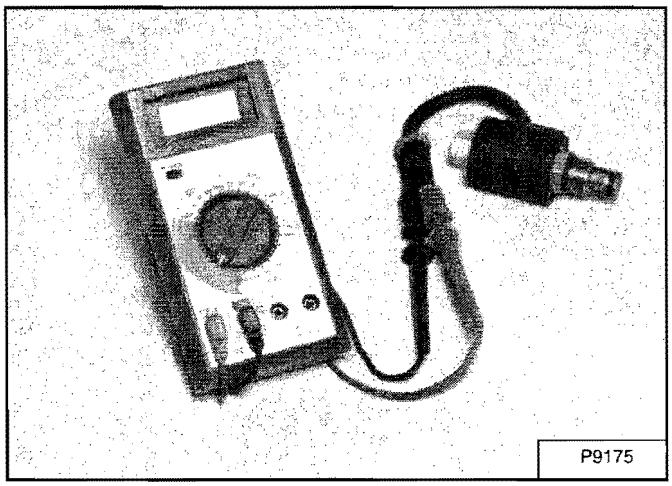
NOTE: The screen (Item 3) [Figure 20-42-49] may be cleaned with solvent. If it is torn or worn replace the solenoid stem.

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

Install new O-rings and new back-up washers on the solenoid stem.

BICS™ Valve, Solenoid Testing

Figure 20-42-50



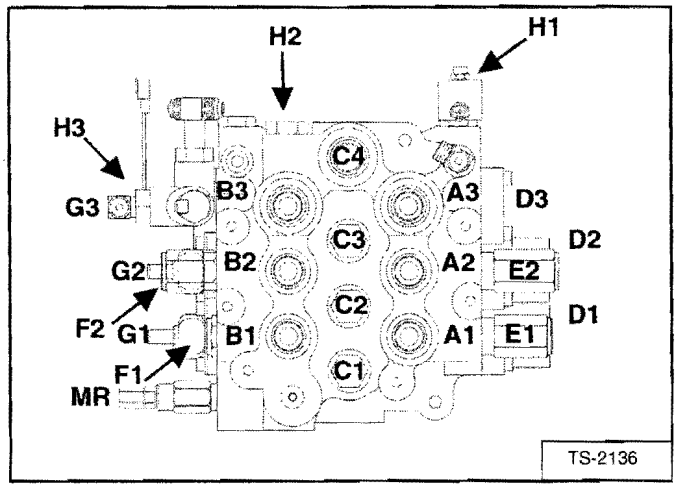
Use a test meter to measure coil resistance **[Figure 20-42-50]**. Coil wires do not have polarity. Correct resistance for the auxiliary pressure relief (small) coil is 7-10 ohm and the other coils 5-8 ohms.

Replace the test meter with 12 volt power. You can see and hear the spool shift.

HYDRAULIC CONTROL VALVE (SELECTABLE JOYSTICK CONTROL) (SJC) (CONT'D)

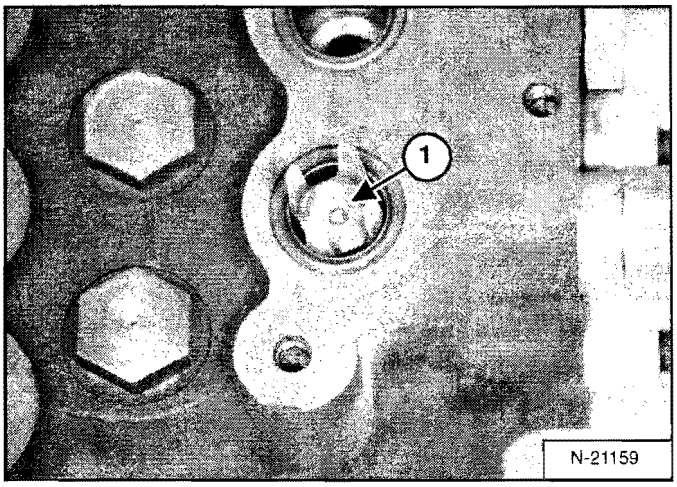
Identification Chart

ITEM	T300 Loader SJC Selectable Joystick Control
A1	Lift Cylinder Base End/Restrictor
A2	Tilt Cylinder Base End
A3	Auxiliary Hydraulics
B1	Lift Cylinder Rod End
B2	Tilt Cylinder Rod End
B3	Auxiliary Hydraulics
C1	Load Check Valve/Lift Function
C2	Load Check Valve/Tilt Function
C3	Orificed Load Check Valve/Auxiliary Function
C4	Outlet Fluid Flow
D1	Lift Spool Centering Spring
D2	Tilt Spool Centering Spring
D3	Auxiliary Spool/Centering Springs
E1	Port Relief Valve – 4000 PSI
E2	Anti–Cavitation/Port Relief Valve – 3500 PSI
F1	Anti-Cavitation Valve
F2	Port Relief Valve – 4000 PSI
G1	Lift Spool End
G2	Tilt Spool End
G3	Auxiliary Spool/Centering Springs
H1	Auxiliary Electric Solenoid
H2	Plug/Port Relief (Optional) – 3500 PSI
H3	Auxiliary Electric Solenoid
MR	Main Relief Valve – 3300 PSI



Lift Base End Restrictor

Figure 20-42-51

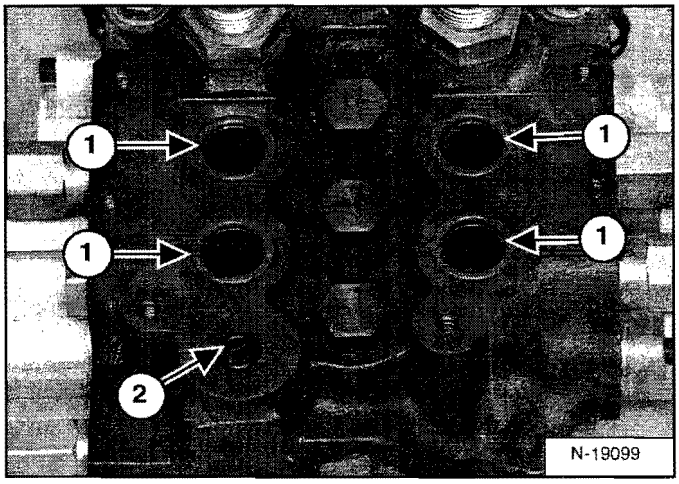


Remove the BICS™ valve assembly from the control valve. (See BICS™ Valve, Removal And Installation on Page 20-41-10.)

Remove the restrictor (Item 1) **[Figure 20-42-51]** from the lift section base end port.

Load Check Valve

Figure 20-42-52



Remove the BICS™ valve assembly from the control valve. (See BICS™ Valve, Removal And Installation on Page 20-41-10.)

Remove the four large O-rings (Item 1) and small O-ring (Item 2) **[Figure 20-42-52]**. Always replace these O-rings before installing the BICS™ valve assembly.

IMPORTANT

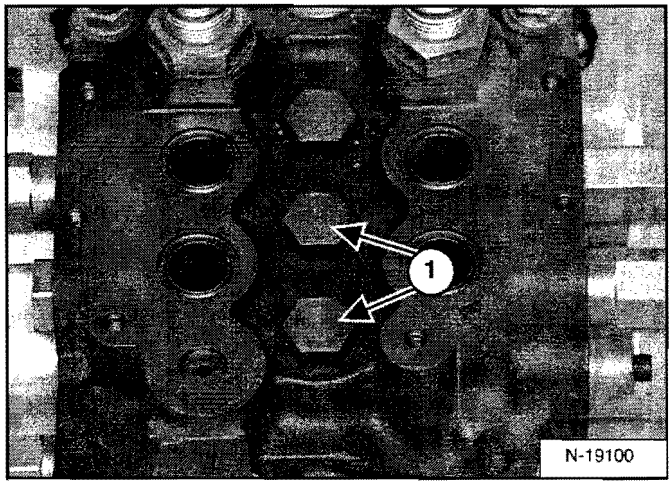
When repairing hydrostatic and hydraulic systems, clean the work area before disassembly and keep all parts clean. Always use caps and plugs on hoses, tubelines and ports to keep dirt out. Dirt can quickly damage the system.

I-2003-0888

Mark each valve section, spool and related parts so that they will be returned to their original valve section during assembly.

Use bolts to fasten the control valve to a work bench for easier disassembly and assembly procedures.

Figure 20-42-53

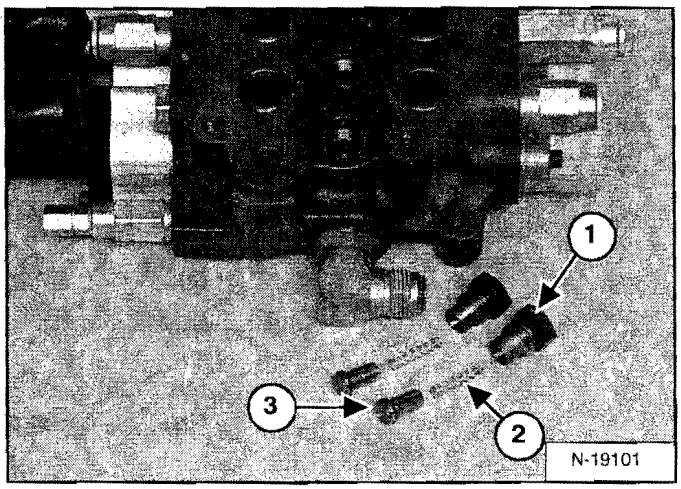


Loosen the load check valve plugs (Item 1) **[Figure 20-42-53]**.

Installation: Always use new O-ring. Tighten the plug to 35-40 ft.-lbs. (47-54 Nm) torque.

Load Check Valve (Cont'd)

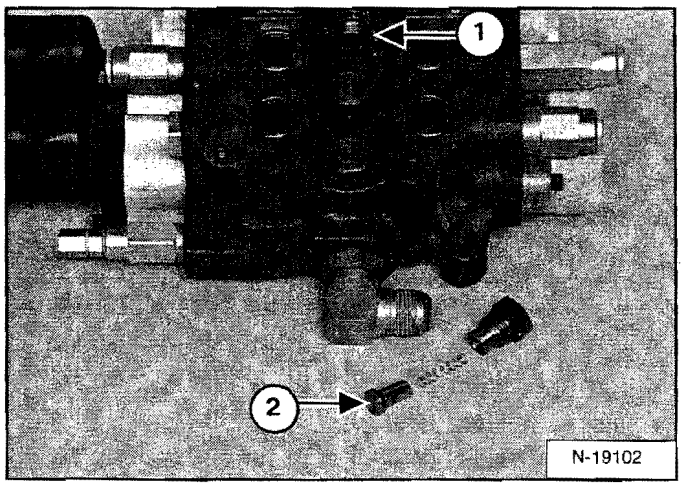
Figure 20-42-54



Remove the load check plugs (Item 1) **[Figure 20-42-54]**.

Remove the spring (Item 2) and poppet (Item 3) **[Figure 20-42-54]**.

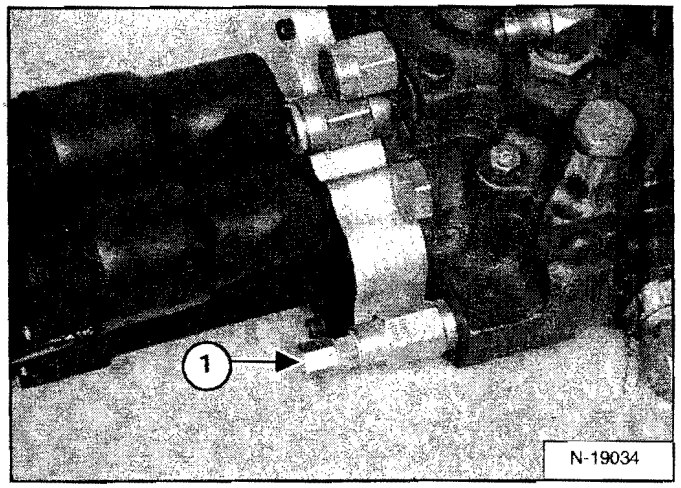
Figure 20-42-55



The auxiliary section (Item 1) uses an orifice load check poppet (Item 2) **[Figure 20-42-55]**.

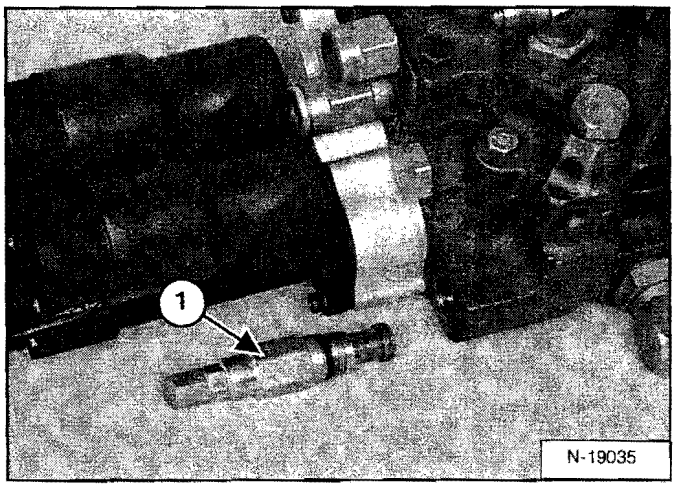
Main Relief Valve

Figure 20-42-56



Loosen the main relief valve (Item 1) **[Figure 20-42-56]**.

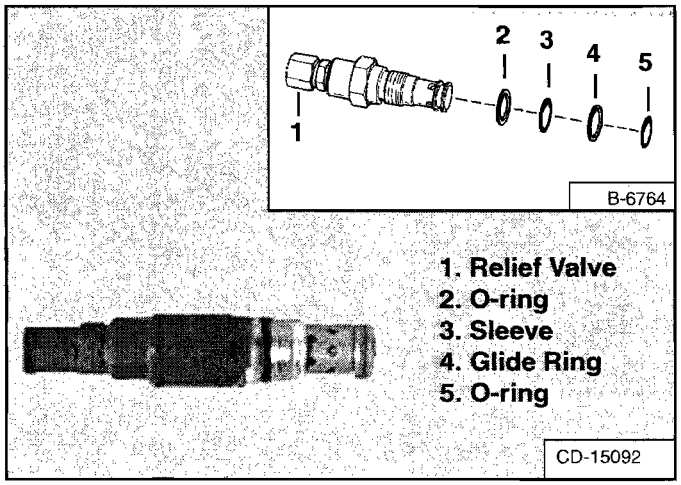
Figure 20-42-57



Remove the main relief valve (Item 1) **[Figure 20-42-57]**.

Main Relief Valve (Cont'd)

Figure 20-42-58



Remove the O-rings, sleeve, and glide ring from the main relief valve **[Figure 20-42-58]**.

Installation: Always use new O-rings, sleeve, and glide ring. Tighten to 35-40 ft.-lbs. (47-54 Nm) torque.

Port Relief Valve

Figure 20-42-59

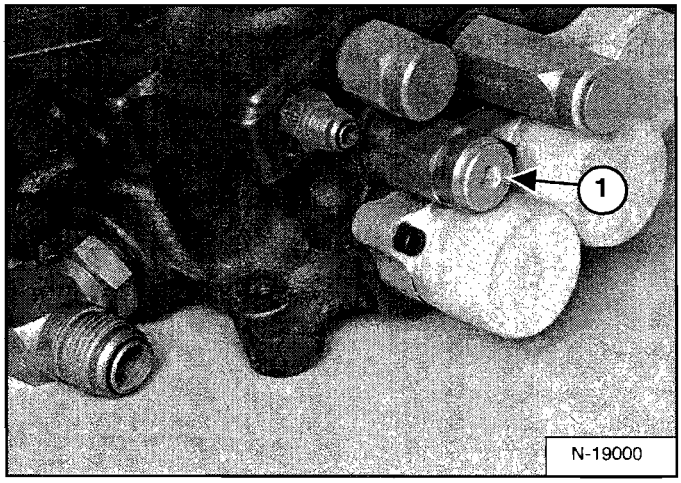
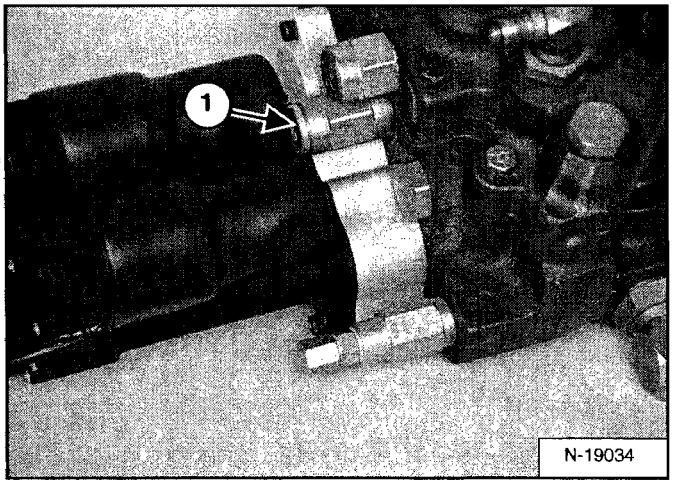


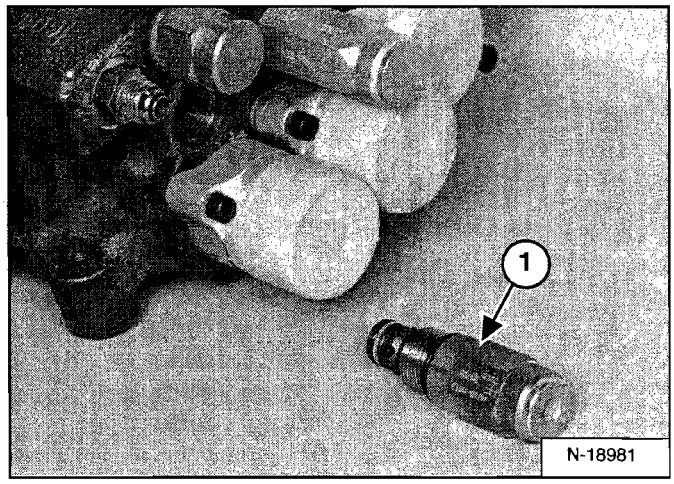
Figure 20-42-60



Loosen the port relief valve (Item 1) **[Figure 20-42-59]** & **[Figure 20-42-60]** (Port E1 or F2). (See Identification Chart on Page 20-41-17.)

Installation: Always use new O-rings and back-up washers. Tighten to 35-40 ft.-lbs. (47-54 Nm) torque.

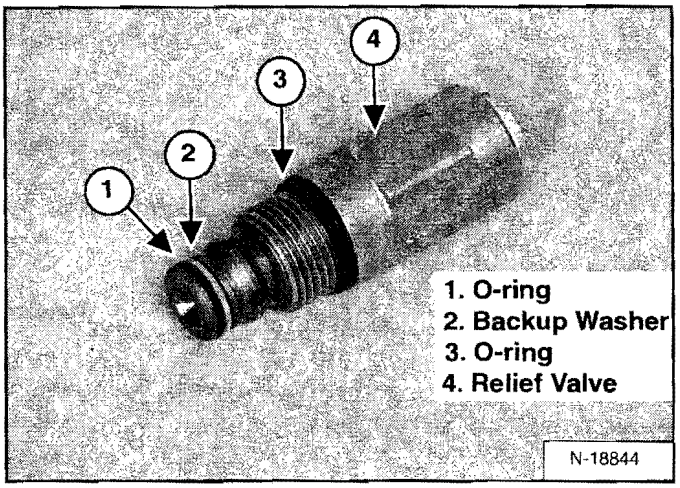
Figure 20-42-61



Remove the port relief valve (Item 1) **[Figure 20-42-61]**.

Port Relief Valve (Cont'd)

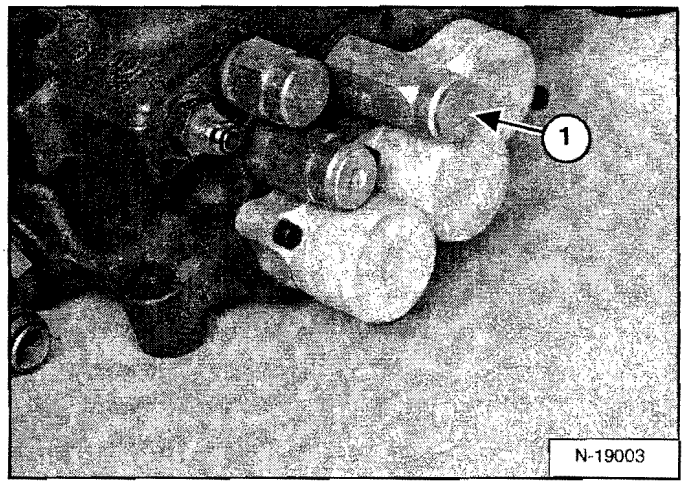
Figure 20-42-62



Remove the O-rings and back-up washer from the port relief valve **[Figure 20-42-62]**.

Anti-Cavitation Valve/Port Relief Valve

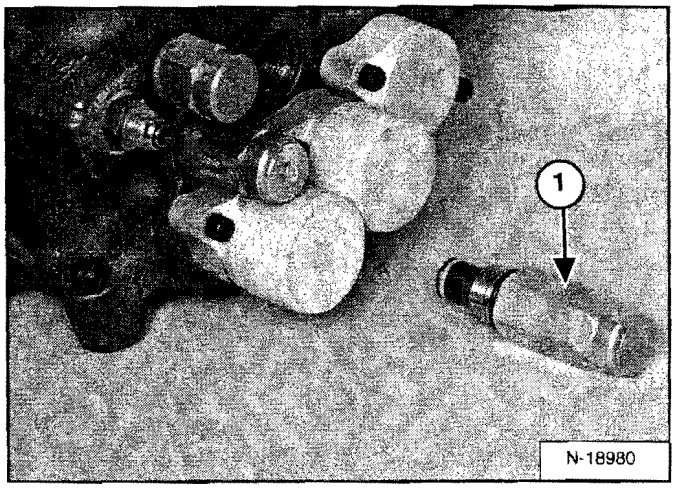
Figure 20-42-63



Loosen the anti-cavitation valve (Item 1) **[Figure 20-42-63]**.

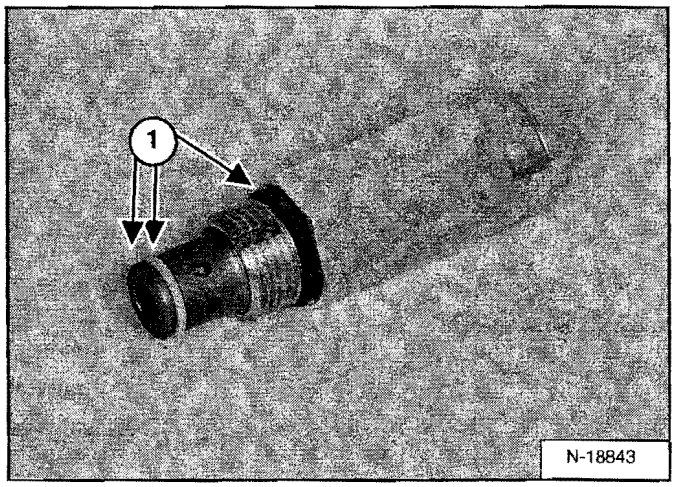
Installation: Always use new O-rings and back-up washers. Tighten to 35-40 ft.-lbs. (47-54 Nm) torque.

Figure 20-42-64



Remove the anti-cavitation/port relief valve (Item 1) **[Figure 20-42-64]** from the control valve for the tilt section.

Figure 20-42-65



Remove the O-rings (Item 1) **[Figure 20-42-65]** from the anti-cavitation/port relief valve.

Anti-Cavitation Valve

Figure 20-42-66

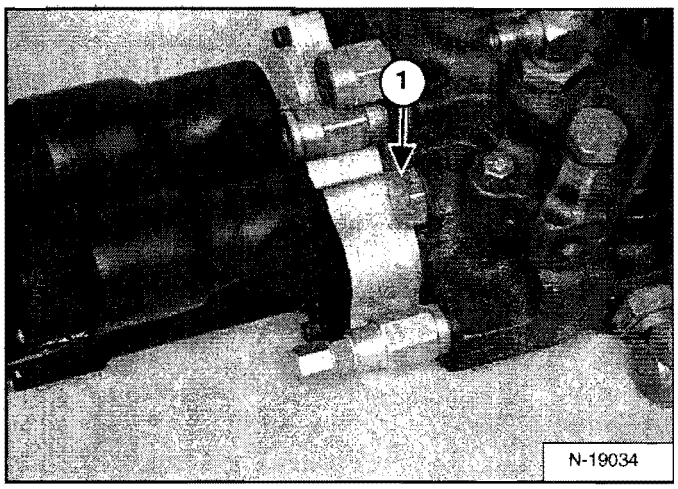
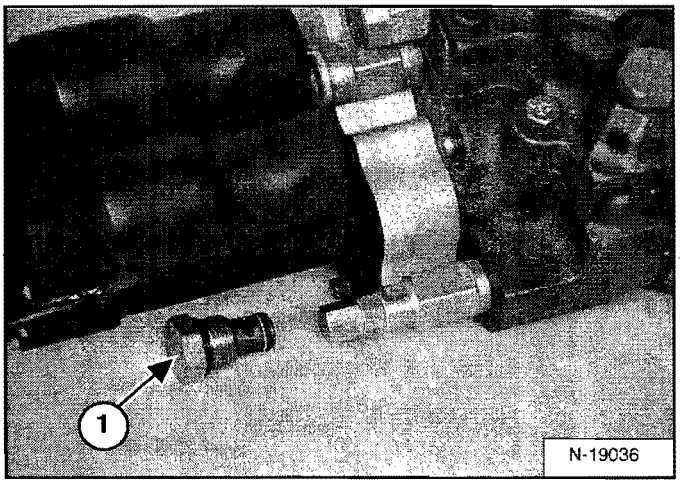
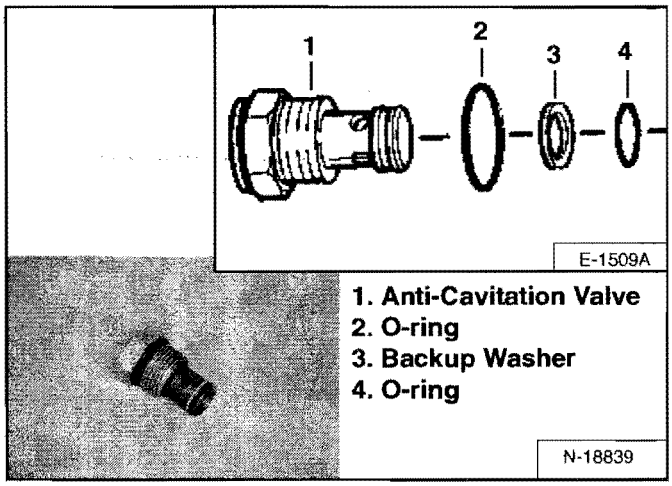


Figure 20-42-67



Remove the anti-cavitation valve (Item 1) **[Figure 20-42-66]** & **[Figure 20-42-67]** from the control valve.

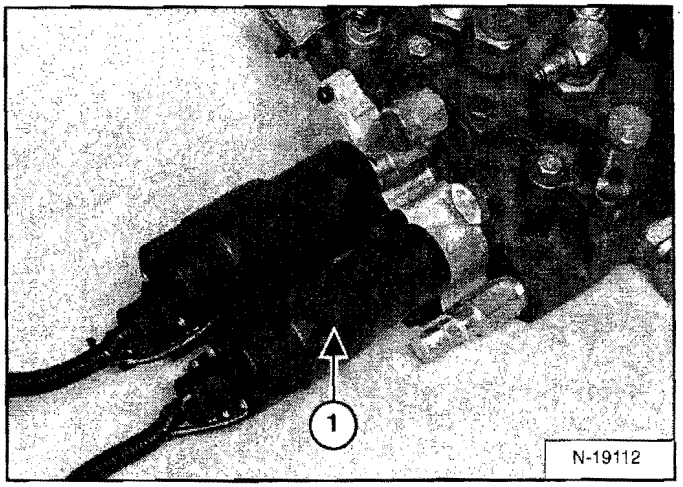
Figure 20-42-68



Remove the O-rings and back-up washer from the anti-cavitation valve **[Figure 20-42-68]**.

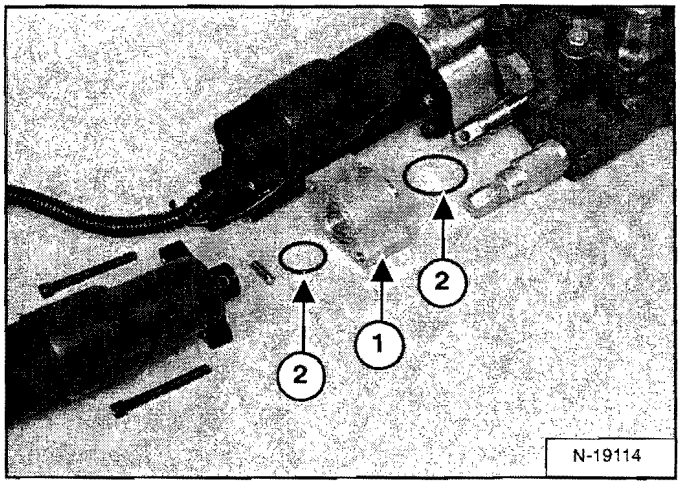
Lift Spool Removal

Figure 20-42-69



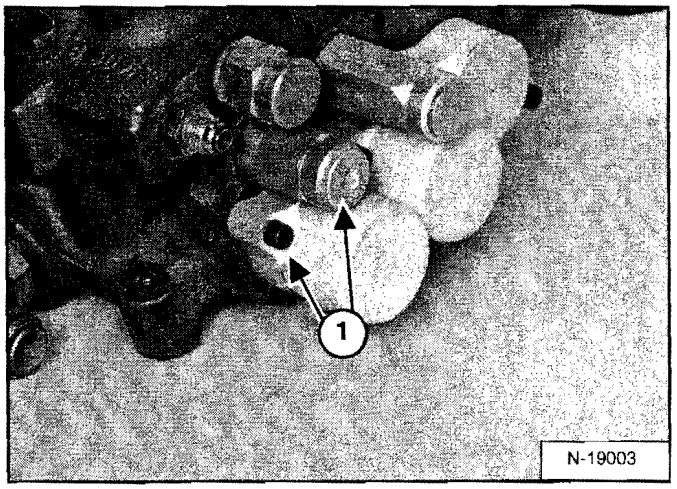
Remove the actuator (Item 1) **[Figure 20-42-69]** from the control valve.

Figure 20-42-70



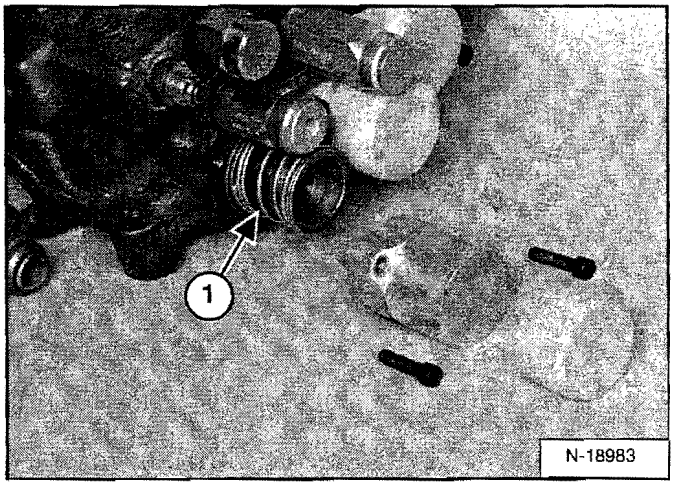
Remove the spacer (Item 1) and O-ring (Item 2) **[Figure 20-42-70]** from the lift spool.

Figure 20-42-71



Remove the screws (Item 1) **[Figure 20-42-71]** from the cap.

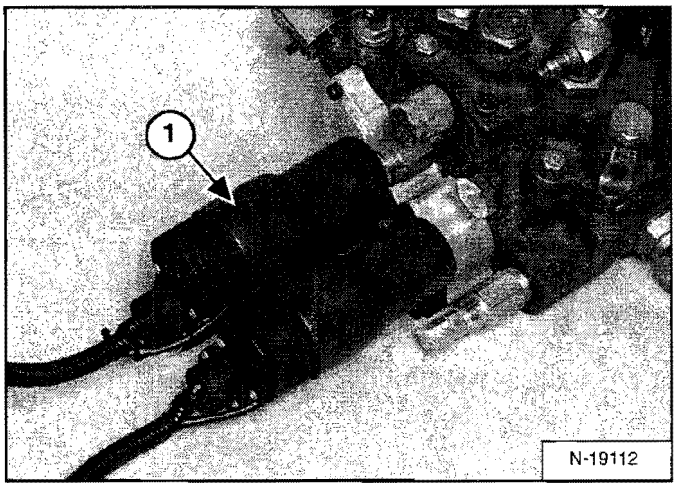
Figure 20-42-72



Remove the spool assembly (Item 1) **[Figure 20-42-72]** and seal from the control valve.

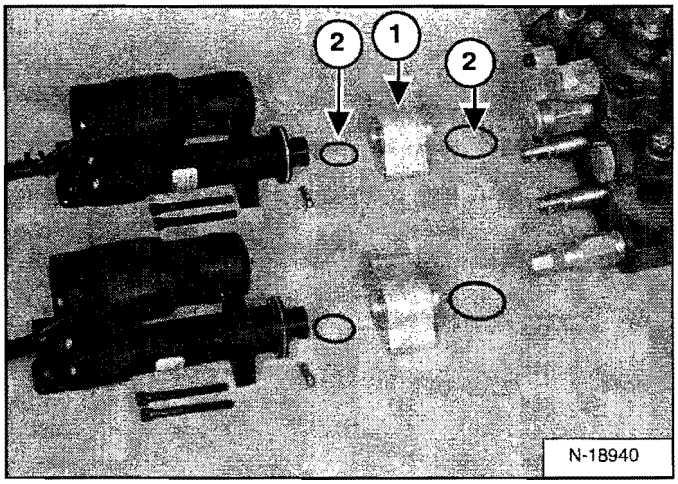
Lift Spool Removal And Installation

Figure 20-42-73



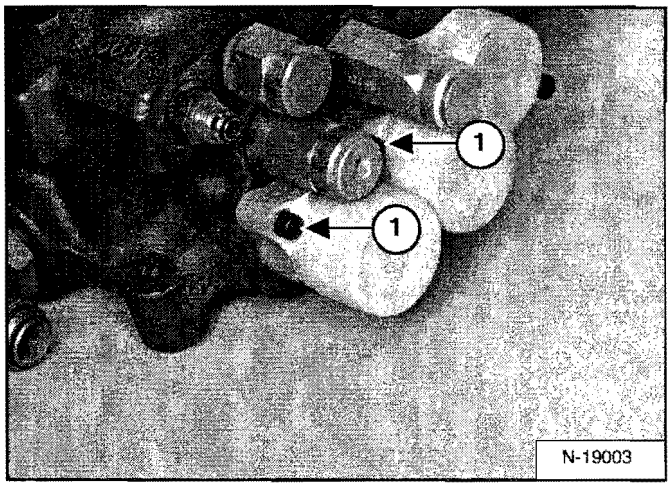
Remove the actuators (Item 1) **[Figure 20-42-73]** from the control valve.

Figure 20-42-74



Remove the spacer (Item 1) and O-ring (Item 2) **[Figure 20-42-74]** from the tilt spool.

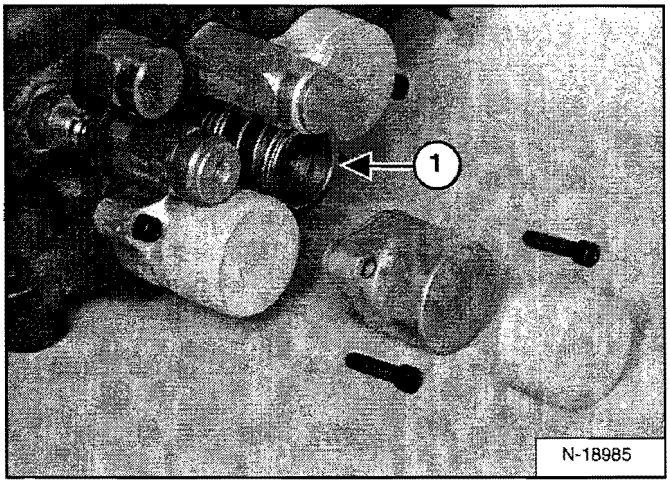
Figure 20-42-75



Remove the screws (Item 1) **[Figure 20-42-75]** from the end cap.

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

Figure 20-42-76



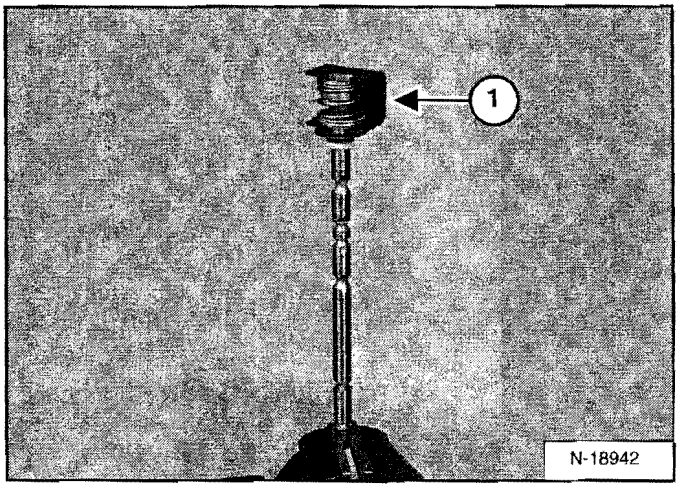
Remove the spool assembly (Item 1) **[Figure 20-42-76]** and seal from the control valve.

Assembly: Always use a new spool seal.

HYDRAULIC CONTROL VALVE (SELECTABLE JOYSTICK CONTROL) (SJC) (CONT'D)

Lift and Tilt Spool Disassembly And Assembly

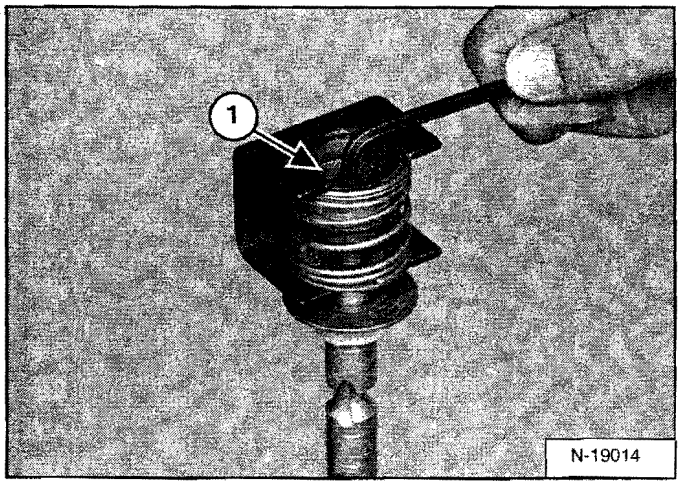
Figure 20-42-77



Put the linkage end of the spool in the vise **[Figure 20-42-77]**.

Install the spool tool (Item 1) **[Figure 20-42-77]** over the centering spring.

Figure 20-42-78

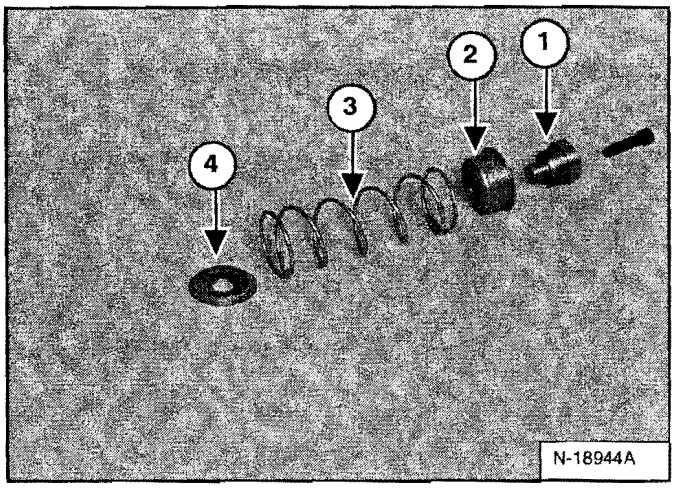


Remove the bolt (Item 1) **[Figure 20-42-78]** holding the centering spring to the spool.

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

Remove spring tool from the spring assembly.

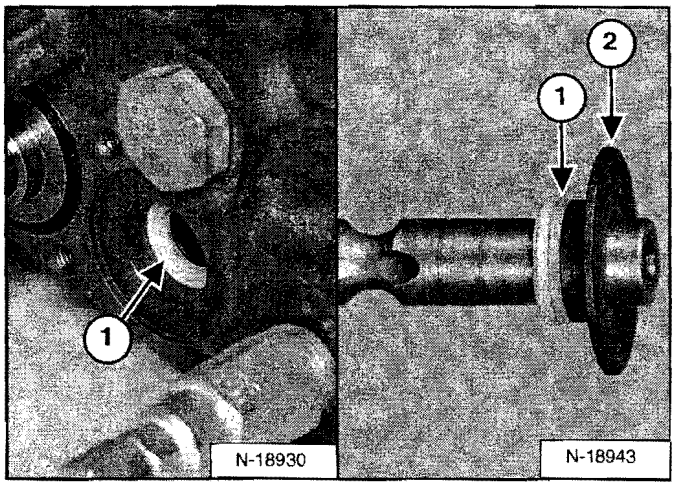
Figure 20-42-79



NOTE: The center spring (Item 3) [Figure 20-42-79] is orange on all 800 Series and T200 loaders.

Inspect the adapter (Item 1), collar (Item 2), spring (Item 3), and washer (Item 4) **[Figure 20-42-79]**.

Figure 20-42-80

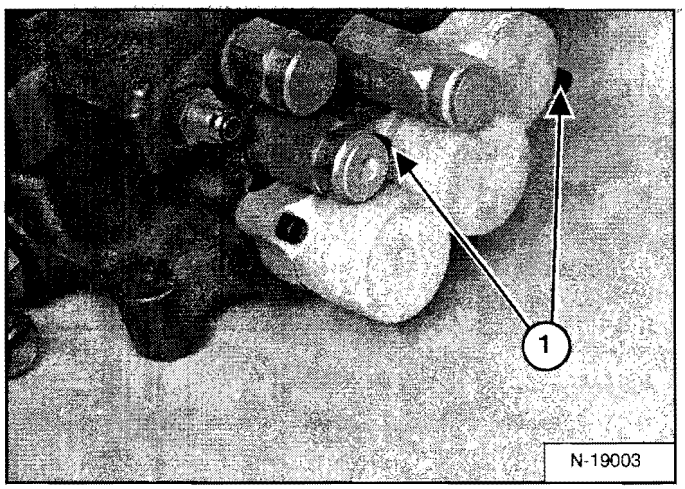


Remove the spool seal (s) (Item 1) and the back-up washer (Item 2) **[Figure 20-42-80]**.

Assembly: Always use a new spool seal.

Auxiliary Spool Removal And Installation

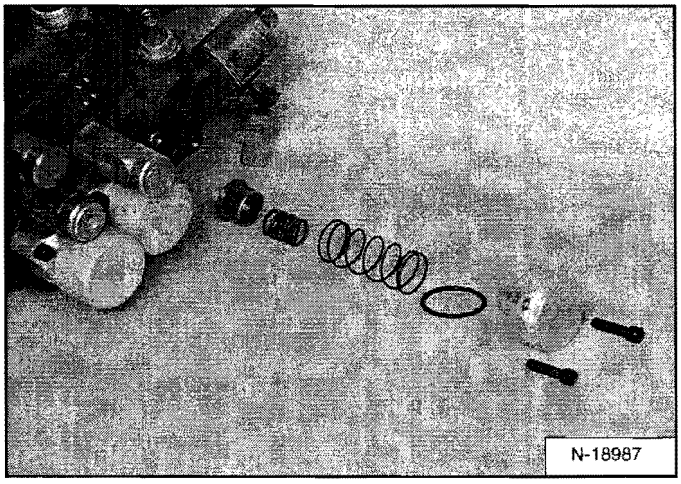
Figure 20-42-81



Remove the screws (Item 1) **[Figure 20-42-81]** from the end cap (both sides).

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

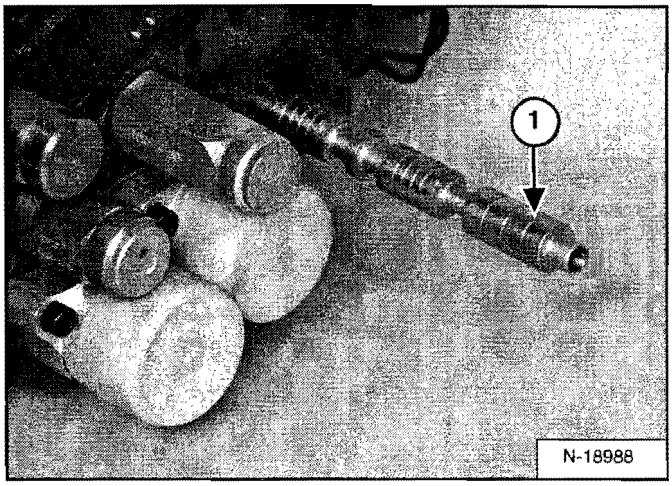
Figure 20-42-82



Remove the end cap, O-ring, springs and washer (both sides) **[Figure 20-42-82]**.

Assembly: Always use a new spool seal.

Figure 20-42-83

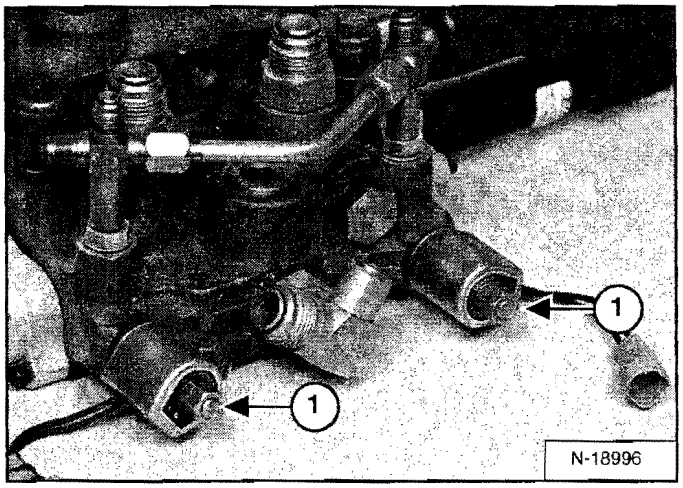


Remove the spool (Item 1) **[Figure 20-42-83]**.

Assembly: Put grease on all the centering spring component parts.

Auxiliary Electric Solenoid Disassembly

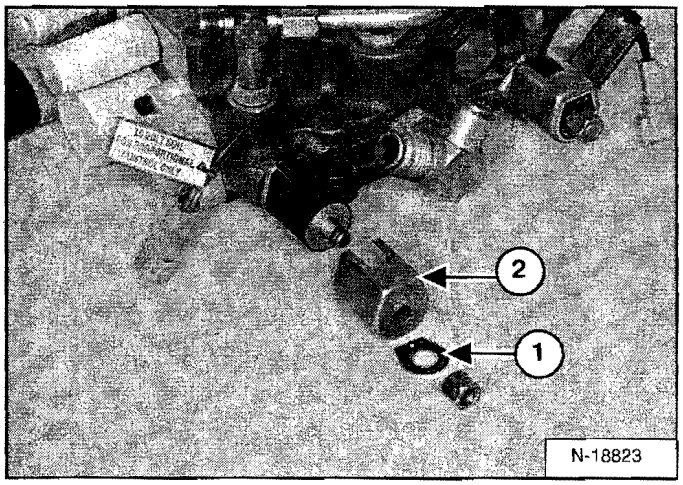
Figure 20-42-84



Remove the nut (Item 1) **[Figure 20-42-84]** from both solenoids.

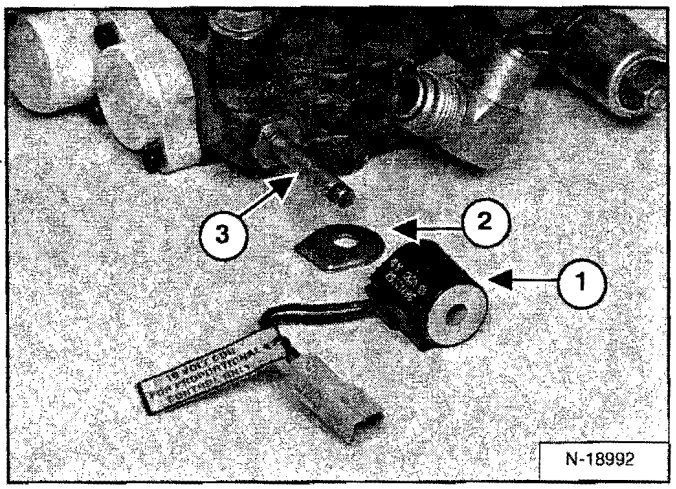
Installation: Tighten the nut to 8-12 ft.-lbs. (11-16 Nm) torque.

Figure 20-42-85



Remove the end plate (Item 1) and housing (Item 2) **[Figure 20-42-85]**.

Figure 20-42-86

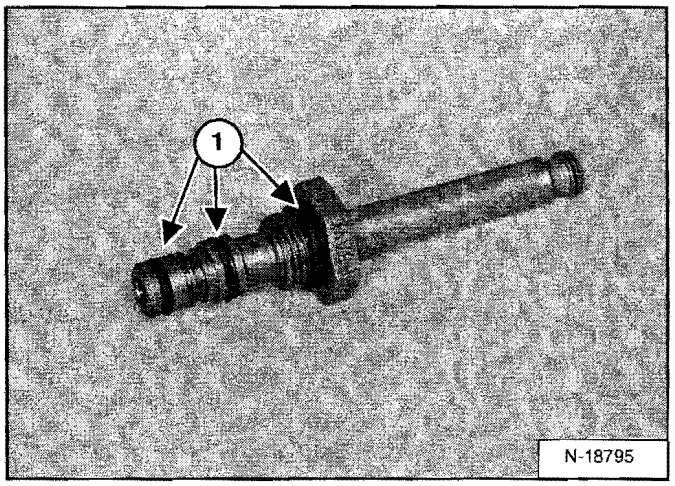


Remove the coil (Item 1) and end plate (Item 2) **[Figure 20-42-86]**.

Remove the solenoid valve (Item 3) **[Figure 20-42-86]**.

Installation: Tighten valve to 8-12 ft.-lbs. (11-16 Nm) torque.

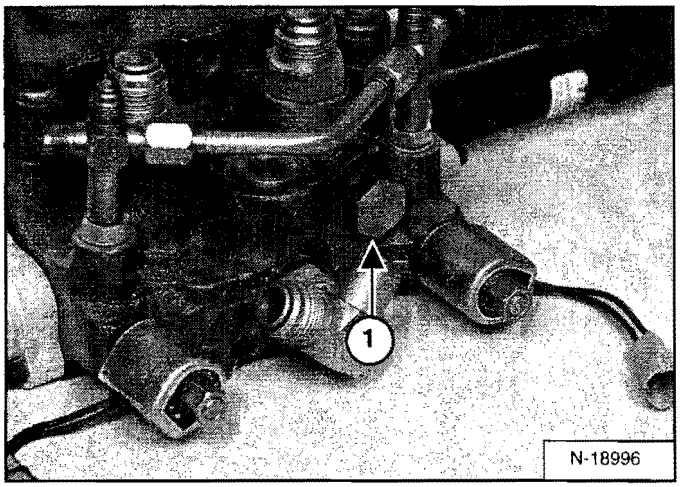
Figure 20-42-87



Remove the O-rings (Item 1) **[Figure 20-42-87]** from the solenoid valves.

Port-Auxiliary Section Disassembly

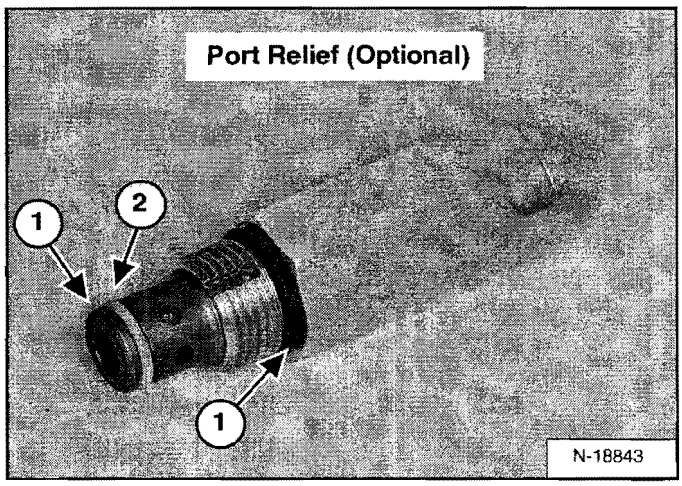
Figure 20-42-88



Remove the plug (Item 1) **[Figure 20-42-88]** or optional port relief valve from the control valve.

NOTE: Optional port relief (Item 1) [Figure 20-42-88] is either 2500 PSI or 3000 PSI depending on the option used.

Figure 20-42-89



Remove the O-rings (Item 1) & and back-up ring (Item 2) & **[Figure 20-42-89]** from the plug.

Cleaning And Inspection

Clean all components with clean solvent and dry with compressed air.

Check the spools for wear or scratches.

Check that the spools are not loose in their bore.

Check that the centering springs are not broken.

Check that the load check valve seats are not worn.

Check the load check poppets for damage.

Check the rubber boots and retainers

Replace the parts as needed.

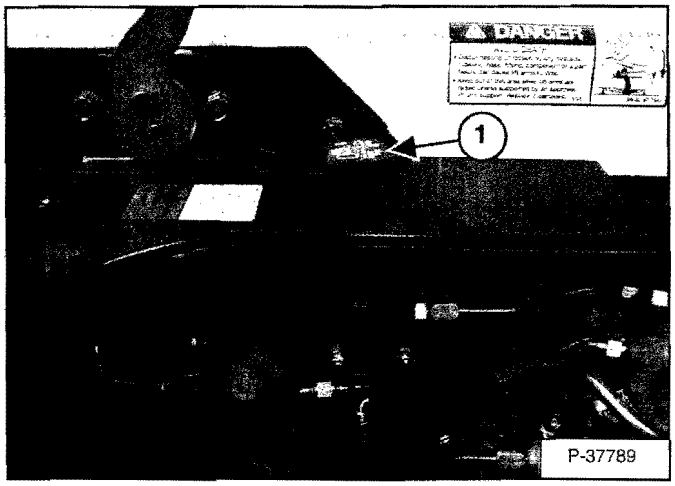
Use new O-rings and back-up rings.

Apply oil to all new O-rings and back-up rings before installation.

LIFT ARM BY-PASS CONTROL VALVE

Inspecting

Figure 20-50-1



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 until the lift arms slowly lower.

Additional Inspection For Loaders W/Advanced Hand Controls

Sit in the operator's seat and fasten the Seat Belt. Lower the Seat Bar, start the engine and press the green PRESS TO OPERATE Button.

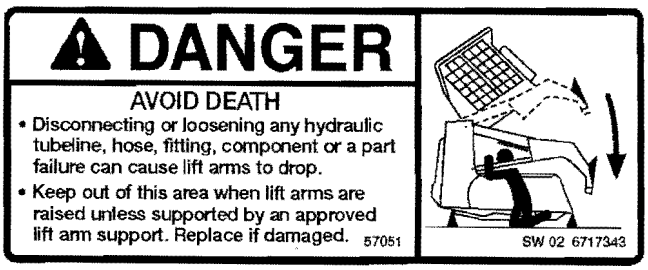
Raise the lift arms about 6 feet (2 meters) off the ground.

Turn the key OFF and wait for the engine to come to a complete stop.

Turn the key ON. Press the green PRESS TO OPERATE Button, move the left hand control toward the operator. The lift arms should not lower.

Move the right hand control away from the operator. The bucket (or attachment) should not tilt forward.

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.

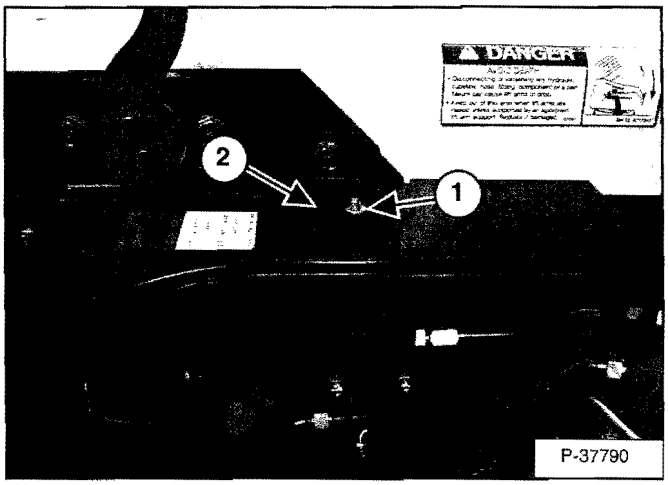
W-2059-0598

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

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

Hold the by-pass control knob (Item 1) **[Figure 20-50-1]** and loosen the jam nut on the by-pass valve shaft.

Figure 20-50-2

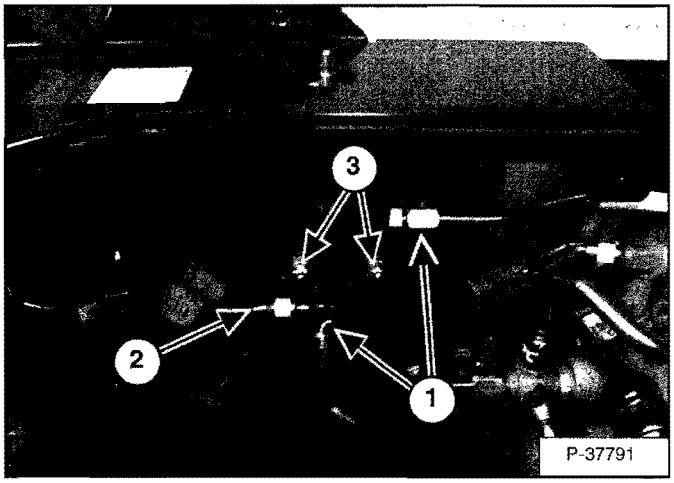


Remove the by-pass control knob. Remove the jam nut (Item 1) **[Figure 20-50-2]** from the valve shaft.

Remove the rubber washer (Item 2) **[Figure 20-50-2]**.

Removal And Installation (Cont'd)

Figure 20-50-3



Disconnect the two hydraulic tubelines (Item 1) **[Figure 20-50-3]** and cap and plug the lines.

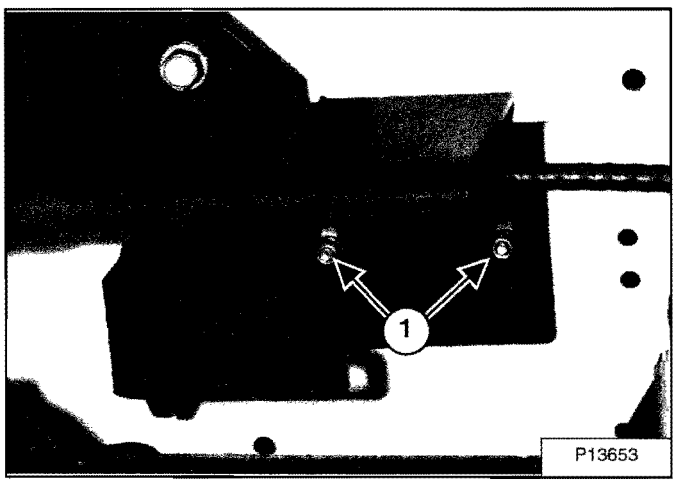
Disconnect the hydraulic hose (Item 2) **[Figure 20-50-3]** and cap and plug the lines.

Remove the two mounting bolts (Item 3) **[Figure 20-50-3]**.

Installation: Tighten the mounting bolts to 180-200 in.-lbs. (21-23 Nm) torque.

Remove the lift arm by-pass valve.

Figure 20-50-4

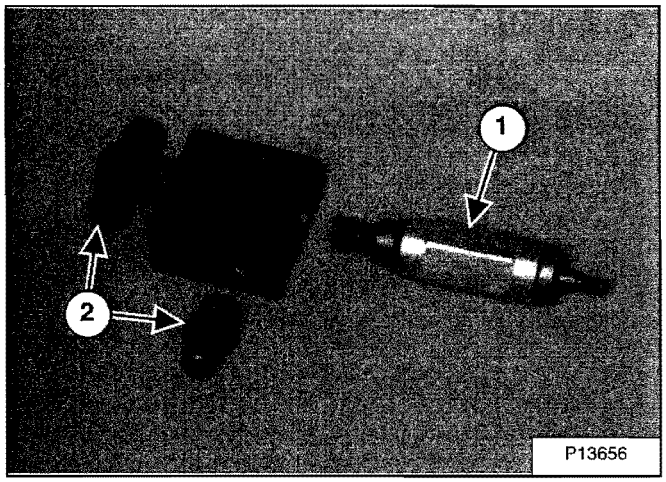


Remove the two bolts (Item 1) **[Figure 20-50-4]** to replace the by-pass valve mounting bracket if necessary.

Reverse the removal procedure to install the lift arm by-pass valve in the loader.

Disassembly And Assembly

Figure 20-50-5



Remove the by-pass valve (Item 1) **[Figure 20-50-5]** 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 (Item 2) **[Figure 20-50-5]** on the valve block for damage and replace if necessary.

HYDRAULIC PUMP

Check The Output Of The Hydraulic Pump

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

MEL1563 - Remote Start Tool
MEL10103 - Hydraulic Tester
MEL10106 - Hydraulic Test Kit

⚠ 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.)

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

⚠ 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.

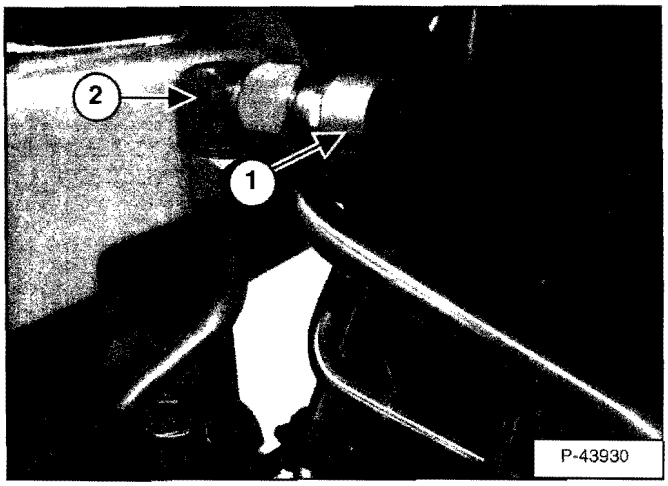
W-2059-0598

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

Open the rear door of the loader.

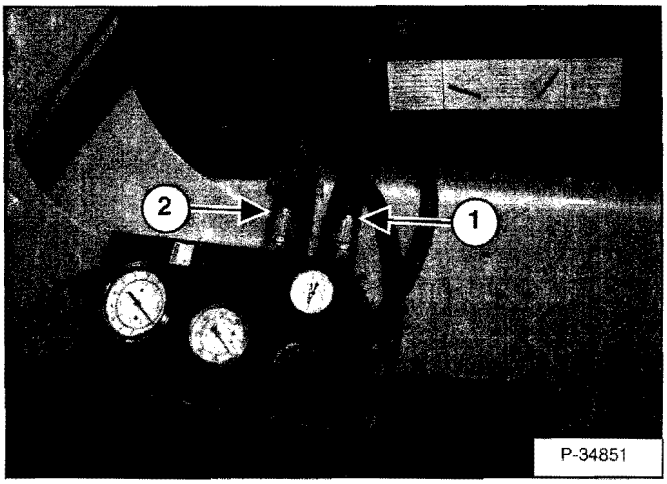
Connect the remote start tool. (See Contents Page 10-01.)

Figure 20-60-1



Disconnect the OUTLET hose (Item 1) **[Figure 20-60-1]** that comes from the gear pump, and connects to the tubeline on the control valve.

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 tubeline (Item 2) **[Figure 20-60-1]** on the control valve.

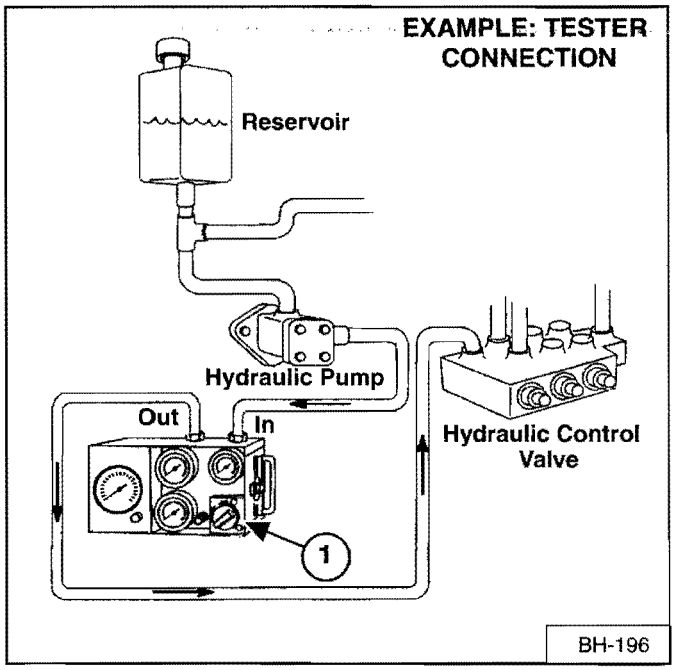
IMPORTANT

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 (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.

Push the maximum/variable flow switch (on the remote start tool) to engage the front auxiliary hydraulics, the light will come ON. Push the button (on the right control lever) for fluid flow to the quick coupler (fluid pressure will go over main relief). Record the highest pressure (PSI) and flow (GPM). 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.

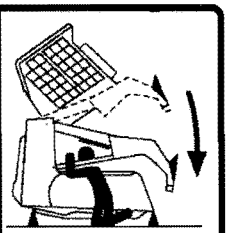
*Refer to SPECIFICATIONS Contents Page SPEC-01 for system relief pressure and full RPM.

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 rear of the loader. (See Contents Page 10-01.)

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

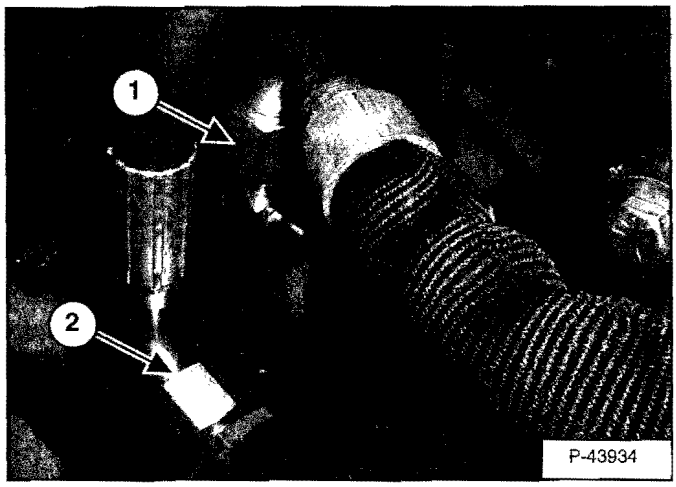
Drain the hydraulic fluid from the reservoir. (See Contents Page 20-01.)

Open the rear door of the loader.

Remove the Power Bob-Tach block if equipped. (See Contents Page 20-01.)

Removal And Installation (Cont"d)

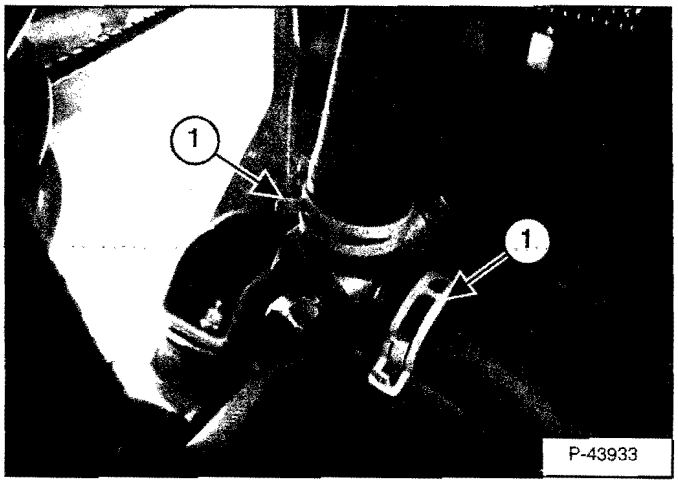
Figure 20-60-4



Disconnect and cap the hose from the outlet fitting (Item 1) **[Figure 20-60-4]** of the hydraulic pump.

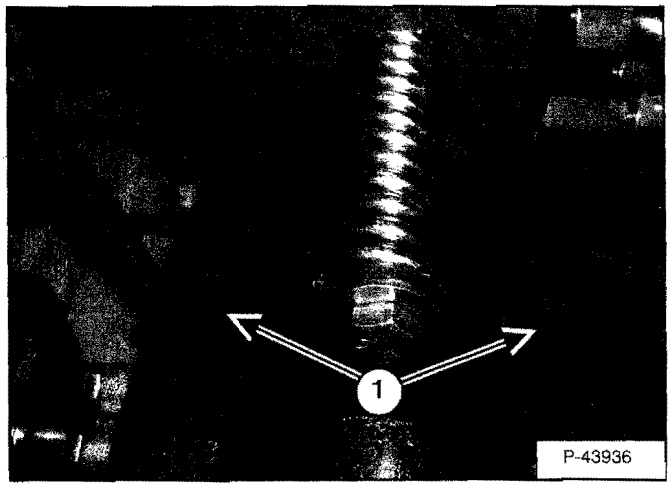
Disconnect and cap the hose from the outlet fitting (Item 2) **[Figure 20-60-4]** of the hydraulic charge pump.

Figure 20-60-5



Disconnect the two inlet hoses (Item 1) **[Figure 20-60-5]** from the front of the hydraulic pump.

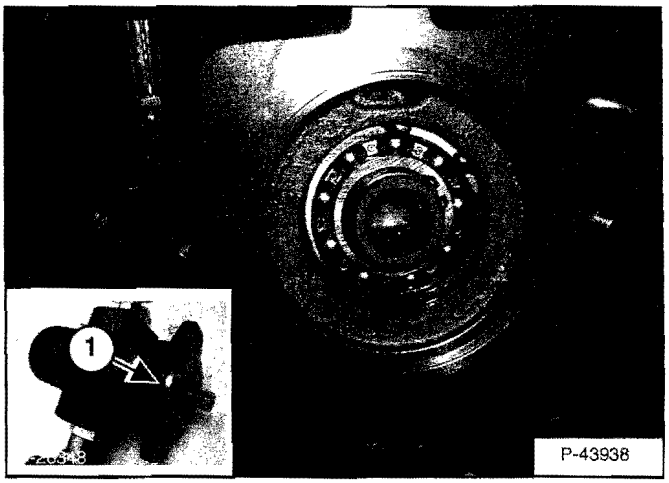
Figure 20-60-6



Remove the two mounting bolts (Item 1) **[Figure 20-60-6]** from the hydraulic pump.

Installation: Tighten the mounting bolts to 27-37 ft.-lbs. (37-50 Nm) torque.

Figure 20-60-7

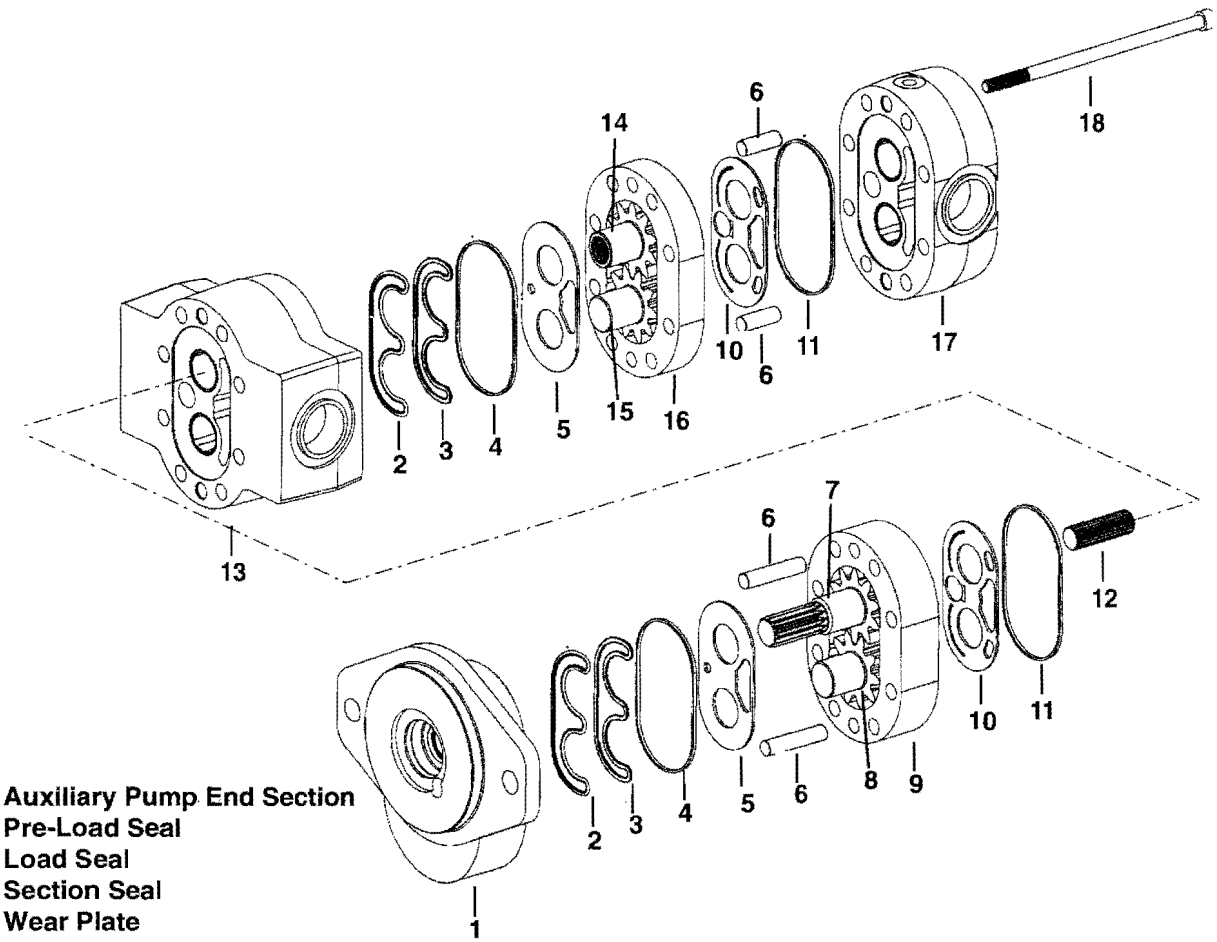


Remove the hydraulic pump from the hydrostatic pump **[Figure 20-60-7]**.

Remove the O-ring (Item 2) **[Figure 20-60-7]**.

Installation: Use a new O-ring when installing the hydraulic pump.

Parts Identification



1. Auxiliary Pump End Section
2. Pre-Load Seal
3. Load Seal
4. Section Seal
5. Wear Plate
6. Pins
7. Drive Gear (Auxiliary Pump)
8. Idler Gear (Auxiliary Pump)
9. Auxiliary Pump Center Section
10. Wear Plate
11. Section Seal
12. Spline Shaft
13. Auxiliary Pump End Section
14. Drive Gear (Charge Pump)
15. Idler Gear (Charge Pump)
16. Charge Pump Center Section
17. Charge Pump End Section
18. Bolts (8)

B-21259

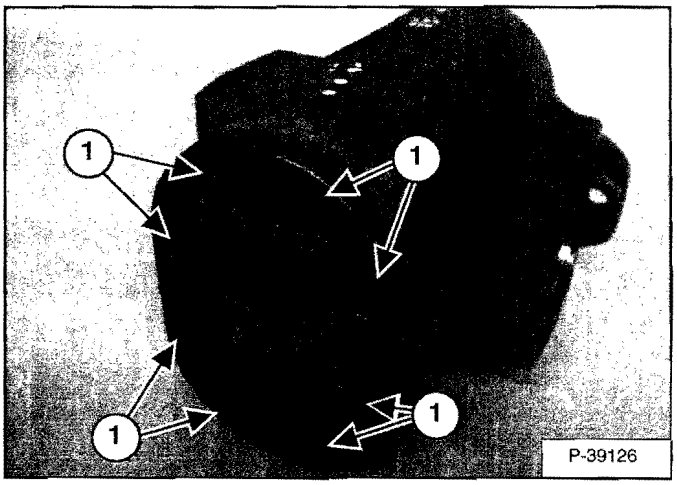
Disassembly And Assembly

IMPORTANT

When repairing hydrostatic and hydraulic systems, clean the work area before disasembly 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 20-60-8

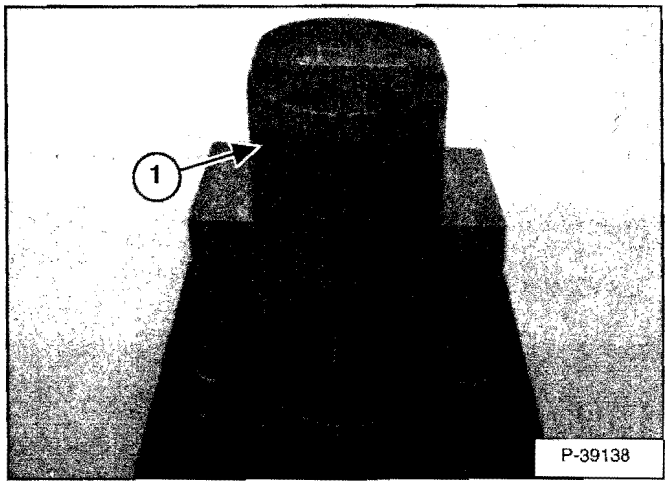


Mark the pump sections for correct assembly **[Figure 20-60-8]**.

Remove the eight pump housing bolts (Item 2) **[Figure 20-60-8]**.

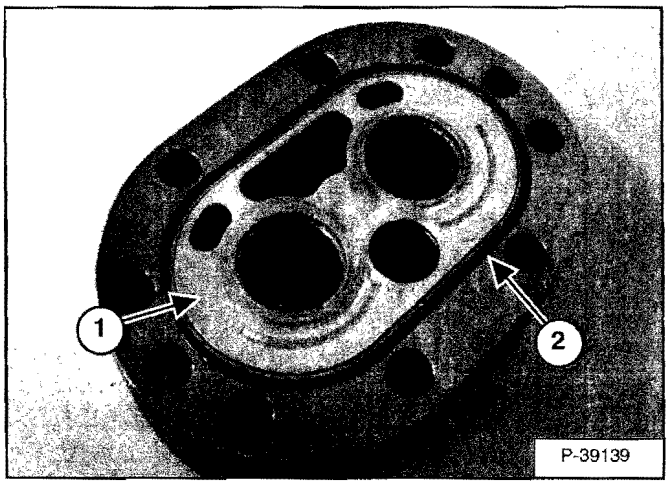
Installation: Tighten the eight bolts (Item 1) **[Figure 20-60-8]** to 45-50 ft.-lbs (60-67 Nm) torque.

Figure 20-60-9



Set the pump on end, and remove the pump end section (Item 1) **[Figure 20-60-9]** from the charge pump.

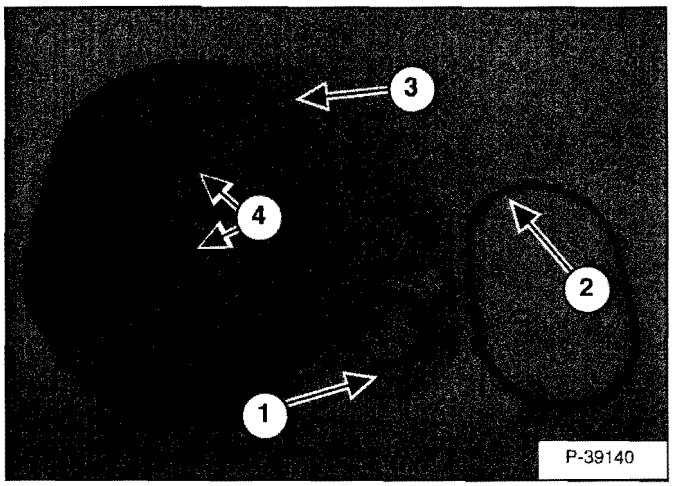
Figure 20-60-10



Remove the wear plate (Item 1) and the section seal (Item 2) **[Figure 20-60-10]**.

Disassembly And Assembly (Cont'd)

Figure 20-60-11

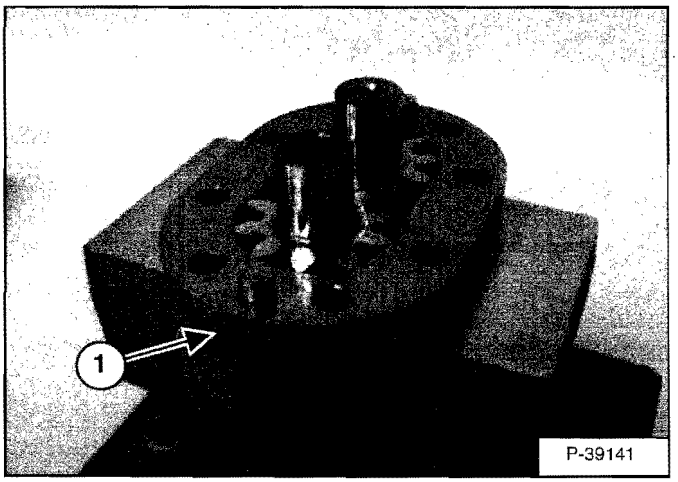


Inspect the wear plate (Item 1) and the section seal (Item 2) **[Figure 20-60-11]** and replace as needed.

NOTE: Position the wear plate (Item 1) [Figure 20-60-11] inlets and traps as shown with the bronze side toward the gears.

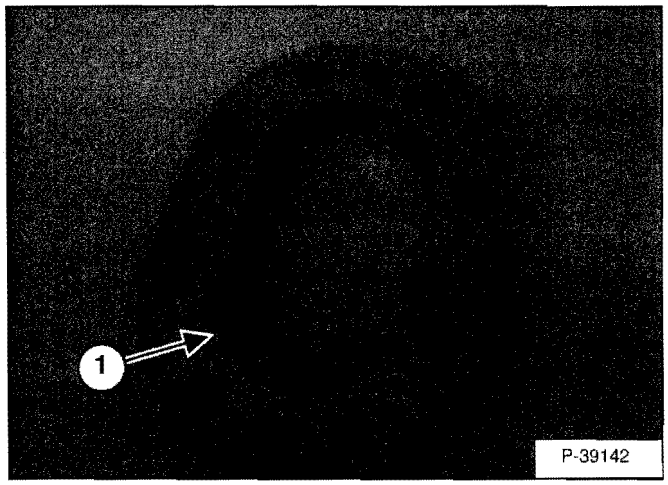
NOTE: Inspect the pump end section (Item 3) and bushings (Item 4) [Figure 20-60-11]. If excessive wear or damage is visible, the pump must be replaced.

Figure 20-60-12



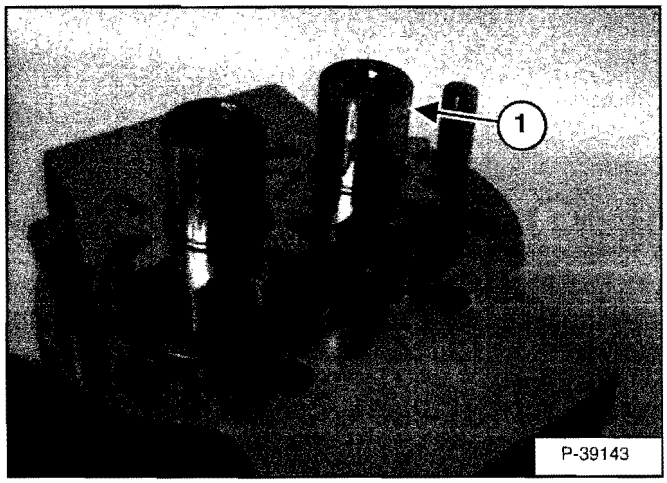
Remove the charge pump center section (Item 1) **[Figure 20-60-12]** from the auxillary pump.

Figure 20-60-13



NOTE: Inspect the charge pump center section (Item 1) [Figure 20-60-13]. If excessive wear or damage is visible, the pump must be replaced.

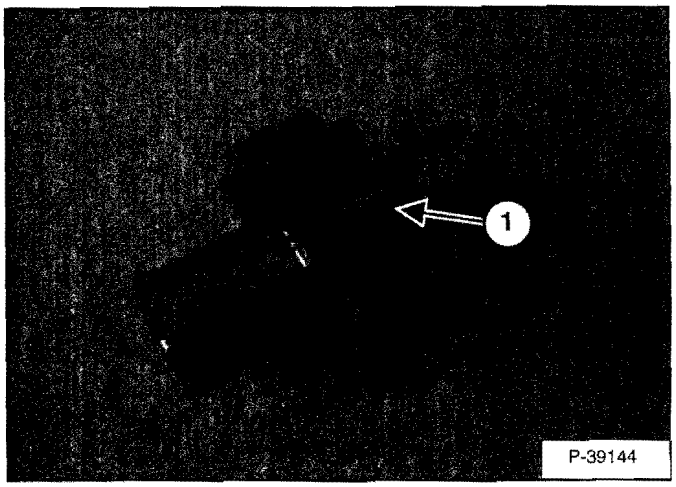
Figure 20-60-14



Remove the idler gear (Item 1) **[Figure 20-60-14]** from the charge pump.

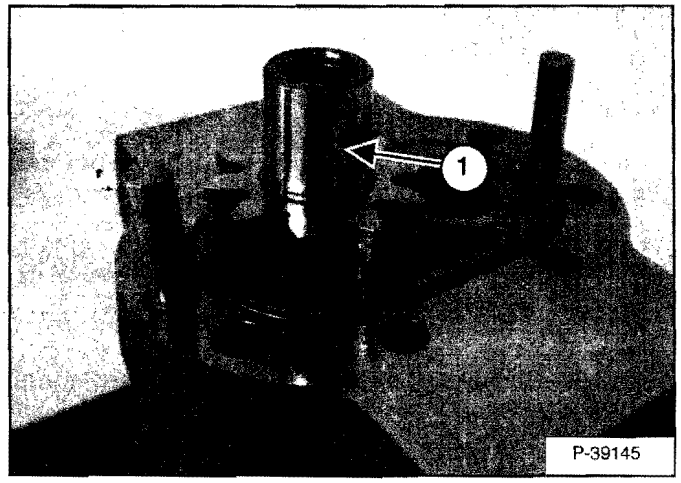
Disassembly And Assembly (Cont'd)

Figure 20-60-15



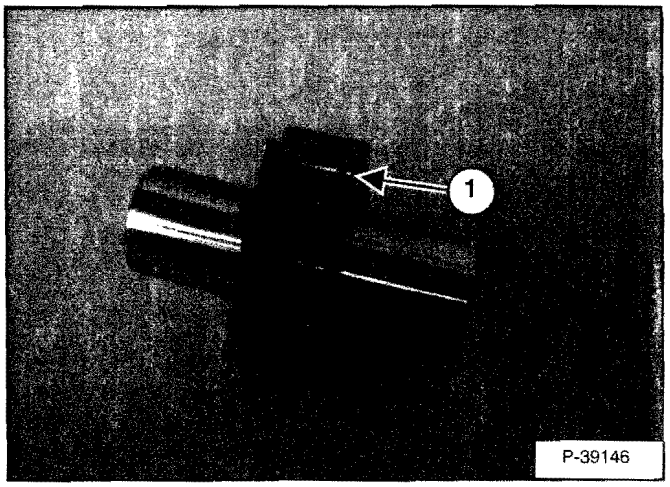
NOTE: Inspect the idler gear (Item 1) [Figure 20-60-15]. If excessive wear or damage is visible, the pump must be replaced.

Figure 20-60-16



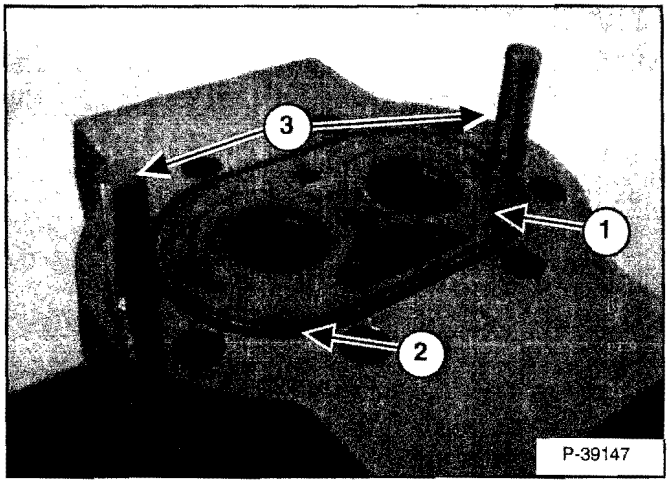
Remove the drive gear (Item 1) **[Figure 20-60-16]** from the charge pump.

Figure 20-60-17



NOTE: Inspect the drive gear (Item 1) [Figure 20-60-17]. If excessive wear or damage is visible, the pump must be replaced.

Figure 20-60-18

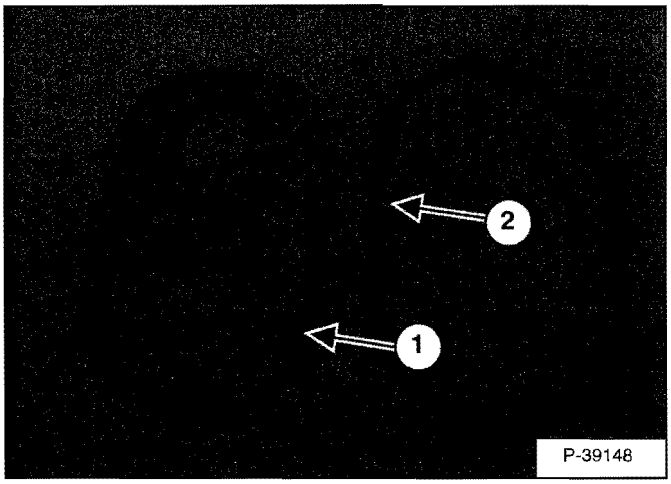


Remove the wear plate (Item 1) and section seal (Item 2) **[Figure 20-60-18]** from the front section of the charge pump.

Remove the locating pins (Item 3) **[Figure 20-60-18]** from the front section of the charge pump.

Disassembly And Assembly (Cont'd)

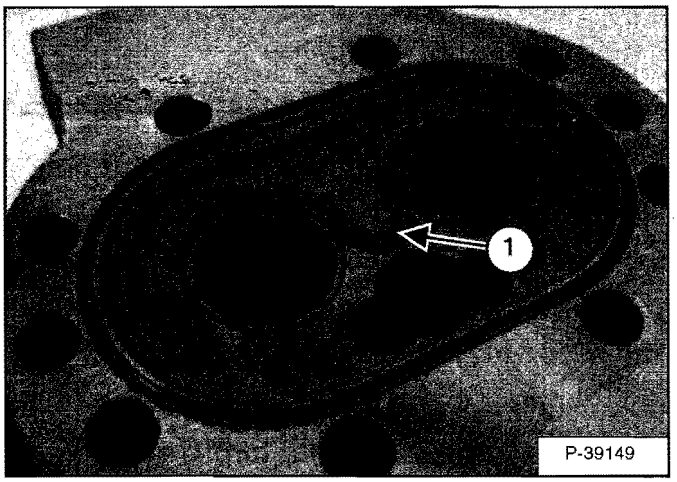
Figure 20-60-19



Inspect the wear plate (Item 1) and the section seal (Item 2) **[Figure 20-60-19]** and replace as needed.

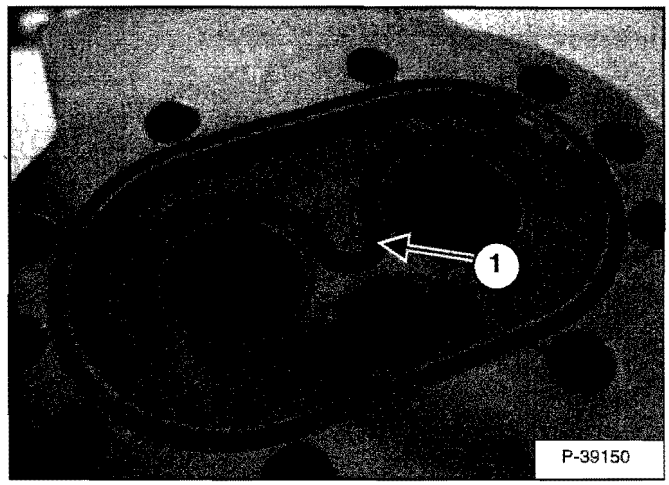
NOTE: Position the wear plate (Item 1) [Figure 20-60-19] inlets and traps as shown with the bronze side toward the gears.

Figure 20-60-20



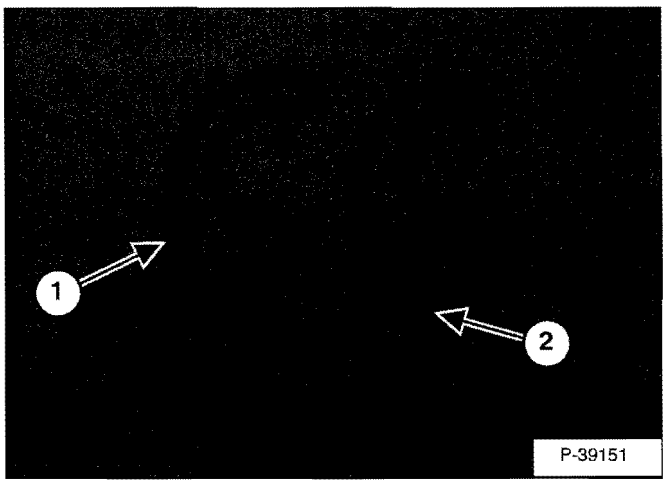
[Figure 20-60-20]Remove the load seal (Item 1) from the front section of the charge pump.

Figure 20-60-21



Remove the Pre-load seal (Item 1) **[Figure 20-60-21]** from the front section of the charge pump.

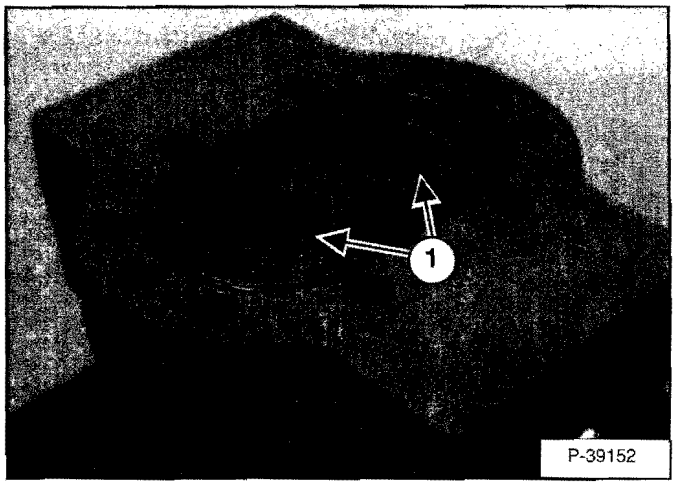
Figure 20-60-22



Inspect the load seal (Item 1) and the Pre-load seal (Item 2) **[Figure 20-60-22]** and replace as needed.

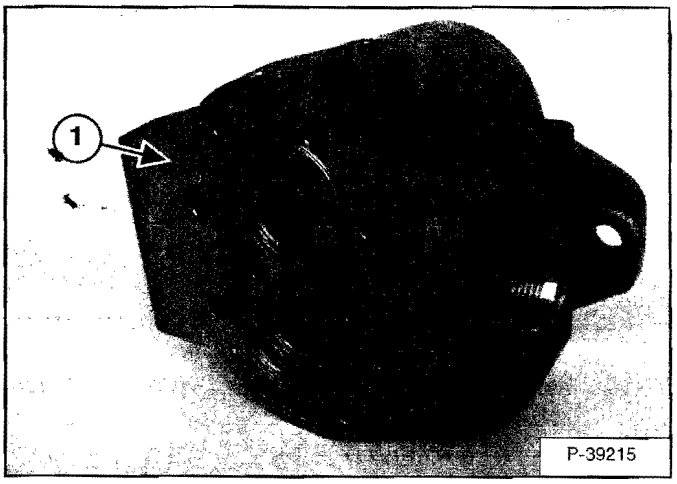
Disassembly And Assembly (Cont'd)

Figure 20-60-23



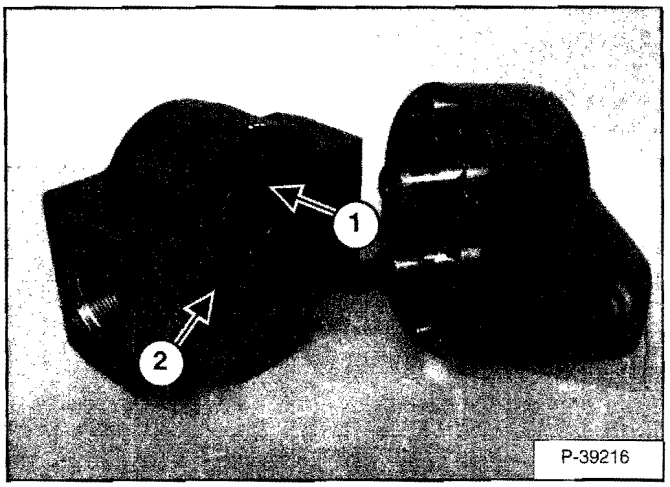
Inspect the pump center section and bushings (Item 1) **[Figure 20-60-23]**. If excessive wear or damage is visible, the pump must be replaced.

Figure 20-60-24



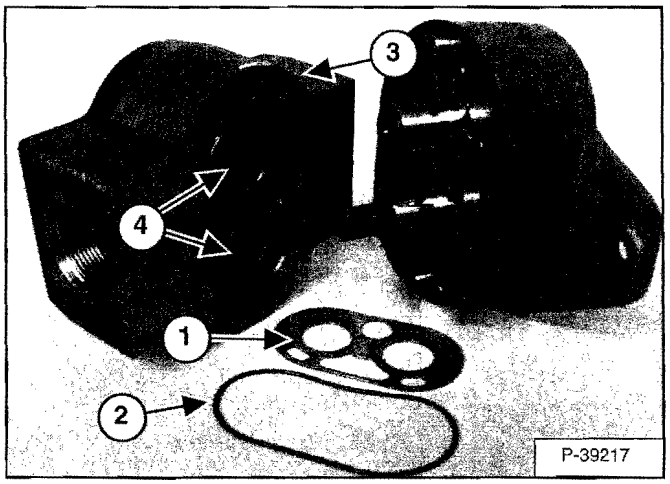
Remove the pump center section (Item 1) **[Figure 20-60-24]** from the pump sections.

Figure 20-60-25



Remove the wear plate (Item 1) **[Figure 20-60-25]** & **[Figure 20-60-26]** and section seal (Item 2) **[Figure 20-60-25]** & **[Figure 20-60-26]** from the pump section.

Figure 20-60-26

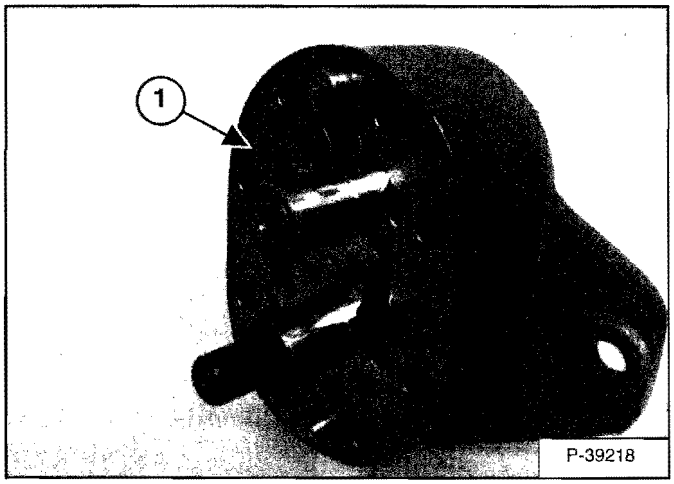


NOTE: Position wear plate (Item 1) [Figure 20-60-26] inlets and traps as shown with bronze side toward gears.

NOTE: Inspect the pump center section (Item 3) and bushings (Item 4) [Figure 20-60-26]. If excessive wear or damage is visible, the pump must be replaced.

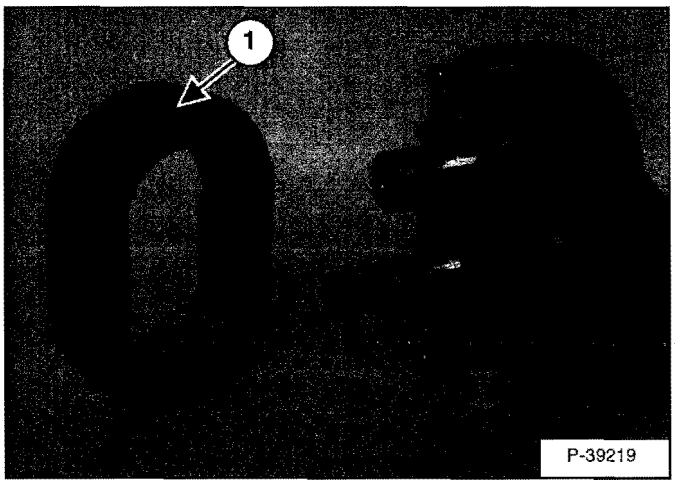
Disassembly And Assembly (Cont'd)

Figure 20-60-27



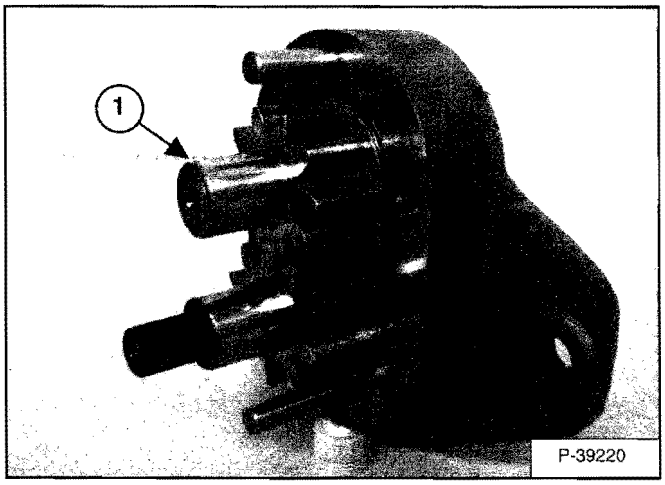
Remove the pump section (Item 1) **[Figure 20-60-27]** from the pump end section.

Figure 20-60-28



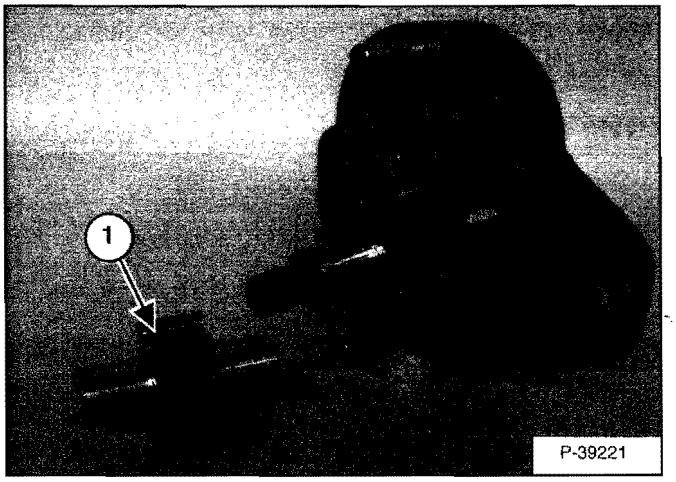
NOTE: Inspect the pump section (Item 1) [Figure 20-60-28]. If excessive wear or damage is visible, the pump must be replaced.

Figure 20-60-29



Remove the idler gear (Item 1) **[Figure 20-60-29]** & **[Figure 20-60-30]**.

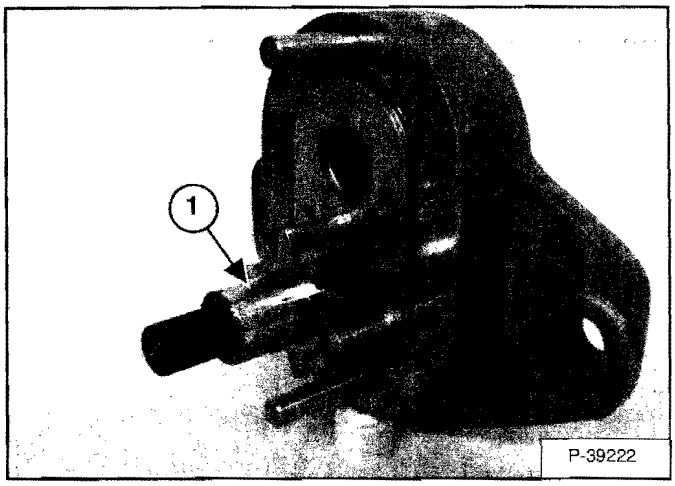
Figure 20-60-30



NOTE: Inspect the idler gear (Item 1) [Figure 20-60-30]. If excessive wear or damage is visible, the pump must be replaced.

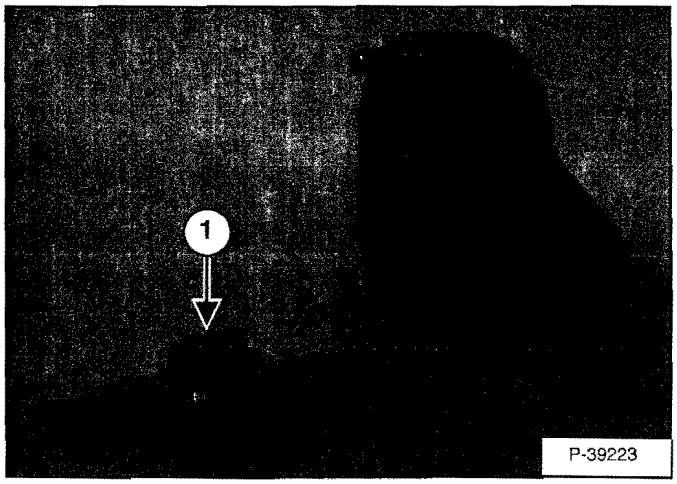
Disassembly And Assembly (Cont'd)

Figure 20-60-31



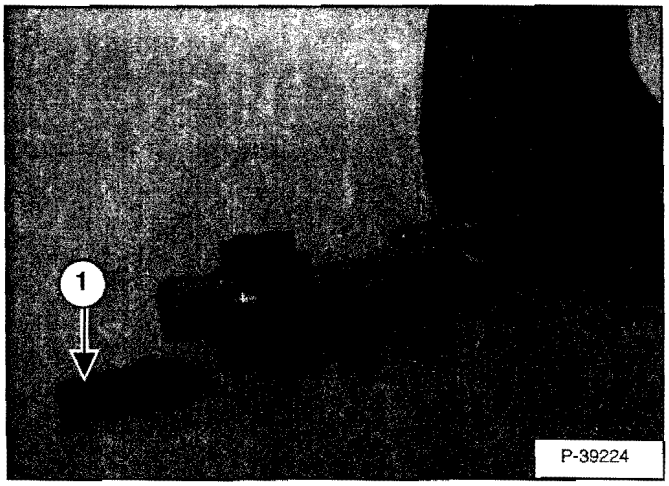
Remove the drive gear (Item 1) **[Figure 20-60-31]** from the pump end section.

Figure 20-60-32



NOTE: Inspect the drive gear (Item 1) [Figure 20-60-32]. If excessive wear or damage is visible, the pump must be replaced.

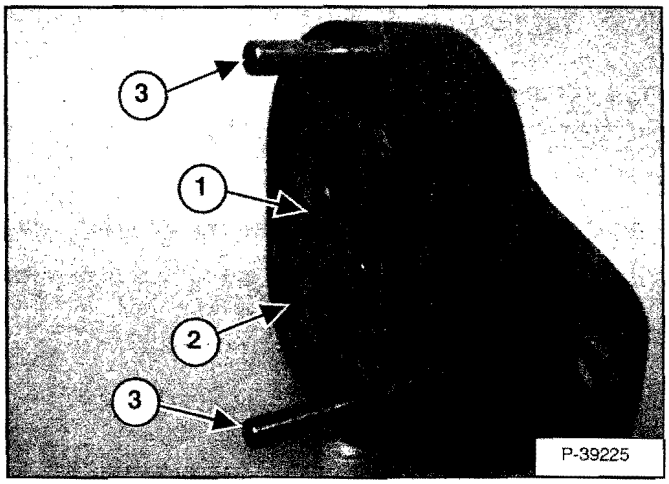
Figure 20-60-33



Remove the spline shaft (Item 1) **[Figure 20-60-33]** from the end of the drive gear.

NOTE: Inspect the spline shaft (Item 1) [Figure 20-60-33]. If excessive wear or damage is visible, the pump must be replaced.

Figure 20-60-34

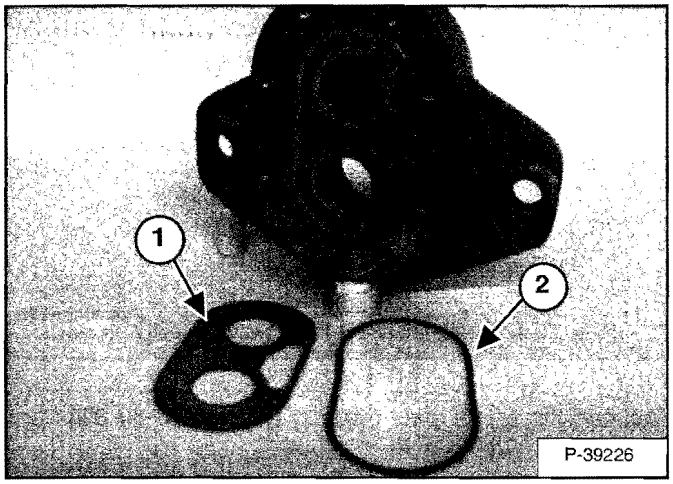


Remove the wear plate (Item 1) and section seal (Item 2) **[Figure 20-60-34]**.

Remove the locating pins (Item 3) **[Figure 20-60-34]**.

Disassembly And Assembly (Cont'd)

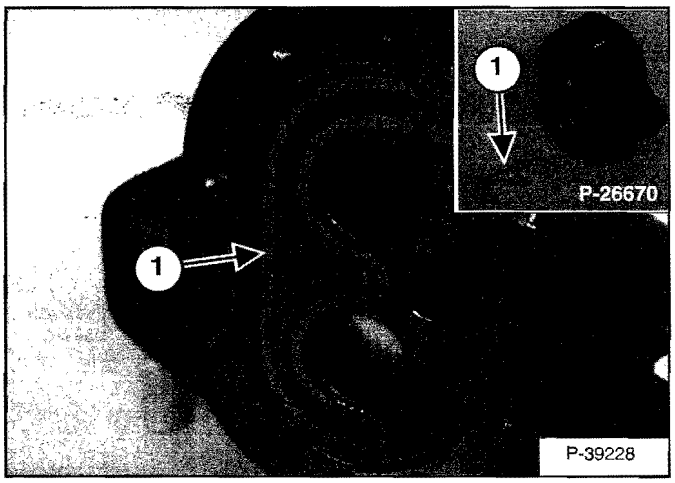
Figure 20-60-35



Inspect the wear plate (Item 1) and the section seal (Item 2) **[Figure 20-60-35]**.

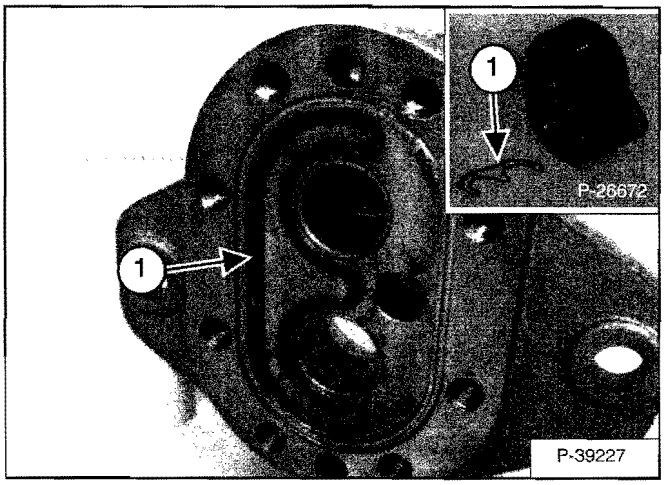
NOTE: Position wear plate (Item 1) [Figure 20-60-35] inlets and traps as shown with bronze side toward gears.

Figure 20-60-36



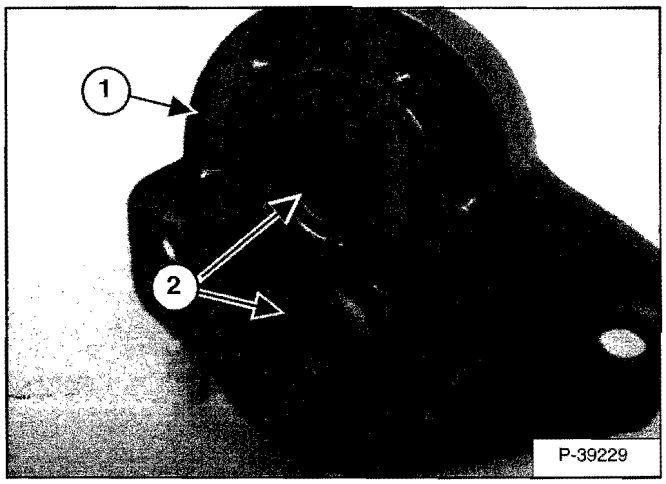
Remove the load seal (Item 1) **[Figure 20-60-36]**.

Figure 20-60-37



Remove the pre-load seal (Item 1) **[Figure 20-60-37]**.

Figure 20-60-38



NOTE: Inspect the pump end section (Item 1) and bushings (Item 2) [Figure 20-60-38]. If excessive wear or damage is visible, the pump must be replaced.

HYDRAULIC PUMP (CHARGE)

Check The Output Of The Hydraulic Pump

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

MEL1563 - Remote Start Tool
MEL10103 - Hydraulic Tester
MEL10106 - Hydraulic Test Kit
6661247 - Filter Assembly
17 KB 1212 - Elbow Fitting
15 KB 1212 - Straight Fitting
15 KB 0812 - Reducer Fitting

⚠ 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.)

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

⚠ 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

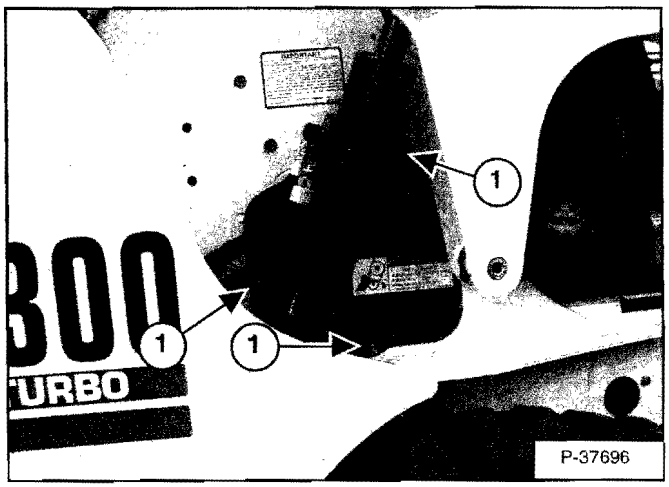
NOTE: The fluid from the charge pump must be filtered after it passes through the Hydraulic Tester, to prevent any contamination to the Hydrostatic Pumps.

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

Open the rear door of the loader.

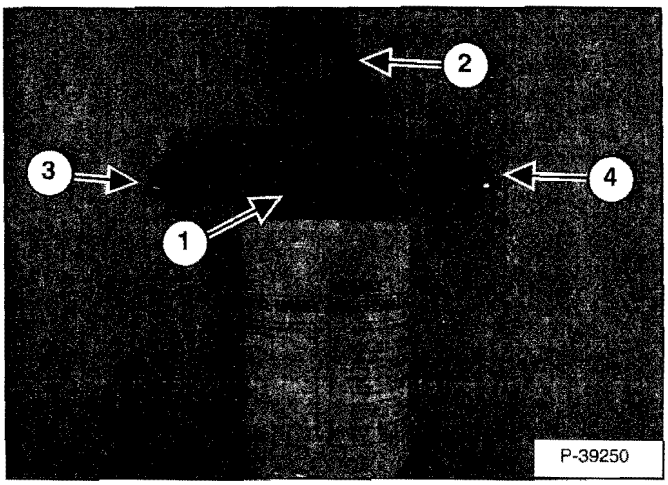
Connect the remote start tool. (See Contents Page 10-01.)

Figure 20-61-1



Remove the three mount bolts (Item 1) **[Figure 20-61-1]** from the right side access panel. Remove the panel.

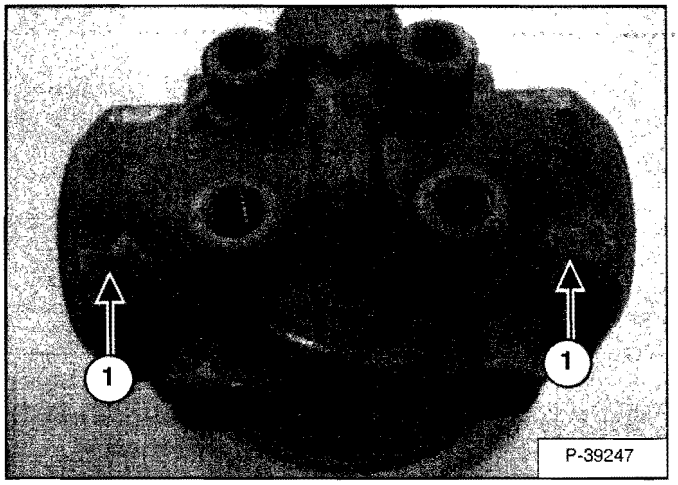
Figure 20-61-2



Assemble the filter assembly (Item 1), elbow fitting (Item 2), straight fitting (Item 3) and the reducer fitting (Item 4) **[Figure 20-61-2]**.

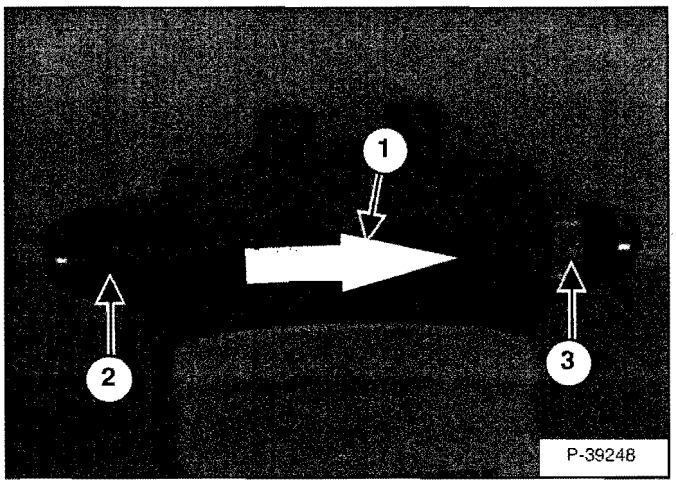
Check The Output Of The Hydraulic Pump (Cont'd)

Figure 20-61-3



Determine the proper direction of oil flow through the filter housing (Item 1) **[Figure 20-61-3]** and **[Figure 20-61-4]**.

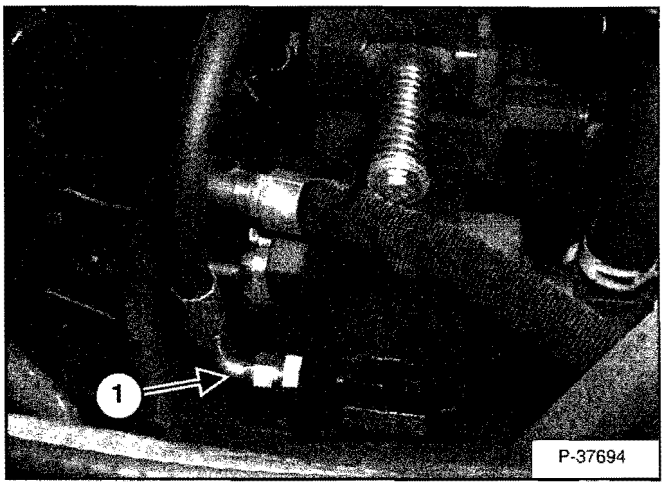
Figure 20-61-4



Install the fitting (15KB 1212-Straight Fitting) (Item 2) **[Figure 20-61-4]** in the filter housing inlet.

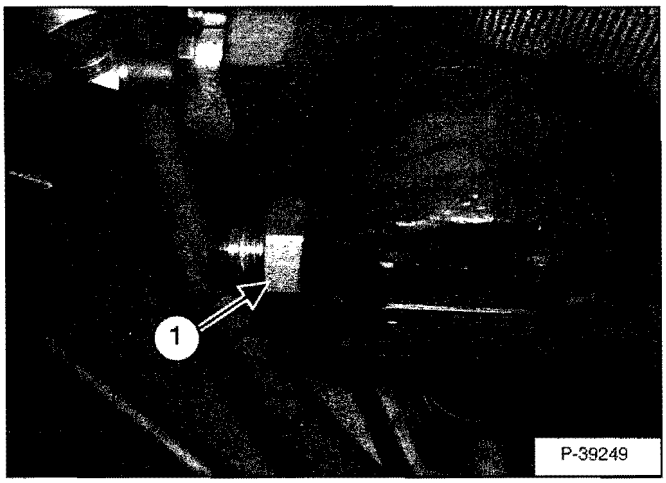
Install the fitting (15KB 0812-Reducer Fitting) (Item 3) **[Figure 20-61-4]** in the filter housing outlet.

Figure 20-61-5



Disconnect the OUTLET hose (Item 1) **[Figure 20-61-5]** from the charge pump, that goes to the back side of the hydrostatic pump.

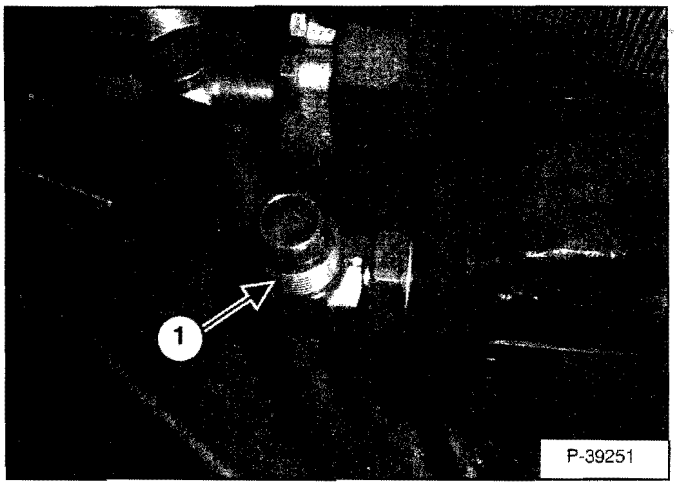
Figure 20-61-6



Remove the OUTLET fitting (Item 1) **[Figure 20-61-6]** from the charge pump.

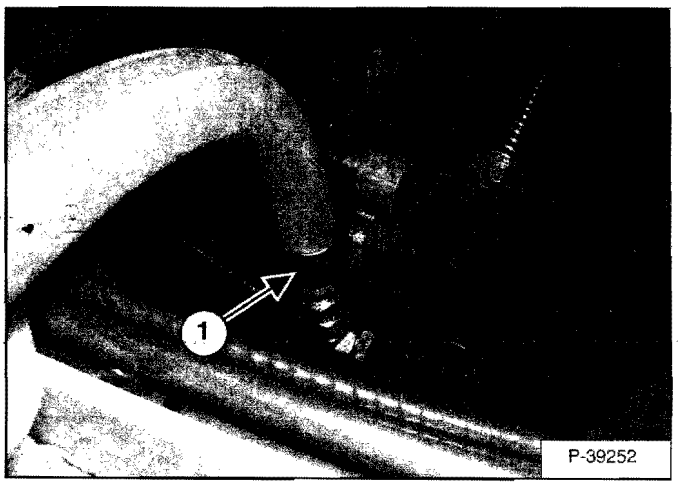
Check The Output Of The Hydraulic Pump (Cont'd)

Figure 20-61-7



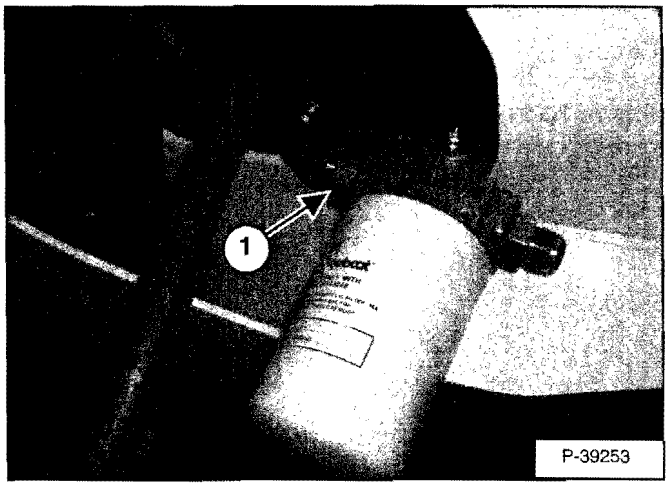
Install the elbow fitting 17KB 1212 (Item 1) **[Figure 20-61-7]** into the OUTLET of the charge pump.

Figure 20-61-8



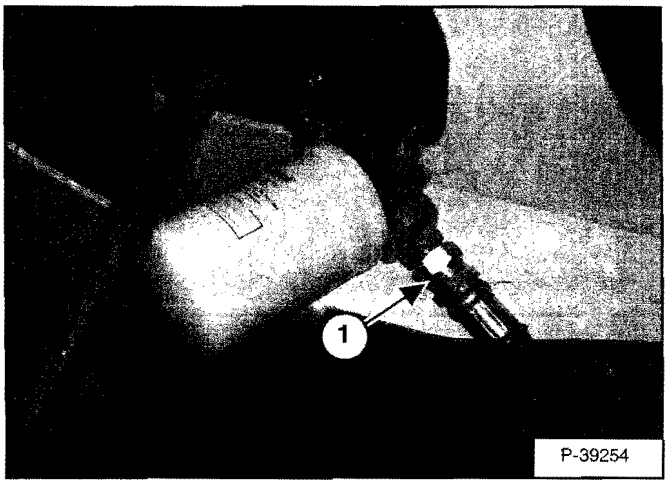
Connect the Inlet hose from the hydraulic tester (Item 1) **[Figure 20-61-8]** to the OUTLET fitting of the charge pump.

Figure 20-61-9



Connect the outlet fitting on the hydraulic filter (Item 1) **[Figure 20-61-9]** to the hose that was remove from the charge pump and routes to the back side of the hydrostatic pump.

Figure 20-61-10

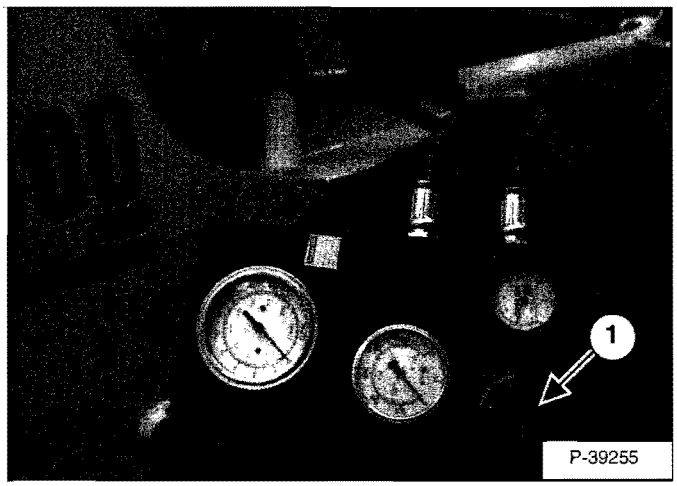


Connect the outlet hose on the hydraulic tester (Item 1) **[Figure 20-61-10]** to the inlet fitting on the hydraulic filter assembly.

HYDRAULIC PUMP (CHARGE) (CONT'D)

Check The Output Of The Hydraulic Pump (Cont'd)

Figure 20-61-11



Be sure all connections are tight and that the hoses are not touching any moving parts before starting the loader **[Figure 20-61-11]**.

IMPORTANT

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

I-2024-0284

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) 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 down to system operating pressure. DO NOT EXCEED SYSTEM RELIEF PRESSURE. (2000 PSI) 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 Contents Page SPEC-01 for system relief pressure and full RPM.

*Refer to the Hydraulic Schematics for pump flow and RPM.

Removal and Installation

See Hydraulic Pump Removal and Installation (Standard or Hi-Flow) Contents Page 20-01.

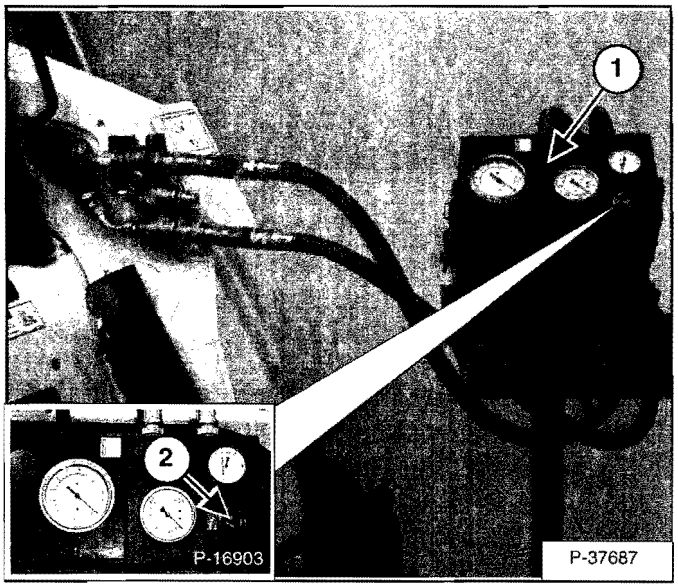
HYDRAULIC PUMP (HI FLOW)

Hydraulic Pump Test

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

MEL10103 - Hydraulic Tester
MEL10106 - Hydraulic Test Kit

Figure 20-62-1



Install a hydraulic tester (Item 1) **[Figure 20-62-1]** onto the front auxiliary quick couplers.

This procedure will require a operator in the cab and one operator running the tester.

Start the engine and run at low idle RPM. Press the Front Auxiliary button. Engage the front auxiliary with the trigger on the right handle. 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 clockwise on the tester so it reads about a 1000 PSI (6895 kPa).

NOTE: ***DO NOT EXCEED 3300 PSI.***

Turn the restrictor control (Item 2) **[Figure 20-62-1]** on the tester counterclockwise to obtain free flow, the flow should be at 20 GPM. Start turning the restrictor clockwise, causing more restriction on the flow. The GPM should drop off slightly until the pressure reaches approximately 2800 PSI. At approximately 2800 PSI the flow should start decreasing rapidly until the pressure reaches 3250-3300 PSI. At 3250-3300 PSI the flow should be at 0 GPM. Turn the restrictor (Item 2) **[Figure 20-62-1]** counter clockwise to free flow. Shut the front auxiliary hydraulics off.

If flow and pressure specs are not obtained, go to the Inline Standard Hydraulic Pump Test. (See Page 20-61-2.) If flow and pressure specs are obtained continue on to the next paragraph.

With the engine running at low idle RPM. Press the Front Auxiliary button. Engage the front auxiliary with the trigger on the right handle. 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 on the tester to about 1000 PSI (6895 kPa).

NOTE: ***DO NOT EXCEED 3300 PSI.***

Turn the restrictor control (Item 2) **[Figure 20-62-1]** on the tester counter clockwise, to obtain free flow, the flow should be at 21.2 GPM. Press the High Flow button. The flow should increase to 31.7 GPM. Start turning the restrictor clockwise, causing more restriction on the flow. The GPM should drop off slightly until the pressure reaches approximately 3100 PSI. At approximately 3100 PSI the flow should start decreasing rapidly until the pressure reaches 3250-3350 PSI. At 3250-3350 PSI the flow should be at 0 GPM. Turn the restrictor control (Item 2) **[Figure 20-62-1]** counter clockwise to free flow. Shut the front auxiliary hydraulics off.

If the specs from above are reached, the high flow hydraulic pump is OK.

If the flow and pressure were not obtained, go to the Inline High Flow Hydraulic Pump Test (See Page 20-61-4.)

*Refer to SPECIFICATIONS Contents Page SPEC-01 for system relief pressure and full RPM.

Inline Hydraulic Pump Test (Standard)

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

MEL10103 - Hydraulic Tester
MEL10106 - Hydraulic Test Kit

⚠ 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.)

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

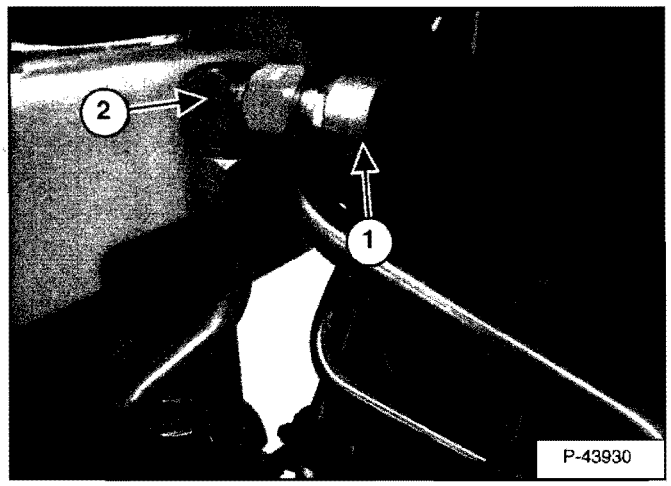
⚠ WARNING

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

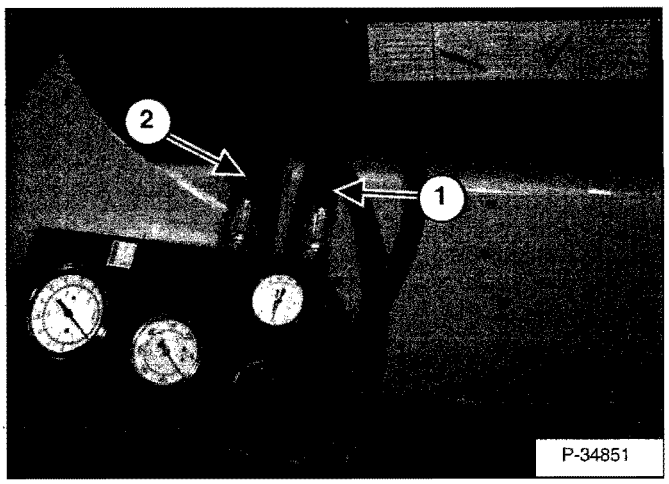
Raise the operator cab. (See Contents Page 10-01.)

Figure 20-62-2



At the control valve, disconnect the standard (auxiliary) pump OUTLET hose (Item 1) **[Figure 20-62-2]** from the tube line.

Figure 20-62-3



Connect the INLET hose (Item 1) **[Figure 20-62-3]** from the tester to the OUTLET hose (Item 1) **[Figure 20-62-2]** of the pump. Connect the OUTLET hose (Item 2) **[Figure 20-62-3]** from the tester to the tube line (Item 2) **[Figure 20-62-2]** which goes to the control valve.

Lower the cab down.

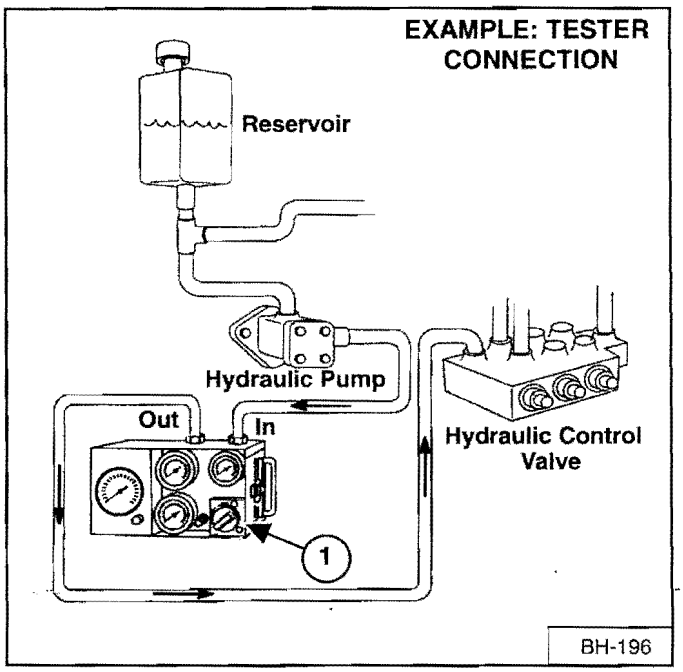
Inline Hydraulic Pump Test (Standard) (Cont'd)

IMPORTANT

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

I-2024-0284

Figure 20-62-4



Sample tester connection shown **[Figure 20-62-4]**.

This procedure will require a operator in the cab and one operator running the tester.

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 20-62-4]** on the tester clockwise to about 1000 PSI (6895 kPa).

NOTE: ***DO NOT EXCEED 3300 PSI.***

Open the restrictor control and record the free flow (GPM) at full RPM.

Record the flow (GPM) at 2700 PSI, this is the high pressure flow. 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 Contents Page SPEC-01 for system relief pressure and full RPM.

Inline Hydraulic Pump Test (High Flow)

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

MEL10103 - Hydraulic Tester
MEL10106 - Hydraulic Test Kit

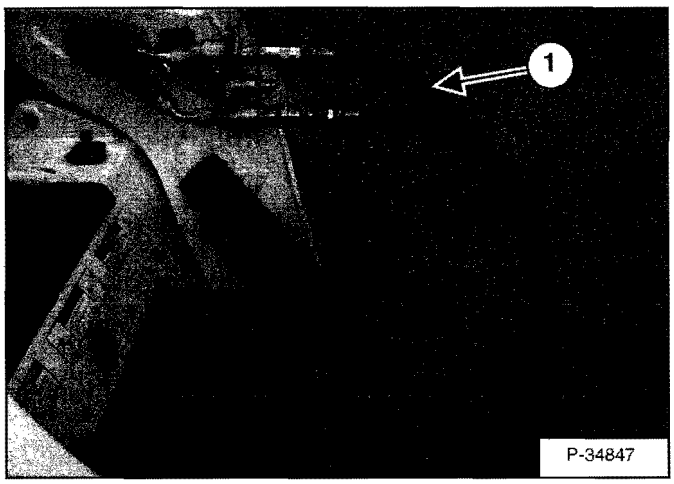
⚠ WARNING

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.)

Figure 20-62-5



Install a jumper hose (Item 1) **[Figure 20-62-5]** onto the front auxiliary quick couplers.

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

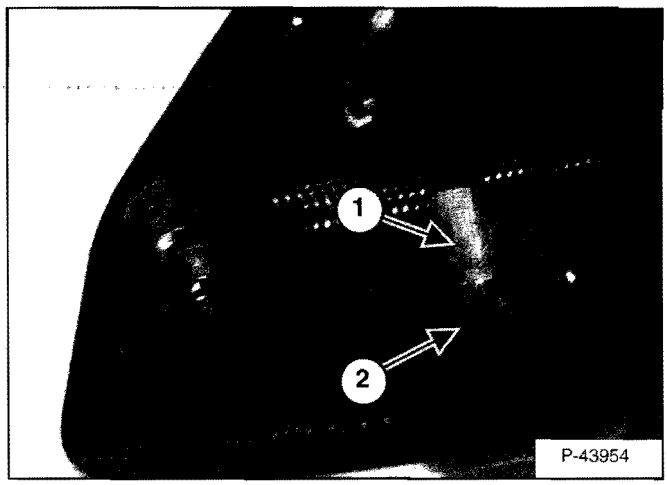
⚠ WARNING

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

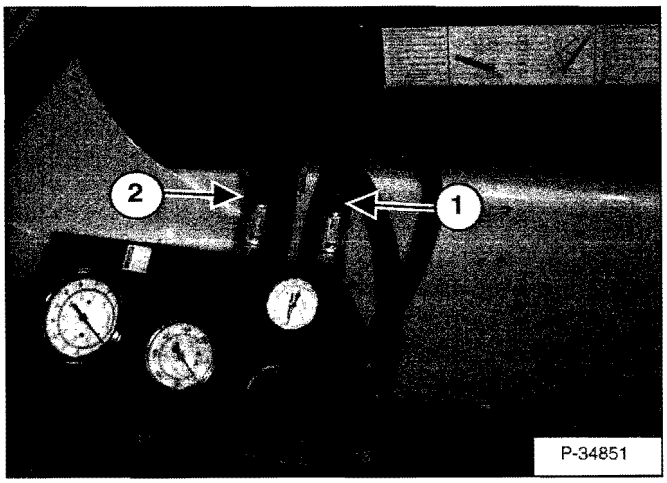
Figure 20-62-6



Remove the left side access cover.

Disconnect the high flow pump OUTLET hose (Item 1) from the fitting (Item 2) **[Figure 20-62-6]** on the tube line.

Figure 20-62-7



Connect the INLET hose (Item 1) **[Figure 20-62-7]** from the tester to the OUTLET hose (Item 1) **[Figure 20-62-6]** of the pump. Connect the OUTLET hose (Item 2) **[Figure 20-62-7]** from the tester to the fitting (Item 2) **[Figure 20-62-6]** on the tube line.

Lower the cab down.

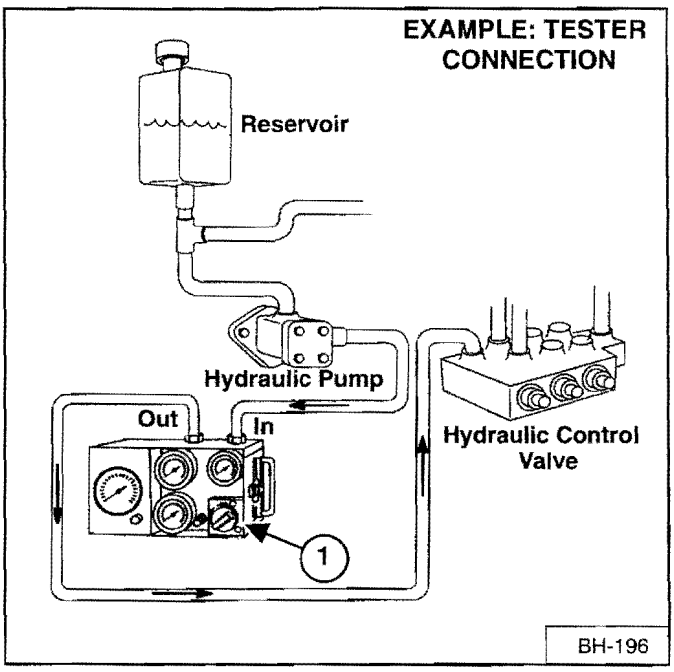
Inline Hydraulic Pump Test (High Flow) (Cont'd)

IMPORTANT

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

I-2024-0284

Figure 20-62-8



Sample tester connection shown **[Figure 20-62-8]**.

This procedure will require a operator in the cab and one operator running the tester.

Start the engine and run at low idle RPM. Press the Front Auxiliary button. Press the High Flow button. Engage the front auxiliary with the trigger on the right handle. 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 20-62-8]** clockwise on the tester to about 1000 PSI (6895 kPa).

NOTE: ***DO NOT EXCEED 3300 PSI.***

Turn the restrictor control clockwise on the tester to 3300 PSI and the flow should go to zero GPM. If the pressure readings are not obtained go to the High Flow Relief Pump Adjustment (See Contents Page 20-61-6). If the pressure readings are correct, continue on to the next paragraph.

Open the restrictor control and record the free flow (GPM) at full RPM.

Record the flow (GPM) at 2500 PSI, this is the high pressure flow. 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 Contents Page SPEC-01 for system relief pressure and full RPM.

High Flow Relief Adjustment Procedure

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

MEL10103 - Hydraulic Tester
MEL10106 - Hydraulic Test Kit

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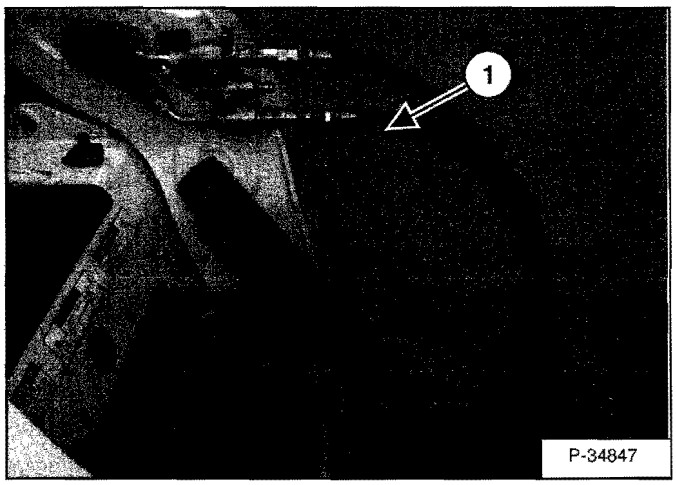
Lift and block the loader. (See Contents Page 10-01.)

Remove the right rear tire.

Figure 20-62-9



Install a jumper hose (Item 1) **[Figure 20-62-9]** onto the front auxiliary quick couplers.

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

⚠ 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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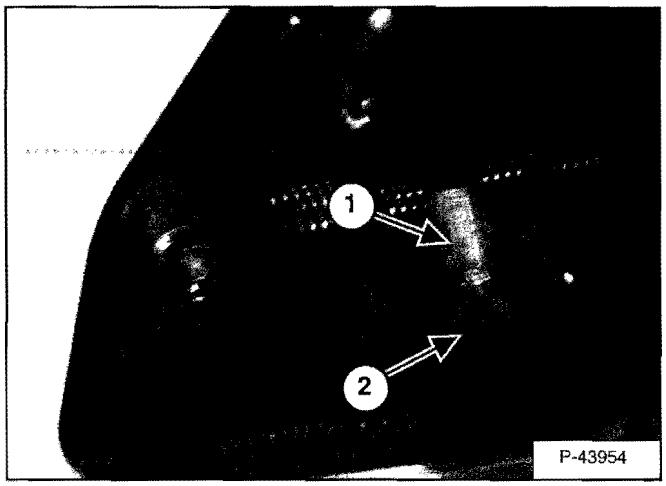
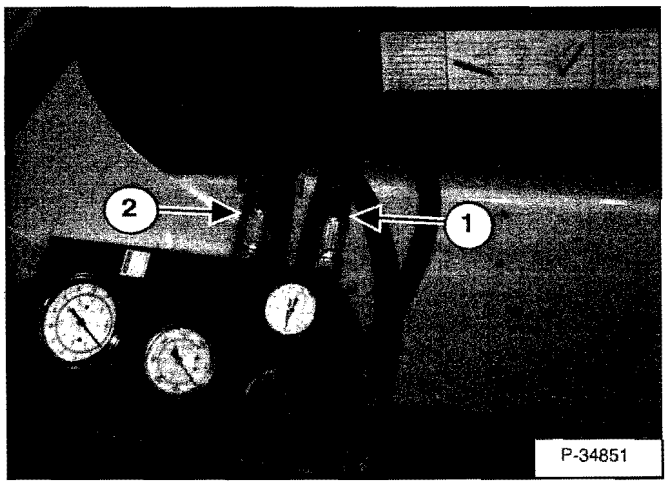
Figure 20-62-10



Remove the left side access cover.

Disconnect the high flow pump OUTLET hose (Item 1) **[Figure 20-62-10]** from the fitting (Item 2) **[Figure 20-62-10]** on the tube line.

Figure 20-62-11

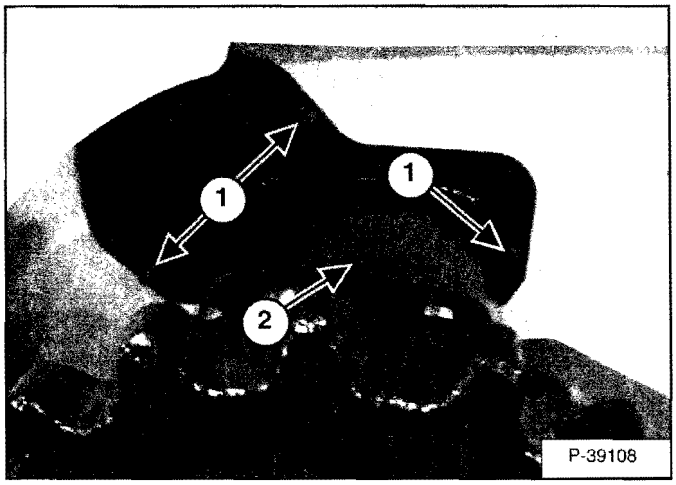


Connect the INLET hose (Item 1) **[Figure 20-62-11]** from the tester to the OUTLET hose (Item 1) **[Figure 20-62-10]** of the pump. Connect the OUTLET hose (Item 2) **[Figure 20-62-11]** from the tester to the tube line (Item 2) **[Figure 20-62-10]** at the control valve.

Lower the cab down.

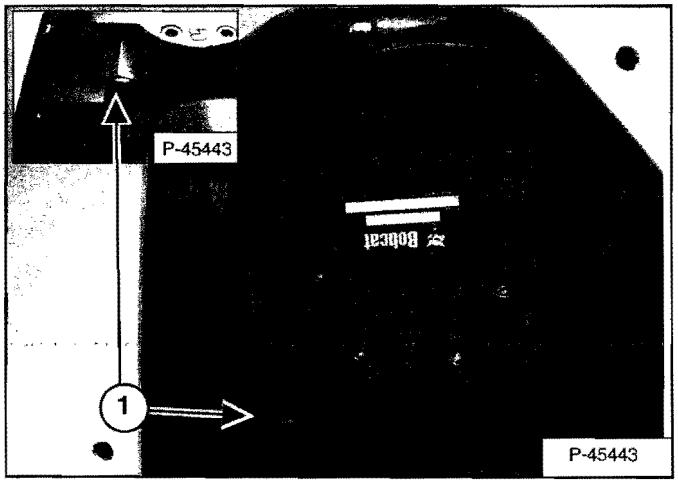
High Flow Relief Adjustment Procedure (Cont'd)

Figure 20-62-12



Remove the three access cover mounting bolts (Item 1) and the cover (Item 2) **[Figure 20-62-12]** from the frame.

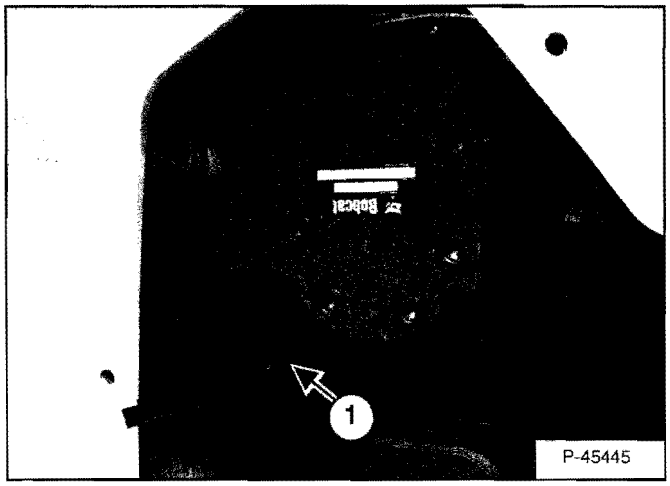
Figure 20-62-13



Remove the plug (Item 1) **[Figure 20-62-13]** from the bottom of the relief valve at the pump.

This procedure will require a operator in the cab and one operator running the tester.

Figure 20-62-14



Start the engine and run at low idle RPM. Press the Front Auxiliary button. Press the High Flow button. Engage the front auxiliary with the trigger on the right handle. 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 clockwise on the tester to about 1000 PSI (6895 kPa).

NOTE: *DO NOT EXCEED 3300 PSI.*

Turn the restrictor control clockwise on the tester to causing more restriction on the flow. The GPM should drop off slightly until the pressure reaches approximately 3100 PSI. At approximately 3100 PSI the flow should start decreasing rapidly until the pressure reaches 3250-3350 PSI. At 3250-3350 PSI the flow should be at 0 GPM. Turn the restrictor counter clockwise to free flow. Shut the front auxiliary hydraulics off.

If the specs from above are reached, the pump is OK.

If the pump is unable to reach 3300 PSI the relief (Item 1) **[Figure 20-62-14]** will need to be turned clockwise a 1/4 turn and retested with the procedure above. (1/4 turn equals approximately 200 PSI.)

NOTE: If the relief plug has been turned in 1/4 turn and the pressure remains the same, go to the relief valve removal and installation section. (See Contents Page 20-01.) If relief valve has been checked and is OK, go to the high flow pump disassembly and assembly section. (See Contents Page 20-01.)

If the pump reaches 3300 PSI and there is flow, the relief plug must be turned counter clockwise 1/4 turn and retested with the procedure above.

High Flow Relief Valve Removal and Installation

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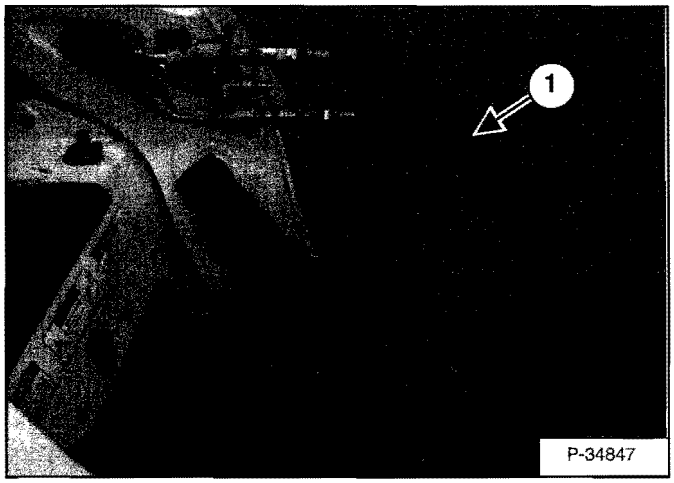
Lift and block the loader. (See Contents Page 10-01.)

Remove the right rear tire.

Figure 20-62-15



Install a jumper hose (Item 1) **[Figure 20-62-15]** onto the front auxiliary quick couplers.

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

⚠ 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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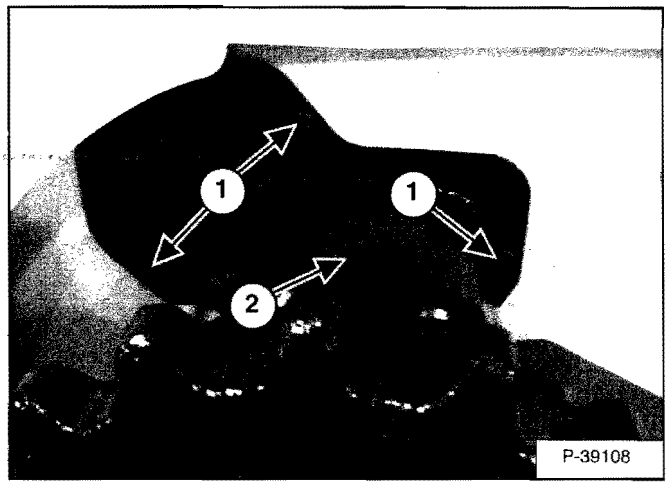
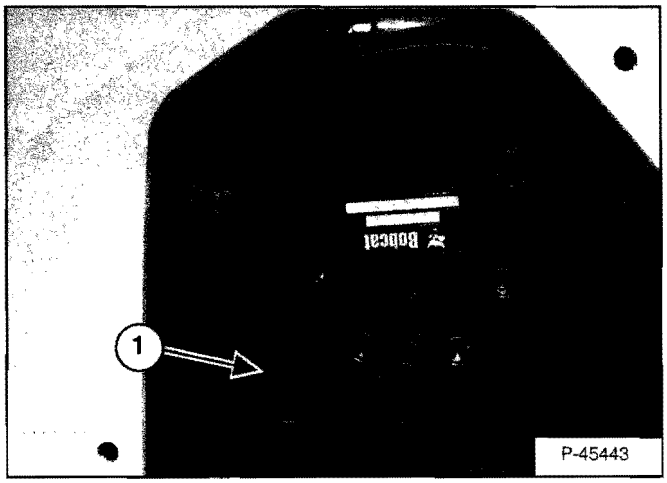
Figure 20-62-16



Remove the three access cover mount bolts (Item 1) and the access cover (Item 2) **[Figure 20-62-16]** from the frame.

Figure 20-62-17

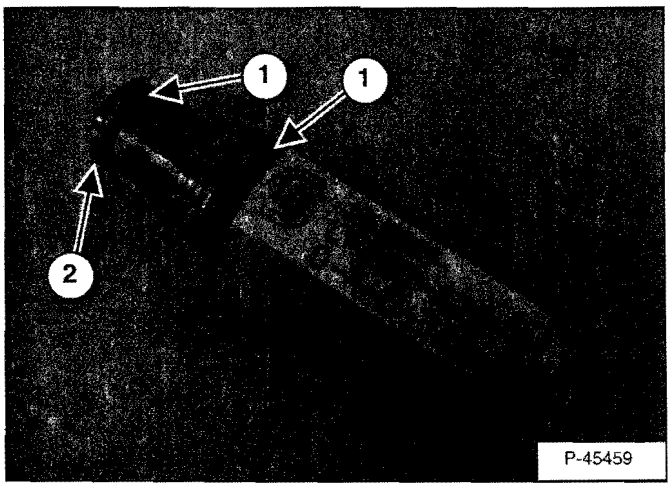


Remove the relief valve (Item 1) **[Figure 20-62-17]** from the pump.

Installation: Tighten the relief valve to 30-35 ft.-lbs. (41-47 Nm) torque.

High Flow Relief Valve Removal and Installation (Cont'd)

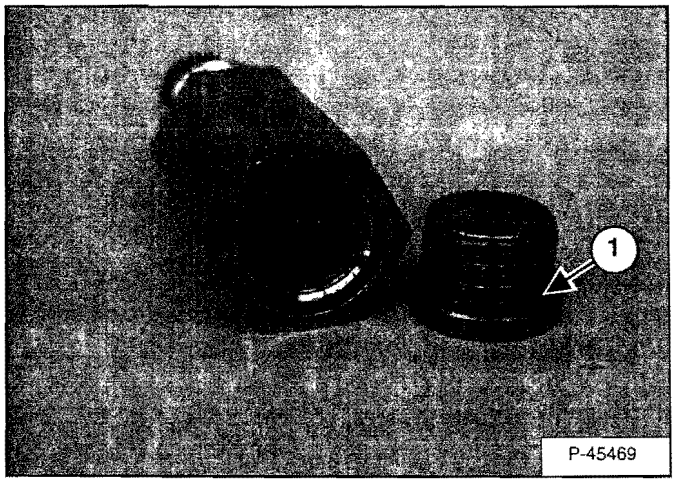
Figure 20-62-18



Inspect the relief valve and replace the two o-rings (Item 1) and washer (Item 2) **[Figure 20-62-18]**.

If the relief valve is bad, it must be replaced as a complete unit.

Figure 20-62-19



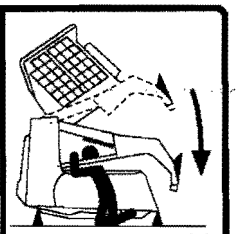
Inspect the o-ring (Item 1) **[Figure 20-62-19]** on the relief valve adjustment plug for damage and replace as needed.

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.

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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 rear of the loader. (See Contents Page 10-01.)

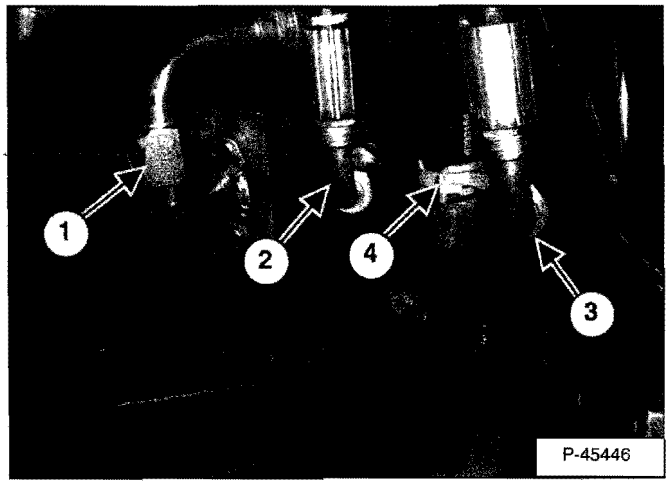
Raise the operator cab. (See Contents Page 10-01.)

Drain the hydraulic fluid from the reservoir. (See Contents Page 20-01.)

Open the rear door of the loader.

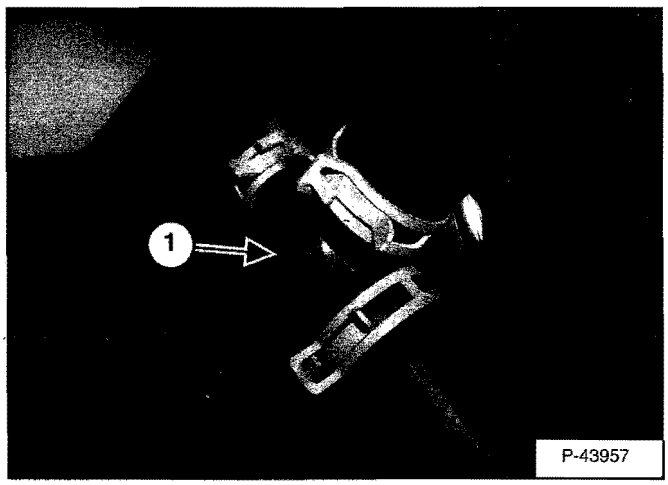
Remove the hoses from the Power Bob-Tach block. (If so equipped.) (See Contents Page 20-01.)

Figure 20-62-20



At the back side of the gear pump, disconnect and cap the hose from the outlet fitting (Item 1) of the standard flow pump. Disconnect and cap the hose (Item 2) from the charge pump. Disconnect and cap the hoses from the High Flow pump outlet fitting (Item 3) and the low pressure hose (Item 4) **[Figure 20-62-20]**.

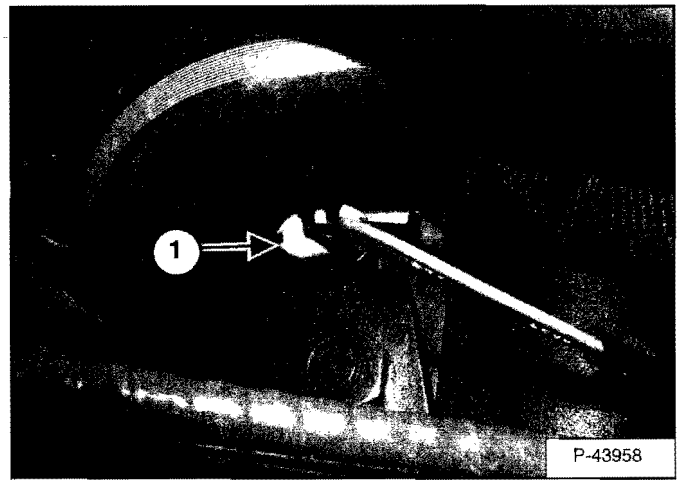
Figure 20-62-21



At the front side of the gear pump, disconnect and cap the three hoses from the inlet fitting (Item 1) **[Figure 20-62-21]** of the hydraulic pump.

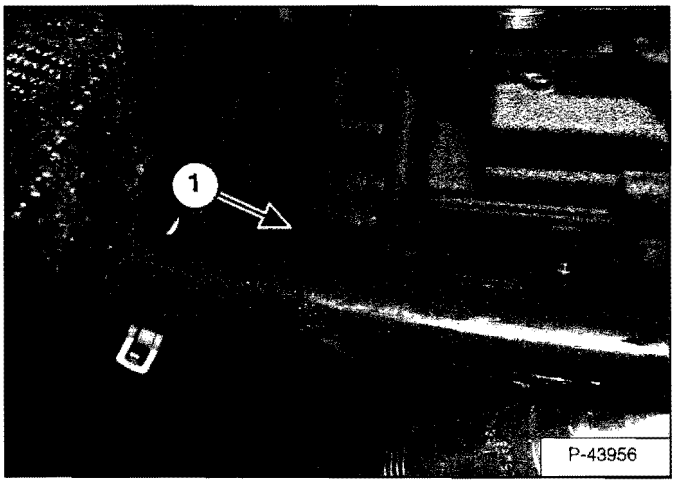
Removal And Installation (Cont'd)

Figure 20-62-22



At the right side access hole, disconnect the electrical connector (Item 1) **[Figure 20-62-22]** from the high flow pump solenoid.

Figure 20-62-23



Remove the two mounting bolts (Item 1) **[Figure 20-62-23]** from the hydraulic pump.

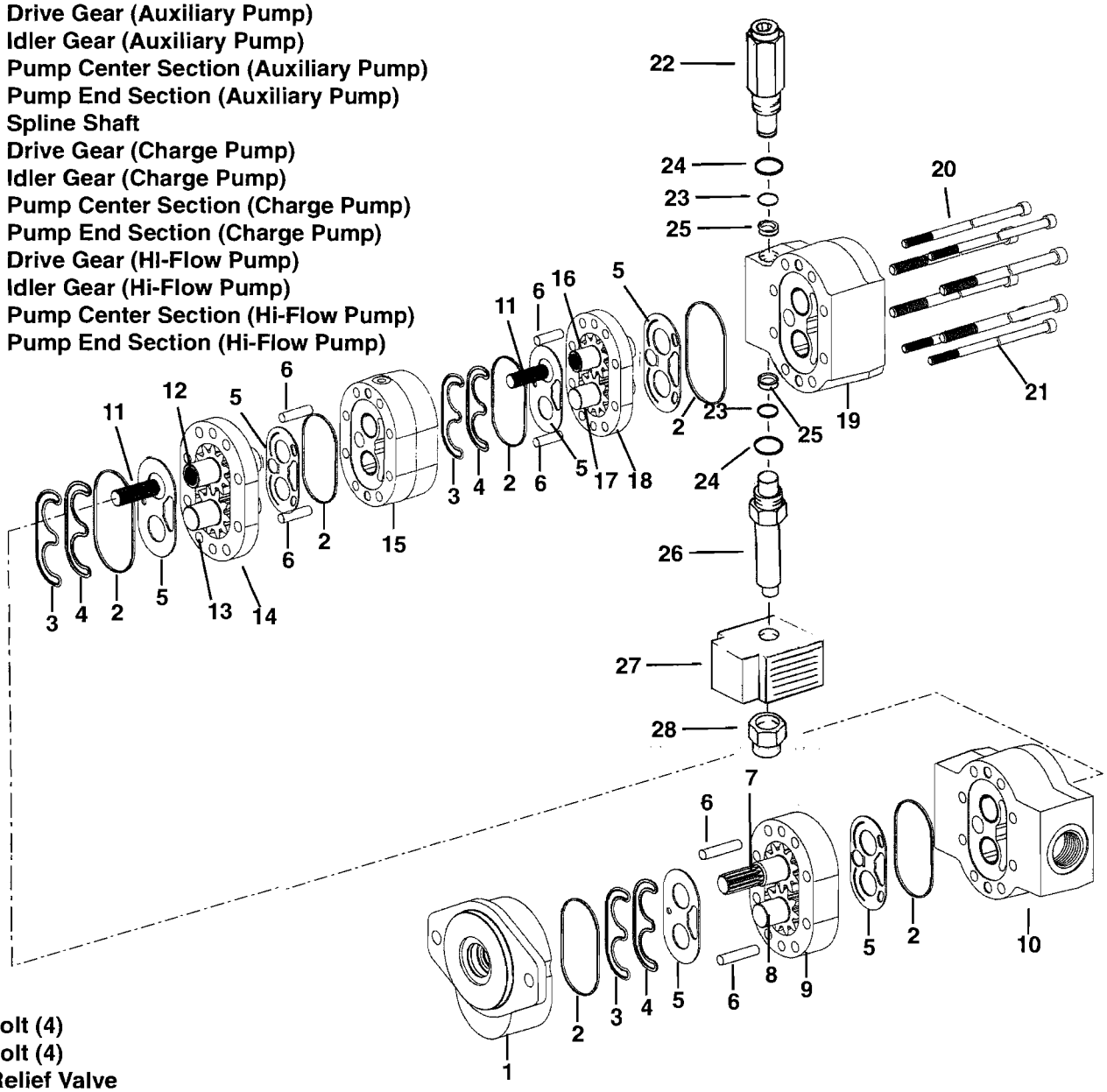
Installation: Tighten the mounting bolts to 27-37 ft.-lbs. (37-50 Nm) torque.

Remove the hydraulic pump from the hydrostatic pump.

Installation: Use a new O-ring when installing the hydraulic pump.

Identification

1. Auxiliary Pump End Section
2. Section Seal
3. Pre-Load Seal
4. Load Seal
5. Wear Plate
6. Pin
7. Drive Gear (Auxiliary Pump)
8. Idler Gear (Auxiliary Pump)
9. Pump Center Section (Auxiliary Pump)
10. Pump End Section (Auxiliary Pump)
11. Spline Shaft
12. Drive Gear (Charge Pump)
13. Idler Gear (Charge Pump)
14. Pump Center Section (Charge Pump)
15. Pump End Section (Charge Pump)
16. Drive Gear (HI-Flow Pump)
17. Idler Gear (Hi-Flow Pump)
18. Pump Center Section (Hi-Flow Pump)
19. Pump End Section (Hi-Flow Pump)



20. Bolt (4)
21. Bolt (4)
22. Relief Valve
23. O-Ring
24. O-Ring
25. Back-up Washer
26. Valve
27. Coil
28. Nut

B-22288

Disassembly And Assembly

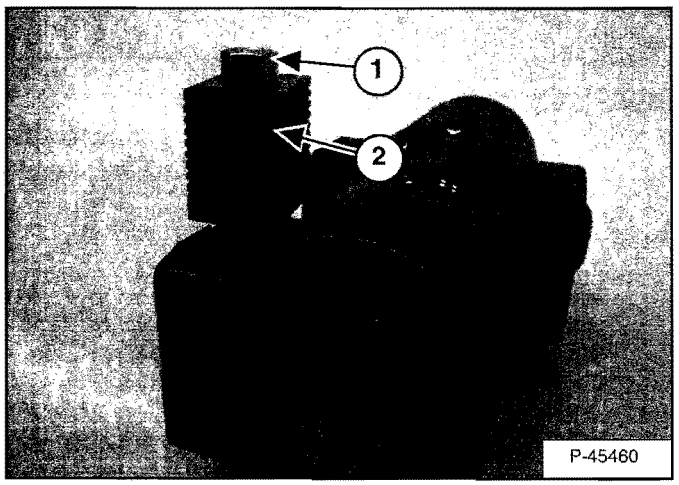
Mark the pump sections for correct assembly.

IMPORTANT

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

I-2003-0888

Figure 20-62-24

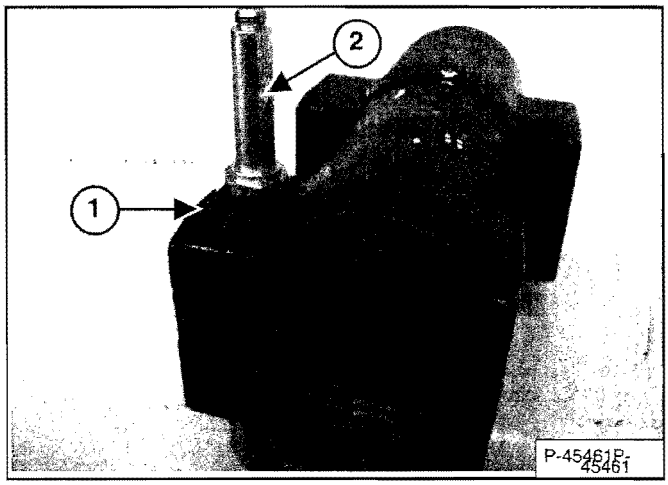


Remove the solenoid nut (Item 1) **[Figure 20-62-24]**.

Remove the solenoid (Item 2) **[Figure 20-62-24]**.

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

Figure 20-62-25

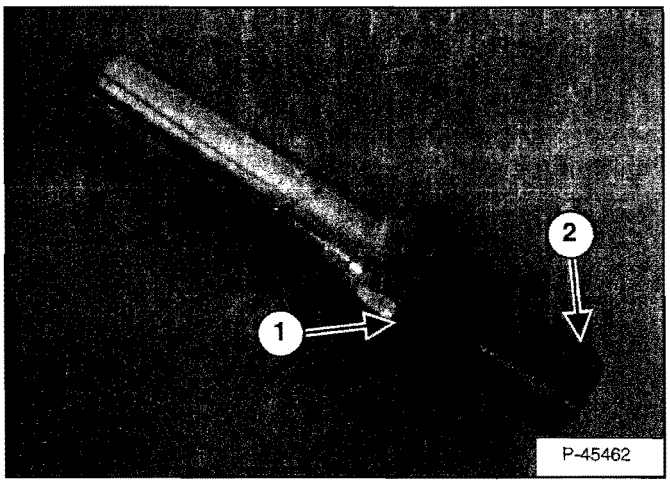


NOTE: Mark the pump housing (Item 1) [Figure 20-62-25] for proper installation of the solenoid valve cartridge.

Remove the valve cartridge (Item 1) **[Figure 20-62-25]**.

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

Figure 20-62-26

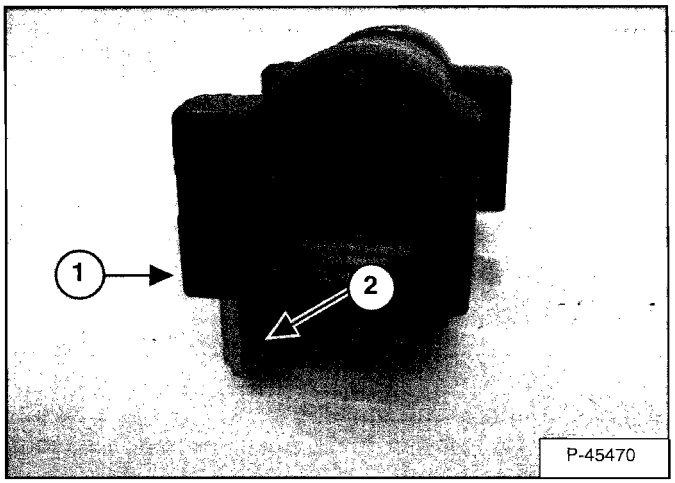


Inspect the o-ring (Item 1) **[Figure 20-62-26]** and replace as needed.

Inspect the o-ring and back-up washer (Item 2) **[Figure 20-62-26]** and replace as needed.

Disassembly And Assembly (Cont'd)

Figure 20-62-27

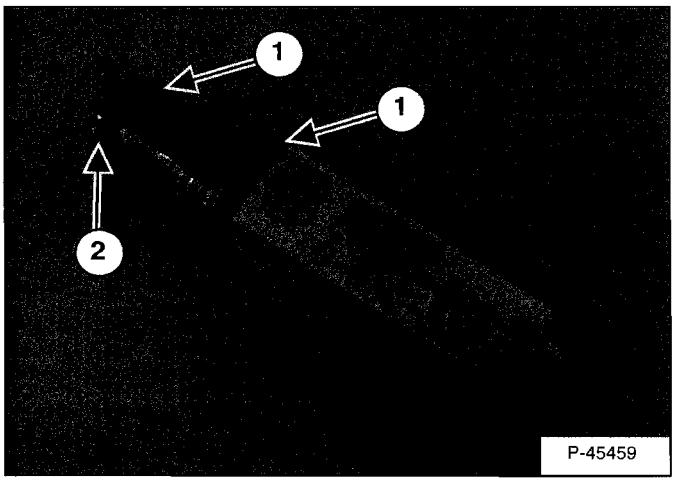


NOTE: Mark the pump housing (Item 1) [Figure 20-62-27] for proper installation of the relief valve.

Remove the relief valve (Item 2) **[Figure 20-62-27]** from the pump

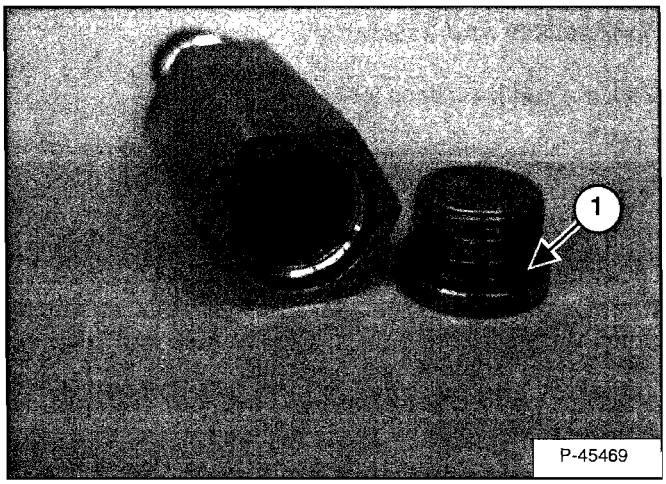
Installation: Tighten the relief valve to 30-35 ft.-lbs (41-47 Nm) torque.

Figure 20-62-28



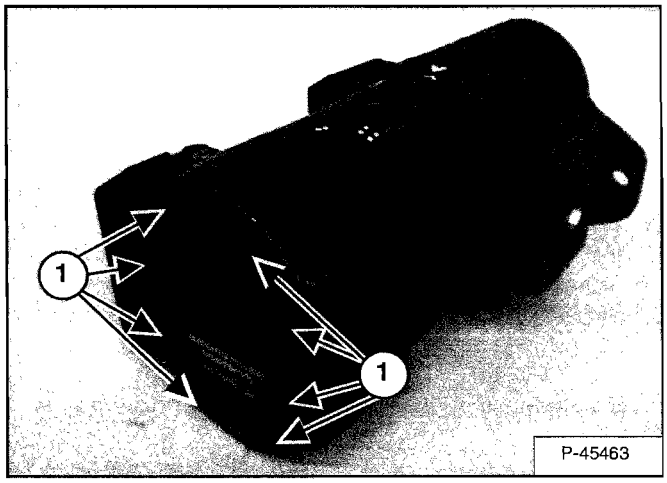
Inspect the relief valve and replace the two o-rings (Item 1) and back-up washer (Item 2)**[Figure 20-62-28]**.

Figure 20-62-29



Inspect the O-ring (Item 1) **[Figure 20-62-29]** on the relief valve adjustment plug for damage and replace as needed.

Figure 20-62-30



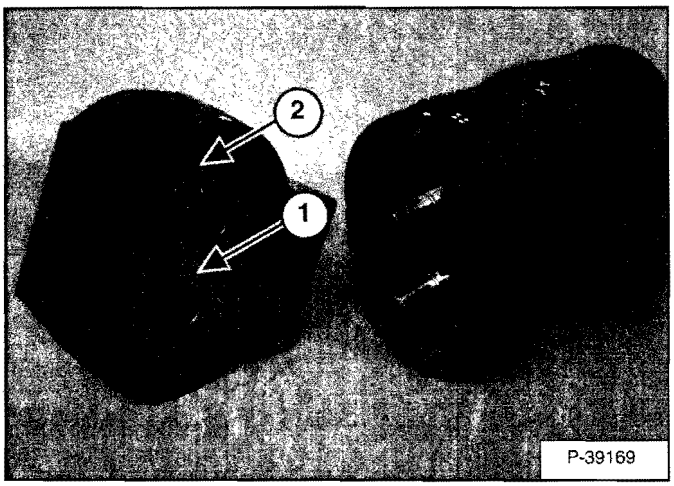
Mark the pump sections for proper installation.

Remove the eight bolts (Item 1) **[Figure 20-62-30]**.

Installation: Tighten the assembly bolts to 45-50 ft.-lbs (60-67 Nm).

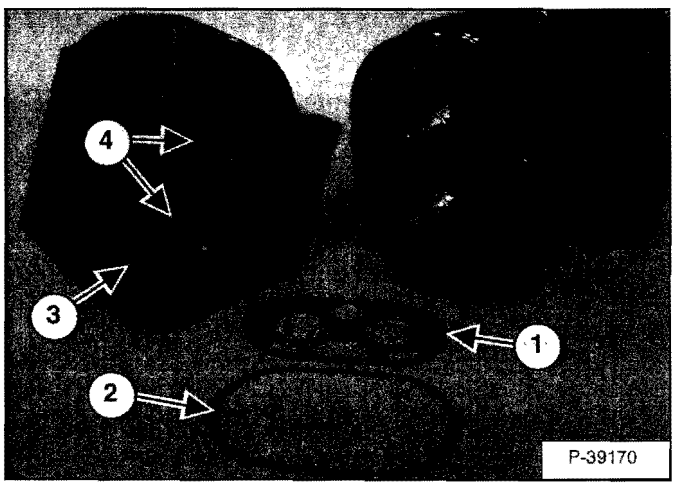
Disassembly And Assembly (Cont'd)

Figure 20-62-31



Remove the wear plate (Item 1) and section seal (Item 2) **[Figure 20-62-31]** from the pump end section.

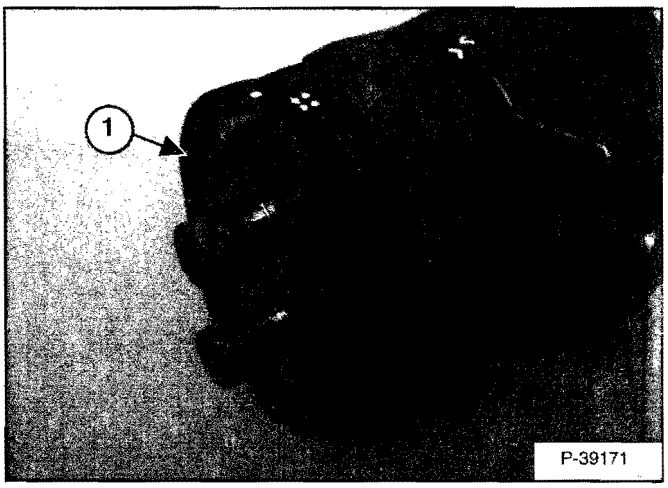
Figure 20-62-32



NOTE: Position wear plate (Item 1) [Figure 20-62-32] inlets and traps as shown with bronze side toward gears.

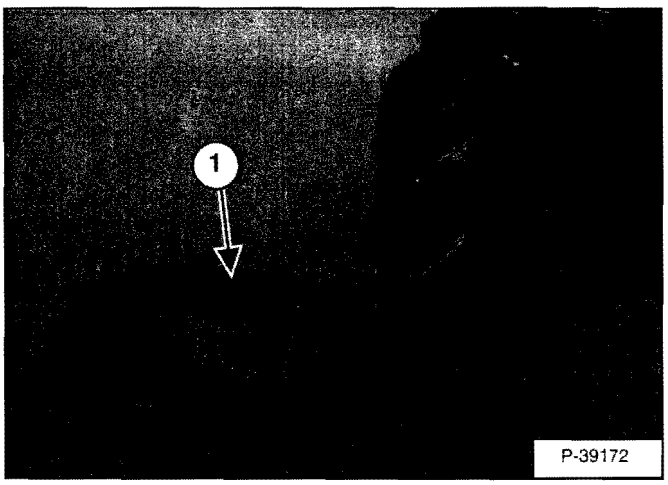
NOTE: Inspect the pump end section (Item 3) and bushings (Item 4) [Figure 20-62-32]. If excessive wear or damage is visible, the pump must be replaced.

Figure 20-62-33



Remove the pump center section (Item 1) **[Figure 20-62-33]** & **[Figure 20-62-34]** from the pump.

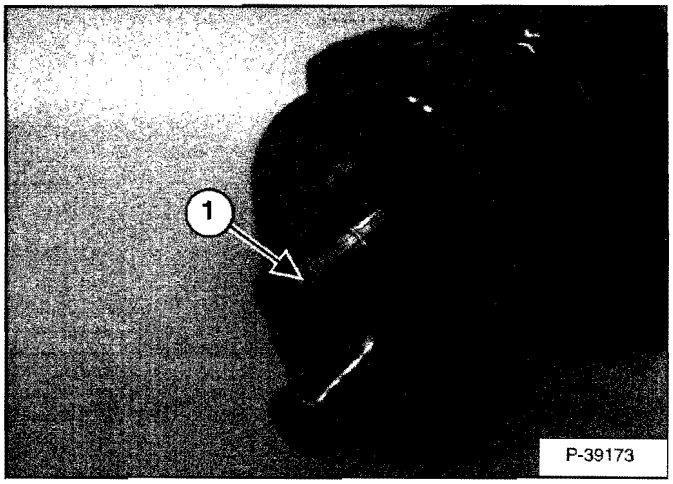
Figure 20-62-34



NOTE: Inspect the pump center section (Item 1) [Figure 20-62-34]. If excessive wear or damage is visible, the pump must be replaced.

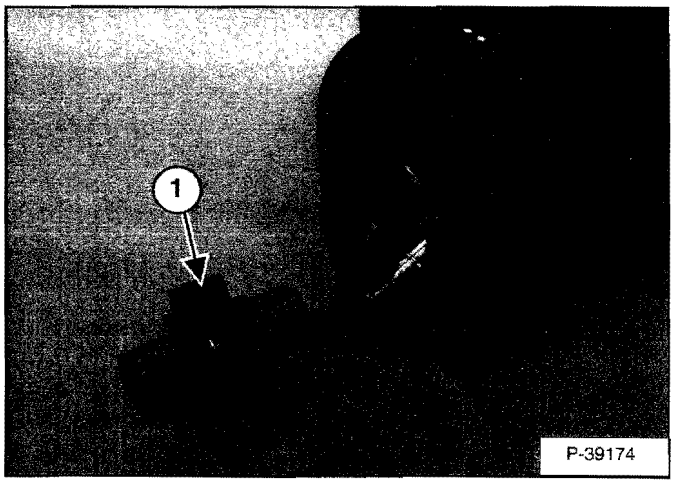
Disassembly And Assembly (Cont'd)

Figure 20-62-35



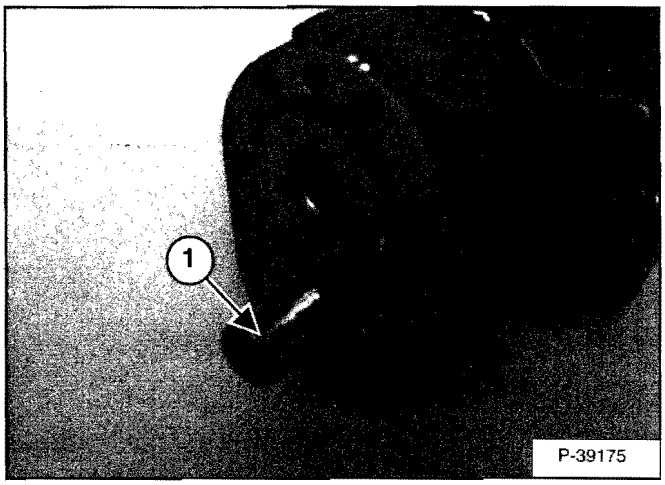
Remove the idler gear (Item 1) **[Figure 20-62-35]** & **[Figure 20-62-36]**.

Figure 20-62-36



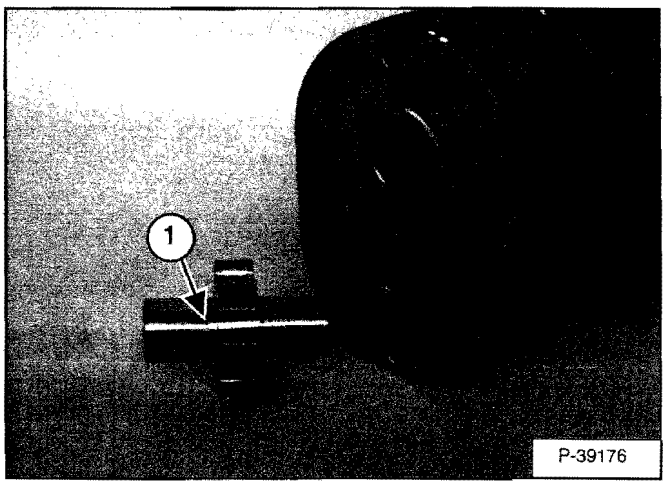
NOTE: Inspect the idler gear (Item 1) [Figure 20-62-36]. If excessive wear or damage is visible, the pump must be replaced.

Figure 20-62-37



Remove the drive gear (Item 1) **[Figure 20-62-37]** & **[Figure 20-62-38]**.

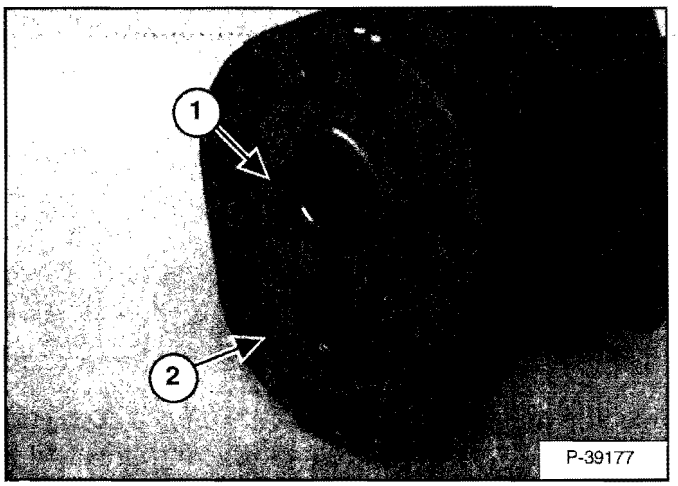
Figure 20-62-38



NOTE: Inspect the drive gear (Item 1) [Figure 20-62-38]. If excessive wear or damage is visible, the pump must be replaced.

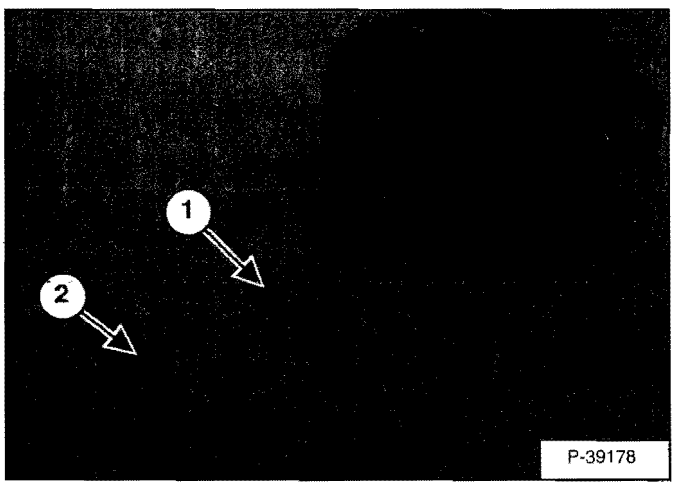
Disassembly And Assembly (Cont'd)

Figure 20-62-39



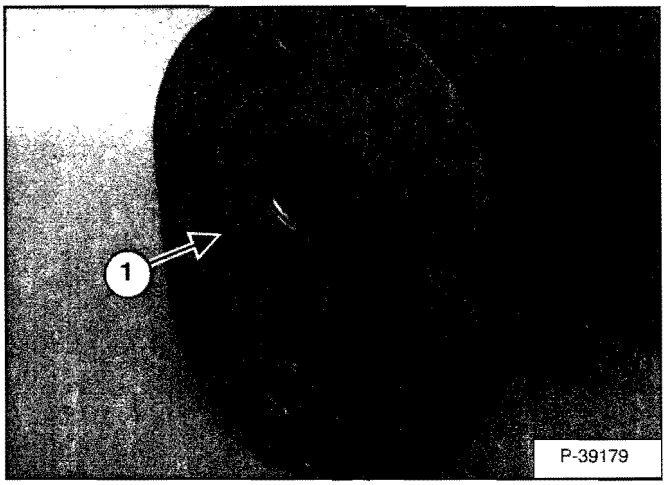
Remove the wear plate (Item 1) **[Figure 20-62-39]** & **[Figure 20-62-40]** and section seal (Item 2) **[Figure 20-62-39]** & **[Figure 20-62-40]** from the pump center section.

Figure 20-62-40



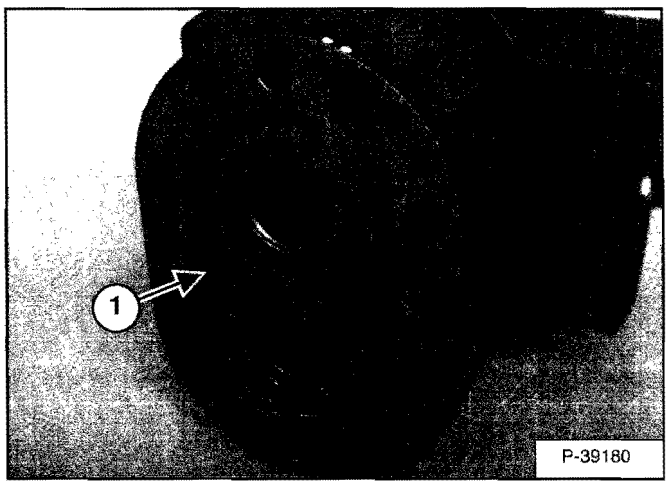
NOTE: Position wear plate (Item 1) [Figure 20-62-40] inlets and traps as shown with bronze side toward gears.

Figure 20-62-41



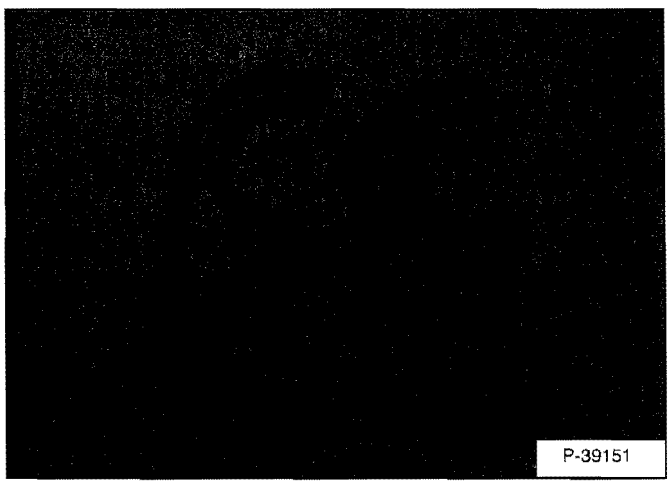
Remove the load seal (Item 1) **[Figure 20-62-41]**.

Figure 20-62-42



Remove the pre-load seal (Item 1) **[Figure 20-62-42]**.

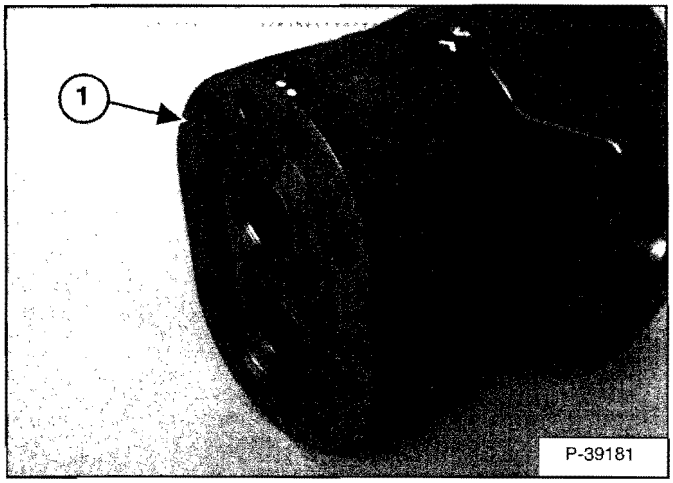
Figure 20-62-43



Inspect both seals **[Figure 20-62-43]**.

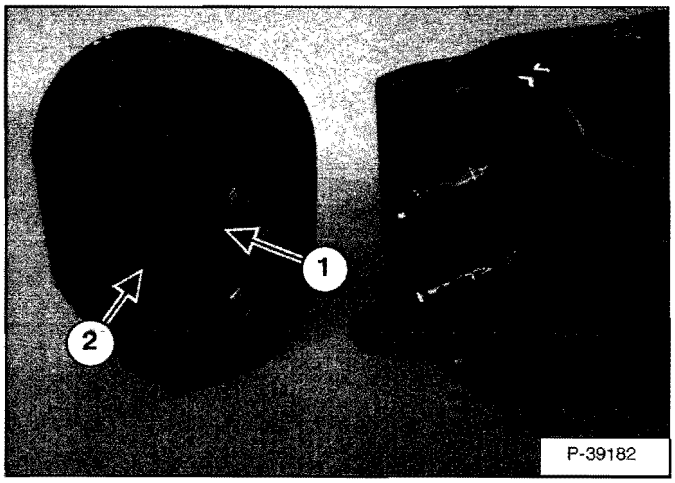
Disassembly And Assembly (Cont'd)

Figure 20-62-44



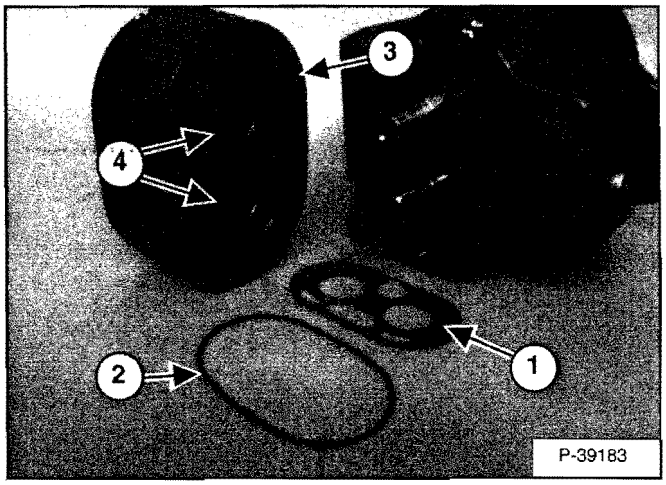
Remove the pump center section (Item 1) **[Figure 20-62-44]** from the pump sections.

Figure 20-62-45



Remove the wear plate (Item 1) **[Figure 20-62-45]** & **[Figure 20-62-46]** and section seal (Item 2) **[Figure 20-62-45]** & **[Figure 20-62-46]** from the pump section.

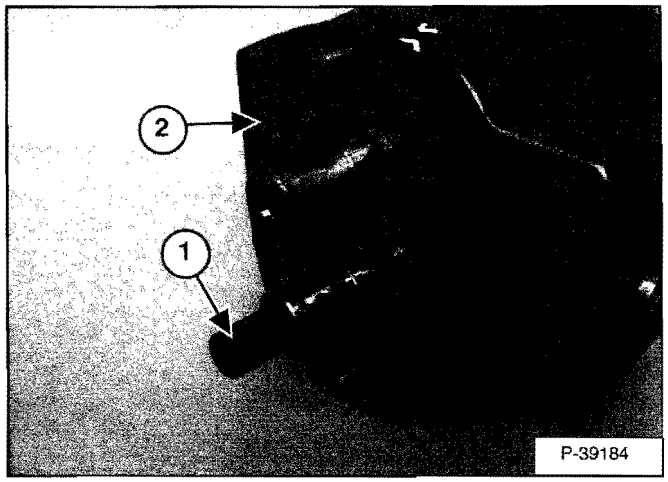
Figure 20-62-46



NOTE: Position wear plate (Item 1) [Figure 20-62-46] inlets and traps as shown with bronze side toward gears.

NOTE: Inspect the pump center section (Item 3) and bushings (Item 4) [Figure 20-62-46]. If excessive wear or damage is visible, the pump must be replaced.

Figure 20-62-47

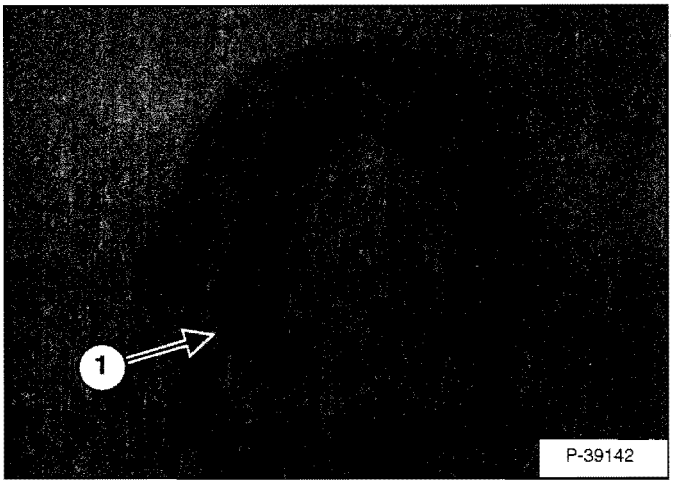


Remove the spline shaft (Item 1) **[Figure 20-62-47]**.

Remove the pump section (Item 2) **[Figure 20-62-47]** from the pump.

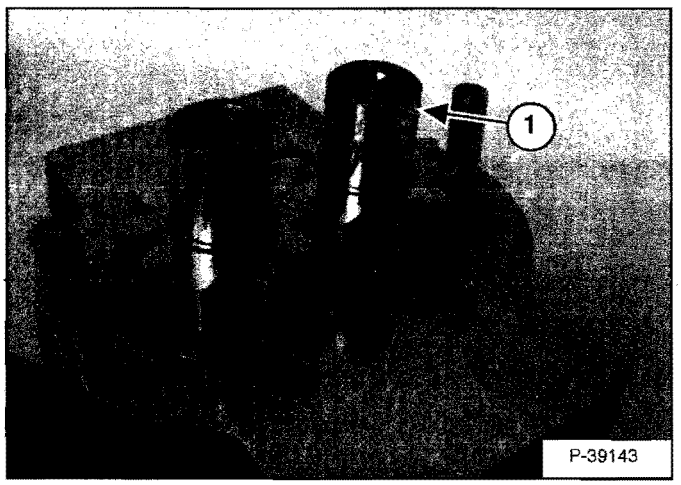
Disassembly And Assembly (Cont'd)

Figure 20-62-48



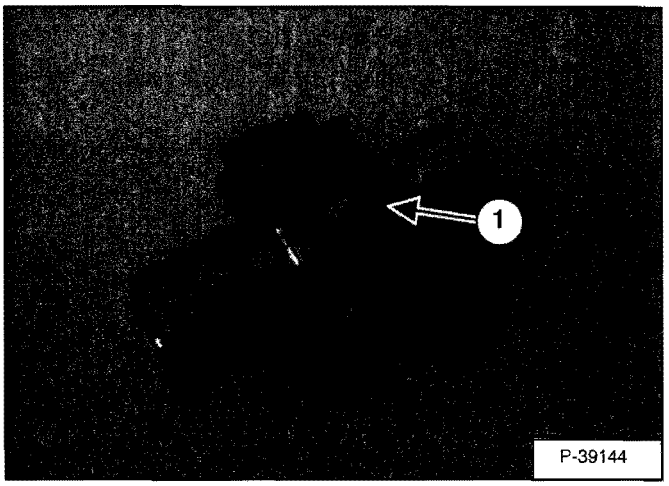
NOTE: Inspect the charge pump center section (Item 1) [Figure 20-62-48]. If excessive wear or damage is visible, the pump must be replaced.

Figure 20-62-49



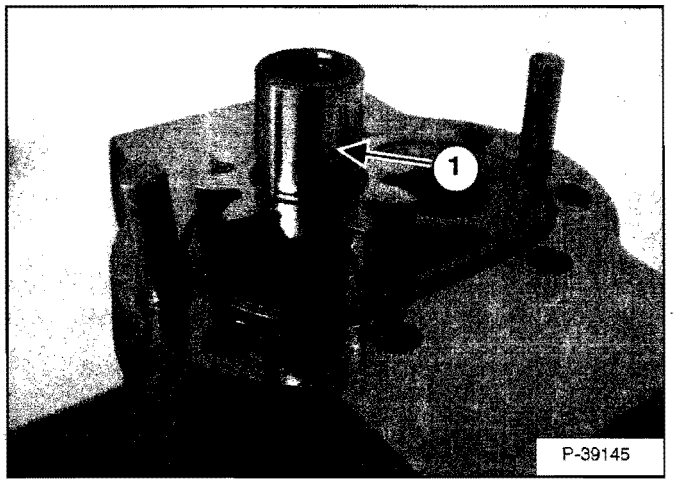
Remove the idler gear (Item 1) **[Figure 20-62-49]** from the charge pump.

Figure 20-62-50



NOTE: Inspect the idler gear (Item 1) [Figure 20-62-50]. If excessive wear or damage is visible, the pump must be replaced.

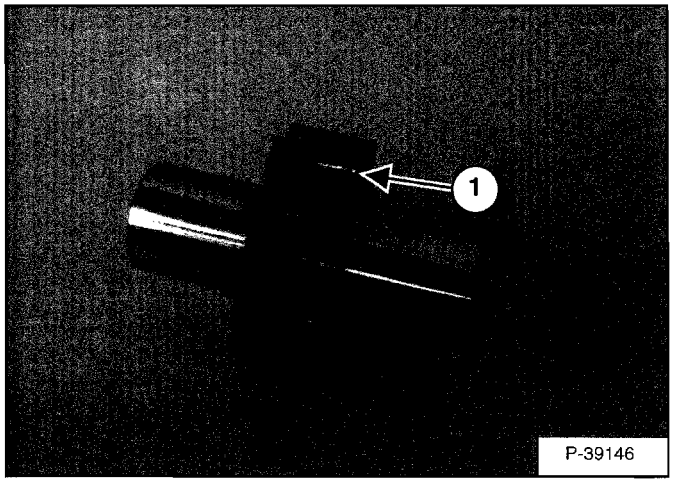
Figure 20-62-51



Remove the drive gear (Item 1) **[Figure 20-62-51]** from the charge pump.

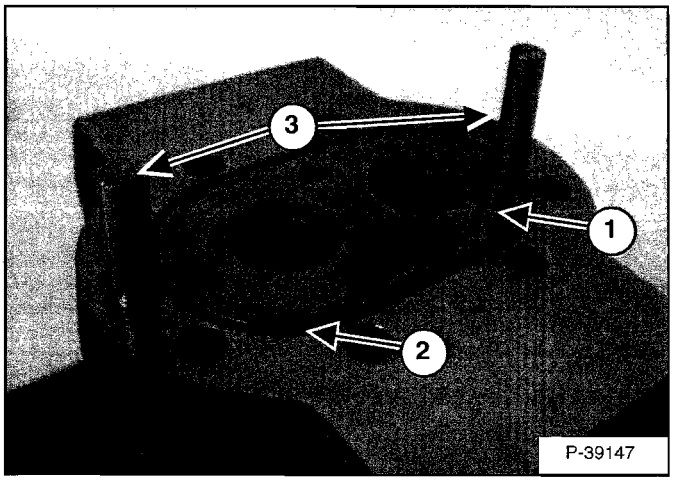
Disassembly And Assembly (Cont'd)

Figure 20-62-52



NOTE: Inspect the drive gear (Item 1) [Figure 20-62-52]. If excessive wear or damage is visible, the pump must be replaced.

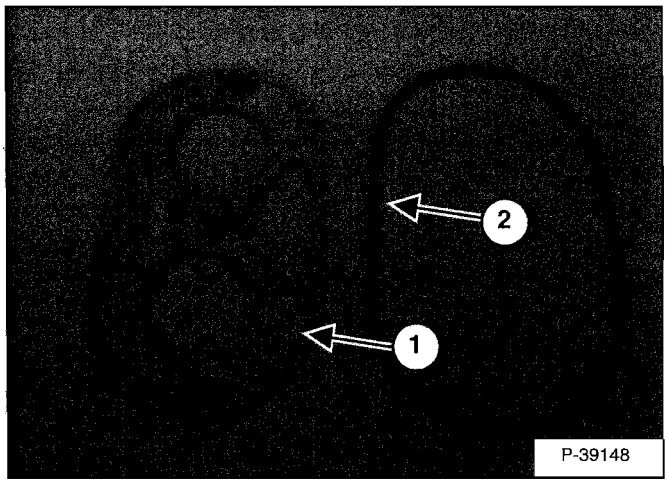
Figure 20-62-53



Remove the wear plate (Item 1) and section seal (Item 2) **[Figure 20-62-53]** from the front section of the charge pump.

Remove the locating pins (Item 3) **[Figure 20-62-53]** from the front section of the charge pump.

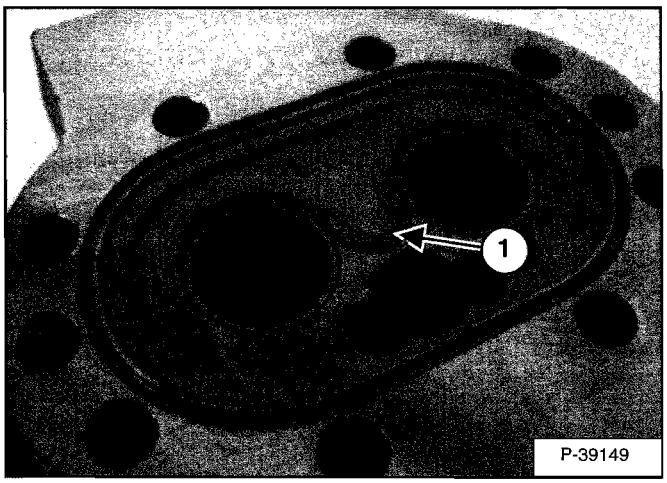
Figure 20-62-54



Inspect the wear plate (Item 1) and the section seal (Item 2)**[Figure 20-62-54]** and replace as needed.

NOTE: Position the wear plate (Item 1) [Figure 20-62-54] inlets and traps as shown with the bronze side toward the gears.

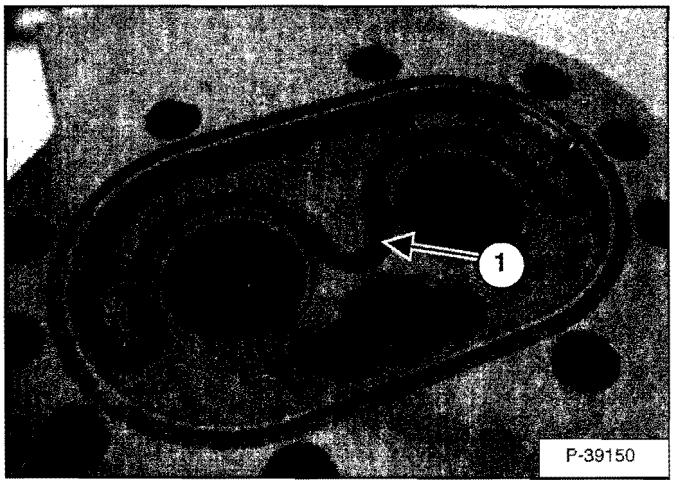
Figure 20-62-55



Remove the load seal (Item 1) **[Figure 20-62-55]** from the front section of the charge pump.

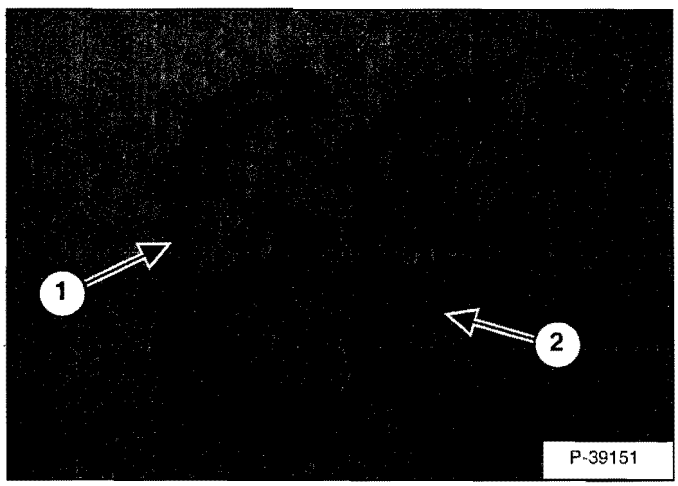
Disassembly And Assembly (Cont'd)

Figure 20-62-56



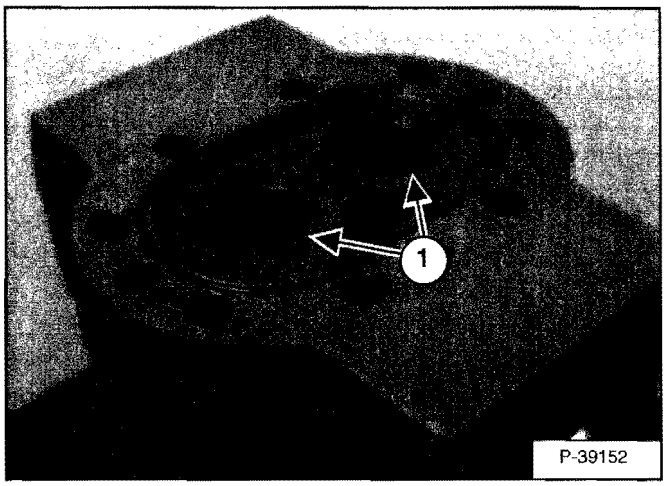
Remove the Pre-load seal (Item 1) **[Figure 20-62-56]** from the front section of the charge pump.

Figure 20-62-57



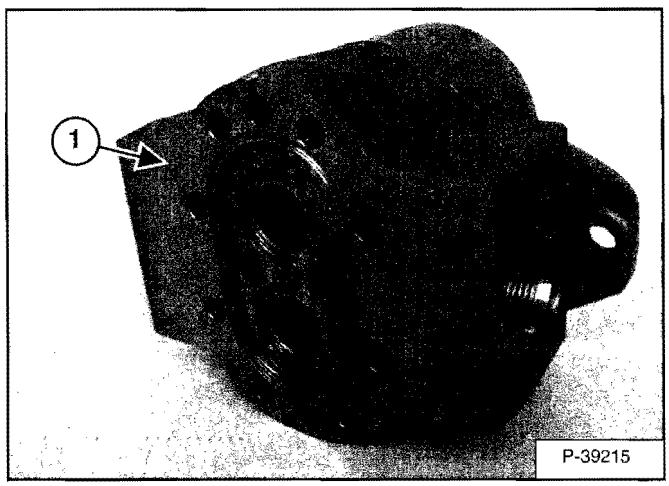
Inspect the load seal (Item 1) and the Pre-load seal (Item 2) **[Figure 20-62-57]** and replace as needed.

Figure 20-62-58



Inspect the pump center section and bushings (Item 1) **[Figure 20-62-58]**. If excessive wear or damage is visible, the pump must be replaced.

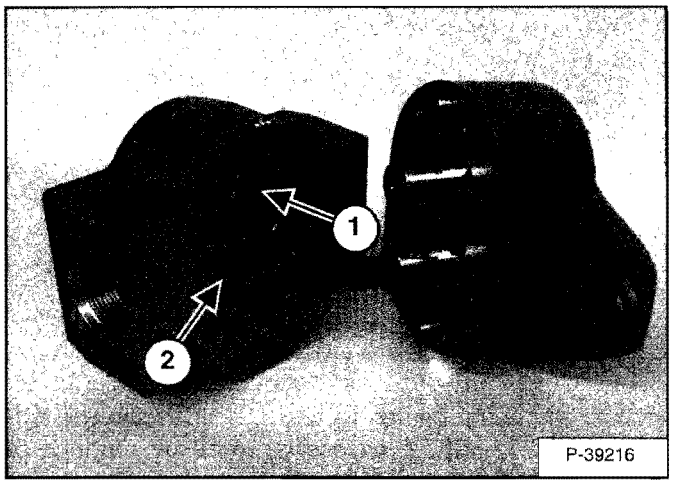
Figure 20-62-59



Remove the pump center section (Item 1) **[Figure 20-62-59]** from the pump sections.

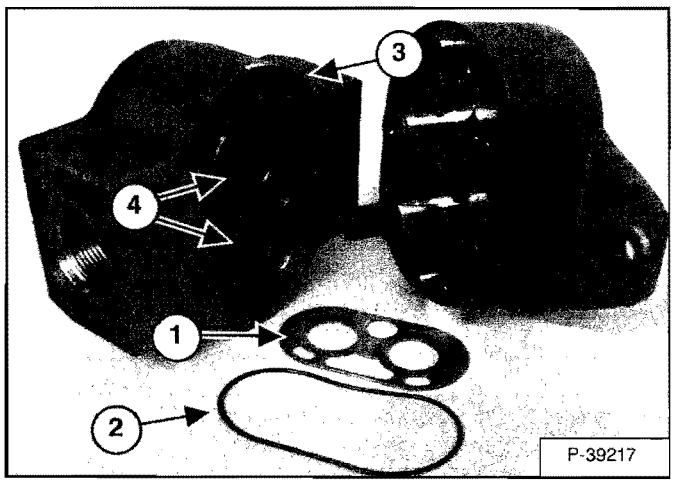
Disassembly And Assembly (Cont'd)

Figure 20-62-60



Remove the wear plate (Item 1) **[Figure 20-62-60]** & **[Figure 20-62-61]** and section seal (Item 2) **[Figure 20-62-60]** & **[Figure 20-62-61]** from the pump section.

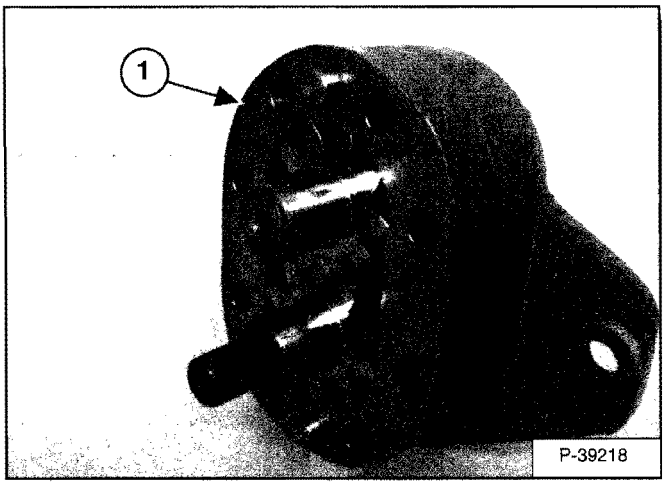
Figure 20-62-61



NOTE: Position wear plate (Item 1) [Figure 20-62-61] inlets and traps as shown with bronze side toward gears.

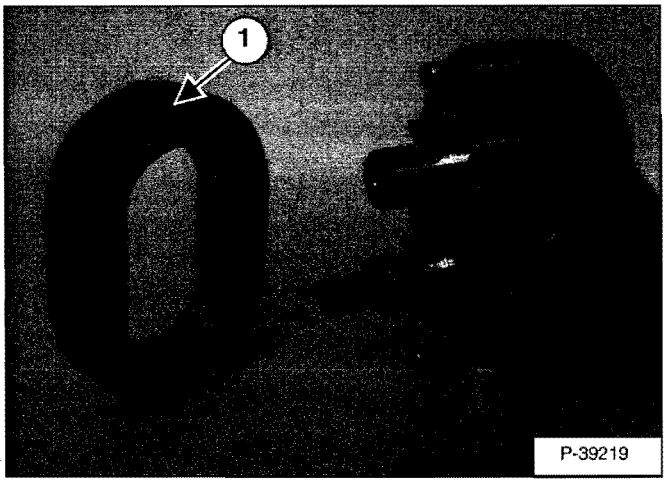
NOTE: Inspect the pump center section (Item 3) and bushings (Item 4) [Figure 20-62-61]. If excessive wear or damage is visible, the pump must be replaced.

Figure 20-62-62



Remove the pump section (Item 1) **[Figure 20-62-62]** from the pump end section.

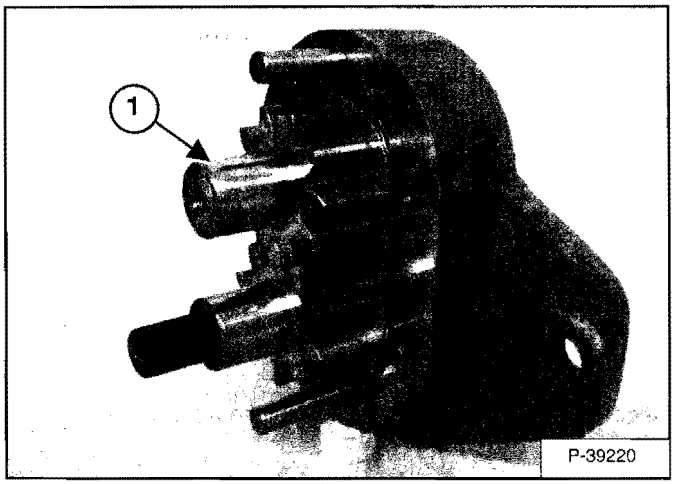
Figure 20-62-63



NOTE: Inspect the pump section (Item 1) [Figure 20-62-63]. If excessive wear or damage is visible, the pump must be replaced.

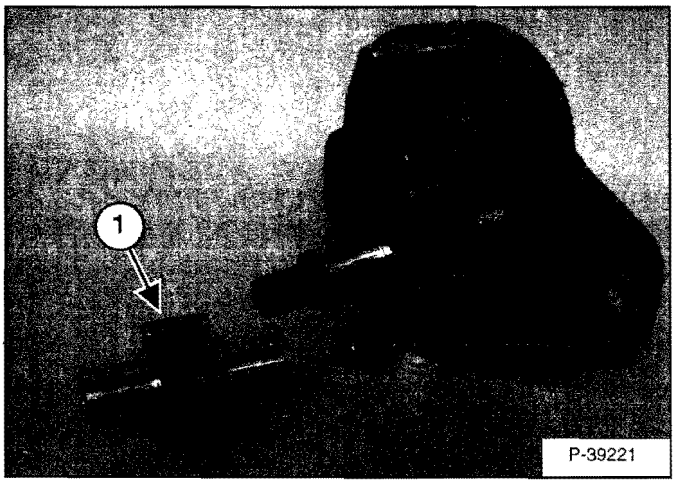
Disassembly And Assembly (Cont'd)

Figure 20-62-64



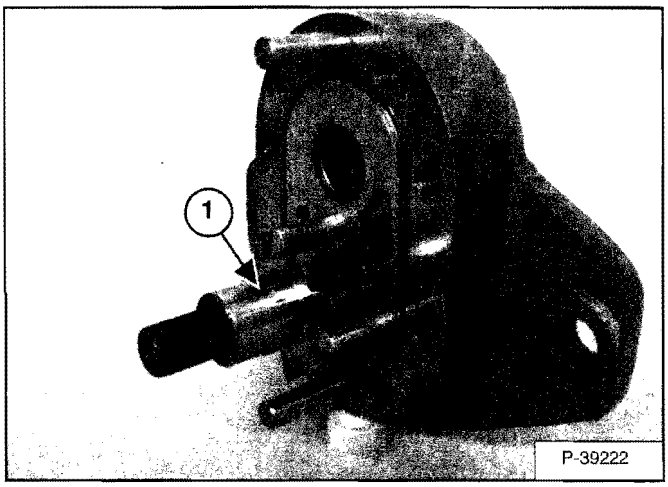
Remove the idler gear (Item 1) **[Figure 20-62-64]** & **[Figure 20-62-65]**.

Figure 20-62-65



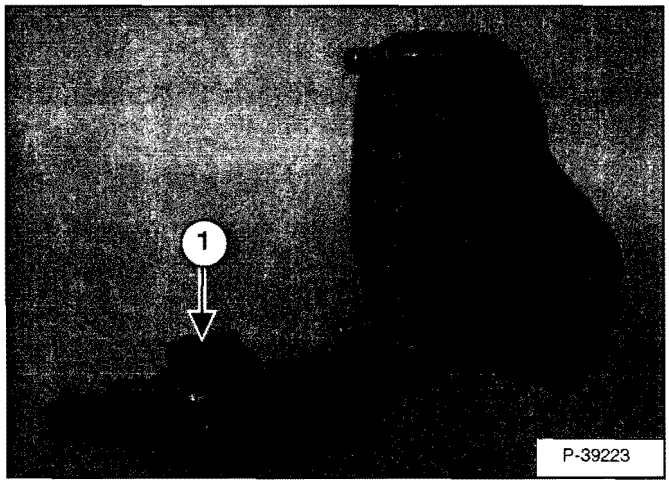
NOTE: Inspect the idler gear (Item 1) [Figure 20-62-65]. If excessive wear or damage is visible, the pump must be replaced.

Figure 20-62-66



Remove the drive gear (Item 1) **[Figure 20-62-66]** from the pump end section.

Figure 20-62-67

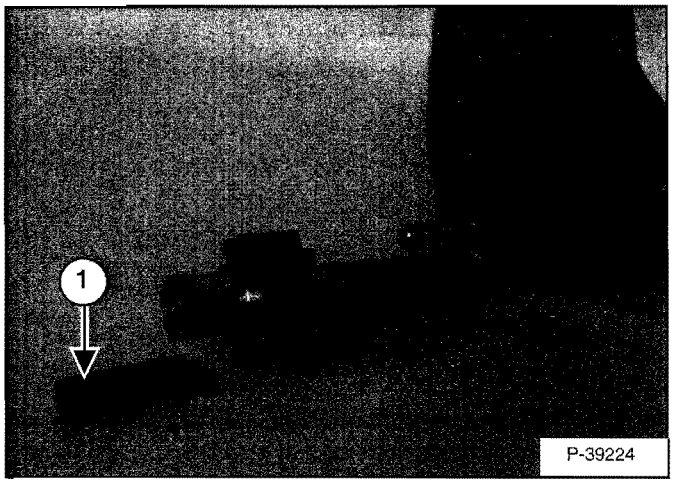


Remove the drive gear (Item 1) **[Figure 20-62-67]** from the pump end section.

NOTE: Inspect the drive gear (Item 1) [Figure 20-62-67]. If excessive wear or damage is visible, the pump must be replaced.

Disassembly And Assembly (Cont'd)

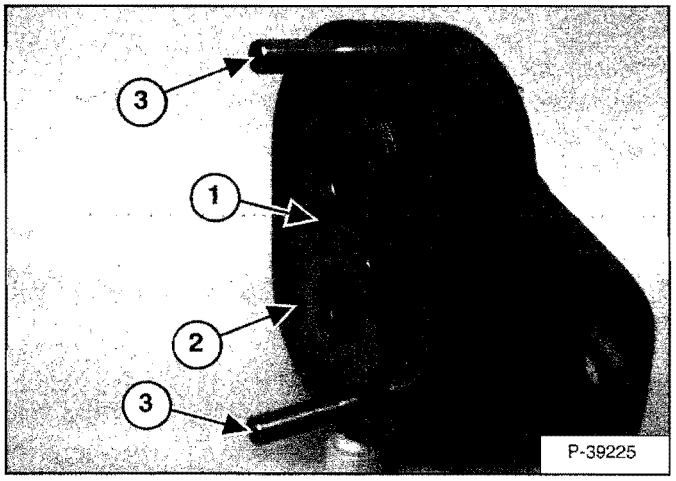
Figure 20-62-68



Remove the spline shaft (Item 1) **[Figure 20-62-68]** from the end of the drive gear.

NOTE: Inspect the spline shaft (Item 1) [Figure 20-62-68]. If excessive wear or damage is visible, the pump must be replaced.

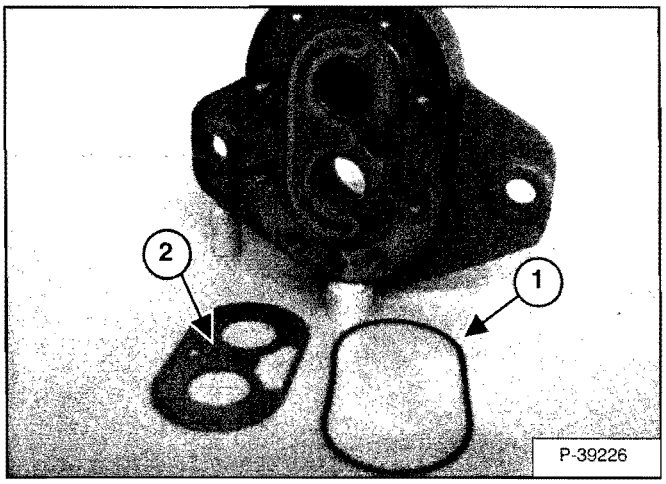
Figure 20-62-69



Remove the wear plate (Item 1) and section seal (Item 2) **[Figure 20-62-69]**.

Remove the locating pins (Item 3) **[Figure 20-62-69]**.

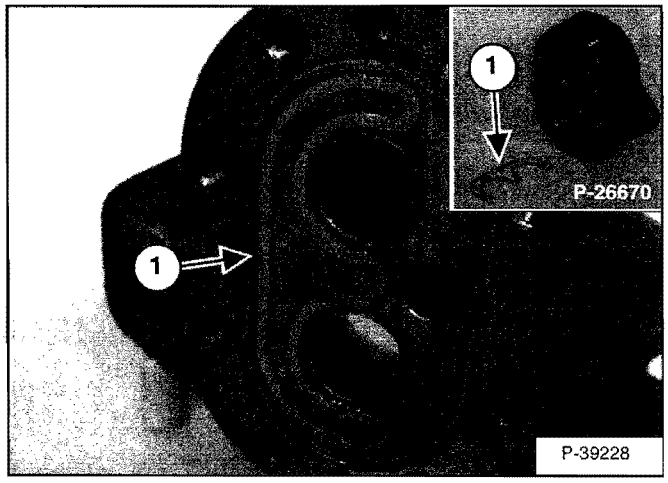
Figure 20-62-70



Inspect the wear plate (Item 1) and the section seal (Item 2) **[Figure 20-62-70]**.

NOTE: Position wear plate (Item 1) [Figure 20-62-70] inlets and traps as shown with bronze side toward gears.

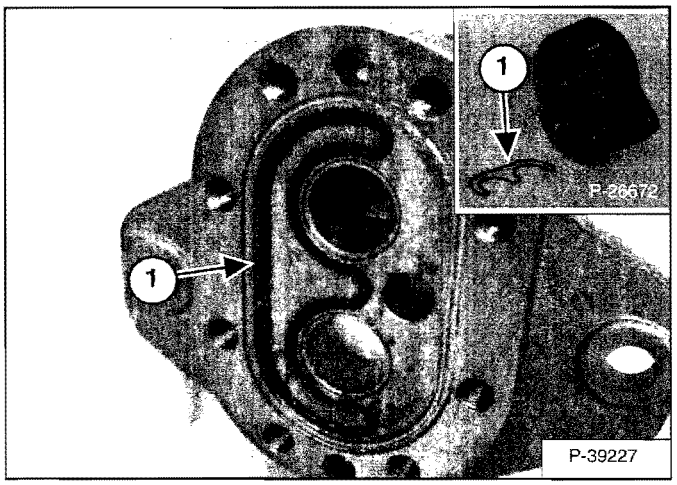
Figure 20-62-71



Remove the load seal (Item 1) **[Figure 20-62-71]**.

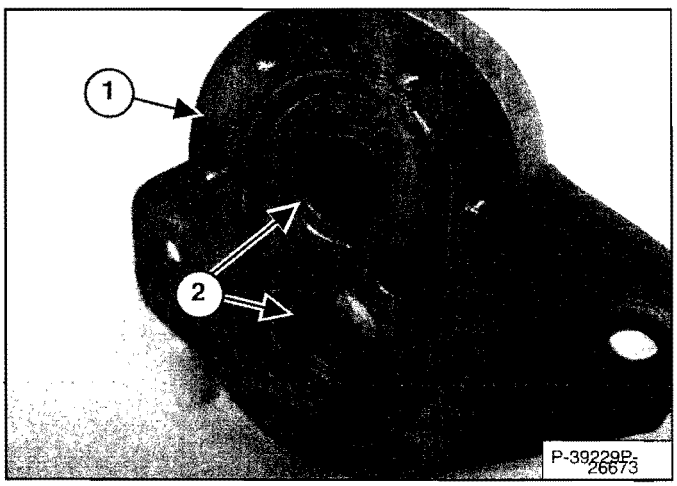
Disassembly And Assembly (Cont'd)

Figure 20-62-72



Remove the pre-load seal (Item 1) **[Figure 20-62-72].**

Figure 20-62-73



NOTE: Inspect the pump end section (Item 1) and bushings (Item 2) [Figure 20-62-73]. If excessive wear or damage is visible, the pump must be replaced.

Bobcat®

HYDRAULIC PUMP (SELECTABLE JOYSTICK CONTROL) (SJC)

Check The Output Of The Hydraulic Pump

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

MEL1563 - Remote Start Tool
MEL10103 - Hydraulic Tester
MEL10106 - Hydraulic Test Kit

⚠ 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.)

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

⚠ 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.

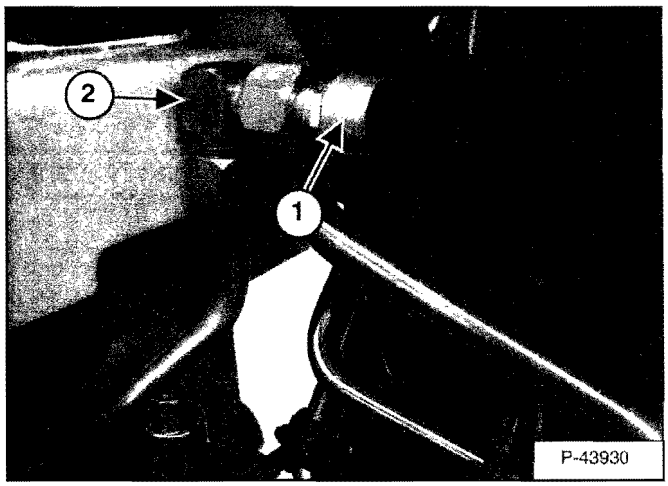
W-2059-0598

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

Open the rear door of the loader.

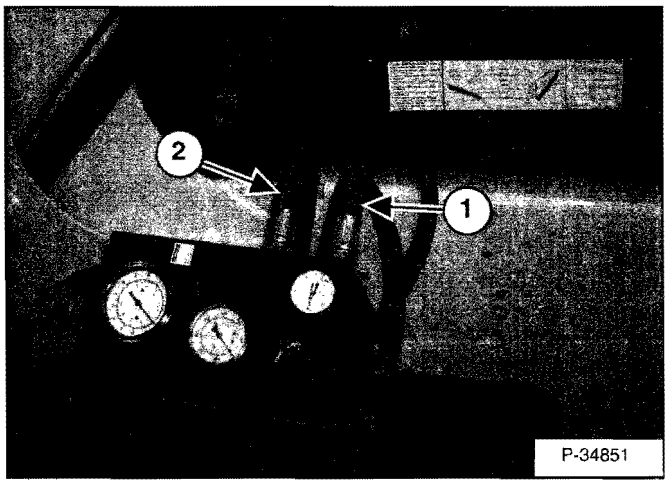
Connect the remote start tool. (See Contents Page 10-01.)

Figure 20-63-1



Disconnect the OUTLET hose (Item 1) **[Figure 20-63-1]** that comes from the gear pump, and connects to the tubeline on the top of the control valve.

Figure 20-63-2



Connect the INLET hose (Item 1) **[Figure 20-63-2]** from the tester to the OUTLET hose (Item 1) **[Figure 20-63-1]** of the pump. Connect the OUTLET hose (Item 2) **[Figure 20-63-2]** from the tester to the tubeline (Item 2) **[Figure 20-63-1]** on the top of the control valve.

IMPORTANT

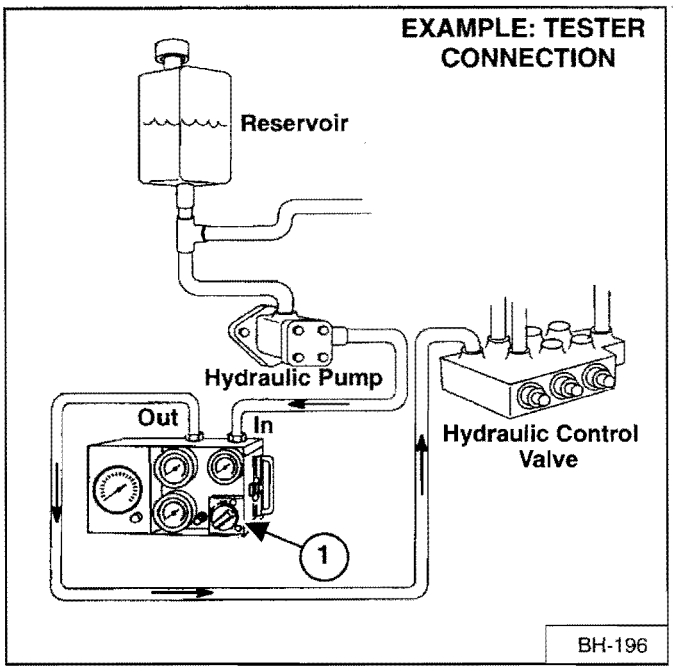
The hydraulic tester must be in the fully open position before you start the engine.

I-2024-0284

HYDRAULIC PUMP (SELECTABLE JOYSTICK CONTROL) (SJC) (CONT'D)

Check The Output Of The Hydraulic Pump

Figure 20-63-3



Sample tester connection shown**[Figure 20-63-3]**.

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 20-63-3]** 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.

Push the maximum/variable flow switch (on the remote start tool) to engage the front auxiliary hydraulics, the light will come ON. Push the button (on the right control lever) for fluid flow to the quick coupler (fluid pressure will go over main relief). Record the highest pressure (PSI) and flow (GPM). 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.

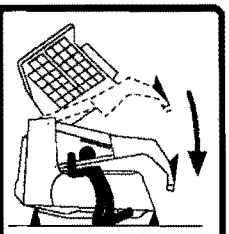
*Refer to SPECIFICATIONS Contents Page SPEC-01 for system relief pressure and full RPM.

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 rear of the loader. (See Contents Page 10-01.)

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

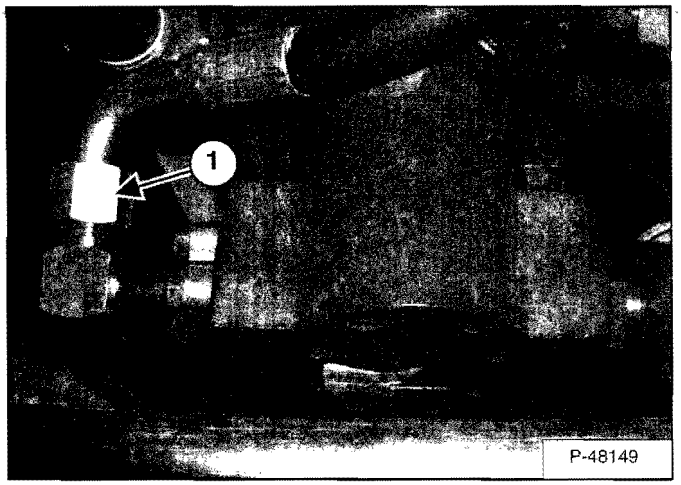
Drain the hydraulic fluid from the reservoir. (See Contents Page 20-01.)

Open the rear door of the loader.

Remove the Power Bob-Tach block if equipped. (See Contents Page 20-01.)

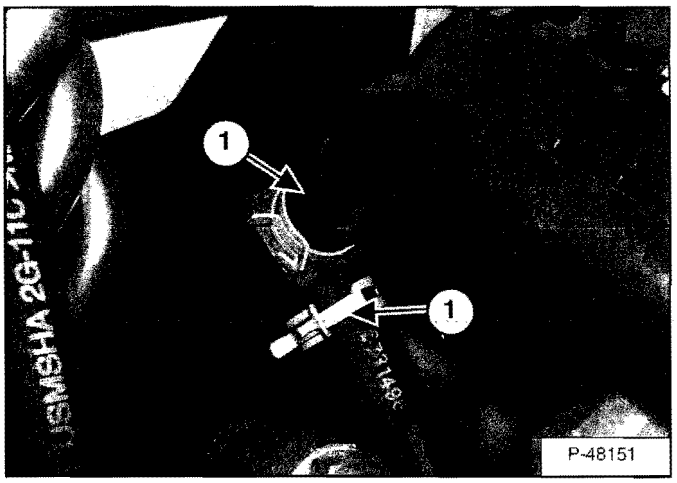
Removal And Installation (Cont"d)

Figure 20-63-4



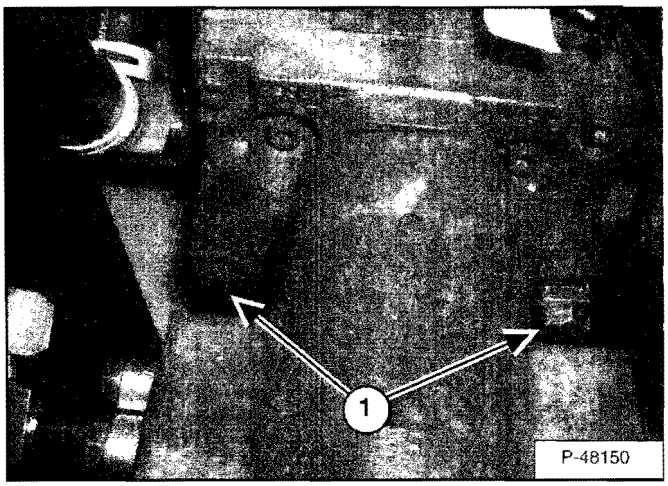
Disconnect and cap the hose from the outlet fitting (Item 1) **[Figure 20-63-4]** of the hydraulic pump.

Figure 20-63-5



Disconnect the two inlet hoses (Item 1) **[Figure 20-63-5]** from the front of the hydraulic pump.

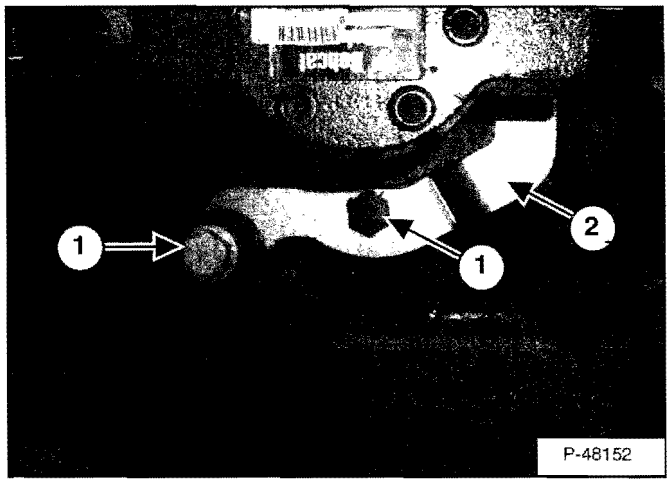
Figure 20-63-6



Remove the two mounting bolts (Item 1) **[Figure 20-63-6]** from the hydraulic pump.

Installation: Tighten the mounting bolts to 27-37 ft.-lbs. (37-50 Nm) torque.

Figure 20-63-7



At the bottom side of the gear pump, remove the two pump bolts (Item 1) **[Figure 20-63-7]** from pump support bracket.

Remove the pump support bracket (Item 2) **[Figure 20-63-7]** from the loader.

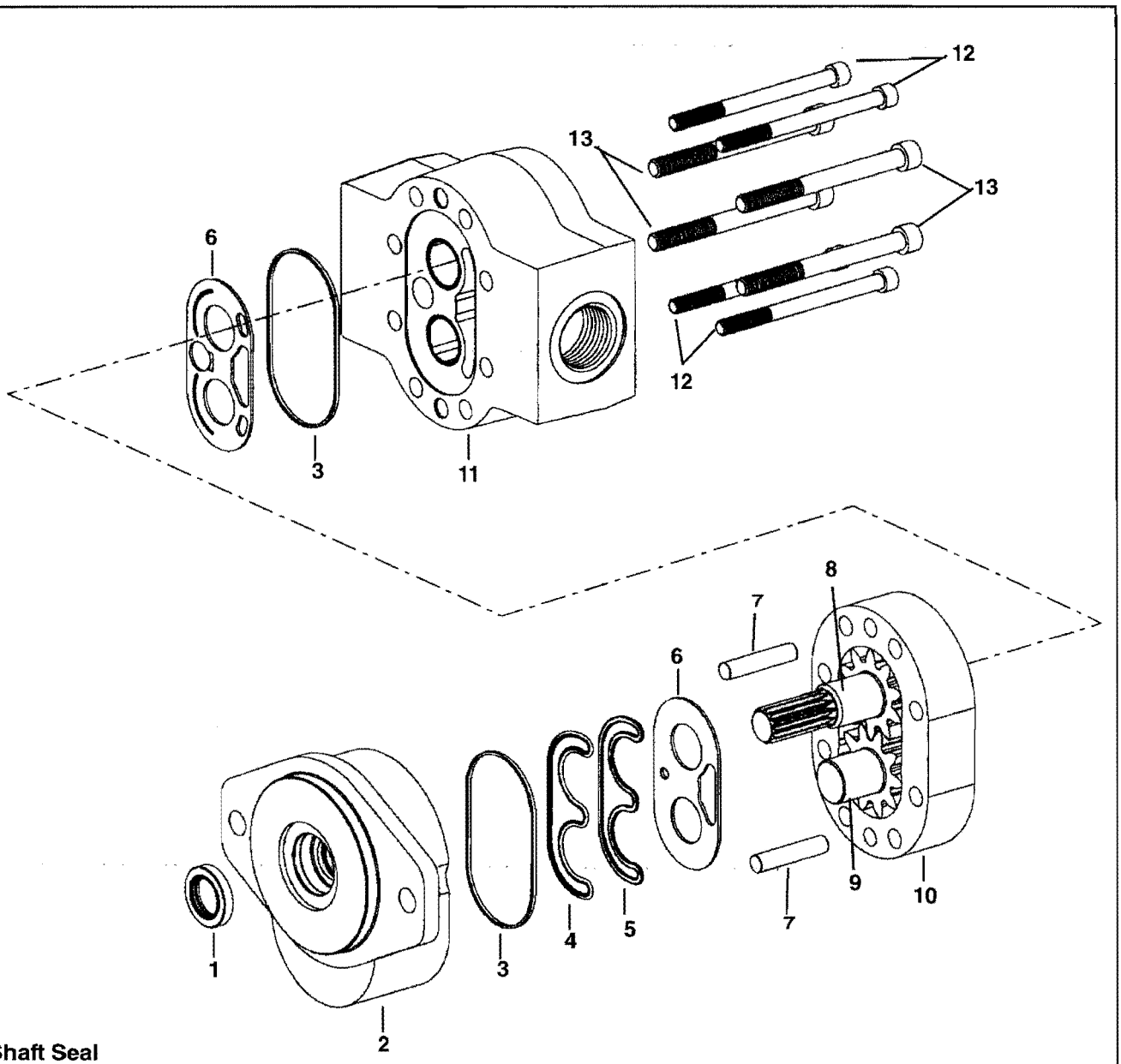
Remove the hydraulic pump from the hydrostatic pump **[Figure 20-63-7]**.

Remove the O-ring (Item 1) from the hydraulic gear pump.

Installation: Use a new O-ring when installing the hydraulic pump.

See Contents Page 20-01 for the proper Hydraulic Pump Disassembly And Assembly procedure.

Identification



1. Shaft Seal
2. Pump End Section
3. Pre-Load Seal
4. Load Seal
5. Section Seal
6. Wear Plate
7. Pins
8. Drive Gear
9. Idler Gear
10. Pump Center Section
11. Pump End Section
12. Bolts (4)
13. Bolts (4)

B-22285

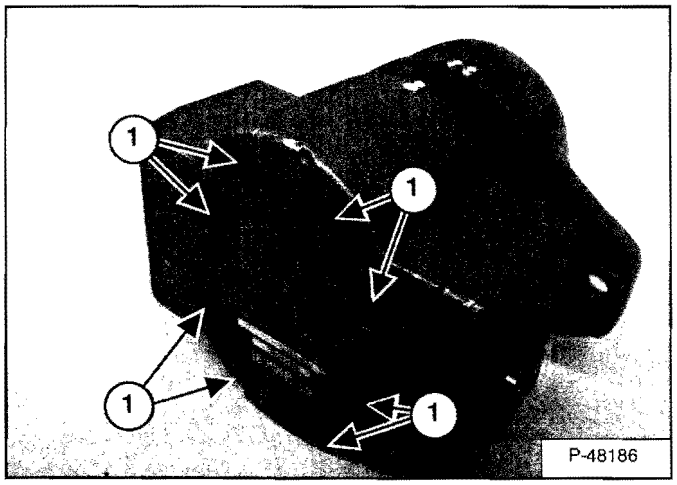
Disassembly And Assembly

IMPORTANT

When repairing hydrostatic and hydraulic systems, clean the work area before disasembly 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 20-63-8

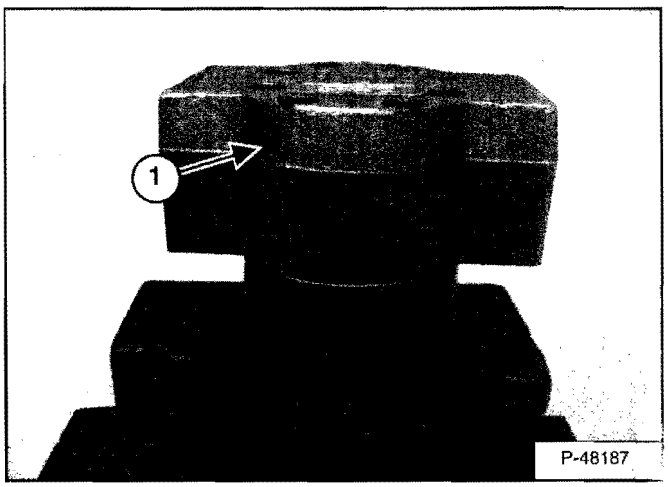


Mark the pump sections for correct assembly **[Figure 20-63-8]**.

Remove the eight pump housing bolts (Item 2) **[Figure 20-63-8]**.

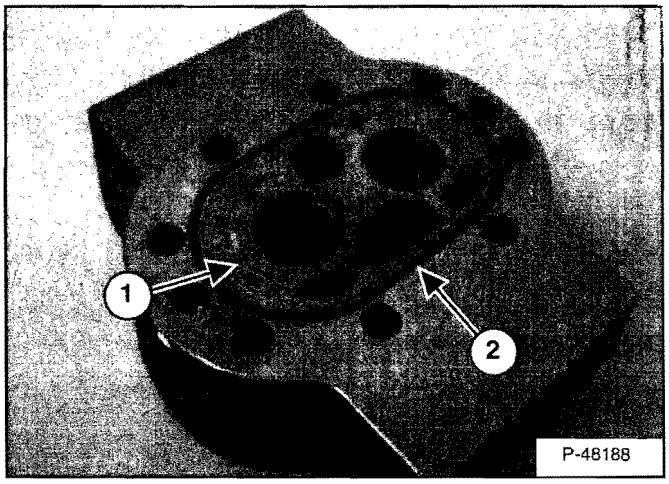
Installation: Tighten the eight bolts (Item 1) **[Figure 20-63-8]** to 45-50 ft.-lbs (60-67 Nm) torque.

Figure 20-63-9



Set the pump on end, and remove the pump end section (Item 1) **[Figure 20-63-9]** from the charge pump.

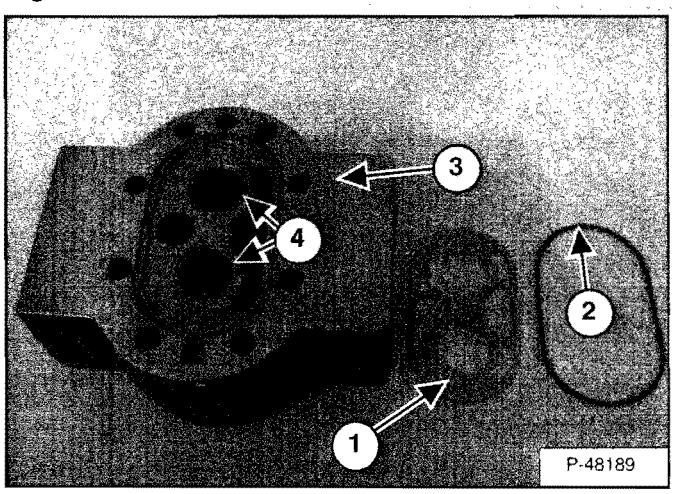
Figure 20-63-10



Remove the wear plate (Item 1) and the section seal (Item 2) **[Figure 20-63-10]**.

Disassembly And Assembly (Cont'd)

Figure 20-63-11

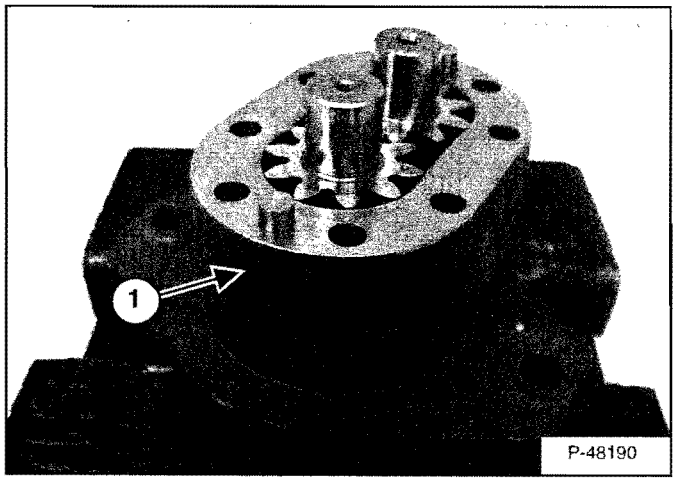


Inspect the wear plate (Item 1) and the section seal (Item 2) **[Figure 20-63-11]** and replace as needed.

NOTE: Position the wear plate (Item 1) [Figure 20-63-11] inlets and traps as shown with the bronze side toward the gears.

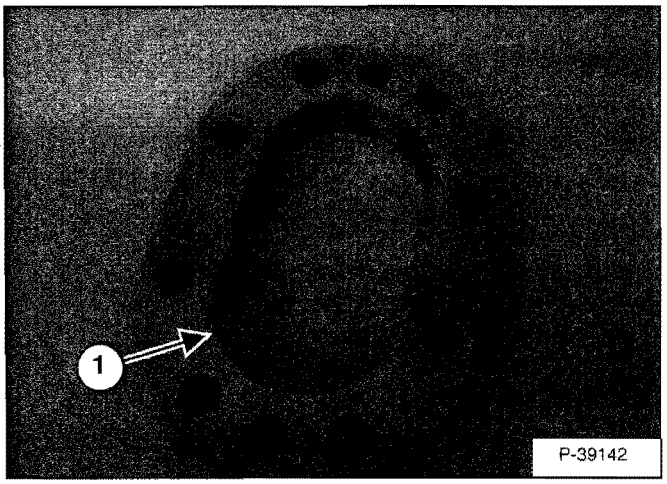
NOTE: Inspect the pump end section (Item 3) and bushings (Item 4) [Figure 20-63-11]. If excessive wear or damage is visible, the pump must be replaced.

Figure 20-63-12



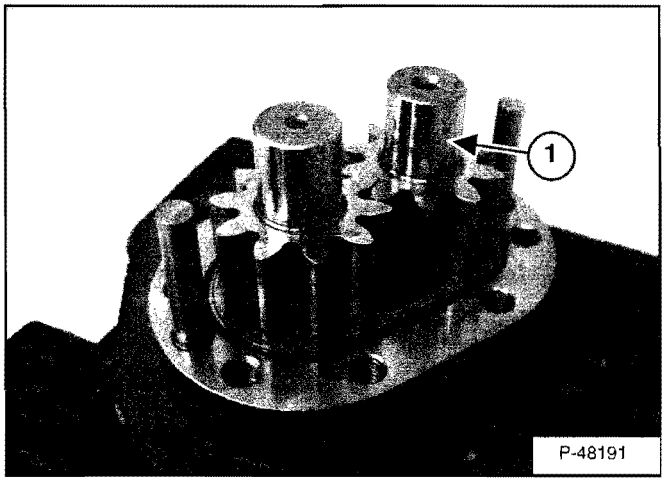
Remove the charge pump center section (Item 1) **[Figure 20-63-12]** from the auxillary pump.

Figure 20-63-13



NOTE: Inspect the charge pump center section (Item 1) [Figure 20-63-13]. If excessive wear or damage is visible, the pump must be replaced.

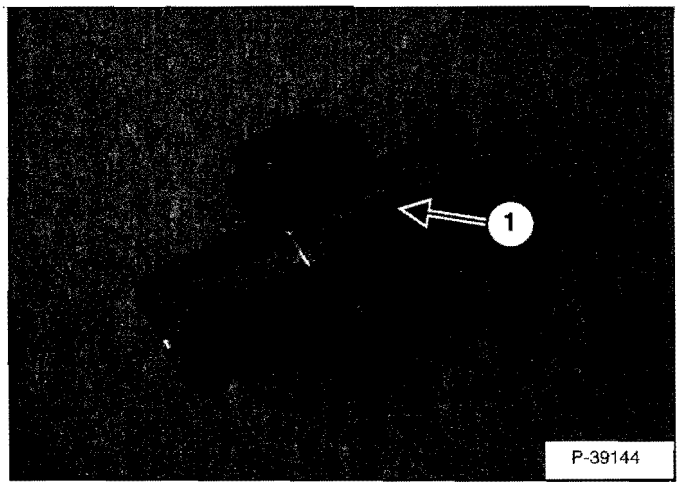
Figure 20-63-14



Remove the idler gear (Item 1) **[Figure 20-63-14]** from the pump.

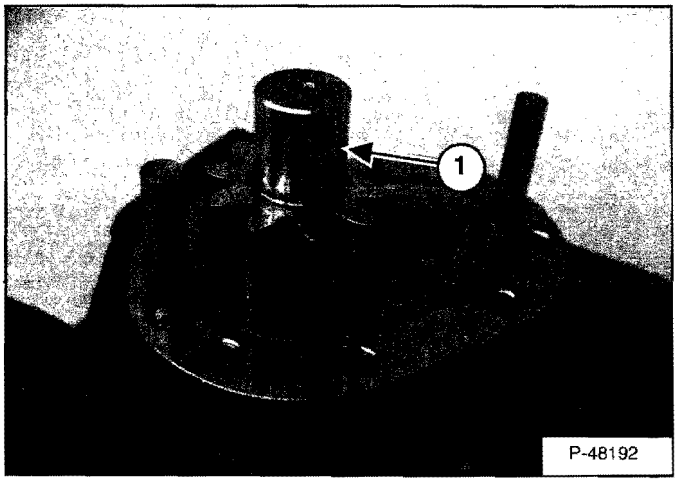
Disassembly And Assembly (Cont'd)

Figure 20-63-15



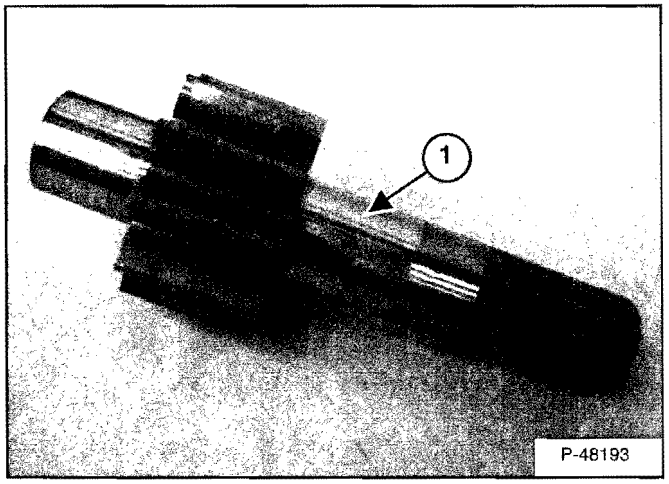
NOTE: Inspect the idler gear (Item 1) [Figure 20-63-15]. If excessive wear or damage is visible, the pump must be replaced.

Figure 20-63-16



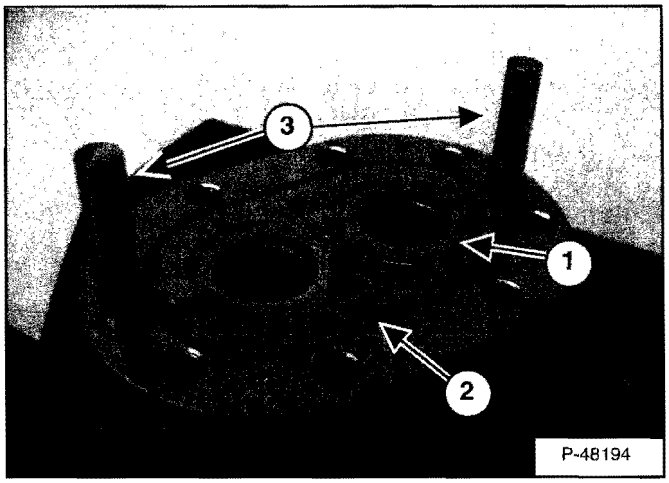
Remove the drive gear (Item 1) **[Figure 20-63-16]** from the pump.

Figure 20-63-17



NOTE: Inspect the drive gear (Item 1) [Figure 20-63-17]. If excessive wear or damage is visible, the pump must be replaced.

Figure 20-63-18

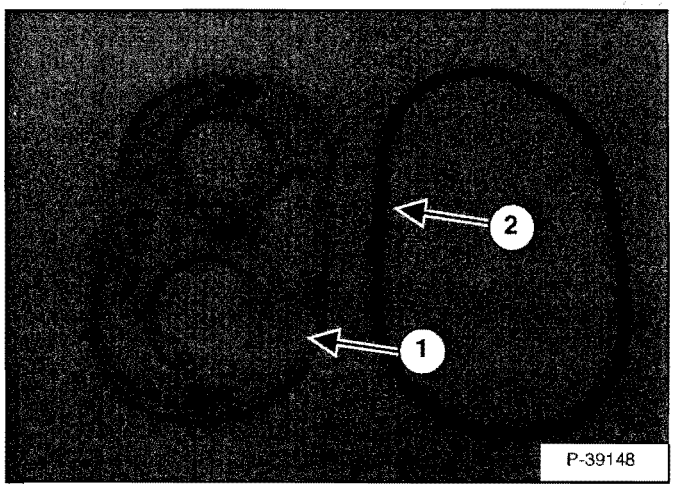


Remove the wear plate (Item 1) and section seal (Item 2) **[Figure 20-63-18]** from the front section of the pump.

Remove the locating pins (Item 3) **[Figure 20-63-18]** from the front section of the pump.

Disassembly And Assembly (Cont'd)

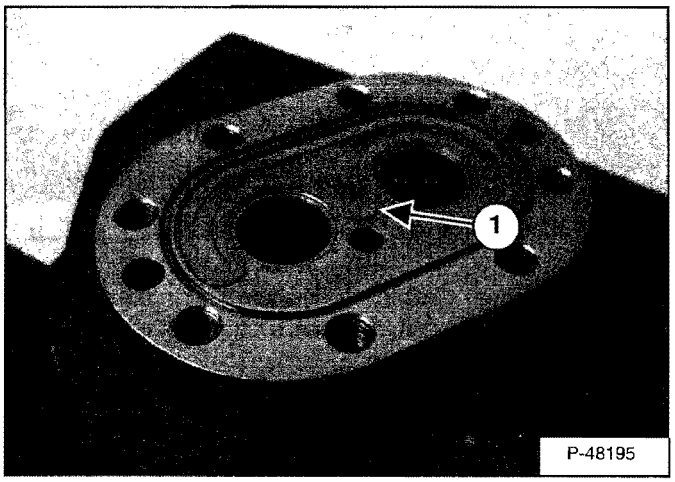
Figure 20-63-19



Inspect the wear plate (Item 1) and the section seal (Item 2)**[Figure 20-63-19]** and replace as needed.

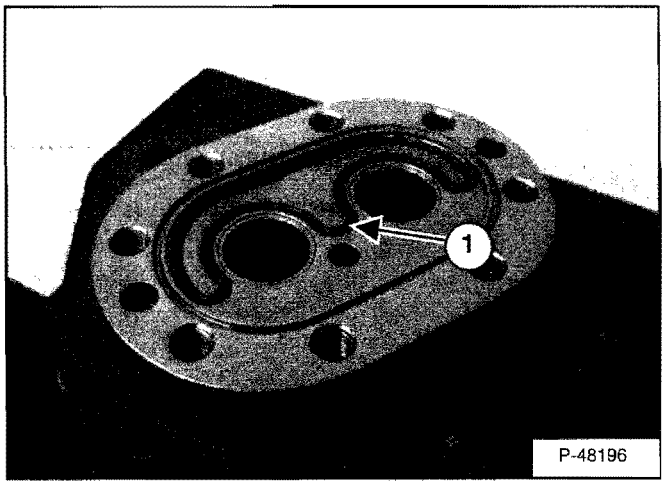
NOTE: Position the wear plate (Item 1) [Figure 20-63-19] inlets and traps as shown with the bronze side toward the gears.

Figure 20-63-20



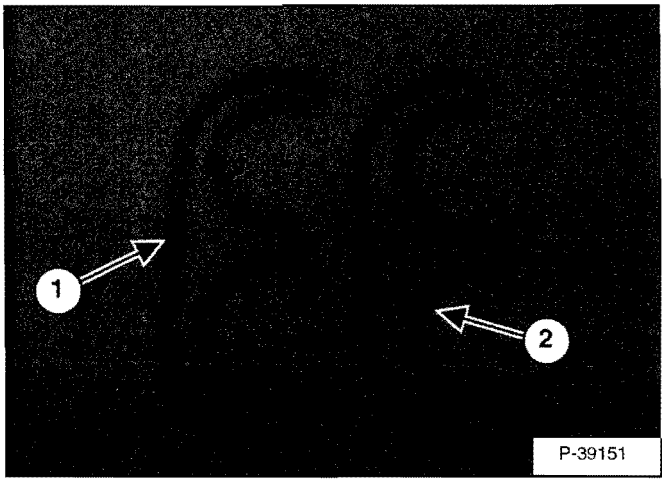
Remove the load seal (Item 1) **[Figure 20-63-20]** from the front section of the pump.

Figure 20-63-21



Remove the Pre-load seal (Item 1) **[Figure 20-63-21]** from the front section of the pump.

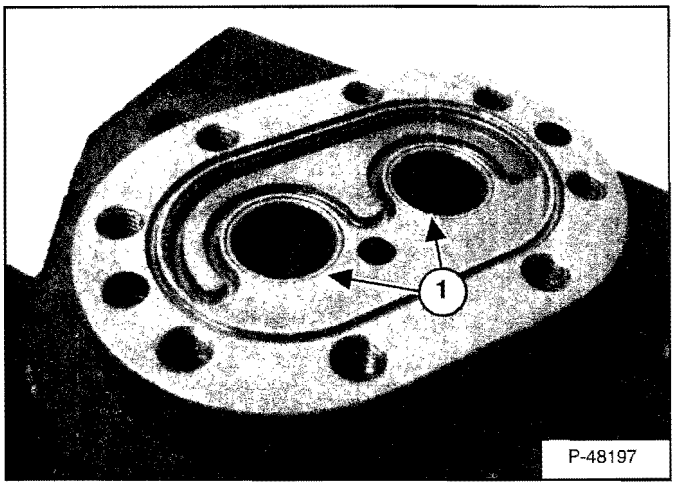
Figure 20-63-22



Inspect the load seal (Item 1) and the Pre-load seal (Item 2) **[Figure 20-63-22]** and replace as needed.

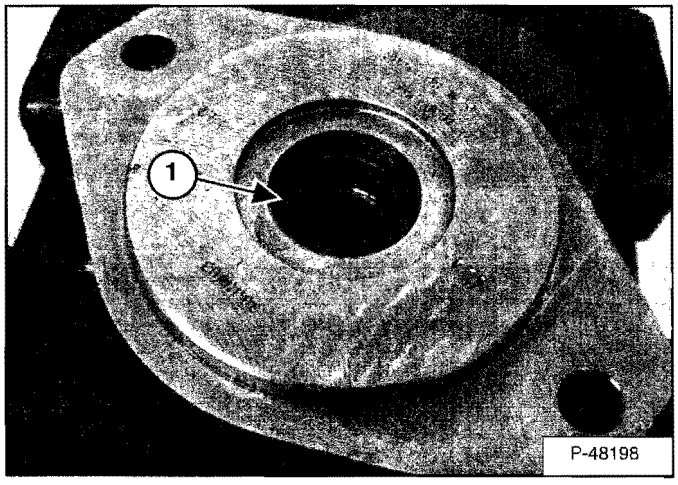
Disassembly And Assembly (Cont'd)

Figure 20-63-23



Inspect the pump end section and bushings (Item 1) **[Figure 20-63-23]**. If excessive wear or damage is visible, the pump must be replaced.

Figure 20-63-24



Replace the end section shaft seal (Item 1) **[Figure 20-63-24]**.

Bobcat®

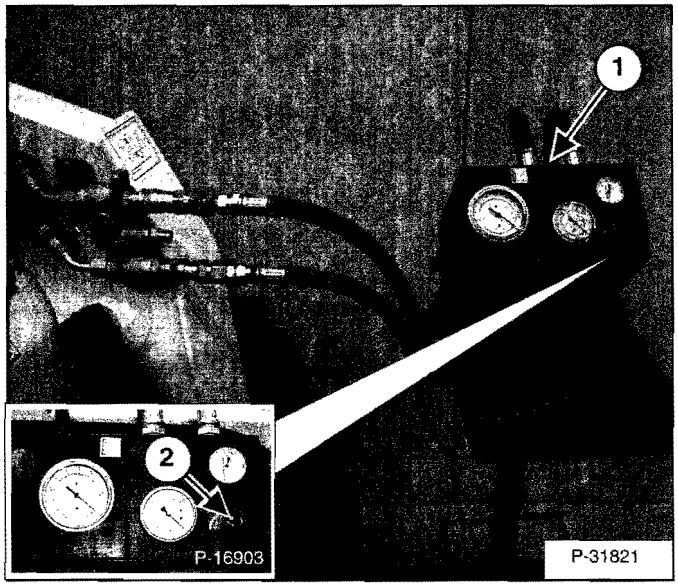
HYDRAULIC PUMP (HI FLOW) (SELECTABLE JOYSTICK CONTROL) (SJC)

Hydraulic Pump Test

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

MEL10103 - Hydraulic Tester
MEL10106 - Hydraulic Test Kit

Figure 20-64-1



Install a hydraulic tester (Item 1) **[Figure 20-64-1]** onto the front auxiliary quick couplers.

This procedure will require a operator in the cab and one operator running the tester.

Start the engine and run at low idle RPM. Press the Front Auxiliary button. Engage the front auxiliary with the trigger on the right handle. 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 clockwise on the tester so it reads about a 1000 PSI (6895 kPa).

NOTE: ***DO NOT EXCEED 3300 PSI.***

Turn the restrictor control (Item 2) **[Figure 20-64-1]** on the tester counterclockwise to obtain free flow, the flow should be at 20 GPM. Start turning the restrictor clockwise, causing more restriction on the flow. The GPM should drop off slightly until the pressure reaches approximately 2800 PSI. At approximately 2800 PSI the flow should start decreasing rapidly until the pressure reaches 3250-3300 PSI. At 3250-3300 PSI the flow should be at 0 GPM. Turn the restrictor (Item 2) **[Figure 20-64-1]** counter clockwise to free flow. Shut the front auxiliary hydraulics off.

If flow and pressure specs are not obtained, go to the Inline Standard Hydraulic Pump Test. (See Page 20-61-2.) If flow and pressure specs are obtained continue on to the next paragraph.

With the engine running at low idle RPM. Press the Front Auxiliary button. Engage the front auxiliary with the trigger on the right handle. 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 on the tester to about 1000 PSI (6895 kPa).

NOTE: ***DO NOT EXCEED 3300 PSI.***

Turn the restrictor control (Item 2) **[Figure 20-64-1]** on the tester counter clockwise, to obtain free flow, the flow should be at 20 GPM. Press the High Flow button. The flow should increase to 30 GPM. Start turning the restrictor clockwise, causing more restriction on the flow. The GPM should drop off slightly until the pressure reaches approximately 2700 PSI. At approximately 2700 PSI the flow should start decreasing rapidly until the pressure reaches 3250-3300 PSI. At 3250-3300 PSI the flow should be at 0 GPM. Turn the restrictor control (Item 2) **[Figure 20-64-1]** counter clockwise to free flow. Shut the front auxiliary hydraulics off.

If the specs from above are reached, the high flow hydraulic pump is OK.

If the flow and pressure were not obtained, go to the Inline High Flow Hydraulic Pump Test (See Page 20-64-4.)

*Refer to SPECIFICATIONS Contents Page SPEC-01 for system relief pressure and full RPM.

Inline Hydraulic Pump Test (Standard)

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

MEL10103 - Hydraulic Tester
MEL10106 - Hydraulic Test Kit

⚠ 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.)

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

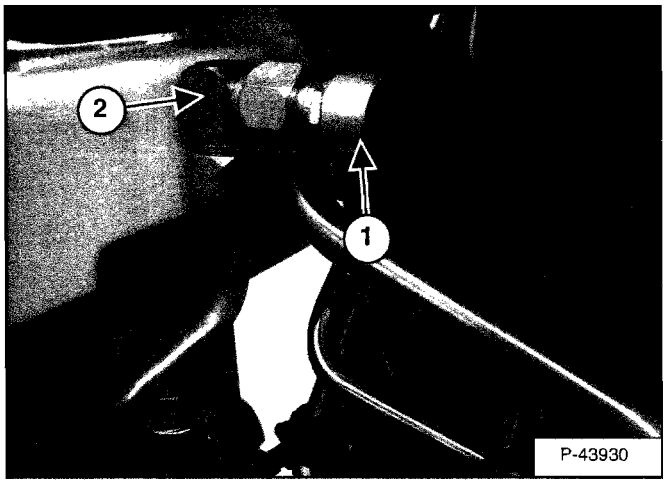
⚠ WARNING

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

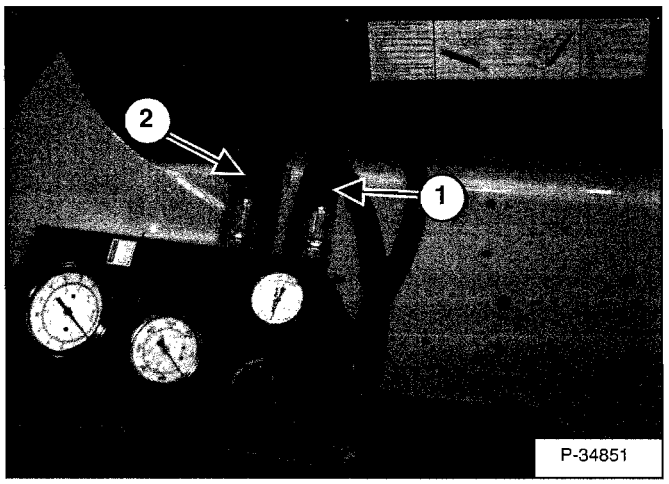
Raise the operator cab. (See Contents Page 10-01.)

Figure 20-64-2



At the control valve, disconnect the standard (auxiliary) pump OUTLET hose (Item 1) **[Figure 20-64-2]** from the tubeline.

Figure 20-64-3



Connect the INLET hose (Item 1) **[Figure 20-64-3]** from the tester to the OUTLET hose (Item 1) **[Figure 20-64-2]** of the pump. Connect the OUTLET hose (Item 2) **[Figure 20-64-3]** from the tester to the tubeline (Item 2) **[Figure 20-64-2]** which goes to the control valve.

Lower the cab down.

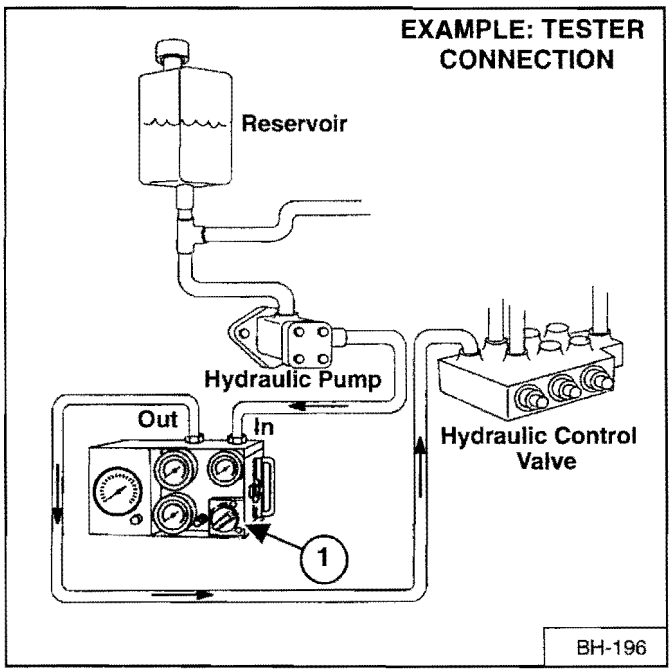
Inline Hydraulic Pump Test (Standard) (Cont'd)

IMPORTANT

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

I-2024-0284

Figure 20-64-4



Sample tester connection shown **[Figure 20-64-4]**.

This procedure will require a operator in the cab and one operator running the tester.

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 20-64-4]** on the tester clockwise to about 1000 PSI (6895 kPa).

NOTE: ***DO NOT EXCEED 3300 PSI.***

Open the restrictor control and record the free flow (GPM) at full RPM.

Record the flow (GPM) at 2700 PSI, this is the high pressure flow. 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 Contents Page SPEC-01 for system relief pressure and full RPM.

HYDRAULIC PUMP (HI FLOW) (SELECTABLE JOYSTICK CONTROL) (SJC) (CONT'D)

Inline Hydraulic Pump Test (High Flow)

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

MEL10103 - Hydraulic Tester
MEL10106 - Hydraulic Test Kit

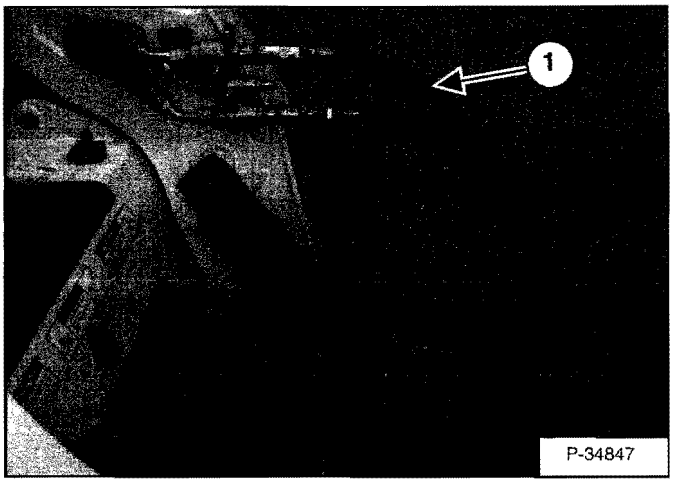
⚠ WARNING

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.)

Figure 20-64-5



Install a jumper hose (Item 1) **[Figure 20-64-5]** onto the front auxiliary quick couplers.

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

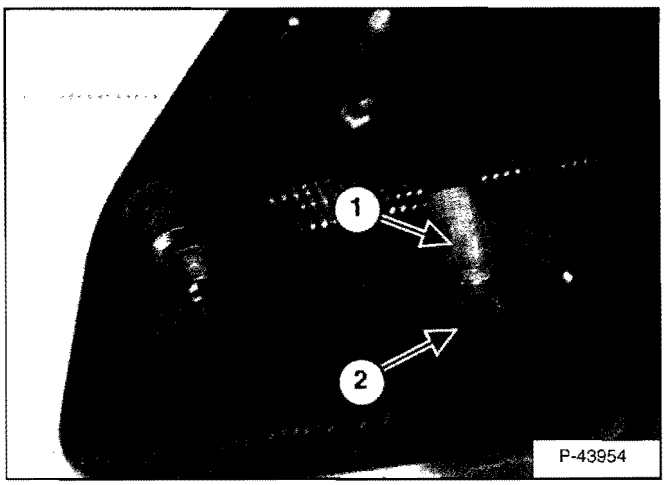
⚠ WARNING

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

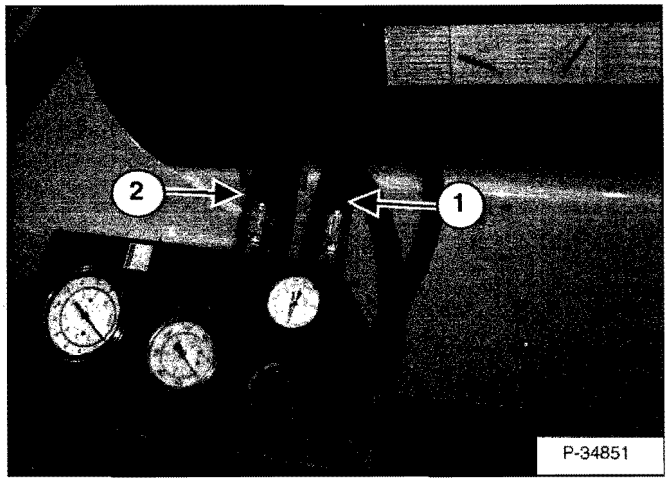
Figure 20-64-6



Remove the left side access cover.

Disconnect the high flow pump OUTLET hose (Item 1) **[Figure 20-64-6]** from the fitting (Item 2) **[Figure 20-64-6]** on the tubeline.

Figure 20-64-7



Connect the INLET hose (Item 1) **[Figure 20-64-7]** from the tester to the OUTLET hose (Item 1) **[Figure 20-64-6]** of the pump. Connect the OUTLET hose (Item 2) **[Figure 20-64-7]** from the tester to the fitting (Item 2) **[Figure 20-64-6]** on the tubeline.

Lower the cab down.

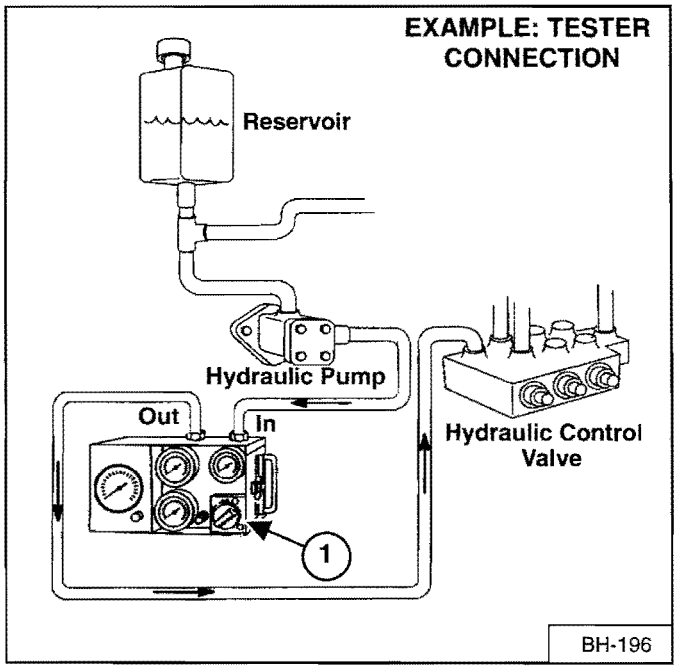
Inline Hydraulic Pump Test (High Flow) (Cont'd)

IMPORTANT

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

I-2024-0284

Figure 20-64-8



Sample tester connection shown **[Figure 20-64-8]**.

This procedure will require a operator in the cab and one operator running the tester.

Start the engine and run at low idle RPM. Press the Front Auxiliary button. Press the High Flow button. Engage the front auxiliary with the trigger on the right handle. 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 20-64-8]** clockwise on the tester to about 1000 PSI (6895 kPa).

NOTE: ***DO NOT EXCEED 3300 PSI.***

Turn the restrictor control clockwise on the tester to 3300 PSI and the flow should go to zero GPM. If the pressure readings are not obtained go to the High Flow Relief Pump Adjustment (See Contents Page 20-64-6). If the pressure readings are correct, continue on to the next paragraph.

Open the restrictor control and record the free flow (GPM) at full RPM.

Record the flow (GPM) at 2500 PSI, this is the high pressure flow. 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 Contents Page SPEC-01 for system relief pressure and full RPM.

High Flow Relief Adjustment Procedure

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

MEL10103 - Hydraulic Tester
MEL10106 - Hydraulic Test Kit

⚠ WARNING

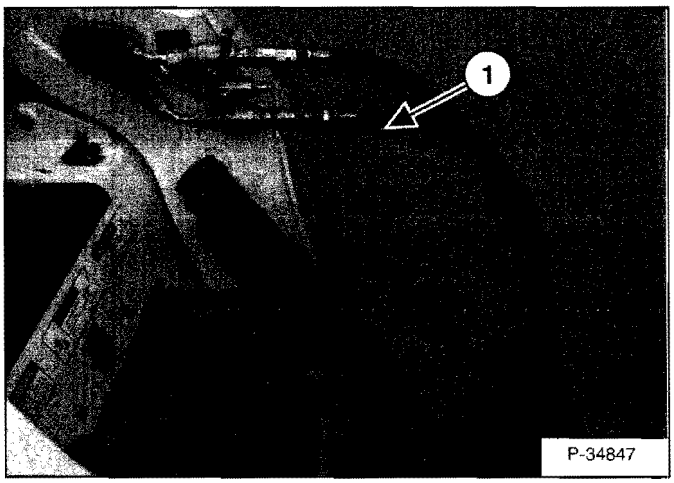
Put jackstands under the front axles and rear corners of the frame before running the engine for service. Failure to use jackstands can allow the machine to fall or move and cause injury or death.

W-2017-0286

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

Remove the right rear tire.

Figure 20-64-9



Install a jumper hose (Item 1) **[Figure 20-64-9]** onto the front auxiliary quick couplers.

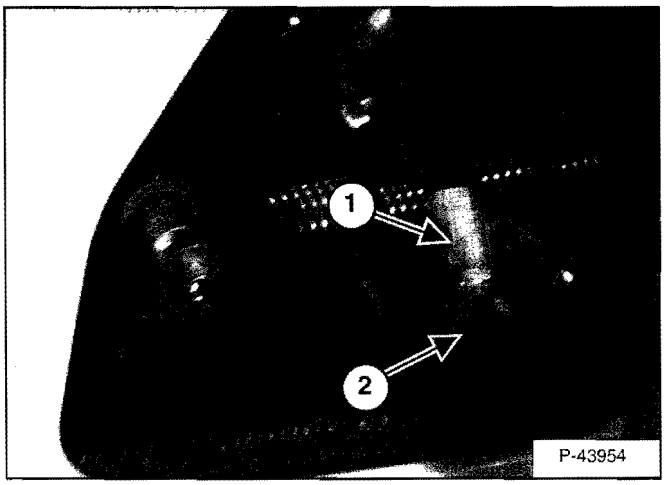
Raise the lift arms and install an approved lift arm support device. (See Contents Page 10-01.)

⚠ 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

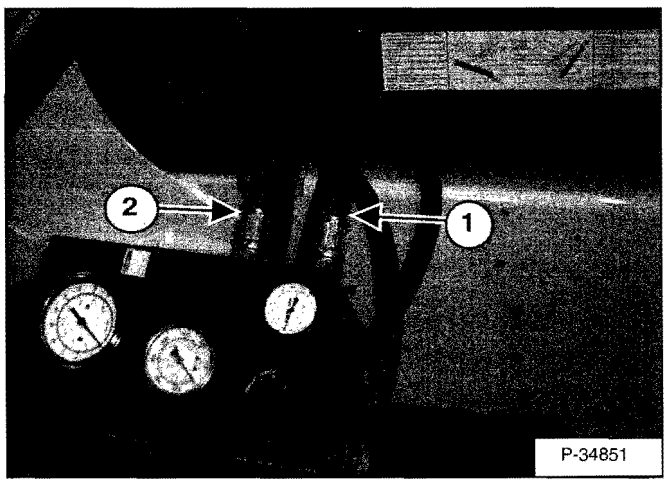
Figure 20-64-10



Remove the left side access cover.

Disconnect the high flow pump OUTLET hose (Item 1) **[Figure 20-64-10]** from the fitting (Item 2) **[Figure 20-64-10]** on the tubeline.

Figure 20-64-11

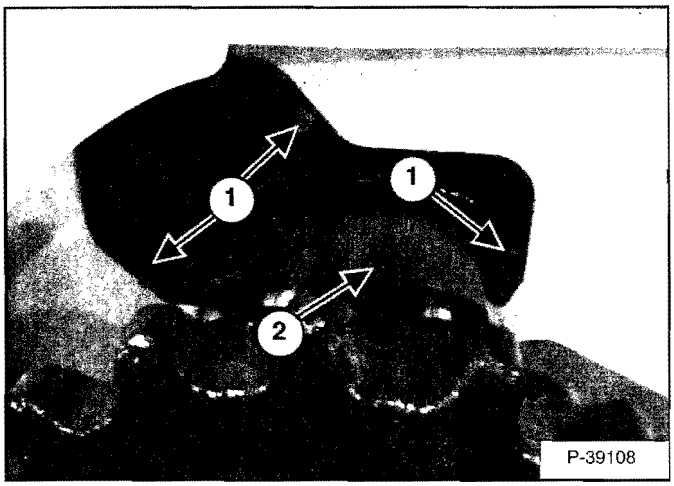


Connect the INLET hose (Item 1) **[Figure 20-64-11]** from the tester to the OUTLET hose (Item 1) **[Figure 20-64-10]** of the pump. Connect the OUTLET hose (Item 2) **[Figure 20-64-11]** from the tester to the tubeline (Item 2) **[Figure 20-64-10]** at the control valve.

Lower the cab down.

High Flow Relief Adjustment Procedure (Cont'd)

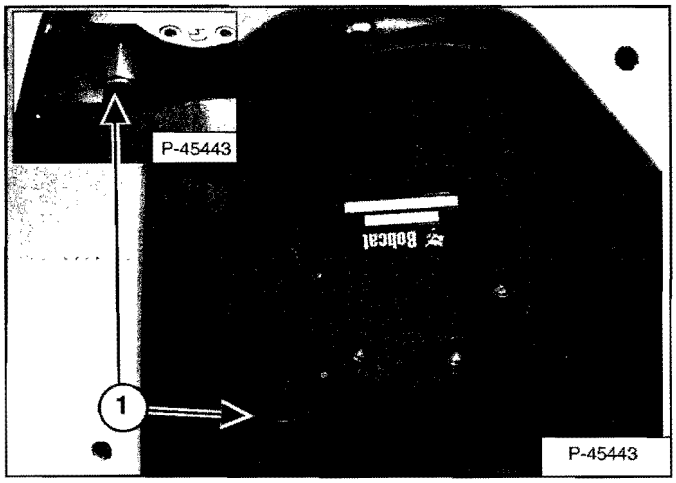
Figure 20-64-12



Remove the right side track. (See Contents Page 40-01.)

Remove the three access cover mounting bolts (Item 1) and the cover (Item 2) **[Figure 20-64-12]** from the frame.

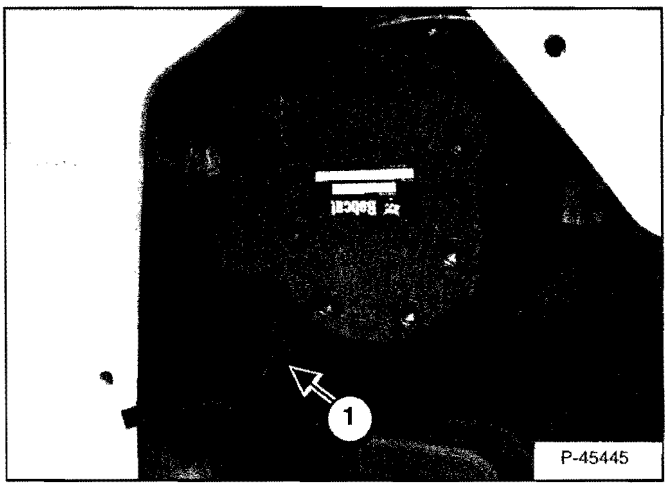
Figure 20-64-13



Remove the cap (Item 1) **[Figure 20-64-13]** from the pump.

This procedure will require a operator in the cab and one operator running the tester.

Figure 20-64-14



Start the engine and run at low idle RPM. Press the Front Auxiliary button. Press the High Flow button. Engage the front auxiliary with the trigger on the right handle. 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 clockwise on the tester to about 1000 PSI (6895 kPa).

NOTE: *DO NOT EXCEED 3300 PSI.*

Turn the restrictor control clockwise on the tester to causing more restriction on the flow. The GPM should drop off slightly until the pressure reaches approximately 2600 PSI. At approximately 3100 PSI the flow should start decreasing rapidly until the pressure reaches 3250-3300 PSI. At 3250-3300 PSI the flow should be at 0 GPM. Turn the restrictor counter clockwise to free flow. Shut the front auxiliary hydraulics off.

If the specs from above are reached, the pump is OK.

If the pump is unable to reach 3300 PSI the relief plug (Item 1) **[Figure 20-64-14]** will need to be turned clockwise a 1/4 turn and retested with the procedure above. (1/4 turn equals 200 PSI.)

NOTE: If the relief plug has been turned in 1/4 turn and the pressure remains the same, go to the relief valve removal and installation section. (See Contents Page 20-01.) If relief valve has been checked and is OK, go to the high flow pump disassembly and assembly section. (See Contents Page 20-01.)

If the pump reaches 3300 PSI and there is flow, the relief plug must be turned counter clockwise 1/4 turn and retested with the procedure above.

High Flow Relief Valve Removal and Installation

⚠ WARNING

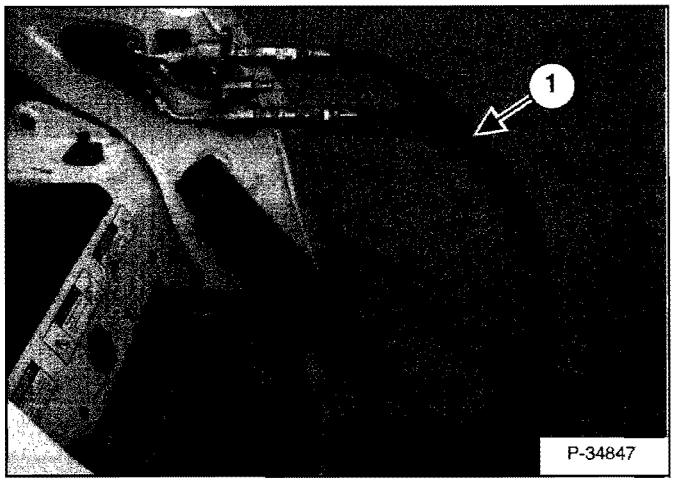
Put jackstands under the front axles and rear corners of the frame before running the engine for service. Failure to use jackstands can allow the machine to fall or move and cause injury or death.

W-2017-0286

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

Remove the right side track. (See Contents Page 40-01.)

Figure 20-64-15



Install a jumper hose (Item 1) **[Figure 20-64-15]** onto the front auxiliary quick couplers.

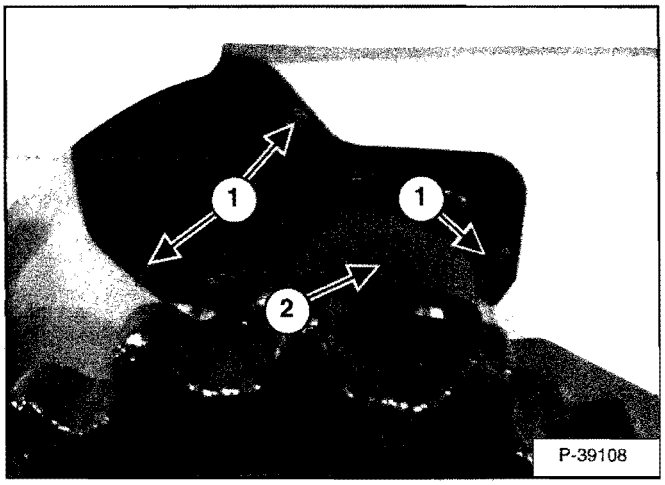
Raise the lift arms and install an approved lift arm support device. (See Contents Page 10-01.)

⚠ 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.

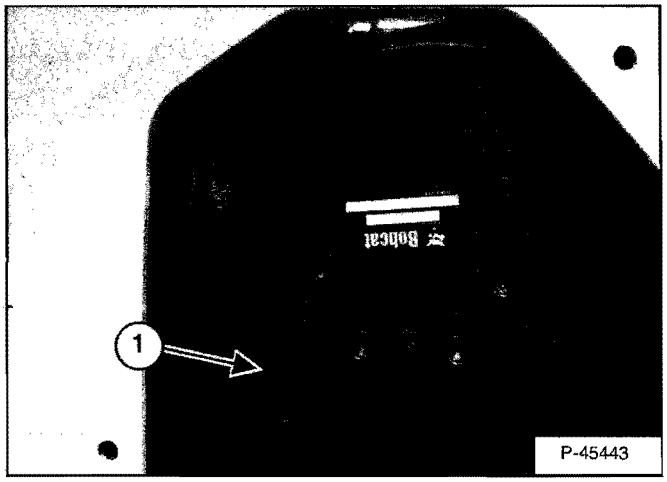
W-2059-0598

Figure 20-64-16



Remove the three access cover mount bolts (Item 1) and the access cover (Item 2) **[Figure 20-64-16]** from the frame.

Figure 20-64-17

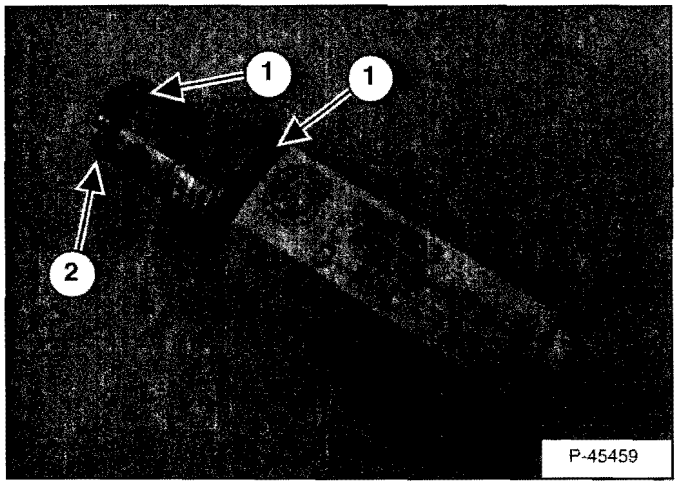


Remove the relief valve (Item 1) **[Figure 20-64-17]** from the pump.

Installation: Tighten the relief valve to 30-35 ft.-lbs. (41-47 Nm) torque.

High Flow Relief Valve Removal and Installation (Cont'd)

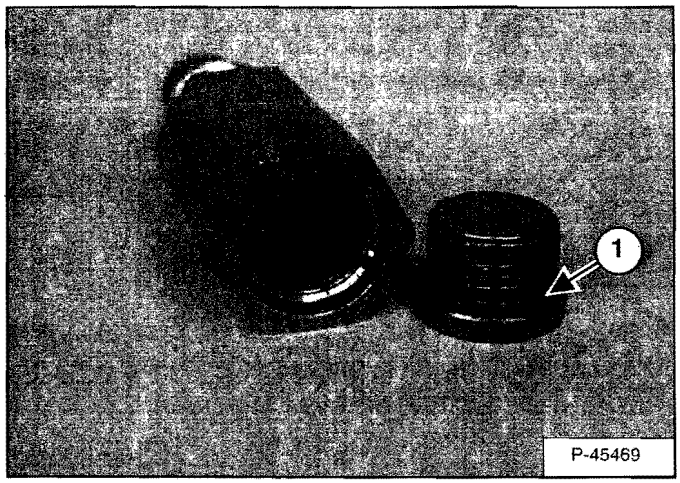
Figure 20-64-18



Inspect the relief valve and replace the two o-rings (Item 1) and washer (Item 2) **[Figure 20-64-18]**.

If the relief valve is bad, it must be replaced as a complete unit.

Figure 20-64-19



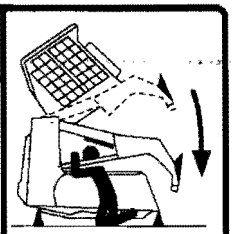
Inspect the o-ring (Item 1) **[Figure 20-64-19]** on the relief valve adjustment plug for damage and replace as needed.

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

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 rear of the loader. (See Contents Page 10-01.)

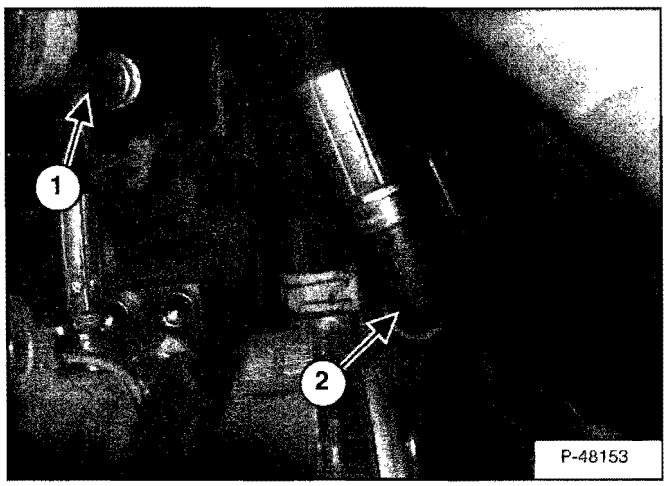
Raise the operator cab. (See Contents Page 10-01.)

Drain the hydraulic fluid from the reservoir. (See Contents Page 20-01.)

Open the rear door of the loader.

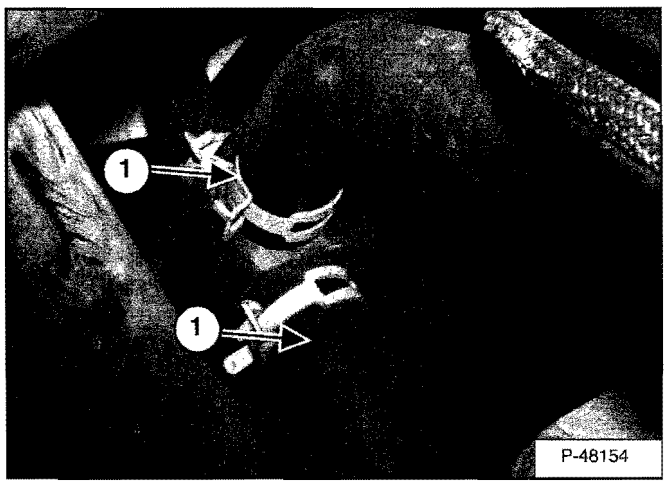
Remove the hoses from the Power Bob-Tach block. (If so equipped.) (See Contents Page 20-01.)

Figure 20-64-20



At the back side of the gear pump, disconnect and cap the hose from the outlet fitting (Item 1) of the standard flow pump. Disconnect and cap the hose from the High Flow pump outlet fitting (Item 2) **[Figure 20-64-20]**.

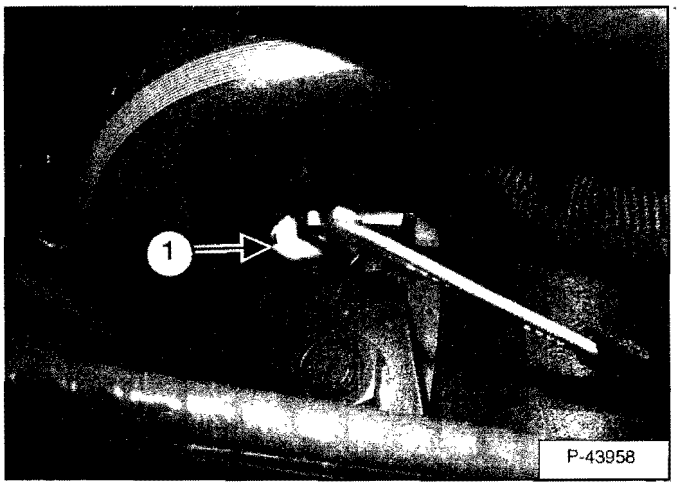
Figure 20-64-21



At the front side of the gear pump, disconnect and cap the two hoses (Item 1) **[Figure 20-64-21]** from the inlet fitting of the hydraulic pump.

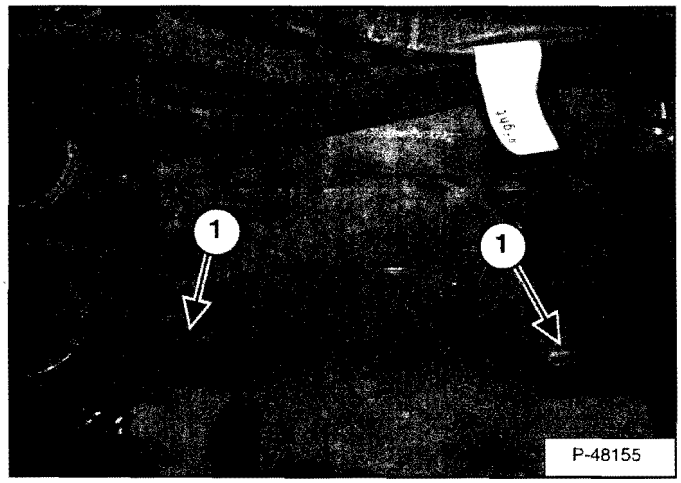
Removal And Installation (Cont'd)

Figure 20-64-22



At the right side access hole, disconnect the electrical connector (Item 1) **[Figure 20-64-22]** from the high flow pump solenoid.

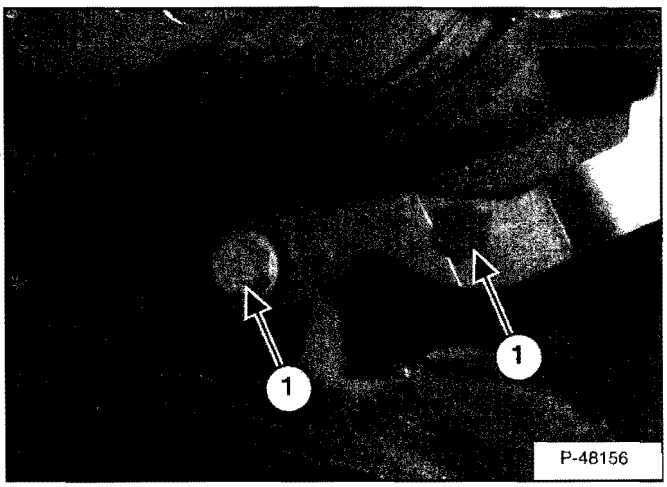
Figure 20-64-23



Remove the two mounting bolts (Item 1) **[Figure 20-64-23]** from the hydraulic pump.

Installation: Tighten the mounting bolts to 27-37 ft.-lbs. (37-50 Nm) torque.

Figure 20-64-24



At the bottom side of the gear pump, remove the two pump bolts (Item 1) **[Figure 20-64-24]** from pump support bracket.

Remove the pump support bracket (Item 2) **[Figure 20-64-24]** from the loader.

Remove the hydraulic pump from the hydrostatic pump.

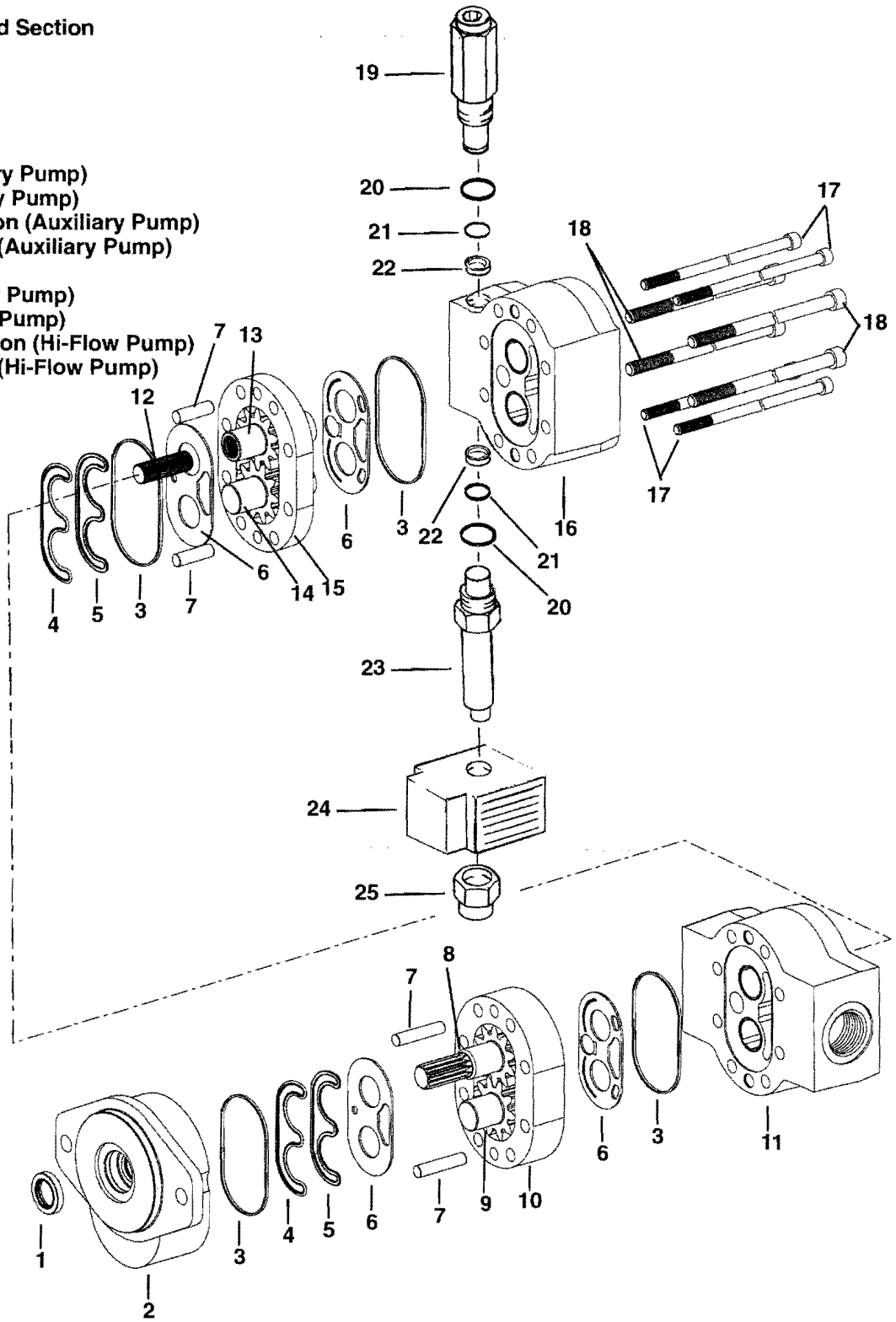
Remove the O-ring from the hydraulic gear pump.

Installation: Use a new O-ring when installing the hydraulic pump.

See Contents Page 20-01 for the proper Hydraulic Pump Disassembly And Assembly procedure.

Identification

1. Seal
2. Auxliliary Pump End Section
3. Pre-Load Seal
4. Load Seal
5. Section Seal
6. Wear Plate
7. Pin
8. Drive Gear (Auxiliary Pump)
9. Idler Gear (Auxiliary Pump)
10. Pump Center Section (Auxiliary Pump)
11. Pump End Section (Auxiliary Pump)
12. Spline Shaft
13. Drive Gear (HI-Flow Pump)
14. Idler Gear (Hi-Flow Pump)
15. Pump Center Section (Hi-Flow Pump)
16. Pump End Section (Hi-Flow Pump)
17. Bolt (4)
18. Bolt (4)
19. Relief Valve
20. O-Ring
21. O-Ring
22. Back-up Washer
23. Valve
24. Coil
25. Nut



B-22284

Disassembly And Assembly

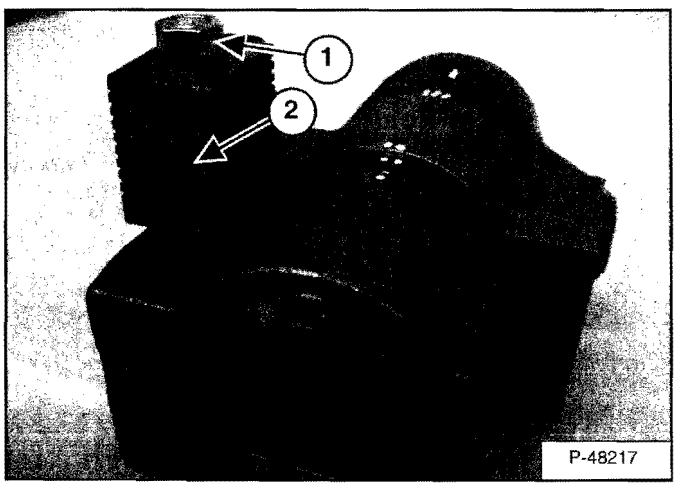
Mark the pump sections for correct assembly.

IMPORTANT

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

I-2003-0888

Figure 20-64-25

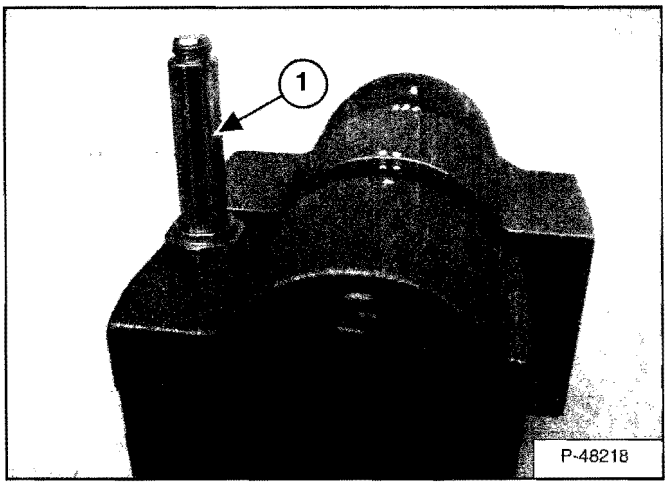


Remove the solenoid nut (Item 1) **[Figure 20-64-25]**.

Remove the solenoid (Item 2) **[Figure 20-64-25]**.

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

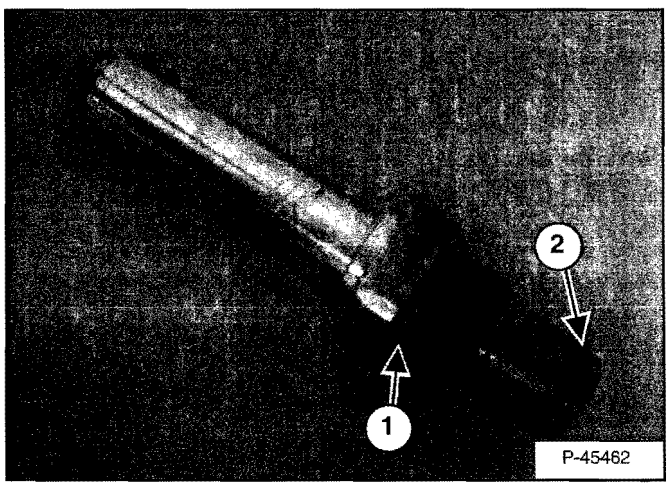
Figure 20-64-26



Remove the valve cartridge (Item 1) **[Figure 20-64-26]**.

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

Figure 20-64-27

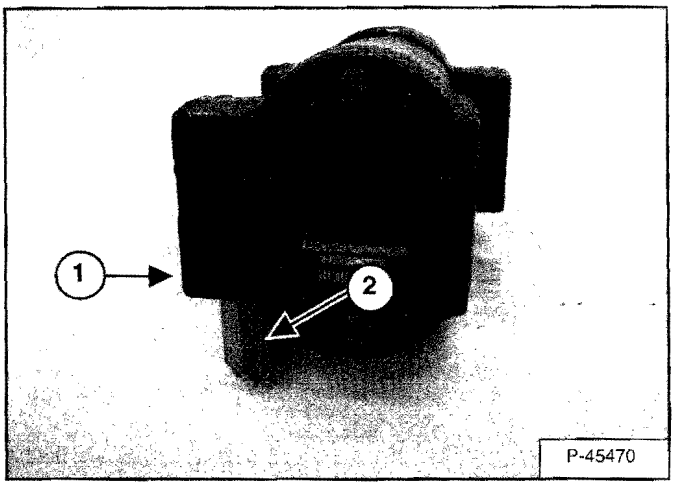


Inspect the o-ring (Item 1) **[Figure 20-64-27]** and replace as needed.

Inspect the o-ring and back-up ring (Item 2) **[Figure 20-64-27]** and replace as needed.

Disassembly And Assembly (Cont'd)

Figure 20-64-28

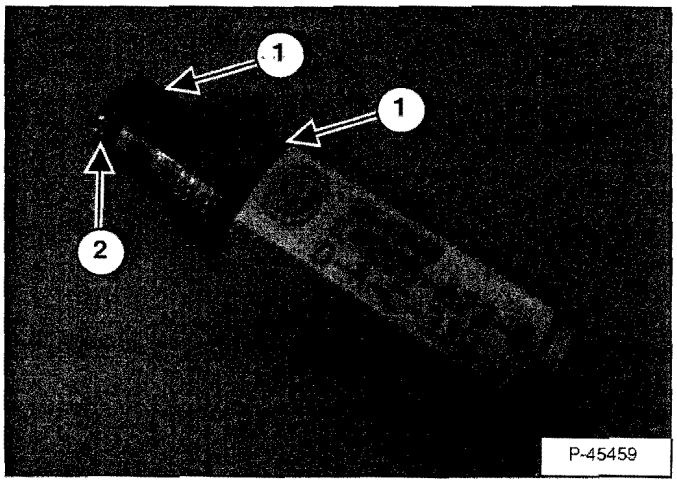


NOTE: Mark the pump housing (Item 1) [Figure 20-64-28] for proper installation of the relief valve.

Remove the relief valve (Item 2) **[Figure 20-64-28]** from the pump

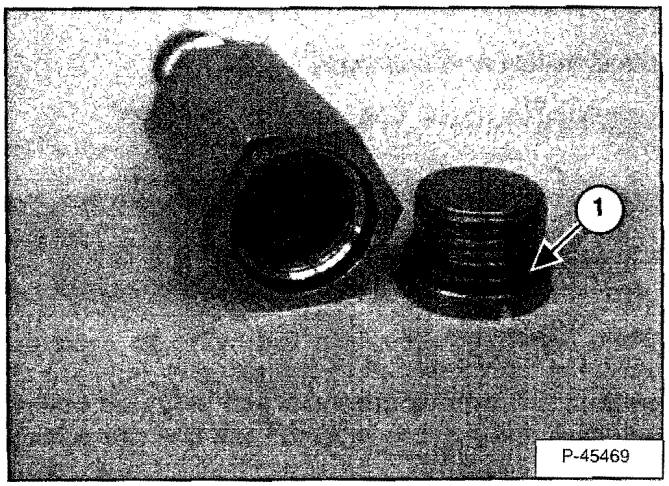
Installation: Tighten the relief valve to 30-35 ft.-lbs (41-47 Nm) torque.

Figure 20-64-29



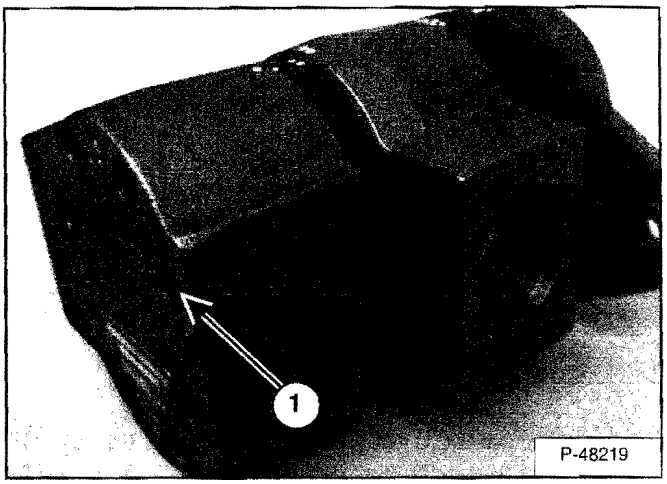
Inspect the relief valve and replace the two o-rings (Item 1) and back-up washer (Item 2)**[Figure 20-64-29]**.

Figure 20-64-30



Inspect the o-ring (Item 1) **[Figure 20-64-30]** on the relief valve adjustment plug for damage and replace as needed.

Figure 20-64-31



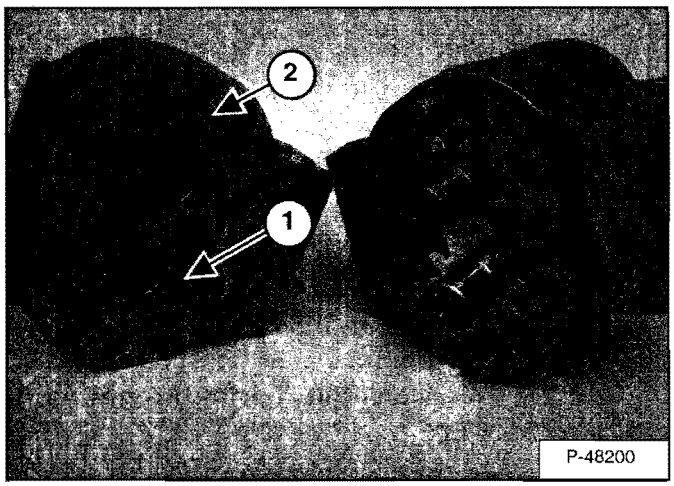
Mark the pump sections for proper installation.

Remove the eight bolts (Item 1) **[Figure 20-64-31]**.

Installation: Tighten the assembly bolts to 45-50 ft.-lbs (60-67 Nm).

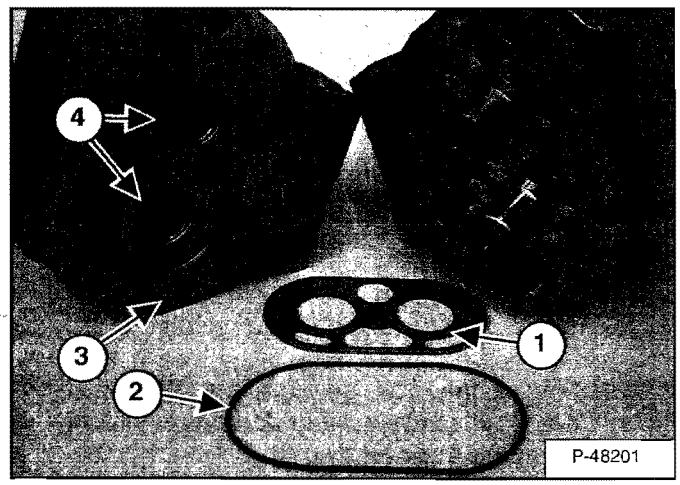
Disassembly And Assembly (Cont'd)

Figure 20-64-32



Remove the wear plate (Item 1) and section seal (Item 2) **[Figure 20-64-32]** from the Hi-flow pump end section.

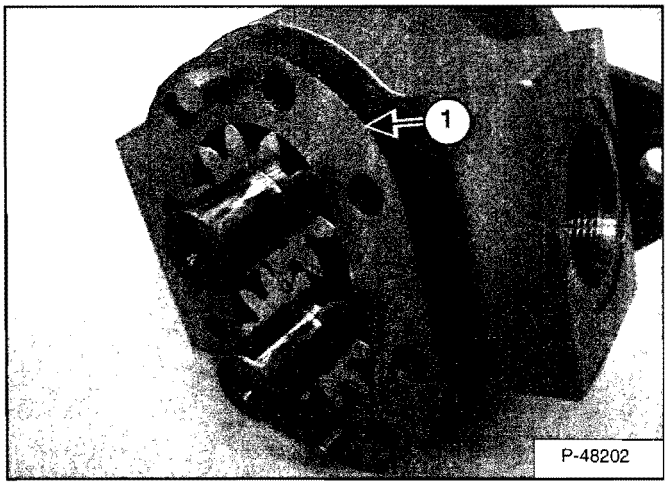
Figure 20-64-33



NOTE: Position wear plate (Item 1) [Figure 20-64-33] inlets and traps as shown with bronze side toward gears.

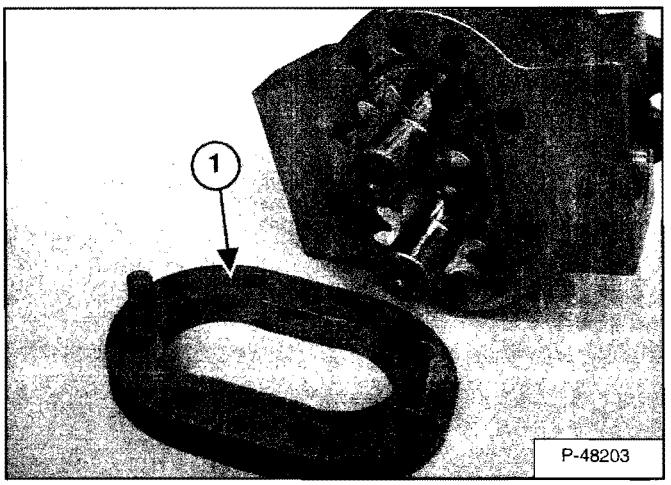
NOTE: Inspect the Hi-flow pump end section (Item 3) and bushings (Item 4) [Figure 20-64-33]. If excessive wear or damage is visible, the pump must be replaced.

Figure 20-64-34



Remove the Hi-flow pump center section (Item 1) **[Figure 20-64-34]** & **[Figure 20-64-35]** from the pump.

Figure 20-64-35

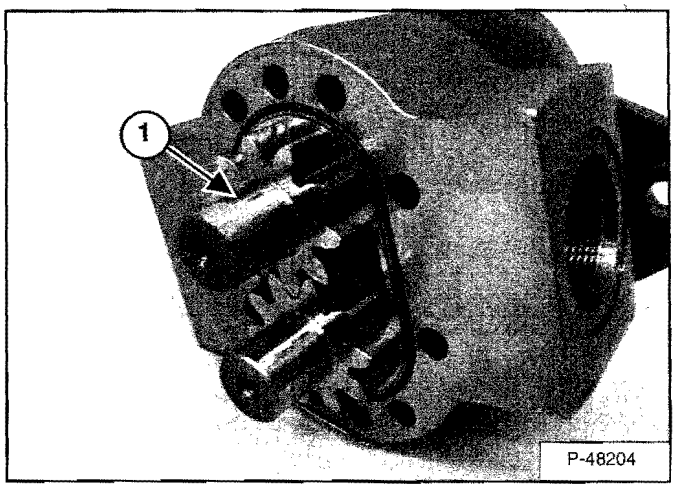


NOTE: Inspect the Hi-flow pump center section (Item 1) [Figure 20-64-35]. If excessive wear or damage is visible, the pump must be replaced.

HYDRAULIC PUMP (HI FLOW) (SELECTABLE JOYSTICK CONTROL) (SJC) (CONT'D)

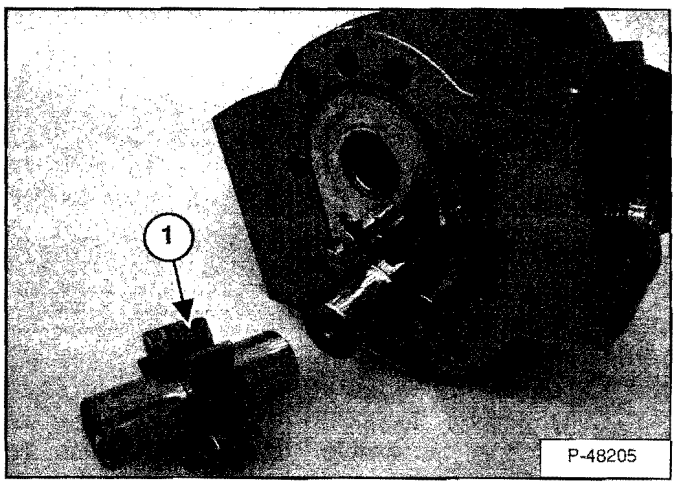
Disassembly And Assembly (Cont'd)

Figure 20-64-36



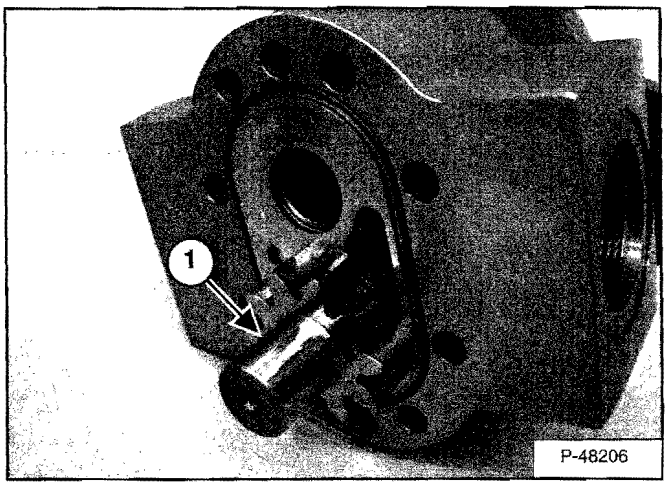
Remove the idler gear (Item 1) **[Figure 20-64-36]** & **[Figure 20-64-37]**.

Figure 20-64-37



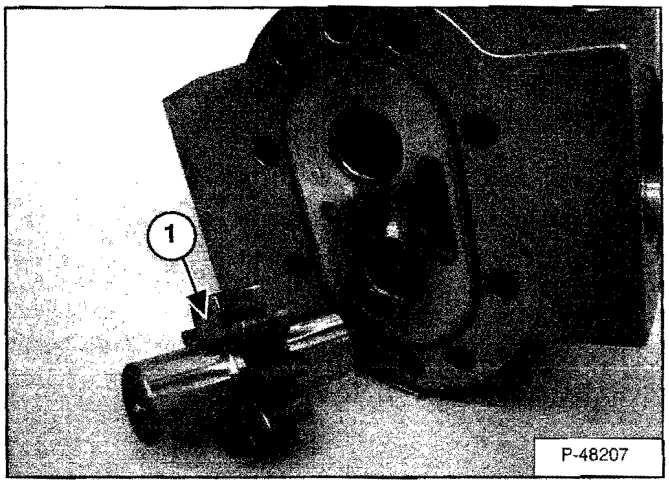
NOTE: Inspect the idler gear (Item 1) [Figure 20-64-37]. If excessive wear or damage is visible, the pump must be replaced.

Figure 20-64-38



Remove the drive gear (Item 1) **[Figure 20-64-38]** & **[Figure 20-64-39]**.

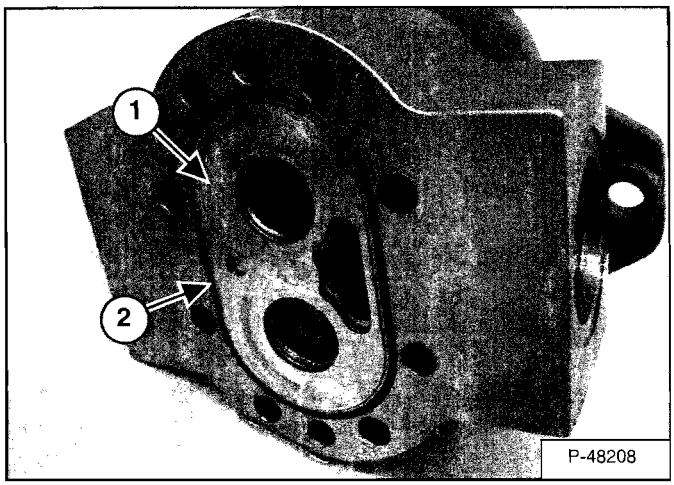
Figure 20-64-39



NOTE: Inspect the drive gear (Item 1) [Figure 20-64-39]. If excessive wear or damage is visible, the pump must be replaced.

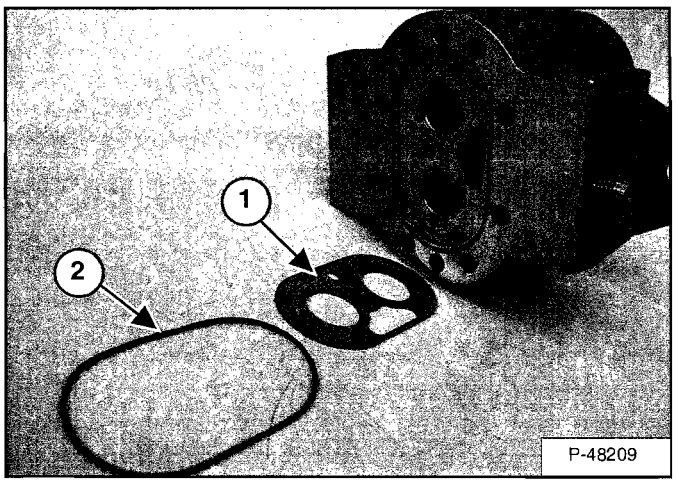
Disassembly And Assembly (Cont'd)

Figure 20-64-40



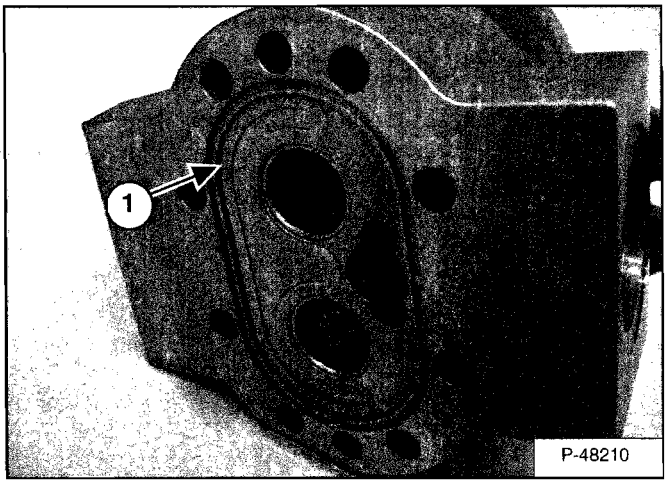
Remove the wear plate (Item 1) **[Figure 20-64-40]** & **[Figure 20-64-41]** and section seal (Item 2) **[Figure 20-64-40]** & **[Figure 20-64-41]** from the pump center section.

Figure 20-64-41



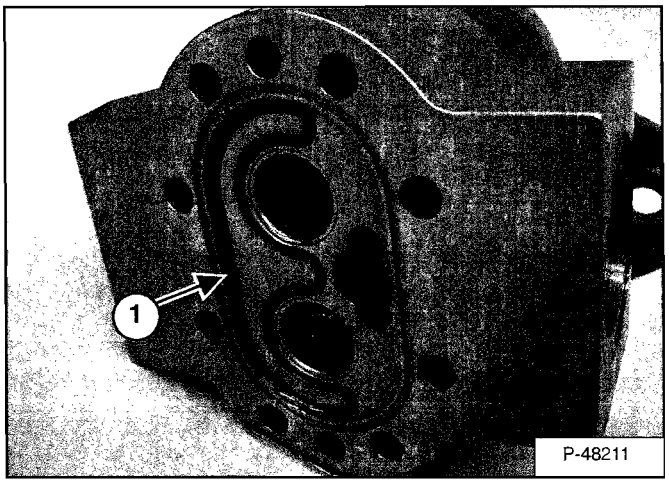
NOTE: Position wear plate (Item 1) [Figure 20-64-41] inlets and traps as shown with bronze side toward gears.

Figure 20-64-42



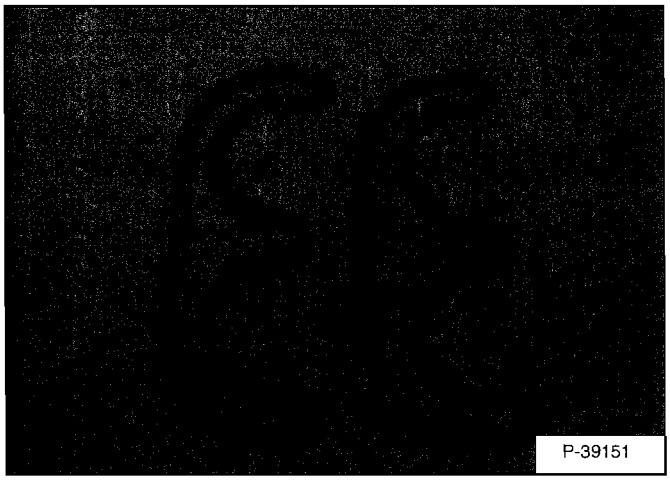
Remove the load seal (Item 1) **[Figure 20-64-42]**.

Figure 20-64-43



Remove the pre-load seal (Item 1) **[Figure 20-64-43]**.

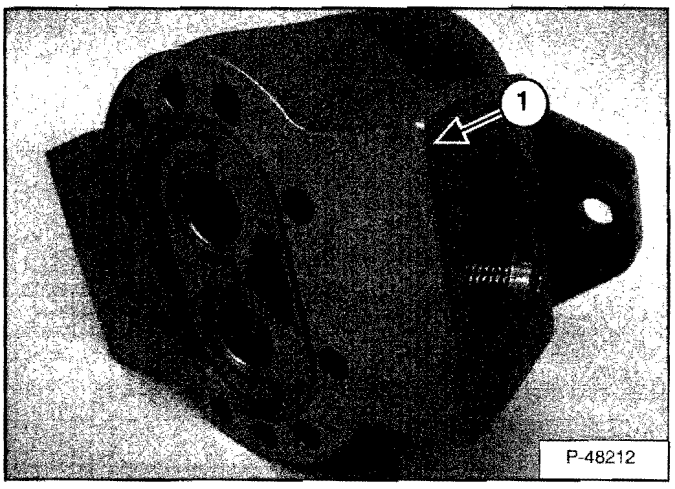
Figure 20-64-44



Inspect both seals **[Figure 20-64-44]**.

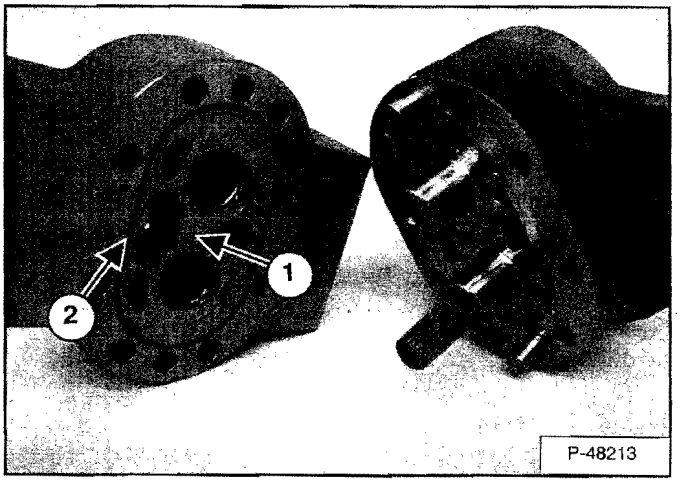
Disassembly And Assembly (Cont'd)

Figure 20-64-45



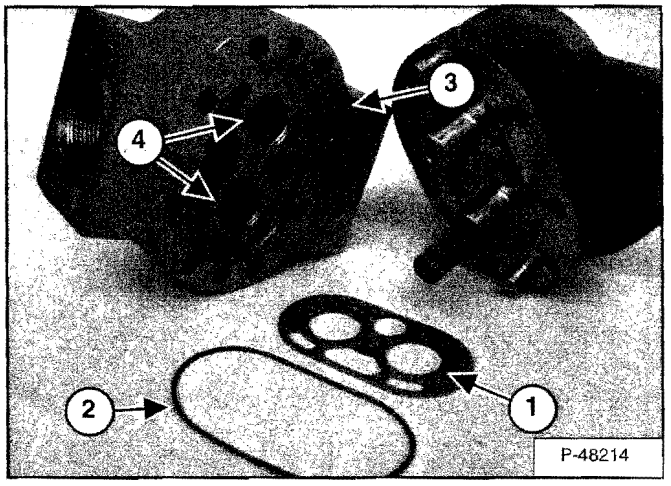
Remove the pump center section (Item 1) **[Figure 20-64-45]** from the pump sections.

Figure 20-64-46



Remove the wear plate (Item 1) **[Figure 20-64-46]** & **[Figure 20-64-47]** and section seal (Item 2) **[Figure 20-64-46]** & **[Figure 20-64-47]** from the pump section.

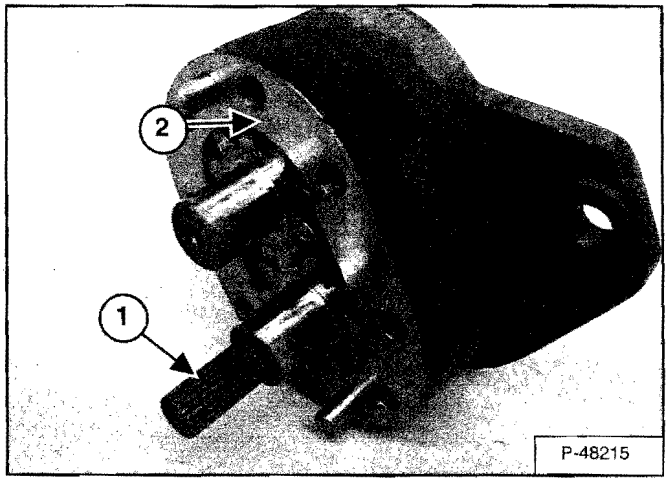
Figure 20-64-47



NOTE: Position wear plate (Item 1) [Figure 20-64-47] inlets and traps as shown with bronze side toward gears.

NOTE: Inspect the pump center section (Item 3) and bushings (Item 4) [Figure 20-64-47]. If excessive wear or damage is visible, the pump must be replaced.

Figure 20-64-48

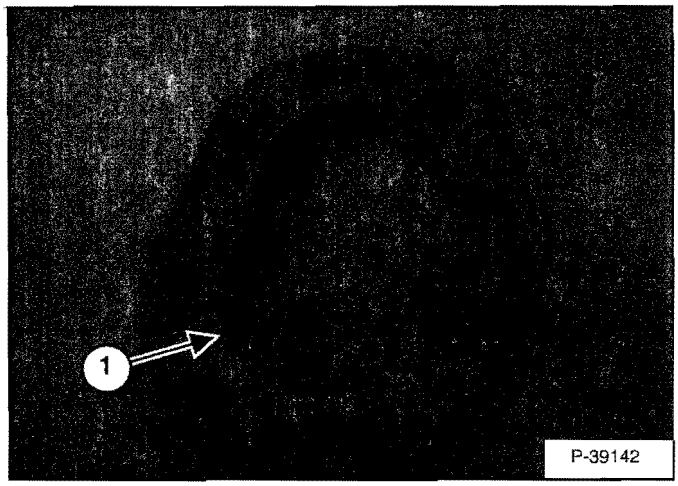


Remove the spline shaft (Item 1) **[Figure 20-64-48]**.

Remove the auxilliary pump center section (Item 2) **[Figure 20-64-48]** from the pump.

