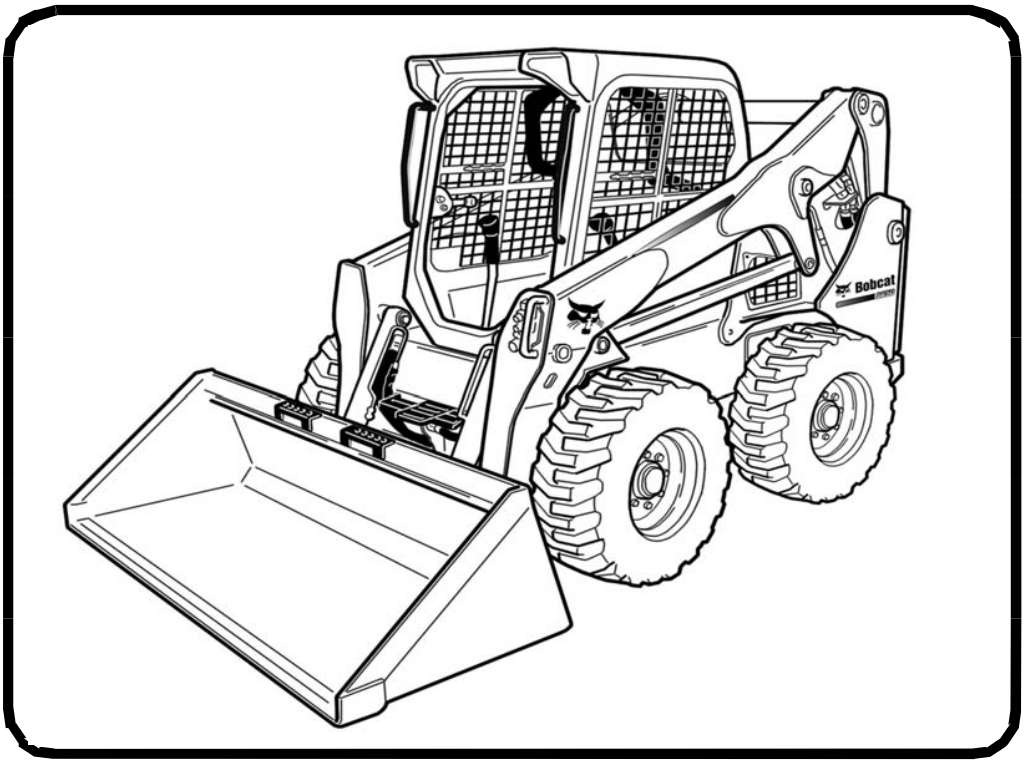
Service Manual
S650 Skid-Steer Loader

S/N A3NV11001 & Above
S/N A3NW11001 & Above



EQUIPPED WITH
BOBCAT INTERLOCK
CONTROL SYSTEM (BICS™)

6987168 (10-10)

Printed in U.S.A.

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MAINTENANCE SAFETY

WARNING

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

W-2003-0807

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

CORRECT



P-90216

Never service the Bobcat Skid-Steer Loader without instructions.

CORRECT



NA1204

Use the correct procedure to lift or lower operator cab.

CORRECT



NA1193

Cleaning and maintenance are required daily.

WRONG



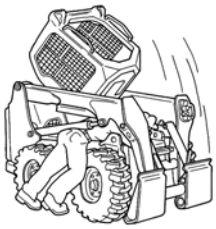
NA1192

Have good ventilation when welding or grinding painted parts.

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

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

WRONG



NA1205

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



NA1206

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

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

WRONG



NA1200

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



NA1191

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.

MSW35-0409

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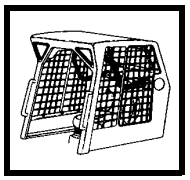
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FOREWORD

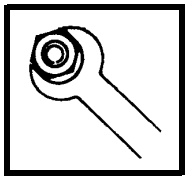
This manual is for the Bobcat loader mechanic. It provides necessary servicing and adjustment procedures for the Bobcat loader and its component parts and systems. Refer to the Operation & Maintenance Manual for operating instructions, starting procedure, daily checks, etc.

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

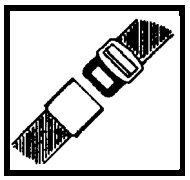
1. Check that the ROPS/FOPS (Including side screens) is in good condition and is not modified.



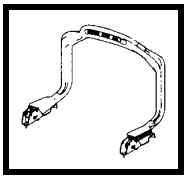
2. Check that ROPS mounting hardware is tightened and is Bobcat approved.



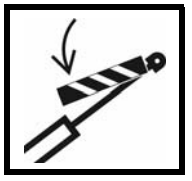
3. The seat belt must be correctly installed, functional and in good condition.



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



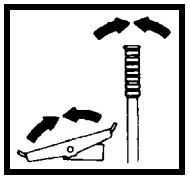
5. Check lift arm support device, replace if damaged.



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



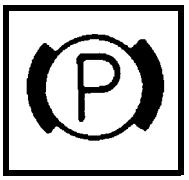
7. Steering levers, hand controls and foot pedals must return to neutral (as applicable).



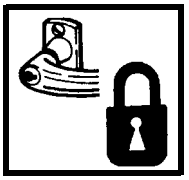
8. Check for correct function of the work lights.



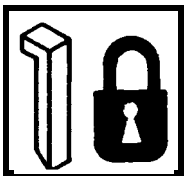
9. The parking brake must function correctly.



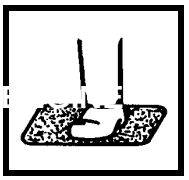
10. Enclosure door latches must open and close freely.



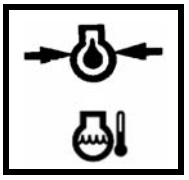
11. Bob-Tach wedges and linkages must function correctly and be in good condition.



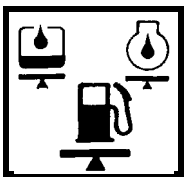
12. Safety treads must be in good condition.



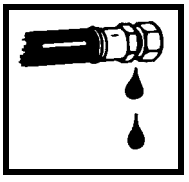
13. Check for correct function of indicator lamps.



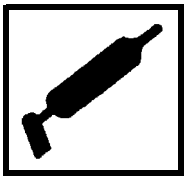
14. Check hydraulic fluid level, engine oil level and fuel supply.



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



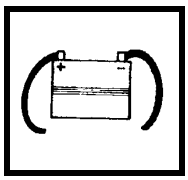
16. Lubricate the loader.



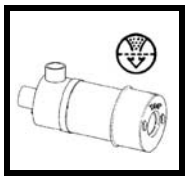
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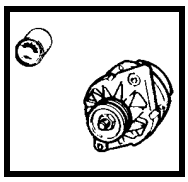
17. Check the condition of the battery and cables.



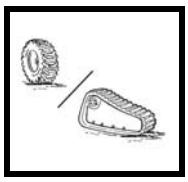
18. Inspect the air cleaner for damage or leaks. Check the condition of the element.



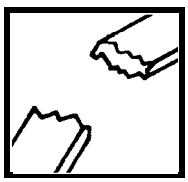
19. Check the electrical charging system.



20. Check tires for wear and pressure. Check tracks for wear and tension. Use only approved tires or tracks.



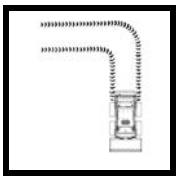
21. Inspect for loose or broken parts or connections.



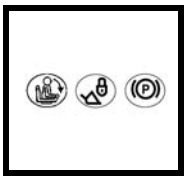
22. Check for any field modification not completed.



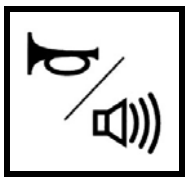
23. Operate the machine and check all functions.



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



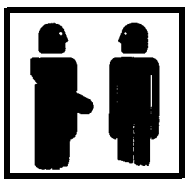
25. Check for proper function of front horn and back-up alarm (if equipped).



26. Check function or condition of all equipped options and accessories (examples: fire extinguisher, rotating beacon, lift kits, etc.).



27. 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.

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SAFETY INSTRUCTIONS

Safety Alert Symbol

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

WARNING

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

W-2003-0903

IMPORTANT

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

I-2019-0284

DANGER

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

D-1002-1107

WARNING

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

W-2044-1107

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

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

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



Call Before You Dig
Dial 811 (USA Only)
1-888-258-0808 (USA & Canada)

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



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

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FIRE PREVENTION



Maintenance

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

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

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

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

Operation

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

Electrical



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

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

Hydraulic System

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

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

Fueling



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

Starting

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

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

Spark Arrestor Exhaust System

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

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

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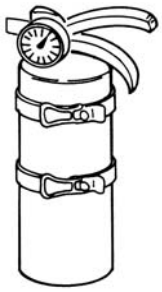
Welding And Grinding

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

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

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

Fire Extinguishers



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

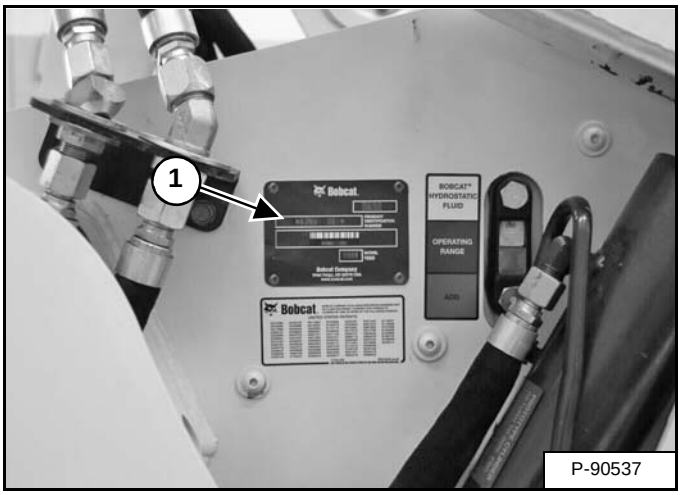
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SERIAL NUMBER LOCATIONS

Always use the serial number of the 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.

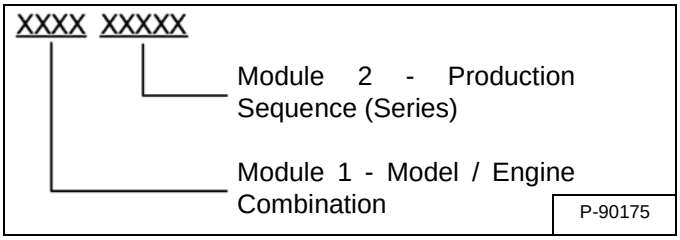
Loader Serial Number

Figure 1



The loader serial number plate (Item 1) **[Figure 1]** is located on the outside of the loader frame.

Figure 2



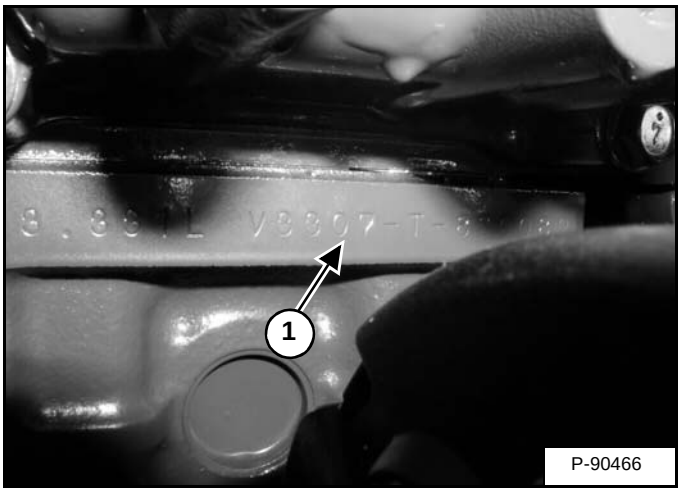
Explanation of loader Serial Number **[Figure 2]**:

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

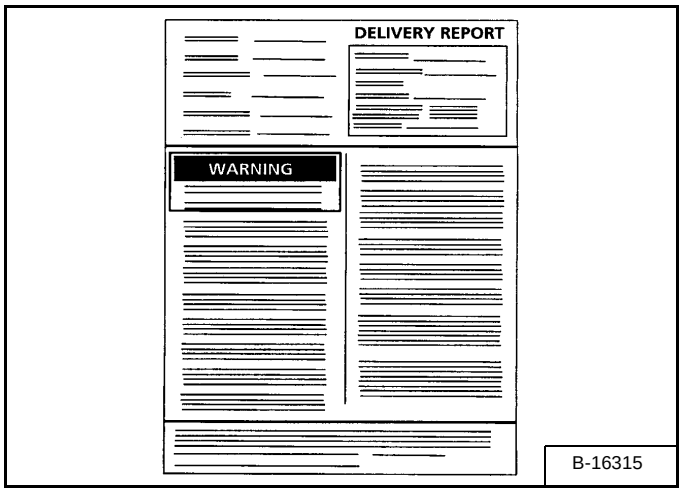


The engine serial number is located on the side of the engine (Item 1) **[Figure 3]** behind the alternator.

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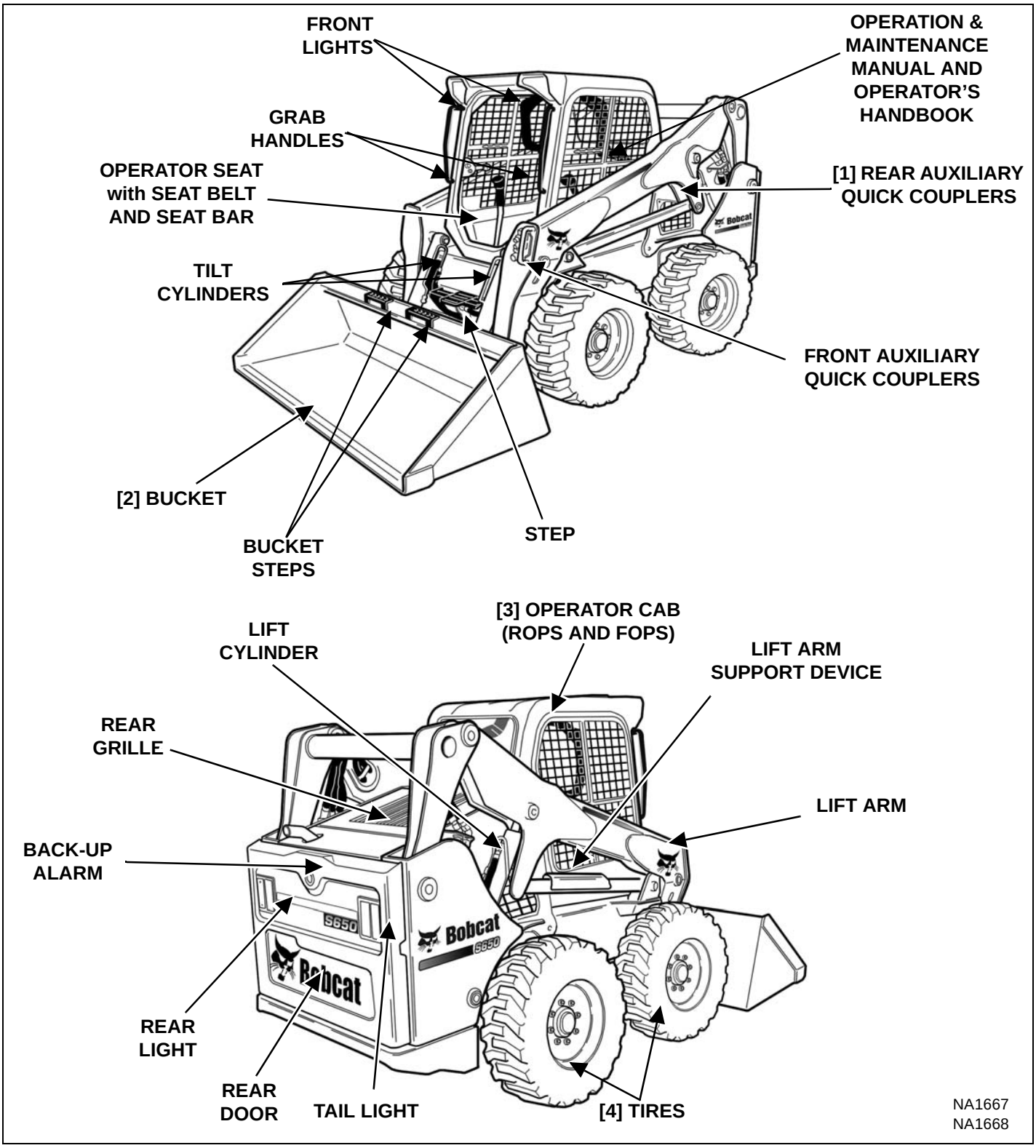
DELIVERY REPORT

Figure 4



The delivery report **[Figure 4]** must be completed 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.

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[1] Optional or Field Accessory. (Not Standard Equipment).

[2] BUCKETS - Several different buckets and other attachments are available for the Bobcat loader.

[3] ROPS, FOPS - Roll Over Protective Structure, per ISO 3471, and Falling Object Protective Structure per ISO 3449, Level I. Level II is available. The Bobcat loader is base-equipped with a standard operator cab as shown. Extra insulated cab is available as an option (Reduced noise level).

[4] TIRES - Standard tires are shown. Several different tire styles and sizes are available for the Bobcat loader.

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LIFTING AND BLOCKING THE LOADER

Procedure

Figure 10-10-1



WARNING

AVOID INJURY OR DEATH

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-2003-0807

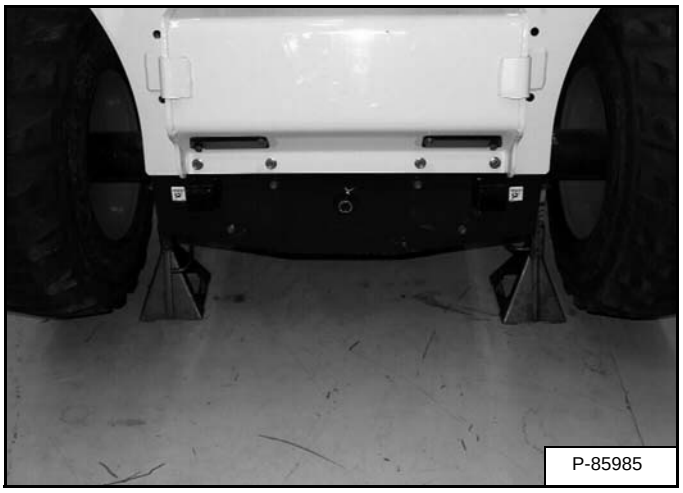
Always park the loader on a level surface.

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 front of the loader and put jack stands under the axle tubes **[Figure 10-10-2]**.

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

Figure 10-10-3



Lift the rear of the loader and install jack stands **[Figure 10-10-3]**.

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LIFT ARM SUPPORT DEVICE

Installing

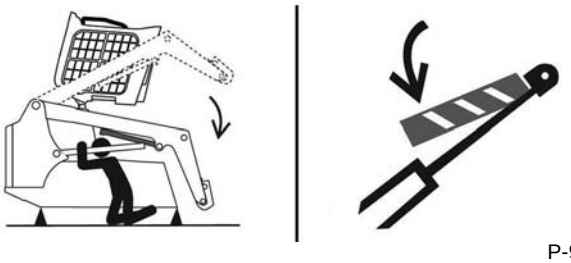
WARNING

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.

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-2572-0407

DANGER



P-90328

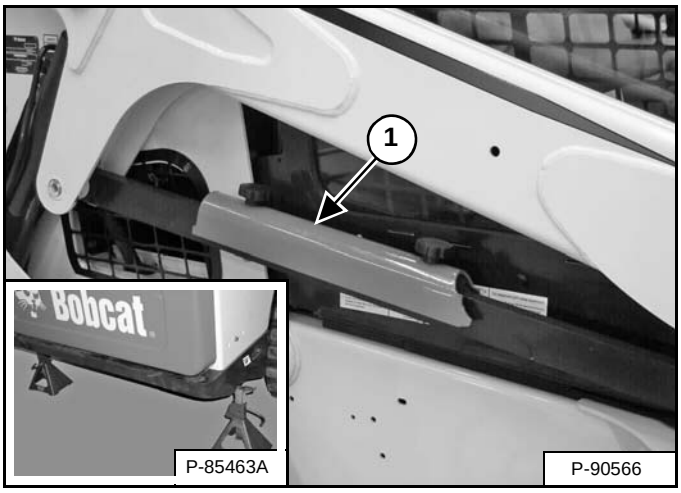
AVOID DEATH

- **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.**

D-1009-0409

Remove attachment from the loader. (See Removal And Installation on Page 50-40-1.) ***OR*** (See Removal And Installation on Page 50-41-1.)

Figure 10-20-1



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



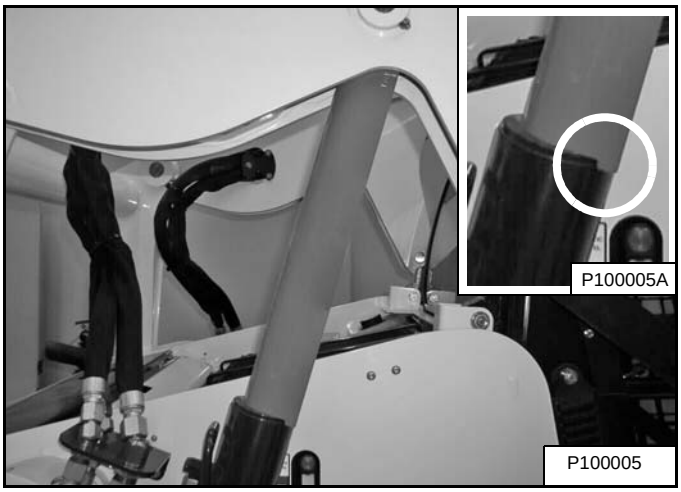
Have a second person install the lift arm support device over the rod of one of the lift cylinders **[Figure 10-20-2]**.

The lift arm support device must be tight against the cylinder rod.

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Installing (Cont'd)

Figure 10-20-3



Lower the lift arms slowly until the lift arm support device is held between the lift arms and the lift cylinder **[Figure 10-20-3]**. The tabs of the lift arm support device must go past the end of the cylinder (Inset) **[Figure 10-20-3]**.

Removing

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 and 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 the storage position and secure with clamping knobs.

Remove the jackstands.

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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. The seat belt must be worn for rollover protection.

Check the ROPS / FOPS cab, mounting and hardware for damage. Never modify the ROPS / FOPS cab. Replace the cab and hardware if damaged. See your Bobcat dealer for parts.

ROPS / FOPS - Roll Over Protective Structure per ISO 3471, and Falling Object Protective Structure per 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 sites.

Level II

Protection from falling trees, rocks: for machines involved in site clearing, overhead demolition or forestry.

⚠ WARNING

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

W-2069-0200

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Raising

Always stop the engine before raising or lowering the operator cab.

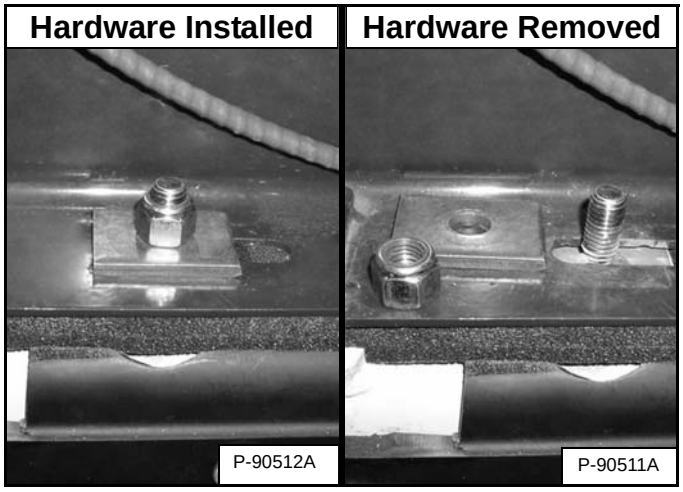
Stop the loader on a level surface. Lower the lift arms. If the lift arms must be up while raising the operator cab, install the lift arm support device. (See LIFT ARM SUPPORT DEVICE on Page 10-20-1.)

Figure 10-30-1



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

Figure 10-30-2



Remove the nuts and washers **[Figure 10-30-2]** (both sides) at the front corners of the operator cab.

⚠ WARNING

UNEXPECTED LOADER, LIFT ARM OR ATTACHMENT MOVEMENT CAUSED BY CAB CONTACT WITH CONTROLS CAN CAUSE SERIOUS INJURY OR DEATH

- **STOP ENGINE before raising or lowering cab.**

W-2758-0908

NOTE: On some machines, the operator cab frame could contact the steering levers while raising or lowering the operator cab. The engine MUST be stopped before raising or lowering the operator cab.

Figure 10-30-3



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

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OPERATOR CAB (CONT'D)

Lowering

Always stop the engine before raising or lowering the operator cab.

NOTE: Always use the grab handles to lower the operator cab.

Figure 10-30-4



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

NOTE: The weight of the operator cab increases when equipped with options and accessories such as cab door, heater, air conditioning, etc. In these cases, the operator cab may need to be raised slightly from the latch to be able to release the latch.

⚠ WARNING

UNEXPECTED LOADER, LIFT ARM OR ATTACHMENT MOVEMENT CAUSED BY CAB CONTACT WITH CONTROLS CAN CAUSE SERIOUS INJURY OR DEATH

- **STOP ENGINE before raising or lowering cab.**

W-2758-0908

NOTE: On some machines, the operator cab frame could contact the steering levers while raising or lowering the operator cab. The engine MUST be stopped before raising or lowering the operator cab.

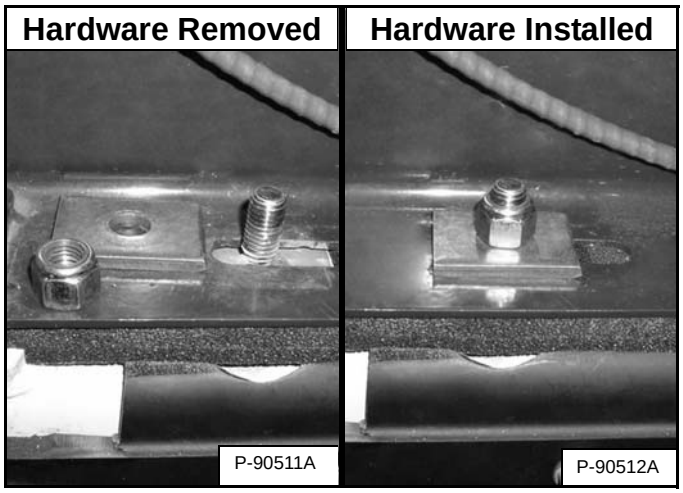
Support the operator cab and release the latching mechanism (Inset) **[Figure 10-30-4]**. Remove your hand from the latch mechanism when the operator cab is past the latch stop. Use both hands to lower the operator cab all the way down.

⚠ WARNING

PINCH POINT CAN CAUSE INJURY
Remove your hand from the latching mechanism when the cab is past the latch stop.

W-2469-0803

Figure 10-30-5



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

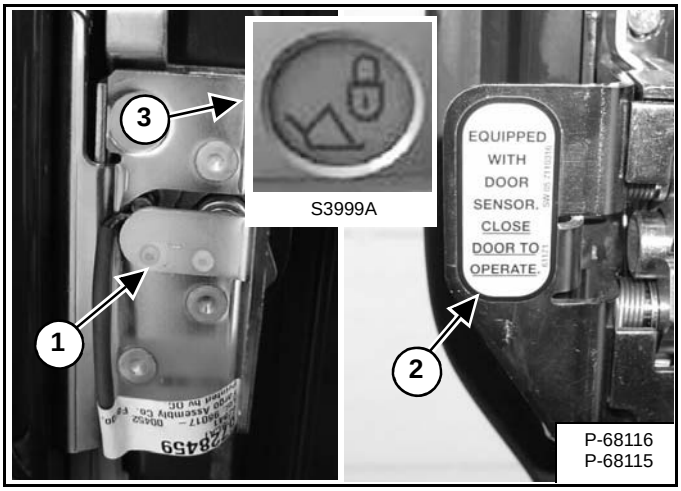
Tighten the nuts to 54 - 61 N•m (40 - 45 ft-lb) torque.

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Cab Door Sensor

This machine may be equipped with a Cab Door Sensor.

Figure 10-30-6



The cab door has a sensor (Item 1) **[Figure 10-30-6]** installed which deactivates the lift and tilt valves when the door is open.

A decal is located on the latch mechanism (Item 2) **[Figure 10-30-6]**.

The LIFT & TILT VALVE light (Item 3) **[Figure 10-30-6]** will be OFF when the door is closed, the key switch is turned to RUN or the RUN button is pressed, the seat bar is lowered and the PRESS TO OPERATE LOADER button is pressed.

Figure 10-30-7



The LIFT & TILT VALVE light (Item 3) **[Figure 10-30-6]** will be ON when the door is open, the key switch is turned to RUN or the RUN button is pressed, the seat bar is lowered and the PRESS TO OPERATE LOADER button is pressed.

[DOOR] will appear in the data display **[Figure 10-30-7]**.

Special Applications Kit

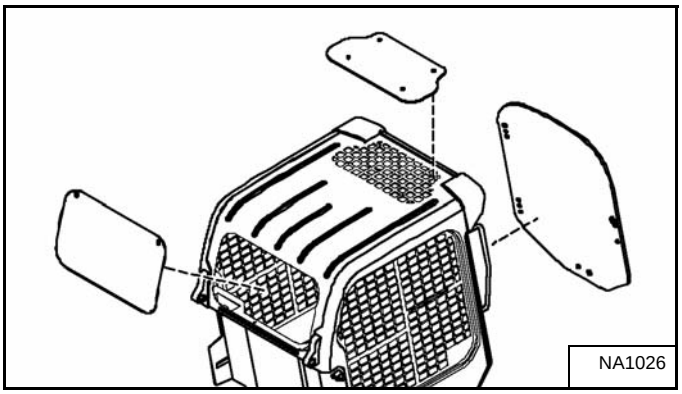
WARNING

AVOID INJURY OR DEATH

Some attachment applications can cause flying debris or objects to enter front, top or rear cab openings. Install the Special Applications Kit to provide added operator protection in these applications.

W-2737-0508

Figure 10-30-8



Available for special applications to restrict material from entering cab openings. Kit includes 1/2 inch thick polycarbonate front door and polycarbonate rear window **[Figure 10-30-8]**.

Polycarbonate top window (standard item) must be installed for special applications to restrict material from entering cab openings.

See your Bobcat dealer for availability.

Special Applications Kit Inspection And Maintenance

- Inspect for cracks or damage. Replace if required.
- Pre-rinse with water to remove gritty materials.
- Wash with a mild household detergent and warm water.
- Use a sponge or soft cloth. Rinse well with water and dry with a clean soft cloth or rubber squeegee.
- Do not use abrasive or highly alkaline cleaners.
- Do not clean with metal blades or scrapers.

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TRANSPORTING LOADER ON A TRAILER

Loading And Unloading

⚠ WARNING

AVOID SERIOUS INJURY OR DEATH

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-2058-0807

Be sure the transport and towing vehicles are of adequate size and capacity for weight of loader. (See Performance on Page SPEC-10-2.)

Figure 10-40-1

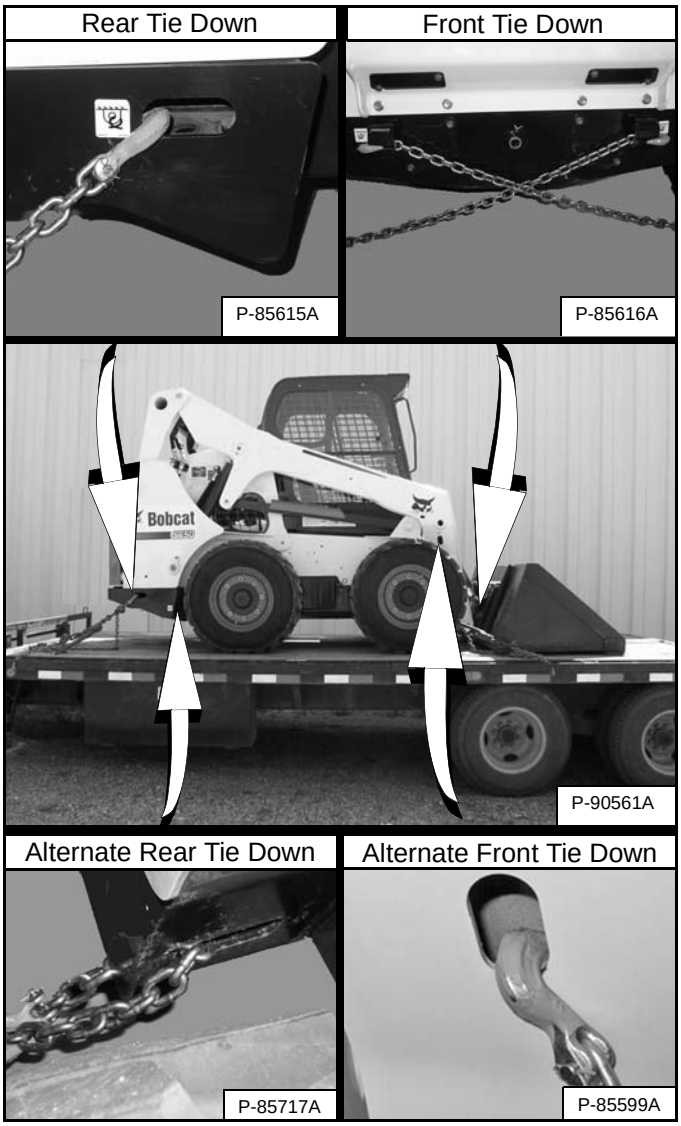


A loader with an empty bucket or no attachment must be loaded backward onto the transport vehicle **[Figure 10-40-1]**.

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

Fastening

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]**.

1. Lower the bucket or attachment to the floor.
2. Stop the engine.
3. Engage the parking brake.
4. Install chains at the front and rear loader tie down positions **[Figure 10-40-2]**. (Lift arms shown raised for clarity.)
5. Fasten each end of the chain to the transport vehicle.
6. Use chain binders to tighten the chains.

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TOWING THE LOADER

Procedure

Because of the design of the loader, there is not a recommended towing procedure.

- The loader can be lifted onto a transport vehicle.

- The loader can be skidded a short distance to move for service (EXAMPLE: Move onto a transport vehicle.) without damage to the hydrostatic system. (The tires will not turn.) There might be slight wear to the tires when the loader is skidded.

The towing chain (or cable) must be rated at 1.5 times the weight of the loader. (See Performance on Page SPEC-10-2.)

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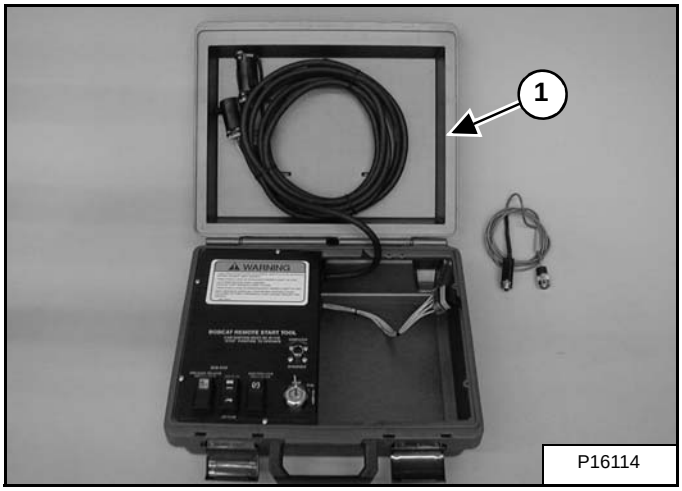
REMOTE START TOOL KIT-MEL1563

Remote Start Tool - MEL1563

Tools that will be needed to complete the following steps are:

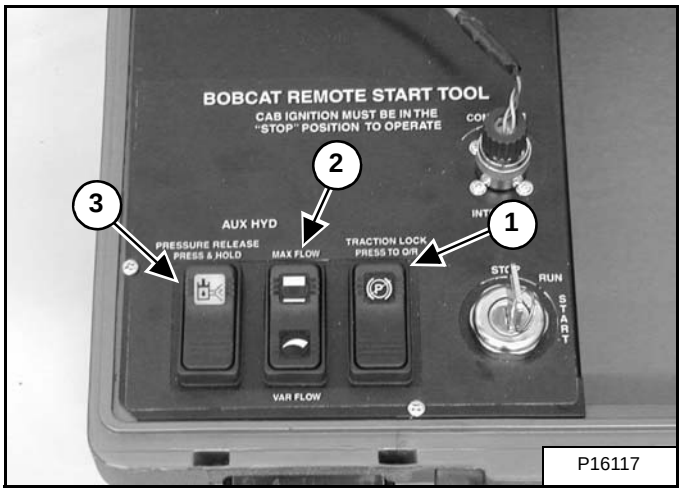
MEL1563 - Remote Start Tool
MEL1565 - Service Tool Harness Control
MEL1566 - Service Tool Harness Communicator (Computer Interface)

Figure 10-60-1



The remote start tool (Item 1) **[Figure 10-60-1]** is required when the service technician is checking the hydraulic / hydrostatic system, adjusting the steering linkage, and electrical diagnostics.

Figure 10-60-2



The traction lock switch (Item 1) **[Figure 10-60-2]** is used to turn traction lock ON or OFF. Push the switch to the override position. The switch will illuminate to indicate traction lock OVERRIDE, in this position the wheels are able to turn.

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

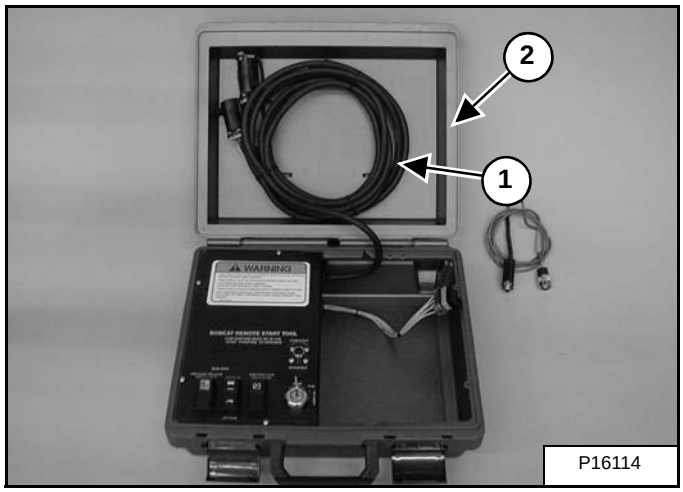
NOTE: With the engine running; pushing and holding the pressure release switch (Item 3) [Figure 10-60-2] will cause the engine to stop.

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REMOTE START TOOL-MEL1563 (CONT'D)

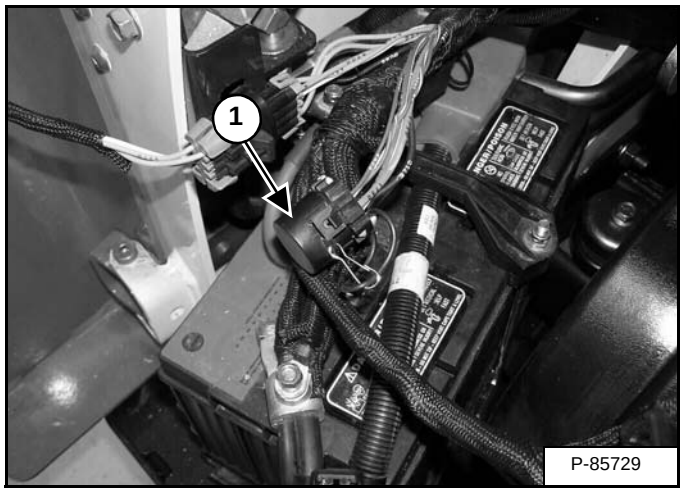
Service Tool Harness Control - MEL1565

Figure 10-60-3



The service tool harness control (Item 1) is used to connect the remote start tool (Item 2) **[Figure 10-60-3]** to the electrical system on the loader.

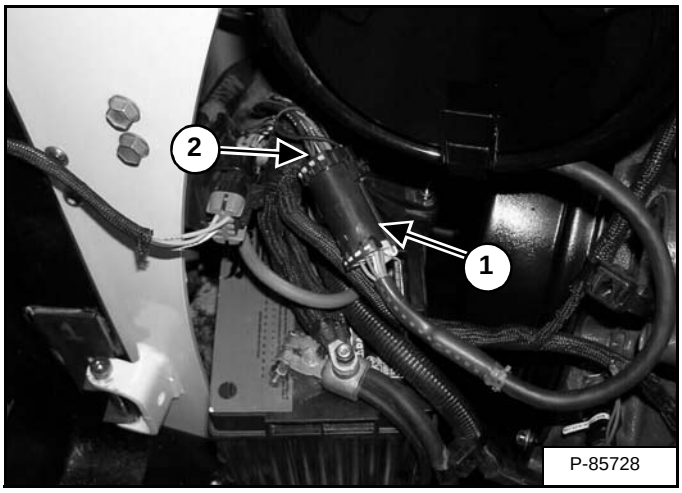
Figure 10-60-4



Remove the cap (Item 1) **[Figure 10-60-4]** from the loader harness connector.

Connect the service tool harness control to the loader harness connector.

Figure 10-60-5



Loaders equipped with an attachment harness (Item 1) must disconnect the attachment harness from the loader harness (Item 2) **[Figure 10-60-5]**.

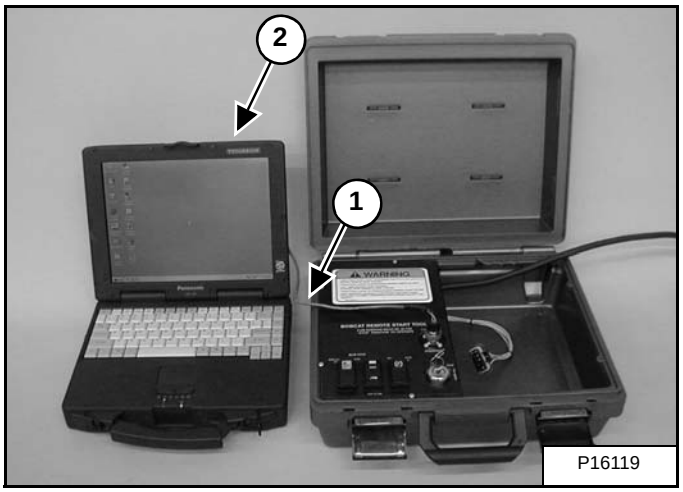
Connect the service tool harness to the ACD connector and the loader harness connector.

NOTE: To monitor, diagnose or load new software the Service PC must be connected to the Remote Start Tool.

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Service Tool Harness Communicator - MEL1566

Figure 10-60-6



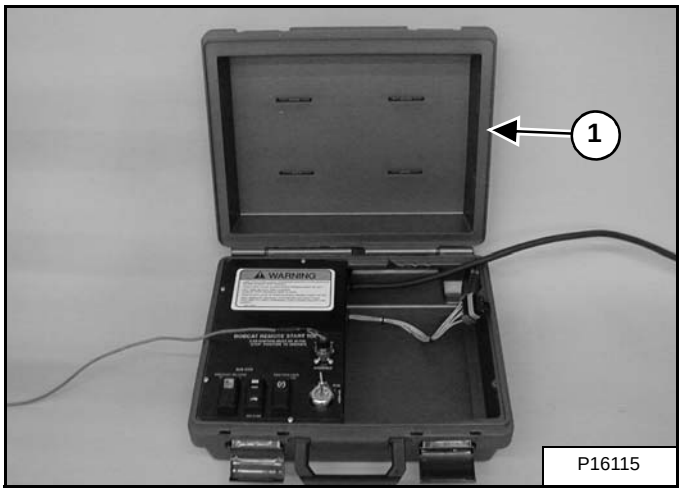
The service tool harness communicator (Item 1) is required to connect remote start tool to the Service PC (Item 2) **[Figure 10-60-6]**.

Remote Start Procedure

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

MEL1563: Remote Start Tool Kit

Figure 10-60-7



The remote start tool (Item 1) **[Figure 10-60-7]** 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.

Raise the lift arms (if required by the procedure) and install an approved lift arm support device.

Raise the operator cab (if required by the procedure).

Open the rear door of the loader.

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Remote Start Procedure (Cont'd)

Figure 10-60-8

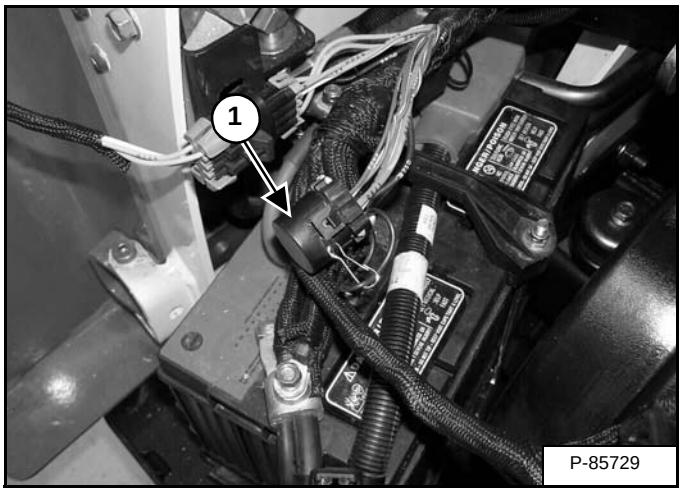
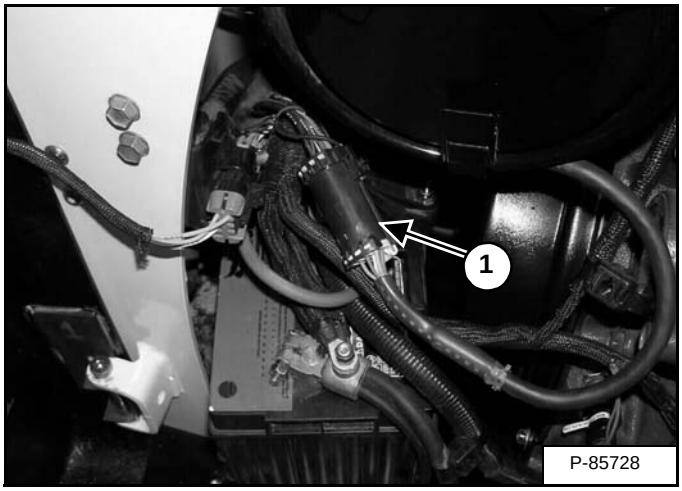


Figure 10-60-9



Remove the cap (Item 1) **[Figure 10-60-8]**.

OR

Disconnect the attachment control harness (Item 1) **[Figure 10-60-9]** (If equipped).

Figure 10-60-10

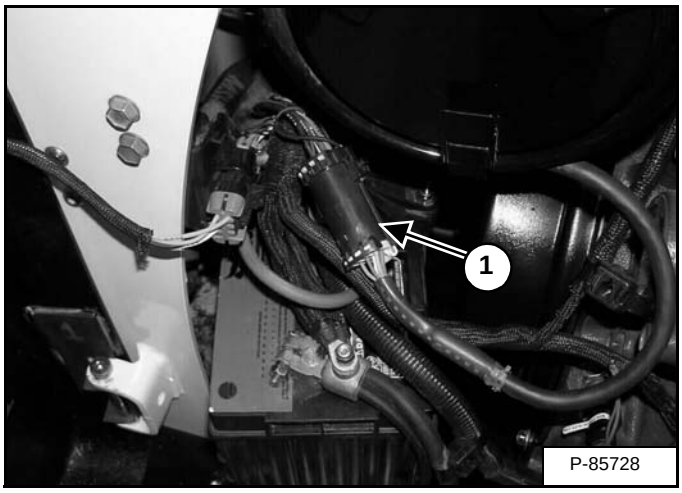
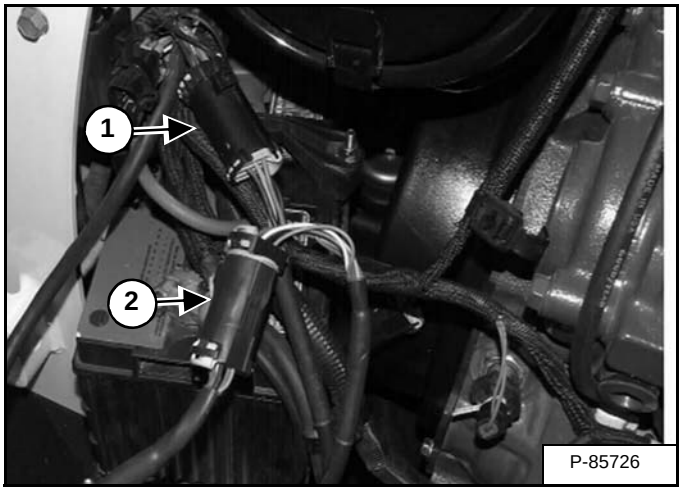


Figure 10-60-11



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

OR

Connect the remote start tool to the engine harness connector (Item 1) and to the attachment control harness (Item 2) **[Figure 10-60-11]** (If equipped).

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

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Remote Start Procedure (Cont'd)

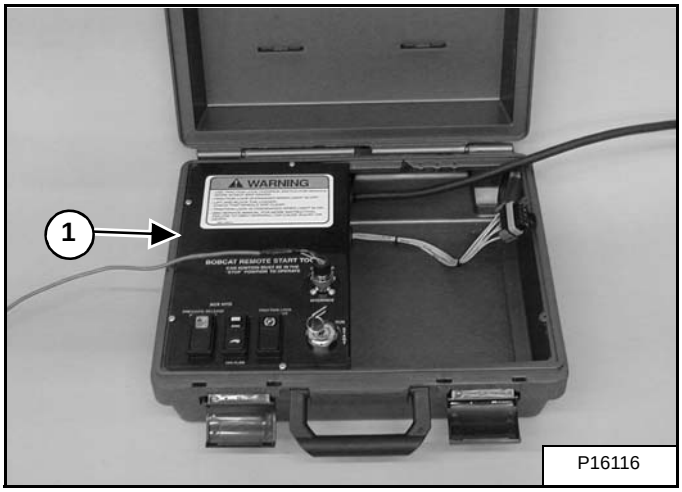
WARNING

AVOID INJURY OR DEATH

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

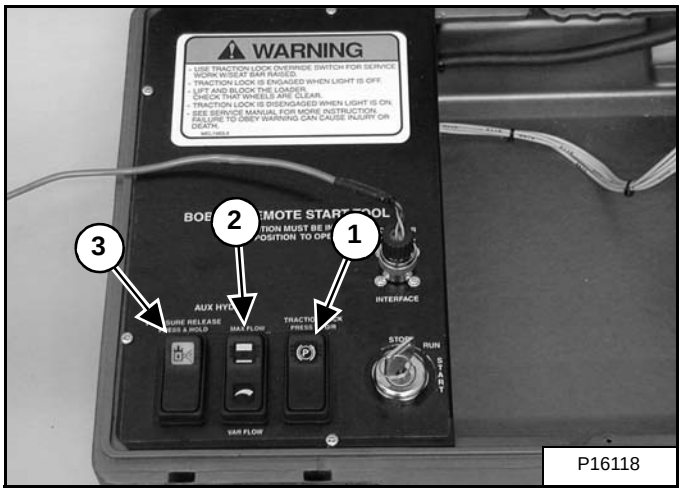
W-2357-0899

Figure 10-60-12



The remote start tool (Item 1) **[Figure 10-60-12]** has three rocker switches.

Figure 10-60-13



The traction lock switch (Item 1) **[Figure 10-60-13]** is used to turn traction lock ON or OFF. Push the switch to the override position. The switch will illuminate to indicate traction lock OVERRIDE, in this position the wheels are able to turn.

The maximum flow / variable flow switch (Item 2) **[Figure 10-60-13]** is used to activate the auxiliary hydraulics. Pressing the switch will activate variable flow. The switch will illuminate to indicate the flow rate is active. Pressing the switch again will turn the flow OFF. The switch is used when checking pressures and flow rate.

NOTE: With the engine running; pushing and holding the pressure release switch (Item 3) [Figure 10-60-13] will cause the engine to stop.

WARNING

AVOID INJURY OR DEATH

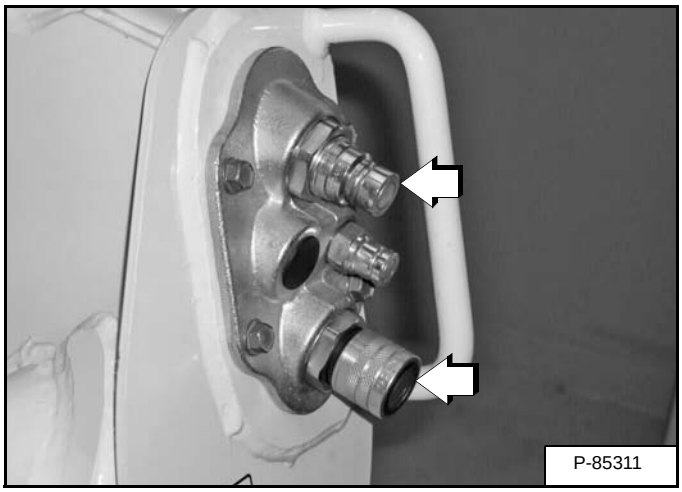
- **Use traction lock override switch for service work with seat bar raised.**
- **Traction lock is engaged when light is OFF.**
- **Lift and block the loader. Check that wheels are clear.**
- **Traction lock is disengaged when light is ON.**
- **See Service Manual for more instruction.**

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Remote Start Procedure (Cont'd)

Figure 10-60-14



Push the couplers on the front auxiliary block toward the block and hold for five seconds to release the front auxiliary pressure **[Figure 10-60-14]**.

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REMOTE START TOOL (SERVICE TOOL) KIT - 7003031

Description

The Remote Start Tool (Service Tool) Kit is a replacement tool for MEL 1563 Remote Start Tool and MEL 1400B - BOSS® Diagnostic Tool.

The Remote Start Tool (Service Tool) Kit, P/N 7003031, can be used to service newer loaders using the supplied harness P/N 6689747.

A computer can be connected to the Remote Start Tool (Service Tool) for diagnostics and software updates using the computer harness P/N 6689746 in conjunction with the loader harness.

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REMOTE START TOOL (SERVICE TOOL) KIT - 7003031 (CONT'D)

Remote Start Tool (Service Tool) - 7003030

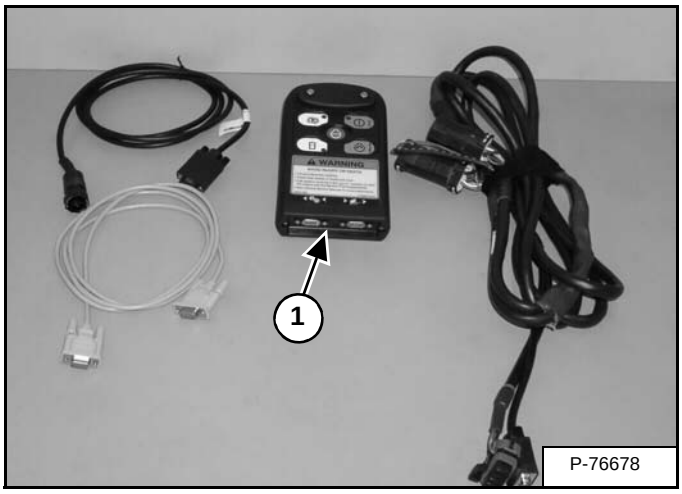
Tools that will be needed to complete the following steps are:

Order from Bobcat Parts P/N: 7003031 - Remote Start Tool (Service Tool) Kit

Kit Includes:

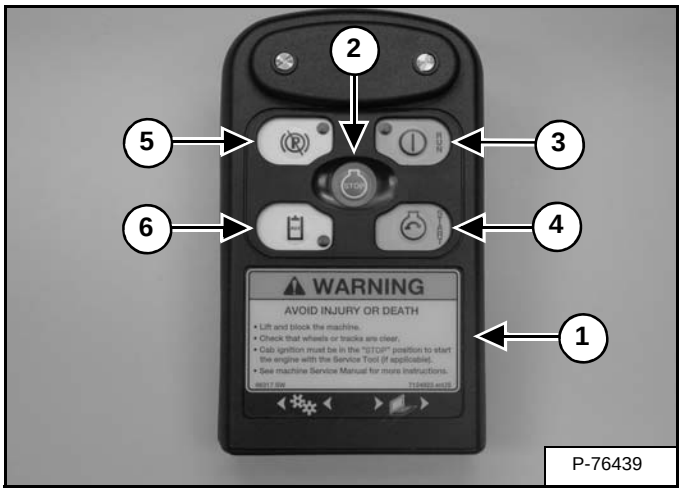
7003030 - Remote Start Tool (Service Tool)
6689747 - Loader Service Tool Harness
6689746 - Computer Service Tool Harness
6689745 - BOSS® Service Tool Harness

Figure 10-61-1



The remote start tool (Item 1) **[Figure 10-61-1]** is required when the service technician is checking the hydraulic / hydrostatic system, adjusting the steering linkage, and electrical diagnostics.

Figure 10-61-2



The Remote Start Tool (Service Tool) (Item 1) **[Figure 10-61-2]** has five buttons.

The STOP button (Item 2) **[Figure 10-61-2]** is used to stop the Remote Start Tool (Service Tool) from communicating and stop the loader engine.

The RUN button (Item 3) **[Figure 10-61-2]** is used to turn the Remote Start Tool (Service Tool) on and activates the loader ignition power. The button will illuminate to indicate the service tool is active.

The START button (Item 4) **[Figure 10-61-2]** is used to start the loader engine.

The traction lock button (Item 5) **[Figure 10-61-2]** is used to turn traction lock ON or OFF. Push the button and the button will illuminate indicating the traction lock is disabled in which the wheels or tracks are able to turn.

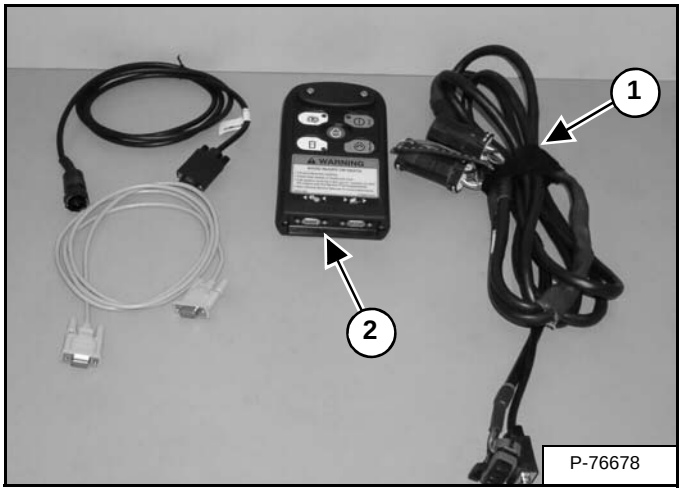
The auxiliary button (Item 6) **[Figure 10-61-2]** is used to activate the auxiliary hydraulics. The button will illuminate to indicate the auxiliary hydraulics are active. Pressing the button a second time will turn the flow OFF. The button is used when checking pressures and flow rate.

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REMOTE START TOOL (SERVICE TOOL) KIT - 7003031 (CONT'D)

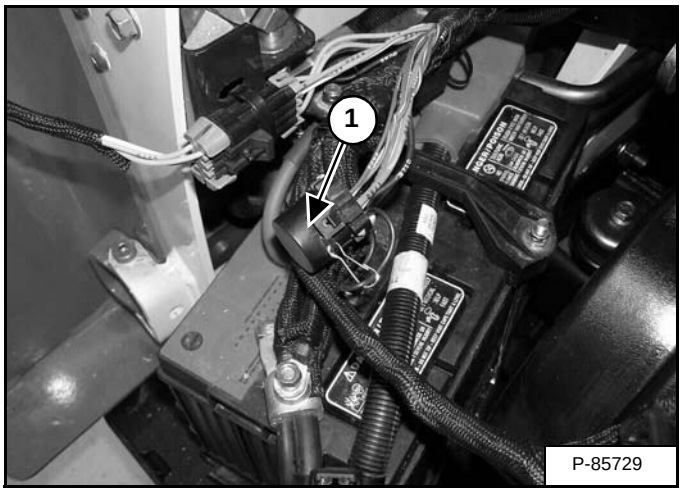
Loader Service Tool Harness - 6689747

Figure 10-61-3



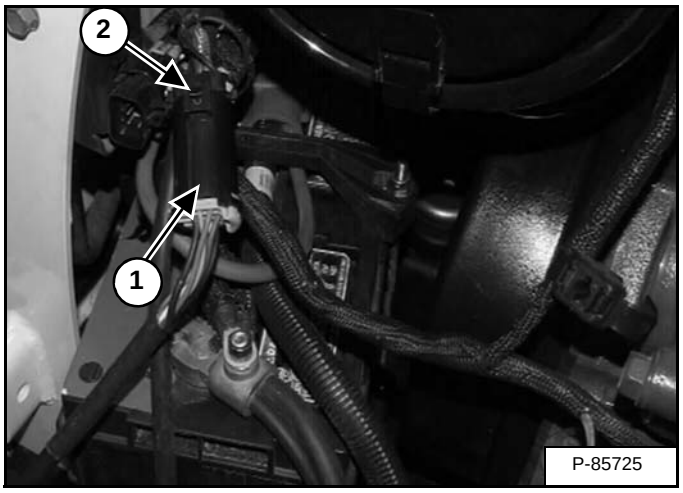
The loader service tool harness (Item 1) **[Figure 10-61-3]** is used to connect the remote start tool (service tool) (Item 2) **[Figure 10-61-3]** to the electrical system on the loader.

Figure 10-61-4



Loaders without an attachment control harness, remove the loader harness cap (Item 1) **[Figure 10-61-4]** and connect the Loader Service Tool Harness from the Remote Start Tool (Service Tool).

Figure 10-61-5



Loaders with an attachment control harness (7 pin or 14 pin), the attachment harness (Item 1) must be disconnected from the loader harness (Item 2) **[Figure 10-61-5]**.

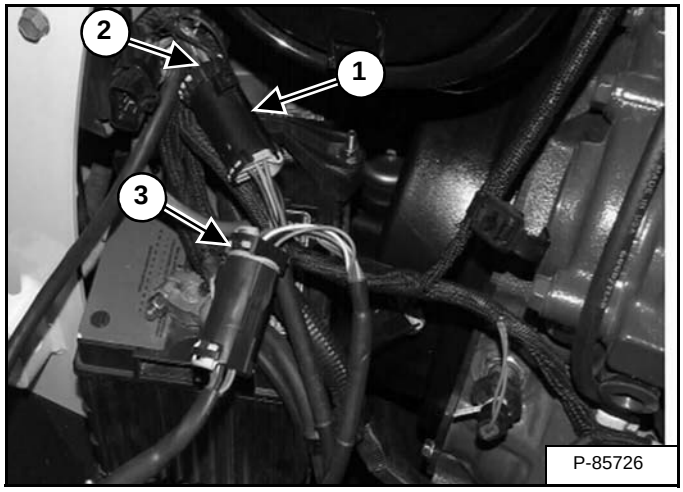
When the remote start procedure is completed, replace the loader connector cap (Item 1) **[Figure 10-61-4]** or reconnect the attachment control harness to the loader harness **[Figure 10-61-5]**.

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REMOTE START TOOL (SERVICE TOOL) KIT - 7003031 (CONT'D)

Loader Service Tool Harness - 6689747 (Cont'd)

Figure 10-61-6



NOTE: The Remote Start Tool (Service Tool) connection harness has two connectors (Item 1) and (Item 3). The main connector (Item 1) [Figure 10-61-6] is always used for connection to the loader harness.

The second connector (Item 3) [Figure 10-61-6] is used for attachment ACD upgrades or attachment operational diagnostics only. This connector has a cap attached to it to prevent damage or corrosion when not in use.

Connect the Remote Start Tool (Service Tool) connector (Item 1) to the loader harness connector (Item 2) and the other Remote Start Tool (Service Tool) connector to the ACD harness connector (Item 3) **[Figure 10-61-6]**.

NOTE: The key switch must be in the off position or the Remote Start Tool (Service Tool) will not operate.

⚠ WARNING

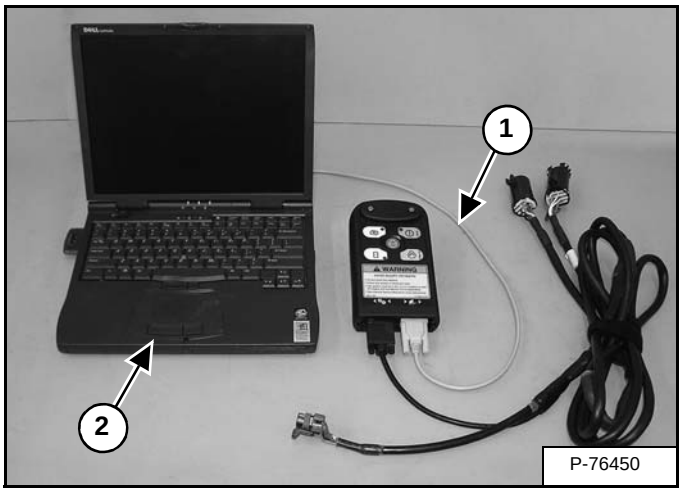
AVOID INJURY OR DEATH

- **Lift and block the machine.**
- **Check that wheels or tracks are clear.**
- **Cab ignition must be in the "STOP" position to start the engine with the Service Tool (if applicable).**
- **See machine Service Manual for more instructions.**

W-2792-0409

Computer Service Tool Harness - 6689746

Figure 10-61-7



The computer service tool harness (Item 1) **[Figure 10-61-7]** is required to connect remote start tool (service tool) to the Service PC (Item 2) **[Figure 10-61-7]**.

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Remote Start Procedure

⚠ WARNING

AVOID INJURY OR DEATH

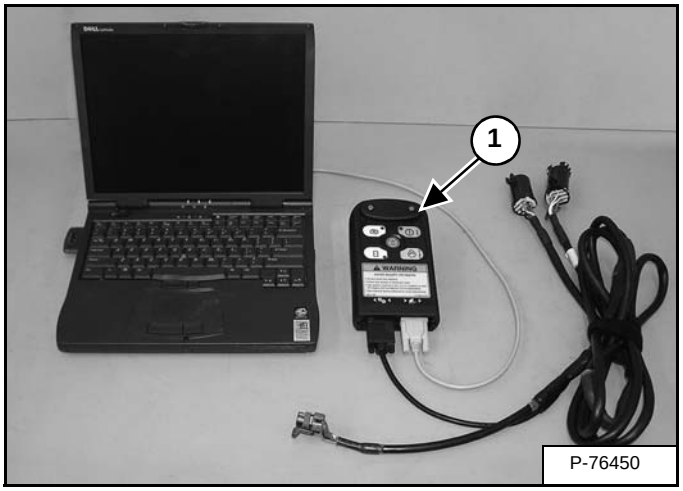
With the 7-pin connector plugged into the loader and Remote Start Key Switch in the OFF position, the loader can still be started from the operator panel inside the cab. Placing the key switch of the remote start tool in the run position disconnects the operator panel key switch from the start circuit.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

W-2357-0899

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

7003031: Remote Start Tool (Service Tool) Kit

Figure 10-61-8



The Remote Start Tool (Service Tool) (Item 1) **[Figure 10-61-8]** is required when the operator cab is in the raised position for service and the service technician needs to turn on the loader or start the engine. Example: adjusting the steering linkage.

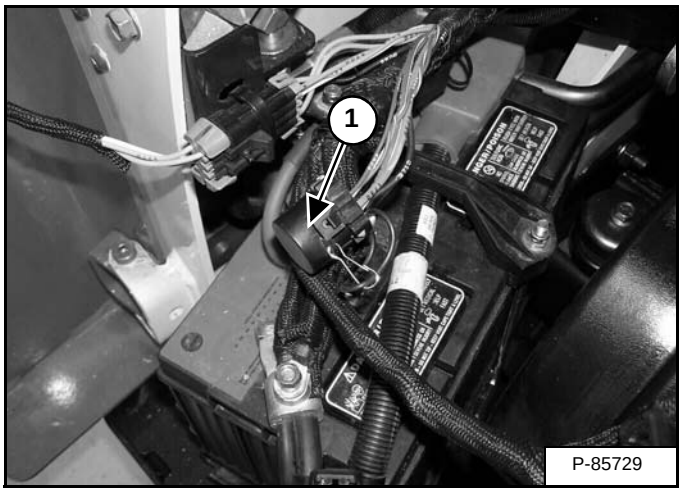
Lift and block the loader.

Raise the lift arms (if required by the procedure) and install an approved lift arm support device.

Raise the operator cab (if required by the procedure).

Open the rear door of the loader.

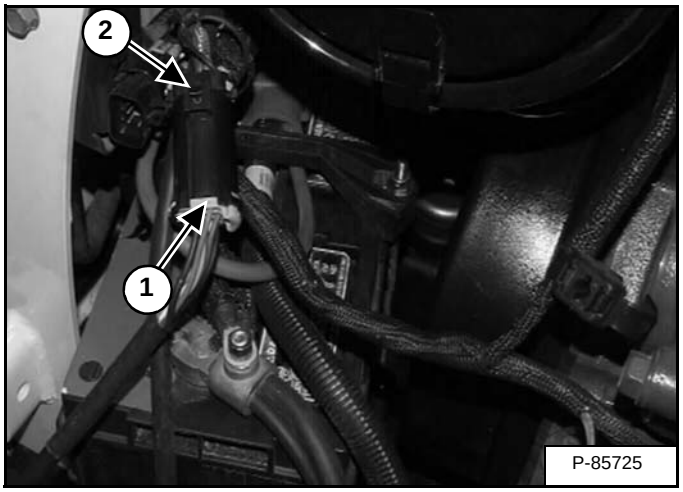
Figure 10-61-9



Loaders without an attachment control harness, remove the loader harness cap (Item 1) **[Figure 10-61-9]** and connect the Loader Service Tool Harness from the Remote Start Tool (Service Tool).

NOTE: When using a Remote Start Tool (Service tool) harness on loaders not equipped with an attachment control device, the Remote Start Tool (Service Tool) harness attachment control device connector must be capped.

Figure 10-61-10



Loaders with an attachment control harness (7 pin or 14 pin), the attachment harness (Item 1) must be disconnected from the loader harness (Item 2) **[Figure 10-61-10]**.

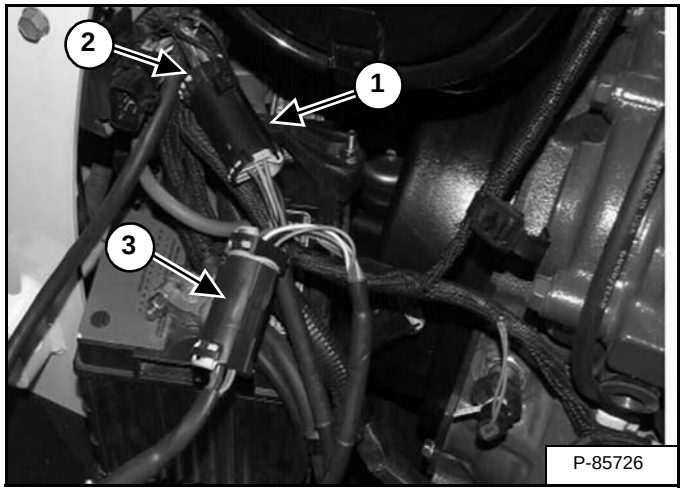
When the remote start procedure is completed, replace the loader connector cap (Item 1) **[Figure 10-61-10]** or reconnect the attachment control harness to the loader harness.

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REMOTE START TOOL (SERVICE TOOL) KIT - 7003031 (CONT'D)

Remote Start Procedure (Cont'd)

Figure 10-61-11



NOTE: The Remote Start Tool (Service Tool) connection harness has two connectors (Item 1) and (Item 3). The main connector (Item 1) [Figure 10-61-11] is always used for connection to the loader harness.

The second connector (Item 3) [Figure 10-61-11] is used for attachment ACD upgrades or attachment operational diagnostics only. This connector has a cap attached to it to prevent damage or corrosion when not in use.

Connect the Remote Start Tool (Service Tool) connector (Item 1) to the loader harness connector (Item 2) and the other Remote Start Tool (Service Tool) connector to the ACD harness connector (Item 3) **[Figure 10-61-11]**.

NOTE: The key switch must be in the off position or the Remote Start Tool (Service Tool) will not operate.

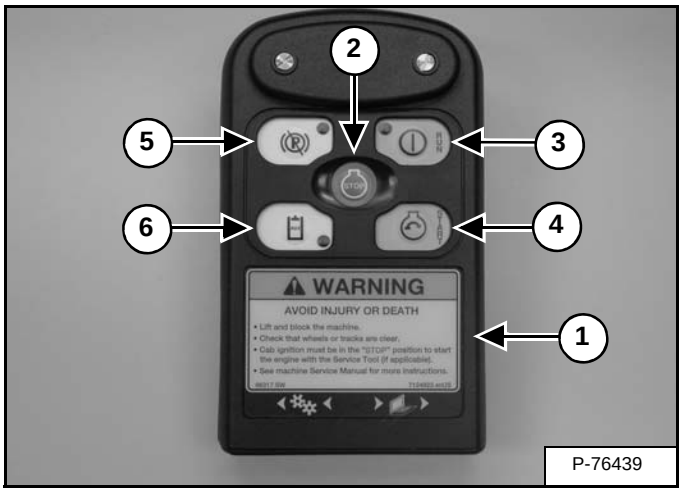
⚠ WARNING

AVOID INJURY OR DEATH

- **Lift and block the machine.**
- **Check that wheels or tracks are clear.**
- **Cab ignition must be in the "STOP" position to start the engine with the Service Tool (if applicable).**
- **See machine Service Manual for more instructions.**

W-2792-0409

Figure 10-61-12



The Remote Start Tool (Service Tool) (Item 1) **[Figure 10-61-12]** has five buttons.

The STOP button (Item 2) **[Figure 10-61-12]** is used to stop the Remote Start Tool (Service Tool) from communicating and stop the loader engine.

The RUN button (Item 3) **[Figure 10-61-12]** is used to turn the Remote Start Tool (Service Tool) on and activates the loader ignition power. The button will illuminate to indicate the service tool is active.

The START button (Item 4) **[Figure 10-61-12]** is used to start the loader engine.

The traction lock button (Item 5) **[Figure 10-61-12]** is used to turn traction lock ON or OFF. Push the button and the button will illuminate indicating the traction lock is disabled in which the wheels or tracks are able to turn.

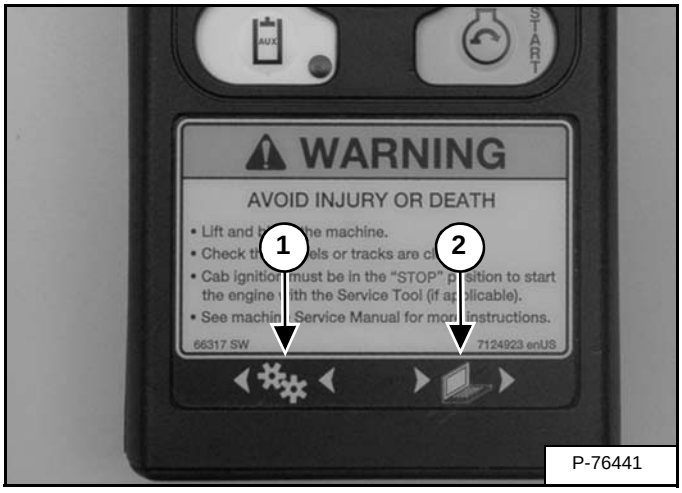
The auxiliary button (Item 6) **[Figure 10-61-12]** is used to activate the auxiliary hydraulics. The button will illuminate to indicate the auxiliary hydraulics are active. Pressing the button a second time will turn the flow OFF. The button is used when checking pressures and flow rate.

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REMOTE START TOOL (SERVICE TOOL) KIT - 7003031 (CONT'D)

Remote Start Procedure (Cont'd)

Figure 10-61-13

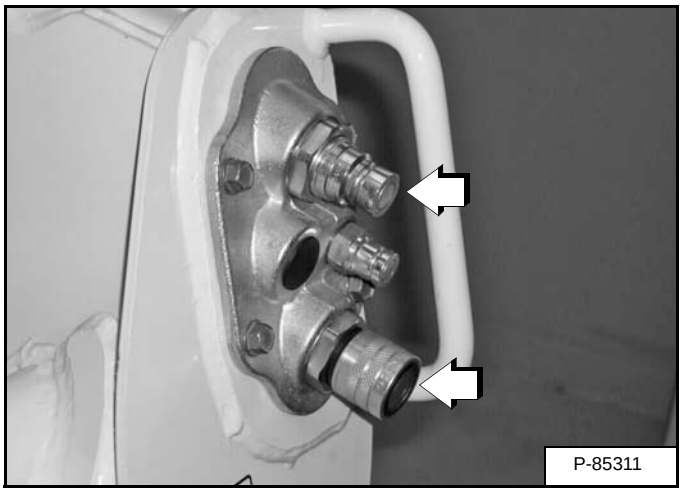


The gear icon with the left facing arrows (Item 1) **[Figure 10-61-13]** will illuminate and blink when the RUN key is pressed and the loader is communicating with the service tool.

The computer icon with the right facing arrows (Item 2) **[Figure 10-61-13]** will illuminate and blink when the Remote Start Tool (Service Tool) is transmitting data to and from the computer.

NOTE: To relieve the pressure at the rear or secondary front auxiliary, (if equipped) press the RUN button on the remote start tool. Then press the auxiliary (AUX) hydraulics button on the remote start tool and move the AUXILIARY Hydraulic Switch to the right and left several times.

Figure 10-61-14



Push the couplers on the front auxiliary block toward the block and hold for five seconds to release the front auxiliary pressure **[Figure 10-61-14]**.

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SERVICE SCHEDULE

Chart

Maintenance work must be done at regular intervals. Failure to do so will result in excessive wear and early failures. The service schedule is a guide for correct maintenance of the Bobcat 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	[5] 250	[5] 500	[5] 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 and grille. Check coolant level COLD and add premixed coolant as needed.	■					
Fuel Filter	Remove the trapped water.	■					
Lift Arms, Lift Links, Cylinders, Bob-Tach, Pivot Pins, Wedges	Lubricate with multi-purpose lithium based grease.	■					
Tires	Check for damaged tires and correct air pressure. Inflate to MAXIMUM pressure shown on the sidewall of the tire.	■					
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 seat bar and control interlocks for correct operation. Clean dirt and debris from moving parts.	■					
Bobcat Interlock Control Systems (BICS)	Check for correct function. Lift and Tilt functions MUST NOT operate with seat bar raised. See details in this Manual.	■					
Front Horn / Back-up Alarm	Check for proper function.	■					
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 (If Equipped)	Clean or replace filters as needed.	■					
Hydraulic Fluid	Check fluid level and add as needed.	■					
Hydraulic Hoses and Tubelines	Check for damage and leaks. Repair or replace as needed.		■				
Final Drive Trans. (Chaincase),	Check fluid level and add as needed.		■				
Parking Brake, Foot Pedals, Hand Controls and Steering Levers or Joysticks	Check for correct operation. Repair or adjust as needed.		■				
Wheel Nuts	Check for loose wheel nuts and tighten to correct torque. (See TIRE MAINTENANCE in this manual.)	[1]	■				
Spark Arrestor Muffler	Clean the spark chamber.			■			
Battery	Check cables, connections and electrolyte level. Add distilled water as needed.			■			
Fuel Filter	Replace filter element.				■		
Engine / Hydro. Drive Belt	Check for wear or damage. Check idler arm stop.		[2]		■		
Drive Belts (Alternator, air conditioning, water pump)	Check condition. Replace as needed.				■		
Bobcat Interlock Control System (BICS)	Check the function of the lift arm bypass control.				■		
Engine Oil and Filter	Replace oil and filter.		[2]	[3]	■		
Hydraulic / Hydrostatic Filter, Charge Filter, Reservoir Breather	Replace the hydraulic / hydrostatic filter, charge filter, and the reservoir breather.					■	
Final Drive Trans. (Chaincase)	Replace the fluid.						■
Hydraulic Reservoir	Replace the fluid.						■
Engine Valves	Adjust the engine valves.					[4]	■
Coolant	Replace the coolant	Every 2 years					

[1] Check every 8 - 10 hours for the first 24 hours, then at 50 hour intervals.
[2] Perform at first 50 hours, then as scheduled.
[3] Change oil and filter every 100 hours when operating under severe conditions.
[4] Perform at first 500 hours, then as scheduled.
[5] Or every 12 months.

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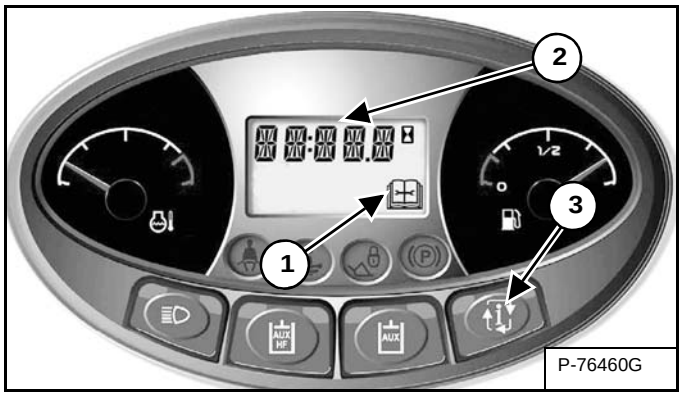


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AIR CLEANER SERVICE

Replacing Filter Elements

Figure 10-80-1

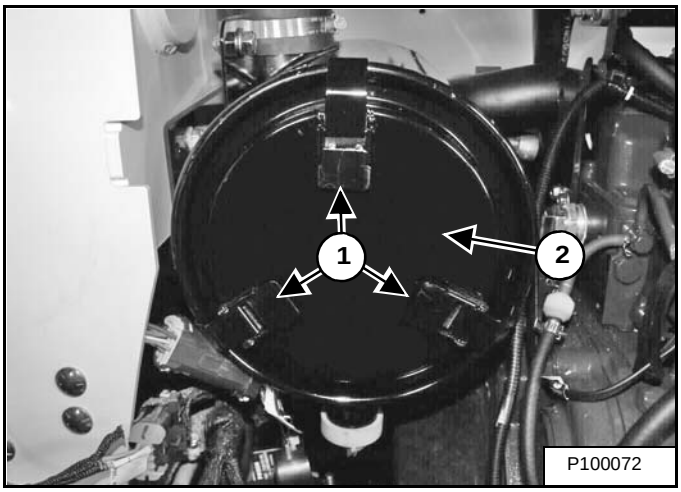


It is important to change the air filter element only when necessary. The service indicator (Item 1) will FLASH. Press the information button (Item 3) until the display screen (Item 2) shows the service codes. Service code **[M0117]** (Air Filter Plugged) will show in the display screen (Item 2) **[Figure 10-80-1]** when air filter change is necessary.

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

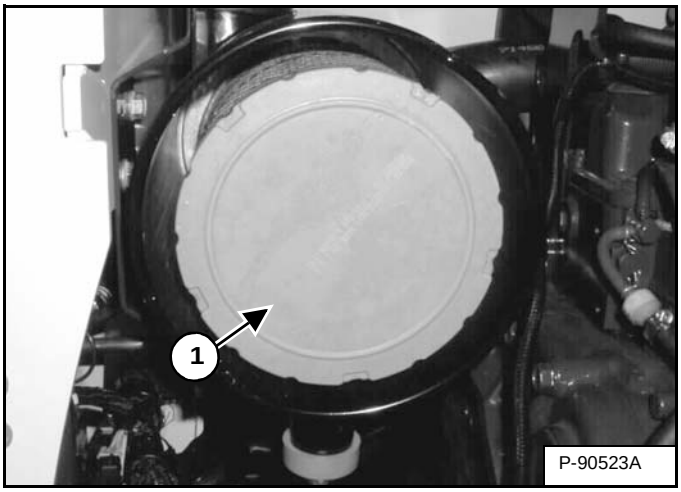
Outer Filter

Figure 10-80-2



Open the latches (Item 1) and remove the dust cover (Item 2) **[Figure 10-80-2]**.

Figure 10-80-3



Pull the outer filter element (Item 1) **[Figure 10-80-3]** out and discard.

NOTE: Make sure all sealing surfaces are free of dirt and debris. DO NOT use compressed air.

Install new filter element. Push all the way in until it contacts the base of the housing.

Install the dust cover and secure the latches **[Figure 10-80-2]**.

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Replacing Filter Elements (Cont'd)

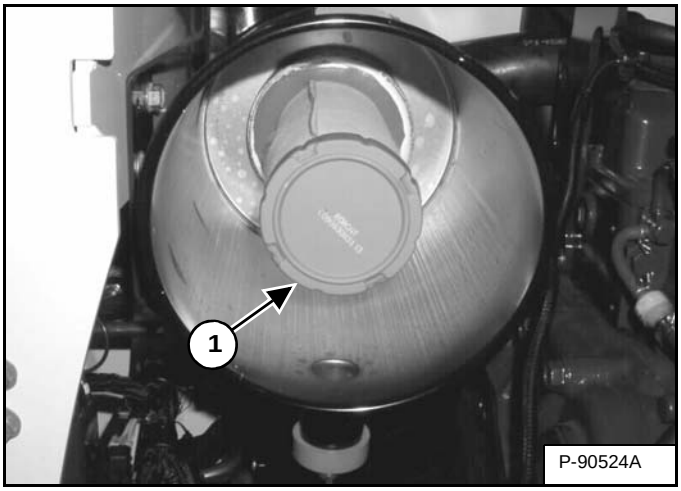
Inner Filter

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 service code **[M0117]** (Air Filter Plugged) is still displayed in the data display, replace the inner filter element.

Remove the dust cover **[Figure 10-80-2]** and the outer filter element **[Figure 10-80-3]**.

Figure 10-80-4



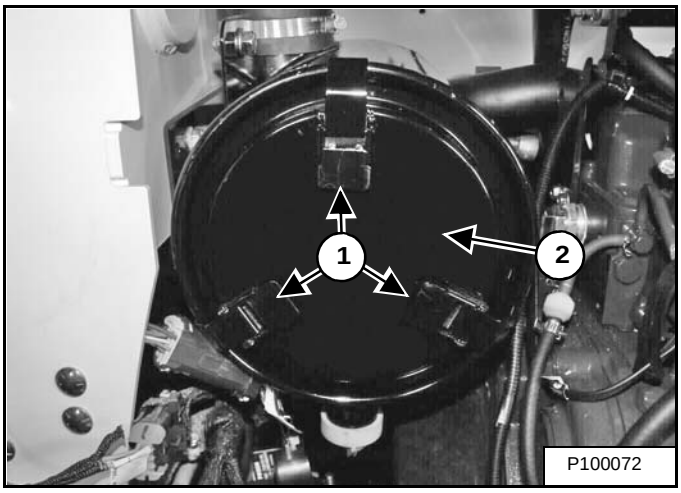
Remove the inner filter element (Item 1) **[Figure 10-80-4]**.

NOTE: Make sure all sealing surfaces are free of dirt and debris. DO NOT use compressed air.

Install new inner filter element. Push all the way in until it contacts the base of the housing.

Install the outer filter element **[Figure 10-80-3]**.

Figure 10-80-5



Install the dust cover (Item 2) and secure the latches (Item 1) **[Figure 10-80-5]**.

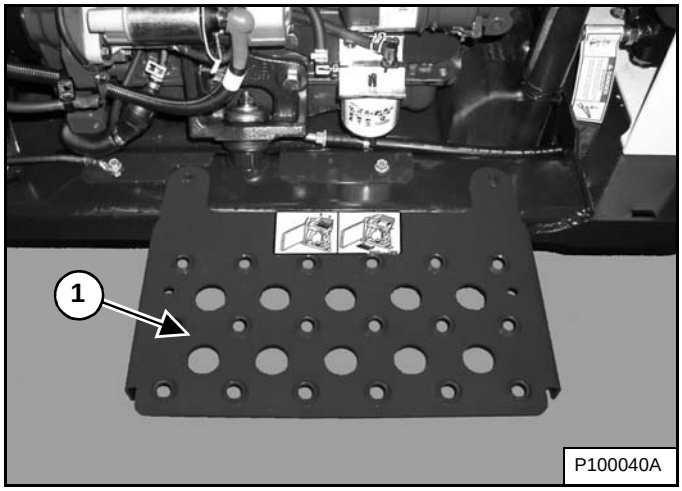
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ENGINE COOLING SYSTEM

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

Maintenance Platform

Figure 10-90-1



A maintenance platform (Item 1) **[Figure 10-90-1]** is available from your Bobcat dealer to facilitate access when cleaning the engine cooling system.

⚠ WARNING

AVOID INJURY OR DEATH

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

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

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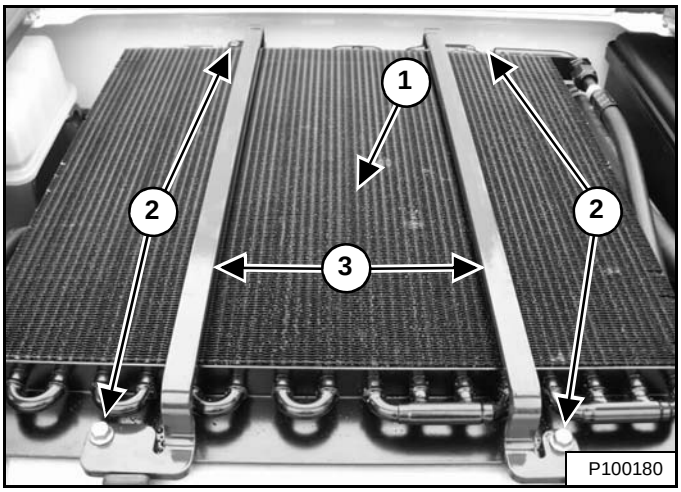
Cleaning

Open the rear door. (See REAR DOOR (TAILGATE) on Page 50-70-1.)

Remove the rear grille. (See REAR GRILLE on Page 50-60-1.)

Loaders With Air Conditioning

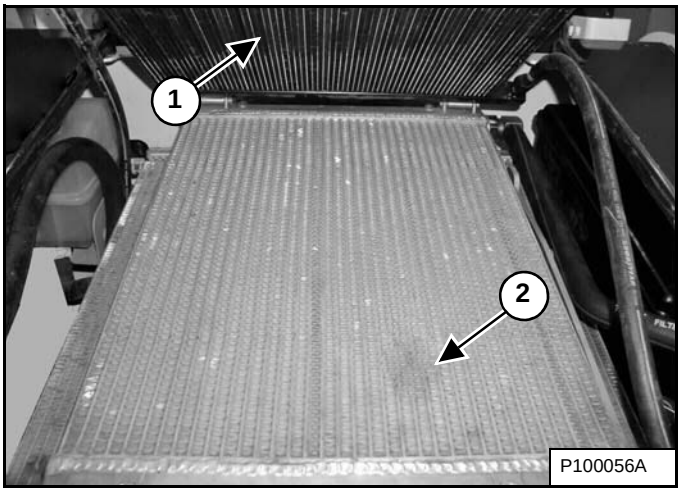
Figure 10-90-2



Use low air pressure or water pressure to clean the top of the air conditioning condenser (Item 1) **[Figure 10-90-2]**.

The area between the air conditioning condenser and the oil cooler will require occasional cleaning. Remove the bolts (Item 2) and the brackets (Item 3) **[Figure 10-90-2]**.

Figure 10-90-3



NOTE: Be careful when raising and lowering the air conditioning condenser so that the air conditioning condenser does not fall on the oil cooler and damage the fins.

Raise the air conditioning condenser (Item 1) and use low air pressure or water pressure to clean the top of the oil cooler (Item 2) **[Figure 10-90-3]**.

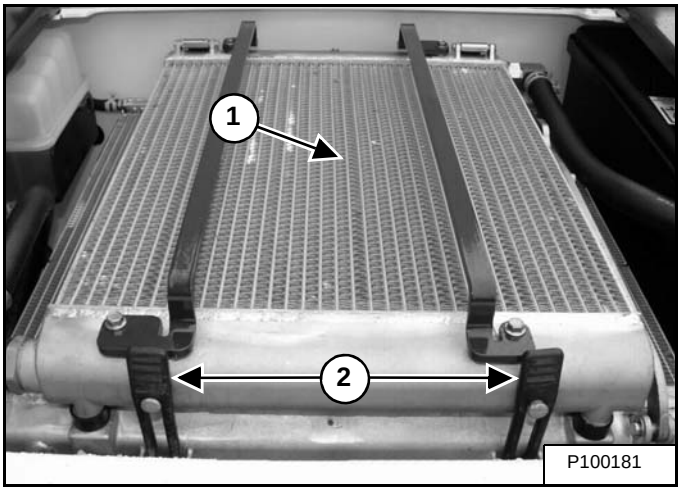
Lower the air conditioning condenser (Item 1) **[Figure 10-90-3]**. Install the brackets (Item 3) **[Figure 10-90-2]** and the bolts (Item 2) **[Figure 10-90-2]**.

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Cleaning (Cont'd)

Loaders Without Air Conditioning

Figure 10-90-4

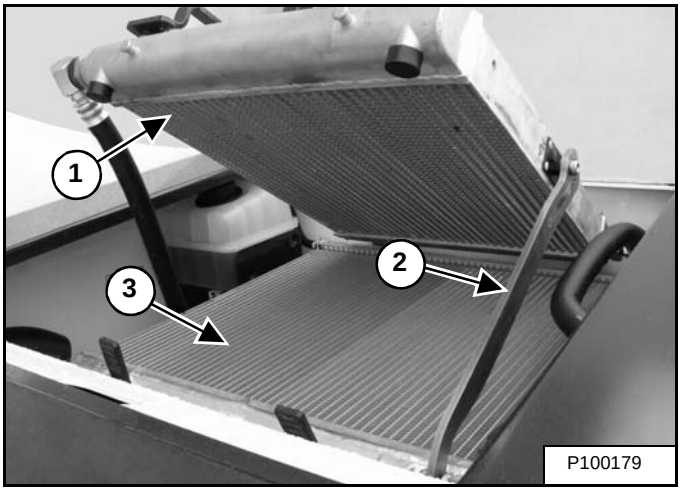


Use low air pressure or water pressure to clean the top of the oil cooler (Item 1) **[Figure 10-90-4]**.

All Loaders

Unhook the two rubber straps (Item 2) **[Figure 10-90-4]**.

Figure 10-90-5



Raise the oil cooler (Item 1) until the bar (Item 2) drops into place to support the oil cooler. Use low air pressure or water pressure to clean the top of the radiator (Item 3) **[Figure 10-90-5]**.

Raise the bar (Item 2) **[Figure 10-90-5]** slightly and lower the oil cooler. Fasten the two rubber straps.

Check the cooling system for leaks.

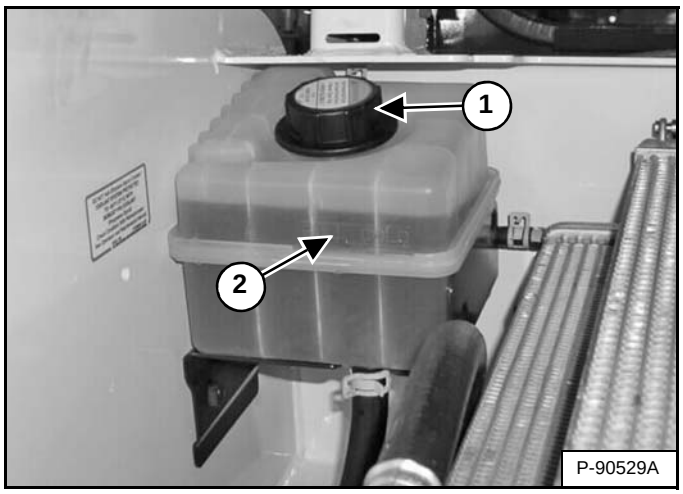
Install the rear grille and close the rear door.

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Checking Level

Open the rear door and raise the rear grille.

Figure 10-90-6



Check coolant level using the level markers (Item 2) **[Figure 10-90-6]** on the tank. Coolant must be at the bottom marker when the engine is cold; top marker when hot.

Lower the rear grille and close the rear door.

IMPORTANT

AVOID ENGINE DAMAGE

Always use the correct ratio of water to antifreeze.

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

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

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

I-2124-0497

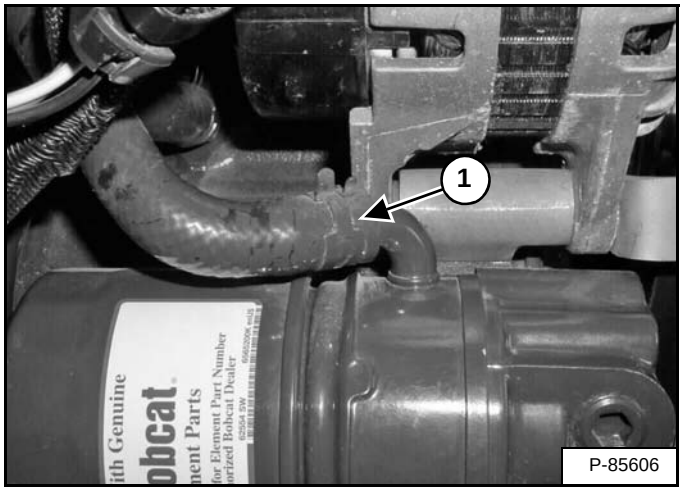
Removing And Replacing Coolant

For the service interval for replacing the engine coolant (See SERVICE SCHEDULE on Page 10-70-1.)

Open the rear door and remove the rear grille.

Remove the coolant fill cap (Item 1) **[Figure 10-90-6]**.

Figure 10-90-7



Disconnect the coolant hose (Item 1) **[Figure 10-90-7]** from the oil filter assembly. Drain the coolant into a container. Connect the coolant hose to the oil filter assembly. Recycle or dispose of coolant in an environmentally safe manner.

Mix new coolant in a separate container. (See Capacities on Page SPEC-10-4.)

The correct mixture of coolant to provide a -37°C (-34°F) freeze protection is 5 L propylene glycol mixed with 4,4 L of water **OR** 1 U.S. gal propylene glycol mixed with 3.5 qt of water.

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

Add premixed coolant, 47% water and 53% propylene glycol to the coolant tank until the coolant level reaches the lower marker on the tank **[Figure 10-90-6]**.

Use a refractometer to check the condition of propylene glycol in your cooling system and install coolant fill cap.

NOTE: When installing the coolant fill cap, the cap must be tightened until it clicks.

Run the engine until it is at operating temperature. Stop the engine. Check the coolant level when cool. Add coolant as needed.

Install the rear grille and close the rear door.

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FUEL SYSTEM

Fuel Specifications

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

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

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

At a minimum, Low Sulfur (500 ppm sulfur) Diesel Fuel must be used in this machine:

The following fuels may also be used in this machine:

- Ultra Low Sulfur (15 ppm sulfur) Diesel Fuel.
- Biodiesel Blend Fuel - Must contain no more than five percent biodiesel mixed with low sulfur or ultra low sulfur petroleum based diesel. This is commonly marketed as B5 blended diesel fuel. B5 blended diesel fuel must meet ASTM D975 (US Standard) or EN590 (EU Standard) specifications.

Biodiesel Blend Fuel

Biodiesel blend fuel has unique qualities that should be considered before using in this machine:

- Cold weather conditions can lead to plugged fuel system components and hard starting.
- Biodiesel blend fuel is an excellent medium for microbial growth and contamination which can cause corrosion and plugging of fuel system components.
- Use of biodiesel blend fuel may result in premature failure of fuel system components, such as plugged fuel filters and deteriorated fuel lines.
- Shorter maintenance intervals may be required, such as cleaning the fuel system and replacing fuel filters and fuel lines.
- Using biodiesel blended fuels containing more than five percent biodiesel can affect engine life and cause deterioration of hoses, tubelines, injectors, injector pump and seals.

Apply the following guidelines if biodiesel blend fuel is used:

- Ensure the fuel tank is as full as possible at all times to prevent moisture from collecting in the fuel tank.
- Ensure that the fuel tank cap is securely tightened.
- Biodiesel blend fuel can damage painted surfaces, remove all spilled fuel from painted surfaces immediately.
- Drain all water from the fuel filter daily before operating the machine.
- Do not exceed engine oil change interval. Extended oil change intervals can cause engine damage.
- Before vehicle storage; drain the fuel tank, refill with 100% petroleum diesel fuel, add fuel stabilizer and run the engine for at least 30 minutes.

NOTE: Biodiesel blend fuel does not have long term stability and should not be stored for more than three months.

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Filling The Fuel Tank

WARNING

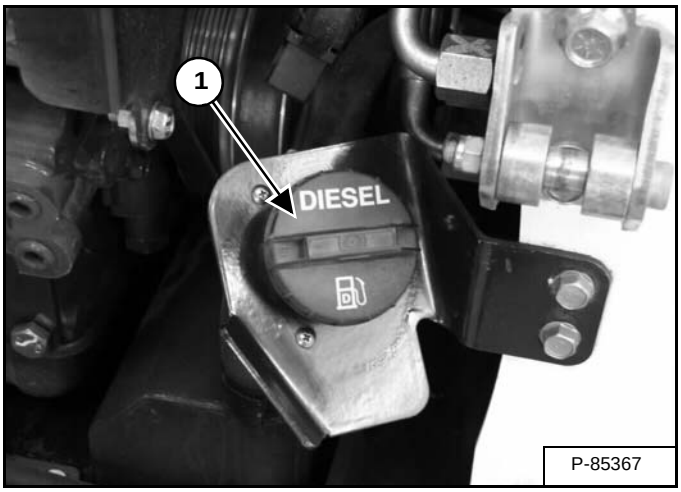
AVOID INJURY OR DEATH

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

W-2063-0807

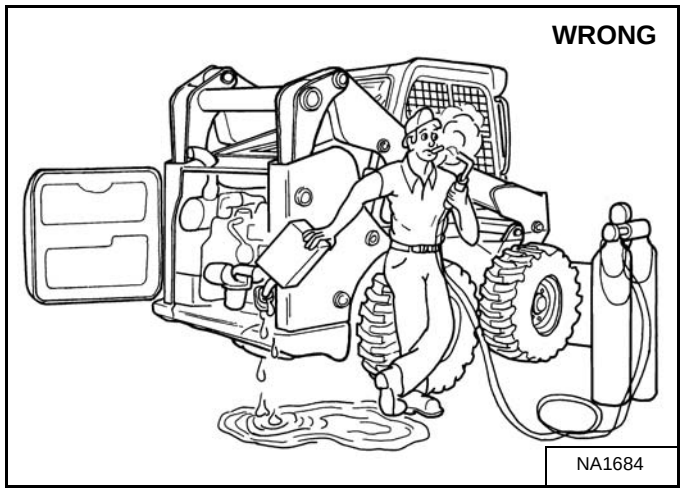
Open the rear door.

Figure 10-100-1



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

Figure 10-100-2



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

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

Close the rear door.

WARNING

AVOID INJURY OR DEATH

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.

W-2103-0508

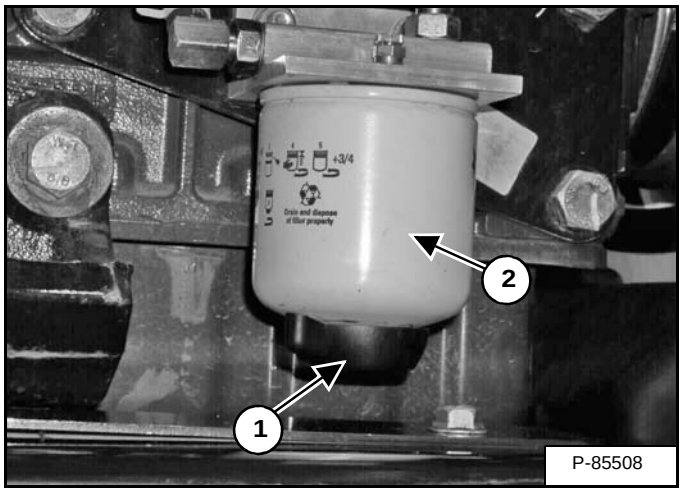
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Fuel Filter

For the service interval for removing water from, or replacing the fuel filter (See SERVICE SCHEDULE on Page 10-70-1.)

Removing Water

Figure 10-100-3



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

Replacing Element

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

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

Remove air from the fuel system. (See Removing Air From The Fuel System on Page 10-100-3.)

WARNING

AVOID INJURY OR DEATH

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.

W-2103-0508

Removing Air From The Fuel System

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

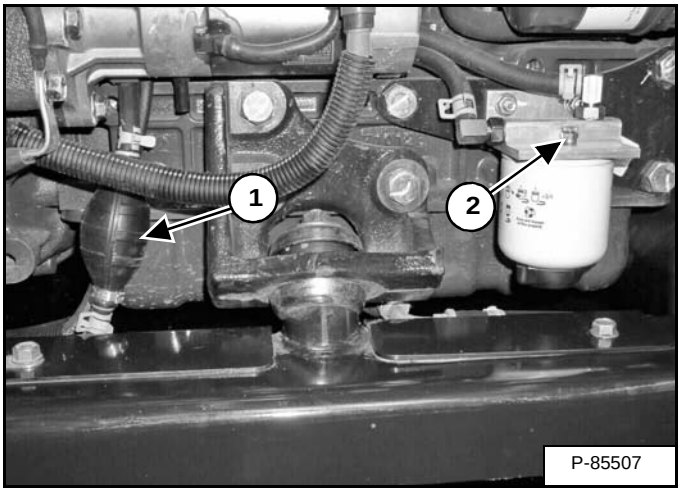
WARNING

AVOID INJURY OR DEATH

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

W-2072-0807

Figure 10-100-4



Open the vent (Item 2) **[Figure 10-100-4]** on the fuel filter housing.

Squeeze the hand pump (priming bulb) (Item 1) **[Figure 10-100-4]** until fuel flows from the vent with no air bubbles.

Close the vent (Item 2) **[Figure 10-100-4]**.

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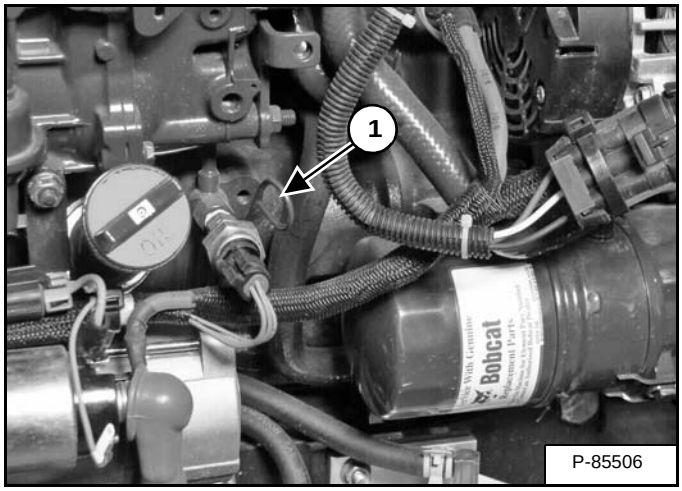
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ENGINE LUBRICATION SYSTEM

Checking And Adding Engine Oil

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

Figure 10-110-1



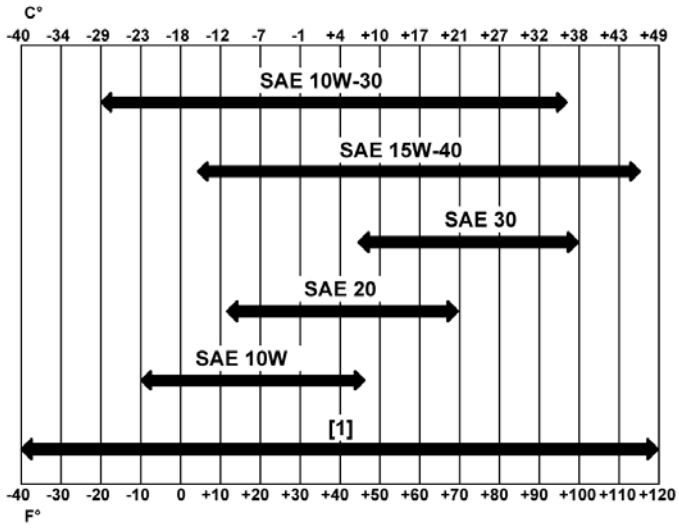
Park the machine on level ground. Open the rear door and remove the dipstick (Item 1) **[Figure 10-110-1]**.

Keep the oil level between the marks on the dipstick. Do not overfill.

Engine Oil Chart

Figure 10-110-2

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



TEMPERATURE RANGE ANTICIPATED BEFORE NEXT OIL CHANGE (DIESEL ENGINES MUST USE API CLASSIFICATION CI-4 OR BETTER)

[1] Synthetic Oil - Use recommendation from Synthetic Oil Manufacturer.

Use good quality engine oil that meets API Service Classification of CI-4 or better **[Figure 10-110-2]**.

WARNING

AVOID INJURY OR DEATH

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.

W-2103-0508

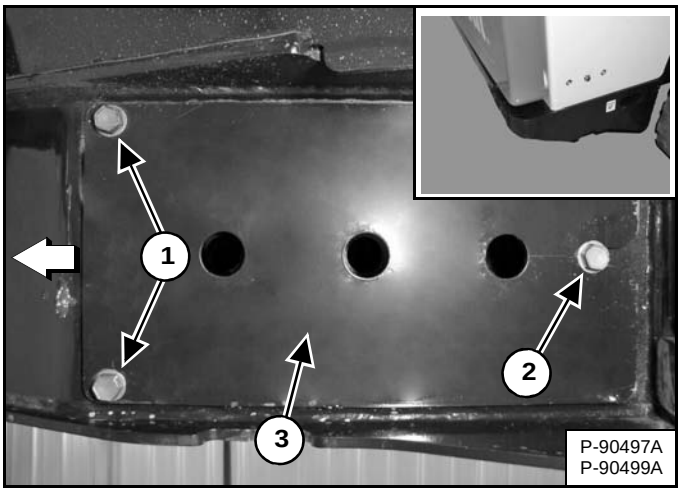
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Removing And Replacing Oil And Filter

For the service interval for replacing the engine oil and filter (See SERVICE SCHEDULE on Page 10-70-1.)

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

Figure 10-110-3

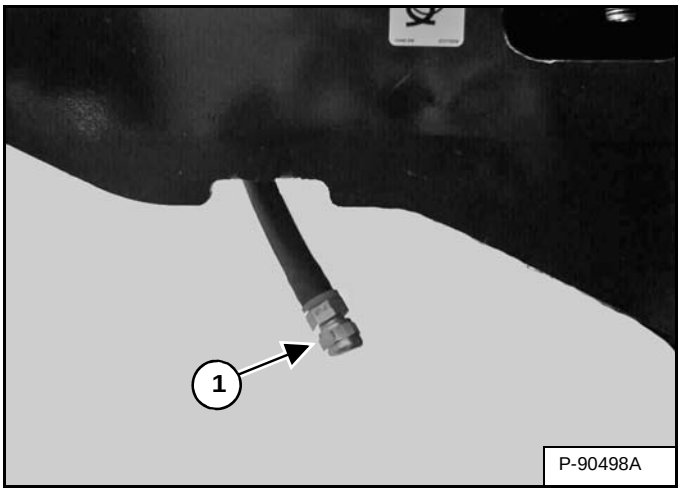


The oil drain hose is located behind a cover under the right rear corner of the loader (Inset) **[Figure 10-110-3]**.

Remove two cover mounting bolts (Item 1) **[Figure 10-110-3]**.

Loosen one cover mounting bolt (Item 2) and slide the cover (Item 3) **[Figure 10-110-3]** to the rear of the loader.

Figure 10-110-4

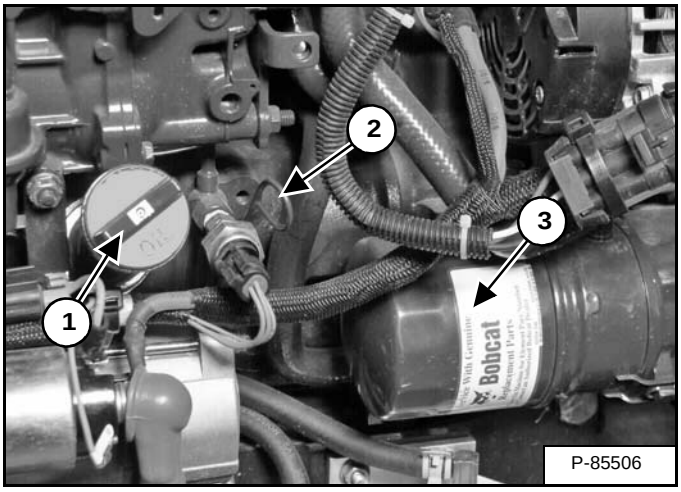


Remove the oil drain cap (Item 1) **[Figure 10-110-4]** from the oil drain hose and drain the oil into a container. Recycle or dispose of used oil in an environmentally safe manner.

Install and tighten the oil drain cap **[Figure 10-110-4]**.

Install the cover and the cover mounting bolts **[Figure 10-110-3]**. Tighten all bolts.

Figure 10-110-5



Open the rear door, remove the oil filter (Item 3) **[Figure 10-110-5]** and clean the filter housing surface.

Use genuine Bobcat filter only.

Put oil on the new filter gasket, install the filter and hand tighten.

Remove the oil fill cap (Item 1) **[Figure 10-110-5]**.

Put oil in the engine. For the correct quantity (See Capacities on Page SPEC-10-4.) Do not overfill.

Start the engine and let it run for several minutes. Stop the engine and check for leaks at the filter.

Remove the dipstick (Item 2) **[Figure 10-110-5]** and check the oil level.

Add oil as needed if it is not at the top mark on the dipstick. Install the dipstick and close the rear door.

⚠ WARNING

AVOID INJURY OR DEATH

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.

W-2103-0508

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HYDRAULIC/HYDROSTATIC SYSTEM

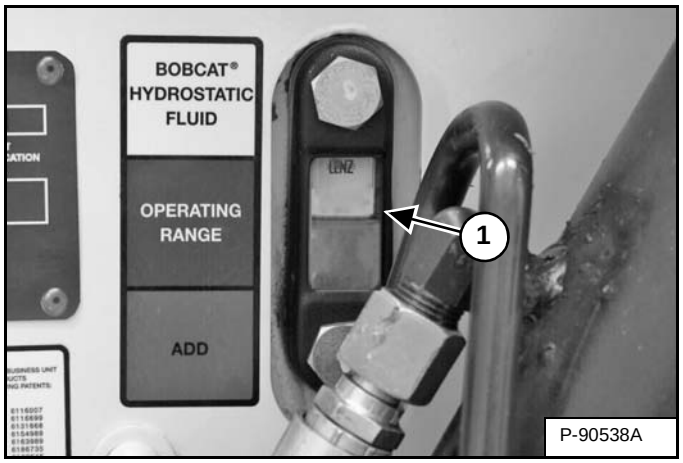
Checking And Adding Fluid

Check the hydraulic / hydrostatic fluid level every day before starting the work shift.

Park the loader on a level surface, lower the lift arms and place the attachment flat on the ground or tilt the Bob-Tach fully back if no attachment is installed.

Stop the engine.

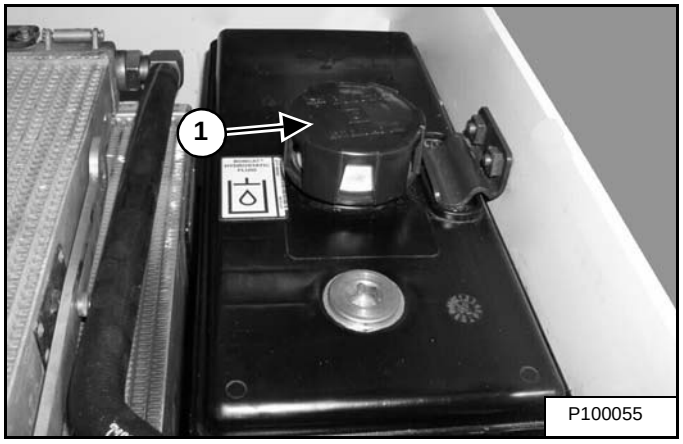
Figure 10-120-1



Check the fluid level in the sight gauge (Item 1) **[Figure 10-120-1]**. Keep the fluid level within the operating range.

Remove the rear grille. (See REAR GRILLE on Page 50-60-1.)

Figure 10-120-2



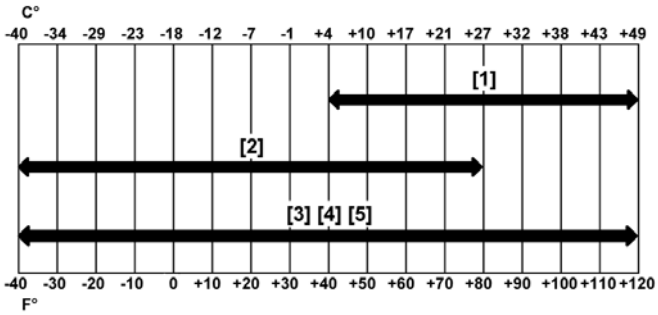
Remove the fill cap (Item 1) **[Figure 10-120-2]**.

Add fluid as needed to bring the level within the operating range in the sight gauge (Item 1) **[Figure 10-120-1]**.

Install the fill cap (Item 1) **[Figure 10-120-2]** and install the rear grille.

Hydraulic / Hydrostatic Fluid Chart

Figure 10-120-3
HYDRAULIC / HYDROSTATIC FLUID RECOMMENDED ISO VISCOSITY GRADE (VG) AND VISCOSITY INDEX (VI)



TEMPERATURE RANGE ANTICIPATED DURING MACHINE USE

[1] VG 100; Minimum VI 130
[2] VG 46; Minimum VI 150
[3] BOBCAT All-Season Fluid
[4] BOBCAT Synthetic Fluid
[5] BOBCAT Biodegradable Hydraulic / Hydrostatic Fluid (Unlike biodegradable fluids that are vegetable based, Bobcat biodegradable fluid is formulated to prevent oxidation and thermal breakdown at operating temperatures.)

Use only recommended fluid in the hydraulic system **[Figure 10-120-3]**. (See Hydraulic System on Page SPEC-10-3.)

⚠ WARNING

AVOID INJURY OR DEATH

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.

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Removing And Replacing Hydraulic Fluid

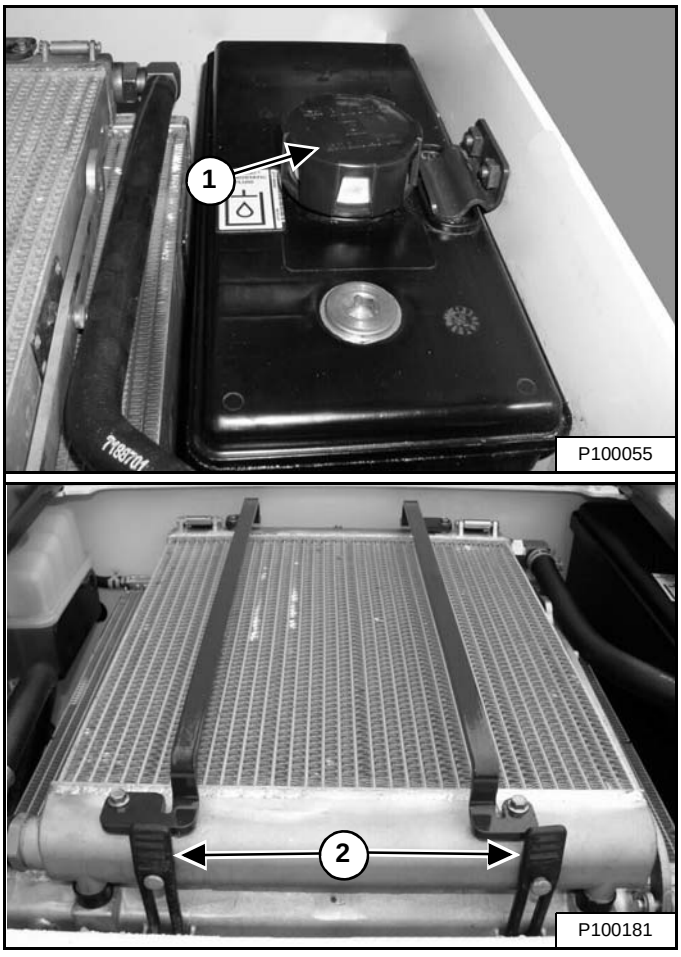
For the correct service interval (See SERVICE SCHEDULE on Page 10-70-1.)

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

Always replace the hydraulic / hydrostatic filter and the hydraulic charge filter whenever the hydraulic fluid is replaced. (See Removing And Replacing Hydraulic / Hydrostatic Filter on Page 10-120-4.)

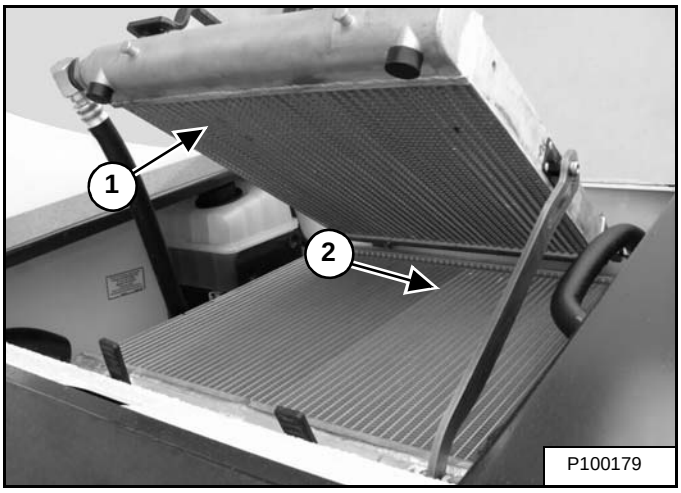
Remove the rear grille. (See REAR GRILLE on Page 50-60-1.)

Figure 10-120-4



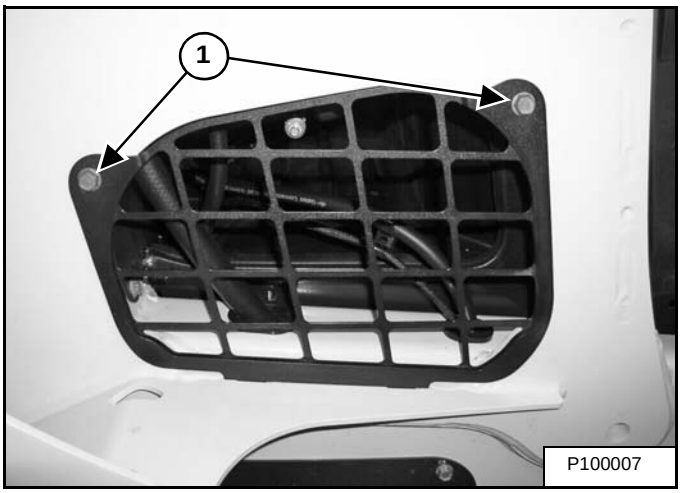
Remove the hydraulic fill cap (Item 1) and unhook the two rubber straps (Item 2) **[Figure 10-120-4]**.

Figure 10-120-5



Raise the oil cooler (Item 1) until the bar (Item 2) **[Figure 10-120-5]** drops into place to support the oil cooler. This will aid in draining the hydraulic fluid.

Figure 10-120-6

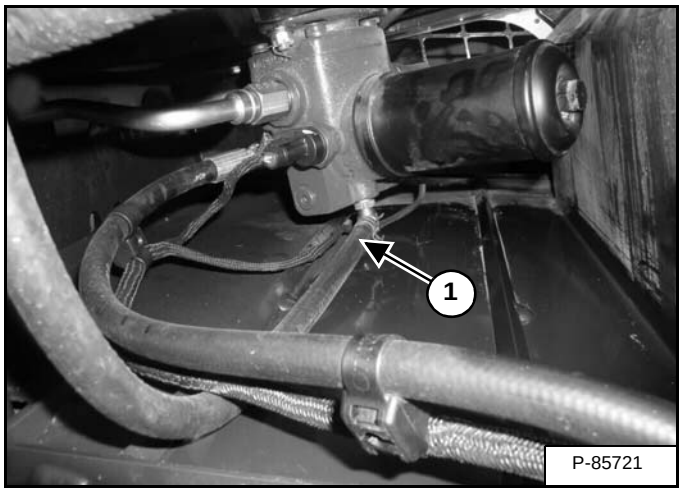


Remove the right side access cover bolts (Item 1) **[Figure 10-120-6]** and remove the cover. (Lift arms shown raised for visual clarity.)

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Removing And Replacing Hydraulic Fluid (Cont'd)

Figure 10-120-7



Pinch off and disconnect the hose (Item 1) **[Figure 10-120-7]** from the cooling fan motor. Route the hose out the side of the loader and drain the fluid into a container.

Connect the hose to the cooling fan motor when the fluid stops draining.

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

⚠ WARNING

AVOID INJURY OR DEATH

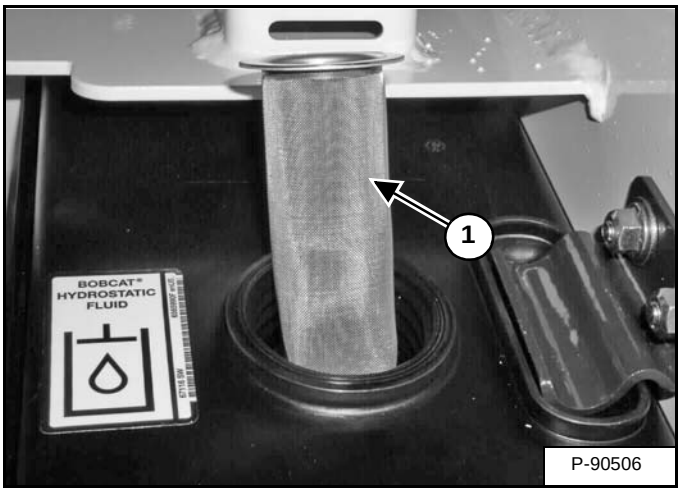
Always clean up spilled fuel or oil. Keep heat, flames, sparks or lighted tobacco away from fuel and oil. Failure to use care around combustibles can cause explosion or fire.

W-2103-0508

Install the side access cover.

Raise the bar supporting the oil cooler and lower the oil cooler. Fasten the two rubber straps.

Figure 10-120-8



Remove and clean the hydraulic fill screen (Item 1) **[Figure 10-120-8]**. Use low air pressure to dry the screen.

Install hydraulic fill screen and add the correct fluid to the reservoir until the fluid level is within the operating range of the sight gauge. (See Capacities on Page SPEC-10-4.) and (See Checking And Adding Fluid on Page 10-120-1.)

Install the hydraulic fill cap.

Install the rear grille.

Start the engine and operate the loader hydraulic controls.

Stop the engine and check for leaks.

Check the fluid level in the reservoir and add as needed. (See Checking And Adding Fluid on Page 10-120-1.)

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Removing And Replacing Hydraulic / Hydrostatic Filter

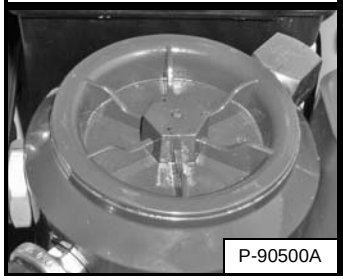
For the correct service interval. (See SERVICE SCHEDULE on Page 10-70-1.)

Remove the rear grille. (See REAR GRILLE on Page 50-60-1.)

The filter housing is located behind the hydraulic fluid reservoir.

Clean the top of the filter housing.

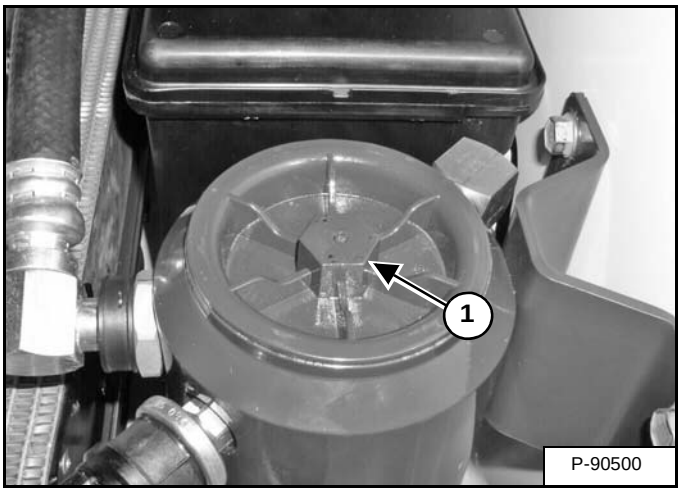
Figure 10-120-9

Earlier Model	Later Model
 P-90500A	 P100047A

Two types of filters are used on this model loader **[Figure 10-120-9]**. Select the correct procedure for your machine.

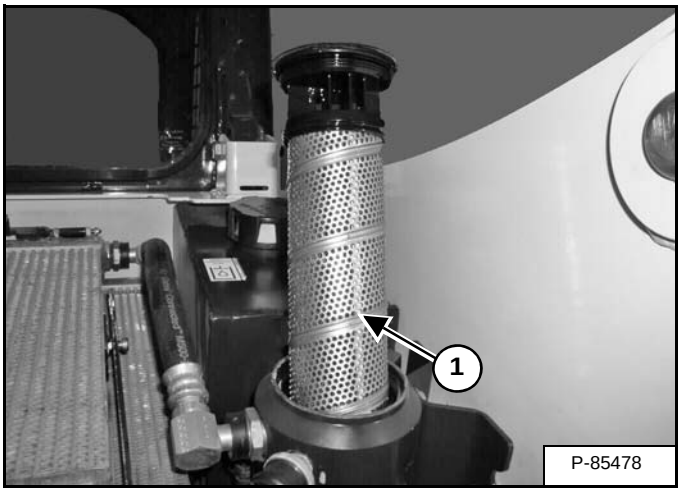
Earlier Models

Figure 10-120-10



Remove the filter (Item 1) **[Figure 10-120-10]** using a socket wrench.

Figure 10-120-11



Discard the entire filter (Item 1) **[Figure 10-120-11]**.

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

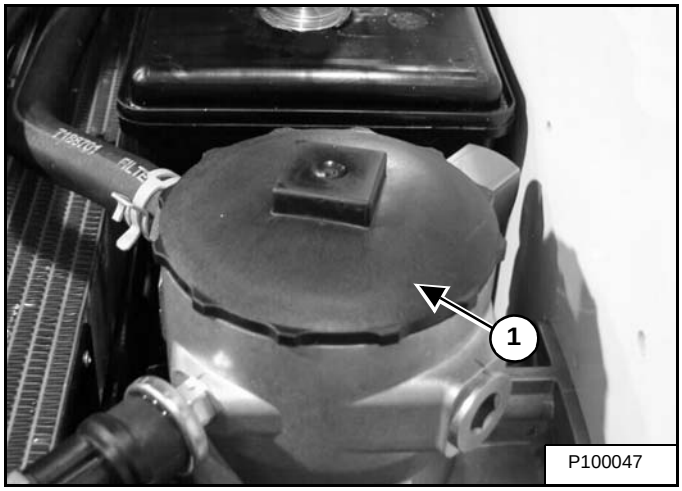
Install new filter and tighten to 61 N•m (45 ft-lb) torque.

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Removing And Replacing Hydraulic / Hydrostatic Filter (Cont'd)

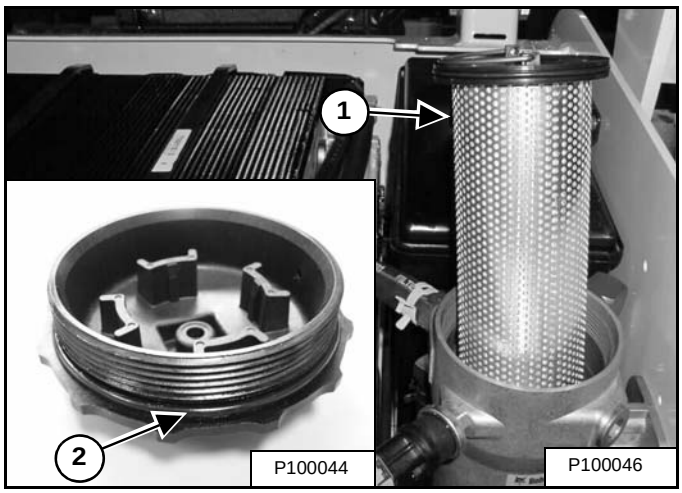
Later Models

Figure 10-120-12



Remove the filter cap (Item 1) **[Figure 10-120-12]**.

Figure 10-120-13



Remove the filter element (Item 1) **[Figure 10-120-13]** and discard.

Remove the O-ring (Item 2) **[Figure 10-120-13]** and discard.

Install new O-ring and lubricate with clean oil.

Install new filter element ensuring that element is fully seated in the housing.

Install the filter cap and tighten to 25 N•m (18 ft-lb) torque.

All Models

WARNING

AVOID INJURY OR DEATH

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.

W-2103-0508

Install the rear grille.

Start the engine and operate the loader hydraulic controls.

WARNING

AVOID INJURY OR DEATH

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

W-2072-0807

Stop the engine and check for leaks at the filter.

Check the fluid level in the reservoir and add as needed. (See Checking And Adding Fluid on Page 10-120-1.)

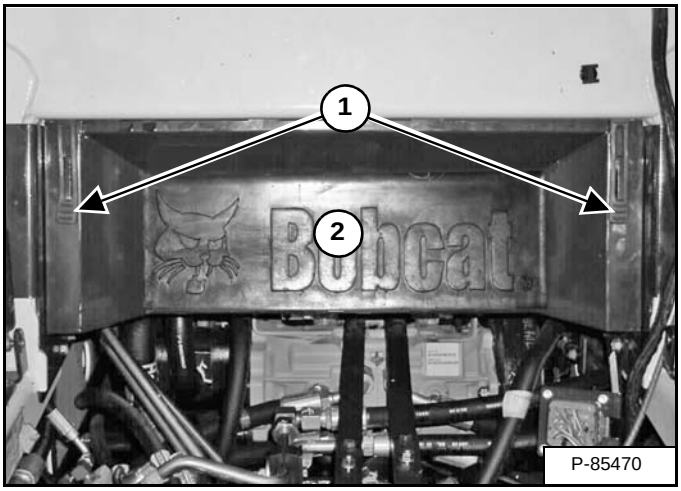
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Removing And Replacing Hydraulic Charge Filter

The hydraulic charge filter is located under the operator cab. For the correct service interval (See SERVICE SCHEDULE on Page 10-70-1.)

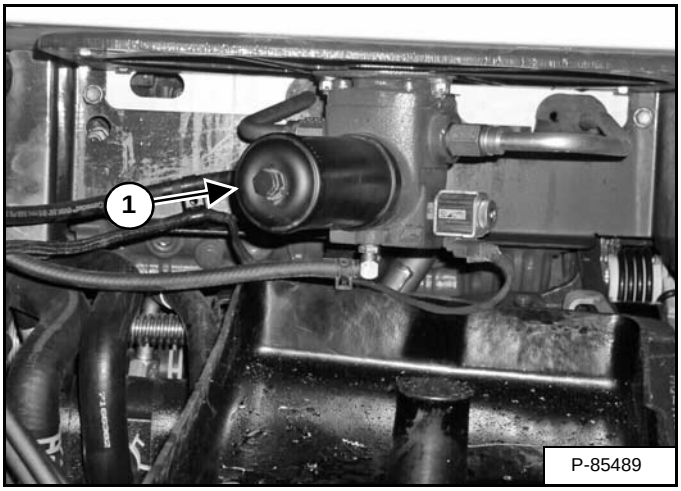
Raise the operator cab. (See Raising on Page 10-30-2.)

Figure 10-120-14



Unhook the rubber straps (Item 1) and remove the lower fan duct (Item 2) **[Figure 10-120-14]**.

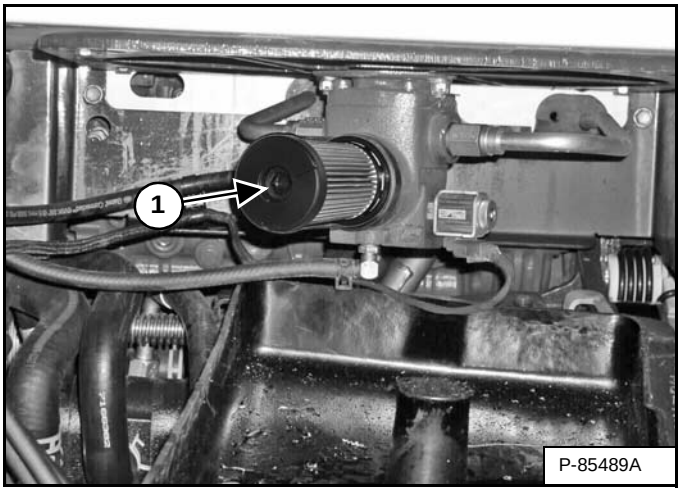
Figure 10-120-15



Place a suitable container below the filter housing and remove the filter housing (Item 1) **[Figure 10-120-15]** using a socket wrench.

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

Figure 10-120-16



Remove and discard the filter element (Item 1) **[Figure 10-120-16]**.

Clean the surface of the filter housing and the filter base where they contact the filter element seal.

Put clean oil on the seal of the new filter element. Install the element on the filter base. Install and tighten the filter housing to 47 - 54 N•m (35 - 40 ft-lb) torque.

⚠ WARNING

AVOID INJURY OR DEATH

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.

W-2103-0508

Install the lower fan duct **[Figure 10-120-14]**.

NOTE: Failure to install the lower fan duct correctly may result in decreased cooling.

Lower the operator cab. (See Lowering on Page 10-30-3.)

Start the engine and operate the loader hydraulic controls.

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Removing And Replacing Hydraulic Charge Filter (Cont'd)

WARNING

AVOID INJURY OR DEATH

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

W-2072-0807

Stop the engine and check for leaks at the filter.

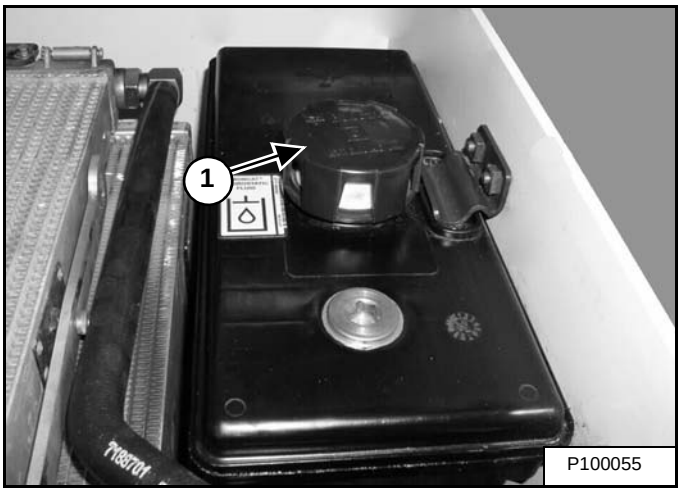
Check the fluid level in the reservoir and add as needed. (See Checking And Adding Fluid on Page 10-120-1.)

Breather Cap

See the SERVICE SCHEDULE for the correct replacement interval. (See SERVICE SCHEDULE on Page 10-70-1.)

Remove the rear grille. (See REAR GRILLE on Page 50-60-1.)

Figure 10-120-17



Remove the breather cap (Item 1) **[Figure 10-120-17]** and discard.

Install new breather cap.

Install the rear grille.

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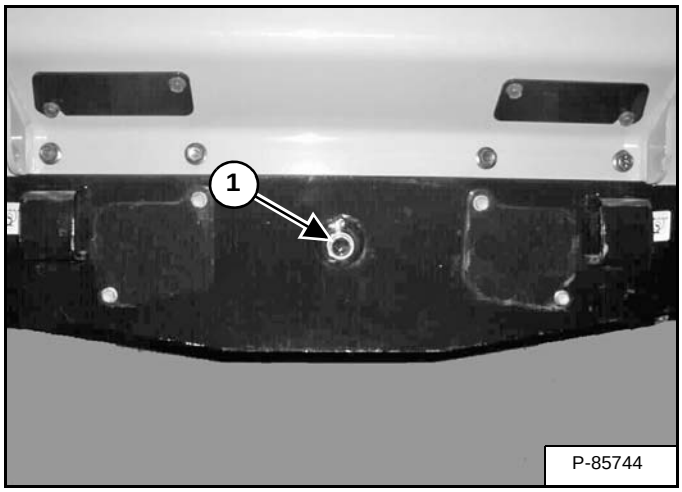
FINAL DRIVE TRANSMISSION (CHAINCASE)

Checking And Adding Oil

The chaincase contains the final drive sprockets and chains and uses the same type of oil as the hydraulic / hydrostatic system. (See Hydraulic System on Page SPEC-10-3.)

Stop the loader on a level surface and stop the engine.

Figure 10-130-1



Remove the check plug (Item 1) **[Figure 10-130-1]** from the front of the chaincase housing. (Lift arms shown raised for clarity.)

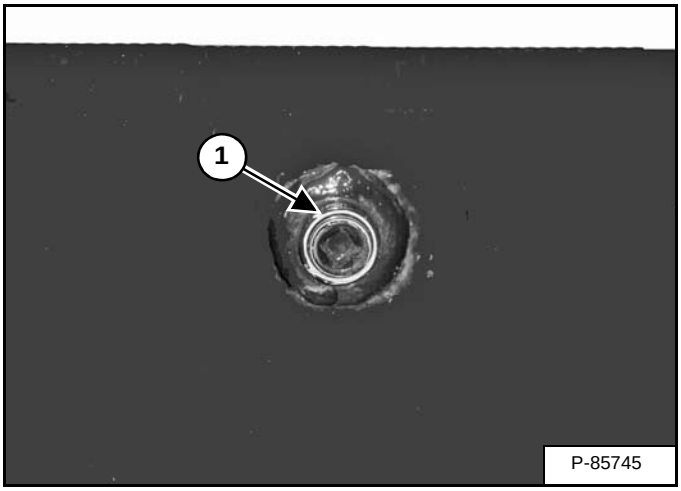
If oil can be reached with the tip of your finger through the hole, the oil level is correct.

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

Install and tighten the plug.

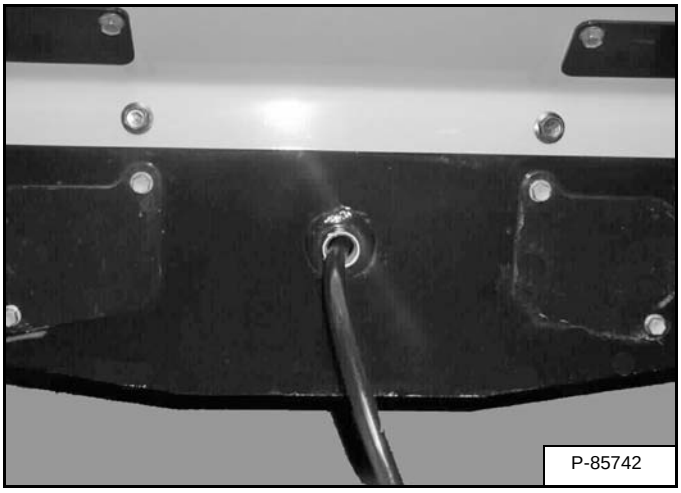
Removing And Replacing Oil

Figure 10-130-2



Remove the check plug (Item 1) **[Figure 10-130-2]** from the front of the chaincase housing.

Figure 10-130-3



Pump the oil out of the chaincase **[Figure 10-130-3]**.

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

Add oil through the check plug hole until the oil flows from the hole.

WARNING

AVOID INJURY OR DEATH

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.

W-2103-0508

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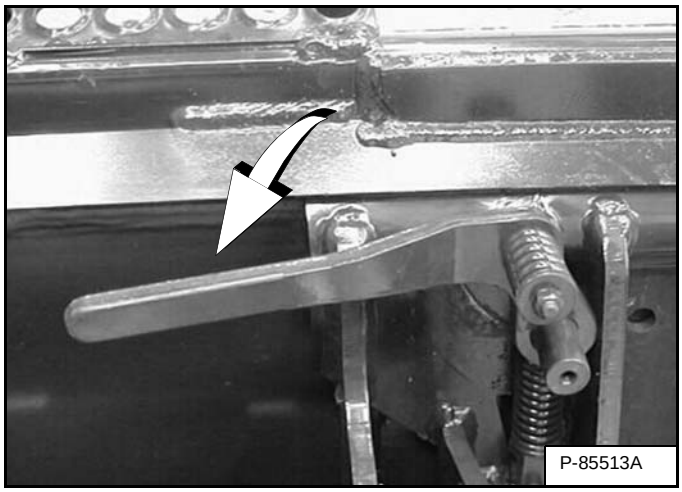


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BOB-TACH (HAND LEVER)

Inspection And Maintenance

Figure 10-140-1



Move the Bob-Tach levers down to engage the wedges **[Figure 10-140-1]**.

The levers and wedges must move freely.

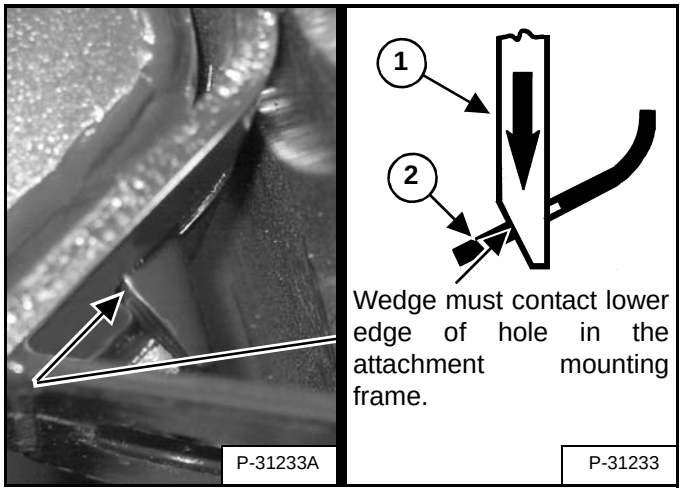
⚠ WARNING

AVOID INJURY OR DEATH

The Bob-Tach wedges must extend through the holes in the attachment mounting frame. Levers must be fully down and locked. Failure to secure wedges can allow attachment to come off.

W-2715-0208

Figure 10-140-2

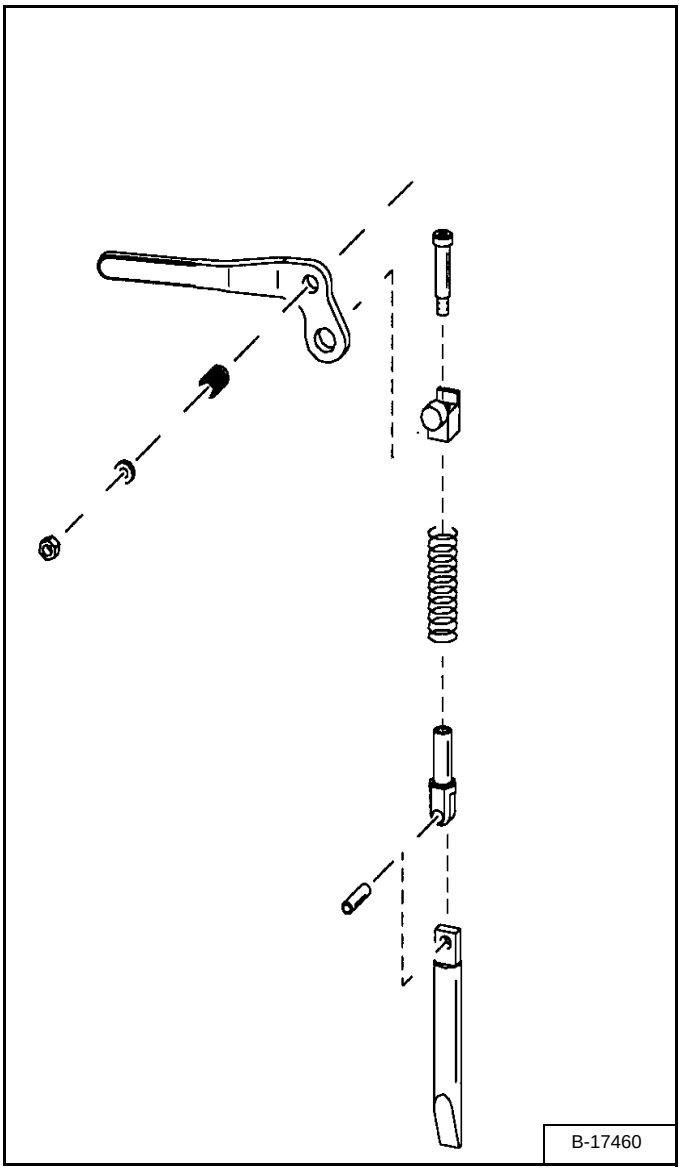


The wedges (Item 1) **[Figure 10-140-2]** must extend through the holes in the attachment mounting frame.

The spring loaded wedges (Item 1) must contact the lower edge of the holes in the attachment mounting frame (Item 2) **[Figure 10-140-2]**.

If the wedges do not contact the lower edge of the holes **[Figure 10-140-2]**, the attachment will be loose and can come off the Bob-Tach.

Figure 10-140-3



Inspect the mounting frame on the attachment and Bob-Tach, linkages and wedges for excessive wear or damage **[Figure 10-140-3]**. 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 on Page 10-70-1.) (See LUBRICATING THE LOADER on Page 10-150-1.)

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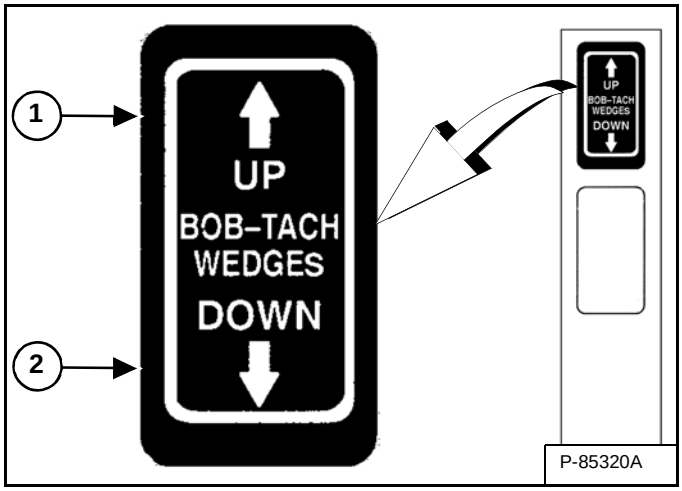
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BOB-TACH (POWER)

This machine may be equipped with a Power Bob-Tach.

Inspection And Maintenance

Figure 10-141-1



Push and hold the BOB-TACH “WEDGES UP” switch (Item 1) until wedges are fully raised. Push and hold the BOB-TACH “WEDGES DOWN” switch (Item 2) **[Figure 10-141-1]** until the wedges are fully down.

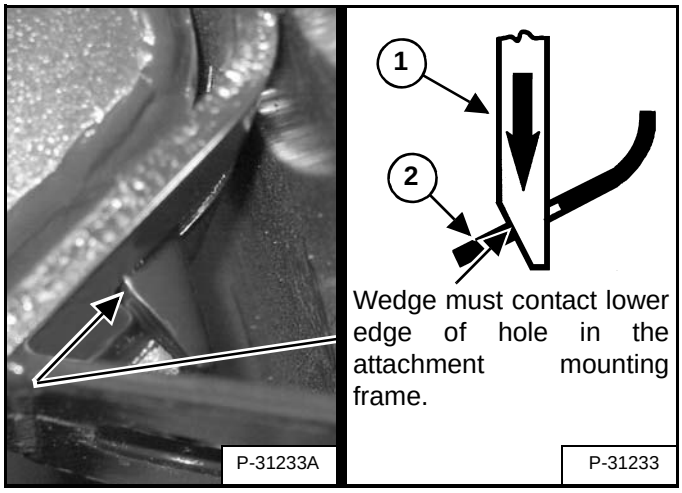
The levers and wedges must move freely.

⚠ WARNING

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

W-2102-0497

Figure 10-141-2

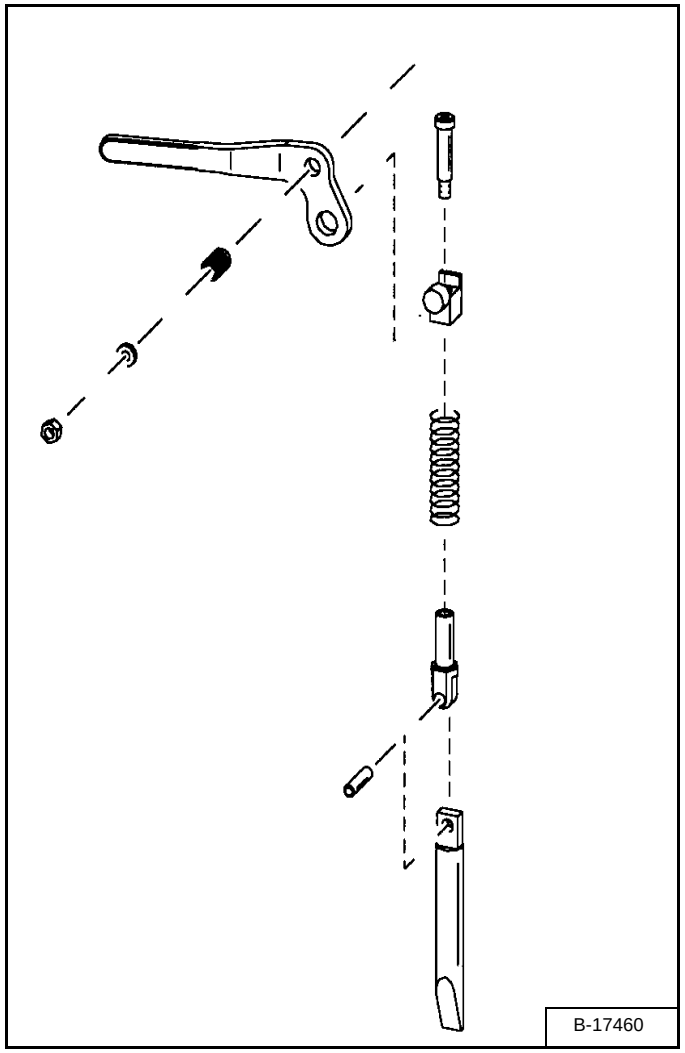


The wedges (Item 1) **[Figure 10-141-2]** must extend through the holes in the attachment mounting frame.

The spring loaded wedges (Item 1) must contact the lower edge of the holes in the attachment mounting frame (Item 2) **[Figure 10-141-2]**.

If the wedges do not contact the lower edge of the holes **[Figure 10-141-2]**, the attachment will be loose and can come off the Bob-Tach.

Figure 10-141-3



Inspect the mounting frame on the attachment and Bob-Tach, linkages and wedges for excessive wear or damage **[Figure 10-141-3]**. 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 on Page 10-70-1.) and (See LUBRICATING THE LOADER on Page 10-150-1.)

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LUBRICATING THE LOADER

Lubrication Locations

Lubricate the loader as specified for the best performance of the loader. (See SERVICE SCHEDULE on Page 10-70-1.)

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.

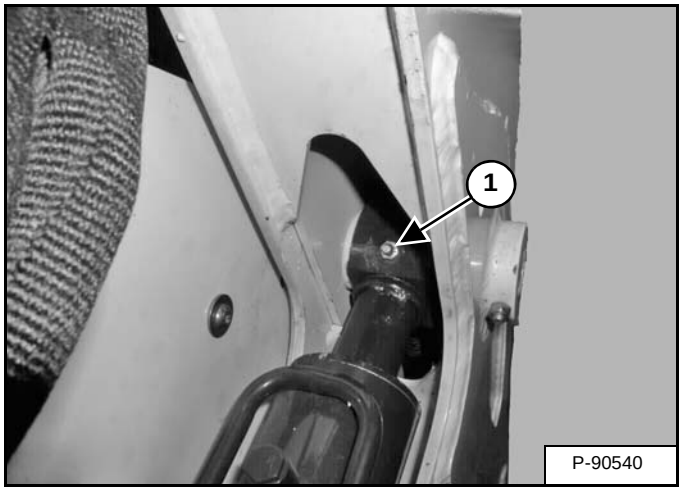
Remove attachment from the loader.

Tilt the Bob-Tach forward until it contacts the ground.

Stop the engine.

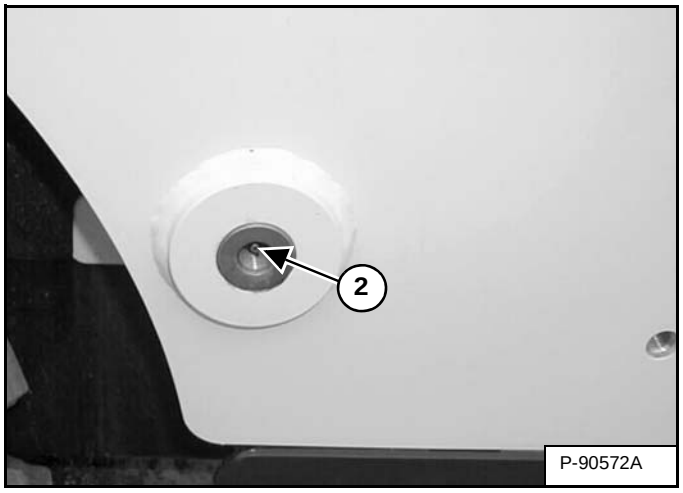
Lubricate the following:

Figure 10-150-1



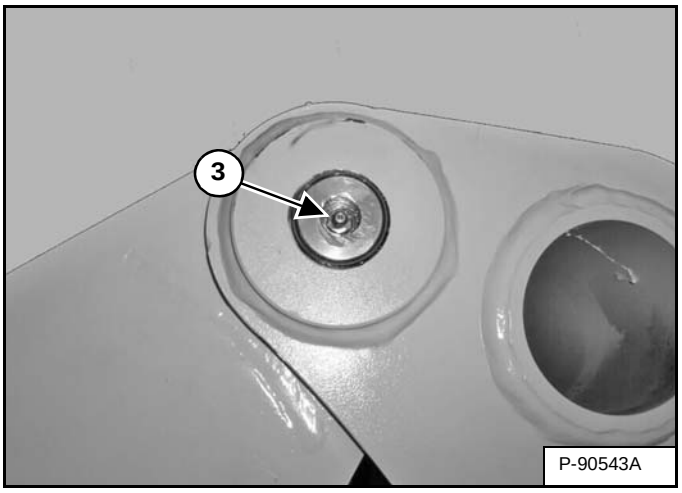
1. Rod End Lift Cylinder (Both Sides) (2) **[Figure 10-150-1]**.

Figure 10-150-2



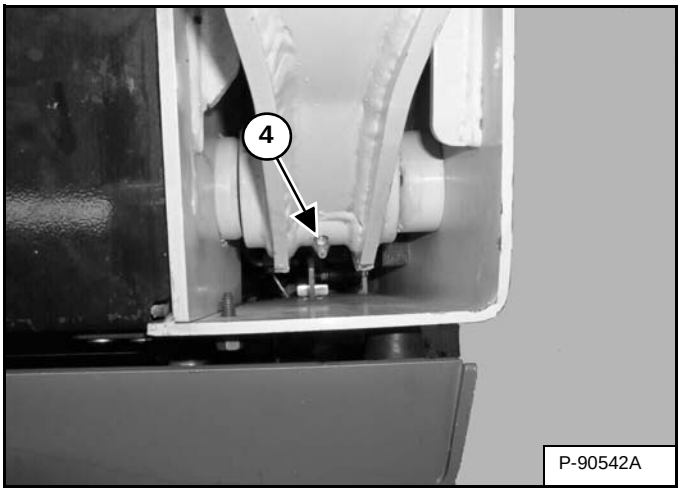
2. Base End Lift Cylinder (Both Sides) (2) **[Figure 10-150-2]**.

Figure 10-150-3



3. Lift Arm Pivot Pin (Both Sides) (2) **[Figure 10-150-3]**.

Figure 10-150-4

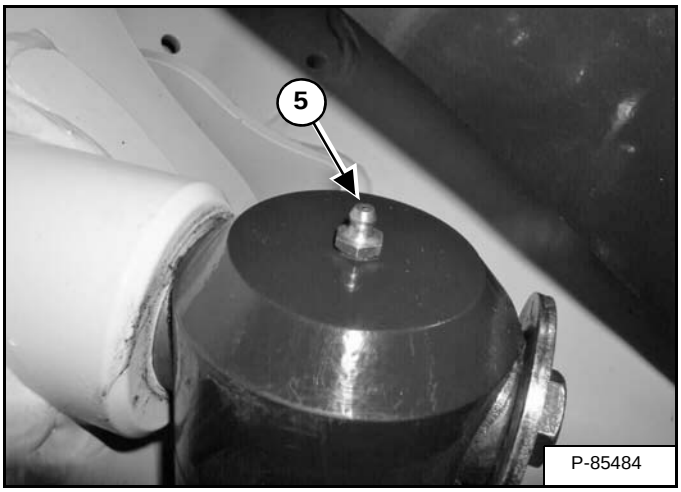


4. Lift Arm Link Pivot (Both Sides) (2) **[Figure 10-150-4]**.

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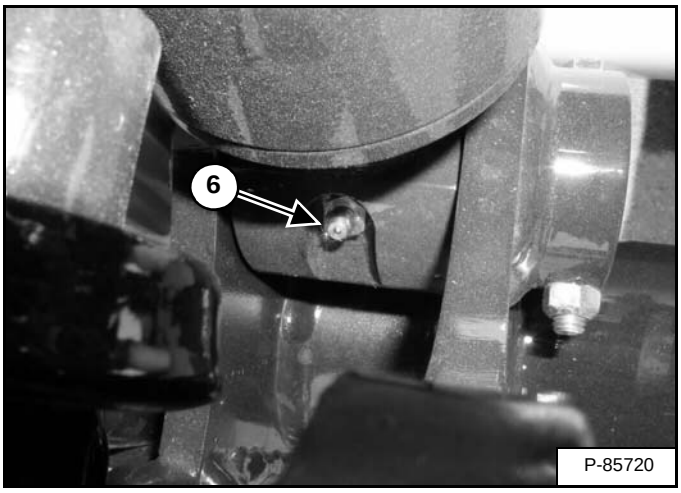
Lubrication Locations (Cont'd)

Figure 10-150-5



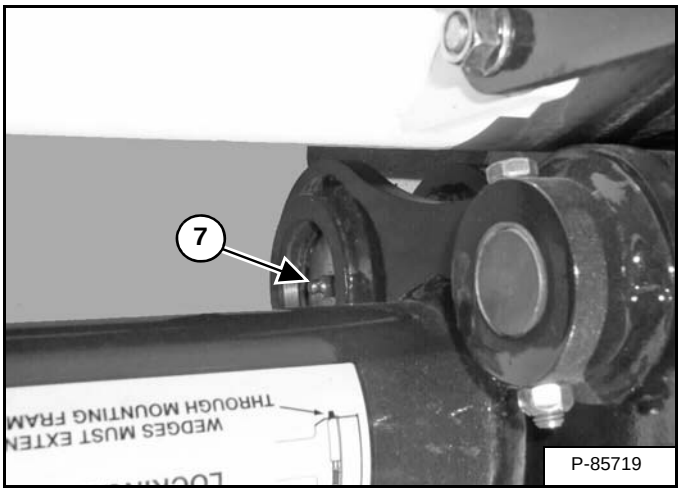
5. Base End Tilt Cylinder (Both Sides) (2) **[Figure 10-150-5]**.

Figure 10-150-6



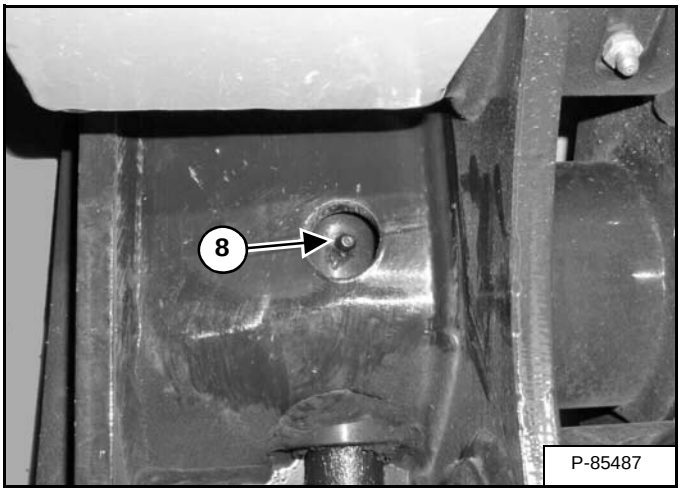
6. Rod End Tilt Cylinder (Both Sides) (2) **[Figure 10-150-6]**.

Figure 10-150-7



7. Bob-Tach Pivot Pin (Both Sides) (2) **[Figure 10-150-7]**.

Figure 10-150-8

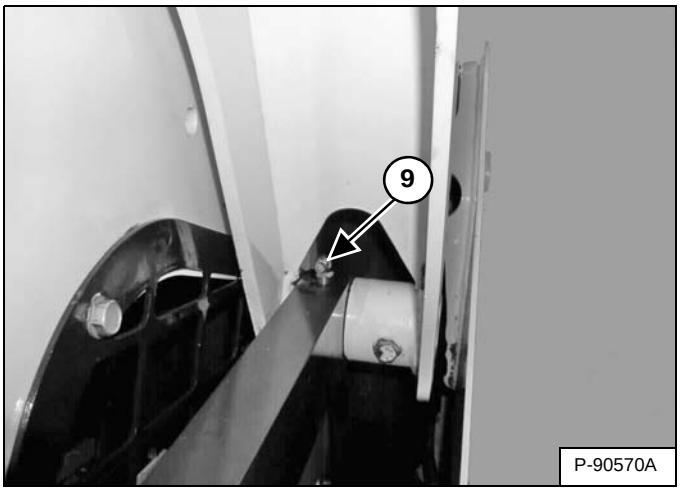


8. Bob-Tach Wedge (Both Sides) (2) **[Figure 10-150-8]**.

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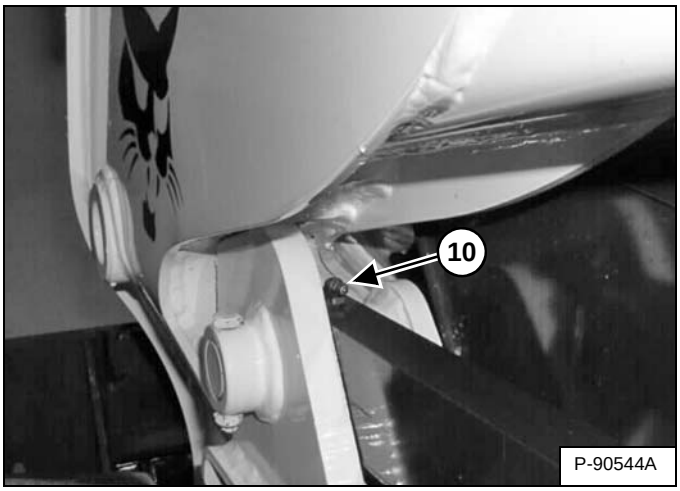
Lubrication Locations (Cont'd)

Figure 10-150-9



9. Rear Control Link (Both Sides) (2) **[Figure 10-150-9]**.

Figure 10-150-10



10. Front Control Link (Both Sides) (2) **[Figure 10-150-10]**.

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TIRE MAINTENANCE

Wheel Nuts

Figure 10-160-1



See your SERVICE SCHEDULE for the correct interval to check the wheel nuts **[Figure 10-160-1]**. (See SERVICE SCHEDULE on Page 10-70-1.)

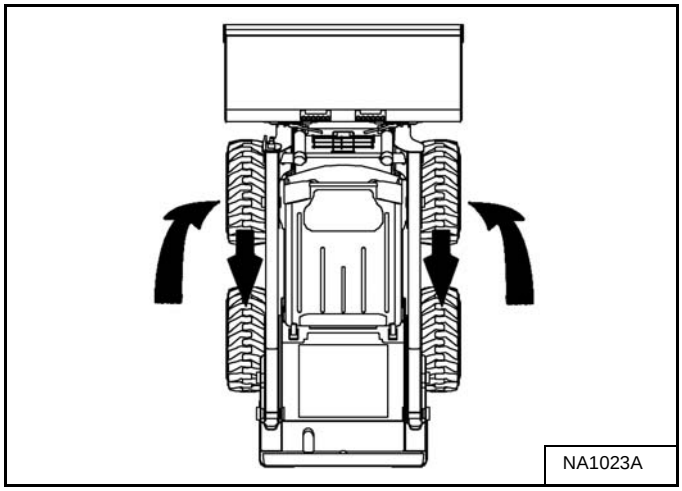
When installing wheel nuts, tighten to 217 N•m (160 ft-lb) torque.

When checking wheel nut torque, set the torque wrench to 190 N•m (140 ft-lb) to prevent over-tightening.

Rotating

Check the tires regularly for wear, damage and pressure.

Figure 10-160-2



Rear tires usually wear faster than front tires. To keep tire wear even, move the front tires to the rear and rear tires to the front **[Figure 10-160-2]**.

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

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

Mounting

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

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

The rim flange must be cleaned and free of rust.

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

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

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

⚠ WARNING

AVOID INJURY OR DEATH

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

W-2078-1007

IMPORTANT

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

I-2057-0794

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SPARK ARRESTOR MUFFLER

Cleaning Procedure

See the SERVICE SCHEDULE for service interval for cleaning the spark arrestor muffler. (See SERVICE SCHEDULE on Page 10-70-1.)

Do not operate the loader with a defective exhaust system.

IMPORTANT

This machine is factory equipped with a U.S.D.A. Forestry Service approved spark arrestor exhaust system.

The spark arrestor muffler, if equipped, must be cleaned to keep it in working condition. The spark arrestor muffler must be serviced by dumping the spark chamber every 100 hours of operation.

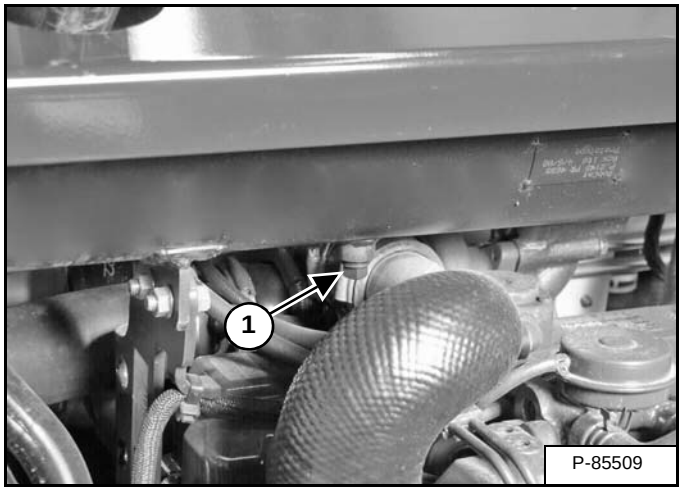
On some models, the turbocharger functions as the spark arrestor and must operate correctly for proper spark arrestor function.

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

I-2284-0409

Stop the engine and open the rear door.

Figure 10-170-1



Remove the plug (Item 1) **[Figure 10-170-1]** from the bottom of the muffler.

WARNING

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

W-2006-1209

Start the engine and run for about 10 seconds while a second person, wearing safety glasses, holds a piece of wood over the outlet of the muffler.

This will force contaminants out through the cleanout hole.

Stop the engine.

Install and tighten the plug. Close the rear door.

WARNING

AVOID INJURY OR DEATH

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

W-2050-0807

WARNING

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

W-2011-1285

WARNING

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

W-2068-1285

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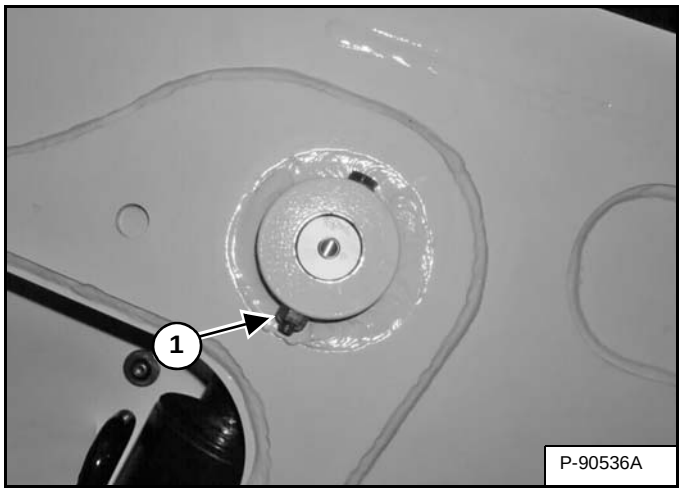


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PIVOT PINS

Inspection And Maintenance

Figure 10-180-1



All lift arm and cylinder pivots have a large pin held in position with a retainer bolt and lock nut (Item 1) **[Figure 10-180-1]**.

Check that the lock nuts are tightened to 48 - 54 N•m (35 - 40 ft-lb) torque.

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LOADER STORAGE AND RETURN TO SERVICE

Storage

Sometimes it may be necessary to store your Bobcat loader for an extend period of time. Below is a list of items to perform before storage.

- Thoroughly clean the loader including the engine compartment.
- Lubricate the loader.
- Replace worn or damaged parts.
- Park the loader in a dry protected shelter.
- Lower the lift arms all the way and put the bucket flat on the ground.
- Put blocks under the frame to remove weight from the tires.
- Put grease on any exposed cylinder rods.
- Put fuel stabilizer in the fuel tank and run the engine a few minutes to circulate the stabilizer to the pump and fuel injectors.

  If biodiesel blend fuel has been used, perform the following:

  Drain the fuel tank, refill with 100% petroleum diesel fuel, add fuel stabilizer and run the engine for at least 30 minutes.
- Drain and flush the cooling system. Refill with premixed coolant.
- Replace all fluids and filters (engine, hydraulic / hydrostatic).
- Replace air cleaner, heater and air conditioning filters.
- Put all controls in neutral position.
- Remove the battery. Be sure the electrolyte level is correct then charge the battery. Store it in a cool dry place above freezing temperatures and charge it periodically during storage.
- Cover the exhaust pipe opening.
- Tag the machine to indicate that it is in storage condition.

Return To Service

After the Bobcat loader has been in storage, it is necessary to follow a list of items to return the loader to service.

- Check the engine and hydraulic oil levels; check coolant level.
- Install a fully charged battery.
- Remove grease from exposed cylinder rods.
- Check all belt tensions.
- Be sure all shields and guards are in place.
- Lubricate the loader.
- Check tire inflation and remove blocks from under frame.
- Remove cover from exhaust pipe opening.
- Start the engine and let run for a few minutes while observing the instrument panels and systems for correct operation.
- Operate machine, check for correct function.
- Stop the engine and check for leaks. Repair as needed.

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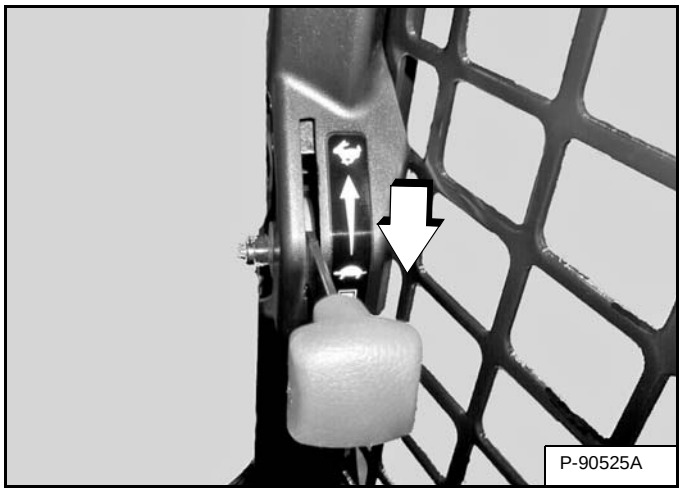
STOPPING THE ENGINE AND LEAVING THE LOADER

Procedure

Stop the loader on level ground.

Fully lower the lift arms and put the attachment flat on the ground.

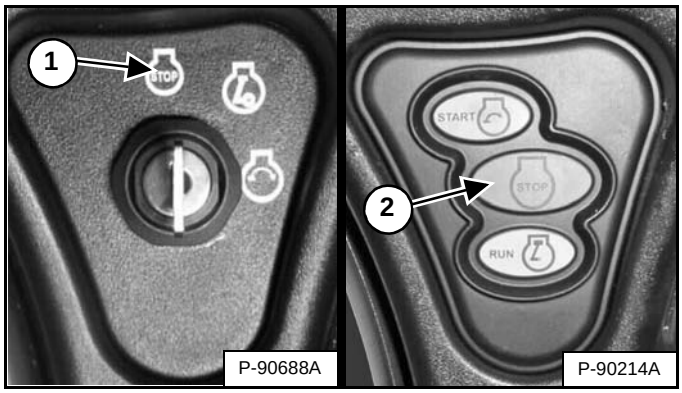
Figure 10-200-1



Push the engine speed control fully down **[Figure 10-200-1]** to decrease the engine speed.

Engage the parking brake.

Figure 10-200-2



Turn the key switch to the STOP position (Item 1) *or* press the STOP button (Item 2) **[Figure 10-200-2]**.

NOTE: If the loader lights are ON, they will remain ON for approximately 90 seconds after turning the loader OFF.

Raise the seat bar and make sure the lift and tilt functions are deactivated.

Unbuckle the seat belt.

Remove the key from the switch *(Standard Key Panel)* to prevent operation of the loader by unauthorized personnel.

NOTE: Activating the Password Lockout Feature on machines with the Keyless Start Panel or the Deluxe Instrumentation Panel allows operation of the loader without using a password. (See Password Lockout Feature on Page 60-190-2.) or (See Password Lockout Feature on Page 60-191-1.)

Figure 10-200-3



Exit the loader using grab handles, safety tread and steps (maintaining a 3-point contact) **[Figure 10-200-3]**.

WARNING

AVOID INJURY OR DEATH

Before you leave the operator's seat:

- **Lower the lift arms and put the attachment flat on the ground.**
- **Stop the engine.**
- **Engage the parking brake.**
- **Raise the seat bar.**
- **Move all controls to the NEUTRAL / LOCKED position to make sure the lift, tilt and traction drive functions are deactivated.**

The seat bar system must deactivate these functions when the seat bar is up. Service the system if controls do not deactivate.

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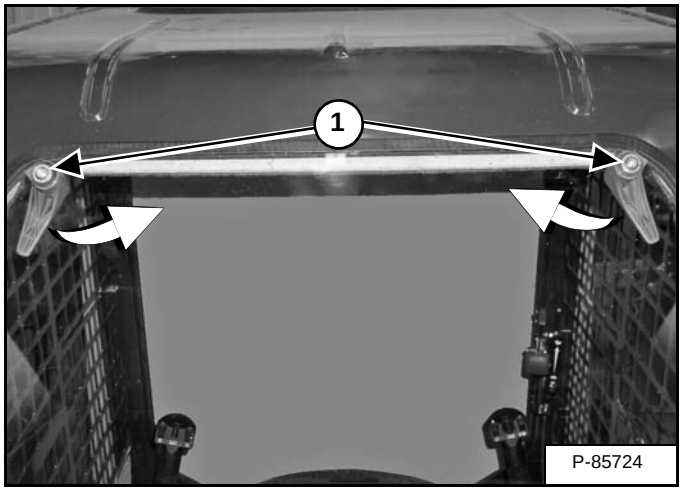
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EMERGENCY EXIT

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

External Access

Figure 10-210-1

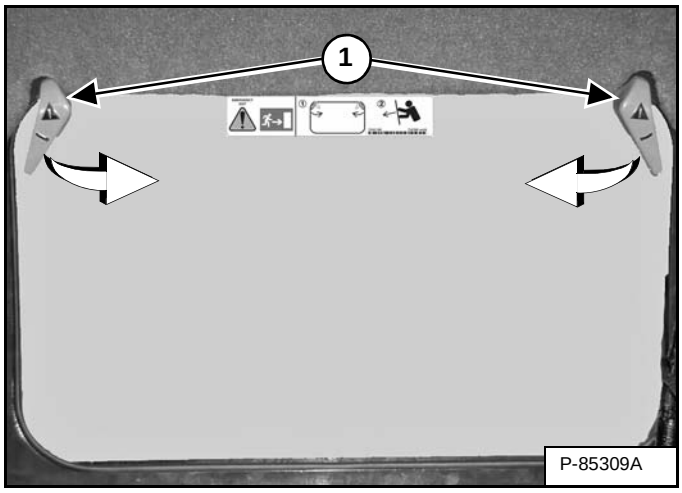


The rear window can be removed from outside the loader using a T40 TORX® driver. Turn both screws (Item 1) **[Figure 10-210-1]** in until the latches disengage from the window frame. Pull the top of the window away from the cab and lift up to remove.

Rear Window

NOTE: Use this procedure to remove the rear window only under emergency conditions. Damage to machine may occur.

Figure 10-210-2



Turn both latches (Item 1) **[Figure 10-210-2]** in until they disengage from the window frame.

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

Figure 10-210-3



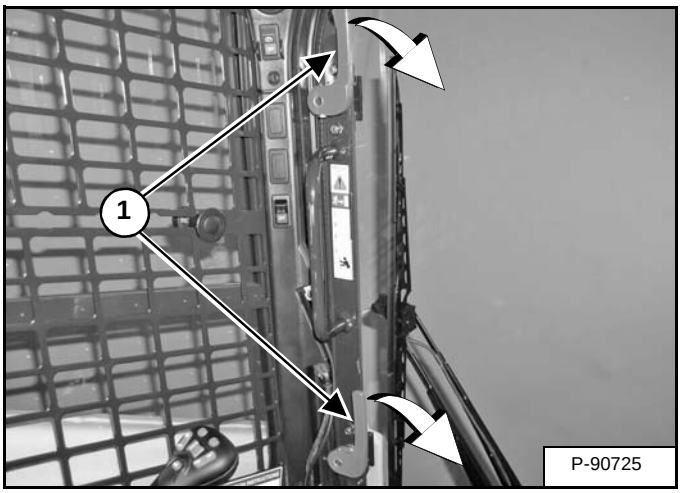
Exit through the rear of the operator cab **[Figure 10-210-3]**.

Front Door

This machine may be equipped with a front door.

NOTE: Use this procedure to remove the front door only under emergency conditions. Damage to machine may occur.

Figure 10-210-4



Turn both latches (Item 1) **[Figure 10-210-4]** down until they disengage from the door frame.

Push the door out of the operator cab door frame.

Exit through the opening.

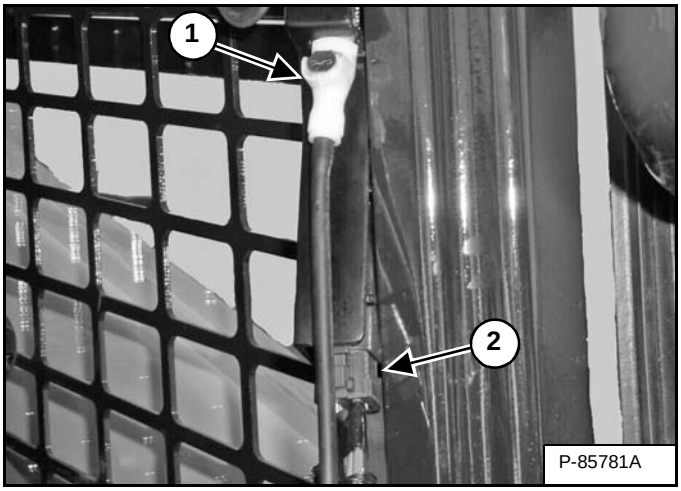
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EMERGENCY EXIT (CONT'D)

Front Door (Cont'd)

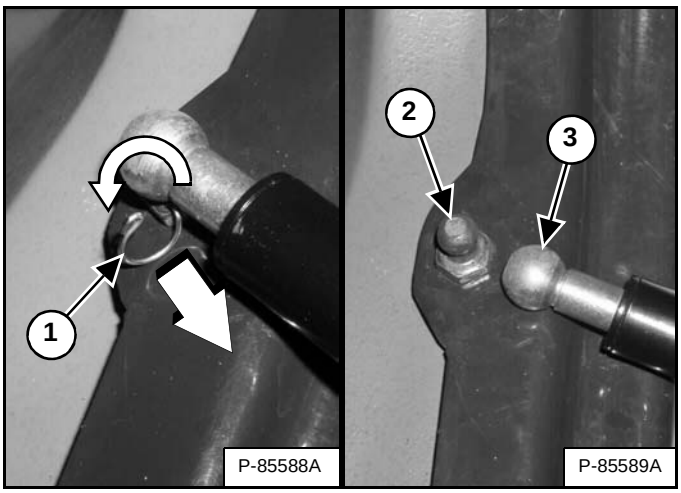
Front Door Reassembly

Figure 10-210-5



Disconnect electrical connector (Item 2) and washer fluid hose (Item 1) **[Figure 10-210-5]**.

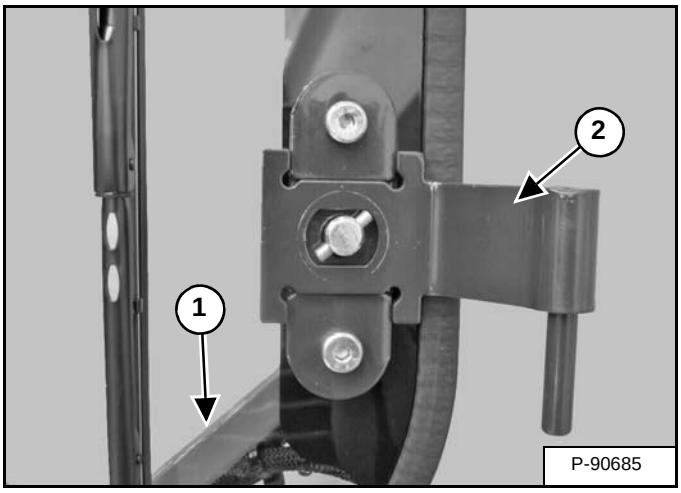
Figure 10-210-6



Rotate and pull the clip (Item 1) out of the gas spring socket. Pull the gas spring socket (Item 3) straight off the ball stud fitting (Item 2) **[Figure 10-210-6]**.

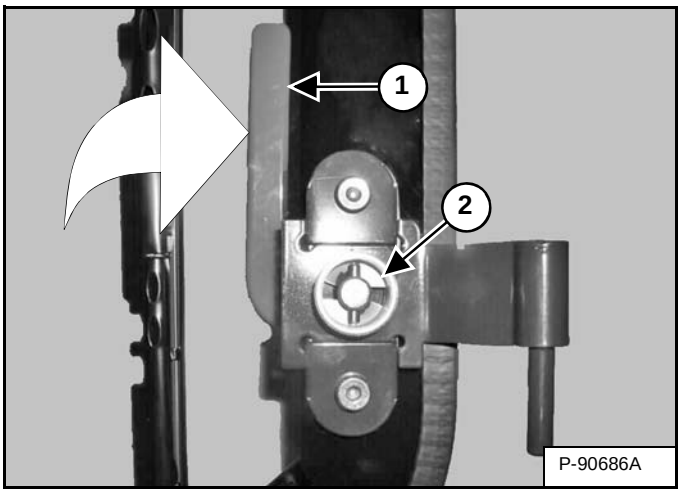
Remove the door hinges from the loader.

Figure 10-210-7



Orient the latches as shown (Item 1) and install the door hinges (Item 2) **[Figure 10-210-7]** on the door. (Bottom hinge shown)

Figure 10-210-8



Install cast washers (Item 2) on door hinges taking care to match rectangular surfaces. Hold cast washer firmly against door and rotate latch (Item 1) **[Figure 10-210-8]** up to lock cast washer into place. (Bottom hinge shown) (Plastic cap shown removed for clarity)

Install door on loader.