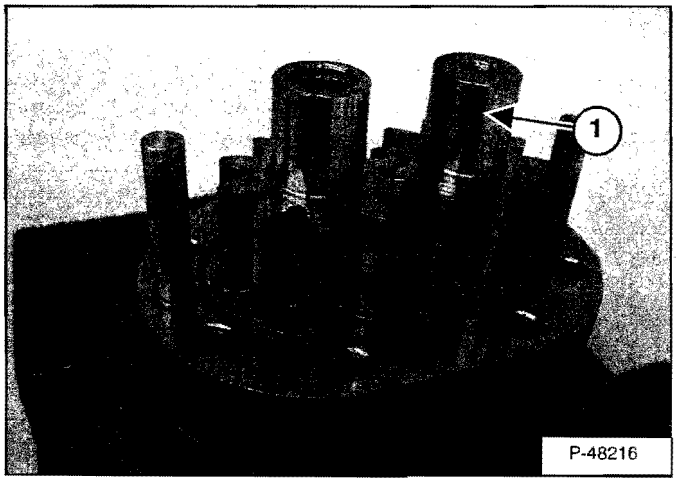
Disassembly And Assembly (Cont'd)

Figure 20-64-49



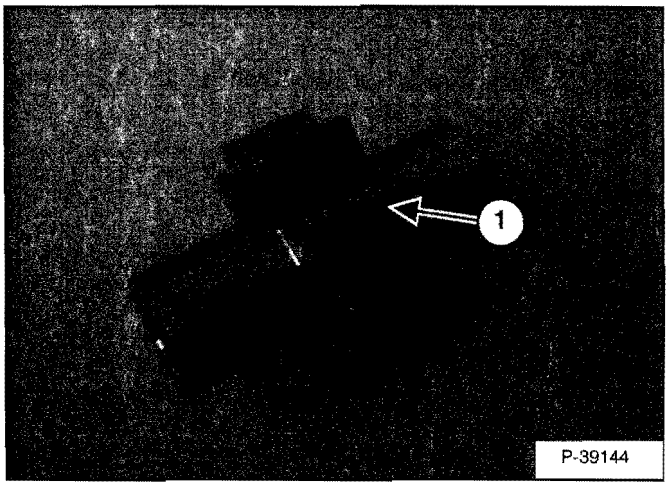
NOTE: Inspect the auxilliary pump center section (Item 1) [Figure 20-64-49]. If excessive wear or damage is visible, the pump must be replaced.

Figure 20-64-50



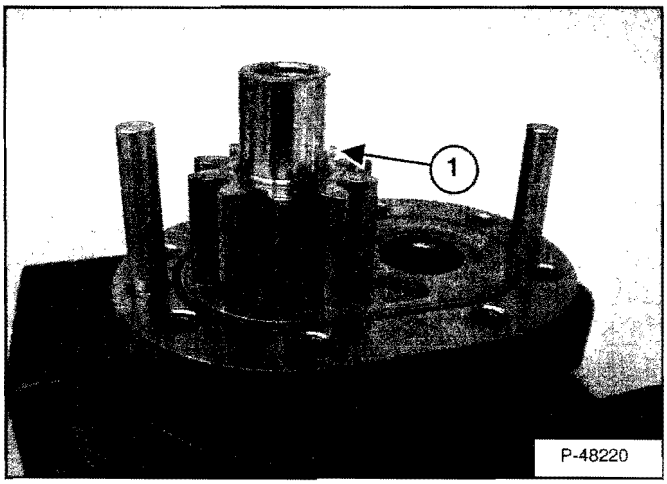
Remove the idler gear (Item 1) **[Figure 20-64-50]** from the auxilliary pump.

Figure 20-64-51



NOTE: Inspect the idler gear (Item 1) [Figure 20-64-51]. If excessive wear or damage is visible, the pump must be replaced.

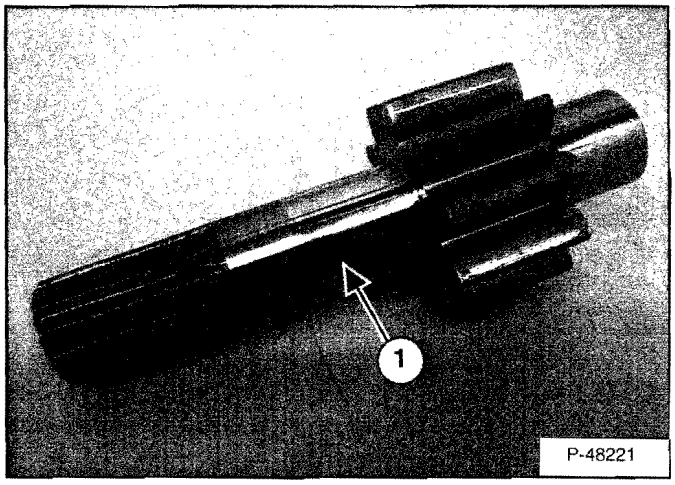
Figure 20-64-52



Remove the drive gear (Item 1) **[Figure 20-64-52]** from the auxilliary pump.

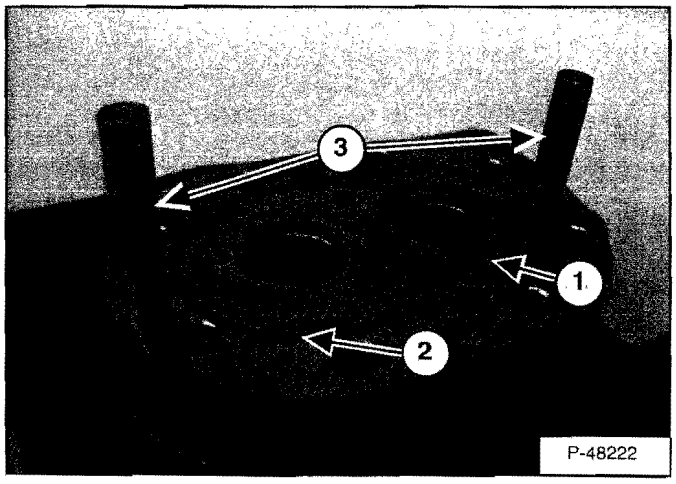
Disassembly And Assembly (Cont'd)

Figure 20-64-53



NOTE: Inspect the drive gear (Item 1) [Figure 20-64-53]. If excessive wear or damage is visible, the pump must be replaced.

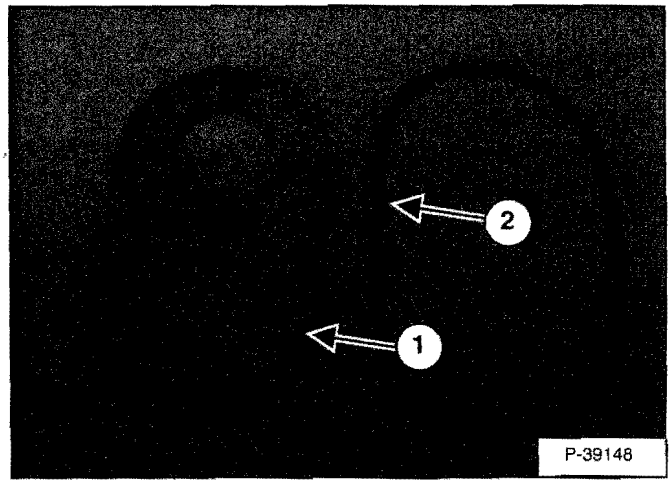
Figure 20-64-54



Remove the wear plate (Item 1) and section seal (Item 2) **[Figure 20-64-54]** from the front section of the auxilliary pump.

Remove the locating pins (Item 3) **[Figure 20-64-54]** from the front section of the auxilliary pump.

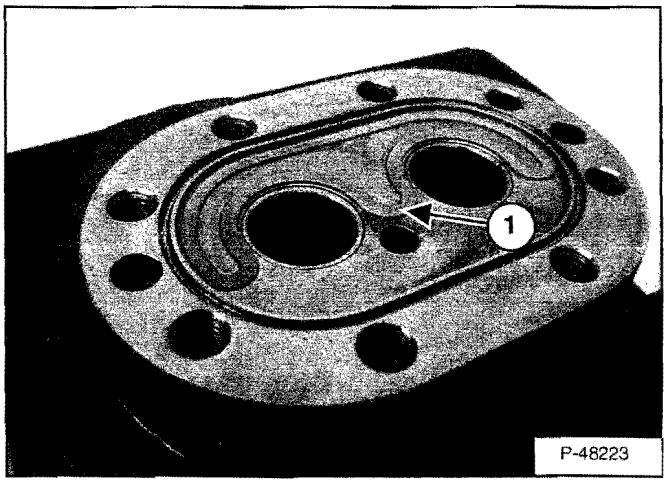
Figure 20-64-55



Inspect the wear plate (Item 1) and the section seal (Item 2) **[Figure 20-64-55]** and replace as needed.

NOTE: Position the wear plate (Item 1) [Figure 20-64-55] inlets and traps as shown with the bronze side toward the gears.

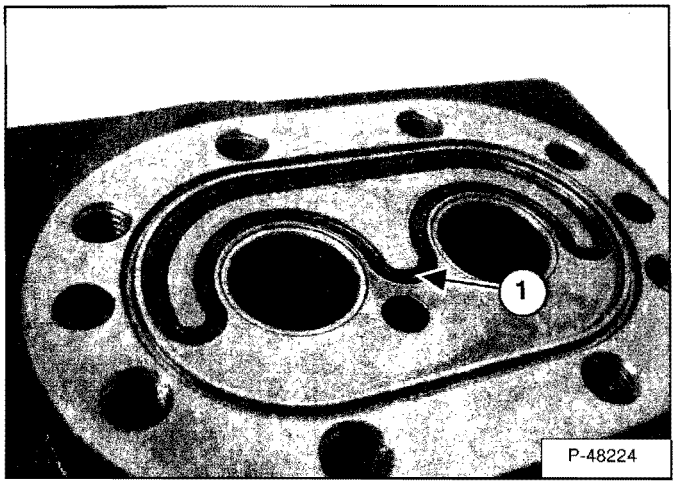
Figure 20-64-56



Remove the load seal (Item 1) **[Figure 20-64-56]** from the front section of the auxilliary pump.

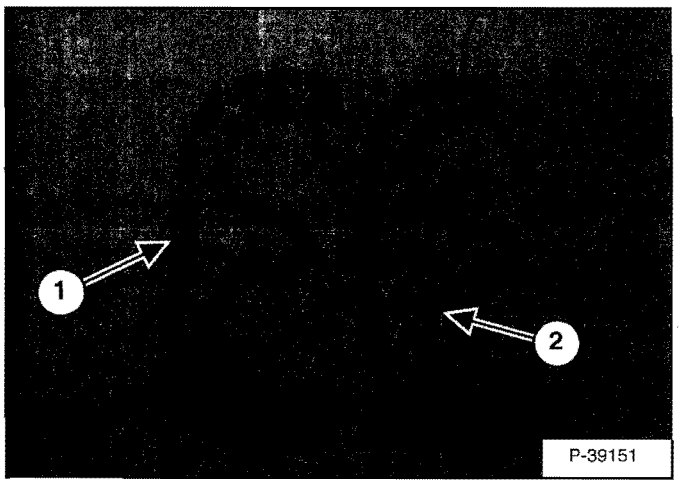
Disassembly And Assembly (Cont'd)

Figure 20-64-57



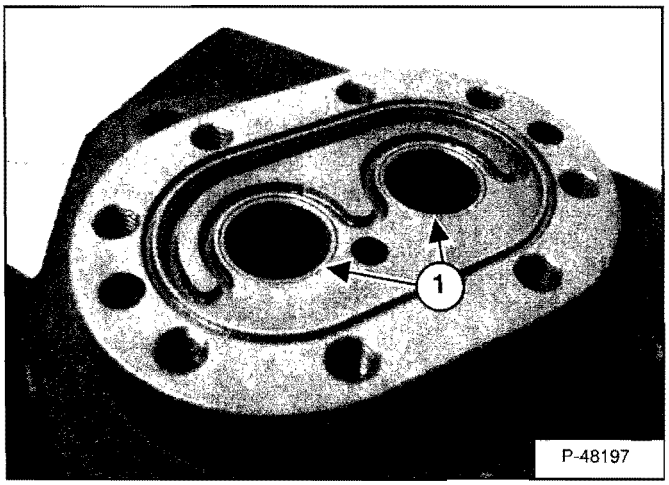
Remove the pre-load seal (Item 1) **[Figure 20-64-57]** from the front section of the auxilliary pump.

Figure 20-64-58



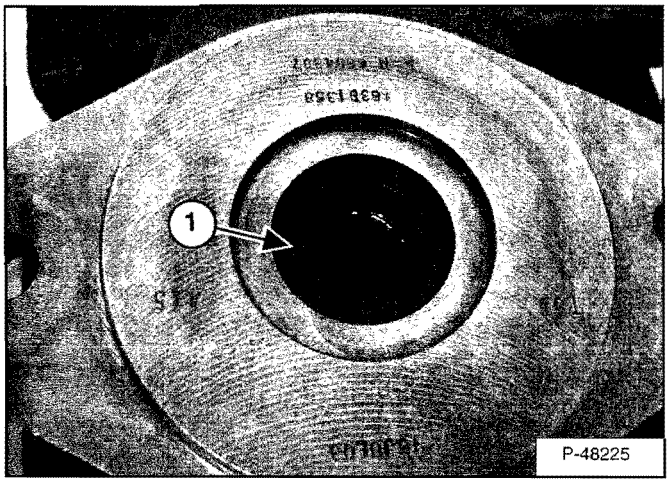
Inspect the load seal (Item 1) and the Pre-load seal (Item 2) **[Figure 20-64-58]** and replace as needed.

Figure 20-64-59



Inspect the pump end section and bushings (Item 1) **[Figure 20-64-59]**. If excessive wear or damage is visible, the pump must be replaced.

Figure 20-64-60



Remove and replace the pump end section shaft seal (Item 1) **[Figure 20-64-60]**.

Bobcat®

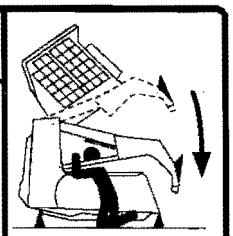
HYDRAULIC/HYDROSTATIC FILTER

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

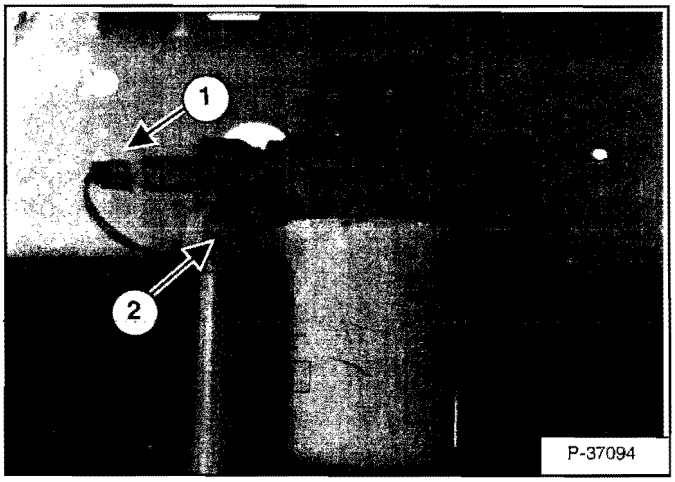


⚠ WARNING

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

Figure 20-70-1



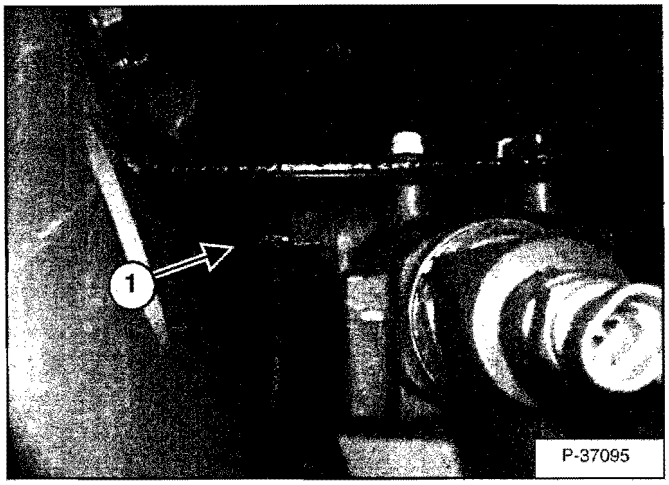
Raise the lift arms and install an approved lift arm support device. (See Contents Page 10-01.)

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

Disconnect the electrical connector (Item 1) **[Figure 20-70-1]** from the filter sender.

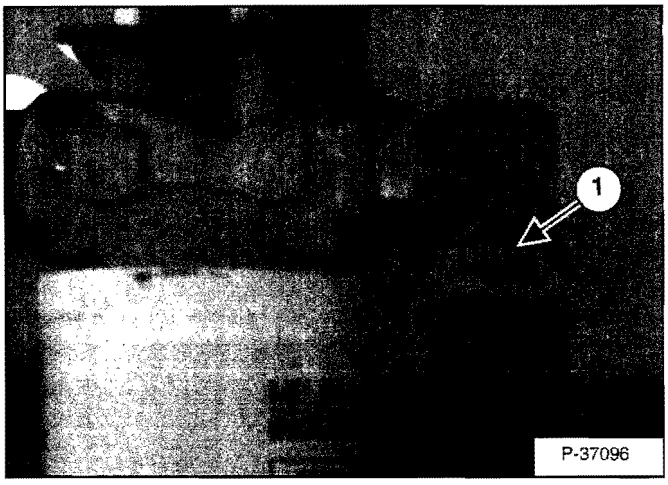
Loosen the nut (Item 2) **[Figure 20-70-1]** and disconnect the tubeline from the filter block.

Figure 20-70-2



Loosen the nut (Item 1) **[Figure 20-70-2]**, and remove the electrical wire from the filter housing.

Figure 20-70-3

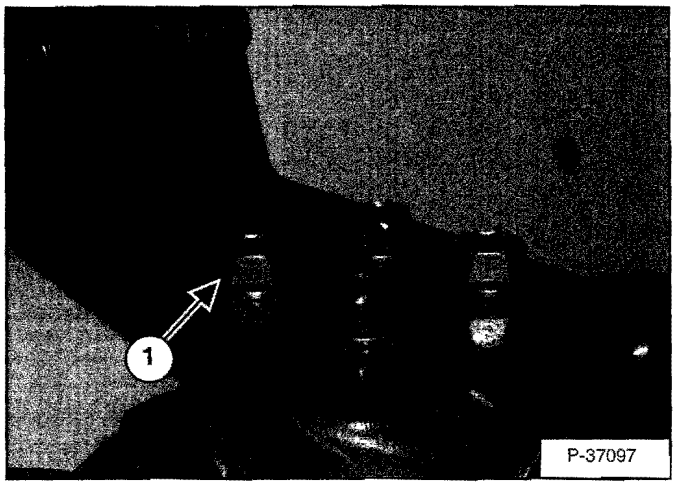


Remove the hose clamp (Item 1) **[Figure 20-70-3]**.

Remove the hose from the filter housing fitting.

Housing Removal And Installation

Figure 20-70-4



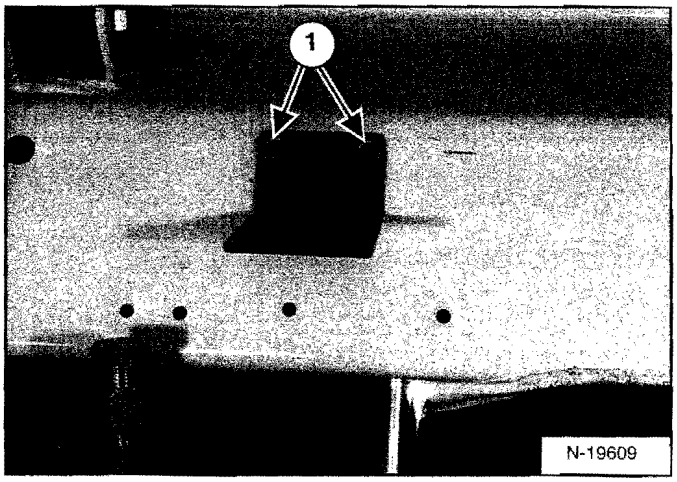
Remove the four mounting bolts (Item 1) **[Figure 20-70-4]**.

Installation; Tighten the mount bolts to 25 ft.-lbs (34 Nm) torque.

Remove the filter assembly from the loader.

Mount Removal And Installation

Figure 20-70-5



Remove the two filter bracket mount bolts (Item 1) **[Figure 20-70-5]**.

Remove the bracket from the loader.

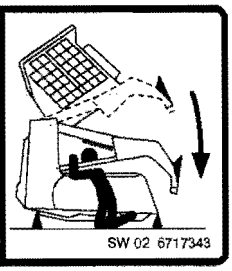
HYDRAULIC FLUID RESERVOIR

Fluid Removal

⚠ 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

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.

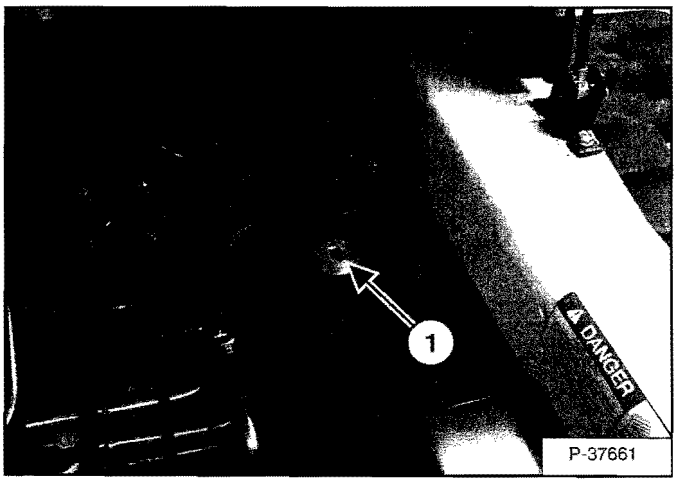
W-2103-1295

⚠ 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 20-80-1



Remove the plug (Item 1) **[Figure 20-80-1]** from the hydraulic reservoir, with a suction pump remove the fluid.

Removal And Installation

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

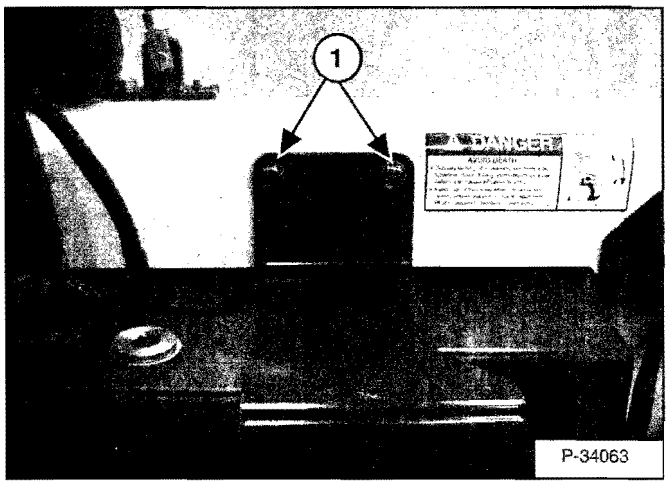
Raise the operator cab. (See Contents Page 10-01.)

Remove the fluid from the reservoir.

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

Remove bucket position valve. (If so equipped.) (See Contents Page 20-01.)

Figure 20-80-2



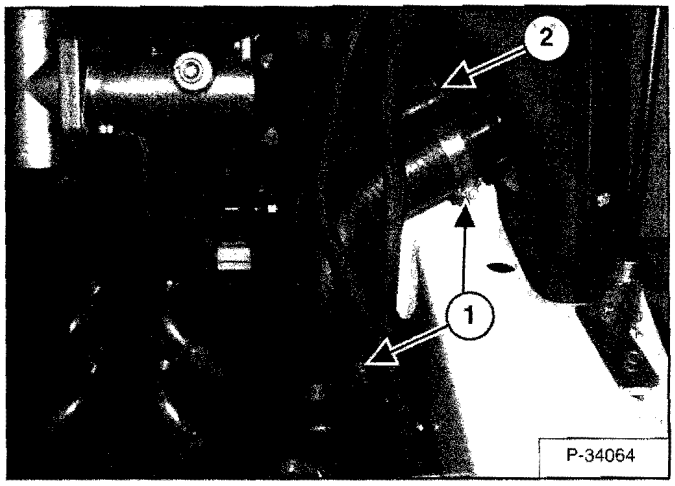
Remove the two mount bolts (Item 1) **[Figure 20-80-2]** from the bucket positon valve mount plate. (If so equipped.)

Remove the mount plate from the loader. (If so equipped.)

HYDRAULIC FLUID RESERVOIR (CONT'D)

Removal And Installation (Cont'd)

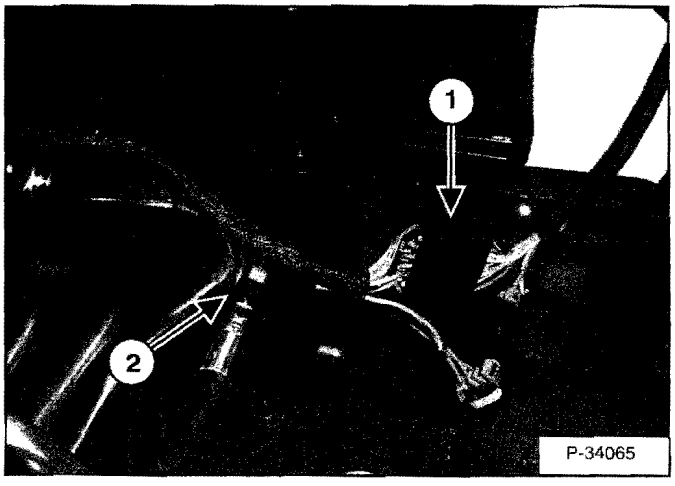
Figure 20-80-3



Loosen the two hose clamps (Item 1) **[Figure 20-80-3]** and remove the reservoir fill hose.

Remove the hose clamp (Item 2) **[Figure 20-80-3]** and remove the hydraulic vent hose.

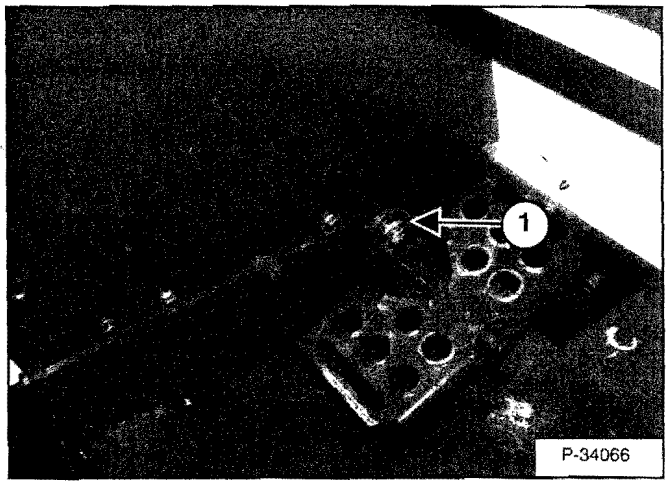
Figure 20-80-4



Disconnect the wiring harness connector (Item 1) **[Figure 20-80-4]**

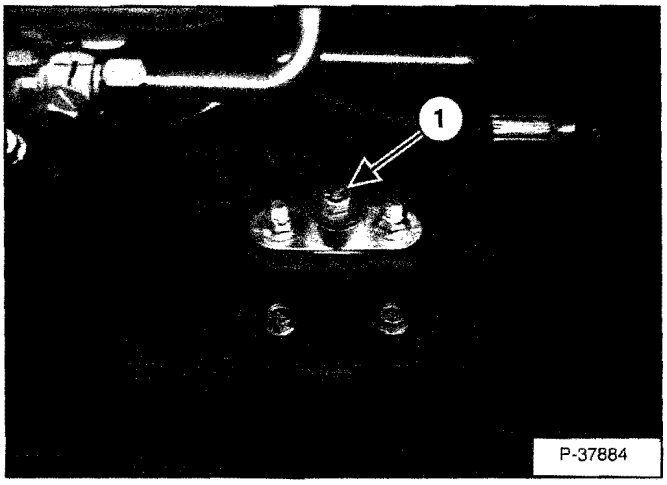
Disconnect the hydraulic hose (Item 2) **[Figure 20-80-4]** from the reservoir. Cap the hose and plug the fitting on the reservoir.

Figure 20-80-5



Remove the lift pedal linkage mount bolt (Item 1) **[Figure 20-80-5]**.

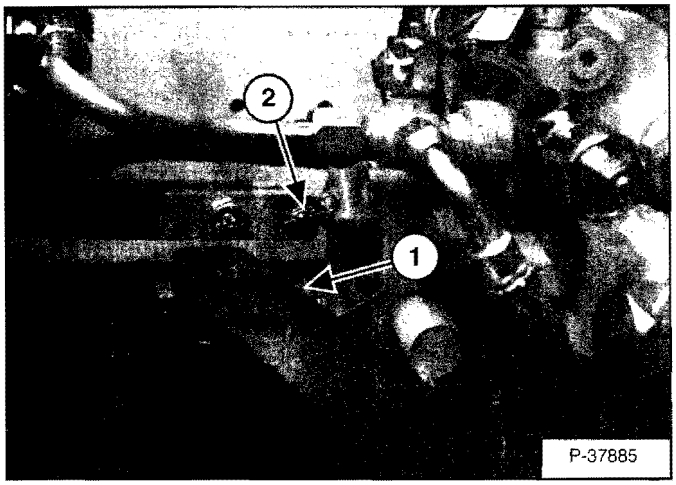
Figure 20-80-6



Remove the crossbar pivot bolt (Item 1) **[Figure 20-80-6]**.

Removal And Installation (Cont'd)

Figure 20-80-7

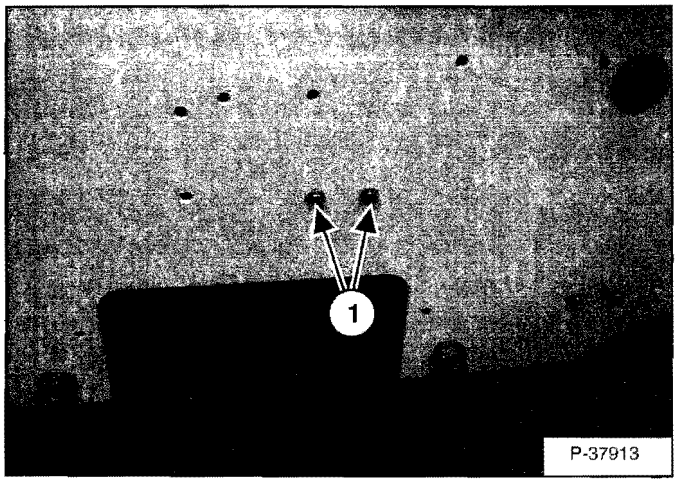


Remove the linkage pin (Item 1) **[Figure 20-80-7]** from the tilt linkage bar, and remove the linkage bar from the control valve lift spool.

Remove the hairpin clip from the crossmember pin.

Remove the crossmember and lift linkage bar from the pivot, and the loader.

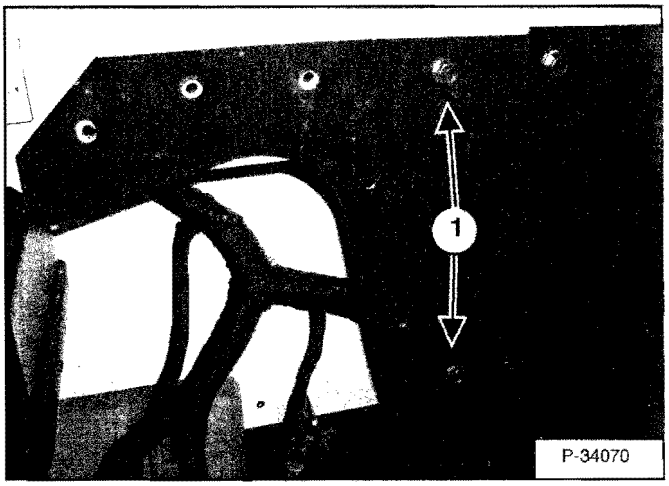
Figure 20-80-8



At the left fender, remove the two mount bolts (Item 1) **[Figure 20-80-8]** from the front reservoir mount bracket.

Remove the mount bracket from the loader.

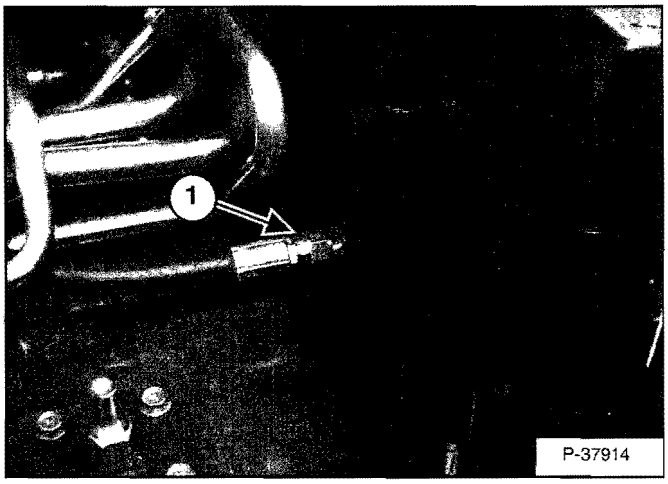
Figure 20-80-9



Rremove the two mount bolts (Item 1) **[Figure 20-80-9]** from the side panel.

Remove the side panel from the loader.

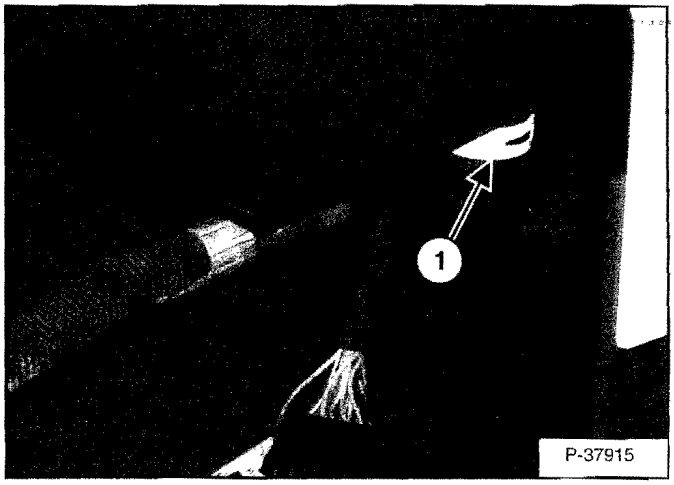
Figure 20-80-10



Disconnect the hose (Item 1) **[Figure 20-80-10]** from the resevoir.

Removal And Installation (Cont'd)

Figure 20-80-11

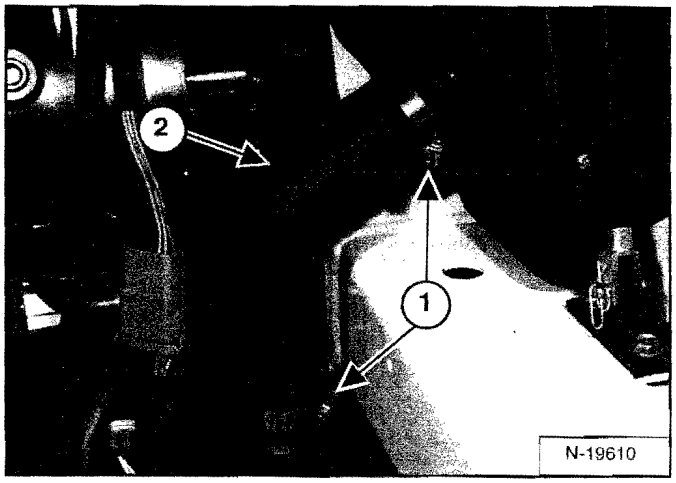


Slide the reservoir ahead. At the left motor access hole remove the hose clamp and hose (Item 1) **[Figure 20-80-11]** from the bottom of the reservoir.

Remove the hydraulic reservoir from the loader.

Hydraulic Fluid Screen

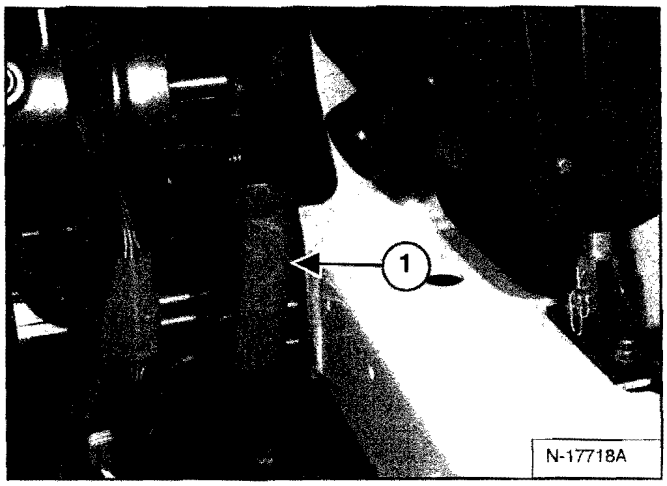
Figure 20-80-12



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

Remove the two hose clamps (Item 1) and remove the hydraulic fill hose (Item 2) **[Figure 20-80-12]** from the hydraulic reservoir.

Figure 20-80-13



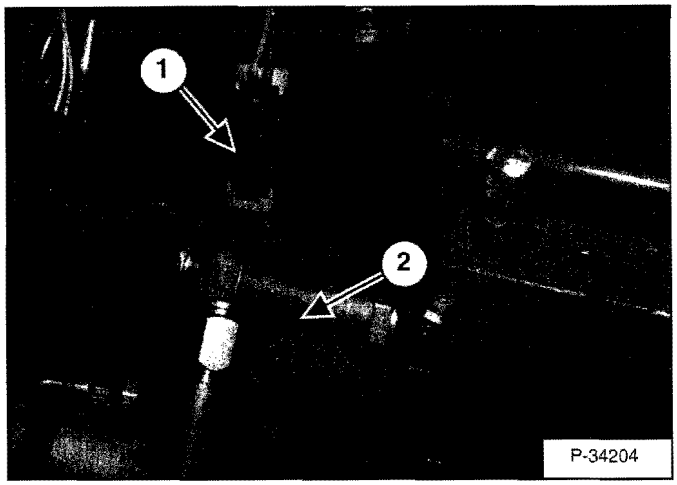
Remove the hydraulic fluid screen (Item 1) **[Figure 20-80-13]** from the reservoir.

Wash the screen in clean solvent and air dry, before replacing.

BUCKET POSITION VALVE

Solenoid Removal And Installation

Figure 20-90-1

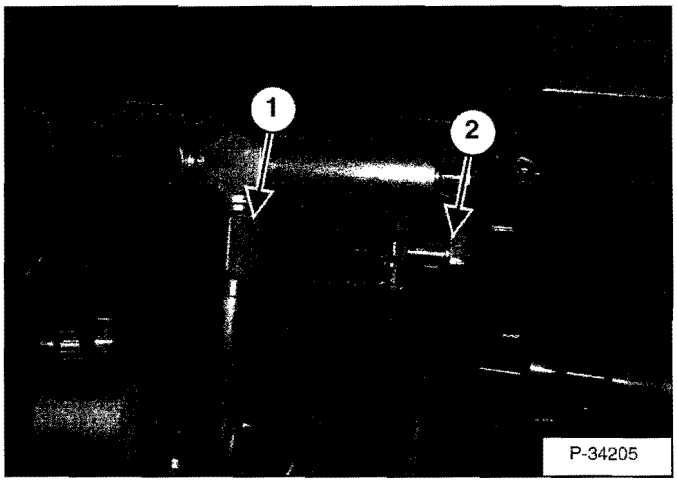


Disconnect the wire harness connector (Item 1) **[Figure 20-90-1]** from the bucket position solenoid.

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

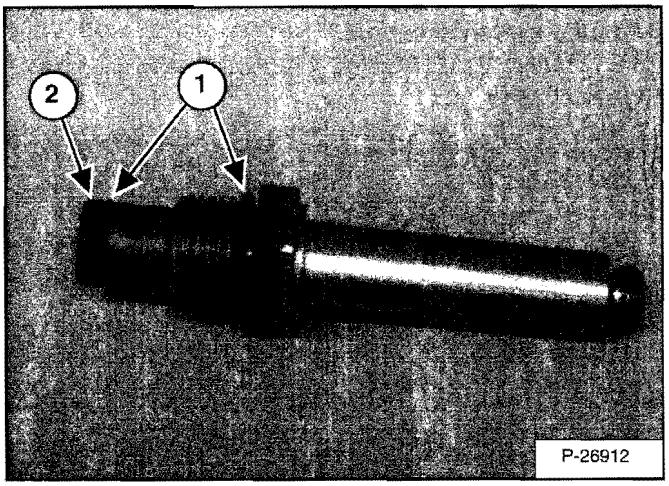


Move the solenoid until it touches the tubeline (Item 1) **[Figure 20-90-2]**.

Remove the solenoid stem and solenoid (Item 2) **[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.

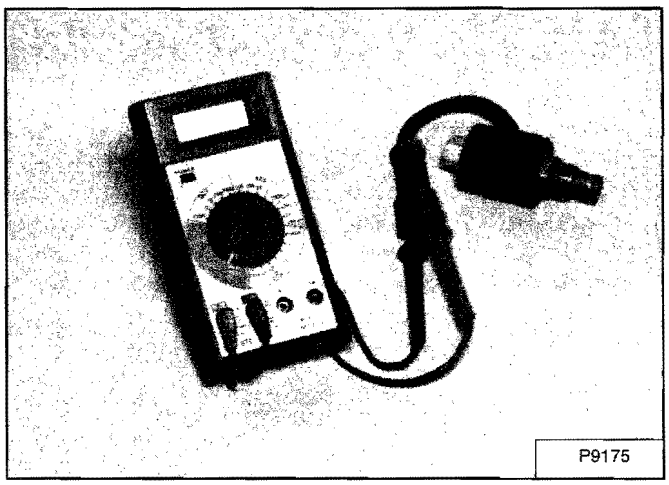
Figure 20-90-3



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



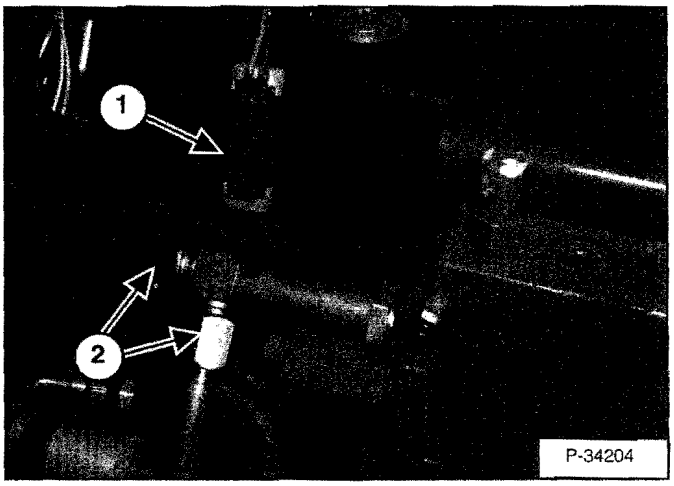
Use a test meter to measure coil resistance **[Figure 20-90-4]**. Coil wires do not have polarity. Correct resistance for the pressure relief (small) coil is 7-10 ohm and the other coils 5-8 ohms.

Replace the test meter with 12 volt power. You can see and hear the spool shift.

BUCKET POSITION VALVE (CONT'D)

Removal And Installation

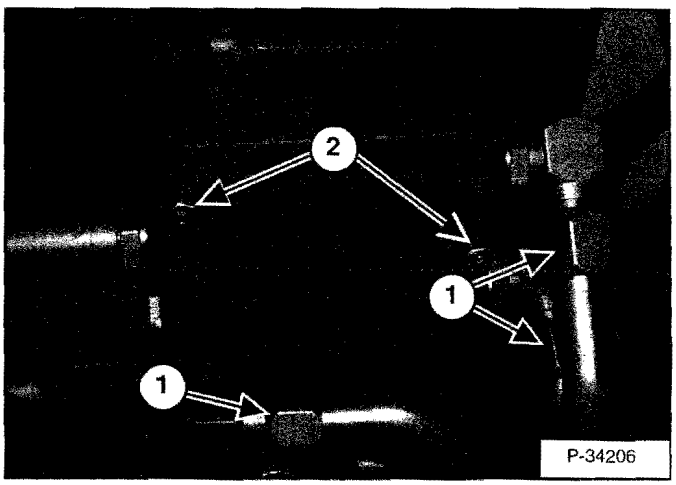
Figure 20-90-5



Disconnect the electrical harness (Item 1) **[Figure 20-90-5]**.

Disconnect the two tubelines (Item 2) **[Figure 20-90-5]**.

Figure 20-90-6

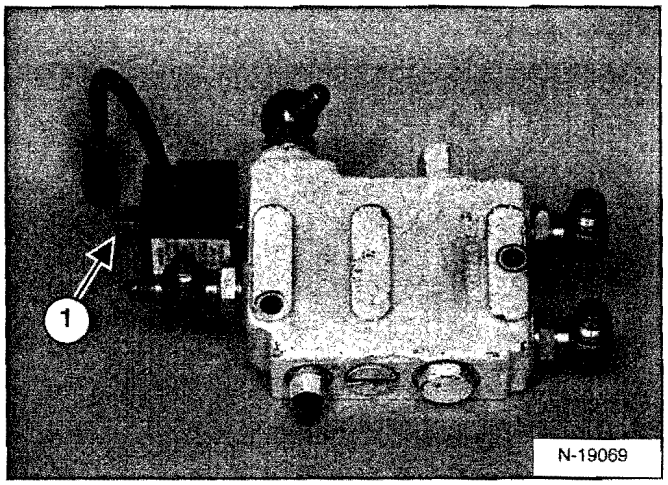


Disconnect the three tubelines (Item 1) **[Figure 20-90-6]** from the long tee fitting.

Remove the mounting bolts (Item 2) **[Figure 20-90-6]** from the bucket position valve.

Disassembly And Assembly

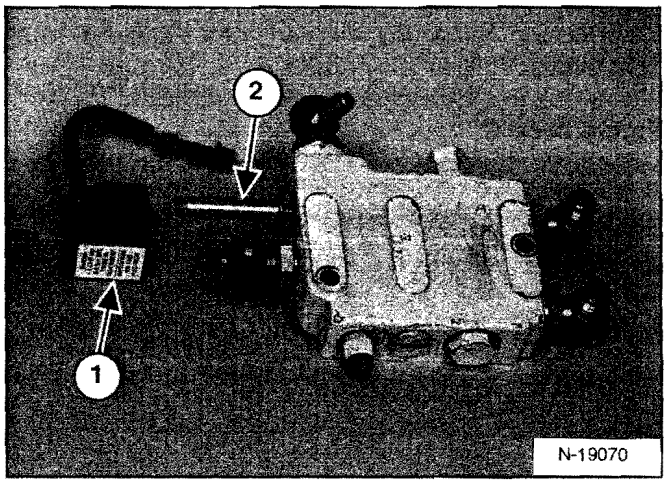
Figure 20-90-7



Remove the solenoid nut (Item 1) **[Figure 20-90-7]**.

Installation: Tighten the nut to 60 in.-lbs. (6,78 Nm) torque.

Figure 20-90-8

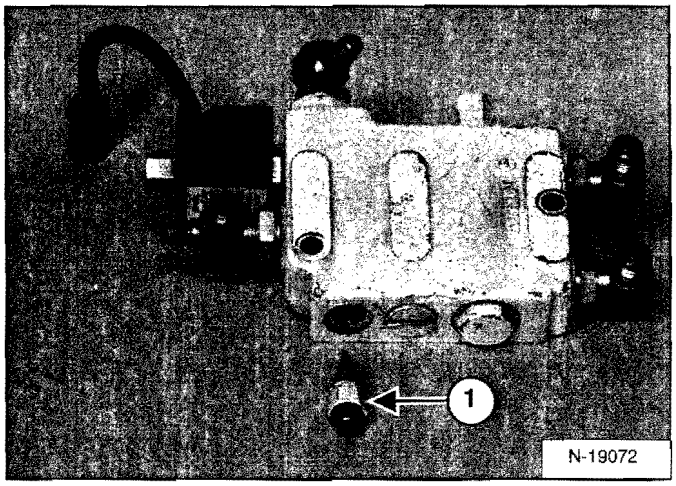


Remove the solenoid (Item 1) and the solenoid stem (Item 2) **[Figure 20-90-8]**.

Installation: Tighen the solenoid stem to 30-35 ft.-lbs. (40,8-47,6 Nm) torque.

Disassembly And Assembly (Cont'd)

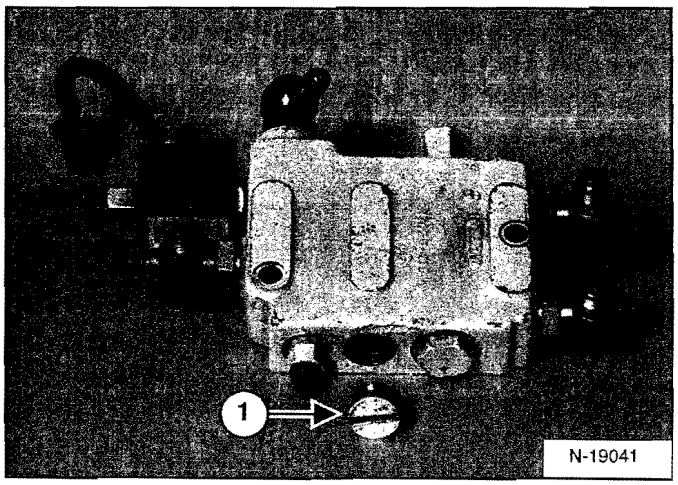
Figure 20-90-9



Remove the flow adjustment valve and O-ring (Item 1) **[Figure 20-90-9]**

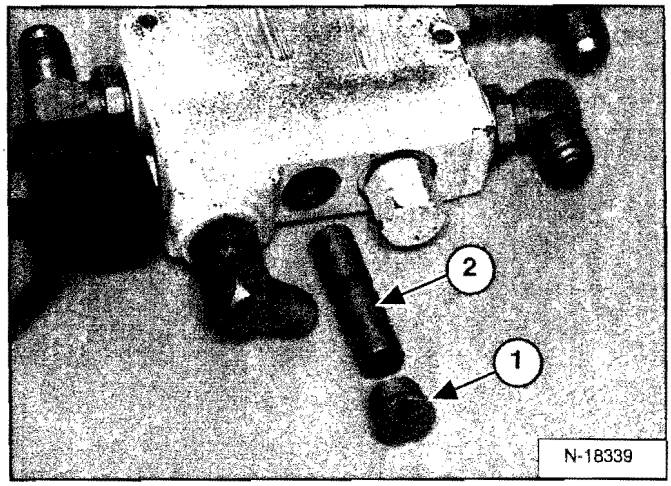
NOTE: Always install new O-rings before any parts are installed into the valve. Check the parts for wear or damage and replace as needed.

Figure 20-90-10



Remove the plug (Item 1) **[Figure 20-90-10]**.

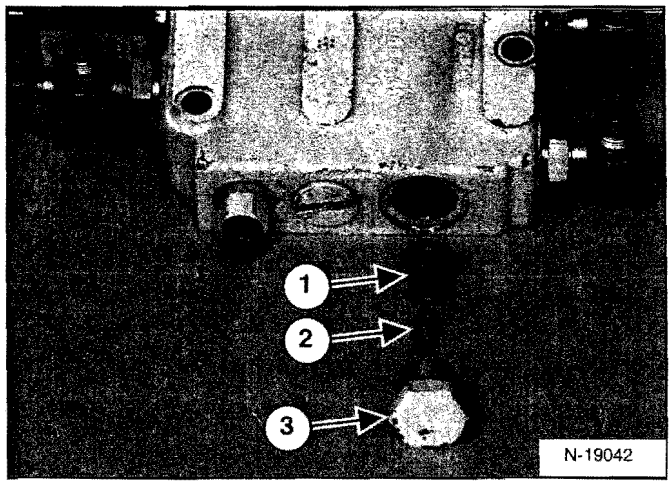
Figure 20-90-11



Remove the plug (Item 1), and flow control spool (Item 2) **[Figure 20-90-11]**.

Check the flow control spool for wear, check the O-ring on the plug and replace as needed.

Figure 20-90-12

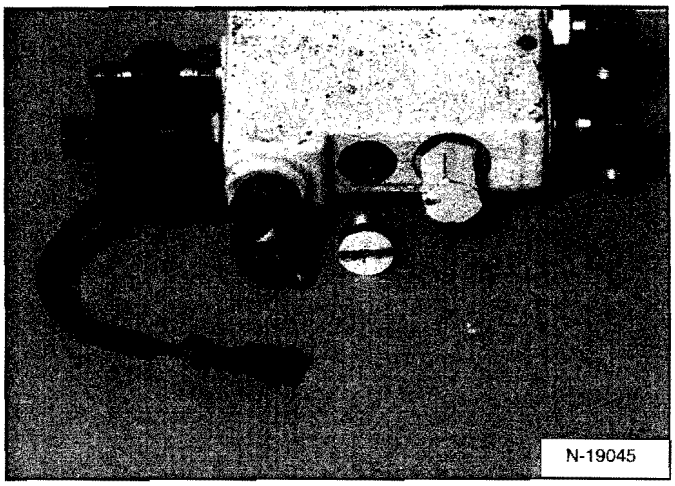


Remove the tilt cylinder check valve (Item 1) spring (Item 2) and plug (Item 3) **[Figure 20-90-12]**. Check for wear, check the O-ring and replace as needed.

BUCKET POSITION VALVE (CONT'D)

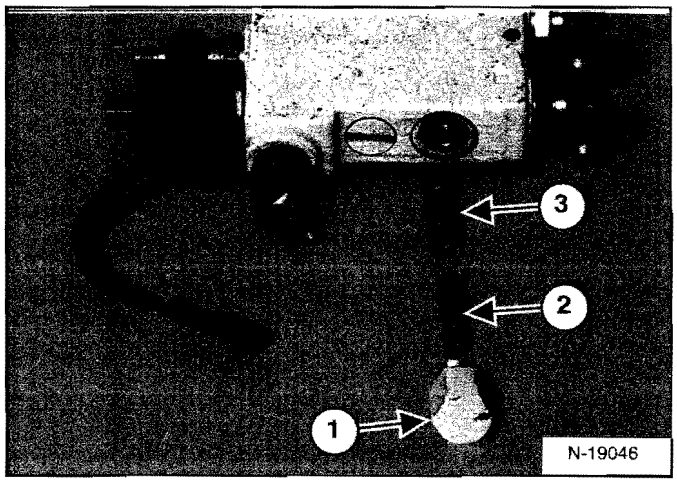
Disassembly And Assembly (Cont'd)

Figure 20-90-13



Remove the plug **[Figure 20-90-13]**.

Figure 20-90-14



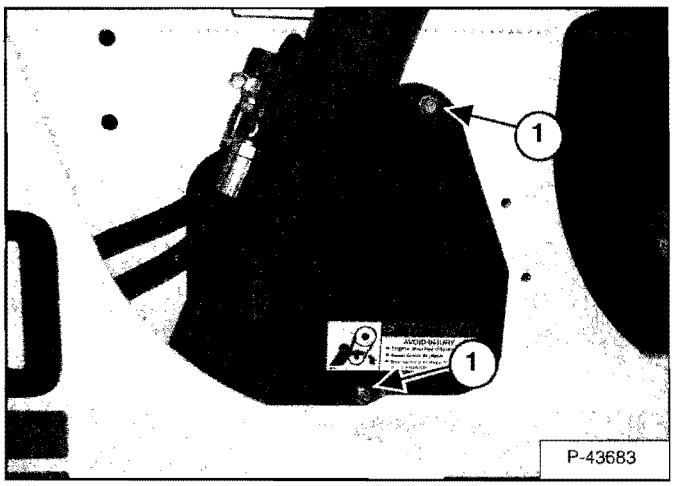
Remove the plug (Item 1), spring (Item 2) and unloading spool (Item 3) **[Figure 20-90-14]**.

Check all parts and replace as needed. Install a new O-ring on the plug before installing.

REAR AUXILIARY DIVERTER

Removal and Installation

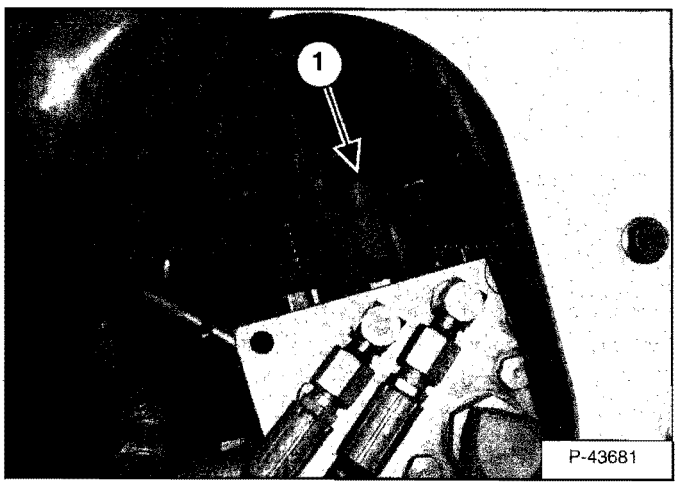
Figure 20-100-1



Remove the two access cover mount bolts (Item 1) **[Figure 20-100-1]** from the right side acces cover. Remove the access cover.

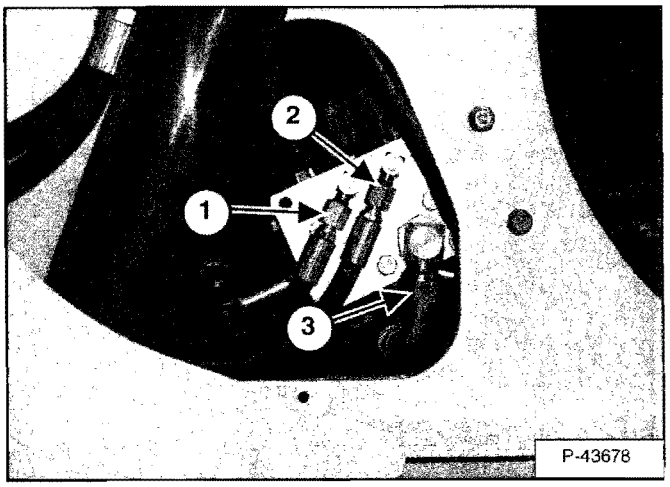
Mark all wires and hoses for proper installation.

Figure 20-100-2



Disconnect the four electrical connectors (Item 1) **[Figure 20-100-2]** from the diverter solenoids.

Figure 20-100-3



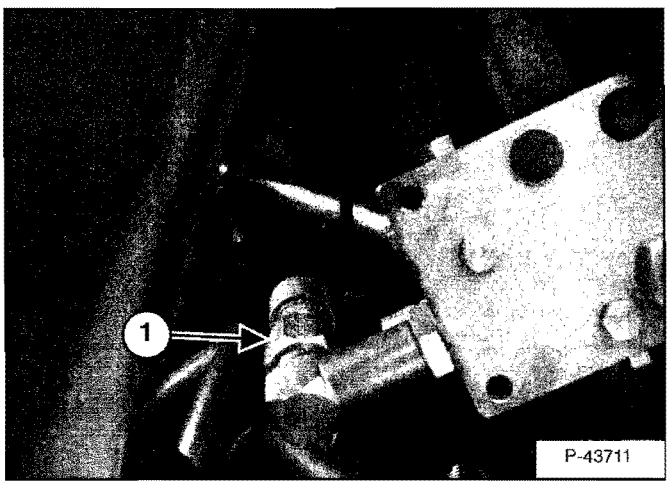
Disconnect the hose (Item 1) **[Figure 20-100-3]** from the base end fitting.

Disconnect the hose (Item 2) **[Figure 20-100-3]** from the rod end fitting.

Disconnect the hose (Item 3) **[Figure 20-100-3]** from the pressure out port.

Cap and plug all fittings and hoses.

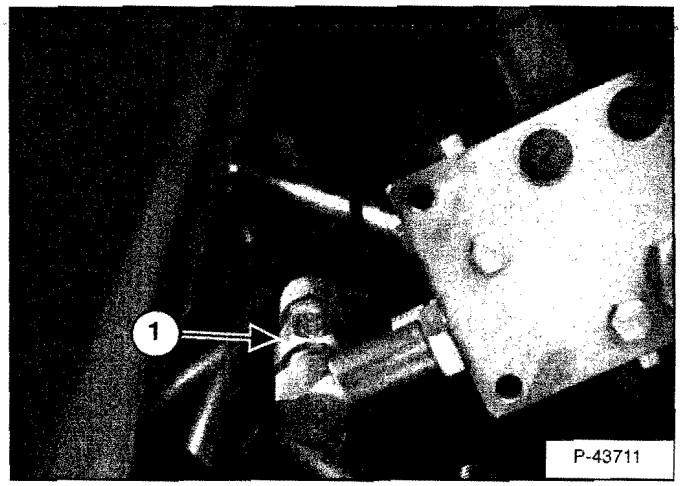
Figure 20-100-4



Disconnect the hose (Item 1) **[Figure 20-100-4]** from the pressure in fitting.

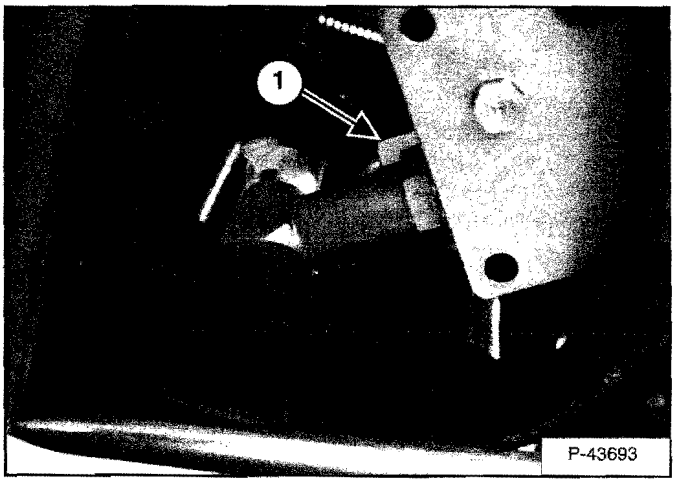
Removal and Installation (Cont'd)

Figure 20-100-5



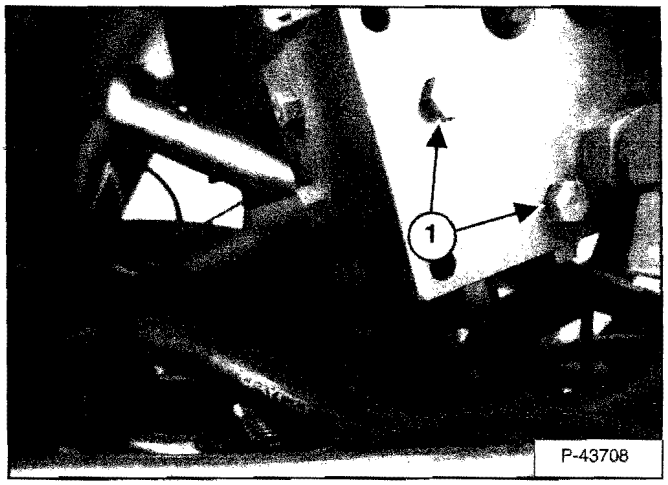
Disconnect the hose (Item 1) **[Figure 20-100-5]** from the pressure in fitting.

Figure 20-100-6



Disconnect the hose (Item 1) **[Figure 20-100-6]** from the fitting that goes to tank.

Figure 20-100-7



Remove the two mount bolts (Item 1) **[Figure 20-100-7]** from the block.

Remove the diverter valve from the loader.

Disassembly And Assembly

Figure 20-100-8

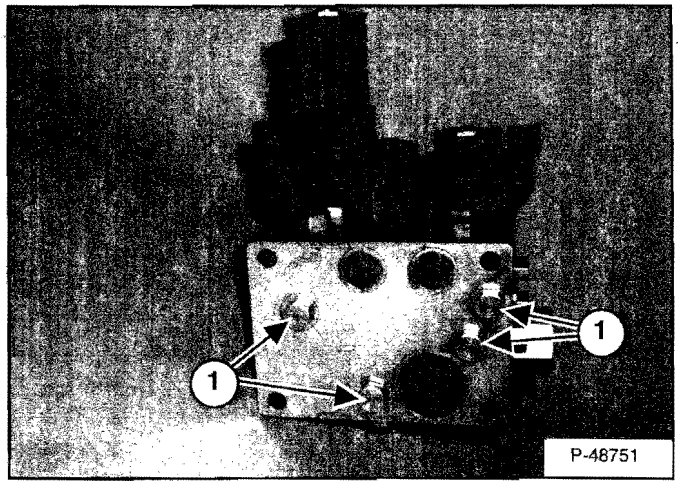
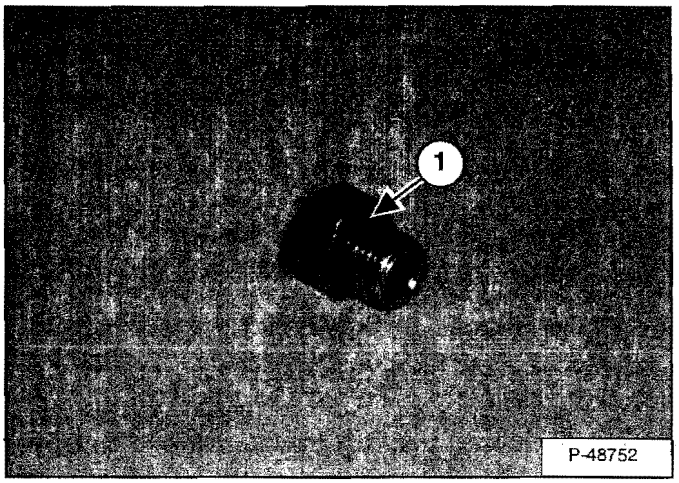


Figure 20-100-9



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.

IMPORTANT

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

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Figure 20-100-10

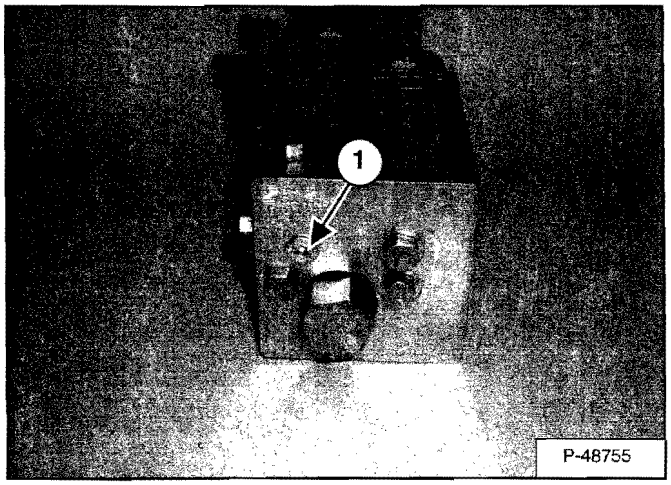
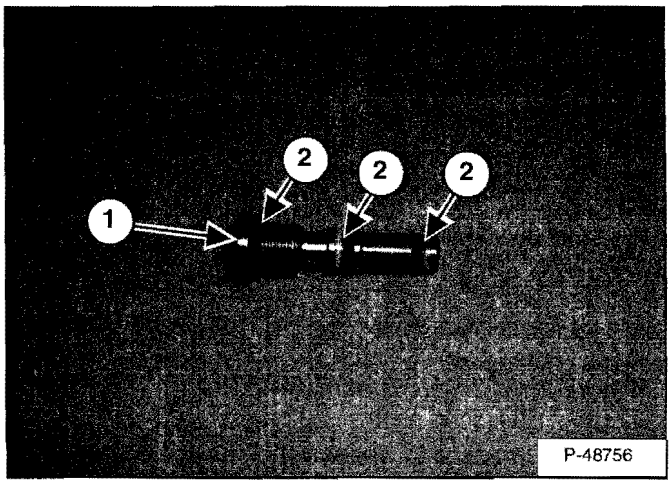


Figure 20-100-11



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.

Disassembly And Assembly (Cont'd)

Figure 20-100-12

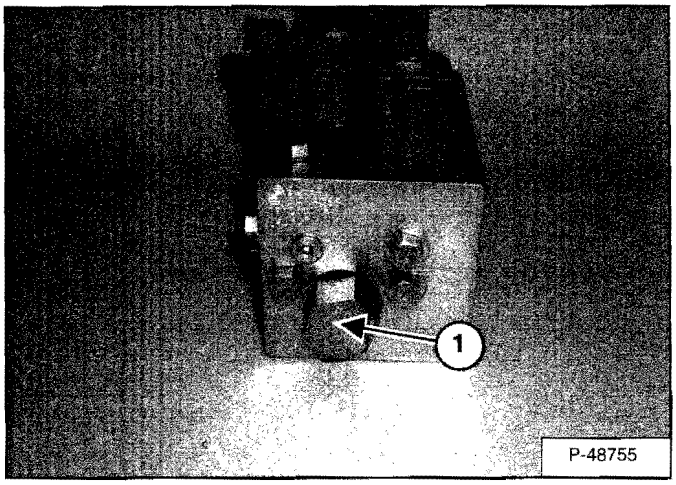
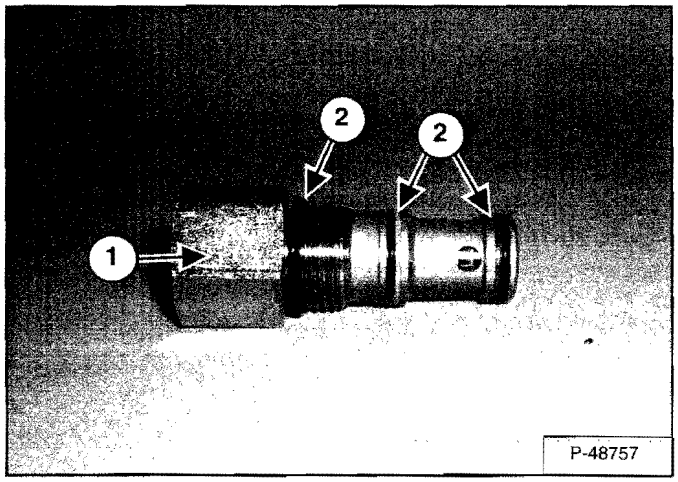


Figure 20-100-13



Remove the differential sensing valve (Item 1) **[Figure 20-100-12]** & **[Figure 20-100-13]** from 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.

Figure 20-100-14

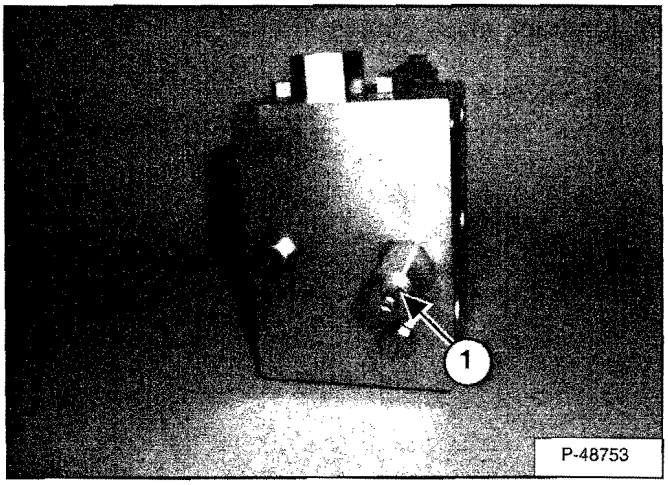
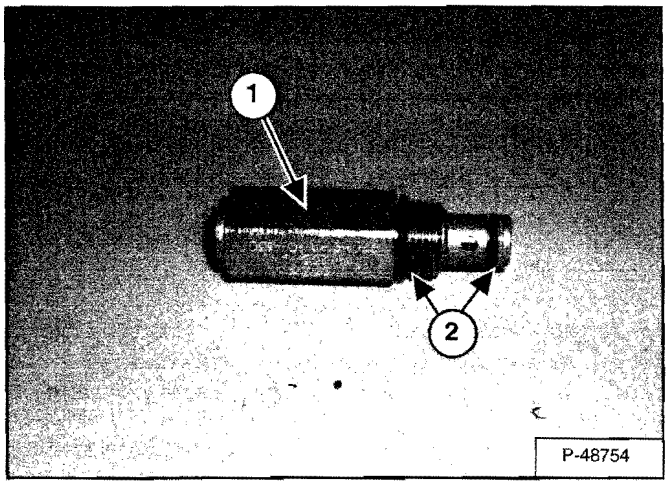


Figure 20-100-15



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.

Disassembly And Assembly (Cont'd)

Figure 20-100-16

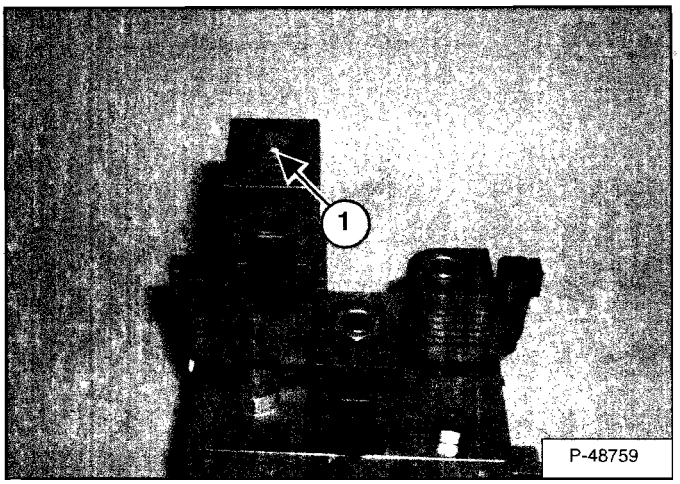
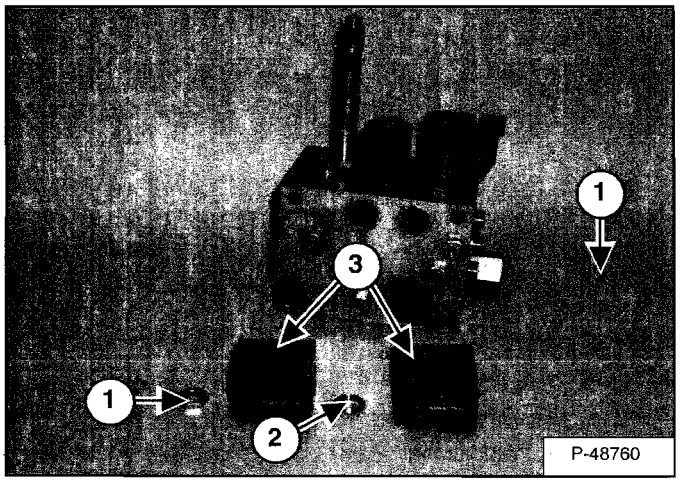


Figure 20-100-17



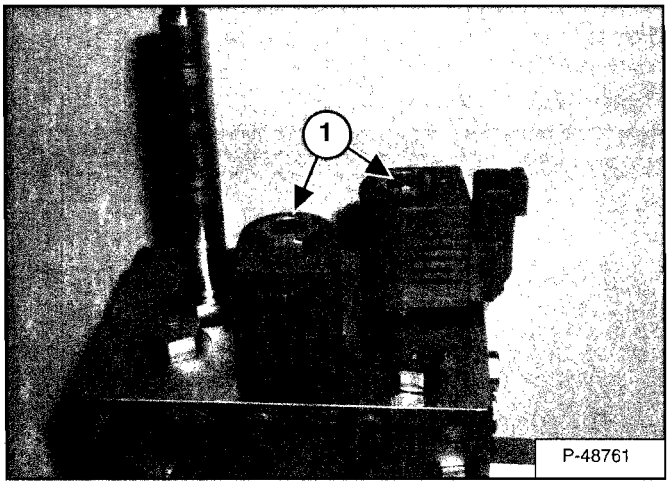
NOTE: Before removing the solenoid coils mark the coils for proper alignment.

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]**.

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.

Disassembly And Assembly (Cont'd)

Figure 20-100-19

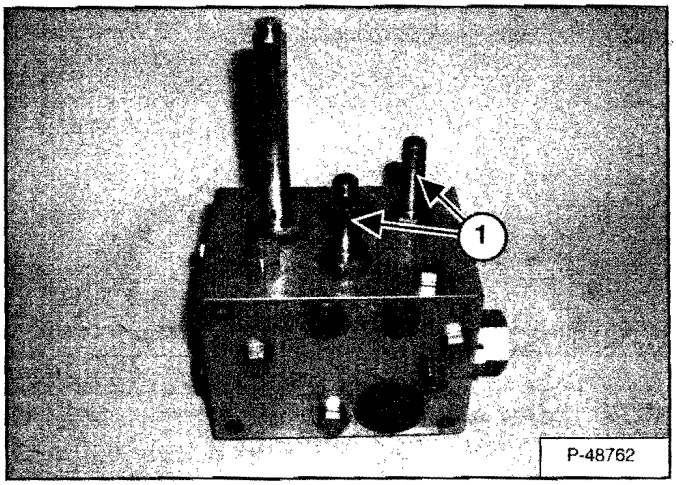
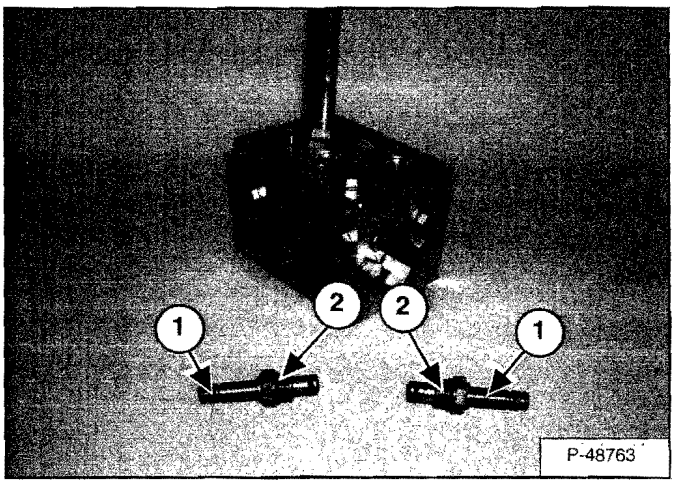


Figure 20-100-20



Remove the solenoid valve stem (Item 1) **[Figure 20-100-20]** & **[Figure 20-100-21]** and inspect the O-rings and back-up washers (Item 2) **[Figure 20-100-21]** for damage.

Installation: Put oil on O-rings and back-up washers. Tighten to 20-25 ft.-lbs. (27-34 Nm) torque.

Figure 20-100-21

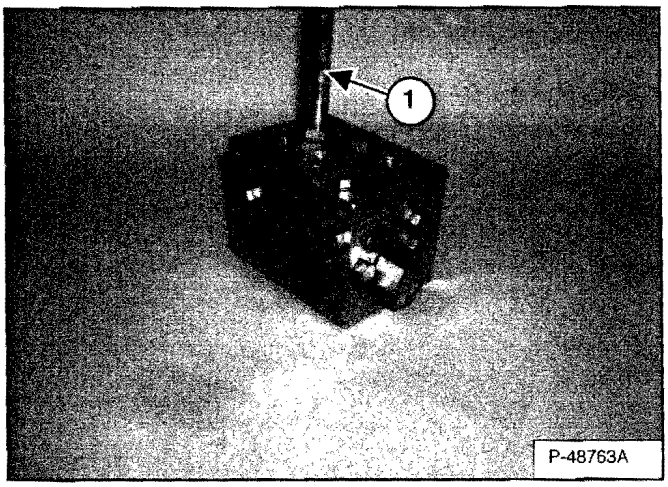
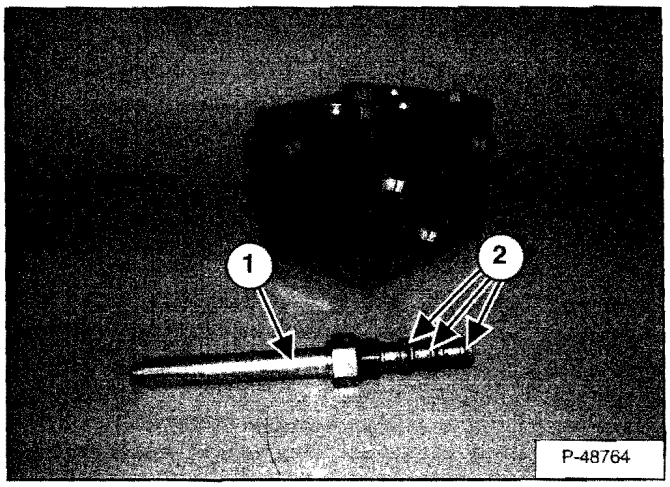


Figure 20-100-22

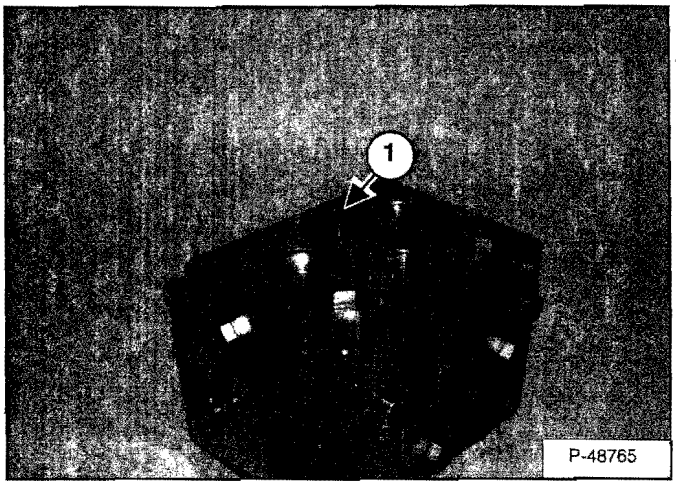


Remove the solenoid valve stem (Item 1) **[Figure 20-100-21]** & **[Figure 20-100-22]** and inspect the O-rings and back-up washers (Item 2) **[Figure 20-100-22]** for damage.

Installation: Put oil on O-rings and back-up washers. Tighten to 30-35 ft.-lbs. (41-47 Nm) torque.

Disassembly And Assembly (Cont'd)

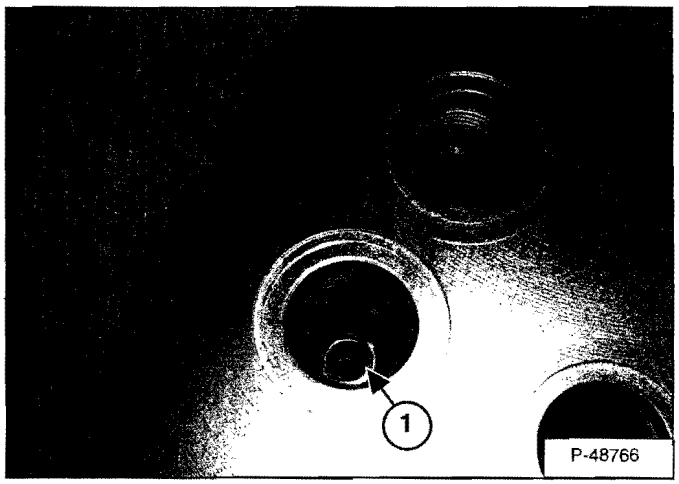
Figure 20-100-23



Remove the plug (Item 1) **[Figure 20-100-23]**.

Installation: Tighten the plug to 38 ft.-lbs. (51,5 Nm) torque.

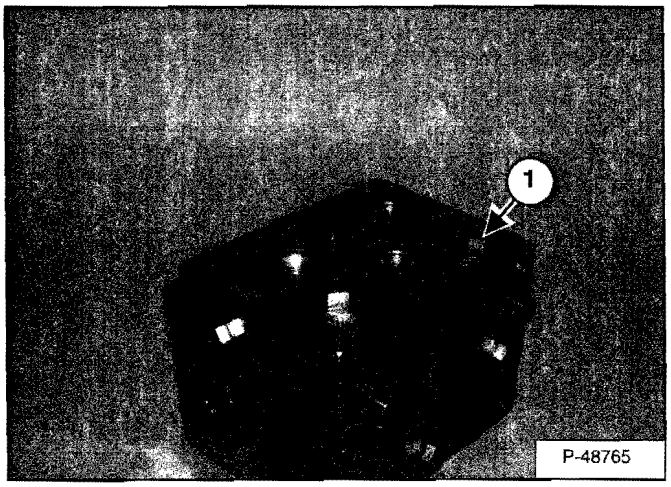
Figure 20-100-24



Remove and inspect the orifice (Item 1) **[Figure 20-100-24]** for dirt and debris.

Installation: Tighten the orifice to 22 ft.-lbs. (29,8 Nm) torque.

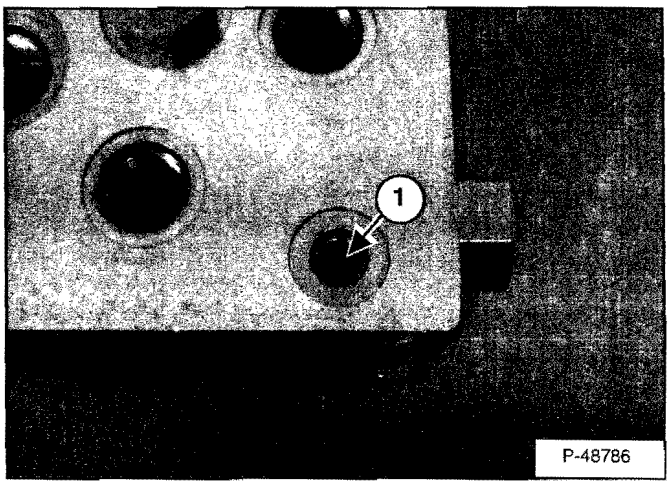
Figure 20-100-25



Remove the plug (Item 1) **[Figure 20-100-23]**.

Installation: Tighten the plug to 10 ft.-lbs. (13,6 Nm) torque.

Figure 20-100-26

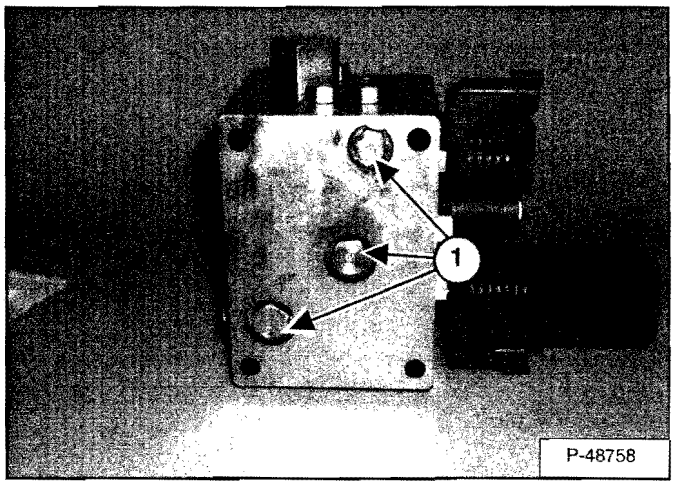


Remove the orifice (Item 1) **[Figure 20-100-23]**.

Installation: Tighten the orifice to 3.3 ft.-lbs. (4,5 Nm) torque.

Disassembly And Assembly (Cont'd)

Figure 20-100-27

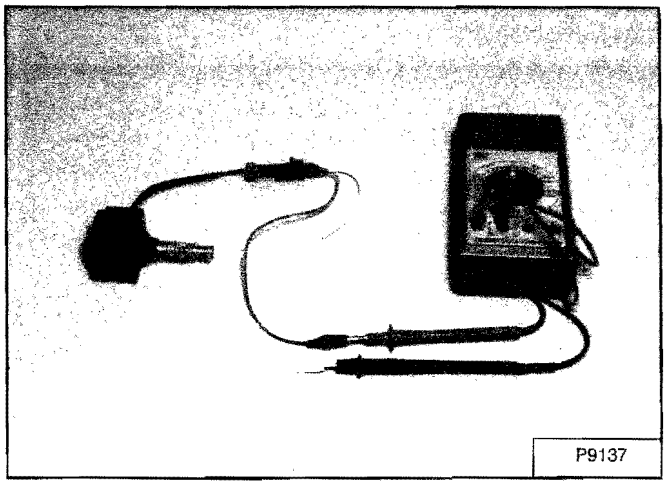


Remove the plugs (Item 1) **[Figure 20-100-23]**.

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

Solenoid Testing

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 air 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

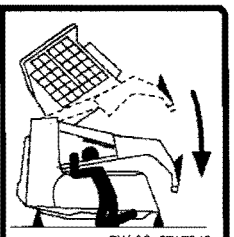
Never work on a machine with the lift arms up unless the lift arms are secured by an approved lift arm support device. Failure to use an approved lift arm support device can allow the lift arms or attachment to fall and cause injury or death.

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.

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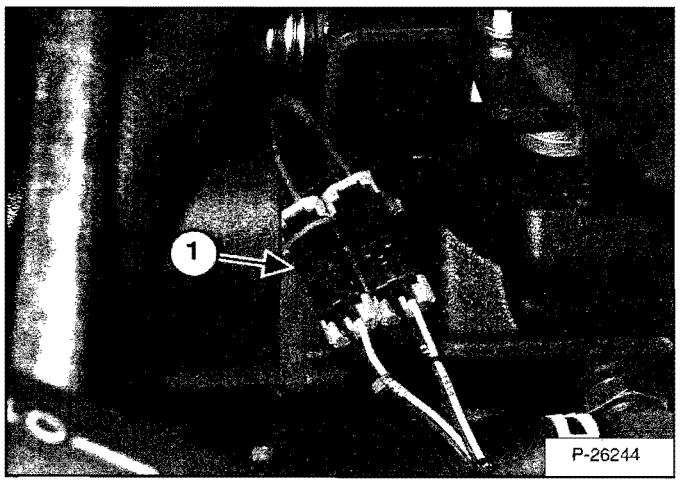
Figure 20-110-1



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

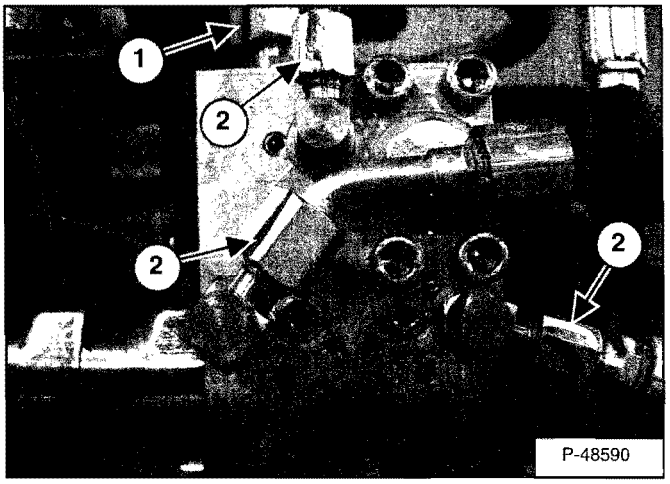
Raise the lift arms and install an approved lift arm support device. (See Contents Page 10-01.)

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

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

Disconnect and cap the two electrical solenoid connectors (Item 1) **[Figure 20-110-1]** from the loader electrical harness.

Figure 20-110-2

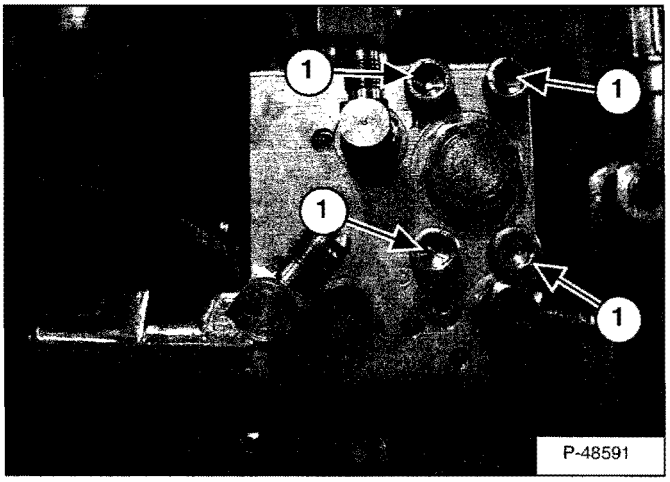


Disconnect and cap the outlet hose (Item 1) **[Figure 20-110-2]** from block.

Mark the hydraulic hoses for proper installation.

Disconnect and cap the hose (Item 2) **[Figure 20-110-2]** from block.

Figure 20-110-3



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

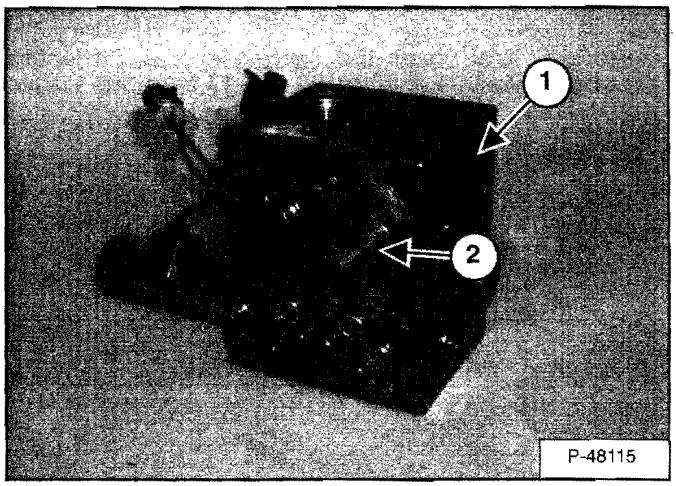
Installation: Tighten the mounting bolts to 25-28 ft.-lbs. (34-38 Nm) torque.

Remove the power Bob-Tach block.

POWER BOB-TACH BLOCK (CONT'D)

Disassembly And Assembly

Figure 20-110-4



Clean the block (Item 1) **[Figure 20-110-4]** to remove dirt before disassembly. Block ports are labeled for correct assembly.

Remove the plug (Item 2) **[Figure 20-110-4]**.

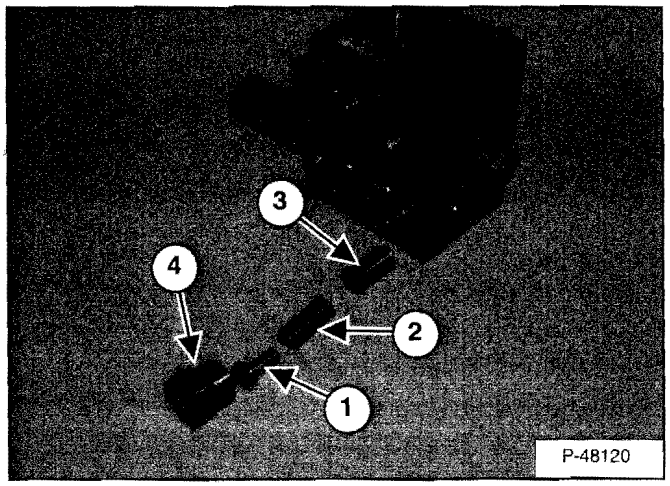
Installation: Tighten the plug to 25-30 ft.-lbs. (34-40,6 Nm) torque.

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

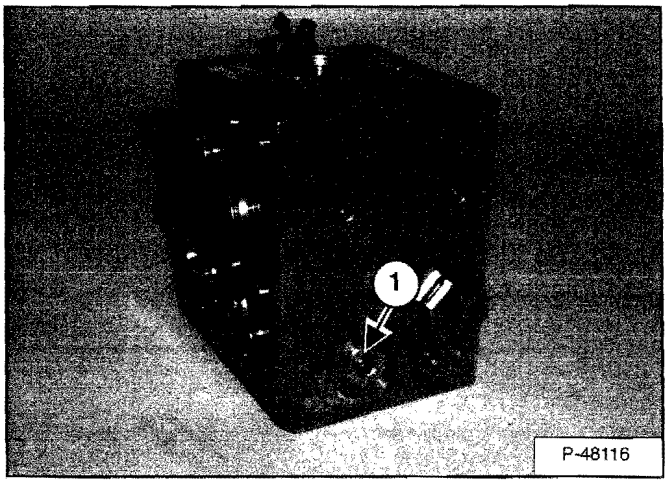
Figure 20-110-5



Remove the spring guide (Item 1), spring (Item 2) and the spool (Item 3) **[Figure 20-110-5]**.

Check the O-ring (Item 4) **[Figure 20-110-5]** on the plug and replace as needed.

Figure 20-110-6



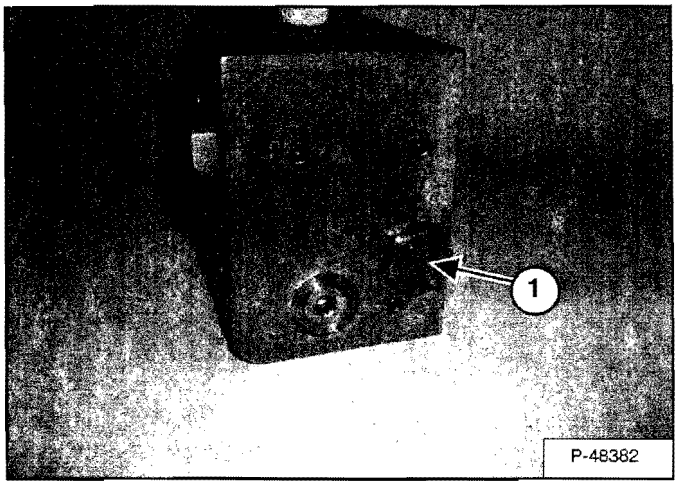
NOTE: This plug is a zero leak plug and should not be removed. If removed damage may occur and the plug and O-ring must be replaced.

Do not remove the plug (Item 1) **[Figure 20-110-6]**.

Installation: Tighten the plug to 12-14 ft.-lbs. (16,3-19 Nm) torque.

Disassembly And Assembly (Cont'd)

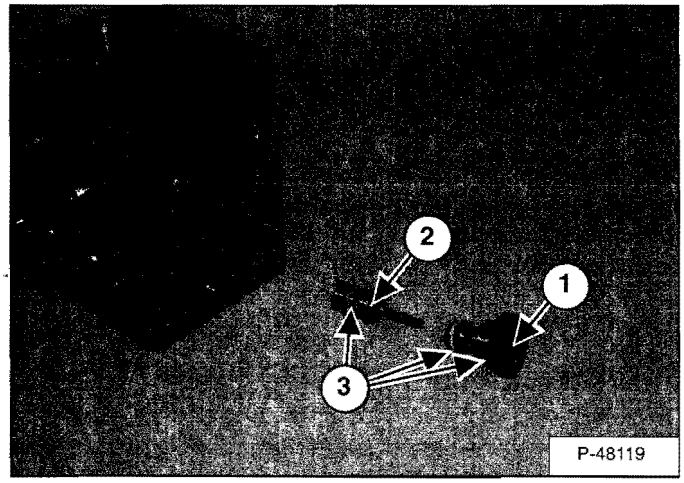
Figure 20-110-7



Remove the check valve (Item 1) **[Figure 20-110-7]**.

Installation: Oil the check valve and O-rings and tighten the check valve to to 20-25 ft.-lbs. (27,1-34 Nm) torque.

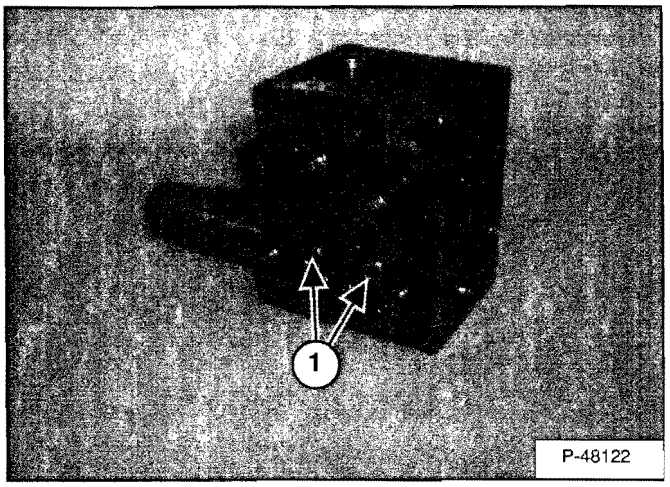
Figure 20-110-8



Inspect the check valve (Item 1) and piston assembly (Item 2) **[Figure 20-110-8]**.

Check the O-rings and back up washers (Item 3) **[Figure 20-110-8]** on the check valve and piston assembly and replace as needed.

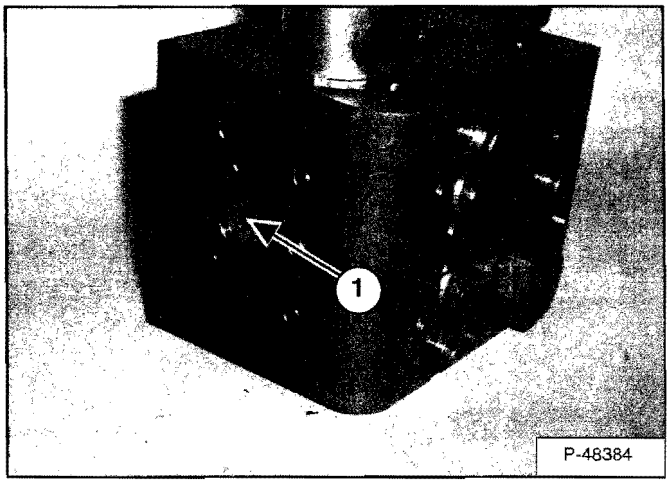
Figure 20-110-9



Do not remove the plugs (Item 1) **[Figure 20-110-9]**.

NOTE: Do not remove plugs. If the plugs are removed the internal pressure relieving spring setting will be altered.

Figure 20-110-10



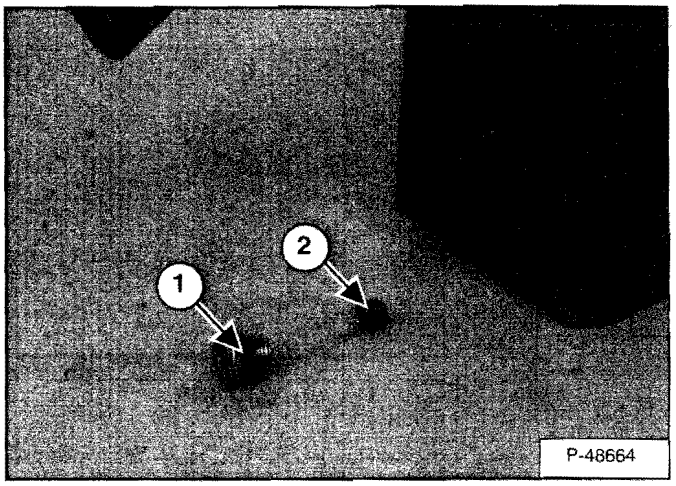
Remove the plug (Item 1) **[Figure 20-110-10]**, inspect the O-ring and replace as needed.

Installation: Tighten the plug (Item 1) **[Figure 20-110-10]** to 12-14 ft.-lbs. (16,3-19 Nm) torque.

POWER BOB-TACH BLOCK (CONT'D)

Disassembly And Assembly (Cont'd)

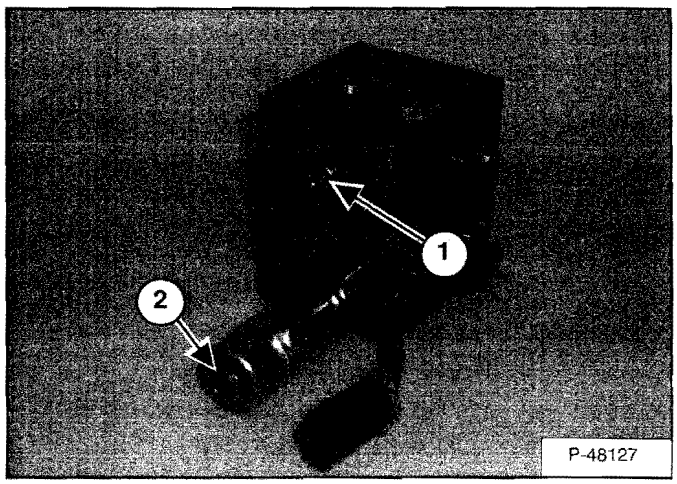
Figure 20-110-11



Remove the orifice screw (Item 2) located behind the plug (Item 1) **[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 20-110-12



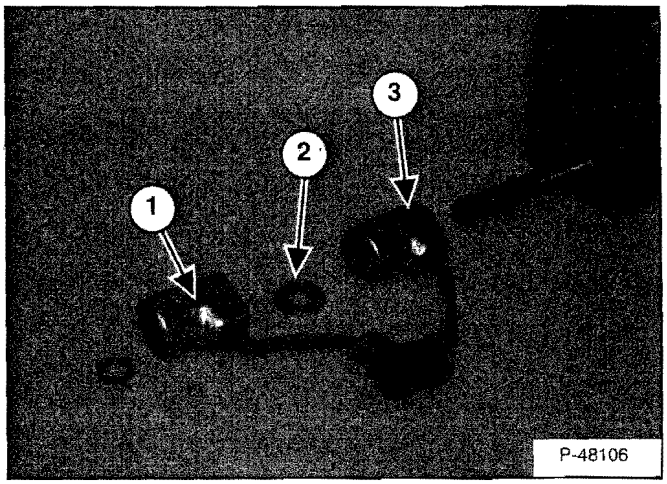
NOTE: This plug is a zero leak plug and should not be removed. If removed damage may occur and the plug and O-ring must be replaced.

Do not remove the plug (Item 1) **[Figure 20-110-12]**.

Remove the solenoid nut (Item 2) **[Figure 20-110-12]**.

Installation: Tighten the solenoid valve stem nut to 15-45 in.-lbs. (1,7-5,1 Nm) torque.

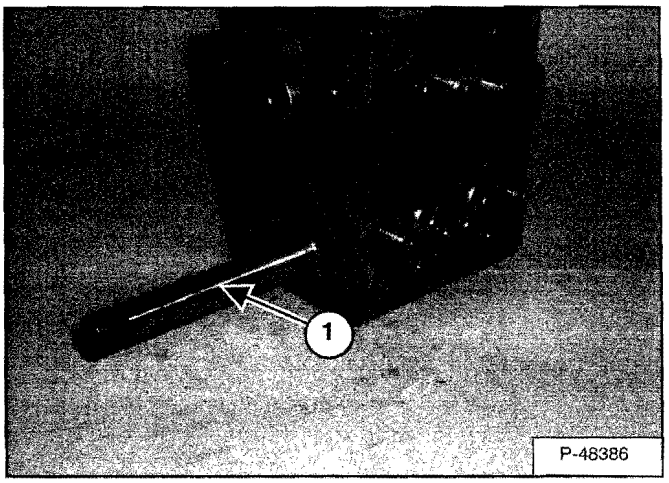
Figure 20-110-13



Remove the first solenoid coil (Item 1), spacer (Item 2) and the second solenoid coil (Item 3) **[Figure 20-110-13]**.

NOTE: Remember the solenoid coil orientation for ease of installation.

Figure 20-110-14

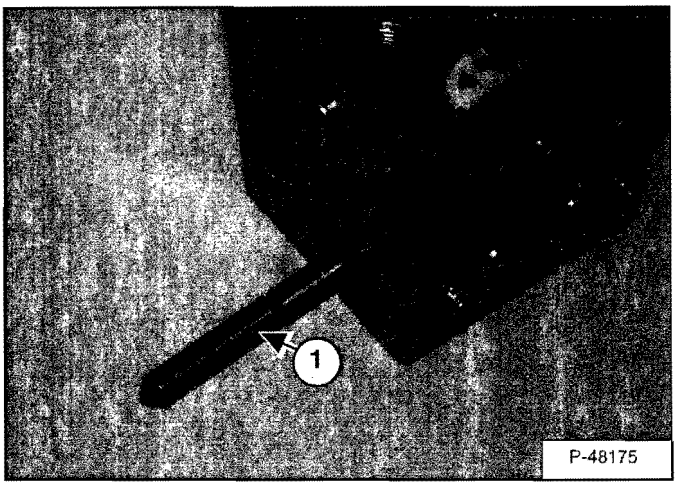


Remove the the solenoid stem (Item 1) **[Figure 20-110-14]**.

Installation: Tighten the solenoid stem to to 20-25 ft.-lbs. (27,1-34 Nm) torque.

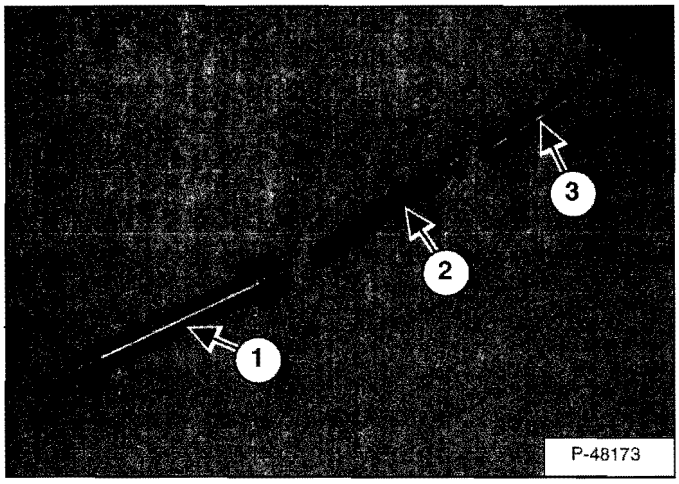
Disassembly And Assembly (Cont'd)

Figure 20-110-15



Remove the armature rod assembly (Item 1) **[Figure 20-110-15]**.

Figure 20-110-16

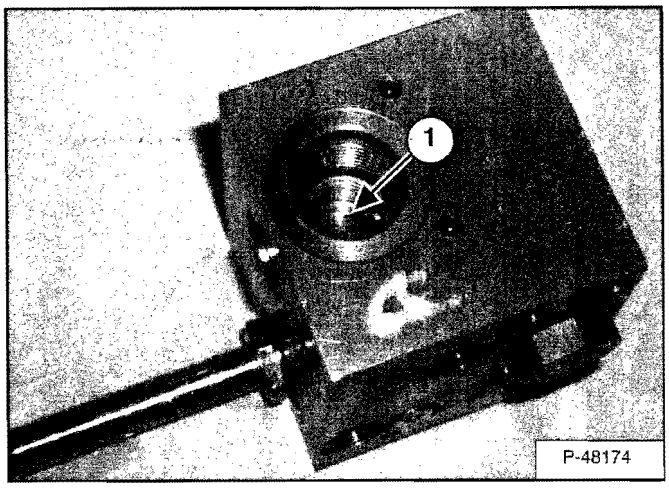


Inspect the solenoid stem (Item 1), armature assembly (Item 2) and the spool (Item 3) for damage **[Figure 20-110-16]**.

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 20-110-16].

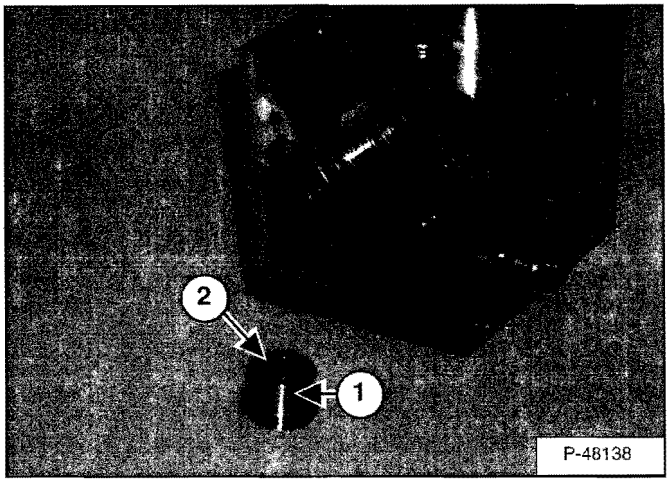
Figure 20-120-17



Remove the screened orifice plug (Item 1) **[Figure 20-120-17]**.

Installation: Tighten the screened orifice plug to to 11-12 ft.-lbs. (14,9-16,3 Nm) torque.

Figure 20-110-18



Inspect the screened orifice plug (Item 1) **[Figure 20-110-18]** for damage replace as needed. If the screened orifice plug is blocked replace with a new plug.

Check the O-ring (Item 2) **[Figure 20-110-18]** and replace as needed.

Bobcat®

FRONT AUXILIARY HYDRAULIC COUPLER BLOCK

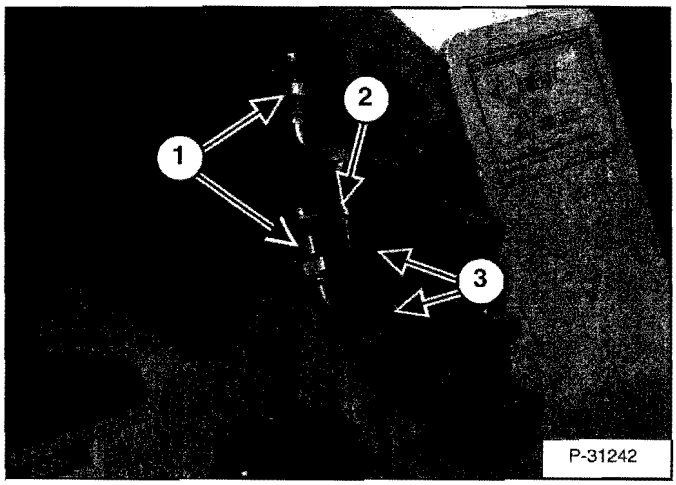
Removal and Installation

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 hoses (Item 1) and drain hose (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

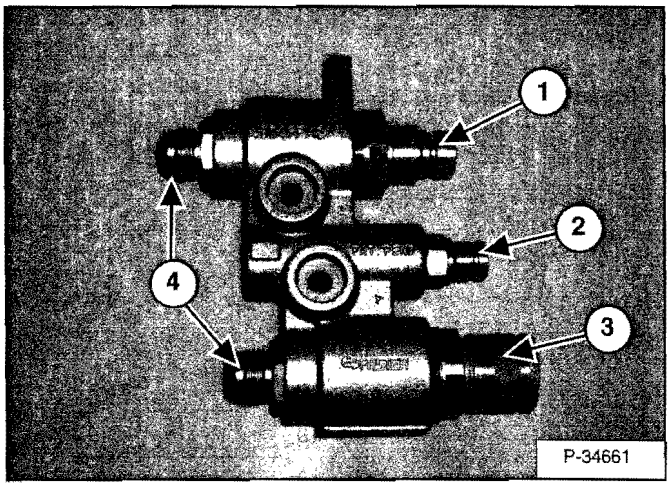
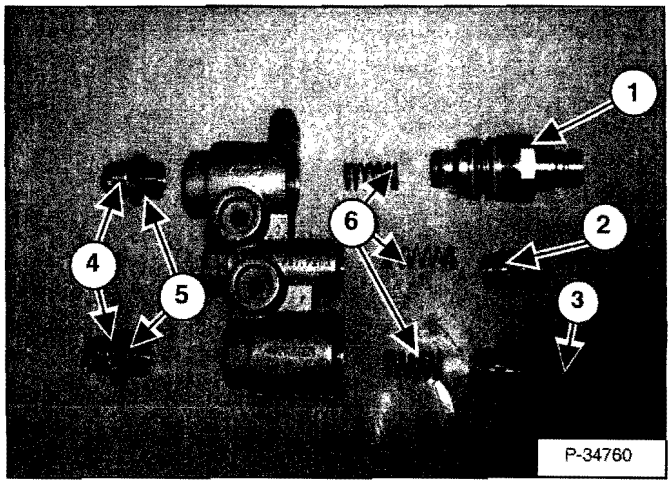


Figure 20-120-3



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)

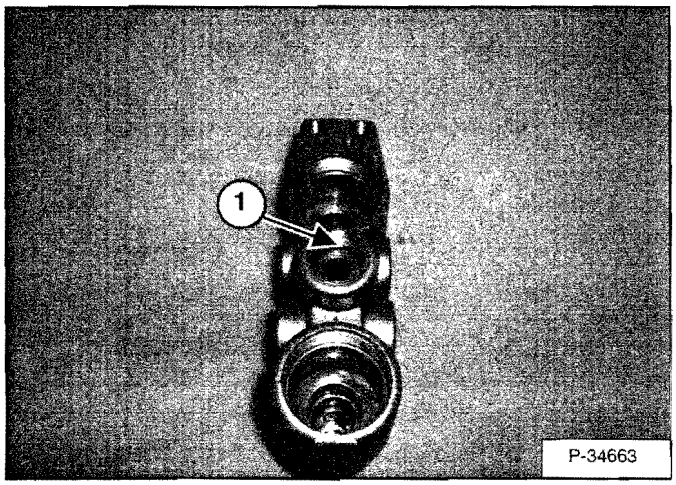
Remove the fittings (Item 4) **[Figure 20-120-2]** & **[Figure 20-120-3]** check the O-rings (Item 5) **[Figure 20-120-3]** and replace as needed.

Remove the springs (Item 6) **[Figure 20-120-3]**.

FRONT AUXILIARY HYDRAULIC COUPLER BLOCK (CONT'D)

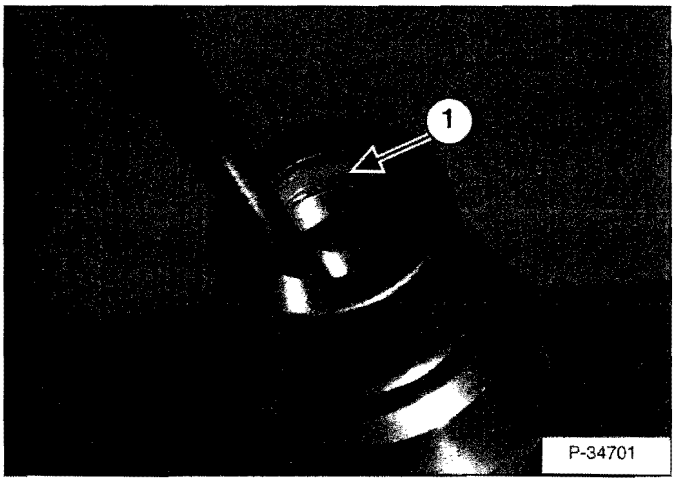
Disassembly And Assembly (Cont'd)

Figure 20-120-4



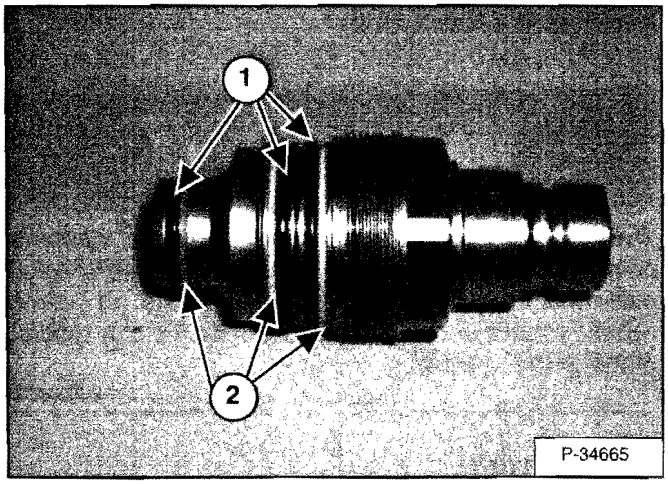
Check the O-ring (Item 1) **[Figure 20-120-4]** for damage and replace as needed.

Figure 20-120-5



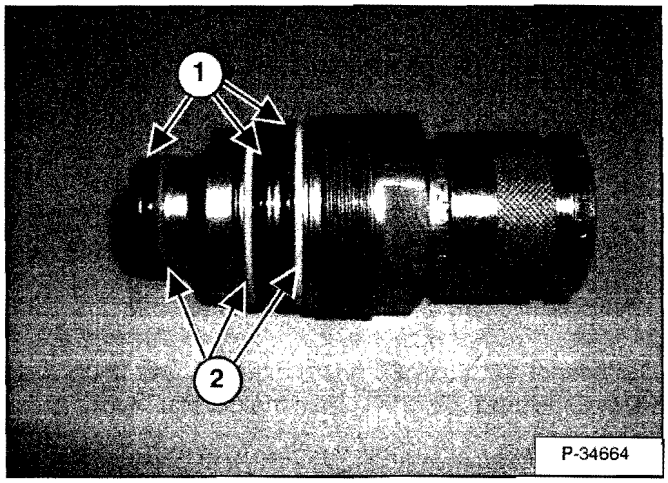
Press center of male couplers down and check the O-ring (Item 1) **[Figure 20-120-5]** for damage and replace as needed.

Figure 20-120-6



Check the O-rings (Item 1) back-up O-rings (Item 2) **[Figure 20-120-6]** for damage and replace as needed.

Figure 20-120-7



Check the O-rings (Item 1) back-up O-rings (Item 2) **[Figure 20-120-7]** for damage and replace as needed.

HYDROSTATIC SYSTEM

Continued On Next Page

HYDROSTATIC SYSTEM (CONT'D)

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

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

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.

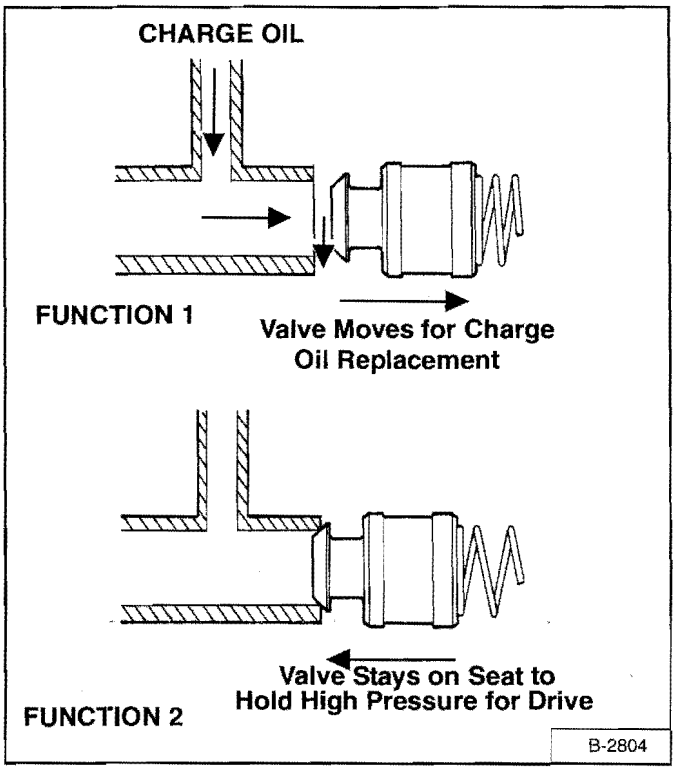
IMPORTANT

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

Replenishing Valve Function

Figure 30-10-1



The functions of the replenishing valves are:

- 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]**.

- To keep high pressure fluid out of the low pressure side of the hydrostatic circuitry; Function 2 **[Figure 30-10-1]**.

(See Contents, Page 30-01 for valve location and repair information.)

HYDROSTATIC MOTOR

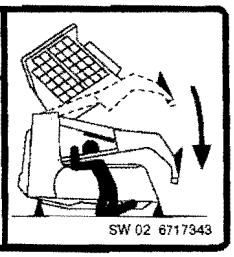
Removal And Installation

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

⚠ 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

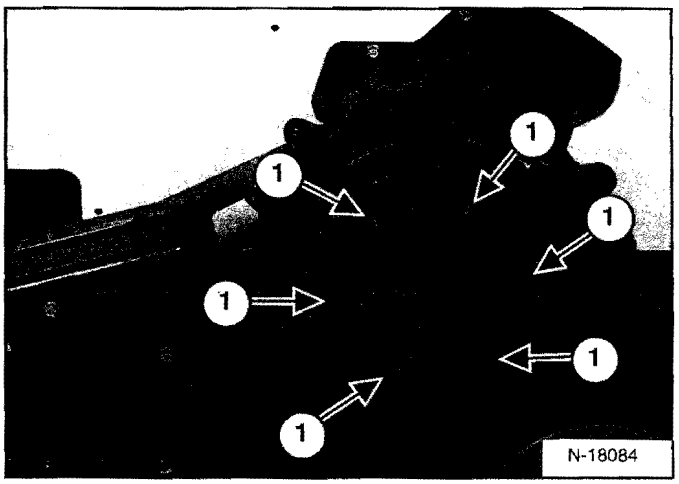


⚠ WARNING

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 30-20-1



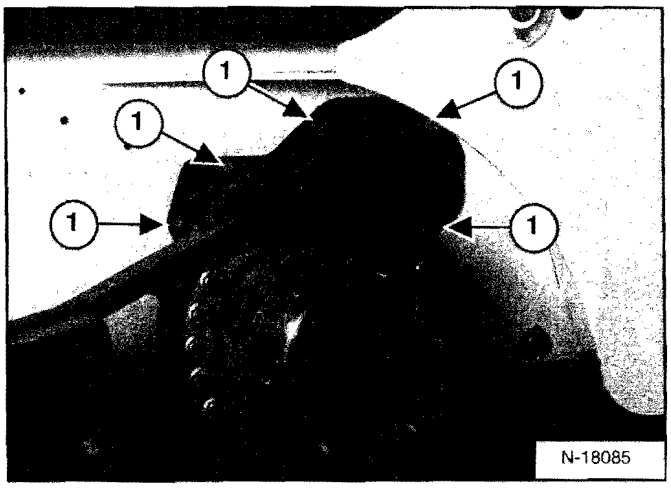
Raise the lift arms and install an approved lift arm support device. (See Contents Page 10-01.)

Remove the track. (See Contents Page 40-01.)

Loosen the six mounting bolts (Item 1) **[Figure 30-20-1]** and remove the drive sprocket from the motor.

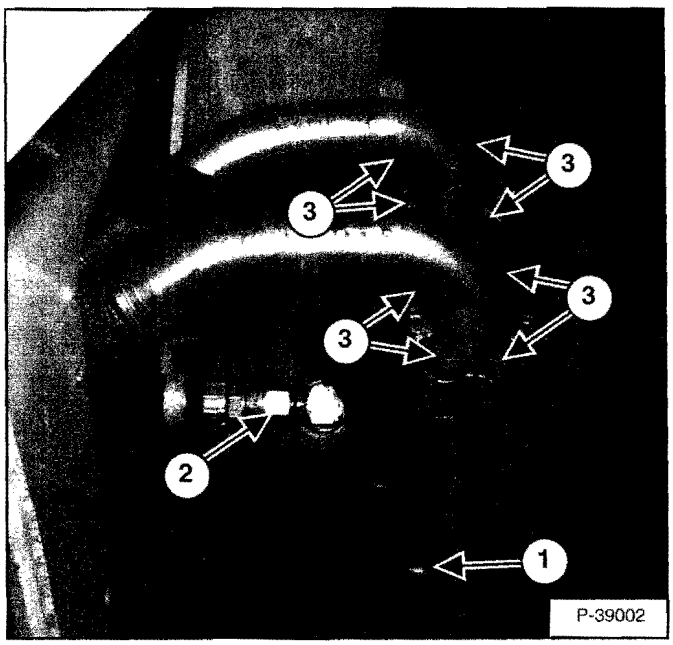
Installation: Tighten the mount bolts to 190-215 ft.-lbs. (260-290 Nm) torque.

Figure 30-20-2



Remove the five mounting bolts (Item 1) **[Figure 30-20-2]** from the access cover and remove the cover from the loader.

Figure 30-20-3



Remove the case drain hydraulic hose (Item 1) **[Figure 30-20-3]** from the motor.

Remove the hydraulic brake hose (Item 2) **[Figure 30-20-3]** from the motor.

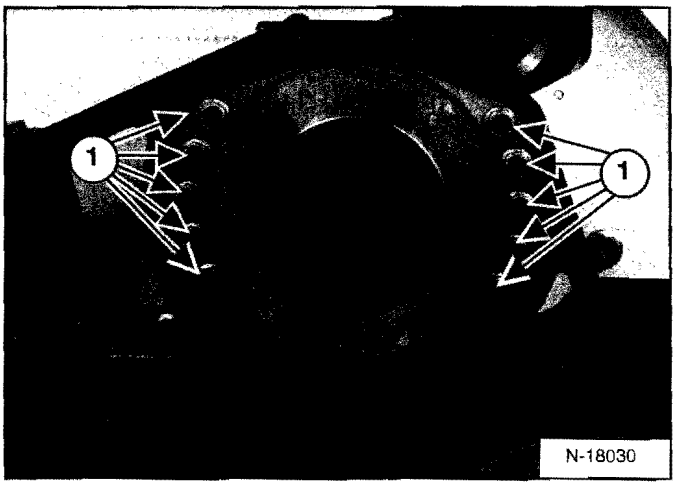
Remove the eight flange bolts (Item 3) **[Figure 30-20-3]** from the main drive hoses. Remove the flanges and drive hoses.

Installation: Tighten the flange bolts to 35-40 ft.-lbs. (48-54 Nm) torque.

Cap and plug all hydraulic lines and hoses.

Removal And Installation (Cont'd)

Figure 30-20-4



With an arm hoist support the hydraulic motor.

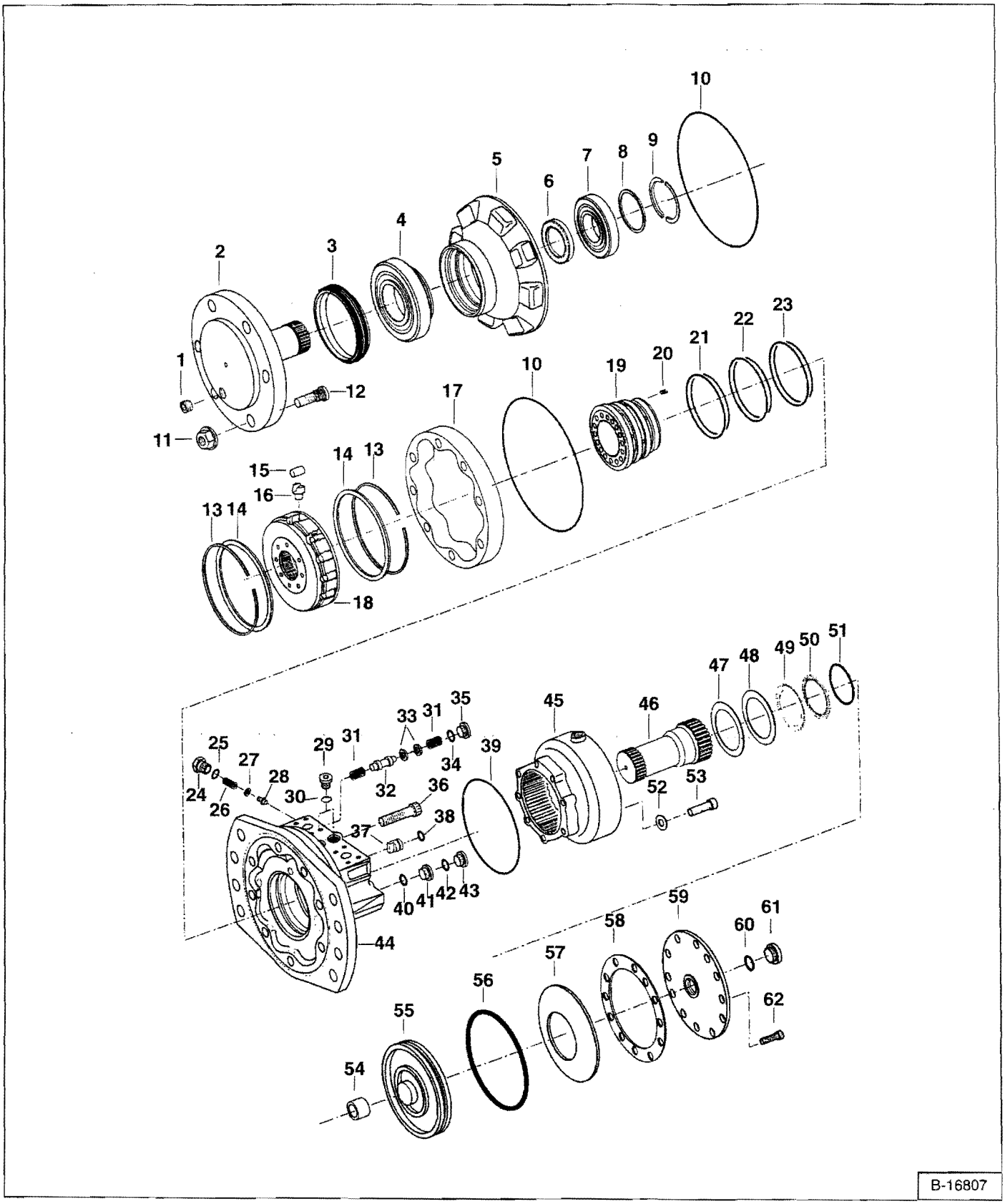
Remove the ten hydraulic motor mounting bolts (Item 1) **[Figure 30-20-4]**.

Installation: Tighten the motor mounting bolts to 190 ft.-lbs. (257,6 Nm) torque.

Remove the hydrostatic motor from the loader.

Bobcat®

Parts Identification

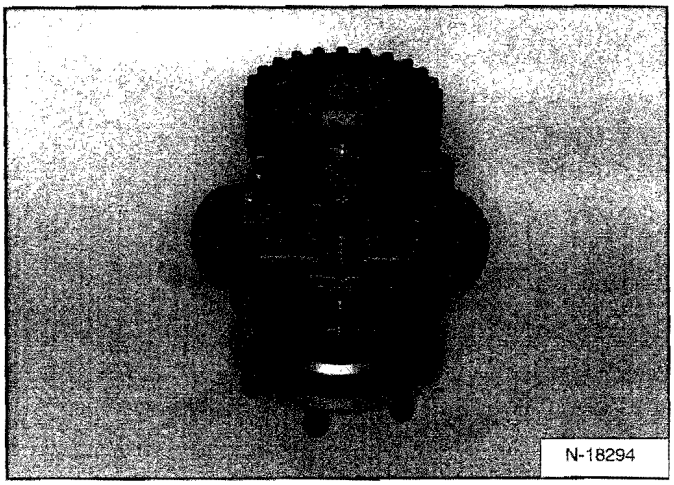


Parts Identification (Cont'd)

Ref.	Description
1.	PLUG
2.	SHAFT
3.	SEAL
4.	BEARING
5.	HOUSING
6.	SEAL
7.	BEARING
8.	WASHER
9.	RINGS
10.	O-RING
11.	NUT
12.	STUD
13.	SNAP RING
14.	RETAINER
15.	ROLLER
16.	PISTON
17.	CAM
18.	BLOCK
19.	DISTRIBUTOR
20.	SPRING
21.	SEAL
22.	SEAL
23.	SEAL
24.	PLUG
25.	O-RING
26.	SPRING
27.	SHIM
28.	POPPET
29.	PLUG
30.	O-RING
31.	SPRING
32.	SPOOL
33.	WASHER
34.	O-RING
35.	PLUG
36.	BOLT
37.	PIN
38.	O-RING
39.	SEAL
40.	O-RING
41.	PLUG
42.	O-RING
43.	PLUG
44.	HOUSING
45.	HOUSING
46.	SHAFT
47.	SHIM
48.	SHIM
49.	DISC
50.	DISC
51.	O-RING
52.	WASHER
53.	BOLT
54.	BUSHING
55.	PISTON
56.	SEAL
57.	WASHER
58.	GASKET
59.	COVER
60.	O-RING
61.	PLUG
62.	BOLT

Disassembly

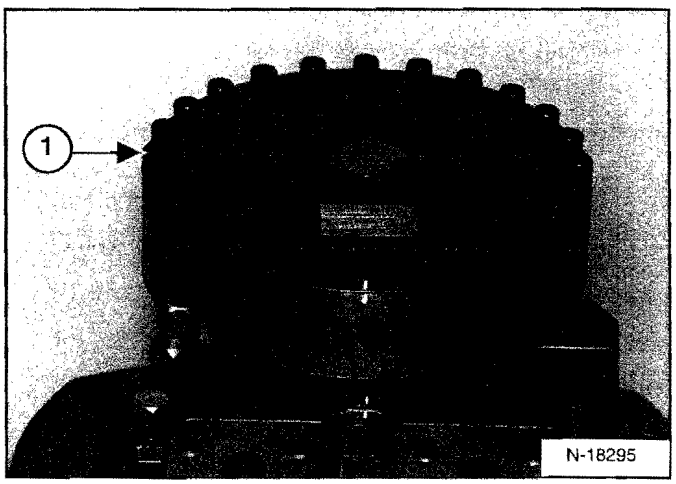
Figure 30-20-5



NOTE: Mark the motor, brake and motor carrier housings for proper alignment for ease of assembly [Figure 30-20-5].

Drain the oil from the motor casing.

Figure 30-20-6

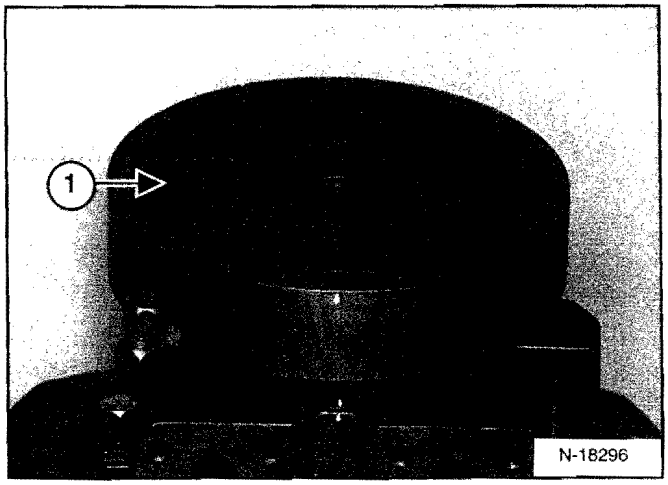


Remove the twenty four mounting bolts (Item 1) **[Figure 30-20-6]** from the brake cover plate.

NOTE: Unscrew the bolts alternately, one turn at a time to release the preload on the end cap.

Remove the cover plate and gasket from the brake housing.

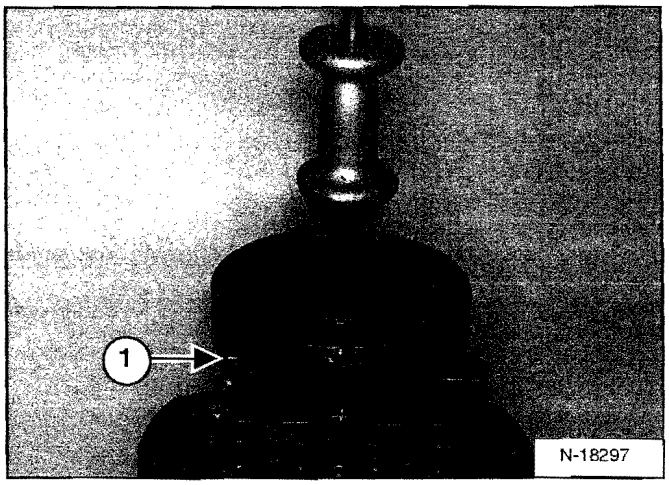
Figure 30-20-7



Remove the disk spring (Item 1) **[Figure 30-20-7]** from the brake housing.

NOTE: Mark the top side of the disk spring for proper installation.

Figure 30-20-8

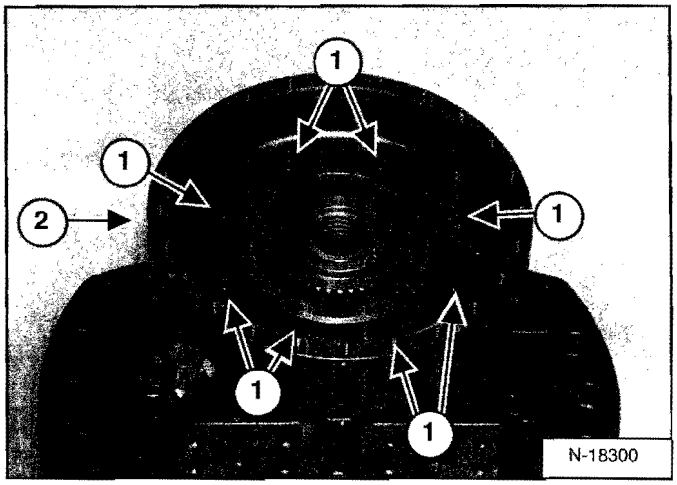


Remove the piston from the brake housing **[Figure 30-20-8]**.

NOTE: The use of air pressure through the brake line connection (Item 1) [Figure 30-20-8] will aid in piston removal.

Disassembly (Cont'd)

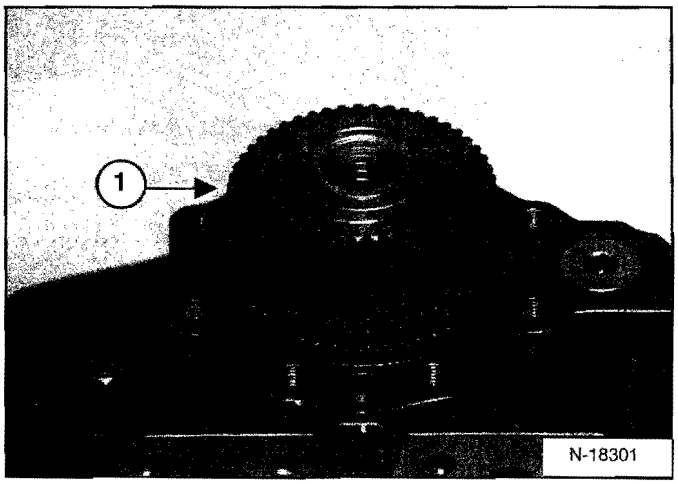
Figure 30-20-9



Remove the eight mounting bolts (Item 1) **[Figure 30-20-9]** and washers from the brake housing.

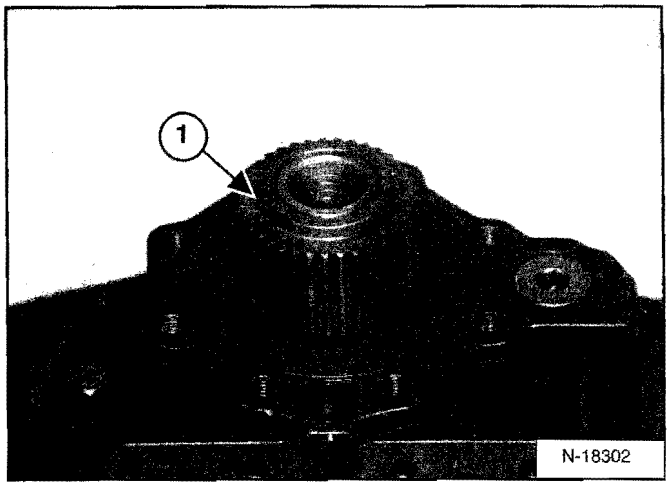
Remove the brake housing (Item 2) **[Figure 30-20-9]** from the rear housing.

Figure 30-20-10



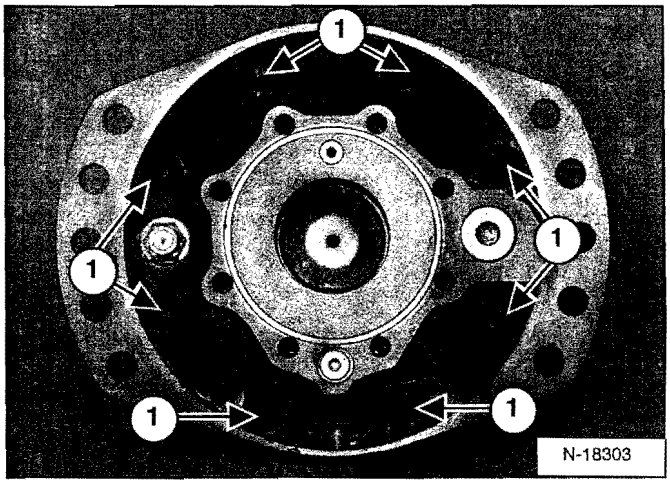
Remove the brake disks (Item 1) **[Figure 30-20-10]** and shims from the brake shaft.

Figure 30-20-11



Remove the brake shaft (Item 1) **[Figure 30-20-11]** from the rear housing.

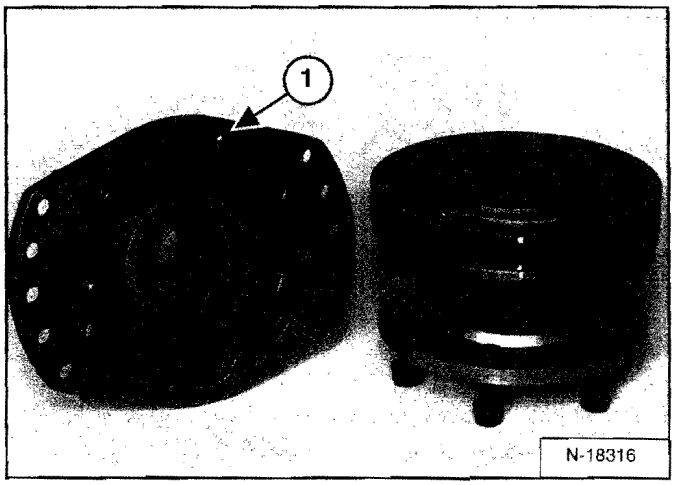
Figure 30-20-12



Remove the eight mounting bolts (Item 1) **[Figure 30-20-12]** from the rear housing.

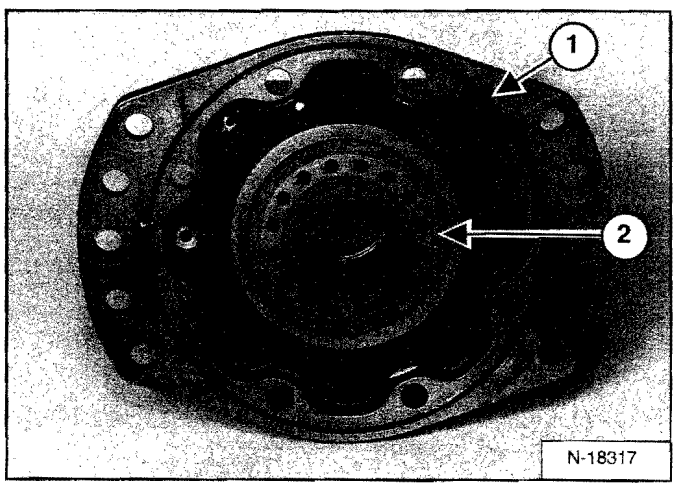
Disassembly (Cont'd)

Figure 30-20-13



Remove the rear housing assembly (Item 1) **[Figure 30-20-13]** from the rotating group/front housing assembly.

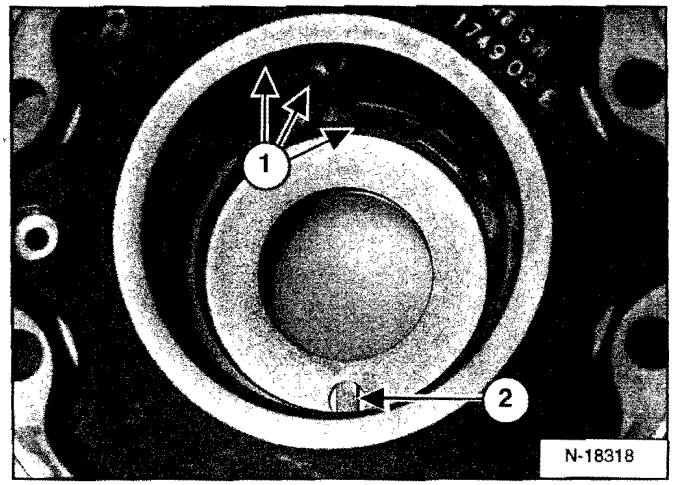
Figure 30-20-14



Remove the O-ring (Item 1) **[Figure 30-20-14]**.

Remove the distributor (Item 2) **[Figure 30-20-14]** from the rear housing.

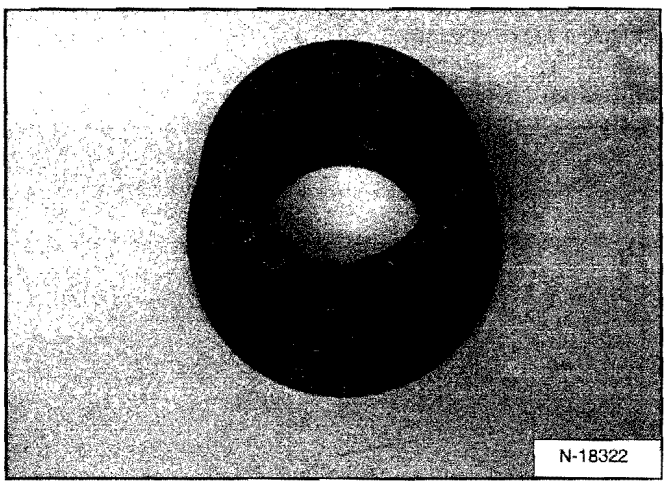
Figure 30-20-15



Remove the three seals and back-up O-rings (Item 1) **[Figure 30-20-15]** under the seals, from the rear housing.

Remove the stop pin (Item 2) **[Figure 30-20-15]**.

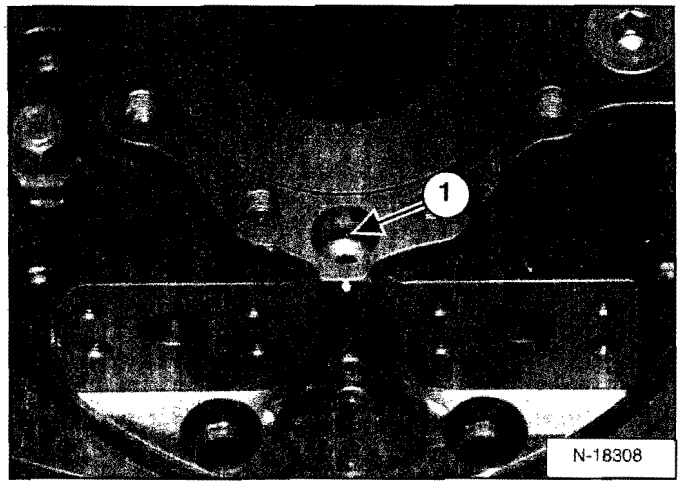
Figure 30-20-16



Remove the twelve springs from the distributor **[Figure 30-20-16]**.

Disassembly (Cont'd)

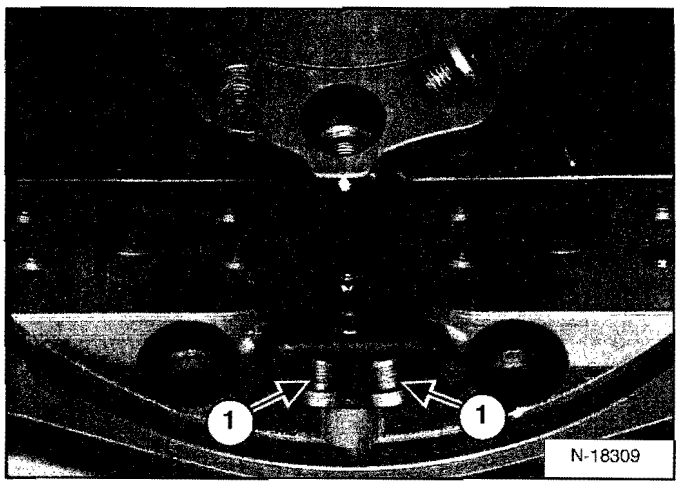
Figure 30-20-17



Remove the plug (Item 1) **[Figure 30-20-17]** from the rear housing assembly.

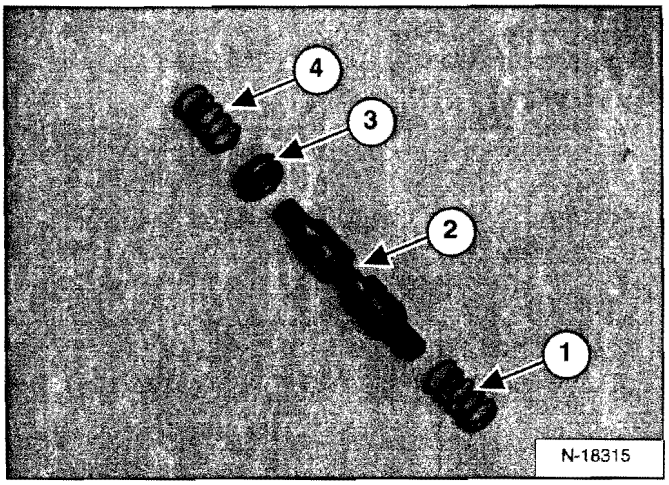
Remove the spring (Item 1), spool (Item 2), and washer (Item 3) and rear spring (Item 4) **[Figure 30-20-19]**.

Figure 30-20-18



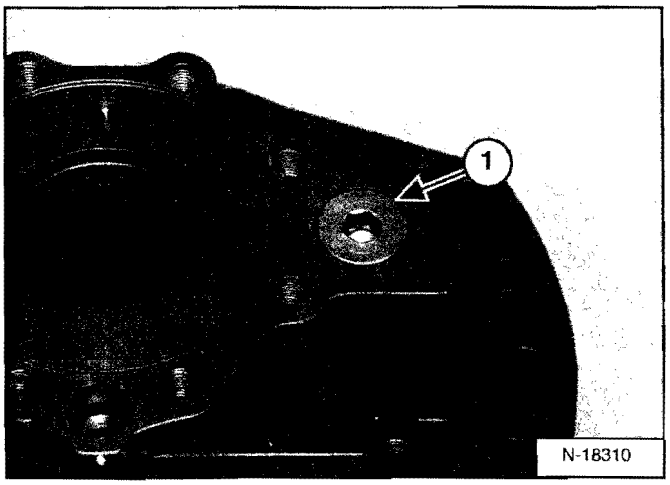
Remove the plugs (Item 1) **[Figure 30-20-18]** from the rear housing assembly to check alignment of springs, washer and spool when reassembling.

Figure 30-20-19



Inspect all parts and replace as needed **[Figure 30-20-19]**.

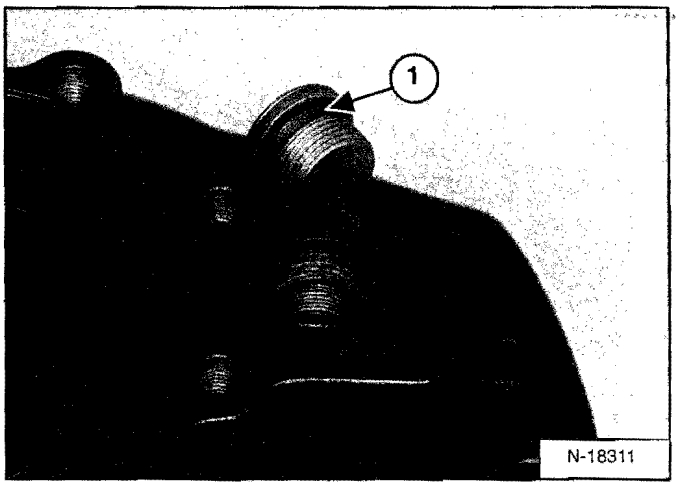
Figure 30-20-20



Remove the drain plug (Item 1) **[Figure 30-20-20]**.

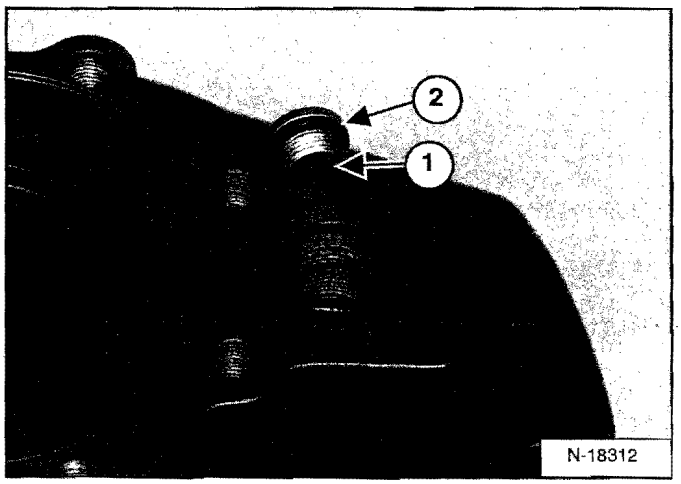
Disassembly (Cont'd)

Figure 30-20-21



Check the O-ring (Item 1) **[Figure 30-20-21]** on the plug and replace as needed.

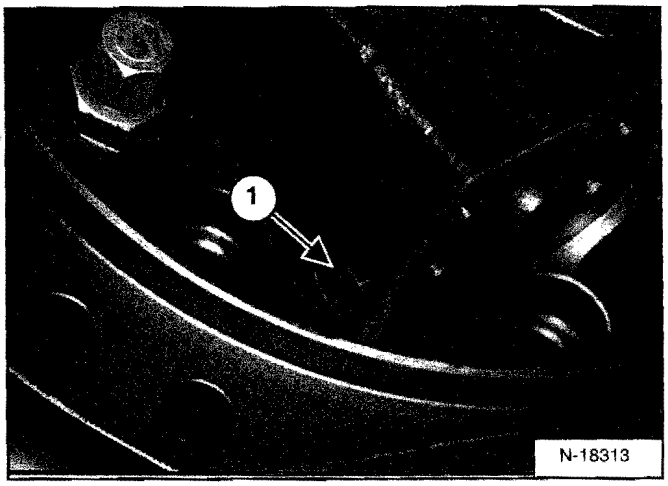
Figure 30-20-22



Remove the internal plug (Item 1) **[Figure 30-20-22]**.

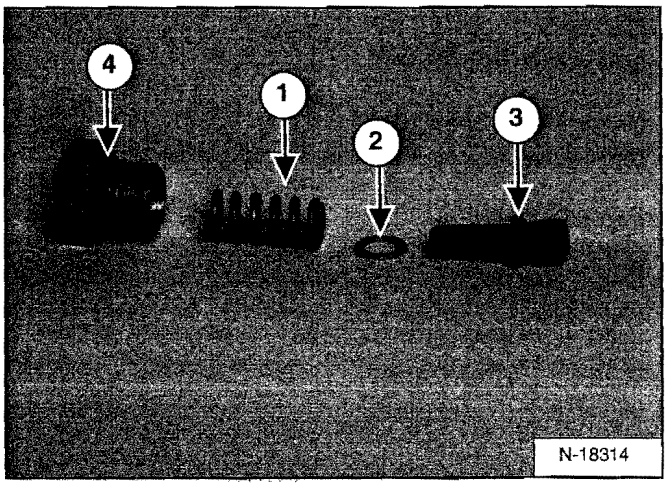
Check the O-ring (Item 2) **[Figure 30-20-22]** and replace as needed.

Figure 30-20-23



Remove the plug (Item 1) **[Figure 30-20-23]**.

Figure 30-20-24



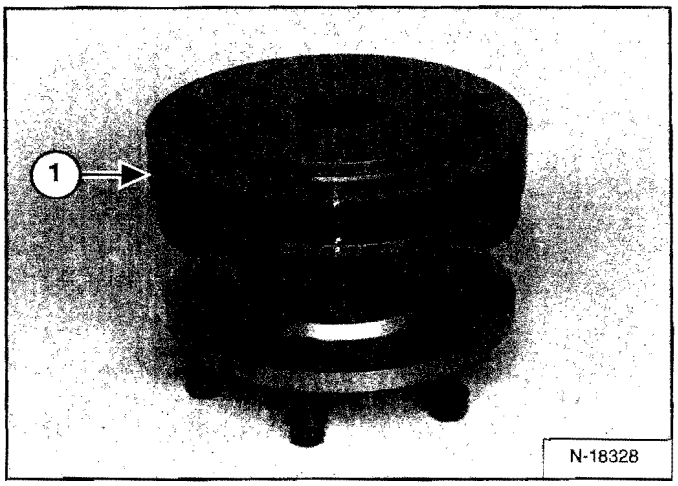
Remove the spring (Item 1) shim (Item 2) and poppet (Item 3) **[Figure 30-20-24]**.

Inspect all parts and replace as needed.

Install a new O-ring (Item 4) **[Figure 30-20-24]** on the plug before installation.

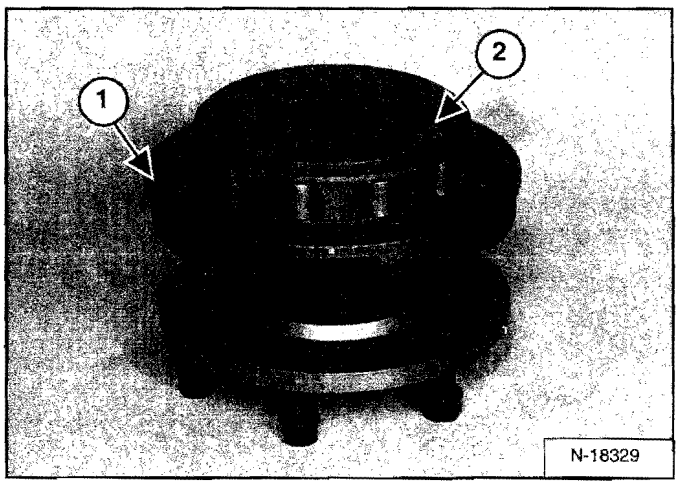
Disassembly (Cont'd)

Figure 30-20-25



Remove the cam ring (Item 1) **[Figure 30-20-25]** from the front housing assembly.

Figure 30-20-26



Remove the O-ring (Item 1) **[Figure 30-20-26]** from the front housing assembly.

Remove the rotating group (Item 2) **[Figure 30-20-26]** from the front housing assembly.

Figure 30-20-27

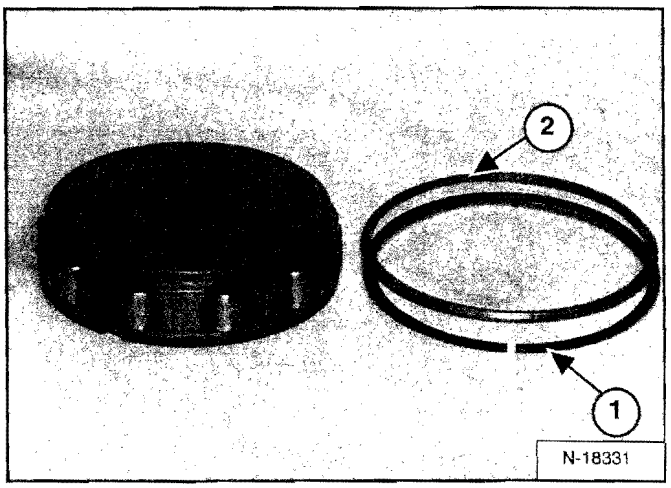
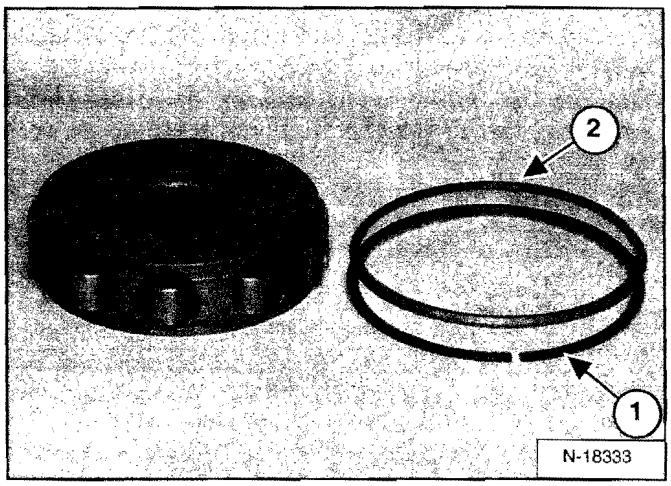


Figure 30-20-28

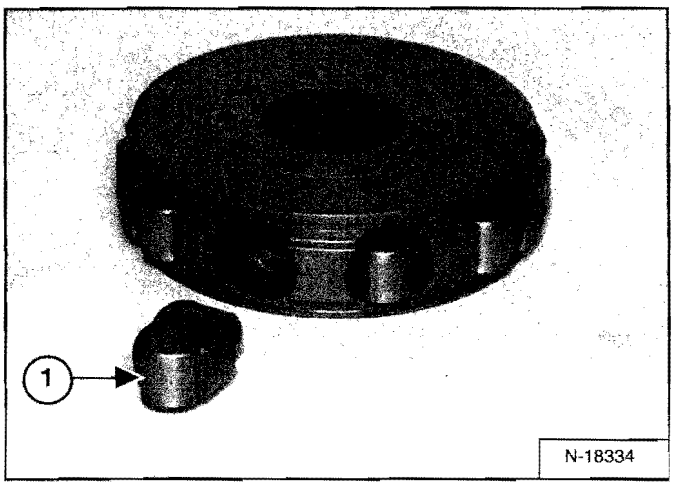


Remove the snap ring (Item 1) **[Figure 30-20-27]** & **[Figure 30-20-28]** from the rotating group.

Remove the retainer ring (Item 2) **[Figure 30-20-27]** & **[Figure 30-20-28]** from the rotating group.

Disassembly (Cont'd)

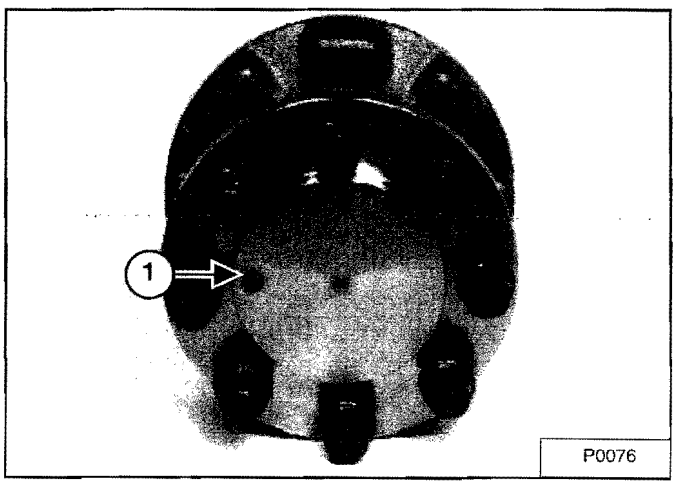
Figure 30-20-29



Use low air pressure to remove the roller/piston assembly (Item 1) **[Figure 30-20-29]** from the cylinder block.

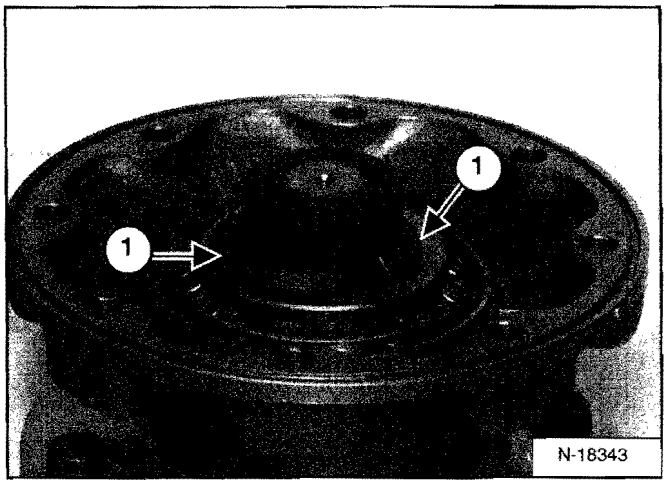
NOTE: Put all roller/piston assembles back in the original bore.

Figure 30-20-30



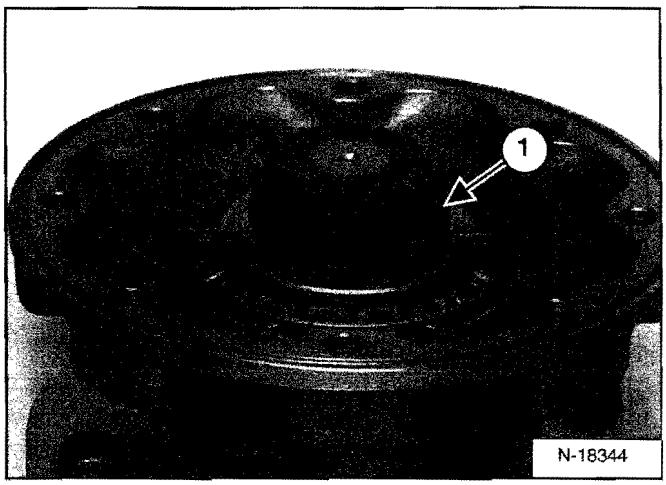
Remove the oil fill plug (Item 1) **[Figure 30-20-30]** from the housing to drain the oil from the bearing and face seal area.

Figure 30-20-31



With a hammer and punch remove the split ring **[Figure 30-20-31]**.

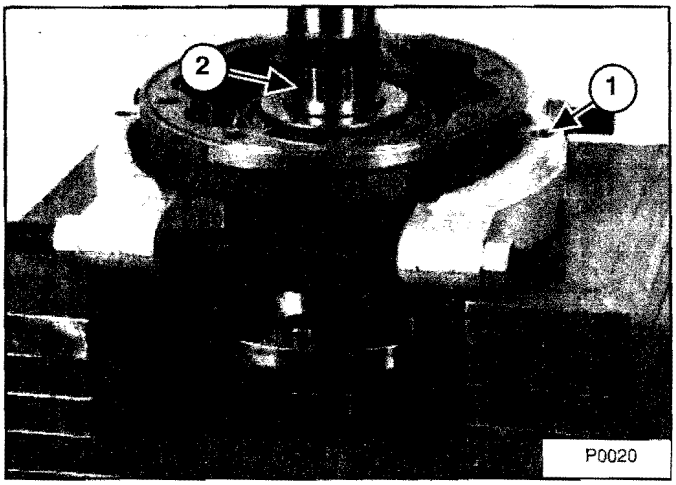
Figure 30-20-32



Remove the washer (Item 1) **[Figure 30-20-32]** from under the split ring.

Disassembly (Cont'd)

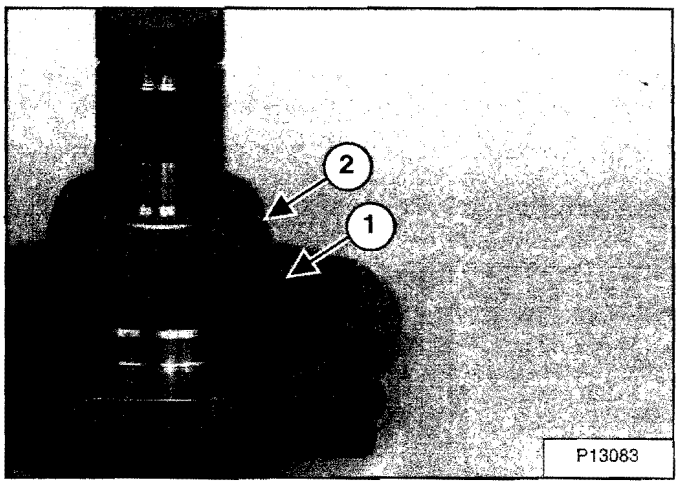
Figure 30-20-33



Install the bearing puller (Item 1) **[Figure 30-20-33]** under the front housing and support the puller and housing with blocks.

Press the shaft (Item 2) **[Figure 30-20-33]** from the housing.

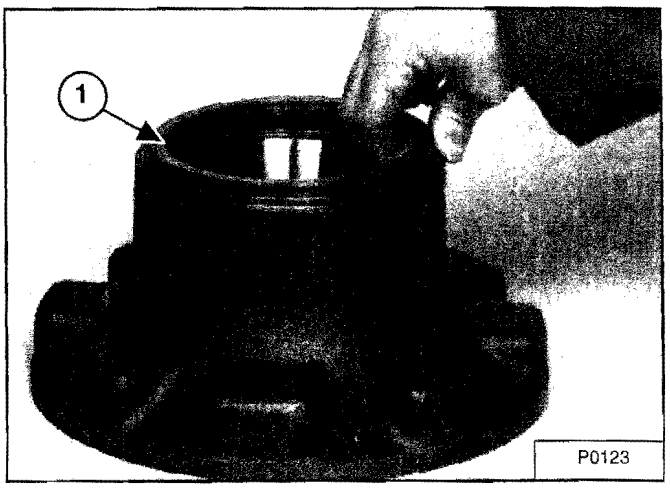
Figure 30-20-34



Remove the face seal (Item 1) **[Figure 30-20-34]** from the shaft.

Discard the face seal.

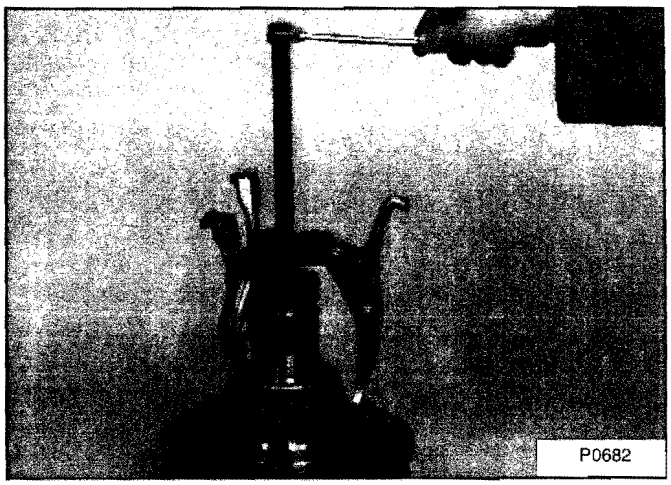
Figure 30-20-35



Remove the face seal (Item 1) **[Figure 30-20-35]** from the front housing.

Discard the face seal.

Figure 30-20-36

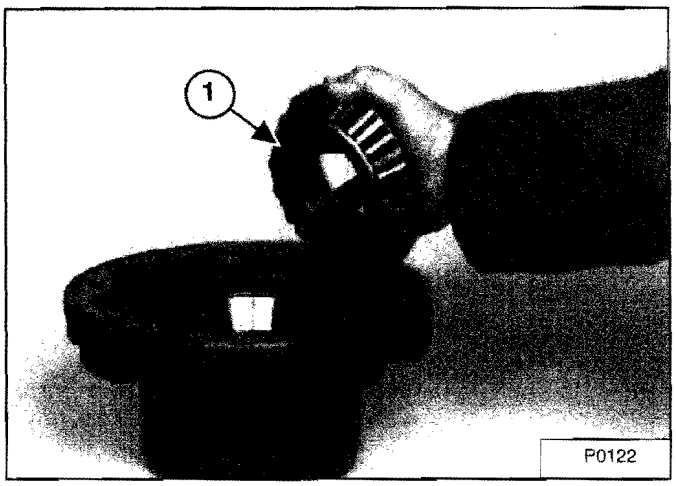


Use a bearing puller to remove the bearing from the shaft **[Figure 30-20-36]**.

NOTE: The bearing will be destroyed during the removal procedure. Be sure to have a new bearing on hand before removing the old bearing.

Disassembly (Cont'd)

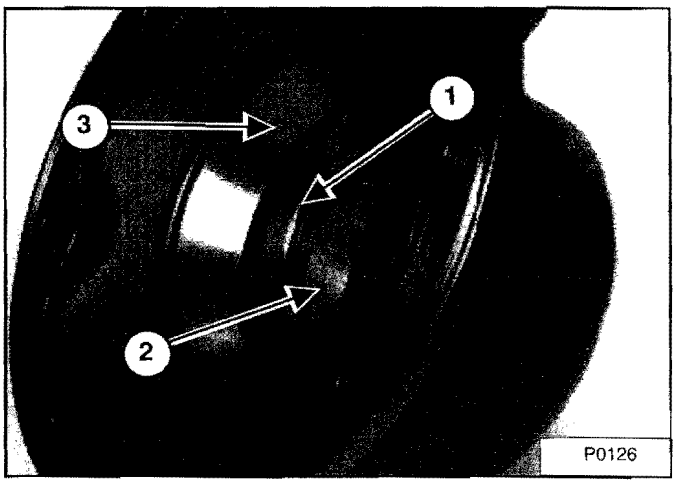
Figure 30-20-37



Remove and inspect the bearing (Item 1) **[Figure 30-20-37]** located in the front housing.

Replace the bearing if worn or damaged.

Figure 30-20-38



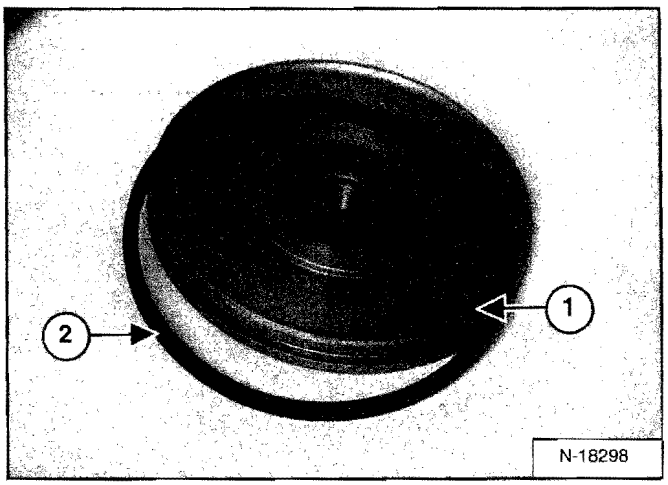
Remove the shaft seal (Item 1) **[Figure 30-20-38]**.

Replace the outer O-ring and inner shaft seal (Item 2) **[Figure 30-20-38]**.

Remove the bearing cup (Item 3) **[Figure 30-20-38]** if it needs replacement.

Inspection

Figure 30-20-39

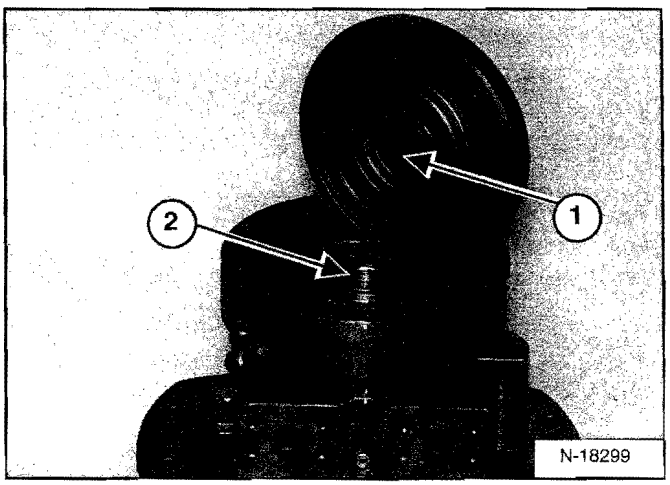


Clean all parts in clean solvent and use air pressure to dry them. Do Not use cloth or paper because small pieces of material can get into the system and cause damage.

Before the motor is assembled, check the following items:

Check the brake piston (Item 1) **[Figure 30-20-39]** and seal (Item 2) **[Figure 30-20-39]** and replace as needed.

Figure 30-20-40

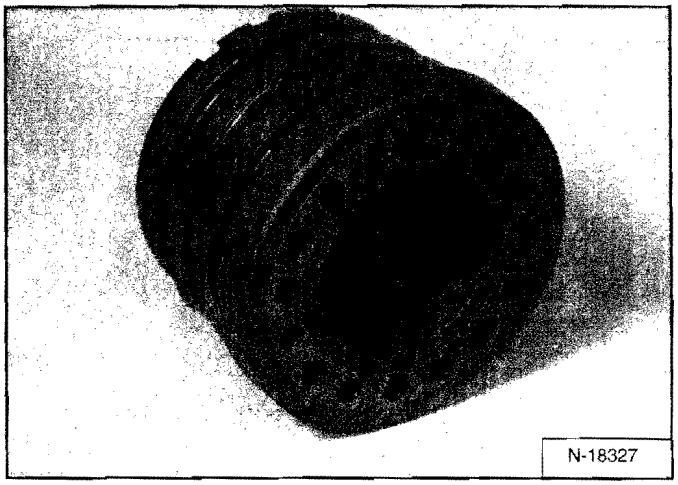


Check the piston surface (Item 1) and the bushing surface (Item 2) **[Figure 30-20-40]** in the brake shaft.

NOTE: The bushing (Item 2) [Figure 30-20-40] can be replaced in the brake shaft.

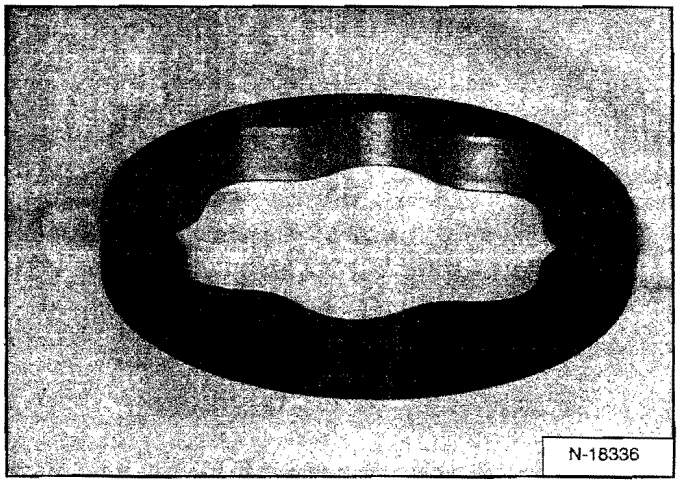
Inspection (Cont'd)

Figure 30-20-41



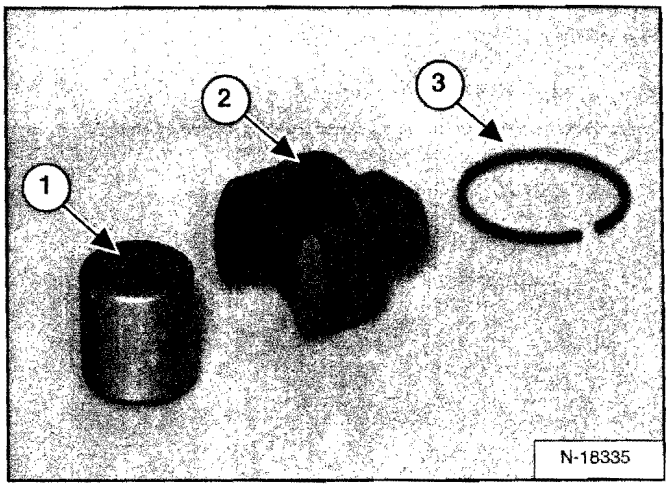
Check the distributor surfaces for scratches **[Figure 30-20-41]**.

Figure 30-20-42



Check the cam ring inside surface for wear and scratches **[Figure 30-20-42]**.

Figure 30-20-43

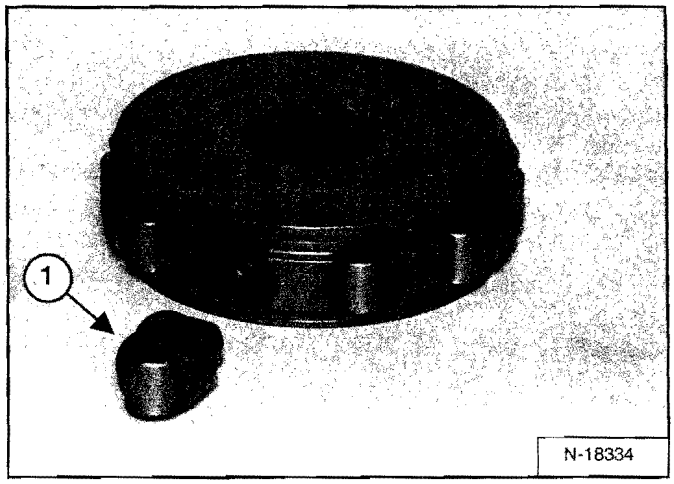


Check all rollers (Item 1), pistons (Item 2) and piston rings (Item 3) **[Figure 30-20-43]** for wear and replace as needed.

NOTE: Put all roller/piston assembly back in their original position.

Assembly

Figure 30-20-44



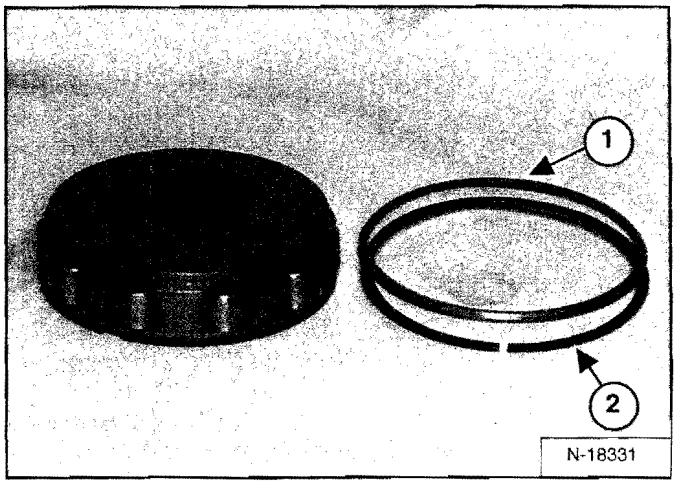
NOTE: Always use new O-rings and seals when assembling the motor and brake assemblies.

Dip the roller/piston assembly (Item 1) **[Figure 30-20-44]** in oil and replace back its original bore.

Repeat procedure for each roller/piston assembly.

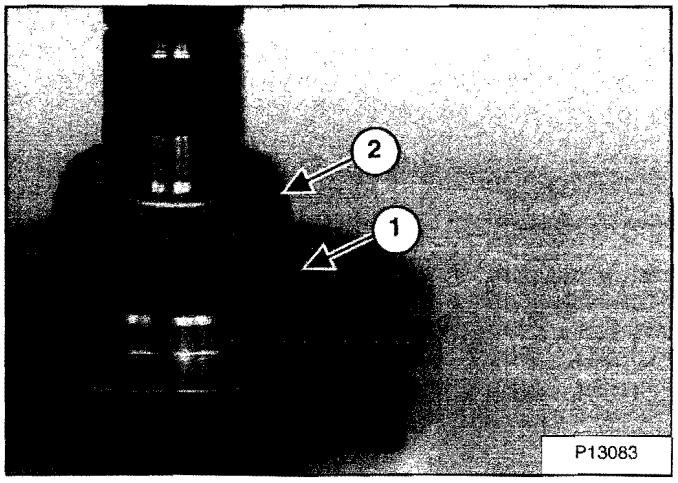
Assembly (Cont'd)

Figure 30-20-45



Install the retainer ring (Item 1) and snap ring (Item 2) **[Figure 30-20-45]** on the cylinder block (both sides).

Figure 30-20-46

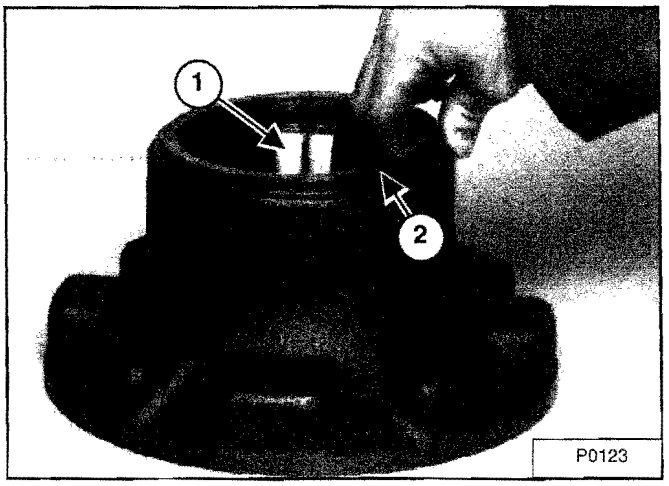


Replace the face seal (Item 1)**[Figure 30-20-46]** on the shaft.

NOTE: When installing face seals, apply a layer of good quality lithium grease to the mating surfaces of the face seal.

Install a new bearing (Item 2) **[Figure 30-20-46]** onto the shaft.

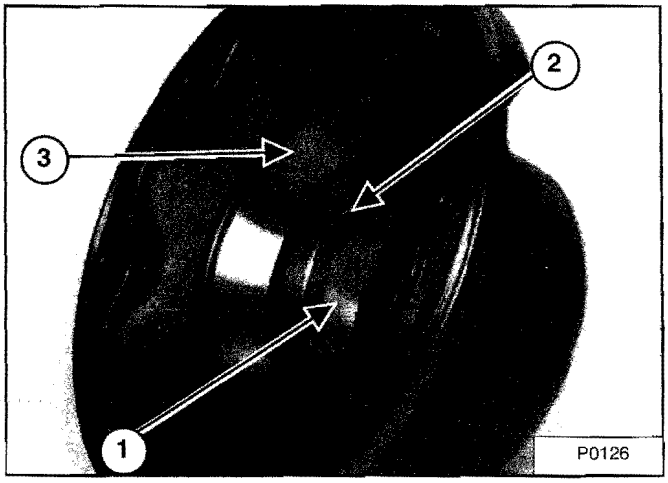
Figure 30-20-47



Replace the bearing cup (Item 1) **[Figure 30-20-47]**.

Replace the face seal (Item 2) **[Figure 30-20-47]** in the front housing.

Figure 30-20-48

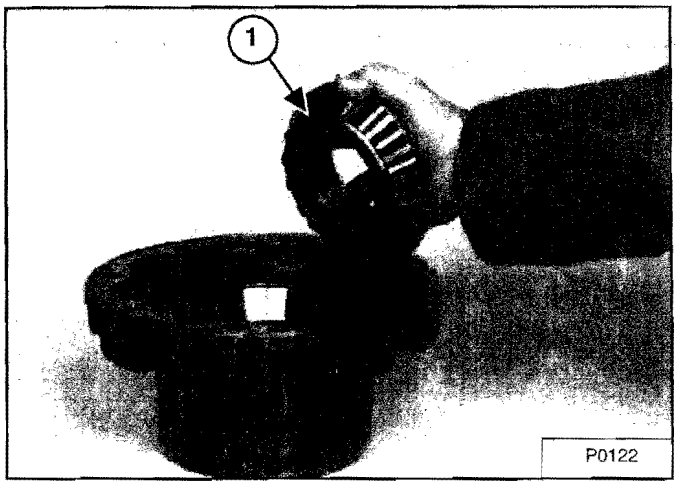


Replace the inner shaft seal (Item 1) and the outer shaft seal (Item 2) **[Figure 30-20-48]**.

Replace the bearing cup (Item 3) **[Figure 30-20-48]**.

Assembly (Cont'd)

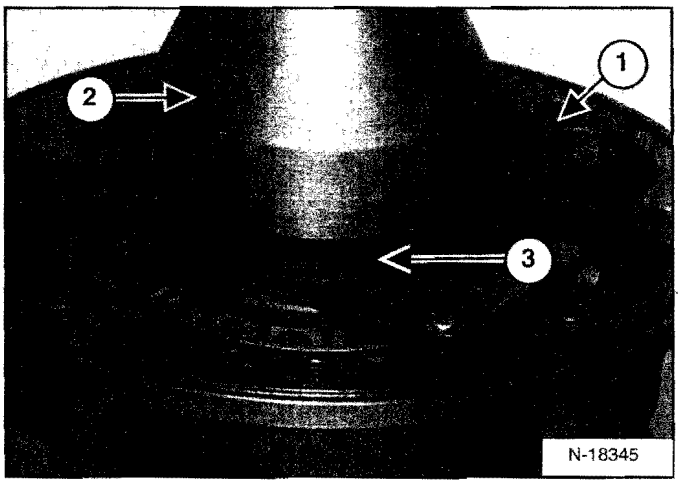
Figure 30-20-49



Install a new bearing (Item 1) **[Figure 30-20-49]** into the front housing.

Place the shaft on a hydraulic press table.

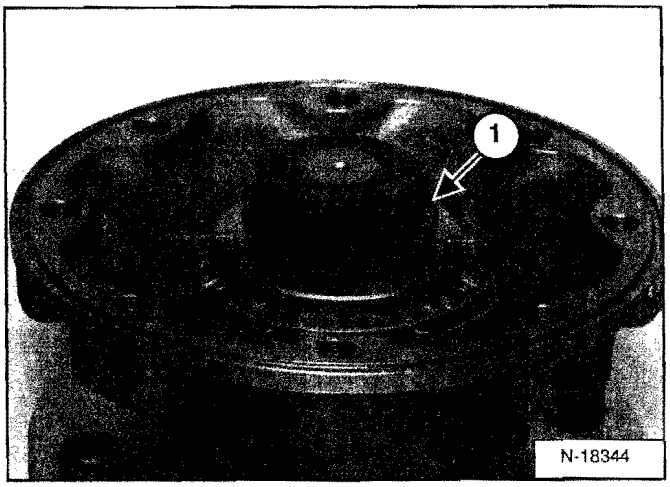
Figure 30-20-50



Install the front housing (Item 1) and bearing over the shaft. Install the special tool (MEL1562) (Item 2) **[Figure 30-20-50]** over the bearing and press the bearing onto the shaft. Apply 9000 lbs. of pressure to set the bearing. Rotate the housing to check for free travel.

Install the split ring (Item 3) **[Figure 30-20-50]** with a feeler gauge measure the distance between the split ring and the top of the bearing inner race.

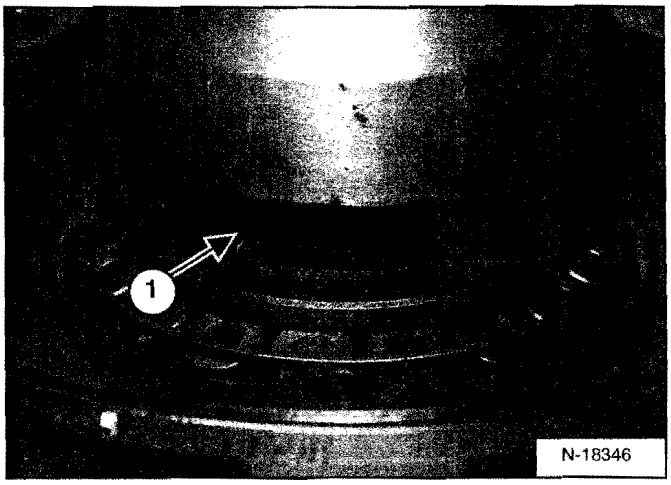
Figure 30-20-51



Release the pressure from the bearing. Remove the tool from the bearing.

Add one pre-load washer (Item 1) **[Figure 30-20-51]** that is closest to the measurement between the bearing race and split ring.

Figure 30-20-52

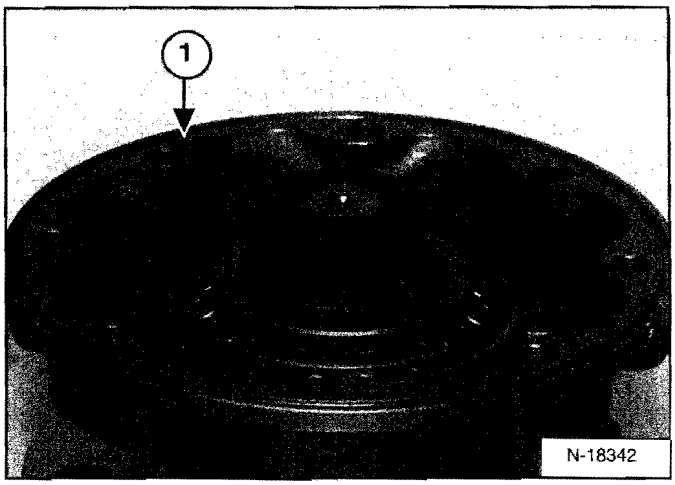


Install the tool and press the bearing to 9000 lbs. pressure.

Install the split rings (Item 1) **[Figure 30-20-52]**.

Assembly (Cont'd)

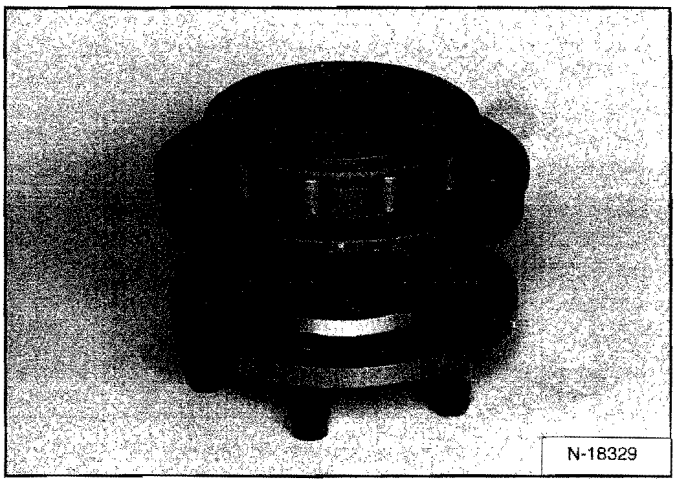
Figure 30-20-53



Remove from press.

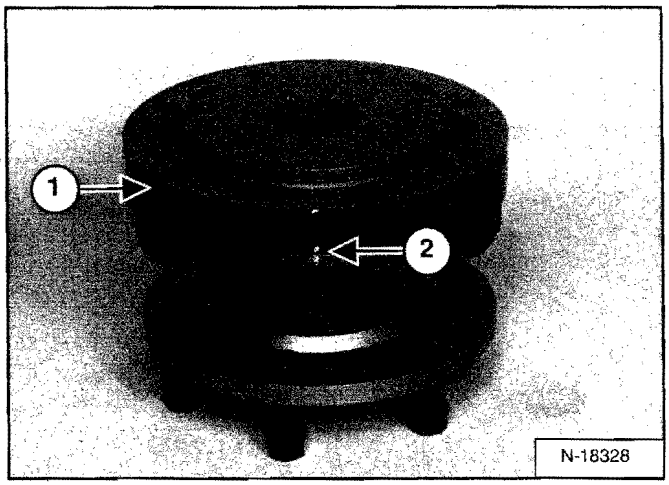
Install a new O-ring on the front housing assembly (Item 1) **[Figure 30-20-53]** and lightly smear with grease.

Figure 30-20-54



Install the cylinder block on the front housing **[Figure 30-20-54]**.

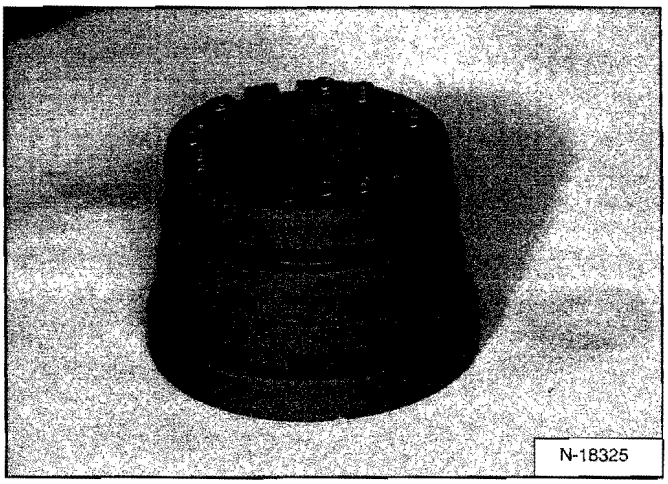
Figure 30-20-55



Install the cam ring (Item 1) **[Figure 30-20-55]** on the front housing.

Align the marks (Item 2) **[Figure 30-20-55]** on the cam ring to the front housing.

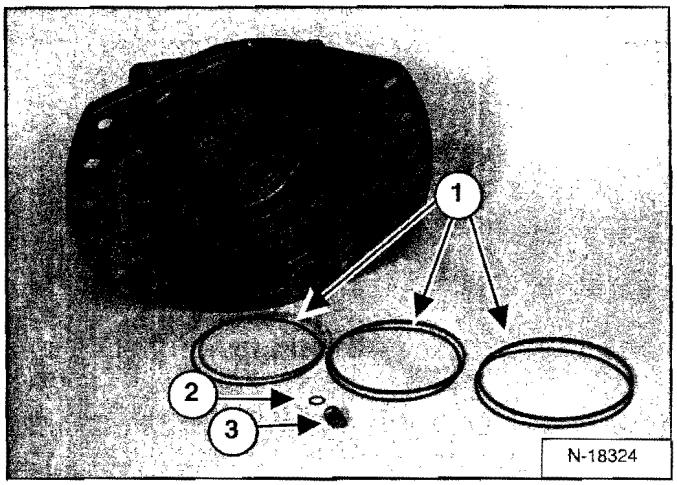
Figure 30-20-56



Using a small amount of grease, install the twelve springs into the distributor valve **[Figure 30-20-56]**.

Assembly (Cont'd)

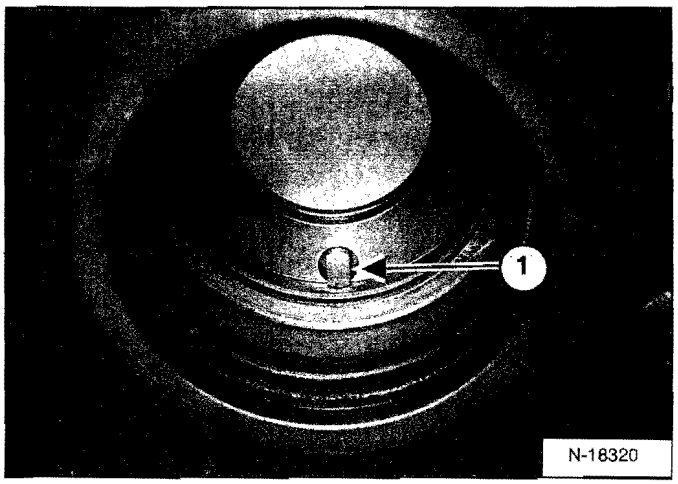
Figure 30-20-57



Install new O-rings and new seals (Item 1) **[Figure 30-20-57]** into the rear housing.

Install a new O-ring (Item 2) onto the stop pin (Item 3) **[Figure 30-20-57]**.

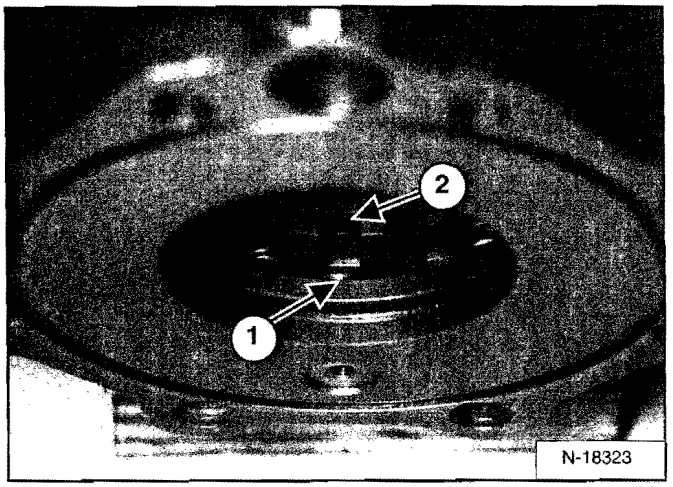
Figure 30-20-58



Lightly smear grease over seals and O-rings.

Install the stop pin (Item 1) **[Figure 30-20-58]** into the rear housing.

Figure 30-20-59

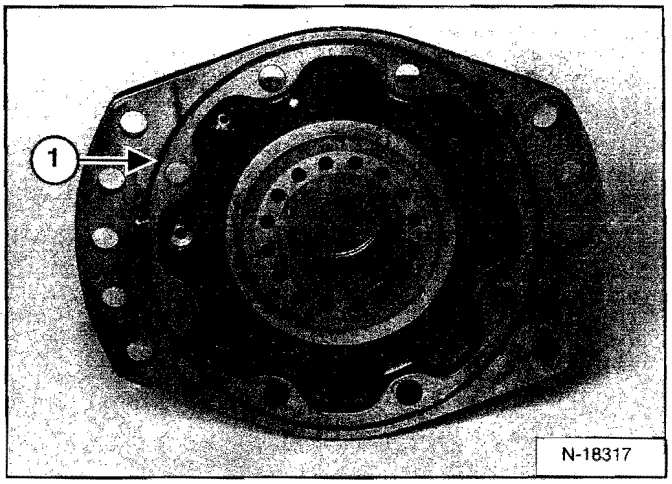


Install the distributor into the rear housing.

Align the stop pin (Item 1) with the notch in the distributor marked L (Item 2) **[Figure 30-20-59]**.

When the distributor is aligned correctly, the distributor can be depressed slightly.

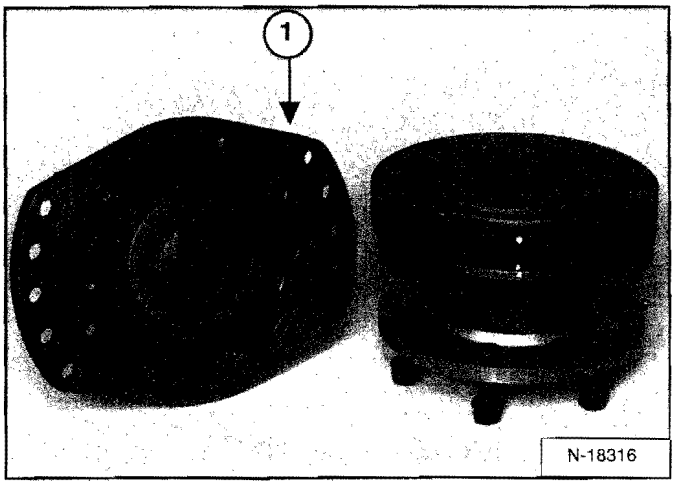
Figure 30-20-60



Install a new O-ring (Item 1) **[Figure 30-20-60]** on the rear housing and lightly smear with grease.

Assembly (Cont'd)

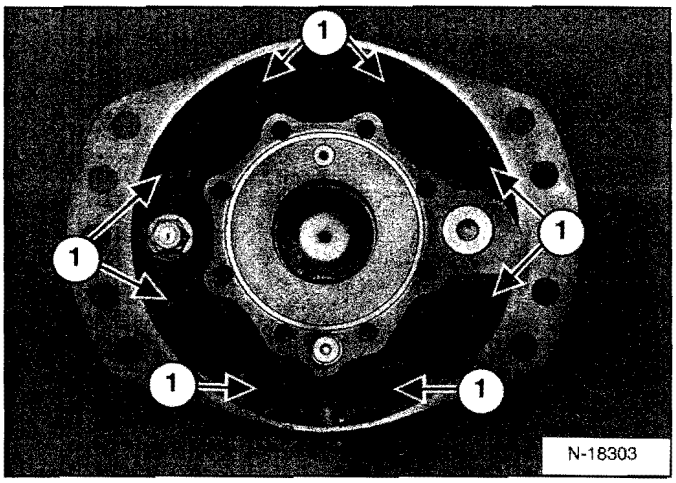
Figure 30-20-61



Install the rear housing (Item 1) **[Figure 30-20-61]** on the cam ring/front housing assembly.

Align the marks.

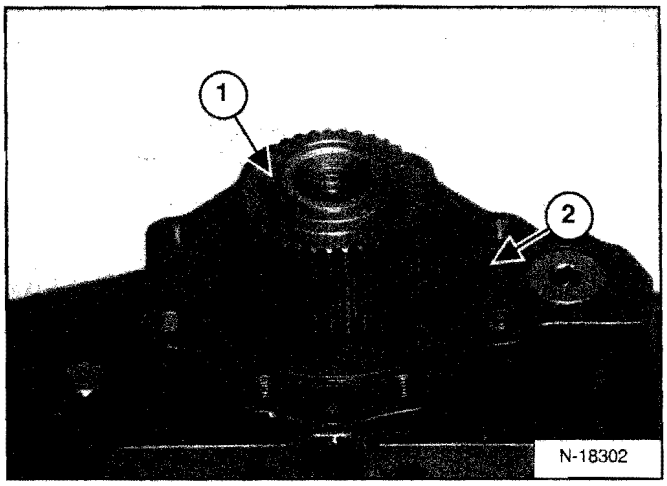
Figure 30-20-62



Use LOCTITE #243 on the threads and install the eight mounting bolts (Item 1) **[Figure 30-20-62]**.

Tighten the bolts to 208-221 ft.-lbs. (282-300 Nm) torque.

Figure 30-20-63

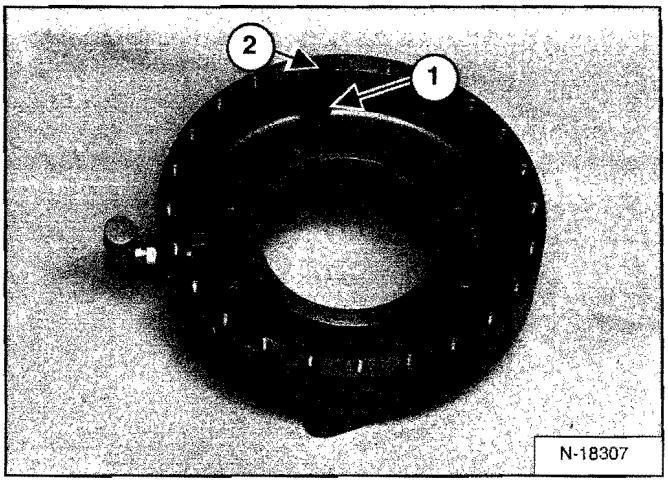


Install the brake shaft (Item 1) **[Figure 30-20-63]** through the rear housing into the cylinder block.

NOTE: Be sure shaft seats fully into the cylinder block.

Install a new O-ring on the rear housing (Item 2) **[Figure 30-20-63]** and lightly coat with greases.

Figure 30-20-64



Install new washers (Item 1) on the brake housing mount bolts (Item 2) **[Figure 30-20-64]**.

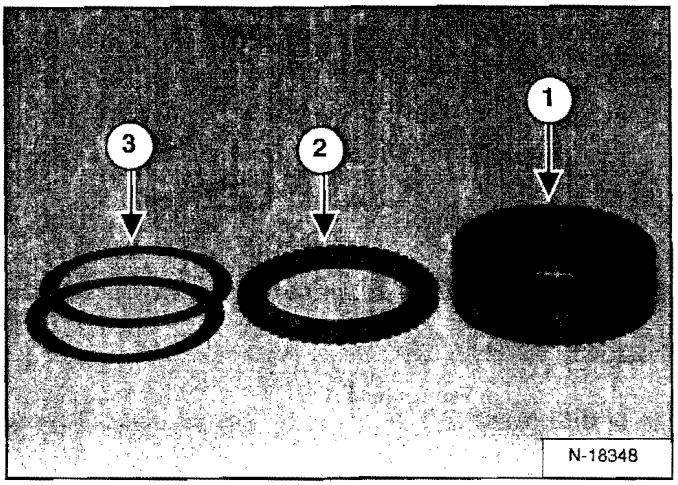
Install the brake housing on the rear housing assembly.

Align the reference marks. Apply LOCTITE #243 to bolts and install bolts and washers into the rear case. Start each bolt by hand, tighten opposite bolts to maintain squareness.

Tighten bolts to 86-90 ft.-lbs. (117-122 Nm) torque.

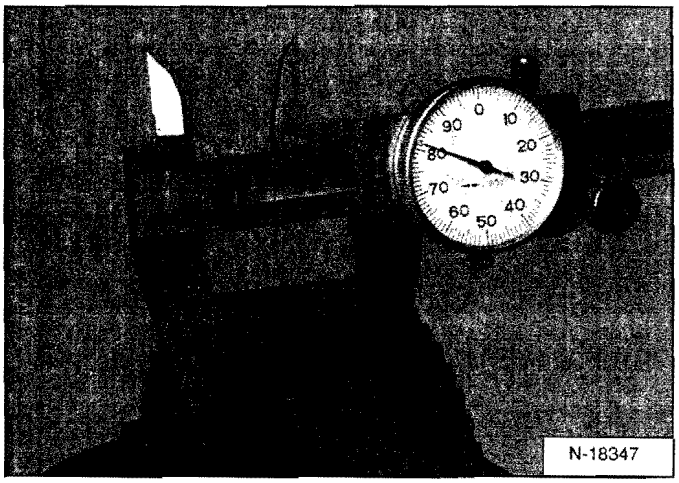
Assembly (Cont'd)

Figure 30-20-65



Assemble the brake discs into a pack making sure the inner discs, alternate with the outer disc and an outer disc is placed at each end of the disc pack (Item 1) **[Figure 30-20-65]**.

Figure 30-20-66

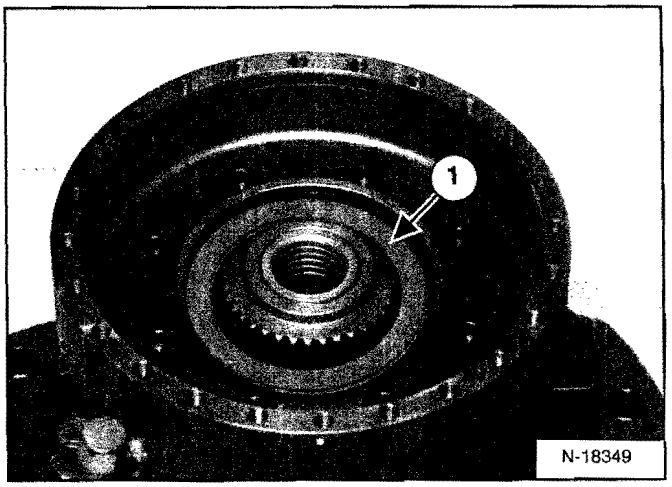


Clamp the disc pack in a vise and check the disc pack height **[Figure 30-20-66]**.

The correct disc pack specifications is 1.48 + 0.002 in. (37,7 + 0,05 mm).

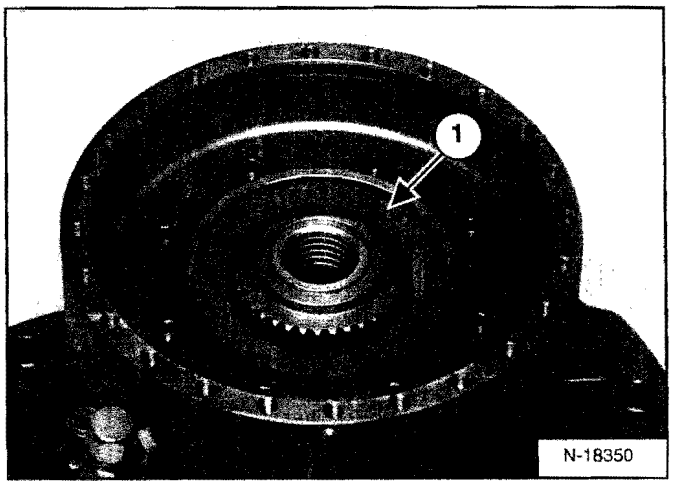
Extra outer disc's (Item 2) are used to reduce the number of required shims (Item 3) **[Figure 30-20-65]** to make up the required thickness for the brake pack.

Figure 30-20-67



Install the needed amount of shims (Item 1) **[Figure 30-20-67]**.

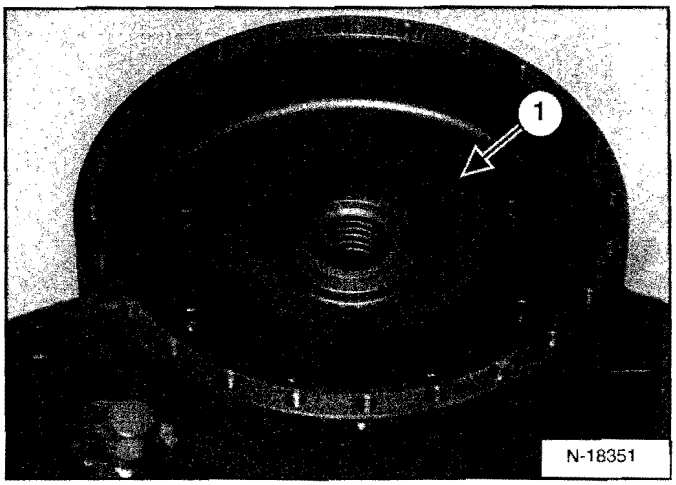
Figure 30-20-68



Install the needed amount of outer discs (Item 1) **[Figure 30-20-68]** to act as shims.

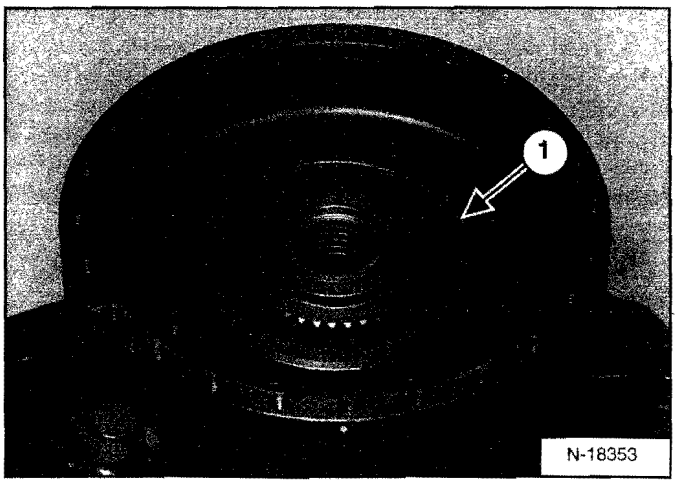
Assembly (Cont'd)

Figure 30-20-69



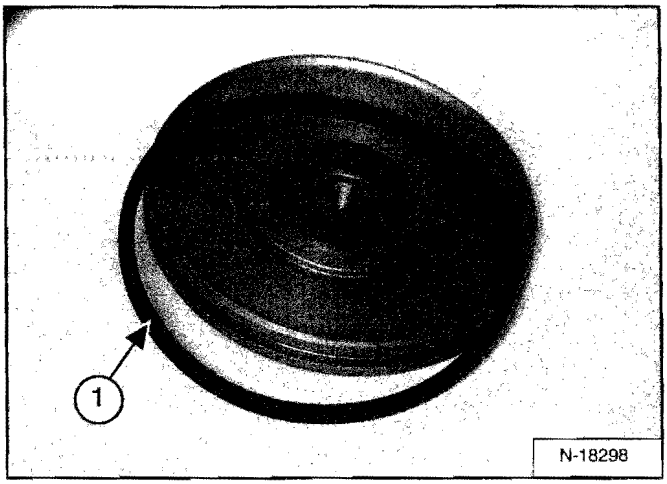
Install the disc pack (Item 1) **[Figure 30-20-69]** starting with an outer and alternating every other disc with an inner disc.

Figure 30-20-70



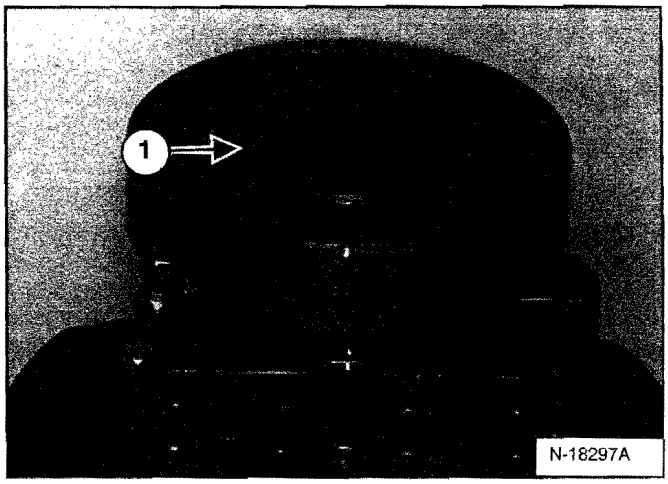
Install a new piston inner seal (Item 1) **[Figure 30-20-70]**.

Figure 30-20-71



Install a new piston seal (Item 1) **[Figure 30-20-71]** on the piston.

Figure 30-20-72

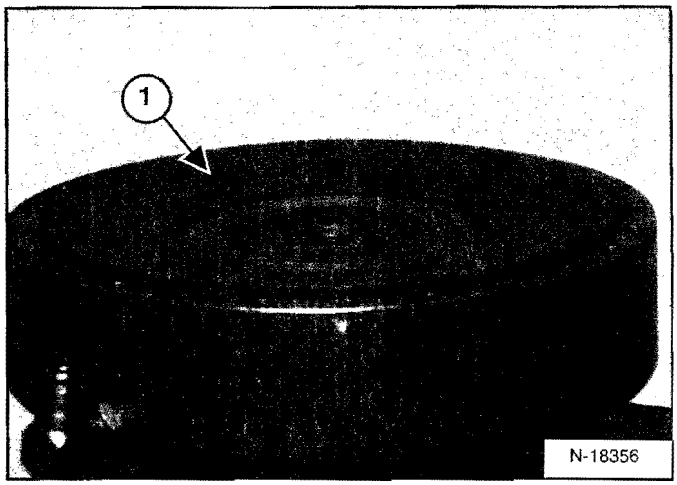


Put a slight amount of grease on the piston seal.

Install the piston (Item 1) **[Figure 30-20-72]** in the brake housing.

Assembly (Cont'd)

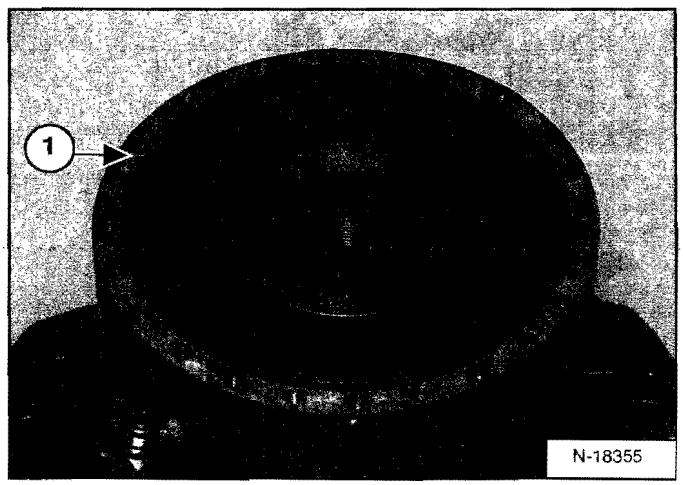
Figure 30-20-73



Put multi-purpose moly grease on the surface of the disc spring where it contacts the piston.

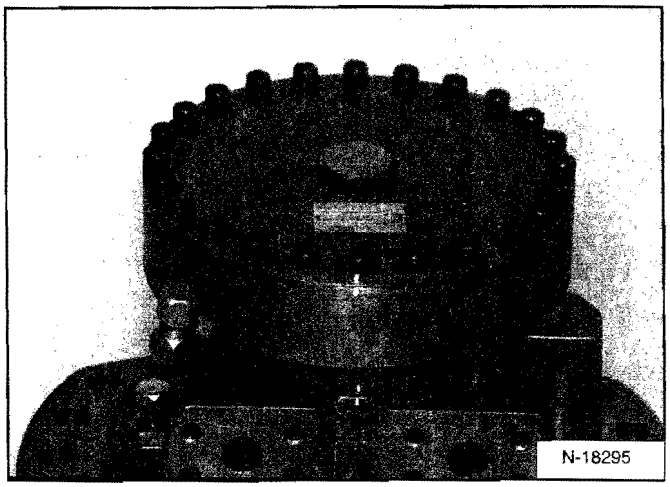
Install the disc spring (Item 1) **[Figure 30-20-73]** on the top of the piston as shown.

Figure 30-20-74



Install a new gasket (Item 1)**[Figure 30-20-74]**.

Figure 30-20-75



Align the marks on the end cover and install on the brake housing **[Figure 30-20-75]**.

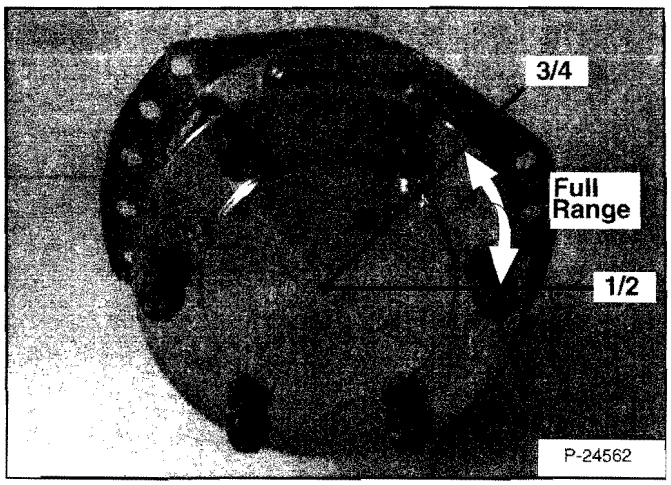
Install the socket head bolts into the end cover and finger tighten only.

NOTE: Tighten the bolts alternately one turn at a time until the end cover is fully seated.

Tighten the bolts to 10-12 ft.-lbs. (14-16 Nm) torque.

Filling

Figure 30-20-76



Fill housing with synthetic Mobilgear SHC XMP 150, fill with plug in fill range **[Figure 30-20-76]** 1/2 to 3/4 full.

Bobcat®

HYDROSTATIC MOTOR (SELECTABLE JOYSTICK CONTROL) (SJC)

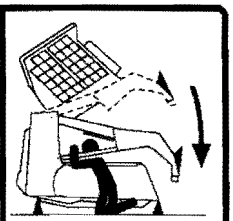
Removal And Installation

Place the loader on jackstands. (See Contents Page 10-01.)

⚠ 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

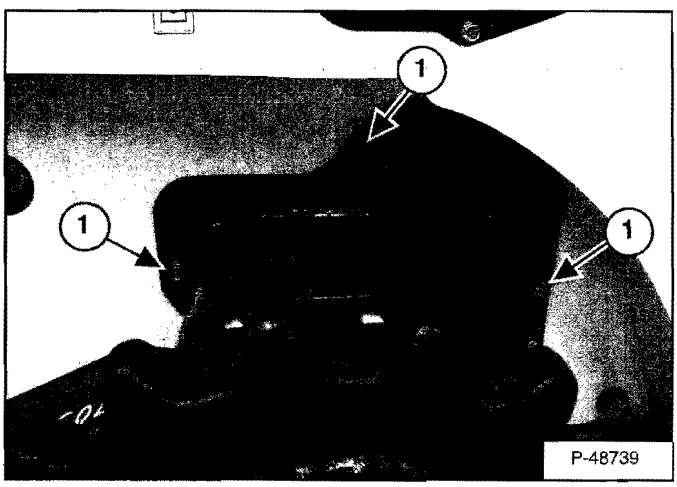
Never work on a machine with the lift arms up unless the lift arms are secured by an approved lift arm support device. Failure to use an approved lift arm support device can allow the lift arms or attachment to fall and cause injury or death.

W-2059-0598

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

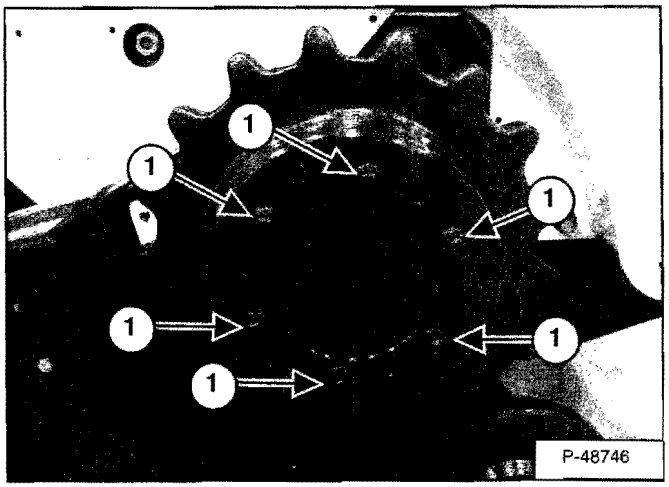
Remove the track. (See Contents Page 40-01.)

Figure 30-21-1



Remove the three mounting bolts (Item 1) **[Figure 30-21-1]** from the access cover and remove the cover from the loader.

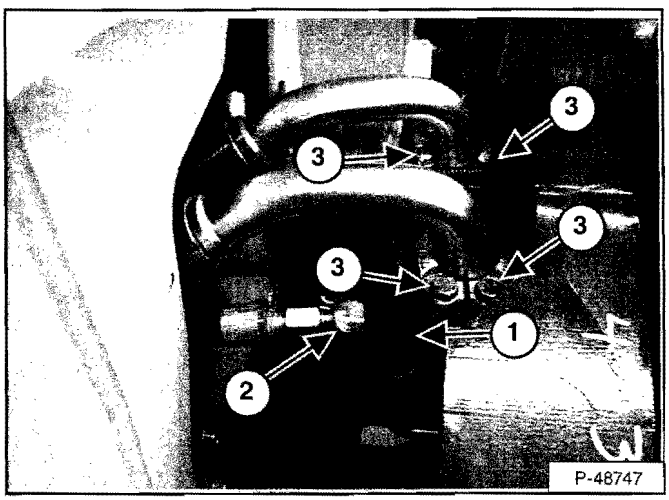
Figure 30-21-2



Loosen the six mounting bolts (Item 1) **[Figure 30-21-2]** and remove the drive sprocket from the motor.

Installation: Tighten the mount bolts to 190-215 ft.-lbs. (260-290 Nm) torque.

Figure 30-21-3



Remove the case drain hydraulic hose (Item 1) **[Figure 30-21-3]** from the motor.

Remove the hydraulic brake hose (Item 2) **[Figure 30-21-3]** from the motor.

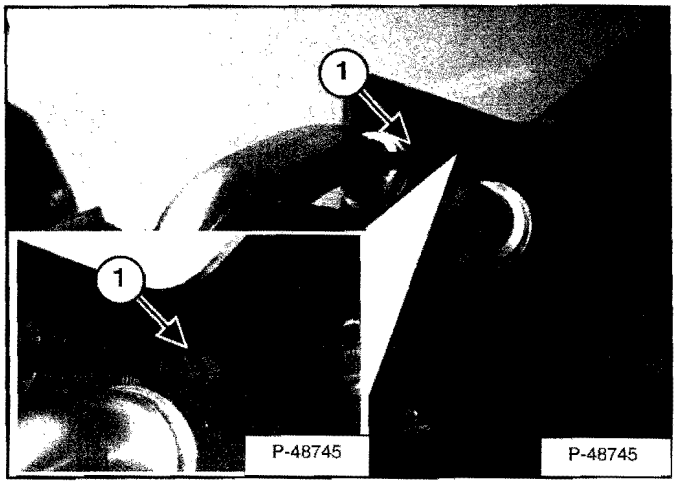
Remove the eight flange bolts (Item 3) **[Figure 30-21-3]** from the main drive hoses. Remove the flanges and drive hoses.

Installation: Tighten the flange bolts to 35-40 ft.-lbs. (48-54 Nm) torque.

Cap and plug all hydraulic lines and hoses.

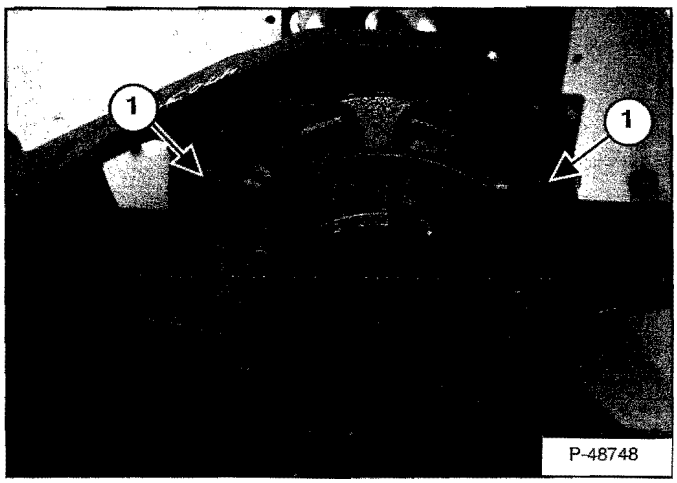
Removal And Installation (Cont'd)

Figure 30-21-4



Remove the zip ties from the speed sensor wiring harness and disconnect the speed sensor harness (Item 1) **[Figure 30-21-4]** from the loader harness.

Figure 30-21-5



With an arm hoist support the hydrostatic motor.

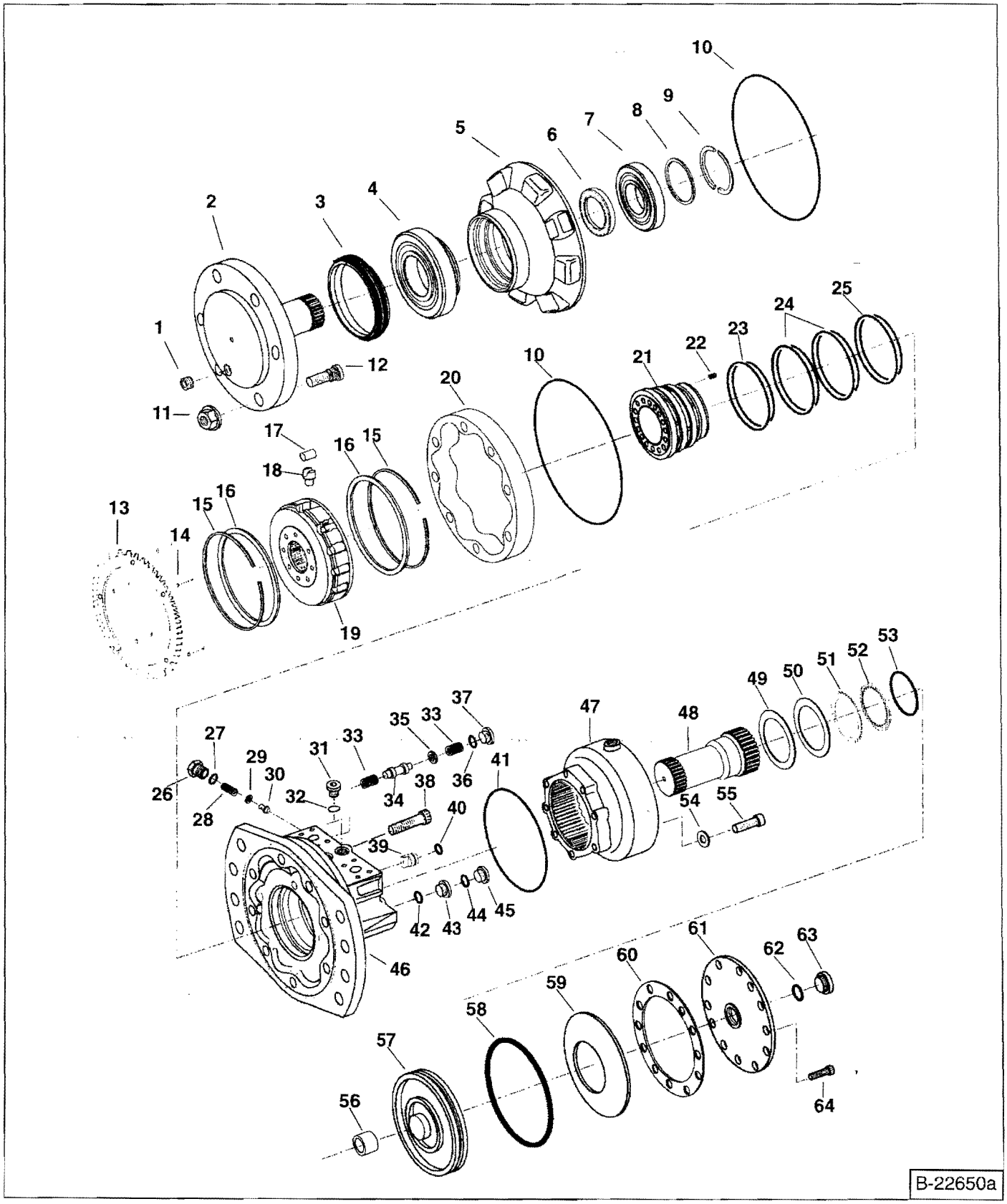
Remove the ten hydraulic motor mounting bolts (Item 1) **[Figure 30-21-5]**.

Installation: Tighten the motor mounting bolts to 190 ft.-lbs. (257,6 Nm) torque.

Remove the hydrostatic motor from the loader.


Bobcat®

Parts Identification

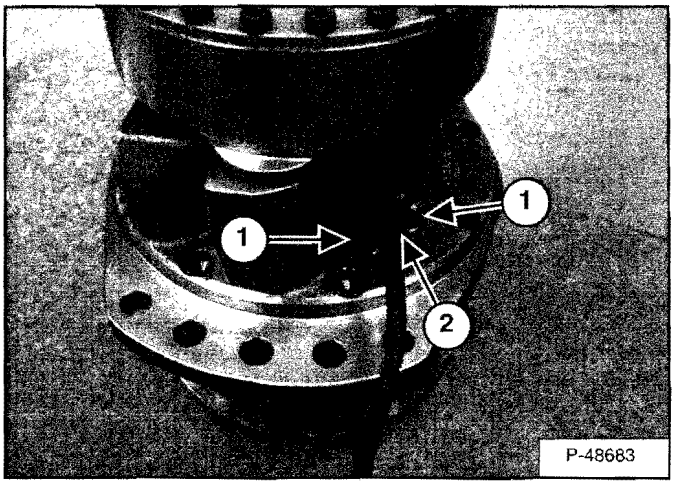


Parts Identification (Cont'd)

Ref.	Description
1.	PLUG
2.	SHAFT
3.	SEAL
4.	BEARING
5.	HOUSING / FRONT
6.	SEAL
7.	BEARING
8.	WASHER
9.	RINGS
10.	O-RING
11.	NUT
12.	STUD
13.	RPM TARGET DISK
14.	ROLL PIN
15.	SNAP RING
16.	RETAINER
17.	ROLLER
18.	PISTON
19.	BLOCK
20.	CAM
21.	DISTRIBUTOR
22.	SPRING
23.	SEAL W / O-RING
24.	SEAL W / O-RING
25.	SEAL W / O-RING
26.	PLUG
27.	O-RING
28.	SPRING
29.	SHIM
30.	POPPET
31.	PLUG
32.	O-RING
33.	SPRING
34.	SPOOL
35.	WASHER
36.	O-RING
37.	PLUG
38.	BOLT
39.	PIN
40.	O-RING
41.	O-RING
42.	O-RING
43.	PLUG
44.	O-RING
45.	PLUG
46.	HOUSING / REAR
47.	HOUSING / BRAKE
48.	SHAFT
49.	SHIM
50.	SHIM
51.	DISC / OUTER
52.	DISC / INNER
53.	SEAL
54.	WASHER
55.	BOLT
56.	BUSHING
57.	PISTON
58.	SEAL
59.	WASHER
60.	GASKET
61.	COVER
62.	O-RING
63.	PLUG
64.	BOLT

Disassembly

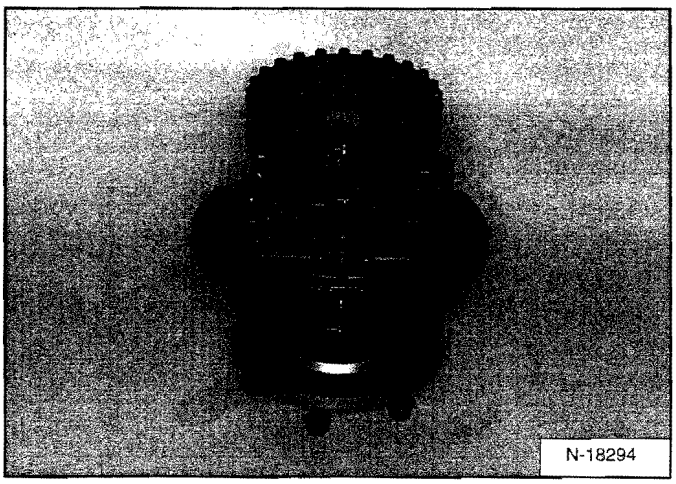
Figure 30-21-6



NOTE: Mark the RPM speed sensor for the proper installation.

Remove the two speed sensor mount bolts (Item 1) and remove the speed sensor (Item 2) **[Figure 30-21-6]** from the drive motor.

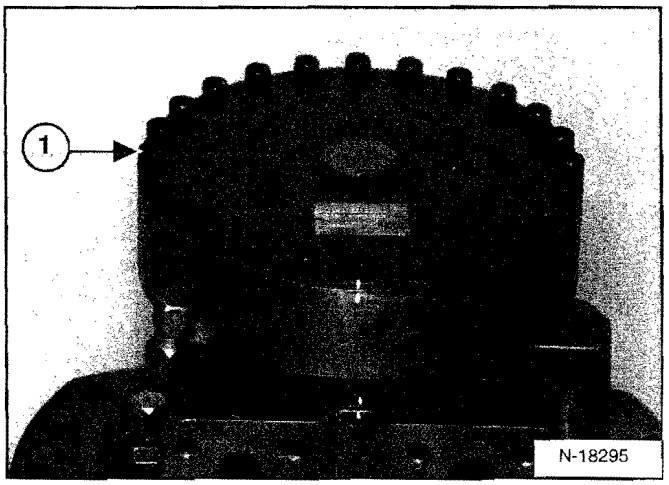
Figure 30-21-7



NOTE: Mark the motor, brake and motor carrier housings for proper alignment for ease of assembly [Figure 30-21-7].

Drain the oil from the motor casing.

Figure 30-21-8

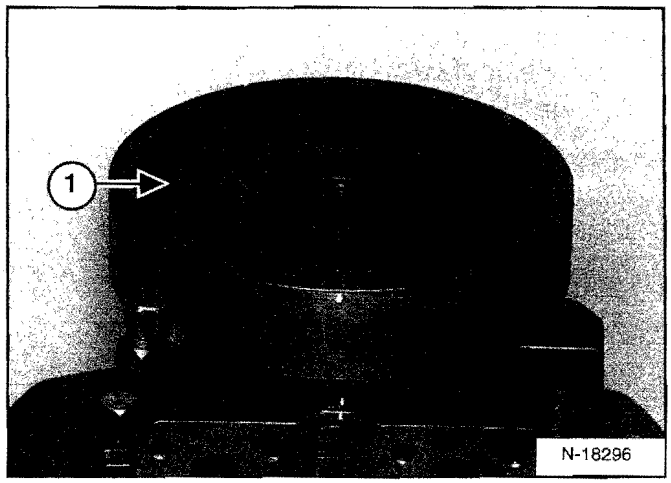


Remove the twenty four mounting bolts (Item 1) **[Figure 30-21-8]** from the brake cover plate.

NOTE: Unscrew the bolts alternately, one turn at a time to release the preload on the end cap.

Remove the cover plate and gasket from the brake housing.

Figure 30-21-9

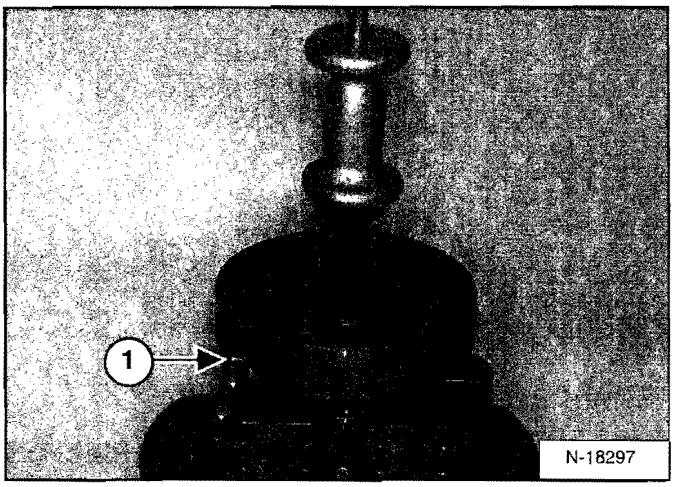


Remove the disk spring (Item 1) **[Figure 30-21-9]** from the brake housing.

NOTE: Mark the top side of the disk spring for proper installation.

Disassembly (Cont'd)

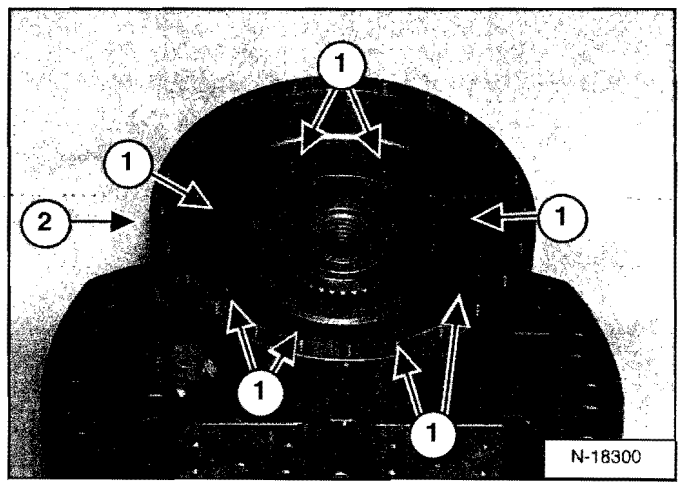
Figure 30-21-10



Remove the piston from the brake housing **[Figure 30-21-10]**.

NOTE: The use of air pressure through the brake line connection (Item 1) [Figure 30-21-10] will aid in piston removal.

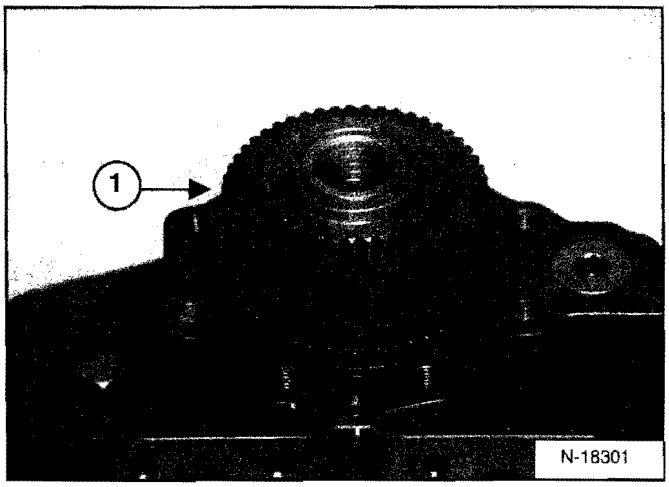
Figure 30-21-11



Remove the eight mounting bolts (Item 1) **[Figure 30-21-11]** and washers from the brake housing.

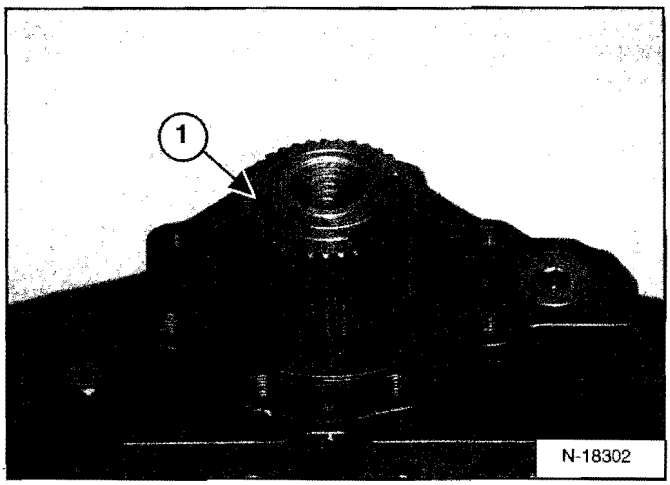
Remove the brake housing (Item 2) **[Figure 30-21-11]** from the rear housing.

Figure 30-21-12



Remove the brake disks (Item 1) **[Figure 30-21-12]** and shims from the brake shaft.

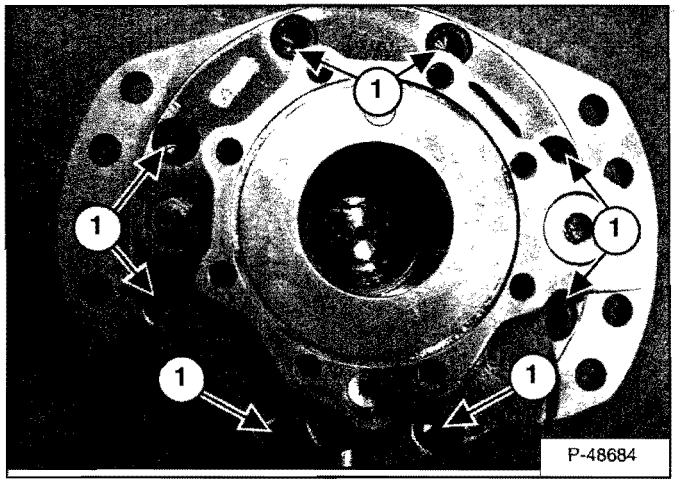
Figure 30-21-13



Remove the brake shaft (Item 1) **[Figure 30-21-13]** from the rear housing.

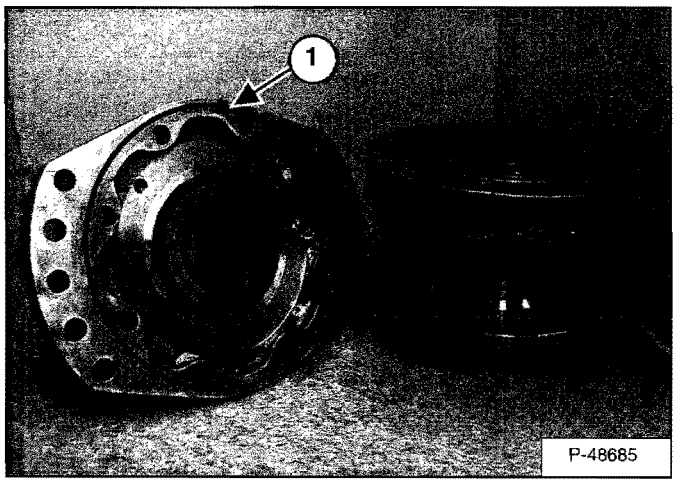
Disassembly (Cont'd)

Figure 30-21-14



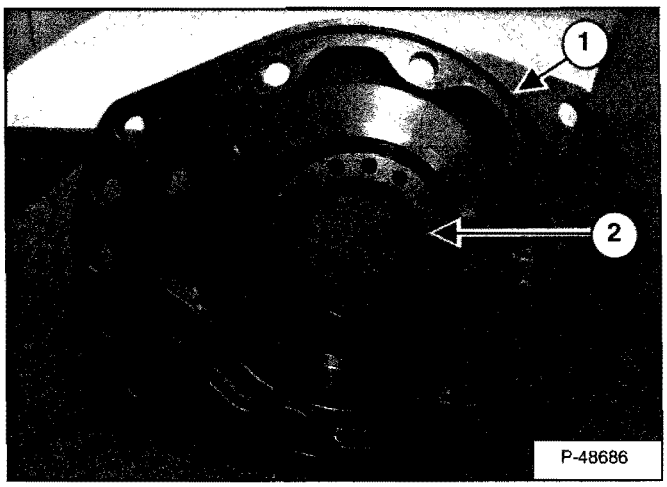
Remove the eight mounting bolts (Item 1) **[Figure 30-21-14]** from the rear housing.

Figure 30-21-15



Remove the rear housing assembly (Item 1) **[Figure 30-21-15]** from the rotating group/front housing assembly.

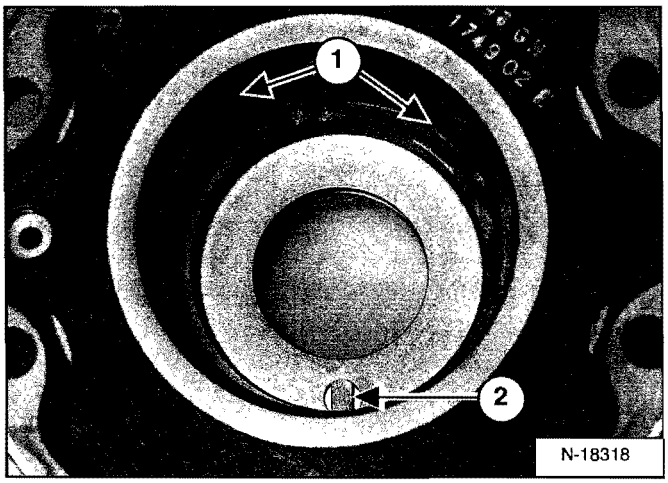
Figure 30-21-16



Remove the O-ring (Item 1) **[Figure 30-21-16]**.

Remove the distributor (Item 2) **[Figure 30-21-16]** from the rear housing.

Figure 30-21-17

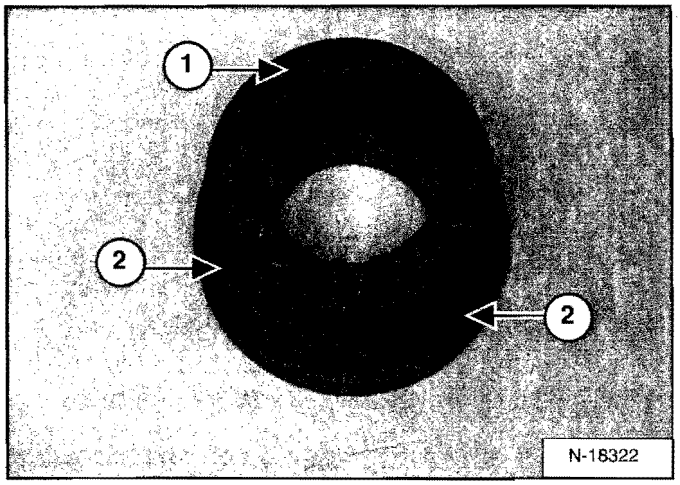


Remove the two seals and back-up O-rings (Item 1) **[Figure 30-21-17]** under the seals, from the rear housing.

Remove the stop pin (Item 2) **[Figure 30-21-17]**.

Disassembly (Cont'd)

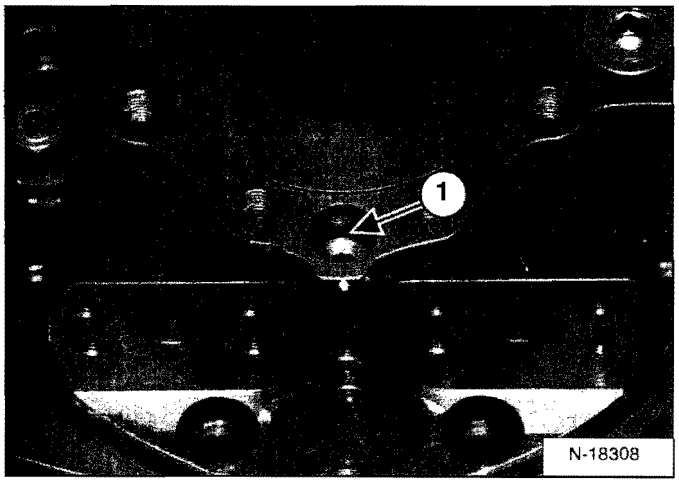
Figure 30-21-18



Remove the twelve springs from the distributor (Item 1) **[Figure 30-21-18]**.

Remove the two seals and back-up O-rings (Item 2) **[Figure 30-21-18]** under the seals, from the distributor.

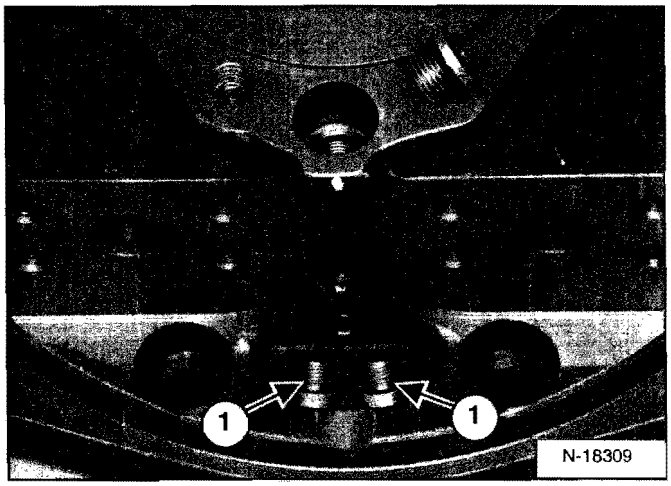
Figure 30-21-19



Remove the plug (Item 1) **[Figure 30-21-19]** from the rear housing assembly.

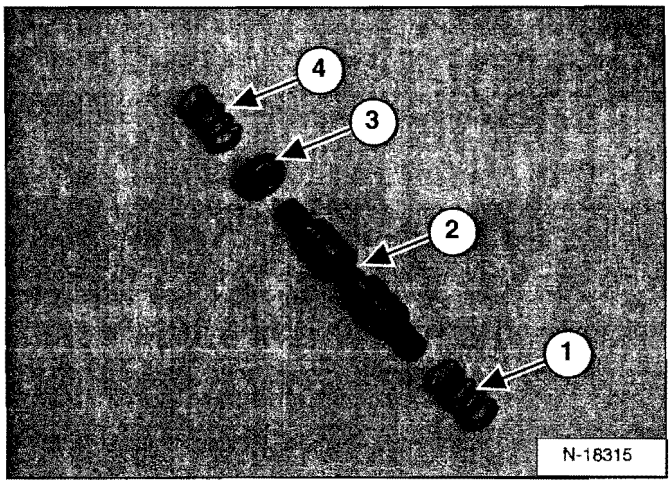
Remove the spring (Item 1), spool (Item 2), and washer (Item 3) and rear spring (Item 4) **[Figure 30-21-21]**.

Figure 30-21-20



Remove the plugs (Item 1) **[Figure 30-21-20]** from the rear housing assembly to check alignment of springs, washer and spool when reassembling.

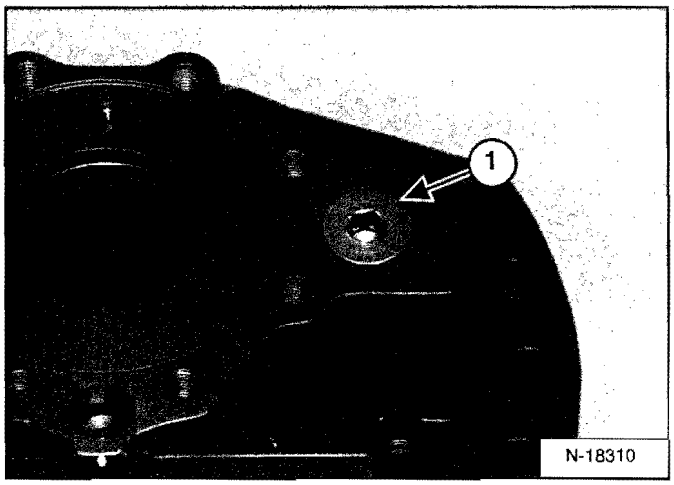
Figure 30-21-21



Inspect all parts and replace as needed **[Figure 30-21-21]**.

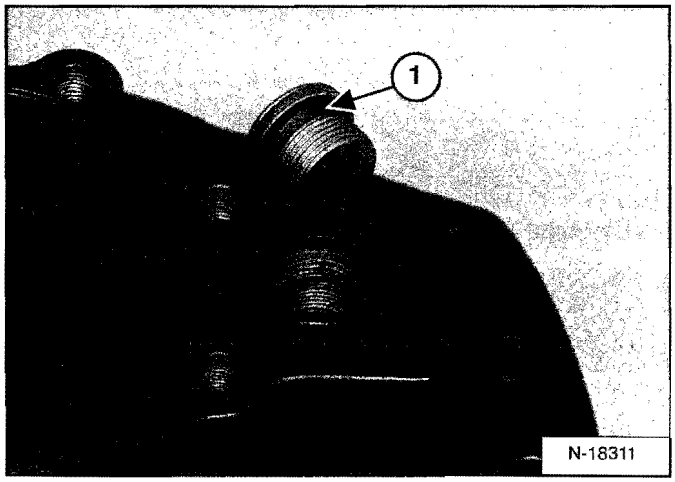
Disassembly (Cont'd)

Figure 30-21-22



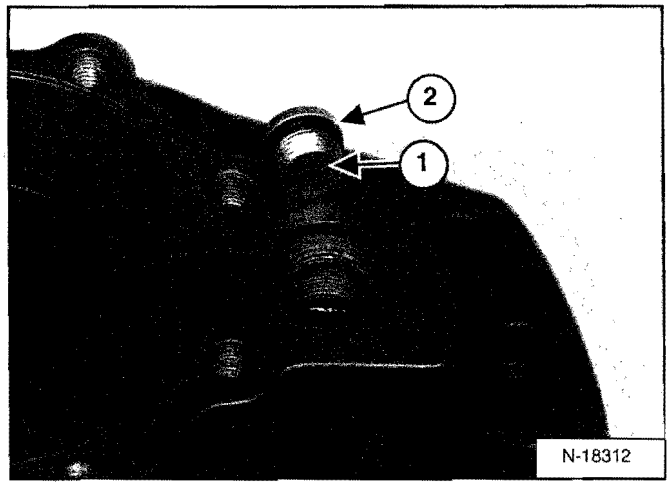
Remove the drain plug (Item 1) **[Figure 30-21-22]**.

Figure 30-21-23



Check the O-ring (Item 1) **[Figure 30-21-23]** on the plug and replace as needed.

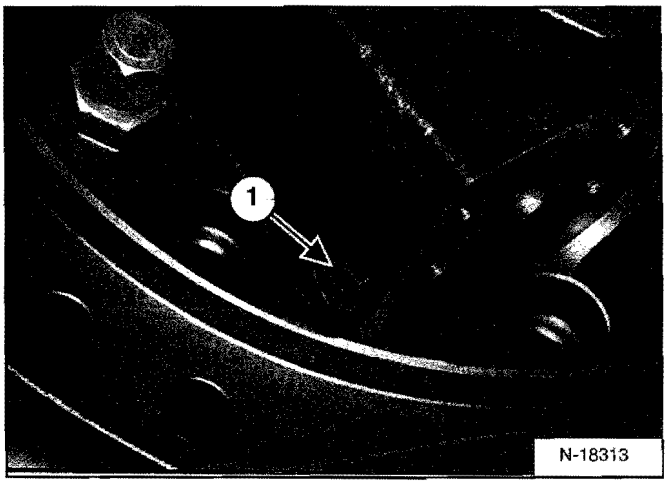
Figure 30-21-24



Remove the internal plug (Item 1) **[Figure 30-21-24]**.

Check the O-ring (Item 2) **[Figure 30-21-24]** and replace as needed.

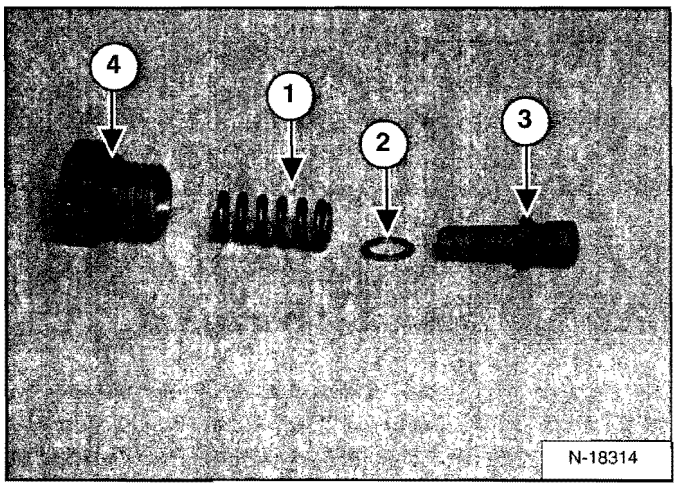
Figure 30-21-25



Remove the plug (Item 1) **[Figure 30-21-25]**.

Disassembly (Cont'd)

Figure 30-21-26

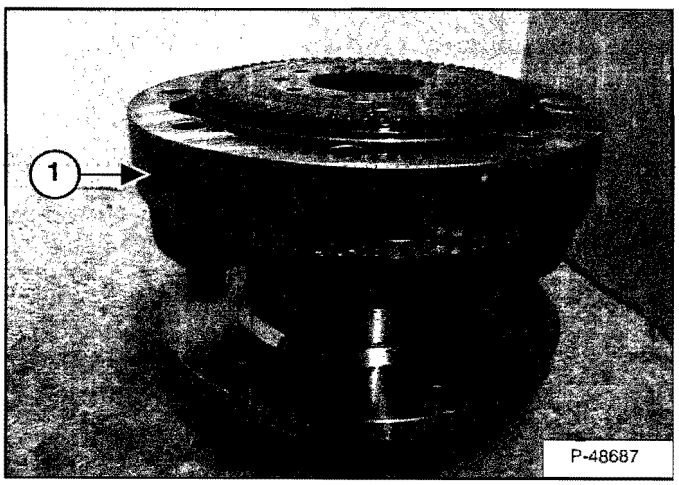


Remove the spring (Item 1) shim (Item 2) and poppet (Item 3) **[Figure 30-21-26]**.

Inspect all parts and replace as needed.

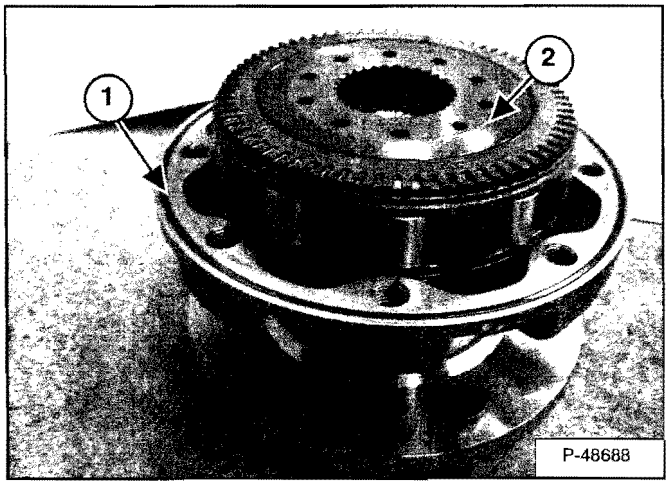
Install a new O-ring (Item 4) **[Figure 30-21-26]** on the plug before installation.

Figure 30-21-27



Remove the cam ring (Item 1) **[Figure 30-21-27]** from the front housing assembly.

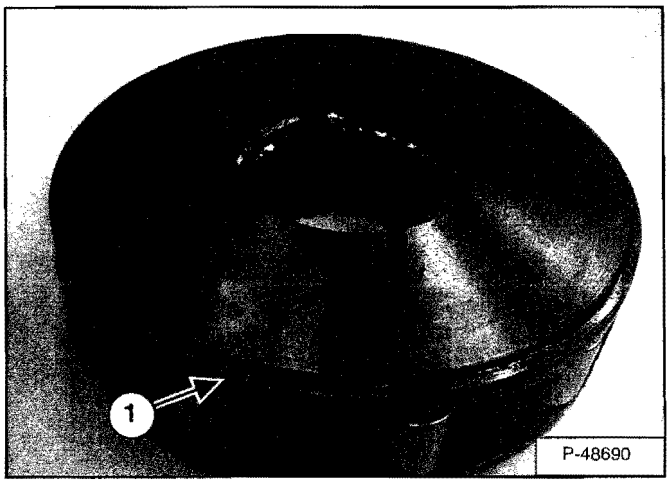
Figure 30-21-28



Remove the O-ring (Item 1) **[Figure 30-21-28]** from the front housing assembly.

Remove the rotating group (Item 2) **[Figure 30-21-28]** from the front housing assembly.

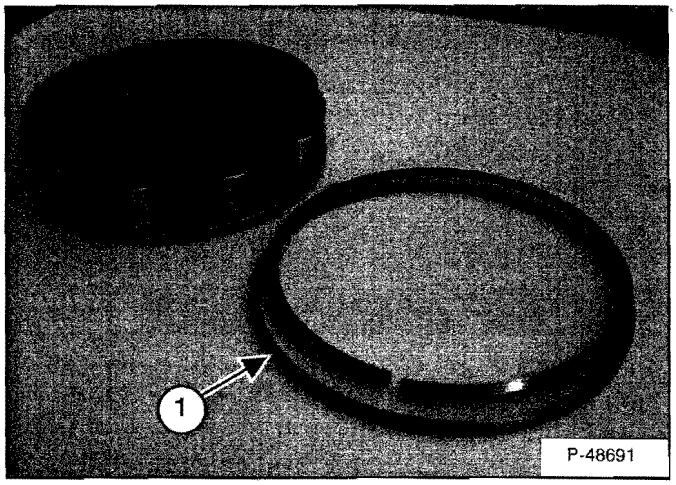
Figure 30-21-29



Remove the snap ring (Item 1) **[Figure 30-21-29]** from the bottom side of the rotating group.

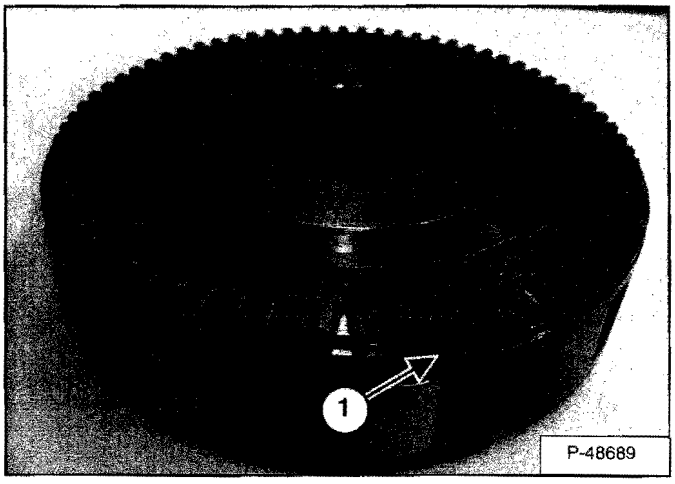
Disassembly (Cont'd)

Figure 30-21-30



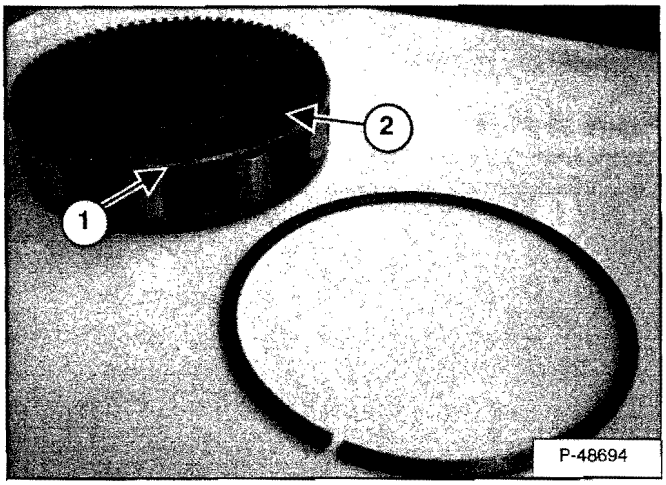
Remove the retainer ring (Item 1) **[Figure 30-21-30]** from the bottom side of the rotating group.

Figure 30-21-31



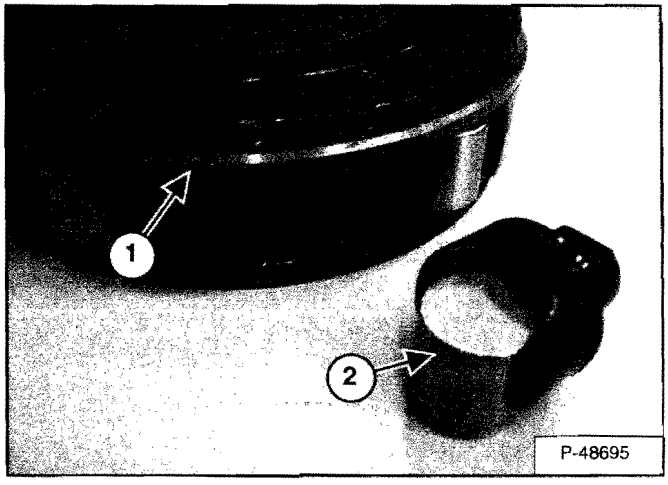
Remove the snap ring (Item 1) **[Figure 30-21-31]** from the top side of the rotating group.

Figure 30-21-32



The retainer ring (Item 1) **[Figure 30-21-32]** cannot be removed from the top side of the rotating group, because the RPM target disk is attached directly to the rotating group.

Figure 30-21-33



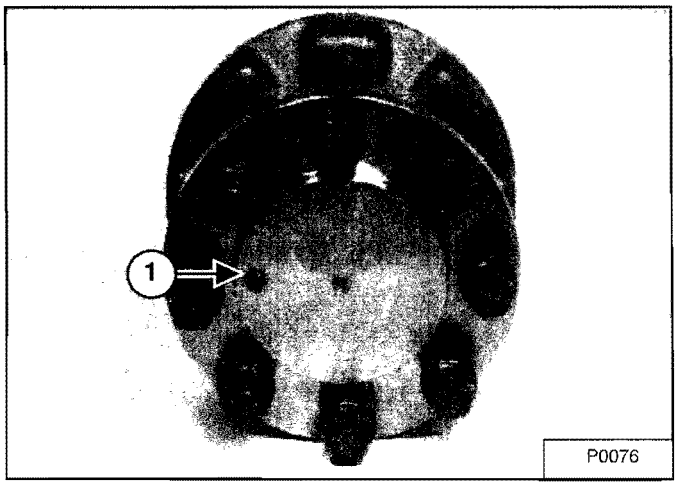
Lift the retaining ring (Item 1) **[Figure 30-21-33]**.

Use low air pressure and remove the roller/piston assembly (Item 2) **[Figure 30-21-33]** from the cylinder block.

NOTE: Put all roller/piston assembles back in the original bore.

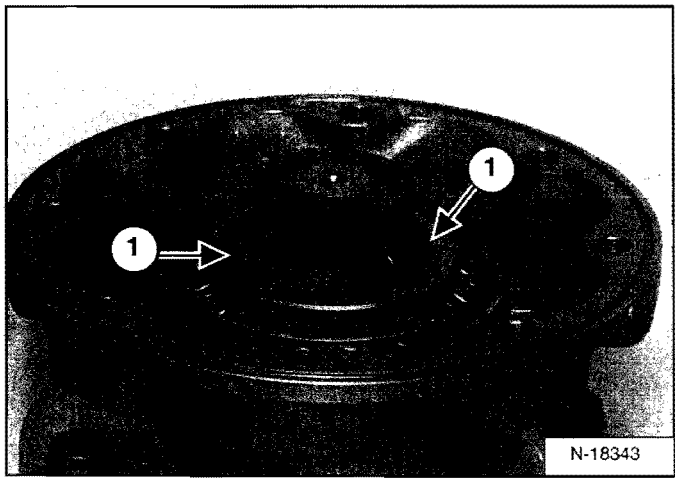
Disassembly (Cont'd)

Figure 30-21-34



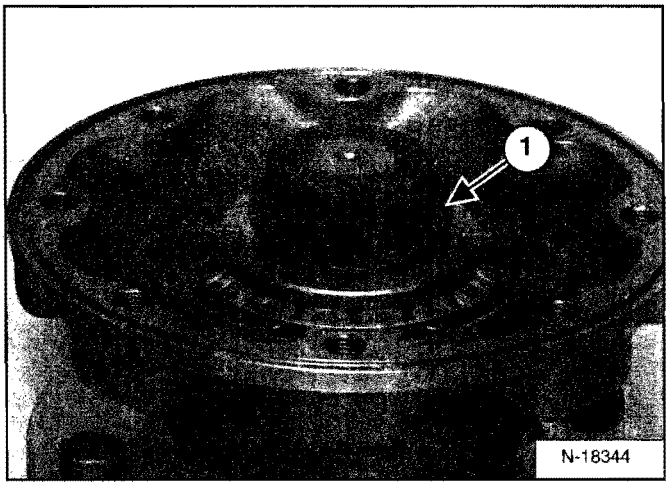
Remove the oil fill plug (Item 1) **[Figure 30-21-34]** from the housing to drain the oil from the bearing and face seal area.

Figure 30-21-35



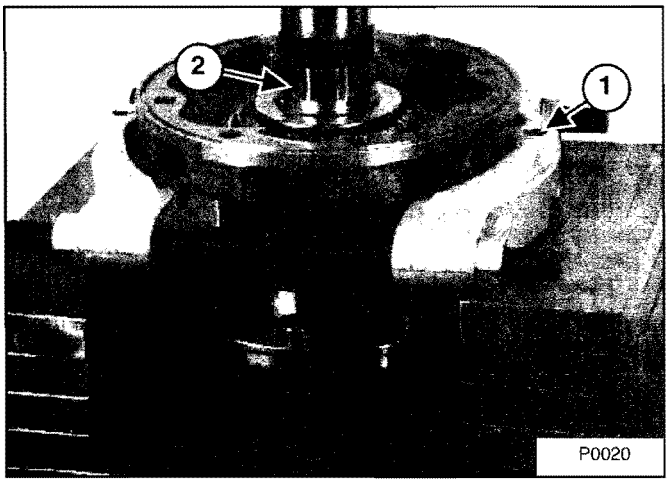
With a hammer and punch remove the split ring **[Figure 30-21-35]**.

Figure 30-21-36



Remove the washer (Item 1) **[Figure 30-21-36]** from under the split ring.

Figure 30-21-37

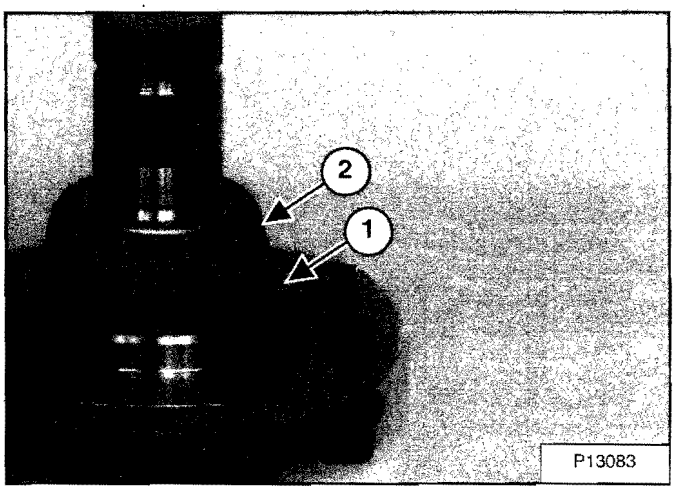


Install the bearing puller (Item 1) **[Figure 30-21-37]** under the front housing and support the puller and housing with blocks.

Press the shaft (Item 2) **[Figure 30-21-37]** from the housing.

Disassembly (Cont'd)

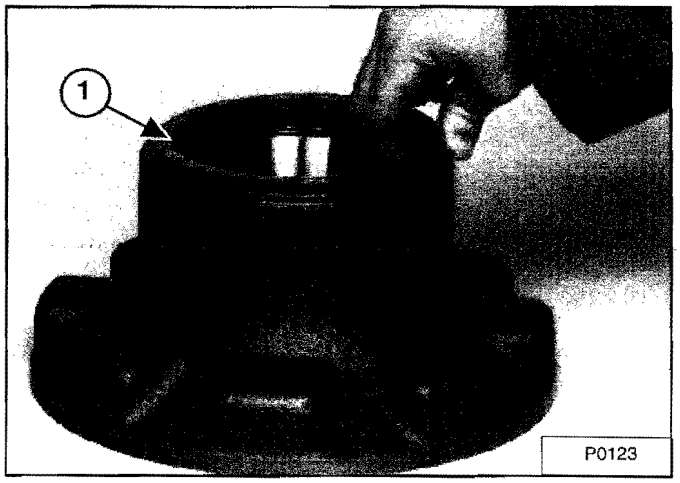
Figure 30-21-38



Remove the face seal (Item 1) **[Figure 30-21-38]** from the shaft.

Discard the face seal.

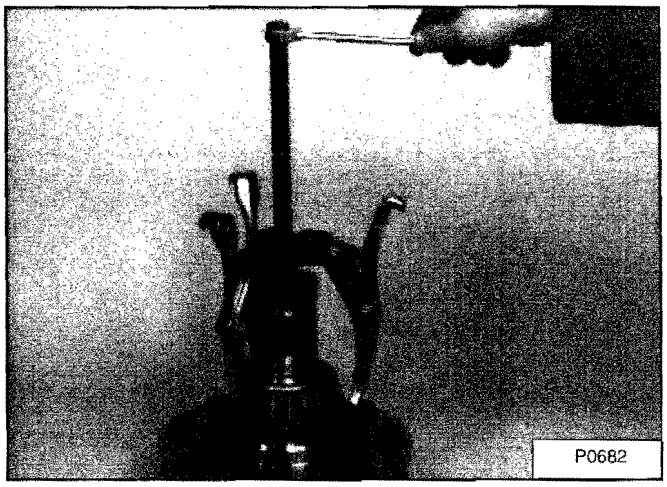
Figure 30-21-39



Remove the face seal (Item 1) **[Figure 30-21-39]** from the front housing.

Discard the face seal.

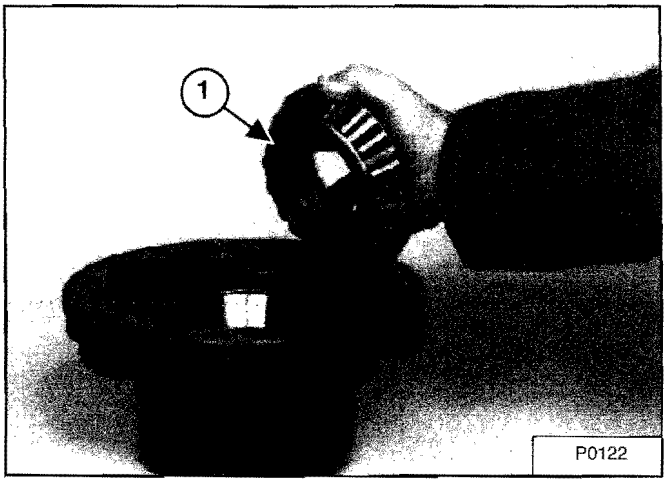
Figure 30-21-40



Use a bearing puller to remove the bearing from the shaft **[Figure 30-21-40]**.

NOTE: The bearing will be destroyed during the removal procedure. Be sure to have a new bearing on hand before removing the old bearing.

Figure 30-21-41

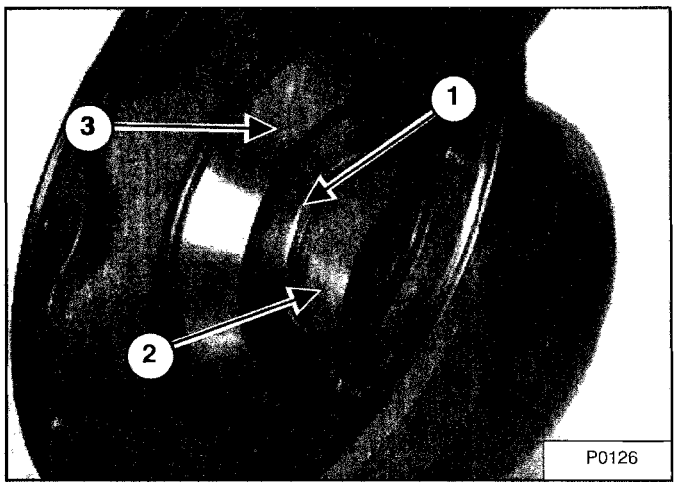


Remove and inspect the bearing (Item 1) **[Figure 30-21-41]** located in the front housing.

Replace the bearing if worn or damaged.

Disassembly (Cont'd)

Figure 30-21-42



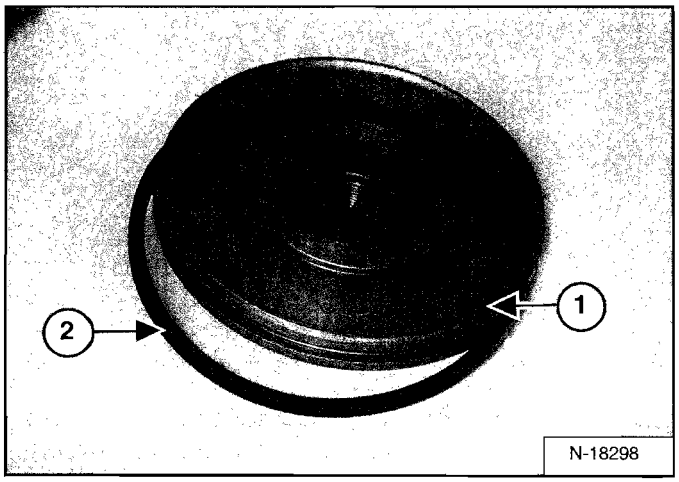
Remove the shaft seal (Item 1) **[Figure 30-21-42]**.

Replace the outer O-ring and inner shaft seal (Item 2) **[Figure 30-21-42]**.

Remove the bearing cup (Item 3) **[Figure 30-21-42]** if it needs replacement.

Inspection

Figure 30-21-43

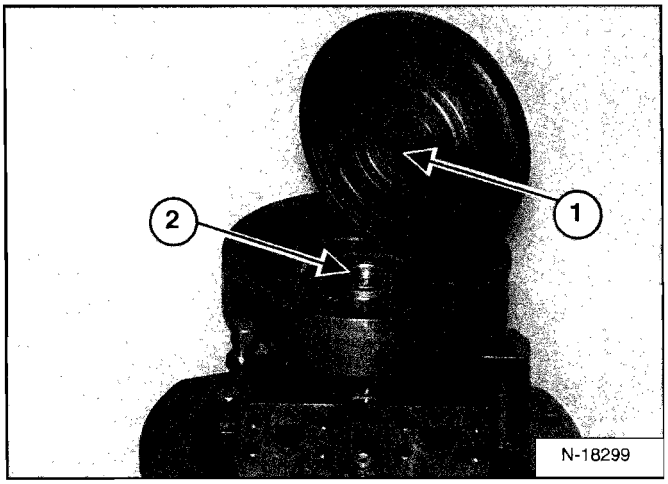


Clean all parts in clean solvent and use air pressure to dry them. Do Not use cloth or paper because small pieces of material can get into the system and cause damage.

Before the motor is assembled, check the following items:

Check the brake piston (Item 1) and seal (Item 2) **[Figure 30-21-43]** and replace as needed.

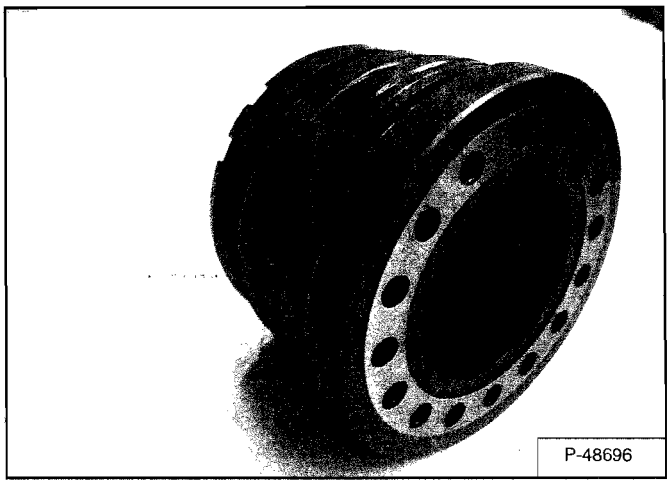
Figure 30-21-44



Check the piston surface (Item 1) and the bushing surface (Item 2) **[Figure 30-21-44]** in the brake shaft.

NOTE: The bushing (Item 2) [Figure 30-21-44] can be replaced in the brake shaft.

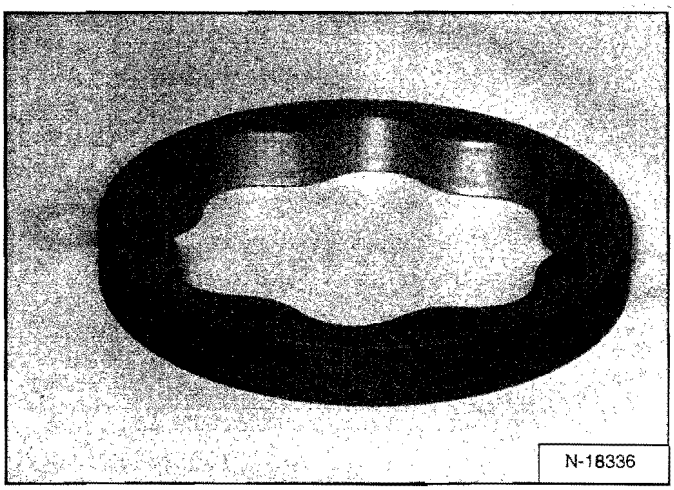
Figure 30-21-45



Check the distributor surfaces for scratches **[Figure 30-21-45]**.

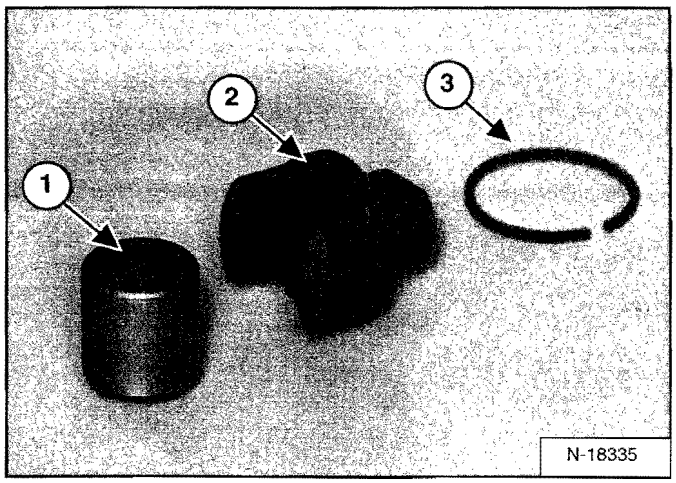
Inspection (Cont'd)

Figure 30-21-46



Check the cam ring inside surface for wear and scratches **[Figure 30-21-46]**.

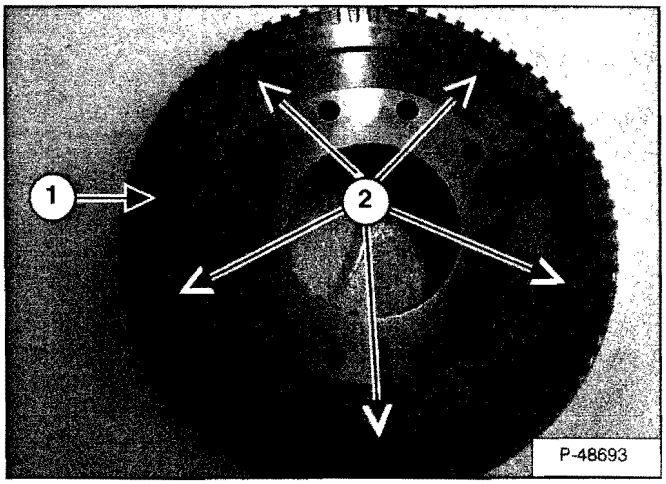
Figure 30-21-47



Check all rollers (Item 1), pistons (Item 2) and piston rings (Item 3) **[Figure 30-21-47]** for wear and replace as needed.

NOTE: Put all roller/piston assembly back in their original position.

Figure 30-21-48

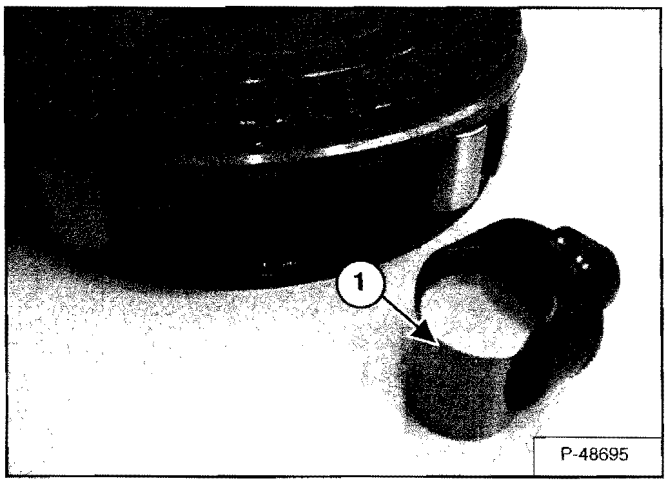


Check the RPM target disk (Item 1) **[Figure 30-21-48]** for wear and replace as needed.

If the RPM target disk needs to be changed, remove the heads of the five roll pins (Item 2) **[Figure 30-21-48]** and remove the disk. Replace the target disk and use new roll pins. Using a small hammer, tap the new roll pins through the new target disk into the cylinder block.

Assembly

Figure 30-21-49



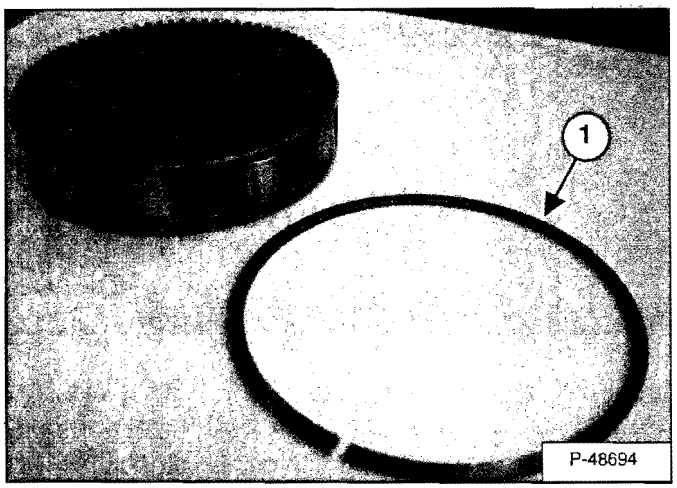
NOTE: Always use new O-rings and seals when assembling the motor and brake assemblies.

Dip the roller/piston assembly (Item 1) **[Figure 30-21-49]** in oil and replace back its original bore.

Repeat procedure for each roller/piston assembly.

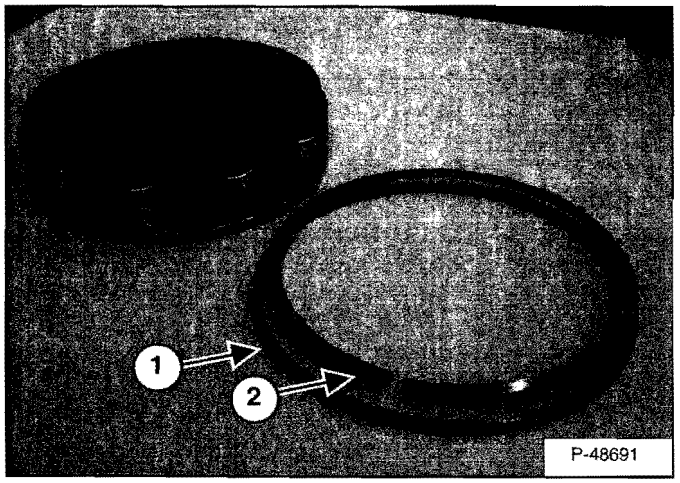
Assembly (Cont'd)

Figure 30-21-50



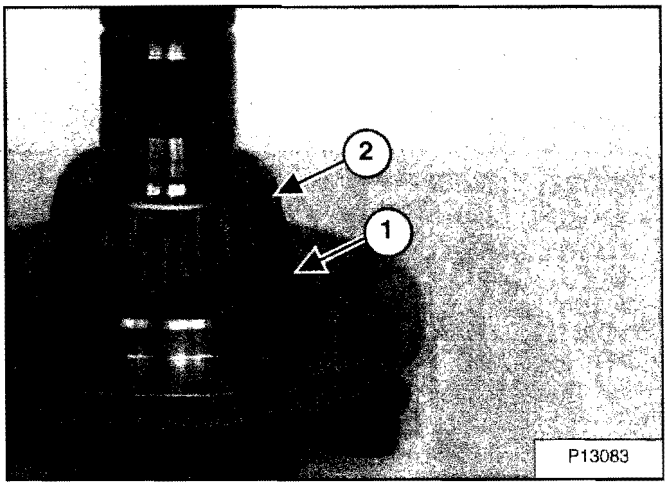
Install the snap ring (Item 1) **[Figure 30-21-50]** on the cylinder block.

Figure 30-21-51



Install the retainer ring (Item 1) and snap ring (Item 2) **[Figure 30-21-51]** on the bottom side of the cylinder block.

Figure 30-21-52

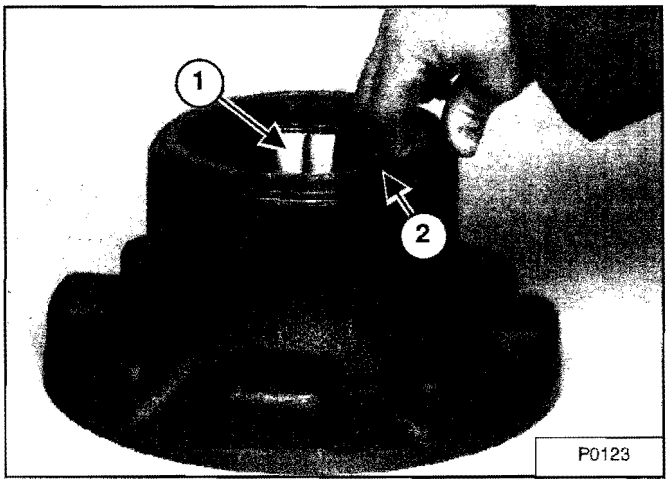


Replace the face seal (Item 1)**[Figure 30-21-52]** on the shaft.

NOTE: When installing face seals, apply a layer of good quality lithium grease to the mating surfaces of the face seal.

Install a new bearing (Item 2) **[Figure 30-21-52]** onto the shaft.

Figure 30-21-53

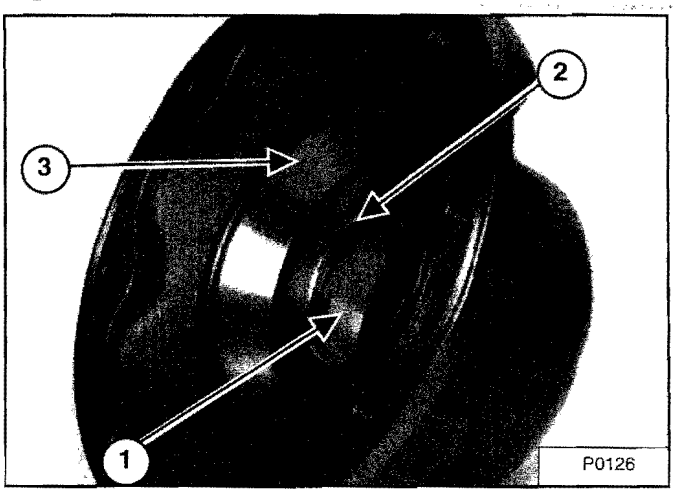


Replace the bearing cup (Item 1) **[Figure 30-21-53]**.

Replace the face seal (Item 2) **[Figure 30-21-53]** in the front housing.

Assembly (Cont'd)

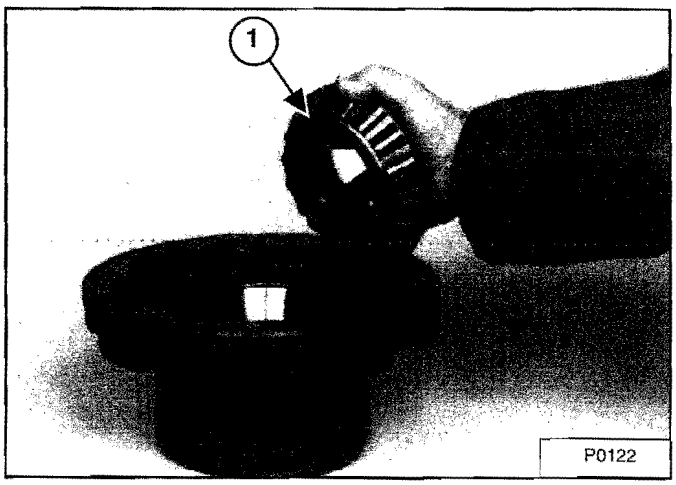
Figure 30-21-54



Replace the inner shaft seal (Item 1) and the outer shaft seal (Item 2) **[Figure 30-21-54]**.

Replace the bearing cup (Item 3) **[Figure 30-21-54]**.

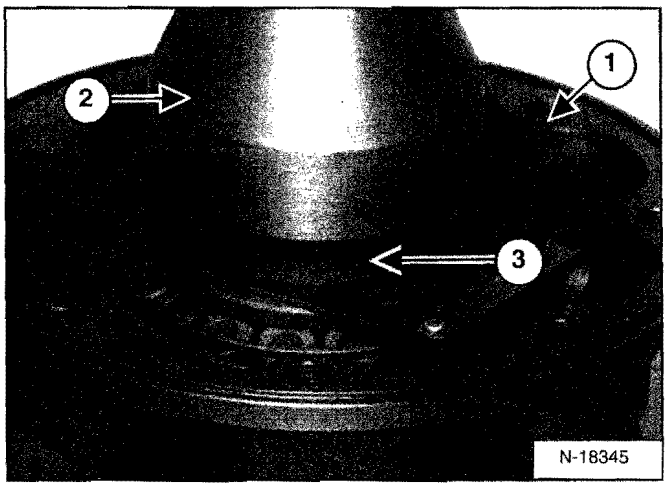
Figure 30-21-55



Install a new bearing (Item 1) **[Figure 30-21-55]** into the front housing.

Place the shaft on a hydraulic press table.

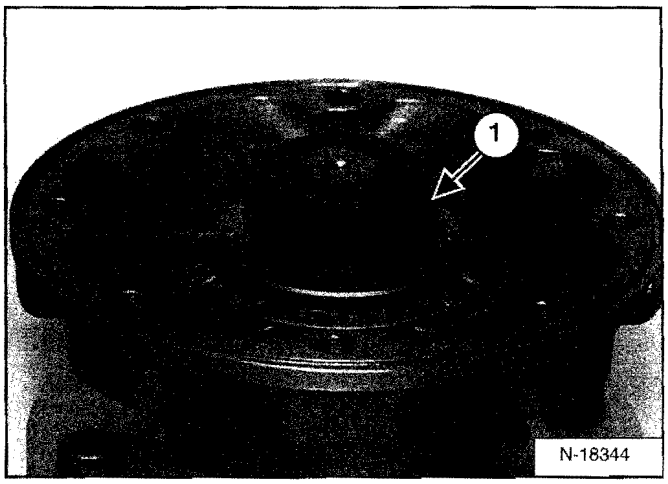
Figure 30-21-56



Install the front housing (Item 1) and bearing over the shaft. Install the special tool (MEL1562) (Item 2) **[Figure 30-21-56]** over the bearing and press the bearing onto the shaft. Apply 9000 lbs. of pressure to set the bearing. Rotate the housing to check for free travel.

Install the split ring (Item 3) **[Figure 30-21-56]** with a feeler gauge measure the distance between the split ring and the top of the bearing inner race.

Figure 30-21-57

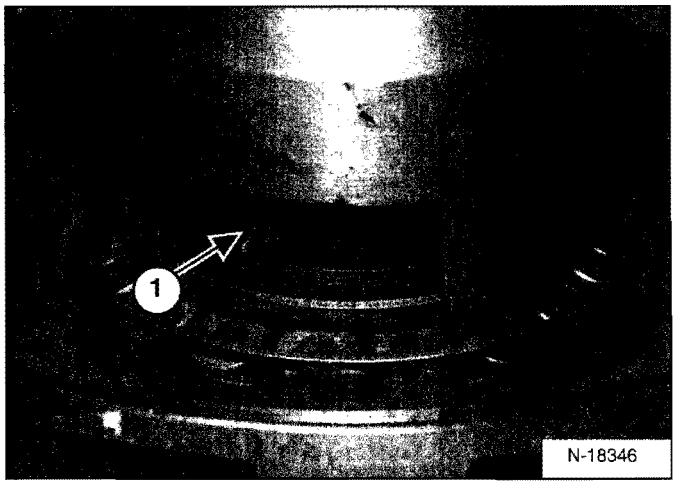


Release the pressure from the bearing. Remove the tool from the bearing.

Add one pre-load washer (Item 1) **[Figure 30-21-57]** that is closest to the measurement between the bearing race and split ring.

Assembly (Cont'd)

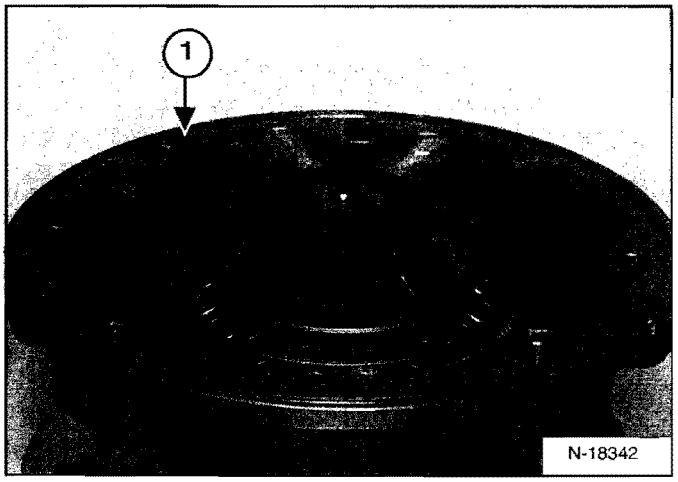
Figure 30-21-58



Install the tool and press the bearing to 9000 lbs. pressure.

Install the split rings (Item 1) **[Figure 30-21-58]**.

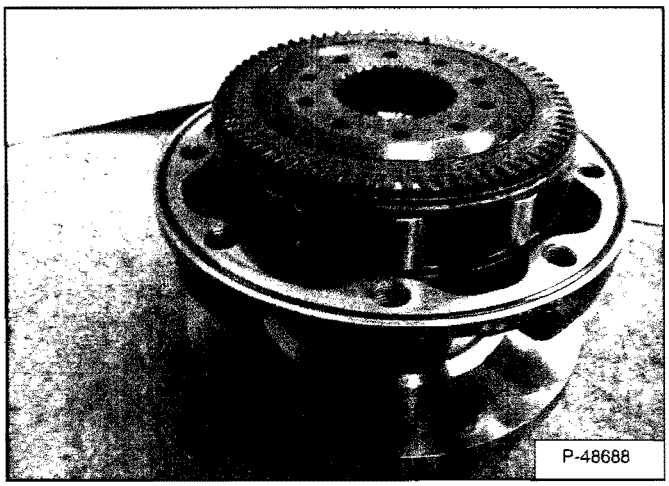
Figure 30-21-59



Remove from press.

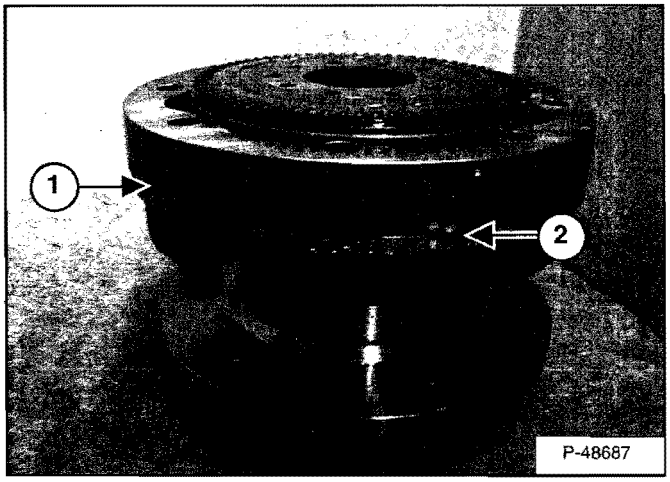
Install a new O-ring on the front housing assembly (Item 1) **[Figure 30-21-59]** and lightly smear with grease.

Figure 30-21-60



Install the cylinder block on the front housing **[Figure 30-21-60]**.

Figure 30-21-61

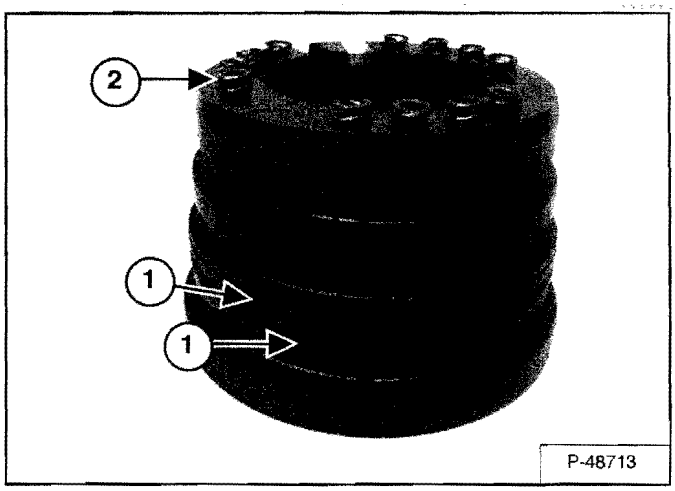


Install the cam ring (Item 1) **[Figure 30-21-61]** on the front housing.

Align the marks (Item 2) **[Figure 30-21-61]** on the cam ring to the front housing.

Assembly (Cont'd)

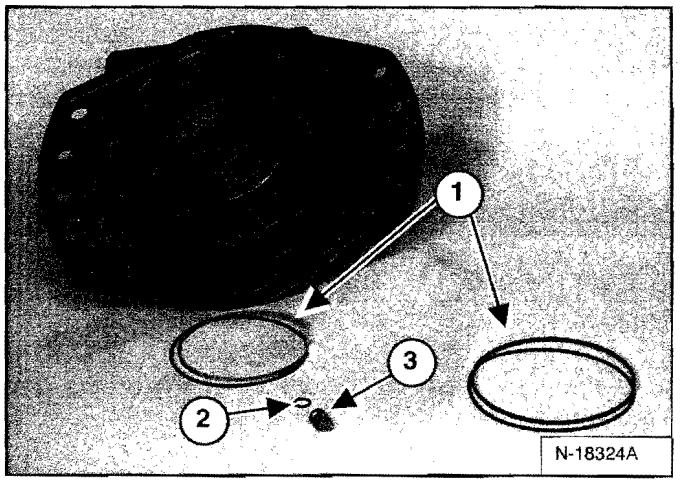
Figure 30-21-62



Install new O-rings and seals (Item 1) **[Figure 30-21-62]** on the distributor.

Using a small amount of grease, install the twelve springs into the distributor (Item 2) **[Figure 30-21-62]**.

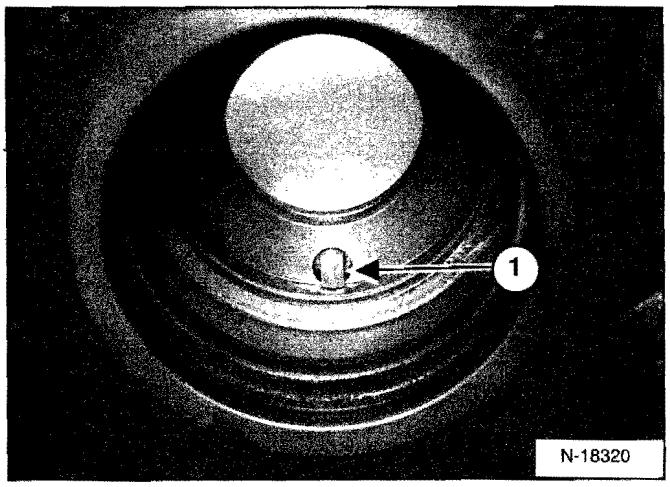
Figure 30-21-63



Install new O-rings and new seals (Item 1) **[Figure 30-21-63]** into the rear housing.

Install a new O-ring (Item 2) onto the stop pin (Item 3) **[Figure 30-21-63]**.

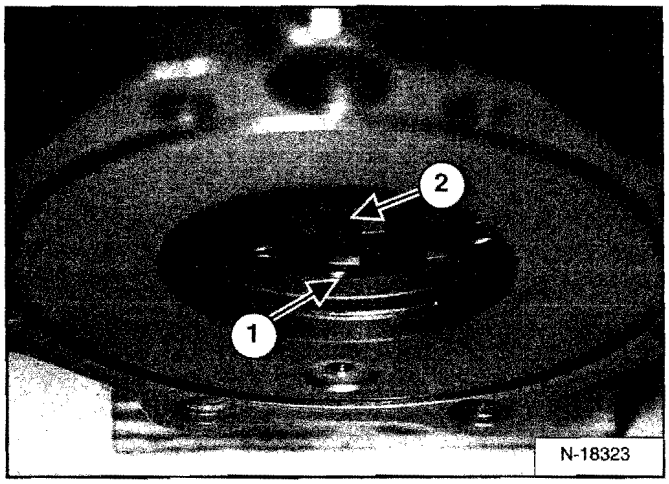
Figure 30-21-64



Lightly smear grease over seals and O-rings.

Install the stop pin (Item 1) **[Figure 30-21-64]** into the rear housing.

Figure 30-21-65



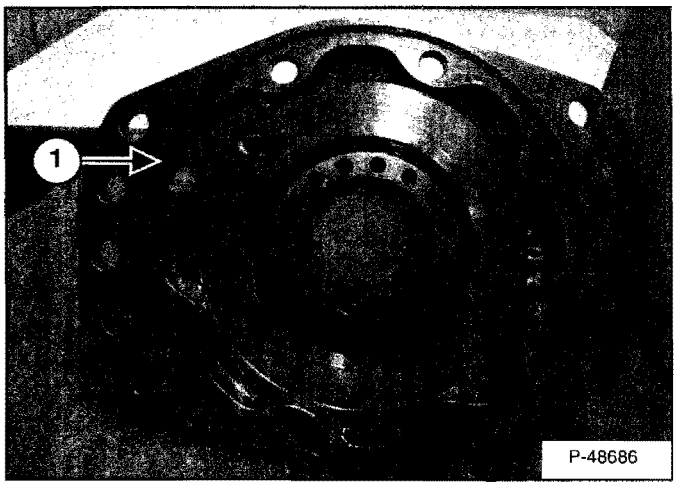
Install the distributor into the rear housing.

Align the stop pin (Item 1) with the notch in the distributor marked L (Item 2) **[Figure 30-21-65]**.

When the distributor is aligned correctly, the distributor can be depressed slightly.

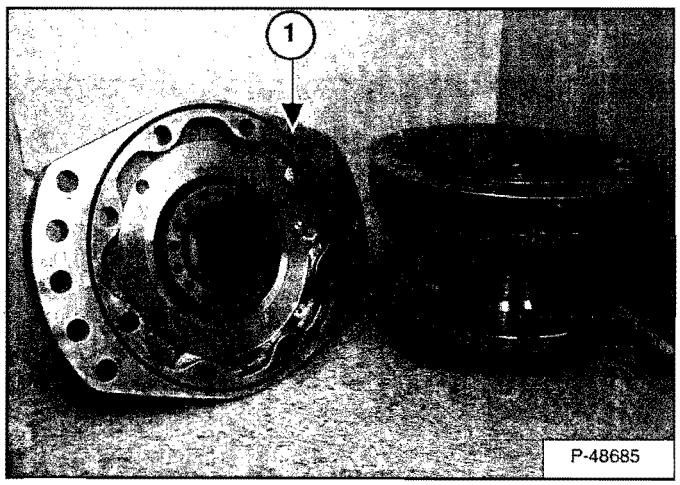
Assembly (Cont'd)

Figure 30-21-66



Install a new O-ring (Item 1) **[Figure 30-21-66]** on the rear housing and lightly smear with grease.

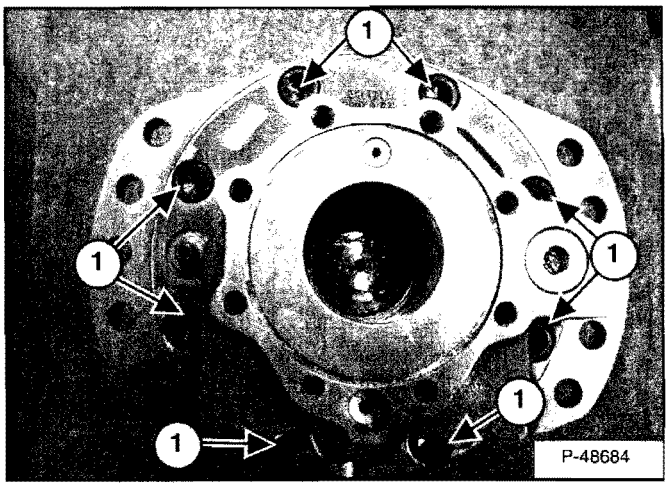
Figure 30-21-67



Install the rear housing (Item 1) **[Figure 30-21-67]** on the cam ring/front housing assembly.

Align the marks.

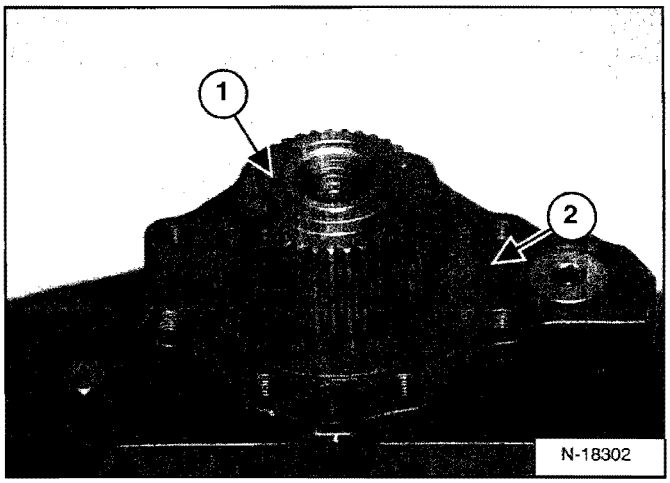
Figure 30-21-68



Use LOCTITE #243 on the threads and install the eight mounting bolts (Item 1) **[Figure 30-21-68]**.

Tighten the bolts to 208-221 ft.-lbs. (282-300 Nm) torque.

Figure 30-21-69



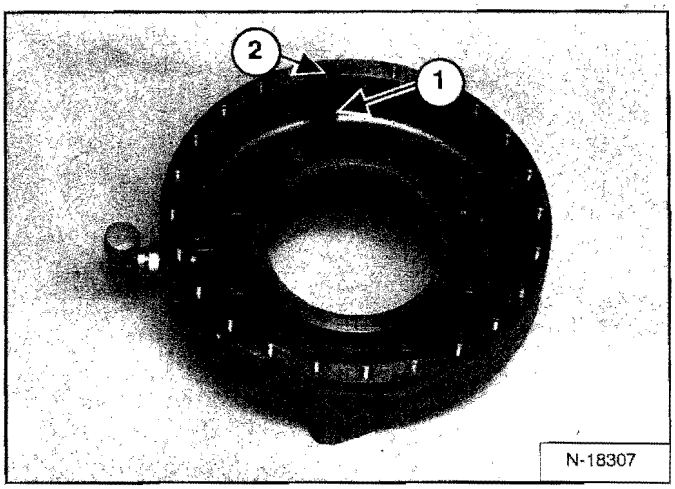
Install the brake shaft (Item 1) **[Figure 30-21-69]** through the rear housing into the cylinder block.

NOTE: Be sure shaft seats fully into the cylinder block.

Install a new O-ring on the rear housing (Item 2) **[Figure 30-21-69]** and lightly coat with greases.

Assembly (Cont'd)

Figure 30-21-70



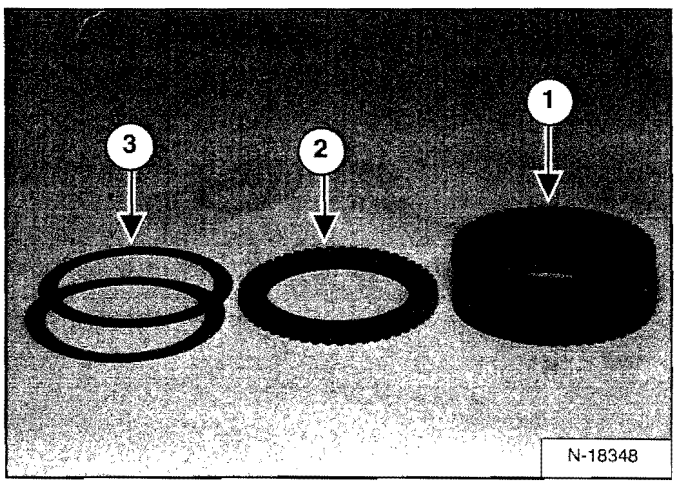
Install new washers (Item 1) on the brake housing mount bolts (Item 2) **[Figure 30-21-70]**.

Install the brake housing on the rear housing assembly.

Align the reference marks. Apply LOCTITE #243 to bolts and install bolts and washers into the rear case. Start each bolt by hand, tighten opposite bolts to maintain squareness.

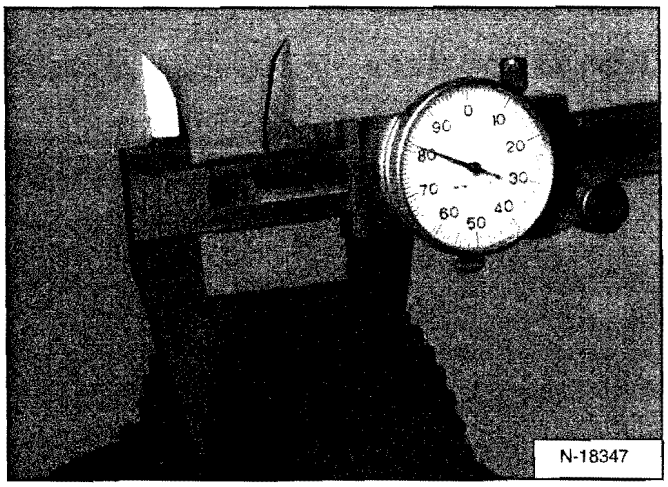
Tighten bolts to 86-90 ft.-lbs. (117-122 Nm) torque.

Figure 30-21-71



Assemble the brake discs into a pack making sure the inner discs, alternate with the outer disc and an outer disc is placed at each end of the disc pack (Item 1) **[Figure 30-21-71]**.

Figure 30-21-72

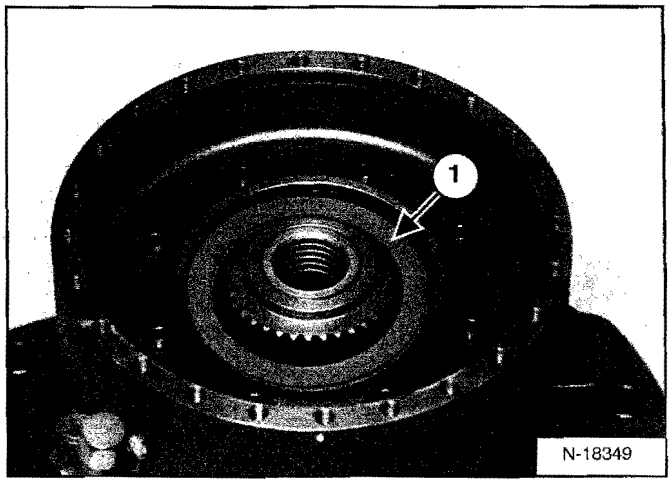


Clamp the disc pack in a vise and check the disc pack height **[Figure 30-21-72]**.

The correct disc pack specifications is 1.48 + 0.002 in. (37,7 + 0,05 mm).

Extra outer disc's (Item 2) are used to reduce the number of required shims (Item 3) **[Figure 30-21-71]** to make up the required thickness for the brake pack.

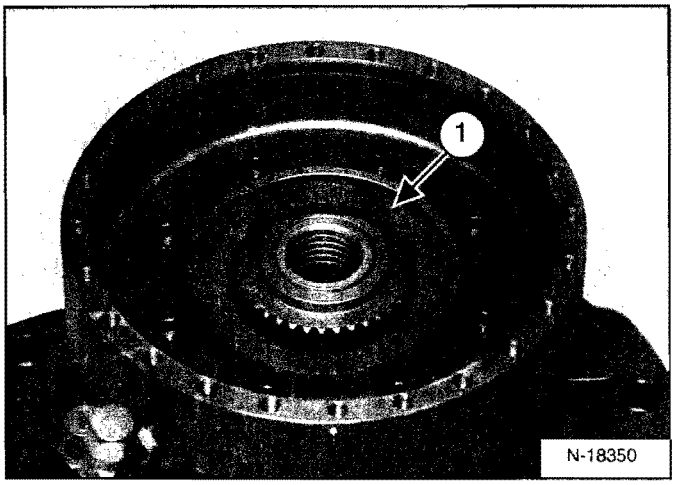
Figure 30-21-73



Install the needed amount of shims (Item 1) **[Figure 30-21-73]**.

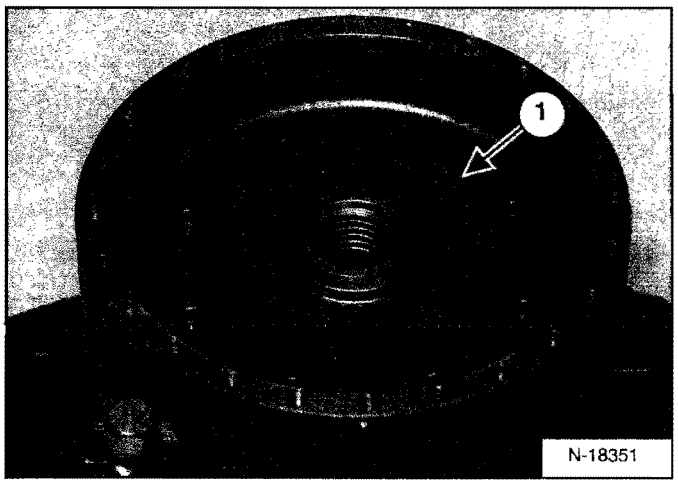
Assembly (Cont'd)

Figure 30-21-74



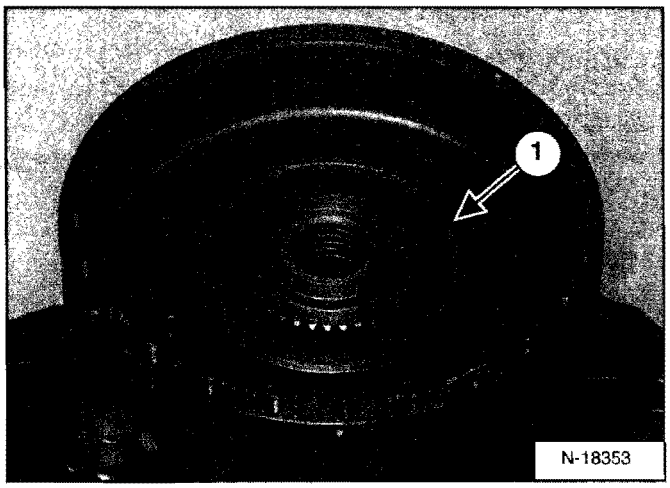
Install the needed amount of outer discs (Item 1) **[Figure 30-21-74]** to act as shims.

Figure 30-21-75



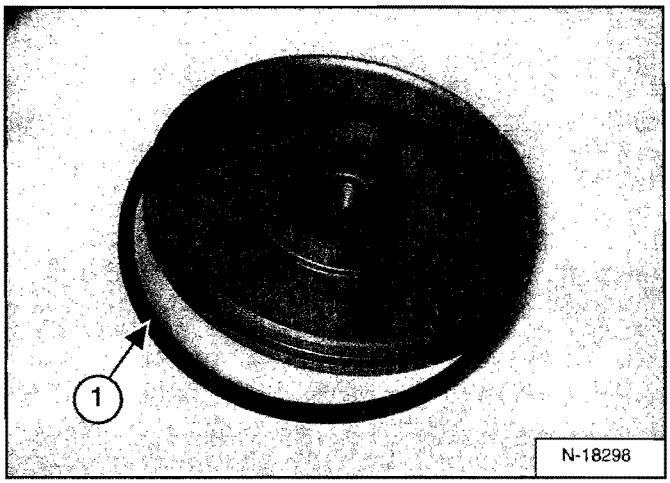
Install the disc pack (Item 1) **[Figure 30-21-75]** starting with an outer and alternating every other disc with an inner disc.

Figure 30-21-76



Install a new piston inner seal (Item 1) **[Figure 30-21-76]**.

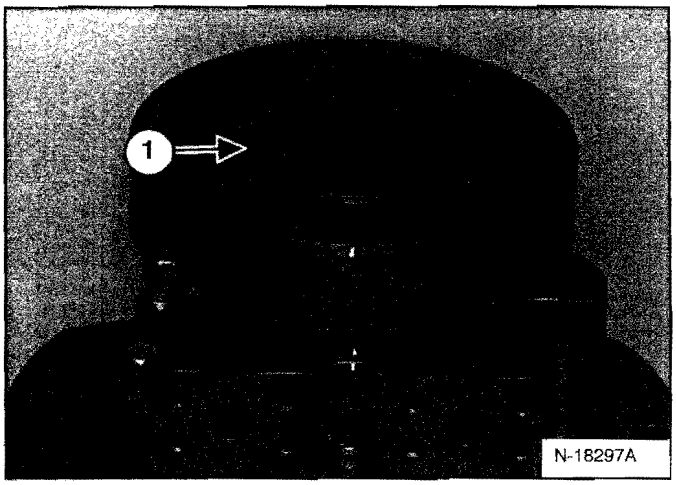
Figure 30-21-77



Install a new piston seal (Item 1) **[Figure 30-21-77]** on the piston.

Assembly (Cont'd)

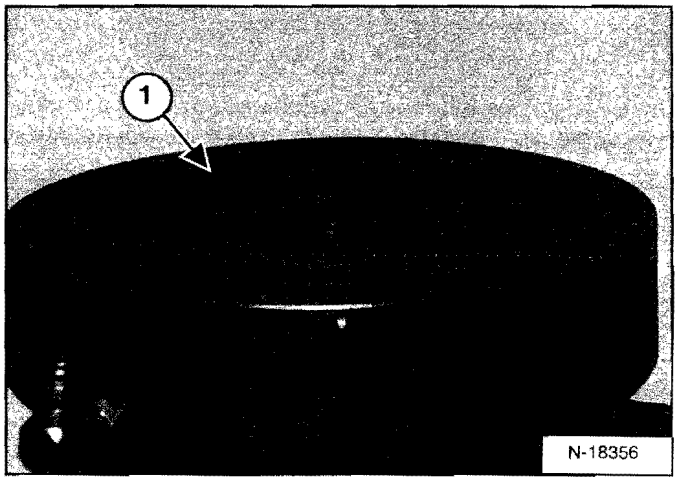
Figure 30-21-78



Put a slight amount of grease on the piston seal.

Install the piston (Item 1) **[Figure 30-21-78]** in the brake housing.

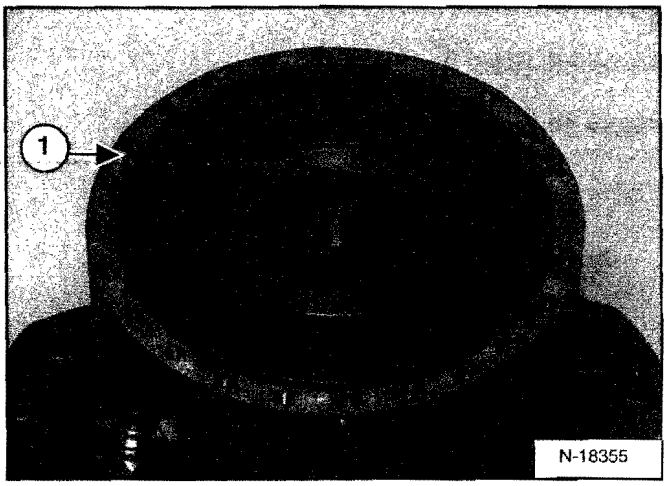
Figure 30-21-79



Put multi-purpose moly grease on the surface of the disc spring where it contacts the piston.

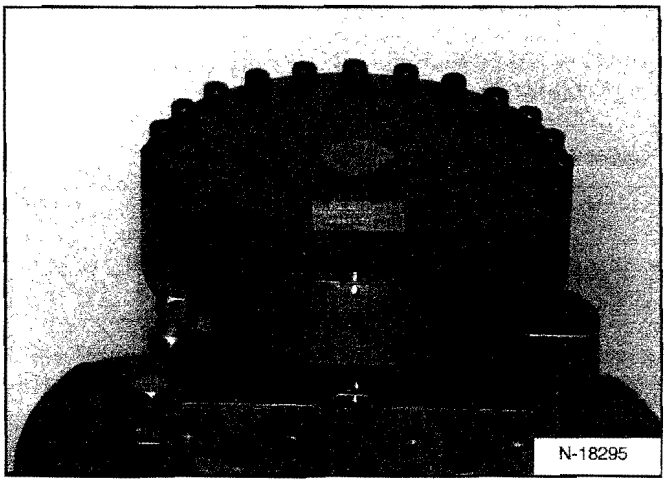
Install the disc spring (Item 1) **[Figure 30-21-79]** on the top of the piston as shown.

Figure 30-21-80



Install a new gasket (Item 1) **[Figure 30-21-80]**.

Figure 30-21-81



Align the marks on the end cover and install on the brake housing **[Figure 30-21-81]**.

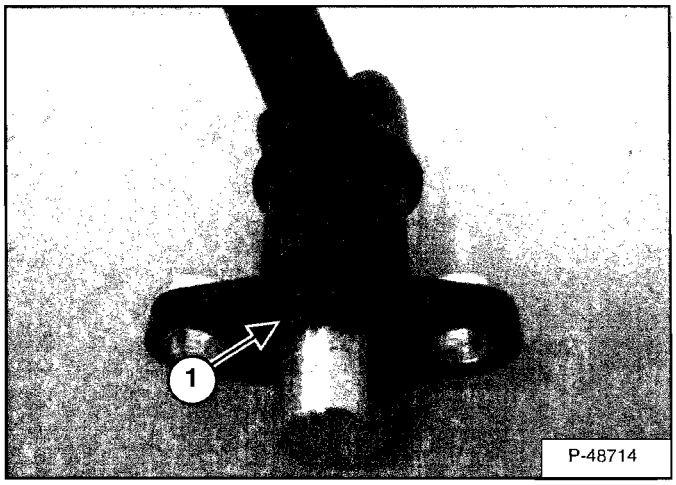
Install the socket head bolts into the end cover and finger tighten only.

NOTE: Tighten the bolts alternately one turn at a time until the end cover is fully seated.

Tighten the bolts to 10-12 ft.-lbs. (14-16 Nm) torque.

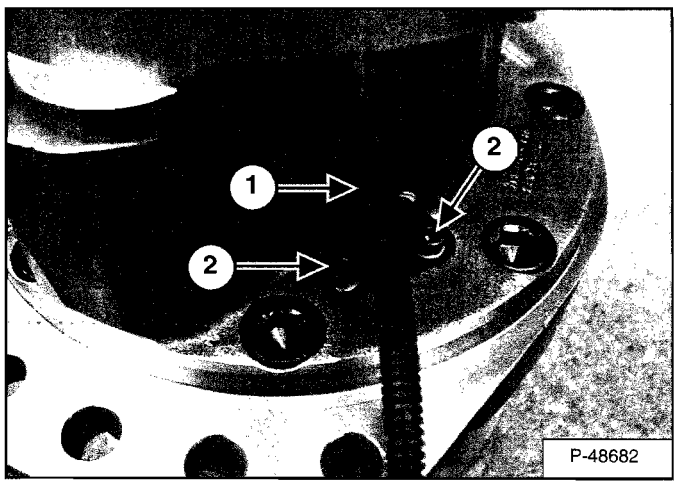
Assembly (Cont'd)

Figure 30-21-82



Coat the O-ring on the RPM sensor (Item 1) **[Figure 30-21-83]** with light oil before installation.

Figure 30-21-83



Install the RPM sensor (Item 1) **[Figure 30-21-83]** into the motor.

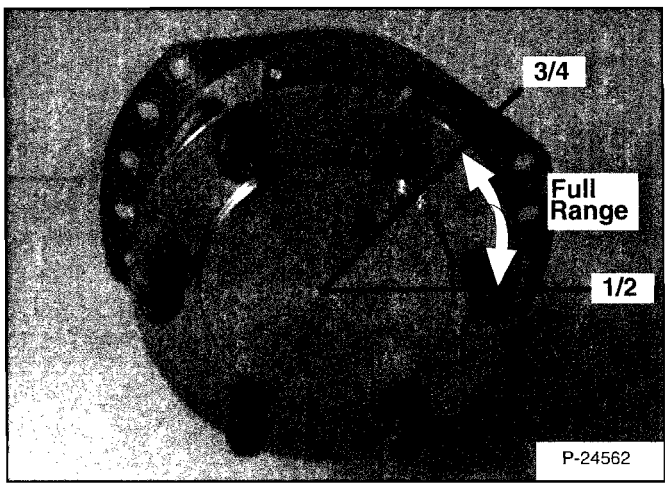
NOTE: The RPM sensor must be installed in the proper alignment, or the mount bolts will not align with the holes in the casting.

Seat the sensor into the motor port prior to installing the bolts. Tighten down the bolts, alternate tightening from left to right to evenly load the o-ring

Installation: Tighten the sensor mount bolts (Item 2) **[Figure 30-21-83]** to 88 in.-lbs. (9,94 Nm) torque.

Filling

Figure 30-21-84



Fill housing with synthetic Mobilgear SHC XMP 150, fill with plug in fill range **[Figure 30-21-84]** 1/2 to 3/4 full.

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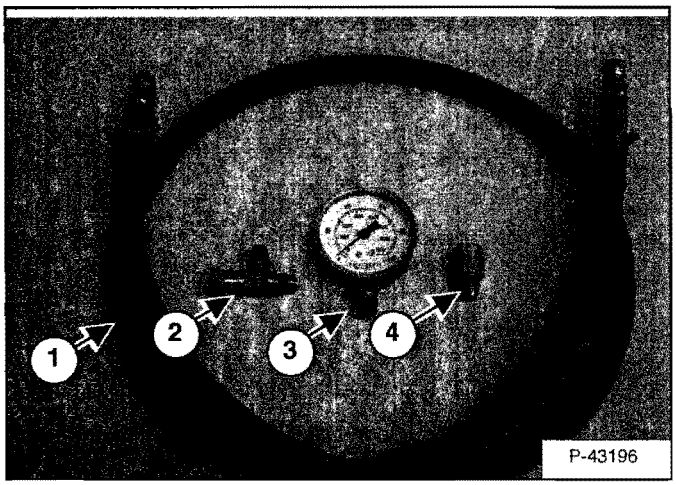
CHARGE PRESSURE

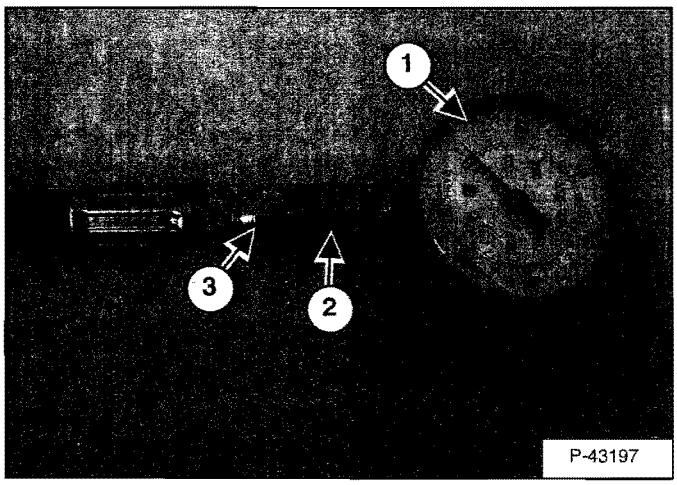
Testing

Figure 30-30-1



The tools needed to check charge pressure, hydraulic hose (Item 1), T fitting (P/N 13K-5) (Item 2), Hydraulic guage (1000 PSI) (Item 3) and adapter fitting (P/N 93F-5) (Item 4) **[Figure 30-30-1]**.

Figure 30-30-2



Connect the guage (Item 1), to the adapter fitting (P/N 93F5) (Item 2) **[Figure 30-30-2]**.

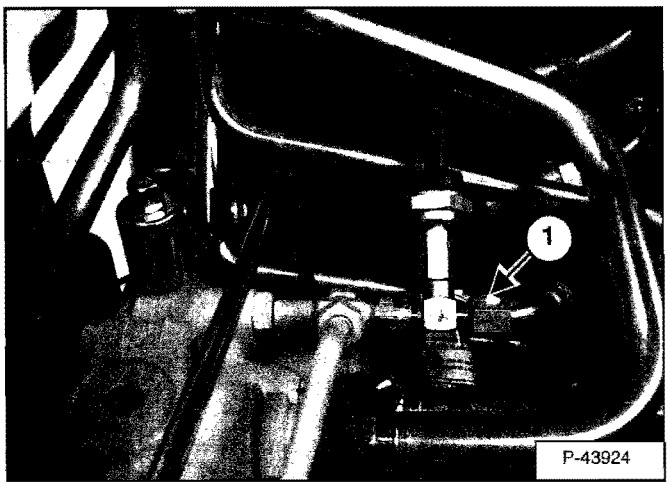
Connect the hydraulic hose (Item 3) **[Figure 30-30-2]** to the adapter fitting. Tighten all connections.

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

Place the loader on jackstands. (See Contents Page 10-01.)

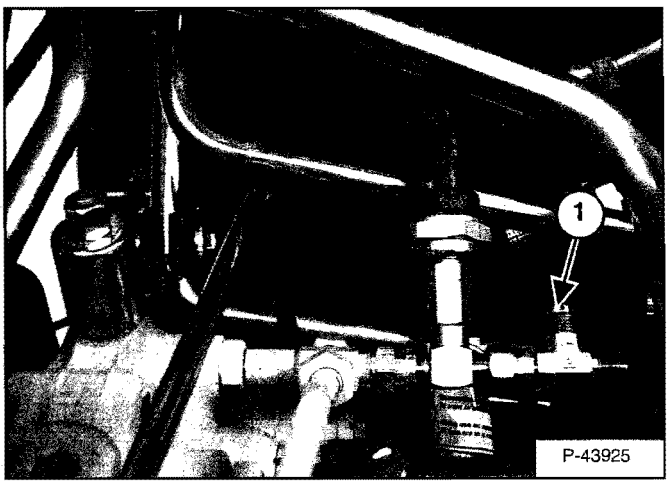
Raise the operator cab. (See Contents Page 10-01.)

Figure 30-30-3



Disconnect the hydraulic hose (Item 1) **[Figure 30-30-3]** from the charge pressure sender.

Figure 30-30-4

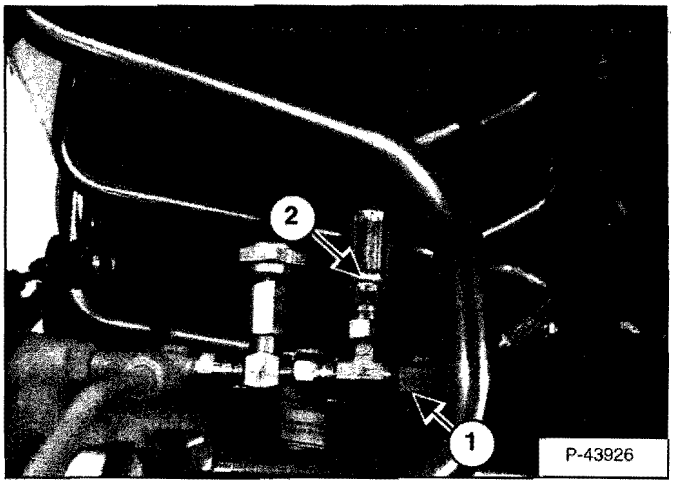


Install the T fitting (P/N 13K-5) (Item 1) **[Figure 30-30-4]**.

CHARGE PRESSURE (CONT'D)

Testing (Cont'd)

Figure 30-30-5



Install the hose (Item 1) **[Figure 30-30-5]**, that was disconnected from the charge pressure sender, to the T fitting.

Install the hose (Item 2) **[Figure 30-30-5]**, that is attached to the pressure guage, to the T fitting.

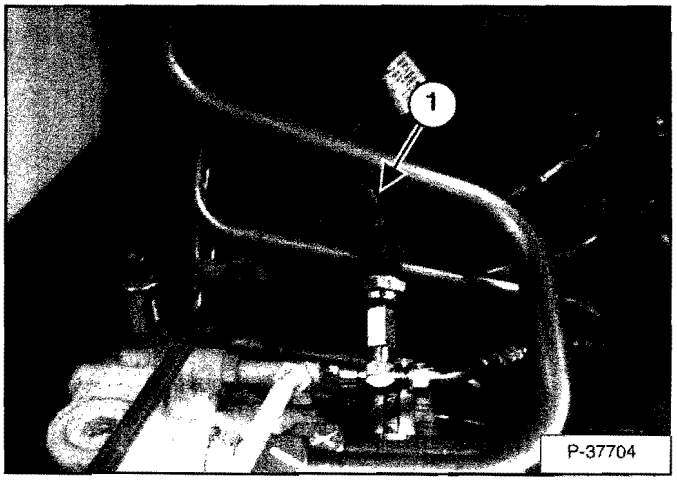
Tighten the hydraulic fittings

Start the loader and run at an idle and allow the hydraulic fluid to warm to 140 degrees Farenheit.

The charge pressure at high idle, with the fluid temperature of 140 degree Farenheit is **390-430 PSI** with the pump in neutral.

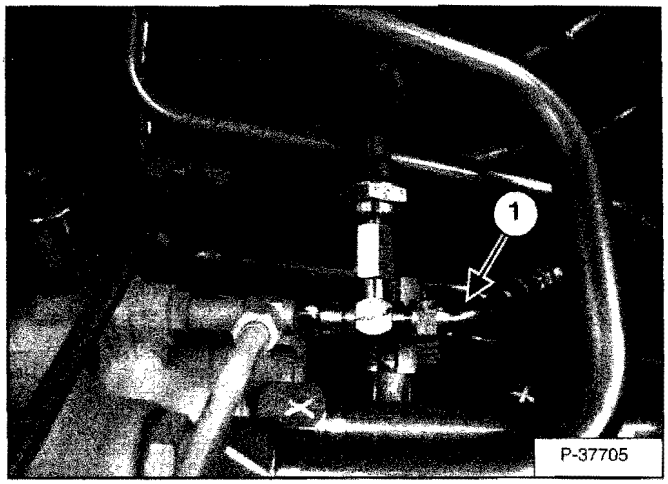
Removal and Installation

Figure 30-30-6



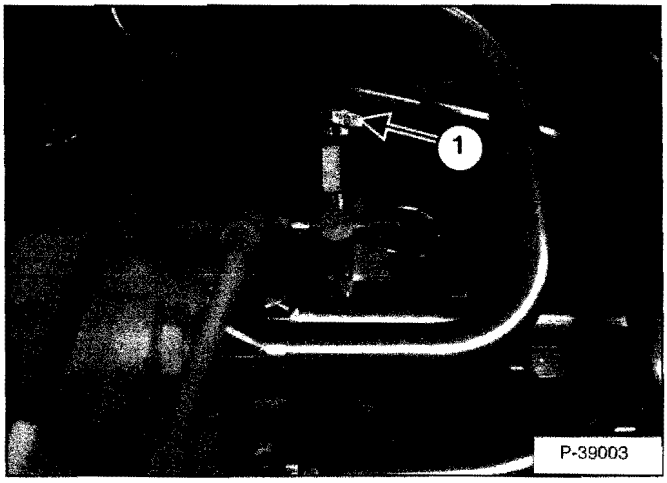
Disconnect the wire (Item 1) **[Figure 30-30-6]** from the sender.

Figure 30-30-7



Remove the charge pressure line (Item 1) **[Figure 30-30-7]**.

Figure 30-30-8



Remove the sender (Item 1) **[Figure 30-30-8]** from the hydraulic control valve.

Installation: Tighten the charge pressure sender to 7.4-8.1 ft.-lbs. (10-11 Nm) torque.

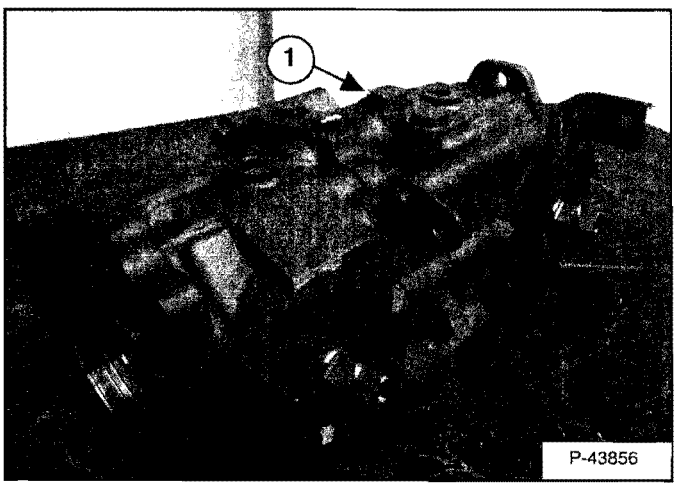
Setting Charge Pressure

IMPORTANT

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

I-2003-0888

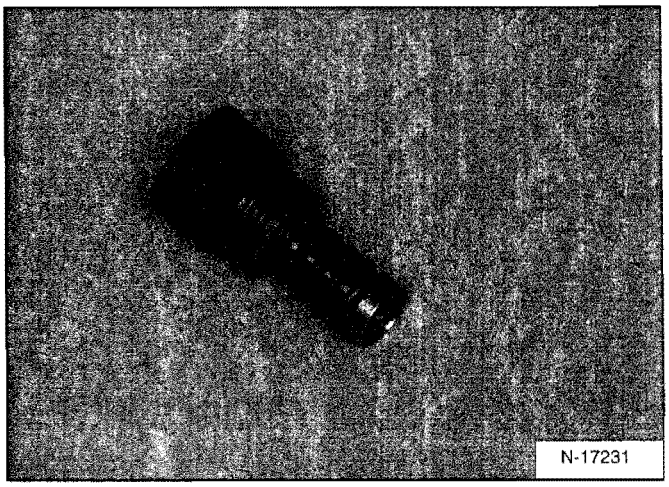
Figure 30-30-9



If the charge pressure is not correct loosen the charge relief valve plug (Item 1) **[Figure 30-30-9]**.

Assemble: Always use a new O-ring. Tighten the plug to 30-50 ft.-lbs. (41-68 Nm) torque.

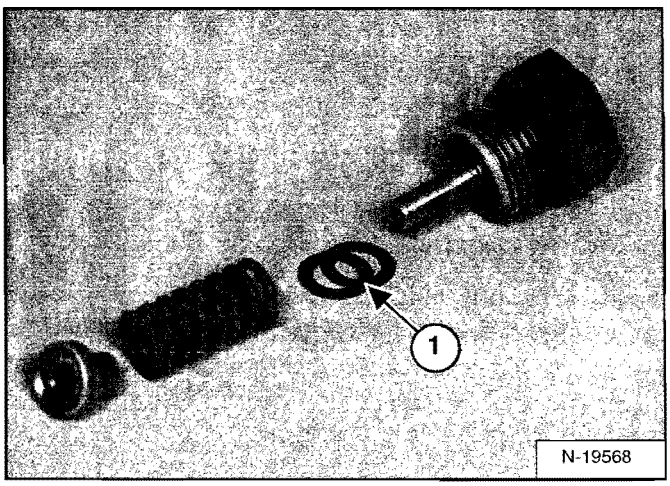
Figure 30-30-10



Remove the plug, spring and poppet **[Figure 30-30-10]**.

Check the poppet and spring for wear or damage.

Figure 30-30-11



There are several different thickness of the shims (Item 1) **[Figure 30-30-11]** and 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 **390-430** PSI (2689-2965 kPa) at 120 F (53 C) fluid @ High Idle.

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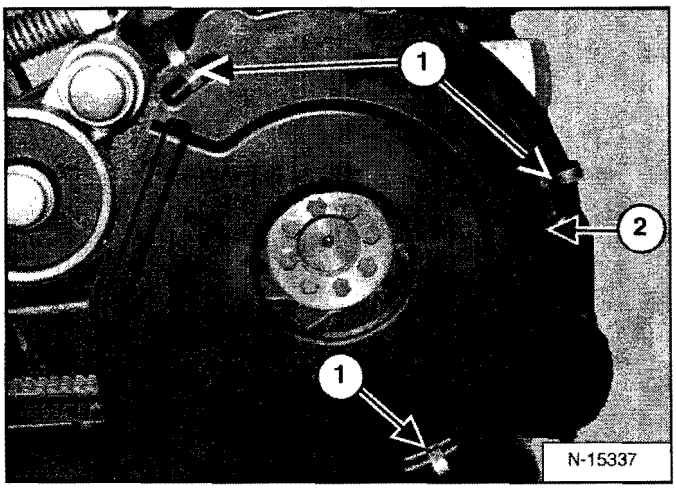
HYDROSTATIC PUMP

Removal And Installation

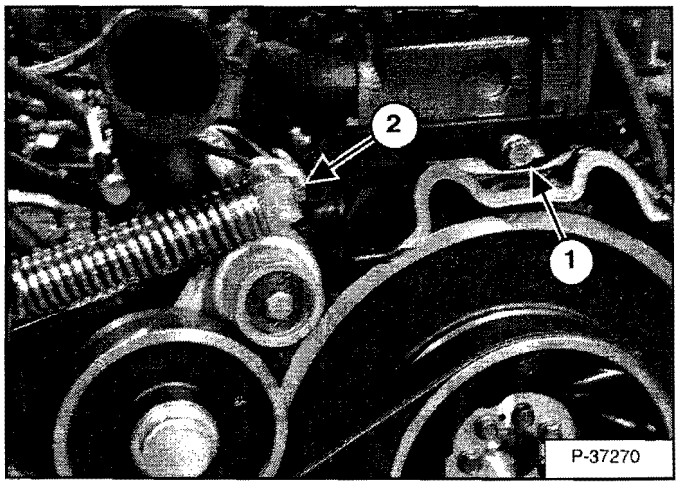
Figure 30-40-1



Remove the hydrostatic pump/engine assembly from the loader. (See Contents Page 70-01.)

Remove the belt shield clips (Item 1) and belt shield (Item 2) **[Figure 30-40-1]**.

Figure 30-40-2

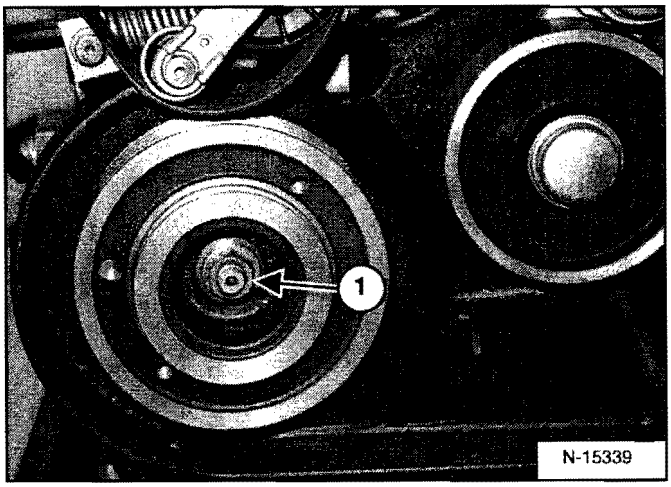


Loosen the stop mounting bolt (Item 1) **[Figure 30-40-2]**.

Loosen the spring tension bolt (Item 2) **[Figure 30-40-2]**.

Remove the drive belt.

Figure 30-40-3

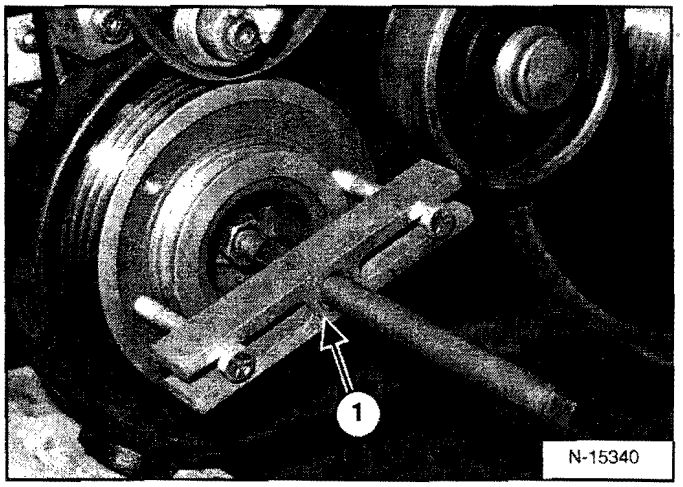


Remove the nut and washer (Item 1) **[Figure 30-40-3]** from the hydrostatic pump drive shaft.

Installation: Tighten the nut to 175-200 ft.-lbs. (237-271 Nm) torque.

Removal And Installation (Cont'd)

Figure 30-40-4



Install the nut on the end of the pump drive shaft (without washer).

Use a puller (Item 1) **[Figure 30-40-4]** to remove the pulley from the pump drive shaft.

Figure 30-40-5

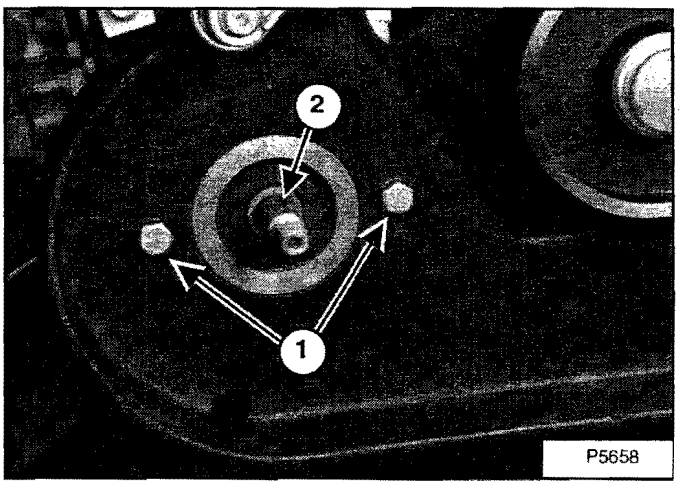
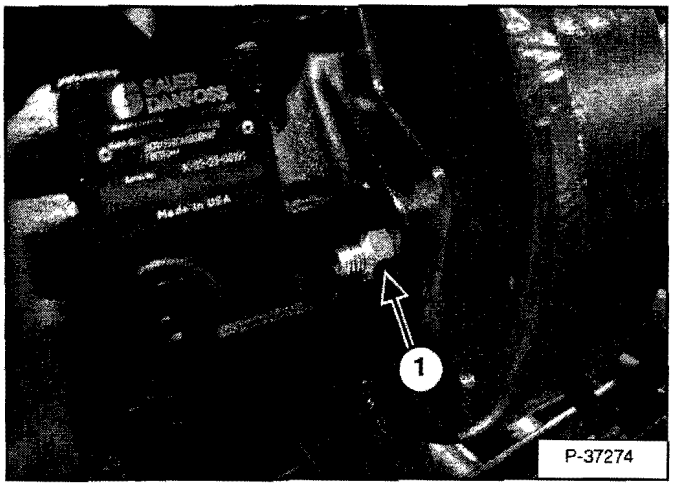


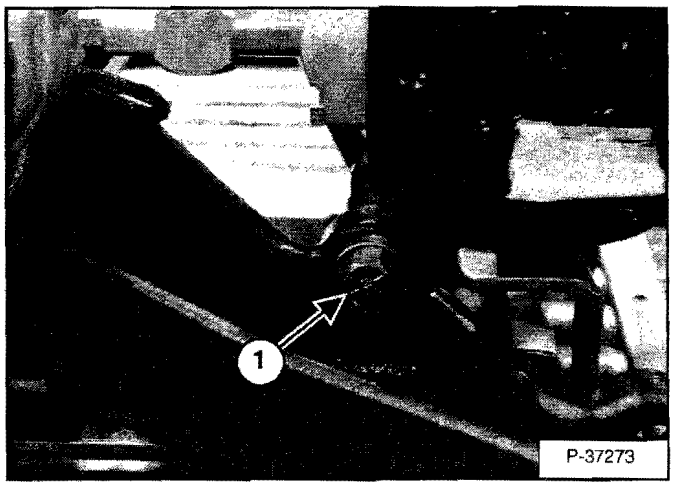
Figure 30-40-6



Remove the two mounting bolts (Item 1) **[Figure 30-40-5]** and nuts (Item 1) **[Figure 30-40-6]**.

Installation: Tighten the mounting bolts and nuts to 65-70 ft.-lbs. (88-95 Nm) torque. Make sure the key (Item 2) **[Figure 30-40-5]** is installed.

Figure 30-40-7

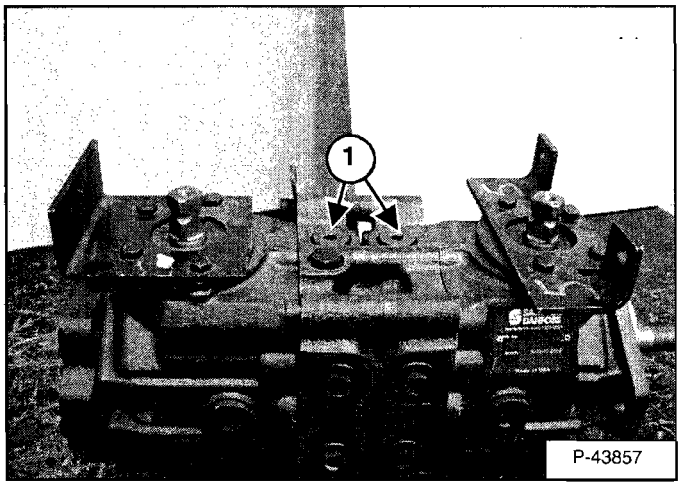


Remove the mounting bolt (Item 1) **[Figure 30-40-7]** at the hydraulic pump end of the pump.

Remove the hydrostatic pump from the mounting bracket and drive belt housing.

Replenishing/High Pressure Relief Valve

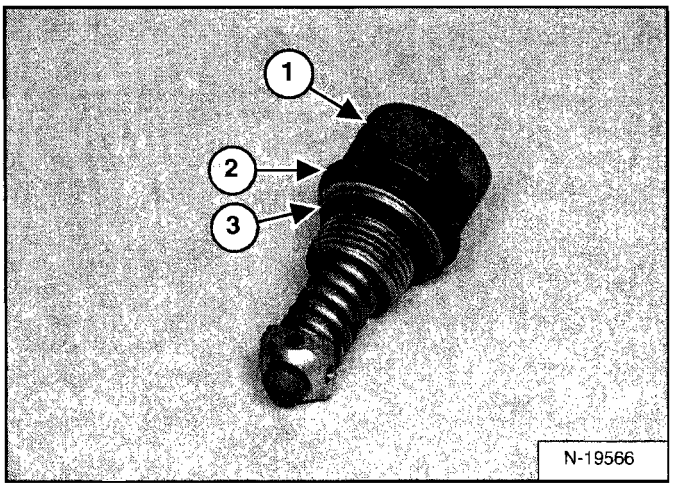
Figure 30-40-8



There are four replenishing/high pressure relief valves (Item 1) **[Figure 30-40-8]** 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 30-40-9



Remove the high pressure relief valve (Items 1) **[Figure 30-40-9]** from the pump.

Assemble: Tighten the plug to 30-50 ft.-lbs. (41-68 Nm) torque.

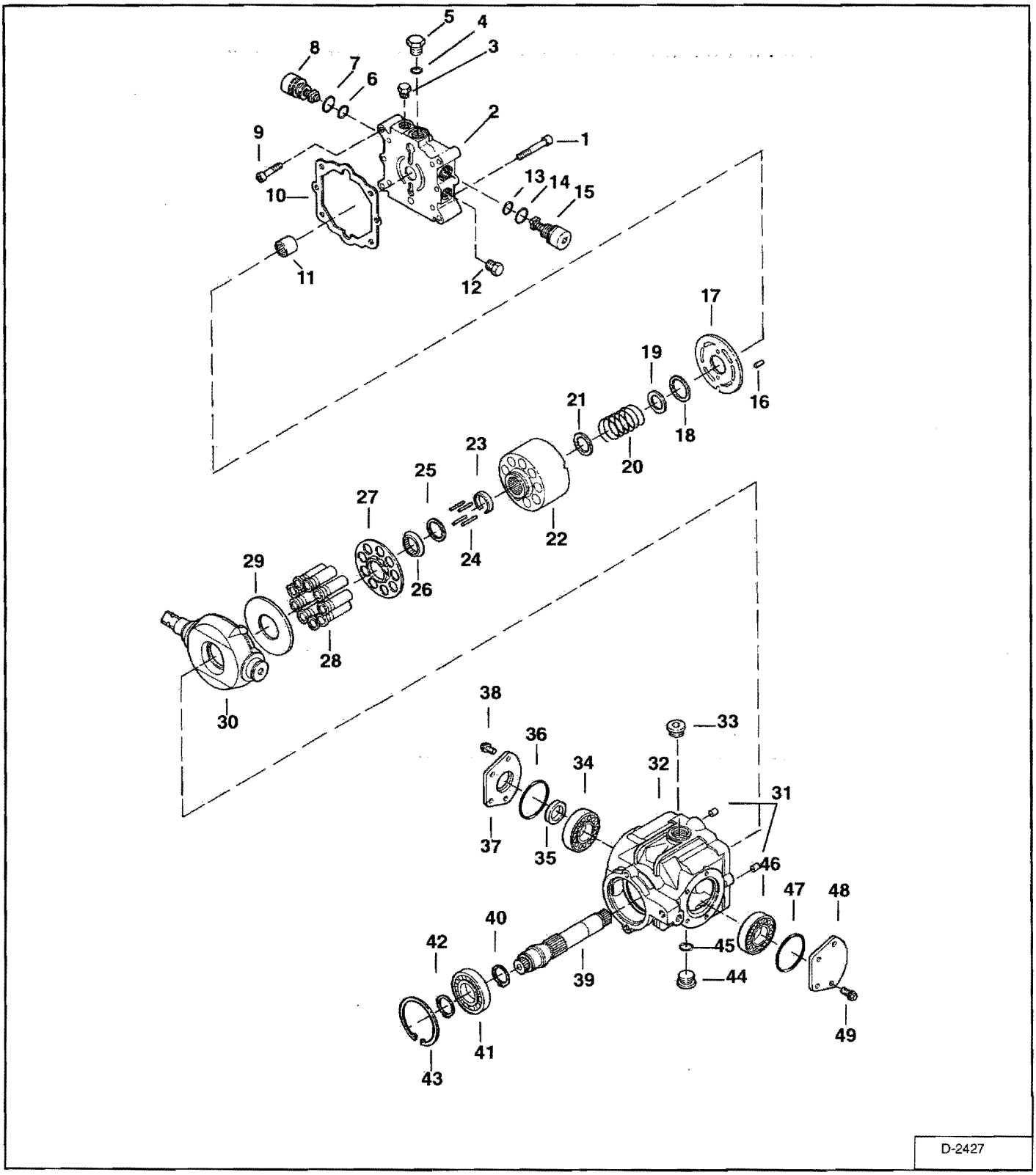
Check for damage and replace as needed.

Check the o-rings (Items 2 & 3) **[Figure 30-40-9]** 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).

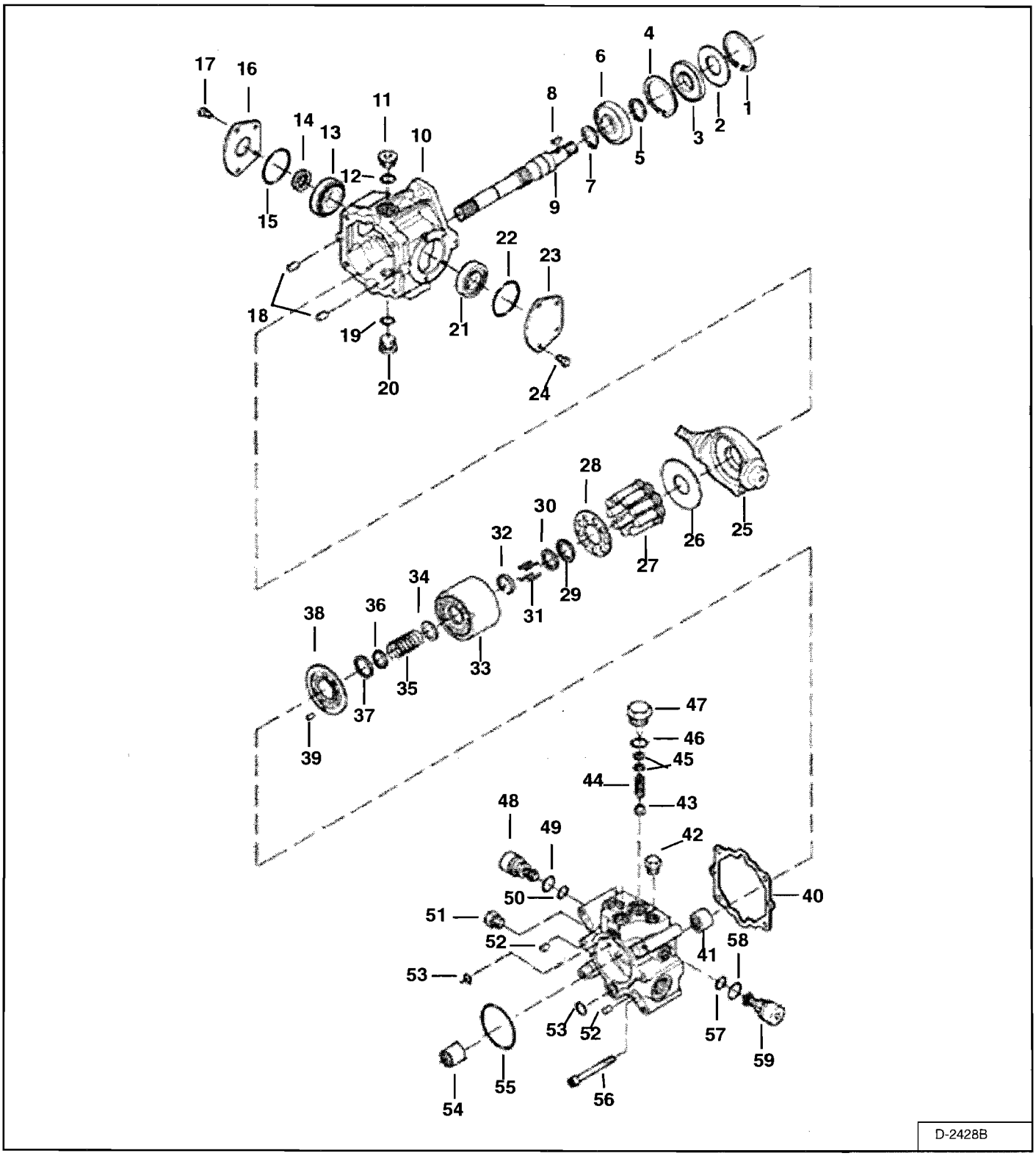
Parts Identification (Right Half)



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.	SWACHPLATE
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)

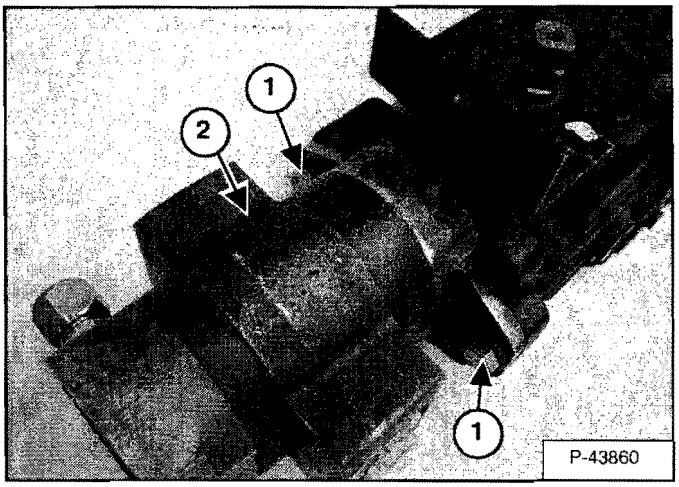


Parts Identification (Left Half) (Cont'd)

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.	O-RING
52.	PIN
53.	O-RING
54.	COUPLER
55.	O-RING
56.	BOLT
57.	O-RING
58.	O-RING
59.	RELIEF VALVE

Hydraulic Pump Removal And Installation

Figure 30-40-10

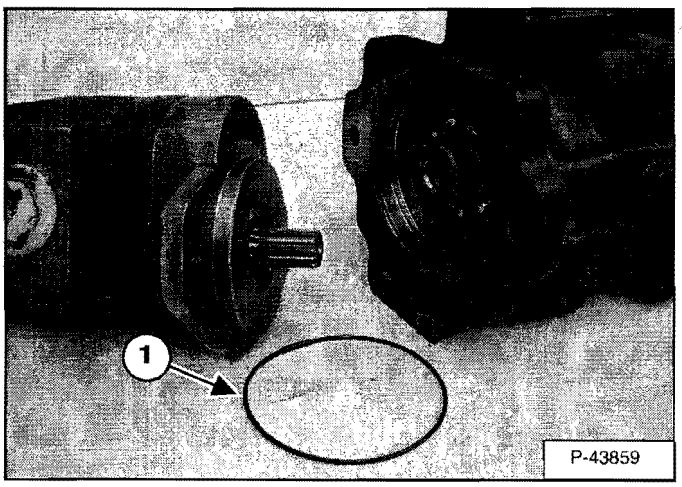


Remove the two pump mounting bolts (Item 1) **[Figure 30-40-10]** (both sides).

Installation: Tighten the mounting bolts to 27-37 ft.-lbs. (37-50 Nm) torque.

Remove the hydraulic pump (Item 2) **[Figure 30-40-10]** from the hydrostatic pumps.

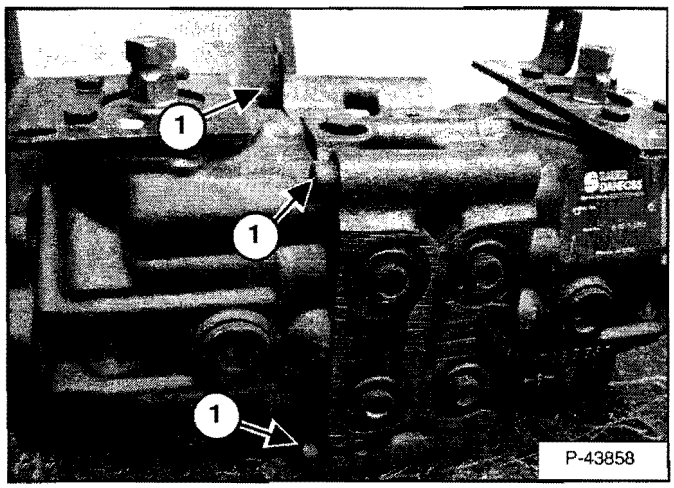
Figure 30-40-11



Remove the O-ring (Item 1) **[Figure 30-40-11]** from the hydraulic pump.

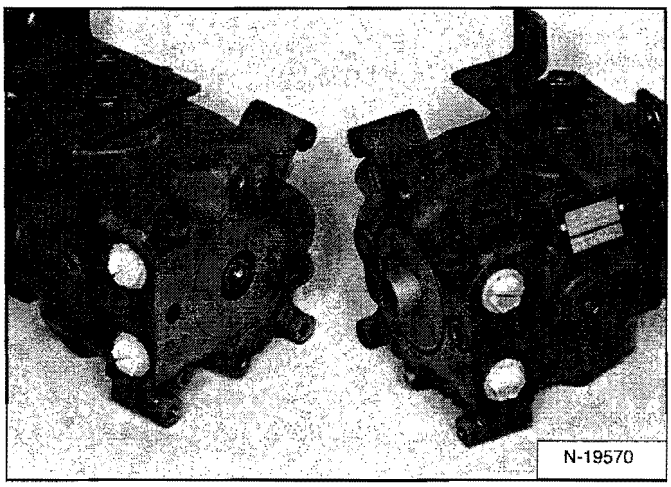
Pump Separation

Figure 30-40-12



Remove the four mounting bolts (Item 1) **[Figure 30-40-12]**.

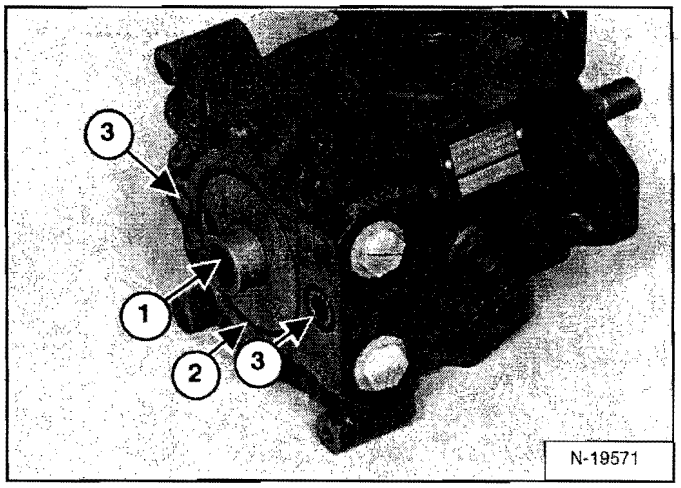
Figure 30-40-13



Separate the two hydrostatic pumps **[Figure 30-40-13]**.

Pump Separation (Cont'd)

Figure 30-40-14



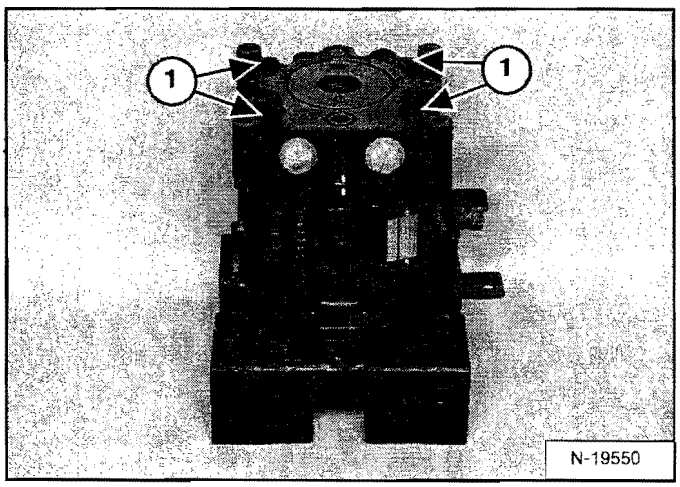
Remove the pump coupler (Item 1) **[Figure 30-40-14]**.

Remove the large O-ring (Item 2) **[Figure 30-40-14]**.

Remove the two small O-rings (Item 3) **[Figure 30-40-14]**.

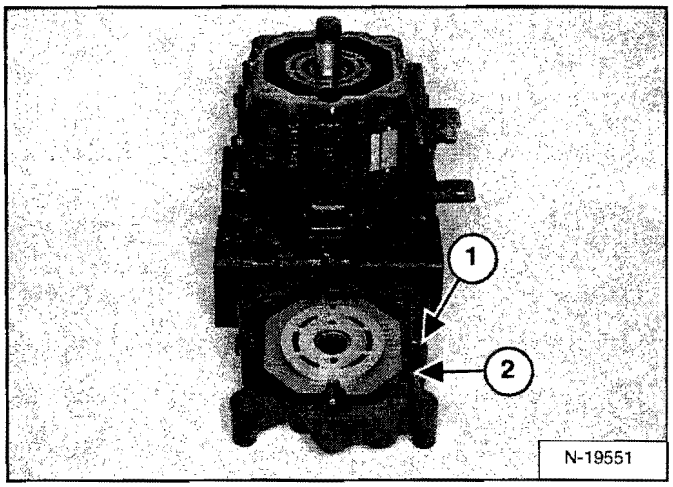
Disassembly

Figure 30-40-15



Remove the four bolts (Item 1) **[Figure 30-40-15]** from the pump housing end cap.

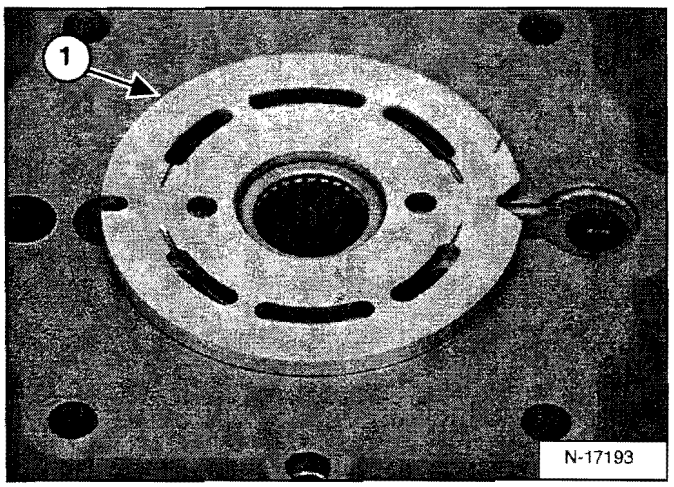
Figure 30-40-16



Remove the pump housing end cap (Item 1) **[Figure 30-40-16]**.

Remove the gasket (Item 2) **[Figure 30-40-16]**.

Figure 30-40-17

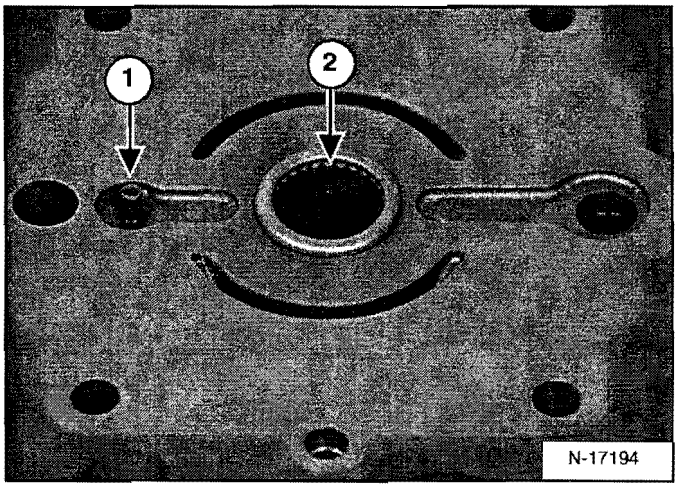


Remove the valve plate (Item 1) **[Figure 30-40-17]**.

Check the valve plate for wear. (Both Sides.)

Disassembly (Cont'd)

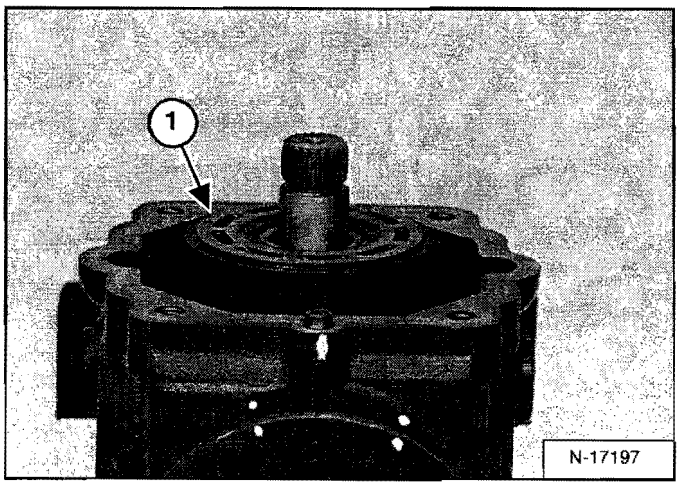
Figure 30-40-18



Check the valve plate locating pin (Item 1) **[Figure 30-40-18]** for wear and replace if needed.

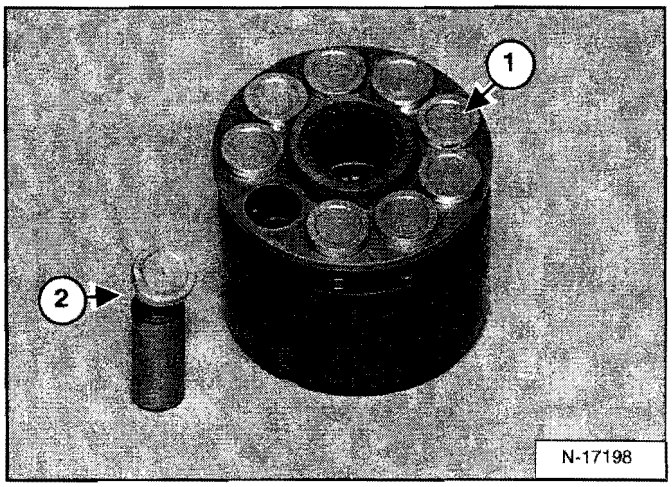
Check the needle bearing (Item 2) **[Figure 30-40-18]** for wear and replace if needed.

Figure 30-40-19



Remove the rotating group (Item 1) **[Figure 30-40-19]** from the pump.

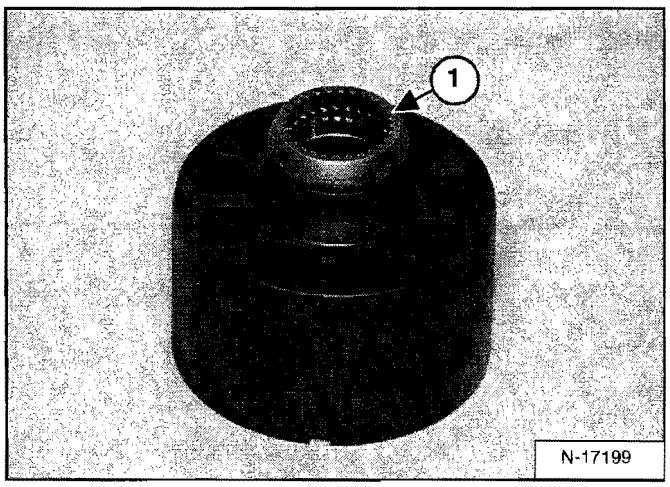
Figure 30-40-20



Remove the slipper guide and pistons (Item 1) **[Figure 30-40-20]** from the cylinder block.

Check all the pistons (Item 2) **[Figure 30-40-20]** for wear and replace the rotating group as needed.

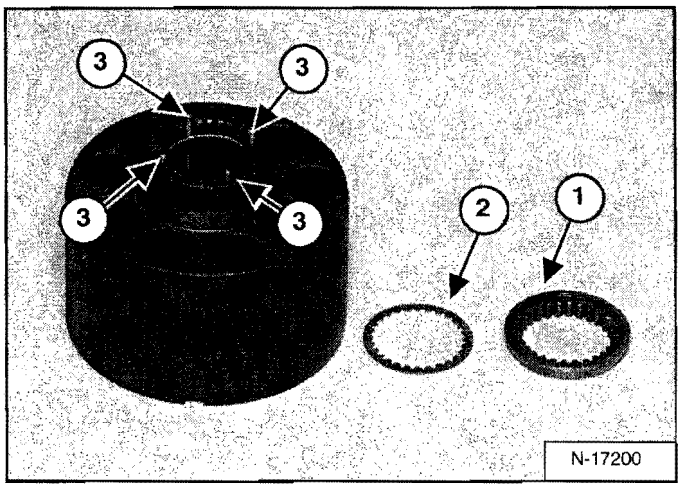
Figure 30-40-21



Remove the ball guide retainer (Item 1) **[Figure 30-40-21]** from the cylinder block.

Disassembly (Cont'd)

Figure 30-40-22



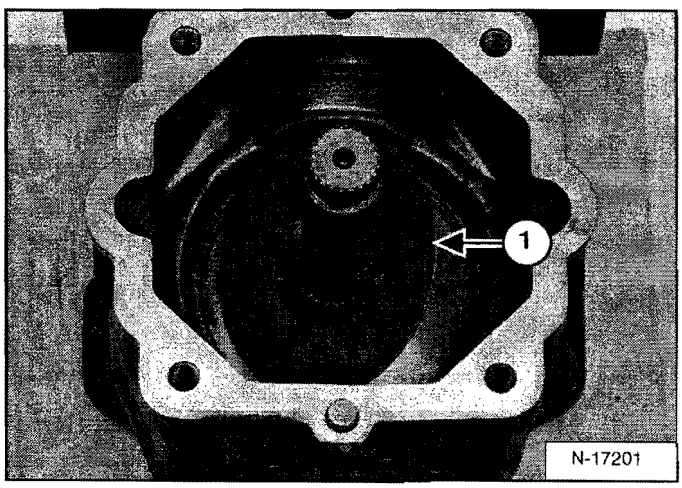
Check the ball guide retainer (Item 1) and washer (Item 2) **[Figure 30-40-22]** for wear and replace as needed.

Remove the four pins (Item 3) **[Figure 30-40-22]** from the cylinder block.

Check the cylinder block for wear and replace as needed.

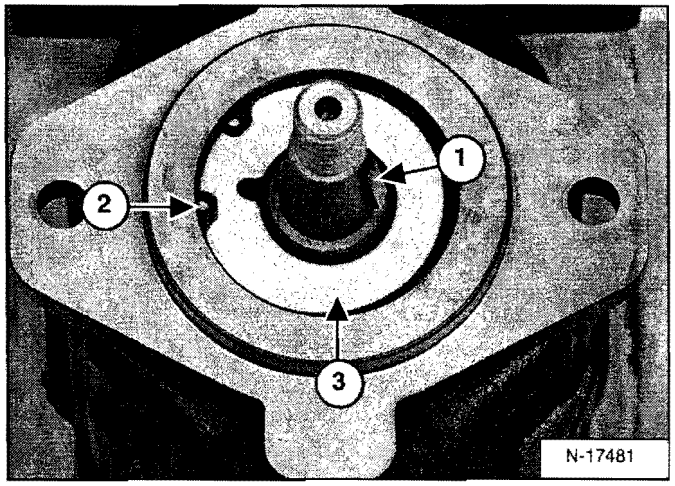
Check pins (Item 3) **[Figure 30-40-22]** to see if they are all the same length.

Figure 30-40-23



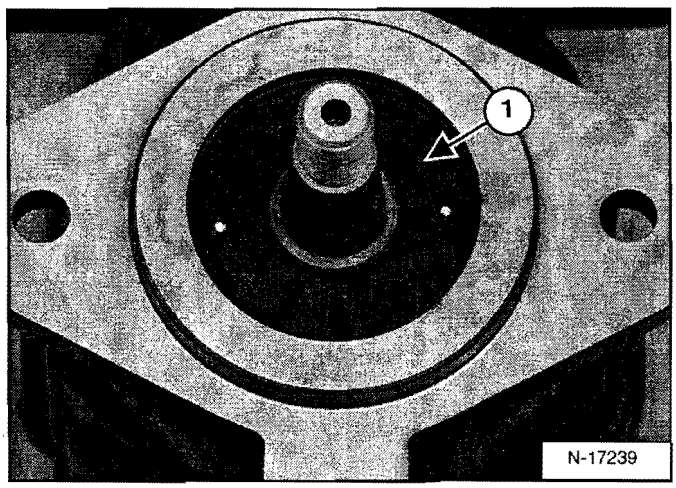
Remove the thrust plate (Item 1) **[Figure 30-40-23]** from the pump housing.

Figure 30-40-24



Remove the driveshaft key (Item 1) the snap ring (Item 2) and the support washer (Item 3) **[Figure 30-40-24]** from the drive shaft end of the pump.

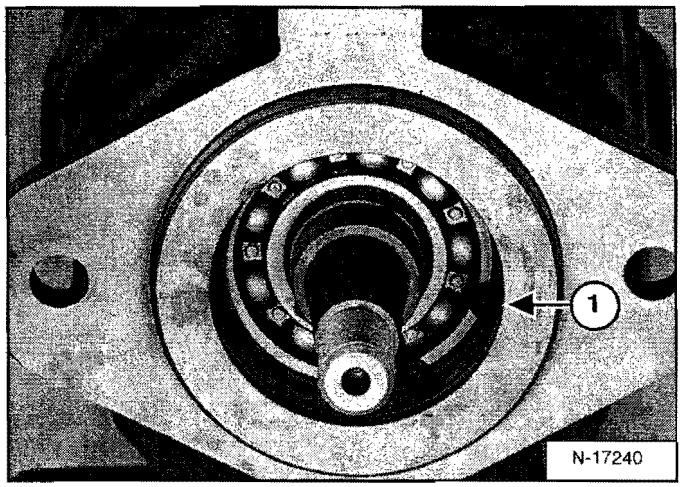
Figure 30-40-25



Use a seal puller and remove the seal (Item 1) **[Figure 30-40-25]** from the pump housing.

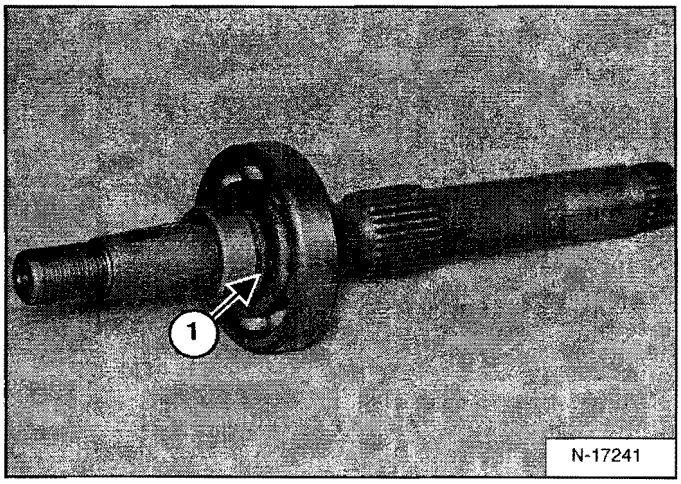
Disassembly (Cont'd)

Figure 30-40-26



Remove the snap ring (Item 1) **[Figure 30-40-26]** from the pump housing and remove the driveshaft and bearing from the housing.

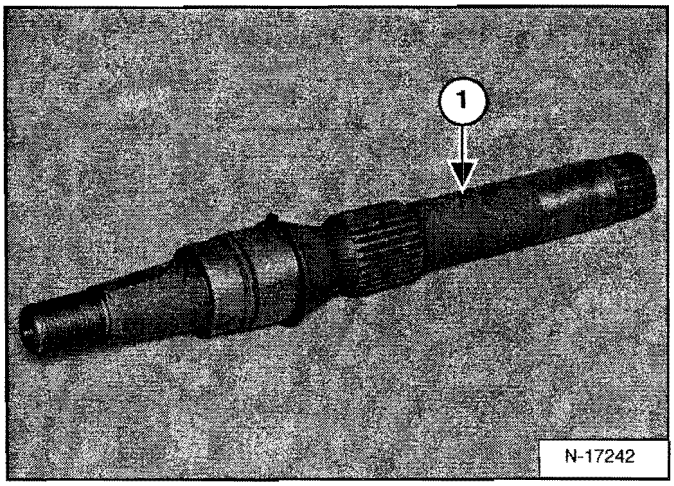
Figure 30-40-27



Remove the snap ring (Item 1) **[Figure 30-40-27]** from the driveshaft and remove the bearing.

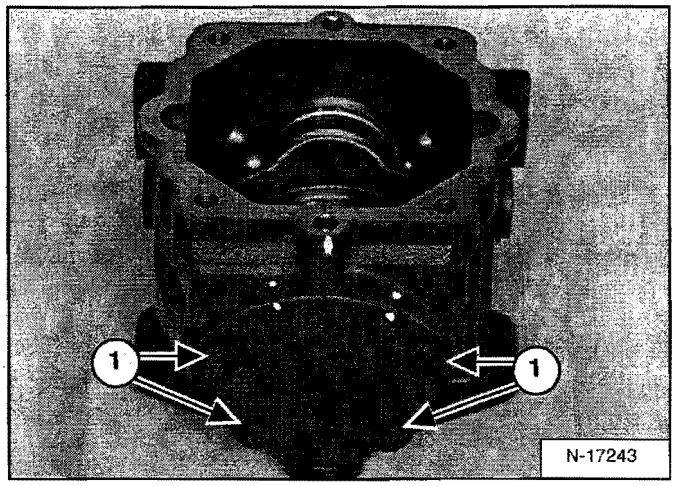
Check the bearing for wear and replace if worn.

Figure 30-40-28



Check the pump shaft (Item 1) **[Figure 30-40-28]** for wear and replace if needed.

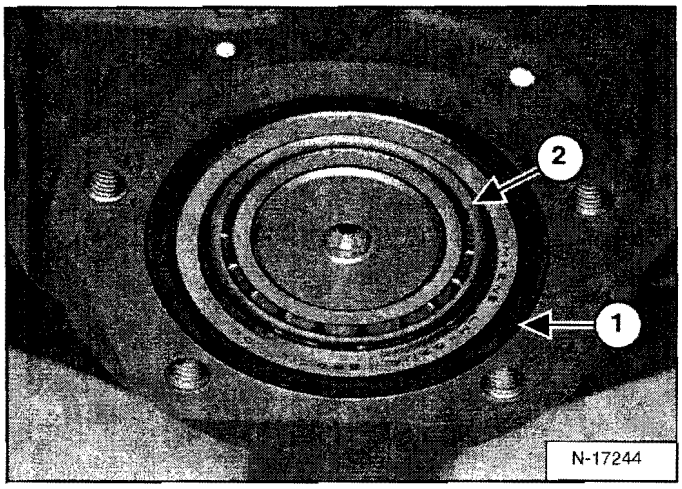
Figure 30-40-29



Remove the four mount bolts (Item 1) **[Figure 30-40-29]** from the lower trunnion cover. Remove the cover.

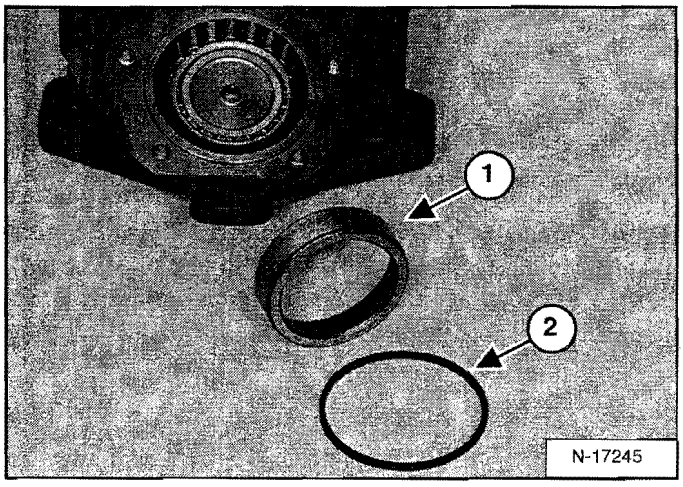
Disassembly (Cont'd)

Figure 30-40-30



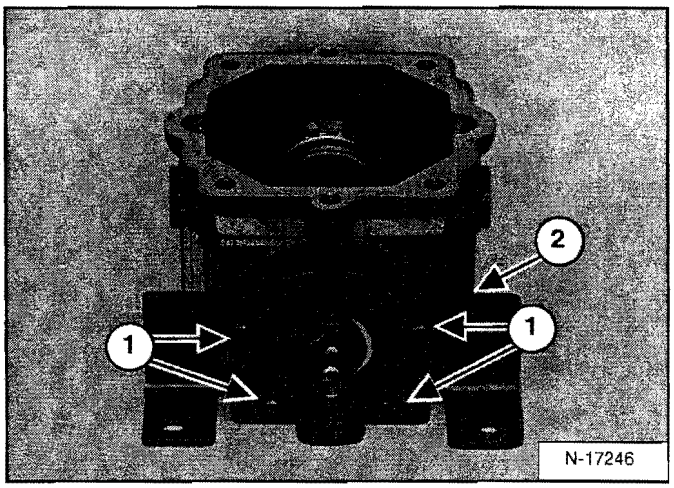
Remove the O-ring (Item 1) and bearing race (Item 2) **[Figure 30-40-30]** from the pump housing.

Figure 30-40-31



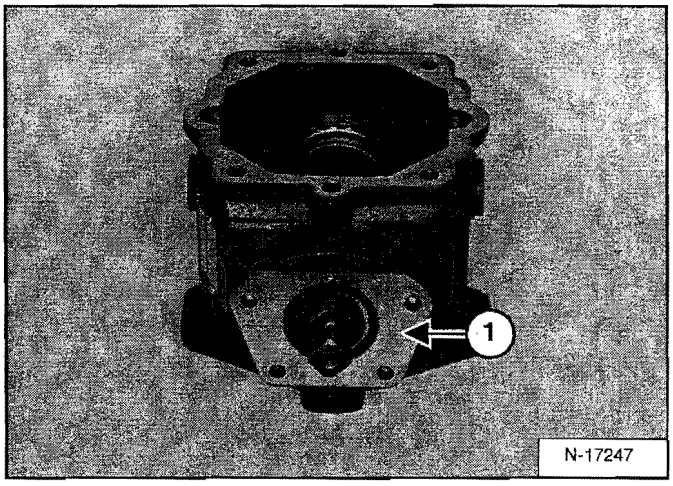
Check the bearing race (Item 1) and O-ring (Item 2) **[Figure 30-40-31]** for wear and replace as needed.

Figure 30-40-32



Remove the four mount bolts (Item 1) from the pump housing and remove the linkage bracket (Item 2) **[Figure 30-40-32]**.

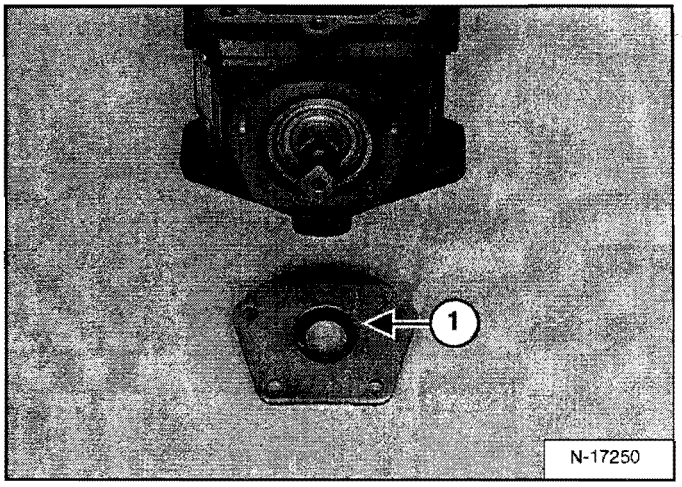
Figure 30-40-33



Remove the upper trunnion cover (Item 1) **[Figure 30-40-33]**.

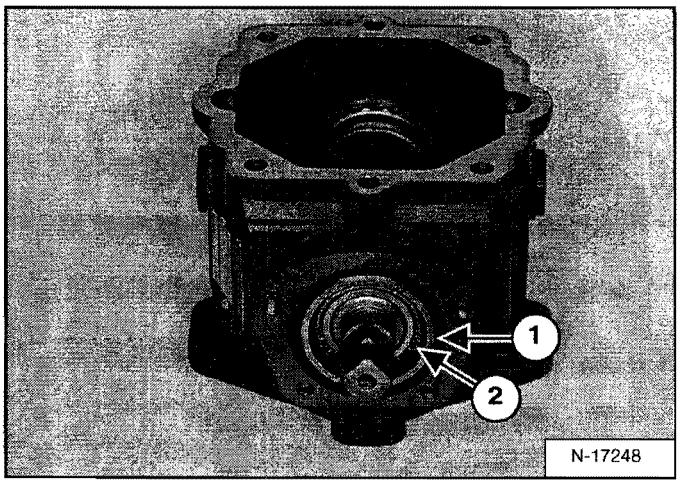
Disassembly (Cont'd)

Figure 30-40-34



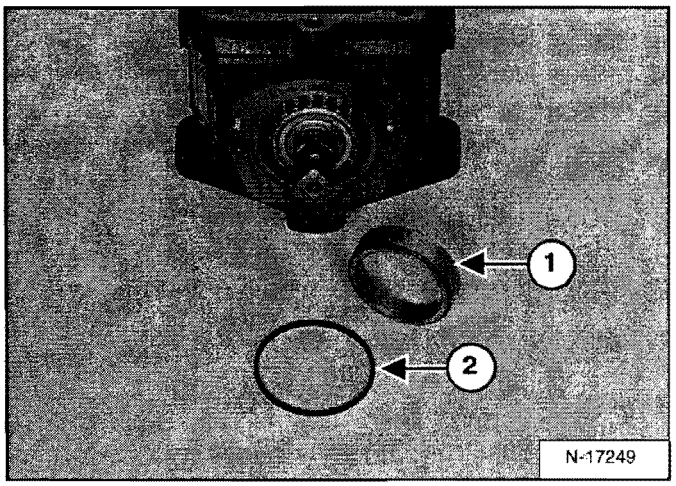
Inspect the seal (Item 1) **[Figure 30-40-34]** in the upper trunnion cover and replace if needed.

Figure 30-40-35



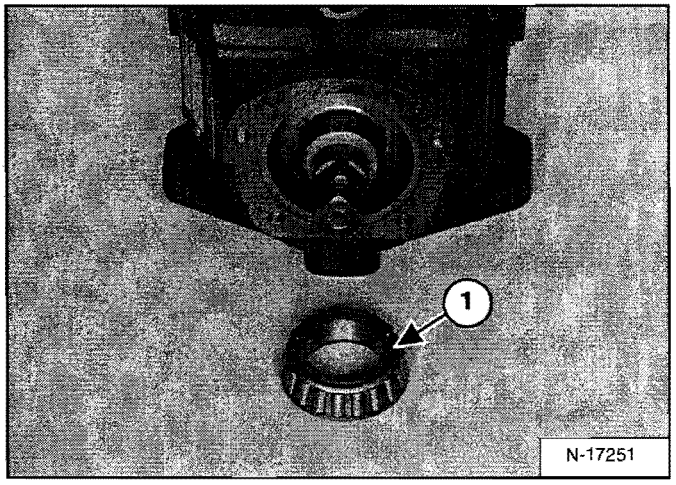
Remove the O-ring (Item 1) and bearing race (Item 2) **[Figure 30-40-35]** from the pump housing.

Figure 30-40-36



Inspect the bearing race (Item 1) and O-ring (Item 2) **[Figure 30-40-36]** and replace as needed.

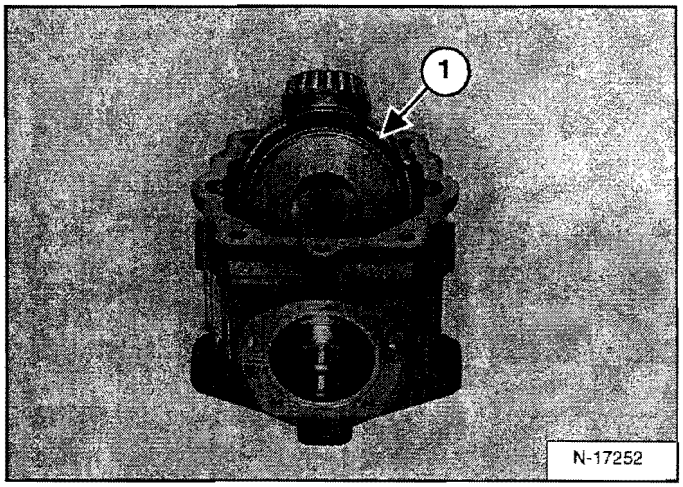
Figure 30-40-37



Slide the swashplate from side to side and remove the tapered roller bearing (Item 1) **[Figure 30-40-37]** from the swashplate shaft.

Disassembly (Cont'd)

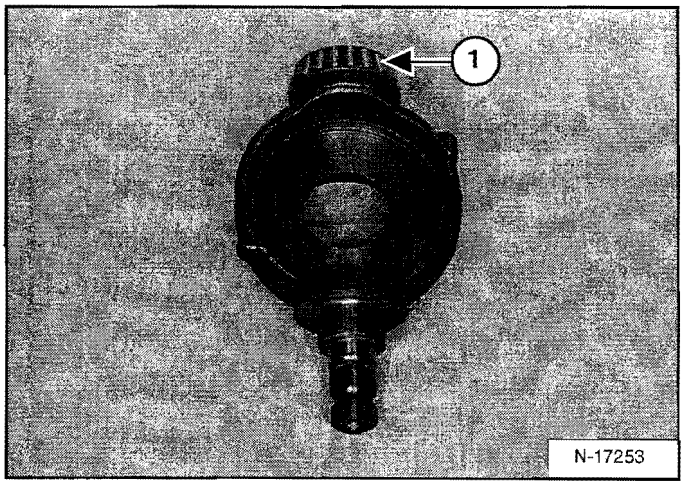
Figure 30-40-38



Tilt the swashplate (Item 1) **[Figure 30-40-38]** and remove the swashplate and lower bearing from the pump housing.

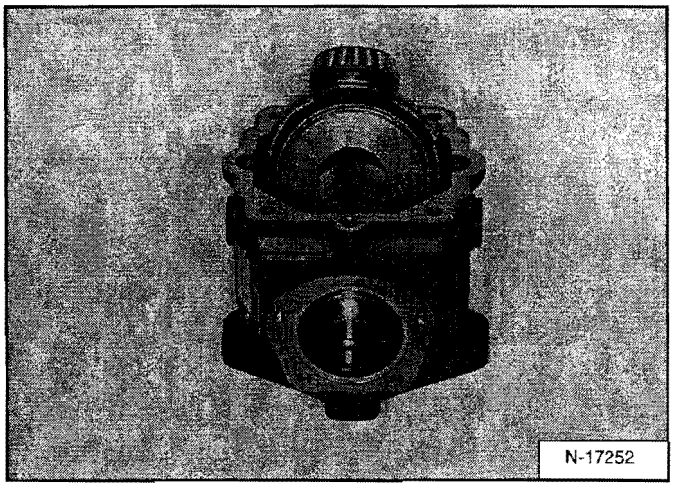
Assembly

Figure 30-40-39



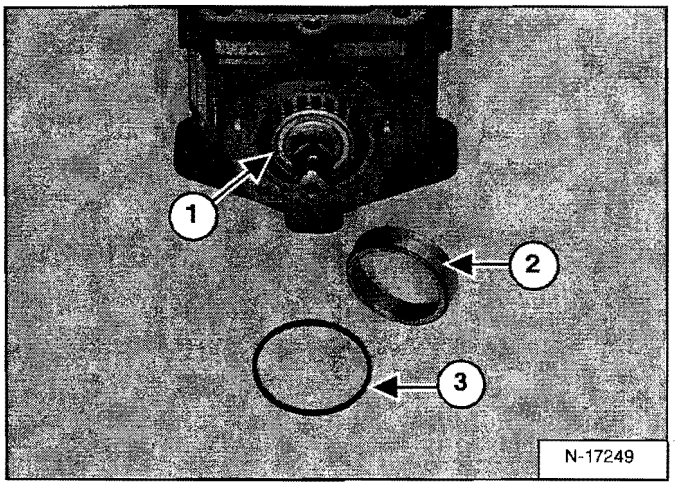
Install the lower bearing (Item 1) **[Figure 30-40-39]** on the swashplate.

Figure 30-40-40



Install the swashplate and bearing into the pump housing **[Figure 30-40-40]**.

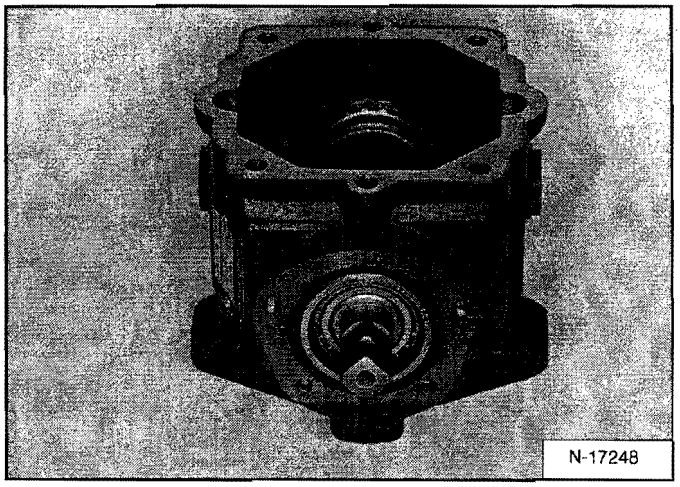
Figure 30-40-41



Install the tapered bearing (Item 1) **[Figure 30-40-41]** on the swashplate shaft.

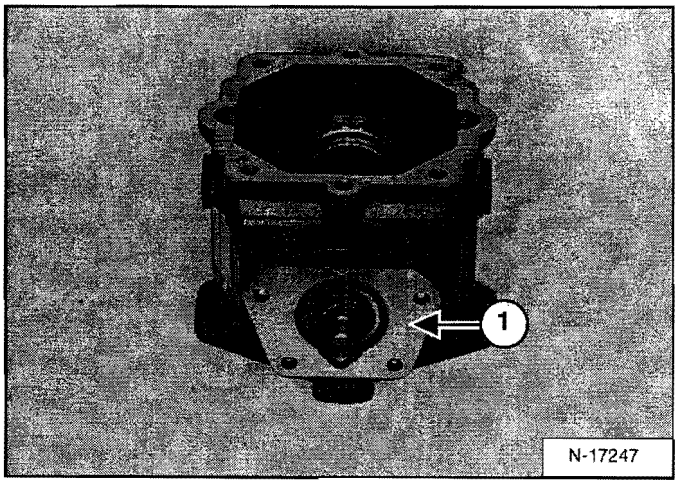
Assembly (Cont'd)

Figure 30-40-42



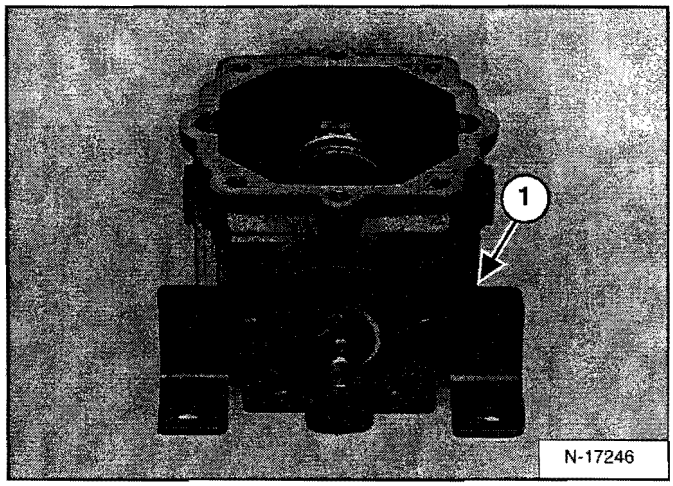
Install the bearing race (Item 2) **[Figure 30-40-41]** and O-ring (Item 3) **[Figure 30-40-41]** as shown in **[Figure 30-40-42]**.

Figure 30-40-43



Install the upper trunnion seal (Item 1) **[Figure 30-40-43]** and cover.

Figure 30-40-44



Install the linkage bracket (Item 1) **[Figure 30-40-44]** and the four mounting bolts and tighten to 18-22 ft.-lbs. (24-30 Nm) torque.

Assembly (Cont'd)

Figure 30-40-45

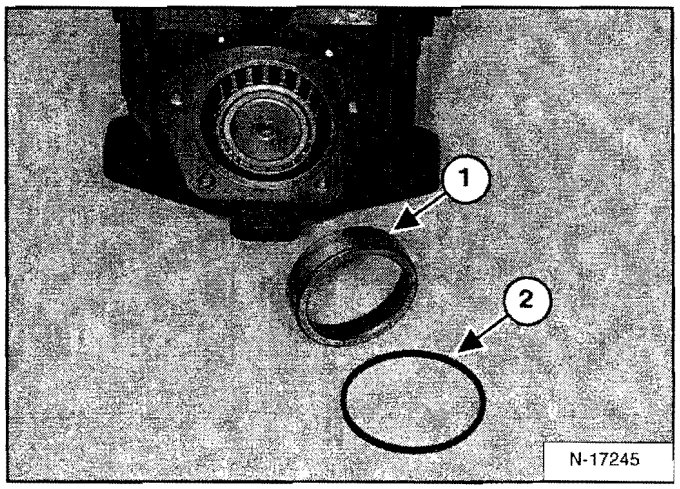
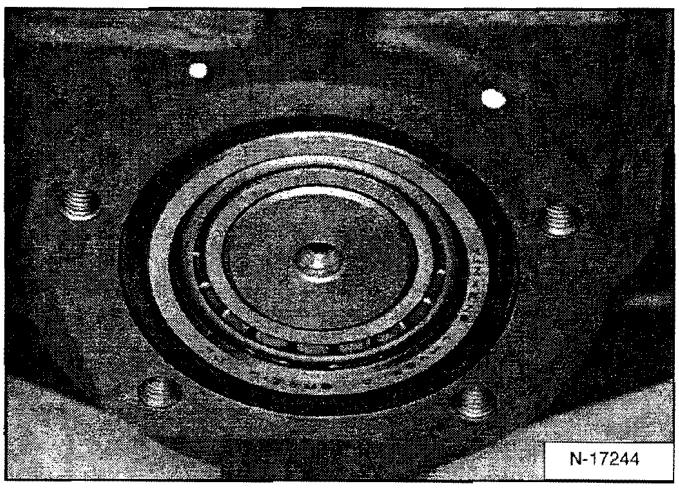
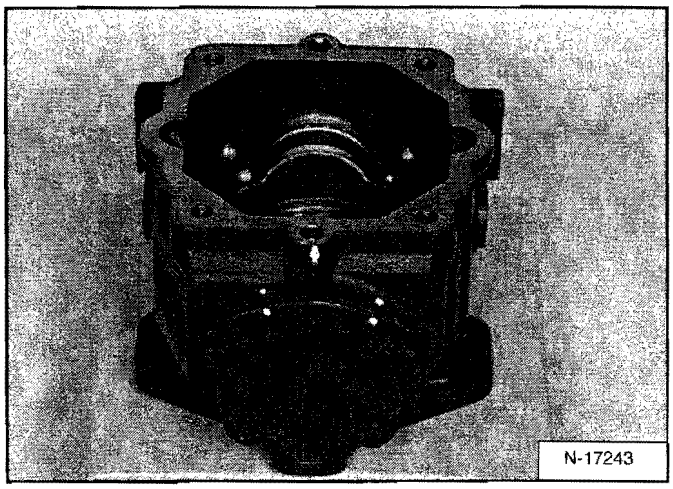


Figure 30-40-46



Install the bearing race (Item 1) **[Figure 30-40-45]** and O-ring (Item 2) **[Figure 30-40-45]** at the lower trunnion as shown in **[Figure 30-40-46]**.

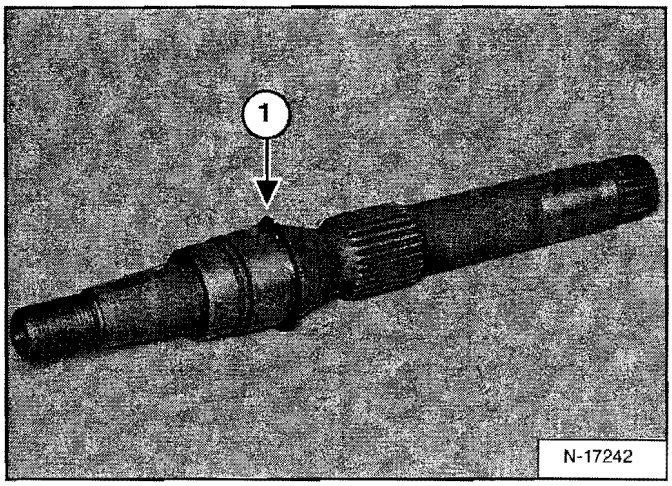
Figure 30-40-47



Align the marks on the lower trunnion cover and pump housing as shown in **[Figure 30-40-47]**.

Install the four mounting bolts and tighten to 18-22 ft.-lbs. (24-30 Nm) torque.

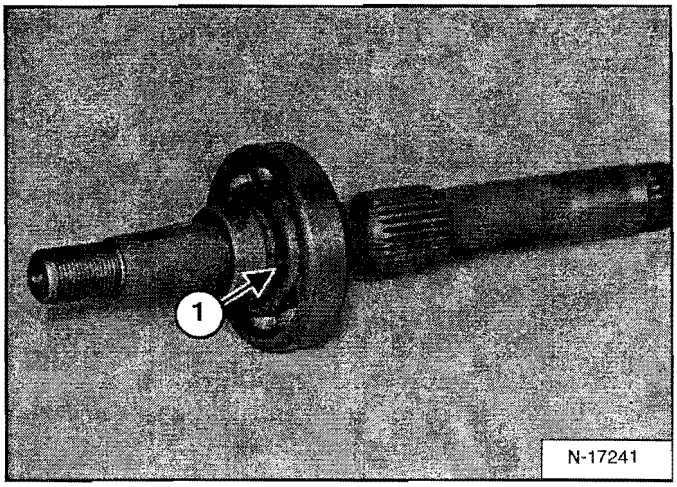
Figure 30-40-48



Install the snap ring (Item 1) **[Figure 30-40-48]** on the pump shaft.

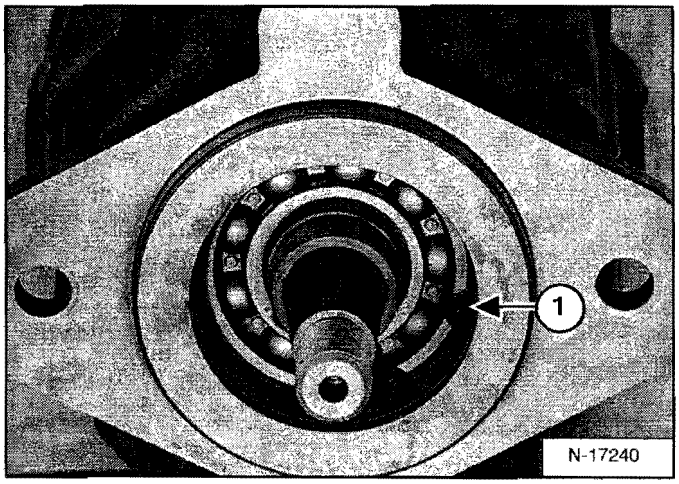
Assembly (Cont'd)

Figure 30-40-49



Install the bearing and snap ring (Item 1) **[Figure 30-40-49]** on the pump shaft.

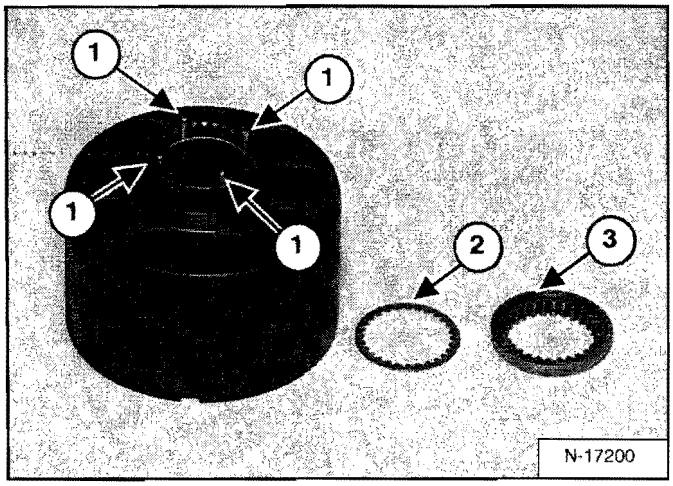
Figure 30-40-50



Install the pump shaft into the pump housing **[Figure 30-40-50]**.

Install the snap ring (Item 1) **[Figure 30-40-50]**.

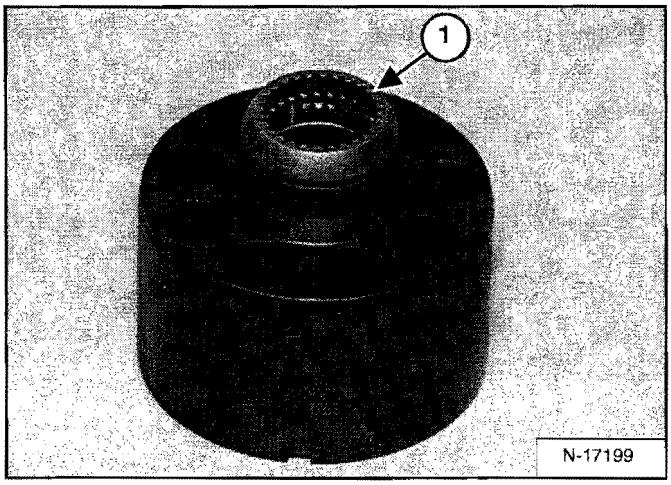
Figure 30-40-51



Install the four slipper pins (Item 1) **[Figure 30-40-51]** into the cylinder block.

Apply a small amount of grease to the washer (Item 2) and install into the ball guide retainer (Item 3) **[Figure 30-40-51]**.

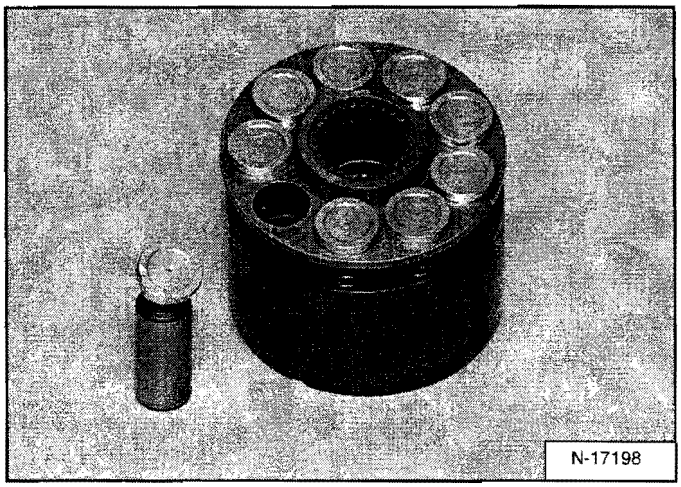
Figure 30-40-52



Install the ball guide retainer and washer (Item 1) **[Figure 30-40-52]** onto the slipper holddown pins.

Assembly (Cont'd)

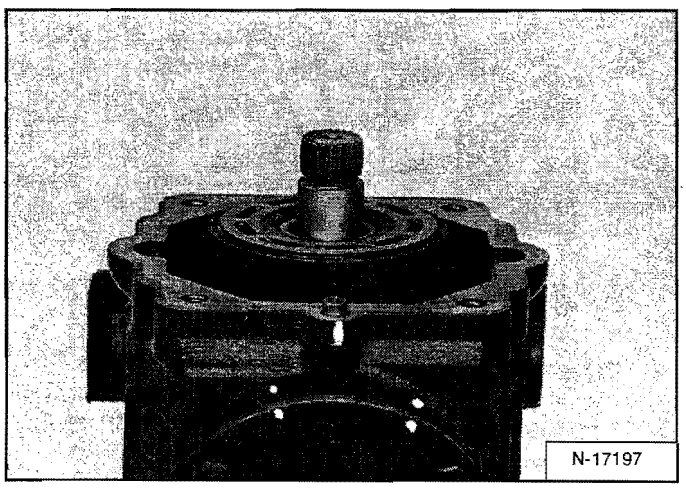
Figure 30-40-53



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 30-40-53]**.

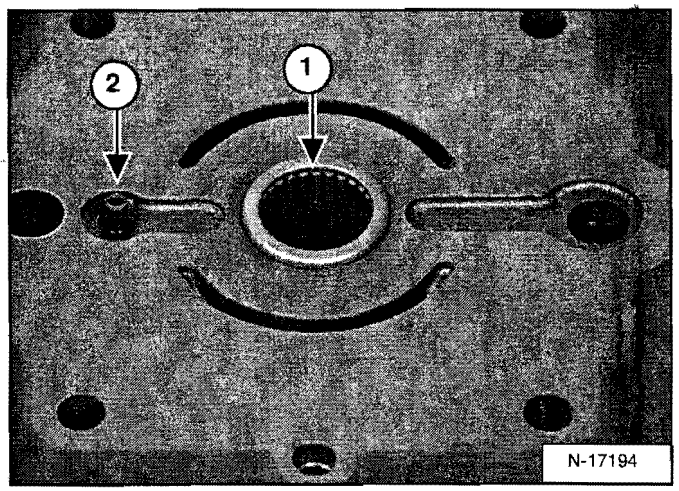
Lay the pump housing on its side and install the cylinder block, piston assembly into the housing.

Figure 30-40-54



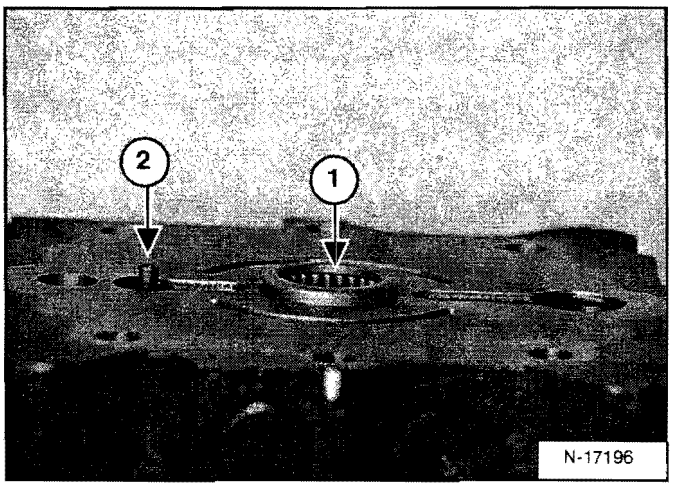
Place the pump on a work surface with the end cap opening up **[Figure 30-40-54]**.

Figure 30-40-55



Replace the needle bearing (Item 1) and valve plate locating pin (Item 2) **[Figure 30-40-55]** in the charge pump.

Figure 30-40-56

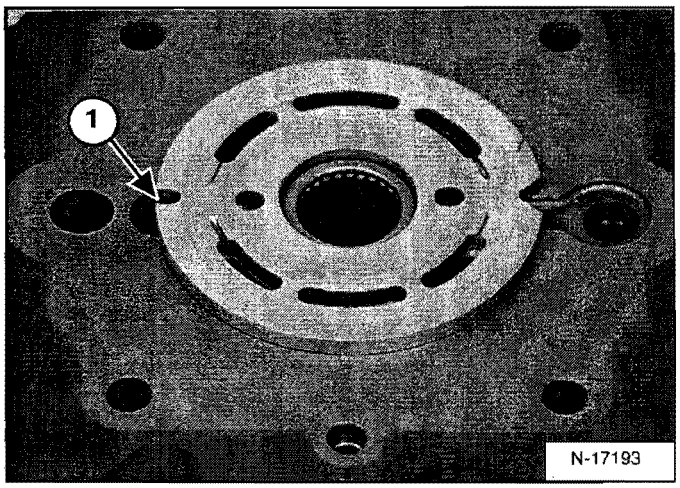


The bearing cage (Item 1) **[Figure 30-40-56]** will protrude from 0.08-0.10 inch (2,0-2,5 mm) from the surface of the charge pump.

The valve plate locating spring pin (Item 2) **[Figure 30-40-56]** will protrude from .165-0.185 inch (4,19-4,70 mm) from the surface of the charge pump.

Assembly (Cont'd)

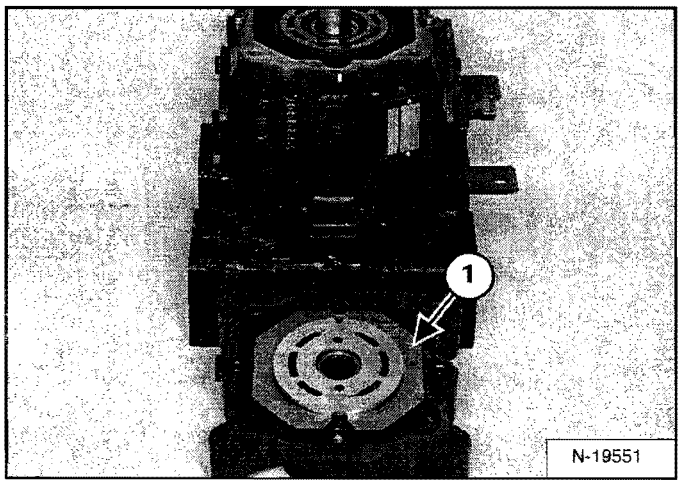
Figure 30-40-57



Coat the backside of the valve plate with petroleum jelly to hold it in position and install the valve plate onto the charge pump, bronze face up **[Figure 30-40-57]**.

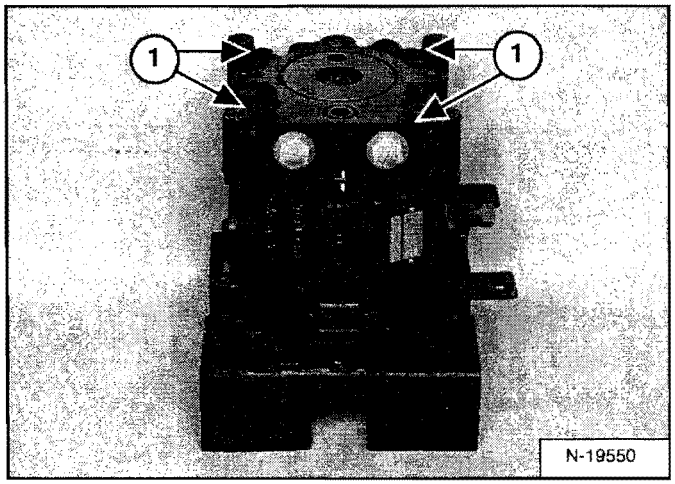
The notch (Item 1) **[Figure 30-40-57]** on the valve plate must engage the locating pin.

Figure 30-40-58



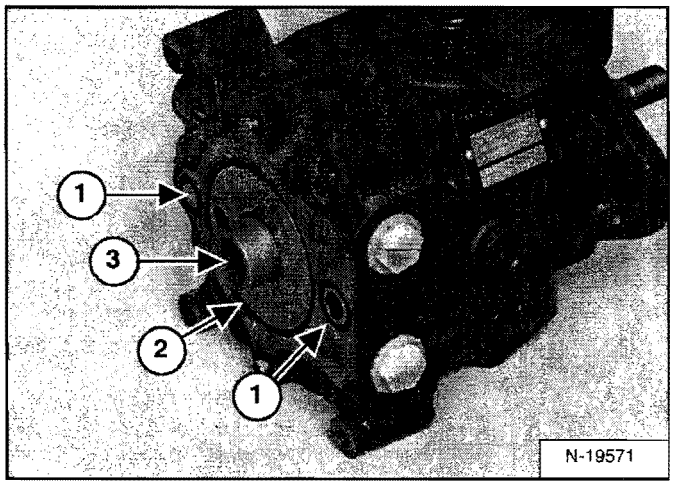
Coat a new end cap gasket (Item 1) **[Figure 30-40-58]** with petroleum jelly and install onto the end cap.

Figure 30-40-59



Install the valve plate and end cap on the pump housing. Tighten the bolts (Item 1) **[Figure 30-40-59]** to 35-45 ft.-lbs. (47-61 Nm) torque.

Figure 30-40-60



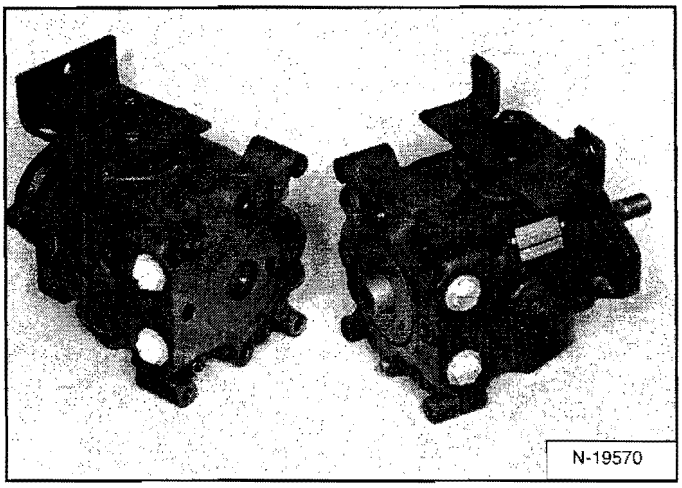
Install the two small O-rings (Item 1) **[Figure 30-40-60]**.

Install the large new O-ring (Item 2) **[Figure 30-40-60]**.

Install the pump coupler (Item 3) **[Figure 30-40-60]**.

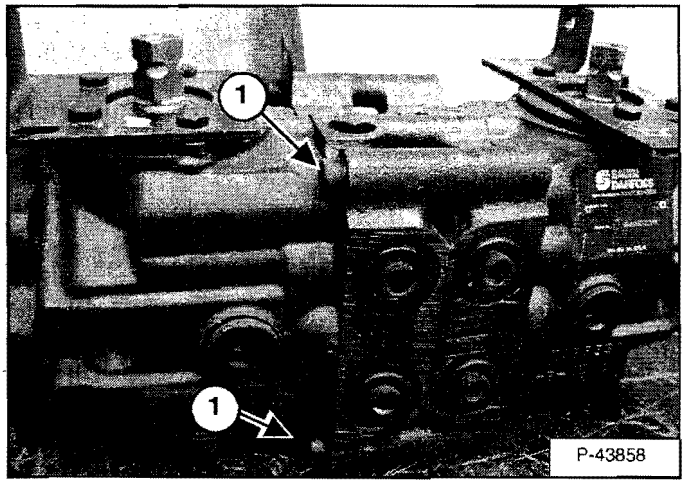
Assembly (Cont'd)

Figure 30-40-61



Install the two pumps together **[Figure 30-40-61]**.

Figure 30-40-62



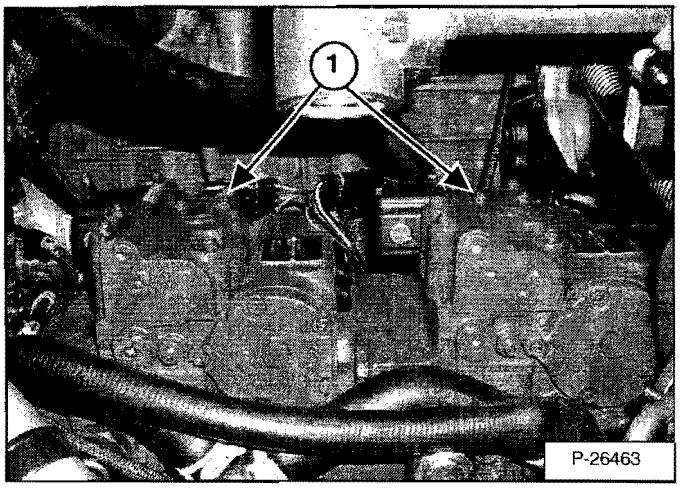
Tighten the four bolts (Item 1) **[Figure 30-40-62]** to 35-45 ft.-lbs. (47-61 Nm) torque.


Bobcat®

HYDROSTATIC PUMP (SELECTABLE JOYSTICK CONTROL) (SJC)

Pump Controller Removal And Installation

Figure 30-41-1



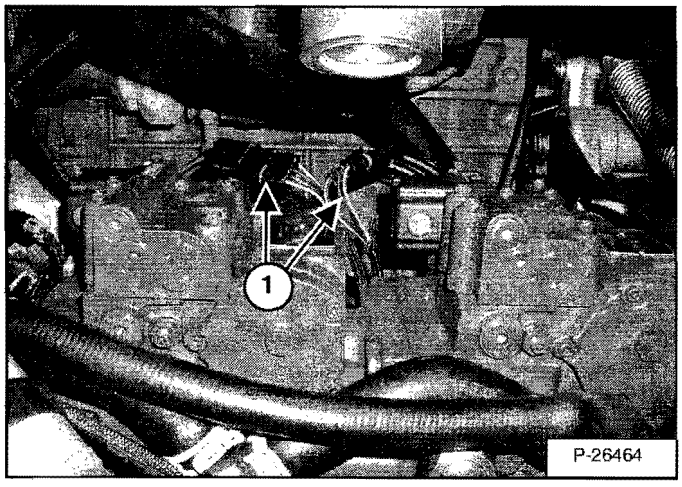
Raise the lift arms and install and approved lift arm support device. (See Contents Page 10-01.)

Place the loader on jackstands. (See Contents Page 10-01.)

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

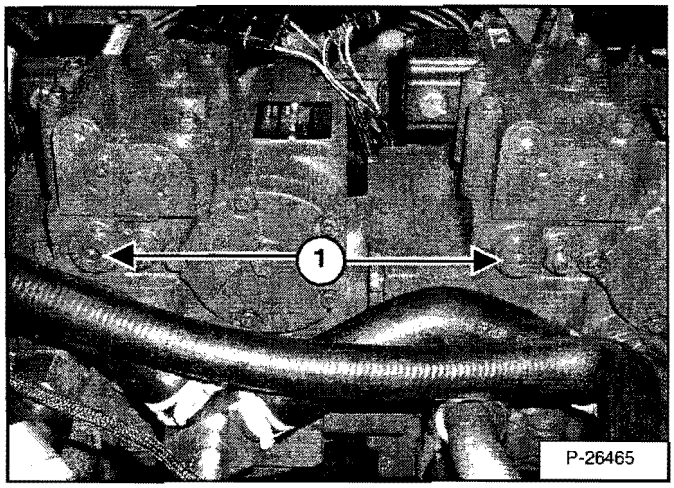
Locate the two pump controllers (Item 1) **[Figure 30-41-1]** on the hydrostatic pumps.

Figure 30-41-2



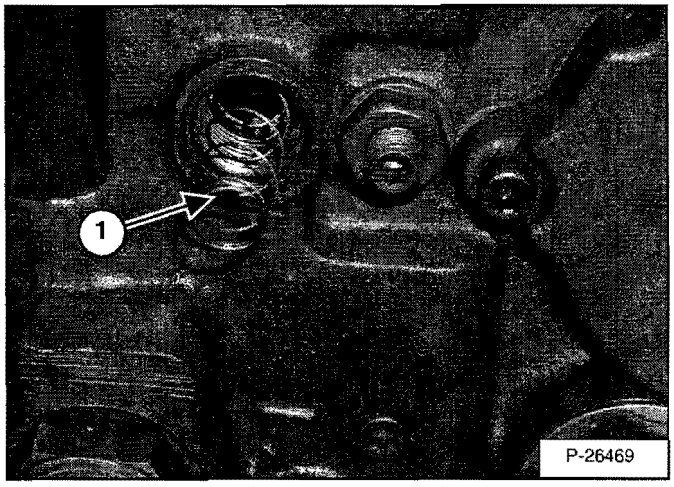
Disconnect the electrical connectors (Item 1) **[Figure 30-41-2]** from the loader harness.

Figure 30-41-3



Remove the control spool plug (Item 1) **[Figure 30-41-3]** at the front side of the pump.

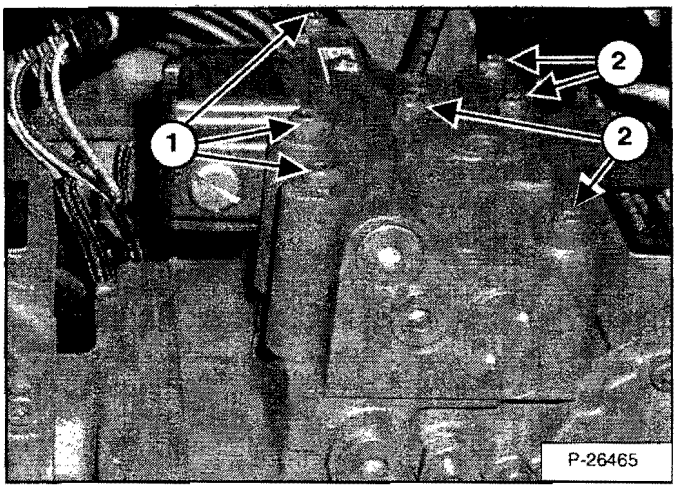
Figure 30-41-4



Do Not remove the spring (Item 1) **[Figure 30-41-4]**,as it is attached to the control spool.

Pump Controller Removal And Installation (Cont'd)

Figure 30-41-5

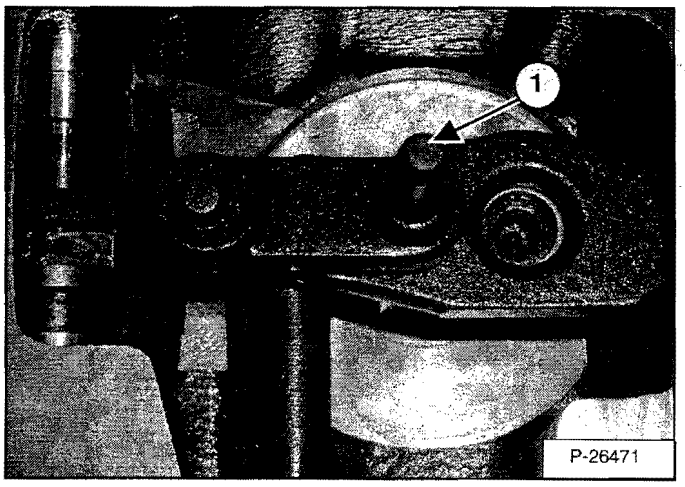


Remove the seven mount bolts (Item 1) **[Figure 30-41-5]** from the pump controller.

Remove the controller from the pump.

Remove the controller gasket from the pump.

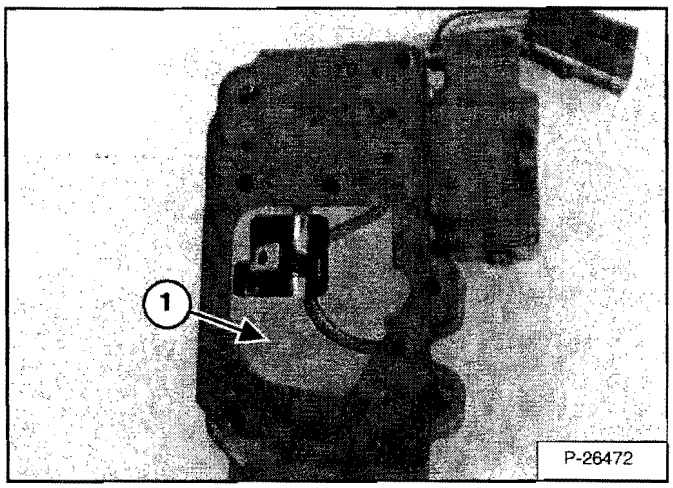
Figure 30-41-6



Installation:

Be sure the summing link pin (Item 1) **[Figure 30-41-6]** is in the center.

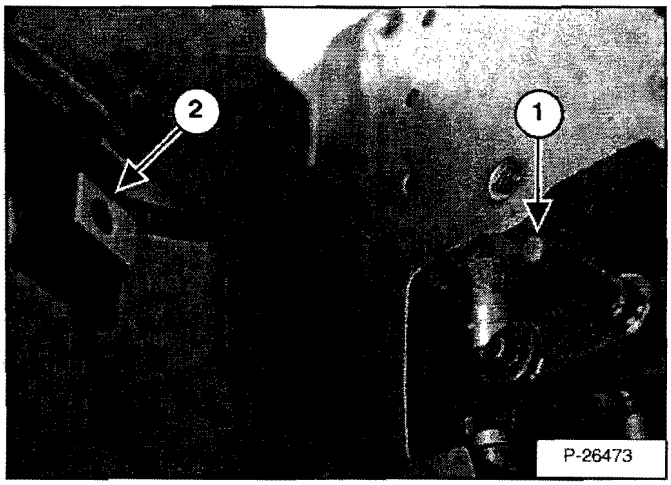
Figure 30-41-7



Use a small amount of grease on a new gasket and install the gasket on the pump controller (Item 1) **[Figure 30-41-7]**.

Be sure the pump surface is clean.

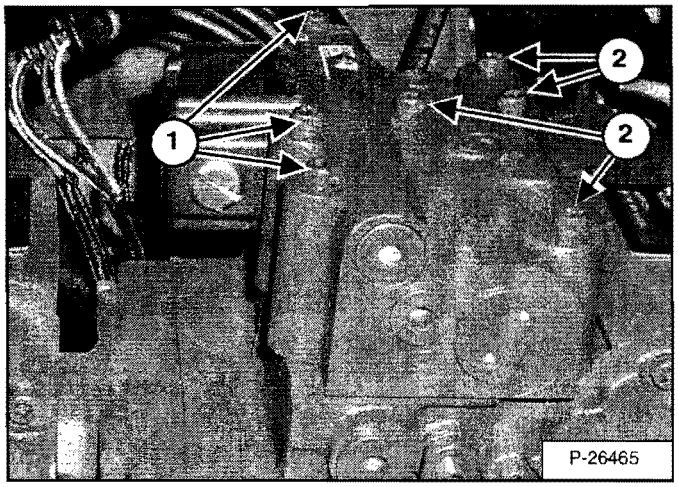
Figure 30-41-8



Align the summing link pin (Item 1) on the pump with the bore (Item 2) **[Figure 30-41-8]** in the pump controller module.

Pump Controller Removal And Installation (Cont'd)

Figure 30-41-9

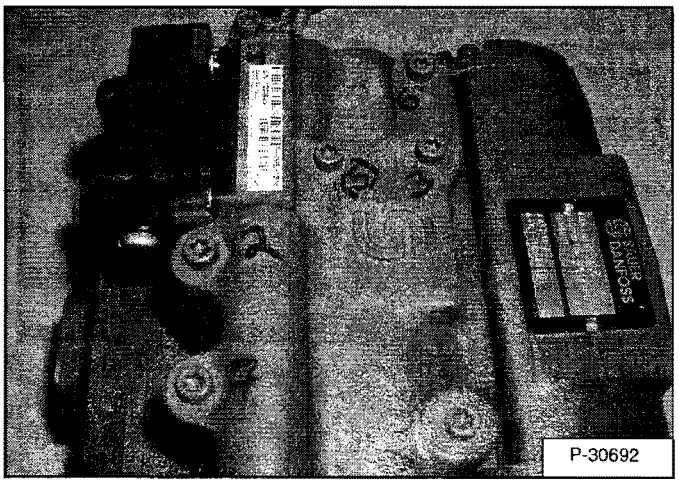


Install the pump controller on the hydrostatic pump.

Align the bolt holes.

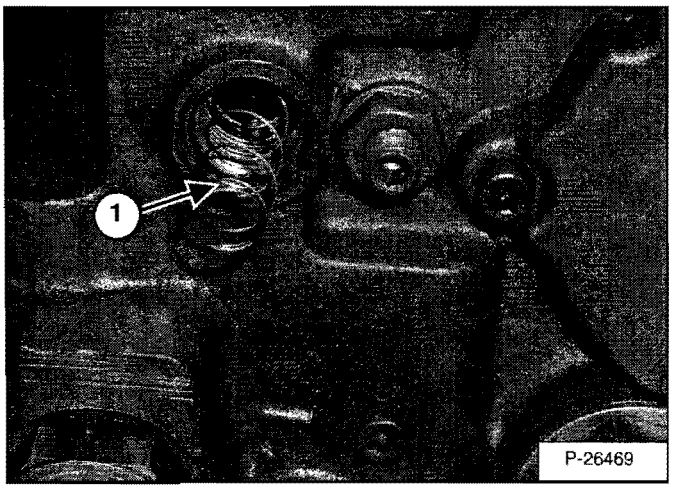
Install the seven mount bolts, (Item 1) **[Figure 30-41-9]** and tighten to 11-13 ft.-lbs. (15-17.5 Nm) torque.

Figure 30-41-10



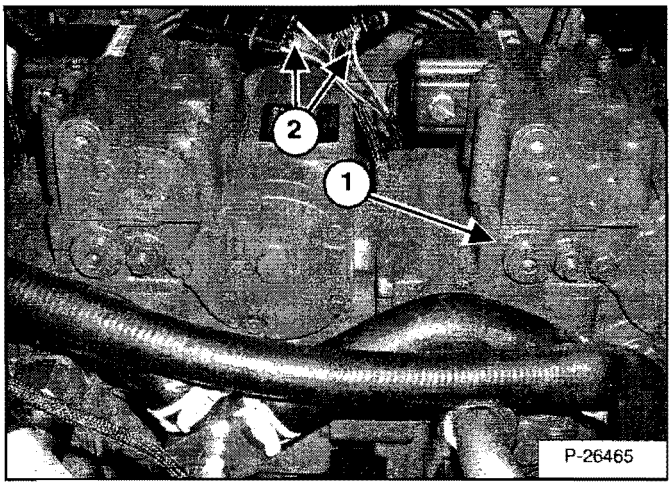
Tighten the controller mounting bolts to 132-156 in.-lbs. (15-17.5 Nm) torque using the tightening pattern **[Figure 30-41-10]**

Figure 30-41-11



Be sure the spring (Item 1) **[Figure 30-41-11]** is properly attached to the control spool.

Figure 30-41-12



Install the control spool bore plug (Item 1) **[Figure 30-41-12]** in the pump and tighten to 30-70 ft.-lbs. (41-94 Nm) torque.

Connect the electrical connectors (Item 1) **[Figure 30-41-12]** to the loader harness.

NOTE: When a pump controller is replaced the hydrostatic pumps must be calibrated. (See Hydrostatic Pump Calibration on Page 30-40-4.) for the proper procedure.)

Hydrostatic Pump Calibration

⚠ 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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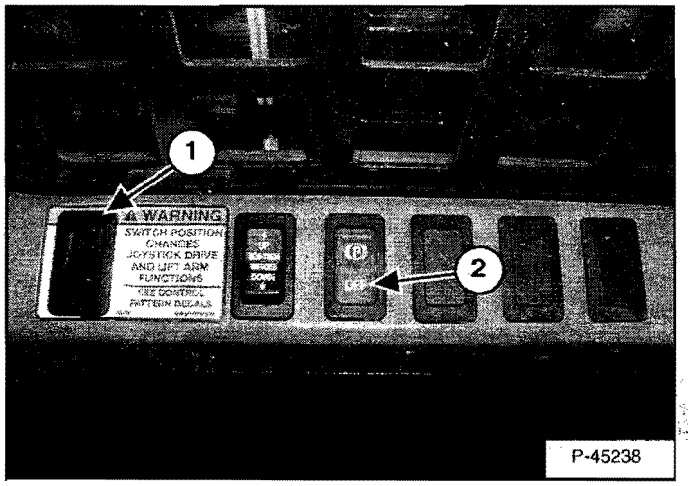
Place the loader on jackstands. (See Contents Page 10-01.)

Operator must be in the seat and the seat bar down.

Figure 30-41-13



Close the cab door. (If loader is so equipped.)

Place the loader Control Pattern Switch (Item 1) **[Figure 30-41-13]** in the ISO position.

Verify the parking brake (Item 2) **[Figure 30-41-13]** is OFF.

Figure 30-41-14

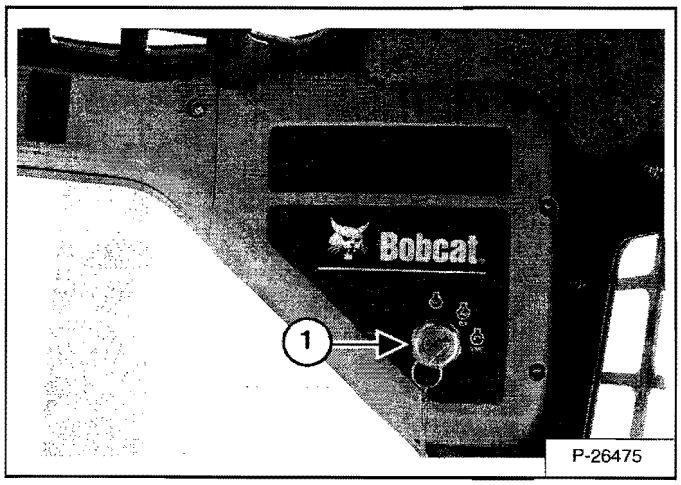
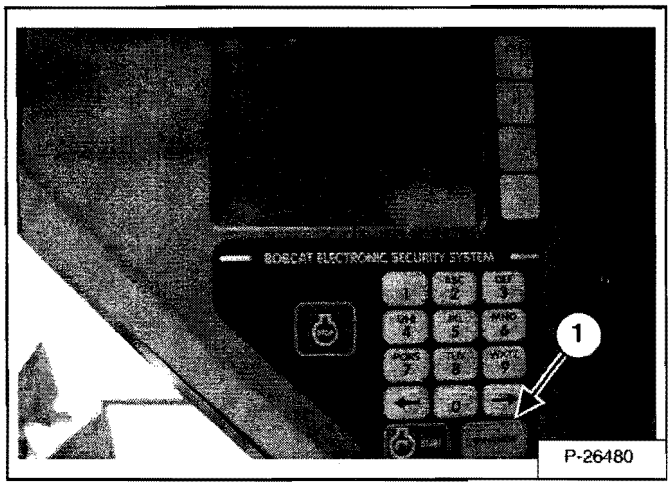


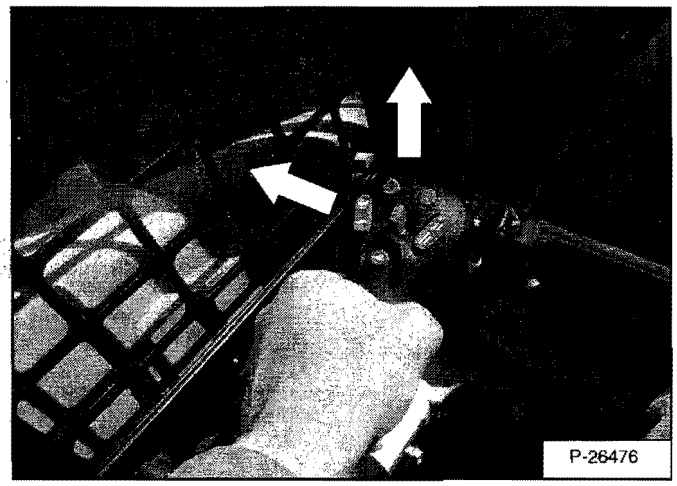
Figure 30-41-15



Turn the key (Item 1) **[Figure 30-41-14]** to the *RUN* position or press the *RUN/ENTER* button (Item 1) **[Figure 30-41-15]** for power, without starting the loader.

The Control Pattern **ISO** Switch (Item 1) **[Figure 30-41-13]** will start flashing.

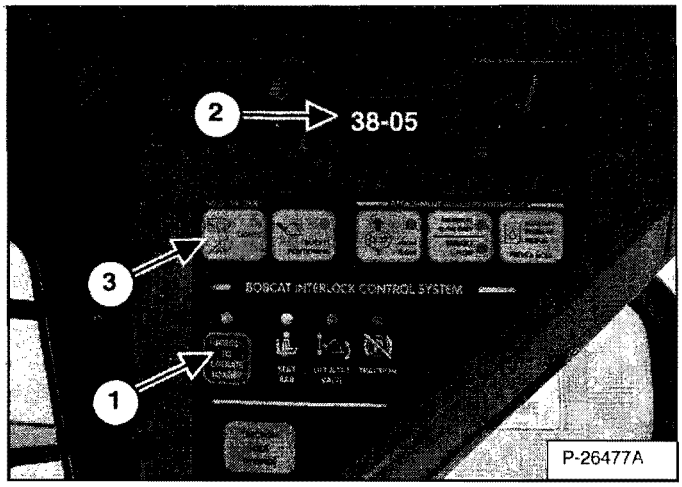
Figure 30-41-16



Move the left joystick to the forward position and toward the side screen **[Figure 30-41-16]** and hold in position.

Hydrostatic Pump Calibration (Cont'd)

Figure 30-41-17

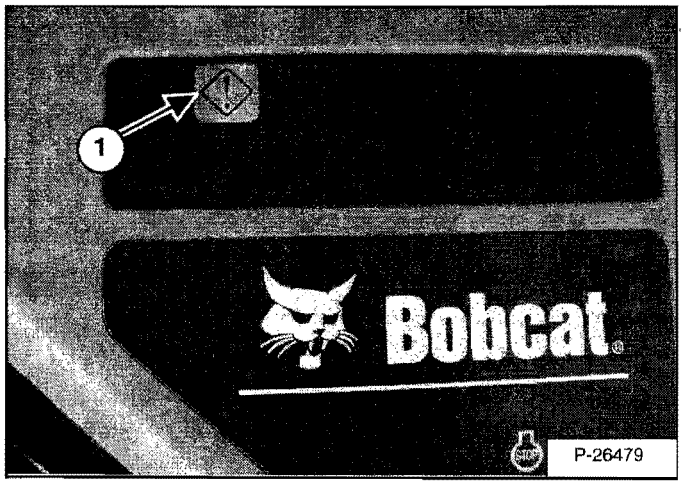


Press the *PRESS TO OPERATE LOADER* Button (Item 1) **[Figure 30-41-17]**.

Three audible beeps will sound and an error code (Item 2) **(38-05 & 38-07)** will be displayed if the operator presses the PRESS FOR CODES, (LIGHTS) switch (Item 3) **[Figure 30-41-17]**.

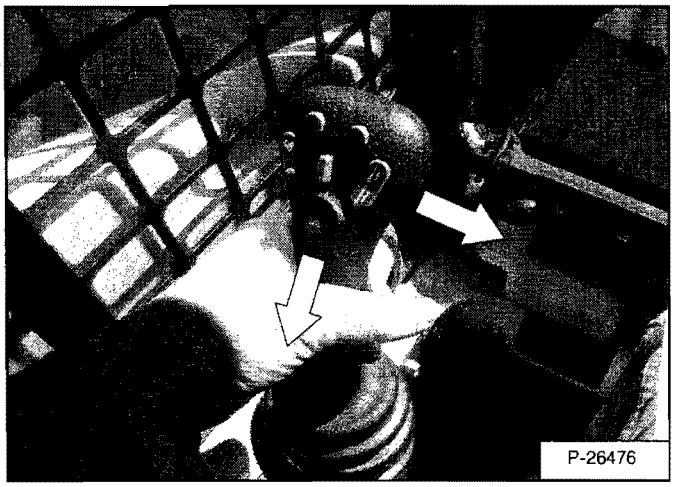
The Control Pattern **ISO** Switch (Item 1) **[Figure 30-41-13]** will stop flashing, and will remain ON for the rest of the calibration procedure.

Figure 30-41-18



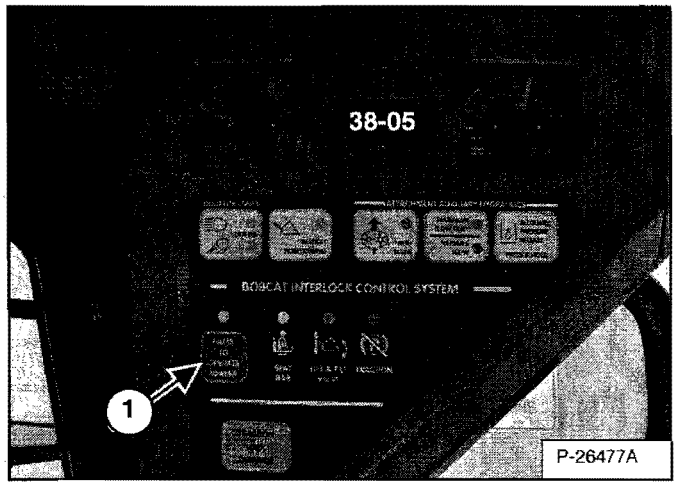
The warning light (Item 1) **[Figure 30-41-18]** on the right console will be ON.

Figure 30-41-19



Move the left joystick to the reverse position and toward the operator **[Figure 30-41-19]** and hold in position.

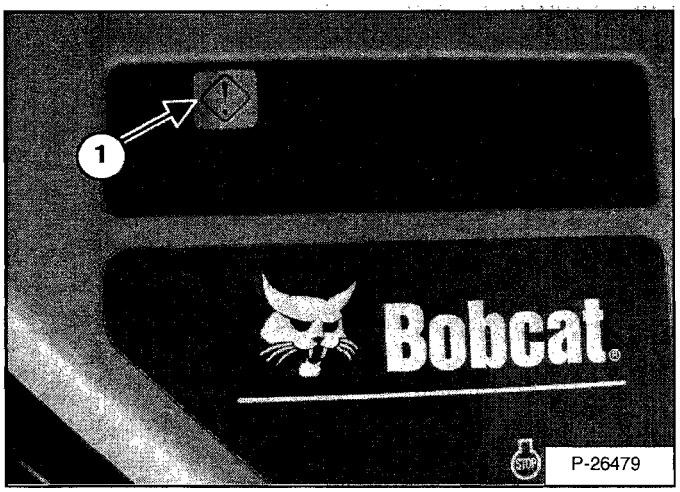
Figure 30-41-20



Press the *PRESS TO OPERATE LOADER* Button (Item 1) **[Figure 30-41-20]**.

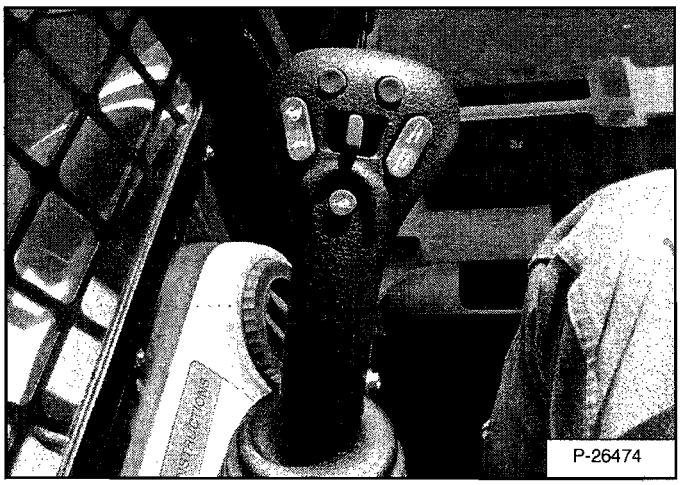
Hydrostatic Pump Calibration (Cont'd)

Figure 30-41-21



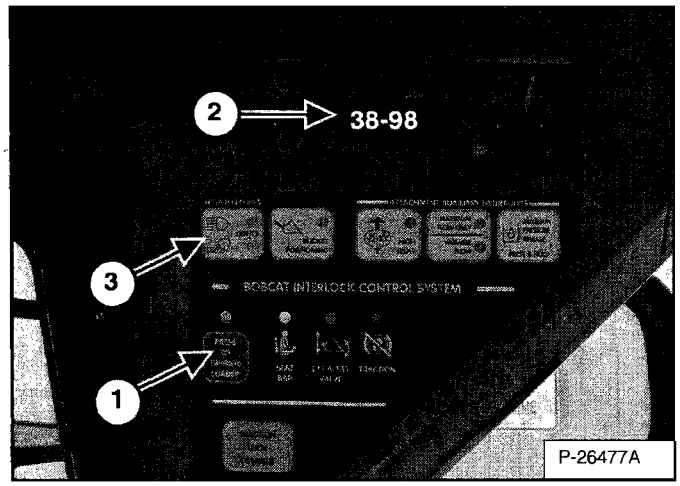
The warning light (Item 1) **[Figure 30-41-21]** on the right console will continue to be ON.

Figure 30-41-22



Allow the left joystick to go to the neutral position **[Figure 30-41-22]**.

Figure 30-41-23



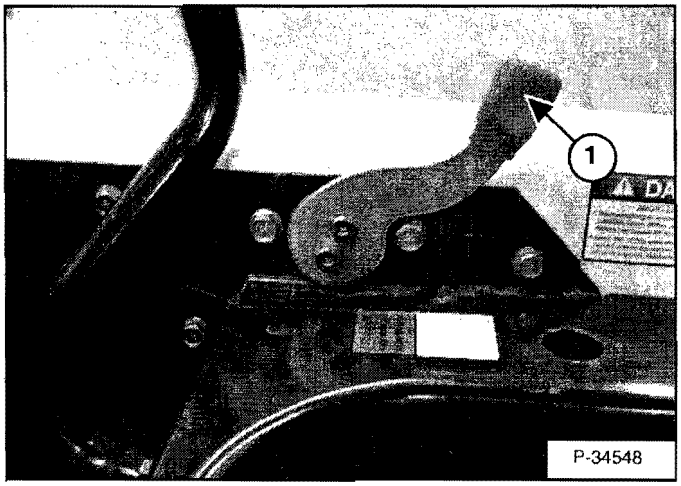
Press the *PRESS TO OPERATE LOADER* Button (Item 1) **[Figure 30-41-23]**.

Three audible beeps will sound and the error code (Item 2) **(38-98)** will be displayed if the operator presses the PRESS FOR CODES (LIGHTS) switch (Item 3) **[Figure 30-41-23]**.

Start the engine from the *RUN, RUN/ENTER* position. **DO NOT TURN TO OFF POSITION**. This would cancel the calibration mode and the procedure would have to be repeated.

Hydrostatic Pump Calibration (Cont'd)

Figure 30-41-24



Move the throttle (Item 1) **[Figure 30-41-24]** to high idle.

NOTE: If at any time, during calibration, the operator needs to stop the loader, turn the key OFF, lift the seat bar, or return the joystick to the neutral position.

The calibration procedure will stop.

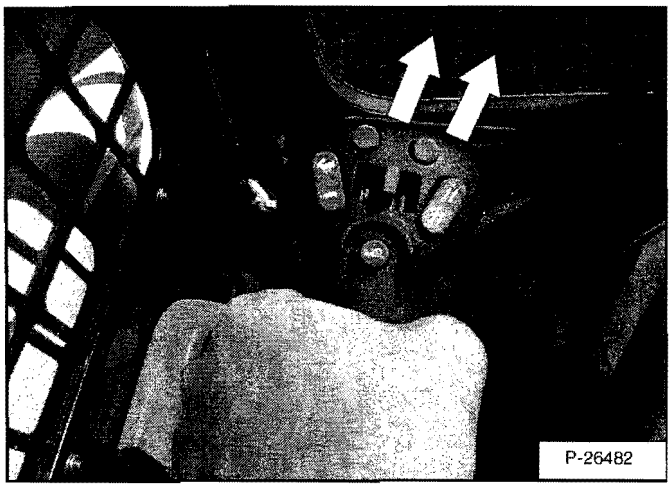
To return to calibration mode the operator must start the complete procedure from the beginning.

⚠ 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 30-41-25



Move and hold the left joystick to the forward position **[Figure 30-41-25]** until the forward calibration is completed.

The pump controller will start increasing the electrical current to the hydrostatic pumps until it sees a pulse from the wheel sensors.

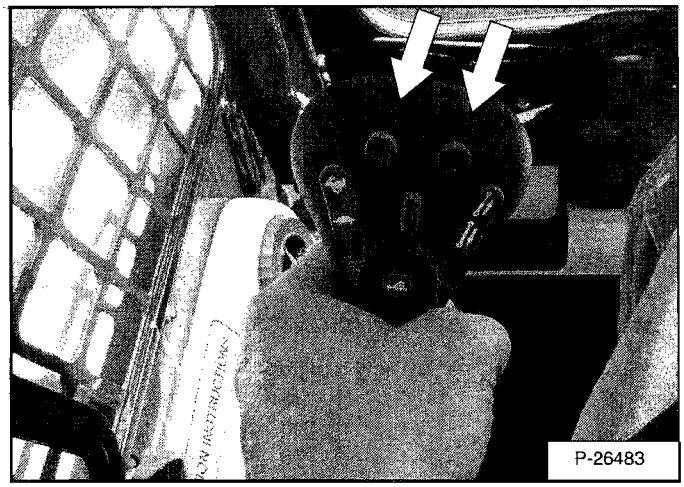
The loader wheels will rotate a short distance forward each time it sees a pulse.

The four wheels will then go to *Full Speed Forward*. Continue holding the joystick in the forward position until the wheels stop and there is an audible beep. Forward calibration is complete.

NOTE: If the wheels do not stop going in *Full Speed Forward* in 2 minutes or less, there was an error in the calibration procedure. The operator must shut the loader OFF, and start the calibration procedure from the beginning.

Hydrostatic Pump Calibration (Cont'd)

Figure 30-41-26



Move and hold the left joystick to the reverse position **[Figure 30-41-26]** until the reverse calibration is completed.

The pump controller will start increasing the electrical current to the hydrostatic pumps until it sees a pulse from the wheel speed sensors.

The loader wheels will rotate a short distance in reverse each time it sees a pulse.

The four wheels will then go to *Full Speed Reverse*. Continue holding the joystick in the reverse position until the wheels stop and there is an audible beep. Reverse calibration is complete.

NOTE: If the wheels do not stop going in *Full Speed Reverse* in 2 minutes or less, there was an error in the calibration procedure. The operator must shut the loader OFF, and start the calibration procedure from the beginning.

There will be an audible beep and the PRESS TO OPERATE LOADER and TRACTION lights will go out. The SEAT BAR and LIFT AND TILT lights will remain on. The **38-98** error code will clear.

Allow the joystick to go to the neutral position.

The calibration procedure is completed.

Press the *PRESS TO OPERATE LOADER* button. Move the joystick to forward position **[Figure 30-41-25]** and check for normal forward wheel rotation.

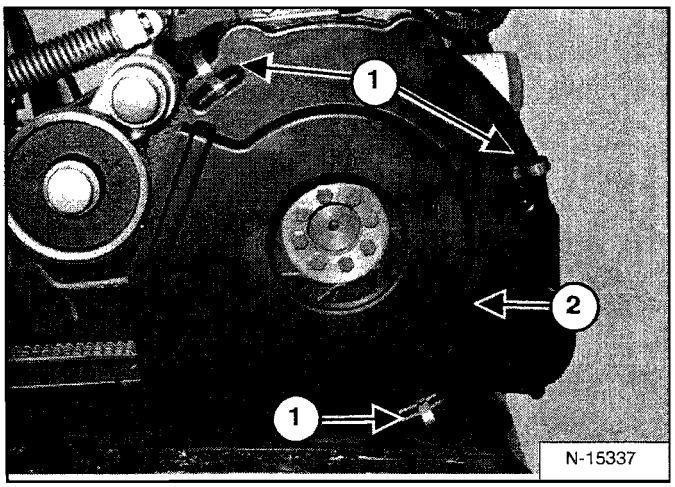
Move the joystick to the reverse position **[Figure 30-41-26]** and check for normal reverse wheel rotation.

Stop the engine, and remove the loader from jackstands.

Start the loader, press the PRESS TO OPERATE LOADER button and return to normal loader operation.

Removal And Installation

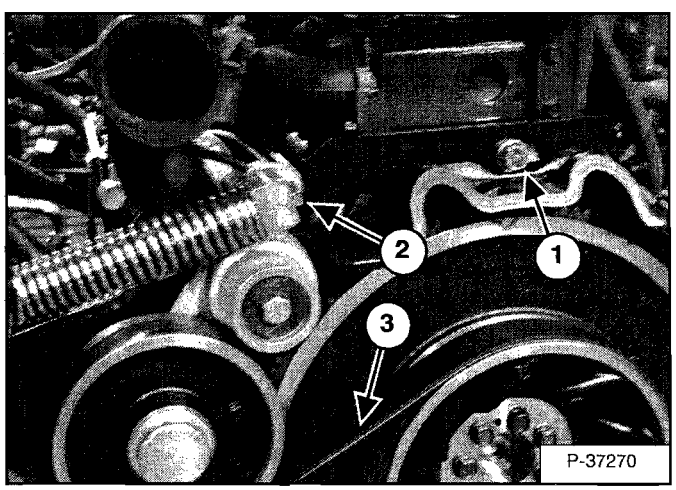
Figure 30-41-27



Remove the hydrostatic pump/engine assembly from the loader. (See Contents Page 70-01.)

Remove the belt shield clips (Item 1) and belt shield (Item 2) **[Figure 30-41-27]**.

Figure 30-41-28



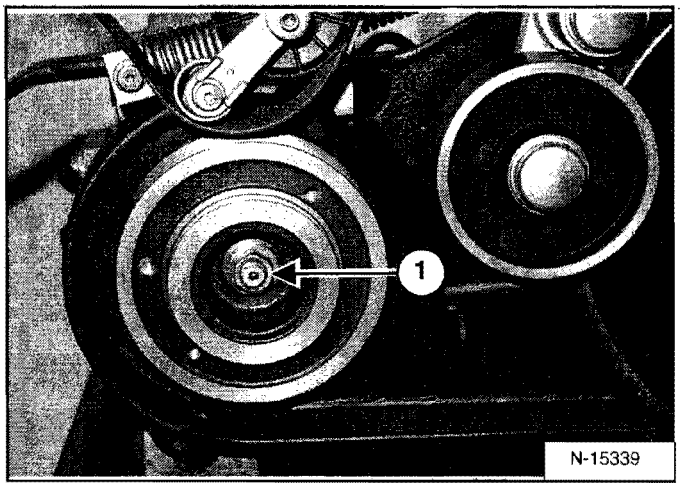
Loosen the stop mounting bolt (Item 1) **[Figure 30-41-28]**.

Loosen the spring tension bolt (Item 2) **[Figure 30-41-28]**.

Remove the drive belt (Item 3) **[Figure 30-41-28]**.

Removal And Installation (Cont'd)

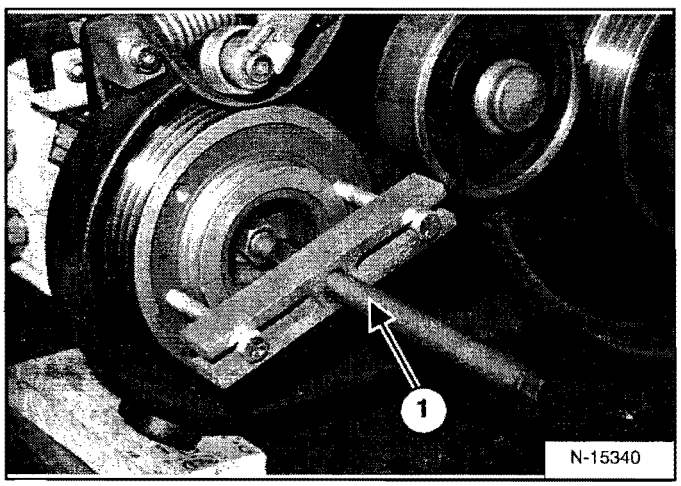
Figure 30-41-29



Remove the washer and nut (Item 1) **[Figure 30-41-29]** from the hydrostatic pump drive shaft.

Installation: Tighten the nut to 175-200 ft.-lbs. (237-271 Nm) torque

Figure 30-41-30



Install the nut on the end of the pump drive shaft (without washer).

Use a puller (Item 1) **[Figure 30-41-30]** to remove the pulley from the pump drive shaft.

Figure 30-41-31

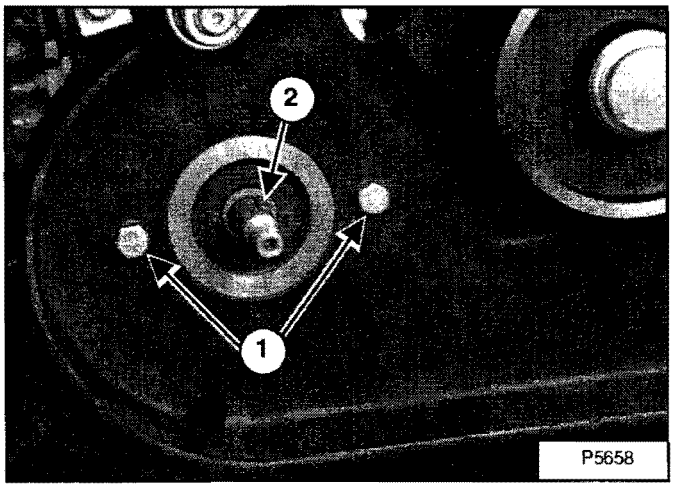
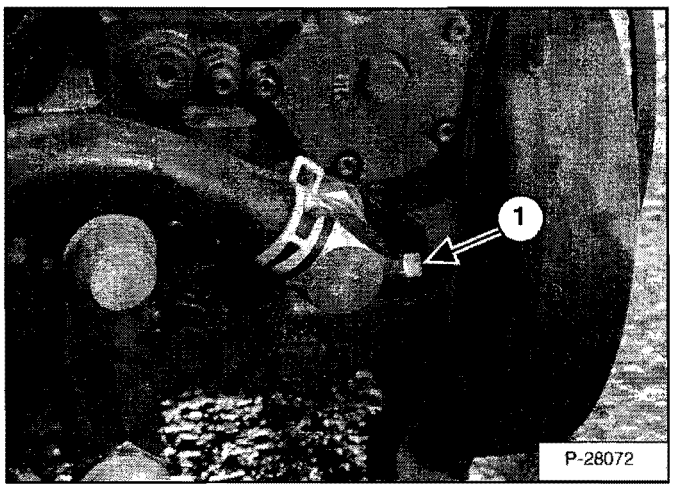


Figure 30-41-32

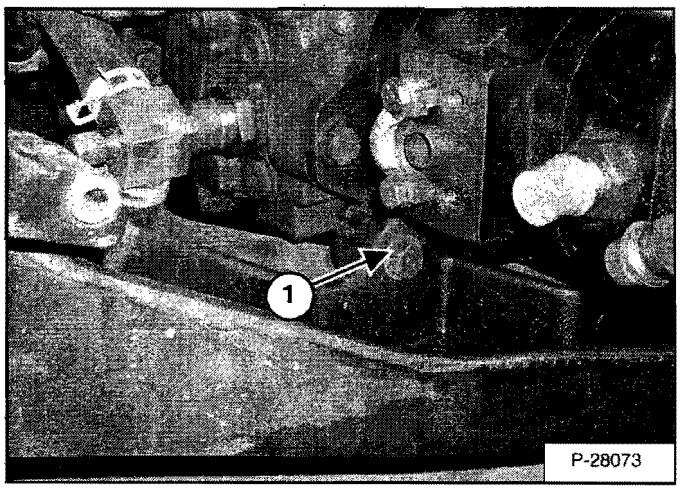


Remove the two mounting bolts (Item 1) and nuts (Item 1) **[Figure 30-41-32]**.

Installation: Tighten the mounting bolts and nuts to 65-70 ft.-lbs. (88-95 Nm) torque. Make sure the key (Item 2) **[Figure 30-41-31]** is installed.

Hydrostatic Pump Calibration (Cont'd)

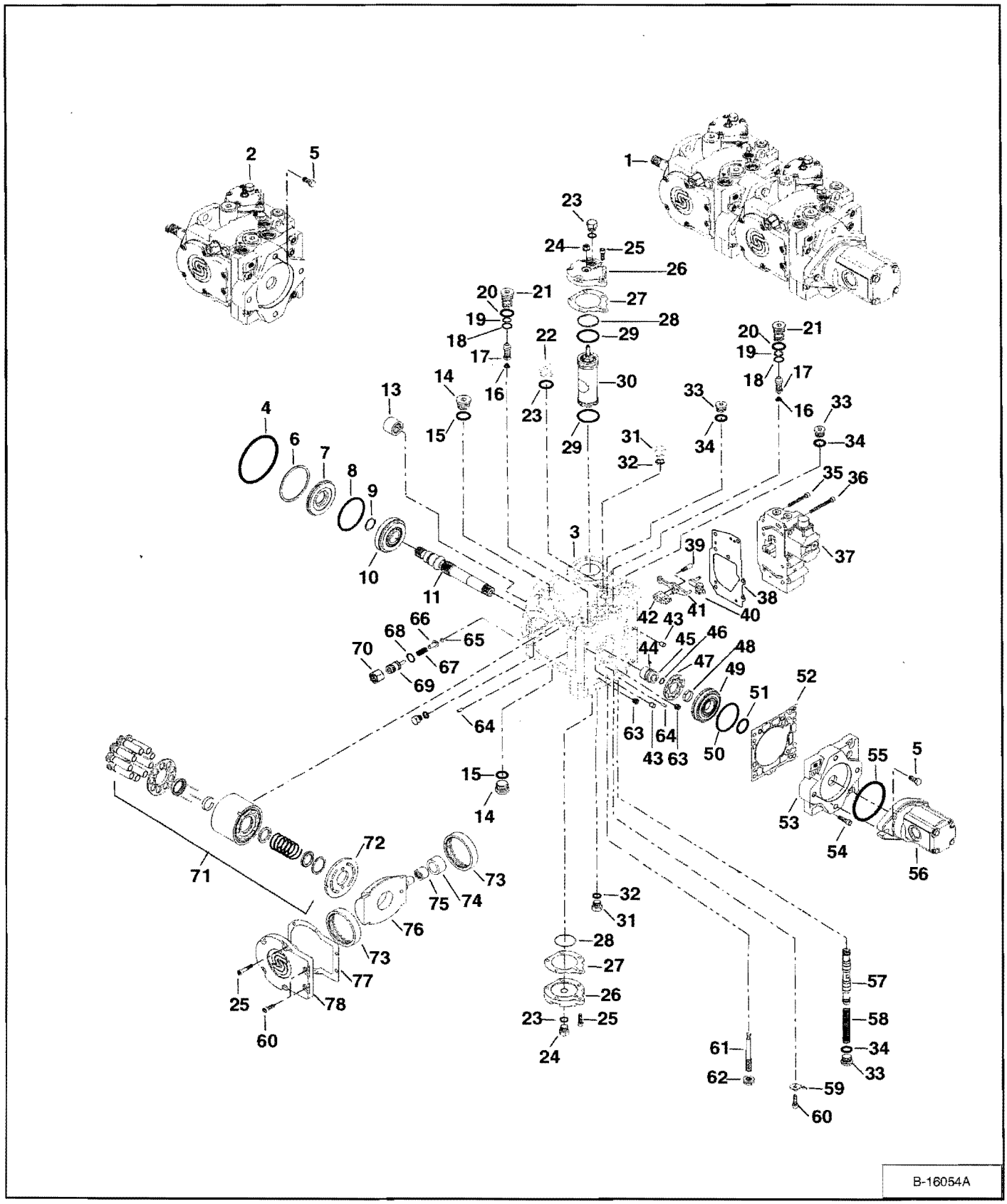
Figure 30-41-33



Remove the mounting bolt (Item 1) **[Figure 30-41-33]** at the hydraulic pump end of the pump.

Remove the hydrostatic pump from the mounting bracket and drive belt housing.

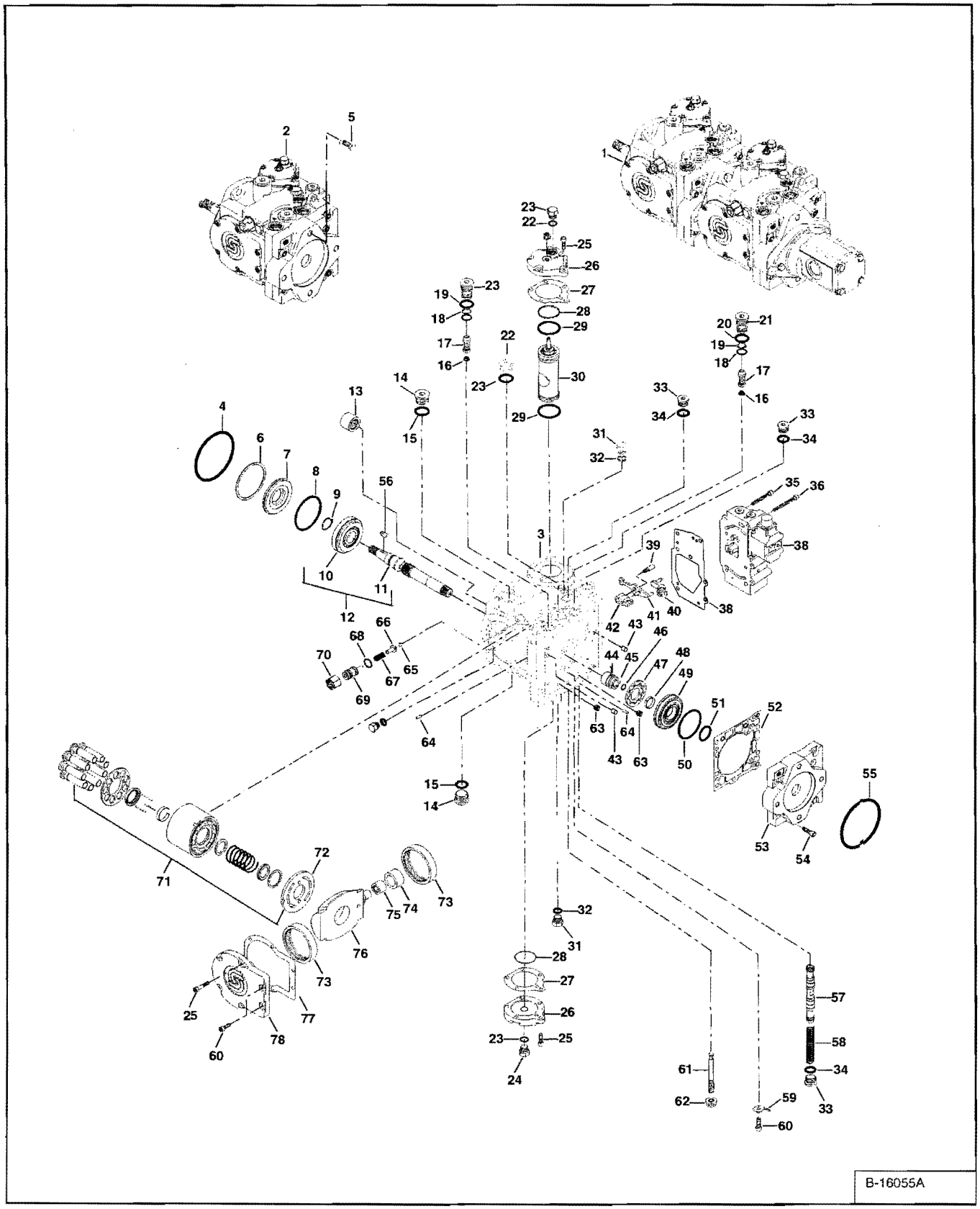
Parts Identification (Right Half)



Parts Identification (Right Half) (Cont'd)

Ref.	Description
1.	Pump
2.	Pump
3.	Housing
4.	O-ring
5.	Bolt
6.	Snap Ring
7.	Seal
8.	O-ring
9.	Snap Ring
10.	Bearing
11.	Shaft
12.	Shaft
13.	Bearing
14.	Plug
15.	O-ring
16.	Spring
17.	Valve
18.	O-ring
19.	Washer
20.	O-ring
21.	Valve
22.	Nut
23.	O-ring
24.	Plug
25.	Screw
26.	Cover
27.	Gasket
28.	Ring
29.	O-ring
30.	Servo
31.	Plug
32.	O-ring
33.	Plug
34.	O-ring
35.	Screw
36.	Screw
37.	Control
38.	Gasket
39.	Screw
40.	Link
41.	Link
42.	Link
43.	Pin
44.	Key
45.	Coupler
46.	Snap Ring
47.	Geroter
48	Bearing
49.	Cover
50.	O-ring
51.	O-ring
52.	Gasket
53.	Cover
54.	Screw
55.	O-ring
56.	Gear Pump
57.	Spool
58.	Spring
59.	Bracket
60.	Screw
61.	Screw
62.	Nut
63.	Plug
64.	Pin
65.	Filter
66.	Poppet
67.	Spring
68.	O-ring
69.	Adjuster
70.	Nut
71.	Rotating Piece
72.	Valve Plate
73.	Bearing
74.	Cam
75.	Bearing
76.	Swash plate
77.	Gasket
78.	Cover

Parts Identification (Left Half)

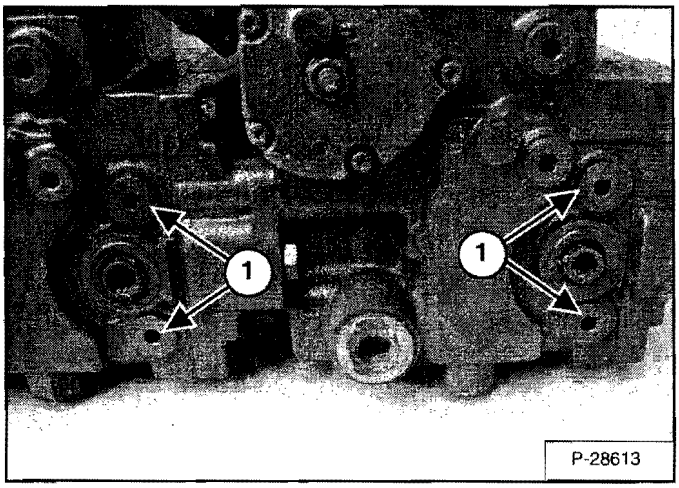


Parts Identification (Left Half) (Cont'd)

Ref.	Description
1.	Pump
2.	Pump
3.	Housing
4.	O-ring
5.	Bolt
6.	Snap Ring
7.	Seal
8.	O-ring
9.	Snap Ring
10.	Bearing
11.	Shaft
12.	Shaft
13.	Bearing
14.	Plug
15.	O-ring
16.	Spring
17.	Valve
18.	O-ring
19.	Washer
20.	O-ring
21.	Valve
22.	Nut
23.	O-ring
24.	Plug
25.	Screw
26.	Cover
27.	Gasket
28.	Ring
29.	O-ring
30.	Servo
31.	Plug
32.	O-ring
33.	Plug
34.	O-ring
35.	Screw
36.	Screw
37.	Control
38.	Gasket
39.	Screw
40.	Link
41.	Link
42.	Link
43.	Pin
44.	Key
45.	Coupler
46.	Snap Ring
47.	Geroter
48	Bearing
49.	Cover
50.	O-ring
51.	O-ring
52.	Gasket
53.	Cover
54.	Screw
55.	O-ring
56.	Key
57.	Spool
58.	Spring
59.	Bracket
60.	Screw
61.	Screw
62.	Nut
63.	Plug
64.	Pin
65.	Filter
66.	Poppet
67.	Spring
68.	O-ring
69.	Adjuster
70.	Nut
71.	Rotating Piece
72.	Valve Plate
73.	Bearing
74.	Cam
75.	Bearing
76.	Swash plate
77.	Gasket
78.	Cover

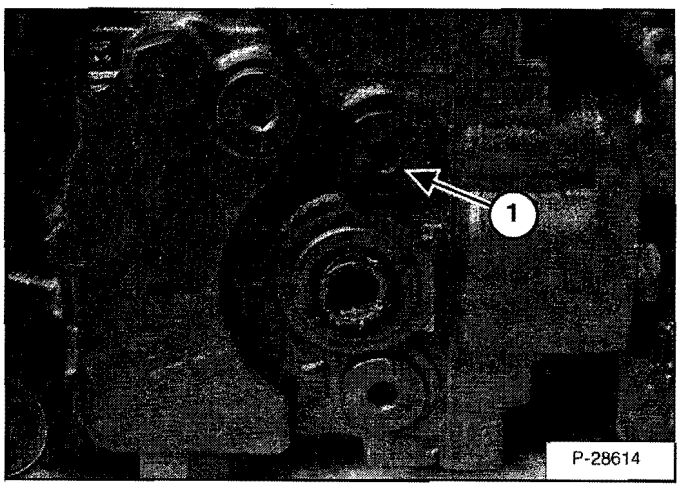
System Check Relief Valves (High Pressure Relief, Charge Check & By-Pass Valve)

Figure 30-41-34



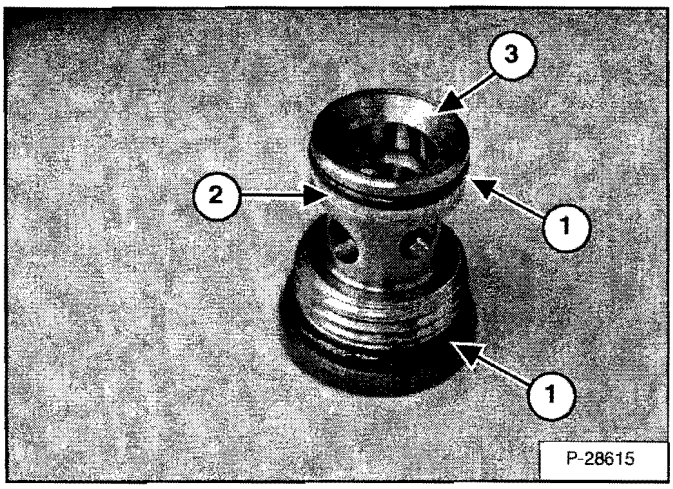
There are four system check relief valves (Item 1) **[Figure 30-41-34]** in the hydrostatic pump. Two are located on the back side of each pump half.

Figure 30-41-35



Remove the valve seat plug (Item 1) **[Figure 30-41-35]** from the pump.

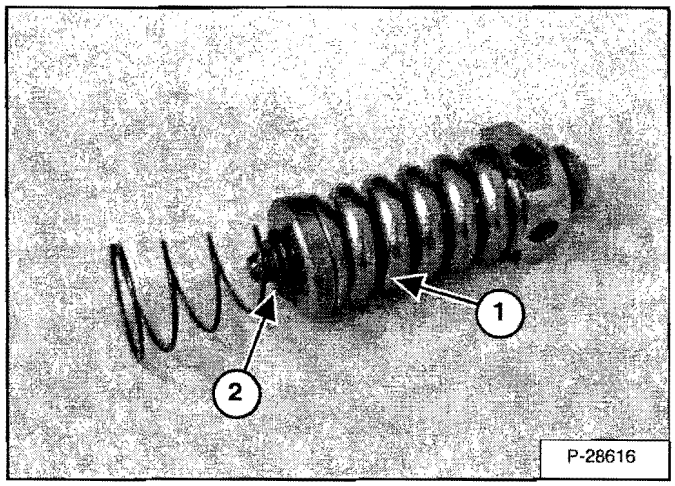
Figure 30-41-36



Check the valve seat plug O-rings (Item 1) and back-up ring (Item 2) **[Figure 30-41-36]**, and replace as needed.

Check the valve seat surface (Item 3) **[Figure 30-41-36]** for scratches and replace as needed.

Figure 30-41-37

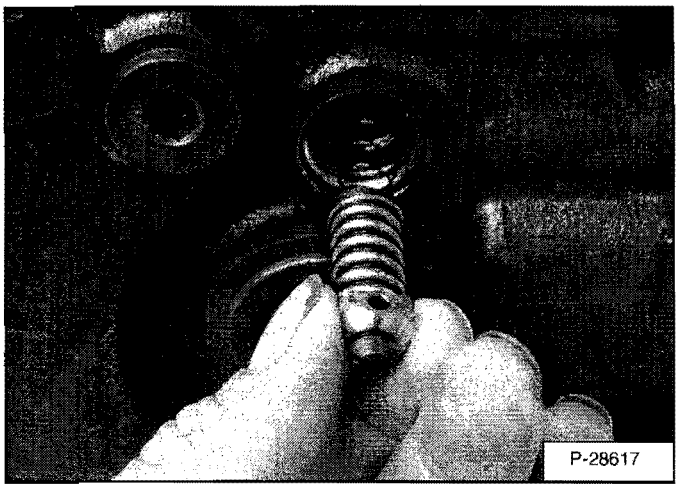


Remove relief valve assembly (Item 1) **[Figure 30-41-37]** from the pump housing.

Check the conical spring (Item 2) **[Figure 30-41-36]** to be sure it is retained on the relief valve. DO NOT REMOVE.

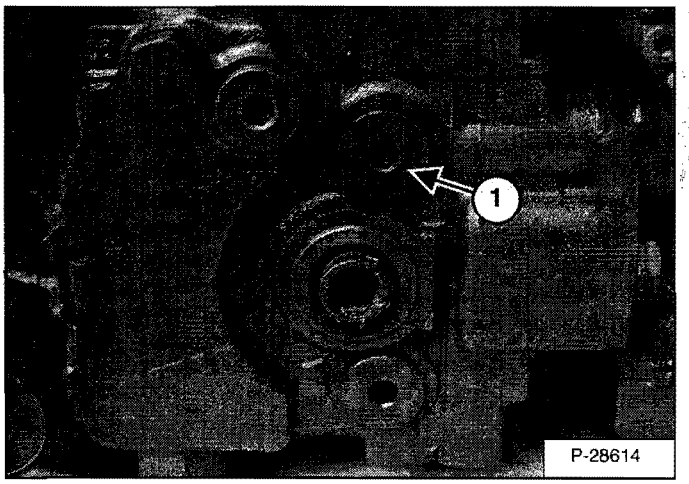
System Check Relief Valves (High Pressure Relief, Charge Check & By-Pass Valve) (Cont'd)

Figure 30-41-38



Install relief valve into the pump housing spring first **[Figure 30-41-38]**.

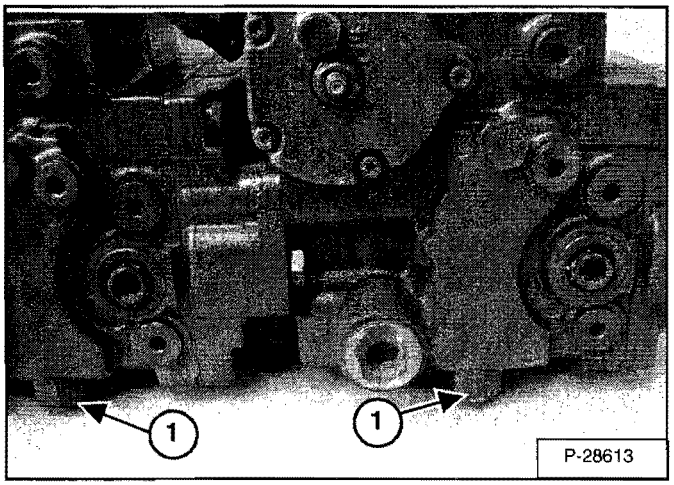
Figure 30-41-39



Install the valve seat plug (Item 1) **[Figure 30-41-39]** in the pump, and tighten to 30-70 ft.-lbs. (40-95 Nm) torque.

Charge Relief Valve

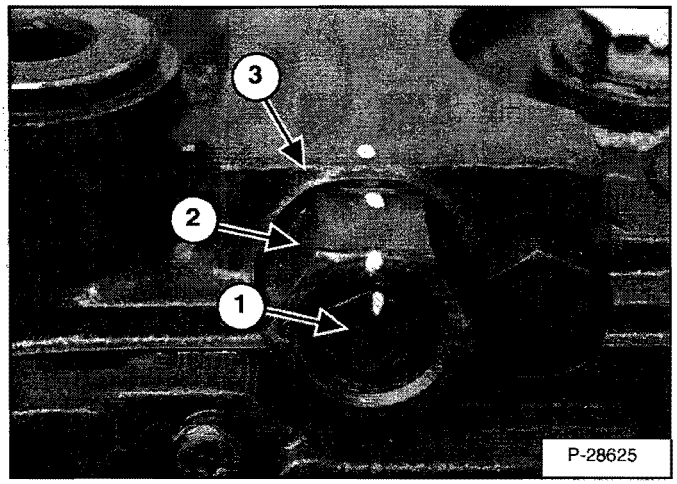
Figure 30-41-40



There are two charge pressure relief valves (Item 1) **[Figure 30-41-40]**.

The charge pressure relief valves are located on the bottom side of the pumps, with one valve on each pump section **[Figure 30-41-40]**.

Figure 30-41-41



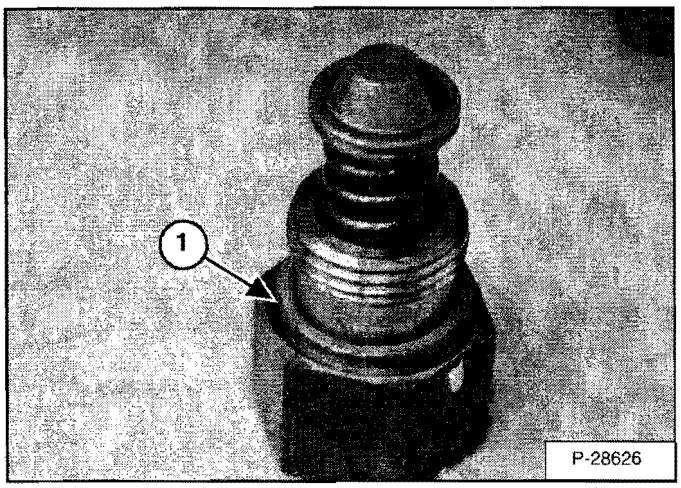
Mark the plug (Item 1) the lock nut (Item 2) and the housing (Item 3) **[Figure 30-41-41]** for ease of assembly.

Loosen the lock nut.

Loosen the charge pressure plug, and remove the complete assembly from the pump housing.

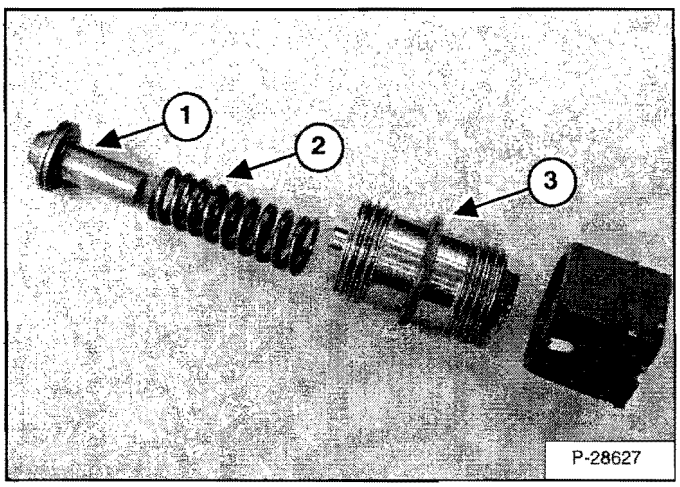
Charge Relief Valve (Cont'd)

Figure 30-41-42



Check and replace the O-ring (Item 1) **[Figure 30-41-42]**.

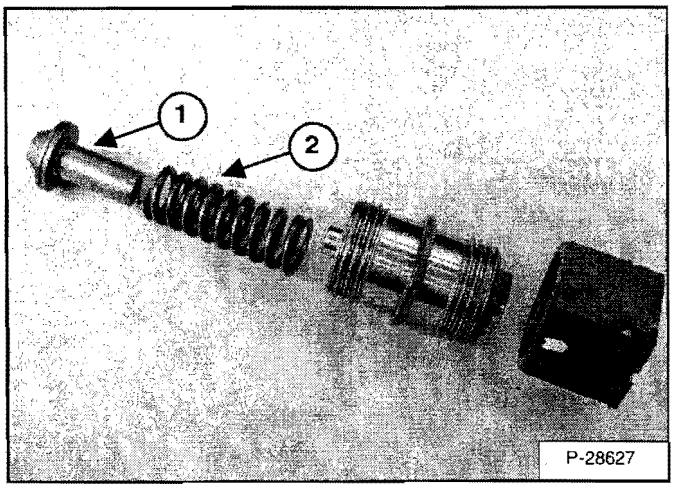
Figure 30-41-43



Inspect the poppet (Item 1) **[Figure 30-41-43]** and the mating seat in the pump housing for damage or foreign material.

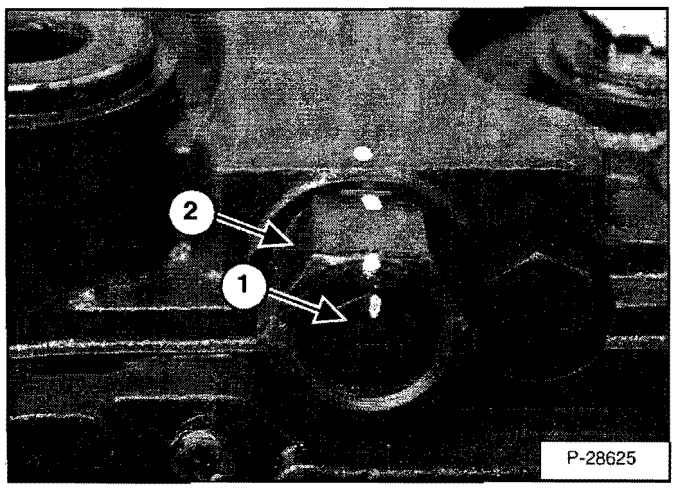
Inspect the spring (Item 2) and the adjustable charge relief valve (Item 3) **[Figure 30-41-43]**.

Figure 30-41-44



Install the poppet (Item 1) and spring (Item 2) **[Figure 30-41-44]** into the pump housing.

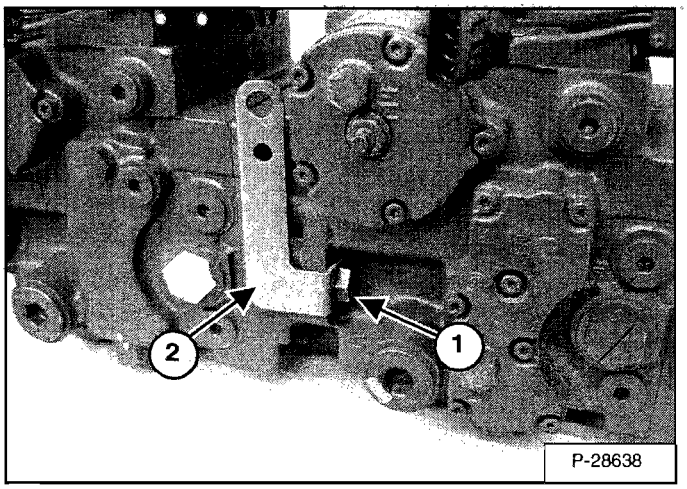
Figure 30-41-45



Install the plug (Item 1) and its lock nut (Item 2) **[Figure 30-41-45]**, align the marks made during disassembly. Tighten to 34-42 ft.-lbs. (47-57 Nm) torque.

Pump Separation

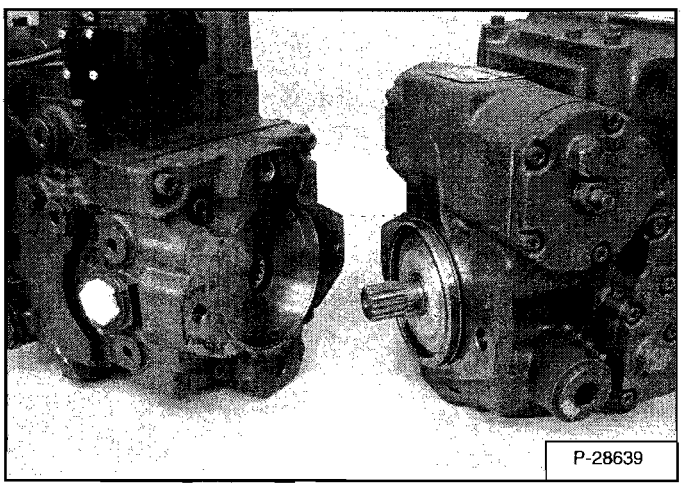
Figure 30-41-46



Remove the two mount bolts (Item 1) **[Figure 30-41-46]**. (Front and Rear.)

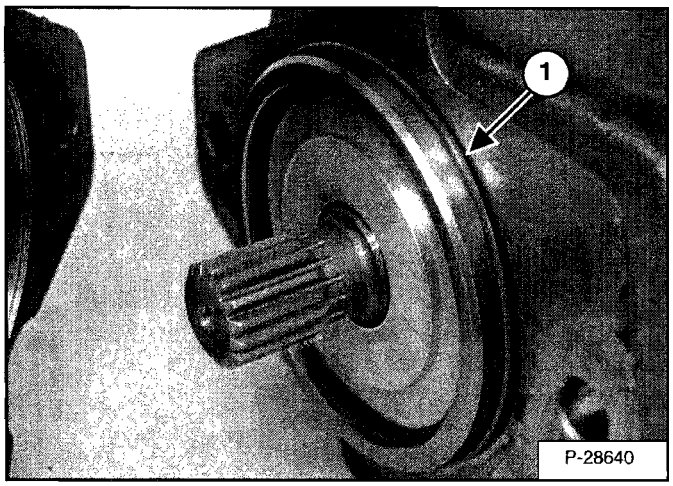
Remove the lifting bracket (Item 2) **[Figure 30-41-46]** from the pump.

Figure 30-41-47



Separate the two hydrostatic pumps **[Figure 30-41-47]**.

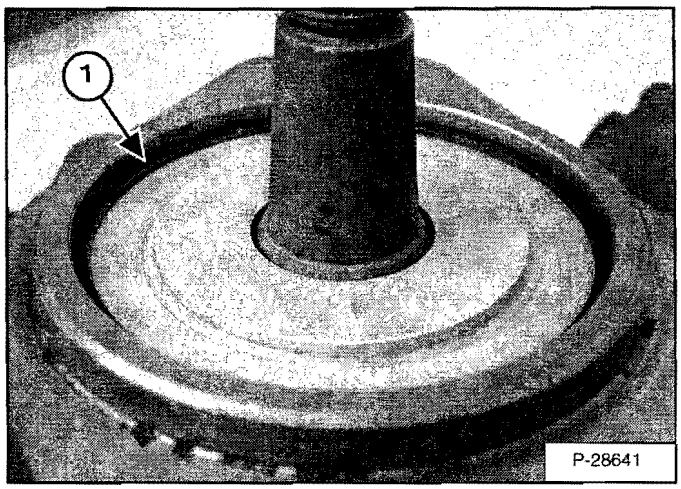
Figure 30-41-48



Replace the O-ring (Item 1) **[Figure 30-41-48]**.

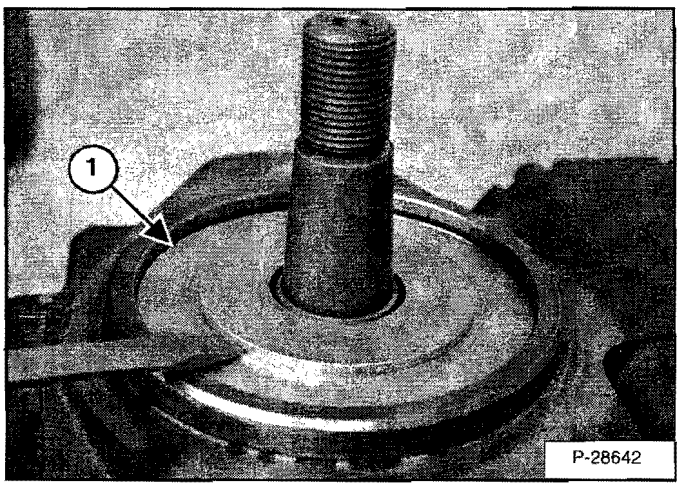
Shaft Seal And Shaft Replacement

Figure 30-41-49



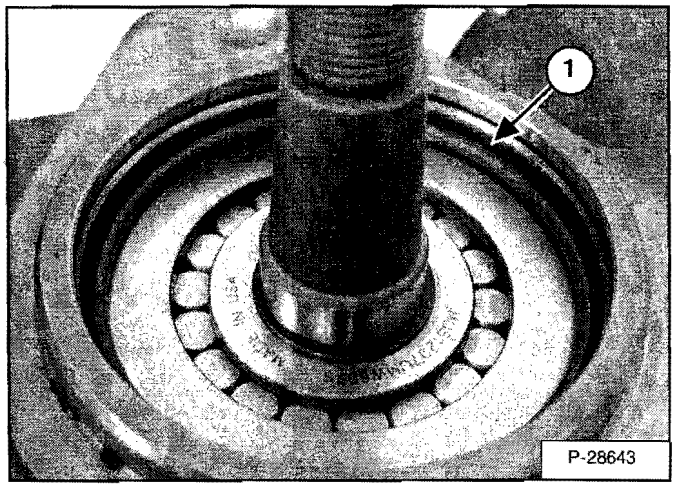
Remove the snap ring (Item 1) **[Figure 30-41-49]**.

Figure 30-41-50



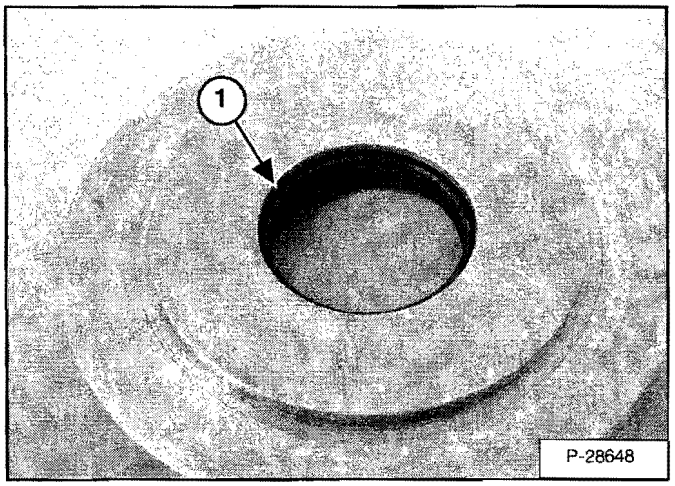
With the pump shaft up, remove the seal carrier assembly (Item 1) **[Figure 30-41-50]** using a screwdriver.

Figure 30-41-51



Remove the O-ring (Item 1) **[Figure 30-41-51]** from the top of the bearing.

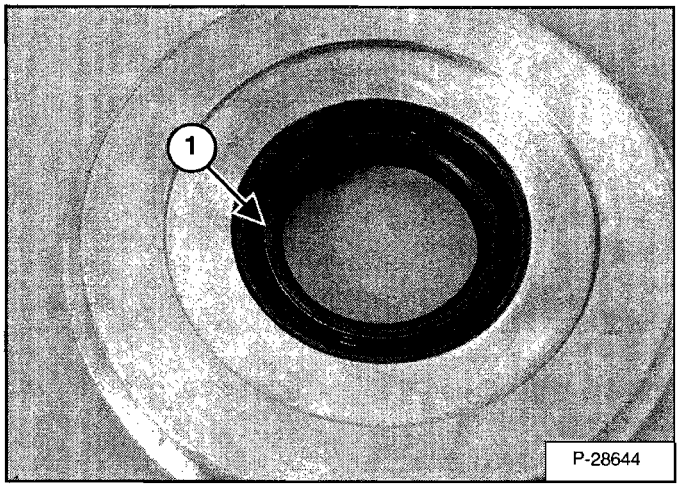
Figure 30-41-52



Using a press, remove the old seal (Item 1) **[Figure 30-41-52]** from the seal carrier.

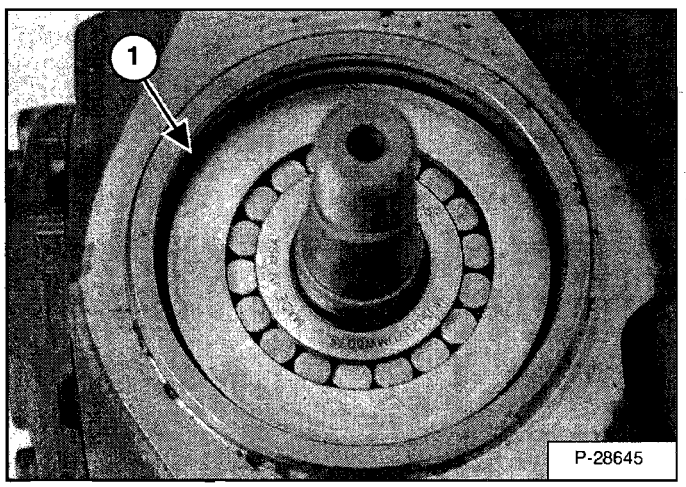
Shaft Seal And Shaft Replacement (Cont'd)

Figure 30-41-53



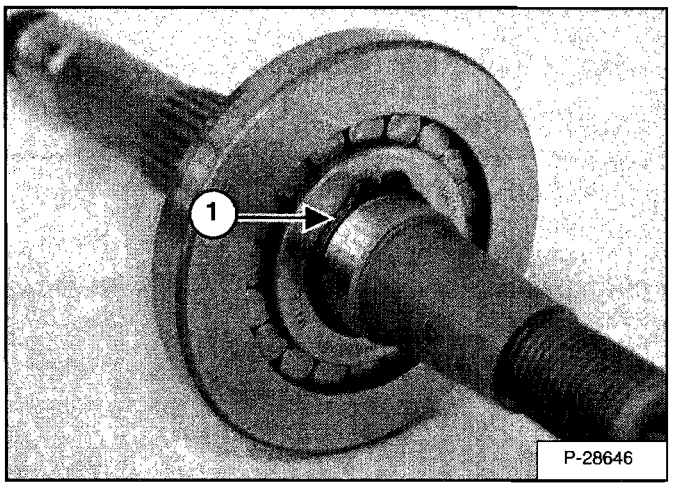
Press a new seal into the shaft bearing side of the seal carrier (Item 1) **[Figure 30-41-53]**.

Figure 30-41-54



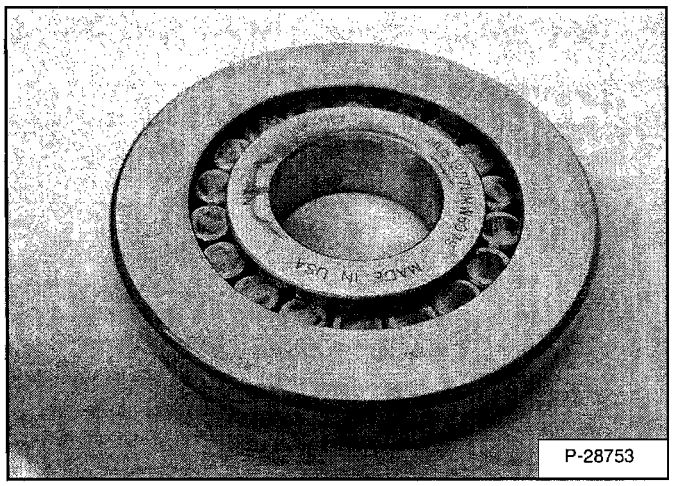
Grip the splines or threads of the input shaft and remove the pump shaft and roller bearing assembly (Item 1) **[Figure 30-41-54]**.

Figure 30-41-55



Remove the snap ring (Item 1)**[Figure 30-41-55]** from the shaft.

Figure 30-41-56

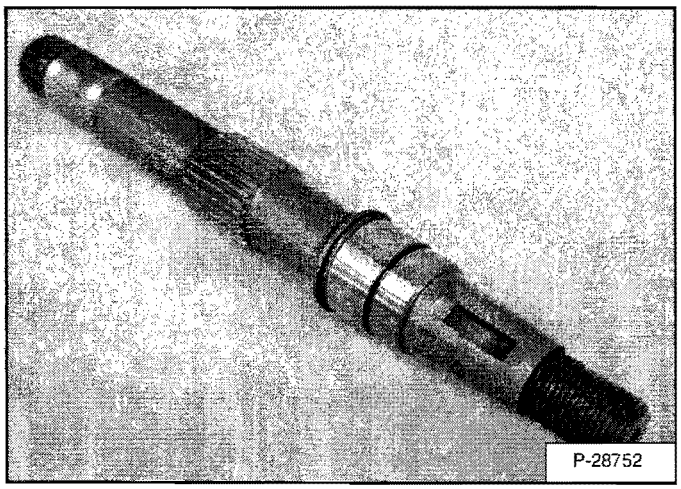


Remove the roller bearing **[Figure 30-41-56]** from the shaft.

Inspect the bearing for wear and replace as needed.

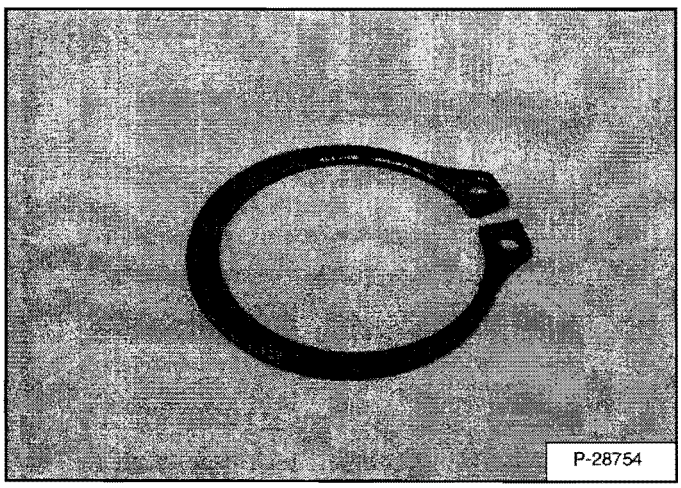
Shaft Seal And Shaft Installation

Figure 30-41-57



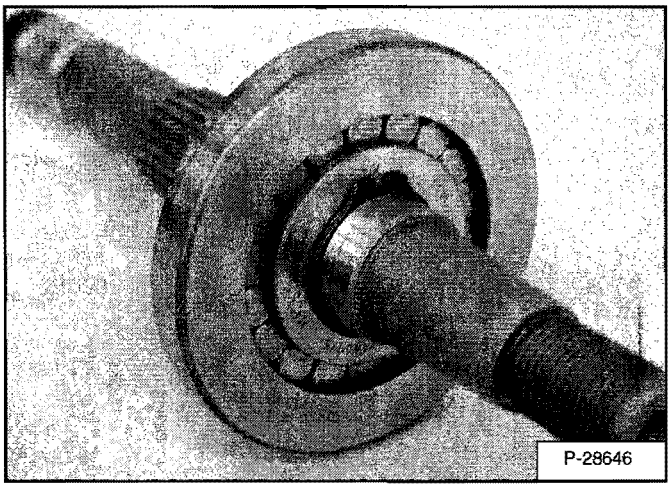
Inspect the shaft **[Figure 30-41-57]** for wear and replace as needed.

Figure 30-41-58



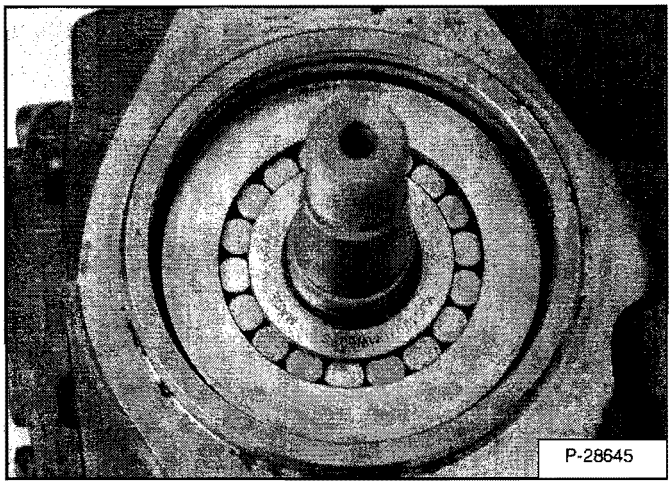
Inspect the snap ring **[Figure 30-41-58]** and replace as needed.

Figure 30-41-59



Install the bearing and snap ring on the shaft **[Figure 30-41-59]**.

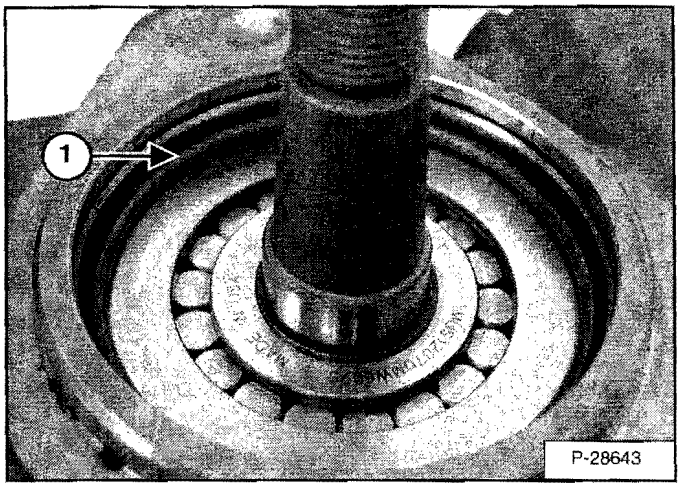
Figure 30-41-60



Install the shaft and roller bearing in the pump housing **[Figure 30-41-60]**.

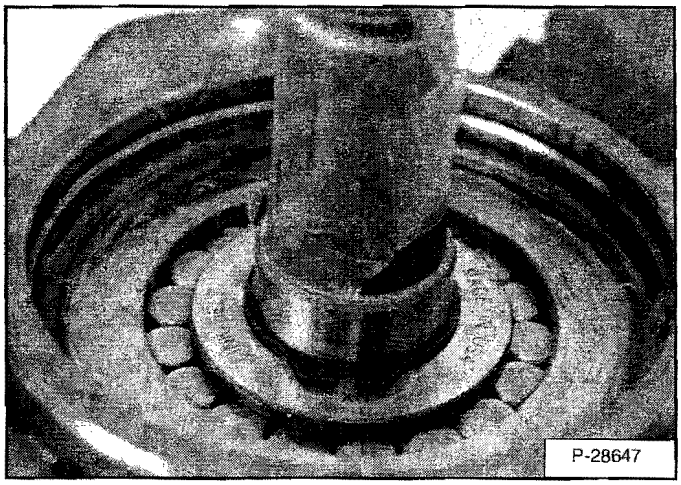
Shaft Seal And Shaft Installation (Cont'd)

Figure 30-41-61



Install the O-ring (Item 1) **[Figure 30-41-61]** on top of the shaft bearing.

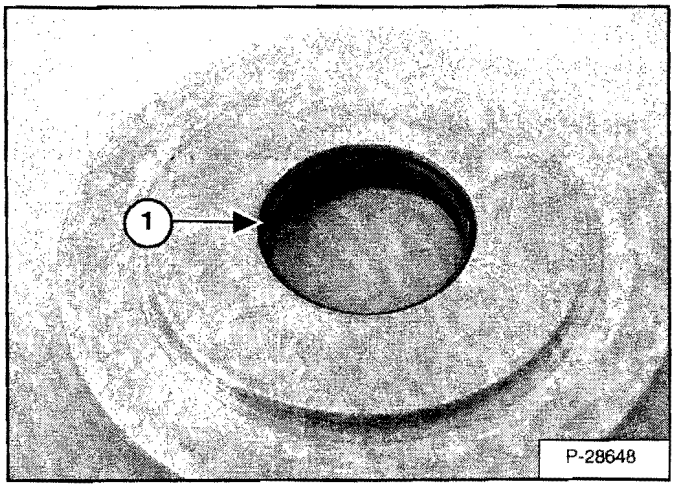
Figure 30-41-62



Wrap the spline and key way with a thin layer of plastic to prevent damage to the seal lip during installation **[Figure 30-41-62]**.

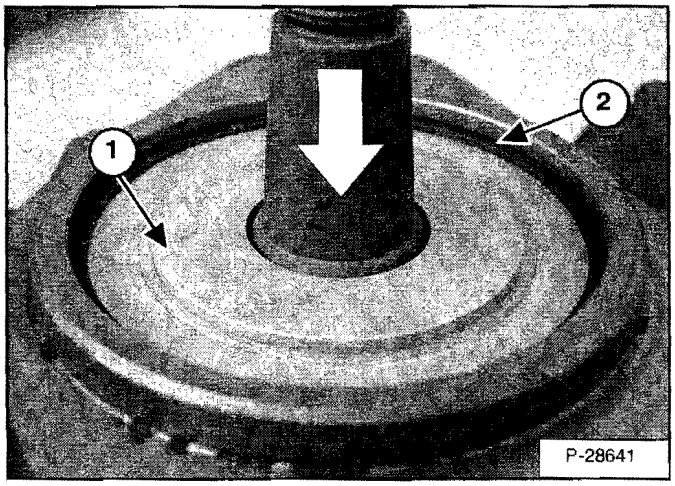
Lubricate the O-ring with petroleum jelly **[Figure 30-41-62]**.

Figure 30-41-63



Lubricate the seal (Item 1) **[Figure 30-41-63]** with petroleum jelly.

Figure 30-41-64

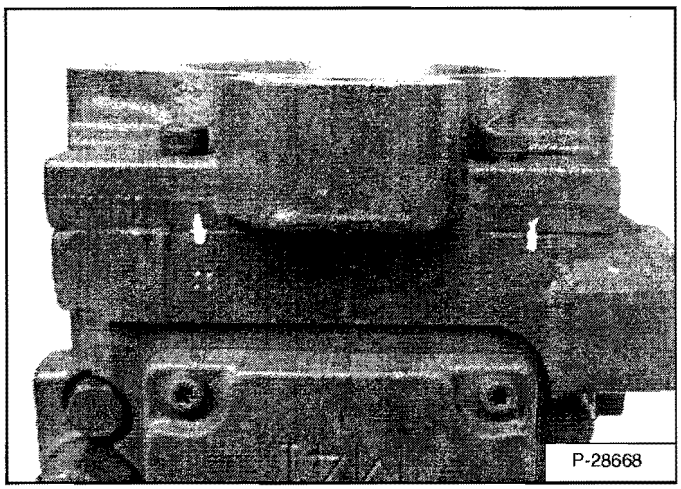


Slide the seal carrier (Item 1) **[Figure 30-41-64]** assembly over the shaft and into the housing bore. Press against the O-ring. Hold downward pressure against the shaft to compress the cylinder block spring while pressing the seal carrier into place.

Install the retaining ring (Item 2) **[Figure 30-41-64]**.

Charge Pump Removal

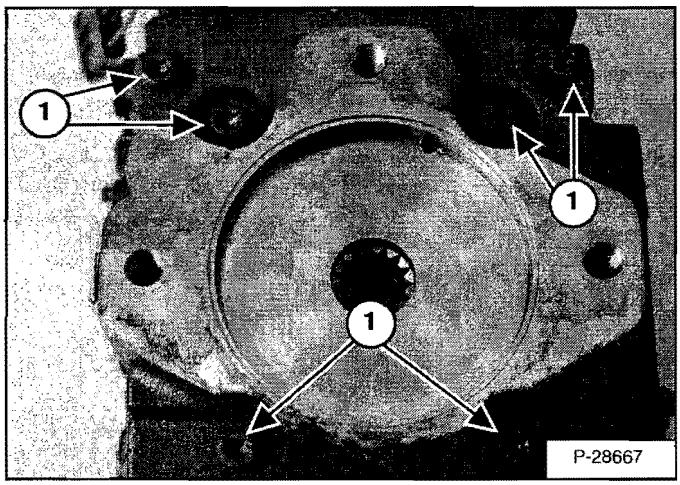
Figure 30-41-65



Position the pump so the auxiliary mounting pad is facing up.

Mark pump housing for proper installation **[Figure 30-41-65]**.

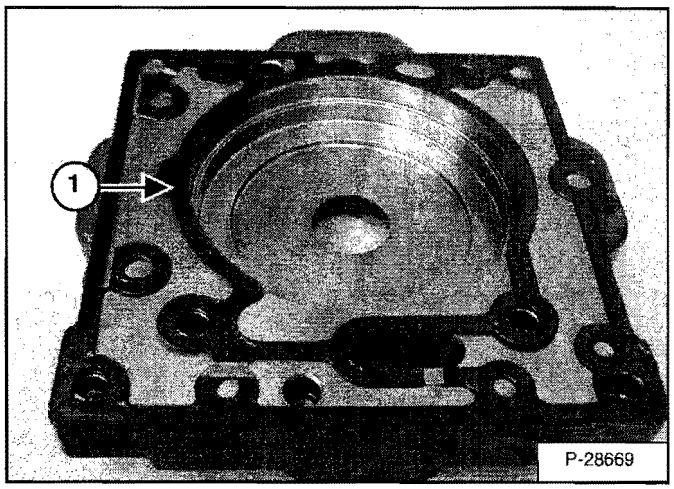
Figure 30-41-66



Remove the six auxiliary mount pad mount bolts (Item 1) **[Figure 30-41-66]**.

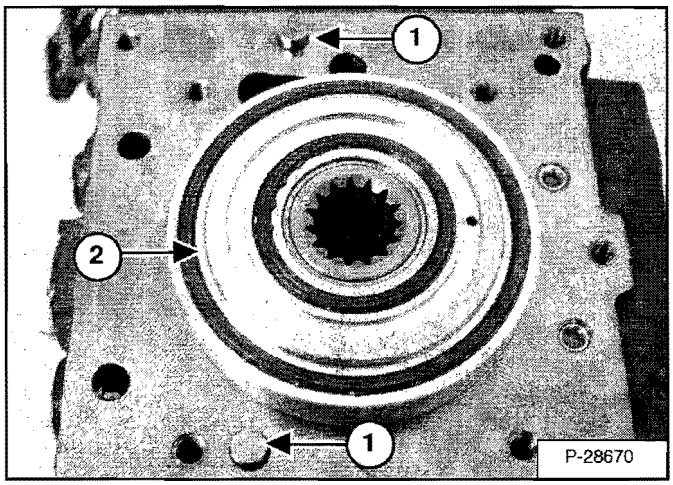
Remove the charge pump cover.

Figure 30-41-67



Remove the old charge pump cover gasket (Item 1) **[Figure 30-41-67]**.

Figure 30-41-68

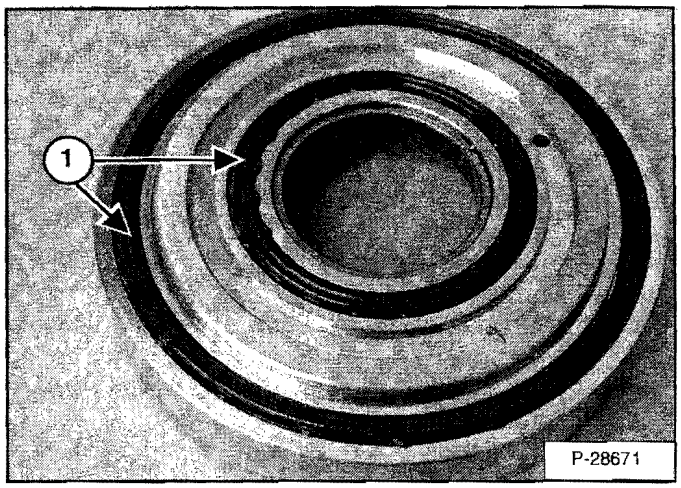


Remove the alignment pins (Item 1) **[Figure 30-41-68]**.

Remove the gerotor cover (Item 2) **[Figure 30-41-68]**.

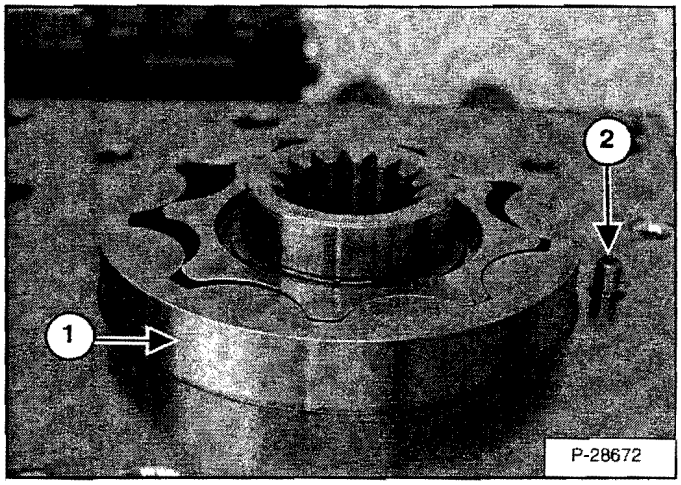
Charge Pump Removal (Cont'd)

Figure 30-41-69



Remove the old gerotor cover O-rings (Item 1) **[Figure 30-41-69]**.

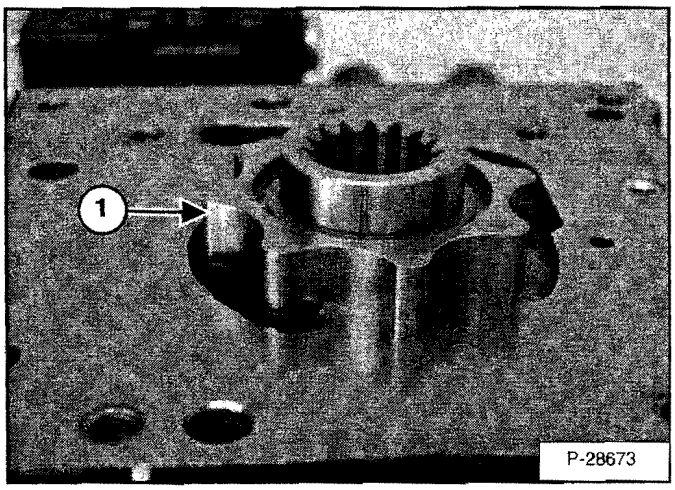
Figure 30-41-70



Remove the outer gerotor assembly from the pump housing (Item 1) **[Figure 30-41-70]**.

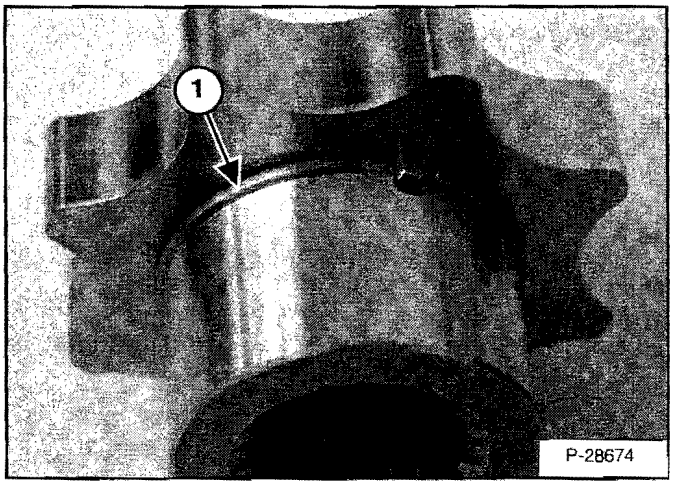
Remove the gerotor cover alignment pin from the housing.

Figure 30-41-71



Remove the inner gerotor and drive coupler (Item 1) **[Figure 30-41-71]**.

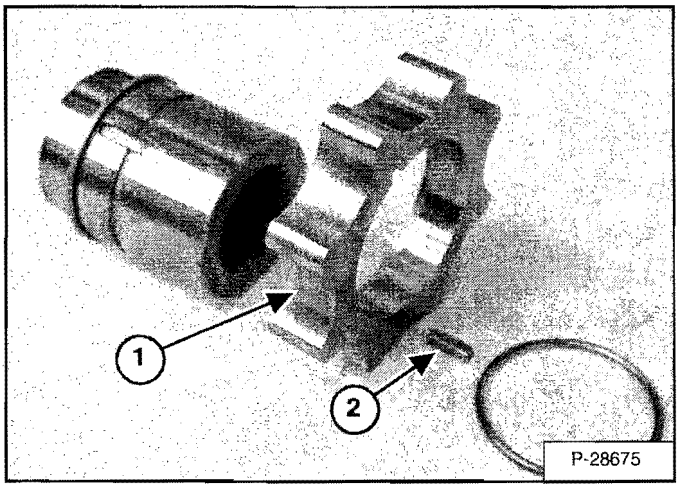
Figure 30-41-72



Remove the retainer ring from the drive coupler (Item 1) **[Figure 30-41-72]**.

Charge Pump Removal (Cont'd)

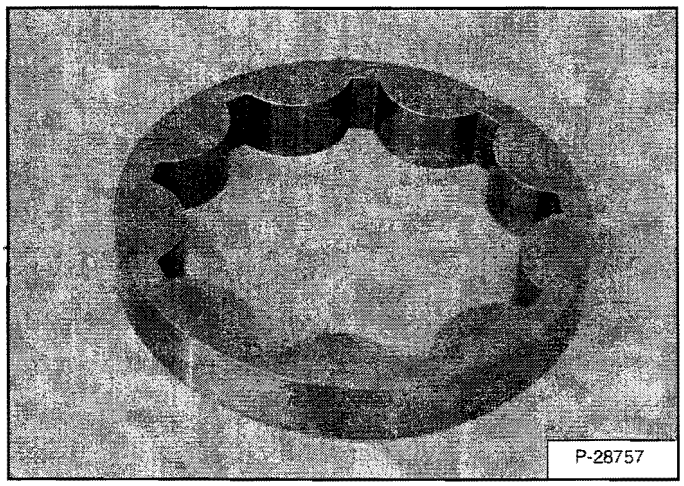
Figure 30-41-73



Remove the inner gerotor (Item 1) and key (Item 2) **[Figure 30-41-73]** from the drive couple.

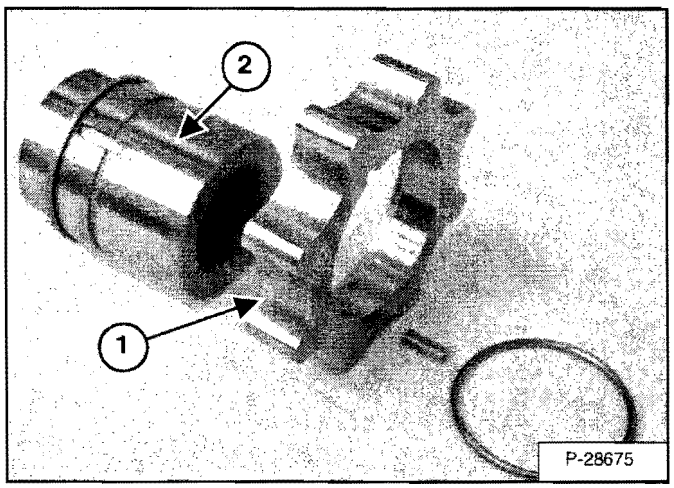
Charge Pump Inspection

Figure 30-41-74



Inspect the outer gerotor assembly **[Figure 30-41-74]** for scratches and wear, if it must be replaced, replace both the outer and inner gerotors as a set.

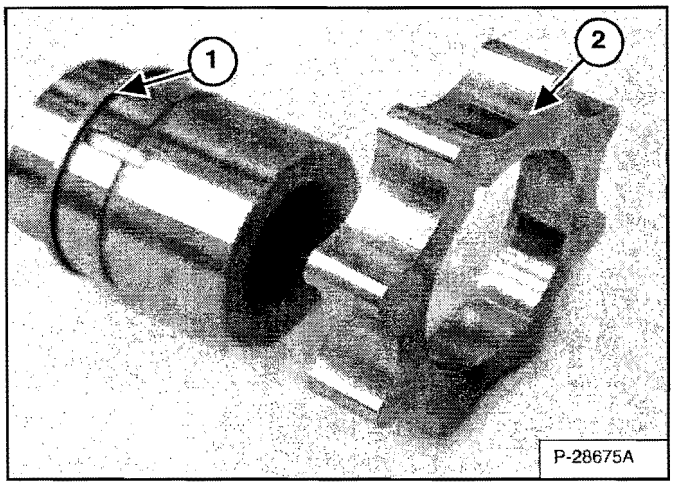
Figure 30-41-75



Inspect the inner gerotor assembly (Item 1) **[Figure 30-41-75]** for scratches and wear, if it must be replaced, replace both the outer and inner gerotors as a set.

Inspect the drive coupler (Item 2) **[Figure 30-41-75]** for wear, and replace as needed.

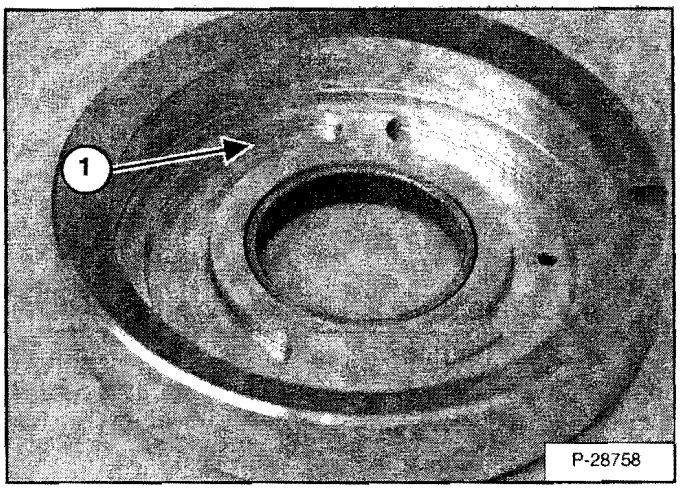
Figure 30-41-76



Inspect the gerotor drive key (Item 1) and retainer ring (Item 2) **[Figure 30-41-76]**, and replace as needed.

Charge Pump Inspection (Cont'd)

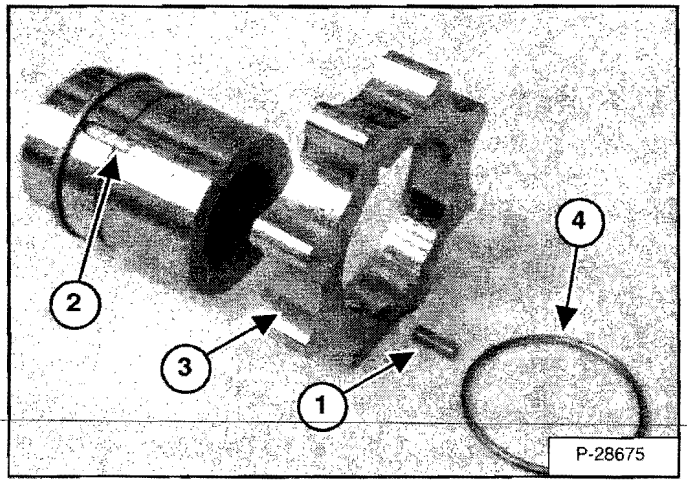
Figure 30-41-77



Inspect the inside of the gerotor cover (Item 1) **[Figure 30-41-77]** for scratches and foreign material, replace as needed.

Charge Pump Installation

Figure 30-41-78

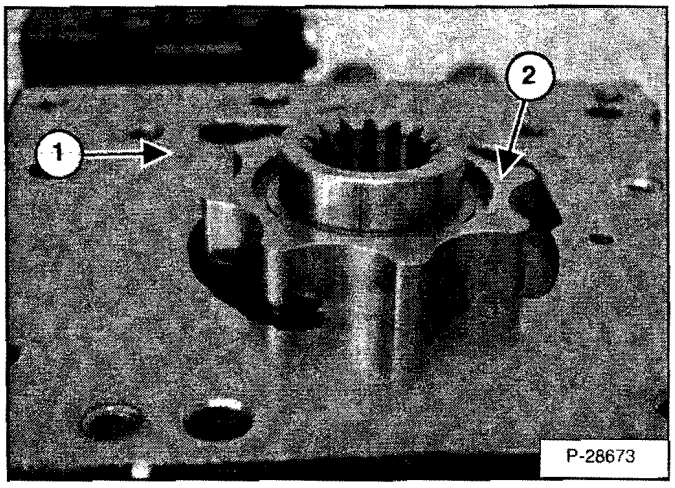


Install the key (Item 1) in the drive coupler (Item 2) **[Figure 30-41-78]**.

Install the inner gerotor (Item 3) and the retaining ring (Item 4) **[Figure 30-41-78]** on the drive coupler.

Lubricate the gerotor assembly with clean oil.

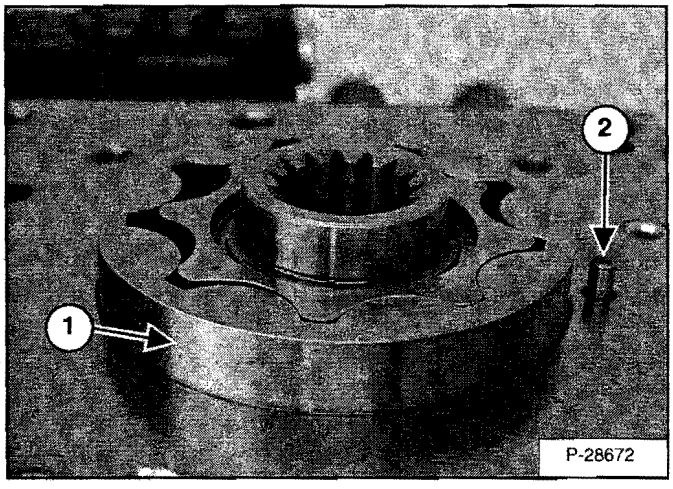
Figure 30-41-79



Be sure the pump surface (Item 1) **[Figure 30-41-79]** is clean and free of gasket material.

Install the drive coupler/inner gerotor in the pump housing (Item 2) **[Figure 30-41-79]**.

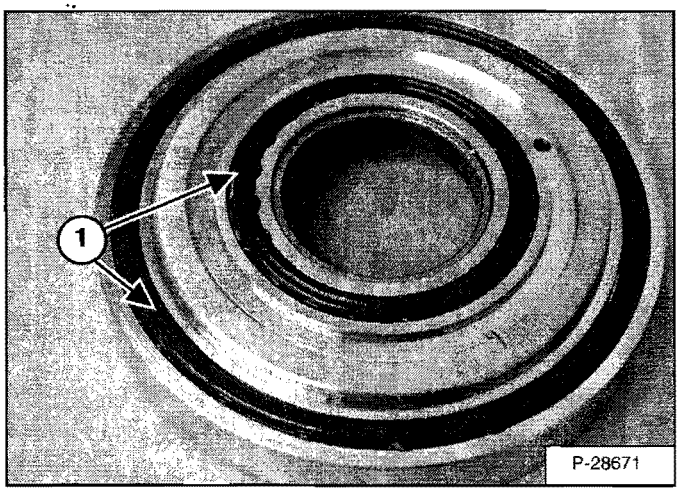
Figure 30-41-80



Install the outer gerotor (Item 1) **[Figure 30-41-80]** and gerotor cover alignment pin (Item 2) **[Figure 30-41-80]**.

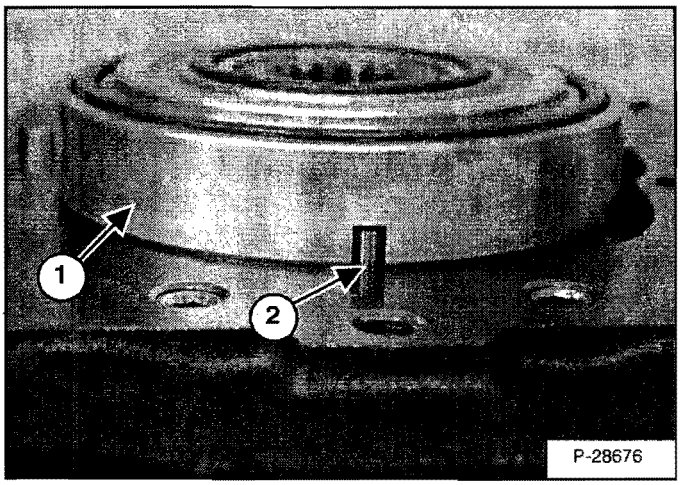
Charge Pump Installation (Cont'd)

Figure 30-41-81



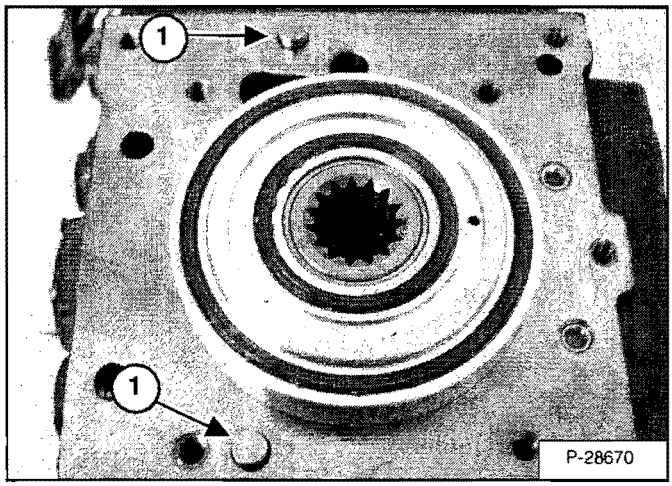
Install the new O-rings (Item 1) **[Figure 30-41-81]** on the gerotor cover.

Figure 30-41-82



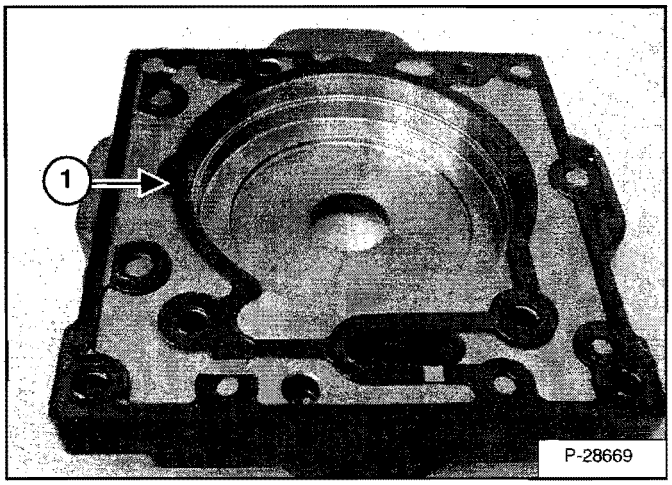
Install the gerotor cover over the gerotor assembly (Item 1) and align the pin in the cover (Item 2) **[Figure 30-41-82]**.

Figure 30-41-83



Install the charge pump cover locating pins (Item 1) **[Figure 30-41-83]**.

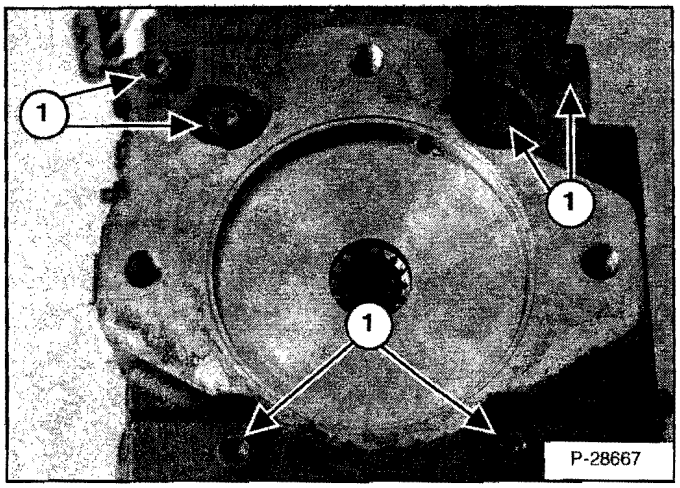
Figure 30-41-84



Install a new charge pump cover gasket (Item 1) **[Figure 30-41-84]**

Charge Pump Installation (Cont'd)

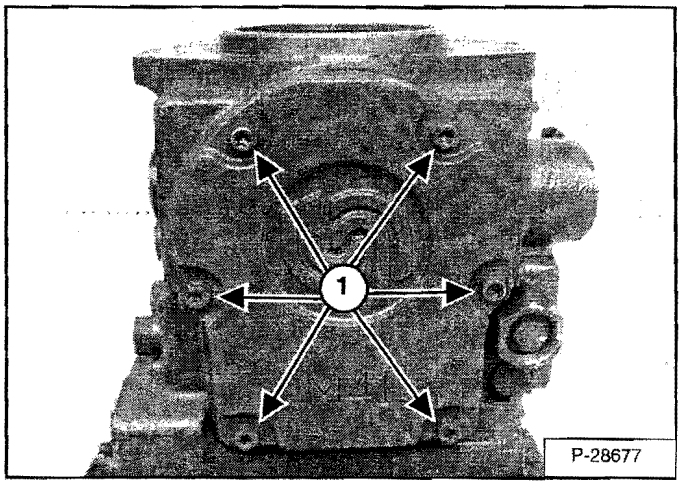
Figure 30-41-85



Align the charge pump cover on the alignment pins. Install the six cover bolts (Item 1) **[Figure 30-41-85]** and tighten to 26-32 ft.-lbs. (36-43 Nm) torque.

Disassembly

Figure 30-41-86



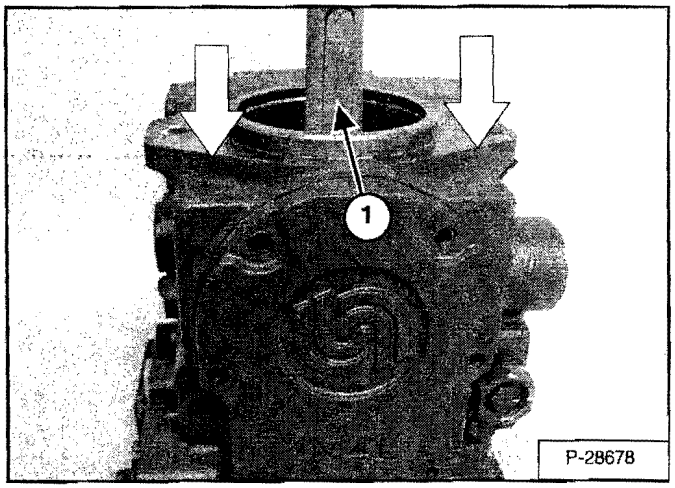
Separate the two hydrostatic pumps. (See Pump Separation on Page 30-40-18.)

Remove the charge pump. (See Charge Pump Removal on Page 30-40-23.)

Remove the shaft and shaft seal. (See Shaft Seal And Shaft Replacement on Page 30-40-19.)

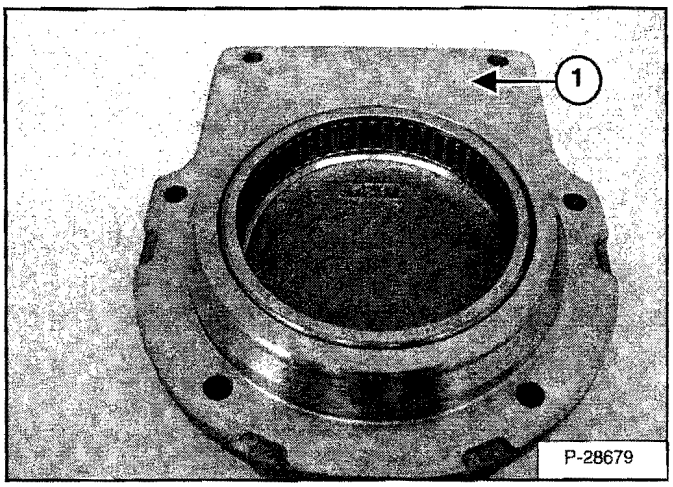
Remove the six side cover bolts (Item 1) **[Figure 30-41-86]**.

Figure 30-41-87



Press down on the swash plate with the handle of a clean rubber mallet (Item 1) **[Figure 30-41-87]** and remove the side cover.

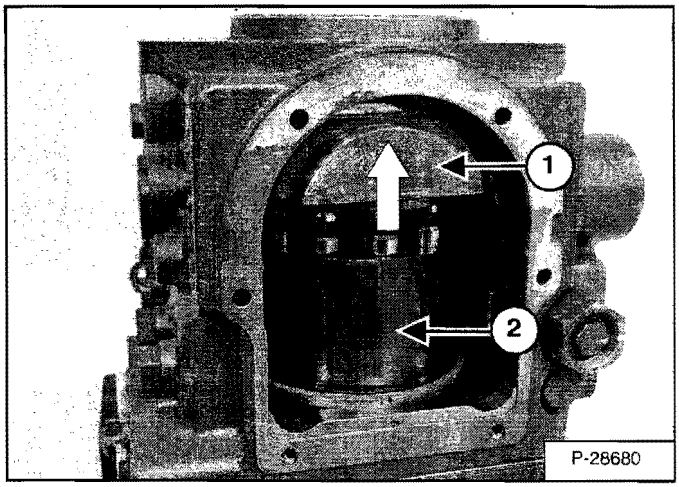
Figure 30-41-88



Remove the gasket (Item 1) **[Figure 30-41-88]** from side cover.

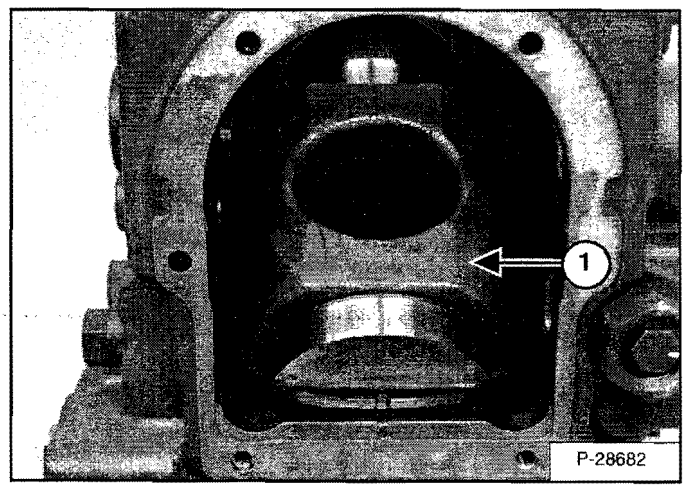
Disassembly (Cont'd)

Figure 30-41-89



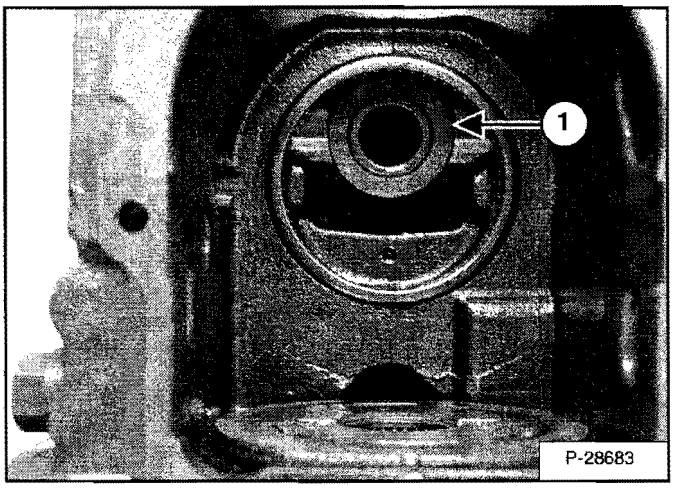
Lift the swash plate (Item 1) and remove cylinder block (Item 2) **[Figure 30-41-89]**.

Figure 30-41-90



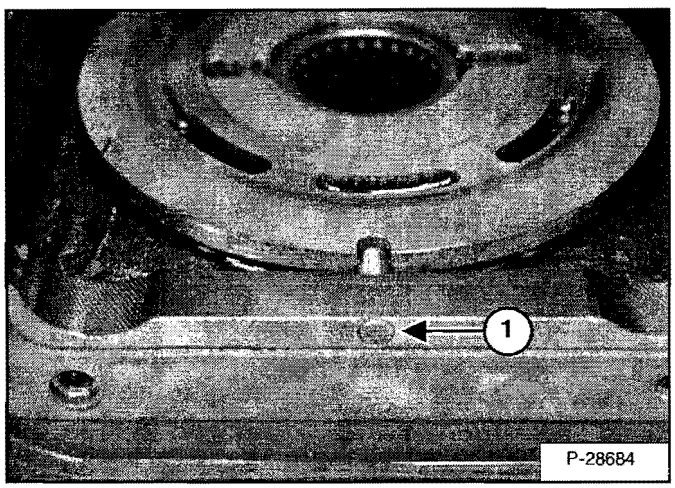
Remove the swash plate (Item 1) **[Figure 30-41-90]**.

Figure 30-41-91



Remove the swash plate needle bearing assembly (Item 1) **[Figure 30-41-91]**. It may be necessary to rotate the servo piston, so the bearing can be removed.

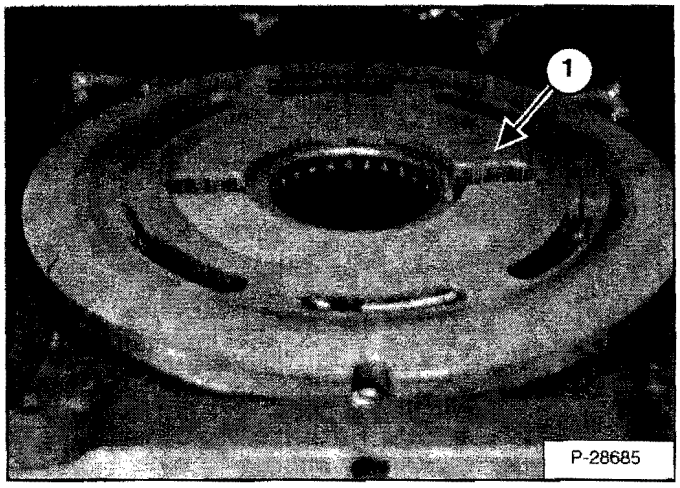
Figure 30-41-92



Remove the valve plate timing pin (Item 1) **[Figure 30-41-92]**.

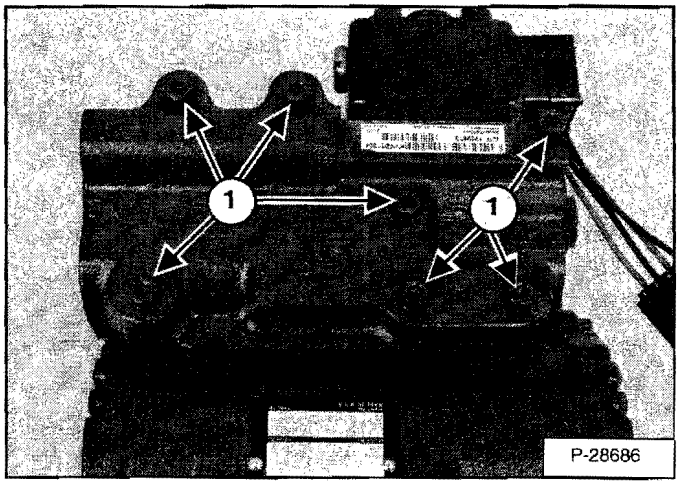
Disassembly (Cont'd)

Figure 30-41-93



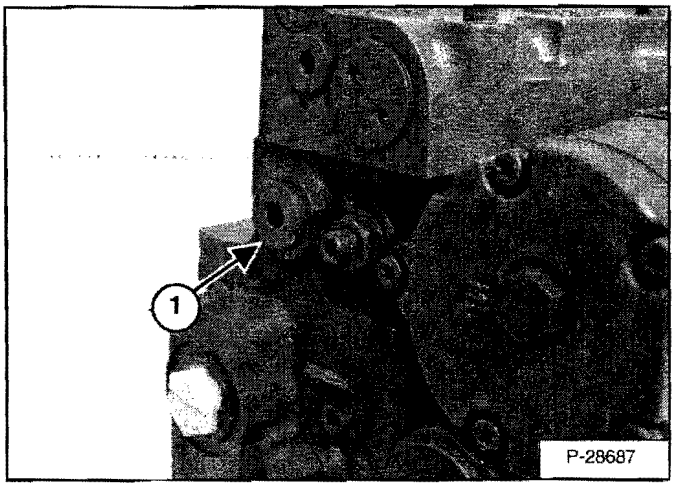
Remove the valve plate (Item 1) **[Figure 30-41-93]**.

Figure 30-41-94



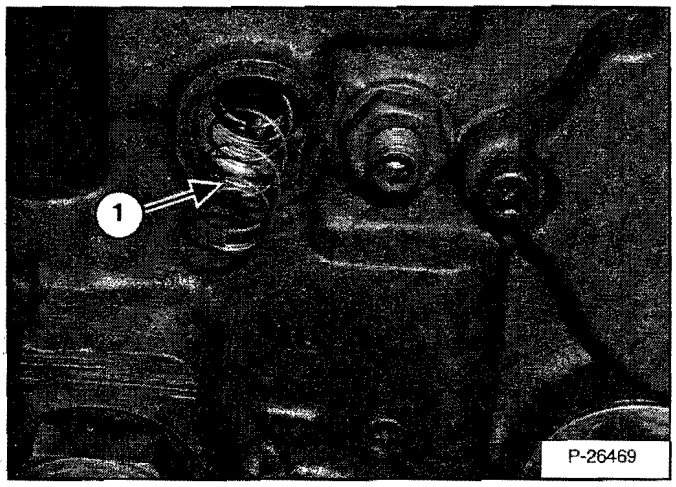
Remove the seven mounting bolts from the electrical displacement control (Item 1) **[Figure 30-41-94]**.

Figure 30-41-95



Remove the control spool plug (Item 1) **[Figure 30-41-95]**.

Figure 30-41-96

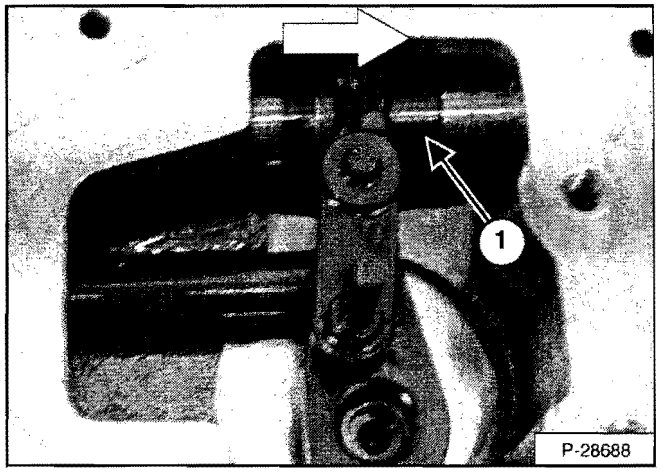


Do Not remove the spring (Item 1) **[Figure 30-41-96]**, as it is attached to the control spool.

Remove the electrical displacement control from the pump.

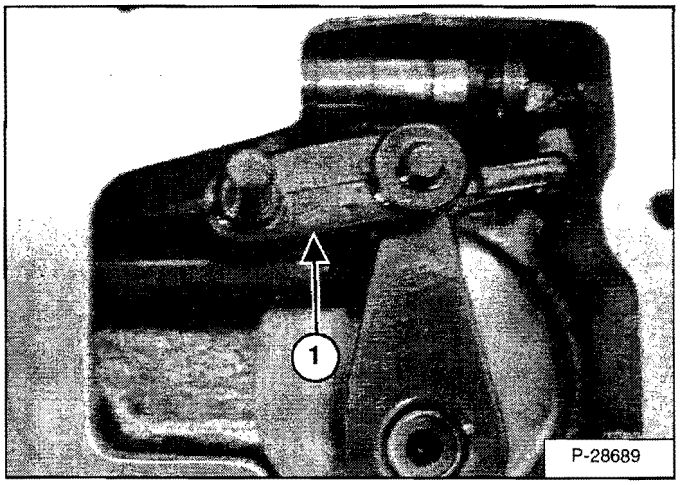
Disassembly (Cont'd)

Figure 30-41-97



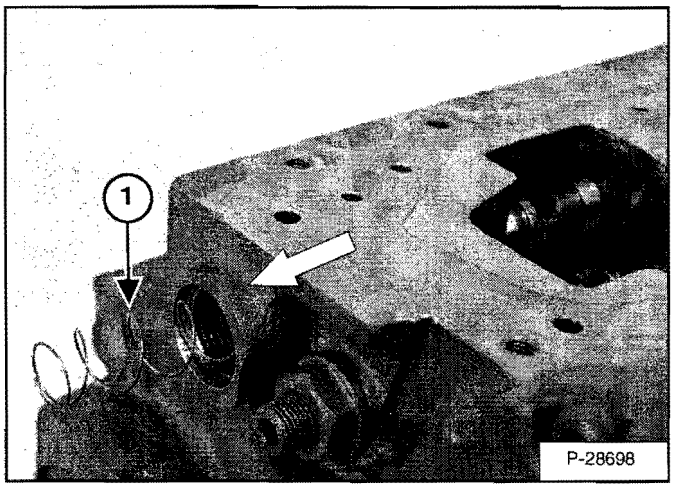
Move the control spool and summing link (Item 1) **[Figure 30-41-97]** until the summing link disconnects from the control spool.

Figure 30-41-98



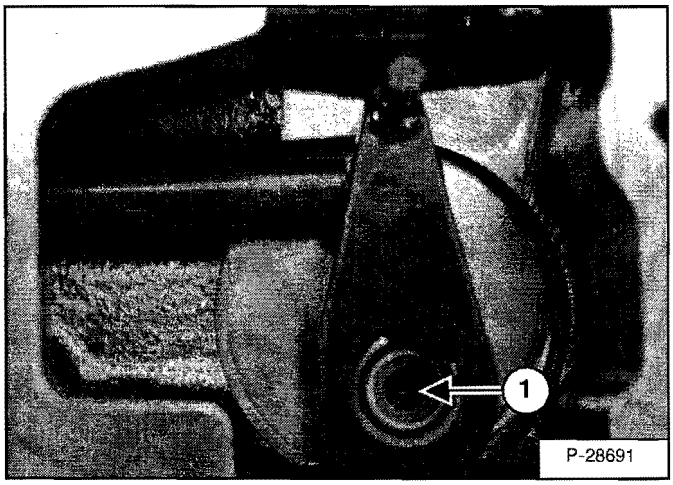
Remove the summing link (Item 1) **[Figure 30-41-98]**.

Figure 30-41-99



Remove control spool and spring (Item 1) **[Figure 30-41-99]**.

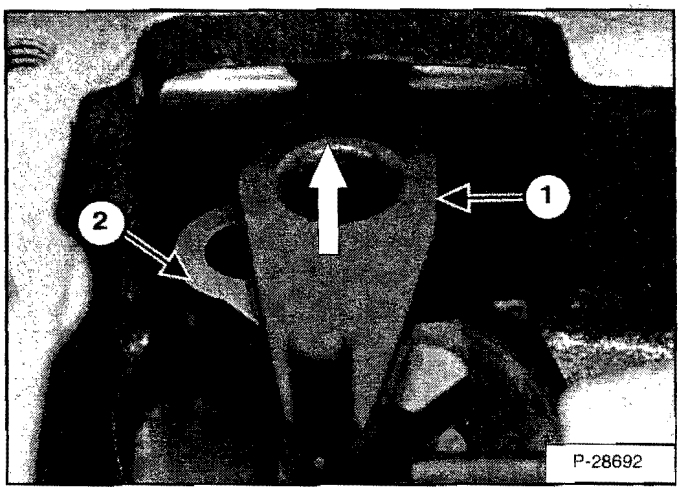
Figure 30-41-100



Remove the linkage pivot bolt (Item 1) **[Figure 30-41-100]**.

Disassembly (Cont'd)

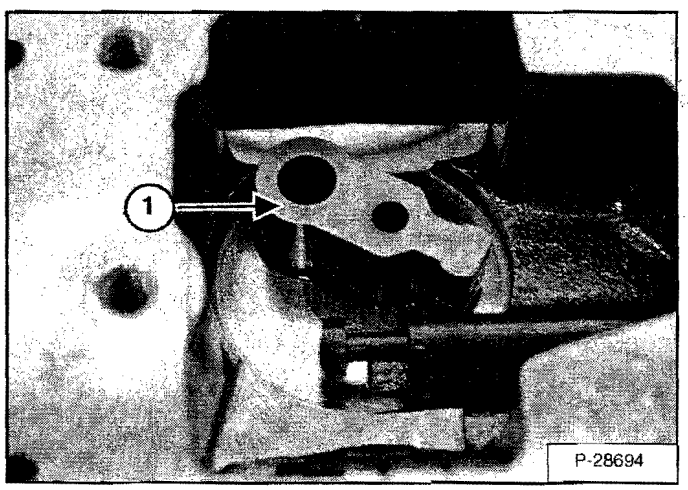
Figure 30-41-101



Slide the control feedback link (Item 1) toward the servo piston and disengage it from the neutral adjustment link (Item 2) **[Figure 30-41-101]**.

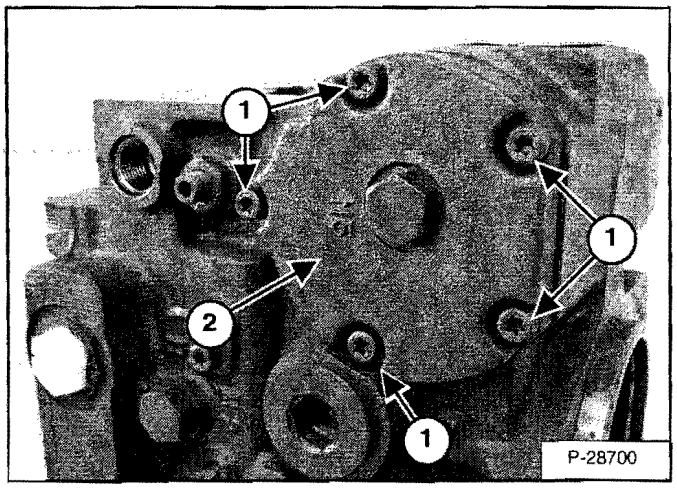
Remove the control feedback link.

Figure 30-41-102



Remove the neutral adjustment link (Item 1) **[Figure 30-41-102]** from the pump housing.

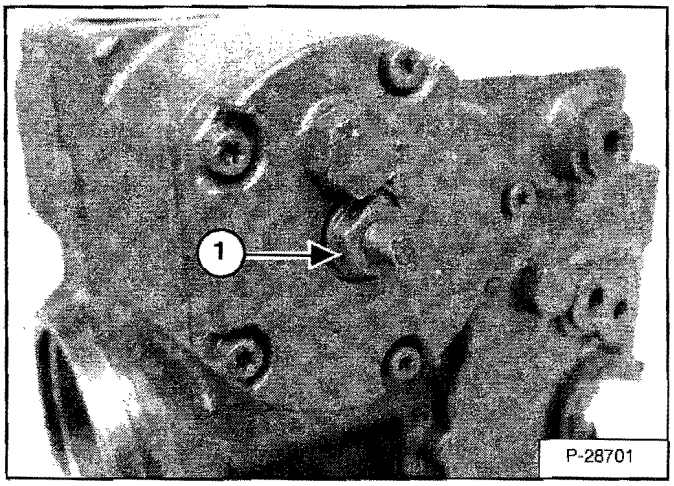
Figure 30-41-103



Remove the five servo cover mount bolts (Item 1) **[Figure 30-41-103]** from the servo cover that does NOT have the servo piston neutral adjustment tie bolt.

Remove the cover (Item 2) **[Figure 30-41-103]** and gasket.

Figure 30-41-104

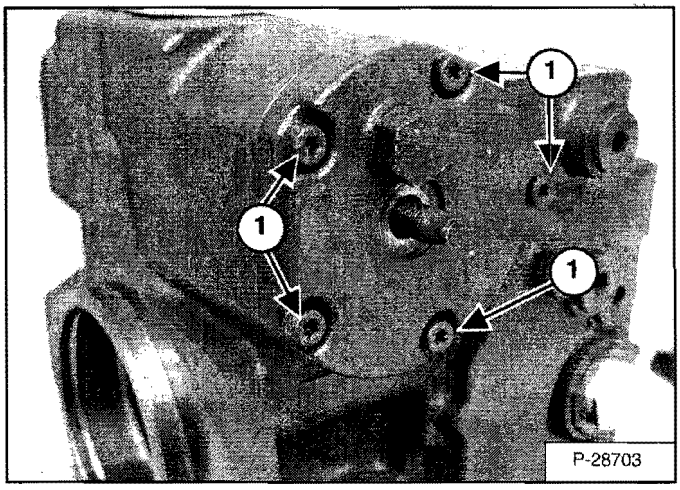


Remove the servo piston adjustment seal nut (Item 1) **[Figure 30-41-104]** and discard.

NOTE: Once a servo adjustment seal nut has been removed, it should be discarded and replaced with new, to insure a proper seal.

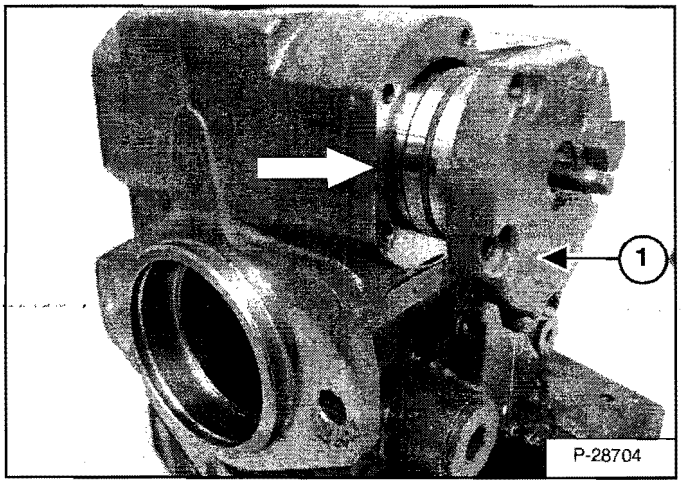
Disassembly (Cont'd)

Figure 30-41-105



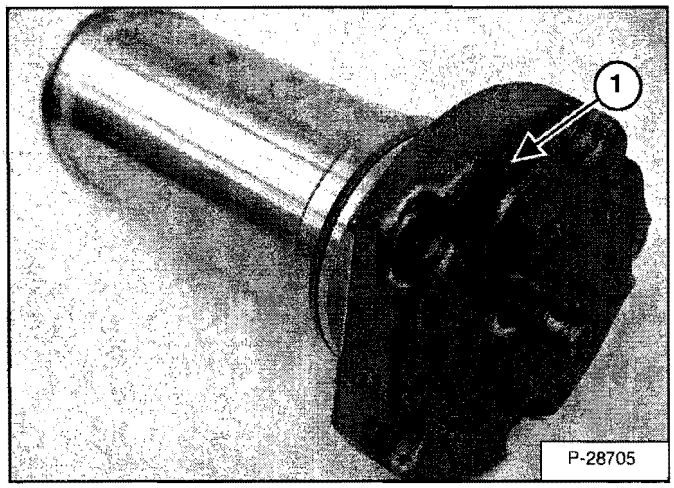
Remove the five servo piston cover mount bolts (Item 1) **[Figure 30-41-105]**.

Figure 30-41-106



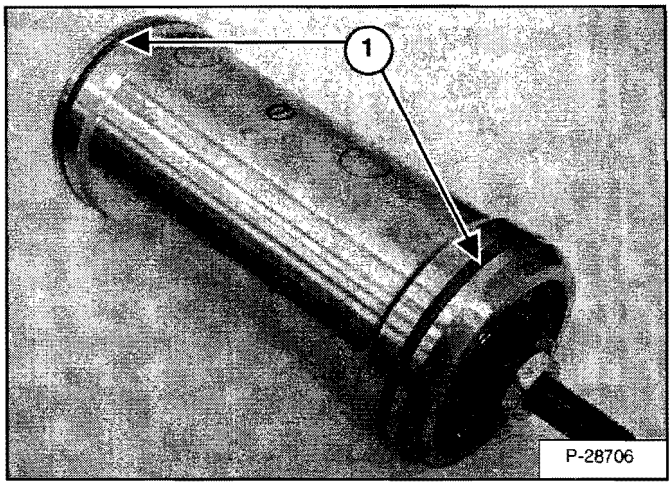
Remove the servo cover and servo piston (Item 1) **[Figure 30-41-106]** from the pump.

Figure 30-41-107



Remove the servo cover (Item 1) **[Figure 30-41-107]** from the servo piston.

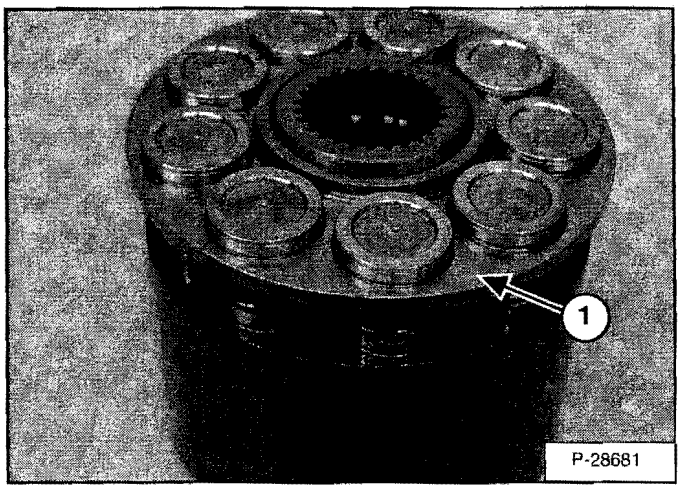
Figure 30-41-108



Remove the piston seals (Item 1) **[Figure 30-41-108]** and O-rings located under the seals, from the servo piston.

Disassembly (Cont'd)

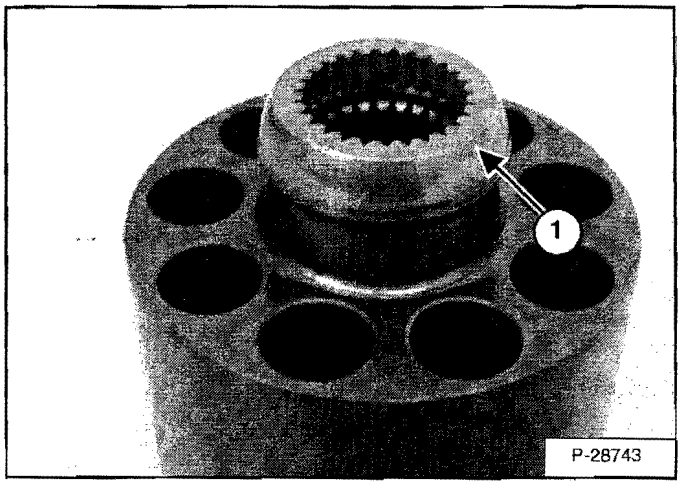
Figure 30-41-109



Inspection: Rotating Group

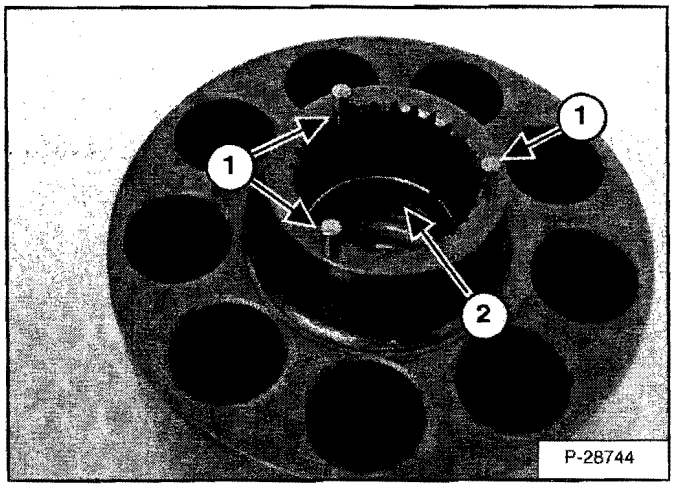
Remove the piston assemblies and slipper retainer (Item 1) **[Figure 30-41-109]** from the cylinder block.

Figure 30-41-110



Remove the ball guide (Item 1) **[Figure 30-41-110]**.

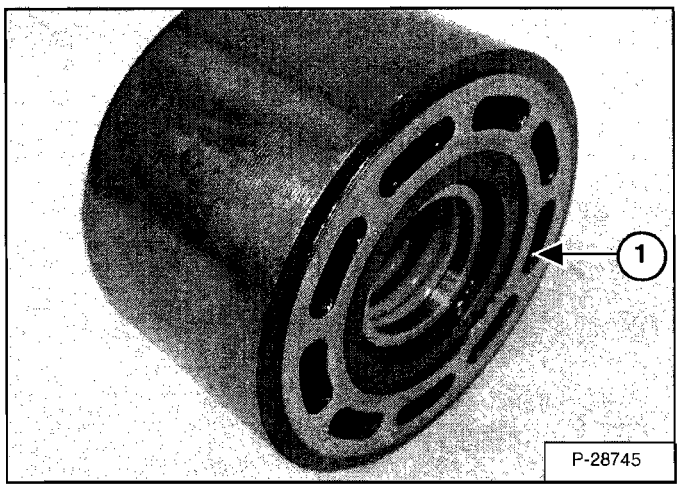
Figure 30-41-111



Remove the three hold down pins (Item 1) and retainer ring (Item 2) **[Figure 30-41-111]**.

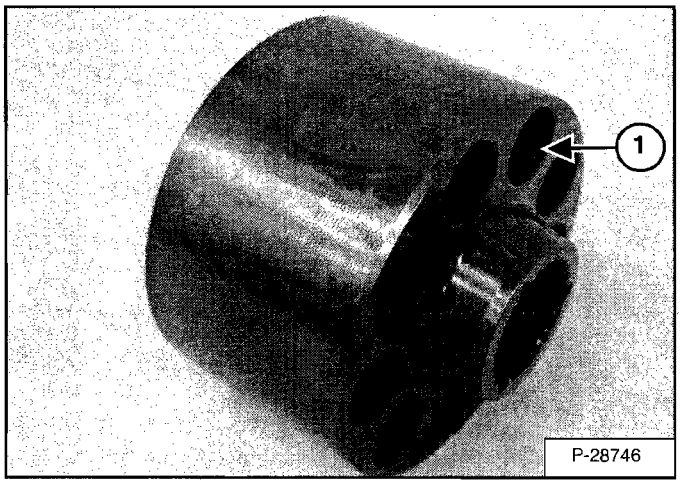
Inspection

Figure 30-41-112



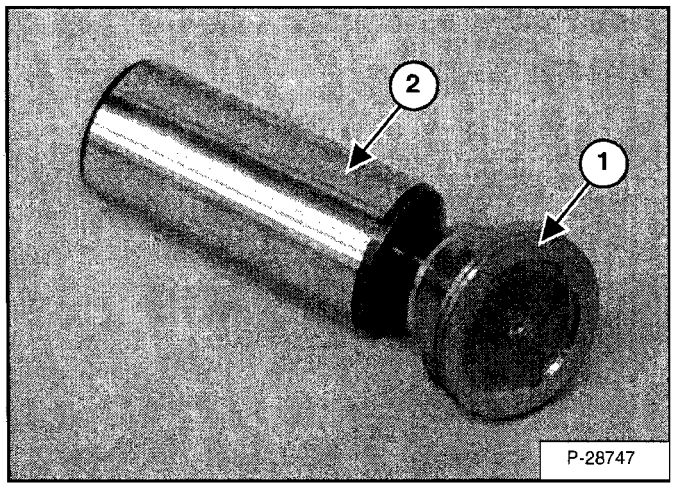
Inspect the cylinder block surface, that runs against the valve plate (Item 1) **[Figure 30-41-112]** for nicks or burrs.

Figure 30-41-113



Check the cylinder bores (Item 1) **[Figure 30-41-113]** for grooves or scratches.

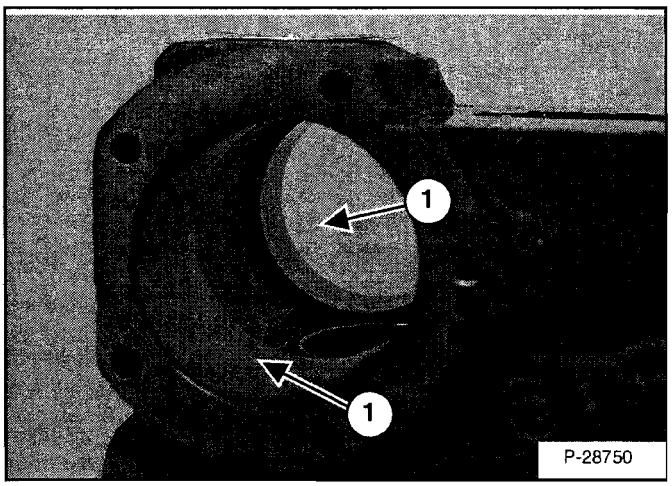
Figure 30-41-114



Check the piston slippers (Item 1) **[Figure 30-41-114]** for any excess wear or damage.

Check the pistons (Item 2) **[Figure 30-41-114]** for any discoloration, due to excessive heat.

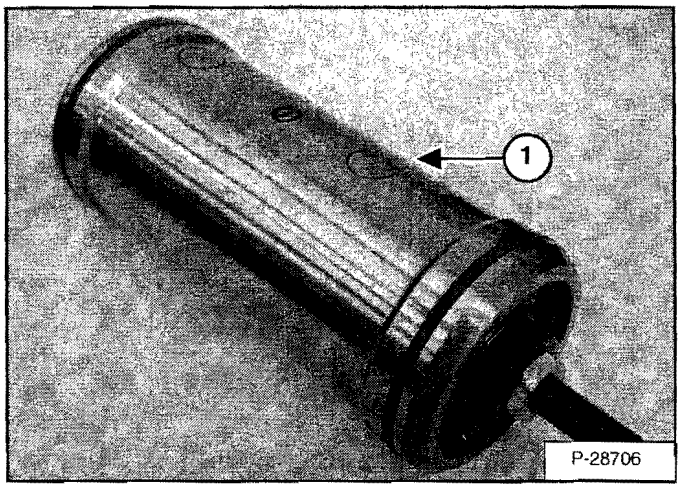
Figure 30-41-115



Check the pump housing and housing piston bore (Item 1) **[Figure 30-41-115]** for piston seal fragments, scratches or damage.

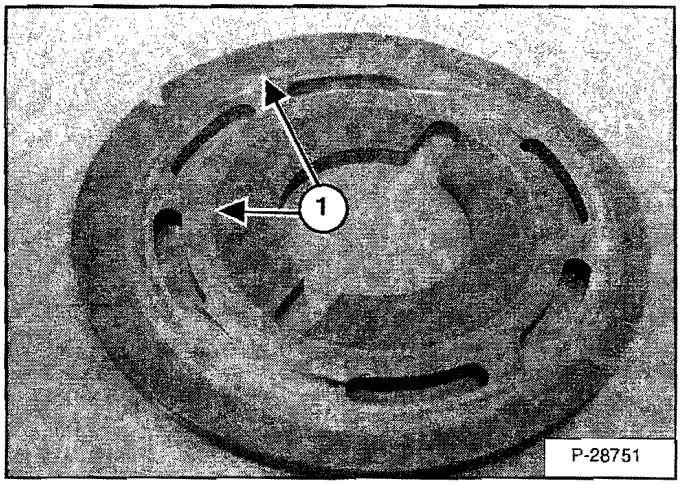
Inspection (Cont'd)

Figure 30-41-116



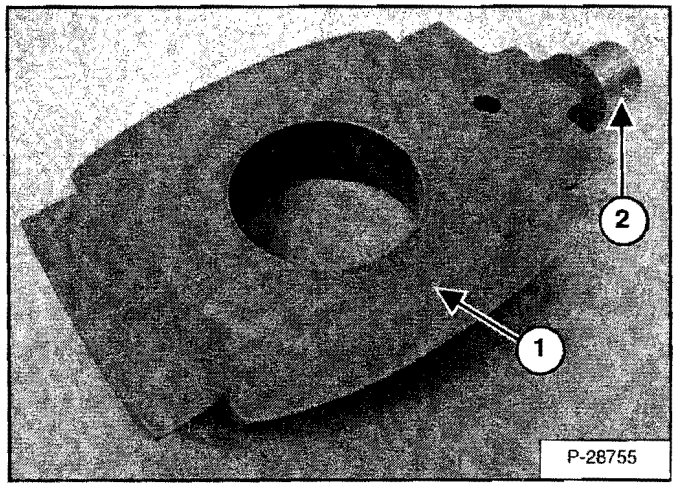
Check the surface of the servo piston (Item 1) **[Figure 30-41-116]** for scratches or damage.

Figure 30-41-117



Check the valve plate for wear. Run a finger nail over the diameter of the sealing land surface (Item 1) **[Figure 30-41-117]**. It should be free of deep groves.

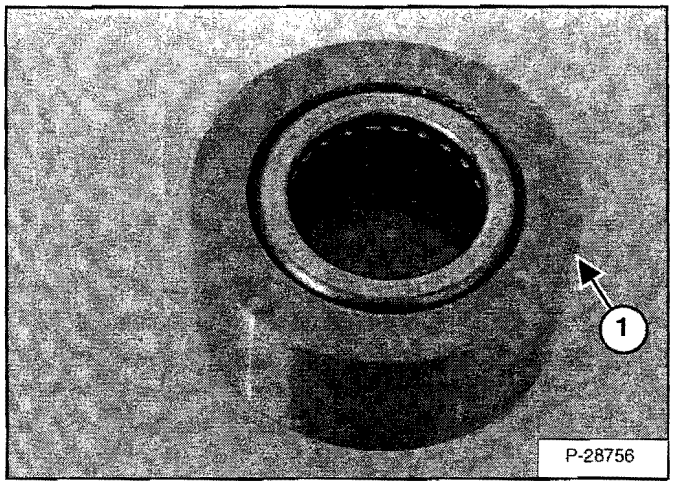
Figure 30-41-118



Check the swash plate surface (Item 1) **[Figure 30-41-118]** for scratches or damage.

Check the swash plate bearing surface (Item 2) **[Figure 30-41-118]** for wear.

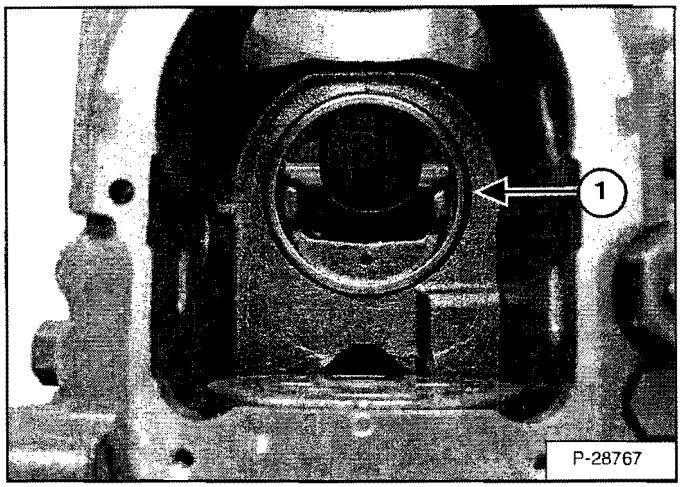
Figure 30-41-119



Check the swash plate needle bearing (Item 1) **[Figure 30-41-119]** and replace as needed, as this bearing is a serviceable part.

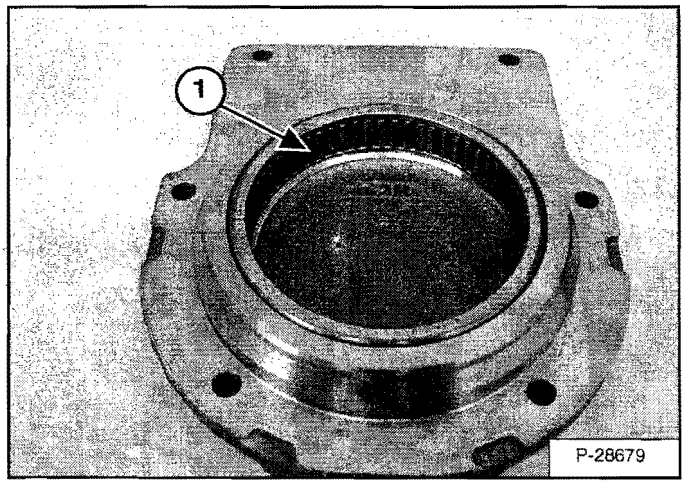
Inspection (Cont'd)

Figure 30-41-120



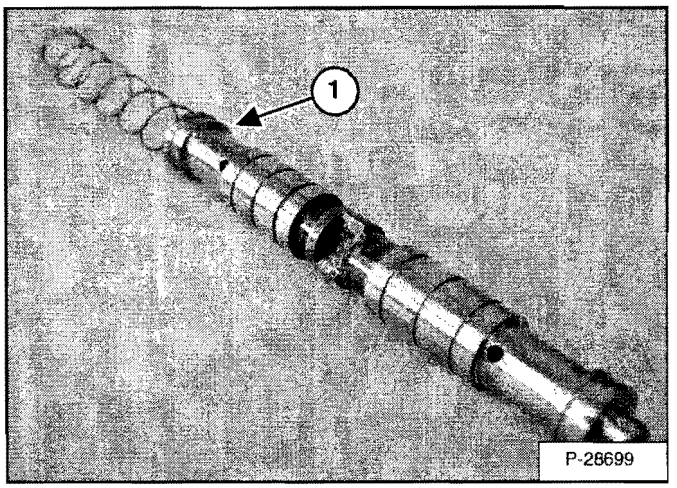
Check the pump housing swash plate needle bearing (Item 1) **[Figure 30-41-120]** for wear. If this bearing needs to be changed, the complete pump housing must be replaced, as the bearing is a non-serviceable part.

Figure 30-41-121



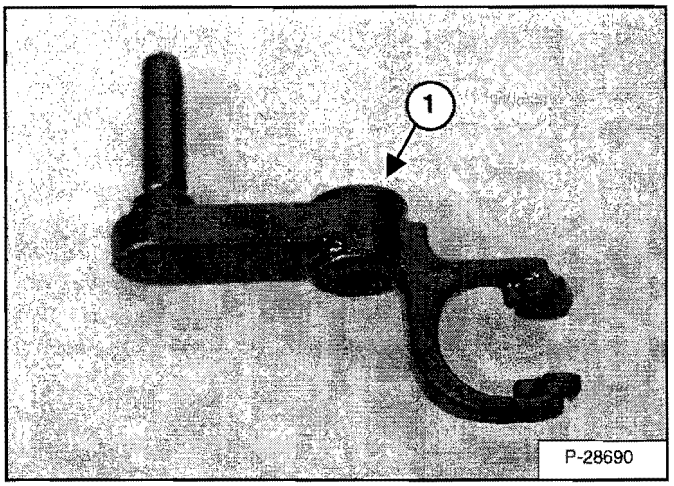
Check the pump side cover swash plate needle bearing (Item 1) **[Figure 30-41-121]** for wear. If this bearing needs to be changed, the complete pump side cover must be replaced, as the bearing is a non-serviceable part.

Figure 30-41-122



Check the control spool and spring (Item 1) **[Figure 30-41-122]** for wear and replace as needed.

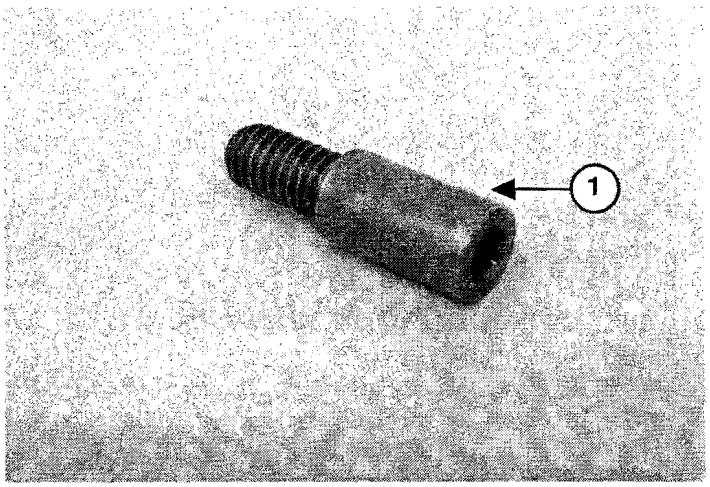
Figure 30-41-123



Check the summing link (Item 1) **[Figure 30-41-123]** for wear and replace as needed.

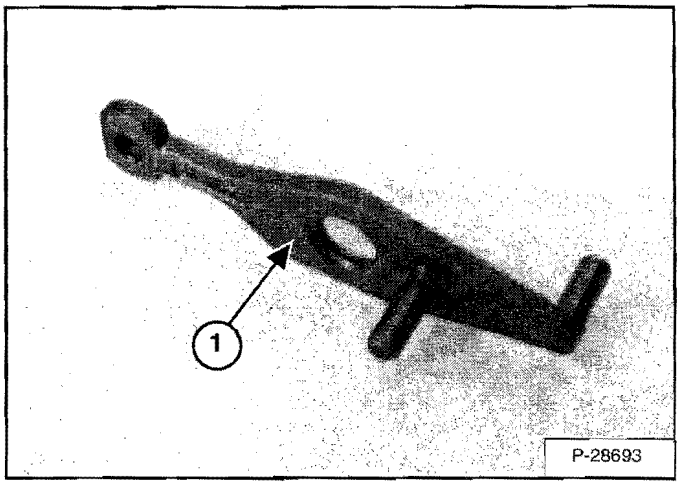
Inspection (Cont'd)

Figure 30-41-124



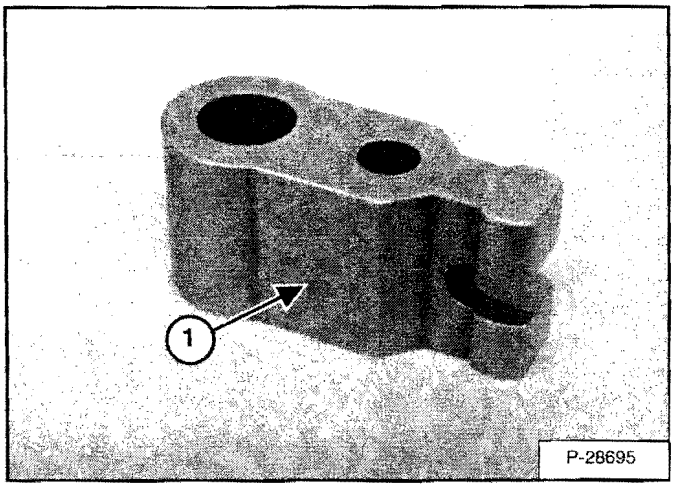
Check the linkage pivot bolt (Item 1) **[Figure 30-41-124]** for wear and replace as needed.

Figure 30-41-125



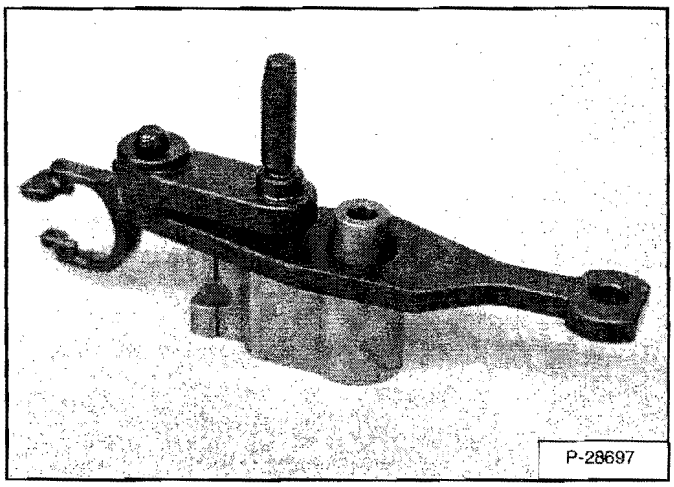
Check the control feedback link (Item 1) **[Figure 30-41-125]** for wear and replace as needed.

Figure 30-41-126



Check the neutral adjustment link (Item 1) **[Figure 30-41-126]** for wear and replace as needed.

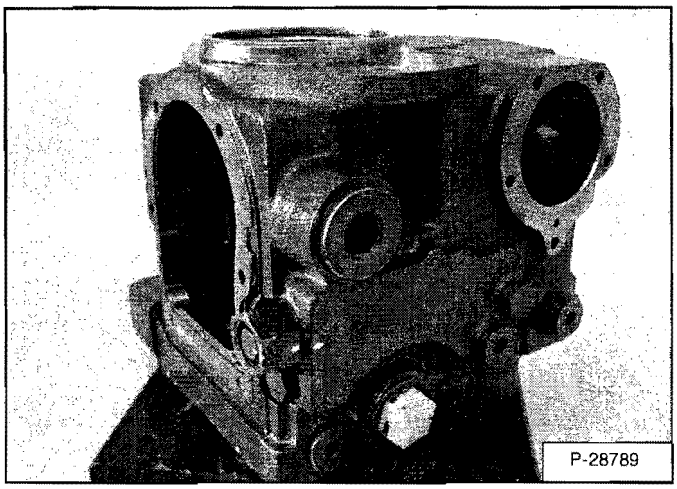
Figure 30-41-127



Check the complete linkage assembly for wear **[Figure 30-41-127]**.

Assembly

Figure 30-41-128



Position the pump housing so the charge pump face is pointing downward **[Figure 30-41-128]**.

Figure 30-41-129

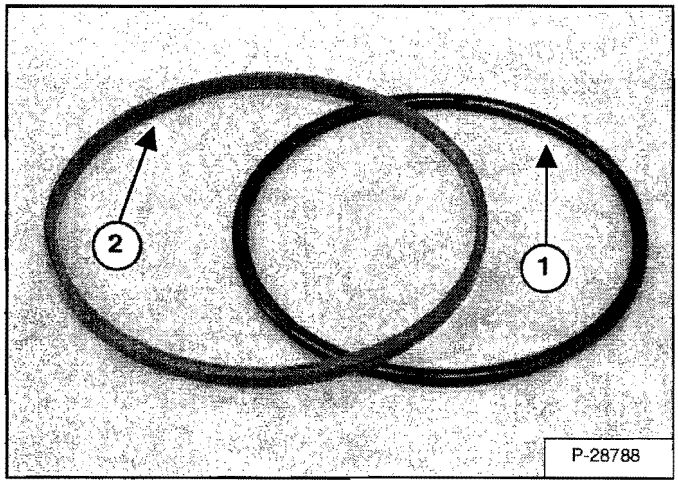
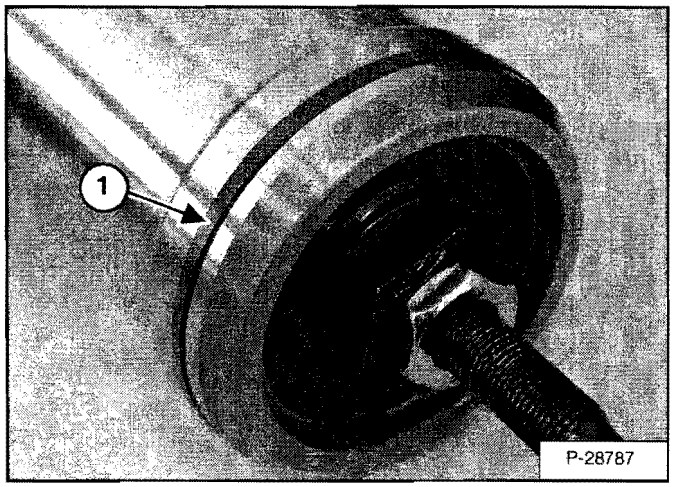


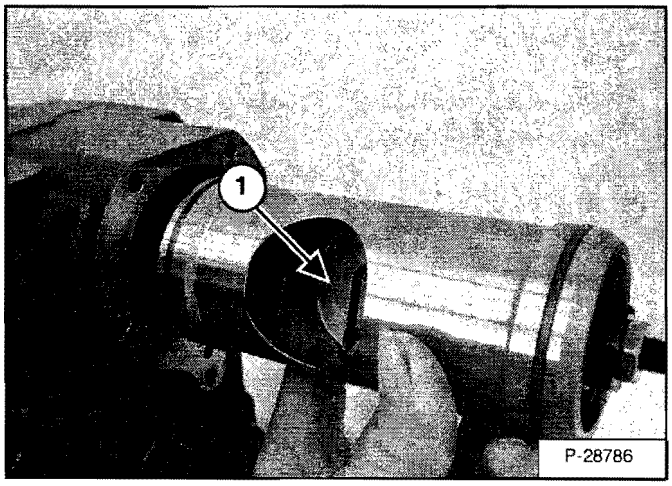
Figure 30-41-130



Install a new O-ring (Item 1) **[Figure 30-41-129]** and new piston ring (Item 2) **[Figure 30-41-129]** on the tie bolt end of the servo piston (Item 1) **[Figure 30-41-130]**.

Lubricate the piston ring with a liberal amount of hydraulic oil.

Figure 30-41-131



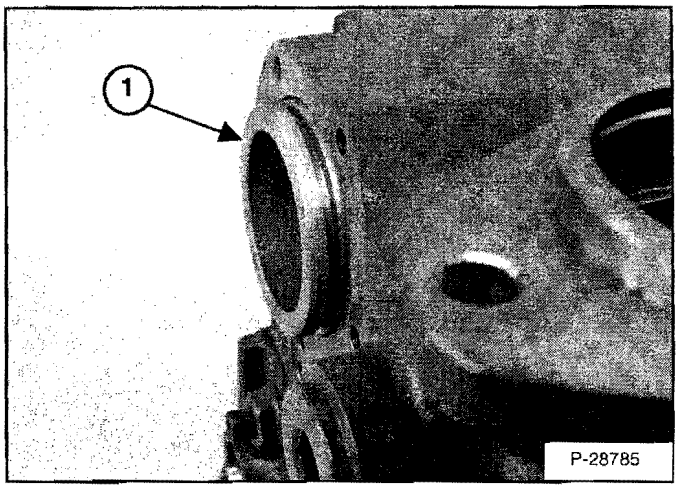
Install the servo piston in the corresponding housing bore in the pump housing **[Figure 30-41-131]**.

Install the non-tie bolt end of the servo piston into the housing first **[Figure 30-41-131]**.

Be sure the cavity for the servo piston/swash plate needle bearing (Item 1) **[Figure 30-41-131]** faces the center of the housing.

Assembly (Cont'd)

Figure 30-41-132



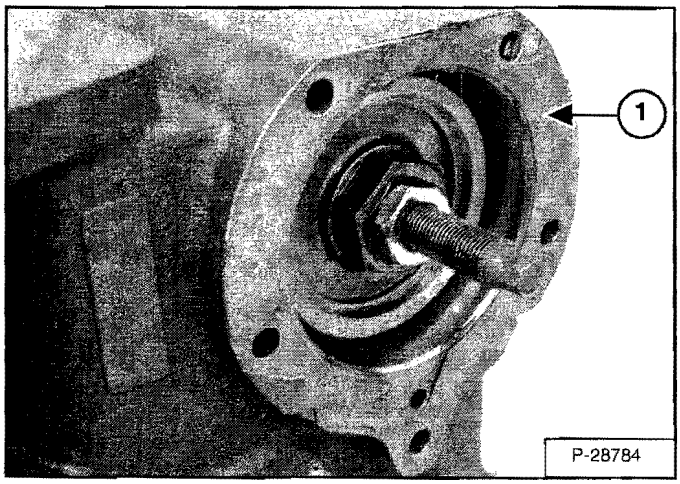
Push the servo piston through the housing far enough that the other O-ring and piston seal may be installed (Item 1) **[Figure 30-41-132]**.

NOTE: Do not let the tie bolt end of the piston ring pass completely through its bore. This will cause damage to the new piston rings earlier installed.

Install the new O-ring and piston ring.

Lubricate the piston ring with a liberal amount of hydraulic oil.

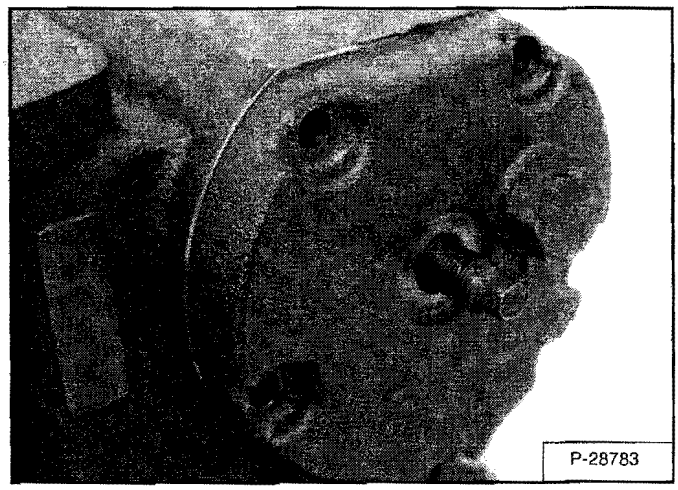
Figure 30-41-133



Push the servo piston back through the bore so the tie bolt sticks back out of the housing and the piston is almost flush with the housing **[Figure 30-41-133]**.

Install a new servo cover gasket (Item 1) **[Figure 30-41-133]**.

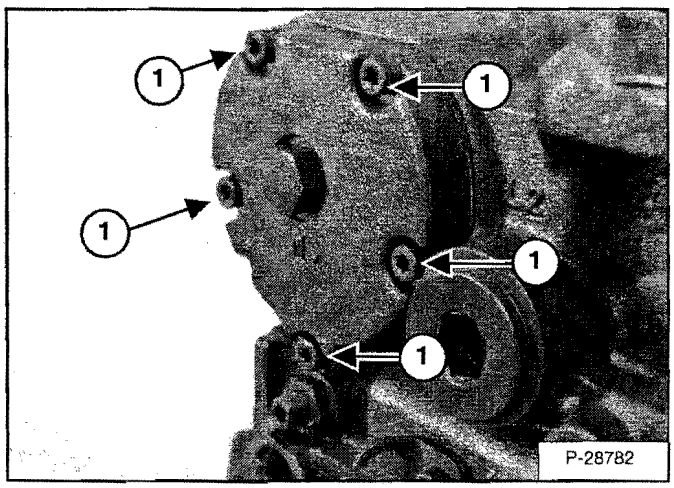
Figure 30-41-134



Spin the servo cover down as far as possible and slide the piston back in the housing so the servo cover is holding the gasket against the housing **[Figure 30-41-134]**.

Install the five servo cover mount bolts and finger tighten.

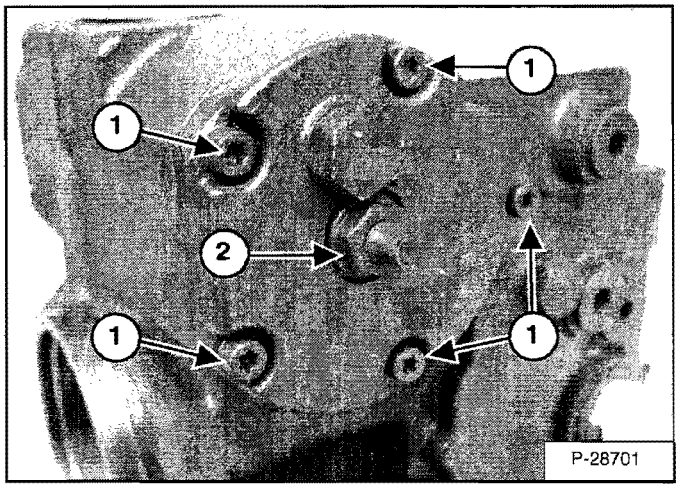
Figure 30-41-135



Install the second servo cover gasket and cover. Install the five mount bolts (Item 1) **[Figure 30-41-135]** and tighten to 11-13 ft.-lbs. 15-17,5 Nm) torque.

Assembly (Cont'd)

Figure 30-41-136

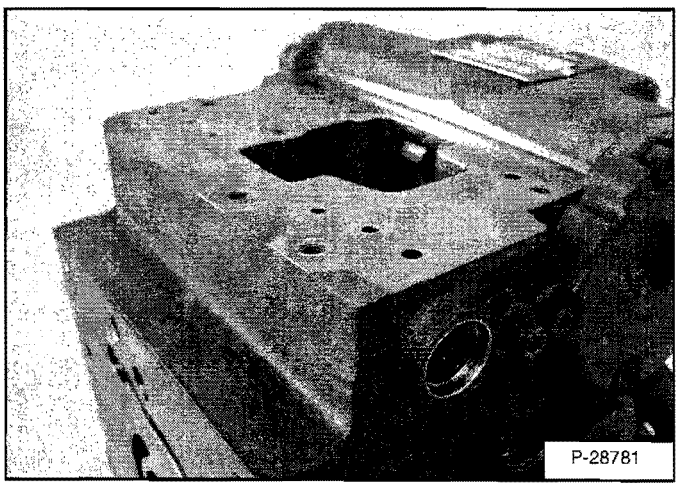


Tighten the tie bolt end, mount bolts (Item 1) **[Figure 30-41-136]** to 11-13 ft.-lbs. 15-17,5 Nm) torque.

Install a new adjustment seal nut (Item 2) **[Figure 30-41-136]** and tighten until the sealing face touches the servo cover.

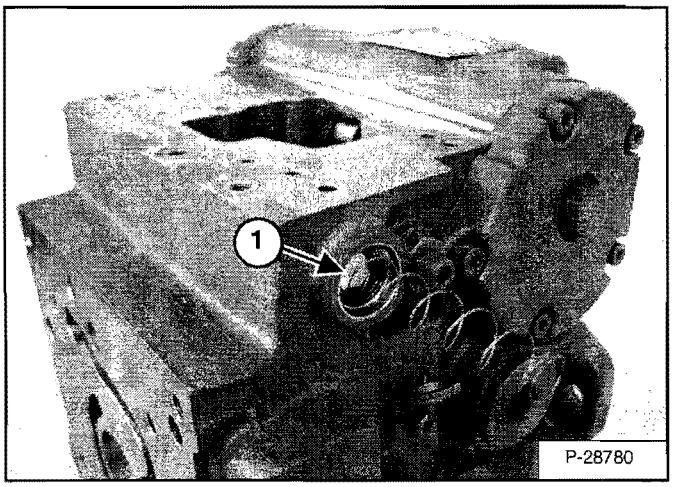
NOTE: The pump neutral adjustment must be made to the pump after it is installed in the loader. (See Pump Neutral Adjustment on Page 30-40-48.)

Figure 30-41-137



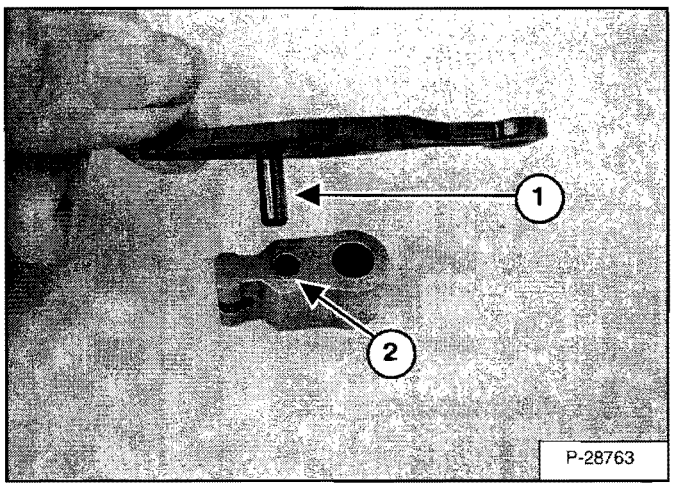
Rotate the pump housing so that the control face is accessible **[Figure 30-41-137]**.

Figure 30-41-138



Install the control spool and spring (Item 1) **[Figure 30-41-138]** into the pump housing.

Figure 30-41-139



Install the center pin on the control feedback link (Item 1) into the bore in the neutral adjustment link (Item 2) **[Figure 30-41-139]**.

Assembly (Cont'd)

Figure 30-41-140

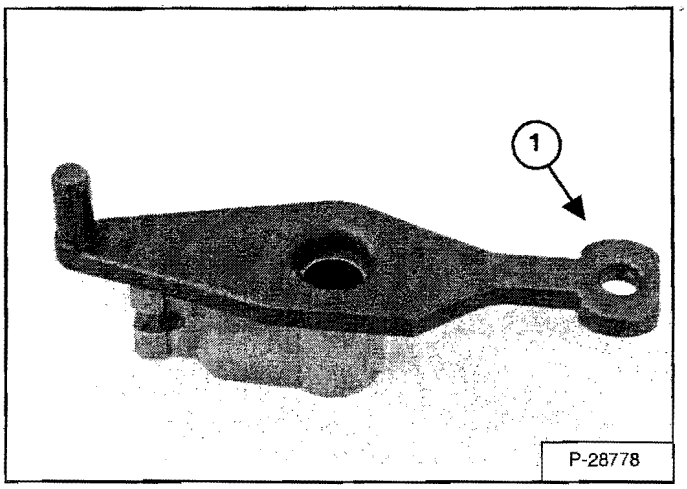
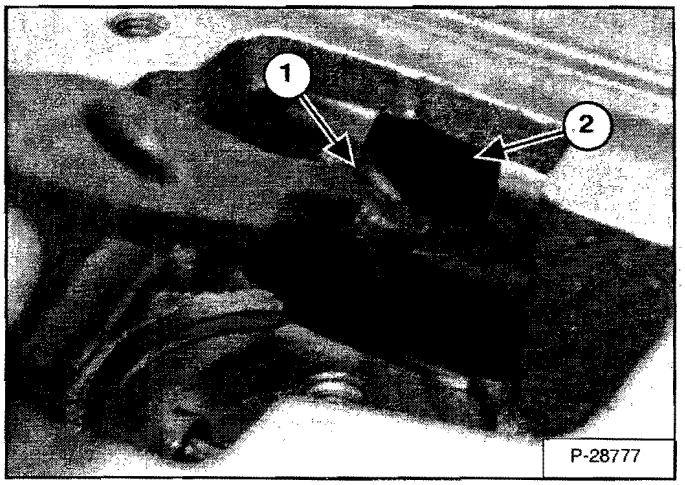
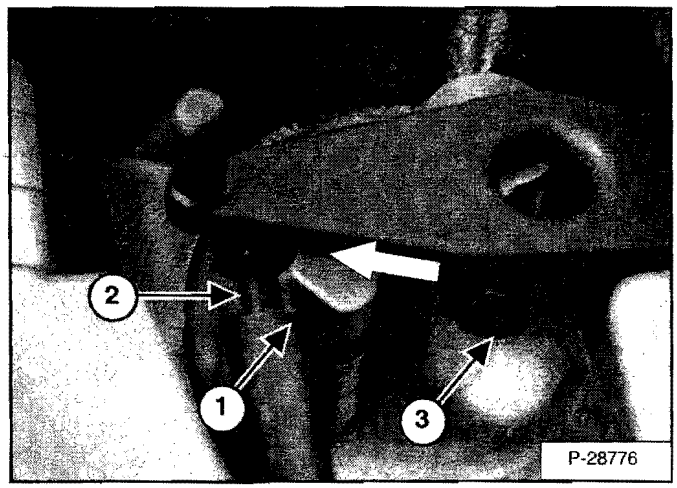


Figure 30-41-141



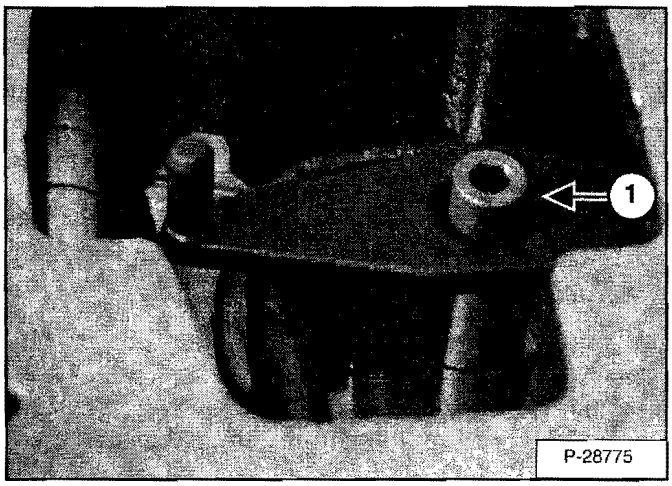
Install the end of the feedback link containing the hole (Item 1) **[Figure 30-41-140]** into the servo piston slot (Item 2) **[Figure 30-41-141]**.

Figure 30-41-142



The neutral adjustment link (Item 1) should mate and engage the neutral adjustment screw (Item 2), and both links should align with the pivot screw hole (Item 3) **[Figure 30-41-142]**.

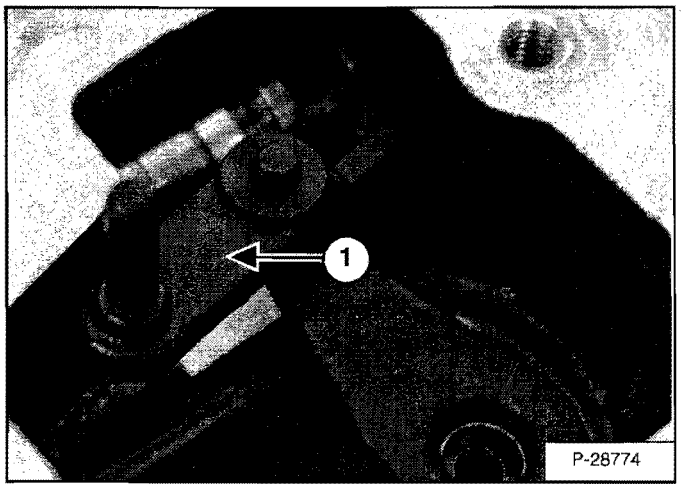
Figure 30-41-143



Install the linkage pivot screw (Item 1) **[Figure 30-41-143]** and tighten to 6-11 ft.-lbs. (8-15 Nm) torque.

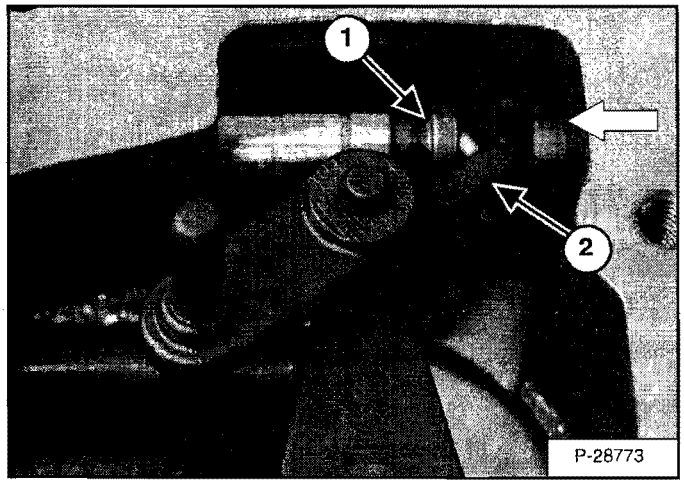
Assembly (Cont'd)

Figure 30-41-144



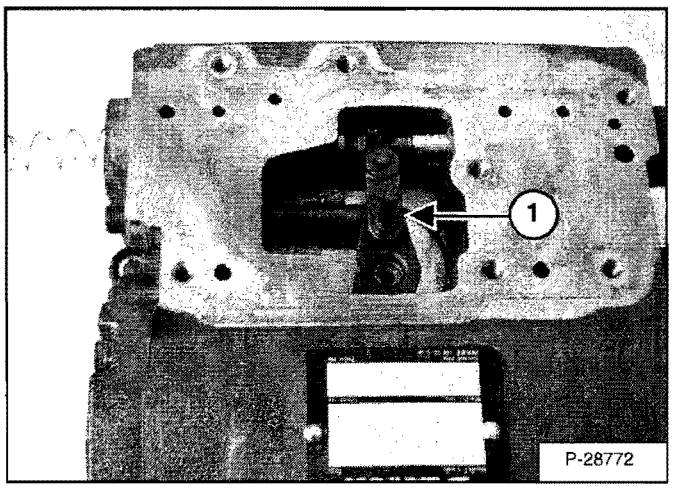
Install the summing link (Item 1) **[Figure 30-41-144]** on to the feedback link pin.

Figure 30-41-145



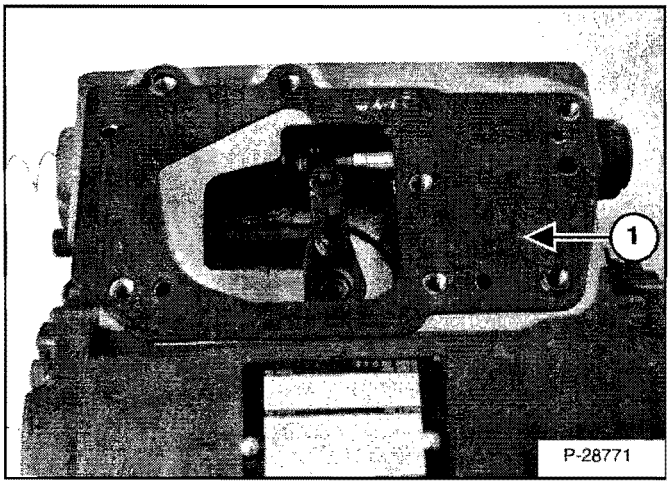
Move the control spool (Item 1) until the summing link (Item 2) **[Figure 30-41-145]** lines up with the flat spot on the control spool.

Figure 30-41-146



Shift the control spool to the center of the housing until the summing link pin (Item 1) **[Figure 30-41-146]** is located in the center.

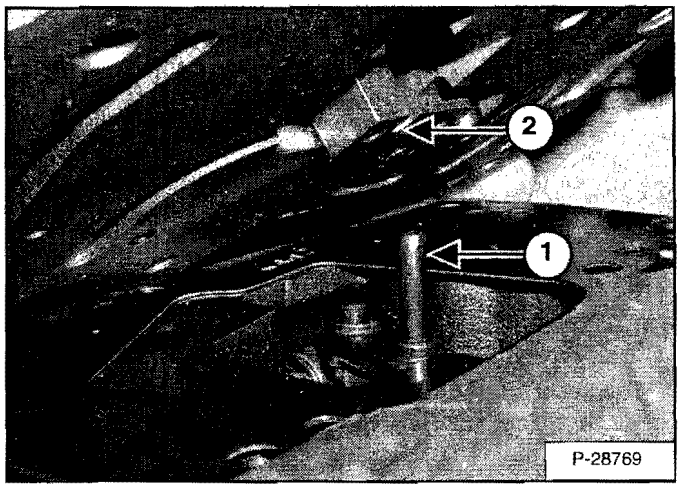
Figure 30-41-147



Install a new gasket (Item 1) **[Figure 30-41-147]** on the pump housing controller face.

Assembly (Cont'd)

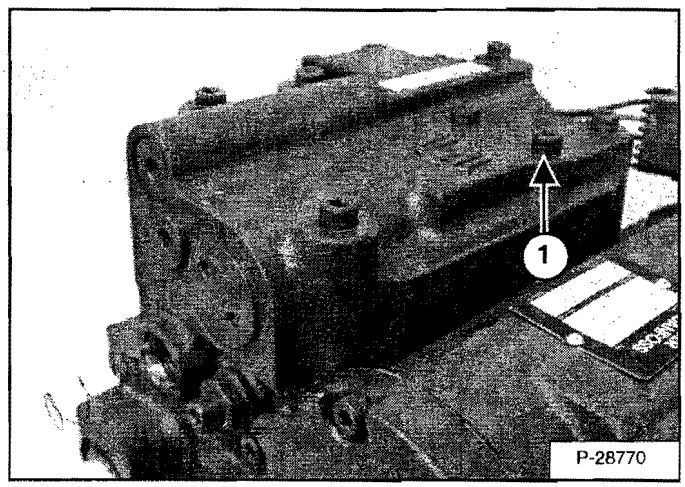
Figure 30-41-148



Install the control module on the pump housing.

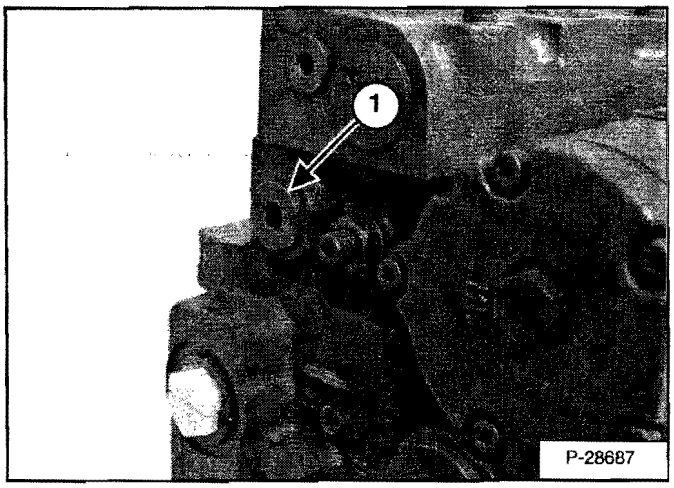
NOTE: The pin on the summing link (Item 1) must engage the bore (Item 2) [Figure 30-41-148] on the control module for proper control operation.

Figure 30-41-149



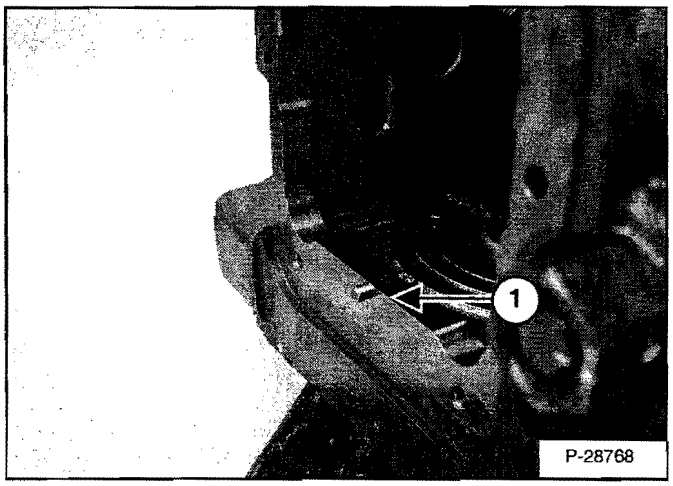
Install the seven controller mount bolts (Item 1) **[Figure 30-41-149]** and tighten to 11-13 ft.-lbs. (15-17.5 Nm) torque.

Figure 30-41-150



Install the control spool bore plug (Item 1) **[Figure 30-41-150]** and tighten to 30-70 ft.-lbs (41-94 Nm) torque.

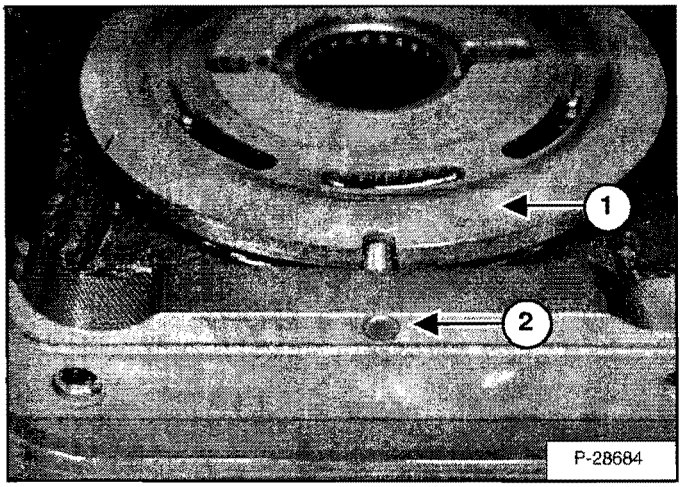
Figure 30-41-151



Install the valve plate timing pin (Item 1) **[Figure 30-41-151]** and allow it to stick out roughly 1/16 Inch, (1,588 mm) beyond the interface of the pump housing side cover.

Assembly (Cont'd)

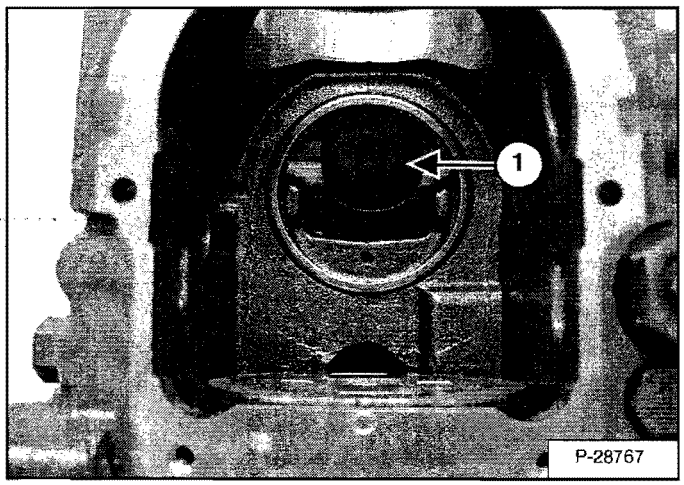
Figure 30-41-152



Install the pump valve plate (Item 1) and engage the valve plate timing pin (Item 2) **[Figure 30-41-152]**.

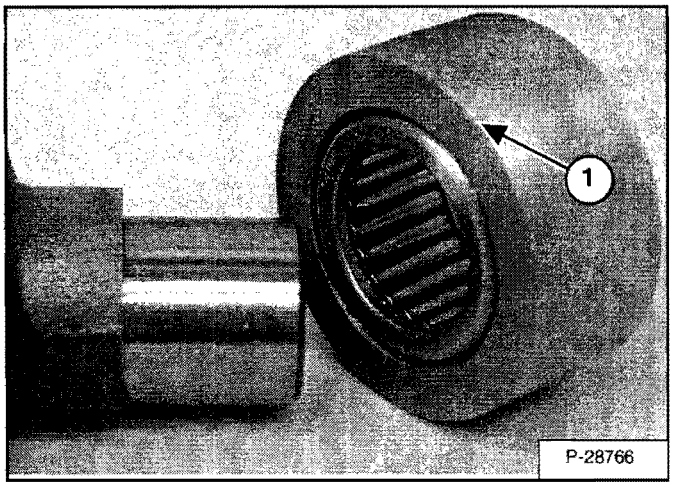
Lubricate the top surface of the valve plate with a coating of hydraulic fluid.

Figure 30-41-153



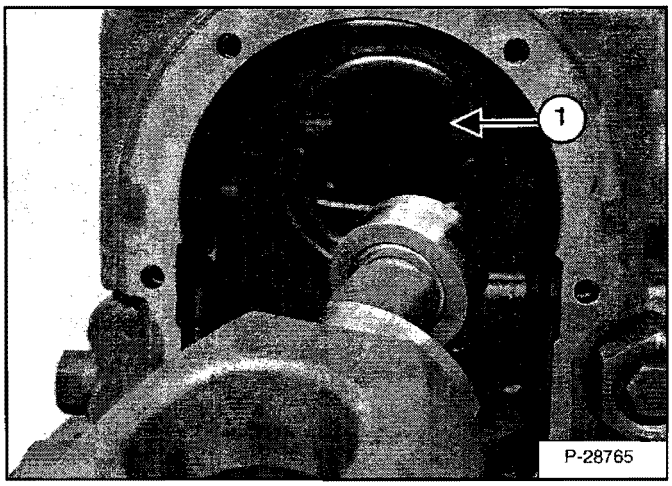
Be sure the servo piston cavity (Item 1) **[Figure 30-41-153]** is facing the center of the pump.

Figure 30-41-154



Install the swash plate needle bearing (Item 1) **[Figure 30-41-154]** on the swash plate, ***so the letters on the bearing face the swash plate.***

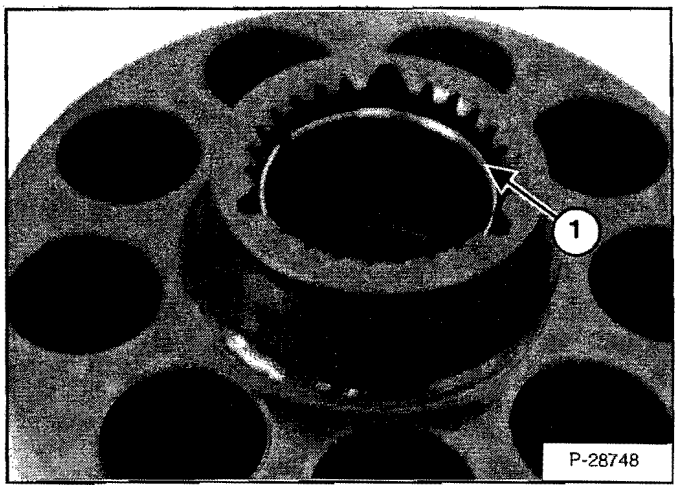
Figure 30-41-155



Install the swash plate and needle bearing into the servo piston cavity (Item 1) **[Figure 30-41-155]**.

Assembly (Cont'd)

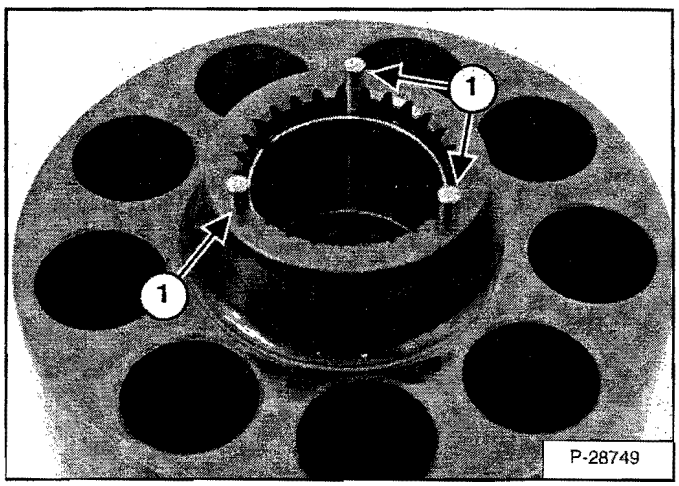
Figure 30-41-156



Lightly coat all parts with hydraulic oil, before installing the cylinder block.

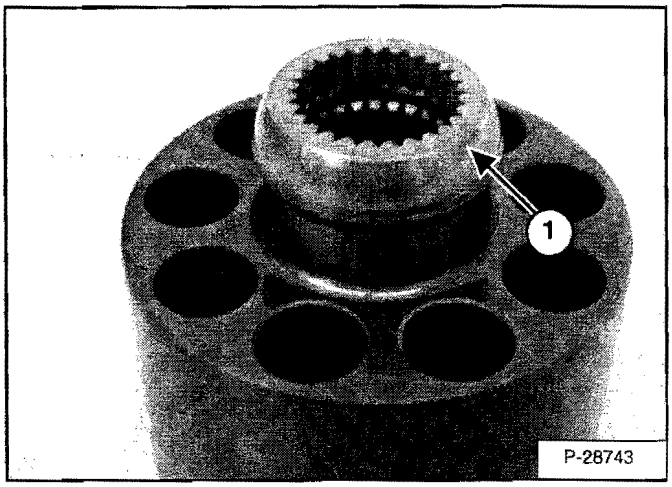
Place the retainer ring (Item 1) **[Figure 30-41-156]** in the cylinder block, so that it sits approximately 1/8 inch (3,175 mm) below the surface.

Figure 30-41-157



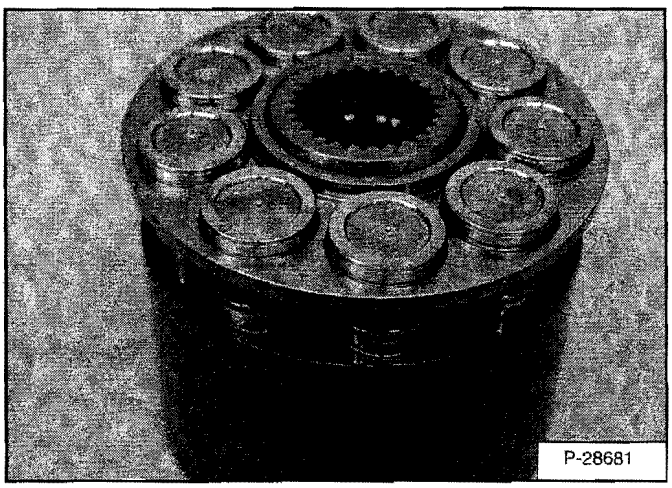
Install the three hold down pins (Item 1) **[Figure 30-41-157]**, making sure they are setting squarely in the grooves.

Figure 30-41-158



Install the ball guide (Item 1) **[Figure 30-41-158]** on the hold down pins.

Figure 30-41-159



Install the slipper retainer, containing the slippers and pistons **[Figure 30-41-159]**.

Apply a liberal amount of hydraulic oil to the top and bottom of the slippers and cylinder block.

Assembly (Cont'd)

Figure 30-41-160

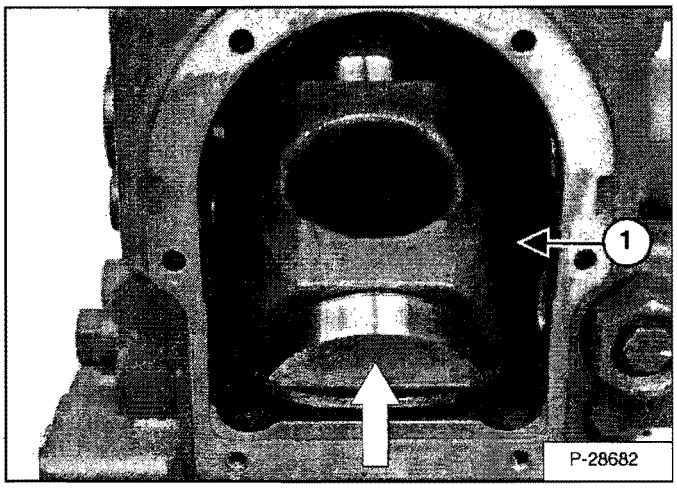
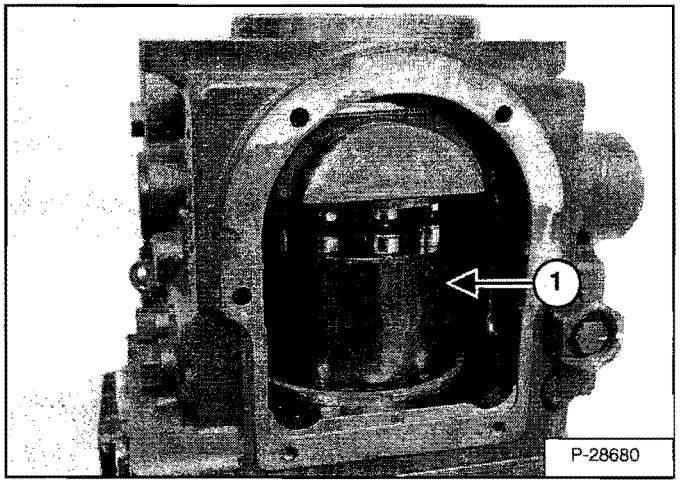


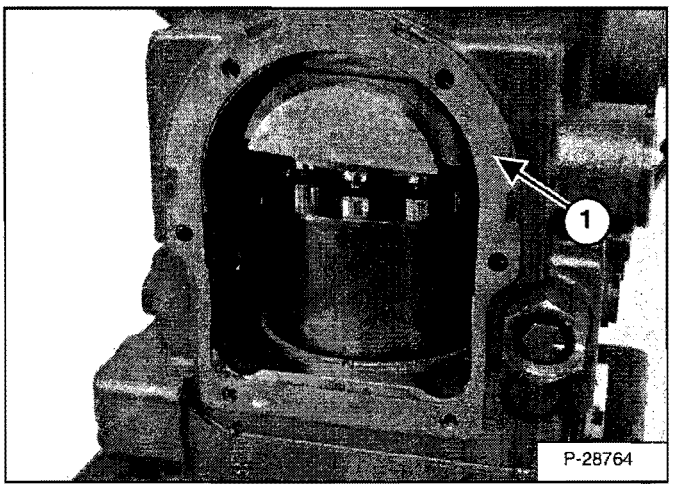
Figure 30-41-161



Lift the end of the swash plate (Item 1) **[Figure 30-41-160]** and insert the cylinder block assembly (Item 1) **[Figure 30-41-161]**.

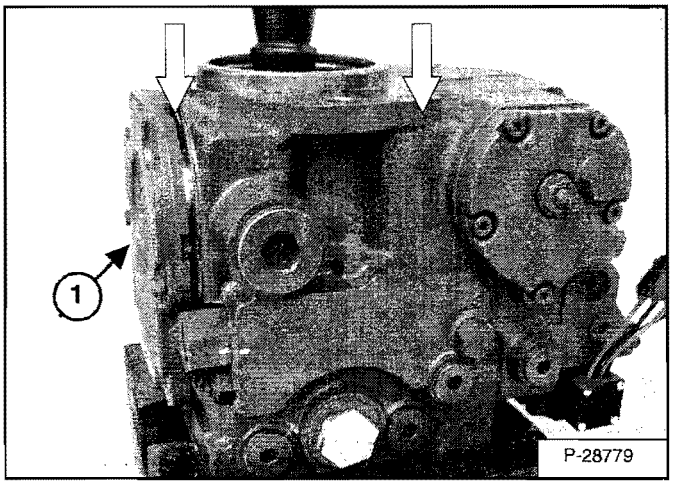
Visually center the cylinder block assembly over the valve plate **[Figure 30-41-161]**.

Figure 30-41-162



Install a new gasket (Item 1) **[Figure 30-41-162]** on the side cover.

Figure 30-41-163

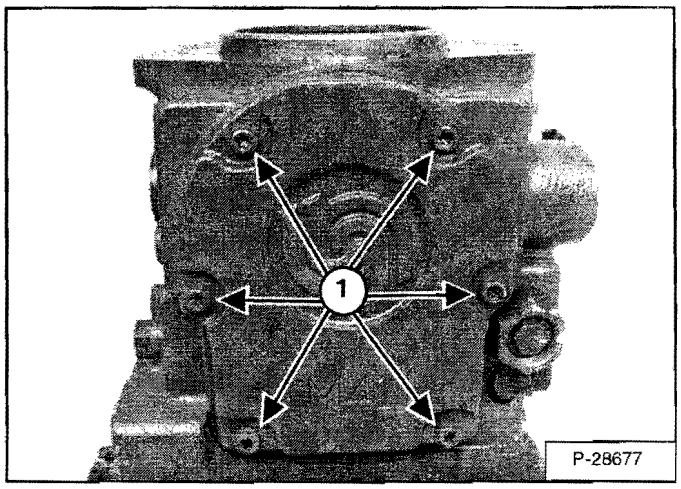


Press down on the swash plate, with a clean rubber mallet.

Install the side cover/swash plate bearing assembly (Item 1) **[Figure 30-41-163]** into the pump housing.

Assembly (Cont'd)

Figure 30-41-164



Align the holes and the gasket, and install the six mounting bolts (Item 1) **[Figure 30-41-164]** and tighten to 11-13 ft.-lbs (15-17,5) Nm torque.

Install the shaft assembly into the pump housing. (See Shaft Seal And Shaft Installation on Page 30-40-21.)

Install the charge pump. (See Charge Pump Removal on Page 30-40-23.)

Pump Neutral Adjustment

Figure 30-41-165

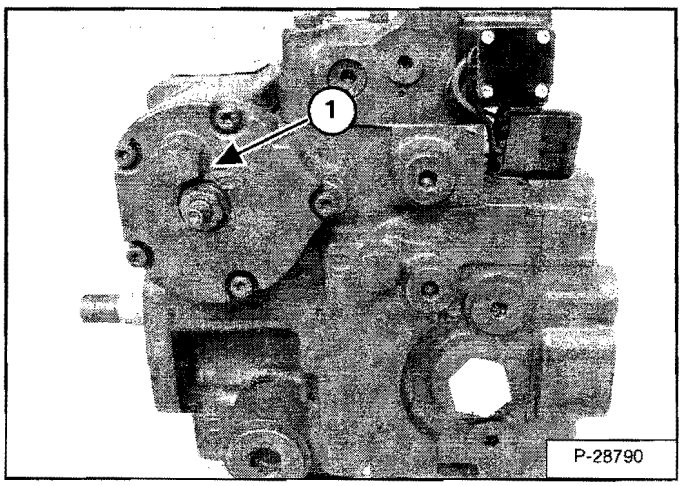
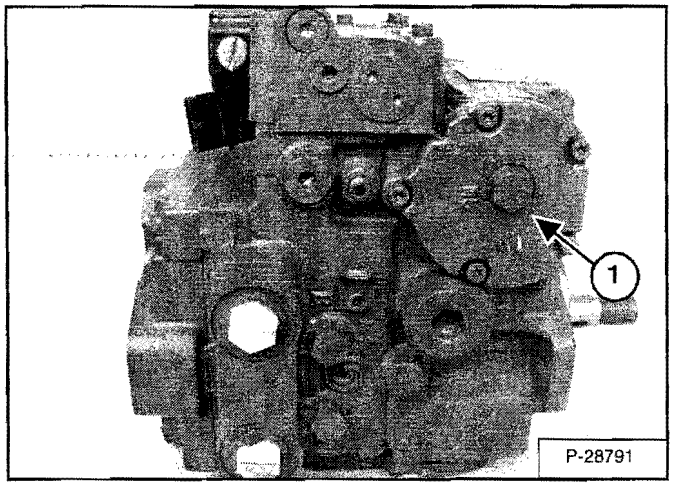


Figure 30-41-166



The pump neutral adjustment sets the position of the servo piston and pump swash plate relative to the controlling mechanism.

Place the loader on jackstands. (See Contents Page 10-01.)

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

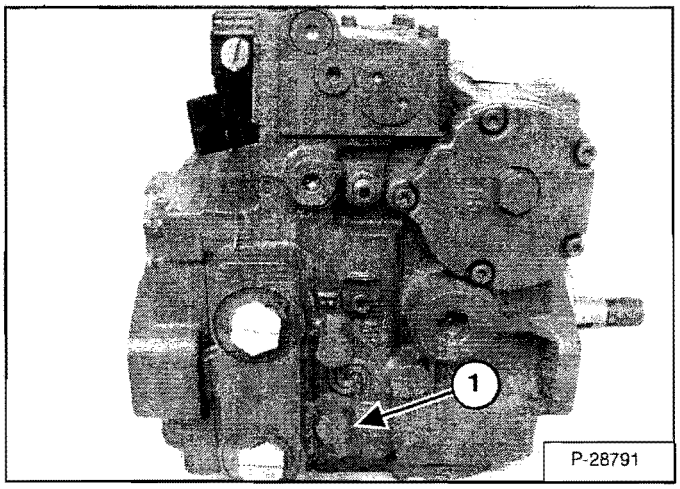
Raise the operator cab. (See Contents Page 10-01.)

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

Connect a hydraulic hose between port M4 (Item 1) **[Figure 30-41-165]** on the back side of the hydrostatic pump, and port M5 (Item 1) **[Figure 30-41-166]** on the front side of the hydrostatic pump, to equalize the pressures on both ends of the servo piston.

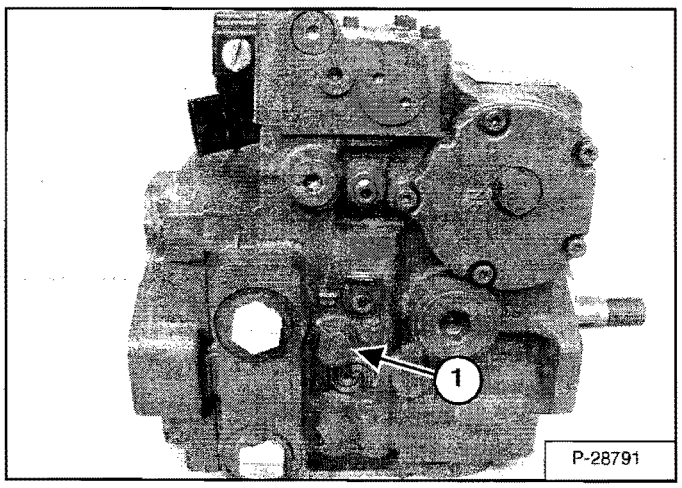
Pump Neutral Adjustment (Cont'd)

Figure 30-41-167



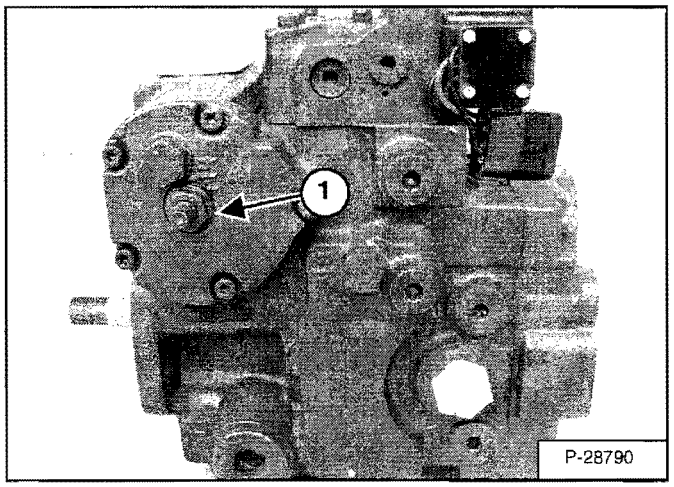
Remove the plug (Item 1) **[Figure 30-41-167]** from the M1 port on the front side of the pump, and install a 7500 PSI pressure gauge.

Figure 30-41-168



Remove the plug (Item 1) **[Figure 30-41-168]** from the M2 port on the front side of the pump, and install a 7500 PSI pressure gauge.

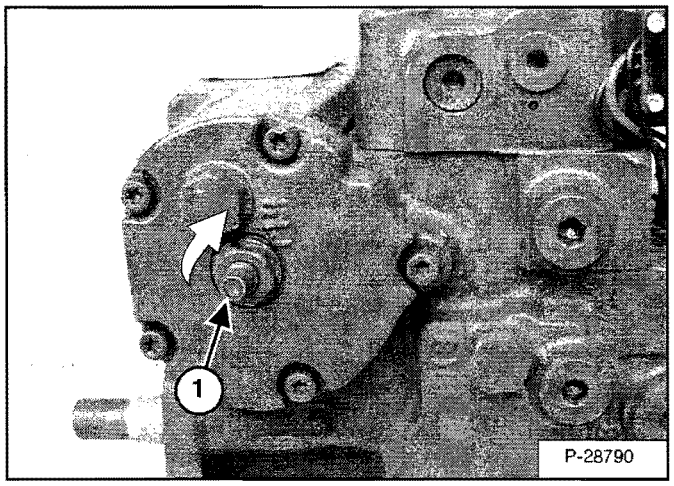
Figure 30-41-169



Loosen the pump neutral adjustment lock nut (Item 1) **[Figure 30-41-169]**.

Start the loader using the remote start tool and run at an idle.

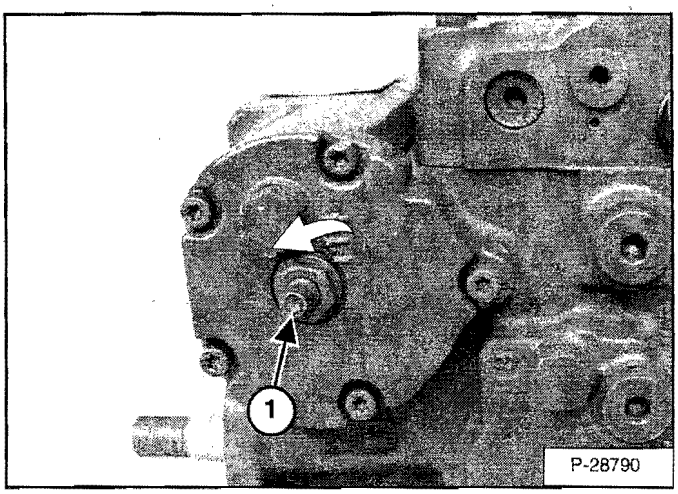
Figure 30-41-170



Turn the adjustment screw (Item 1) **[Figure 30-41-170]** clockwise, until one of the gauges registers an increase in system pressure. Mark the position of the adjustment screw.

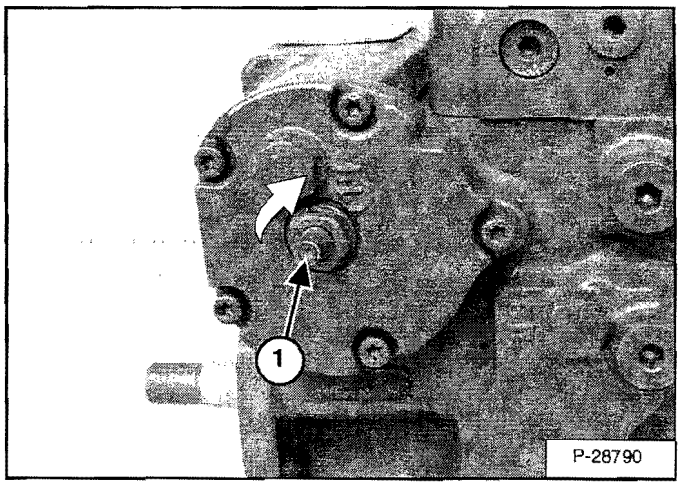
Pump Neutral Adjustment (Cont'd)

Figure 30-41-171



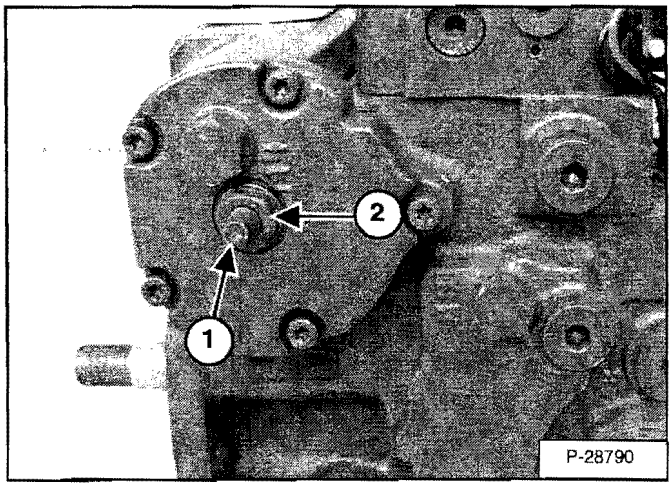
Turn the adjustment screw (Item 1) **[Figure 30-41-171]** counterclockwise, until the other gauge registers an increase in system pressure. Mark the position of the adjustment screw.

Figure 30-41-172



Turn the adjustment screw (Item 1) **[Figure 30-41-172]** clockwise, to a position halfway between the recorded positions. The pressure gauges should read equal pressures.

Figure 30-41-173



While holding the adjustment screw (Item 1) in position, tighten the seal lock nut (Item 2) **[Figure 30-41-173]** to 21-37 ft.-lbs. (28-51 Nm) torque.

Shut loader OFF.

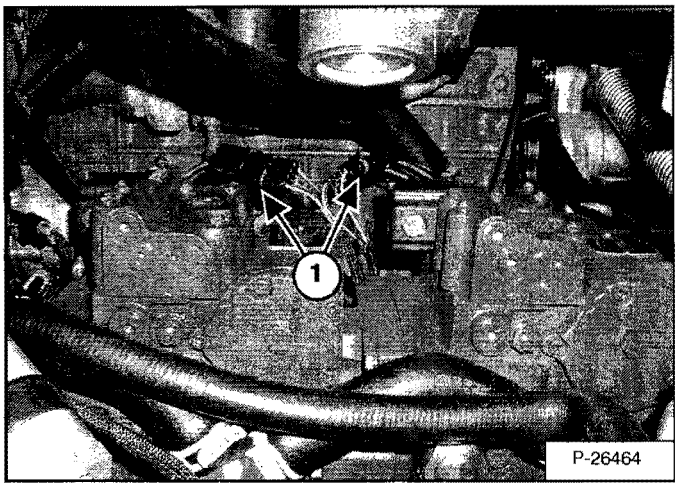
Remove the hydraulic hose from the M4 and M5 ports on the pump. Install the plugs and tighten.

Remove the pressure gauges from the M1 and M2 ports on the pump. Install the plugs and tighten.

NOTE: This pump is equipped with an EDC Controller. The Controller Neutral Adjustment procedure must be performed, before running the loader. (See Pump Controller Neutral Adjustment on Page 30-40-51.)

Pump Controller Neutral Adjustment

Figure 30-41-174



The pump controller neutral adjustment, aligns the pump swash plate and the control spool so that a zero angle control setting provides a zero degree swash plate setting. This adjustment should be performed whenever any part of the control or swash plate mechanisms are adjusted or removed or after the pump neutral setting is adjusted.

Place the loader on jackstands. (See Contents Page 10-01.)

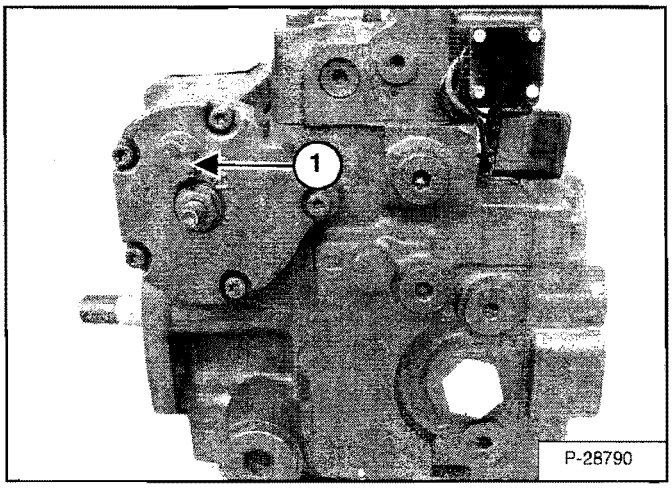
Raise the lift arms, and install an approved lift arm support device. (See Contents Page 10-01.)

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

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

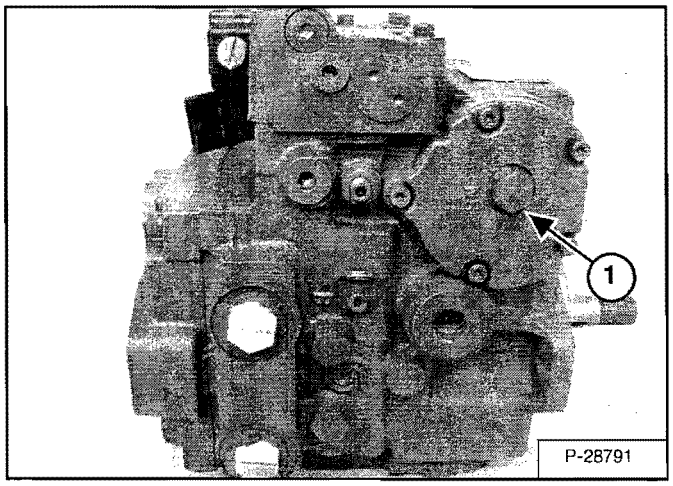
Disconnect the pump controllers (Item 1) **[Figure 30-41-174]** from the loader wiring harness.

Figure 30-41-175



Remove the M4 plug (Item 1) **[Figure 30-41-175]** and install a 500 PSI pressure gauge.

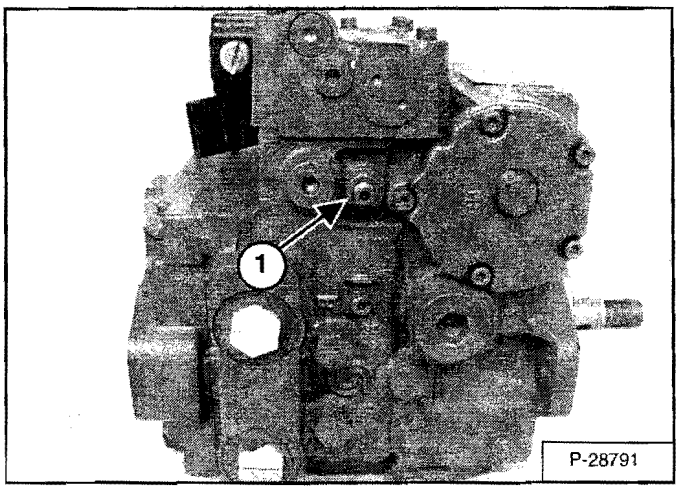
Figure 30-41-176



Remove the M5 plug (Item 1) **[Figure 30-41-176]** and install a 500 PSI pressure gauge.

Pump Controller Neutral Adjustment (Cont'd)

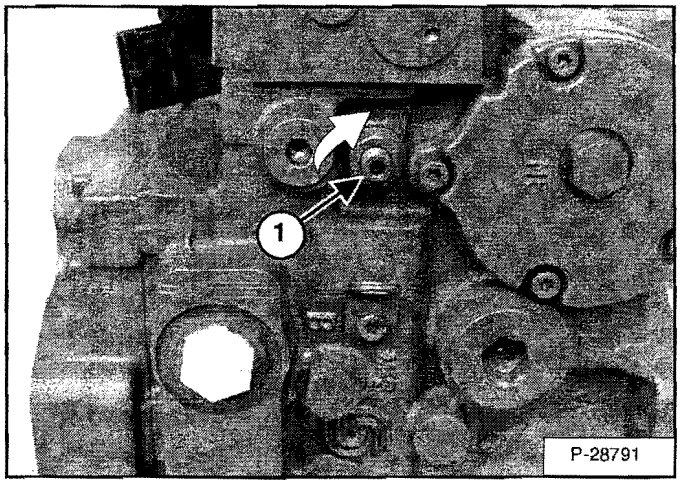
Figure 30-41-177



Loosen the control spool neutral adjustment seal lock nut (Item 1) **[Figure 30-41-177]**.

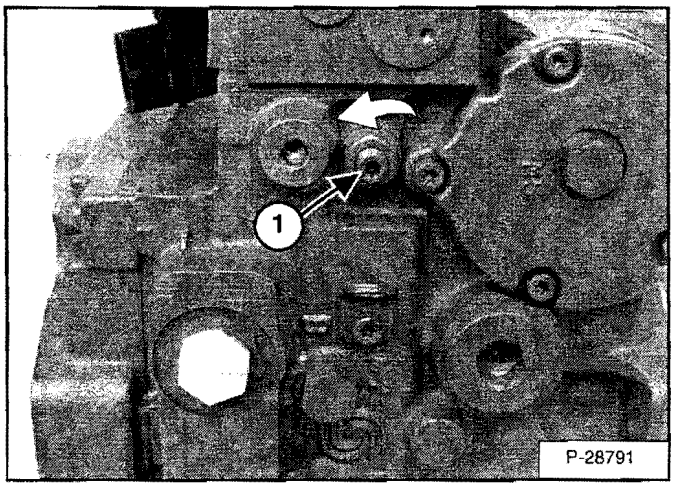
Start the loader using the remote start tool and run at an idle.

Figure 30-41-178



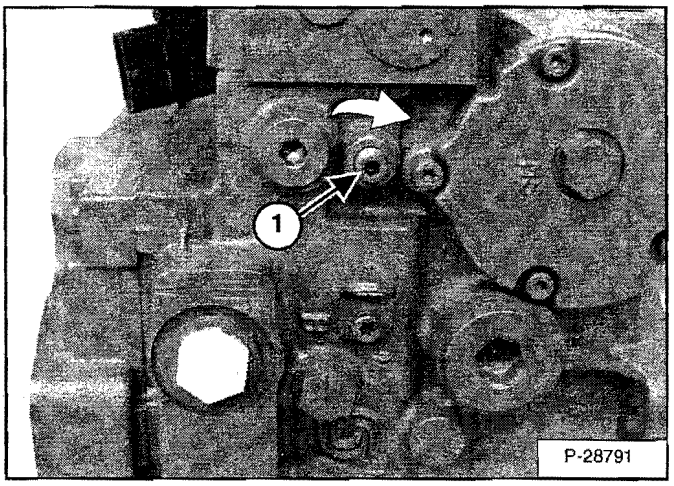
Turn the adjustment screw (Item 1) **[Figure 30-41-178]** clockwise, until one of the gauges registers an increase in system pressure. Mark the position of the adjustment screw.

Figure 30-41-179



Turn the adjustment screw (Item 1) **[Figure 30-41-179]** counterclockwise, until the other gauge registers an increase in system pressure. Mark the position of the adjustment screw.

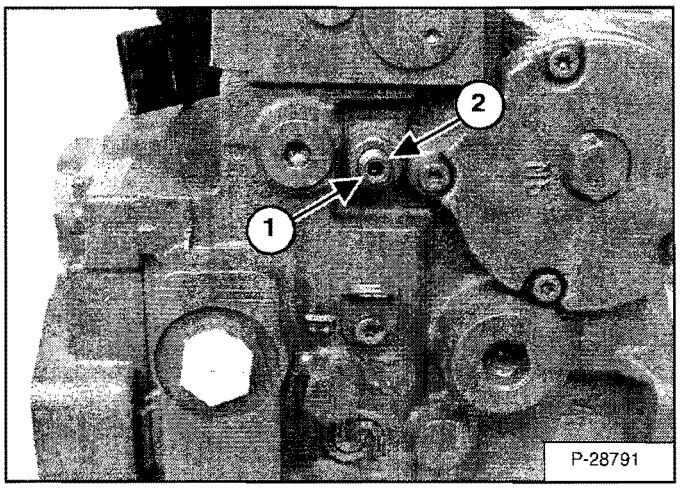
Figure 30-41-180



Turn the adjustment screw (Item 1) **[Figure 30-41-180]** clockwise, to a position halfway between the recorded positions. The pressure gauges should read equal pressures.

Pump Controller Neutral Adjustment (Cont'd)

Figure 30-41-181



While holding the adjustment screw (Item 1) in position, tighten the seal lock nut (Item 2) **[Figure 30-41-181]** to 10-18 ft.-lbs. (14-24 Nm) torque.

Shut loader OFF.

Remove the pressure gauges from the M4 and M5 ports on the pump. Install the plugs and tighten.

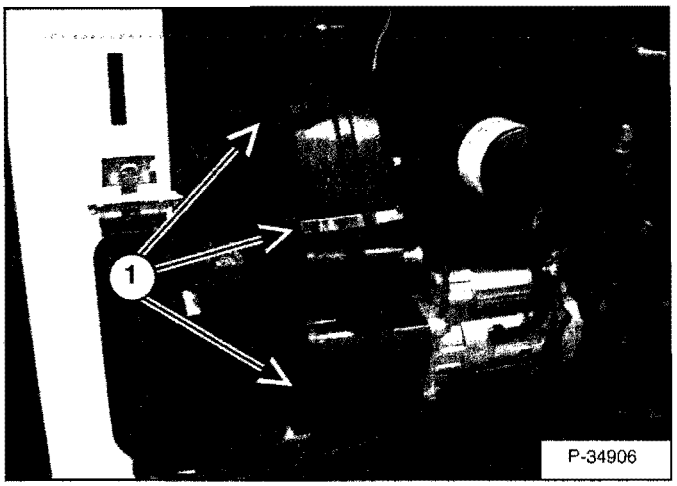
Connect the pump controller wire connector to the loader wiring harness.


Bobcat®

DRIVE BELT

Shield Removal And Installation

Figure 30-50-1



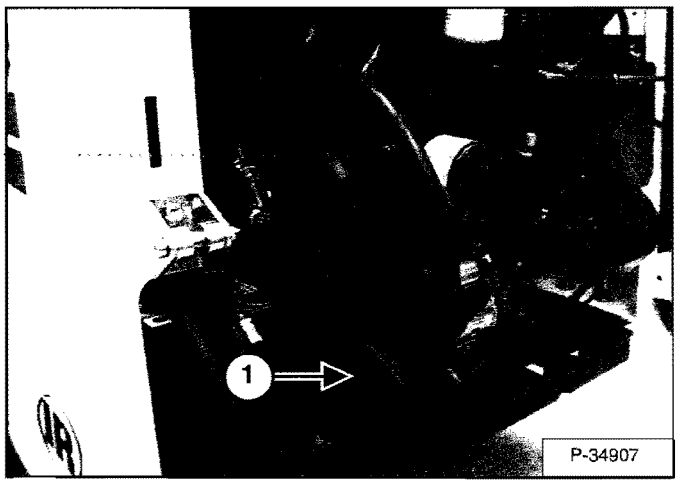
Stop the engine.

Open the rear door.

There are three belt shield holddown clips.

Remove the three belt shield holddown clips (Item 1) **[Figure 30-50-1]**.

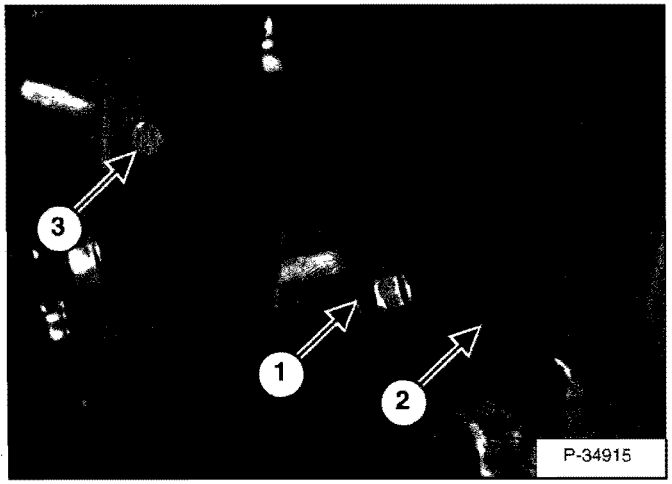
Figure 30-50-2



Remove the belt shield (Item 1) **[Figure 30-50-2]** from the drive belt housing.

Adjustment

Figure 30-50-3



The drive belt idler arm stop is located on the left side of the engine block.

Remove the engine air cleaner. (See Contents Page 70-01.)

Loosen the bolt (Item 1) and slide the stop (Item 2) **[Figure 30-50-3]** against the idler arm. Tighten the bolt.

There is no adjustment for the spring, just make sure the spring bolt (Item 3) **[Figure 30-50-3]** is tight.

Replacement

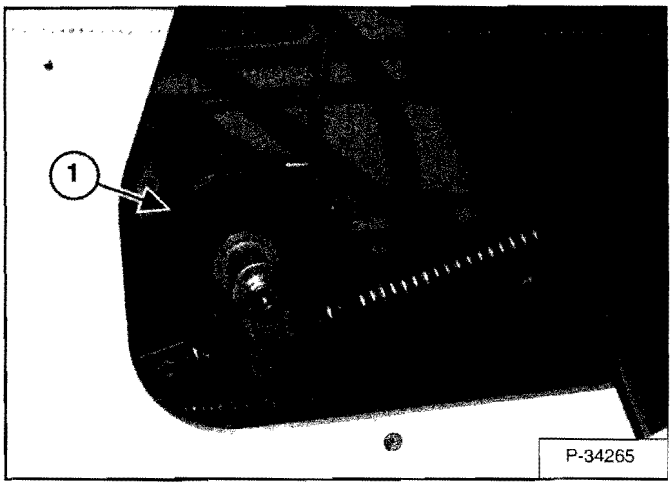
Remove the engine air cleaner. (See Contents Page 70-01.)

Loosen the stop mounting bolt (Item 1) **[Figure 30-50-3]**.

Loosen the spring tension bolt (Item 3) **[Figure 30-50-3]**.

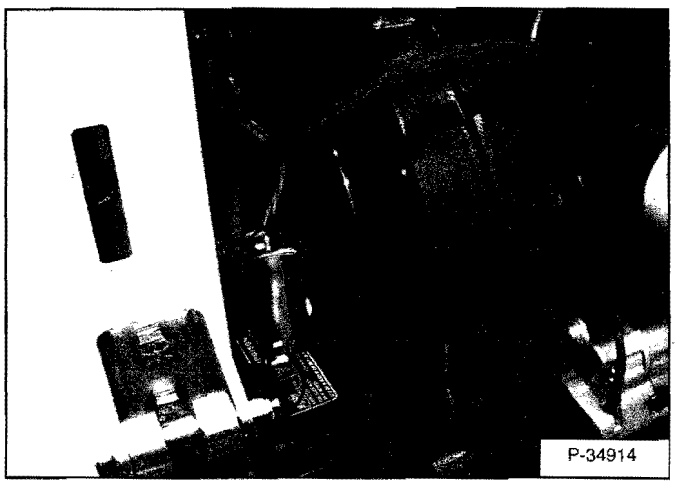
Replacement (Cont'd)

Figure 30-50-4



Remove the fan drive belt from the tension pulley (Item 1) **[Figure 30-50-4]**.

Figure 30-50-5

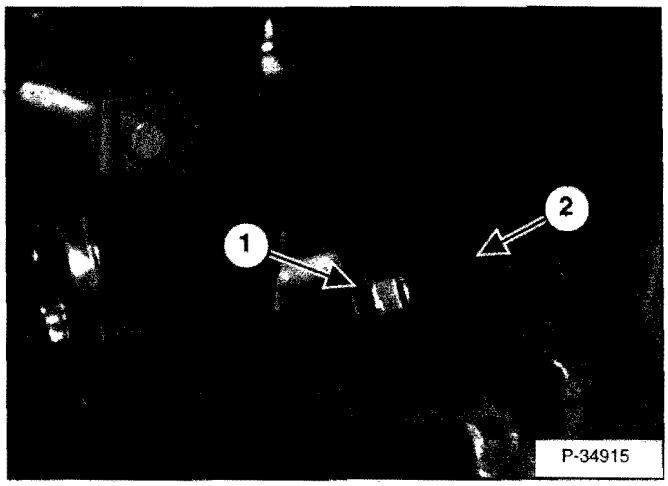


Remove the drive belt from the hydrostatic pump pulley and flywheel pulley **[Figure 30-50-5]**.

Remove the drive belt **[Figure 30-50-5]**.

Tensioner Pulley Removal And Installation

Figure 30-50-6



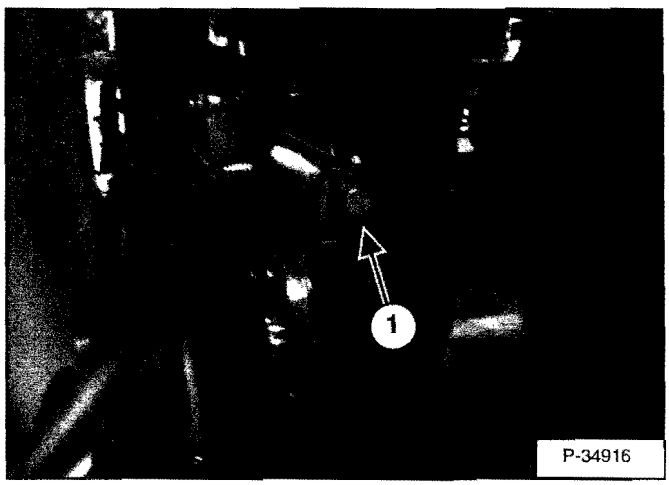
Remove the belt shield. (See Shield Removal And Installation on Page 30-50-1.)