Install the gas spring socket on the ball stud fitting. Install the clip into the hole in the gas spring socket. Rotate the clip to lock into place **[Figure 10-210-6]**.

Connect electrical connector (Item 2) and washer fluid hose (Item 1) **[Figure 10-210-5]**.

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Inspection And Maintenance

WARNING

Failure to properly inspect and maintain the seat belt can cause lack of operator restraint resulting in serious injury or death.

W-2466-0703

Check the seat belt daily for correct function.

Inspect the seat belt system thoroughly at least once each year or more often if the machine is exposed to severe environmental conditions or applications.

Any seat belt system that shows cuts, fraying, extreme or unusual wear, significant discolorations due to ultraviolet UV exposure, dusty / dirty conditions, abrasion to the seat belt webbing, or damage to the buckle, latch plate, retractor (if equipped), hardware or any other obvious problem should be replaced immediately.

The items below are referenced in **[Figure 10-220-1]**.

1. Check the webbing. If the system is equipped with a retractor, pull the webbing completely out and inspect the full length of the webbing. Look for cuts, wear, fraying, dirt and stiffness.

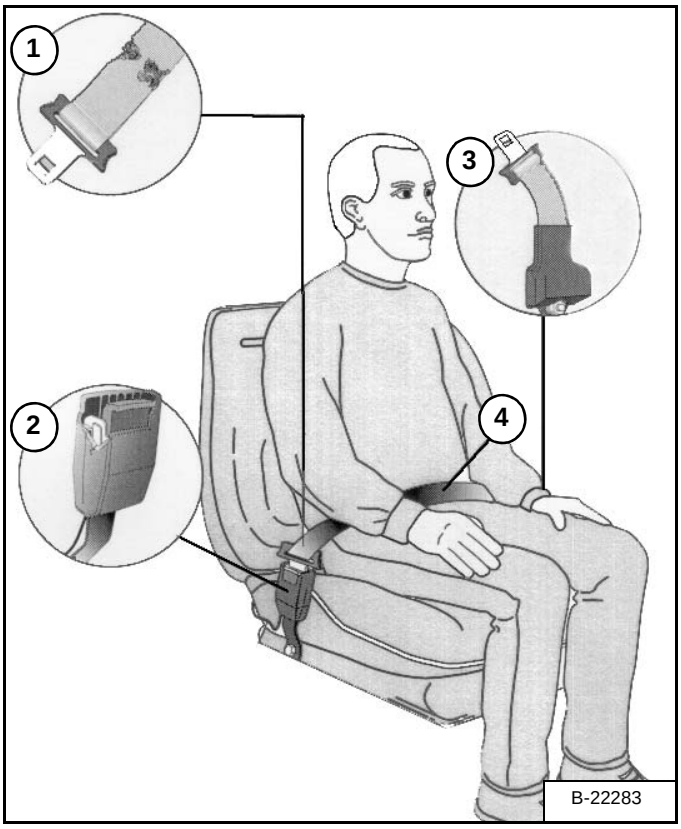
2. Check the buckle and latch for correct operation. Make sure latch plate is not excessively worn, deformed or buckle is not damaged or casing broken.

3. Check the retractor web storage device (if equipped) by extending webbing to determine if it looks correct and that it spools out and retracts webbing correctly.

4. Check webbing in areas exposed to ultraviolet (UV) rays from the sun or extreme dust or dirt. If the original color of the webbing in these areas is extremely faded and / or the webbing is packed with dirt, the webbing strength may have deteriorated.

See your Bobcat dealer for seat belt system replacement parts for your machine.

Figure 10-220-1



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WITH NO OPTIONS
S650 (S/N A3NV11001 AND ABOVE)
(S/N A3NW11001 AND ABOVE)

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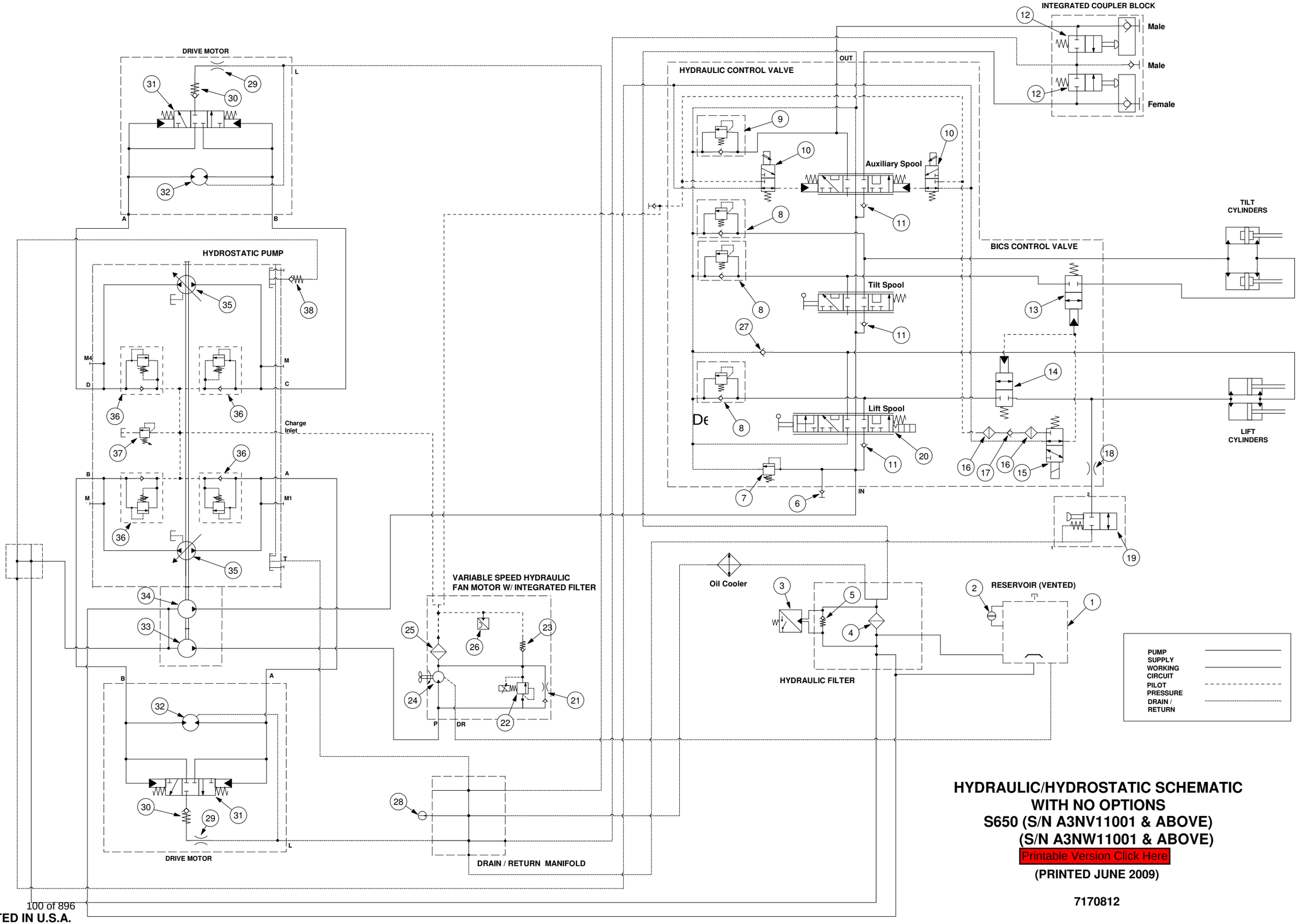
LEGEND

1. RESERVOIR:
   Capacity at sight gauge . . 10.7 Qts. (10,2 L)
   System Capacity . . . . . 10.5 Gal. (39,7 L)
2. SIGHT GUAGE
3. DIFFERENTIAL PRESSURE SWITCH:
   15 PSI (1,07 bar)
   Normally Closed
4. FILTER - HYDRAULIC (CANISTER)
5. SPRING LOADED FILTER BY-PASS VALVE: 25 PSI (1,7 bar)
6. DIAGNOSTIC COUPLER
7. RELIEF VALVE - MAIN:
   3500 PSI (241 bar)
   at Front Quick Couplers
8. RELIEF/ANTICAVITATION VALVE - PORT 4000 PSI (276 bar)
9. RELIEF/ANTICAVITATION VALVE - PORT (OPTIONAL) 4000 PSI (276 bar)
10. SOLENOID ACTIVATED DIRECTIONAL CONTROL VALVE - AUXILIARY
11. LOAD CHECK VALVE
12. FRONT AUXILIARY MANUAL PRESSURE BLEED-OFF VALVE
13. PILOTED ACTIVATED DIRECTIONAL CONTROL VALVE - TILT CONTROL
14. PILOTED ACTIVATED DIRECTIONAL CONTROL VALVE - LIFT CONTROL
15. SOLENOID ACTIVATED DIRECTIONAL CONTROL VALVE - BICS CONTROL
16. FILTER - BICS CONTROL VALVE (SCREEN)
17. CHECK VALVE - With 14.5 PSI (1,0 bar) Spring
18. RESTRICTION . . . . . 0.079 in. (2,0 mm)
19. PULL BUTTON ACTIVATED DIRECTIONAL CONTROL VALVE - LIFT ARM BY-PASS
20. LIFT CYLINDER SPOOL - MADE TO RESTRICT FLOW DURING BOOM DOWN BUT NOT DURING BOOM UP
21. ANTICAVITATION VALVE
22. PROPORTIONAL RELIEF VALVE – (Fan Speed Regulator):
    1566 - 1784 PSI (108 - 123 bar)
23. SPRING LOADED FILTER BY-PASS VALVE: 75 - 83 PSI (5,2 - 5,7 bar)
24. FIXED CAPACITY DISPLACEMENT HYDRAULIC MOTOR
25. FILTER - HYDRAULIC (CANISTER)
26. SENSOR – CHARGE PRESSURE – Fan Filter
27. ANTICAVITATION VALVE
28. SENSOR – HYD. TEMPERATURE
29. RESTRICTION - 0.06 inch (1,5 mm)
30. CHECK VALVE - With 200 PSI (13,8 bar) Spring
31. DRIVE MOTOR SHUTTLE VALVE
32. FIXED CAPACITY DISPLACEMENT BIDIRECTIONAL HYDROSTATIC MOTOR
33. CHARGE PUMP -
    13.5 GPM (51,1 L/min) at High Engine Idle
34. HYDRAULIC PUMP . . . . . Gear Type
    23.0 GPM (87,1 L/min.) at High Engine Idle
35. VARIABLE CAPACITY DISPLACEMENT BIDIRECTIONAL HYDROSTATIC PUMP
36. RELIEF/REPLENISHING VALVE - HIGH PRESSURE: 5294 PSI (365 bar)
37. RELIEF VALVE - CHARGE INLET:
    465 PSI (32, bar)
    at High Engine Idle
    With 140 degrees F. (60 degrees C.) Fluid
38. CHECK VALVE – COLD WEATHER BY-PASS
    With 50 PSI (3,45 bar) Spring

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

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HYDRAULIC/HYDROSTATIC SCHEMATIC WITH NO OPTIONS S650 (S/N A3NV11001 & ABOVE) (S/N A3NW11001 & ABOVE)

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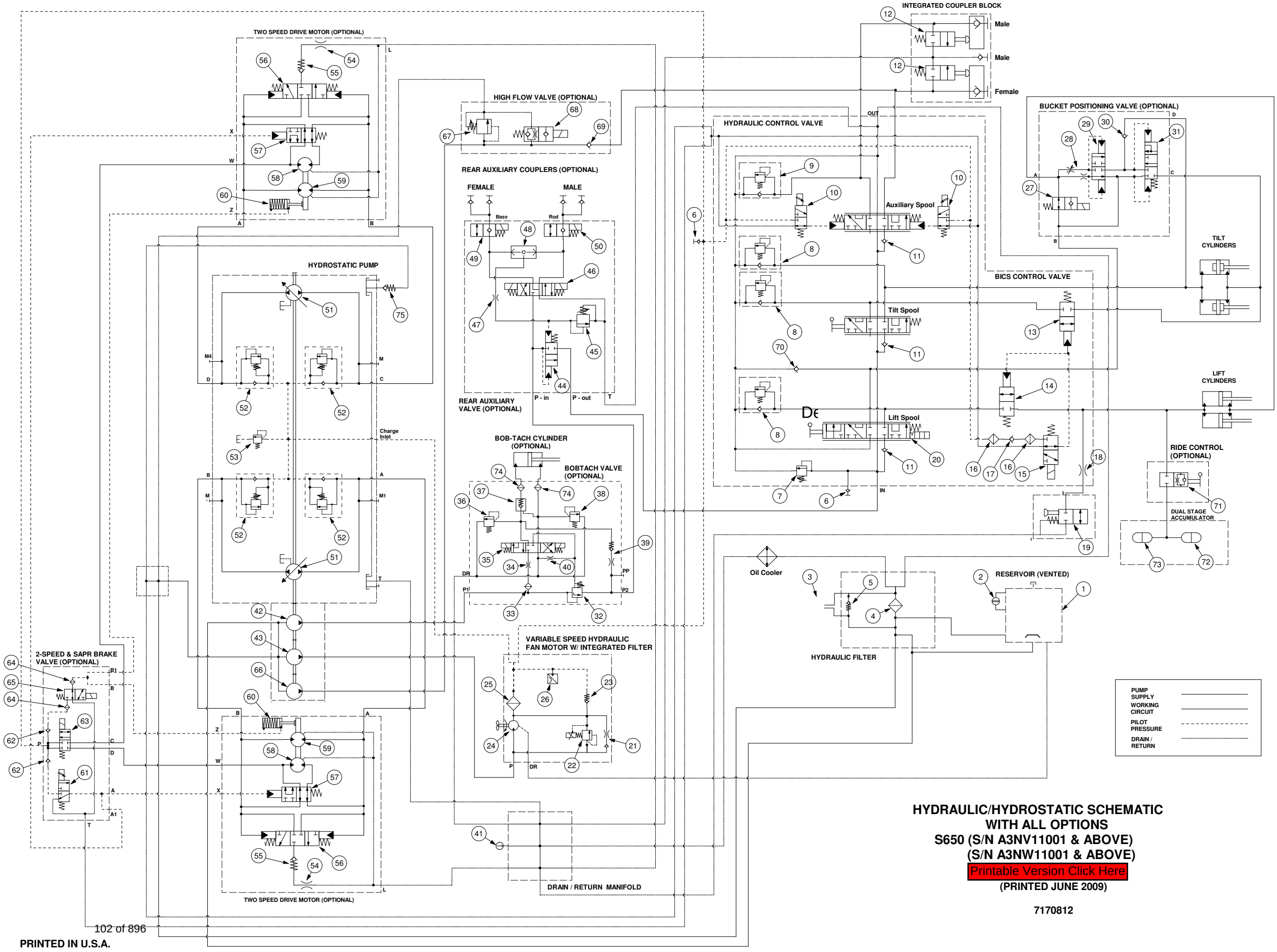
LEGEND

1. RESERVOIR:
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   System Capacity . . . . . 10.5 Gal. (39,7 L)
2. SIGHT GUAGE
3. DIFFERENTIAL PRESSURE SWITCH:
   15 PSI (1,07 bar)
   Normally Closed
4. FILTER - HYDRAULIC (CANISTER)
5. SPRING LOADED FILTER BY-PASS VALVE: 25 PSI (1,7 bar)
6. DIAGNOSTIC COUPLER
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   at Front Quick Couplers
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9. RELIEF/ANTICAVITATION VALVE - PORT (OPTIONAL) 4000 PSI (276 bar)
10. SOLENOID ACTIVATED DIRECTIONAL CONTROL VALVE - AUXILIARY
11. LOAD CHECK VALVE
12. FRONT AUXILIARY MANUAL PRESSURE BLEED-OFF VALVE
13. PILOTED ACTIVATED DIRECTIONAL CONTROL VALVE - TILT CONTROL
14. PILOTED ACTIVATED DIRECTIONAL CONTROL VALVE - LIFT CONTROL
15. SOLENOID ACTIVATED DIRECTIONAL CONTROL VALVE - BICS CONTROL
16. FILTER - BICS CONTROL VALVE (SCREEN)
17. CHECK VALVE - With 14.5 PSI (1,0 bar) Spring
18. RESTRICTION . . . . . 0.079 in. (2,0 mm)
19. PULL BUTTON ACTIVATED DIRECTIONAL CONTROL VALVE - LIFT ARM BY-PASS
20. LIFT CYLINDER SPOOL - MADE TO RESTRICT FLOW DURING BOOM DOWN BUT NOT DURING BOOM UP
21. ANTICAVITATION VALVE
22. PROPORTIONAL RELIEF VALVE – (Fan Speed Regulator):
    1566 - 1784 PSI (108 - 123 bar)
23. SPRING LOADED FILTER BY-PASS VALVE: 75 - 83 PSI (5,2 - 5,7 bar)
24. FIXED CAPACITY DISPLACEMENT HYDRAULIC MOTOR
25. FILTER - HYDRAULIC (CANISTER)
26. SENSOR – CHARGE PRESSURE – Fan Filter
27. SOLENOID ACTIVATED DIRECTIONAL CONTROL VALVE - BUCKET POSITION VALVE (ON/OFF)
28. FLOW DIVIDER ADJUSTMENT VALVE
29. PILOTED ACTIVATED DIRECTIONAL CONTROL VALVE - FLOW CONTROL SPOOL
30. CHECK VALVE - BUCKET POSITION VALVE
31. PILOTED ACTIVATED DIRECTIONAL CONTROL VALVE - UNLOADING SPOOL
32. PILOT ACTIVATED DIRECTIONAL CONTROL VALVE - HYDRAULIC POWERED BOB-TACH
33. FILTER - BOB-TACH VALVE
34. RESTRICTION - 0.089 inch (2,26 mm)
35. SOLENOID ACTIVATED DIRECTIONAL CONTROL VALVE (TWO COIL)
36. RELIEF VALVE - 1200 PSI (83 bar)
37. CHECK VALVE - With 80 PSI (5,5 bar) Spring
38. RELIEF VALVE - 2000 PSI (137 bar)
39. CHECK VALVE - With 300 PSI (20,7 bar) Spring And With 0.016 inch (0,40 mm) Orifice
40. RESTRICTION - 0.025 inch (0,6 mm)
41. SENSOR – HYD. TEMPERATURE
42. HYDRAULIC PUMP . . . . . Gear Type 23.0 GPM (87,1 L/min.) at High Engine Idle
43. CHARGE PUMP - 13.5 GPM (51,1 L/min) at High Engine Idle
44. PILOT ACTIVATED DIRECTIONAL CONTROL VALVE - REAR AUXILIARY
45. RELIEF VALVE: 3300 PSI (228 bar)
46. SOLENOID ACTIVATED DIRECTIONAL CONTROL VALVE - TWO COIL
47. RESTRICTOR - 0.031 inch (0,8 mm)
48. LOAD SHUTTLE VALVE - BLEED OFF
49. SOLENOID ACTIVATED DIRECTIONAL CONTROL VALVE - BASE
50. SOLENOID ACTIVATED DIRECTIONAL CONTROL VALVE - ROD
51. VARIABLE CAPACITY DISPLACEMENT BIDIRECTIONAL HYDROSTATIC PUMP
52. RELIEF/REPLENISHING VALVE - HIGH PRESSURE: 5294 PSI (365 bar)
53. RELIEF VALVE - CHARGE INLET:
    465 PSI (32, bar)
    at High Engine Idle
    With 140 degrees F. (60 degrees C.) Fluid
54. RESTRICTION - 0.06 inch (1,5 mm)
55. CHECK VALVE - With 200 PSI (13,8 bar) Spring
56. DRIVE MOTOR SHUTTLE VALVE
57. HIGH PRESSURE SHUTTLE
58. FIXED CAPACITY DISPLACEMENT BIDIRECTIONAL HYDROSTATIC MOTOR – 2 SPEED
59. FIXED CAPACITY DISPLACEMENT BIDIRECTIONAL HYDROSTATIC MOTOR
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62. CHECK VALVE
63. SOLENOID ACTIVATED DIRECECTIONAL CONTROL VALVE – MAKE-UP
64. FILTER - BRAKE
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66. HIGH FLOW HYDRAULIC PUMP Gear Type 7.5 GPM (28,4 L/min.) at High Engine Idle
67. RELIEF VALVE - 3500 PSI (241 bar)
68. DUMP VALVE – ON / OFF
69. CHECK VALVE - With 5.0 PSI (0,34 bar) Spring
70. ANTICAVITATION VALVE
71. RIDE CONTROL VALVE
72. HIGH PRESSURE CHAMBER
73. LOW PRESSURE CHAMBER
74. FILTER – BOB-TACH VALVE
75. CHECK VALVE – COLD WEATHER BY-PASS With 50 PSI (3,45 bar) Spring

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

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7170812

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HYDRAULIC/HYDROSTATIC SCHEMATIC
SJC WITH NO OPTIONS
S650 (S/N A3NV11001 AND ABOVE)
(S/N A3NW11001 AND ABOVE)
(PRINTED JUNE 2009)

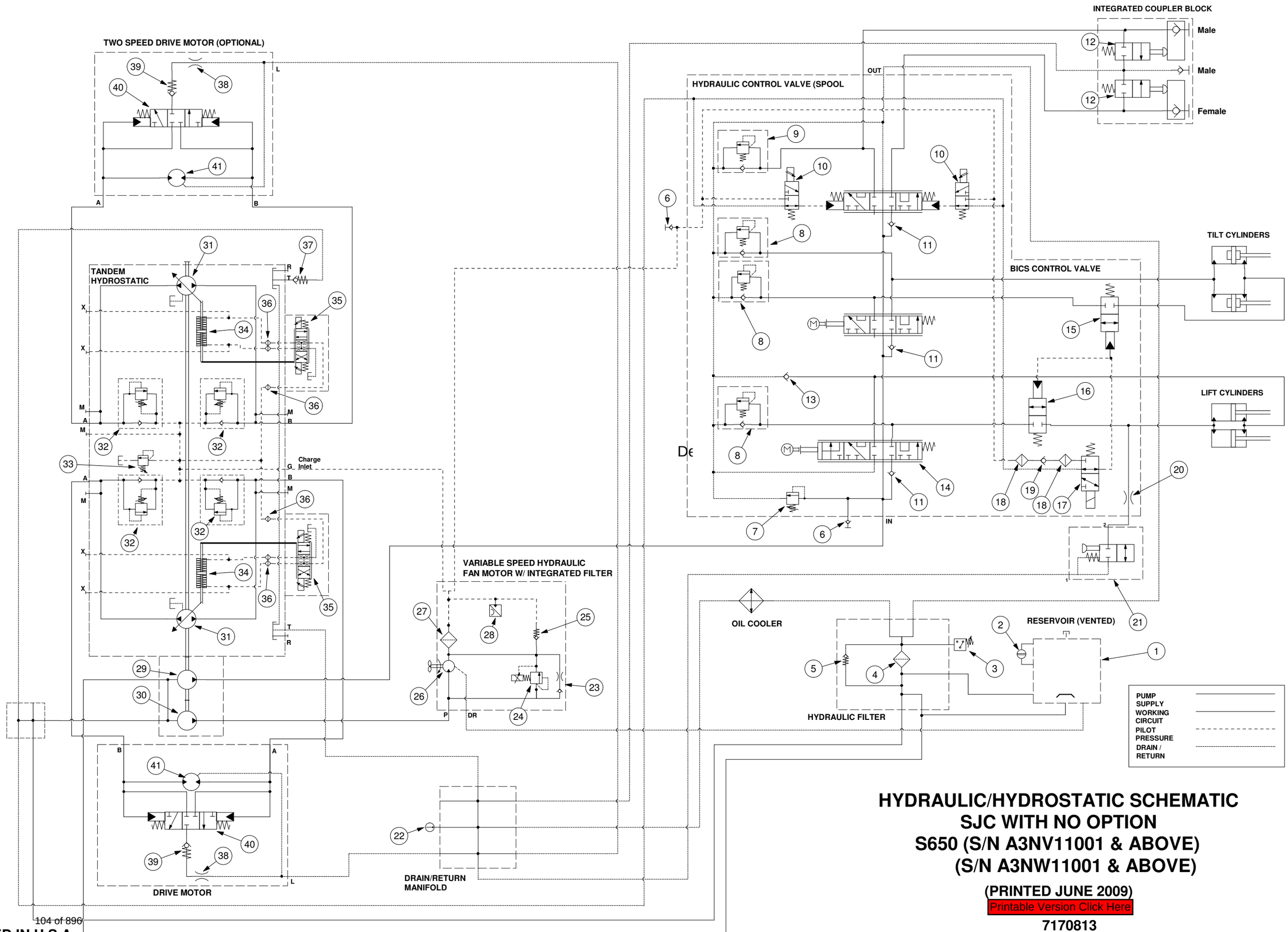
V-1350legend

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LEGEND

1. RESERVOIR:
   Capacity at sight gauge . . 10.7 Qts. (10,2 L)
   System Capacity . . . . . 10.5 Gal. (39,7 L)
2. SIGHT GUAGE
3. DIFFERENTIAL PRESSURE SWITCH:
   15 PSI (1,07 bar)
   Normally Closed
4. FILTER - HYDRAULIC (CANISTER)
5. SPRING LOADED FILTER BY-PASS VALVE: 25 PSI (1,7 bar)
6. DIAGNOSTIC COUPLER
7. RELIEF VALVE - MAIN:
   3500 PSI (241 bar)
   at Front Quick Couplers
8. RELIEF/ANTICAVITATION VALVE - PORT 4000 PSI (276 bar)
9. RELIEF/ANTICAVITATION VALVE - PORT (OPTIONAL) 4000 PSI (276 bar)
10. SOLENOID ACTIVATED DIRECTIONAL CONTROL VALVE - AUXILIARY
11. LOAD CHECK VALVE
12. FRONT AUXILIARY MANUAL PRESSURE BLEED-OFF VALVE
13. ANTICAVITATION VALVE
14. LIFT CYLINDER SPOOL - MADE TO RESTRICT FLOW DURING BOOM DOWN BUT NOT DURING BOOM UP
15. PILOTED ACTIVATED DIRECTIONAL CONTROL VALVE - TILT CONTROL
16. PILOTED ACTIVATED DIRECTIONAL CONTROL VALVE - LIFT CONTROL
17. SOLENOID ACTIVATED DIRECTIONAL CONTROL VALVE - BICS CONTROL
18. FILTER - BICS CONTROL VALVE (SCREEN)
19. CHECK VALVE - With 14.5 PSI (1,0 bar) De Spring
20. RESTRICTION . . . . . 0.079 in. (2,0 mm)
21. PULL BUTTON ACTIVATED DIRECTIONAL CONTROL VALVE - LIFT ARM BY-PASS
22. SENSOR – HYD. TEMPERATURE
23. ANTICAVITATION VALVE
24. PROPORTIONAL RELIEF VALVE – (Fan Speed Regulator):
    1566 - 1784 PSI (108 - 123 bar)
25. SPRING LOADED FILTER BY-PASS VALVE: 75 - 83 PSI (5,2 - 5,7 bar)
26. FIXED CAPACITY DISPLACEMENT HYDRAULIC MOTOR
27. FILTER - HYDRAULIC (CANISTER)
28. SENSOR – CHARGE PRESSURE – Fan Filter
29. HYDRAULIC PUMP . . . . . Gear Type
    23.0 GPM (87,1 L/min.) at High Engine Idle
30. CHARGE PUMP -
    13.5 GPM (51,1 L/min) at High Engine Idle
31. VARIABLE CAPACITY DISPLACEMENT BIDIRECTIONAL HYDROSTATIC PUMP
32. RELIEF/REPLENISHING VALVE - HIGH PRESSURE: 5294 PSI (365 bar)
33. RELIEF VALVE - CHARGE INLET:
    385 PSI (26,5 bar) at High Engine Idle
    With 140 degrees F. (60 degrees C.) Fluid
34. SERVO PISTON – Swash Plate
35. SOLENOID ACTIVATED DIRECTIONAL CONTROL VALVE – FORWARD/REVERSE
36. FILTER
37. CHECK VALVE – COLD WEATHER BY-PASS
    With 50 PSI (3,45 bar) Spring
38. RESTRICTION - 0.06 inch (1,5 mm)
39. CHECK VALVE - With 200 PSI (13,8 bar) Spring
40. DRIVE MOTOR SHUTTLE VALVE
41. FIXED CAPACITY DISPLACEMENT BIDIRECTIONAL HYDROSTATIC MOTOR

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



HYDRAULIC/HYDROSTATIC SCHEMATIC
SJC WITH NO OPTION
S650 (S/N A3NV11001 & ABOVE)
(S/N A3NW11001 & ABOVE)

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HYDRAULIC/HYDROSTATIC SCHEMATIC
SJC WITH ALL OPTIONS
S650 (S/N A3NV11001 AND ABOVE)
(S/N A3NW11001 AND ABOVE)

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V-1351legend

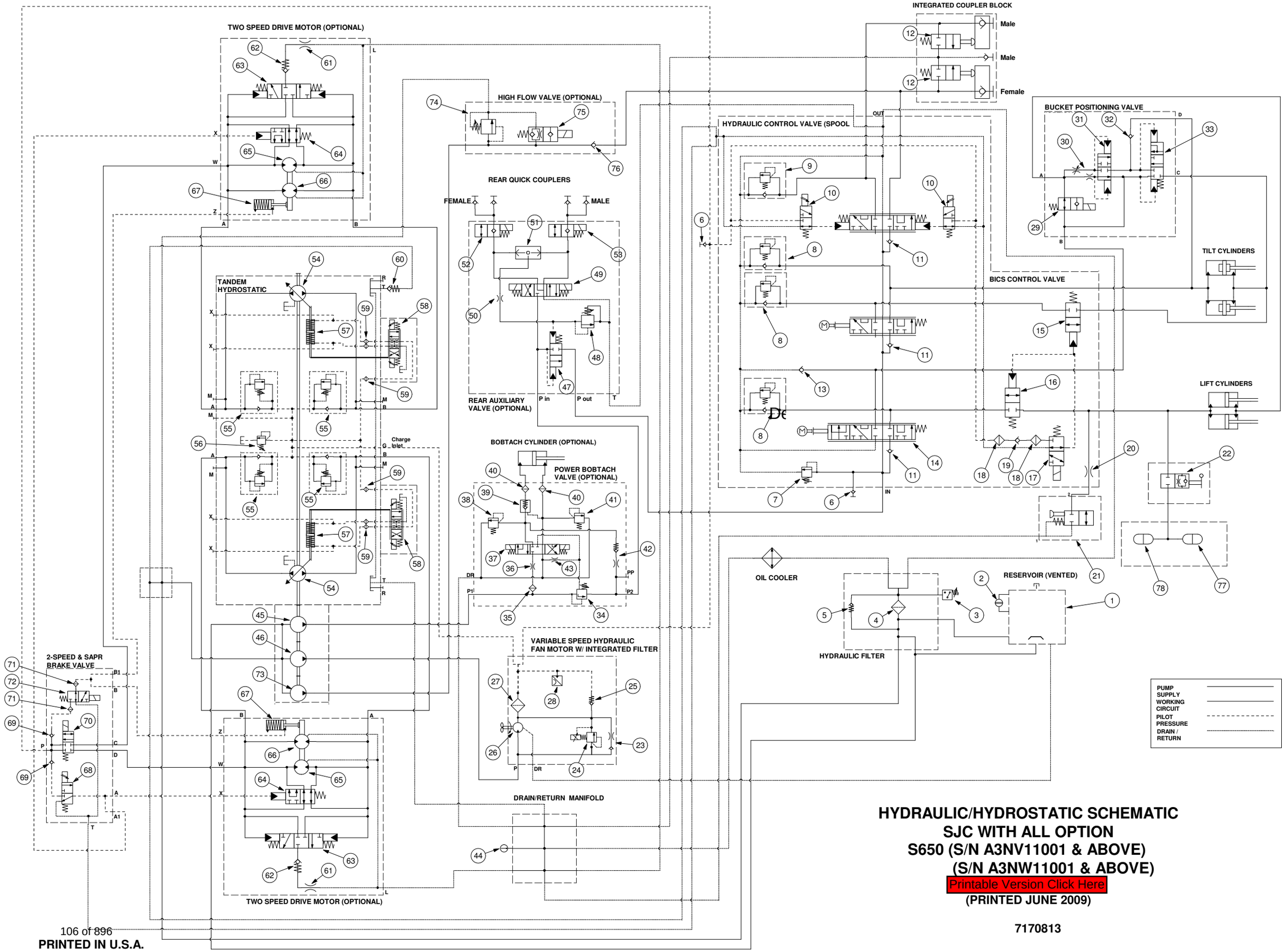
LEGEND

1. RESERVOIR:
   Capacity at sight gauge . . 10.7 Qts. (10,2 L)
   System Capacity . . . . . 10.5 Gal. (39,7 L)
2. SIGHT GUAGE
3. DIFFERENTIAL PRESSURE SWITCH:
   15 PSI (1,07 bar)
   Normally Closed
4. FILTER - HYDRAULIC (CANISTER)
5. SPRING LOADED FILTER BY-PASS VALVE: 25 PSI (1,7 bar)
6. DIAGNOSTIC COUPLER
7. RELIEF VALVE - MAIN:
   3500 PSI (241 bar)
   at Front Quick Couplers
8. RELIEF/ANTICAVITATION VALVE - PORT 4000 PSI (276 bar)
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10. SOLENOID ACTIVATED DIRECTIONAL CONTROL VALVE - AUXILIARY
11. LOAD CHECK VALVE
12. FRONT AUXILIARY MANUAL PRESSURE BLEED-OFF VALVE
13. ANTICAVITATION VALVE
14. LIFT CYLINDER SPOOL - MADE TO RESTRICT FLOW DURING BOOM DOWN BUT NOT DURING BOOM UP
15. PILOTED ACTIVATED DIRECTIONAL CONTROL VALVE - TILT CONTROL
16. PILOTED ACTIVATED DIRECTIONAL CONTROL VALVE - LIFT CONTROL
17. SOLENOID ACTIVATED DIRECTIONAL CONTROL VALVE - BICS CONTROL
18. FILTER - BICS CONTROL VALVE (SCREEN)
19. CHECK VALVE - With 14.5 PSI (1,0 bar) Spring
20. RESTRICTION . . . . . 0.079 in. (2,0 mm)
21. PULL BUTTON ACTIVATED DIRECTIONAL CONTROL VALVE - LIFT ARM BY-PASS
22. RIDE CONTROL VALVE
23. ANTICAVITATION VALVE
24. PROPORTIONAL RELIEF VALVE – (Fan Speed Regulator):
    1566 - 1784 PSI (108 - 123 bar)
25. SPRING LOADED FILTER BY-PASS VALVE: 75 - 83 PSI (5,2 - 5,7 bar)
26. FIXED CAPACITY DISPLACEMENT HYDRAULIC MOTOR
27. FILTER - HYDRAULIC (CANISTER)
28. SENSOR – CHARGE PRESSURE – Fan Filter
29. SOLENOID ACTIVATED DIRECTIONAL CONTROL VALVE - BUCKET POSITION VALVE (ON/OFF)
30. FLOW DIVIDER ADJUSTMENT VALVE
31. PILOTED ACTIVATED DIRECTIONAL CONTROL VALVE - FLOW CONTROL SPOOL
32. CHECK VALVE - BUCKET POSITION VALVE
33. PILOTED ACTIVATED DIRECTIONAL CONTROL VALVE - UNLOADING SPOOL
34. PILOT ACTIVATED DIRECTIONAL CONTROL VALVE - HYDRAULIC POWERED BOB-TACH
35. FILTER - BOB-TACH VALVE
36. RESTRICTION - 0.089 inch (2,26 mm)
37. SOLENOID ACTIVATED DIRECTIONAL CONTROL VALVE (TWO COIL)
38. RELIEF VALVE - 1200 PSI (83 bar)
39. CHECK VALVE - With 80 PSI (5,5 bar) Spring
40. FILTER – BOB-TACH VALVE
41. RELIEF VALVE - 2000 PSI (137 bar)
42. CHECK VALVE - With 300 PSI (20,7 bar) Spring And With 0.016 inch (0,40 mm) Orifice
43. RESTRICTION - 0.025 inch (0,6 mm)
44. SENSOR – HYD. TEMPERATURE
45. HYDRAULIC PUMP . . . . . Gear Type 23.0 GPM (87,1 L/min.) at High Engine Idle
46. CHARGE PUMP - 13.5 GPM (51,1 L/min) at High Engine Idle
47. PILOT ACTIVATED DIRECTIONAL CONTROL VALVE - REAR AUXILIARY
48. RELIEF VALVE: 3300 PSI (228 bar)
49. SOLENOID ACTIVATED DIRECTIONAL CONTROL VALVE - TWO COIL
50. RESTRICTOR - 0.031 inch (0,8 mm)
51. LOAD SHUTTLE VALVE - BLEED OFF
52. SOLENOID ACTIVATED DIRECTIONAL CONTROL VALVE - BASE
53. SOLENOID ACTIVATED DIRECTIONAL CONTROL VALVE - ROD
54. VARIABLE CAPACITY DISPLACEMENT BIDIRECTIONAL HYDROSTATIC PUMP
55. RELIEF/REPLENISHING VALVE - HIGH PRESSURE: 5294 PSI (365 bar)
56. RELIEF VALVE - CHARGE INLET:
    385 PSI (26,5 bar) at High Engine Idle
    With 140 degrees F. (60 degrees C.) Fluid
57. SERVO PISTON – Swash Plate
58. SOLENOID ACTIVATED DIRECTIONAL CONTROL VALVE – FORWARD/REVERSE
59. FILTER
60. CHECK VALVE – COLD WEATHER BY-PASS With 50 PSI (3,45 bar) Spring
61. RESTRICTION - 0.06 inch (1,5 mm)
62. CHECK VALVE - With 200 PSI (13,8 bar) Spring
63. DRIVE MOTOR SHUTTLE VALVE
64. HIGH PRESSURE SHUTTLE
65. FIXED CAPACITY DISPLACEMENT BIDIRECTIONAL HYDROSTATIC MOTOR – 2 SPEED
66. FIXED CAPACITY DISPLACEMENT BIDIRECTIONAL HYDROSTATIC MOTOR
67. HYDRAULIC BRAKE – SPRING APPLIED – PRESSURE RELEASE (SAPR)
68. SOLENOID ACTIVATED DIRECECTIONAL CONTROL VALVE – 2 SPEED
69. CHECK VALVE
70. SOLENOID ACTIVATED DIRECECTIONAL CONTROL VALVE – MAKE-UP
71. FILTER - BRAKE
72. SOLENOID ACTIVATED DIRECECTIONAL CONTROL VALVE – BRAKE
73. HIGH FLOW HYDRAULIC PUMP Gear Type 7.5 GPM (28,4 L/min.) at High Engine Idle
74. RELIEF VALVE - 3500 PSI (241 bar)
75. DUMP VALVE – ON / OFF
76. CHECK VALVE - With 5.0 PSI (0,34 bar) Spring
77. HIGH PRESSURE CHAMBER
78. LOW PRESSURE CHAMBER

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

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V-1351legend (6-8-09)



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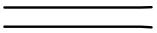
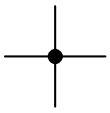
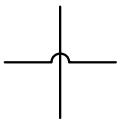
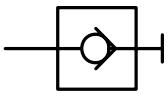
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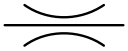
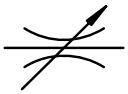
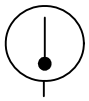
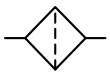
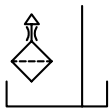
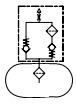
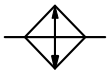
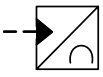
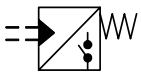
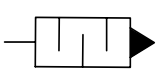
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Glossary Of Hydraulic / Hydrostatic Symbols

FLOW LINES and CONNECTIONS

SYMBOL	DESCRIPTION
	WORKING CIRCUITS - Continuous, Solid Line - Working (Main) Line, Return Line (line conducting fluid from working devices to the reservoir) and Feed line (main line conductor).
	PILOT PRESSURE - Dashed Line - Pilot Line (Line which conducts control fluid).
	DRAIN CIRCUITS - Dotted Line - Drain Line (drain or bleed line - line conducting fluid from a component housing to the reservoir.
	COMPONENTS - Long Chain Line - Enclosure outline for several components assembled in one unit.
	MECHANICAL CONNECTIONS - Double Line (Shaft, Lever, Piston Rod).
	CONNECTED JUNCTION OF OIL LINES (Flow Line Connection).
	OIL LINES CROSSING (NOT Connected).
	COUPLER - Quick - Acting Coupling (uncoupled, closed by non-return valve).

BASIC and MISCELLANEOUS SYMBOLS

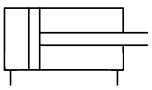
SYMBOL	DESCRIPTION
	RESTRICTION - Line with Fixed Restriction - Affected by Viscosity (property of resistance to flowing fluid).
	VARIABLE ADJUSTMENT RESTRICTION - Regulated or Variable Restriction.
	TEMPERATURE CONTROL - (Indication of temperature).
	TEMPERATURE INDICATOR - (temperature measurement - thermometer).
	FILTER (strainer or screen) - For fluid conditioning.
	VENTED AND FILTERED RESERVOIR (reservoir open to atmosphere).
	PRESSURIZED, VENTED AND FiLTERED RESERVOIR (Reservoir uses a pressured cap).
	OIL COOLER (heat exchanger) - The arrows in the diamond indicate the extraction of heat (heat dissipation).
	PRESSURE SENSOR - Varies electric signal with pressure.
	DIFFERENTIAL PRESSURE SWITCH - Switch activates when pressure difference reaches specified level.
	PRESSURE SWITCH - Switch activates when pressure reaches specified level.
	MUFFLER (silencer) - Reduces noise.

Dealer Copy -- Not for Resale

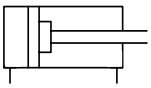
Glossary Of Hydraulic / Hydrostatic Symbols (Cont'd)

SYMBOL DESCRIPTION

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

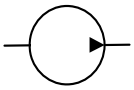


DOUBLE ACTING HYDRAULIC CYLINDER, UNEQUAL DISPLACEMENT - With single piston rod.

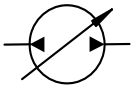


DOUBLE ACTING HYDRAULIC CYLINDER, UNEQUAL DISPLACEMENT and CUSHION ON ONE END - With single piston rod.

PUMP: To convert mechanical energy into hydraulic energy.

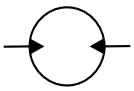


FIXED CAPACITY DISPLACEMENT HYDRAULIC PUMP - With one direction of flow.



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

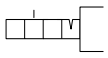
MOTOR: To convert hydraulic energy into rotary mechanical energy.



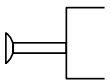
FIXED CAPACITY DISPLACEMENT BIDIRECTIONAL HYDRAULIC MOTOR - With two directions of flow (bidirectional.

SYMBOL DESCRIPTION

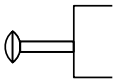
CONTROL MECHANISMS



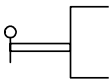
CONTROL VALVE WITH DETENT (Holds Valve in Position) - device for maintaining a given position (mechanical).



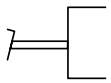
CONTROL VALVE ACTIVATED BY A PULL BUTTON (manual).



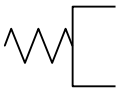
CONTROL VALVE ACTIVATED BY A PUSH-PULL BUTTON (manual).



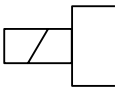
CONTROL VALVE ACTIVATED BY A LEVER (manual).



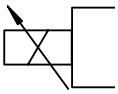
CONTROL VALVE ACTIVATED BY A PEDAL (manual).



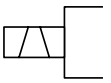
CONTROL VALVE WITH SPRING RETURN (mechanical).



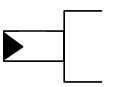
CONTROL VALVE ACTIVATED BY AN ELECTRIC SOLENOID (electrical).



CONTROL VALVE ACTIVATED BY A PROPORTIONAL ELECTRICAL SOLENOID (electrical).



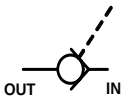
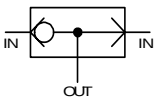
CONTROL VALVE ACTIVATED BY DUAL ELECTRICAL SOLENOID (electrical).

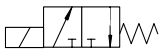
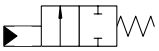
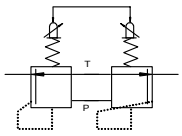
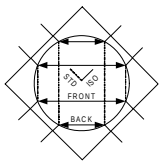
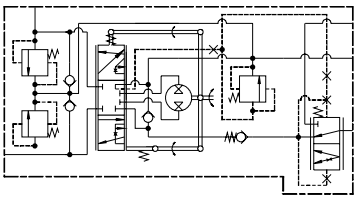
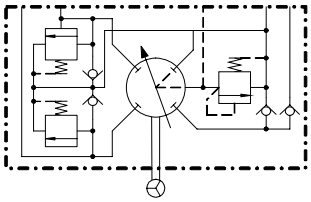
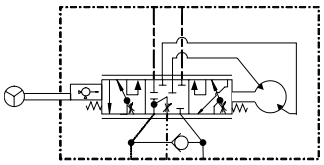


CONTROL VALVE ACTIVATED BY PILOT PRESSURE (indirect control, pilot actuated by application of pressure).

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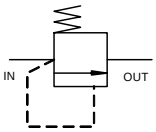
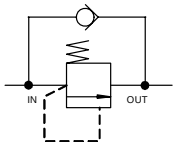
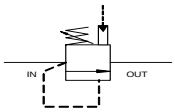
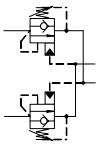
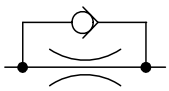
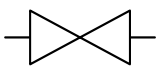
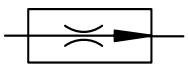
Glossary Of Hydraulic / Hydrostatic Symbols (Cont'd)

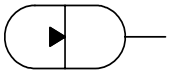
SYMBOL	DESCRIPTION
NON-RETURN VALVE, SHUTTLE VALVE: Valve which allows free flow in one direction only.	
	NON-RETURN VALVE (Check Valve) - Used as Replenishing Valve, Lock Check Valve or Anticavitation Valve - Opens if the Inlet pressure is higher than the Outlet pressure. Often contains internal spring which has NO significant pressure value.
	SPRING LOADED VALVE (bypass Valve) - Opens if the Inlet pressure is greater than the Outlet pressure plus the spring pressure.
	PILOT CONTROLLED NON-RETURN VALVE- It is possible to open the valve by pilot pressure.
	SHUTTLE VALVE - The Inlet port connected to the higher pressure is automatically connected to the Outlet port while the other Inlet port is closed.

SYMBOL	DESCRIPTION
DIRECTIONAL CONTROL VALVE: Valve providing for the opening (fully or restricted) or the closing of one or more flow paths (represented by several squares).	
	TWO PORTS and CLOSED FLOW PATHS
	SOLENOID ACTIVATED DIRECTIONAL CONTROL VALVE (Two Position) - controlled by an electric solenoid (with return spring).
	PILOT ACTIVATED DIRECTIONAL CONTROL VALVE (Two Position) - controlled by pressure (with return spring).
	MANUALLY ACTIVATED DIRECTION CONTROL VALVE (Variable Position) Joystick Controlled, variable pressure to shift the pilot activated directional control valve spool.
	MANUALLY ACTIVATED FLOW CONTROL VALVE (Two Position) allows for changing pilot flow to control switching joystick functions for STD / ISO Control (Excavators Only).
	STEERING CONTROL VALVE (Variable Position) - Used for controlling the hydraulic flow for the steering cylinders in relationship to the amount the steering wheel is rotated.
	
	

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Glossary Of Hydraulic / Hydrostatic Symbols (Cont'd)

SYMBOL	DESCRIPTION
PRESSURE CONTROL VALVE: Valve ensuring the control of pressure.	
	RELIEF VALVE - When the Inlet pressure overcomes the opposing force of the spring, the valve opens permitting flow from the Outlet port.
	RELIEF/REPLENISHING VALVE or RELIEF/ANTICAVITATION VALVE - When the Inlet pressure overcomes the opposing force of the spring, the valve opens permitting flow from the Outlet port - Allows free flow in the opposite direction.
	DUAL PRESSURE RELIEF VALVE - When the Inlet pressure overcomes the opposing force of the spring, the valve opens permitting flow from the Outlet port. Pilot pressure provides a second pressure value.
	LOCK VALVE - hydraulic pressure is applied to open the valve to allow the hydraulic cylinder to move.
FLOW CONTROL VALVE: Valve controlling the flow in one or both directions.	
	ONE WAY RESTRICTOR VALVE (Non-Return Valve with Restriction) - Unit allowing free flow in one direction but restricted flow in the other direction.
	TOW VALVE - Normally in closed position.
	LOAD SENSE BLEED VALVE - Regulates small amount of fluid flow (leakage).

SYMBOL	DESCRIPTION
MISCELLANEOUS	
	ACCUMULATOR - Supplies temporary reserve pressure to the hydraulic system when the engine has been stopped.

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Troubleshooting

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

If a service code appears in the left instrument panel. (See DIAGNOSTIC SERVICE CODES on Page 60-90-1.)

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
Slow hydraulic system action.	1, 3, 4, 6, 8
Hydraulic action is not smooth.	1, 4, 5, 6, 7
Lift arms go up slowly at full engine RPM	1, 3, 4, 5, 6, 7, 8, 9
The lift arms or Bob-Tach will move when the pedal is in neutral position	4
The lift arms come down when the pedal is in neutral position	4, 9, 10, 11
Lift arm bypass control valve stuck	12
Lift arm bypass control valve stem bent or broken	13

KEY TO CORRECT 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 HYDRAULIC / HYDROSTATIC FLUID SPECIFICATIONS on Page SPEC-40-1.)
8. Exceeding the loaders rated operating capacity.
9. Internal leak in the lift cylinder(s).
10. External leak from the cylinder(s).
11. Damaged lift spool.
12. Rotate shaft.
13. Replace lift arm bypass control valve assembly.

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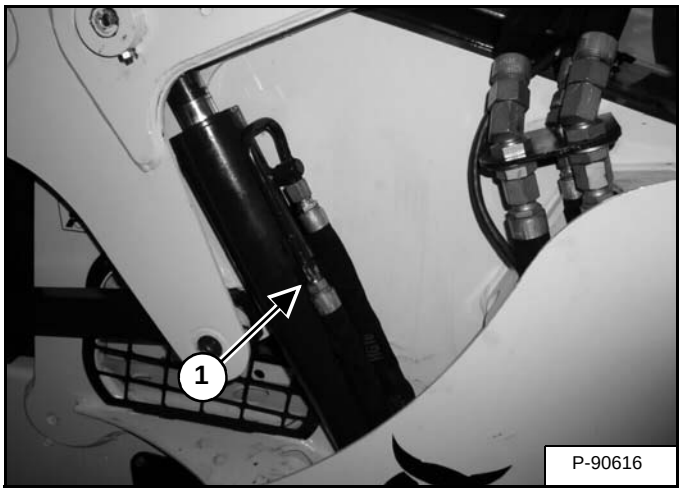


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CYLINDER (LIFT)

Testing

Figure 20-20-1



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

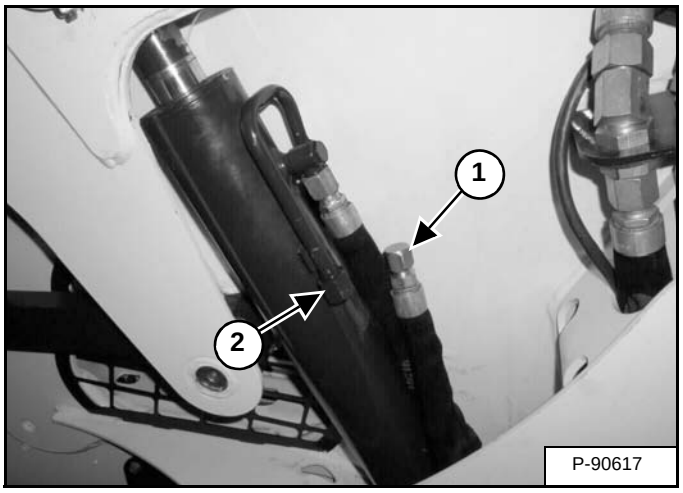
⚠ WARNING

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 possible 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]** on the hose and tighten.

Engage the parking brake. Lower the seat bar. Start the engine and press the PTOL button.

Operate the controls that lower the lift arms.

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.

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CYLINDER (LIFT) (CONT'D)

Removal And Installation

Lift and block the loader. (See Procedure on Page 10-10-1.)

NOTE: Remove only one cylinder at a time.

⚠ 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.

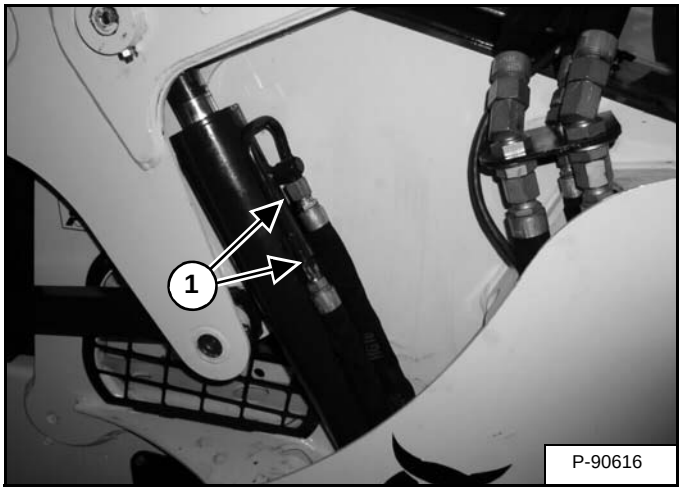
W-2017-0286

IMPORTANT

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

I-2003-0888

Figure 20-20-3



Mark and disconnect the two hydraulic hoses (Item 1) **[Figure 20-20-3]**.

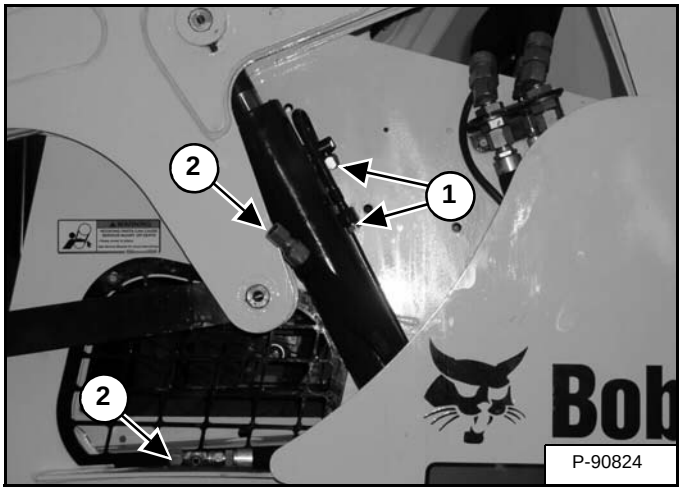
⚠ WARNING

AVOID INJURY OR DEATH

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.

W-2103-0508

Figure 20-20-4



Cap and plug both fittings on the cylinder (Item 1) **[Figure 20-20-4].**

NOTE: Do not cap or plug the two hydraulic hoses (Item 2) [Figure 20-20-4].

Place the hoses (Item 2) **[Figure 20-20-4]** in a suitable container to collect the hydraulic oil as the lift arms are raised.

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

⚠ WARNING

AVOID INJURY OR DEATH

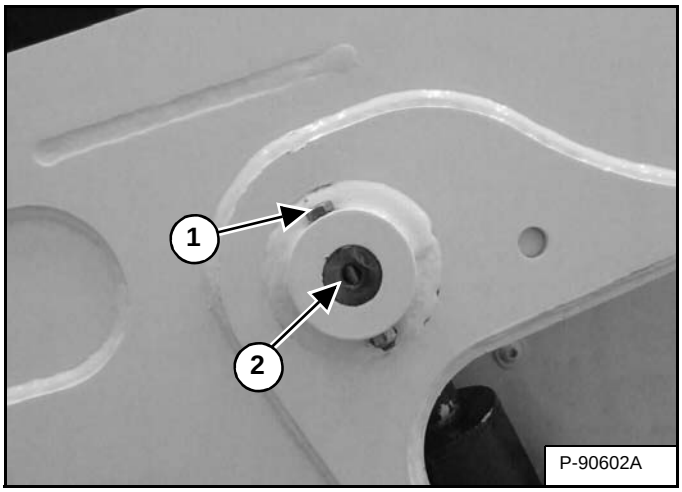
Diesel fuel or hydraulic fluid under pressure can penetrate skin or eyes, causing serious injury or death. Fluid leaks under pressure may not be visible. Use a piece of cardboard or wood to find leaks. Do not use your bare hand. Wear safety goggles. If fluid enters skin or eyes, get immediate medical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

W-2072-0807

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Removal And Installation (Cont'd)

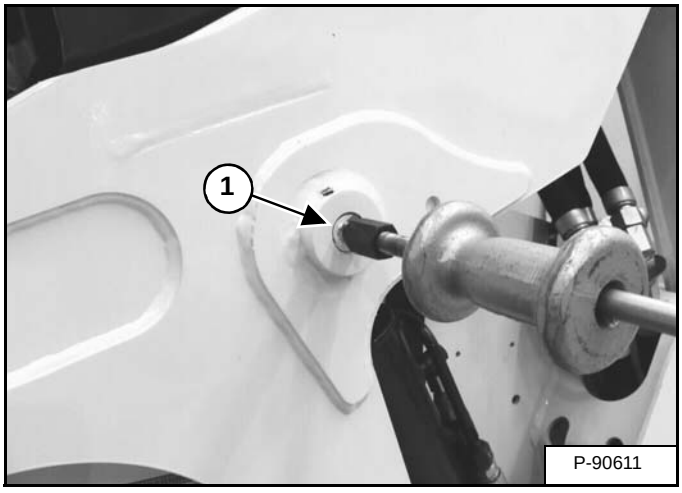
Figure 20-20-5



Remove the retaining bolt and nut (Item 1) **[Figure 20-20-5]** from the pin on the rod end of the cylinder.

Installation: Tighten the retainer bolt and nut to 48 - 54 N•m (35 - 40 ft-lb) torque.

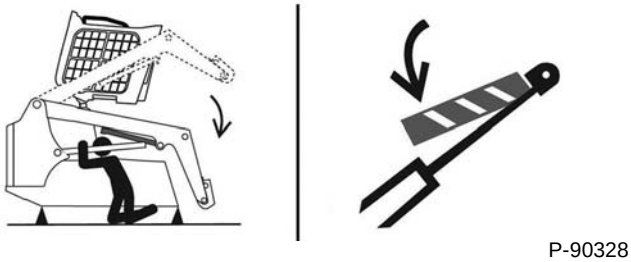
Figure 20-20-6



With a slide hammer, remove the pin (Item 1) **[Figure 20-20-6]** from the rod end of the cylinder.

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DANGER



P-90328

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.**

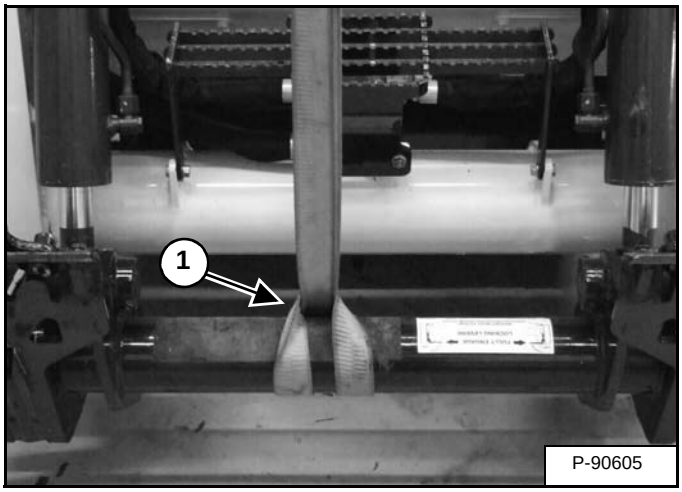
D-1009-0409

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

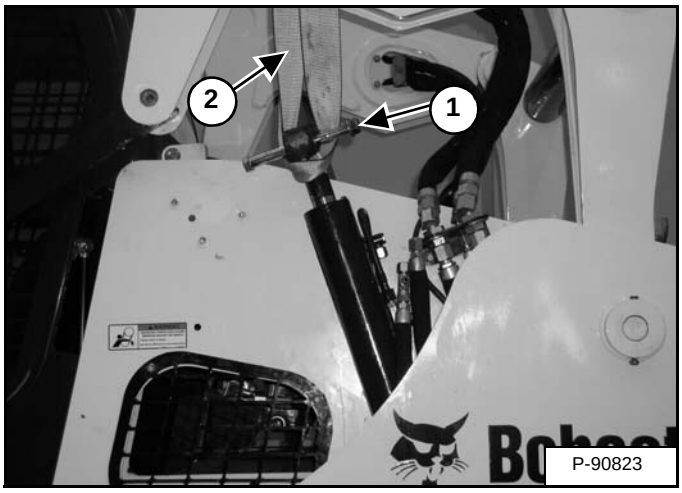
Figure 20-20-7



Install a sling in the middle of the Bob-Tach as shown in (Item 1) **[Figure 20-20-7].**

Using a chain hoist raise the lift arms and install an approved lift arm support device on the cylinder that is connected to the lift arm.

Figure 20-20-8



Install a bolt (Item 1) **[Figure 20-20-8]** through the eyelet of the cylinder and install a strap (Item 2) **[Figure 20-20-8]** to secure the cylinder.

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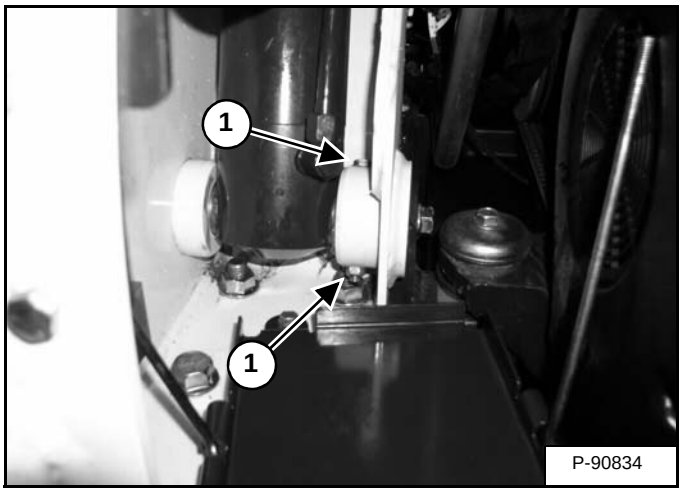
Removal And Installation (Cont'd)

Open the rear door.

NOTE: When removing the left side lift cylinder the battery will need to be removed to gain access to the lower retaining bolt and nut.

Remove the battery (If required). (See Removal And Installation on Page 60-20-1.)

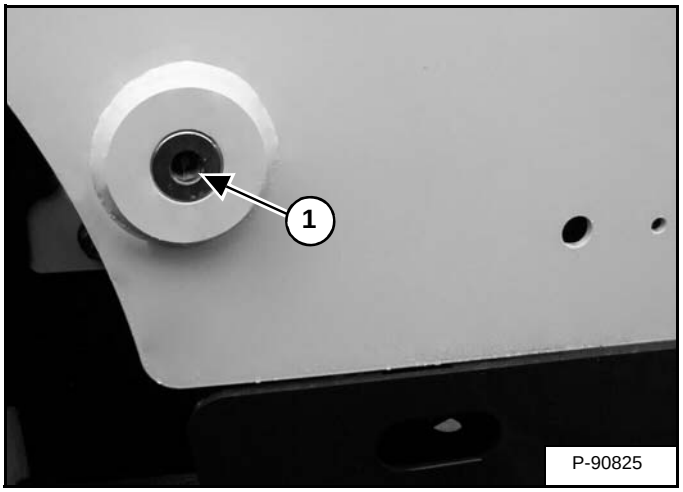
Figure 20-20-9



Remove the retaining bolt and nut (Item 1) **[Figure 20-20-9]** from the pin on the base end of the lift cylinder.

Installation: Tighten the retainer bolt and nut to 48 - 54 N•m (35 - 40 ft-lb) torque.

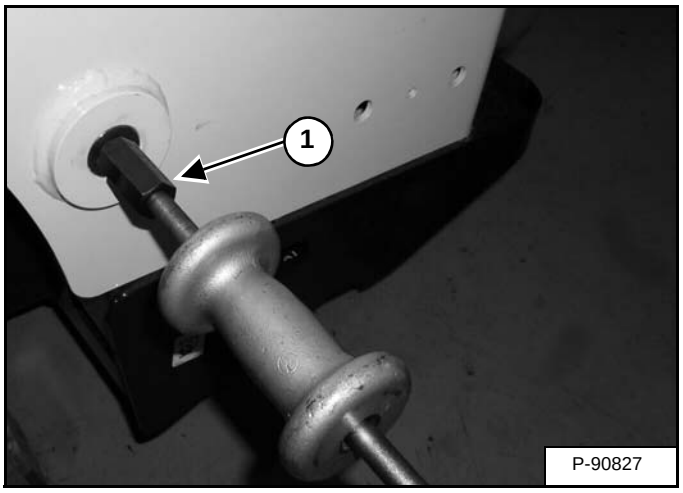
Figure 20-20-10



Remove the grease fitting (Item 1) **[Figure 20-20-10]** from the base end of the lift cylinder.

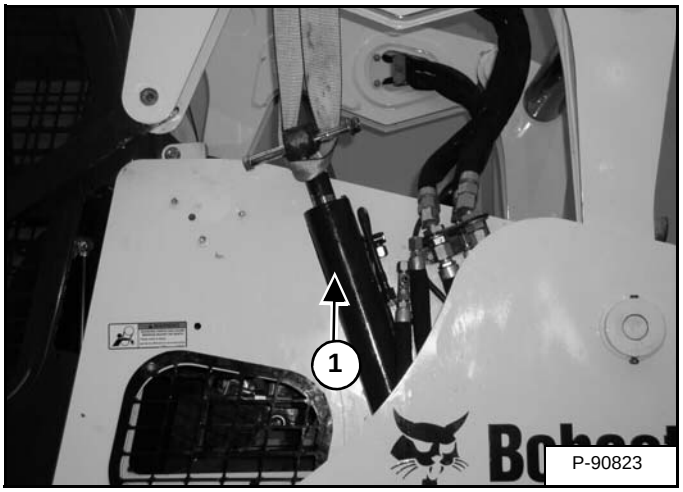
Installation: Tighten the grease fitting to 20 N•m (15 ft-lb) torque.

Figure 20-20-11



With a slide hammer, remove the pin (Item 1) **[Figure 20-20-11]** from the base end of the lift cylinder.

Figure 20-20-12

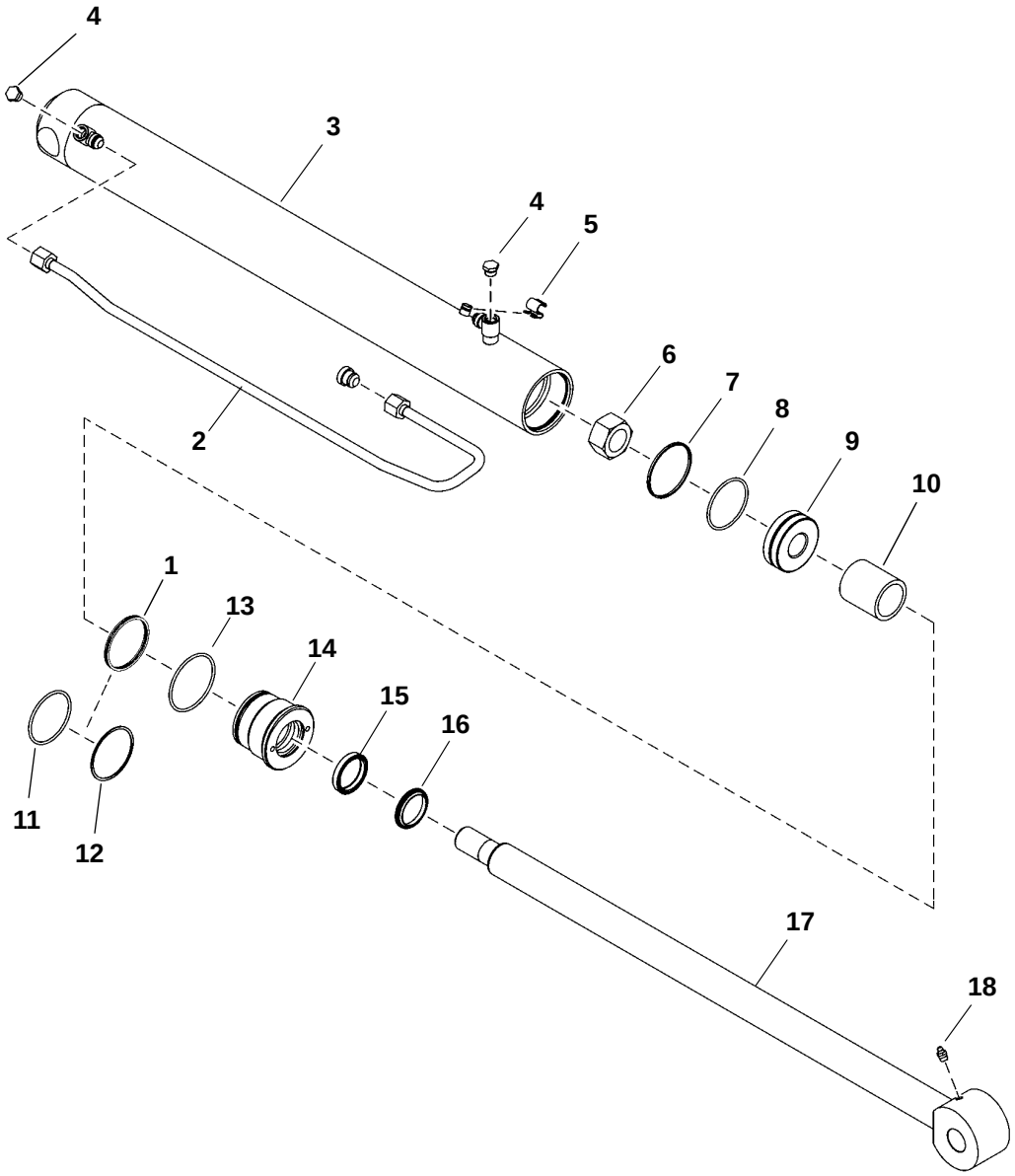


Using a chain hoist remove the lift cylinder (Item 1) **[Figure 20-20-12]** from the loader.

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Parts Identification

1. Seal
2. Hydraulic Tubeline
3. Cylinder Case Tube
4. Plug
5. Clamp
6. Nut
7. Back-up Ring
8. O-ring
9. Piston Assembly
10. Spacer
11. O-ring
12. Back-up Ring
13. O-ring
14. Head
15. Rod Seal
16. Wiper Seal
17. Rod
18. Grease Fitting



NA1413S

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Disassembly

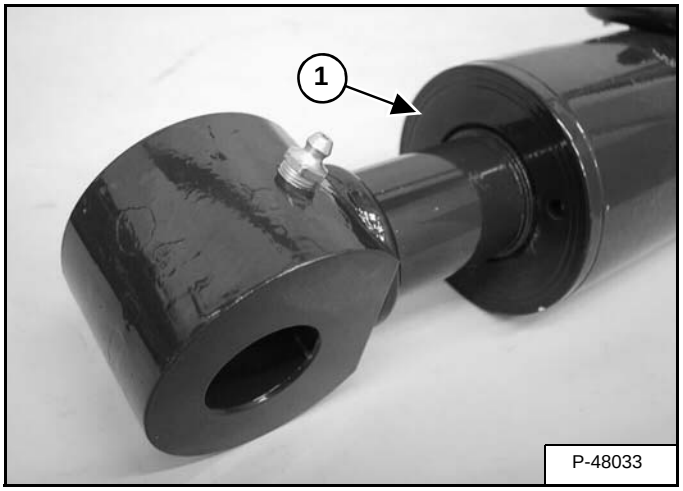
Use the following tools to disassemble the cylinder:

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.

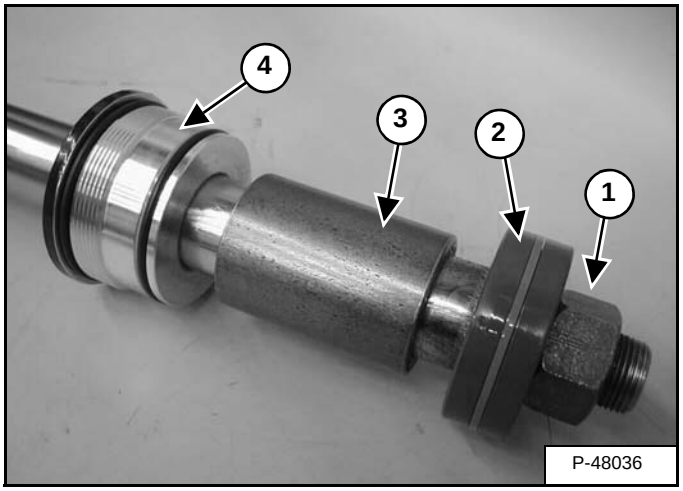
Put the base end of the cylinder in a vise.

Figure 20-20-13



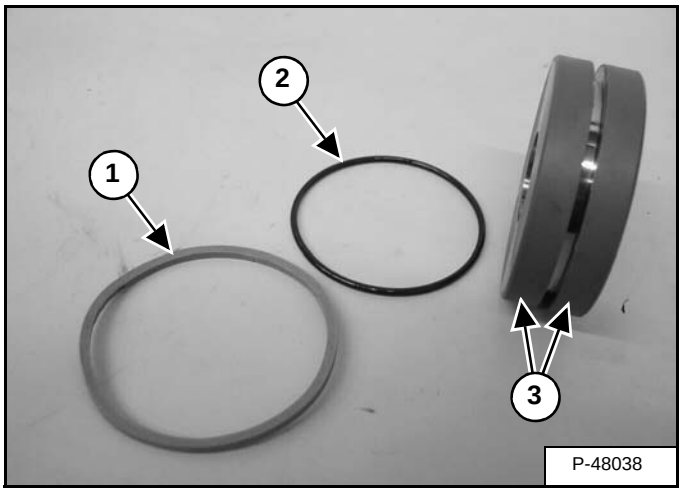
Use a spanner wrench to loosen the head (Item 1) **[Figure 20-20-13]** from the cylinder case.

Figure 20-20-14



Remove the nut (Item 1), piston (Item 2), spacer (Item 3) and head (Item 4) **[Figure 20-20-14]**.

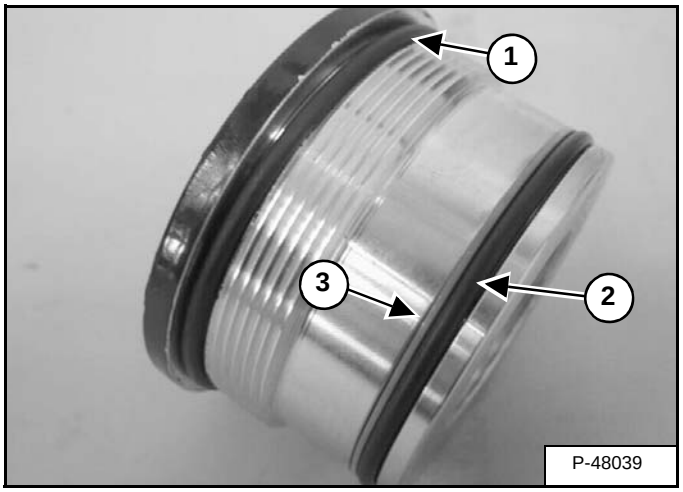
Figure 20-20-15



Remove the back-up ring (Item 1) and O-ring (Item 2) **[Figure 20-20-15]** from the piston.

NOTE: If the fiber surface (Item 3) [Figure 20-20-15] on the piston, becomes damaged, the complete piston must be replaced.

Figure 20-20-16



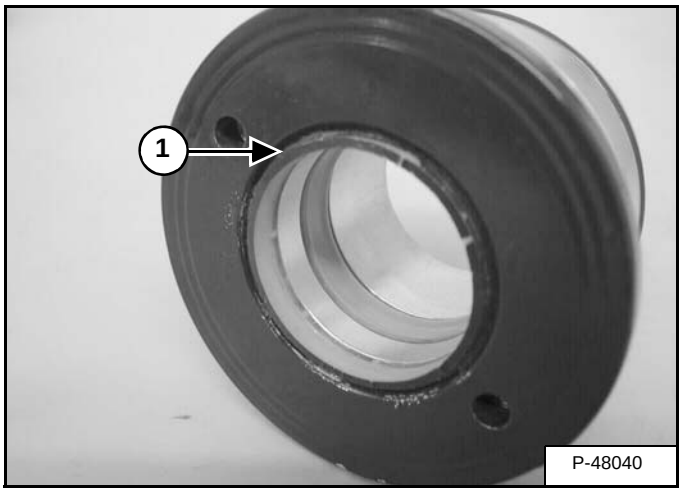
Remove the O-ring (Item 1). Remove the O-ring (Item 2) and the back-up ring (Item 3) **[Figure 20-20-16]** from the cylinder head.

NOTE: The O-ring (Item 2) and back-up ring (Item 3) [Figure 20-20-16] are no longer available parts. The seal kit will contain a one piece seal that is used in place of the O-ring and back-up ring.

Dealer Copy -- Not for Resale

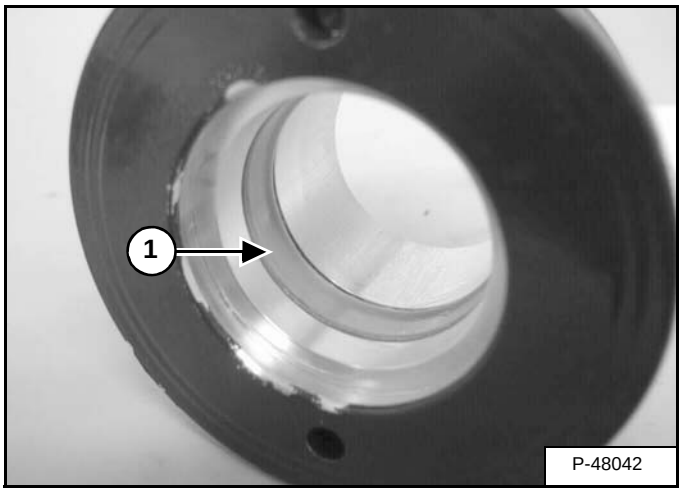
Disassembly (Cont'd)

Figure 20-20-17



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

Figure 20-20-18



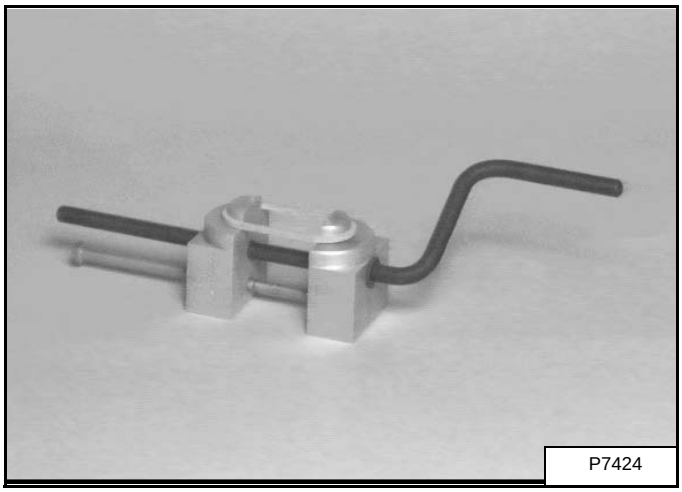
Remove the rod seal (Item 1) **[Figure 20-20-18]** from the cylinder head.

Assembly

Use the following tools to assemble the cylinder:

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

Figure 20-20-19



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.

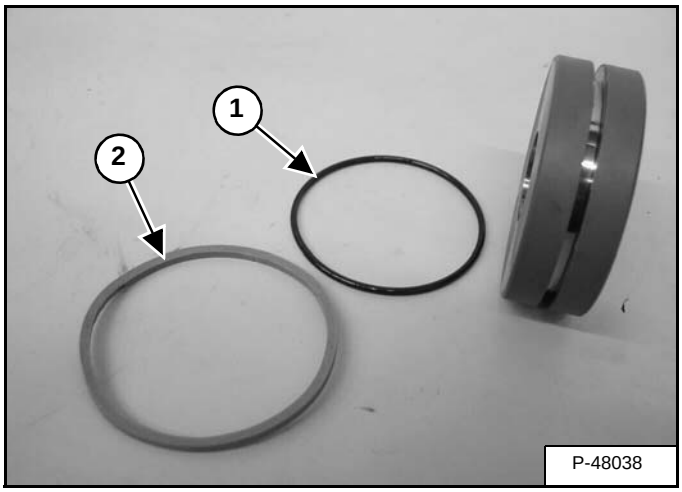
Install the new seal on the tool and slowly stretch it until it fits the piston **[Figure 20-20-19]**.

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

Dealer Copy -- Not for Resale

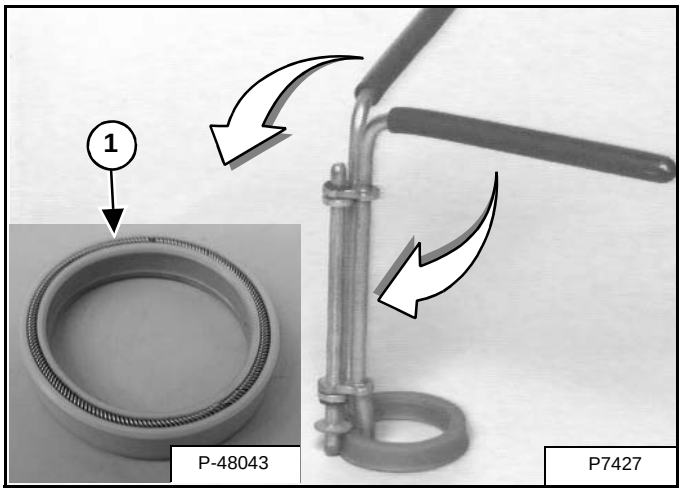
Assembly (Cont'd)

Figure 20-20-20



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

Figure 20-20-21

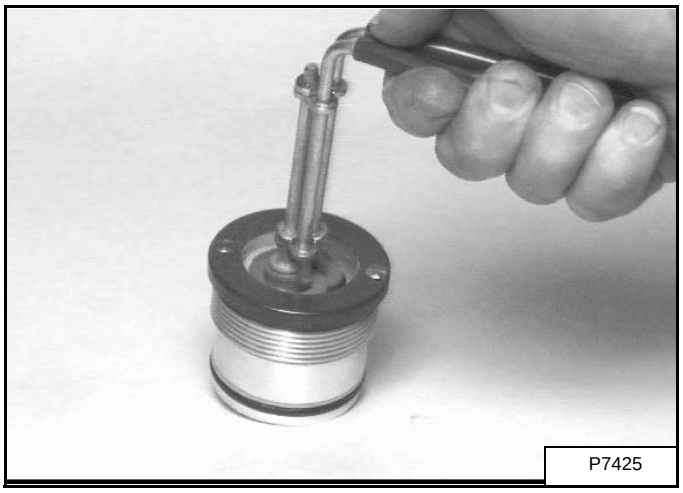


Install the rod seal on the rod seal tool **[Figure 20-20-21]**.

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

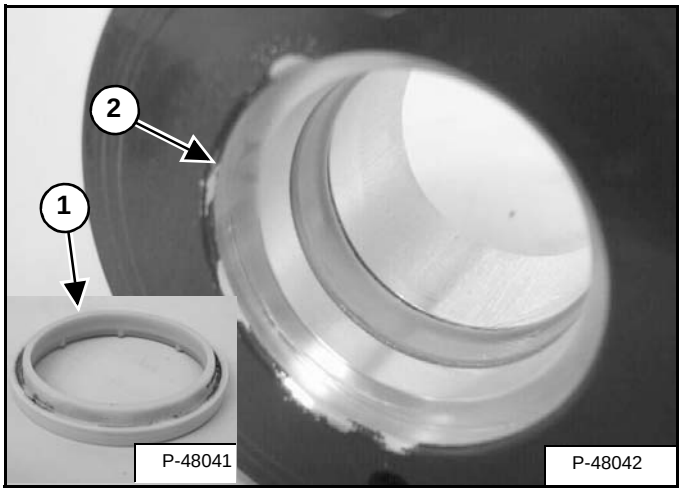
Rotate the handles to collapse the rod seal **[Figure 20-20-21]**.

Figure 20-20-22



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

Figure 20-20-23

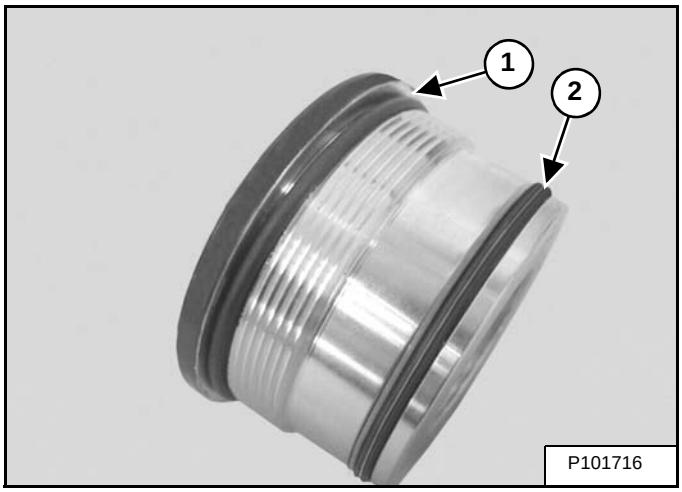


Install the wiper seal, with the wiper side of the seal (Item 1) toward the outside of the head (Item 2) **[Figure 20-20-23]**.

Dealer Copy -- Not for Resale

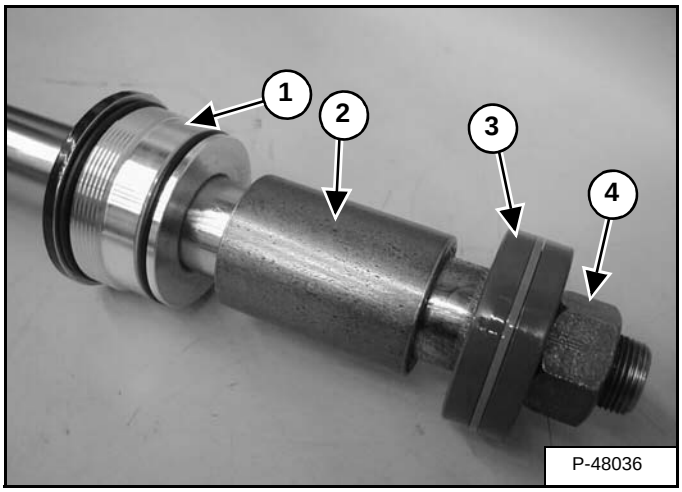
Assembly (Cont'd)

Figure 20-20-24



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

Figure 20-20-25

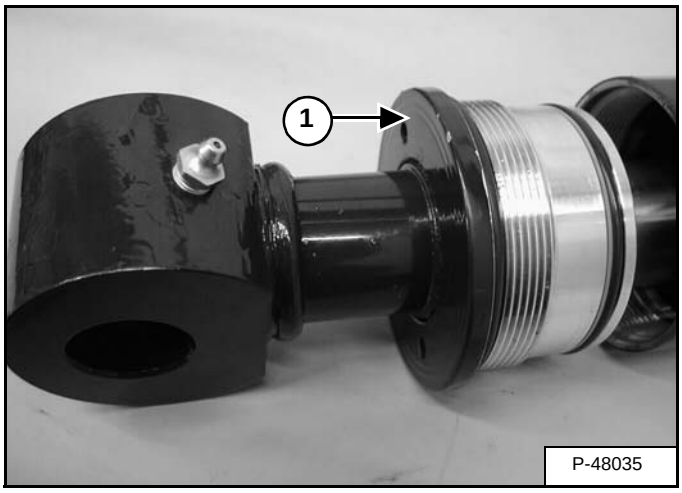


NOTE: Clean and dry the threads before installing the nut. Install the new nut from the kit.

Install the head (Item 1), spacer (Item 2) piston (Item 3), and nut (Item 4) **[Figure 20-20-25]**.

Tighten the nut (Item 4) **[Figure 20-20-25]** to 1152 N•m (850 ft-lb) torque.

Figure 20-20-26



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

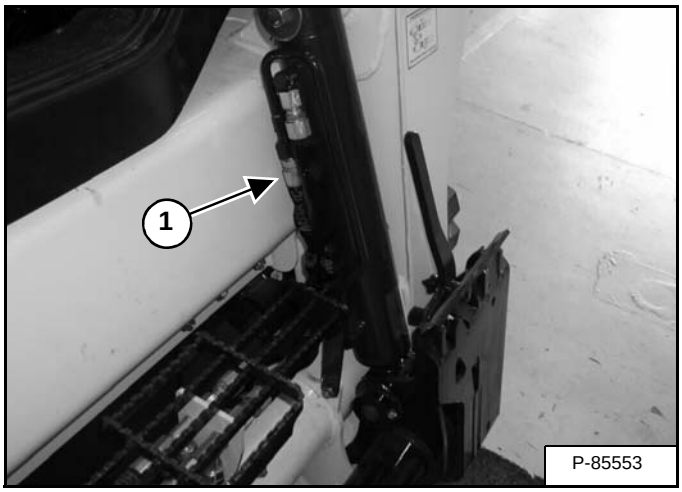
Using a spanner wrench, tighten the head (Item 1) **[Figure 20-20-26]** until the head is flush with the end of the cylinder tube assembly.

Dealer Copy -- Not for Resale

CYLINDER (TILT)

Testing

Figure 20-21-1



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

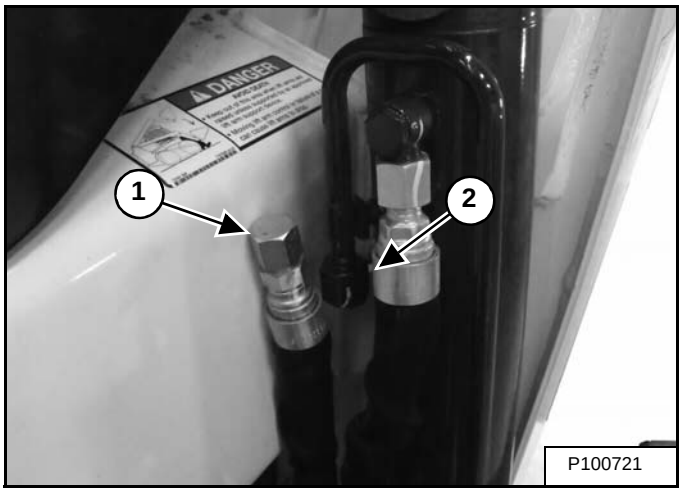
⚠ WARNING

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 possible 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 rod 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 press the PTOL button.

Operate the controls that rolls the Bob-Tach forward.

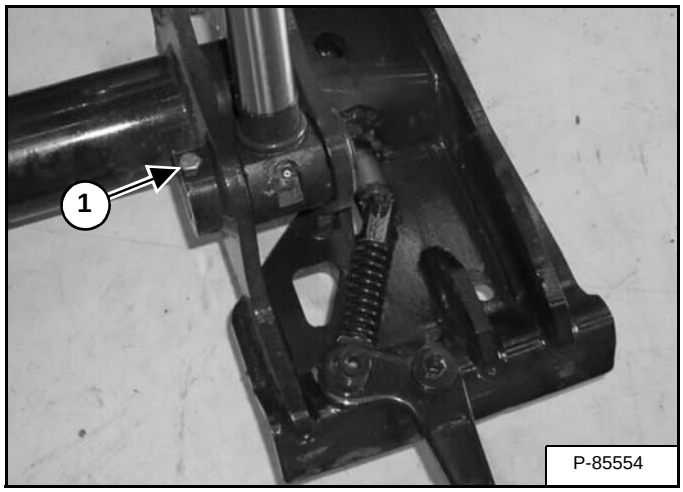
If there is any leakage from the fitting on the cylinder (Item 2) **[Figure 20-21-2]**. Remove the cylinder for repair.

Repeat procedure to check the other cylinder.

Dealer Copy -- Not for Resale

Removal And Installation

Figure 20-21-3



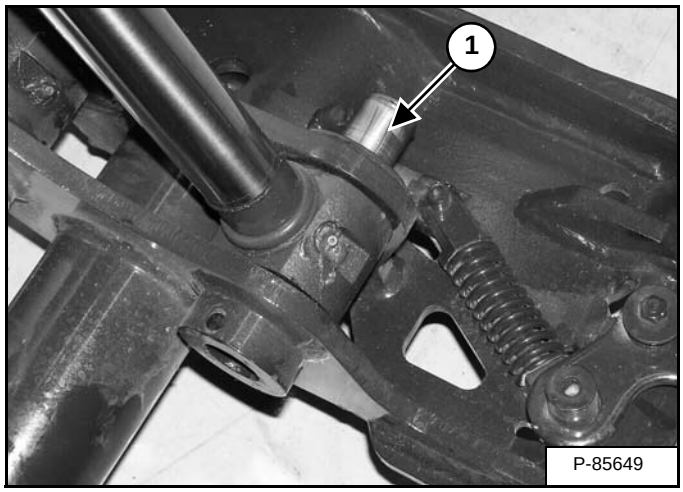
Remove the attachment from the Bob-Tach. Roll the Bob-Tach forward

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.