Remove the engine air cleaner. (See Contents Page 70-01.)

Remove the stop mounting bolt (Item 1) **[Figure 30-50-6]**.

Remove the stop (Item 2) **[Figure 30-50-6]**.

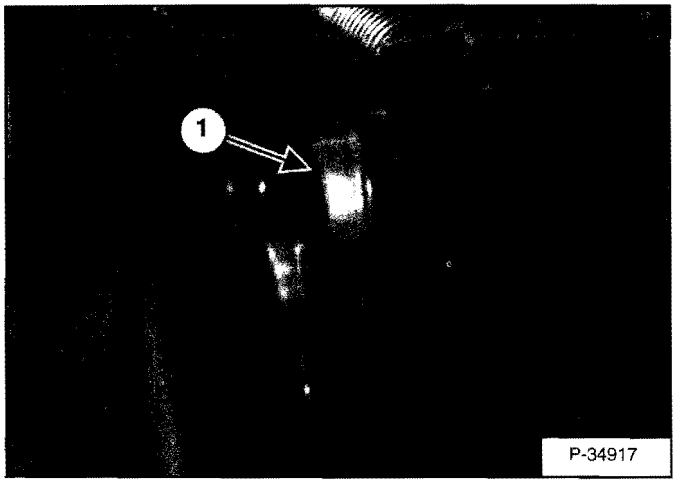
Figure 30-50-7



Remove the spring tension bolt (Item 1) **[Figure 30-50-7]**.

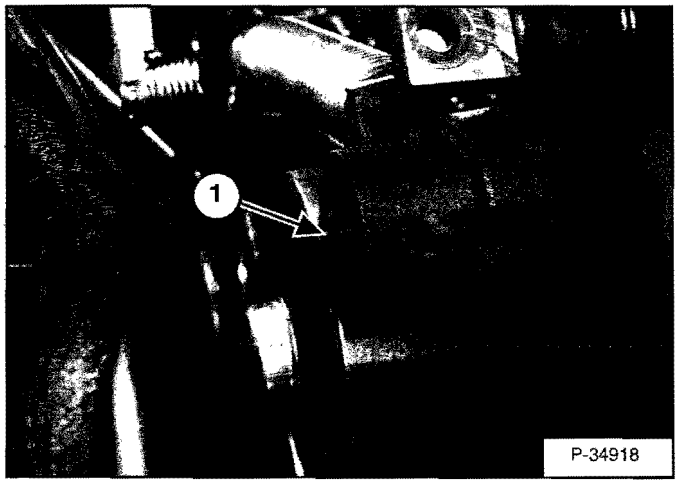
Tensioner Pulley Removal And Installation (Cont'd)

Figure 30-50-8



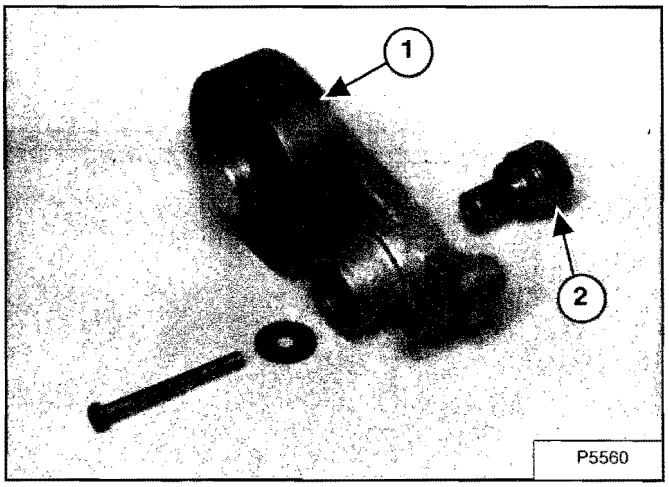
Remove the end cap (Item 1) **[Figure 30-50-8]** from the tension pulley arm.

Figure 30-50-9



Remove the mounting bolt (Item 1) **[Figure 30-50-9]** from the tension pulley arm.

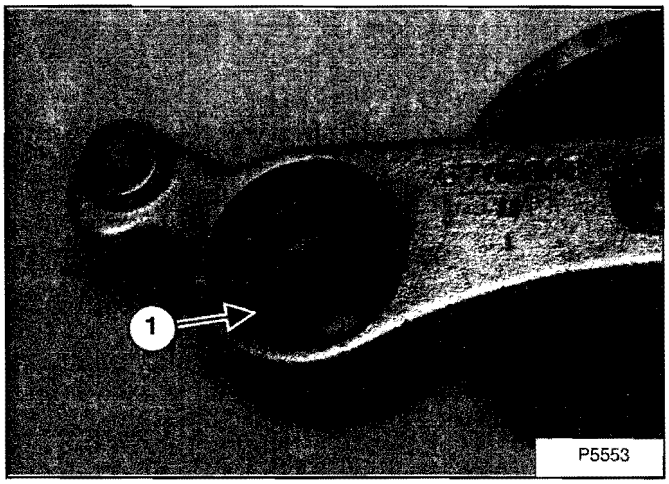
Figure 30-50-10



Remove the pulley/arm assembly (Item 1) **[Figure 30-50-10]** from the engine housing.

Remove the arm bushing (Item 2) **[Figure 30-50-10]**. Check for wear and replace as needed.

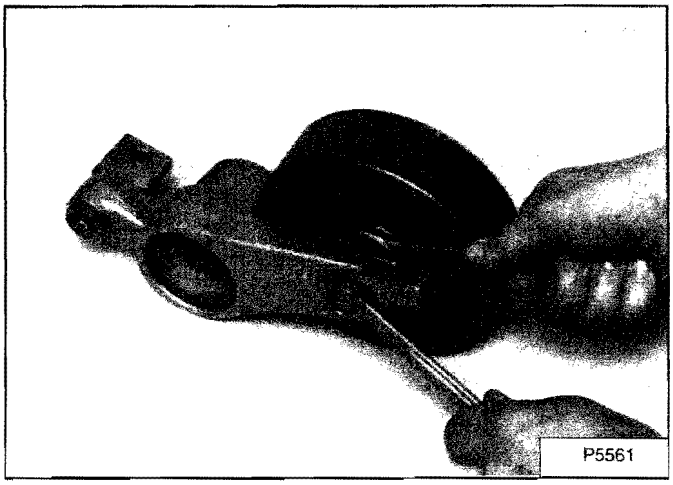
Figure 30-50-11



Check the arm seal (Item 1) **[Figure 30-50-11]**. Replace the seal as needed.

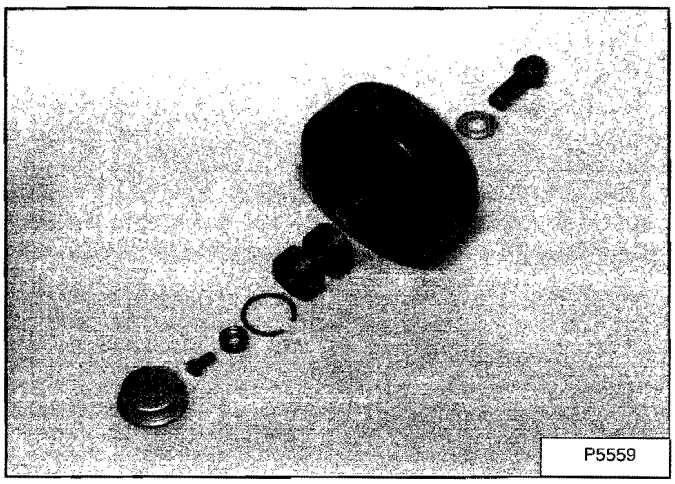
Tensioner Pulley Removal And Installation (Cont'd)

Figure 30-50-12



Remove the pulley mounting bolt **[Figure 30-50-12]**.

Figure 30-50-13

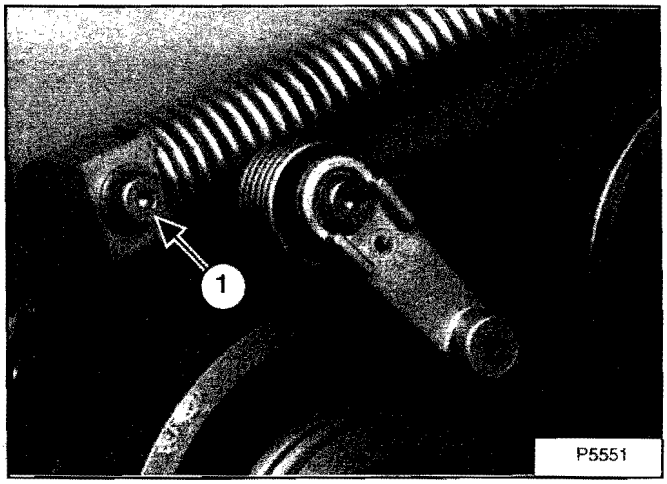


Disassembly the pulley and bearings as shown in figure **[Figure 30-50-13]**.

Check the parts for wear and replace as needed.

Tensioner Pulley Tension Spring

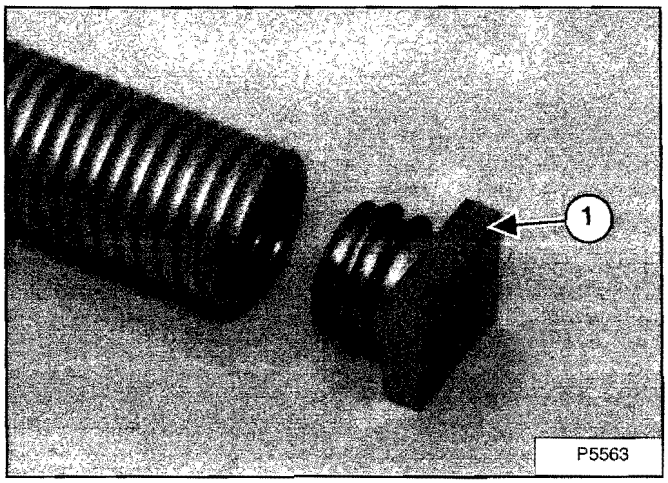
Figure 30-50-14



Remove the base end bolt (Item 1) **[Figure 30-50-14]** from the spring block.

Remove the tension spring from the engine housing.

Figure 30-50-15



Remove the end block (Item 1) **[Figure 30-50-15]** (both ends) from the spring.

Check the spring for wear and etc. Replace the spring as needed.

Check the spring end blocks for wear and replace as needed.

OIL COOLER (SEAL TO CONNECT) (STC)

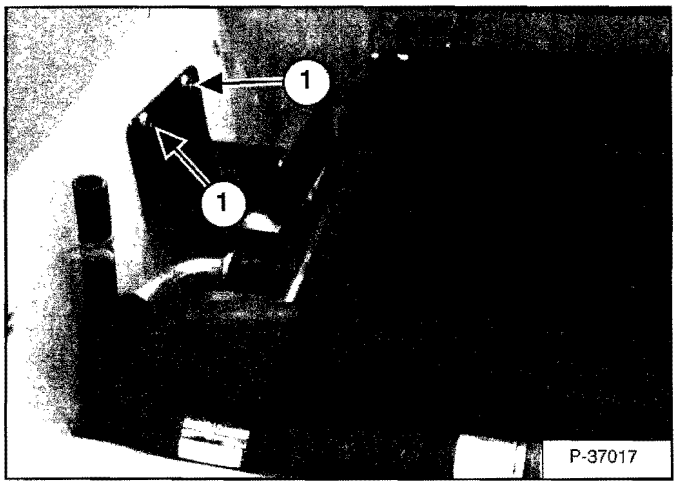
Hydraulic Oil Cooler Removal and Installation

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.

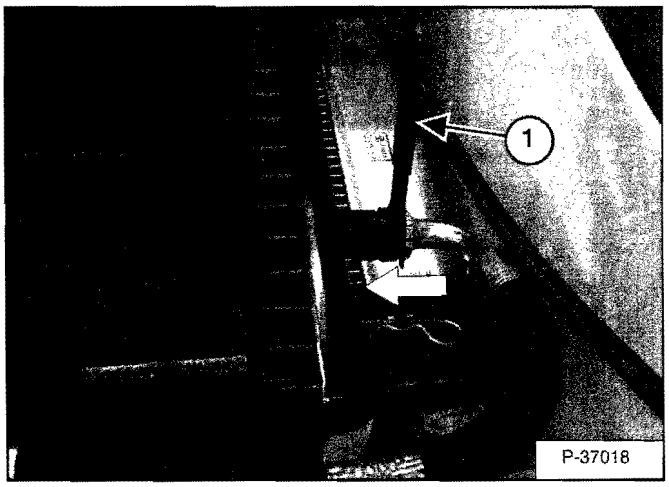
Raise and remove the rear grill.

Drain the coolant from the radiator and remove the radiator coolant tank.

Remove the two radiator coolant tank mount bolts (Item 1) **[Figure 30-60-1]**.

Remove the mount from the loader.

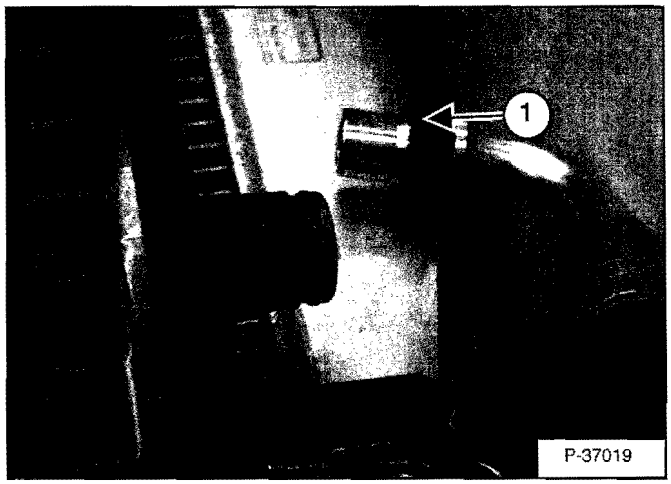
Figure 30-60-2



Install tool MEL1613 (Item 1) **[Figure 30-60-2]** to the outside of the rubber sleeve.

Slide the rubber sleeve in toward the radiator.

Figure 30-60-3



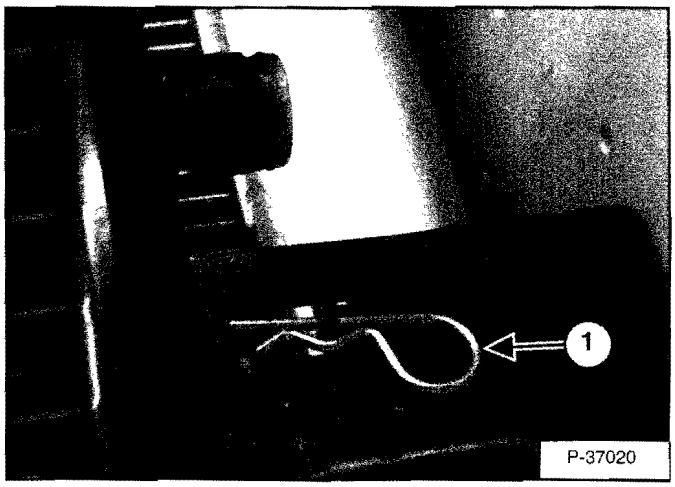
The connector will release from the radiator **[Figure 30-60-3]**.

Repeat the procedure for the other hose and fitting on the cooler.

NOTE: When installing the cooler hoses, the fittings should make a clicking sound when pushed together.

Hydraulic Oil Cooler Removal and Installation (Cont'd)

Figure 30-60-4



Remove the clip (Item 1) **[Figure 30-60-4]**. (Both sides.)

Lift the oil cooler from the mount and remove it from the loader.

DRIVE SYSTEM

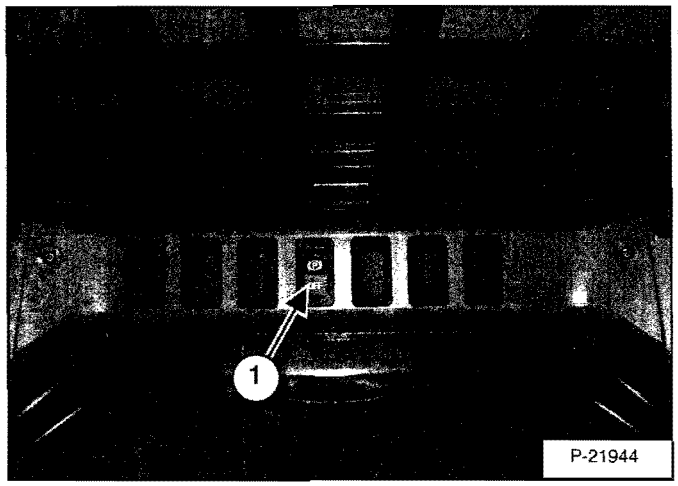
TIGHTEN ALL HARDWARE PER SIZE TO GRADE 5 TORQUE (SEE STANDARD TORQUE SPECIFICATIONS FOR BOLTS, SECTION SPEC-01) UNLESS OTHERWISE SPECIFIED.

Bobcat®

BRAKE

Switch Operated Parking Brake

Figure 40-10-1



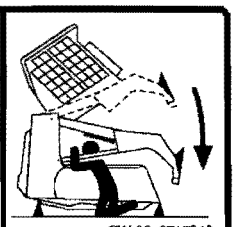
The parking brake switch in the front panel (Item 1) **[Figure 40-10-1]** replaced the pedal parking brake. (See Page 60-01 Instrument Panel For Front Accessory Panel Removal.)

Block 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.

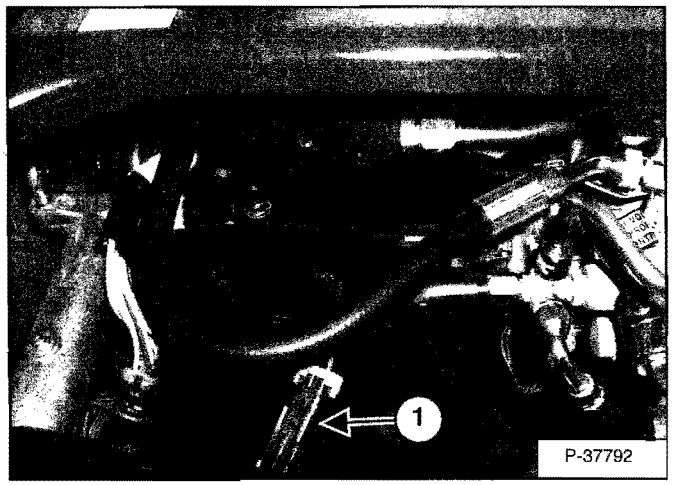
W-2059-0598

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

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

Remove the lift arm by-pass valve. (See Contents Page 20-01.)

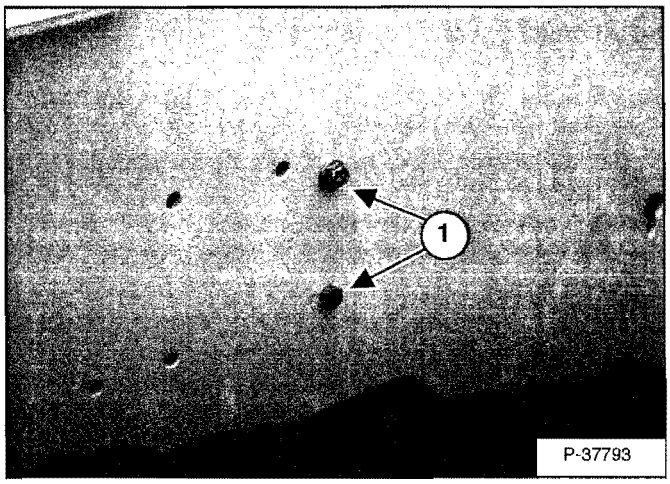
Figure 40-10-2



Disconnect the electrical wire harness connector (Item 1) **[Figure 40-10-2]**.

Mark the hydraulic hoses on the brake block for proper installation.

Figure 40-10-3

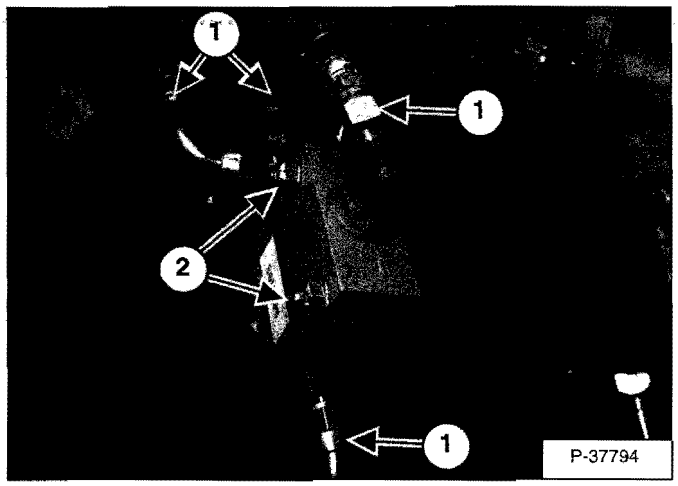


At the right side fender remove the two mount bolts (Item 1) **[Figure 40-10-3]** from the lift arm by-pass valve/brake valve mount bracket.

Move the bracket and brake valve to access the hoses.

Block Removal And Installation (Cont'd)

Figure 40-10-4



Mark the hydraulic hoses for proper installation.

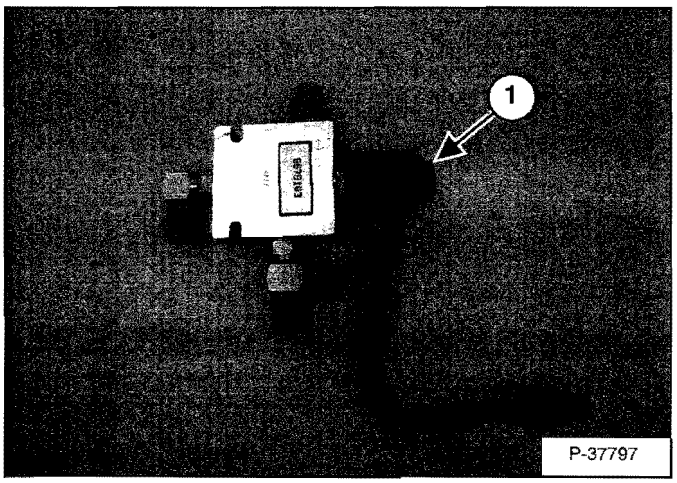
Remove the four hydraulic hoses (Item 1) **[Figure 40-10-4]** that go from the brake block to the brakes at the hydrostatic motors.

Remove the two mount bolts (Item 2) **[Figure 40-10-4]**.

Remove the brake block and mount from the loader.

Block Disassembly And Assembly

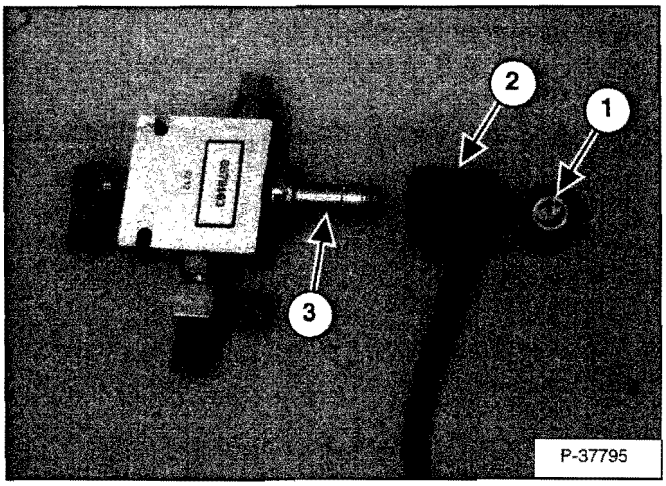
Figure 40-10-5



Loosen the electrical brake solenoid nut (Item 1) **[Figure 40-10-5]**.

Assembly: Tighten the solenoids nut to 9-12 in.-lbs. (1,02-1,36 Nm) torque.

Figure 40-10-6

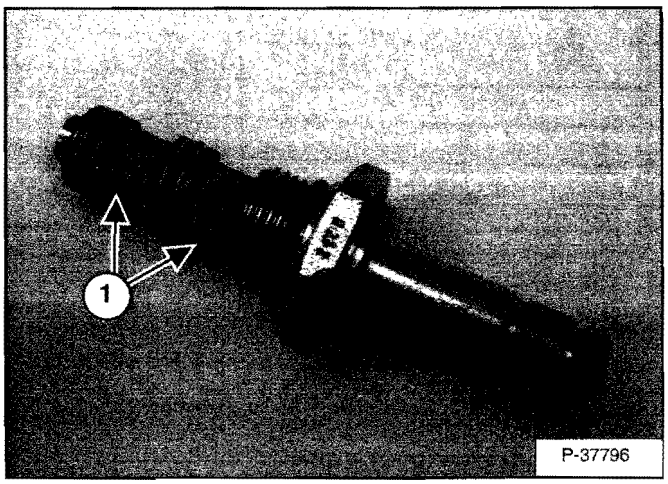


Remove the solenoid nut (Item 1) and solenoid coil (Item 2) **[Figure 40-10-6]**.

Installation: Tighten the solenoid nut 48-60 in.-lbs. (5,4-6,8 Nm) torque.

Remove the solenoid valve (Item 3) **[Figure 40-10-6]** from the block.

Figure 40-10-7



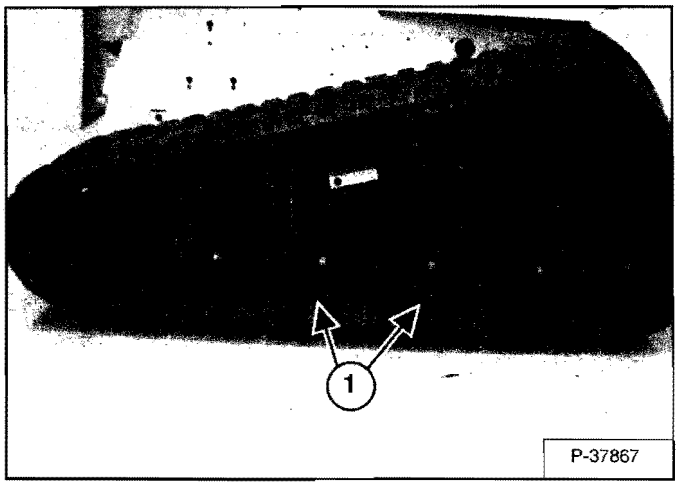
Inspect the O-rings and back-up washer on the solenoid valve and replace as needed **[Figure 40-10-7]**.

Check the screens (Item 1) **[Figure 40-10-7]** and clean with solvent.

Assembly: Tighten the solenoid valve to 16-20 ft.-lbs. (21,7-27,1 Nm) torque.

Track Checking

Figure 40-20-1



Track tension is important for good performance and to prevent the tracks from derailing.

NOTE: The wear of track rollers vary with the working conditions and different types of soil conditions.

Park the loader on a level surface.

Raise one side of the loader and put jackstands at the front and rear of the loader frame so that the track is about 3 inches (76 mm) off the ground **[Figure 40-20-1]**. Lower the loader to the jackstands. Be sure the jackstands do not touch the tracks.

Measure the track sag at either middle track roller (Item 1) **[Figure 40-20-1]**.

Figure 40-20-2

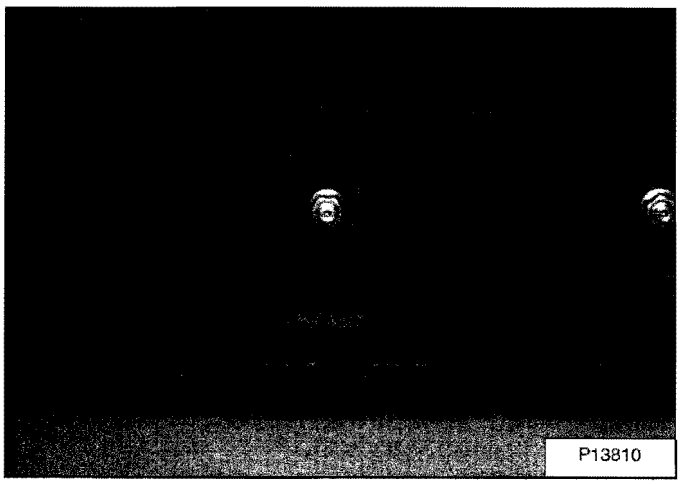
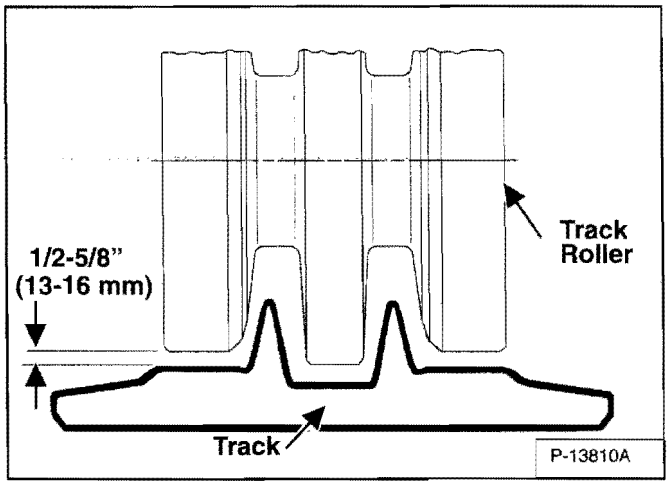


Figure 40-20-3



DO NOT put your fingers into the pinch points between the track and the roller. Use a 1/2 to 5/8 inch bolt, dowel or block to check the gap **[Figure 40-20-2]** & **[Figure 40-20-3]**.

⚠ WARNING

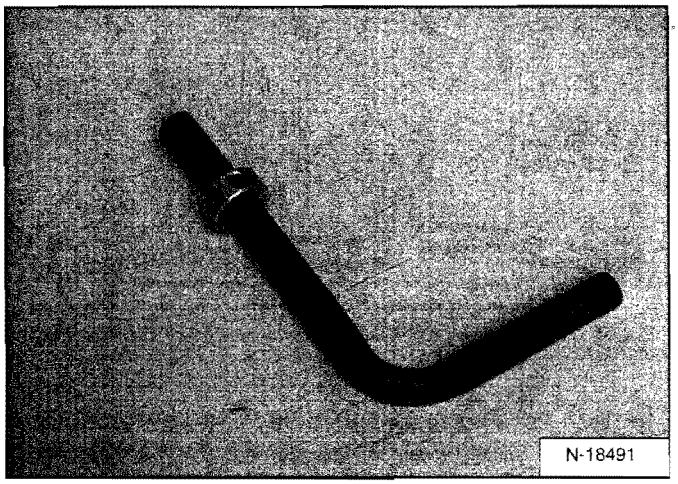
AVOID INJURY OR DEATH

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

W-2142-0189

Track Adjustment

Figure 40-20-4



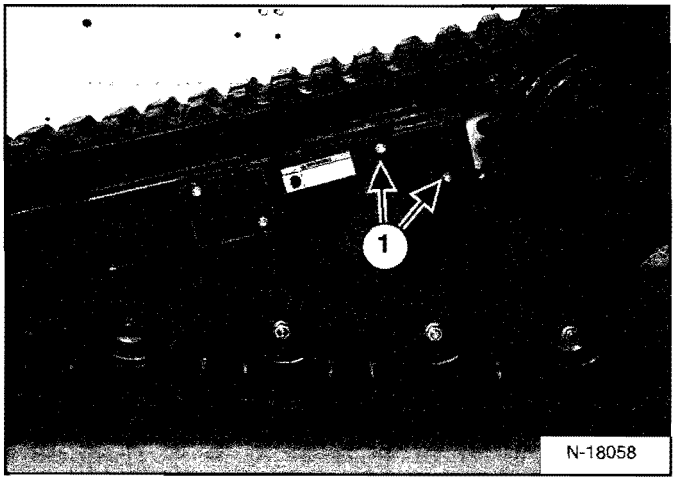
The tool listed will be needed to do the following procedure:

MEL1560- Bleed Tool **[Figure 40-20-4]**.

NOTE: It is recommended to catch the excess grease and dispose of it in an environmentally safe way.

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

Figure 40-20-5



Loosen the access cover bolts (Item 1) **[Figure 40-20-5]** and turn the access cover down.

Figure 40-20-6

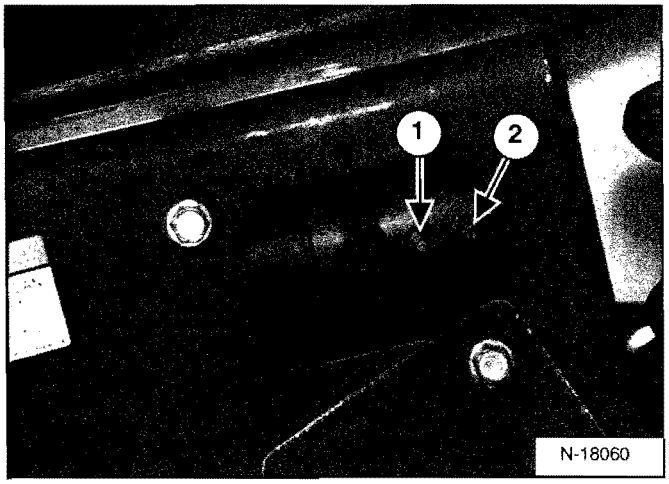
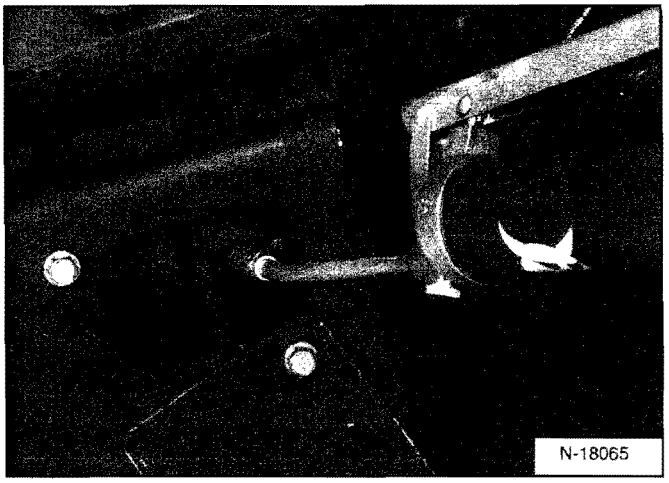


Figure 40-20-7



To increase the track tension, add grease to the adjustment fitting (Item 1) **[Figure 40-20-6]**, using a grease gun as shown in **[Figure 40-20-7]**. (See Page 40-20-1 for proper track tension.)

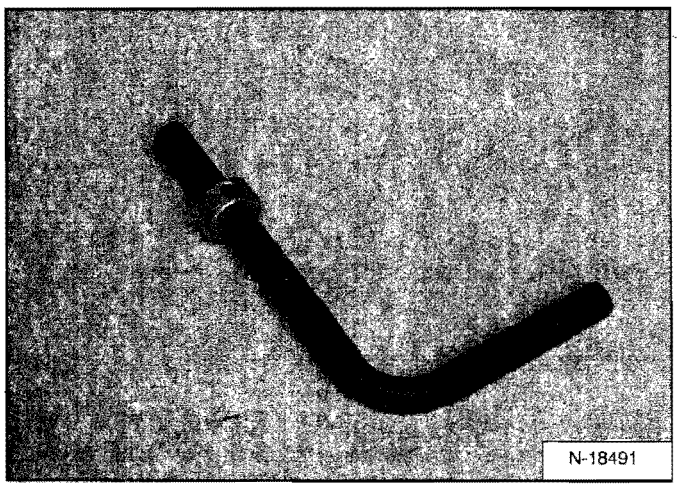
NOTE: Do not loosen the adjustment fitting (Item 1) [Figure 40-20-6] while there is tension on the tracks.

To decrease the track tension, loosen the bleed fitting (Item 2) **[Figure 40-20-6]**, a small amount of grease will come out of the bleed hole.

NOTE: The track tension cylinder is under pressure. Use care when loosening the bleed fitting, and use bleed tool (MEL1560).

Track Removal And Installation

Figure 40-20-8



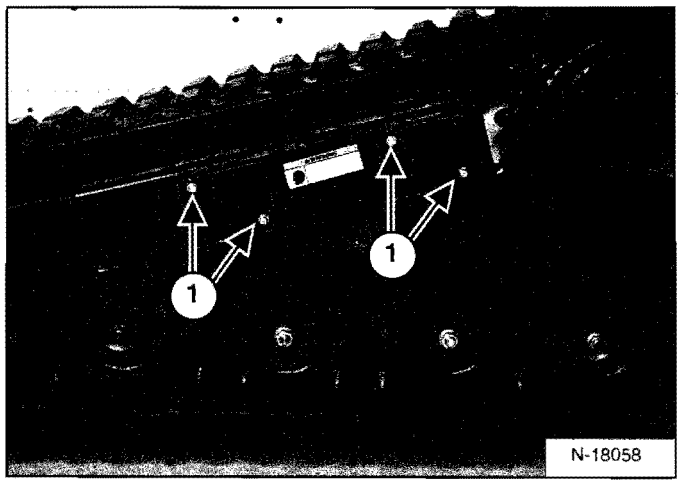
The tool listed will be needed to do the following procedure:

MEL1560- Bleed Tool **[Figure 40-20-8]**.

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

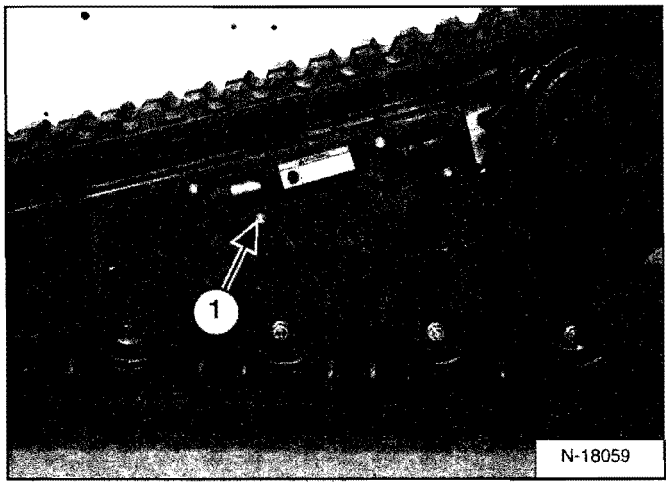
NOTE: When the loader is on jack stands be sure the bottom of the track clears the floor by at least 3 inches (76 mm).

Figure 40-20-9



Loosen the four mount bolts (Item 1) **[Figure 40-20-9]** from the covers.

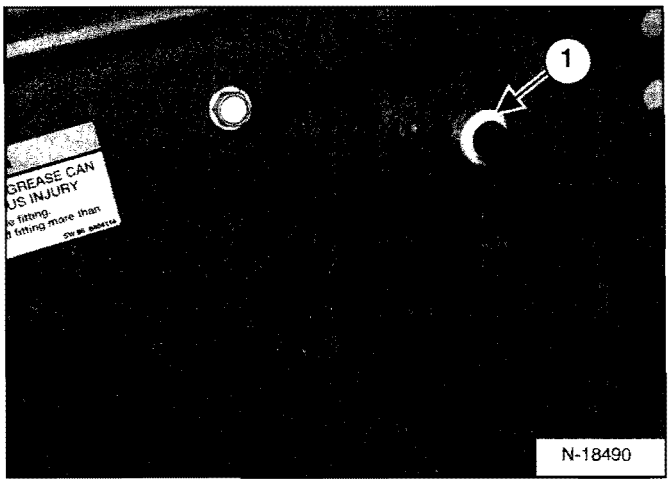
Figure 40-20-10



Pivot the covers downward **[Figure 40-20-10]**.

Loosen the cover mount bolt (Item 1) **[Figure 40-20-10]** so it is flush with the metal on the track frame.

Figure 40-20-11

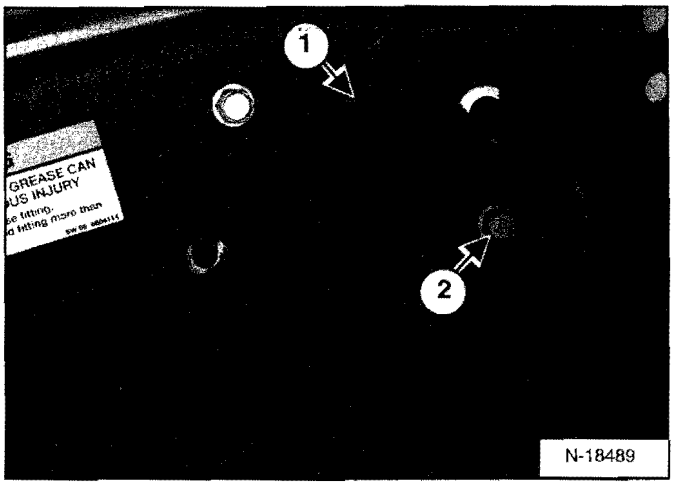


Install the MEL1560 tool on the bleed fitting **[Figure 40-20-11]**.

Be sure the collar (Item 1) **[Figure 40-20-11]** is positioned behind the track housing plate.

Track Removal And Installation (Cont'd)

Figure 40-20-12



Pivot the track cover (Item 1) against the MEL tool and lock the mount bolt (Item 2) **[Figure 40-20-12]**.

Give the MEL tool/bleed fitting a 1/4 turn, counterclockwise to release the pressure from the spring assembly.

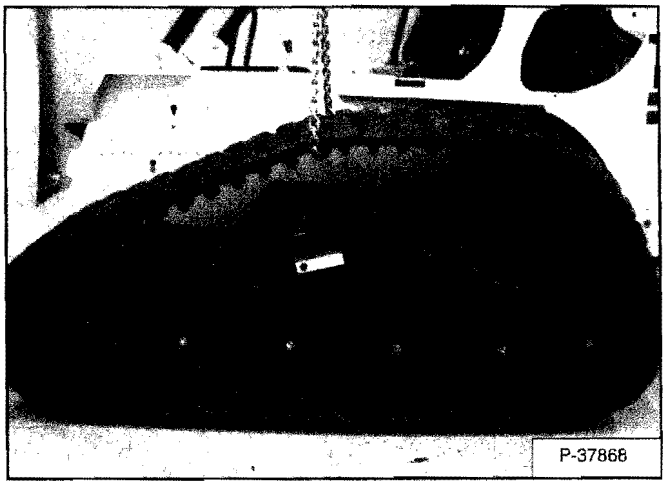
IMPORTANT

Fluid such as engine oil, hydraulic fluid, coolants, grease, etc. must be deposed of in an environmentally safe manner. Some regulations require that certain spills and leaks on the ground must be cleaned in a specific manner. See local, state and federal regulations for the correct disposal.

I-2067-0499

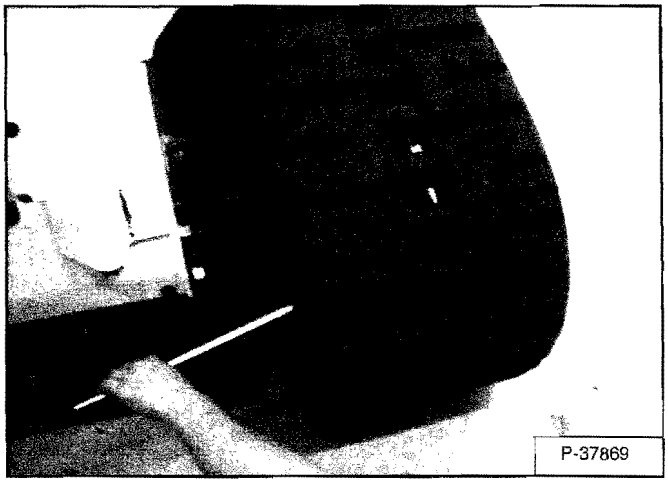
Turn the MEL tool/bleed fitting one more complete turn counterclockwise.

Figure 40-20-13



With a chain hoist, lift on the track moving the front idler assembly toward the rear of the track assembly until all track tension has been released **[Figure 40-20-13]**.

Figure 40-20-14

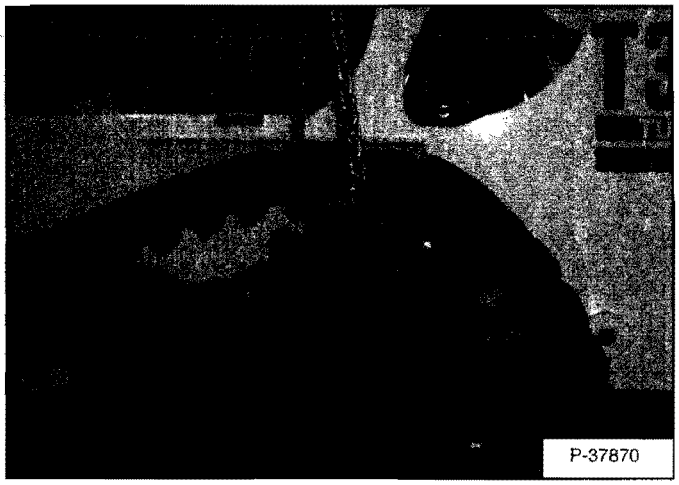


With pry bars, pry the track up and over the front idler **[Figure 40-20-14]**.

Completely remove the track from the front track assembly.

Track Removal And Installation (Cont'd)

Figure 40-20-15



With a chain hoist or arm hoist lift the track clear of the drive sprocket and remove the track from the loader **[Figure 40-20-15]**.

To install the rubber track:

Completely retracted the front idler/spring assembly.

Put the track over the rear drive sprocket lugs.

Put the track over the rear idler.

Slide the track under the rollers.

Put the track on the front idler wheel.

Adjust the track to the proper tension. (See Track Checking on Page 40-20-1.)

NOTE: The grease cylinder must be completely retracted against the spring assembly block before adding grease, to prevent air from being trapped in the grease cylinder.

Track Idler (Front) End Play Specifications

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

Remove the track. (See Track Removal And Installation on Page 40-20-3.)

Attach a dial indicator to the track housing frame and measure the front idler end play. The specifications are as follows:

Min:.006
Nominal:.027
Max:.048

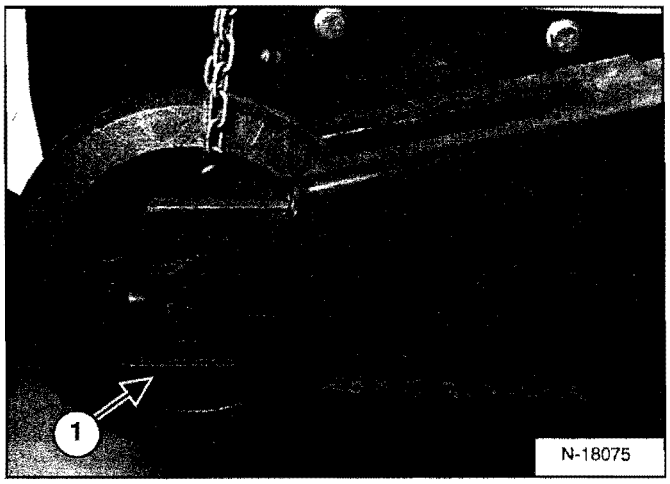
Track Idler (Front) Removal And Installation

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

Remove the track. (See Track Removal And Installation on Page 40-20-3.)

Install a chain hoist on the front idler.

Figure 40-20-16

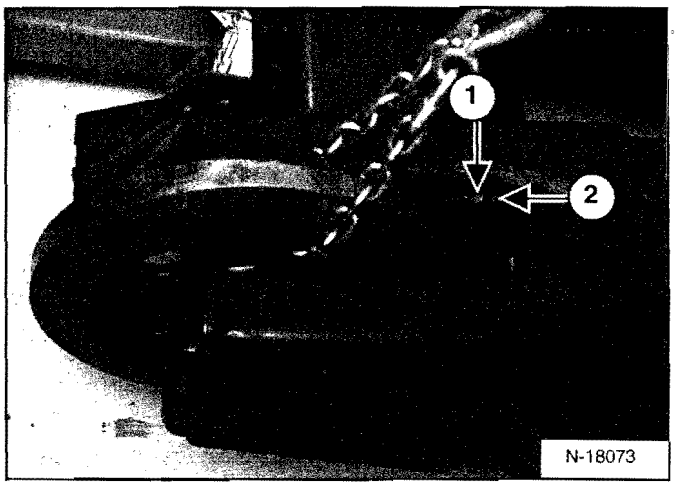


Slide the front track idler out of the track frame **[Figure 40-20-16]**.

NOTE: The short side of the block (Item 1) [Figure 40-20-16] is toward the bottom of the track housing for installation.

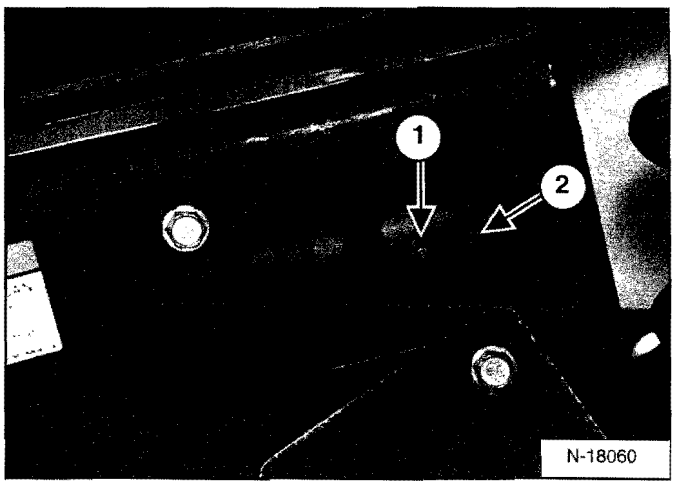
Track Idler (Front) Removal And Installation (Cont'd)

Figure 40-20-17



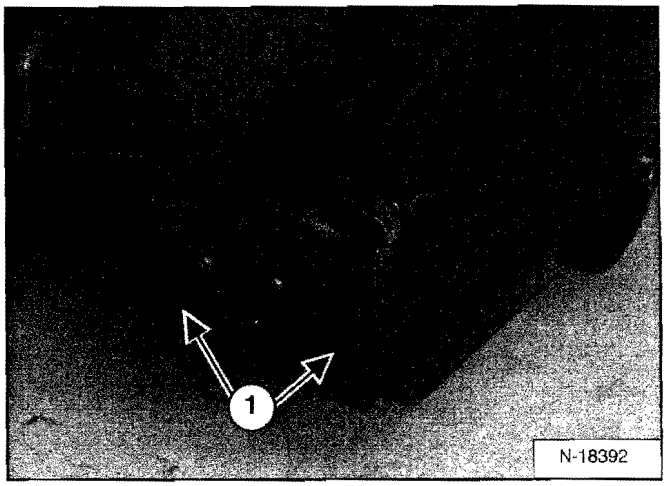
Installation: Make sure the tabs (Item 1) **[Figure 40-20-17]** engage the holes (Item 2) **[Figure 40-20-17]** and (Item 1) **[Figure 40-20-19]** on the track tensioner block.

Figure 40-20-18



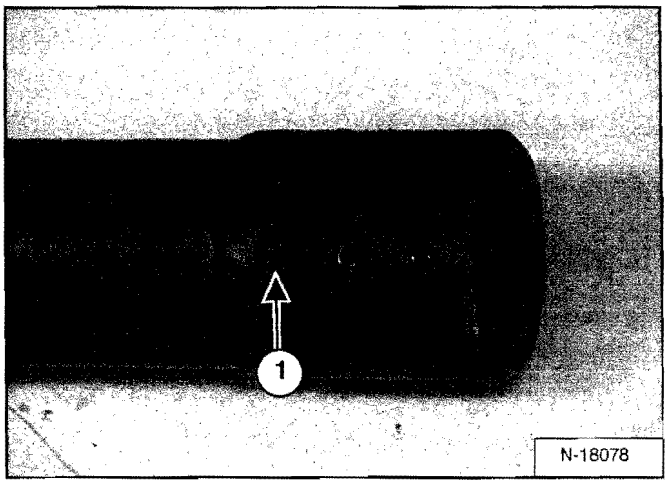
Remove the grease fitting (Item 1) and bleed fitting (Item 2) **[Figure 40-20-18]**, to prevent damage during removal.

Figure 40-20-19

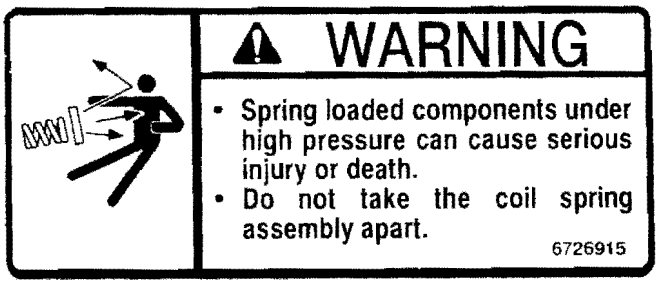


Remove the track tensioner **[Figure 40-20-19]** from the track housing.

Figure 40-20-20

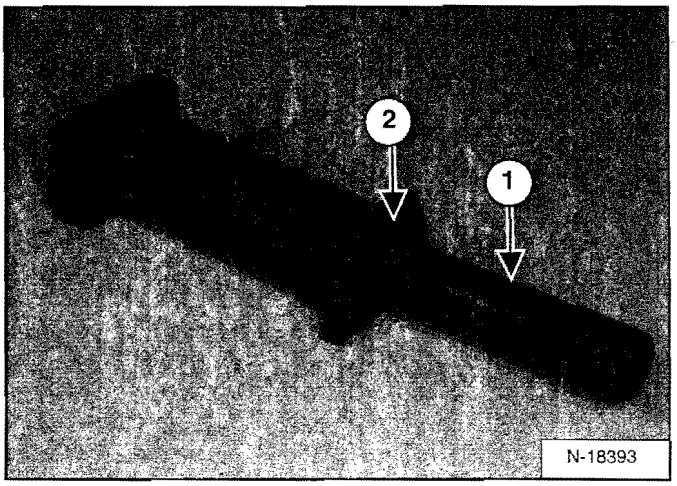


NOTE: When installing the track tensioner, make sure the grease fitting holes and alignment bolt (Item 1) [Figure 40-20-20] are pointed to the outside of the track frame.



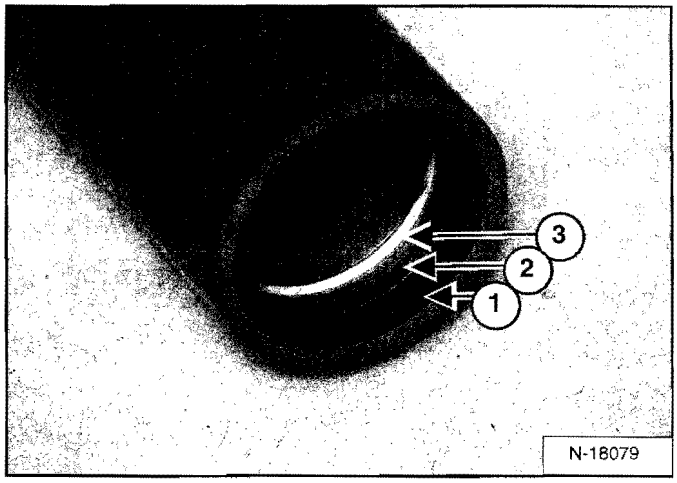
Track Idler (Front) Removal And Installation (Cont'd)

Figure 40-20-21



Remove the cylinder (Item 1) **[Figure 40-20-21]** from the shaft.

Figure 40-20-22

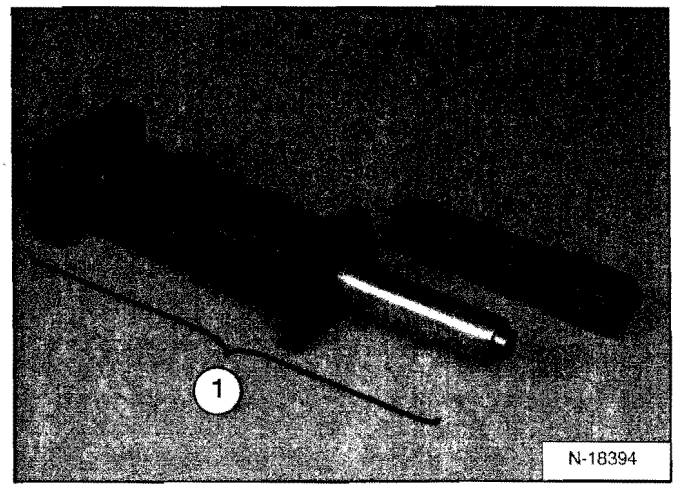


Remove the seal (Item 1), O-ring (Item 2), and back-up ring (Item 3) **[Figure 40-20-22]** from the cylinder.

Installation: Apply oil to the O-ring, back-up ring and seal before installation.

NOTE: The grease cylinder (Item 1) must be completely retracted against the spring assembly block (Item 2) [Figure 40-20-21] before adding grease, to prevent air from being trapped in the grease cylinder.

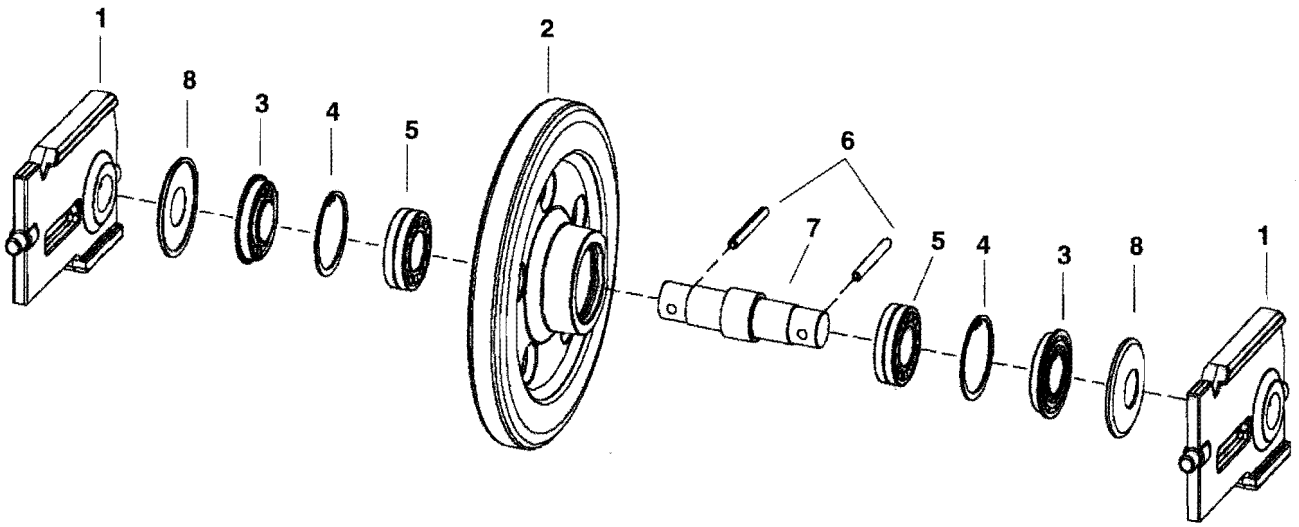
Figure 40-20-23



DO NOT DISASSEMBLE OR REPAIR THE COIL SPRING ASSEMBLY. THE COMPRESSION FORCE OF THE SPRING EXCEEDS 10,000 LBS.

The coil spring assembly (Item 1) **[Figure 40-20-23]** is only sold as a complete unit from Bobcat Parts.

Track Idler (Front) Parts Identification

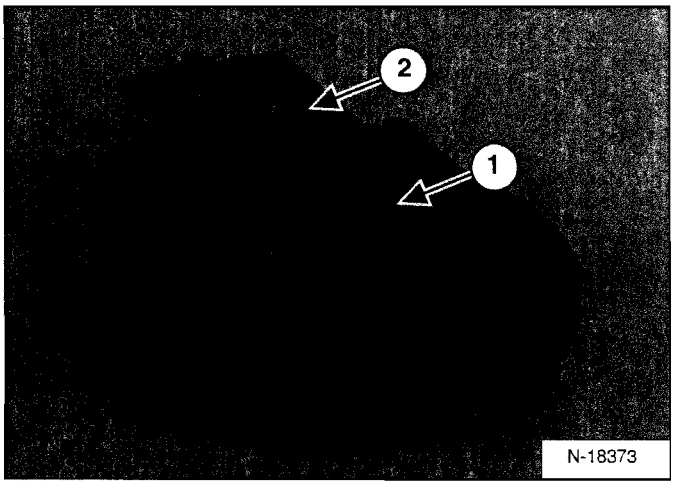


1. Block
2. Idler
3. Seal
4. Snap Ring
5. Bearing
6. Roll Pin
7. Axle
8. Cover

PE1221

Track Idler (Front) Disassembly

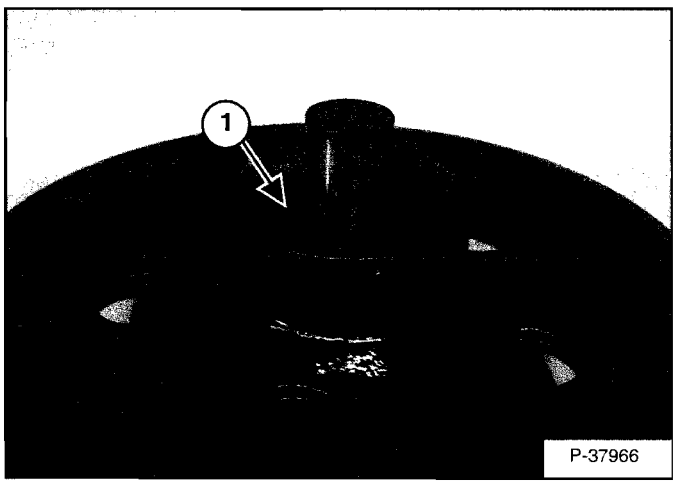
Figure 40-20-24



Drive the roll pin (Item 1) **[Figure 40-20-24]** into the block. Remove the roll pin. (Both sides of the idler.)

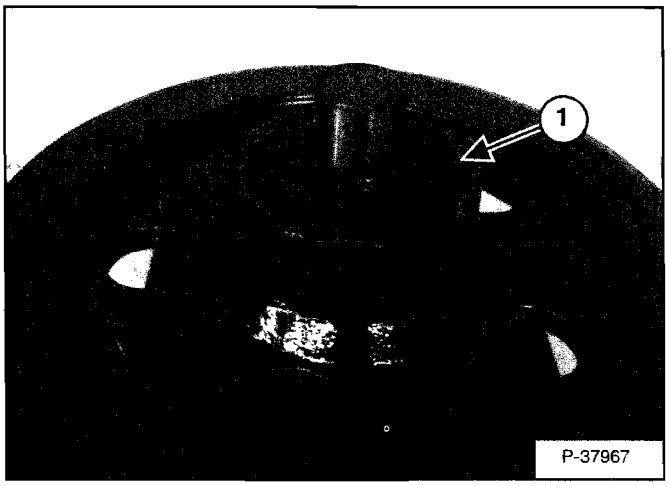
Remove the block (Item 2) **[Figure 40-20-24]** from the axle shaft. (Both sides of the idler.)

Figure 40-20-25



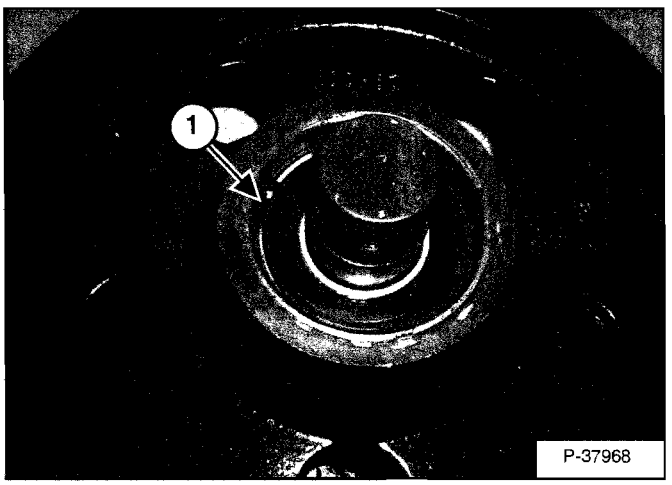
Remove the seal cover (Item 1) **[Figure 40-20-25]** from the idler. (Both sides of the idler.)

Figure 40-20-26



Remove the seal (Item 1) **[Figure 40-20-26]** using a screwdriver. (Both sides of the idler.)

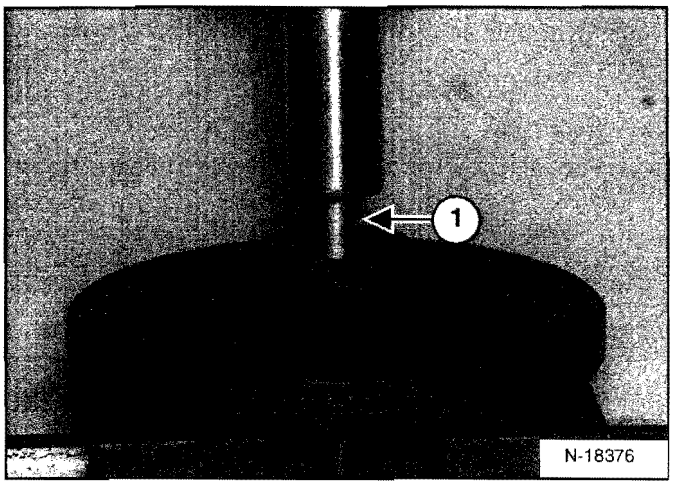
Figure 40-20-27



Remove the snap ring (Item 1) **[Figure 40-20-27]**. (Both sides of the idler.)

Track Idler (Front) Disassembly (Cont'd)

Figure 40-20-28

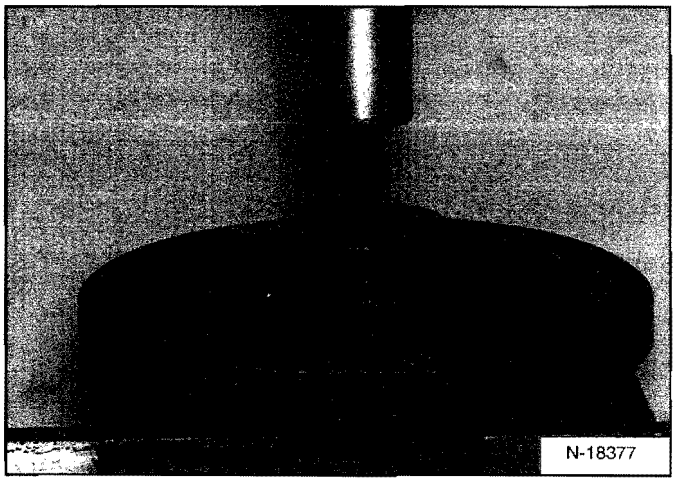


In a press, press the idler axle shaft (Item 1) **[Figure 40-20-28]** and one bearing from the idler.

Remove the bearing from the axle shaft.

Check axle shaft for wear and replace if needed.

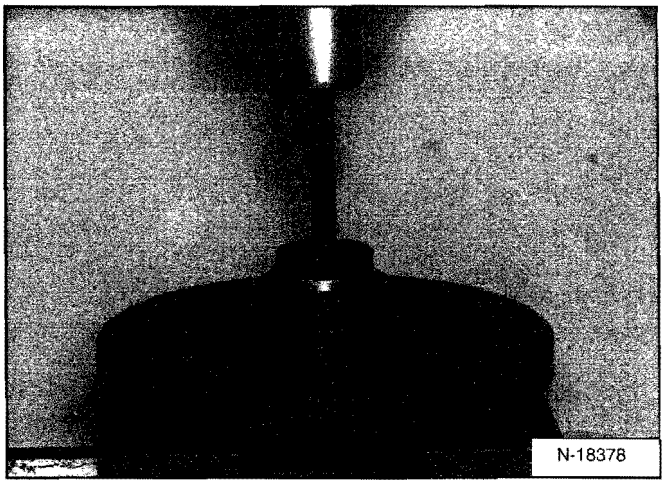
Figure 40-20-29



Turn the idler over and press the other bearing out, using a bearing driver tool **[Figure 40-20-29]**.

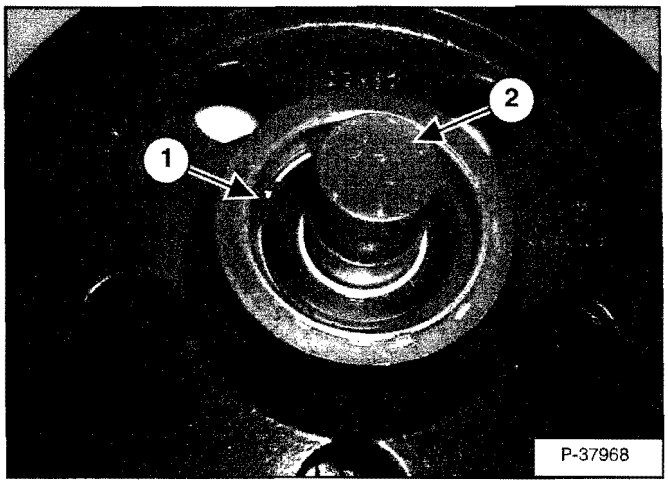
Track Idler (Front) Assembly

Figure 40-20-30



Press a new bearing into the idler **[Figure 40-20-30]**.

Figure 40-20-31

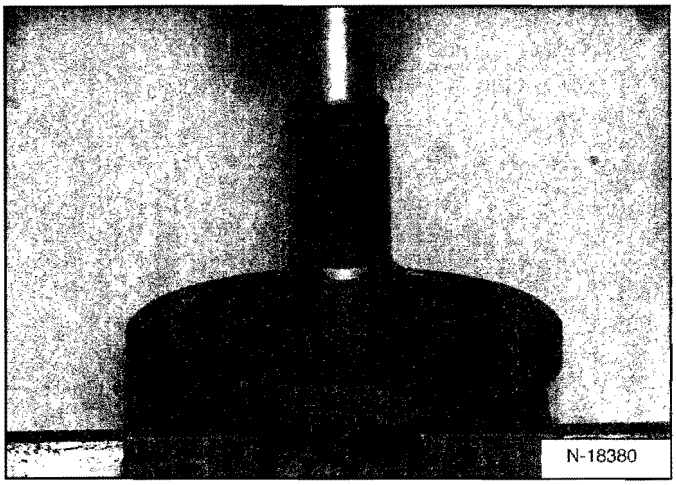


Install a snap ring (Item 1) **[Figure 40-20-31]** to retain the bearing.

Install the axle shaft (Item 2) **[Figure 40-20-31]** into the bearing from the opposite side of the idler.

Track Idler (Front)Assembly (Cont'd)

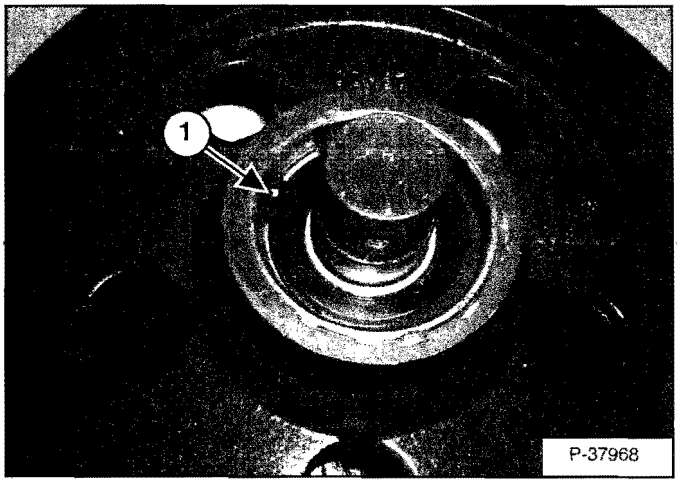
Figure 40-20-32



Place the idler, bearing, and axle shaft assembly in a press.

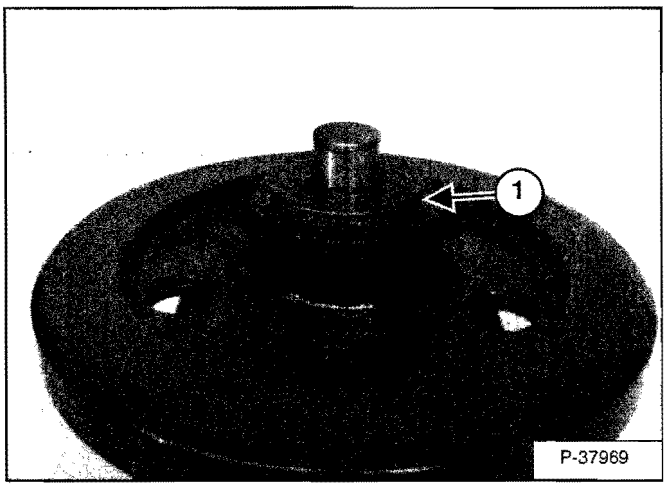
Using a bearing driver tool, press a new bearing over the axle shaft into the front idler **[Figure 40-20-32]**.

Figure 40-20-33



Install the snap ring (Item 1) **[Figure 40-20-33]**.

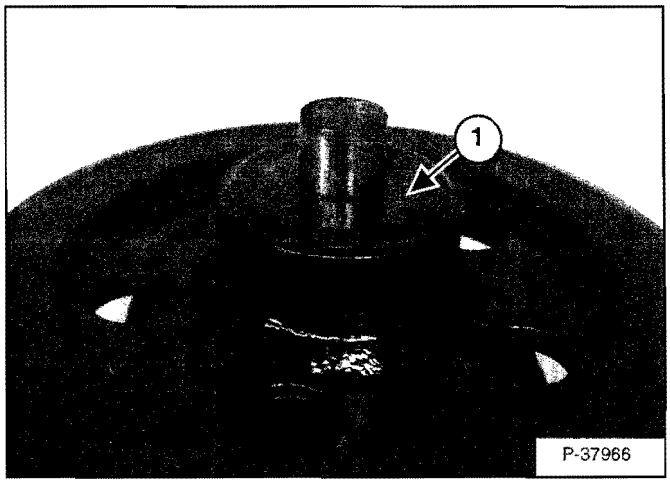
Figure 40-20-34



With a seal driver, install the seal (Item 1) **[Figure 40-20-34]** into the idler. (Both sides.)

NOTE: The seals must be installed,so they are seated against the hub of the idler without distorting the seal surface.

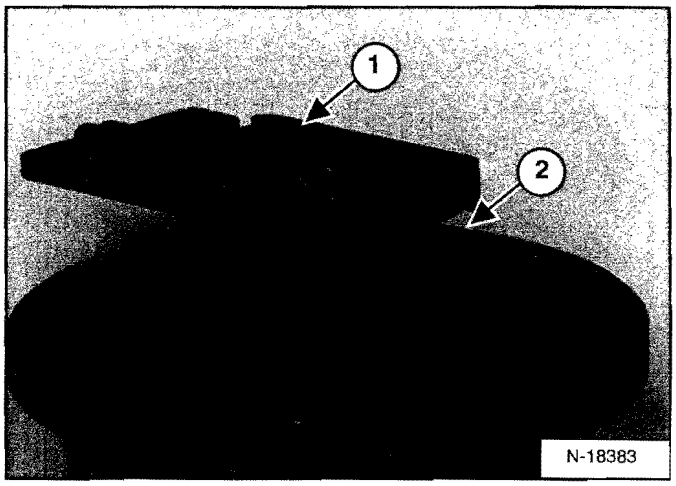
Figure 40-20-35



Install the seal cover (Item 1) **[Figure 40-20-36]** on the idler axle shaft. (Both sides of the idler.)

Track Idler (Front)Assembly (Cont'd)

Figure 40-20-36



Install the block (Item 1) on the idler axle shaft and drive the roll pin (Item 2) **[Figure 40-20-36]** through the axle shaft. (Both sides of the idler.)

The two blocks must point in the same direction.

Track Idler (Rear) End Play Specifications

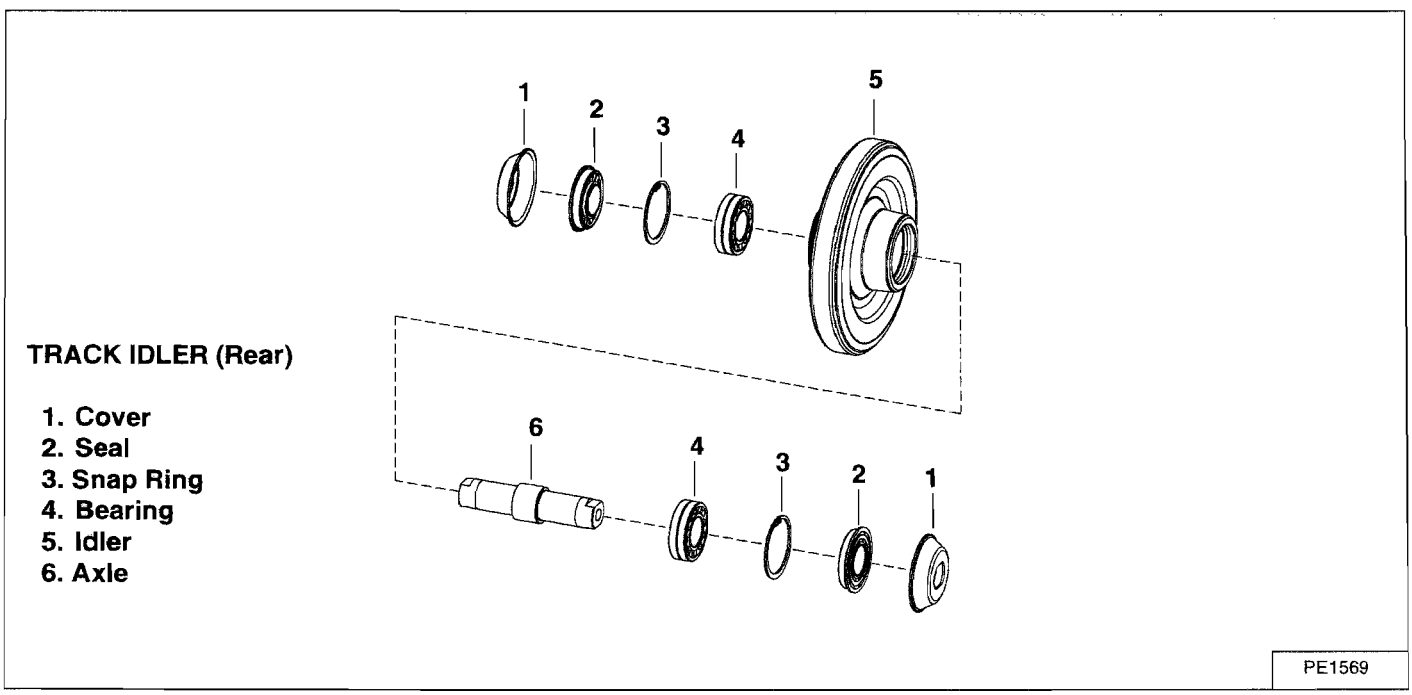
Lift and block the loader. (See Contents Page 10-01.)

Remove the track. (See Track Removal And Installation on Page 40-20-3.)

Attach a dial indicator to the track housing frame and measure the rear idler end play. The specifications are as follows:

Min:.006
Nominal:.027
Max:.048

Track Idler (Rear) Parts Identification



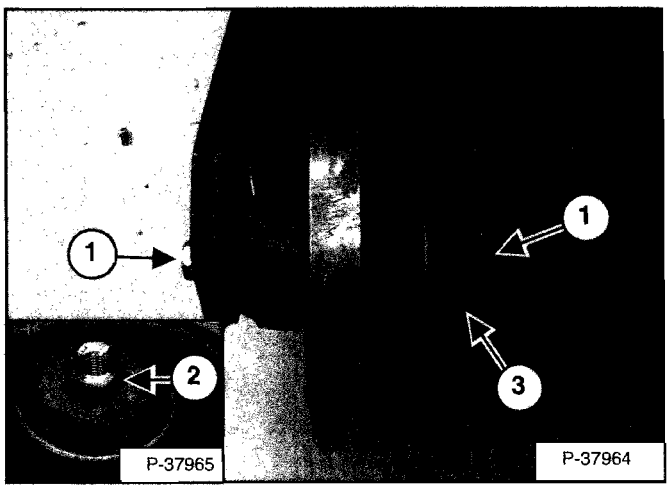
TRACK IDLER (Rear)

1. Cover
2. Seal
3. Snap Ring
4. Bearing
5. Idler
6. Axle

Track Idler (Rear) Removal And Installation

Remove the track. (See Track Removal And Installation on Page 40-20-3.)

Figure 40-20-37



Remove the two mount bolts (Item 1) **[Figure 40-20-37]**.

Remove the rear idler from the loader.

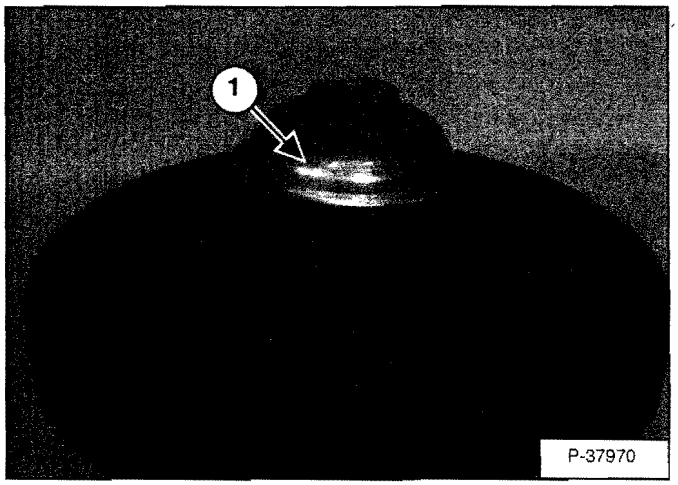
Installation: Align the square sides of the idler shaft (Item 2) with the notches in the track housing (Item 3) **[Figure 40-20-37]**.

Align the holes in the frame with the holes in the shaft.

Install the bolts and tighten to 300-330 ft.-lbs. (406,8-443,5 Nm) torque.

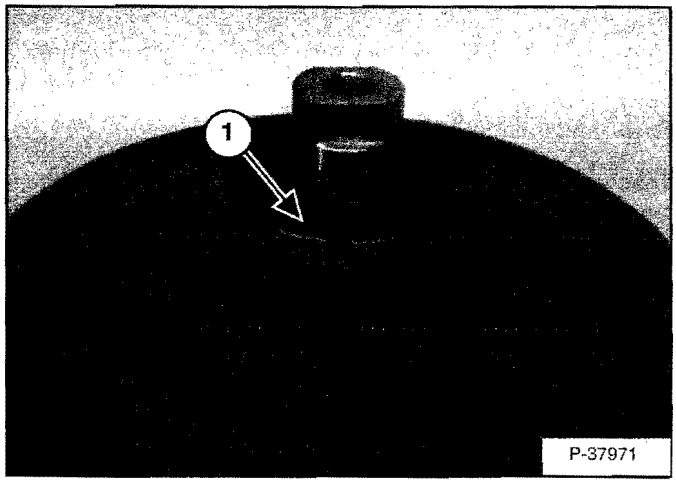
Track Idler (Rear) Disassembly

Figure 40-20-38



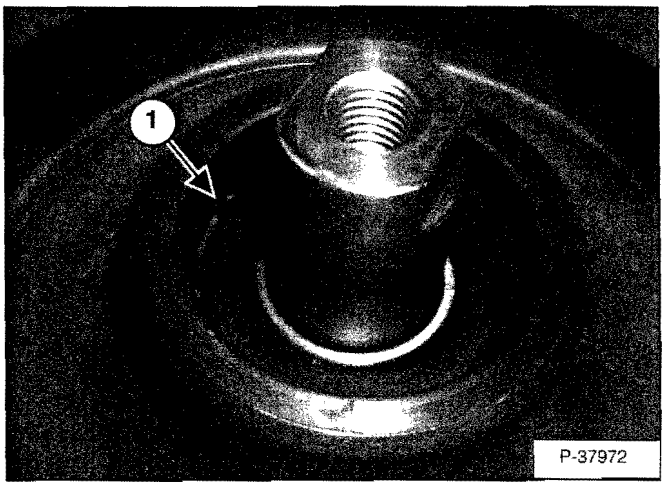
Remove the seal cover (Item 1) **[Figure 40-20-38]** from the rear idler. (Both sides of the rear idler.)

Figure 40-20-39



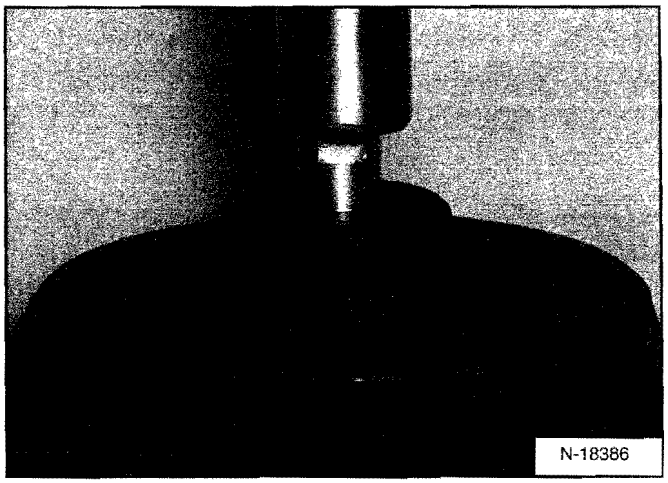
Remove seal (Item 1) **[Figure 40-20-39]**. (Both sides of the rear idler.)

Figure 40-20-40



Remove the snap ring (Item 1) **[Figure 40-20-40]**. (Both sides of the rear idler.)

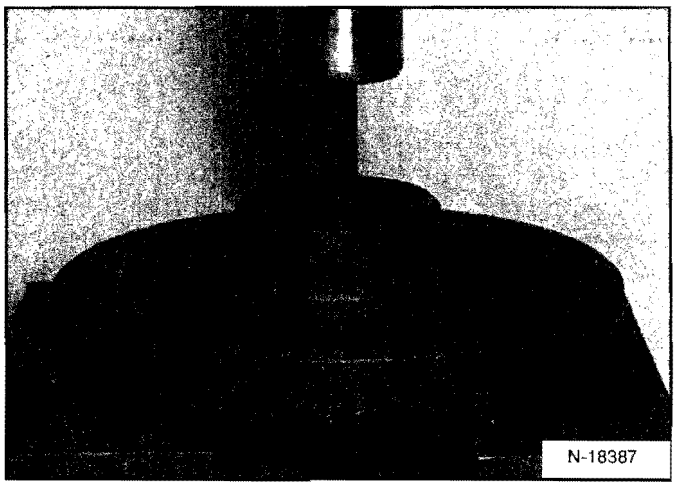
Figure 40-20-41



In a press, press the axle shaft and one bearing from the rear idler **[Figure 40-20-41]**.

Track Idler (Rear) Disassembly (Cont'd)

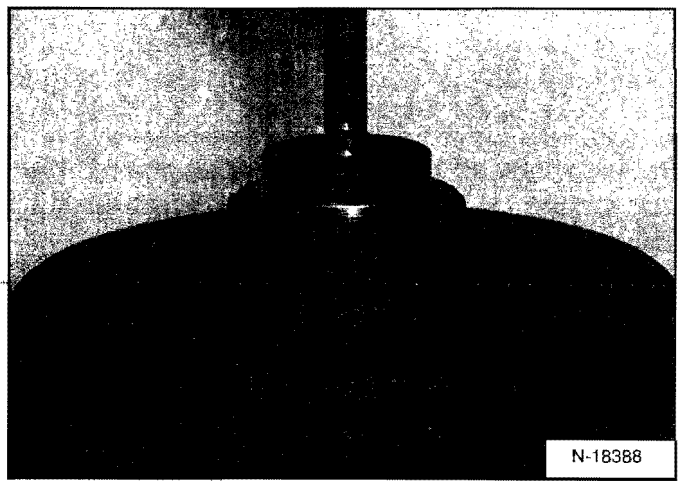
Figure 40-20-42



Turn the rear idler over and press the old bearing out **[Figure 40-20-42]**.

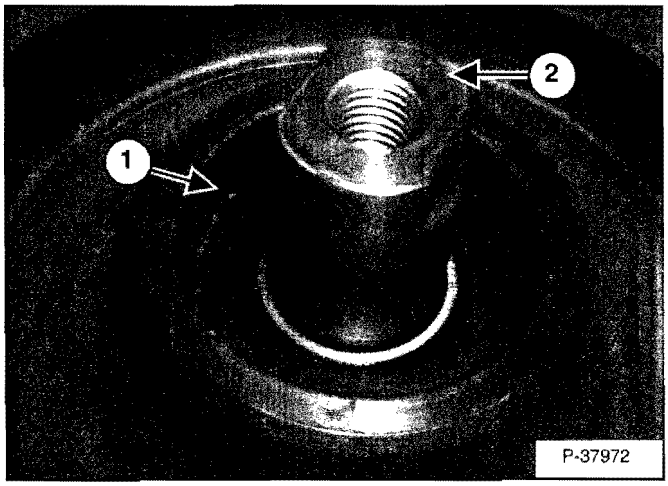
Check the idler and replace as needed.

Figure 40-20-43



Install a new bearing into the rear idler using a press and bearing driver tool **[Figure 40-20-43]**.

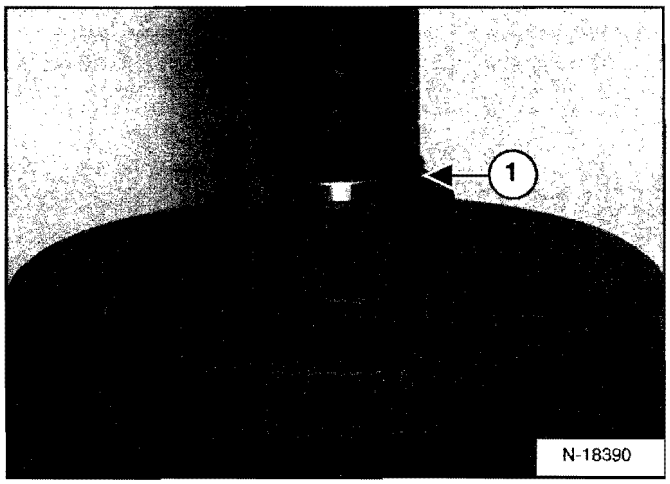
Figure 40-20-44



Install a snap ring (Item 1) **[Figure 40-20-44]**.

Install the axle shaft (Item 2) **[Figure 40-20-44]** into the idler from the opposite side.

Figure 40-20-45

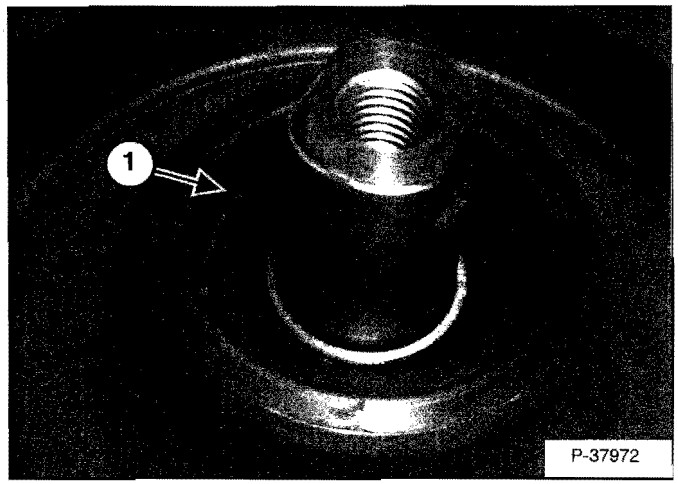


Place the idle, bearing and axle shaft assembly in a press.

Press a new bearing (Item 1) **[Figure 40-20-45]** over the axle shaft into the rear idler.

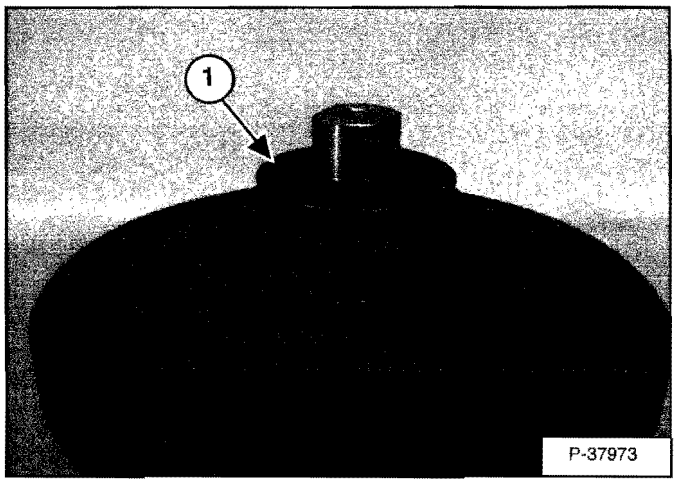
Track Idler (Rear) Assembly

Figure 40-20-46



Install a snap ring (Item 1) **[Figure 40-20-46]**.

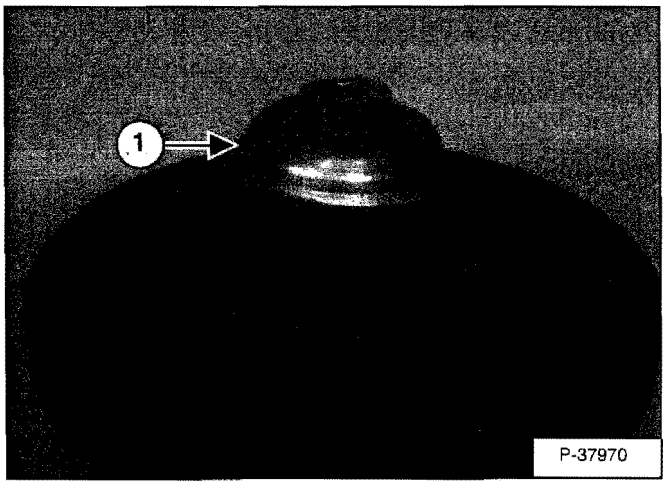
Figure 40-20-47



With a seal driver, install the seal (Item 1) **[Figure 40-20-47]** in the rear idler. (Both sides of the rear idler.)

NOTE: The seals must be installed,so they are seated against the hub of the idler without distorting the seal surface.

Figure 40-20-48



Install the seal cover (Item 1) **[Figure 40-20-48]**.

Install the rear idler assembly in the track housing and install the two mount bolts.

Track Roller Assembly End Play Specifications

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

Remove the track. (See Track Removal And Installation on Page 40-20-3.)

Attach a dial indicator to the track housing frame and measure the track roller end play. The specifications are as follows:

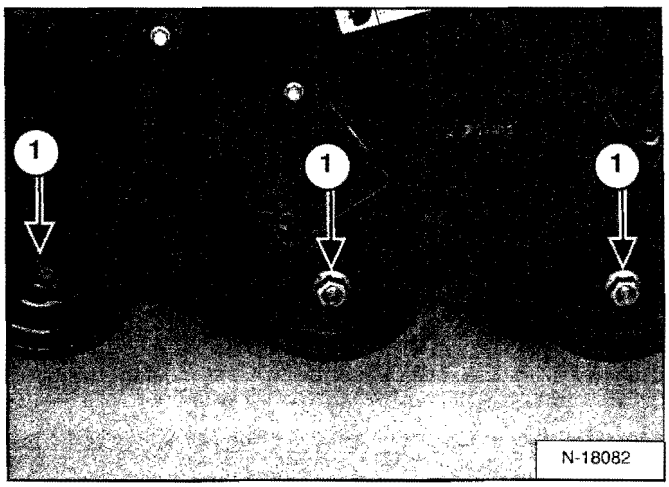
Min:.006
Nominal:.027
Max:.048

Track Roller Removal And Installation

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

Remove the track from the loader. (See Track Removal And Installation on Page 40-20-3.)

Figure 40-20-49

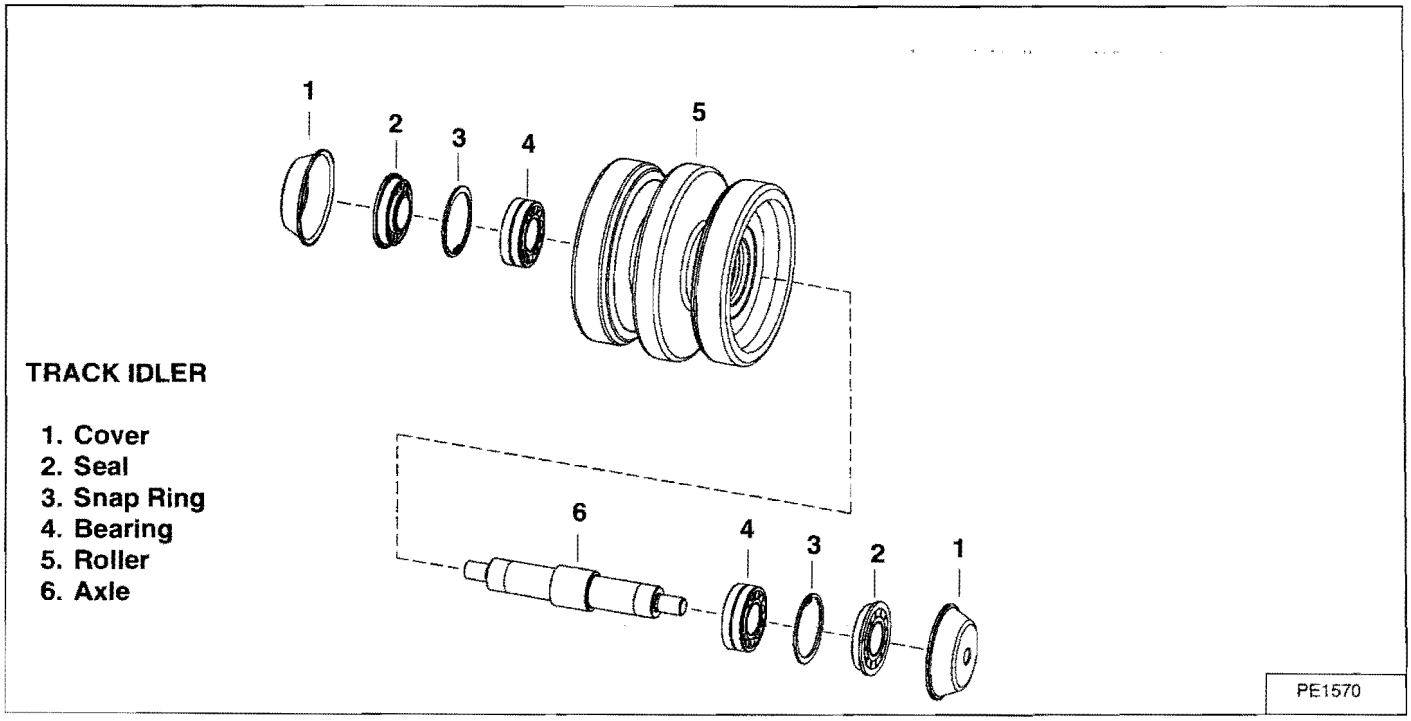


Remove the nuts (Item 1) **[Figure 40-20-49]** from the roller shaft. (Both ends of the roller shaft.)

Installation: Tighten the nuts to 300-330 ft.-lbs. (406,8-443,5 Nm) torque.

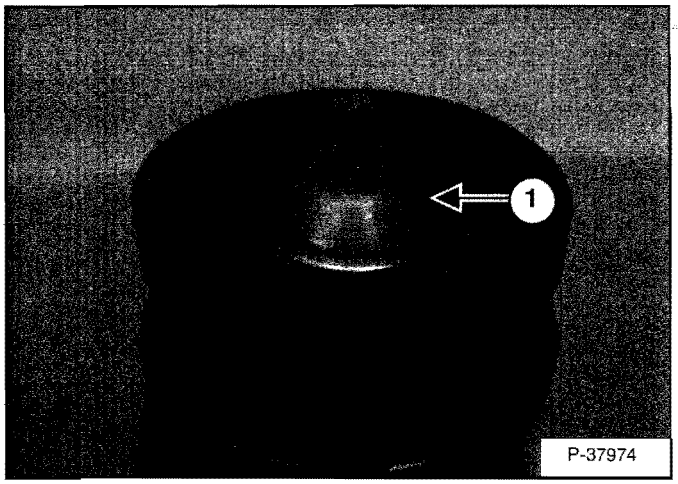
Remove the roller from the track assembly.

Track Roller Parts Identification



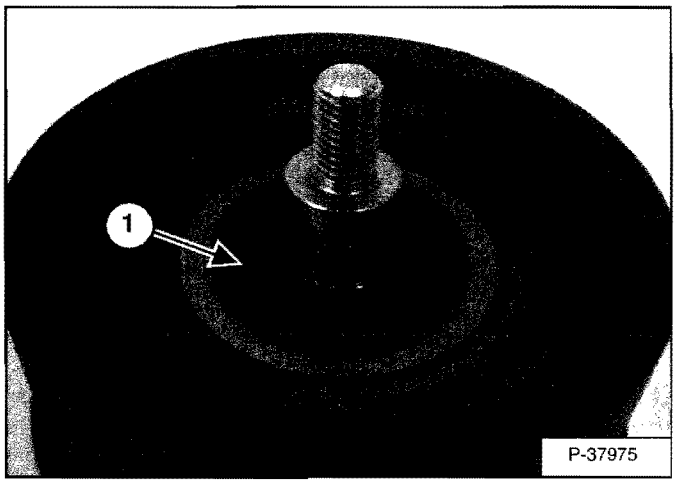
Track Roller Disassembly

Figure 40-20-50



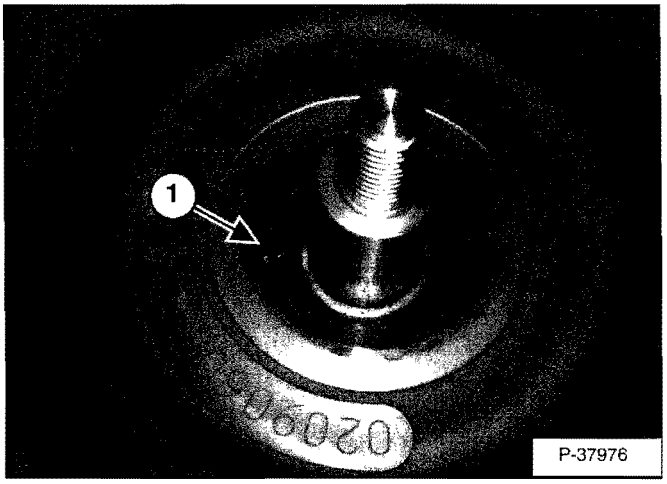
Remove the seal cover (Item 1) **[Figure 40-20-50]** from the roller.

Figure 40-20-51



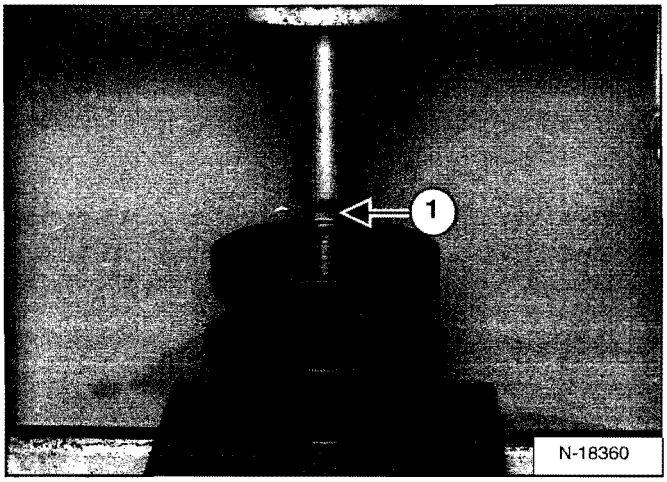
Remove the seal from the roller (Item 1) **[Figure 40-20-51]**. (Both sides of the roller.)

Figure 40-20-52



Remove the snap ring (Item 1) **[Figure 40-20-52]** from the roller. (Both sides of the roller.)

Figure 40-20-53

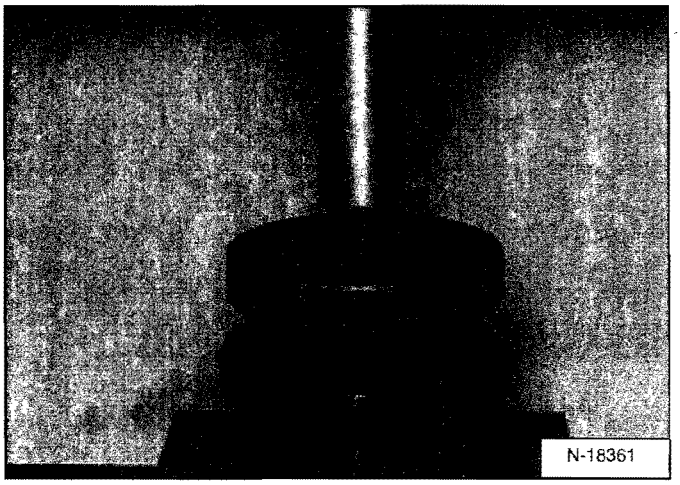


Place the mounting nut (Item 1) **[Figure 40-20-53]** on the shaft.

With a press, press the axle shaft and one bearing from the roller **[Figure 40-20-53]**.

Track Roller Disassembly (Cont'd)

Figure 40-20-54

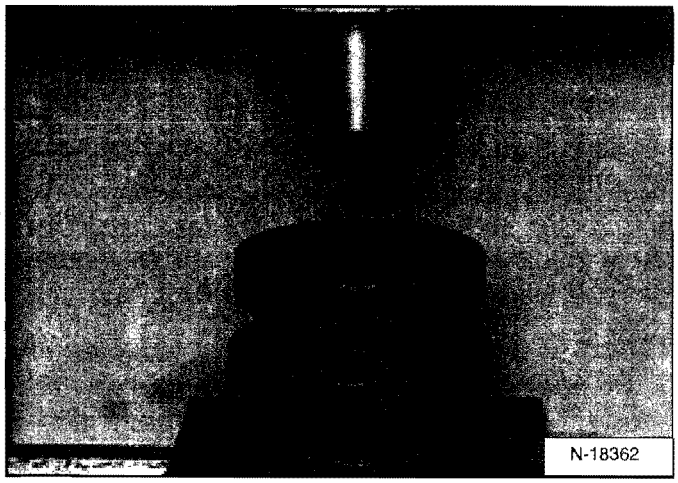


Turn the roller to the opposite end.

With a bearing driver tool press the remaining bearing out of the roller **[Figure 40-20-54]**.

Track Roller Assembly

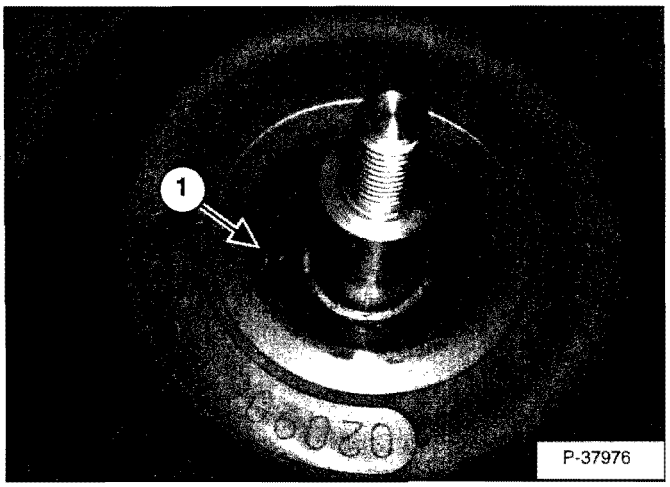
Figure 40-20-55



Check the roller for wear and replace as needed.

Press a new bearing into the roller **[Figure 40-20-55]**.

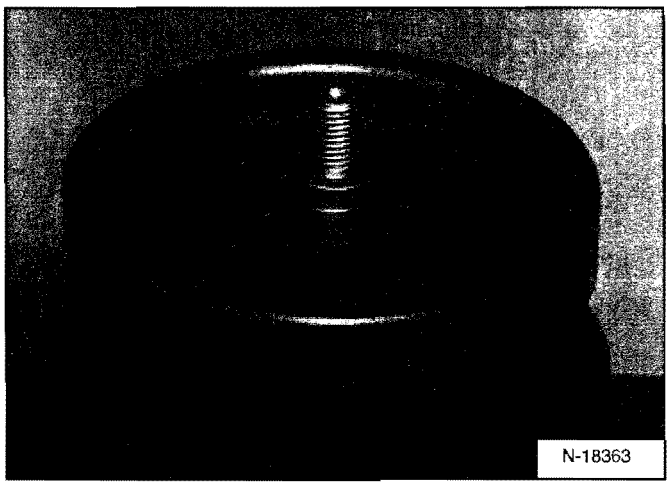
Figure 40-20-56



Install a new snap ring (Item 1) **[Figure 40-20-56]** into the roller.

Install the axle shaft into the bearing from the opposite side **[Figure 40-20-56]**.

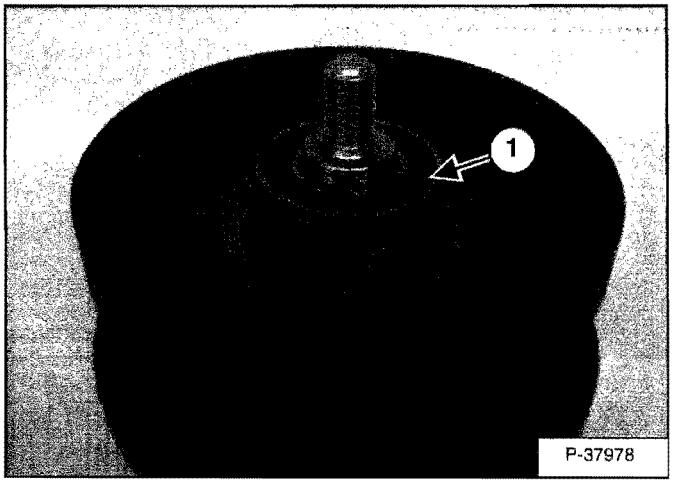
Figure 40-20-57



Set in press with axle shaft up **[Figure 40-20-57]**.

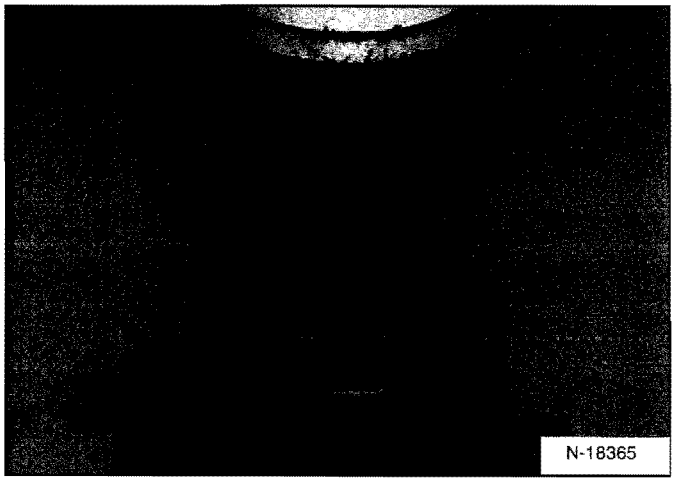
Track Roller Assembly (Cont'd)

Figure 40-20-58



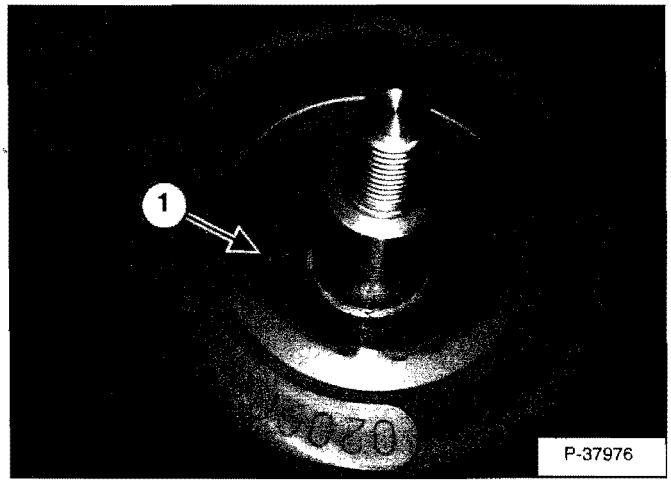
Install a new bearing (Item 1) **[Figure 40-20-58]** over the axle shaft.

Figure 40-20-59



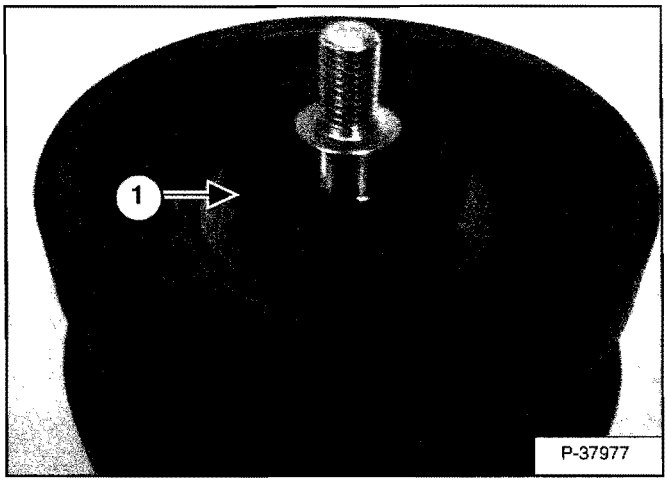
With a bearing driver tool and a press, press a new bearing into the roller **[Figure 40-20-59]**.

Figure 40-20-60



Install the snap ring (Item 1) **[Figure 40-20-60]**.

Figure 40-20-61



With a seal driver, install the seal (Item 1) **[Figure 40-20-61]** into the roller. (Both sides of the roller.)

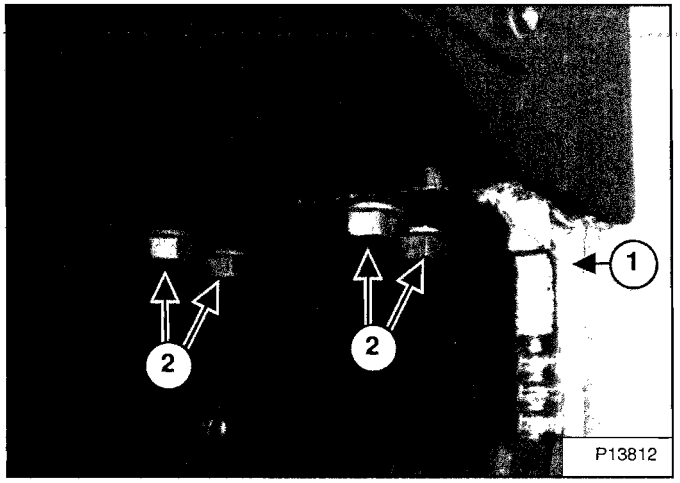
NOTE: The seals must be installed, so they are seated against the hub of the roller without distorting the seal surface. [Figure 40-20-61]

Install the seal cover on the roller. (Both sides of the roller.)

Install the roller assembly in the track housing.

Track Housing Removal And Installation

Figure 40-20-62



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

NOTE: Position the jackstand (Item 1) [Figure 40-20-62] at the front of the loader to allow for track housing removal.

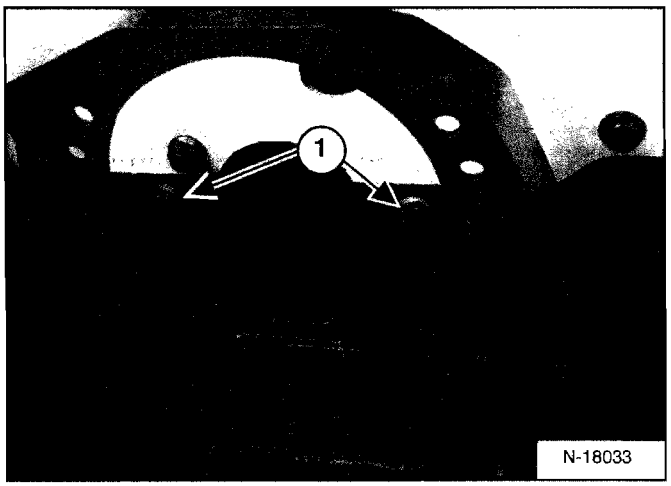
Remove the track from the loader. (See Track Removal And Installation on Page 40-20-3.)

Remove the hydrostatic motor from the track housing. (See Contents Page 30-01.)

Support the track housing.

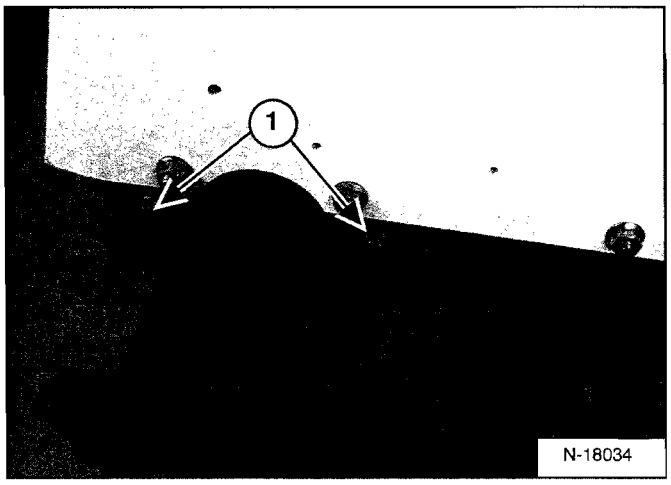
Remove the four mounting bolts (Item 2) **[Figure 40-20-62]** from the track housing mount plate. (At the front and rear of the loader.)

Figure 40-20-63



At the rear of the loader remove the two mount bolts (Item 1) **[Figure 40-20-63]**.

Figure 40-20-64



Remove the two mounting bolts (Item 1) **[Figure 40-20-64]**.

Remove the track housing from the loader.

Installation: Tighten the twelve mounting bolts to 330 ft.-lbs. (447,5 Nm) torque.

Track Damage Identification

Figure 40-20-65

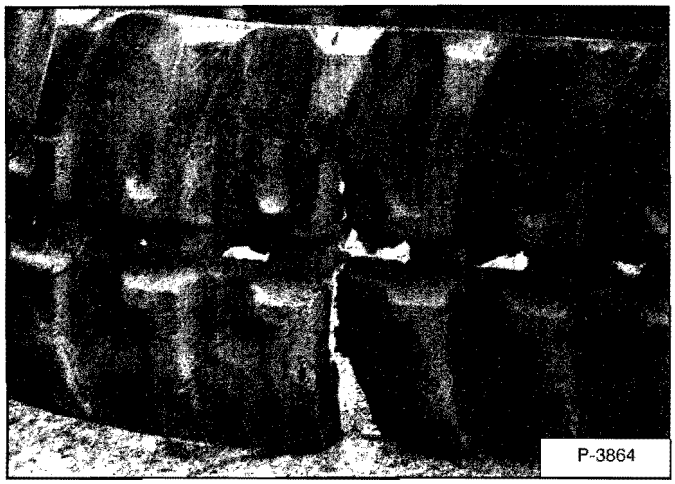
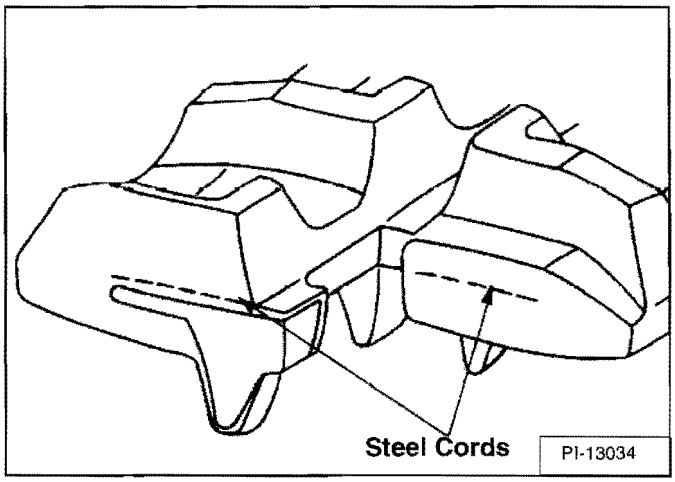


Figure 40-20-66



Cutting Of Steel Cords

The following pages show photos and illustrations of track damage and the probable cause of the damage. It is intended to be used for identifying the reason for track damage and how to avoid future track damage.

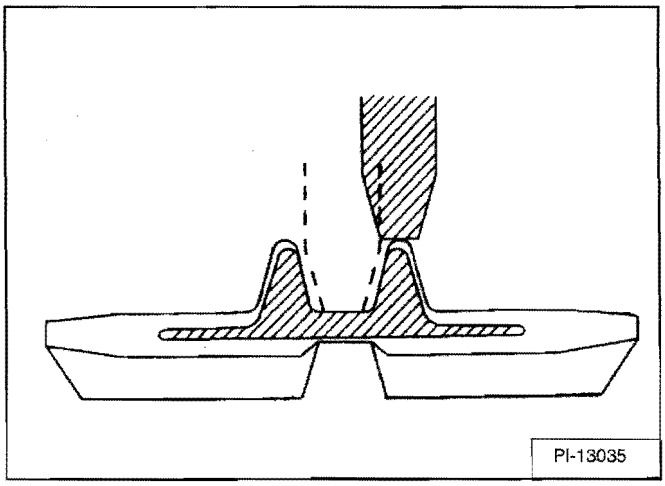
Damage:

Embedded steel cords are cut off **[Figure 40-20-65]** & **[Figure 40-20-66]**.

Replacement:

Replacement is required **[Figure 40-20-65]** & **[Figure 40-20-66]**.

Figure 40-20-67



Causes of the damage:

When applied to rubber tracks under the following circumstances, tension in excess of the breaking strength of the embedded steel cords causes steel cords to be cut:

When the rubber track is detracting, the idler or sprocket rides on the projections of the embedded metal **[Figure 40-20-67]**.

When the rubber track is detracted, projections of rubber tracks get stuck between the frame of the undercarriage.

The rubber track is clogged with stones or foreign obstacles.

Furthermore, when moisture invades through a cut on the lug side rubber surface, the embedded steel cords will corrode. The deterioration of the design strength may lead to the breaking off of the steel cords.

Prevention:

The following preventions should be taken to minimize the risk of this damage:

Periodical checking on site of the recommended track tension. (See Track Checking on Page 40-20-1.)

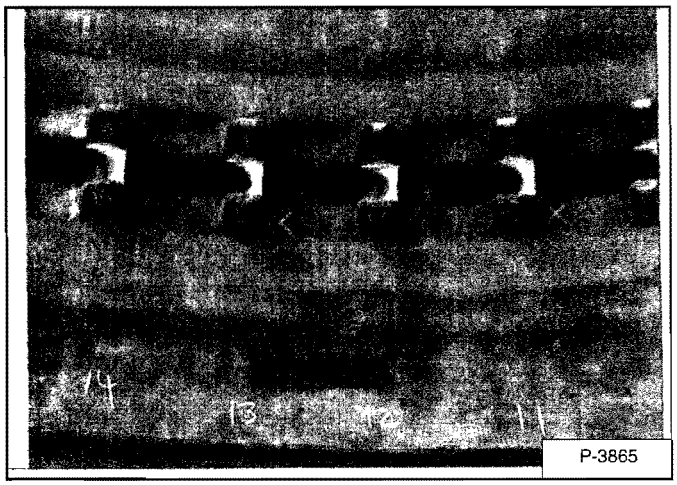
Avoiding quick turns on bumpy and rocky fields.

Drive carefully to avoid having stones and other articles clog the rubber tracks.

Driving over sharp objects should be avoided. If this is impossible, do not make turns while driving over sharp objects.

Track Damage Identification (Cont'd)

Figure 40-20-68

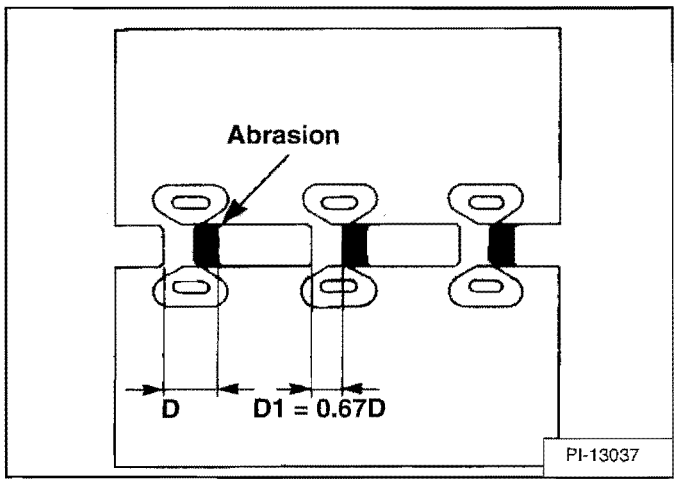


Abrasion Of Embedded Metals

Damage:

In proportion to the service time, embedded metals will gradually wear away by friction **[Figure 40-20-68]**.

Figure 40-20-69



Replacement:

Replacement is required when the width of the embedded metals (D1) becomes 67% of their original width (D) **[Figure 40-20-69]**.

Causes of the damage:

When the track rollers, sprockets and idler gears roll over the embedded metals, abrasion of embedded metals is inevitable. The following cases sometimes accelerate their abrasion:

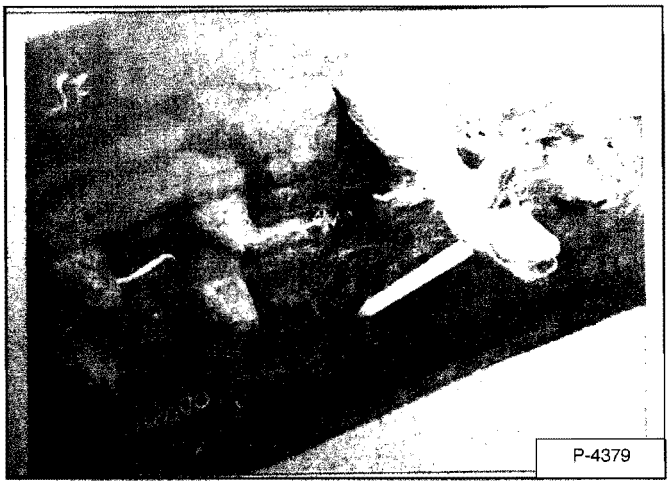
Rubber tracks are driven with an extraordinary heavy load on them.

Rubber tracks are used on sandy fields.

Prevention:

As long as rubber tracks are used under normal operating conditions, abnormal abrasion is unlikely to occur. The level of abrasion should be carefully checked when the machines are used for dozing which generate a heavy load for rubber tracks, and when they are operated under a sandy field condition for a long time.

Figure 40-20-70



Separation Of Embedded Metals

Damage:

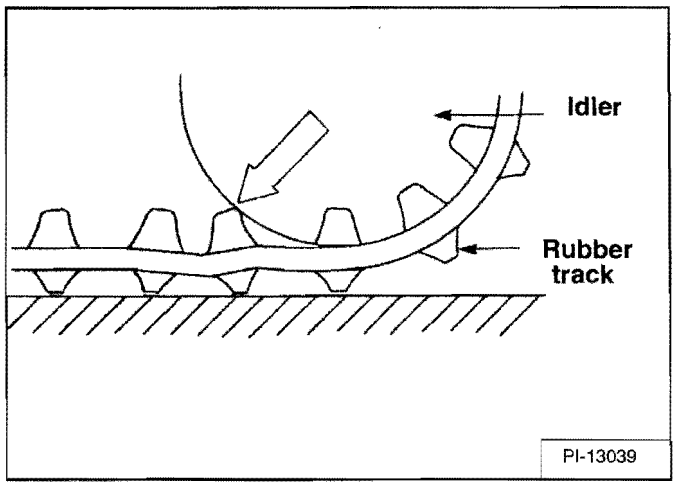
Extraordinary outer forces applied to embedded metals cause their separation from the rubber track's body **[Figure 40-20-70]**.

Replacement:

Even a partial separation of embedded metals requires replacement of the track.

Track Damage Identification (Cont'd)

Figure 40-20-71

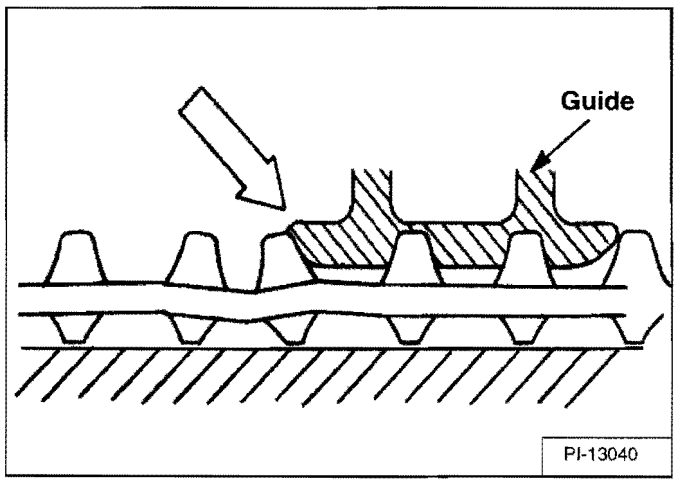


Causes of the damage:

Embedded metals are adhered between the steel cords and the rubber body. The following cases generate external forces greater than the adhesion strength, causing separation of the embedded metals:

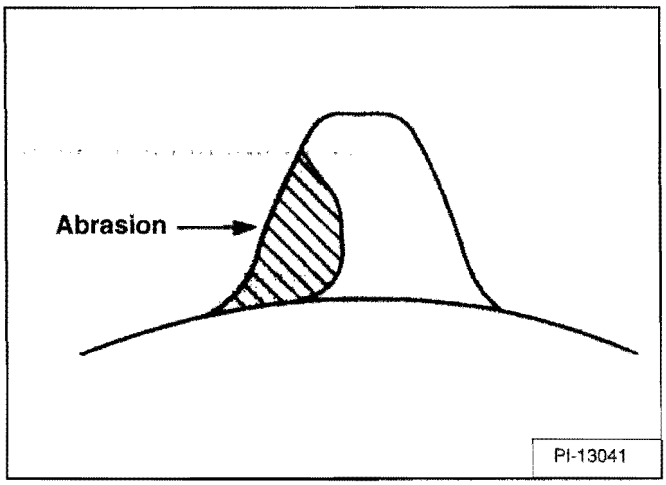
When the idler continually rides on the projections of embedded metals, the embedded metals will eventually peel off **[Figure 40-20-71]**.

Figure 40-20-72



When a rubber track is detracted, it becomes stuck between the guide or the undercarriage frame, causing the separation of embedded metals **[Figure 40-20-72]**.

Figure 40-20-73



Abnormally worn sprockets as shown will pull embedded metals out **[Figure 40-20-73]**.

Prevention:

Similar to the prevention against the cutting of the steel cords:

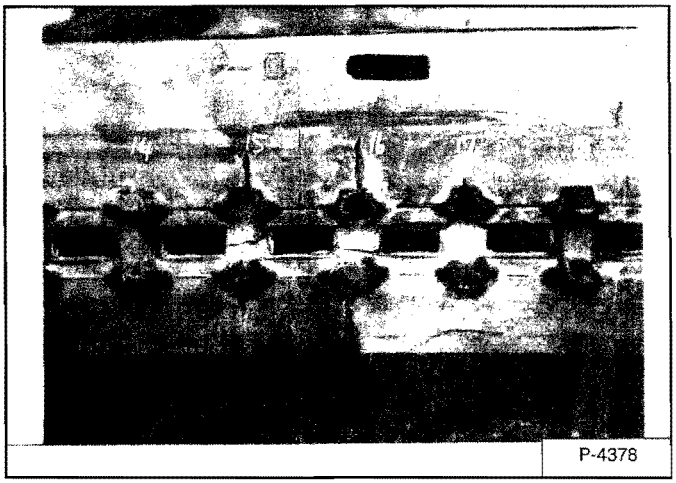
Recommended track tension should be periodically checked. (See Track Checking on Page 40-20-1.)

Quick turns on bumpy and rocky fields should be avoided.

If abnormal wear of sprockets is observed, they should be immediately replaced.

Track Damage Identification (Cont'd)

Figure 40-20-74



Separation Of Embedded Metals Due To Corrosion

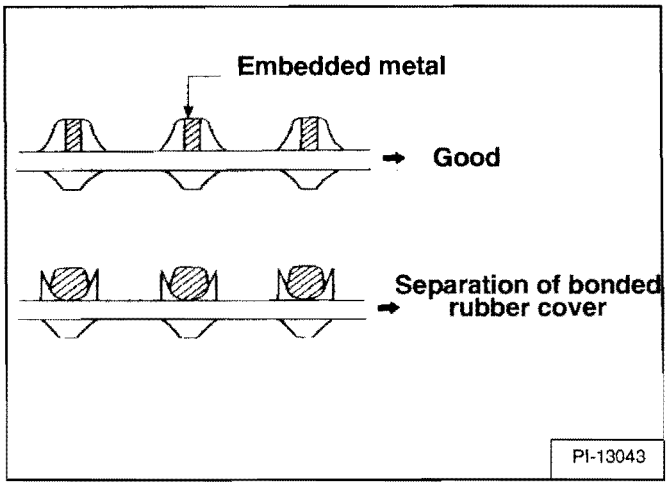
Damage:

Due to corrosion of embedded metals, the adhesion to the rubber body deteriorates, resulting in complete separation **[Figure 40-20-74]**.

Replacement:

Even a partial separation of embedded metals requires a rubber track replacement.

Figure 40-20-75



Causes of the damage:

Embedded metals are bonded to the rubber body. The following operating conditions cause embedded metals to corrode, causing deterioration of the bonding, and finally resulting in separation of the embedded metals from the rubber body **[Figure 40-20-75]**.

Excessively salty fields, like the sea shore

Strong acidic or alkali soil conditions

Compost spread grounds

On tracks that are out of adjustment, the track rollers, idlers and sprockets will gradually wear the rubber surface at track roller side, causing exposure of the embedded metals. Consequently the embedded metals will corrode resulting in their separation from the rubber body.

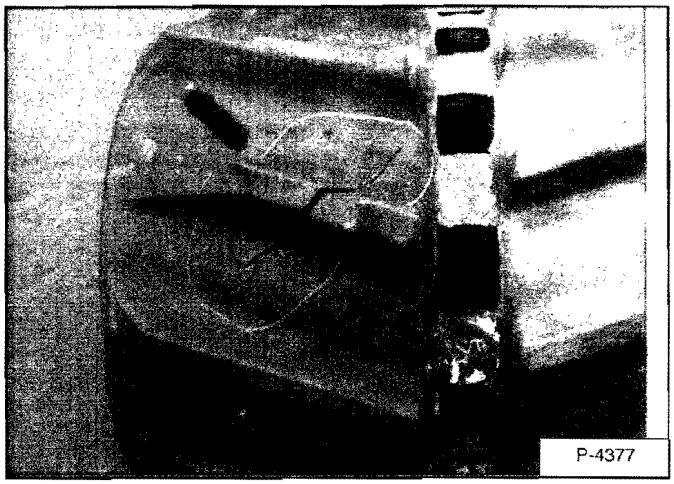
Prevention:

If rubber tracks are used under such field conditions as described under (Causes of the damage), they should be washed with plenty of water. After being completely dried, they should be stored correctly.

When the bonded rubber cover is separated from the embedded metal projections and the metals in the rubber body become loose, it is time to consider replacement of the rubber track.

Track Damage Identification (Cont'd)

Figure 40-20-76



Cuts On The Lug Side Rubber

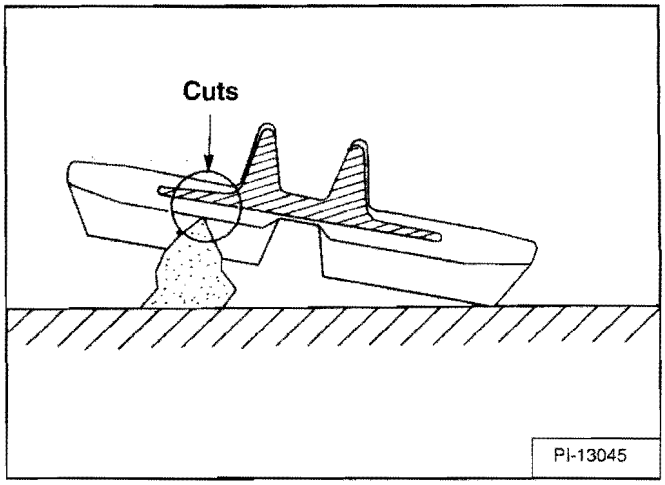
Damage:

Cuts on the lug side rubber often occurs as one of the most typical failure modes **[Figure 40-20-76]**.

Replacement:

When a cut on the lug side rubber reaches the embedded steel cords, it should be immediately repaired with cold vulcanization rubber.

Figure 40-20-77



Causes of the damage:

When rubber tracks drive over projections or sharp stones in the fields, the concentrated forces applied cause cuts on the lug side rubber surface. In case of making turns on projections, the lug side rubber surface will have an even higher chance to be cut. If the cuts run through the embedded steel cords, it might result in the steel cords' breakage due to their corrosion. It is highly recommended to repair the cuts with cold vulcanization rubber as soon as they are observed **[Figure 40-20-77]**.

Prevention:

Machine operators are requested to drive with great attention to the ground's surface especially in terrains of the following type:

Construction sites

Demolition sites

Paths covered with rocks and wood

Concrete ridges

Stumpy fields

When operating on terrains as mentioned above, high speed, quick turns and overloading should be avoided.

Track Damage Identification (Cont'd)

Figure 40-20-78

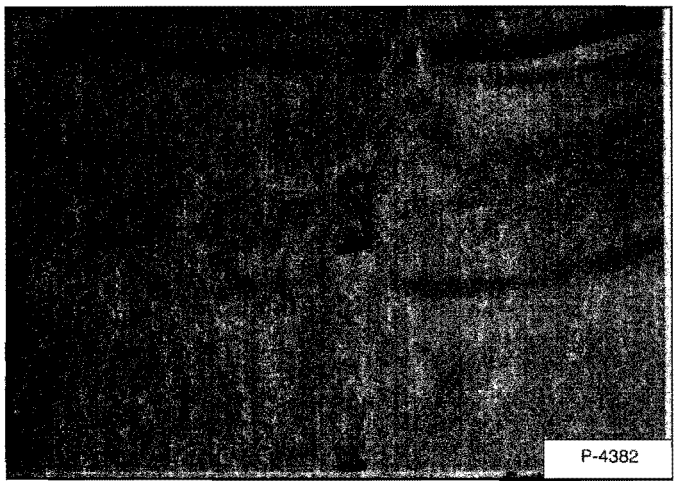
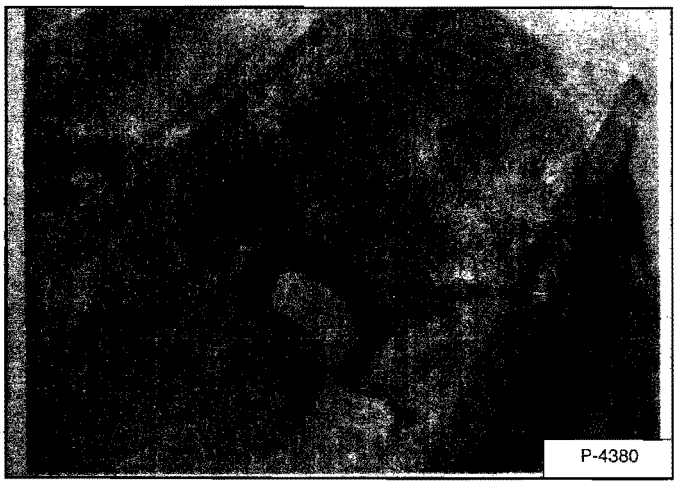


Figure 40-20-79



Cracks On The Lug Side Rubber Due To Fatigue

Damage:

Small cracks around the root of the lug as a result from operation fatigue **[Figure 40-20-78]** & **[Figure 40-20-79]**.

Replacement:

When the cracks reach so deep that they expose the steel cords, track replacement is required.

Causes of the damage:

Because of wound stress applied to rubber tracks around the undercarriage parts during operation, the fatigue especially causes cracks on the lug side rubber surface. Once the cracks occur, they gradually deteriorate with even small external cracks. Also when operating near seashores or under cold temperatures, rubber tracks are more likely to suffer from ozone cracks.

Prevention:

Rubber tracks are designed with special rubber compounds to prevent cracks due to fatigue. However, external injuries on the lug side rubber sometimes cause more chance of cracking. Machine operators should observe soil conditions when driving, so as not to cause external injuries to the lug side rubber. In order to minimize the occurrence of ozone cracks, attention should be paid to the following instructions for maintenance:

Avoid exposing stored tracks to direct sun light.

Avoid exposing stored tracks to direct rain and snow fall.

Store tracks in well ventilated warehouses.

Use the tracks at least once a month.

Track Damage Identification (Cont'd)

Figure 40-20-80

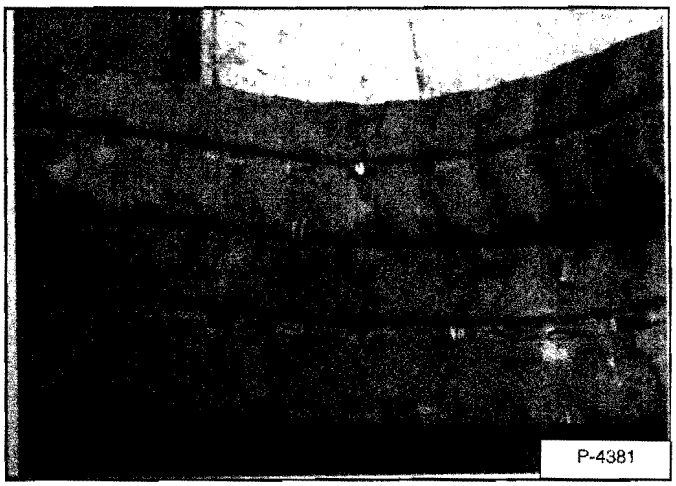
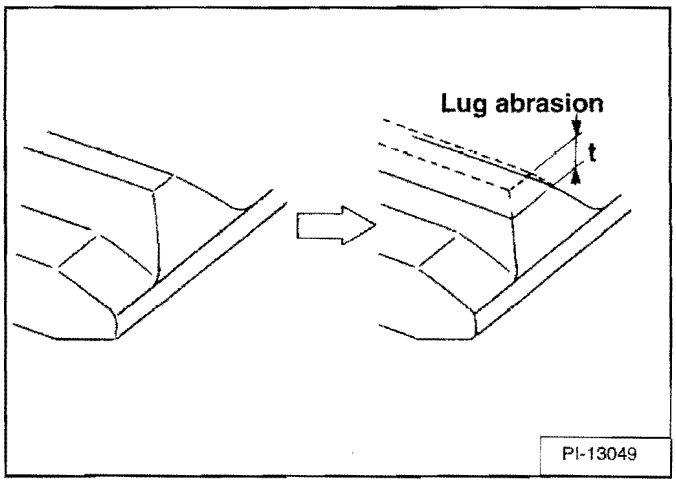


Figure 40-20-81



Lug Abrasion

Damage:

As its service time proceeds, the lug side inevitably undergoes abrasion **[Figure 40-20-80]** & **[Figure 40-20-81]**.

Replacement:

No replacement is required.

Causes of the damage:

Lug abrasion is more or less inevitable. Even if lug abrasion is proceeding, the rubber track can be used. However, as the traction performance deteriorates accordingly, it is highly recommended to replace the abraded tracks with new ones when the lug height becomes less than 5 mm.

Prevention:

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

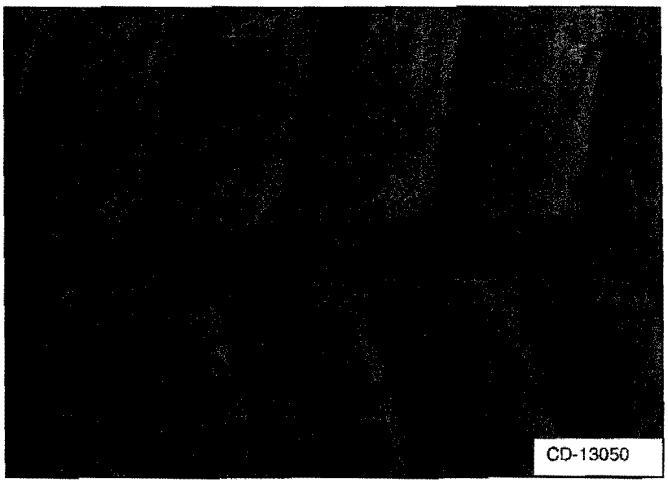
Making quick and repeated turns on concrete and asphalt roads

Driving up and down hilly paths with slippage.

Making frequent turns on paths covered with rocks and wood.

Cracks And Cuts On The Lug Side Rubber

Figure 40-20-82



Damage:

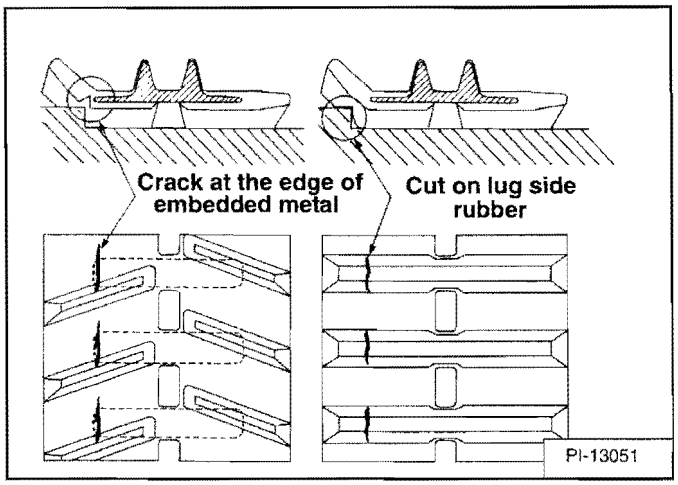
Sometimes cracks and cuts on the lug side rubber at the edges of the embedded metals can be observed **[Figure 40-20-82]**.

Replacement:

Basically, no replacement is required unless the cuts on the lug side rubber are discovered all around the edges of the embedded metals, as this will result in a complete cut off.

Track Damage Identification (Cont'

Figure 40-20-83



Causes of the damage:

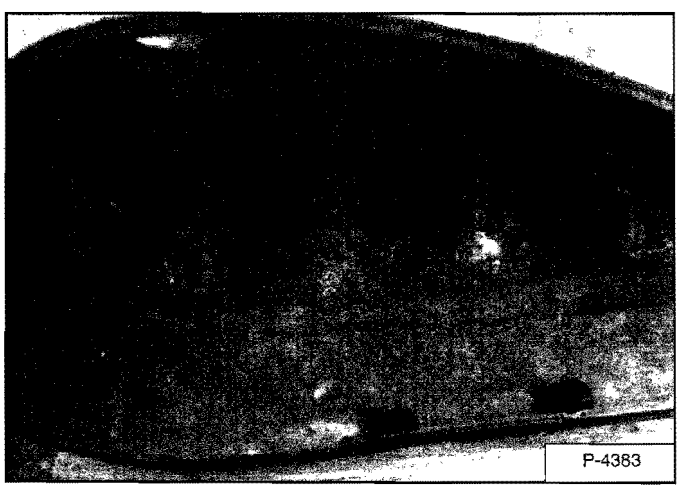
When rubber tracks drive over sharp projections, intensive stress is applied to the lug side rubber surface, especially at the edges of embedded metals, causing cracks and cuts in the area around the embedded metals **[Figure 40-20-83]**.

Prevention:

To avoid extensive stress applied to the lug root where metals are embedded, machine operators are requested to avoid driving over stumps and ridges.

Abrasion Of The Track Roller Side

Figure 40-20-84



Damage:

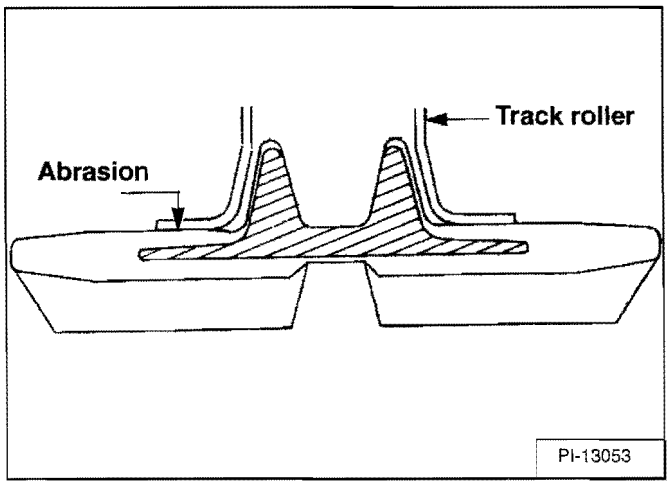
The rubber surface on which track rollers run is gradually abraded. It will end in the exposure of the embedded metals **[Figure 40-20-84]**.

Replacement:

It is recommended to replace the rubber track when more than half of the embedded metals are completely exposed.

Causes of the damage:

Figure 40-20-85



The abrasion of the track roller side rubber surface occurs because of sand and gravel being clogged between the rubber and the outside surface of the track rollers. The stress pushes the sand and gravel against the side of the rubber track to cause the abrasion **[Figure 40-20-85]**.

The level of abrasion is highly dependent on terrain conditions. A higher level of abrasion will occur when the rubber tracks are operated in fields covered with many stones and gravel. Small stones hardened with mud, stuck to the track rollers increase the abrasion level. After an extended period of abrasion, it will be more likely for exposed embedded metals to catch moisture through the inside steel cords, which can cause breakage of steel cords and separation of the metals from the rubber body.

Prevention:

After operation in wet fields containing many small stones, wash off the mud that is stuck to the track rollers completely. When operating on gravel paths and stony grounds, machines should be driven slowly and the turning radius should be big enough to prevent stones and gravel from getting stuck to the track roller side rubber.

Track Damage Identification (Cont'd)

Cuts On The Edges Of Track Roller Side

Figure 40-20-86

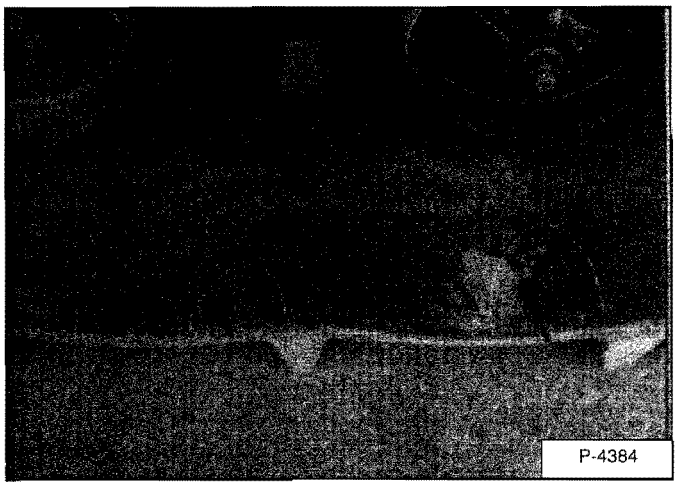
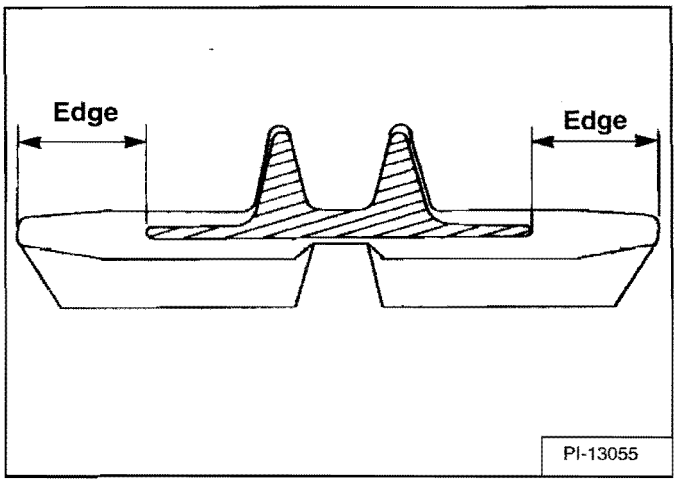


Figure 40-20-87



Damage:

Both edges of a rubber track have no special reinforcements. It sometimes occurs during operation that they are cut or torn off **[Figure 40-20-86]** & **[Figure 40-20-87]**.

Replacement:

In such case, the rubber track does not have to be replaced.

Causes of the damage:

This damage is caused by objects on the field or by interference with the machine frame.

Track Damage Identification (Cont'd)

Figure 40-20-88

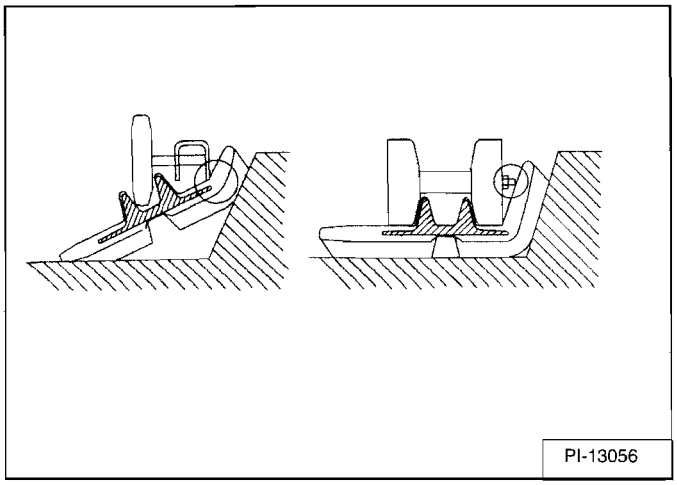
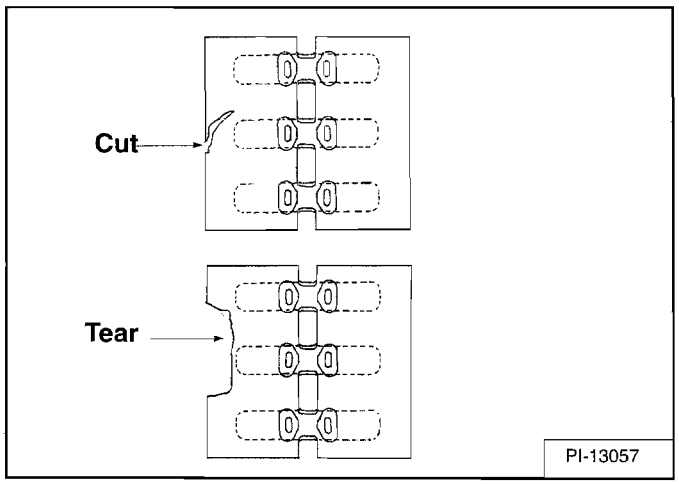


Figure 40-20-89



In case of damage by objects on the operating ground:

The edges of rubber track are often deformed largely due to a bumpy ground surface, stones and other objects, which cause extensive stress on the edges resulting in the damage. Especially, when a machine drives over concrete ridges, this type of damage easily occurs **[Figure 40-20-88]**.

In case of damage by interference with the machine frame

If a machine continues operating with rubber tracks being detracted, the rubber tracks may get caught up in the machine frame or undercarriage parts resulting in damage. Furthermore, when a machine travels along side slopes, the rubber tracks are deformed so much that they come into contact with the machine frame and undercarriage parts, which causes cutting, gouging and rubbing of rubber tracks in the end **[Figure 40-20-89]**.

Prevention:

When traveling, a machine operator should be careful not to drive over any projections on the ground. He should also prevent rubber tracks from coming into contact with concrete walls, ditches and ridges. If rubber tracks are detracted, the machine should be stopped immediately for retracting.

Bobcat®

Continued On Next Page

Continued On Next Page

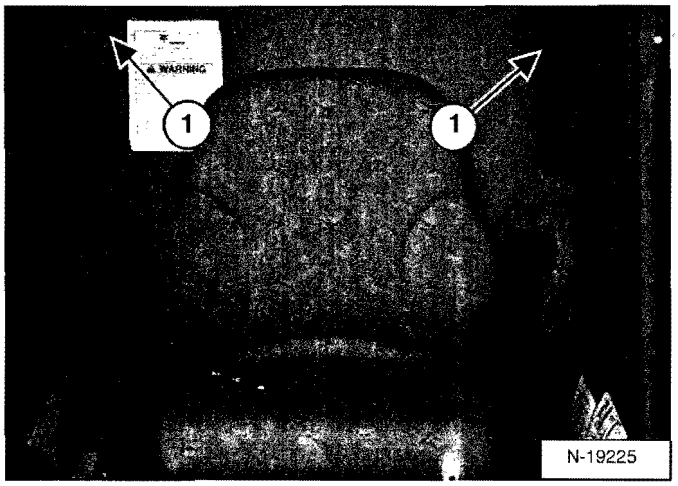
TIGHTEN ALL HARDWARE PER SIZE TO GRADE 5 TORQUE (SEE STANDARD TORQUE SPECIFICATIONS FOR BOLTS, SECTION SPEC-01) UNLESS OTHERWISE SPECIFIED.


Bobcat®

SEAT BAR

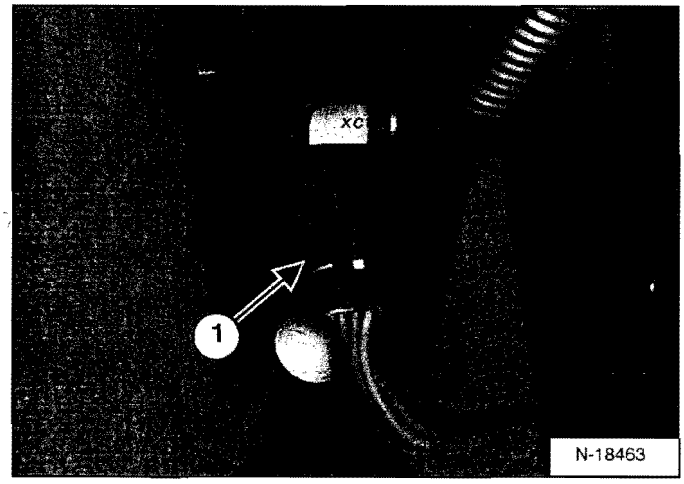
Removal And Installation

Figure 50-10-1



Raise the seat bar (Item 1) **[Figure 50-10-1]**.

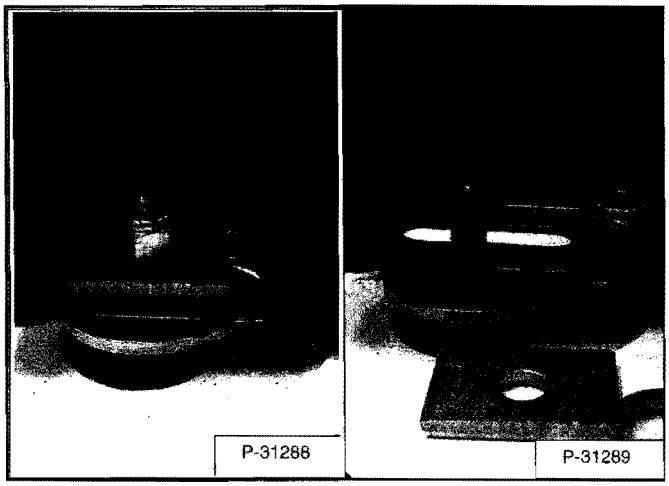
Figure 50-10-2



Disconnect the seat bar sensor (Item 1) **[Figure 50-10-2]** from the cab harness.

Lower the seat bar.

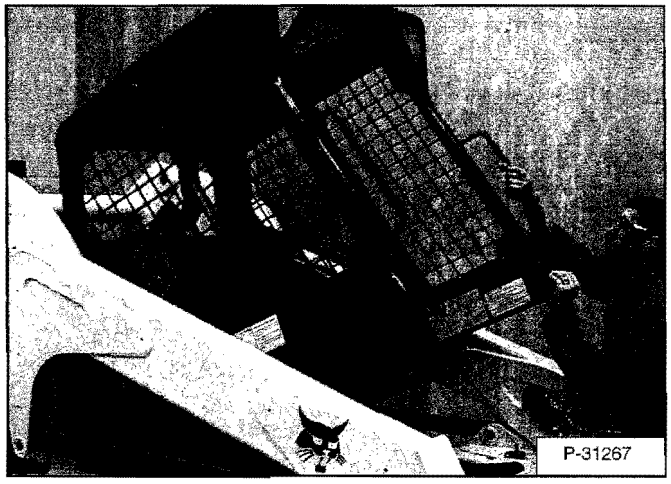
Figure 50-10-3



Loosen the nut (both sides) at the front corner of the operator cab **[Figure 50-10-3]**.

Remove the nuts and plates **[Figure 50-10-3]** (both sides).

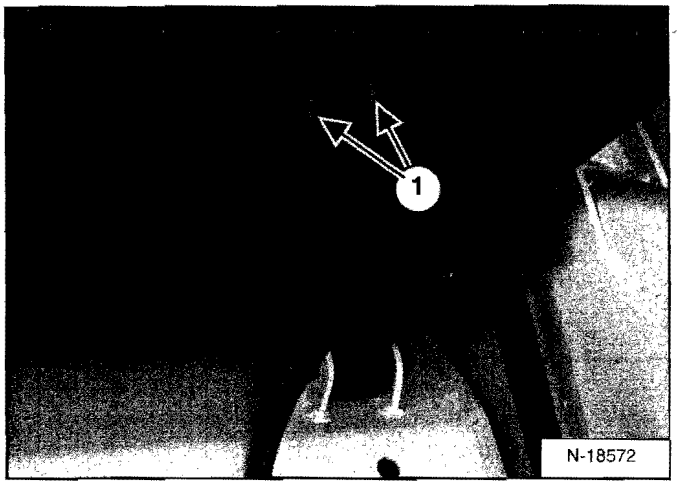
Figure 50-10-4



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

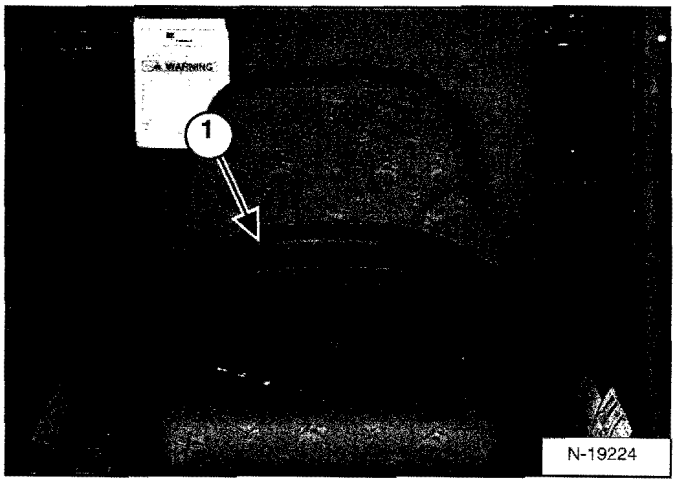


Remove the seat bar mounting nuts (Item 1) **[Figure 50-10-5]** (both sides).

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

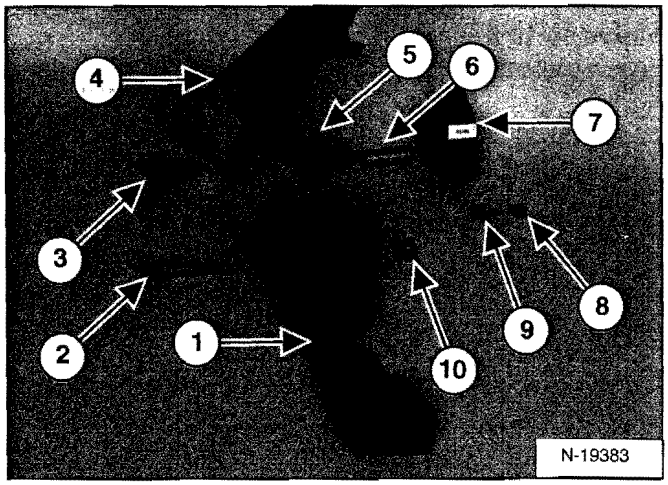
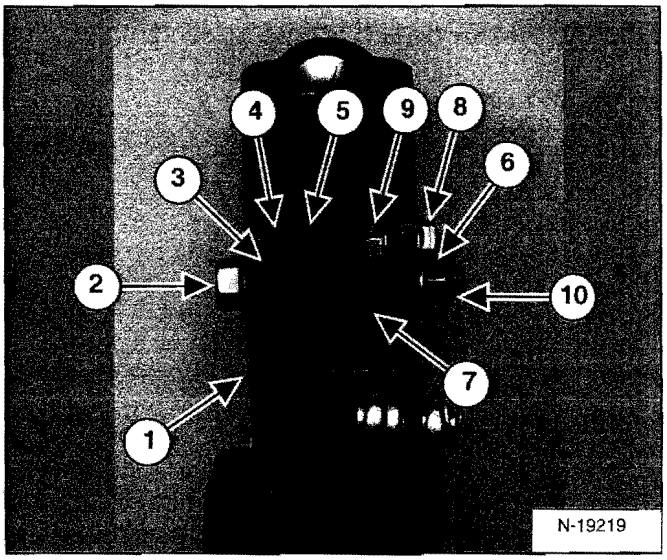


Figure 50-10-8



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 Busing 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)

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

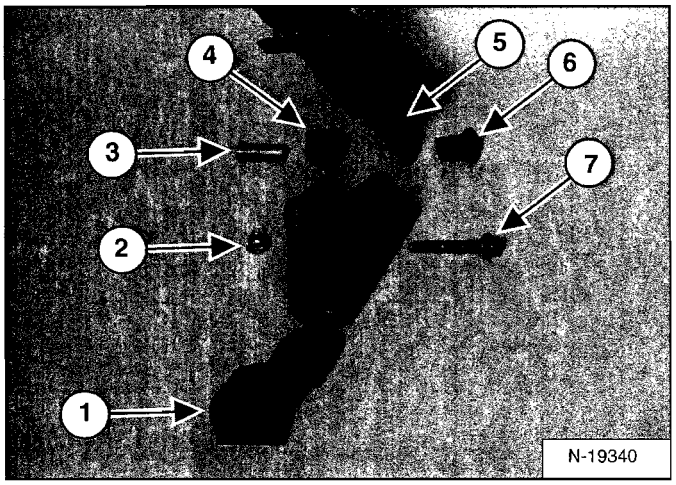
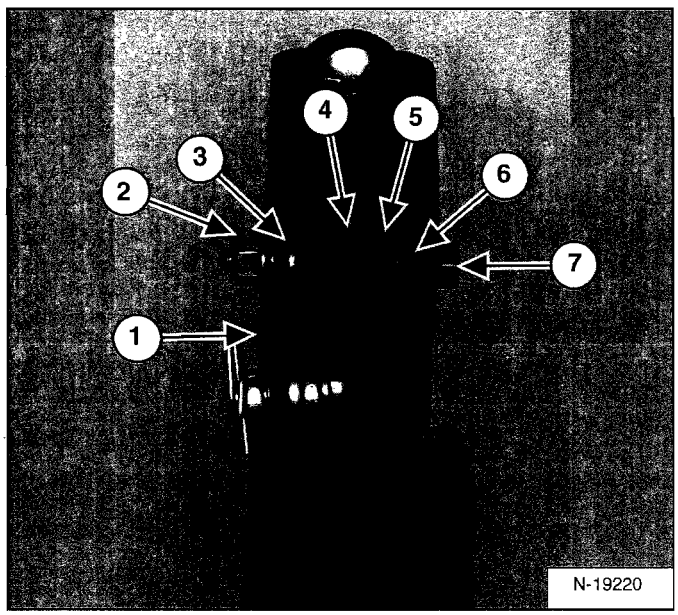


Figure 50-10-10



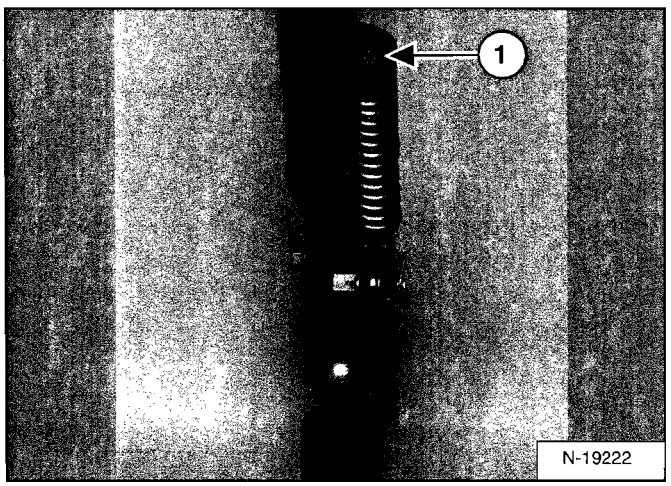
Assemble the parts as shown for the right side of the seat bar pivot assembly **[Figure 50-10-9]** & **[Figure 50-10-10]**.

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)

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

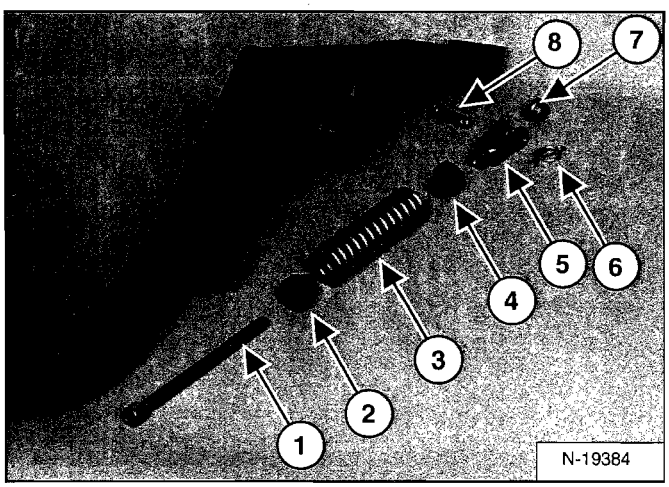


Turn the bolt (Item 1) **[Figure 50-10-11]** & **[Figure 50-10-12]** out of the clevis.

Assembly: Apply LOCTITE #518 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 #518 adhesive, thoroughly clean and dry affected parts before the application of LOCTITE #518.

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®

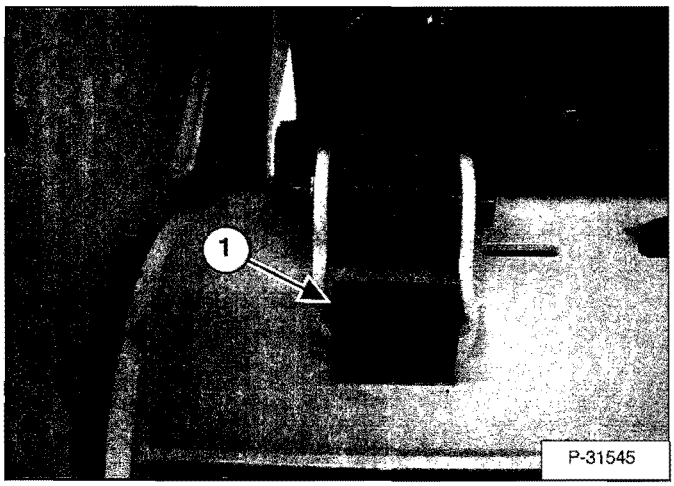
Gas Cylinder Removal And Installation

⚠ WARNING

Cylinder contains high pressure gas. Do not open. Opening cylinder can release rod and cause injury or death.

W-2113-0288

Figure 50-20-1

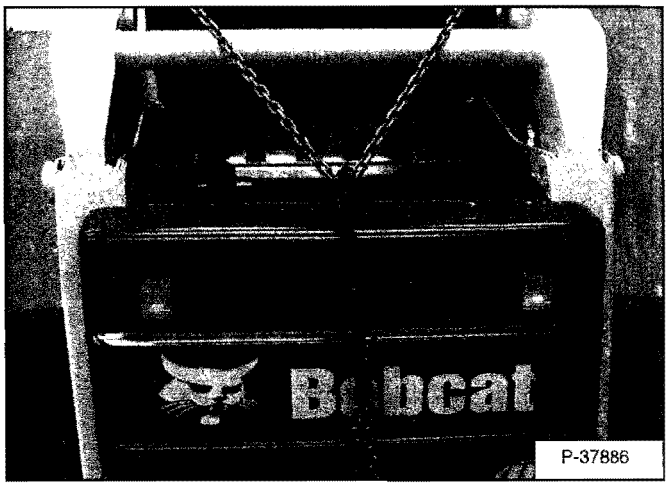


Remove the operator cab stop (Item 1) **[Figure 50-20-1]**. (Both sides.)

NOTE: Be careful not to break the rear window (if so equipped) when the cab is raised after the cab stops are removed.

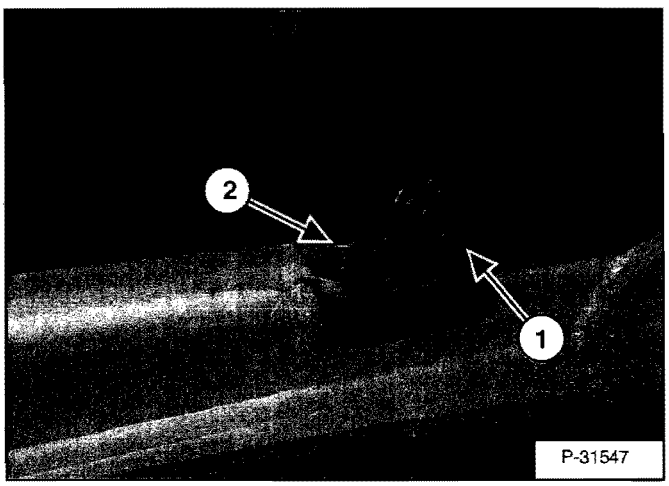
Raise the operator cab. (See Contents Page 10-01.)

Figure 50-20-2



Install a chain (Item 1) **[Figure 50-20-2]** from the operator cab to the loader main frame to prevent the cab from tipping forward when the gas cylinder(s) are removed.

Figure 50-20-3

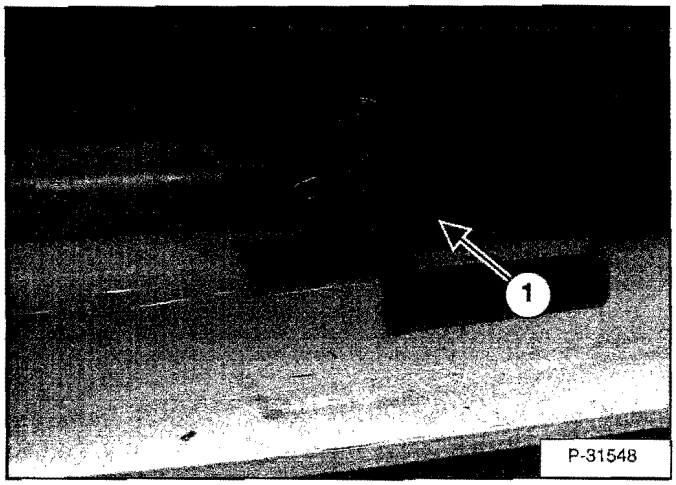


Remove the bolt (Item 1) **[Figure 50-20-3]** from the gas cylinder mounting bracket.

Loosen the mount bolt (Item 2) **[Figure 50-20-3]**.

Gas Cylinder Removal And Installation (Cont'd)

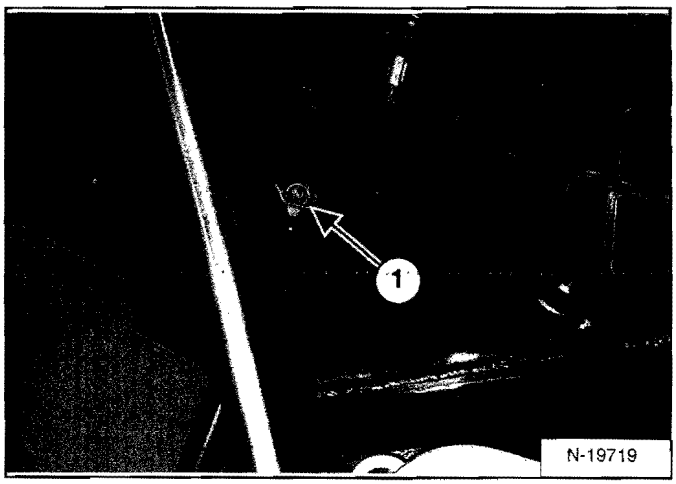
Figure 50-20-4



Turn the mounting bracket forward to relieve any remaining tension on the gas cylinder **[Figure 50-20-4]**.

Remove the mount bolt (Item 1) **[Figure 50-20-4]**.

Figure 50-20-5

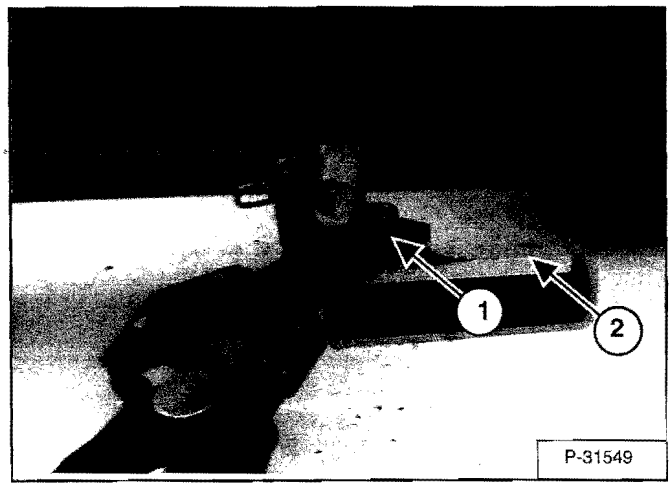


Remove the retainer clip (Item 1) **[Figure 50-20-5]** from the top pivot pin.

Remove the gas cylinder from the cab.

Repeat the procedure for the opposite side.

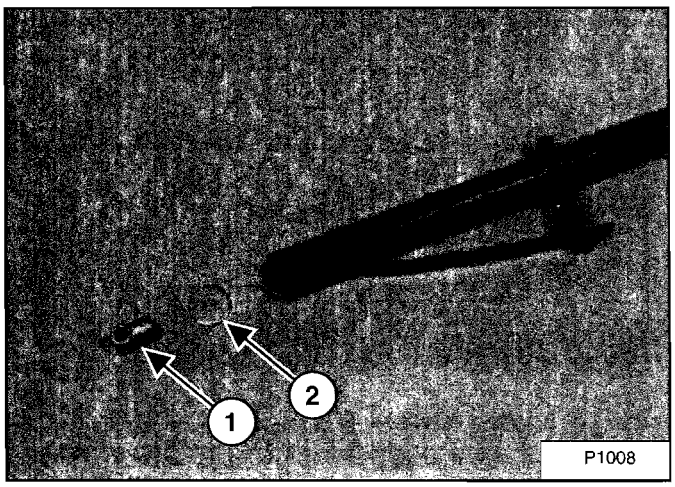
Figure 50-20-6



Installation: Mount the gas cylinder to the cab pivot pin **[Figure 50-20-5]**. Install the front mount bolt (Item 1) **[Figure 50-20-6]**. Use a locking pliers and turn the mount bracket to allign the bracket with the hole (Item 2) **[Figure 50-20-6]**. Install the bolt and tighten the mount bolts to 15-20 ft.-lbs. (20,3-27,1 Nm) torque.

Gas Cylinder Bracket Disassembly And Assembly

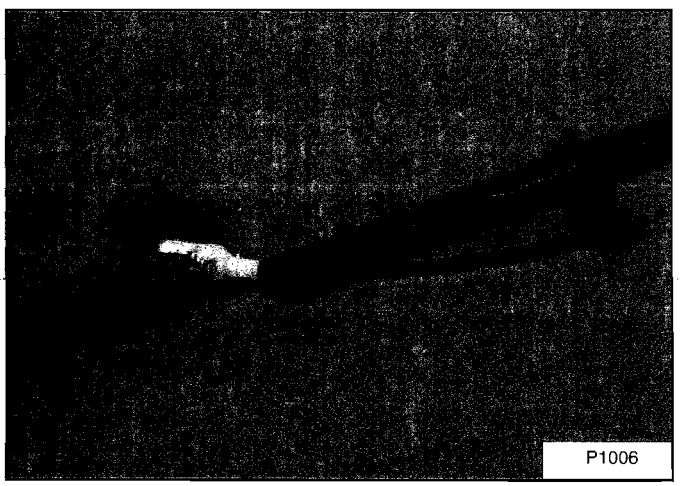
Figure 50-20-7



Remove the clevis (Item 1) and washer (Item 2) **[Figure 50-20-7]** from the end of the gas cylinder.

Remove the gas cylinder from the outer housing.

Figure 50-20-8



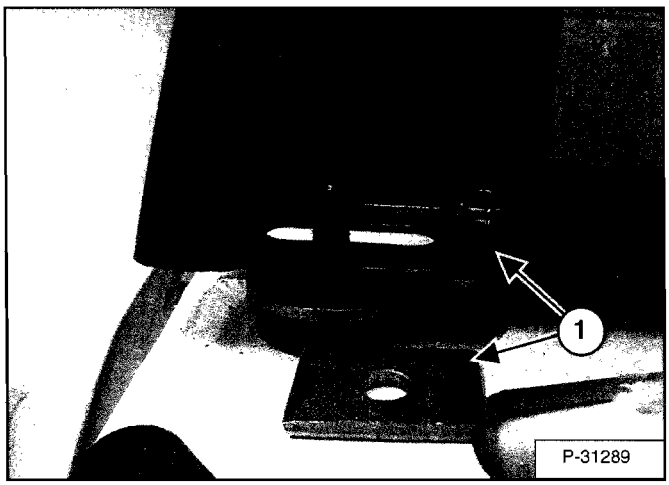
Assembly: Install a replacement cylinder inside the cylinder housing.

Apply a small amount of LOCTITE on the threads of the cylinder rod **[Figure 50-20-8]**.

Reinstall the washer and clevis on the cylinder rod.

Removal And Installation

Figure 50-20-9

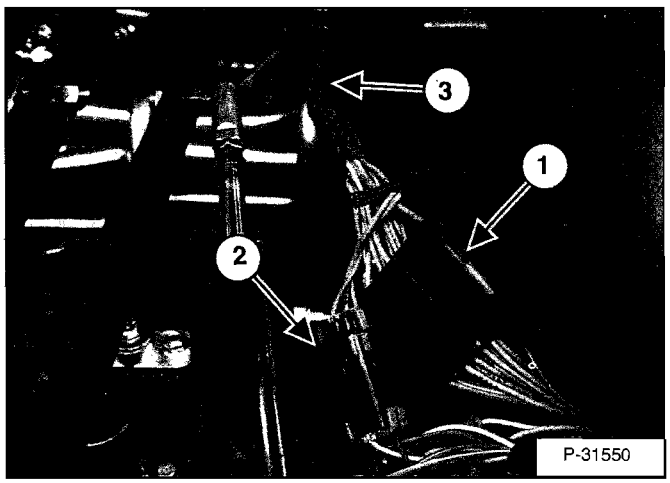


Remove the cab nut and holddown plate (Item 1) **[Figure 50-20-9]** (both sides).

Installation: Tighten the nut to 40-50 ft.-lbs. (54-68 Nm) torque.

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

Figure 50-20-10

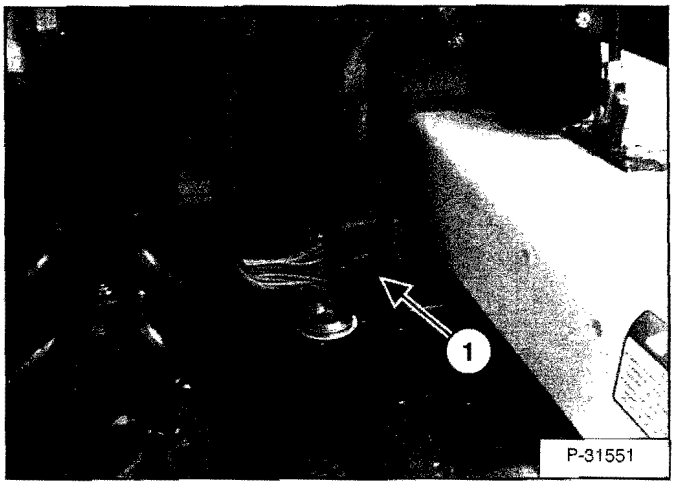


Disconnect the two wiring harness connectors (Items 1 & 2) **[Figure 50-20-10]**.

Remove the tie-straps (Item 3) **[Figure 50-20-10]** from the wiring harness.

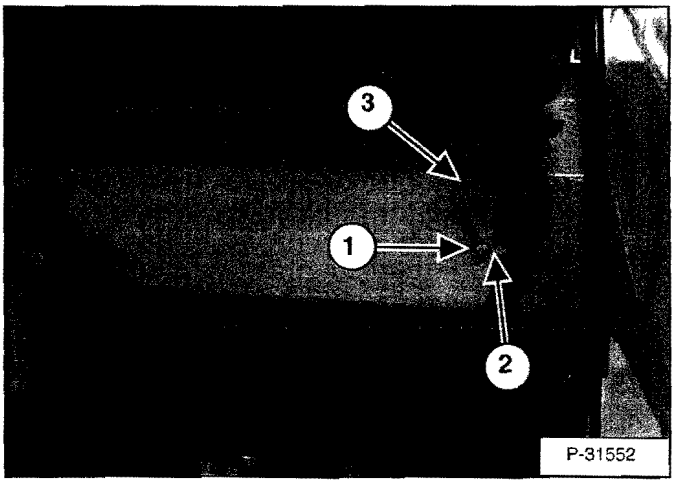
Removal And Installation (Cont'd)

Figure 50-20-11



Disconnect the electrical connector (Item 1) **[Figure 50-20-11]**.

Figure 50-20-12

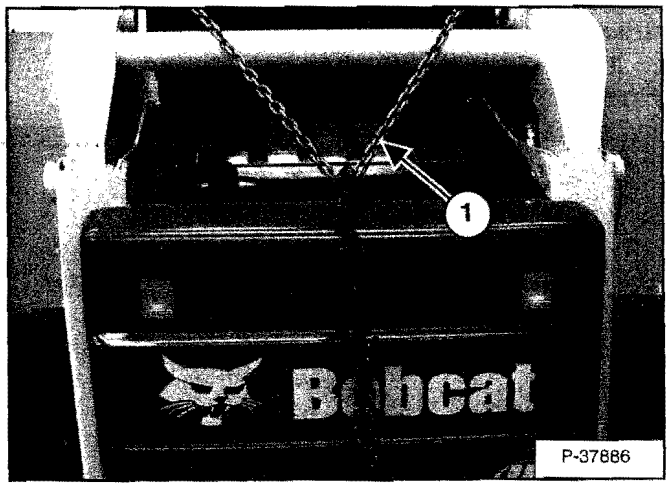


Remove the mount bolt (Item 1) from the wire harness mount bracket (Item 2) and ground strap (Item 3) **[Figure 50-20-12]**.

Remove the tie-straps from the wiring harness.

Position the wiring harness, so that it does not get damaged when the cab is removed.

Figure 50-20-13

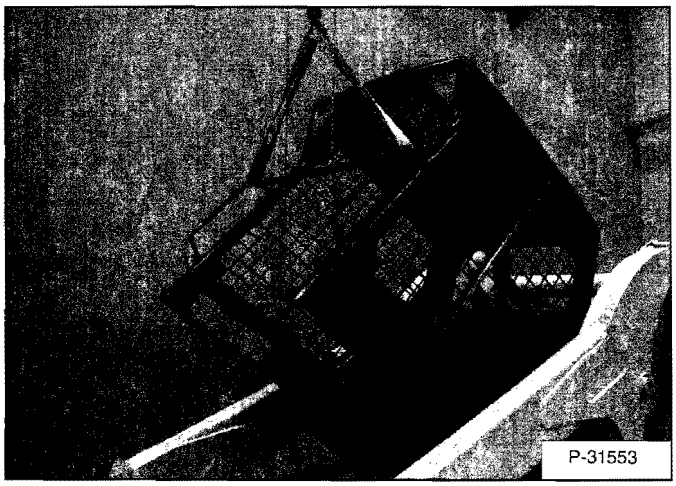


Install a chain (Item 1) **[Figure 50-20-13]** from the operator cab to the loader main frame to prevent the cab from tipping forward when the gas cylinders are removed.

Remove both gas cylinders. (See Gas Cylinder Removal And Installation on Page 50-20-1.)

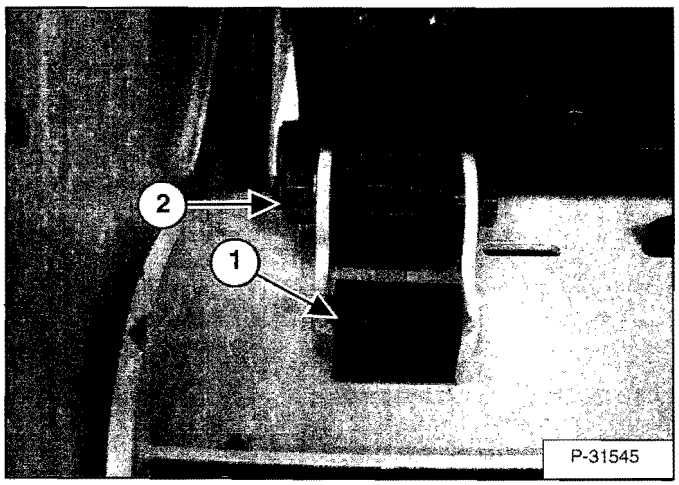
Removal And Installation (Cont'd)

Figure 50-20-14



Connect a sling and chain hoist to the operator cab grab handles and lower (or raise) the operator cab when the gas cylinders are disconnected **[Figure 50-20-14]**.

Figure 50-20-15



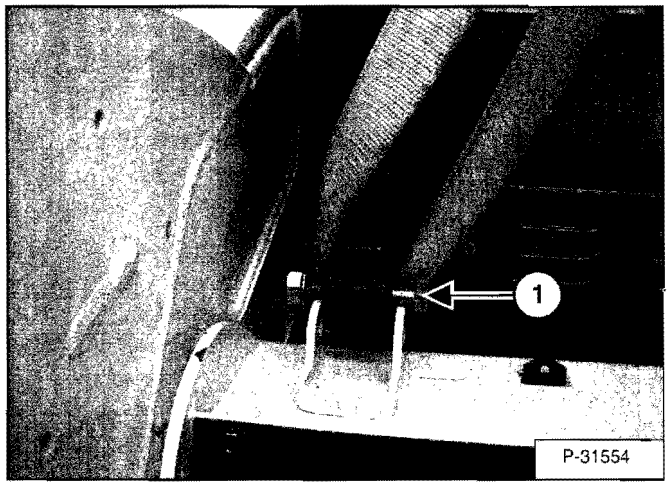
Remove the operator cab stop (Item 1) **[Figure 50-20-15]**.

Remove the nut (Item 2) **[Figure 50-20-15]** from the pivot bolt (both sides).

Installation: Tighten the pivot bolt and nut to 25-35 ft.-lbs. (34-47 Nm) torque.

Remove the pivot bolt (both sides).

Figure 50-20-16

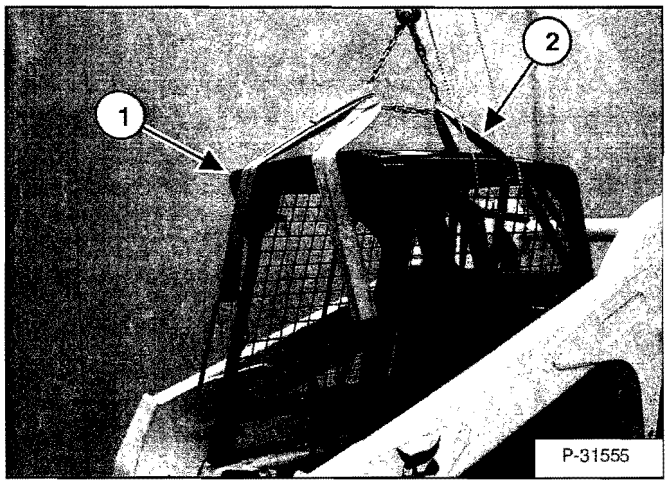


Move the operator cab forward a small amount for clearance at the pivot mounting brackets **[Figure 50-20-16]**.

Install the pivot bolt, washer and nut (Item 1) **[Figure 50-20-16]** in the cab pivot (both sides).

Install the sling under the pivot bolt and pivot of the operator cab **[Figure 50-20-16]**.

Figure 50-20-17



Connect the slings (Items 1 & 2) **[Figure 50-20-17]** to a chain hoist.

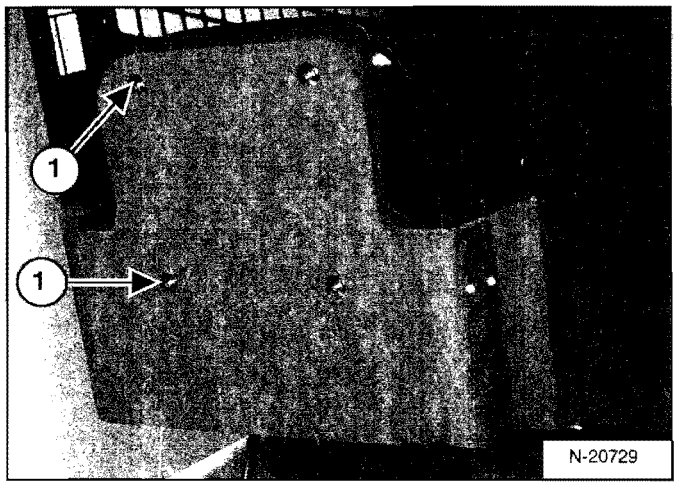
Remove the operator cab from the loader **[Figure 50-20-17]**.

Bobcat®

OPERATOR SEAT

Removal And Installation

Figure 50-30-1



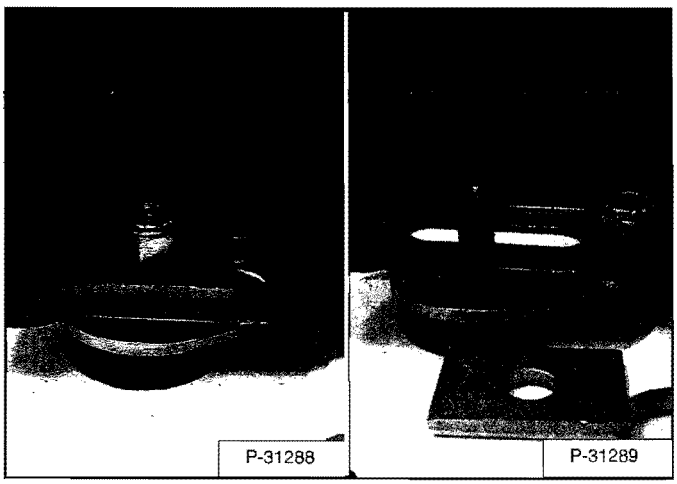
Raise the operator cab. (See Contents Page 10-01.)

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



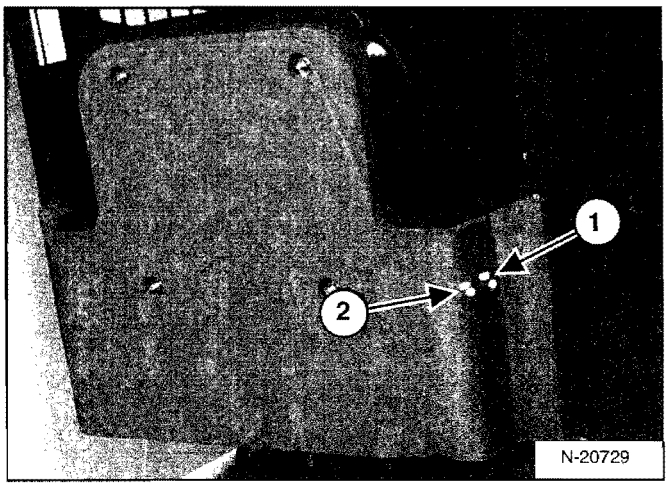
Lower the cab and install one of the mounting washer and nut **[Figure 50-30-2]**.

NOTE: With the seat removed the cab will raise.

Reverse the removal procedure to install the operator seat.

Seat Belt Removal And Installation

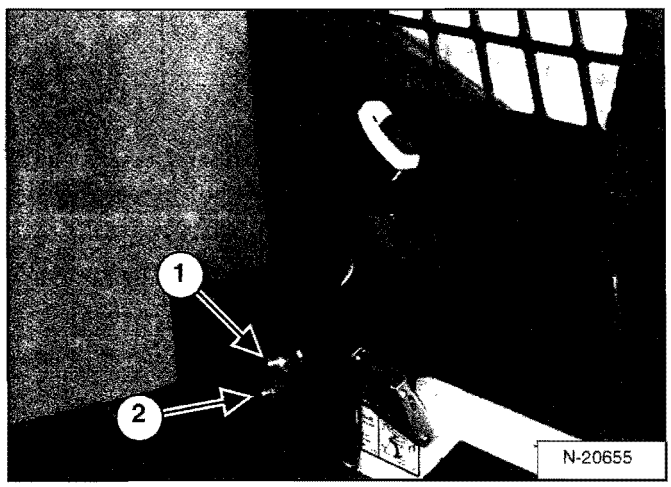
Figure 50-30-3



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.

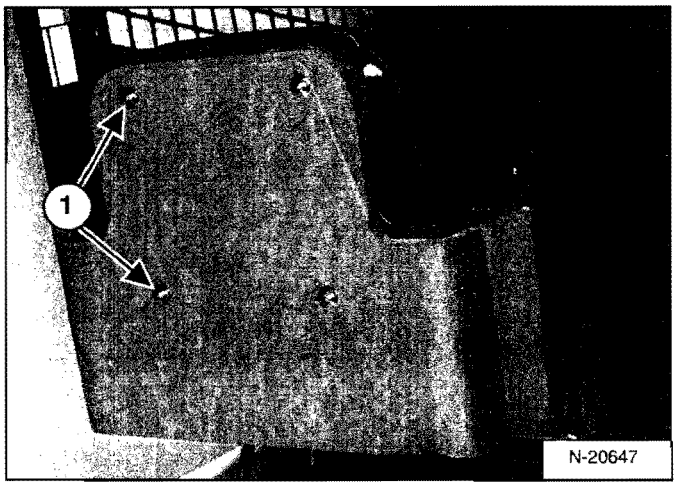
Repeat for other half of seat belt and guide.

Bobcat®

OPERATOR SEAT (SUSPENSION)

Removal And Installation

Figure 50-31-1

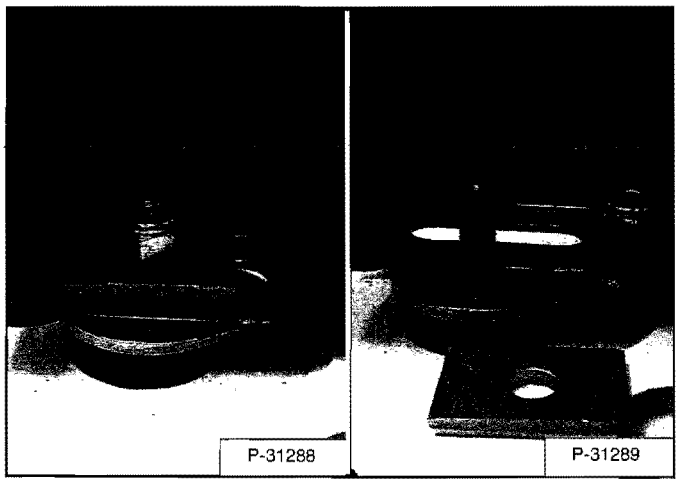


Raise the operator cab. (See Contents Page 10-01.)

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

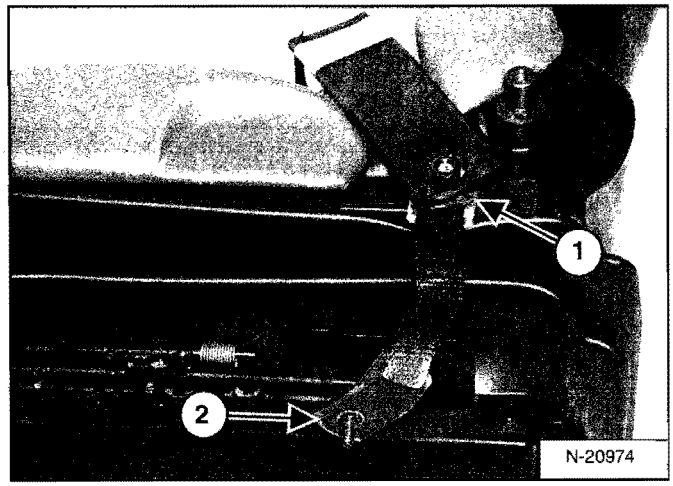


Lower the cab and install one of the mounting washer and nut **[Figure 50-31-2]**.

NOTE: With the seat removed the cab will raise.

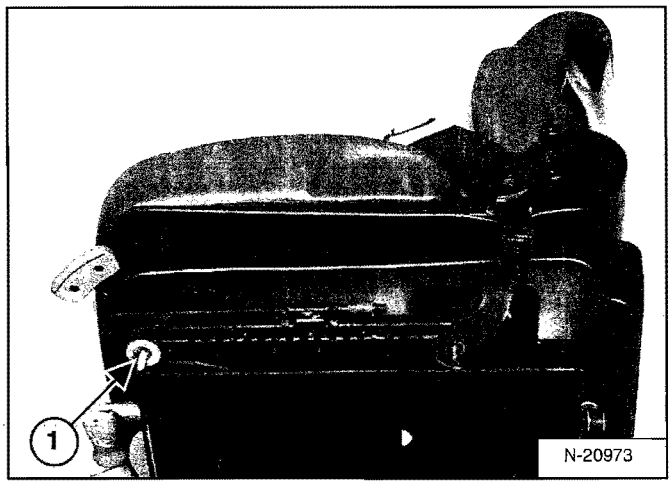
Reverse the removal procedure to install the operator seat.

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].

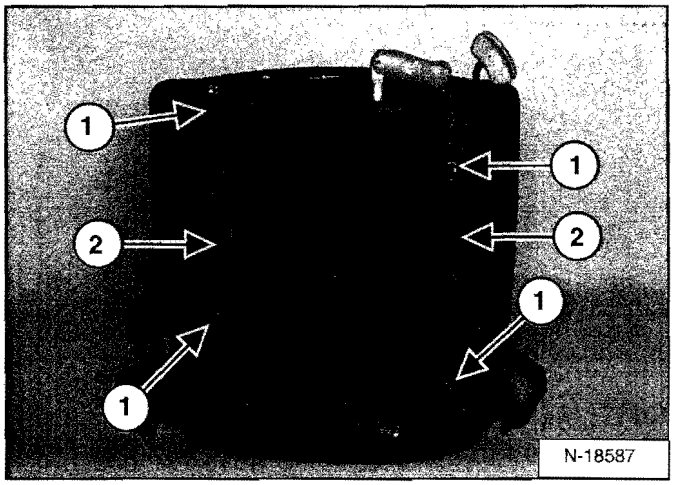
Figure 50-31-4



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 Contents Page 50-01.)

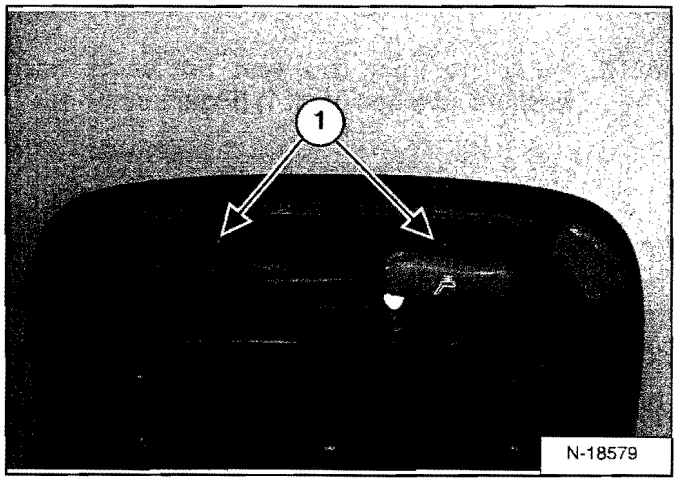
Remove the two slide rail mounting bolts (Item 1) **[Figure 50-31-5]**.

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

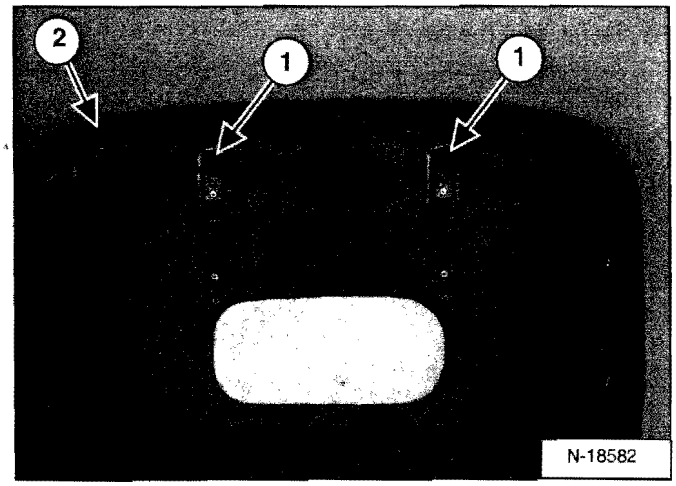
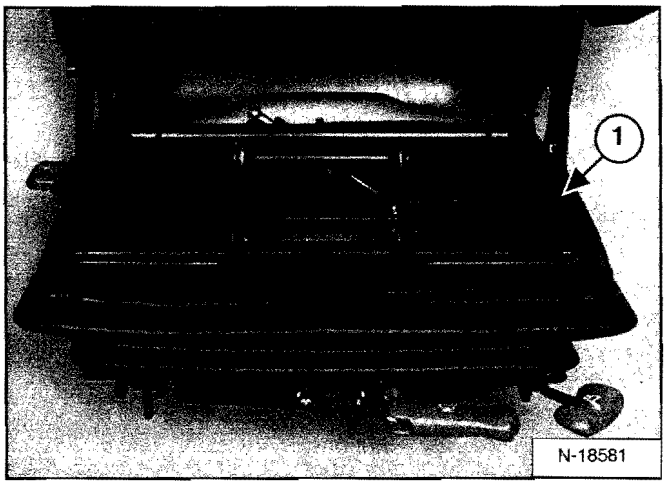


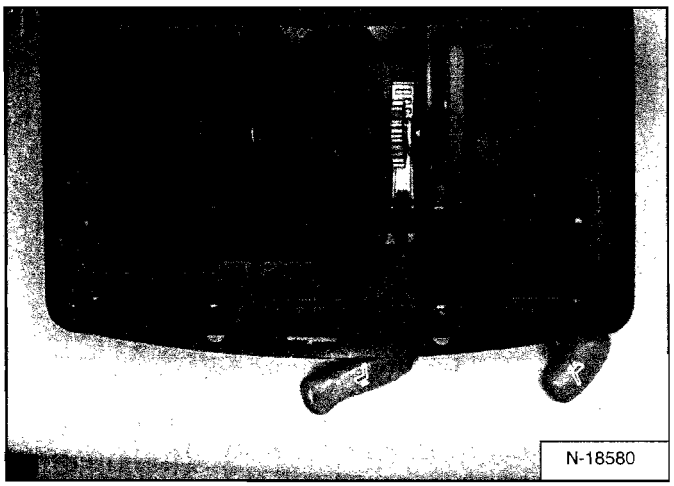
Figure 50-31-8



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

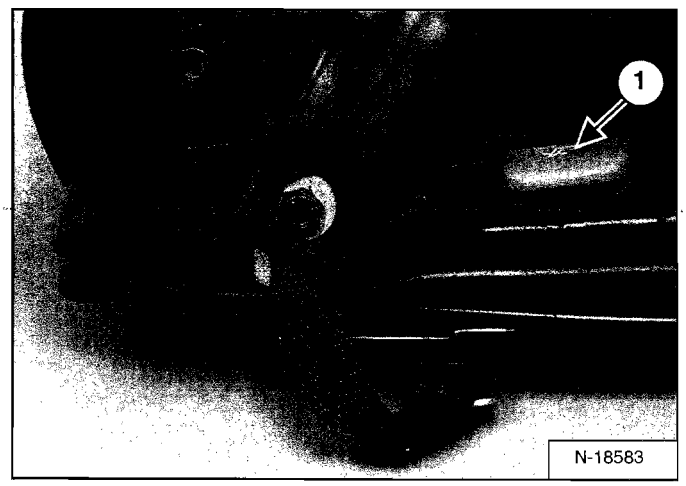


Inspect the seat ride adjustment **[Figure 50-31-9]**.

Reverse the removal procedure to install the operator seat back.

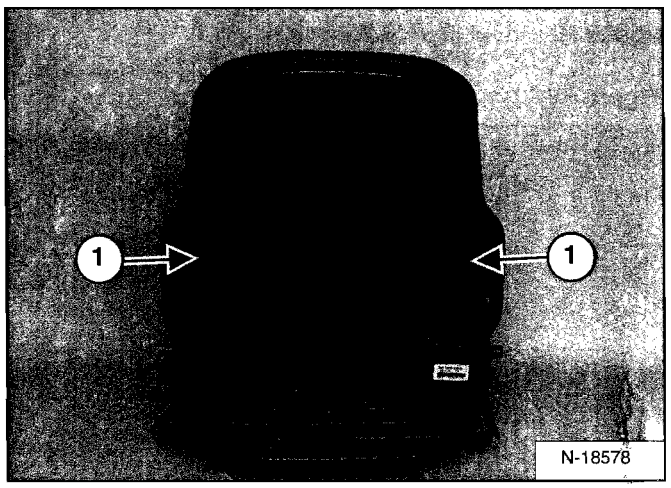
Back Removal And Installation

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

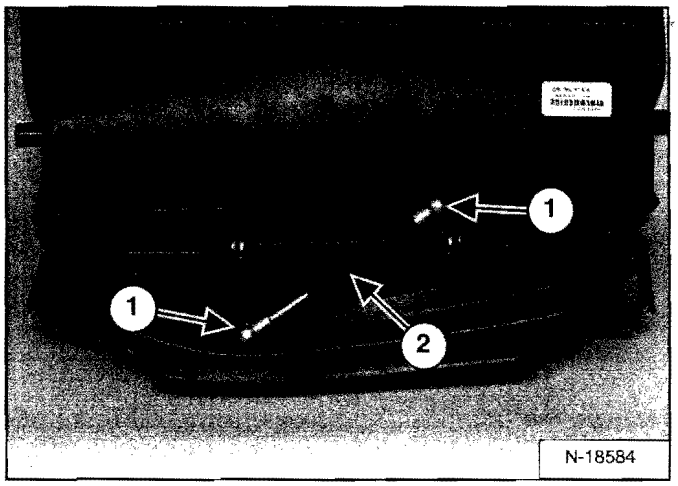
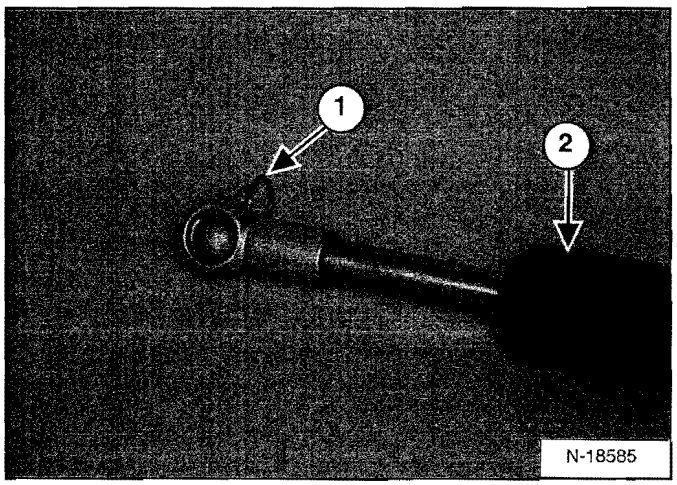


Figure 50-31-13



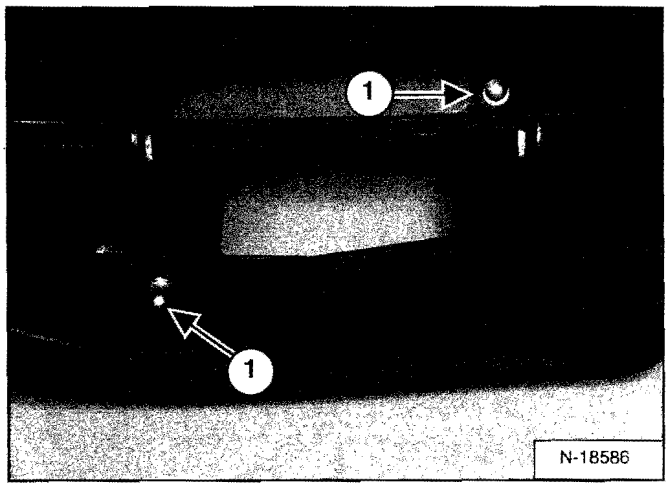
Raise the operator cab. (See Contents Page 10-01.)

Remove the operator seat. (See Contents Page 50-01.)

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



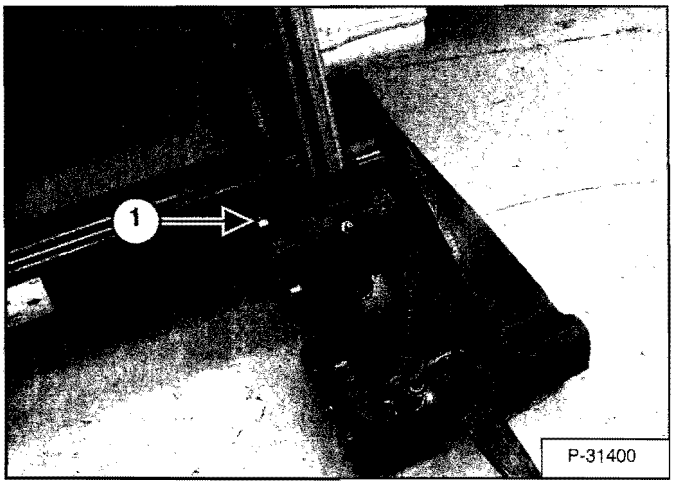
NOTE: The seat block mounting studs (Item 1) [Figure 50-31-14] are replaceable.

Reverse the removal procedure to install the operator seat shock.

BOB-TACH

Removal And Installation

Figure 50-40-1



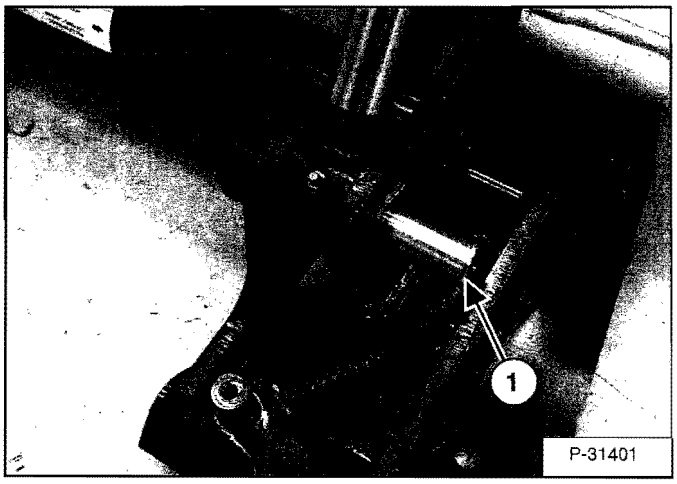
Tilt the Bob-Tach forward, so it is parallel to the floor. Put blocks (approximately 3 inches) under each side of the Bob-Tach **[Figure 50-40-1]**.

Lower the Bob-Tach onto the blocks.

Remove the retainer nut (Item 1) **[Figure 50-40-1]** and bolt from the tilt cylinder rod end pin (both sides).

Installation: Tighten the retainer bolt and nut to 18-20 ft.-lbs. (24-27 Nm) torque.

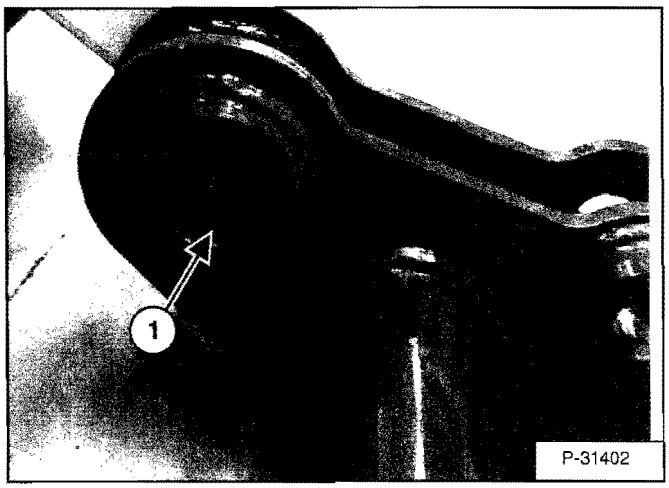
Figure 50-40-2



Remove the pivot pin (Item 1) **[Figure 50-40-2]** from the tilt cylinder rod end (both sides).

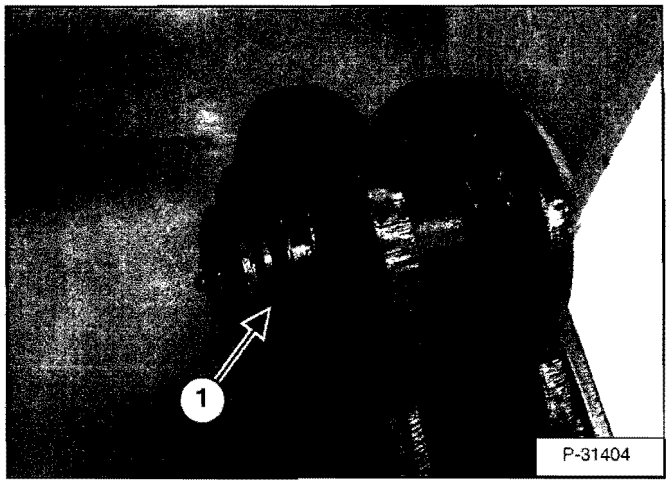
Remove the tilt cylinder rod end from the Bob-Tach (both sides).

Figure 50-40-3



Remove the snap ring (Item 1) **[Figure 50-40-3]** from the Bob-Tach pivot pin grease plug (both sides).

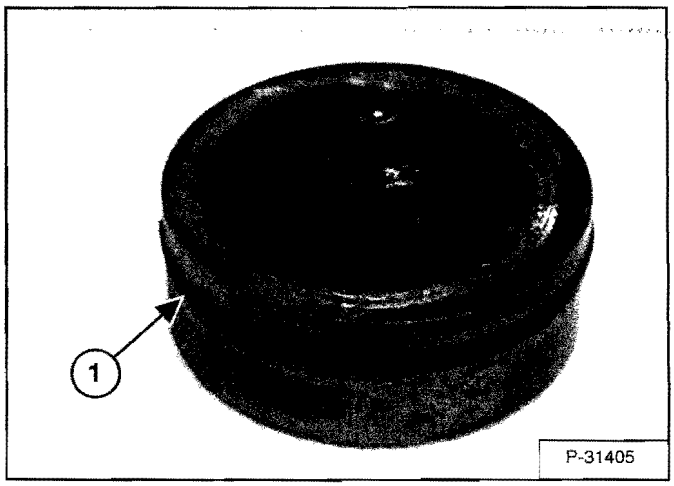
Figure 50-40-4



Use a grease gun and pump grease into the pivot pin forcing the grease plug out of the Bob-Tach (Item 1) **[Figure 50-40-4]**.

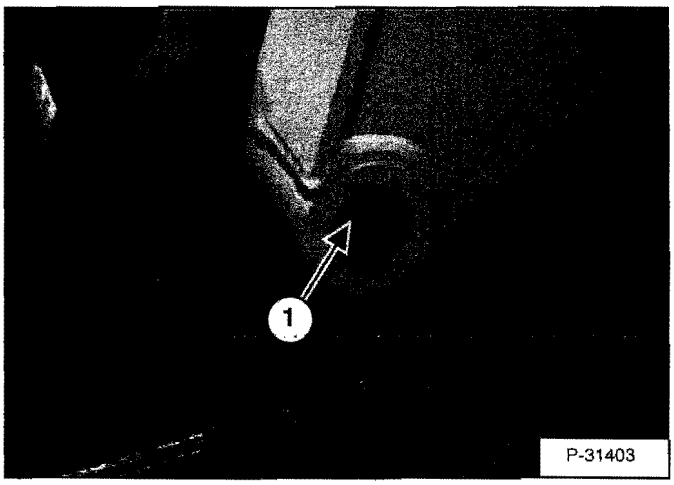
Removal And Installation (Cont'd)

Figure 50-40-5



Check and replace O-ring (Item 1) **[Figure 50-40-5]** on the grease plug.

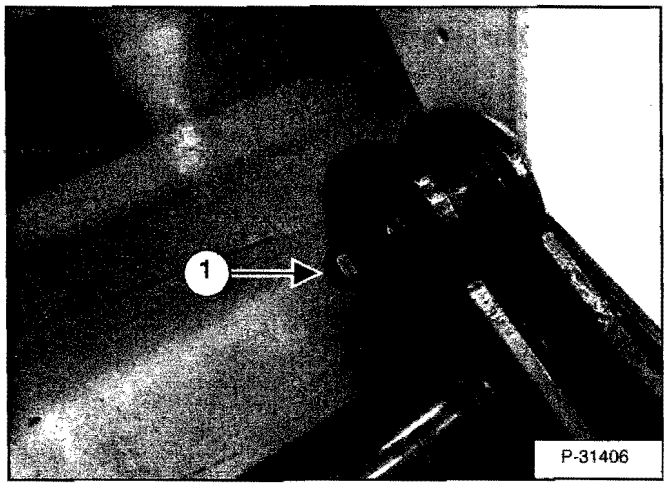
Figure 50-40-6



Remove the nut (Item 1) **[Figure 50-40-6]** from the Bob-Tach pivot pin retaining bolt (both sides).

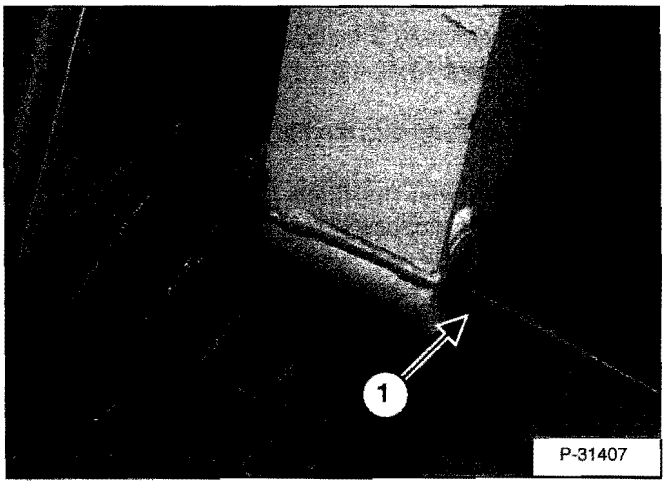
Installation: Tighten the retainer nut and bolt to 190 ft.-lbs. (258 Nm) torque.

Figure 50-40-7



Remove the retainer bolt (Item 1) **[Figure 50-40-7]** from the Bob-Tach pin.

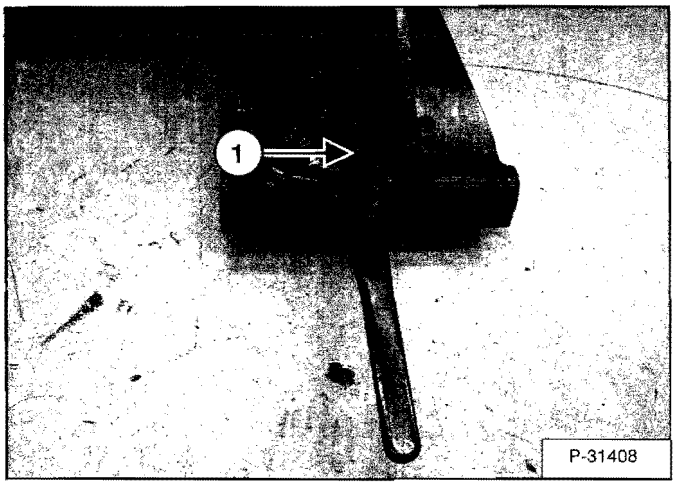
Figure 50-40-8



With a 7/8" (.875 mm) drift (Item 1) **[Figure 50-40-8]** and a hammer, drive the pivot pin out of the lift arm & Bob-Tach.

Bob-Tach Lever And Wedge

Figure 50-40-9

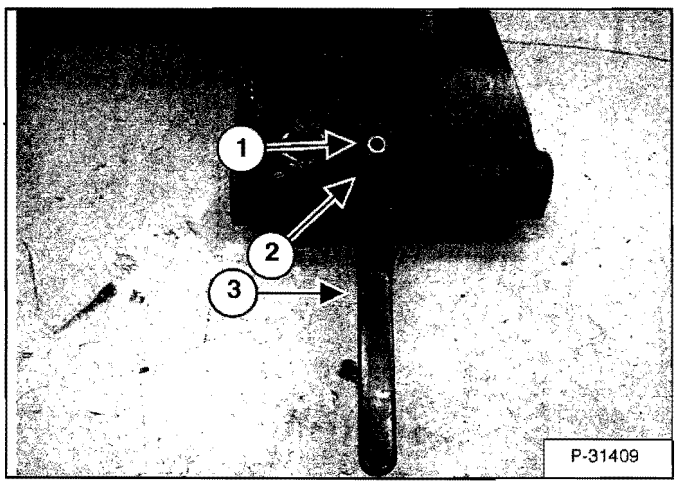


Tilt the Bob-Tach forward, so it is parallel to the floor. Put blocks (approximately 3 inches) under each side of the Bob-Tach **[Figure 50-40-9]**.

Remove the nut (Item 1) **[Figure 50-40-9]** from the Bob-Tach lever pivot bolt.

NOTE: Removal procedure is shown for the left side. Right side procedure is the same.

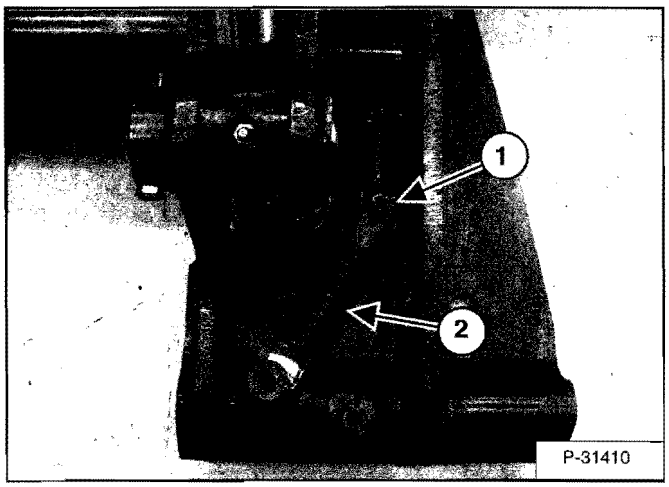
Figure 50-40-10



Remove the lever mounting washer (Item 1), spring (Item 2) and lever (Item 3) **[Figure 50-40-10]**.

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

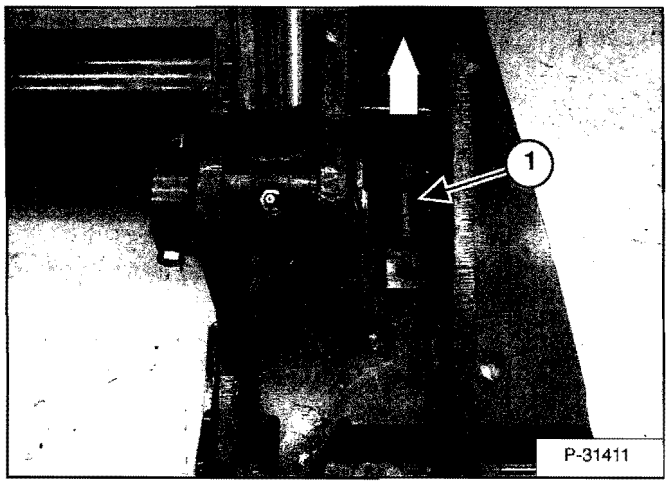
Figure 50-40-11



Use a punch and hammer, remove the roll pin (Item 1) **[Figure 50-40-11]** from the Bob-Tach wedge and spring clevis.

Remove the spring/clevis (Item 2) **[Figure 50-40-11]** assembly.

Figure 50-40-12

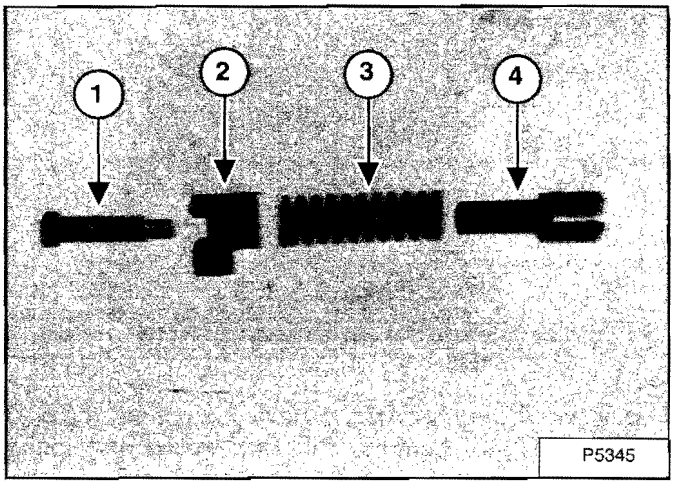


Remove the wedge (Item 1) **[Figure 50-40-12]** out of the bottom of the Bob-Tach

Always replace bent or broken wedges.

Bob-Tach Lever And Wedge (Cont'd)

Figure 50-40-13



If the bolt (Item 1), handle pivot (Item 2), spring (Item 3) or clevis (Item 4) **[Figure 50-40-13]** are damaged, put the assembly in a vise.

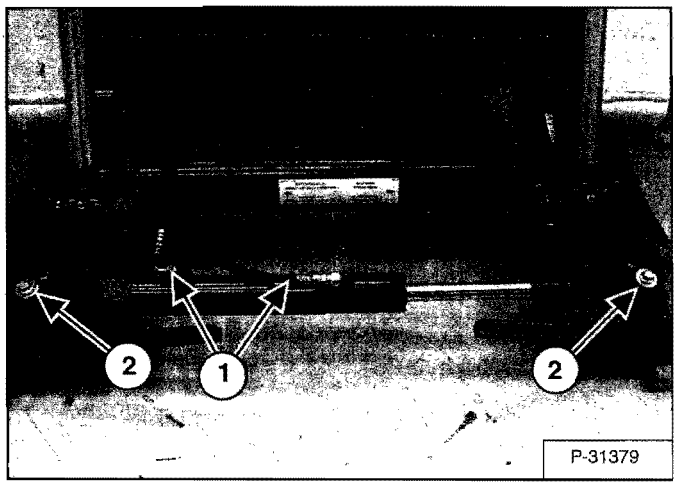
Remove the bolt and replace the damaged parts as needed,

Reverse the removal procedure to install the Bob-Tach lever and wedge.

POWER BOB-TACH

Removal And Installation

Figure 50-41-1



Tilt the Bob-Tach forward, so it is parallel to the floor. Put 2x4 blocks under each side of the Bob-Tach **[Figure 50-41-1]**.

Lower the Bob-Tach onto the blocks.

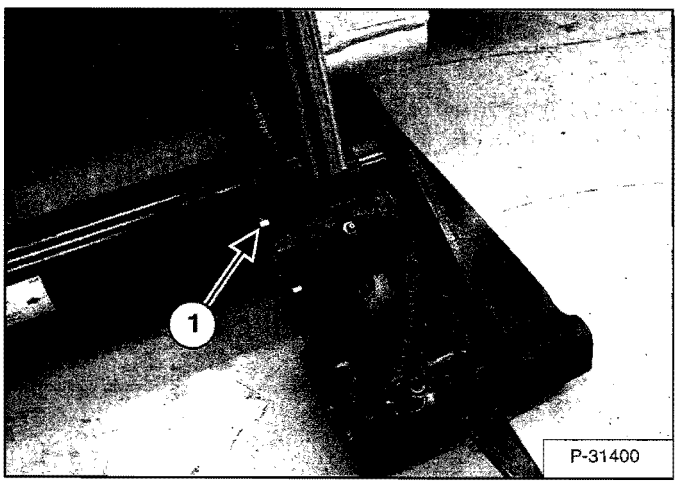
Mark the hoses (Item 1) **[Figure 50-41-1]** for correct installation.

Remove the hoses from the cylinder fittings.

Remove the mount bolt (Item 2) **[Figure 50-41-1]** from the cylinder (both ends).

Remove the cylinder from the Bob-Tach.

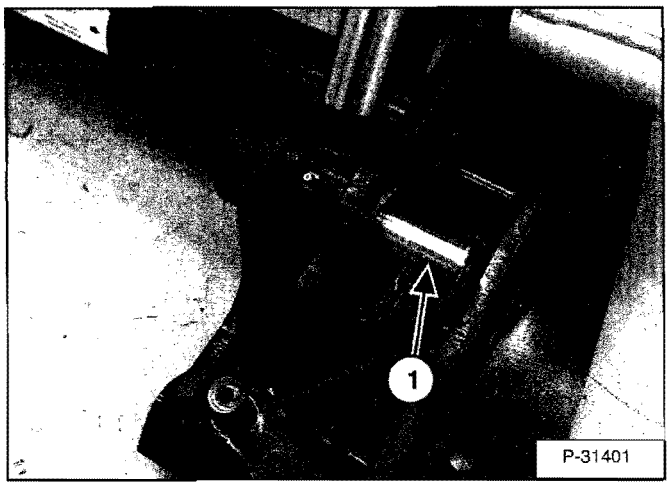
Figure 50-41-2



Remove the retainer nut and bolt (Item 1) **[Figure 50-41-2]** from the tilt cylinder rod end pin (both sides).

Installation: Tighten the retainer nut to 18-20 ft.-lbs. (24-27 Nm) torque.

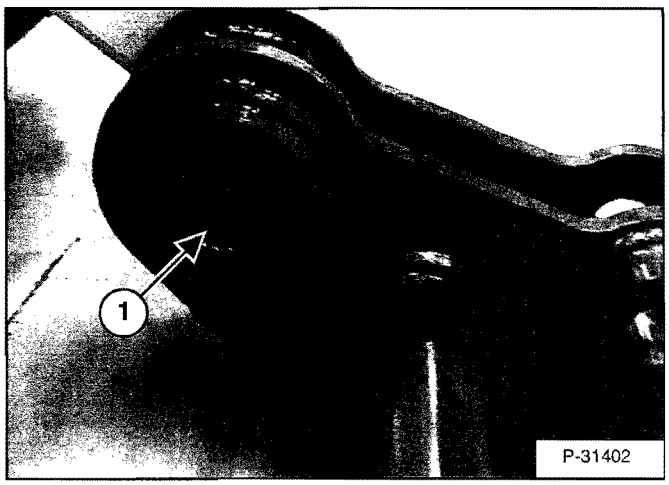
Figure 50-41-3



Remove the pivot pin (Item 1) **[Figure 50-41-3]** from the tilt cylinder rod end (both sides).

Remove the tilt cylinder rod end from the Bob-Tach (both sides).

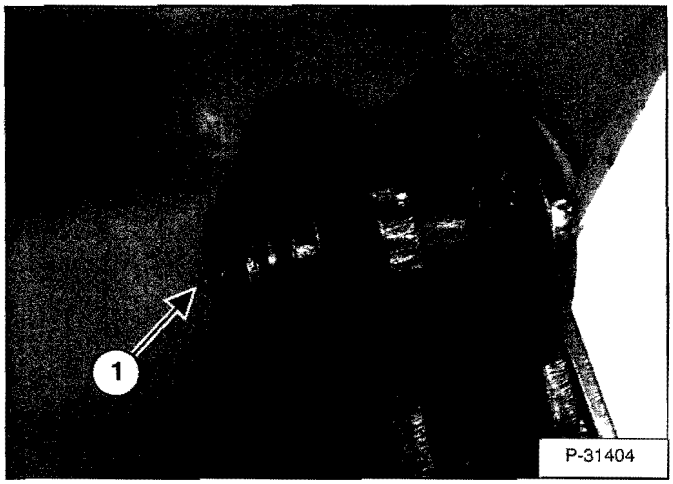
Figure 50-41-4



Remove the snap ring (Item 1) **[Figure 50-41-4]** at the Bob-Tach pivot pin grease plug (both sides).

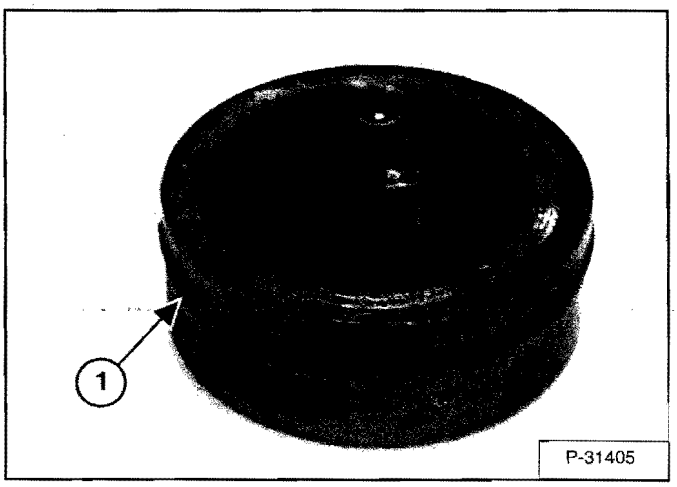
Removal And Installation (Cont'd)

Figure 50-41-5



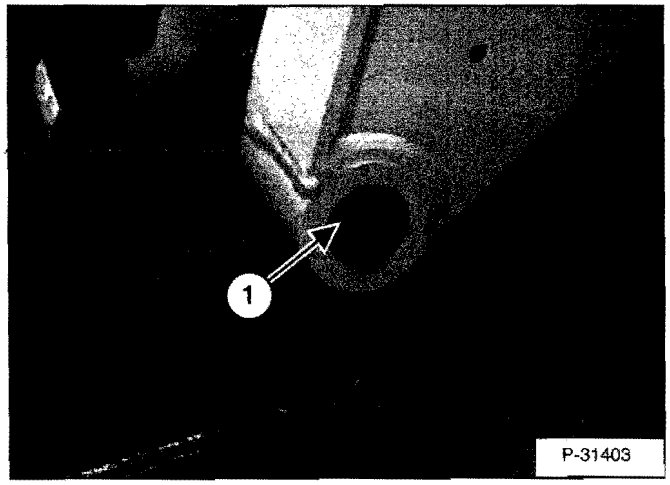
Use a grease gun and pump grease into the pivot pin forcing the grease plug out of the Bob-Tach (Item 1) **[Figure 50-41-5]** (both sides).

Figure 50-41-6



Check and replace the O-ring (Item 1) **[Figure 50-41-6]** on the grease plug.

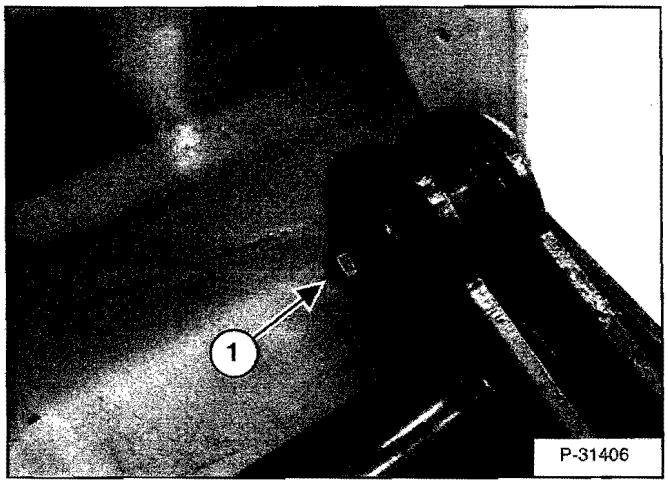
Figure 50-41-7



Remove the nut (Item 1) **[Figure 50-41-7]** from the Bob-Tach pivot pin retaining bolt (both sides).

Installation: Tighten the retainer nut and bolt to 190 ft.-lbs. (258 Nm) torque.

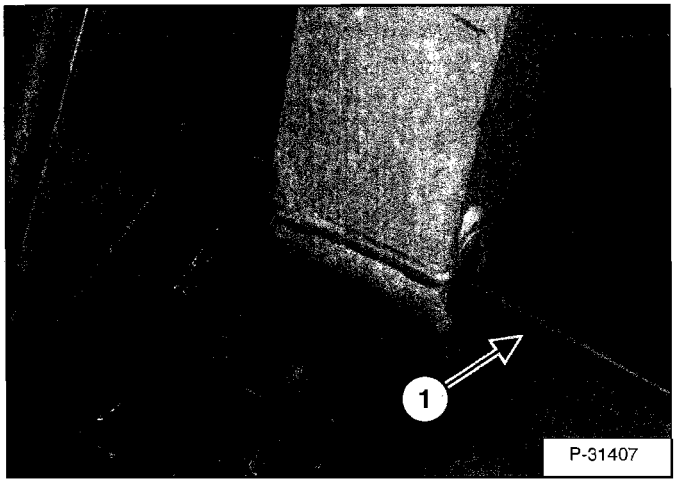
Figure 50-41-8



Remove the retainer bolt (Item 1) **[Figure 50-41-8]** from the Bob-Tach pivot pin (both sides).

Removal And Installation (Cont'd)

Figure 50-41-9

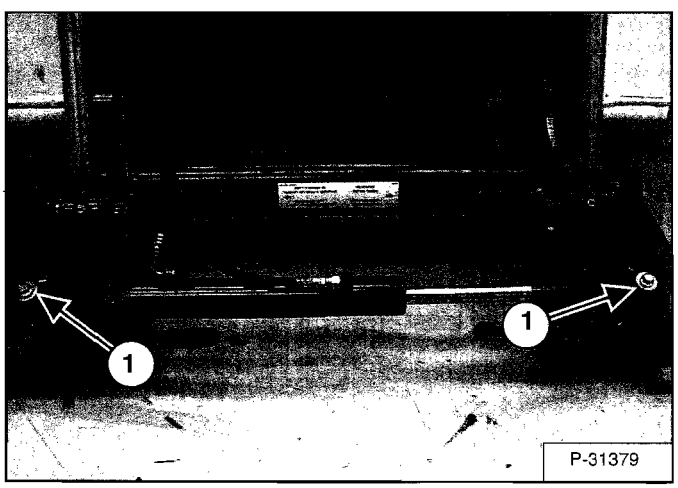


With a 7/8" (.875 mm) drift (Item 1) **[Figure 50-41-9]** and a hammer, drive the pivot pin out of the lift arm and Bob-Tach (both sides).

Remove the Bob-Tach from the loader.

Power Bob-Tach Lever And Wedge

Figure 50-41-10

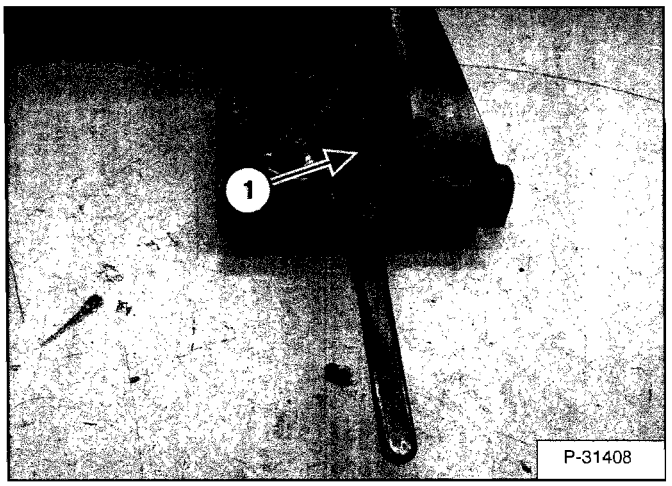


Remove the washers and bolts (Item 1) **[Figure 50-41-10]** (both ends of the cylinder).

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

Remove the cylinder from the lever pivots.

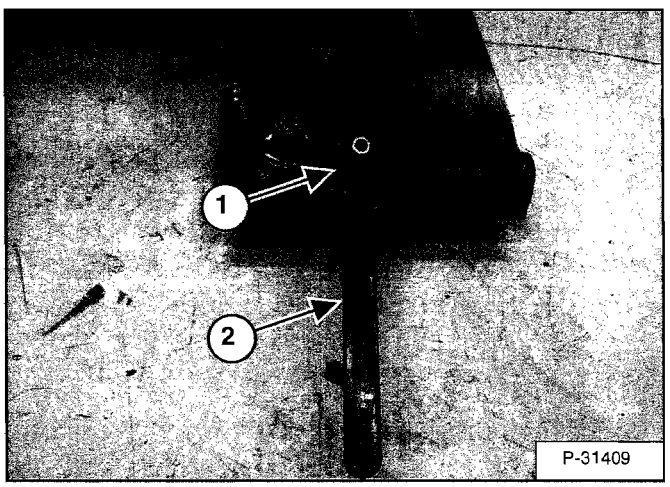
Figure 50-41-11



Remove the lever mounting nut (Item 1) **[Figure 50-41-11]**.

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

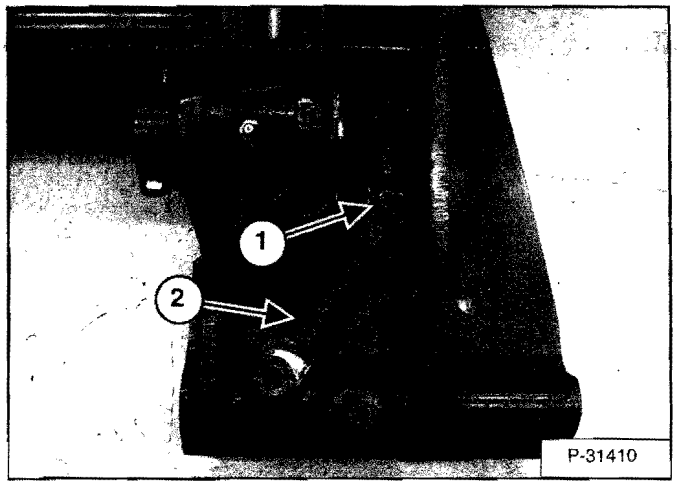
Figure 50-41-12



Remove the washer and spring, (Item 1) and the lever assembly (Item 2) **[Figure 50-41-12]**.

Power Bob-Tach Lever And Wedge (Cont'd)

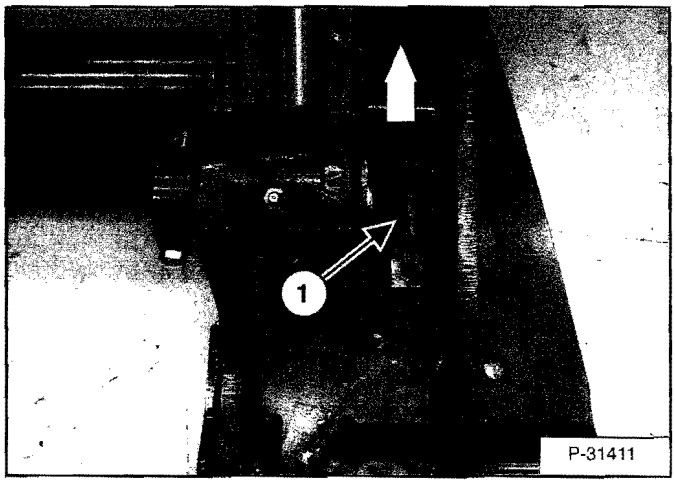
Figure 50-41-13



Use a punch and hammer to remove the roll pin (Item 1) **[Figure 50-41-13]** from the Bob-Tach Wedge and spring clevis.

Remove the spring clevis assembly (Item 2) **[Figure 50-41-13]**.

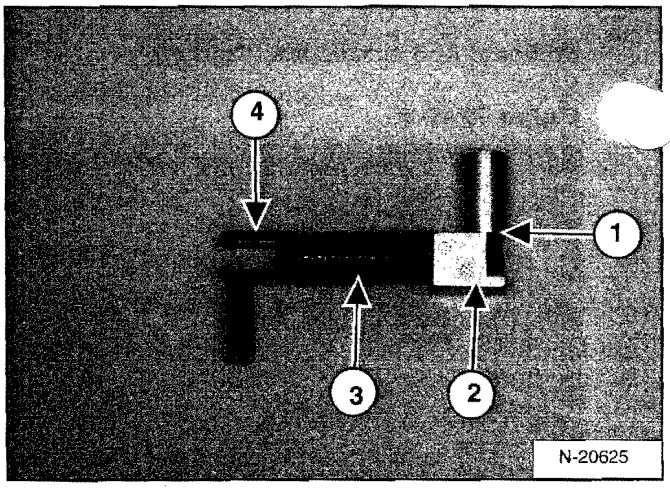
Figure 50-41-14



Remove the wedge (Item 1) **[Figure 50-41-14]** out of the bottom of the Bob-Tach.

Always replace bent or broken wedges.

Figure 50-41-15

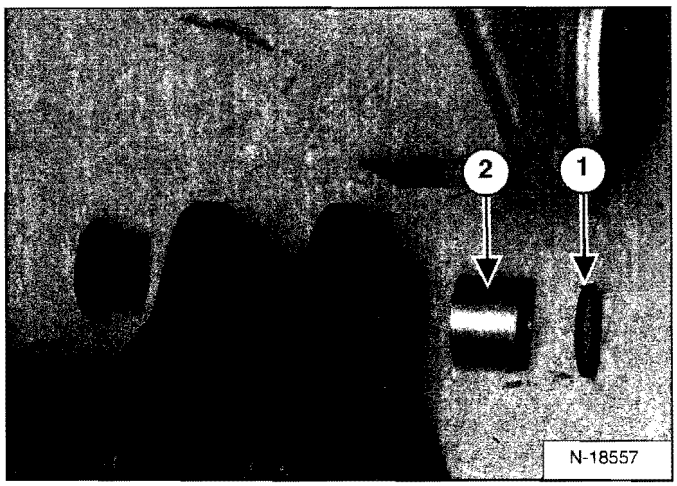


If the bolt (Item 1), handle pivot (Item 2), spring (Item 3), or clevis (Item 4) **[Figure 50-41-15]** are damaged, put the assembly in a vise.

Remove the bolt and replace the damaged parts as needed.

Pivot Pin Bushing And Seal Replacement

Figure 50-41-16



Remove the Power Bob-Tach. (See Removal And Installation on Page 50-41-1.)

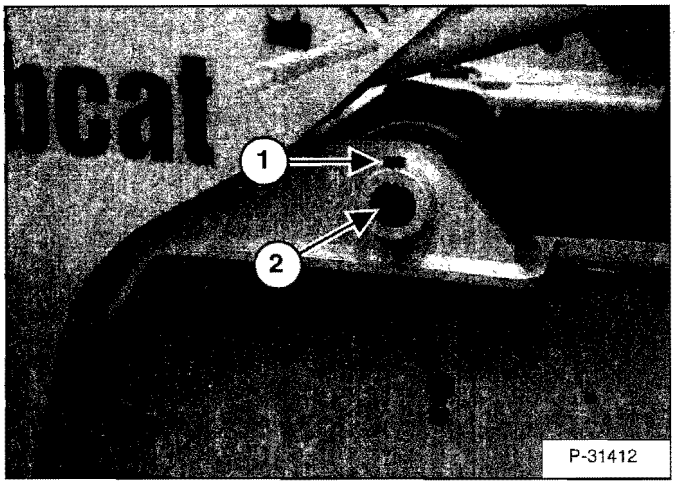
Use a seal pick to remove seal (Item 1) **[Figure 50-41-16]** on the Bob-Tach.

Remove and replace bushing (Item 2) **[Figure 50-41-16]** with a driver tool and hammer.

Bobcat®

Stabilizer Bar Removal And Installation

Figure 50-50-1



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

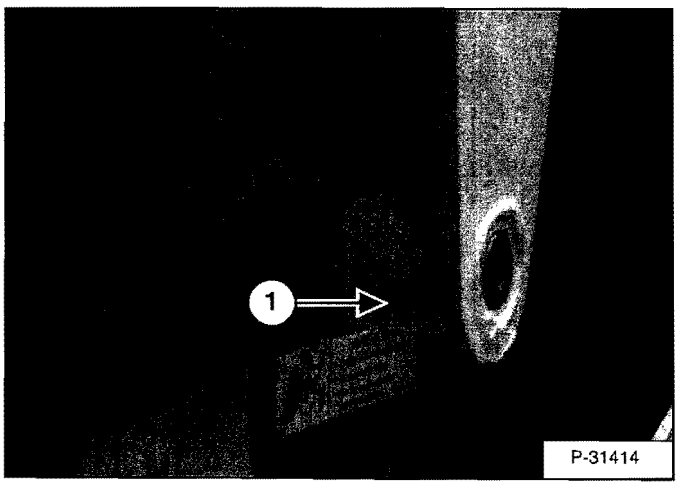
NOTE: Remove the lift arm stabilizer bar from one side of the loader at a time.

Remove the retainer bolt (Item 1) **[Figure 50-50-1]** and nut from the front stabilizer bar pivot pin.

Installation: Tighten the retainer bolt and nut to 18-20 ft.-lbs. (24-27 Nm) torque.

Remove the stabilizer bar pivot pin (Item 2) **[Figure 50-50-1]**.

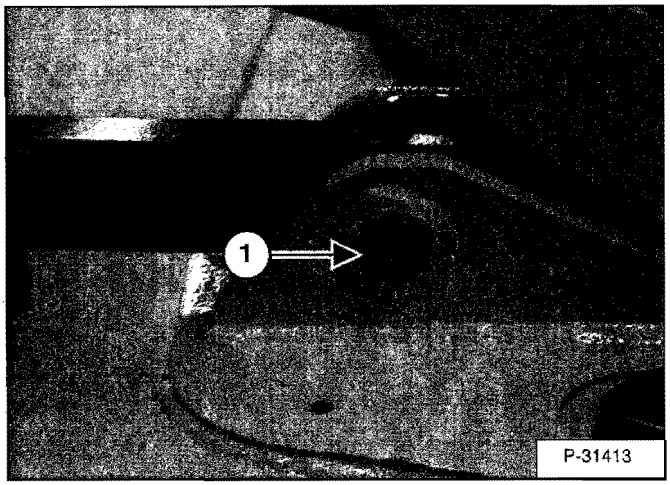
Figure 50-50-2



Remove the retainer bolt (Item 1) **[Figure 50-50-2]** from the stabilizer bar rear pivot pin at the lift arm.

Installation: Tighten the retainer bolt to 18-20 ft.-lbs. (24-27 Nm) torque.

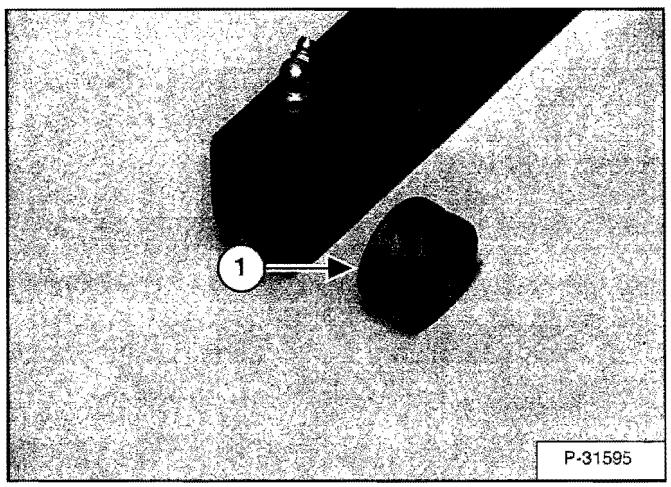
Figure 50-50-3



Remove the stabilizer bar, rear pivot pin (Item 1) **[Figure 50-50-3]**

Remove the stabilizer bar from the loader.

Figure 50-50-4

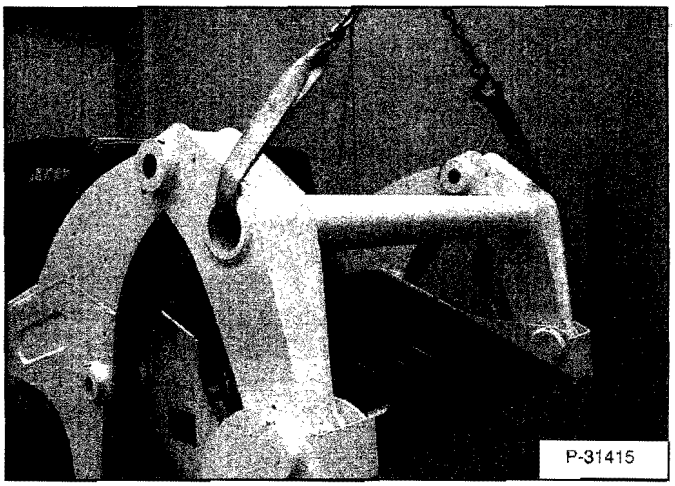


Remove the bushings (Item 1) **[Figure 50-50-4]** from the stabilizer bar (both ends).

Inspect the bushings and replace as needed.

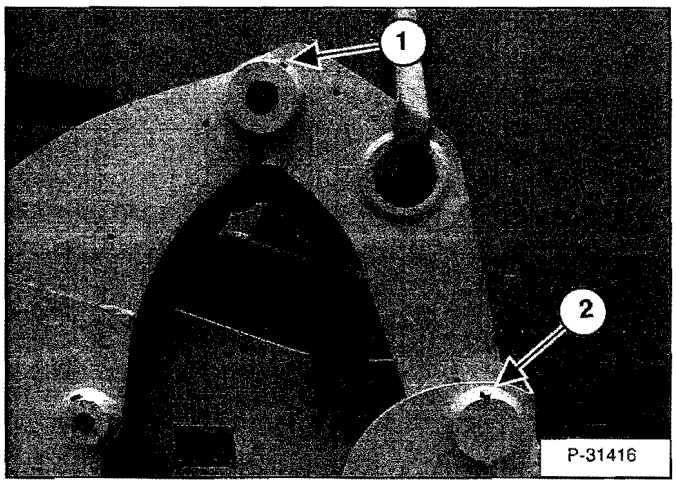
Link Removal And Installation

Figure 50-50-5



Install a sling and chain hoist on the lift arm link **[Figure 50-50-5]**.

Figure 50-50-6

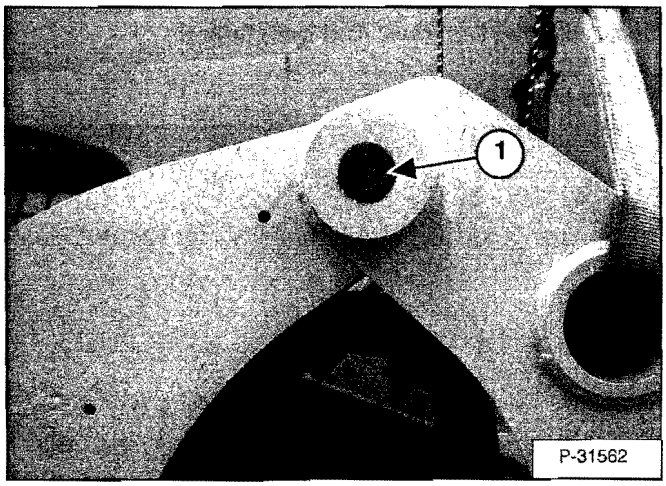


Remove the retainer bolt and nut (Item 1) **[Figure 50-50-6]** from the lift arm pivot pin (both sides).

Remove the retainer bolt and nut (Item 2) **[Figure 50-50-6]** from the lift arm link pivot pin (both sides)

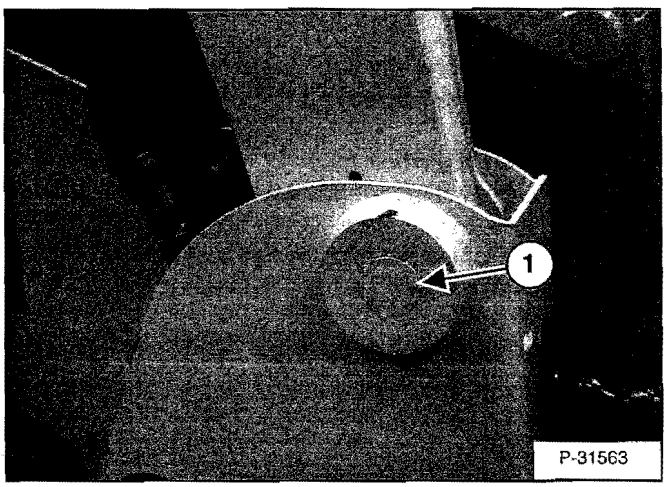
Installation: Tighten retainer bolt and nut to 18-20 ft.-lbs. (24-27 Nm) torque.

Figure 50-50-7



Remove the lift arm pivot pin (Item 1) **[Figure 50-50-7]** (both sides).

Figure 50-50-8

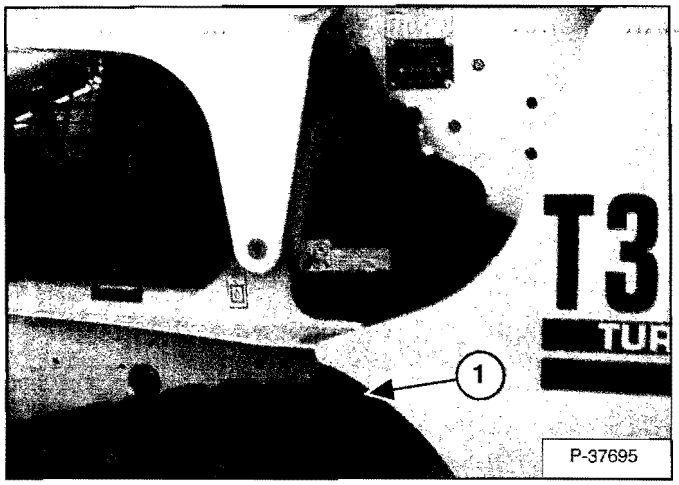


Remove the lift arm link pivot pin (Item 1) **[Figure 50-50-8]** (both sides).

Remove the lift arm link from the loader.

Removal And Installation

Figure 50-50-9



⚠ WARNING

Lift arms must be fully lowered before removing the stabilizer link pins. Even with the approved lift arm support installed, the lift arms and links can suddenly move if both link pins are removed with the lift arms raised.

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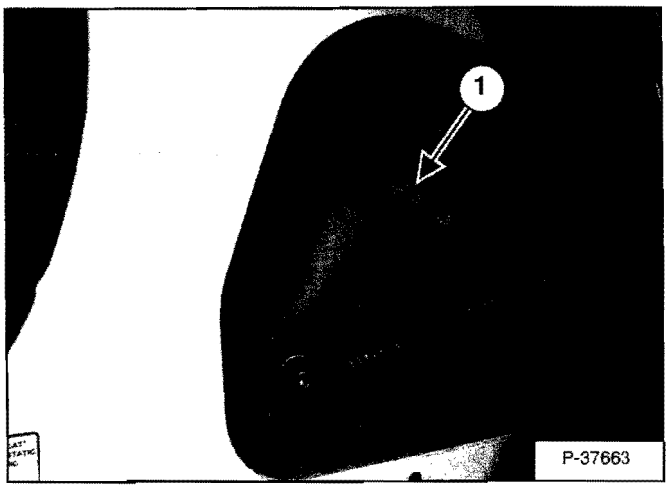
Raise the operator cab. (See Contents Page 10-01.)

Remove the left side access panel (Item 1) **[Figure 50-50-9]**.

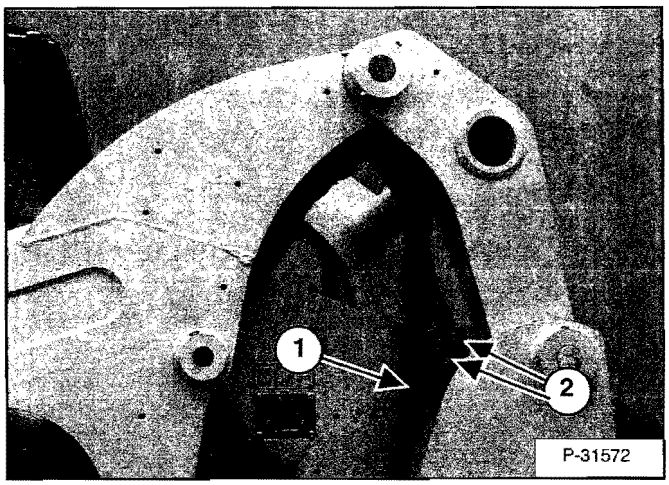
Figure 50-50-10



Disconnect the hydraulic hose (Item 1) **[Figure 50-50-10]** from the filter that goes to the case drain on the auxiliary hydraulic coupler.

Cap and plug the hose and filter fittings.

Figure 50-50-11



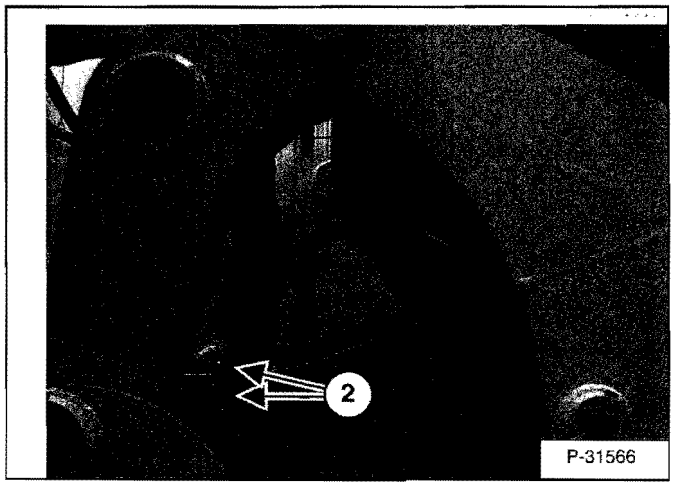
Pull the hose (Item 1) **[Figure 50-50-11]** up and out of the upright to allow for lift arm removal.

Mark the auxiliary hydraulic hoses and tubelines for proper installaion.

Disconnect the two auxiliary hydraulic hoses (Item 2) **[Figure 50-50-11]**.

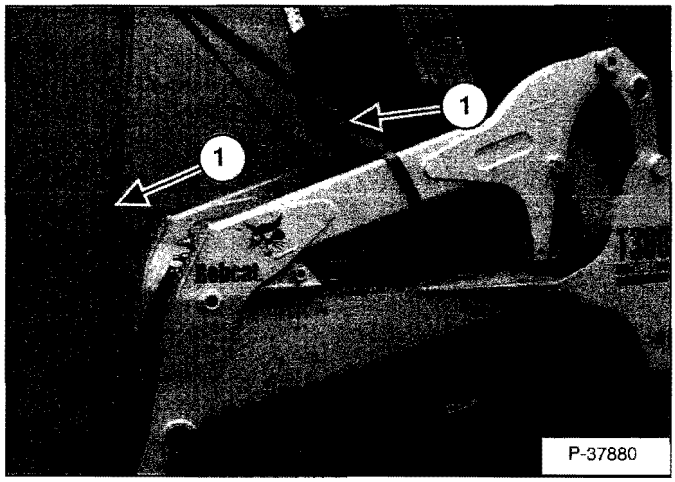
Removal And Installation (Cont'd)

Figure 50-50-12



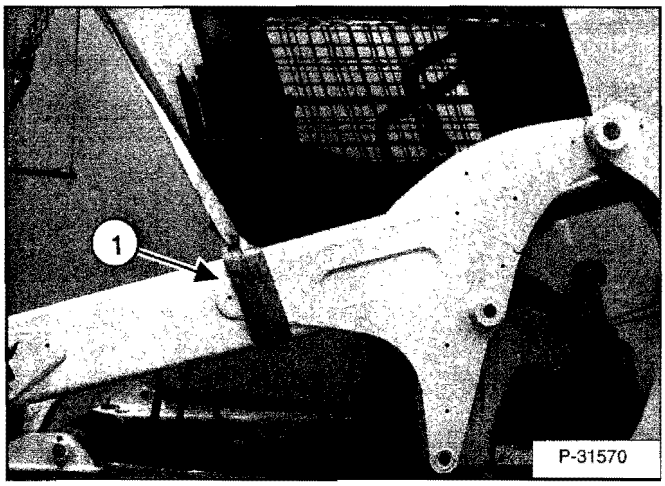
At the right side of the loader, mark the two tilt hoses and tubelines. Disconnect the two tilt hoses (Item 1) **[Figure 50-50-12]** from the tubelines.

Figure 50-50-13



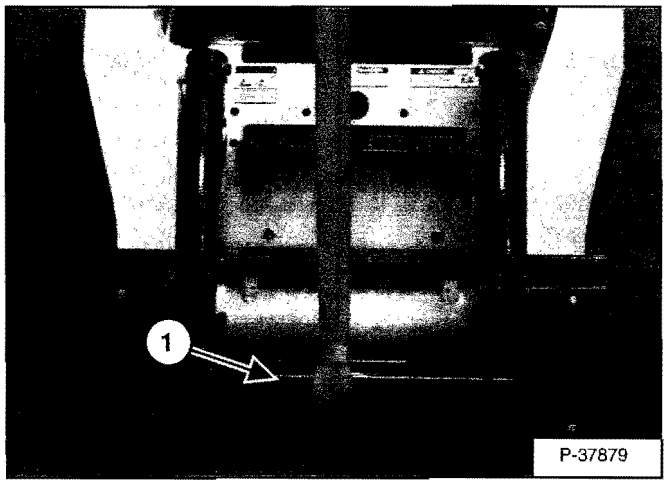
Install slings and a chain (Item 1) **[Figure 50-50-13]** on the lift arms and connect to a chain hoist.

Figure 50-50-14



NOTE: Be sure the slings on the lift arms are in a position to balance the lift arms when being remove. See (Item 1) [Figure 50-50-14].

Figure 50-50-15

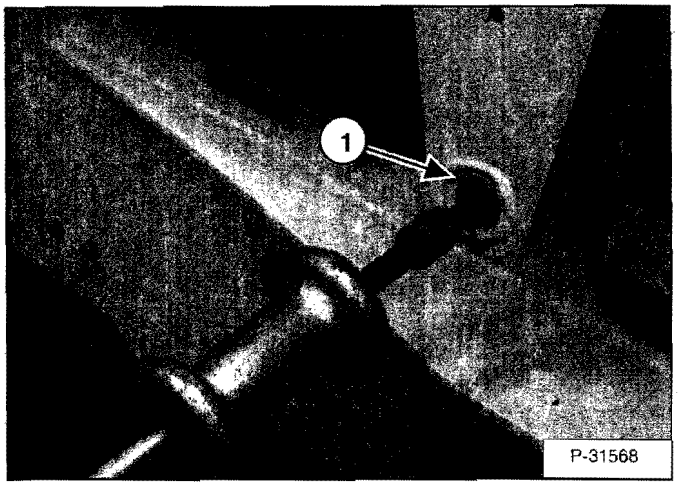


Position the front sling in the middle of the Bob-Tach as shown in (Item 1) **[Figure 50-50-15].**

Support the lift arms with the chain hoist.

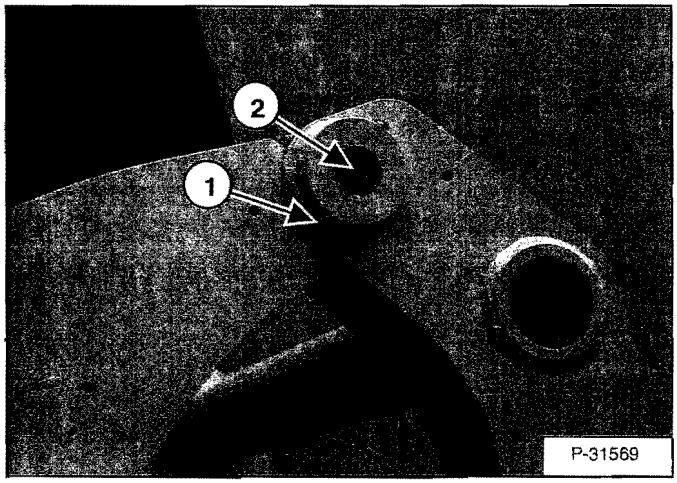
Removal And Installation (Cont'd)

Figure 50-50-16



With a slide hammer, remove the rear lift arm stabilizer pin (Item 1) **[Figure 50-50-16].** (Both sides.)

Figure 50-50-17



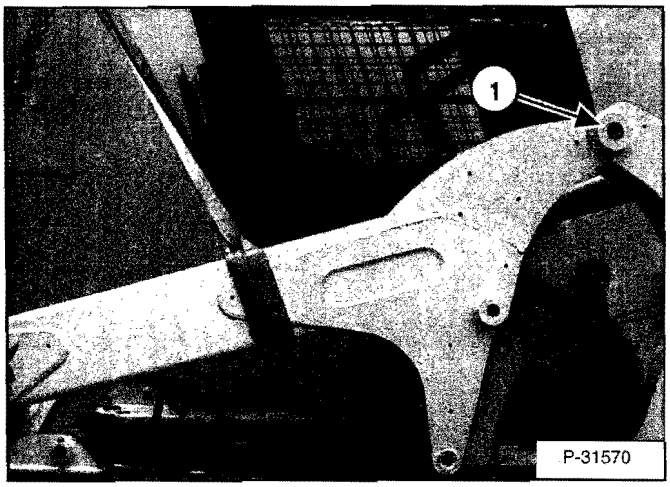
Remove the retainer bolt and nut (Item 1) **[Figure 50-50-17]** from the lift arm pivot pin (both sides).

Remove the lift arm pivot pin (Item 2) **[Figure 50-50-17]** (both sides).

Using the chain hoist, remove the lift arms from the loader.

Installation Of Lift Arms

Figure 50-50-18

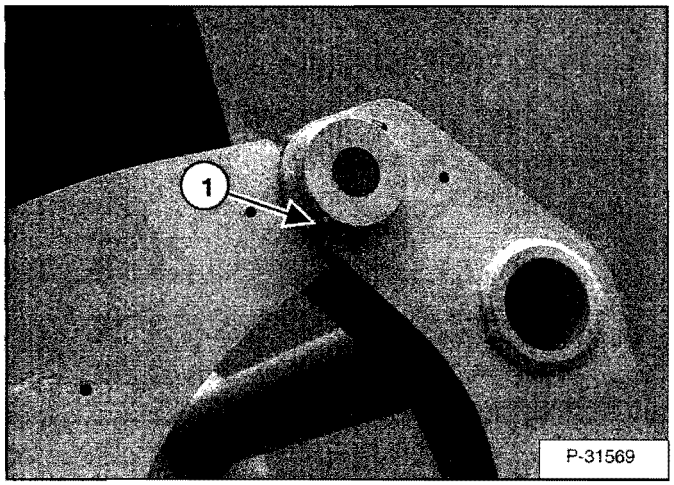


Install lift arms.

Install the lift arm pivot pin (Item 1) **[Figure 50-50-18]**. (Both sides.)

Installation Of Lift Arms (Cont'd)

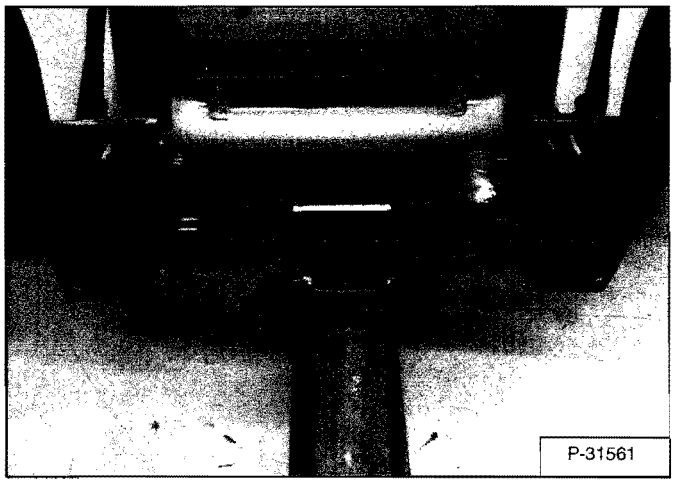
Figure 50-50-19



Install pivot pin retainer bolt and nut (Item 1) **[Figure 50-50-19]** (both sides).

Installation: Tighten retainer bolt and nut to 18-20 ft.-lbs. (24-27 Nm) torque.

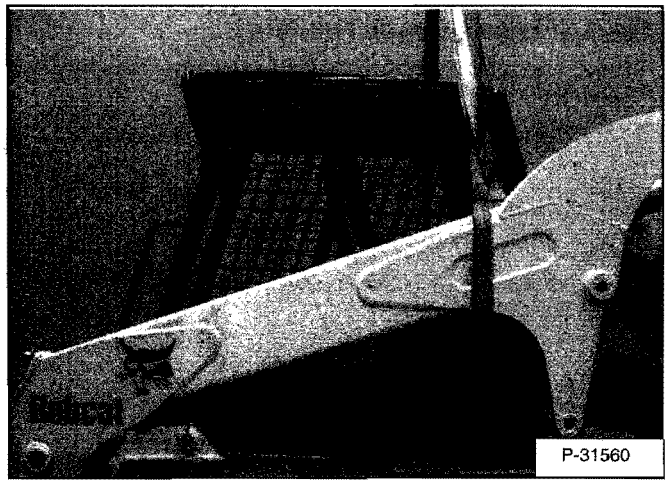
Figure 50-50-20



Remove the chain hoist and lift slings from the lift arms.

Support the front of the lift arms with a floor jack.

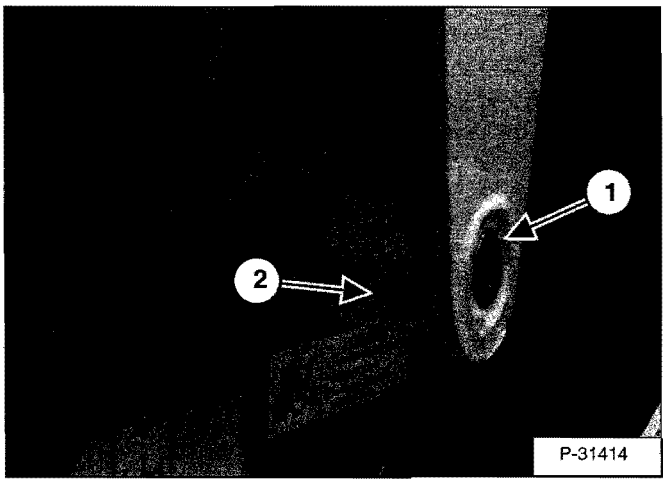
Figure 50-50-21



Reposition the lift straps and lower cab **[Figure 50-50-21]**.

Move the lift arms and link toward the rear of the machine, using the chain hoist and floor jack until stabilizer bar pins line up.

Figure 50-50-22



Install the stabilizer pins (Item 1) **[Figure 50-50-22]** (both sides).

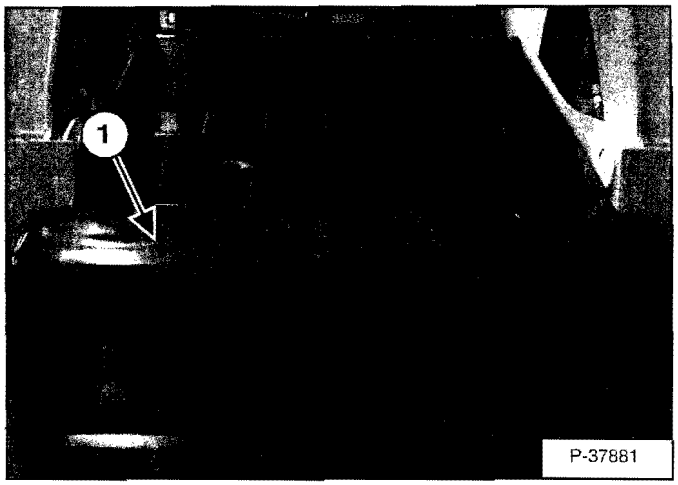
Install the stabilizer pin retainer bolt and nut (Item 2) **[Figure 50-50-22]** (both sides).

Installation: Tighten retainer bolt and nut to 18-20 ft.-lbs. (24-27 Nm) torque.

REAR GRILL

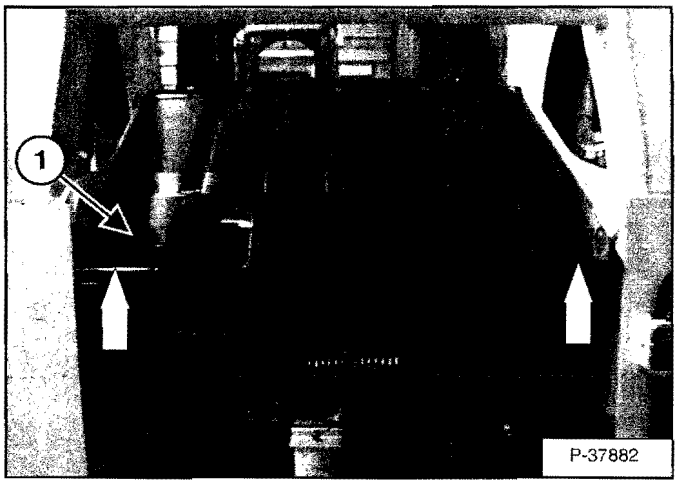
Removal And Installation

Figure 50-60-1



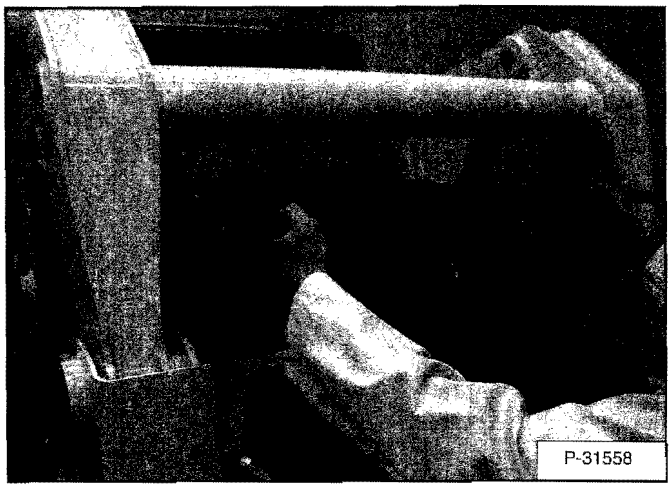
Open the rear door (Item 1) **[Figure 50-60-1]**.

Figure 50-60-2



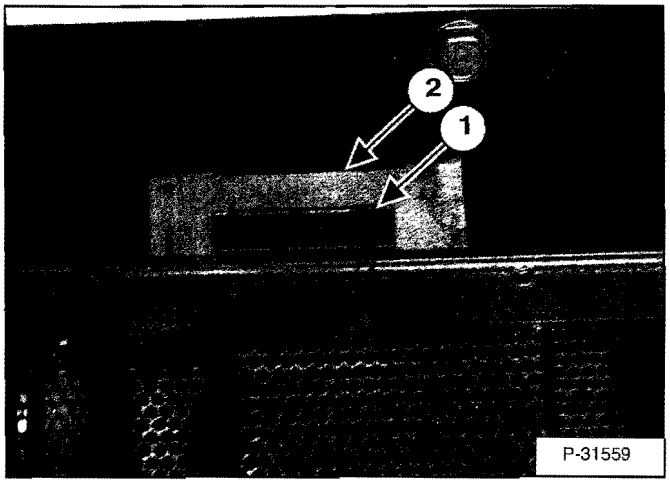
Lift the rear grill assembly (Item 1) **[Figure 50-60-2]** over the muffler.

Figure 50-60-3



Lift and pull the rear grill and remove it from the loader **[Figure 50-60-3]**.

Figure 50-60-4



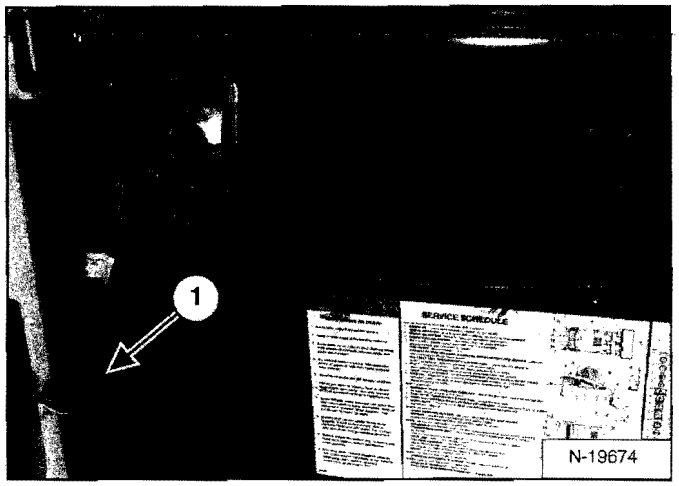
Installation: Insert the tab on the rear grill (Item 1) into the notch (Item 2) **[Figure 50-60-4]** on the loader frame. (Both sides.)

Bobcat®

REAR DOOR

Removal And Installation

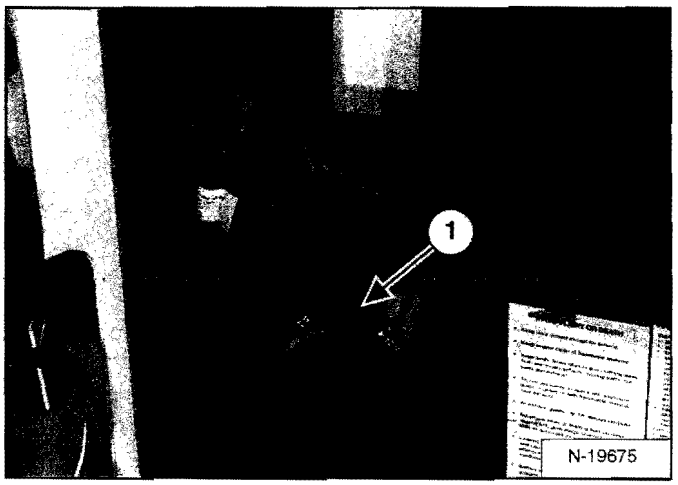
Figure 50-70-1



Open the rear door.

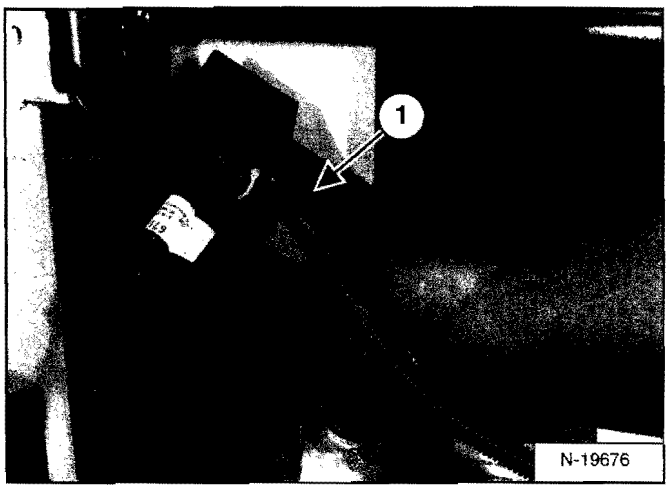
Disconnect the light harness connector (Item 1) **[Figure 50-70-1]** from the engine harness.

Figure 50-70-2



Remove the light bulb (Item 1) **[Figure 50-70-2]** from the light housing. (Both sides).

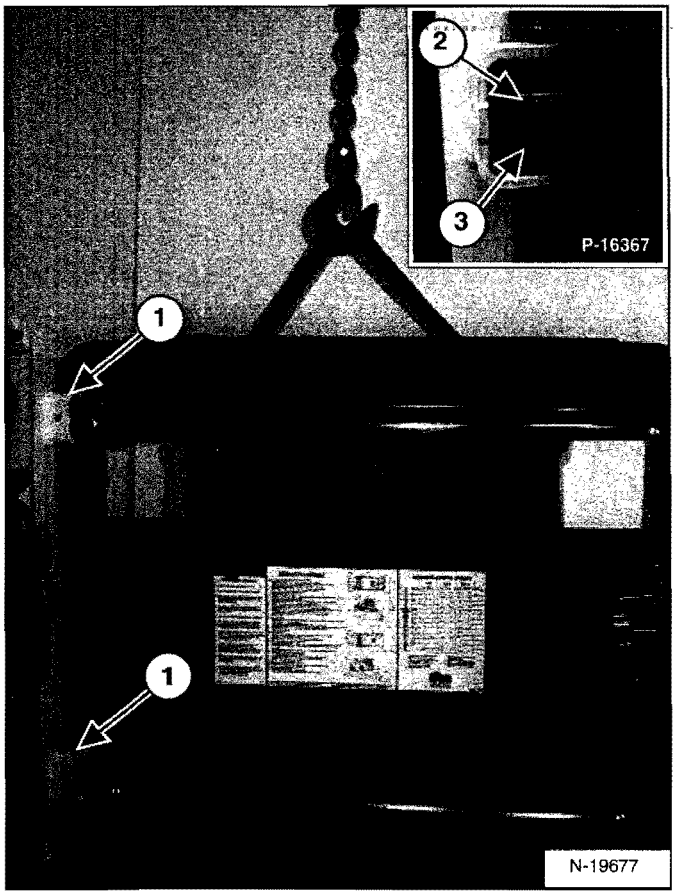
Figure 50-70-3



Remove the light housing (Item 1) **[Figure 50-70-3]** from the rear door. (Both sides).

Removal And Installation (Cont'd)

Figure 50-70-4



Install a nylon sling (Item 1) **[Figure 50-70-4]** through the holes for the light housings.

Connect a chain hoist to the nylon sling.

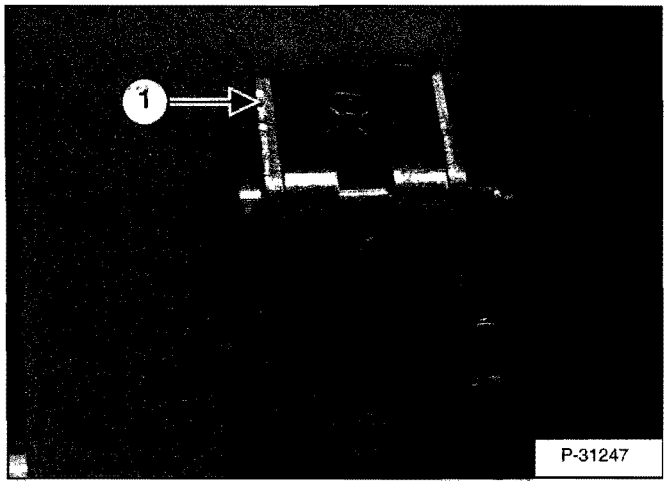
Remove the nuts from the top and bottom hinge bolts (Item 1) **[Figure 50-70-4]** and remove the hinge bolts.

Installation: Tigthen the mounting bolts and nuts to 25-28 ft.-lbs. (34-38 Nm) torque. The door stop (Item 2) is installed in the top hinge bolt, above the stop retainer (Item 3) **[Figure 50-70-4]**.

Remove the rear door from the loader frame and lay it flat on the floor.

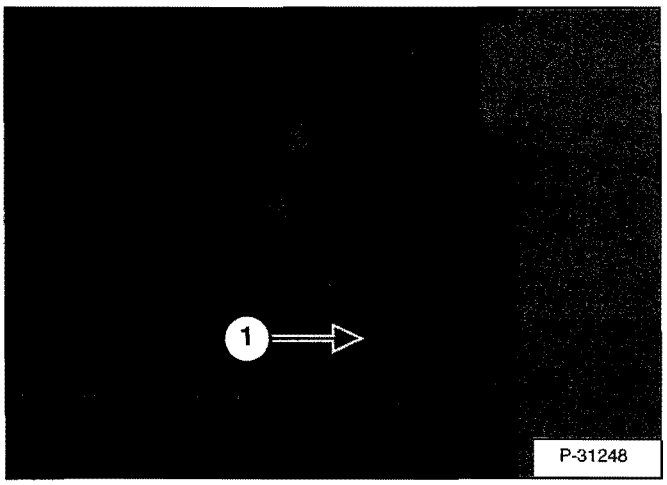
Adjusting The Rear Door Latch

Figure 50-70-5



The door catch (Item 1) **[Figure 50-70-5]** can be adjusted side to side for alignment with the door latch.

Figure 50-70-6



The door latch (Item 1) **[Figure 50-70-6]** cannot be adjusted.

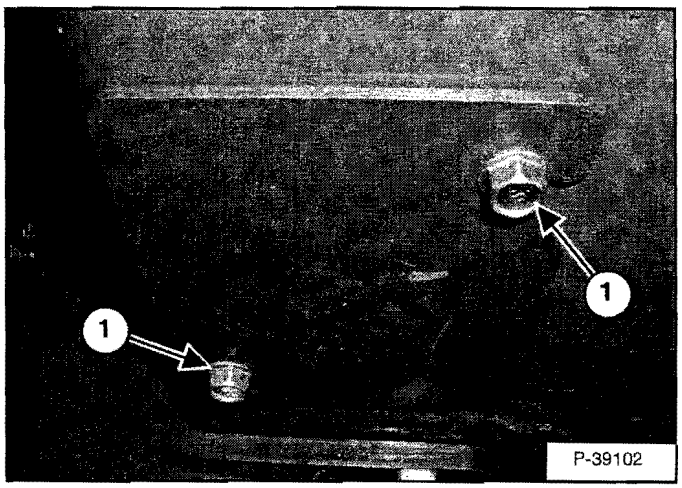
FUEL TANK

Removal And Installation

Place the loader on jackstands. (See Contents Page 10-01.)

Remove the loader tracks. (See Contents Page 40-01.)

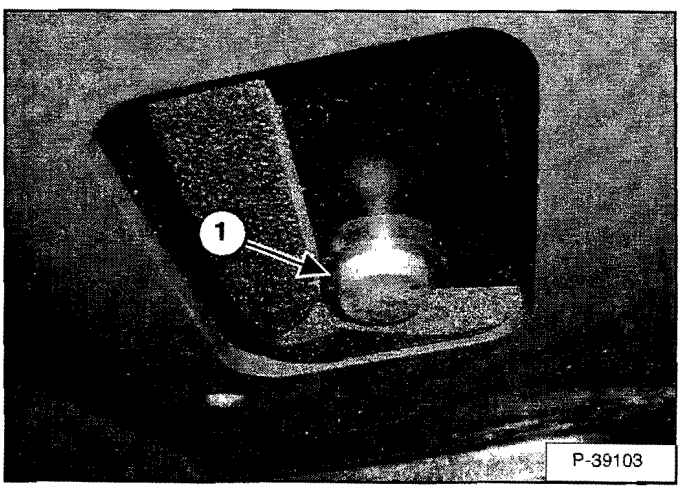
Figure 50-80-1



At the rear, left side of the lower main frame, remove the two mount bolts (Item 1) **[Figure 50-80-1]** from the access cover.

Remove the access cover.

Figure 50-80-2

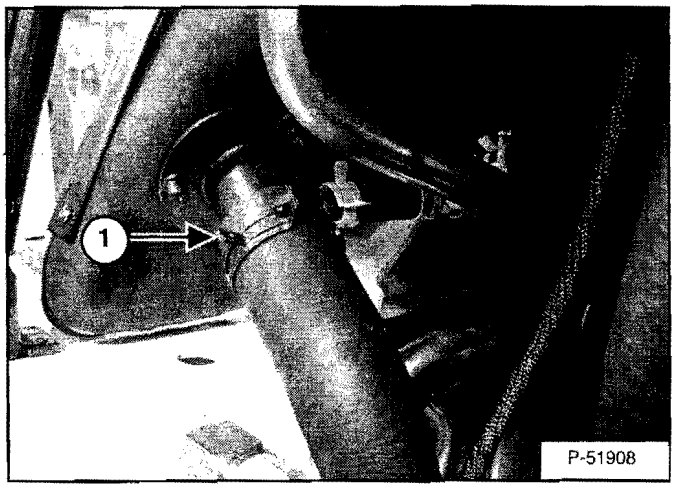


Remove the drain plug (Item 1) **[Figure 50-80-2]**.

Drain the fuel into a container.

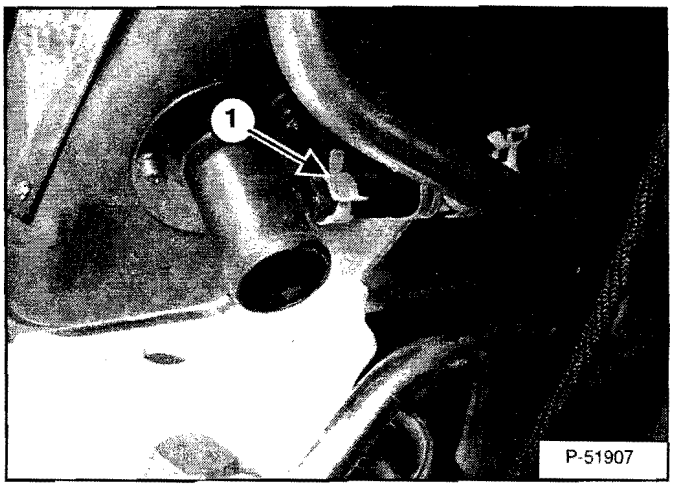
Check the drain plug and replace if necessary.

Figure 50-80-3



Disconnect the fuel fill hose (Item 1) **[Figure 50-80-3]**.

Figure 50-80-4

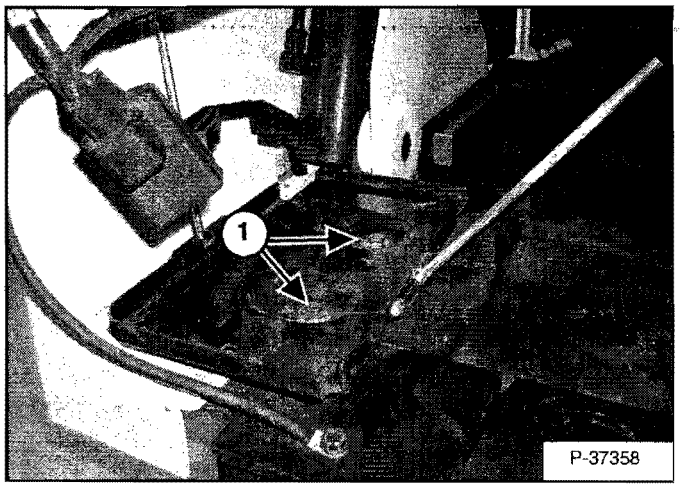


Disconnect the tank vent hose (Item 1) **[Figure 50-80-4]**.

Remove the engine/hydrostatic pump assembly from the loader. (See Contents Page 70-01.)

Removal And Installation (Cont'd)

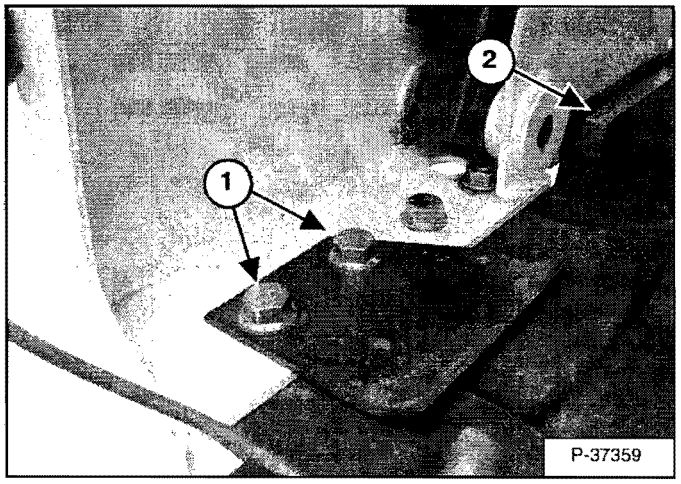
Figure 50-80-5



Remove the bolts (Item 1) **[Figure 50-80-5]** from the battery holddown plate.

Remove the holddown plate from the loader.

Figure 50-80-6



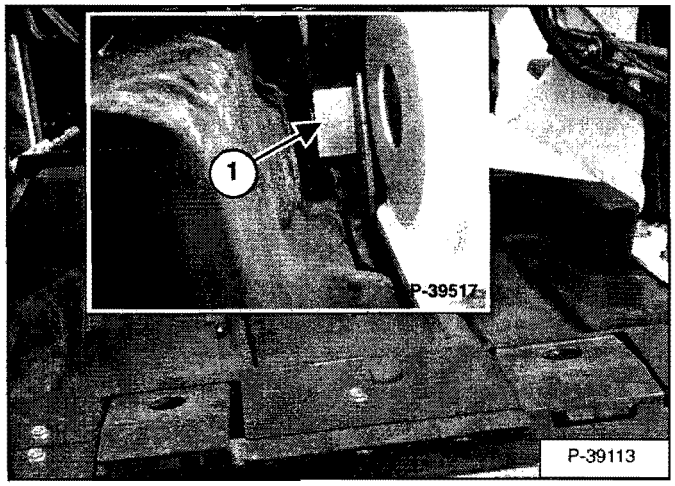
Remove the two mounting bolts (Item 1) **[Figure 50-80-6]** from the battery hold down plate mounting bracket.

Remove the mount bracket from the loader.

At the left side of the loader, remove the three main frame mount bolts from the mounting block (Item 2) **[Figure 50-80-6]**. Remove the mount block from the loader.

Installatin: Tighten the main frame mount bolts to 300-330 ft.-lbs. (407-447 Nm) torque.

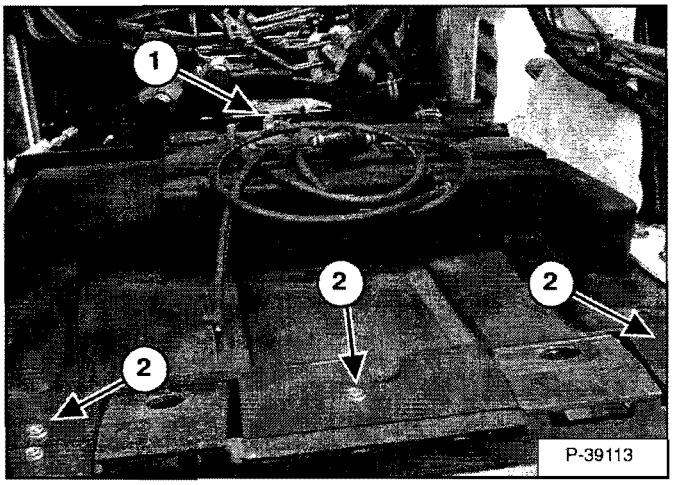
Figure 50-80-7



At the right side of the loader, remove the three main frame mount bolts from the mounting block (Item 1) **[Figure 50-80-7]**. Remove the mount block from the loader.

Installatin: Tighten the main frame mount bolts to 300-330 ft.-lbs. (407-447 Nm) torque.

Figure 50-80-8



Disconnect the wire harness connector (Item 1) **[Figure 50-80-8]** from the fuel level sender.

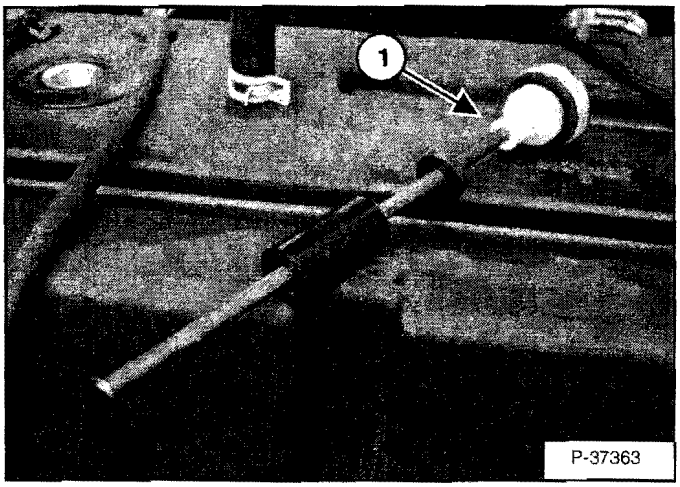
Remove the three mount bolts (Item 2) **[Figure 50-80-8]** from the fuel tank mount plate. Remove the mount plate.

Lift the fuel tank and remove it from the loader frame.

NOTE: When installing the fuel tank, avoid striking the tank with heavy objects to prevent damage.

Fuel Level Sender

Figure 50-80-9



Disconnect the wire harness connector from the fuel level sender.

Loosen the fuel level sender in fuel tank.

Remove the fuel level sender (Item 1) **[Figure 50-80-9]**.

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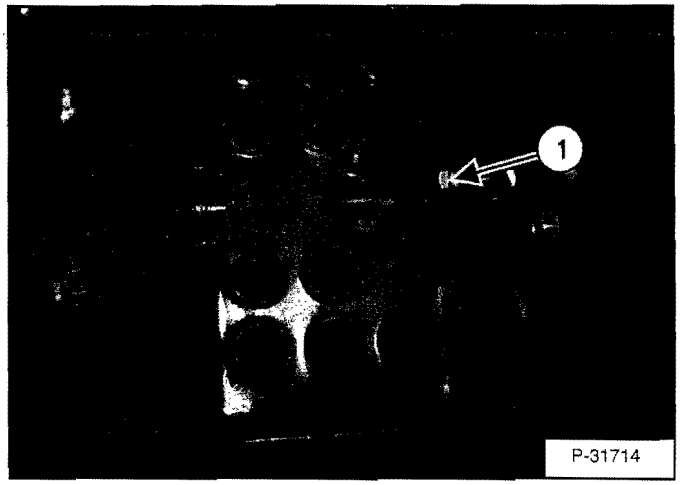
CONTROL PEDALS

Removal And Installation

Figure 50-90-1

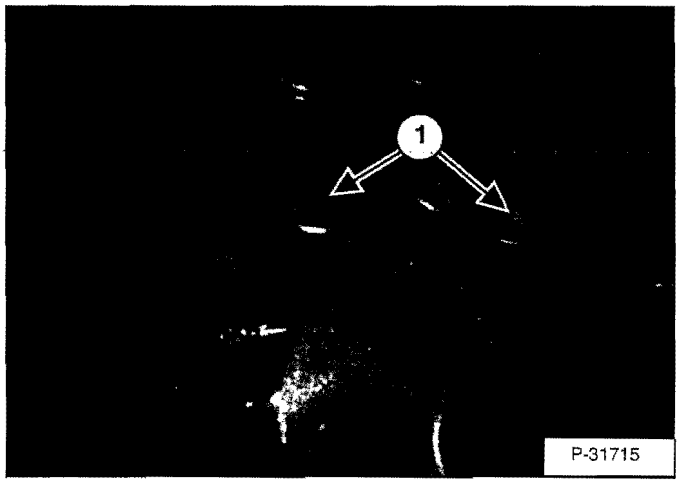


Remove the bolt and nut (Item 1) **[Figure 50-90-1]** from the pedal linkage.

Installation: Tighten the bolt and nut to 21-25 ft.-lbs. (28-34 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]**.

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 and the valve spool must travel full stroke without hitting the floor panel.

⚠ WARNING

AVOID INJURY OR DEATH

Adjust locking tabs on pedal control linkage so the at lift and tilt control pedals are locked in neutral when the seat bar is up.

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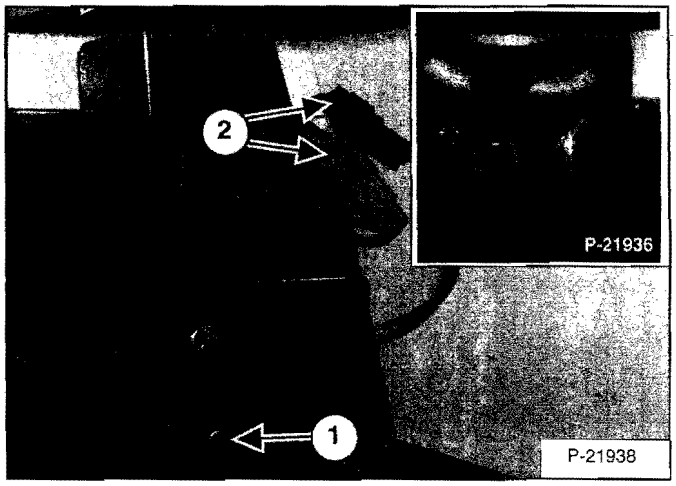
Bobcat®

CONTROL PEDALS (ACS)

Foot Sensor Removal And Installation

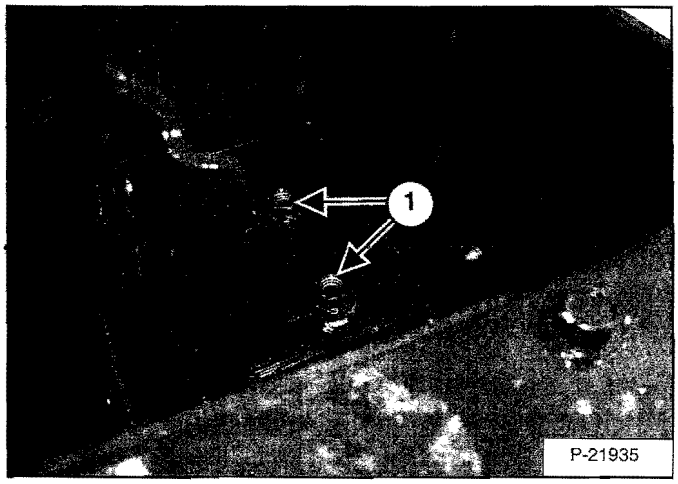
Figure 50-91-1



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.

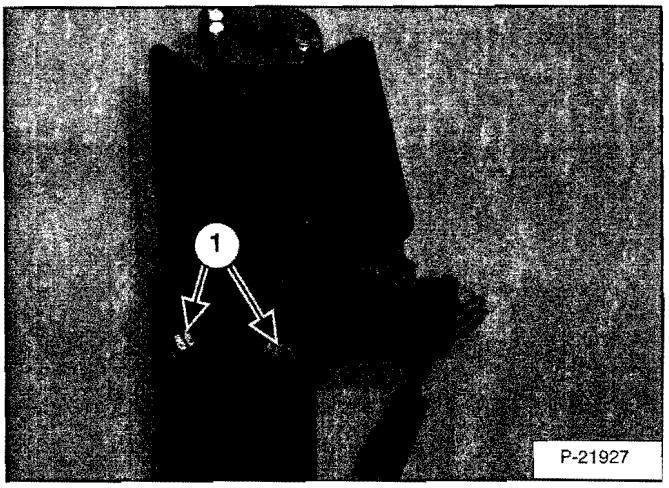
Figure 50-91-2



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.

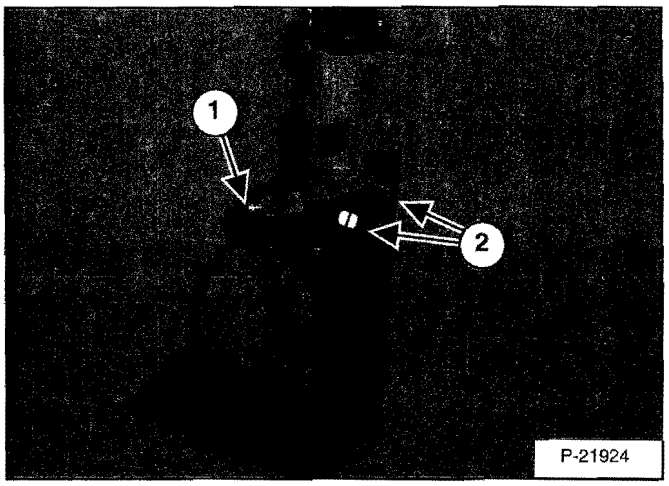
Figure 50-91-3



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.

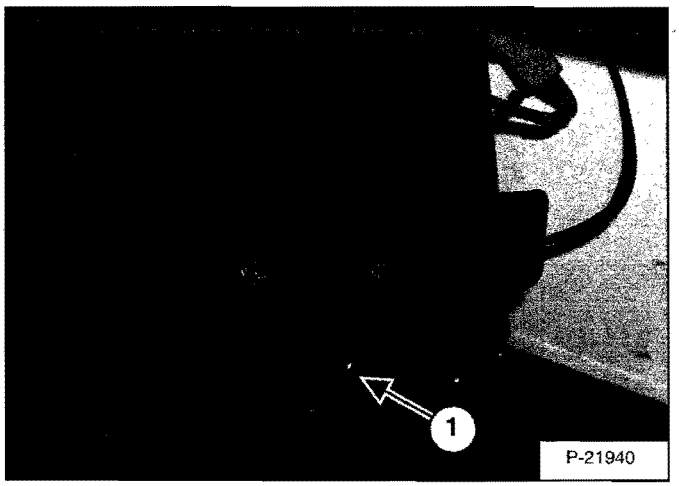
Installation: Tighten the bolts to 25-28 ft.-lbs. (34-38 Nm) torque.

Remove the sensor assembly

NOTE: The calibration must be followed when replacing handle sensor, foot pedal sensor, actuator or ACS Controller. (See Contents Page 60-01.)

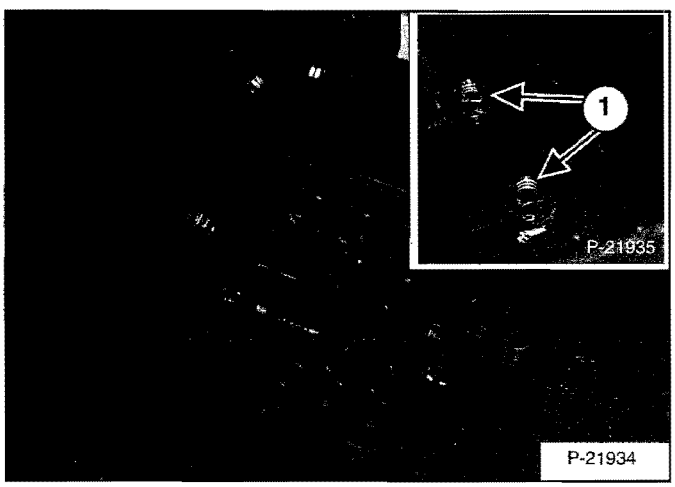
Foot Pedal Removal And Installation

Figure 50-91-5



Remove the pin (Item 1) **[Figure 50-91-5]** holding the linkage to the sensor.

Figure 50-91-6

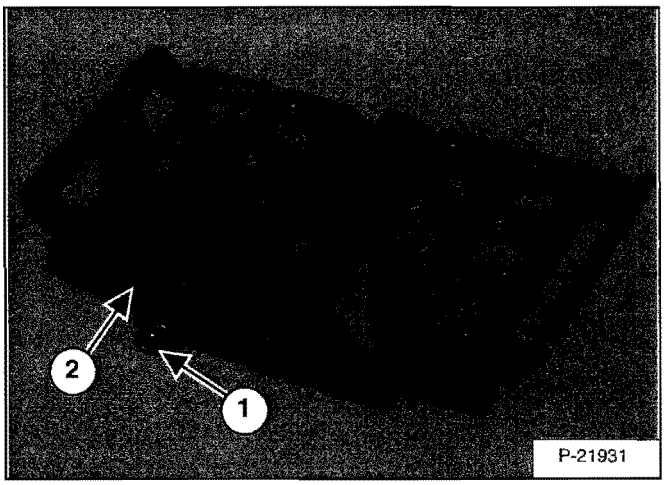


Tip the foot pedal up and remove the two nuts (Item 1) **[Figure 50-91-6]**.

Remove the foot pedal assembly.

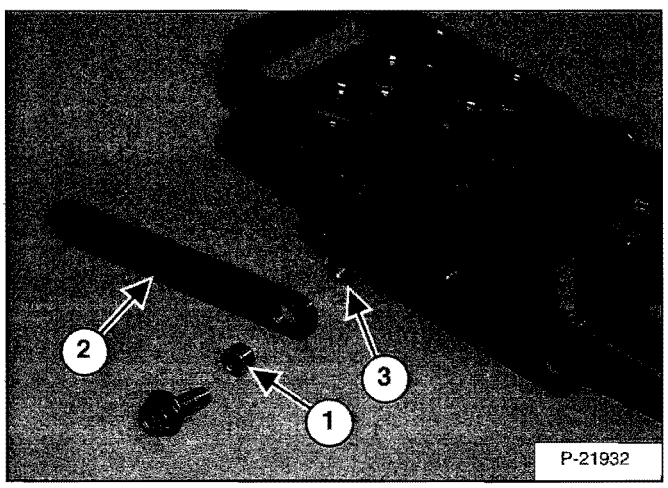
Foot Pedal Linkage Disassembly And Assembly

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.

CONTROL PANEL (NON-ADJUSTABLE PINTLES)

Removal And Installation

⚠ WARNING

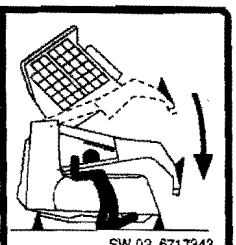
Put jackstands under the front axles and rear corners of the frame before running the engine for service. Failure to use jackstands can allow the machine to fall or move and cause injury or death.

W-2017-0286

⚠ 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



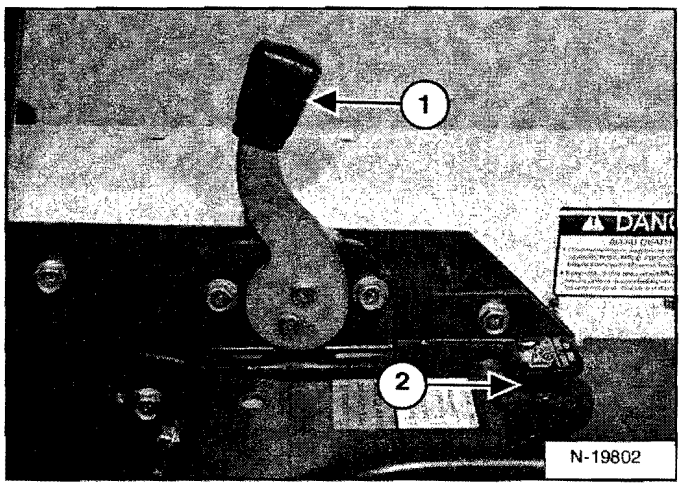
SW 02 6717343

⚠ 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 50-100-1



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

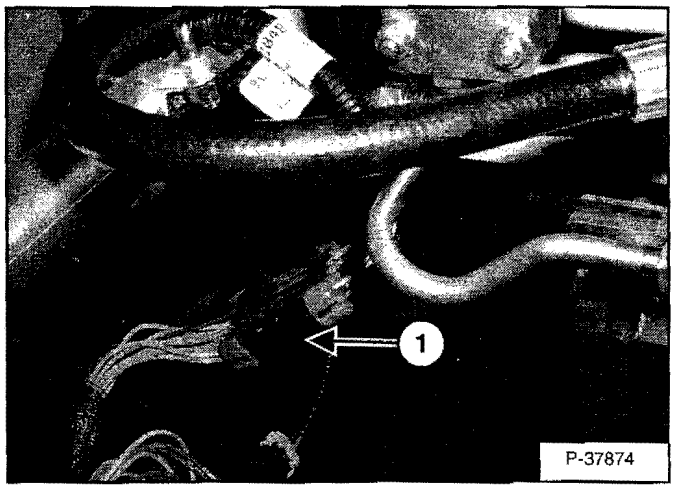
Raise the operator cab. (See Contents Page 10-01.)

Remove the engine speed control (Item 1) **[Figure 50-100-1]**. (See Contents Page 70-01.)

Loosen the jam nut from the by-pass control knob (Item 2) **[Figure 50-100-1]**.

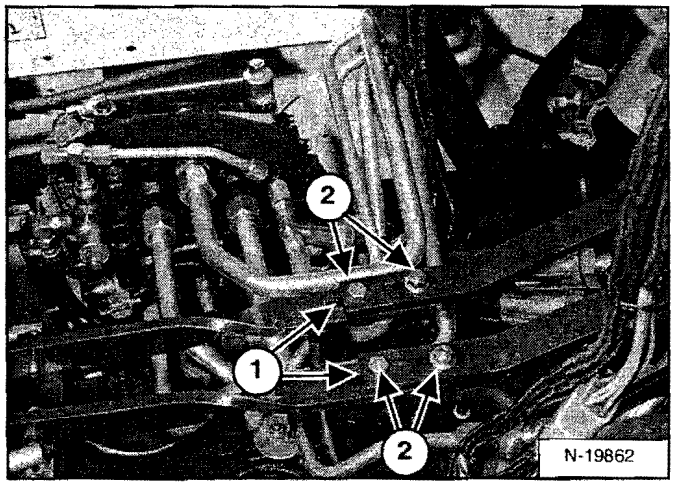
Remove the control knob, jam nut, and rubber washer.

Figure 50-100-2



Disconnect the control harness connector (Item 1) **[Figure 50-100-2]** from the right side steering lever.

Figure 50-100-3



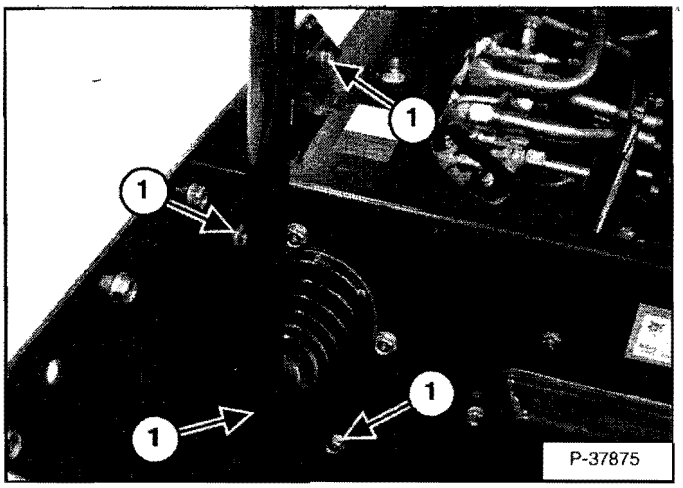
Scribe a mark across the top of the steering linkage bars (Item 1) **[Figure 50-100-3]**.

Remove the four steering linkage mounting bolts (Item 2) **[Figure 50-100-3]**.

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

Removal And Installation (Cont'd)

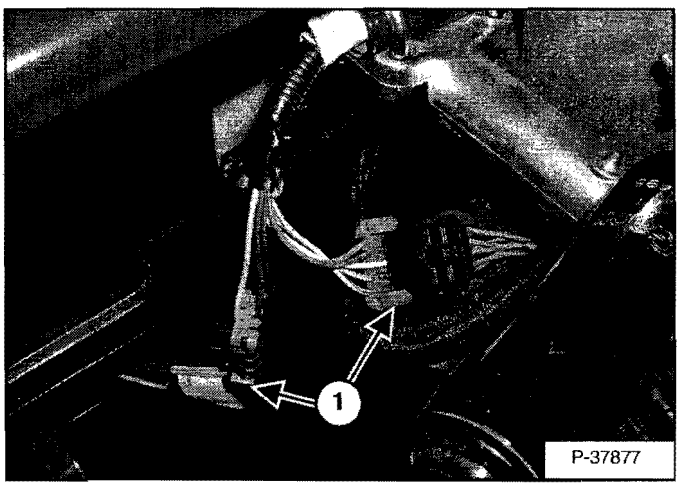
Figure 50-100-4



Remove the four control panel mounting bolts (Item 1) **[Figure 50-100-4]** from right side of the control panel.

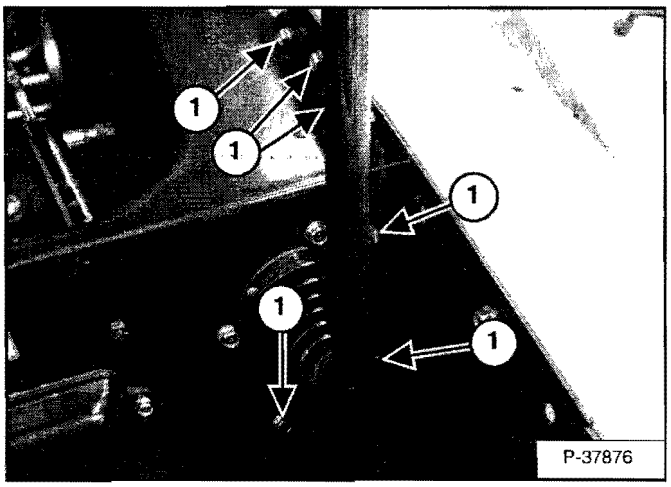
Installation: Tighten the control panel mounting bolts to 25-28 ft.-lbs. (34-38 Nm) torque.

Figure 50-100-5



Remove the electrical connectors (Item 1) **[Figure 50-100-5]** from the left handle. (If so equipped.)

Figure 50-100-6

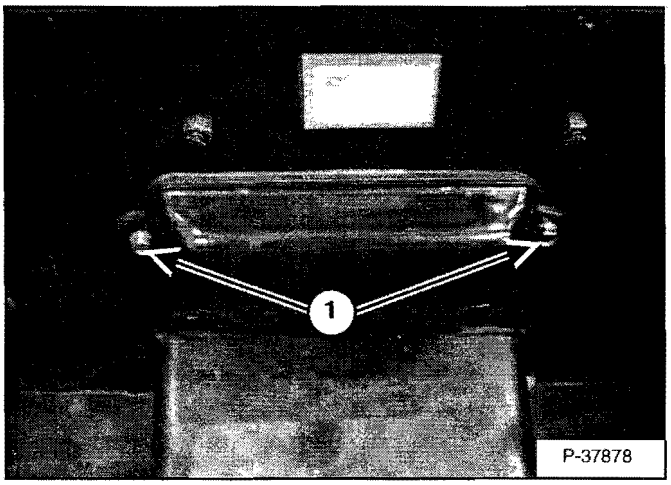


Remove the six control panel mounting bolts (Item 1) **[Figure 50-100-6]** from the left side of the control panel.

Remove the side panel mount bolts (Item 2) **[Figure 50-100-6]**.

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

Figure 50-100-7



Remove the fuse cover mount bolts (Item 1) **[Figure 50-100-7]**.

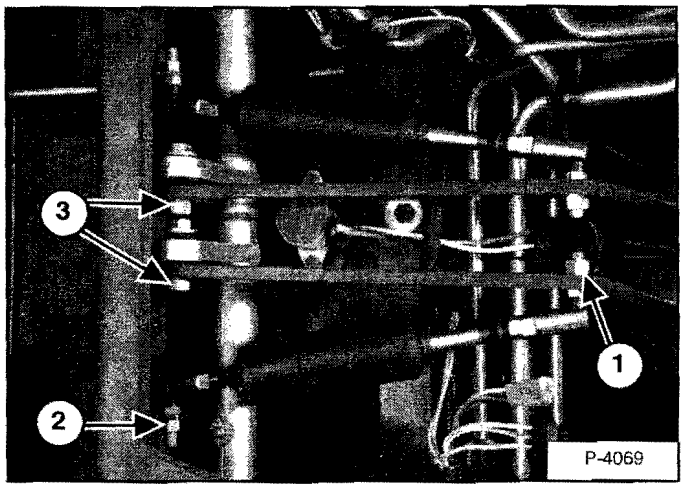
Remove the fuse cover from the loader.

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

Remove the control panel from the loader.

Shock Removal And Installation

Figure 50-100-8



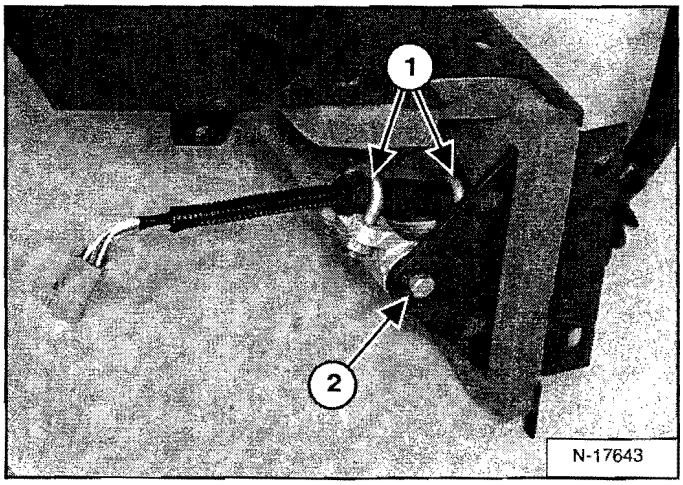
Remove the mounting nut (Item 1) **[Figure 50-100-8]** from the end of the shock connected to the steering linkage.

Remove the mounting nut (Item 2) **[Figure 50-100-8]** 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

Figure 50-100-9



NOTE: The steering shaft can be removed without removing the control panel from the loader. Photo [Figure 50-100-9] shows the control panel removed for clarity purpose only.

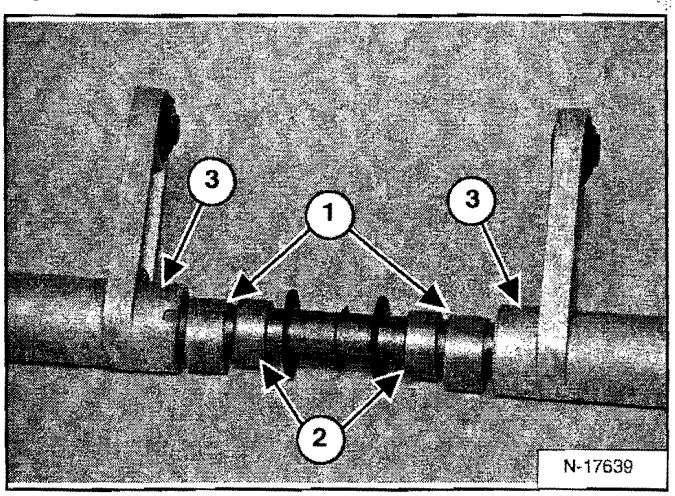
Loosen both U-bolts (Item 1) **[Figure 50-100-9]** at the steering lever (both sides).

Remove the steering cross shaft mounting bolts (Item 2) **[Figure 50-100-9]** (both sides).

Installation: Tighten the mounting bolts to 180-200 in.-lbs. (21-23 Nm) torque.

Shaft Disassembly And Assembly

Figure 50-100-10



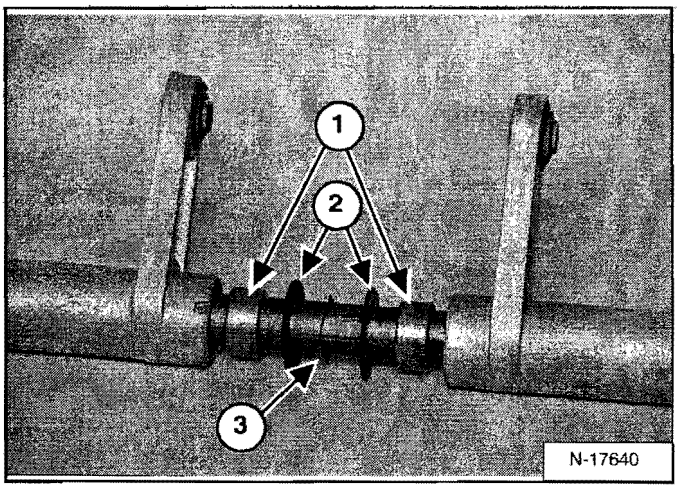
Remove the steering cross shaft from the control panel.

Disassemble the right and left steering shafts from the cross shaft assembly.

NOTE: Some loaders may have a sleeve (Item 1), between the bearing (Item 2) and the bell crank (Item 3) [Figure 50-100-10].

Shaft Disassembly And Assembly (Cont'd)

Figure 50-100-11

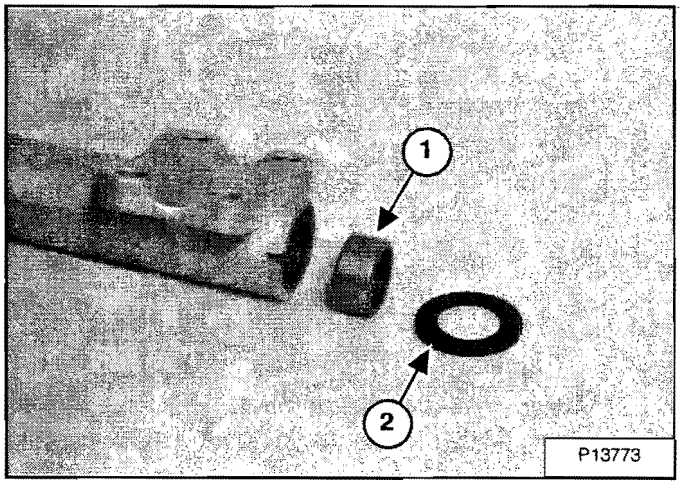


Check the bearings (Item 1) **[Figure 50-100-11]** for wear and replace as needed.

Check the fiber washers (Item 2) **[Figure 50-100-11]** for wear and replace as needed.

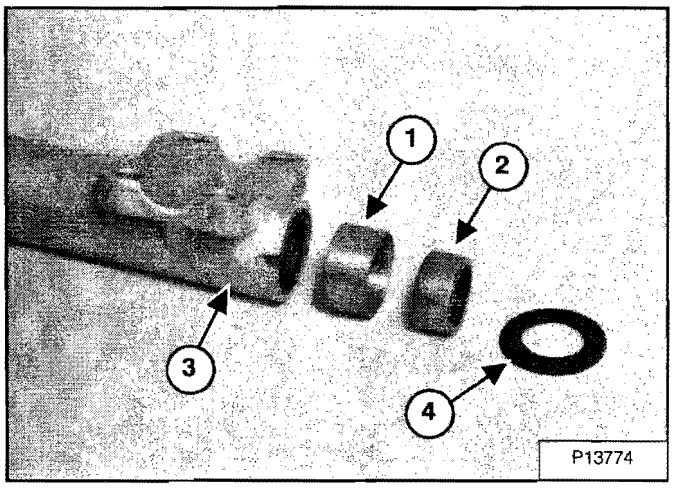
Replace the wave washer (Item 3) **[Figure 50-100-11]** if worn.

Figure 50-100-12



Check the end bearing (Item 1) **[Figure 50-100-12]** and fiber washer (Item 2) **[Figure 50-100-12]** and replace as needed.

Figure 50-100-13



NOTE: Some loaders may have a spacer (Item 1), between the bearing (Item 2) and the bell crank (Item 3) [Figure 50-100-13].

Check the fiber washer (Item 4) **[Figure 50-100-13]** and replace all worn parts.

Linkage Removal And Installation

⚠ WARNING

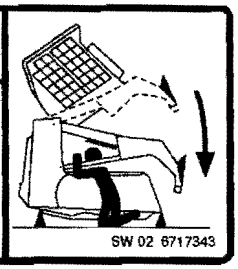
Put jackstands under the front axles and rear corners of the frame before running the engine for service. Failure to use jackstands can allow the machine to fall or move and cause injury or death.

W-2017-0286

⚠ 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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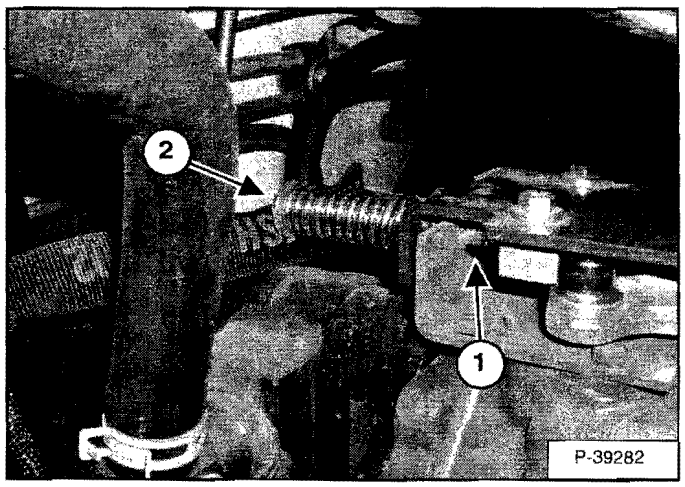
Figure 50-100-14



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.)

Open the access covers (both sides).

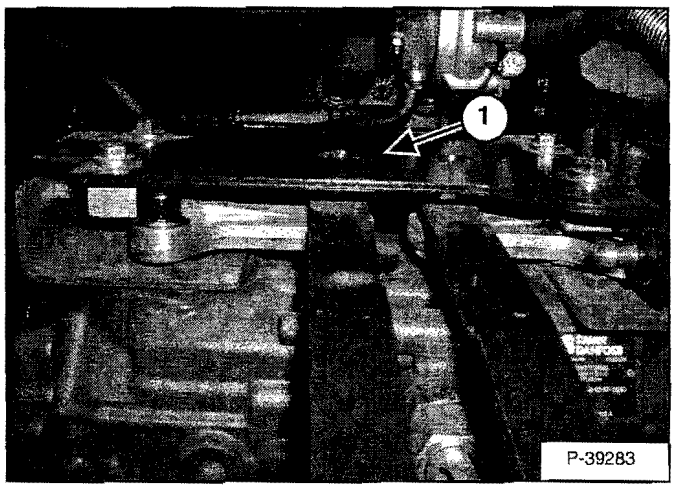
Remove the nut (Item 1) **[Figure 50-100-14]** from the end of the centering spring shoulder bolt (Item 2) **[Figure 50-100-14]**.

Remove the shoulder bolt/spring assembly.

Installation: Tighten the centering spring shoulder bolt and a NEW lock nut to 25-28 ft.-lbs. (34-38 Nm) torque.

Drain the hydraulic reservoir. (See Contents Page 20-01.)

Figure 50-100-15

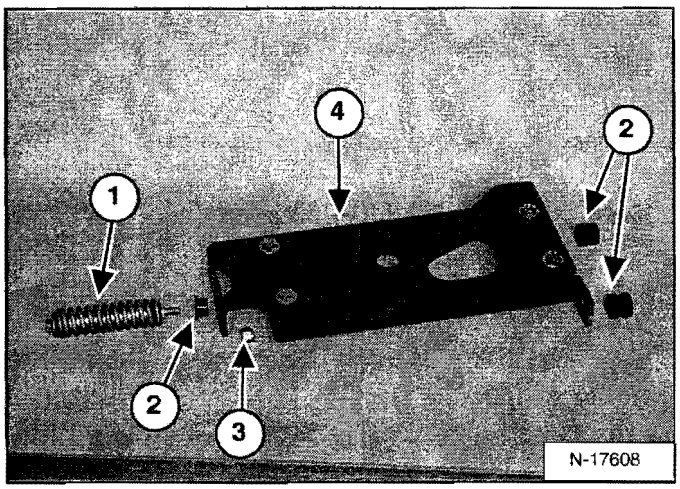


Slide the plate (Item 1) **[Figure 50-100-15]** to the right and remove it from the two guide pins.

NOTE: The two guide bushings will be loose and can fall out of the plate as soon as it is removed from the guide pins.

Linkage Removal and Installation (Cont'd)

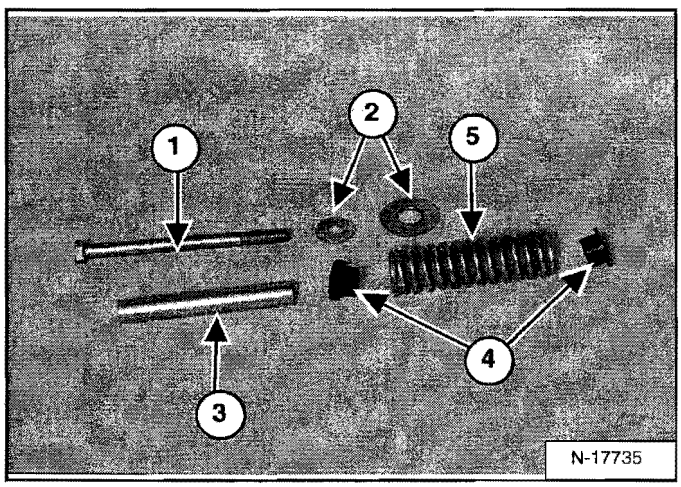
Figure 50-100-16



The centering plate/centering spring assembly consists of the following parts **[Figure 50-100-16]**:

ITEM	DESCRIPTION
1	Centering Spring Assembly
2	Guide Bushings
3	Lock Nut
4	Centering Plate

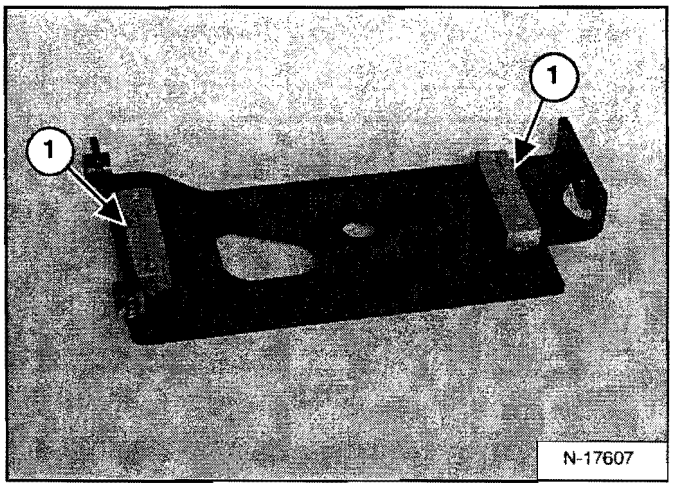
Figure 50-100-17



The centering plate/centering spring assembly consists of the following parts **[Figure 50-100-17]**:

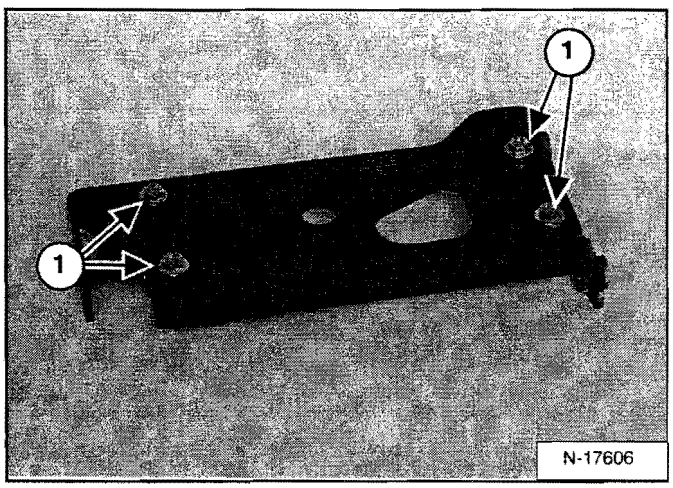
ITEM	DESCRIPTION
1	Bolt
2	Washer
3	Sleeve
4	Bushing
5	Spring

Figure 50-100-18



Check the wear on the centering blocks (Item 1) **[Figure 50-100-18]**.

Figure 50-100-19

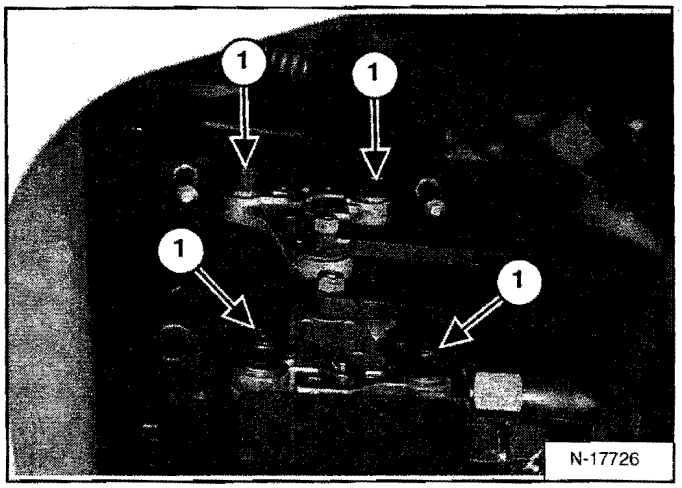


If the centering blocks need replacement, remove the bolts (Item 1) **[Figure 50-100-19]**. Remove the centering blocks.

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

Linkage Removal and Installation (Cont'd)

Figure 50-100-20

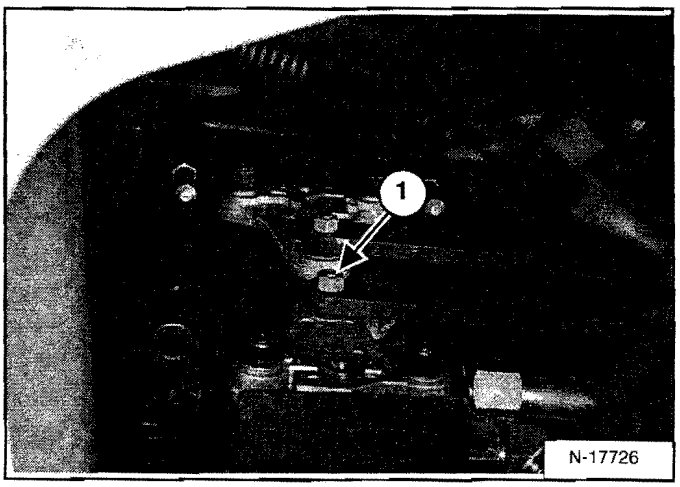


Check the surface of the four pintle cams (Item 1) **[Figure 50-100-20]**.

If worn replace the cam.

Installation: Tighten the bolts to 45-50 ft.-lbs. (62-68 Nm) torque.

Figure 50-100-21

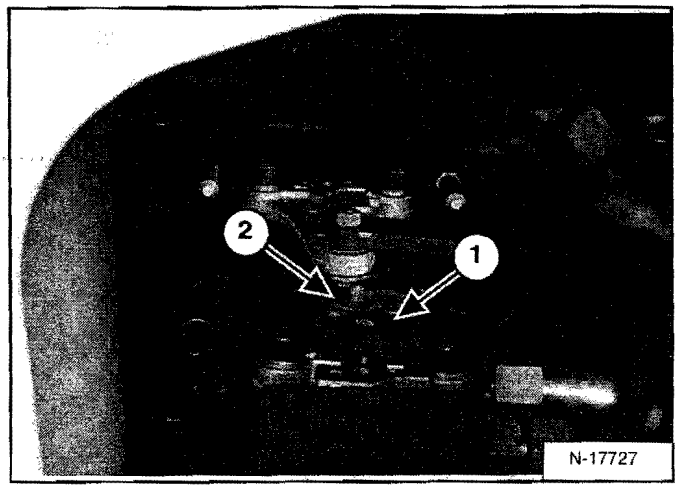


Remove the linkage bar nut (Item 1) **[Figure 50-100-21]** from the torsion bushing.

The bolt is threaded into the linkage bar, remove the bolt from underneath the pintle arm.

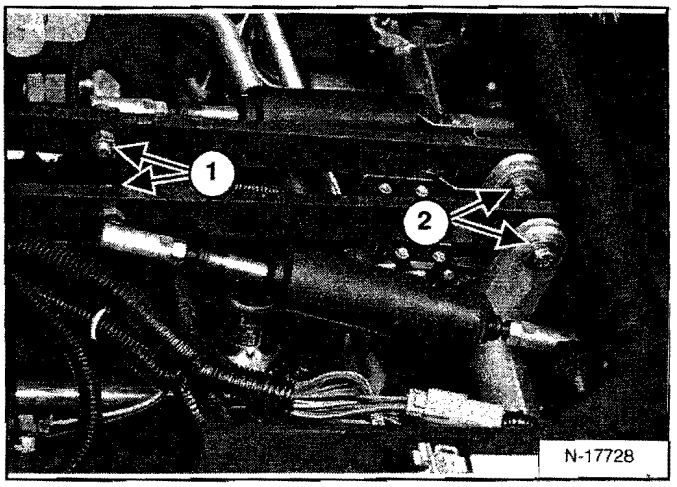
Installation: Tighten the bolt to 11-13 ft.-lbs. (21-25 Nm) torque, then tighten the nut (Item 1) **[Figure 50-100-21]** to 21-25 ft.-lbs. (28-33 Nm) torque.

Figure 50-100-22



Remove the linkage bar (Item 1) **[Figure 50-100-22]** from the pintle arm. remove the torsion bushing (Item 2) **[Figure 50-100-22]** from the pintle arm.

Figure 50-100-23



Remove the nuts (Item 1) **[Figure 50-100-23]** from both shock absorber ball joint ends.

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

Disconnect the shock absorbers from the linkage bars.

Remove the nuts (Item 2) **[Figure 50-100-23]** from the linkage bar mounting bolt. The bolts are threaded into the linkage bars, remove the bolts.

Installation: Tighten the bolts to 11-13 ft.-lbs. (21-25 Nm) torque, then tighten the nuts to 21-25 ft.-lbs. (28-33 Nm) torque.

The torsion bushings can now be removed from the steering bell cranks.

The linkage and the centering plate must be readjusted for neutral after the components have been reassembled.

Linkage Neutral Adjustment

⚠ WARNING

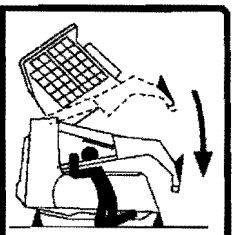
Put jackstands under the front axles and rear corners of the frame before running the engine for service. Failure to use jackstands can allow the machine to fall or move and cause injury or death.

W-2017-0286

⚠ 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.

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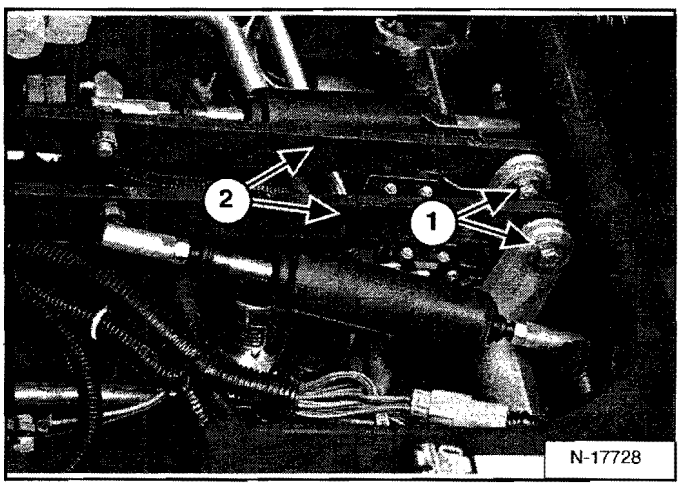
Figure 50-100-24



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

Place the loader on jackstands. (See Contents Page 10-01.)

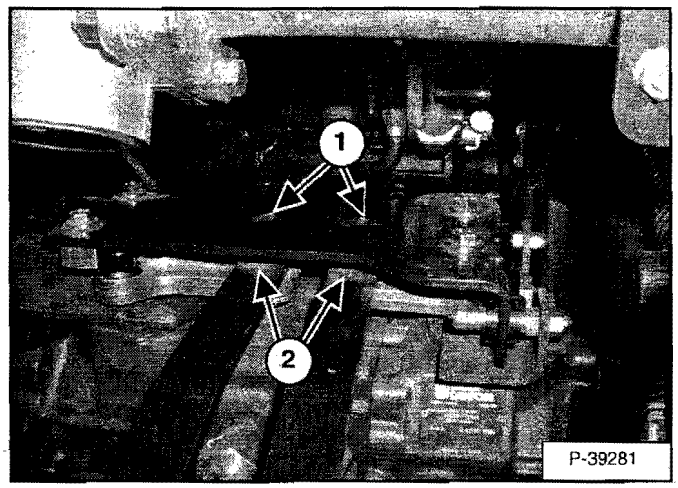
Raise the operator cab. (See Contents Page 10-01.)

Connect the remote start tool. (MEL 1563) (See Contents Page 10-01.)

Pre-load tension in the torsion bushings must be removed before adjusting the steering linkage.

Loosen the nut (Items 1) (three to four turns), then loosen the bolt. The bolt is threaded into the linkage bar (Item 2) **[Figure 50-100-24]**. The bolt must be loosened enough to allow the torsion bushing to turn freely between the steering bellcrank and the linkage bar.

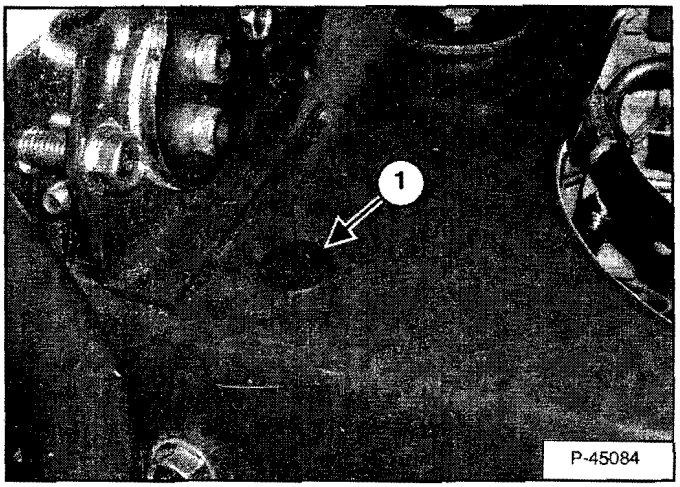
Figure 50-100-25



Loosen the nut (three to four turns), then loosen the bolt at the linkage bar (Items 1). The bolt is threaded into the linkage bar (Items 2) **[Figure 50-100-25]**. The bolt must be loosened enough to allow the torsion bushing to turn freely between the pintle arm and the linkage bar.

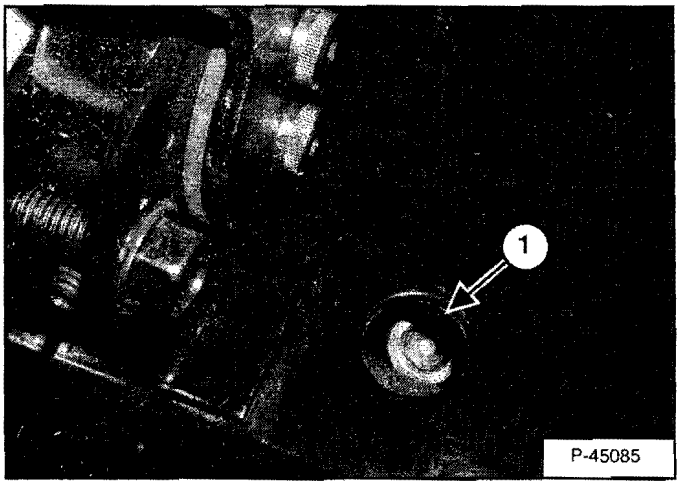
Linkage Neutral Adjustment (Cont'd)

Figure 50-100-26



Remove the plug (Item 1) **[Figure 50-100-26]** from the control panel. (Both sides.)

Figure 50-100-27



With an Alan wrench turn the loader drift adjustment bolt (Item 1) **[Figure 50-100-27]** counterclockwise until it is flush with the bottom side of the nut (Item 1) **[Figure 50-100-28]**. (Both sides.)

NOTE: This allows the steering lever to be move to the full forward position without hitting the adjustment bolt.

Figure 50-100-28

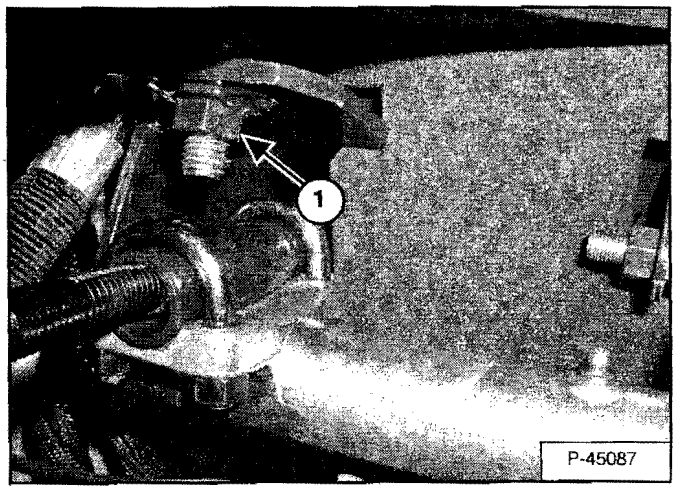
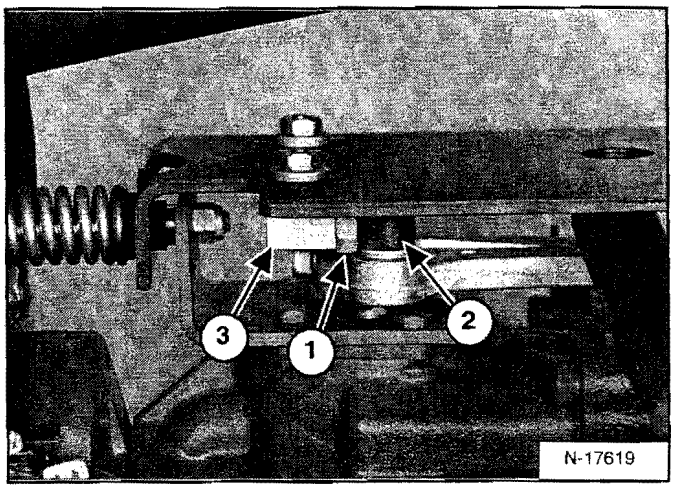


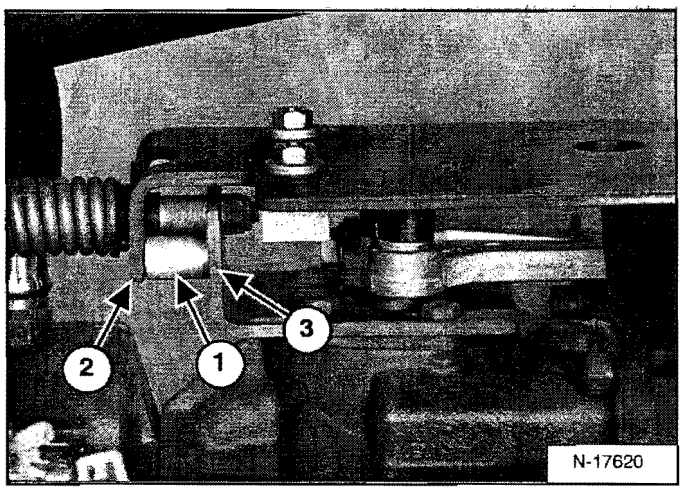
Figure 50-100-29



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 50-100-29]**.

Linkage Neutral Adjustment (Cont'd)

Figure 50-100-30

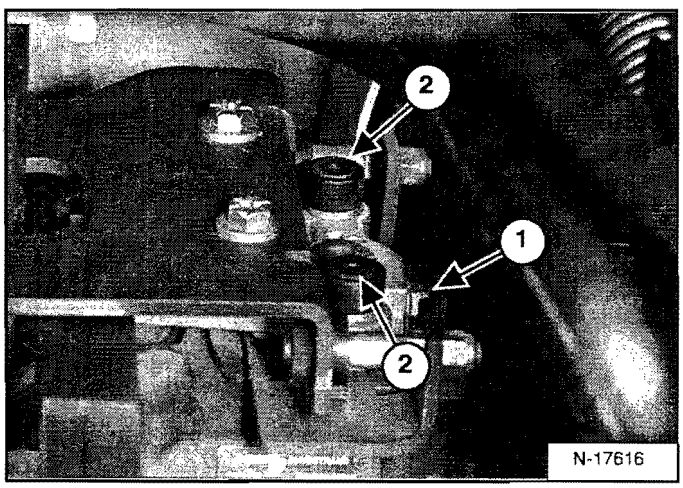


Move the right side steering lever forward and install a 15/16 inch (24 mm) thick spacer (Item 1) between the centering plate (Item 2) and the mounting plate (Item 3) **[Figure 50-100-30]**.

This will allow the pintle arms to move freely while adjusting the steering linkage for full forward travel speed.

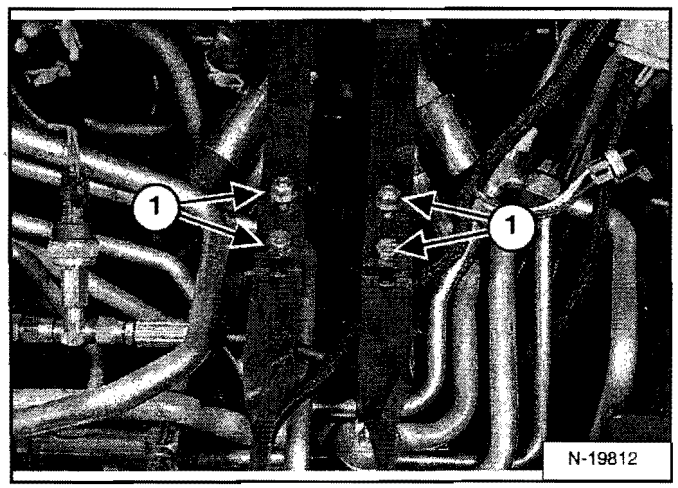
Remove the 3/8 inch (10 mm) thick spacer (Item 1) **[Figure 50-100-29]**.

Figure 50-100-31



Check that the pintle arm mounting bolt (Item 1) is tight, 25-28 ft.-lbs. (34-38 Nm) torque and that there is no play between the pintle arm and the square pump shaft. Also check that the cam mounting bolts (Item 2) **[Figure 50-100-31]** are tight, 45-50 ft.-lbs. (62-68 Nm) torque.

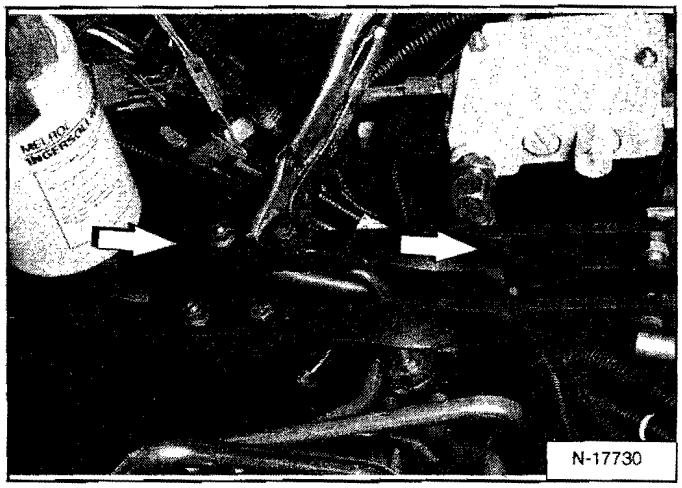
Figure 50-100-32



Loosen the two bolts and nuts (Item 1) **[Figure 50-100-32]** on each steering linkage bar.

Linkage Neutral Adjustment (Cont'd)

Figure 50-100-33



Move the left side steering lever to the full forward position, then pull forward on the left side rear linkage bar until the pintle arm is rotated to the front as far as possible. Use a clamping plier and clamp the two linkage bars together **[Figure 50-100-33]**.

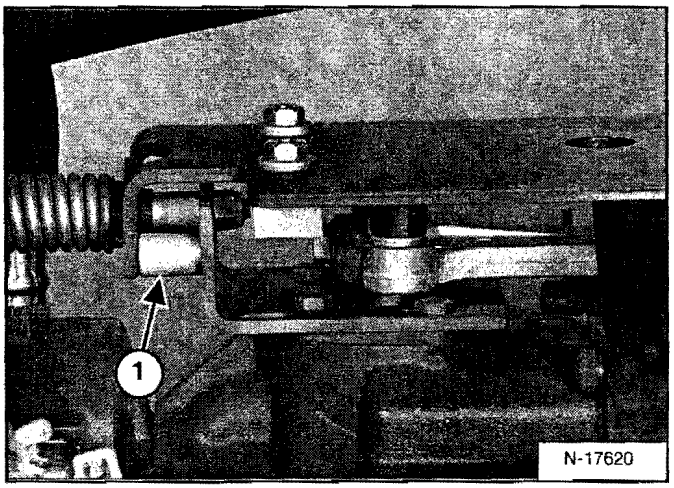
Tighten the nuts and bolts to 25-28 ft.-lbs. (34-38 Nm) torque.

Check the lever movement to make sure that the pintle arm and the steering lever are both at full stroke at the same time. This will allow for maximum forward speed.

Repeat the procedure for the right side steering linkage bar.

After both sides of the linkage bars have been adjusted, the feel of both levers at full stroke should be the same. Readjust the linkage if necessary.

Figure 50-110-34



Remove the spacer (Item 1) **[Figure 50-110-34]**.

Linkage Neutral Adjustment (Cont'd)

Figure 50-100-35

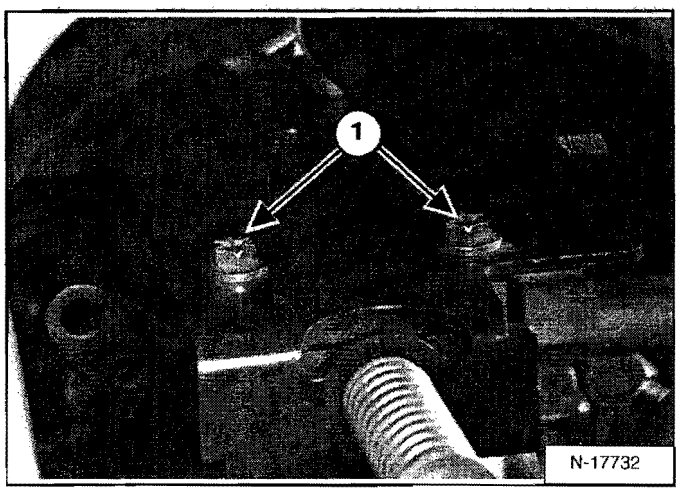
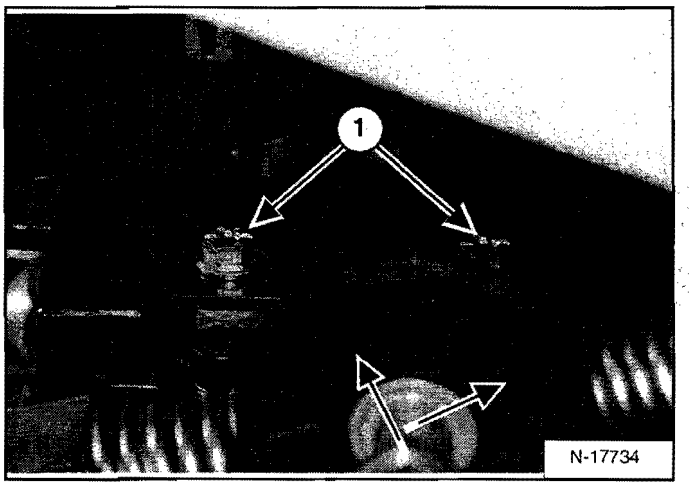


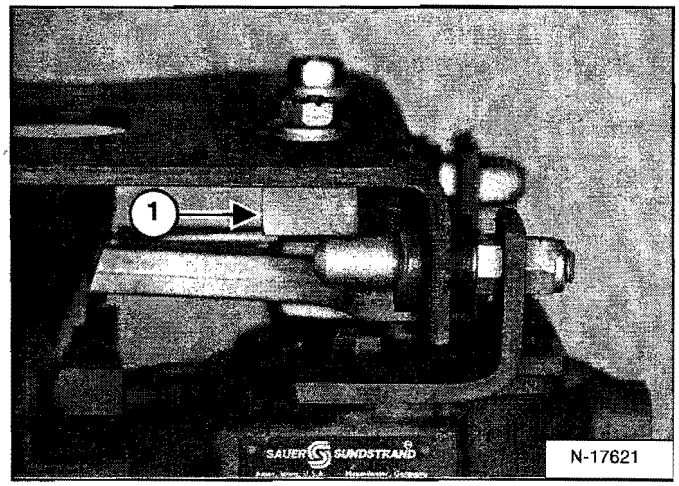
Figure 50-100-36



Loosen the four bolts (Item 1) **[Figure 50-100-35]** & **[Figure 50-100-36]** holding the two centering blocks. Move the right side centering block to the right as far as possible.

NOTE: Bolt holes are slotted for pintle arm centering adjustment.

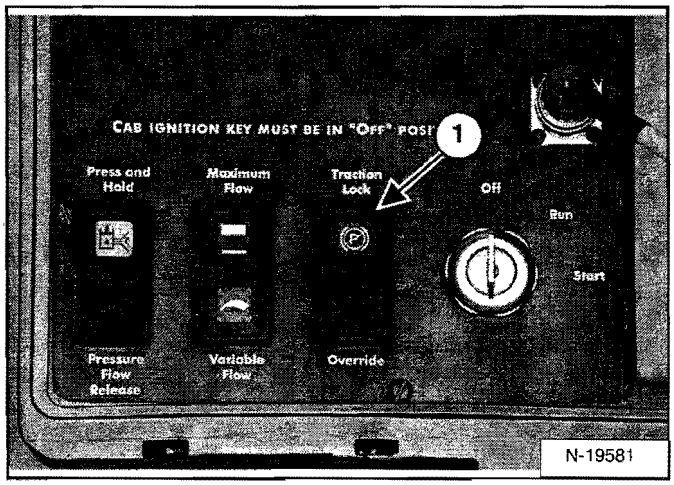
Figure 50-100-37



Adjust the left side centering block first (Item 1) **[Figure 50-100-37]**.

Start the engine, using the remote start tool, and run the loader at high RPM.

Figure 50-100-38



On the remote start tool, move the traction lock override switch (Item 1) **[Figure 50-100-38]** to the OFF position so the traction function is unlocked. The wheels are now able to turn.

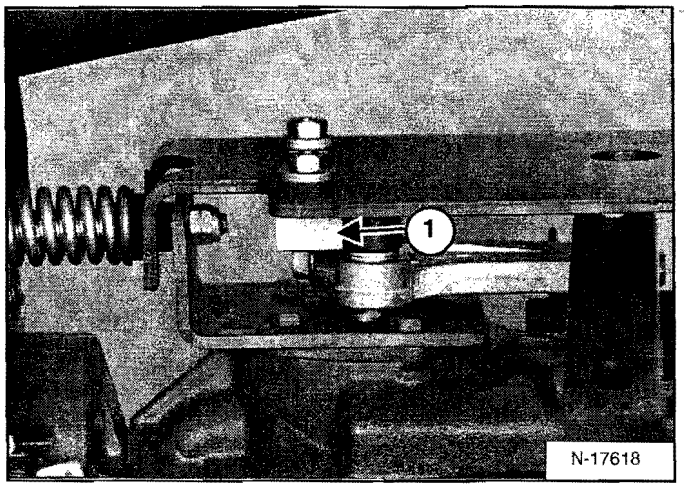
Move the left hand steering lever until the tires do not turn (neutral position).

Move the left side centering block to the left until it contacts both pintle cams and the steering lever is still in the neutral position.

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

Linkage Neutral Adjustment (Cont'd)

Figure 50-100-39



Adjust the right side centering block (Item 1) **[Figure 50-100-39]**.

Move the right side steering lever until the tires do not turn (neutral position).

Move the right side centering block to the left until it contacts both pintle cams and the steering lever is still in the neutral position **[Figure 50-100-39]**.

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

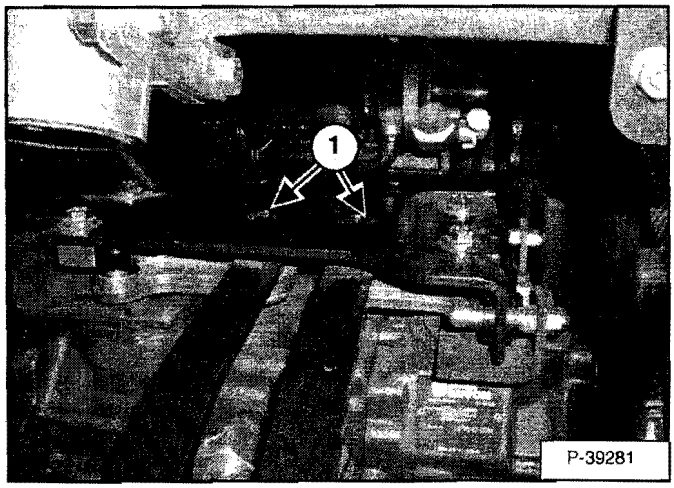
Test both levers by moving them backward and forward and letting them return to neutral by the return spring force.

If the levers do not return to neutral and the tires do not come to a complete stop, repeat the adjustment procedure again.

Stop the engine.

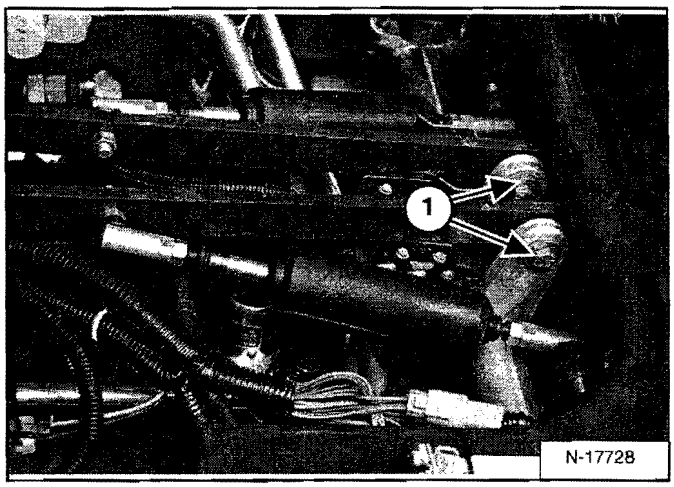
Remove the remote start tool from the loader.

Figure 50-100-40



Tighten the two linkage bar bolts to 221-25 ft.-lbs. (28-33 Nm) torque, then tighten the two nuts to 21-25 ft.-lbs. (28-33 Nm) torque at the pintle levers (Items 1) **[Figure 50-100-40]**.

Figure 50-100-41

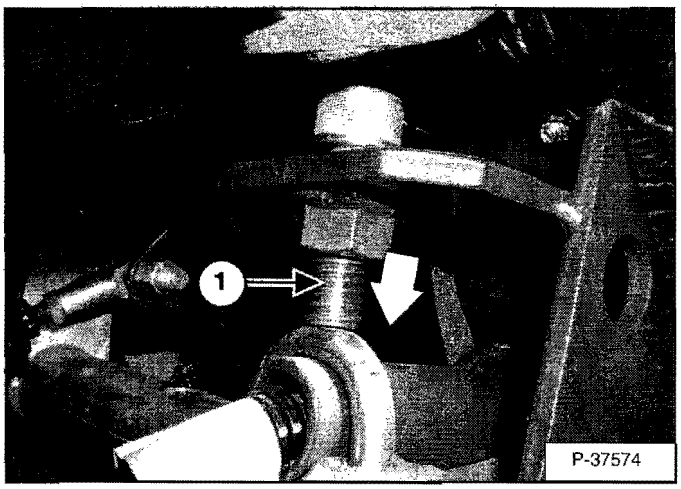


Tighten the two linkage bar bolts to 21-25 ft.-lbs. (28-33 Nm) torque, then tighten the two nuts to 21-25 ft.-lbs. (28-33 Nm) torque at the steering cross shaft (Item 1) **[Figure 50-100-41]**.

Remove the loader from the jackstands.

Linkage Neutral Adjustment (Cont'd)

Figure 50-100-42



Push the control lever to full stroke and turn drift adjustment bolt (Item 1) **[Figure 50-100-42]** clockwise until it touches the U-bolt holding the control lever.

Repeat steps on the other control lever.

With operator in the seat and seat belt fastened, start the loader.

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 50-100-42]** clockwise.

If the drift is excessive to the right, turn the left adjustment bolt clockwise.

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 excess 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 PANEL (ADJUSTABLE PINTLES)

Removal And Installation

⚠ WARNING

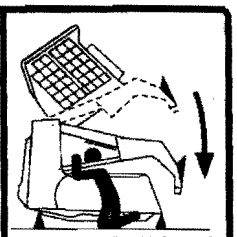
Put jackstands under the front axles and rear corners of the frame before running the engine for service. Failure to use jackstands can allow the machine to fall or move and cause injury or death.

W-2017-0286

⚠ 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

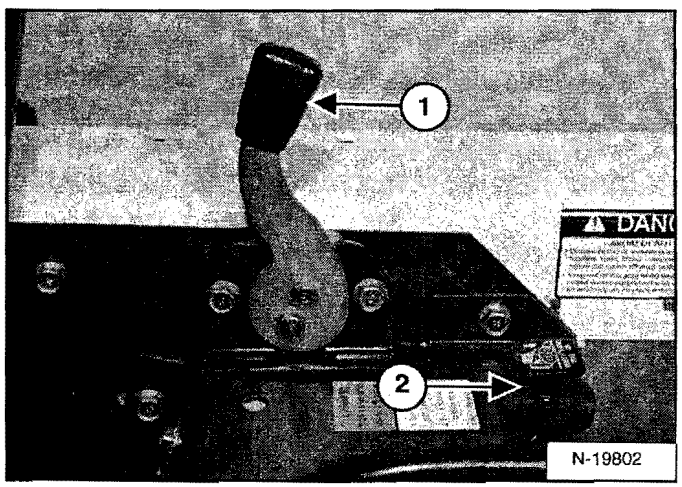
Never work on a machine with the lift arms up unless the lift arms are secured by an approved lift arm support device. Failure to use an approved lift arm support device can allow the lift arms or attachment to fall and cause injury or death.

W-2059-0598

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 50-101-1

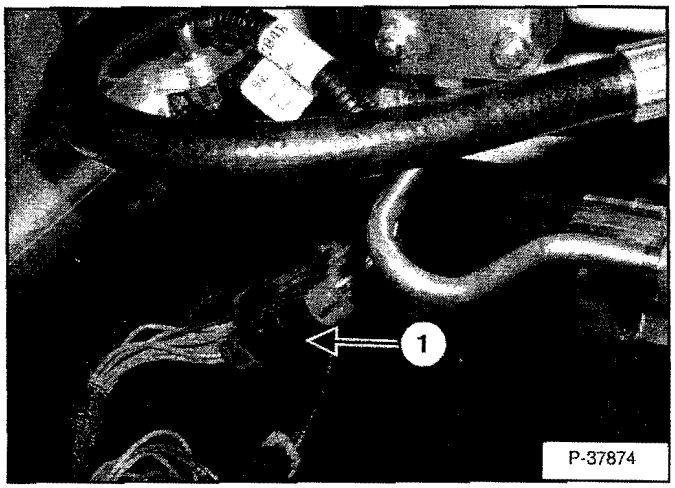


Remove the engine speed control (Item 1) **[Figure 50-101-1]**. (See Contents Page 70-01.)

Loosen the jam nut from the by-pass control knob (Item 2) **[Figure 50-101-1]**.

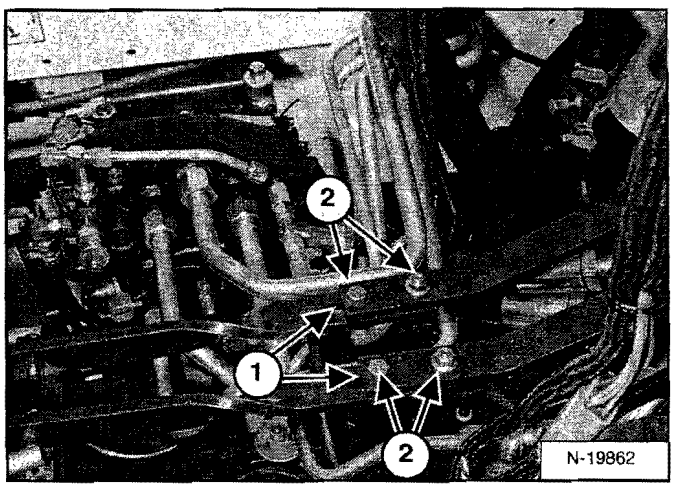
Remove the control knob, jam nut, and rubber washer.

Figure 50-101-2



Disconnect the control harness connector (Item 1) **[Figure 50-101-2]** from the right side steering lever.

Figure 50-101-3



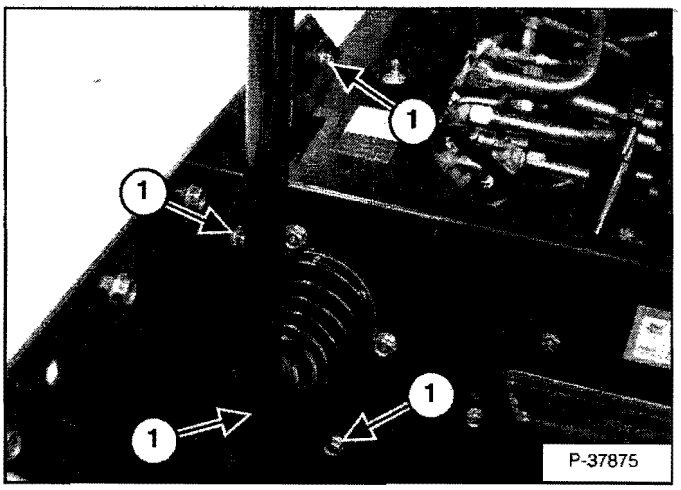
Scribe a mark across the top of the steering linkage bars (Item 1) **[Figure 50-101-3]**.

Remove the four steering linkage mounting bolts (Item 2) **[Figure 50-101-3]**.

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

Removal And Installation (Cont'd)

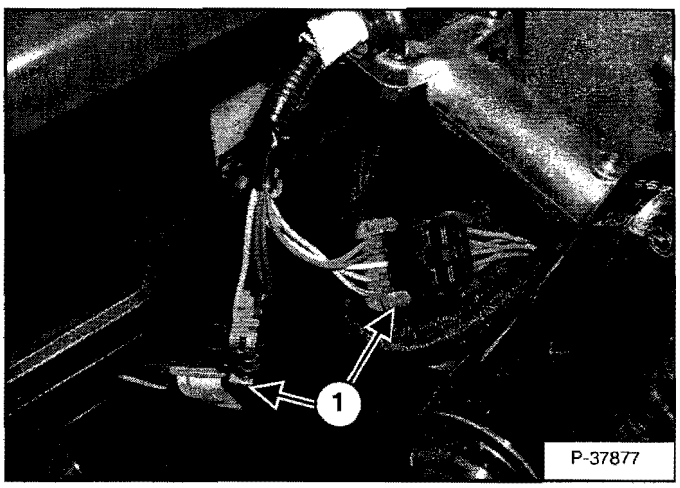
Figure 50-101-4



Remove the four control panel mounting bolts (Item 1) **[Figure 50-101-4]** from right side of the control panel.

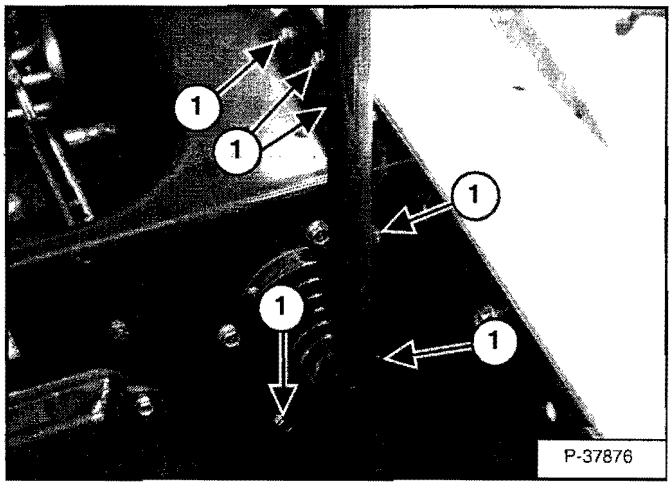
Installation: Tighten the control panel mounting bolts to 25-28 ft.-lbs. (34-38 Nm) torque.

Figure 50-101-5



Remove the electrical connectors (Item 1) **[Figure 50-101-5]** from the left handle. (If so equipped.)

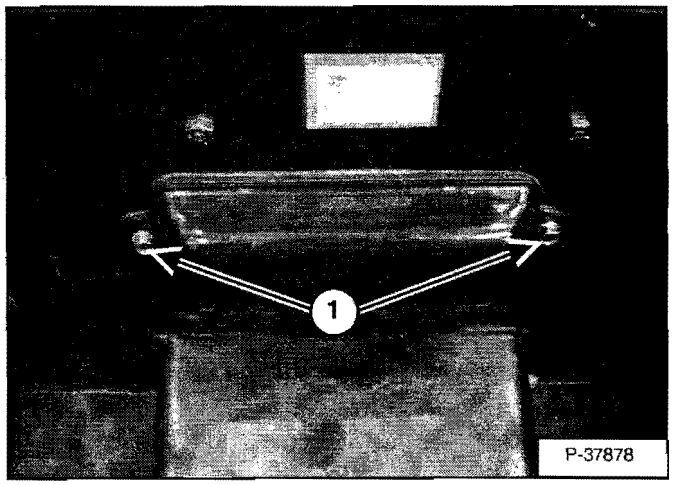
Figure 50-101-6



Remove the six control panel mounting bolts (Item 1) **[Figure 50-101-6]** from the left side of the control panel.

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

Figure 50-101-7



Remove the fuse cover mount bolts (Item 1) **[Figure 50-101-7]**.

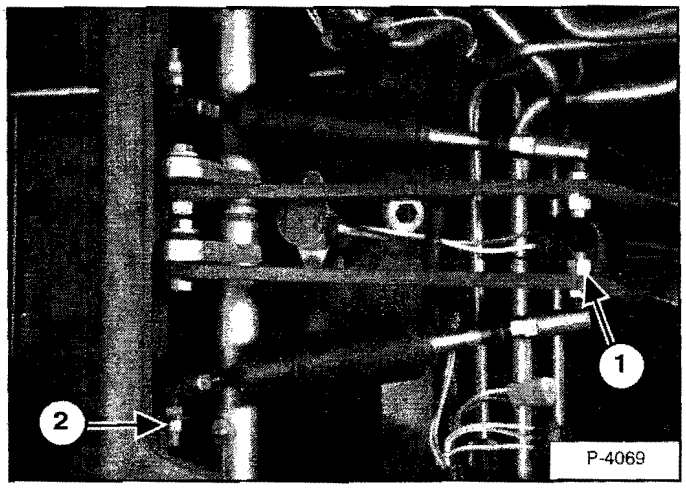
Remove the fuse cover from the loader.

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

Remove the control panel from the loader.

Shock Removal And Installation

Figure 50-101-8



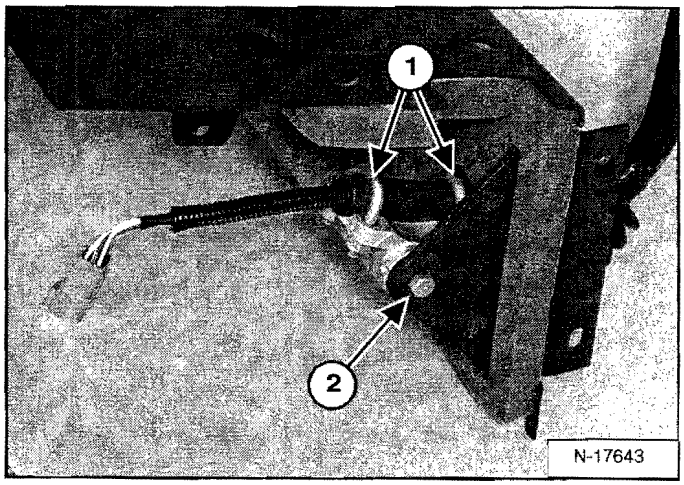
Remove the mounting nut (Item 1) **[Figure 50-101-8]** from the end of the shock connected to the steering linkage.

Remove the mounting nut (Item 2) **[Figure 50-101-8]** 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

Figure 50-101-9



NOTE: The steering shaft can be removed without removing the control panel from the loader. Photo [Figure 50-101-9] shows the control panel removed for clarity purpose only.

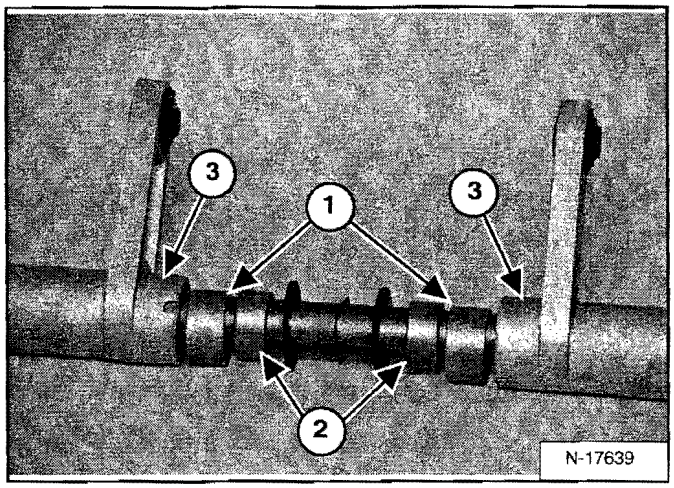
Loosen both U-bolts (Item 1) **[Figure 50-101-9]** at the steering lever (both sides).

Remove the steering cross shaft mounting bolts (Item 2) **[Figure 50-101-9]** (both sides).

Installation: Tighten the mounting bolts to 180-200 in.-lbs. (21-23 Nm) torque.

Shaft Disassembly And Assembly

Figure 50-101-10



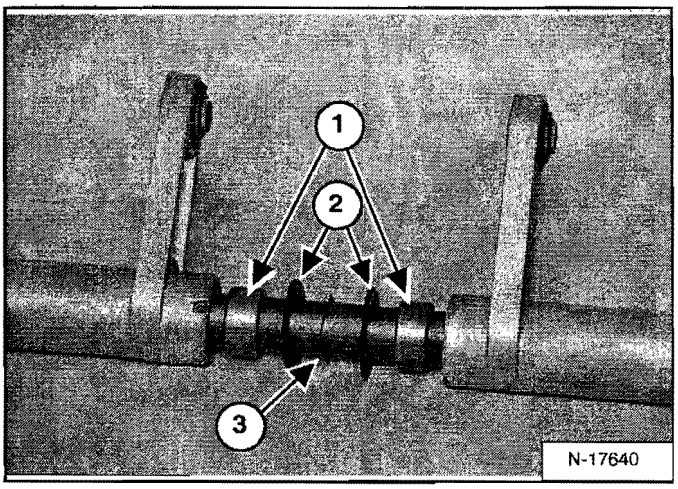
Remove the steering cross shaft from the control panel.

Disassemble the right and left steering shafts from the cross shaft assembly.

NOTE: Some loaders may have a sleeve (Item 1), between the bearing (Item 2) and the bell crank (Item 3) [Figure 50-101-10].

Shaft Disassembly And Assembly (Cont'd)

Figure 50-101-11

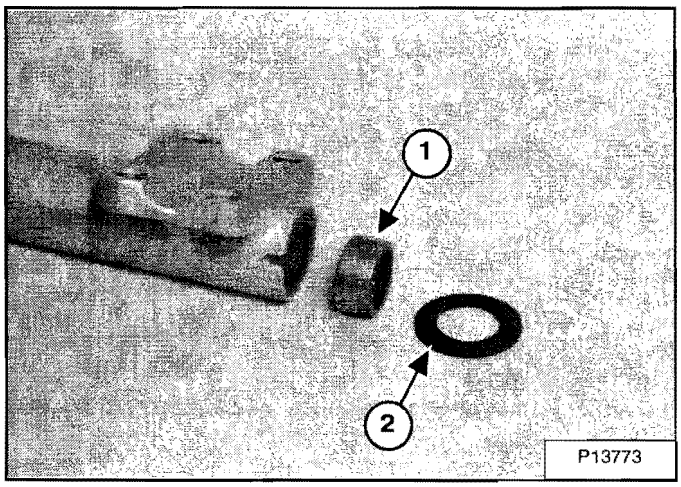


Check the bearings (Item 1) **[Figure 50-101-11]** for wear and replace as needed.

Check the fiber washers (Item 2) **[Figure 50-101-11]** for wear and replace as needed.

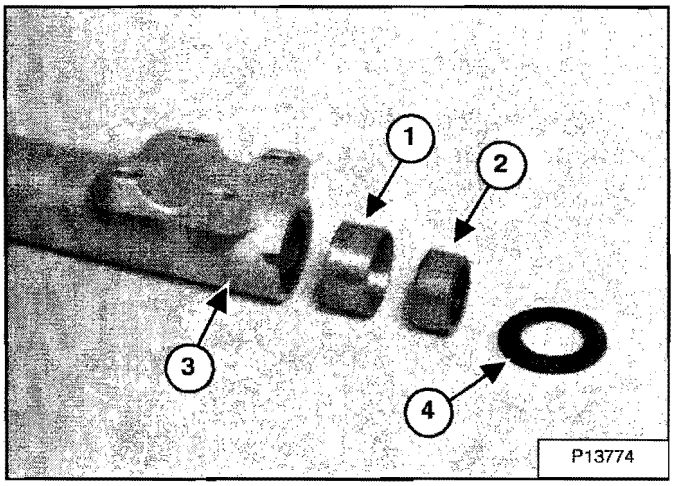
Replace the wave washer (Item 3) **[Figure 50-101-11]** if worn.

Figure 50-101-12



Check the end bearing (Item 1) **[Figure 50-101-12]** and fiber washer (Item 2) **[Figure 50-101-12]** and replace as needed.

Figure 50-101-13



NOTE: Some loaders may have a spacer (Item 1), between the bearing (Item 2) and the bell crank (Item 3) [Figure 50-101-13].

Check the fiber washer (Item 4) **[Figure 50-101-13]** and replace all worn parts.

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

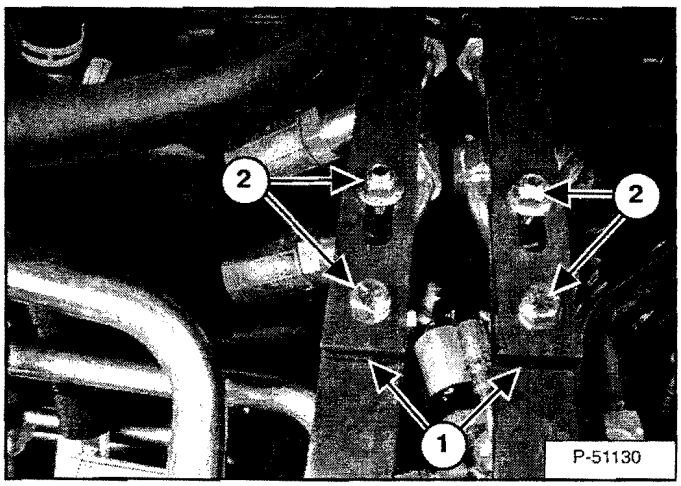
Put jackstands under the front axles and rear corners of the frame before running the engine for service. Failure to use jackstands can allow the machine to fall or move and cause injury or death.

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 50-101-14



Scribe a mark across the top of the steering linkage bars (Item 1) **[Figure 50-101-14]** which are connected to the steering shaft on the control panel.

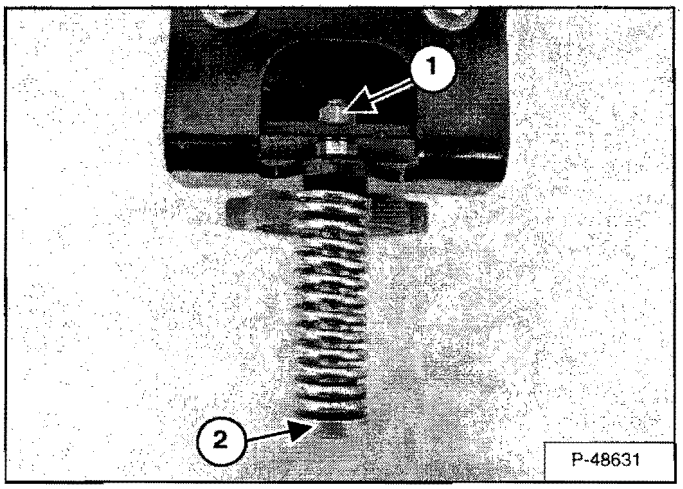
Remove the four steering linkage mounting bolts (Item 2) **[Figure 50-101-14]**.

Installation: Align the marks on the steering linkage bars. Tighten the steering linkage mounting bolts to 25-28 ft.-lbs. (34-38 Nm) torque.

NOTE: After removal and installation of the linkage, the linkage neutral adjustment procedure must be performed. (See Linkage Neutral Adjustment on Page 50-100-10.)

Linkage Removal And Installation (Cont'd)

Figure 50-101-15

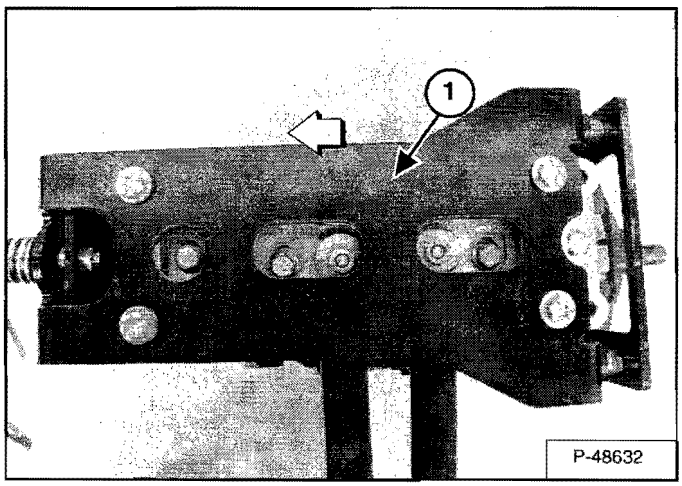


Remove the nut (Item 1) **[Figure 50-101-15]** from the end of the centering spring shoulder bolt (Item 2) **[Figure 50-101-15]**.

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.

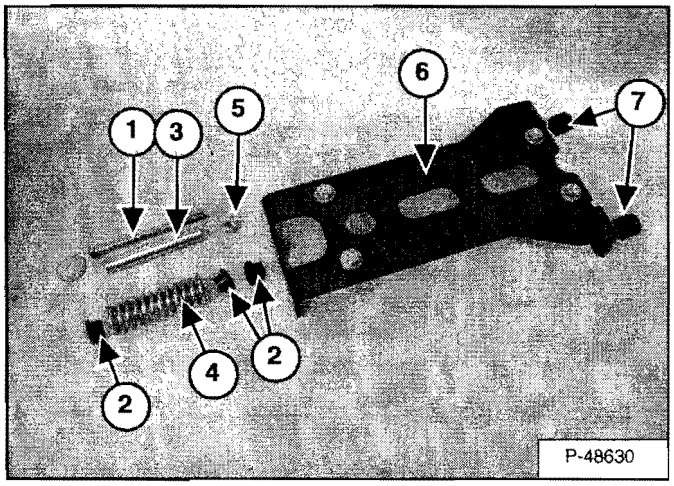
Figure 50-101-16



Slide the centering plate (Item 1) **[Figure 50-101-16]** to the right and remove it from the hydrostatic pumps.

NOTE: Directions are shown and stated as if you were sitting in the operators seat.

Figure 50-101-17

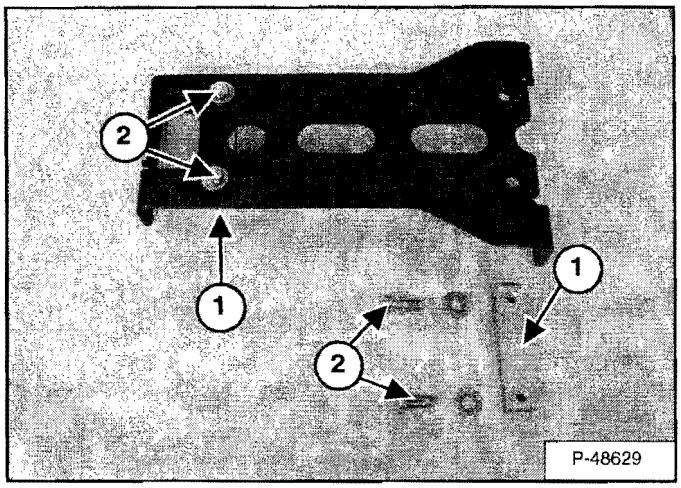


The centering plate/centering spring assembly consists of the following parts;

ITEM	DESCRIPTION
1	Bolt
2	Bushings
3	Bushing Spacer
4	Spring
5	Lock Nut
6	Centering Plate
7	Guide Bushings

Linkage Removal And Installation (Cont'd)

Figure 50-101-18



Check the wear on the centering blocks (Item 1) **[Figure 50-101-18]**.

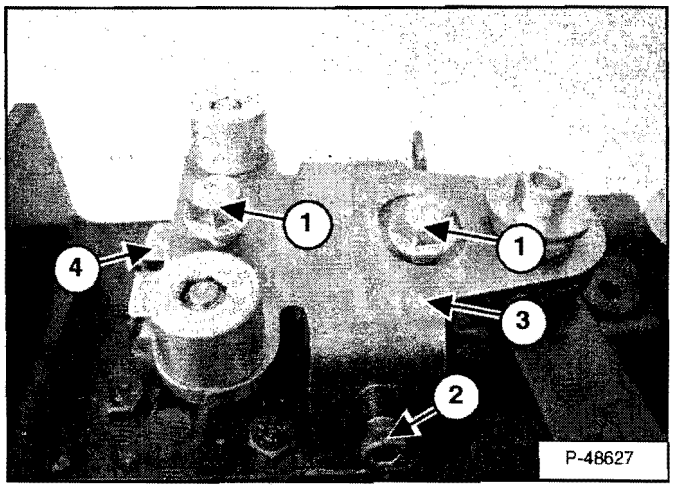
If the centering blocks need replacement, remove the bolts (Item 2) **[Figure 50-101-18]**. Remove the centering blocks.

Installation: Tighten the centering block bolts to 35-40 ft.-lbs. (48-54 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 cams are worn, they can be loosened and rotated 90 degrees and reinstalled.

Figure 50-101-19

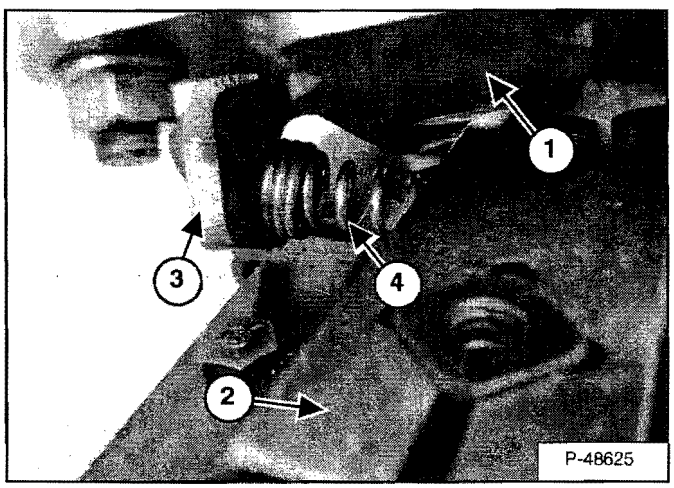


Remove the bolts (Item 1) **[Figure 50-101-19]** from the pintle.

Loosen the creep adjustment bolt (Item 2) **[Figure 50-101-19]**.

Remove the pintle arm (Item 3) from the pintle base (Item 4) **[Figure 50-101-19]**.

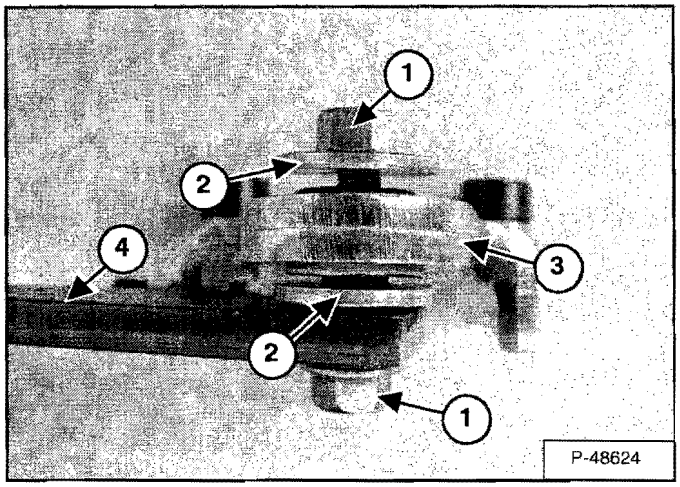
Figure 50-101-20



NOTE: When installing the pintle arm (Item 1) onto the pintle base (Item 2) align the rear of pintle arm (engine side) (Item 3) on the spring (Item 4) [Figure 50-101-20].

Linkage Removal And Installation (Cont'd)

Figure 50-101-21

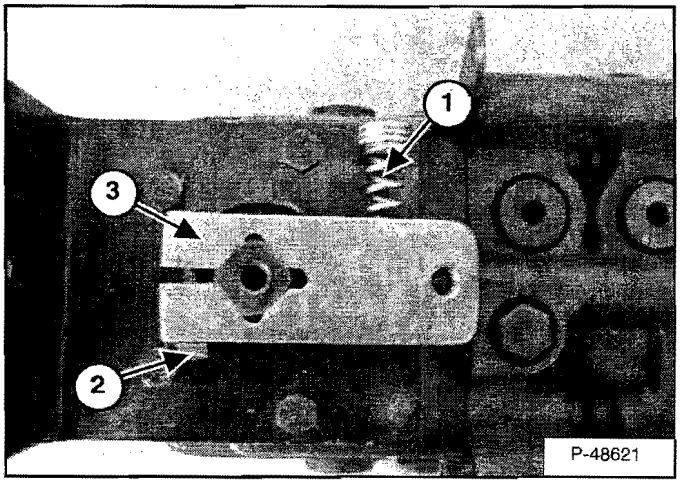


Remove the bolt and nut (Item 1) **[Figure 50-101-21]**.

Inspect the washers (Item 2), pintle arm (Item 3) and the lever (Item 4) for damage and replace as needed **[Figure 50-101-21]**.

NOTE: The washers (Item 2) [Figure 50-101-21] are a hardened washer and should only be replaced through Bobcat Parts.

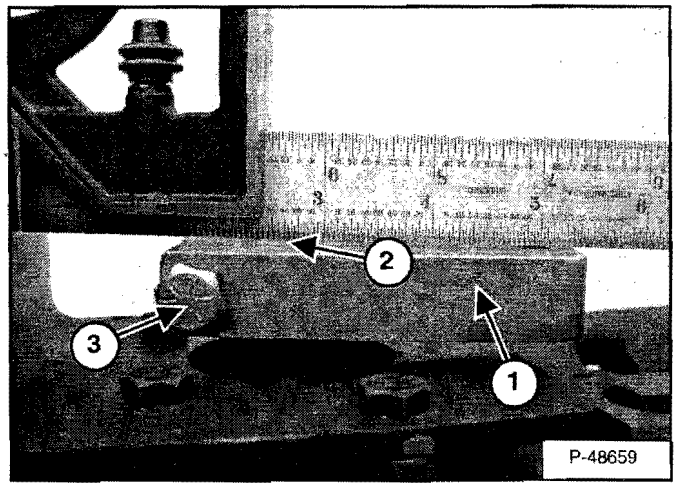
Figure 50-101-22



Remove and inspect the spring (Item 1) **[Figure 50-101-22]**.

Loosen the bolt (Item 2) and remove the pintle base (Item 3) **[Figure 50-101-22]**.

Figure 50-101-23



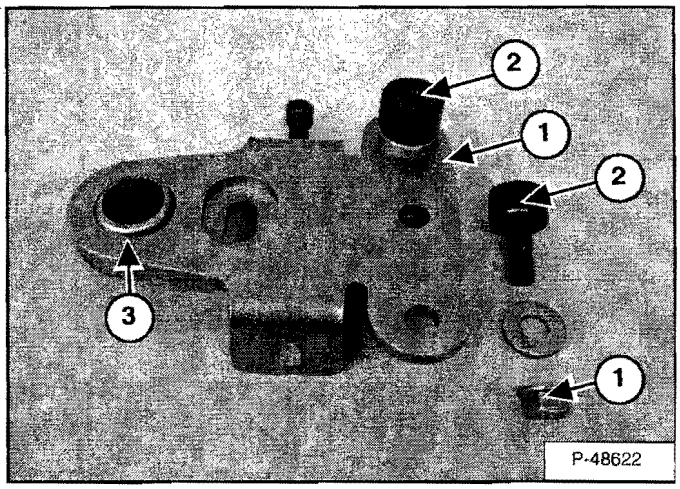
Installation: When installing the pintle base (Item 1) onto the pump shaft the cutouts on the pump shaft will not line up with the bolt (Item 3) **[Figure 50-101-23]**.

Installation: Install the pintle base (Item 1) onto the pump shaft (Item 2). The top of the pintle base should be level with the top of the pump shaft **[Figure 50-101-23]**. Tighten the pintle base bolt to 35-40 ft.-lbs. (48-54 Nm) torque.

NOTE: After installing the linkage onto the hydrostatic pumps the linkage neutral adjustment procedure must be performed. (See Linkage Neutral Adjustment on Page 50-100-10.)

Pintle Arm Disassembly and Assembly

Figure 50-101-24

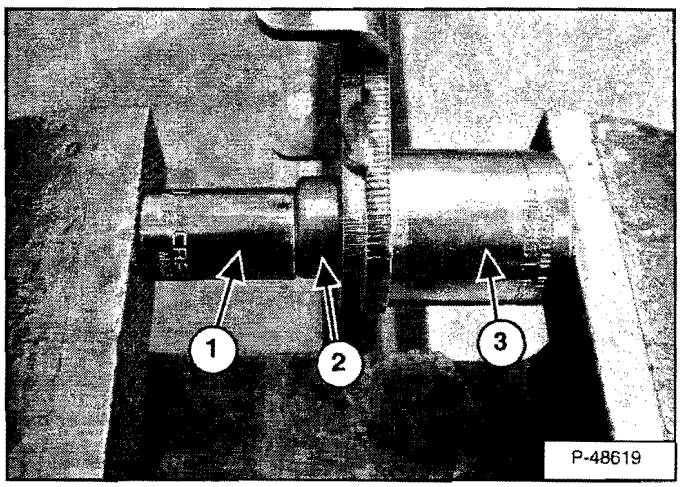


Remove the nut (Item 1) from the pintle roller cams and inspect the pintle roller cams (Item 2) and washers for damage **[Figure 50-101-24]**.

Inspect the torsion bushing (Item 3) **[Figure 50-101-24]** for damage and replace as needed.

Installation: Tighten the nuts to 45-50 ft.-lbs. (62-68 Nm) torque.

Figure 50-101-25

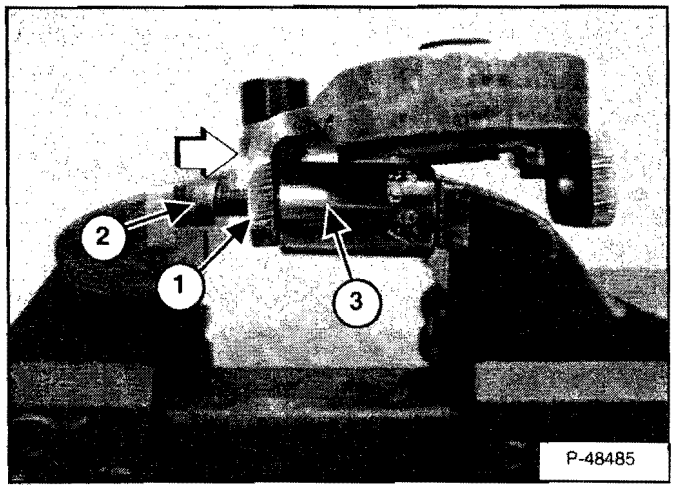


Using a bushing driver (Item 1) remove the torsion bushing (Item 2) by pressing the bushing through the pintle arm into an oversized socket (Item 3) to catch the torsion bushing **[Figure 50-101-25]**.

Installation: Install the torsion bushing (Item 1) **[Figure 50-101-25]** 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.

Figure 50-101-26



Inspect the adjusting screw threaded insert (Item 1) **[Figure 50-101-26]**.

To remove the threaded insert install the adjustment screw (Item 2) into the threaded insert as shown **[Figure 50-101-26]**.

Place an oversized socket (Item 3) **[Figure 50-101-26]** on the threaded insert side of the pintle arm and using a vise push the threaded insert out.

Installation: To install the threaded insert place a proper sized pipe or socket (same as the outside diameter of the threaded insert) on the threaded insert and press it into the pintle arm.

CONTROL PANEL (ADJUSTABLE PINTLES) (CONT'D)

Linkage Neutral Adjustment

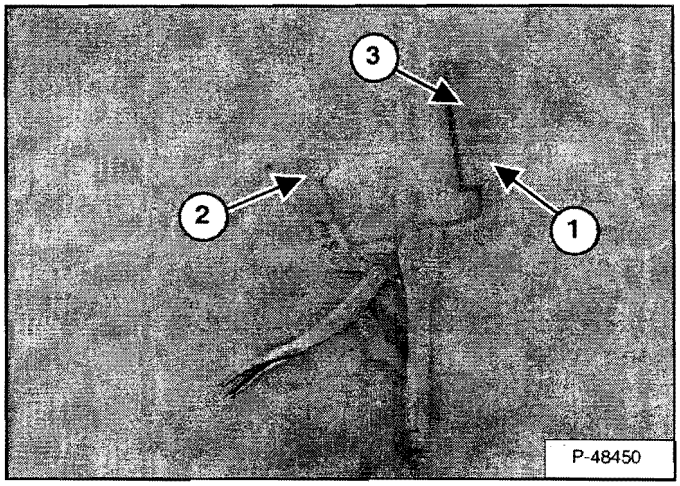
The following tool listed will be needed to do the following procedure:

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 50-101-27



Tool that may assist in the neutral adjustment **[Figure 50-101-27]**.

To make this tool use a locking grip C-Clamp and grind one edge flat (Item 1) and grind the other edge (Item 2) to a small rounded edge **[Figure 50-101-27]**.

A steering centering block (Item 3) **[Figure 50-101-27]** 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.

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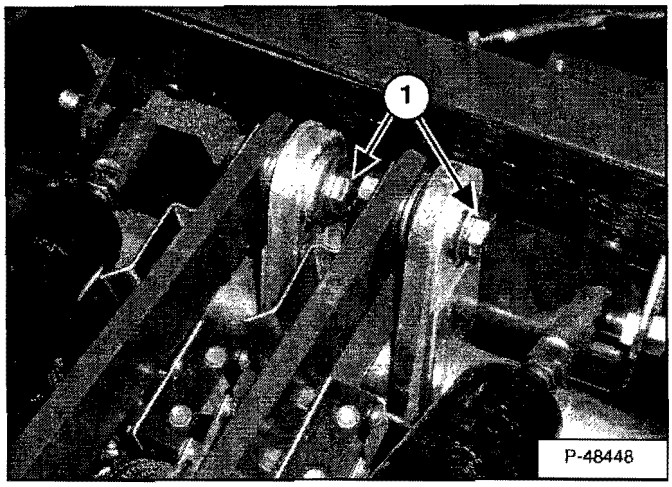
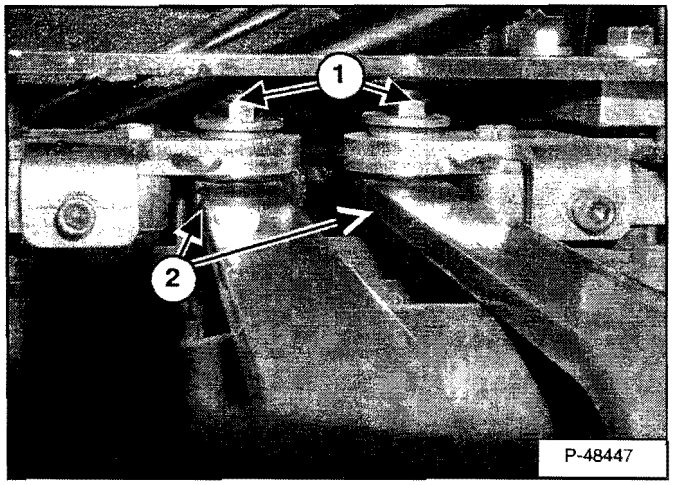
Figure 50-101-28



Loosen the bolt/nut (Item 1) **[Figure 50-101-28]** only until the tension is released from the torsion bushing.

Figure 50-101-29

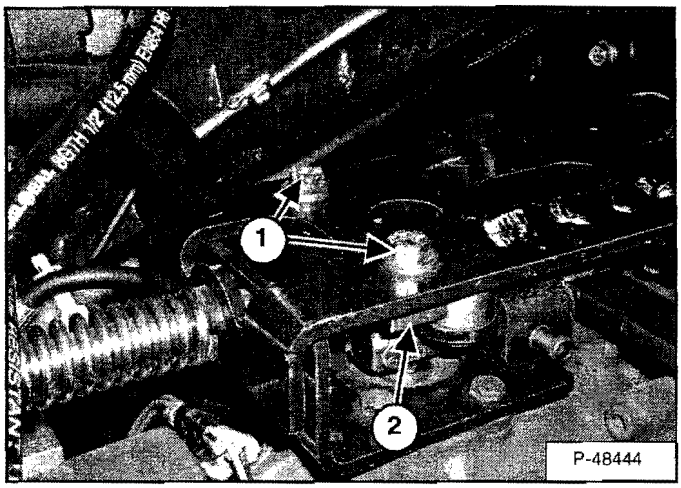


Loosen the nut (Item 1) only until the tension is released from the torsion bushing. (Item 2). **[Figure 50-101-29]**.

The bolt (Item 2) **[Figure 50-101-29]** must be loose enough to allow the torsion bushing to turn freely between the pintle arm and the linkage bar.

Linkage Neutral Adjustment (Cont'd)

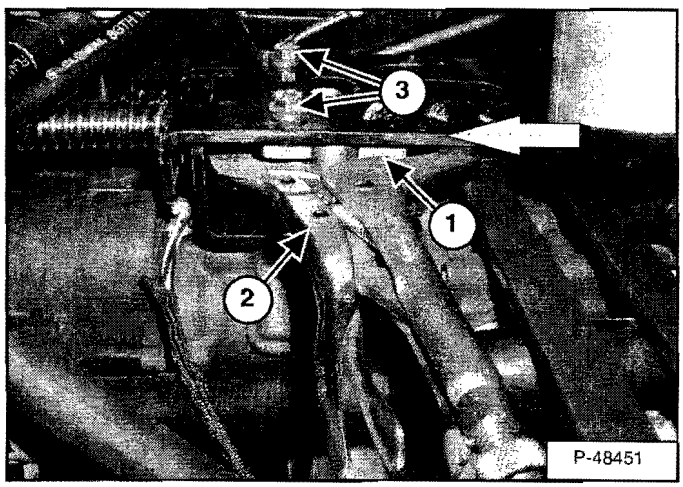
Figure 50-101-30



Loosen the two bolts (Item 1) holding the right centering block. Move the right hand centering block (Item 2) until both pintle cams contact the centering block **[Figure 50-101-30]**.

NOTE: The left centering block is not adjustable. By adjusting the right centering block the left centering block will also become aligned properly.

Figure 50-101-31

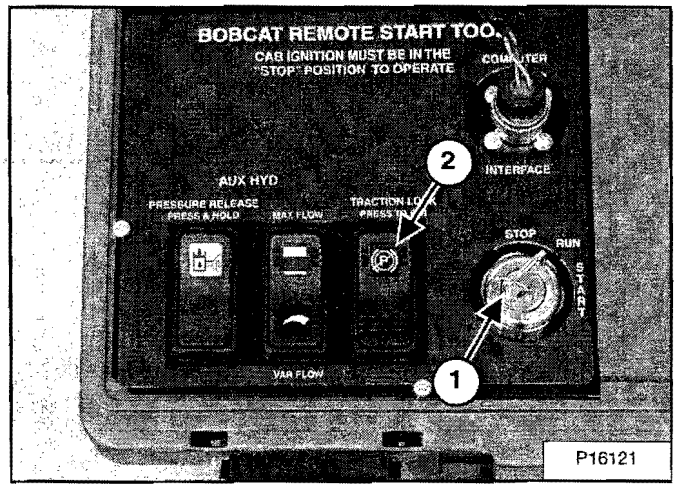


A modified locking grip C-Clamp and steering block shown in **[Figure 50-101-27]** may be used to help in aligning the centering blocks.

Install the centering block (Item 1) on the inside of the pintle cams and the C-Clamp (Item 2) **[Figure 50-101-31]** around both centering blocks.

Lock the C-Clamp in place.

Figure 50-101-32



Using the remote start tool, turn the key (Item 1) **[Figure 50-101-32]** to the run position.

Move the traction lock override switch (Item 2) **[Figure 50-101-32]** 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 50-101-32]** and start the engine and run at low idle.

Tighten bolts (Item 3) **[Figure 50-101-31]** to 35-40 ft.-lbs. (47,5-54,2 Nm).

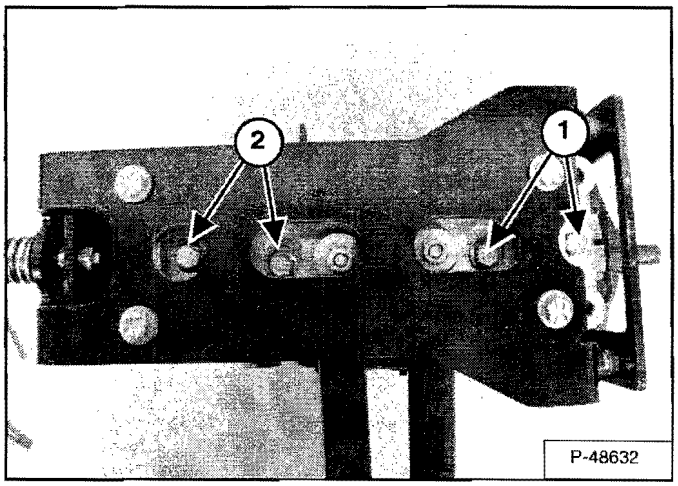
NOTE: Check for slack between centering blocks and pintle cams. If there is excessive slack repeat above steps [Figure 50-101-30] & [Figure 50-101-31].

CONTROL PANEL (ADJUSTABLE PINTLES) (CONT'D)

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.

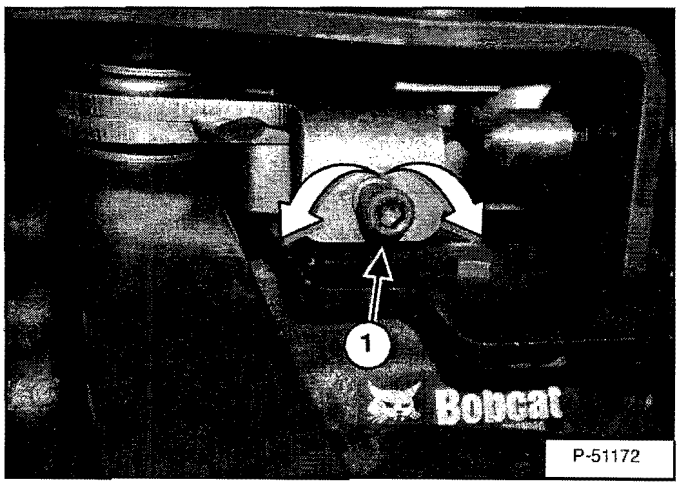
Figure 50-101-33



Loosen the left pump pintle adjustment lock bolts (Item 1) **[Figure 50-101-33]**. (The right pump pintle adjustment lock bolts are (Item 2) **[Figure 50-101-33]**.) Loosen the bolts enough to allow free movement between the pintle arm and the pintle base.

NOTE: If the bolts are to loose or to tight the neutral adjustment may be affected.

Figure 50-101-34



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.

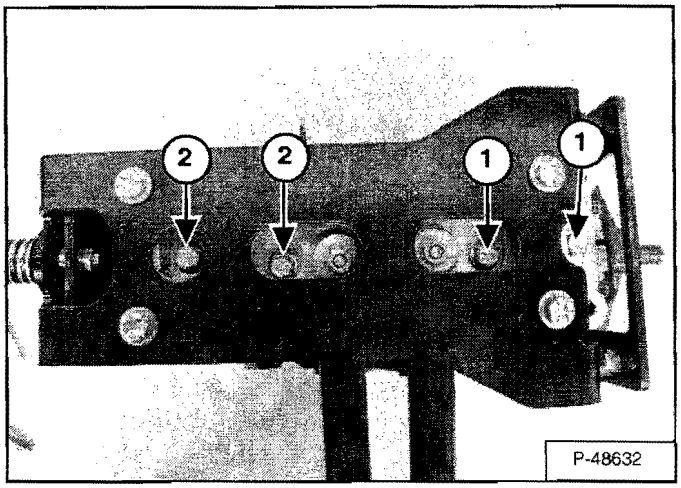
Turn the adjustment screw (Item 1) **[Figure 50-101-34]** counterclockwise until forward creep is seen.

Turn the adjustment screw (Item 1) **[Figure 50-101-34]** clockwise until zero creep is seen.

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 in either direction, on the left side. Turn the adjustment screw (if necessary) until zero creep is obtained.

Linkage Neutral Adjustment (Cont'd)

Figure 50-101-35



Torque the left pump pintle adjustment lock bolts (Item 1) **[Figure 50-101-35]** to 35-40 ft.-lbs. (47,5-54,2 Nm).

Repeat the procedure for the right pump.

Torque the right pump pintle adjustment lock bolts (Item 2) **[Figure 50-101-35]** 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.

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 one pintle adjustment bolt (Item 1) **[Figure 50-101-35]** 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.

Remove the loader remote start tool.

NOTE: After the neutral adjustment is completed on both pumps, the linkage adjustment MUST be completed. (See Page 50-101-14.)

Linkage Adjustment

NOTE: When the linkage 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 to loose, which will effect 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.

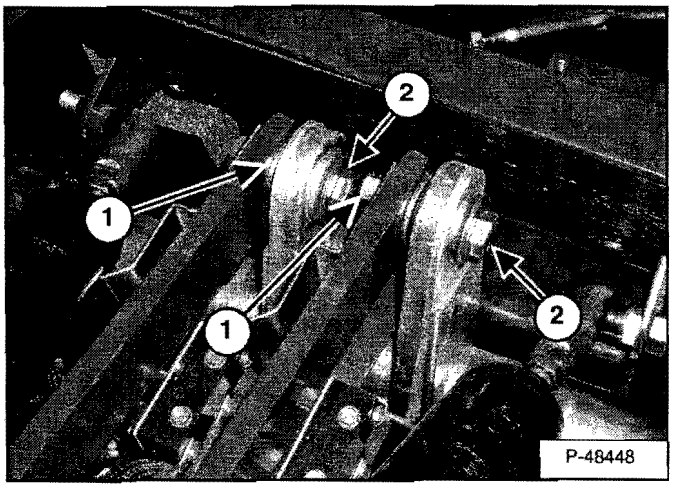
W-2017-0286

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

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

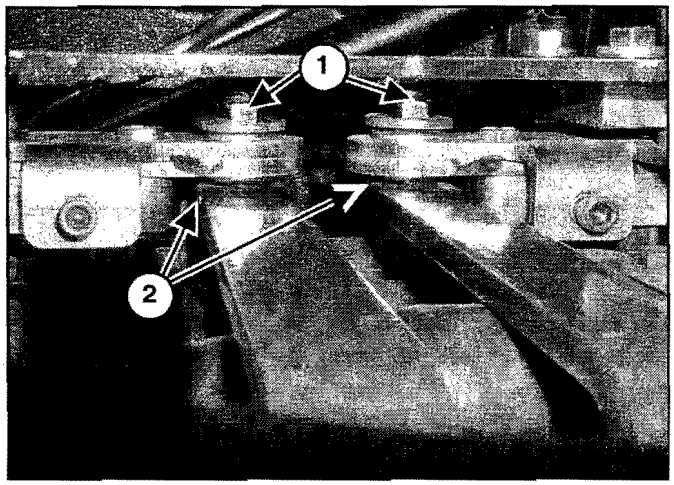
Pre-load tension in the torsion bushings must be removed before adjusting the steering linkage.

Figure 50-101-36



Loosen the nut (Item 1) 3 to 4 turns, then loosen the bolt (Item 2). The bolt (Item 2) must be loosened enough to allow the torsion bushing to turn freely between the steering bellcrank and the linkage bar **[Figure 50-101-36]**.

Figure 50-101-37

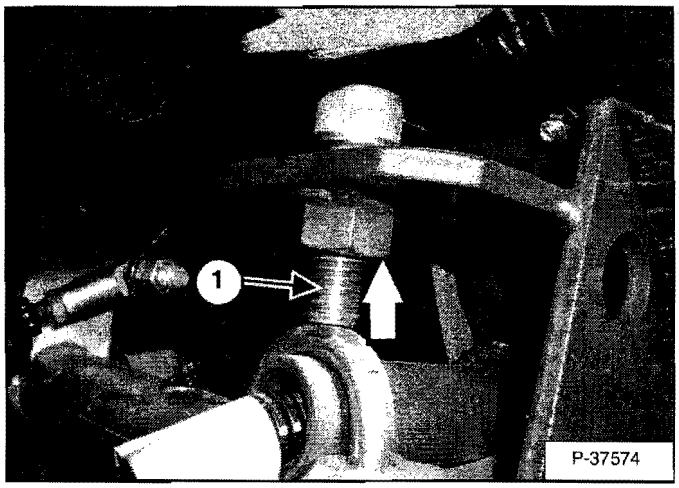


Loosen the nut (Item 1) only until the tension is released from the torsion bushing. (Item 2) **[Figure 50-101-37]**.

The bolt (Item 2) **[Figure 50-101-37]** must be loose enough to allow the torsion bushing to turn freely between the pintle arm and the linkage bar.

Linkage Adjustment (Cont'd)

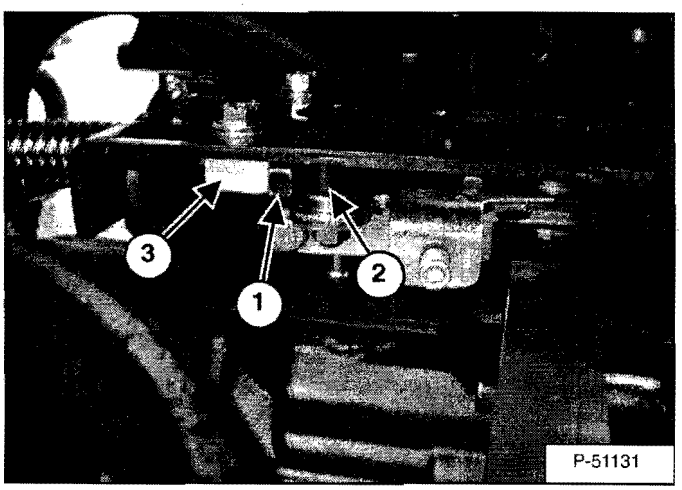
Figure 50-101-38



Remove access plug from the top of the control panel.

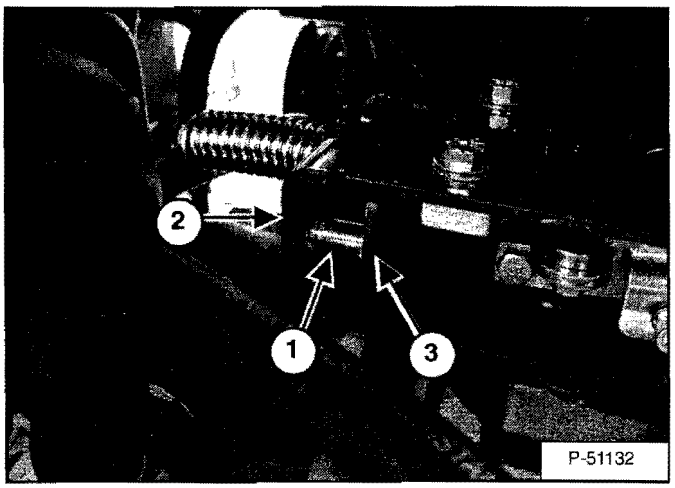
Turn the control lever drift adjustment bolts (Item 1) **[Figure 50-101-38]** (one on each control lever) out until it is flush with the bottom of the nut.

Figure 50-101-39



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 50-101-39]**.

Figure 50-101-40

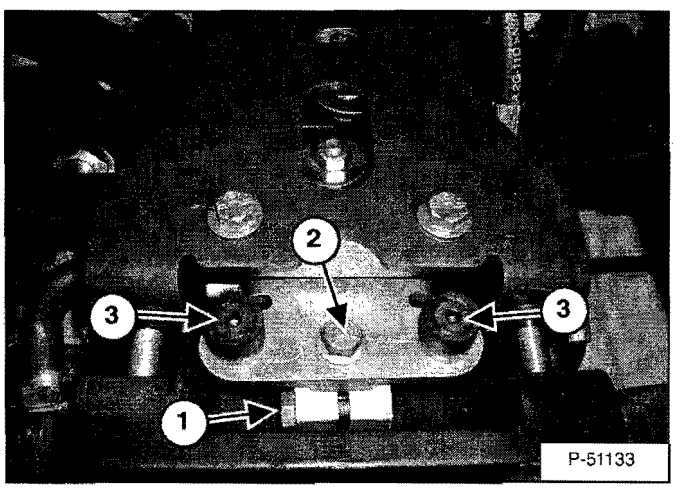


Move the right side steering lever forward and install a 15/16 inch (24 mm) thick spacer (Item 1) between the center plate (Item 2) and the mounting plate (Item 3) **[Figure 50-101-40]**.

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 1) **[Figure 50-101-39]**.

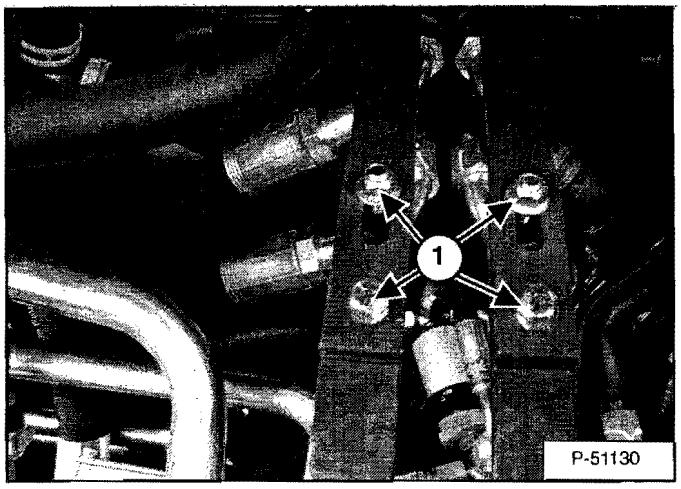
Figure 50-101-41



Before adjusting the linkage, tighten the lower pintle arm mounting bolt (Item 1) and both of the upper pintle mount bolts (Item 2) 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 bolts (Item 3) are tight, 45-50 ft.-lbs. (62-68 Nm) torque **[Figure 50-101-41]**.

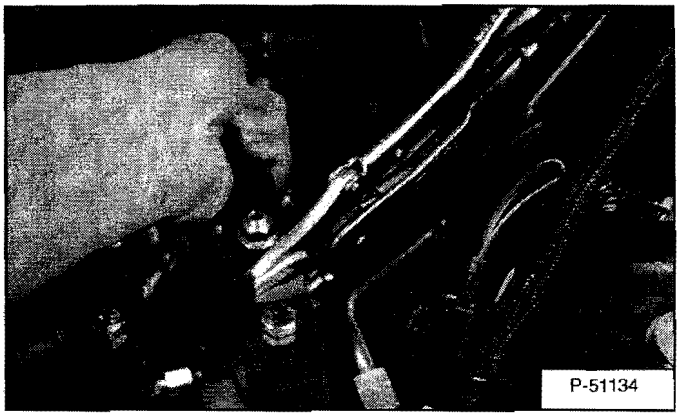
Linkage Adjustment (Cont'd)

Figure 50-101-42



Loosen the two bolts and nuts (Item 1) **[Figure 50-101-42]** on each steering linkage bar.

Figure 50-101-43



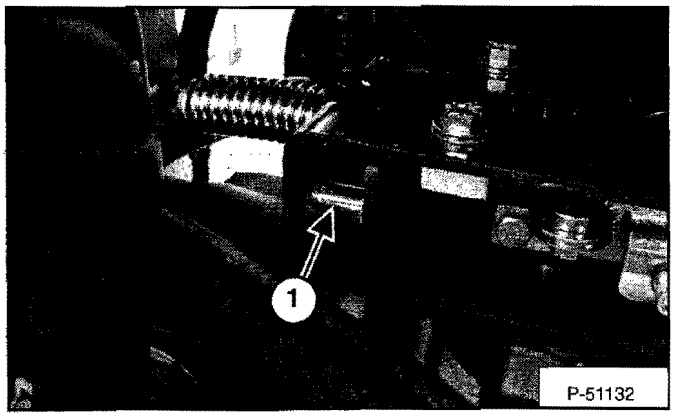
Move the left control lever to the full forward position, then pull forward on the left rear linkage bar until the pintle arm is rotated to the front as far as possible **[Figure 50-101-43]**. Use a locking plier, clamp the two linkage bars together.

Installation: Tighten the nuts and bolts to 25-28 ft.-lbs. (34-38 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 procedure for the right side linkage.

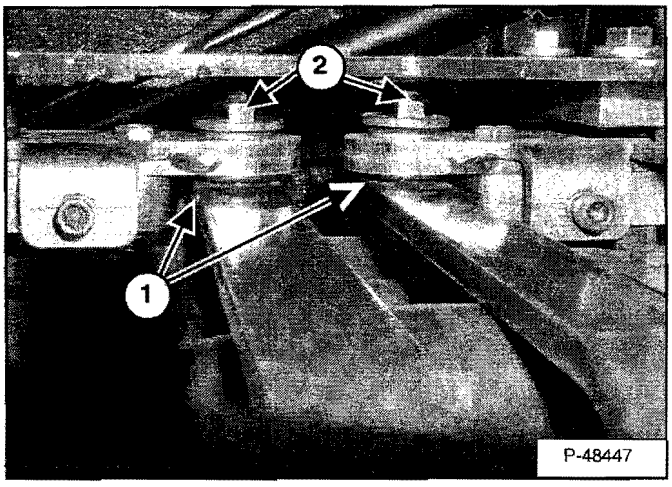
Figure 50-101-44



Remove the spacer (Item 1) **[Figure 50-101-44]**.

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

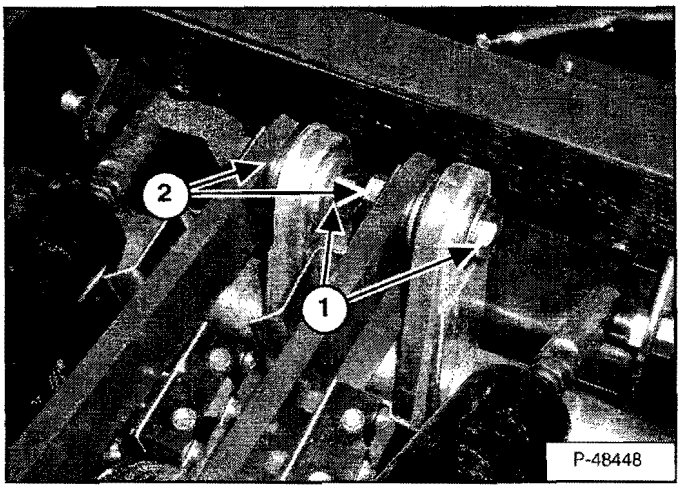
Figure 50-101-45



Tighten the two bolts (Item 1) and nuts (Item 2) to 35-40 ft.-lbs. (47,5-54,2 Nm) **[Figure 50-101-45]**.

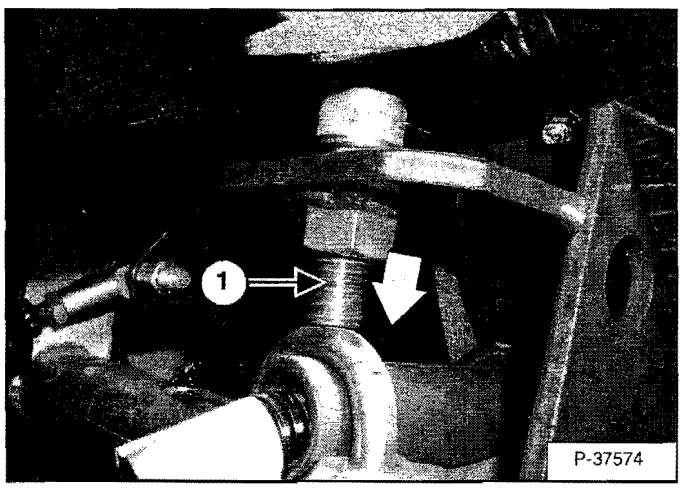
Linkage Adjustment (Cont'd)

Figure 50-101-46



Tighten the two bolts and nuts to 35-40 ft.-lbs. (47,5-54,2 Nm) torque at the steering cross shaft (Items 1 & 2) **[Figure 50-101-46]**.

Figure 50-101-47



Push the control lever to full stroke and turn drift adjustment bolt (Item 1) **[Figure 50-101-47]** 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 50-101-47]** 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 excess 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.

Bobcat®

CONTROL PANEL (SELECTABLE JOYSTICK CONTROL) (SJC)

Removal And Installation

⚠ WARNING

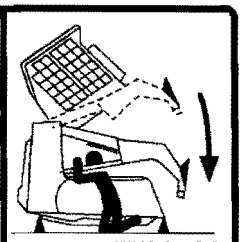
Put jackstands under the front axles and rear corners of the frame before running the engine for service. Failure to use jackstands can allow the machine to fall or move and cause injury or death.

W-2017-0286

⚠ 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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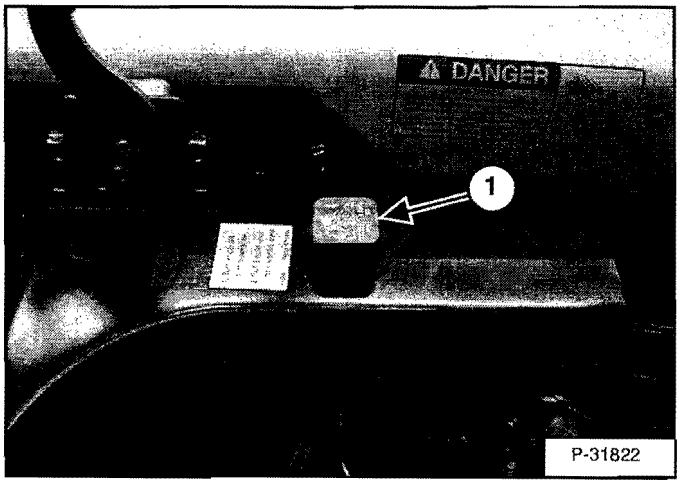
⚠ WARNING

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

Figure 50-102-1

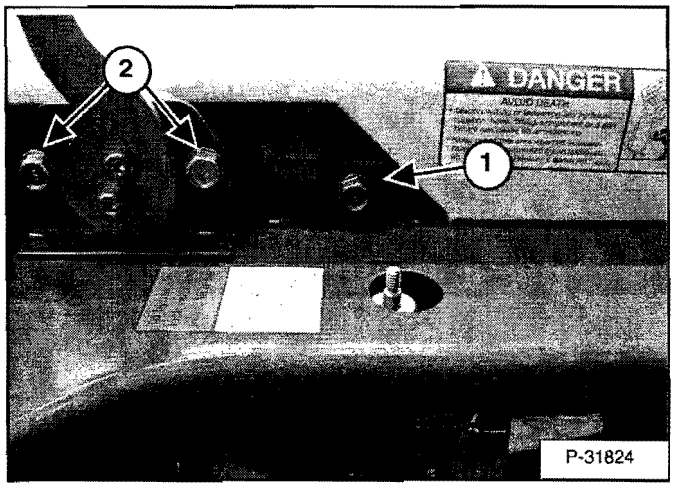


Raise the lift arms and install an approved lift arm support device. (See Contents Page 10-01.)

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

Remove the lift arm by-pass control knob and washer (Item 1) **[Figure 50-102-1]**.

Figure 50-102-2

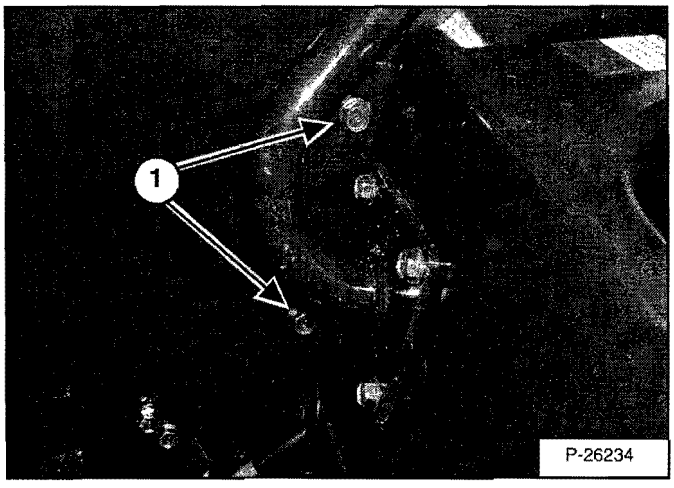


Remove the control panel mount bolt (Item 1) **[Figure 50-102-2]**.

Remove the two mount bolts (Item 2) **[Figure 50-102-2]** from the engine speed control.

Remove the engine speed control linkage from the engine speed control lever, and remove the lever from the loader.

Figure 50-102-3

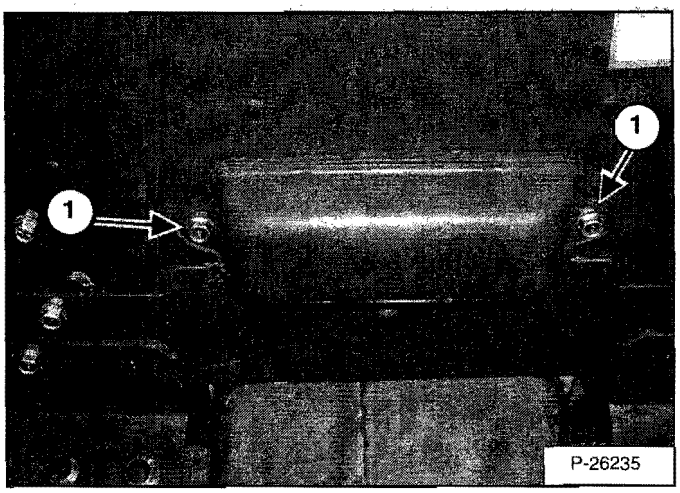


Remove the two control panel mount bolts (Item 1) **[Figure 50-102-3]**.

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

Removal And Installation (Cont'd)

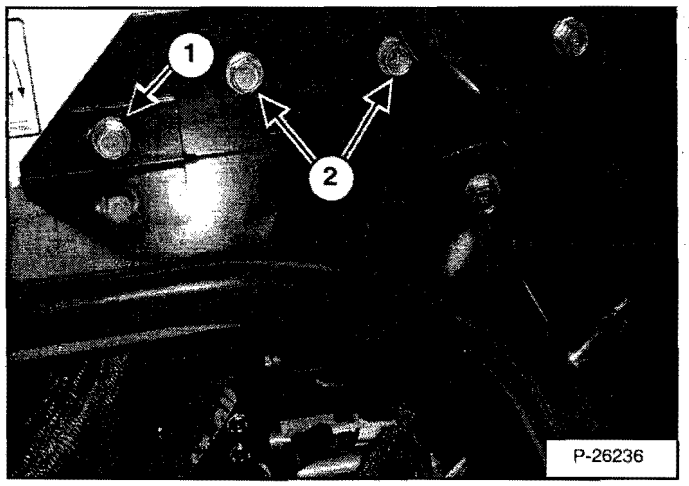
Figure 50-102-4



Remove the fuse cover mount bolts (Item 1) **[Figure 50-102-4]**.

Remove the fuse cover.

Figure 50-102-5

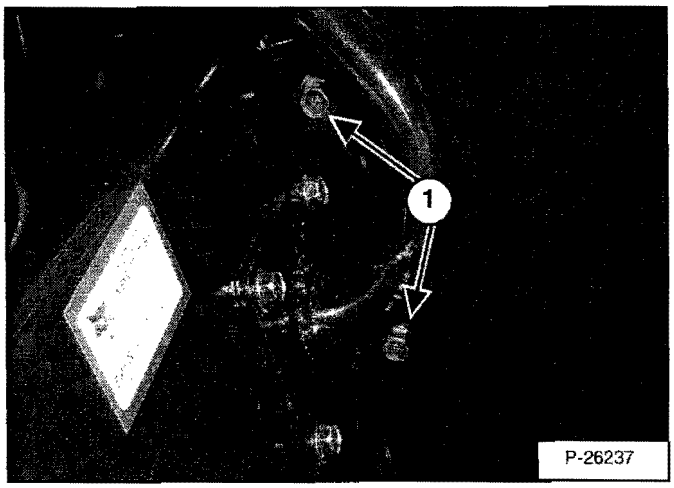


Remove the control panel mount bolt (Item1) **[Figure 50-102-5]** from the left side of the control panel.

Remove the two side panel mount bolts (Item 2) **[Figure 50-102-5]**, to allow clearance for the removal of the cotrol panel.

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

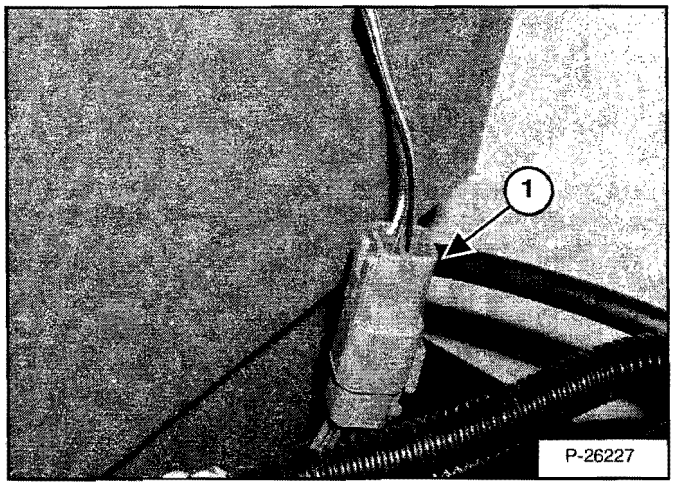
Figure 50-102-6



Remove the two side panel mount bolts (Item 1) **[Figure 50-102-6]**, to allow clearance for the removal of the control panel.

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

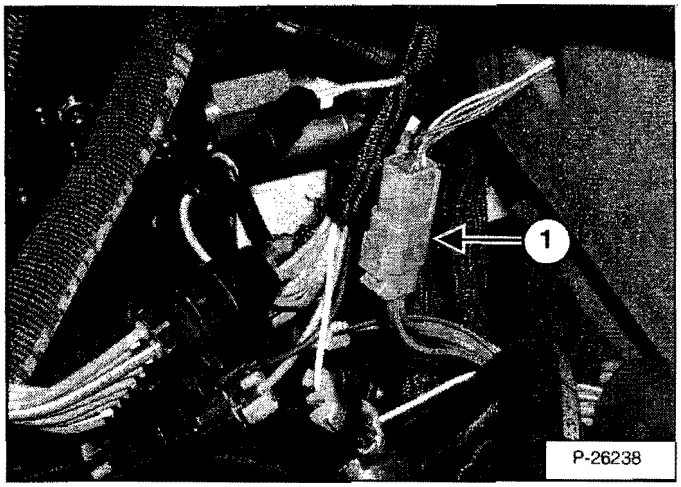
Figure 50-102-7



Disconnect the right joystick wire harness connector (Item 1) **[Figure 50-102-7]**.

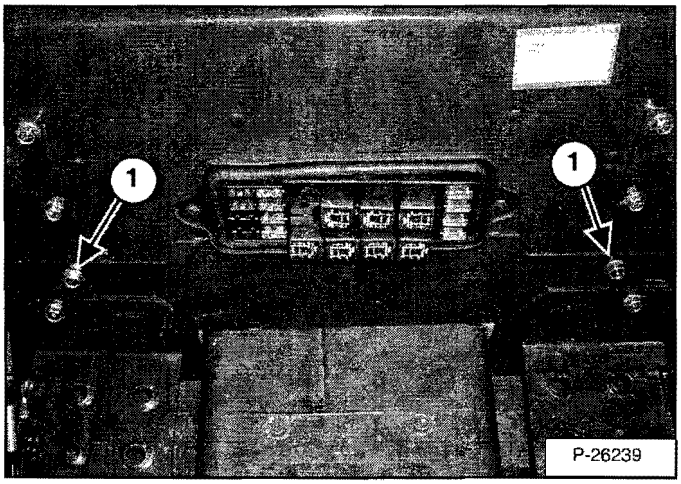
Removal And Installation (Cont'd)

Figure 50-102-8



Disconnect the left joystick wire harness connector (Item 1) **[Figure 50-102-8]**.

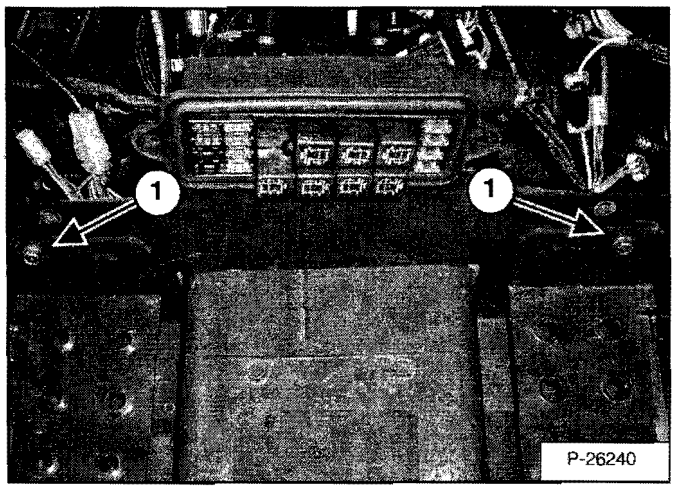
Figure 50-102-9



Remove the two control panel mount bolts (Item 1) **[Figure 50-102-9]**.

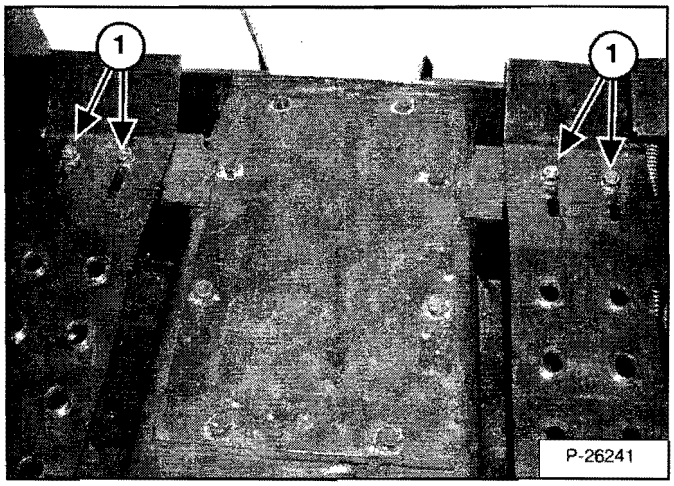
Remove the control panel from the loader.

Figure 50-102-10



Remove the two mount bolts (Item 1) **[Figure 50-102-10]** from the foot rests.

Figure 50-102-11

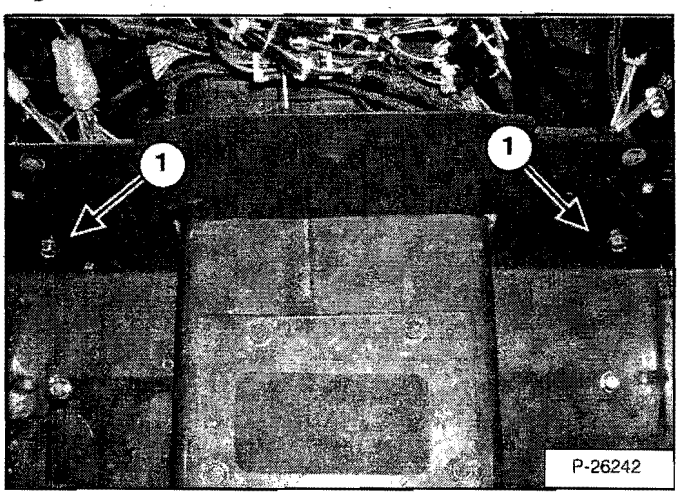


Remove the front four mount bolts (Item 1) **[Figure 50-102-11]** from the foot rests.

Remove the foot rests from the loader.

Removal And Installation (Cont'd)

Figure 50-102-12



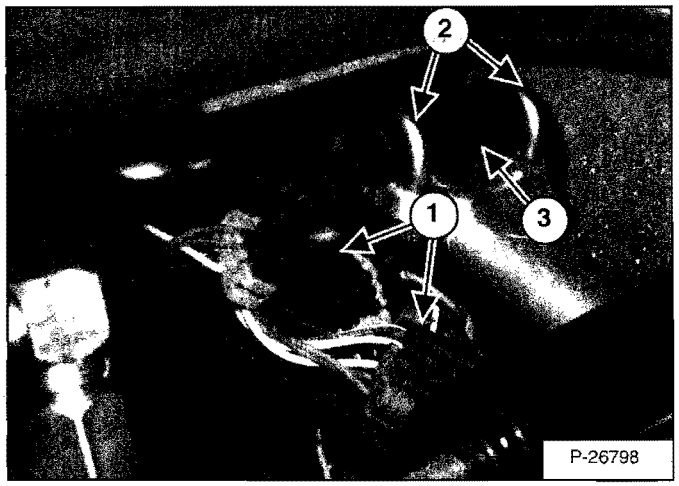
Remove the two mount bolts (Item 1) **[Figure 50-102-12]** from the lower fill panel.

Remove the panel from the loader.

CONTROL HANDLE

Lever Removal And Installation

Figure 50-110-1



Disconnect the electrical connectors (Item 1) **[Figure 50-110-1]** from the control lever.

Remove the nuts from the two U-bolts (Item 2) **[Figure 50-110-1]** used to mount the control lever.

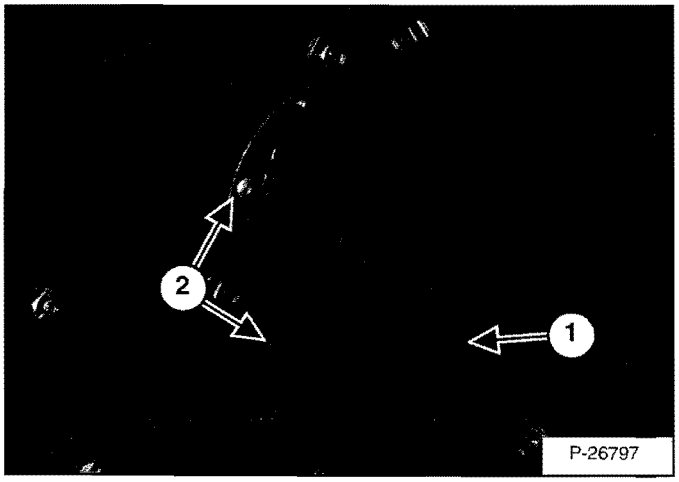
Remove the U-bolts from the control lever mount.

Remove the control lever (Item 3) **[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 either 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.

Steering Lever Boot

Figure 50-110-2



To replace the rubber boot (Item 1) **[Figure 50-110-2]** on the control panel, remove the steering lever. (See above procedure.)

Drill out the four rivets (Item 2) **[Figure 50-110-2]** located on the flange of the rubber boot and remove the old boot.

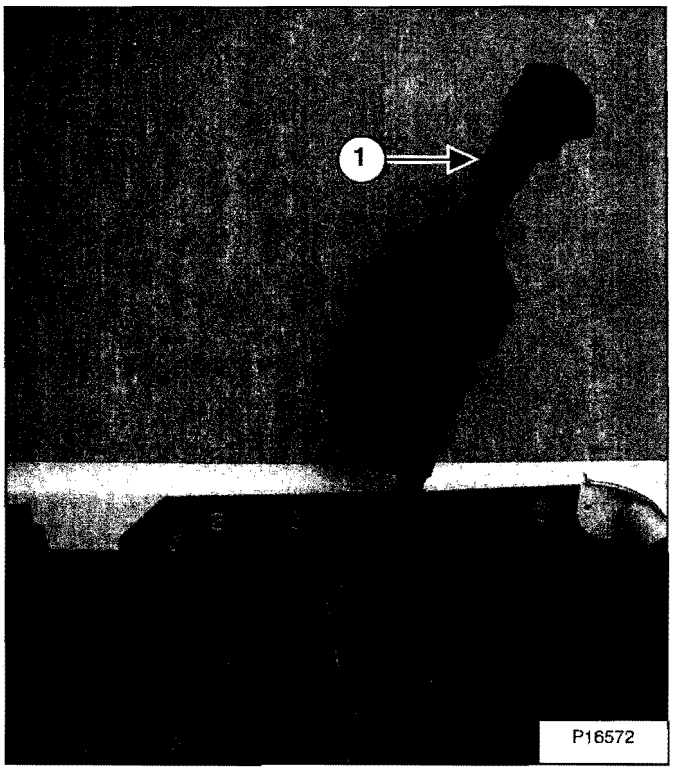
Install the new boot and reinstall the steering lever.

Bobcat®

CONTROL HANDLE (ADVANCED CONTROL SYSTEM) (ACS) SELECTABLE HAND/FOOT CONTROL

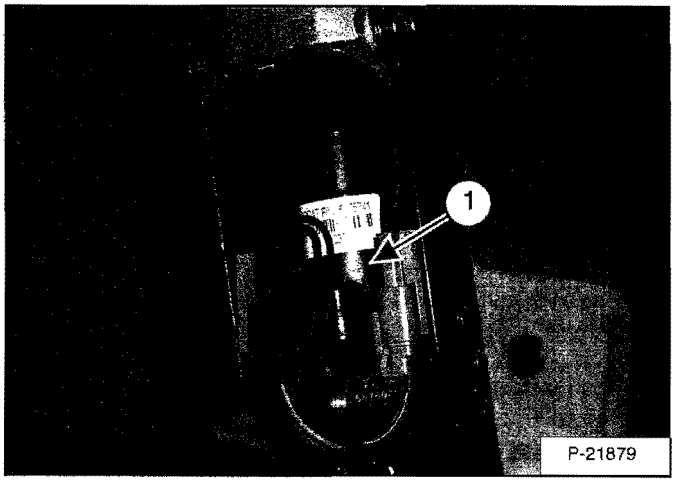
Components Identification

Figure 50-111-1



Control Handle (Item 1) **[Figure 50-111-1]**.

Figure 50-111-2

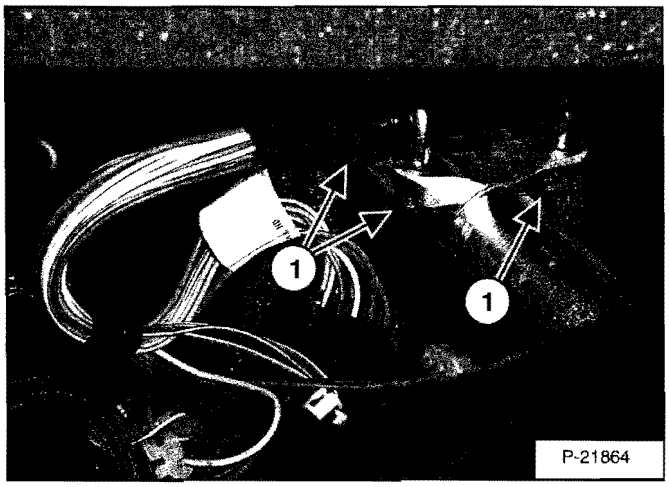


Handle Sensor (Item 1) **[Figure 50-111-2]**.

NOTE: The calibration procedure must be followed when replacing handle sensor, foot pedal sensor, actuator or ACS Controller. (See Page 60-01.)

Handle Sensor Removal And Installation

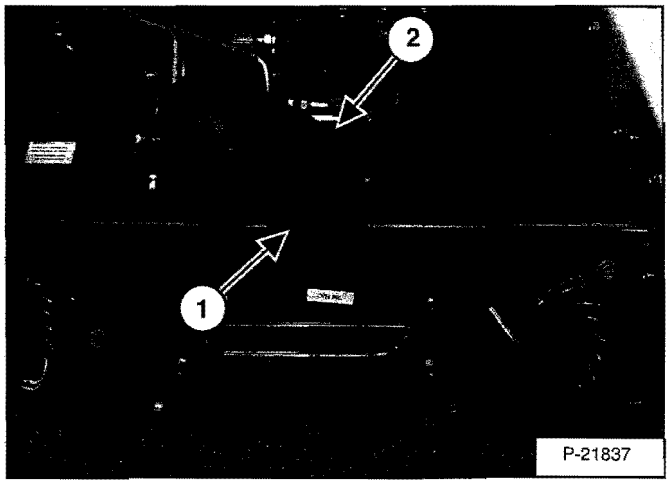
Figure 50-111-3



Loosen the nuts (Item 1) **[Figure 50-111-3]**.

Installation: Tighten the u-bolts so the lever can not be moved either 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

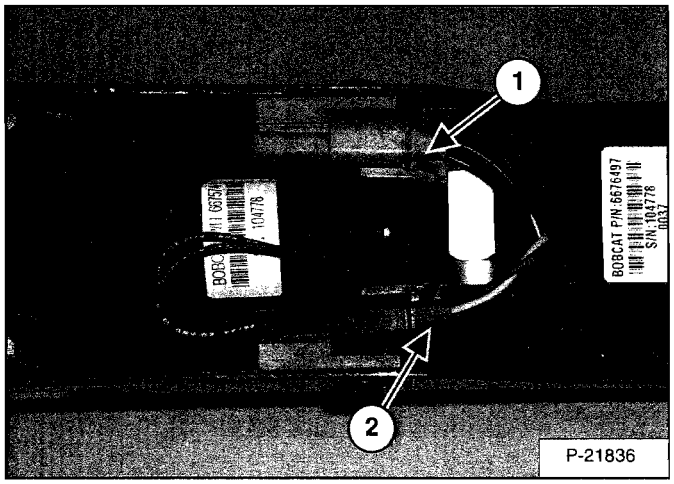


Tilt the control handle (Item 1) **[Figure 50-111-4]** to the center of the loader.

Lift the boot cover (Item 2) **[Figure 50-111-4]**.

Handle Sensor Removal And Installation (Cont'd)

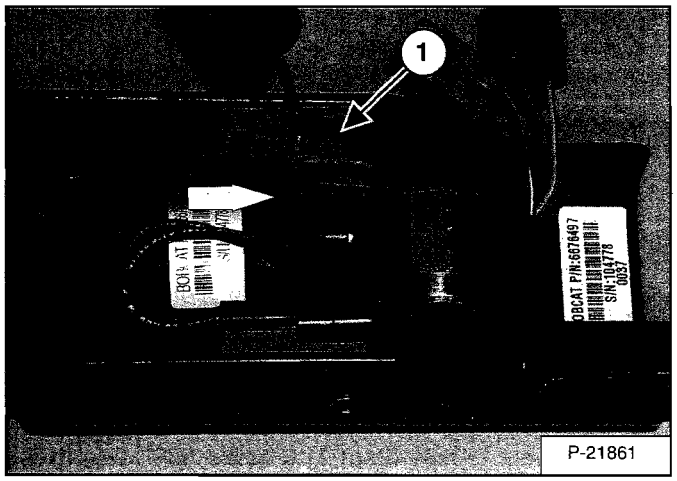
Figure 50-111-5



Disconnect the harness connector (Item 1) from the handle sensor connector.**[Figure 50-111-5]**.

Disconnect the harness connector (Item 2) **[Figure 50-111-5]** from the handle lock solenoid connector.

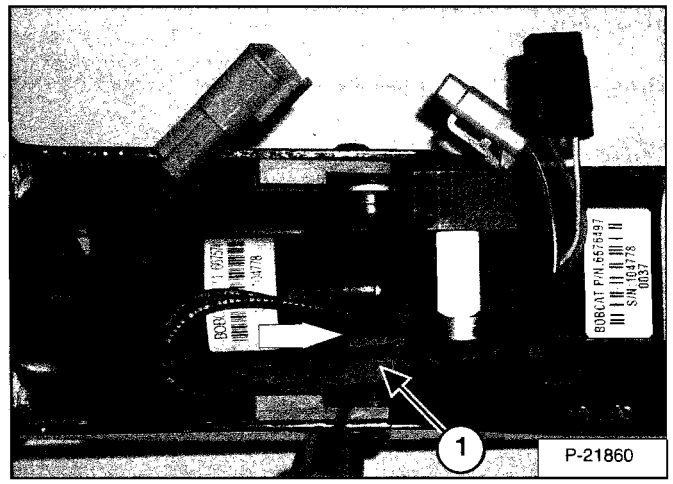
Figure 50-111-6



Remove the handle sensor connector (Item 1) **[Figure 50-111-6]** from the clip.

NOTE: Pry out with a small screwdriver and push the connector down.

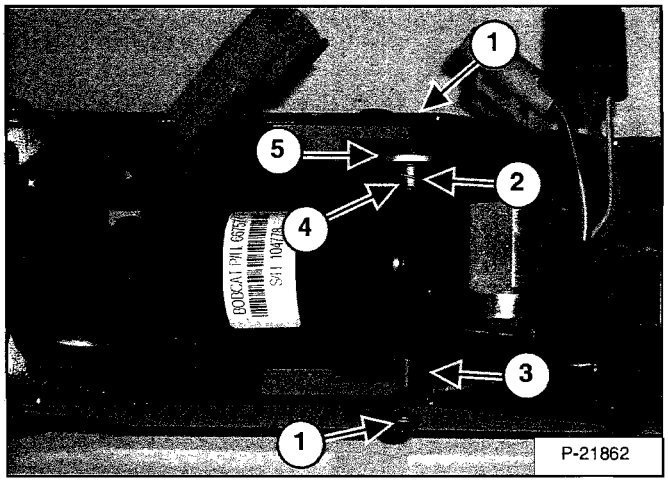
Figure 50-111-7



Remove the handle lock solenoid connector (Item 1) **[Figure 50-111-7]** from the clip.

NOTE: Pry out with a small screwdriver and push the connector down.

Figure 50-111-8



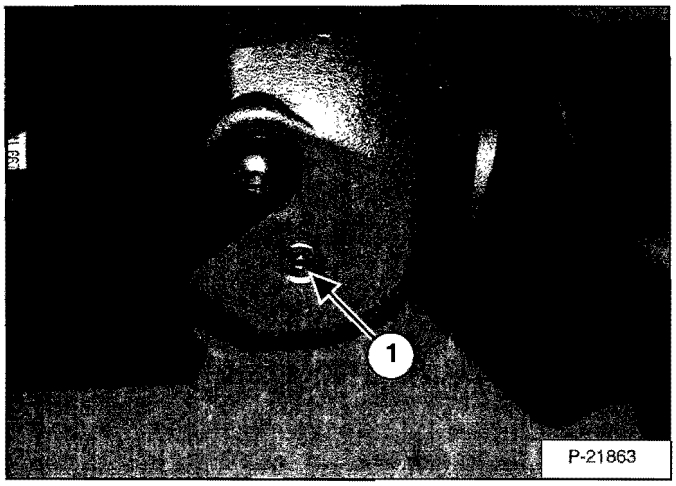
Remove one of the two mounting screws (Item 1) B from the handle sensor.

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]**.

Handle Sensor Removal And Installation (Cont'd)

Figure 50-111-9



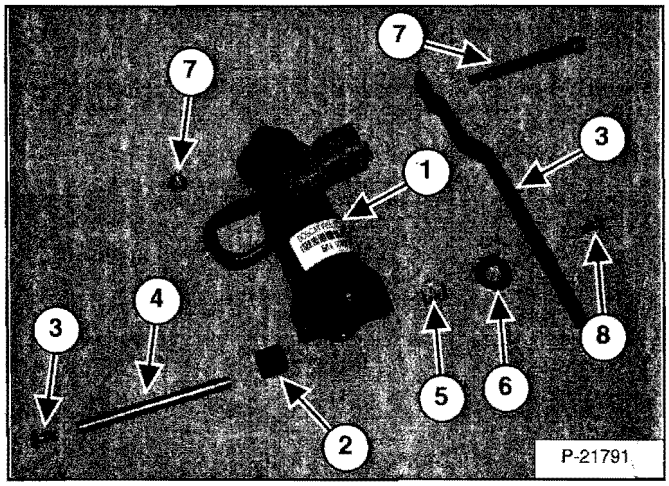
EARLIER VERSION HAND CONTROLS ONLY:

Remove the top mounting bolt (Item 1) **[Figure 50-111-9]**from the handle sensor.

NOTE: Be careful not to loose the recessed nut on the other side of the handle.

Installation: Tighten bolt to 32-38 in.-lbs. (3,6-4,3 Nm) torque.

Figure 50-111-10

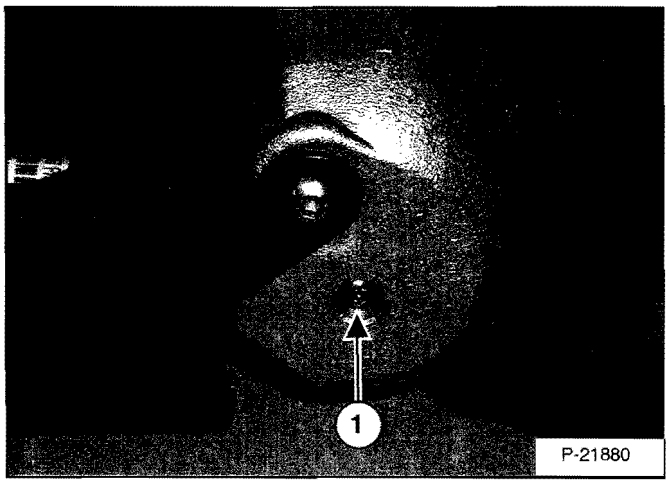


Remove the handle sensor (Item 1) **[Figure 50-111-10]** from the handle assembly.

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), bolt/nut (Item 7), stop strap (Item 8) **[Figure 50-111-10]** and replace as needed.

Figure 50-111-11



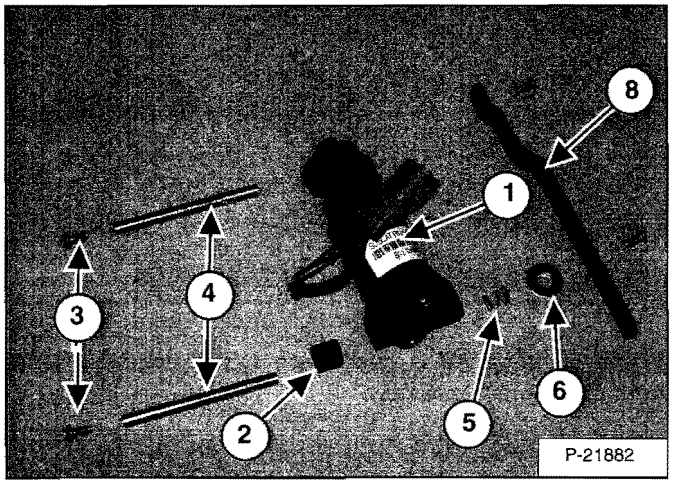
CURRENT VERSION HAND CONTROLS:

Remove one of the two mounting screws (Item 1) **[Figure 50-111-11]** from the handle sensor.

Installation: Tighten bolt to 32-38 in.-lbs. (3,6-4,3 Nm) torque.

Handle Sensor Removal And Installation (Cont'd)

Figure 50-111-12



Remove the handle sensor (Item 1) **[Figure 50-111-12]** from the handle assembly.

NOTE: The handle sensor (Item 1) [Figure 50-111-12] can only be replaced as a complete assembly.

Check the spacers (Item 2), and screws (Item 3), mounting pins (Item 4), spring (Item 5), washer (Item 6), bolt/nut (Item 7), stop strap (Item 8) **[Figure 50-111-12]** and replace as needed.

Figure 50-111-13

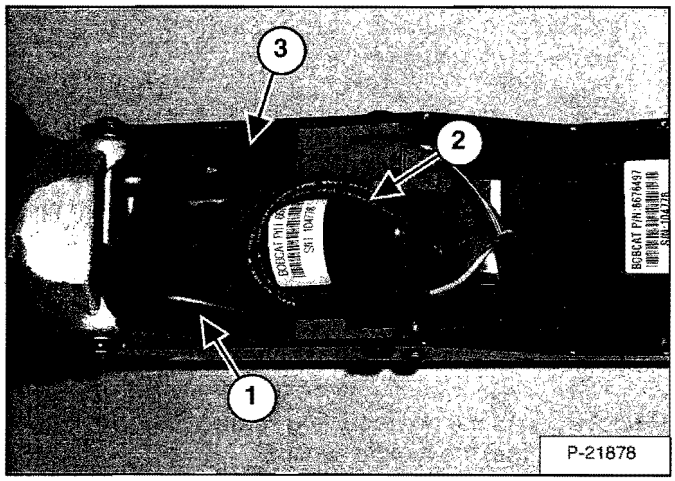
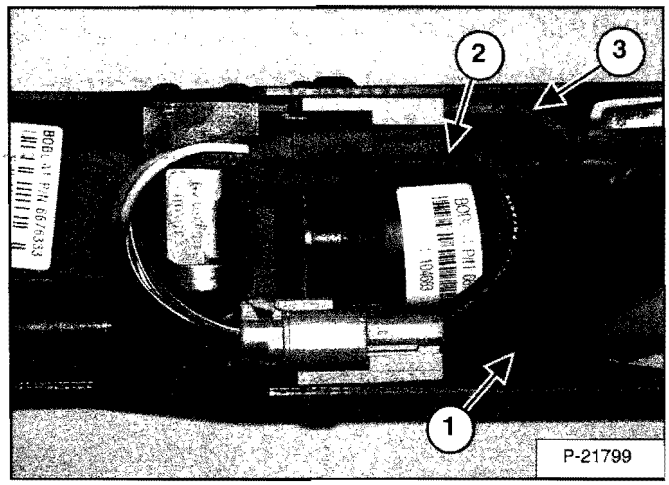


Figure 50-111-14



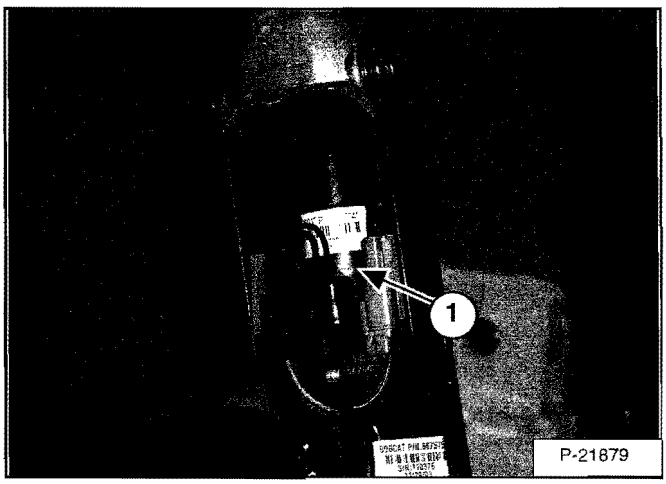
Installation: When installing the handle sensor into the control handle, check the routing of the switch handle wire harness (Item 1) **[Figure 50-111-13]** & **[Figure 50-111-14]** to assure proper return of the control handle to neutral and minimize harness movement.

NOTE: Route wires (Item 2) [Figure 50-111-13] & [Figure 50-111-14] as shown away from stop strap (Item 3) [Figure 50-111-13] & [Figure 50-111-14] to avoid wire damage.

NOTE: The calibration procedure must be followed when replacing handle sensor, foot pedal sensor, actuator or ACS Controller. (See Page 60-01.)

Control Handle Removal And Installation

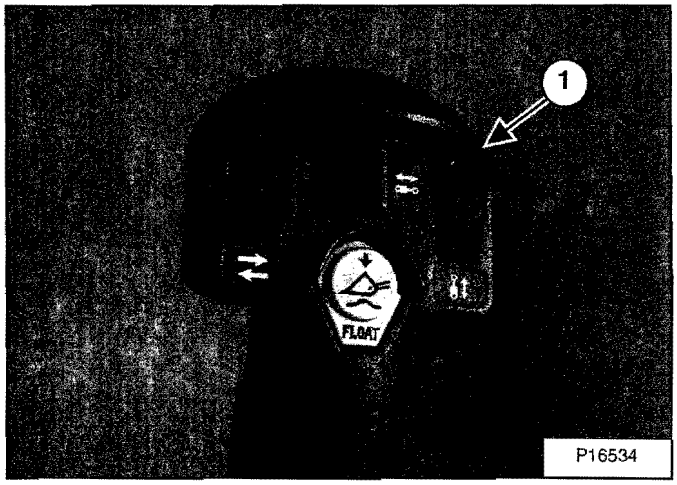
Figure 50-111-15



Remove the handle sensor (Item 1) **[Figure 50-111-15]**. (See Page 50-111-1.)

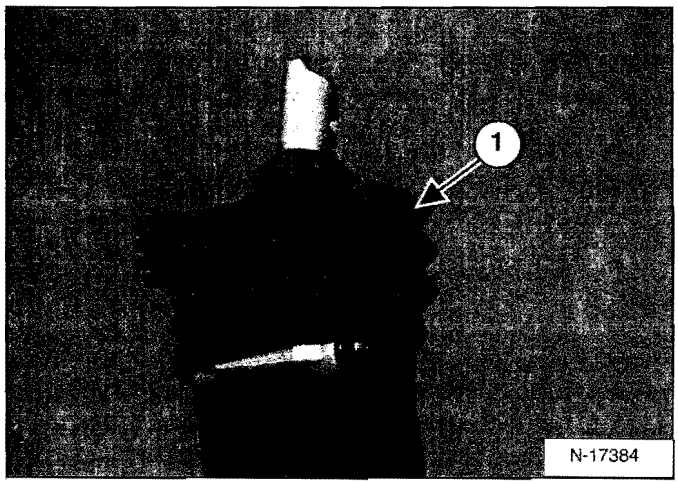
Control Handle Removal And Installation (Cont'd)

Figure 50-111-16



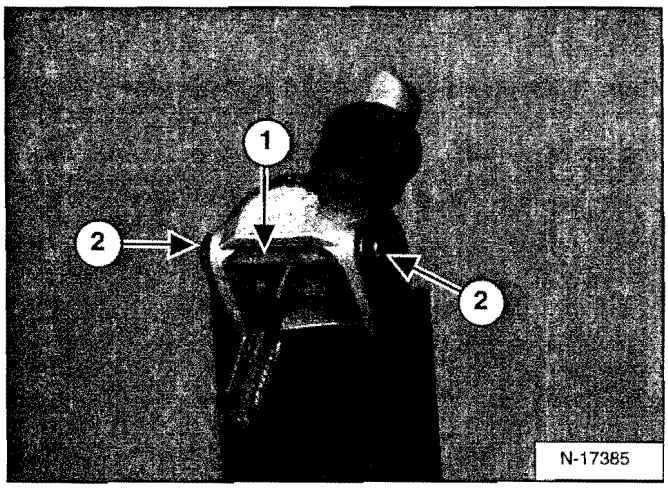
Remove the switch handle (Item 1) **[Figure 50-111-16]**. (See Page 60-01.)

Figure 50-111-17



Remove the rubber handle cover (Item 1) **[Figure 50-111-17]** from the handle.

Figure 50-111-18

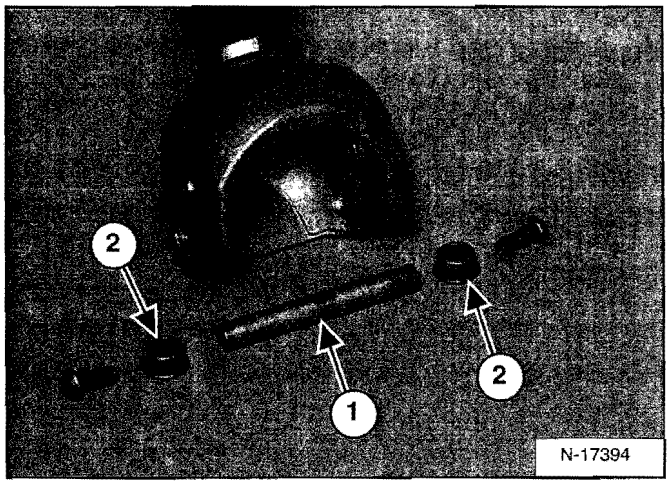


Using a small screwdriver, hold the handle spacer (Item 1) and remove the allen head screws (Item 2) **[Figure 50-111-18]** from the handle assembly.

Installation: Tighten the allen head screws to 35 in.-lbs. (4 Nm) torque.

Control Handle Disassembly And Assembly

Figure 50-111-19

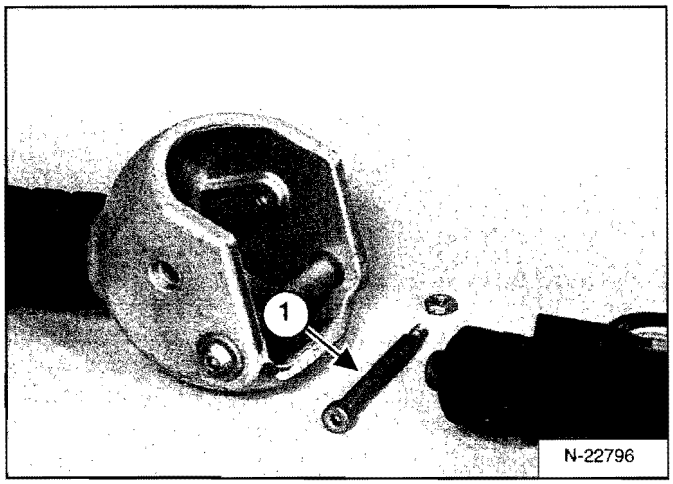


Remove the handle sleeve (Item 1) and bushings (Item 2) **[Figure 50-111-19]** from the handle.

Check all parts for wear and replace as needed.

Control Handle Disassembly And Assembly (Cont'd)

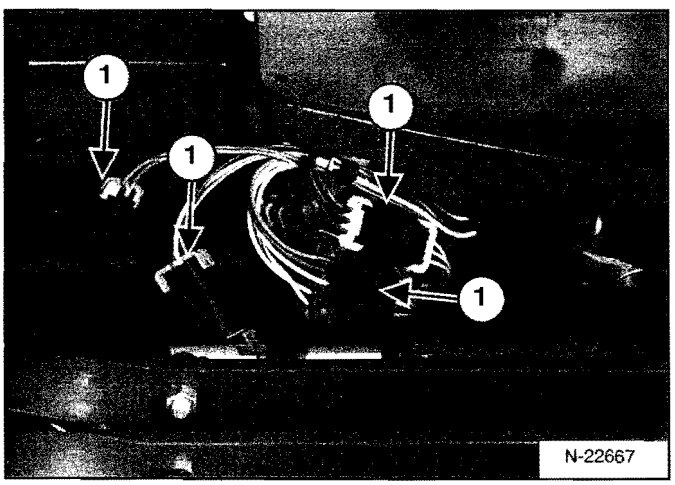
Figure 50-111-20



Check the mounting bolt (Item 1) **[Figure 50-111-20]** that connects the handle to the handle sensor unit for wear, replace as needed.

Control Lever Removal And Installation

Figure 50-111-21



Disconnect the electrical connectors (Item 1) **[Figure 50-111-21]** from the control lever switch handle.

Remove the electrical connectors from the control lever switch handle. (See Page 60-01.)

Figure 50-111-22

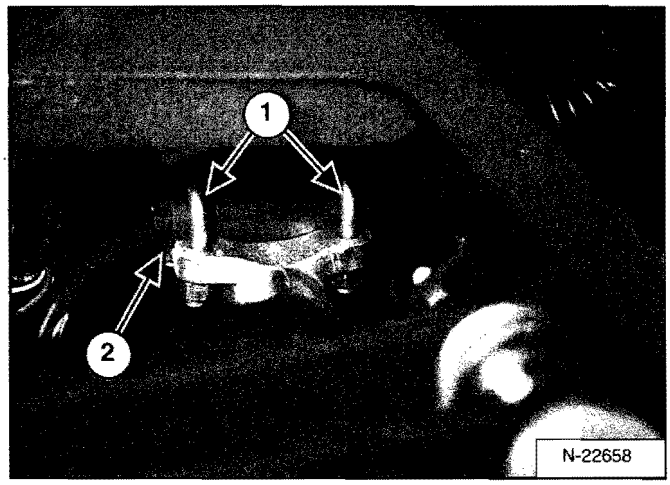
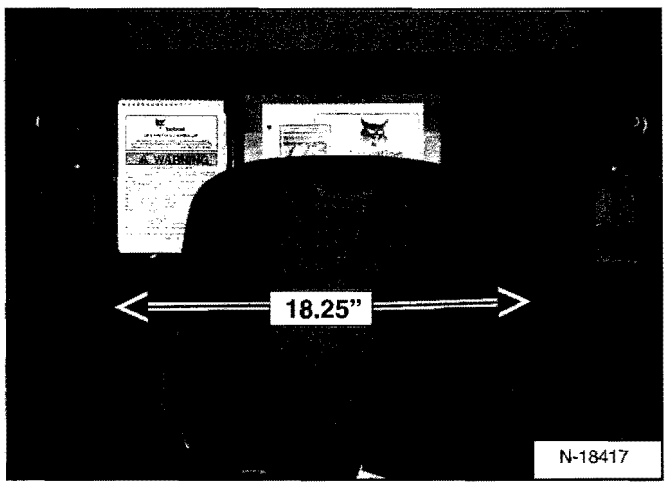


Figure 50-111-23



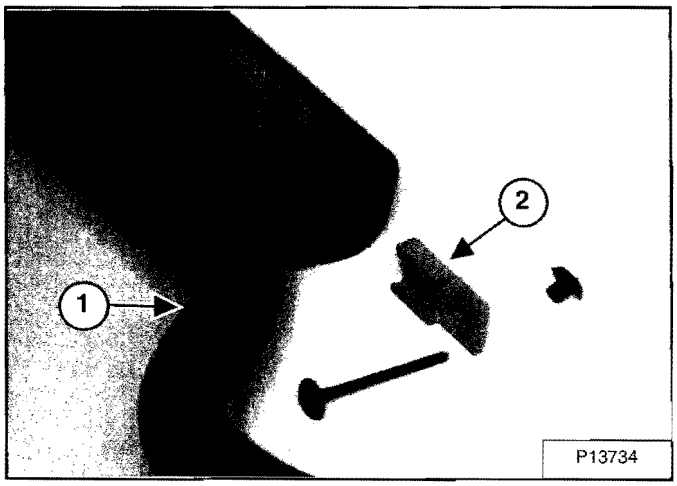
Loosen the two u-clamps (Item 1) **[Figure 50-111-22]** nuts.

Installation: Tighten the u-bolts so the lever can not be moved either right or left when seated in the operator seat. Control lever end (Item 2) **[Figure 50-111-22]** 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 50-111-23]**.

Remove the control lever from the cross shaft and control panel.

Control Lever Removal And Installation

Figure 50-111-24

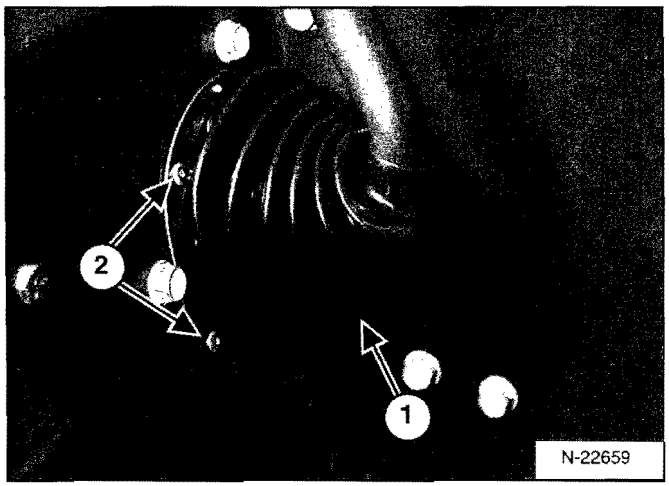


The control lever (Item 1) **[Figure 50-111-24]** must be replaced as a complete unit.

The connector clip (Item 2) **[Figure 50-111-24]** can be replaced separately from the control lever.

Control Lever Boot

Figure 50-111-25



To replace the rubber boot (Item 1) **[Figure 50-111-25]** on the control panel, remove the control lever. (See Contents Page 50-01.)

Drill out the four rivets (Item 2) **[Figure 50-111-25]** located on the flange of the rubber boot and remove the old boot.

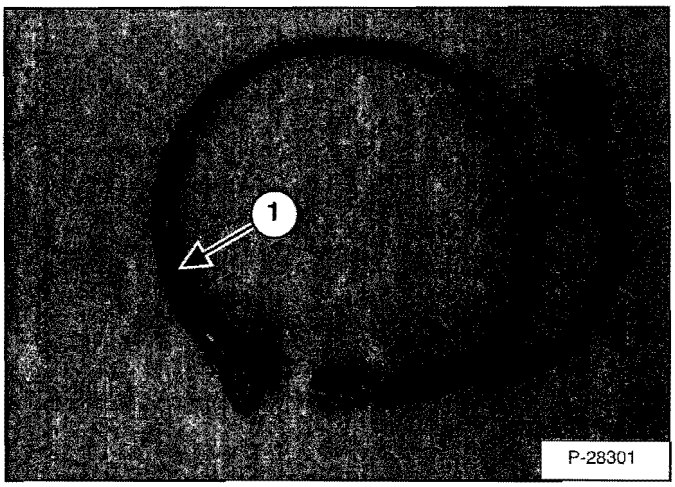
Install the new boot and reinstall the control lever. (See Contents Page 50-01)

Bobcat®

CONTROL HANDLE (SELECTABLE JOYSTICK CONTROL) (SJC)

Joystick Testing (Right & Left)

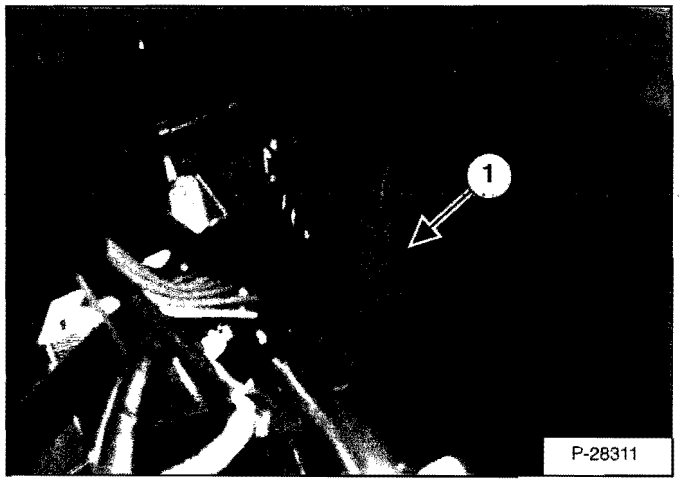
Figure 50-112-1



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

MEL1608-Joystick Test Harness **[Figure 50-112-1]**
MEL1563-Remote Start Tool
Multimeter

Figure 50-112-2



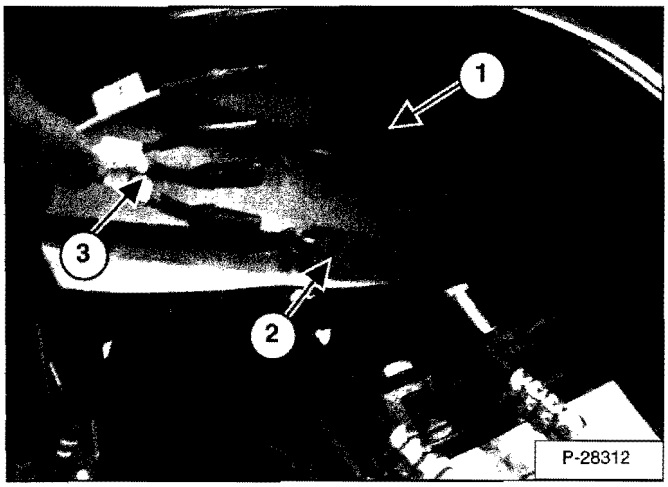
Raise the lift arms and install an approved lift arm support device. (See Contents Page 10-01.)

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

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

At the back side of the control panel, locate the left joystick wire connector (Item 1) **[Figure 50-112-2]**.

Figure 50-112-3



Disconnect the joystick harness connector (Item 1) from the loader wiring harness (Item 2) **[Figure 50-112-3]**.

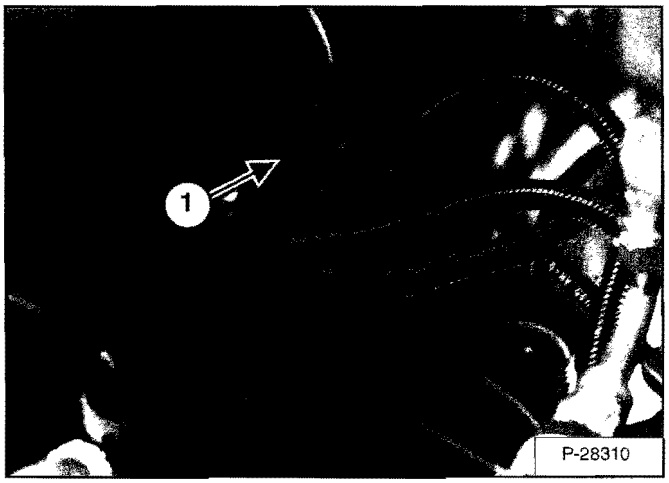
Install the test harness (Item 3) **[Figure 50-112-3]** between the two connectors.

Turn the remote start key to ON position without starting the loader.

Check the voltage between pin 3 and pin 5 on the joystick test harness (Item 3) **[Figure 50-112-3]**.

The voltage should be between 2.45 and 2.55 volts.

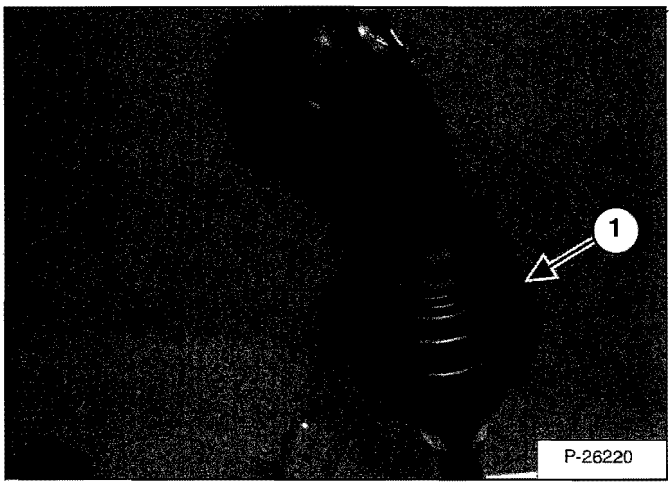
Figure 50-112-4



Repeat the procedure at the right joystick wiring harness connector (Item 1) **[Figure 50-112-4]**. (If needed.)

Joystick Removal (Right & Left)

Figure 50-112-5

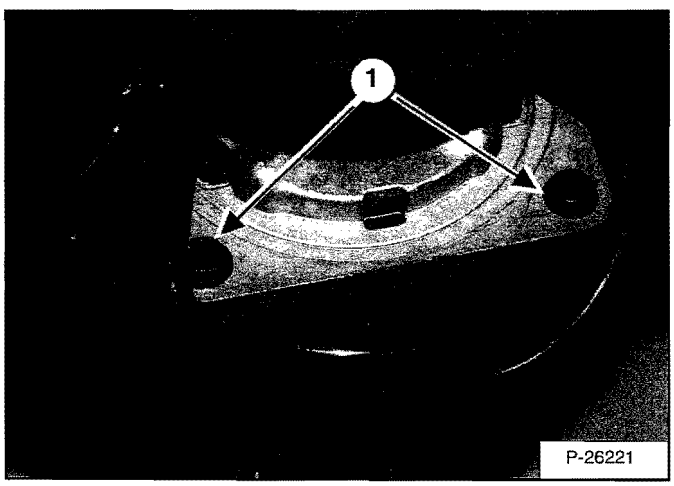


Raise the lift arms and install an approved lift arm support device. (See Contents Page 10-01.)

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

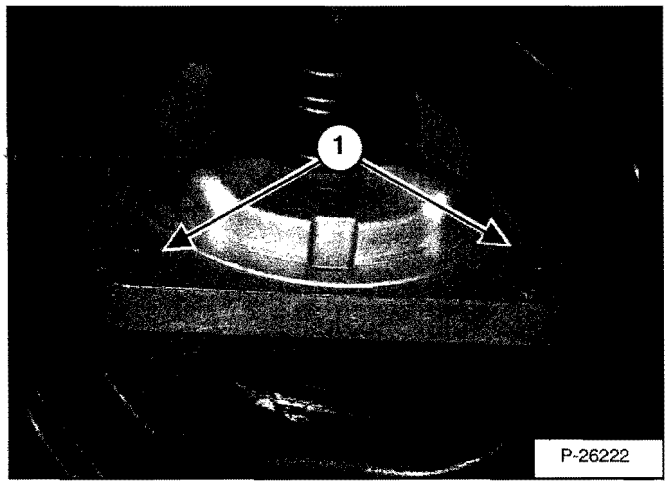
Roll the joystick rubber boot (Item 1) **[Figure 50-112-5]** down from the joystick handle.

Figure 50-112-6



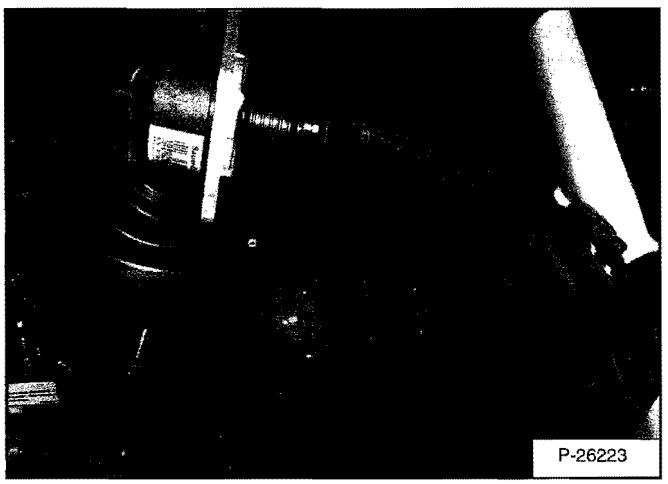
Remove the two inside joystick mount bolts (Item 1) **[Figure 50-112-6]**.

Figure 50-112-7



Remove the two outside joystick mount bolts (Item 1) **[Figure 50-112-7]**.

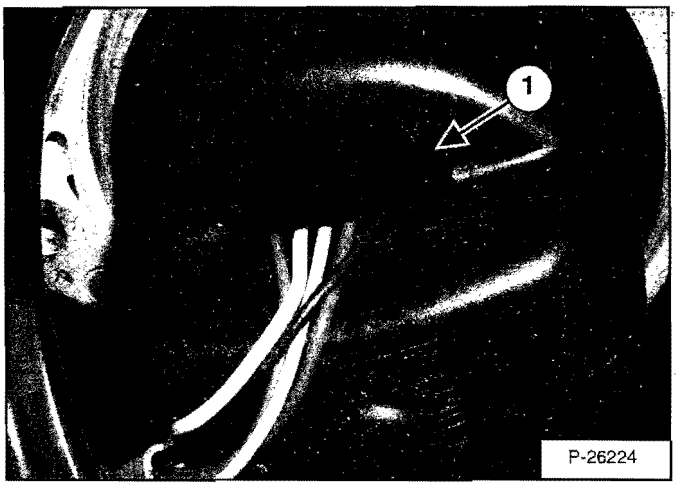
Figure 50-112-8



Remove the joystick from the rubber boot **[Figure 50-112-8]**.

Joystick Removal (Right & Left) (Cont'd)

Figure 50-112-9

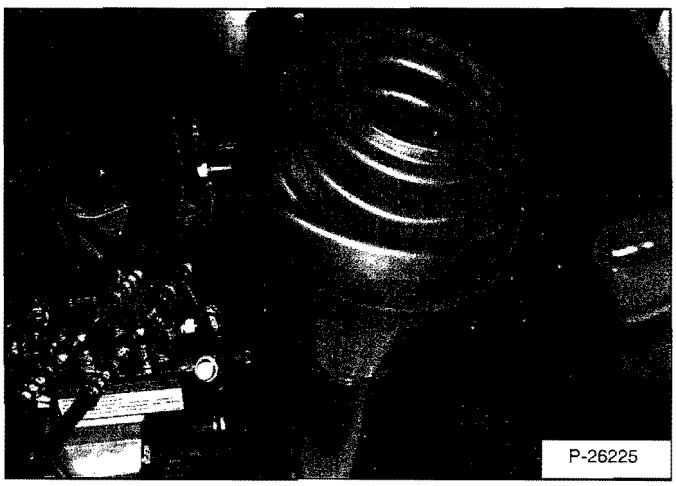


Disconnect the electrical harness (Item 1) **[Figure 50-112-9]** from the joystick.

Remove the joystick from the loader.

Joystick Boot Removal (Right & Left)

Figure 50-112-10



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

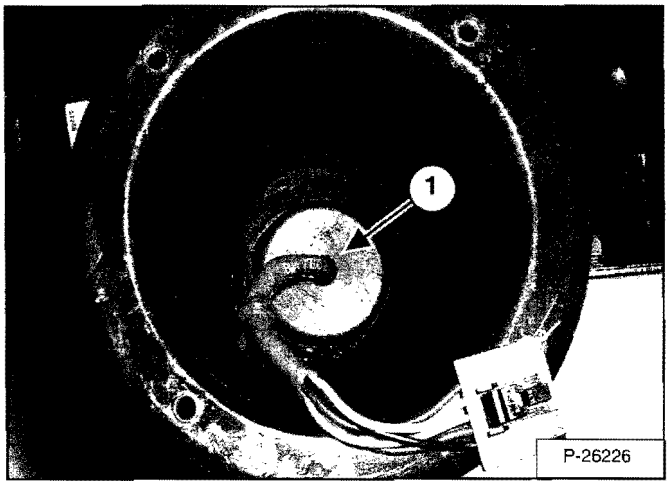
Raise the operator cab. (See Contents Page 10-01.)

Remove the joystick. (See Joystick Removal (Right & Left) on Page 50-90-2.)

Remove the joystick boot from the control lever assembly **[Figure 50-112-10]**.

Lever Assembly Removal (Right & Left)

Figure 50-112-11



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

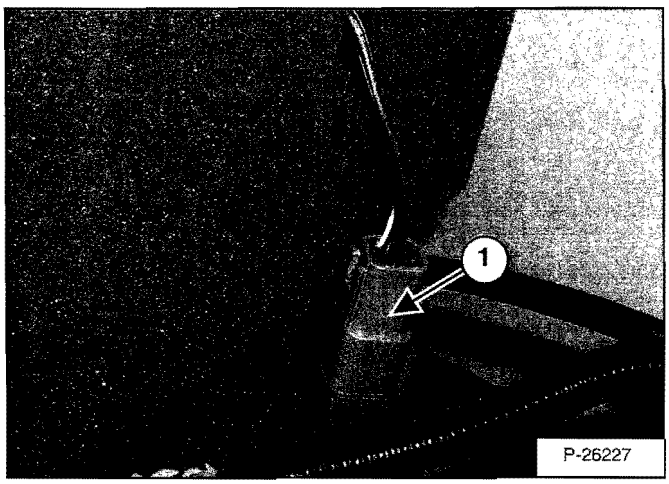
Raise the operator cab. (See Contents Page 10-01.)

Remove the joystick. (See Joystick Removal (Right & Left) on Page 50-90-2.)

Remove the joystick boot. (See Joystick Boot Removal (Right & Left) on Page 50-90-3.)

Remove the joystick wiring grommet (Item 1) **[Figure 50-112-11]**

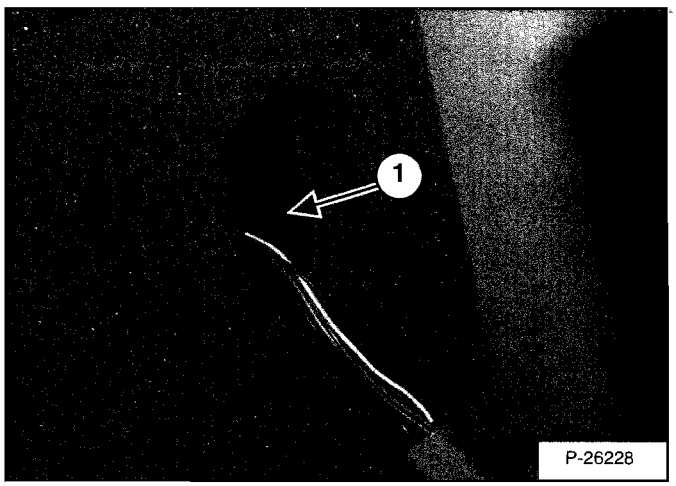
Figure 50-112-12



Disconnect the joystick wiring harness connector (Item 1) **[Figure 50-112-12]**.

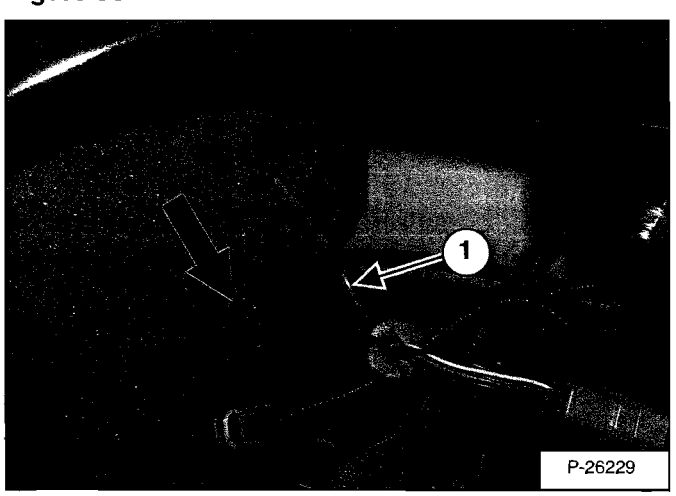
Lever Assembly Removal (Right & Left) (Cont'd)

Figure 50-112-13



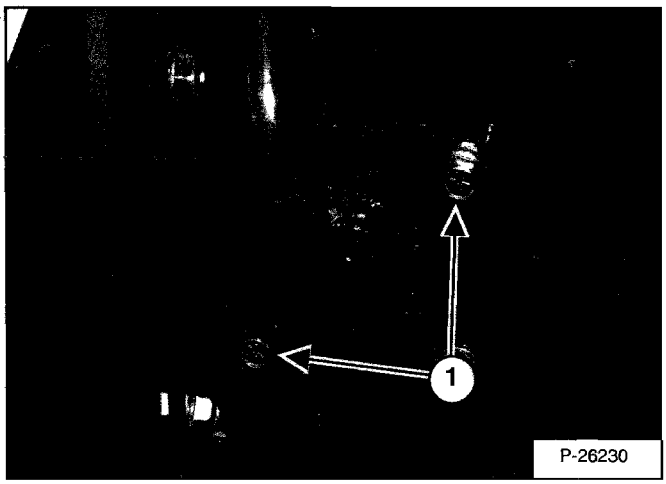
Remove the wiring harness grommet (Item 1) **[Figure 50-112-13]** from the lower steering lever assembly.

Figure 50-112-14



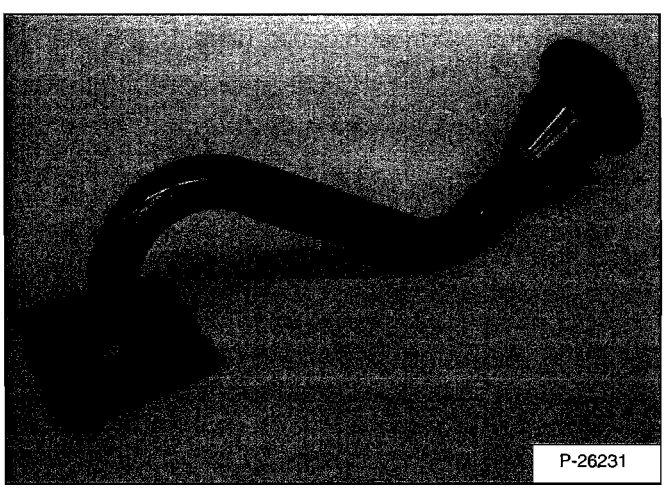
Remove the wiring harness (Item 1) **[Figure 50-112-14]** from the control lever assembly.

Figure 50-112-15



Remove the two control lever mounting bolts (Item 1) **[Figure 50-112-15]**.

Figure 50-112-16

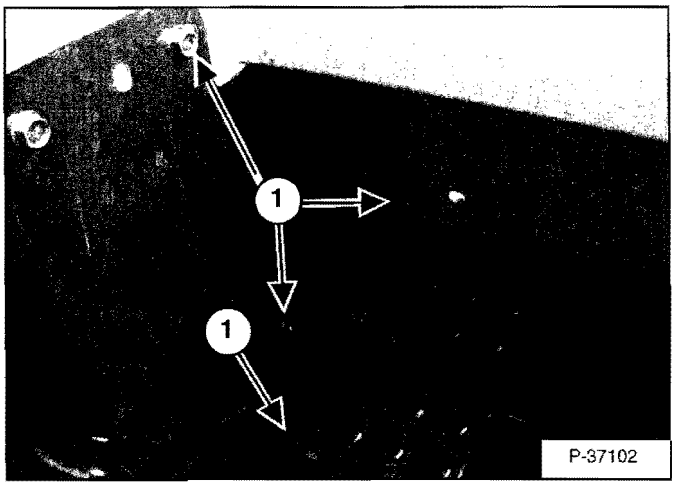


Remove the control lever from the loader **[Figure 50-112-16]**.

INSIDE ACCESS PANEL

Removal And Installation (Left)

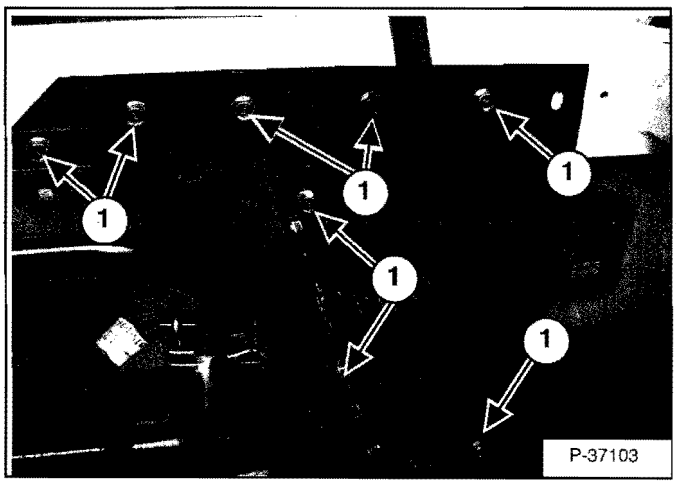
Figure 50-120-1



Remove the four mounting bolts (Item 1) **[Figure 50-120-1]** from the front access panel.

Remove the front access panel from the loader.

Figure 50-120-2

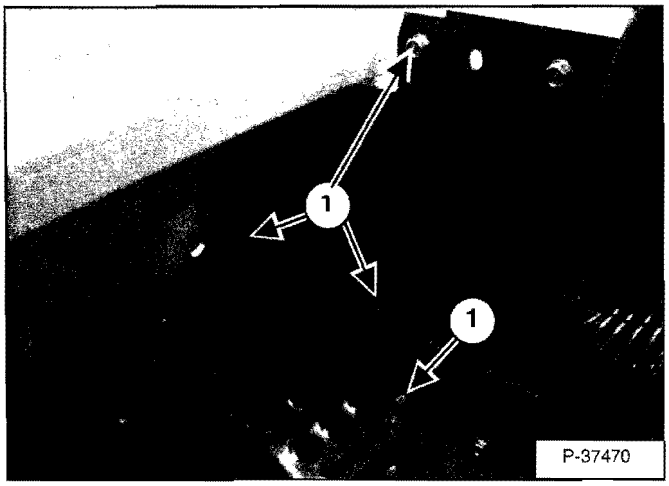


Remove the eight mount bolts (Item 1) **[Figure 50-120-2]** from the rear access panel.

Remove the rear access panel from behind the steering panel, remove the panel from the loader.

Removal And Installation (Right)

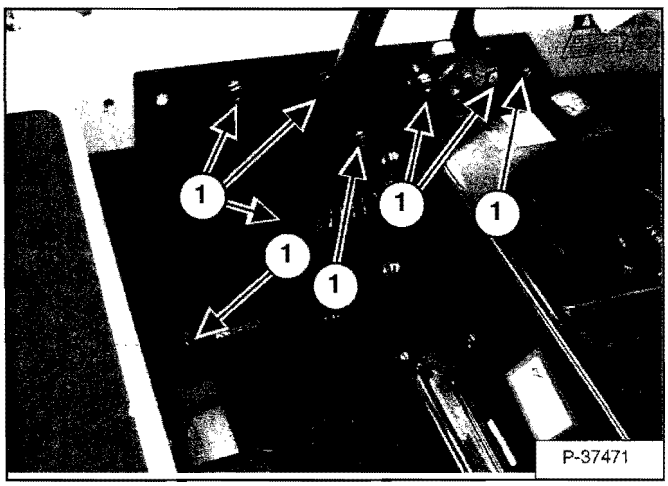
Figure 50-120-3



Remove the four mounting bolts (Item 1) **[Figure 50-120-3]** from the front access panel.

Remove the front access panel from the loader.

Figure 50-120-4



Remove the eight mount bolts (Item 1) **[Figure 50-120-4]** from the rear access panel.

Remove the throttle lever assembly from the access panel.

Remove the rear access panel from behind the steering panel, remove the panel from the loader.

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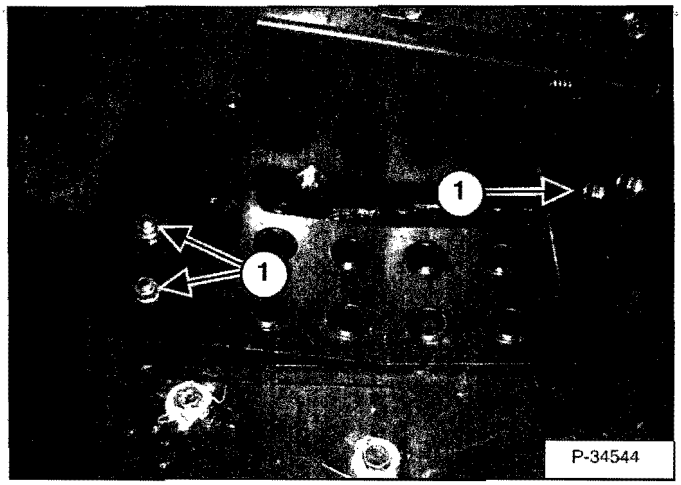
INSIDE ACCESS PANEL (SELECTABLE JOYSTICK CONTROL) (SJC)

Panel Removal (Right)

Figure 50-121-1



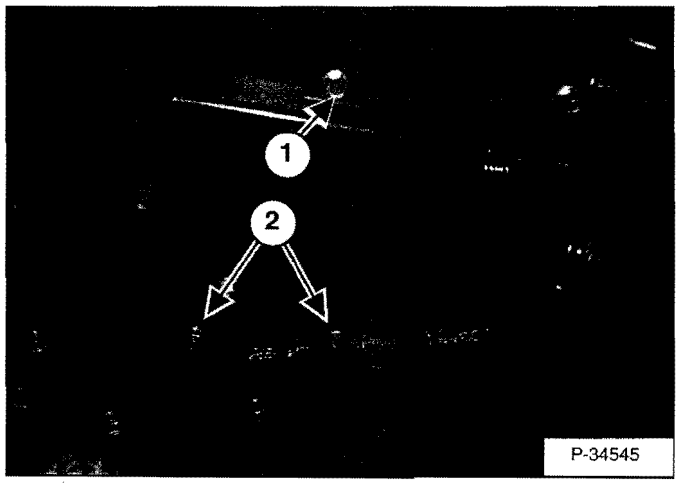
Raise the lift arms and install an approved lift arm support device. (See Contents Page 10-01.)

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

Remove the three mounting bolts (Item 1) **[Figure 50-121-1]**, from the right side foot rest.

Remove the foot rest, from the loader.

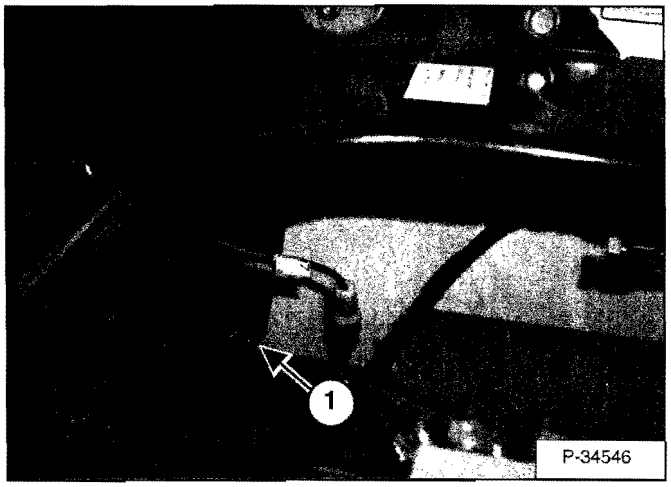
Figure 50-121-2



Remove the mount bolt (Item 1) **[Figure 50-121-2]** from the foot operated speed control assembly.

Loosen the two mount bolts (Item 2) **[Figure 50-121-2]** from the foot operated speed control assembly.

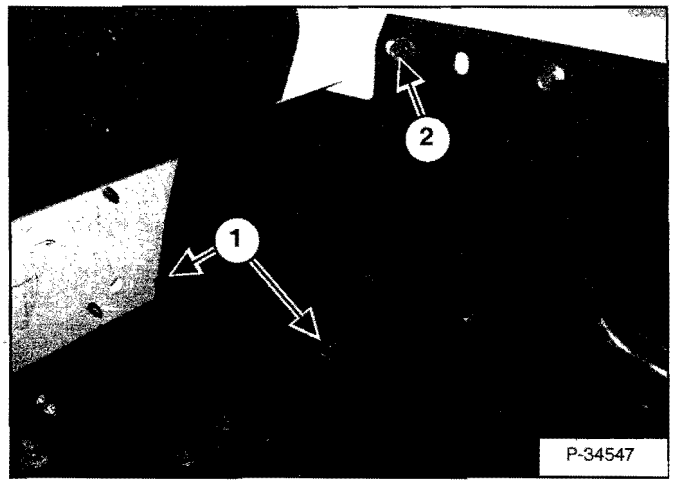
Figure 50-121-3



Disconnect the foot operated speed control linkage (Item 1) **[Figure 50-121-3]** from the hand operated speed control lever arm.

Remove the foot operated speed control assembly from the loader.

Figure 50-121-4



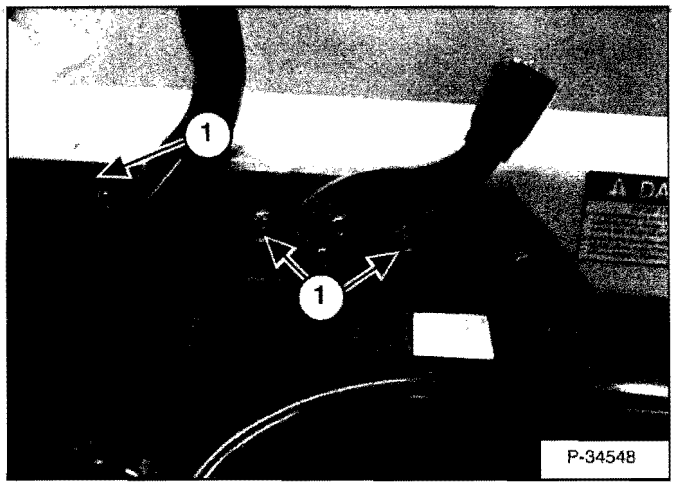
Loosen the two mount bolts (Item 1) **[Figure 50-121-4]** from the front inside access panel.

Remove the mount bolt (Item 2) **[Figure 50-121-4]** from the front inside access panel.

Remove the inside access panael from the loader.

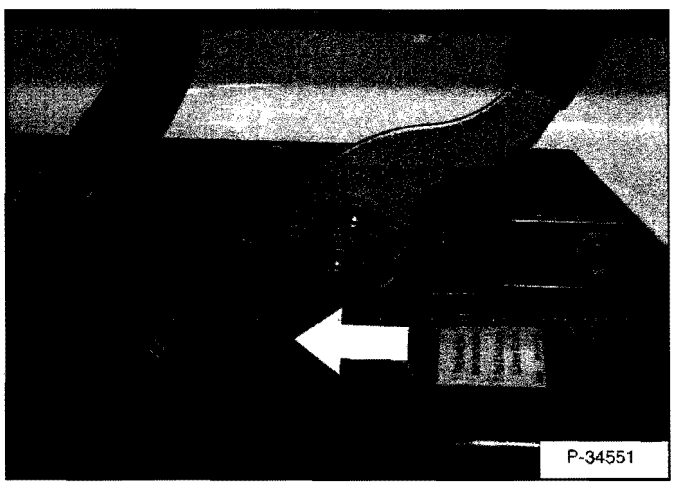
Panel Removal (Right) (Cont'd)

Figure 50-121-5



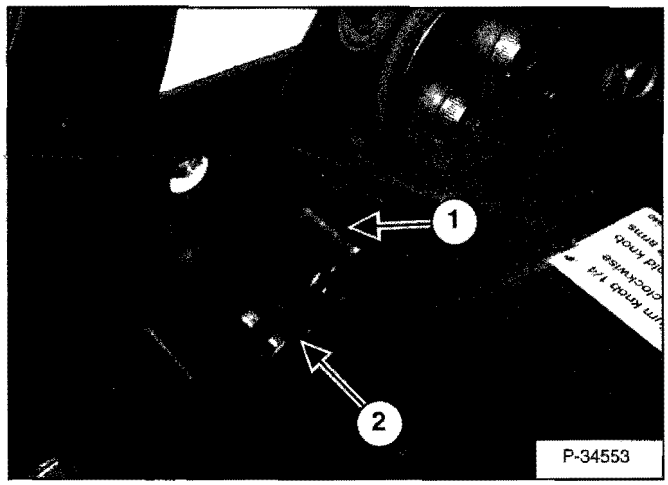
Remove the two mount bolts (Item 1) **[Figure 50-121-5]** from the hand operated speed control lever.

Figure 50-121-6



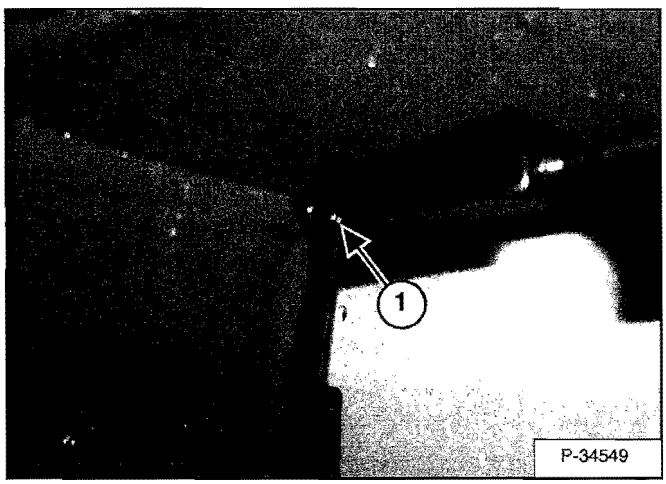
Lift slightly on the speed control handle and move it toward the front of the loader **[Figure 50-121-6]**.

Figure 50-121-7



Lift the speed control pin (Item 1) from the notch (Item 2) **[Figure 50-121-7]** in throttle cable.

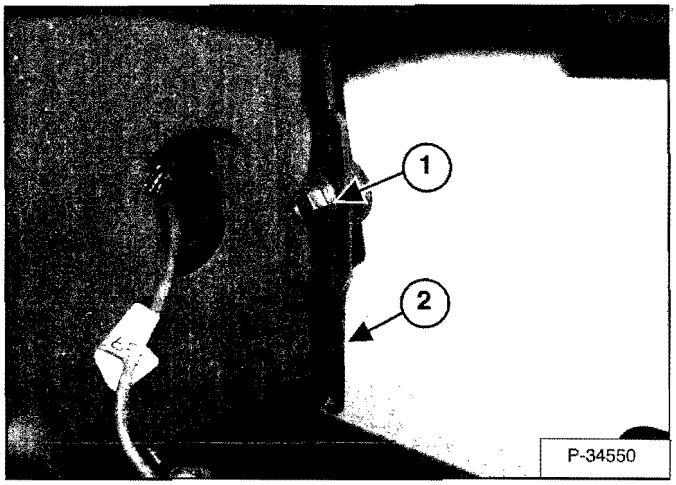
Figure 50-121-8



At the bottom right side of the control panel, remove the keeper and pin (Item 1) **[Figure 50-121-8]** that connects the speed control linkage arm to the speed control cable.

Panel Removal (Right) (Cont'd)

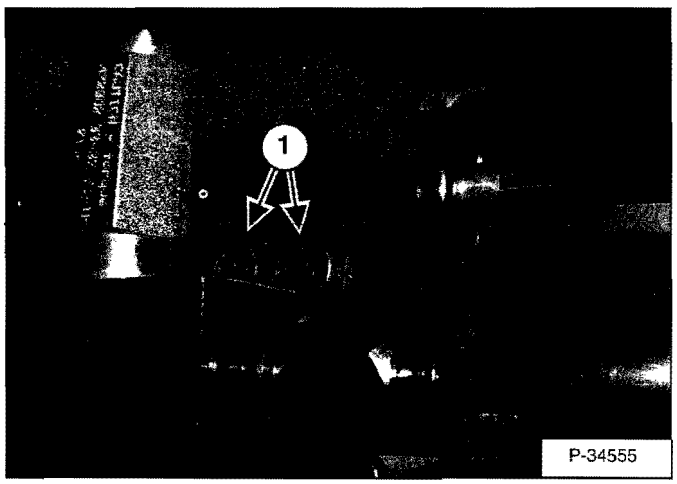
Figure 50-121-9



Remove the mount bolt and nut (Item 1) **[Figure 50-121-9]** from the speed control linkage arm.

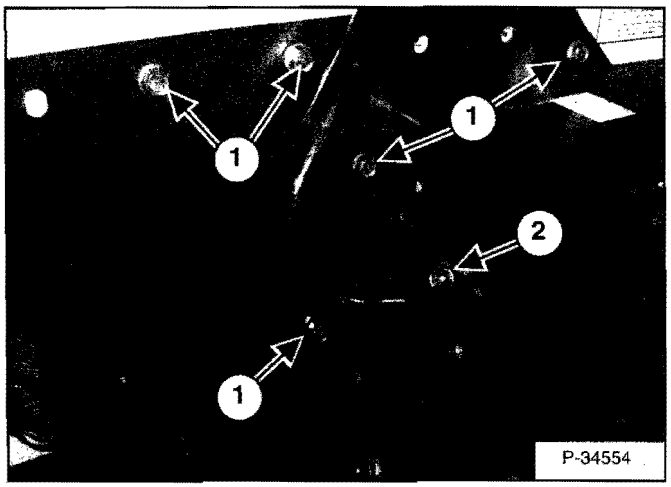
Remove the speed control linkage arm (Item 1) **[Figure 50-121-9]** from the access panel.

Figure 50-121-10



At the bottom right side of the control panel, behind the lift arm by-pass valve, remove the two bolts and nuts (Item 1) **[Figure 50-121-10]** that mount the engine speed cable to the access panel.

Figure 50-121-11



Remove the five mount bolts (Item 1) **[Figure 50-121-11]** from the access panel.

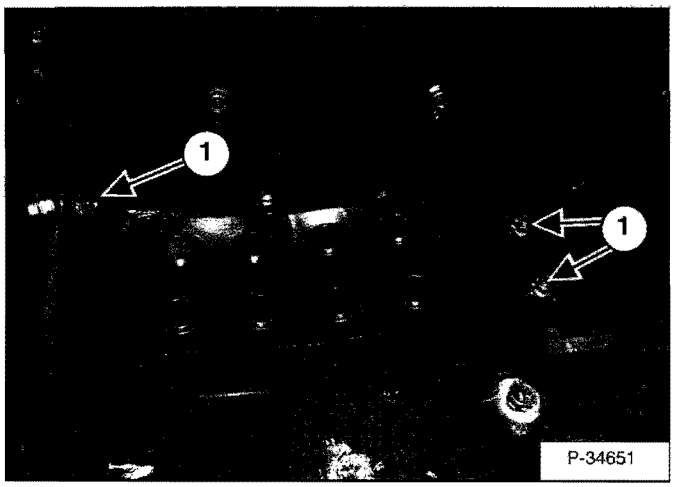
Remove the mount bolt (Item 2) **[Figure 50-121-11]** from the lever assembly. Move the lever assembly a slight amount toward the center of the loader, to allow clearance for the panel to be removed.

Remove the panel from the loader.

INSIDE ACCESS PANEL (SELECTABLE JOYSTICK CONTROL) (SJC) (CONT'D)

Panel Removal (Left)

Figure 50-121-12



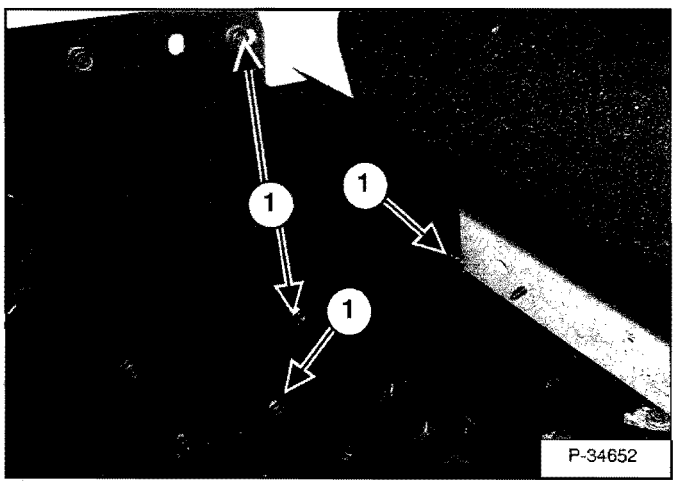
Raise the lift arms and install an approved lift arm support device. (See Contents Page 10-01.)

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

Remove the three mounting bolts (Item 1) **[Figure 50-121-12]**, from the left foot rest.

Remove the foot rest from the loader.

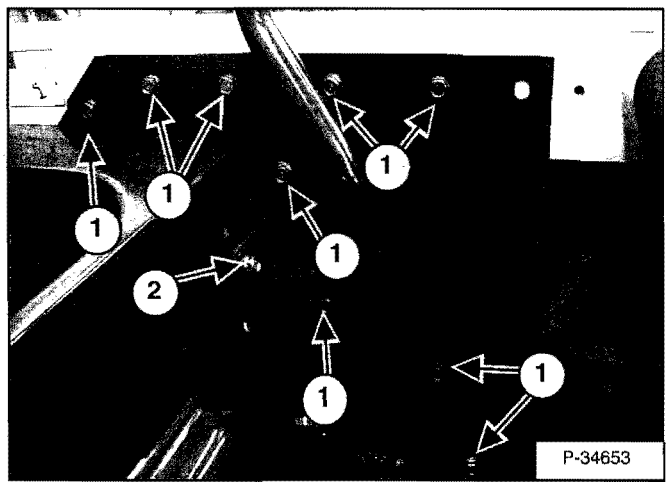
Figure 50-121-13



Remove the four mounting bolts (Item 1) **[Figure 50-121-13]**.

Remove the front access panel from the loader.

Figure 50-121-14



Remove the nine mount bolts (Item 1) **[Figure 50-121-14]**

Remove the mount bolt (Item 2) **[Figure 50-121-14]** from the lever assembly. Move the lever assembly a slight amount toward the center of the loader, to allow clearance for the panel to be removed.

Remove the inside access panel from the loader.

ELECTRICAL SYSTEM & ANALYSIS

Continued On Next Page

Continued On Next Page

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

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WIRING SCHEMATIC
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(PRINTED OCTOBER 2003)
V-0407

WIRING SCHEMATIC
(With ACS Option)
T300 (S/N 525411001 & ABOVE)
(S/N 525511001 & ABOVE)
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WIRING SCHEMATIC
(With SJC OPTION)
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(S/N 525511001 & ABOVE)
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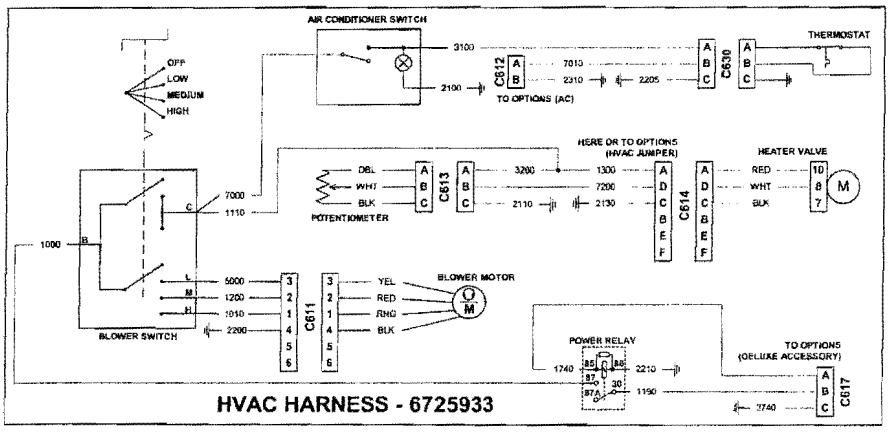
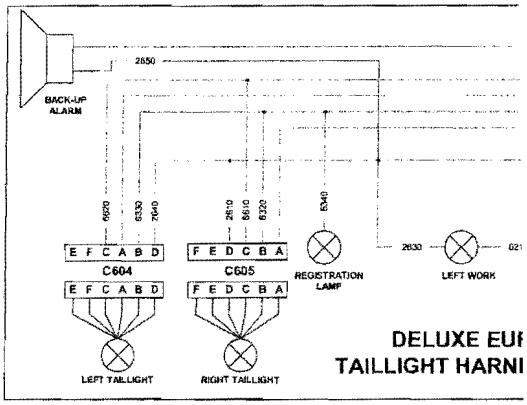
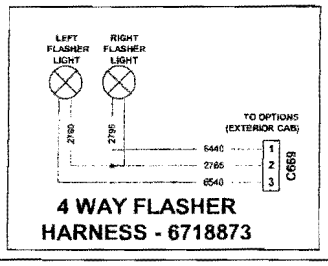


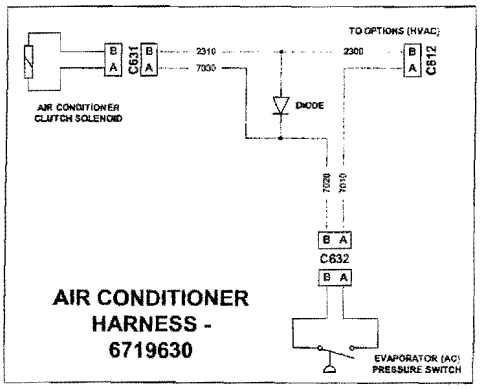
HVAC HARNESS - 6725933



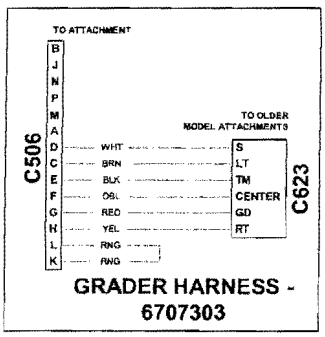
DELUXE EUR TAILLIGHT HARNI



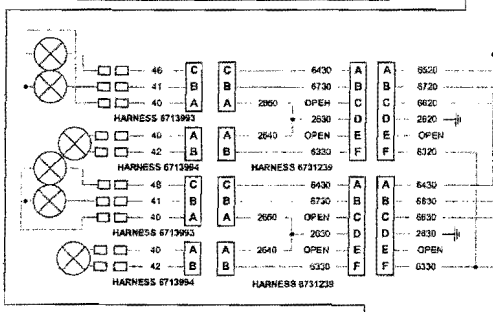
4 WAY FLASHER HARNESS - 6718873

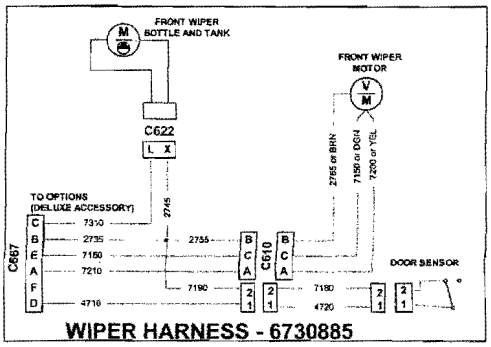


AIR CONDITIONER HARNESS - 6719630



GRADER HARNESS - 6707303





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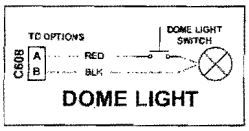
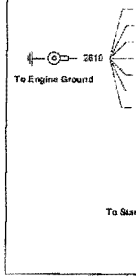
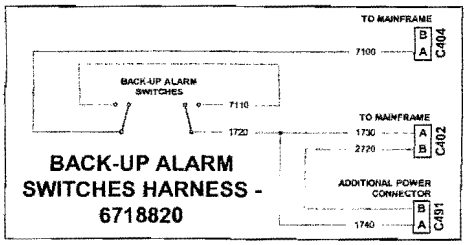
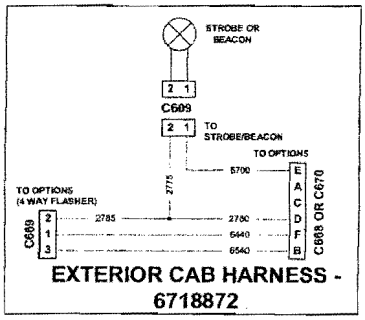


DOME LIGHT

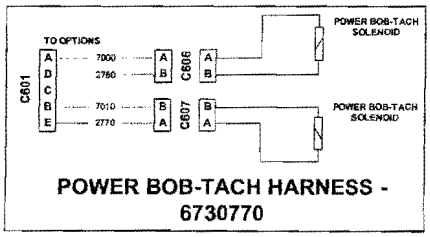




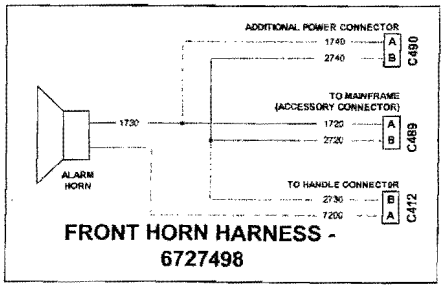
BACK-UP ALARM SWITCHES HARNESS - 6718820



EXTERIOR CAB HARNESS - 6718872

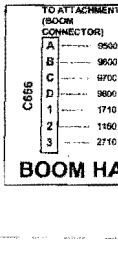


POWER BOB-TACH HARNESS - 6730770

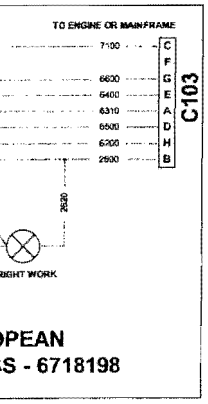


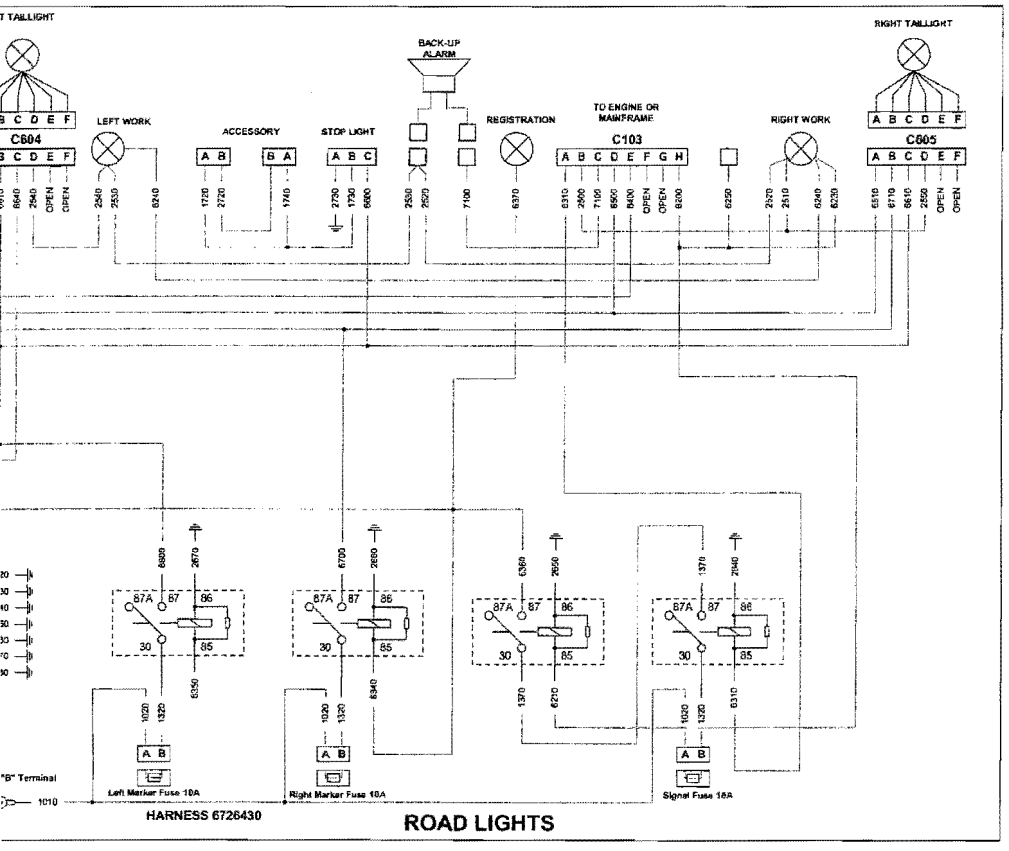
FRONT HORN HARNESS - 6727498

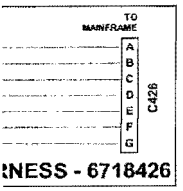
HVAC HARNI

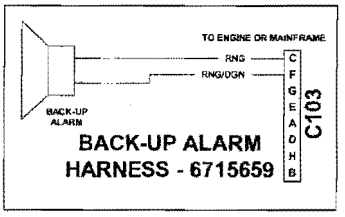


BOOM HA

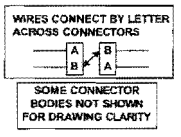








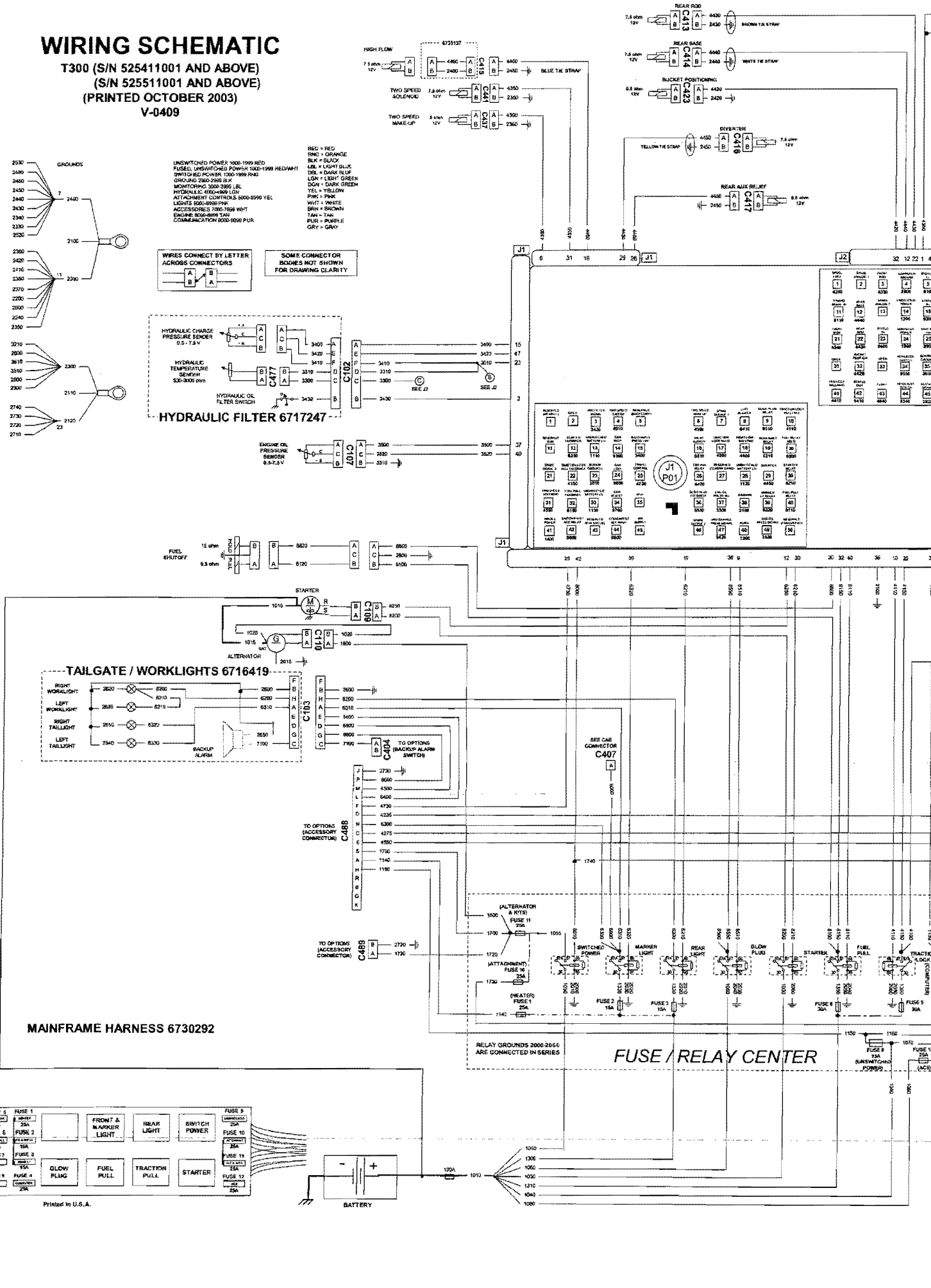
RED = RED
RNG = ORANGE
BLK = BLACK
LBL = LIGHT BLUE
DBL = DARK BLUE
LGN = LIGHT GREEN
DGN = DARK GREEN
YEL = YELLOW
PNK = PINK
WHT = WHITE
BRN = BROWN
TAN = TAN
PUR = PURPLE
GRY = GRAY

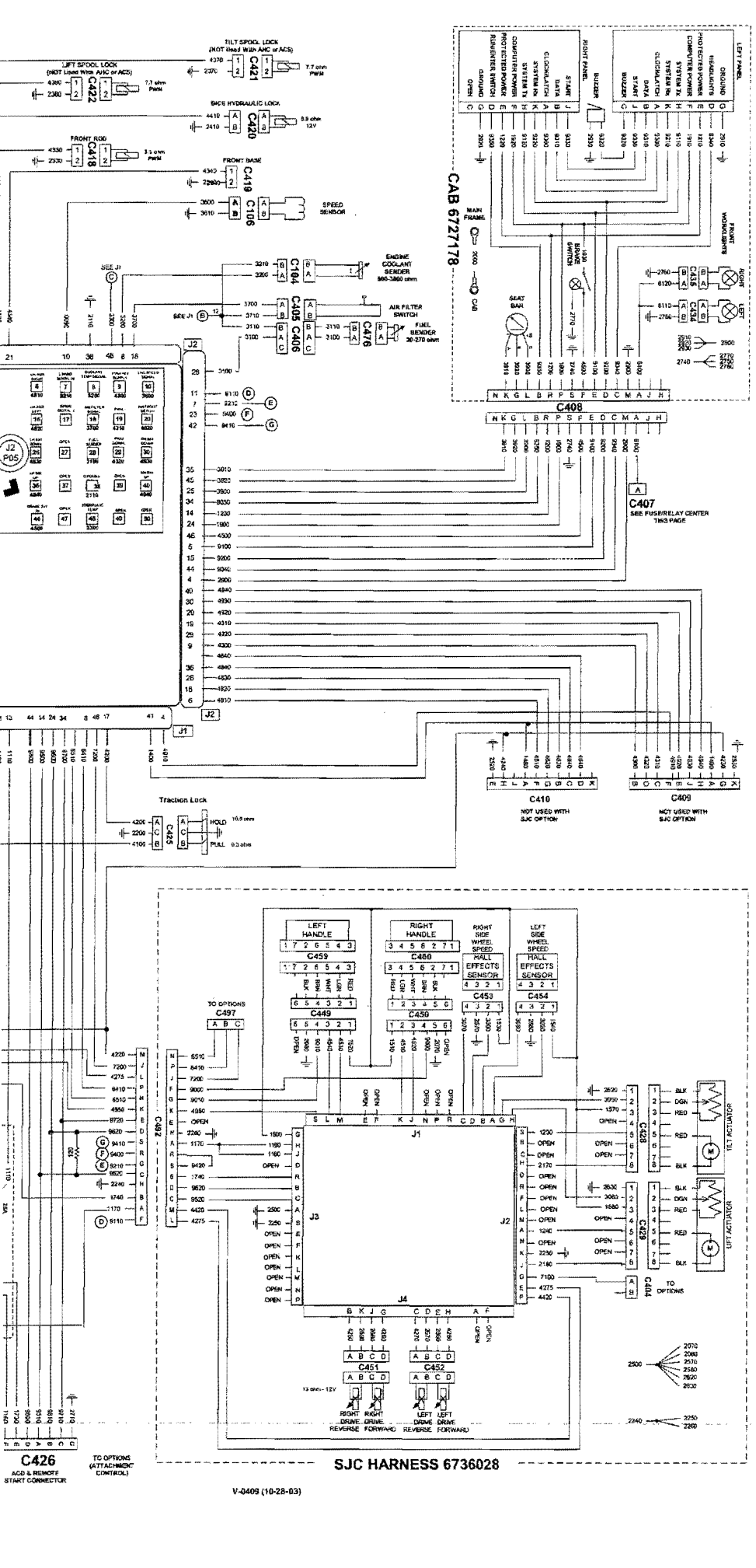


BATTERY FEED 1000-1999 RED, RED/WHT, RNG
GROUND 2000-2999 BLK
MONITORING 3000-3999 LBL
HYDRAULIC 4000-4999 LGN
ATTACHMENT CONTROLS 5000-5999 YEL
LIGHTS 6000-6999 PNK
ACCESSORIES 7000-7999 WHT
ENGINE 8000-8999 TAN
COMMUNICATION 9000-9999 PUR

WIRING SCHEMATIC

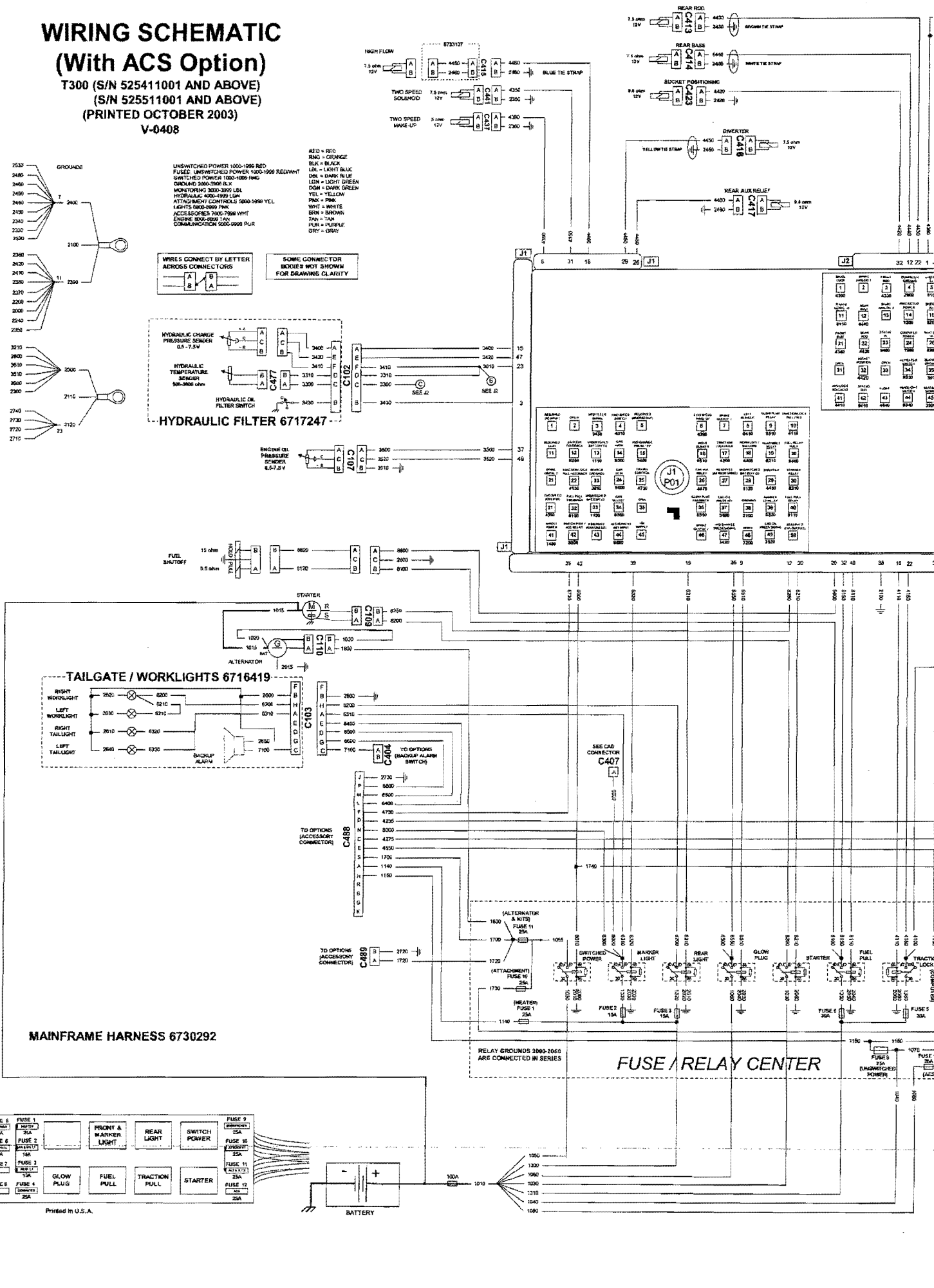
T300 (S/N 525411001 AND ABOVE)
(S/N 525511001 AND ABOVE)
(PRINTED OCTOBER 2003)
V-0409

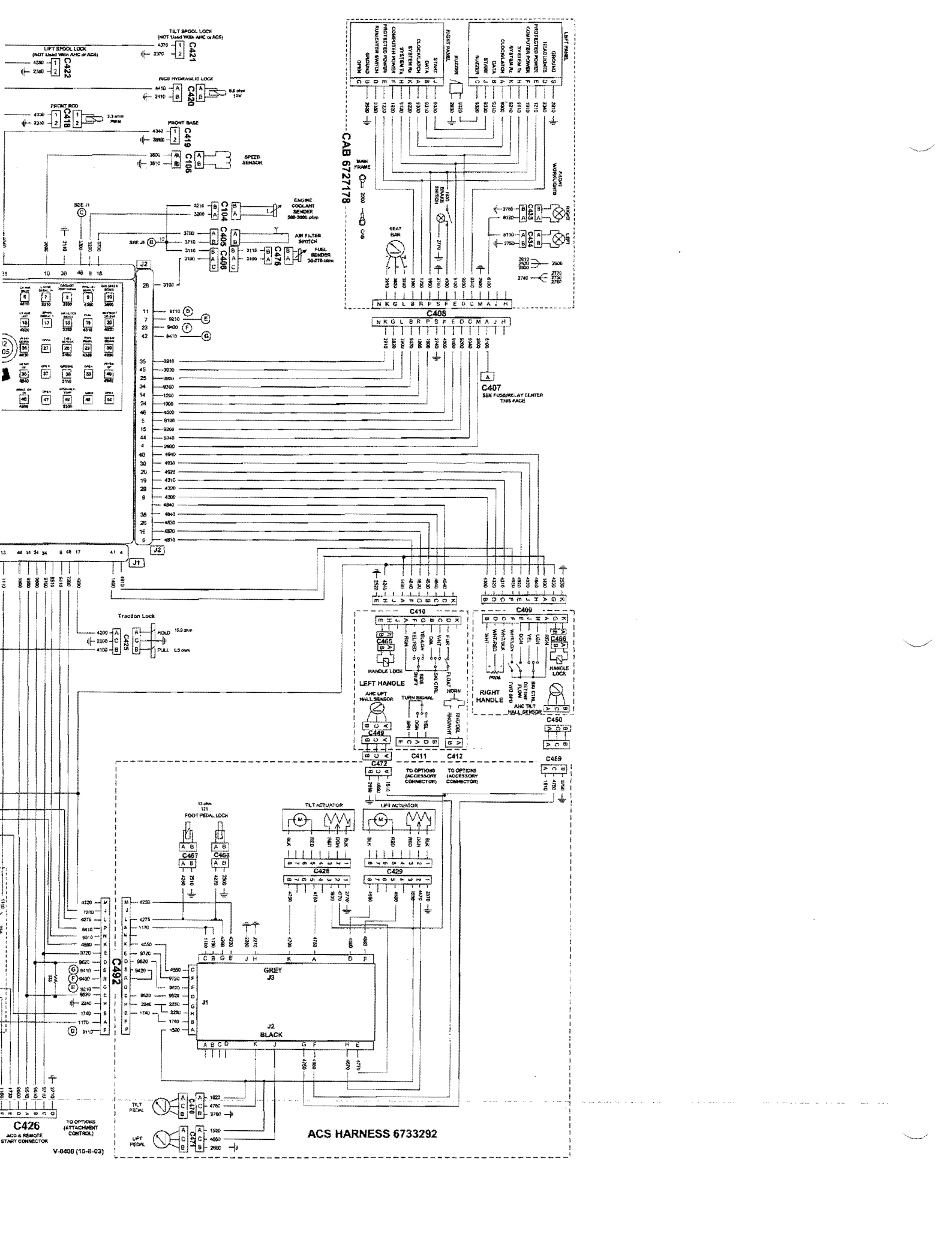



CAB 6727178
C408
C407
SEE FUSE/RELAY CENTER THIS PAGE
C410
NOT USED WITH SJC OPTION
C409
NOT USED WITH SJC OPTION
C426
ACD & REMOTE START CONNECTOR
TO OPTIONS (ATTACHMENT CONTROL)
SJC HARNESS 6736028
V-0409 (10-28-03)

WIRING SCHEMATIC
(With ACS Option)

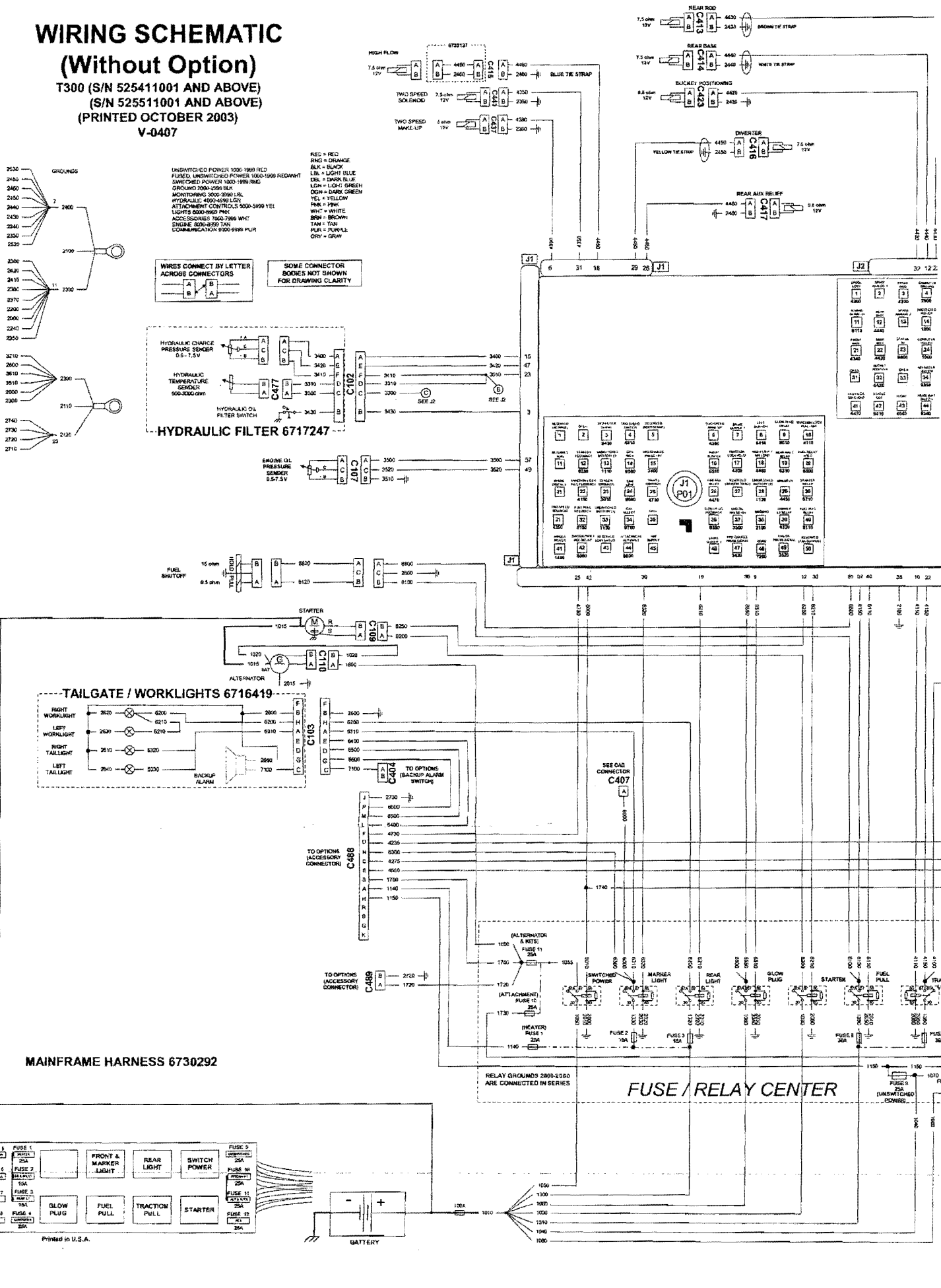
T300 (S/N 525411001 AND ABOVE)
(S/N 525511001 AND ABOVE)
(PRINTED OCTOBER 2003)
V-0408

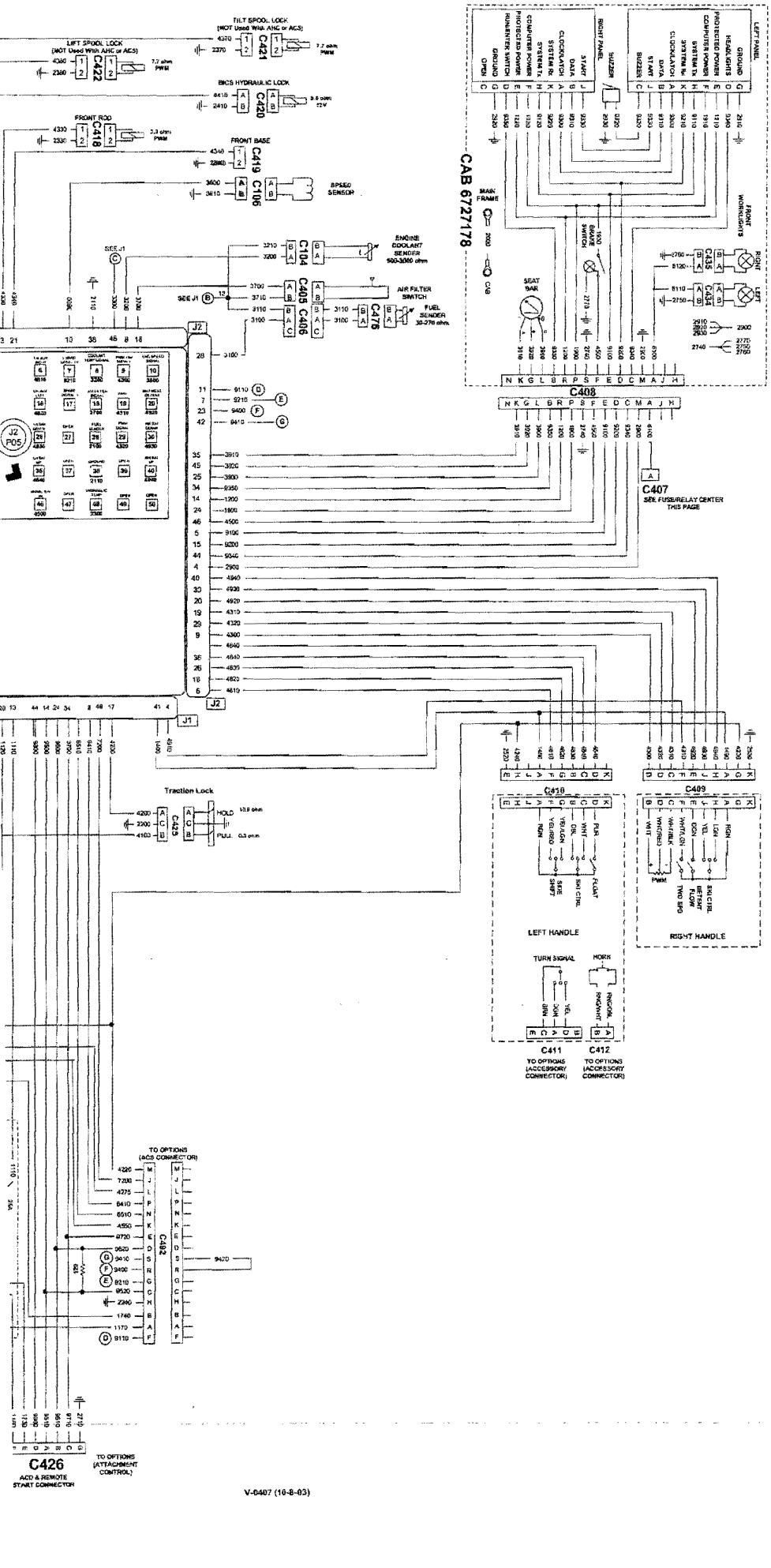



ACS HARNESS 6733292
CAB 6727178
C407
C408
C409
C410
C411
C412
C420
C421
C422
C425
C426
C428
C429
C449
C450
C465
C466
C467
C468
C469
C472
C492
J1
J2
J3
GREY
BLACK
LEFT HANDLE
RIGHT HANDLE
HANDLE LOCK
TILT ACTUATOR
LIFT ACTUATOR
FOOT PEDAL LOCK
TRACTION LOCK
TILT SPOOL LOCK
LIFT SPOOL LOCK
ENGINE COOLANT SENDER
AIR FILTER SWITCH
FUEL SENDER
SPEED SENSOR
SEAT BAR
HORN
TURN SIGNAL
TO OPTIONS (ACCESSORY CONNECTOR)
TO OPTIONS (ATTACHMENT CONTROL)
ACD & REMOTE START CONNECTOR
V-0408 (10-8-03)

WIRING SCHEMATIC
(Without Option)

T300 (S/N 525411001 AND ABOVE)
(S/N 525511001 AND ABOVE)
(PRINTED OCTOBER 2003)
V-0407

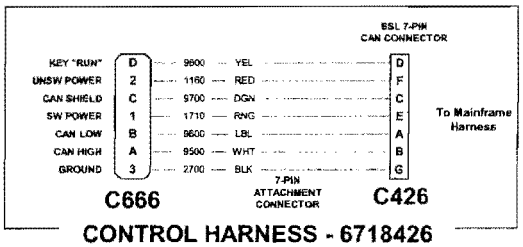



CAB 6727178
TILT SPOOL LOCK
(NOT Used With AHC or AC3)
LIFT SPOOL LOCK
(NOT Used With AHC or AC3)
BKCS HYDRAULIC LOCK
FRONT ROD
FRONT BASE
SPEED SENSOR
ENGINE COOLANT SENDER 500-3000 ohm
AIR FILTER SWITCH
FUEL SENDER 30-270 ohm
SEAT BAR
BRAKE SWITCH
MAIN FRAME
FRONT WORKGROUP
LEFT PANEL
RIGHT PANEL
BUZZER
HEADLIGHTS
RIGHT
LEFT
C408
C407
SEE FUSE/RELAY CENTER THIS PAGE
C410
C409
LEFT HANDLE
RIGHT HANDLE
TURN SIGNAL
HORN
C411
C412
TO OPTIONS (ACCESSORY CONNECTOR)
Traction Lock
HOLD
PULL
TWO SPD
DETENT FLOW
SHUTTLE
PWM
TO OPTIONS (ACD CONNECTOR)
C426
ACD & REMOTE START CONNECTOR
TO OPTIONS (ATTACHMENT CONTROL)

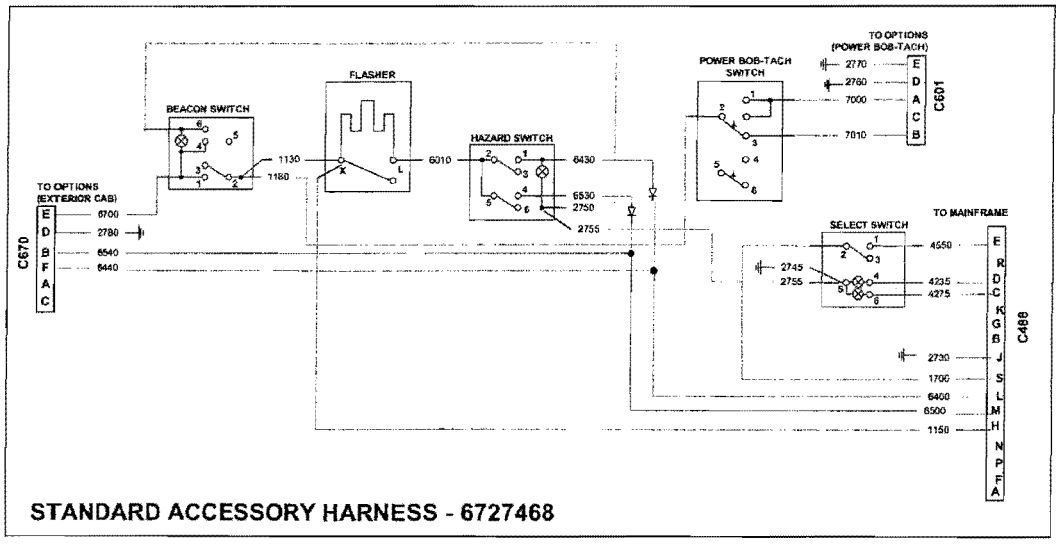
V-0407 (10-8-03)

WIRING SCHEMATIC
OPTIONS
T300 (S/N 525411001 AND ABOVE)
(S/N 525511001 AND ABOVE)

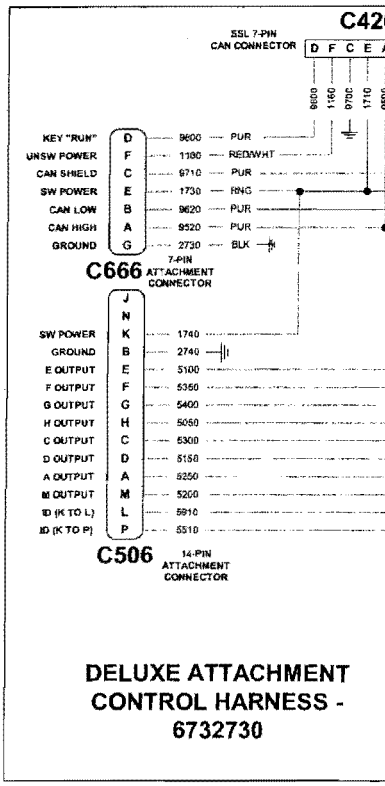
(PRINTED OCTOBER 2003)
V-0411



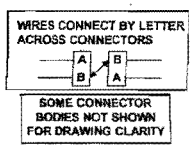
CONTROL HARNESS - 6718426

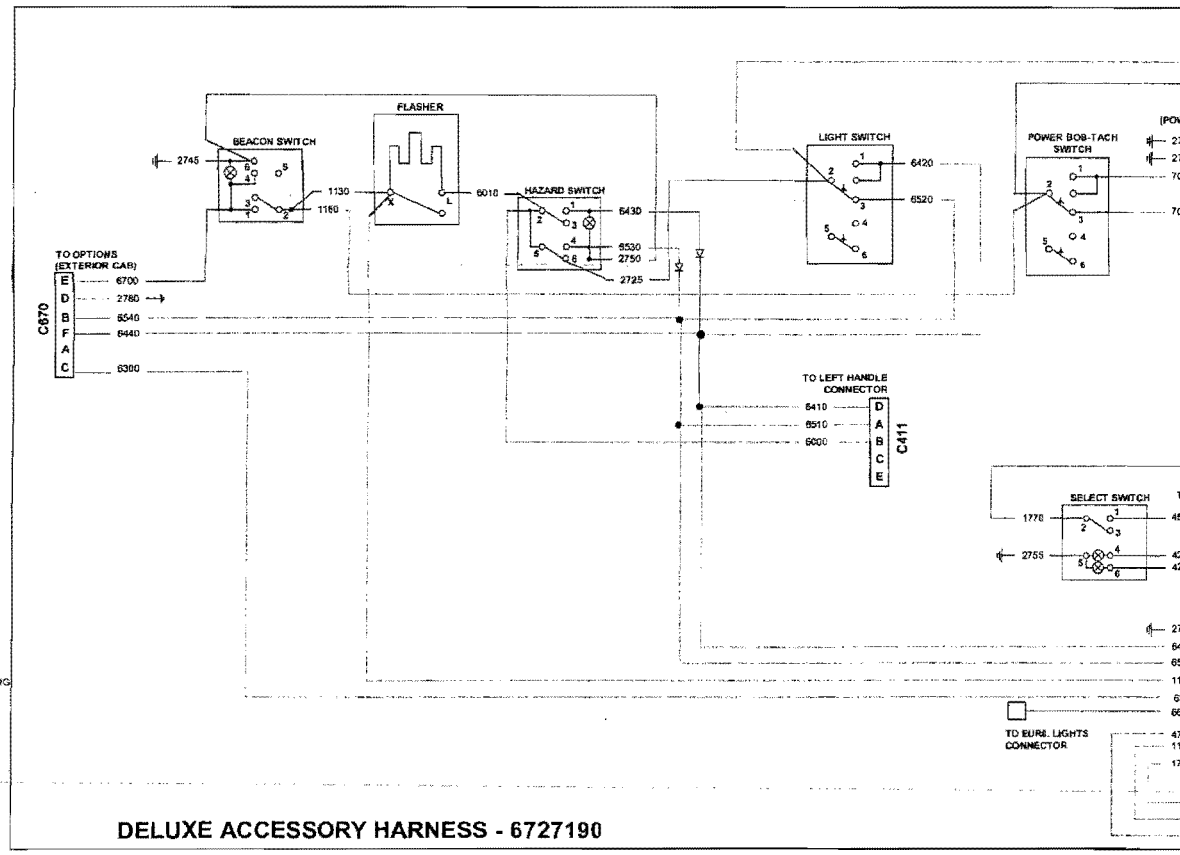


STANDARD ACCESSORY HARNESS - 6727468



DELUXE ATTACHMENT CONTROL HARNESS - 6732730





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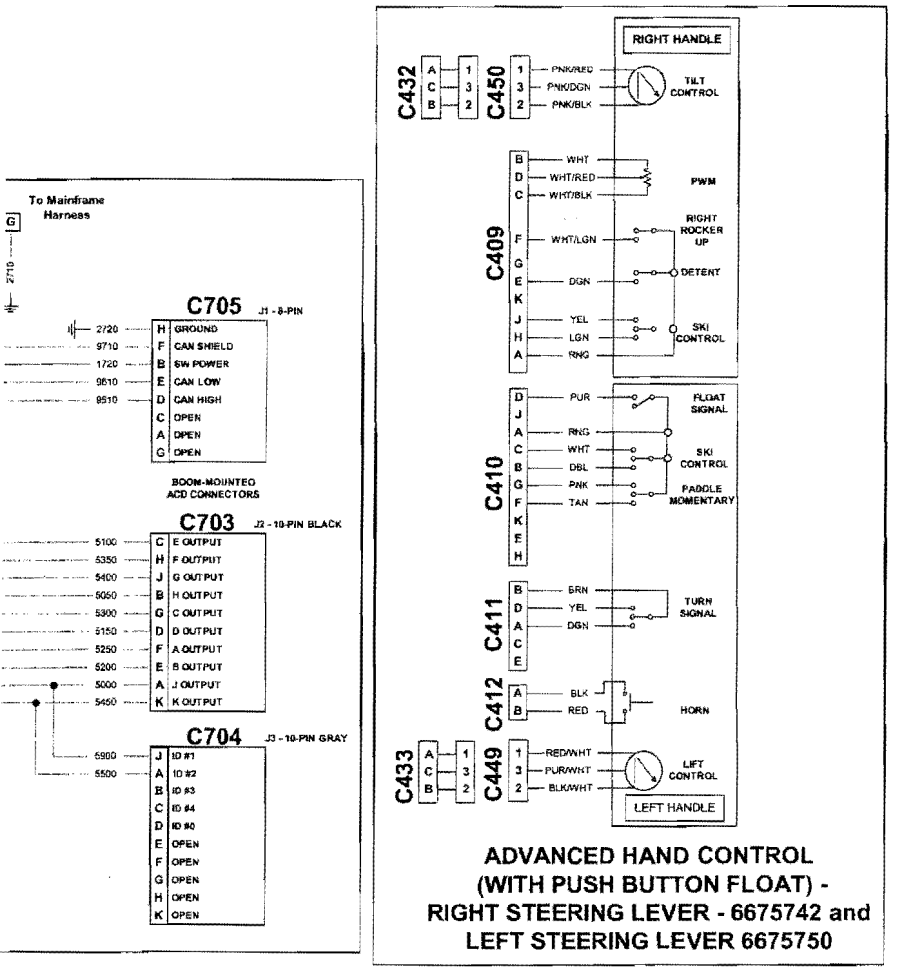
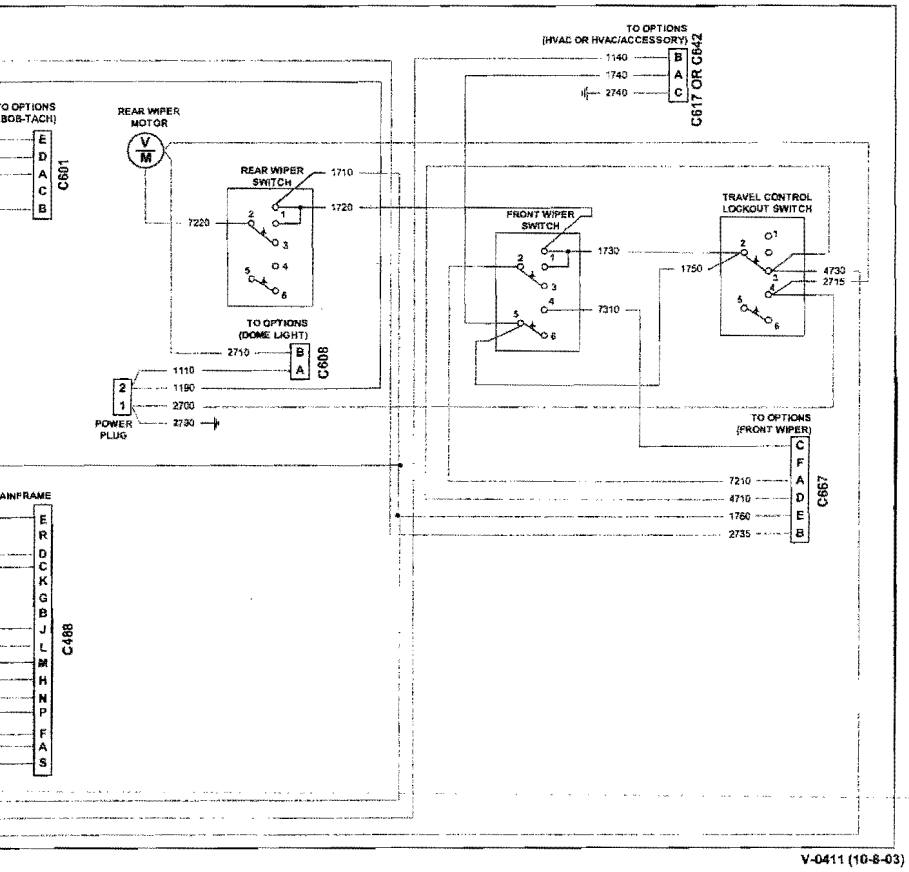
ATTACHMENT CONTROLS 5000-5999 YEL
LIGHTS 6000-6999 PNK
ACCESSORIES 7000-7999 WHT
ENGINE 8000-8999 TAN
COMMUNICATION 9000-9999 PUR

DELUXE ACCESSORY HARNESS - 6727190

Printed in U.S.A.



ADVANCED HAND CONTROL (WITH PUSH BUTTON FLOAT) - RIGHT STEERING LEVER - 6675742 and LEFT STEERING LEVER 6675750



V-0411 (10-8-03)

Troubleshooting

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

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.

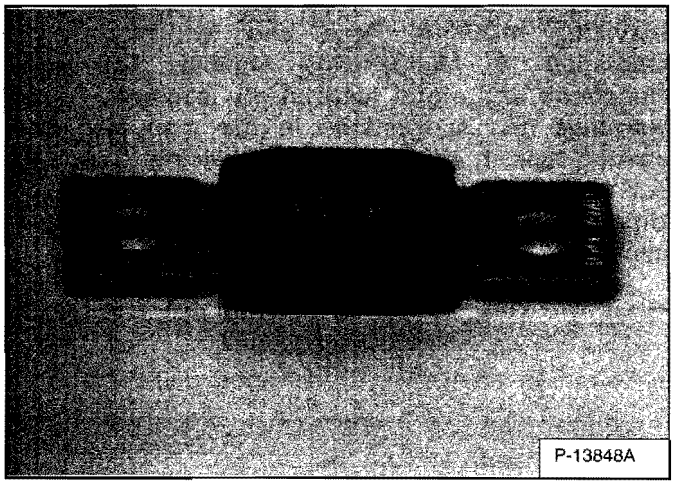
W-2003-0903

PROBLEM	CAUSE
Battery will not take a charge.	2, 3, 4
Alternator will not charge.	1, 4
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 cable & wire connection are not making a good contact.
5. The alternator is damaged.
6. The engine is locked.
7. The starter is damaged.
8. The wiring or the solenoid is damaged.
9. Check the fuses.

Description

Figure 60-10-1



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]** to protect against serious system overloads that could lead to burned up harness or loader damage.

Figure 60-10-2

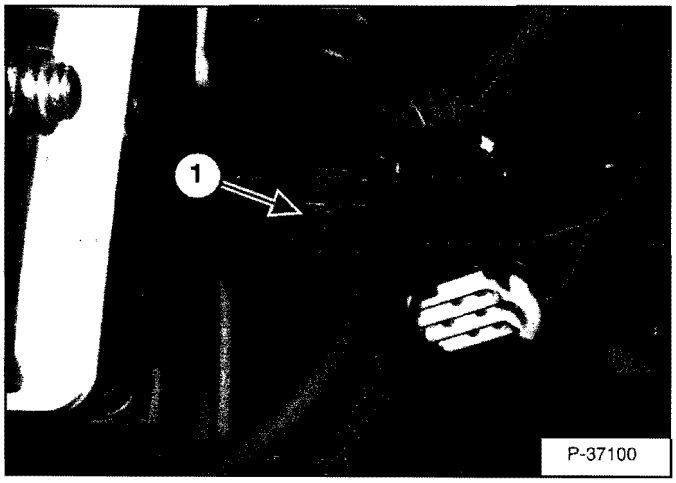
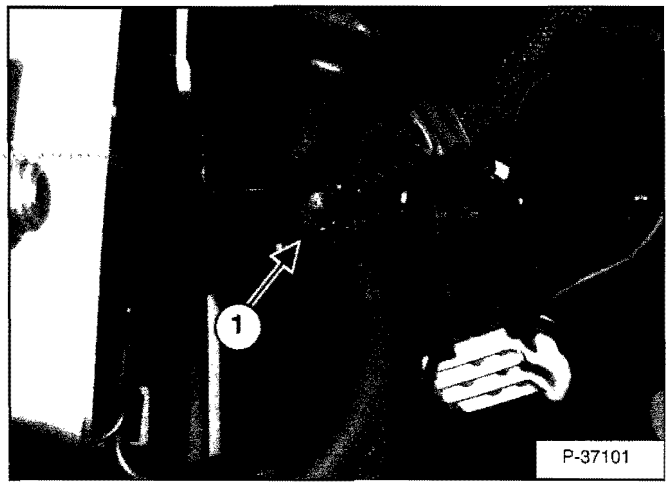


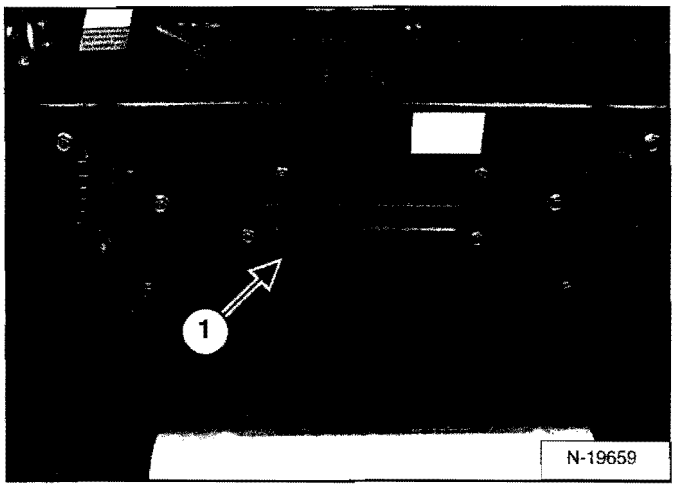
Figure 60-10-3



The fuse holder is located in the engine compartment, below the engine harness connector (Item 1) **[Figure 60-10-2]** & **[Figure 60-10-3]**.

Description (Cont'd)

Figure 60-10-4



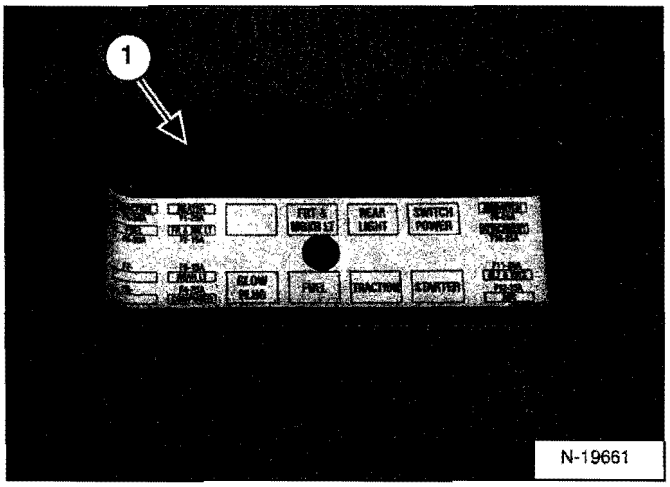
The electrical system is also protected by fuses and relays under the fuse panel cover (Item 1) **[Figure 60-10-4]** located in the cab on the steering control panel.

IMPORTANT

Do Not use silicone base sprays and/or sealants on harness connectors or components.

I-2123-0397

Figure 60-10-5



Remove the fuse panel cover (Item 1) **[Figure 60-10-4]**.

The fuse panel decal (Item 1) **[Figure 60-10-5]** is shown inside the cover.

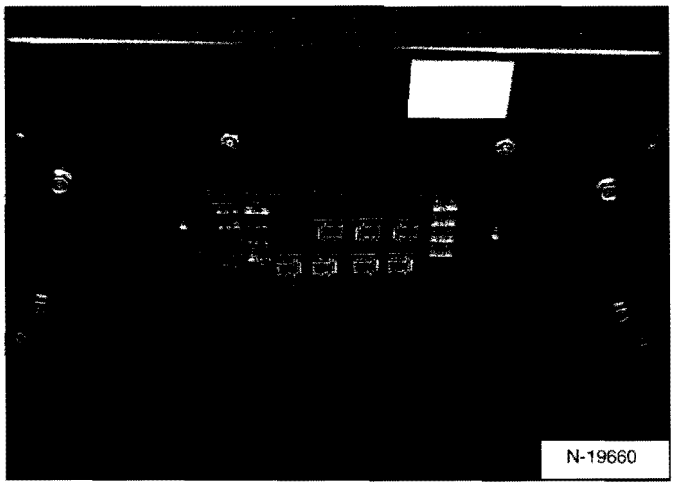
Fuse Location

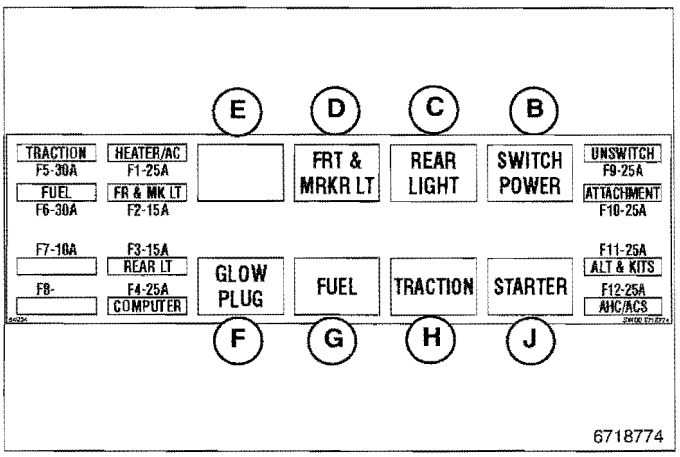
Remove the cover to check or replace the fuses.

The location and sizes are shown in **[Figure 60-10-6]** & **[Figure 60-10-7]**.

Ref	Description	Amp.	Ref	Description	Amp.
F1	Heater	25	F9	Unswitched Attch.	25
F2	Front & Marker Lights	15	F10	Switched Attach.	25
F3	Rear Lights	15	F11	Alternator & Kits	25
F4	Bobcat Controller	25	F12	AHC Power	25
F5	Traction	30			
F6	Fuel Shutoff	30			
F7	*Not Used*	--			
F8	*Not Used*	--			

Figure 60-10-6





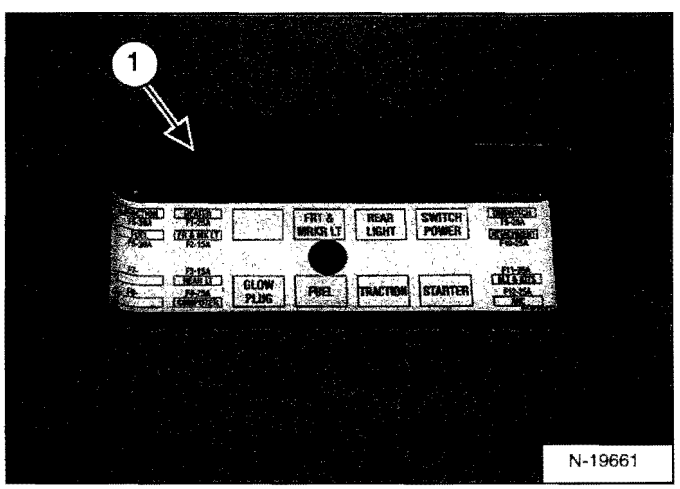
Relay Switch Location

Remove the cover to check or replace the relays.

The location is shown in **[Figure 60-10-6]** & **[Figure 60-10-7]**.

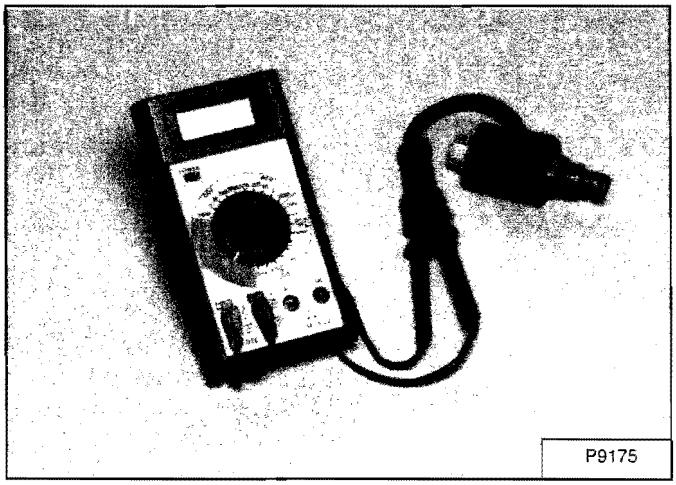
Ref	Description	Ref	Description
B	Switch Power	F	Glow Plugs
C	Rear Lights	G	Fuel Shutoff
D	Front & Marker Lights	H	Traction
E	*Not Used*	J	Starter

Figure 60-10-7



Solenoid Test

Figure 60-10-8



Use a test meter to measure coil resistance **[Figure 60-10-8]**. Coil wires do not have polarity. Correct resistance for the pressure relief (small) coil is 7-10 ohm and the other coils 5-8 ohms.

Replace the test meter with 12 volt power. You can see and hear the spool shift.

Bobcat®

BATTERY

Removal And Installation

⚠ WARNING

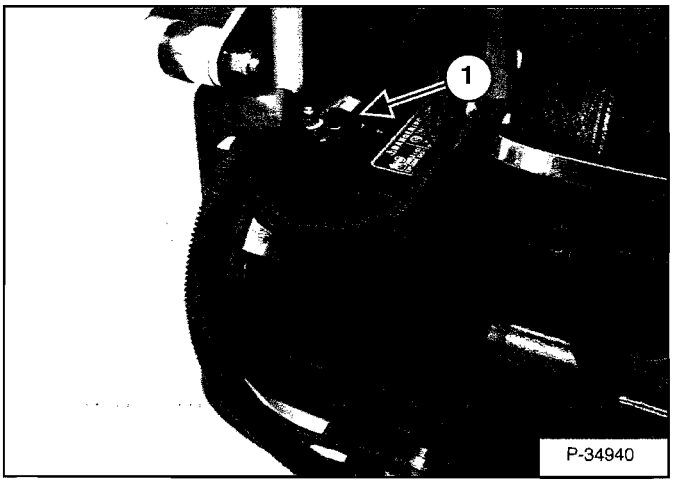
Batteries contain acid which burns eyes and skin on contact. Wear goggles, protective clothing and rubber gloves to keep acid off body.

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

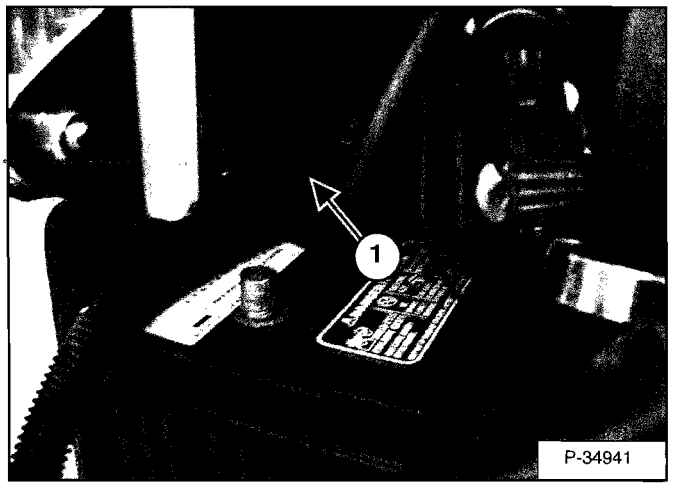
Figure 60-20-1



Open the rear door.

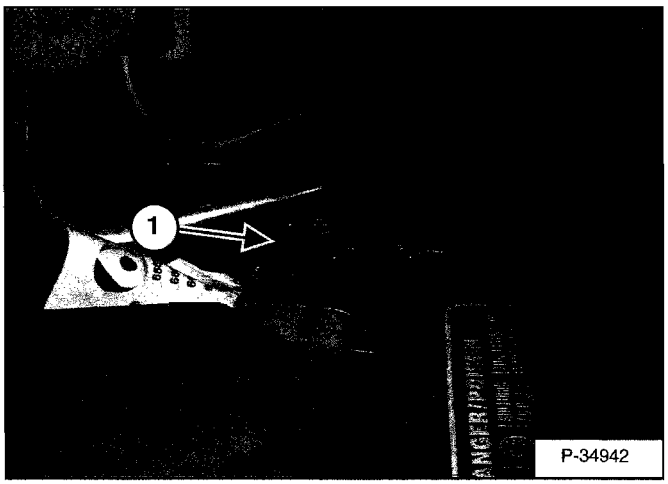
Disconnect the negative (-) cable (Item 1) **[Figure 60-20-1]** from the battery.

Figure 60-20-2



Remove the battery holddown clamp (Item 1) **[Figure 60-20-2]**.

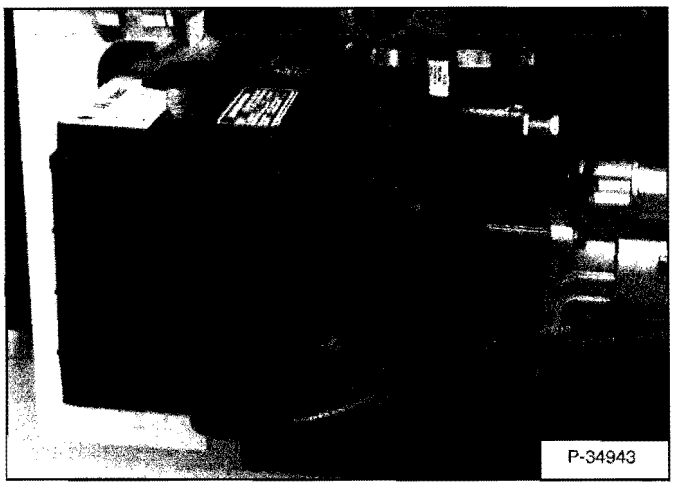
Figure 60-20-3



Disconnect the positive (+) cable (Item 1) **[Figure 60-20-3]** from the battery.

Removal And Installation (Cont'd)

Figure 60-20-4



Remove the battery from the loader **[Figure 60-20-4]**.

Figure 60-20-5

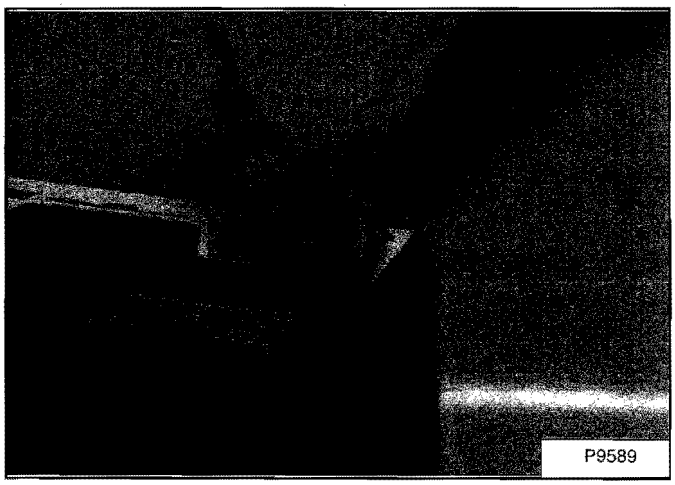
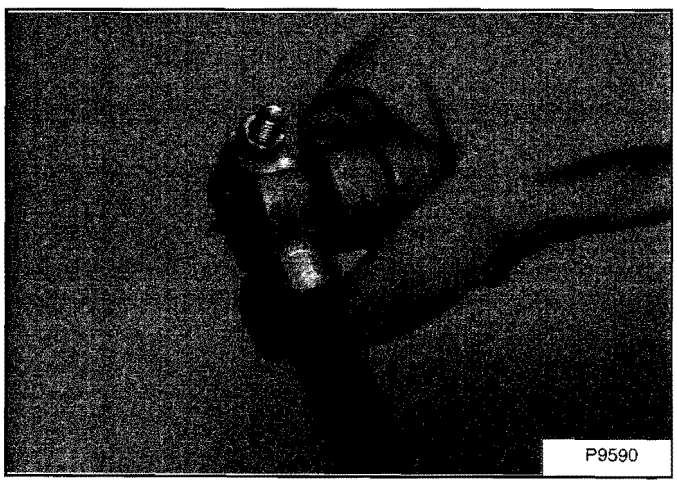


Figure 60-20-6

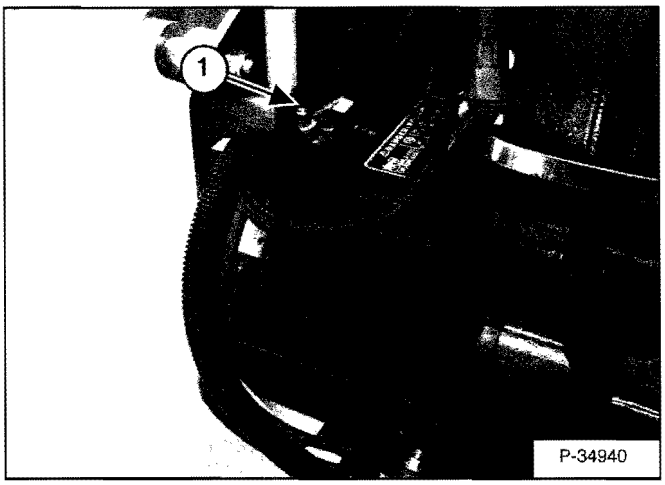


Always clean the terminals and cable ends when installating a battery **[Figure 60-20-5]** & **[Figure 60-20-6]**.

When installing the battery in the loader, do not touch any metal parts with the battery terminals.

Connect and tighten the battery cables.

Figure 60-20-7



Connect the negative (-) cable (Item 1) **[Figure 60-20-7]** last to prevent sparks.

⚠ 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

Servicing The Electrical System

⚠ 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 60-20-8

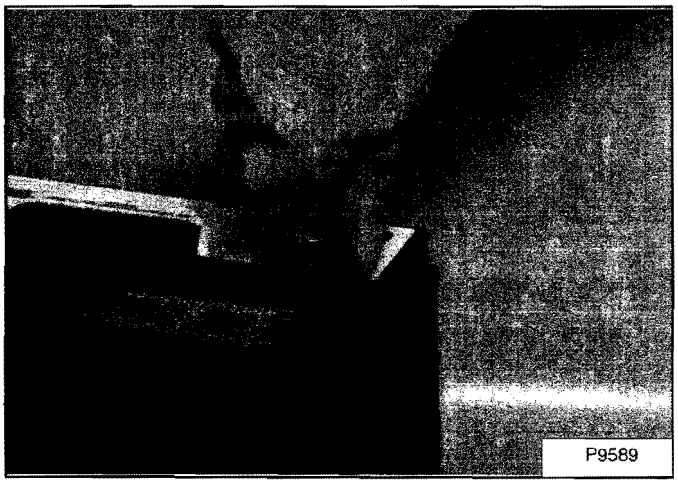
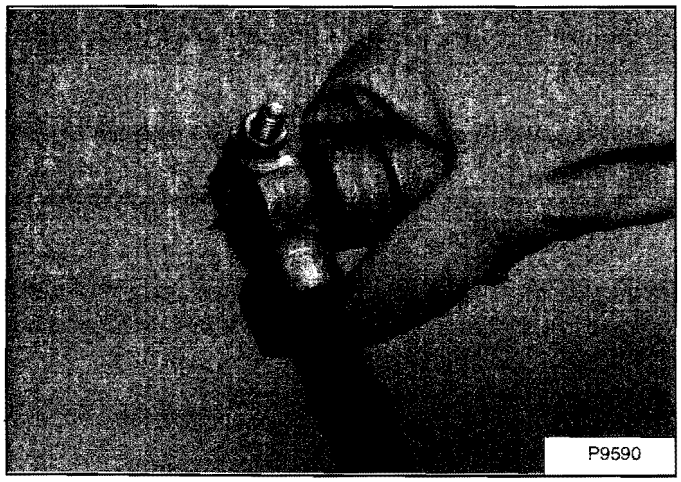
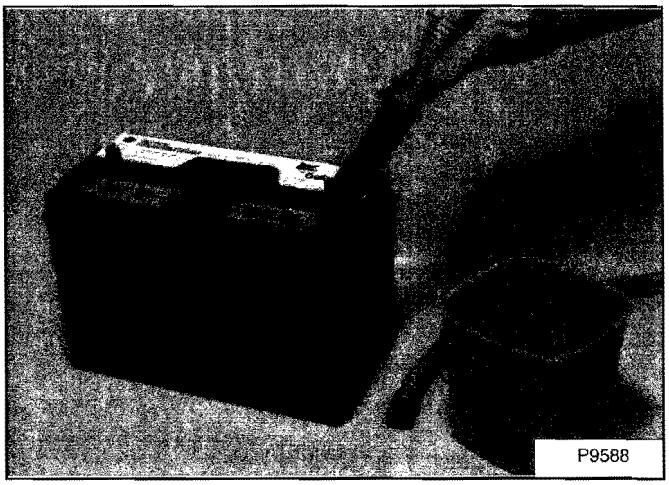


Figure 60-20-9



Clean the terminals and cable ends as shown in **[Figure 60-20-8]** & **[Figure 60-20-9]**.

Figure 60-20-10



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 60-20-10]**.

Check the electrolyte level in the battery. Add distilled water as needed.

Put Battery Saver 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

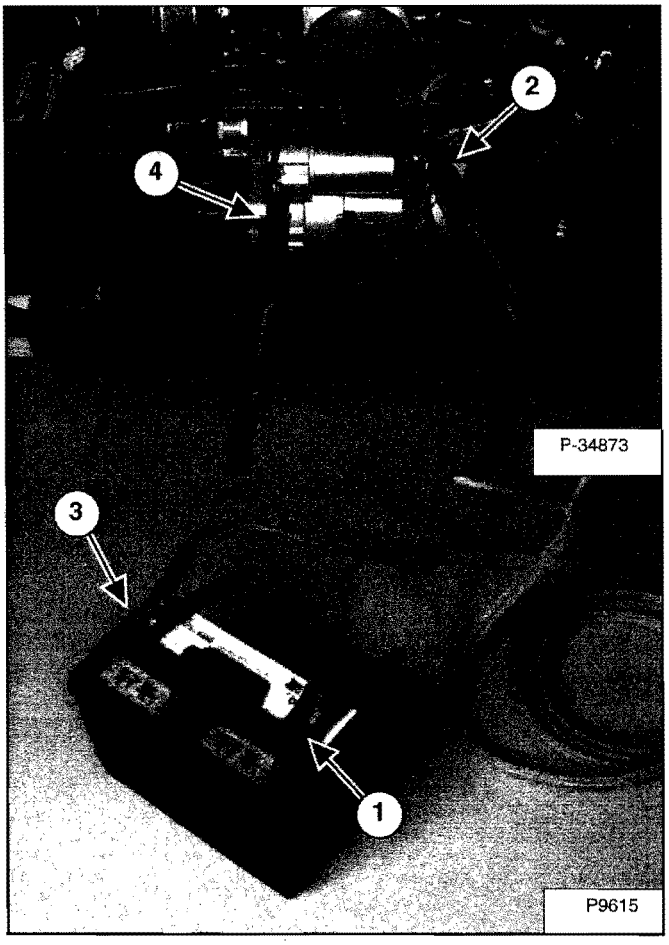
Keep arcs, sparks flames and lighted tobacco away from batteries. When *jumping* from booster battery make final connection (negative) at engine frame.

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

Figure 60-20-11



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 ignition must be in the OFF position. The booster battery to be used must be 12 volt.

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 60-20-11]** to the positive terminal on the 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 60-20-11]** to the engine frame.

Keep cables away from moving parts. Start the engine (See Cold Temperature Starting Condition, Operation & Maintenance Manual.)

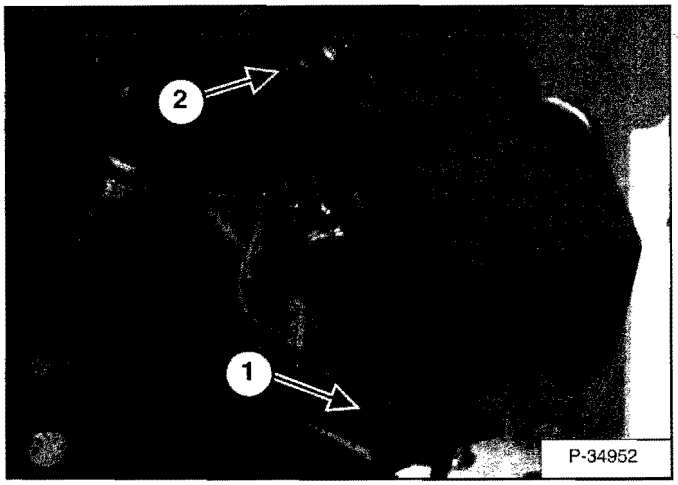
After the engine has started, remove the ground (-) cable (Item 4) **[Figure 60-20-11]** first.

Remove the cable from the starter.

ALTERNATOR

Adjusting The Alternator Belt

Figure 60-30-1



Stop the engine.

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

Loosen the alternator adjustment bolt (Item 1) **[Figure 60-30-1]**.

At the top side of the altenator, loosen the alternator mounting bolt (Item 2) **[Figure 60-30-1]**.

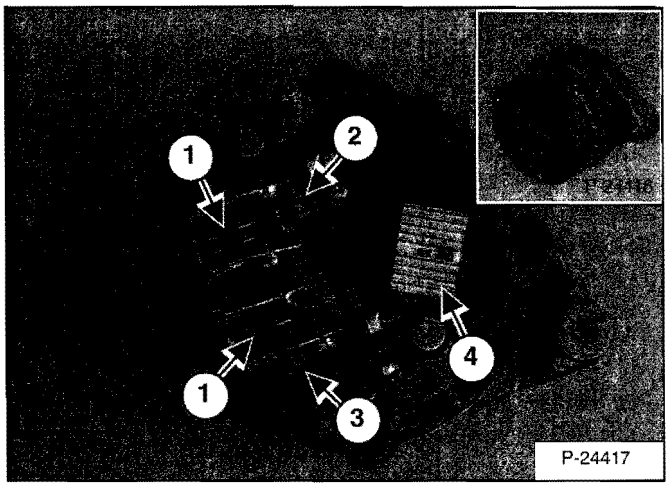
Move the alternator until the belt has 5/16 inch (8,0 mm) movement at the middle of the belt span with 15 lbs. (66 N) of force.

Tighten the adjustment bolts and mounting bolt.

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

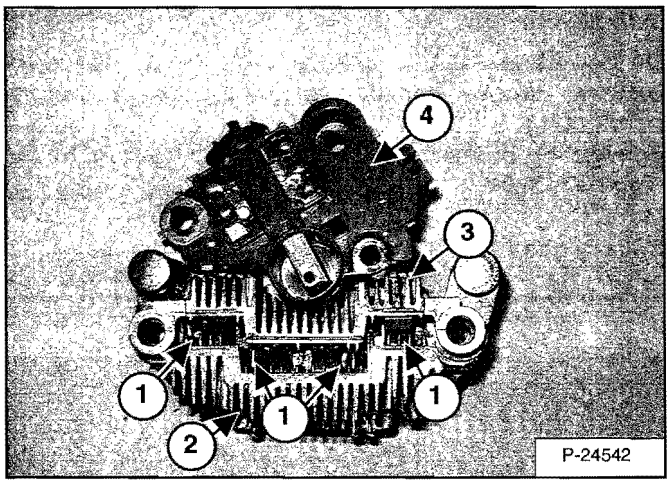
Alternator Identification

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

⚠ 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

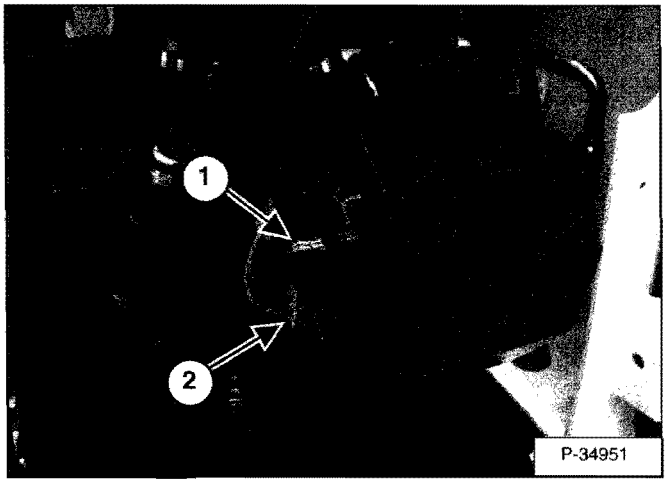
IMPORTANT

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

Figure 60-30-4



If the charging system malfunctions check the following:

Check the condition and tension of the alternator belt. (See Adjusting The Alternator Belt on Page 60-30-1.) If belt is worn or deteriorated replace.

Inspect the alternator wiring harness and connectors at alternator. Harness and connectors must be clean and tight.

Check the fuse for the alternator in the fuse panel. If 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.

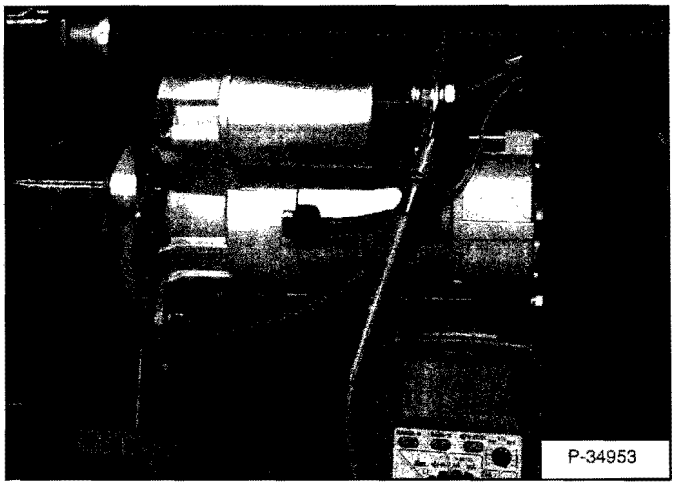
Disconnect the battery cables (negative first, then positive). Inspect the cable clamps and battery posts for corrosion. Remove acid or corrosion from the battery and cables with a sodium bicarbonate and water solution. Put grease on the cable ends and battery terminals to prevent corrosion. Reconnect 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 Below.)
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.
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 rear door. (See Contents Page 50-01.)

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]**.

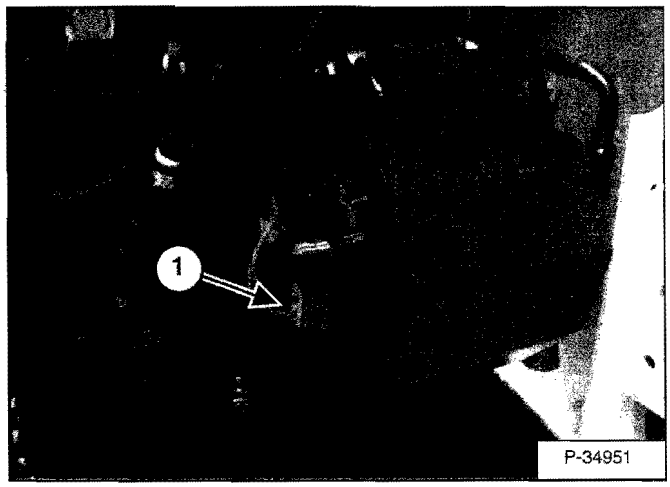
The voltage must be higher than 13.5 volts but lower than 14.7 volts at 70° F (Alternator Temperature).

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

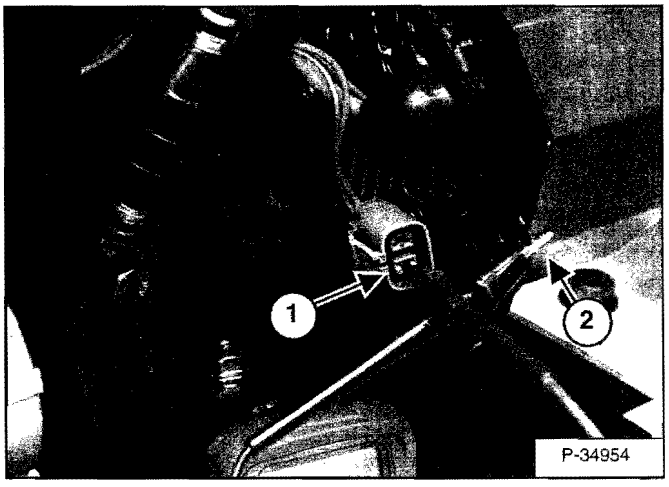
Figure 60-30-6



Turn engine OFF and remove the L & S terminal connector (Item 1) **[Figure 60-30-6]** off the alternator.

Turn the remote start tool key to the ON position.

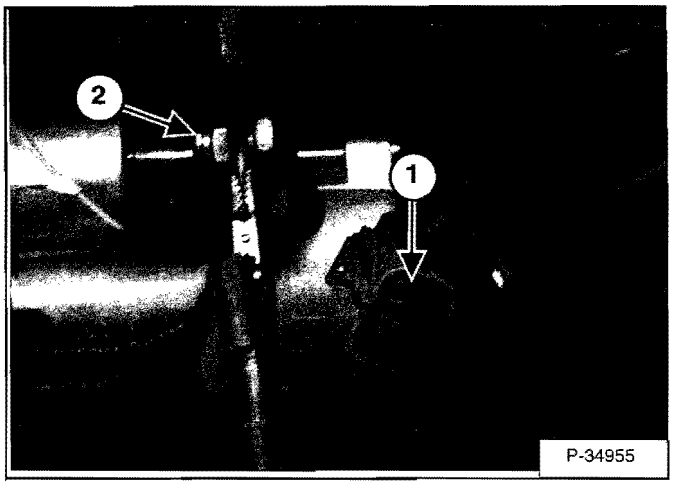
Figure 60-30-7



Check the voltage across the "L" terminal (Item 1) and ground (Item 2) **[Figure 60-30-7]**. 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.

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) **[Figure 60-30-8]** 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.

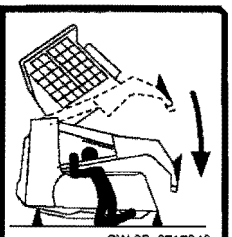
If voltage is still above 14.7 volts at 70° F (Alternator Temperature), then remove alternator for replacement or repair.

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

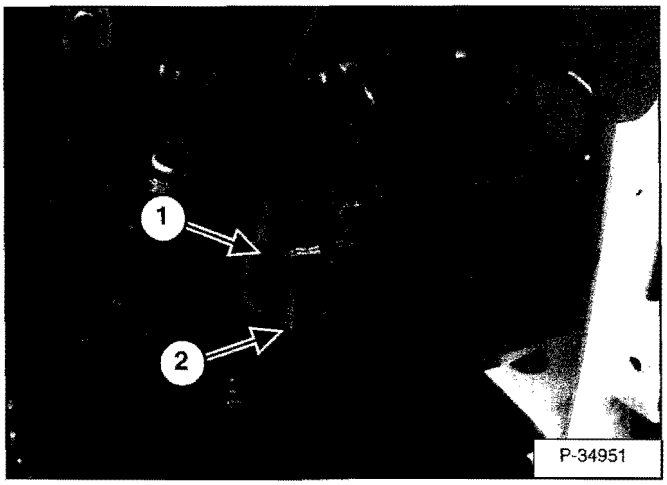
IMPORTANT

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

Figure 60-30-9



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.)

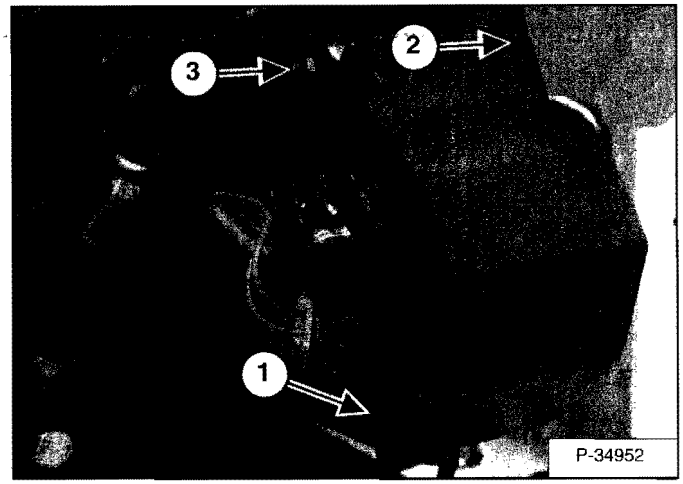
Disconnect the negative (-) cable from the battery.

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.

Removal And Installation (Cont'd)

Figure 60-30-10



Remove the adjustment bolt (Item 1) **[Figure 60-30-10]** from the mounting bracket.

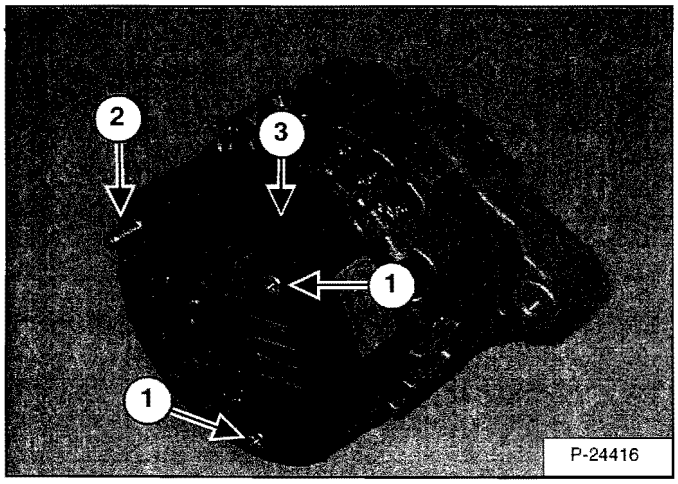
Remove the alternator belt (Item 2) **[Figure 60-30-10]** from the alternator pulley.

At the top of the alternator, remove the mounting bolt (Item 3) **[Figure 60-30-10]**.

Remove the alternator from the loader.

Rectifier Continuity (Diode) Test

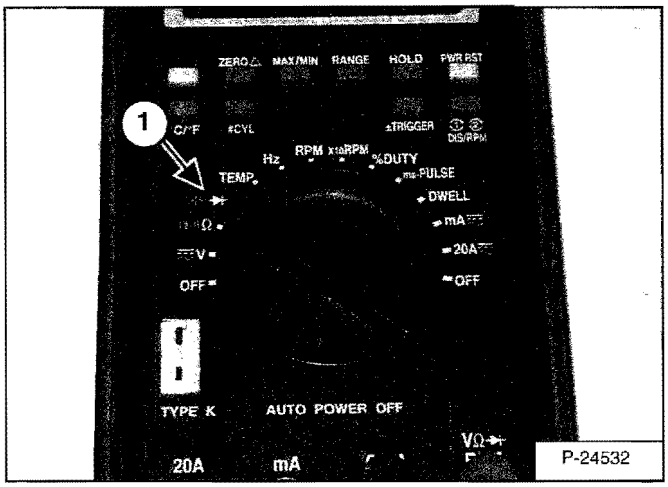
Figure 60-30-11



Remove the two screws (Item 1), nut/washer (Item 2) and the plastic cover (Item 3) **[Figure 60-30-11]** from the alternator.

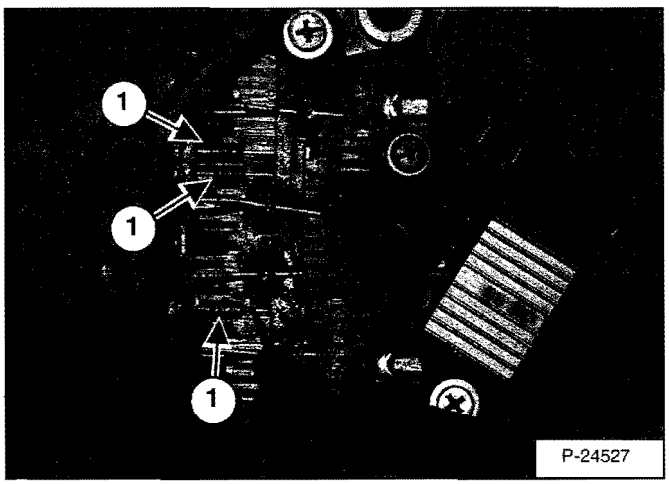
NOTE: In the diode tests there should be continuity in one direction only. Meter readings should be different when probes are reversed. If the diode being tested shows no continuity or continuity in both directions, replace the rectifier assembly.

Figure 60-30-12



NOTE: Use the diode function (Item 1) [Figure 60-30-12] on the multimeter.

Figure 60-30-13



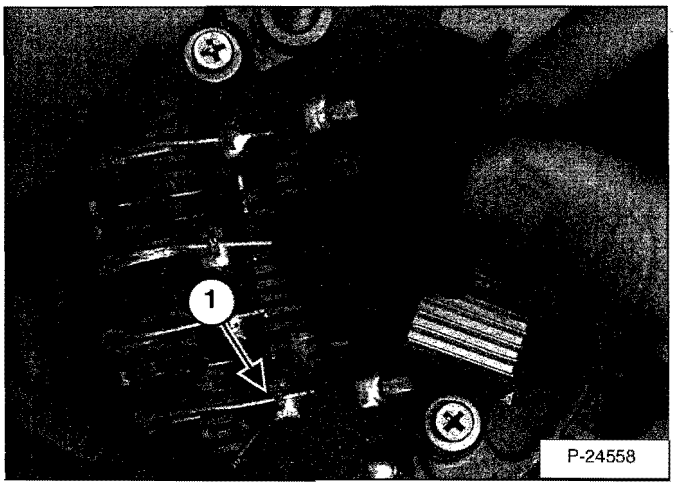
Touch the probes to the terminals (Item 1) **[Figure 60-30-13]** of each diode and read the meter.

Reverse the probes to check the diode in the other direction.

Meter readings should be different when probes are reversed.

Rectifier Continuity (Diode) Test (Cont'd)

Figure 60-30-14



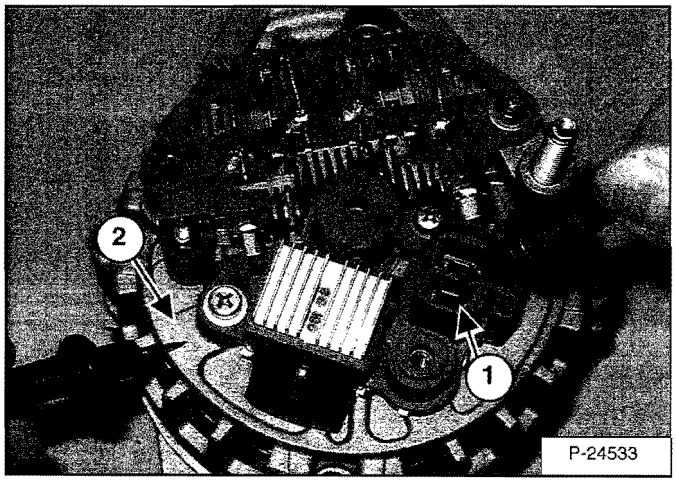
Touch one probe to the diode (Item 1) **[Figure 60-30-14]** and the other probe to each heat sink and read the meter.

Reverse the probes to check the diode in the other direction.

Meter readings should be different when probes are reversed.

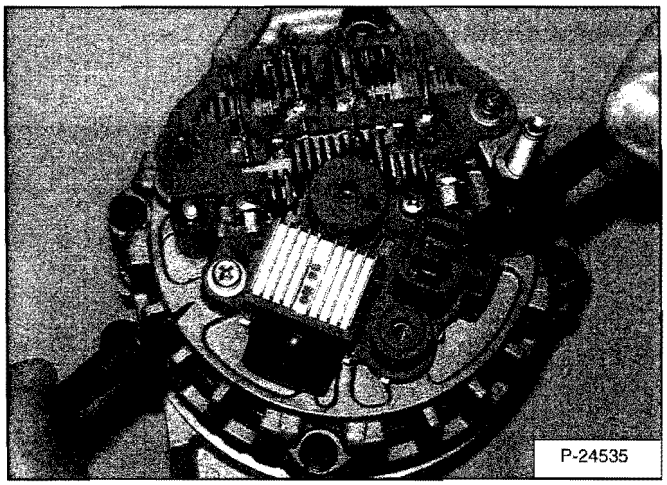
Alternator Regulator Test

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

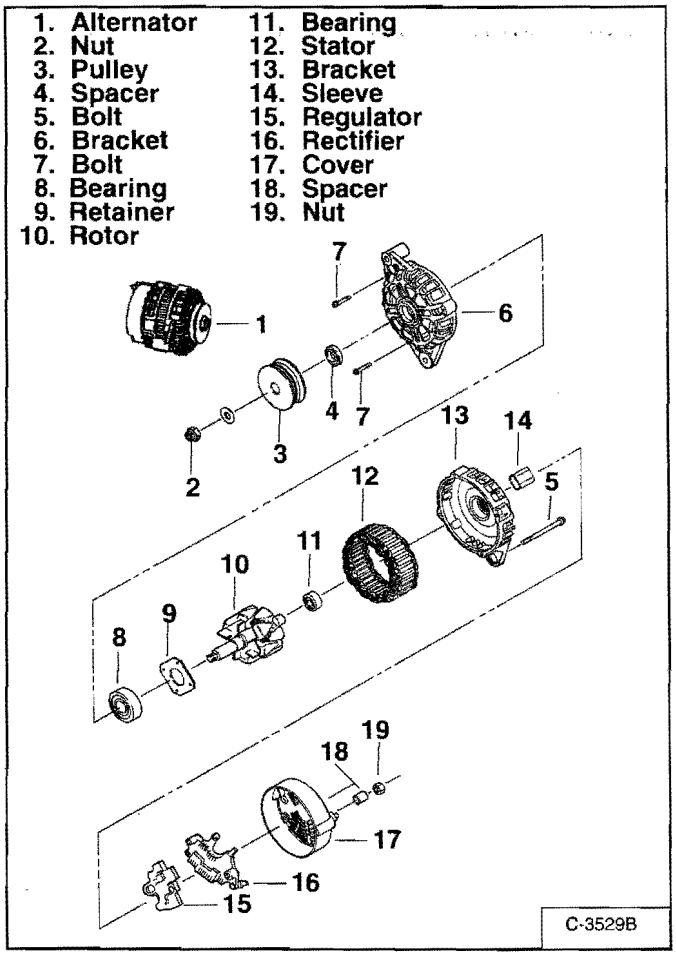


Reverse the probes to check in the other direction **[Figure 60-30-15]**.

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.

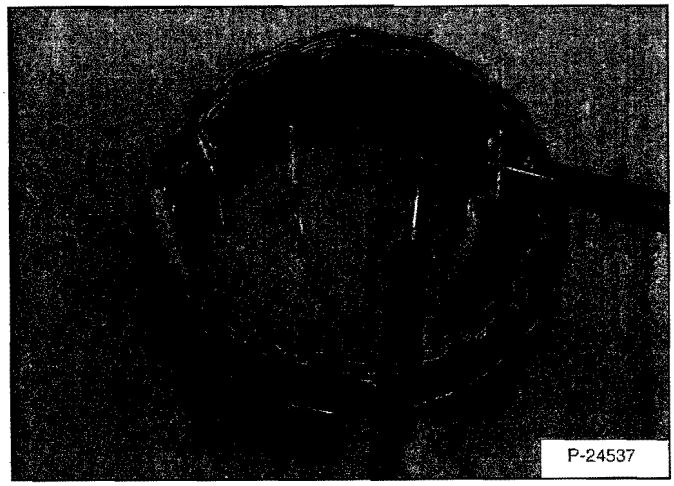
Remove front case half from the rotor using a plastic hammer or press.

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]**.

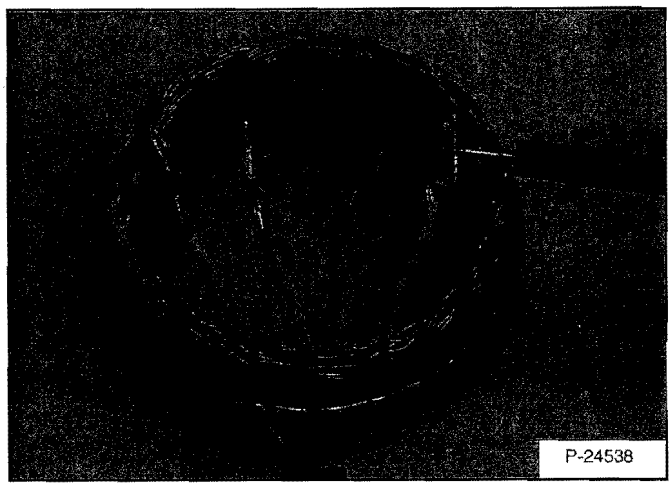
Move one of the probes to the third wire.

The readings should be the same.

If there is no continuity, replace the stator.

Stator Ground Test

Figure 60-30-19



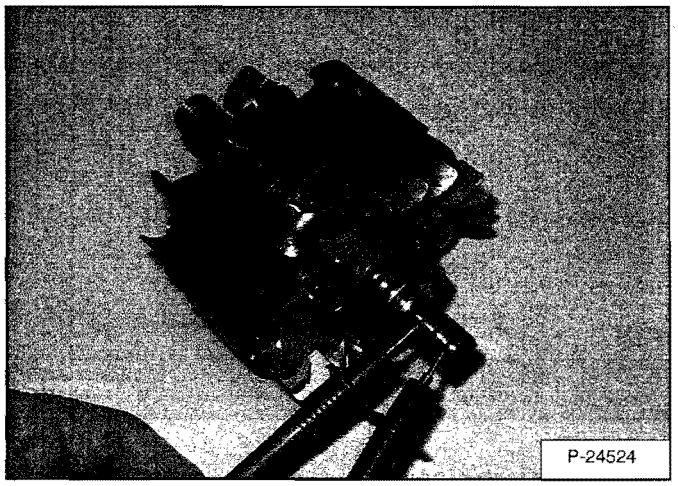
Touch one probe to a bare stator lead and the other probe to the bare metal surface of the stator **[Figure 60-30-19]**.

There should be no continuity.

Replace the stator if there is continuity.

Rotor Continuity Test

Figure 60-30-20



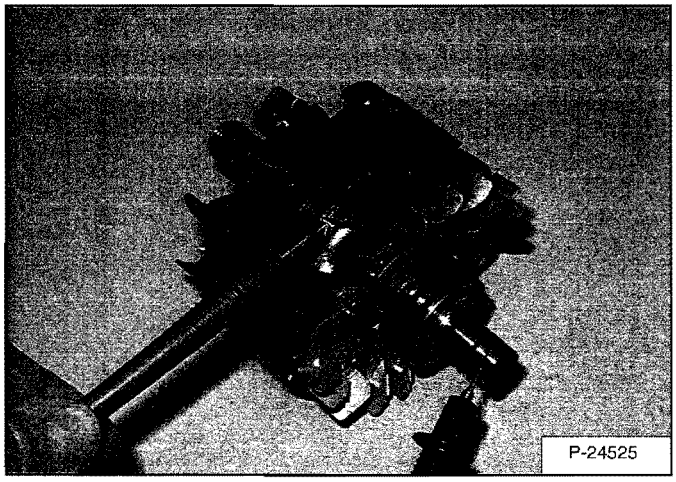
Touch the probes to the slip rings **[Figure 60-30-20]**.

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



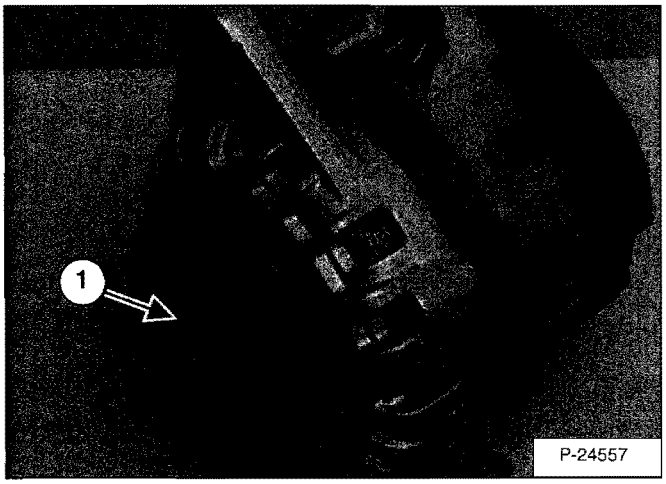
Touch one probe to one of the slip rings and the other probe to the rotor shaft **[Figure 60-30-21]**.

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.

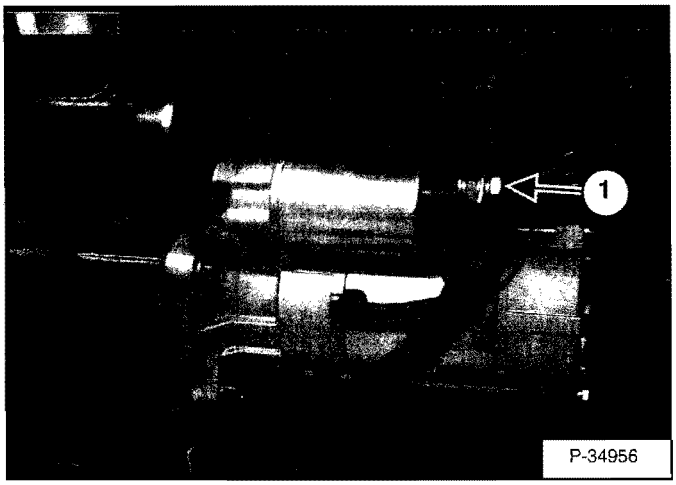
Place the rotor in soft jaws when tightening the shaft nut (Item 1) **[Figure 60-30-22]**. Tighten to 72 ± 14.5 ft.-lbs. (98 ± 20 Nm) torque.

Install the rear case half and the remaining parts.

STARTER

Removal And Installation

Figure 60-40-1

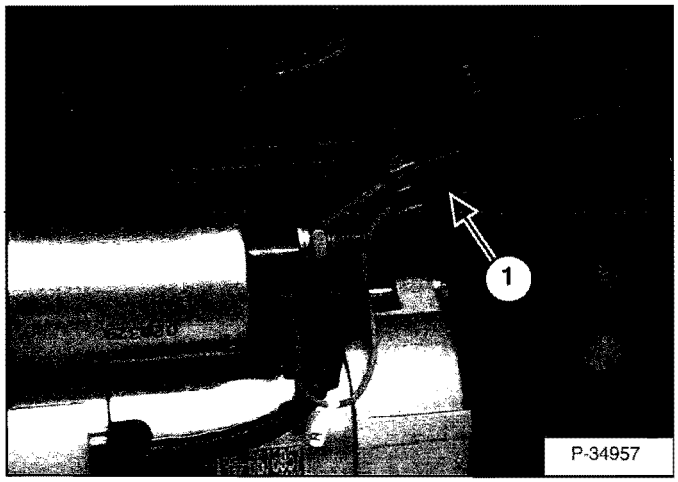


Open the rear door.

Disconnect the negative(-) cable from the battery.

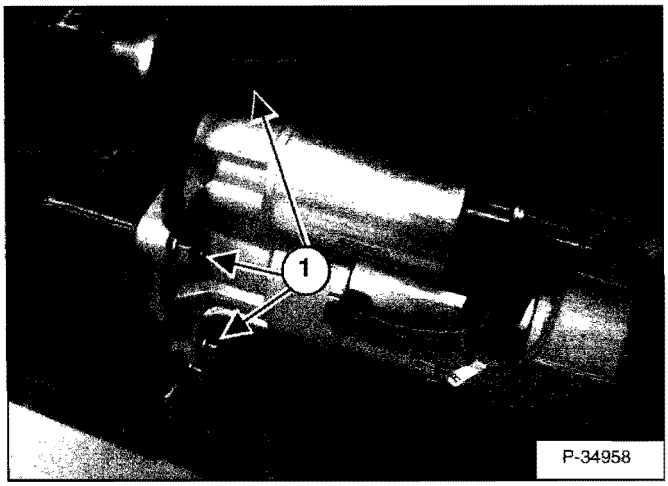
Disconnect the wires and positive (+) cable (Item 1) **[Figure 60-40-1]** from the starter solenoid.

Figure 60-40-2



Disconnect the wire connector (Item 1) **[Figure 60-40-2]** from the two solenoid solenoid wires.

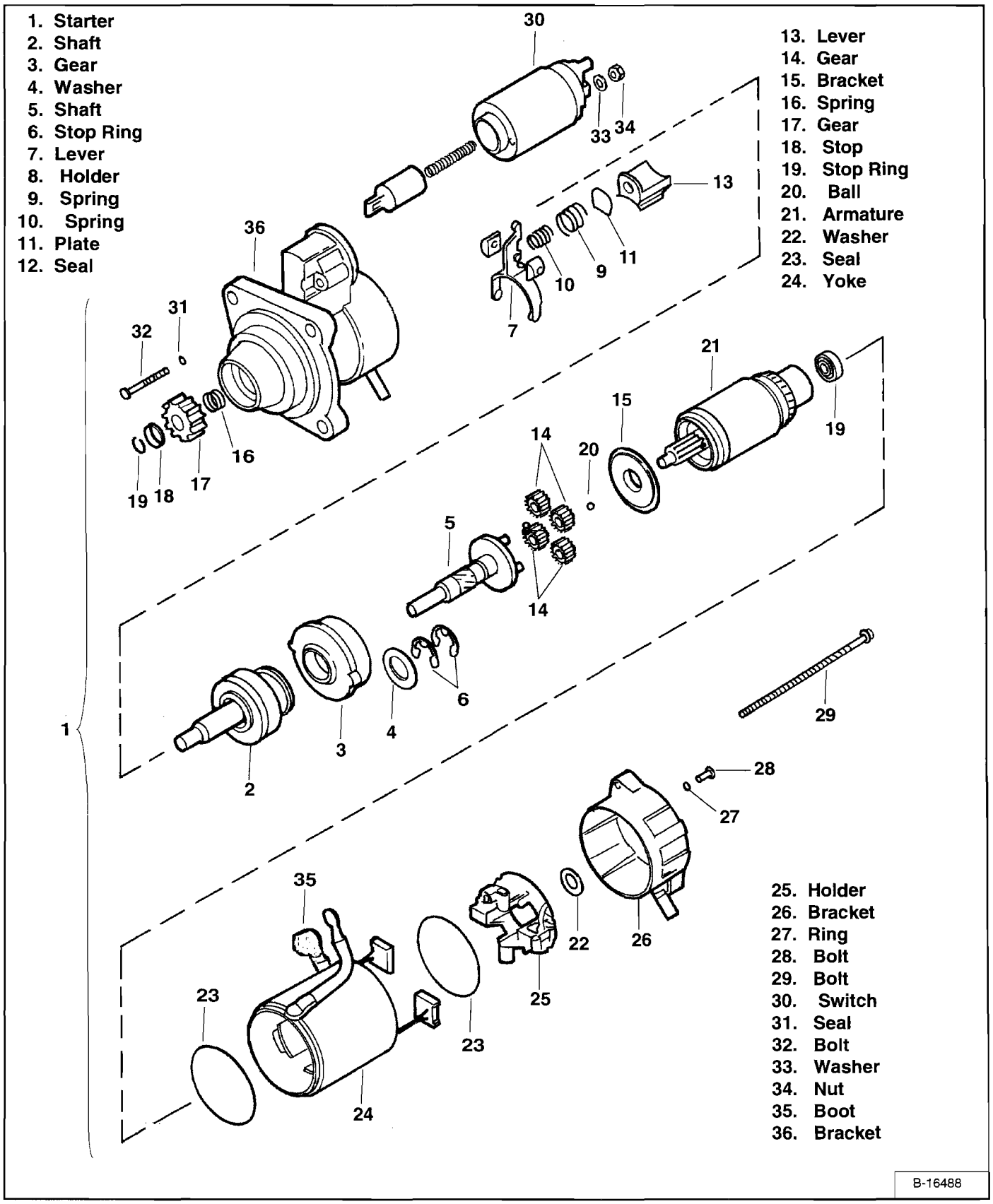
Figure 60-40-3



Remove the three mounting bolts (Item 1) **[Figure 60-40-3]**.

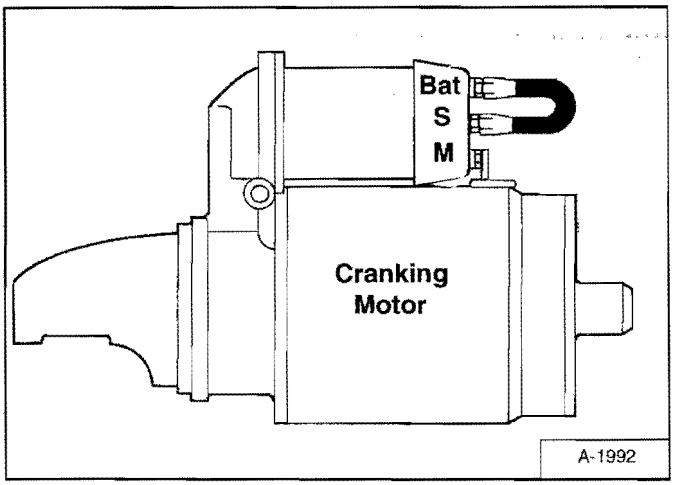
Remove the starter from the engine.

Parts Identification



Checking

Figure 60-40-4



The key switch must be in the OFF position.

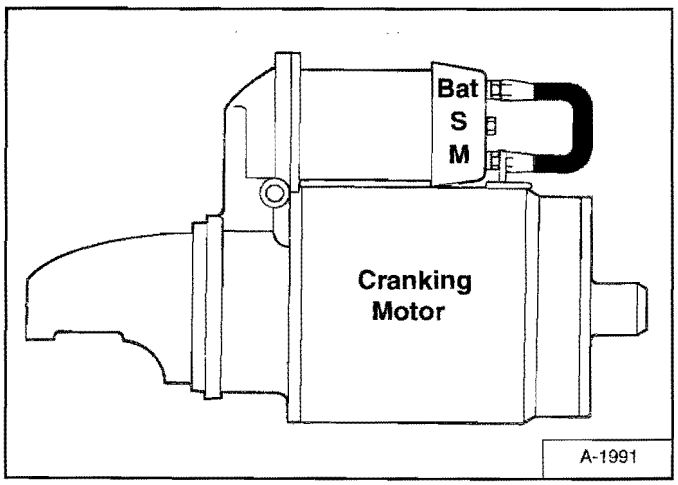
The battery must be at full charge.

The cable connections on the battery must be clean and tight.

Connect a jumper wire between S terminal and BAT terminal **[Figure 60-40-4]**.

If the starter turns but does not turn the engine, the starter drive has a defect.

Figure 60-40-5

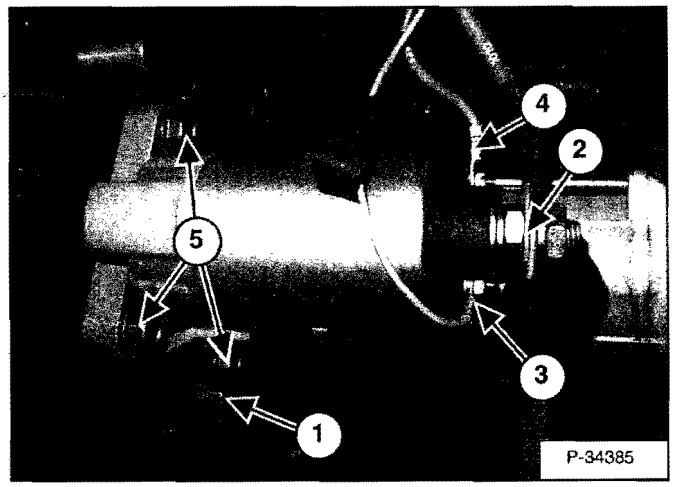


Connect a jumper wire **(of at least 4gauge in size)** between the M terminal and the BAT terminal **[Figure 60-40-5]**.

If the starter turns, the defect is in the solenoid.

If the starter does not turn, the starter is defective.

Figure 60-40-6



Stop the engine and open the rear door.

Remove the negative (-) and positive (+) cables from the battery.

Disconnect the ground wire (Item 1) **[Figure 60-40-6]** from the starter.

Disconnect the engine harness power wire and positive (+) battery cable from the starter solenoid terminal (Item 2) **[Figure 60-40-6]**.

Installation: Tighten the nut to 18-24 ft. lbs. (24,4-32,5 Nm) torque.

Disconnect the tan wire (Item 3) **[Figure 60-40-6]** from the R terminal on the starter solenoid.

Disconnect the brown wire (Item 4) **[Figure 60-40-6]** from the S terminal on the starter solenoid.

Remove the mounting bolts (Item 5) **[Figure 60-40-6]** from the starter.

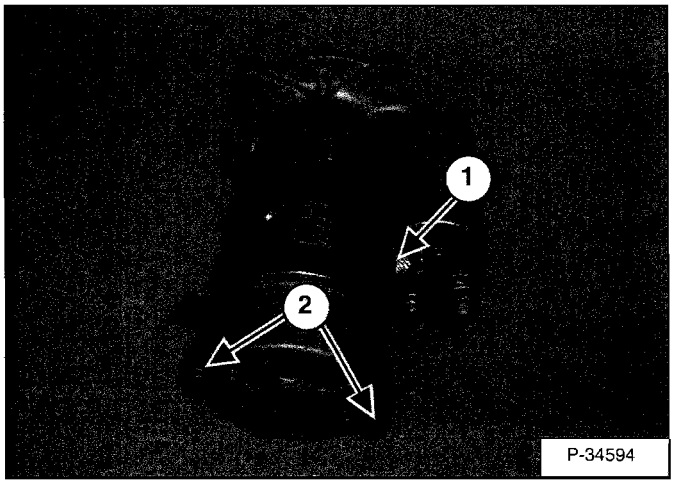
Remove the starter from the engine.

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

Reverse the removal procedure to install the starter.

Disassembly And Assembly

Figure 60-40-7

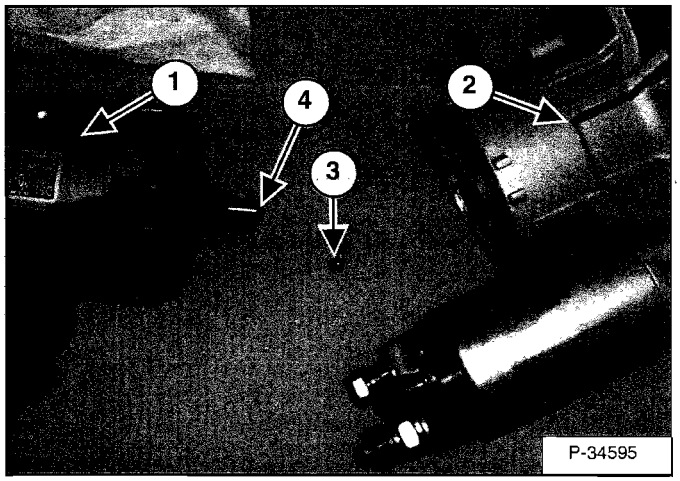


Remove the cable (Item 1) **[Figure 60-40-7]** from the magnetic switch.

Remove the bolts (Item 2) **[Figure 60-40-7]**.

Installation: Tighten the bolts to 63-129 ft.lbs. (7,1-14,6 Nm) torque.

Figure 60-40-8

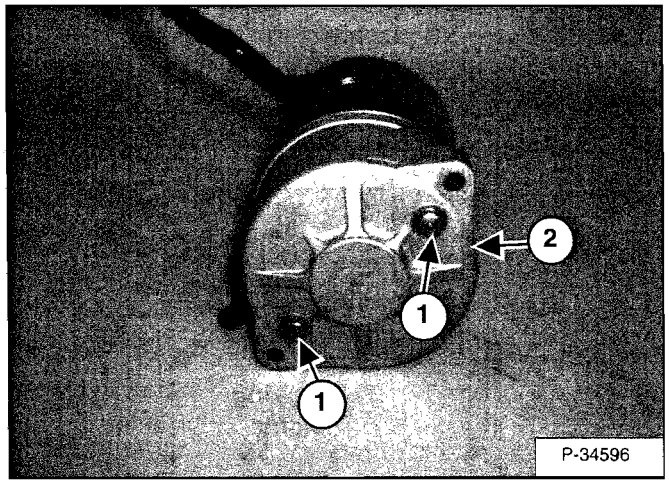


Remove the armature, yoke, brush holder and rear bracket assemblies (Item 1) from the front assembly (Item 2) **[Figure 60-40-8]**.

NOTE: When separating the parts there will be a steel ball (Item 3)located at the end of the armature shaft (Item 4) [Figure 60-40-8].

Installation: Apply grease to the steel ball (Item 3) and install into the end of the armature shaft (Item 4) **[Figure 60-40-8]**.

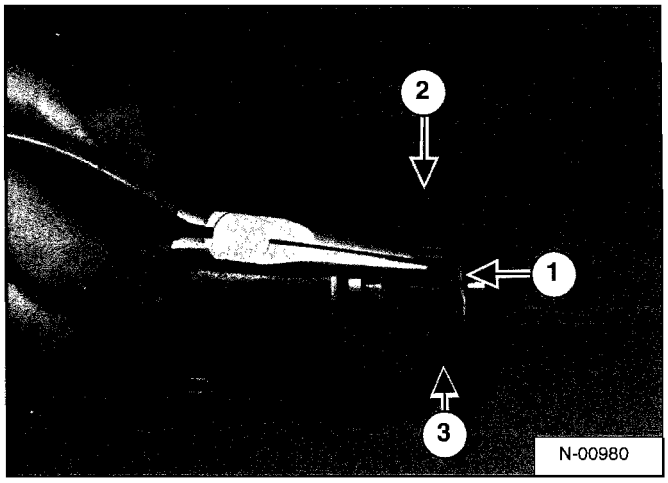
Figure 60-40-9



Remove the bolts (Item 1) from the brush cover (Item 2) **[Figure 60-40-9]**.

Remove the cover (Item 2) **[Figure 60-40-9]**.

Figure 60-40-10



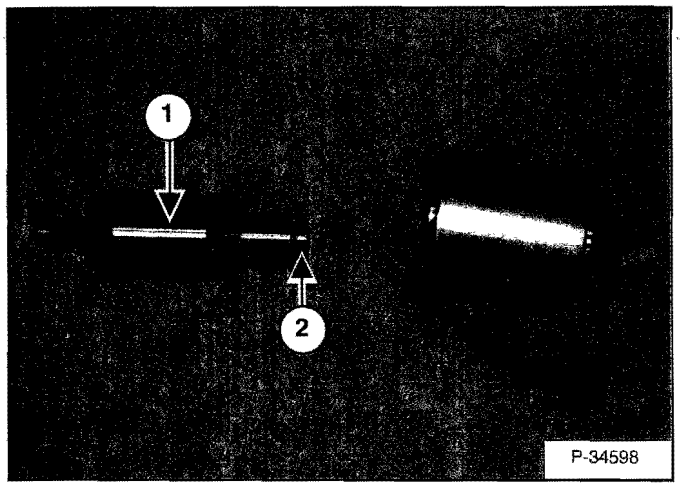
Using a needle nose pliers, pull the brush springs (Item 1) back and remove the brushes (Item 2) **[Figure 60-40-10]**.

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 60-40-10]** from the end of the armature.

Disassembly And Assembly (Cont'd)

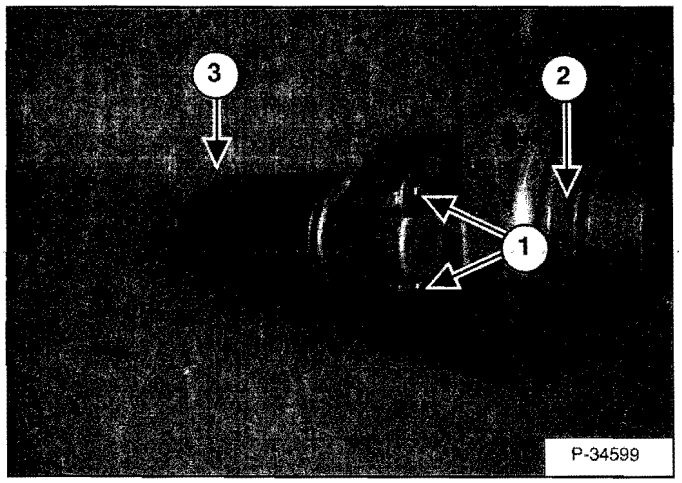
Figure 60-40-11



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

Remove the bearing (Item 2) **[Figure 60-40-11]** from the end of the armature.

Figure 60-40-12

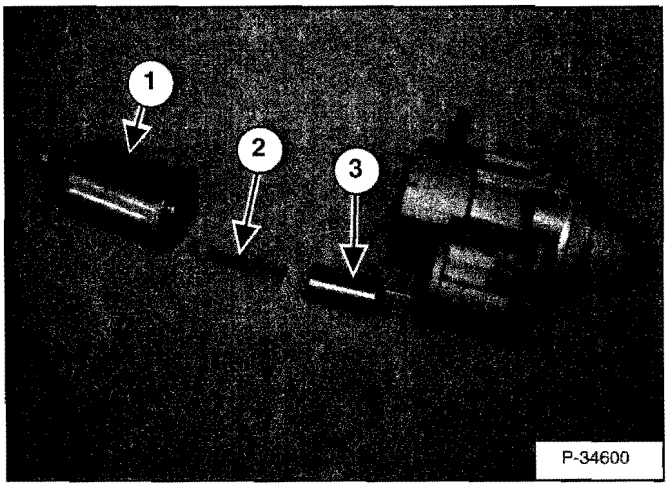


Remove the bolts (Item 1) **[Figure 60-40-12]** from the magnetic switch.

Installation: Tighten bolts to 34-69 ft.-lbs. (3,8-7,8 Nm) torque.

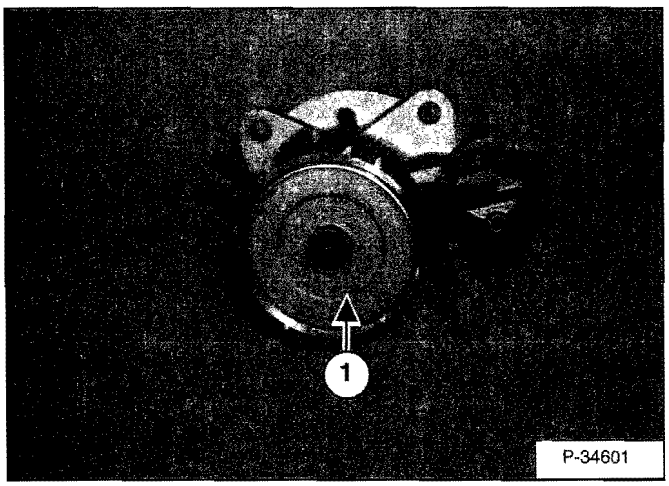
Remove the front assembly (Item 2) from the magnetic switch (Item 3) **[Figure 60-40-12]**.

Figure 60-40-13



Inspect the magnetic switch (Item 1), the spring (Item 2),and the plunger (Item 3) **[Figure 60-40-13]** for wear and replace as needed.

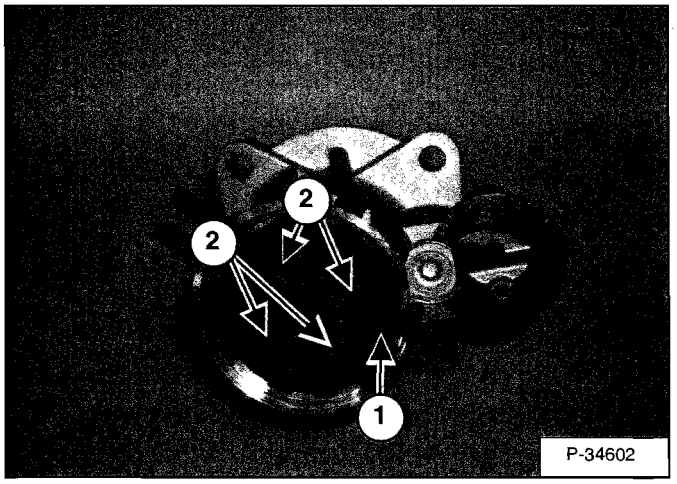
Figure 60-40-14



Remove the center bracket (Item 1) **[Figure 60-40-14]**.

Disassembly And Assembly (Cont'd)

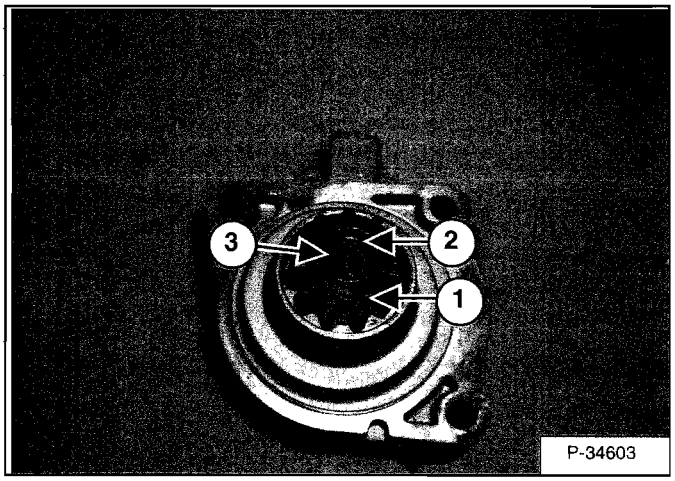
Figure 60-40-15



Remove the rubber retainer (Item 1) **[Figure 60-40-15]**.

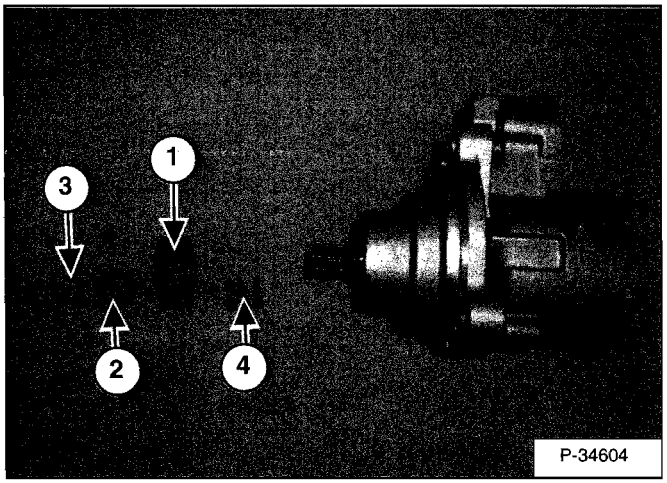
Remove the planetary gears (Item 2) **[Figure 60-40-15]** and inspect for damage.

Figure 60-40-16



Press down on the pinion (Item 1) **[Figure 60-40-16]** & **[Figure 60-40-17]** and retainer (Item 2) **[Figure 60-40-16]** & **[Figure 60-40-17]**.

Figure 60-40-17



Remove the snap ring (Item 3) **[Figure 60-40-16]** & **[Figure 60-40-17]**

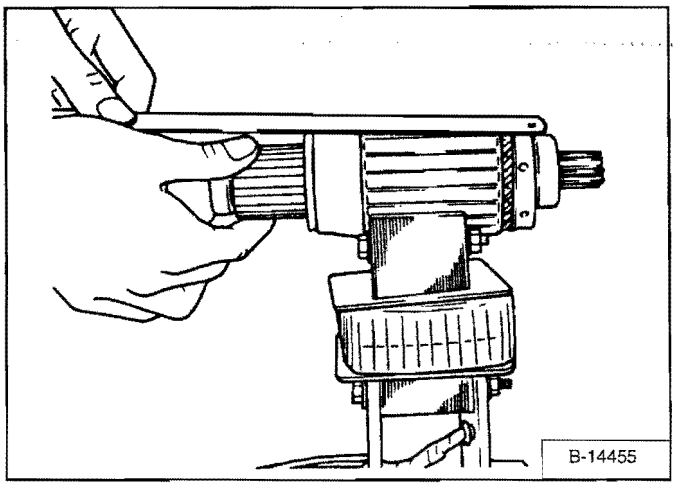
Remove the retainer (Item 2) **[Figure 60-40-16]** & **[Figure 60-40-17]** and pinion (Item 1) **[Figure 60-40-16]** & **[Figure 60-40-17]**.

Remove the spring (Item 4) **[Figure 60-40-17]**.

Installation: Inspect all parts for wear and replace as needed.

Inspection And Repair

Figure 60-40-18

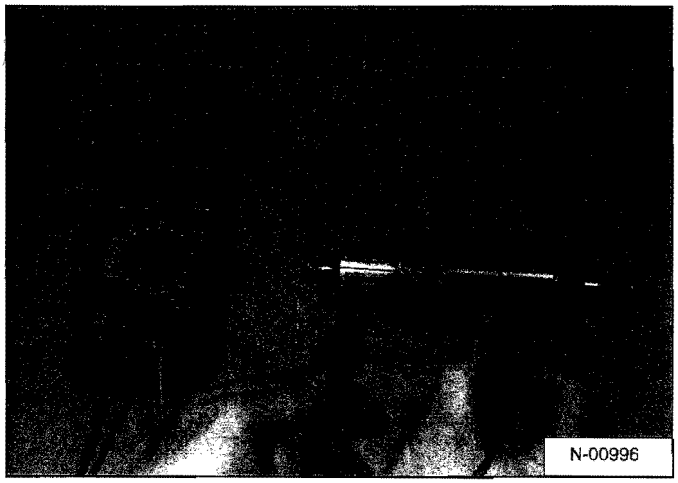


Inspect the brush cover for discoloration, indication the starter has been overheated.

Inspect the pinion teeth for wear and damage.

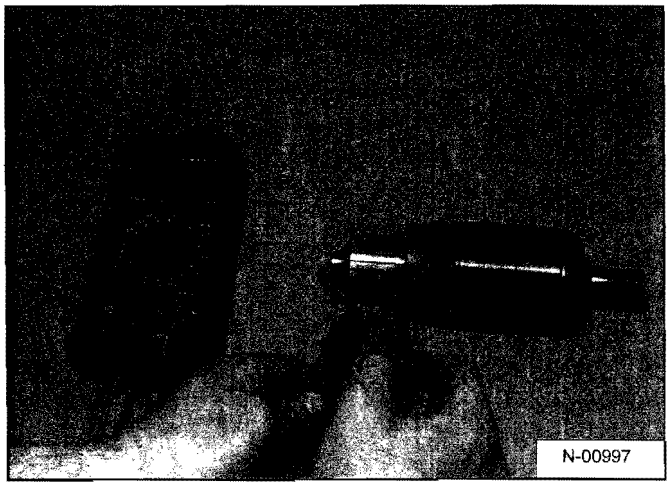
Armature Short-Circuit Test: Use a growler tester, put the armature on the growler and hold a hack saw blade against the armature core while slowly rotating the armature **[Figure 60-40-18]**. A short circuited armature causes the blade to vibrate and be attracted to the core. An armature which is short-circuited must be replaced.

Figure 60-40-19



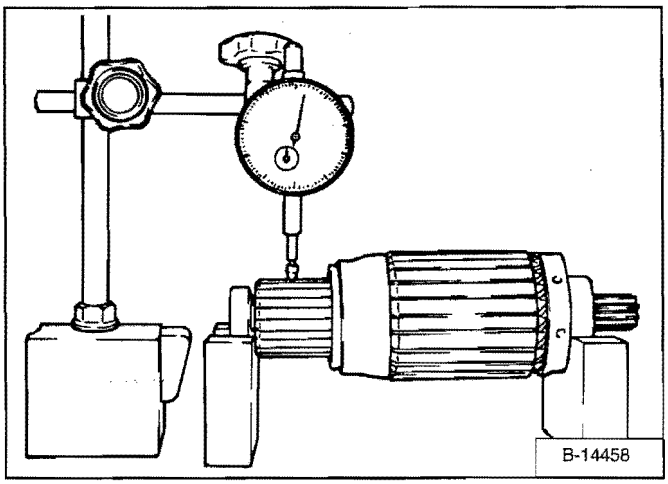
Armature Winding Ground Test: Use a circuit tester, touch one probe to a commutator segment and the other probe to the armature core **[Figure 60-40-19]**. There should be no continuity. If there is continuity, the armature is grounded and must be replaced.

Figure 60-40-20



Armature Winding Continuity Test: Use a circuit tester, touch the probes to two commutator segments **[Figure 60-40-20]**. There should be continuity at any point. If there is no continuity, the winding is open-circuited, replace the armature.

Figure 60-40-21



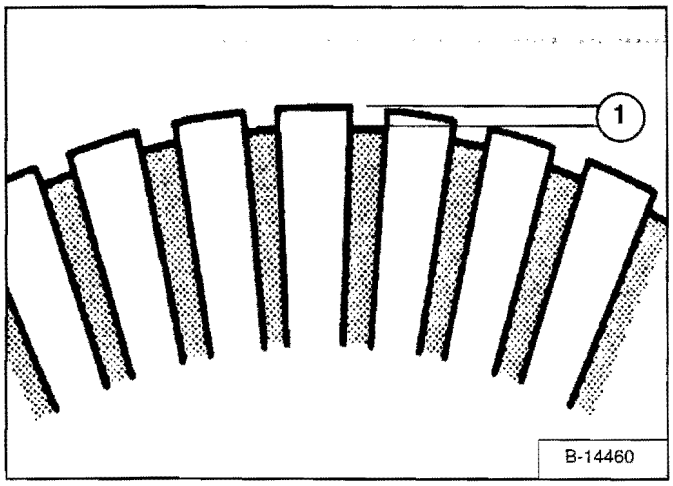
Commutator Run-Out Test: check the commutator run-out as shown in **[Figure 60-40-21]**.

Service Limit - 0.002 inch (0,7 mm)

If the commutator exceeds the service limit, repair as needed.

Inspection And Repair (Cont'd)

Figure 60-40-22



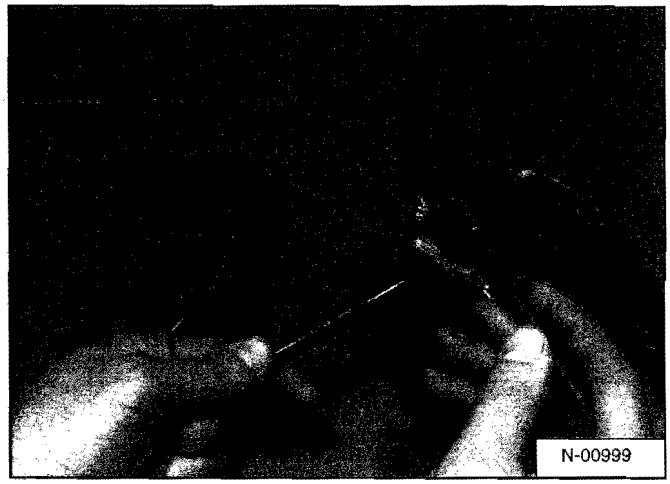
Measure the segment mica depth (Item 1) **[Figure 60-40-22]**.

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 60-40-23



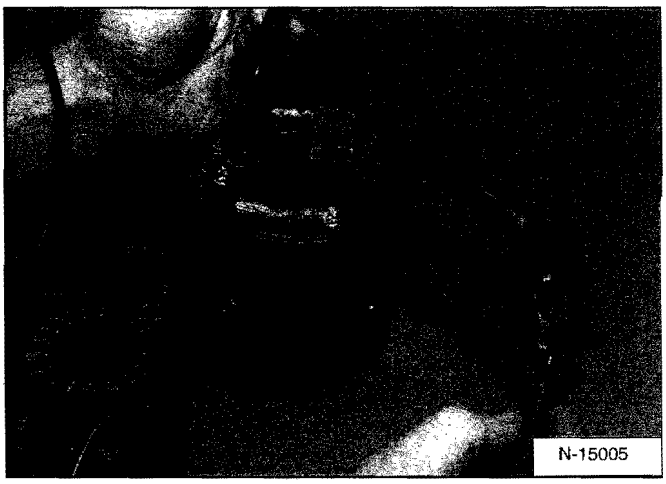
Check the field windings for wear and damage.

Check all the connections for clean and tight solder joints.

Field Winding Ground Test: Use a circuit tester, touch one probe to the field winding end of the brush and the other probe to the surface of the frame **[Figure 60-40-23]**. There should be no continuity. If there is continuity, the field windings are grounded.

Replace the frame.

Figure 60-40-24

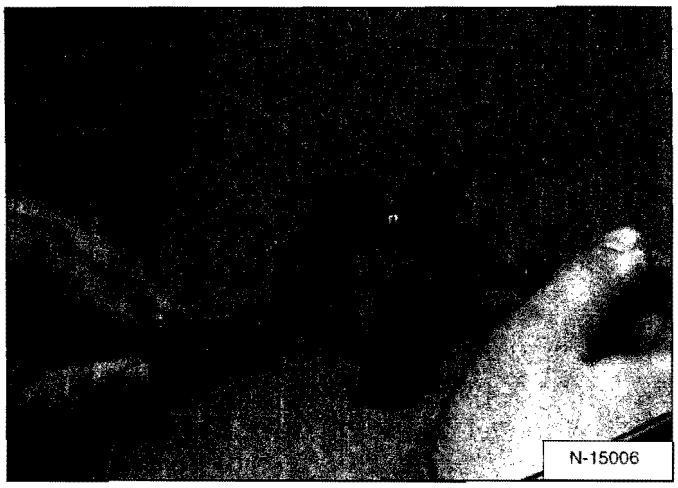


Field Windings Continuity Test: Use a circuit tester, touch one probe to the wire and the other probe to the brush **[Figure 60-40-24]**. There should be continuity. If there is no continuity, the field windings are open-circuited.

Replace the frame.

Inspection And Repair (Cont'd)

Figure 60-40-25



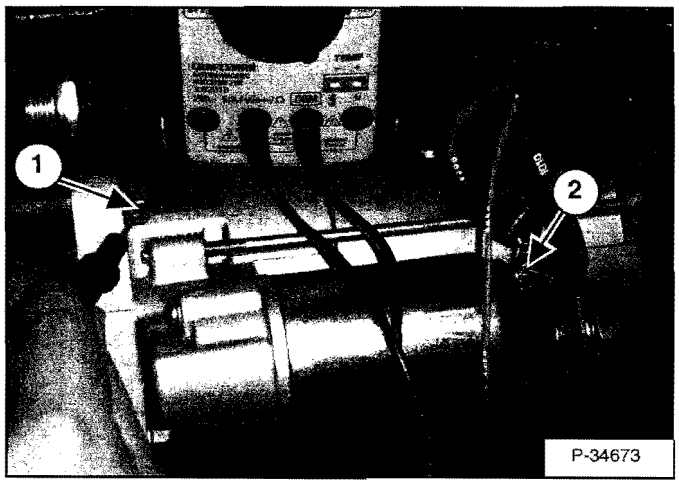
Inspect the brushes for wear and damage.

Replace the brush holder and yoke if the brushes need replacement.

Check brush spring, for damage or rust. Replace as needed.

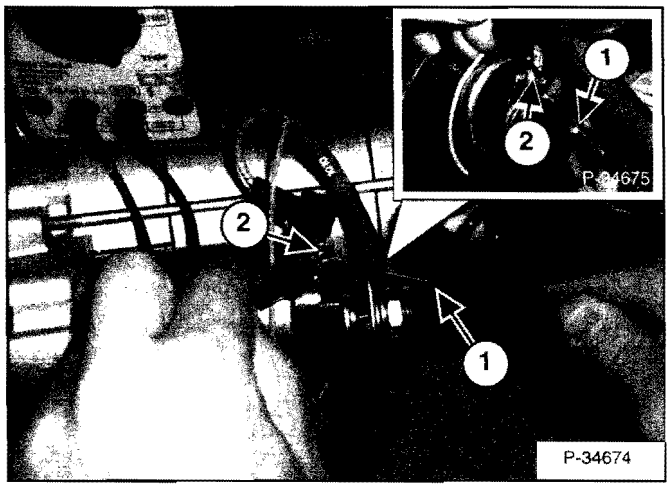
Brush Holder Insulation Test: Use a circuit tester, touch one probe to the positive brush holder plate and the other probe to the holder plate **[Figure 60-40-25]**. There should be no continuity. If there is continuity, replace or repair.

Figure 60-40-26



Hold-In Test: Use circuit tester, touch one probe to the mounting bolt (Item 1) and one probe to the S terminal (Item 2) **[Figure 60-40-26]** on the magnetic switch.

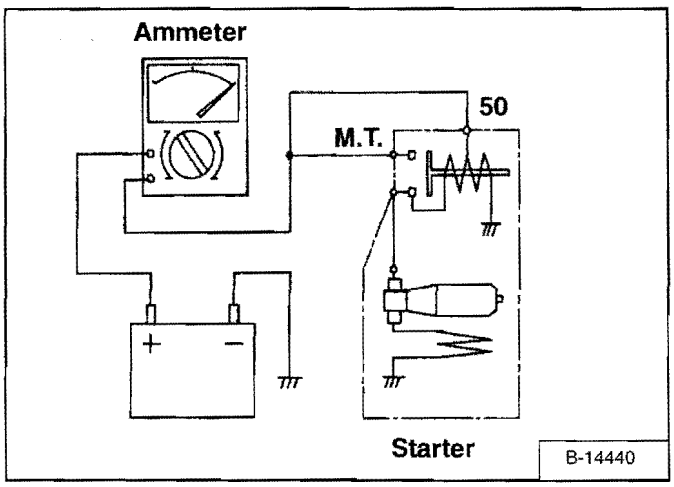
Figure 60-40-27



Pull-In Test: Use circuit tester, touch one probe to the starter motor terminal (Item 1) and one probe to the S terminal (Item 2) **[Figure 60-40-27]**.

No Load Test

Figure 60-40-28



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 60-40-28]**. Connect the negative wire to the starter body. Using a jumper wire, connect the 50 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.

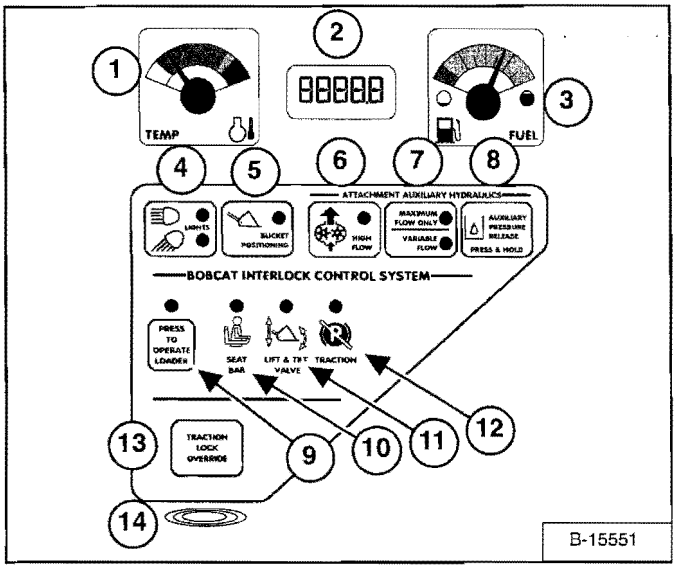
Service Limit - 1470 Amp. at Stall Condition

Clean all parts and apply high temperature grease to the armature bearing, return spring, steel ball, over running clutch, and idler gear rollers.

INSTRUMENT PANEL

Left Panel

Figure 60-50-1



The left instrument panel is the same for both the Standard and 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.

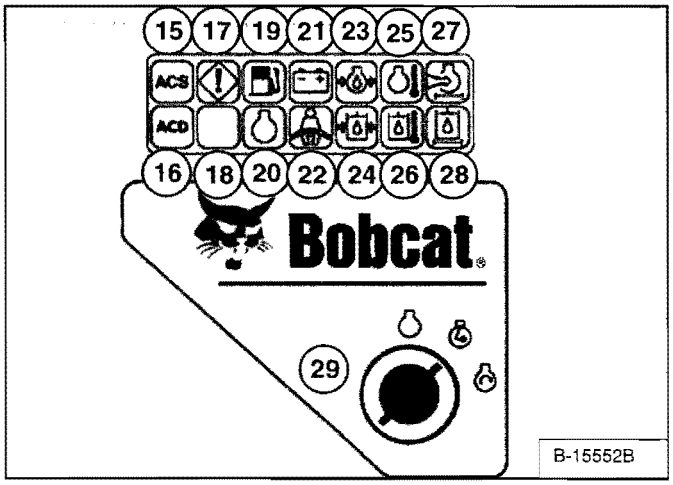
Press and hold LIGHTS button (Item 4) **[Figure 60-50-1]** for two seconds to view SERVICE CODES in the HOURMETER/CODE DISPLAY (Item 2) **[Figure 60-50-1]**. If more than one SERVICE CODE is present, the codes will scroll on the HOURMETER/CODE DISPLAY.

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 - Display numeric SERVICE CODES* relating to the loader monitoring system. COUTNTDOWN - Glow Plug time remaning
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 seonds 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 BASE or SHTDN (◆ SHUTDOWN) 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 auxiliary functions.) MAXIMUM FLOW allows for only fast movement.]
8	AUXILIARY PRESSURE RELEASE	Press and hold for two seconds. The engine wil stop. Hydraulic pressure will be released in the rear auxiliary (If so equipped) or right side front auxiliary circuit (If so equipped).
	BOBCAT INTERBLOCK CONTROL SYSTEM (BICS™) (See BICS™ SYSTEM, Contents Page 60-01 Troubleshooting Guide for Troubleshooting	
9	PRESS TO OPERATE LOADER	Press to activate BICS™ System when the Seat Bar is down and operator is seated in operating position.
10	SEAT BAR	The light comes *ON* when the seat bar is down.
11	LIFT & TILT VALVE	The light comes *ON* when the seat bar is down and the PRESS TO OPERATE Button is pressed. The lift and tilt functions can be operated when the light is *ON*.
12	TRACTION	The light comes *ON* when the seat bar is down, engine is running, and parking brake is released. The loader can be moved forward or backward when the light is *ON*.
13	TRACTION LOCK OVERRIDE	(Function Only When Seat Bar Is Raised And The Engine Is Running) Press to unlock the brakes. Allows you to use the steering levers to move the loader forward or backward when using the backhoe attachment or for loader service. (See TRACTION LOCK OVERRIDE Page 60-01). Press a second time to lock the brakes.
14	ALARM	The ALARM beeps when there is an Error, WARNING or ◆SHUTDOWN condition.

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.