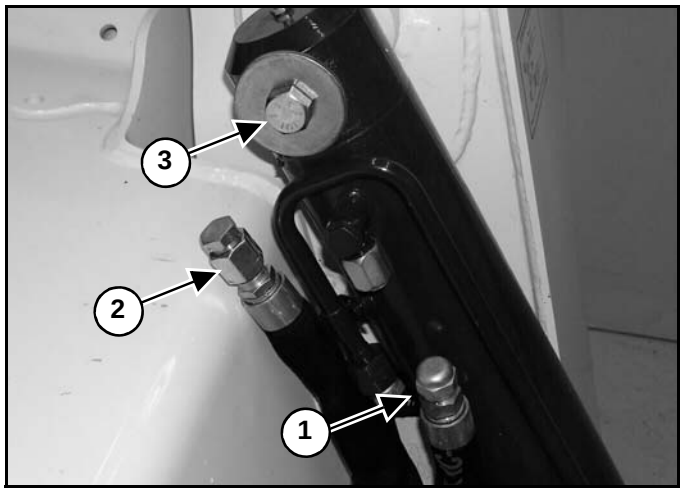
Installation: Tighten the retainer nut to 48 - 54 N•m (35 - 40 ft-lb) torque.

Figure 20-21-4



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

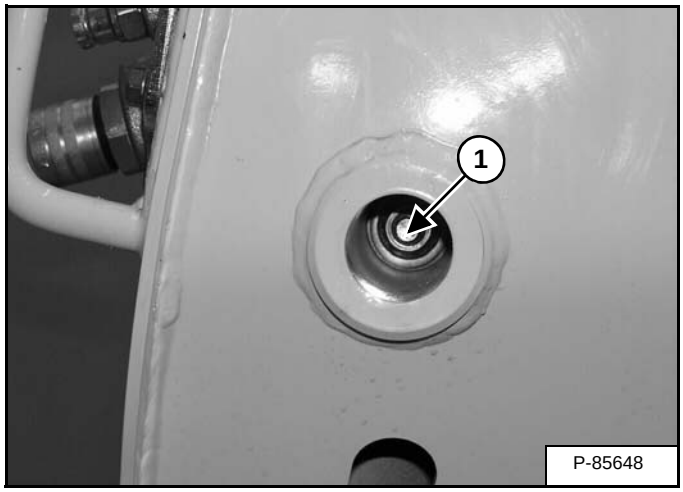
Figure 20-21-5



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

Cap the hoses and plug the fittings on the cylinder.

Figure 20-21-6



Remove the base end pivot bolt and washer (Item 3) **[Figure 20-21-5]**.

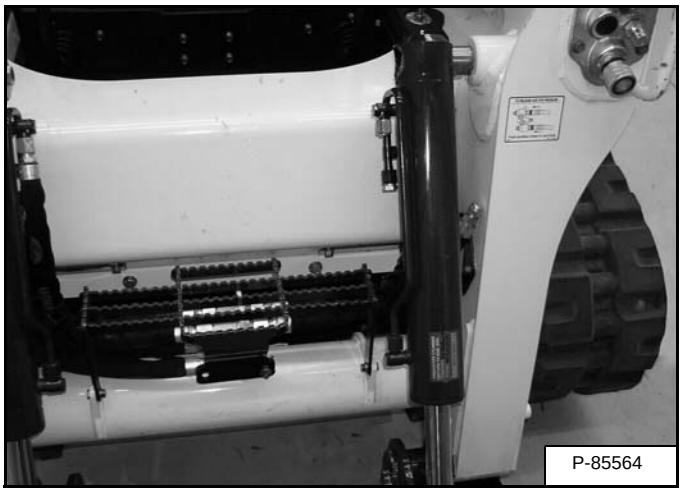
Remove the retainer nut and washer (Item 1) **[Figure 20-21-6]** from the base end pivot pin.

Installation: Tighten the retainer nut to 257,6 N•m (190 ft-lb) torque.

Dealer Copy -- Not for Resale

Removal And Installation (Cont'd)

Figure 20-21-7



Slide the cylinder from the base pin and remove the cylinder from the loader **[Figure 20-21-7]**.

Dealer Copy -- Not for Resale

Base End Pivot Pin Removal And Installation

Use the following tools to assemble the cylinder:

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

Figure 20-21-8

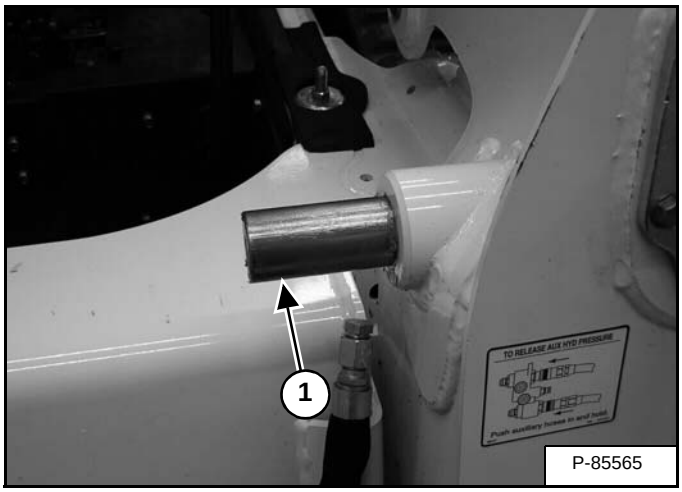
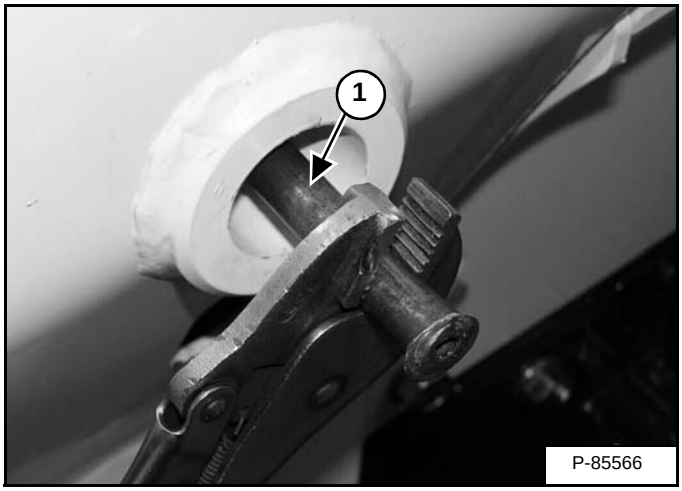


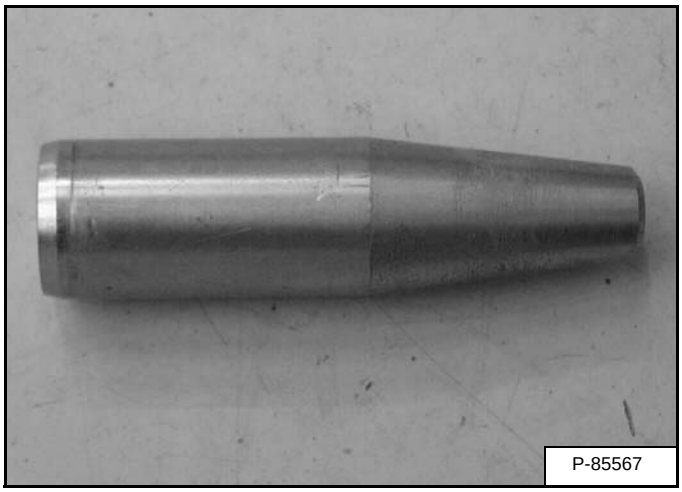
Figure 20-21-9



Remove the cylinder from the cylinder base pin (Item 1) **[Figure 20-21-8]**. (See Removal And Installation on Page 20-21-2.)

Use a shaft (Item 1) **[Figure 20-21-9]** and a hammer to remove the cylinder base pin from the lift arms.

Figure 20-21-10

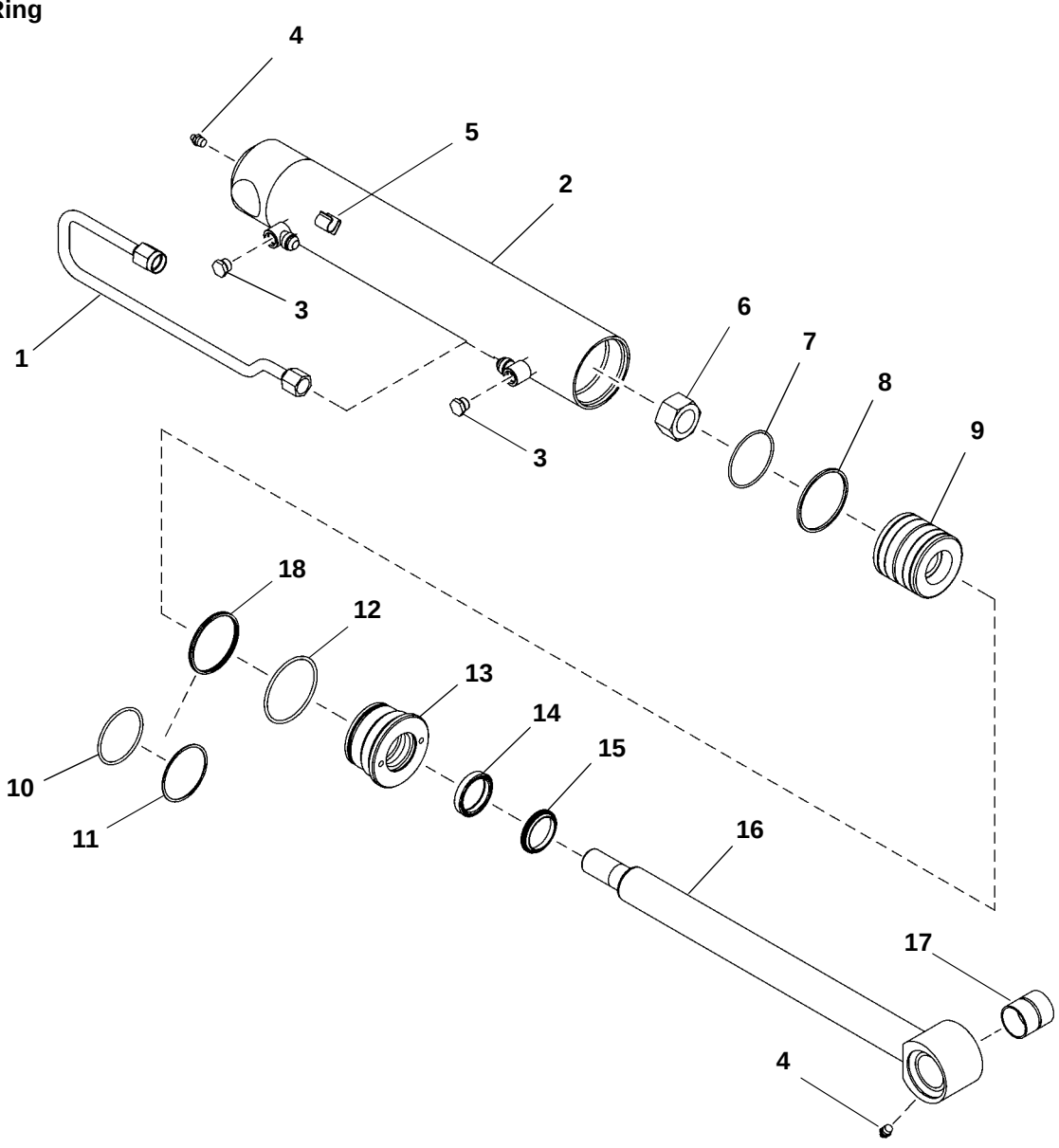


Check pivot pin and replace as needed **[Figure 20-21-10]**.

Dealer Copy -- Not for Resale

Parts Identification

1. Tubeline
2. Case
3. Plug
4. Grease Fitting
5. Clamp
6. Nut
7. Back-up Ring
8. O-ring
9. Piston
10. O-ring
11. Back-up Ring
12. O-ring
13. Head
14. Seal
15. Wiper
16. Rod
17. Bushing
18. Seal



NA1210S

Dealer Copy -- Not for Resale

Disassembly

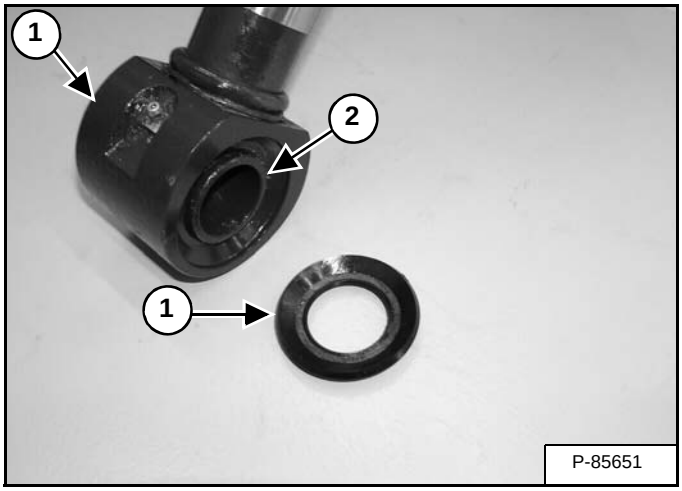
Use the following tools to disassemble the cylinder:

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.

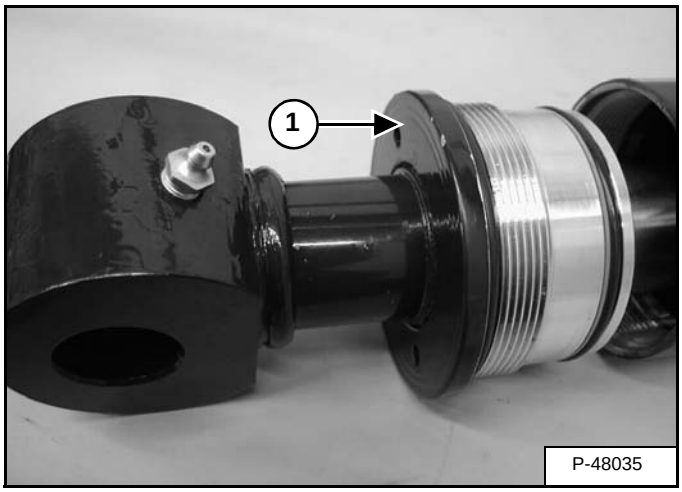
Figure 20-21-11



Remove the seals (Item 1) **[Figure 20-21-11]** on both sides of the pivot bushing.

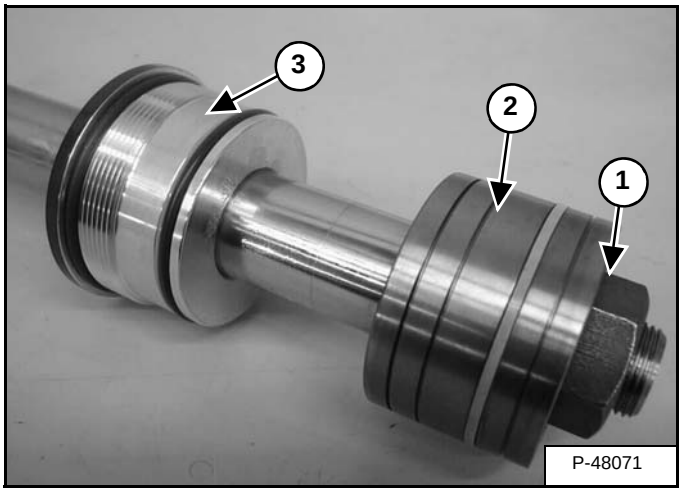
Remove and replace bushing (Item 2) with a driver tool and hammer **[Figure 20-21-11]**.

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

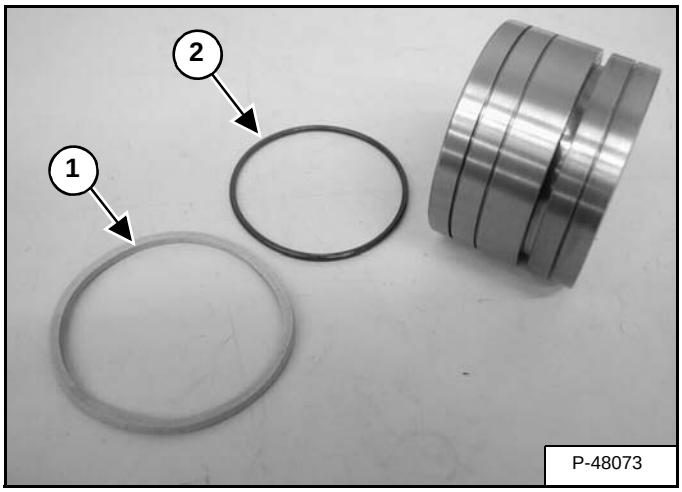


Remove the nut (Item 1), piston (Item 2) and head (Item 3) **[Figure 20-21-13]**.

Dealer Copy -- Not for Resale

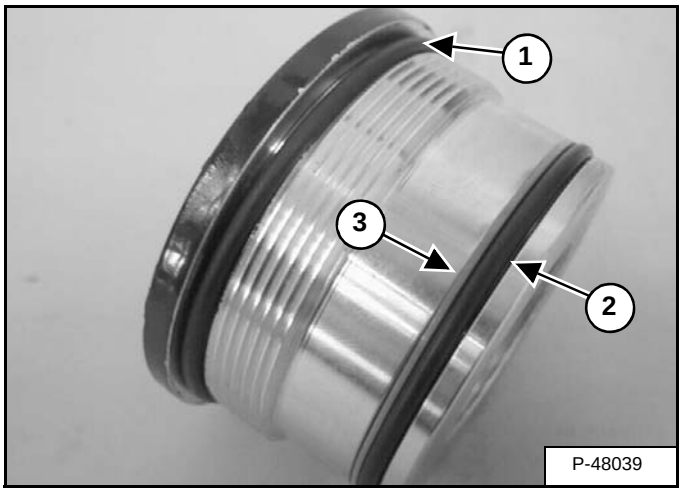
Disassembly (Cont'd)

Figure 20-21-14



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

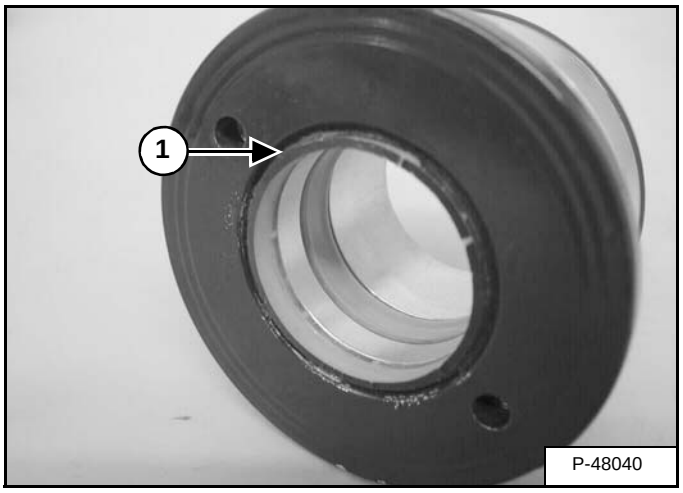
Figure 20-21-15



Remove the O-ring (Item 1). Remove the O-ring (Item 2) and back-up washer (Item 3) **[Figure 20-21-15]**.

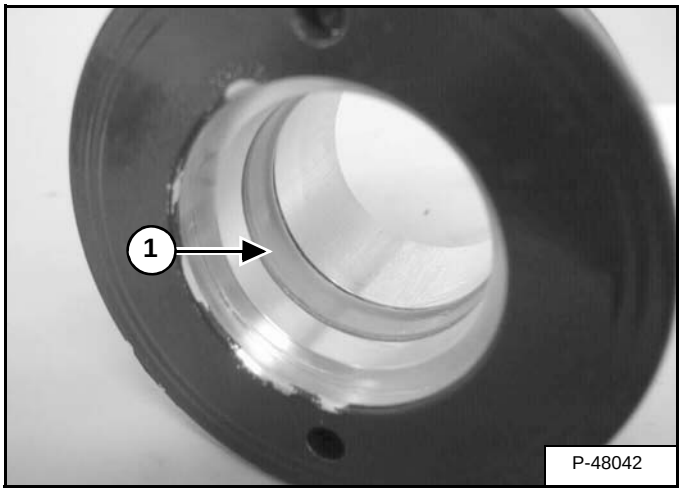
NOTE: The O-ring (Item 2) and back-up ring (Item 3) [Figure 20-21-15] are no longer available parts. The seal kit will contain a one piece seal that is used in place of the O-ring and back-up ring.

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.

Dealer Copy -- Not for Resale

Assembly

Use the following tools to assemble the cylinder:

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

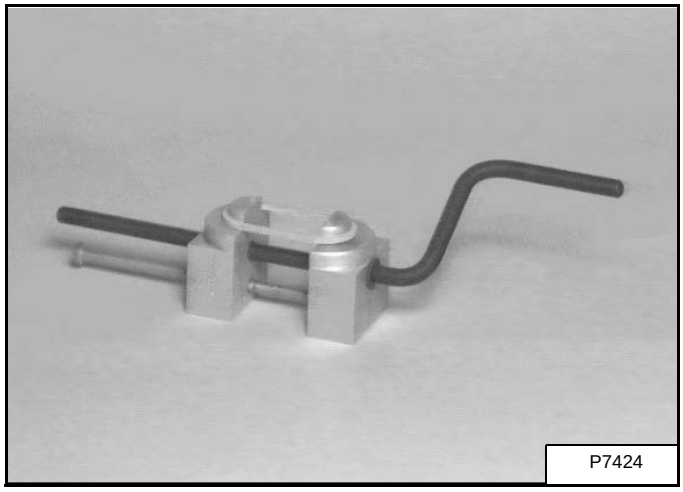
Wash the cylinder parts in solvent and air dry them.

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.

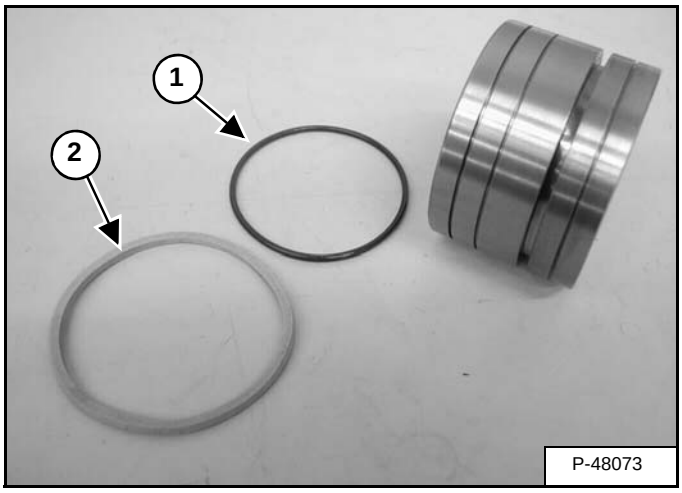
Figure 20-21-18



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

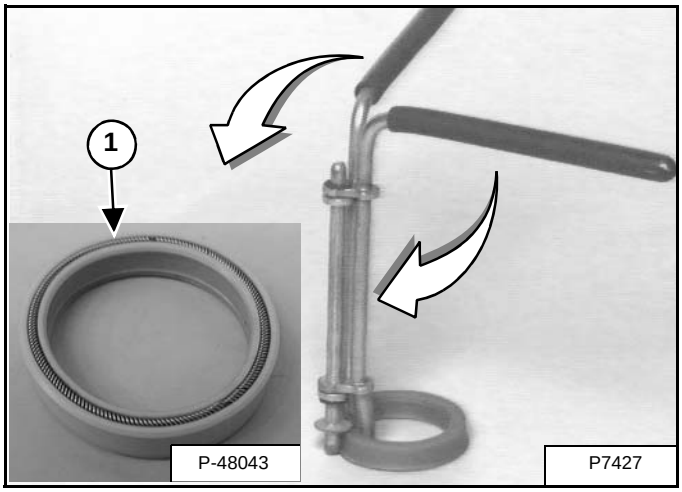
Allow the seal to stretch for 30 seconds before installing it on the piston.

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]**.

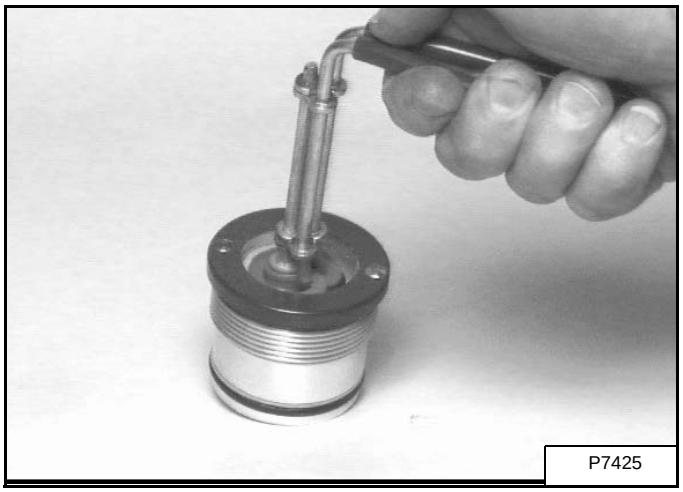
NOTE: During installation the spring side of the seal (Item 1) [Figure 20-21-20] must be installed toward the inside of the cylinder.

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

Dealer Copy -- Not for Resale

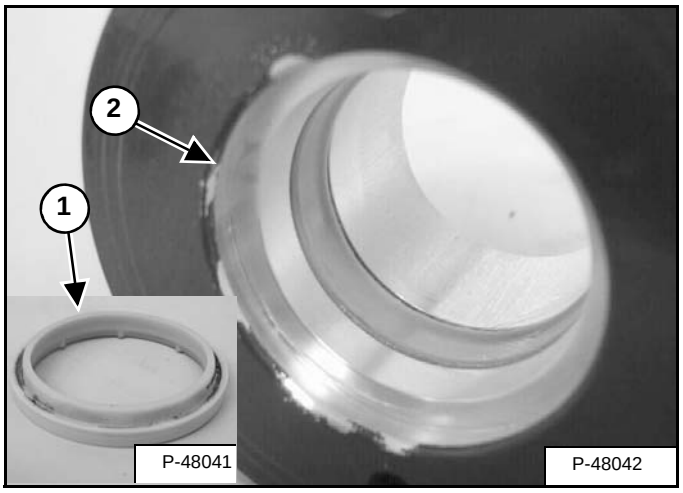
Assembly (Cont'd)

Figure 20-21-21



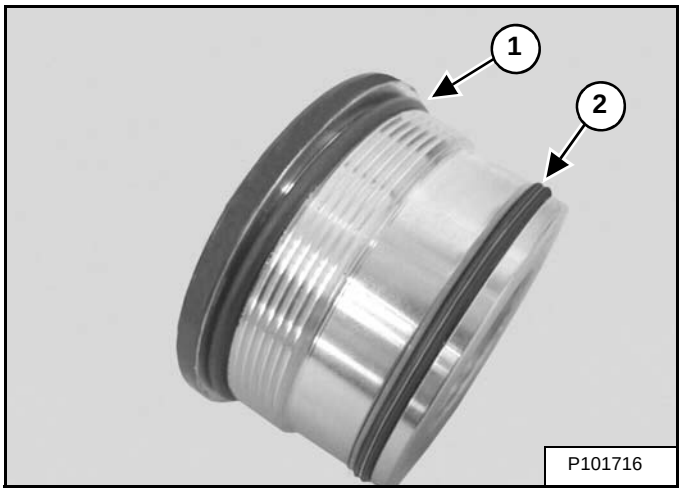
Install the rod seal in the head **[Figure 20-21-21]**.

Figure 20-21-22



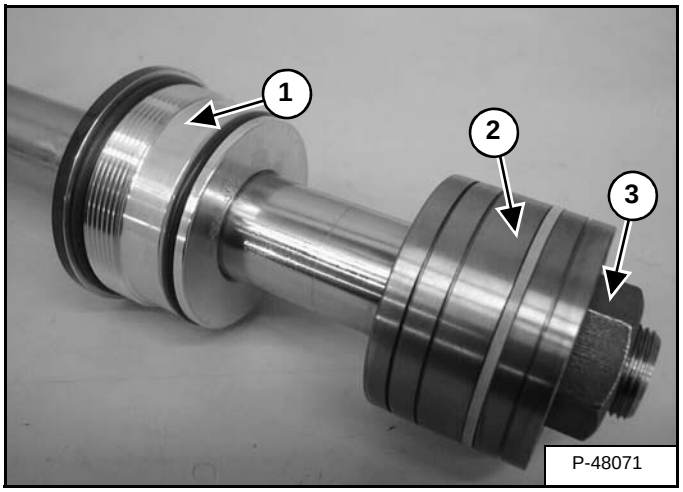
Install the wiper seal, with the wiper side of the seal (Item 1) toward the outside of the head (Item 2) **[Figure 20-21-22]**.

Figure 20-21-23



Install the O-ring (Item 1) and seal (Item 2) **[Figure 20-21-16]** on the cylinder head.

Figure 20-21-24



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 20-21-24]**.

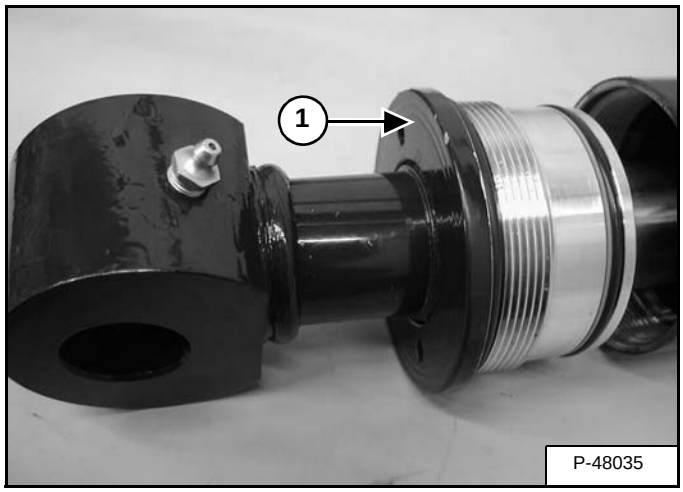
Tighten the nut (Item 3) **[Figure 20-21-24]** to 1152 N•m (850 ft-lb) torque.

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

Dealer Copy -- Not for Resale

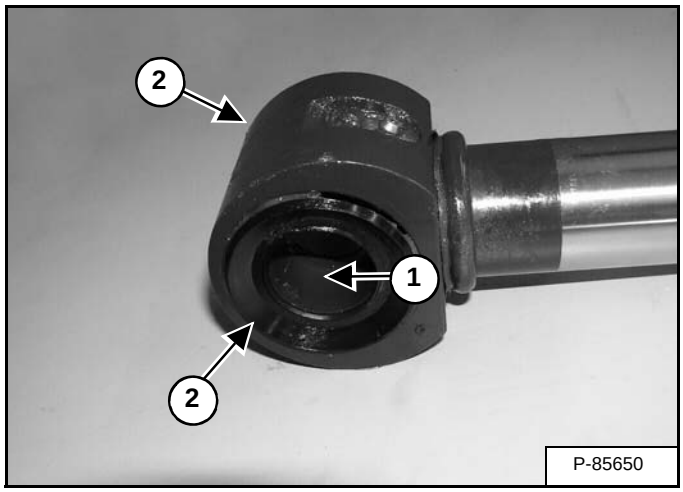
Assembly (Cont'd)

Figure 20-21-25



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.

Figure 20-21-26



Install the bushing (Item 1) and seals (Item 2) **[Figure 20-21-26]** using a driver tool and hammer.

Dealer Copy -- Not for Resale

CYLINDER (BOB-TACH)

Testing

WARNING

AVOID INJURY OR DEATH

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

W-2072-0807

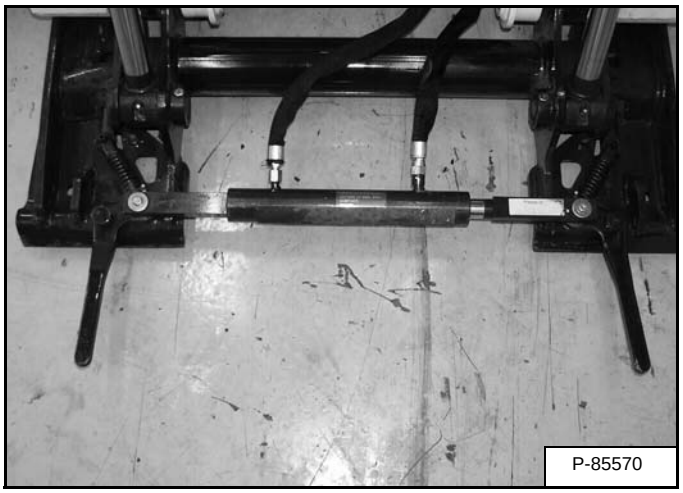
WARNING

AVOID INJURY OR DEATH

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.

W-2103-0508

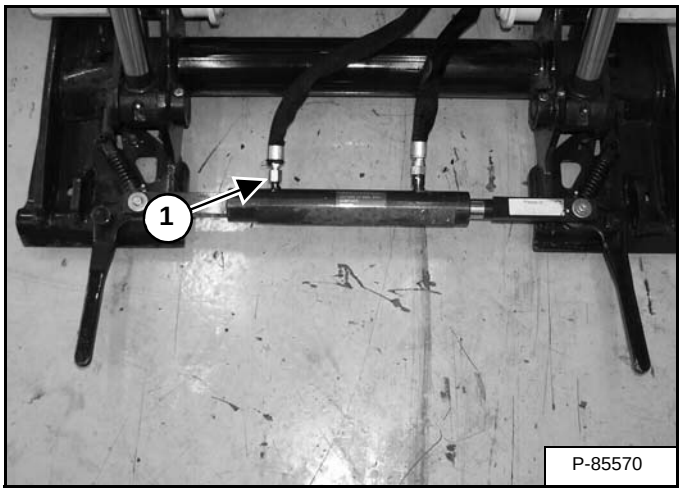
Figure 20-22-1



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

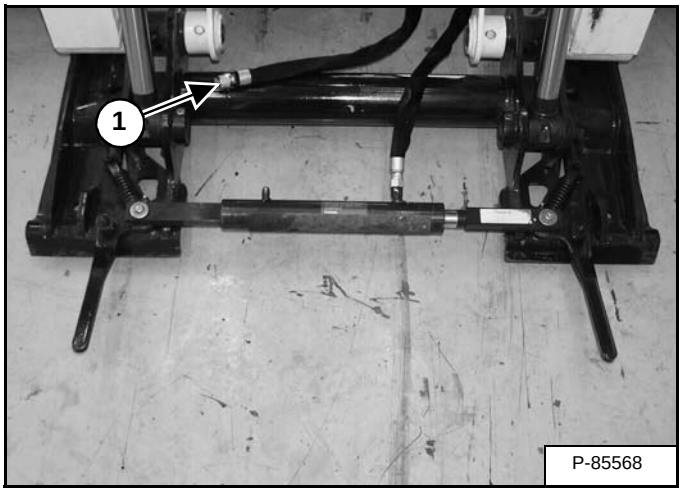
Push and hold BOB-TACH “WEDGES UP” switch until levers are in the unlocked position (Wedges fully raised).

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.

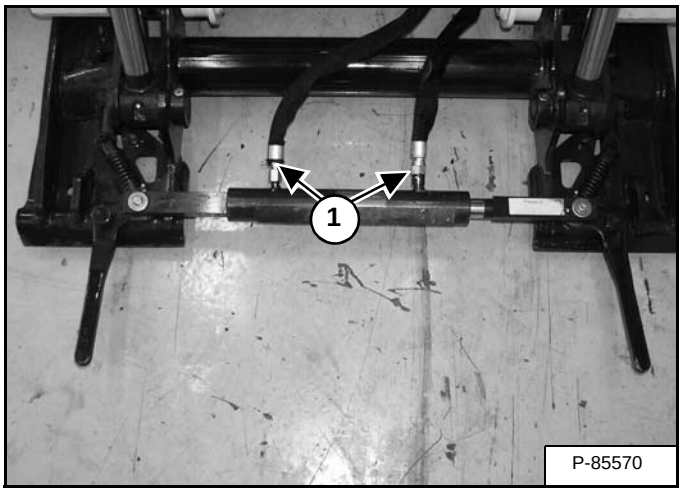
Push and hold the BOB-TACH “WEDGES UP” Switch (Front Accessory Panel).

If there is any leakage from the base end cylinder port (Item 2) **[Figure 20-22-3]**, remove the cylinder for repair.

Dealer Copy -- Not for Resale

Removal And Installation

Figure 20-22-4

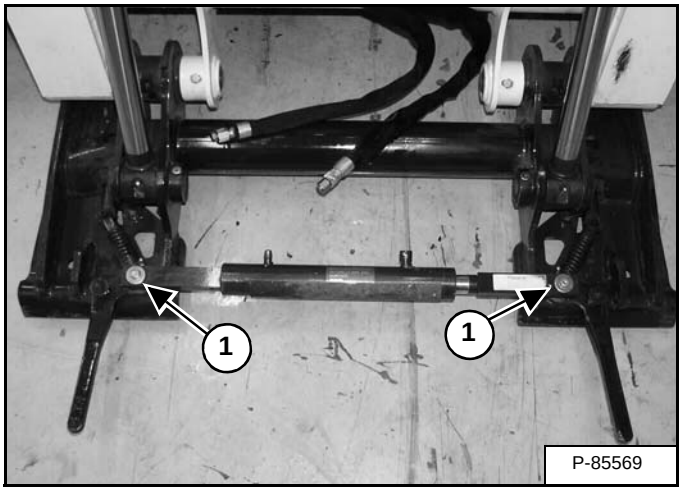


Disconnect the hoses from the rod and base end cylinder fitting (Item 1) **[Figure 20-22-4]**.

Installation: Tighten the hoses to 29,8 - 32,5 N•m (22 - 24 ft-lb) torque.

Install plugs in the hoses and cap on fittings.

Figure 20-22-5



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

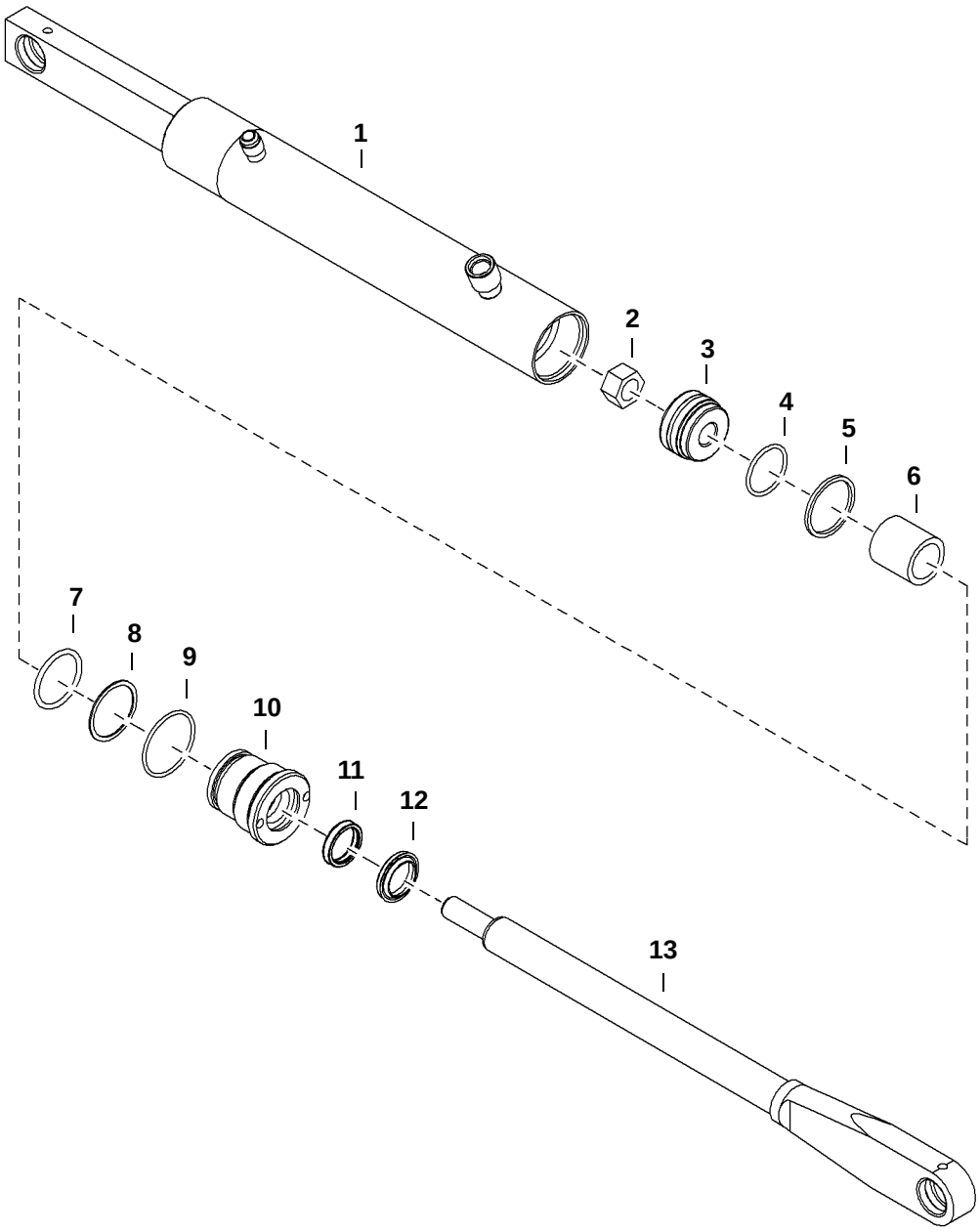
Installation: Tighten the bolts to 48 - 54 N•m (35 - 40 ft-lb) torque.

Remove the cylinder from the lever pivots.

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Parts Identification

1. Tube
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

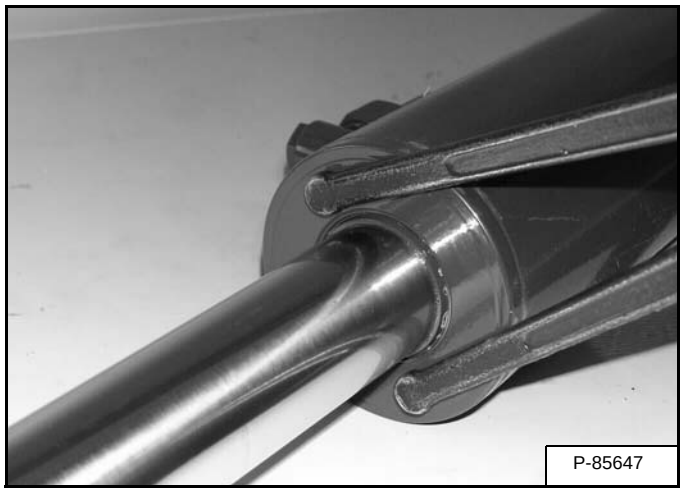


PE3954S

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Disassembly

Figure 20-22-6



Use the following tools to disassemble the cylinder:

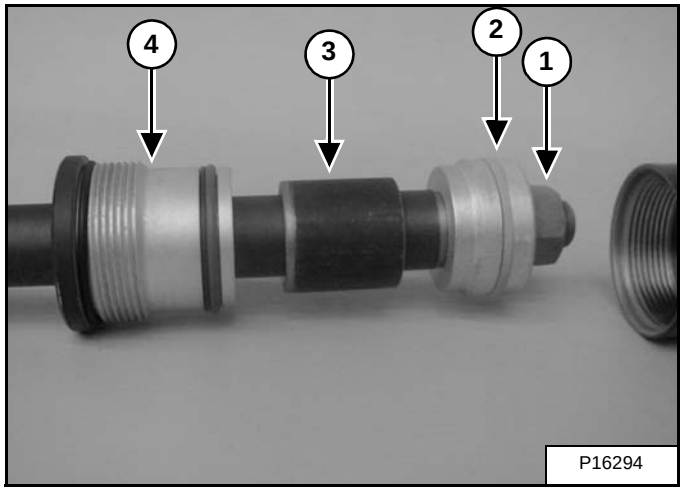
MEL1074 - O-ring Seal Hook
Spanner Wrench

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]**.

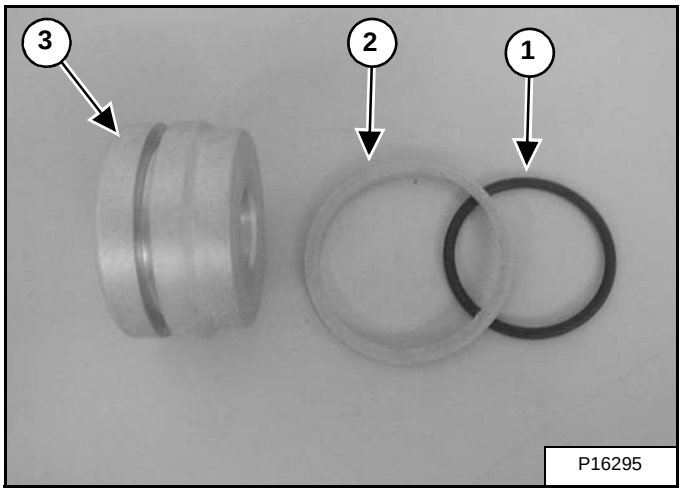
Figure 20-22-7



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

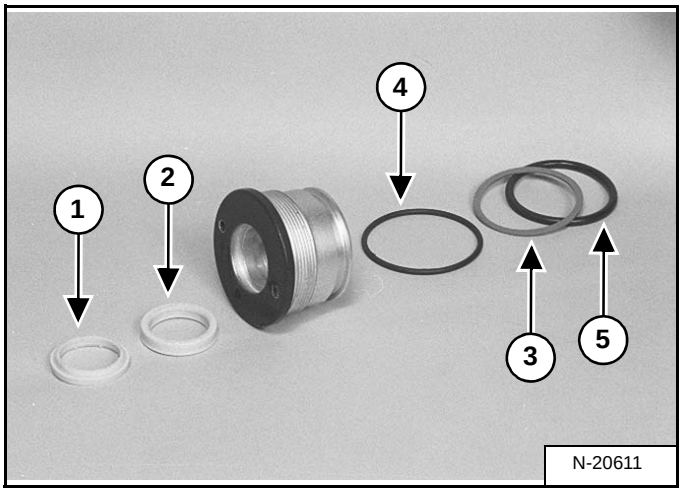
Remove the nut (Item 1), piston (Item 2), spacer (Item 3), and head (Item 4) **[Figure 20-22-7]** from the rod.

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

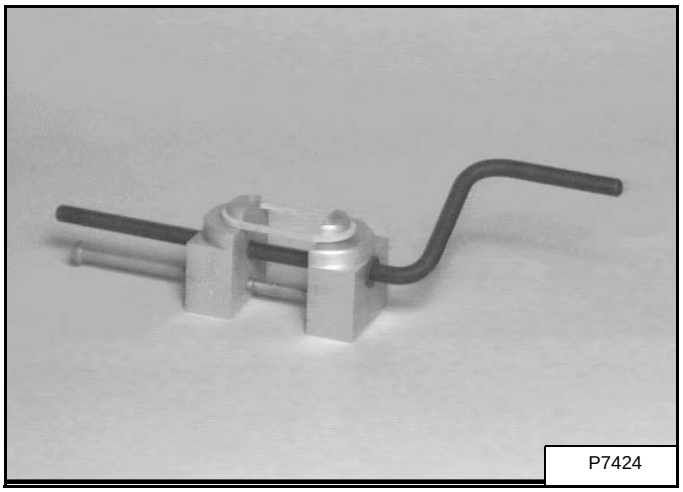


Remove the wiper seal (Item 1), and rod seal (Item 2), the back-up washer (Item 3), the thin O-ring (Item 4), and the thick O-ring (Item 5) **[Figure 20-22-9]** from the head.

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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.

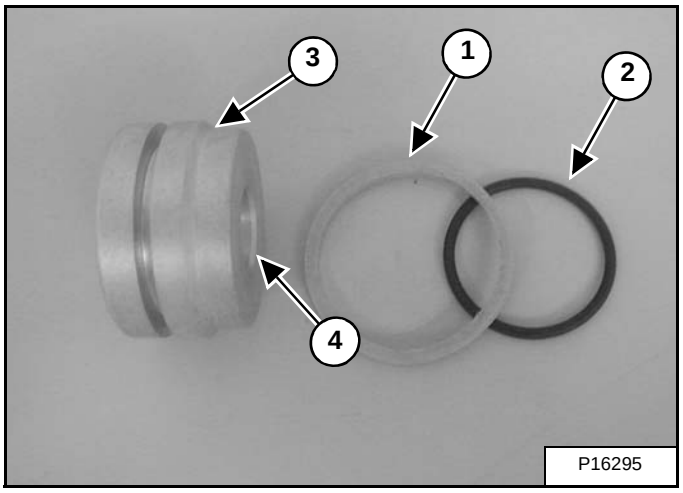
Always install new O-rings and seals during assembly.

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.

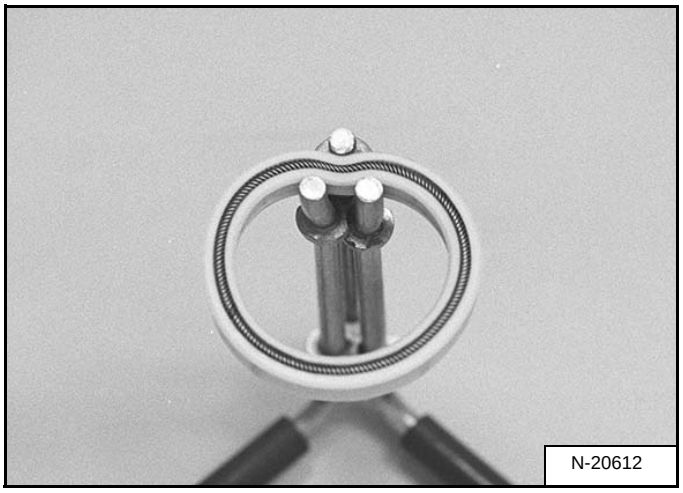
Figure 20-22-11



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



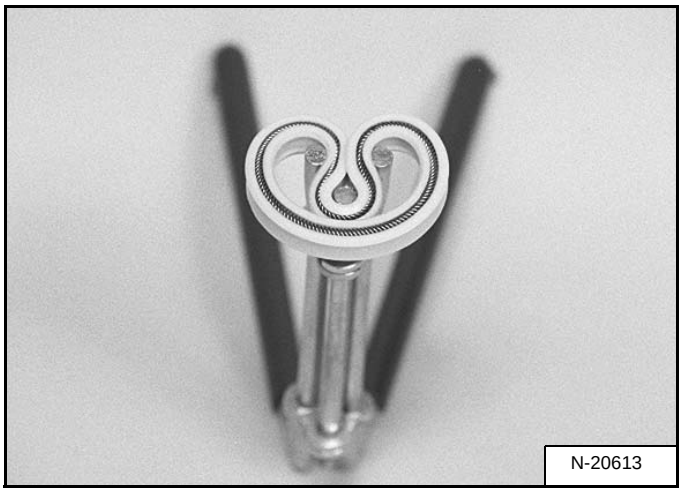
Install the rod seal on the rod seal tool **[Figure 20-22-12]**.

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

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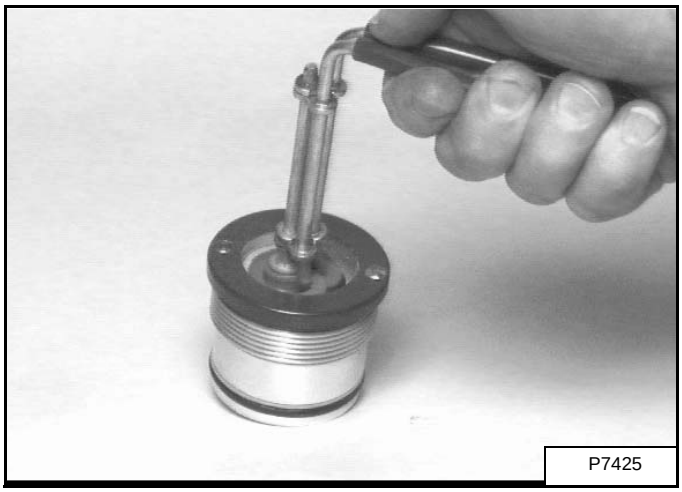
Assembly (Cont'd)

Figure 20-22-13



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

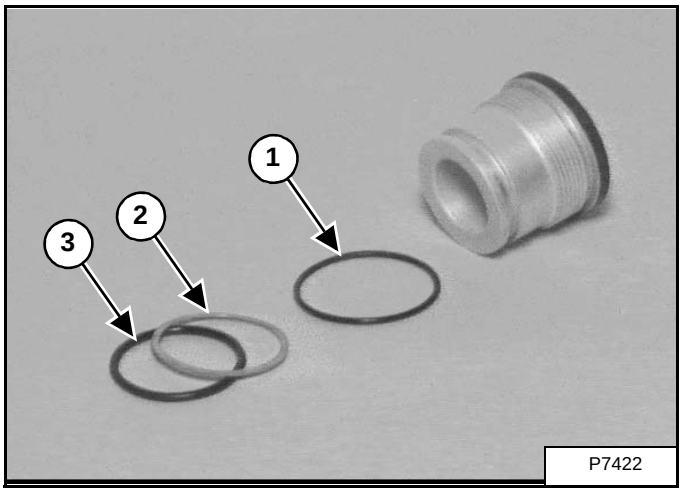
Figure 20-22-14



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

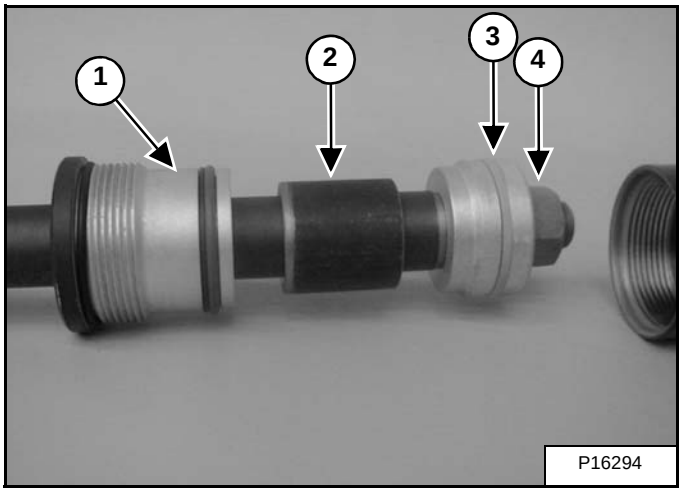


Install the thin O-ring (Item 1) **[Figure 20-22-15]**.

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]**.

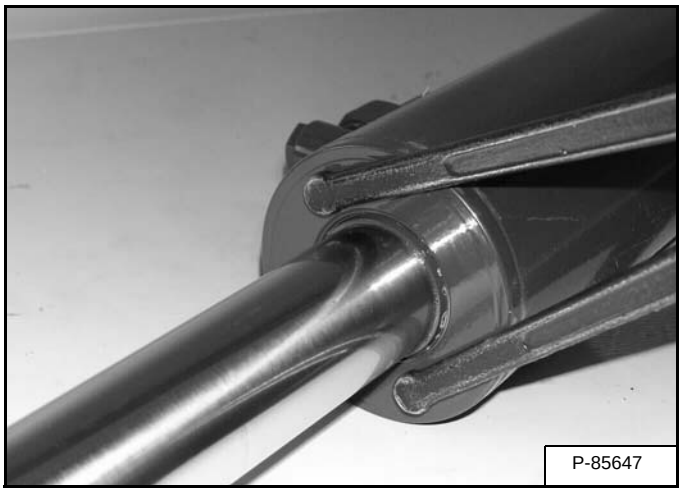
Grease the piston where the nut contacts the piston. do not get grease on the threads. Install the new nut (Item 4) **[Figure 20-22-16]**.

Tighten the nut to 122 N•m (90 ft-lb) torque.

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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]**.

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Dealer Copy -- Not for Resale

MAIN RELIEF VALVE

Description

The main relief valve limits the hydraulic system pressure by opening at a certain pressure and allowing the hydraulic oil to flow back to the hydraulic reservoir. (See Hydraulic System on Page SPEC-10-3.)

The main relief valve is adjustable and is located on the hydraulic control valve near the bottom, facing the front of the loader.

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Testing

IMPORTANT

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

I-2024-0284

⚠ WARNING

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

W-2006-1209

⚠ 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

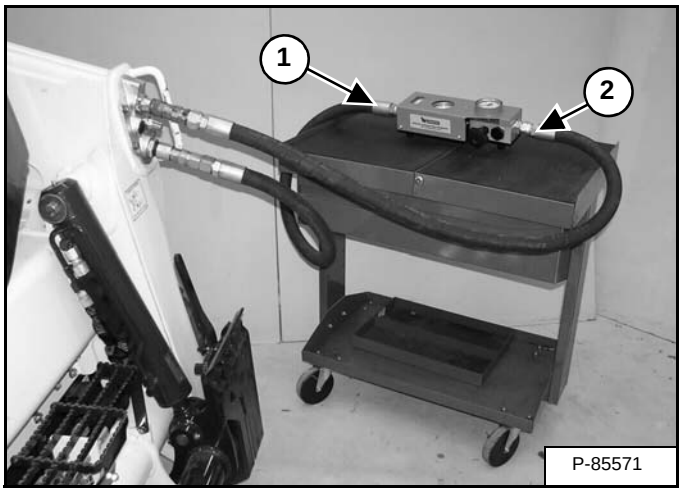
The tools listed will be needed to do the following procedure:

TWX-RFIK200-S-6 54 U.S. gpm FLOW METER
MEL10006 - Hydraulic Test Kit

NOTE: This procedure is for standard loaders, loaders equipped with ACS option and loaders equipped with SJC option. The main relief valve is located in the same place on all of the loaders.

Lift and block the loader. (See Procedure on Page 10-10-1.)

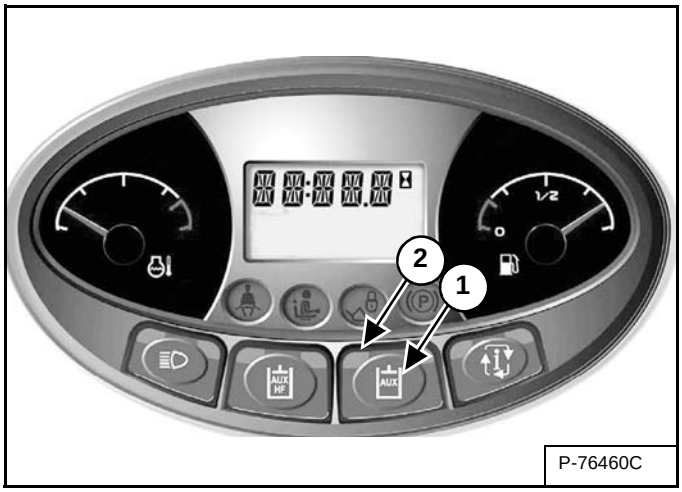
Figure 20-30-1



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

Connect the OUT port (Item 2) **[Figure 20-30-1]** of the hydraulic tester to the top (male) quick coupler on the loader.

Figure 20-30-2



Start the engine and run at low idle.

- Press the AUXILIARY HYDRAULICS Button (Item 1) **[Figure 20-30-2]** once to engage the auxiliary hydraulics.

NOTE: The light (Item 2) [Figure 20-30-2] will be on.

Dealer Copy -- Not for Resale

Testing (Cont'd)

Figure 20-30-3

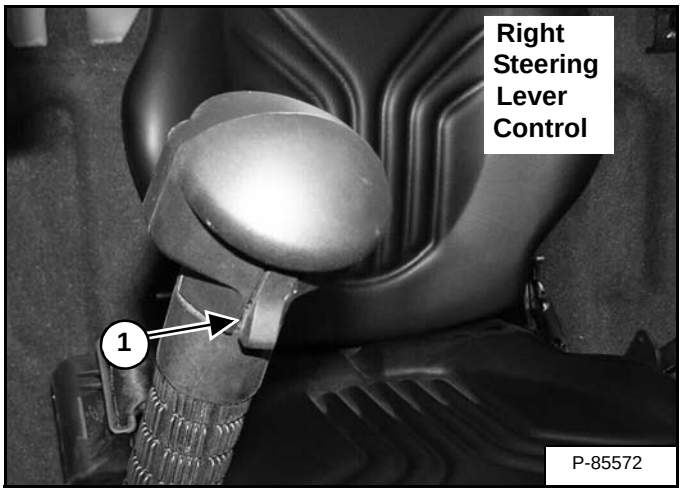
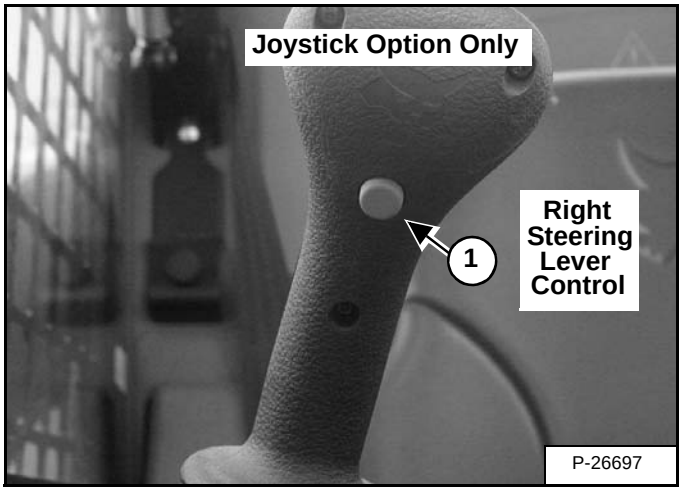


Figure 20-30-4



- Push the front switch (Item 1) **[Figure 20-30-3]** and **[Figure 20-30-4]** to give the **front** quick couplers a constant flow of fluid.

- To release from continuous operation, press the front switch (Item 1) **[Figure 20-30-3]** and **[Figure 20-30-4]** a second time.

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

Refer to (See Hydraulic System on Page SPEC-10-3.) for both flow and pressure specifications of the hydraulic system.

Check the free flow specification.

With the engine at high idle and hydraulic oil at 140 °F turn the restrictor control on the tester until the flow through the tester drops to zero. Check the relief pressure.

If the relief pressure is not correct, stop the engine and adjust the main relief valve.

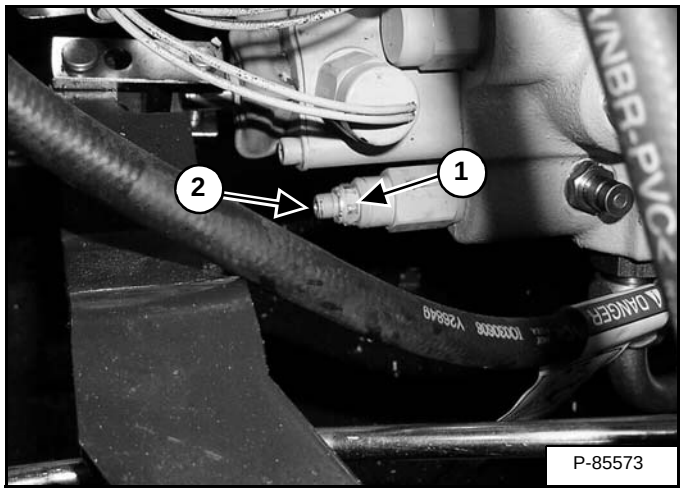
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MAIN RELIEF VALVE (CONT'D)

Adjusting

NOTE: This procedure is for standard loaders, loaders equipped with ACS option and loaders equipped with SJC option. The main relief valve is located in the same place on all of the loaders.

Figure 20-30-5



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 20-30-5]** 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.

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Removal And Installation

IMPORTANT

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

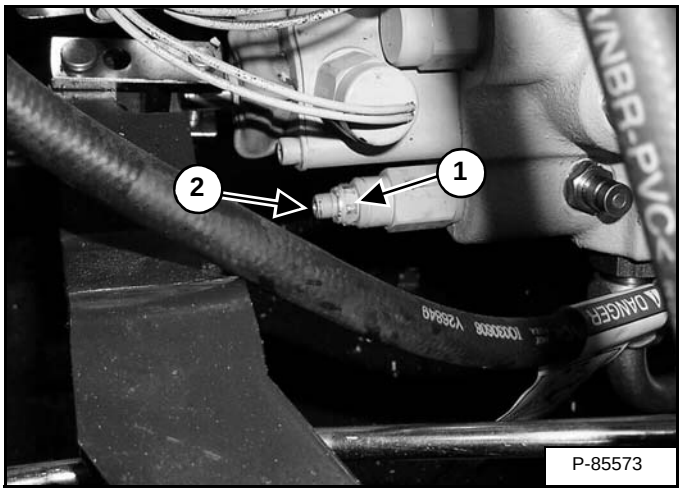
I-2003-0888

Raise the operator cab. (See Raising on Page 10-30-2.)

Clean the area around the control valve.

NOTE: This procedure is for standard loaders, loaders equipped with ACS option and loaders equipped with SJC option. The main relief valve is located in the same place on all of the loaders.

Figure 20-30-6



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 20-30-5]** 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.

Figure 20-30-7



Remove the O-rings and back-up washers from the main relief valve **[Figure 20-30-7]**.

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 20-30-7]**.

Installation: Tighten the main relief valve to 48 - 54 N•m (35 - 40 ft-lb) torque.

Check the pressure again. (See Testing on Page 20-30-2.)

Dealer Copy -- Not for Resale

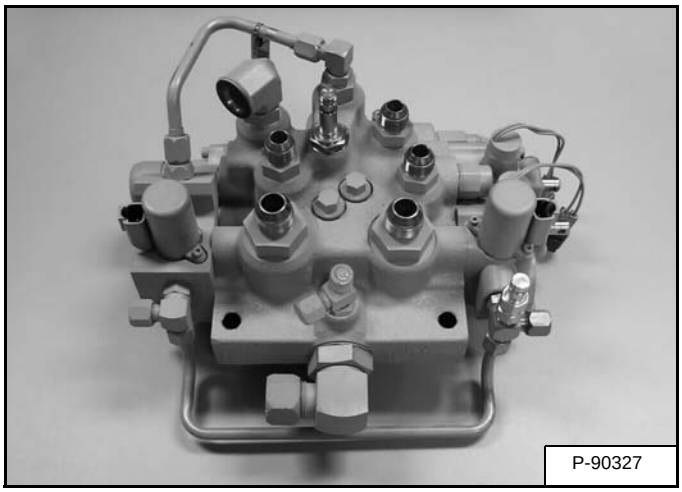


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HYDRAULIC CONTROL VALVE (STANDARD)

Description

Figure 20-40-1



The hydraulic control valve is located inside the main frame on the right hand side, below the operators cab.

The hydraulic control valve is the hydraulic component that uses spools to direct the flow of hydraulic fluid to the lift, tilt and auxiliary functions.

The lift and tilt functions in the hydraulic control valve are operated by linkage connected to the foot pedals.

The auxiliary function is operated by pilot pressure. There is one solenoid located by each side of the spool. Only one solenoid at a time is activated by the switch on the right side control handle/lever. The activated solenoid sends pilot pressure oil to one side of the spool and forces the spool to shift.

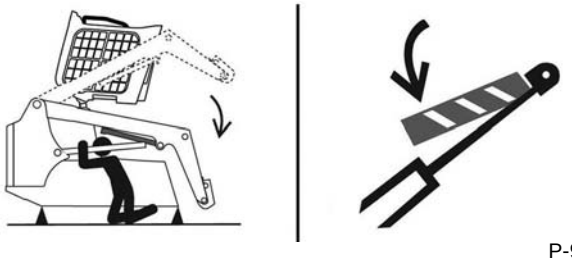
The hydraulic control valve also contains a main relief valve which is adjustable.

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HYDRAULIC CONTROL VALVE (STANDARD) (CONT'D)

Removal And Installation

⚠ DANGER



P-90328

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.**

D-1009-0409

⚠ WARNING

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

W-2059-0598

IMPORTANT

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

I-2003-0888

Raise the lift arms and install an approved lift arm support device. (See LIFT ARM SUPPORT DEVICE on Page 10-20-1.)

Raise the operator cab. (See Raising on Page 10-30-2.)

Drain the hydraulic reservoir. (See Removing And Replacing Hydraulic Fluid on Page 10-120-2.)

Remove the control panel. (See Removal And Installation on Page 50-100-2.)

Remove the control linkage. (See Linkage Removal And Installation on Page 50-90-2.)

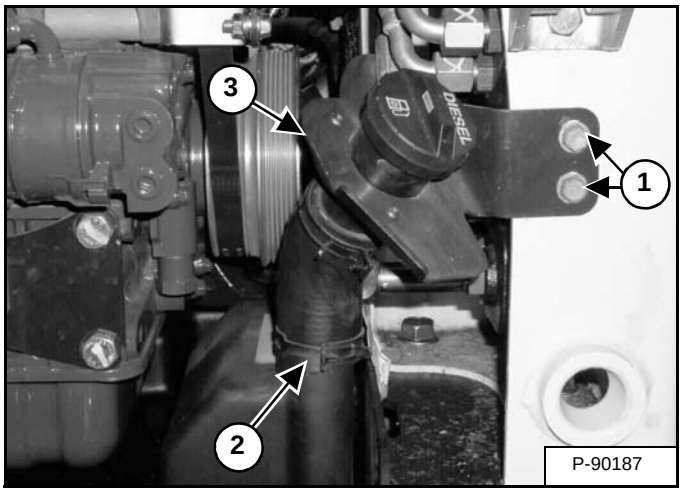
NOTE: Mark all tubelines, hoses, and electrical connections for correct installation.

NOTE: Cap and plug all hydraulic connection points when tubelines or hoses are removed.

Clean area around control valve.

Open rear door.

Figure 20-40-2

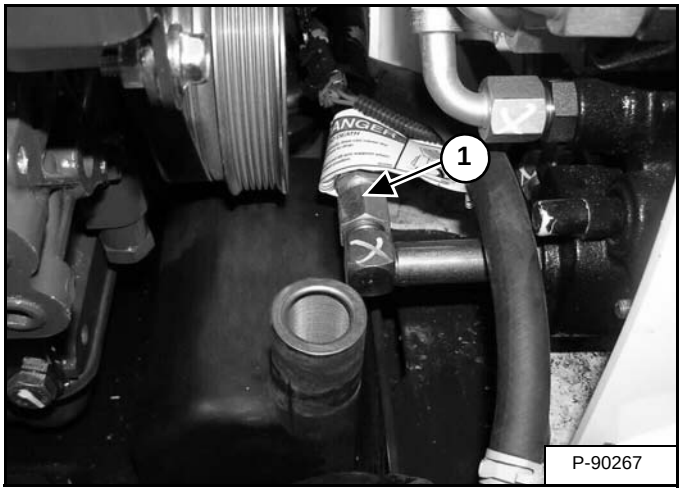


Remove the two bolts (Item 1), move the hose clamp (Item 2) to the middle of the hose, and the place the fuel inlet assembly (Item 3) **[Figure 20-40-2]** off to the side.

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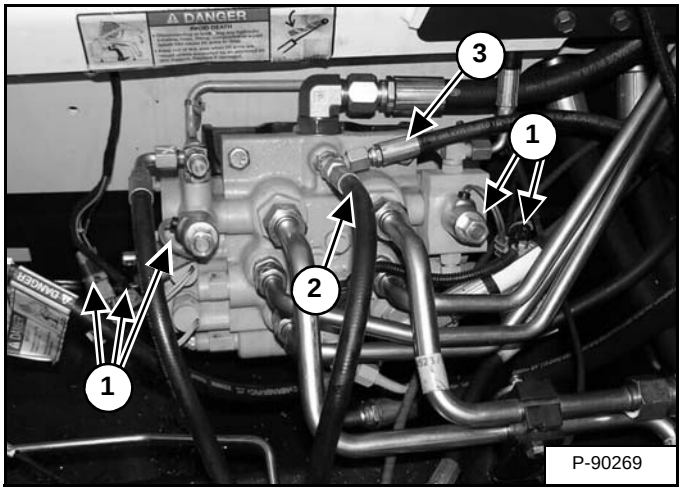
Removal And Installation (Cont'd)

Figure 20-40-3



The fixed end main valve hose assembly is connected to a fixed end fitting on the control valve. The hose is routed to the junction block at the rear of the loader where it feeds the base end of both lift cylinders. The hose can only be removed by first removing it from the fitting (Item 1)**[Figure 20-40-3]**.

Figure 20-40-4

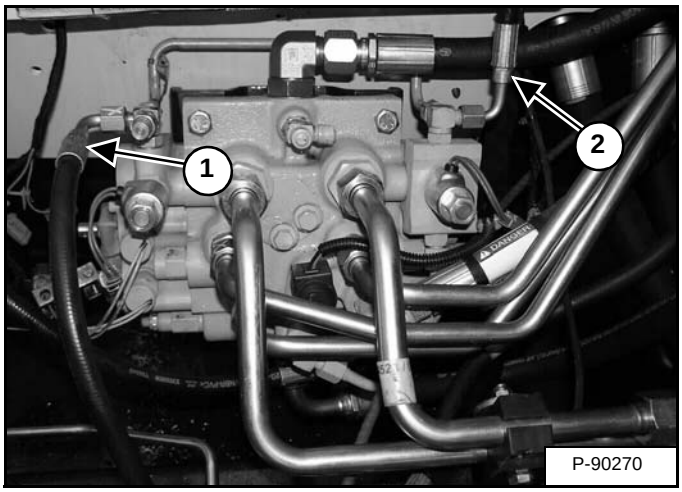


Disconnect the wire harness connectors (Item 1) **[Figure 20-40-4]** from the control valve.

Disconnect the hose (Item 2) **[Figure 20-40-4]** that routes from the control valve to the drain manifold.

Disconnect the hose (Item 3) **[Figure 20-40-4]** that routes from the control valve to the inlet fitting of the hydraulic pump.

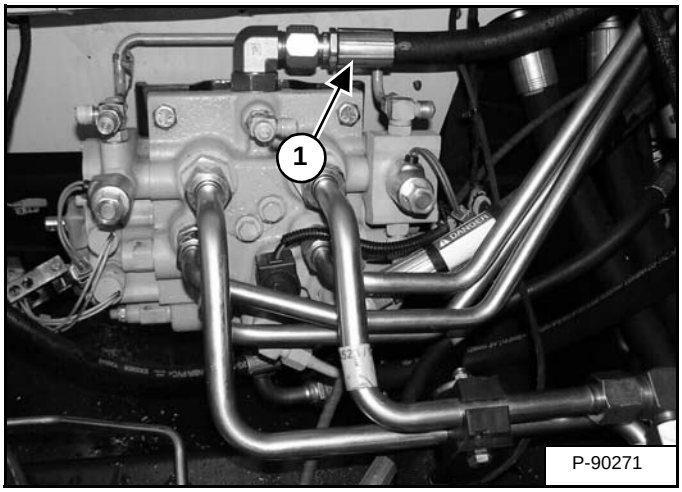
Figure 20-40-5



Disconnect the hose (Item 1) **[Figure 20-40-5]** that routes from the control valve to the brake valve.

Disconnect the hose (Item 2) **[Figure 20-40-5]** that routes from the control valve to the fan motor.

Figure 20-40-6

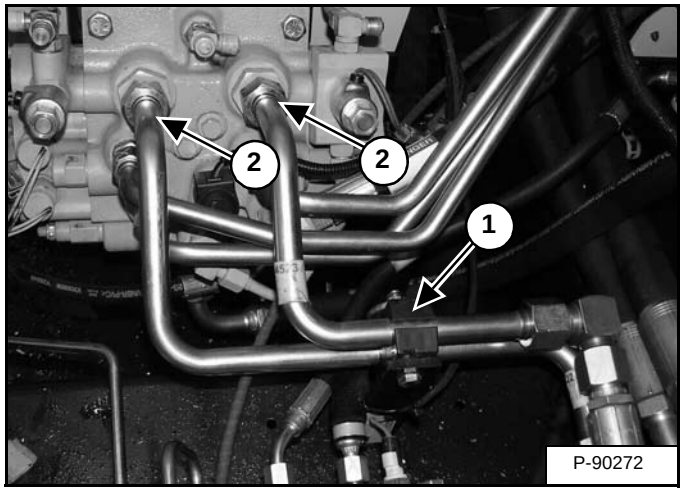


Disconnect the hose (Item 1) **[Figure 20-40-6]** that routes from the top of the control valve to the hydraulic filter.

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Removal And Installation (Cont'd)

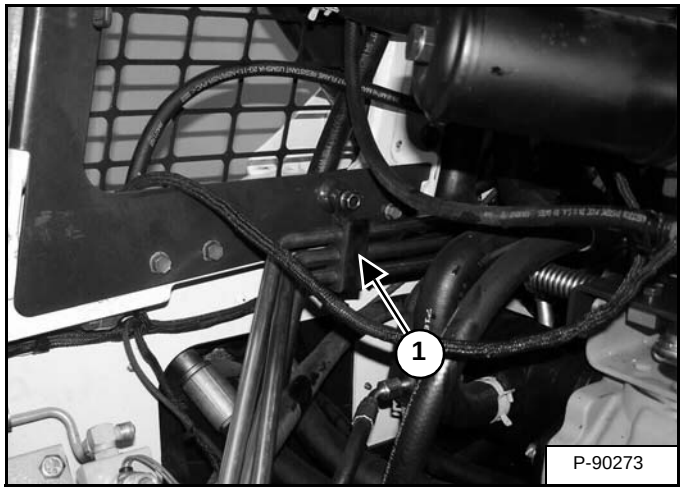
Figure 20-40-7



Remove the tubeline clamp (Item 1) **[Figure 20-40-7]**.

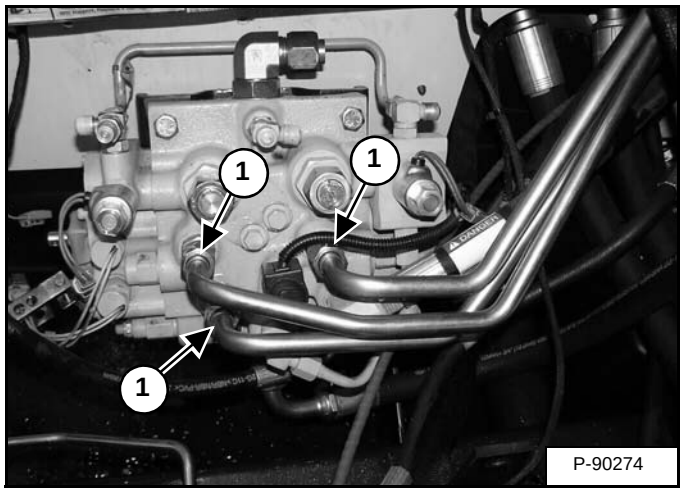
Disconnect the two tubelines (Item 2) **[Figure 20-40-7]** that route from the control valve to the front auxiliary hydraulics.

Figure 20-40-8



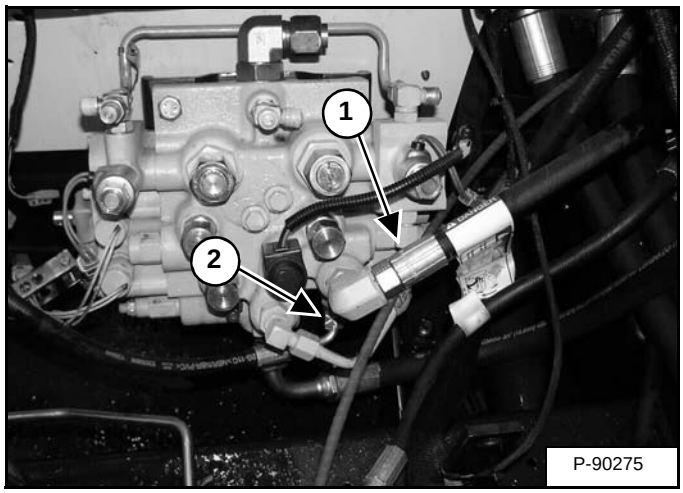
Remove the tubeline clamp (Item 1) **[Figure 20-40-8]**.

Figure 20-40-9



Disconnect the three tubelines (Item 1) **[Figure 20-40-9]** that route from the control valve to the junction block at the rear of the loader.

Figure 20-40-10



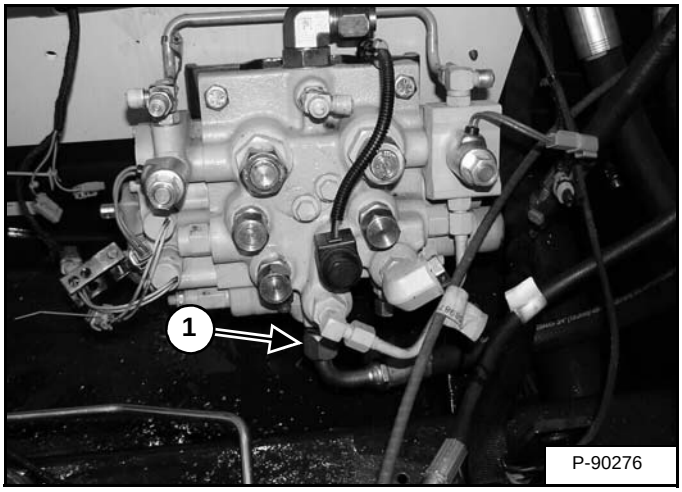
Disconnect the hose (Item 1) **[Figure 20-40-10]** that routes from the control valve to the junction block at the rear of the machine.

Disconnect the lift arm bypass drain hose (Item 2) **[Figure 20-40-10]** from the control valve.

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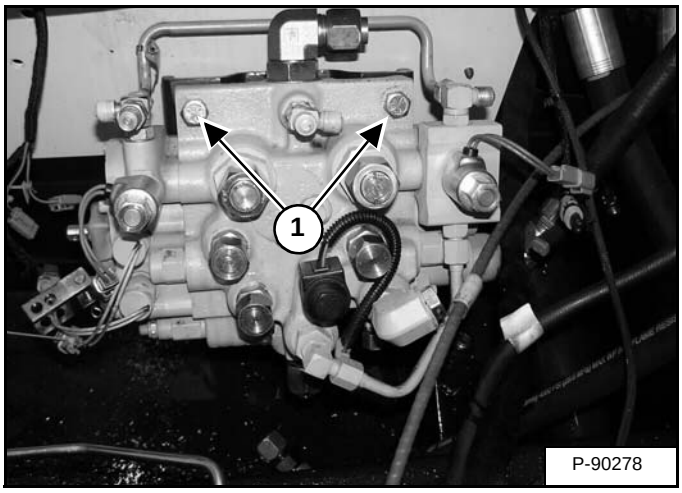
Removal And Installation (Cont'd)

Figure 20-40-11



Disconnect the hose (Item 1) **[Figure 20-40-11]** that routes from the bottom of the control valve to the outlet fitting of the hydraulic pump.

Figure 20-40-12

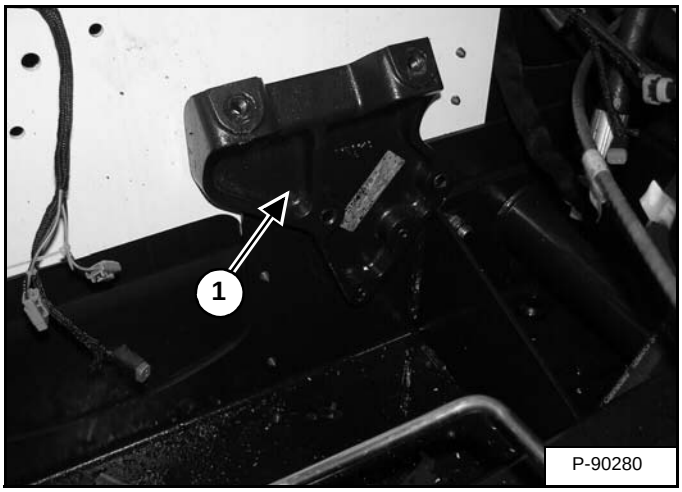


Support the control valve and remove the two bolts (Item 1) **[Figure 20-40-12]**.

Remove the control valve from the loader.

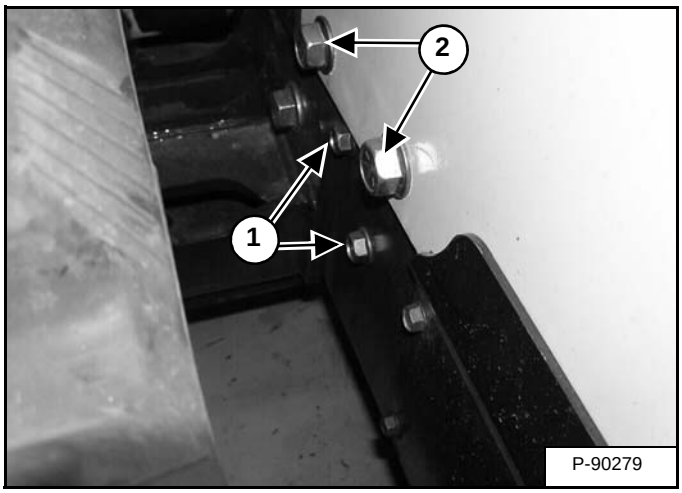
Mount Bracket Removal And Installation

Figure 20-40-13



Support the mounting bracket (Item 1) **[Figure 20-40-13]**.

Figure 20-40-14



Remove the two control valve mount bolts (Item 1) **[Figure 20-40-14]**.

Remove the two frame bolts (Item 2) **[Figure 20-40-14]**

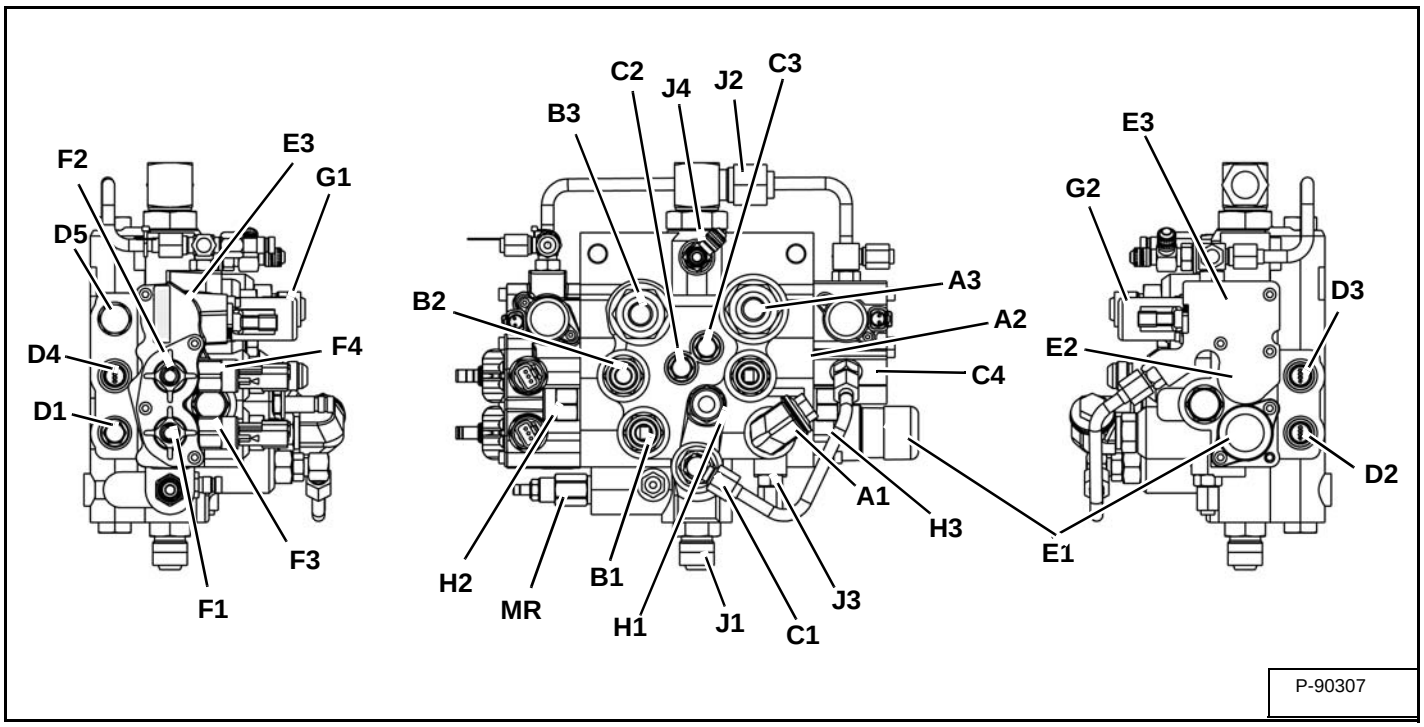
Installation: Torque the two frame bolts (Item 2) **[Figure 20-40-14]** to 406 - 447 N•m (300 - 330 ft-lb).

Remove the control valve bracket from the loader.

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Identification Chart

Figure 20-40-15



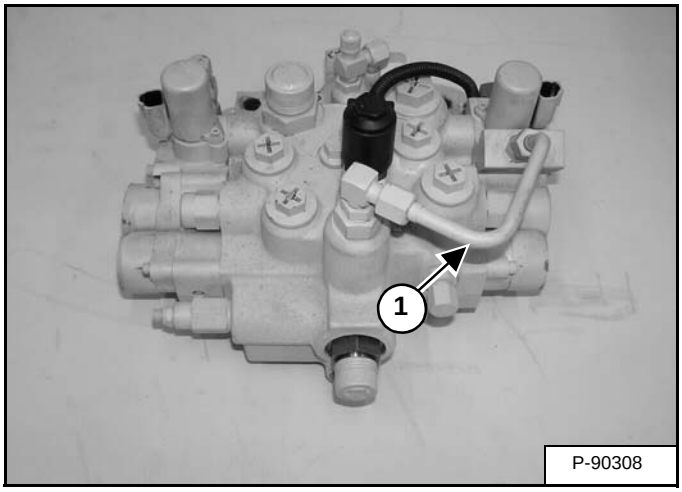
ITEM	S650 LOADER
A1	Lift Cylinder Base End
A2	Tilt Cylinder Base End
A3	Auxiliary Hydraulic Rod End
B1	Lift Cylinder Rod End
B2	Tilt Cylinder Rod End
B3	Auxiliary Hydraulics Base End
C1	Load Check
C2	Load Check Valve Tilt Function
C3	Load Check Valve Auxiliary Function
C4	Check Valve
D1	Anti-Cavitation Valve Lift (Rod End)
D2	Port Relief/Anti-Cavitation Valve – 27,6 MPa (275,8 bar) (4000 psi) Lift (Base End)
D3	Port Relief/Anti-Cavitation Valve – 27,6 MPa (275,8 bar) (4000 psi) Tilt (Base End)
D4	Port Relief/Anti-Cavitation Valve – 27,6 MPa (275,8 bar) (4000 psi) Tilt (Rod End)
D5	Port Relief/Anti-Cavitation Valve (Auxiliary) 27,6 MPa (275,8 bar) (4000 psi) (Optional)

ITEM	S650 LOADER
E1	Lift Spool Detent
E2	Tilt Spool Centering Spring
E3	Auxiliary Spool/Centering Springs
F1	Lift Spool
F2	Tilt Spool
F3	Lift Spool Lock Solenoid
F4	Tilt Spool Lock Solenoid
G1	Auxiliary Solenoid Stem
G2	Auxiliary Solenoid Stem
H1	BICS Solenoid
H2	BICS Lock Valve (Tilt)
H3	BICS Lock Valve (Lift)
J1	Inlet Fluid Flow (From Pump)
J2	Outlet Fluid Flow (Return to Tank)
J3	Lift Arm Bypass Orifice
J4	Drain (Case)
MR	Main Relief Valve – 24,1 MPa (241,3 bar) (3500 psi)

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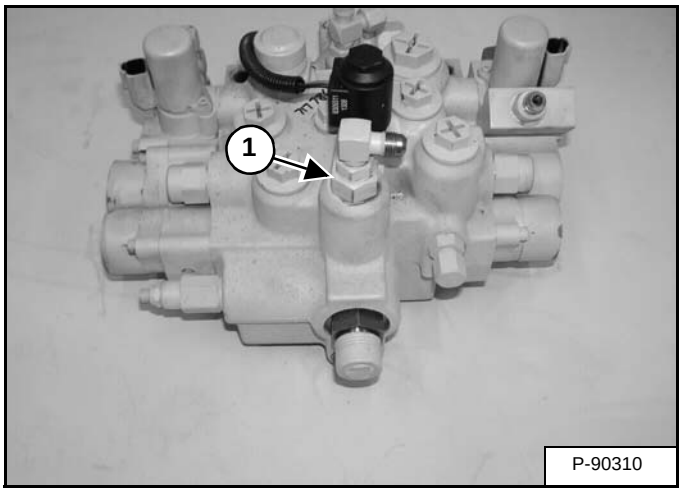
Lift Load Check Valve Removal And Installation

Figure 20-40-16



Remove the charge tubeline (Item 1) **[Figure 20-40-16]** from the BICS valve fitting on the top of the lift load check valve.

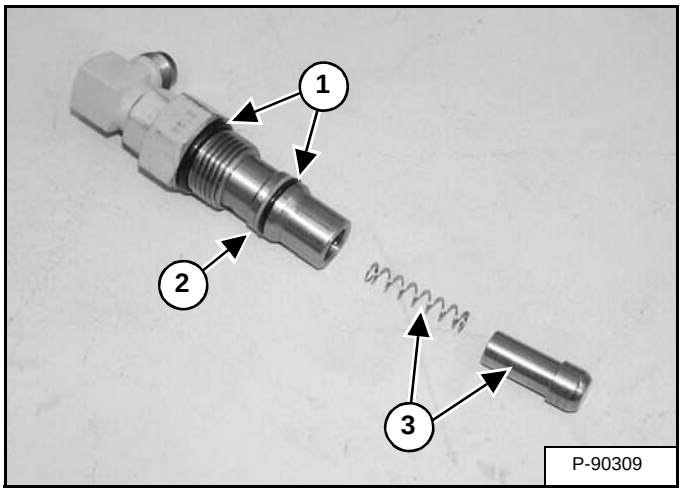
Figure 20-40-17



Remove the lift load check valve (Item 1) **[Figure 20-40-17]** and fitting from the top of the control valve.