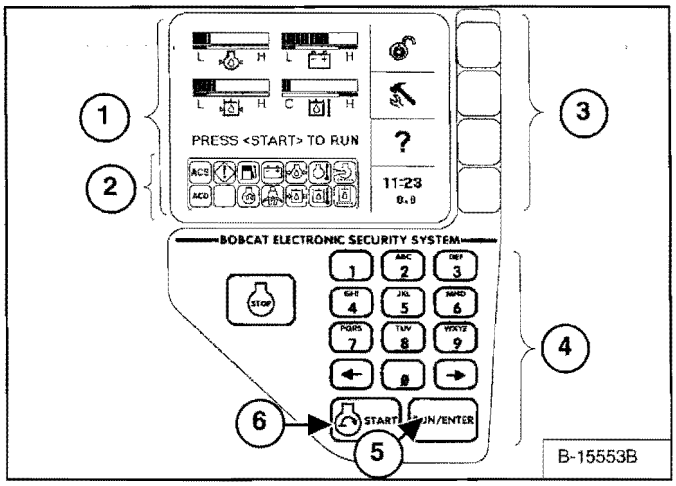
The table below shows the Icons and other components of the Right Standard Panel

* These functions are monitored and have SERVICE CODES associated with them. See Contents Page 60-01 for descriptions of DIAGNOSTICS SERVICE CODES.

REF.	FUNCTION	ICON/ LIGHT	ALARM	CODE	CONDITION	DESCRIPTION
ACS 15	Advanced Control System (ACS)	ON	3 Beeps	*	Error	Error with Advanced Control System (ACS)
ACD 16	Attachment Control Device (ACD)	FLASHING	3 Beeps	*	Error	Error with Attachment Control Device (ACD)
17	General Warning	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	ON FLASHING	3 Beeps 3 Beeps	* *	Error WARNING	Fuel level sender system fault. Fuel level low.
20	Glow Plugs	ON FLAHSING	--- 3 Beeps	- *	--- Error	Glow plugs are energized. Error with glow plugs
21	System Voltage	ON	3 Beeps	*	WARNING	Voltage low, high or very high.
22	Seat Belt	ON	---	-	---	Light stays on for 45 seconds to remind operator to fasten seat belt.
23	Engine Oil Pressure	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	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	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	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	ON FLASHING	3 Beeps 3 Beeps	* *	Error WARNING	Air filter with high restriction. Air filter switch not connected.
28	Hydraulic Filter	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



The right instrument panel shown **[Figure 60-50-3]** is the Deluxe Panel.

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.

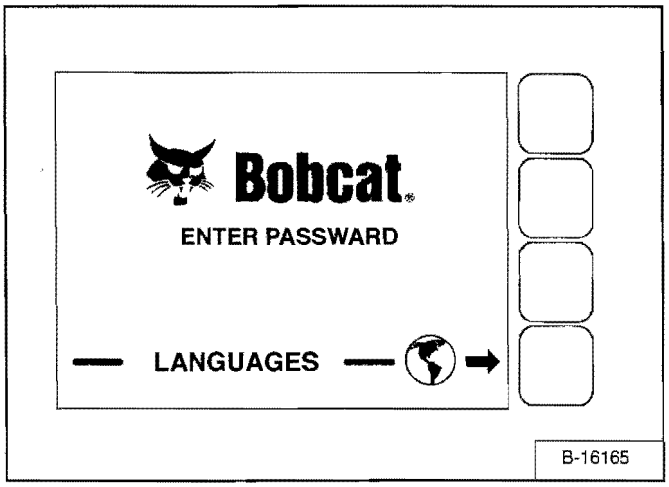
3. Selection Buttons: The four Selection Buttons allow you to select items from the Display Panel and scroll through screens.

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 SERVICE MANUAL.) Keep your password in a safe place for future needs.

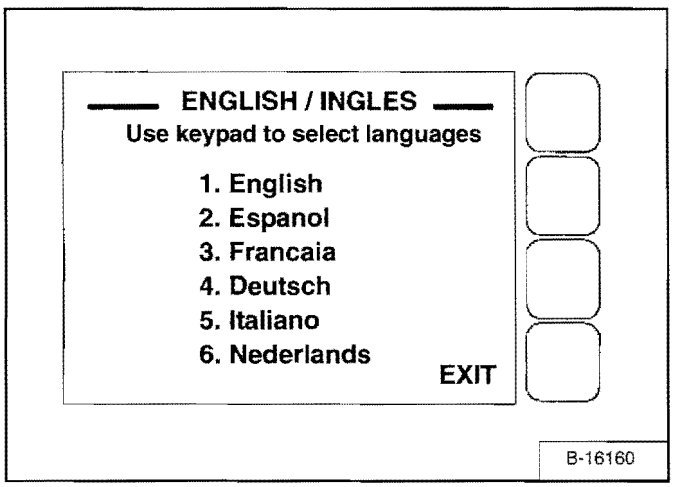
Start Engine: Use the Keypad to enter the numbers (letters) of your password and press the RUN / ENTER key (Item 5) **[Figure 60-50-3]**.

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



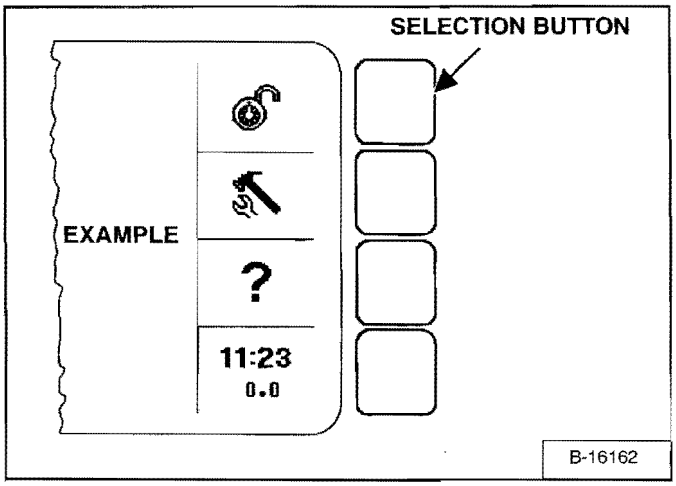
Use the Keypad to select the number of the language **[Figure 60-50-5]**

Press EXIT. The screen will return to **[Figure 60-50-4]**. You can then enter the password and start the engine.

Right Panel Setup Display Options (Deluxe)

Icon Identification

Figure 60-50-6



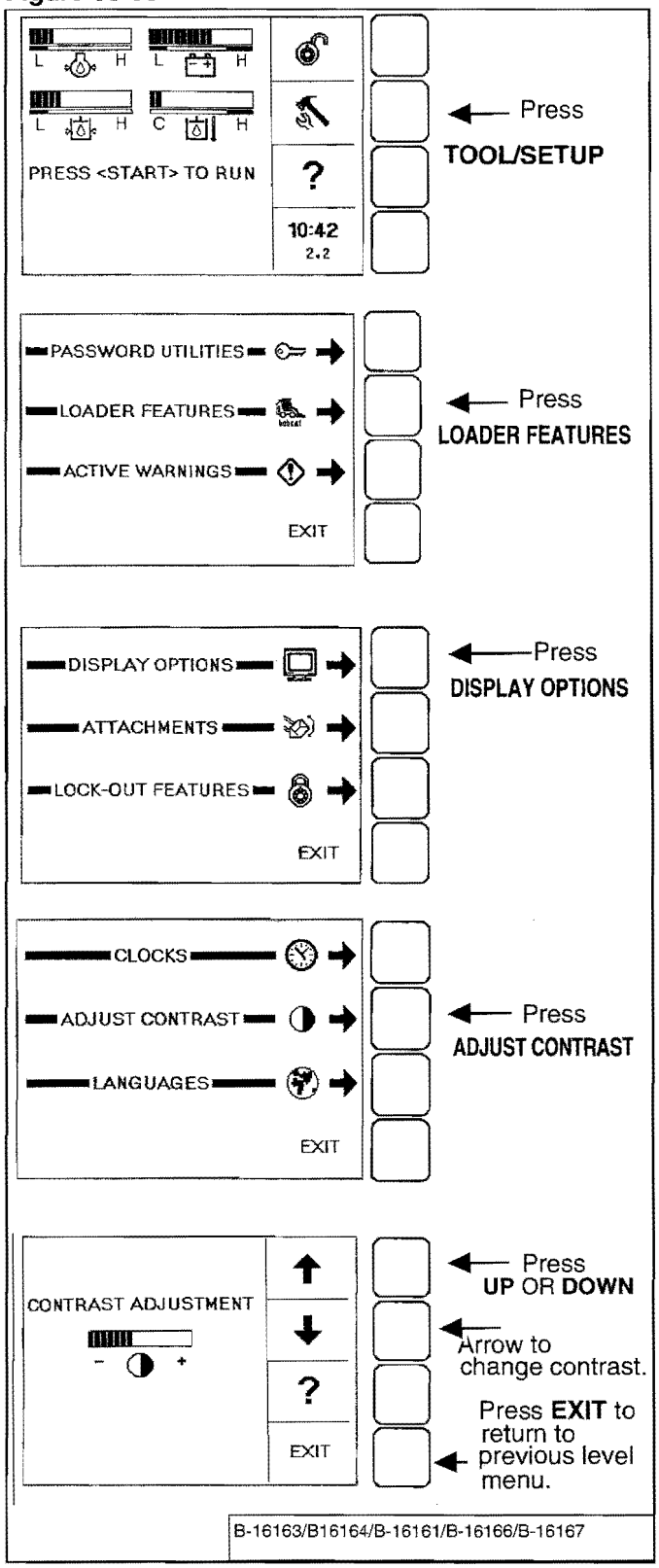
Make selection by pressing SELECTION BUTTON opposite the Icon **[Figure 60-50-6]**.

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.

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 (Deluxe)

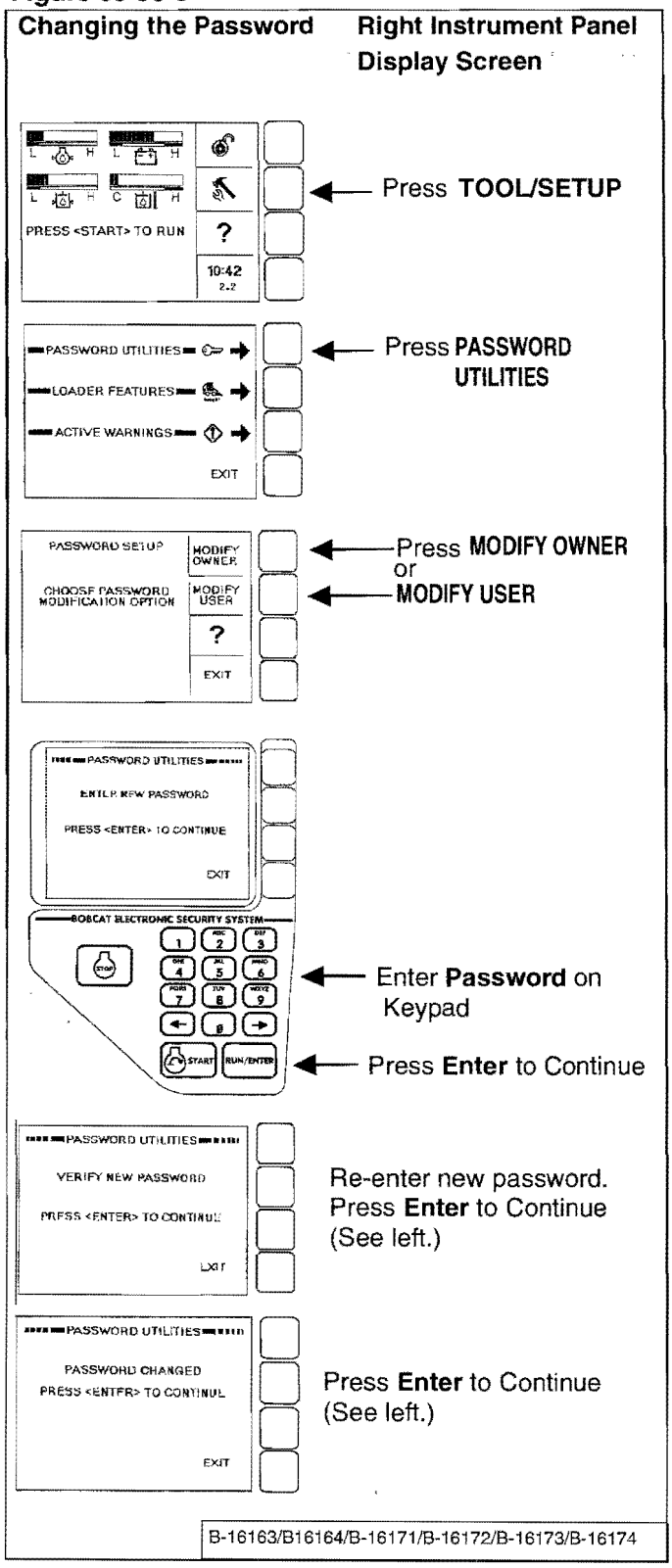
For security purposes, your dealer may change the password and also set it in the locked mode. Your dealer will provide you with the password.

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.

Passwords (Deluxe) (Cont'd)

Figure 60-50-8



B-16163/B16164/B-16171/B-16172/B-16173/B-16174

More EXAMPLES:

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

TOOL/SETUP
LOADER FEATURES.
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-tim readouts of:
Engine Oil Pressure
Engine Coolant Temperature
Hydraulic Charge Pressure
Hydraulic Ouil Temperature
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 (If Equipped)

Figure 60-50-9

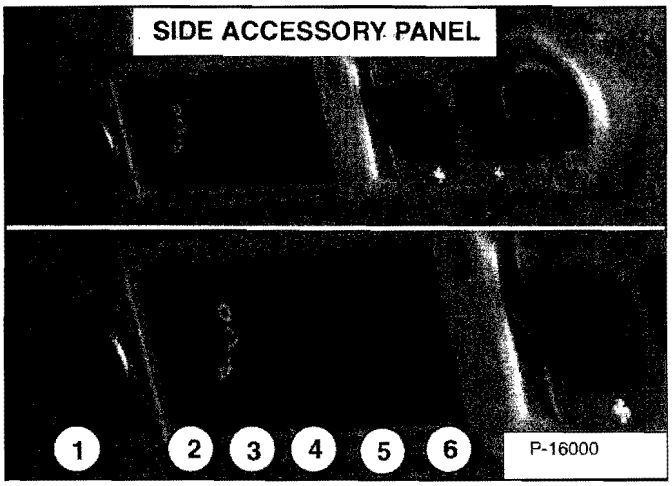


Figure 60-50-10

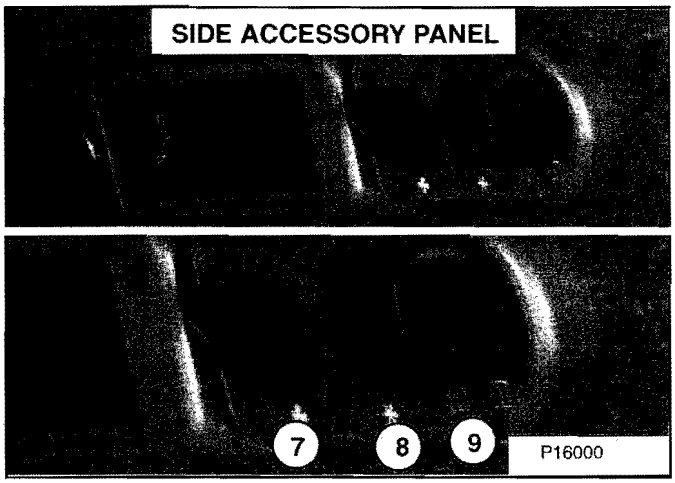
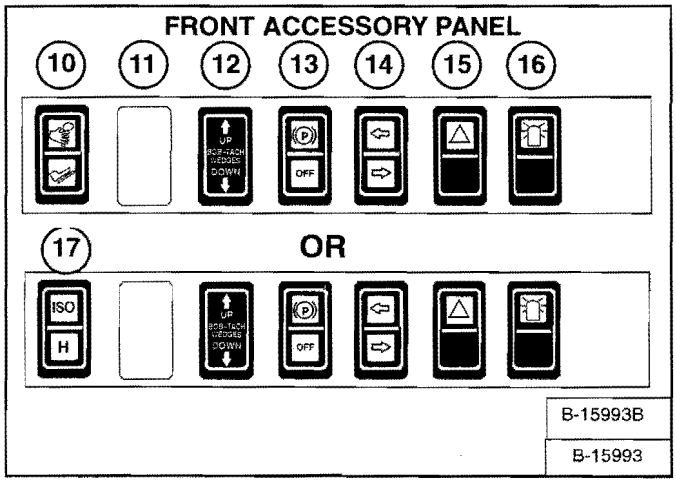


Figure 60-50-11



Side Accessory Panel **[Figure 60-50-9]** and **[Figure 60-50-10]**.

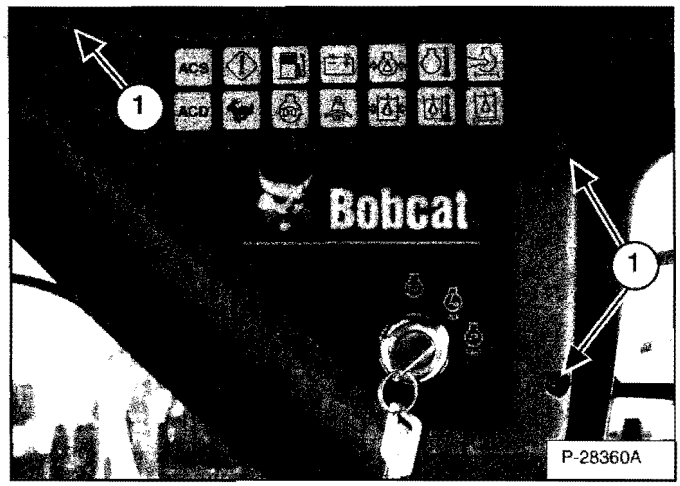
REF. NO.	DESC.	FUNCTION/OPERATION
1.	POWER PLUG	Provides a 12V receptacle for accessories.
2.	NOT USED	---
3.	FRONT WIPER	Press the top of the switch to start the front wiper (press and hold for washer fluid). Press the bottom of the switch to stop the wiper.
4.	REAR WIPER	Press the bottom of the switch 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	---
7.	FAN MOTOR	Turn clockwise to increase fan speed; counterclockwise to decrease. There are four positions; OFF-1-2-3.
8.	TEMP. CONTROL	Turn clockwise to increase the temperature; counterclockwise to decrease.

Front Accessory Panel **[Figure 60-50-11]**

REF. NO.	DESC.	FUNCTION/OPERATION
10.	ADVANCED CONTROL SYSTEM (ACS)	Press the top to select Hand Controls; bottom to select Foot Controls.
11.	NOT USED	---
12.	POWER BOB-TACH (If Equipped)	Press and hold the up arrow to disengage the the Bob-Tach wedges. Press and hold the down arrow to engage the wedges into the mounting frame holes.
13.	PARKING BRAKE	Press the top to engage the PARKING BRAKE; bottom to disengage.
14.	TURN SIGNAL INDICATORS	Indicates left or right TURN SIGNALS are ON.
15.	HAZARD LIGHTS	Press the left side (or top) to turn the HAZARD LIGHTS ON; right side (or bottom) to turn OFF.
16.	ROTATING BEACON	Press the left side (or top) to turn the ROTATING BEACON ON; right side (or bottom) to turn OFF.
17.	SELECTABLE JOYSTICK CONTROL (SJC)	Press the top to select 'ISO' Control Pattern; bottom to select 'H' Control Pattern.

Standard Panel Removal And Installation (Right Side)

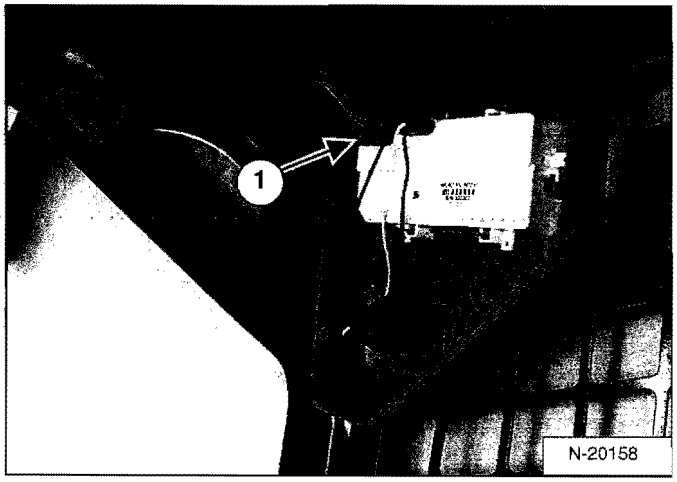
Figure 60-50-12



Remove the three mounting bolts (Item 1) **[Figure 60-50-12]**.

Installation: Be careful to not overtighten the instrument panel mounting bolts to prevent stripping of the threaded holes in the panels.

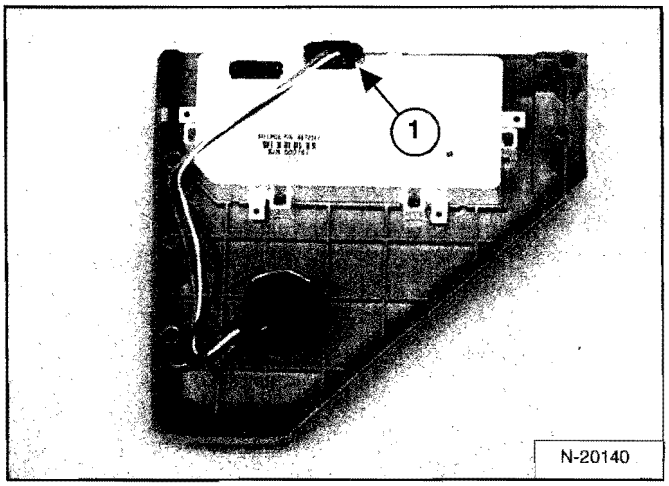
Figure 60-50-13



Pull the right instrument panel down and disconnect the wire harness connector (Item 1) **[Figure 60-50-13]** from the panel.

Remove the panel from the loader cab.

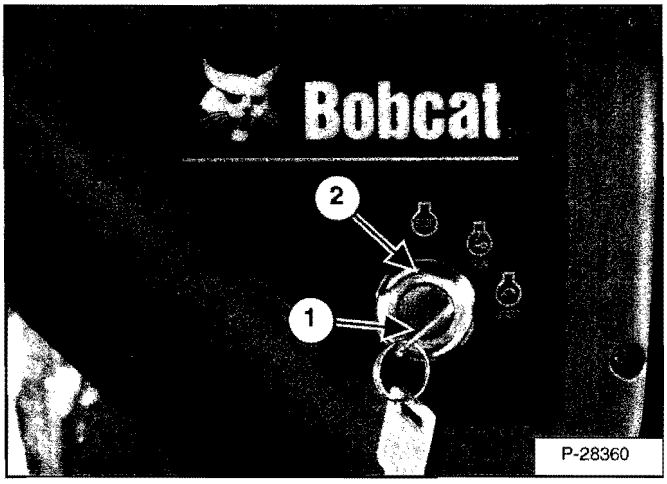
Figure 60-50-14



Ignition Switch Removal and Installation (Standard Panel)

Disconnect the key switch wiring harness (Item 1) **[Figure 60-50-14]** from the back of the control panel.

Figure 60-50-15

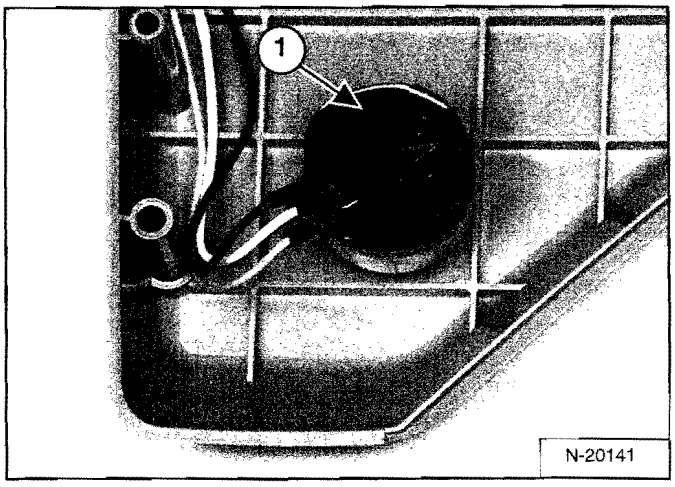


Remove the ignition key (Item 1) from the switch. Remove the ignition switch retaining nut (Item 2) **[Figure 60-50-15]** from the switch.

Standard Panel Removal And Installation (Right Side) (Cont'd)

Ignition Switch Removal And Installation Standard Panel (Cont'd)

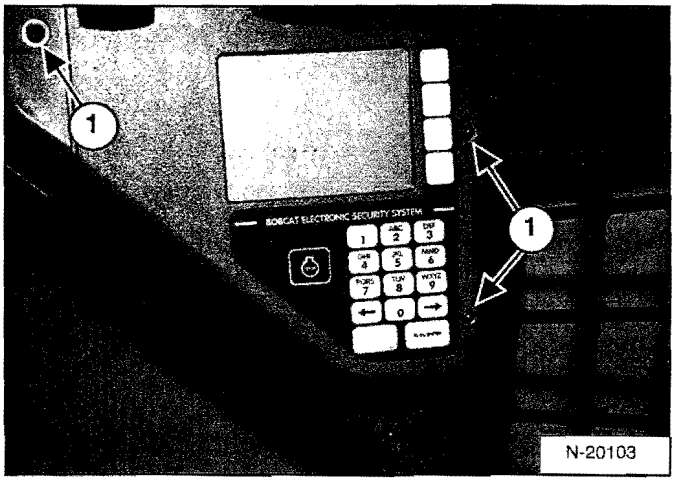
Figure 60-50-16



Remove the ignition switch (Item 1) **[Figure 60-50-16]** from the control panel.

Deluxe Panel Removal And Installation (Right Side)

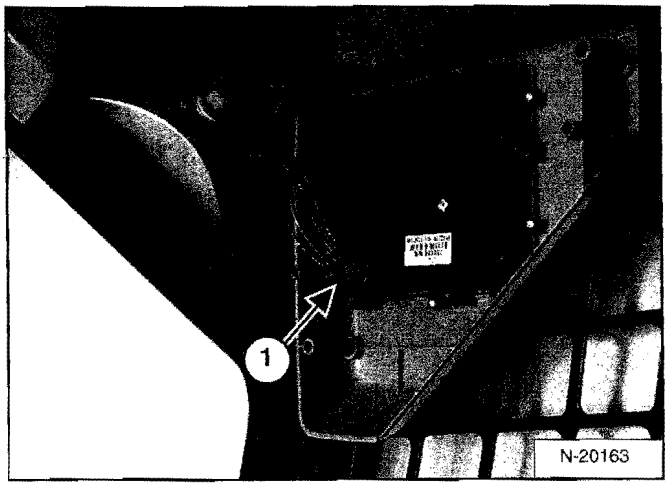
Figure 60-50-17



Remove the three mounting bolts (Item 1) **[Figure 60-50-17]**.

Installation: Be careful to not overtighten the instrument panel mounting bolts to prevent stripping of the threaded holes in the panels.

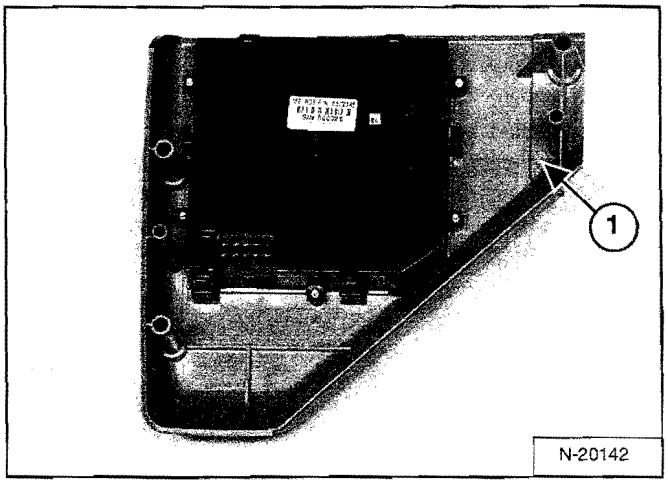
Figure 60-50-18



Pull the right instrument panel down and disconnect the wire harness connector (Item 1) **[Figure 60-50-18]** from the panel.

Remove the panel from the loader cab.

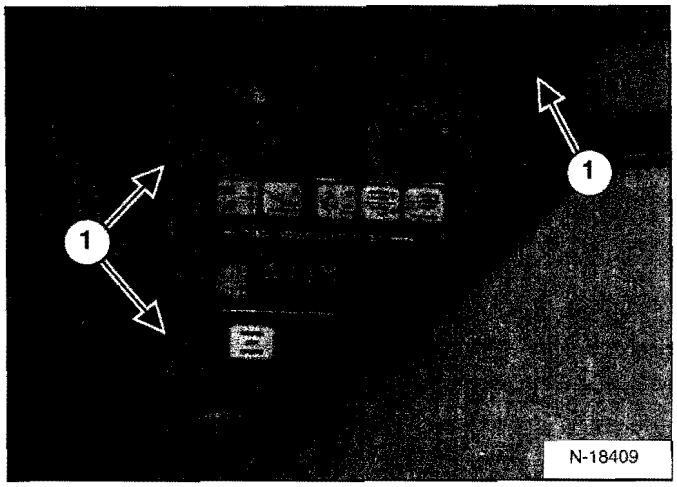
Figure 60-50-19



NOTE: The instrument panel (Item 1) [Figure 60-50-19] must be replaced as a complete unit.

Standard & Deluxe Panel Removal And Installation (Left Side)

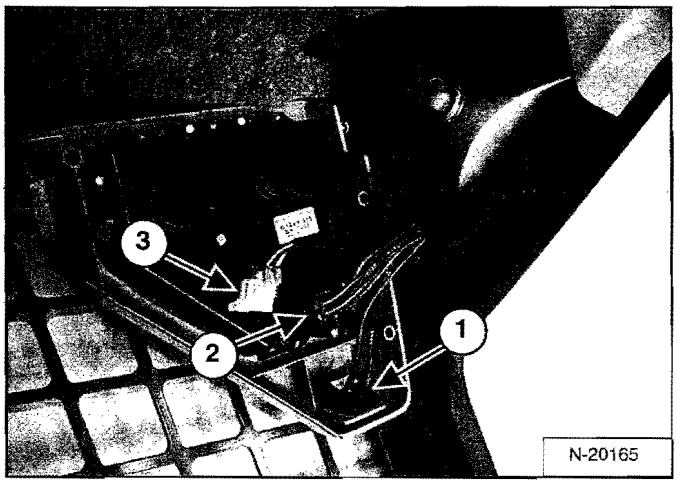
Figure 60-50-20



Remove the three mounting bolts (Item 1) **[Figure 60-50-20]**.

Installation: Be careful to not overtighten the instrument panel mounting bolts to prevent stripping of the threaded holes in the panels.

Figure 60-50-21



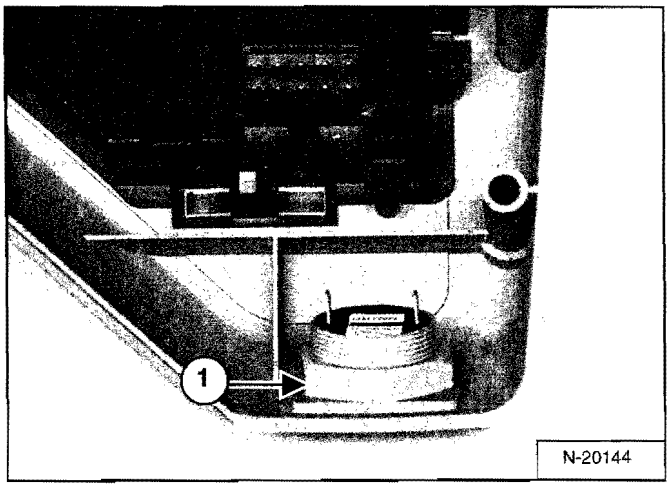
Pull the left instrument panel down and disconnect the wire harness connector (Item 1) **[Figure 60-50-21]** from the loader alarm.

Disconnect the wire harness connector (Item 2) **[Figure 60-50-21]** from the loader instrument panel.

NOTE: The wiring harness (Item 3) [Figure 60-50-21] is an optional accessory harness.

Remove the instrument panel from the loader.

Figure 60-50-22



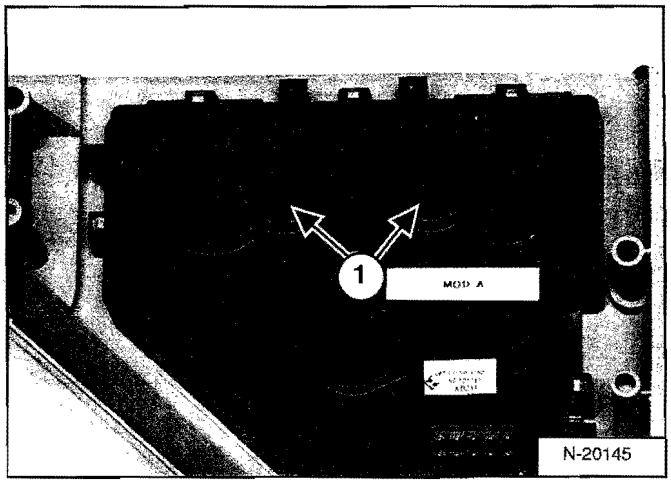
Alarm Removal and Installation

Remove the left side instrument panel.

Remove the retaining nut (Item 1) **[Figure 60-50-22]** from the loader alarm.

Remove the alarm from the loader instrument panel.

Figure 60-50-23



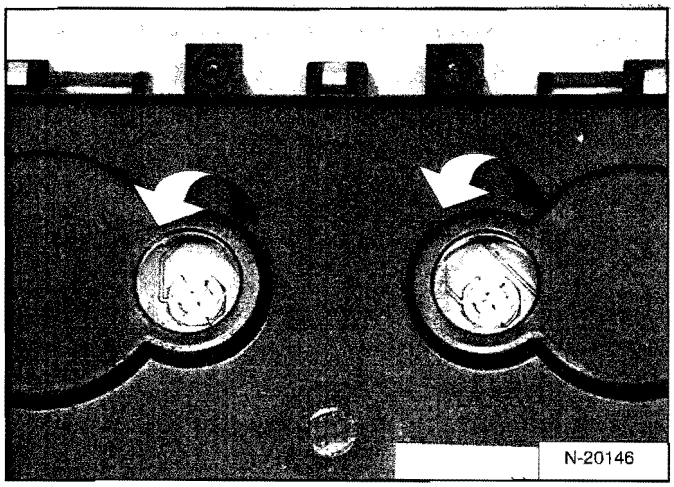
Bulb Removal And Installation

Remove the left side instrument panel.

Remove the two light bulb covers (Item 1) **[Figure 60-50-23]** from the back of the instrument panel.

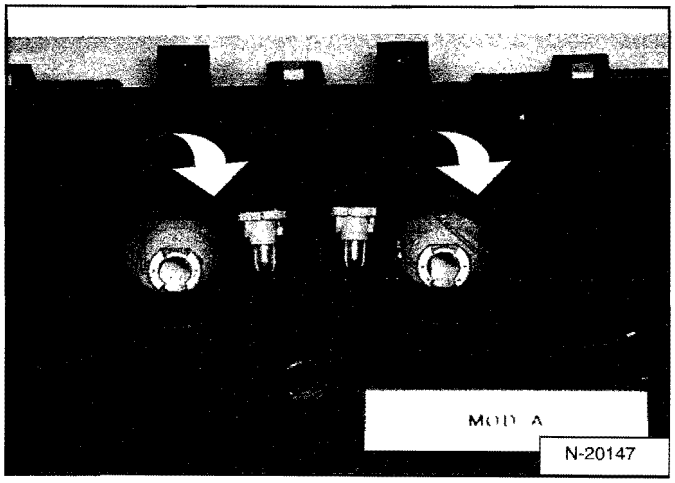
Standard & Deluxe Panel Removal And Installation (Left Side) (Cont'd)

Figure 60-50-24



With a flat blade screw driver, turn the light bulb counterclockwise **[Figure 60-50-24]** and remove from the panel.

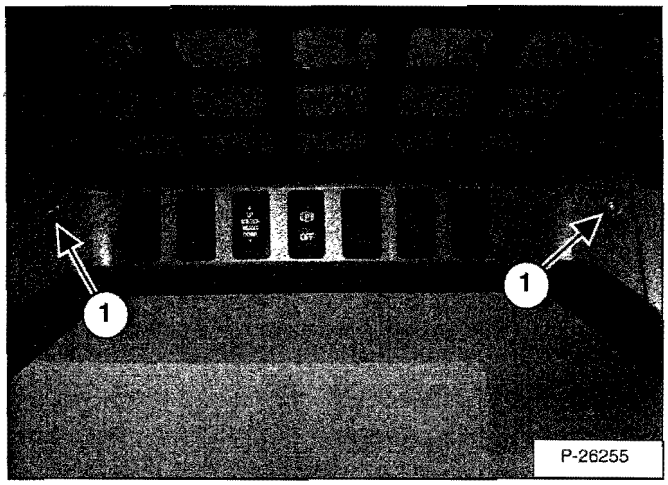
Figure 60-50-25



To install the bulbs, place them in the sockets and turn clockwise **[Figure 60-50-25]**.

Front Accessory Panel Removal And Installation

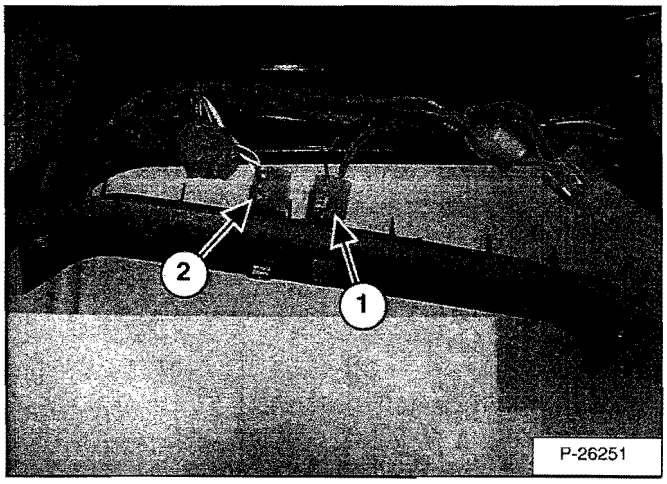
Figure 60-50-26



Remove the two mounting bolts (Item 1) **[Figure 60-50-26]**.

Installation: Be careful to not overtighten the front accessory panel mounting bolts to prevent damage to the plastic panel.

Figure 60-50-27



Pull the front accessory panel down and disconnect the wire harness connector(s) (Items 1 & 2) **[Figure 60-50-27]** from the switches.

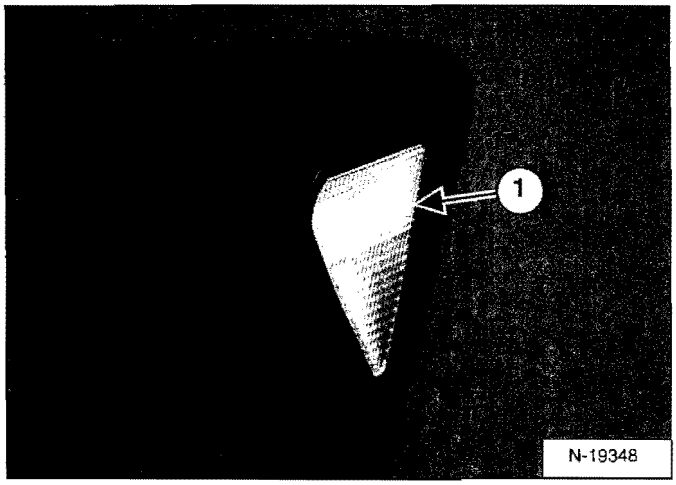
Remove the panel.

Reverse the procedure to install the front accessory panel.

LIGHTS

Front Removal And Installation

Figure 60-60-1

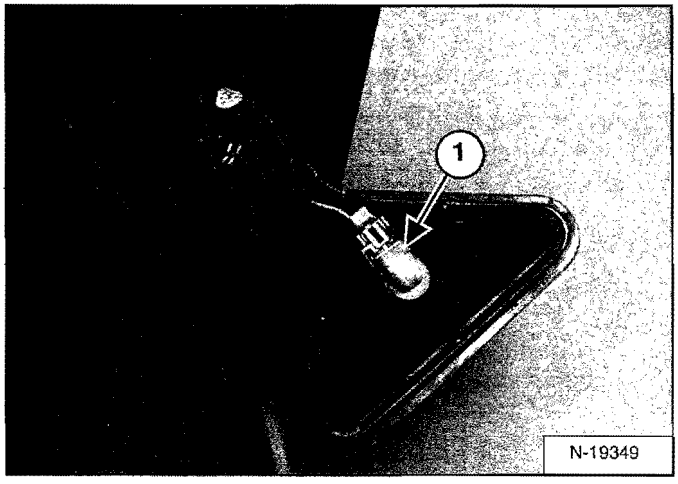


Open the rear door.

Disconnect the negative(-) cable from the battery. (See Contents Page 60-01.)

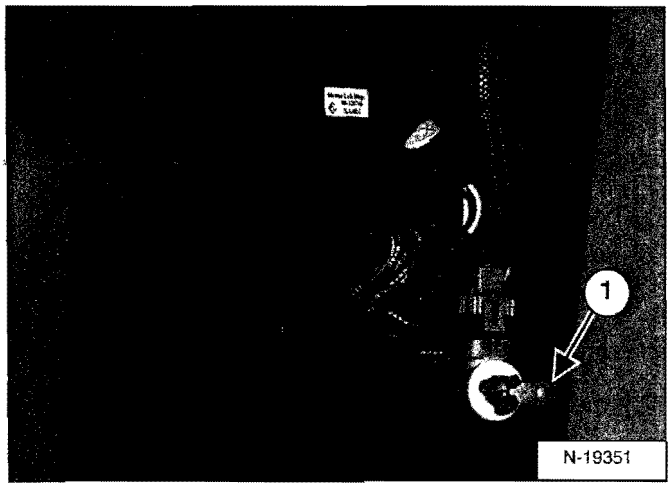
Remove the light housing (Item 1) **[Figure 60-60-1]** from the operator cab.

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

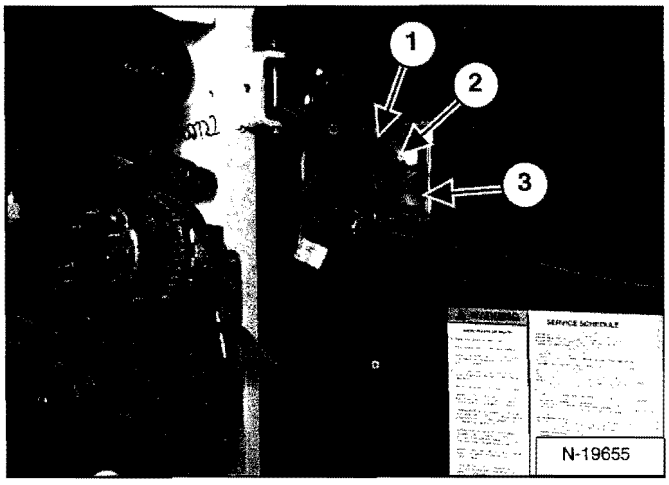


Remove the bulb (Item 1) **[Figure 60-60-3]** from the socket.

Reverse the above procedure to install the bulb.

Rear Removal And Installation

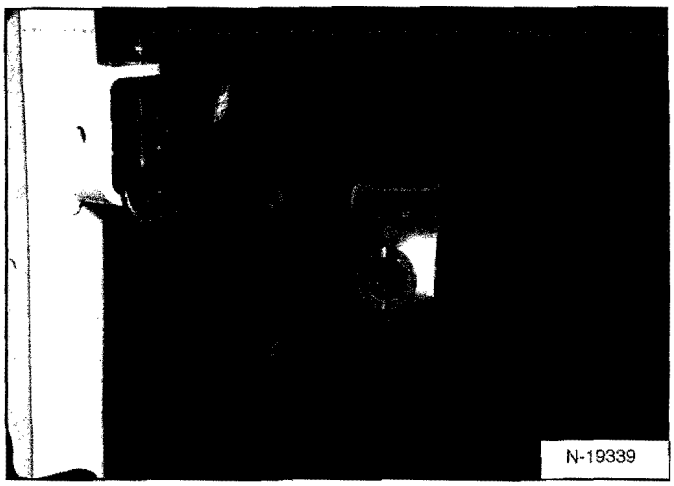
Figure 60-60-4



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.

Rear Removal And Installation (Cont'd)

Figure 60-60-5



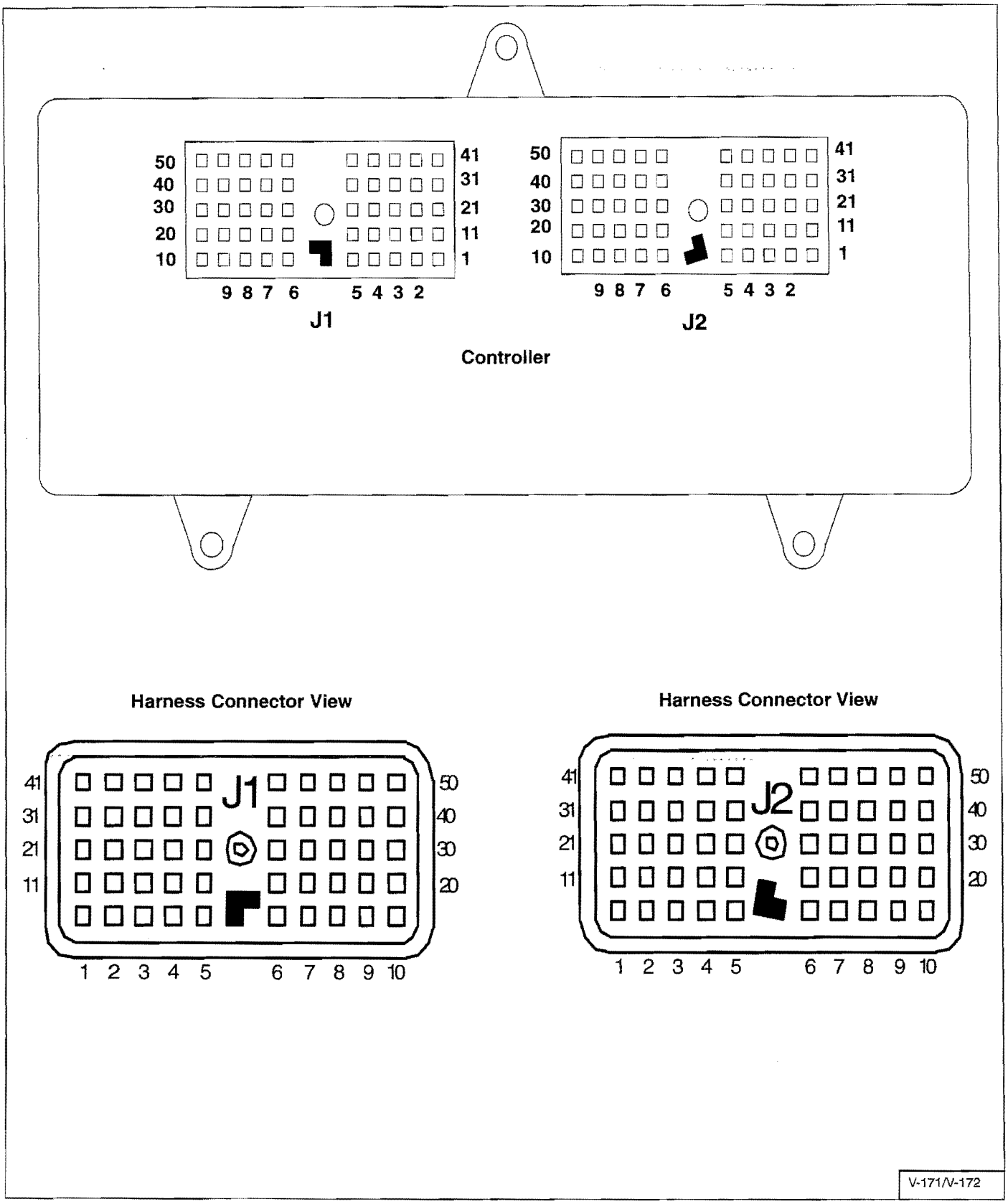
Using care press the rear light and housing from the door **[Figure 60-60-5]**.

Reverse this procedure for installation.


Bobcat®

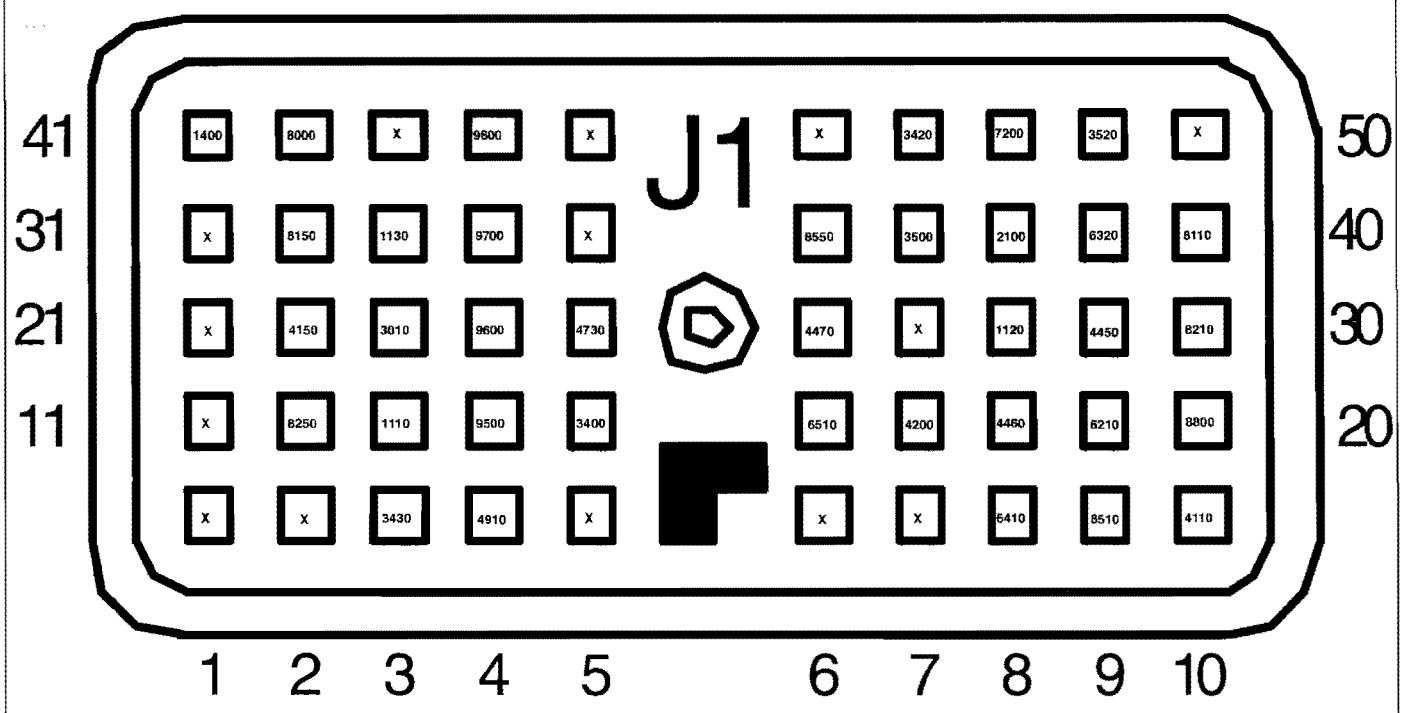
BOBCAT CONTROLLER

Identification Chart

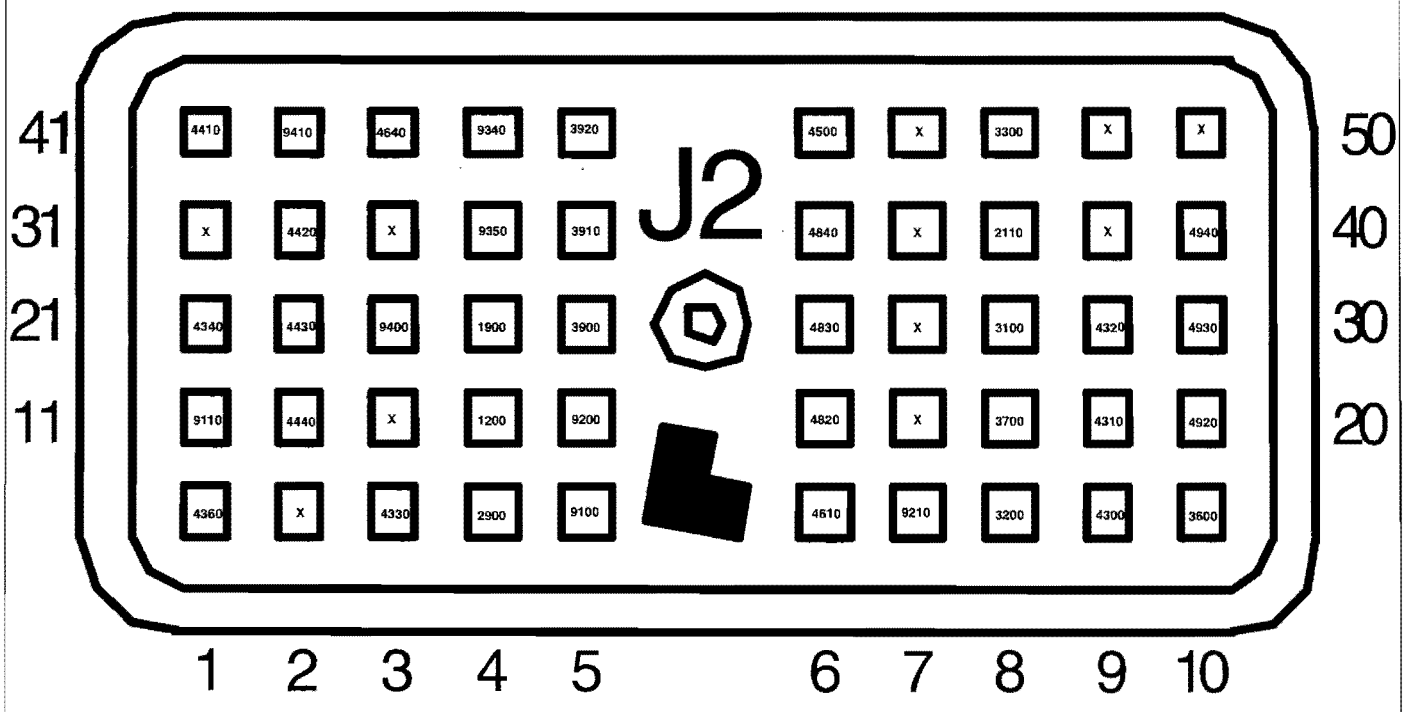


Identification Chart (Cont'd)

Harness Connector View



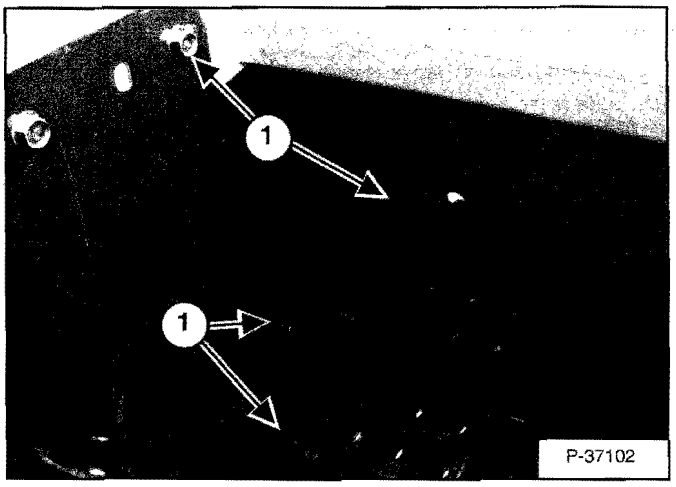
Harness Connector View



V-172

Removal And Installation

Figure 60-70-1



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

Stop the engine. Raise the seat bar.

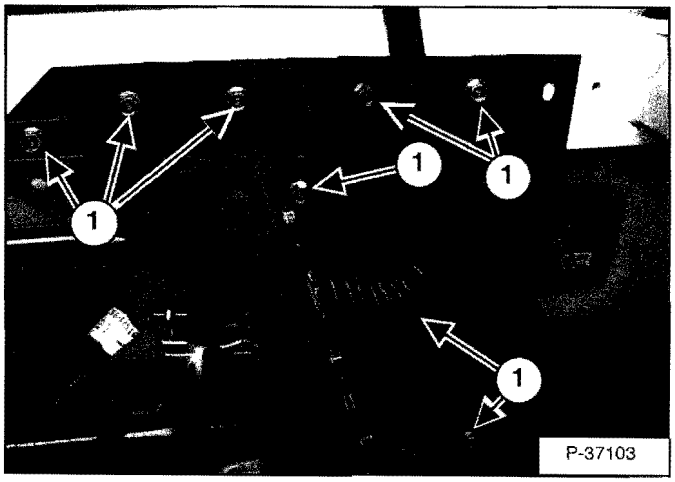
Lift and block the rear of the loader. (See Contents Page 10-01.)

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

Remove the four left front side panel mount bolts (Item 1) **[Figure 60-70-1]**.

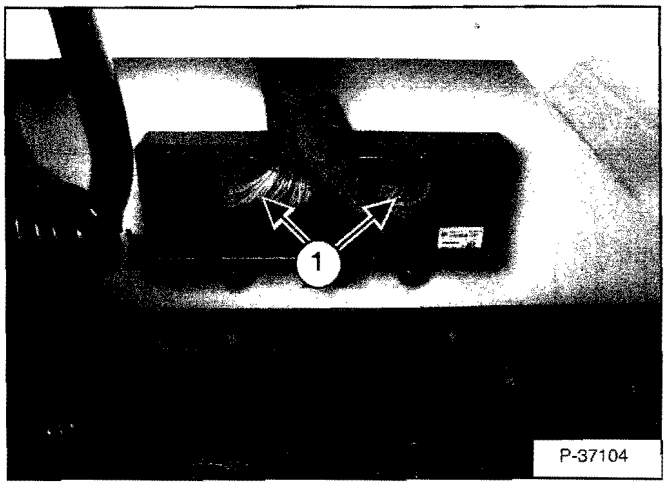
Remove the front panel from the loader.

Figure 60-70-2



Remove the eight panel mount bolts (Item 1) **[Figure 60-70-2]** and remove the rear panel.

Figure 60-70-3



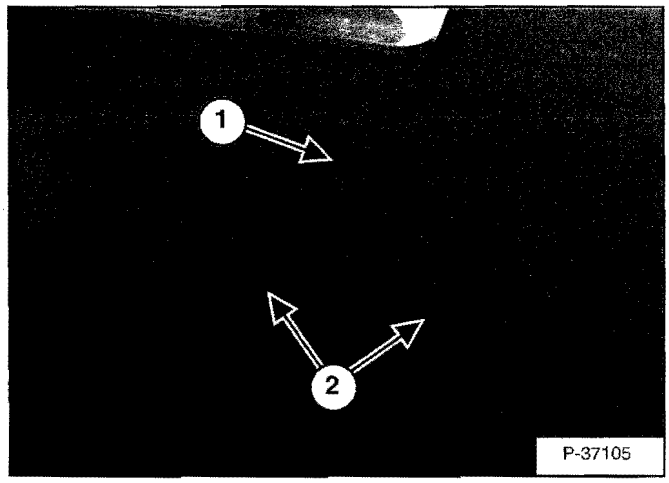
Remove the two harness connector bolts (Item 1) **[Figure 60-70-3]**.

Installation: Tighten the connector mounting bolts to 30-35 in.-lbs. (3,39-3,96 Nm) torque.

Unplug the two harness connectors from the controller.

NOTE: The connectors are keyed and will only plug in one way.

Figure 60-70-4



Remove the top controller mount bolt (Item 1) **[Figure 60-70-4]**.

Loosen the two controller mounting bolts (Item 2) **[Figure 60-70-4]**.

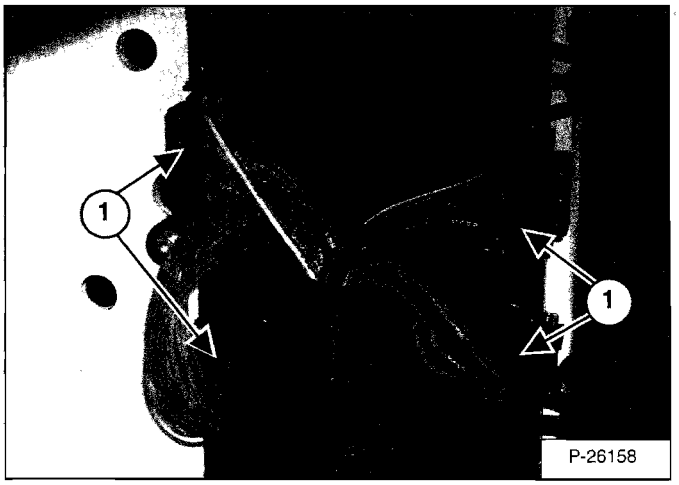
Installation: Tighten the controller mounting bolts to 12-14 ft.-lbs. (16-19 Nm) torque.

Remove the system controller from the loader.

CONTROLLER (SELECTABLE JOYSTICK CONTROL) (SJC)

Removal

Figure 60-71-1



⚠ 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.)

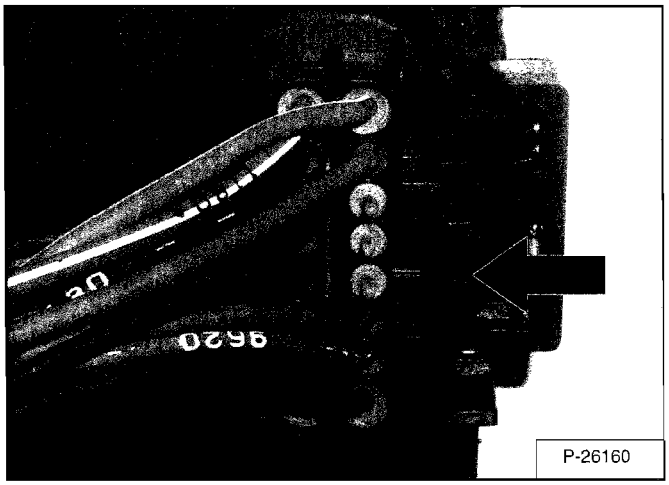
Raise the operator cab. (See Contents Page 10-01.)

Remove the engine speed control. (See Contents Page 70-01.)

Remove the inside access panel (right side). (See Contents Page 50-01.)

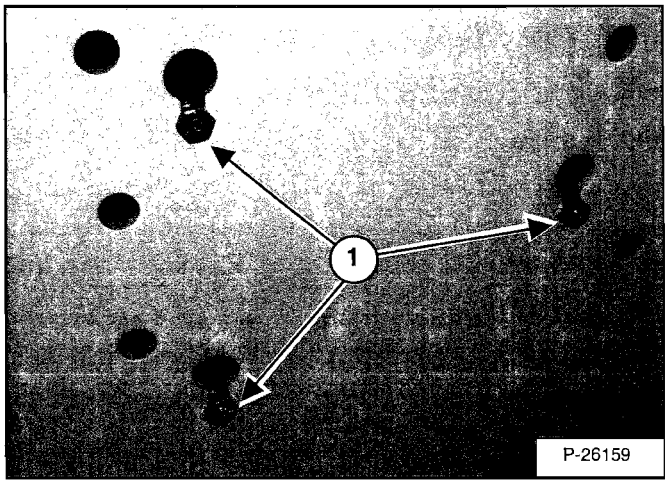
Disconnect the four electrical connectors (Item 1) **[Figure 60-71-1]**.

Figure 60-71-2



Press in on the connector release, (toward the connector **[Figure 60-71-2]** to release the connector.

Figure 60-71-3



Loosen the three control mounting bolts (Item 1) **[Figure 60-71-3]** on the right side fender.

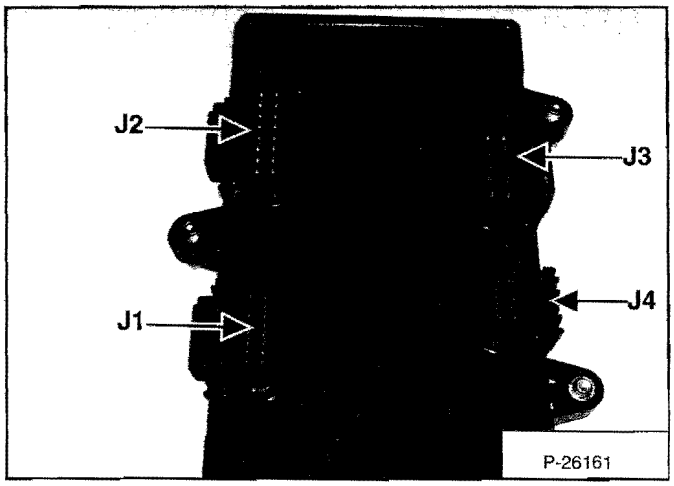
Installation: Tighten the mounting bolts to 12-14 ft.-lbs (16-19 Nm) torque.

Lift and remove the controller from the fender.

CONTROLLER (SELECTABLE JOYSTICK CONTROL) (SJC) (CONT'D)

Removal (Cont'd)

Figure 60-71-4



Remove the AWS controller **[Figure 60-71-4]**.

Figure 60-71-5

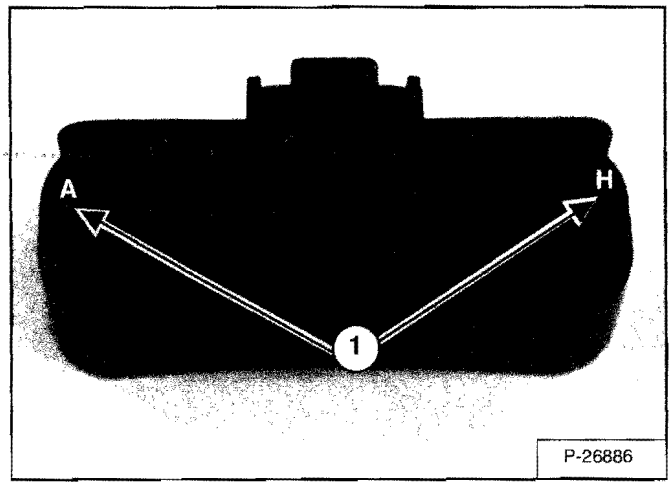
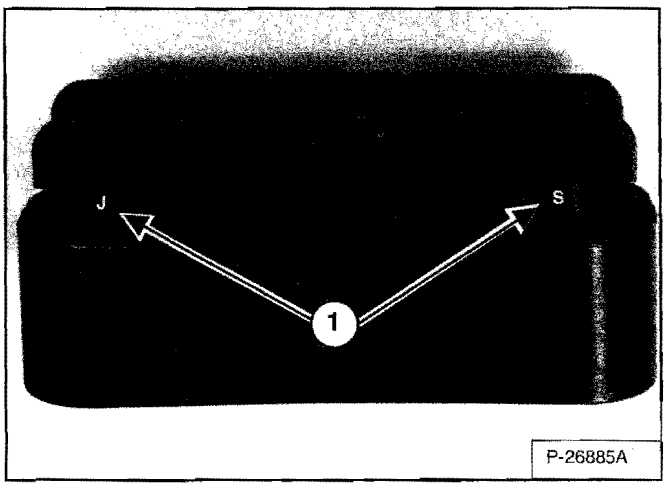


Figure 60-71-6

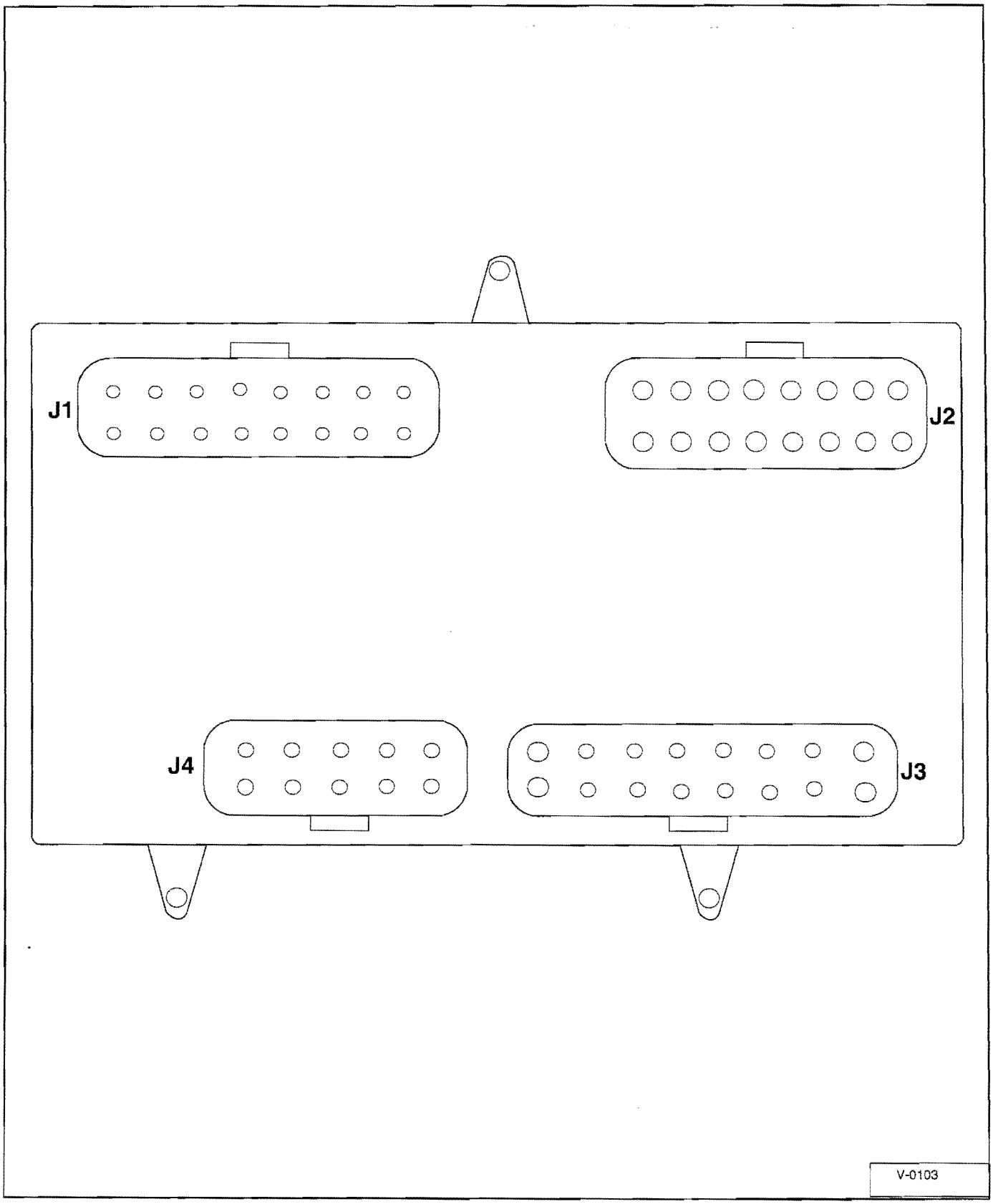


The wire location (Item 1) **[Figure 60-71-5]** & **[Figure 60-71-6]**, are printed on the individual wire connectors, in the locations shown.

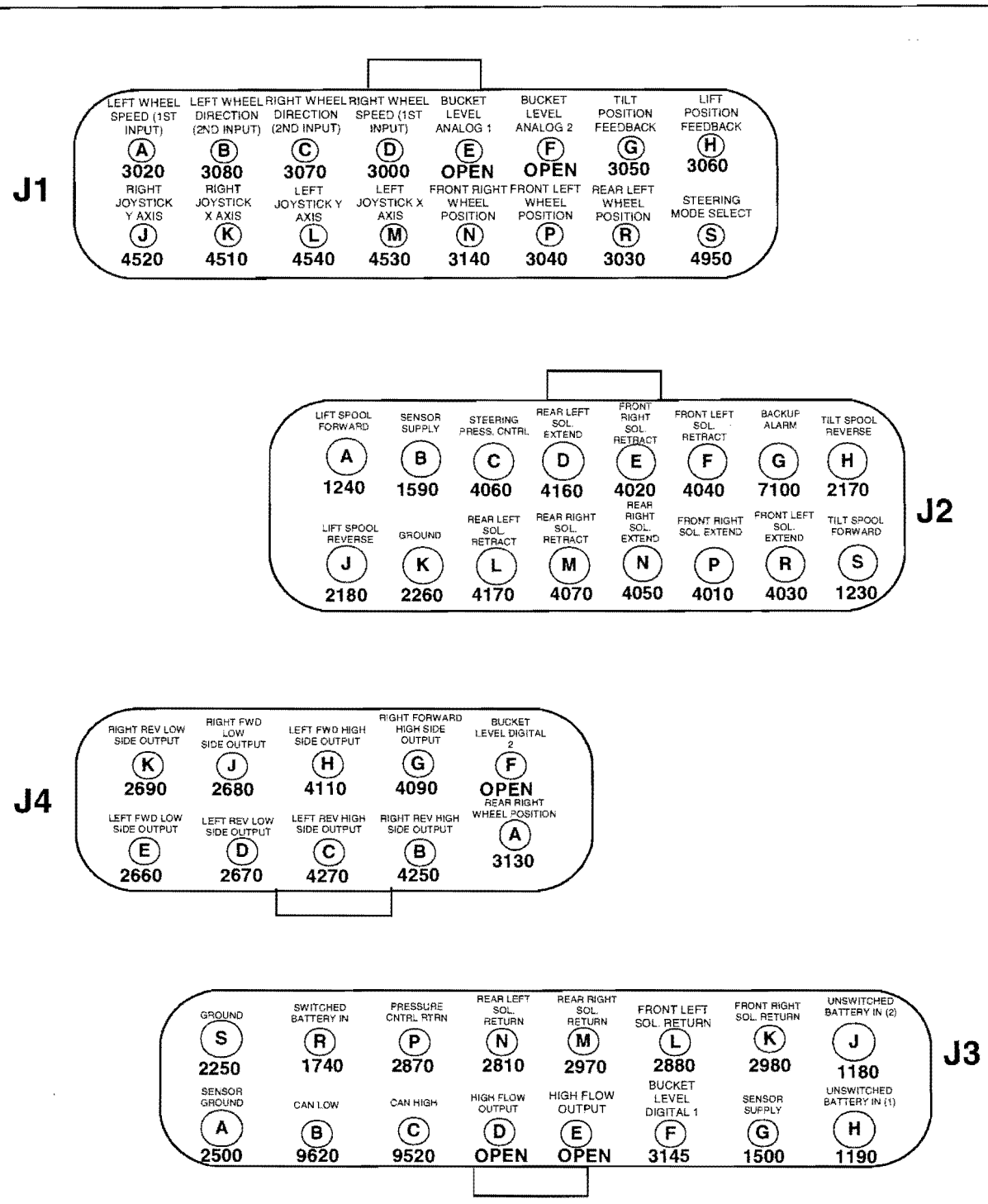
NOTE: The wire location letters (A,H,J,&S) have been made larger to show there location on the wiring connector. The actual letters on the connectors are smaller.


Bobcat®

Identification Chart



Identification Chart (Cont'd)



Connectors are Viewed From the Wire Side.

V-0111 (6-14-01)

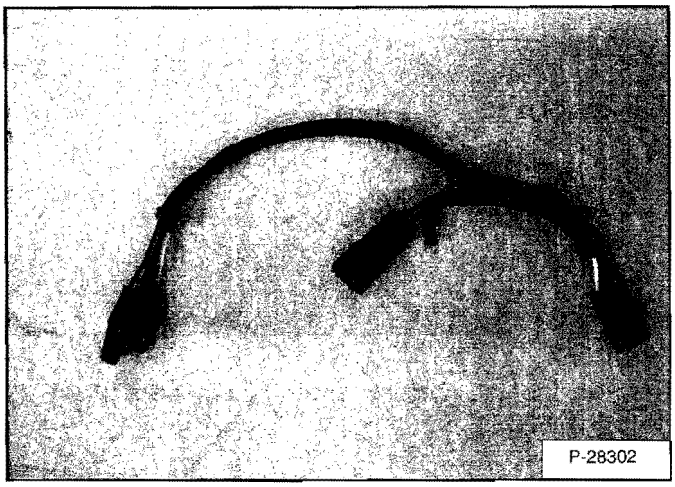
V-0111

Bobcat®

SPEED SENSOR (SELECTABLE JOYSTICK CONTROL) (SJC)

Testing

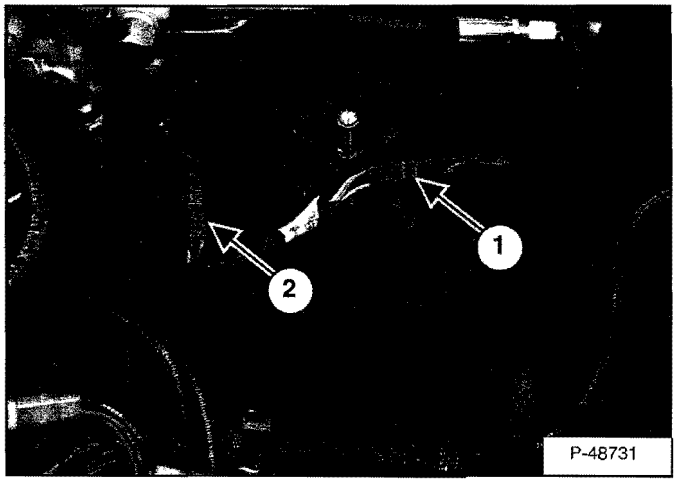
Figure 60-80-1



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

MEL1609-RPM Speed Sensor Test Harness **[Figure 60-80-1]**
MEL1563-Remote Start Tool
Multimeter

Figure 60-80-2



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

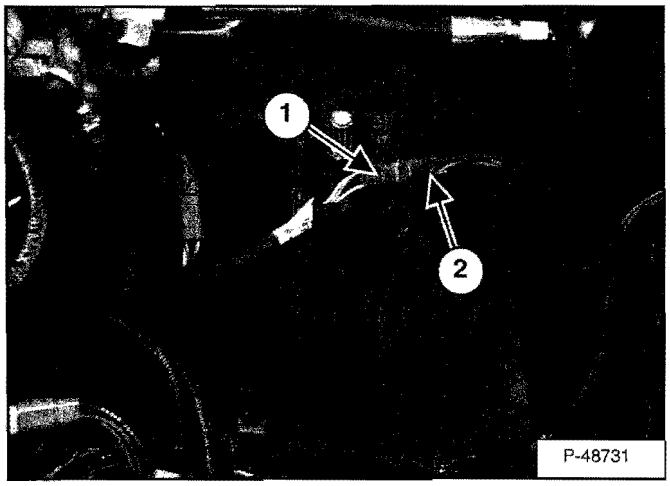
Raise the operator cab. (See Contents Page 10-01.)

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

Locate the electrical connector (Item 1) **[Figure 60-80-2]** for the left RPM speed sensor.

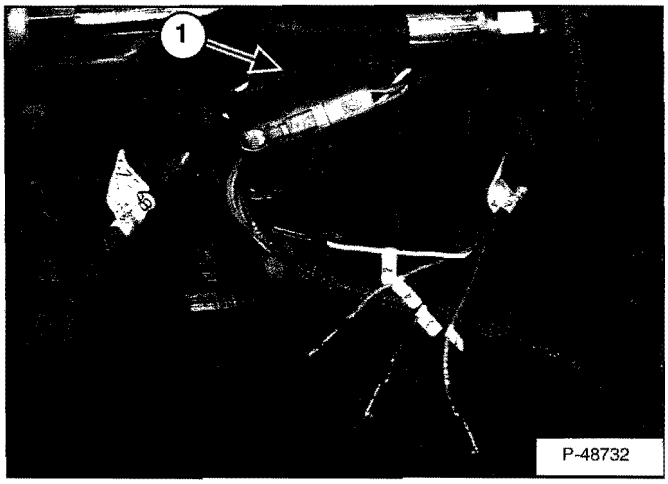
Locate the electrical connector (Item 2) **[Figure 60-80-2]** for the right RPM speed sensor.

Figure 60-80-3



Disconnect the RPM speed sensor wire connector (Item 1), from the loader harness wire connector (Item 2) **[Figure 60-80-3]**.

Figure 60-80-4



Connect the RPM speed sensor test harness (Item 1) **[Figure 60-80-4]** in line, between the loader wiring harness and the speed sensor harness.

Turn the remote start key to ON position without starting the loader.

Take a voltage reading, with the multimeter, at the speed sensor test harness, between pin 1 and pin 3 (Item 1) **[Figure 60-80-4]**.

The voltage should be 5 volts.

Repeat the procedure for the opposite side speed sensor. (If needed.)

SPEED SENSOR (SELECTABLE JOYSTICK CONTROL) (SJC) (CONT'D)

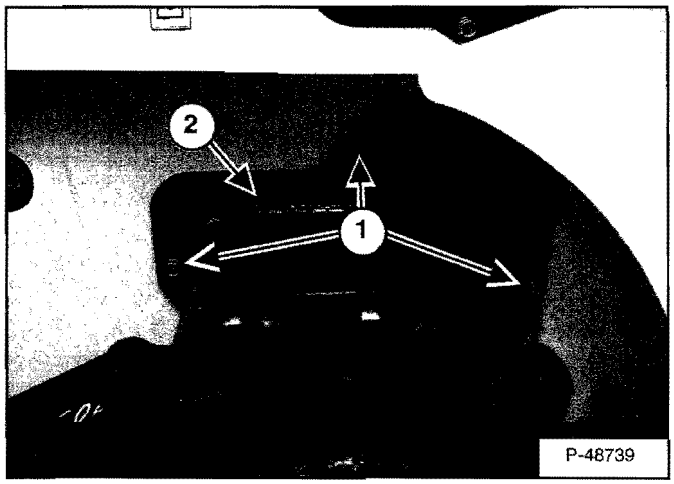
Removal

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 loader track/s. (See Contents Page 40-01.)

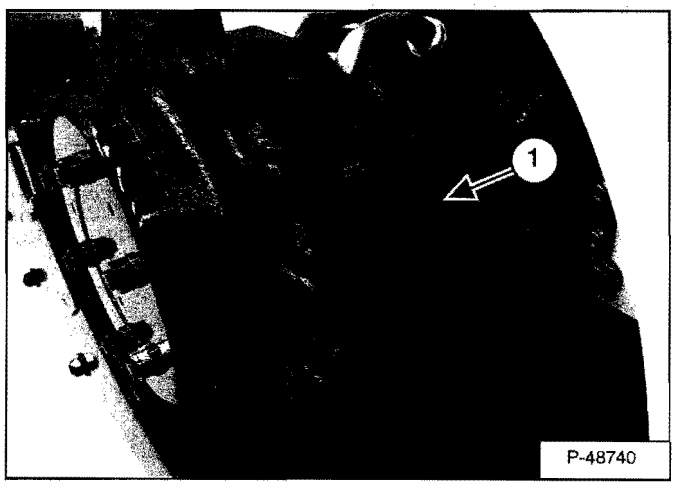
Figure 60-80-5



Remove the three access cover mount bolts (Item 1) **[Figure 60-80-5]**.

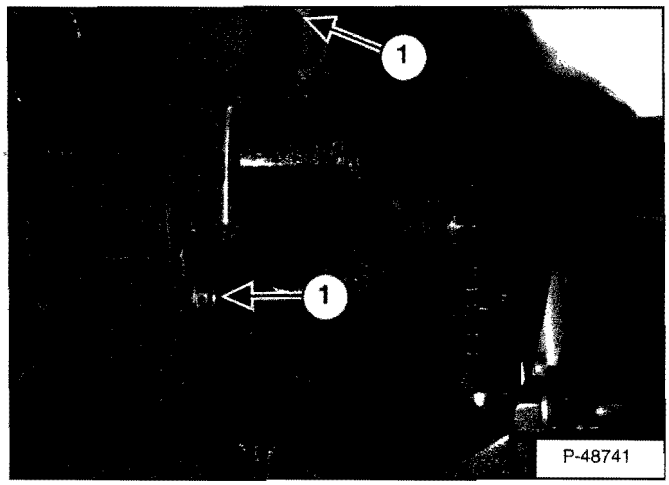
Remove the access cover (Item 2) **[Figure 60-80-5]** from the loader.

Figure 60-80-6



At the back side of the hydrostatic motor mount (Item 1) **[Figure 60-80-6]**, locate the speed sensor access cover.

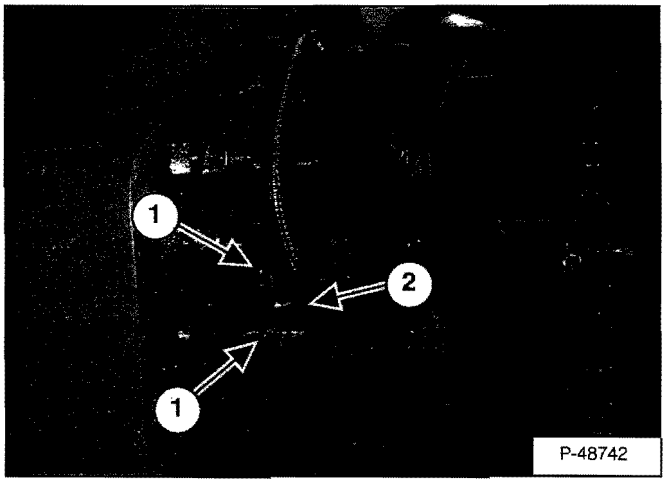
Figure 60-80-7



Remove the two access cover mount bolts (Item 1) **[Figure 60-80-7]**.

Remove the speed sensor access cover from the loader.

Figure 60-80-8



Clean the area around the speed sensor, to prevent contamination from getting into the hydrostatic motor after the speed sensor is removed.

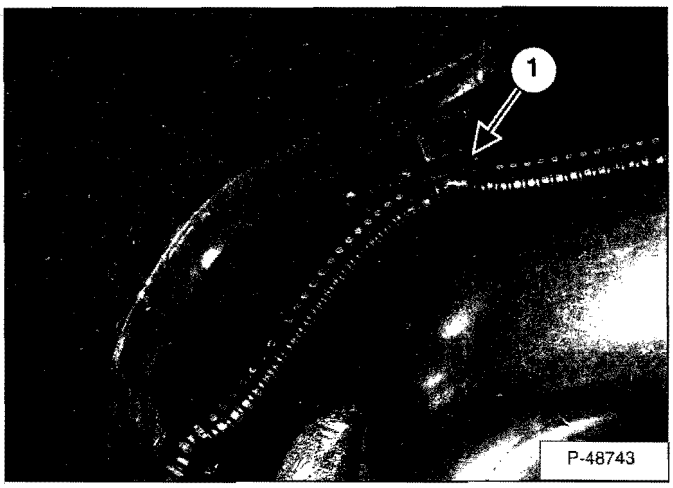
Remove the two speed sensor mount bolts (Item 1) **[Figure 60-80-8]**.

Installation: Lubricate the speed sensor O-ring with oil before installing.
Seat the sensor into the motor port prior to installing the bolts. Tighten down the bolts, alternate tightening from left to right to evenly load the o-ring.
Tighten the speed sensor mount bolts to 88 in.-lbs. (9,94 Nm) torque.

Remove the speed sensor (Item 2) **[Figure 60-80-8]** from the motor.

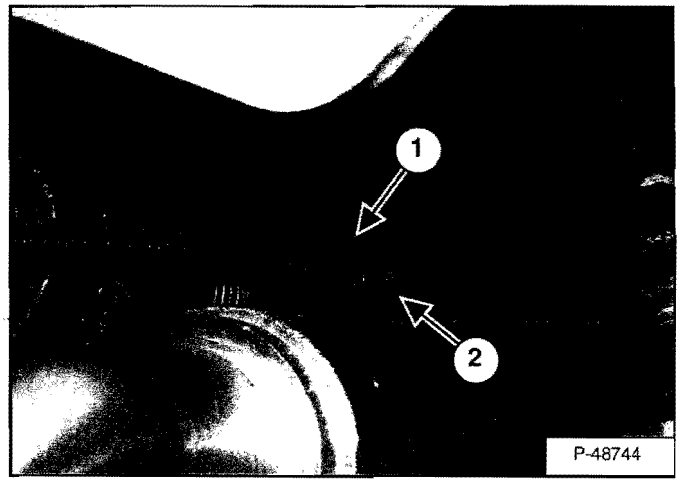
Removal (Cont'd)

Figure 60-80-9



Remove the zip tie (Item 1) **[Figure 60-80-9]** from the wiring harness.

Figure 60-80-10

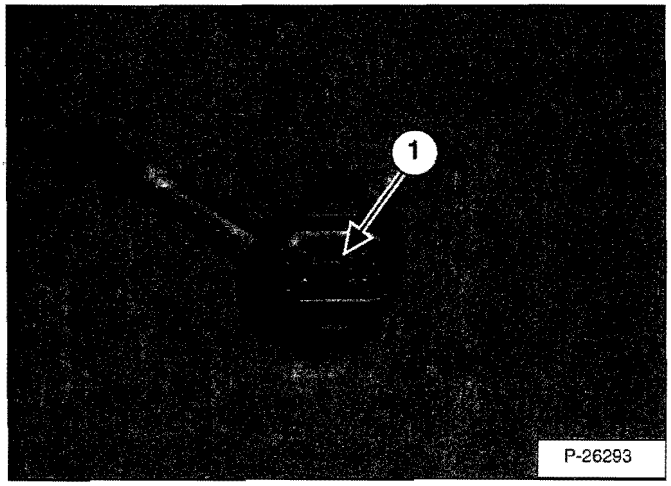


Remove the zip tie (Item 1) **[Figure 60-80-10]** from the wiring harness.

Disconnect the speed sensor harness (Item 2) **[Figure 60-80-10]** from the loader harness.

Remove the speed sensor from the loader.

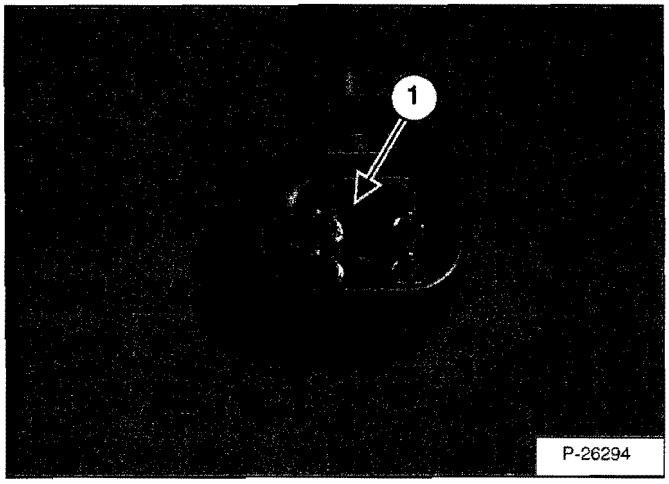
Figure 60-80-11



The electrical connector can be replaced.

Remove the connector wedge (Item 1) **[Figure 60-80-11]**.

Figure 60-80-12



With a thin screwdriver lift the tabs and remove the wires from the connector **[Figure 60-80-12]**.

Wire Code

1 Red
2 White
3 Black
4 Blue

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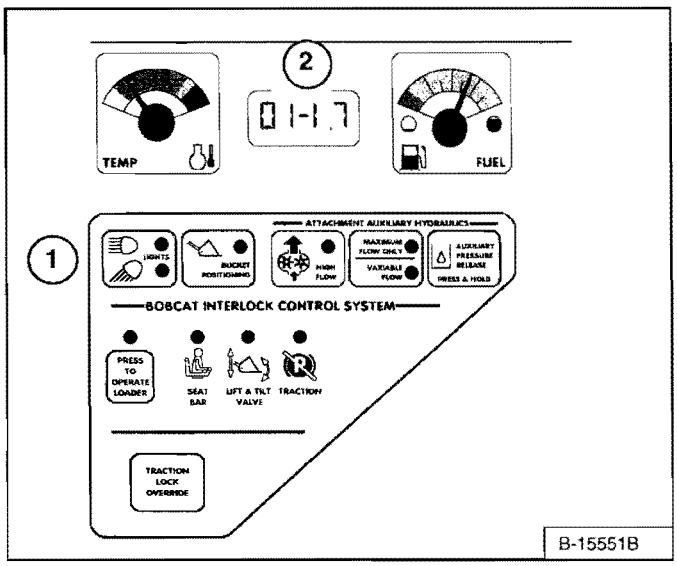
DIAGNOSTICS SERVICE CODES

Display

Figure 60-90-1



The left instrument panel is the same for both the Standard and Deluxe Instrumentation **[Figure 60-90-1]**.

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 60-90-1]**. If more than one SERVICE CODE is present, the codes will scroll on the HOURMETER/CODE DISPLAY.

The following word errors may be displayed.

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.)**

DIAGNOSTICS SERVICE CODES (CONT'D)

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 shot-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 as 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)

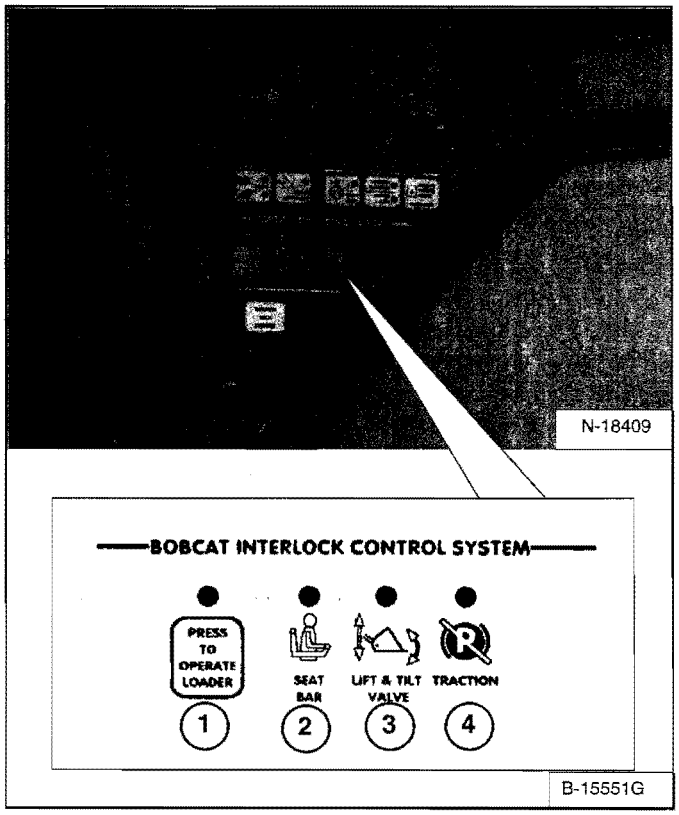
⚠ WARNING

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

Figure 60-100-1



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) **[Figure 60-100-1]** [PRESS TO OPERATE LOADER, SEAT BAR, and LIFT & TILT VALVE] on left instrument panel should be ON **[Figure 60-100-1]**.

2. Raise the Seat Bar fully. All four BICS lights (Items 1, 2, 3, & 4) **[Figure 60-100-1]** [PRESS TO OPERATE LOADER, SEAT BAR, LIFT & TILT VALVE and TRACTION*] on left instrument panel should be OFF **[Figure 60-100-1]**.

NOTE: Record what lights are blinking (if any) and number of light flashes. See Troubleshooting Guide 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 steering 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.

Additional Inspection For Loaders With Advanced Controls System (ACS) or Selectable Joystick Control (SJC)

9. Sit in the operator's seat and fasten the Seat Belt. Lower the Seat Bar, start the engine and press the PRESS TO OPERATE LOADER Button.

10. Raise the lift arms about 6 feet (2 meters) off the ground.

11. Turn key OFF (Standard Panel), press the STOP Button (Deluxe Panel, and wait for the engine to come to a complete stop.

12. Turn key ON (Standard Panel), press RUN /ENTER Button (Deluxe Panel). **(Do Not Start Loader.)** Press the PRESS TO OPERATE LOADER Button, move the control to lower the lift arms. The lift arms should not lower.

13. Move the control to tilt the bucket/attachment forward. The bucket/attachment should not tilt forward.

Troubleshooting

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	CAUSE
All indicator lights flashing.	5
One of the indicator lights flashing.	1
Intermittent indicator lights.	2, 3, 4

KEY TO CORRECT THE CAUSE
1. Refer to BICS troubleshooting guide. (See Page 60-100-4.)
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 seat bar sensor tester MEL1428 to isolate problem between sensor and controller and wiring.
5. Possible low or high voltage.

BICS™ SYSTEM (CONT'D)

Troubleshooting Guide

The following list shows the effects which can happen to the loader, and the probable causes when the BICS System lights are off or flashing and associated service code. (See Contents Page 60-01 for service codes.)

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 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 BAR② LIFT & TILT VALVE③ TRACTION④				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.

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

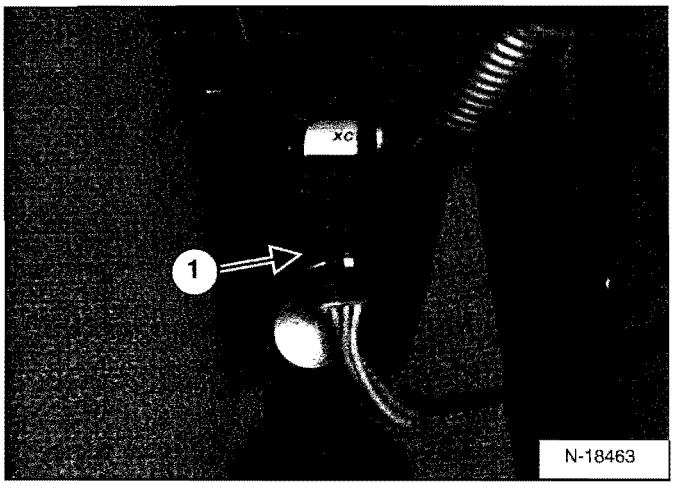
PROBLEM	CAUSE
Indicator light does not come ON when seat bar is lowered.	1, 2, 3, 4, 5

KEY TO CORRECT THE CAUSE
1. Check sensor wire connection.
2. Use the BICS sensor tester MEL1428 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 60-110-1

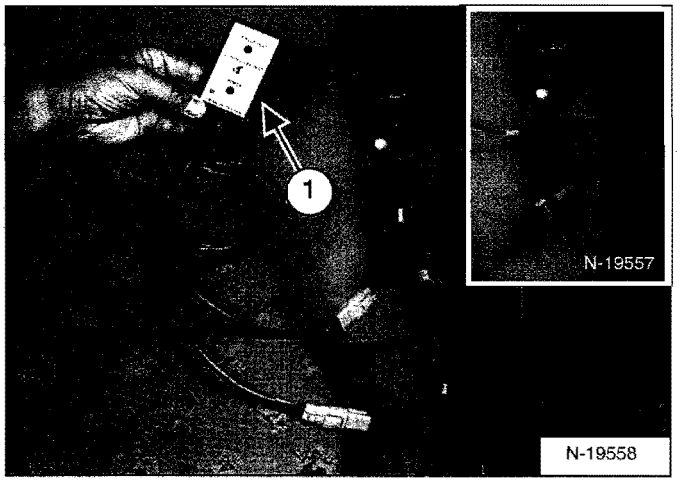


Use Sensor Tester (MEL1428) and seat bar sensor tester adapter (MEL1567) for the following procedure:

Connect the seat bar adapter sensor leads (MEL1567) to the sensor tester.

Disconnect the seat bar sensor connector (Item 1) **[Figure 60-110-1]**.

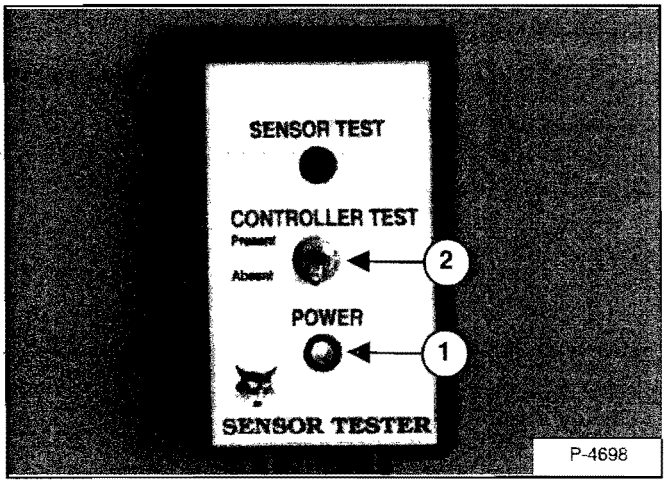
Figure 60-110-2



Connect the Sensor Tester (Item 1) inline, to the seat bar sensor connectors. See inset **[Figure 60-110-2]**.

Turn the key to the ON position. DO NOT START THE ENGINE.

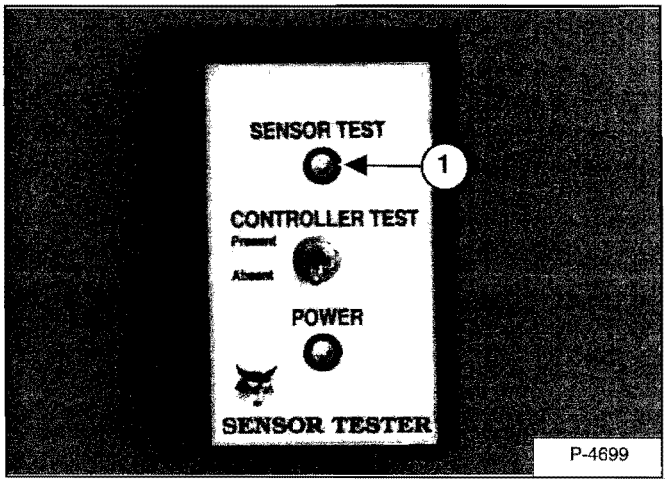
Figure 60-110-3



The toggle switch (Item 2) **[Figure 60-110-3]** can be in either the Absent or Present position.

If there is no power light (Item 1) **[Figure 60-110-3]** on the sensor tester, check the tester or wiring harness.

Figure 60-110-4



Lower the seat bar. The Sensor Test light (Item 1) **[Figure 60-110-4]** should illuminate.

Raise the seat bar. The Sensor Test light (Item 1) **[Figure 60-110-4]** should go off.

If the above test fails, there is a problem with the seat bar sensor.

Disconnect the Sensor Tester.

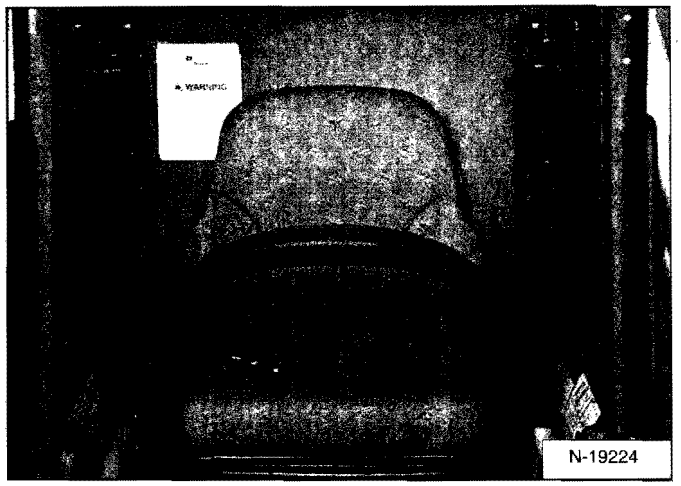
Replace the Seat Bar Sensor. (See Removal And Installation on Page 60-100-3.)

If the above test passes, run the seat bar sensor BICS circuit test. (See BICS™ Circuit Test on Page 60-100-4.)

SEAT BAR SENSOR (CONT'D)

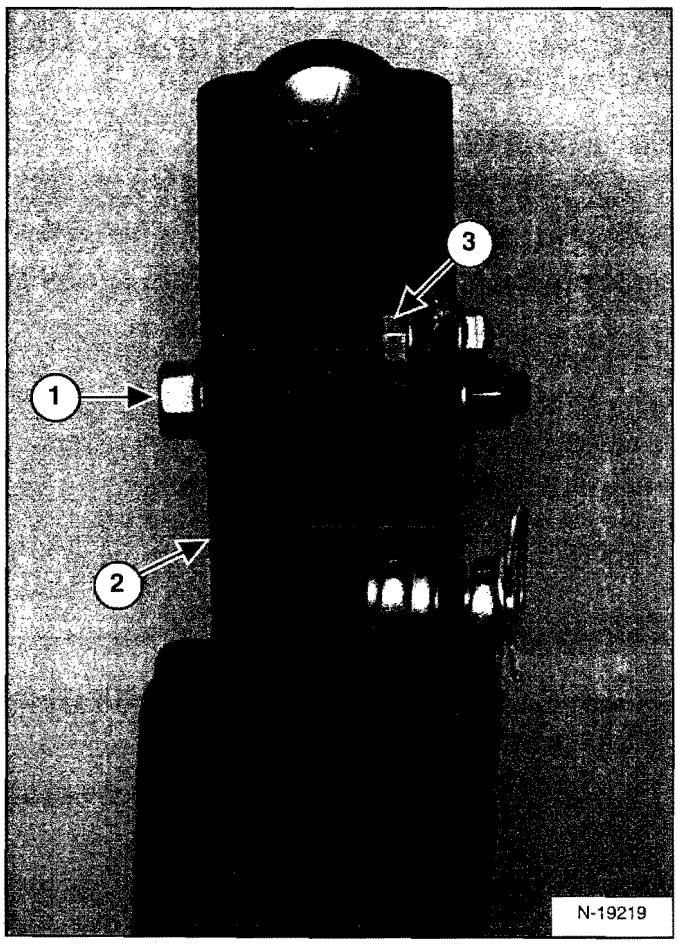
Removal And Installation

Figure 60-110-5



Remove the seat bar (Item 1) **[Figure 60-110-5]** from the loader. (See Contents Page 50-01.)

Figure 60-110-6

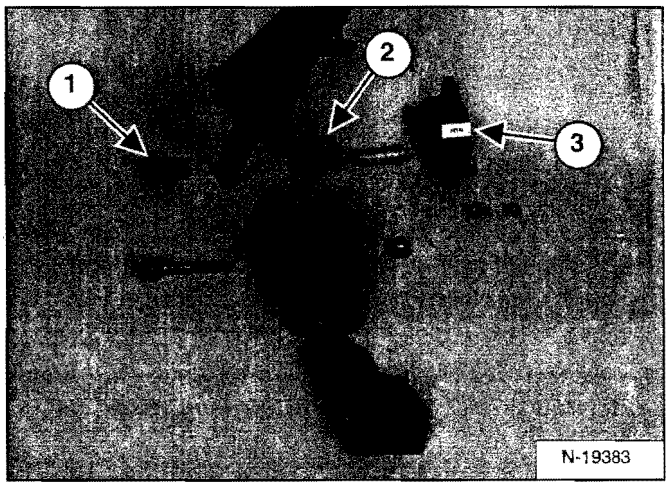


Remove the mounting bolt (Item 1) from the seat bar mount (Item 2) **[Figure 60-110-6]**.

Installation: Tighten the mounting bolt to 50-70 in.-lbs. (5,6-7,9 Nm) torque.

Remove the sensor mounting bolt (Item 3) **[Figure 60-110-6]** and nut.

Figure 60-110-7



Remove the keyed plastic bushing (Item 1), magnetic bushing assembly (Item 2) and sensor bracket (Item 3) **[Figure 60-110-7]**.

IMPORTANT

Be careful to not overtighten the sensor mounting bolt and nut to prevent breakage of the sensor.

I-2088-1095

Installation: Be sure the tabs on the pivot bushing are positioned in the slotted hole (Item 1) **[Figure 60-110-7]** of the seat bar

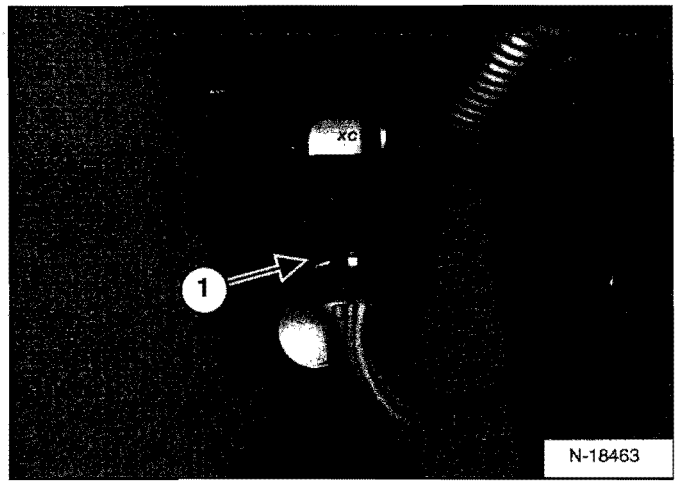
Inspect all parts for damage and wear and replace if necessary.

Reverse the removal procedure to install the seat bar sensor.

SEAT BAR SENSOR (CONT'D)

BICS™ Circuit Test

Figure 60-110-8

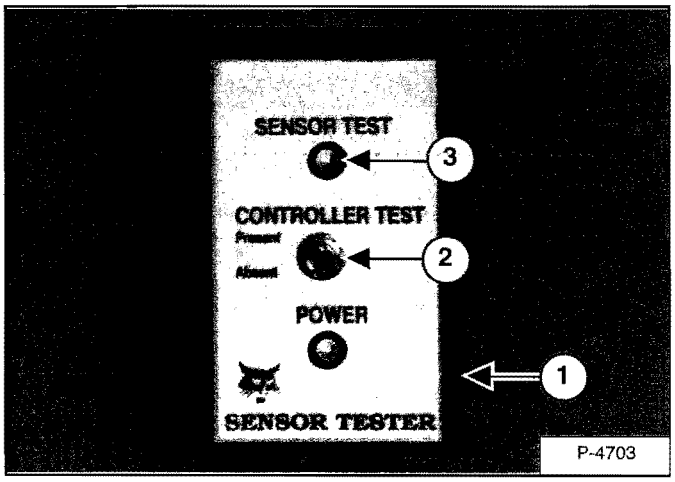


Use Sensor Testers (MEL1428) and seat bar sensor tester adapter (MEL1567) for the following procedure:

Connect the seat bar sensor tester adapter MEL1567 to the sensor tester.

Disconnect the seat bar sensor connector (Item 1) **[Figure 60-110-8]**.

Figure 60-110-9



Connect Sensor Tester (Item 1) **[Figure 60-110-9]** inline to the seat bar sensor connectors.

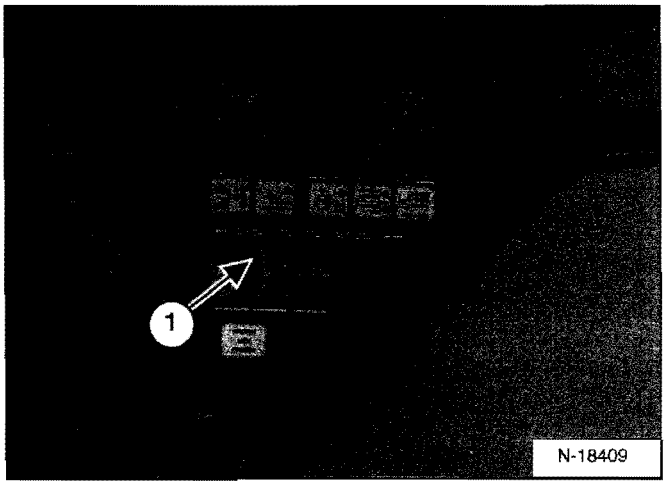
Turn the key to the ON position. DO NOT START THE ENGINE.

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 60-110-9]** on the sensor tester to the Present position.

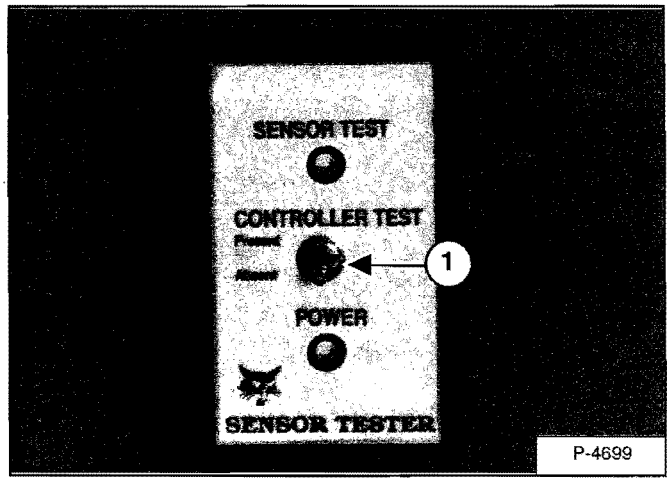
NOTE: The sensor test light (Item 3) [Figure 60-110-9] is only activated by the seat bar. It will be off with the seat bar up or on with the seat bar down.

Figure 60-110-10



The BICS seat bar indicator light (Item 1) **[Figure 60-110-10]** should illuminate.

Figure 60-110-11



Move the toggle switch (Item 1) **[Figure 60-110-11]** on the sensor tester to the Absent position.

The Seat Bar light (Item 1) **[Figure 60-110-11]** 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, 7,11
Intermittent activation of traction lock.	8, 9, 10,11

SOLUTION SUGGESTIONS
1. Make sure brake pedal is not engaged.
2. Check the dash display for an error code. (See Electrical System Service Manual.)
3. If all lights indicate the brake should be released, but it doesn't, check the brake 30 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 coil should be about 9.8 ohms.
6. Check brake solenoid wiring voltage, solenoid wiring should read 12 volts.
7. Check the brake solenoid mounting nut for correct torque.
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.
11. Check the flywheel speed sensor and wiring.

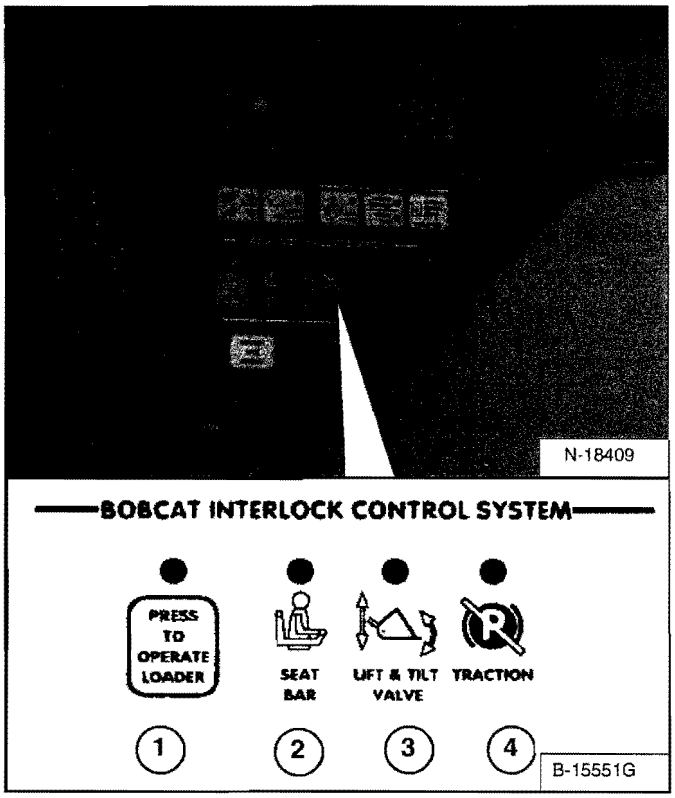
TRACTION LOCK (CONT'D)

Description Of The Control System

The Traction Lock Control System will lock the traction drive system when the engine stops. The Traction Lock Control System is incorporated into the BICS™ System.

Inspecting The Control System

Figure 60-120-1

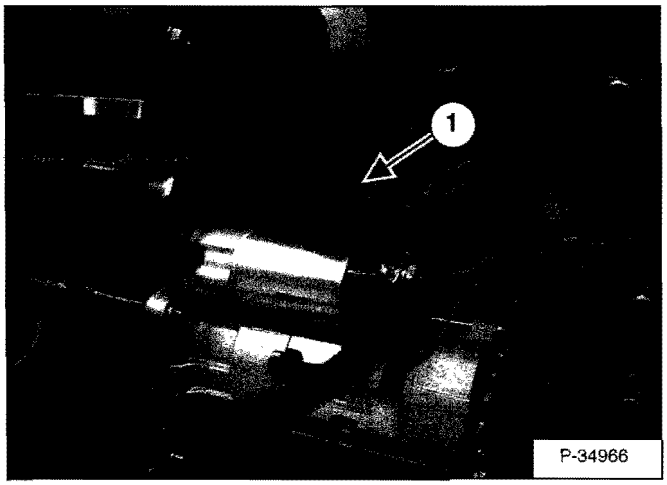


Fasten the seat belt, disengage the parking brake button, press the PRESS TO OPERATE LOADER Button (Item 1) and raise the Seat Bar fully. Move the steering levers slowly forward and backward. The TRACTION lock (Item 4) should be engaged. Lower the Seat Bar. Press the PRESS TO OPERATE LOADER Button (Item 1) **[Figure 60-120-1]**.

Engage the parking brake pedal and move the steering 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.

Figure 60-120-2



Check the wire connections at the engine speed sensor (Item 1) **[Figure 60-120-2]**.

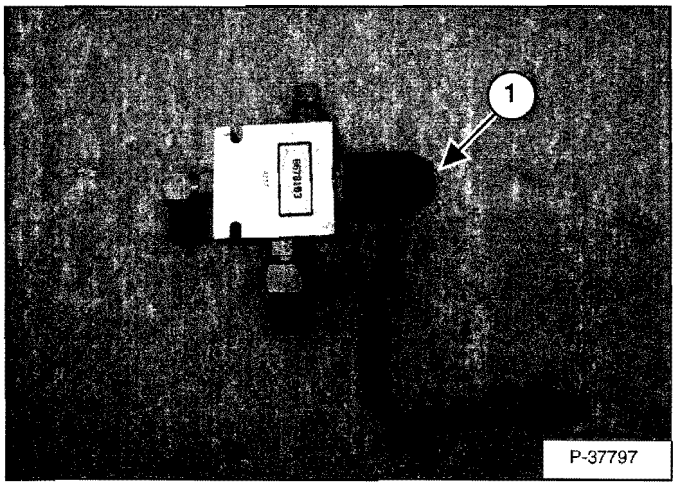
Check the adjustment of the flywheel speed sensor and replace the speed sensor if needed. (See Page 60-01.)

NOTE: When the Traction Lock Override Button is activated, the Traction Lock Override Control System will NOT engage the Traction Lock if the engine stops.

Parking Brake Solenoid Removal And Installation

NOTE: Brake valve is removed for picture clarity.

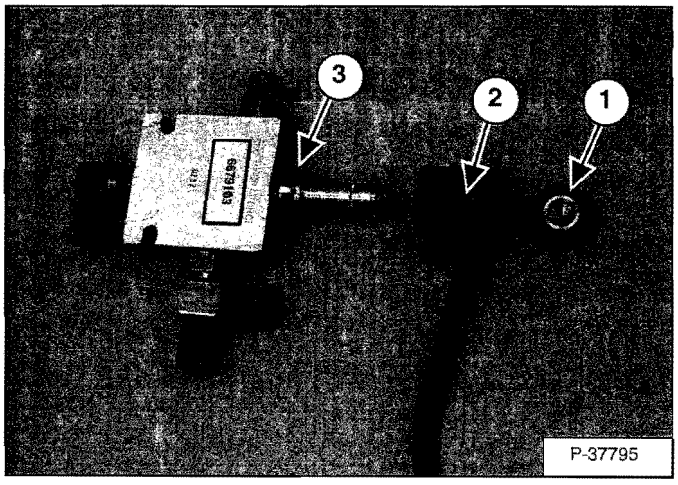
Figure 60-120-3



Loosen the electrical brake solenoid nut (Item 1) **[Figure 60-120-3]**.

Installation: Tighten the solenoids nut to 48-60 in.-lbs. (5,4-6,8 Nm) torque.

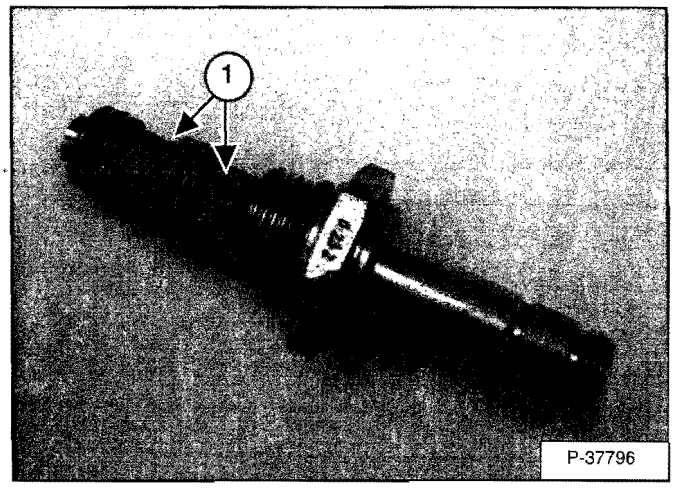
Figure 60-120-4



Remove the solenoid nut (Item 1) and solenoid coil (Item 2) **[Figure 60-120-4]**.

Remove the solenoid valve (Item 3) **[Figure 60-120-4]** from the block.

Figure 60-120-5



Inspect the O-rings and back-up washer on the solenoid valve and replace as needed **[Figure 60-120-5]**.

Check the screens (Item 1) **[Figure 60-120-5]** and clean with solvent if needed.

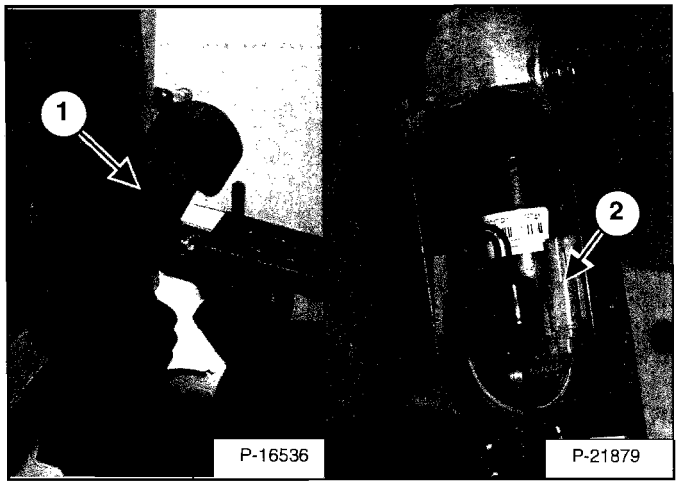
Installation: Tighten the solenoid valve to 16-20 ft.-lbs. (21,7-27,1 Nm) torque.

Bobcat®

ADVANCED CONTROL SYSTEM (ACS)

Components Identification

Figure 60-130-1



The Advanced Control System (ACS) is a selectable foot/hand control system.

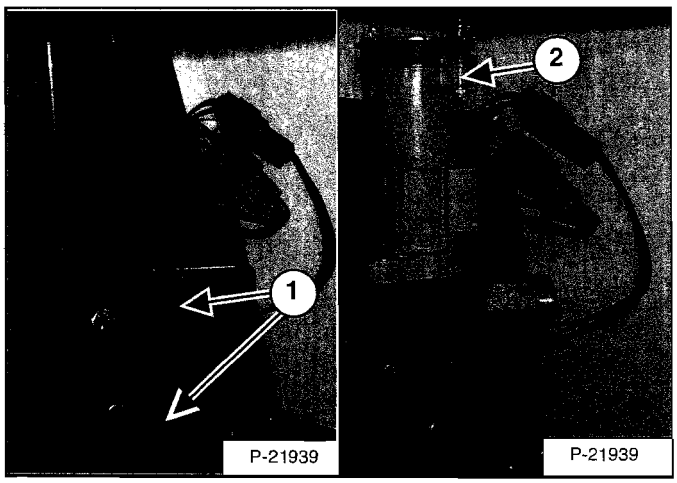
The ACS system allows the operator to quickly switch between foot and hand control modes.

Control Handle (Item 1) **[Figure 60-130-1]**.

Handle Sensor (Item 2) **[Figure 60-130-1]**.

NOTE: The calibration procedure must be followed when replacing a handle sensor, foot pedal sensor, actuator or ACS Controller. (See Calibration Of The ACS System on Page 60-130-14.)

Figure 60-130-2

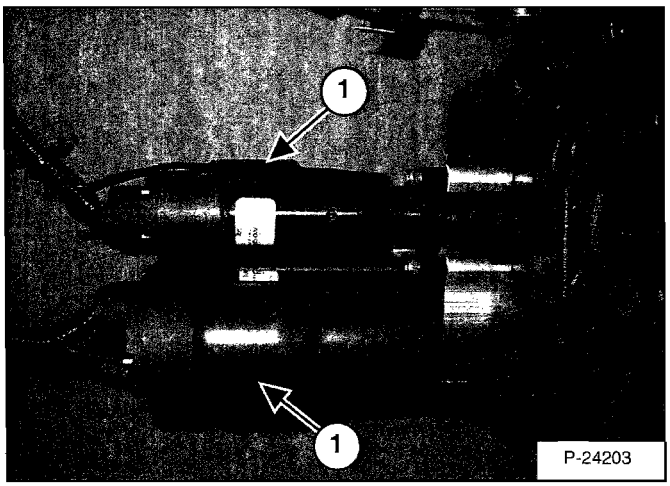


Foot control/sensor assembly (Item 1) **[Figure 60-130-2]**.

Foot sensor (Item 2) **[Figure 60-130-2]**.

NOTE: The calibration procedure must be followed when replacing a handle sensor, foot pedal sensor, actuator or ACS Controller. (See Calibration Of The ACS System on Page 60-130-14.)

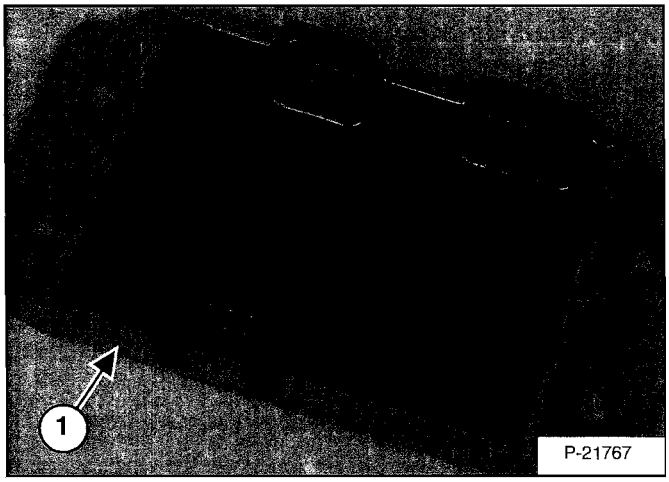
Figure 60-130-3



Control Valve Actuators (Item 1) **[Figure 60-130-3]**.

NOTE: The calibration procedure must be followed when replacing a handle sensor, foot pedal sensor, actuator or ACS Controller. (See Calibration Of The ACS System on Page 60-130-14.)

Figure 60-130-4

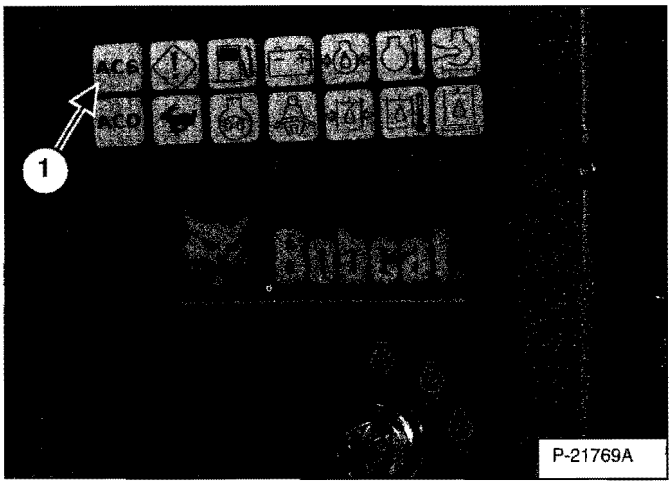


ACS Controller (Item 1) **[Figure 60-130-4]**.

NOTE: The calibration procedure must be followed when replacing a handle sensor, actuator or ACS Controller. (See Calibration Of The ACS System on Page 60-130-14.)

Components Identification (Cont'd)

Figure 60-130-5



ACS error indicator (Item 1) **[Figure 60-130-5]**.

NOTE: The ACS icon will illuminate when an error occurs. The error is stored as a service code. (See Diagnostics Contents Page 60-01.)

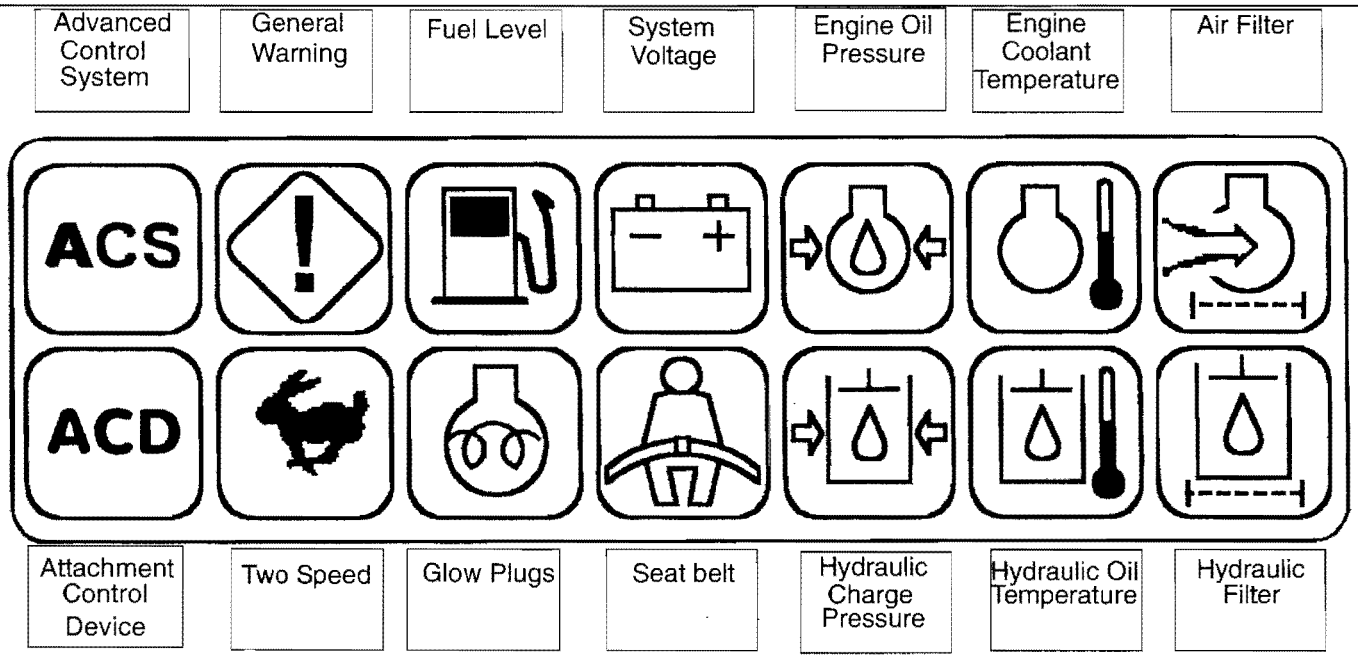
Troubleshooting Guide

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.



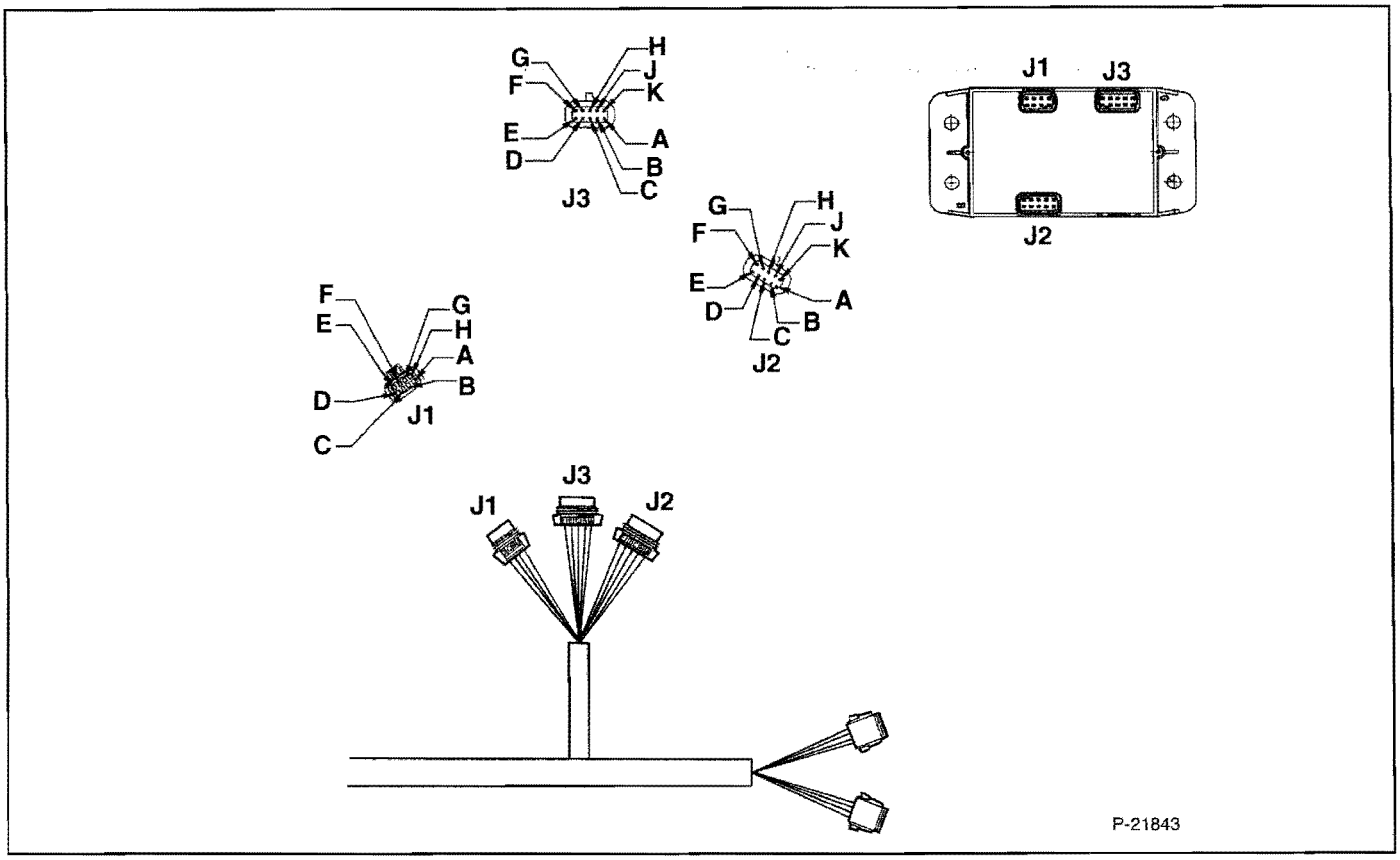
ACS

Advanced Control System

Errors - **lights** solid with 3 beeps
32-04 - **ACS** in error
32-23 - **ACS** not calibrated
32-49 - **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** out of range
32-67 - **Switch** moved while operating

To see what error occurred. Check the service code on the left instrument panel. (See Diagnostics Page 60-01.)

Controller, Connector And Wire Identification

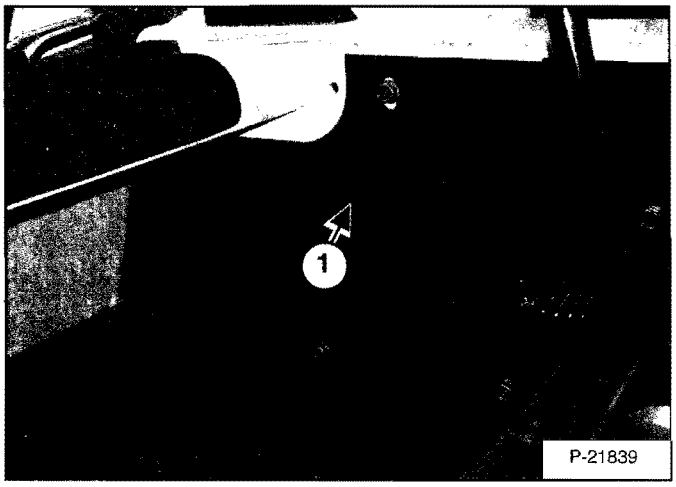


P/N	PIN	DESCRIPTION
J1		CONNECTOR, METRI-PACK
Orange	A	5V HALL EFFECT SUPPLY
Orange	B	SWITCHED AHC POWER
Green	C	HAND/FOOT INPUT
Purple	D	CAN SIGNAL HIGH AHC
Purple	E	CAN SIGNAL LOW AHC
Purple	F	CAN SHIELD AHC
Black	G	AHC GROUND
Black	H	AHC GROUND
J2		CONNECTOR, METRI-PACK
	A	OPEN
	B	OPEN
	C	OPEN
	D	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

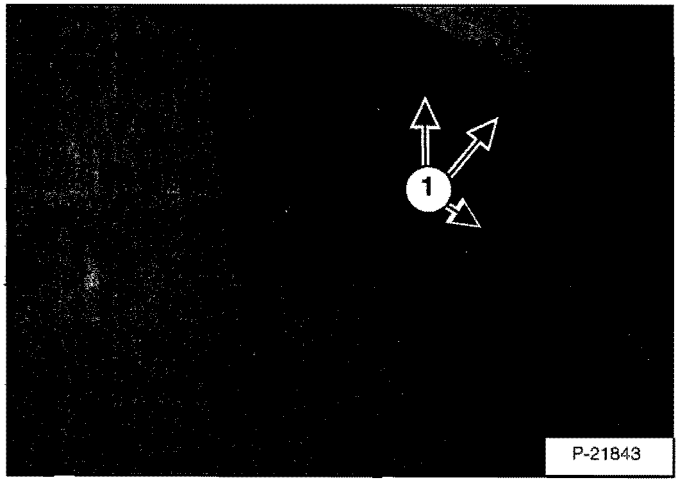
Figure 60-130-6



Loosen the bottom bolts and remove the top bolt.

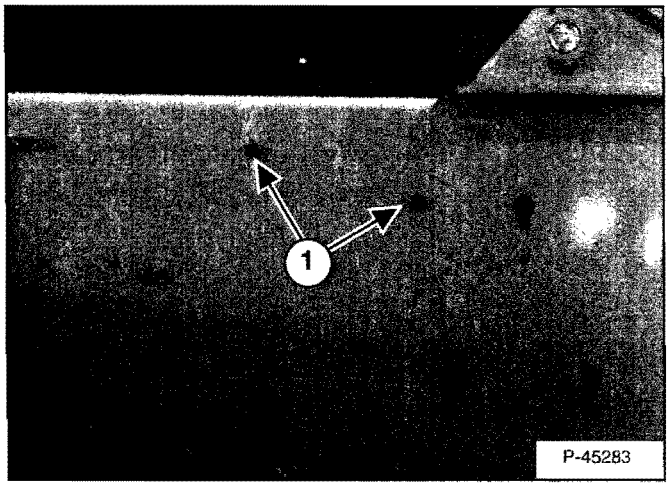
Remove the right front panel (Item 1) **[Figure 60-130-6]** from the loader.

Figure 60-130-7



Disconnect the wiring harness connectors (Item 1) **[Figure 60-130-7]** from the controller.

Figure 60-130-8



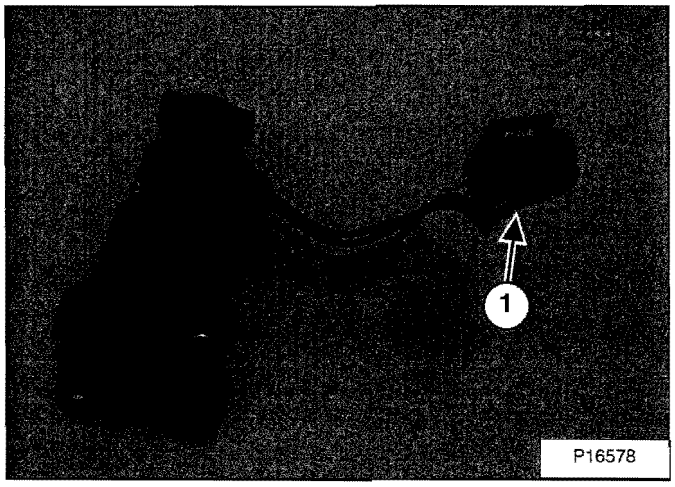
Remove the two mounting bolts (Item 1) **[Figure 60-130-8]** from the controller.

Remove the controller from the loader.

NOTE: The calibration procedure must be followed when replacing handle sensor, foot control sensor, actuator or ACS Controller. (See Calibration Of The ACS System on Page 60-130-14.)

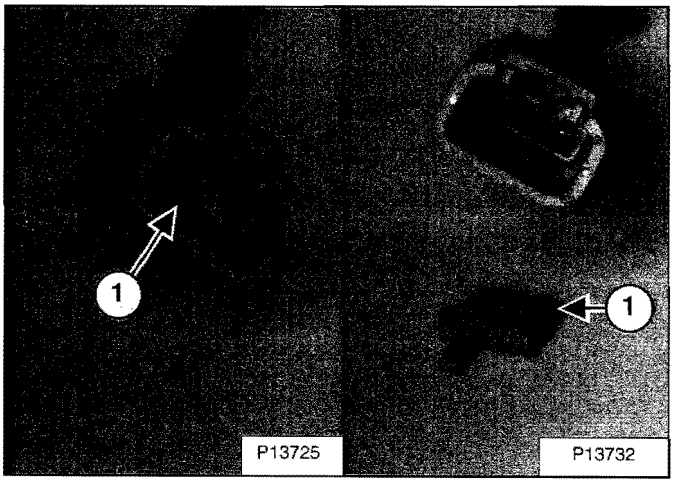
Handle Sensor Connector

Figure 60-130-9



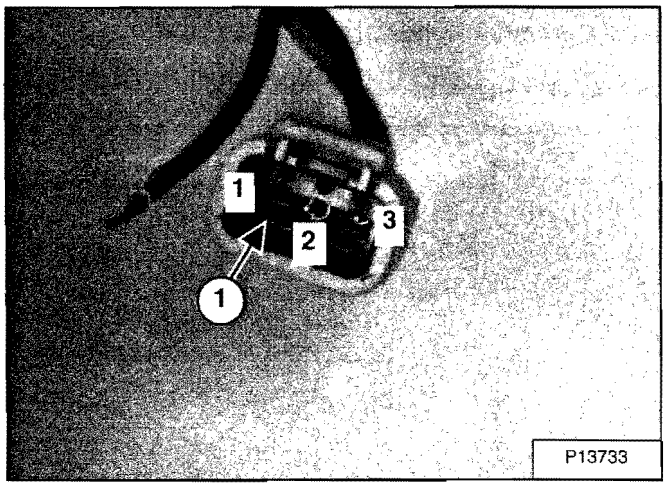
The wire connector (Item 1) **[Figure 60-130-9]** can be removed from the handle sensor wires, use the following procedure.

Figure 60-130-10



Remove the wedge (Item 1) **[Figure 60-130-10]** from the connector.

Figure 60-130-11



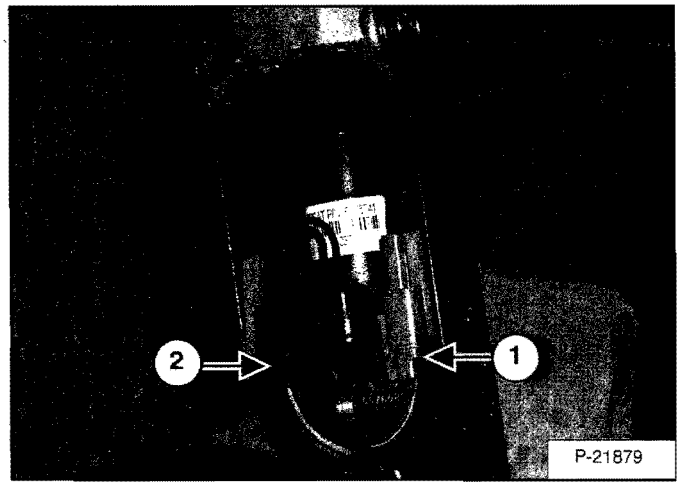
With a pointed tool, lift the tab (Item 1) **[Figure 60-130-11]** and pull the wire from the connector.

Installation: Install the wires into the connector as listed below **[Figure 60-130-11]**:

1-Terminal - Red
2-Terminal - Black
3-Terminal - Green

Switch Handle Removal

Figure 60-130-12

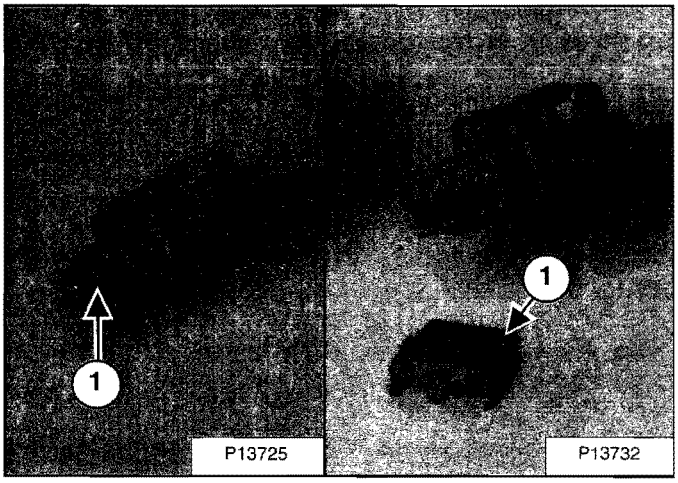


NOTE: Switch handle can be removed and installed while in loader.

Disconnect the harness connector (Item 1) **[Figure 60-130-12]** from the handle sensor connector.

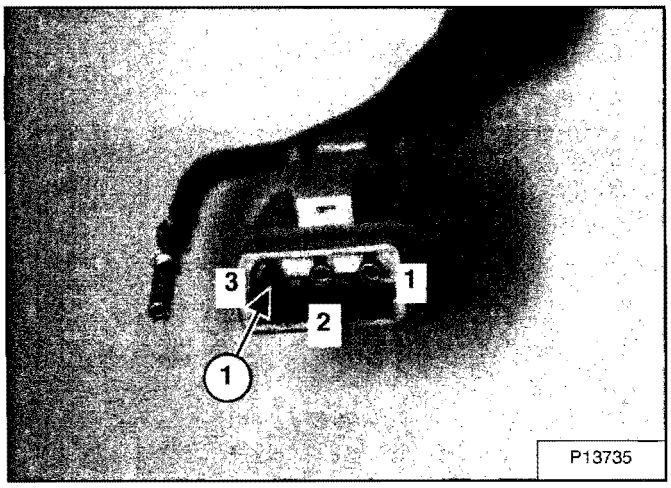
Disconnect the harness connector (Item 2) **[Figure 60-130-12]** from the handle lock solenoid connector.

Figure 60-130-13



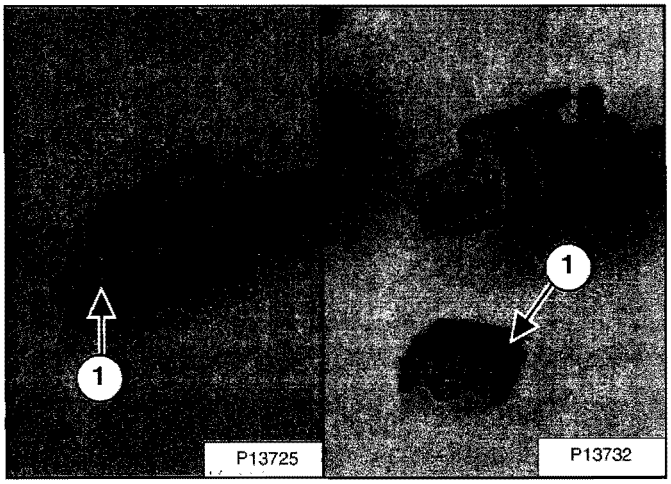
Remove the wedge (Item 1) **[Figure 60-130-13]** from the harness connector (Gray) that connects to the handle sensor connector.

Figure 60-130-14



Using a pointed tool, press down on the tab (Item 1) **[Figure 60-130-14]** and pull the wire from the connector.

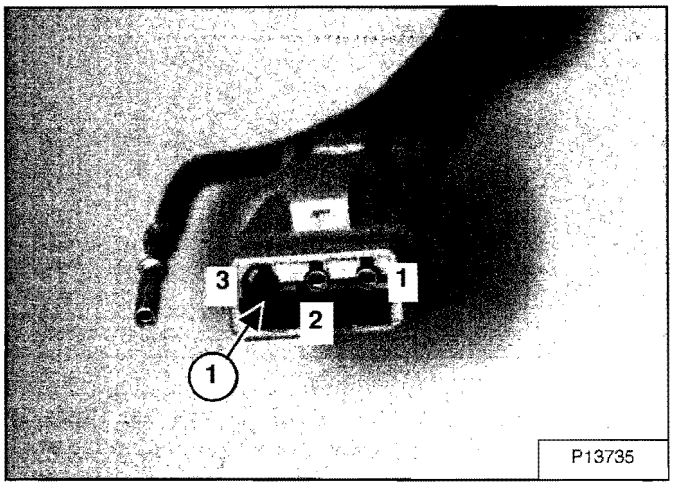
Figure 60-130-15



Remove the wedge (Item 1) **[Figure 60-130-15]** from the harness connector (Black) that connects to the handle lock solenoid connector.

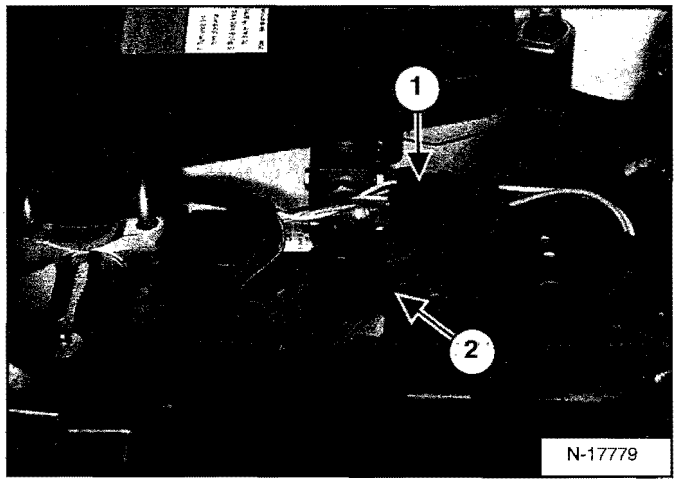
Switch Handle Removal (Cont'd)

Figure 60-130-16



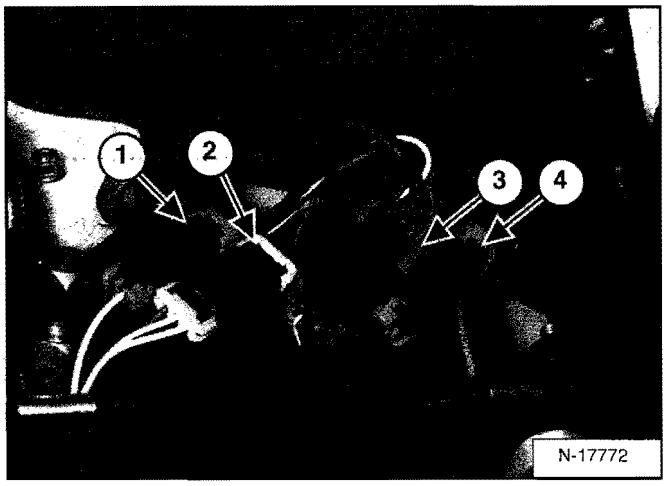
Use a pointed tool, press down on the tab (Item 1) **[Figure 60-130-16]** and pull the wire from the connector.

Figure 60-130-17



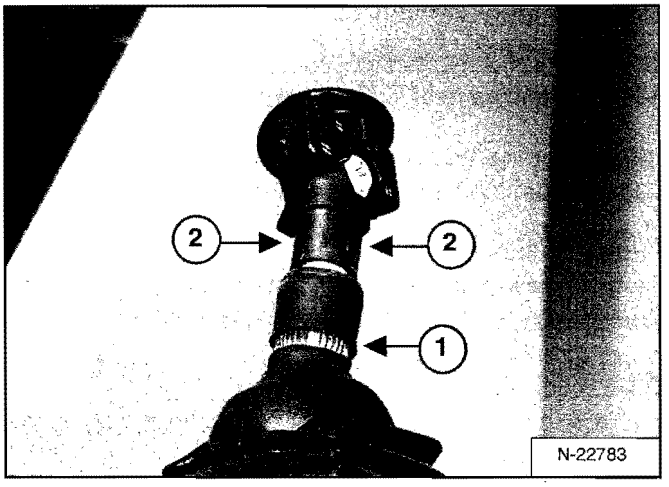
Disconnect the right switch handle connectors (Items 1 & 2) **[Figure 60-130-17]** from the loader wiring harness connectors.

Figure 60-130-18



Disconnect the left switch handle connectors (Items 1, 2, 3 & 4) **[Figure 60-130-18]** from the loader wiring harness connectors.

Figure 60-130-19

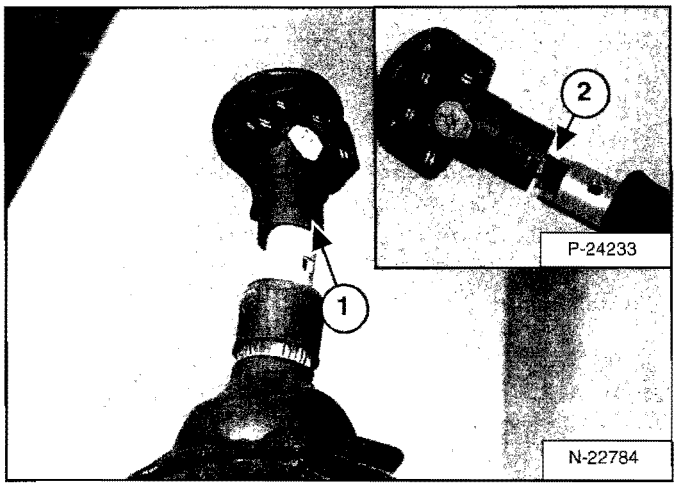


Roll the pistol grip handle cover (Item 1) **[Figure 60-130-19]** down.

Using a small screwdriver, lift the handle tabs (Item 2) **[Figure 60-130-19]** and slightly rotate the switch handle.

Switch Handle Removal (Cont'd)

Figure 60-130-20

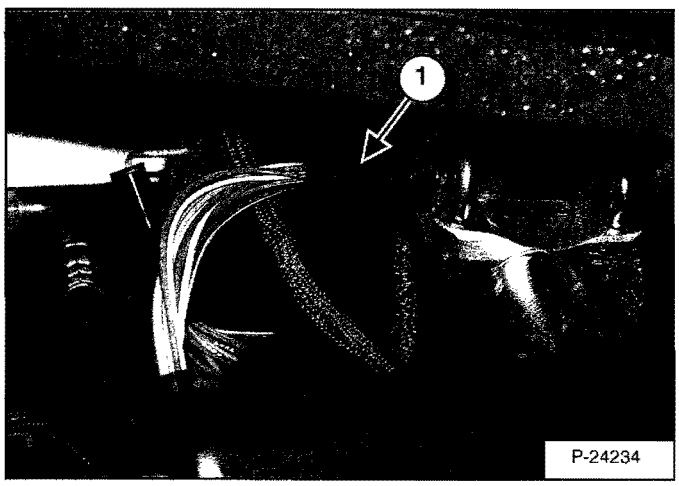


Pull the switch handle and wiring harness assembly (Item 1) **[Figure 60-130-20]** from the control lever.

Cut the wires (Item 2) **[Figure 60-130-20]** 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.

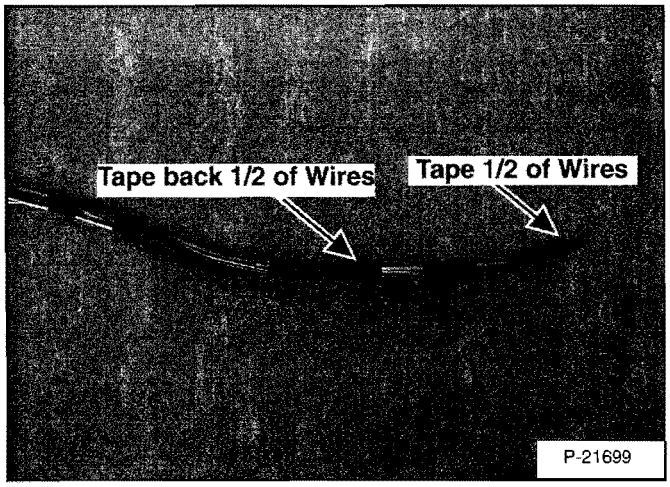
Figure 60-130-21



Pull harness (Item 1) **[Figure 60-130-21]** out the bottom of the control lever tube.

Switch Handle Installation

Figure 60-130-22



When installing the new switch handle, tape the wire terminals together.

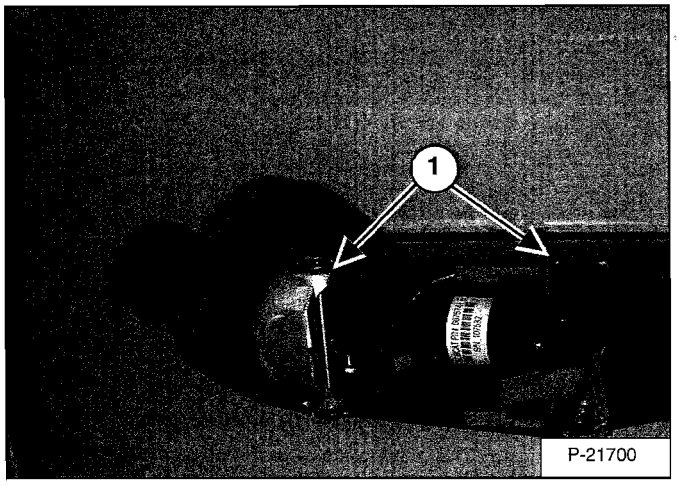
The switch handle comes with a 6 inch piece of heat shrink tube side on the end of the wires. Remove the heat shrink tube from the end of the wires before routing through handle and control lever tube.

NOTE: Leave all the other heat shrink tube on the wires for protection.

Tape half of the wires back and half forward **[Figure 60-130-22]** to keep the harness small enough to route through the control lever tube.

Switch Handle Installation (Cont'd)

Figure 60-130-23

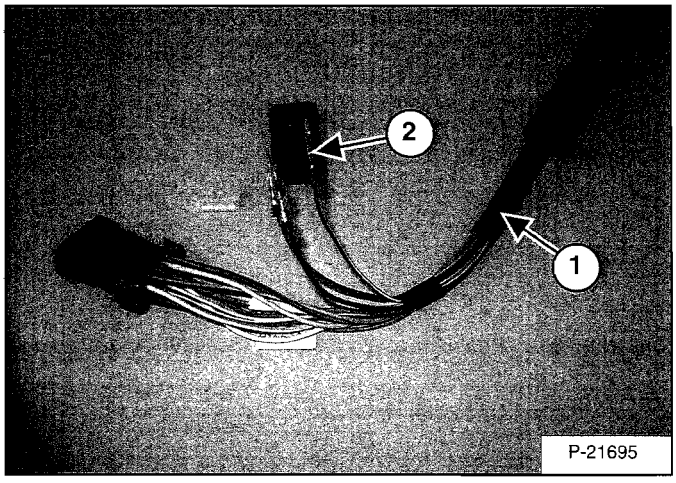


Install the new switch handle and wires from the top of the control lever.

Route wire (Item 1) **[Figure 60-130-23]** 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 60-130-24



Remove tape from wires for installation and install the 6 inches of heat shrink tube (Item 1) **[Figure 60-130-24]** approximately 3 inches into the control lever. Apply heat to the exposed heat shrink tube.

Inspect the wire terminal tabs (Item 2) **[Figure 60-130-24]** 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 60-130-25

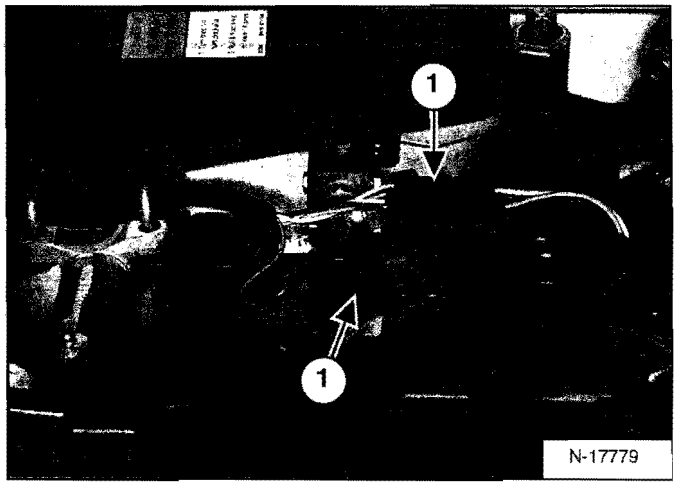
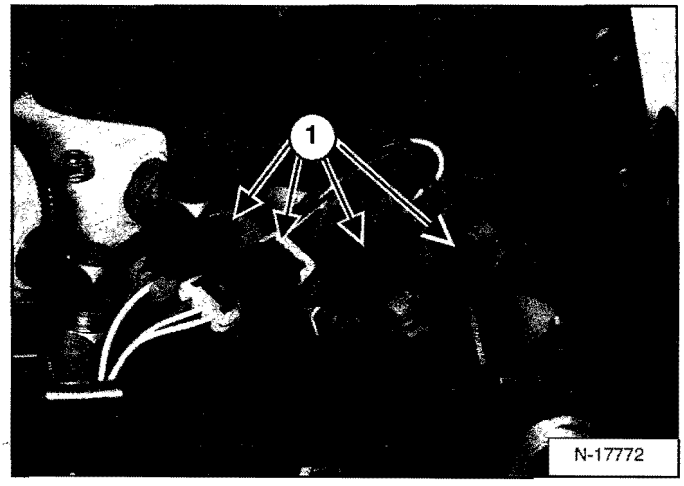
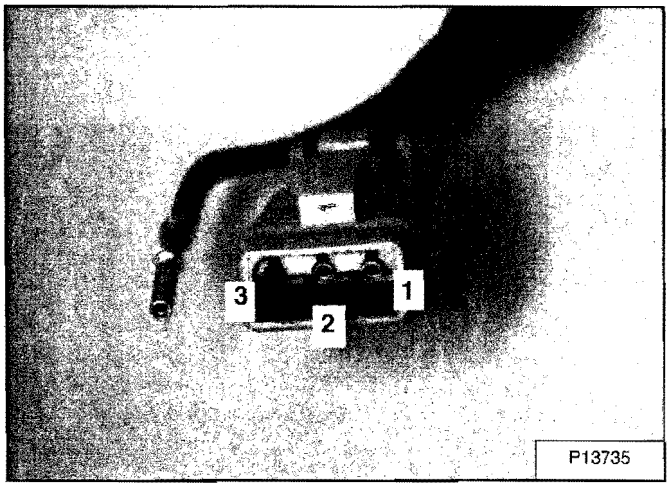


Figure 60-130-26



Connect the handle harness connectors (Item 1) **[Figure 60-130-25]** & **[Figure 60-130-26]** to the loader harness connectors.

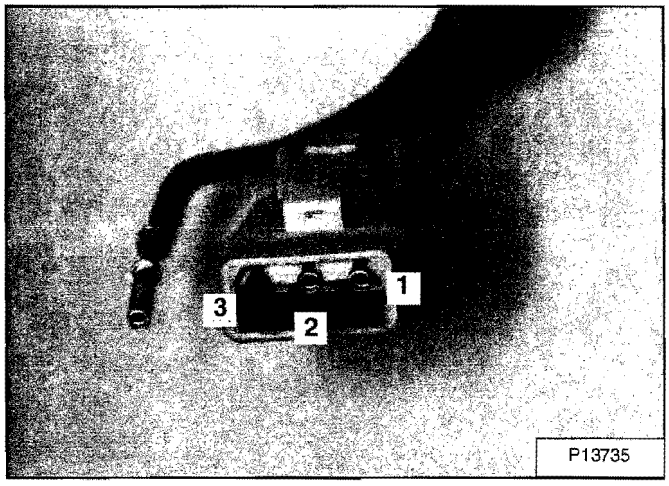
Figure 60-130-27



Install the wires into the connectors as listed below:

Left and Right Control Lever Switch Handle **[Figure 60-130-27]**
1-Terminal - Red/White
2-Terminal - Black/White
3-Terminal - Purple/White

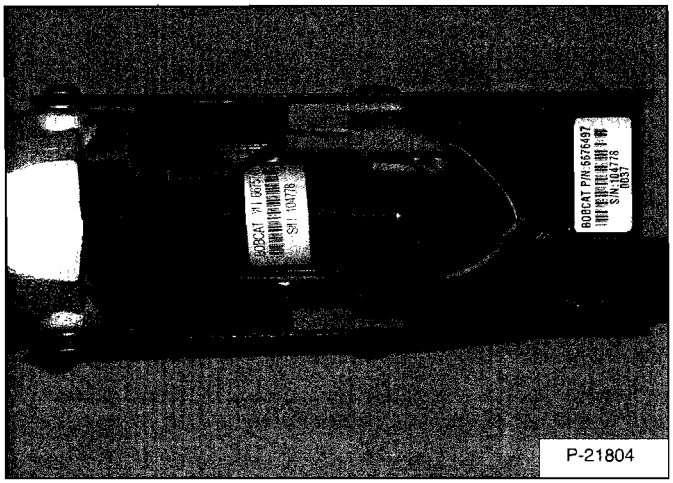
Figure 60-130-28



Left and Right Control Lever Switch Handle **[Figure 60-130-28]**
1-Terminal - Yellow/Red
2-Terminal - Open
3-Terminal - Orange/Black

Switch Handle Installation (Cont'd)

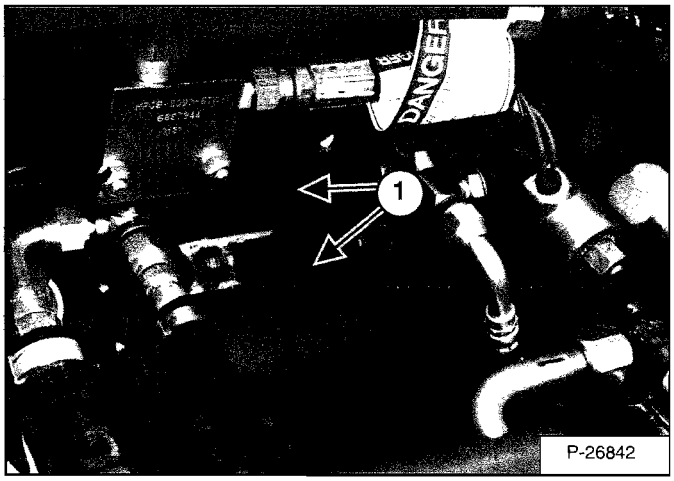
Figure 60-130-29



Connect the handle harness connectors to the sensor and lock solenoid connectors **[Figure 60-130-29]**.

Actuators Disassembly And Assembly

Figure 60-130-30

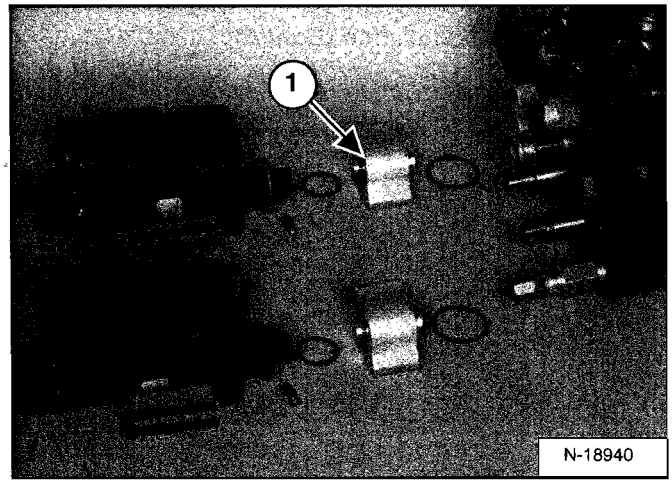


Remove the control panel. (See Contents Page 50-01.)

Remove the actuator (Item 1) **[Figure 60-130-30]** from the hydraulic control valve. (See Contents Page 20-01.)

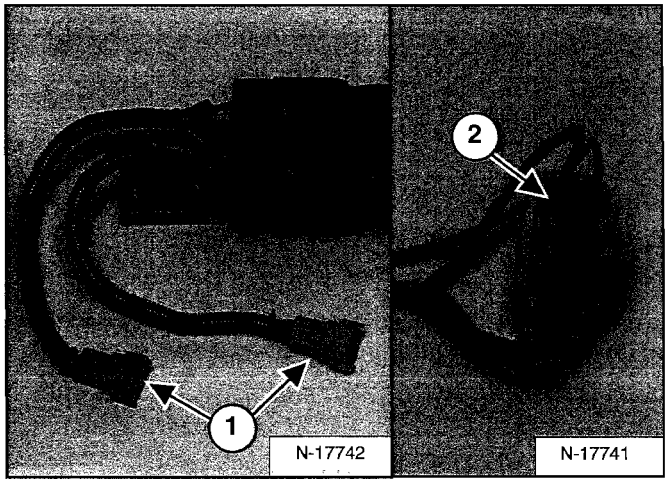
Installation: Tighten the mount bolts to 90-100 in.-lbs. (10,2-11,3 Nm) torque.

Figure 60-130-31



Check the mounting block (Item 1) **[Figure 60-130-31]** and bolts for wear and replace as needed.

Figure 60-130-32



Check the actuator wiring harness connector (Item 1) **[Figure 60-130-32]** and replace if broken.

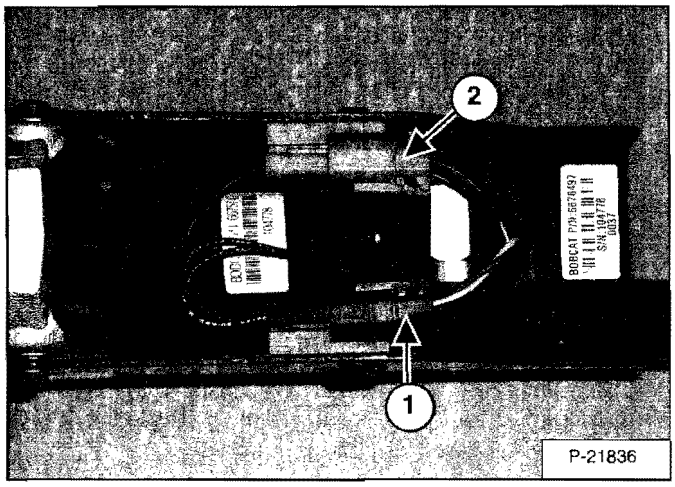
Installation: Install the wires into the connector as listed below. The terminal numbers are written on the back of the connector (Item 2) **[Figure 60-130-32]**.

Lift and Tilt Actuator
1 - Terminal-Black/Green-Larger dia. 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 - Terminal-Black-Smaller diameter wire (18 gauge)

NOTE: The calibration procedure must be followed when replacing a handle sensor, actuator or ACS controller. (See Calibration Of The ACS System on Page 60-130-14.)

Handle Lock Solenoid Removal And Installation

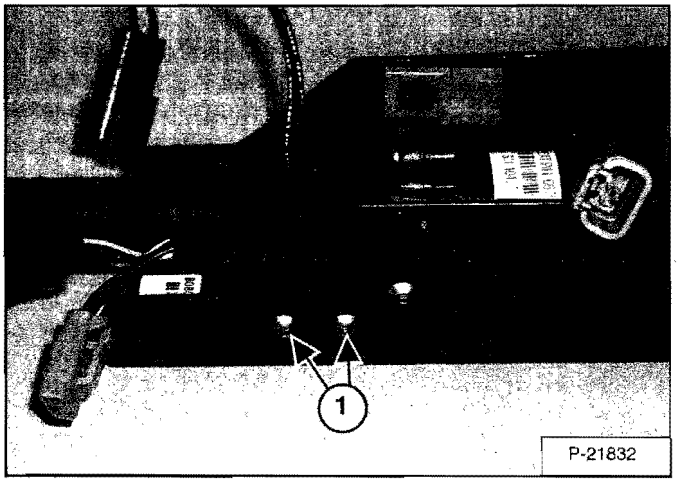
Figure 60-130-33



Disconnect the harness connector (Item 1) **[Figure 60-130-33]** from the handle sensor connector.

Disconnect the harness connector (Item 2) **[Figure 60-130-33]** from the handle lock solenoid connector.

Figure 60-130-34



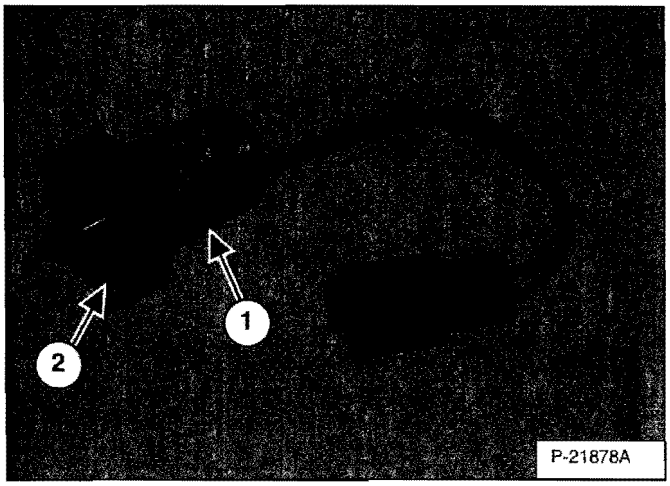
Remove the two screws (Item 1) **[Figure 60-130-34]** holding the handle lock solenoid to the handle.

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

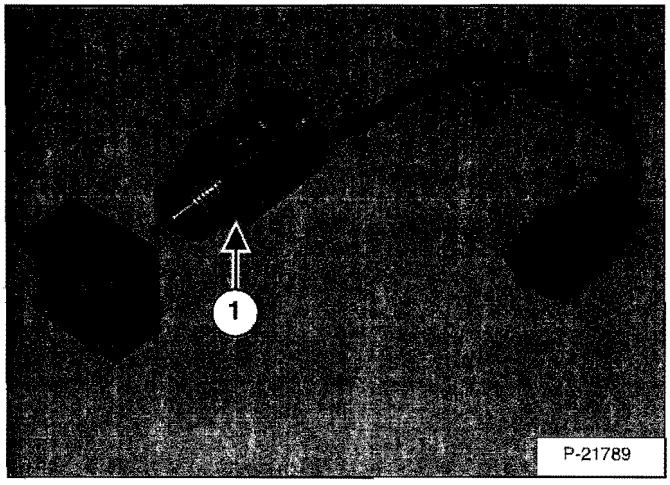
Figure 60-130-35



Remove solenoid (Item 1) from the solenoid mount (Item 2) **[Figure 60-130-35]**.

Installation: Apply a drop of oil to the solenoid threads and tighten solenoid to 35-40 ft.-lbs. (47-54 Nm) lubed torque.

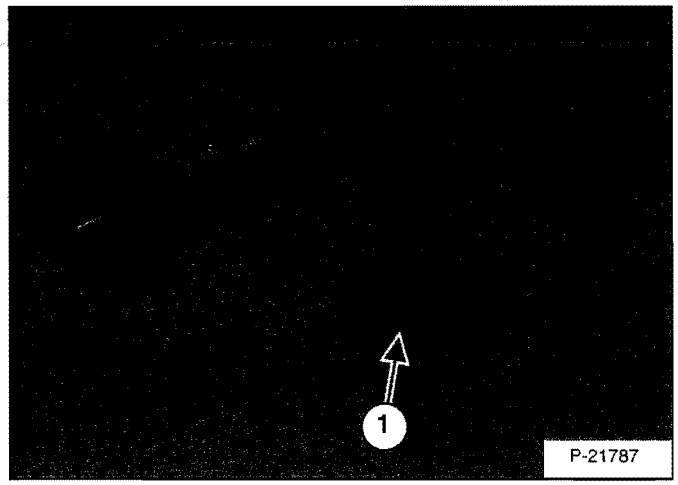
Figure 60-130-36



Check the O-ring (Item 1) **[Figure 60-130-36]** for damage. Replace as necessary.

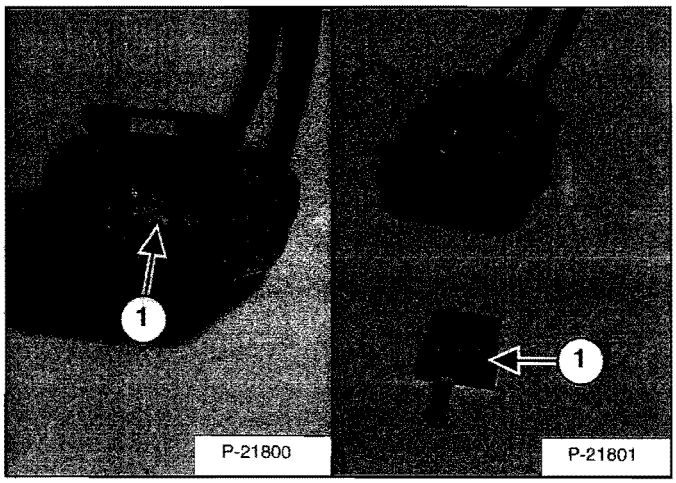
Handle Lock Solenoid Connector

Figure 60-130-37



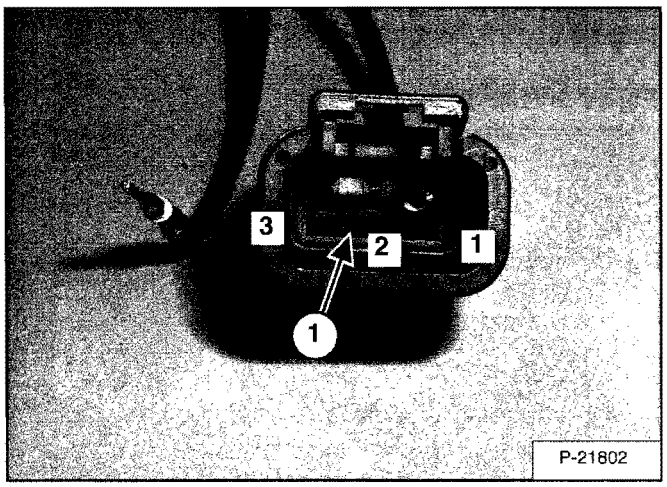
The wire connector (Item 1) **[Figure 60-130-37]** can be removed from the solenoid, use the following procedure.

Figure 60-130-38



Remove the wedge (Item 1) **[Figure 60-130-38]** from the connector.

Figure 60-130-39



With a pointed tool, lift the tab (Item 1) **[Figure 60-130-39]** and pull the wire from the connector.

Installation: Install the wires into the connector as listed below **[Figure 60-130-39]**.

1 - Terminal - Black
2 - Terminal - Open
3 - Terminal - Black

Calibration Of The ACS System

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.

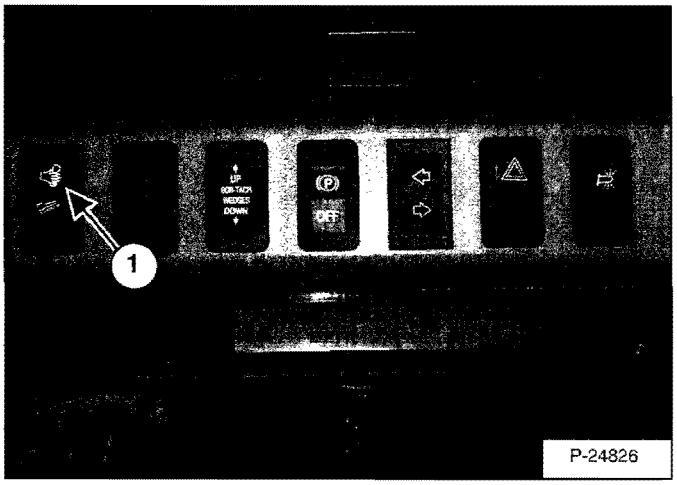
NOTE: This calibration procedure must be followed when replacing a handle sensor, actuator or ACS controller. Failure to calibrate after component replacement may result in poor performance or reduced life of actuator(s).

Calibration Procedure

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, actuator or ACS controller. Failure to calibrate after component replacement may result in poor performance or reduced life of actuator(s).

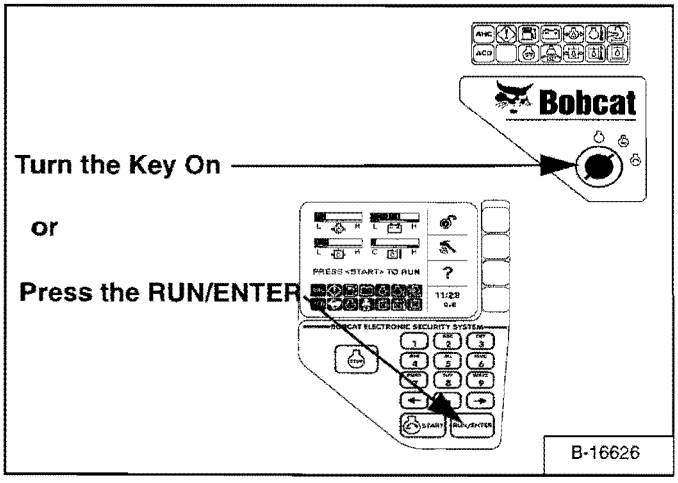
Figure 60-130-40



Update the loader service software to the latest version.

Place the rocker switch (Item 1) **[Figure 60-130-40]** in the hand control mode.

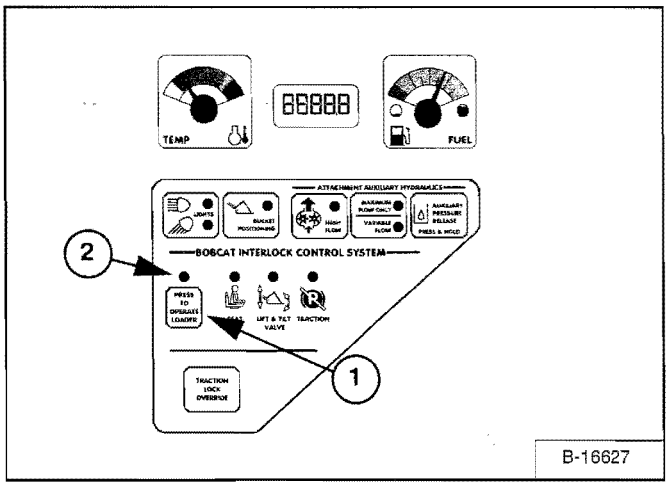
Figure 60-130-41



With the seat bar down, turn the ignition key ON (keyless panel press RUN/ENTER) **[Figure 60-130-41]**.

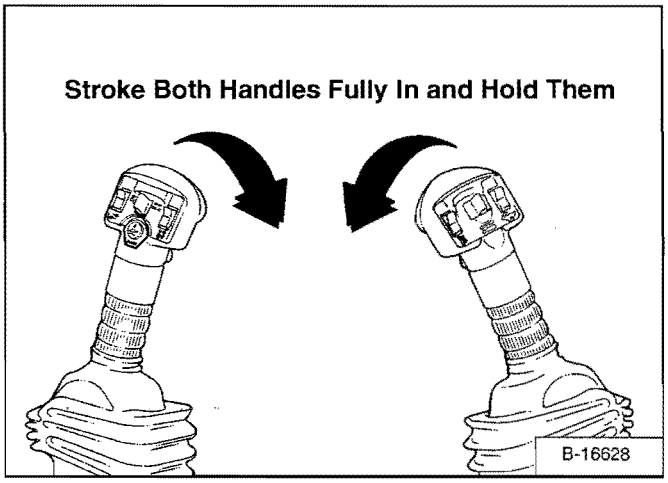
NOTE: Do not start the engine.

Figure 60-130-42



Push the PRESS TO OPERATE button (Item 1) **[Figure 60-130-42]** to unlock the hand controls.

Figure 60-130-43



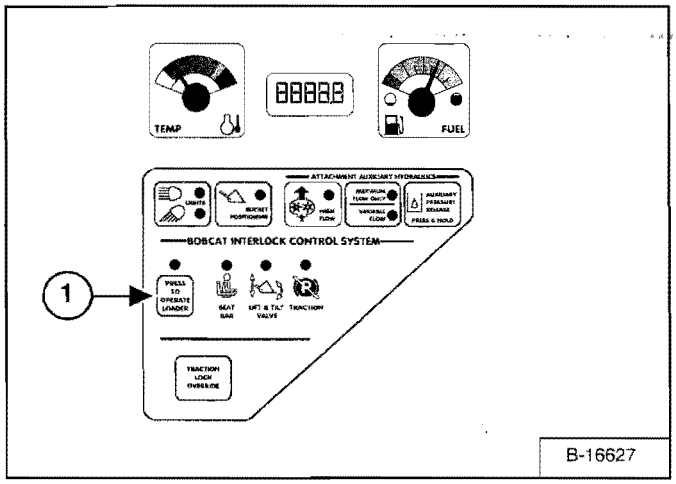
Fully stroke both control handles in toward the center of the cab and hold the handles **[Figure 60-130-43]**.

Lift the seat bar, high enough for the PRESS TO OPERATE light (Item 2) **[Figure 60-130-42]** to go **OFF**.

Lower the seat bar.

Calibration Procedure (Cont'd)

Figure 60-130-44



Push the PRESS TO OPERATE button (Item 1) **[Figure 60-130-44]** to begin calibration.

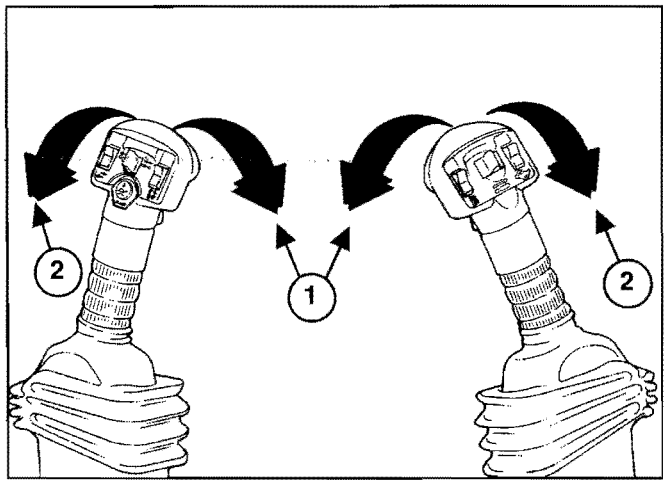
NOTE: The ACS icon will light up and if you listen closely the cycling of the actuators can be heard. The ACS icon will stay lit until the ignition key is cycled or the loader is started and a function is operated.

NOTE: During the calibration cycle, the system will beep three times. The calibration process generates two codes 32-35 (tilt handle not in neutral) and 32-40 (lift handle not in neutral). Ignore these two codes, this is normal during the calibration procedure.

Release the control handles.

NOTE: The remaining portion of the procedure must be completed in twenty seconds or less. If not the handles and pedals will lock and the procedure must be started over from the beginning.

Figure 60-130-45

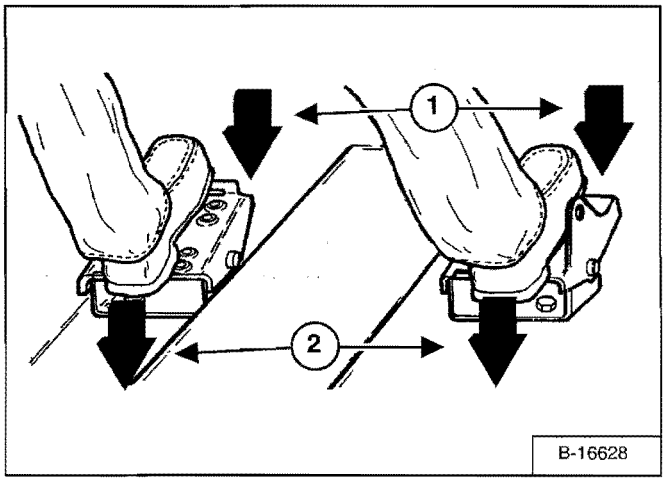


Fully move both handles in toward the center of the cab and hold the handles for one second (Item 1) **[Figure 60-130-45]**.

Fully move both handles out toward the cab side screens and hold for one second (Item 2) **[Figure 60-130-45]**.

Allow both handles to return to neutral.

Figure 60-130-46



Fully press the toe of the lift and tilt pedals (Item 1) **[Figure 60-130-46]** down and hold for one second.

Fully press the heel of the lift and tilt pedals (Item 2) **[Figure 60-130-46]** down and hold for one second.

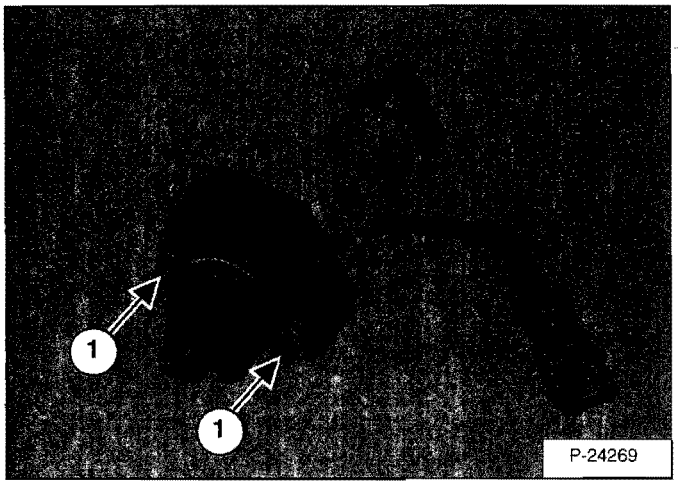
Allow both pedals to return to neutral.

At the end of the twenty second time frame, the handles and pedals will lock.

Calibration is complete.

Foot Sensor Disassembly And Assembly

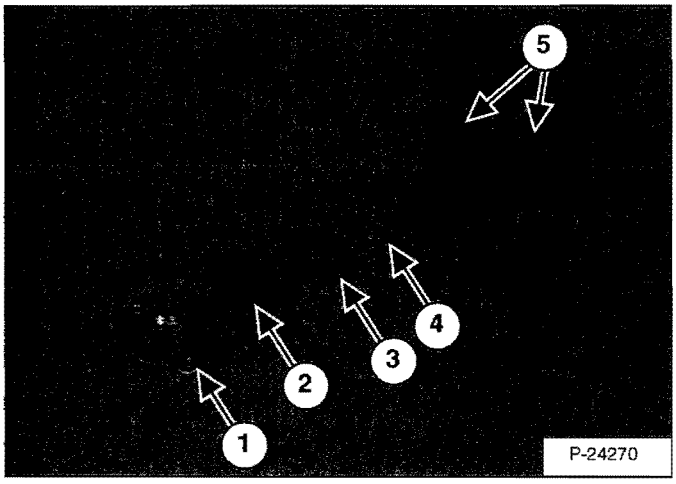
Figure 60-130-47



Remove the two bolts (Item 1) **[Figure 60-130-47]** 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 60-130-48

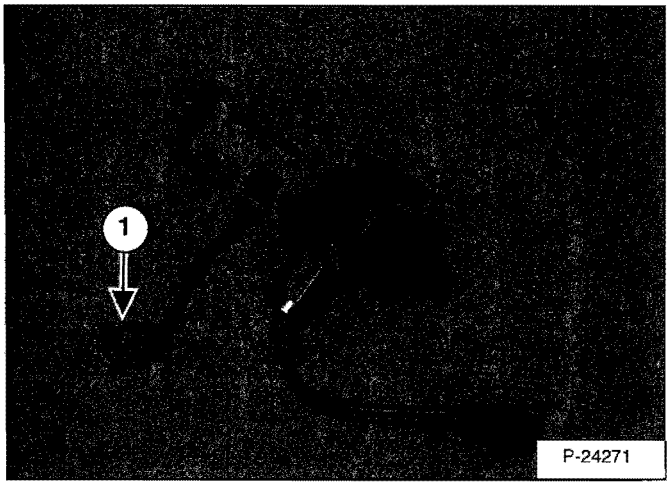


Remove the boot retainer (Item 1), boot (Item 2), spool stop plate (Item 3) and O-ring (Item 4) **[Figure 60-130-48]**.

NOTE: Do not disassemble the sensor assembly (Item 5) [Figure 60-130-48]. The sensor assembly is a calibrated assembly and cannot be serviced. Order through Bobcat Parts.

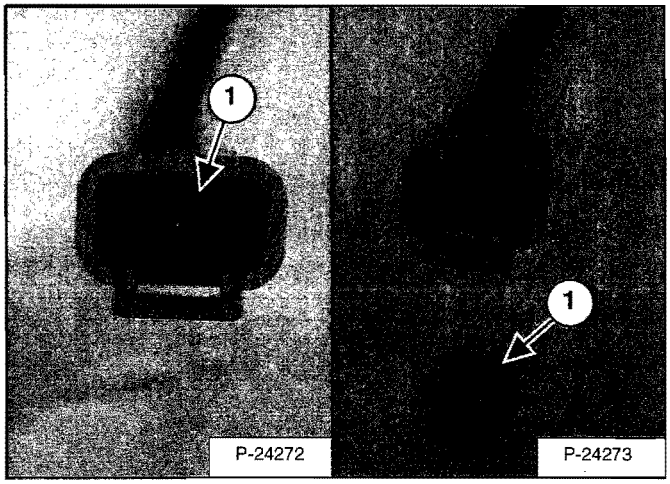
Foot Sensor Connector

Figure 60-130-49



The wire connector (Item 1) **[Figure 60-130-49]** can be removed from the sensor wires, use the following procedure.

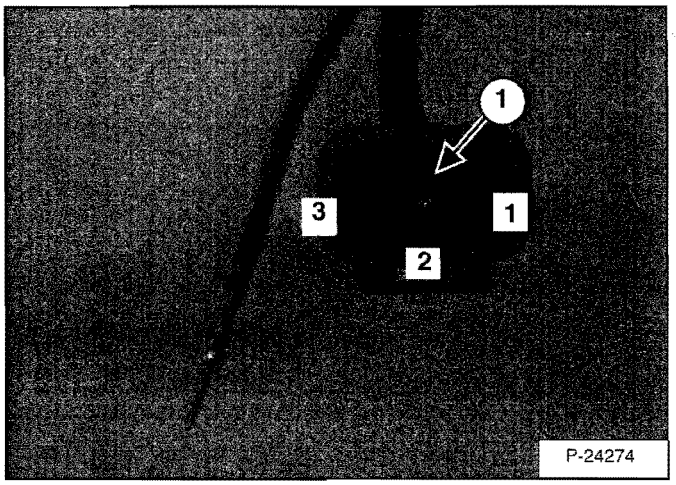
Figure 60-130-50



Remove the wedge (Item 1) **[Figure 60-130-50]** from the connector.

Foot Sensor Connector (Cont'd)

Figure 60-130-51



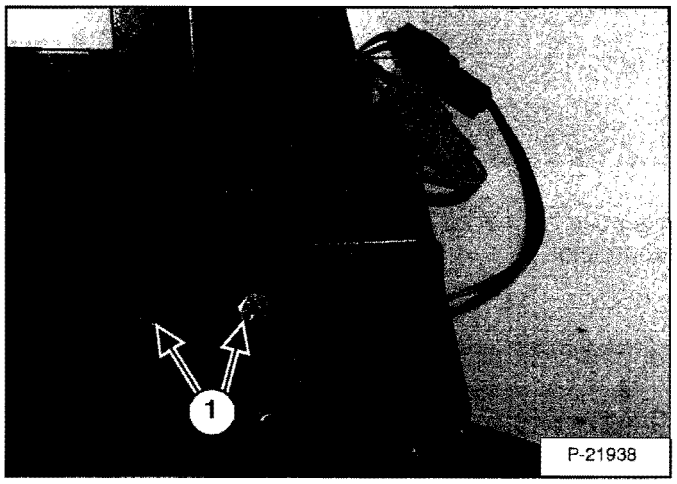
With a pointed tool, lift the tab (Item 1) **[Figure 60-130-51]** and pull the wire from the connector.

Installation: Install the wires into the connector as listed below [A]:

1 - Terminal - Red
2 - Terminal - Black
3 - Terminal - Green

Foot Lock Solenoid Removal And Installation

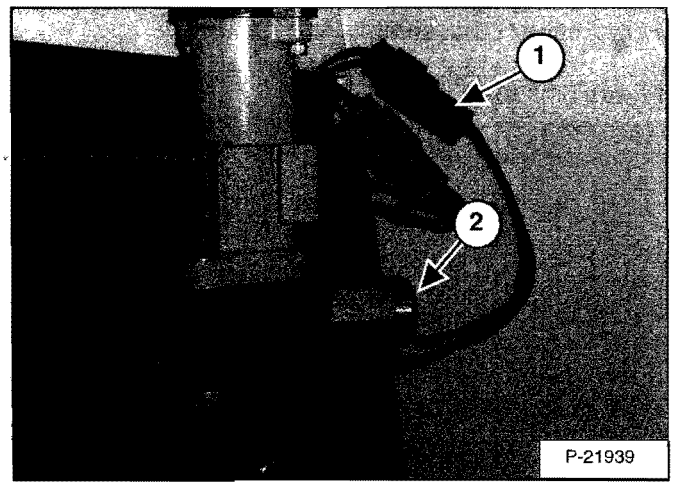
Figure 60-130-52



Remove the two bolts (Item 1) **[Figure 60-130-52]** from the foot sensor shield.

Installation: Tighten the bolts to 80-90 in.-lbs. (9,0-10,2 Nm) torque.

Figure 60-130-53

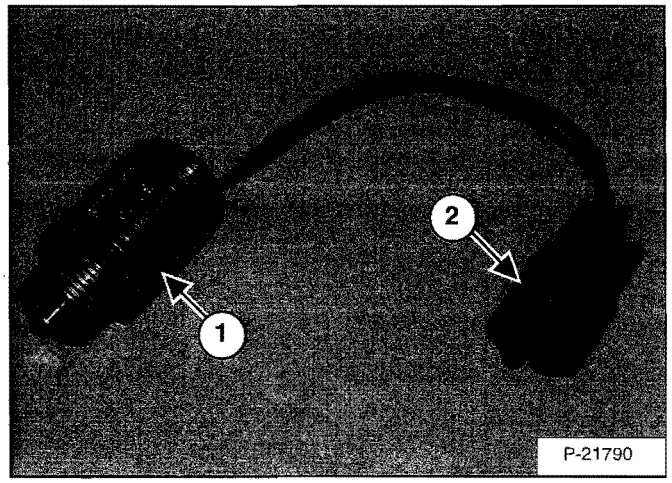


Disconnect the foot lock solenoid connector (Item 1) **[Figure 60-130-53]** from the harness.

Remove foot lock solenoid (Item 2) **[Figure 60-130-53]**.

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 60-130-54

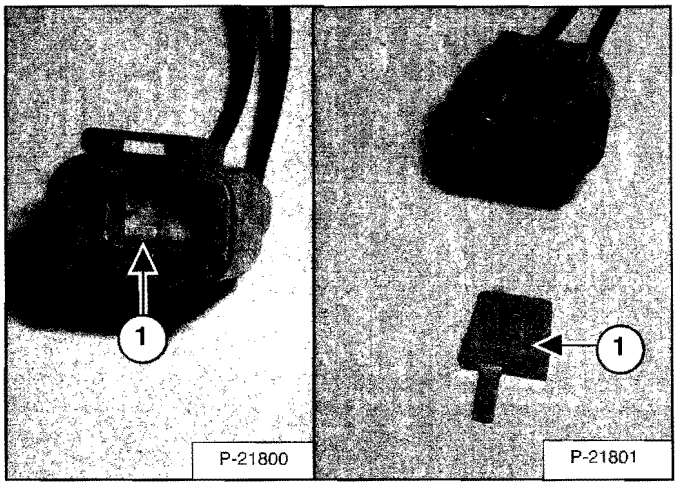


Check the O-ring (Item 1) **[Figure 60-130-54]** for damage. Replace as necessary.

Foot Lock Solenoid Connector

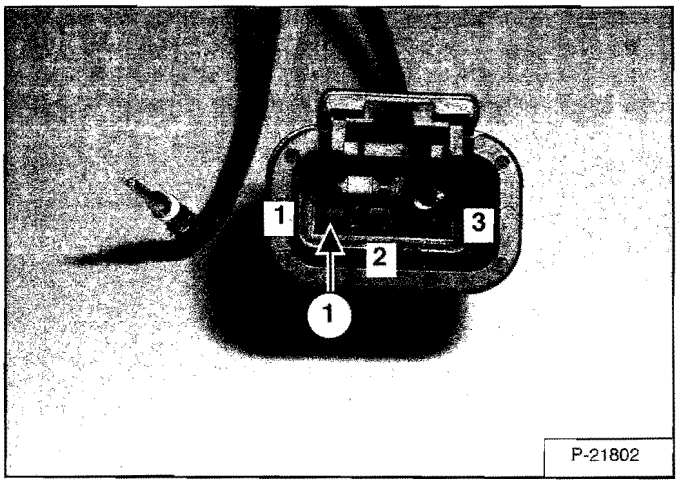
The wire connector (Item 2) **[Figure 60-130-54]** can be removed from the solenoid wires, use the following procedure.

Figure 60-130-55



Remove the wedge (Item 1) **[Figure 60-130-55]** from the connector.

Figure 60-130-56



With a pointed tool, lift the tab (Item 1) **[Figure 60-130-56]** and pull the wire from the connector.

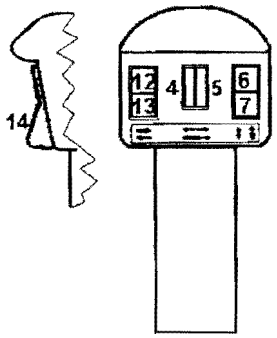
Installation: Install the wires into the connector as listed below **[Figure 60-130-56]**:

1 - Terminal - Black
2 - Terminal - Open
3 - Terminal - Black

Bobcat®

Controls Identification Chart

Left Side Control Handle Switches

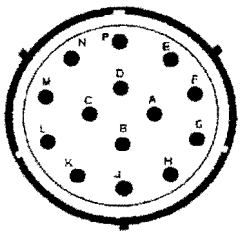


B-16447

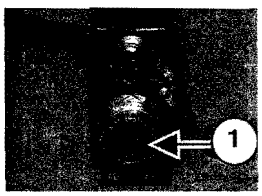
Switch Number	Solenoid Number Activated			Attachment Harness Terminal Activated
		RH	HFH	
1	1	1	1, 8	K
2	2	2	2	K
3	1	1	1, 8	K
4	2	2, 3	6, 7	K, A, D
5	1	1, 3	5, 7	K, A, C
6	1	1, 3	5, 7	K, E
7	1	1, 3	5, 7	K, F
8	1	1, 3	5, 7	K, G
9	1	1, 3	5, 7	K, H
10, 11, 12, 13, 14	-	--	--	K

Attachment Harness Connector

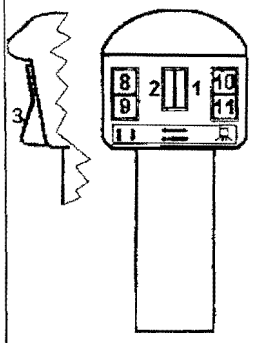
Fourteen Pin Connector Viewed from front (pin side of connector) of loader.



B-16449



Right Side Control Handle Switches



B-16448

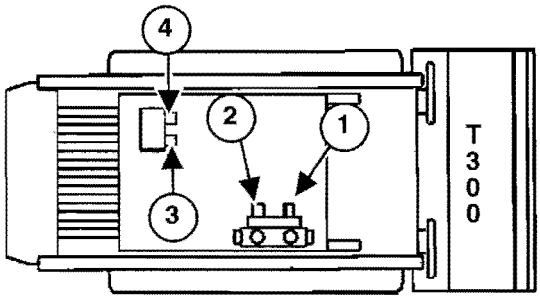
NOTE: All diagnostics must be done at the fourteen pin connector (Item 1). (If so equipped as a dealer installed kit.)

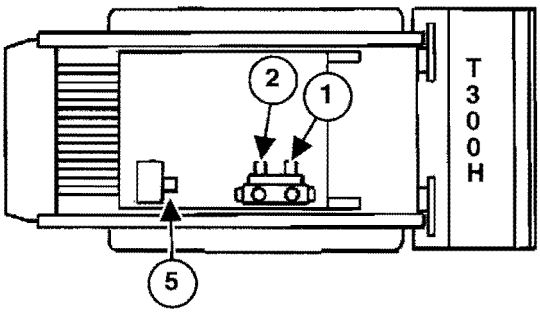
The ACD (Attachment Control Device) automatically recognizes the use of the seven or fourteen pin connector when connected.

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.
HFH - Loaders with High Flow 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)





Solenoid Number	Hydraulic Coupler	Wiring Number
1	Front Female (Rod)	4330
2	Front Male (Base)	4340
3 (Top)	Diverter	4450
4 (Bottom)	Bleed - Rear Male & Female	4480
5	High Flow on Pump	4460

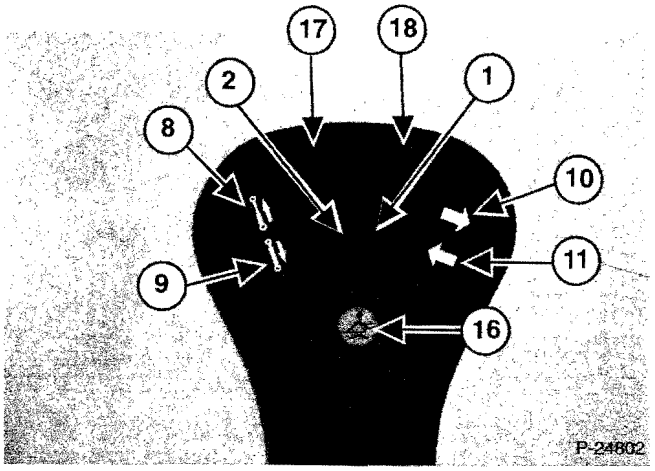
NOTE: Front Auxiliary Pressure Release is accomplished by manually pushing the male and female couplers in at the front auxiliary block.

The Hydraulic Pressure Release Button will activate solenoid number 4 at the diverter valve, shut down the loader, and bleed the rear auxiliary (If so equipped.) and also the right side front auxiliary. (If so equipped.)

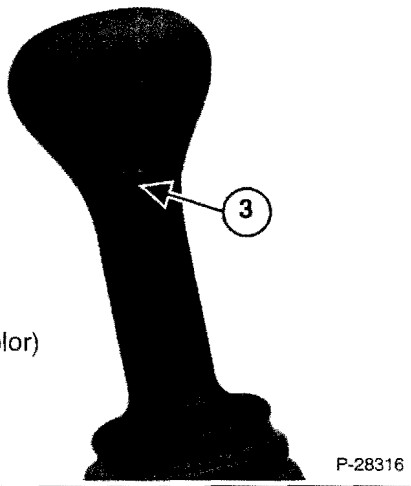
The Hi-Flow Button in the left side instrument panel must be pushed ON to activate solenoid number 5 at the gear pump.

Controls Identification Chart

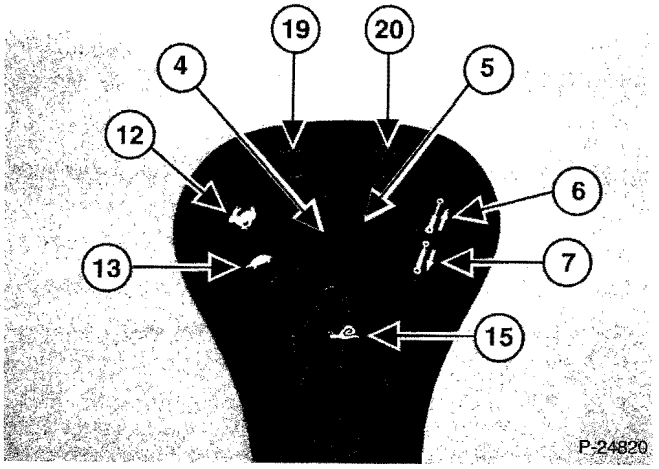
RIGHT HAND



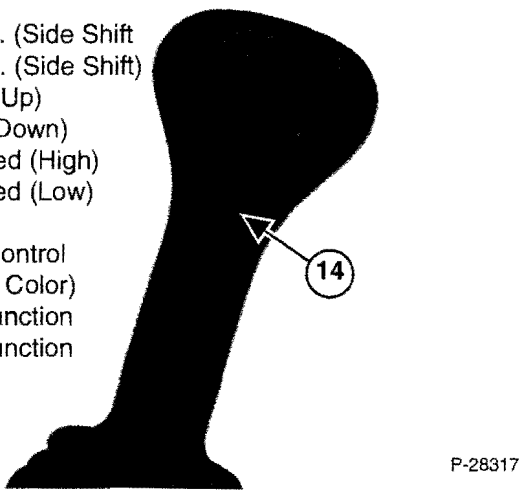
1. Front Aux.
2. Front Aux.
3. Auxiliary Detent
8. Right Ski (Up)
9. Right Ski (Down)
10. Right Blink
11. Left Blink
16. Float (Yellow in Color)
17. Future Function
18. Future Function



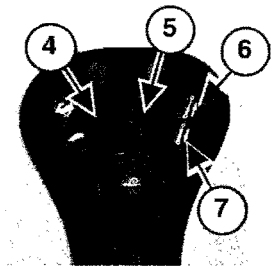
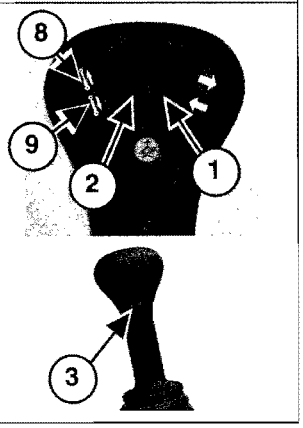
LEFT HAND



4. Rear Aux. (Side Shift
5. Rear Aux. (Side Shift)
6. Left Skit (Up)
7. Left Ski (Down)
12. Two-Speed (High)
13. Two-Speed (Low)
14. Horn
15. Inching Control (Grey in Color)
19. Future Function
20. Future Function

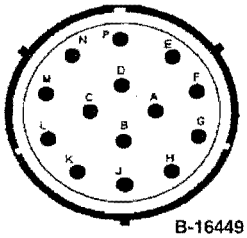


Controls Identification Chart (Cont'd)

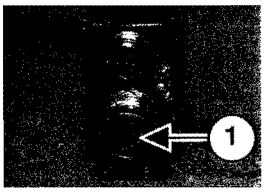
Left Side Control Handle Switches	Switch Number	Solenoid Number Activated				Attachment Harness Terminal Activated	Right Side Control Handle Switches
		STD	RH	HFH	HRH		
	1	1	1	1, 6	1, 6	K	
	2	2	2	2	2	K	
	3	1	1	1, 6	1, 6	K	
	4	2	3, 5	2	3, 5	K, A, D	
	5	1	3, 4	1	3, 4	K, A, C	
	6	1	3, 4	1	3, 4	K, E	
	7	1	3, 4	1	3, 4	K, F	
	8	1	3, 4	1	3, 4	K, G	
	9	1	3, 4	1	3, 4	K, H	

Attachment Harness Connector

Fourteen Pin Connector Viewed from front (pin side of connector) of loader.



B-16449



NOTE: All diagnostics must be done at the fourteen pin connector (Item 1). (If so equipped as a dealer installed kit.)

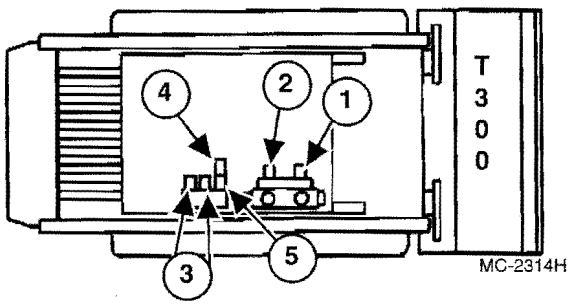
The ACD (Attachment Control Device) automatically recognizes the use of the seven or fourteen pin connector when connected.

If the ACD light flashes, check for diagnostic service codes. See the Electrical System Service Manual for the proper procedure.

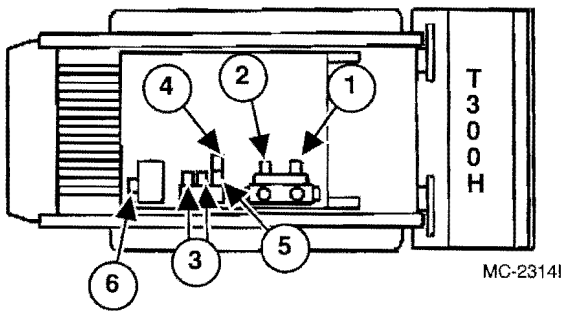
RH - Loaders with Rear Hydraulics Option.
HFH - Loaders with High Flow Hydraulics Option.
* If harness terminals K & L are jumped together, switches 4 thru 9 will function the same as switch 1 & 2.
* Terminal K is activated with Key switch ON.

HRH - Loaders with High Flow and Rear Hydraulics Option.

Controls Identification Chart (Cont'd)



MC-2314H



MC-2314I

Solenoid Number	Hydraulic Coupler	Wiring Number
1	Front Female (Base)	4340
2	Front Male (Rod)	4330
3	Diverter & Bleed	4450/4480
4	Rear Aux Base	4440
5	Rear Aux Rod	4430
6	High Flow on Pump	4460

NOTE: Front Auxiliary Pressure Release is accomplished by manually pushing the male and female couplers in at the front auxiliary block.

The Hydraulic Pressure Release Button will activate solenoid number 3 on the Standard Flow Loader and the High Flow Loader. (If so equipped.) It will also shut down the loader, and bleed the rear auxiliary. (If so equipped.)

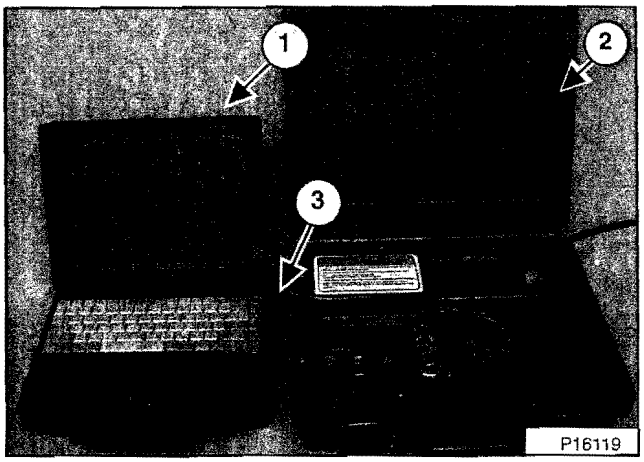
The Hi-Flow Button in the left side instrument panel must be pushed ON to activate solenoid number 6 on the select valve.

Bobcat®

SERVICE PC (LAPTOP COMPUTER)

Connecting The Service PC To Remote Start Tool

Figure 60-150-1



Tools that will be needed to complete the following steps are:

MEL1563 - Remote Start Tool
MEL1565 - Service Tool Harness Control
MEL1566 -Service Tool Harness Communicator (Computer Interface)

NOTE: Make all connections with the key in the OFF position.

The Service PC (Item 1) with the remote start tool (Item 2) **[Figure 60-150-1]**. When connected to the loader, the Service PC is used to monitor, conduct diagnostic and load software.

Connect the Service Tool Harness Communicator (MEL1566) (Item 3) **[Figure 60-150-1]** to the designated serial port on the Service PC.

NOTE: The recommended serial cable length should not exceed 15 feet. A serial cable longer than 15 feet will create a degraded signal causing communication errors.

Connect the other end to the connector on the remote start tool.

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

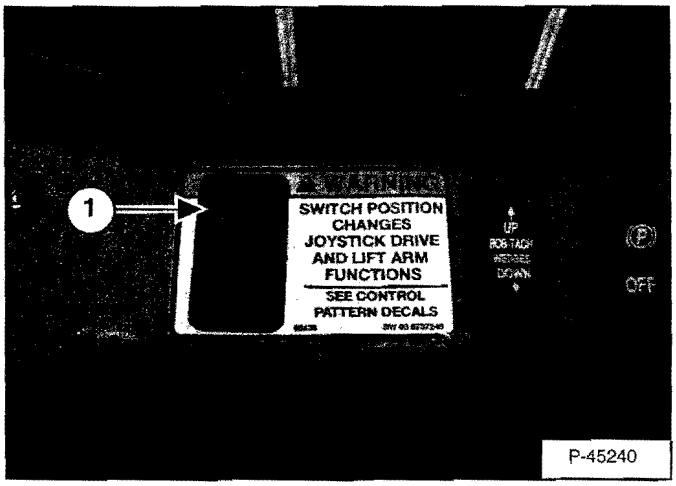
Bobcat®

LIFT AND TILT ACTUATOR CALIBRATION (SELECTABLE JOYSTICK CONTROL) (SJC)

Procedure

NOTE: This calibration procedure must be followed when replacing the lift or tilt actuator, SJC controller or joystick. Failure to calibrate after component replacement may result in poor performance or reduced life of actuator(s).

Figure 60-160-1

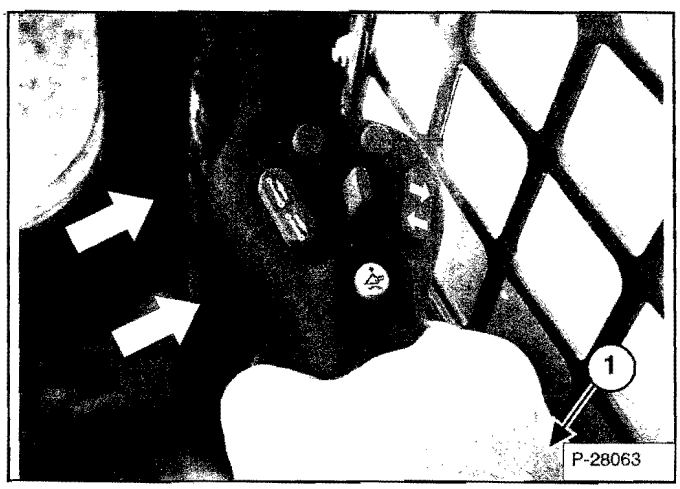


With an operator in the seat and the seat bar down.

Close the cab door. (If loader is so equipped.)

Place the loader Control Pattern Switch (Item 1) **[Figure 60-160-1]** in the **ISO** position.

Figure 60-160-2



Move the right joystick to the full forward position and toward the side screen **[Figure 60-160-2]** and hold in position.

Figure 60-160-3

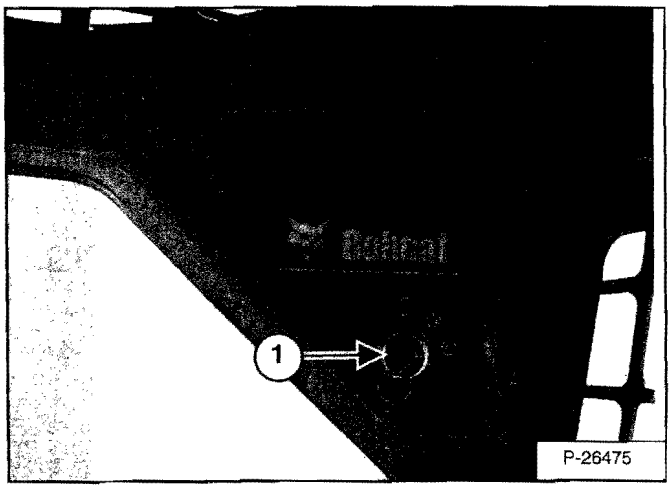
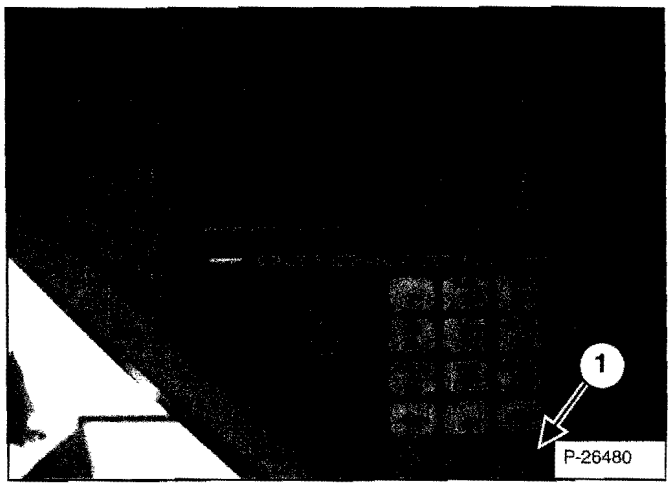


Figure 60-160-4

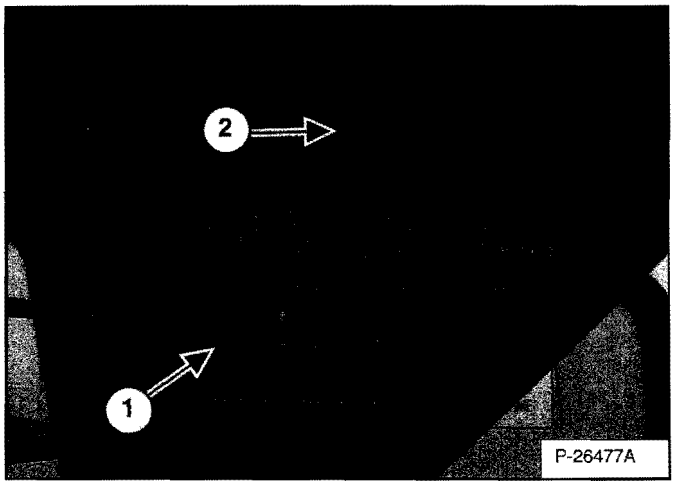


Turn the key (Item 1) **[Figure 60-160-3]** to the RUN position or press the RUN/ENTER button (Item 1) **[Figure 60-160-4]** for power, without starting the loader.

The loader Control Pattern Switch (Item 1) **[Figure 60-160-1]** will start flashing and will continue to flash until the calibration procedure is completed.

Procedure (Cont'd)

Figure 60-160-5



At the left panel, press the PRESS TO OPERATE Button (Item 1) **[Figure 60-160-5]**.

Release the joystick.

An audible beep will sound and an error code (Item 2) **[Figure 60-160-5]** (38-06 & 38-08) will be displayed if the operator presses the PRESS FOR CODES, (LIGHTS) switch.

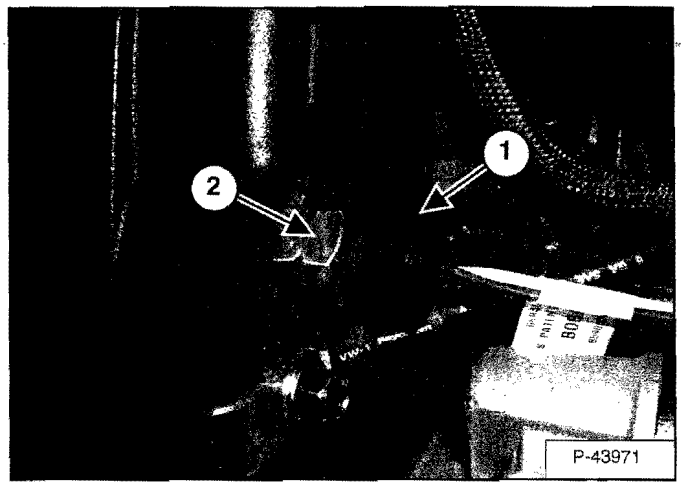
The *SJC* controller will cycle the actuators.

The calibration is complete.

FLYWHEEL RPM SENSOR

Adjustment

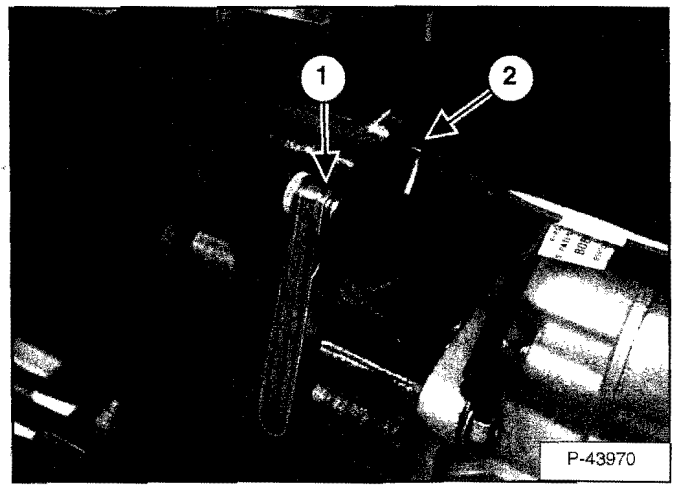
Figure 60-170-1



When reinstalling the RPM sensor, turn the RPM sensor (Item 1) **[Figure 60-170-1]** in until it makes contact with the engine flywheel.

Turn the jam nut (Item 2) **[Figure 60-170-1]** 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 60-170-2



Turn the RPM sensor and the jam nut out from the flywheel. Set a clearance of 0.050 inch. (1,27 mm) between the jam nut and the housing with a feeler gauge (Item 1) **[Figure 60-170-2]**.

Remove the feeler gauge.

Tighten the jam nut (Item 2) **[Figure 60-170-2]** to 12-17 ft.-lbs. (16-23 Nm) torque.

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.

Bobcat®

ENGINE SERVICE

Continued On Next Page

Continued On Next Page

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

Bobcat®

TROUBLESHOOTING

Chart

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

PROBLEM	CAUSE
Slow cranking speed.	1, 2, 3, 4
Engine will not start.	2, 5, 6, 7, 8, 9, 11, 12, 13, 14, 15, 16, 17, 19, 27, 28, 29
Difficult to start.	5, 7, 8, 9, 10, 11, 12, 13, 15, 16, 17, 18, 19, 20, 25, 27, 28, 29
No power 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, 46, 47
Low oil pressure.	4, 31, 32, 33, 34, 35, 37, 38, 39, 45, 48
Engine knocking.	13, 15, 16, 19, 22, 24, 25, 27, 29, 31, 40, 41, 49
Engine running rough.	7, 8, 9, 10, 11, 12, 13, 17, 18, 22, 24, 25, 26, 29, 40, 49
Vibration.	2, 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, 32, 40, 44, 47
Too much crankcase pressure.	22, 27, 29, 46
Poor compression.	10, 16, 21, 24, 25, 27, 28, 29, 30, 41, 49
Start and stop.	9, 10, 11

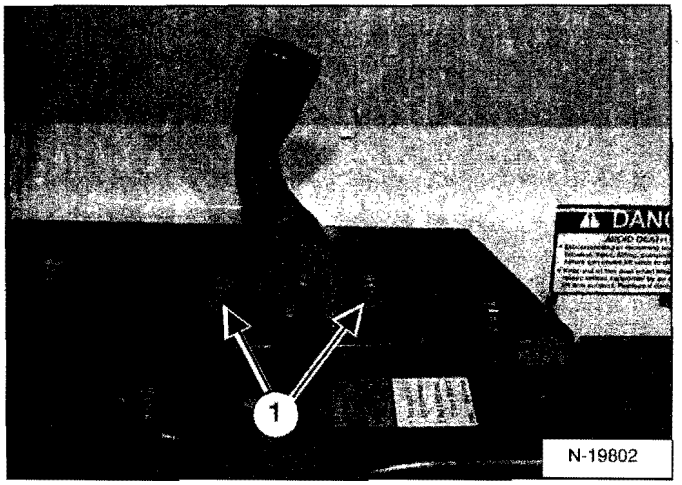
Chart (Cont'd)

KEY TO CORRECT THE CAUSE	
1. Battery capacity low.	26. Incorrect high pressure fuel pipes.
2. Bad electrical connections.	27. Worn cylinder bores.
3. Faulty starter motor.	28. Worn valve and seats.
4. Incorrect grade of oil.	29. Broken, worn or sticking piston rings.
5. Low cranking speed.	30. Worn valve stems or guides.
6. Fuel tank empty.	31. Worn or damaged bearings.
7. Faulty stop control operation.	32. Not enough oil in the oil pan.
8. Plugged fuel line.	33. Switch/sensor is defective.
9. Plugged fuel filter.	34. Oil pump worn.
10. Restriction in the air cleaner.	35. Pressure relief valve is sticking open.
11. Air in the fuel system.	36. Pressure relief valve is sticking closed.
12. Faulty fuel injection pump.	37. Broken relief valve spring.
13. Faulty fuel injectors.	38. Faulty suction pipe.
14. Broken injection pump drive.	39. Plugged oil filter.
15. Incorrect injection pump timing.	40. Piston seizure.
16. Incorrect valve timing.	41. Incorrect piston height.
17. Poor compression.	42. Faulty engine mounting.
18. Plugged fuel tank vent.	43. Incorrect alignment of flywheel.
19. Incorrect grade of fuel.	44. Faulty thermostat.
20. Exhaust pipe restriction.	45. Plugged oil cooler.
21. Cylinder head gasket leaking.	46. Plugged PCV system.
22. Overheating.	47. Damaged valve stem oil deflectors.
23. Cold running.	48. Plugged oil pump pipe strainer.
24. Incorrect tappet adjustment.	49. Broken valve spring.
25. Sticking valves.	

ENGINE SPEED CONTROL

Removal And Installation

Figure 70-20-1

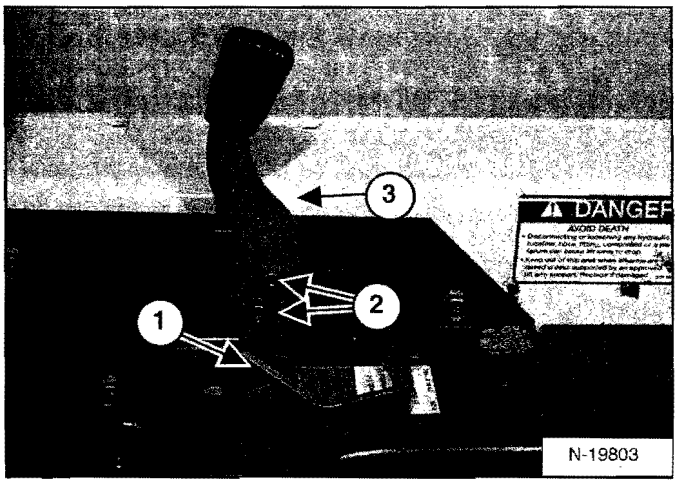


Raise the lift arms and install an approved lift arm device. (See Contents Page 10-01.)

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

Remove the two mounting bolts (Item 1) **[Figure 70-20-1]**.

Figure 70-20-2



Mark the front of the stop bracket (Item 1) **[Figure 70-20-2]** and remove the stop bracket.

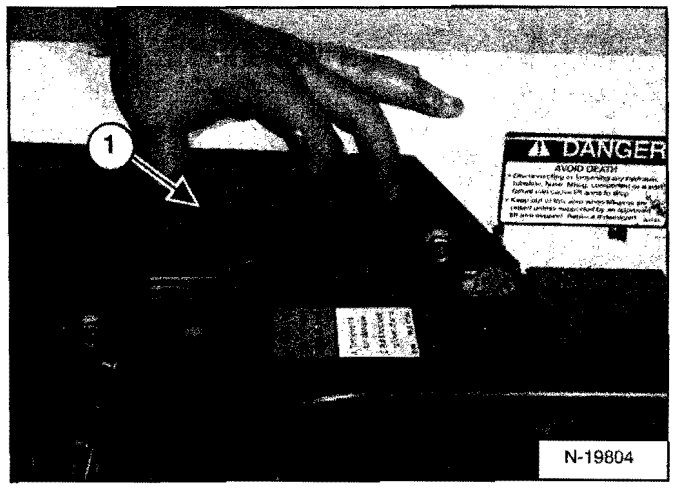
Installation: It is important for the front and rear stop on the bracket to be located correctly.

Remove the bolts (Item 2) **[Figure 70-20-2]**.

Installation: Tighten the bolts evenly until the speed control lever moves backward and forward at a comfortable tension.

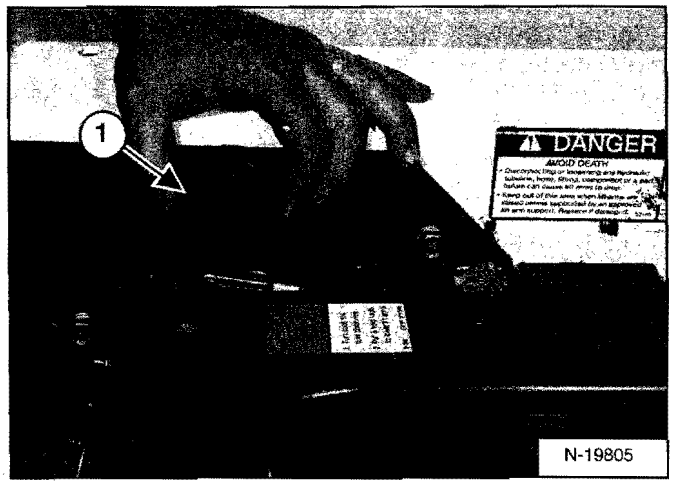
Remove the speed control lever (Item 3) **[Figure 70-20-2]**.

Figure 70-20-3



Remove the mounting bracket (Item 1) **[Figure 70-20-3]** from the speed control arm (Item 1) **[Figure 70-20-4]**

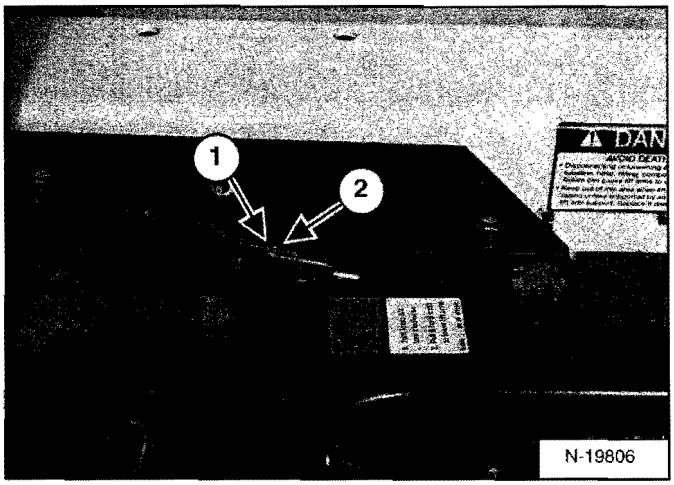
Figure 70-20-4



NOTE: Do not lubricate the speed control parts when assembling.

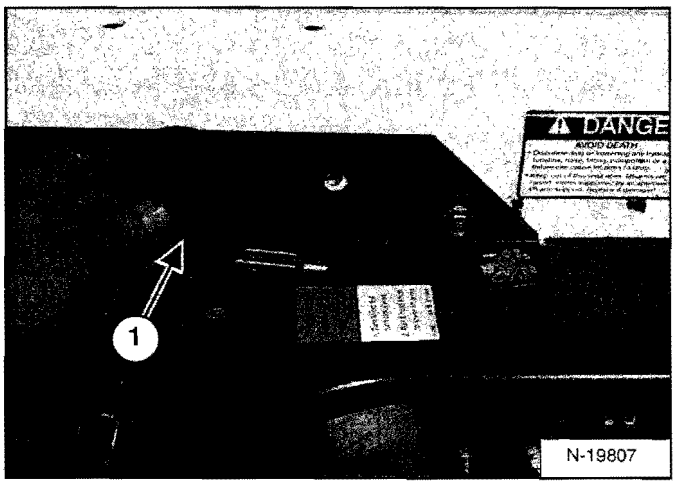
Removal And Installation (Cont'd)

Figure 70-20-5



Remove the retainer pin (Item 1) and pivot pin (Item 2) **[Figure 70-20-5]** from the speed control arm, to disconnect the speed control cable clevis.

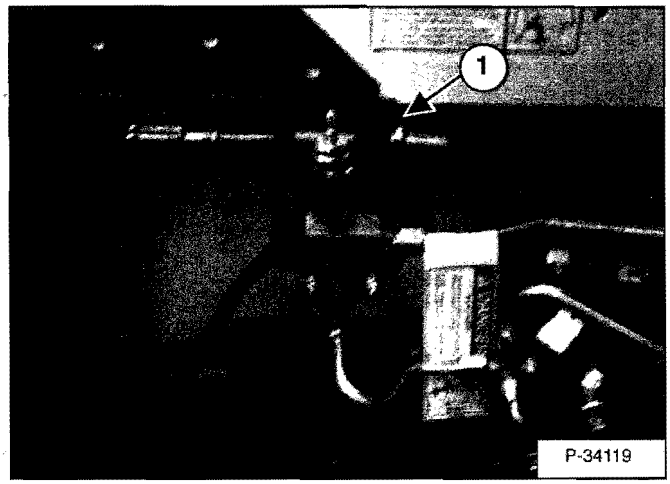
Figure 70-20-6



Remove the speed control arm (Item 1) **[Figure 70-20-6]** from the loader.

Speed Control Cable

Figure 70-20-7



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

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

Remove the speed control lever assembly. (See Removal And Installation on Page 70-20-1.)

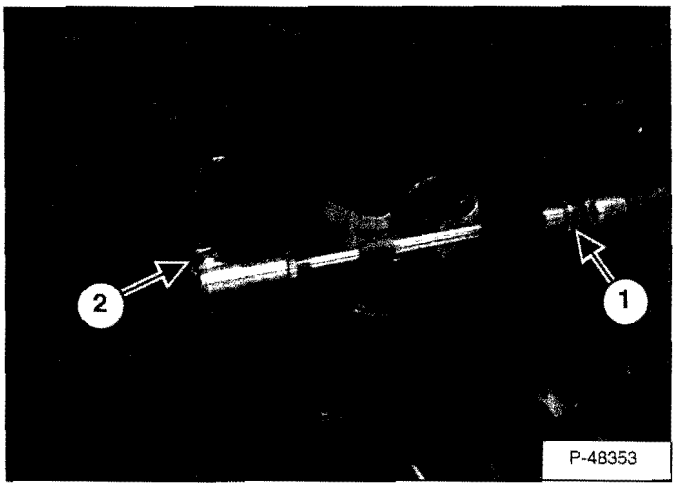
NOTE: The front panel/steering levers are shown removed for clarity.

Remove the u-bolt (Item 1) **[Figure 70-20-7]** from the cable.

Open the rear door.

Speed Control Cable (Cont'd)

Figure 70-20-8



Loosen the jam nut (Item 1) **[Figure 70-20-8]** from the speed control cable.

Remove the nut (Item 2) **[Figure 70-20-8]**, and disconnect the cable from the linkage.

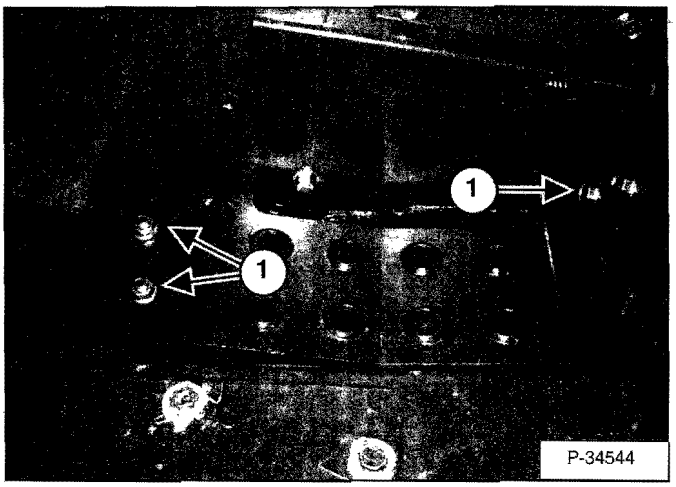
Remove the speed control cable.

Bobcat®

ENGINE SPEED CONTROL (SELECTABLE JOYSTICK CONTROL) (SJC)

Removal

Figure 70-21-1



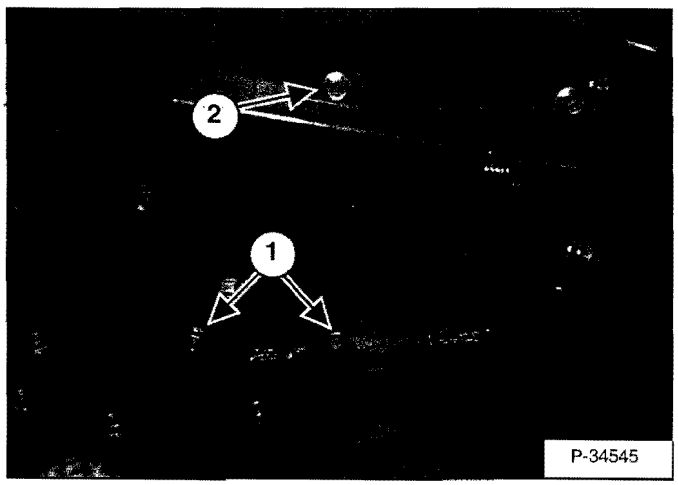
Raise the lift arms and install an approved lift arm support device. (See Contents Page 10-01.)

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

Remove the three mounting bolts (Item 1) **[Figure 70-21-1]**, from the right side foot rest.

Remove the foot rest, from the loader.

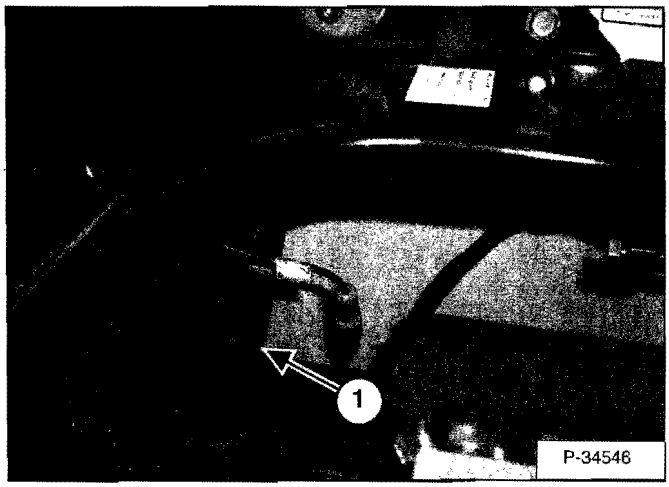
Figure 70-21-2



Loosen the two lower access panel mount bolts (Item 1) **[Figure 70-21-2]**

Remove the upper mount bolt (Item 2) **[Figure 70-21-2]**

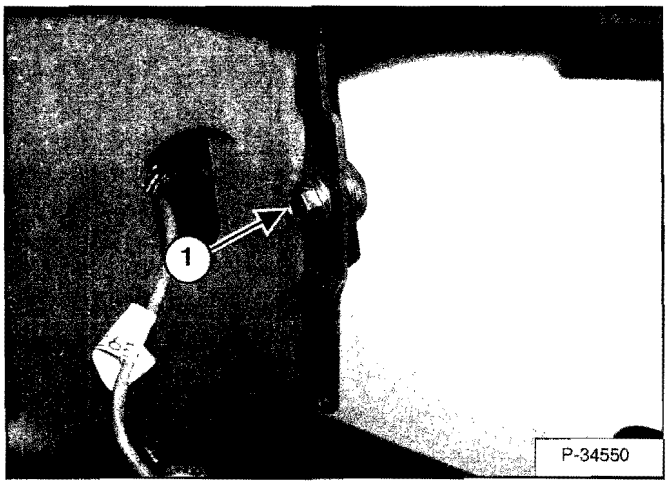
Figure 70-21-3



Disconnect the foot speed control linkage (Item 1) **[Figure 70-21-3]** from the hand control pivot arm.

Remove the foot speed control assembly from the loader.

Figure 70-21-4

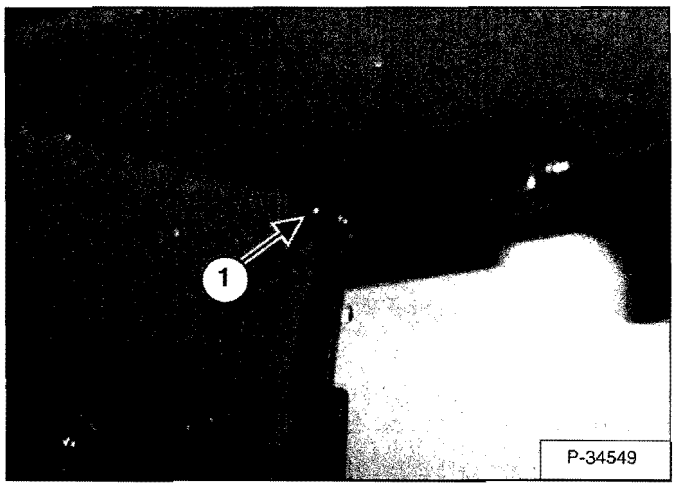


Remove the bolt and nut (Item 1) **[Figure 70-21-4]** from the hand speed control pivot arm.

ENGINE SPEED CONTROL (SELECTABLE JOYSTICK CONTROL) (SJC) (CONT'D)

Removal (Cont'd)

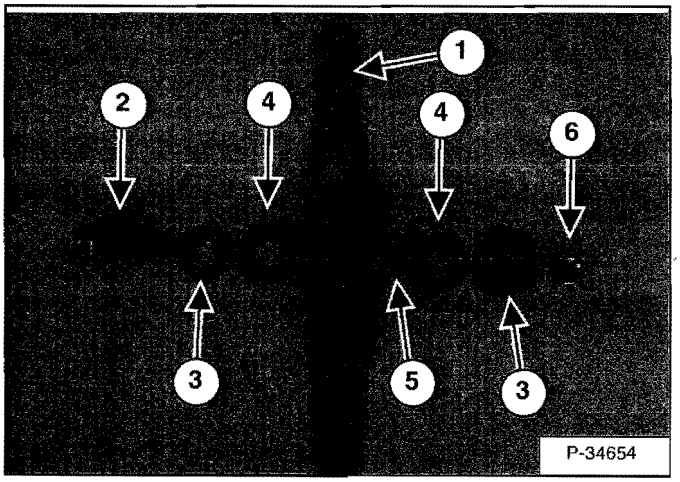
Figure 70-21-5



Remove the keeper and pin (Item 1) **[Figure 70-21-5]** that attaches the pivot arm to the speed control cable.

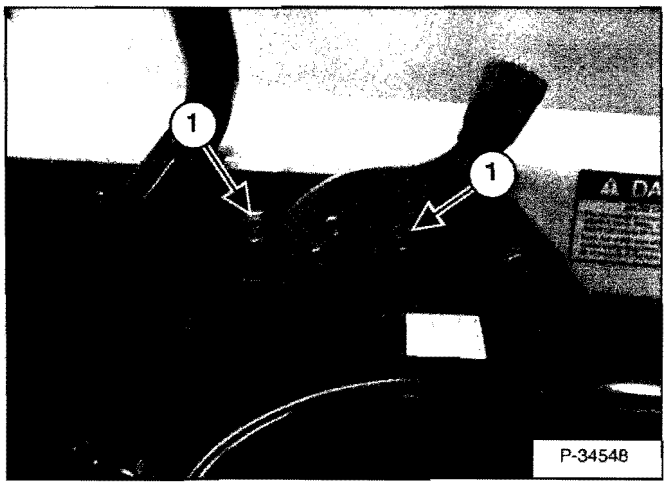
Remove the speed control pivot arm from the loader.

Figure 70-21-6



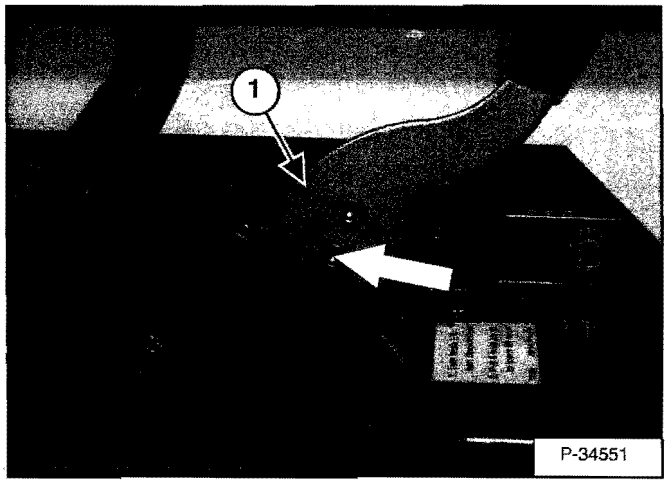
The parts that go into the pivot arm (Item 1) are the bolt (Item 2), washers (Items 3), fiber washers (Items 4), spacer (Item 5) and nut (Item 6) **[Figure 70-21-6]**.

Figure 70-21-7



Remove the two bolts (Item 1) **[Figure 70-21-7]** from the hand speed control lever assembly.

Figure 70-21-8

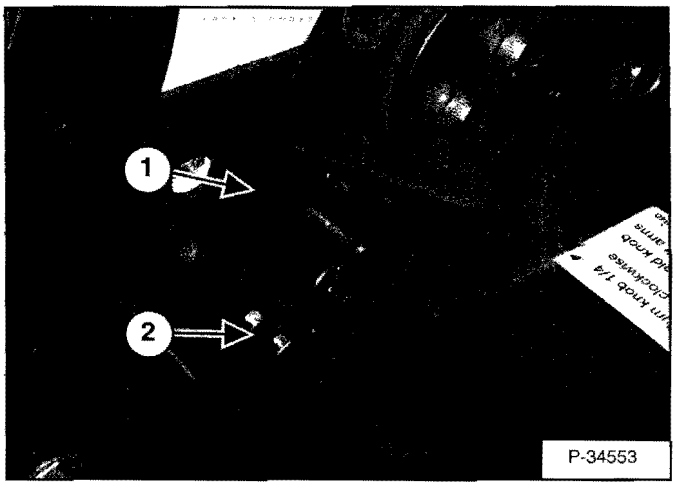


At the bottom side of the control panel, move the speed control linkage toward the rear of the loader.

Slide the hand speed control lever (Item 1) **[Figure 70-21-8]** forward and lift, and disconnect the assembly from the speed control cable.

Removal (Cont'd)

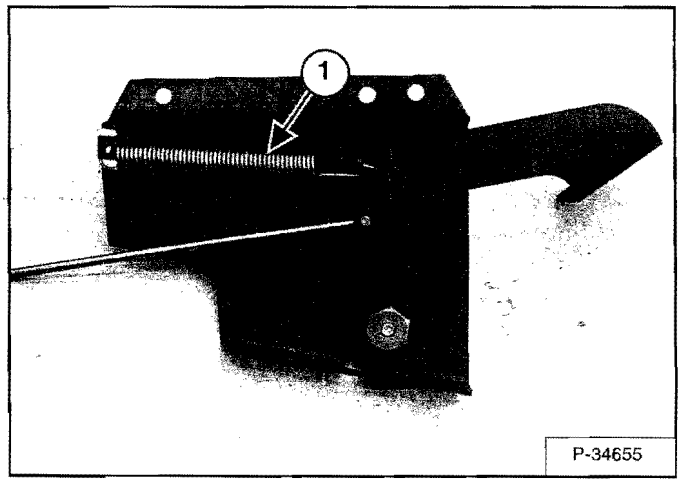
Figure 70-21-9



Installation: When installing the hand speed control to the speed control cable, be sure the speed control lever (Item 1) fits in the notch (Item 2) **[Figure 70-21-9]** of the speed control cable clevis.

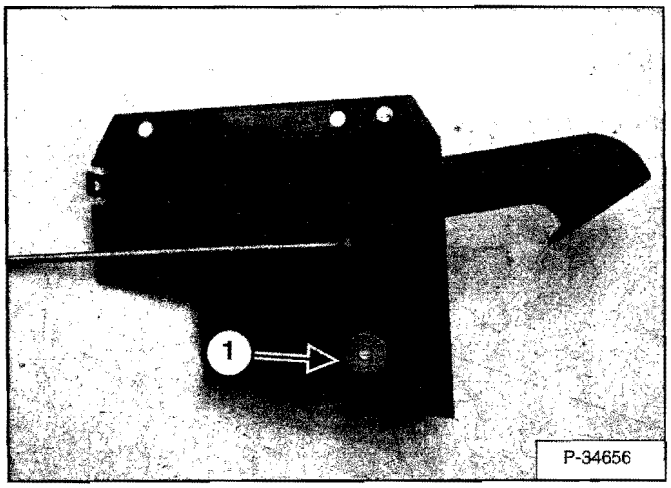
Disassembly

Figure 70-21-10



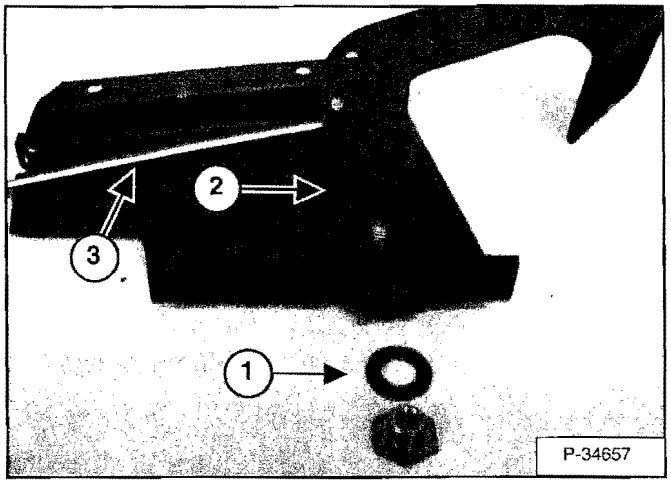
Remove the spring (Item 1) **[Figure 70-21-10]** from the foot speed control assembly.

Figure 70-21-11



Remove the bushing/nut (Item 1) **[Figure 70-21-11]** from the pedal lever.

Figure 70-21-12

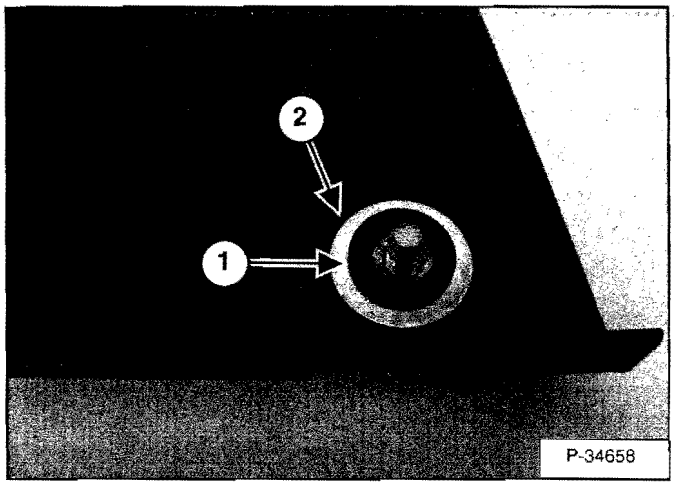


Remove the fiber washer (Item 1) **[Figure 70-21-12]** from the bushing/nut.

Remove the foot pedal lever (Item 2) and linkage rod (Item 3) **[Figure 70-21-12]**.

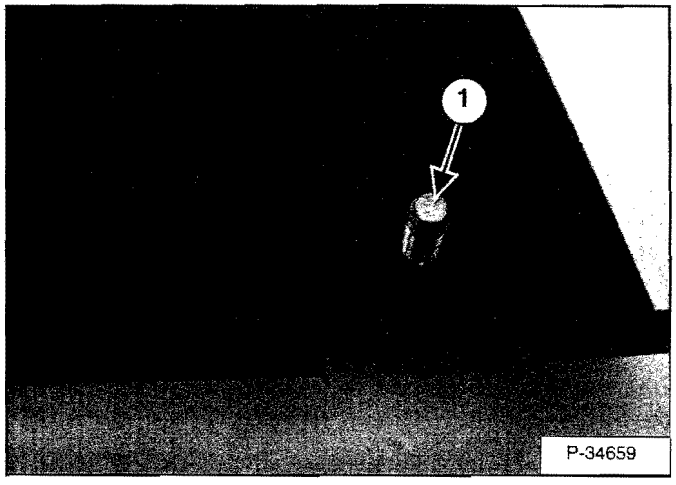
Disassembly

Figure 70-21-13



Remove the fiber washer (Item 1) and washer (Item 2) **[Figure 70-21-13]** from the pivot bolt.

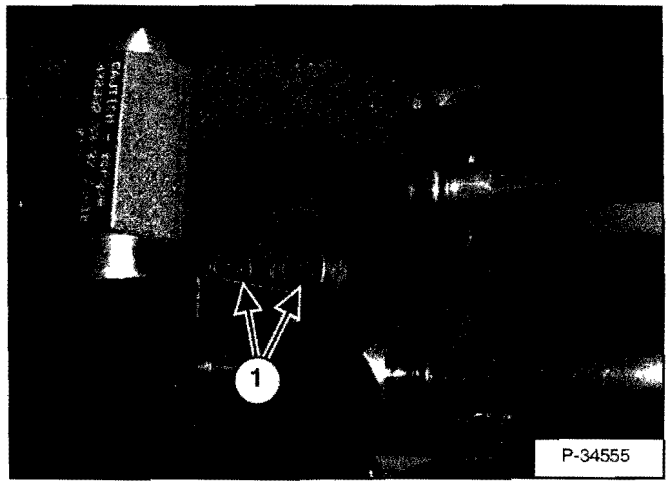
Figure 70-21-14



Remove the pivot bolt (Item 1) **[Figure 70-21-14]** from the speed control.

Speed Control Cable

Figure 70-21-15



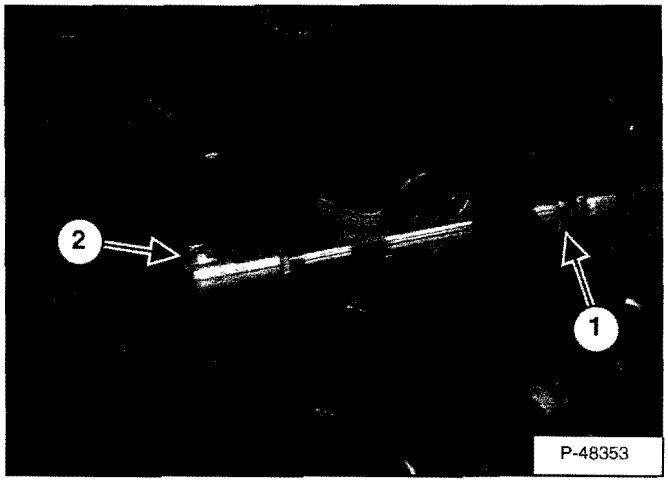
Raise the lift arm and install an approved lift arm support device. (See Contents Page 10-01.)

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

Remove the speed control lever assembly. (See Contents Page 70-01.)

At the lower right side of the control panel, remove the two mounting bolts (Item 1) **[Figure 70-21-15]** from the speed control cable mount bracket.

Figure 70-21-16



At the right side of the engine compartment loosen the jam nut (Item 1) **[Figure 70-21-16]** from the speed control cable.

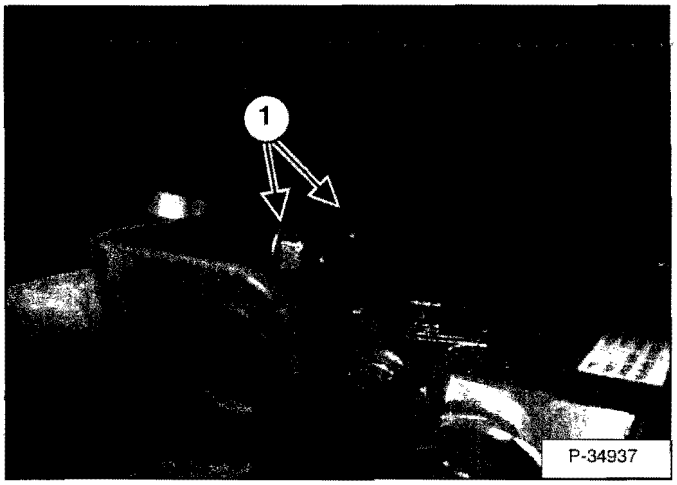
Remove the nut (Item 2) **[Figure 70-21-16]**, and disconnect the cable from from the linkage.

Remove the speed control cable.

MUFFLER

Removal And Installation

Figure 70-30-1

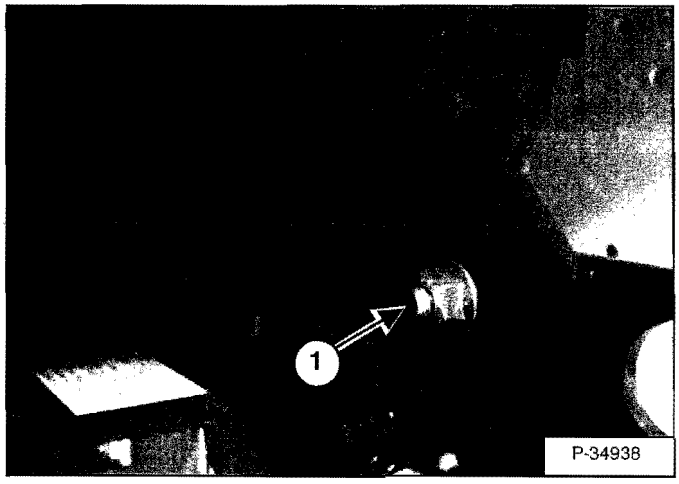


Open the rear door.

Remove the rear grill.

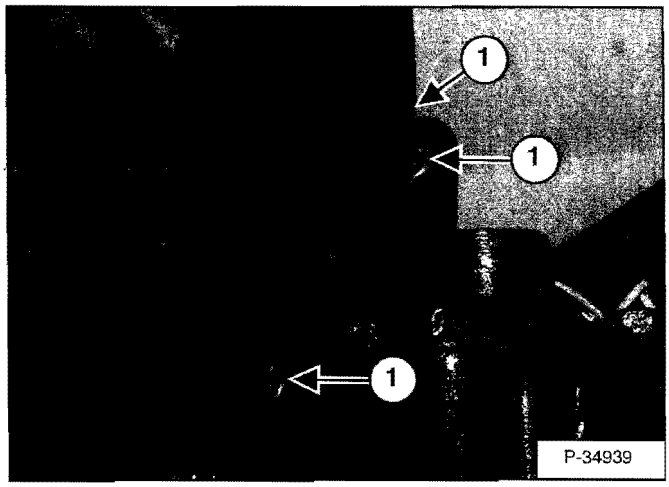
Remove the two bolts and nuts (Item 1) **[Figure 70-30-1]** from the left end of the engine muffler.

Figure 70-30-2



Remove the bolt and nut (Item 1) **[Figure 70-30-2]** from the right end of the engine muffler.

Figure 70-30-3



Remove the three bolts and nuts (Item 1) **[Figure 70-30-3]** from the muffler mounting bracket.

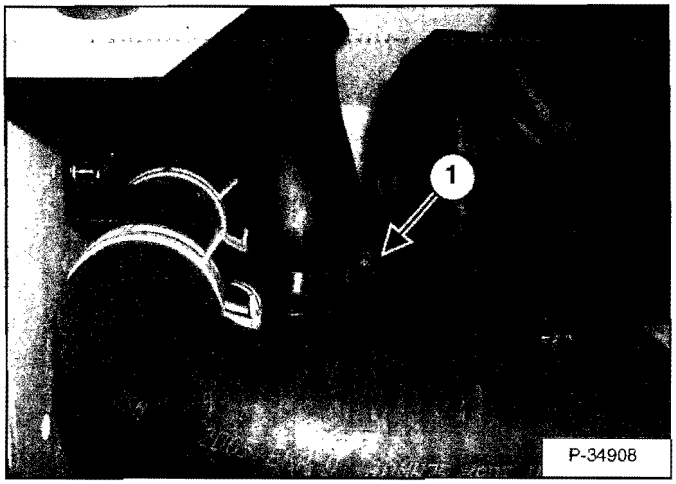
Remove the muffler from the loader.

Bobcat®

AIR CLEANER

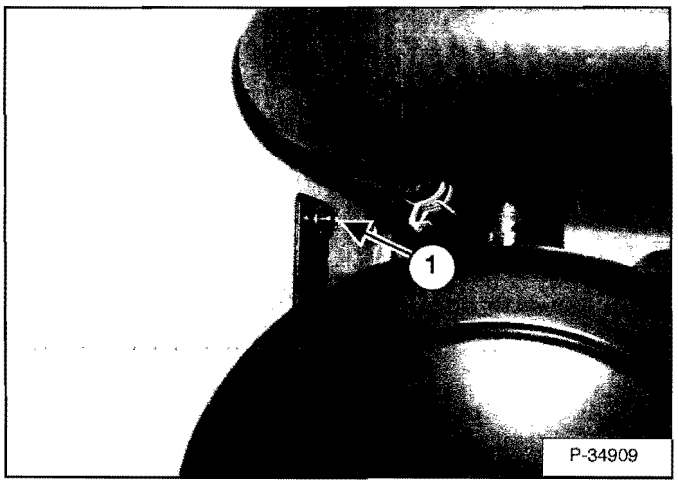
Housing Removal And Installation

Figure 70-40-1



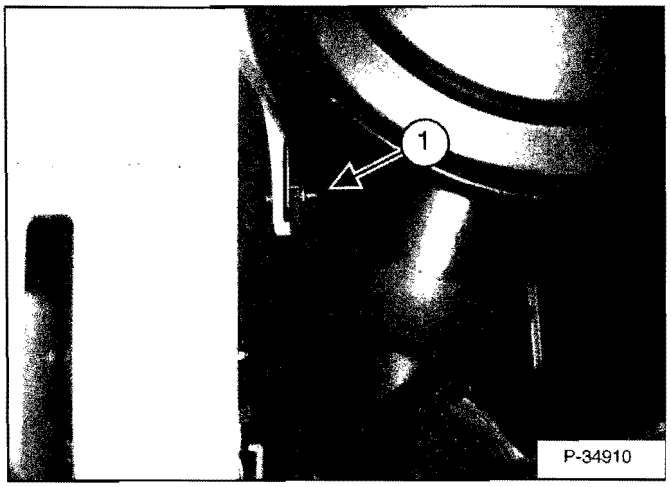
Loosen the hose clamp (Item 1) **[Figure 70-40-1]** and disconnect the inlet hose from the air cleaner.

Figure 70-40-2



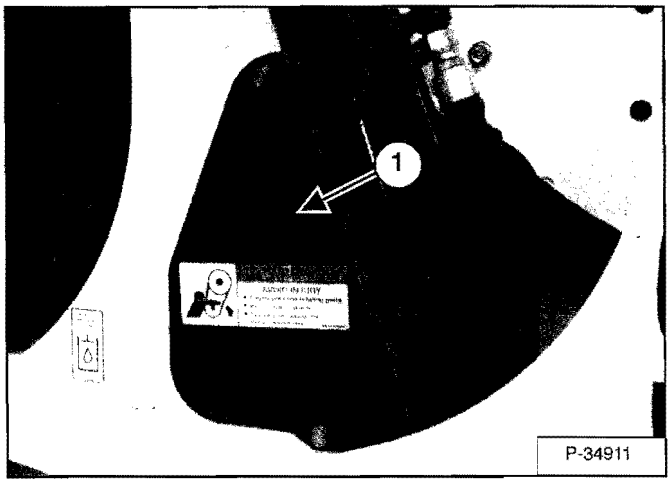
Remove the top mounting bolt (Item 1) **[Figure 70-40-2]** from the air cleaner mount bracket.

Figure 70-40-3



Remove the lower mount bolt (Item 1) **[Figure 70-40-3]** from the air cleaner mount bracket.

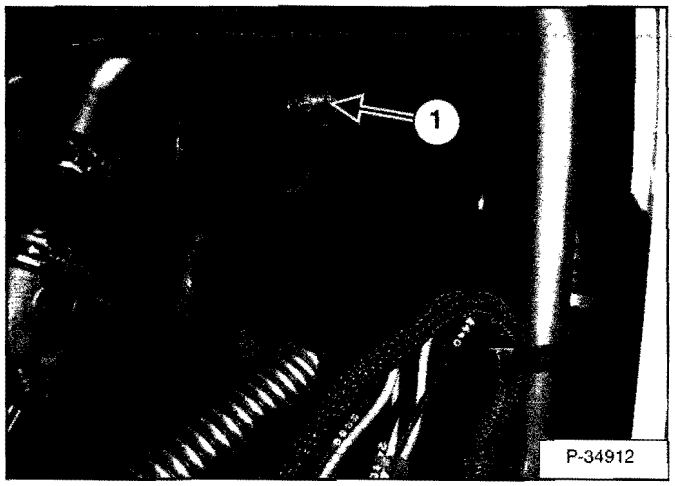
Figure 70-40-4



Remove the left side access panel (Item 1) **[Figure 70-40-4]** from the loader.

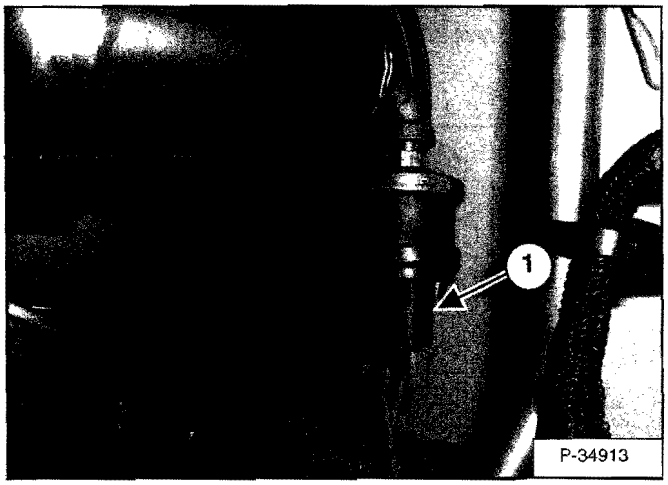
Housing Removal And Installation (Cont'd)

Figure 70-40-5



Remove the hose clamp (Item 1) **[Figure 70-40-5]** from the hose that goes from the air cleaner to the turbo charger.

Figure 70-40-6



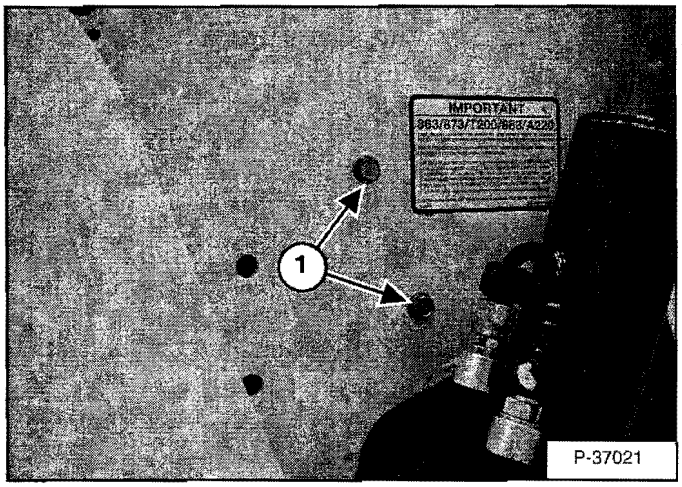
Disconnect the wire connector (Item 1) **[Figure 70-40-6]** from the air cleaner sender.

Remove the air cleaner from the loader.

RADIATOR

Removal And Installation

Figure 70-50-1



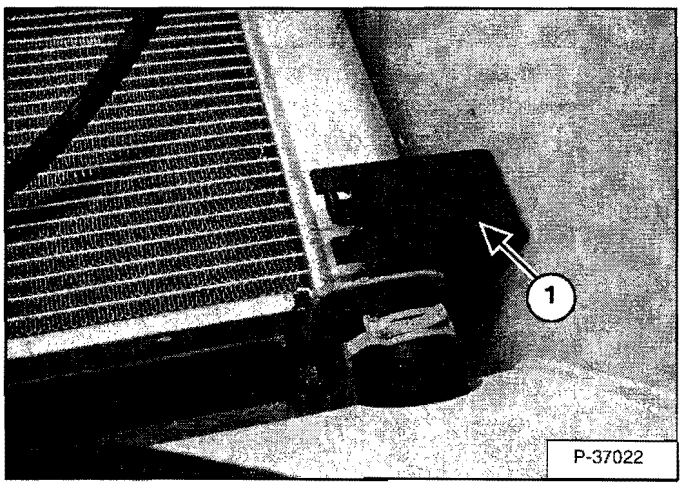
Remove the rear grill.

Drain the fluid from the radiator.

Remove the hydraulic oil cooler. (See Contents Page 30-01.)

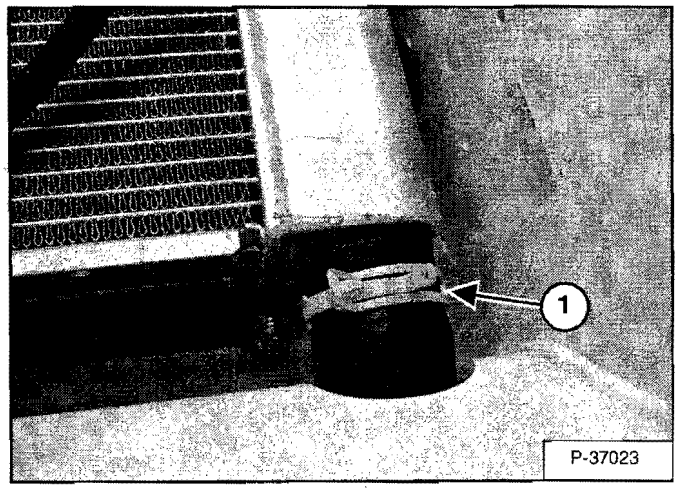
Remove the two mounting bolts (Item 1) **[Figure 70-50-1]** from the oil cooler mount bracket. (Both sides.)

Figure 70-50-2



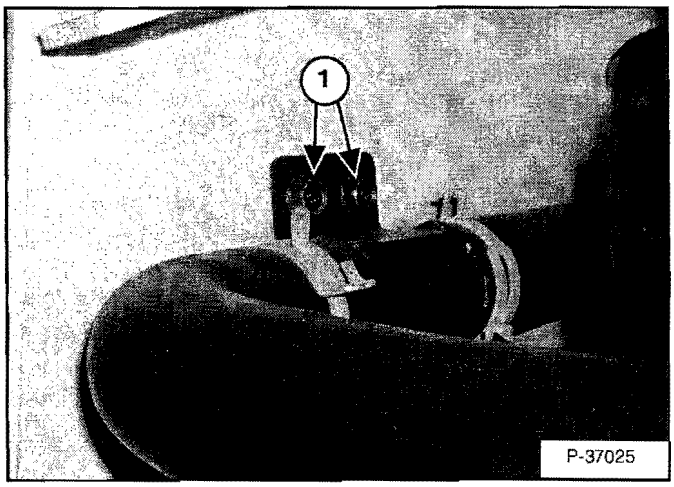
Remove the oil cooler mount bracket (Item 1) **[Figure 70-50-2]**. (Both sides.)

Figure 70-50-3



Remove the radiator hose clamp (Item 1) **[Figure 70-50-3]** and remove the right side radiator hose from the radiator.

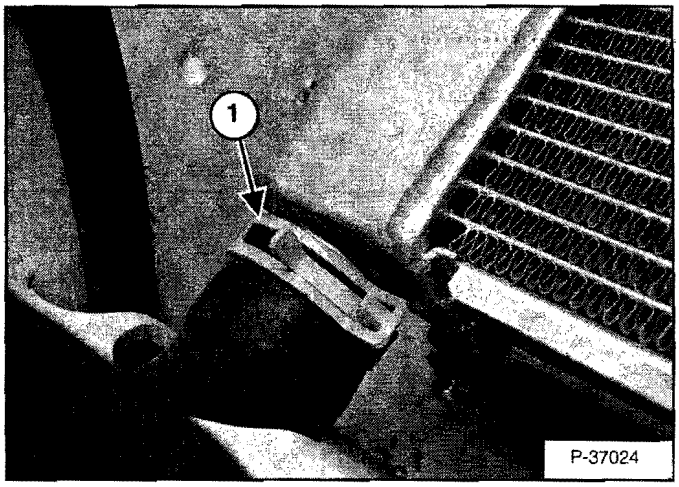
Figure 70-50-4



Remove the two mounting bolts (Item 1) **[Figure 70-50-4]** from the radiator hose mounting bracket.

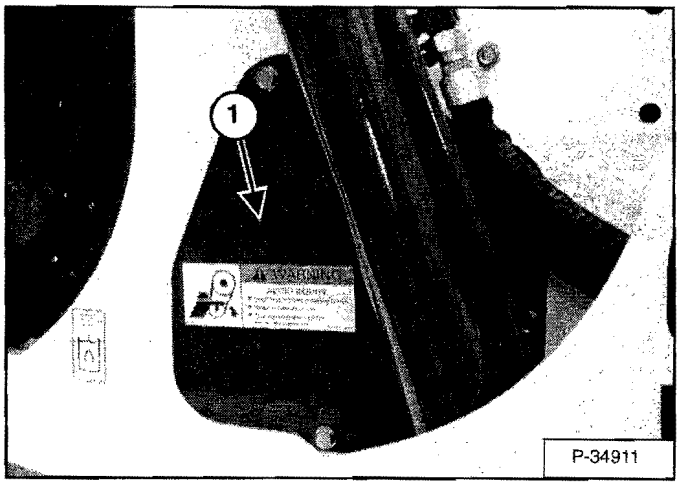
Removal And Installation (Cont'd)

Figure 70-50-5



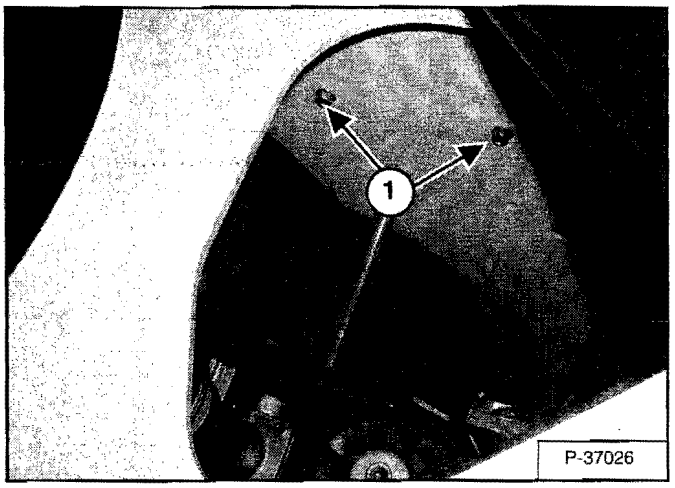
Remove the radiator hose clamp (Item 1) **[Figure 70-50-5]** and remove the left side radiator hose.

Figure 70-50-6



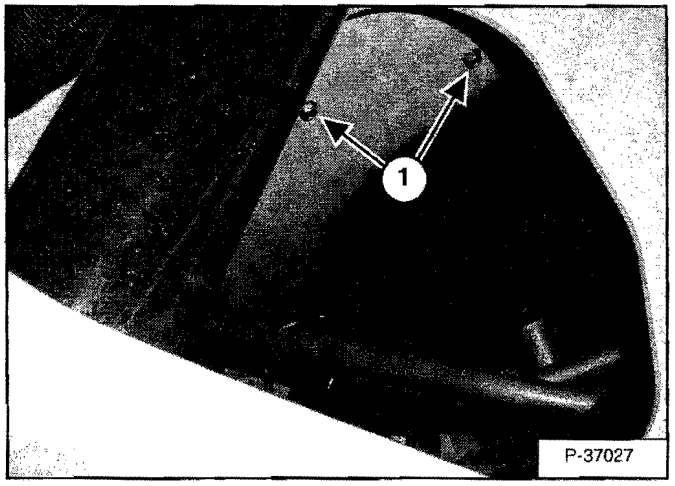
Remove the access panel (Item 1) **[Figure 70-50-6]**. (Both sides.)

Figure 70-50-7



At the left side access hole, remove the two radiator mount bolts (Item 1) **[Figure 70-50-7]**.

Figure 70-50-8

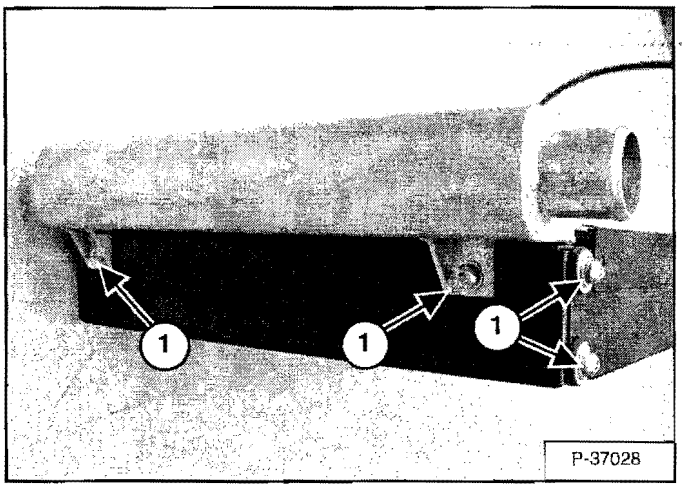


At the right side access hole, remove the two radiator mount bolts (Item 1) **[Figure 70-50-8]**.

Remove the radiator and mount assembly from the loader.

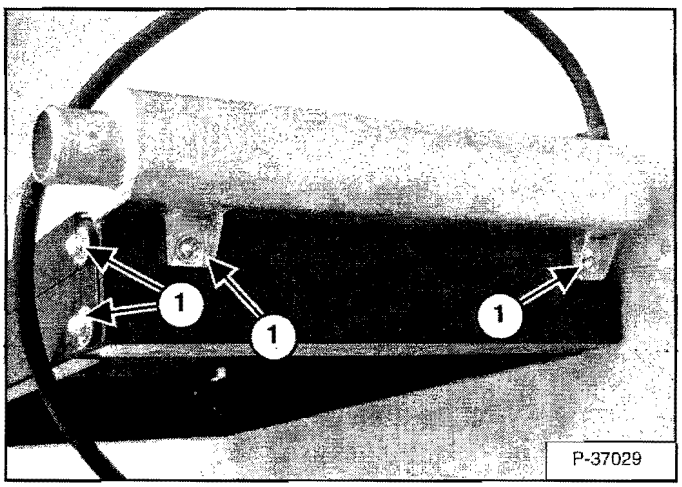
Mount Removal (Early Loaders)

Figure 70-50-9



Remove the four mounting bolts (Item 1) **[Figure 70-50-9]** from the radiator and radiator mount bracket.

Figure 70-50-10

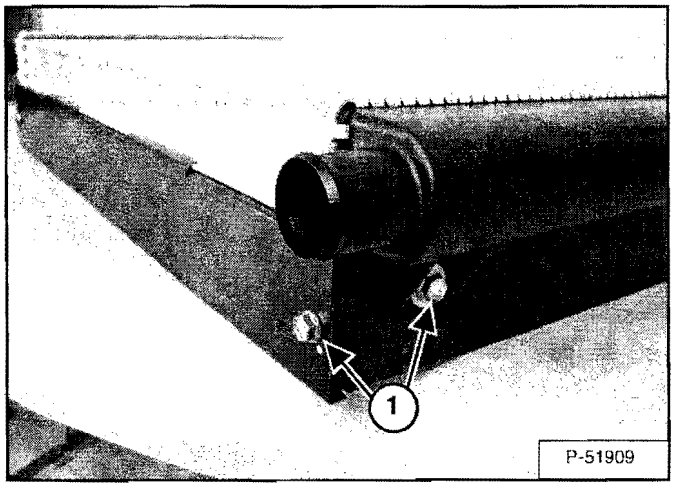


Remove the four mounting bolts (Item 1) **[Figure 70-50-10]** from the radiator and radiator mount bracket.

Remove the radiator from the mount bracket.

Mount Removal (Later Loaders)

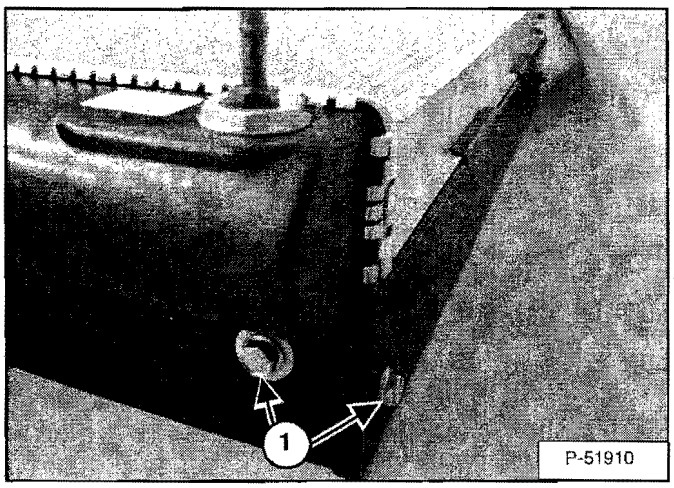
Figure 70-50-11



Remove the two mounting bolts (Item 1) **[Figure 70-50-11]** from the radiator and radiator mount bracket.

Installation: Tighten the bolts to 7.5-11.5 ft.-lbs. (10.1-15.5 Nm) torque.

Figure 70-50-12

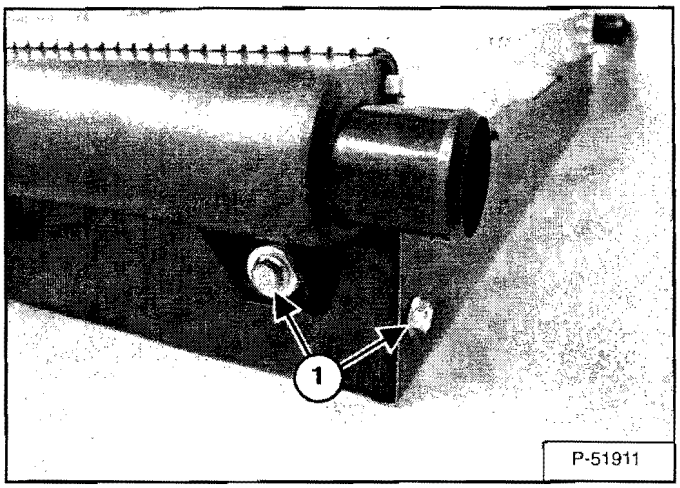


Remove the two mounting bolts (Item 1) **[Figure 70-50-12]** from the radiator and radiator mount bracket.

Installation: Tighten the bolts to 7.5-11.5 ft.-lbs. (10.1-15.5 Nm) torque.

Mount Removal (Later Loaders) (Cont'd)

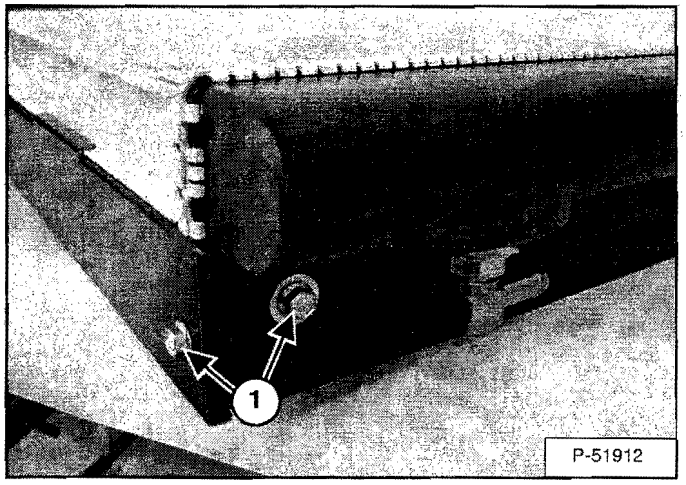
Figure 70-50-13



Remove the two mounting bolts (Item 1) **[Figure 70-50-13]** from the radiator and radiator mount bracket.

Installation: Tighten the bolts to 7.5-11.5 ft.-lbs. (10.1-15.5 Nm) torque.

Figure 70-50-14



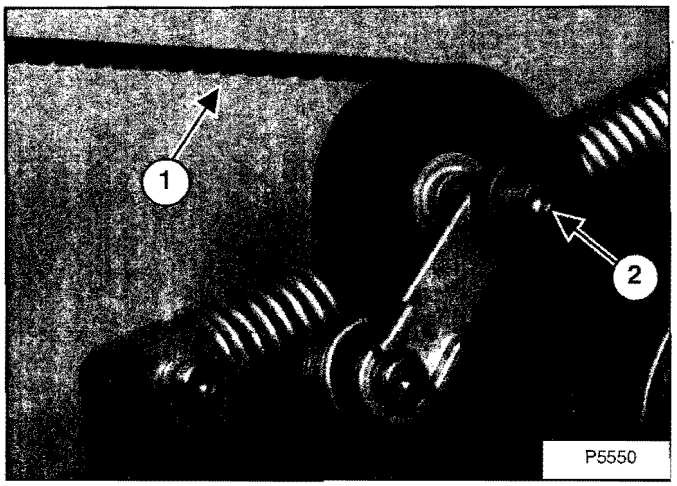
Remove the two mounting bolts (Item 1) **[Figure 70-50-14]** from the radiator and radiator mount bracket.

Installation: Tighten the bolts to 7.5-11.5 ft.-lbs. (10.1-15.5 Nm) torque.

COOLING FAN

Drive Tension Pulley Removal And Installation

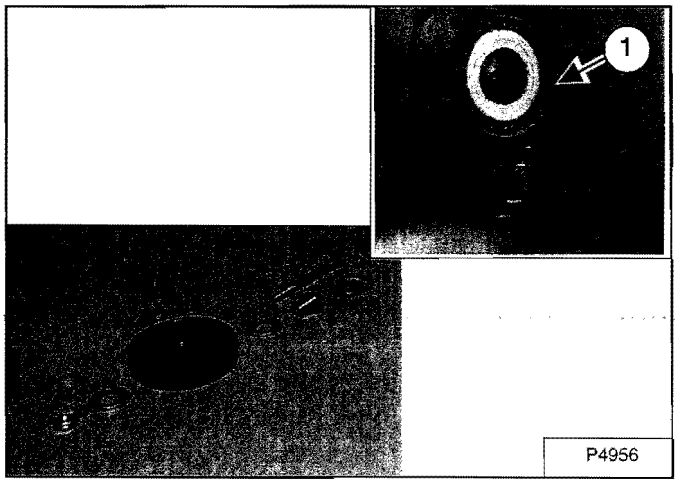
Figure 70-60-1



Remove the fan drive belt (Item 1) **[Figure 70-60-1]**.

Remove the idler pulley bolt (Item 2) **[Figure 70-60-1]**.

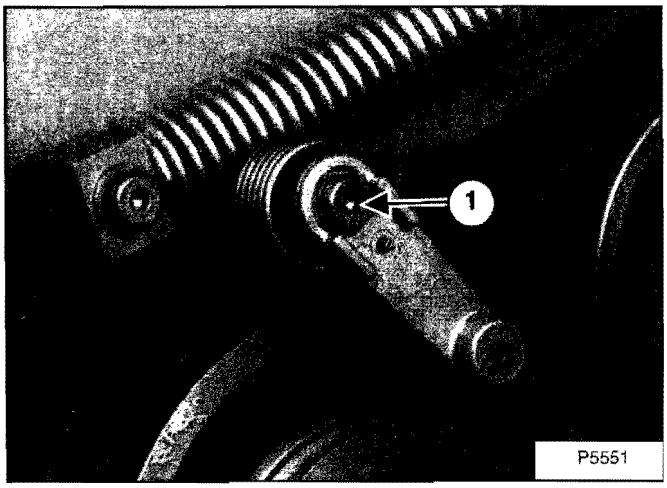
Figure 70-60-2



Remove the spacers, bolt and washers from the arm **[Figure 70-60-2]**.

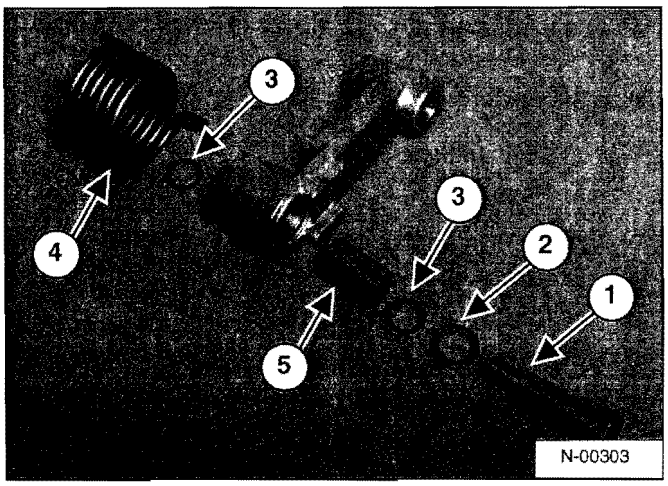
Installation: Put a small amount of grease around the outside edge on the grease rings (Item 1) **[Figure 70-60-2]** between ring and bearing.

Figure 70-60-3



Remove the bolt (Item 1) **[Figure 70-60-3]** & **[Figure 70-60-4]**.

Figure 70-60-4



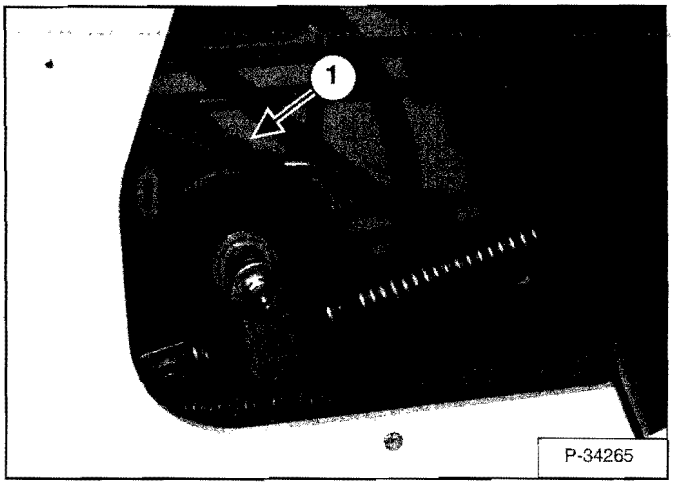
Remove the thrust washer (Item 2), O-rings (Item 3) and spring (Item 4) **[Figure 70-60-4]**.

Check all parts for damage or wear and replace them as needed.

NOTE: When making any repairs, replace the bronze bushing (Item 5) [Figure 70-60-4] with a new style nylon bushing. Clean all parts and assemble dry. Do not lubricate. (See Parts Mircofiche for correct part numbers.)

Gearbox/Blower Housing Removal And Installation

Figure 70-60-5



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

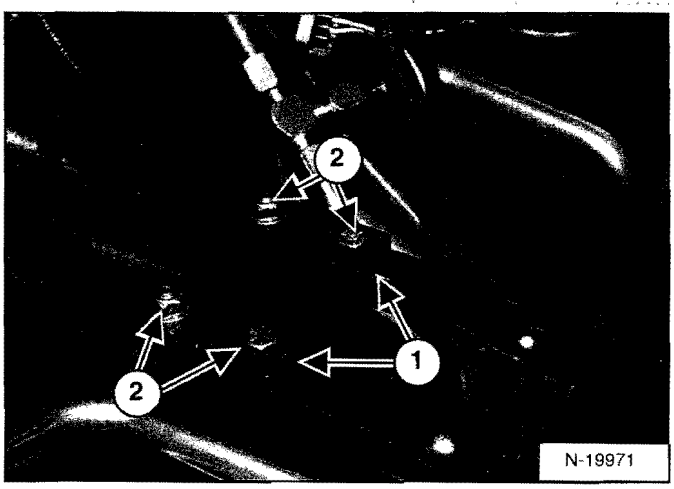
Raise the operator cab. (See Contents Page 10-01.)

Drain the hydraulic fluid from the reservoir. (See Contents Page 20-01.)

Remove the hydraulic/hydrostatic filter housing. (See Contents Page 20-01.)

At the left side access hole remove the fan drive belt (Item 1) **[Figure 70-60-5]**.

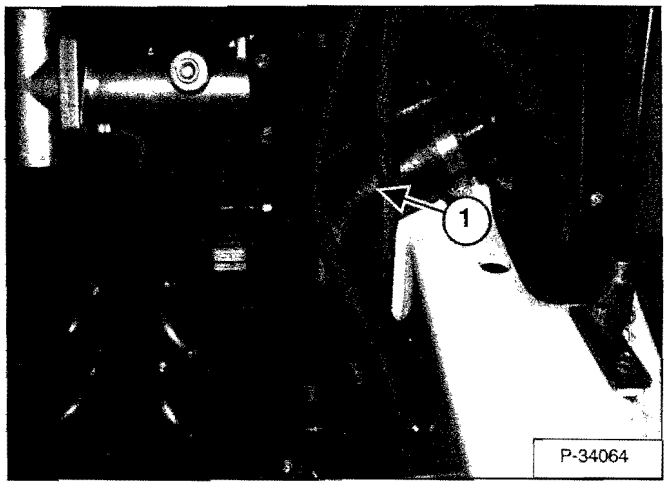
Figure 70-60-6



Scribe a mark across the steering linkage bars (Item 1) **[Figure 70-60-6]**.

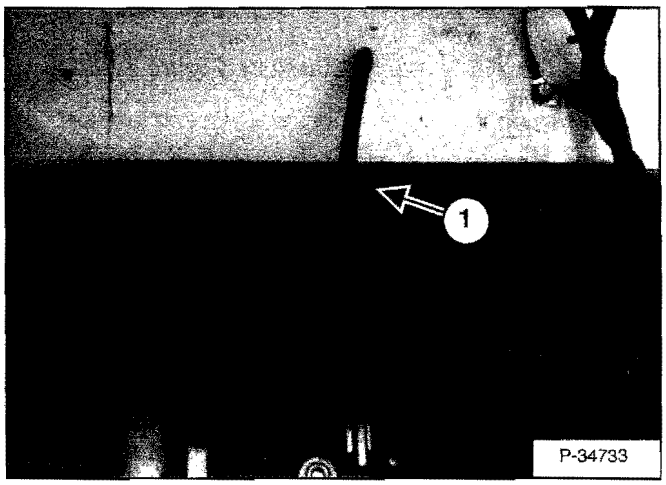
Remove the four steering linkage mount bolts (Item 2) **[Figure 70-60-6]**.

Figure 70-60-7



Remove hydraulic reservoir fill hose (Item 1) **[Figure 70-60-7]**.

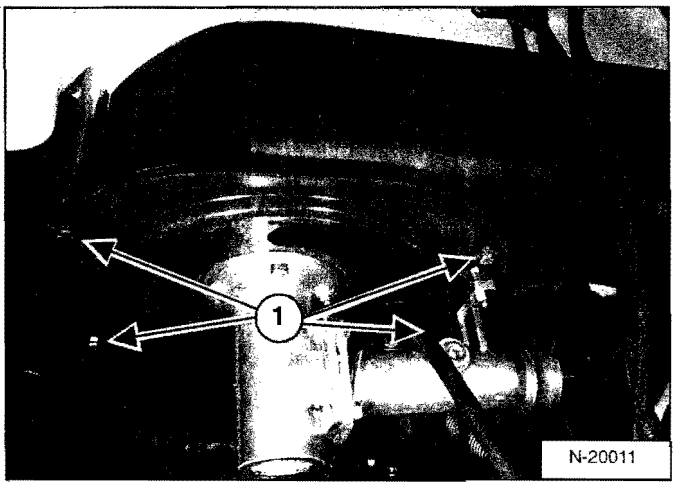
Figure 70-60-8



Remove vent hose mount bracket (Item 1) **[Figure 70-60-8]** and remove the fan vent hose from the fan.

Gearbox/Blower Housing Removal And Installation (Cont'd)

Figure 70-60-9

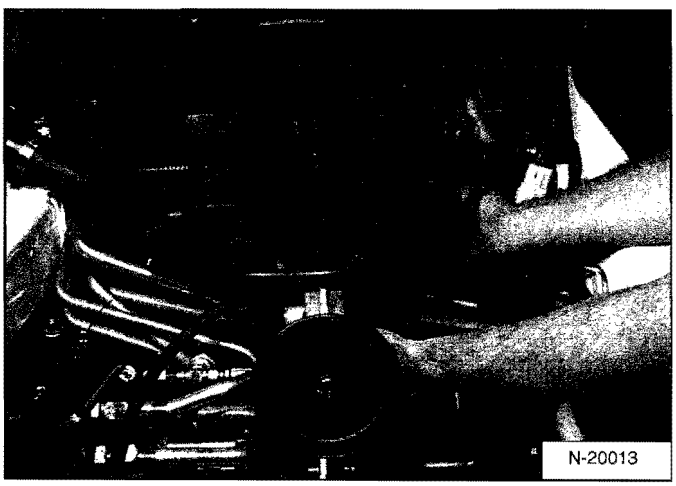


Remove the four mounting bolts (Item 1) **[Figure 70-60-9]** and spacer tubes (two outside housing and two inside housing).

NOTE: Remove the two rear mounting bolts first.

Installation: Use sealant on each end of the inside spacer tubes to prevent the tubes from falling out of the housing during installation. Tighten the mounting bolts to 25-28 ft.-lbs. (34-38 Nm) torque.

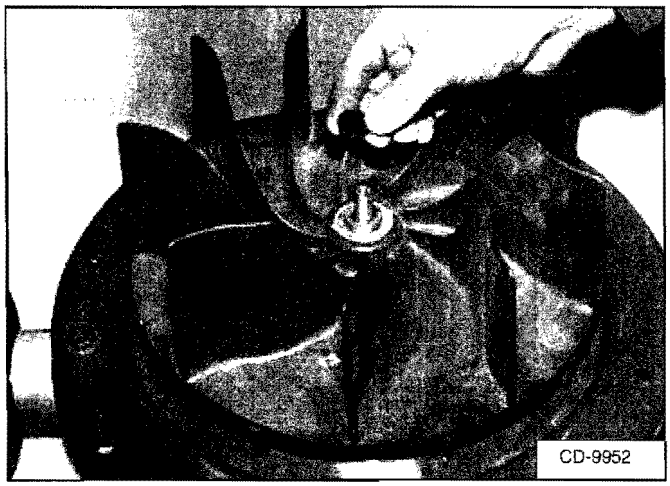
Figure 70-60-10



Remove the blower housing from the loader **[Figure 70-60-10]**.

Blower Removal And Installation

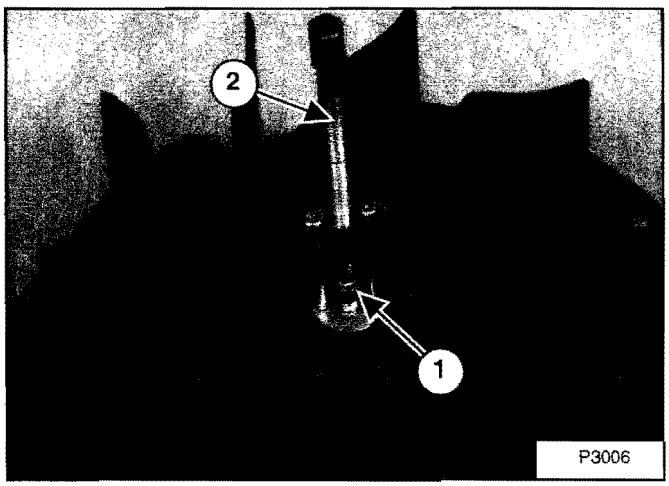
Figure 70-60-11



Remove the lock nut and spacer **[Figure 70-60-11]**.

Installation: Tighten the nut to 45-55 ft.-lbs. (61-75 Nm) torque.

Figure 70-60-12



Use the following procedure to remove the fan from the shaft:

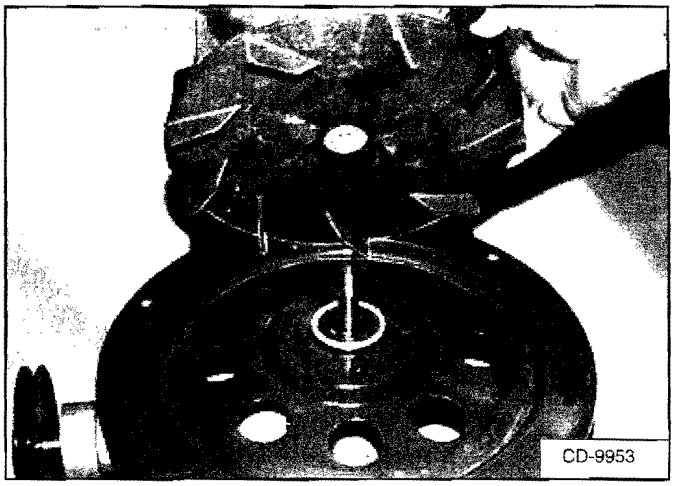
Install the nut (Item 1) **[Figure 70-60-12]** on the tapered shaft to protect the shaft and threads.

Install the puller on the fan as shown **[Figure 70-60-12]**.

As the center bolt (Item 2) **[Figure 70-60-12]** is tightened, periodically strike the bolt head to loosen the fan from the shaft.

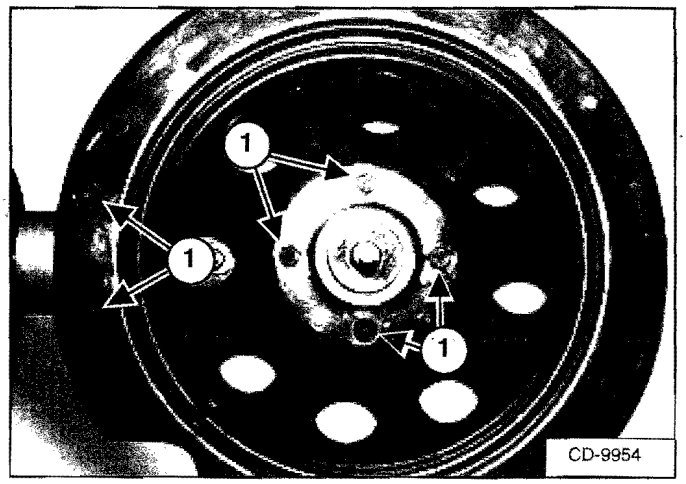
Blower Removal And Installation (Cont'd)

Figure 70-60-13



Remove the fan from the tapered shaft **[Figure 70-60-13]**.

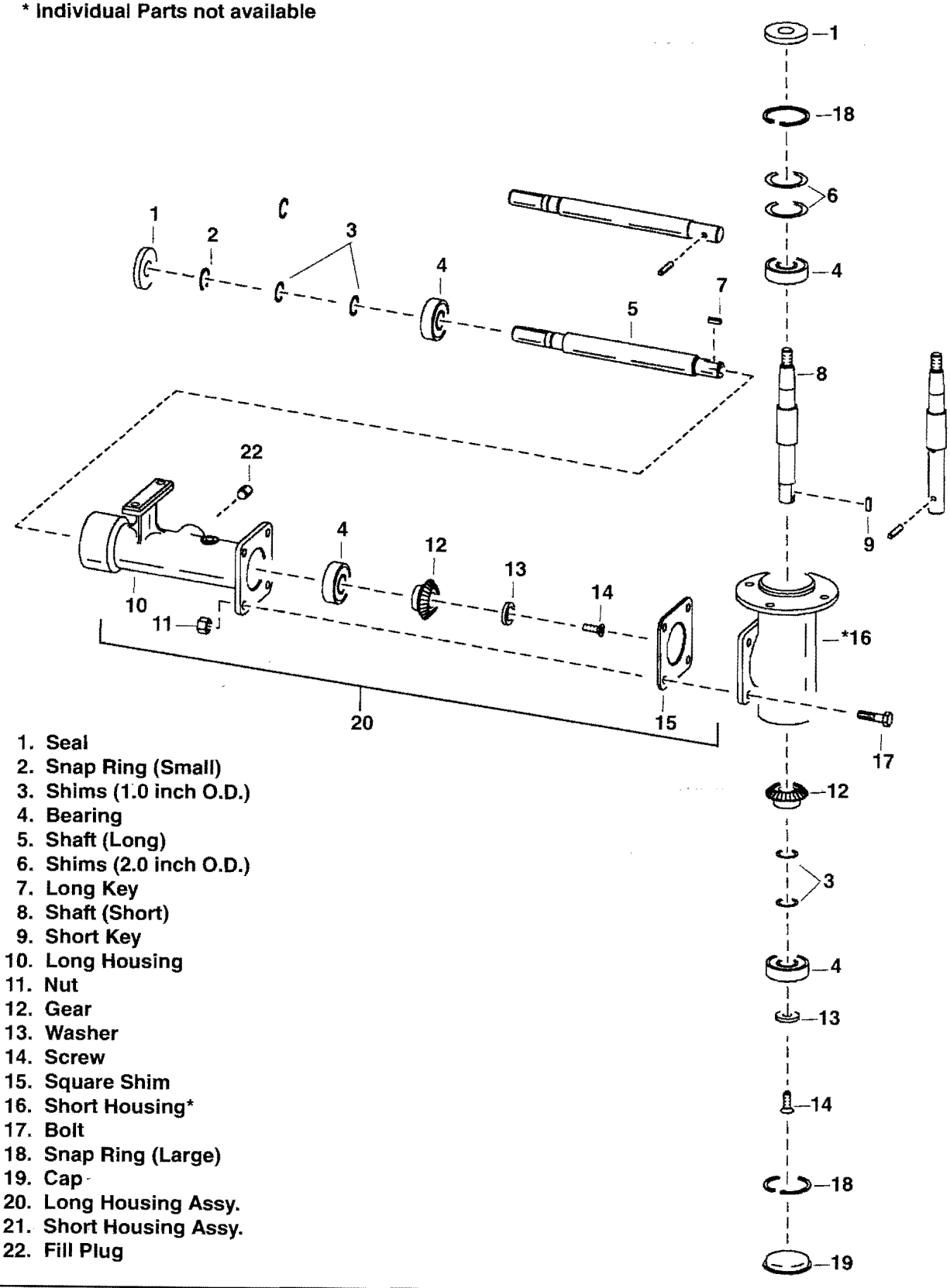
Figure 70-60-14



To remove the blower housing mounting plate, remove the six bolts (Item 1) **[Figure 70-60-14]**.

Gearbox Parts Identification

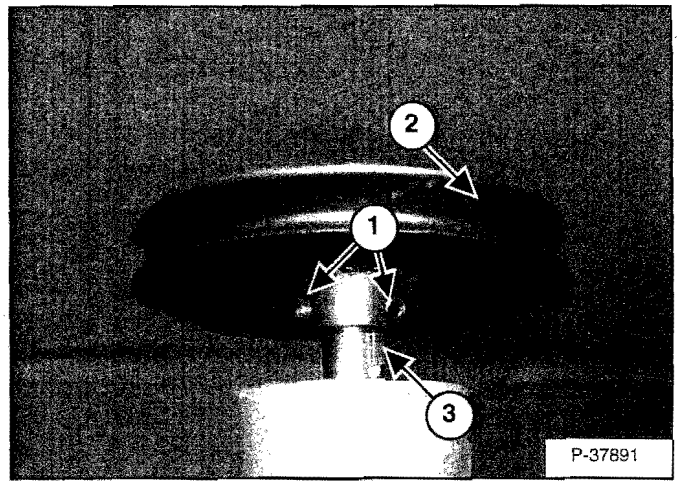
* Individual Parts not available



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

Gearbox Disassembly

Figure 70-60-15



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 for reference.) (Order parts from Melroe Parts Sales.)

NOTE: Be sure to count the number and thickness of shims during disassembly. Install the shims in the original location during assembly.

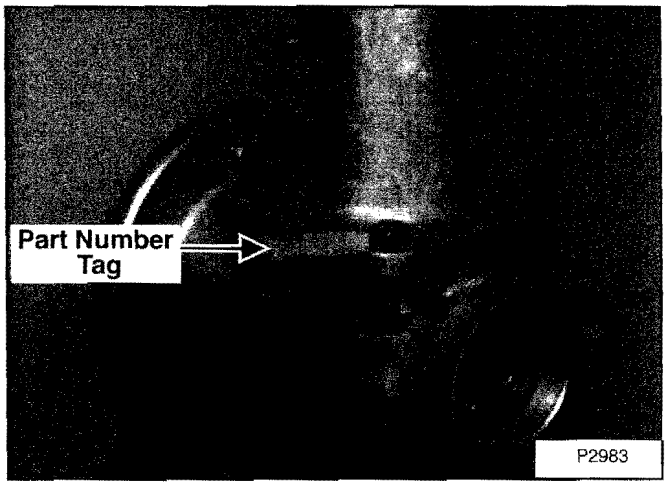
Remove the fan and blower housing mounting plate. (See Gearbox/Blower Housing Removal And Installation on Page 70-60-2.)

Long Housing

Loosen the set screws (Item 1) **[Figure 70-60-15]** and remove the pulley (Item 2) **[Figure 70-60-15]**.

Remove the long key (Item 3) **[Figure 70-60-15]**.

Figure 70-60-16



Remove the four mounting bolts and the part number tag **[Figure 70-60-16]**.

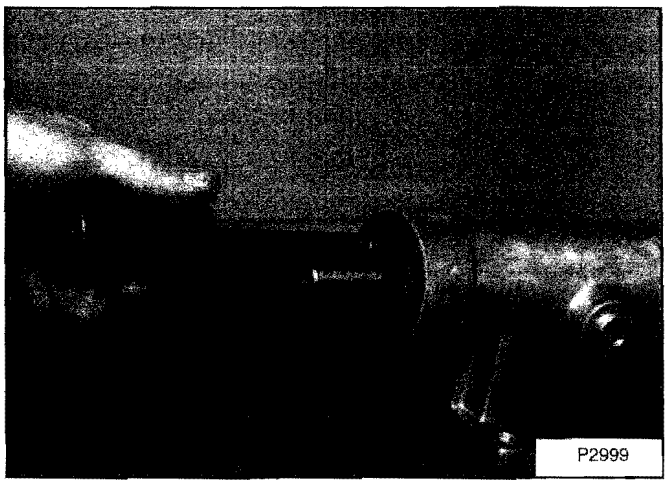
⚠ WARNING

AVOID INJURY OR DEATH

Wear safety goggles to prevent eye injury when drilling or grinding.

W-2108-1186

Figure 70-60-17

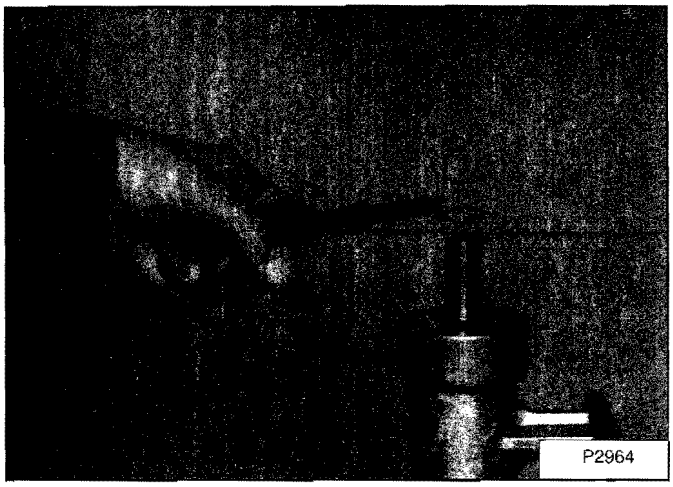


Remove the oil from the gearbox.

Drill an 1/8 inch (13 mm) hole in the seal. Use a slide hammer tool to remove the seal **[Figure 70-60-17]**.

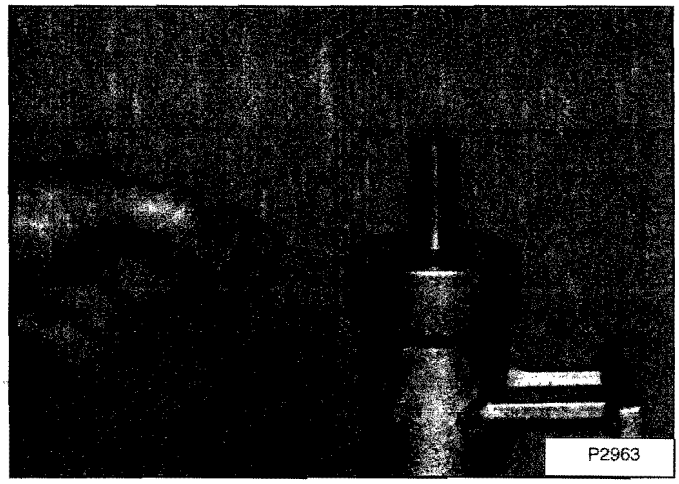
Gearbox Disassembly (Cont'd)

Figure 70-60-18



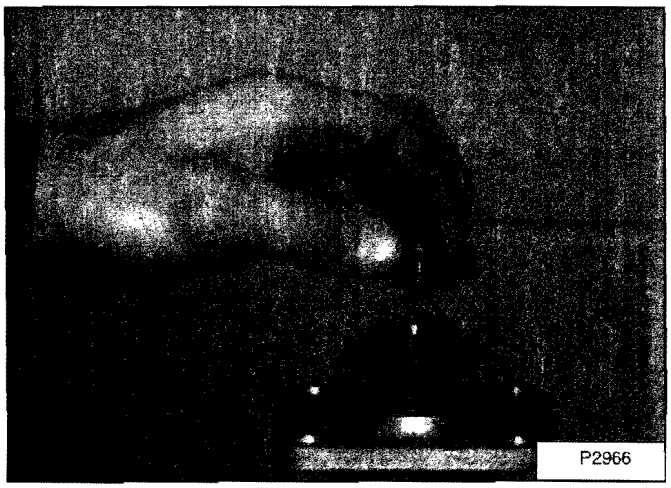
Remove the small snap ring **[Figure 70-60-18]**.

Figure 70-60-19



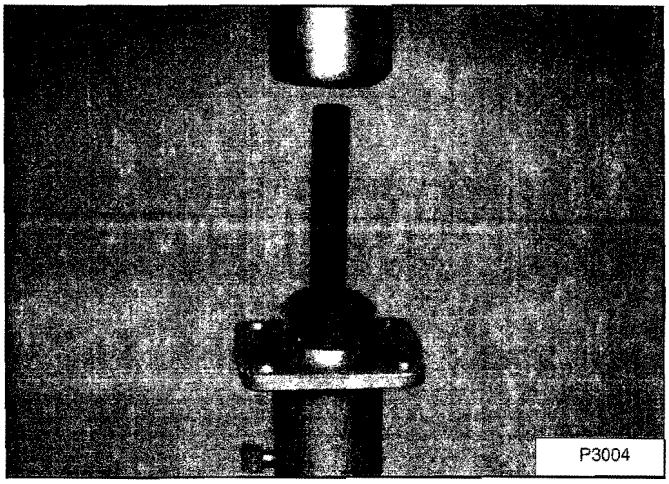
Remove the small shims **[Figure 70-60-19]**.

Figure 70-60-20



Remove the screw and washer from the shaft **[Figure 70-60-20]**.

Figure 70-60-21

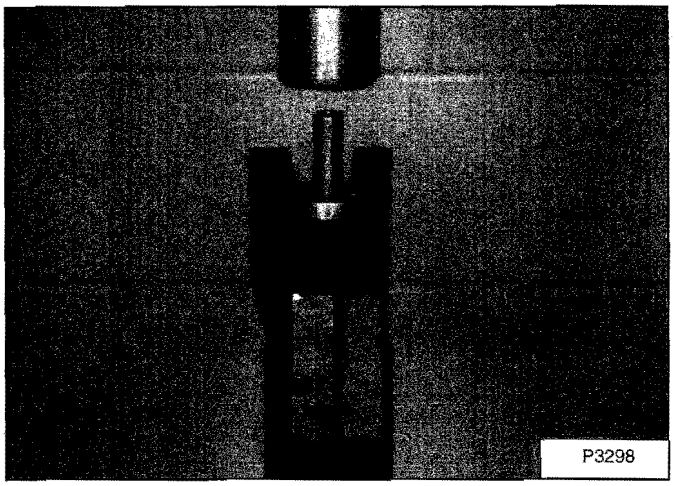


Support the lower flange and press the shaft from the bearing **[Figure 70-60-21]**.

NOTE: The gear and the other bearing (pulley end) will be removed with the shaft.

Gearbox Disassembly (Cont'd)

Figure 70-60-22



Support the bearing and press the shaft from the bearing **[Figure 70-60-22]**.

Short Housing

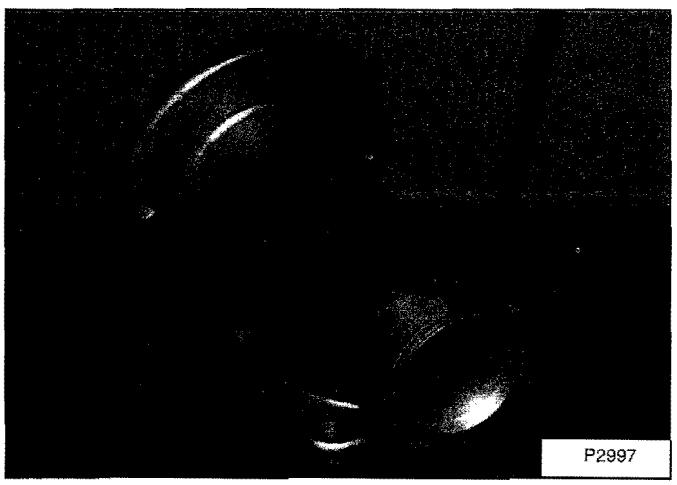
⚠ WARNING

AVOID INJURY OR DEATH

Wear safety goggles to prevent eye injury when drilling or grinding.

W-2108-1186

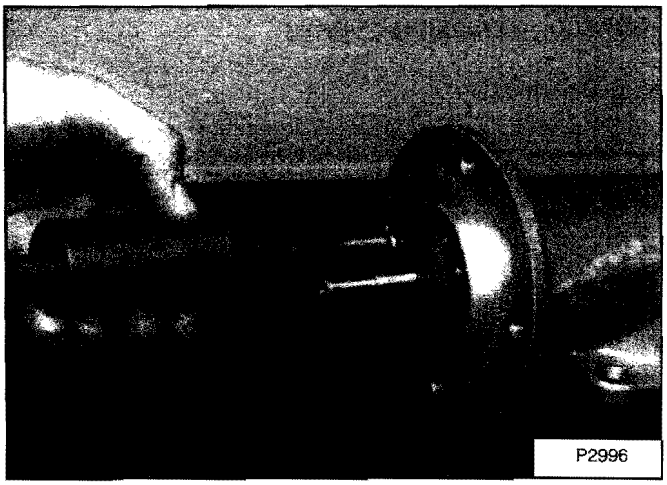
Figure 70-60-23



Remove the end cap **[Figure 70-60-23]**.

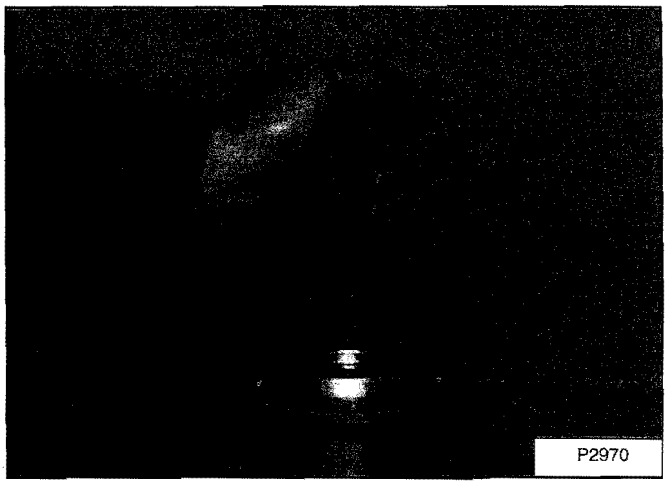
Use care not to damage the housing.

Figure 70-60-24



Drill an 1/8 inch (3 mm) hole in the seal. Use a slide hammer tool to remove the seal **[Figure 70-60-24]**.

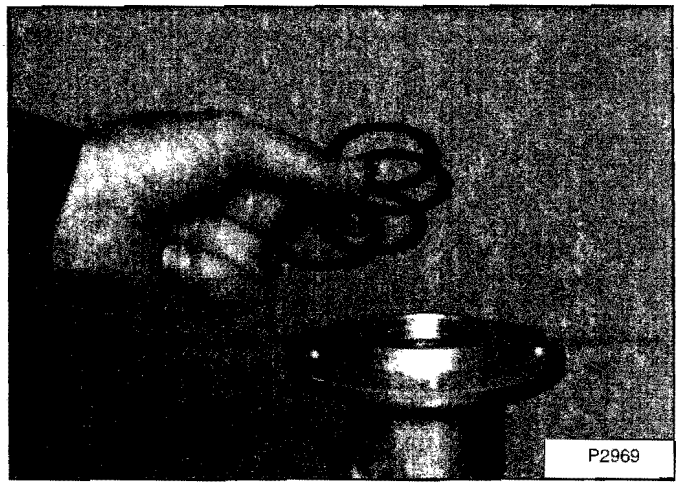
Figure 70-60-25



Remove the large snap ring from the flange end of the housing **[Figure 70-60-25]**.

Gearbox Disassembly (Cont'd)

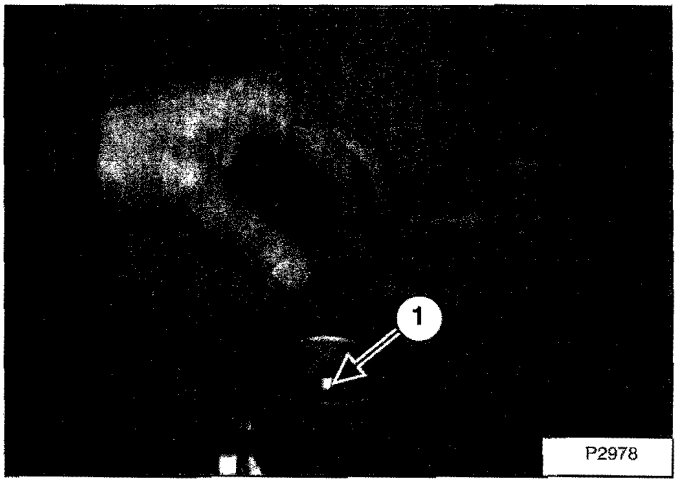
Figure 70-60-26



Remove the large shims from the housing **[Figure 70-60-26]**.

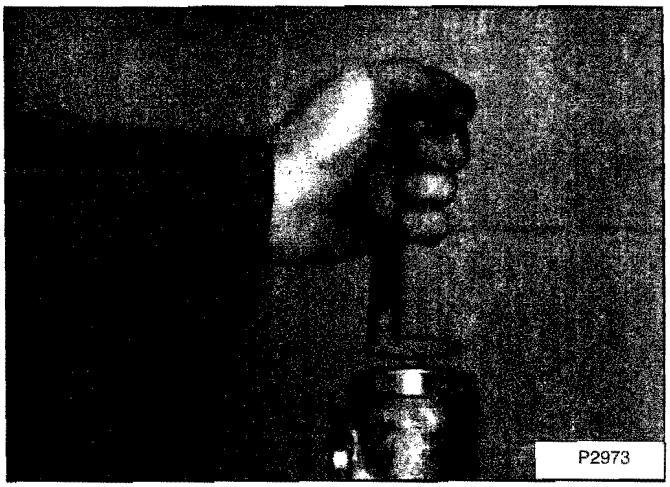
NOTE: Use the same size and thickness of shims during assembly.

Figure 70-60-27



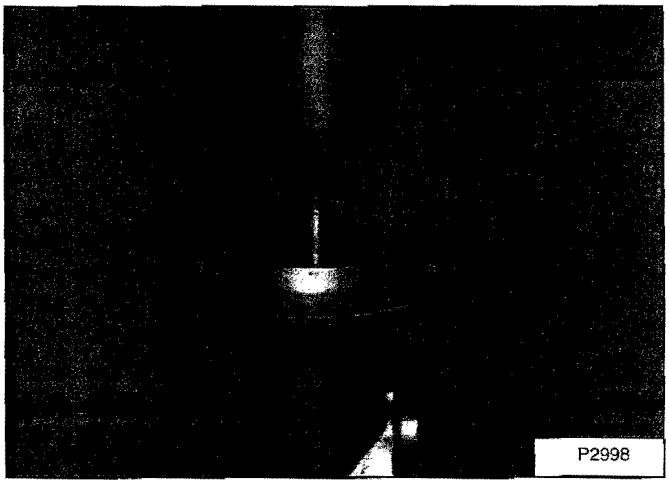
Remove the screw and washer (Item 1) **[Figure 70-60-27]** from the shaft.

Figure 70-60-28



Remove the snap ring from the cap end of the housing **[Figure 70-60-28]**.

Figure 70-60-29

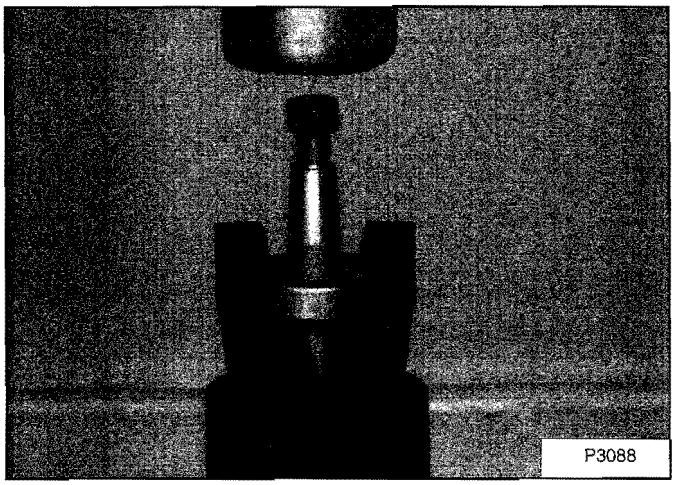


Press the shaft from the housing **[Figure 70-60-29]**.

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.

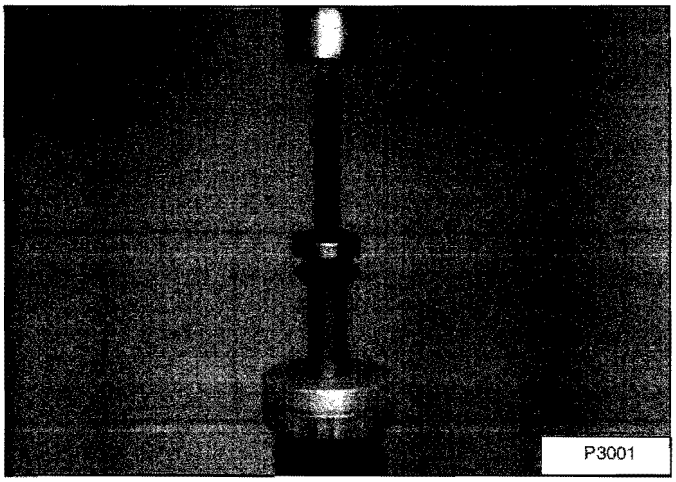
Gearbox Disassembly (Cont'd)

Figure 70-60-30



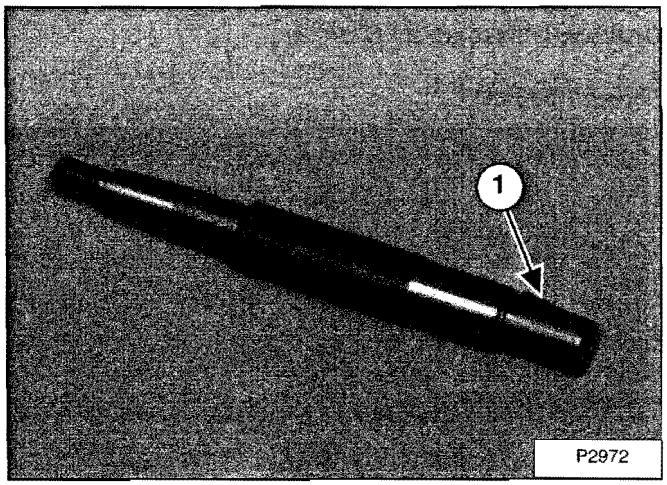
Press the bearing from the tapered end of the shaft **[Figure 70-60-30]**.

Figure 70-60-31



Press the bearing, shims and gear from the shaft **[Figure 70-60-31]**.

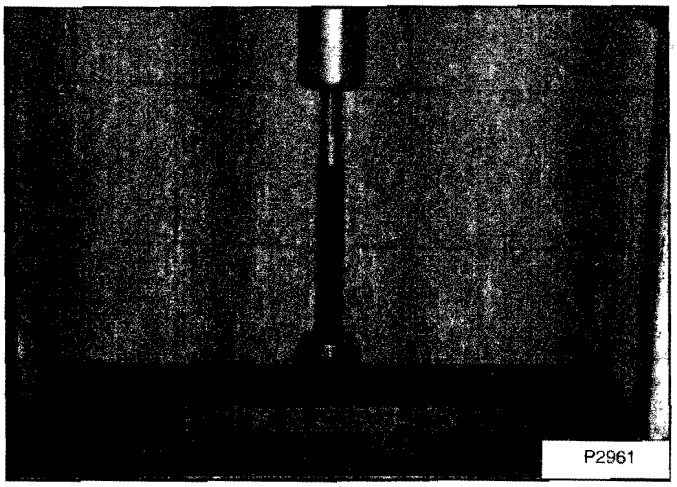
Figure 70-60-32



Remove the key (Item 1) **[Figure 70-60-32]** from the shaft.

Gearbox Assembly

Figure 70-60-33



NOTE: The gear and the other bearing (pulley end) will be removed with the shaft.

NOTE: Always replace seals during assembly. Replace the parts in the gearbox as needed.

NOTE: Do not install the seals and cap in the housing until after the backlash has been checked.

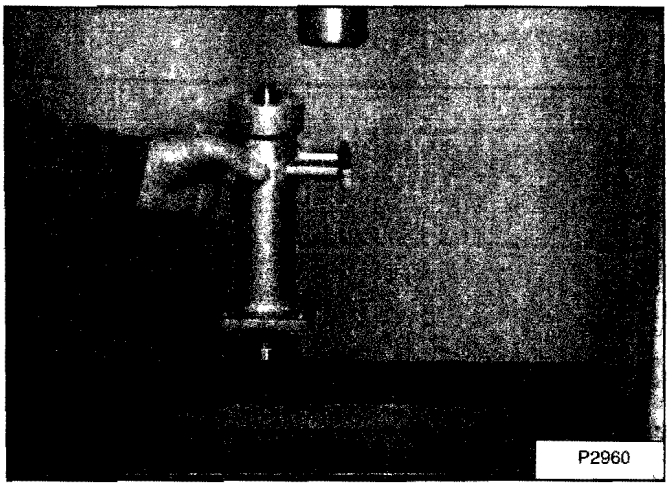
NOTE: Use care when pressing the bearings into the aluminum housing. The housing can be damaged if too much pressure is used.

NOTE: For procedures requiring the use of LOCTITE #242 adhesive, thoroughly clean and dry affected parts before the application of LOCTITE #242.

Long Housing

Press a bearing on the short keyed end of the long shaft **[Figure 70-60-33]**.

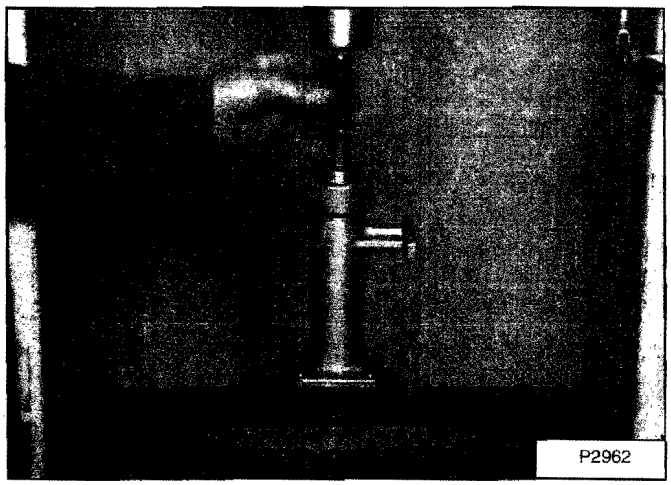
Figure 70-60-34



Install the long housing on the shaft **[Figure 70-60-34]**.

Be sure the bearing is seated in the bore at the lower end of the housing.

Figure 70-60-35

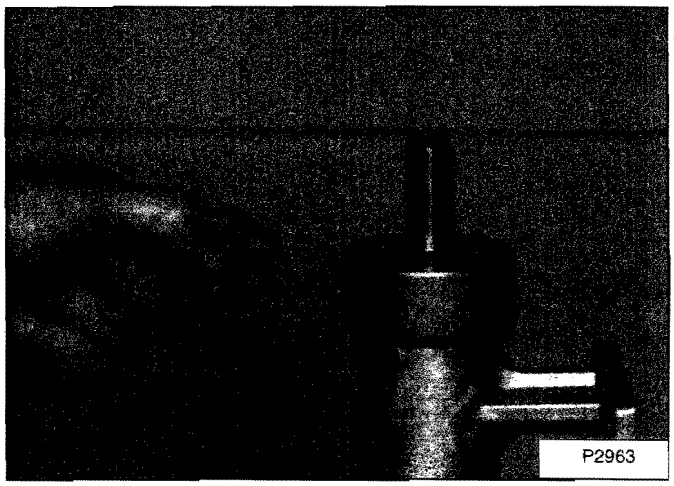


Install a bearing on the long keyed end of the shaft **[Figure 70-60-35]**.

Support the lower bearing and press the other bearing in the housing until the bearings seat in the housing **[Figure 70-60-35]**.

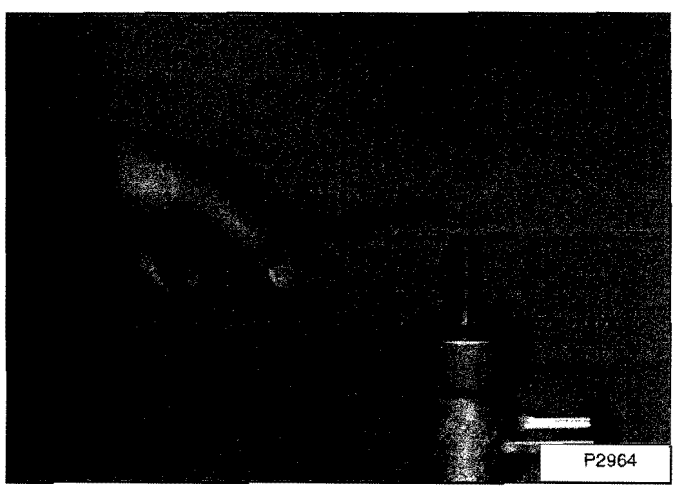
Gearbox Assembly (Cont'd)

Figure 70-60-36



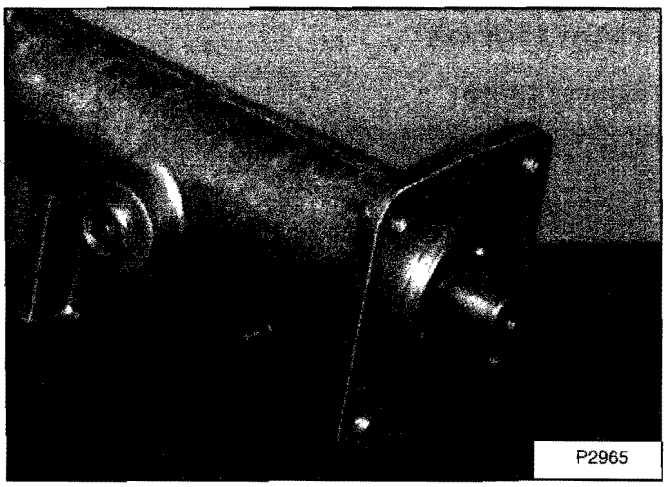
Install on the bearing, the same number and size shims that were removed during disassembly **[Figure 70-60-36]**.

Figure 70-60-37



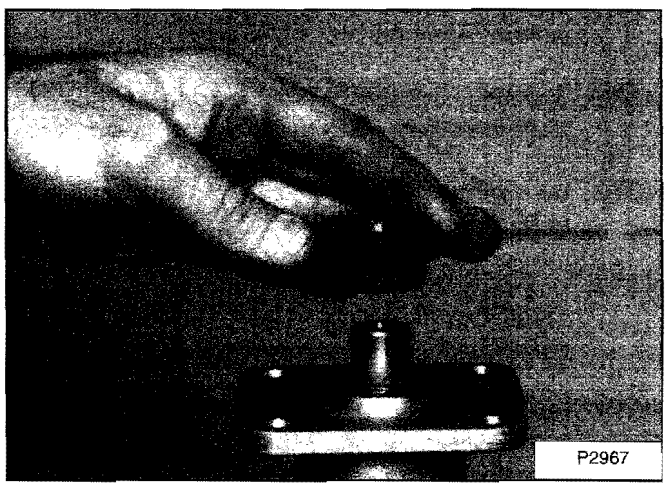
Install the small snap ring in the groove above the shims **[Figure 70-60-37]**.

Figure 70-60-38



Install the gear key in the flange end of the shaft **[Figure 70-60-38]**.

Figure 70-60-39



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 70-60-39]**.

Gearbox Assembly (Cont'd)

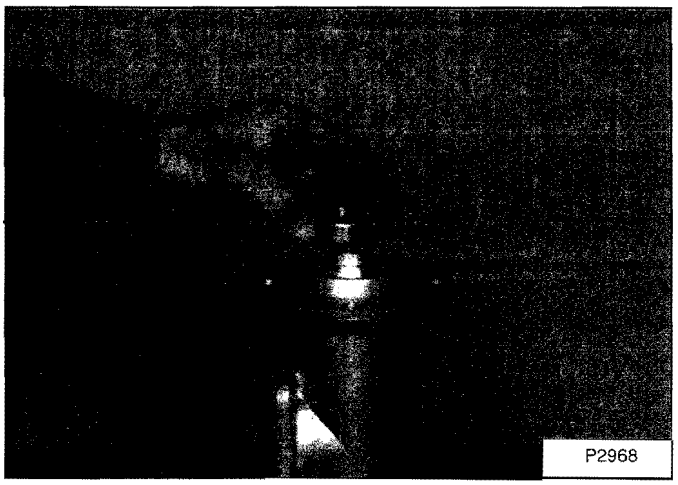
Figure 70-60-40

Install the washer **[Figure 70-60-40]**.

Put liquid adhesive (LOCTITE #242) on the screw threads. Install and tighten the screw **[Figure 70-60-40]**.

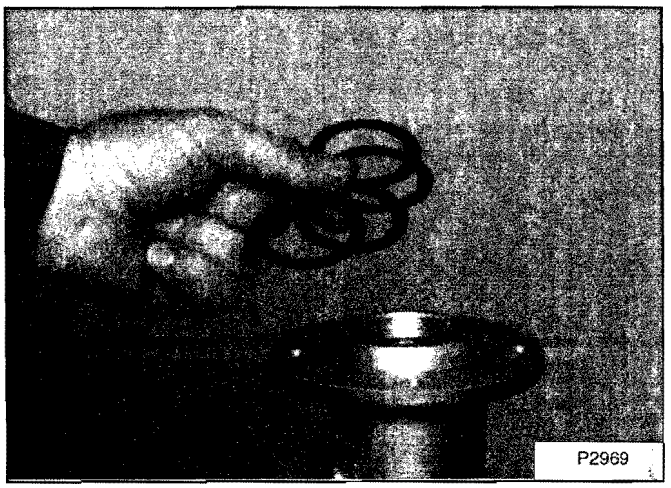
Short Housing

Figure 70-60-41



Install a bearing in the flanged end of the housing **[Figure 70-60-41]**.

Figure 70-60-42



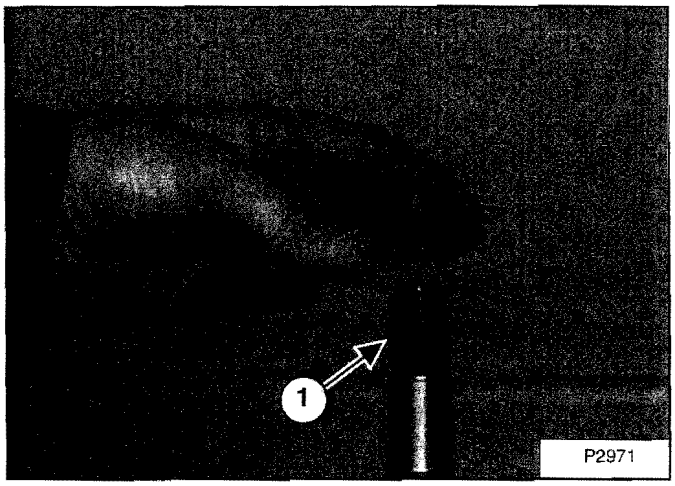
Install the large shims on the bearing (flanged end) **[Figure 70-60-42]**.

Figure 70-60-43

Install the large snap ring in the groove above the shims **[Figure 70-60-43]**.

Gearbox Assembly (Cont'd)

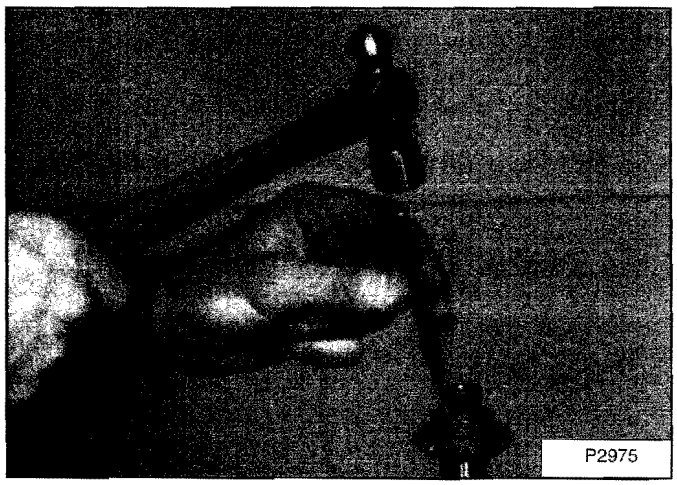
Figure 70-60-44



Install the short key (Item 1) **[Figure 70-60-44]**.

Align and press the gear on the shaft (teeth toward the tapered end of the shaft).

Figure 70-60-45



After the gear is seated, drive the key down inside the gear key way **[Figure 70-60-45]**.

NOTE: This will prevent damage to the shims when the bearing is installed later.

Figure 70-60-46

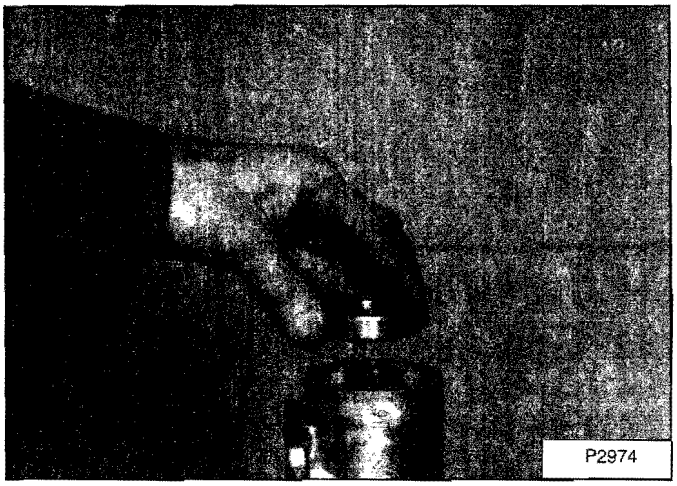
Install the shaft in the housing, tapered end in the bearing at the round flange end of the housing **[Figure 70-60-46]**.

Figure 70-60-47

Install on the shaft, the same number and size shims that were removed during disassembly **[Figure 70-60-47]**.

Gearbox Assembly (Cont'd)

Figure 70-60-48

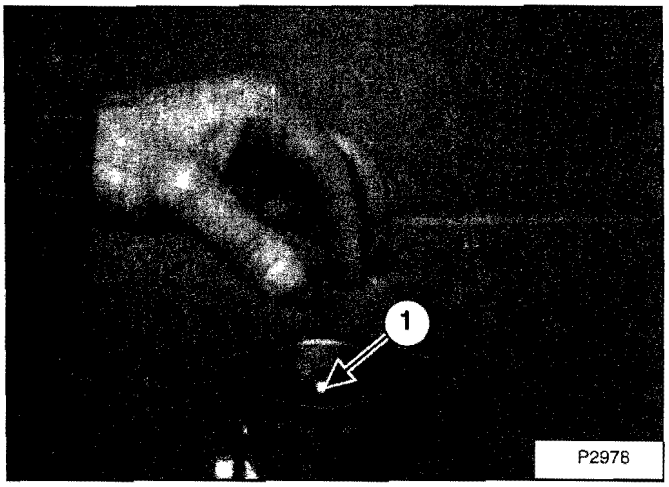


Install a bearing on the gear end of the shaft **[Figure 70-60-48]**.

Figure 70-60-49

Install the snap ring in the groove above the bearing **[Figure 70-60-49]**.

Figure 70-60-50

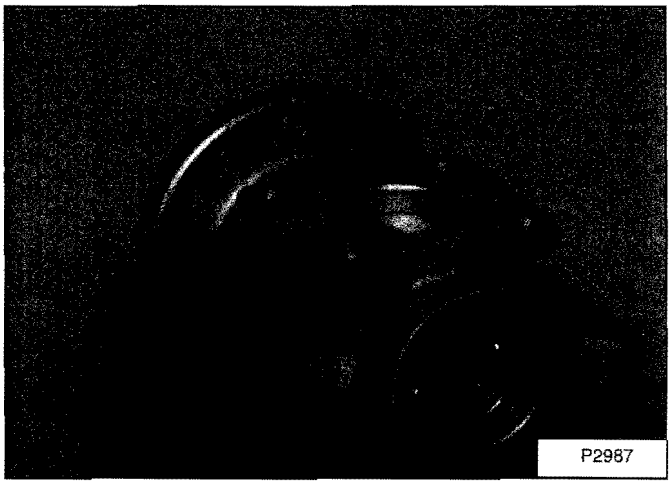


Install the washer (Item 1) **[Figure 70-60-50]** on the shaft. Put liquid adhesive (LOCTITE #242) on the screw threads and install the screw.

Gearbox, Checking Backlash

NOTE: For procedures requiring the use of LOCTITE #242 adhesive, thoroughly clean and dry affected parts before the application of LOCTITE #242.

Figure 70-60-51



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:

Put the short housing in a vise, square flange facing up as shown **[Figure 70-60-51]**.

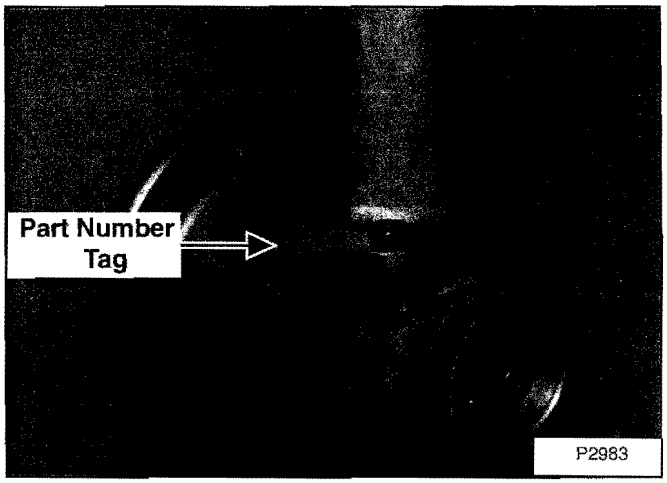
Figure 70-60-52

Install the same size and number of square shims (if present during disassembly) between the two housings **[Figure 70-60-52]**.

Set the long housing on the short housing with a small amount of liquid adhesive (LOCTITE #242) between the mounting surfaces.

NOTE: If square shims are used, put a small amount of the liquid adhesive on both sides of all shims.

Figure 70-60-53



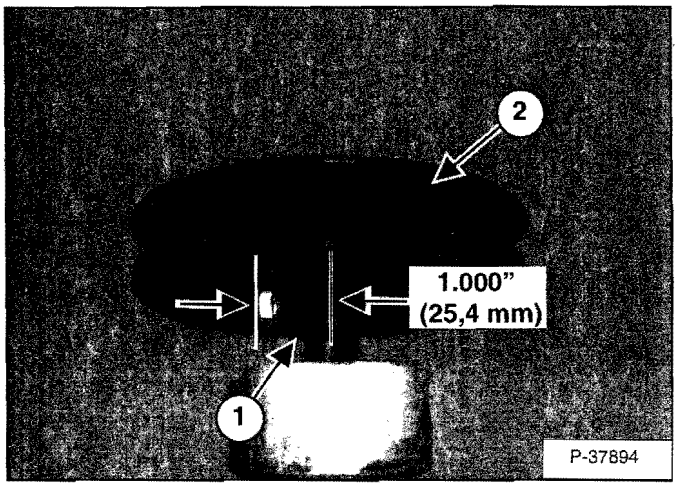
Install the four mounting bolts through the flange holes **[Figure 70-60-53]**.

Install the part number tag **[Figure 70-60-53]**.

Install and tighten the nut to 25-28 ft.-lbs. (34-38 Nm) torque.

Gearbox, Checking Backlash (Cont'd)

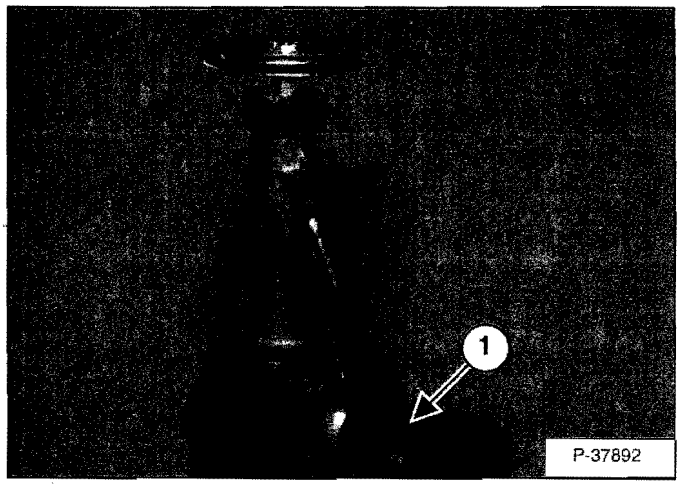
Figure 70-60-54



Install the long key (Item 1) and the pulley (Item 2) **[Figure 70-60-54]**.

Install a bolt in the set screw hole to maintain a 1.000 inch (25,4 mm) distance from the shaft center to the bolt head (to be used with a dial indicator) **[Figure 70-60-54]**.

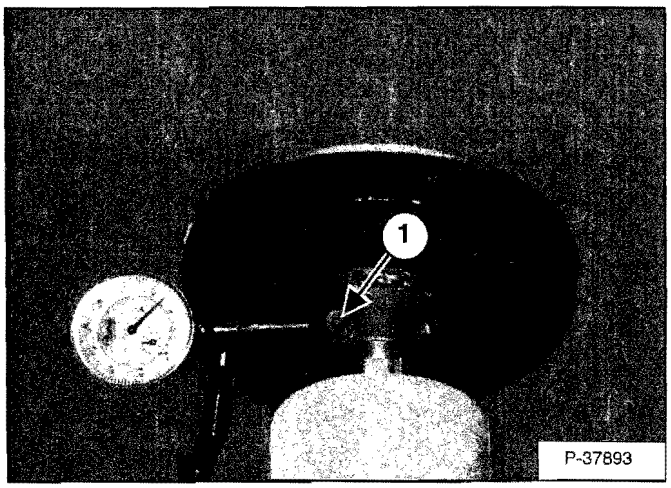
Figure 70-60-55



Put the fan nut (Item 1) **[Figure 70-60-55]** on the shaft and tighten snugly.

Install a locking pliers on the fan nut and support the handle against the long housing **[Figure 70-60-55]**.

Figure 70-60-56



Using a magnetic based dial indicator mounted on a bench vise, touch the dial stem on the bolt (Item 1) **[Figure 70-60-56]**.

Hold the locking pliers against the long housing and rotate the pulley back and forth to read the dial gauge **[Figure 70-60-56]**.

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.

Gearbox, Checking Backlash (Cont'd)

Figure 70-60-57

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 70-60-57]**.

Figure 70-60-58

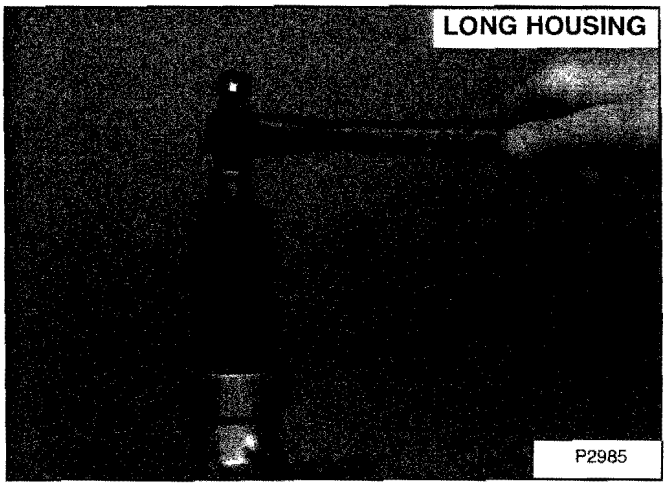
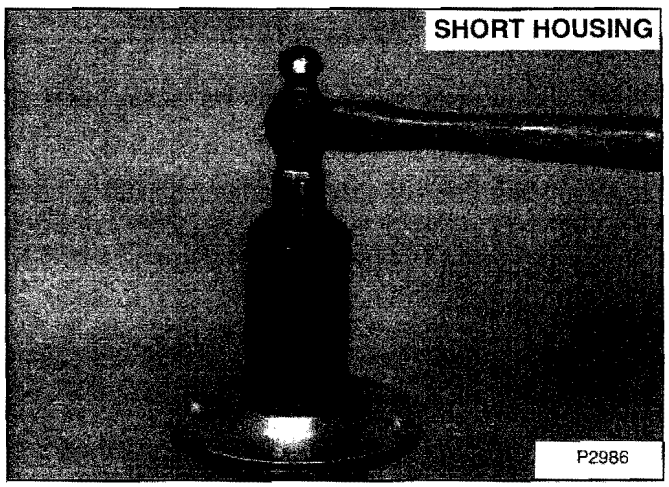


Figure 70-60-59



Install the seal(s) flush with the housing surface **[Figure 70-60-58]** & **[Figure 70-60-59]**.

Clean any oil from the flange surface.

Install the long housing on the short housing flange.

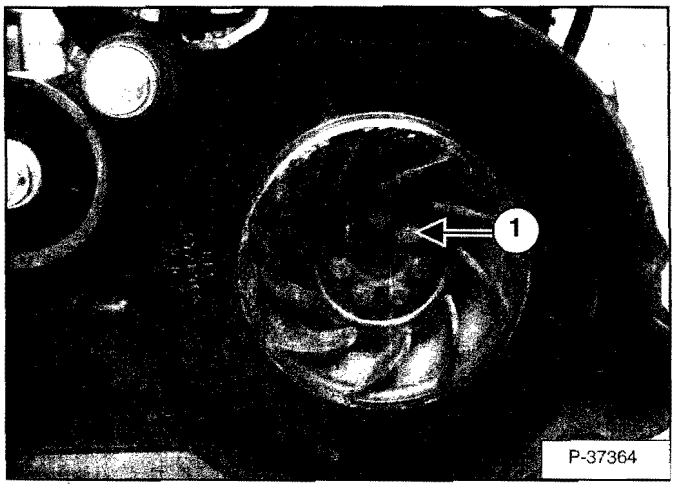
Install the four bolts and part number tag.

Install and tighten the nuts to 25-28 ft.-lbs. (34-38 Nm) torque.

FLYWHEEL AND HOUSING

Flywheel Removal And Installation

Figure 70-80-1



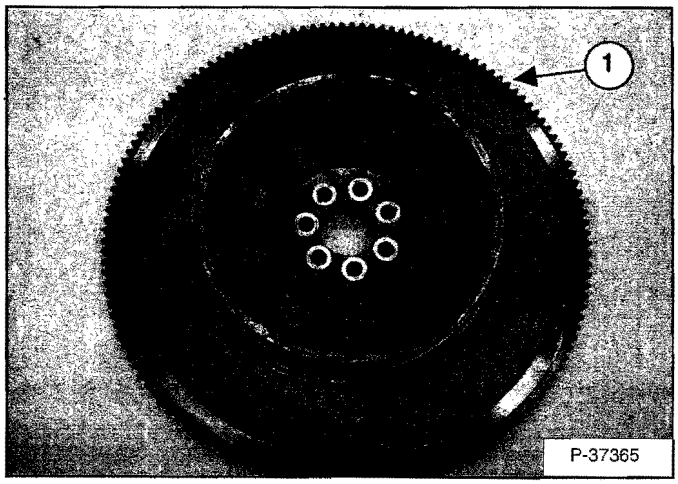
NOTE: To avoid damage to the RPM sensor, remove the RPM sensor before removing the flywheel.

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

Remove the bolts (Item 1) **[Figure 70-80-1]** from the flywheel.

Installation: Tighten the flywheel bolts to 75-80 ft.lbs.(101,7-108,4 Nm) torque.

Figure 70-80-2



Remove the flywheel from the engine crankshaft **[Figure 70-80-2]**.

Ring Gear Removal And Installation

NOTE: The lead chamfer on ring gear tooth must face the starter.

The ring gear (Item 1) **[Figure 70-80-2]** on the flywheel is an interference fit. Heat the ring gear enough to expand it and hit it with a hammer to remove it evenly.

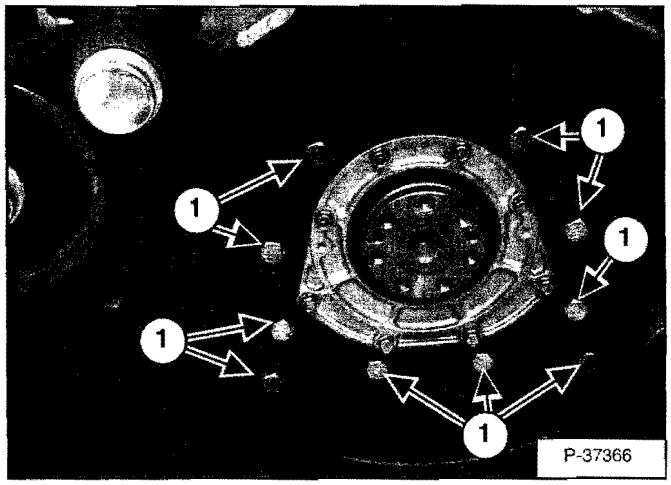
Clean the outer surface of the flywheel to give it a smooth fit.

Clean the new ring gear and heat it to a maximum temperature of 428°F (220°C).

Fit the ring gear over the flywheel. Make sure the gear is on the seat correctly.

Flywheel Housing Removal And Installation

Figure 70-80-3



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

Remove the hydrostatic pump. (See Contents Page 30-01.)

Remove the belt tension pulley assembly. (See Contents Page 30-01.)

Remove the starter. (See Contents Page 60-01.)

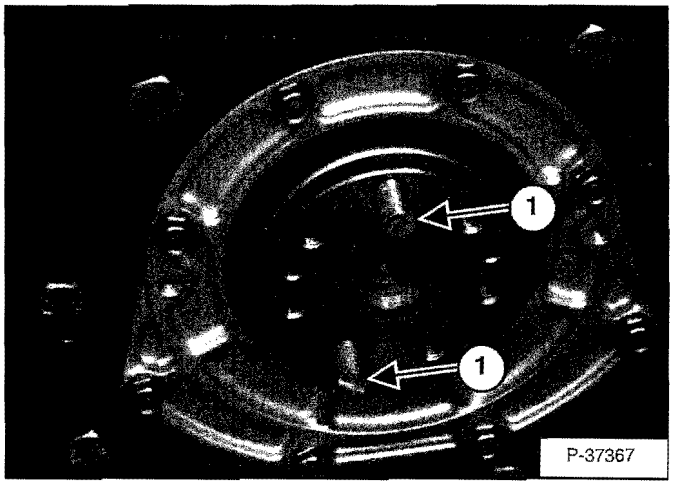
Remove the ten flywheel housing mounting bolts (Item 1) **[Figure 70-80-3]**.

Installation: Tighten the mounting bolts to 65-75 ft.-lbs. (88,1-101,7 Nm) torque.

Remove the flywheel housing from the engine.

Flywheel Removal And Installation (Cont'd)

Figure 70-80-4



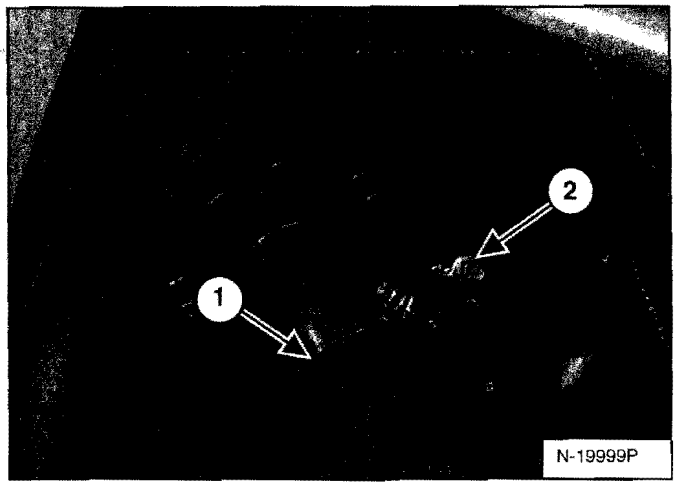
Installation: Install the flywheel housing on the engine.

Install two alignment studs (Item 1) **[Figure 70-80-4]** into the engine crankshaft to help align the flywheel.

The two studs are M12 x 1.25 Pitch x 76 mm (3 in.) long.

Removal And Installation

Figure 70-70-1



NOTE: The engine and hydrostatic pump will be removed as an assembly.

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

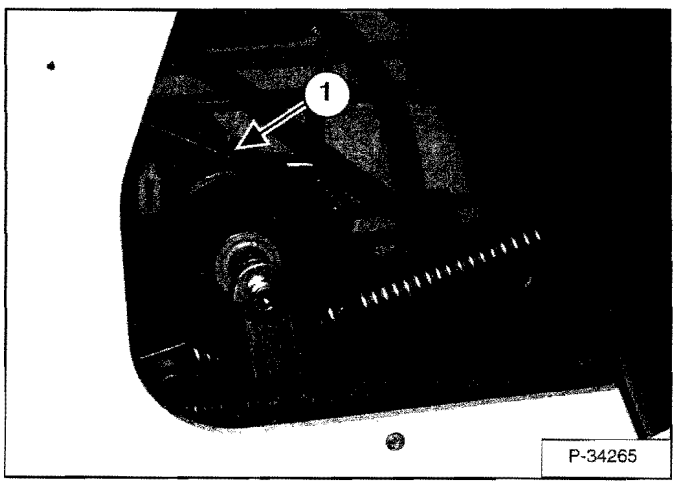
Raise the operator cab. (See Contents Page 10-01.)

Drain the hydraulic fluid from the hydraulic reservoir. (See Contents Page 20-01.)

Disconnect the fuel fill hose (Item 1) **[Figure 70-70-1]** from the fuel fill neck.

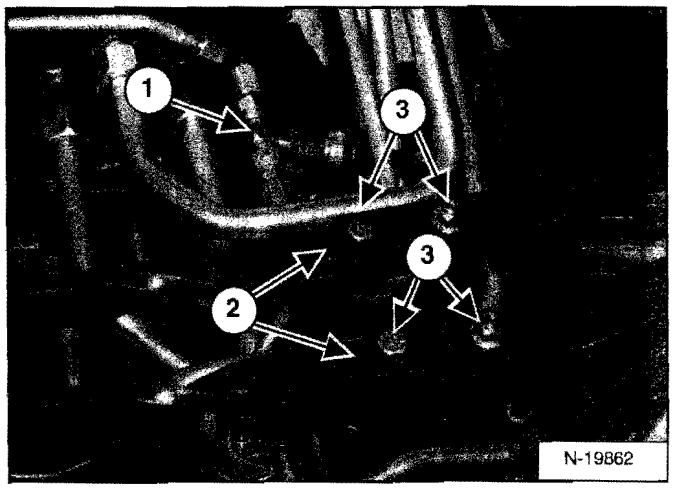
Disconnect the air vent hose (Item 2) **[Figure 70-70-1]** from the fuel fill neck.

Figure 70-70-2



At the left side access hole, remove the fan drive belt (Item 1) **[Figure 70-70-2]**.

Figure 70-70-3

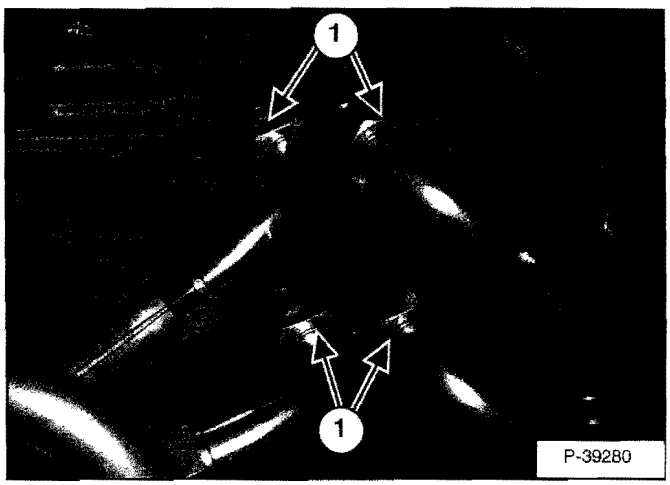


Disconnect the charge pressure hose (Item 1) **[Figure 70-70-3]**.

Mark the steering linkages (Item 2). Remove the four steering linkage bolts (Item 3) **[Figure 70-70-3]** and separate the linkages.

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

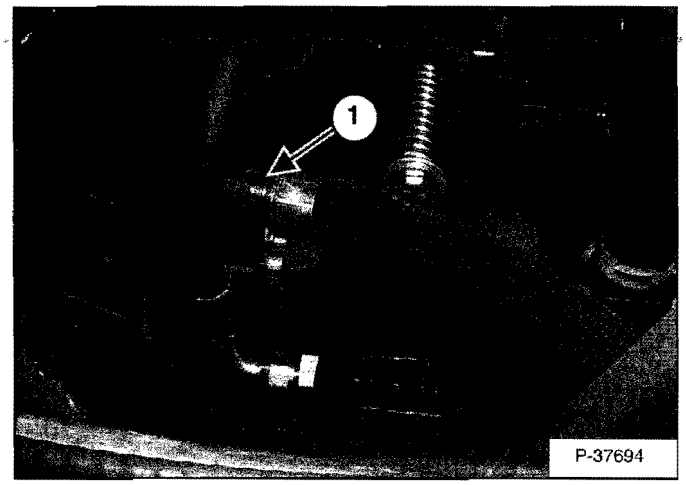
Figure 70-70-4



Remove the four high pressure hydraulic hoses (Item 1) **[Figure 70-70-4]** from the hydrostatic pump.

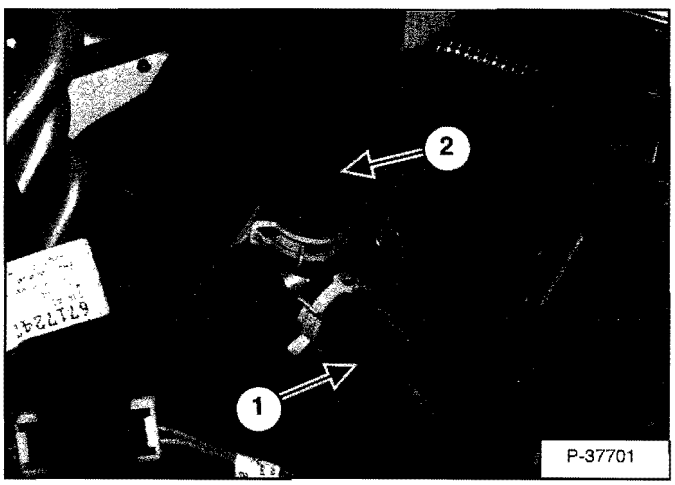
Removal And Installation (Cont'd)

Figure 70-70-5



At the right side access hole, remove the hydraulic hose (hoses if Hi-flow equipped) (Item 1) **[Figure 70-70-5]** from the hydraulic gear pump (pumps).

Figure 70-70-6

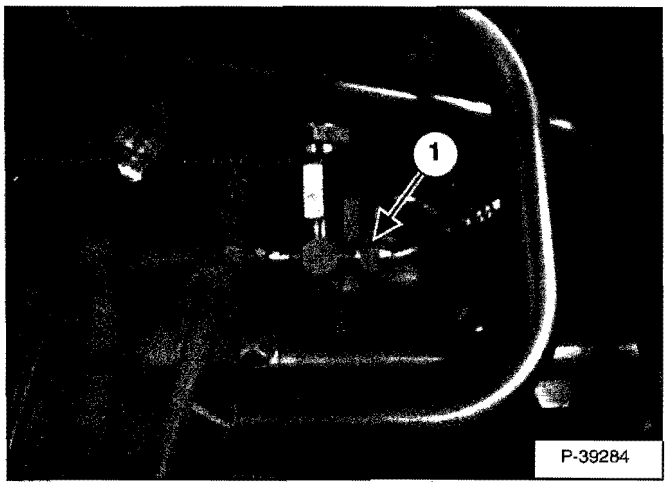


Disconnect the hose (Item 1) **[Figure 70-70-6]** that goes from the hydraulic reservoir to the pump.

Disconnect the hose (Item 2) **[Figure 70-70-6]** that comes from the hydraulic filter.

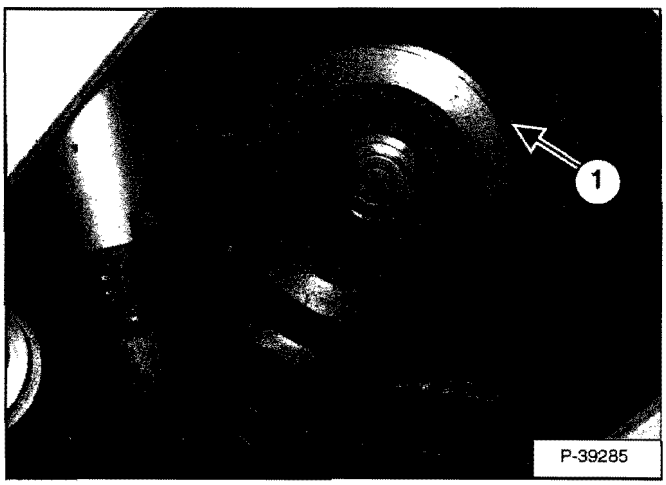
Cap and plug the hoses and fittings.

Figure 70-70-7



Disconnect the hydraulic charge pressure hose (Item 1) **[Figure 70-70-7]** from the fitting at the control valve, that goes to the back side of the hydrostatic pumps.

Figure 70-70-8



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

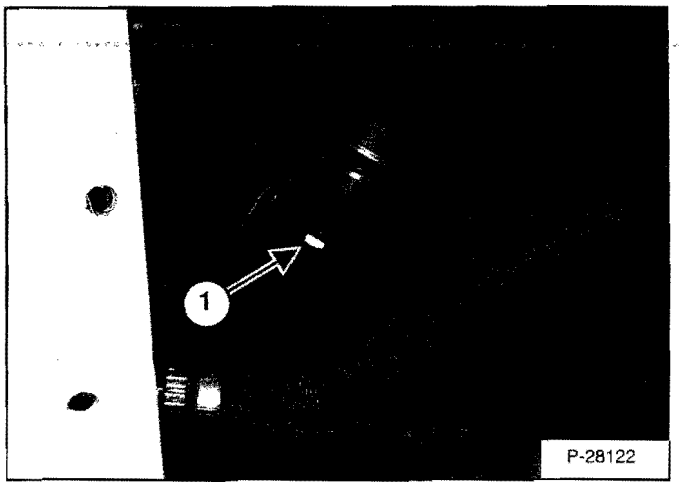
Remove the racks from the loader. (See Contents Page 40-01.)

Remove the side access covers.

At the left side access hole, remove the fan drive belt (Item 1) **[Figure 70-70-8]** from the flywheel pulley.

Removal And Installation (Cont'd)

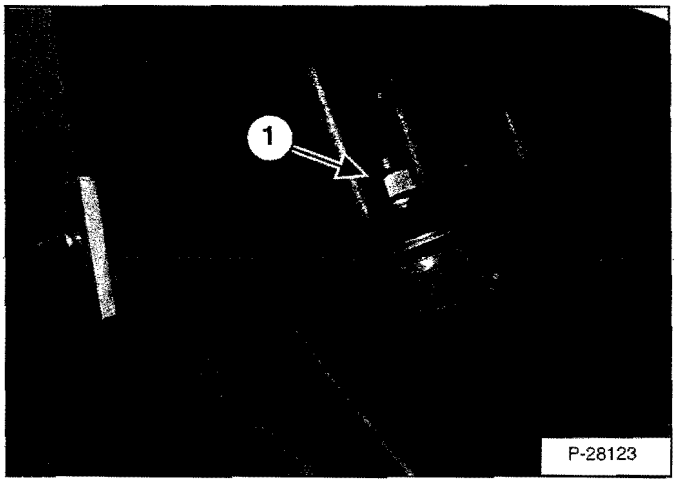
Figure 70-70-9



Remove the engine mount bolt (Item 1) **[Figure 70-70-9]** at the left front engine mount.

Installation: Tighten the mounting bolt 61-69 ft.-lbs.(83-94 Nm) torque.

Figure 70-70-10



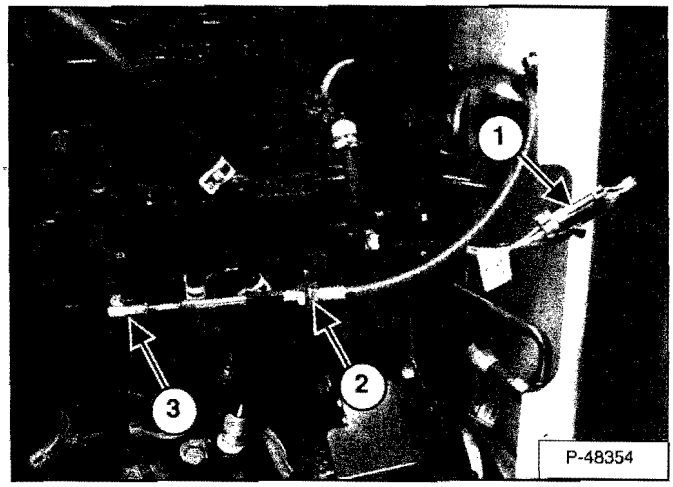
Remove the engine mount bolt (Item 1) **[Figure 70-70-10]** at the right front engine mount.

Installation: Tighten the mounting bolt 61-69 ft.-lbs.(83-94 Nm) torque.

At the engine compartment, remove the battery. (See Contents Page 60-01.)

Remove the engine air cleaner. (See Contents Page 70-01.)

Figure 70-70-11

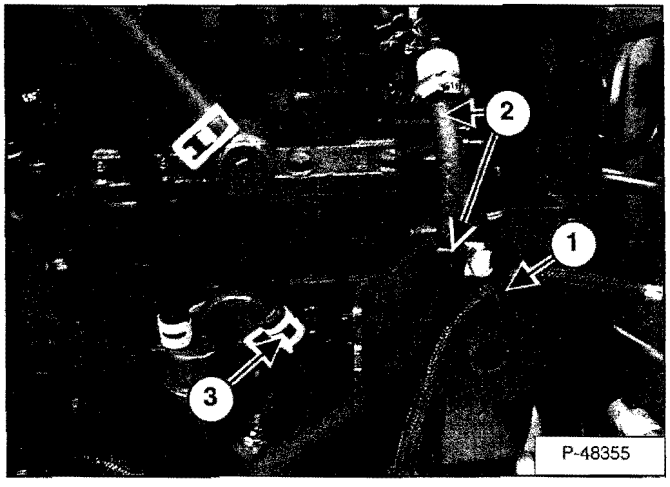


At the rear door, disconnect the engine electrical harness connector (Item 1) **[Figure 70-70-11]**.

Loosen the mounting jam nut (Item 2) **[Figure 70-70-11]** on the engine throttle cable.

Remove the throttle cable nut (Item 3) **[Figure 70-70-11]**, and remove the cable from the injector pump.

Figure 70-70-12



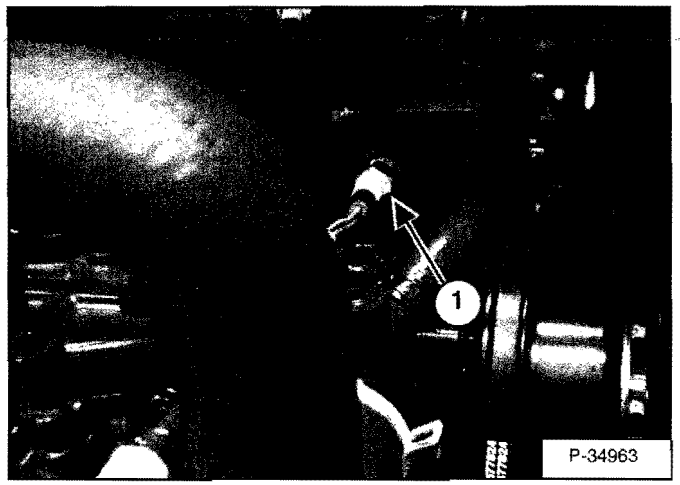
Remove the wiring harness clamp (Item 1) **[Figure 70-70-12]**.

Remove the fuel return line and mount clamp (Item 2) **[Figure 70-70-12]**. Plug and cap the fuel line and fitting.

Disconnect the fuel inlet hose (Item 3) **[Figure 70-70-12]**. Plug and cap the fuel line and fitting.

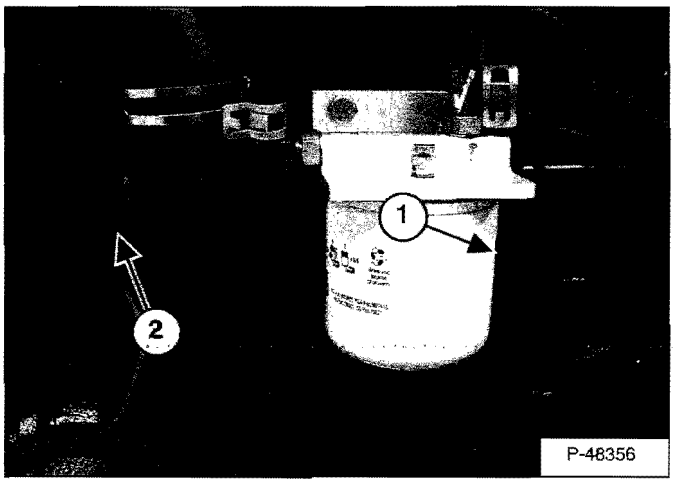
Removal And Installation (Cont'd)

Figure 70-70-13



Disconnect the wiring harness connector (Item 1) **[Figure 70-70-13]** from the water temperature sender.

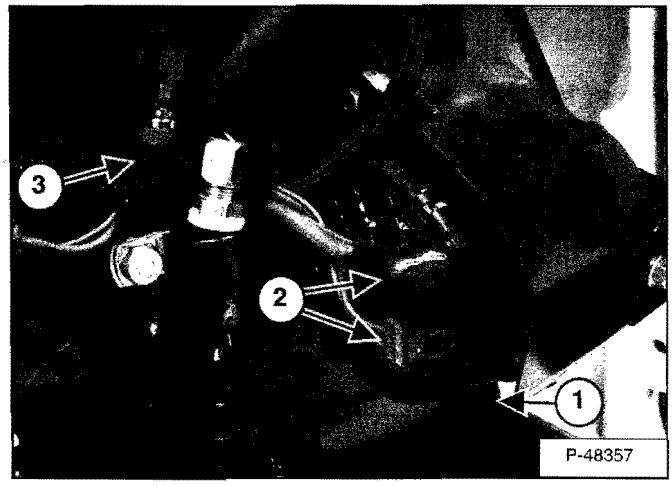
Figure 70-70-14



Disconnect the wiring harness connector (Item 1) **[Figure 70-70-14]** from the fuel shut-off solenoid.

Disconnect the wiring harness (Item 2) **[Figure 70-70-14]** from the air intake heater.

Figure 70-70-15

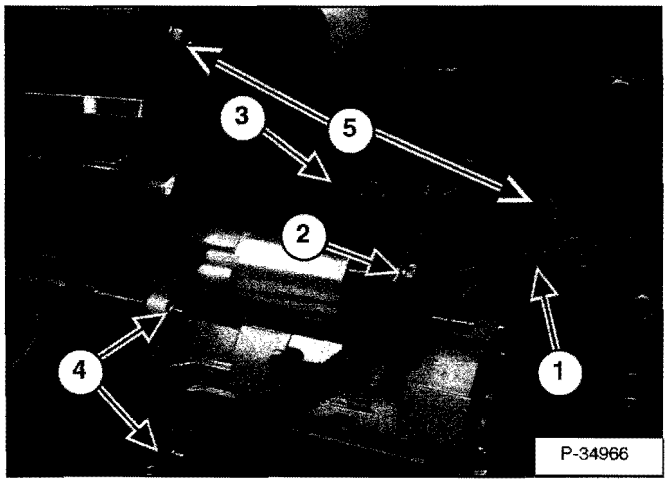


Remove the ground wire (Item 1) **[Figure 70-70-15]** from the alternator.

Disconnect the two wires (Item 2) **[Figure 70-70-15]** from the alternator.

Disconnect the wire connector (Item 3) **[Figure 70-70-15]** from the oil pressure sender.

Figure 70-70-16



Disconnect the wire connector (Item 1) **[Figure 70-70-16]** from the starter solenoid wires.

Disconnect the positive (+) wires (Item 2) **[Figure 70-70-16]** from the starter.

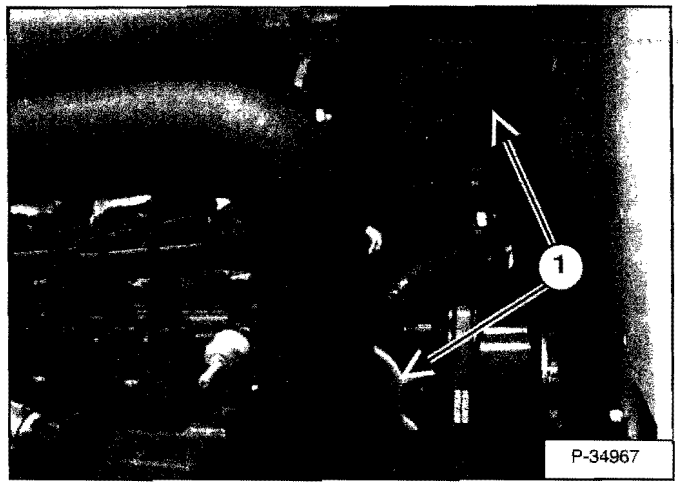
Disconnect the wire connector (Item 3) **[Figure 70-70-16]** from the engine speed sensor.

Disconnect the two ground wires (Item 4) **[Figure 70-70-16]**.

Remove the two wire harness clamps (Item 5) **[Figure 70-70-16]**.

Removal And Installation (Cont'd)

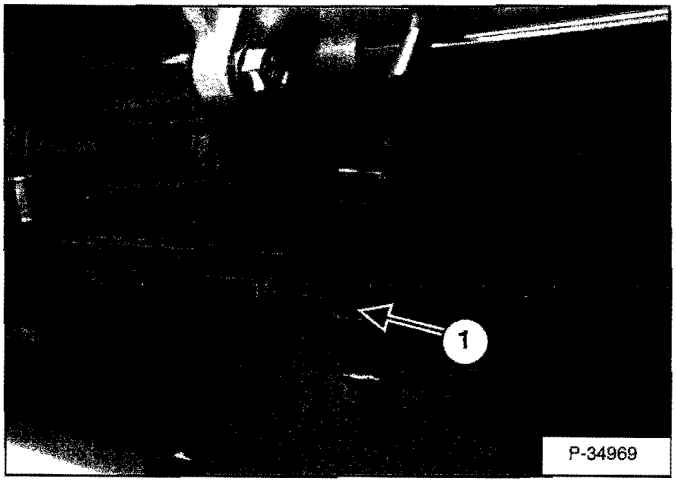
Figure 70-70-17



Drain the coolant from the radiator.

Remove the two radiator hoses (Item 1) **[Figure 70-70-17]**.

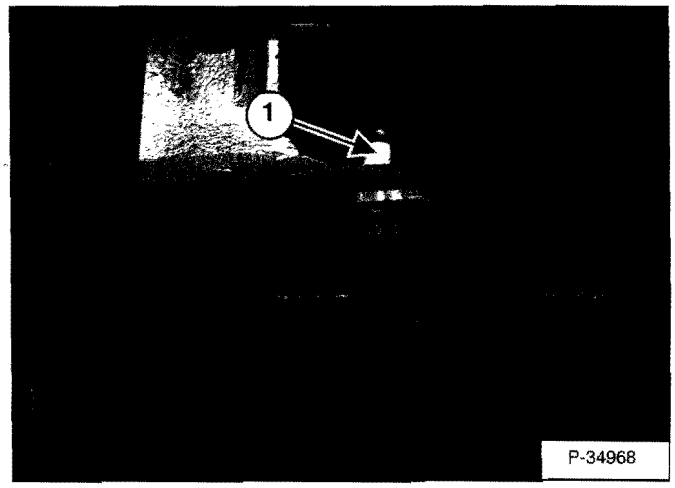
Figure 70-70-18



Remove the left rear engine mouinting bolt (Item 1) **[Figure 70-70-18]**.

Installation: Tighten the nut and bolt to 61-69 ft.-lbs. (83-94 Nm) torque.

Figure 70-70-19



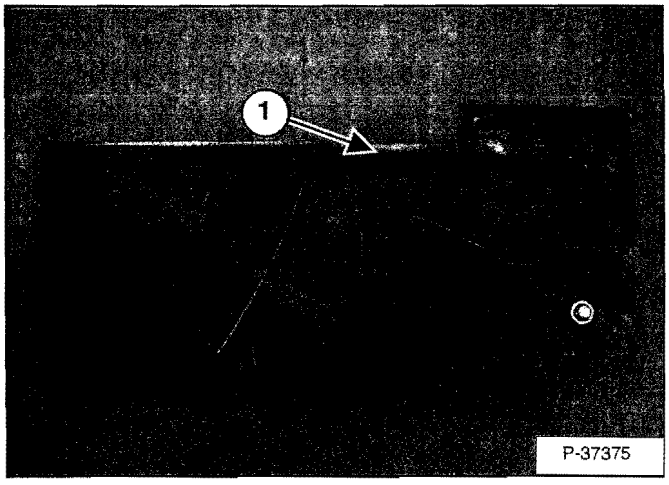
Remove the right rear engine mounting bolt (Item 1) **[Figure 70-70-19]**.

Installation: Tighten the nut and bolt to 61-69 ft.-lbs. (83-94 Nm) torque.

Remove the engine muffler. (See Contents Page 70-01.)

Use the dimensions (See Removal And Installation Tools on Page 70-70-9) to make the engine removal and installation tools.

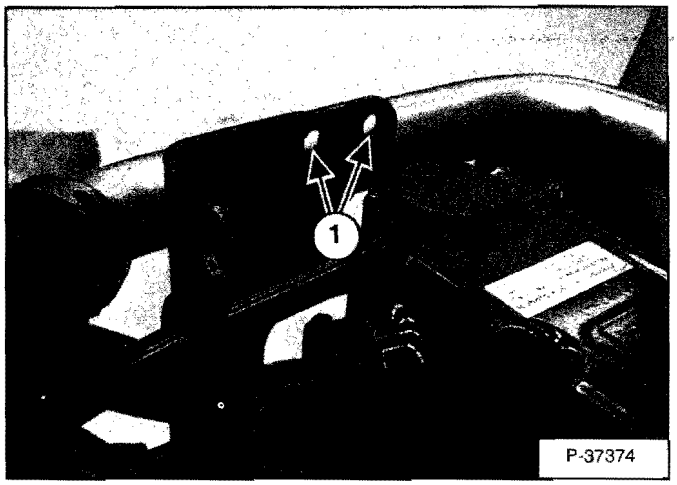
Figure 70-70-20



Install the engine removal bracket (Item 1) **[Figure 70-70-20]** on the engine.

Removal And Installation (Cont'd)

Figure 70-70-21



Install the engine removal bracket on the engine using the two holes (Item 1) **[Figure 70-70-21]** on the muffler mount bracket and the hole (Item 1) **[Figure 70-70-22]** in the exhaust tube/bracket coming from the turbo charger.

Figure 70-70-22

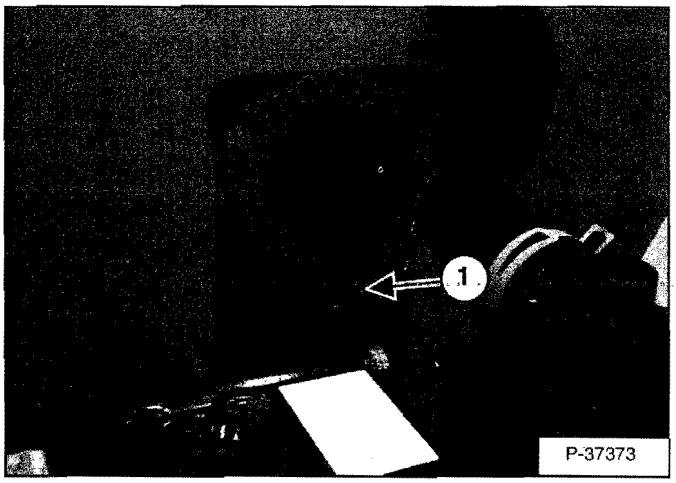
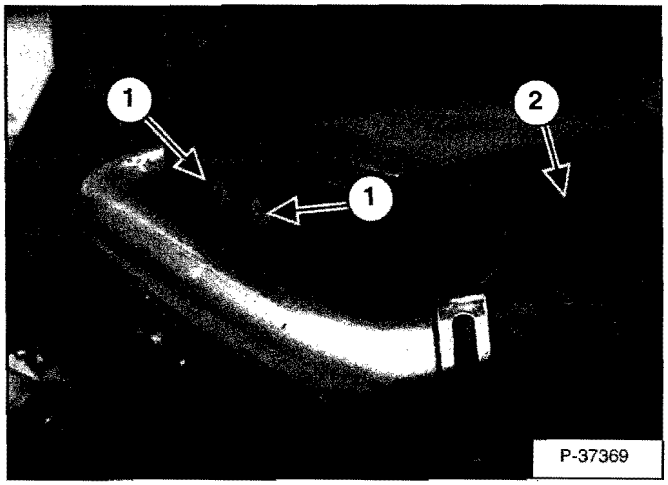


Figure 70-70-23

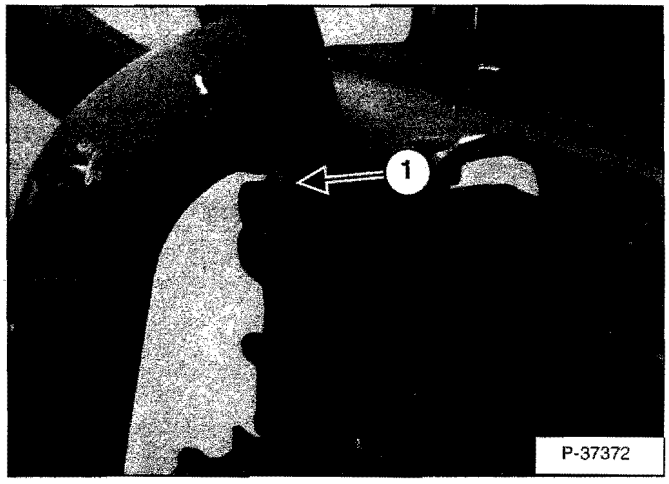


Install two bolts (Item 1) **[Figure 70-70-23]** through the engine removal bracket and through the two holes in the muffler bracket (Item 1) **[Figure 70-70-21]**.

Installation: Use .375 in. x 1.5 in (9.525 mm x 38,1mm) bolts and nuts.

Finger tighten the bolts.

Figure 70-70-24



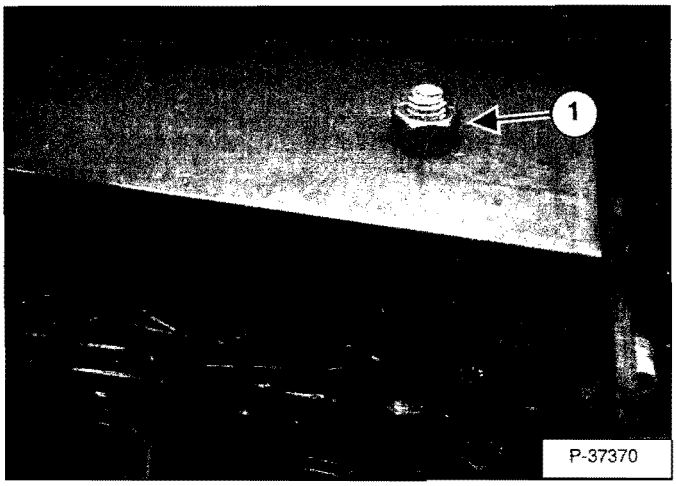
Install the bolt (Item 1) **[Figure 70-70-24]** through the exhaust bracket on the engine, and through the engine removal bracket.

Installation: Use .375 in. x 1.5 in (9.525 mm x 38,1mm) bolts and nuts.

Tighten the bolts and nuts.

Removal And Installation (Cont'd)

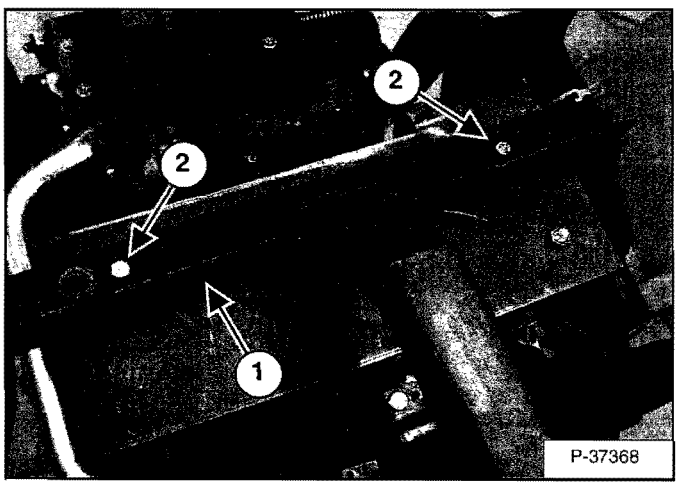
Figure 70-70-25



Install a bolt, with two nuts (Item 1) **[Figure 70-70-25]** through the engine removal bracket, and allow it to set on the engine head bolt. Use the nuts to adjust the length of the bolt against the engine head. Lock the nuts tight against the removal bracket, when the proper length has been obtained.

Installation: Use .500 in. x 5.5 in (12.7 mm x 139,7mm) bolt and nuts.

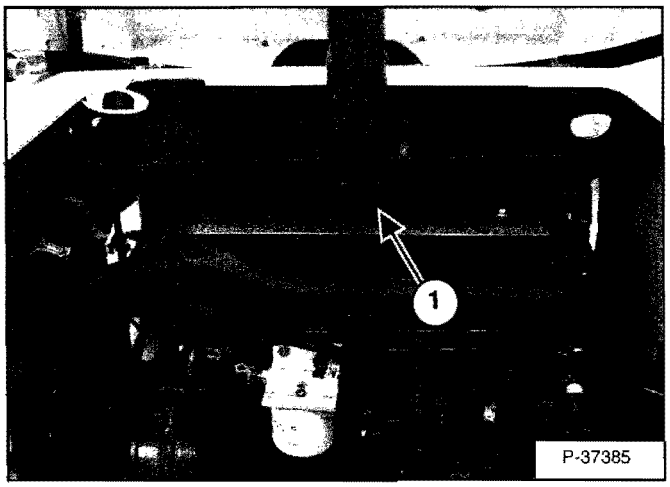
Figure 70-70-26



Install the engine lift bracket (Item 1) to the removal bracket using two bolts (Item 2) **[Figure 70-70-26]**.

Installation: Use two .375 in. x 1.5 in (9.525 mm x 38,1mm) bolts and nuts.

Figure 70-70-27



Check all bolts that attach the engine lift brackets (Item 1) **[Figure 70-70-27]** to the engine and tighten as needed.

Removal And Installation (Cont'd)

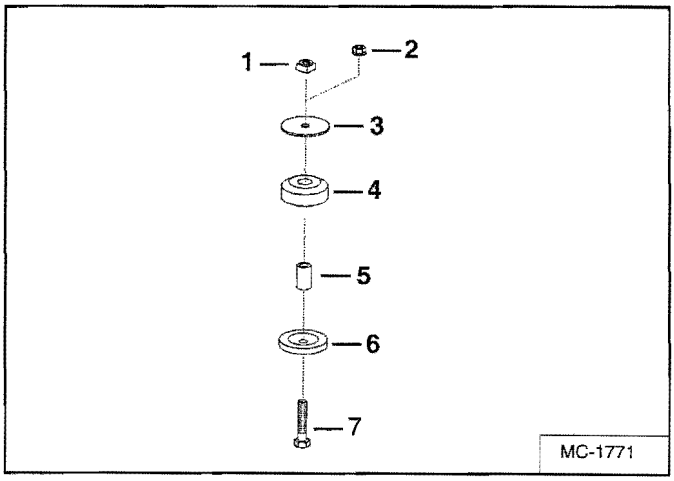
Figure 70-70-28

Connect a chain hoist to the ring (Item 1) **[Figure 70-70-28]** on the lift bracket.

Remove the engine/hydrostatic pump assembly from the loader **[Figure 70-70-28]**

Mount Replacement

Figure 70-70-29



Use the following procedure to install new engine mounts:

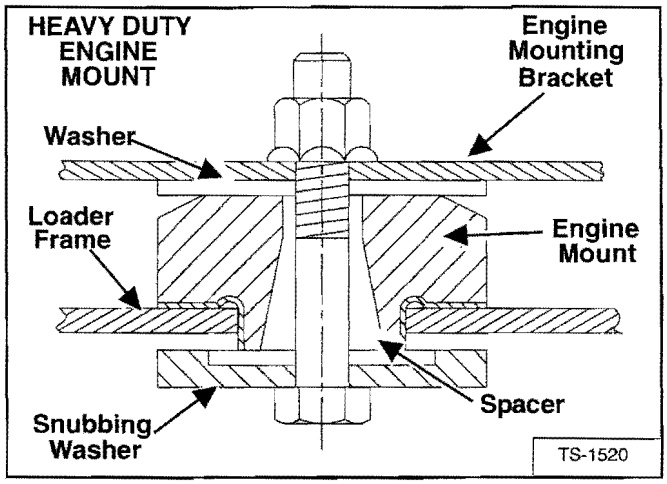
Remove the existing mount from the engine. Refer to engine removal and installation for engine mount locations.

Replace all four engine mounts (two front and two rear).

Use the parts shown to install the new engine mounts **[Figure 70-70-29]**.

Item 1 - Square Nut - Used on left side engine mounts
Item 2 - Hex Nut - Used on right side engine mounts
Item 3 - Mount Washer
Item 4 - Engine Mount
Item 5 - Tube Spacer
Item 6 - Snubbing Washer
Item 7 - Mounting Bolt

Figure 70-70-30

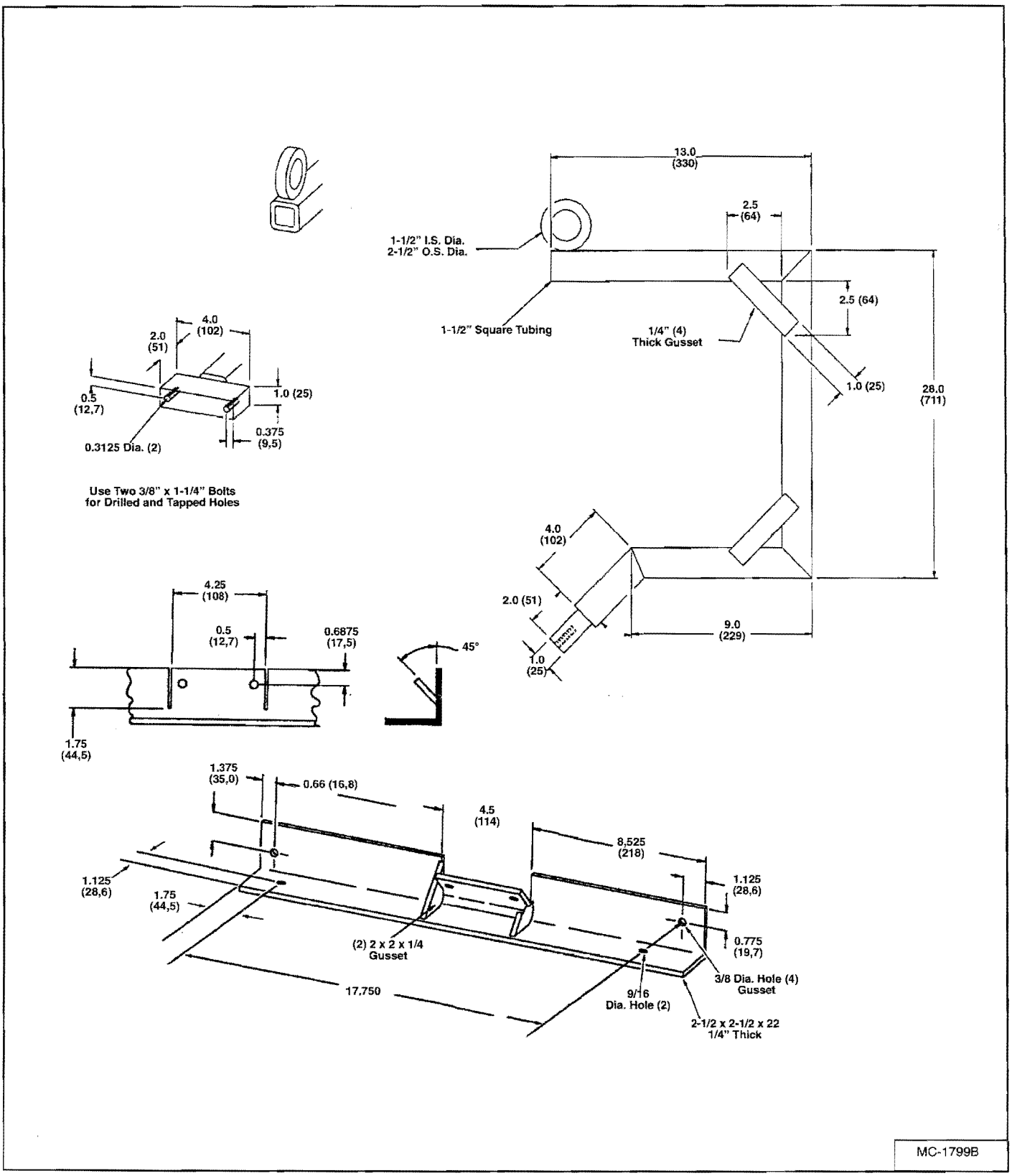


Install the new engine mount as shown in the cut away side view **[Figure 70-70-30]**.

Tighten the mounting bolts to 61-69 ft.-lbs. (83-94 Nm) torque.

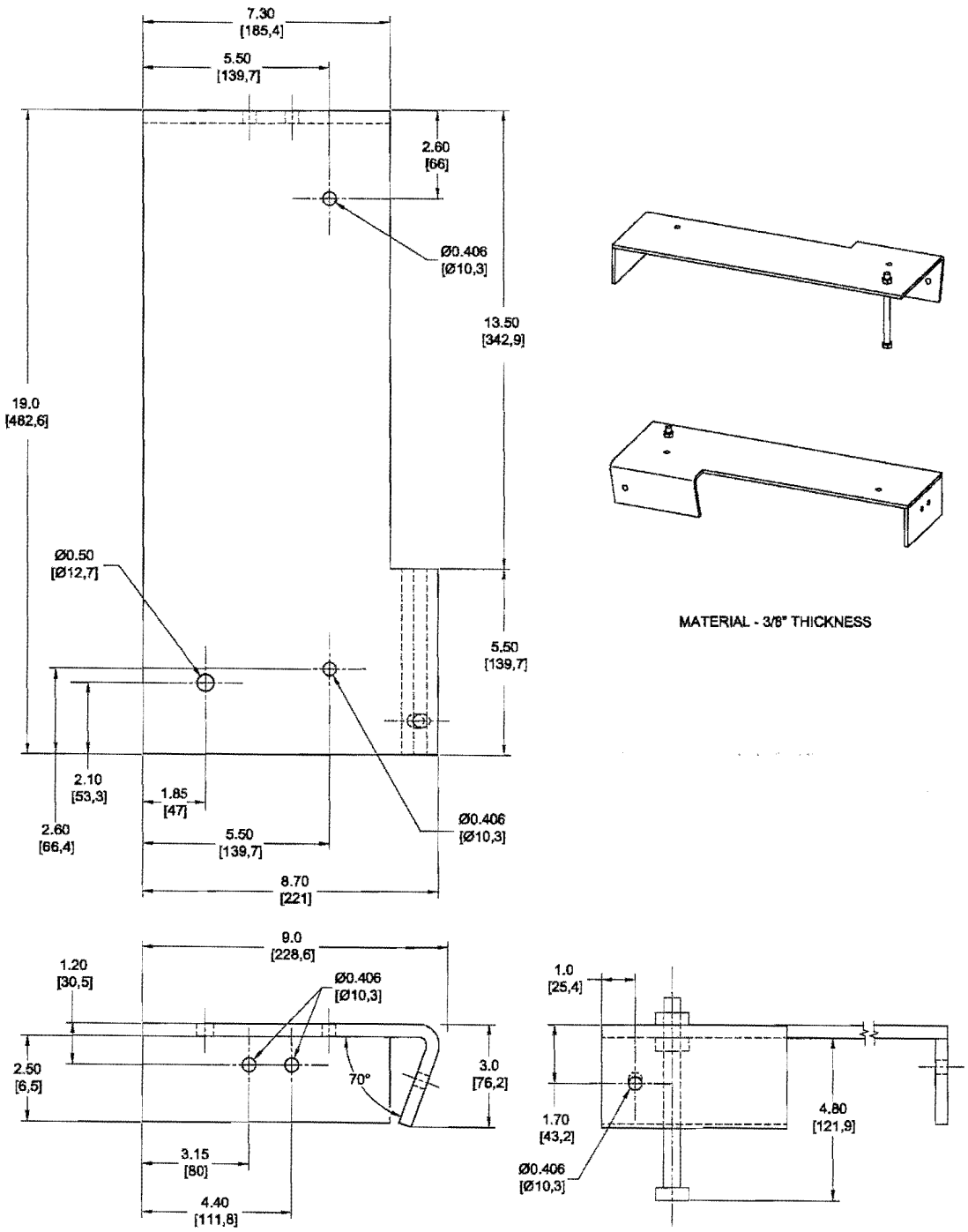
Removal And Installation Tools

Figure 70-70-31



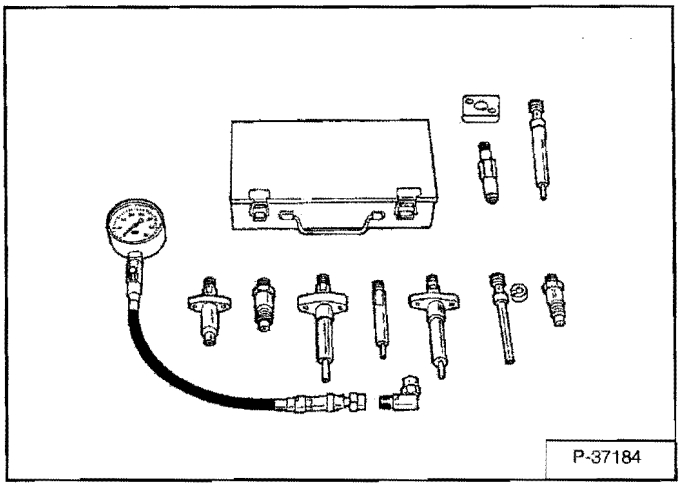
Removal And Installation Tools (Cont'd)

Figure 70-70-32



Engine Tools Identification Chart

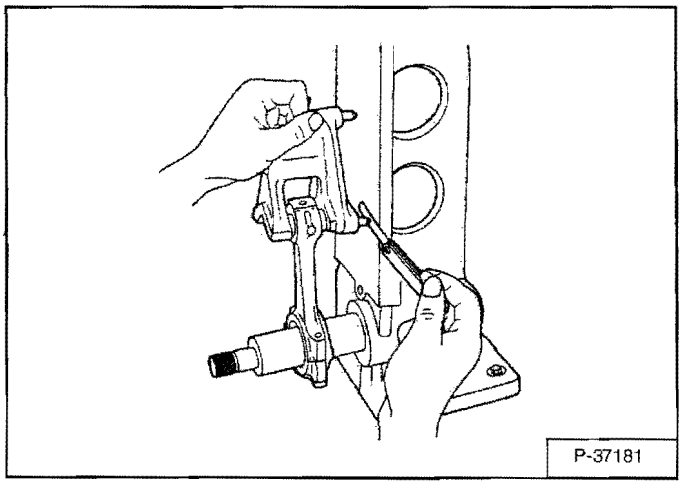
Figure 70-90-1



Valve Seat Cutter Set

Code No:	07909-33102
Application:	Use for correcting valve seats.

Figure 70-90-2



Connecting Rod Alignment Tool

Code No:	07909-31661
Application:	Use for checking the connecting rod alignment.
Application Range:	Connecting rod big end I.D. 30 to 75 mm (1.18 to 2.95 in. dia.) Connecting rod length 65 to 330 mm (2.56 to 12.99 in.)

The following special tools are not provided, so make them referring to [**Figure 70-90-3**] & [**Figure 70-90-4**].

Figure 70-90-3

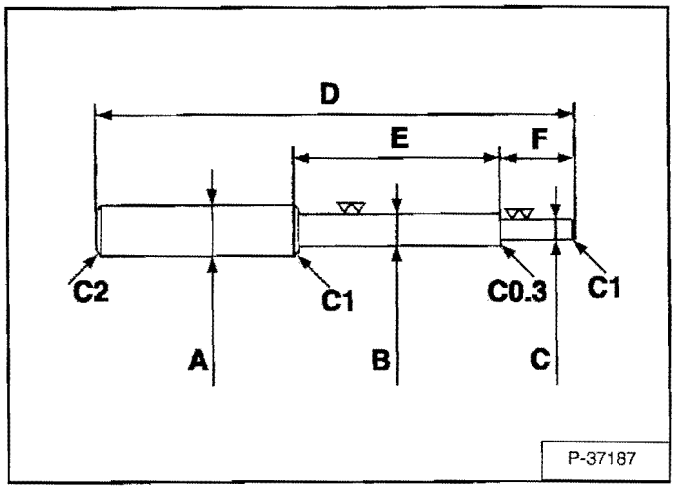
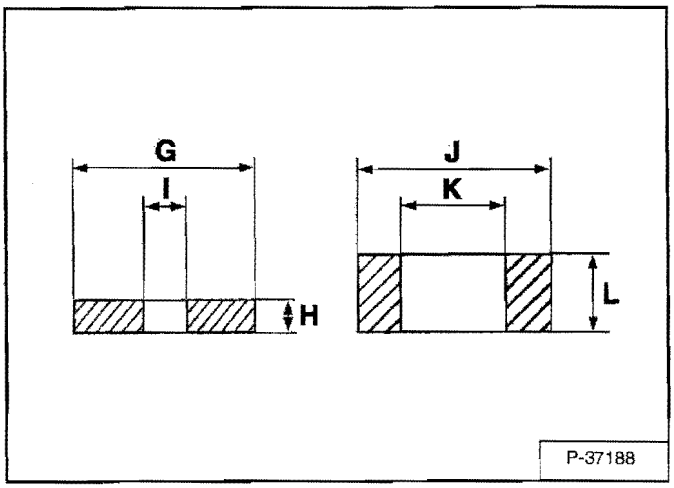


Figure 70-90-4



Valve Guide Replacing Tool

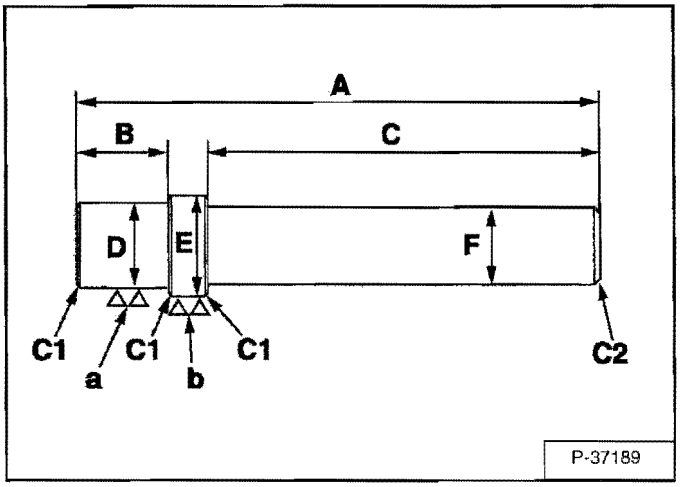
Application: Use to press out and press fit the valve guide.

A	20 mm dia. (0.79 in. dia.)
B	11.7 to 11.9 mm dia. (0.460 to 0.468 in. dia.)
C	6.5 to 6.6 mm dia. (0.256 to 0.259 in. dia.)
D	225 mm (8.86 in.)
E	70 mm (2.76 in.)
F	45 mm (1.77 in.)
G	25 mm (0.98 in.)
H	5 mm (0.197 in.)
I	6.7 to 7.0 mm dia. (0.263 to 0.275 in. dia.)
J	20 mm dia. (0.787 in. dia.)
K	12.5 to 12.8 mm dia. (0.492 to 0.504 in. dia.)
L	8.9 to 9.1 mm (0.350 to 0.3578 in. dia.)
C1	Chamfer 1.0 mm (0.039 in.)
C2	Chamfer 2.0 mm (0.079 in.)
C0.3	Chamfer 0.3 mm (0.012 in.)

Engine Tools Identification Chart (Cont'd)

The following special tools are not provided, so make them referring to **[Figure 70-90-5]** & **[Figure 70-90-6]**.

Figure 70-90-5



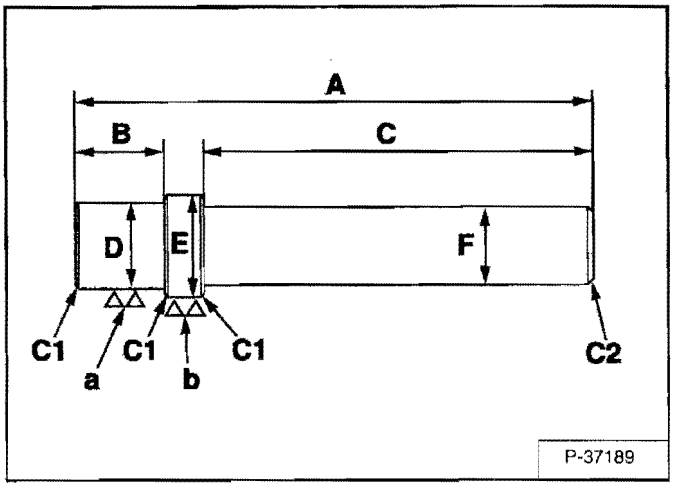
Bushing Replacing Tool

Application: Use to press out and press fit the bushing.

1. For idle gear bushing.

A	196 mm (7.7165 in.)
B	37.5 to 1.476 mm
C	150 mm (5.9055 in.)
D	46.325 to 46.500 mm dia. (1.8238 to 1.8307 in. dia.)
E	48.100 to 48.075 mm dia. (1.8937 to 1.8927 in. dia.)
F	20 mm (0.7874 in.)
a	0.0000063 mm (0.00025 in.)
b	0.0000063 mm (0.00025 in.)
C1	Chamfer 1.0 mm (0.039 in.)
C2	Chamfer 2.0 mm (0.079 in.)

Figure 70-90-6



Small End Bushing Replacing Tool

Application: Use to press out and to press fit the sma; end bushing.

(Press out)

A	157 mm dia. (6.181 in.)
B	14.5 mm (0.571 in.)
C	120 mm (4.7244 in.)
D	30.101 to 30.156 mm dia. (1.1851 to 1.187 in. dia.)
E	33.075 to 33.100 mm dia. (1.3021 to 1.3031 in. dia.)
F	20 mm (0.7874 in.)
a	0.0000063 mm (0.00025 in.)
b	0.0000063 mm (0.00025 in.)
C1	Chamfer 1.0 mm (0.039 in.)
C2	Chamfer 2.0 mm (0.079 in.)

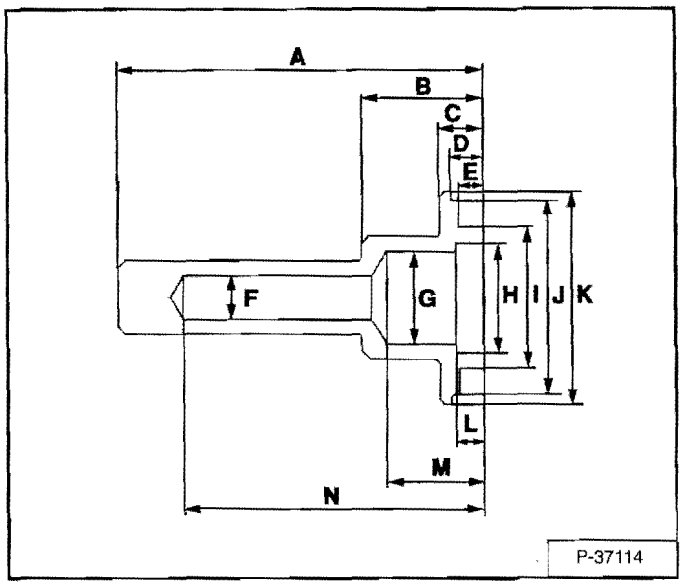
(Press fit)

A	157 mm dia. (6.181 in.)
B	14.5 mm (0.571 in.)
C	120 mm (4.7244 in.)
D	30.101 to 30.156 mm dia. (1.1851 to 1.187 in. dia.)
E	42.000 mm dia. (1.6535 in. dia.)
F	20 mm (0.7874 in.)
a	0.0000063 mm (0.00025 in.)
b	0.0000063 mm (0.00025 in.)
C1	Chamfer 1.0 mm (0.039 in.)
C2	Chamfer 2.0 mm (0.079 in.)

Engine Tools Identification Chart (Cont'd)

The following special tools are not provided, so make them referring to [**Figure 70-90-7**] & [**Figure 70-90-8**].

Figure 70-90-7

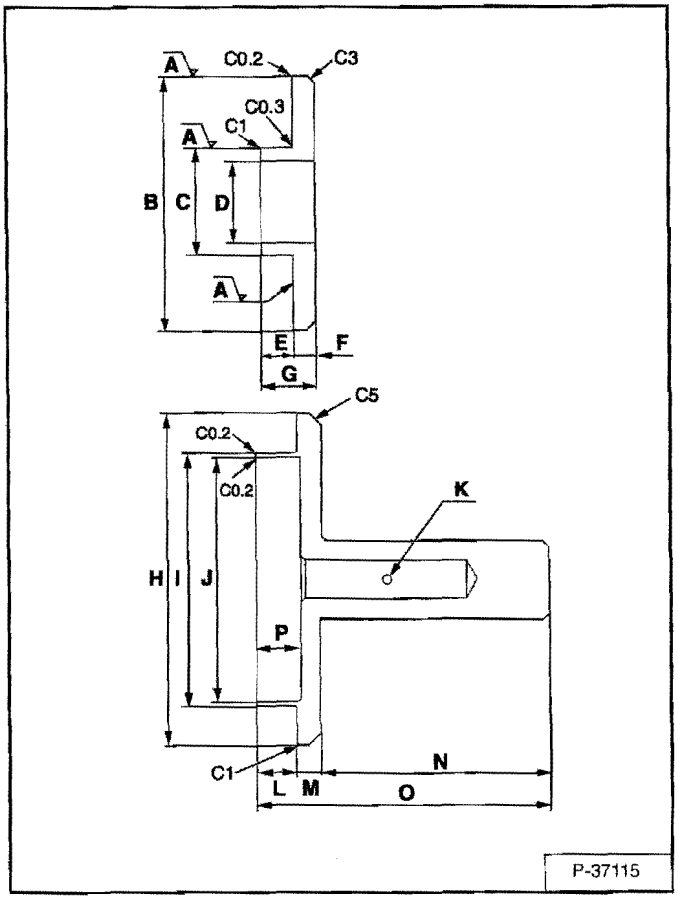


Gearcase Oil Seal Replacing Tool

Application: Use to press fit the oil seal.

A	148.8 mm (5.8582 in.)
B	50 mm (1.9685 in.)
C	18.8 mm (0.7401 in.)
D	13.7 to 13.9 mm (0.5394 to 0.5472 in.)
E	11 mm (0.433 in.)
F	18 mm dia. (0.7087 in. dia.)
G	38 mm dia. (1.4961 in. dia.)
H	45 mm dia. (1.7716 in. dia.)
I	57.9 to 58.1 mm (2.2795 to 2.2874 in.)
J	79.5 mm dia. (3.1299 in. dia.)
K	87 mm (3.452 in.)
L	12 mm (0.4724 in.)
M	40 mm (1.5748 in.)
N	120 mm (4.7244 in.)

Figure 70-90-8



Auxiliary Socket For Fixing Crankshaft Sleeve

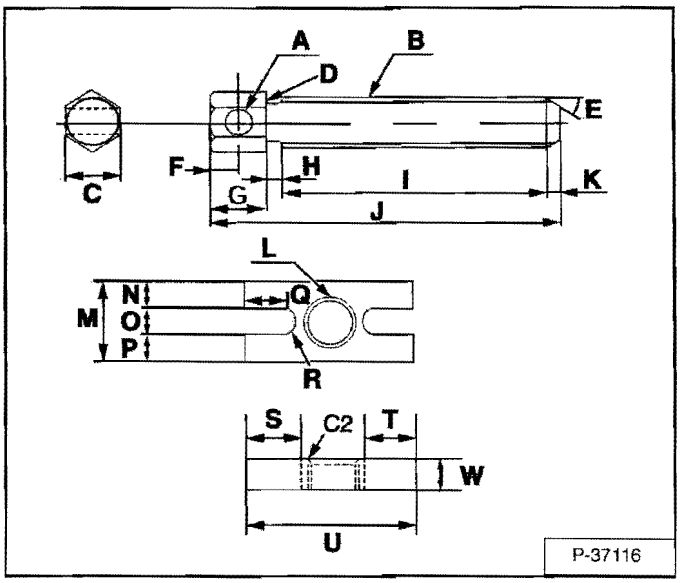
Application: Use to fix the crankshaft sleeve of the diesel engine.

A	Rmax = 12.5 S
B	94.5 to 95.0 mm (3.7205 to 3.7402 in.)
C	40 mm (1.5748 in.)
D	30 mm (1.1811 in.)
E	12 mm (0.4724 in.)
F	7.9 to 8.1 mm (0.3110 to 0.3189 in.)
G	20 mm (0.0787 in.)
H	130 mm (5.1181 in.)
I	99.4 to 99.6 mm (3.9134 to 3.9213 in.)
J	95.05 to 95.20 mm (3.7421 to 3.7480 in.)
K	3 mm dia. (0.1181 in. dia.)
L	15 mm (0.5905 in.)
M	10 mm (0.3937 in.)
N	90 mm (3.5433 in.)
O	115 mm (4.5275 in.)
P	16.9 to 17.1 mm (0.6654 to 0.6732 in.)
C1	Chamfer 1.0 mm (0.039 in.)
C3	Chamfer 3.0 mm (0.1181 in.)
C5	Chamfer 5.0 mm (0.1969 in.)
C0.2	Chamfer 0.2 mm (0.0079 in.)
C0.3	Chamfer 0.3 mm (0.0118 in.

Engine Tools Identification Chart (Cont'd)

The following special tools are not provided, so make them referring to **[Figure 70-90-9]**.

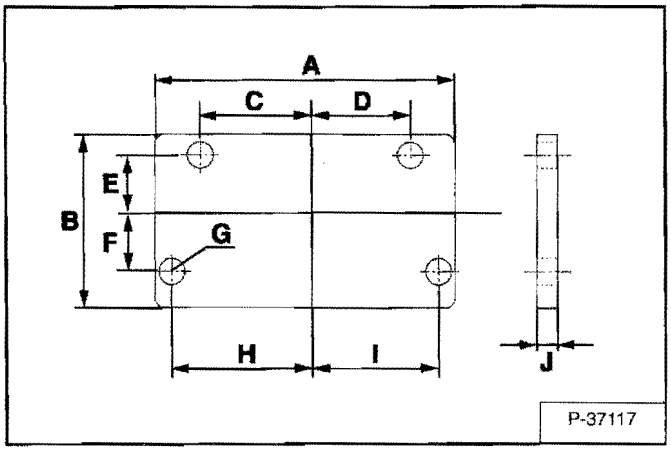
Figure 70-90-9



Injection Pump Gear Puller
Application: Use for removing the injection pump gear from the governor shaft.

A	10 mm (0.39 in. dia.)
B	M16 x Pitch 1.5
C	19 mm (0.75 in.)
D	0.5 mm radius (0.02 in. radius)
E	0.89 rad. (50°)
F	10 mm dia. (0.39 in.)
G	20 mm (0.79 in.)
H	5 mm (0.20 in.)
I	95 mm (3.74 in.)
J	125 mm (4.93 in.)
K	5 mm (0.20 in.)
L	M16 x Pitch 1.5
M	30 mm (1.18 in.)
N	9.5 mm (0.3740 in.)
O	11 mm (0.4331 in.)
P	9.5 mm (0.3740 in.)
Q	15.5 mm (0.6102 in.)
R	4.5 mm radius (0.18 in. radius)
S	20 mm (0.79 in.)
T	20 mm (0.79 in.)
U	80 mm (3.1496 in.)
W	12 mm (0.47 in.)
C2	Chamfer 2.0 mm (0.079 in.)

Figure 70-90-10

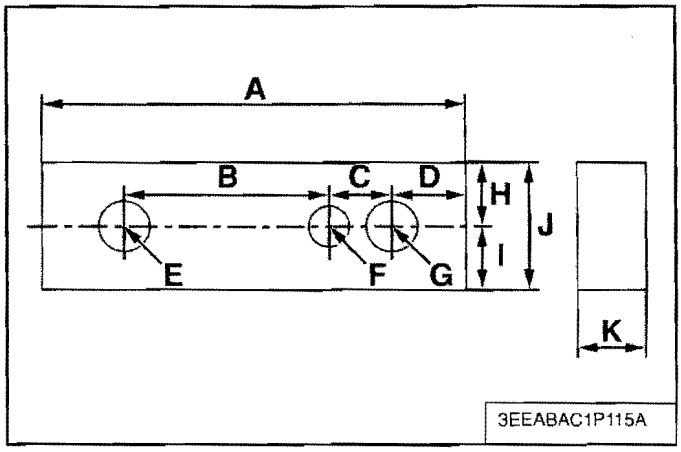


Flywheel Stopper (For SAE Flywheel And Housing)
Application: Use to loosen and tighten the flywheel screw.

A	140 mm (5.5 in.)
B	90 mm (3.15 in.)
C	49.3 mm (1.94 in.)
D	49.3 mm (1.94 in.)
E	23.8 mm (0.94 in.)
F	23.8 mm (0.94 in.)
G	11 mm dia. (0.43 in. dia.)
H	56.5 mm (2.22 in.)
I	56.5 mm (2.22 in.)
J	8 mm (0.31 in.)

Engine Tools Identification Chart (Cont'd)

Figure 70-90-11

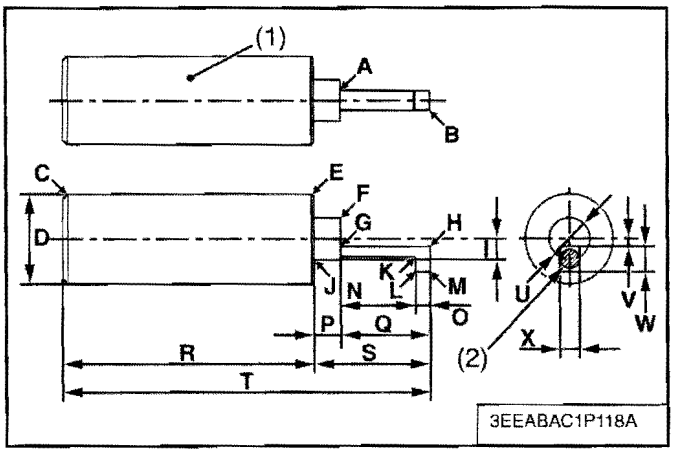


Tool for aligning the crankcase 1 and 2

Application: Use for aligning the crankcase 1 and 2.

A	115 mm (4.5276 in.)
B	56 mm (2.2047 in.)
C	17 mm (0.6693 in.)
D	20 mm (0.7874 in.)
E	f14 mm (0.5512 in. dia.)
F	f11 mm (0.4331 in. dia.)
G	f14 mm (0.5512 in. dia.)
H	17.5 mm (0.6890 in.)
I	17.5 mm (0.6890 in.)
J	35 mm (1.3780 in.)
K	19mm (0.7480 in.)

Figure 70-90-12



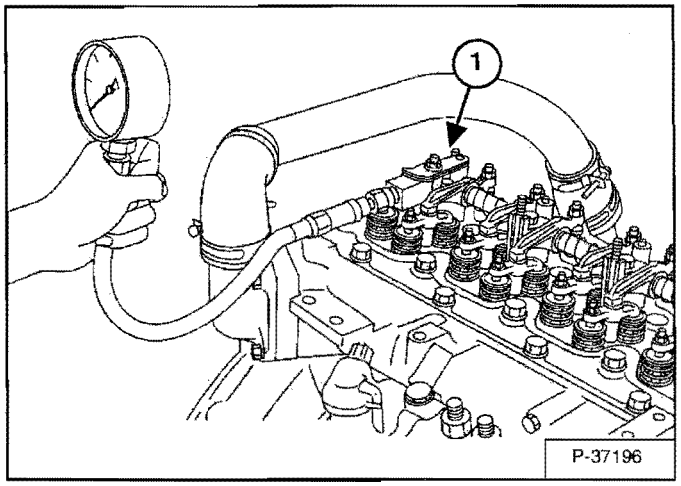
Jig for Governor Connecting Rod

Application: Use for connecting the governor connecting rod to the rack pin of the fuel injection pump assembly.

A	1 mm (0.0394 in.)
B	C0.2 mm (0.0079 in.)
C	C2 mm (0.0787 in.)
D	f35 mm (1.3780 in. dia.)
E	C1 mm (00394 in.)
F	C0.1 mm (0.0039 in.)
G	1 mm (0.0394 in.)
H	C0.2 mm (0.0079 in.)
I	R8 mm (0.3150 in. dia.)
J	1 mm (0.0394 in.)
K	1mm (0.0394 in.)
L	C0.2 mm (0.0079 in.)
M	C0.2 mm (0.0079 in.)
N	29 mm (1.1417 in.)
O	6 mm (0.2362 in.
P	10.7 mm (0.4213 in.)
Q	35 mm (1.3780 in.)
R	99.3 mm (3.9095 in.)
S	45.7 ± 0.05 mm (1.7992 ± 0.0020 in.)
T	145 mm (5.7087 in.)
U	16.25 ± 0.1 mm (0.6398 ± 0.0039 in.)
V	3 mm (0.1181 in.)
W	10 mm (0.3937 in.)
X	8 mm (0.3150 in.)

Compression Pressure

Figure 70-90-13



After warming up the engine, stop it and remove the air cleaner, the muffler, high pressure pipes, cylinder head cover, overflow pipe, all nozzle holders and all nozzle gaskets.

Install a compression tester and nozzle adaptor MEL1614 for diesel engines to nozzle holder hole (Item 1) **[Figure 70-90-13]**.

After making sure that the speed control lever is set at the stop position (Non-injection), run the engine at 200 to 300 RPM with the starter.

Read the maximum pressure. Measure the pressure more than twice.

If the measurement is below the allowable limit, apply a small amount of oil to the cylinder wall through the nozzle hole and measure the compression pressure again.

If the compression pressure increase after applying oil. check the cylinder wall and piston rings.

If the compression pressure is still less than the allowable limit, check the top clearance, valve and cylinder head.

NOTE: Check the compression pressure with the specified valve clearance.

Always use a fully charged battery for performing this test.

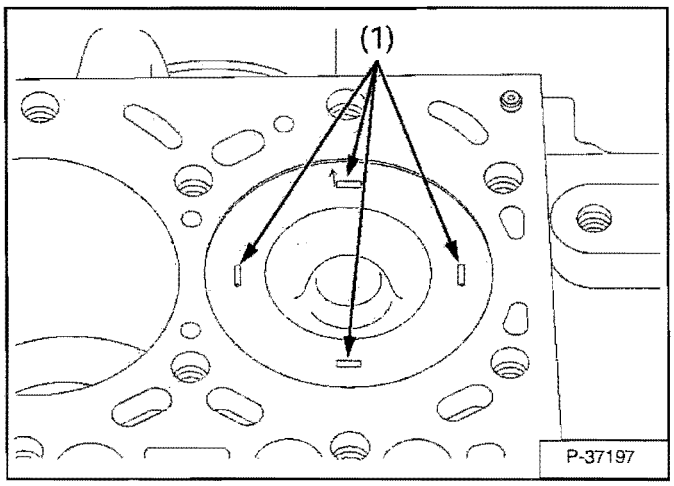
Variances in cylinder compression values should be under 10%.

Compression pressure	Factory spec.	3.43 to 3.63 MPa / 250 RPM 35 to 37 kgf/cm² / 250 RPM 498 to 526 PSI / 250 RPM
	Allowable limit	2.60 MPa / 250 RPM 26.5 kgf/cm² / 250 RPM 377 PSI / 250 RPM

Tightening Torque	Nozzle holder clamp nut	17.7 to 20.6 Nm 1.8 to 2.1 kgf·m 13.0 to 15.2 ft.-lbs.
	Overflow pipe assembly retaining screw	9.8 to 11.3 Nm 1.0 to 1.15 kgf·m 7.23 to 8.32 ft.-lbs.
	Cylinder head cover screw	1.6 to 2.3 Nm 0.15 to 0.23 kgf·m 1.15 to 1.66 ft.-lbs.
	Injection pipe retaining nut	22.6 to 36.3 Nm 2.3 to 3.7 kgf·m 16.6 to 26.8 ft.-lbs.

Cylinder Head Clearance

Figure 70-90-14



Remove the cylinder head (remove the cylinder head gasket completely).

Bring the piston to its top dead center fasten 1.5 mm dia. 5 to 7 mm long fuse wires to 3 to 4 spots (Item 1) **[Figure 70-90-14]** on the piston top with grease so as to avoid the intake and exhaust valves.

Bring the piston to its middle position, install the cylinder head, and tighten the cylinder head screws to specification. (Head gasket must be changed to new one).

Turn the crankshaft until the piston exceeds its top dead center.

Cylinder Head Clearance (Cont'd)

Remove the cylinder head, and measure squeezed fuse wires for thickness.

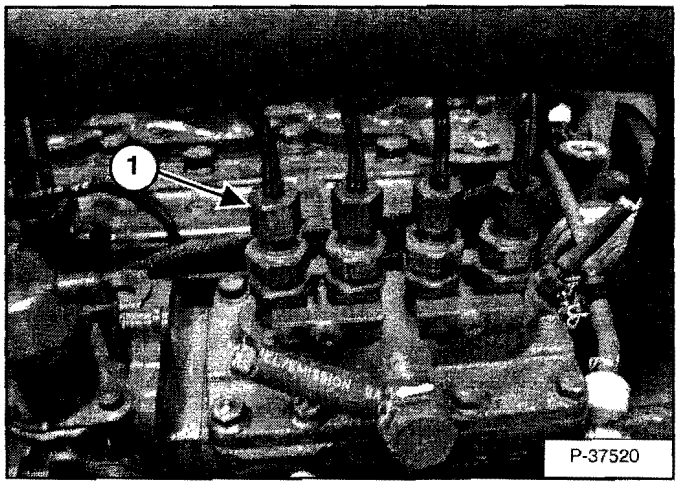
If the measurement is not within the specified value, check the oil clearance of the crank pin journal and the piston pin.

Top clearance	Factory spec.	0.72 to 0.90 mm 0.0283 to 0.0354 in.
Tightening torque	Cylinder head screw	98.1 to 107.9 Nm 10.0 to 11.0 kgf·m 72.3 to 79.6 ft.-lbs.

Valve Cover, Injector Nozzle And Seal Removal And Installation

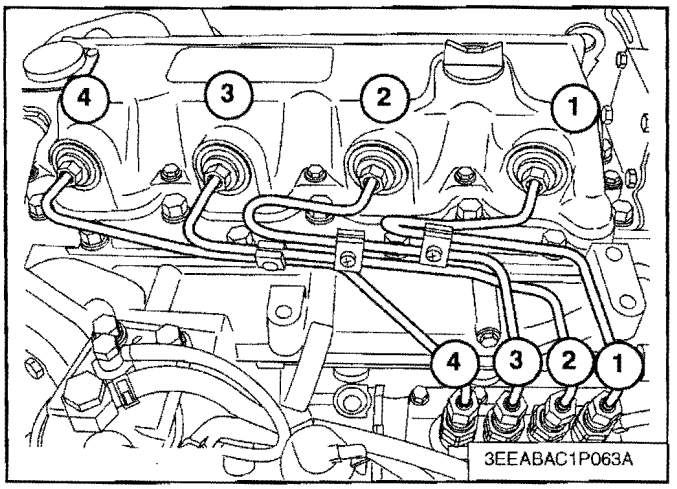
Remove the engine muffler.

Figure 70-90-15



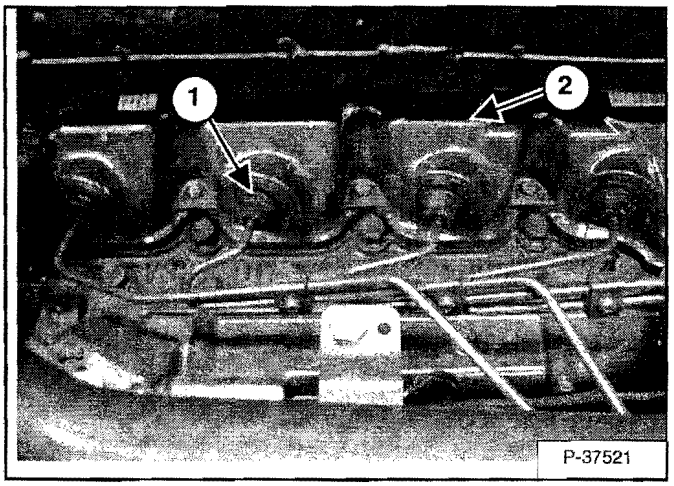
Remove the four injector lines (Item 1) **[Figure 70-90-15]** from the injector pump.

Figure 70-90-16



Connection between injection pump and nozzle	
Injection Pump	Nozzle
1	1
2	3
3	2
4	4

Figure 70-90-17

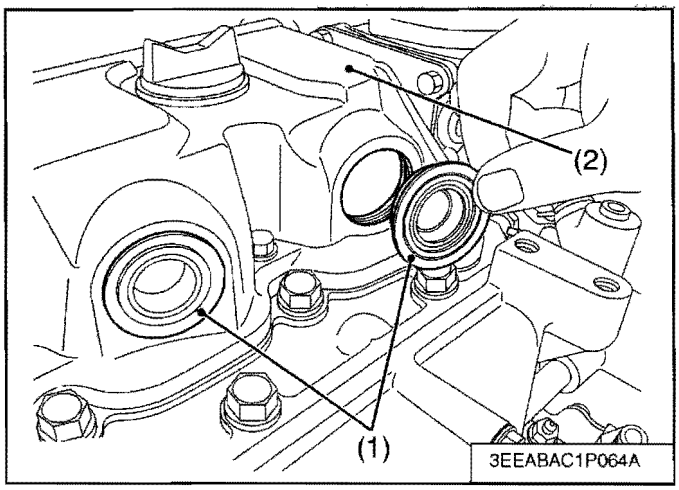


Remove the four injection lines (Item 1) **[Figure 70-90-17]**.

Remove the valve cover (Item 2) **[Figure 70-90-17]**.

Valve Cover, Injector Nozzle And Seal Removal And Installation (Cont'd)

Figure 70-90-18

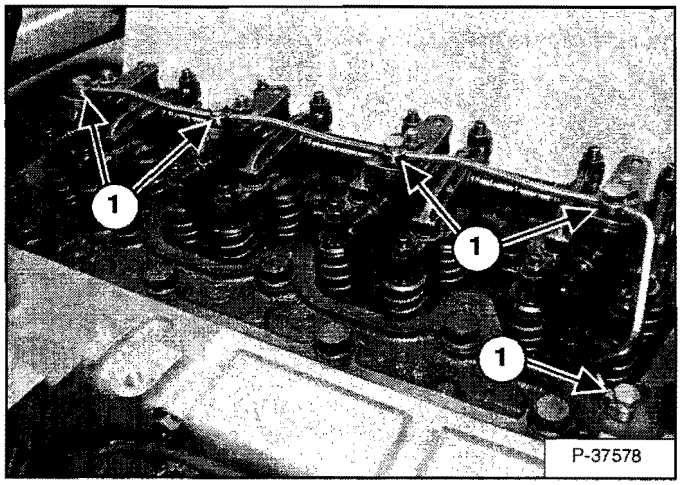


Remove the injection nozzle oil seal (Item 1) from the cylinder head cover (Item 2) **[Figure 70-90-18]**.

Installation: Install new injection nozzle oil seals.

Installation: Tighten the valve cover bolts to 14-20 in.-lbs (1.6 to 2.3 Nm) torque.

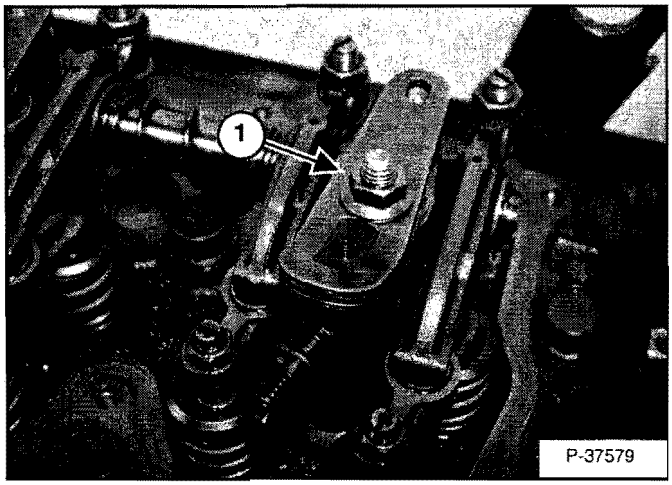
Figure 70-90-19



Remove the five over flow pipe retaining bolts (Item 1) **[Figure 70-90-19]**.

Installation: Tighten the retaining bolts to 85-96 in.-lbs (9,6-10,8 Nm) torque.

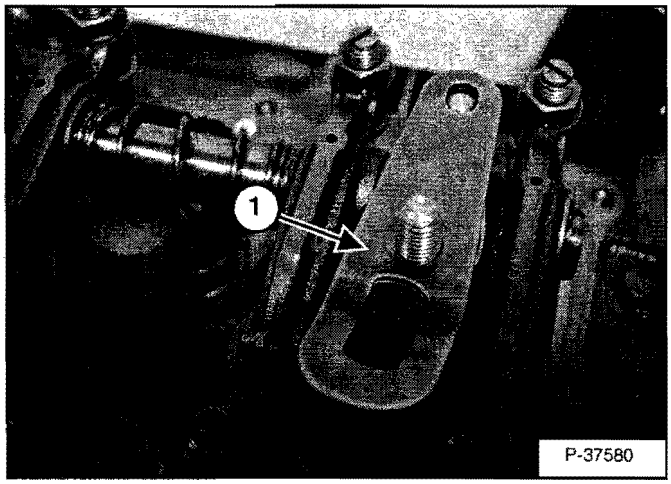
Figure 70-90-20



Remove the nut (Item 1) **[Figure 70-90-20]** from the injector nozzle holder clamp.

Installation: Tighten the injector nozzle holder clamp nut to 13-15 ft.-lbs. (18-21 Nm) torque.

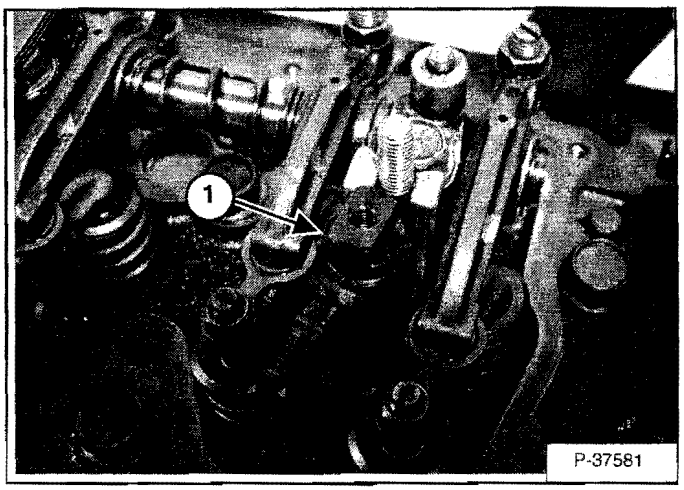
Figure 70-90-21



Remove the nozzle holder clamps (Item 1) **[Figure 70-90-21]** from the injector nozzle.

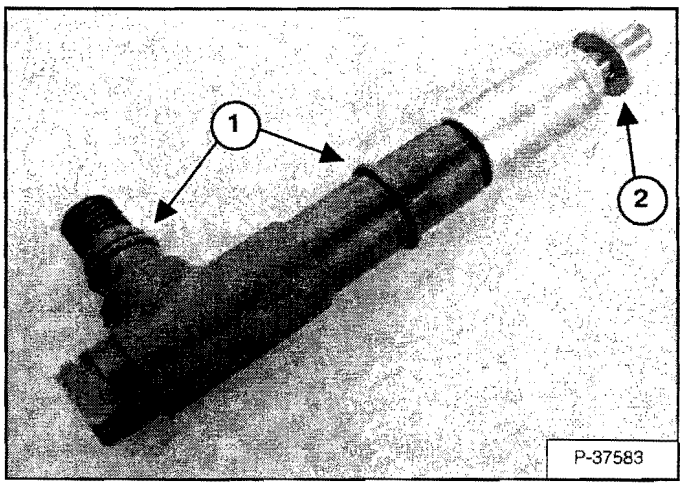
Valve Cover, Injector Nozzle And Seal Removal And Installation (Cont'd)

Figure 70-90-22



Remove the injector nozzle (Item 1) **[Figure 70-90-22]** from the engine.

Figure 70-90-23

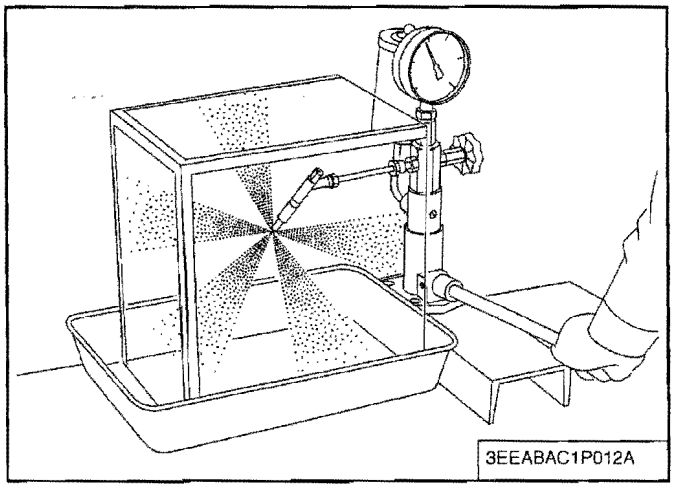


Check the injector nozzle O-rings (Item 1) and nozzle washer (Item 2) **[Figure 70-90-23]**.

Always replace the injector O-rings and washer before installation.

Checking Nozzle Injection Pressure

Figure 70-90-24



Set the injection nozzle to the nozzle tester (Code No.: 07909-31361).

Slowly move the tester handle to measure the pressure at which fuel begins jetting out from the nozzle.

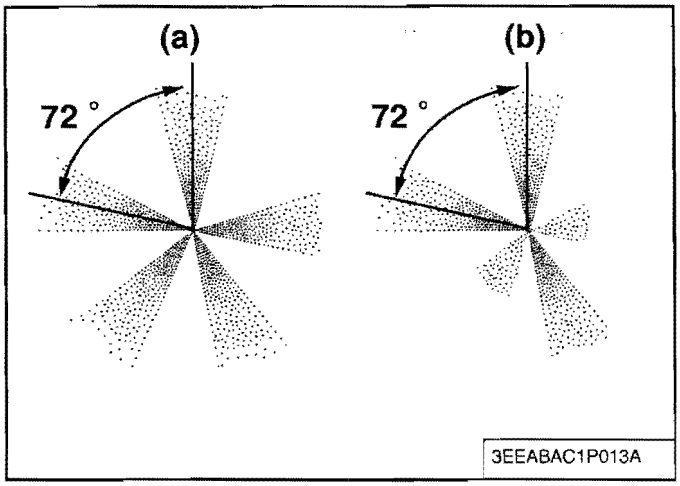
If the measurement is not within the factory specifications, replace the injection nozzle assembly or repair at Denso service shop.

NOTE: Injection nozzle gasket must be replaced when the injection nozzle is removed for checking.

Injection pressure	Factory spec.	1st stage	18.63 to 19.61 MPa 190 to 200 kgf/cm² 2702 to 2845 PSI

Nozzle Spraying Condition

Figure 70-90-25

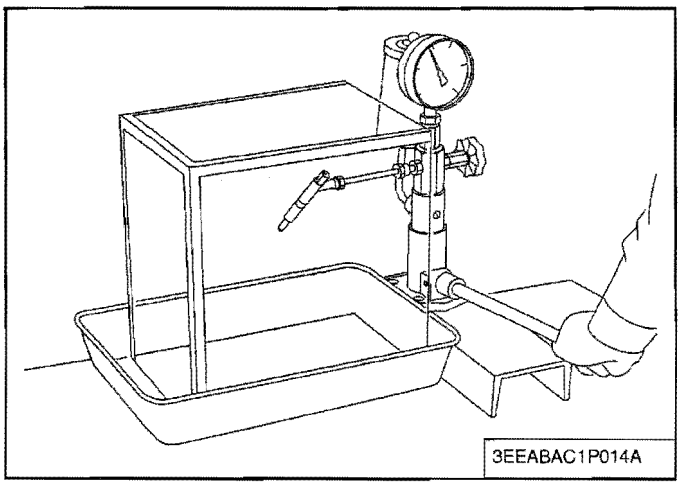


Set the injection nozzle to a nozzle tester (Code No. 07909-31361), and check the nozzle spraying condition.

If the spraying condition is defective, replace the injection nozzle assembly or repair at Denso service shop.

Valve Seat Tightness

Figure 70-90-26



Set the injection nozzle to a nozzle tester (Code No. 07909-31361).

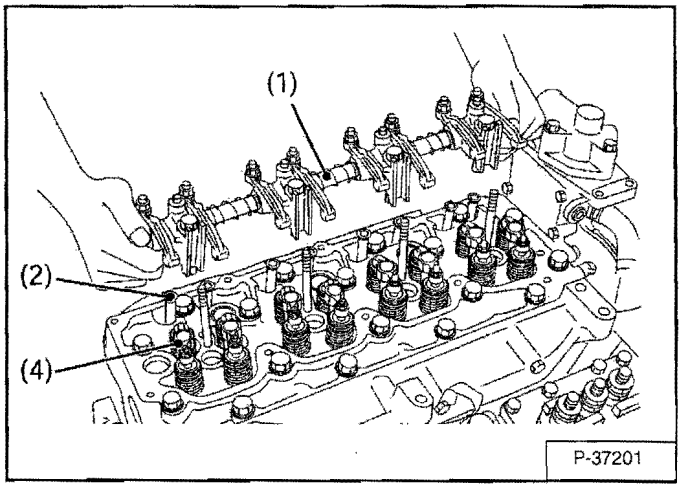
Raise the fuel pressure, and keep at 16.67 MPa (170 kgf/cm², 2418 PSI) for 10 seconds.

If any fuel leak is found, replace the injection nozzle assembly or repair at Denso service Shop.

Valve seat tightness	Factory spec.	No fuel leak at 16.67 MPa 170 kgf/cm² 2418 PSI

Rocker Arm And Push Rod Disassembly And Assembly

Figure 70-90-27

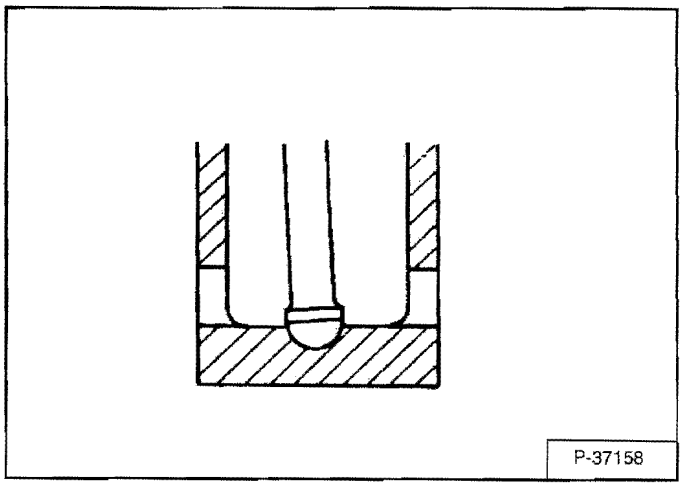


Remove the rocker arm assembly (Item 1) **[Figure 70-90-27]**.

Remove the push rods (Item 2) **[Figure 70-90-27]**.

Remove the bridge arm (Item 4) **[Figure 70-90-27]**.

Figure 70-90-28



Putting the push rods onto the tappets (Item 3) **[Figure 70-90-28]**, check to see if their ends are properly engaged with the grooves.

NOTE: After reassembling the rocker arm, be sure to adjust the valve clearance.

Tightening torque	Rocker arm	49.0 to 55.9 Nm 5.0 to 5.7 kgf-m 36.2 to 41.2 ft.-lbs.

Valve Clearance

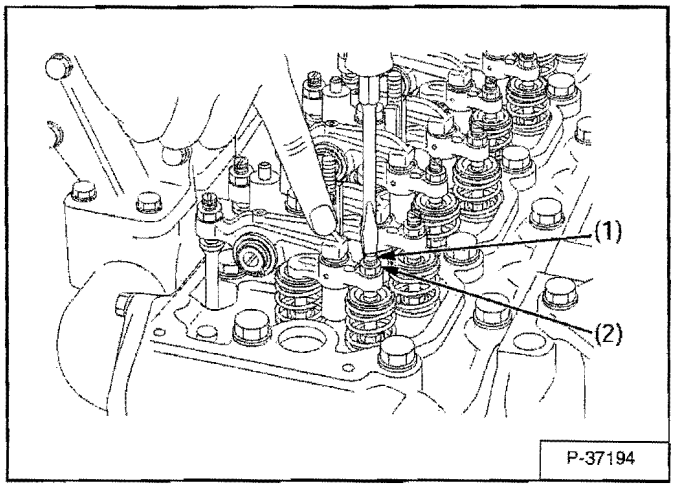
NOTE: Valve clearance must be checked and adjusted when engine is cold.

Remove the high pressure pipes and the head cover.

Put the engine in Top Dead Center. (See Engine Timing (TDC) on Page 70-90-15.)

Before adjusting the valve clearance, adjust the bridge to set the height of valves.

Figure 70-90-29

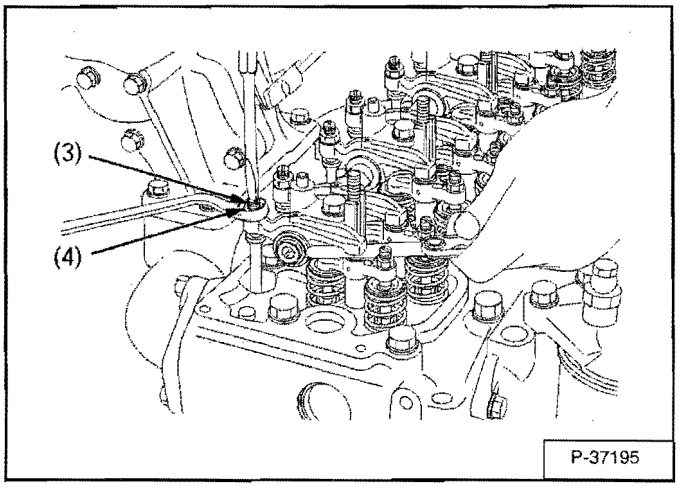


Loosen the lock nut (Item 2) and return the adjusting screw (Item 1) **[Figure 70-90-29]**.

Push the rocker arm by your fingers and screw in the adjusting screw slowly until you feel the screw touch the top of valve stem, then tighten the lock nut.

Valve Clearance (Cont'd)

Figure 70-90-30



Loosen the lock nut (Item 4) of adjusting screw (Item 3) **[Figure 70-90-30]** (push rod side) and insert the thickness gauge between the rocker arm and the bridge head. Set the adjusting screw to the specified value, then tighten the lock nut.

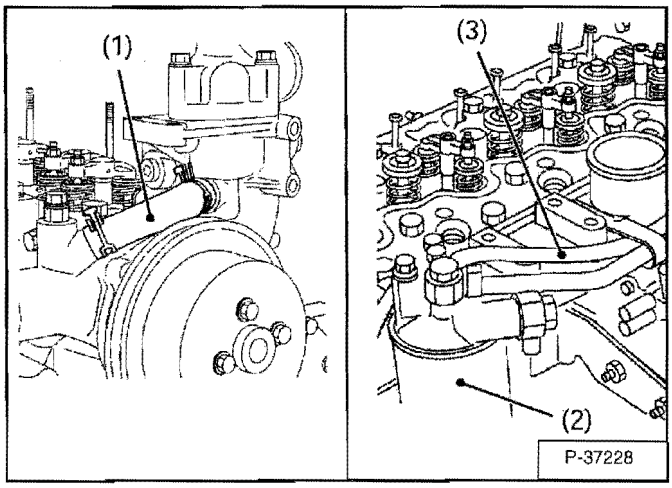
Valve clearance	Factory spec.	0.23 to 0.27 mm 0.0091 to 0.0106 in.

NOTE: After adjusting, tighten the lock nut (Item 4) [Figure 70-90-30] securely.

Valve arrangement Adjustment cylinder Location of piston		IN.	EX.
When No. 1 piston is compression top dead center	1st	*	*
	2nd	*	
	3rd		*
	4th		
When No. 1 piston is overlap pisition	1st		
	2nd		*
	3rd	*	
	4th	*	*

Cylinder Head And Tappet Disassembly And Assembly

Figure 70-90-31

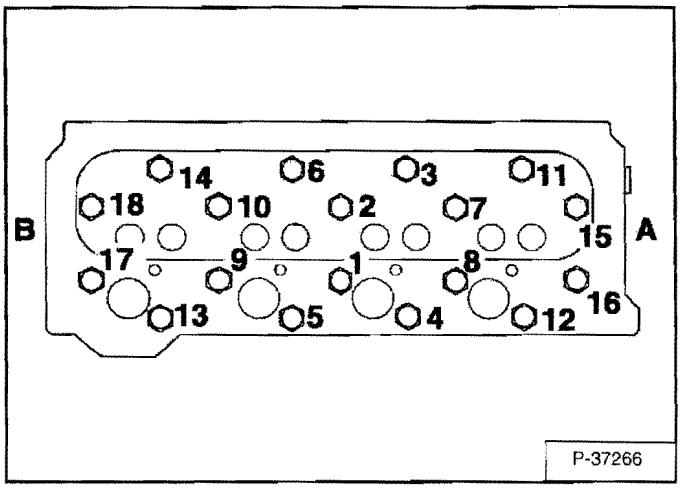


Loosen the pipe band, and remove the water return pipe (Item 1) **[Figure 70-90-31]**.

Disconnect the fuel pipe (Item 3) first and then the fuel filter (Item 2) **[Figure 70-90-31]**.

Cylinder Head And Tappet Disassembly And Assembly (Cont'd)

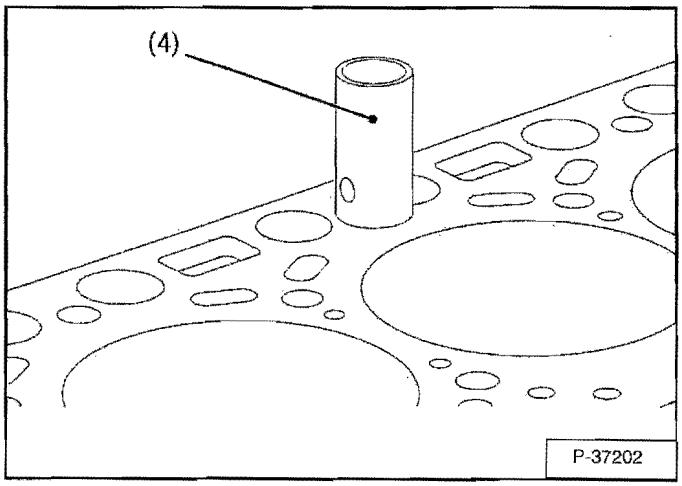
Figure 70-90-32



Remove the cylinder head screw in the order of (18) to (1) **[Figure 70-90-32]**, and remove the cylinder head.

Remove the cylinder head gasket. (O-ring is not attached to because of metal type cylinder head gasket.)

Figure 70-90-33



Remove the tappets (Item 4) **[Figure 70-90-33]** from the crankcase.

When reassembling replace the head gasket with a new one.

Before installing the tappets (Item 4) **[Figure 70-90-33]**, apply engine oil thinly around them.

When mounting the gasket, set it to the knock pin dowel. Take care not to mount it reversely.

The cylinder head should be free of scratches and dust.

Take care for handling the gasket not to damage it.

Install the cylinder head.

Tighten the cylinder head screw gradually in the order of (1) to (18) after applying engine oil.

Be sure to adjust the valve clearance. (See Valve Clearance on Page 70-90-11.)

It is not necessary to retighten the cylinder head screw after running the engine for 30 minutes.

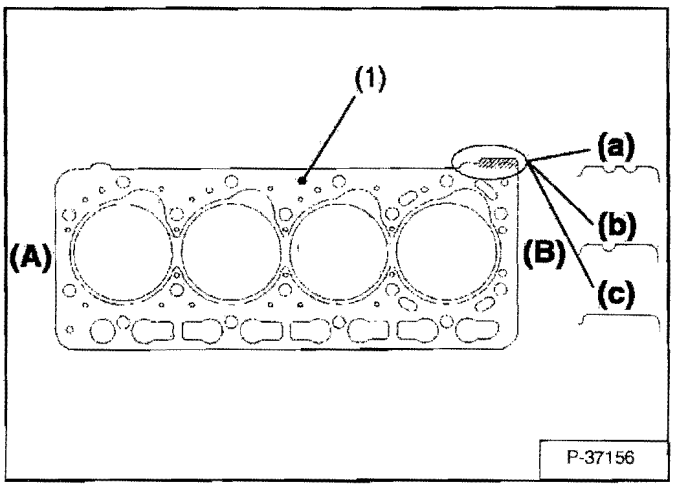
NOTE: When replacing the piston, piston pin bushing, connecting rod or crank pin bearing, select the cylinder head gasket thickness to meet with the top clearance. Refer to the "Selecting Cylinder Head Gasket".

NOTE: Mark the cylinder number to the tappets to prevent interchanging.

Tightening torque	Cylinder head screw	98.1 to 107.9 Nm 10.0 to 11.0 kgf-m 72.3 to 79.6 ft.-lbs.

Selecting Cylinder Head Gasket Disassembly And Assembly

Figure 70-90-34



Make sure to not the notch **(a)**, **(b)** or **(c)** of cylinder head gasket (Item 1) **[Figure 70-90-34]** in advance.

Replace the same notch (a), (b) or (c) as the original cylinder head gasket (Item 1) **[Figure 70-90-34]**.

Select the cylinder head gasket (Item 1) thickness to meet with the top clearance when replacing the piston, piston pin bushing, connecting rod or crank pin bearing.

Selecting Cylinder Head Gasket Disassembly And Assembly (Cont'd)

Figure 70-90-35

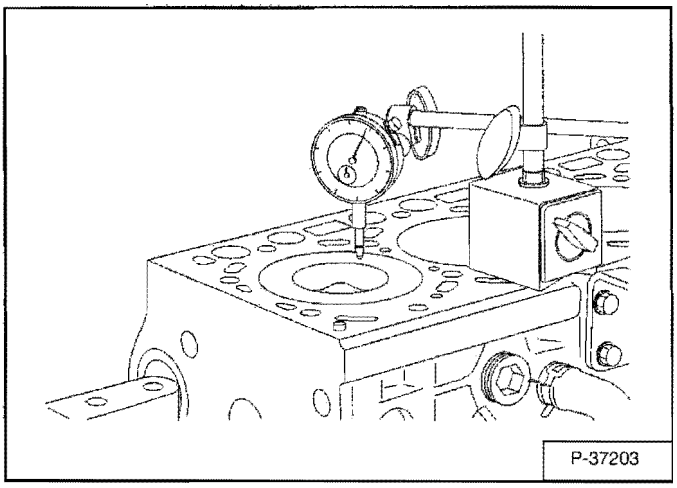
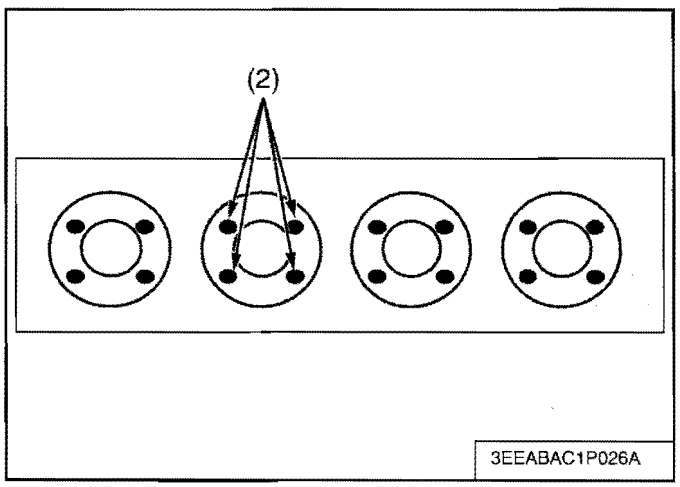


Figure 70-90-36



Measure the piston head's recessing or protrusion from the crankcase cylinder face 4 spots per each piston **[Figure 70-90-36]** and (average of four pistons) using the dial gauge as shown in **[Figure 70-90-35]**.

Select the suitable cylinder head gasket refer to the table below.

Notch of Cylinder Head Gasket	Thickness of cylinder head gasket		Part Code	Piston Head's recessing or protrusion from the level of crankcase cylinder face. (average of 4 pistons)
	Before tightening	After tightening		
2 notches **(a)**	0.90 mm 0.0354 in.	0.80 mm 0.0315 in.	1C020-03310	-0.07 to +0.0490 mm -0.0028 to +0.0019 in.
1 notch **(b)**	1.00 mm 0.0394 in.	0.90 mm 0.0354 in.	1C020-03600	+0.050 to +0.149 mm +0.0020 to +0.0058 in.
Without notch **(c)**	1.05 mm 0.0413 in.	0.95 mm 0.0374 in.	1C020-03610	+0.150 to +0.20 mm +0.0059 to +0.0078 in.

Valve Disassembly And Assembly

Figure 70-90-37

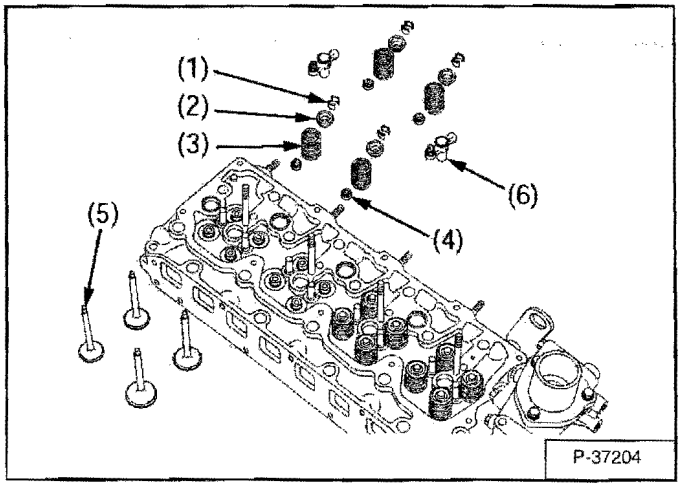
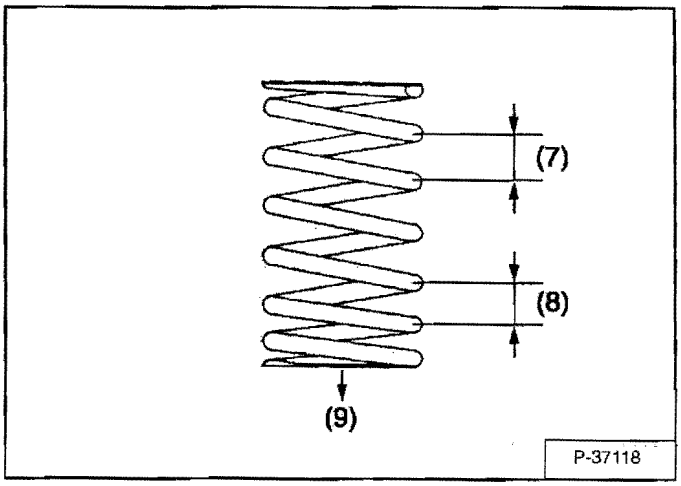


Figure 70-90-38



Remove the valve spring collets (Item 1) after compressing the valve spring (Item 3) with the valve spring retainer (Item 2) **[Figure 70-90-37]**.

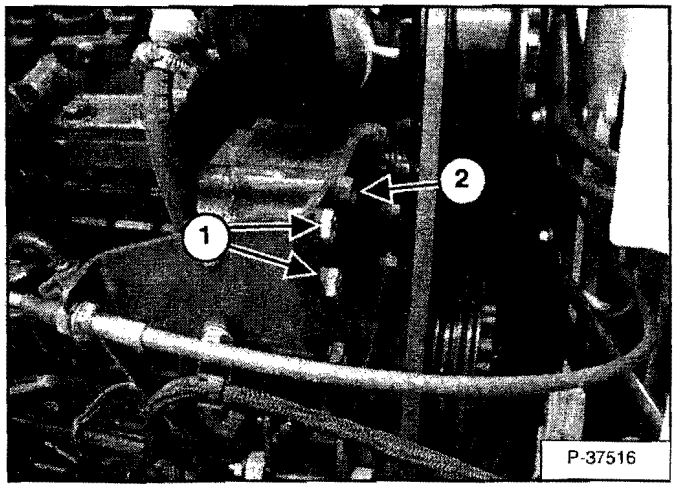
Install the valve spring **[Figure 70-90-38]** with its small-pitch end downward (at the head side).

Wash the valve stem and valve guide hole, and apply engine oil sufficiently.

After installing the valve spring collets, lightly tap the stem to assure proper fit with a plastic hammer.

Engine Timing (TDC)

Figure 70-90-39

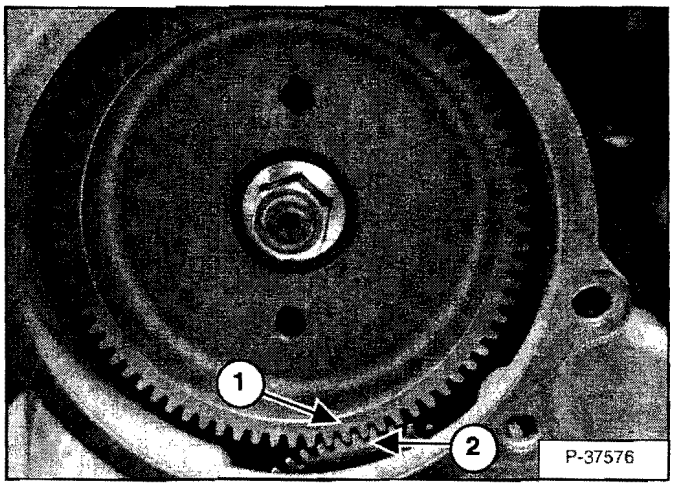


Remove the two bolts (Item 1) **[Figure 70-90-39]** from the throttle linkage mount and the injection pump gear cover.

Remove the six remaining mount bolts (Item 2) **[Figure 70-90-39]** from the injection pump gear cover.

Remove the injection pump gear cover from the engine.

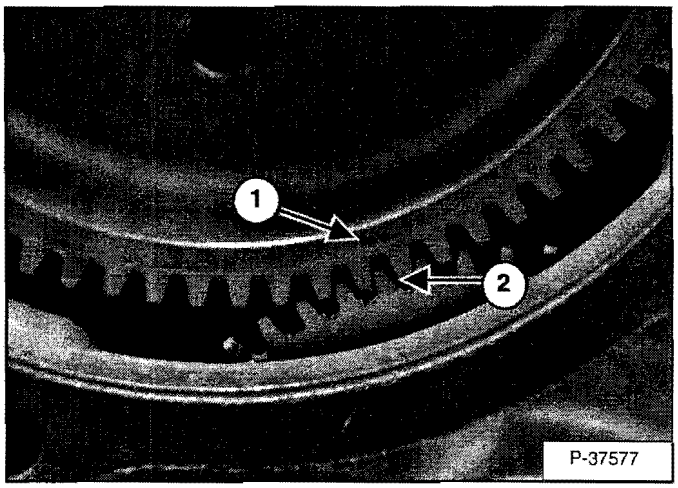
Figure 70-90-40



Rotate the engine, until the timing mark on the injection pump fuel cam gear (Item 1) is meshed with the idler gear (Item 2) **[Figure 70-90-40]**.

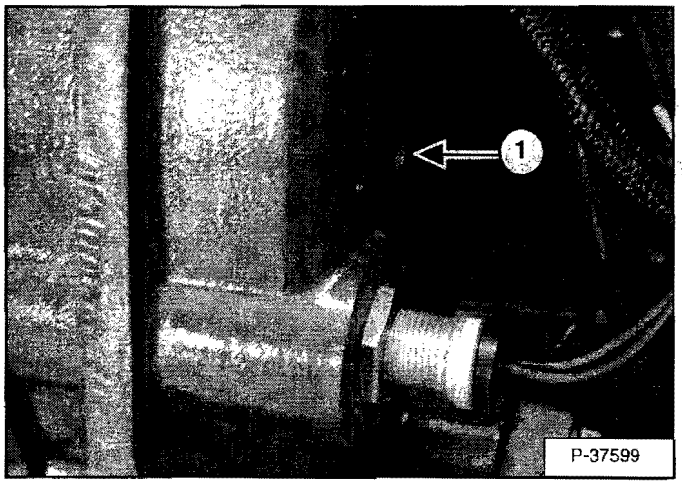
Engine Timing (TDC) (Cont'd)

Figure 70-90-41



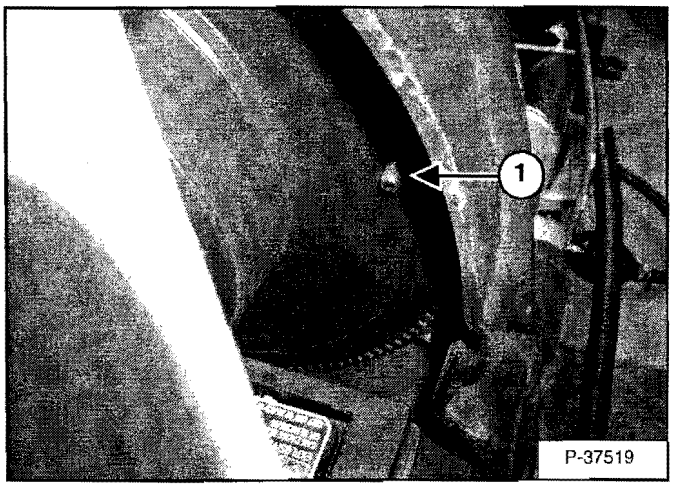
Any time the timing mark (Item 1) on the fuel cam gear is meshed with the idler gear (Item 2) **[Figure 70-90-41]** the engine is on top dead center of the compression stroke on number four cylinder.

Figure 70-90-42



Install a.375 in. (9,525 mm) bolt through the hole in the flywheel casting (Item 1) **[Figure 70-90-42]**.

Figure 70-90-43



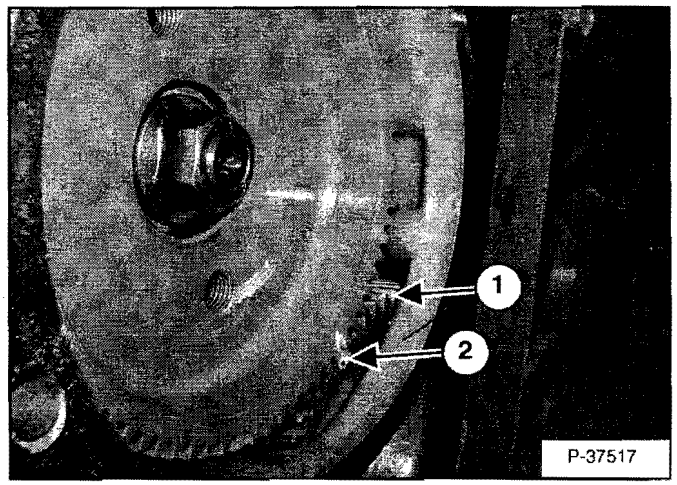
Remove the flywheel cover from the engine flywheel housing.

Check to see that the bolt (Item 1) **[Figure 70-90-43]** is completely through the flywheel.

The engine is now pinned on Top Dead Center.

Injection Pump Housing Removal

Figure 70-90-44



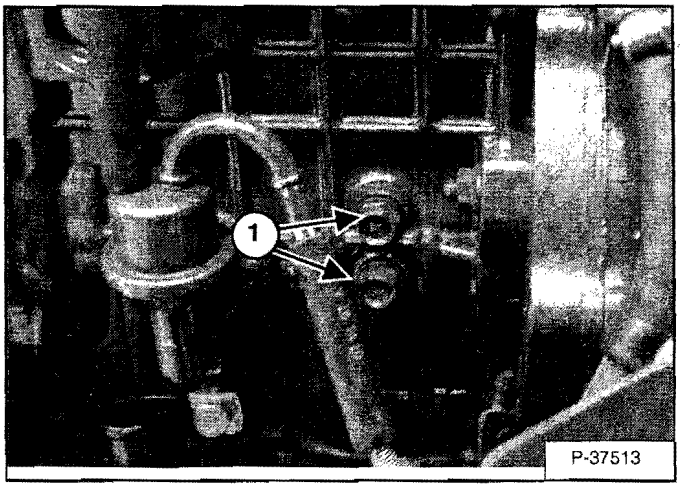
Place the piston of the 4th cylinder at the top dead center in the compression stroke. Fix the flywheel with the flywheel stopper bolt.

Look for a timing mark on the idler gear (Item 1), if one is not present, mark the engaged tooth (Item 2) **[Figure 70-90-44]** with a white marking pin to aid in reassembly.

If the timing marks are present and aligned the gears do not need to be marked.

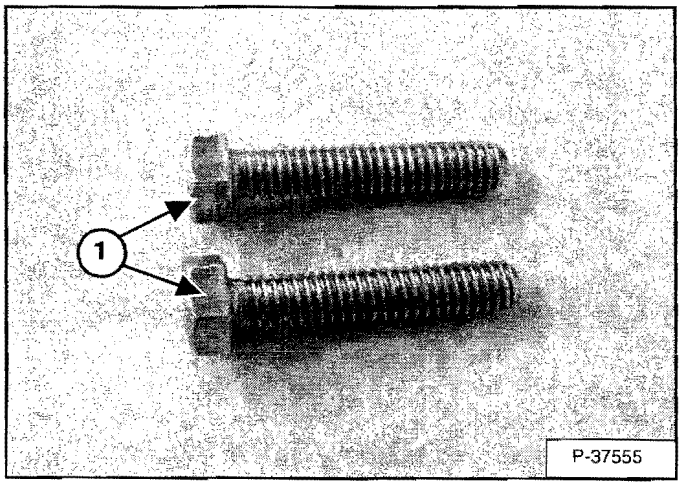
Injection Pump Housing Removal (Cont'd)

Figure 70-90-45



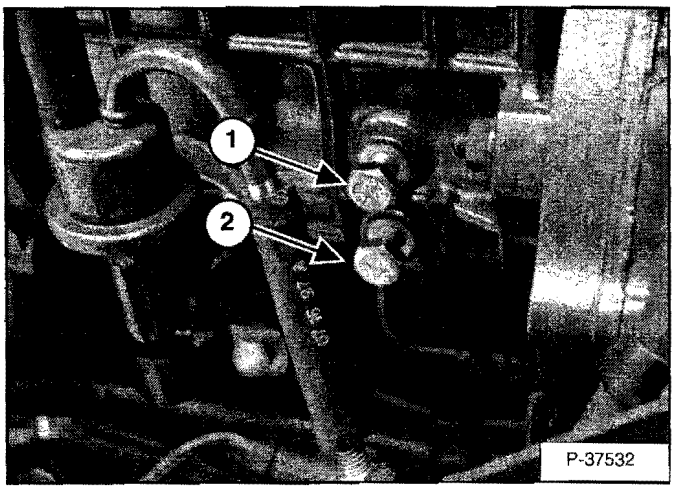
Unscrew the two flange bolts (Item 1) **[Figure 70-90-45]** from the injection pump unit. Have the fuel cam shaft lock bolts at hand.

Figure 70-90-46



The fuel cam shaft lock bolts (Item 1) **[Figure 70-90-46]** are M8 X P1.25 X L30 mm.

Figure 70-90-47

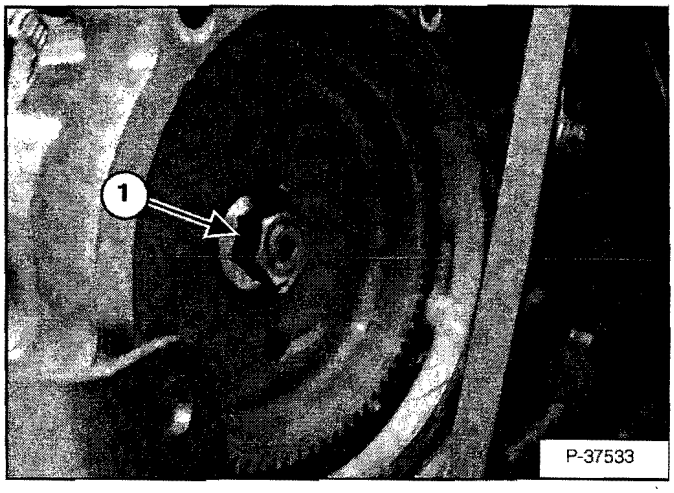


Tighten the upper fuel cam shaft lock bolt (Item 1) **[Figure 70-90-47]** until it comes into contact with the fuel cam shaft. Make sure the cam shaft does not move.

Tighten the lower fuel cam shaft lock bolt (Item 2) **[Figure 70-90-47]** until it comes into contact with the fuel camshaft.

Do not over tighten the lock bolts when they have come in contact with the cam shaft.

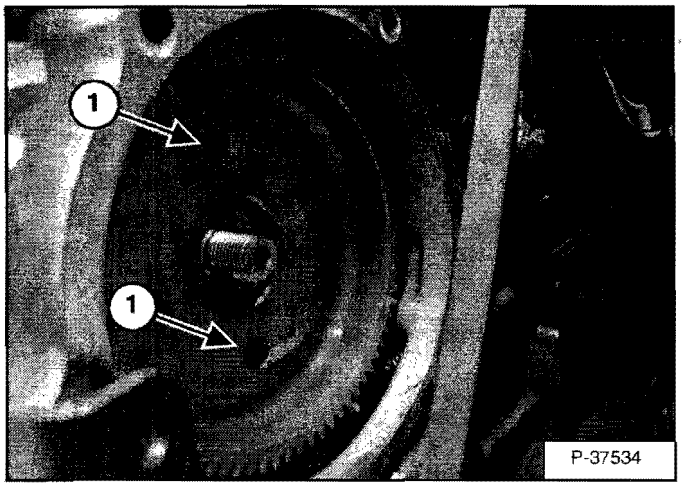
Figure 70-90-48



Loosen the injection pump gear mounting nut (Item 1) **[Figure 70-90-48]**.

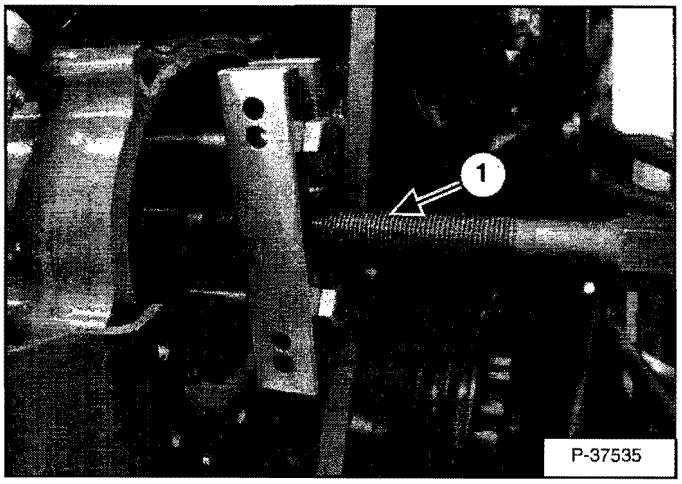
Injection Pump Housing Removal (Cont'd)

Figure 70-90-49



Install two bolts (M10 X P1.25 X L80 mm) into the two threaded holes (Item 1) **[Figure 70-90-49]** in the injection pump cam gear.

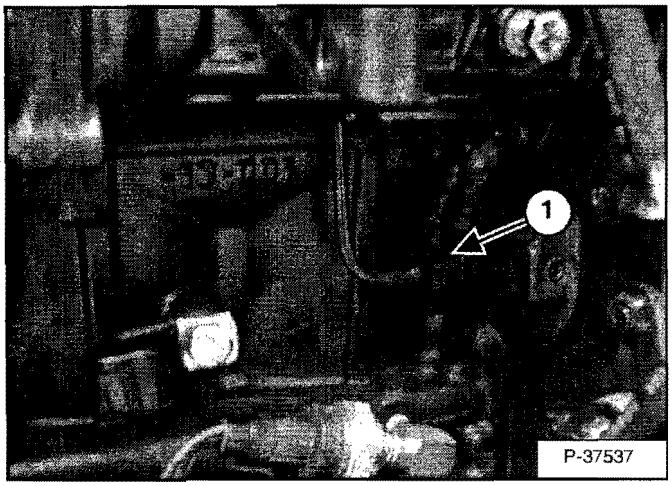
Figure 70-90-50



Install a gear puller (Item 1) **[Figure 70-90-50]** and remove the gear.

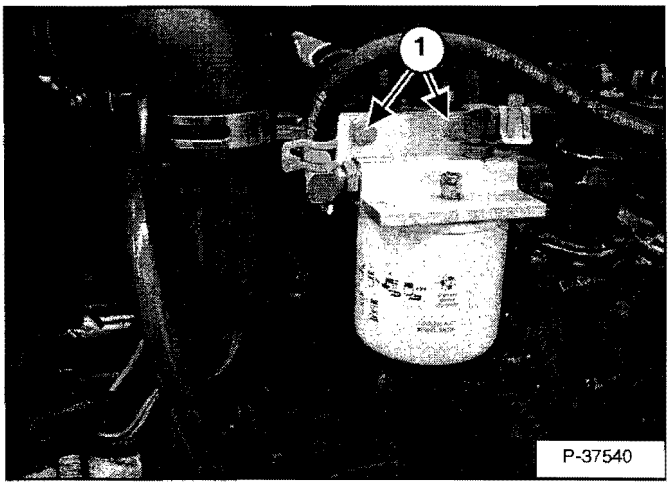
Remove the key from the key way on the injection pump shaft.

Figure 70-90-51



Disconnect the lubricating oil pipe (Item 1) **[Figure 70-90-51]**.

Figure 70-90-52

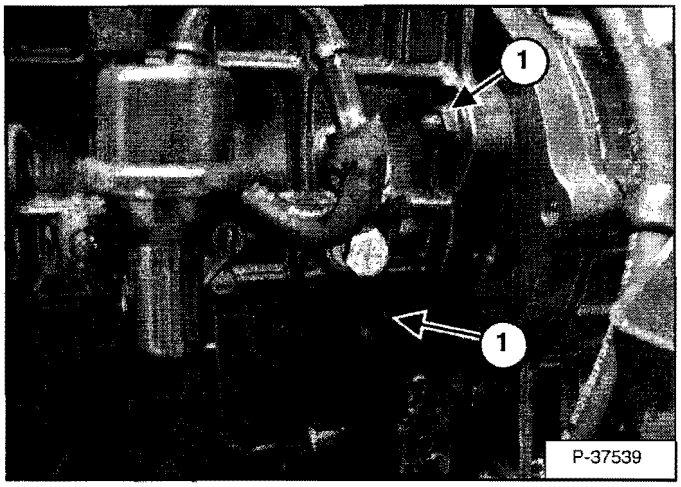


Remove the two mounting bolts (Item 1) **[Figure 70-90-52]** and move the fuel filter, to allow clearance for the injection pump assembly to be removed.

Disconnect the throttle linkage from the injection pump.

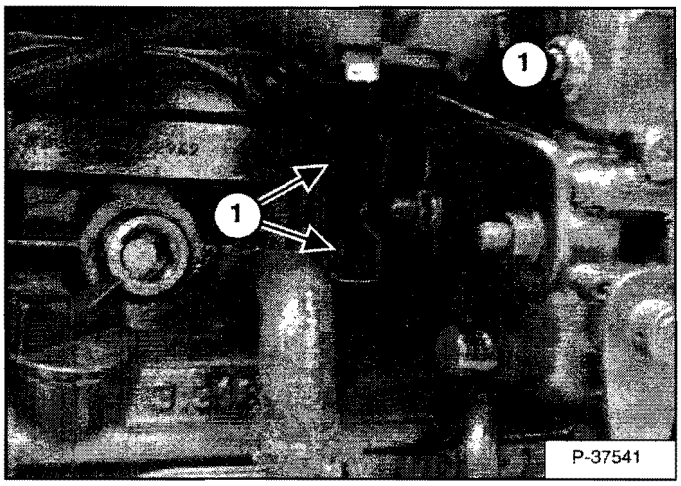
Injection Pump Housing Removal (Cont'd)

Figure 70-90-53



Remove the three injection pump unit mounting flange nuts (Item 1) **[Figure 70-90-53]**. (Two on the front side and one on the back side of the injection pump.)

Figure 70-90-54

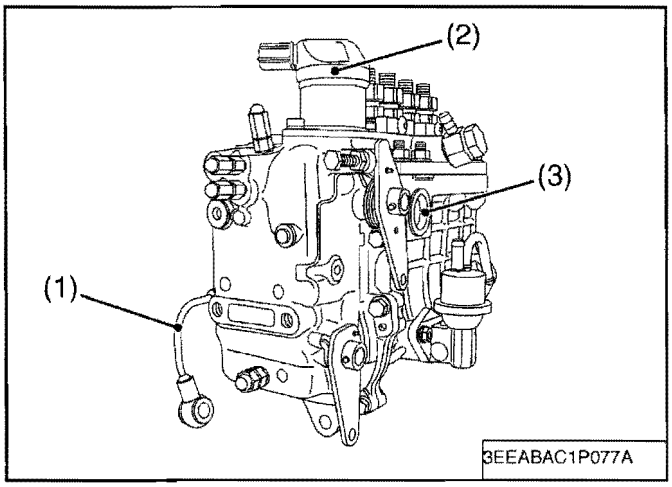


Remove the two injection pump unit support bolts (Item 1) **[Figure 70-90-54]**.

Remove the injection pump unit from the engine.

Injection Pump Governor Housing Removal And Installation

Figure 70-90-55



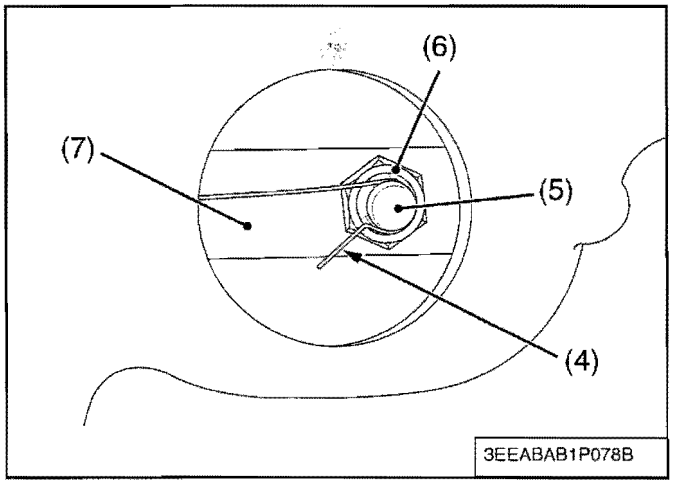
Remove the injection pump unit from the engine.

Remove the governor lubricating pipe (Item 1) **[Figure 70-90-55]**.

Remove the stop solenoid (Item 2) **[Figure 70-90-55]**.

Detach the sight cover (Item 3) **[Figure 70-90-55]** from the injection pump unit.

Figure 70-90-56



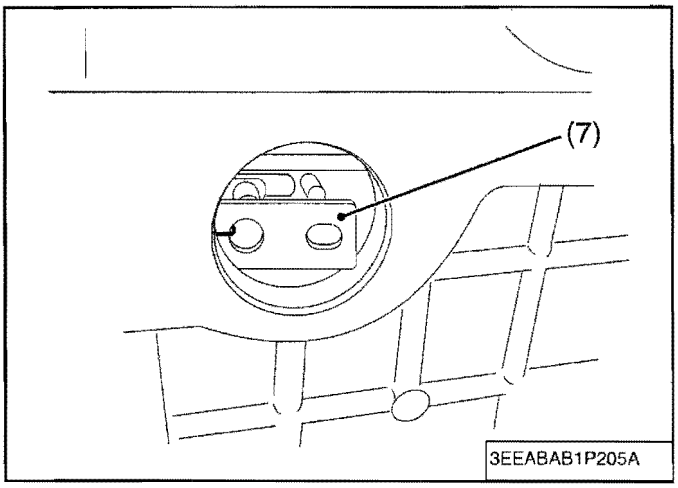
Unhook the start spring (Item 4) from the rack pin (Item 5) **[Figure 70-90-56]** of injection pump assembly.

Remove the nut (Item 6) **[Figure 70-90-56]**.

NOTE: Be careful not to drop the nut inside.

Injection Pump Governor Housing Removal And Installation (Cont'd)

Figure 70-90-57

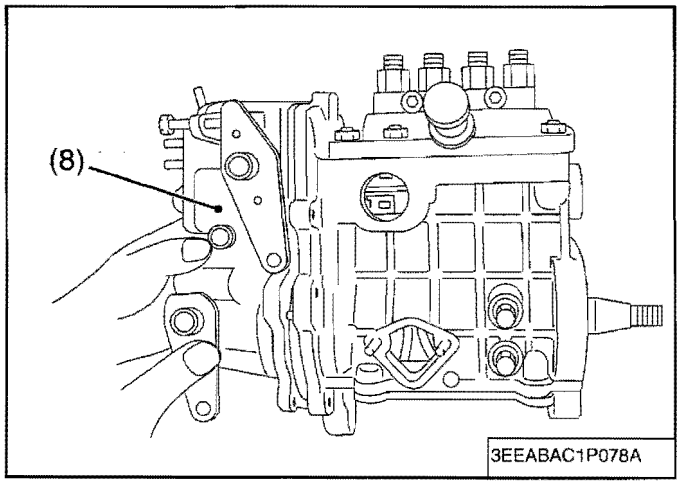


Slide off the governor connecting rod (Item 7) **[Figure 70-90-57]** from the rack pin of injection pump assembly.

For convenient sake, temporarily hook the start spring on the rack pin hole of the governor connecting rod.

Remove the governor housing mounting bolts.

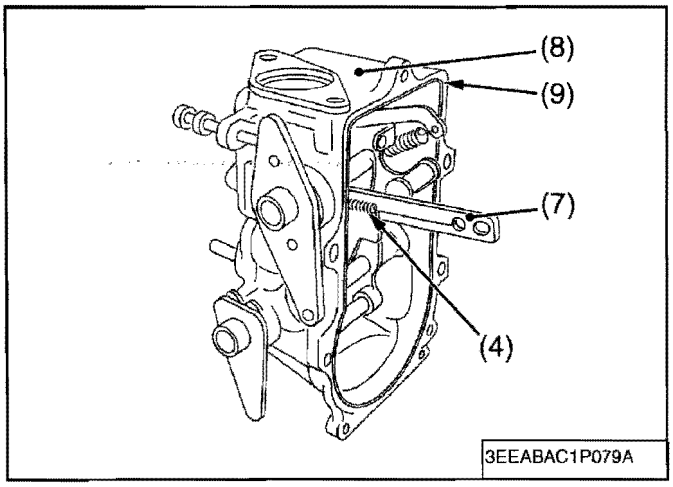
Figure 70-90-58



Detach the governor housing assembly (Item 8) **[Figure 70-90-58]** from the injection pump unit.

NOTE: The injection pump unit is lubricated with engine oil. So, prepare and oil pan for spilt oil.

Figure 70-90-59



When reassembling the inside parts, put the oil on each inside part slightly.

After sliding on the governor connecting rod to the rack pin, tighten the nut with the specified torque with using the jig for keeping the control rod horizontal.

After tightening the nut, hook the start spring on the rack pin.

Check the movement of control rack of injection pump assembly by the stop lever.

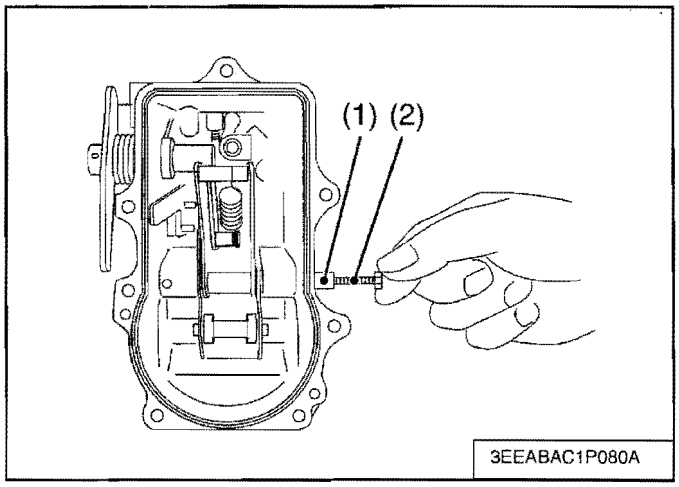
NOTE: When installing the governor housing assembly to the injection pump unit, be careful not to damage O-ring (Item 9) [Figure 70-90-59].

NOTE: When linking the control rod to the rack pin of injection pump, use the jig for keeping the control rod horizontal. Otherwise the control rack may be stuck, and causes to be difficult to start the engine or hunting of governor.

Tightening torque	Governor housing mounting bolt	9.8 to 11.3 Nm 1.00 to 1.15 kgf·m 7.23 to 8.32 ft.-lbs.
	Anti-rotation nut	3.43 Nm 0.35 kgf·m 2.5 ft.-lbs.

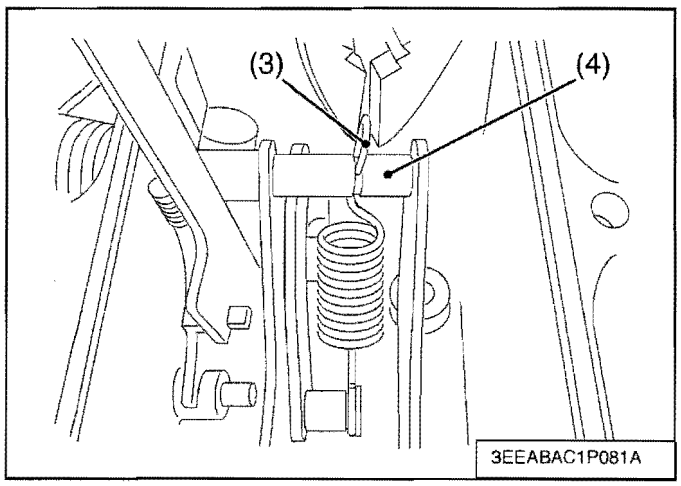
Injection Pump Governor Fork Lever Removal And Installation

Figure 70-90-60



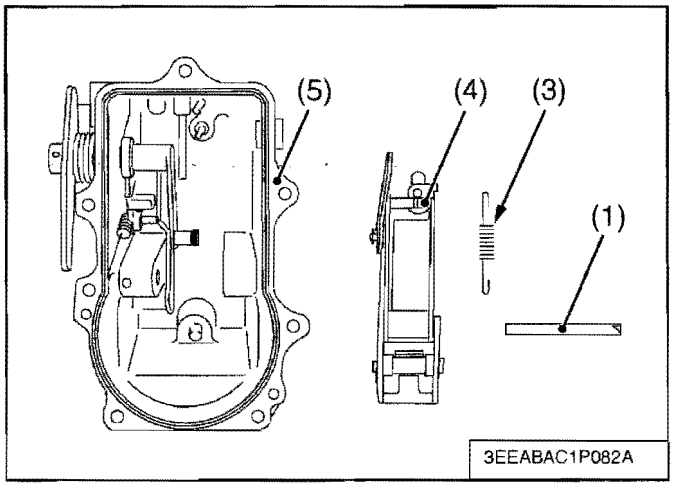
Pull off the governor for lever shaft (Item 1) with the extra bolt (Dia.: 4 mm, Pitch: 0.7 mm, Length: more than 25 mm) (Item 2) **[Figure 70-90-60]**.

Figure 70-90-61



Unhook the governor spring (Item 3) at the governor fork lever (Item 4) **[Figure 70-90-61]** side.

Figure 70-90-62



Remove the governor fork lever assembly from the governor housing (Item 5) **[Figure 70-90-62]**.

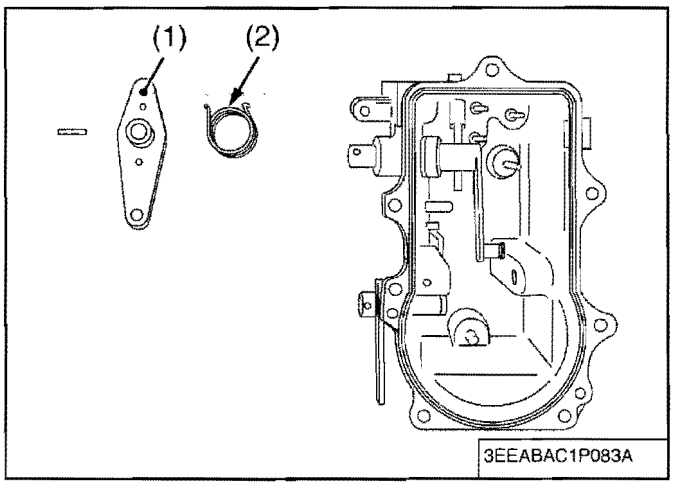
After reassembling the governor housing assembly, check the movement of the governor fork lever assembly, the speed control lever and the stop lever.

NOTE: When assembling the inside parts, put the oil on each inside part slightly.

NOTE: Be careful not to deform the atart spring.

Injection Pump Governor Lever Removal And Installation

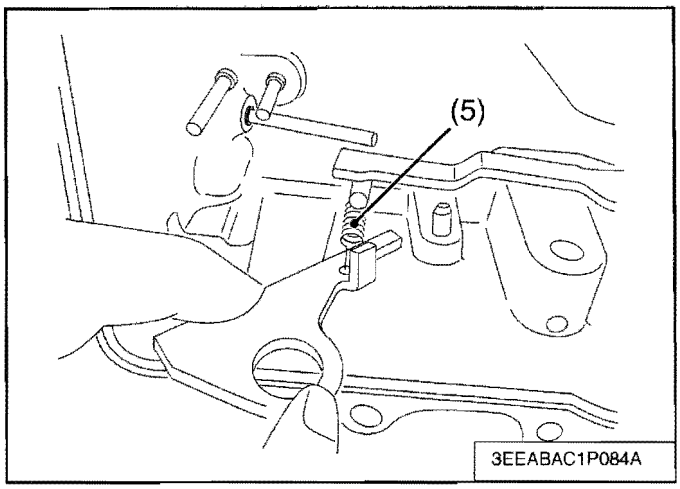
Figure 70-90-63



Remove the speed control lever (Item 1) and the return spring (Item 2) **[Figure 70-90-63]**.

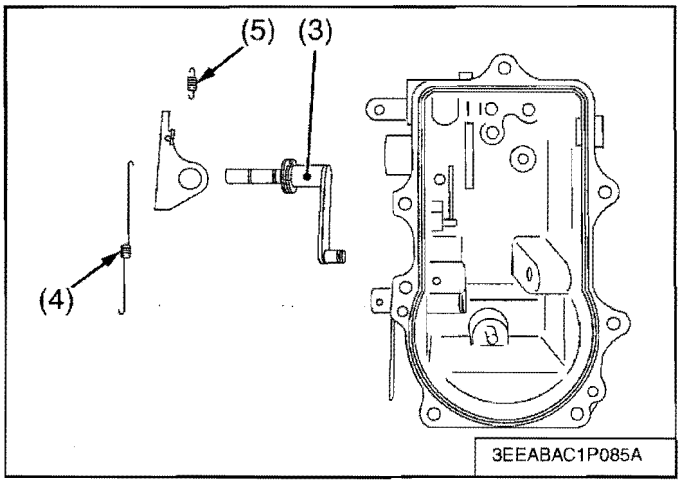
Injection Pump Governor Lever Removal And Installation

Figure 70-90-64



Remove the gover lever assembly (Item 3) **[Figure 70-90-64]** from the governor housing.

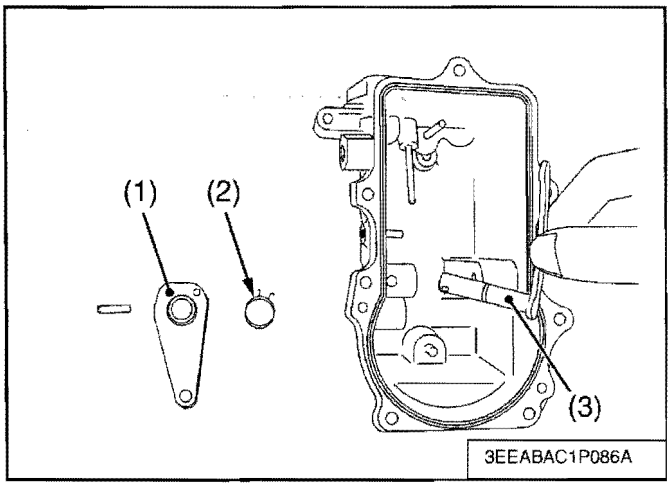
Figure 70-90-65



Remove the start spring (Item 4) and the stop spring (Item 5) **[Figure 70-90-65]**

Injection Pump Stop Lever Removal And Installation

Figure 70-90-66

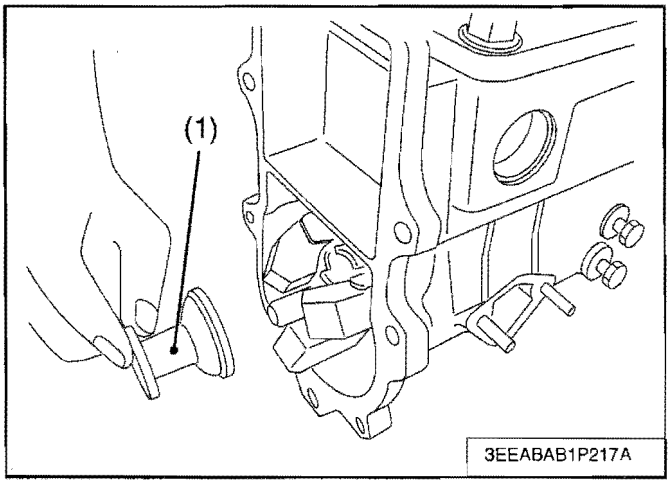


Remove the stop lever (Item 1) and the return spring (Item 2) **[Figure 70-90-66]**.

Remove the stop lever shaft (Item 3) **[Figure 70-90-66]**.

Injection Pump Fuel Camshaft And Governor Weight Removal And Installation

Figure 70-90-67



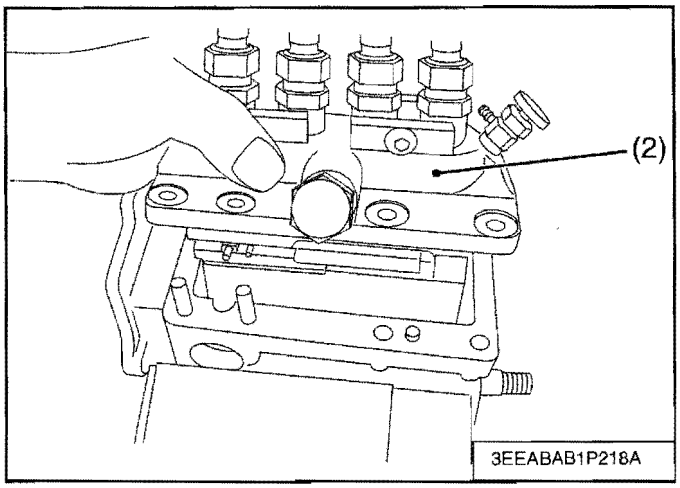
Separate the governor housing assembly from the injection pump unit.

Remove the fuel feed pump from the injection pump unit.

Remove the governor sleeve (Item 1) **[Figure 70-90-67]**.

Injection Pump Fuel Camshaft And Governor Weight Removal And Installation (Cont'd)

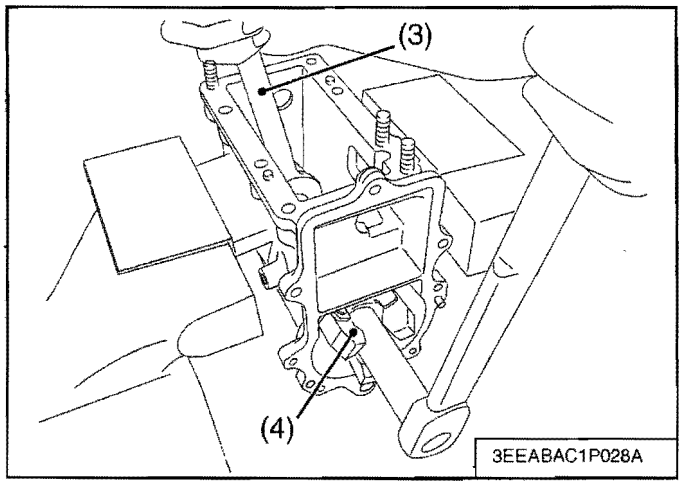
Figure 70-90-68



Remove the injection pump assembly (Item 2) **[Figure 70-90-68]**.

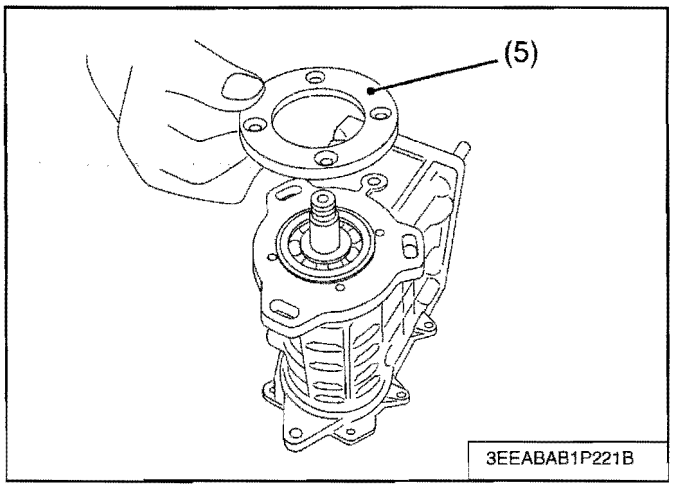
Remove the fuel camshaft lock bolts.

Figure 70-90-69



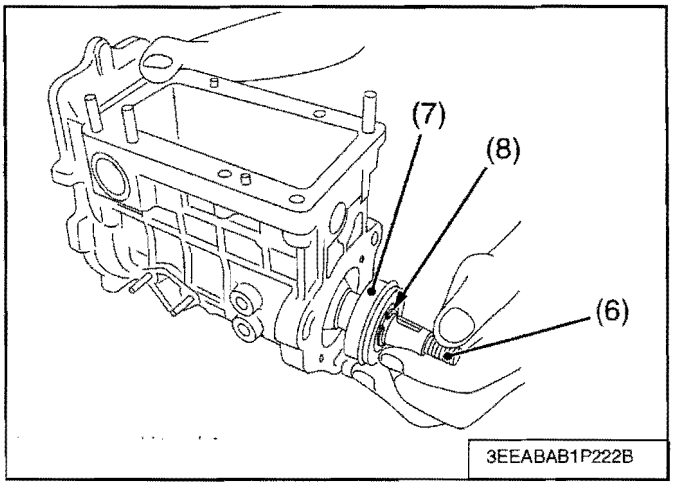
Fix the fuel canshaft with open end wrench (Item 3), and remove the governor weight mounting nut and the governor weight (Item 4) **[Figure 70-90-69]**.

Figure 70-90-70



Loosen the fuel camshaft stopper mounting screws and remove the fuel camshaft stopper (Item 5) **[Figure 70-90-70]**.

Figure 70-90-71



Pull out the fuel camahft (Item 6) and bearings (Item 7) **[Figure 70-90-71]** together.

After removeing the bearing's cir-clip (Item 8) **[Figure 70-90-71]**, press out the bearings.

NOTE: Do not use the fuel camshaft lock bolts, when remove the governor weight mounting nut. Otherwise, the lock bolts or injection pump housing might get damaged.

Press the bearings into the fuel camshaft.

Set the cir-clip at the gear side's bearing.

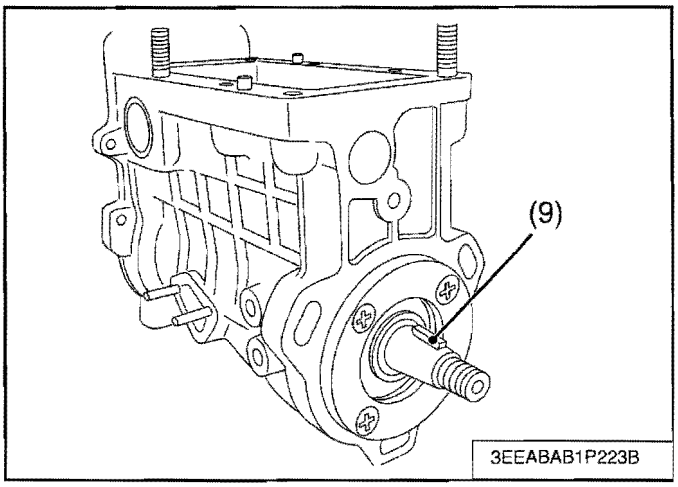
Install the fuel camshaft and bearings to the injection pump housing.

Injection Pump Fuel Camshaft And Governor Weight Removal And Installation (Cont'd)

Attach the fuel camshaft stopper and tighten the fuel camshaft stipper mounting screws with the specified torque.

Attach the governor weight to the fuel camshaft and tighten the governor weight mounting nut with specified torque.

Figure 70-90-72



Fix the fuel camshaft with lock bolts as the key way to fuel camshaft (Item 9) **[Figure 70-90-72]** is right-downward.

Install the injection pump assembly to the injection pump housing.

Attach the O-ring and the cover and tighten the cover mounting bolts.

Install the governor sleeve to the fuel camshaft.

Check the movement of the governor sleeve.

NOTE: Be careful not to damage the O-ring.

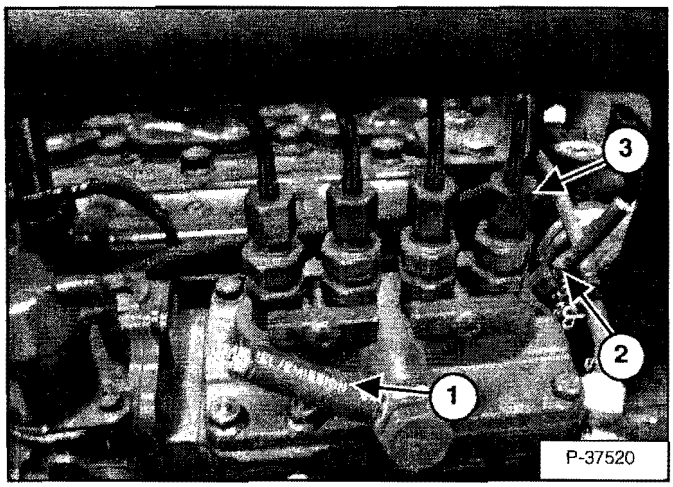
NOTE: Be careful the direction of the governor sleeve.

NOTE: When reassembling the inside parts, put the oil on each inside part slightly.

Tightening torque	Fuel camshaft stopper mounting screw	7.9 to 9.3 Nm 0.80 to 0.95 kgf·m 5.8 to 6.9 ft.-lbs.
	Governor weight mounting screw	62.8 to 72.6 Nm 6.4 to 7.4 kgf·m 46.3 to 53.5 ft.-lbs.

Injection Pump Removal and Installation

Figure 70-90-73



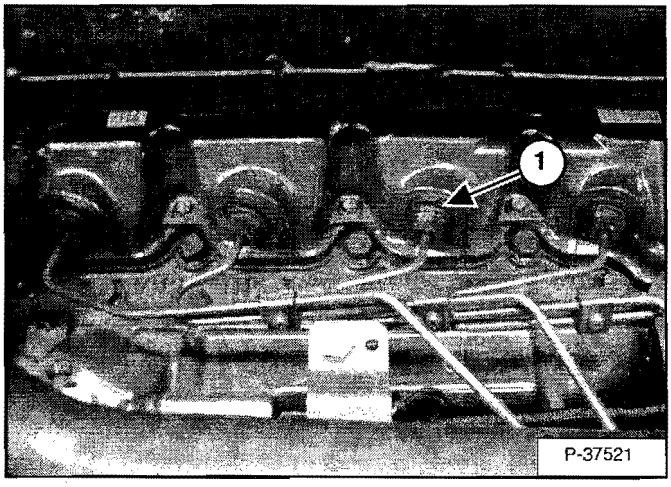
NOTE: The injection pump must be removed as a complete unit. Do Not remove individual pump barrels. If individual pump barrels are removed, the pump must be recalibrated in a certified injection shop.

NOTE: The injection pump can be replaced with the engine crankshaft in any position.

Disconnect and plug the fuel hose (Item 1) and fuel overflow hose (Item 2) **[Figure 70-90-73]**.

Disconnect the four injection lines (Item 3) **[Figure 70-90-73]** at the injection pump.

Figure 70-90-74

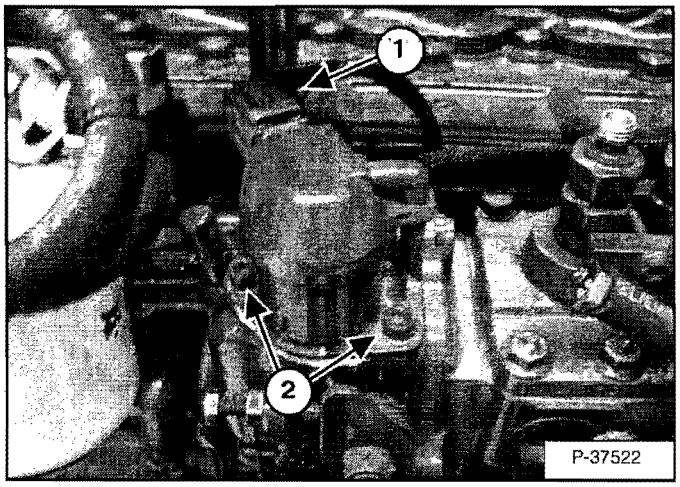


Disconnect the four injection lines (Item 1) **[Figure 70-90-74]** at the injectors.

Remove the injection lines from the loader.

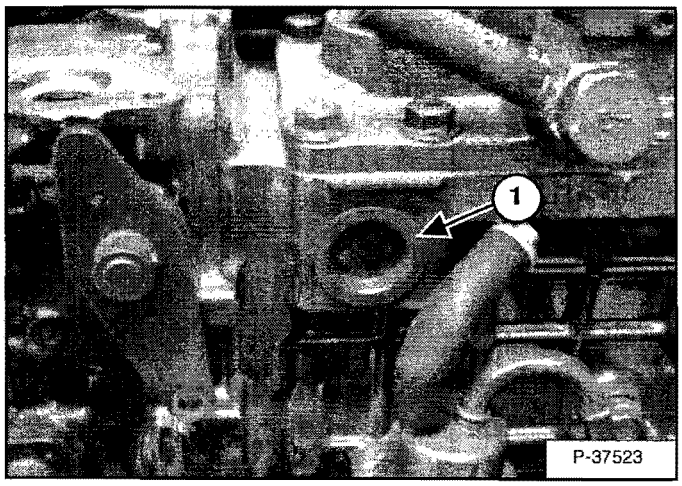
Injection Pump Removal and Installation (Cont'd)

Figure 70-90-75



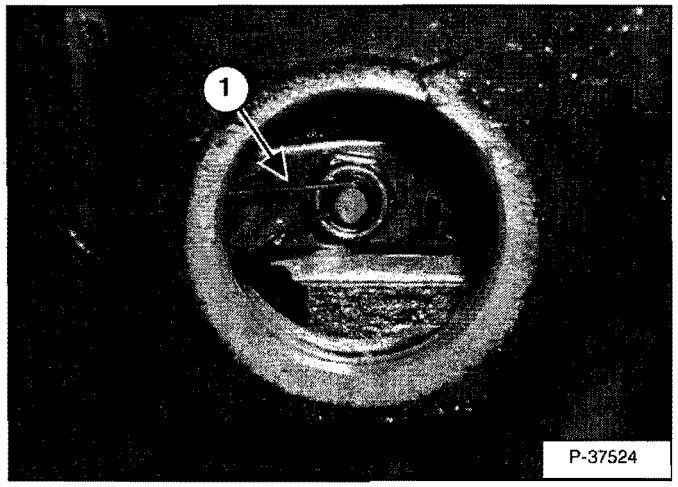
Disconnect the electrical connector (Item 1) from the fuel stop solenoid. Then remove the two mounting bolts (Item 2) **[Figure 70-90-75]** from the fuel stop solenoid. Remove the solenoid from the engine.

Figure 70-90-76



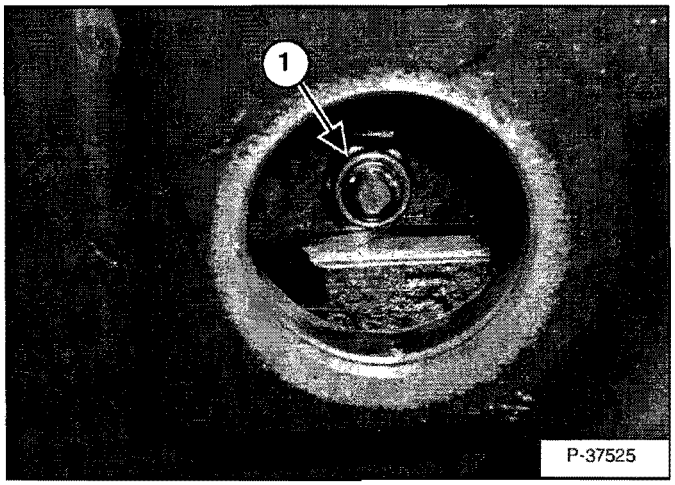
Remove the sight cover (Item 1) **[Figure 70-90-76]** from the injection pump unit.

Figure 70-90-77



Disconnect the starter spring hook (Item 1) **[Figure 70-90-77]**. *(Be careful to not deform the starter spring.)*

Figure 70-90-78

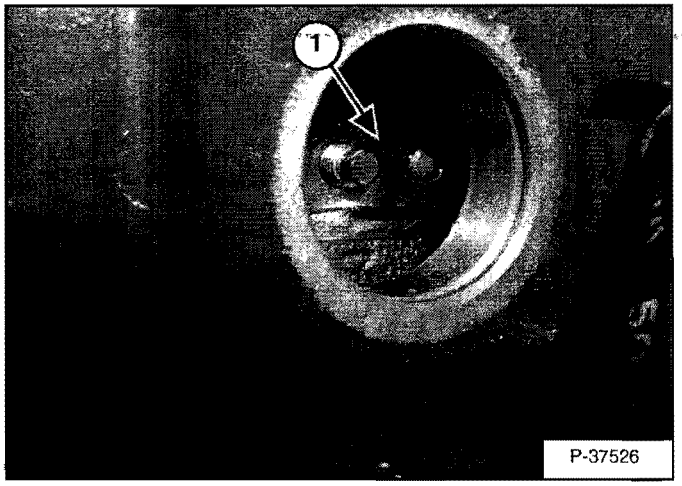


Remove the control rod nut (Item 1) **[Figure 70-90-78]**. *(Be careful not to drop the control rod nut.)*

Installation: Tighten the control rod nut to 24-36 in.-lbs. (3-4 Nm) torque.

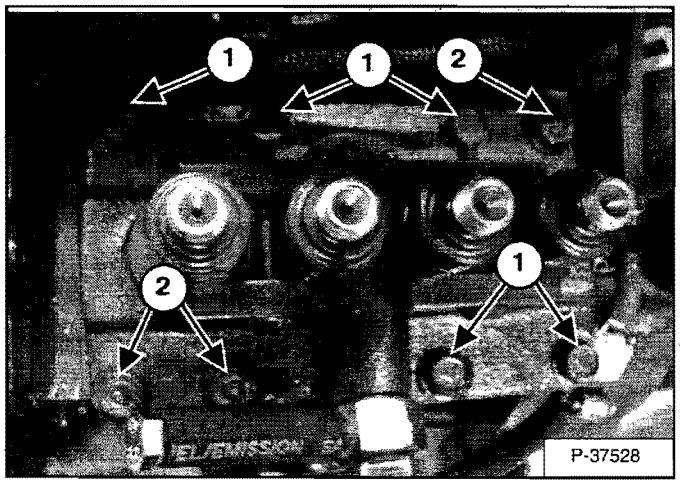
Injection Pump Removal and Installation (Cont'd)

Figure 70-90-79



Disconnect the control rod (Item 1) **[Figure 70-90-79]** from the injection pump.

Figure 70-90-80

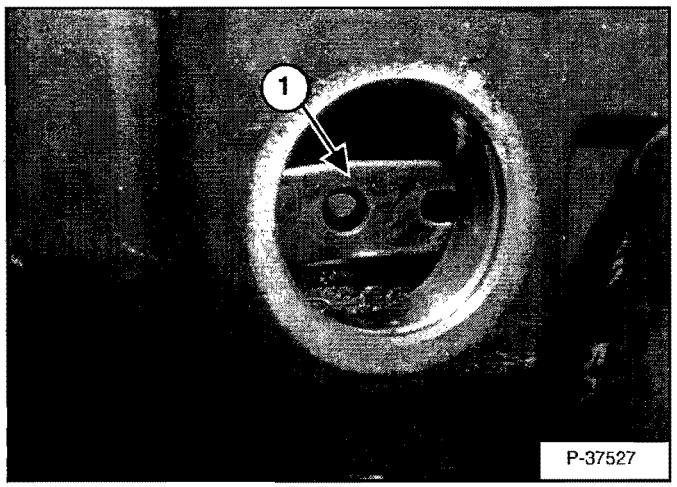


Remove the five injection pump mounting bolts (Item 1) **[Figure 70-90-80]**.

Remove the three injection pump mounting nuts (Item 2) **[Figure 70-90-80]**.

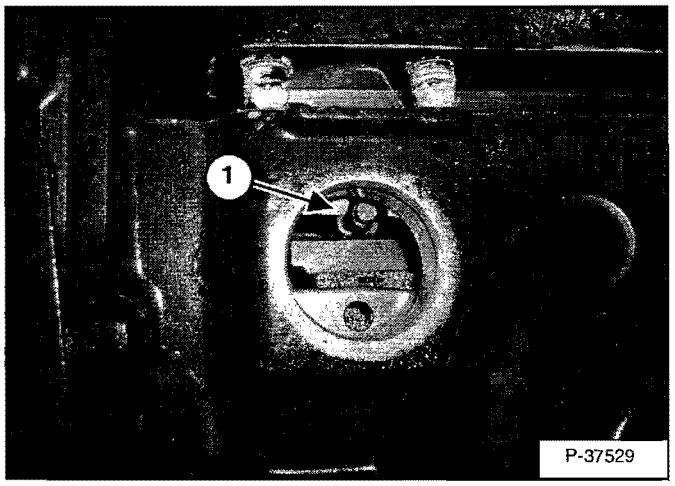
Installation: Tighten the injection pump mounting bolts to 17-20 ft.-lbs. (24-28 Nm) torque. Tighten the injection pump mounting nuts to 13-15 ft.-lbs. (18-21 Nm) torque.

Figure 70-90-81



With the injection pump mounting bolts and nuts loose, be sure the control rod (Item 1) **[Figure 70-90-81]** clears the pin on the injection pump.

Figure 70-90-82

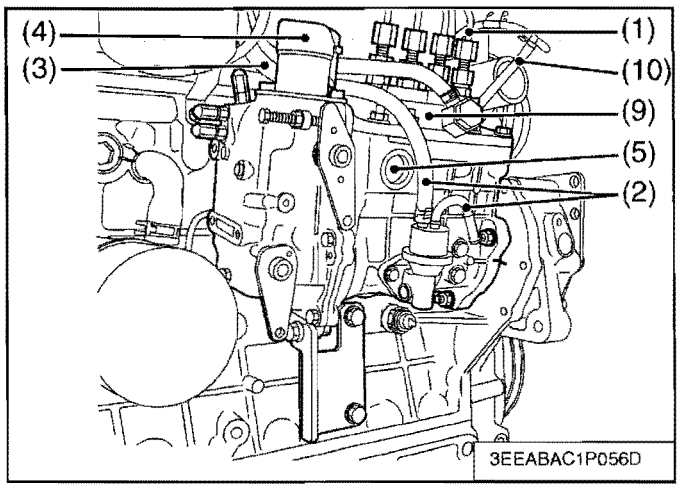


Align the pin on the injection pump (Item 1) **[Figure 70-90-82]** with the notch in the housing.

Remove the injection pump from the injection pump housing.

Injection Pump Removal And Installation (Cont'd)

Figure 70-90-83



The injection pump can be replaced with the crankshaft in whatever position.

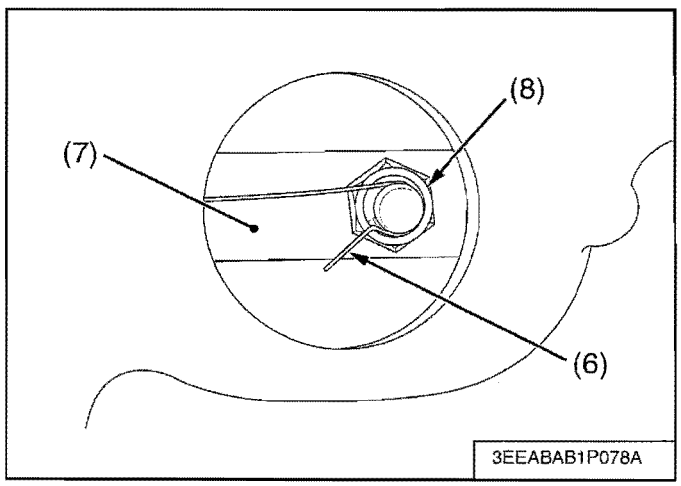
Disconnect all injection pipes (Item 1) **[Figure 70-90-83]**.

Disconnect the fuel pipe (Item 2) and fuel overflow pipe (Item 10) **[Figure 70-90-83]**.

Disconnect the connector (Item 3) from the stop solenoid. Then remove the stop solenoid (Item 4) **[Figure 70-90-83]**.

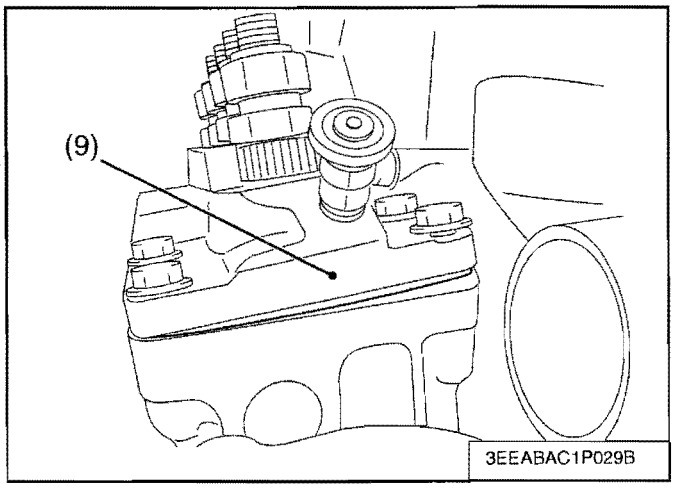
Detach the sight cover (Item 5) **[Figure 70-90-83]** from the injection pump unit.

Figure 70-90-84



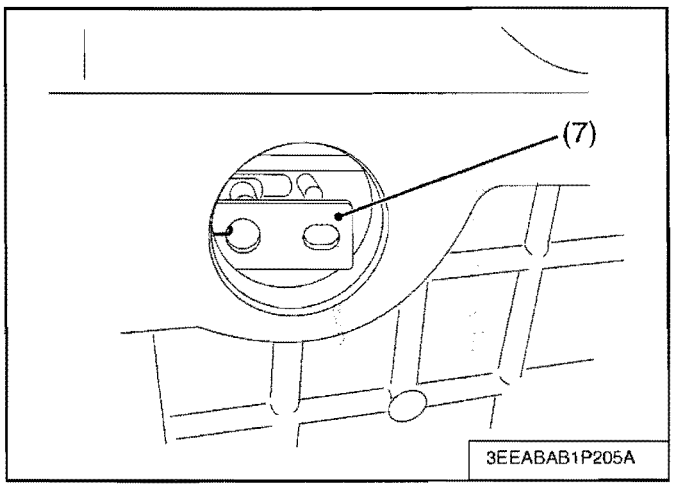
Unhook the start spring (Item 6), and remove the anti-rotation nut (Item 8) **[Figure 70-90-84]**.

Figure 70-90-85



Just loosen the injection pump assembly mounting bolts and nuts, which the injection pump assembly (Item 9) **[Figure 70-90-85]** keeps tilted.

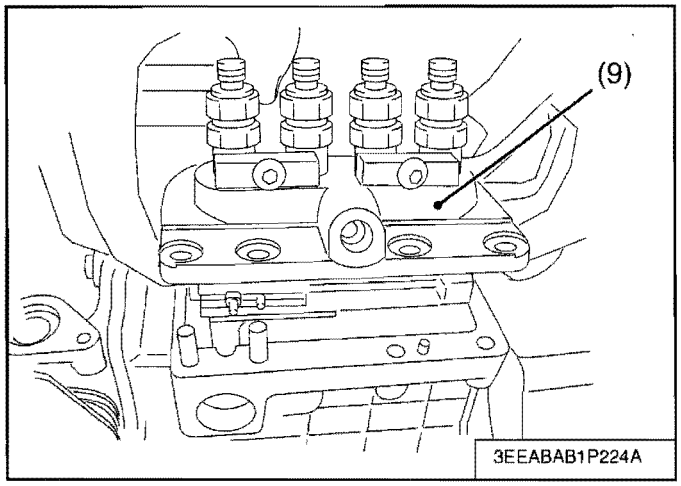
Figure 70-90-86



Slide off the governor connecting rod (Item 7) **[Figure 70-90-86]** from the rack pin of injection pump assembly.

Injection Pump Removal And Installation (Cont'd)

Figure 70-90-87



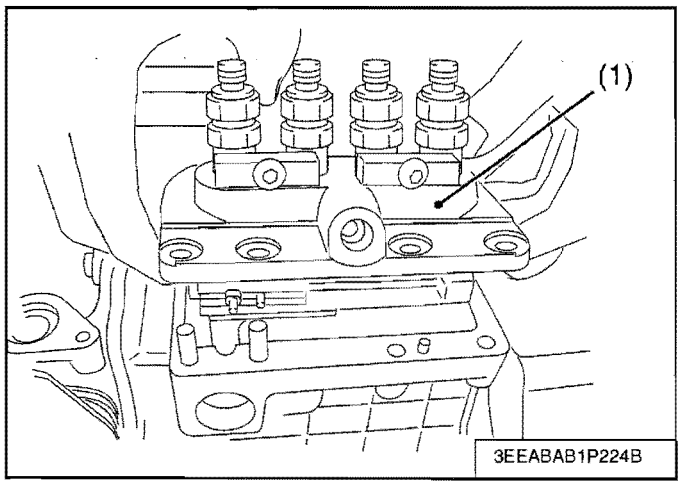
Remove the injection pump mounting bolts and nuts completely and take out the injection pump assembly (Item 9) **[Figure 70-90-87]**.

NOTE: Be careful not to drop the anti-rotation nut.

NOTE: Be careful not to deform the start spring.

NOTE: When taking out the injection pump assembly, be careful not to hit it against the governor connecting rod.

Figure 70-90-88



Install the injection pump assembly (Item 1) in the unit, and tighten the mounting bolts and nuts, which the injection pump assembly (Item 1) **[Figure 70-90-88]** keeps tilted.

Figure 70-90-89

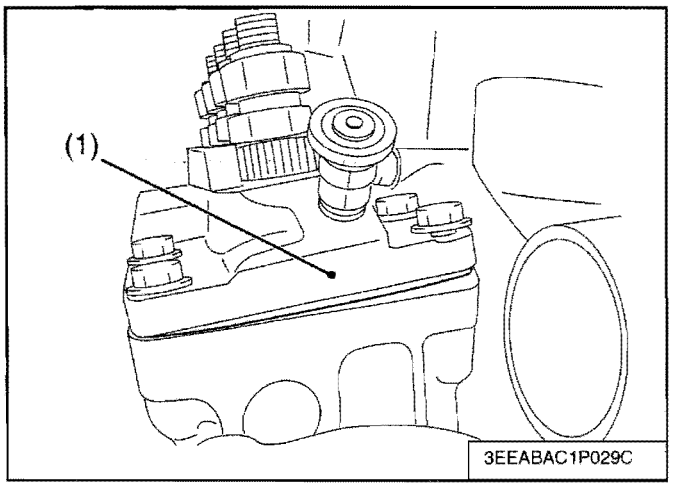
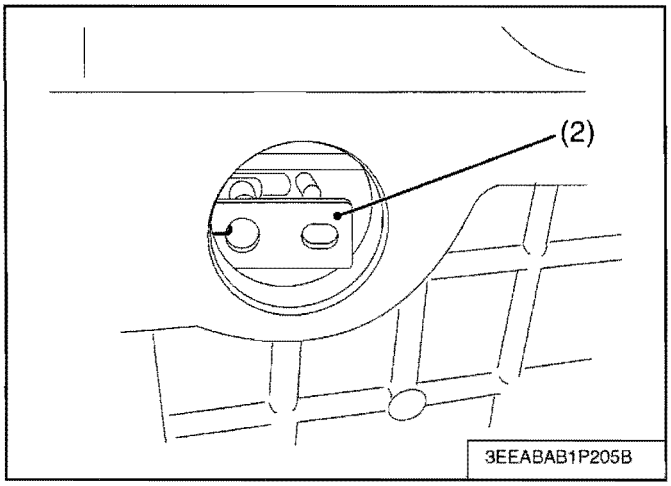


Figure 70-90-90



Hook the governor connecting rod (Item 2) **[Figure 70-90-90]** to the rack pin of the injection pump assembly (Item 1) **[Figure 70-90-89]**.

Tighten the mounting bolts and nuts with the specified torque, not to slide off the governor connecting rod (Item 2) **[Figure 70-90-90]** from the rack pin.

Injection Pump Removal And Installation (Cont'd)

Figure 70-90-91

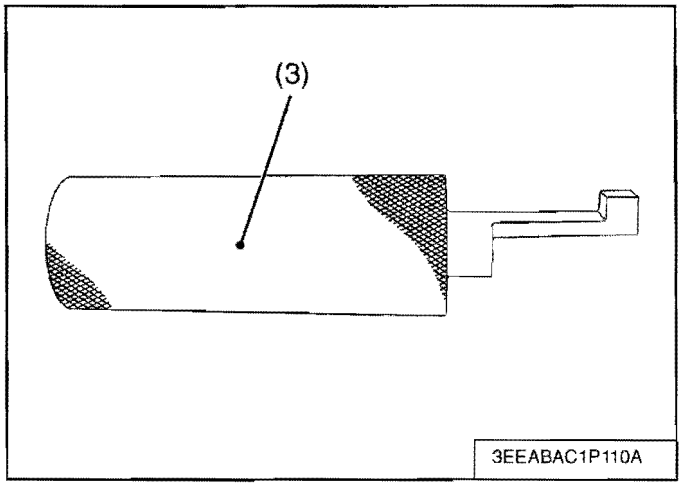
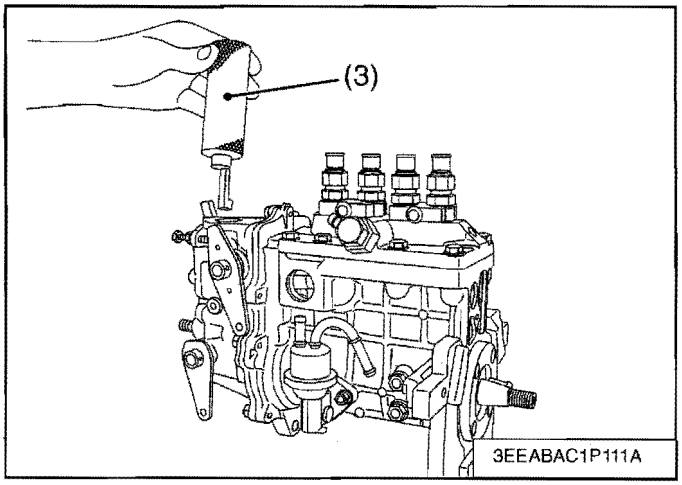


Figure 70-90-92



Place the jig (Item 3) **[Figure 70-90-92]** in the stop solenoid mounting hole of the injection pump unit.

Figure 70-90-93

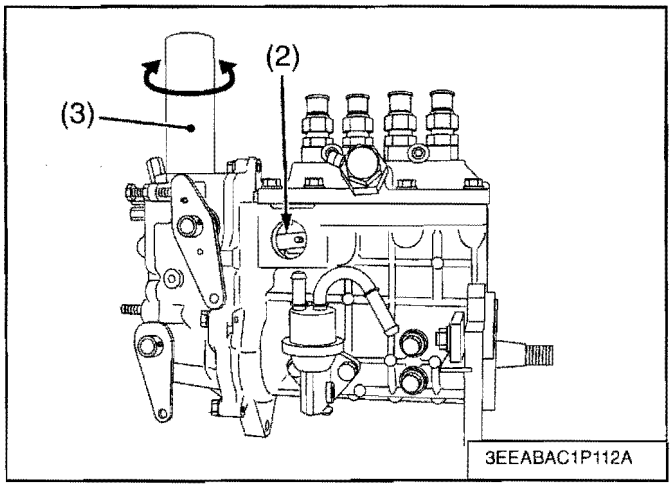


Figure 70-90-94

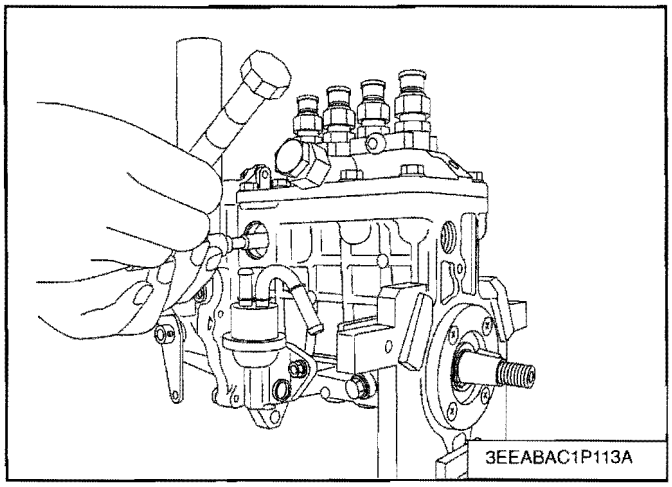
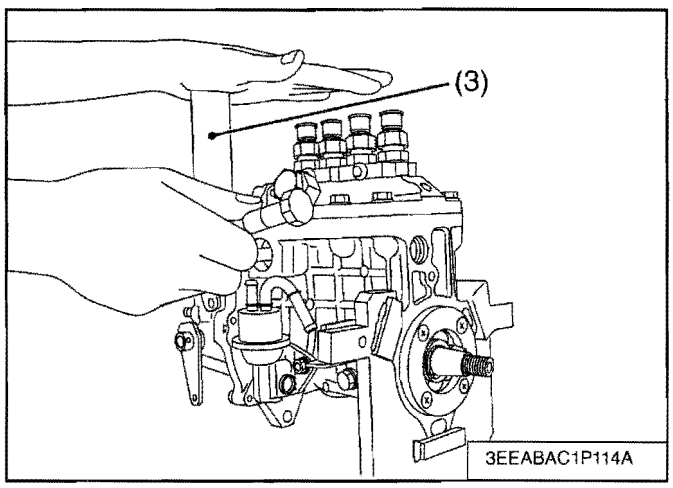


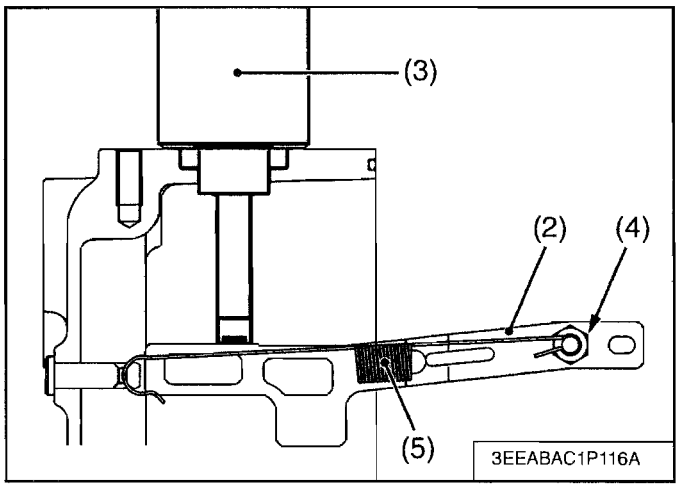
Figure 70-90-95



Make sure the permanent magnet at the top of the jig (Item 3) is attracted to the governor connecting rod (Item 2). To do this, turn the jig a little clockwise and couterclockwise and look into the sight cover hole to see if the governor connecting rod (Item 2) **[Figure 70-90-93]** moves right and left accordingly **[Figure 70-90-94]** & **[Figure 70-90-95]**.

Injection Pump Removal And Installation (Cont'd)

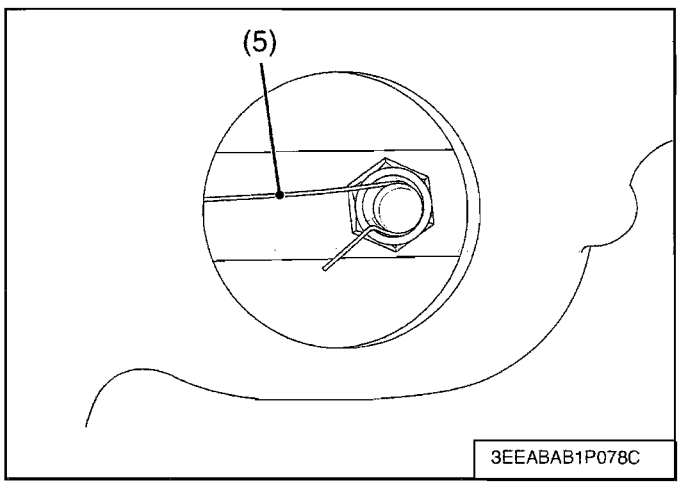
Figure 70-90-96



Slightly tighten the anti-rotation nut (Item 4) **[Figure 70-90-96]** of the governor connecting rod.

Holding down the jig by hand, tighten up the anti-rotation nut to the specified torque.

Figure 70-90-97



Hook the start spring (Item 5) **[Figure 70-90-97]** to the rack pin.

Figure 70-90-98

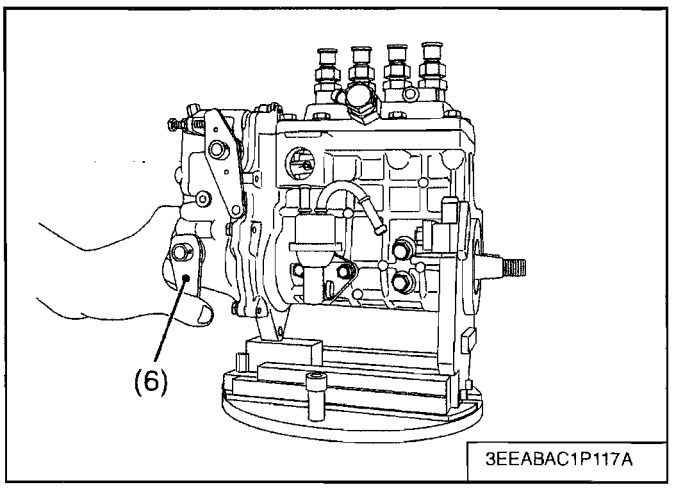
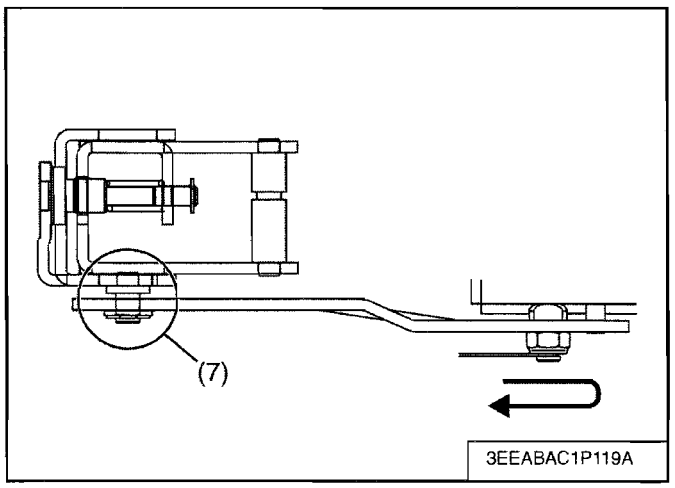


Figure 70-90-99



Move the stop lever (Item 6) **[Figure 70-90-98]** and visually check to see if the fuel injection pump control rack comes smoothly back to the start position by the counter force of the start spring. At the same time, visually check to see if there is no twist in the sliding point (Item 7) **[Figure 70-90-99]** between the governor fork lever and the governor connecting rod from the stop solenoid mounting hole.

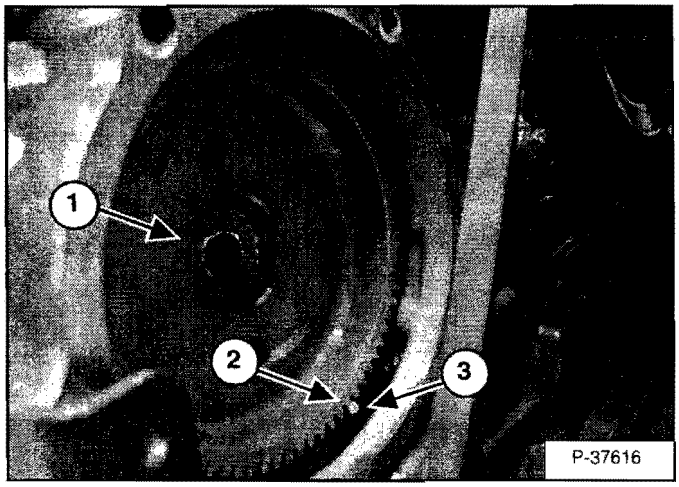
If the control rack fails to move back smoothly, remove the start spring and the anti-rotation nut, and go through the above procedure.

Finally fit the sight cover and the stop solenoid back into place.

Tightening torque	Injection pump mounting bolt and nut	Bolt	23.5 to 27.5 Nm 2.4 to 2.8 kgf·m 17.4 to 20.3 ft.-lbs.
		Nut	17.7 to 20.6 Nm 1.8 to 2.1 kgf·m 13.0 to 15.2 ft.-lbs.
	Anti-rotation nut		2.84 to 4.02 Nm 0.29 to 0.41 kgf·m 2.10 to 2.97 ft.-lbs.

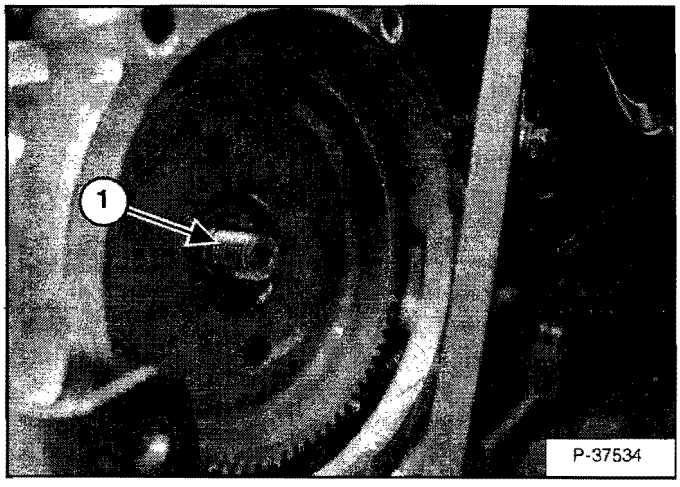
Injection Pump Housing Installation

Figure 70-90-100



Place the injection pump gear (Item 1) back into the gear case. Align the marks of the injection pump gear (Item 2) and the idle gear (Item 3) **[Figure 70-90-100]**.

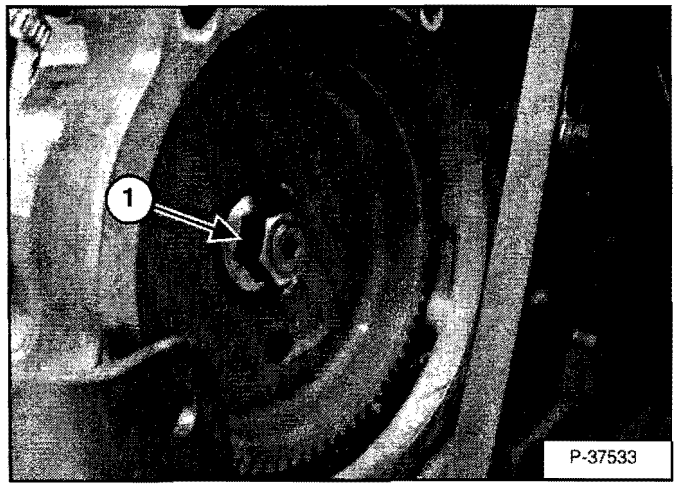
Figure 70-90-101



Install the injection pump unit into the injection pump gear (Item 1) **[Figure 70-90-101]**.

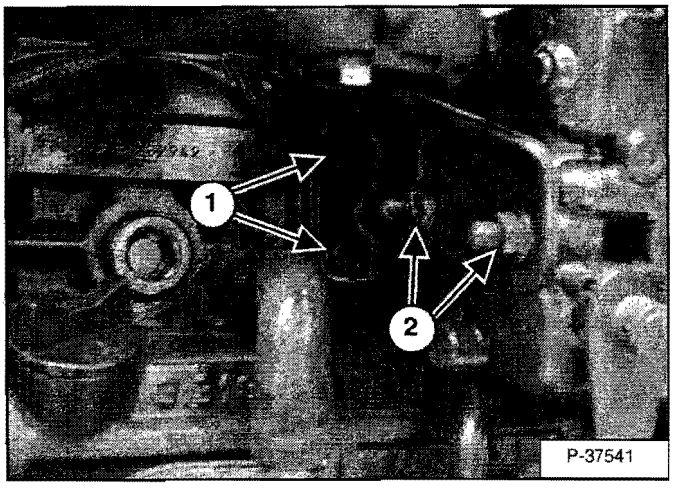
NOTE: When installing the injection pump unit to the injection pump gear, make sure that the key is fit in the keyway of injection pump gear.

Figure 70-90-102



Hand tighten the injection pump gear mounting nut (Item 1) **[Figure 70-90-102]**

Figure 70-90-103

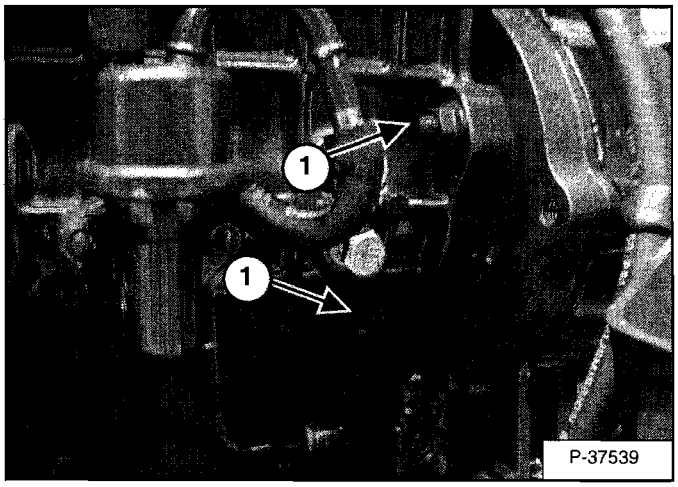


Install the two rear mount bolts (Item 1) **[Figure 70-90-103]** and tighten.

Loosen the two injection pump adjustment bolts (Item 2) **[Figure 70-90-103]**.

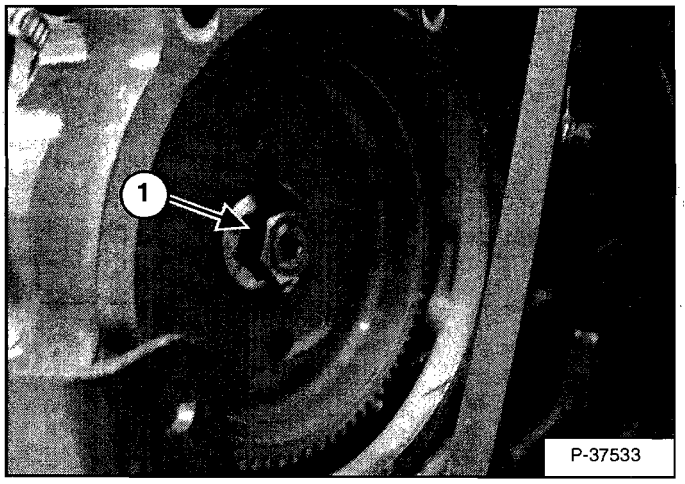
Injection Pump Housing Installation (Cont'd)

Figure 70-90-104



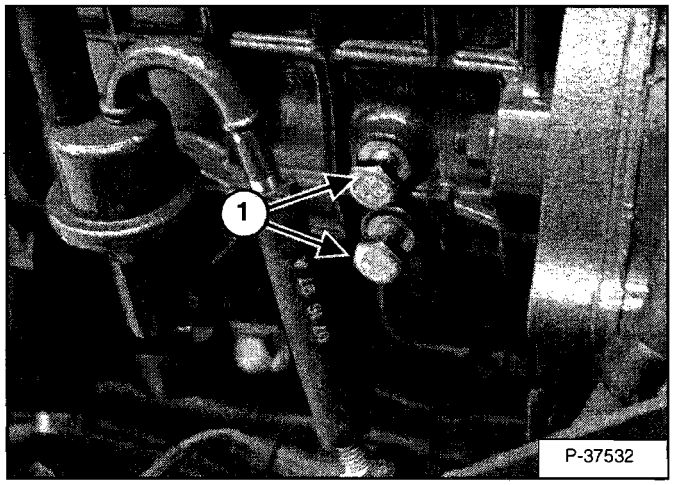
Install the three mounting flange nuts (Item 1) **[Figure 70-90-104]** and finger tighten. (Two on the front side and one on the back side of the injection pump.)

Figure 70-90-105



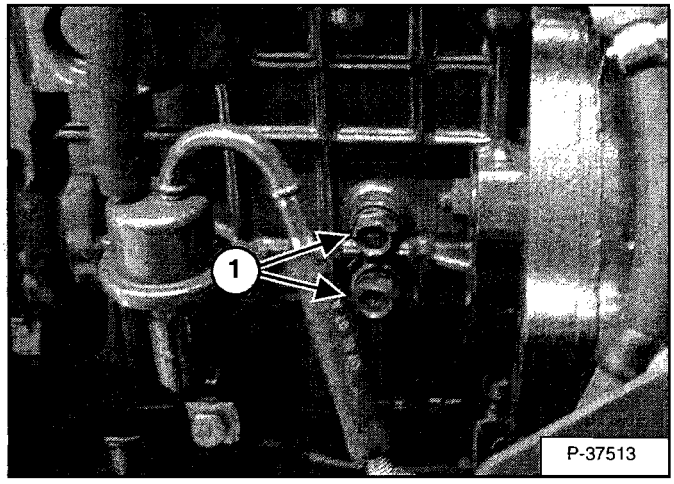
Tighten the injection pump gear nut (Item 1) **[Figure 70-90-105]** to 54 - 62 ft.-lbs. (74 - 83 Nm) torque.

Figure 70-90-106



Remove the two fuel camshaft lock bolts (Item 1) **[Figure 70-90-106]**.

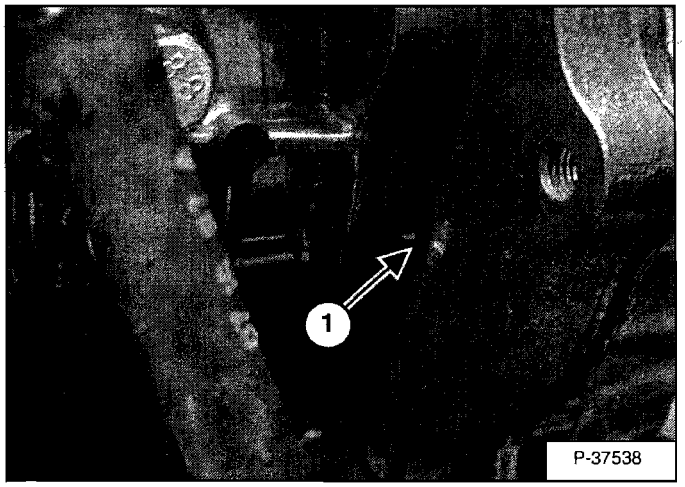
Figure 70-90-107



Install the two flange bolts (Item 1) **[Figure 70-90-107]** and tighten to 17-20 ft.-lbs. (24-28 Nm) torque.

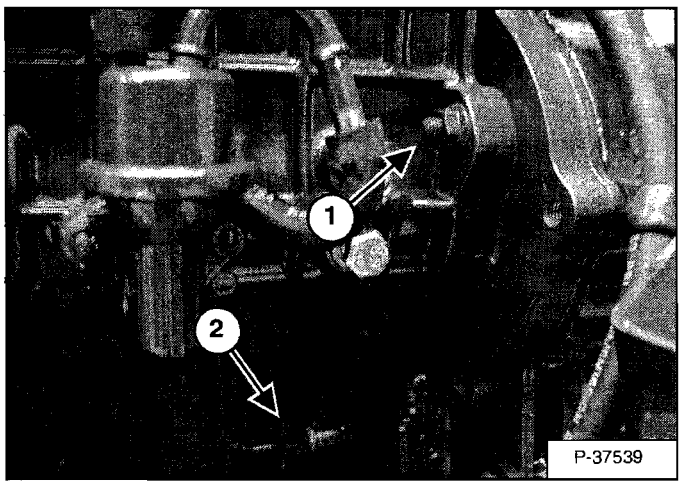
Injection Pump Housing Installation (Cont'd)

Figure 70-90-108



Move the injection pump unit clockwise (viewed from gearcase side), align the injection timing marks (Item 1) **[Figure 70-90-108]** on the injection pump unit and on the engine gearcase.

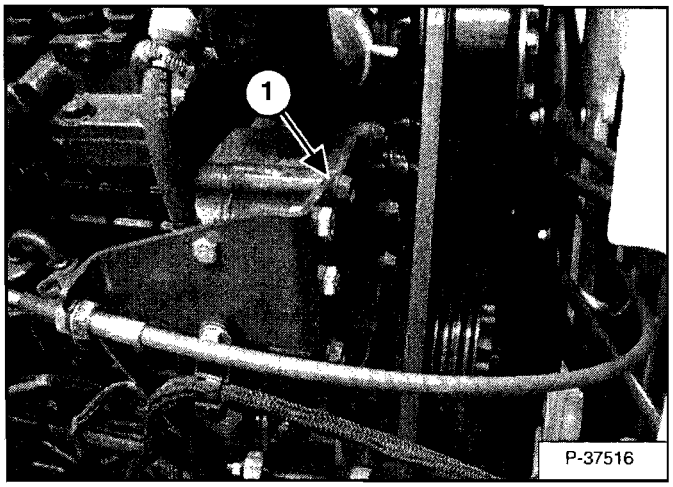
Figure 70-90-109



Tighten the injection pump unit mounting flange nuts (Item 1) **[Figure 70-90-109]** to 17 - 29 ft.-lbs. (24 - 28 Nm) torque.

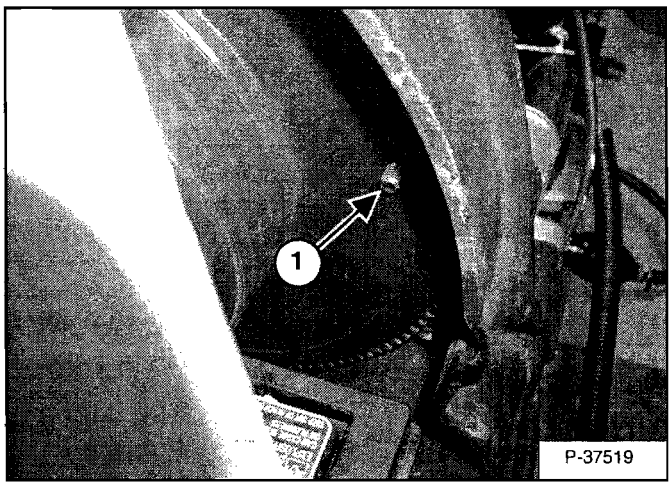
Reconnect the lubricating oil pipe (Item 2) **[Figure 70-90-109]**.

Figure 70-90-110



Install the injection pump gear cover and throttle cable mount bracket, and tighten the eight bolts (Item 1) **[Figure 70-90-110]** to 17- 20 ft.-lbs. (24-28 Nm) torque.

Figure 70-90-111



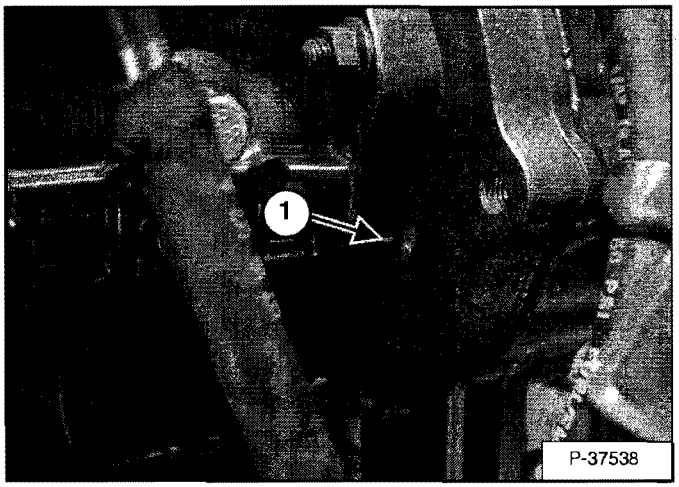
Remove the flywheel pin (Item 1) **[Figure 70-90-111]** from the engine flywheel and flywheel casting.

Check the injection timing. (See Injection Pump Timing on Page 70-90-34.)

Install the flywheel cover on the flywheel casting.

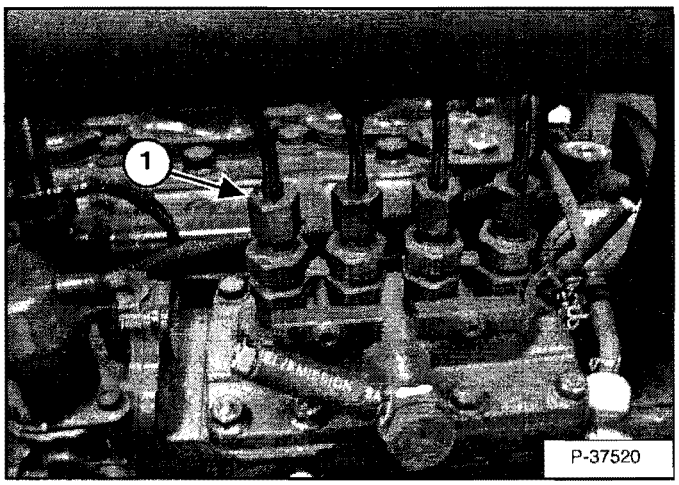
Injection Pump Timing

Figure 70-90-112



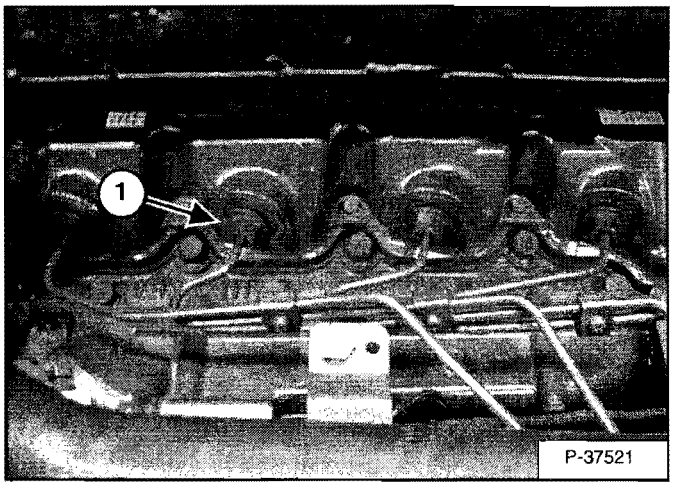
Align the timing mark on the injection pump (Item 1) **[Figure 70-90-112]** with the timing mark on the gearcase housing.

Figure 70-90-113



Disconnect the four injection lines (Item 1) **[Figure 70-90-113]** from the injection pump.

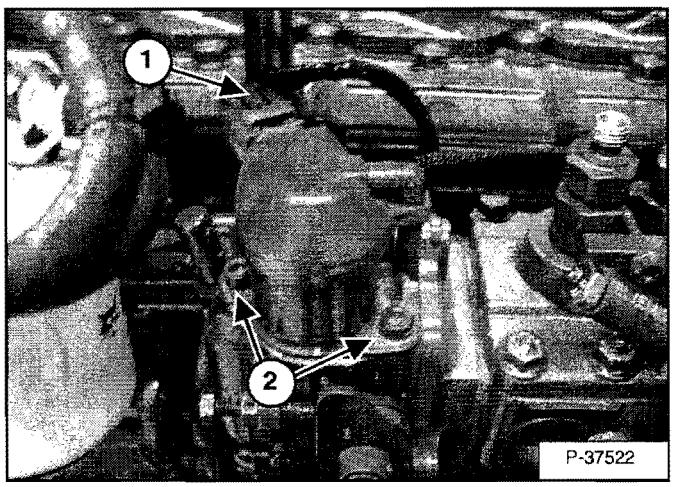
Figure 70-90-114



Disconnect the four injection lines (Item 1) **[Figure 70-90-114]** from the injector.

Remove the injector lines form the engine.

Figure 70-90-115



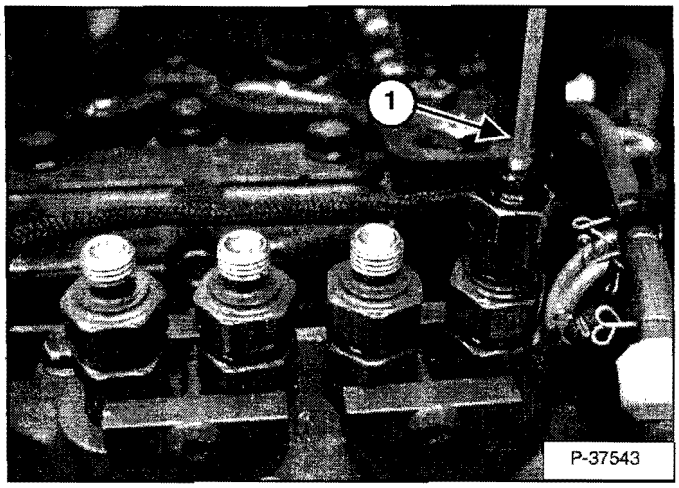
Disconnect the electrical connector (Item 1) **[Figure 70-90-115]** from the fuel shut-off solenoid.

Remove the two mount bolts (Item 2) **[Figure 70-90-115]** from the fuel shut-off solenoid.

Remove the fuel shut-off solenoid from the engine.

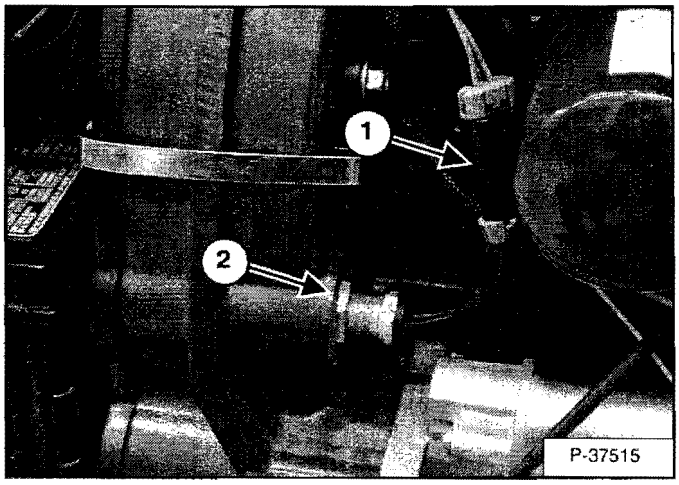
Injection Pump Timing (Cont'd)

Figure 70-90-116



Install a short plastic tube (Item 1) **[Figure 70-90-116]** in the number one cylinder port of the injection pump. The tube should fit securely and point upward.

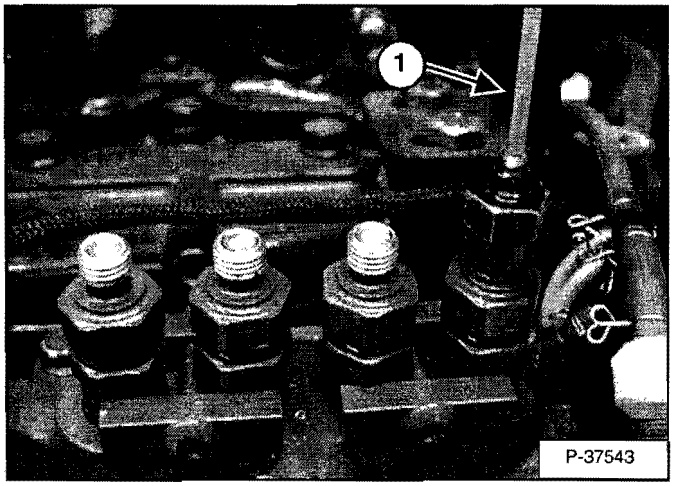
Figure 70-90-117



Disconnect the wiring connector (Item 1) **[Figure 70-90-117]** from the engine speed control sensor.

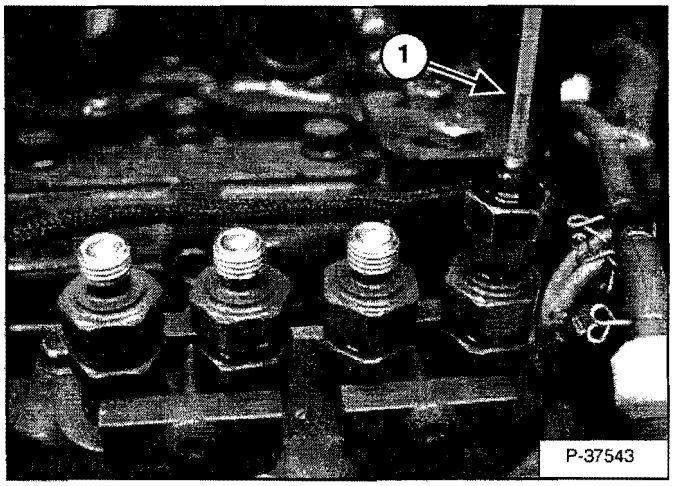
Remove the speed sensor (Item 2) **[Figure 70-90-117]** from the engine.

Figure 70-90-118



Turn the engine counterclockwise (viewed from flywheel end) until the fuel partially fills the plastic tube (Item 1) **[Figure 70-90-118]**.

Figure 70-90-119

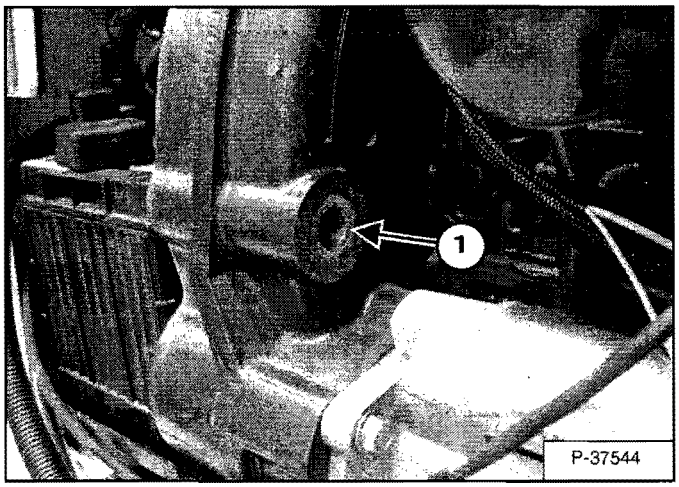


After there is fuel rise seen in the plastic tube, rotate the engine back (clockwise) at least 90 degrees.

Slowly rotate the engine counterclockwise (viewed from flywheel end) and stop turning when the fuel begins to rise in the plastic tube (Item 1) **[Figure 70-90-119]**.

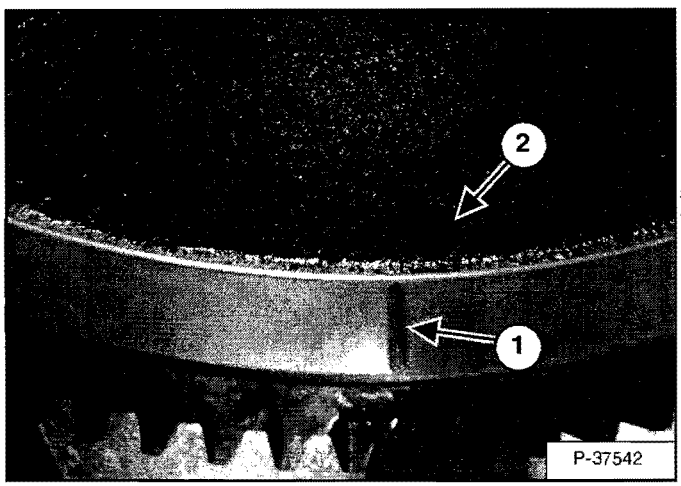
Injection Pump Timing (Cont'd)

Figure 70-90-120



Check the location of the engine timing mark, by looking in the engine speed sensor hole on the engine flywheel casting (Item 1) **[Figure 70-90-120]**.

Figure 70-90-121



The timing mark (Item 1) **[Figure 70-90-121]** should be located in the center of the engine speed sensor hole.

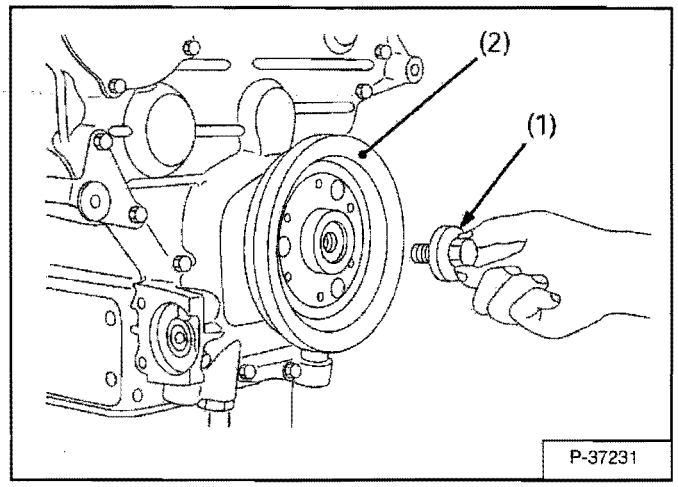
NOTE: The TDC hole (Item 2) [Figure 70-90-121] in the flywheel will not be visible by looking in the speed sensor hole.

If the timing mark is not located in the center of the hole, rotate the injection pump unit until the injection timing is adjusted.

The injection timing is 12 to 13 degrees before T.D.C. (0.21 to 0.23 rad.).

Fan Drive Pulley Disassembly And Assembly

Figure 70-90-122



Install the engine flywheel pin.

Remove the crankshaft screw (Item 1) **[Figure 70-90-122]**.

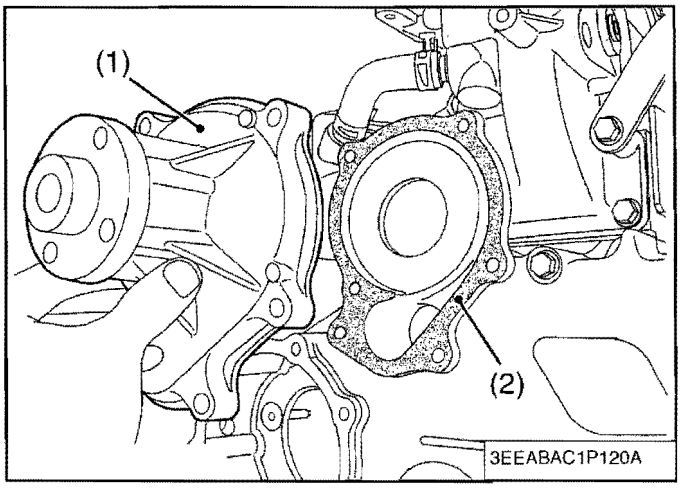
Remove the fan drive pulley (Item 2) **[Figure 70-90-122]**.

NOTE: Clean the crankshaft screw and the fan drive pulley sleeve surface thoroughly and tighten the screw securely to specified torque.

Tightening torque	Crankshaft screw	255.0 to 274.6 Nm 26.0 to 28.0 kgf·m 188.1 to 202.5 ft.-lbs.

Water Pump Disassembly And Assembly

Figure 70-90-123

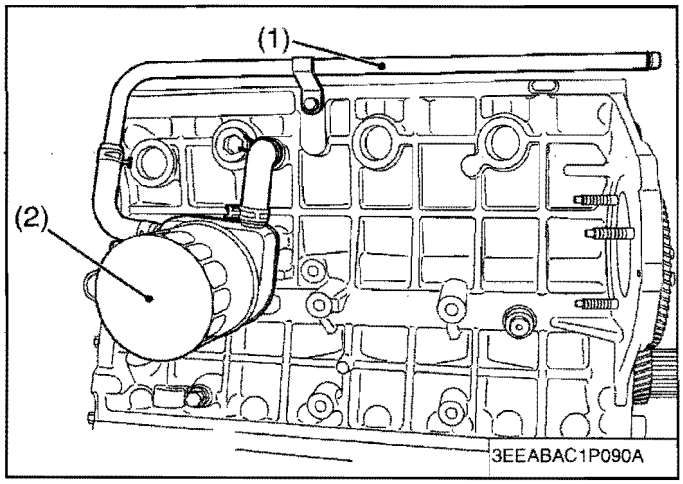


Remove the water pump (Item 1) **[Figure 70-90-123]** from the gearcase.

When mounting the water pump, use the new gasket (Item 2) **[Figure 70-90-123]**.

Oil Cooler And Water Pipe Disassembly And Assembly

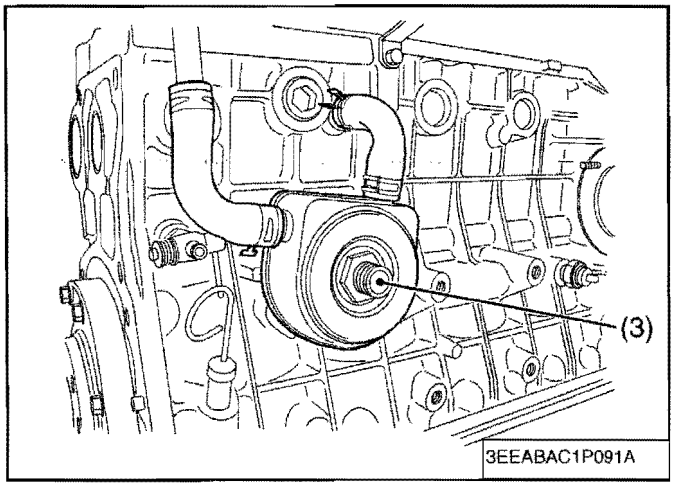
Figure 70-90-124



Remove the water pipe (Item 1) **[Figure 70-90-124]**.

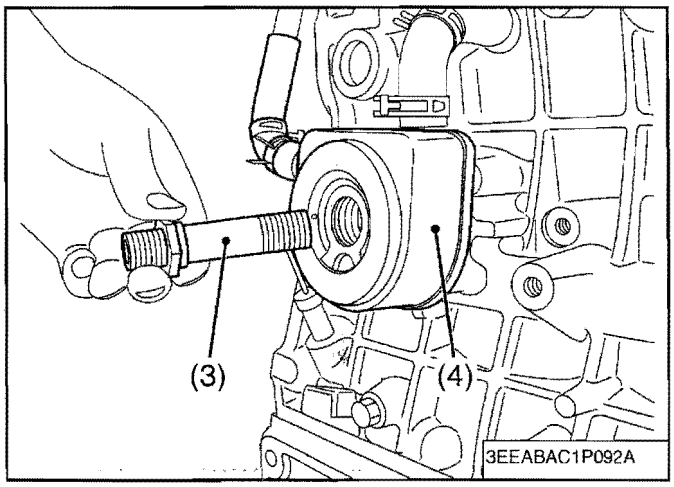
Remove the oil filter cartridge (Item 2) **[Figure 70-90-124]**.

Figure 70-90-125



Remove the oil cooler joint bolt (Item 3) **[Figure 70-90-125]** & **[Figure 70-90-126]**.

Figure 70-90-126

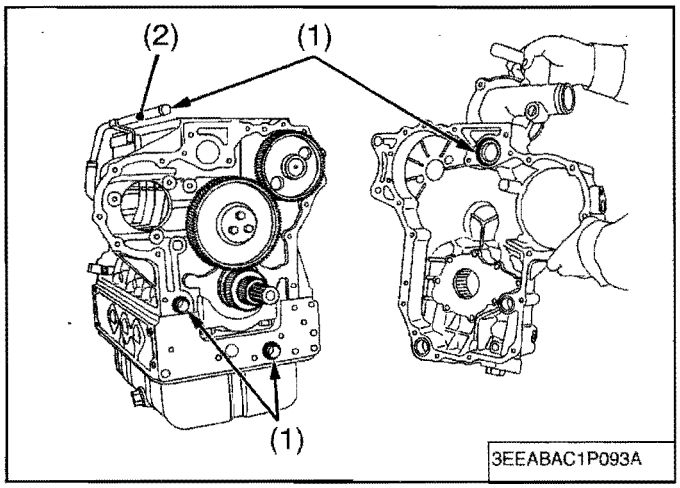


Remove the oil cooler (Item 4) **[Figure 70-90-126]**.

Tightening torque	Oil cooler joint bolt	39.2 to 44.1 Nm 4.0 to 4.5 kgf·m 28.9 to 32.5 ft.-lbs.

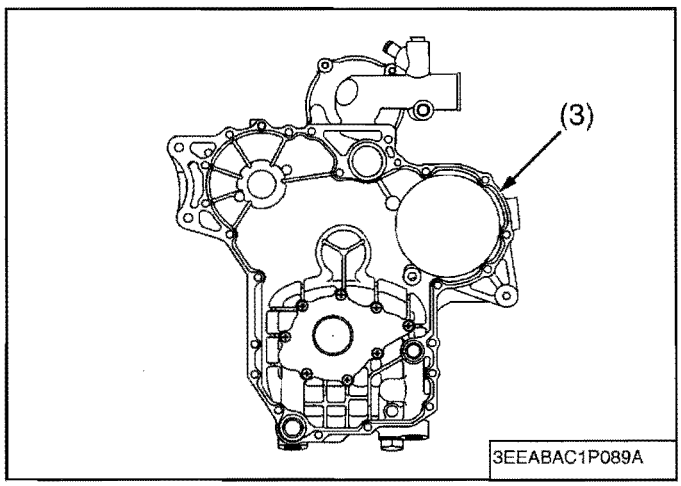
Gearcase Cover Disassembly And Assembly

Figure 70-90-127



Remove the gearcase cover (Item 1) **[Figure 70-90-127]**.

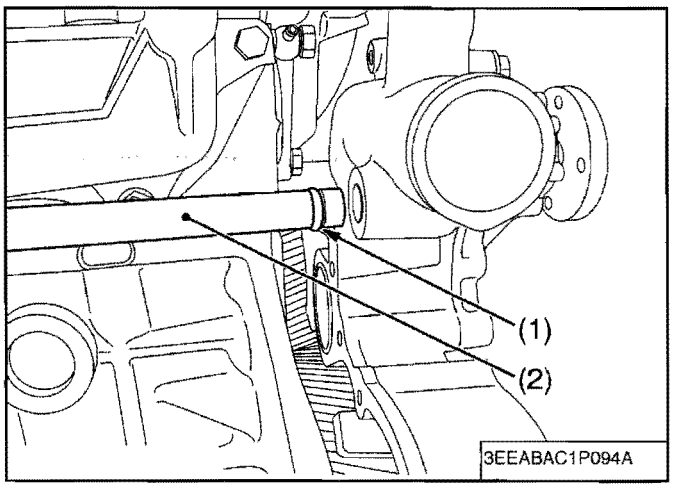
Figure 70-90-128



Confirm that the liquid gasket coating surface is free of water, dust and oil in order to maintain sealing effect.

Carefully apply the adhesive evenly **[Figure 70-90-128]**.

Figure 70-90-129



Be careful not to damage the water pipe (Item 2) **[Figure 70-90-129]**.

NOTE: When mounting the adhesive-applied parts, take care to fit them to the mating parts.

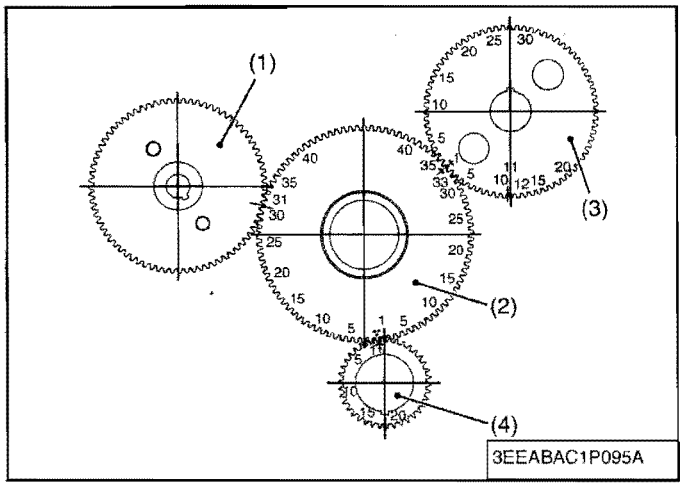
NOTE: Assemble the adhesive-applied parts within ten minutes.

NOTE: Apply a liquid gasket to the gearcase cover.

NOTE: Use the new O-rings when attaching gearcase cover.

Idle Gear And Camshaft Disassembly And Assembly

Figure 70-90-130



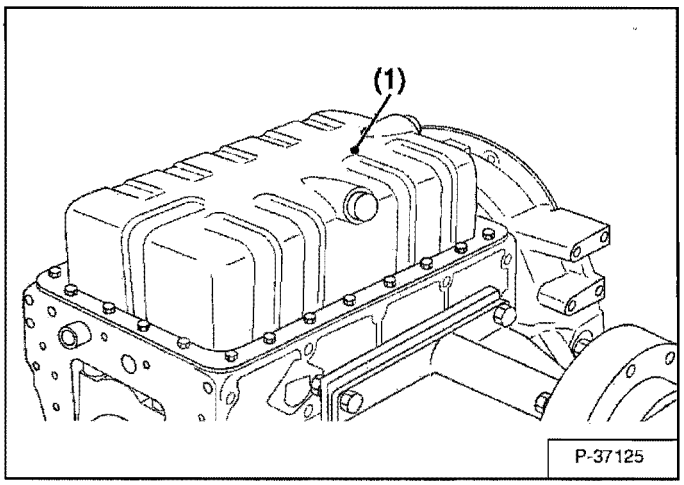
Remove three set screws of the idle gear and draw out the idle gear 1, 2 **[Figure 70-90-130]**.

Remove two set screws of the camshaft stopper and draw out the camshaft.

Set the crankshaft at the top dead center of No. 1 and 4 cylinder and the camshaft key to the top position and align the marks of idle gear and cam gear and crank gear to assemble them **[Figure 70-90-130]**.

Oil Pan And Oil Strainer Disassembly And Assembly

Figure 70-90-131



Unscrew the oil pan mounting screws and remove the oil pan (Item 1) **[Figure 70-90-131]**.

Figure 70-90-132

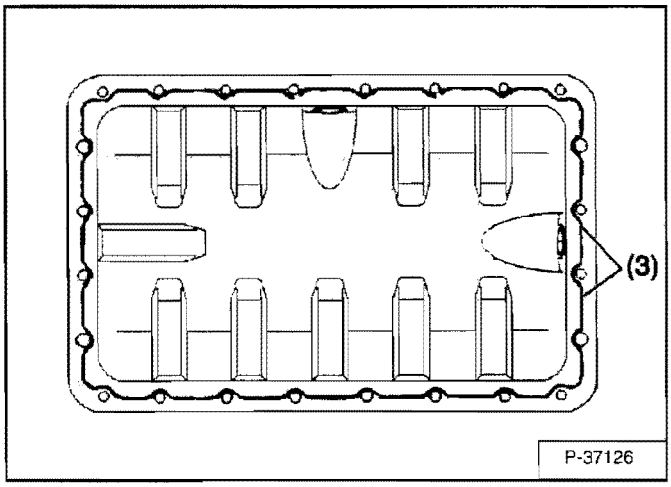
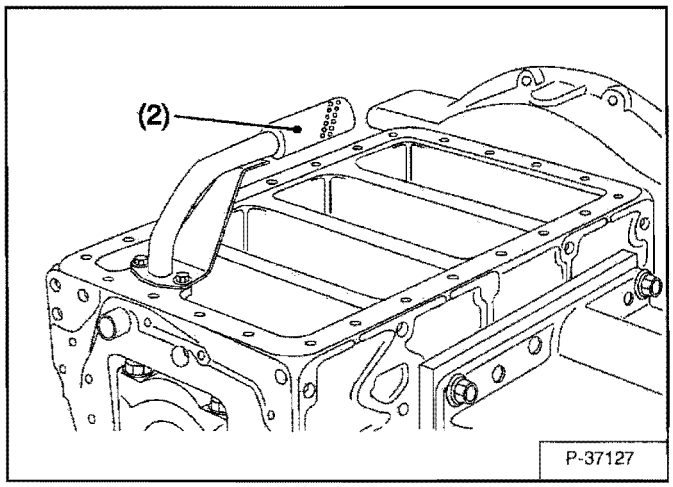


Figure 70-90-133



Unscrew the oil strainer mounting screw, and remove the oil strainer (Item 2) **[Figure 70-90-133]**.

Install the oil strainer, using care not to damage the O-ring.

Apply liquid gasket to the oil pan (Item 3) **[Figure 70-90-132]**.

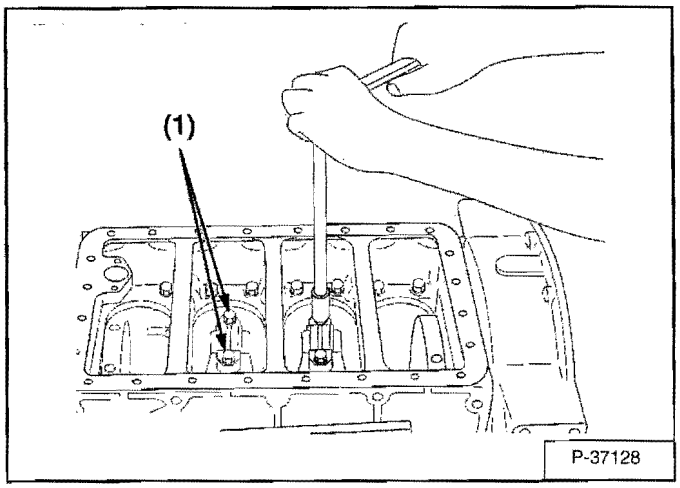
Confirm that the liquid gasket coating surface is free of water, dust and oil in order to maintain sealing effect.

Carefully apply the adhesive evenly.

NOTE: When mounting the adhesive-applied parts, take care to fit them to the mating parts.
Assemble the adhesive-applied parts within ten minutes.
To avoid uneven tightening, tighten mounting screws in diagonal order from the center.
After cleaning the oil strainer, install it.
Attach the oil pan with its central drain plug facing toward the air suction side.

Connecting Rod Cap Disassembly And Assembly

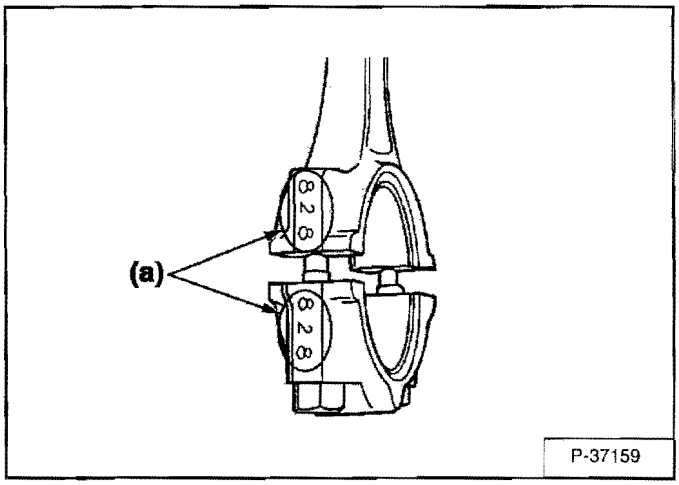
Figure 70-90-134



Remove the connecting rod screws (Item 1) **[Figure 70-90-134]** from connecting rod cap.

Remove the connecting rod caps.

Figure 70-90-135



Align the marks **(a) [Figure 70-90-135]** with each other. **(Face the marks toward the injection pump.)**

Apply engine oil to the connecting rod screws and lightly screw it in by hand, then tighten it to the specified torque. If the connecting rod screw won't be screwed in smoothly, clean the threads. If the connecting rod screw is still hard to screw in, replace it.

When using the existing crank pin metal again, put tally marks on the crank pin metal and the connecting rod in order to keep their positioning.

Fit the crank pin metal in place.

Tightening torque	Connecting rod screw	78.5 to 83.4 Nm 8.0 to 8.5 kgf·m 57.9 to 61.5 ft.-lbs.

Piston Disassembly And Assembly

Figure 70-90-136

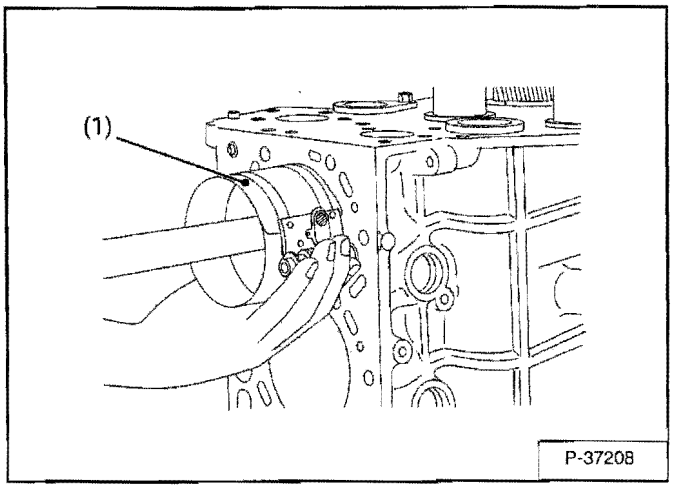


Figure 70-90-137

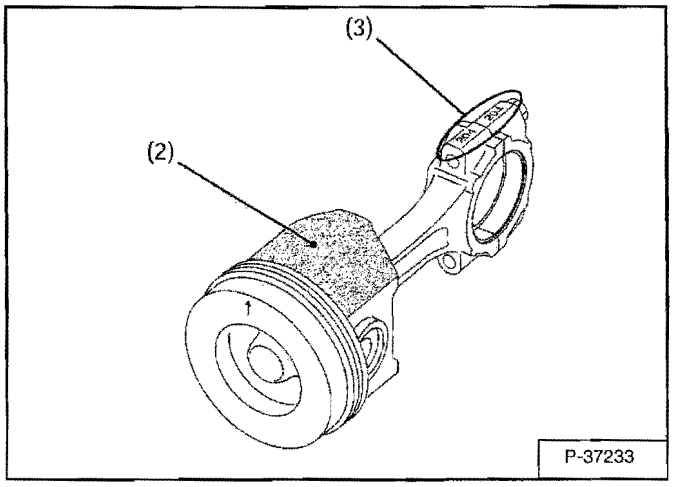
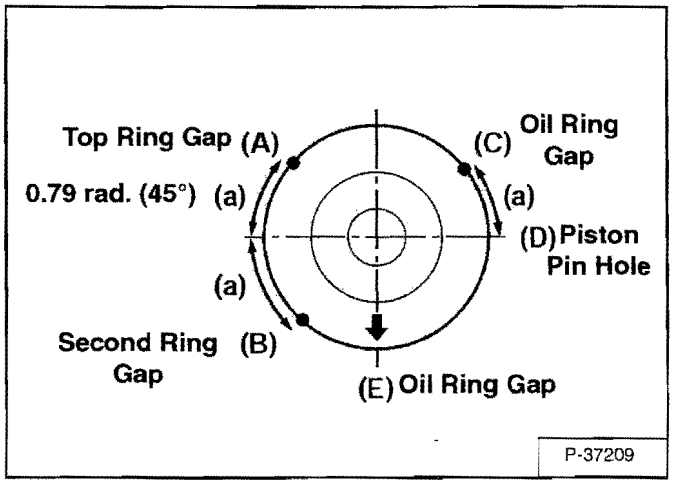


Figure 70-90-138



Completely clean carbon in the cylinders.

Turn the flywheel and set a piston to the top dead center.

Piston Disassembly And Assembly (Cont'd)

Pull out the piston upward by lightly tapping it from the bottom of the crankcase with the grip of a hammer.

Before inserting the piston into the cylinder, apply enough engine oil to the cylinder.

When inserting the piston into the cylinder, face the mark (Item 3) **[Figure 70-90-137]** on the connecting rod to the injection pump.

NOTE: Do not change the combination of cylinder and piston.
Make sure of the position of each piston by marking. For example, mark "1" on the No. 1 position.
When inserting the piston into the cylinder, place the gap of the compression ring 1 on the opposite side of the combustion chamber and stagger the gaps of the compression ring 2 and oil ring marking a right angle from the gap of the compression ring 1.
Carefully insert the pistons using a piston ring compressor (Item 1) [Figure 70-90-136]. Otherwise, their chrome-plated section of piston rings may be scratched, causing trouble inside the liner.

When inserting the piston in place, be careful not to get the molybdenum disulfide coating (Item 2) [Figure 70-90-137] torn off its skirt. This coating is useful in minimizing the clearance with the cylinder liner. Just after the piston pin has been press-fitted, in particular, the piston is still hot and the coating is easy to peel off. Wait until the piston cools down.

Piston Ring And Connecting Rod Disassembly And Assembly

Figure 70-90-139

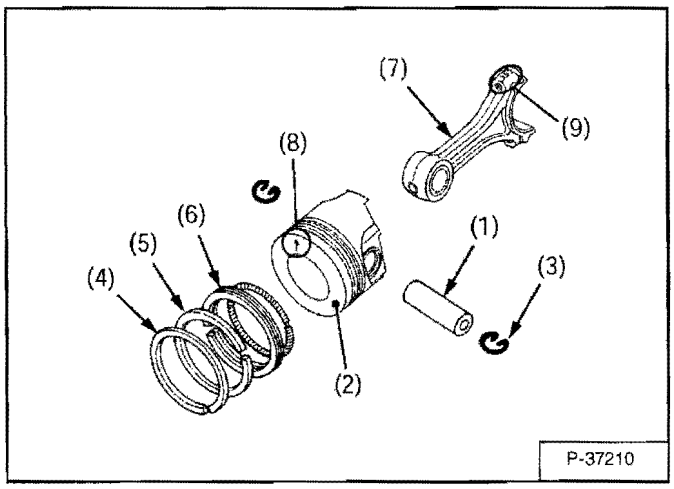
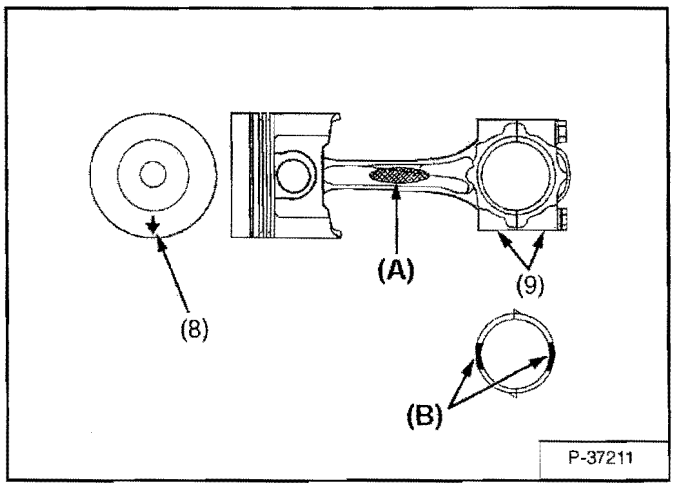


Figure 70-90-140



Remove the piston rings using a piston ring tool.

Remove the piston pin (Item 1), and separate the connecting rod (Item 7) from the piston (Item 2) **[Figure 70-90-139]**.

Be sure to fix the crank pin bearing and the connecting rod are same I.D. colors.

Piston Ring And Connecting Rod Disassembly And Assembly (Cont'd)

Figure 70-90-141

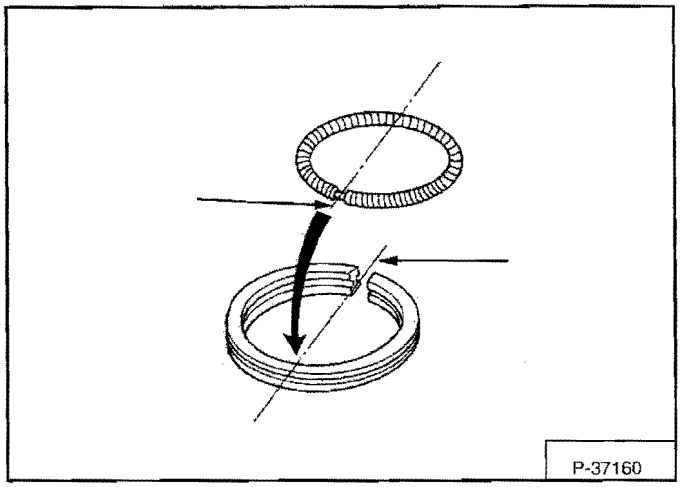
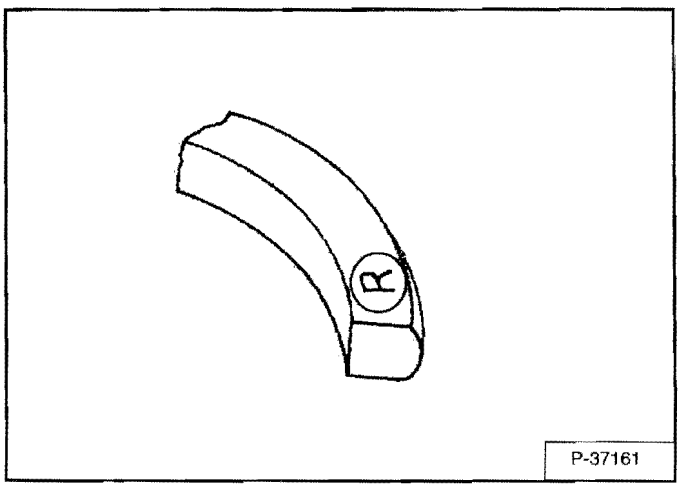


Figure 70-90-142



When installing the ring, assemble the rings so that the manufacture's mark (Item 12) **[Figure 70-90-142]** near the gap faces the top of the piston.

When installing the oil ring onto the piston, place the expander joint (Item 10) on the opposite side of the oil ring gap (Item 11) **[Figure 70-90-141]**.

Apply engine oil to the piston pin (Item 1) **[Figure 70-90-139]**.

When installing the piston pin, immerse the piston in 80°C (176°F) oil for 10 to 15 minutes and insert the piston pin to the piston.

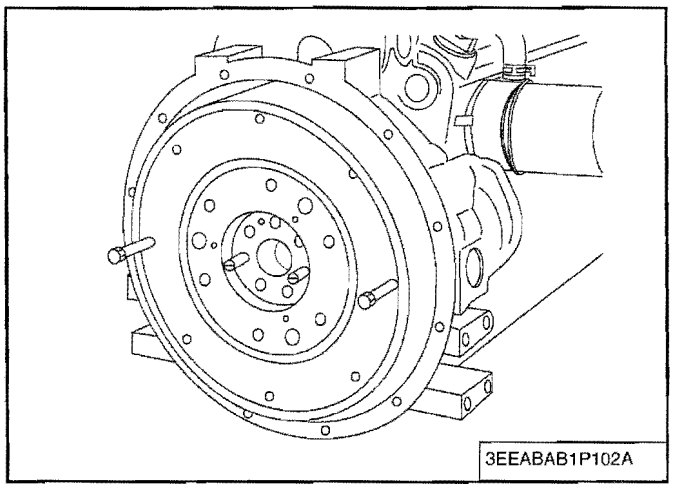
Assemble the piston to the connecting rod with the ↑ mark (Item 8) and the connecting rod numbering mark (Item 9) **[Figure 70-90-140]** facing same side.

The end faces of the oil ring are plated with hard chrome. In putting the piston into the cylinder, be careful not to get the oil ring scratched by the cylinder. Use the piston ring fitter to tighten up the oil ring. If the ring's planted is scratched, it may get stuck on the cylinder wall, causing a serious trouble.

NOTE: Mark the same number on the connecting rod and the piston so as not to change the combination.

Flywheel And Crankshaft Disassembly And Assembly

Figure 70-90-143



Install the stopper to the flywheel so that the flywheel does not turn **[Figure 70-90-143]**.

NOTE: Do not use an impact wrench! Serious damage will occur.

Detach the flywheel screws.

Remove the flywheel.

Apply engine oil to the flywheel screws.

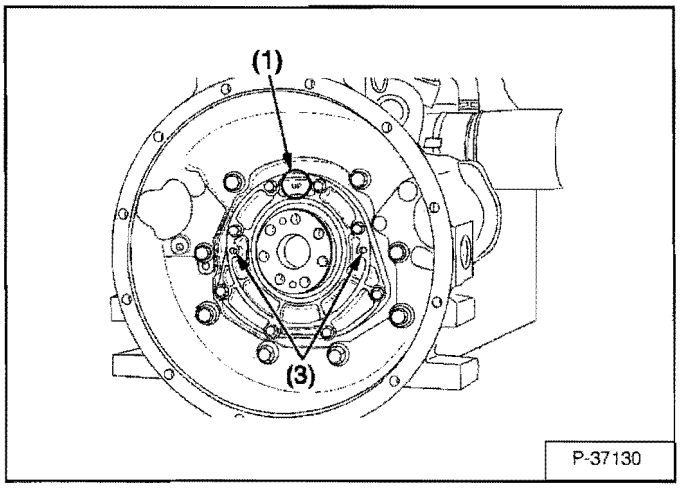
Before fitting the flywheel and the crankshaft together, wipe oil, dust and other foreign substances off their mating faces.

The flywheel and the crankshaft are fitting together in just one position. Make sure they are tightly fit and drive the bolts.

Tightening torque	Flywheel screw	98.1 to 107.9 Nm 10.0 to 11.0 kgf-m 72.3 to 79.6 ft.-lbs.

Bearing Case Cover Disassembly And Assembly

Figure 70-90-144

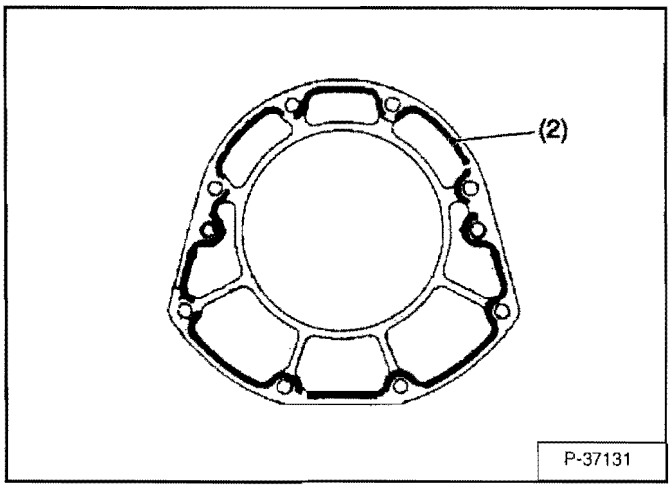


NOTE: Before disassembling, check the side clearance of crankshaft. Also check it during reassembly.

Remove the bearing case cover mounting screws.

Screw two removed screws into the screw hole (Item 3) [**Figure 70-90-144**] of bearing case cover to remove it.

Figure 70-90-145



NOTE: In case of replacing the oil seal, use caution when installing the seal in the bearing case cover as not to install it tilted. The seal should be flush with the cover.

Confirm that the liquid gasket coating surface is free of water, dust and oil in order to maintain sealing effect.

Apply liquid gasket (Item 2) [Figure 70-90-145] to the bearing case cover evenly.

Before installing the bearing case cover / oil seal assembly, lube the seal and be careful not to damage the seal while installing the assembly.

Install the bearing case cover/oil seal assembly to the position the casting mark "UP" on it upward (Item 1) [Figure 70-90-145].

Tighten the bearing case cover mounting screws with even force on the diagonal line.

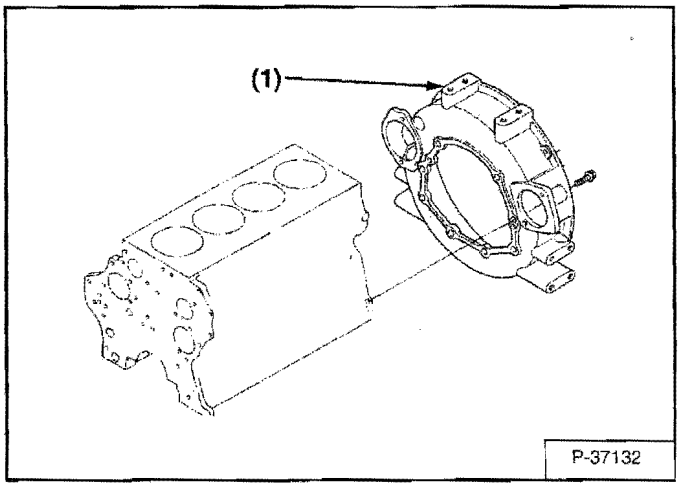
When mounting the adhesive-applied parts, take care to fit them to the mating parts.

Assemble the adhesive-applied parts within ten minutes.

Tightening torque	Bearing Case Cover mounting screw	23.5 to 27.5 Nm 2.4 to 2.8 kgf·m 17.4 to 20.3 ft.-lbs.

Flywheel Housing Disassembly And Assembly

Figure 70-90-146



Remove the flywheel housing (Item 1) **[Figure 70-90-146]**.

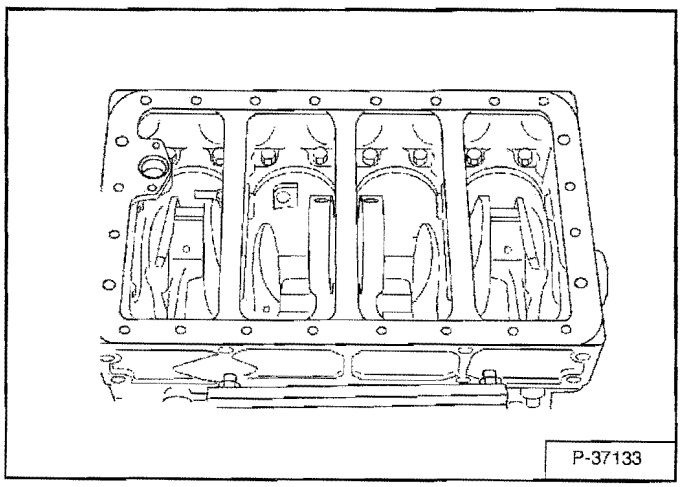
Tighten the flywheel housing mounting screws with even force on the diagonal line.

Make sure the crankcases 1 and 2 are clean. Install them in position, referring to the flywheel's contoured face.

Tightening torque	Flywheel housing screw	77.5 to 90.2 Nm 7.9 to 9.2 kgf·m 57.1 to 66.5 ft.-lbs.

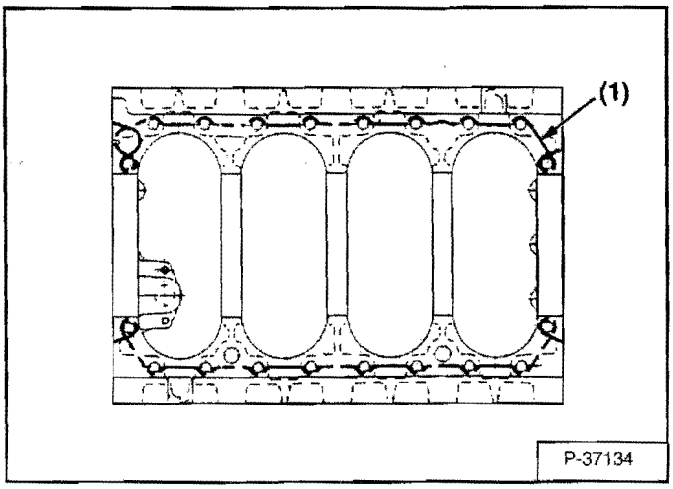
Crankcase No. 2 Disassembly And Assembly

Figure 70-90-147



Remove the crankcase 2 **[Figure 70-90-147]**.

Figure 70-90-148



NOTE: Make sure the crankcase 1 and 2 are clean. Apply liquid gasket (Item 1) [Figure 70-90-148] to the crankcase 2 as shown in the figure.

Tighten the crankcase 2 mounting screws with even force on the diagonal line.
Confirm that the liquid gasket coating surface is free of water, dust and oil in order to maintain sealing effect.
Carefully apply the adhesive evenly.

Tightening torque	Crankcase 2 mounting screw	49.0 to 55.9 Nm 5.0 to 5.7 kgf·m 36.2 to 41.3 ft.-lbs.

Crankcase No. 1 And No. 2 Disassembly And Assembly

Figure 70-90-149

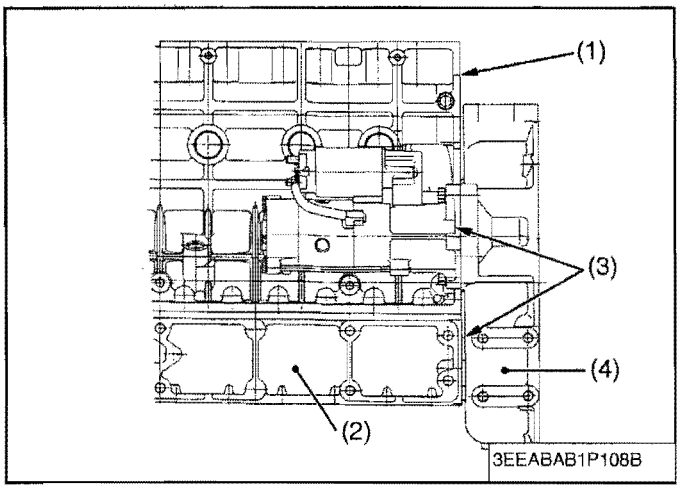
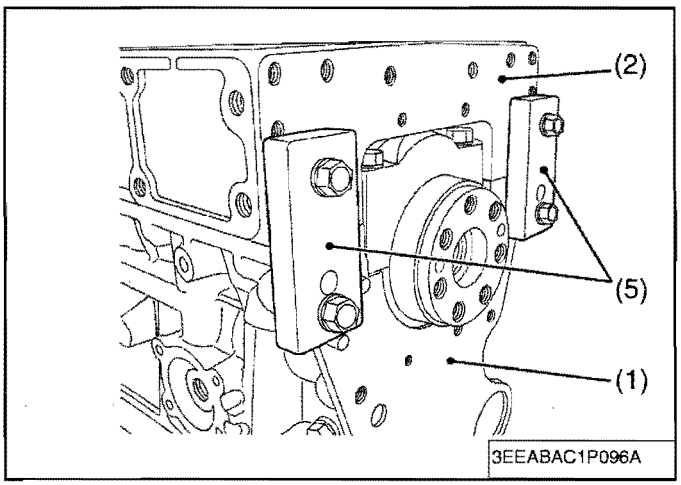


Figure 70-90-150



Match the crankcase 1 (Item 1)and crankcase 2 (Item 2), **[Figure 70-90-149]** referring to the flywheel's contoured face.

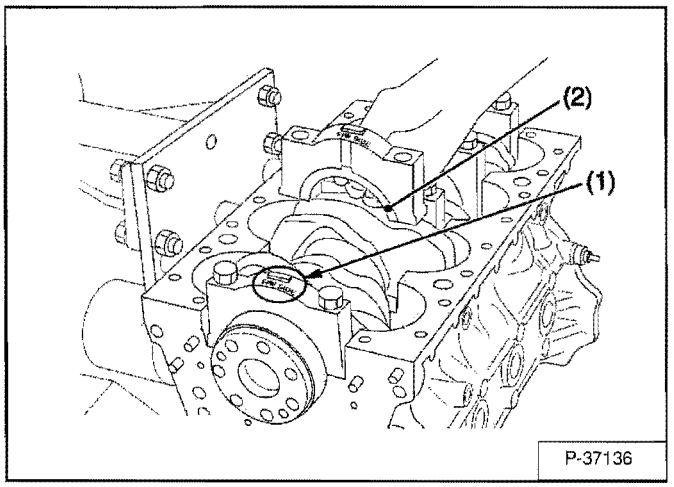
Tighten the crankcase 2 mounting bolts loosely.

Tighten up the jig (Item 5) **[Figure 70-90-150]** to the specified torque same as the flywheel housing screw (Item 4) **[Figure 70-90-149]**. This helps to minimize the level difference between the crankcase 1 and the crankcase 2 (at the flywheel side) Possible gap must be 0.05 mm or smaller (Item 3) **[Figure 70-90-149]**.

Tightening torque	Crankcase 2 mounting screw	49.0 to 55.9 Nm 5.0 to 5.7 kgf·m 36.2 to 41.3 ft.-lbs.
	Flywheel housing screw	77.5 to 90.2 Nm 7.9 to 9.2 kgf·m 57.1 to 66.5 ft.-lbs.

Crankshaft Disassembly And Assembly

Figure 70-90-151

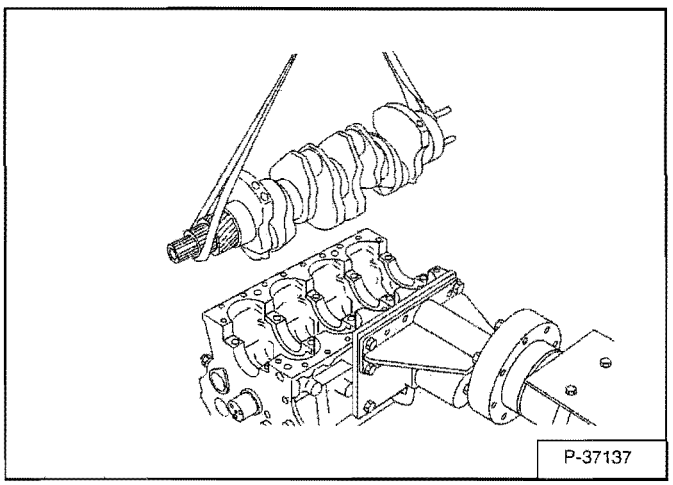


Remove the main bearing case.

Remove the crankshaft.

Reassemble the main bearing case having the same number as the one engraved on the crankcase, and set the casting mark "F / W SIDE" (Item 1) **[Figure 70-90-151]** on the main bearing case facing towards the flywheel side.

Figure 70-90-152



Crankshaft Disassembly And Assembly (Cont'd)

Figure 70-90-153

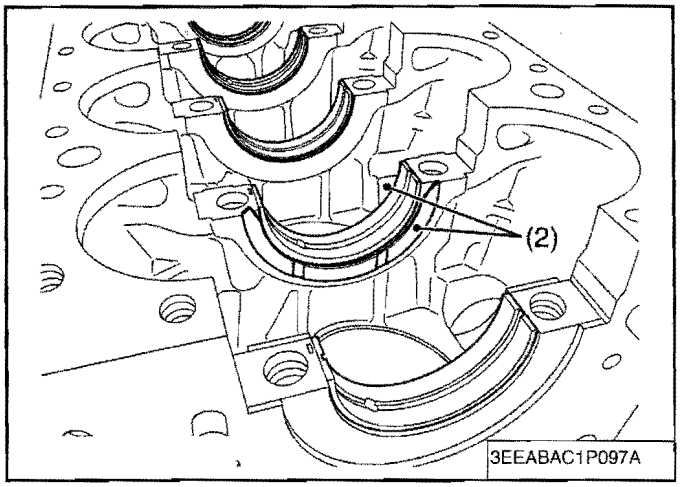


Figure 70-90-154

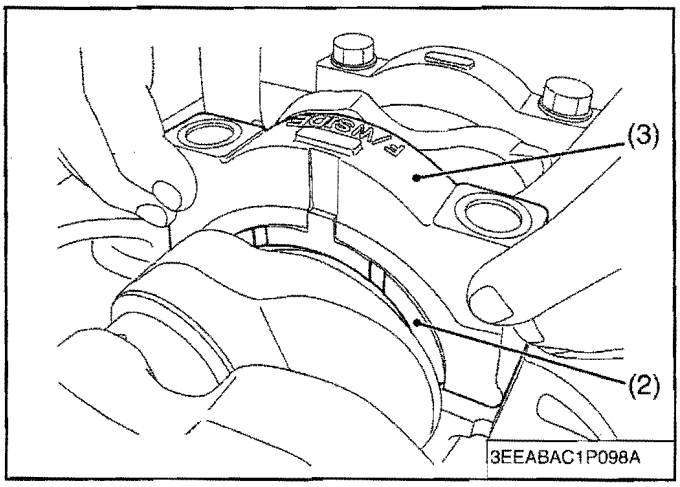
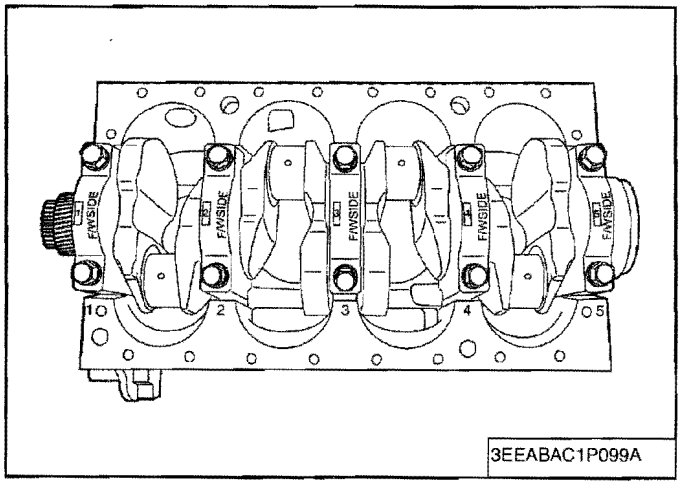


Figure 70-90-155



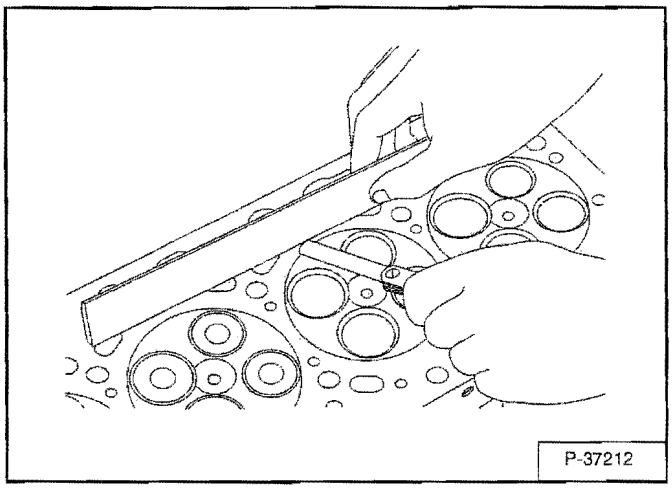
Reassemble the thrust bearing (Item 2) **[Figure 70-90-153]**, with the oil groove facing outside, into both side of the fourth main bearing case.

Apply oil to the bearing case screws and tighten them to the specified torque.

Tightening torque	Main bearing case screw	137.3 to 147.1 Nm 14.0 to 15.0 kgf-m 101.3 to 108.5 ft.-lbs.

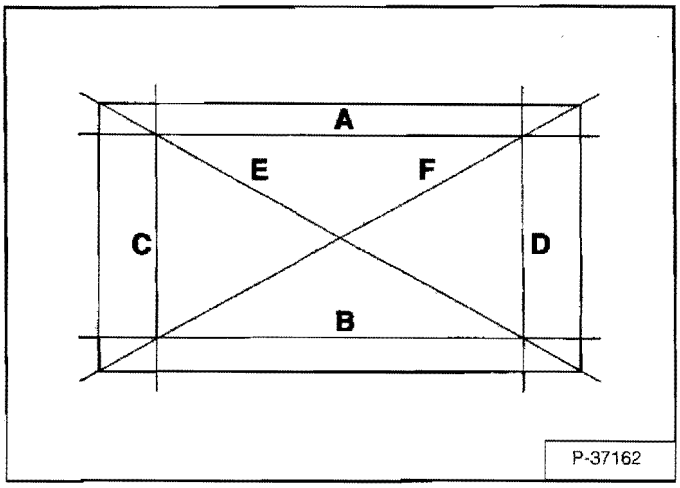
Cylinder Head Surface Flatness

Figure 70-90-156



Cylinder Head Surface Flatness (Cont'd)

Figure 70-90-157



Thoroughly clean the cylinder head surface.

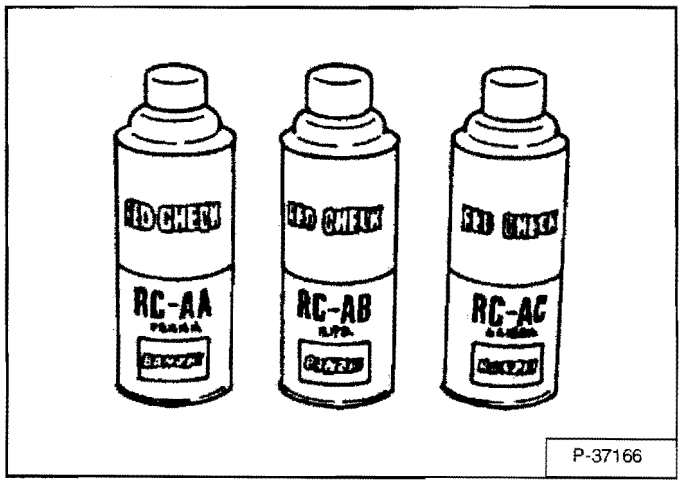
Place a straightedge on the cylinder head's four sides and two diagonal **[Figure 70-90-157]**. Measure the clearance with a feeler gauge **[Figure 70-90-156]**.

If the measurement exceeds the allowable limit, correct it with a surface grinder. (See Contents Page SPEC-01.)

NOTE: Be sure to check the valve recessing after correcting.

Cylinder Head Flaw

Figure 70-90-158



Prepare an air spray red check (Code No. 07909-31371).

Clean the surface of the cylinder head with detergent (Item 1) **[Figure 70-90-158]**.

Spray the cylinder head surface with the red permeative liquid (Item 2) **[Figure 70-90-158]**. Leave it five to ten minutes after spraying.

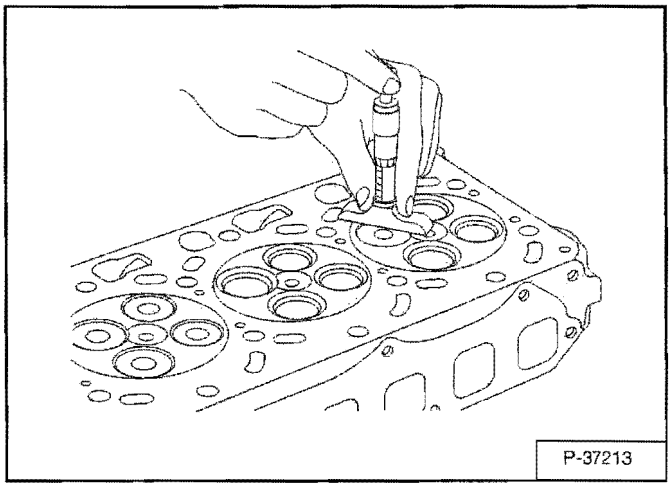
Wash away the red permeative liquid on the cylinder head surface with the detergent (Item 1) **[Figure 70-90-158]**.

Spray the cylinder head surface with white developer (Item 3) **[Figure 70-90-158]**.

If flawed, it can be identified as red marks.

Valve Recessing

Figure 70-90-159



Clean the cylinder head, the valve face and seat.

Insert the valve into the valve guide.

Measure the valve recessing with a depth gauge **[Figure 70-90-159]**.

If the measurement exceeds the allowable limit, replace the valve.

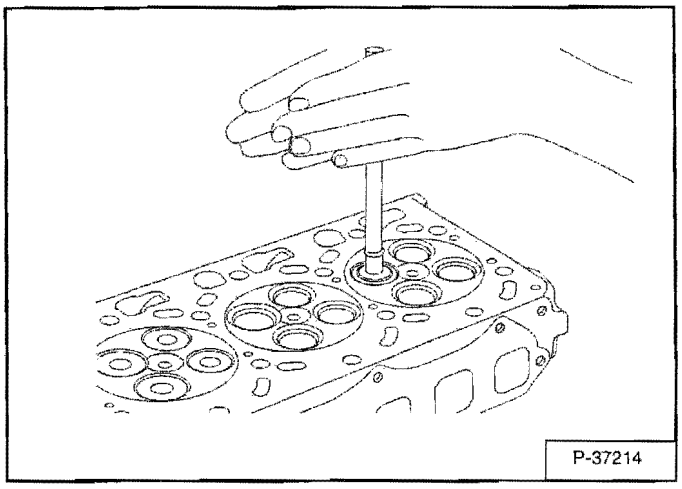
If it still exceeds the allowable limit after replacing the valve, correct the valve seat face of the cylinder head with a valve seat cutter or valve seat grinder.

Then, correct the cylinder head surface with a surface grinder, or replace the cylinder head.

Valve recessing	Factory spec.	Intake valve	(recessing) 0.6 to 0.8 mm (0.0236 to 0.0315 in.)
		Exhaust valve	(recessing) 0.85 to 1.05 mm (0.0335 to 0.0413 in.)
	Allowable limit	(recessing) 1.2 mm (0.0472 in.)	

Valve Lapping

Figure 70-90-160



Apply compound evenly to the valve lapping surface.

Insert the valve into the valve guide. Lap the valve onto its seat with a valve flapper or screwdriver **[Figure 70-90-160]**.

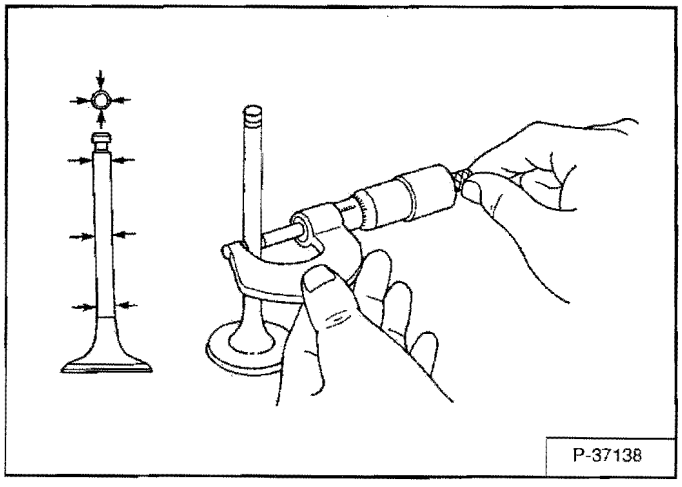
After lapping the valve, wash the compound away and apply oil, then repeat valve lapping with oil.

Apply prussian blue to the contact surface to check the seated rate. If it is less than 70%, repeat valve lapping again.

NOTE: When valve lapping is performed, be sure to check the valve recessing and adjust the valve clearance after assembling the valve.

Clearance Between Valve Stem And Valve Guide

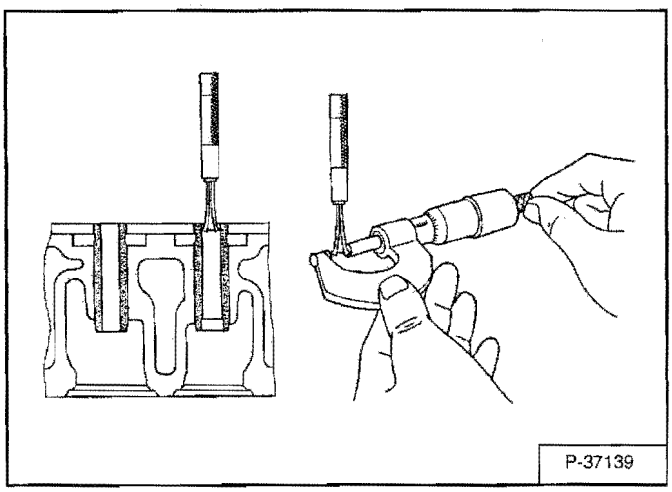
Figure 70-90-161



Remove carbon from the valve guide section.

Measure the valve stem O.D. with an outside micrometer **[Figure 70-90-161]**.

Figure 70-90-162



Measure the valve guide I.D. of the cylinder head at the most wear part as shown in **[Figure 70-90-162]** with a small hole gauge and calculate the clearance.

If the clearance exceeds the allowable limit, replace the valves. If it still exceeds the allowable limit, replace the valve guide.

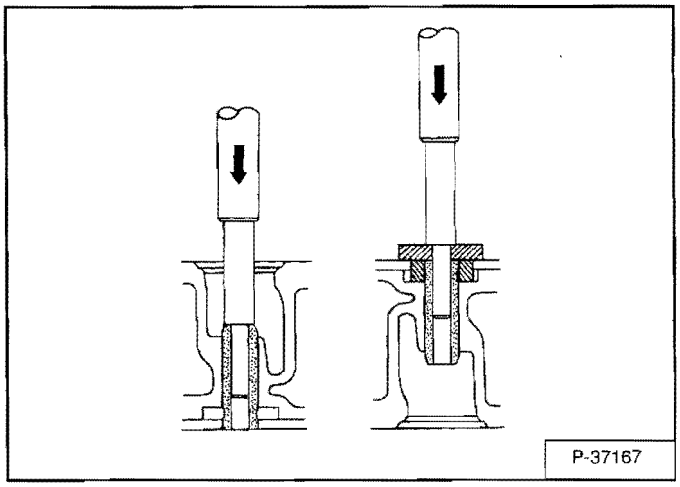
Clearance between valve stem and guide	Factory spec.	Intake valve	0.055 to 0.085 mm 0.0022 to 0.0033 in.
		Exhaust valve	0.055 to 0.085 mm 0.0022 to 0.0033 in.
	Allowable limit	0.1 mm 0.0039 in.	

Valve stem O.D.	Factory spec.	Intake valve	6.960 to 6.975 mm 0.2740 to 0.2746 in.
		Exhaust valve	6.960 to 6.975 mm 0.2740 to 0.2746 in.

Valve guide I.D.	Factory spec.	Intake valve	7.030 to 7.045 mm 0.2768 to 0.2774 in.
		Exhaust valve	7.030 to 7.045 mm 0.2768 to 0.2774 in.

Replacing Valve Guide

Figure 70-90-163



Using a valve guide replacing tool, press out the used valve guide **[Figure 70-90-163]**.

Clean a new valve guide, and apply engine oil to it.

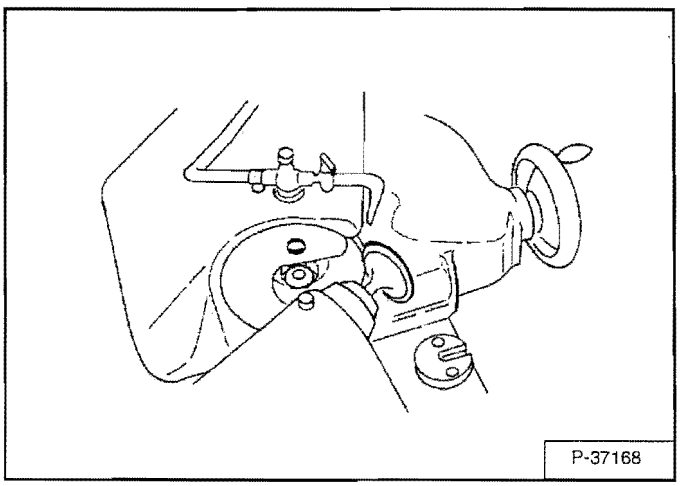
Using a valve guide replacing tool, press in a new valve guide until it is flush with the cylinder head **[Figure 70-90-163]**.

Ream precisely the I.D. of the valve guide to the specified dimension.

NOTE: Do not hit the valve guide with a hammer, etc. during replacement.

Correcting Valve And Valve Seat

Figure 70-90-164



NOTE: Before correcting the valve and seat, check the valve stem and the I.D. of valve guide section, and repair them if necessary.
After correcting the valve seat, be sure to check the valve recessing [Figure 70-90-164].

Correct the valve with a valve refacer.

Figure 70-90-165

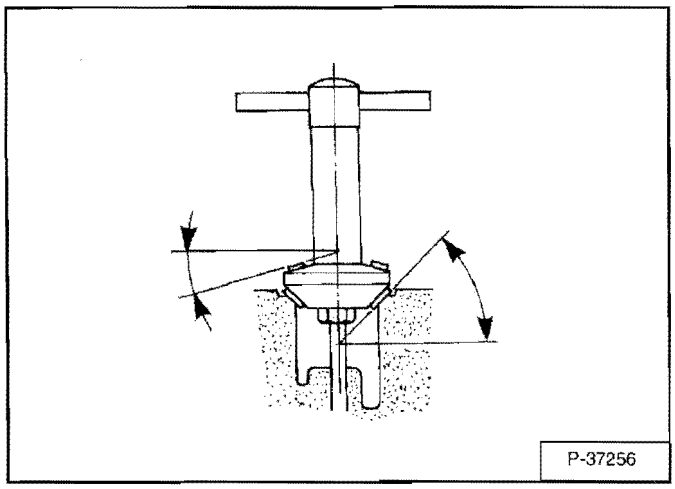
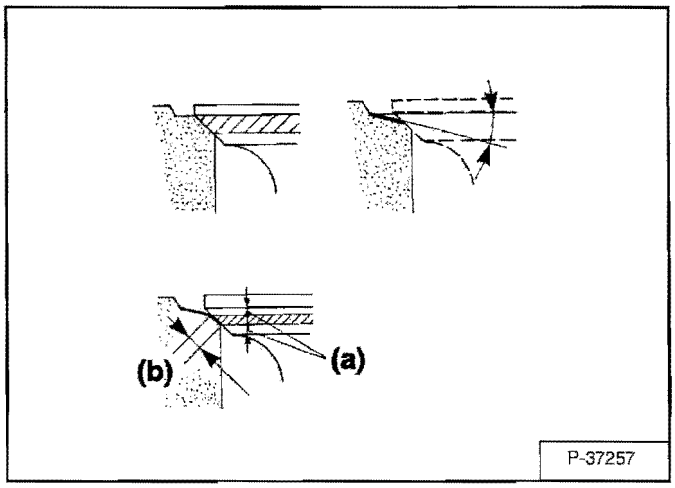


Figure 70-90-166



Slightly correct the seat surface with a 1.047 rad. (60°) (intake valve) or 0.785 rad. (45°) (exhaust valve) seat cutter (Code No. 07909-33102) **[Figure 70-90-165]**.

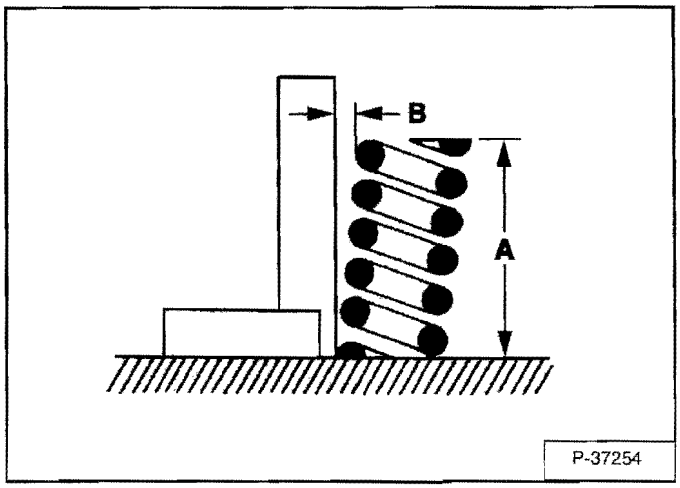
Resurface the seat surface with a 0.523 rad. (30°) valve seat cutter to intake valve seat and with a 0.262 rad. (15°) valve seat cutter to exhaust valve seat so that the width is close to specified valve seat width (2.12 mm, 0.0835 in.) **[Figure 70-90-166]**.

After resurfacing the seat, inspect for even valve seating, apply a thin film of compound between the valve face and valve seat, and fit them with valve lapping tool.

Check the valve seating with prussian blue. The valve seating surface should show good contact all the way around.

Free Length And Tilt Of Valve Spring

Figure 70-90-167



Measure the free length **(A)** with vernier calipers **[Figure 70-90-167]**. If the measurement is less than the allowable limit, replace it.

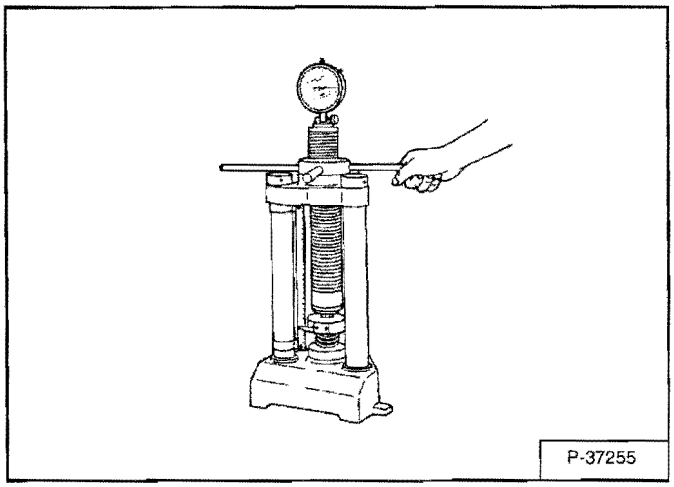
Put the spring on a surface plate, place a square on the side of the spring, and check to see if the entire side is contact with the square. Rotate the spring and measure the maximum **(B) [Figure 70-90-167]**. If the measurement exceeds the allowable limit, replace.

Check the entire surface of the spring for scratches. Replace it, if any.

Free length (A)	Factory spec.	Intake valve	35.1 to 35.6 mm 1.3819 to 1.4016 in.
		Exhaust valve	35.1 to 35.6 mm 1.3819 to 1.4016 in.
	Allowable limit	Intake valve	34.6 mm 1.3622 in.
		Exhaust valve	34.6 mm 1.3622 in.
Tilt (B)	Allowable limit	1.0 mm 0.039 in.	

Valve Spring Setting Load

Figure 70-90-168



Place the valve spring on a tester and compress it to the same length it is actually compressed in the engine **[Figure 70-90-168]**.

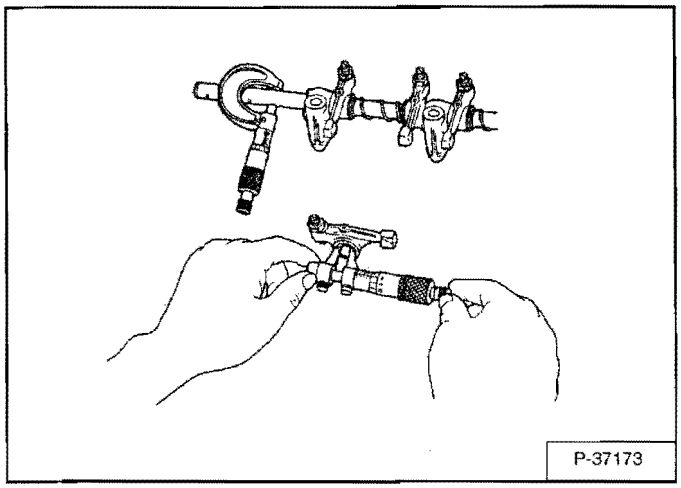
Read the compression load on the gauge.

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

Setting load/setting length	Factory spec.	Intake valve	63.547 N / 31.5 mm 6.48 kgf / 31.5 mm 14.256 lbs. / 1,2401 in.
		Exhaust valve	63.547 N / 31.5 mm 6.48 kgf / 31.5 mm 14.256 lbs. / 1,2401 in.
	Allowable limit	Intake valve	45.864 N / 31.5 mm 4.68 kgf / 31.5 mm 10.296 lbs. / 1,2401 in.
		Exhaust valve	45.864 N / 31.5 mm 4.68 kgf / 31.5 mm 10.296 lbs. / 1,2401 in.

Oil Clearance Between Rocker Arm Shaft And Bearing

Figure 70-90-169



Measure the rocker arm bearing I.D. with an inside micrometer **[Figure 70-90-169]**.

Measure the rocker arm shaft O.D. with an outside micrometer, and then calculate the oil clearance **[Figure 70-90-169]**.

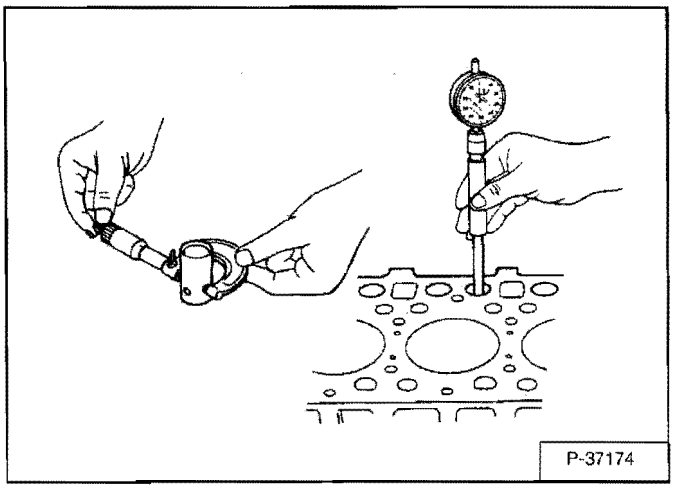
If the clearance exceeds the allowable limit, replace the rocker arm and measure the oil clearance again. If it still exceeds the allowable limit, replace also the rocker arm shaft.

Oil clearance or rocker arm shaft and bearing	Factory spec.	0.016 to 0.045 mm 0.0006 to 0.0018 in.
	Allowable limit	0.15 mm 0.0059 in.

Rocker arm shaft O.D.	Factory spec.	15.973 to 15.984 mm 0.6289 to 0.6293 in.
Rocker arm I.D. for shaft	Factory spec.	16.000 to 16.018 mm 0.6299 to 0.6306 in.

Oil Clearance Between Tappet And Tappet Guide Bore

Figure 70-90-170



Measure the tappet O.D. with an outside micrometer **[Figure 70-90-170]**.

Measure the I.D. of the tappet guide bore with a cylinder gauge, and calculate the oil clearance **[Figure 70-90-170]**.

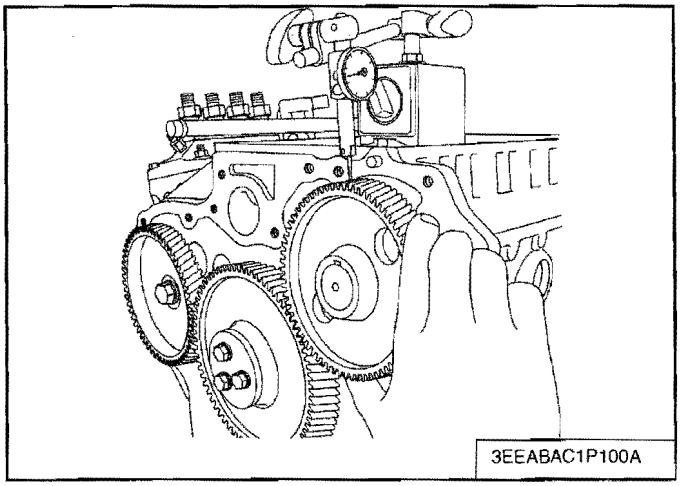
If the oil clearance exceeds the allowable limit or the tappet is damaged, replace the tappet.

Oil clearance between tappet and guide	Factory spec.	0.020 to 0.062 mm 0.0008 to 0.0024 in.
	Allowable limit	0.07 mm 0.0028 in.

Tappet O.D.	Factory spec.	23.959 to 23.980 mm 0.9433 to 0.9411 in.
Tappet guide I.D.	Factory spec.	24.000 to 24.021 mm 0.9449 to 0.9457 in.

Timing Gear Backlash

Figure 70-90-171



Set a dial indicator (lever type) with its tip on the gear tooth **[Figure 70-90-171]**.

Move the gear to measure the backlash, holding its mating gear.

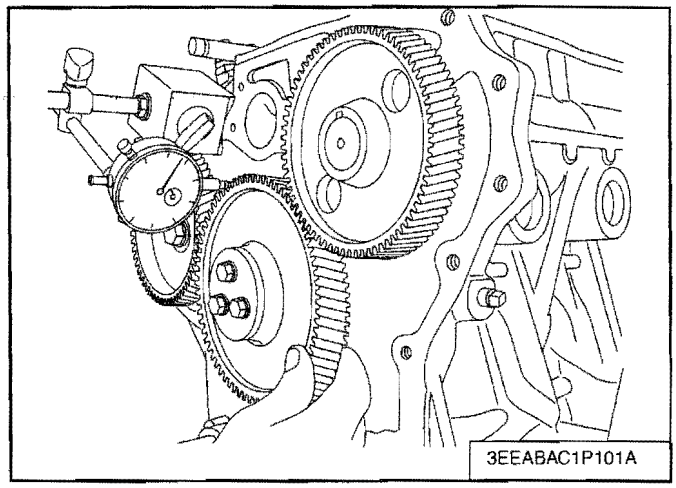
If the backlash exceeds the allowable limit, check the oil clearance of the shafts and the gear.

If the oil clearance is proper, replace the gear.

Crank gear Idle gear	Factory spec.	0.049 to 0.193 mm 0.0019 to 0.0076 in.
	Allowable limit	0.22 mm 0.0087 in.
Idle gear Cam gear	Factory spec.	0.049 to 0.189 mm 0.0019 to 0.0074 in.
	Allowable limit	0.22 mm 0.0087 in.
Idle gear 2 Injection pump gear	Factory spec.	0.030 to 0.165 mm 0.0012 to 0.0065 in.
	Allowable limit	0.22 mm 0.0087 in.

Idler Gear Side Clearance

Figure 70-90-172



Set a dial indicator with its tip on the idle gear **[Figure 70-90-172]**.

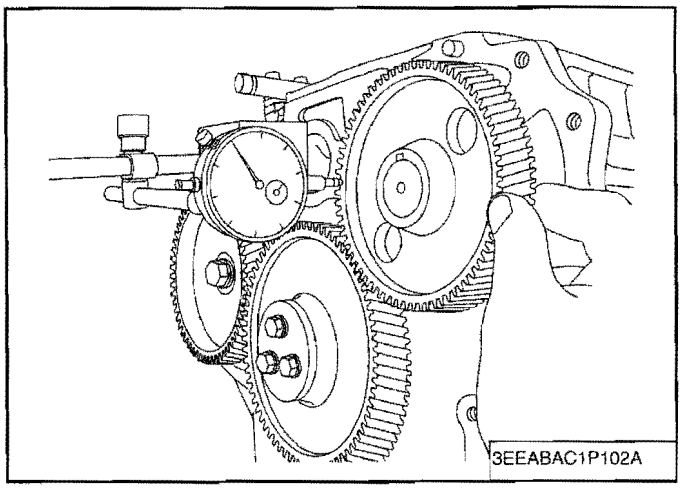
Measure the side clearance by moving the idle gear to the front and rear.

If the measurement exceeds the allowable limit, replace the idle gear collar.

Side clearance	Factory spec.	0.15 to 0.30 mm 0.0059 to 0.0118 in.
	Allowable limit	0.9 mm 0.0354 in.

Camshaft Side Clearance

Figure 70-90-173



Set a dial indicator with its tip on the camshaft **[Figure 70-90-173]**.

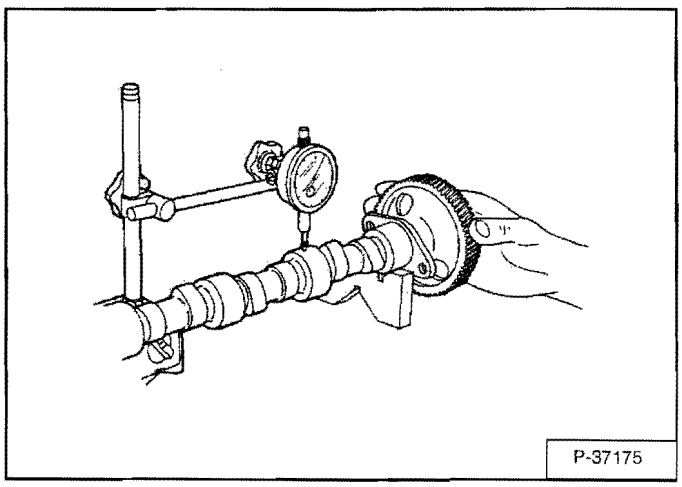
Measure the side clearance by moving the cam gear to the front and rear.

If the measurement exceeds the allowable limit, replace the camshaft stopper.

Side clearance	Factory spec.	0.07 to 0.22 mm 0.0028 to 0.0087 in.
	Allowable limit	0.03 mm 0.0118 in.

Camshaft Alignment

Figure 70-90-174



Support the camshaft with V block on the surface plate and set a dial indicator with its tip on the intermediate journal at right angle **[Figure 70-90-174]**.

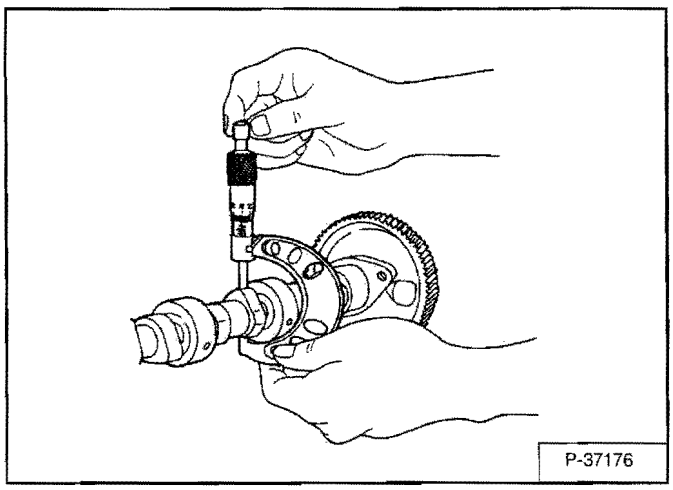
Rotate the camshaft on the V blocks and get the misalignment (half of the measurement).

If the misalignment exceeds the allowable limit, replace the camshaft.

Camshaft alignment	Allowable limit	0.01 mm 0.00039 in.

Cam Height

Figure 70-90-175



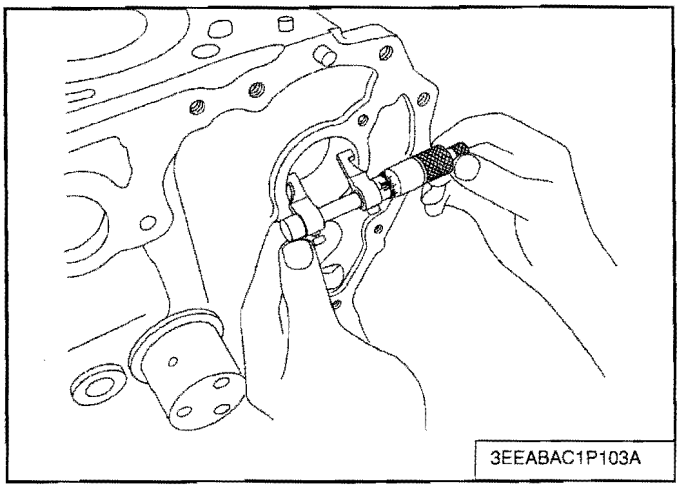
Measure the height of the cam at its highest point with an outside micrometer **[Figure 70-90-175]**.

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

Intake and exhaust cam height	Factory spec.	Intake valve	37.63 mm 1.4815 in.
		Exhaust valve	38.96 mm 1.5338 in.
	Allowable limit	Intake valve	37.13 mm 1.4618 in.
		Exhaust valve	38.46 mm 1.5141 in.

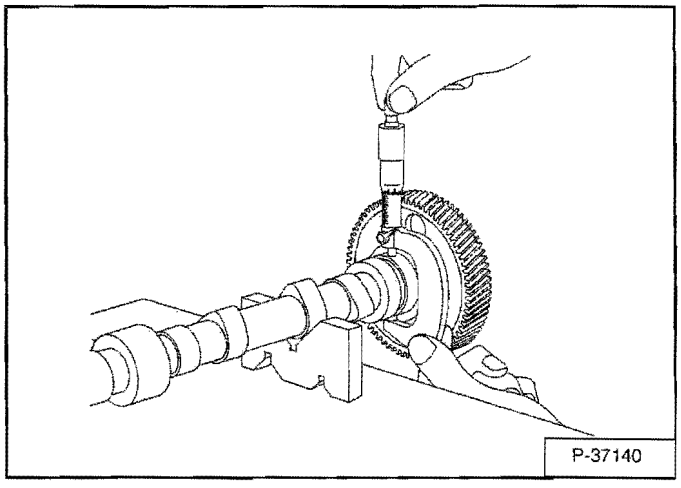
Oil Clearance Of Camshaft Journal

Figure 70-90-176



Measure the cylinder block bore I.D. for camshaft with an inside micrometer **[Figure 70-90-176]**.

Figure 70-90-177



Measure the camshaft journal O.D. with an outside micrometer **[Figure 70-90-177]**.

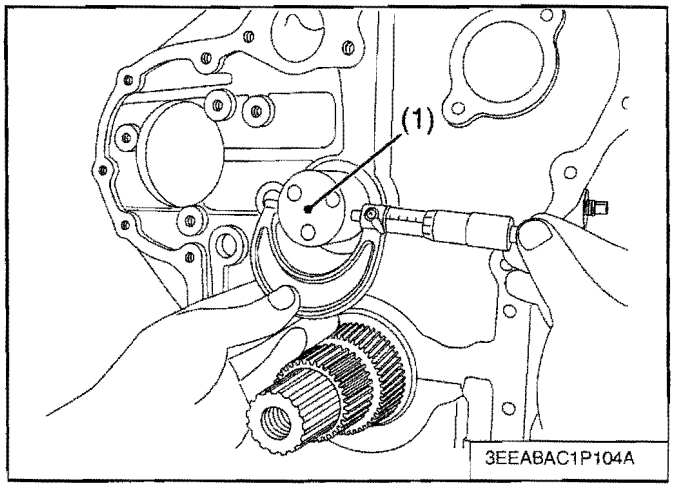
If the clearance exceeds the allowable limit, replace the camshaft.

Oil clearance of camshaft journal	Factory spec.	0.050 to 0.091 mm 0.0020 to 0.0035 in.
	Allowable limit	0.15 mm 0.0059 in.

Camshaft journal O.D.	Factory spec.	45.934 to 45.950 mm 1.8084 to 1.8091 in.
Camshaft journal I.D.	Factory spec.	46.000 to 46.025 mm 1.8110 to 1.8120 in.

Oil Clearance Between Idler Gear Shaft And Idler Gearing Bushing

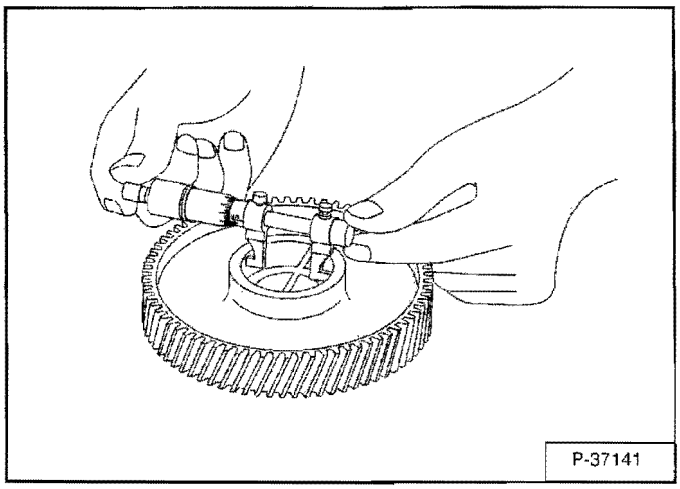
Figure 70-90-178



Measure the idle gear shaft O.D. with an outside micrometer **[Figure 70-90-178]**.

Oil Clearance Between Idler Gear Shaft And Idler Gearing Bushing (Cont'd)

Figure 70-90-179



Measure the idle gear bushings I.D. with an inside micrometer, and calculate the oil clearance **[Figure 70-90-179]**.

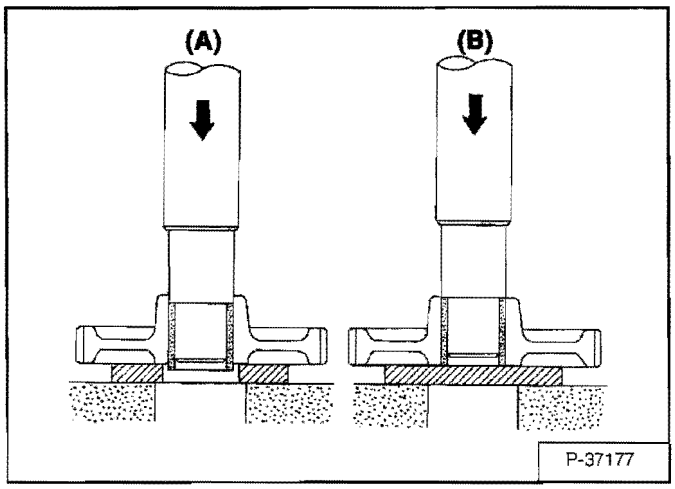
If the oil clearance exceeds the allowable limit, replace the bushing.

Clearance between idle gear shaft and idle gear bushing	Factory spec.	0.050 to 0.091 mm 0.0020 to 0.0036 in.
	Allowable limit	0.10 mm 0.0039 in.

Idle gear bushing I.D.	Factory spec.	45.025 to 45.050 mm 1.7726 to 1.7736 in.
Idle gear shaft O.D.	Factory spec.	44.959 to 44.945 mm 1.7700 to 1.7707 in.

Replacing Idler Gear Bushing

Figure 70-90-180



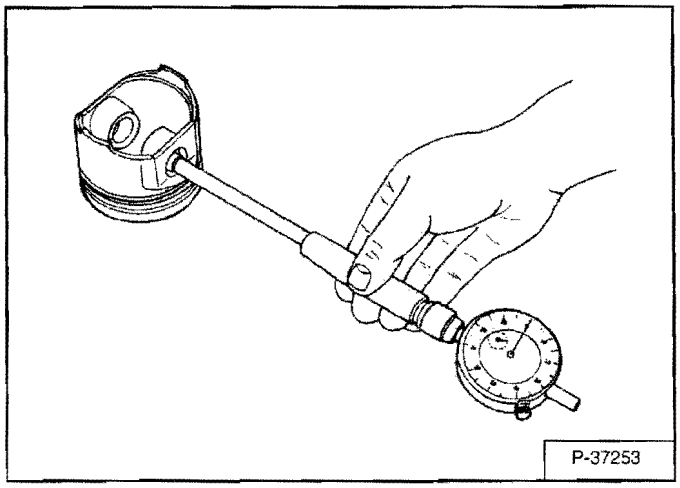
Using an idle gear bushing replacing tool, press out the used bushing. (See Engine Tools Identification Chart on Page 70-90-1.)

Clean a new idle gear bushing and idle gear bore, and apply engine oil to them.

Using an idle gear bushing replacing tool, press in a new bushing (service parts) to the specified dimension **[Figure 70-90-180]**.

Piston Pin Bore I.D.

Figure 70-90-181



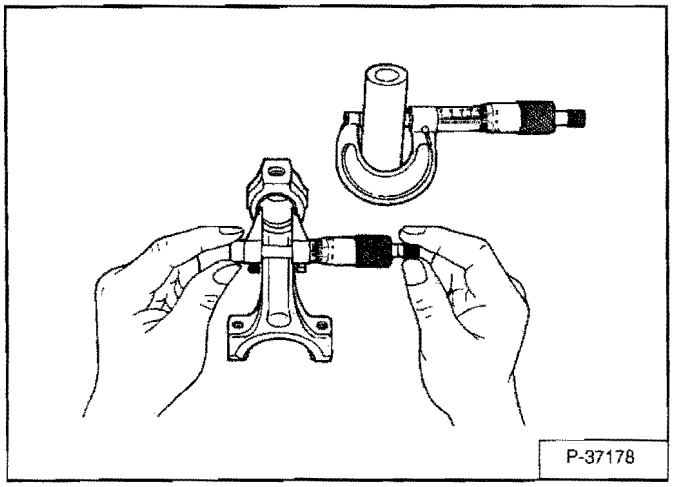
Measure the piston pin bore I.D. in both the horizontal and vertical directions with a cylinder gauge **[Figure 70-90-181]**.

If the measurement exceeds the allowable limit, replace the piston.

Piston pin bore I.D.	Factory spec.	30.000 to 30.013 mm 1.1811 to 1.1816 in.
	Allowable limit	30.05 mm 1.1831 in.

Oil Clearance Between Piston Pin And Small End Bushing

Figure 70-90-182



Measure the O.D. of the piston pin where it contacts the bushing with an outside micrometer **[Figure 70-90-182]**.

Measure the I.D. of the piston pin bushing at the connecting rod small end with a cylinder gauge **[Figure 70-90-182]**.

If the clearance exceeds the allowable limit, replace the bushing. If it still exceeds the allowable limit, replace the piston pin.

Oil clearance between piston pin and small end bushing	Factory spec.	0.020 to 0.040 mm 0.0008 to 0.0016 in.
	Allowable limit	0.15 mm 0.0059 in.

Piston pin O.D.	Factory spec.	30.006 to 30.011 mm 1.1813 to 1.1815 in.
Small end bushing I.D.	Factory spec.	30.031 to 30.046 mm 1.1823 to 1.1829 in.

Replacing Small End Bushing

Figure 70-90-183

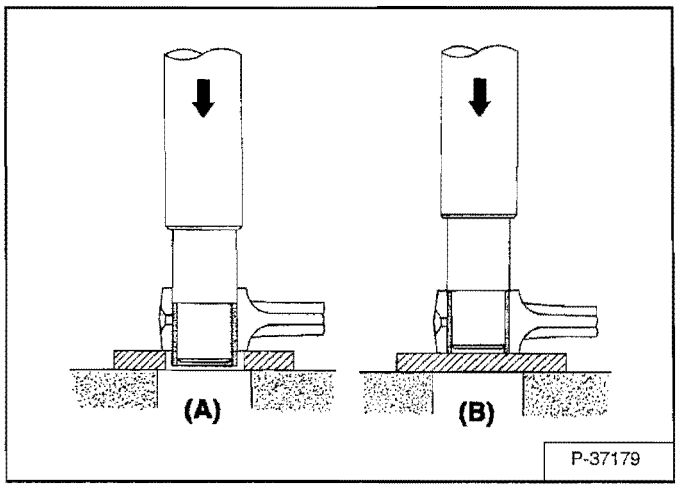
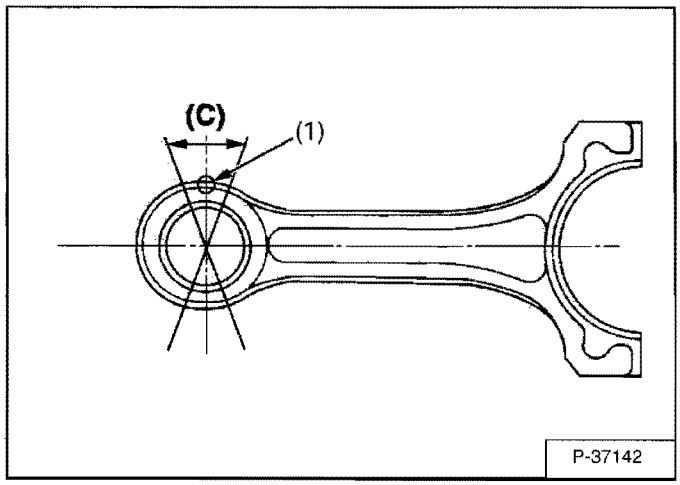


Figure 70-90-184



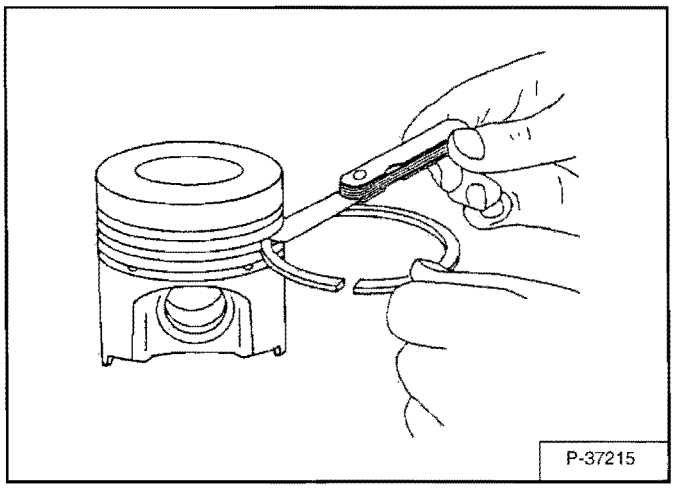
Press out the used bushing using a small end bushing replacing tool **[Figure 70-90-183]**.

Clean a new small end bushing and bore, and apply engine oil to them.

Insert a new bushing onto the tool and press-fit it with a press so that the seam (Item 1) **[Figure 70-90-184]** of the bushing is flush with the connecting rod.

Clearance Between Piston Ring And Groove

Figure 70-90-185



Remove carbon from the ring grooves.

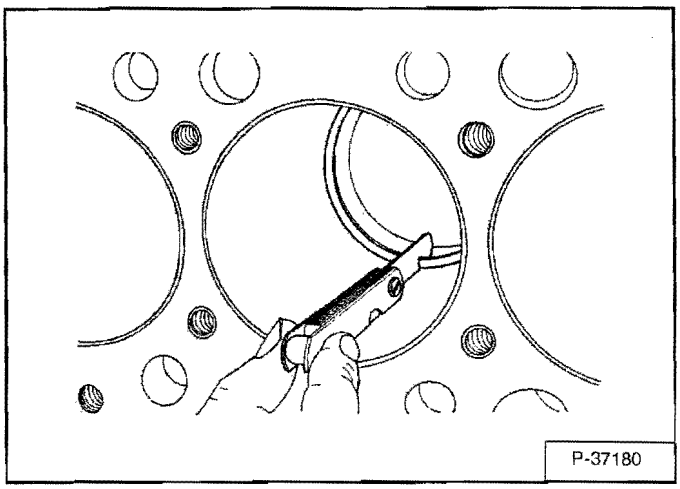
Measure the clearance between the ring and the groove with a feeler gauge **[Figure 70-90-185]**.

If the clearance exceeds allowable limit, check the new rings on an old piston and if it is out of spec, replace the piston.

Factory spec.	Compression ring 1	0.05 to 0.07 mm 0.0020 to 0.0028 in.
	Compression ring 2	0.093 to 0.120 mm 0.0037 to 0.0047 in.
	Oil Ring	0.020 to 0.060 mm 0.0008 to 0.0023 in.
Allowable limit	Compression ring 1	0.15 mm 0.0059 in.
	Compression ring 2	0.20 mm 0.0079 in.
	Oil ring	0.15 mm 0.0059 in.

Piston Ring Gap

Figure 70-90-186



Insert the piston ring into the lower part of the liner (the least worn out part) with the piston.

Measure the ring gap with a feeler gauge **[Figure 70-90-186]**.

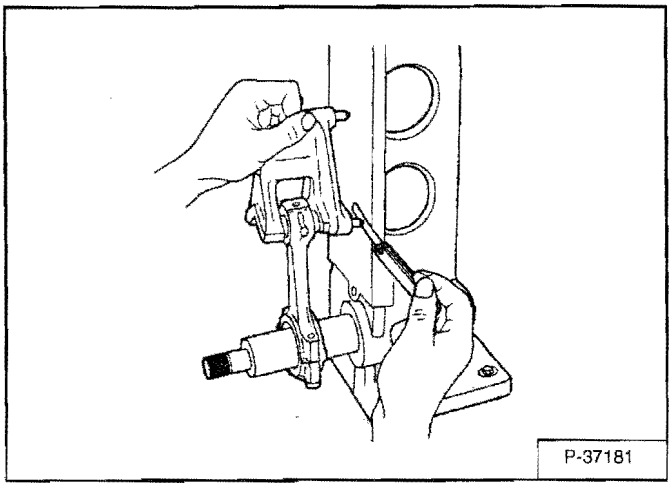
If the gap exceeds the allowable limit, replace the piston ring.

Compression ring 1, 2	Factory spec.	0.30 to 0.45 mm 0.0118 to 0.0177 in.
	Allowable limit	1.25 mm 0.0492 in.

Oil Ring	Factory spec.	0.25 to 0.45 mm 0.0098 to 0.0177 in.
	Allowable limit	1.25 mm 0.0492 in.

Connecting Rod Alignment

Figure 70-90-187



NOTE: Since the I.D. of the connecting rod small end bushing is the basis of this check, check the bushing for wear beforehand.

Remove the piston pin in the connecting rod.

Install the piston pin in the connecting rod.

Install the connecting rod on the connecting rod alignment tool (Code No. 07909-31661). (See Engine Tools Identification Chart on Page 70-90-1.)

Put a gauge over the piston pin, and move it against the face plate **[Figure 70-90-187]**.

If the gauge does not fit squarely against the face plate, measure the space between the pin of the gauge and the face plate.

If the measurement exceeds the allowable limit, replace the connecting rod.

Connecting rod alignment	Allowable limit	0.05 mm 0.0020 in.

Crankshaft Side Clearance

Figure 70-90-188

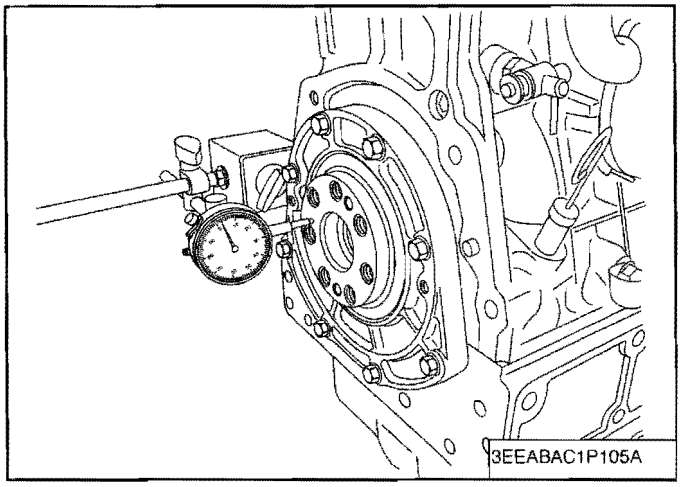
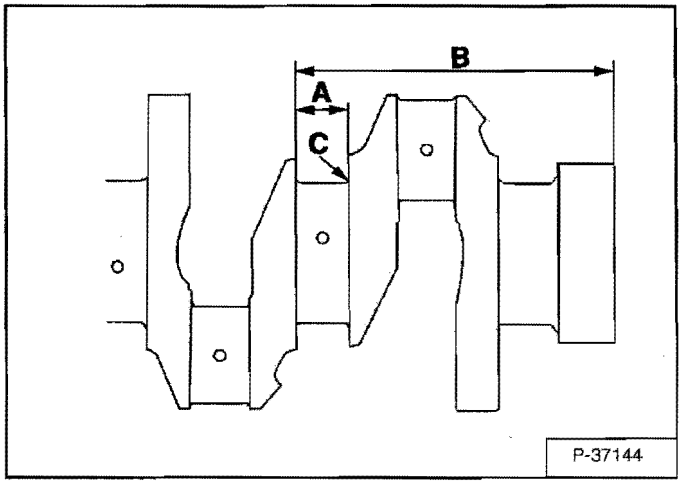


Figure 70-90-189



Set a dial indicator with its tip on the end of the crankshaft **[Figure 70-90-188]**.