Installation: Lubricate the O-ring and threads and tighten to 75 - 88 N•m (55 - 65 ft-lb) torque.

Figure 20-40-18



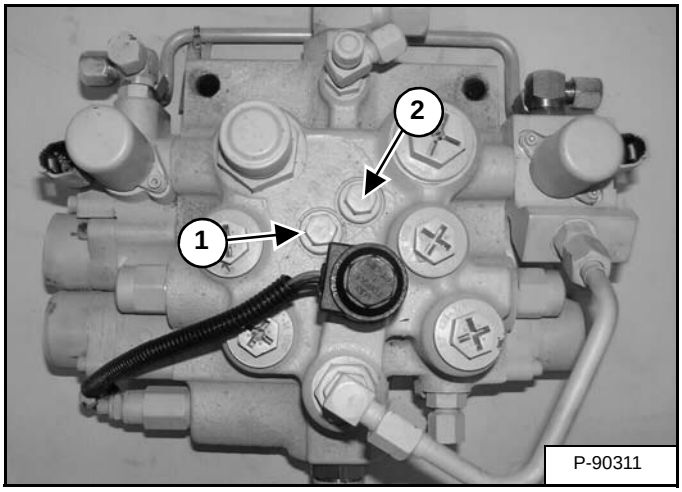
Remove and install new O-rings (Item 1) and back-up ring (Item 2) **[Figure 20-40-18]**.

Check the free movement load check valve and spring (Item 3) **[Figure 20-40-18]**.

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Load Check Valve Removal And Installation (Tilt & Auxiliary)

Figure 20-40-19

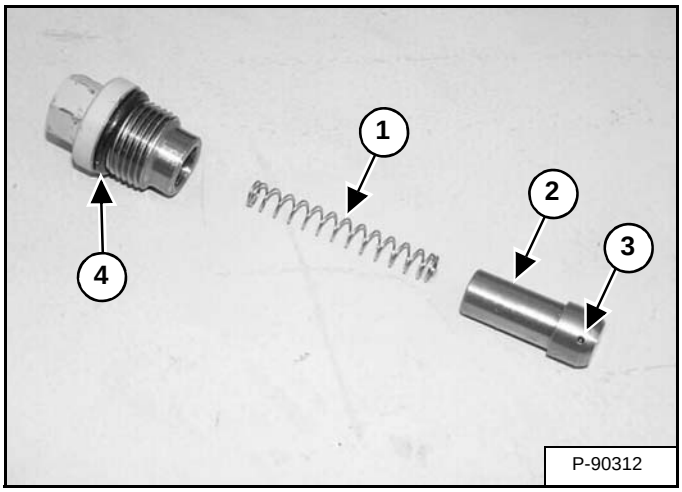


At the front side of the control valve locate the tilt section load check valve (Item 1) **[Figure 20-40-19]**.

At the front side of the control valve locate the auxiliary section load check valve (Item 2) **[Figure 20-40-19]**.

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

Figure 20-40-20



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

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

Installation: Install a new O-ring (Item 4) **[Figure 20-40-20]** on the plug and lightly lubricate with oil before installing. Tighten the plug to 52 - 61 N•m (38 - 45 ft-lb) torque.

IMPORTANT

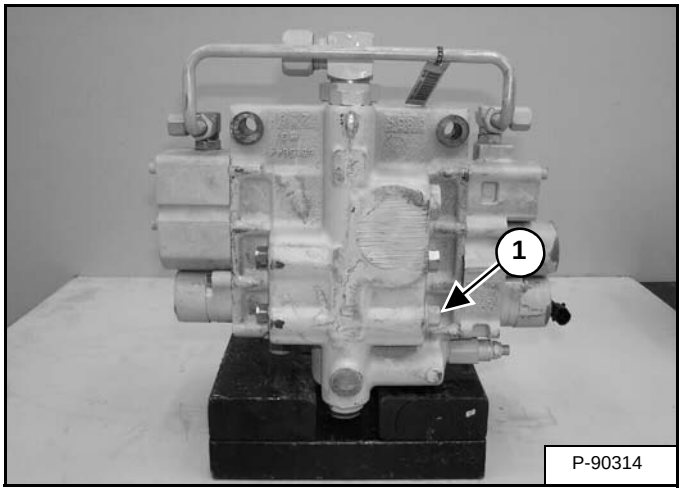
When repairing hydrostatic and hydraulic systems, clean the work area before disassembly and keep all parts clean. Always use caps and plugs on hoses, tubelines and ports to keep dirt out. Dirt can quickly damage the system.

I-2003-0888

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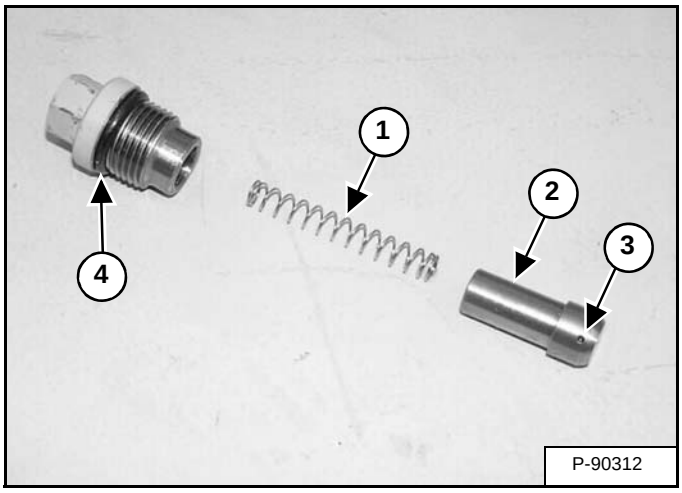
Anti-Cavitation Valve Removal And Installation (Lift, Rod End)

Figure 20-40-21



At the back side of the control valve, remove the lift section anti-cavitation valve (Item 1) **[Figure 20-40-21]**.

Figure 20-40-22



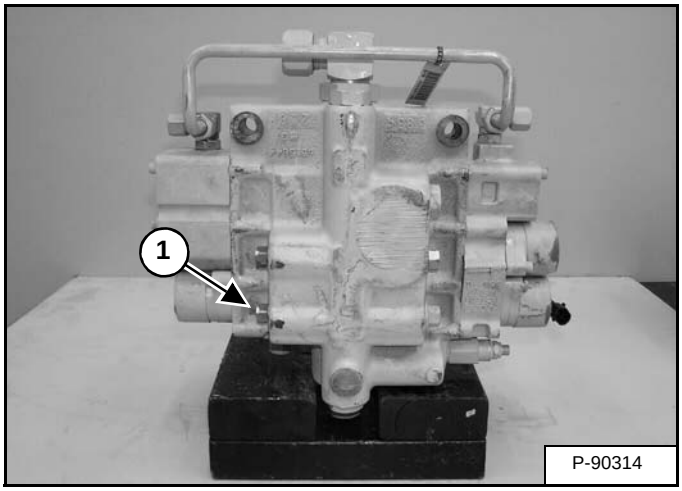
Remove the spring (Item 1) and poppet (Item 2) **[Figure 20-40-22]**.

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

Installation: Install a new O-ring (Item 4) **[Figure 20-40-22]** on the plug and lightly lubricate with oil before installing. Tighten the plug to 52 - 61 N•m (38 - 45 ft-lb) torque.

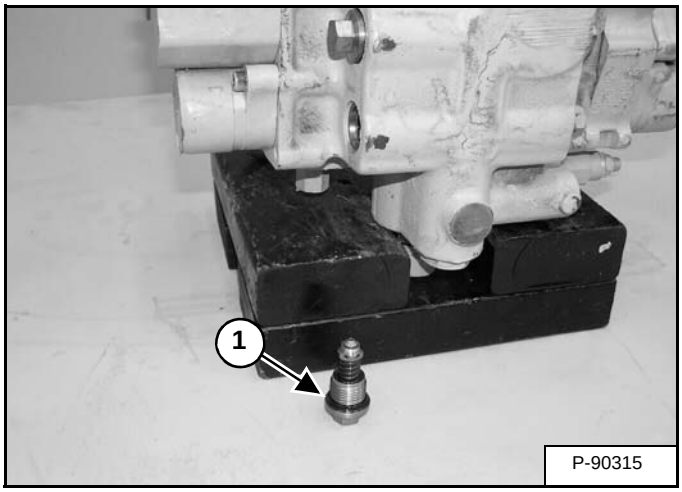
Port Relief / Anti-Cavitation Valve Removal And Installation (Lift, Base End)

Figure 20-40-23



Loosen the lift circuit port relief / anti cavitation valve (Item 1) **[Figure 20-40-23]**.

Figure 20-40-24



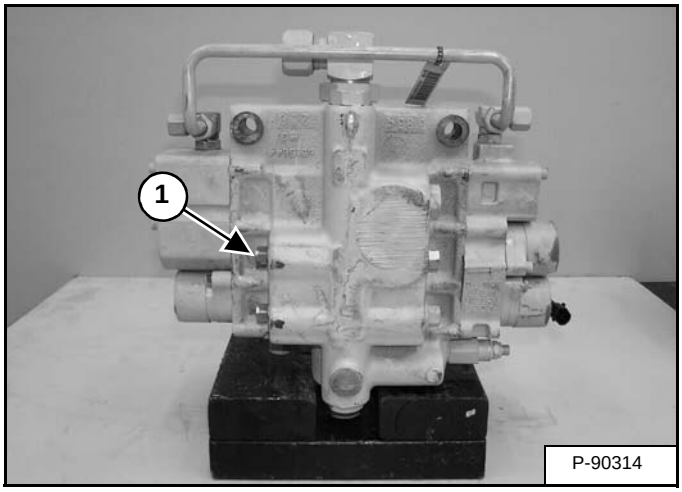
Replace the O-ring (Item 1) **[Figure 20-40-24]** before installation.

Installation: Tighten to 52 - 61 N•m (38 - 45 ft-lb) torque.

Dealer Copy -- Not for Resale

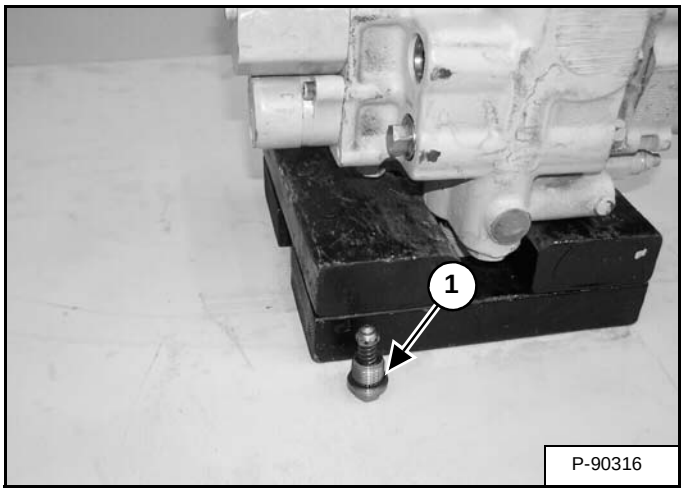
Port Relief / Anti-Cavitation Valve Removal And Installation (Tilt, Base End)

Figure 20-40-25



Remove the tilt port relief / anti cavitation valve (Item 1) **[Figure 20-40-25]** from the base end of the tilt section.

Figure 20-40-26

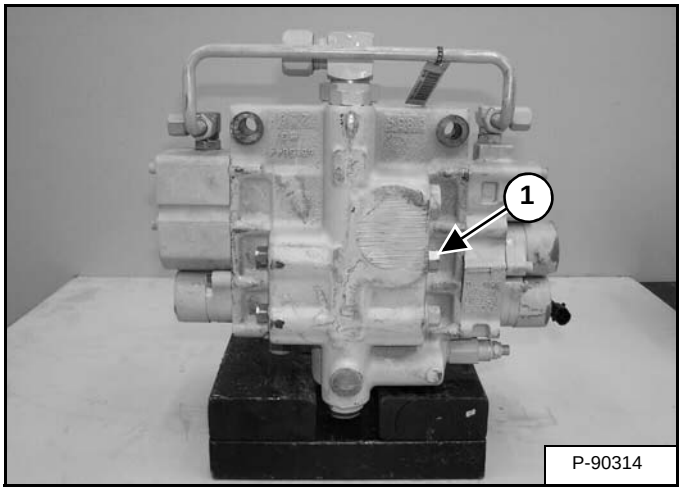


Replace the O-ring (Item 1) **[Figure 20-40-26]** before installation.

Installation: Tighten to 52 - 61 N•m (38 - 45 ft-lb) torque.

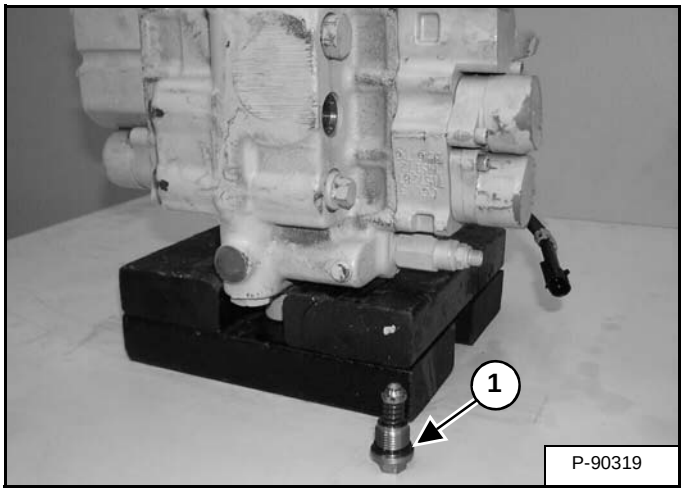
Port Relief / Anti-Cavitation Valve Removal And Installation (Tilt, Rod End)

Figure 20-40-27



Remove the tilt port relief / anti cavitation valve (Item 1) **[Figure 20-40-27]** from the rod end of the tilt section.

Figure 20-40-28



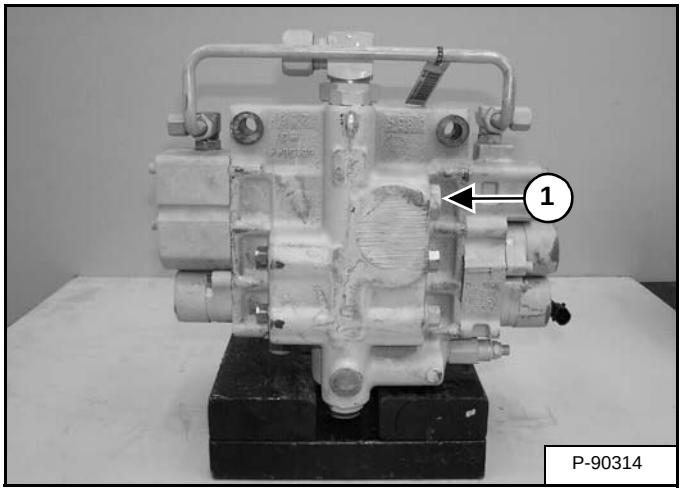
Replace the O-ring (Item 1) **[Figure 20-40-28]** before installation.

Installation: Tighten to 52 - 61 N•m (38 - 45 ft-lb) torque.

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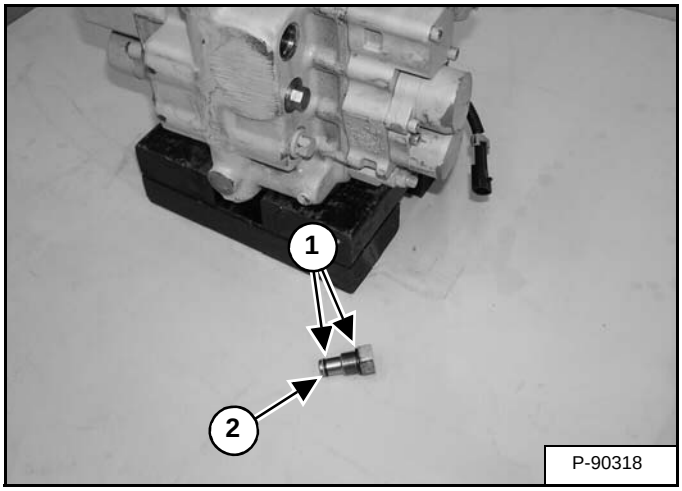
Port Relief Valve Removal And Installation

Figure 20-40-29



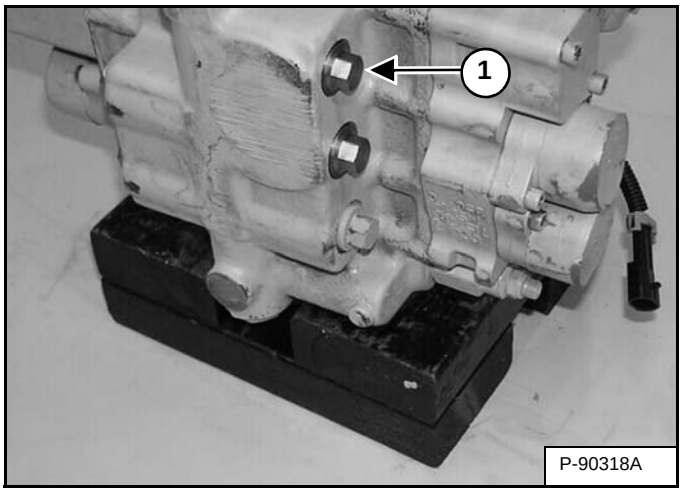
Remove the port relief plug (Item 1) **[Figure 20-40-29]** from the auxiliary circuit of the control valve.

Figure 20-40-30



Installation: Always use new O-rings (Item 1) **[Figure 20-40-30]**. Tighten to 52 - 61 N•m (38 - 45 ft-lb) torque.

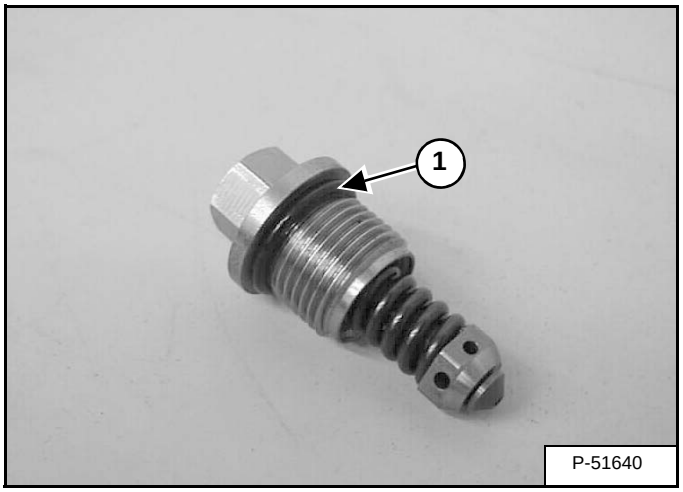
Figure 20-40-31



The control valve may be equipped with an optional auxiliary port relief valve (Item 1) **[Figure 20-40-31]**.

Remove the auxiliary port relief valve.

Figure 20-40-32

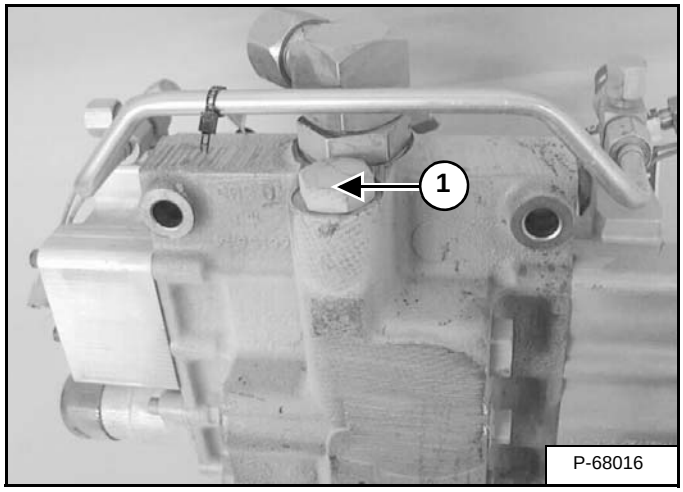


Installation: Always use new O-rings (Item 1) **[Figure 20-40-32]**. Tighten to 52 - 61 N•m (38 - 45 ft-lb) torque.

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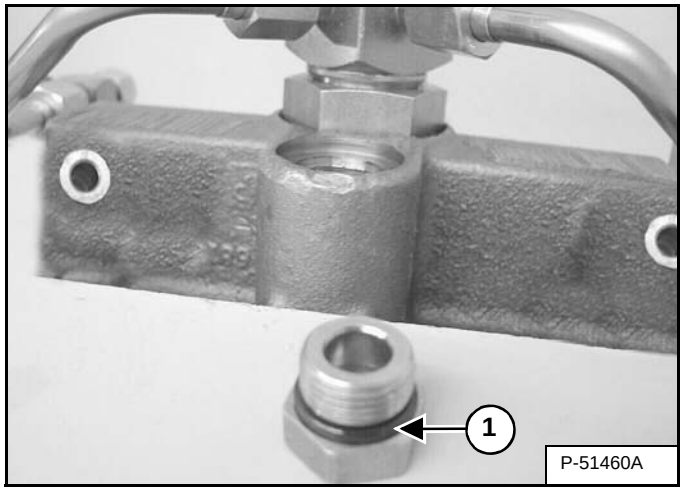
Plug Removal And Installation

Figure 20-40-33



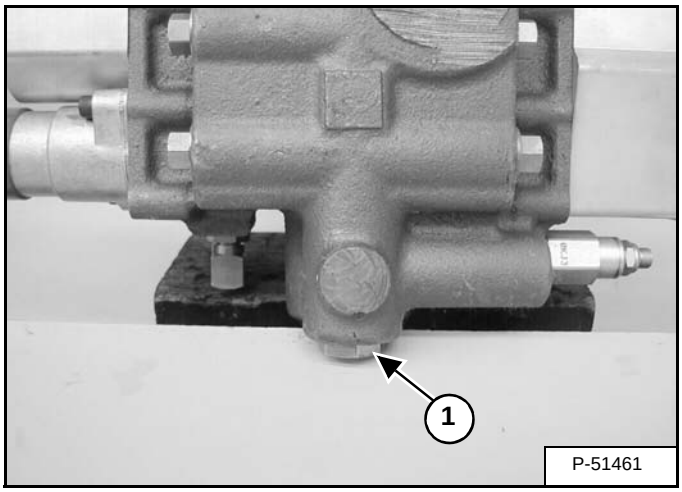
At the top side of the control valve, remove the plug (Item 1) **[Figure 20-40-33]**.

Figure 20-40-34



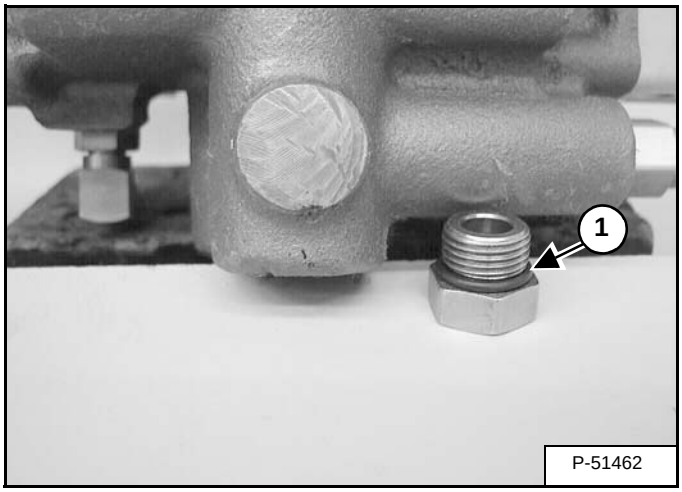
Installation: Always use new O-rings (Item 1) **[Figure 20-40-34]**. Tighten to 54 N•m (40 ft-lb) torque.

Figure 20-40-35



At the bottom side of the control valve remove the plug (Item 1) **[Figure 20-40-35]**.

Figure 20-40-36

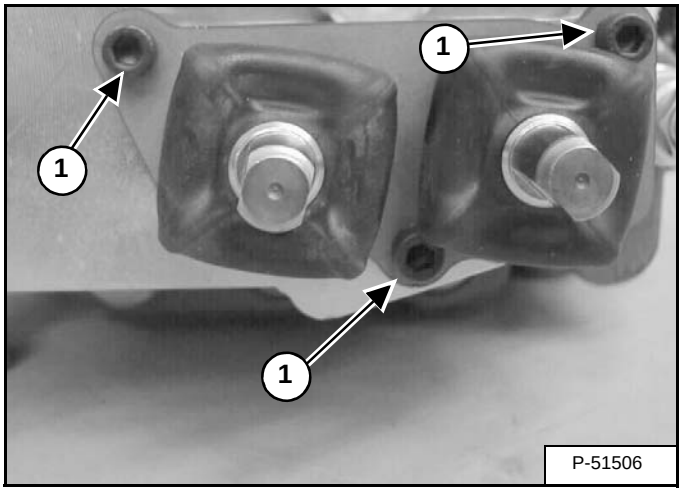


Installation: Always use new O-rings (Item 1) **[Figure 20-40-36]**. Tighten to 54 N•m (40 ft-lb) torque.

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Rubber Boot Removal And Installation

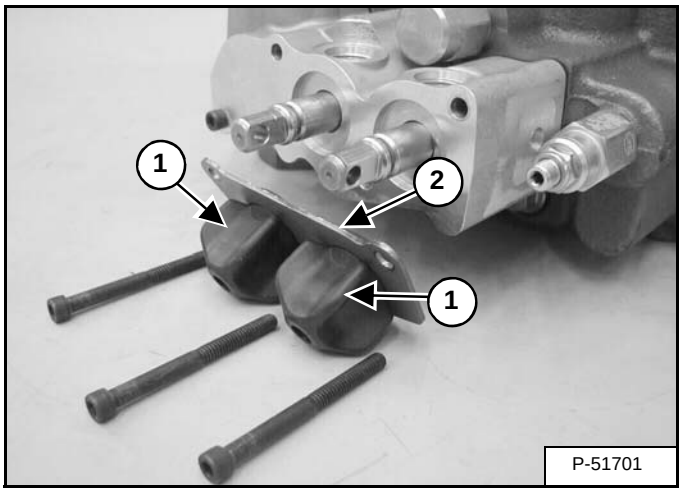
Figure 20-40-37



Remove the three screws (Item 1) **[Figure 20-40-37]** on the rubber boot retainer plate.

Installation: Tighten the screws to 10,2 - 11,3 N•m (90 - 100 in-lb) torque.

Figure 20-40-38

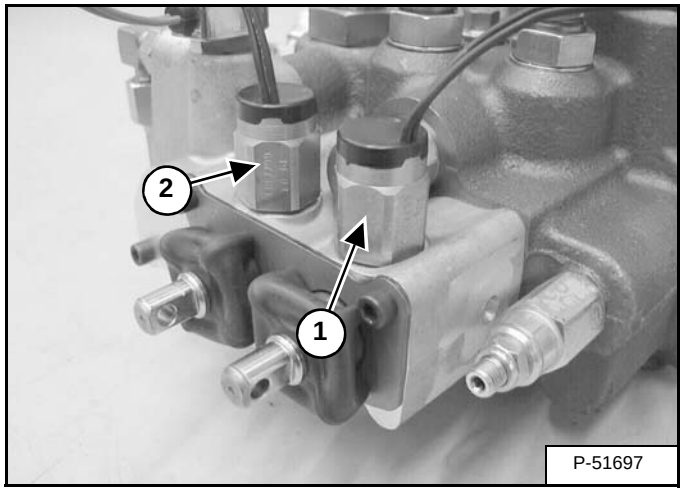


Remove the rubber boots (Item 1) from the retainer plate (Item 2) **[Figure 20-40-38]**.

Dealer Copy -- Not for Resale

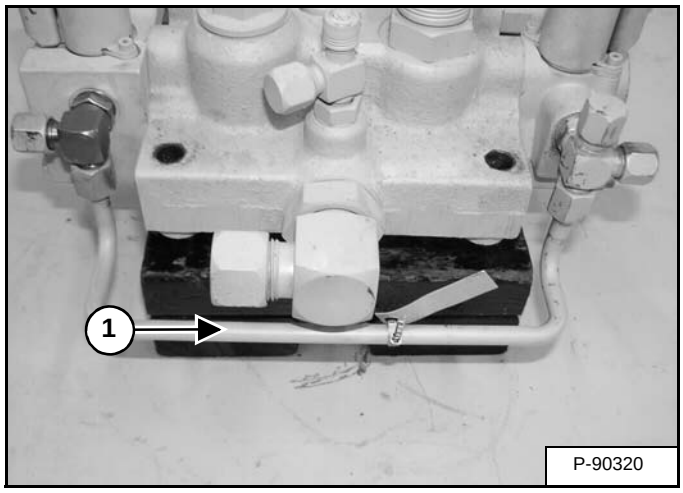
End Cap Block Removal And Installation

Figure 20-40-39



Remove the lift spool lock solenoid (Item 1) and the tilt spool lock solenoid (Item 2) **[Figure 20-40-39]** from the end cap / spool lock block.

Figure 20-40-40



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

Figure 20-40-41

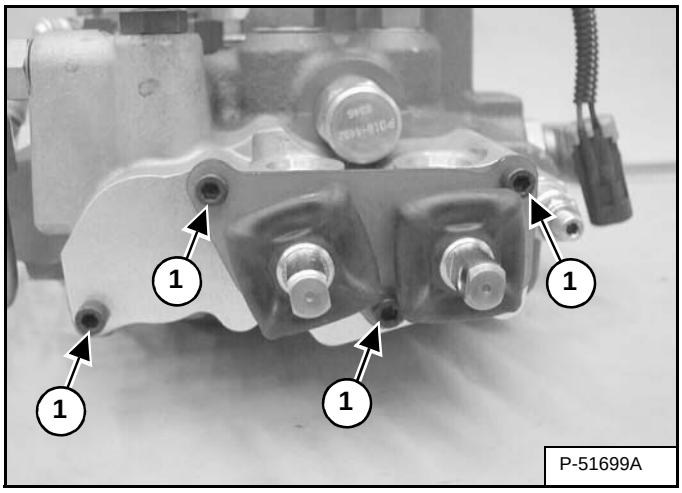
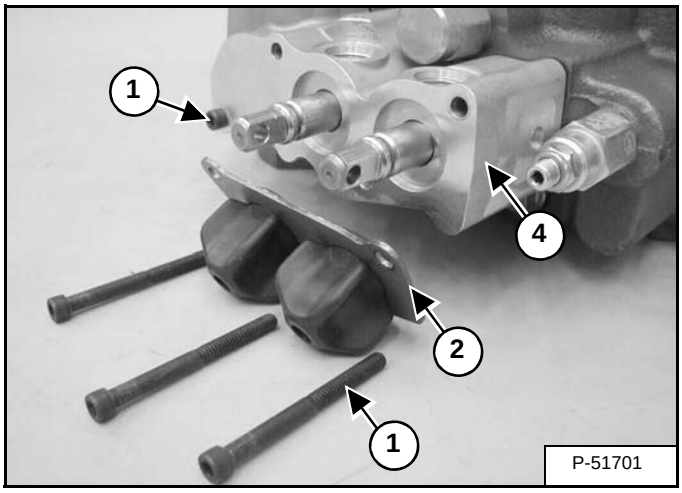


Figure 20-40-42



Remove the four end cap / spool lock block mount screws (Item 1) **[Figure 20-40-41]** and **[Figure 20-40-42]**.

Installation: Tighten the screws to 10,2 - 11,3 N•m (90 - 100 in-lb) torque.

Remove the rubber boots and retainer plate (Item 2) **[Figure 20-40-42]** from the lift and tilt spools.

Remove the end cap / spool lock block (Item 4) **[Figure 20-40-42]** from the control valve.

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HYDRAULIC CONTROL VALVE (STANDARD) (CONT'D)

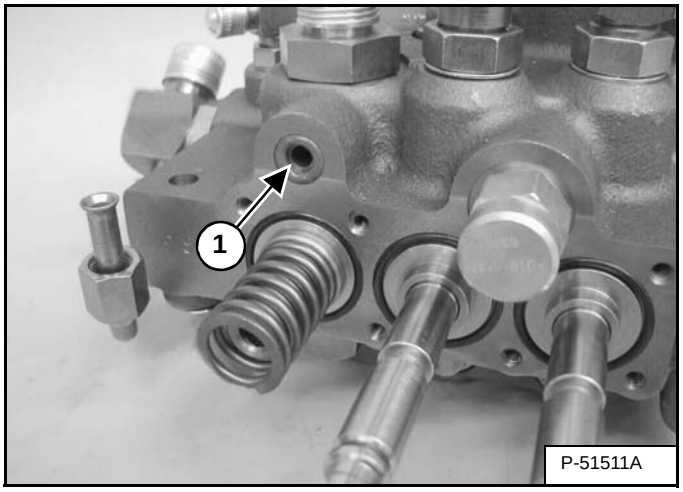
Lift Spool And Detent Removal And Installation

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

MEL1278 - Detent Tool
MEL1285 - Detent Spring Tool

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

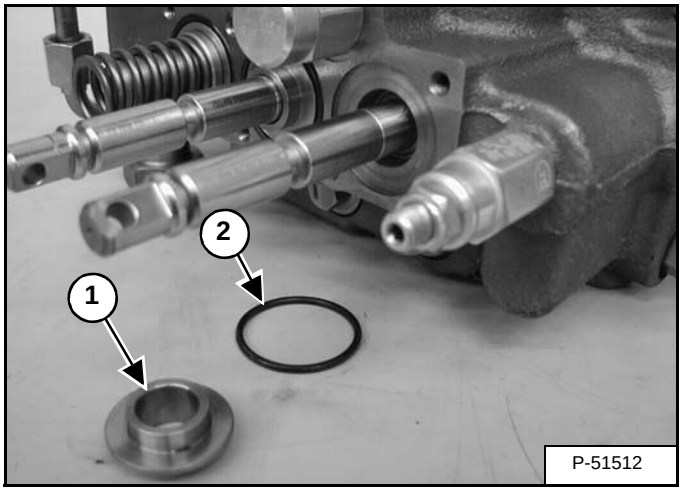
Figure 20-40-43



Remove the O-ring (Item 1) **[Figure 20-40-43]**.

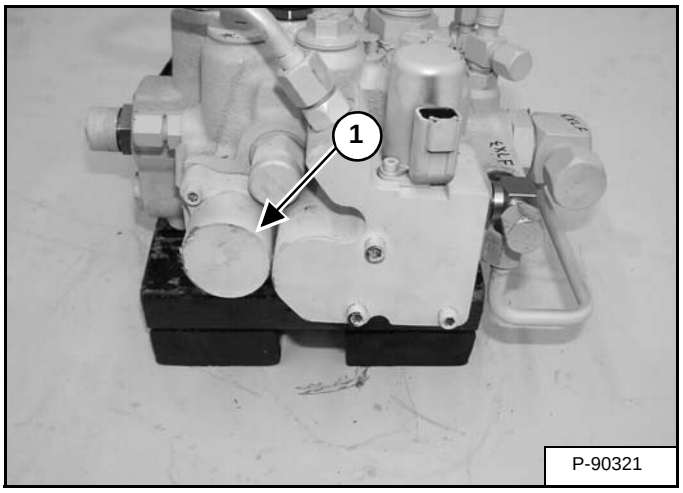
Installation: Replace the O-ring, and lubricate the o-ring lightly with grease or oil before installation of the end cap/ spool lock block.

Figure 20-40-44



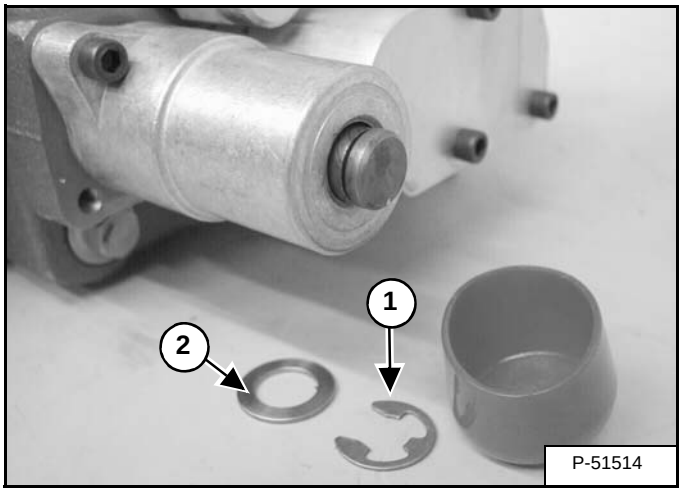
Remove the spacer (Item 1) and O-ring (Item 2) **[Figure 20-40-44]** from the lift spool.

Figure 20-40-45



Remove the end cap (Item 1) **[Figure 20-40-45]**.

Figure 20-40-46



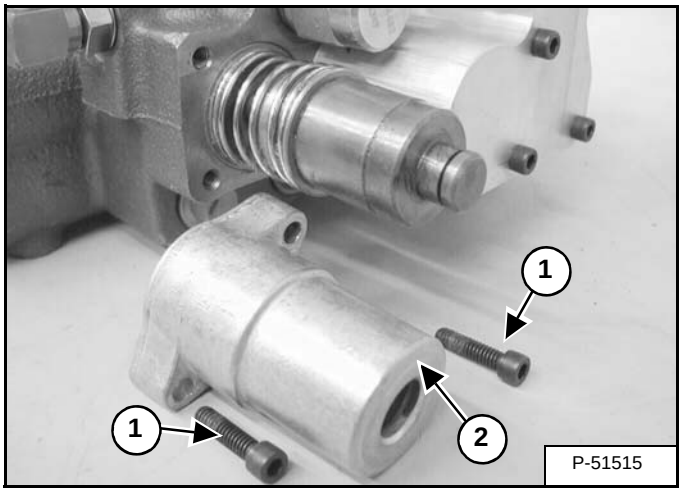
Use a screwdriver to remove the snap ring (Item 1) **[Figure 20-40-46]**.

Remove the washer (Item 2) **[Figure 20-40-46]**.

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

Figure 20-40-47



Remove the screws (Item 1) **[Figure 20-40-47]** from the detent bonnet.

Remove the detent bonnet (Item 2) **[Figure 20-40-47]**.

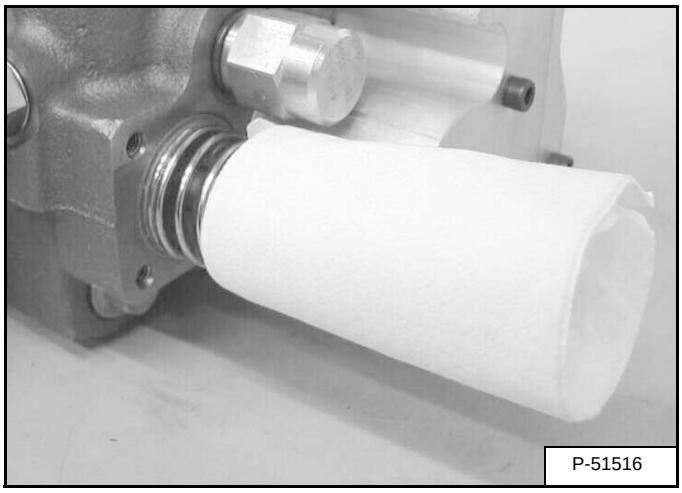
Installation: Lubricate the screws and tighten to 10,2 - 11,3 N•m (90 - 100 in-lb) torque.

IMPORTANT

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

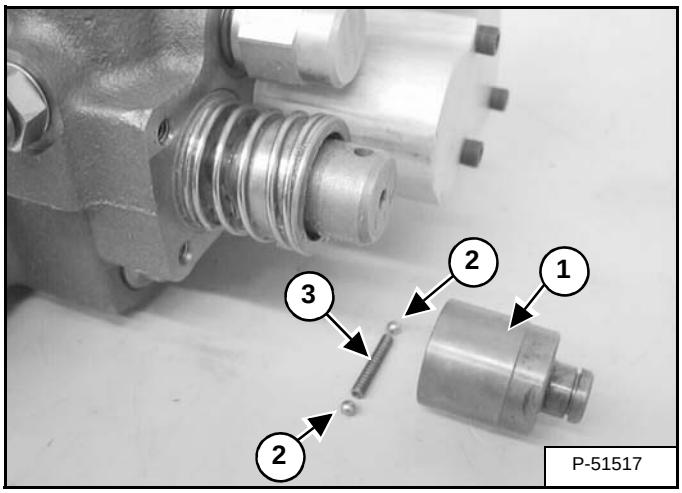
I-2012-0284

Figure 20-40-48



Put a rag around the detent assembly **[Figure 20-40-48]**. This will prevent the detent balls and spring from being lost when the detent sleeve is removed.

Figure 20-40-49

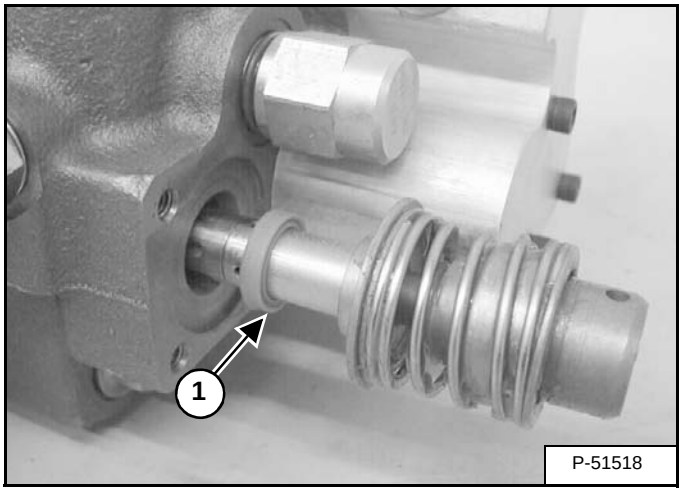


Remove the detent sleeve (Item 1), detent balls (Item 2) and spring (Item 3) **[Figure 20-40-49]**.

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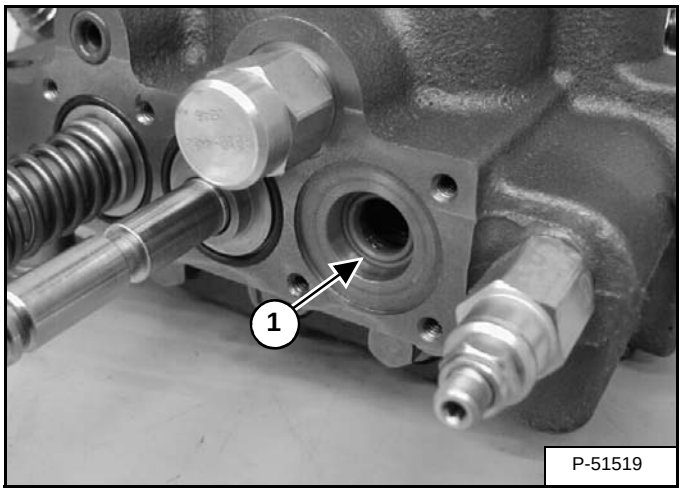
Lift Spool And Detent Removal And Installation (Cont'd)

Figure 20-40-50



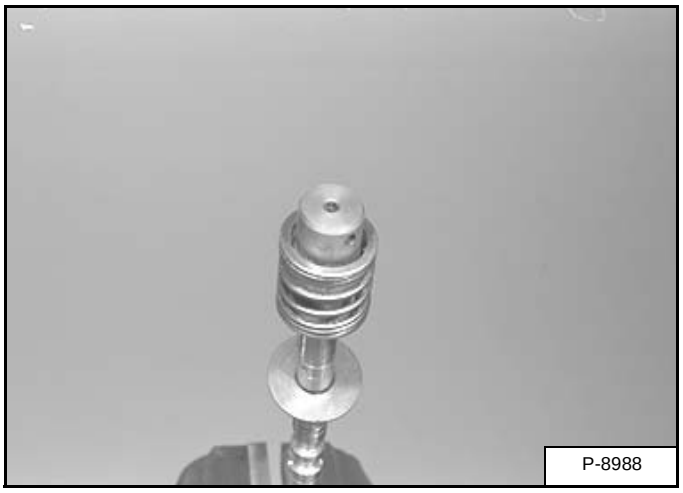
Remove the lift spool assembly and seal (Item 1) **[Figure 20-40-50]** from the control valve.

Figure 20-40-51



Remove the lift spool seal (Item 1) **[Figure 20-40-51]** from the linkage end of the valve.

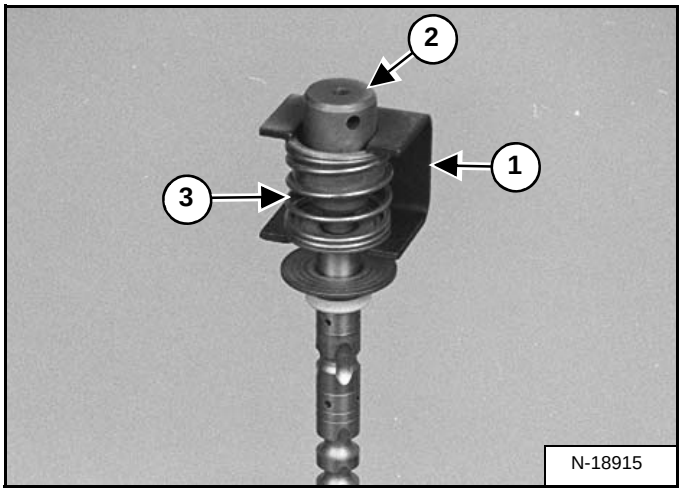
Figure 20-40-52



Clamp the linkage end of the spool in a vise **[Figure 20-40-52]**.

NOTE: Protect spool before clamping in vise.

Figure 20-40-53



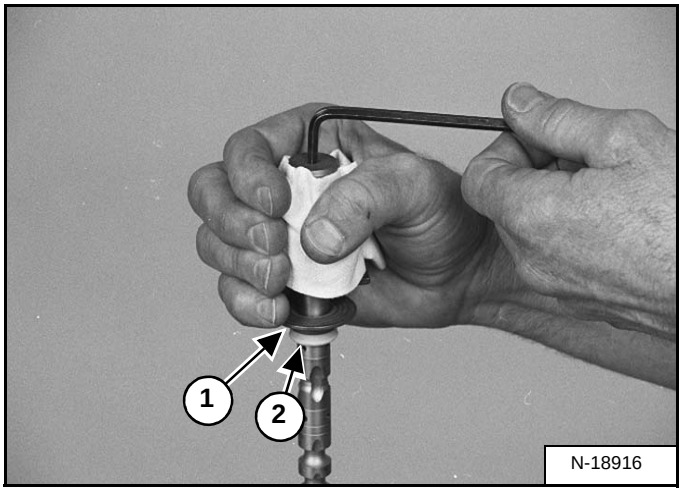
Install the spring tool (Item 1) **[Figure 20-40-53]** over the centering spring.

NOTE: Be careful when removing the detent adapter (Item 2) [Figure 20-40-53] from the centering spring, as it is under spring pressure.

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

Figure 20-40-54

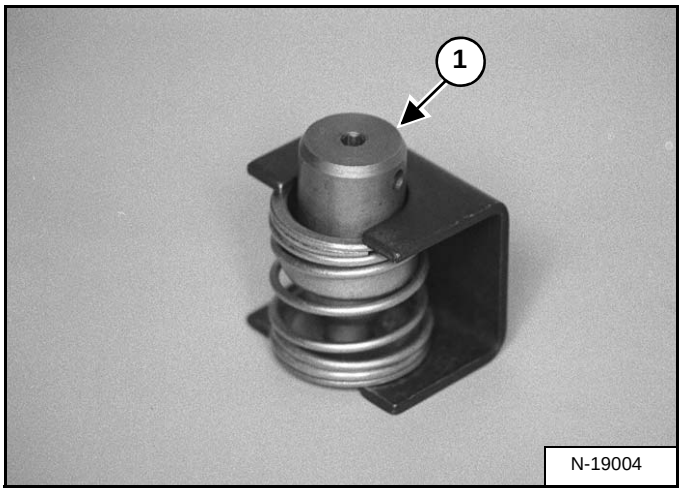


Put a rag around the detent assembly **[Figure 20-40-54]**. This will prevent the detent balls and spring from being lost when the detent adapter is removed.

Remove the detent adapter with an Alan wrench.

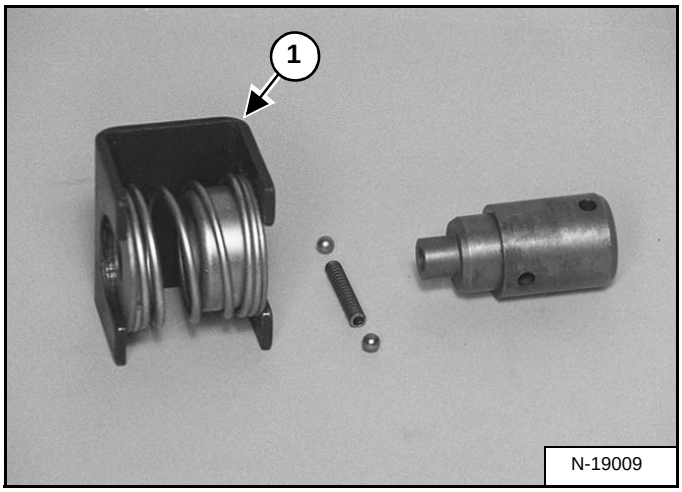
Remove the back-up washer (Item 1) and spool seal (Item 2) **[Figure 20-40-54]**.

Figure 20-40-55



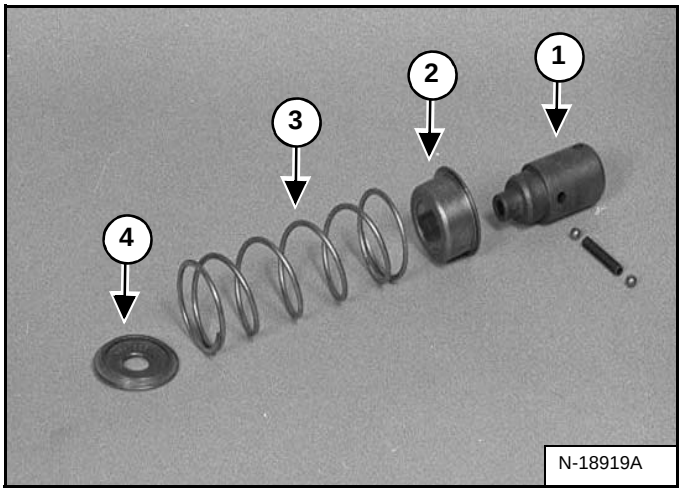
Remove the detent adapter (Item 1) **[Figure 20-40-55]** from the spring assembly.

Figure 20-40-56



Remove spring tool (Item 1) **[Figure 20-40-56]** from the spring assembly.

Figure 20-40-57

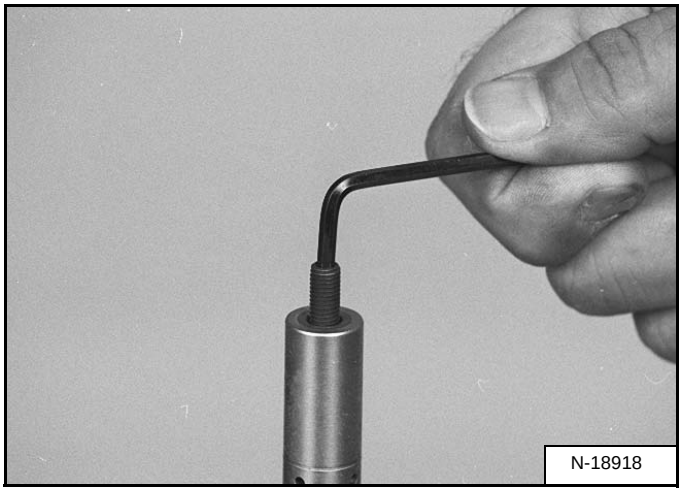


Inspect the adapter (Item 1), collar (Item 2), spring (Item 3) and washer (Item 4) **[Figure 20-40-57]**.

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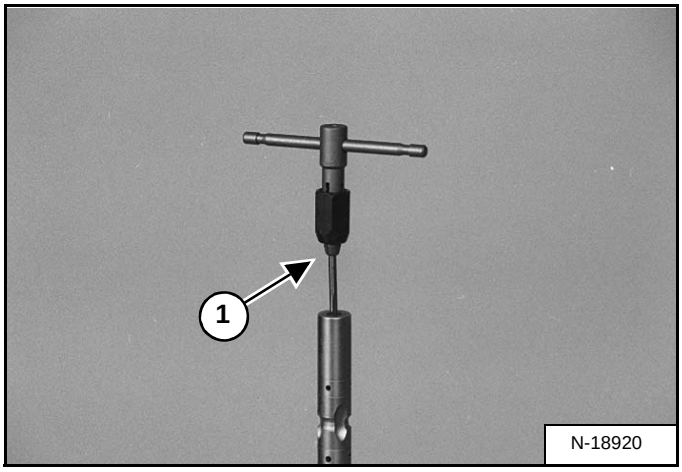
Lift Spool And Detent Removal And Installation (Cont'd)

Figure 20-40-58



Remove the stud from the end of the spool **[Figure 20-40-58]**.

Figure 20-40-59



Removal of the plastic plug:

Make a center point in the plug using a 1,6 mm (1/16 in) drill.

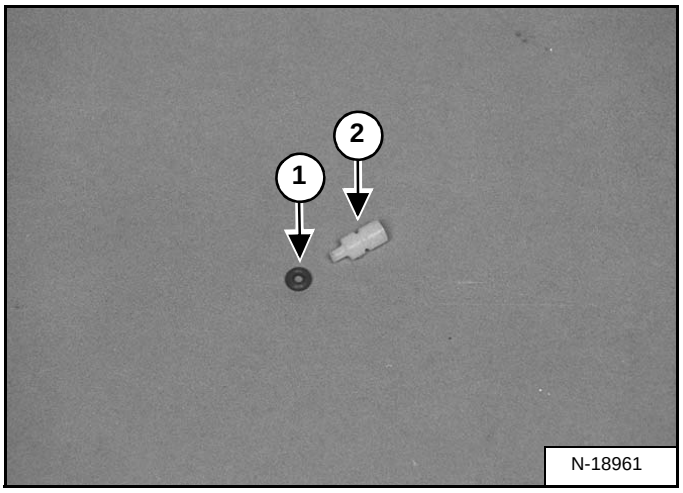
Drill a hole all the way through the plug using a 2,8 mm (7/64 in) tap drill

Turn a 6-32 tap (Item 1) **[Figure 20-40-59]** into the plug. Pull the tap and plug out of the spool. Be careful, do not break the tap.

Clean all the debris from inside the spool bore.

NOTE: DO NOT USE Loctite® ON THE STUD THREADS.

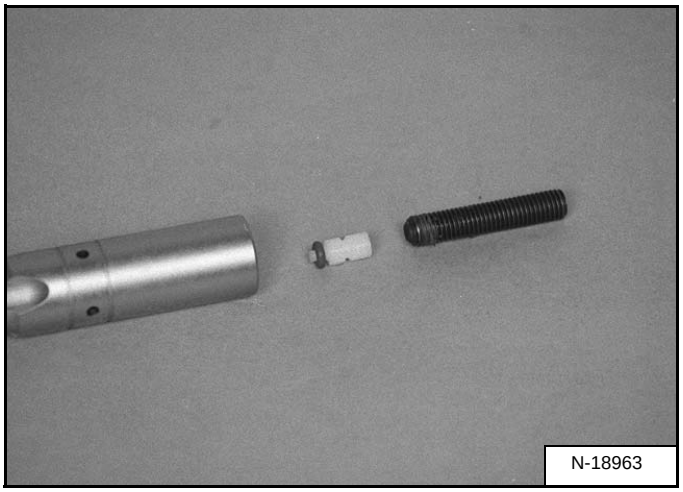
Figure 20-40-60



Install the O-ring (Item 1) over the nipple on the plastic plug (Item 2) **[Figure 20-40-60]**.

NOTE: Check the O-ring for damage. The lift spool will have an internal leak if there is damage to this O-ring. Always replace the O-ring and recheck the lift spool before the control valve is replaced.

Figure 20-40-61

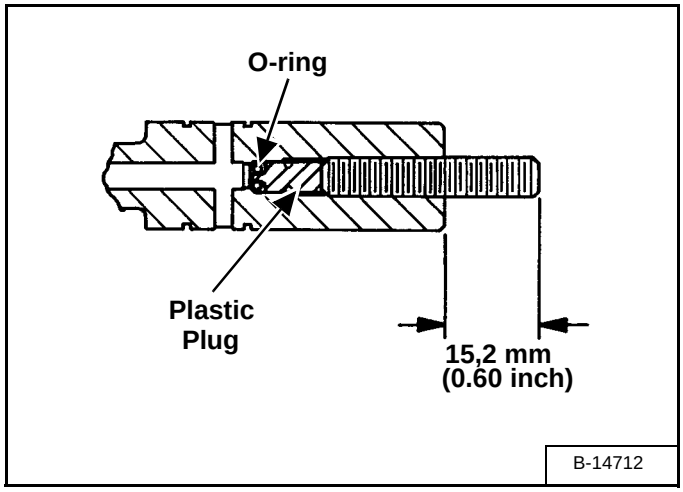


Install the plastic plug and O-ring in the spool **[Figure 20-40-61]**.

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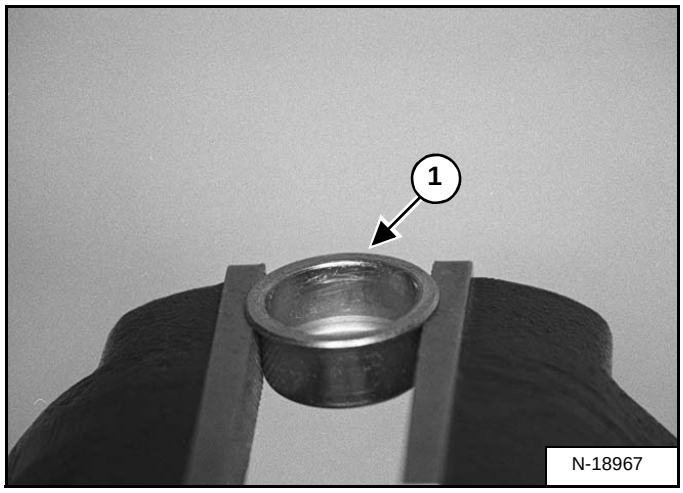
Lift Spool And Detent Removal And Installation (Cont'd)

Figure 20-40-62



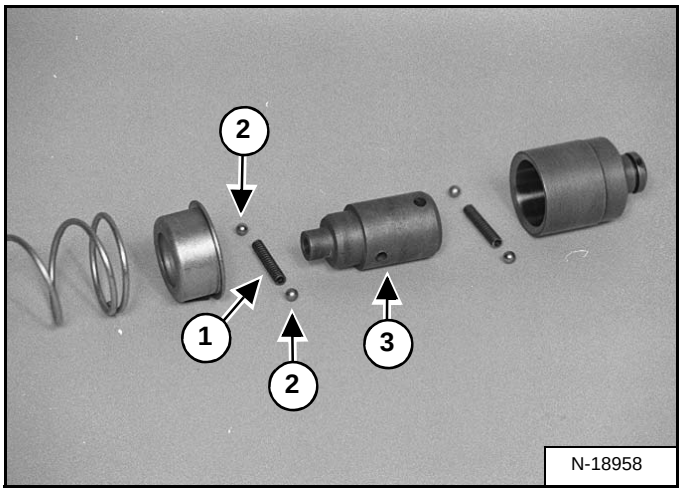
Install the stud and tighten until the other end of the stud is out about 15,2 mm (0.600 in) from the spool **[Figure 20-40-62]**.

Figure 20-40-63



Clamp the collar (Item 1) **[Figure 20-40-63]** in a vice.

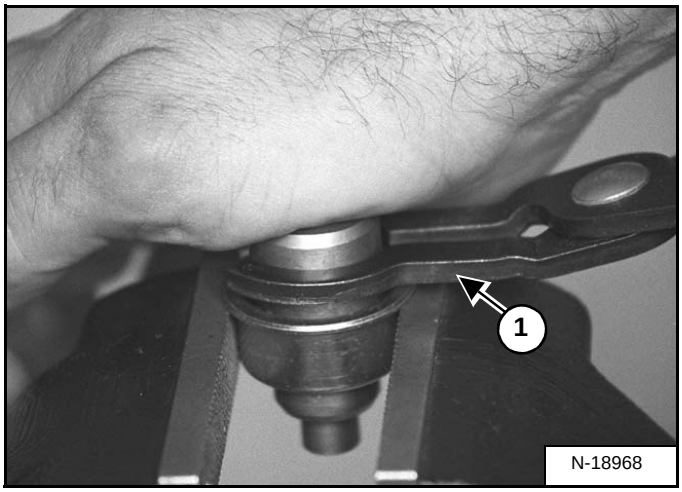
Figure 20-40-64



Apply grease on all the detent component surfaces before assembly **[Figure 20-40-64]**.

Install the spring (Item 1) **[Figure 20-40-64]** and detent balls (Item 2) **[Figure 20-40-64]** into the adapter (Item 3) **[Figure 20-40-64]** and compress with the detent pliers (Item 1) **[Figure 20-40-65]**.

Figure 20-40-65



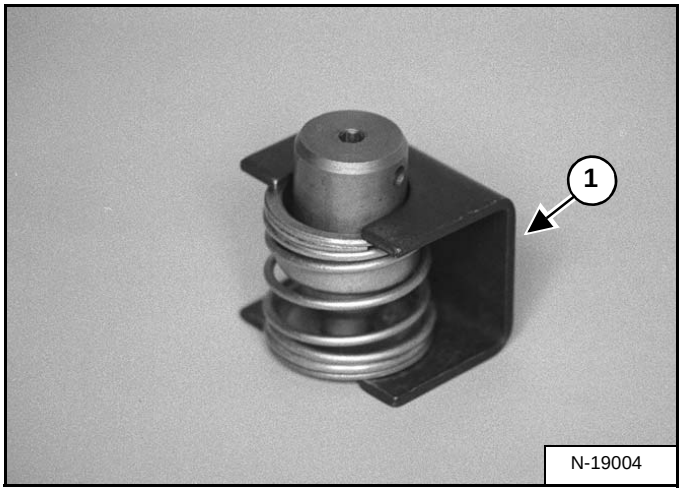
Install the detent adapter to the collar **[Figure 20-40-65]**.

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.

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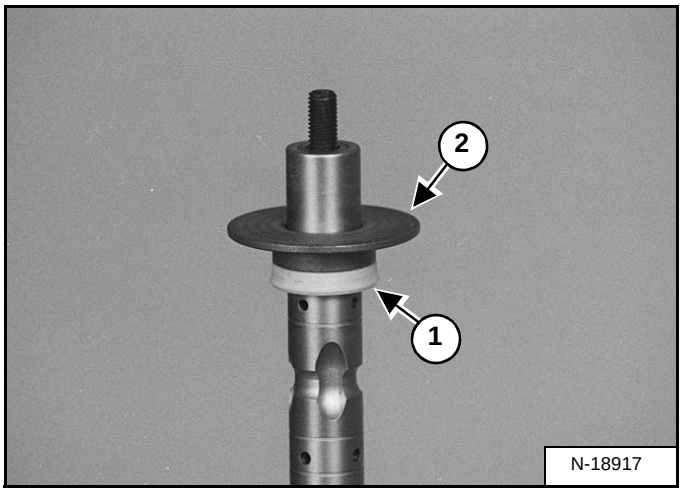
Lift Spool And Detent Removal And Installation (Cont'd)

Figure 20-40-66



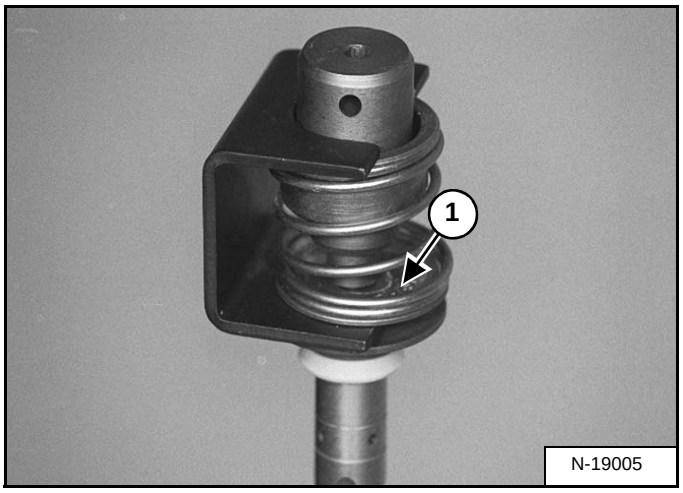
Install the spring tool (Item 1) **[Figure 20-40-66]** over the washer, spring, collar and detent adapter.

Figure 20-40-67



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

Figure 20-40-68



Install the spring assembly to the lift spool hand tight **[Figure 20-40-68]**.

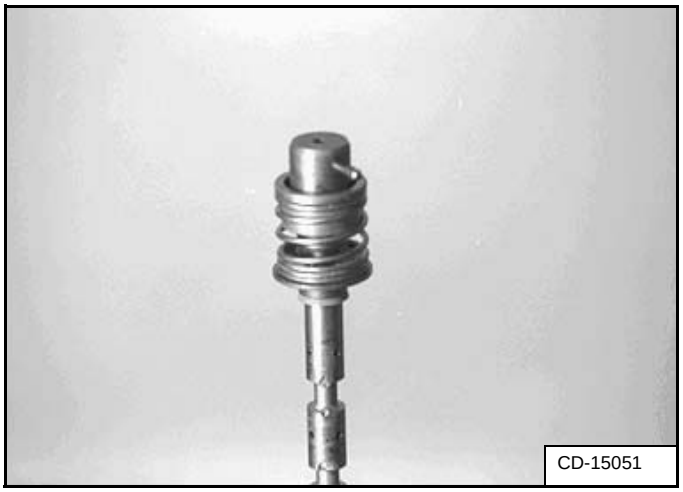
Remove the spring tool.

Check the alignment of the detent adapter and the washer.

Tighten the adapter to 10,2 - 11,3 N•m (90 - 100 in-lb).

NOTE: The adapter must fit in the center of the washer (Item 1) [Figure 20-40-68].

Figure 20-40-69

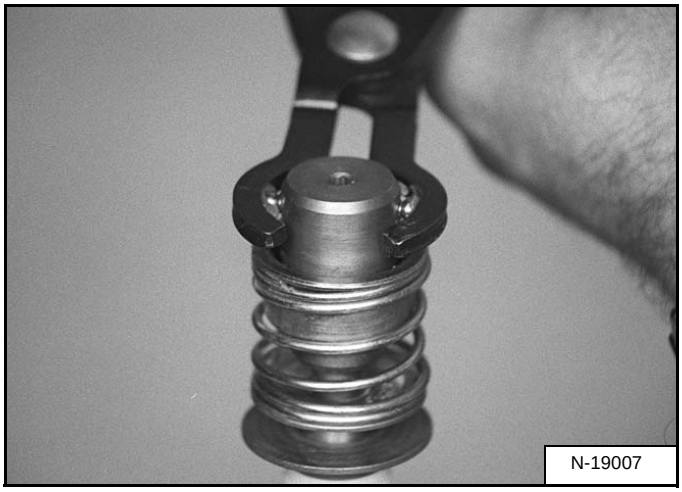


Install the detent balls and spring **[Figure 20-40-69]**.

Dealer Copy -- Not for Resale

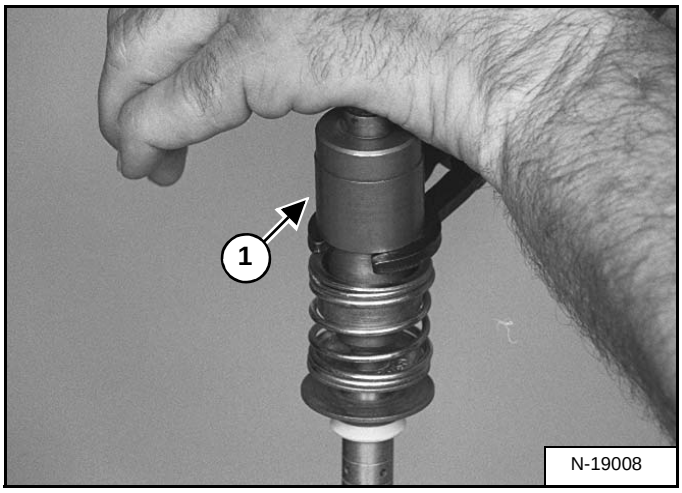
Lift Spool And Detent Removal And Installation (Cont'd)

Figure 20-40-70



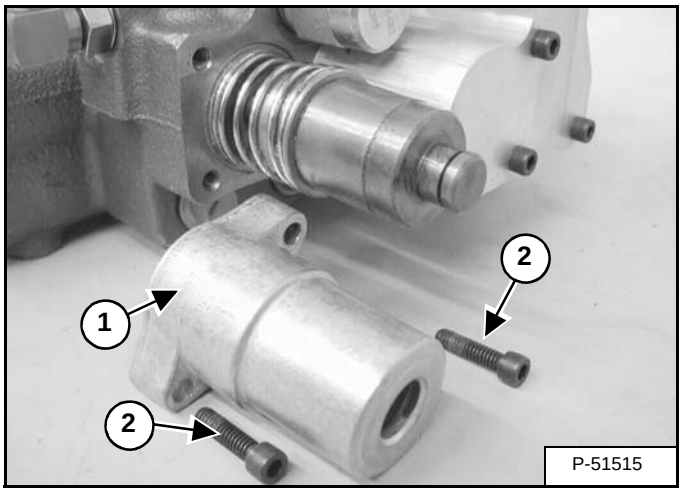
Hold the detent balls in place with the detent pliers **[Figure 20-40-70]**.

Figure 20-40-71



Install the detent sleeve (Item 1) **[Figure 20-40-71]** to the detent adapter.

Figure 20-40-72



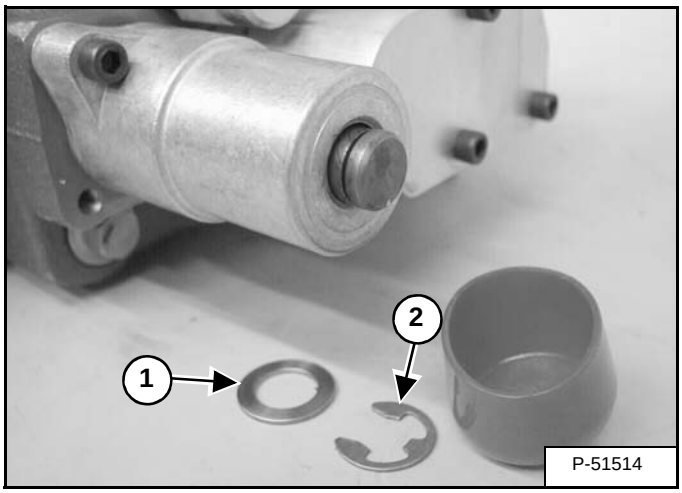
Install the lift spool assembly in the spool bore **[Figure 20-40-72]**.

Install the detent bonnet (Item 1) **[Figure 20-40-72]**.

Install the mounting screws (Item 2) **[Figure 20-40-72]**.

Installation: Lubricate the screws and tighten to 10,2 - 11,3 N•m (90 - 100 in-lb) torque.

Figure 20-40-73

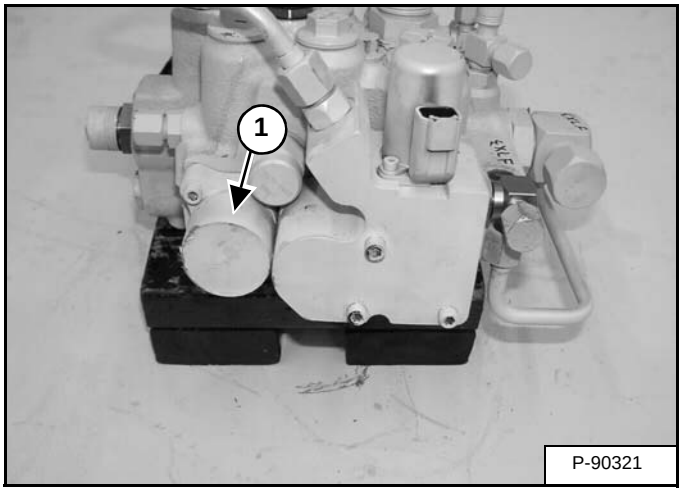


Install the washer (Item 1) and snap ring (Item 2) **[Figure 20-40-73]**.

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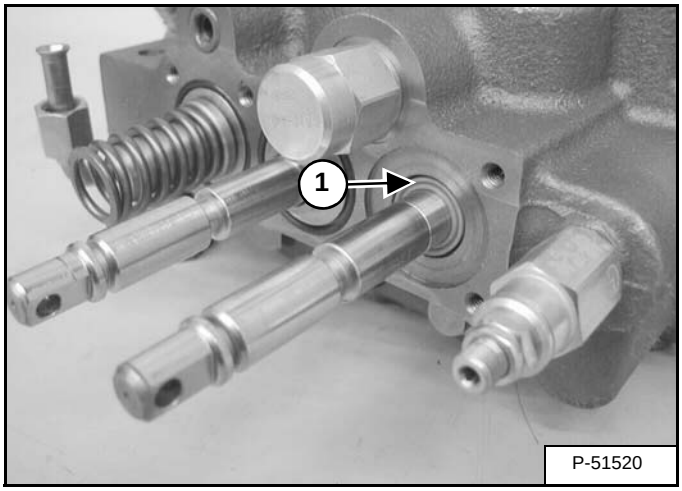
Lift Spool And Detent Removal And Installation (Cont'd)

Figure 20-40-74



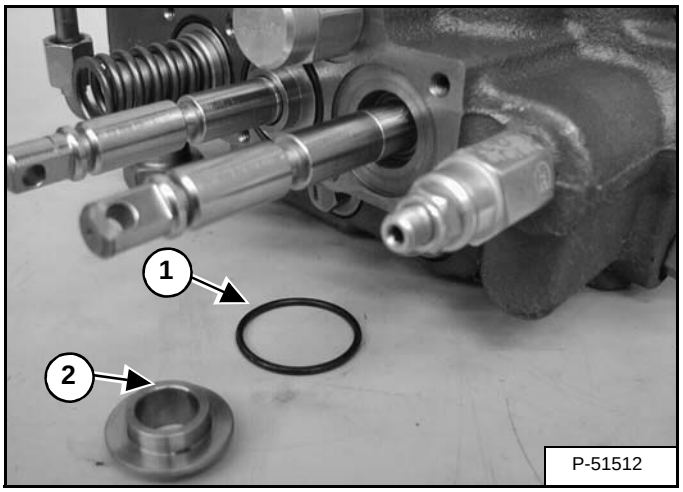
Install the end cap (Item 1) **[Figure 20-40-74]**.

Figure 20-40-75



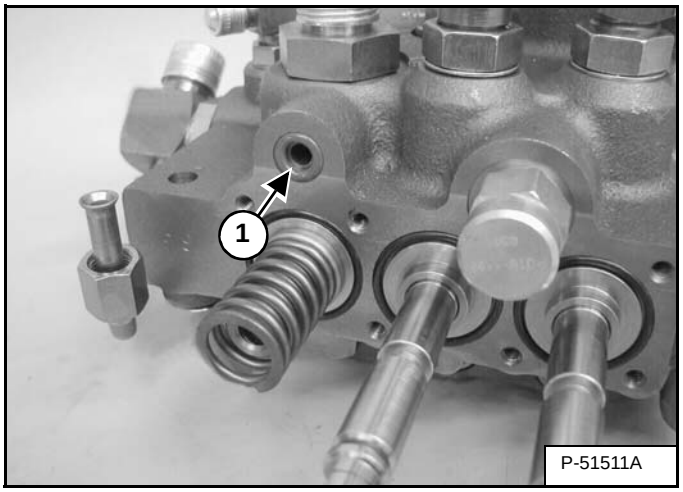
Install the spool seal (Item 1) **[Figure 20-40-75]** on the linkage end of the valve.

Figure 20-40-76



Install the O-ring (Item 1) and bushing (Item 2) **[Figure 20-40-76]** on the lift spool.

Figure 20-40-77

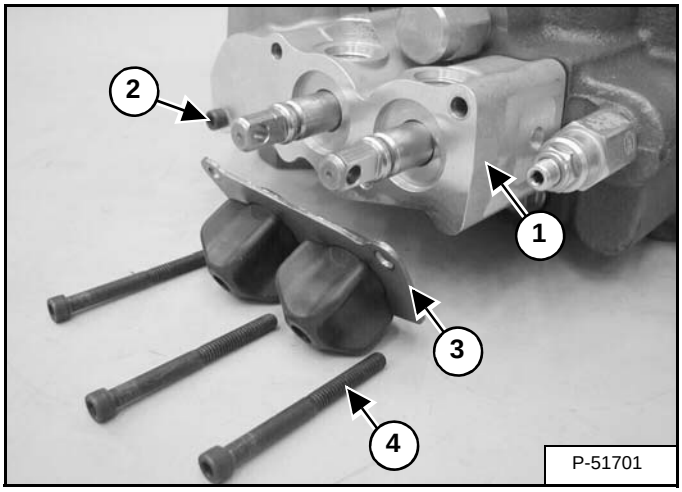


Install the O-ring (Item 1) **[Figure 20-40-77]** on the control valve.

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

Figure 20-40-78

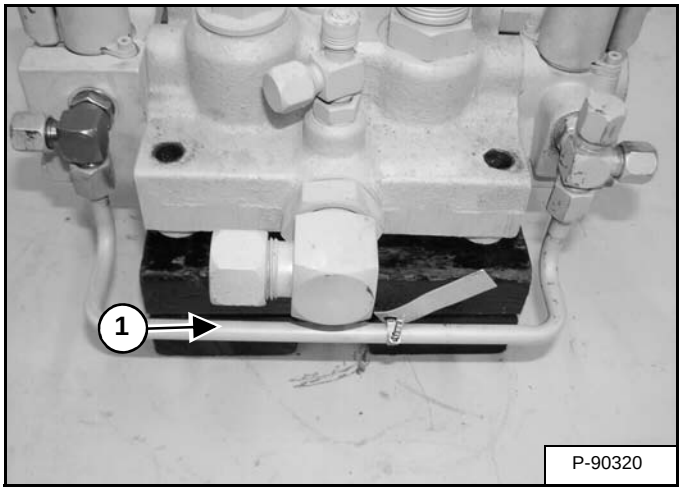


Install the end cap / spool lock block (Item 1) and the mount bolt (Item 2) **[Figure 20-40-78]**.

Install the lift and tilt spool rubber boots and mount plate (Item 3) and install the three mounting screws (Item 4) **[Figure 20-40-78]**.

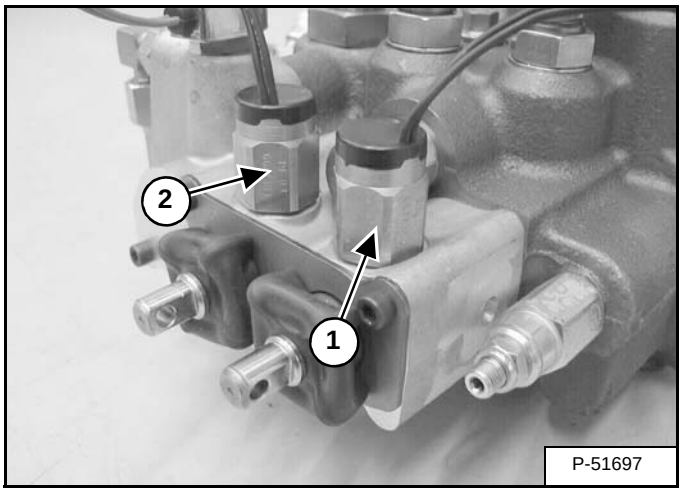
Installation: Tighten the screws to 10,2 - 11,3 N•m (90 - 100 in-lb) torque.

Figure 20-40-79



Connect the tubeline (Item 1) **[Figure 20-40-79]**.

Figure 20-40-80



Use an ohmmeter to measure the lock solenoid coils resistance.

The correct resistance for the coil is 16.02 - 19.58 ohm.

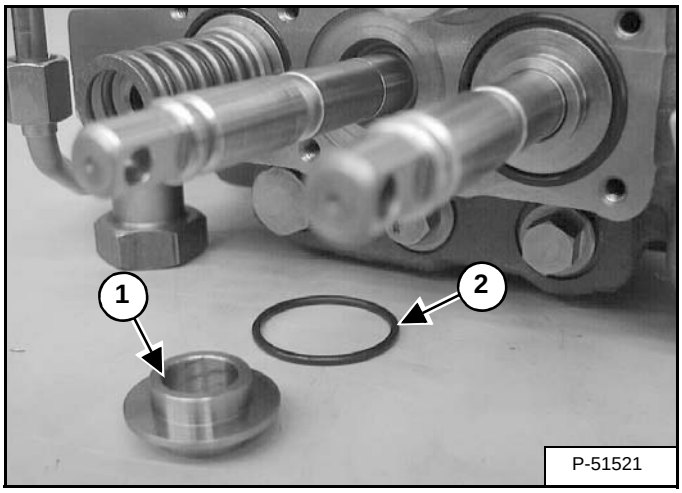
Installation: Install the lift spool (Item 1) and tilt spool (Item 2) lock solenoids and tighten to 52 - 61 N•m (38 - 45 ft-lb) torque **[Figure 20-40-80]**.

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Tilt Spool Removal And Installation

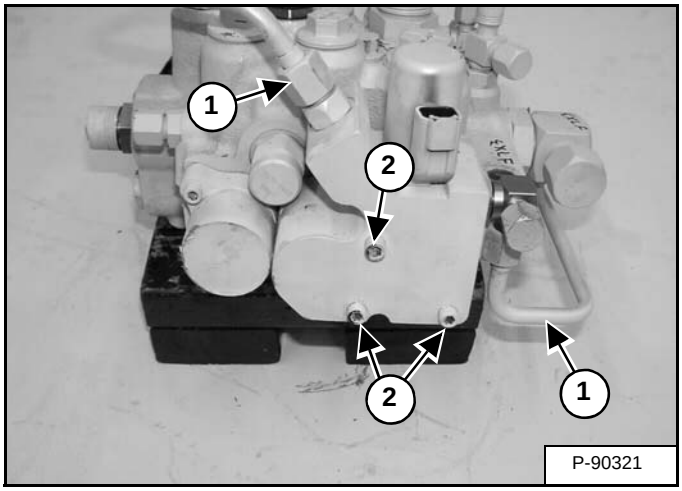
Remove the lift and tilt end cap/spool lock block. (See End Cap Block Removal And Installation on Page 20-40-14.)

Figure 20-40-81



Remove the spacer (Item 1) and O-ring (Item 2) **[Figure 20-40-81]** from the tilt spool.

Figure 20-40-82

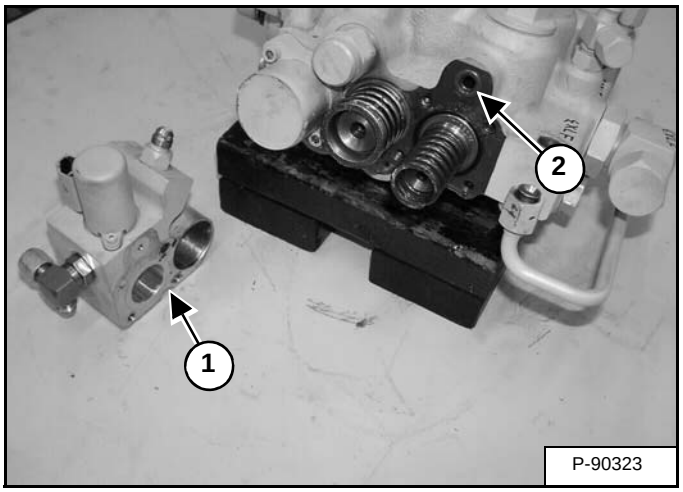


Disconnect the two tubelines (Item 1) **[Figure 20-40-82]** from the spool centering block.

Remove the three screws (Item 2) **[Figure 20-40-82]** from the spool centering block.

Installation: Tighten the bolt to 10,2 - 11,3 N•m (90 - 100 in-lb) torque.

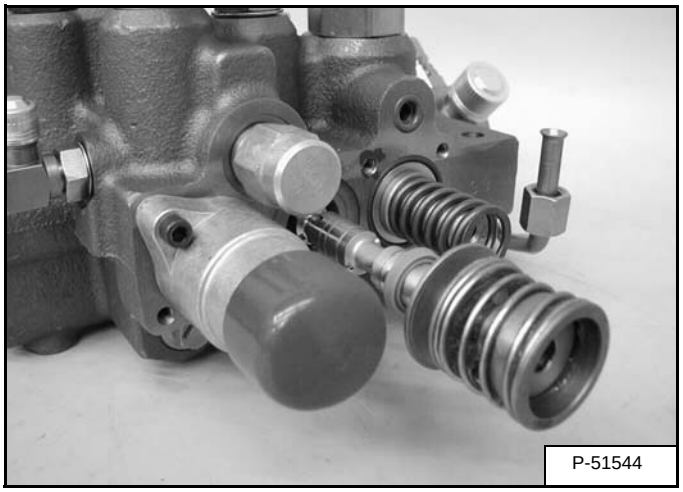
Figure 20-40-83



Remove the spool centering block (Item 1) **[Figure 20-40-83]** from the control valve.

Installation: Replace the O-ring (Item 2) **[Figure 20-40-83]** and lubricate the O-ring lightly with grease or oil before installation of the end cap / spool lock block.

Figure 20-40-84



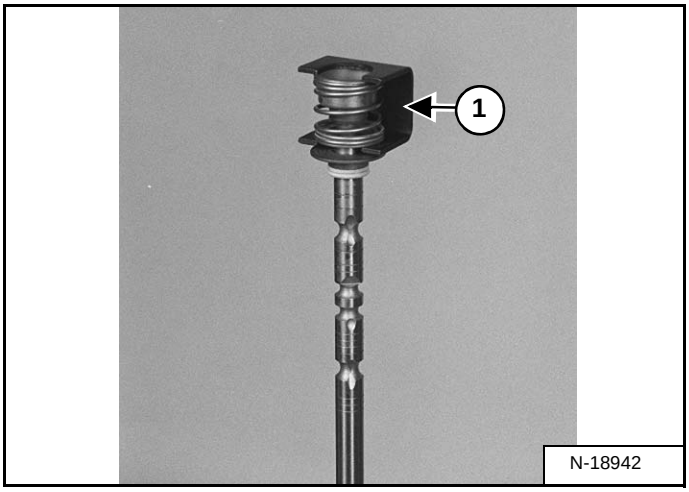
Remove the tilt spool, centering spring, back-up washer and spool seal **[Figure 20-40-84]**.

Assembly: Always use a new spool seal.

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Tilt Spool Removal And Installation (Cont'd)

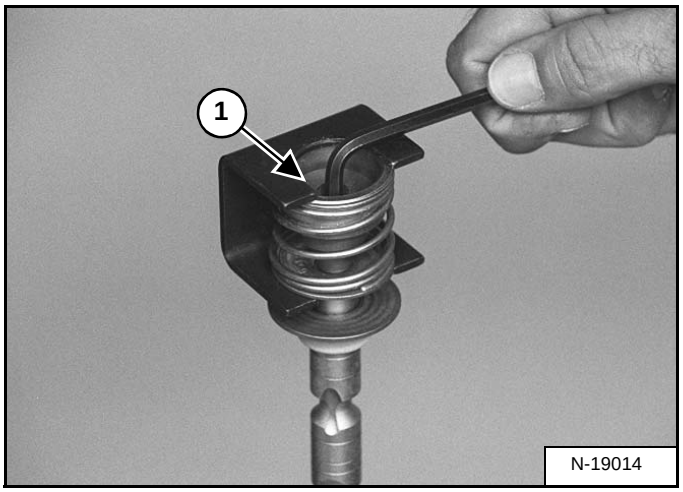
Figure 20-40-85



Put the linkage end of the spool in the vice **[Figure 20-40-85]**.

Install the spool tool (Item 1) **[Figure 20-40-85]** over the centering spring.

Figure 20-40-86

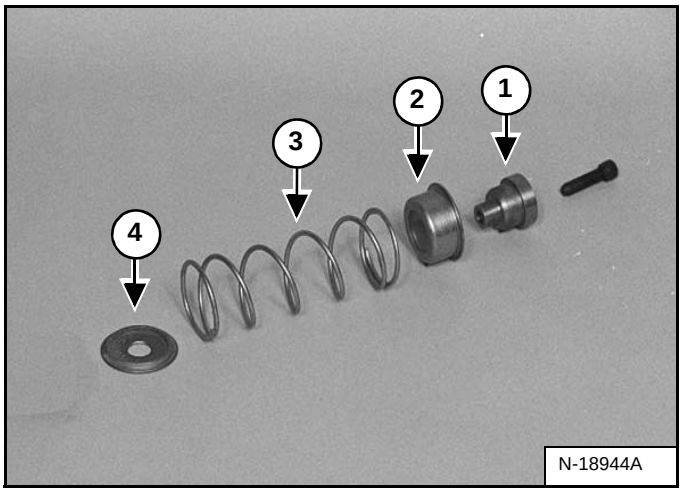


Remove the bolt (Item 1) **[Figure 20-40-86]** holding the centering spring to the spool.

Installation: Tighten the bolt to 10,2 - 11,3 N•m (90 - 100 in-lb) torque.

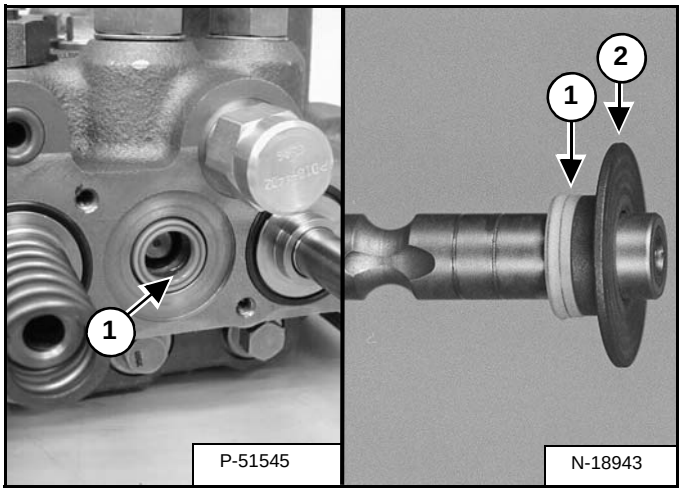
Remove spring tool from the spring assembly.

Figure 20-40-87



Inspect the adapter (Item 1), collar (Item 2), spring (Item 3) and washer (Item 4) **[Figure 20-40-87]**.

Figure 20-40-88



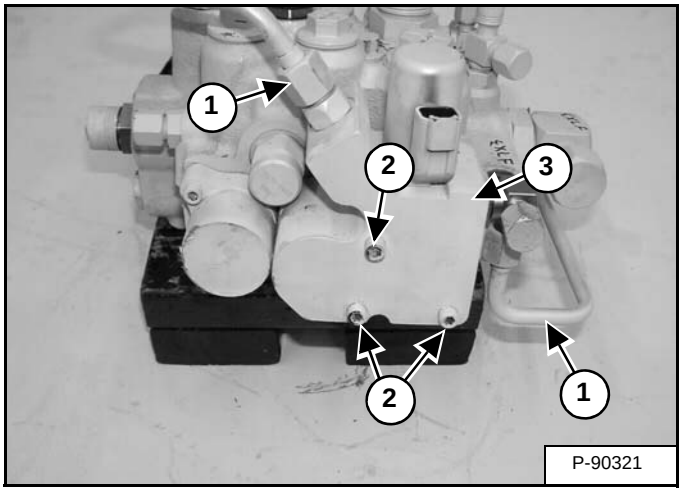
Remove the spool seal(s) (Item 1) and the back-up washer (Item 2) **[Figure 20-40-88]**.

Assembly: Always use a new spool seal.

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Auxiliary Spool Removal And Installation

Figure 20-40-89



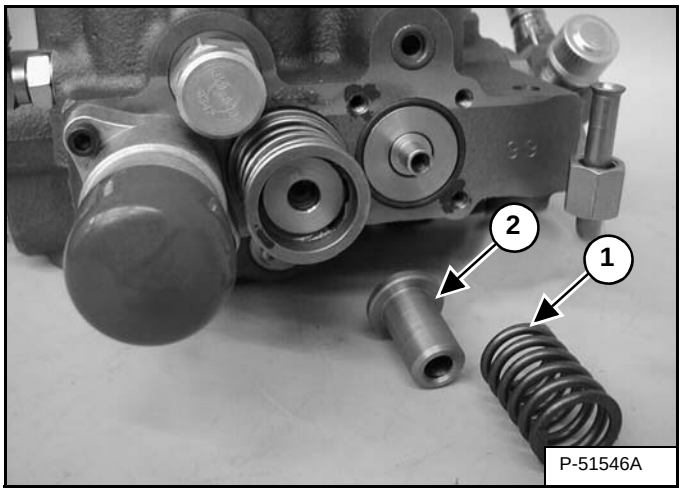
Remove the two tubelines (Item 1) **[Figure 20-40-89]** from the spool centering block.

Remove the three screws (Item 2) **[Figure 20-40-89]** from the spool centering block.

Installation: Tighten the bolt to 10,2 - 11,3 N•m (90 - 100 in-lb) torque.

Remove the spool centering block (Item 3) **[Figure 20-40-89]** from the control valve.

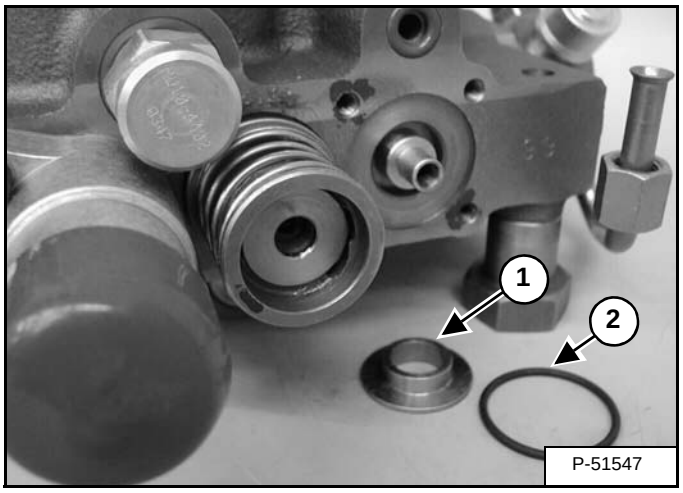
Figure 20-40-90



Remove the spring (Item 1) and center spring retainer (Item 2) **[Figure 20-40-90]** from the auxiliary spool.

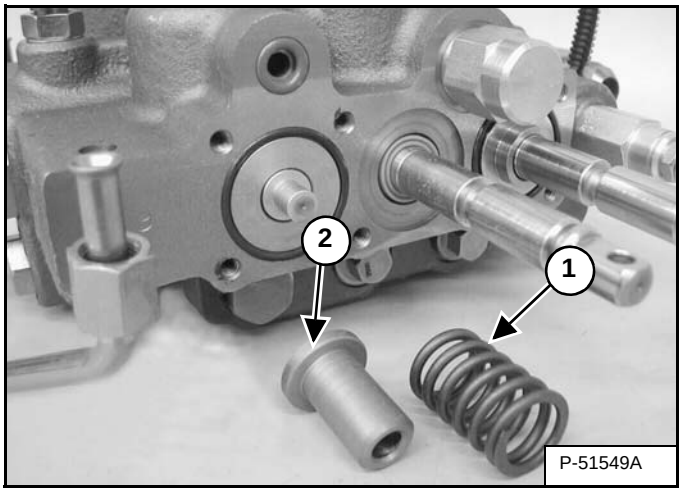
NOTE: If the centering spring retainer (Item 2) [Figure 20-40-90] must be replaced, replace the retainer on the opposite end also.

Figure 20-40-91



Remove the spacer (Item 1) and O-ring (Item 2) **[Figure 20-40-91]** from the auxiliary spool.

Figure 20-40-92



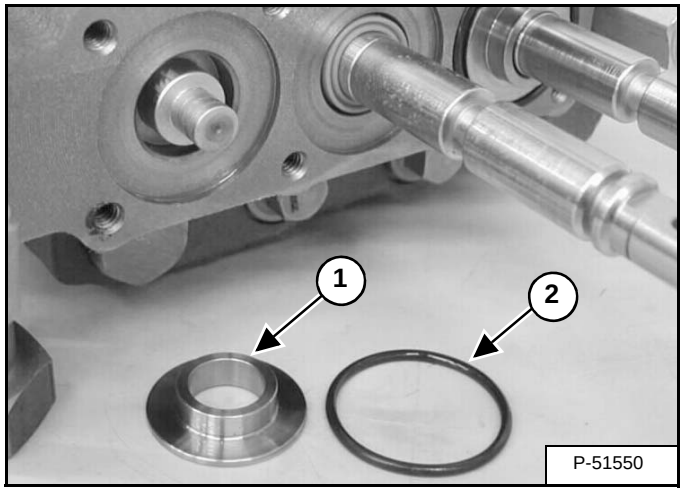
Remove the spring (Item 1) and center spring retainer (Item 2) **[Figure 20-40-92]** from the auxiliary spool.

NOTE: If the centering spring retainer (Item 2) [Figure 20-40-92] must be replaced, replace the retainer on the opposite end also.

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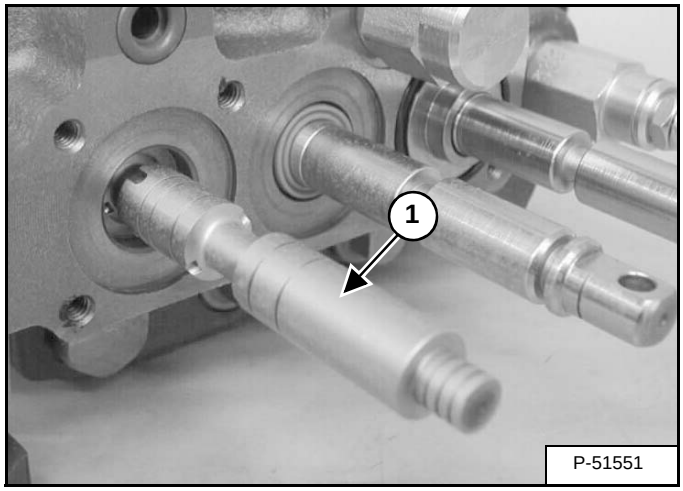
Auxiliary Spool Removal And Installation (Cont'd)

Figure 20-40-93



Remove the spacer (Item 1) and O-ring (Item 2) **[Figure 20-40-93]** from the auxiliary spool.

Figure 20-40-94

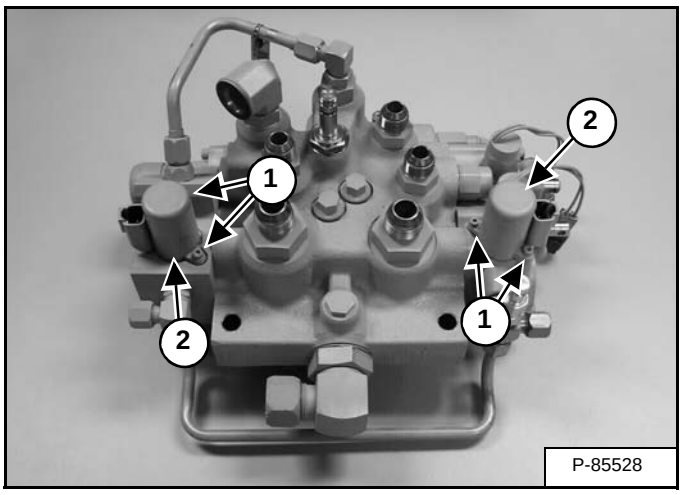


Remove the spool (Item 1) **[Figure 20-40-94]**.

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Auxiliary Solenoid Removal And Installation

Figure 20-40-95

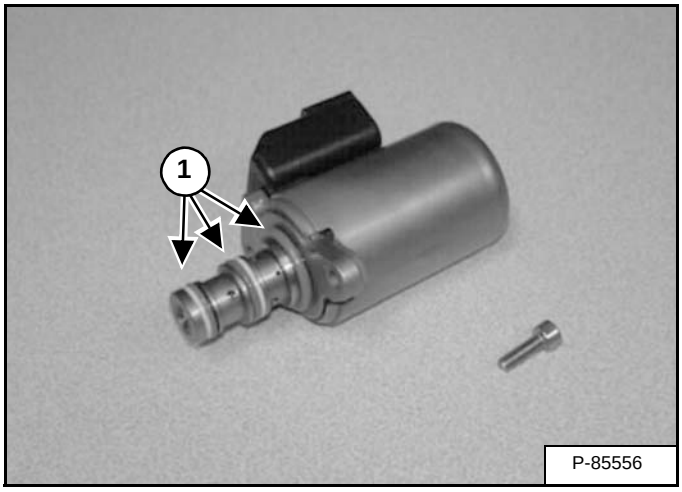


Remove the screws (Item 1) **[Figure 20-40-95]** from both solenoids.

Remove the solenoids (Item 2) **[Figure 20-40-95]** from the control valve.

Installation: Tighten the nut to 2,44 - 2,98 N•m (21.6 - 26.4 in-lb) torque.

Figure 20-40-96



Check and remove the O-rings (Item 1) **[Figure 20-40-96]** from the solenoid stem.

Use an ohmmeter to measure the solenoid coil resistance.

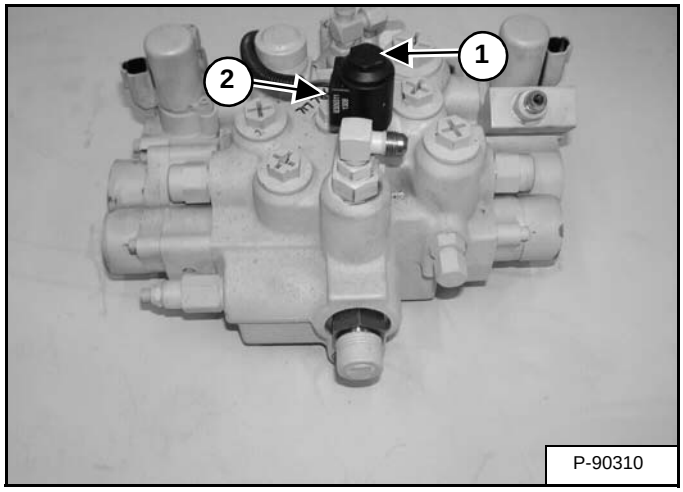
The correct resistance for the coil is 4.1 - 6.1 ohm.

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HYDRAULIC CONTROL VALVE (STANDARD) (CONT'D)

Solenoid Removal And Installation

Figure 20-40-97

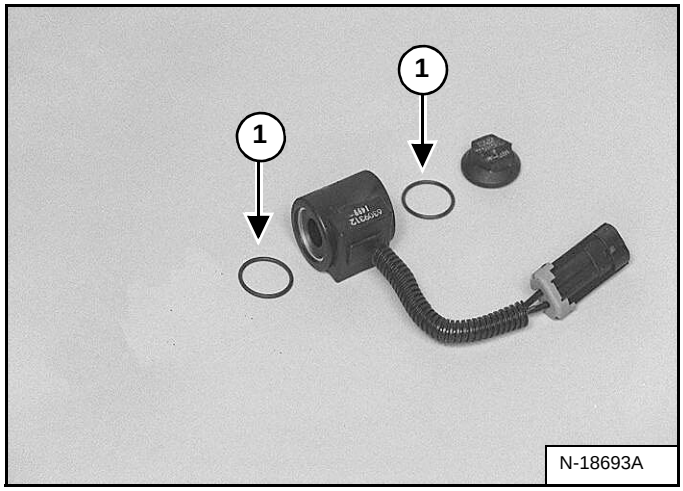


Remove the nut (Item 1) **[Figure 20-40-97]** from the solenoid stem.

Installation: Tighten the nut to 6 N•m (53 in-lb) torque.

Remove the solenoid coil (Item 2) **[Figure 20-40-97]**.

Figure 20-40-98

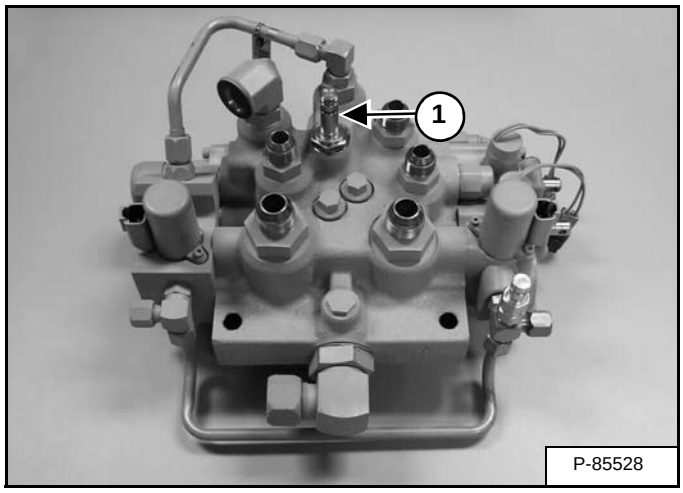


Remove the O-rings (Item 1) **[Figure 20-40-98]** from both ends of the solenoid coil.

Use an ohmmeter to measure the solenoid coil resistance.

The correct resistance for the coil is 9.5 - 10.08 ohm.

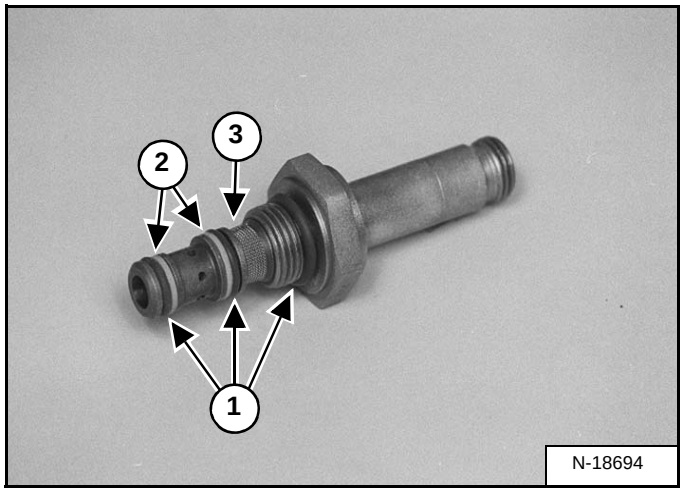
Figure 20-40-99



Remove the solenoid stem (Item 1) **[Figure 20-40-99]**.

Installation: Lubricate the O-rings and tighten the stem to 27 - 33 N•m (20 - 24 ft-lb) torque.

Figure 20-40-100



Remove the O-rings (Item 1) and back-up rings (Item 2) **[Figure 20-40-100]** from the stem.

Clean all parts in solvent and dry with compressed air.

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

NOTE: The screen (Item 3) [Figure 20-40-100] may be cleaned with solvent. If it is torn or worn, replace the solenoid valve

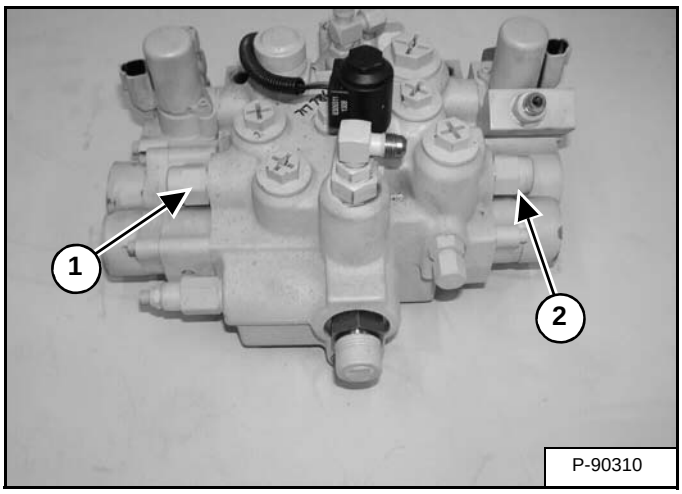
Use only new O-rings and apply oil to all O-rings and back-up rings before installation.

Install new O-rings (Item 1) **[Figure 20-40-98]** and **[Figure 20-40-100]** and new back-up rings (Item 2) **[Figure 20-40-100]** on the solenoid stem.

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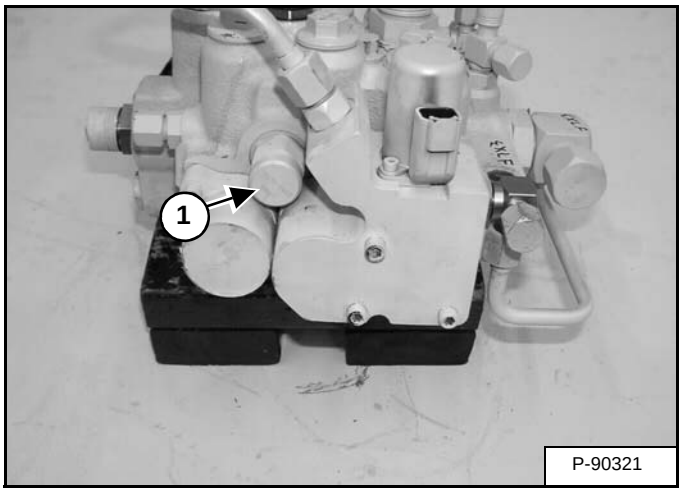
Lock Valve Removal And Installation

Figure 20-40-101



Locate the two BICS lock valves, (Item 1) is for the tilt circuit and (Item 2) **[Figure 20-40-101]** is for the lift circuit.

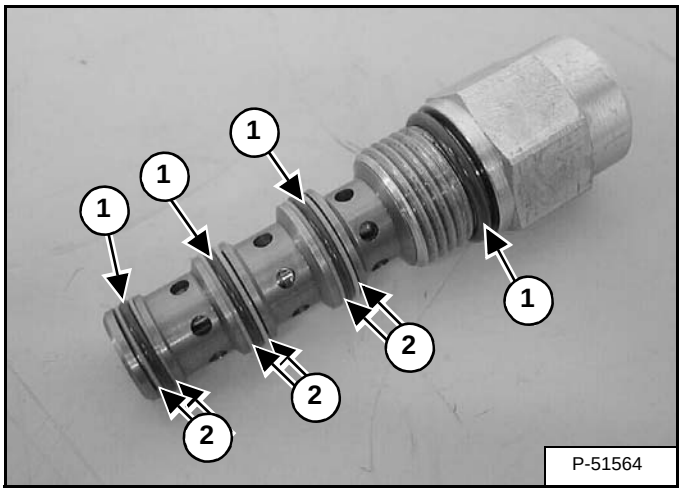
Figure 20-40-102



Remove the lift lock valve (Item 1) **[Figure 20-40-102]** from the back of the control valve.

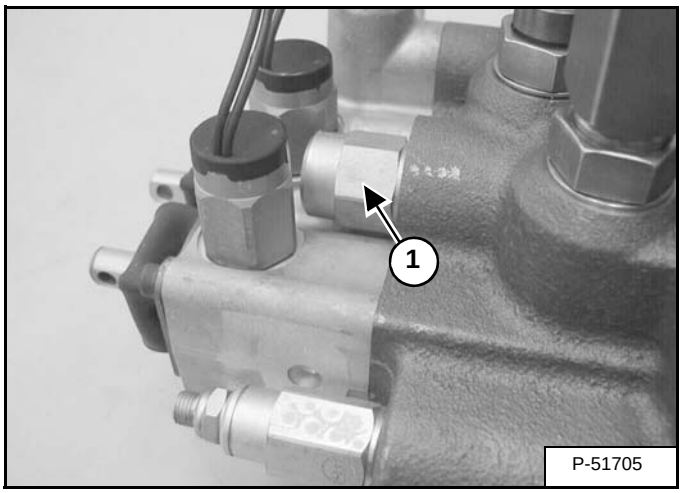
Installation: Lightly lubricate the lock valve O-rings and tighten to 27 - 33 N•m (20 - 24 ft-lb) torque.

Figure 20-40-103



Remove the O-rings (Item 1) and back-up rings (Item 2) **[Figure 20-40-103]** from the lift lock valve, and replace with new.

Figure 20-40-104

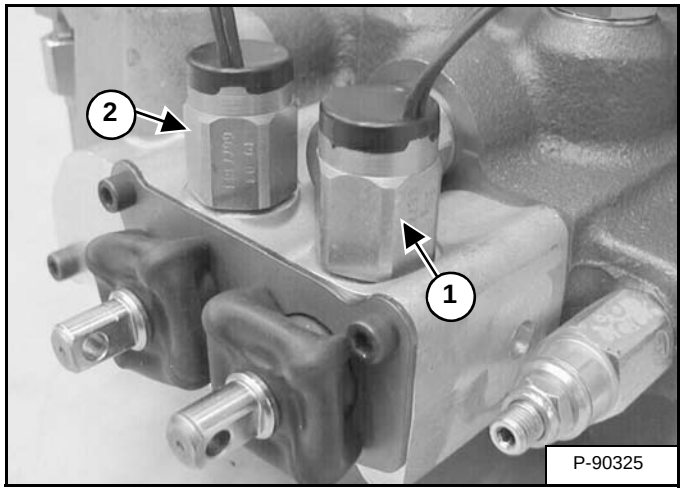


Locate the tilt circuit lock valve (Item 1) **[Figure 20-40-104]**.

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Lock Valve Removal And Installation (Cont'd)

Figure 20-40-105

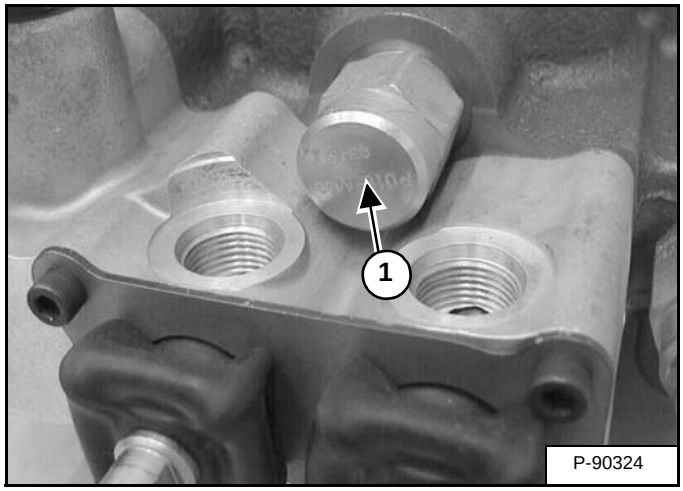


Remove the lift spool lock solenoid (Item 1) **[Figure 20-40-105]**.

Remove the tilt spool lock solenoid (Item 2) **[Figure 20-40-105]**.

Installation: Lubricate the O-rings and tighten the spool lock solenoids to 52 - 61 N•m (38 - 45 ft-lb) torque.

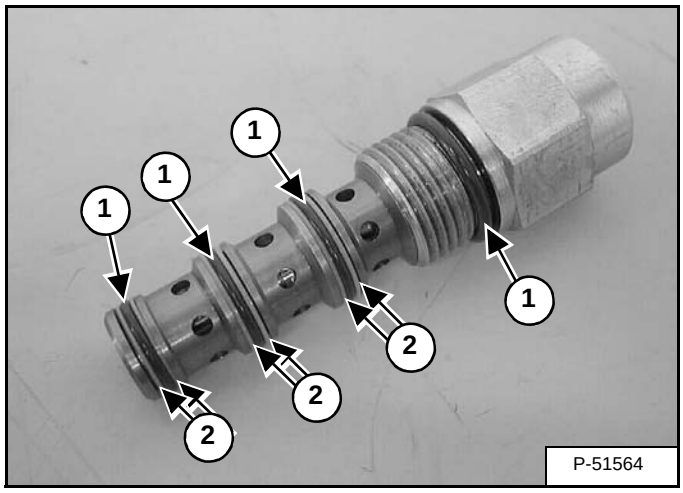
Figure 20-40-106



Remove the tilt lock valve (Item 1) **[Figure 20-40-106]** from the front of the control valve.

Installation: Lightly lubricate the lock valve O-rings and tighten to 27 - 33 N•m (20 - 24 ft-lb) torque.

Figure 20-40-107

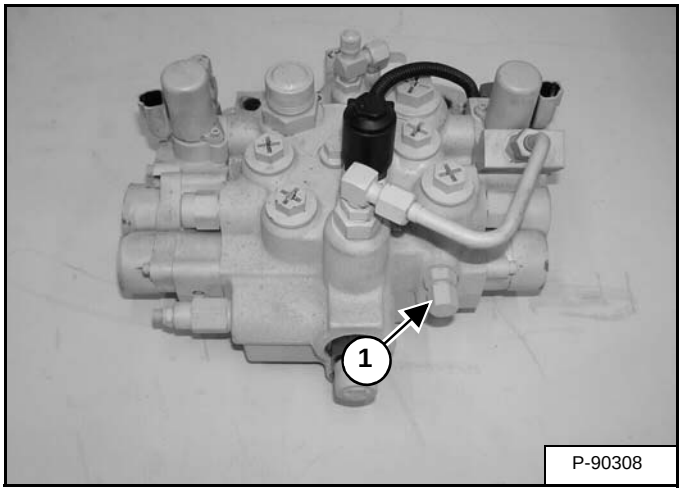


Remove the O-rings (Item 1) and back-up rings (Item 2) **[Figure 20-40-107]** from the tilt lock valve, and replace with new.

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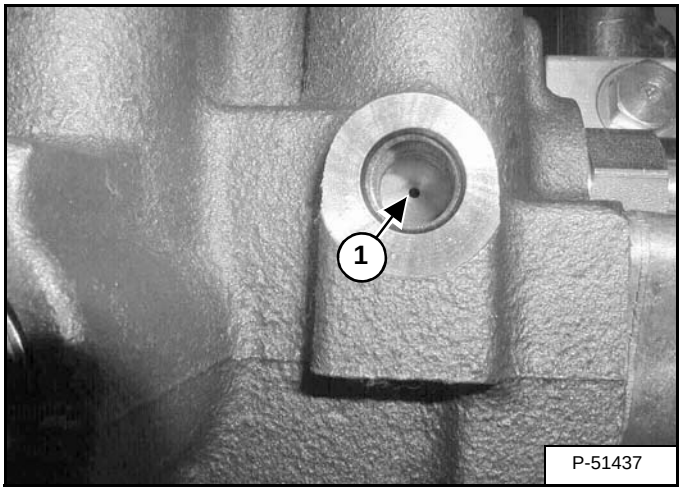
Lift Arm Bypass Orifice Removal And Installation

Figure 20-40-108



Remove the fitting (Item 1) **[Figure 20-40-108]** from the valve.

Figure 20-40-109

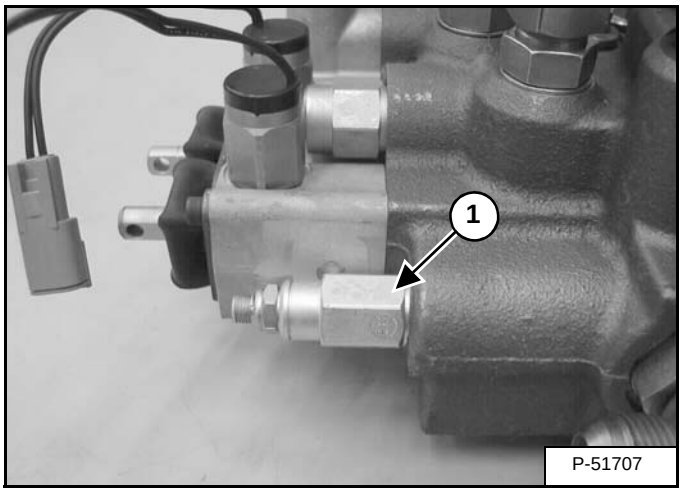


Check the lift arm bypass orifice (Item 1) **[Figure 20-40-109]**.

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

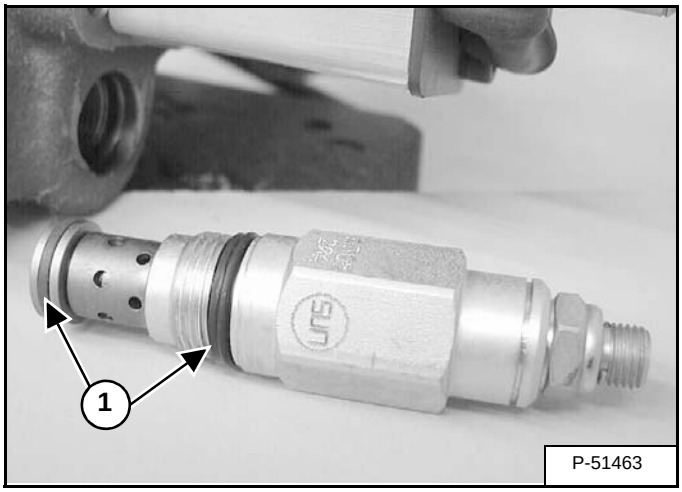
Main Relief Valve Removal And Installation

Figure 20-40-110



Remove the main relief valve (Item 1) **[Figure 20-40-110]**.

Figure 20-40-111



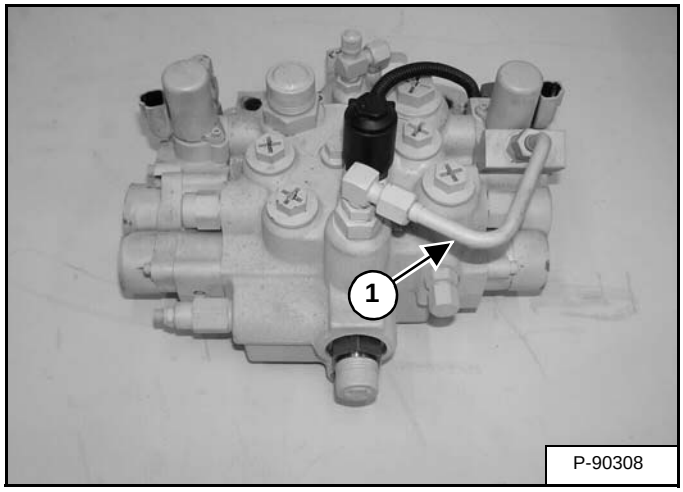
Remove the O-rings from the main relief valve (Item 1) **[Figure 20-40-111]**.

Installation: Always use new O-rings. Tighten to 52 - 61 N•m (38 - 45 ft-lb) torque.

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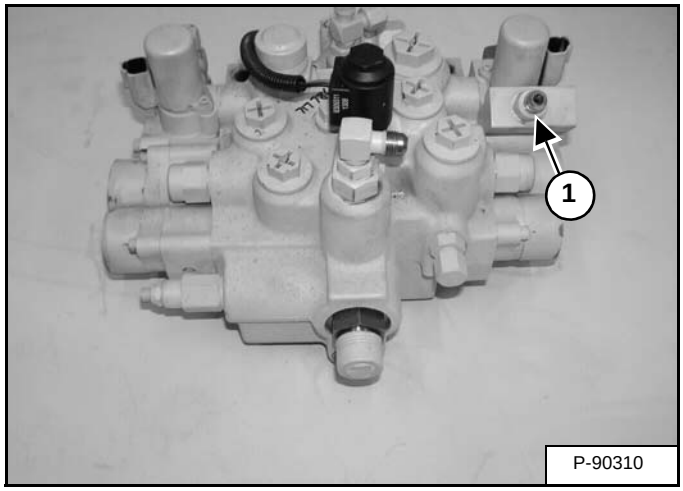
Check Valve Removal And Installation

Figure 20-40-112



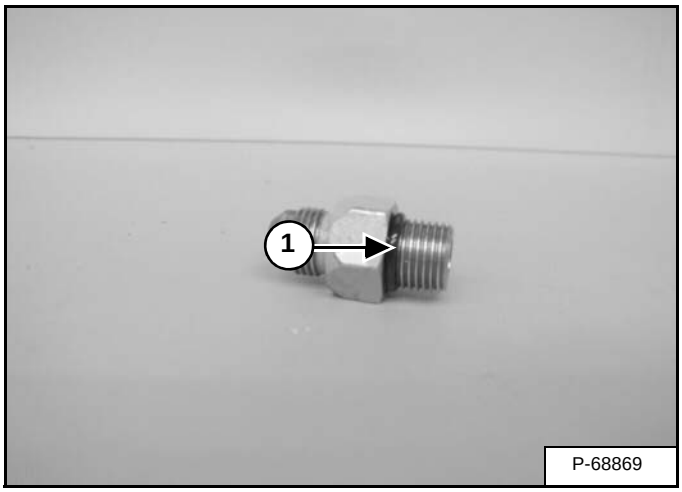
Remove the tubeline (Item 1) **[Figure 20-40-112]**.

Figure 20-40-113



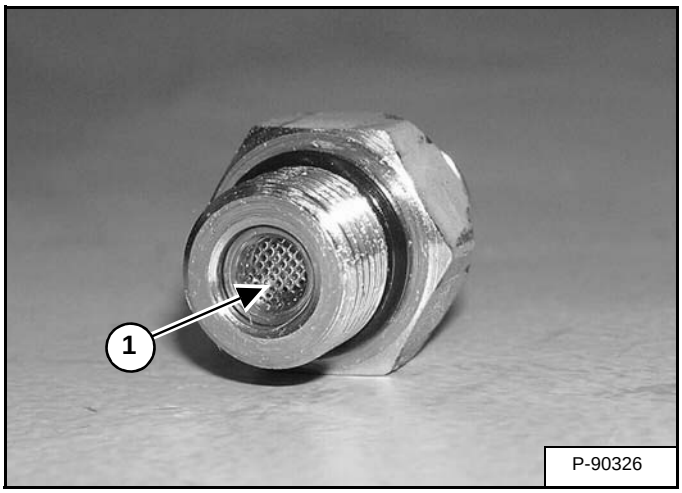
Remove the check valve fitting (Item 1) **[Figure 20-40-113]** from the hydraulic control valve.

Figure 20-40-114



Installation: Lubricate the O-ring (Item 1) **[Figure 20-40-114]** and tighten the fitting to 27 - 33 N•m (20 - 24 ft-lb) torque.

Figure 20-40-115



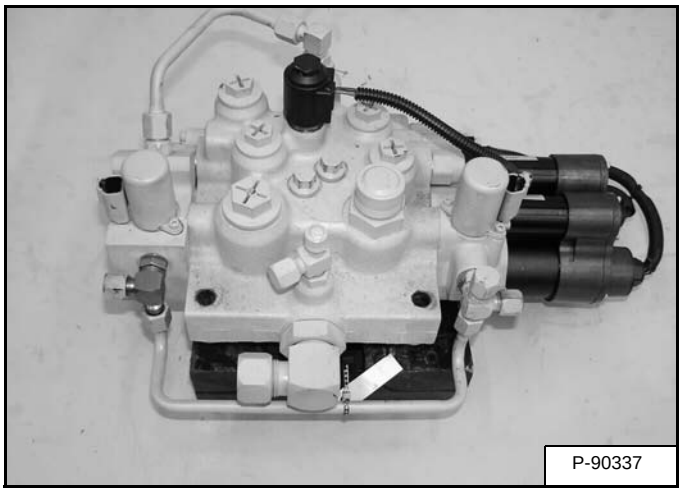
Inspect the screen (Item 1) **[Figure 20-40-115]**.

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HYDRAULIC CONTROL VALVE (ACS) OR (SJC)

Description

Figure 20-41-1



The hydraulic control valve is located inside the main frame on the right hand side, below the operator's cab.

The hydraulic control valve is the hydraulic component that uses spools to direct the flow of hydraulic fluid to the lift, tilt and auxiliary functions.

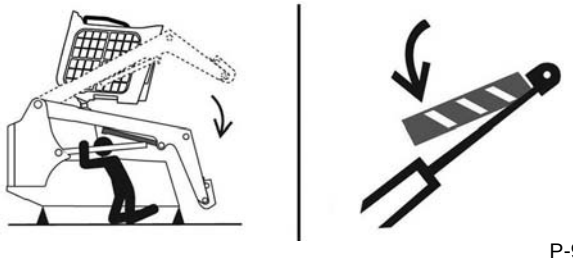
The lift and tilt functions in the hydraulic control valve are operated using electronic control handles / levers that send an electronic signal to the electronic actuators to move the lift and tilt spools in the control valve.

The auxiliary function is operated by pilot pressure. There is one solenoid located by each side of the spool. Only one solenoid at a time is activated by the switch on the right side control handles / levers. The activated solenoid sends pilot pressure oil to one side of the spool and forces the spool to shift.

The hydraulic control valve also contains a main relief valve which is adjustable.

Removal And Installation

DANGER



P-90328

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.**

D-1009-0409

WARNING

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

W-2059-0598

IMPORTANT

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

I-2003-0888

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Removal And Installation (Cont'd)

Raise the lift arms and install an approved lift arm support device. (See LIFT ARM SUPPORT DEVICE on Page 10-20-1.)

Raise the operator cab. (See Raising on Page 10-30-2.)

Drain the hydraulic reservoir. (See Removing And Replacing Hydraulic Fluid on Page 10-120-2.)

Remove the control panel. (See Removal And Installation on Page 50-100-2.)

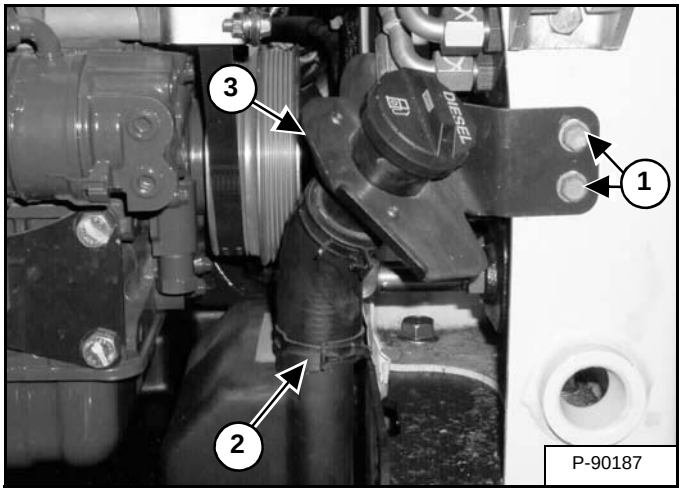
NOTE: Mark all tubelines, hoses, and electrical connections for correct installation.

NOTE: Cap and plug all hydraulic connection points when tubelines or hoses are removed.

Clean area around control valve.

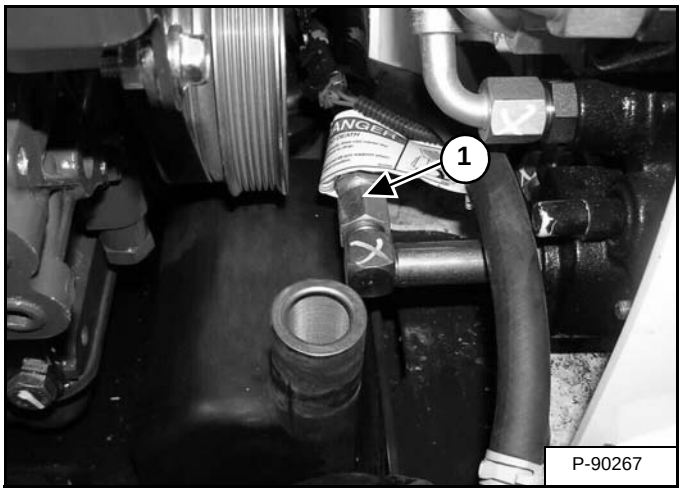
Open rear door.

Figure 20-41-2



Remove the two bolts (Item 1), move the hose clamp (Item 2) to the middle of the hose, and the place the fuel inlet assembly (Item 3) **[Figure 20-41-2]** off to the side.

Figure 20-41-3

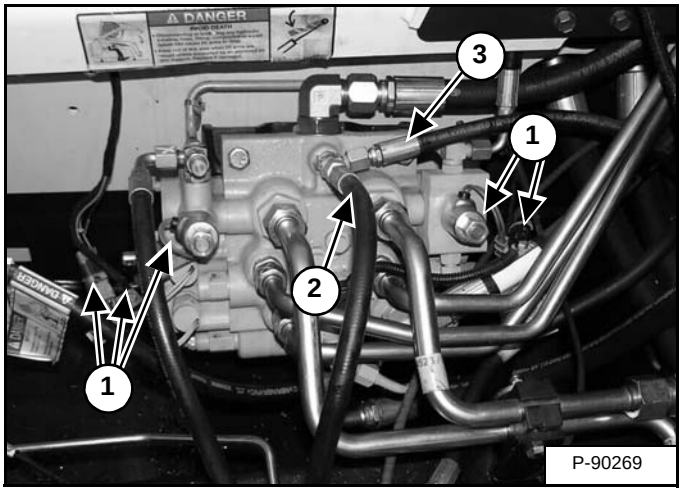


The fixed end main valve hose assembly is connected to a fixed end fitting on the control valve. The hose is routed to the junction block at the rear of the loader where it feeds the base end of both lift cylinders. The hose can only be removed by first removing it from the fitting (Item 1) **[Figure 20-41-3]**.

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Removal And Installation (Cont'd)

Figure 20-41-4

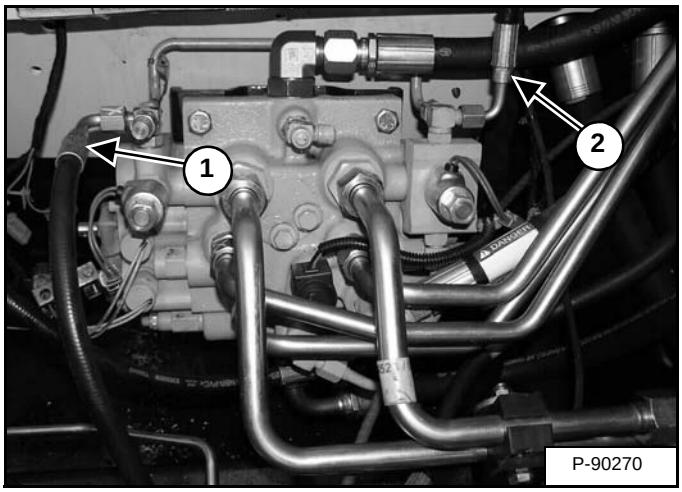


Disconnect the wire harness connectors (Item 1) **[Figure 20-41-4]** from the control valve.

Disconnect the hose (Item 2) **[Figure 20-41-4]** that routes from the control valve to the drain manifold.

Disconnect the hose (Item 3) **[Figure 20-41-4]** that routes from the control valve to the inlet fitting of the hydraulic pump.

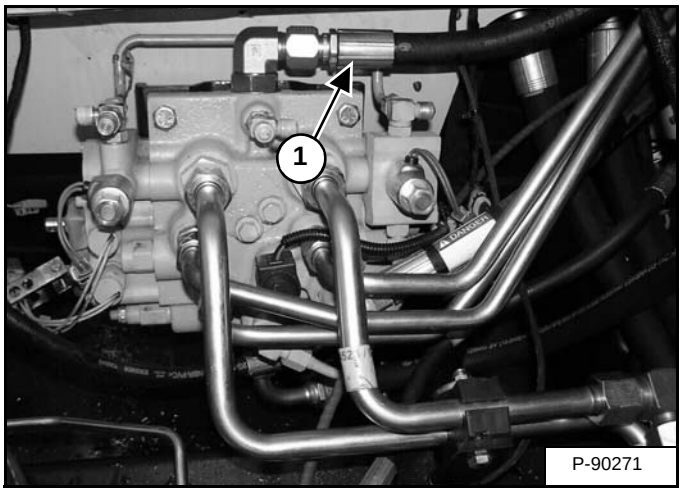
Figure 20-41-5



Disconnect the hose (Item 1) **[Figure 20-41-5]** that routes from the control valve to the brake valve.

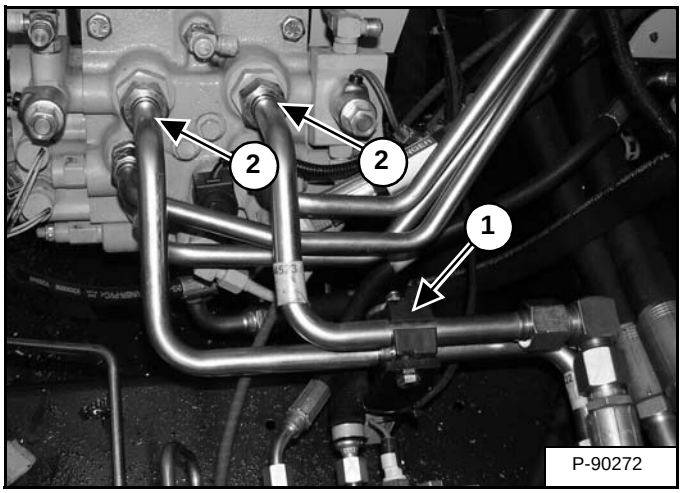
Disconnect the hose (Item 2) **[Figure 20-41-5]** that routes from the control valve to the fan motor.

Figure 20-41-6



Disconnect the hose (Item 1) **[Figure 20-41-6]** that routes from the top of the control valve to the hydraulic filter.

Figure 20-41-7



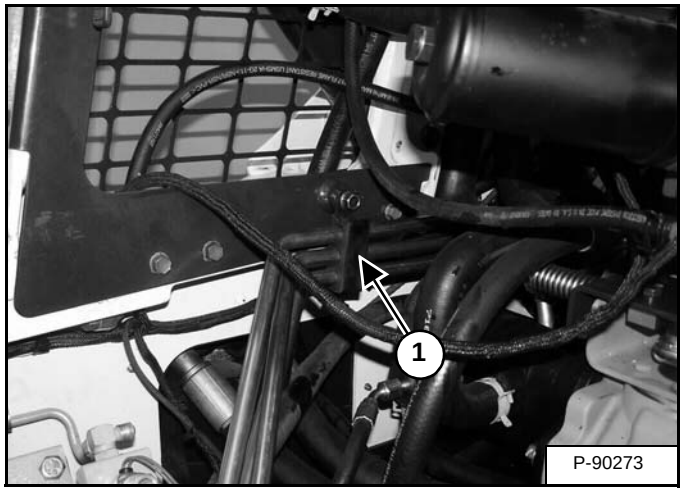
Remove the tubeline clamp (Item 1) **[Figure 20-41-7]**.

Disconnect the two tubelines (Item 2) **[Figure 20-41-7]** that route from the control valve to the front auxiliary hydraulics.

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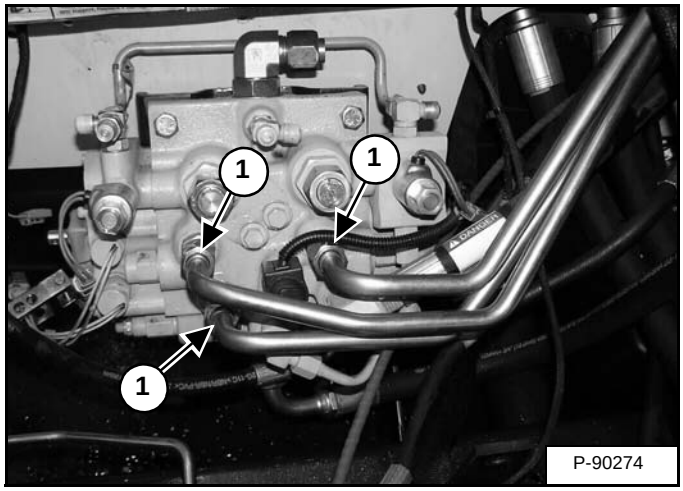
Removal And Installation (Cont'd)

Figure 20-41-8



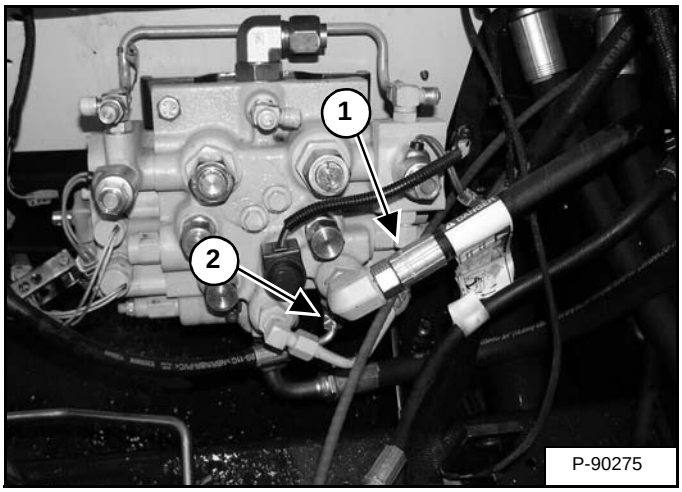
Remove the tubeline clamp (Item 1) **[Figure 20-41-8]**.

Figure 20-41-9



Disconnect the three tubelines (Item 1) **[Figure 20-41-9]** that route from the control valve to the junction block at the rear of the loader.

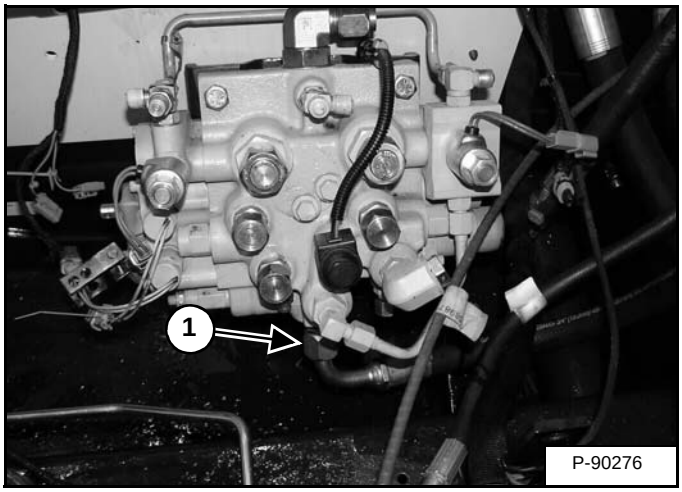
Figure 20-41-10



Disconnect the hose (Item 1) **[Figure 20-41-10]** that routes from the control valve to the junction block at the rear of the machine.

Disconnect the lift arm bypass drain hose (Item 2) **[Figure 20-41-10]** from the control valve.

Figure 20-41-11

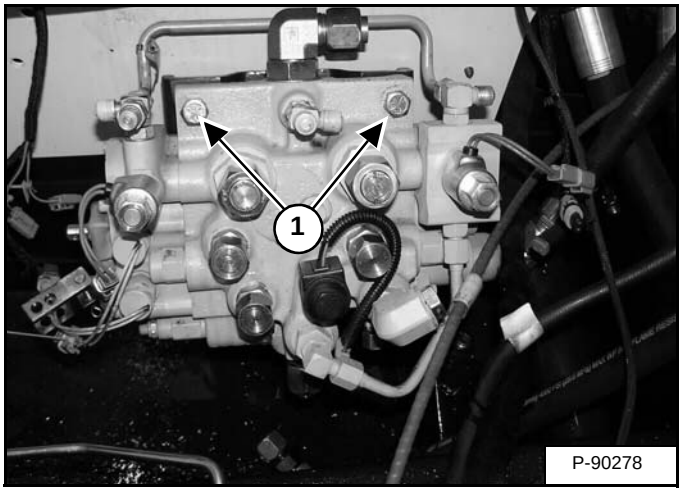


Disconnect the hose (Item 1) **[Figure 20-41-11]** that routes from the bottom of the control valve to the outlet fitting of the hydraulic pump.

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Removal And Installation (Cont'd)

Figure 20-41-12



Support the control valve and remove the two bolts and nuts (Item 1) **[Figure 20-41-12]**.

Remove the control valve from the loader.

Actuator Removal And Installation (In Loader)

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.

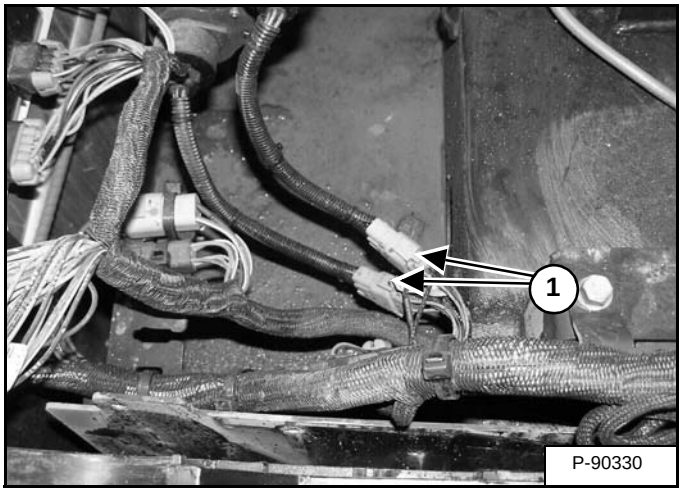
W-2059-0598

Raise the lift arms and install an approved lift arm support device. (See Installing on Page 10-20-1.)

Stop the engine. Raise the seat bar.

Mark the actuator wiring harness connectors for proper installation.

Figure 20-41-13

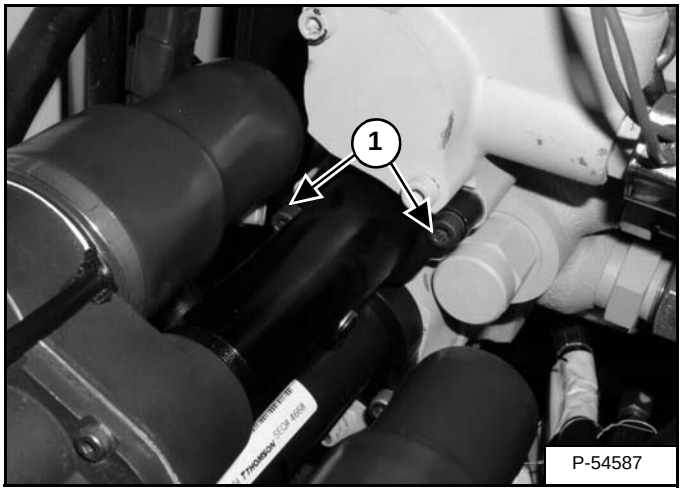


Unplug the actuator connectors (Item 1) **[Figure 20-41-13]** from the loader harness.

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

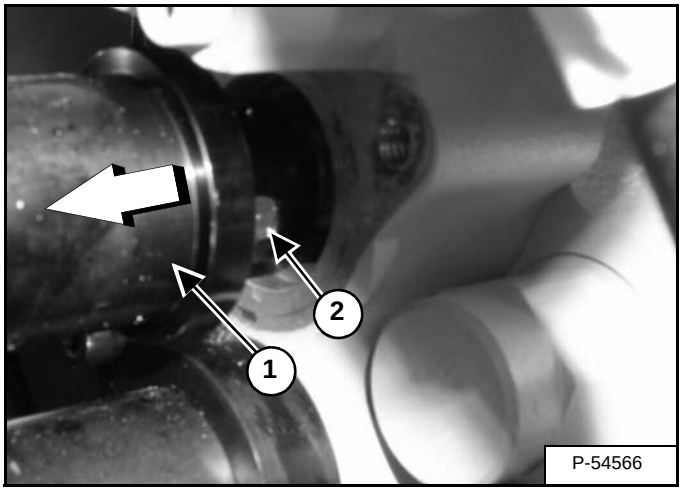
Figure 20-41-14



Remove the two screws (Item 1) **[Figure 20-41-14]** from the actuator retainer.

Installation: Tighten the bolts to 10,2 - 11,3 N•m (90 - 100 in-lb) torque.

Figure 20-41-15



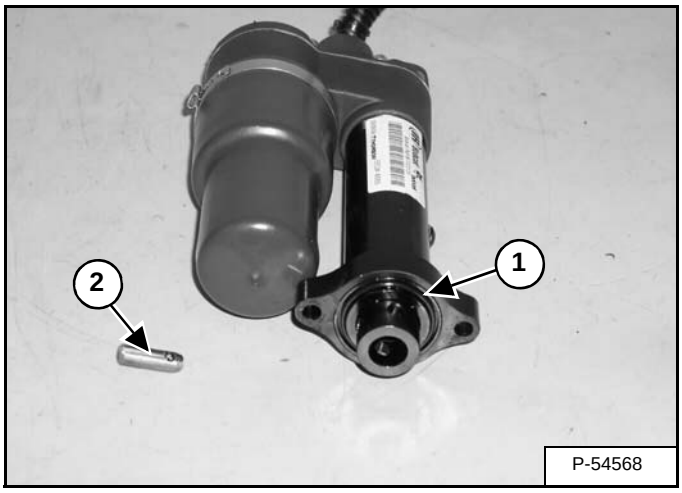
Pull the actuator (Item 1) **[Figure 20-41-15]** away from the control valve.

Use a punch to remove the actuator pin (Item 2) **[Figure 20-41-15]** from the actuator and spool.

Remove the actuator from the hydraulic control valve.

NOTE: The calibration procedure must be followed when replacing a lift or tilt actuator. (See Lift And Tilt Calibration (SJC) on Page 60-160-4.)

Figure 20-41-16



Inspect the O-ring (Item 1) **[Figure 20-41-16]** on the face of the actuator, and replace as needed.

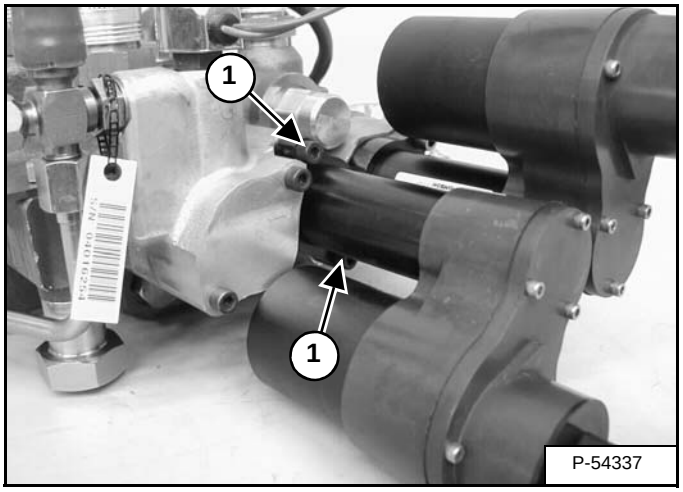
Check the linkage pin (Item 2) **[Figure 20-41-16]** and replace as needed.

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Actuator Removal And Installation (Out Of Loader)

Remove the control valve from the loader.

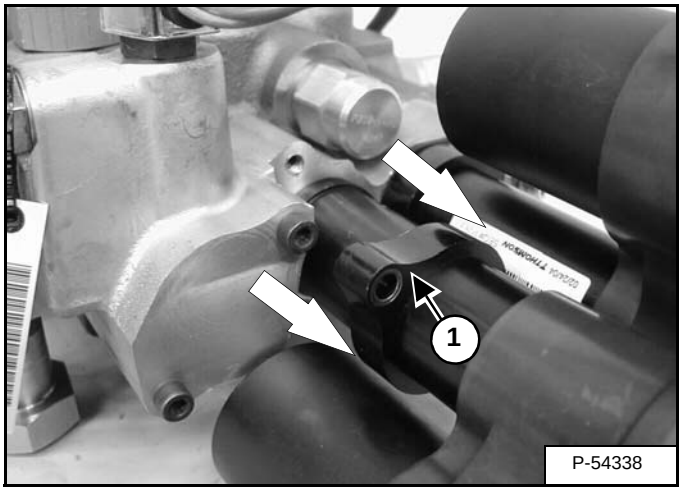
Figure 20-41-17



Remove the two mount bolts (Item 1) **[Figure 20-41-17]** from the tilt actuator.

Installation: Tighten the mounting bolts to 10,2 - 11,3 N•m (90 - 100 in-lb) torque.

Figure 20-41-18



Slide the actuator mount bracket (Item 1) **[Figure 20-41-18]** away from the control valve.

Pull the actuator away from the control valve **[Figure 20-41-18]**.

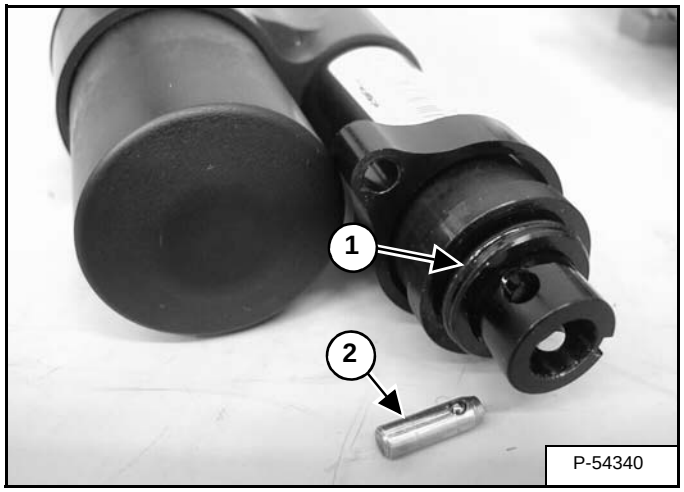
Figure 20-41-19



Using a punch and a hammer, remove the actuator linkage pin (Item 1) **[Figure 20-41-19]** from the actuator and the tilt spool.

Remove the actuator and linkage pin from the valve.

Figure 20-41-20



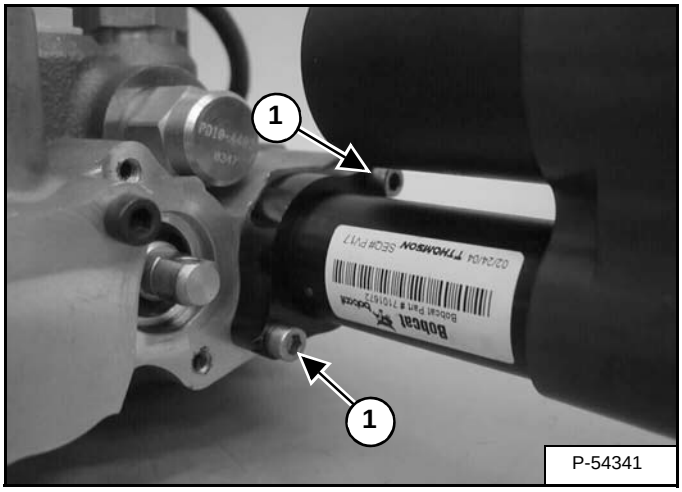
Inspect the O-ring (Item 1) **[Figure 20-41-20]** on the face of the actuator, and replace as needed.

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

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

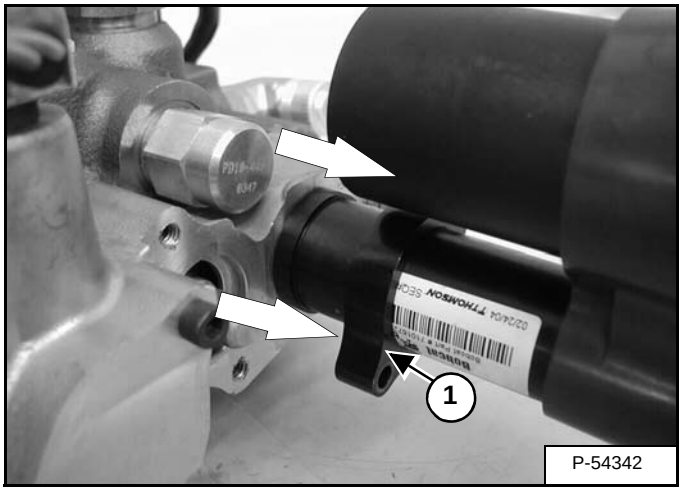
Figure 20-41-21



Remove the two mount bolts (Item 1) **[Figure 20-41-21]** from the lift actuator.

Installation: Tighten the mounting bolts to 10,2 - 11,3 N•m (90 - 100 in-lb) torque.

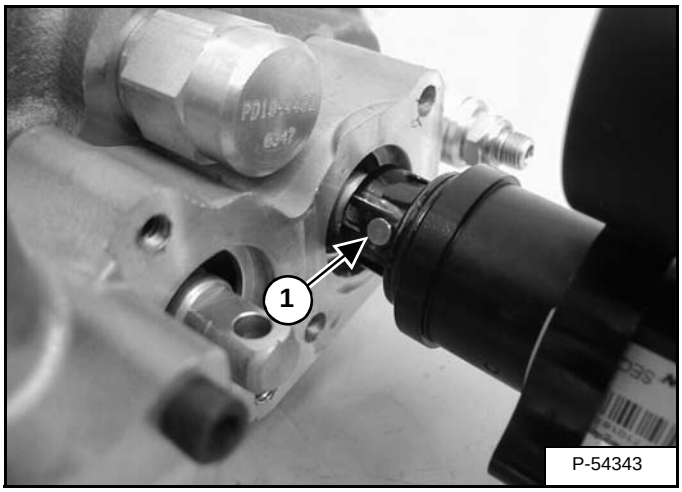
Figure 20-41-22



Slide the actuator mount bracket (Item 1) **[Figure 20-41-22]** away from the control valve.

Pull the actuator away from the control valve **[Figure 20-41-22]**.

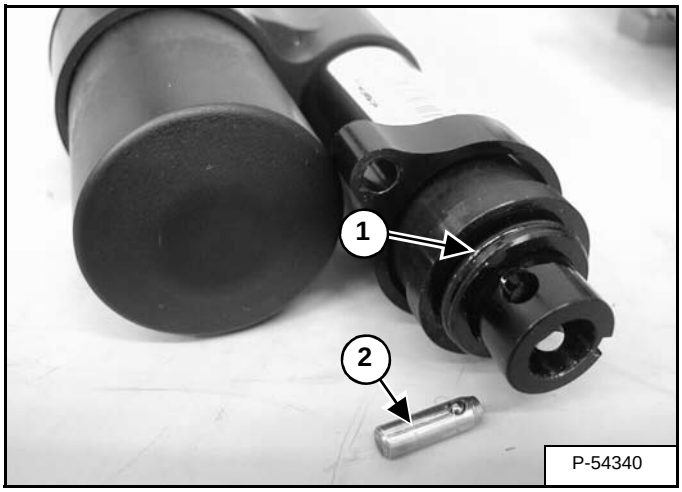
Figure 20-41-23



Using a punch and a hammer, remove the actuator linkage pin (Item 1) **[Figure 20-41-23]** from the actuator and the tilt spool.

Remove the actuator and linkage pin from the valve.

Figure 20-41-24



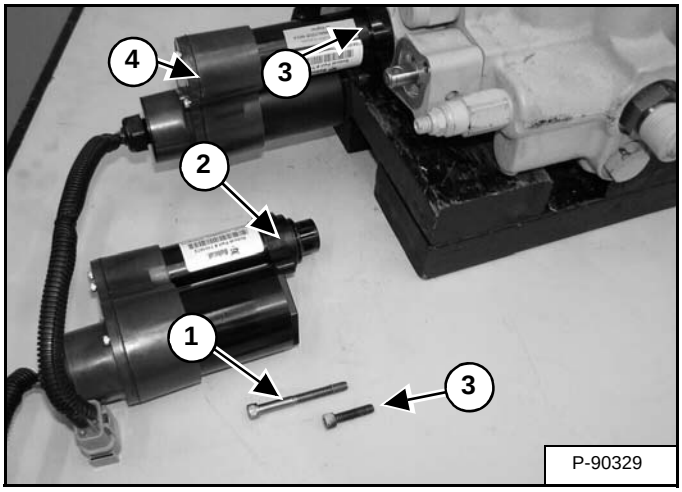
Inspect the O-ring (Item 1) **[Figure 20-41-24]** on the face of the actuator, and replace as needed.

Check the linkage pin (Item 2) **[Figure 20-41-24]** and replace as needed.

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

Figure 20-41-25



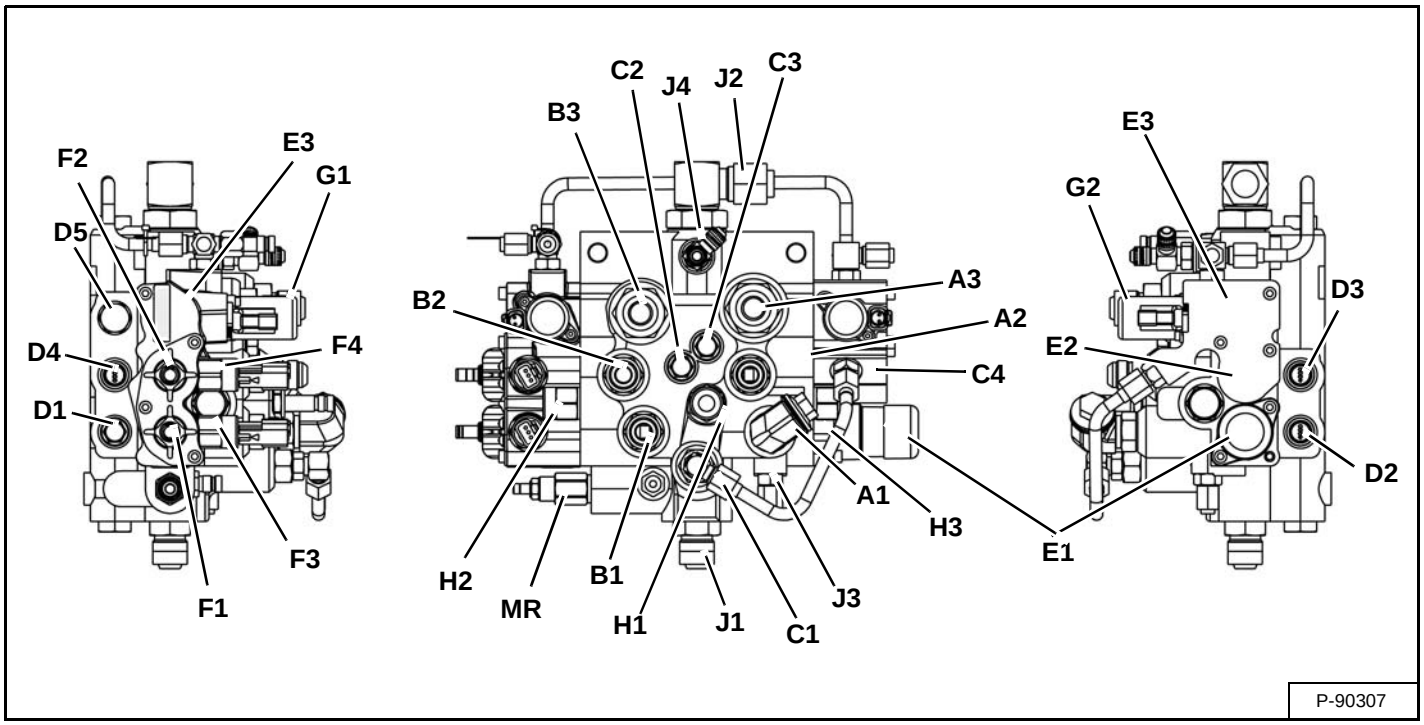
NOTE: The two longer bolts (Item 1) are used to mount the lift actuator and end cap (Item 2) [Figure 20-41-25] to the control valve.
The two shorter mount bolts (Item 3) are used to mount the tilt actuator to the end cap (Item 4) [Figure 20-41-25].

Installation: Tighten the mounting bolts to 10,2 - 11,3 N•m (90 - 100 in-lb) torque (Item 1) **[Figure 20-41-25]**

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Identification Chart

Figure 20-41-26



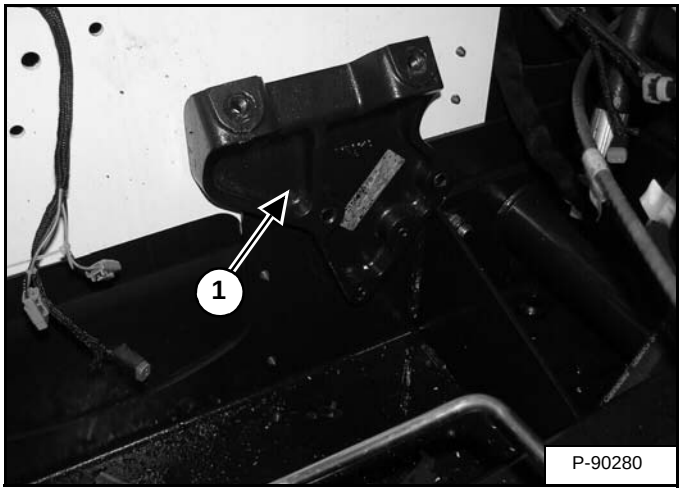
ITEM	S650 LOADER
A1	Lift Cylinder Base End
A2	Tilt Cylinder Base End
A3	Auxiliary Hydraulic Rod End
B1	Lift Cylinder Rod End
B2	Tilt Cylinder Rod End
B3	Auxiliary Hydraulics Base End
C1	Load Check
C2	Load Check Valve Tilt Function
C3	Load Check Valve Auxiliary Function
C4	Check Valve
D1	Anti-Cavitation Valve Lift (Rod End)
D2	Port Relief/Anti-Cavitation Valve – 27,6 MPa (275,8 bar) (4000 psi) Lift (Base End)
D3	Port Relief/Anti-Cavitation Valve – 27,6 MPa (275,8 bar) (4000 psi) Tilt (Base End)
D4	Port Relief/Anti-Cavitation Valve – 27,6 MPa (275,8 bar) (4000 psi) Tilt (Rod End)
D5	Port Relief/Anti-Cavitation Valve (Auxiliary) 27,6 MPa (275,8 bar) (4000 psi) (Optional)

ITEM	S650 LOADER
E1	Lift Spool Detent
E2	Tilt Spool Centering Spring
E3	Auxiliary Spool/Centering Springs
F1	Lift Spool
F2	Tilt Spool
F3	Lift Spool Lock Solenoid
F4	Tilt Spool Lock Solenoid
G1	Auxiliary Solenoid Stem
G2	Auxiliary Solenoid Stem
H1	BICS Solenoid
H2	BICS Lock Valve (Tilt)
H3	BICS Lock Valve (Lift)
J1	Inlet Fluid Flow (From Pump)
J2	Outlet Fluid Flow (Return to Tank)
J3	Lift Arm Bypass Orifice
J4	Drain (Case)
MR	Main Relief Valve – 24,1 MPa (241,3 bar) (3500 psi)

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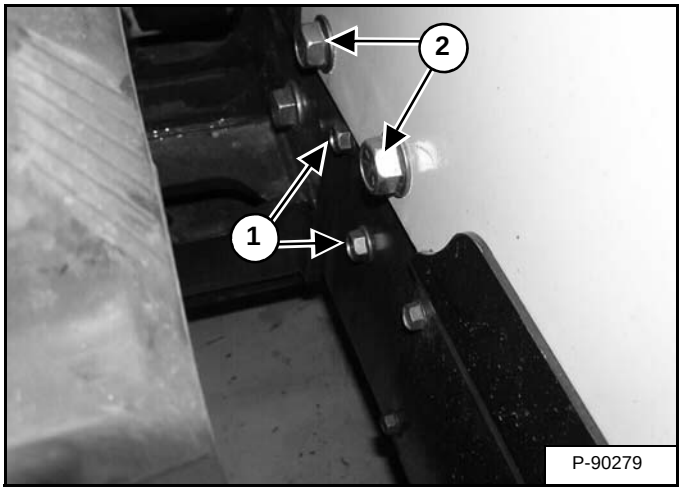
Mount Bracket Removal And Installation

Figure 20-41-27



Support the mounting bracket (Item 1) **[Figure 20-41-27]**.

Figure 20-41-28



Remove the two control valve mount bolts (Item 1) **[Figure 20-41-28]**.

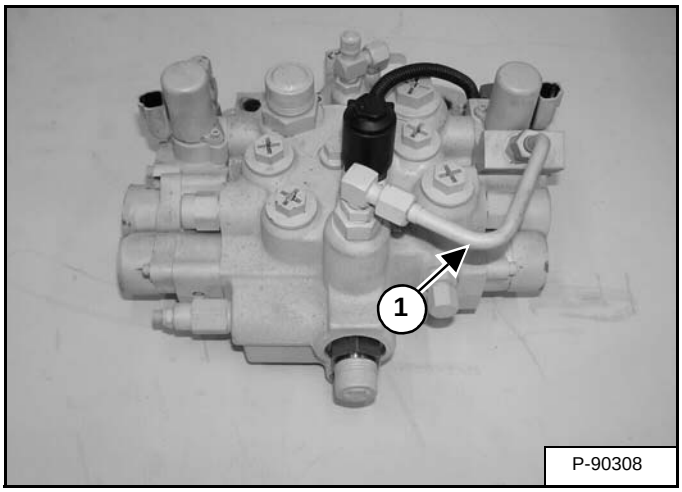
Remove the two frame bolts (Item 2) **[Figure 20-41-28]**

Installation: Torque the two frame bolts (Item 2) **[Figure 20-41-28]** to 406 - 447 N•m (300 - 330 ft lb).

Remove the control valve bracket from the loader.

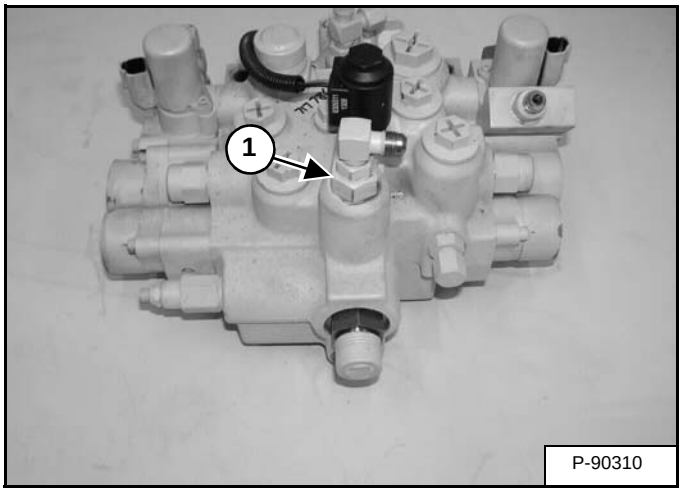
Lift Load Check Valve Removal And Installation

Figure 20-41-29



Remove the charge tubeline (Item 1) **[Figure 20-41-29]** from the BICS valve fitting on the top of the lift load check valve.

Figure 20-41-30



Remove the lift load check valve (Item 1) **[Figure 20-41-30]** and fitting from the top of the control valve.

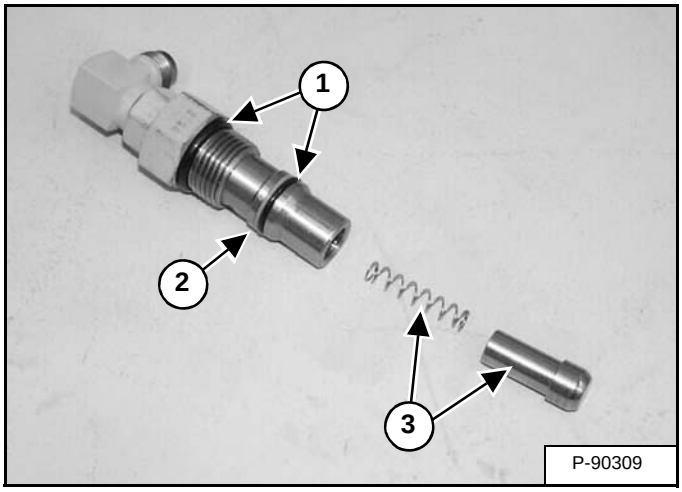
Installation: Lubricate the O-ring and threads and tighten to 75 - 88 N•m (55 - 65 ft-lb) torque.

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HYDRAULIC CONTROL VALVE (ACS) OR (SJC) (CONT'D)

Lift Load Check Valve Removal And Installation (Cont'd)

Figure 20-41-31



Remove and install new O-rings (Item 1) and back-up ring (Item 2) **[Figure 20-41-31]**.

Check the free movement load check valve and spring (Item 3) **[Figure 20-41-31]**.

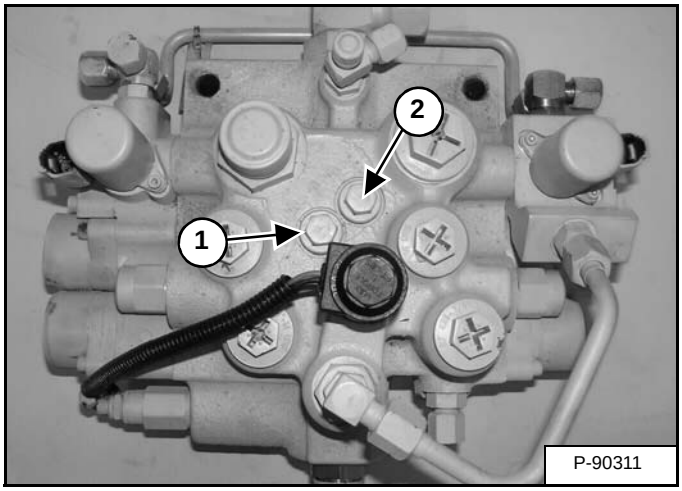
IMPORTANT

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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Load Check Valve Removal And Installation (Tilt & Auxiliary)

Figure 20-41-32

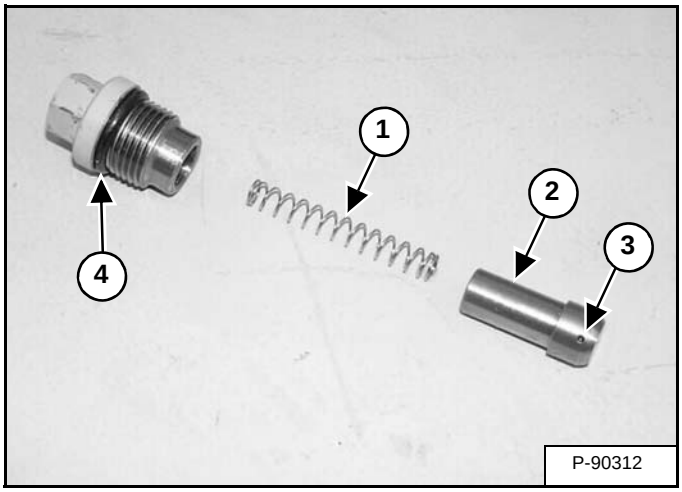


At the front side of the control valve locate the tilt section load check valve (Item 1) **[Figure 20-41-32]**.

At the front side of the control valve locate the auxiliary section load check valve (Item 2) **[Figure 20-41-32]**.

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

Figure 20-41-33



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

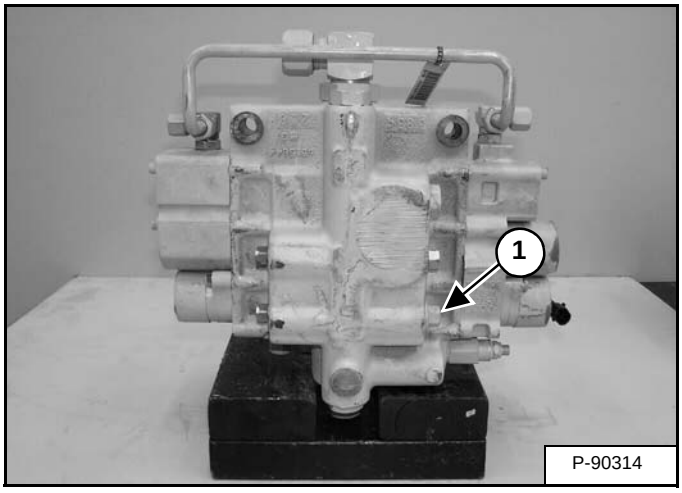
Check the orifice (Item 3) **[Figure 20-41-33]** in the poppet to be sure it is not plugged.

Installation: Install a new O-ring (Item 4) **[Figure 20-41-33]** on the plug and lightly lubricate with oil before installing. Tighten the plug to 52 - 61 N•m (38 - 45 ft-lb) torque.

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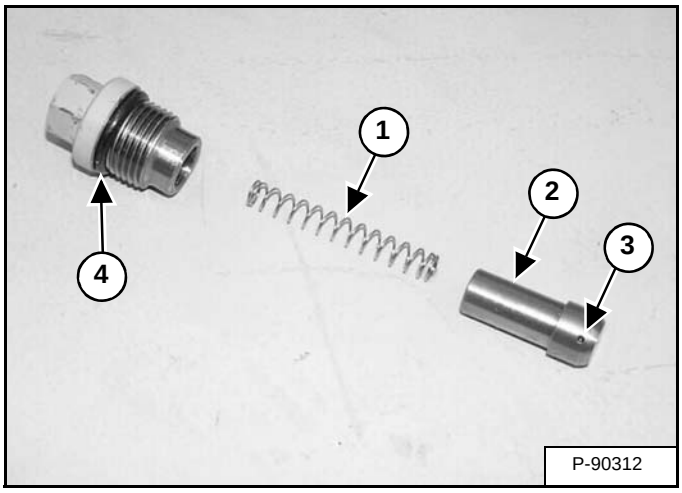
Anti-Cavitation Valve Removal And Installation (Lift, Rod End)

Figure 20-41-34



At the back side of the control valve, remove the lift section anti-cavitation valve (Item 1) **[Figure 20-41-34]**.

Figure 20-41-35



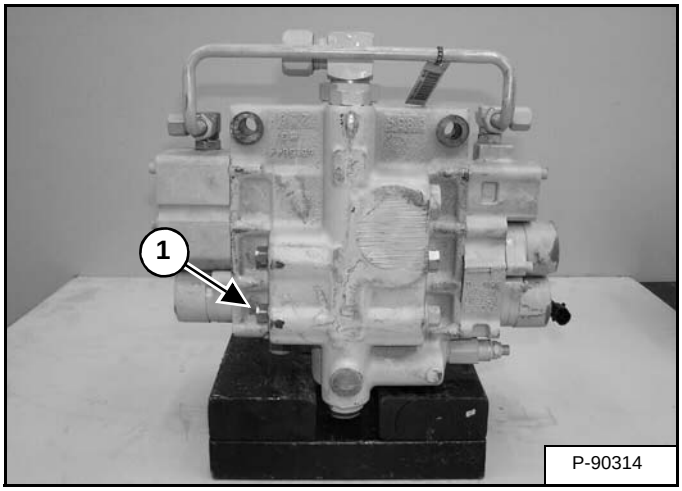
Remove the spring (Item 1) and poppet (Item 2) **[Figure 20-41-35]**.

Check the orifice (Item 3) **[Figure 20-41-35]** in the poppet to be sure it is not plugged.

Installation: Install a new O-ring (Item 4) **[Figure 20-41-35]** on the plug and lightly lubricate with oil before installing. Tighten the plug to 52 - 61 N•m (38 - 45 ft-lb) torque.

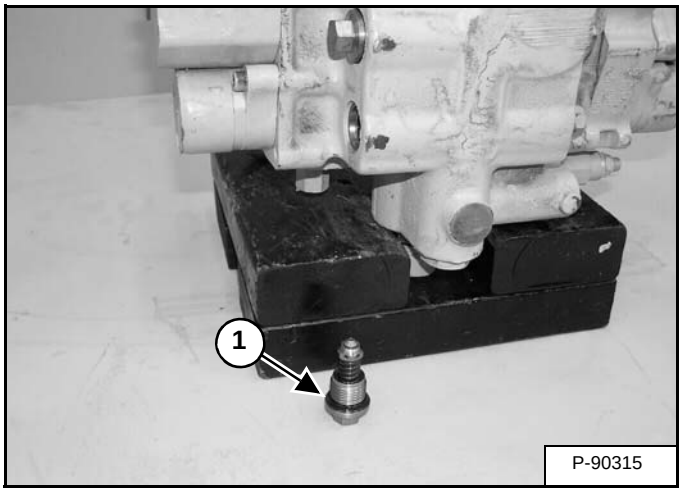
Port Relief / Anti-Cavitation Valve Removal And Installation (Lift, Base End)

Figure 20-41-36



Loosen the lift circuit port relief / anti cavitation valve (Item 1) **[Figure 20-41-36]**.

Figure 20-41-37



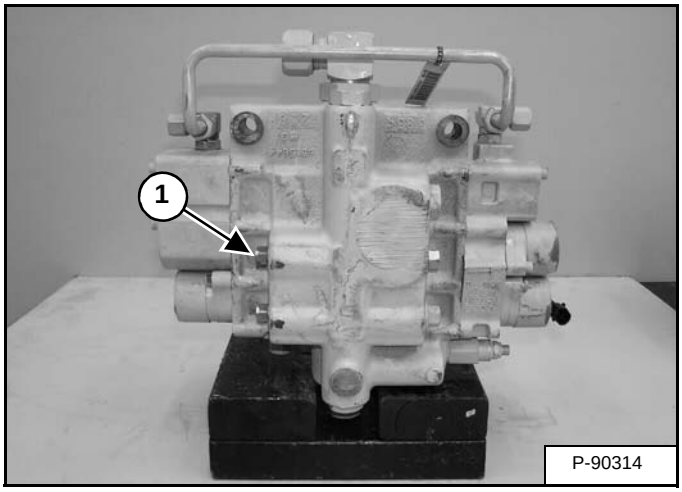
Replace the O-ring (Item 1) **[Figure 20-41-37]** before installation.

Installation: Tighten to 52 - 61 N•m (38 - 45 ft-lb) torque.

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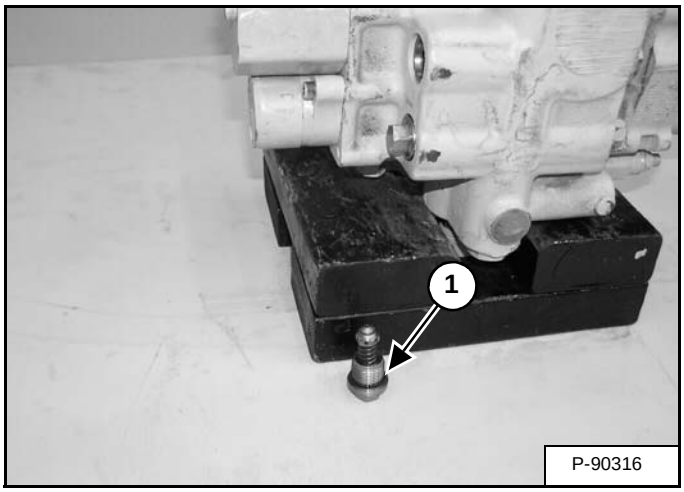
Port Relief / Anti-Cavitation Valve Removal And Installation (Tilt, Base End)

Figure 20-41-38



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

Figure 20-41-39

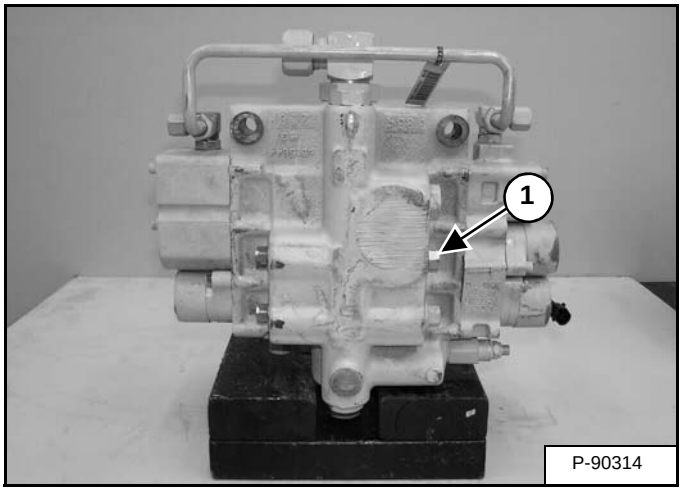


Replace the O-ring (Item 1) **[Figure 20-41-39]** before installation.

Installation: Tighten to 52 - 61 N•m (38 - 45 ft-lb) torque.

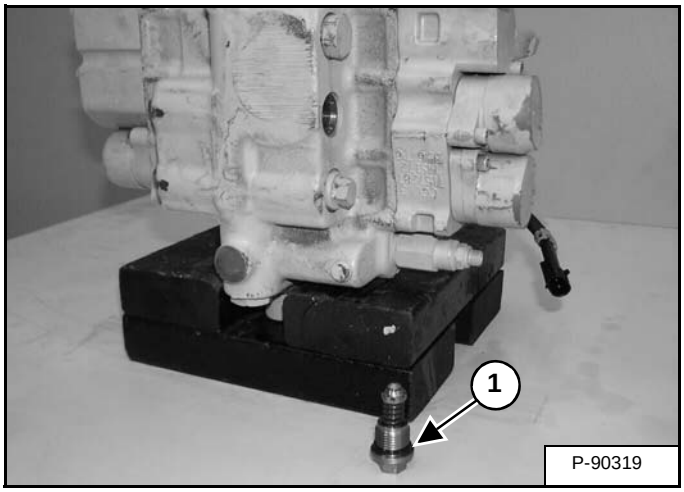
Port Relief / Anti-Cavitation Valve Removal And Installation (Tilt, Rod End)

Figure 20-41-40



Remove the tilt port relief / anti cavitation valve (Item 1) **[Figure 20-41-40]** from the rod end of the tilt section.

Figure 20-41-41



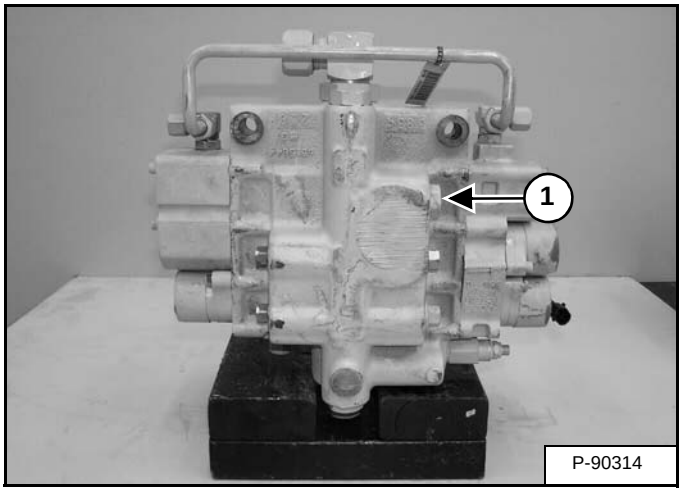
Replace the O-ring (Item 1) **[Figure 20-41-41]** before installation.

Installation: Tighten to 52 - 61 N•m (38 - 45 ft-lb) torque.

Dealer Copy -- Not for Resale

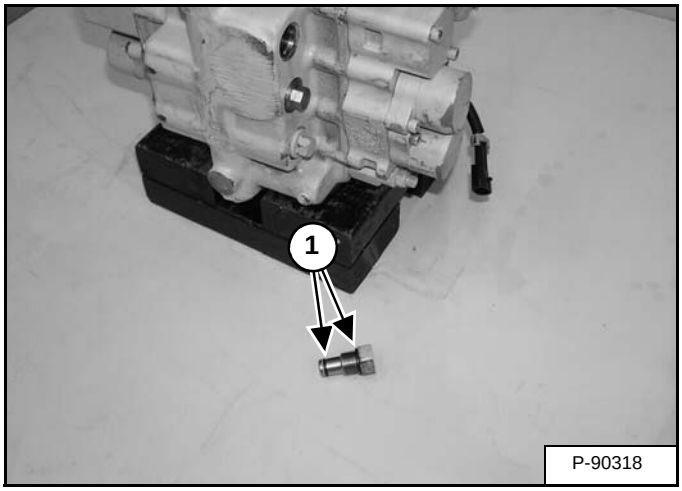
Port Relief Valve Removal And Installation

Figure 20-41-42



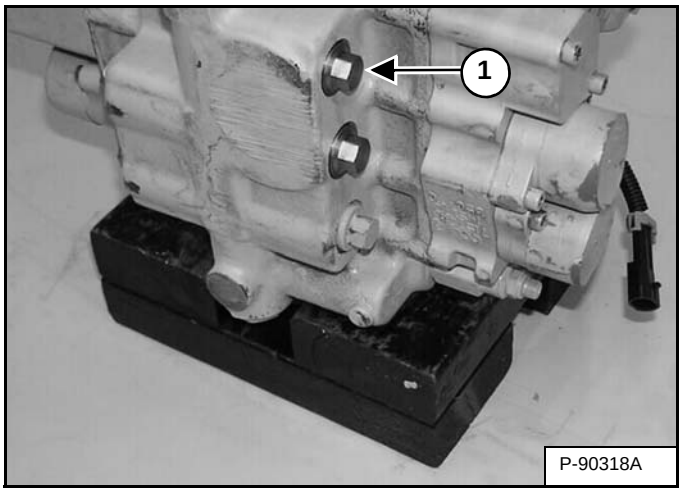
Remove the port relief plug (Item 1) **[Figure 20-41-42]** from the auxiliary circuit of the control valve.