Measure the side clearance by moving the crankshaft to the front and rear.

If the measurement exceeds the allowable limit, replace the thrust bearings.

If the same size bearing is useless because of the crankshaft journal wear, replace it with an oversize one referring to the table and **[Figure 70-90-189]**.

Crankshaft side clearance	Factory spec.	0.15 to 0.31 mm 0.0059 to 0.0122 in.
	Allowable limit	0.50 mm 0.0197 in.

Oversize thrust bearing

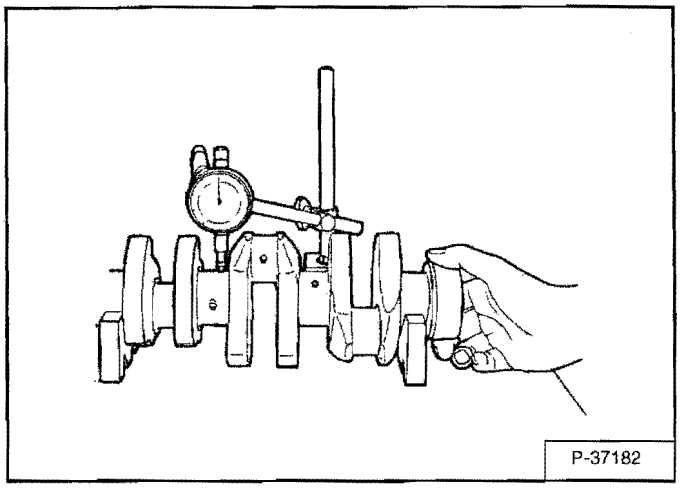
Oversize	Bearing	Code Number	Marking
0.2 mm 0.008 in.	Thrust bearing 1 02	1C010-23951	020 OS
	Thrust bearing 2 02	1C010-23971	020 OS
0.4 mm 0.016 in.	Thrust bearing 1 04	1C010-23961	040 OS
	Thrust bearing1 04	1C010-23981	040 OS

Oversize dimensions of crankshaft journal.

Oversize	0.2 mm 0.008 in.	0.4 mm 0.016 in.
Dimension A	29.20 to 29.25 mm 1.1496 to 1.1515 in.	29.40 to 29.45 mm 1.1574 to 1.1594 in.
Dimension B	169.1 to 169.15 mm 6.6575 to 6.6594 in.	169.2 to 169.25 mm 6.6614 to 6.6634 in.
Dimension C	2.8 to 3.2 mm radius 0.1102 to 0.1260 in. radius	2.8 to 3.2 mm radius 0.1102 to 0.1260 in. radius
The crankshaft journal must be fine-finished to higher than ———		(0.8-S)

Crankshaft Alignment

Figure 70-90-190



Support the crankshaft with V block on the surface plate and set a dial indicator with its tip on the intermediate journal at right angle **[Figure 70-90-190]**.

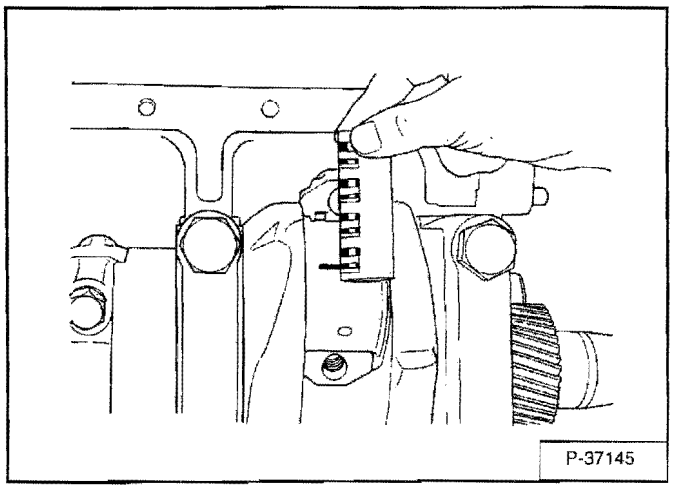
Rotate the crankshaft on the V block and get the misalignment (half of the measurement).

If the misalignment exceeds the allowable limit, replace the crankshaft.

Crankshaft alignment	Allowable limit	0.02 mm 0.00079 in.

Oil Clearance Between Crankpin And Crankpin Bearing

Figure 70-90-191



Clean the crank pin and crank pin bearing.

Put a strip of plastigage (Code No. 07909-30241) **[Figure 70-90-191]** on the center of the crank pin.

Install the connecting rod cap and tighten the connecting rod screws to the specified torque, and remove the cap again.

Measure the amount of the flattening with the scale, and get the oil clearance.

If the oil clearance exceeds the allowable limit, replace the crank pin bearing.

If the same size bearing is useless because of the crank pin wear, replace it with an undersize one referring to the table and figure.

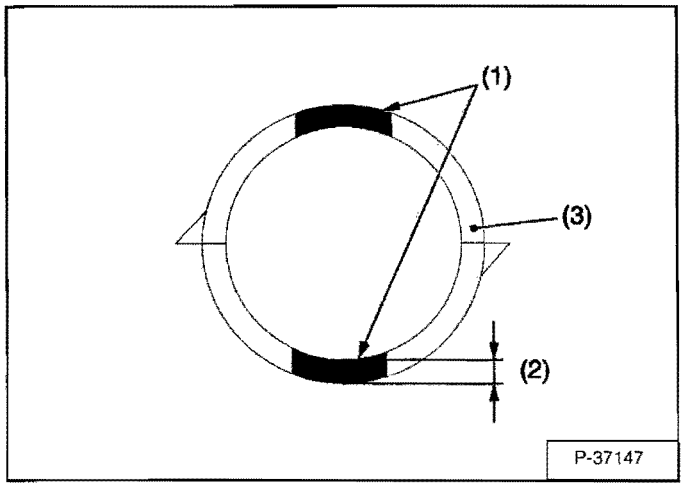
NOTE: Never insert the plastigage into the crank pin oil hole. Be sure not to move the crankshaft while the connecting rod screws are tightened.

Crank pin O.D.	Factory spec.	52.977 to 52.990 mm 2.0857 to 2.0862 in.

Oil clearance between crank pin and crank pin bearing	Factory spec.	0.018 to 0.051 mm 0.0007 to 0.0020 in.
	Allowable limit	0.20 mm 0.0079 in.

Oil Clearance Between Crankpin And Crankpin Bearing (Cont'd)

Figure 70-90-192



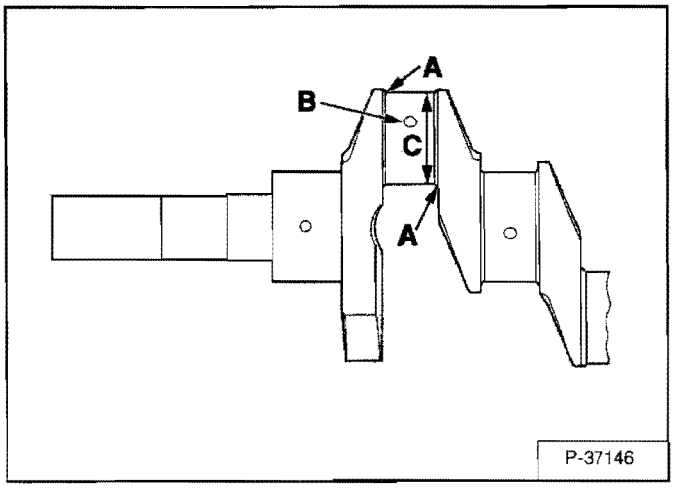
NOTE: STD size crank pin bearing for V3300. To replace it with a specific STD service part, make sure the crank pin bearing has the same ID color as the connecting rod [Figure 70-90-192].

ID Color	Connecting rod	Crank pin bearing		
	Large-end in. dia.	Class	Part code	Center wall thick
Blue	56.01 to 56.02 mm 2.2051 to 2.2055 in.	L	1C020-22311	1.496 to 1.501 mm 0.0589 to 0.0591 in.
Yellow or No Color	56.00 to 56.01 mm 2.2047 to 2.2051 in.	S	1C020-22331	1.491 to 1.496 mm 0.0587 to 0.0589 in.

Undersize crank pin bearing.

Undersize	Bearing	Code Number	Marking
0.2 mm 0.008 in.	Crank pin bearing 02	1C020-22960	020 US
0.4 mm 0.016 in.	Crank pin bearing 04	1C020-22970	040 US

Figure 70-90-193

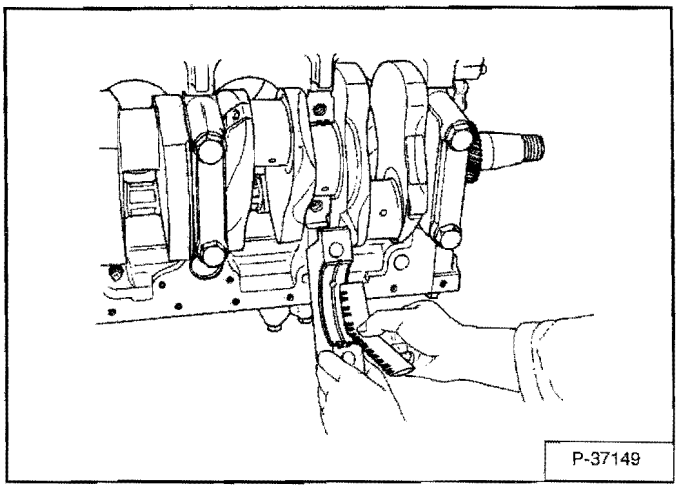


Undersize dimensions of crank pin.

Undersize	0.2 mm 0.008 in.	0.4 mm 0.016 in.
Dimension A	2.8 to 3.2 mm radius 0.1102 to 0.1260 in. radius	2.8 to 3.2 mm radius 0.1102 to 0.1260 in. radius
Dimension B	1.0 to 1.5 mm radius 0.0394 to 0.0591 in. radius	1.0 to 1.5 mm radius 0.0394 to 0.0591 in. radius
Dimension C	52.777 to 52.790 mm 2.0778 to 2.0783 in.	52.577 to 52.590 mm 2.0700 to 2.0705 in.
The crank pin must be fine-finished to higher than (0.8-S)		

Oil Clearance Between Crankshaft Journal And Crankshaft Bearing

Figure 70-90-194



Clean the crankshaft journal and crankshaft bearing.

Put a strip of press gauge (Code No.: 07909-30241) on the center of the journal [**Figure 70-90-194**].

NOTE: Never insert the press gauge into the oil hole of the journal.

Install the main bearing case and tighten the screws to the specified torque, and remove the cases again.

Measure the amount of the flattening with the scale and get the oil clearance.

If the clearance exceeds the allowable limit, replace the crankshaft bearing.

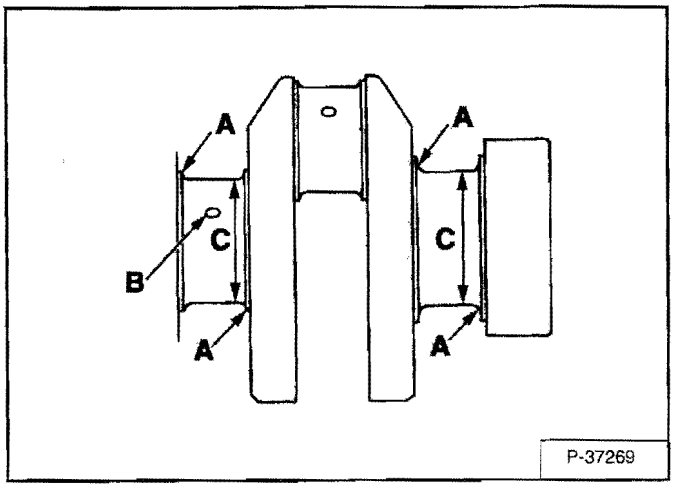
Crank pin O.D.	Factory spec.	74.977 to 74.990 mm 2.9518 to 2.9548 in.

Oil clearance between crankshaft journal and crankshaft bearing	Factory spec.	0.018 to 0.062 mm 0.0007 to 0.0020 in.
	Allowable limit	0.20 mm 0.0079 in.

Undersize crank pin bearing.

Undersize	Bearing	Code Number	Marking
0.2 mm 0.008 in.	Crankshaft bearing 02	1C020-23910	020 US
0.4 mm 0.016 in.	Crankshaft bearing 04	1C020-22920	040 US

Figure 70-90-195

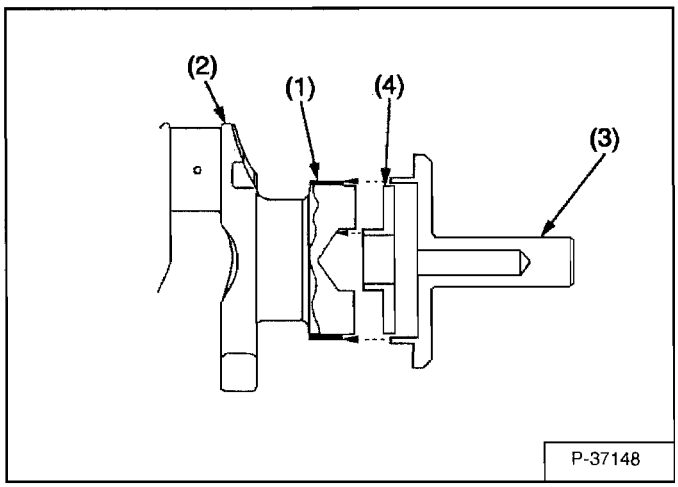


Undersize dimensions of crank pin [**Figure 70-90-195**].

Undersize	0.2 mm 0.008 in.	0.4 mm 0.016 in.
Dimension A	2.8 to 3.2 mm radius 0.1102 to 0.1260 in. radius	2.8 to 3.2 mm radius 0.1102 to 0.1260 in. radius
Dimension B	1.0 to 1.5 mm radius 0.0394 to 0.0591 in. radius	1.0 to 1.5 mm radius 0.0394 to 0.0591 in. radius
Dimension C	74.777 to 74.790 mm 2.9440 to 2.9445 in.	74.577 to 74.590 mm 2.9361 to 2.9366 in.
The crank pin must be fine-finished to higher than (0.8-S)		

Replacing Crankshaft Sleeve

Figure 70-90-196



Remove the used crankshaft sleeve (Item 1) **[Figure 70-90-196]** using a special-use puller set (Code No.: 07916-09032).

Set the sleeve guide (Item 4) to the crankshaft (Item 2) **[Figure 70-90-196]**.

Heat a new sleeve to a temperature between 150 and 200°C (302 and 392°F), and fix the sleeve to the crankshaft.

Press fit the sleeve using the auxiliary socket for pushing (Item 3) **[Figure 70-90-196]**.

NOTE: Mount the sleeve with its largely chamfered surface facing outward.

Cylinder Bore I.D.

Figure 70-90-197

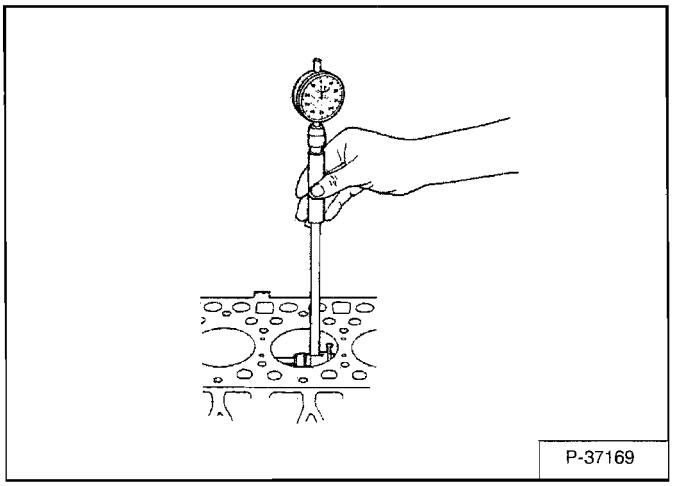
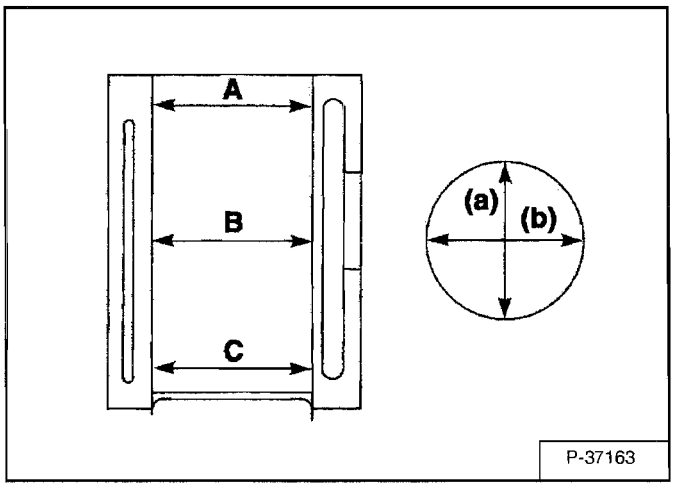


Figure 70-90-198

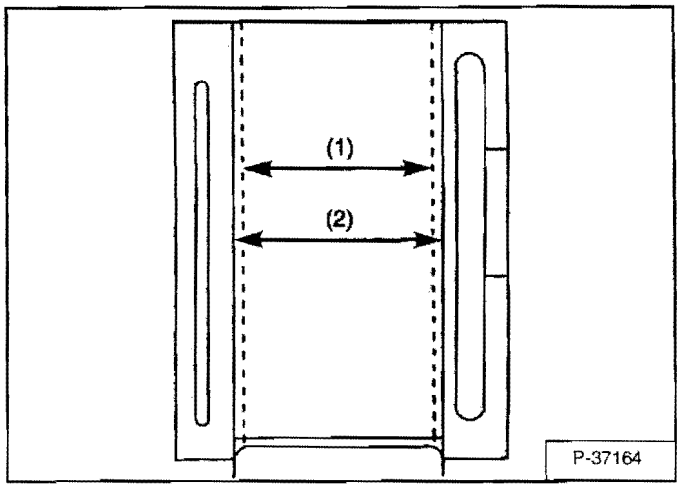


Measure the six points with a cylinder gauge to find out the maximum wear **[Figure 70-90-197]**. Generally, position (1) in the (**a, b**) direction (at about 20 mm (0.79 in.) from the top) shows the maximum wear **[Figure 70-90-198]**. Since position (3) at the lower part of the bore will show the minimum wear, find these difference. (See Page S-13.)

Cylinder bore I.D.	Factory spec.	98.000 to 98.022 mm 3.8582 to 3.8591 in.
	Allowable limit	98.15 mm 3.8642 in.

Correcting Cylinder (Oversize +0.5 mm)

Figure 70-90-199



When the cylinder is worn beyond the allowable limit, bore and hone it to the specified dimension **[Figure 70-90-199]**.

Cylinder I.D. (2)	Oversize (+ 0.5 mm) Spec.	98.500 to 98.522 mm 3.8780 to 3.8788 in.
Maximum wear	Allowable limit	98.65 mm 3.8839 in.
Finishing	Hone to 1.2 to 2.0 μR max. (0.000047 to 0.0079 in.R max.	

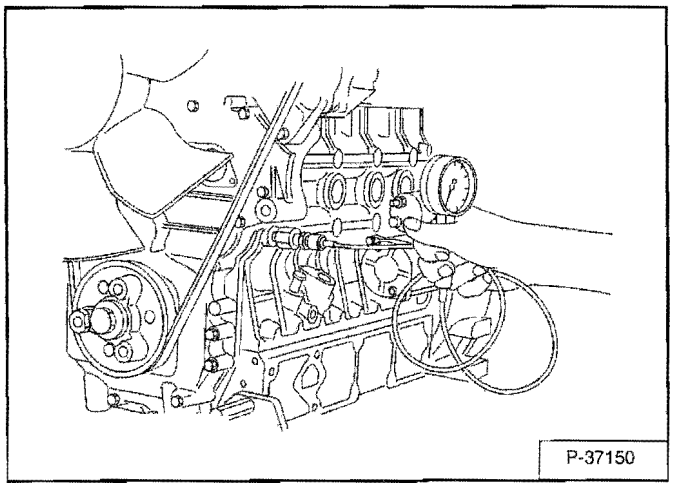
Replace the piston and piston rings with oversize (0.5 mm) ones.

Part Name	Part Code	Marking
Piston	1C050-21910	05 OS
Piston Ring Assembly	1C020-21090	05 OS

NOTE: When the oversize cylinder is worn beyond the allowable limit, replace the cylinder block with a new one.

Engine Oil Pressure

Figure 70-90-200



Remove the oil switch and set a pressure tester (Code No. 07916-32031) **[Figure 70-90-200]**.

Start the engine. After warming up, measure the oil pressure of both idling and rated speeds.

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

Engine oil insufficient
Oil pump defective
Oil strainer clogged
Oil filter cartridge
Oil gallery clogged
Excessive oil clearance of bearing
Foreign matter in the relief valve

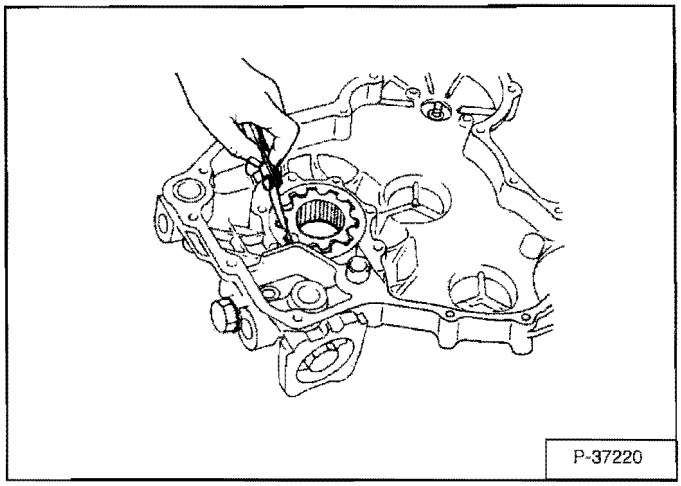
After checking the engine oil pressure, tighten the engine oil pressure switch to the specified torque.

At idle speed	Allowable limit	49 kPa 0.5 kgf/cm² 7 PSI

At rated speed	Factory spec.	196 to 392 kPa 2.0 to 4.0 kgf/cm² 28 to 56 PSI
	Allowable limit	147.1 kPa 1.5 kgf/cm² 21.3 PSI

Rotor Lobe Clearance

Figure 70-90-201



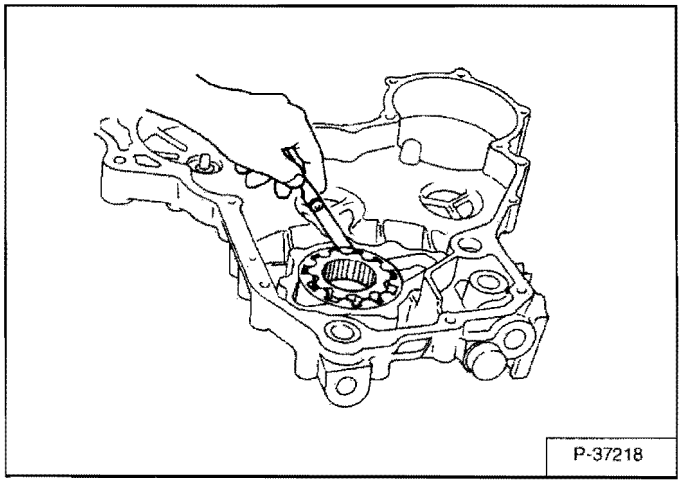
Measure the clearance between lobes of the inner rotor and the outer rotor with a feeler gauge **[Figure 70-90-201]**.

If the clearance exceeds the factory specifications, replace the oil pump rotor assembly.

Clearance between inner rotor and outer rotor	Factory spec.	0.04 to 0.16 mm 0.0016 to 0.0063 in.

Clearance Between Outer Rotor And Pump Body

Figure 70-90-202



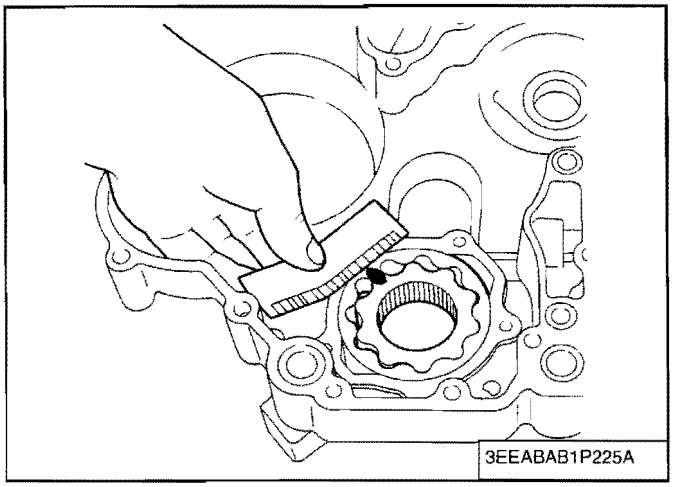
Measure the clearance between the outer rotor and the pump body with a feeler gauge **[Figure 70-90-202]**.

If the clearance exceeds the factory specifications, replace the oil pump rotor assembly.

Clearance between outer rotor and pump body	Factory spec.	0.100 to 0.184 mm 0.0039 to 0.0072 in.
	Allowable limit	0.3 mm 0.0118 in.

Clearance Between Rotor And Cover

Figure 70-90-203



Put a strip of plastigage (Code No. 07909-30241) onto the rotor face with grease **[Figure 70-90-203]**.

Install the cover and tighten the screws with the specified torque.

Remove the cover carefully, and measure the amount of the flattening with the scale and get the clearance.

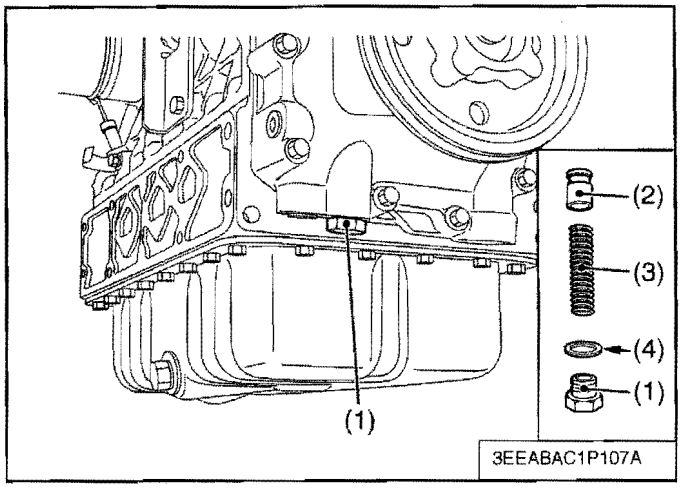
If the clearance exceeds the allowable limit, replace oil pump rotor assembly and the cover.

Clearance between rotor and cover	Factory spec.	0.025 to 0.075 mm 0.0010 to 0.0030 in.
	Allowable limit	0.225 mm 0.0089 in.

Tightening torque	Oil pump cover screw	7.9 to 9.3 Nm 0.80 to 0.95 kgf-m 5.8 to 6.9 ft.-lbs.

Relief Valve

Figure 70-90-204



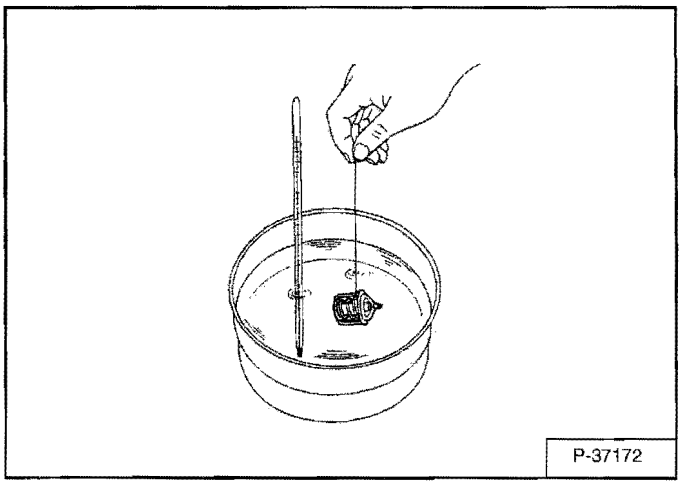
Remove the bolt (Item 1) **[Figure 70-90-204]**.

Remove the relief valve (Item 2), the spring (Item 3) and the packing (Item 4) **[Figure 70-90-204]**.

Tightening torque	Relief valve	68.6 to 78.4 Nm 7.0 to 8.0 kgf-m 50.6 to 57.9 ft.-lbs.

Thermostat Valve Opening Temperature

Figure 70-90-205



Push down the thermostat valve and insert a string between the valve and the valve seat.

Place the thermostat and a thermometer in a container with water and gradually heat the water **[Figure 70-90-205]**.

Hold the string to suspend the thermostat in the water. When the water temperature rises, the thermostat valve will open, allowing it to fall down from the string.

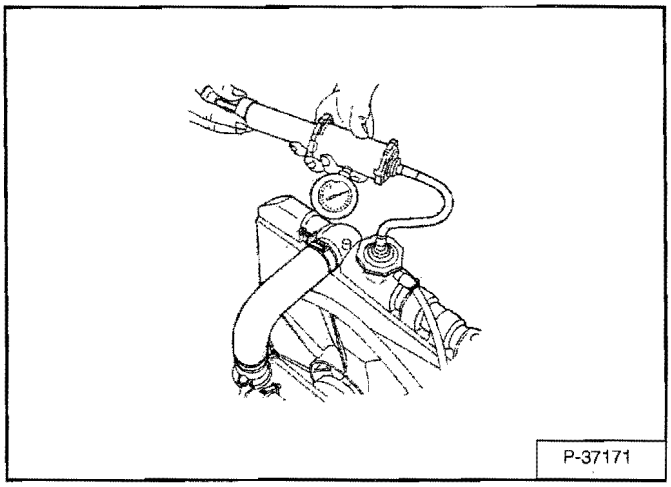
Continue heating the water and read the temperature when the valve has risen by about 8 mm (0.315 in.).

If the measurement is not acceptable, replace the thermostat.

Thermostat's valve opening temperature	Factory spec.	74.5 to 78.5°C 166.1 to 173.3°F
Temperature at which thermostat completely opens	Factory spec.	90°C 194°F

Radiator Water Leakage

Figure 70-90-206



Pour a specified amount of water into the radiator.

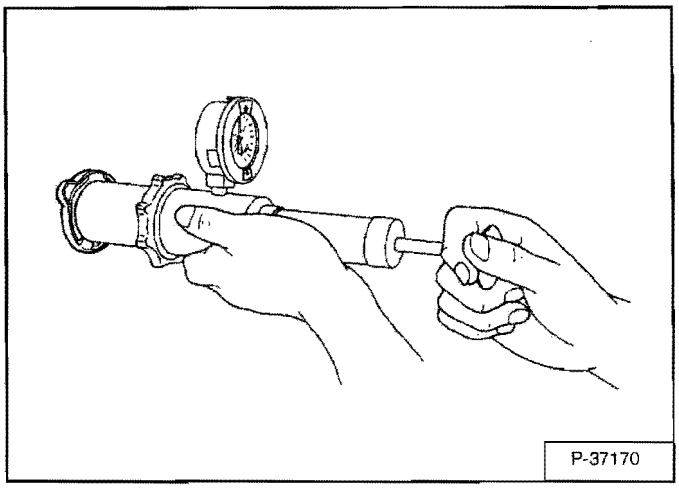
Set a radiator tester **[Figure 70-90-206]**. Increase water pressure to the specified pressure of 137 kPa (1.4 kgf/cm², 20 PSI).

Check the radiator for water leaks.

When water leakage is excessive, replace the radiator. If water leakage is caused by a small pinhole, correct the radiator with radiator cement.

Radiator Cap Air Leakage

Figure 70-90-207



Set a radiator tester on the radiator cap **[Figure 70-90-207]**.

Apply the specified pressure of 88 kPa (0.9 kgf/cm² 13 PSI).

Check if the pressure drop to less than 59 kPa (0.6 kgf/cm², 9 PSI) in 10 seconds.

If the pressure is less than the factory specification, replace it.

Thermostat Assembly

Figure 70-90-208

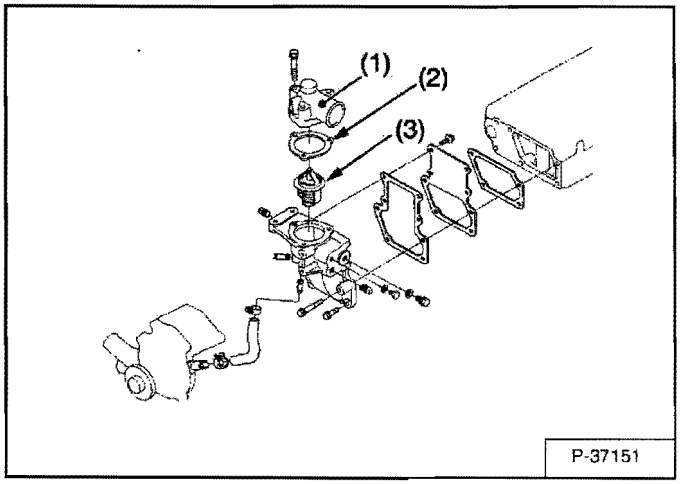
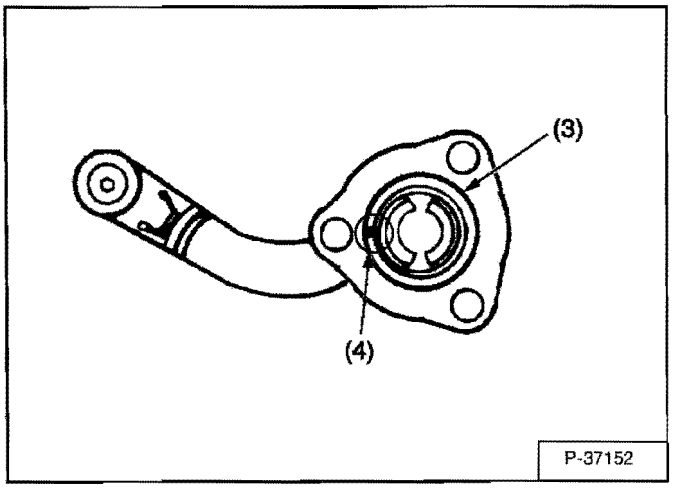


Figure 70-90-209



Remove the thermostat cover mounting screws, and remove the thermostat cover (Item 1) **[Figure 70-90-208]**.

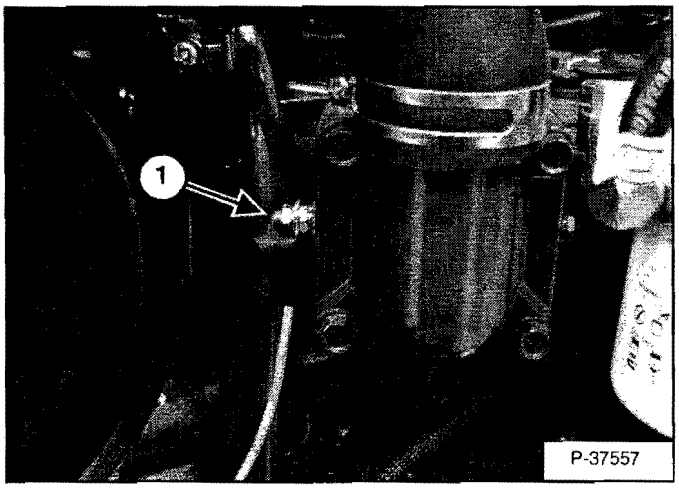
Remove the thermostat assembly (Item 3) **[Figure 70-90-208]**.

Apply a liquid gasket (Three Bond 1215 or equivalent) only at the thermostat cover side of the gasket (Item 2) **[Figure 70-90-208]**.

Attach the thermostat (Item 3) with its hole (Item 4) **[Figure 70-90-209]** facing toward the air suction side.

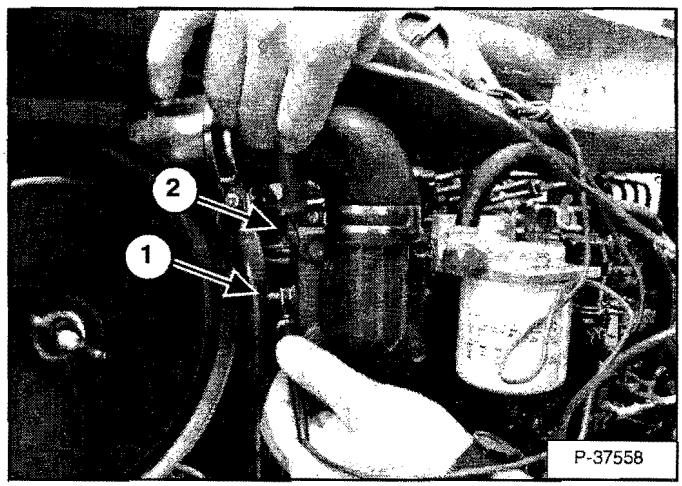
Intake Air Heater

Figure 70-90-210



Disconnect the electrical wire (Item 1) **[Figure 70-90-210]** from the air intake heater.

Figure 70-90-211



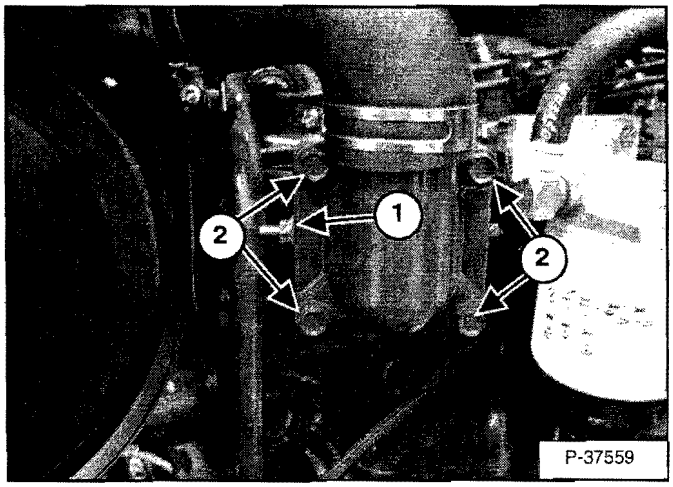
Measure the resistance between + terminal (Item 1) and intake air heater body (Item 2) **[Figure 70-90-211]**.

If the resistance is open, the intake air heater is faulty.

Intake air heater resistance	Factory spec.	Approx. 0.3 Ohms. (At cold occasion)

Intake Air Heater

Figure 70-90-212

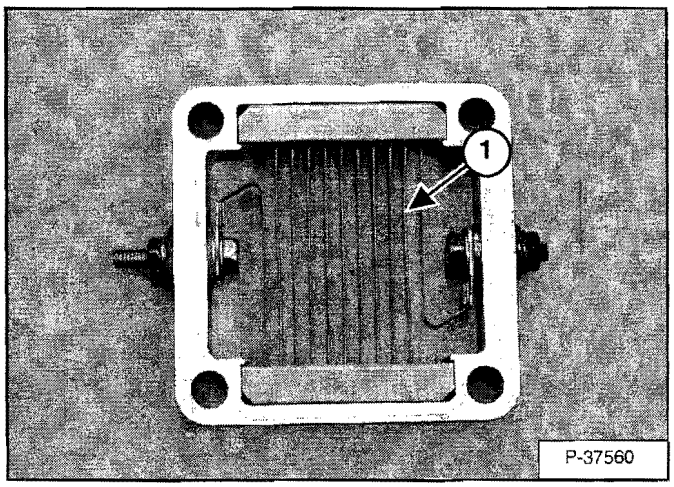


Disconnect the electrical wire from the intake heater lead (Item 1) **[Figure 70-90-212]**

Remove the four mount bolts (Item 2) **[Figure 70-90-212]** from the intake air heater housing.

Installation: Tighten the bolts to 17-20 ft.-lbs. (24-28 Nm) torque.

Figure 70-90-213

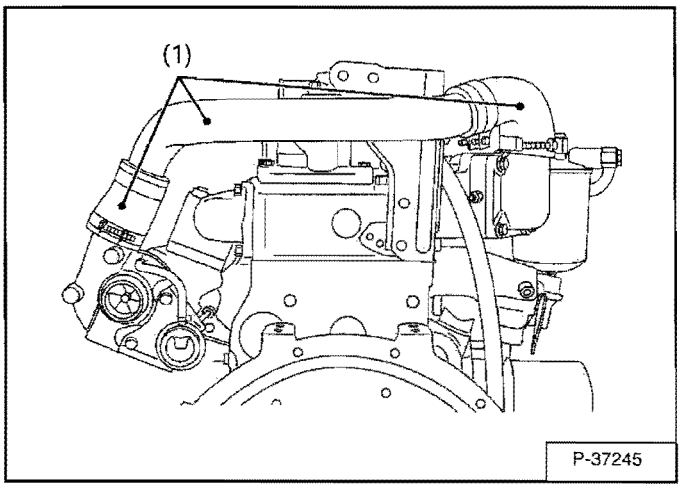


NOTE: When installing the intake air heater in the housing, install the intake air heater so the heater lines (Item 1) [Figure 70-90-213] are vertical, to prevent a short-circuit in the system.

Air Cleaner, Intake Pipe, Inlet Pipe And Muffler

NOTE: When detaching and attaching the turbocharger assembly, be very careful not to allow dust, dirt and other foreign matter in the oil pipes.
When the turbocharger assembly has been replace, pour fresh engine oil through the oil supply port of the turbocharger.
Before starting the engine, make sure that air cleaner is in position.

Figure 70-90-214



Remove the intake pipe.

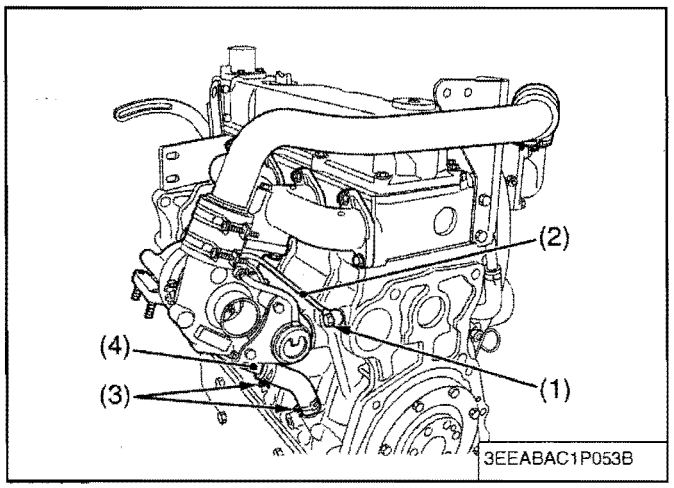
Remove the inlet pipe (Item 1) **[Figure 70-90-214]**.

Remove the muffler.

Replace the gaskets with new one.

Oil Pipe

Figure 70-90-215



Remove the joint bolt (Item 1) and take off the pipe 1 (Item 2) **[Figure 70-90-215]**.

Remove the bolts (Item 3) and release the clamp (Item 4) **[Figure 70-90-215]**.

Remove the oil pipe 2 (Item 5) **[Figure 70-90-215]**.

Before installation pour fresh engine oil through the oil supply port of the turbocharger.

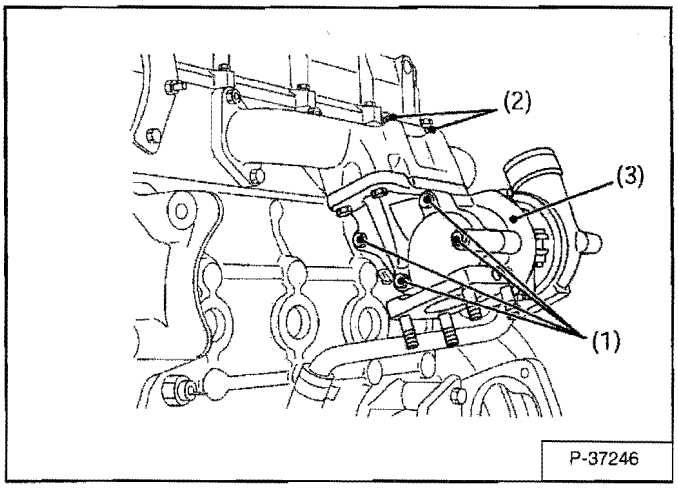
Replace the gasket with new one.

Be careful not to allow dust, dirt and other foreign matters in the oil pipes.

NOTE: Tape or plug all openings to prevent foreign matters from damaging the oil cavities in the turbocharger.

Turbocharger

Figure 70-90-216



Remove the bolt (Item 1) **[Figure 70-90-216]**.

Take off the turbocharger assembly (Item 3) **[Figure 70-90-216]**.

Replace the gasket with new one.

HEATING, VENTILATION, AIR CONDITIONING

Continued On Next Page

HVAC

HEATING, VENTILATION, AIR CONDITIONING (CONT'D)

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


Bobcat®

AIR CONDITIONING SYSTEM FLOW

Principals

In an air conditioning system the refrigerant is circulated under pressure through five major components in a closed circuit. At these five points in the system the refrigerant goes through pressure and temperature changes.

The compressor (Item 1) (See Chart on Page 80-10-3.) takes in heated, low pressure refrigerant gas through the suction valve (low pressure side) and as the name indicates, pressurizes the heated refrigerant and forces it through the discharge valve (high pressure side) on the condenser (Item 2) (See Chart on Page 80-10-3.)

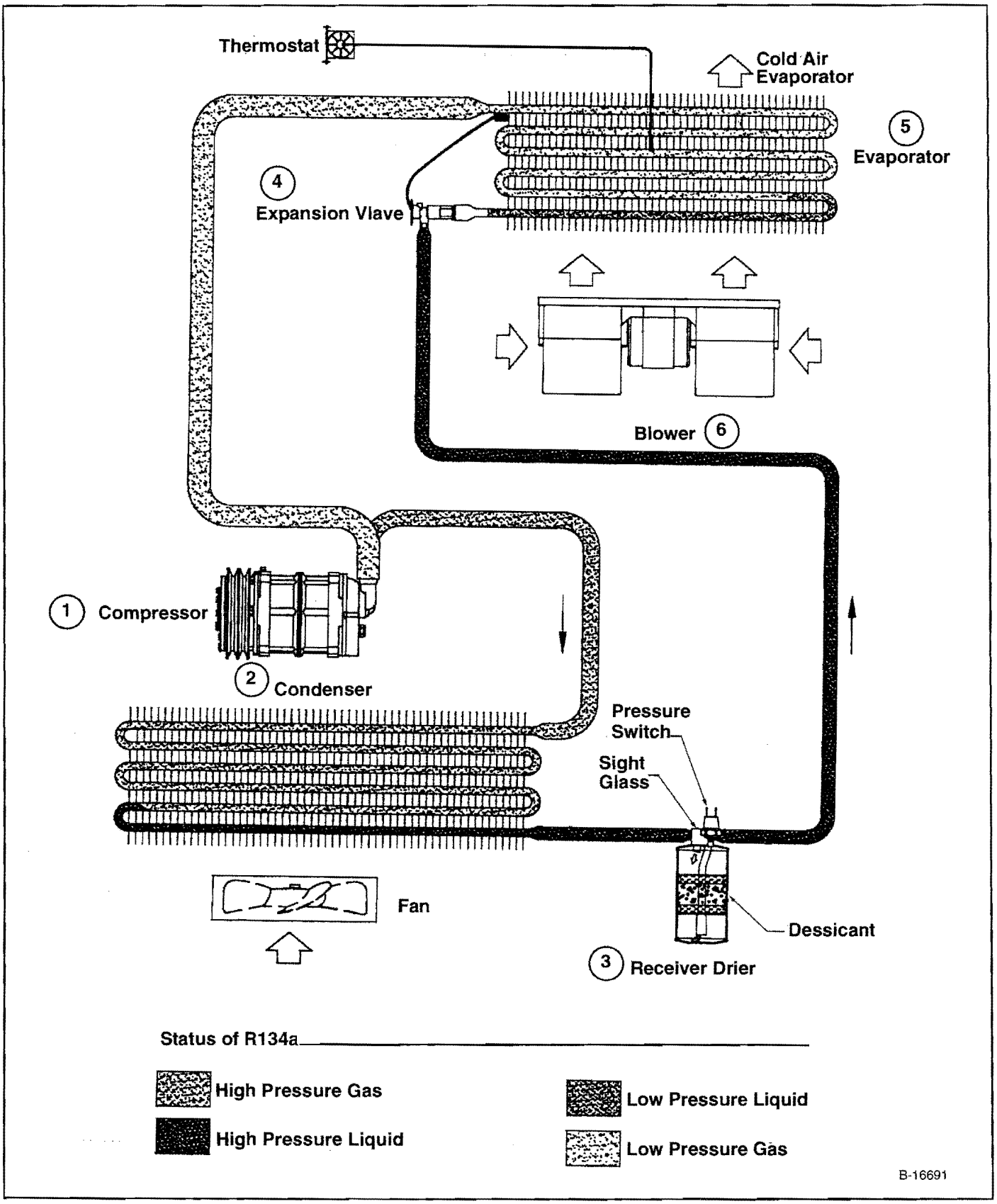
Ambient air passing through the condenser removes the heat from refrigerant resulting in physical state change in the refrigerant from a gas to a liquid.

The liquid refrigerant moves on to the receiver/drier (Item 3) (See Chart on Page 80-10-3.) where impurities such as moisture and dirt are filtered out. The receiver/drier also serves as the storage tank for the liquid refrigerant. The liquid refrigerant (still under high pressure) flows to the expansion valve (Item 4) (See Chart on Page 80-10-3.)

The expansion valve meters the amount of refrigerant into the evaporator coil (Item 5) (See Chart on Page 80-10-3.) As the refrigerant passes through the expansion valve, it again changes its physical state. It becomes a low temperature, low-pressure liquid and saturated vapor. The low pressure liquid immediately starts to boil and vaporize as it enters the evaporator. The hot humid air of the machine's cab is drawn through or blown into the evaporator by the evaporator fan (Item 6) (See Chart on Page 80-10-3.) Since the refrigerant is colder than the air, it absorbs the heat from the air and produces cooled air, which is pushed into the cab by the fan. The moisture in the air condenses on the evaporator coil and drips into the drain pan, which directs the water out of the cab.

The refrigerant cycle is completed when the heated low pressure gas is again drawn into the compressor.

Chart

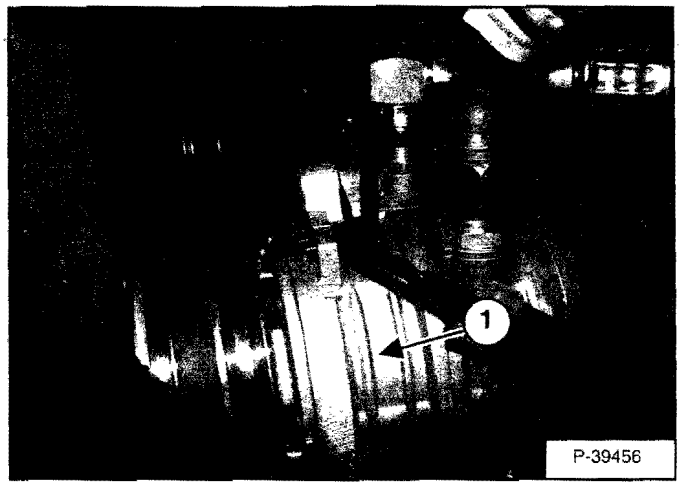

Thermostat
Cold Air Evaporator
5 Evaporator
4 Expansion Vlave
Blower 6
1 Compressor
2 Condenser
Pressure Switch
Sight Glass
Fan
Dessicant
3 Receiver Drier
Status of R134a
High Pressure Gas
High Pressure Liquid
Low Pressure Liquid
Low Pressure Gas
B-16691

Bobcat®

COMPONENTS

Identification

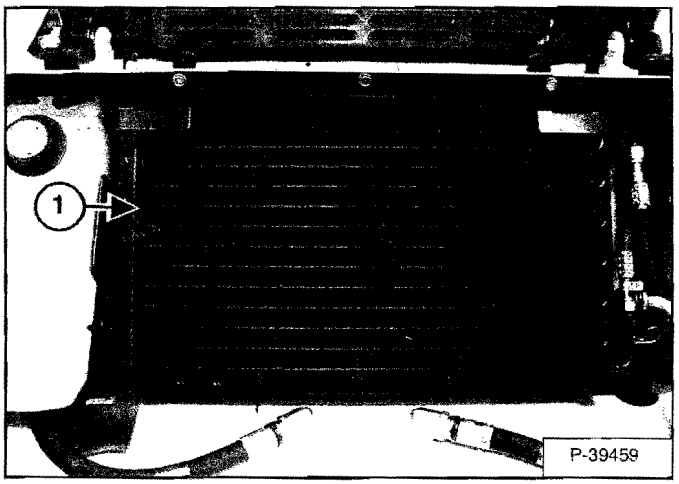
Figure 80-20-1



Compressor: The compressor (Item 1) **[Figure 80-20-1]** is the pump that circulates the refrigerant throughout the system. It raises the pressure of the refrigerant for heat transfer through the condenser and evaporator.

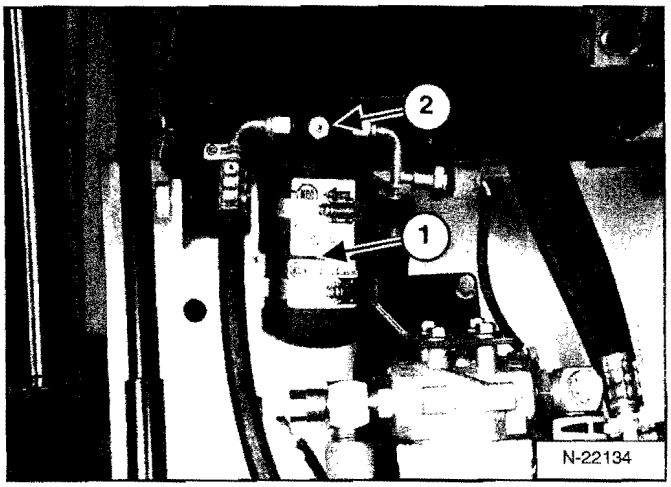
NOTE: The A/C system (Compressor) is recommended to be turned on for at least 5 minutes weekly throughout the year to lubricate the internal components.

Figure 80-20-2



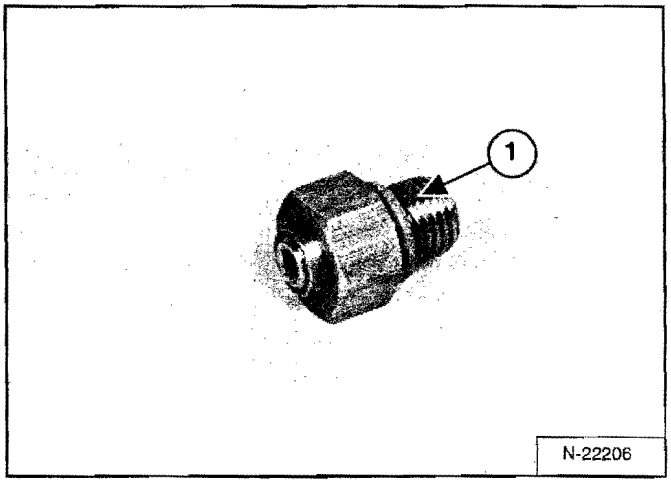
Condenser: The condenser (Item 1) **[Figure 80-20-2]** is the unit that receives the high pressure, high temperature refrigerant vapor from the compressor and condenses it into a high temperature liquid.

Figure 80-20-3



Receiver/Drier: The receiver/drier (Item 1) **[Figure 80-20-3]** is the unit that receives the liquid refrigerant from the condenser and removes moisture and foreign matter from the system. It also serves as a storage tank for the extra liquid refrigerant until it is needed by the evaporator.

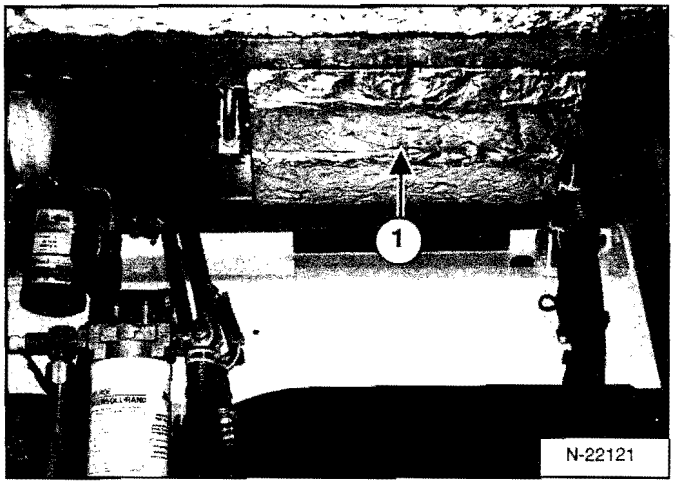
Figure 80-20-4



Pressure Relief Valve: The pressure relief valve (Item 2) **[Figure 80-20-3]** is located on the receiver drier assembly. This small brass valve (Item 1) **[Figure 80-20-4]** is a safety feature that is designed to open and release the A/C charge if the pressure reaches 535 PSI.

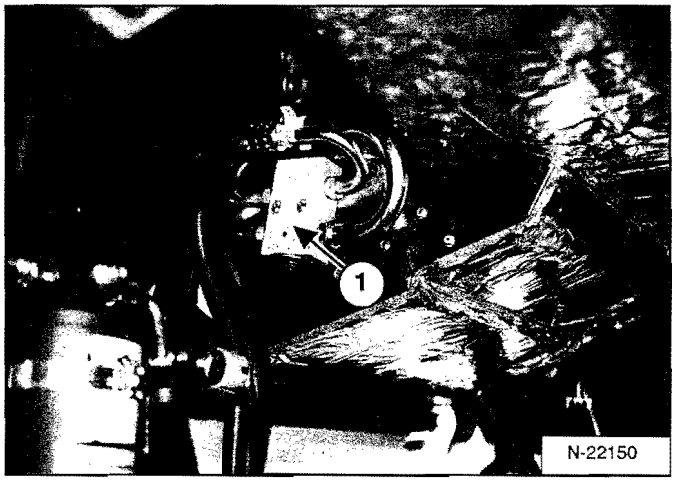
Identification (Cont'd)

Figure 80-20-5



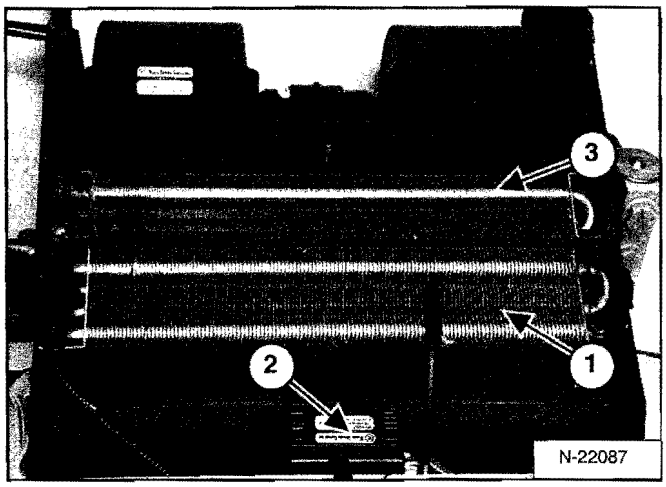
Heater/Evaporator Unit: The heater/evaporator unit (Item 1) **[Figure 80-20-5]** is located behind the loader cab. The unit delivers the cold air for the A/C and warm air for heat into the cab. The unit contains the blower, heat & A/C coils , thermostat and expansion valve.

Figure 80-20-6



Expansion Valve: The expansion valve (Item 1) **[Figure 80-20-6]** controls the amount of refrigerant entering the evaporator coil.

Figure 80-20-7

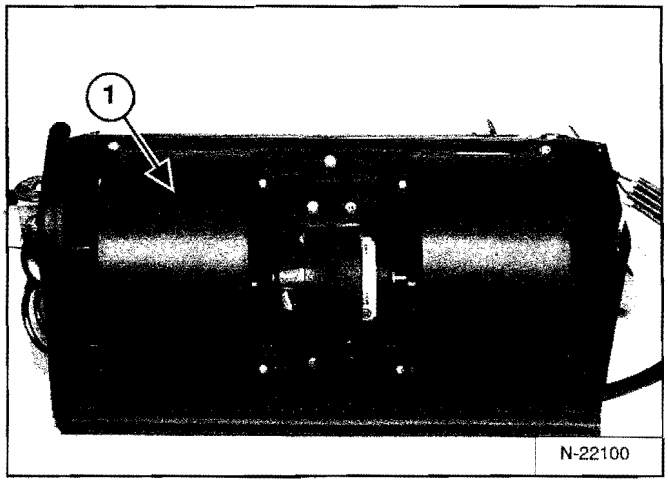


Evaporator Coil: The evaporator coil (Item 1) **[Figure 80-20-7]** cools and dehumidifies the air before it enters the cab.

Thermostat: The thermostat (Item 2) **[Figure 80-20-7]** controls the temperature of the evaporator coil.

Heater Coil: The heater coil (Item 3) **[Figure 80-20-7]** supplies the warm air into the cab by passing air through the coil.

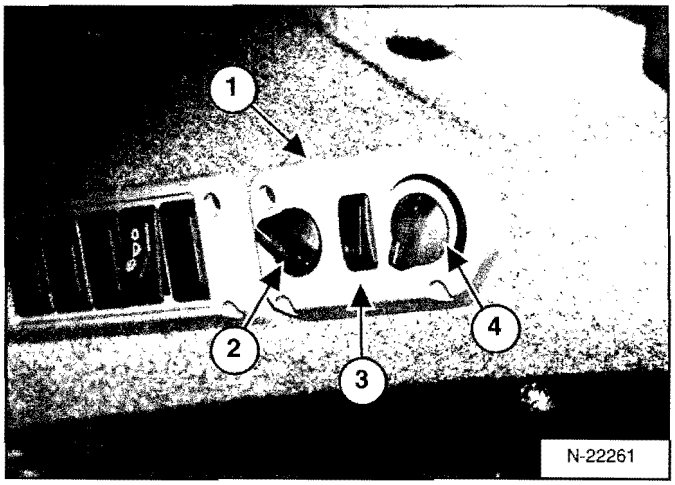
Figure 80-20-8



Heater/Evaporator Blower: The blower (Item 1) **[Figure 80-20-8]** is used to push air through the heater and evaporator coils and into the cab.

Identification (Cont'd)

Figure 80-20-9



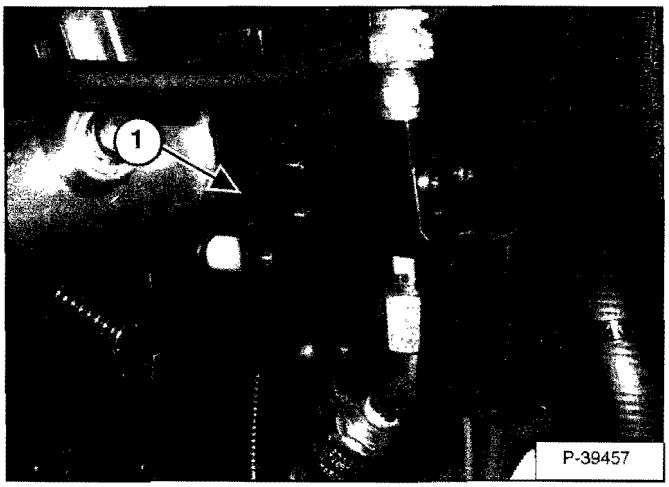
Control Panel: The panel (Item 1) **[Figure 80-20-9]** has three separate components.

Fan Switch: This is a four position rotary switch (Item 2) **[Figure 80-20-9]**. When the fan switch is in the off position the A/C will not engage, but the heat valve will operate, as it is controlled by the ignition power.

A/C Switch: The rocker switch (Item 3) **[Figure 80-20-9]** will be illuminated when the A/C is engaged.

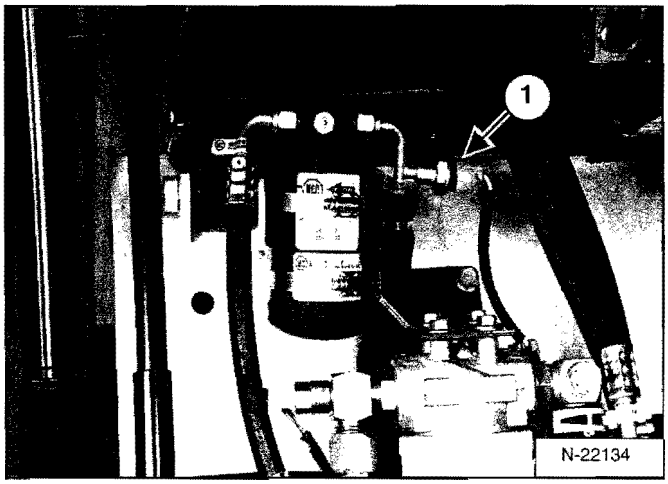
Potentiometer: The potentiometer (Item 4) **[Figure 80-20-9]** controls the Heat Valve from fully Off to fully On. This can be used in conjunction with the A/C for defrost of the windows and temperature control.

Figure 80-20-10



Heater Valve: The heater valve (Item 1) **[Figure 80-20-10]** is used to control the amount of engine coolant that flows to the heater coil.

Figure 80-20-11



Pressure Switch: The pressure switch (Item 1) **[Figure 80-20-11]** will disengage the compressor clutch at high pressure readings over 384 PSI. (2647 kPa) on the high side, or at very low pressure of 28 PSI (193 kPa) or less on the high side, which indicates loss of refrigerant.

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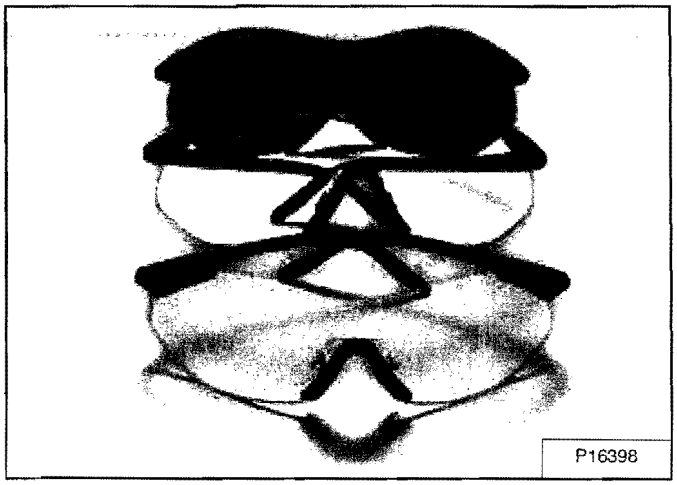
SAFETY

Safety Equipment

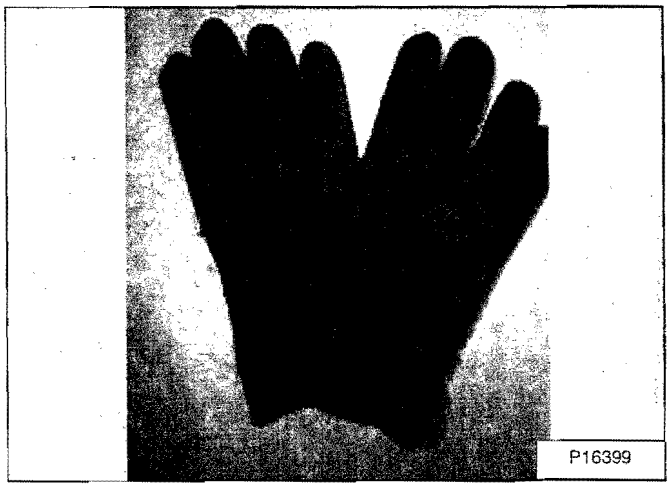
Figure 80-30-1



In servicing A/C and heater systems you will be exposed to high pressures, temperatures and several chemical hazards. Moving belts and pulleys are normal shop hazards.

In addition to exercising caution in your work, **DO WEAR SAFETY GLASSES OR A FACE SHIELD [Figure 80-30-1]** when you are using R-134a or a leak detector, adjusting service valves or the manifold gage set connectors. Safety glasses or a transparent face shield are practical safety items and one or the other is absolutely required.

Figure 80-30-2



R-134a inside a canister or in an A/C system is a liquid under pressure. When it escapes or releases into the air, **ITS TEMPERATURE DROPS TO 21.6 F DEGREES "INSTANTLY".** If it spills on your skin or in your eyes you should flood the area with cool water and **SEEK MEDICAL ATTENTION FAST!** It is a good idea to wear gloves **[Figure 80-30-2]** to prevent frost bite if you should get refrigerant on your hands.

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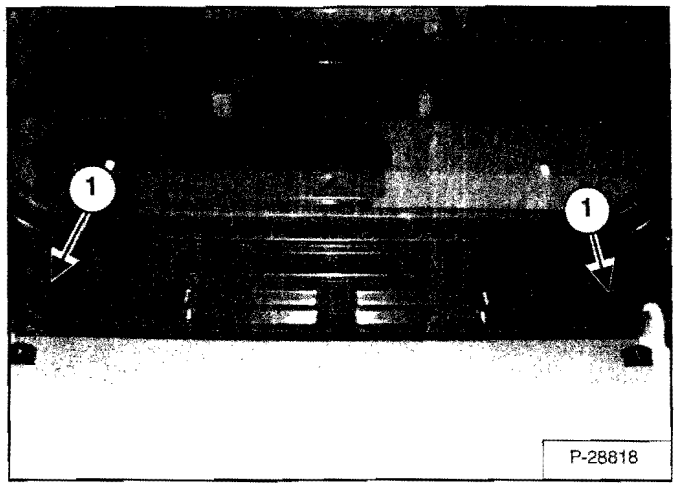
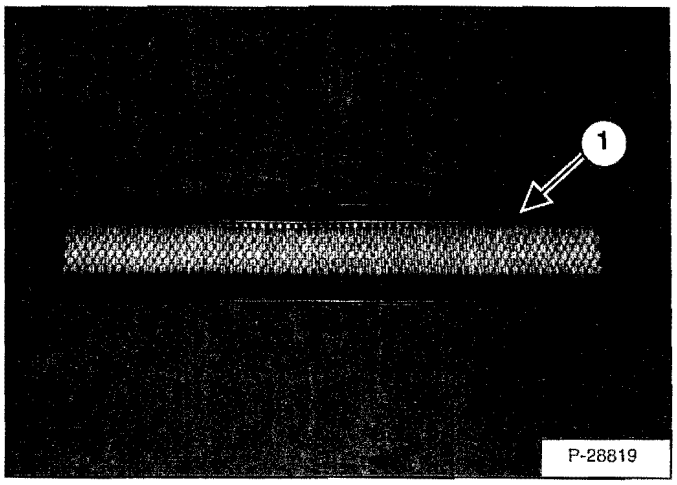
Filter Elements Removal And Installation

Figure 80-40-1



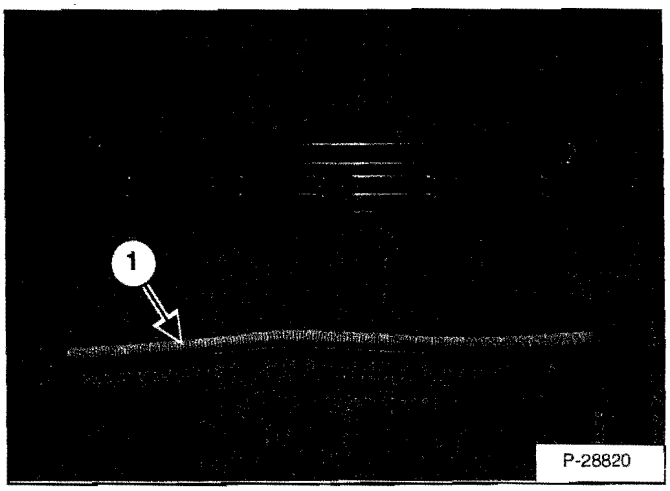
Remove the two retainer knobs (Item 1) **[Figure 80-40-1]** from the fresh air filter cover at the rear of the loader cab.

Figure 80-40-2



Remove the filter cover and filter (Item 1) **[Figure 80-40-2]** from the loader.

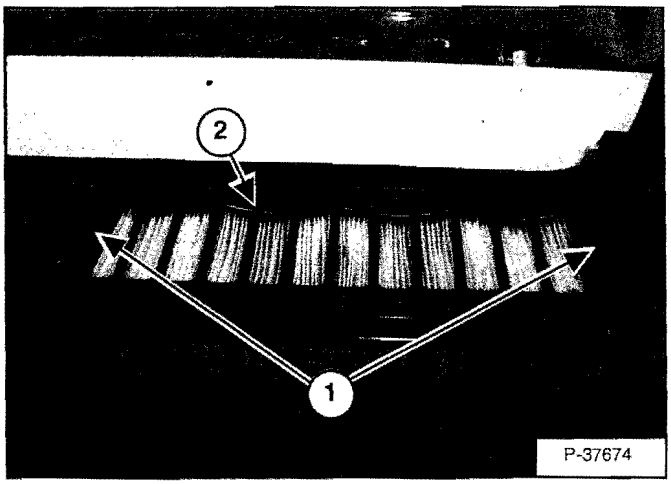
Figure 80-40-3



Remove the filter (Item 1) **[Figure 80-40-3]** 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 80-40-4

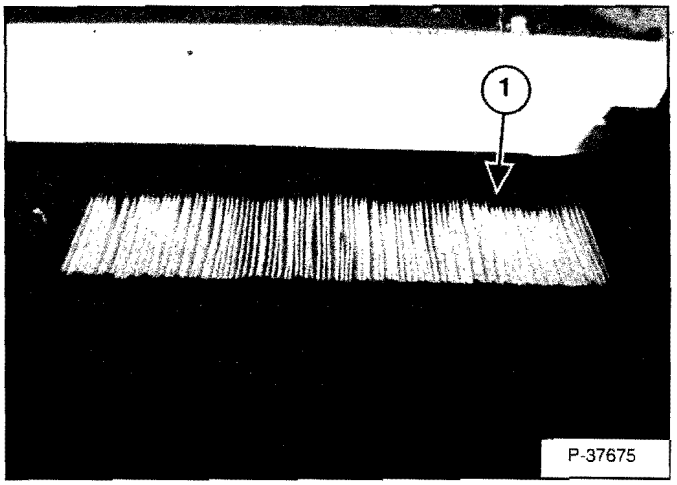


Remove the two retaining knobs (Item 1) **[Figure 80-40-4]** from the recirculating air filter cover, at the back of the cab.

Remove the retaining cover (Item 2) **[Figure 80-40-4]** from the loader cab.

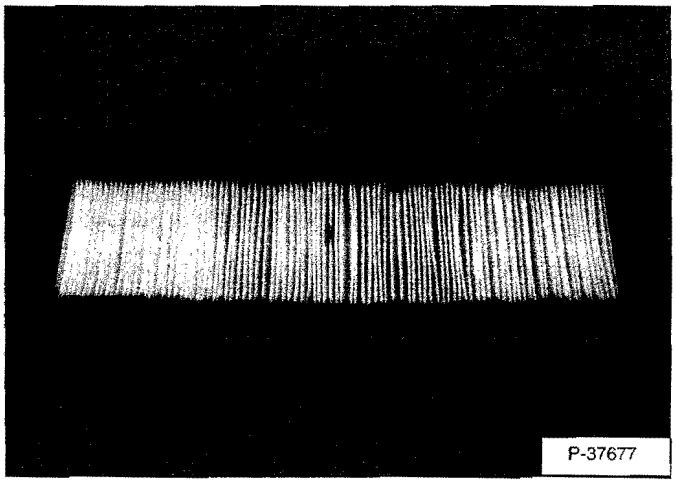
Filter Elements Removal And Installation (Cont'd)

Figure 80-40-5



Remove the recirculating air filter (Item 1) **[Figure 80-40-5]** from the rear of the cab.

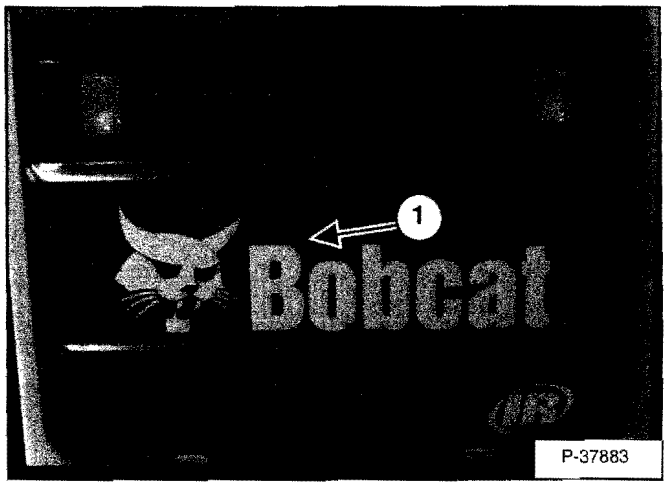
Figure 80-40-6



The recirculating air filter **[Figure 80-40-6]** may be cleaned using low air pressure.

Compressor Drive Belt Inspection

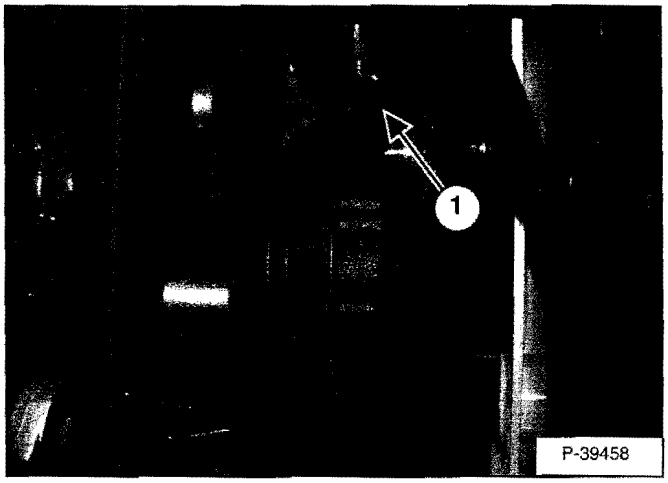
Figure 80-40-7



It is a good rule to regularly inspect (weekly) the compressor drive belt for tension and wear.

Open the rear door (Item 1) **[Figure 80-40-7]**.

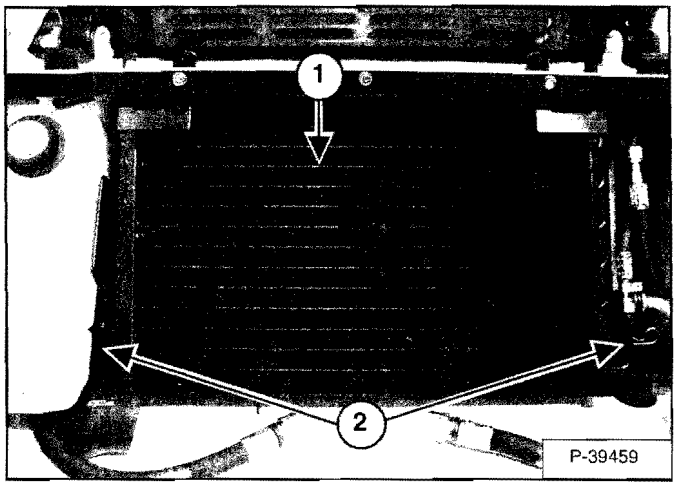
Figure 80-40-8



At the lower right side of the engine, check the tension on the compressor belt (Item 1) **[Figure 80-40-8]**.

Cleaning The Condenser

Figure 80-40-9



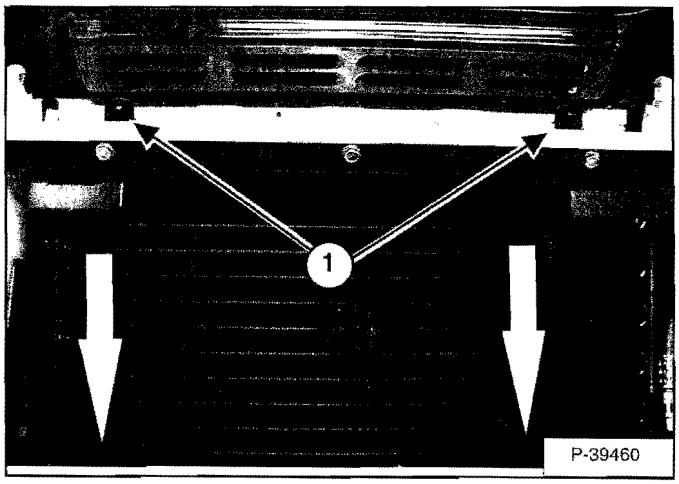
Open the rear door.

Remove the grill on the loader. (See Contents Page 50-01.)

Check the condenser (Item 1) **[Figure 80-40-9]** for mud or dirt.

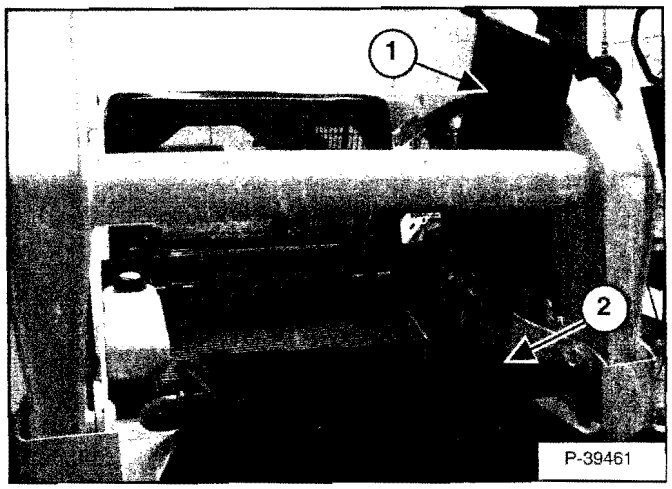
Remove the two retainer clips (Item 2) **[Figure 80-40-9]**.

Figure 80-40-10



Lift the condenser, and slide it toward the rear of the loader until the mounting tabs (Item 1) **[Figure 80-40-10]** clear the frame of the loader.

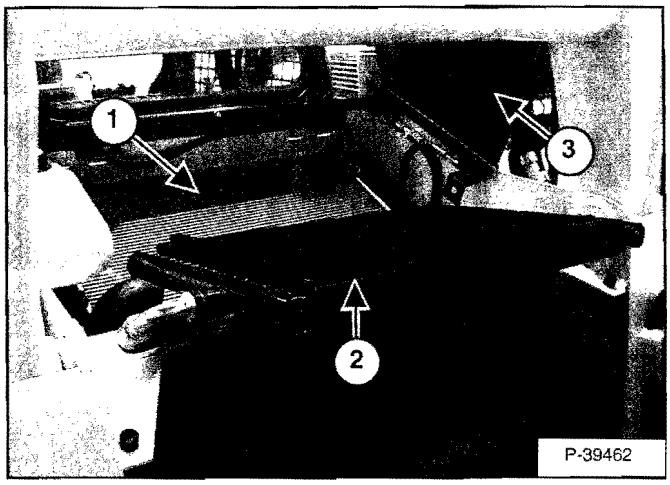
Figure 80-40-11



Rotate the condenser (Item 1) **[Figure 80-40-11]** up against the right side lift arm.

Slide the hydraulic cooler (Item 2) **[Figure 80-40-11]** toward the rear of the loader.

Figure 80-40-12



With water, or air, the radiator (Item 1) the oil cooler (Item 2) and the condenser (Item 3) **[Figure 80-40-12]** can be cleaned.

Bobcat®

BASIC TROUBLESHOOTING

Poor A/C Performance

Start the loader, lock the park brake, and engage the A/C system with the blower fan on High. Run the loader at full throttle for approximately 15 minutes, with the loader cab door closed.

Figure 80-50-1

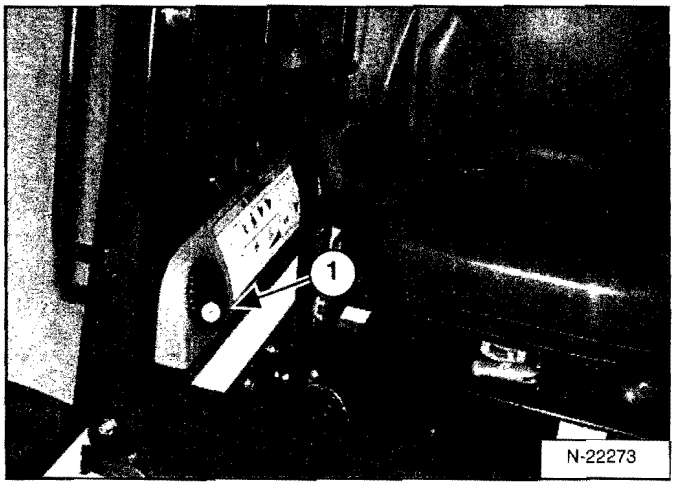
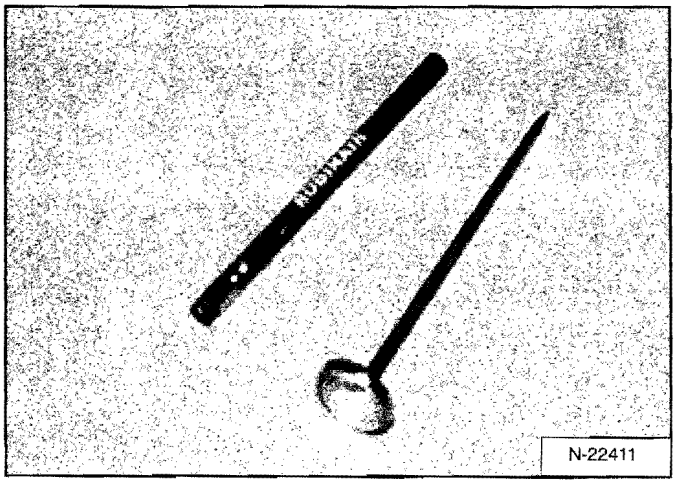


Figure 80-50-2



Check the temperature at the louvers (Item 1) **[Figure 80-50-1]** with a thermometer **[Figure 80-50-2]**.

The louver temperature should be between 45-53° F. (2,2-11,6° C) depending on the amount of humidity in the air and ambient temperature.

If louver temperature is too high. (See Contents, Page 80-01.)

Check the blower for proper operation, or noise, and replace if necessary. (See Contents, Page 80-01.)

Check the belt tension on the A/C compressor. (See Compressor Drive Belt Inspection on Page 80-50-2.)

Check the A/C condenser for dirt or mud and clean if necessary. (See Contents Page 80-01.)

Check the A/C evaporator coil for dirt or mud and clean if necessary. (See Cleaning The A/C Evaporator Coil & Heater Coil on Page 80-50-2.)

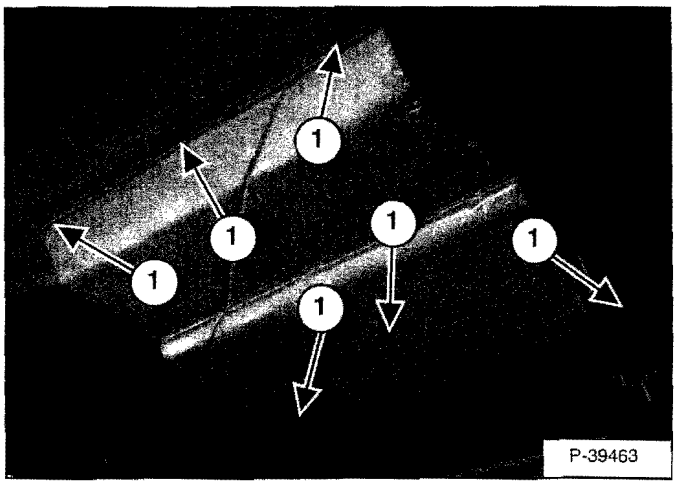
Check the engine coolant to see if it is by-passing the heater valve. (See Engine Coolant By-Passing The Heater Valve on Page 80-50-11.)

Cleaning The A/C Evaporator Coil & 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.)

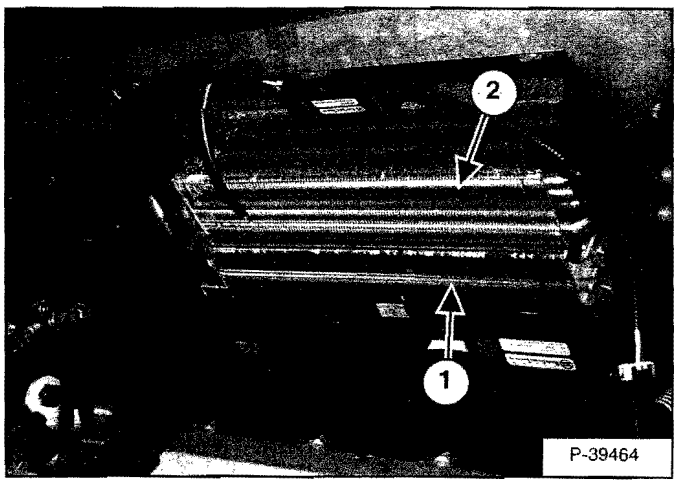
Figure 80-50-3



At the rear of the cab, remove the six mounting bolts (Item 1) **[Figure 80-50-3]** from the access cover on the evaporator/heater unit.

Remove the access cover from the loader.

Figure 80-50-4

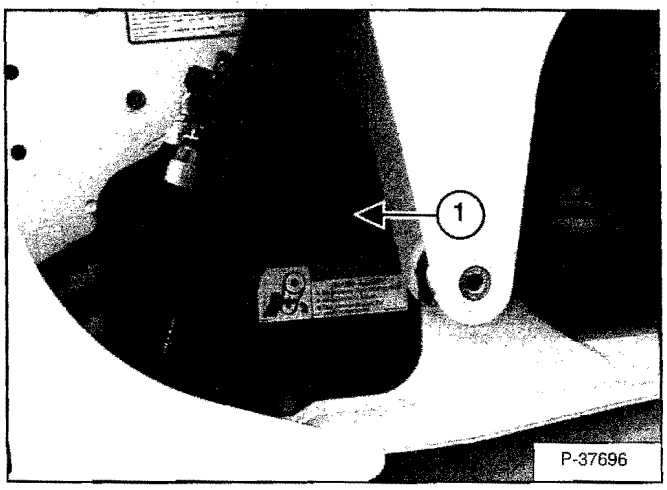


With air or water clean the heater coil (Item 1) and the evaporator coil (Item 2) **[Figure 80-50-4]**.

Compressor Drive Belt Inspection

It is good rule to regularly inspect (weekly) the compressor drive belt for tension and wear.

Figure 80-50-5



Remove the right side access cover (Item 1) **[Figure 80-50-5]**.

Open the rear door.

Compressor Drive Belt Inspection (Cont'd)

Figure 80-50-6

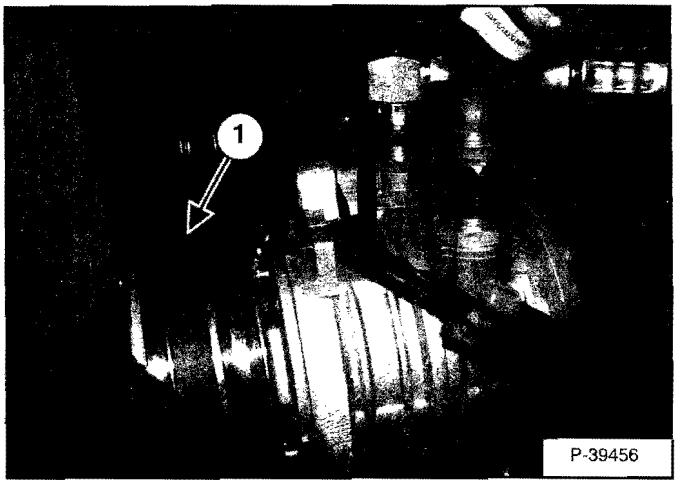
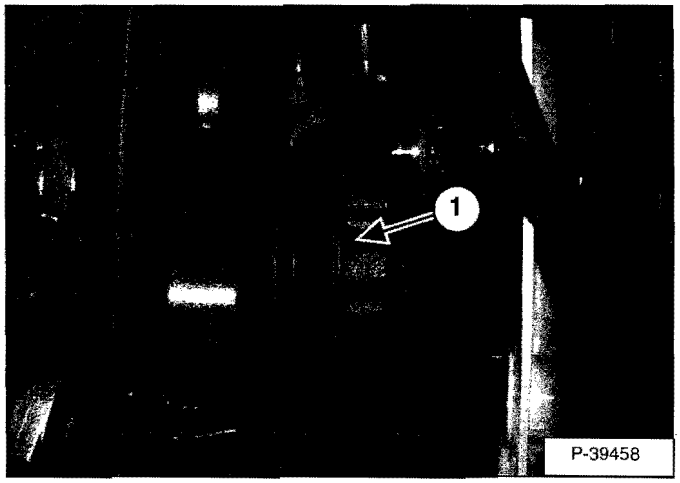


Figure 80-50-7



Check the tension on the compressor belt (Item 1) **[Figure 80-50-6]** & **[Figure 80-50-7]**.

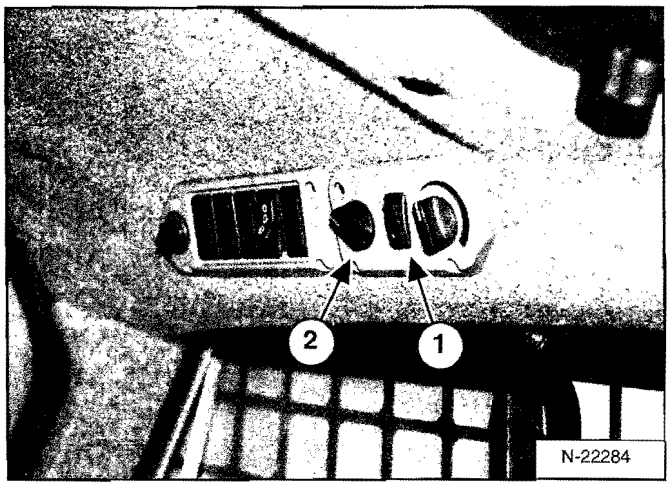
The belt tension should be set by measuring the belt deflection, which should be 0.16 in. (4 mm) with a deflection load of 3.5-4 lbs (1,6-1,8 kg) force.

Checking The Electrical System

Check to see if the compressor clutch is engaging.

With an operator in the loader seat and the cab door open, turn the loader key switch to RUN (Standard Panel) OR press the RUN/ENTER Button (Deluxe Panel), without starting the loader.

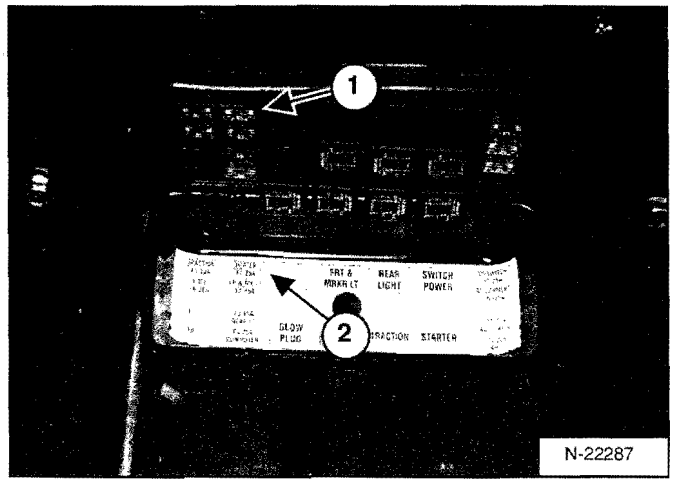
Figure 80-50-8



Push the A/C switch (Item 1) to the ON position. Turn the blower switch (Item 2) **[Figure 80-50-8]** to the first ON position.

The compressor clutch should make a click sound, which indicates the clutch is engaging.

Figure 80-50-9

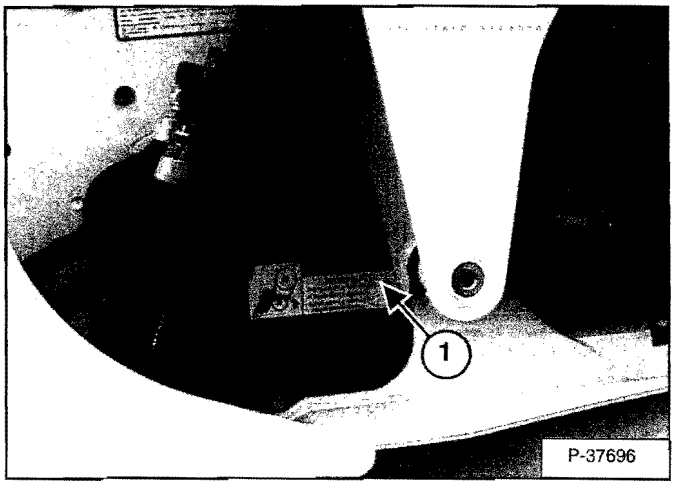


If the compressor clutch does not engage, check the loader fuse (Item 1) **[Figure 80-50-9]** located on the control panel in the loader cab.

Replace the fuse if burned out.

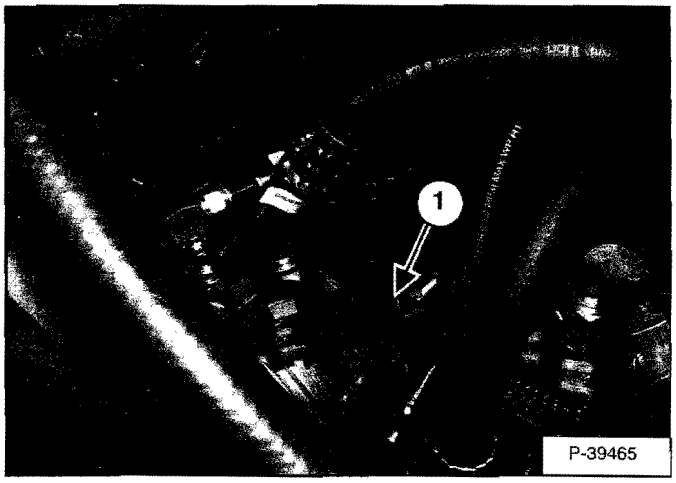
Checking The Electrical System (Cont'd)

Figure 80-50-10



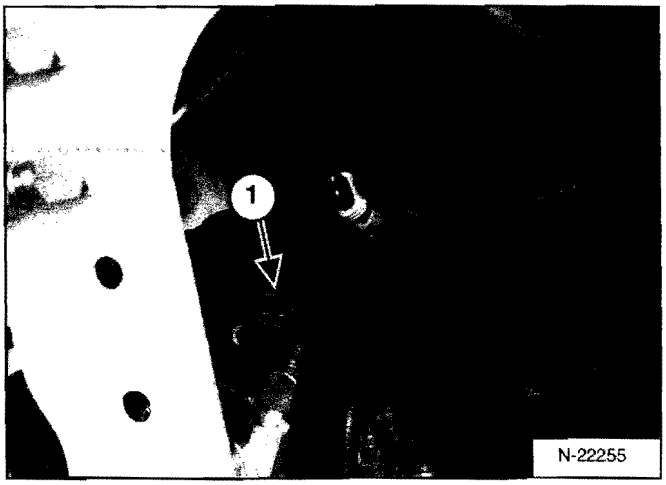
Remove the right side access cover (Item 1) **[Figure 80-50-10]**.

Figure 80-50-11



Disconnect the loader harness (Item 1) **[Figure 80-50-11]** from the compressor clutch wire.

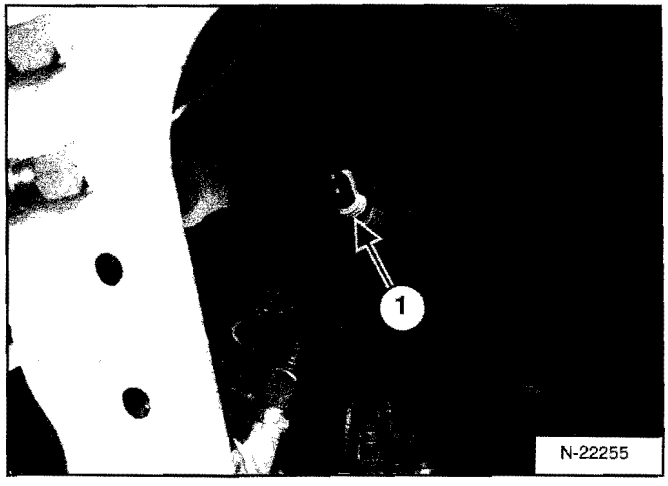
Figure 80-50-12



With a multimeter, check the resistance to the compressor clutch (Item 1) **[Figure 80-50-12]**.

If there is no resistance value, replace the compressor clutch. (See Contents Page 80-01.)

Figure 80-50-13



With a multimeter, check the voltage to the compressor clutch at the loader harness (Item 1) **[Figure 80-50-13]**.

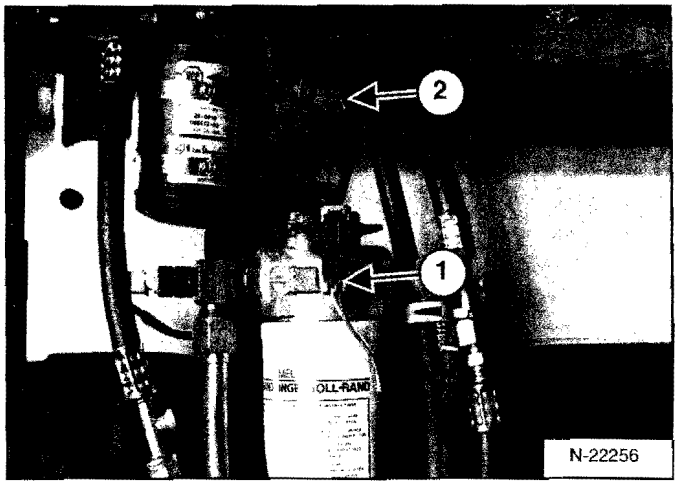
The voltage reading should be around 12 volts.

If there is no power at the clutch, check the wiring harness for broken wires.

If there is power at the clutch, reconnect the wiring harness to the compressor clutch.

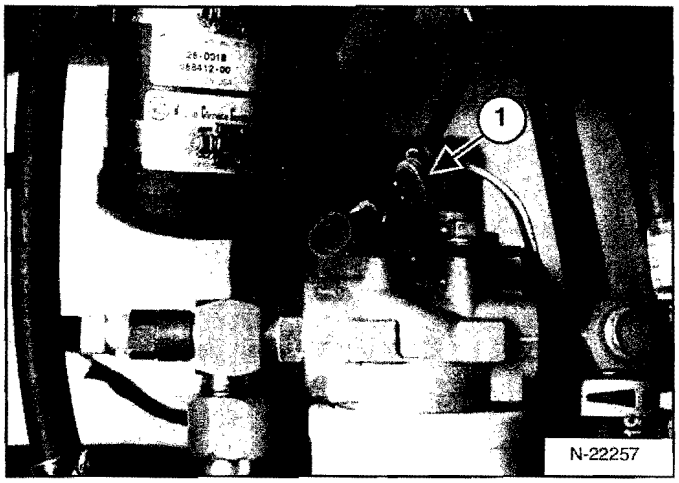
Checking The Electrical System (Cont'd)

Figure 80-50-14



Disconnect the loader harness (Item 1) from the pressure switch (Item 2) **[Figure 80-50-14]**.

Figure 80-50-15

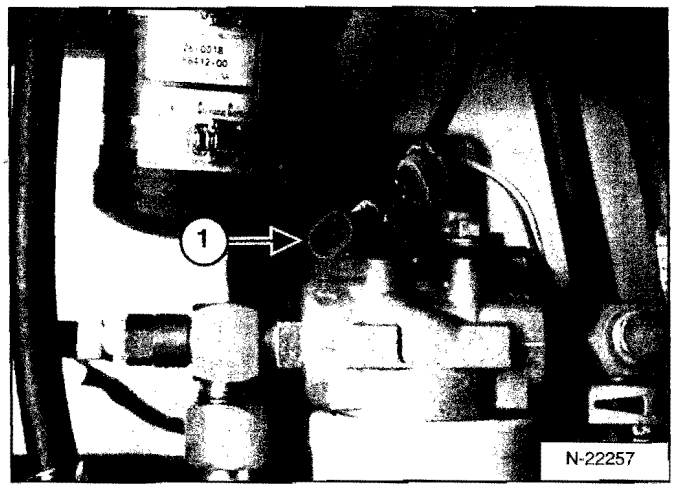


Using a multimeter check the loader wiring harness (Item 1) **[Figure 80-50-15]** for voltage.

The voltage should be around 12 volts.

If there is no voltage at the wiring harness, check the harness for broken wires.

Figure 80-50-16



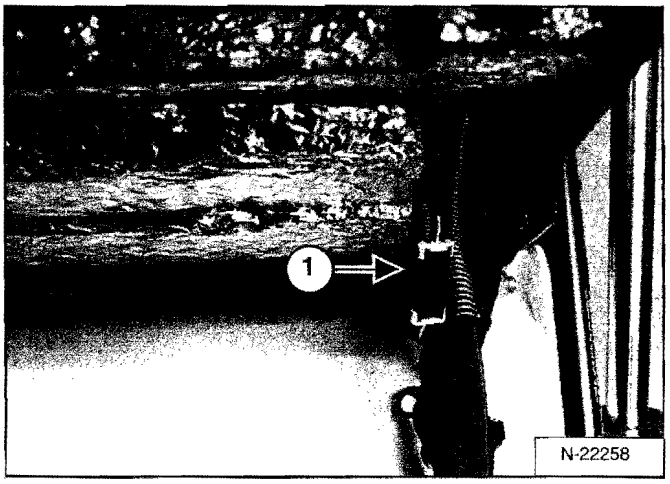
If there is voltage at the harness, check the resistance at the pressure switch (Item 1) **[Figure 80-50-16]**.

If there is no resistance value, check for low refrigerant level. (See Contents Page 80-01.)

If a resistance value is seen, the pressure switch is good.

Reconnect the loader harness to the pressure switch.

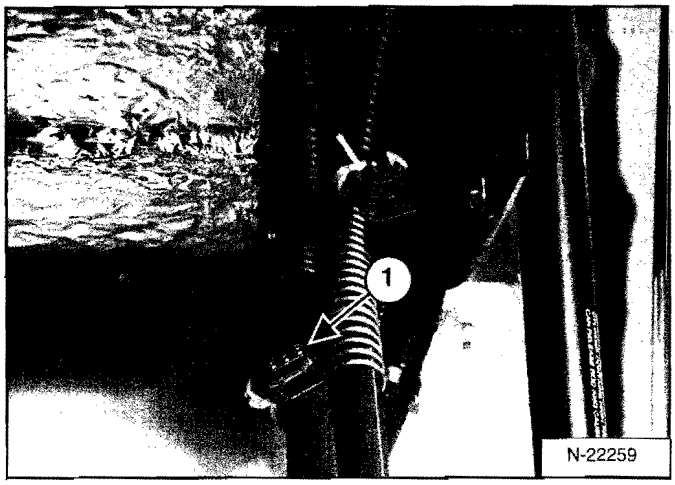
Figure 80-50-17



Disconnect the thermostat wiring connector (Item 1 **[Figure 80-50-17]** from the loader wiring harness.

Checking The Electrical System (Cont'd)

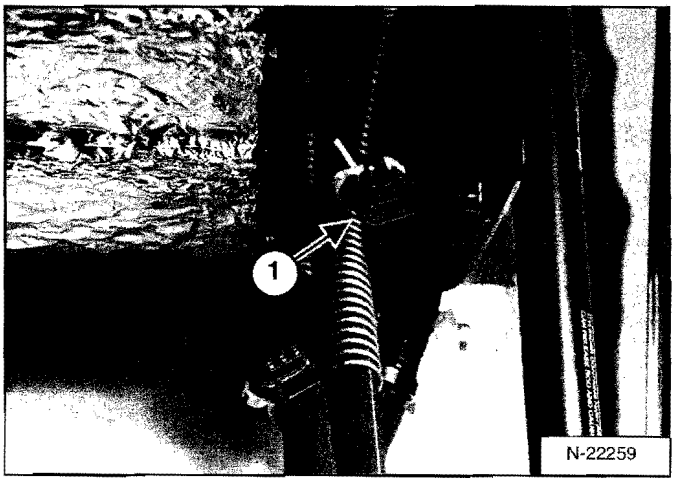
Figure 80-50-18



Check the loader harness (Item 1) **[Figure 80-50-18]** for voltage. The voltage should be 12 volts.

If there is no voltage at the wiring harness, check the harness for broken wires.

Figure 80-50-19



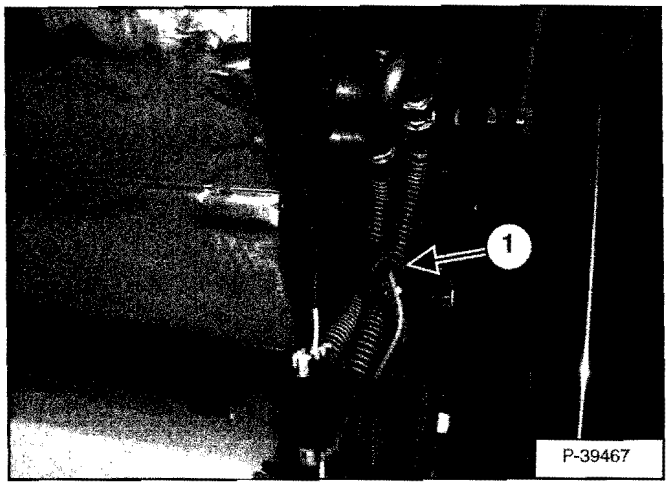
If there is voltage at the wiring harness, check the thermostat (Item 1) **[Figure 80-50-19]** for resistance.

The resistance value of the thermostat should be 10 Ohms at 68° F (20° C).

If there is no resistance value, replace the thermostat. (See Contents Page 80-01.)

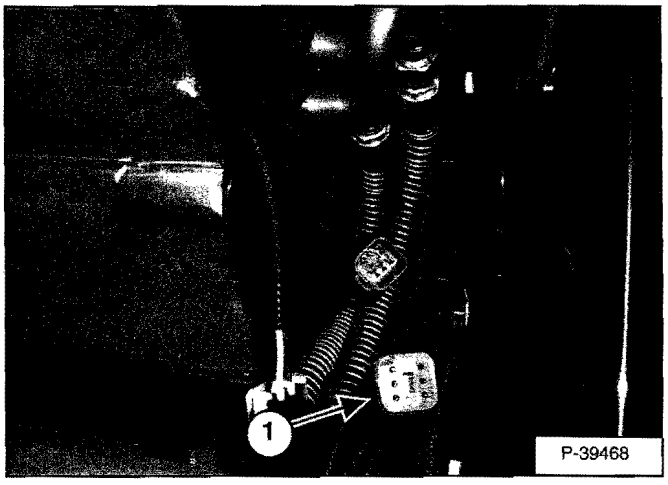
If there is a resistance value, check the blower.

Figure 80-50-20



Disconnect the blower wiring connector (Item 1) **[Figure 80-50-20]** from the loader wiring harness.

Figure 80-50-21

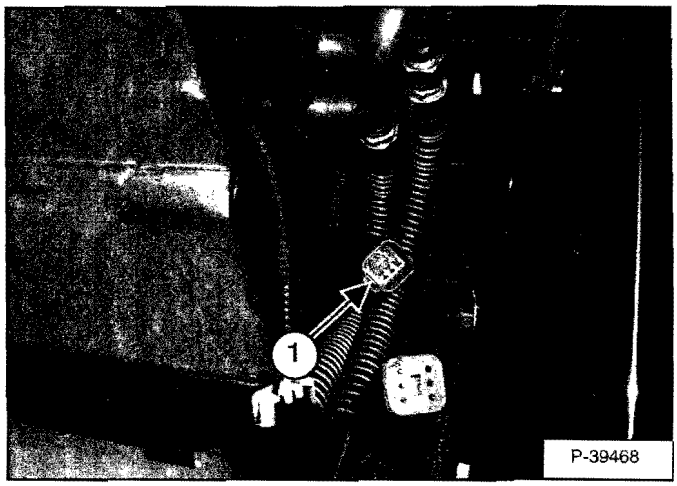


Check the loader harness (Item 1) **[Figure 80-50-21]** for voltage. The voltage should be 12 volts.

If there is no voltage at the wiring harness, check the harness for broken wires.

Checking The Electrical System (Cont'd)

Figure 80-50-22

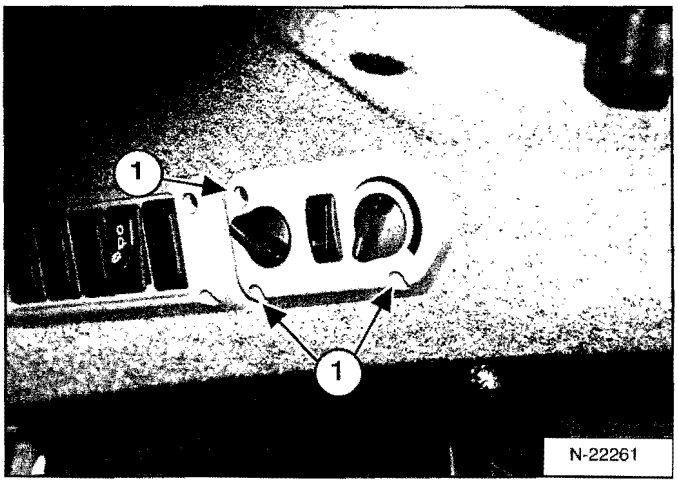


If there is voltage at the wiring harness, check the resistance to the blower at the blower wiring connector (Item 1) **[Figure 80-50-22]**.

If there is no resistance value replace the blower. (See Contents Page 80-01.)

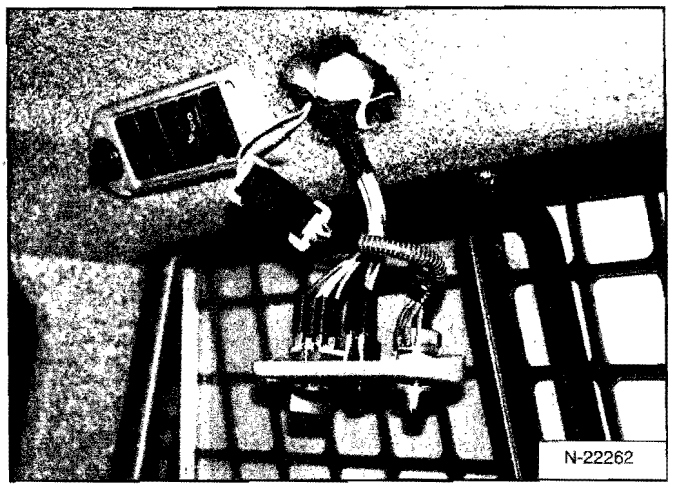
If there is a resistance value check the climate controls at the control panel inside the loader cab.

Figure 80-50-23



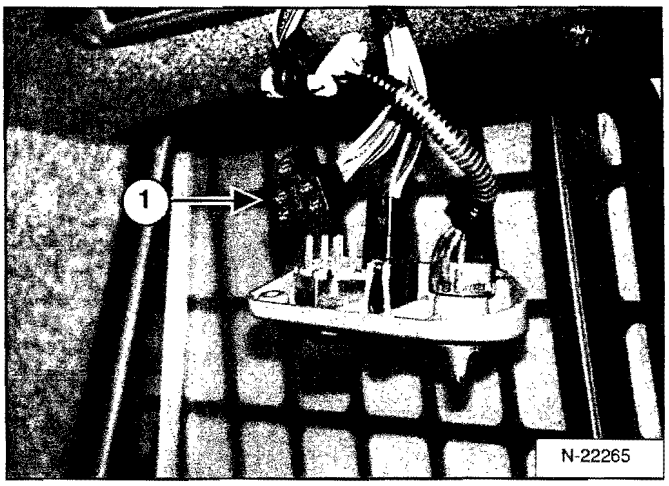
Remove the three mount bolts (Item 1) **[Figure 80-50-23]** from the cab control panel.

Figure 80-50-24



Remove the control panel and wiring harness from the cab **[Figure 80-50-24]**.

Figure 80-50-25



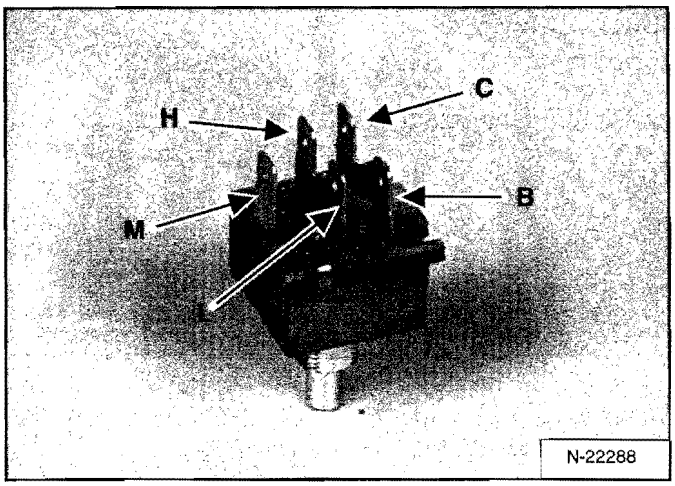
Disconnect the loader wiring harness (Item 1) **[Figure 80-50-25]** from the blower switch.

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.

Checking The Electrical System (Cont'd)

Figure 80-50-26



If there is voltage at the wiring harness, check the blower switch **[Figure 80-50-26]** for resistance.

With the switch in the **OFF** position, there should be zero resistance between all terminals.

With the switch in the **1** position, there should be resistance between **C** terminal and the **B** terminal. And also between the **C** terminal and the **L** terminal frame **[Figure 80-50-26]**.

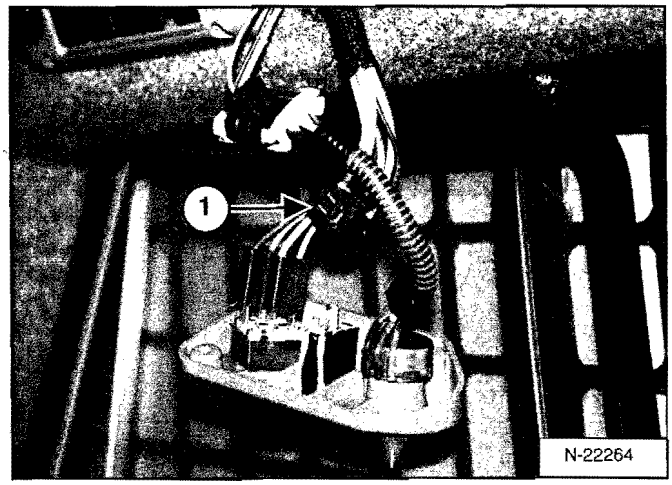
With the switch in the **2** position, there should be resistance between **C** terminal and the **B** terminal. And also between the **C** terminal and the M terminal frame **[Figure 80-50-26]**.

With the switch in the **3** position, there should be resistance between **C** terminal and the **B** terminal. And also between the **C** terminal and the **H** terminal frame **[Figure 80-50-26]**.

If any of the above resistance tests fail, replace the blower switch.

If the above resistance tests are good, check the A/C switch.

Figure 80-50-27



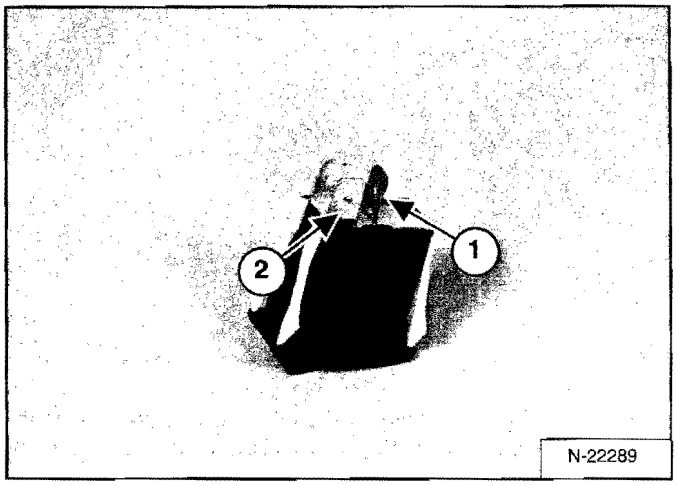
At the loader cab, disconnect the loader harness (Item 1) **[Figure 80-50-27]** from the A/C switch.

Check the harness for voltage. The voltage should be 12 volts.

If there is no voltage at the wiring harness, check the harness for broken wires.

Checking The Electrical System (Cont'd)

Figure 80-50-28



If there is voltage at the wiring harness, check the A/C switch **[Figure 80-50-28]** for resistance.

With the switch in the OFF position there should be no resistance between any of the three terminals on the A/C switch.

With the switch in the ON position there should be resistance between terminal (Item 1) and terminal (Item 2) **[Figure 80-50-28]**.

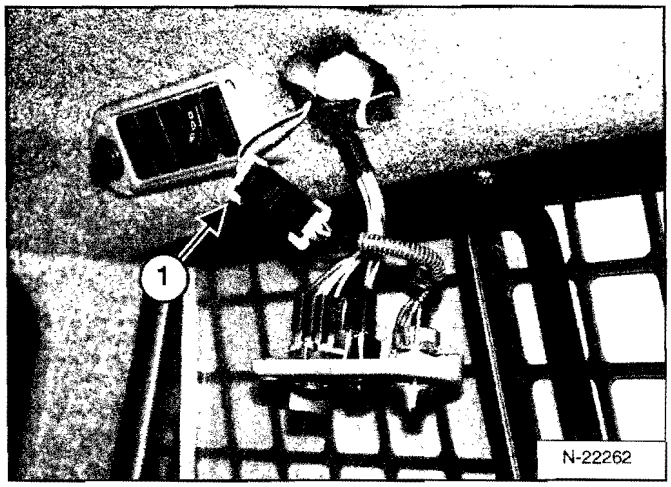
If no resistance value is found, replace the A/C switch.

If a resistance value is found, check the potentiometer.

The potentiometer will effect the A/C system and also effect the operation of the heater.

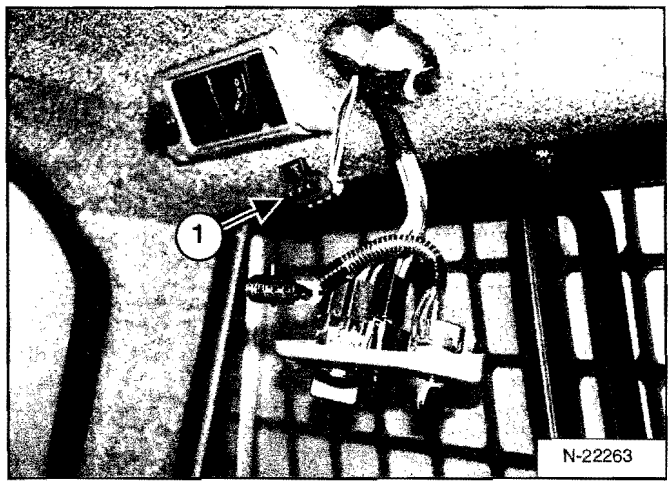
If heater valve does not open, or close, or the A/C does not work, check the potentiometer.

Figure 80-50-29



At the loader cab, disconnect the loader harness (Item 1) **[Figure 80-50-29]** from the potentiometer.

Figure 80-50-30

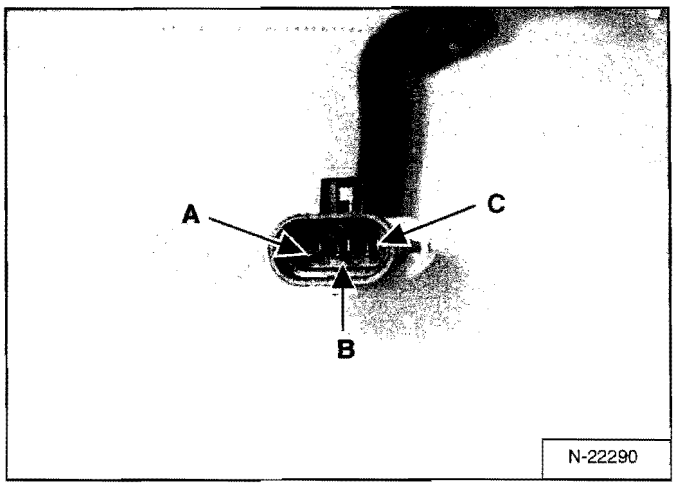


Check the loader harness (Item 1) **[Figure 80-50-30]** for voltage. The voltage should be 12 volts.

If there is no voltage at the wiring harness, check the harness for broken wires.

Checking The Electrical System (Cont'd)

Figure 80-50-31

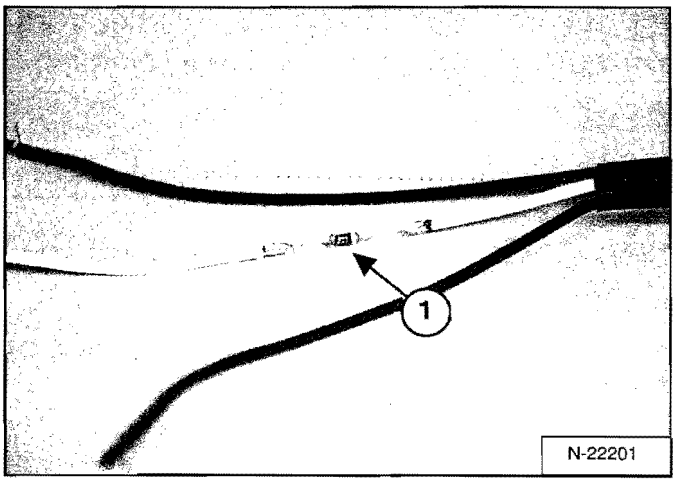


If there is voltage at the wiring harness, check the potentiometer **[Figure 80-50-31]** for resistance.

The resistance should be 10K Ohms between wire pin **A** and wire pin **C** frame **[Figure 80-50-31]**.

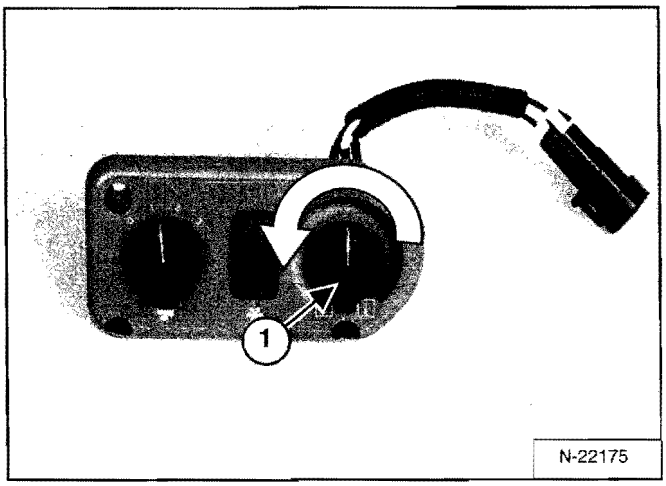
If no resistance is found replace the potentiometer.

Figure 80-50-32



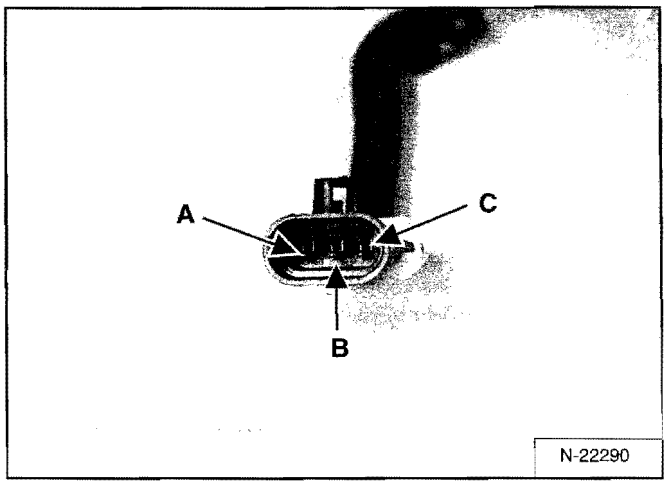
The white wire **B**, (Item 1) **[Figure 80-50-32]**, on the potentiometer, is a resister wire.

Figure 80-50-33



To check the resistance of the white wire, turn the potentiometer control (Item 1) **[Figure 80-50-33]** to the full A/C position.

Figure 80-50-34

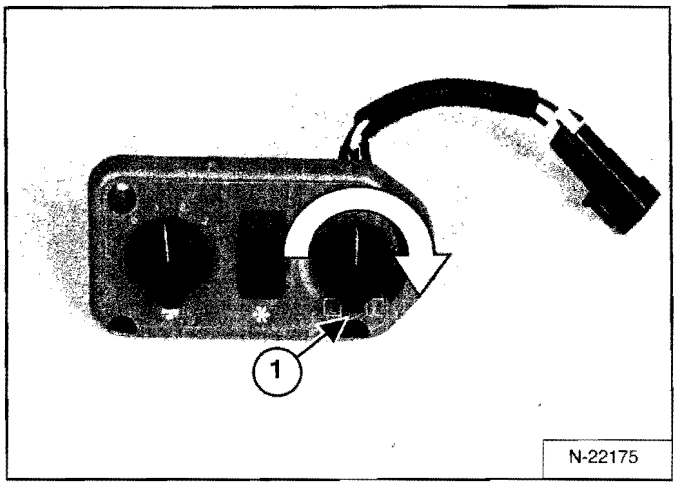


The resistance between the wire terminal **A** and wire terminal **B** frame **[Figure 80-50-34]** should be around 49K Ohms.

Check the resistance between the wire terminal **C** and wire terminal **B** frame **[Figure 80-50-34]** should be around 39K Ohms.

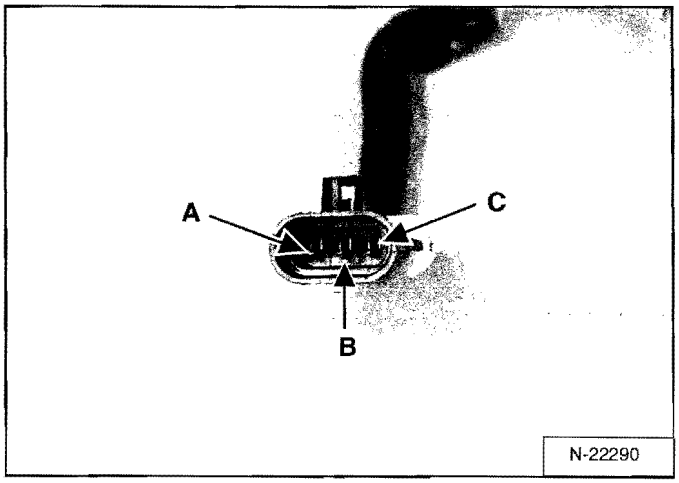
Checking The Electrical System (Cont'd)

Figure 80-50-35



To check the resistance of the white wire, turn the potentiometer control (Item 1) **[Figure 80-50-35]** to the full Heater position.

Figure 80-50-36



Check the resistance between the wire terminal **A** and wire terminal **B** frame **[Figure 80-50-36]** should be around 39K Ohms.

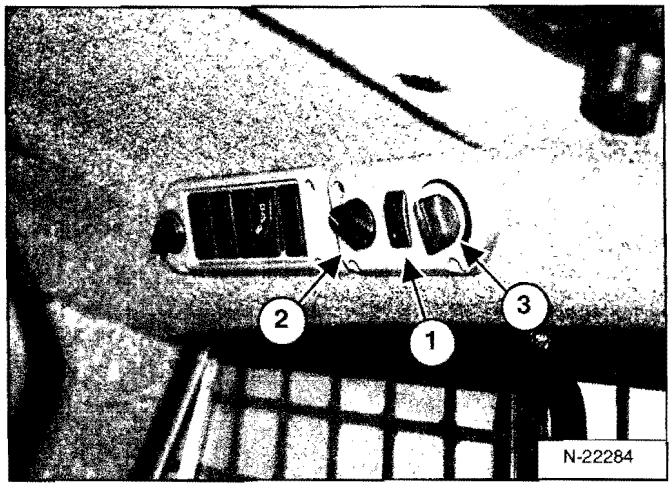
Check the resistance between the wire terminal **C** and wire terminal **B** frame **[Figure 80-50-36]** should be around 49K Ohms.

If the resistance is not found replace the potentiometer.

Engine Coolant By-Passing The Heater Valve

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

Figure 80-50-37



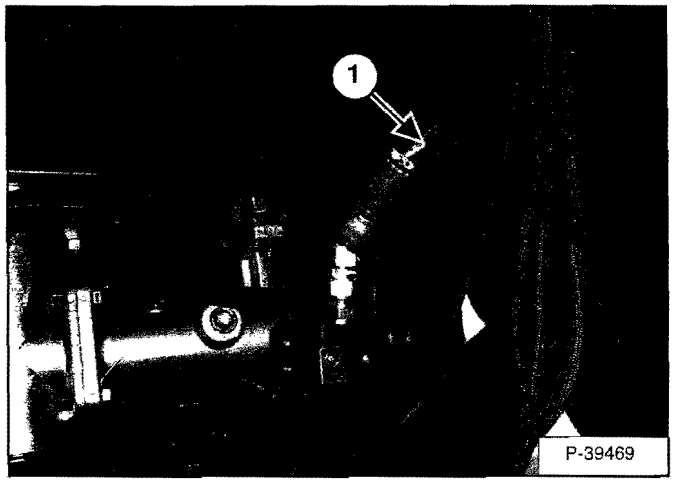
Push the A/C switch (Item 1) to the OFF position, turn the blower switch (Item 2) to position **1**, then turn the temperature control (Item 3) **[Figure 80-50-37]** to the High A/C position, with the loader ignition switch OFF.

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

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

Start the loader and run at high idle, for ten minutes.

Figure 80-50-38



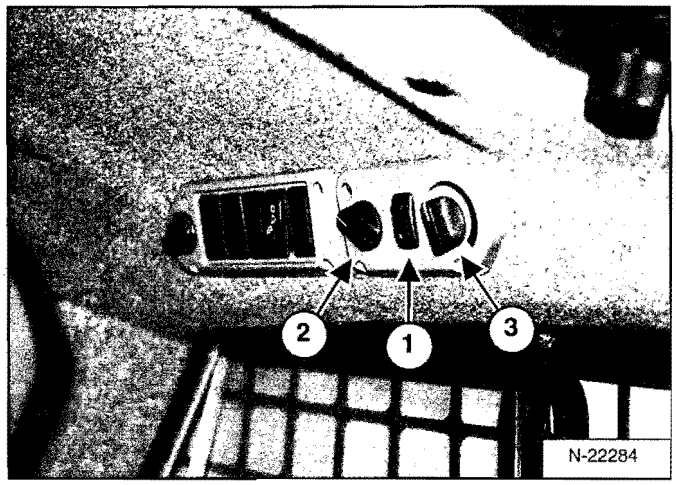
Check the heater hose (Item 1) **[Figure 80-50-38]** for temperature.

If the hose is hot, the heater valve is leaking by, and needs to be replace.

Heater Valve Not Opening Or Closing

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

Figure 80-50-39

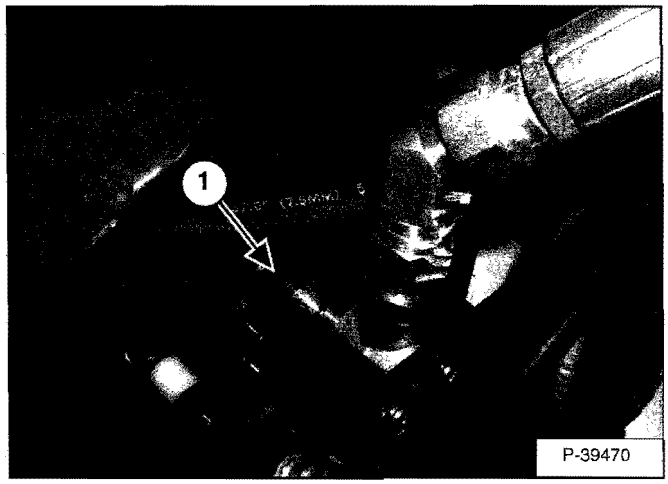


Push the A/C switch (Item 1) to the OFF position, turn the blower switch (Item 2) to position **1** and turn the temperature control (Item 3) **[Figure 80-50-39]** to the High A/C position, with the loader ignition switch OFF.

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

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

Figure 80-50-40



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 80-50-40]**, as the key of the remote start is turned to the ON position without starting the loader. The heater valve should rotate. Place a mark on the loader shaft.

Turn the remote start key to the OFF position and remove the remote start tool from fender.

Lower operator cab.

Turn the temperature control (Item 3) **[Figure 80-50-39]** 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 80-50-40]**, as the key of the remote start is turned to the ON position without starting the loader. The heater valve should rotate.

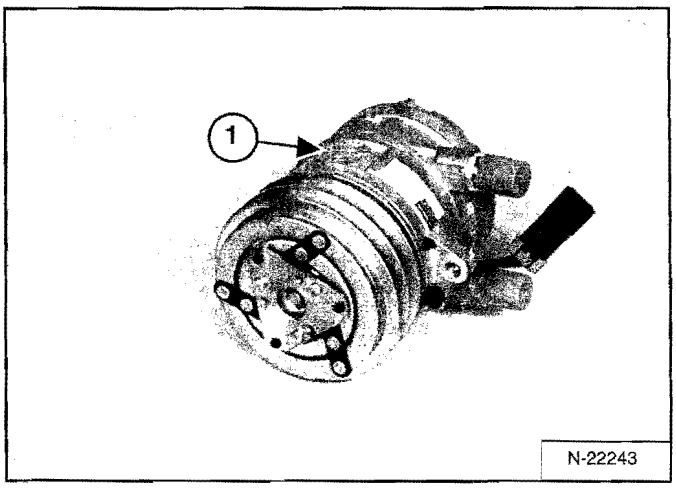
If it does not rotate,check the potentiometer for proper function. (See Checking The Electrical System on Page 80-50-3.)

Replace the heater valve. (See Contents Page 80-01.)

GENERAL AIR CONDITIONING SERVICE GUIDELINES

Compressor Oil

Figure 80-60-1



The compressor (Item 1) **[Figure 80-60-1]** is factory filled with **150-170 cc's** of PAG oil (Poly Alkelene Glycol).

Unlike engine oil, it is not necessary to frequently check or change the compressor oil.

It is necessary to check, replenish or replace the compressor oil in the following cases:

When ever the evaporator, condenser or receiver-drier is replaced.

Whenever the refrigerant has leaked from the system.

Whenever the refrigerant is suddenly released from the cooling cycle.

Whenever any oil-related problems occur in the cooling cycle.

When one of the components (the evaporator, condenser or receiver-drier) is replaced, **one ounce** of oil should be added for each component replaced.

If the A/C compressor is changed, no oil should be added to the system, because the compressor comes factory filled with oil.

NOTE: Only PAG oil should be used, and never mix R-12 and R-134a Oils.

Compressor Oil Check

The compressor oil should be checked as follows when oil is being added to an in service loader.

There is a close affinity between oil and refrigerant. During normal operation, part of the oil circulates with the refrigerant in the system. Therefore, when checking the amount of oil in the system or replacing any system component, the compressor must be run in advance to insure return of oil to the compressor.

If the amount of refrigerant in the system has decreased, charge the system. (See Contents Page 80-01.)

Open the cab door and windows.

Run the blower at maximum speed.

Run the compressor for at least 20 minutes at 800-1200 RPM.

Remove the compressor from the loader. (See Contents Page 80-01.)

Figure 80-60-2

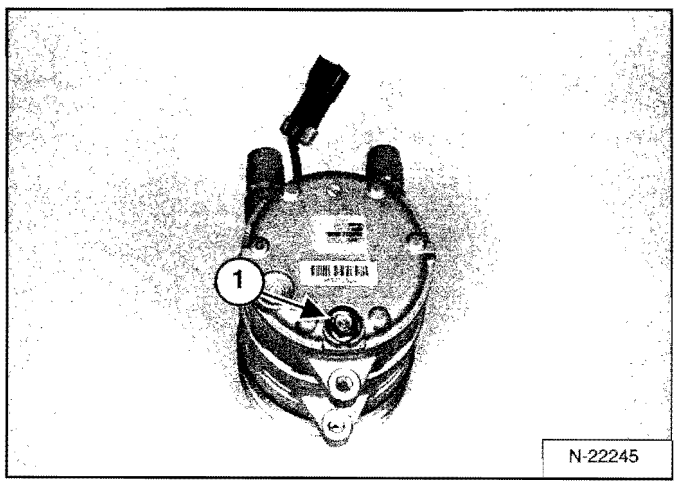
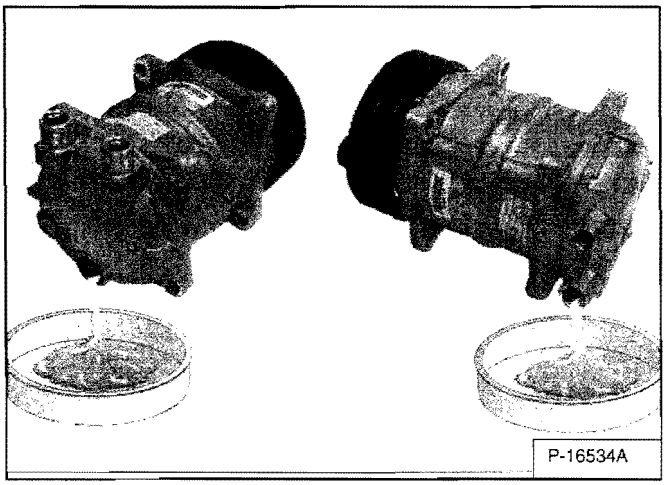


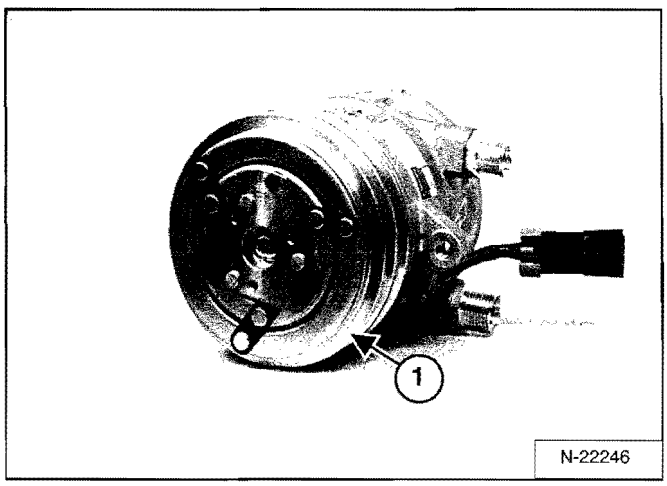
Figure 80-60-3



Remove the oil drain plug (Item 1) **[Figure 80-60-2]** and drain the oil through the connectors and the oil drain hole **[Figure 80-60-3]**.

Installation: Tighten the oil drain plug to 9.4-10.8 ft.-lbs. (13-15 Nm) torque.

Figure 80-60-4



NOTE: After draining the oil through the drain hole and the connectors, extract the remaining oil through the discharge-side connector by rotating the drive pulley (Item 1) [Figure 80-60-4] several times by hand.

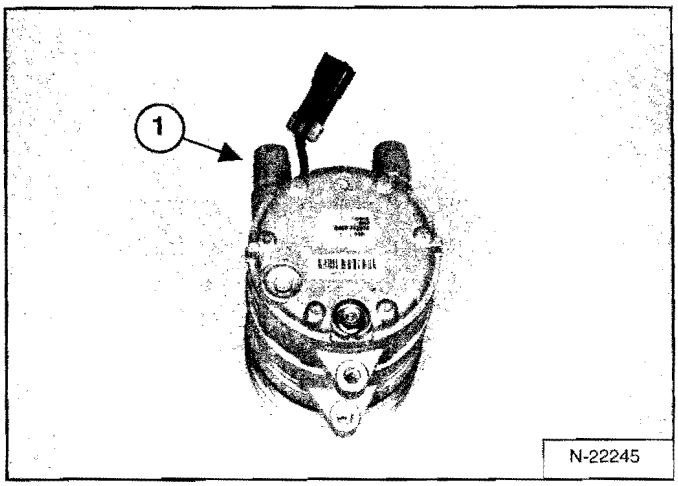
Measure the drained oil in a measuring cylinder.

Check the oil for contamination, dirt, metal shavings, or varnish color, discard the oil if contaminated.

NOTE: If metal shavings are found in the compressor oil, replace the complete compressor assembly.

Compressor Oil Check (Cont'd)

Figure 80-60-5



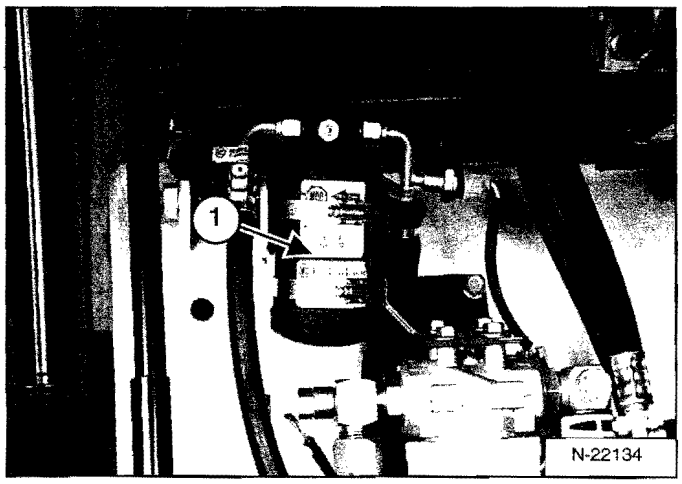
Add new compressor oil through the suction side connector (Item 1) **[Figure 80-60-5]**.

Installation: **Add 150 -170 cc's of PAG oil.**

NOTE: The suction port on the compressor is marked with an S and is the larger port on the compressor.

Component Replacement And Refrigeration Leaks

Figure 80-60-6



Whenever the A/C system is opened to the atmosphere or there has been a leak in the system, the receiver/drier (Item 1) **[Figure 80-60-6]** must be changed.

Never leave hose fittings, compressor fittings or components uncapped while working on the A/C system.

Bobcat®

Blower motor does not operate

Possible Cause	Inspection	Solution
1. Blown fuse.	Inspect the fuse/wiring.	Replace fuse/repair wiring.
2. Broken wiring or bad connection.	Check the fan motor ground and connectors.	Repair the wiring or connector.
3. Fan motor malfunction.	Check the lead wires form the motor with a circuit tester.	Replace Motor.
4. Resistor malfunction.	Check resistor using a circuit tester.	Replace Resistor.
5. Fan motor switch malfunction.	Check power into and out of the fan switch.	Replace Fan Switch.

Blower motor operates normally, but air flow is insufficient

Possible Cause	Inspection	Solution
1. Evaporator inlet obstruction.	Check evaporator for plugging.	Remove obstruction and clean evaporator fins with air or water.
2. Air leak.	Check to make sure air hoses are properly hooked to Louvers, and air ducts.	Repair of adjust.
3. Defective thermo. switch (frozen evaporator).	Check thermostat using a circuit tester.	Replace thermostat.
4. Plugged cab filters	Check cab filter condition.	Clean or replace filters.

Insufficient cooling although air flow and compressor operation are normal

Possible Cause	Inspection	Solution
1. System low on refrigerant.	The high side pressure will be low and bubbles may be present in sight glass on receive drier.	Repair any leaks and recharge the refrigerant to the correct level.
2. Excessive refrigerant.	The high pressure side pressure will be high.	Use refrigerant recovery equipment to capture excess refrigerant. Charge to the correct refrigerant level.

The compressor does not operate at all, or operates improperly

Possible Cause	Inspection	Solution
1. Loose drive belt.	The belt is vibrating or oscillating.	Adjust tension.
2. Internal compressor malfunction.	The compressor is locked up and the belt slips.	Replace compressor.
	Magnetic clutch related	
3. Low battery voltage.	Clutch slips.	Recharge the battery.
4. Faulty coil.	Clutch slips.	Replace the magnetic clutch.
5. Oil on the clutch surface.	Clutch slips.	Replace or clean the clutch surface.
6. Open oil.	Clutch does not engage and there is no reading when a circuit tester is connected between the coil and terminals.	Replace clutch.
7. Broken wiring or poor ground.	Clutch will not engage. Inspect the ground and connections.	Repair.
8. Wiring harness components.	Test the conductance of the pressure switch, thermostat, Relay, etc.	Check operation.

SYSTEM TROUBLESHOOTING CHART (CONT'D)

Gauge Pressure Related Troubleshooting

Normal compressor suction (low side) and discharge (high side) pressure at ambient temperatures of 86-96 degrees F (30-38 degrees C) and compressor speed of approximately 2000 RPM are:

High pressure side pressure: 210-265 PSI

Low pressure side pressure: 15-33 PSI

As a rule of thumb the high side pressure will be around eight times greater then the low side pressure.

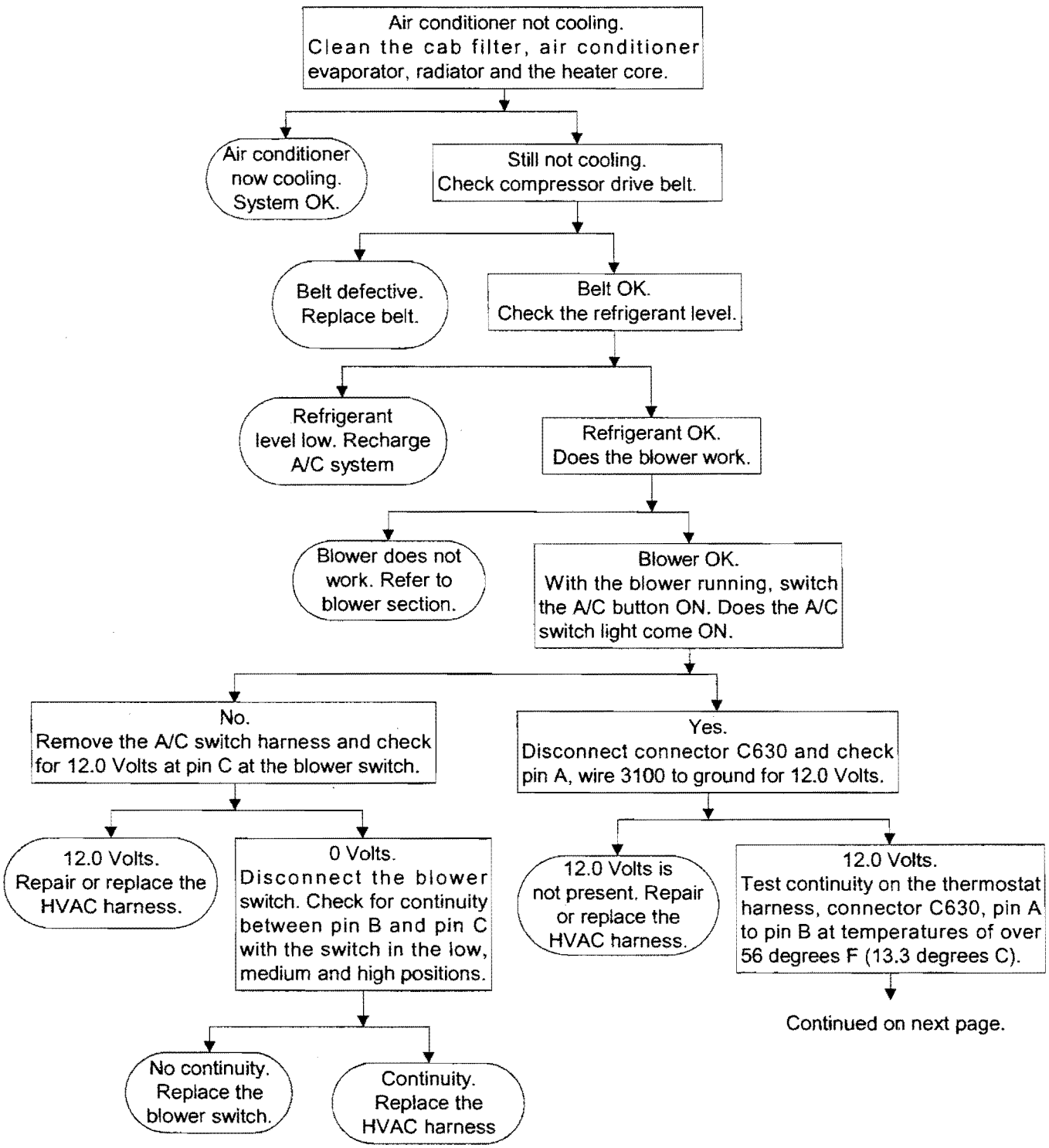
Possible Cause	Inspection	Solution
Low pressure side Too high.	The low pressure side pressure normally becomes too high when the high pressure side pressure is too high. As this is explained below, the following inspection is only used when the low pressure side is too high.	
1. Expansion valve opens too far.	Frost is present on the suction hose.	Replace expansion valve.
2. Dective compressor.	The high and low pressure side gauge pressures equalize when the magnetic clutch is engaged.	Replace compressor.
Low pressure side Too low.		
1. Low refrigerant charge.	The high side pressure will be low and bubbles may be present in sight glass on receive drier.	Repair any leaks and recharge the refrigerant to the correct level.
2. Clogged or closed expansion valve.	The expansion valve's inlet side is frosted. Moisture or other Contaminants can be the cause.	Clean or replace the expansion Valve.
3. Restriction between drier and expansion valve.	Frost on the line between drier and expansion valve. A Negative low pressure reading may be shown.	Flush system or replace hose.
4. Thermostat malfunction.	The evaportator is frozen.	Adjust themostat's temperature setting or probe placement or replace thermostat.
5. Restriction in reciever drier.	Excessive frost on reciever drier.	Replace reciever drier.
High pressure side Too high.		
1. Poor condenser performance.	Dirty or clogged condenser fins. Condenser fans not Operating.	Clean fins, and/or repair the fan.
2. Excessive refrigerant.	The high pressure side pressure will be high.	Use refrigerant recovery equipment to capture excess refrigerant. Charge to the correct refrigerant level.
3. Excessive oil charge.	The high pressure side will be high.	Evacuate system. Remove oil from condenser and compressor. Measure oil from compressor and add correct oil charge back into compressor. Flush system with nitrogen. Replace drier.
4. Air in system.	Pressure is high on both high and low sides.	Evacuate and recharge with Refrigerant.
5. Restriction in drier, condenser or high pressure line.	High pressure side will be high, and low pressure side will be low.	Evacuate and flush system replacing defective parts.

Gauge Pressure Related Troubleshooting (Cont'd)

Possible Cause	Inspection	Solution
High pressure side Too low.		
1. Low refirgerant charge.	The high side pressure will be low and bubbles may be present in sight glass on receive drier.	Repair any leaks and recharge the refrigerant to the correct level.
System pressures Equal		
1. Clutch not operating.	See magnetic clutch related topics above.	
2. Compressor not pumping.	Equal high and low pressures.	Replace compressor.

Troubleshooting Tree

Air Conditioning



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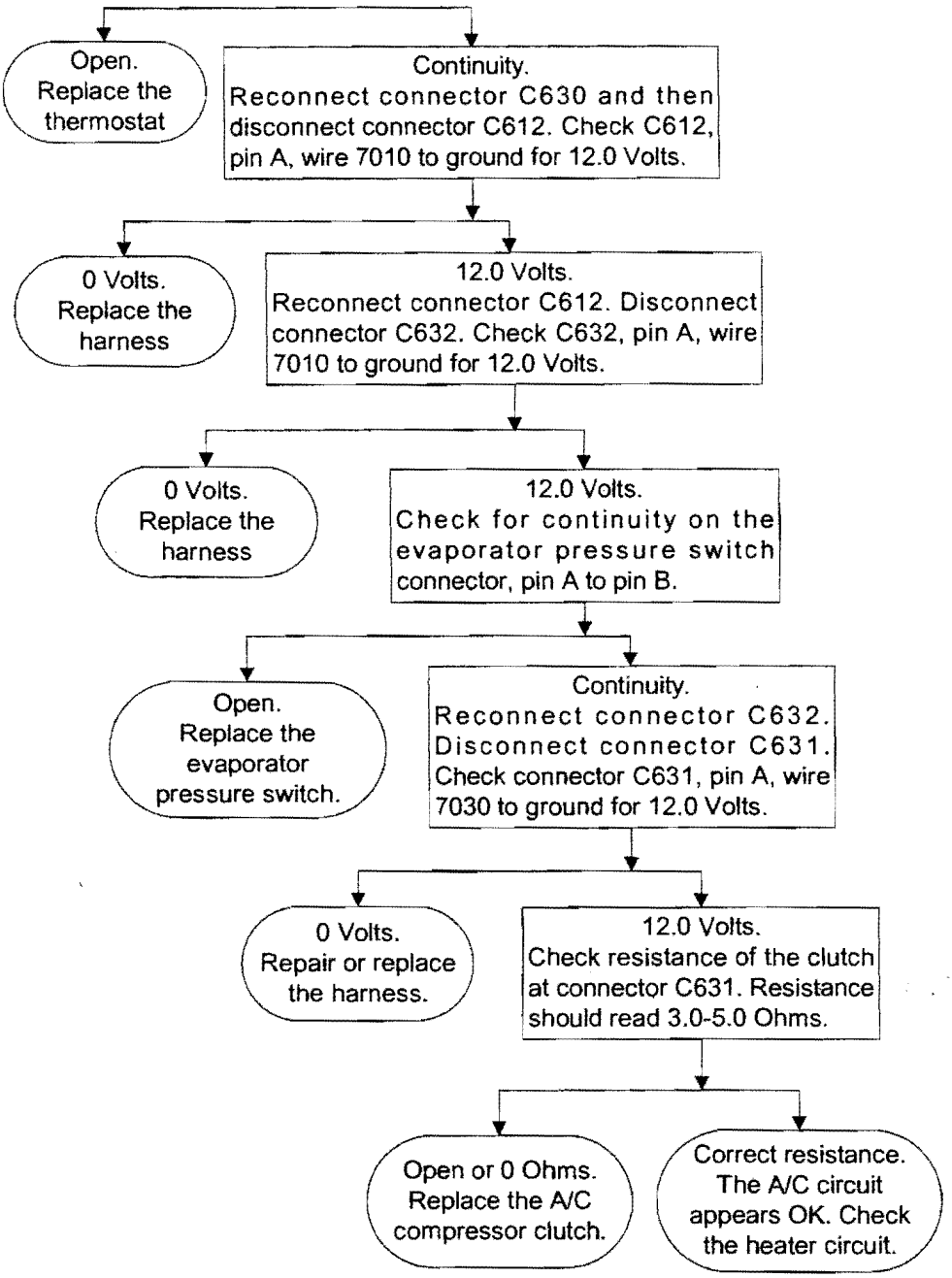
B-21491

Troubleshooting Tree (Cont'd)

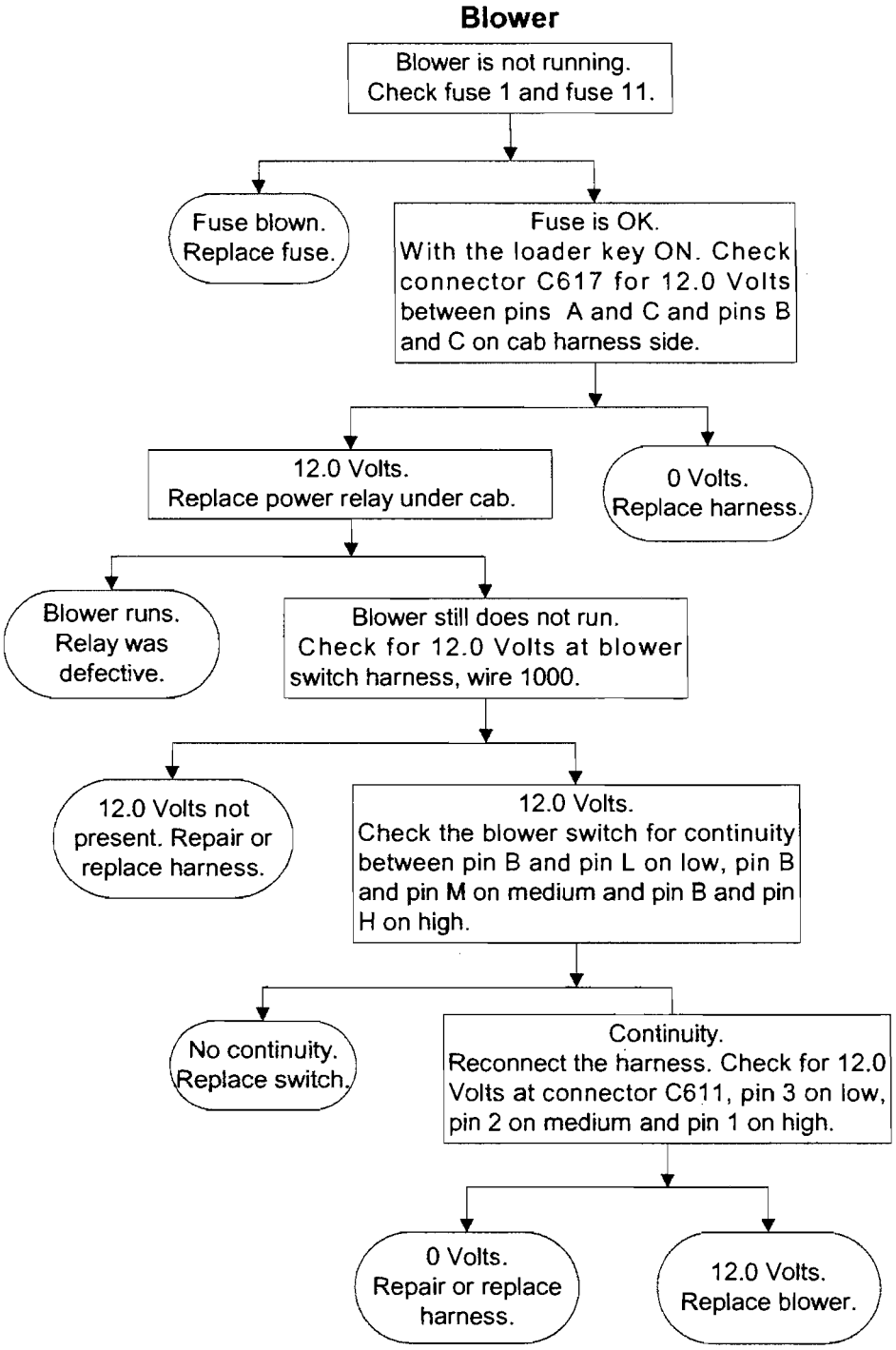
Air Conditioning

Continued on previous page.



B-21491A

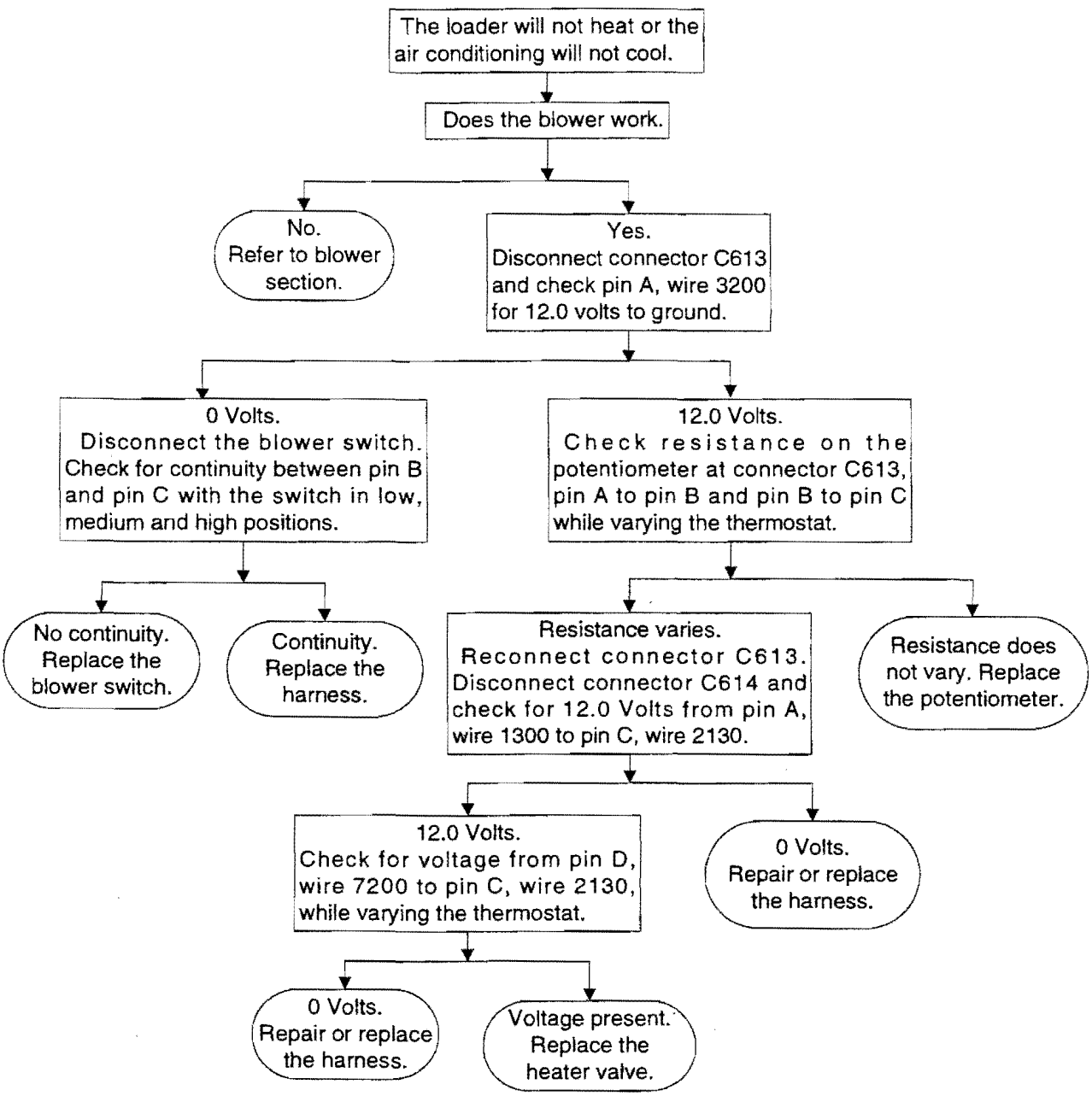
Troubleshooting Tree (Cont'd)



B-21492

Troubleshooting Tree (Cont'd)

Heater Valve



B-21493

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TEMPERATURE/PRESSURE

Chart

NORMAL EVAPORATOR RANGE	
TEMP F.	PSIG
16	15.69
18	17.04
20	18.43
22	19.87
24	21.35
26	22.88
28	24.47
30	26.10
32	27.79
34	29.52
36	31.32
38	33.17
40	35.07
42	37.03
44	39.05
45	40.09
50	45.48
55	51.27
60	57.47
65	64.10
70	71.19
75	78.75
80	86.80
85	95.40
90	104.40
91	106.30
92	108.20

NORMAL CONDENSER RANGE	
TEMP F.	PSIG
93	110.20
94	112.10
95	114.10
100	124.30
102	128.50
104	132.90
106	137.30
108	141.90
110	146.50
112	151.30
114	156.10
116	161.10
118	166.10
120	171.30
122	176.60
124	182.00
126	187.50
128	193.10
130	198.90
135	213.70
140	229.40
145	245.80
150	263.00
155	281.10
160	300.10
165	320.10
170	340.80

TEMPERATURE/PRESSURE (CONT'D)

Chart (Cont'd)

Evaporator

Pressures represent gas temperatures inside the coil. not the coil surface. For an estimate of the temperature of the air coming off the coil add 8-10 degrees F. to the temperature on the chart.

Condenser

Temperatures are not ambient temperatures but condensing temperatures. Add 40 degrees F. to the ambient temperature to get the condensing temperature and then refer to the pressure chart to see appropriate pressure for ambient temperature.

Example: Ambient Temperature=90 degrees F.
90 degrees F.
+40 degrees F.
130 degrees F. condenser temperature=200 psig

Conditions and pressures will vary from system to system. Check with MCC for system specifications.

Chart

Service Company/Phone Number:			
Date:			
Machine Model:		Machine Dealer:	
Machine Serial Number:		Customer:	
Machine Hours:			
Pre Service Conditions	15 Minutes	30 Minutes	Notes
Ambient Temperature:			
Louver Temperature:			
Cab Temperature At Head Position:			
Temperature Into Condenser:			
High Side Pressure			
Low Side Pressure			
Ambient Humidity			
Observations:			
Explain Services Required:			
Post Service Conditions	15 Minutes	30 Minutes	Notes
Ambient Temperature:			
Louver Temperature:			
Cab Temperature:			
Temperature Into Condenser:			
High Side Pressure			
Low Side Pressure			
Ambient Humidity			
Observations:			

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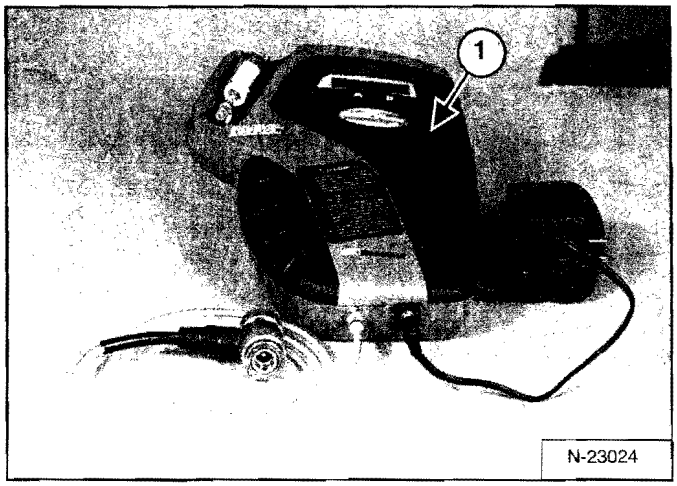
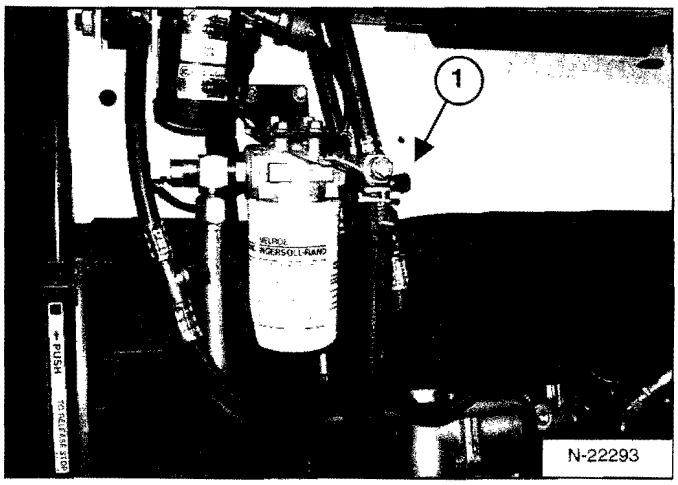
Reclamation Procedure

Figure 80-100-1



NOTE: Before reclaiming a refrigeration system, it is recommended to identify the type of refrigerant that is in the A/C system and if it is pure enough to use. The tool MEL1592, Refrigerant Identifier (Item 1) [Figure 80-100-1] will determine, the kind of refrigerant and any possible harmful or dangerous substances that may be present in the system. Thus preventing mixing of dangerous material with your reclaimed R-134a in your reclaimer, and further contamination to other A/C systems that are reclaimed and charged from your MEL1581 Recovery/Recycling/Recharging Machine.

Figure 80-100-2



Remove the protective cap (Item 1) **[Figure 80-100-2]** from the low pressure hose.

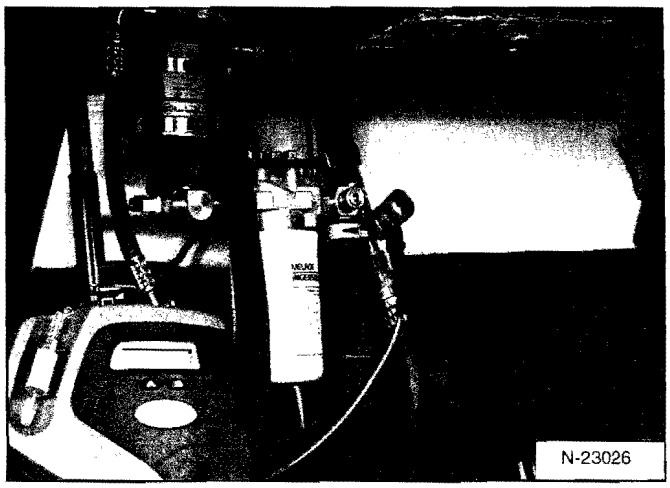
⚠ WARNING

In the event of a leakage, wear safety goggles. Escaping refrigerant can cause severe injuries to eyes. In contact with a flame, R134a refrigerant gives a toxic gas.

W-2371-0500

NOTE: This test is run with the loader engine OFF, and the A/C switch in the OFF position.

Figure 80-100-3



Connect the Refrigerant Identifier to the low pressure hose **[Figure 80-100-3]**.

Connect the Refrigerant Identifier to its power source.

Follow the steps displayed on the refrigerant identifier screen.

Allow two minutes for the refrigerant identifier to display the type of refrigerant and air content. An alarm will sound if potentially flammable hydrocarbons are present and will also indicate on the visual display.

Disconnect the refrigerant identifier from the loader A/C.

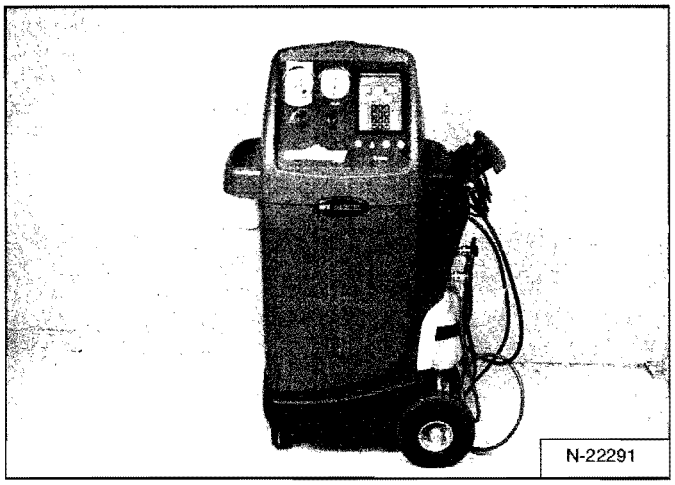
If the refrigerant is dangerous or flammable, it must be evacuated from the A/C system into a separate container and properly and safely disposed of.

If R134a is found , evacuate the system.

Reclamation Procedure (Cont'd)

NOTE: Only A/C trained technicians should perform the reclaiming and recharging procedure.

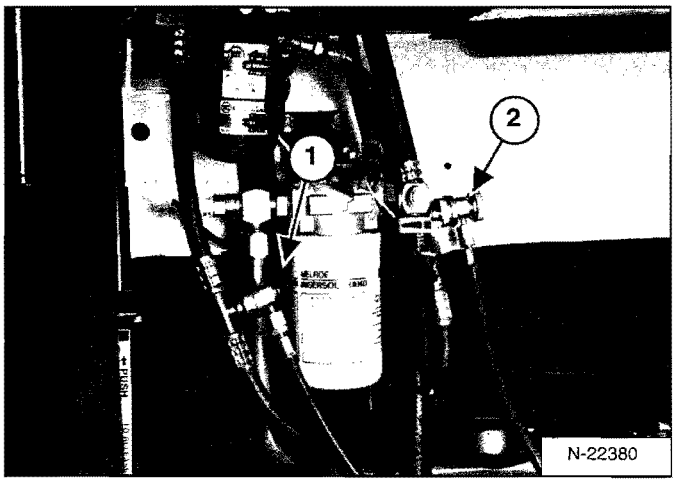
Figure 80-100-4



Use an approved recovery/charging unit **[Figure 80-100-4]** to evacuate the system.

Connect the reclaimer to the loader A/C charge ports.

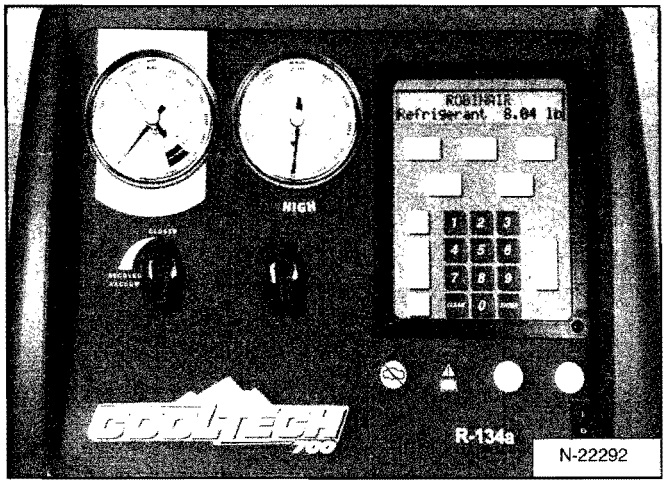
Figure 80-100-5



Connect the Red hose (Item 1) **[Figure 80-100-5]** to the high pressure port and open the valve.

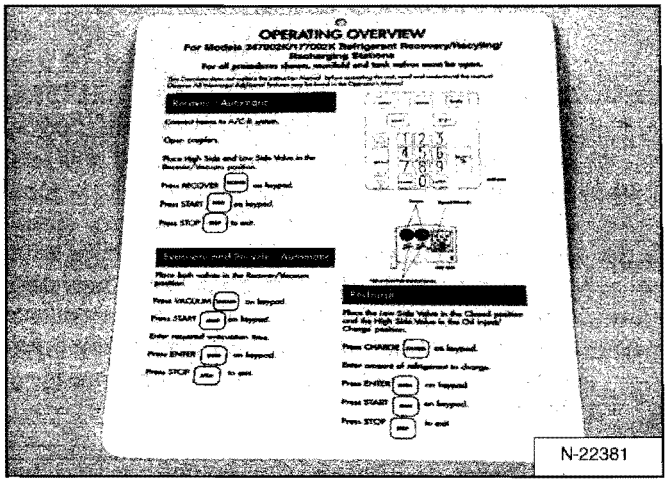
Connect the Blue hose (Item 2) **[Figure 80-100-5]** to the low pressure port and open the valve.

Figure 80-100-6



Turn the reclaimer unit **[Figure 80-100-6]** to the ON position and follow the on screen instructions.

Figure 80-100-7



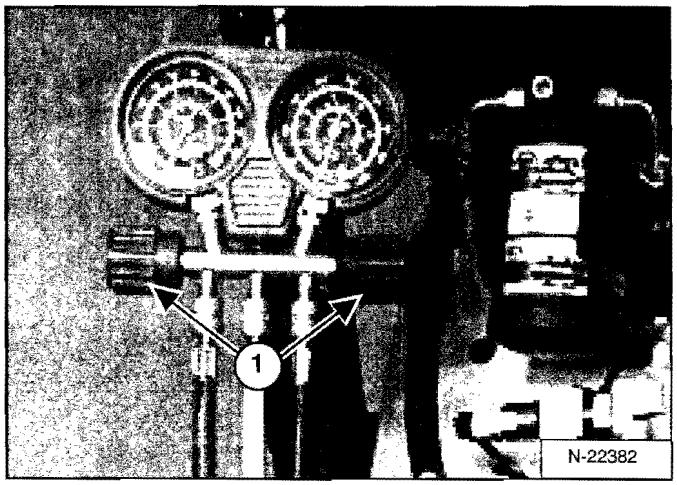
NOTE: The reclaimer unit, has a complete step by step set of instructions [Figure 80-100-7] to follow for reclimation and recharging of the A/C system. A trained technician should follow these instructions as they may very slightly depending on the model and brand of reclaimer used.

Charging Procedure With A Manifold Gauge Set

Raise the loader 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 80-100-8

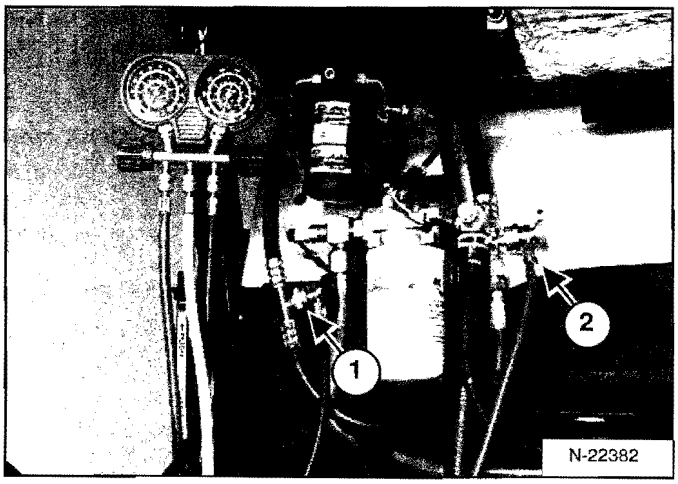


Check to see that the hand valves (Item 1) **[Figure 80-100-8]** are closed on the manifold gauge set.

If there is any refrigerant in the A/C system, it must be recovered by an approved A/C reclamation procedure. (See Contents Page 80-01.)

Connect the gauges to the loader A/C charge ports.

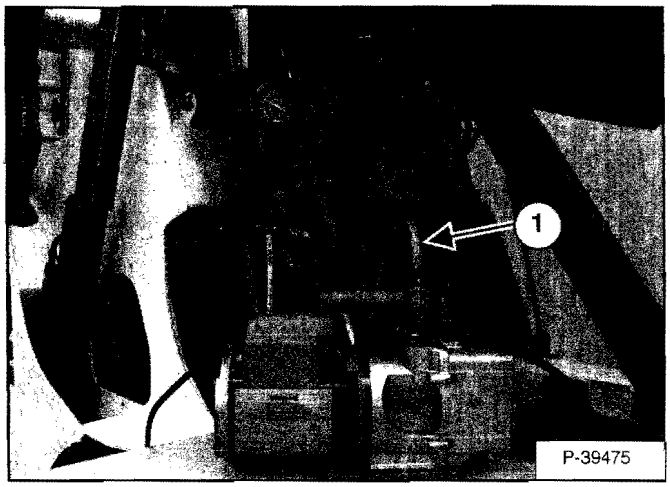
Figure 80-100-9



Connect the Red hose (Item 1) **[Figure 80-100-9]** to the high pressure port and open the valve.

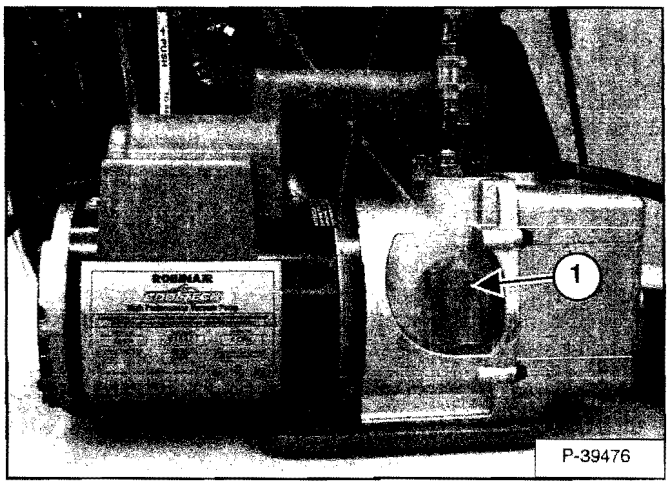
Connect the Blue hose (Item 2) **[Figure 80-100-9]** to the low pressure port and open the valve.

Figure 80-100-10



Connect the Yellow hose (Item 1) **[Figure 80-100-10]** to the vacuum pump.

Figure 80-100-11



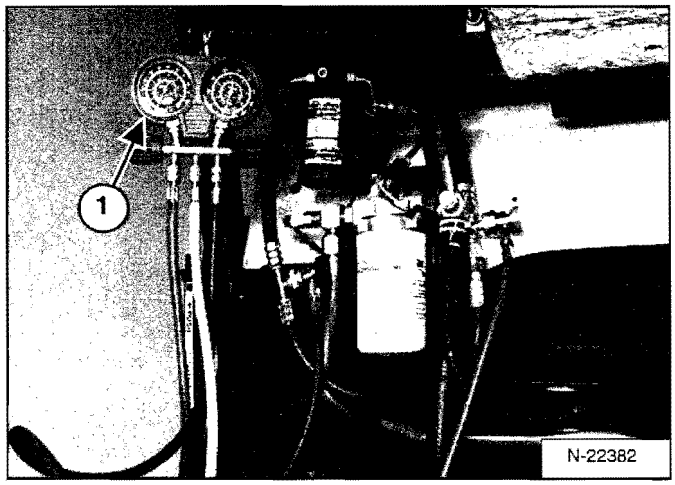
Start the vacuum pump and open Iso-valve (Item 1) **[Figure 80-100-11]** on the vacuum pump.

Run the vacuum pump for at least 5-10 minutes to insure that a vacuum has been pulled on the system.

Close the Iso-valve (Item 1) **[Figure 80-100-11]** (which isolates the vacuum pump from the A/C system) and turn OFF the vacuum pump.

Charging Procedure

Figure 80-100-12

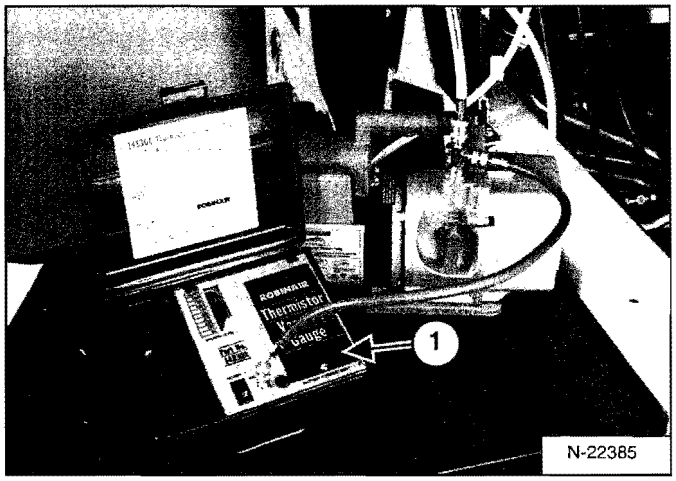


Note vacuum pressure indicated on the low pressure (Blue) gauge (Item 1) **[Figure 80-100-12]**. Let stand for 5-10 min. and recheck the pressure for changes.

If the pressure drops, this may be an indication of a leak in the A/C system.

Determine the problem with the A/C system and repair it.

Figure 80-100-13



A thermistor vacuum gauge (Item 1) **[Figure 80-100-13]** may be necessary to use to determine the critical vacuum level during evacuation. It is a solid state instrument that constantly monitors and visually indicates the vacuum level.

The thermistor vacuum gauge is used with the vacuum pump **[Figure 80-100-13]**.

Start the vacuum pump and open Iso-valve on the vacuum pump.

Be sure that both hand valves, and both charge port valves are open.

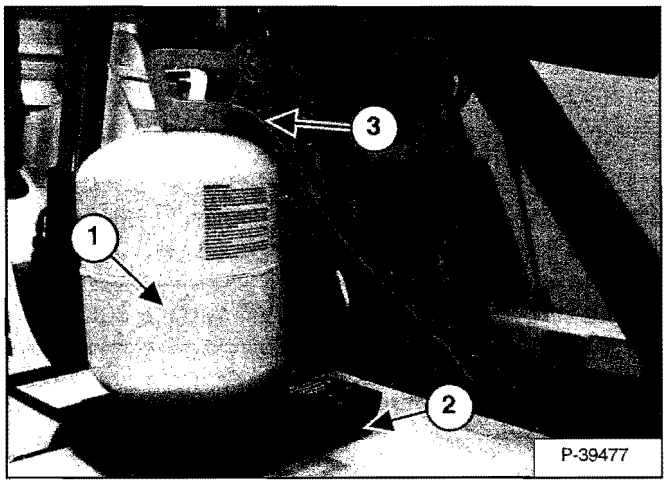
Run the vacuum pump for at least 45 minutes to insure that all the moisture is boiled out of the system.

Stop the vacuum pump and close the Iso-valve on the vacuum pump.

Close both hand valves on the manifold gauge set and remove the yellow hose from the vacuum pump that goes to the manifold gauge set.

Remove the vacuum pump and thermister vacuum gauge.

Figure 80-100-14

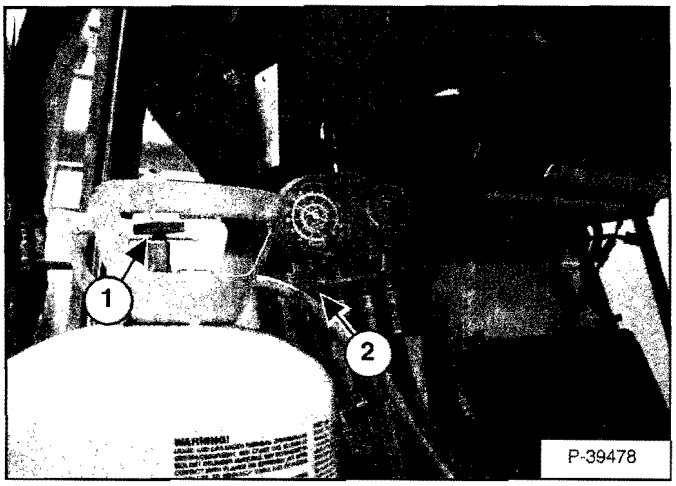


Place a refrigerant container with R134a (Item 1) on a charging scale (Item 2) **[Figure 80-100-14]** and zero out the scale.

Connect the yellow hose (Item 3) **[Figure 80-100-14]** from the manifold gauge set to the valve on the refrigerant tank.

Charging Procedure (Cont'd)

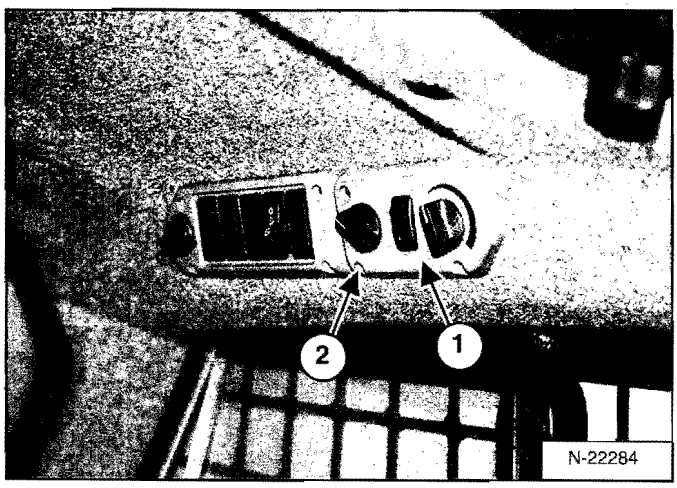
Figure 80-100-15



Open the valve on the refrigerant container (Item 1) and open the low pressure hand valve (Blue) (Item 2) **[Figure 80-100-15]** on the manifold gauge set. Allow the vacuum to pull in the refrigerant until the pressure stabilizes.

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

Figure 80-100-16



Press the A/C (Item 1) **[Figure 80-100-16]** switch to ON position.

Turn blower switch (Item 2) **[Figure 80-100-16]** to HIGH position.

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

Start loader engine, with the remote start switch, and run at medium speed.

Watch the scale and run system until the predetermined amount of refrigerant is added to the A/C system.

The A/C system holds 2.0 lbs. (0.91 kg) of refrigerant.

Turn OFF the valve on the refrigerant container, and hand valves on the manifold gauge set.

Turn OFF the engine, and remove the A/C charging equipment from the loader.

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

Bobcat®

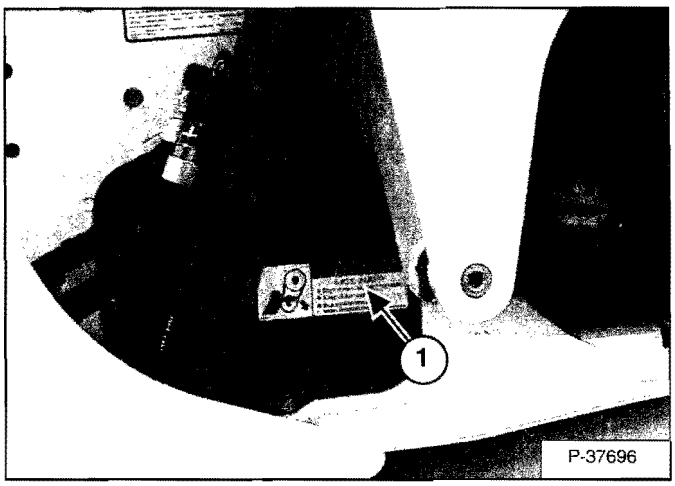
COMPRESSOR

Removal And Installation

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

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

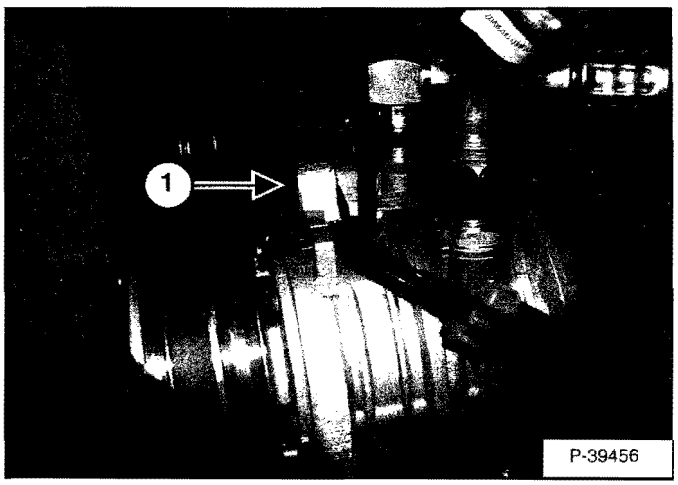
Figure 80-110-1



At the right side of the loader, remove the access cover (Item 1) **[Figure 80-110-1]**.

Evacuate the A/C system. (See Contents Page 80-01.)

Figure 80-110-2



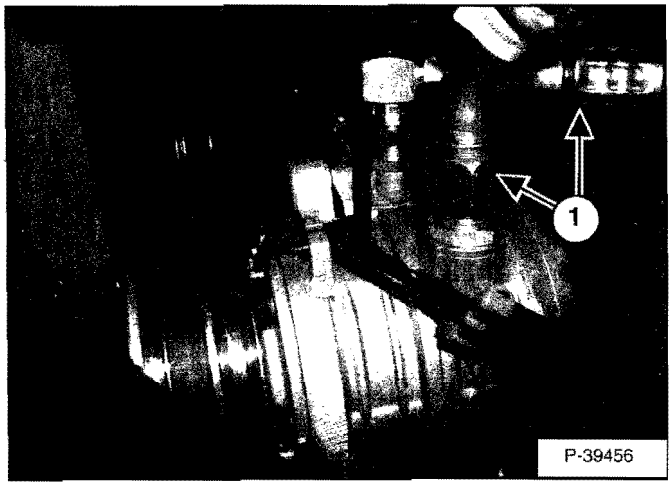
Remove the compressor adjustment bolt (Item 1) **[Figure 80-110-2]**.

Installation: Tighten the compressor adjustment bolt to 34 ft.-lbs. (46 Nm) torque.

Remove the compressor belt.

Mark the compressor hoses for proper installation.

Figure 80-110-3

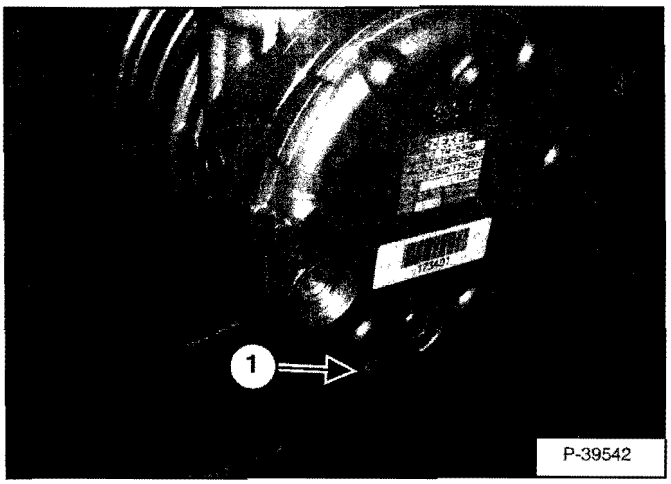


Remove the compressor hoses (Item 1) **[Figure 80-110-3]** from the compressor.

Installation: Tighten the compressor hoses to 22 ft.-lbs. (29,8 Nm) torque.

Cap and plug the compressor hoses and the fittings with with the proper A/C caps and plugs.

Figure 80-110-4

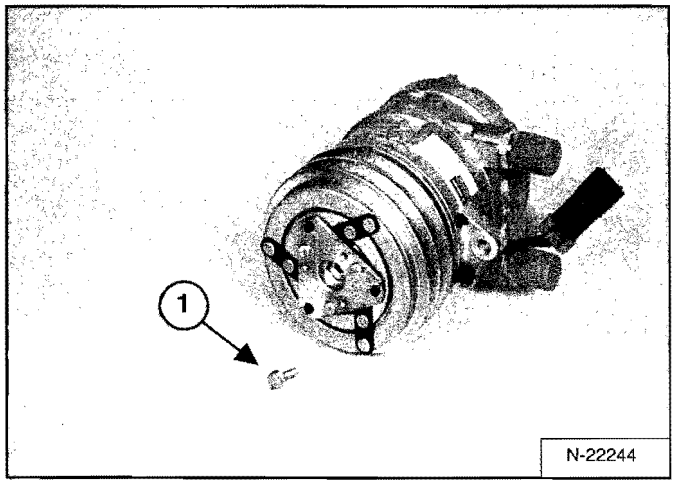


Remove the compressor mount bolt (Item 1) **[Figure 80-110-4]**.

Remove the compressor from the loader.

Compressor Clutch Disassembly

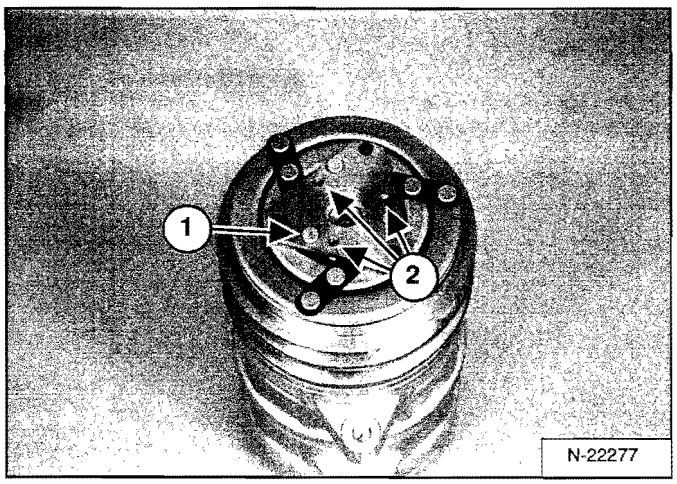
Figure 80-110-5



Remove the center armature bolt (Item 1) **[Figure 80-110-5]**.

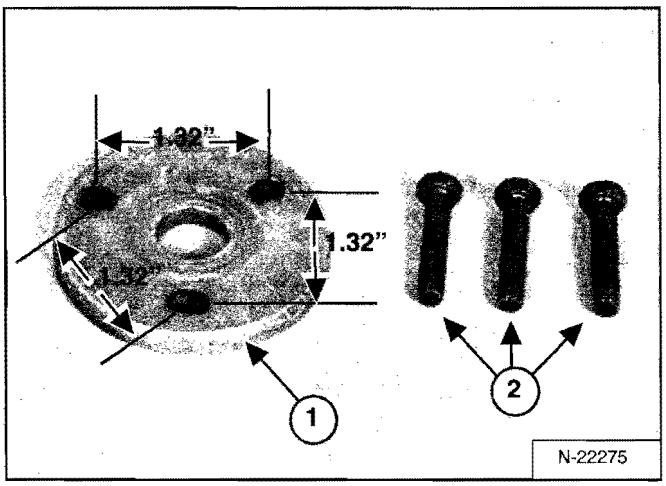
Installation: Tighten the armature bolt to 8-10 ft.-lbs. (12-14 Nm) torque.

Figure 80-110-6



To remove the armature plate (Item 1) **[Figure 80-110-6]** from the clutch face, you must make an armature plate puller.

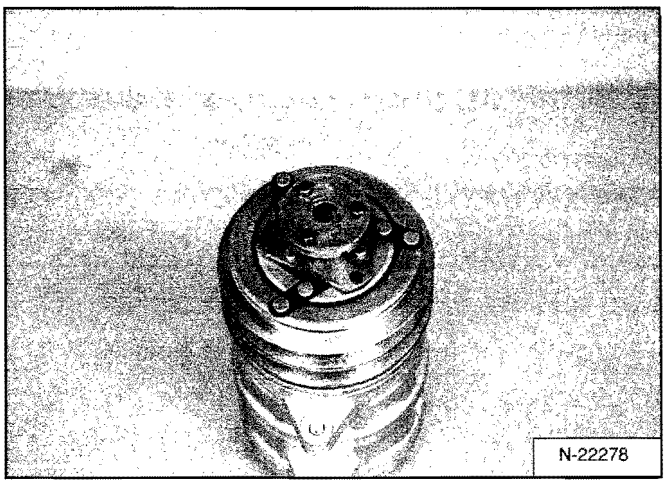
Figure 80-110-7



The armature plate puller, (Item 1) **[Figure 80-110-7]** can be constructed by drilling three 10 mm holes in a flat circular plate, located 1.32 inches apart **[Figure 80-110-7]**.

Attach the puller to the armature plate using three 8 mm bolts (Item 2) **[Figure 80-110-7]**.

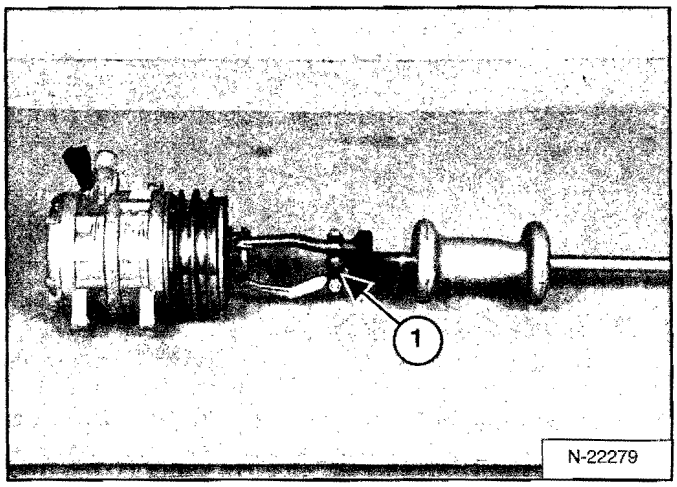
Figure 80-110-8



Turn the bolts into the three 8 mm holes (Item 2) **[Figure 80-110-6]** on the armature plate as shown in **[Figure 80-110-8]**.

Compressor Clutch Disassembly (Cont'd)

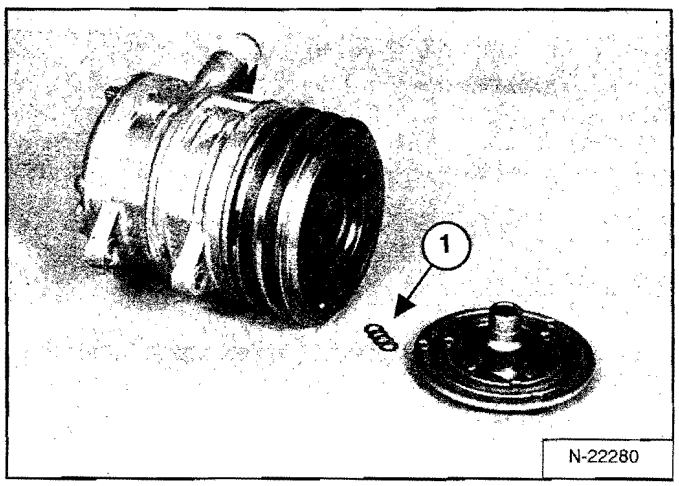
Figure 80-110-9



Attach a slide hammer puller (Item 1) **[Figure 80-110-9]** to the armature puller disk.

Remove the armature plate from the compressor clutch.

Figure 80-110-10

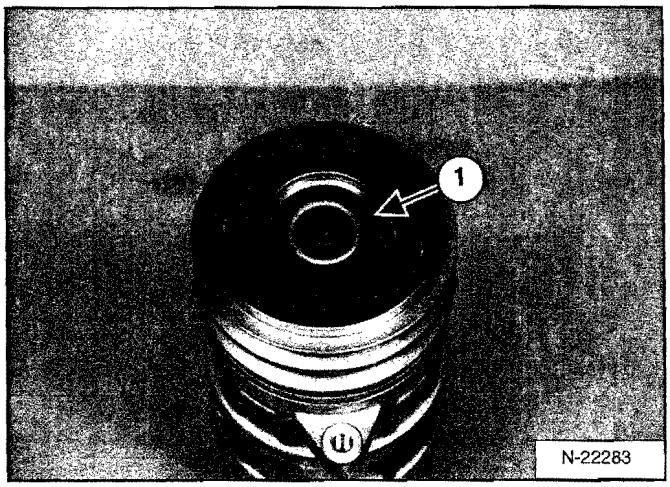


Remove the shims (Item 1) **[Figure 80-110-10]** from either the armature shaft or armature plate.

Installation: Insure that the clutch has the correct clearance by adding the shims (Item 1) **[Figure 80-110-10]**.

The specified clearance for the clutch is 0.01-0.02 in. (0.3-0.6 mm). Adjusting shims are available in the following thicknesses:
0.0039 in. (0.1 mm)
0.0118 in. (0.3 mm)
0.0197 in. (0.5 mm)

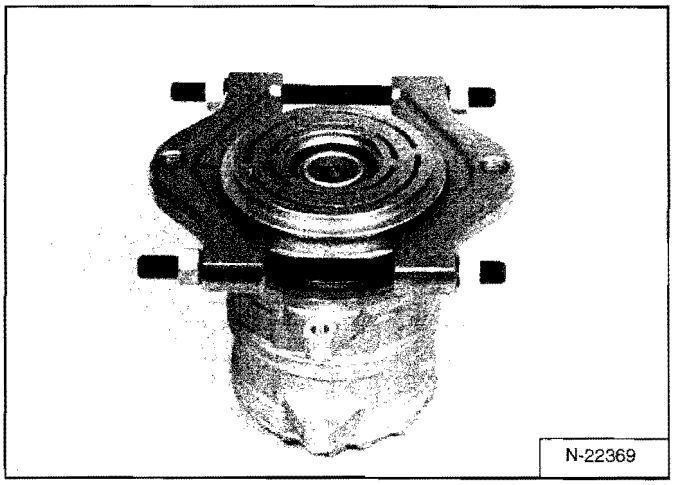
Figure 80-110-11



Remove the snap ring (Item 1) **[Figure 80-110-11]** from the pulley assembly.

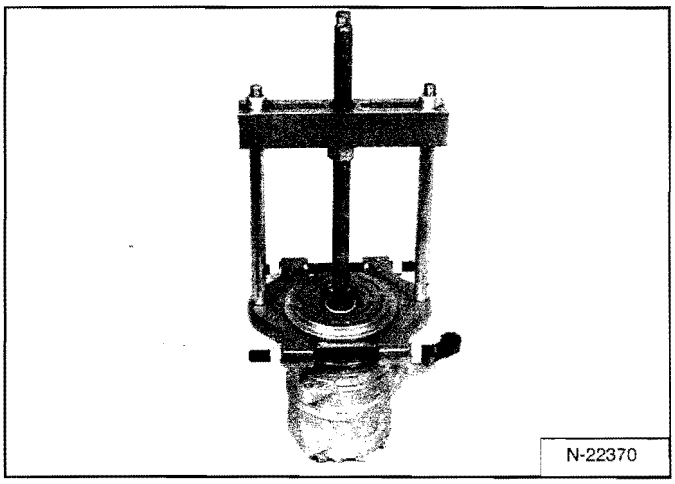
Compressor Clutch Disassembly (Cont'd)

Figure 80-110-12



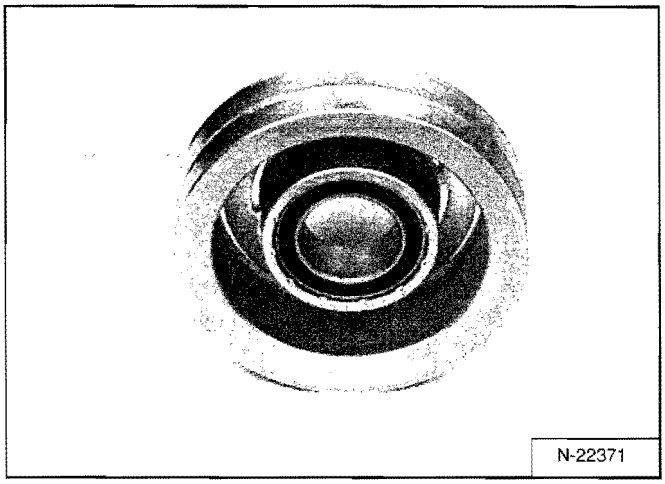
Install the pulley puller tool **MEL 1595** on the compressor pulley **[Figure 80-110-12]**.

Figure 80-110-13



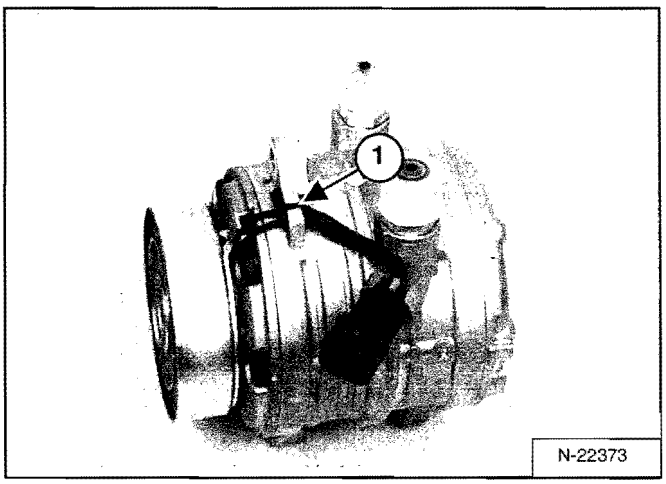
Remove the pulley from the compressor **[Figure 80-110-13]**.

Figure 80-110-14



The pulley assembly and bearing **[Figure 80-110-14]** must be replace as a complete unit.

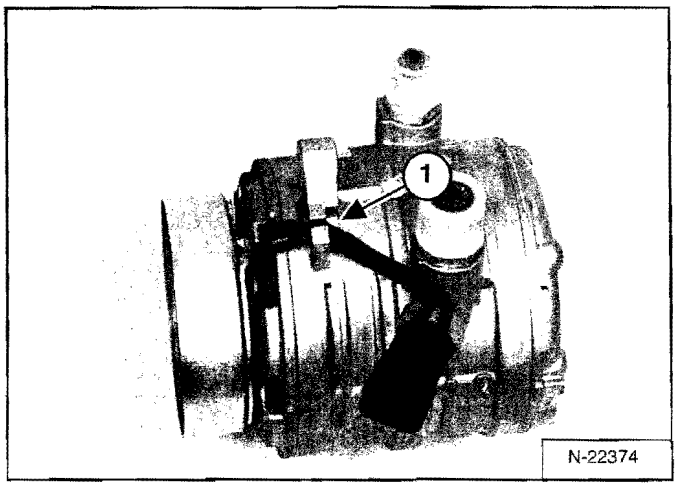
Figure 80-110-15



Slide the wire grommet (Item 1) **[Figure 80-110-15]** from the wire holder.

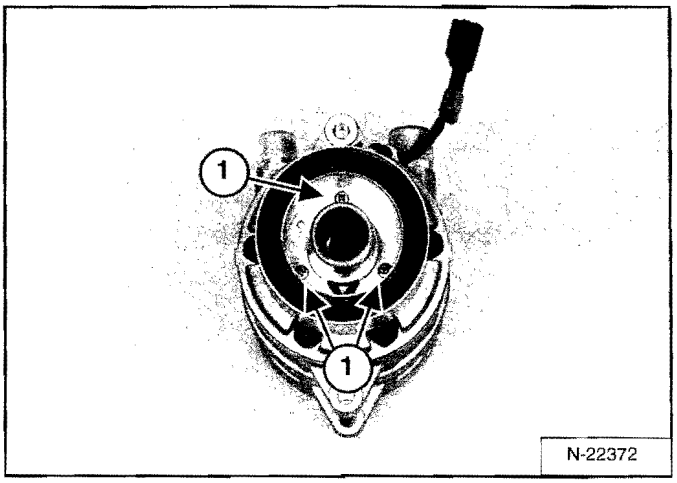
Compressor Clutch Disassembly (Cont'd)

Figure 80-110-16



Remove the coil lead wire (Item 1) **[Figure 80-110-16]** from the wire holder on the compressor.

Figure 80-110-17

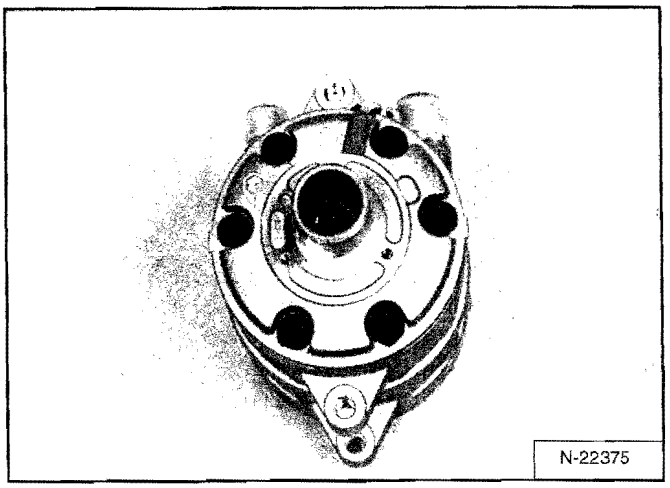


Remove the three coil mount bolts (Item 1) **[Figure 80-110-17]** from the compressor.

Installation: Tighten the mount bolts to 2.9-4.3 ft.-lbs. (4-6 Nm) torque.

Remove the coil from the compressor.

Figure 80-110-18



The compressor **[Figure 80-110-18]** must be replaced as a complete unit.

Bobcat®

CONDENSER

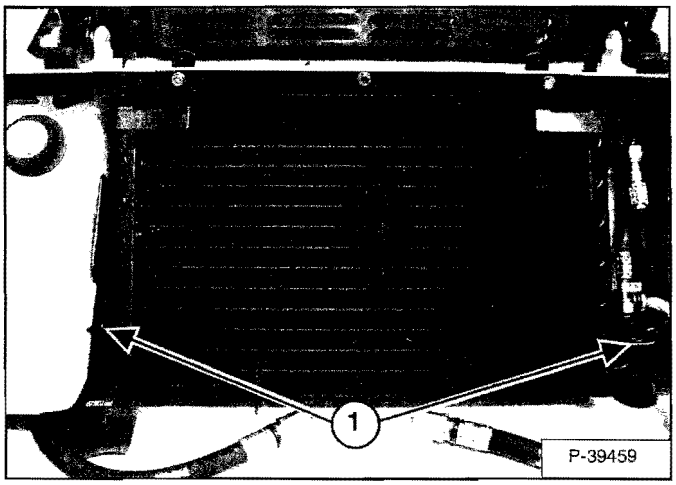
Removal And Installation

Remove the refrigerant from the A/C system. (See Contents Page 80-01.)

Open the rear door of the loader.

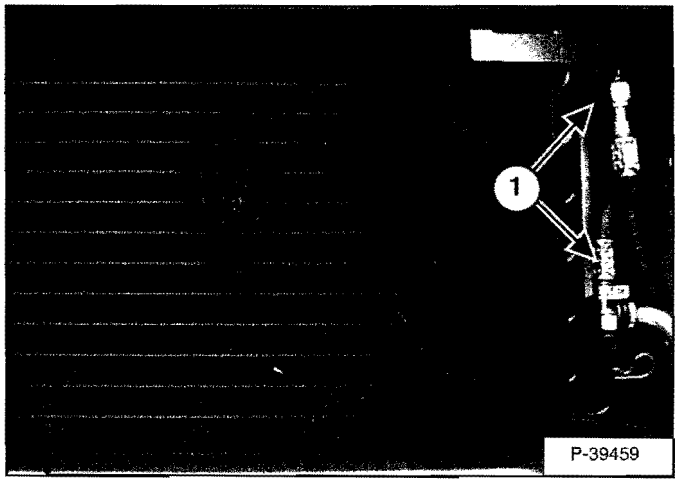
Remove the rear grill from the loader. (See Contents Page 50-01.)

Figure 80-120-1



Remove the two retaining clips (Item 1) **[Figure 80-120-1]** from the condenser mount bracket.

Figure 80-120-2

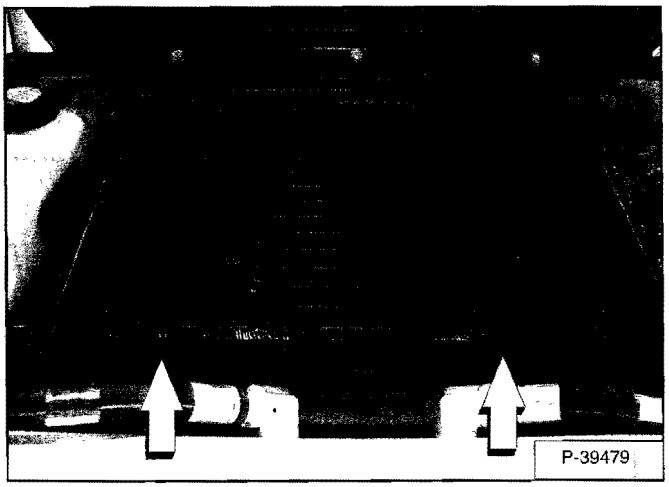


Mark the two A/C hoses (Item 1) **[Figure 80-120-2]** for proper installation.

Disconnect the two hoses from the condenser.

Cap and plug the hoses and the condenser fittings with the proper A/C caps and plugs.

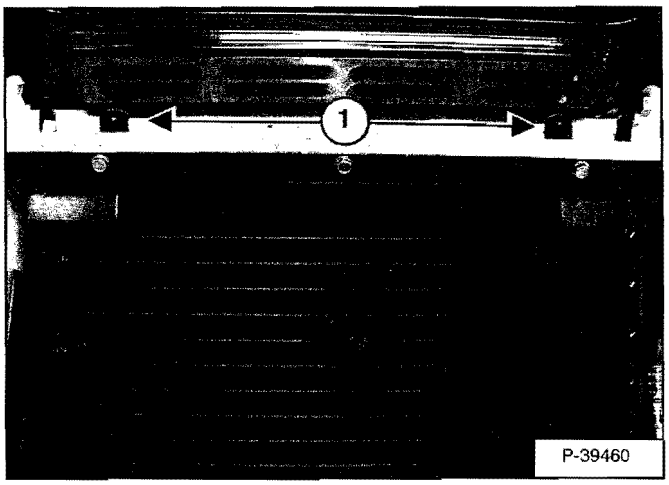
Figure 80-120-3



Lift the rear of the condenser, and pull toward the rear of the loader **[Figure 80-120-3]**.

Remove the condenser from the loader.

Figure 80-120-4



Installation: When installing the condenser, be sure the condenser tabs (Item 1) **[Figure 80-120-4]** are positioned in the slots in the loader frame.

Bobcat®

RECEIVER/DRIER

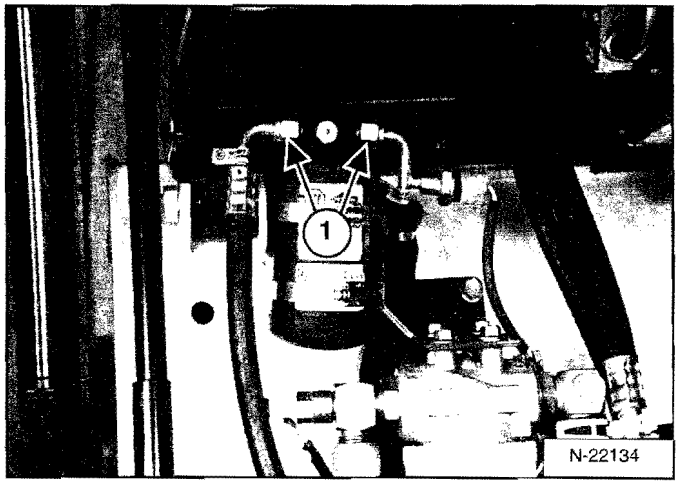
Removal And Installation

Raise the loader 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 refrigerant from the A/C system. (See Contents Page 80-01.)

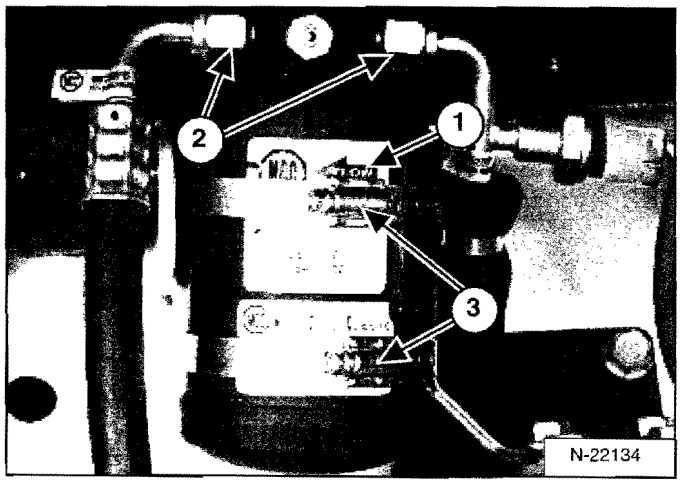
Figure 80-130-1



Mark the A/C hoses (Item 1) **[Figure 80-130-1]** for proper installation.

Both fittings on the drier are the same size, so the hoses can be hooked up incorrectly.

Figure 80-130-2



Note the flow direction on the drier (Item 1) **[Figure 80-130-2]** for proper installation.

Remove the two A/C hoses (Item 2) **[Figure 80-130-2]** from the receiver/drier.

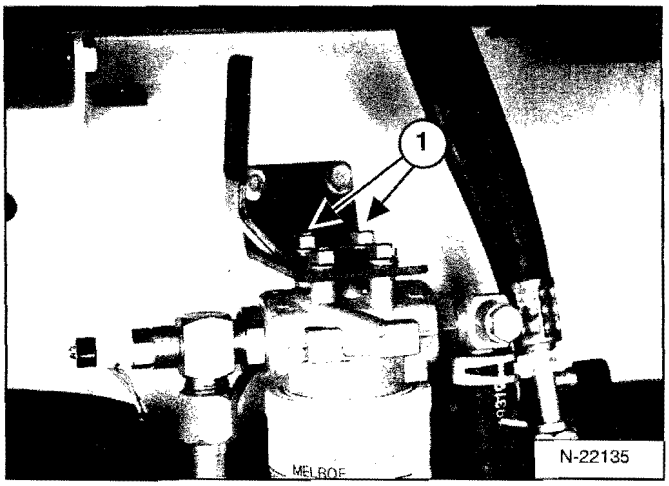
Cap and plug the hoses and the receiver/drier fittings with the proper A/C caps and plugs.

Loosen the hose clamps (Item 3) **[Figure 80-130-2]** that holds the receiver/drier to the mount.

Remove the receiver/drier from the loader.

NOTE: When replacing a receiver/drier in an A/C system 1 fl. oz. (30 cc) of PAG oil must be added to the system when recharging.

Figure 80-130-3



Remove the two mount bolts (Item 1) **[Figure 80-130-3]** from the receiver/drier mount bracket.

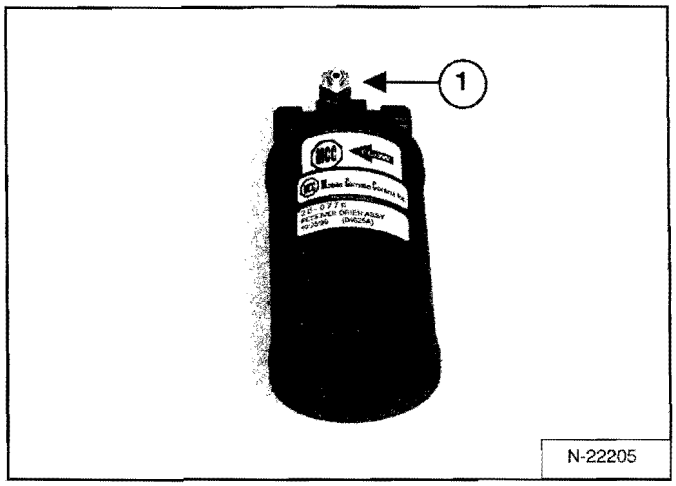
Remove the bracket from the top of the hydraulic filter bracket.

Bobcat®

PRESSURE RELIEF VALVE

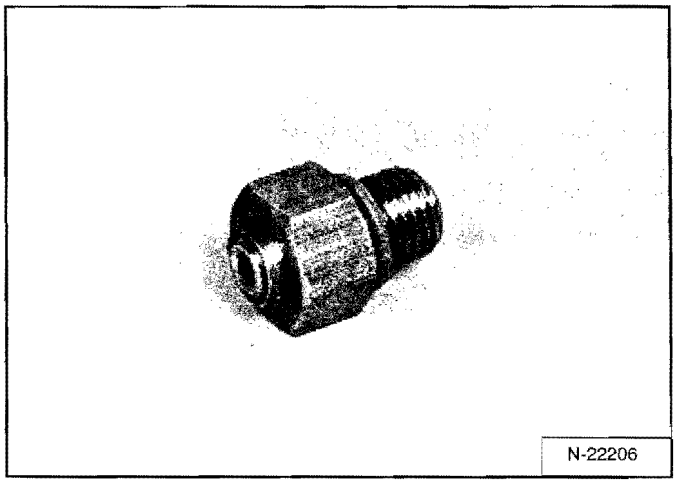
Removal And Installation

Figure 80-140-1



The pressure relief valve (Item 1) **[Figure 80-140-1]** is located on the drier assembly.

Figure 80-140-2



The pressure relief valve **[Figure 80-140-2]** is designed to open and release the A/C charge if the pressure reaches 535 PSI (3689 kPa).

This will cause the A/C system to shut down, saving the compressor.

The Pressure Relief Valve is a secondary protection device in the A/C system, with the Pressure Switch shutting down the system at 384 PSI (2648 kPa).

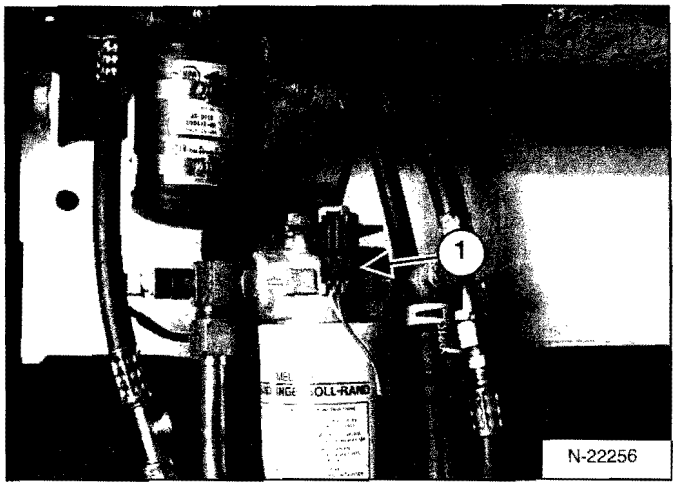
NOTE: If a Pressure Relief Valve is found open, check the A/C system for problems. Replace the complete receiver/drier unit.

Bobcat®

PRESSURE SWITCH

Removal And Installation

Figure 80-150-1



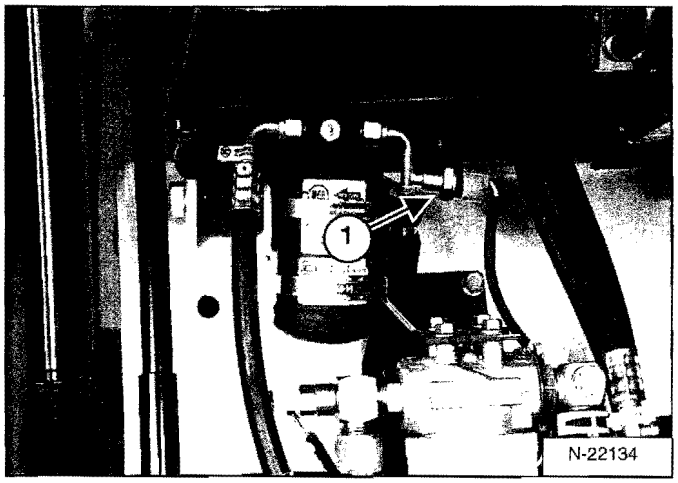
Raise the loader lift arms and install an approved lift arm support device. (See Contents Page 10-01.)

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

Disconnect the loader wire harness (Item 1) **[Figure 80-150-1]** from the pressure switch wire harness.

NOTE: The pressure switch can be changed without evacuating the A/C system.

Figure 80-150-2

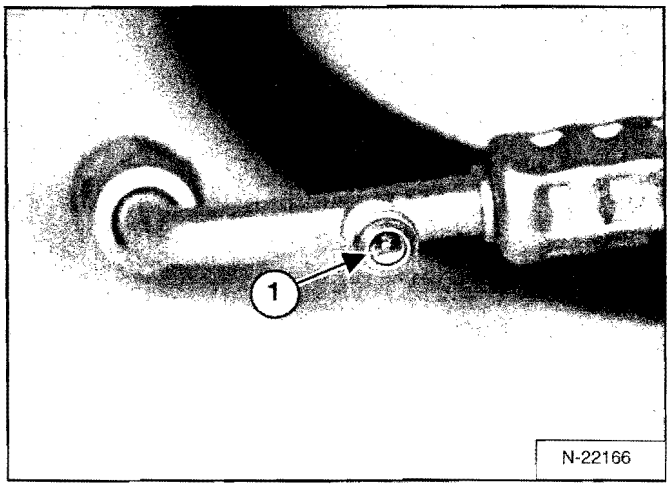


Remove the pressure switch (Item 1) **[Figure 80-150-2]** from the A/C high pressure hose.

Remove the pressure switch from the loader.

Schraeder Valve Removal And Installation

Figure 80-150-3



The schraeder valve (Item 1) **[Figure 80-150-3]** is located in the A/C high pressure hose and is located under the pressure switch.

Raise the loader 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 refrigerant from the A/C system. (See Contents Page 80-01.)

Remove the pressure switch.

With a tire valve core removal tool, remove the valve core from the hose.

Replace with a new core.

Bobcat®

EVAPORATOR/HEATER UNIT

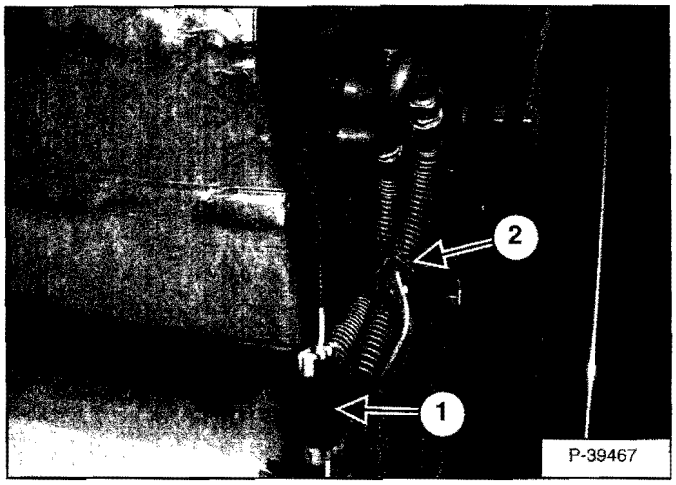
Removal And Installation

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.)

Evacuate the A/C system. (See Contents Page 80-01.

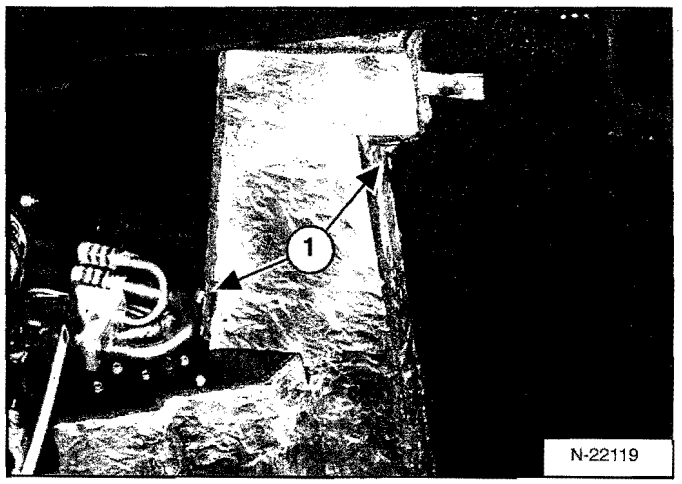
Figure 80-160-1



At the rear of the cab, disconnect the thermostat wiring connector (Item 1) **[Figure 80-160-1]**.

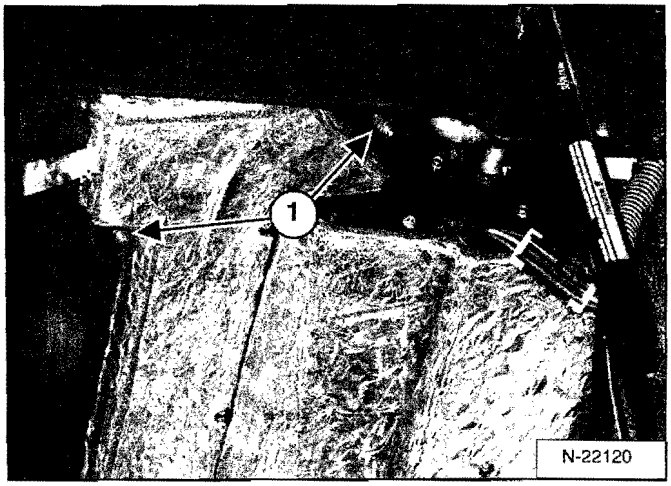
Disconnect the blower fan wiring connector (Item 2) **[Figure 80-160-1]** from the loader wiring harness.

Figure 80-160-2



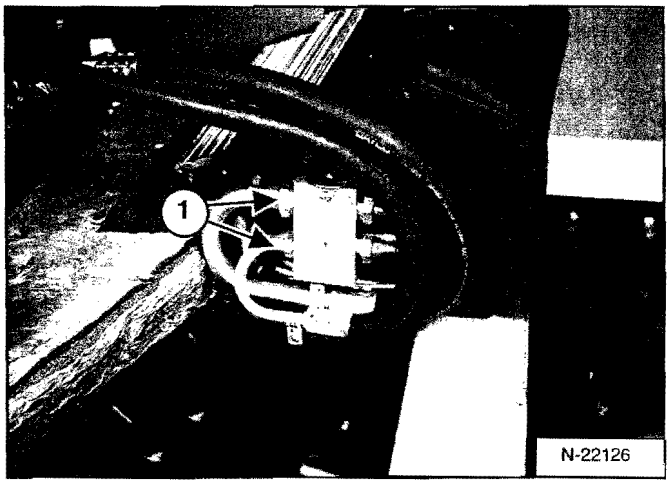
Remove the two mounting nuts (Item 1) **[Figure 80-160-2]**.

Figure 80-160-3



Remove the two mounting nuts (Item 1) **[Figure 80-160-3]**.

Figure 80-160-4



Remove the Evaporator/Heater Unit from the rear of the cab and place it on the fenders of the loader supported by 2 X 4's **[Figure 80-160-4]**.

NOTE: Mark the tubelines for correct installation.

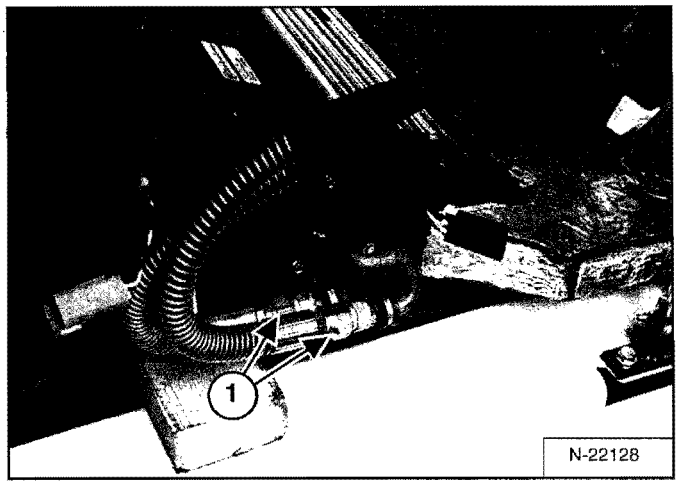
Remove the two A/C hoses (Item 1) **[Figure 80-160-4]** from the expansion valve.

Installation: Tighten the A/C hoses to 22 ft.lbs. (29,8 Nm) torque.

Cap and plug the hoses and the expansion valve fittings with the proper A/C caps and plugs.

Removal And Installation (Cont'd)

Figure 80-160-5



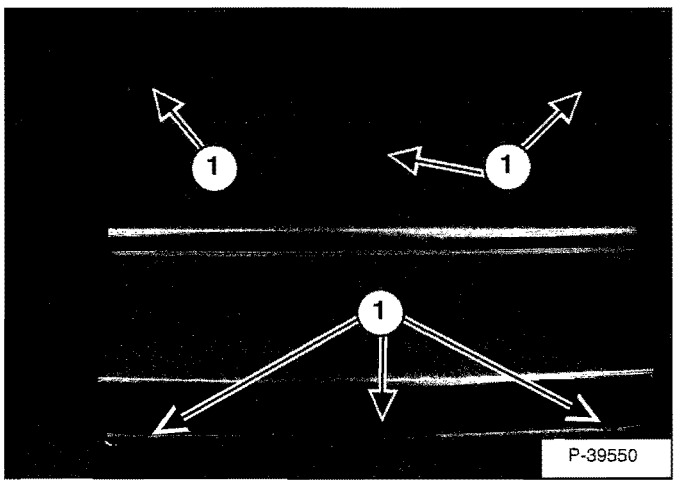
Remove the heater hoses (Item 1) **[Figure 80-160-5]** from the heater coil.

Installation: Tighten the Heater hoses to 22 ft.lbs. (29,8 Nm) torque.

Remove the evaporator/heater unit from the loader.

Disassembly And Assembly

Figure 80-160-6



Remove the six mount bolts (Item 1) **[Figure 80-160-6]** from the Evaporator/Heater Unit rear cover.

Remove the rear cover from the unit.

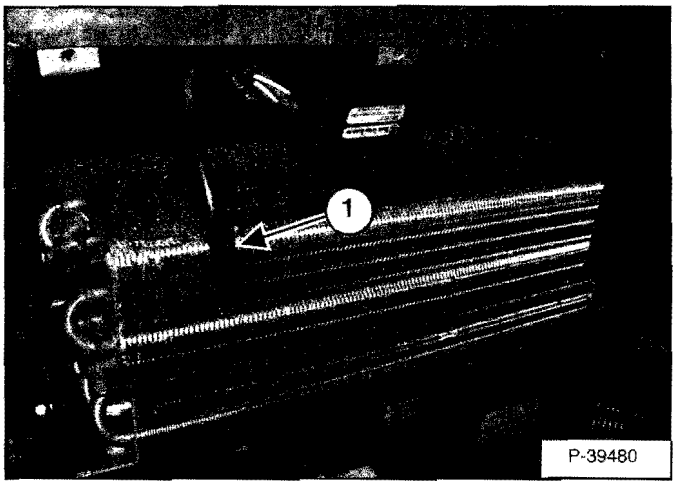
THERMOSTAT

Removal And Installation

NOTE: The thermostat can be changed without evacuating the A/C system, or removing the evaporator/heater unit from the loader.

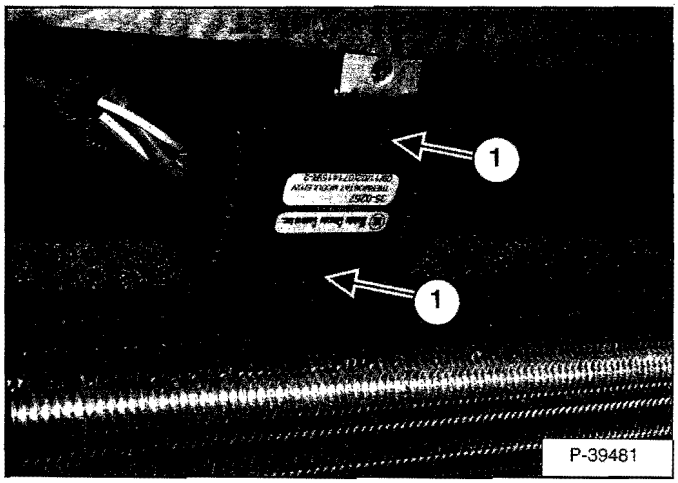
Remove the rear cover from the evaporator/heater unit. (See Contents Page 80-01.)

Figure 80-170-1



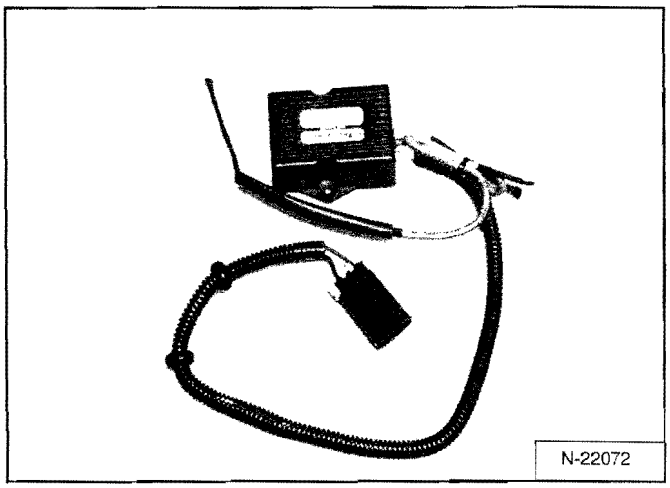
Remove the thermostat probe (Item 1) **[Figure 80-170-1]**, from the A/C evaporator coil.

Figure 80-170-2



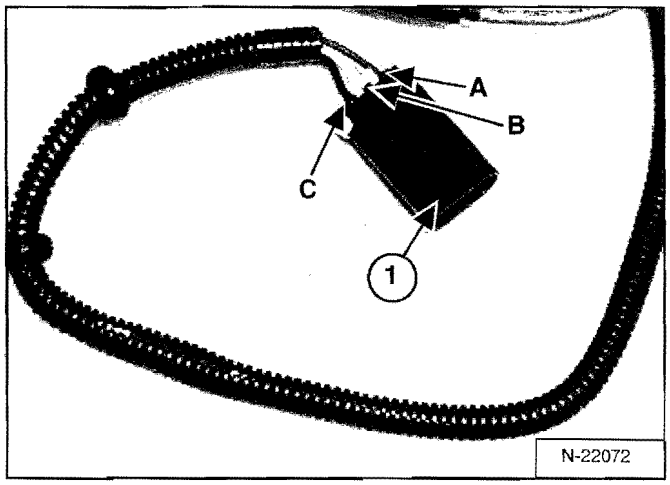
Remove the two thermostat mount bolts (Item 1) **[Figure 80-170-2]** and remove the wiring harness and grommet from the evaporator/heater housing.

Figure 80-170-3



Remove the thermostat from the unit **[Figure 80-170-3]**.

Figure 80-170-4



The wire connector (Item 1) **[Figure 80-170-4]** can be changed. The wiring position and color in the connector is:

A	Blue
B	White
C	Black

Bobcat®

EXPANSION VALVE

Removal And Installation

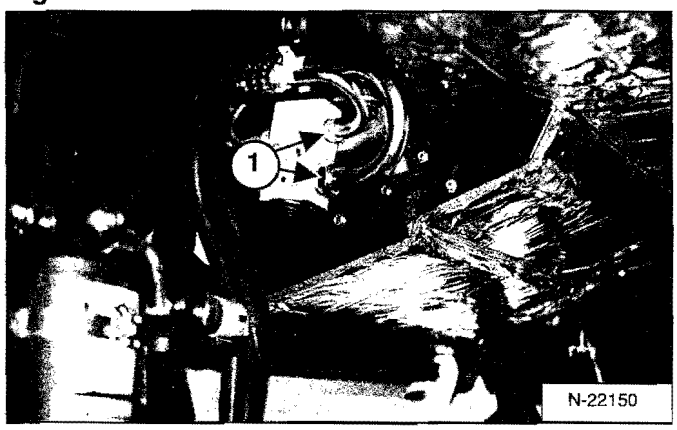
NOTE: The expansion valve can be changed without removing the evaporator/heater unit from the loader.

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.)

Evacuate the A/C system. (See Contents Page 80-01.)

Figure 80-180-1

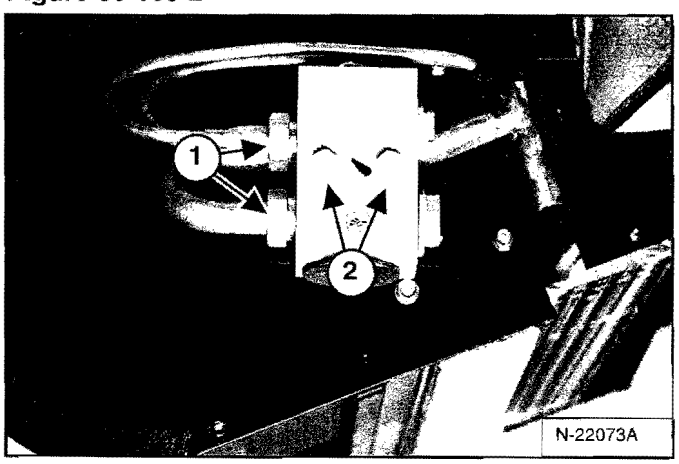


Remove the two A/C hoses (Item 1) **[Figure 80-180-1]** from the expansion valve.

Installation: Tighten the two A/C hose fittings to 22 ft.-lbs. (29,8 Nm) torque.

Cap and plug the hoses and the expansion valve fittings with the proper A/C caps and plugs.

Figure 80-180-2



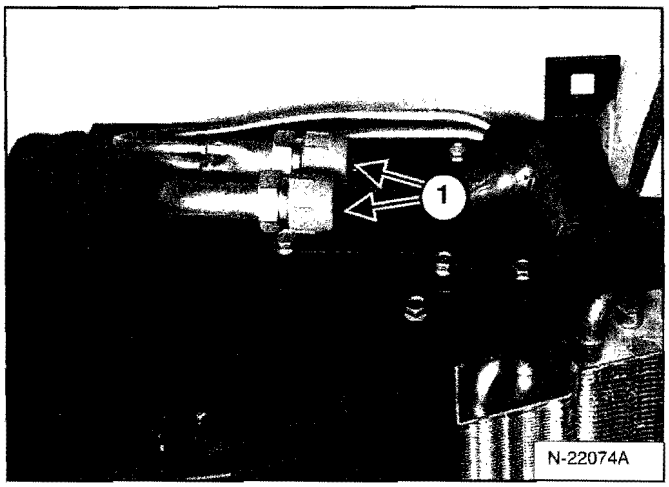
Remove the two evaporator fittings (Item 1) **[Figure 80-180-2]** from the expansion valve.

Installation: Tighten the two evaporator fittings to 22 ft.-lbs. (29,8 Nm) torque.

Remove the two mount bolts (Item 2) **[Figure 80-180-2]**.

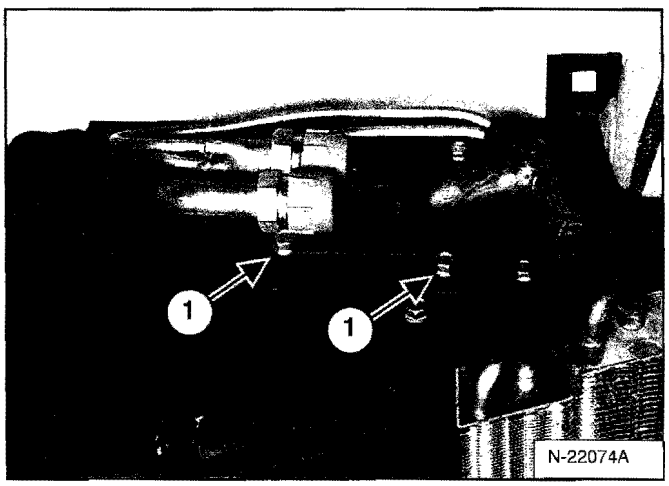
Remove the expansion valve from the loader.

Figure 80-180-3



Cap and plug the evaporator tubelines (Item 1) **[Figure 80-180-3]** and the expansion valve fittings with the proper A/C caps and plugs.

Figure 80-180-4

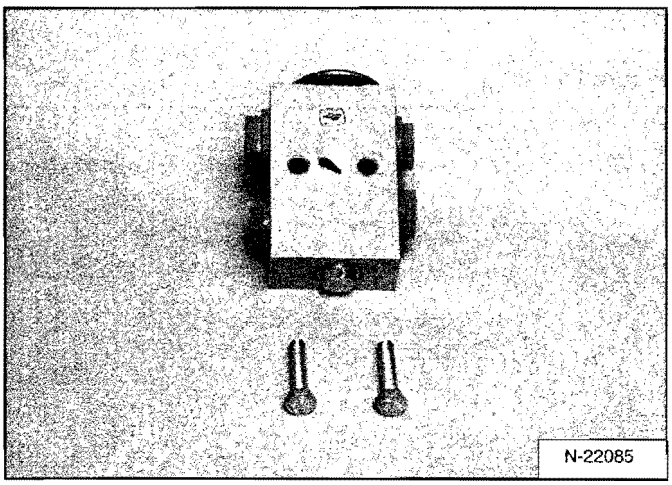


Remove the two mount bolts (Item 1) **[Figure 80-180-4]** from the expansion valve mount.

Remove the expansion valve mount from the unit.

Removal And Installation (Cont'd)

Figure 80-180-5



The expansion valve **[Figure 80-180-5]** is replaced as a complete unit.

EVAPORATOR

Removal And Installation

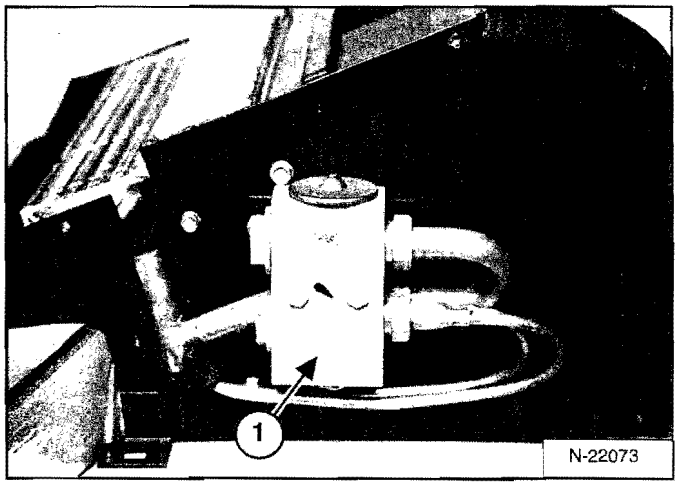
Raise the lift arms and install an approved lift arm support device. (See Contents Page 10-01.)

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

Evacuate the A/C system. (See Contents Page 80-01.)

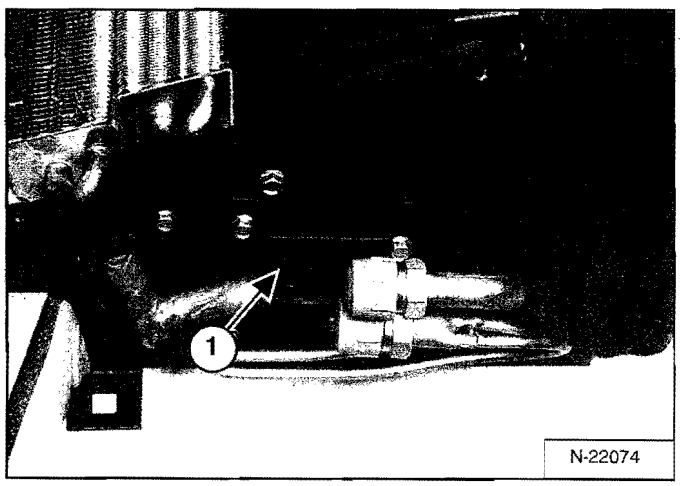
Remove the evaporator/heater unit from the back of the cab. (See Contents Page 80-01.)

Figure 80-190-1



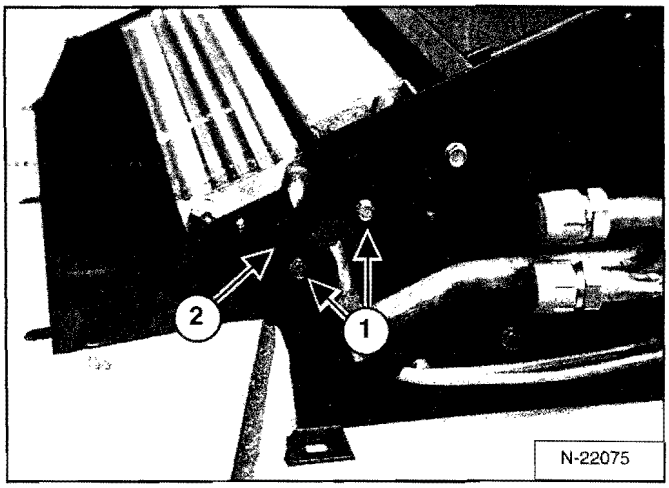
Remove the expansion valve (Item 1) **[Figure 80-190-1]** from the unit. (See Contents Page 80-01.)

Figure 80-190-2



Remove the expansion valve mount bracket (Item 1) **[Figure 80-190-2]** from the unit.

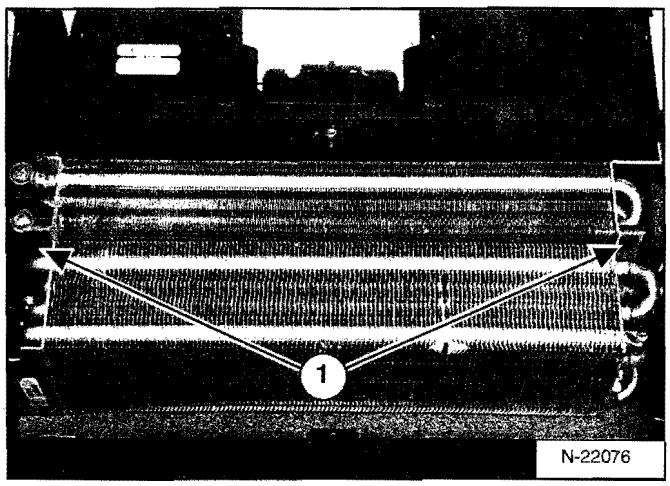
Figure 80-190-3



Remove the two mount bolts (Item 1) from the mount plate (Item 2) **[Figure 80-190-3]**.

Remove the mount plate from the unit.

Figure 80-190-4

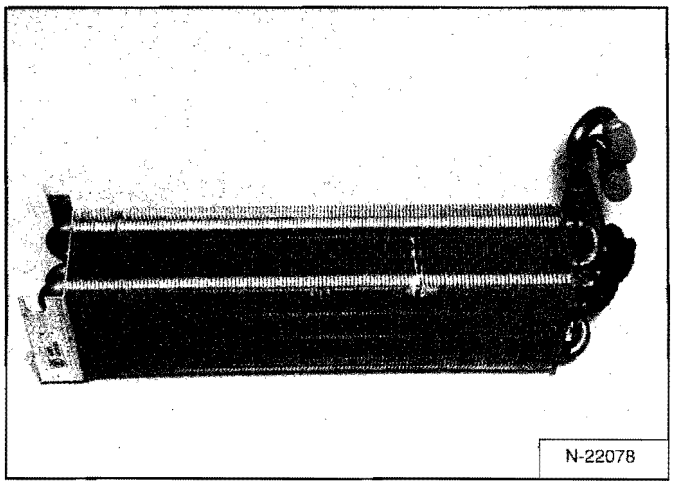


Remove the two retaining clips (Item 1) **[Figure 80-190-4]** that connect the evaporator coil, to the heater coil.

Remove the evaporator coil from the unit.

Removal And Installation (Cont'd)

Figure 80-190-5



Inspect the evaporator coil **[Figure 80-190-5]** for leaks, and replace as needed.

Clean with low water or air pressure.

HEATER COIL

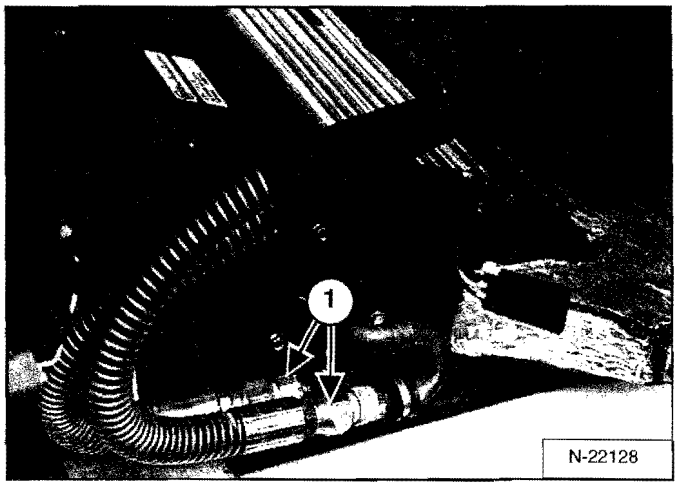
Removal And Installation With A/C

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 evaporator/heater unit from the back of the cab. (See Contents Page 80-01)

Figure 80-200-1



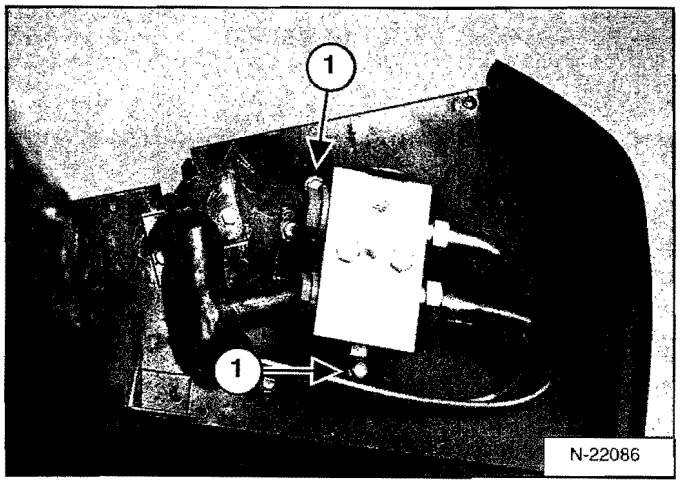
Mark the heater hoses (Item 1) **[Figure 80-200-1]** for proper installation.

Remove the two heater hoses from the heater coil.

Cap the hoses and the heater coil with hydraulic caps and plugs to prevent oil loss from the system.

Installation: Tighten the two heater hose fittings to 22 ft.-lbs. (29,8 Nm) torque.

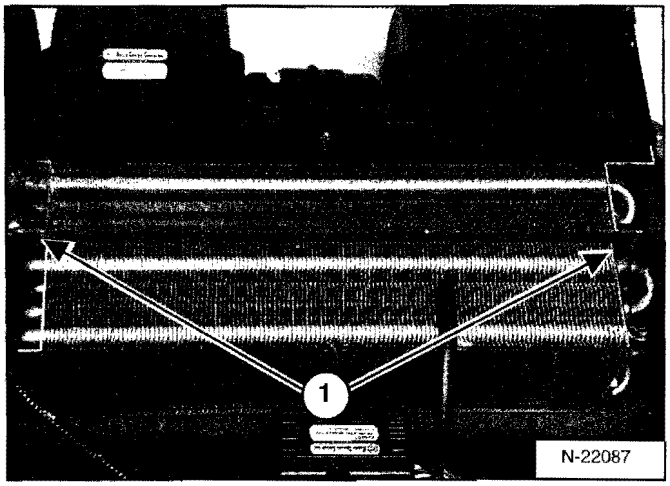
Figure 80-200-2



Remove the rear cover from the evaporator/heater unit. (See Contents Page 80-01)

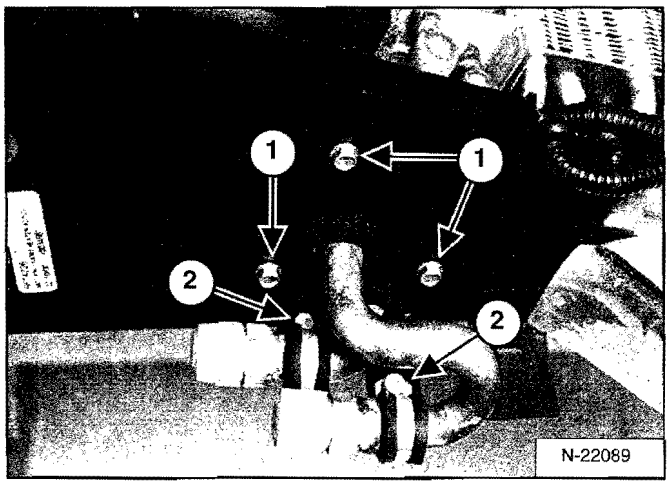
Remove the two mount bolts (Item 1) **[Figure 80-200-2]** from the heater coil at the expansion valve end of the unit.

Figure 80-200-3



Remove the two retaining clips (Item 1) **[Figure 80-200-3]** that connect the evaporator coil, to the heater coil.

Figure 80-200-4



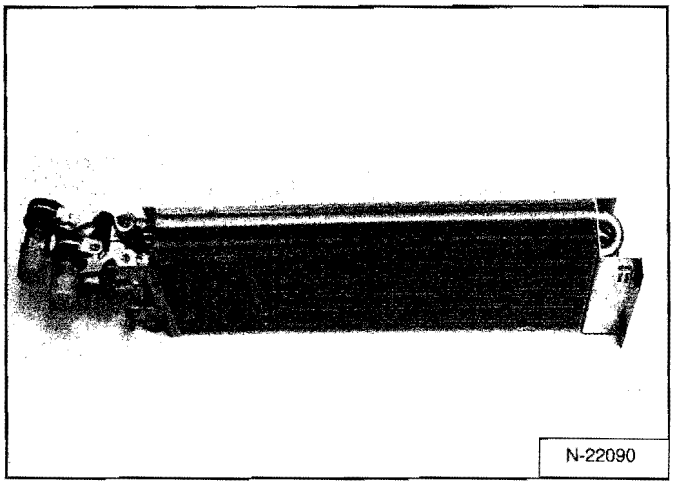
Remove the three mount bolts (Item 1) **[Figure 80-200-4]** and remove the mount plate from the end of the unit.

Remove the two mount bolts (Item 2) **[Figure 80-200-4]** that support the heater coil tubelines to the unit.

Remove the heater coil from the unit.

Removal And Installation With A/C (Cont'd)

Figure 80-200-5

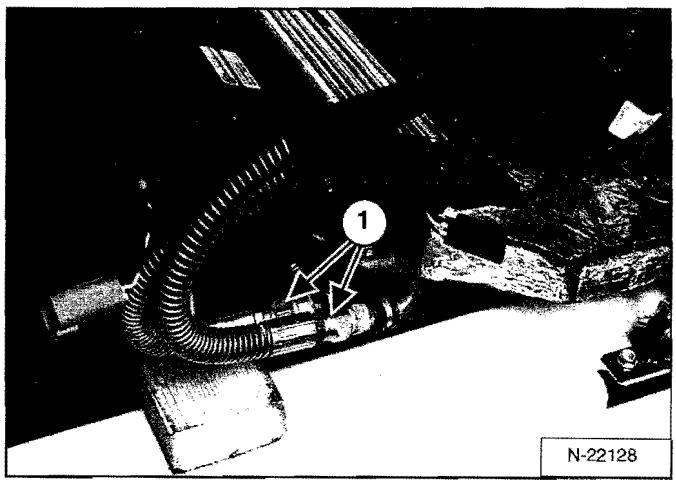


The heater coil **[Figure 80-200-5]** can be cleaned with low air or water pressure.

If the heater coil needs replacement it must be replaced as complete unit.

Removal And Installation Without A/C

Figure 80-200-6



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 80-200-6]** for proper installation.

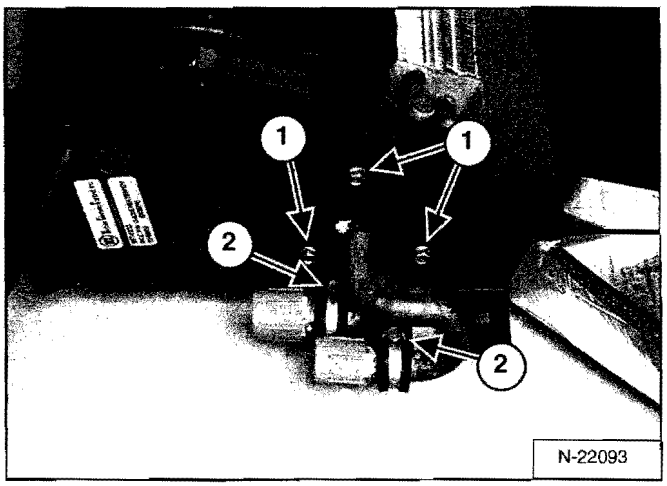
Remove the two heater hoses from the heater coil.

Cap the hoses and the heater coil with hydraulic caps and plugs to prevent oil loss from the system.

Installation: Tighten the two heater hose fittings to 22 ft.-lbs. (29,8 Nm) torque.

Remove the rear cover from the evaporator/heater unit. (See Contents Page 80-01.)

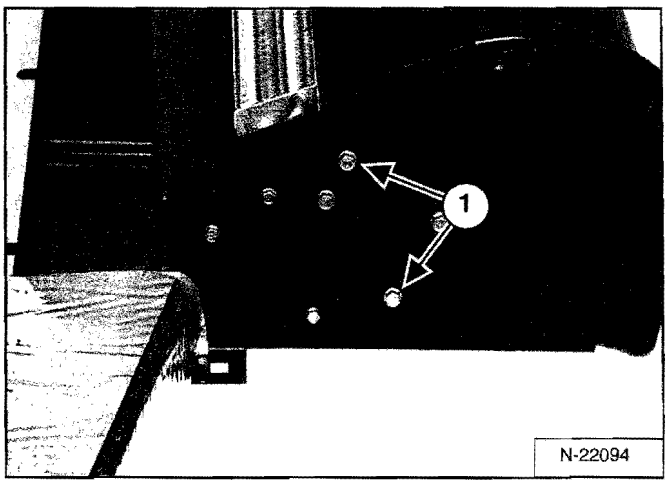
Figure 80-200-7



Remove the three mount bolts (Item 1) **[Figure 80-200-7]** and remove the mount plate from the end of the unit.

Remove the two mount bolts (Item 2) **[Figure 80-200-7]** that support the heater coil tubelines to the unit.

Figure 80-200-8



Remove the two mount bolts (Item 1) **[Figure 80-200-8]** from the heater coil.

Remove the heater coil from the unit.

BLOWER FAN

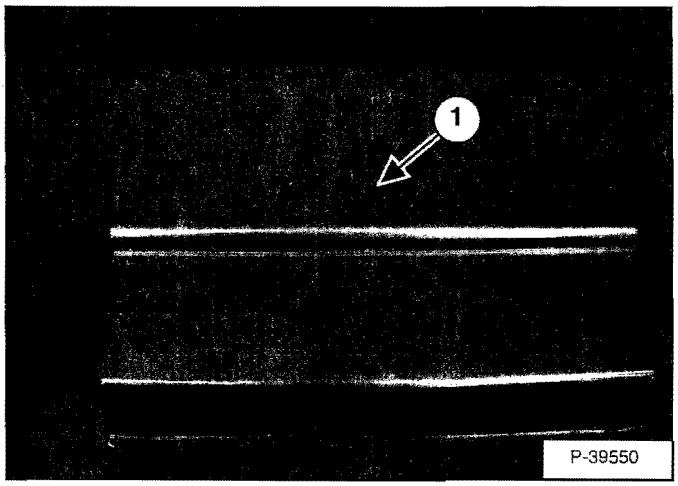
Removal And Installation

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.)

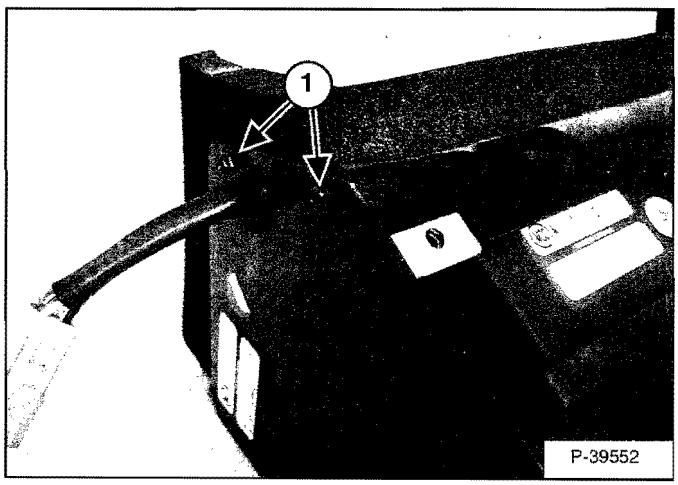
NOTE: The blower fan assembly can be removed from the evaporator/heater unit without disconnecting the heater or A/C plumbing. The unit is remove here for photo clarity.

Figure 80-210-1



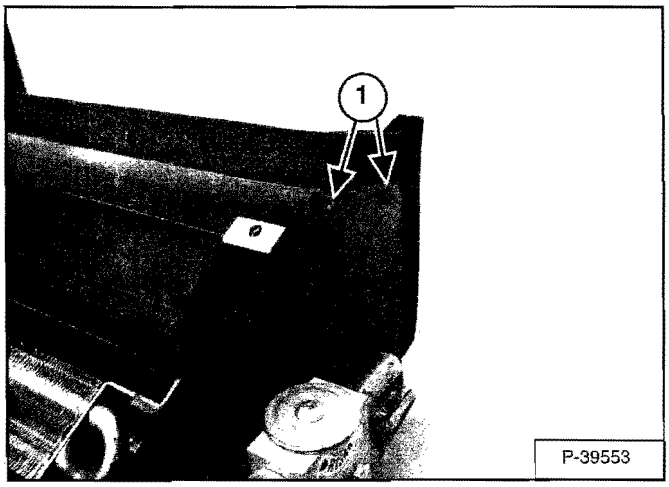
Remove the cover (Item 1) **[Figure 80-210-1]** from the evaporator/heater unit.

Figure 80-210-2



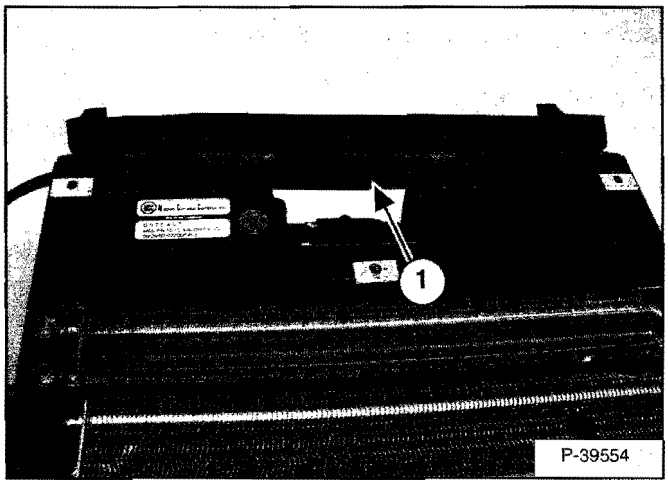
Remove the two flange mount bolts (Item 1) **[Figure 80-210-2]** from the evaporator/heater unit.

Figure 80-210-3



Remove the two flange mount bolts (Item 1) **[Figure 80-210-3]** from the evaporator/heater unit.

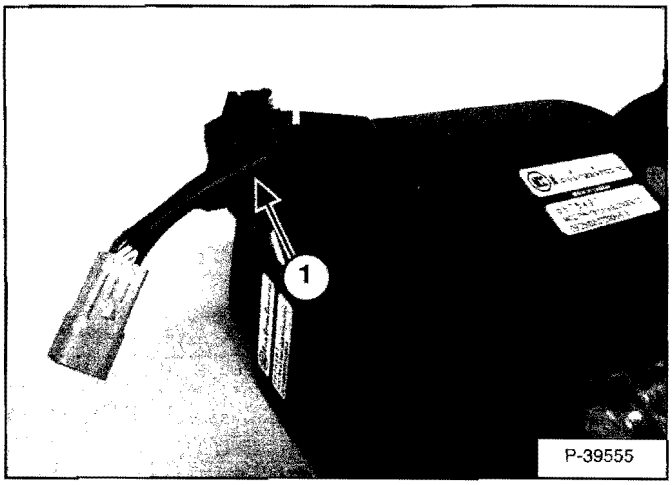
Figure 80-210-4



Remove the flange and attached foam (Item 1) **[Figure 80-210-4]** from the unit.

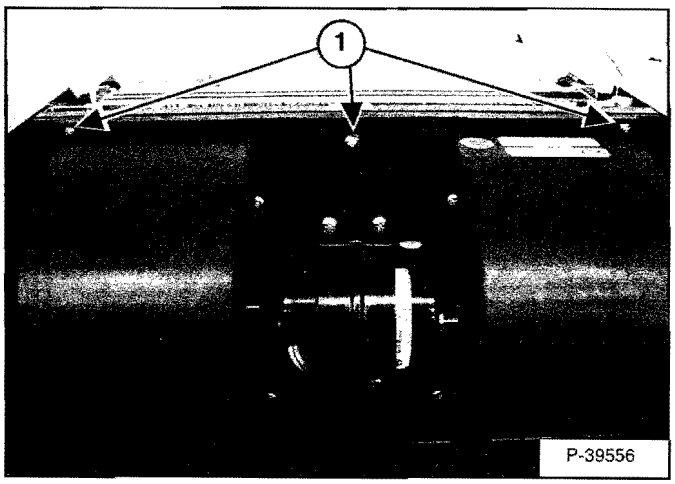
Removal And Installation (Cont'd)

Figure 80-210-5



Remove the blower fan wiring harness and grommet (Item 1) **[Figure 80-210-5]** from the unit.

Figure 80-210-6

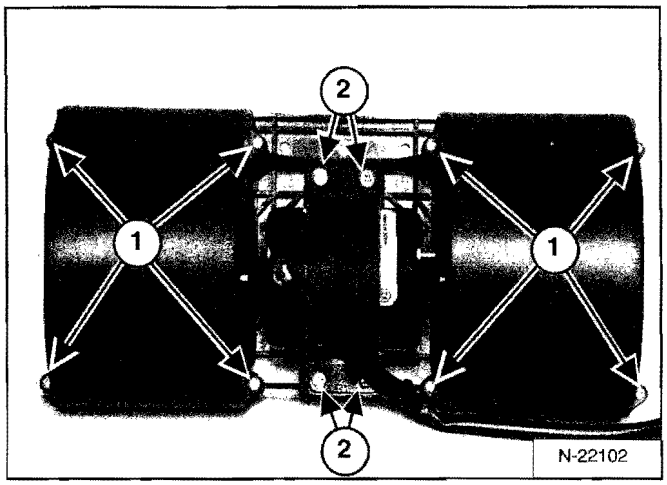


Remove the three mount bolts (Item 1) **[Figure 80-210-6]** from the blower fan housing.

Remove the blower fan housing from the evaporator/ heater unit.

Disassembly And Assembly

Figure 80-210-7



Remove the eight mount bolts (Item 1) **[Figure 80-210-7]** from the blower wheel cover.

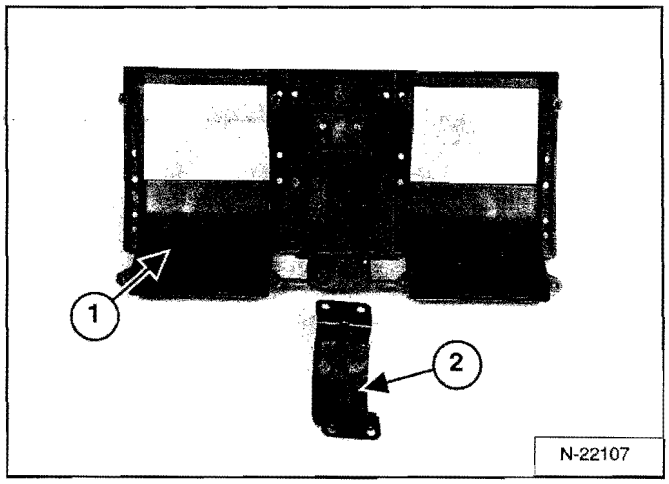
Remove the blower wheel cover from the housings.

Remove the four mount bolts (Item 2) **[Figure 80-210-7]** from the blower motor mount.

Remove the blower motor mount.

Remove the blower motor assembly from the housing.

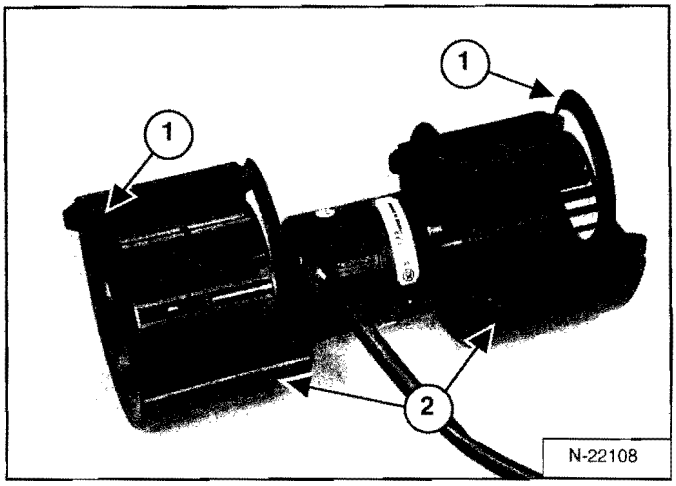
Figure 80-210-8



Check the blower housing (Item 1) and blower motor mount (Item 2) **[Figure 80-210-8]** for wear and replace as needed.

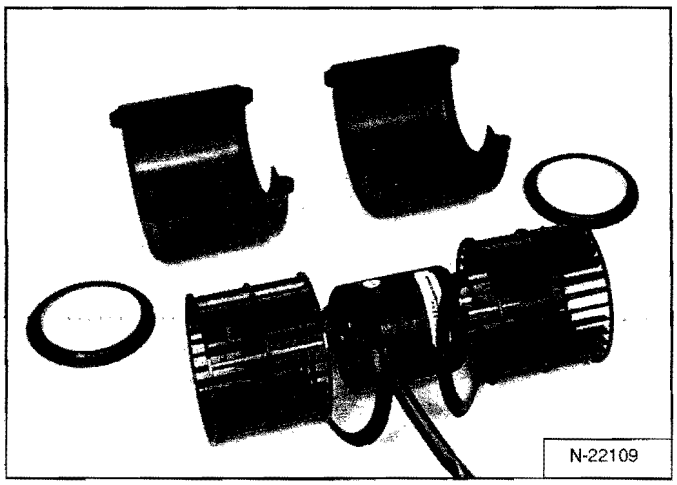
Disassembly And Assembly (Cont'd)

Figure 80-210-9



Remove the outside rings (Item 1) and blower wheel covers (Item 2) **[Figure 80-210-9]** from the blower motor and blower wheels.

Figure 80-210-10



Inspect the end rings and blower wheel covers for wear and replace as needed **[Figure 80-210-10]**.

Figure 80-210-11

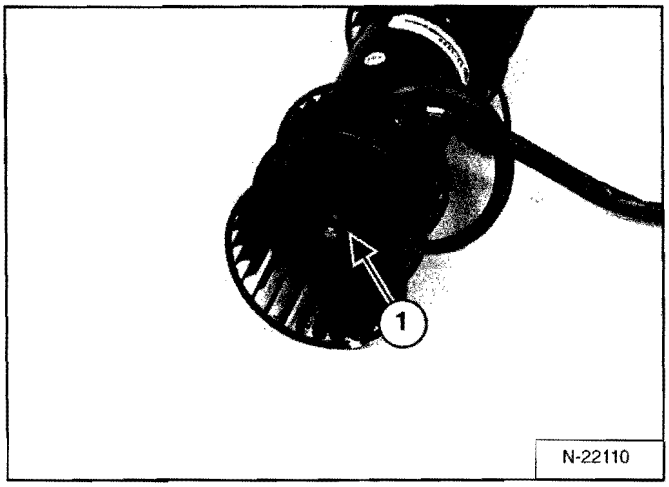
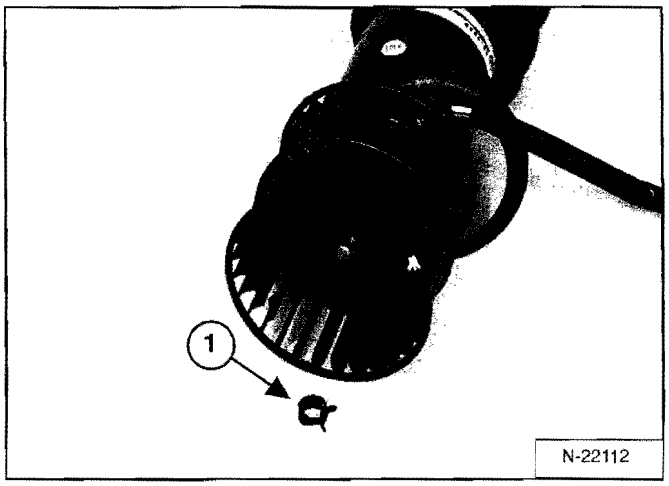


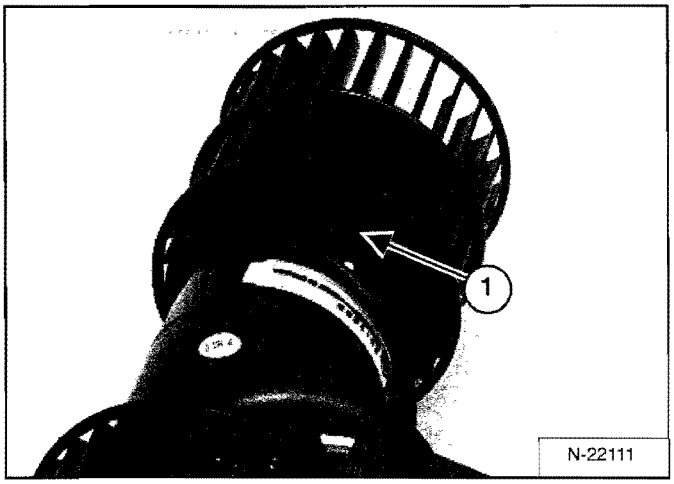
Figure 80-210-12



Remove the outside blower wheel clamp (Item 1) **[Figure 80-210-11]** & **[Figure 80-210-12]** from the blower wheel.

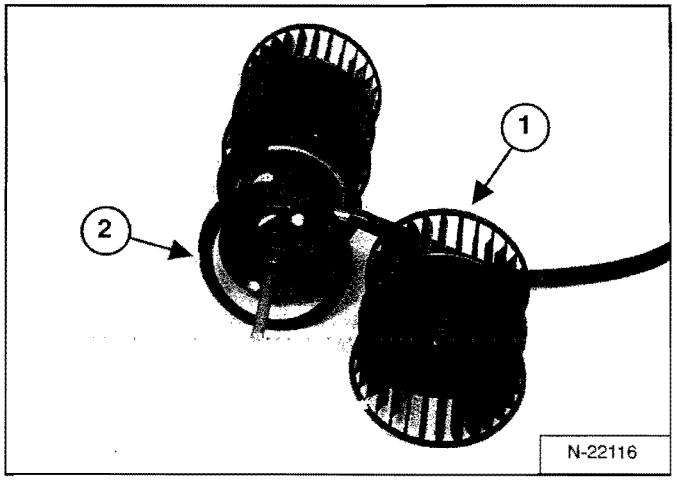
Disassembly And Assembly (Cont'd)

Figure 80-210-13



Remove the inside blower wheel clamp (Item 1) **[Figure 80-210-13]** from the blower wheel.

Figure 80-210-14



Remove the blower wheel (Item 1) and inside ring (Item 2) **[Figure 80-210-14]** from the blower motor shaft.

Repeat the procedure for the other blower wheel.

Wire Connector Removal and Installation

Figure 80-210-15

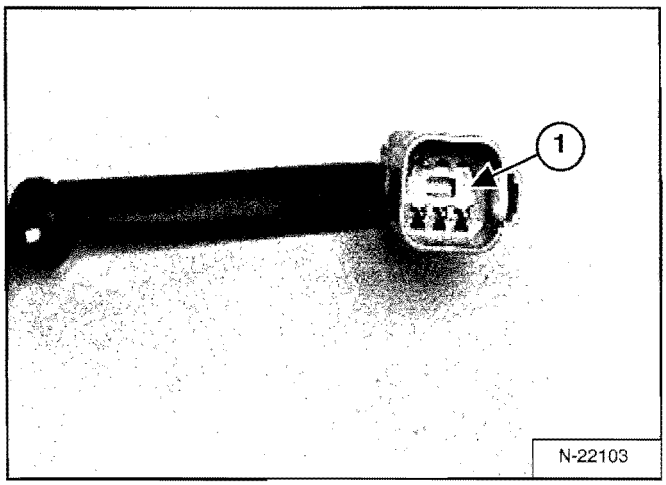
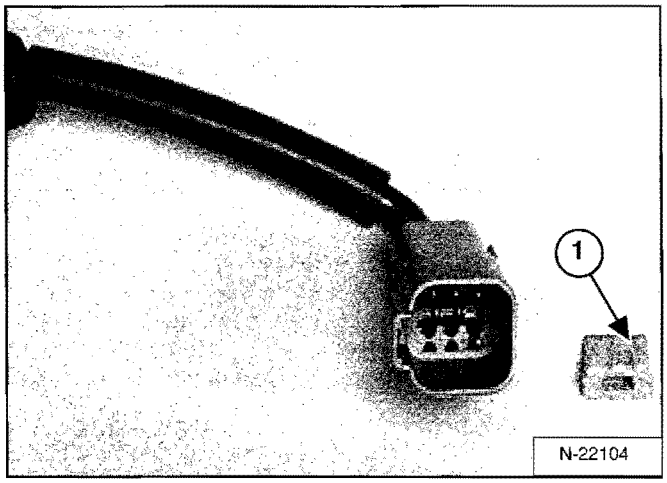


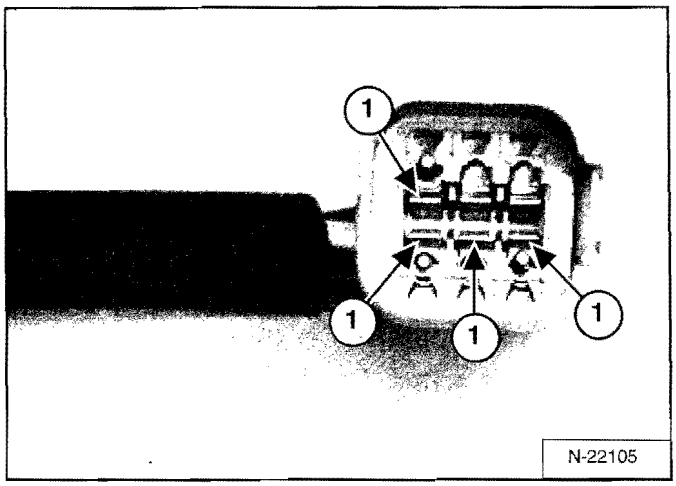
Figure 80-210-16



Remove the plastic wedge (Item 1) **[Figure 80-210-15]** & **[Figure 80-210-16]** from the center of the blower motor wiring connector.

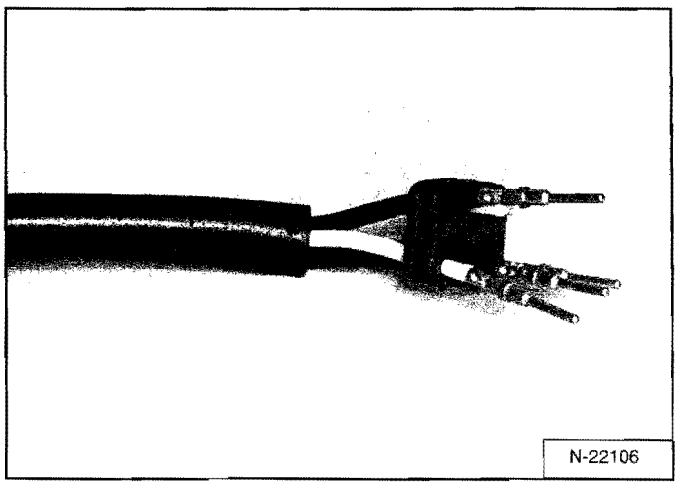
Wire Connector Removal and Installation (Cont'd)

Figure 80-210-17



With a pointed screw driver lightly press in on the tabs (Item 1) **[Figure 80-210-17]** and remove the individual wires from the connector.

Figure 80-210-18



The wiring code for the blower fan connector **[Figure 80-210-18]** is:

Number on Connector	Wire Color
1	Orange
2	Red
3	Yellow
4	Black
5	Open
6	Open

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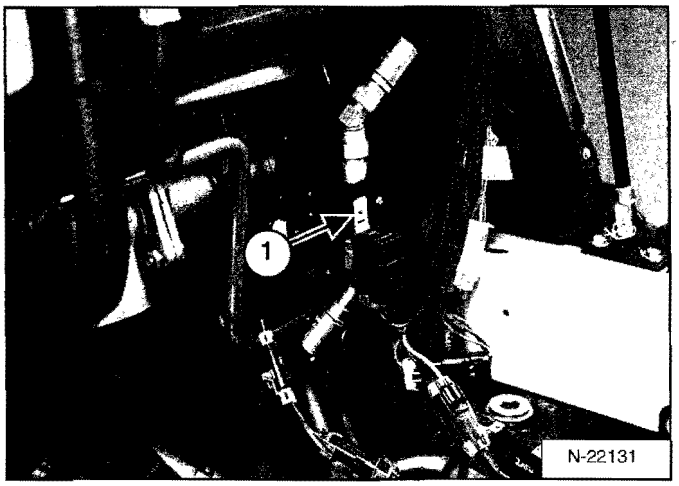
HEATER VALVE

Removal and Installation

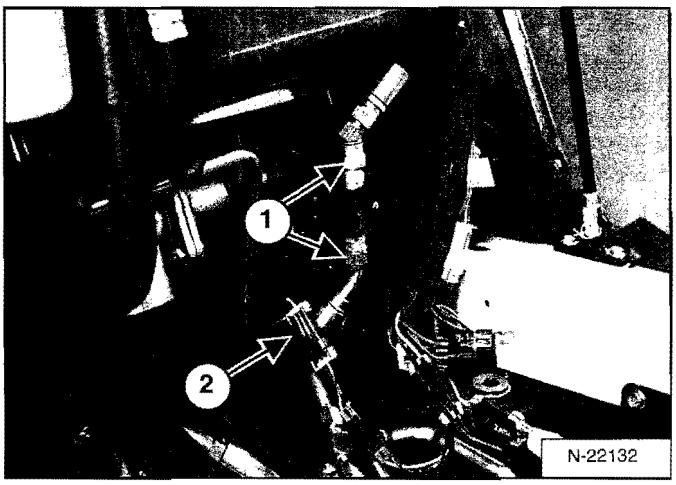
Figure 80-220-1



Remove the mount bolt (Item 1) **[Figure 80-220-1]** from the electrical relay mount.

Move the electrical relay to the side for clearance.

Figure 80-220-2



Remove the two hydraulic hoses (Item 1) **[Figure 80-220-2]** from the heater valve.

Cap the hoses and the heater valve with hydraulic caps and plugs to prevent oil loss from the system.

Disconnect the loader wiring harness (Item 1) **[Figure 80-220-2]** from the heater valve.

Figure 80-220-3

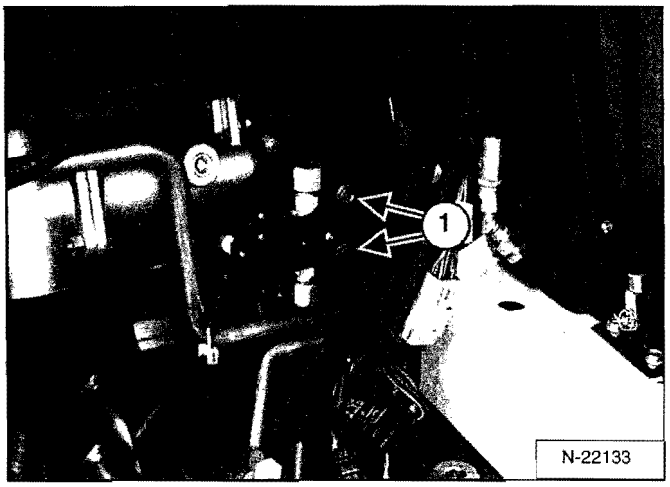
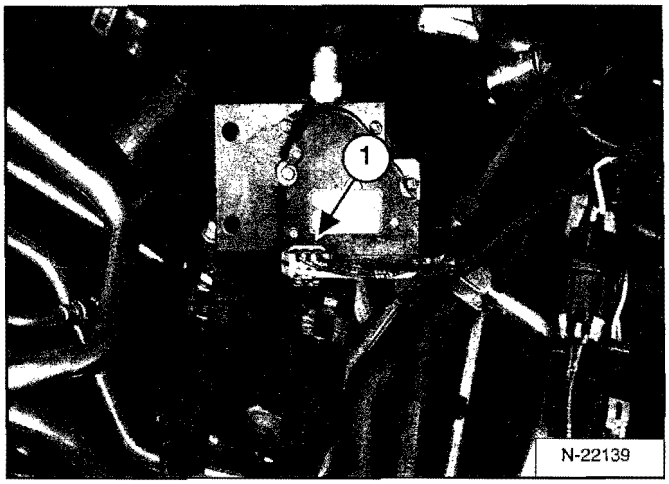


Figure 80-220-4



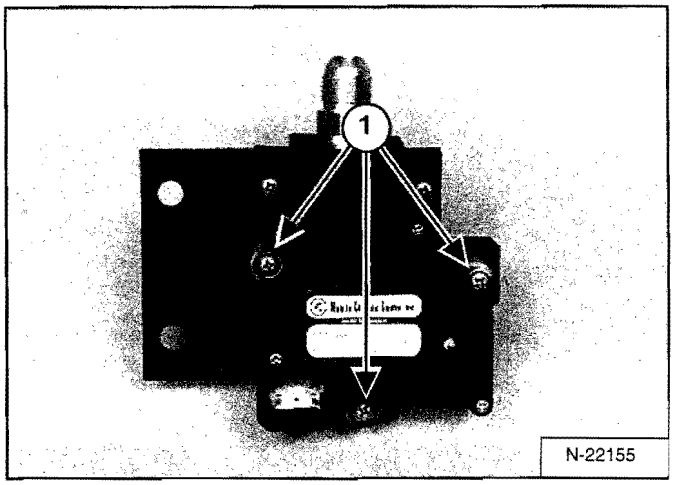
NOTE: Early model loaders were equipped with a heater valve that had a wiring harness, and connector (Item 1) [Figure 80-220-3]. Later model leaders are equipped with heater valves that allowed the loader wiring harness (Item 1) [Figure 80-220-4] to be connected directly to the rear of the valve.

Remove the two mount bolts (Item 1) **[Figure 80-220-3]** from the heater valve mount bracket.

Remove the heater valve and mount bracket from the loader.

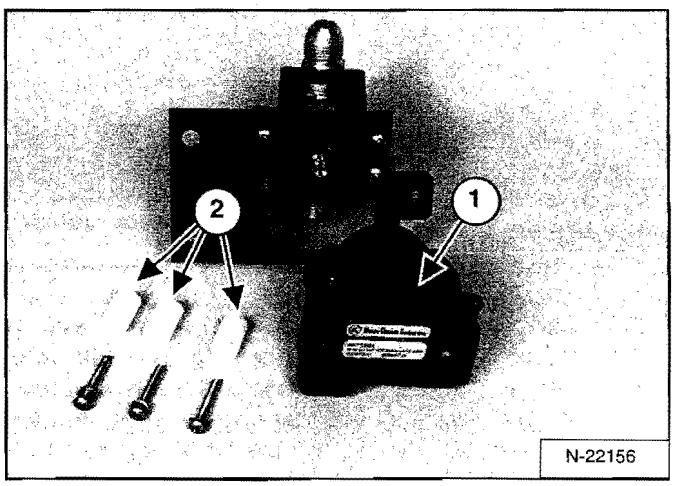
Disassembly And Assembly

Figure 80-220-5



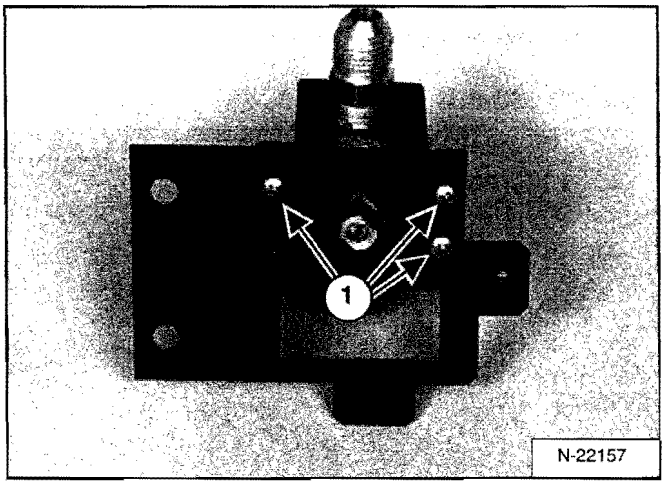
Remove the three mount bolts (Item 1) **[Figure 80-220-5]** from the heater valve actuator.

Figure 80-220-6



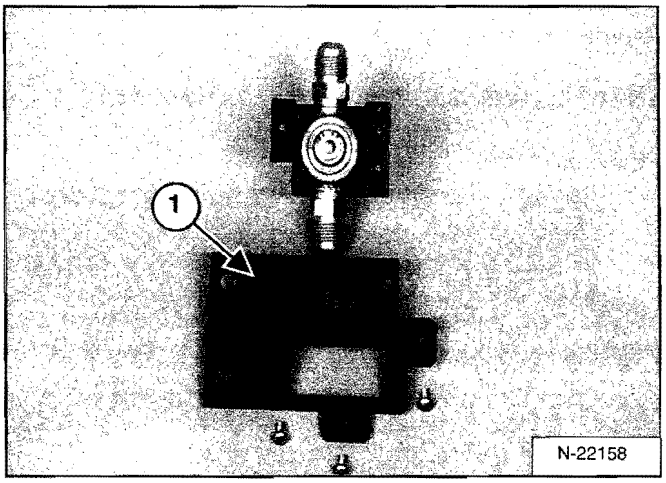
Remove the actuator (Item 1) and the three mounting spacers (Item 2) **[Figure 80-220-6]** from the heater valve mount plate.

Figure 80-220-7



Remove the three mounting bolts (Item 1) **[Figure 80-220-7]** from the heater valve mount plate.

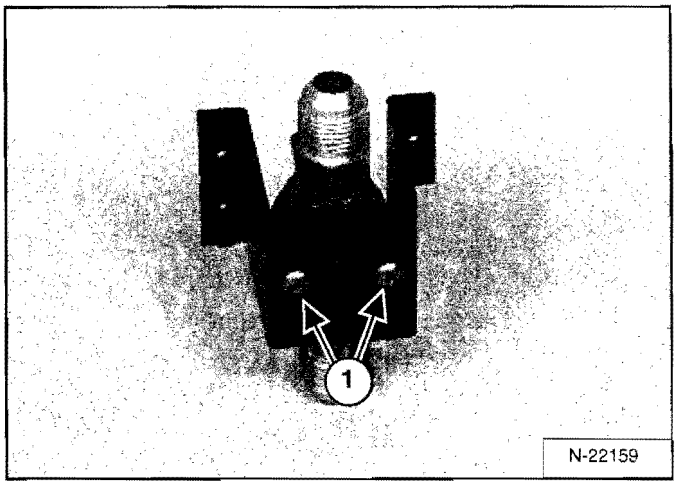
Figure 80-220-8



Remove the mount plate (Item 1) **[Figure 80-220-8]** from the heater valve bracket.

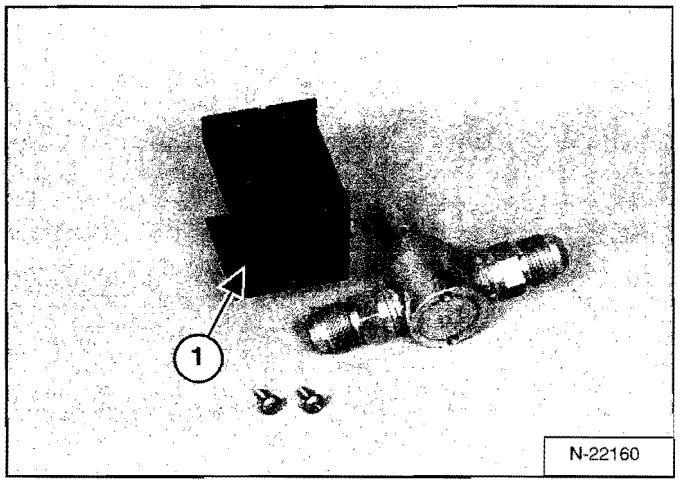
Disassembly And Assembly (Cont'd)

Figure 80-220-9



Remove the two mounting bolts (Item 1) **[Figure 80-220-9]** from the heater valve.

Figure 80-220-10



Remove the heater valve mount bracket (Item 1) **[Figure 80-220-10]** from the heater valve.

Replace the parts as needed.

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SPECIFICATIONS

Continued On Next Page

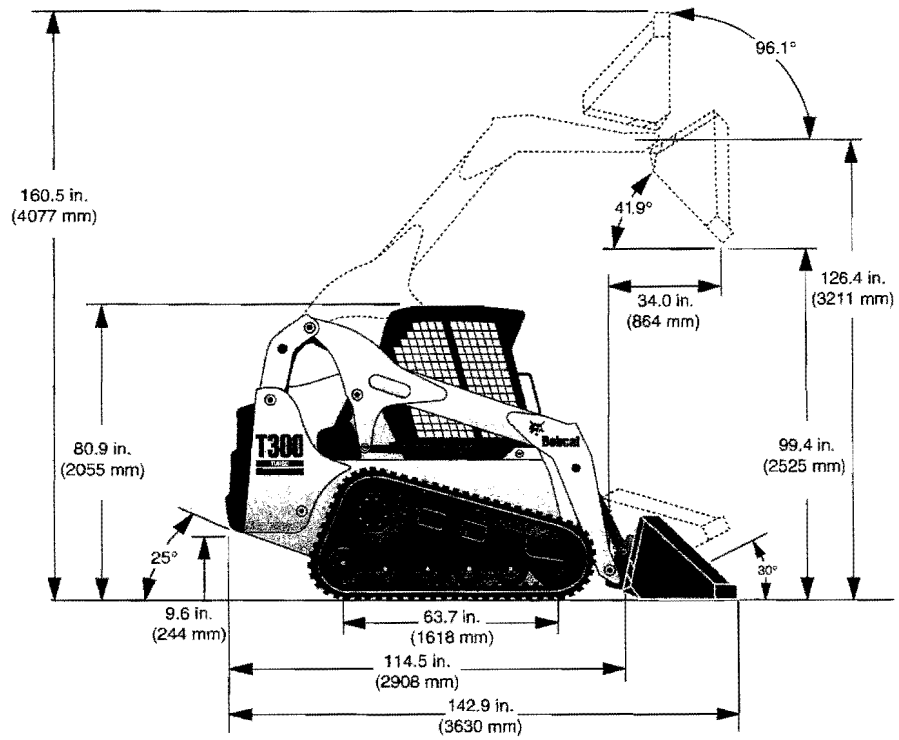
SPECIFICATIONS (CONT'D)

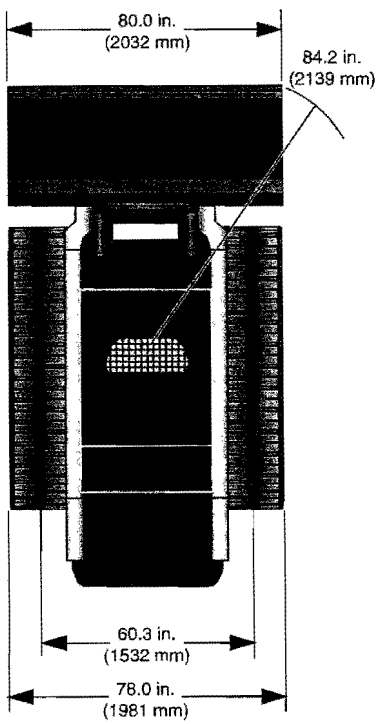
TIGHTEN ALL HARDWARE PER SIZE TO GRADE 5 TORQUE (SEE STANDARD TORQUE SPECIFICATIONS FOR BOLTS, SECTION SPEC-01) UNLESS OTHERWISE SPECIFIED.

LOADER SPECIFICATIONS (T300)

Machine Dimensions

- Dimensions are given for loader equipped with standard tires and dirt 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.





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.

Performance

Rated Operating Capacity (SAE J732)	3000 lbs. (1361 kg)
Tipping Load (SAE)	8571 lbs. (3888 kg)
Operating Weight	9354 lbs. (4243 kg)
Travel Speed	6.6mph (10,6 km/hr)
SAE Breakout Force - Lift	6100 lbf. (27134 N)
SAE Breakout Force - Tilt	6000 lbf. (26689 N)
Push Force	5900 lbf. (26245 N)

Controls

Vehicle Steering	Direction and speed controlled by two hand levers
Loader Hydraulics - Lift and Tilt - Front Auxiliary (Std.) - Rear Auxiliary (Option)	 Controlled by separate foot pedals or optional Advanced Control System (ACS) Controlled by electrical switch on Right Hand steering lever Controlled by electrical switch on Left Hand steering lever
Auxiliary Pressure Release	Pressure relieved through quick couplers. Push couplers in, hold for 5 seconds.
Engine	Hand lever throttle; key-type starter switch and shutdown
Starting Aid	Intake Air Heater - automatically activated by Standard or Deluxe Instrument Panel
Service Brake	Two independent hydrostatic systems controlled by two hand operated steering levers
Secondary Brake	One of the hydrostatic transmissions
Parking Brake	Finger-operated rocker switch on center control panel with spring applied, pressure release multi-disk brake

Engine

Make/Model	Kubota V3300-DI-T Turbo-Charged
Fuel/Cooling	Diesel/Liquid
Horsepower, Maximum	80.8 HP (60,3 kW) @ 2400 RPM
Maximum Governed RPM	2600 RPM
Low Idle	1125-1175 RPM
High Idle	2525-2575 RPM
Torque, Maximum	217.6 lbf.-ft. (295,1 Nm) @ 1400 RPM
Number of Cylinders	4
Displacement	202.5 cu. in. (3,318 L)
Bore/Stroke	3.86/4.33 (98/110)
Lubrication	Pressure System with Filter
Crankcase Ventilation	Open Breathing
Air Cleaner	Dry replaceable paper cartridge with safety element
Ignition	Diesel-Compression
Engine Coolant	Propylene Glycol / Water Mixture
Starting Aid	Intake Air Heater

Hydraulic System

Pump Type	Engine driven, gear type
Pump Capacity - Standard	18.7 GPM (70,8 L/min.) @ 2550 Engine Rpm (High Idle)
High Flow Option	29.2 GPM (110,5 L/min) @ 2550 Engine Rpm (High Idle)
System Relief at Quick Couplers	3300 PSI (227,5 Bar)
Filter (Hydraulic)	Full flow replaceable, 3-micron synthetic media element
Hydraulic Cylinders	Double-acting; tilt cylinders have cushioning feature on dump and rollback
Bore Diameter: Lift Cylinder (2)	3.00 in. (76,2 mm)
Tilt Cylinder (2)	3.00 in. (76,2 mm)
Rod Diameter: Lift Cylinder (2)	1.63 in. (41,4 mm)
Tilt Cylinder (2)	1.50 in. (38,1 mm)
Stroke: Lift Cylinder (2)	25.00 in. (636,0 mm)
Tilt Cylinder (2)	15.10 in. (383,5 mm)
Control Valve	3-Spool, open center type with float detent on lift and electrically controlled auxiliary spool
Fluid Lines	SAE Standard tubelines, hoses and fittings
Fluid Type	Bobcat Fluid (P/N 6563328) If fluid is not available, use 10W-30/10W-40 Class SE motor oil for temperatures above 0°F (-18°C) or 5W-30 Class SE Class SE motor oil for temperatures below 0°F (-18°C)
Hydraulic Function Time:	
Raise Lift Arms	4.4 Seconds
Lower Lift Arms	3.2 Seconds
Bucket Dump	2.5 Seconds
Bucket Rollback	1.9 Seconds

Electrical

Alternator	Belt driven, 90 amps, open
Battery	12 Volt, 950 cold cranking amps @ 0° F (-18° C), 180 Minute reserve capacity
Starter	12 Volt, gear reduction type, 4.02 HP (3,0 kW)
Instrumentation	**Gauges:** Engine Coolant Temperature, Fuel, Hourmeter **Warning lights:** Advanced Control System (ACS), Engine Air Filter, Engine Coolant Temperature, Engine Oil Pressure, Fuel Level, General Warning, Hydraulic Filter, Hydraulic Oil Temperature, Hydrostatic Charge Pressure, Seat Belt, System Voltage **Indicators:** Attachment Control Device, BICS Functions, Intake Air Heater **Optional Deluxe Instrumentation:** *Same gauges and warning lights as standard instrumentation Panel. *Additional bar-type gauges for: Engine Oil Pressure, System Voltage, Hydrostatic Charge Pressure and Hydraulic Oil Temperature. *Additional Features Included: Keyless Start, Digital Clock, Job Clock, Attachments Information, Digital Tachometer, High Flow Lockouts, Multi-Language Display, Help Screens, Diagnostic Capability and Engine/ Hydraulic Systems Shutdown Function.

LOADER SPECIFICATIONS (T300)

Drive System

Main Drive	Fully hydrostatic, rubber track drive
Transmission	Infinitely variable tandem hydrostatic piston pumps, driving two fully reversing hydrostatic motors
Tracks	18in. width (450 mm) tension-grease cylinder and spring rollers-triple flange
Ground Pressure 18 in Track width	4.1 psi (28.3 kpa)

Capacities

Fuel Tank	30.0 gals. (113,6 L)
Engine Lubricating W/Oil Filter	14.0 qts. (13,2 L)
Engine Coolant	4.3 gals. (16,3 L)
Hydraulic Reservoir	4.7 gals. (17,8 L)
Hydraulic/Hydrostatic System	13.0 gals. (49,2 L)

Tracks

Standard	18 in. Rubber, C-Pattern

ENGINE SPECIFICATIONS

All dimensions are given in inches. Respective metric dimensions are given in millimeters enclosed by parentheses.

General

Displacement	202.5 cu. in. (3,32 L)
Bore	3.86 in. (98 mm)
Stroke	4.33 in. (110 mm)
Crankshaft Rotation (Viewed From Flywheel Side)	Counterclockwise
Ignition	Diesel-Compression
Combustion System	Direct Injection (E-CDIS)
Compression Ratio	19.3
Compression	498 - 526 PSI / 250 RPM, 3.43 to 3.63 MPa/250 RPM, 35 to 37 kgf/cm²/250 RPM
Firing Order	1-3-4-2

Fuel System

Injection Timing	12°-13° before T.D.C. 0.21 to 0.23 rad.
Fuel Injection Pressure - 1st Stage	2702-2845 PSI 18.63-19.61 MPa 190-200 kgf/cm²
Fuel Injection Pressure - 2nd Stage	3414-3556 PSI 23.54-24.52 MPa 240-250 kgf/cm²
Fuel Tightness of Nozzle Valve Seat	When the pressure is 16.67 MPa (170 kgf/cm², 2418 PSI), the valve seat must be fuel tightness

Valve And Valve Timing

Valve Clearance (Cold)	0.0091 to 0.0106 in. (0.23 to 0.27 mm)
Valve Seat Width (Intake)	0.0630 to 0.0790 in. (1.6 to 2.0 mm)
Valve Seat Width (Exhaust)	0.0906 to 0.1024 in. (2.3 to 2.6 mm)
Valve Seat Angle (Intake)	60° 1.047 rad.
Valve Seat Angle (Exhaust)	45° 0.785 rad.
Valve Face Angle (Intake)	60° 1.047 rad.
Valve Face Angle (Exhaust)	45° 0.785 rad.
Valve Recessing (Intake)	0.0236 to 0.0315 in. (0.6 to 0.8 mm)
Allowable Limit	0.0472 in. (1.2 mm)
Valve Recessing (Exhaust)	0.0335 to 0.0413 in. (0.85 to 1.05 mm)
Allowable Limit	0.0472 in. (1.2 mm)
Clearance Between Valve Stem And Valve Guide (Intake)	0.0022 to 0.0033 in. (0.055 to 0.085 mm)
Valve Stem O.D.	0.2740 to 0.2764 in. (6.960 to 6.975 mm)
Valve Guide I.D.	0.2768 to 0.2774 in. (7.030 to 7.045 mm)
Allowable Limit	0.0039 in. (0.1 mm)
Clearance Between Valve Stem And Valve Guide (Exhaust)	0.0022 to 0.0033 in. (0.055 to 0.085 mm)
Valve Stem O.D.	0.2740 to 0.2764 in. (6.960 to 6.975 mm)
Valve Guide I.D.	0.2768 to 0.2774 in. (7.030 to 7.045 mm)
Allowable Limit	0.0039 in. (0.1 mm)
Intake Valve - Open	14° before T.D.C. 0.24 rad.
Closed	36° after B.D.C. 0.61 rad.
Exhaust Valve - Open	45° before B.D.C. 0.76 rad.
Closed	17° after T.D.C. 0.29 rad.

All dimensions are given in inches. Respective metric dimensions are given in millimeters enclosed by parentheses.

Valve Spring

Valve Spring (Intake)	1.3819 to 1.4016 in. (35.1 to 35.6 mm)
Allowable Limit	1.3622 in. (34.6 mm)
Valve Spring (Exhaust)	1.3819 to 1.4016 in. (35.1 to 35.6 mm)
Allowable Limit	1.3622 in. (34.6 mm)
Setting Load/Setting Length (Intake)	14.256 lbs / 1.2401 in. (63.547 N / 31.5 mm) (6.48 kgf / 31.5 mm)
Allowable Limit	10.296 lbs /1.2401 in. (45.864 N / 31.5 mm) (4.68 kgf / 31.5 mm)
Setting Load/Setting Length (Exhaust)	14.256 lbs / 1.2401 in. (63.547 N / 31.5 mm) (6.48 kgf / 31.5 mm)
Allowable Limit	10.296 lbs /1.2401 in. (45.864 N / 31.5 mm) (4.68 kgf / 31.5 mm)
Tilt - Allowable Limit	0.039 in. (1.0 mm)

Piston And Piston Ring

Piston Pin Bore I.D.	1.1811 to 1.1816 in. (30.000 to 30.013 mm)
Allowable Limit	1.1831 in. (30.05 mm)
Clearance Between Compression Ring 1 and Ring Groove	0.0020 to 0.0028 in. (0.05 to 0.07 mm)
Allowable Limit	0.0059 in. (0.15 mm)
Clearance Between Compression Ring 2 and Ring Groove	0.0037 to 0.0047 in. (0.093 to 0.120 mm)
Allowable Limit	0.0079 in. (0.20 mm)
Clearance Between Oil Ring And Ring Groove	0.0008 to 0.0023 in. (0.02 to 0.06 mm)
Allowable Limit	0.0059 in. (0.15 mm)
Ring Gap	
Compression Ring 1	0.0118 to 0.0177 in. (0.30 to 0.45 mm)
Allowable Limit	0.0492 in. (1.25 mm)
Compression Ring 2	0.0118 to 0.0177 in. (0.30 to 0.45 mm)
Allowable Limit	0.0492 in. (1.25 mm)
Oil Ring	0.0098 to 0.0177 in. (0.25 to 0.45 mm)
Allowable Limit	0.0492 in. (1.25 mm)

Connecting Rod

Connecting Rod Alignment - Allowable Limit	0.0020 in. (0.05 mm)
Clearance Between Piston Pin And Small End Bushing	0.0008 to 0.0016 in. (0.02 to 0.040 mm)
Allowable Limit	0.0059 in. (0.15 mm)
Piston Pin O.D.	1.1813 to 1.1815 in. (30.006 to 30.011 mm)
Small End Busing I.D.	1.1823 to 1.1829 in. (30.031 to 30.046 mm)

All dimensions are given in inches. Respective metric dimensions are given in millimeters enclosed by parentheses.

Cylinder Head

Cylinder Head Surface Flatness - Allowable Limit	0.0019 in. (0.05 mm)
Compression Pressure	498 to 526 PSI / 250 RPM 3.43 to 3.63 MPa / 250 RPM 35 to 37 kgf/cm² / 250 RPM
Variance Among Cylinder - Allowable Limit	10% or less

Crankshaft

Crankshaft Alignment - Allowable Limit	0.00079 in. (0.02 mm)
Crankpin O.D.	2.0857 to 2.0862 in. (52.977 to 52.990 mm)
Crankshaft Journal O.D.	2.9518 to 2.9548 in. (74.977 to 74.990 mm)
Oil Clearance Between Crankshaft Journal And Crankshaft Bearing	0.0007 to 0.0024 in. (0.018 to 0.062 mm)
Allowable Limit	0.0079 in (0.20 mm)
Oil Clearance Between Crank Pin And Pin Bearing	0.0007 to 0.0020 in. (0.018 to 0.051 mm)
Allowable Limit	0.0079 in (0.20 mm)
Crankshaft Side Clearance	0.0059 to 0.0122 in. (0.015 to 0.31 mm)
Allowable Limit	0.0197 in (0.50 mm)

Cylinder Bore

Cylinder Bore I.D.	3.8582 to 3.8591 in. (98.000 to 98.022 mm)
Allowable Limit	3.8642 in. (98.15 mm)
Oversized Cylinder Liner I.D.	3.8780 to 3.8788 in. (98.500 to 98.522 mm)
Allowable Limit	3.8839 in. (98.65 mm)

Oil Pump

Engine Oil Pressure - At Idle Speed	14 PSI (98 kPa) 1.0 kgf/cm²
Allowable Limit	7 PSI (49 kPa) 0.5 kgf/cm²
Engine Oil Pressure - At Rated Speed	28 to 56 PSI (196 to 392 kPa) 2.0 to 4.0 kgf/cm²
Allowable Limit	21.3 PSI (147.1 kPa) 1.5 kgf/cm²
Engine Oil Pressure Switch Working Pressure	5.6 to 8.4 PSI (39.2 to 58.8 kPa) 0.4 to 0.6 kgf/cm²
Clearance Between Inner Rotor And Outer Rotor	0.0016 to 0.0063 in. (0.04 to 0.16 mm)
Clearance Between Outer Rotor And Pump Body	0.0039 to 0.0072 in. (0.100 to 0.184 mm)
Clearance Between Rotor And Cover	0.0010 to 0.0030 in. (0.025 to 0.075 mm)
Allowable Limit	0.0089 in. (0.225 mm)
Relief Valve Working Pressure	129 PSI (885 kPa) 9.04 kgf/cm²

All dimensions are given in inches. Respective metric dimensions are given in millimeters enclosed by parentheses.

Rocker Arm

Clearance Between Valve Arm Bridge And Valve Arm Bridge Shaft	0.0007 to 0.0026 in. (0.018 to 0.042 mm)
Allowable Limit	0.0059 in. (0.15 mm)
Valve Arm Bridge I.D.	0.3563 to 0.3569 in. (9.050 to 9.065 mm)
Valve Arm Bridge Shaft O.D.	0.3552 to 0.3566 in. (9.023 to 9.032 mm)
Clearance Between Rocker Arm Shaft And Rocker Arm	0.0006 to 0.0018 in. (0.016 to 0.045 mm)
Allowable Limit	0.0059 in. (0.15 mm)
Rocker Arm Shaft O.D.	0.6289 to 0.6293 in. (15.973 to 15.984 mm)
Rocker Arm I.D. For Shaft	0.6299 to 0.6306 in. (16.000 to 16.018 mm)

Tappet

Clearance Between Tappet And Guide	0.0008 to 0.0024 in. (0.020 to 0.062 mm)
Allowable Limit	0.0028 in. (0.07 mm)
Tappet Guide I.D.	0.9449 to 0.9457 in. (24.000 to 24.021 mm)
Tappet O.D.	0.9433 to 0.9441 in. (23.959 to 23.980 mm)

Camshaft

Camshaft Side Clearance	0.0028 to 0.0087 in. (0.07 to 0.22 mm)
Allowable Limit	0.0118 in. (0.3 mm)
Camshaft Alignment - Allowable Limit	0.00039 in. (0.01 mm)
Camshaft Height (Intake)	1.4815 in. (37.63 mm)
Allowable Limit	1.4618 in. (37.13 mm)
Camshaft Height (Exhaust)	1.5338 in. (38.96 mm)
Allowable Limit	1.5141 in. (38.46 mm)
Oil Clearance Of Camshaft	0.0020 to 0.0035 in. (0.050 to 0.091 mm)
Allowable Limit	0.0059 in. (0.15 mm)
Camshaft Journal O.D.	1.8084 to 1.8091 in. (45.934 to 45.950 mm)
Camshaft Bearing I.D.	1.8110 to 1.8120 in. (46.000 to 46.025 mm)

Thermostat

Thermostat Valve Opening Temperature	166.1 to 173.3°F (74.5 to 78.5°C)
Temperature At Which Thermostat Completely Opens	194°F (90°C)

All dimensions are given in inches. Respective metric dimensions are given in millimeters enclosed by parentheses.

Timing Gear

Timing Gear Backlash	
Crank Gear - Idler Gear	0.0019 to 0.0076 in. (0.049 to 0.193 mm)
Allowable Limit	0.0087 in. (0.22 mm)
Idler Gear - Cam Gear	0.0019 to 0.0074 in. (0.049 to 0.189 mm)
Allowable Limit	0.0087 in. (0.22 mm)
Idle Gear - Injection Pump Gear	0.0012 to 0.0065 in. (0.030 to 0.165 mm)
Allowable Limit	0.0087 in. (0.22 mm)
Clearance Between Idle Gear Shaft And Idle Gear Bushing	0.0020 to 0.0036 in. (0.05 to 0.091 mm)
Allowable Limit	0.0039 in. (0.10 mm)
Idle Gear Bushing I.D.	1.7726 to 1.7736 in. (45.025 to 45.050 mm)
Idle Gear Shaft O.D.	1.7700 to 1.7707 in. (44.959 to 44.975 mm)
Idle Gear Side Clearance	0.0059 to 0.0118 in. (0.15 to 0.30 mm)
Allowable Limit	0.0354 in. (0.9 mm)

Intake Air Heater

Intake Air Heater Resistance (at cold occasion)	Approximately 0.3Ω

Turbocharger Compressor Shaft

Axial Clearance	0.0022 to 0.0041 in. (0.057 to 0.103 mm)
Allowable Limit	0.0047 in. (0.12 mm)


Bobcat®

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 Bobcat that have zinc phosphate coating are specified by the letter "H" following the part number.

	THREAD SIZE	SAE GRADE 5	SAE GRADE 8
INCH. LBS. (Nm)	.250	80-90 (9-10)	110-120 (13-14)
	.3125	180-200 (21-23)	215-240 (24-27)
FOOT LBS. (Nm)	.375	25-28 (34-38)	35-40 (48-54)
	.4375	40-45 (54-61)	60-65 (82-88)
	.500	65-70 (88-95)	90-100 (125-135)
	.5625	90-100 (125-135)	125-140 (170-190)
	.625	125-140 (170-190)	175-190 (240-190)
	.750	220-245 (300-330)	300-330 (410-450)
	.875	330-360 (450-490)	475-525 (645-710)
	1.000	475-525 (645-710)	725-800 (985-1085)
	1.125	650-720 (880-975)	1050-1175 (1425-1600)
	1.250	900-1000 (1200-1360)	1475-1625 (2000-2200)
	1.375	1200-1350 (1630-1830)	2000-2200 (2720-2980)
	1.500	1500-1650 (2040-2240)	2600-2850 (3530-3870)
	1.625	2000-2800 (2720-2980)	3450-3800 (4680-5150)
	1.750	2500-2750 (3390-3730)	4300-4800 (5830-6500)
	1.875	3150-3500 (4270-4750)	5500-6100 (7450-8300)
	2.000	3800-4200 (5150-5700)	6500-7200 (8800-9800)

TORQUE SPECIFICATIONS FOR BOLTS (CONT'D)

Torque For General Metric Bolts

Thread Size (Dia.)	Material		
	8.8	10.9	12.9
M4	2.0-2.5 ft.-lbs. (2,5-3,5 Nm)	2.8-3.1 ft.-lbs. (3,8-4,2 Nm)	3.5-3.9 ft.-lbs. (4,7-5,3 Nm)
M5	4.0-5.0 ft.-lbs. (5,5-6,5 Nm)	5.6-6.2 ft.-lbs. (8,4-7,6 Nm)	6.2-7.0 ft.-lbs. (8,5-9,5 Nm)
M6	7.0-7.5 ft.-lbs. (9,5-10,5 Nm)	9.1-10.1 ft.-lbs. (12,2-13,7 Nm)	10.4-11.6 ft.-lbs. (14,2-15,8 Nm)
M7	11.0-12.5 ft.-lbs. (15-17 Nm)	16.2-14.7 ft.-lbs. (20-22 Nm)	17.5-19.5 ft.-lbs. (23,7-26,3 Nm)
M8	18-19 ft.-lbs. (24-26 Nm)	21.7-24.0 ft.-lbs. (29,4-32,6 Nm)	25.5-28.5 ft.-lbs. (35-39 Nm)
M10	32-35 ft.-lbs (43-47 Nm)	42.0-46.5 ft.-lbs. (57-63 Nm)	52.5-58.5 ft.-lbs. (71-79 Nm)
M12	55-60 ft.-lbs. (75-85 Nm)	78-85 ft.-lbs. (105-115 Nm)	91-110 ft.-lbs. (91-110 Nm)
M14	100-90 ft.-lbs. (125-140 Nm)	118-133 ft.-lbs. (118-133 Nm)	140-155 ft.-lbs. (140-155 Nm)
M16	140-155 ft.-lbs. (190-210 Nm)	188-210 ft.-lbs. (255-285 Nm)	225-245 ft.-lbs. (300-330 Nm)
M18	190-215 ft.-lbs. (260-290 Nm)	255-285 ft.-lbs. (345-385 Nm)	210-340 ft.-lbs. (420-460 Nm)
M20	275-300 ft.-lbs. (370-410 Nm)	360-405 ft.-lbs. (490-550 Nm)	440-490 ft.-lbs. (590-650 Nm)
M22	370-400 ft.-lbs. (500-550 Nm)	554-560 ft.-lbs. (740-760 Nm)	590-650 ft.-lbs. (800-880 Nm)
M24	470-520 ft.-lbs. (640-700 Nm)	625-700 ft.-lbs. (850-950 Nm)	730-830 ft.-lbs. (1000-1120 Nm)
M27	680-760 ft.-lbs. (930-1030 Nm)	900-1000 ft.-lbs. (1230-1370 Nm)	1100-1200 ft.-lbs. (1470-1630 Nm)
M30	930-1030 ft.-lbs. (1260-1400 Nm)	1250-1400 ft.-lbs. (1700-1900 Nm)	1500-1600 ft.-lbs. (2000-2200 Nm)
M33	1270-1400 ft.-lbs. (1720-1900 Nm)	2300-2500 ft.-lbs. (2300-2500 Nm)	2000-2300 ft.-lbs. (2700-3100 Nm)
M36	1620-1800 ft.-lbs. (200-2450 Nm)	2200-2400 ft.-lbs. (2900-3200 Nm)	2600-2900 ft.-lbs. (3500-3900 Nm)

NOTE: Use the torque valve 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 Engine Bolts

Thread Size (Dia. x Pitch)	Material		
	Head Mark 4	Head Mark 7	Head Mark 10
M5 x 0.8		3-4 ft.-lbs. (4-5 Nm)	
M6 x 1.0		6-7 ft.-lbs. (8-9 Nm)	6-9 ft.-lbs. (8-12 Nm)
M8 x 1.25	6-9 ft.-lbs. (8-12 Nm)	11-16 ft.-lbs. (15-22 Nm)	18-25 ft.-lbs. (24-34 Nm)
M10 x 1.25	13-18 ft.-lbs. (18-24 Nm)	22-30 ft.-lbs. (30-41 Nm)	36-50 ft.-lbs. (49-68 Nm)
M12 x 1.25	22-30 ft.-lbs. (30-41 Nm)	40-54 ft.-lbs. (54-73 Nm)	69-87 ft.-lbs. (94-118 Nm)
M14 x 1.5	36-50 ft.-lbs (49-68 Nm)	58-80 ft.-lbs. (79-108 Nm)	116-137 ft.-lbs. (157-186 Nm)

Tightening Torques For General Use Screws, Bolts And Nuts

Grade / Nominal Diameter / Unit	Standard Screw and Bolt (4)			Special Screw and Bolt (7)		
	N·m	kgf·m	ft-lbs	N·m	kgf·m	ft-lbs
M6	7.9 to 9.3	0.80 to 0.95	5.8 to 6.9	9.8 to 11.3	1.00 to 1.15	7.23 to 8.32
M8	17.7 to 20.6	1.8 to 2.1	13.0 to 15.2	23.5 to 27.5	2.4 to 2.8	17.4 to 20.3
M10	39.2 to 45.1	4.0 to 4.6	28.9 to 33.3	49.0 to 55.9	5.0 to 5.7	36.2 to 41.2
M12	62.8 to 72.6	6.4 to 7.4	46.3 to 53.5	77.5 to 90.2	7.9 to 9.2	57.1 to 66.5

Screw and bolt material grades are shown by numbers punched on the screw and bolt heads. Prior to tightening, be sure to check out the numbers as shown below.

Punched number	Screw and bolt material grade
None or 4	Standard screw and bolt SS400, S20C
7	Special screw and bolt S43C, S48C (Refined)

Bobcat®

HYDRAULIC CONNECTION SPECIFICATIONS

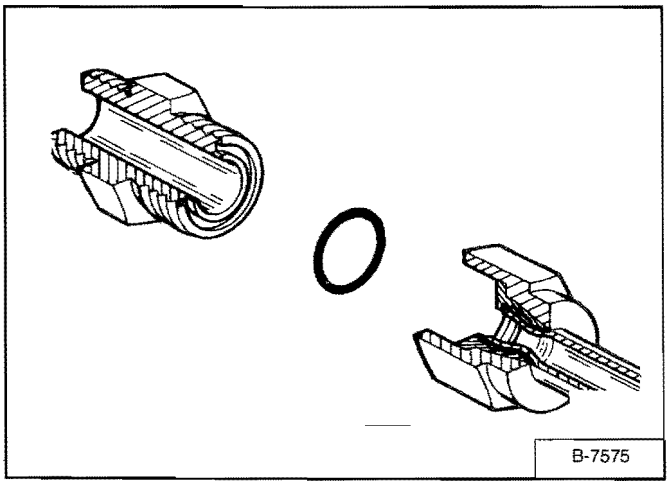
O-ring Face Seal Connection

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.

I-2003-0888

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**].

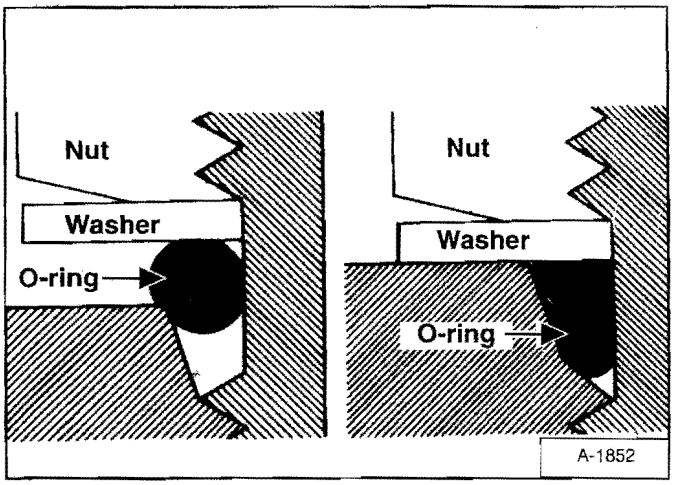
Figure SPEC-40-2

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)

HYDRAULIC CONNECTION SPECIFICATIONS (CONT'D)

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

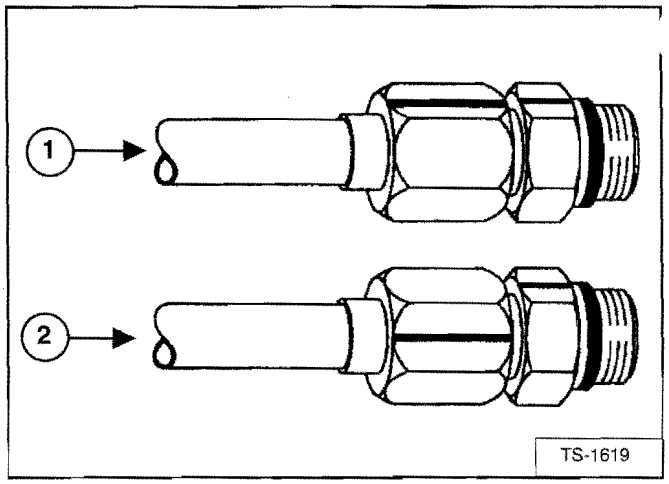
Replace any tubelines that are bent or flattened. They will restrict flow, which will slow hydraulic action and cause heat.

Replace hoses which show signs of wear, damage or weather cracked rubber.

Always use two wrenches when loosening and tightening hose or tubeline fittings.

Flare Fitting

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 **[Figure SPEC-40-5 on Page SPEC-40-3]** 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.

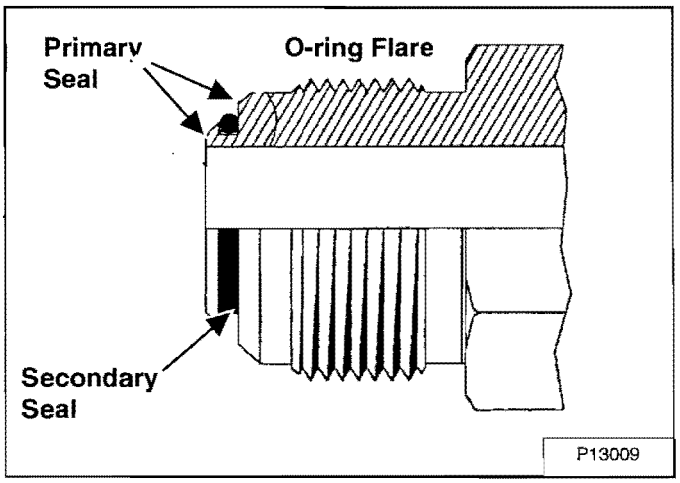
Flare Fitting (Cont'd)

Figure SPEC-40-5

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 (81)
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-40-6

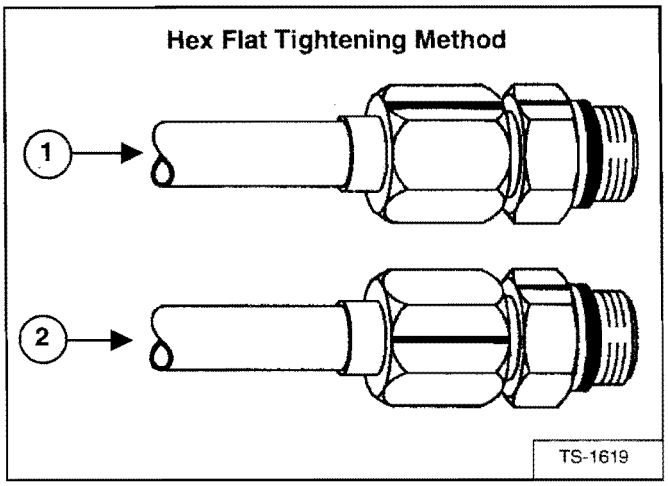


The flare is the primary seal, the O-ring is the secondary seal and helps absorb vibration and pressure pulses at the connection **[Figure SPEC-40-6]**.

If necessary, the O-ring-flare fitting can be used without an O-ring.

Use the following procedure to tighten the O-ring flare fitting.

Figure SPEC-40-7



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-40-7]**.

Use the chart **[Figure SPEC-40-8 on Page SPEC-40-4]** to find the correct tightness needed (Item 2) **[Figure SPEC-40-7]**. If the fitting leaks after tightening, disconnect it and inspect the seat area for damage.

HYDRAULIC CONNECTION SPECIFICATIONS (CONT'D)

O-ring Flare Fitting (Cont'd)

Figure SPEC-40-8

O-ring Flare Fitting Tightening Torque		
Tubeline Outside Diameter	Thread Size	* TORQUE Ft.-lbs. (Nm)
1/4"	7/1" - 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 (81)
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 toque wrench is used to tighten a used fittng to a new hose/tubeline.

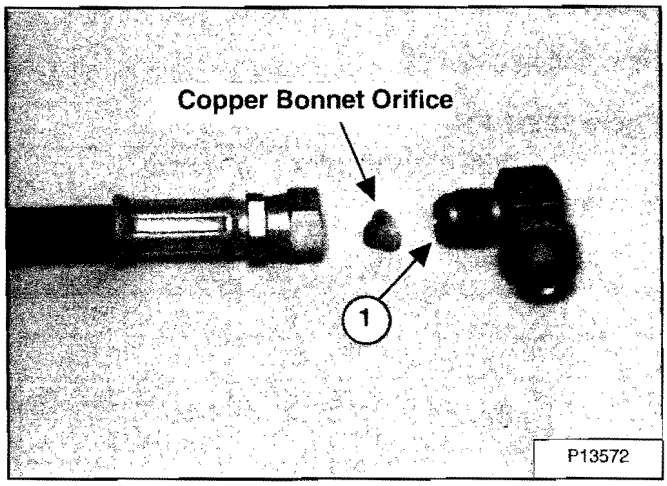
* If a torque wrench is used to tighten a new fitting to a new hose/tubeline.

** If using the hex flat tightening method to tighten a new fitting to a new hose/tubeline.

** If using the hex flate tighening 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.

Figure SPEC-40-9



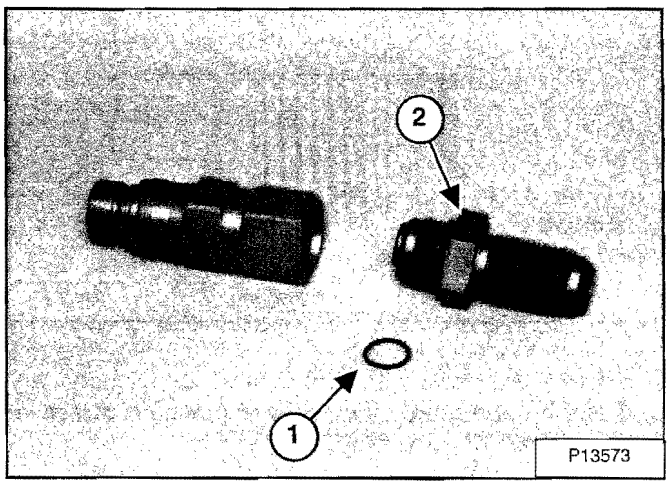
NOTE: O-ring flare fittings are not recommended in all applications. Use the standard flare fittings in these applications.

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-40-9]** 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-40-10

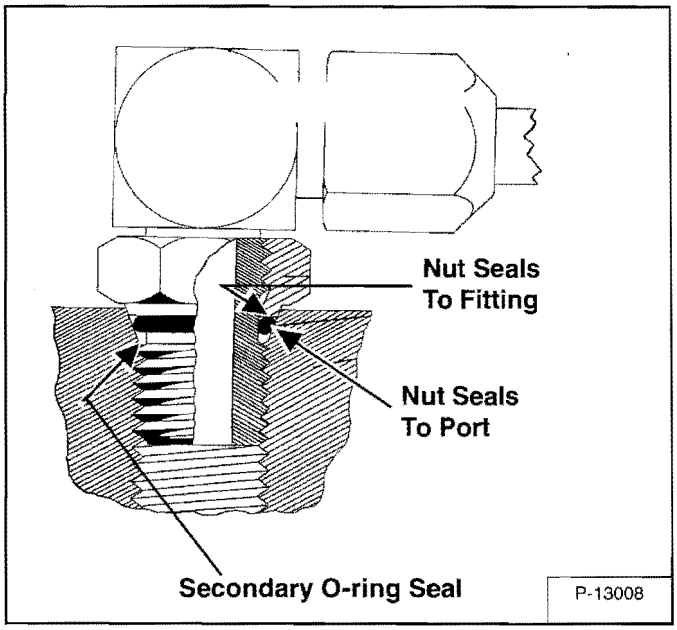


NOTE: Always remove the O-ring (Item 1) [Figure SPEC-40-10] from the flare face as shown.

An O-ring (Item 2) **[Figure SPEC-40-10]** is added to the flat boss of the fitting to seal the connection in this application.

Port Seal Fitting

Figure SPEC-40-11



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-40-11]**.

The hex portion of the nut does not contact the surface of the component when the nut is tight.

Figure SPEC-40-12

Port Seal and O-ring Boss Tightening Torque	
Thread Size	**TORQUE Ft.-lbs. (Nm)**
7/16" - 20	13 18)
9/16" - 18	22 (30)
3/4" -1 6	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 transmission fluid (P/N 6563328). If this fluid is not available, use 10W-30 or 10W-40 SAE Motor Oil (5W-30 for 0°F [-18°C] and Below).

DO NOT use automatic transmission fluids in the 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

FRACTIONS	DECIMALS	MM
33/64	0.515625	13.097
17/32	0.53125	13.494
35/64	0.546875	13.891
9/16	0.5625	14.288
37/64	0.578125	14.684
19/32	0.59375	15.081
39/64	0.609375	15.478
5/8	0.6250	15.875
41/64	0.640625	16.272
21/32	0.65625	16.669
43/64	0.671875	17.066
11/16	0.6875	17.462
45/64	0.703125	17.859
23/32	0.71875	18.256
47/64	0.734375	18.653
3/4	0.7500	19.050
49/64	0.765625	19.447
25/32	0.78125	19.844
51/64	0.796875	20.241
13/16	0.8125	20.638
53/64	0.828125	21.034
27/32	0.84375	21.431
55/64	0.859375	21.828
7/8	0.8750	22.225
57/64	0.890625	22.622
29/32	0.90625	23.019
59/64	0.921875	23.416
15/16	0.9375	23.812
61/64	0.953125	24.209
31/32	0.96875	24.606
63/64	0.984375	25.003
1	1.000	25.400

1 mm = 0.03937"

0.001 = 0.0254 mm

U.S. To Metric Conversion

	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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