Figure 20-41-43



Installation: Always use new O-rings (Item 1) **[Figure 20-41-43]**. Tighten to 52 - 61 N•m (38 - 45 ft-lb) torque.

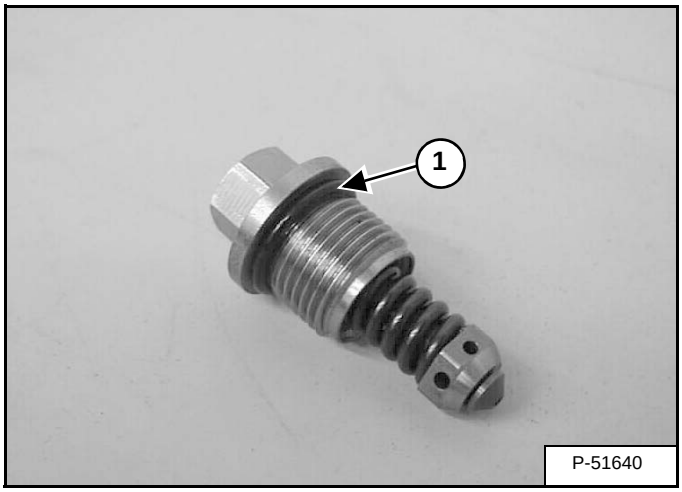
Figure 20-41-44



The control valve may be equipped with an optional auxiliary port relief valve (Item 1) **[Figure 20-41-44]**.

Remove the auxiliary port relief valve.

Figure 20-41-45

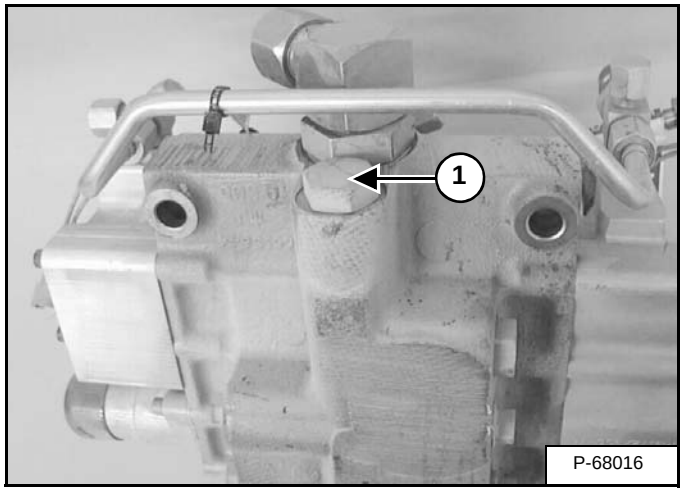


Installation: Always use new O-rings (Item 1) **[Figure 20-41-45]**. Tighten to 52 - 61 N•m (38 - 45 ft-lb) torque.

Dealer Copy -- Not for Resale

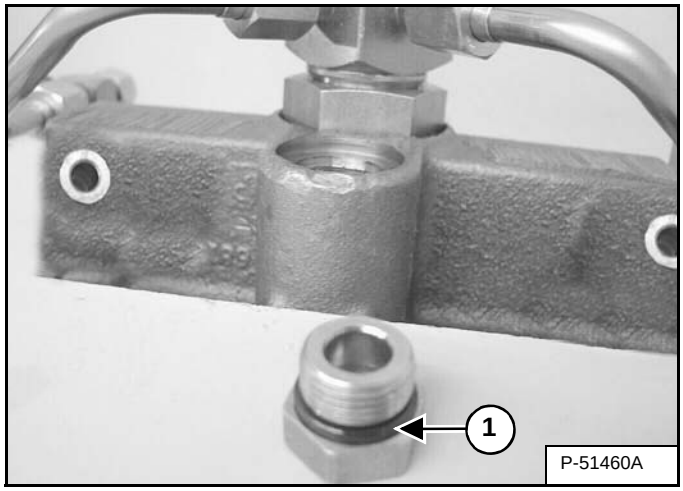
Plug Removal And Installation

Figure 20-41-46



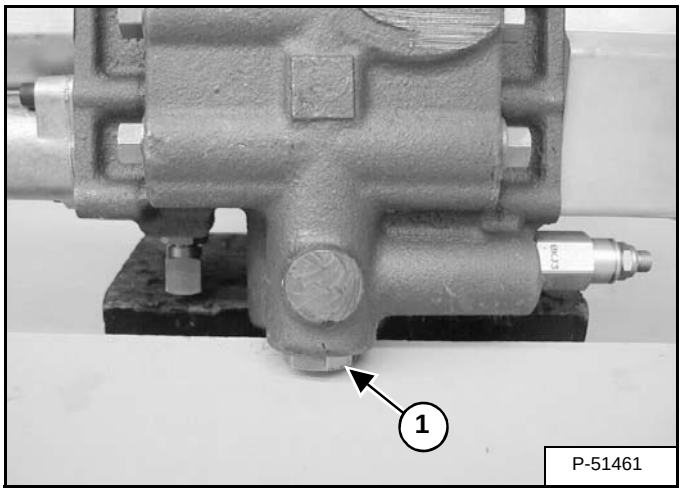
At the top side of the control valve, remove the plug (Item 1) **[Figure 20-41-46]**.

Figure 20-41-47



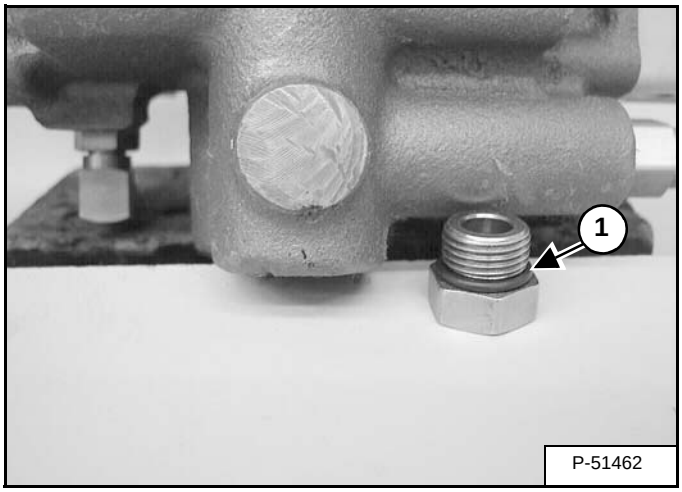
Installation: Always use new O-rings (Item 1) **[Figure 20-41-47]**. Tighten to 81,3 N•m (60 ft-lb) torque.

Figure 20-41-48



At the bottom side of the control valve remove the plug (Item 1) **[Figure 20-41-48]**.

Figure 20-41-49



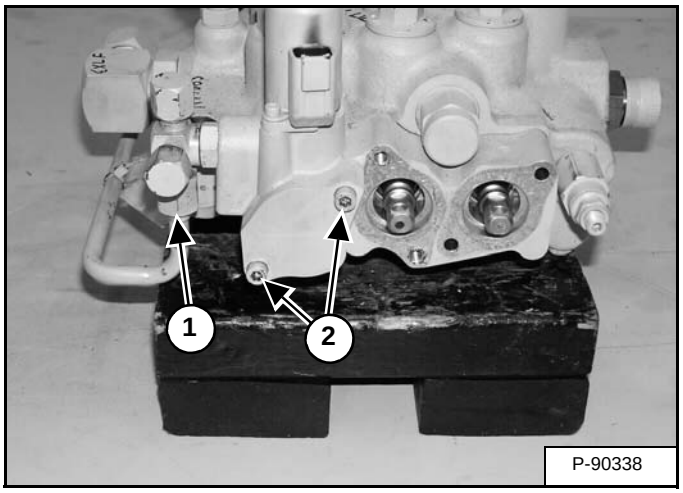
Installation: Always use new O-rings (Item 1) **[Figure 20-41-49]**. Tighten to 81,3 N•m (60 ft-lb) torque.

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End Cap Block Removal And Installation

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

Figure 20-41-50

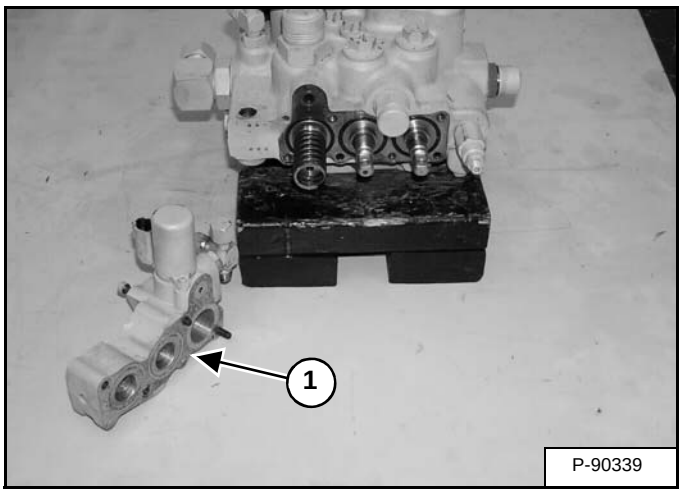


Disconnect the tube line (Item 1) **[Figure 20-41-50]** from the end cap block.

Remove the two end cap block mount screws (Item 2) **[Figure 20-41-50]**.

Installation: Tighten the screws to 10,2 - 11,3 N•m (90 - 100 in-lb) torque.

Figure 20-41-51



Remove the end cap block (Item 1) **[Figure 20-41-51]** from the control valve.

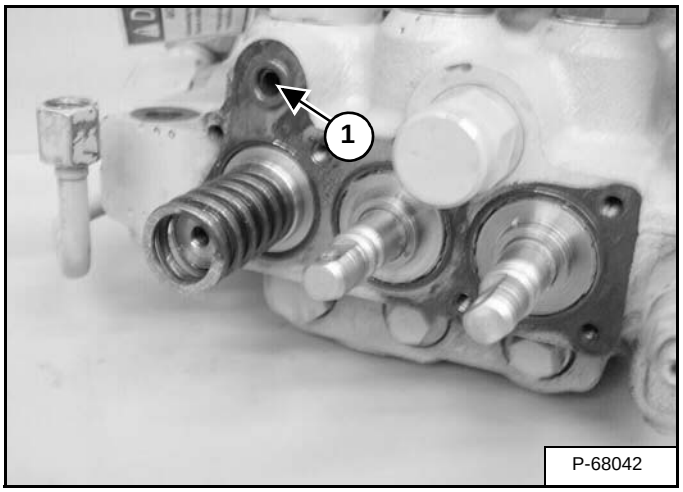
Lift Spool Removal And Installation

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

MEL 1285 - Spring Tool

Remove the end cap block from the control valve.

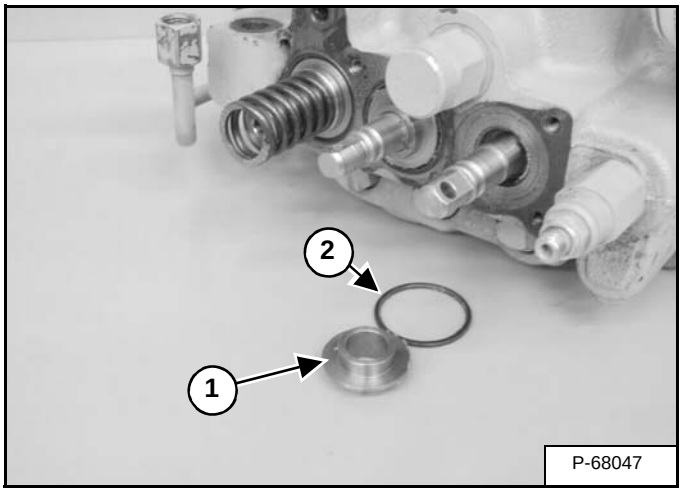
Figure 20-41-52



Remove the O-ring (Item 1) **[Figure 20-41-52]**.

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

Figure 20-41-53

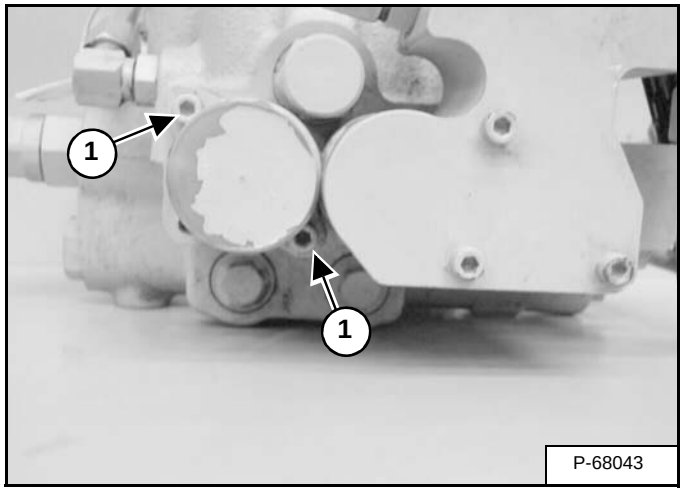


Remove the spacer (Item 1) and O-ring (Item 2) **[Figure 20-41-53]** from the lift spool.

Dealer Copy -- Not for Resale

Lift Spool Removal And Installation (Cont'd)

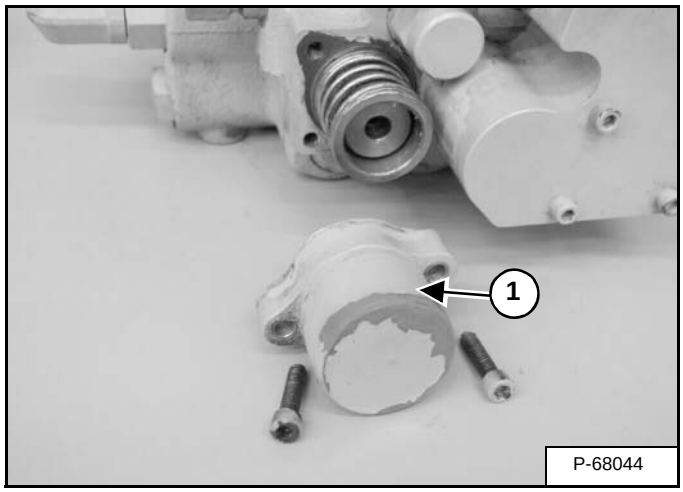
Figure 20-41-54



Remove the two screws (Item 1) **[Figure 20-41-54]** from the lift spool end cap.

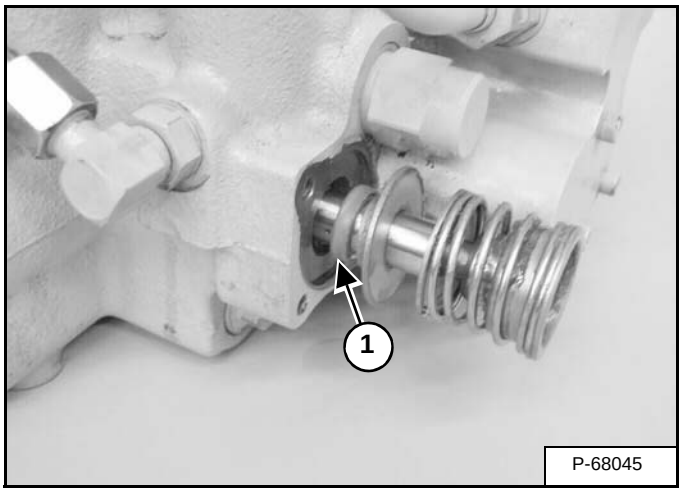
Installation: Lubricate the screws and tighten to 10,2 - 11,3 N•m (90 - 100 in-lb) torque.

Figure 20-41-55



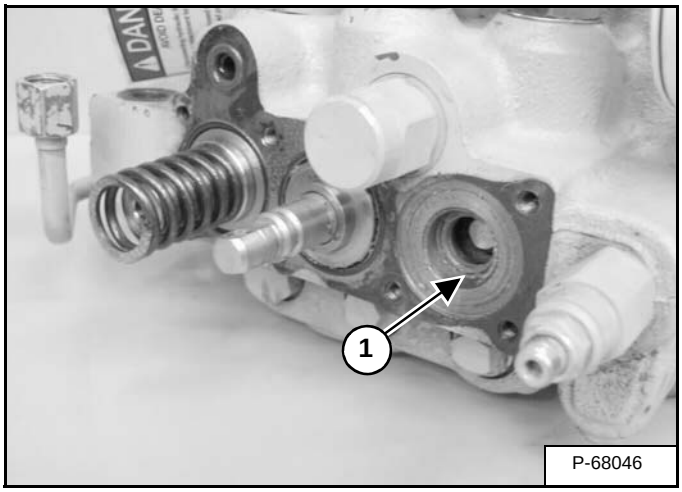
Remove the lift spool end cap (Item 1) **[Figure 20-41-55]** from the control valve.

Figure 20-41-56



Remove the lift spool assembly and seal (Item 1) **[Figure 20-41-56]** from the control valve.

Figure 20-41-57

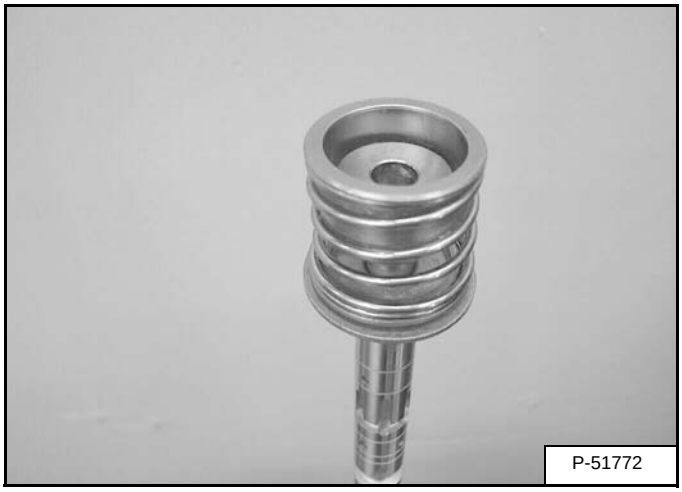


Remove the lift spool seal (Item 1) **[Figure 20-41-57]** from the linkage end of the valve.

Dealer Copy -- Not for Resale

Lift Spool Removal And Installation (Cont'd)

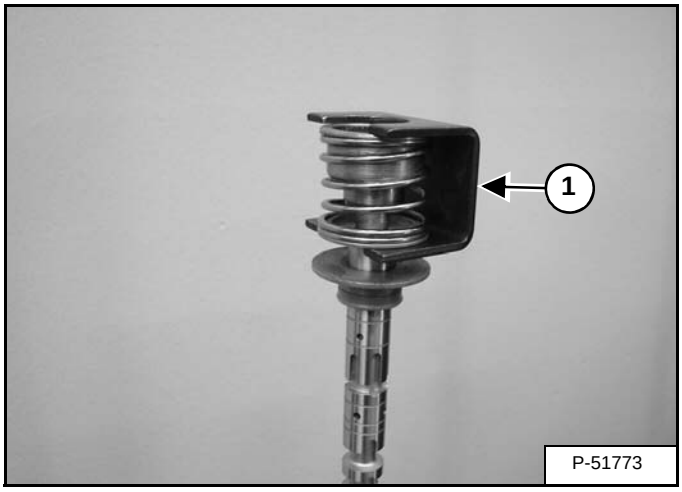
Figure 20-41-58



Clamp the linkage end of the spool in a vise **[Figure 20-41-58]**.

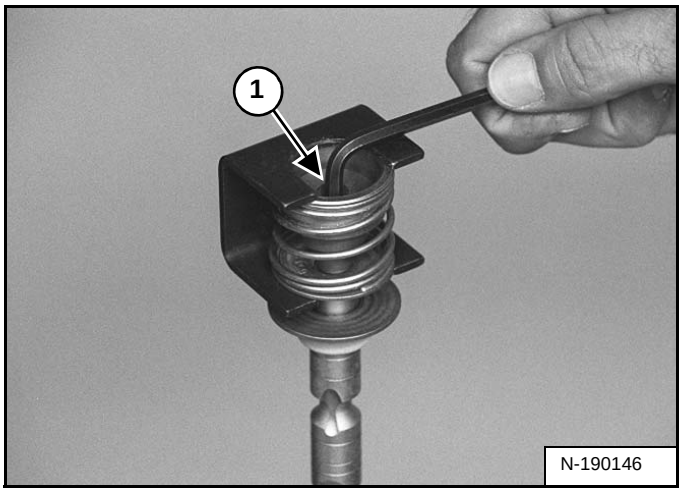
NOTE: Protect spool before clamping in vise.

Figure 20-41-59



Install the spring tool (Item 1) **[Figure 20-41-59]** over the centering spring.

Figure 20-41-60

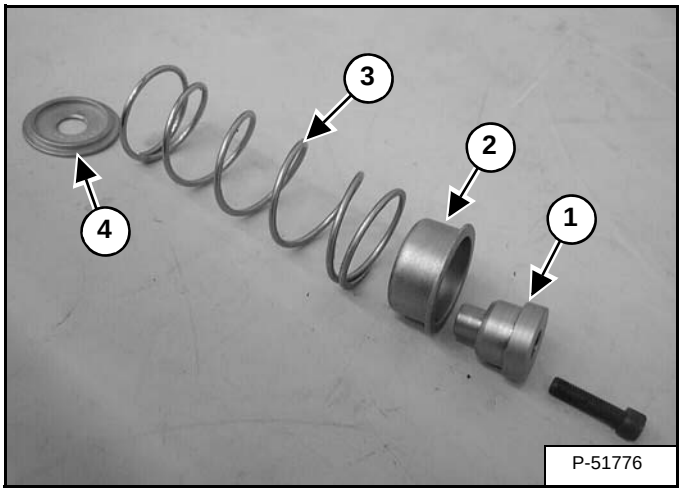


Remove the bolt (Item 1) **[Figure 20-41-60]** holding the centering spring to the spool.

Installation: Tighten the bolt to 10,2 - 11,3 N•m (90 - 100 in-lb) torque.

Remove spring tool from the spring assembly.

Figure 20-41-61

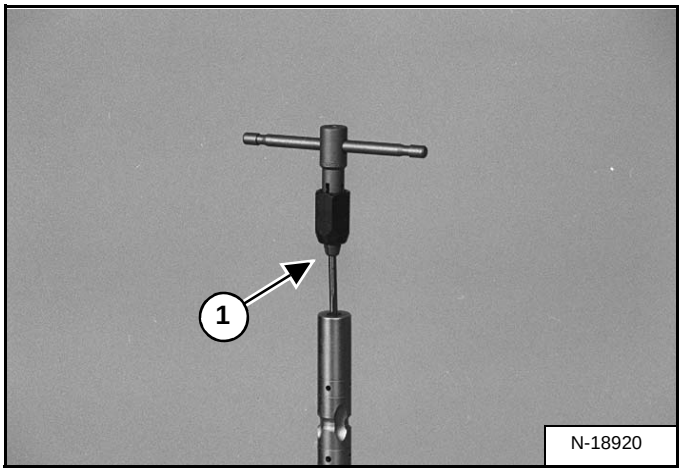


Inspect the adapter (Item 1), collar (Item 2), spring (Item 3) and washer (Item 4) **[Figure 20-41-61]**.

Dealer Copy -- Not for Resale

Lift Spool Removal And Installation (Cont'd)

Figure 20-41-62



Removal of the plastic plug:

Make a center point in the plug using a 1,6 mm (1/16 in) drill.

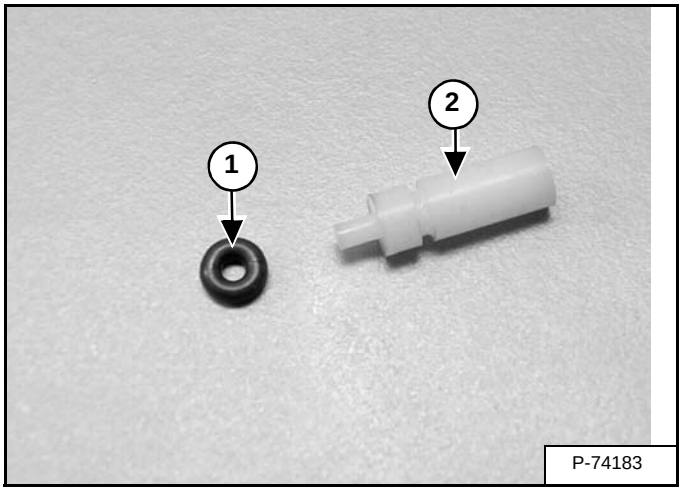
Drill a hole all the way through the plug using a 2,8 mm (7/64 in) tap drill.

Turn a 6-32 tap (Item 1) **[Figure 20-41-62]** into the plug. Pull the tap and plug out of the spool. Be careful, do not break the tap.

Clean all the debris from inside the spool bore.

NOTE: DO NOT USE Loctite® ON THE STUD THREADS.

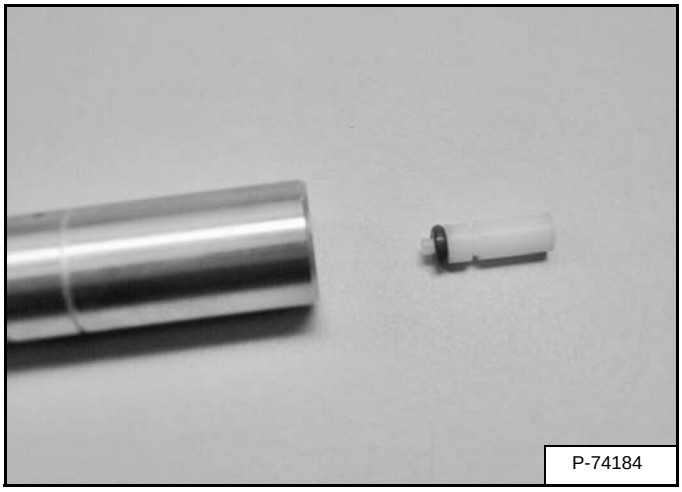
Figure 20-41-63



Install the O-ring (Item 1) over the nipple on the plastic plug (Item 2) **[Figure 20-41-63]**.

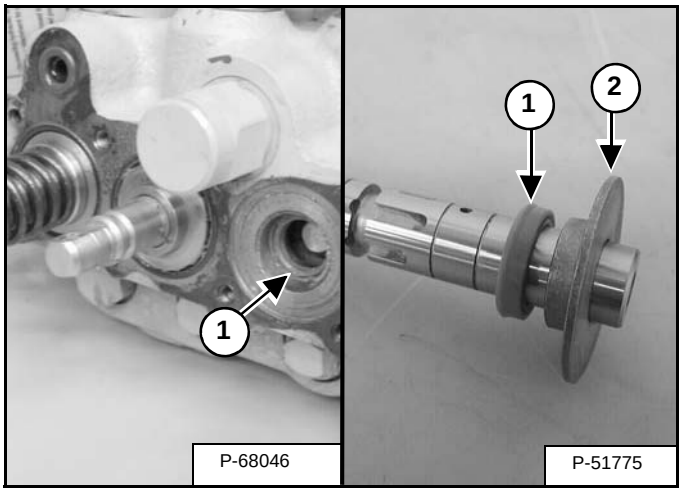
NOTE: Check the O-ring for damage. The lift spool will have an internal leak if there is damage to this O-ring. Always replace the O-ring and recheck the lift spool before the control valve is replaced.

Figure 20-41-64



Install the plastic plug and O-ring in the spool **[Figure 20-41-64]**.

Figure 20-41-65



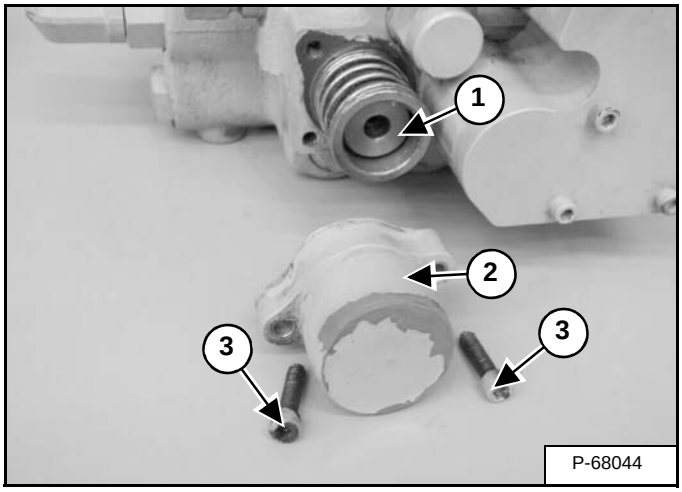
Remove the spool seal(s) (Item 1) and the back-up washer (Item 2) **[Figure 20-41-65]**.

Assembly: Always use a new spool seal.

Dealer Copy -- Not for Resale

Lift Spool Removal And Installation (Cont'd)

Figure 20-41-66



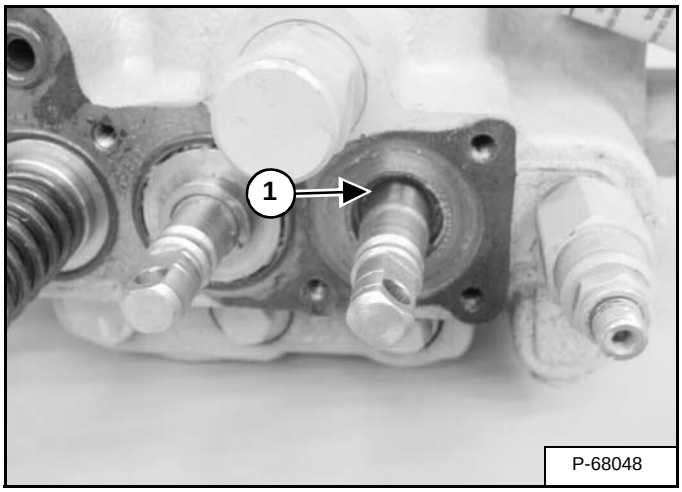
Install the lift spool assembly (Item 1) **[Figure 20-41-66]** in the spool bore.

Install the end cap (Item 2) **[Figure 20-41-66]**.

Install the mounting screws (Item 3) **[Figure 20-41-66]**.

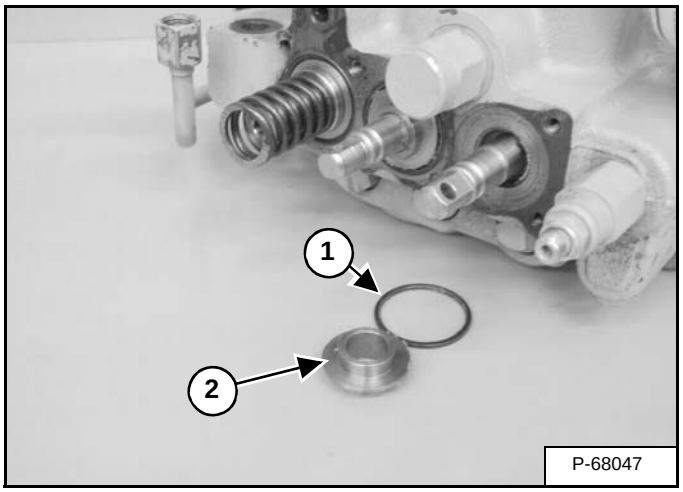
Installation: Lubricate the screws and tighten to 10,2 - 11,3 N•m (90 - 100 in-lb) torque.

Figure 20-41-67



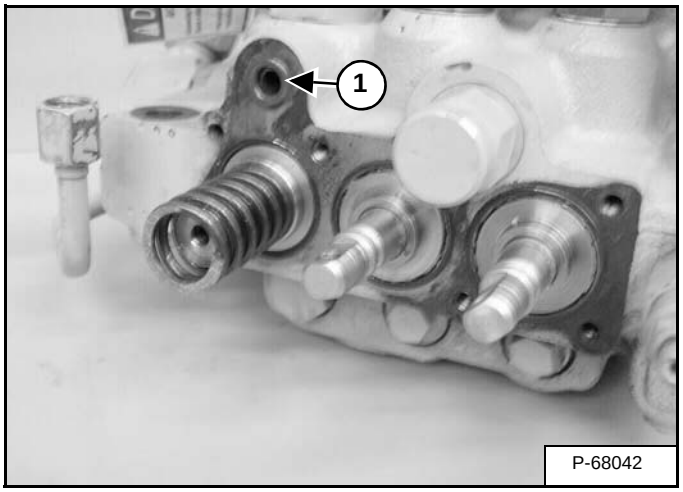
Install the spool seal (Item 1) **[Figure 20-41-67]** on the linkage end of the valve.

Figure 20-41-68



Install the O-ring (Item 1) and bushing (Item 2) **[Figure 20-41-68]** on the lift spool.

Figure 20-41-69



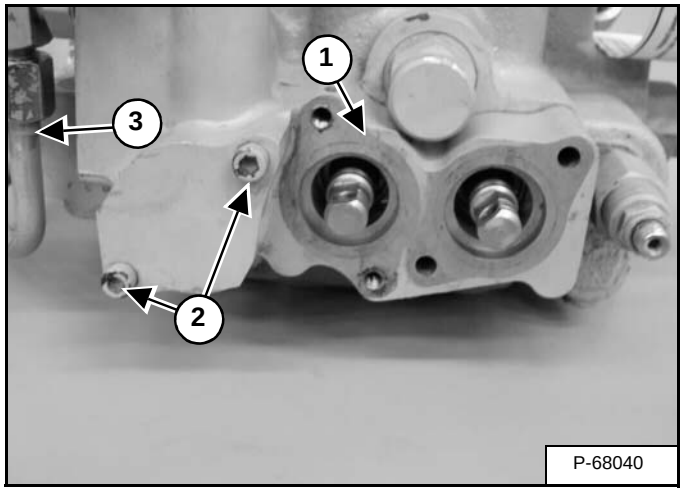
Install the O-ring (Item 1) **[Figure 20-41-69]** on the control valve.

Installation: Replace the O-ring, lubricate lightly with oil or grease before installation of the end cap block.

Dealer Copy -- Not for Resale

Lift Spool Removal And Installation (Cont'd)

Figure 20-41-70



Install the end cap block (Item 1) and the two mount bolts (Item 2) **[Figure 20-41-70]**.

Installation: Tighten the screws to 10,2 - 11,3 N•m (90 - 100 in-lb) torque.

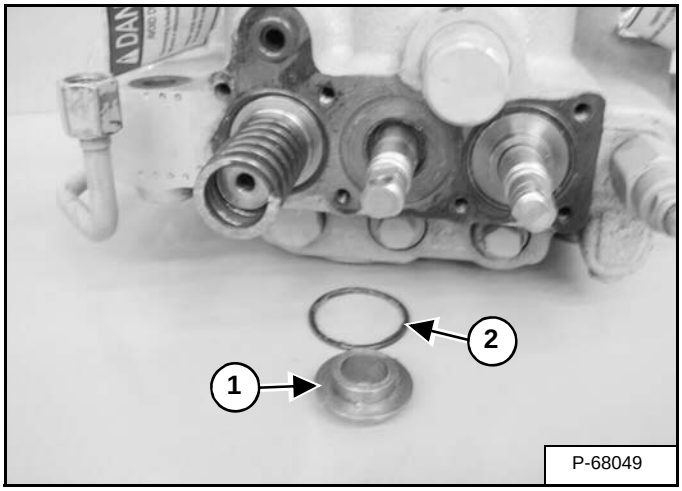
Connect the tubeline (Item 3) **[Figure 20-41-70]** to the end cap block.

Install the lift and tilt actuators to the control valve.

Tilt Spool Removal And Installation

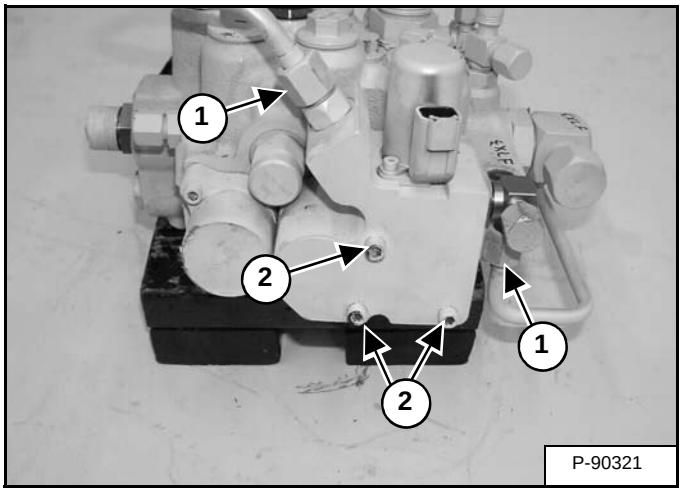
Remove the end cap block. (See End Cap Block Removal And Installation on Page 20-41-17.)

Figure 20-41-71



Remove the spacer (Item 1) and O-ring (Item 2) **[Figure 20-41-71]** from the tilt spool.

Figure 20-41-72



Disconnect the two tubelines (Item 1) **[Figure 20-41-72]**.

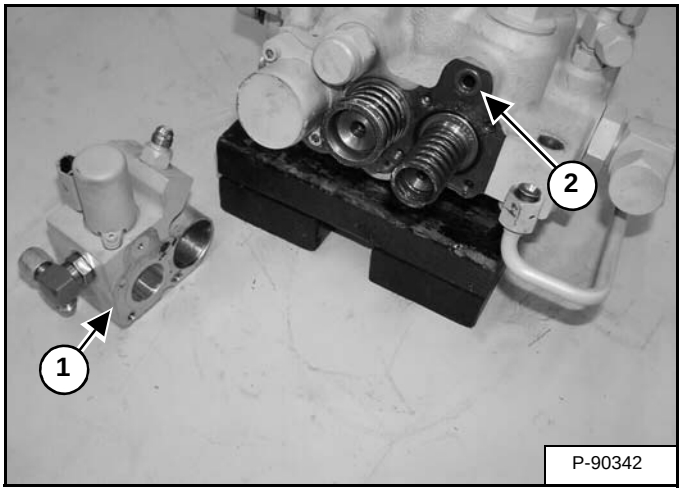
Remove the three screws (Item 2) **[Figure 20-41-72]** from the spool centering block.

Installation: Tighten the bolt to 10,2 - 11,3 N•m (90 - 100 in-lb) torque.

Dealer Copy -- Not for Resale

Tilt Spool Removal And Installation (Cont'd)

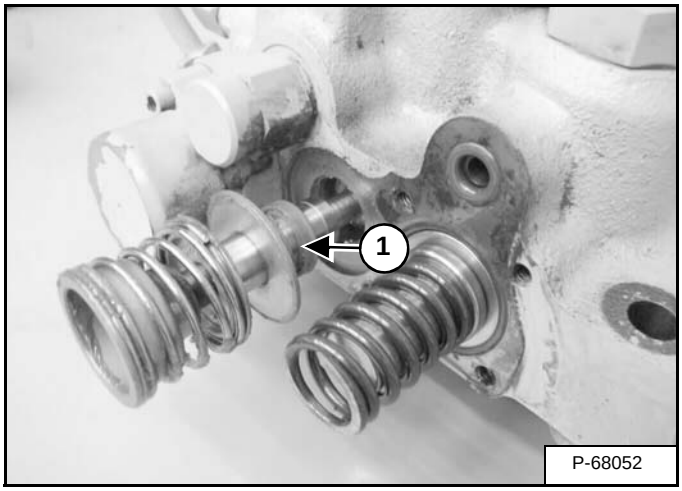
Figure 20-41-73



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

Installation: Replace the O-ring (Item 2) **[Figure 20-41-73]** and lubricate lightly with oil / grease before installation of the end cap block.

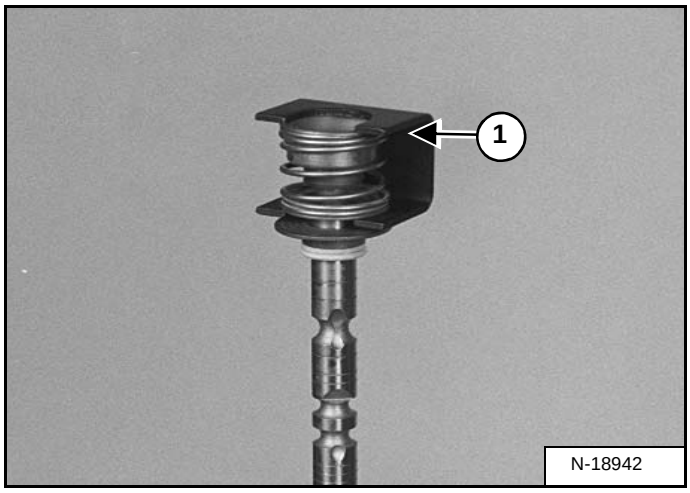
Figure 20-41-74



Remove the tilt spool, centering spring, back-up washer and spool seal (Item 1) **[Figure 20-41-74]**.

Assembly: Always use a new spool seal.

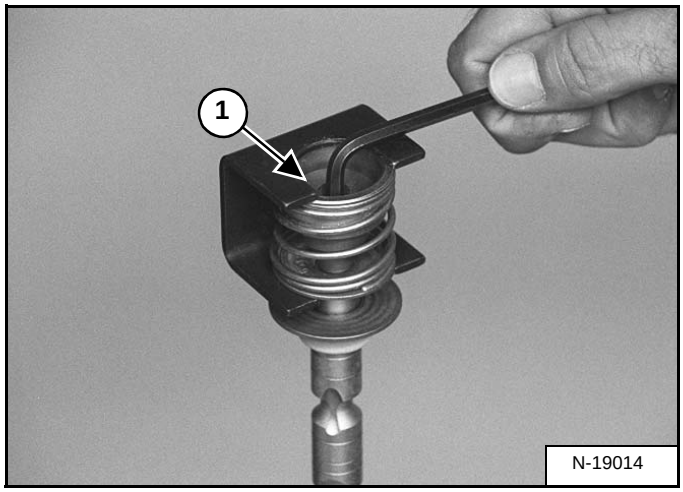
Figure 20-41-75



Put the linkage end of the spool in the vice **[Figure 20-41-75]**.

Install the spring tool (Item 1) **[Figure 20-41-75]** over the centering spring.

Figure 20-41-76



Remove the bolt (Item 1) **[Figure 20-41-76]** holding the centering spring to the spool.

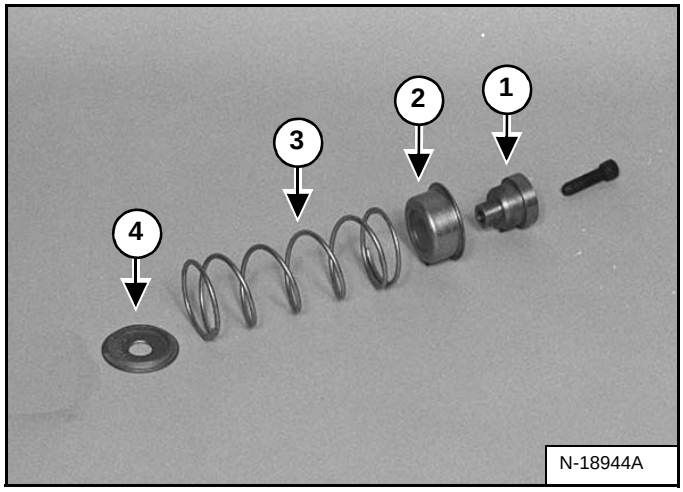
Installation: Tighten the bolt to 10,2 - 11,3 N•m (90 - 100 in-lb) torque.

Remove spring tool from the spring assembly.

Dealer Copy -- Not for Resale

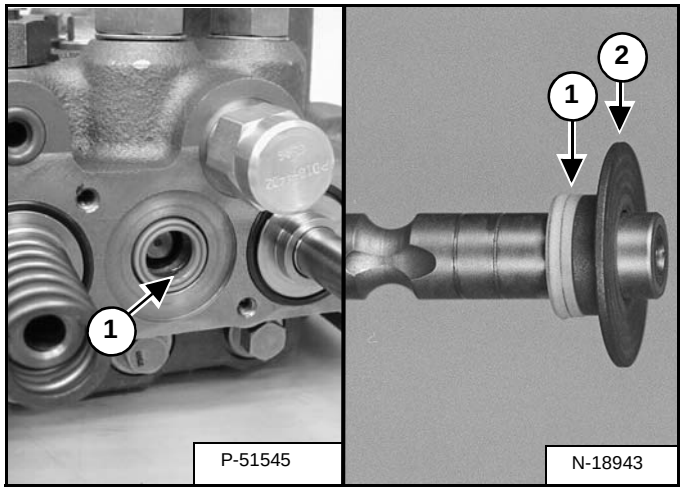
Tilt Spool Removal And Installation (Cont'd)

Figure 20-41-77



Inspect the adapter (Item 1), collar (Item 2), spring (Item 3) and washer (Item 4) **[Figure 20-41-77]**.

Figure 20-41-78

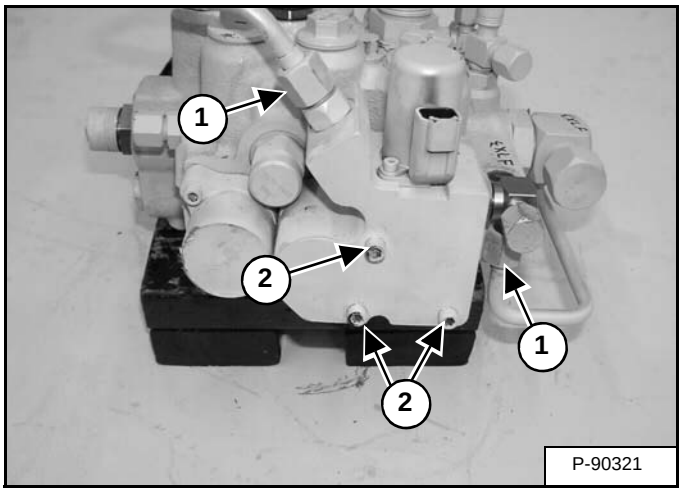


Remove the spool seal(s) (Item 1) and the back-up washer (Item 2) **[Figure 20-41-78]**.

Assembly: Always use a new spool seal.

Auxiliary Spool Removal And Installation

Figure 20-41-79



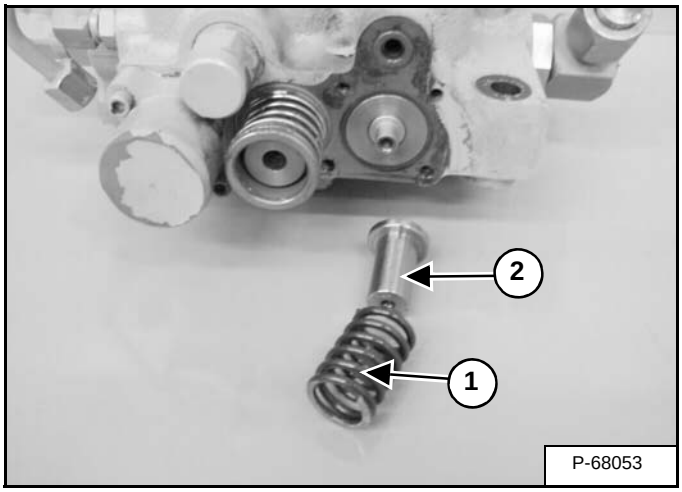
Disconnect the two tubelines (Item 1) **[Figure 20-41-79]** from the spool centering block.

Remove the three screws (Item 2) **[Figure 20-41-79]** from the spool centering block.

Installation: Tighten the bolts to 10,2 - 11,3 N•m (90 - 100 in-lb) torque.

Remove the spool centering block from the control valve.

Figure 20-41-80



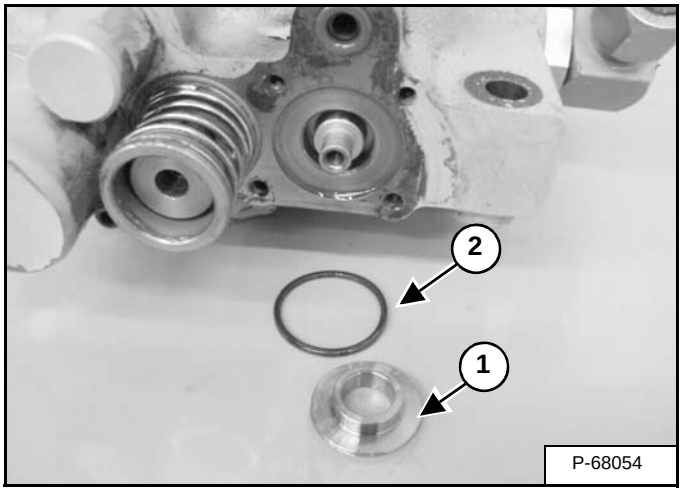
Remove the spring (Item 1) and center spring retainer (Item 2) **[Figure 20-41-80]** from the auxiliary spool.

NOTE: If the centering spring retainer (Item 2) [Figure 20-41-80] must be replaced, replace the retainer on the opposite end also.

Dealer Copy -- Not for Resale

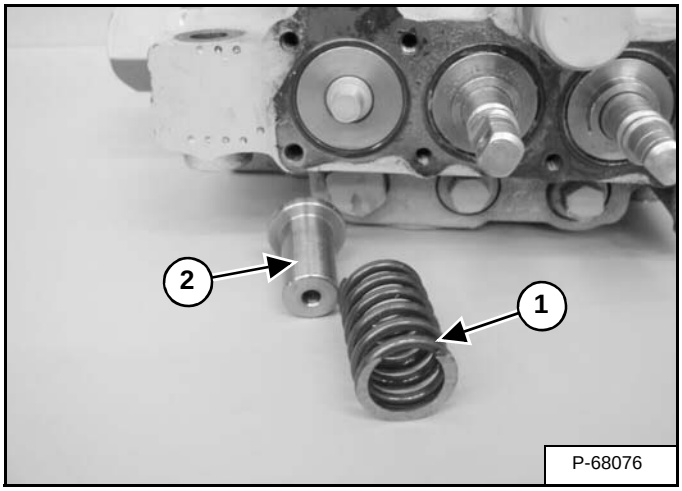
Auxiliary Spool Removal And Installation (Cont'd)

Figure 20-41-81



Remove the spacer (Item 1) and O-ring (Item 2) **[Figure 20-41-81]** from the auxiliary spool.

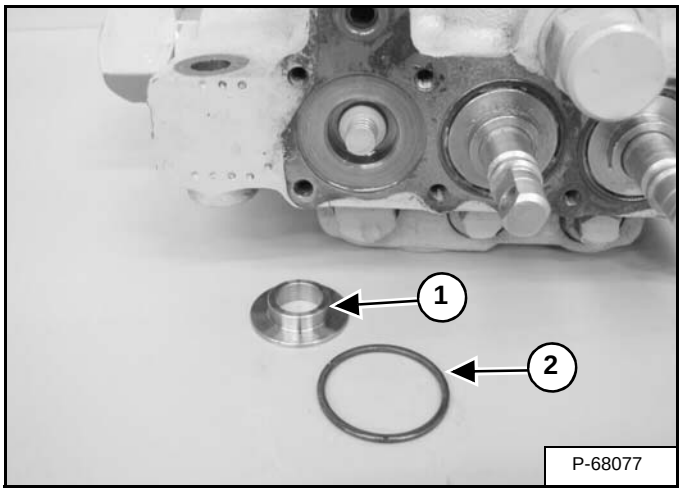
Figure 20-41-82



Remove the spring (Item 1) and center spring retainer (Item 2) **[Figure 20-41-82]** from the auxiliary spool.

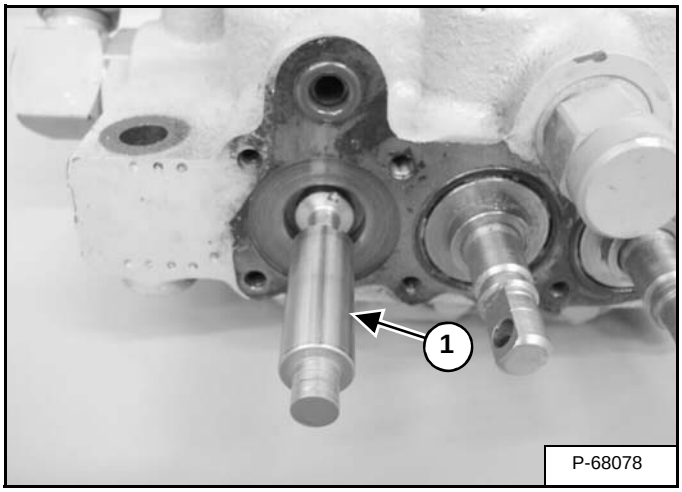
NOTE: If the centering spring retainer (Item 2) [Figure 20-41-82] must be replaced, replace the retainer on the opposite end also.

Figure 20-41-83



Remove the spacer (Item 1) and O-ring (Item 2) **[Figure 20-41-83]** from the auxiliary spool.

Figure 20-41-84

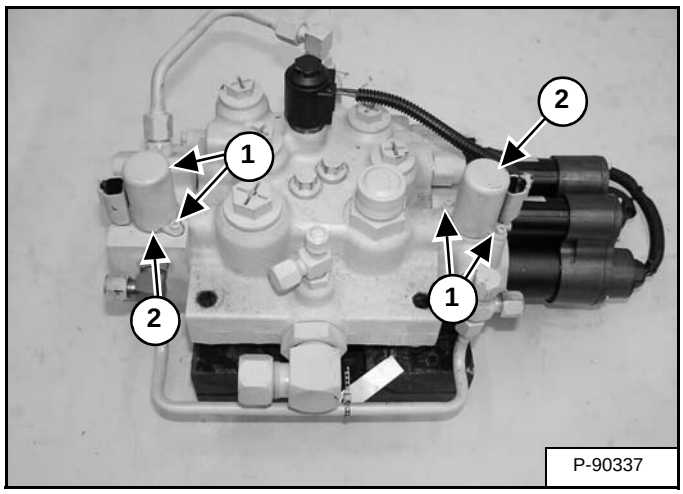


Remove the auxiliary spool (Item 1) **[Figure 20-41-84]**.

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Auxiliary Solenoid Removal And Installation

Figure 20-41-85

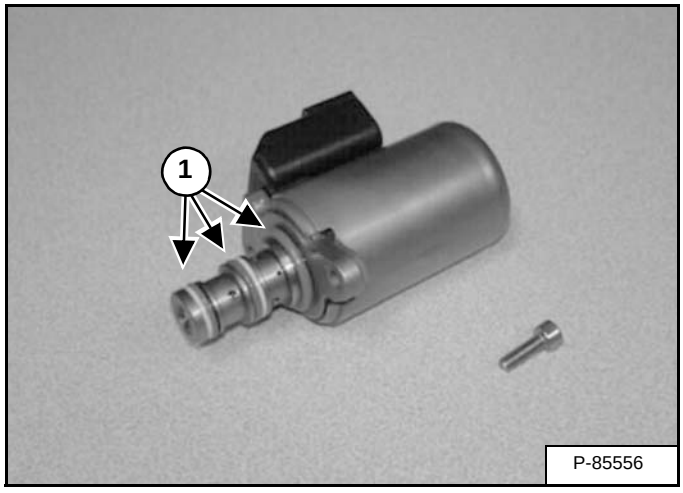


Remove the screws (Item 1) **[Figure 20-41-85]** from both solenoids.

Remove the solenoids (Item 2) **[Figure 20-41-85]**.

Installation: Tighten the screws to 2,44 - 2,98 N•m (21.6 - 26.4 in-lb) torque.

Figure 20-41-86



Check and remove the O-rings (Item 1) **[Figure 20-41-86]** from the solenoid stem.

Use an ohmmeter to measure the solenoid coil resistance.

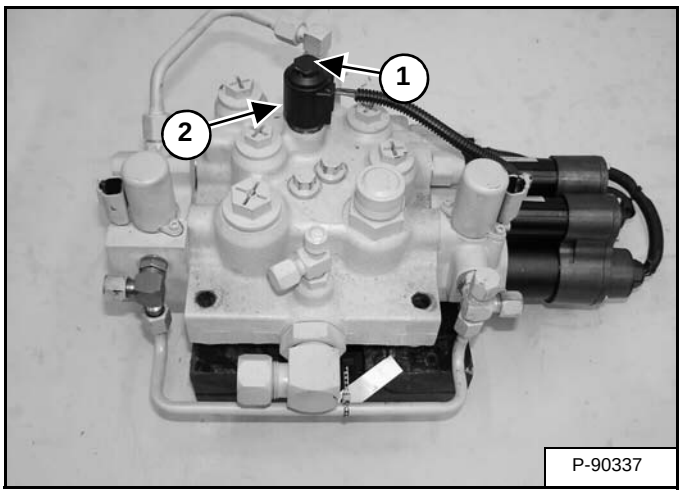
The correct resistance for the coil is 4.1 - 6.1 ohm.

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HYDRAULIC CONTROL VALVE (ACS) OR (SJC) (CONT'D)

Solenoid Removal And Installation

Figure 20-41-87

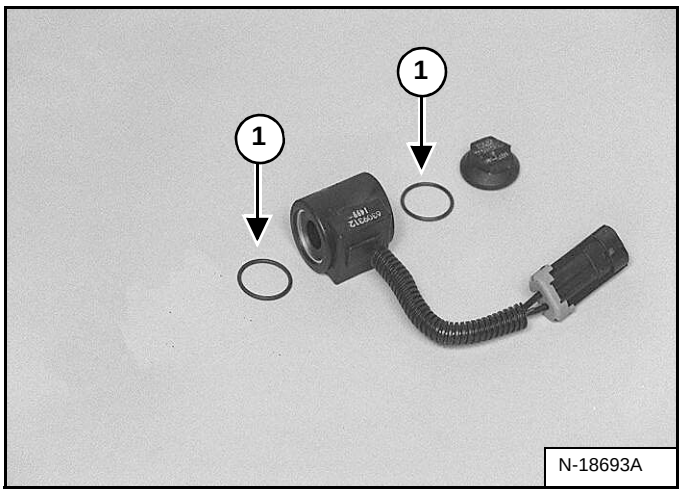


Remove the nut (Item 1) **[Figure 20-41-87]** from the solenoid stem.

Installation: Tighten the nut to 6 N•m (53 in-lb) torque.

Remove the solenoid coil (Item 2) **[Figure 20-41-87]**.

Figure 20-41-88

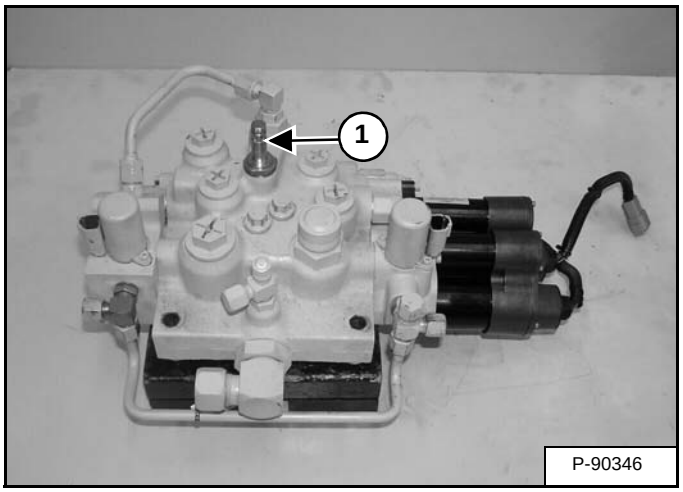


Remove the O-rings (Item 1) **[Figure 20-41-88]** from both ends of the solenoid coil.

Use an ohmmeter to measure the solenoid coil resistance.

The correct resistance for the coil is 9.5 - 10.08 ohm.

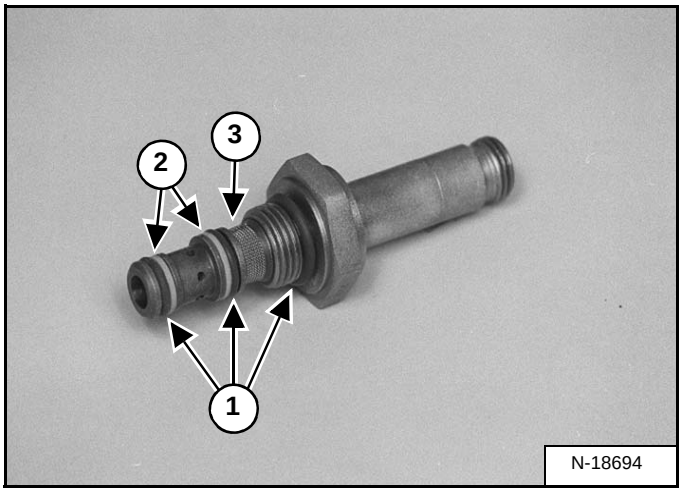
Figure 20-41-89



Remove the solenoid stem (Item 1) **[Figure 20-41-89]**.

Installation: Lubricate the O-rings and tighten the stem to 27 - 33 N•m (20 - 24 ft-lb) torque.

Figure 20-41-90



Remove the O-rings (Item 1) and back-up rings (Item 2) **[Figure 20-41-90]** from the stem.

Clean all parts in solvent and dry with compressed air.

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

NOTE: The screen (Item 3) [Figure 20-41-90] may be cleaned with solvent. If it is torn or worn the solenoid needs to be replaced.

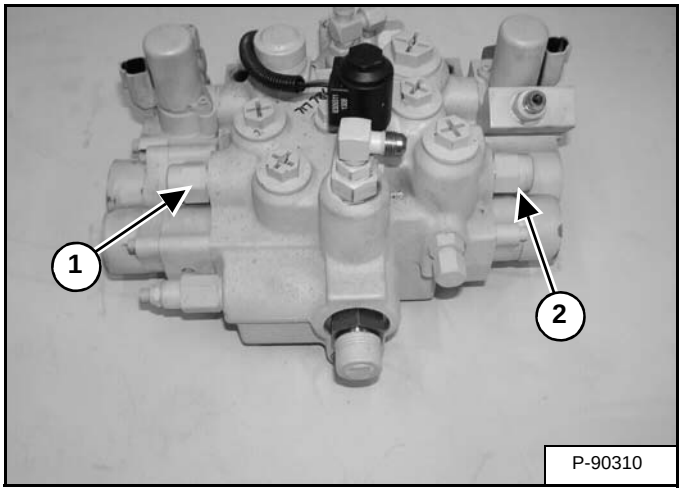
Use only new O-rings and apply oil to all O-rings and back-up rings before installation.

Install new O-rings (Item 1) **[Figure 20-41-88]** and **[Figure 20-41-90]** and new back-up rings (Item 2) **[Figure 20-41-90]** on the solenoid stem.

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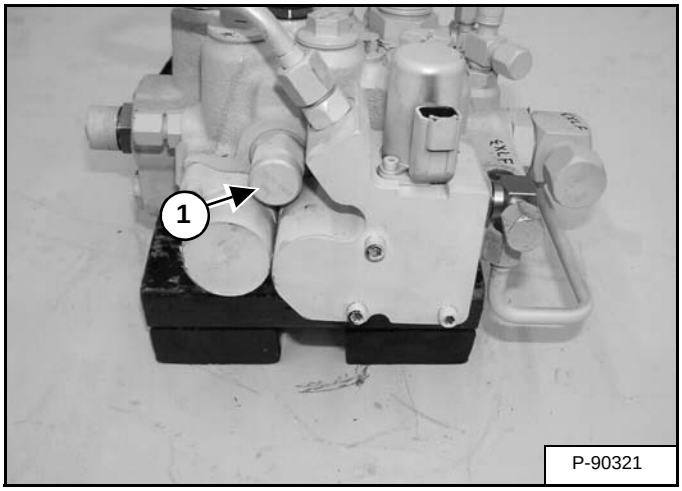
Lock Valve Removal And Installation

Figure 20-41-91



Locate the two BICS lock valves, (Item 1) is for the tilt circuit and (Item 2) **[Figure 20-41-91]** is for the lift circuit.

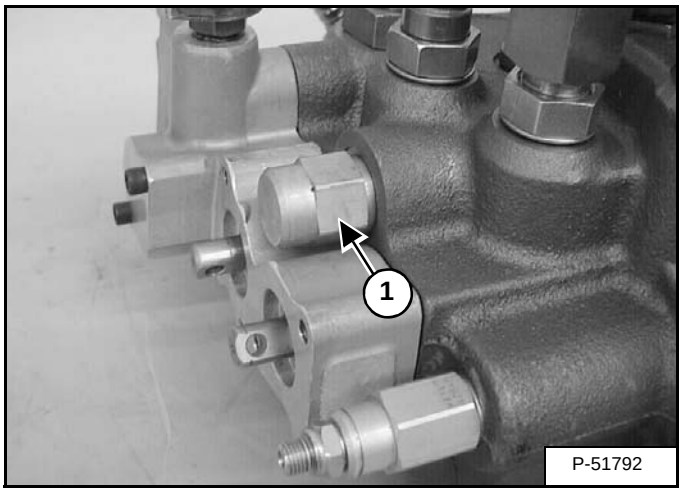
Figure 20-41-92



Remove the lift lock valve (Item 1) **[Figure 20-41-92]** from the back of the control valve.

Installation: Lightly lubricate the lock valve O-rings and tighten to 27 - 33 N•m (20 - 24 ft-lb) torque.

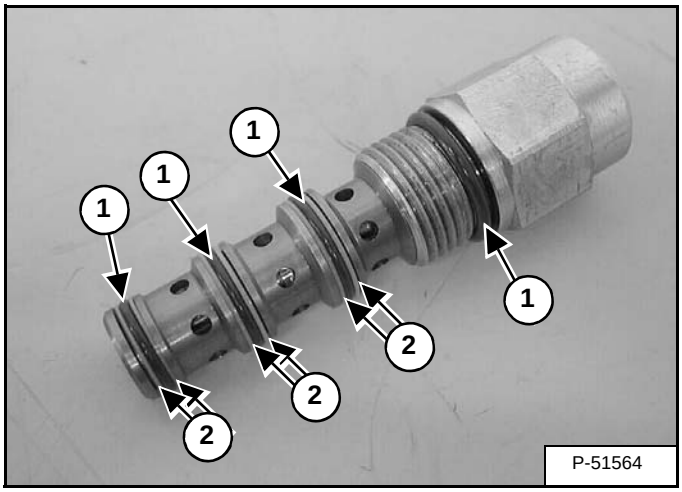
Figure 20-41-93



Remove the tilt lock valve (Item 1) **[Figure 20-41-93]** from the back of the control valve.

Installation: Lightly lubricate the lock valve O-rings and tighten to 27 - 33 N•m (20 - 24 ft-lb) torque.

Figure 20-41-94

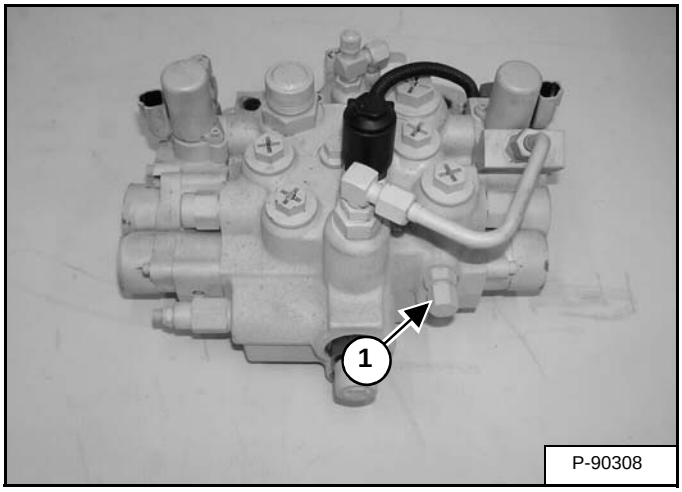


Remove the O-rings (Item 1) and back-up rings (Item 2) **[Figure 20-41-94]** from the valve, and replace with new.

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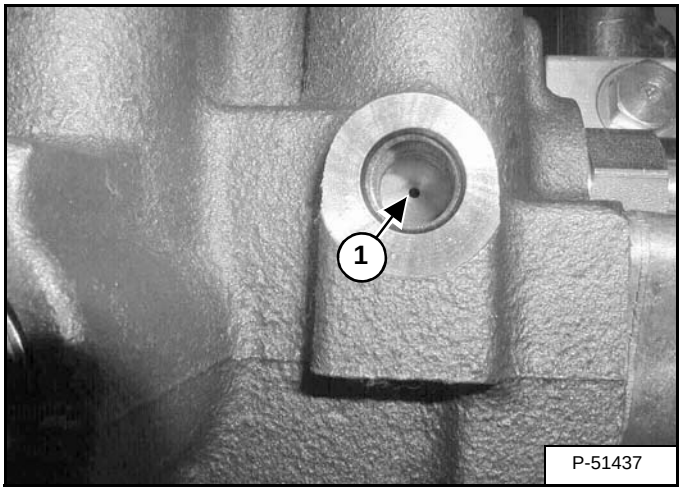
Lift Arm Bypass Orifice Removal And Installation

Figure 20-41-95



Remove the fitting (Item 1) **[Figure 20-41-95]** from the valve.

Figure 20-41-96

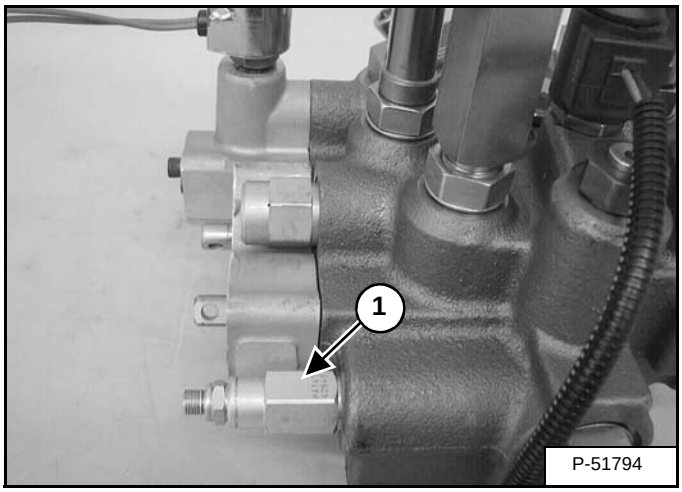


Check the lift arm bypass orifice (Item 1) **[Figure 20-41-96]**.

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

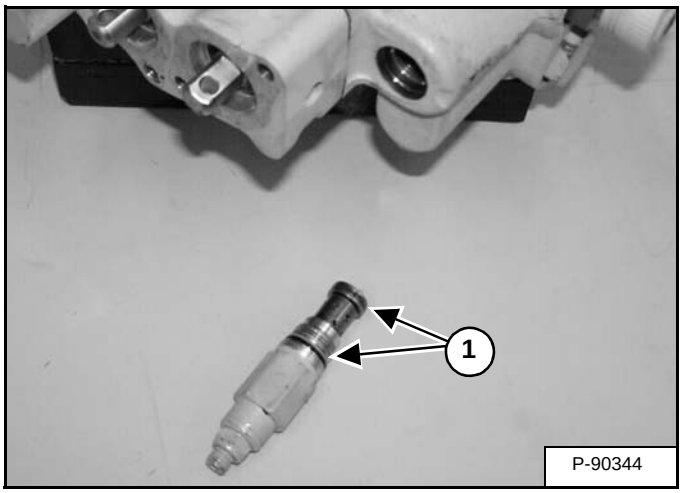
Main Relief Valve Removal And Installation

Figure 20-41-97



Remove the main relief valve (Item 1) **[Figure 20-41-97]**.

Figure 20-41-98



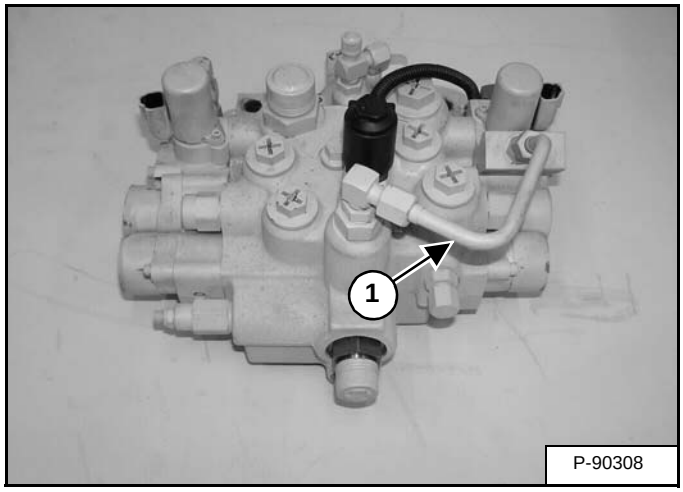
Remove the O-rings from the main relief valve (Item 1) **[Figure 20-41-98]**.

Installation: Always use new O-rings. Tighten to 52 - 61 N•m (38 - 45 ft-lb) torque.

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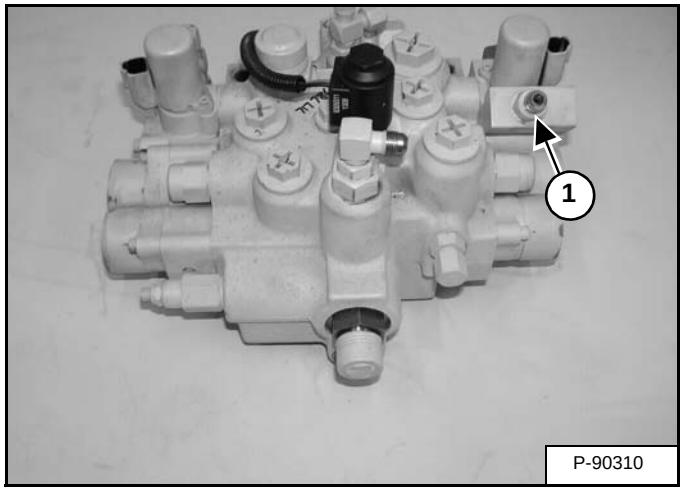
Check Valve Removal And Installation

Figure 20-41-99



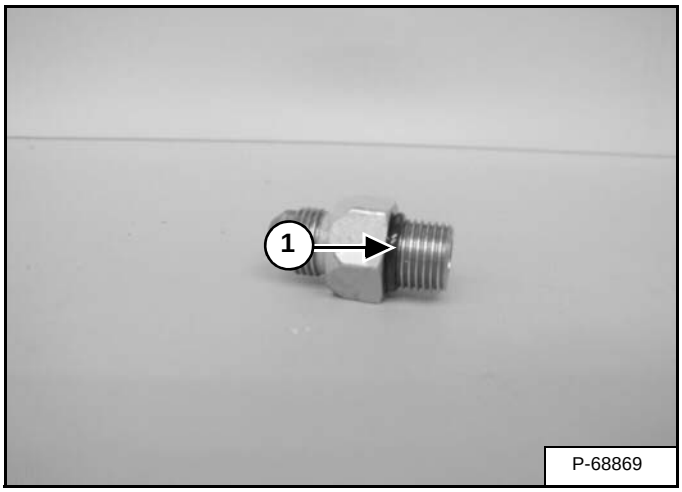
Remove the tubeline (Item 1) **[Figure 20-41-99]**.

Figure 20-41-100



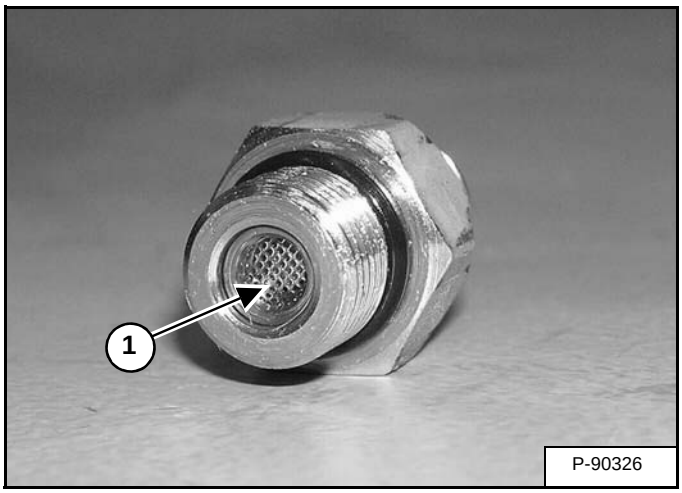
Remove the check valve fitting (Item 1) **[Figure 20-41-100]** from the hydraulic control valve.

Figure 20-41-101



Installation: Lubricate the O-ring (Item 1) **[Figure 20-41-101]** and tighten the fitting to 27 - 33 N•m (20 - 24 ft-lb) torque.

Figure 20-41-102



Inspect the screen (Item 1) **[Figure 20-41-102]**.

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LIFT ARM BYPASS CONTROL VALVE

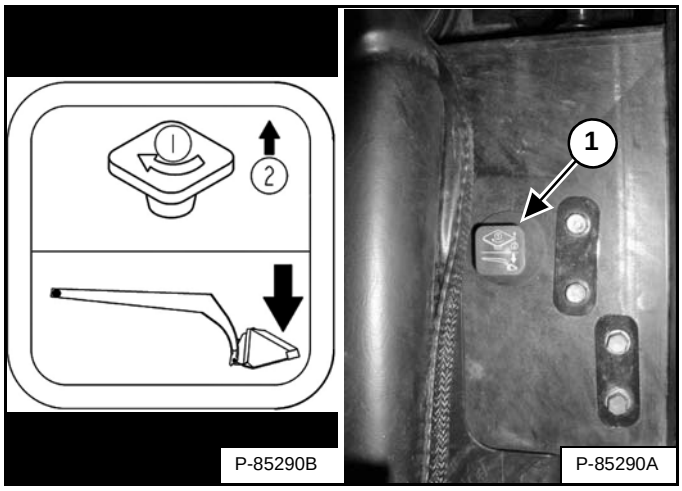
Description

The lift arm bypass control valve is located on the right side of the machine.

The lift arm bypass control valve is manually operated by pulling on the valve (Item 1) **[Figure 20-50-1]** and turning the knob 90° clockwise. The valve releases the hydraulic fluid from the base end of the lift cylinder(s) which allows the lift arm to slowly come down to the transport position.

Testing

Figure 20-50-1



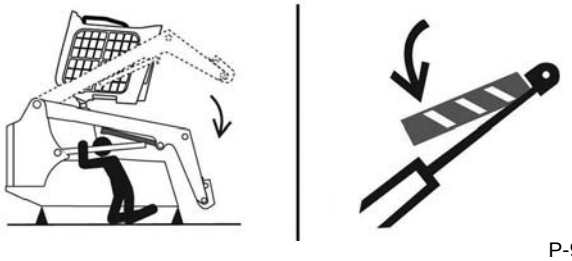
Raise the lift arms 2 m (6 ft) off the ground. Stop the engine. Turn the Lift Arm Bypass Control Knob (Item 1) **[Figure 20-50-1]** 90° clockwise. Then pull up and hold the Lift Arm Bypass Control Knob until the lift arms slowly lower.

The knob should return to its normal position.

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Removal And Installation

DANGER



P-90328

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.**

D-1009-0409

WARNING

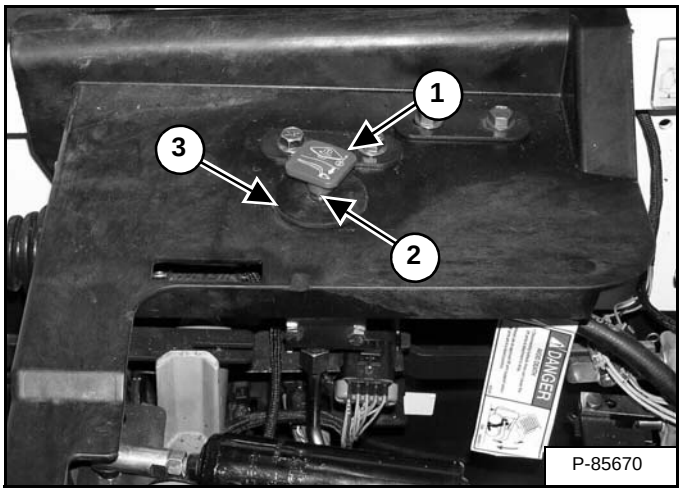
Never work on a machine with the lift arms up unless the lift arms are secured by an approved lift arm support device. Failure to use an approved lift arm support device can allow the lift arms or attachment to fall and cause injury or death.

W-2059-0598

Lower the lift arms.

Raise the operator cab. (See Raising on Page 10-30-2.)

Figure 20-50-2

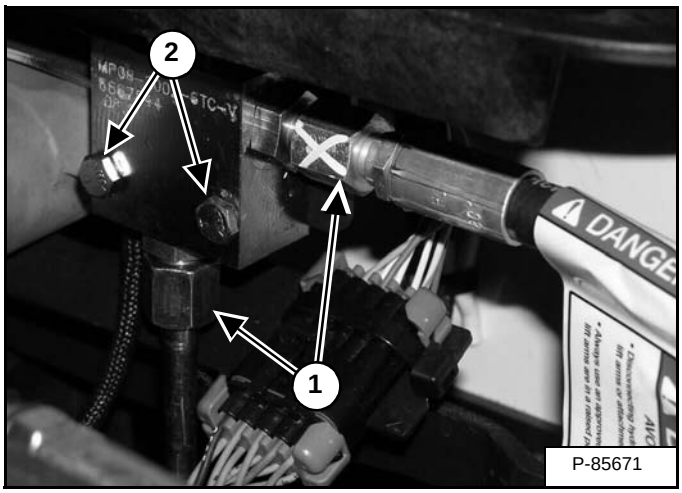


Hold the lift arm bypass control knob (Item 1) **[Figure 20-50-2]** and loosen the jam nut on the lift arm bypass valve shaft.

Remove the lift arm bypass control knob (Item 1). Remove the jam nut (Item 2) from the valve shaft **[Figure 20-50-2]**.

Remove the rubber washer (Item 3) **[Figure 20-50-2]**.

Figure 20-50-3



Disconnect and cap the hydraulic tubeline and hose (Item 1) **[Figure 20-50-3]**.

Remove the two mounting bolts and nuts (Item 2) **[Figure 20-50-3]**.

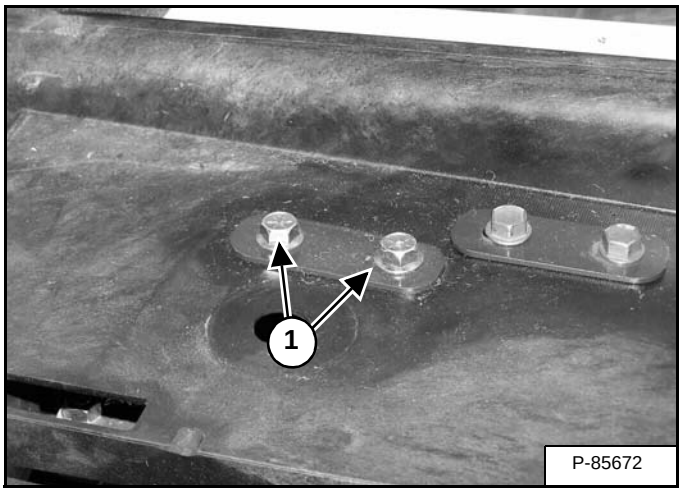
Installation: Tighten the mounting bolts to 21 - 23 N•m (180 - 200 in-lb) torque.

Remove the lift arm bypass valve.

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Bracket Removal And Installation

Figure 20-50-4

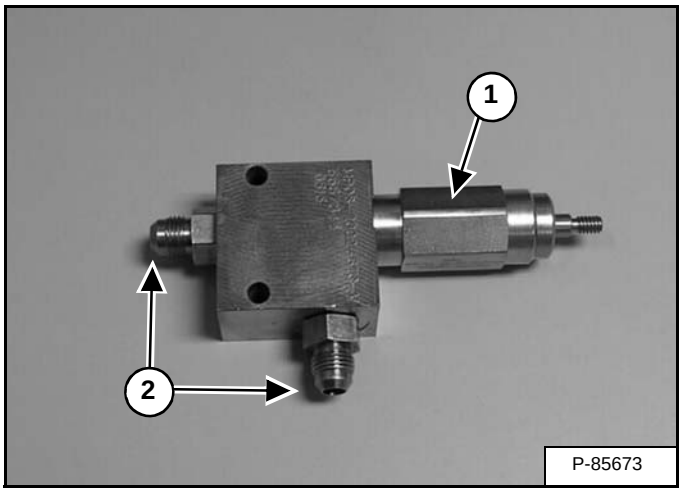


Remove the two bolts (Item 1) **[Figure 20-50-4]** to replace the bypass valve mounting bracket if necessary.

Reverse the removal procedure to install the lift arm bypass valve in the loader.

Disassembly And Assembly

Figure 20-50-5



Remove the lift arm bypass valve (Item 1) **[Figure 20-50-5]** from the valve block. Inspect the bypass valve for damage and replace if necessary.

Installation: Tighten the valve to 45 - 50 N•m (33 - 37 ft-lb) torque.

Inspect the hydraulic fittings (Item 2) **[Figure 20-50-5]** on the valve block for damage and replace if necessary.

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HYDRAULIC PUMP

Description

The hydraulic pump is attached to the end of the hydrostatic pumps and is located on the right side of the loader between the hydraulic control valve and the engine.

The hydraulic pump is a combination of gear pumps that provide hydraulic flow to several hydraulic systems.

The hydraulic pump has a dedicated charge pump. This supplies flow to the hydraulic fan motor and charge pressure to the hydrostatic pump.

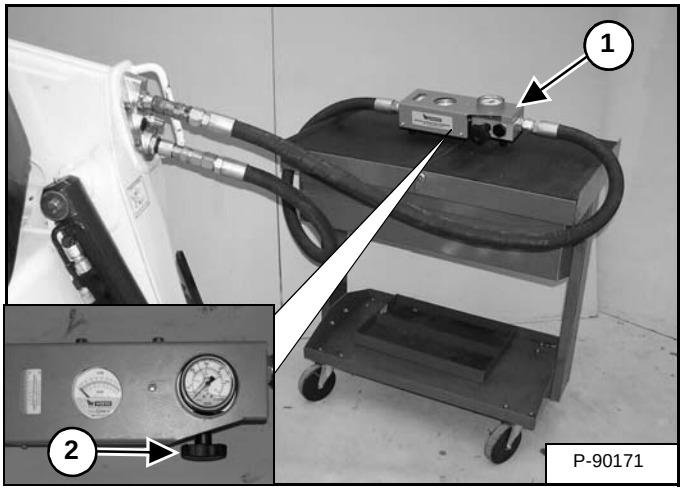
A seal kit is available to service the hydraulic pump. If any of the main components of the pump are damaged, the entire pump must be replaced.

Pump Test At Quick Couplers

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

TWX-RFIK200-S-6 54 U.S. gpm Flow Meter
MEL10006 - Fitting Kit

Figure 20-60-1



NOTE: When testing the hydraulic flow of a machine, hoses must be at least 19,1 mm (0.75 in) in diameter and connected directly to the hydraulic tester without using any type of "quick coupler" on the connection to the tester. Also make sure your hydraulic tester is capable of at least 189,3 L/min (50 U.S. gpm).

Install a hydraulic tester (Item 1) **[Figure 20-60-1]** onto the front auxiliary quick couplers.

This procedure will require one operator in the cab and one operator running the tester.

Start the engine and run at low idle RPM. Press the Auxiliary hydraulics button. Engage the front auxiliary with the trigger on the right handle or joystick. 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 60°C (140°F) by turning the restrictor control clockwise on the tester so it reads about 6,9 MPa (69 bar) (1000 psi).

NOTE: DO NOT EXCEED 25,5 MPa (255 bar) (3700 psi).

Turn the restrictor control (Item 2) **[Figure 20-60-1]** on the tester counterclockwise to obtain free flow, the flow should be approximately 87,1 - 90,8 L/min (23 - 24 U.S. gpm). Start turning the restrictor clockwise, causing more restriction on the flow. The gpm should drop off slightly until the pressure reaches approximately 21,4 MPa (213,7 bar) (3100 psi). At approximately 21,4 MPa (213,7 bar) (3100 psi) the flow should start decreasing rapidly until the pressure reaches 23,8 - 24,1 MPa (237,9 - 241,3 bar) (3450 - 3500 psi). At 23,8 - 24,1 MPa (237,9 - 241,3 bar) (3450 - 3500 psi) the flow should be at zero U.S. gpm. Turn the restrictor (Item 2) **[Figure 20-60-1]** counterclockwise to free flow. Shut the auxiliary hydraulics off.

If flow and pressure specifications are not obtained, go to Direct Pump Testing. (See Direct Pump Test (Standard Section) on Page 20-60-2.)

*Refer to (See Hydraulic System on Page SPEC-10-3.) for system relief pressure and full RPM.

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Direct Pump Test (Standard Section)

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

MEL1563 or 7003031 - Remote Start Tool
TWX-RFIK200-S-6 54 U.S. gpm Flow Meter
MEL10006 - Fitting 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 Procedure on Page 10-10-1.)

Raise the lift arms and install an approved lift arm support device. (See Installing on Page 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.

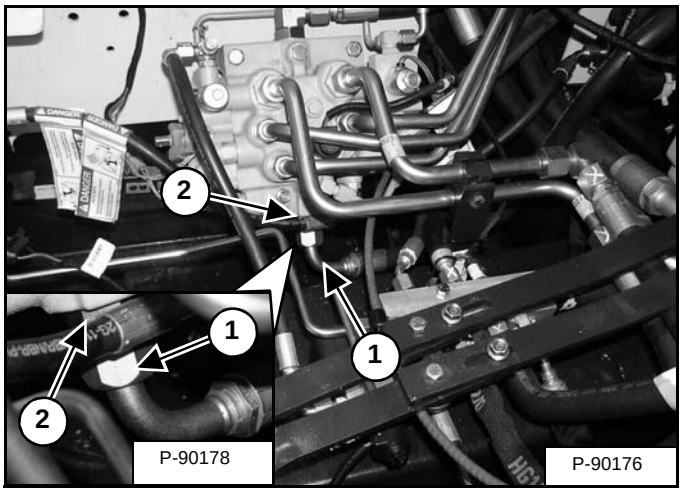
W-2059-0598

Raise the operator cab. (See Raising on Page 10-30-2.)

Connect the remote start tool. (See REMOTE START TOOL KIT-MEL1563 on Page 10-60-1.) or (See REMOTE START TOOL (SERVICE TOOL) KIT - 7003031 on Page 10-61-1.)

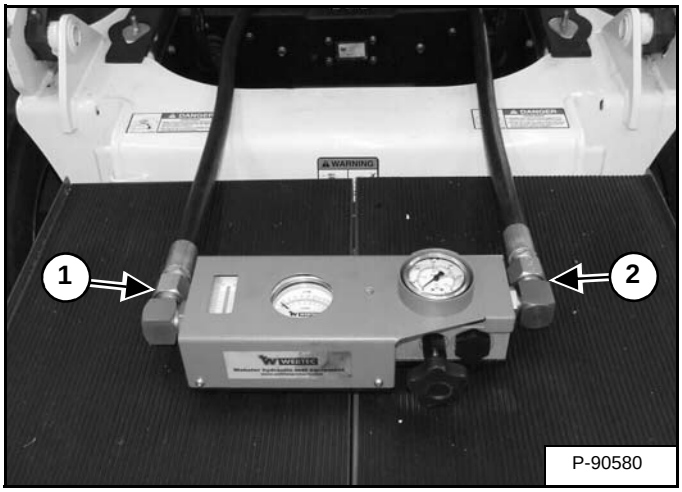
NOTE: The control panel is shown removed for photo clarity.

Figure 20-60-2



Disconnect the OUTLET hose (Item 1) **[Figure 20-60-2]** that comes from the gear pump, and connects to the control valve.

Figure 20-60-3



Connect the INLET hose (Item 1) **[Figure 20-60-3]** from the tester to the OUTLET hose (Item 1) **[Figure 20-60-2]** of the pump. Connect the OUTLET hose (Item 2) **[Figure 20-60-3]** from the tester to the control valve fitting (Item 2) **[Figure 20-60-2]** on the control valve.

IMPORTANT

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

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HYDRAULIC PUMP (CONT'D)

Direct Pump Test (Standard Section) (Cont'd)

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 60°C (140°F) by turning the restrictor control on the tester to about 6,9 MPa (69 bar) (1000 psi). DO NOT exceed system relief pressure. Open the restrictor control and record the free flow (U.S. gpm) at full rpm*.

On the remote start tool engage the auxiliary hydraulics, the light will come ON. Pull the trigger on the right handle or joystick 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.

$$\% = \frac{\text{HIGH PRESSURE FLOW (U.S. gpm)}}{\text{FREE FLOW (U.S. gpm)}} \times 100$$

A low percentage may indicate a failed pump.

*Refer to (See Hydraulic System on Page SPEC-10-3.) for system relief pressure and full RPM.

Dealer Copy -- Not for Resale

Direct Pump Test (Charge Section)

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

MEL1563 or 7003031 - Remote Start Tool
TWX-RFIK200-S-6 54 U.S. gpm Flow Meter
MEL10006 - Fitting 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 Procedure on Page 10-10-1.)

Raise the lift arms and install an approved lift arm support device. (See Installing on Page 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

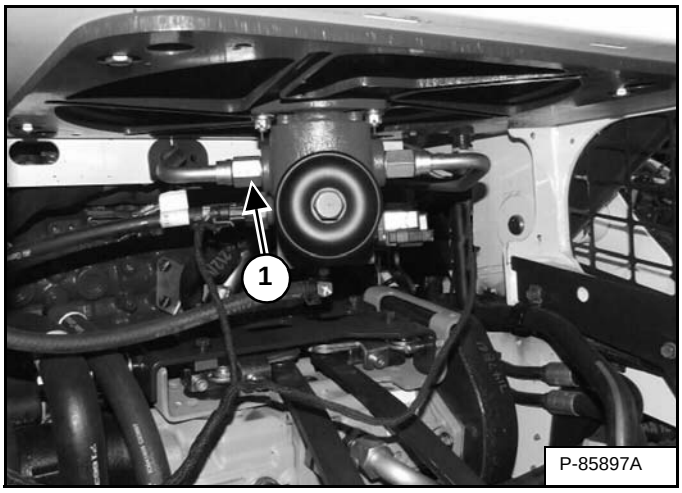
NOTE: The fluid from the charge pump must be filtered after it passes through the Hydraulic Tester, to prevent any contamination to the Hydrostatic Pumps.

Raise the operator cab. (See Raising on Page 10-30-2.)

Open the rear door of the loader.

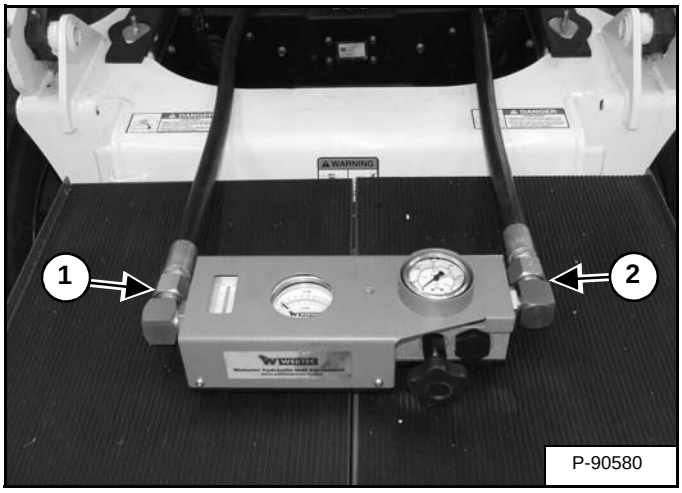
Connect the remote start tool. (See REMOTE START TOOL KIT-MEL1563 on Page 10-60-1.) or (See REMOTE START TOOL (SERVICE TOOL) KIT - 7003031 on Page 10-61-1.)

Figure 20-60-4



Disconnect the inlet hose (Item 1) **[Figure 20-60-4]**.

Figure 20-60-5



Connect the INLET hose (Item 1) **[Figure 20-60-5]** from the tester to the OUTLET hose (Item 1) **[Figure 20-60-4]** of the pump. Connect the OUTLET hose (Item 2) **[Figure 20-60-5]** from the tester to the inlet fitting on the fan (Item 1) **[Figure 20-60-4]**.

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Direct Pump Test (Charge Section) (Cont'd)

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 60°C (140°F) by turning the restrictor control on the tester to about 4,1 MPa (41,4 bar) (600 psi). DO NOT exceed 8,3 MPa (82,7 bar) (1200 psi). Open the restrictor control and record the free flow (U.S. gpm) at full rpm*.

Turn the restrictor down to system operating pressure approximately 6,9 MPa (69 bar) (1000 psi). DO NOT EXCEED 8,3 MPa (82,7 bar) (1200 psi). Refer to Hydraulic Schematics for flow. The high pressure flow must be at least 80% of free flow.

$$\% = \frac{\text{HIGH PRESSURE FLOW (U.S. gpm)}}{\text{FREE FLOW (U.S. gpm)}} \times 100$$

A low percentage may indicate a failed pump.

*Refer to the Hydraulic Schematics for pump flow and rpm.

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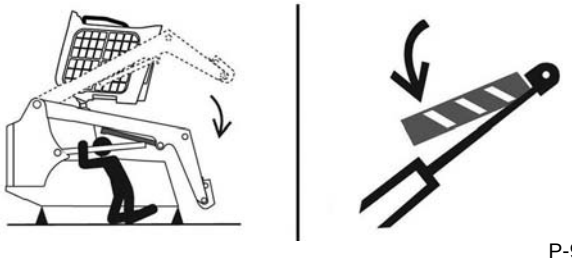
Removal And Installation

⚠ 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



P-90328

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.**

D-1009-0409

IMPORTANT

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

I-2003-0888

Lift and block the rear of the loader. (See Procedure on Page 10-10-1.)

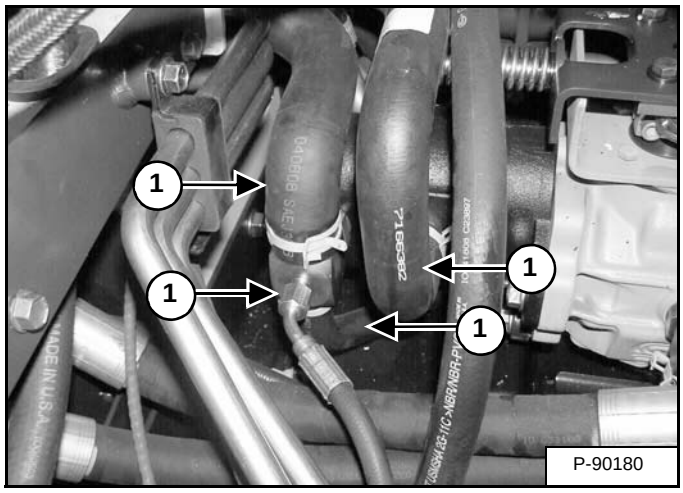
Raise the lift arms and install an approved lift arm support device. (See Installing on Page 10-20-1.)

Raise the operator cab. (See Raising on Page 10-30-2.)

Drain the hydraulic fluid from the reservoir. (See Removing And Replacing Hydraulic Fluid on Page 10-120-2.)

Open the rear door of the loader.

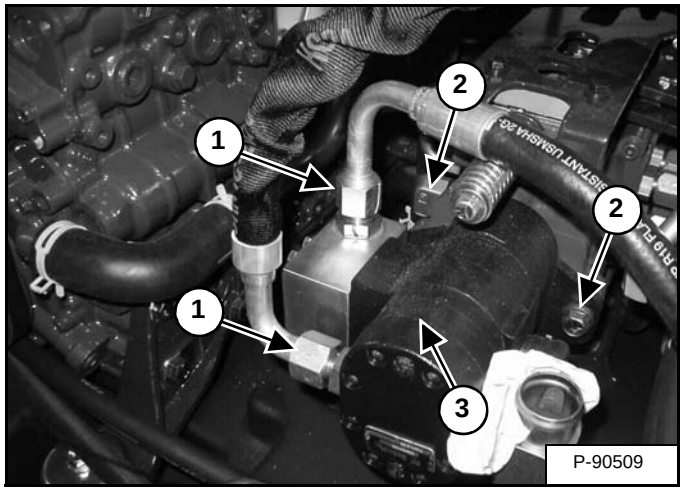
Figure 20-60-6



Disconnect and cap the four hoses (Item 1) **[Figure 20-60-6]** from the hydraulic pump.

Remove the Power Bob-Tach block if equipped. (See Removal And Installation on Page 20-130-1.)

Figure 20-60-7



Disconnect and cap the outlet hoses (Item 1) **[Figure 20-60-7]** from the hydraulic pump.

Remove the two mounting bolts (Item 2) **[Figure 20-60-7]** from the hydraulic pump.

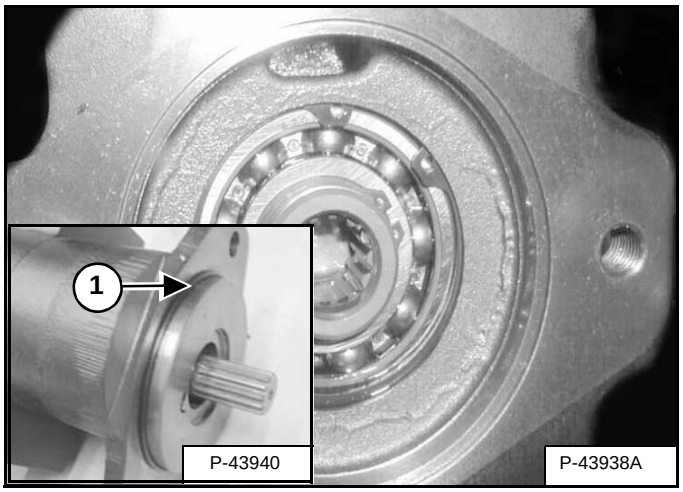
Installation: Tighten the mounting bolts to 75 - 85 N•m (55 - 60 ft-lb) torque.

Remove the hydraulic pump (Item 3) **[Figure 20-60-7]** from the loader.

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Removal And Installation (Cont'd)

Figure 20-60-8



Replace the O-ring (Item 1) **[Figure 20-60-8]** on the hydraulic pump.

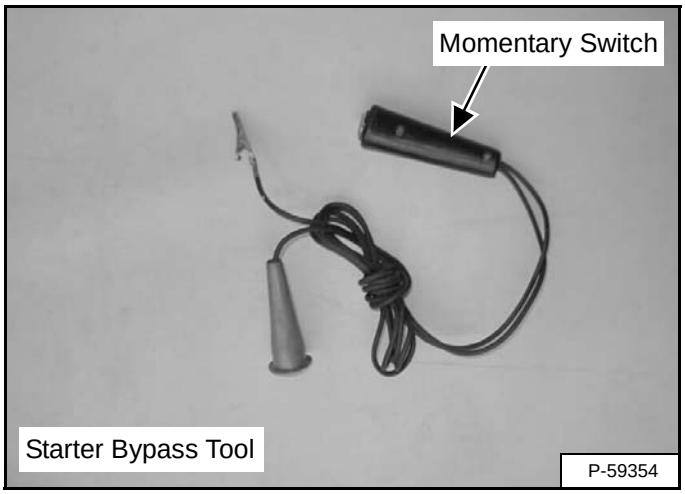
Reverse the removal procedure to install the hydraulic pump.

Hydraulic Pump Startup

NOTE: This procedure is necessary to prevent a dry startup of the hydraulic pump.

Fill the system with hydraulic fluid. (See Removing And Replacing Hydraulic Fluid on Page 10-120-2.)

Figure 20-60-9



To crank the engine without starting, the machine key switch can be bypassed. Obtain a starter bypass tool from a local source which can be used as a universal connection to remotely crank the engine without starting.

The starter bypass tool consists of two wires, each with a clamp. The momentary switch, when depressed, will allow current to pass through the circuit.

Connect the starter bypass tool to the starter solenoid battery terminal and S terminal. Crank the engine for 15 seconds, then stop for at least 30 seconds. Again, crank the engine for 15 seconds. Remove the starter bypass tool.

Start the loader from the operators cab and run the engine at low idle for 1 - 2 minutes without operating the hydraulics.

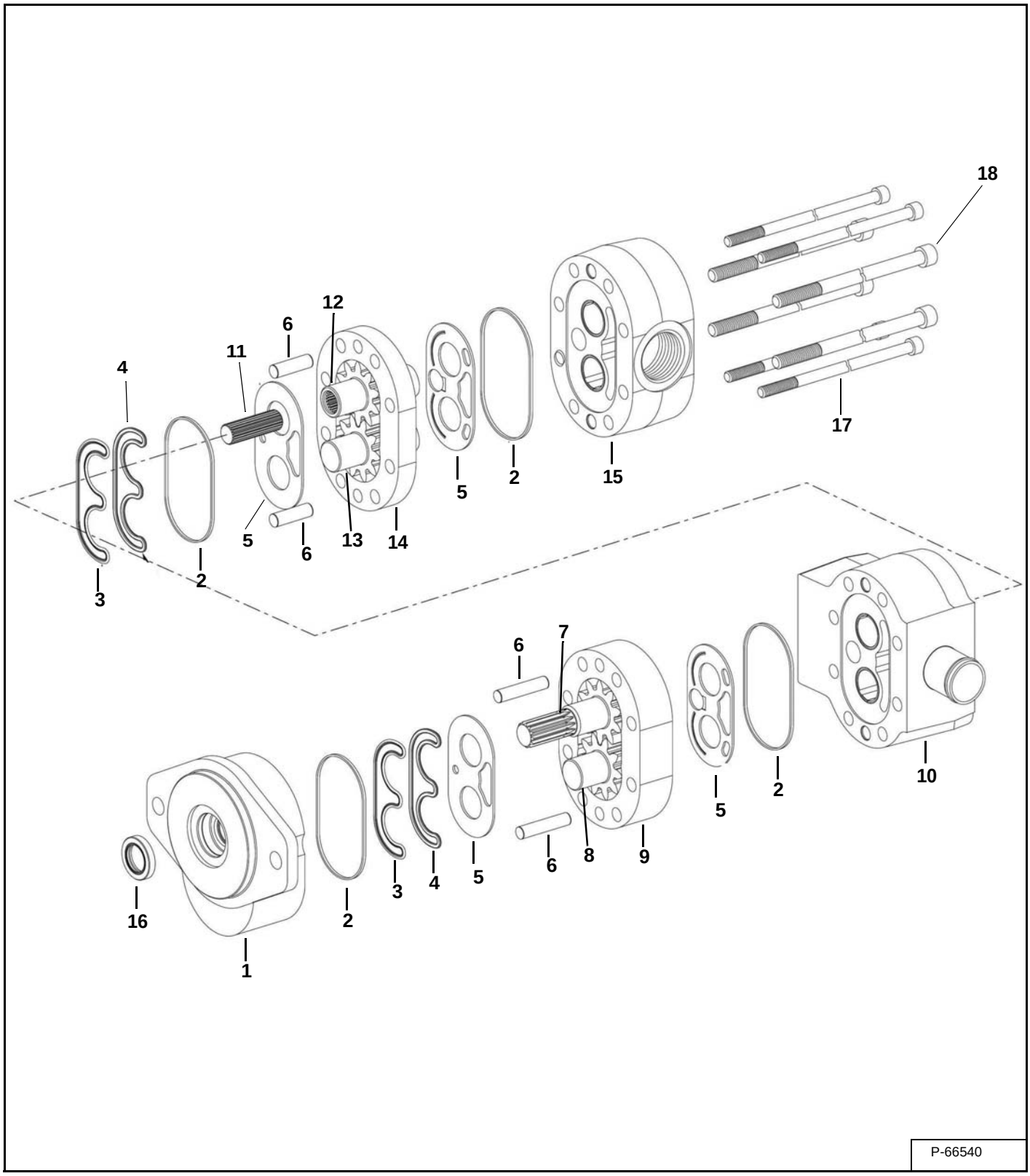
After operating the engine at low idle, remove the lift arm support device and fully raise and lower the loader lift arms several times or until air is purged from the system. ***Avoid running over the relief valve setting at the end of cylinder stroke.***

With the loader parked on a level surface and lift arms down, check and fill the hydraulic reservoir as required. Check for hydraulic leaks.

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Parts Identification

Figure 20-60-10



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Parts Identification (Cont'd)

The items listed below refer to Page 20-60-8 **[Figure 20-60-10]**.

1. Auxiliary Pump End Section
2. Section Seal
3. Pre-Load Seal
4. Load Seal
5. Wear Plate
6. Alignment Pins
7. Drive Gear (Auxiliary Pump)
8. Idler Gear (Auxiliary Pump)
9. Auxiliary Pump Center Section
10. Auxiliary Pump End Section
11. Spline Shaft
12. Drive Gear (Charge Pump)
13. Idler Gear (Charge Pump)
14. Charge Pump Center Section
15. Charge Pump End Section
16. Shaft Seal
17. Bolts (4)
18. Bolts (4)

Disassembly And 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 the pump sections for correct assembly.

To disassemble and assemble the hydraulic pump, follow the Parts Identification page (See Parts Identification on Page 20-60-8.) for proper placement of components along with the information below.

NOTE: A seal kit is available through Bobcat Service Parts.

Assembly: Tighten the eight pump housing bolts (Item 19) **[Figure 20-60-10]** to 50 N•m (37 ft-lb) torque.

NOTE: Position the wear plate (Item 5) [Figure 20-60-10] inlets and traps as shown with the bronze side toward the gears on all wear plates.

NOTE: Inspect all gears, shafts and pump end sections. If any of these components have excessive wear or damage is visible, the complete pump must be replaced.

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HYDRAULIC PUMP (HIGH FLOW)

Description

The hydraulic gear pump is attached to the end of the hydrostatic pumps and is located on the right side of the loader between the hydraulic control valve and the engine.

The hydraulic gear pump is a combination of gear pumps that provide hydraulic flow to several hydraulic systems.

The hydraulic gear pump has a dedicated charge pump. This supplies flow to the hydraulic fan motor and charge pressure to the hydrostatic pump.

The high flow hydraulic pump has an additional pump section that provides an additional amount of flow that is controlled by an external valve. The valve is switched from a button on the panel in the cab.

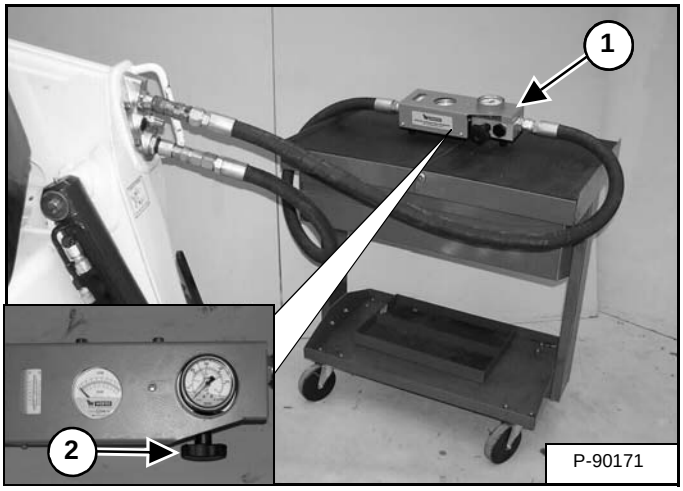
A seal kit is available to service the hydraulic pump. If any of the main components of the pump are damaged, the entire pump must be replaced.

Pump Test At Quick Couplers

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

TWX-RFIK200-S-6 54 U.S. gpm Flow Meter
MEL10006 - Fitting Kit

Figure 20-61-1



NOTE: When testing the hydraulic flow of a machine, hoses must be at least 19,1 mm (0.75 in) in diameter and connected directly to the hydraulic tester without using any type of "quick coupler" on the connection to the tester. Also make sure your hydraulic tester is capable of at least 189,3 L/min (50 U.S. gpm).

Install a hydraulic tester (Item 1) **[Figure 20-61-1]** onto the front auxiliary quick couplers.

This procedure will require one operator in the cab and one operator running the tester.

Start the engine and run at low idle RPM. Press the Auxiliary hydraulics button. Engage the front auxiliary with the trigger on the right handle or joystick. 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 60°C (140°F) by turning the restrictor control clockwise on the tester so it reads about 6,9 MPa (69 bar) (1000 psi).

NOTE: DO NOT EXCEED 25,5 MPa (255 bar) (3700 psi).

Turn the restrictor control (Item 2) **[Figure 20-61-1]** on the tester counterclockwise to obtain free flow, the flow should be approximately 87,1 - 90,8 L/min (23 - 24 U.S. gpm). Start turning the restrictor clockwise, causing more restriction on the flow. The gpm should drop off slightly until the pressure reaches approximately 21,4 MPa (213,7 bar) (3100 psi). At approximately 21,4 MPa (213,7 bar) (3100 psi) the flow should start decreasing rapidly until the pressure reaches 23,8 - 24,1 MPa (237,9 - 241,3 bar) (3450 - 3500 psi). At 23,8 - 24,1 MPa (237,9 - 241,3 bar) (3450 - 3500 psi) the flow should be at zero U.S. gpm. Turn the restrictor (Item 2) **[Figure 20-61-1]** counterclockwise to free flow. Shut the auxiliary hydraulics off.

If flow and pressure specifications are not obtained, go to Direct Pump Testing. (See Direct Pump Test (Standard Section) on Page 20-61-2.)

*Refer to (See Hydraulic System on Page SPEC-10-3.) for system relief pressure and full RPM.

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Direct Pump Test (Standard Section)

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

MEL1563 or 7003031 - Remote Start Tool
TWX-RFIK200-S-6 54 U.S. gpm Flow Meter
MEL10006 - Fitting 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 Procedure on Page 10-10-1.)

Raise the lift arms and install an approved lift arm support device. (See Installing on Page 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.

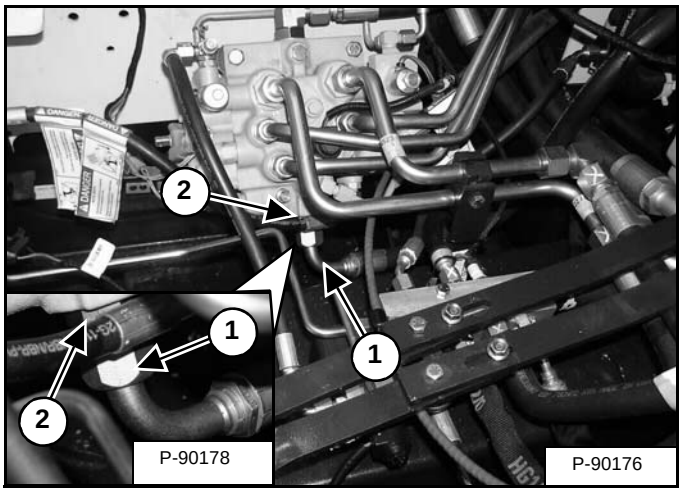
W-2059-0598

Raise the operator cab. (See Raising on Page 10-30-2.)

Connect the remote start tool. (See REMOTE START TOOL KIT-MEL1563 on Page 10-60-1.) or (See REMOTE START TOOL (SERVICE TOOL) KIT - 7003031 on Page 10-61-1.)

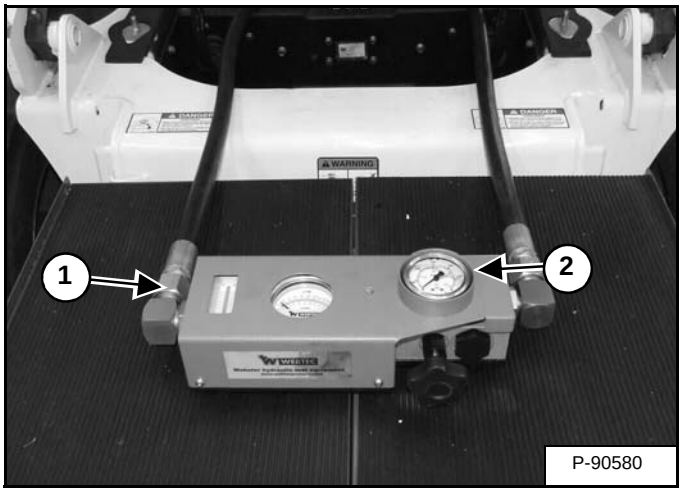
NOTE: The control panel is shown removed for photo clarity.

Figure 20-61-2



Disconnect the OUTLET hose (Item 1) **[Figure 20-61-2]** that comes from the gear pump, and connects to the control valve.

Figure 20-61-3



Connect the INLET hose (Item 1) **[Figure 20-61-3]** from the tester to the OUTLET hose (Item 1) **[Figure 20-61-2]** of the pump. Connect the OUTLET hose (Item 2) **[Figure 20-61-3]** from the tester to the control valve fitting (Item 2) **[Figure 20-61-2]** on the control valve.

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Direct Pump Test (Standard Section) (Cont'd)

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 60°C (140°F) by turning the restrictor control on the tester to about 6,9 MPa (69 bar) (1000 psi). DO NOT exceed system relief pressure. Open the restrictor control and record the free flow (U.S. gpm) at full rpm*.

On the remote start tool engage the auxiliary hydraulics, the light will come ON. Pull the trigger on the right handle or joystick 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.

$$\% = \frac{\text{HIGH PRESSURE FLOW (U.S. gpm)}}{\text{FREE FLOW (U.S. gpm)}} \times 100$$

A low percentage may indicate a failed pump.

*Refer to (See Hydraulic System on Page SPEC-10-3.) for system relief pressure and full RPM.

Direct Pump Test (Charge Section)

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

MEL1563 or 7003031 - Remote Start Tool
TWX-RFIK200-S-6 54 U.S. gpm Flow Meter
MEL10006 - Fitting 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 Procedure on Page 10-10-1.)

Raise the lift arms and install an approved lift arm support device. (See Installing on Page 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

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 Raising on Page 10-30-2.)

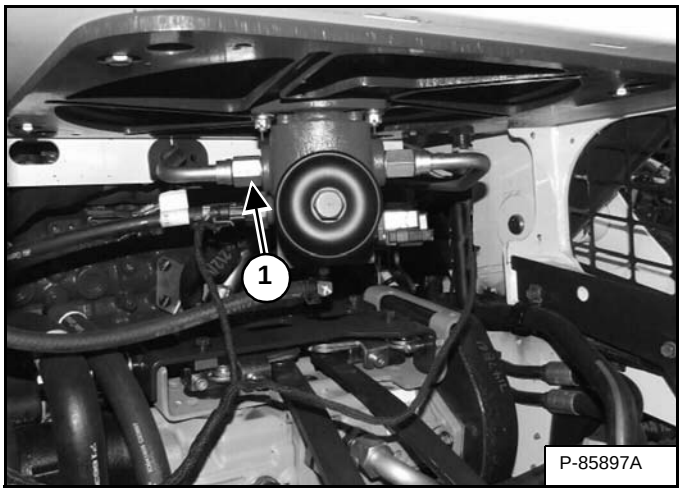
Open the rear door of the loader.

Connect the remote start tool. (See REMOTE START TOOL KIT-MEL1563 on Page 10-60-1.) or (See REMOTE START TOOL (SERVICE TOOL) KIT - 7003031 on Page 10-61-1.)

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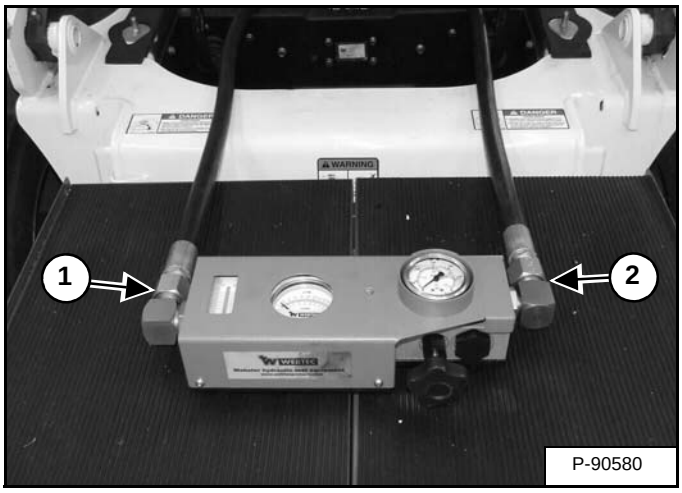
Direct Pump Test (Charge Section) (Cont'd)

Figure 20-61-4



Disconnect the inlet hose (Item 1) **[Figure 20-61-4]**.

Figure 20-61-5



Connect the INLET hose (Item 1) **[Figure 20-61-5]** from the tester to the OUTLET hose (Item 1) **[Figure 20-61-4]** of the pump. Connect the OUTLET hose (Item 2) **[Figure 20-61-5]** from the tester to the inlet fitting on the fan (Item 1) **[Figure 20-61-4]**.

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 60°C (140°F) by turning the restrictor control on the tester to about 4,1 MPa (41,4 bar) (600 psi). DO NOT exceed 8,3 MPa (82,7 bar) (1200 psi). Open the restrictor control and record the free flow (U.S. gpm) at full rpm*.

Turn the restrictor down to system operating pressure approximately 6,9 MPa (69 bar) (1000 psi). DO NOT EXCEED 8,3 MPa (82,7 bar) (1200 psi). Refer to Hydraulic Schematics for flow. The high pressure flow must be at least 80% of free flow.

$$\% = \frac{\text{HIGH PRESSURE FLOW (U.S. gpm)}}{\text{FREE FLOW (U.S. gpm)}} \times 100$$

A low percentage may indicate a failed pump.

*Refer to the Hydraulic Schematics for pump flow and rpm.

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Direct Pump Test (High Flow Section)

⚠ WARNING

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

W-2017-0286

⚠ WARNING

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

W-2059-0598

IMPORTANT

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

I-2024-0284

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

MEL1563 or 7003031 - Remote Start Tool
MEL10003 - Hydraulic Tester
MEL10006 - Hydraulic Test Kit

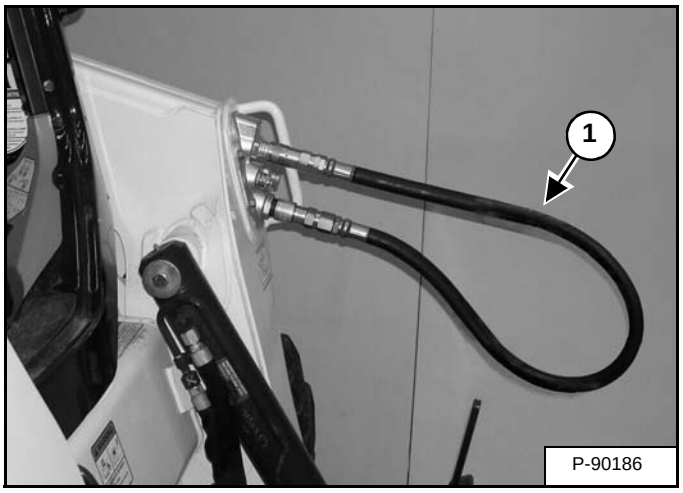
Lift and block the loader. (See Procedure on Page 10-10-1.)

Raise the operator cab. (See Raising on Page 10-30-2.)

Open the rear door of the loader.

Connect the remote start tool. (See REMOTE START TOOL KIT-MEL1563 on Page 10-60-1.) or (See REMOTE START TOOL (SERVICE TOOL) KIT - 7003031 on Page 10-61-1.)

Figure 20-61-6



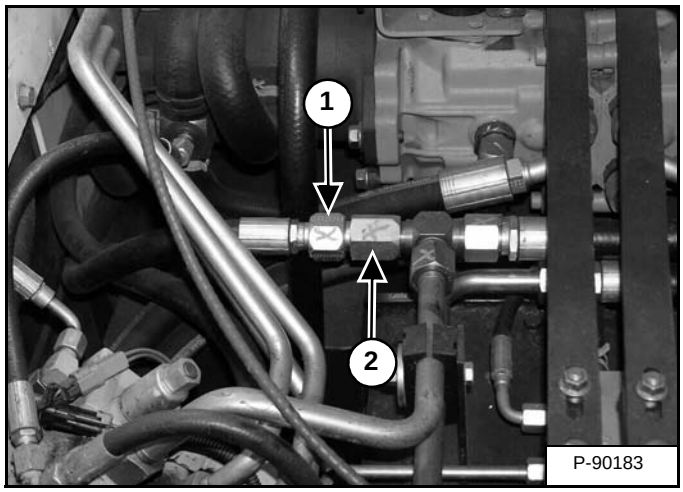
Install a jumper hose (Item 1) **[Figure 20-61-6]** onto the front auxiliary quick couplers.

Raise the lift arms and install an approved lift arm support device. (See Installing on Page 10-20-1.)

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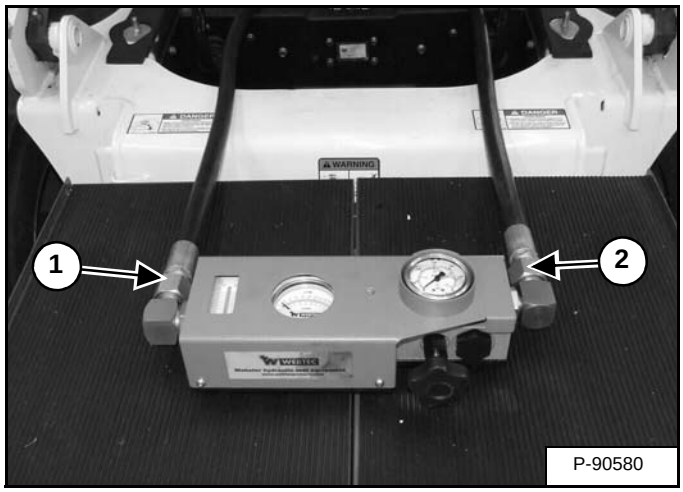
Direct Pump Test (High Flow Section) (Cont'd)

Figure 20-61-7



Disconnect the high flow pump OUTLET hose (Item 1) from the high flow check valve INLET fitting (Item 2) **[Figure 20-61-7]**.

Figure 20-61-8



Connect the INLET hose (Item 1) **[Figure 20-61-8]** from the tester, to the high flow pump OUTLET hose (Item 1) **[Figure 20-61-7]**. Connect the OUTLET hose (Item 2) **[Figure 20-61-8]** from the tester, to the high flow check valve INLET fitting (Item 2) **[Figure 20-61-7]**.

Lower the cab.

Start the engine and run at low idle rpm. Press the front auxiliary button. Press the High Flow button. Push the button (on the right control lever) for fluid flow to the quick coupler. 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 60°C (140°F) by turning the restrictor control on the tester to about 6,9 MPa (69 bar) (1000 psi).

NOTE: DO NOT EXCEED 3700 PSI.

Open the restrictor control and record the free flow (U.S. gpm) at full rpm. Increase the restriction and the flow should drop to zero U.S. gpm between 24,1 MPa (241,3 bar) (3500 psi) and 25,5 MPa (255,1 bar) (3700 psi).

If pressure readings are not obtained go to the High Flow Valve, relief valve adjustment procedure.(See High Flow Relief Valve Removal And Installation on Page 20-61-8.)

Record the highest pressure (psi) and flow (U.S. gpm). The high pressure flow must be at least 80% of free flow.

$$\%= \frac{\text{HIGH PRESSURE FLOW (U.S. gpm)}}{\text{FREE FLOW (U.S. gpm)}} \text{ X100}$$

A low percentage may indicate a failed pump.

*Refer to *Hydraulic Schematics* for system relief pressure and full rpm.

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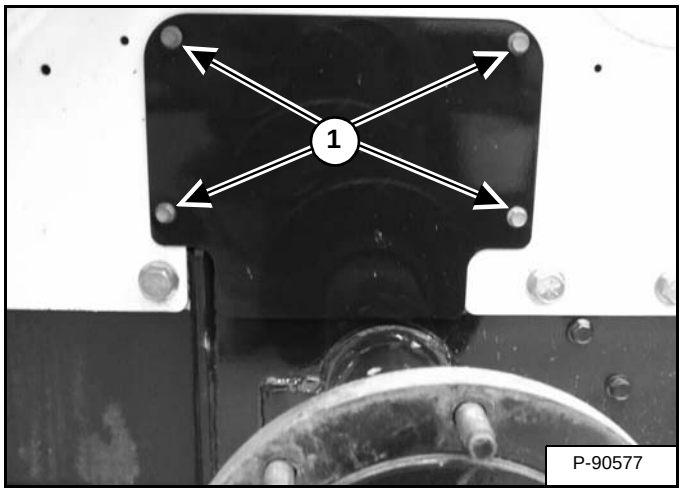
High Flow Relief Valve Adjustment

If the pump is unable to reach 3500 PSI stop the engine. The relief screw (Item 1) **[Figure 20-61-11]** will need to be turned clockwise 90° and retested with the procedure above. (90° equals approximately 1,4 MPa (13,8 bar) (200 PSI).)

NOTE: If the relief screw has been turned in 1/4 turn and the pressure remains the same, go to the high flow relief valve removal and installation section. (See High Flow Relief Valve Removal And Installation on Page 20-61-8.) If relief valve has been checked and is OK, go to the high flow pump disassembly and assembly section. (See Disassembly And Assembly on Page 20-61-13.)

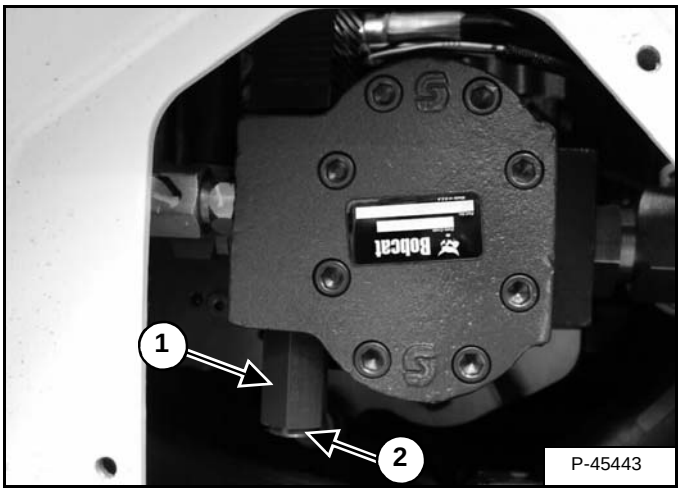
Remove right rear wheel. (See Wheel Nuts on Page 10-160-1.)

Figure 20-61-9



Remove the mounting bolts (Item 1) **[Figure 20-61-9]** from the access cover and remove the cover from the loader.

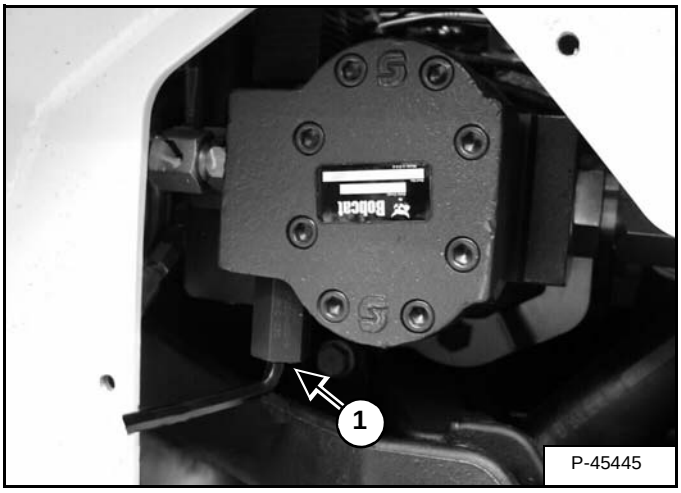
Figure 20-61-10



Locate the high flow relief valve (Item 1) **[Figure 20-61-10]** along the right side of the engine.

Remove the plug (Item 2) **[Figure 20-61-10]** located on the bottom of the high flow relief valve.

Figure 20-61-11



NOTE: [Figure 20-61-11] shows adjusting the relief screw.

If the pump reaches 25,5 MPa (255,1 bar) (3700 psi) and there is flow stop the engine. The relief screw must be turned 90° counterclockwise and retested with the procedure above.

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High Flow Relief Valve Removal And Installation

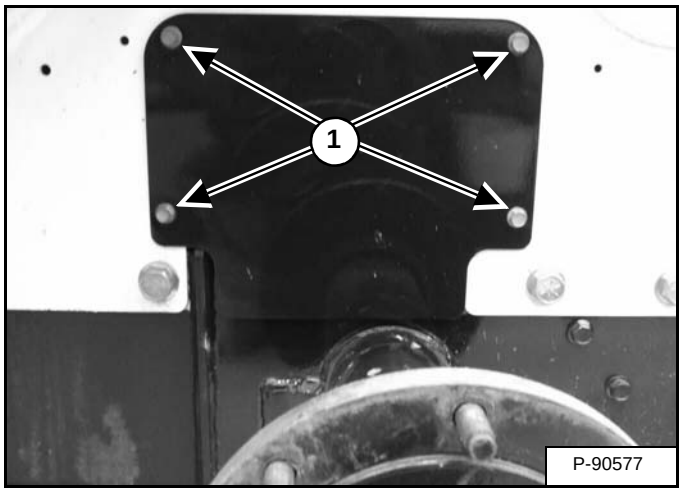
⚠ WARNING

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

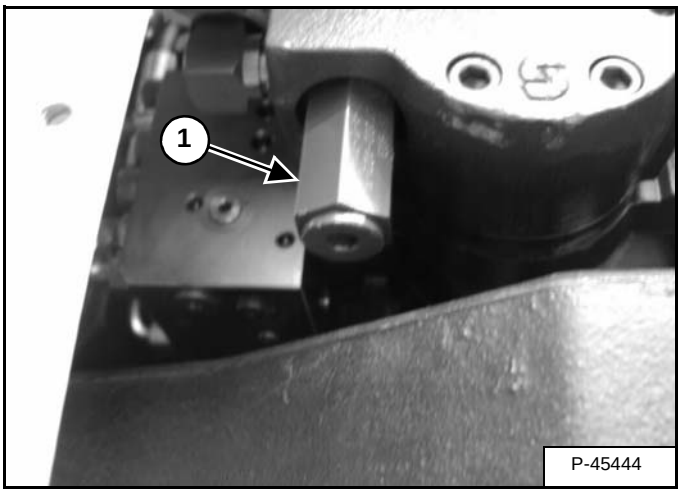
Remove right rear wheel. (See Wheel Nuts on Page 10-160-1.)

Figure 20-61-12



Remove the mounting bolts (Item 1) **[Figure 20-61-12]** from the access cover and remove the cover from the loader.

Figure 20-61-13

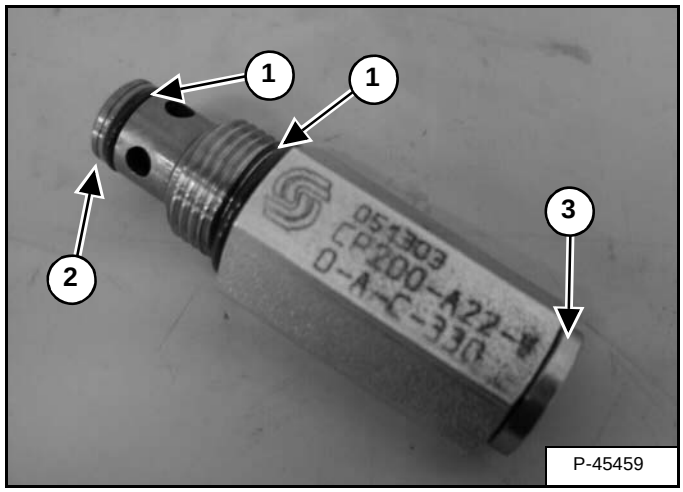


Locate the high flow relief valve through rear door along the right side of the engine.

Remove the relief valve (Item 1) **[Figure 20-61-13]** from the pump.

Installation: Tighten the relief valve to 41 - 47 N•m (30 - 35 ft-lb) torque.

Figure 20-61-14



Inspect the relief valve and replace the two O-rings (Item 1) and washer (Item 2) **[Figure 20-61-14]**.

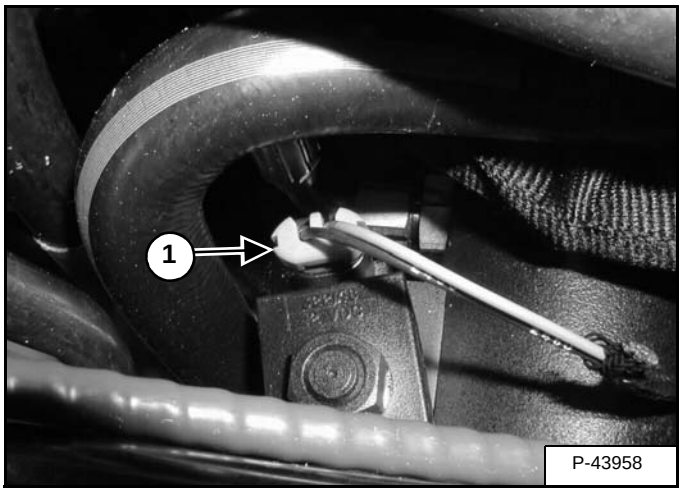
If the relief valve is bad, it must be replaced as a complete unit.

Remove the plug (Item 3) and inspect the O-ring **[Figure 20-61-14]** damage and replace as needed.

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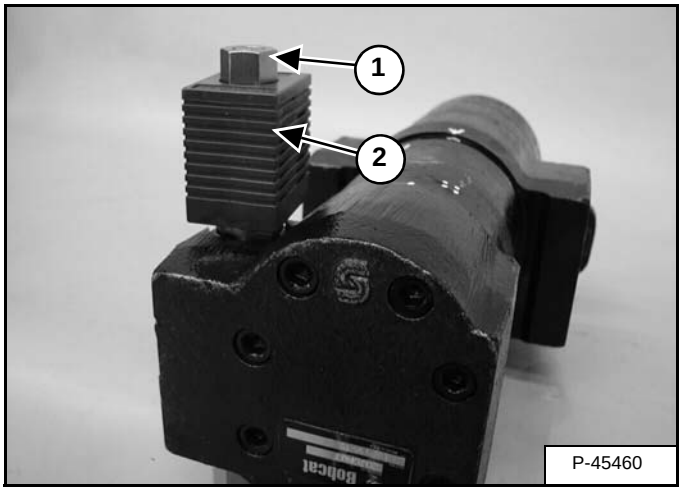
Solenoid Removal And Installation

Figure 20-61-15



At the right side access hole, disconnect the electrical connector (Item 1) **[Figure 20-61-15]** from the high flow pump solenoid.

Figure 20-61-16

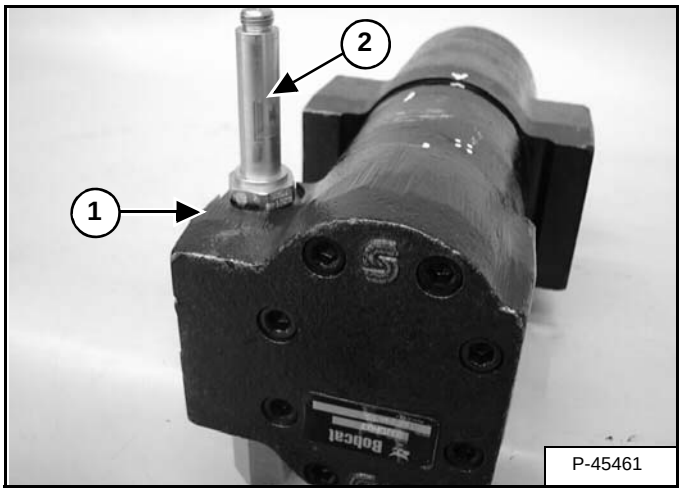


Remove the solenoid nut (Item 1) **[Figure 20-61-16]**.

Remove the solenoid (Item 2) **[Figure 20-61-16]**.

Installation: Tighten the solenoid nut to 5 - 8 N•m (48 - 72 in-lb)

Figure 20-61-17

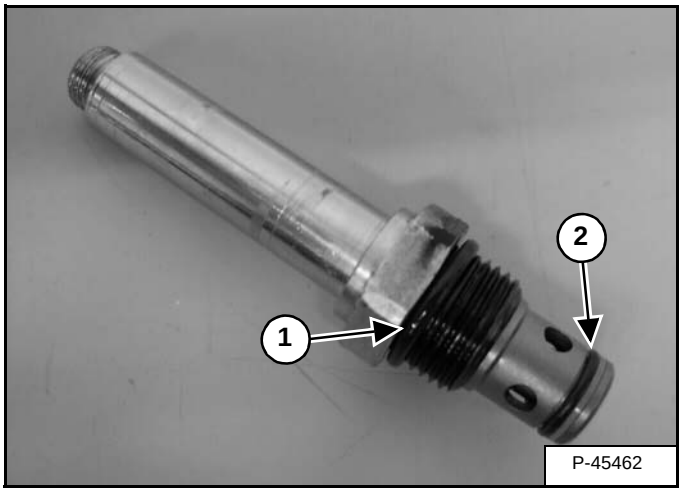


NOTE: Mark the pump housing (Item 1) [Figure 20-61-17] for proper installation of the solenoid valve cartridge.

Remove the valve cartridge (Item 1) **[Figure 20-61-17]**.

Installation: Tighten the solenoid valve to 47 - 54 N•m (35 - 40 ft-lb).

Figure 20-61-18



Inspect the O-ring (Item 1) **[Figure 20-61-18]** and replace as needed.

Inspect the O-ring and back-up washer (Item 2) **[Figure 20-61-18]** and replace as needed.

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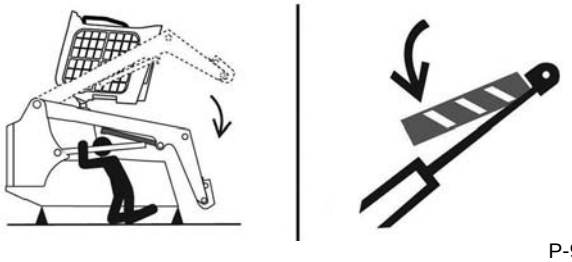
Removal And Installation

⚠ 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



P-90328

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.**

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IMPORTANT

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

I-2003-0888

Lift and block the rear of the loader. (See Procedure on Page 10-10-1.)

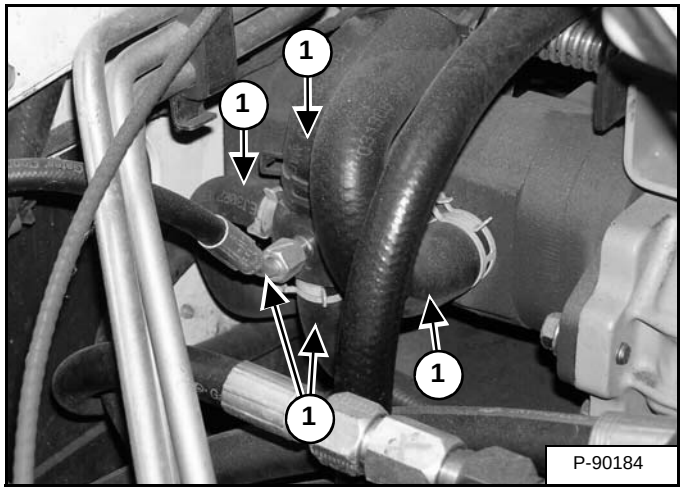
Raise the lift arms and install an approved lift arm support device. (See Installing on Page 10-20-1.)

Raise the operator cab. (See Raising on Page 10-30-2.)

Drain the hydraulic fluid from the reservoir. (See Removing And Replacing Hydraulic Fluid on Page 10-120-2.)

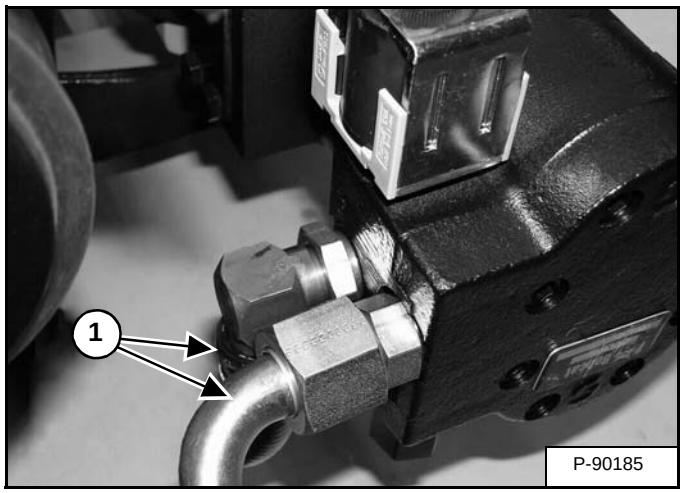
Open the rear door of the loader.

Figure 20-61-19



Disconnect and cap the inlet hoses (Item 1) **[Figure 20-61-19]** from the front of the hydraulic pump.

Figure 20-61-20



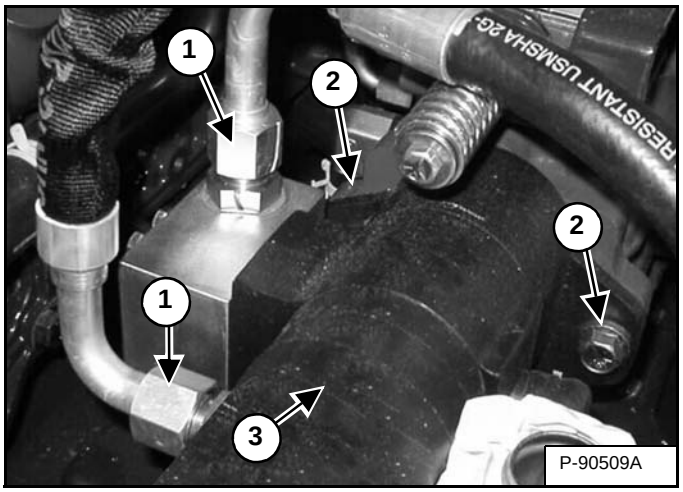
Disconnect and cap the hoses (Item 1) **[Figure 20-61-20]** from the back of the hydraulic pump.

Remove the Power Bob-Tach block if equipped. (See Removal And Installation on Page 20-61-10.)

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Removal And Installation (Cont'd)

Figure 20-61-21



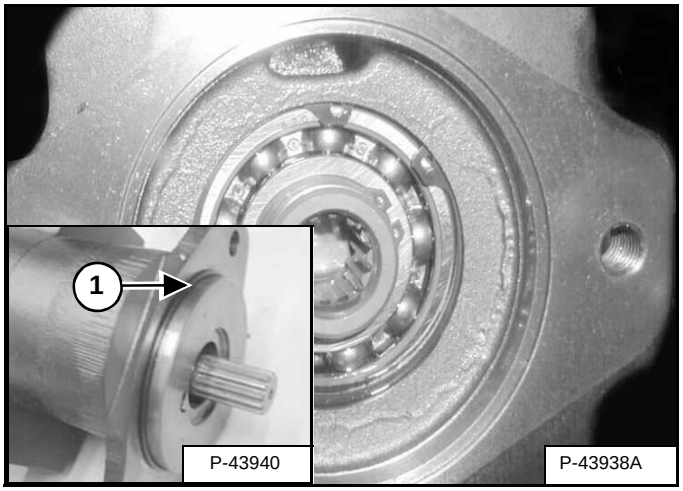
Disconnect and cap the outlet hoses (Item 1) **[Figure 20-61-21]** from the hydraulic pump.

Remove the two mounting bolts (Item 2) **[Figure 20-61-21]** from the hydraulic pump.

Installation: Tighten the mounting bolts to 75 - 85 N•m (55 - 60 ft-lb) torque.

Remove the hydraulic pump (Item 3) **[Figure 20-61-21]** from the loader.

Figure 20-61-22



Replace the O-ring (Item 1) **[Figure 20-61-22]** on the hydraulic pump.

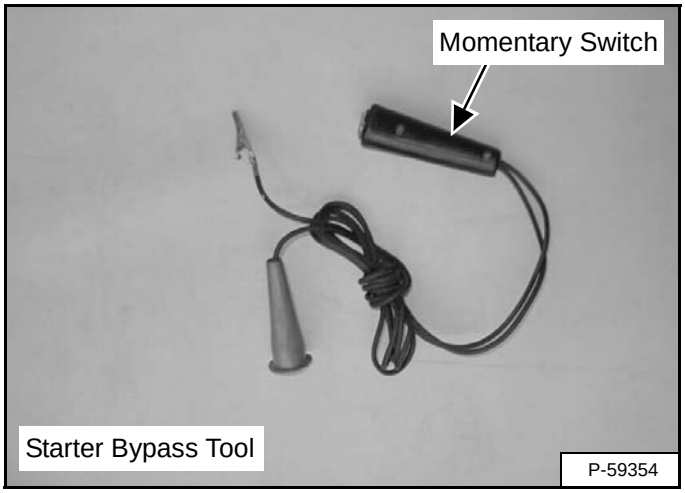
Reverse the removal procedure to install the hydraulic pump.

Hydraulic Pump Startup

NOTE: This procedure is necessary to prevent a dry startup of the hydraulic pump.

Fill the system with hydraulic fluid. (See Removing And Replacing Hydraulic Fluid on Page 10-120-2.)

Figure 20-61-23



To crank the engine without starting, the machine key switch can be bypassed. Obtain a starter bypass tool from a local source which can be used as a universal connection to remotely crank the engine without starting.

The starter bypass tool consists of two wires, each with a clamp. The momentary switch, when depressed, will allow current to pass through the circuit.

Connect the starter bypass tool to the starter solenoid battery terminal and S terminal. Crank the engine for 15 seconds, then stop for at least 30 seconds. Again, crank the engine for 15 seconds. Remove the starter bypass tool.

Start the loader from the operators cab and run the engine at low idle for 1 - 2 minutes without operating the hydraulics.

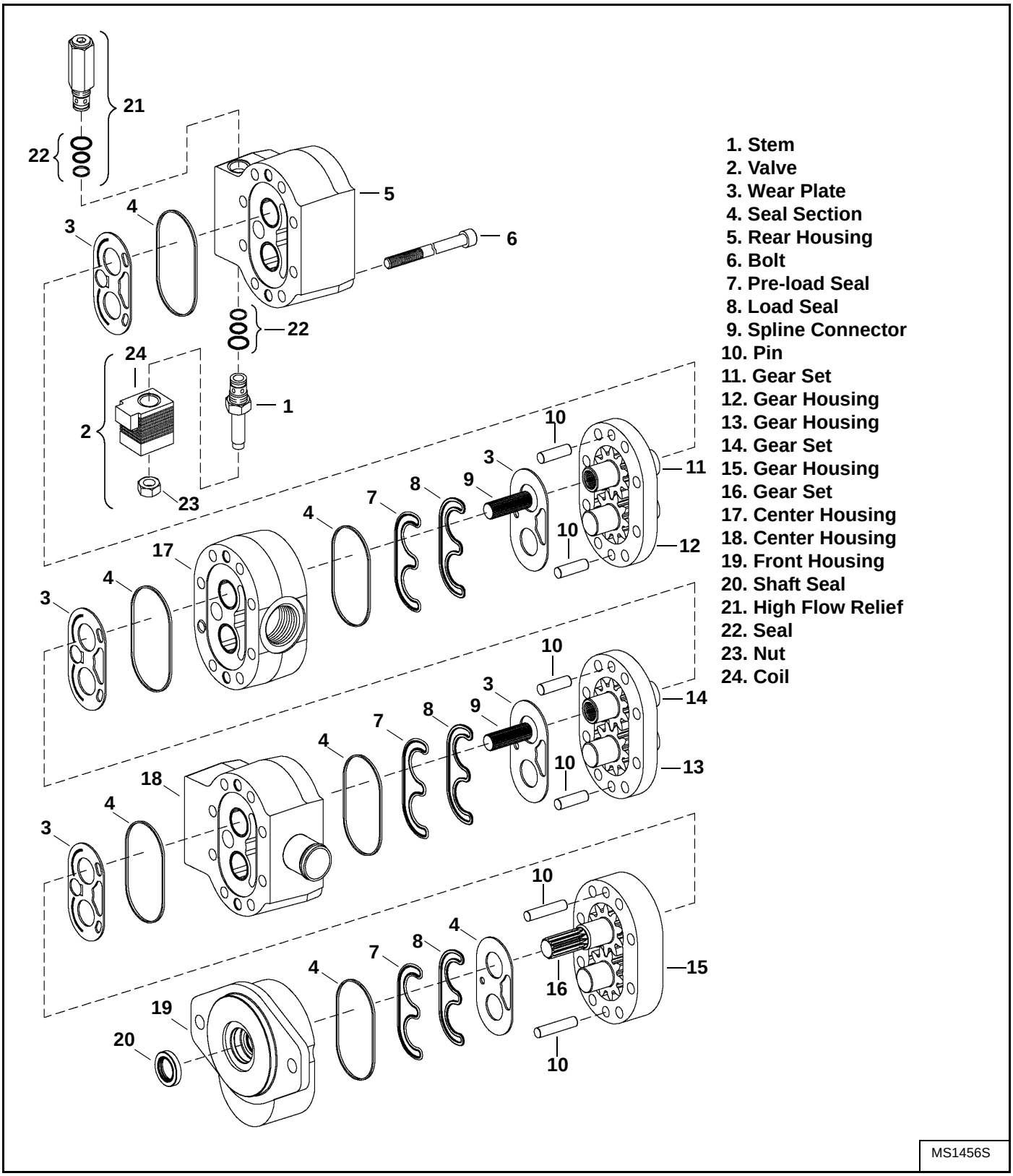
After operating the engine at low idle, remove the lift arm support device and fully raise and lower the loader lift arms several times or until air is purged from the system. ***Avoid running over the relief valve setting at the end of cylinder stroke.***

With the loader parked on a level surface and lift arms down, check and fill the hydraulic reservoir as required. Check for hydraulic leaks.

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Parts Identification

Figure 20-61-24



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Disassembly And 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 the pump sections for correct assembly.

To disassemble and assemble the hydraulic pump, follow the Parts Identification page (See Parts Identification on Page 20-61-12.) for proper placement of components along with the information below.

NOTE: A seal kit is available through Bobcat Service Parts.

Assembly: Tighten the eight pump housing bolts (Item 6) **[Figure 20-61-24]** to 50 N•m (37 ft-lb) torque.

NOTE: Position the wear plate (Item 3) [Figure 20-61-19] inlets and traps as shown with the bronze side toward the gears on all wear plates.

NOTE: Inspect all gears, shafts and pump end sections. If any of these components have excessive wear or damage is visible, the complete pump must be replaced.

NOTE: The relief valve and the solenoid can be replaced along with the o-rings and back-up washers.

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HYDRAULIC / HYDROSTATIC FILTERS

Description

The hydraulic / hydrostatic filters help to remove contaminants from the fluid when the hydraulic / hydrostatic systems are operating.

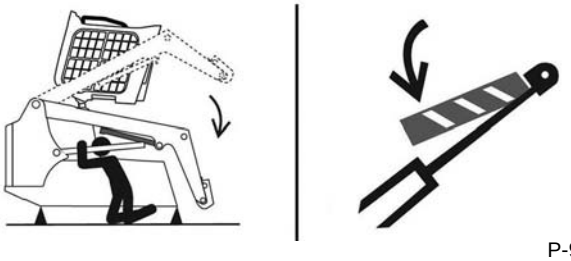
The hydraulic / hydrostatic filter system consists of one main filter and one charge flow filter.

The main filter removes contaminants before entering gear pumps including oil returning from the main valve.

The charge flow filter removes contaminants after the charge pump.

Housing Removal And Installation

DANGER



P-90328

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.**

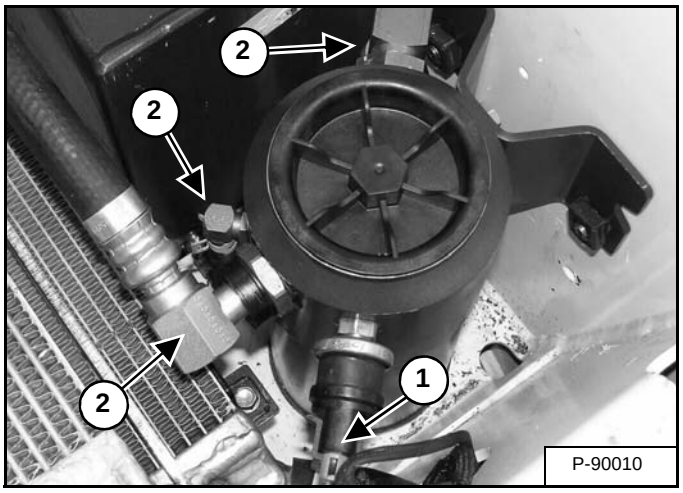
D-1009-0409

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 20-70-1



Raise the lift arms and install an approved lift arm support device. (See Installing on Page 10-20-1.)

Raise the operator cab. (See Raising on Page 10-30-2.)

Drain the fluid from the reservoir. (See Removing And Replacing Hydraulic Fluid on Page 10-120-2.)

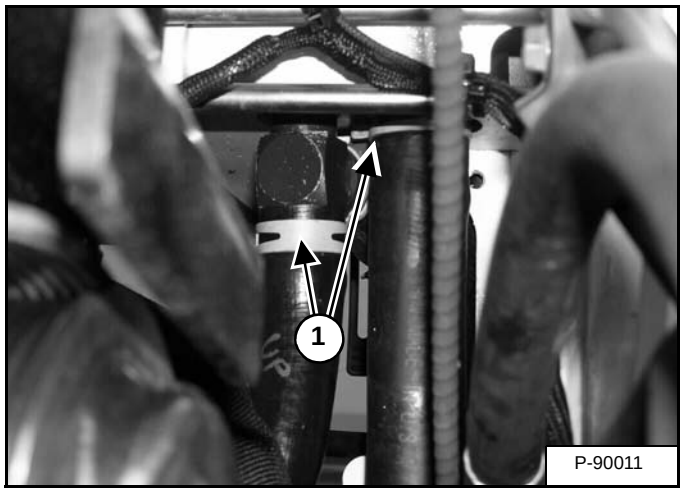
Disconnect the electrical connector (Item 1) **[Figure 20-70-1]** from the hydraulic / hydrostatic filter sender.

Disconnect and plug the three hoses (Item 2) **[Figure 20-70-1]** from the hydraulic / hydrostatic filter housing.

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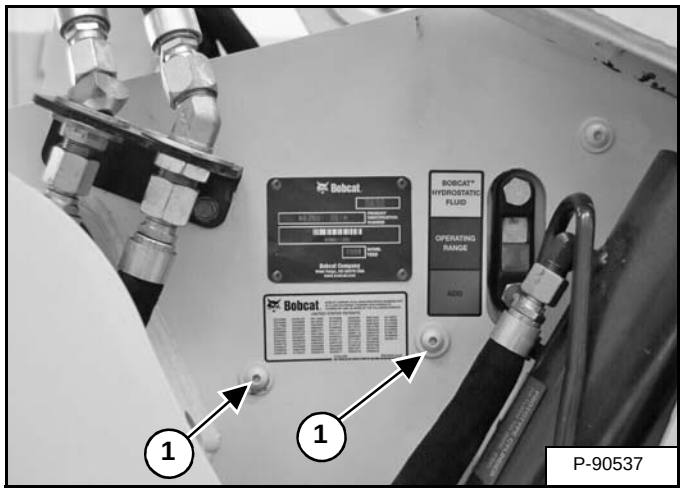
Housing Removal And Installation (Cont'd)

Figure 20-70-2



Remove and plug the two hoses (Item 1) **[Figure 20-70-2]** from the bottom of the hydraulic / hydrostatic filter housing.

Figure 20-70-3



Remove the two bolts (Item 1) **[Figure 20-70-3]**.

Remove the hydraulic / hydrostatic filter housing from the loader.

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HYDRAULIC FLUID RESERVOIR

Description

The hydraulic fluid reservoir is a storage container for the loader's hydraulic / hydrostatic fluid. The reservoir contains a vented fill cap with a fluid screen to prevent contaminants from entering the reservoir while adding fluid.

The hydraulic fluid reservoir is located behind the operator's cab under the rear grille on the right side of the loader.

Removal And Installation

Raise the lift arms and install an approved lift arm support device. (See Installing on Page 10-20-1.)

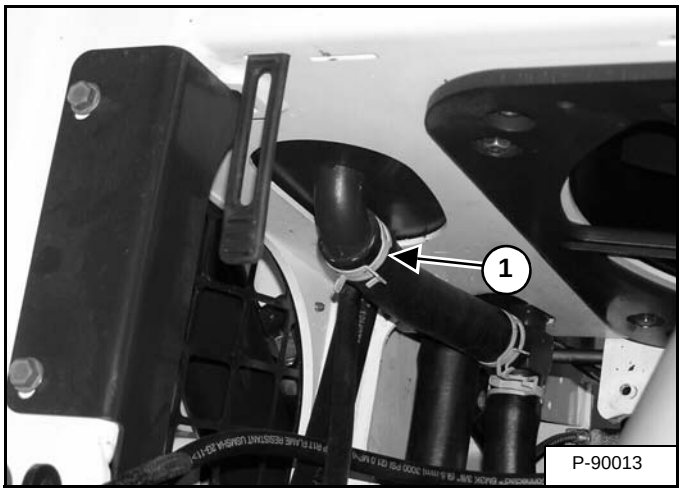
Raise the operator cab. (See Raising on Page 10-30-2.)

Drain the fluid from the reservoir. (See Removing And Replacing Hydraulic Fluid on Page 10-120-2.)

Remove the Hydraulic / Hydrostatic Filter Housing (See Housing Removal And Installation on Page 20-70-1.)

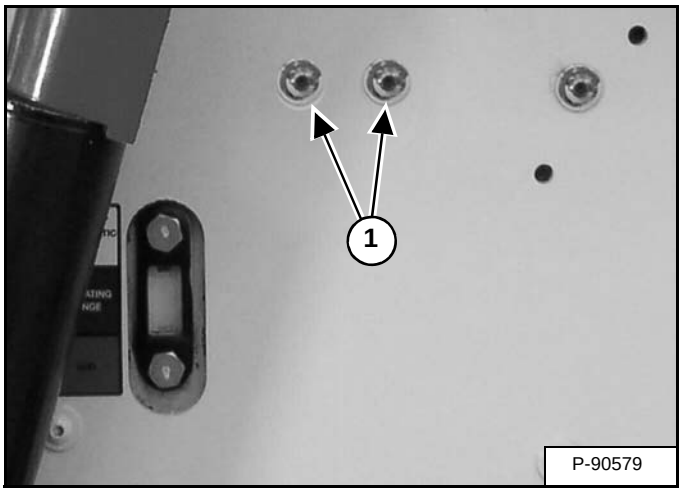
Remove the rear grille (See Removal And Installation on Page 50-60-1.)

Figure 20-80-1



Remove the clamp and the hose (Item 1) **[Figure 20-80-1]**.

Figure 20-80-2



Remove the two bolts (Item 1) **[Figure 20-80-2]**.

Remove the hydraulic fluid reservoir from the loader.

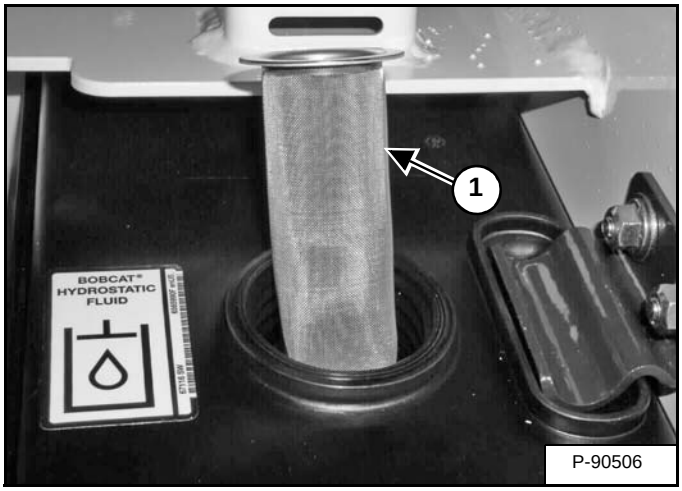
Installation: Tighten the mount bolts and nuts to 21,7 - 24,4 N•m (16 - 18 ft-lb) torque.

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Hydraulic Fluid Screen

Remove the rear grille (See Removal And Installation on Page 50-60-1.)

Figure 20-80-3



Remove the hydraulic fluid reservoir breather cap **[Figure 20-80-3]** from the reservoir.

Remove the hydraulic fluid screen (Item 1) **[Figure 20-80-3]** from the reservoir.

Wash the screen in clean solvent and air dry, before replacing.

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OIL COOLER

Description

The oil cooler is used to cool the loaders hydraulic and hydrostatic oil. Oil passages are coiled into a heat exchanger. Air is forced, with the cooling fan, around the passages cooling the oil.

The oil cooler is located underneath the rear grille between the A/C condenser (if so equipped) and the radiator.

Removal And Installation

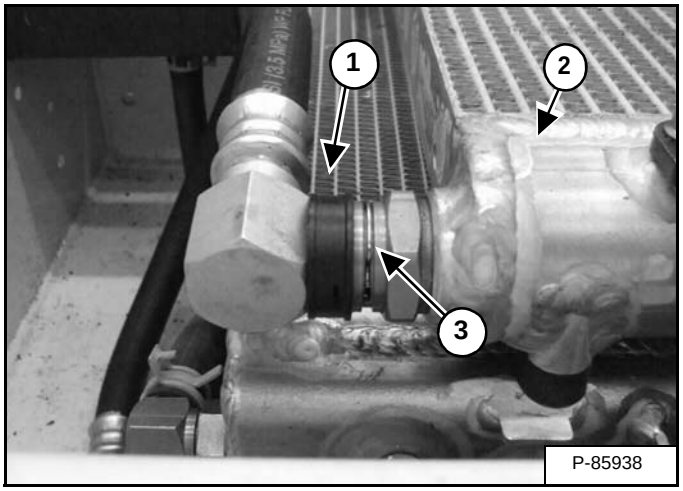
IMPORTANT

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

I-2003-0888

Remove the rear grille from the loader. (See Removal And Installation on Page 50-60-1.)

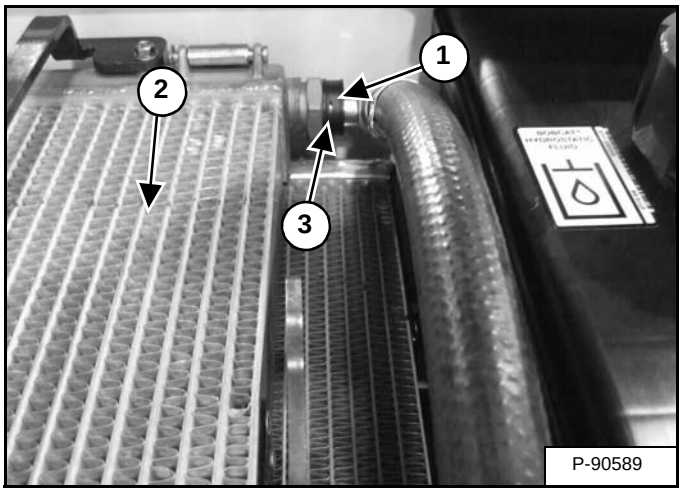
Figure 20-90-1



Slide the plastic sleeve (Item 1) away from the oil cooler (Item 2). Remove the clip (Item 3) **[Figure 20-90-1]** and pull hose out.

Cap or plug all hoses and fittings.

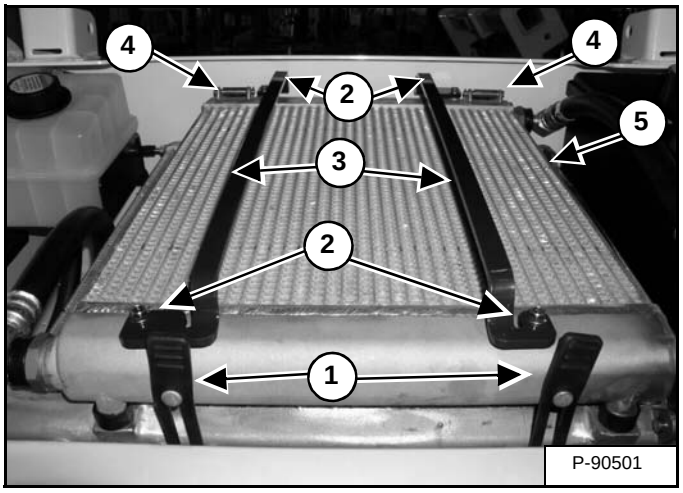
Figure 20-90-2



Slide the plastic sleeve (Item 1) away from the oil cooler (Item 2). Remove the clip (Item 3) **[Figure 20-90-2]** and pull hose out.

Cap or plug all hoses and fittings.

Figure 20-90-3



Undo the rubber straps (Item 1) **[Figure 20-90-3]**

Remove the bolts (Item 2) and remove the condenser guards (Item 3) **[Figure 20-90-3]**.

Remove the clips and pins (Item 4) **[Figure 20-90-3]**.

Remove the bolt (Item 5) **[Figure 20-90-3]** from the prop rod.

NOTE: When installing the cooler hoses, the fittings should make a clicking sound when pushed together.

Lift up the oil cooler and remove the cooler from the loader.

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BUCKET POSITION VALVE

Description

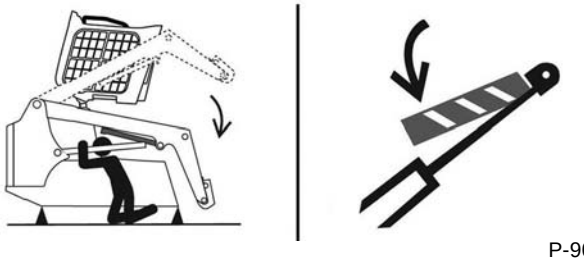
The Bucket Position Valve is an option that allows the operator to hold the attachment at the same angle from the ground to maximum lift height without using the tilt function.

The bucket position valve is mounted to the inside lower right rear side of the loader frame.

See Hydraulic Schematic for more circuit information.

Solenoid Removal And Installation

⚠ DANGER



P-90328

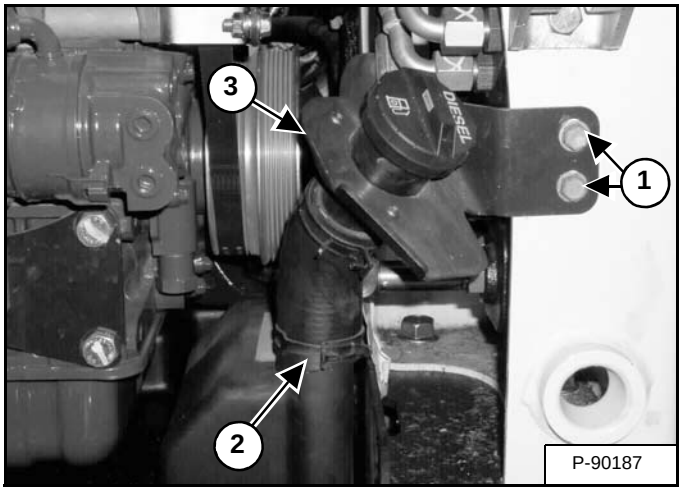
AVOID DEATH

- **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.**

D-1009-0409

Drain the hydraulic reservoir. (See Removing And Replacing Hydraulic Fluid on Page 10-120-2.)

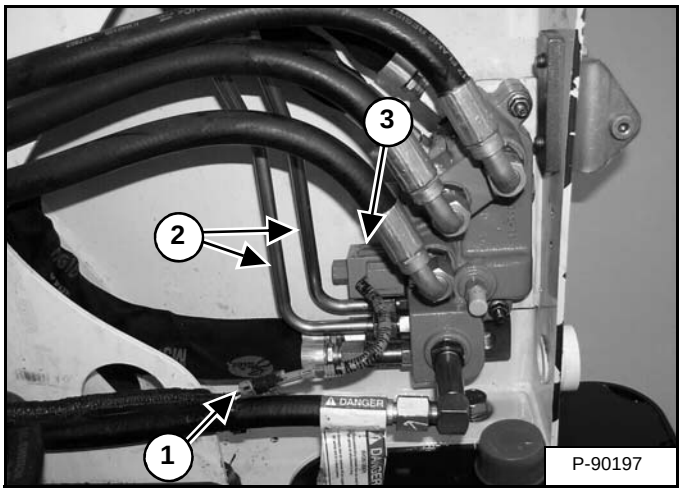
Figure 20-100-1



Remove the two bolts (Item 1), move the hose clamp (Item 2) to the middle of the hose, and the place the fuel inlet assembly (Item 3) **[Figure 20-100-1]** off to the side.

Cover the fuel tank inlet.

Figure 20-100-2



Disconnect the wire harness connector (Item 1) **[Figure 20-100-2]** from the bucket position shut-off solenoid.

Disconnect the cap the two tubelines (Item 2) **[Figure 20-100-2]**.

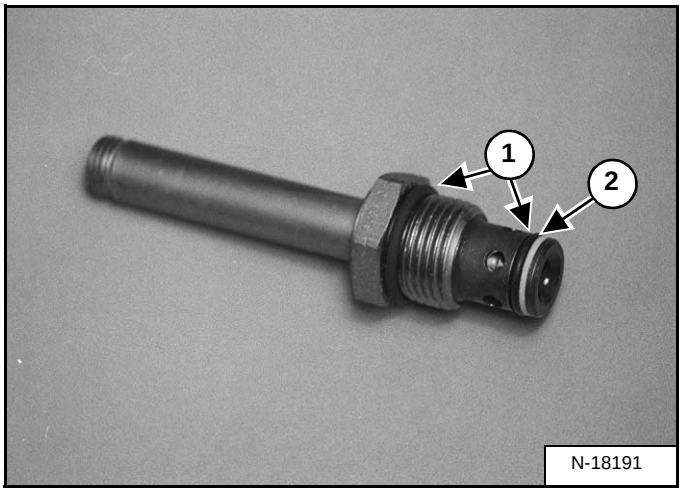
Remove the solenoid nut, coil, and stem (Item 3) from the bucket positioning valve **[Figure 20-100-2]**.

Installation: Put oil on O-rings and back-up washers and tighten the solenoid stem to 40,7 - 50,2 N•m (30 - 40 ft-lb) torque.

Installation: Tighten the solenoid nut to 8 N•m (6 ft-lb) torque. Overtightening may cause valve failure.

NOTE: The engine is shown removed for photo clarity.

Figure 20-100-3



Inspect the solenoid stem and replace the O-rings (Item 1) and the back-up washer (Item 2) **[Figure 20-100-3]**.

Dealer Copy -- Not for Resale

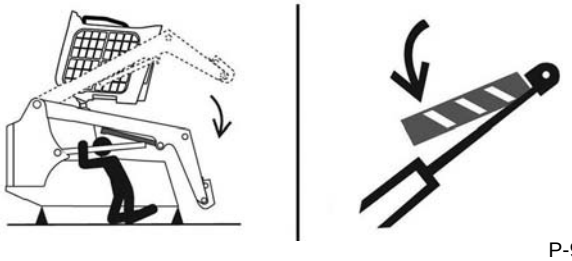
BUCKET POSITION VALVE (CONT'D)

Solenoid Testing

Refer to Bobcat Advanced Troubleshooting System (B.A.T.S.) for electrical testing and troubleshooting information. It is recommended that these procedures be performed by authorized Bobcat Service Personnel only.

Removal And Installation

⚠ DANGER



P-90328

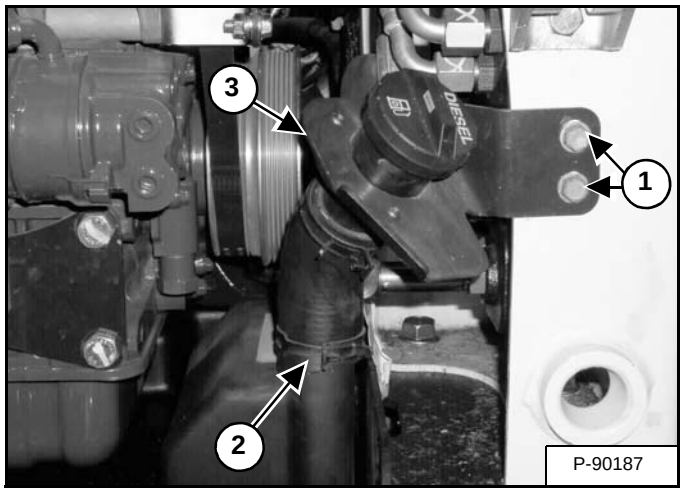
AVOID DEATH

- **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.**

D-1009-0409

Drain the hydraulic reservoir. (See Removing And Replacing Hydraulic Fluid on Page 10-120-2.)

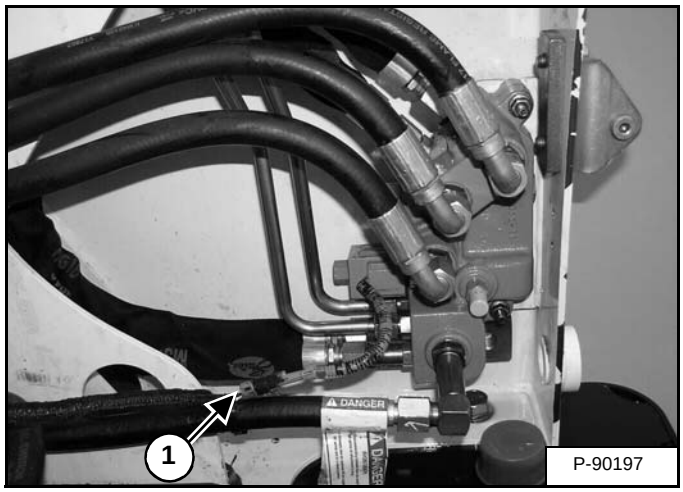
Figure 20-100-4



Remove the two bolts (Item 1), move the hose clamp (Item 2) to the middle of the hose, and the place the fuel inlet assembly (Item 3) **[Figure 20-100-4]** off to the side.

Cover the fuel tank inlet.

Figure 20-100-5

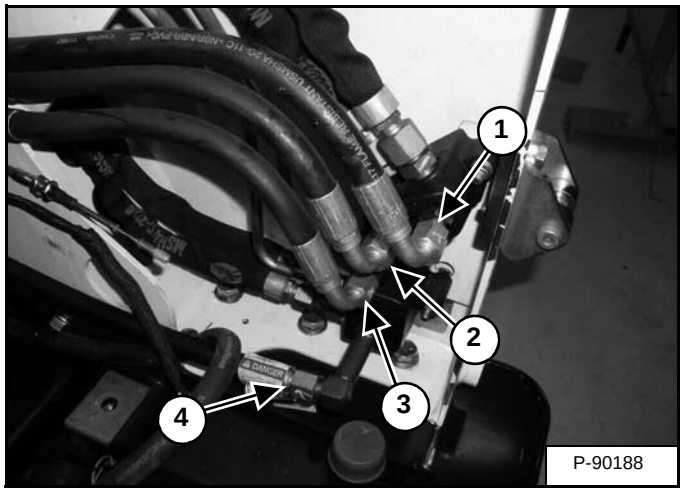


NOTE: The engine is shown removed for photo clarity.

NOTE: Mark all hoses and tubelines for correct installation.

Disconnect the electric solenoid connector (Item 1) **[Figure 20-100-5]**.

Figure 20-100-6

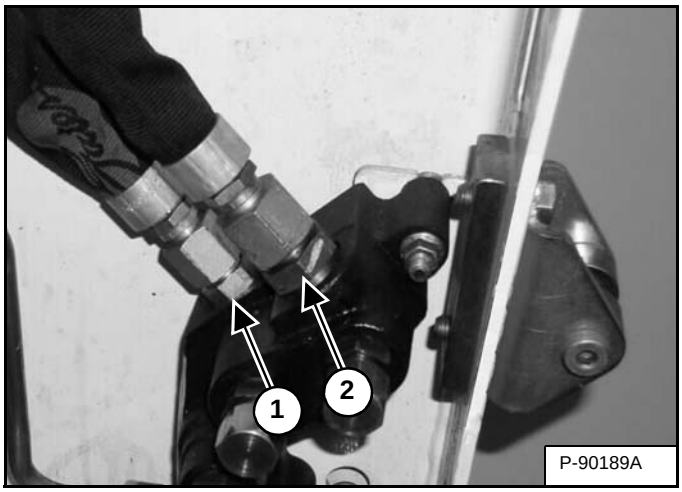


Disconnect and cap the tilt base inlet hose (Item 1), the tilt rod inlet hose (Item 2), the lift rod inlet hose (Item 3), and the lift base inlet hose (Item 4) **[Figure 20-100-6]** that route from the control valve.

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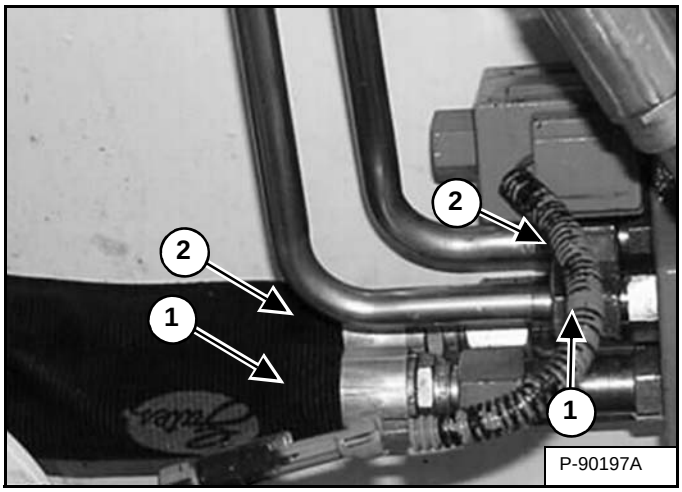
Removal And Installation (Cont'd)

Figure 20-100-7



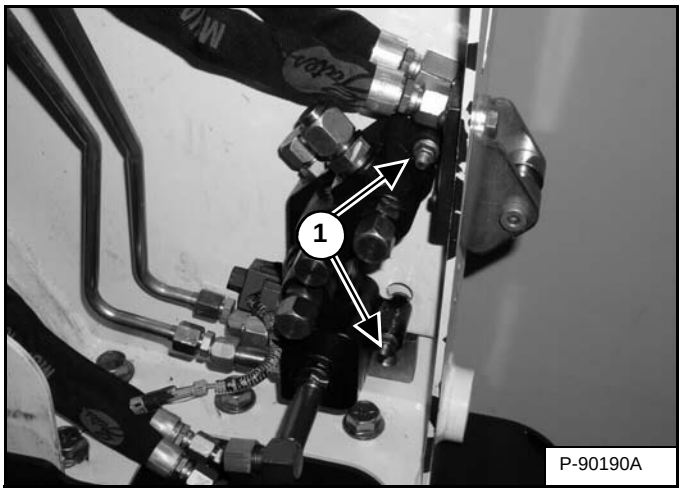
Disconnect and cap the tilt cylinder hose (Item 1) and the tilt cylinder base end hose (Item 2) **[Figure 20-100-7]** from the valve block.

Figure 20-100-8



Disconnect and cap the lift base outlet hose and tubeline (Item 1) and the lift rod outlet hose and tubeline (Item 2) **[Figure 20-100-8]** that route from the lift cylinders.

Figure 20-100-9



Remove the mounting screws (Item 1) **[Figure 20-100-9]**.

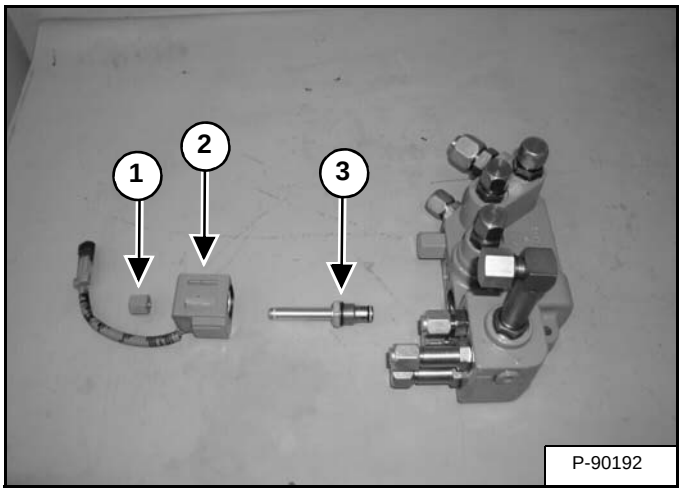
Remove the bucket position valve from the loader.

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BUCKET POSITION VALVE (CONT'D)

Disassembly And Assembly

Figure 20-100-10

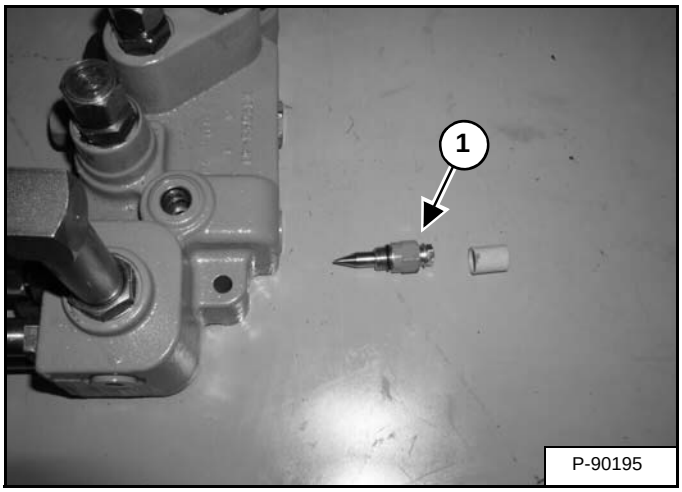


Remove the solenoid nut (Item 1), coil (Item 2), and the stem (Item 3) **[Figure 20-100-10]**.

Assembly: Tighten the nut to a maximum of 8 N•m (6 ft-lb) torque. Overtightening may cause valve failure.

Assembly: Put oil on O-rings and back-up washers and tighten the solenoid stem to 40,7 - 50,2 N•m (30 - 40 ft-lb) torque.

Figure 20-100-11

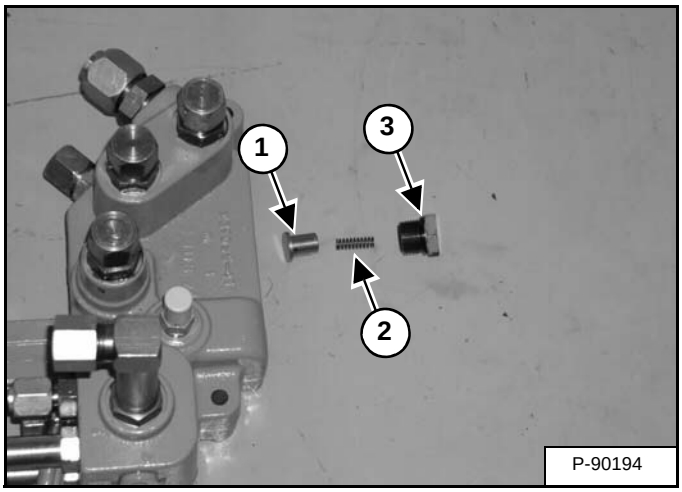


Remove the flow adjustment valve and O-ring (Item 1) **[Figure 20-100-11]**.

Assembly: Tighten the flow adjustment valve to 36,6 - 48,8 N•m (27 - 36 ft-lb) torque.

NOTE: Always install new O-rings before any parts are installed into the valve. Inspect the parts for wear or damage and replace as needed.

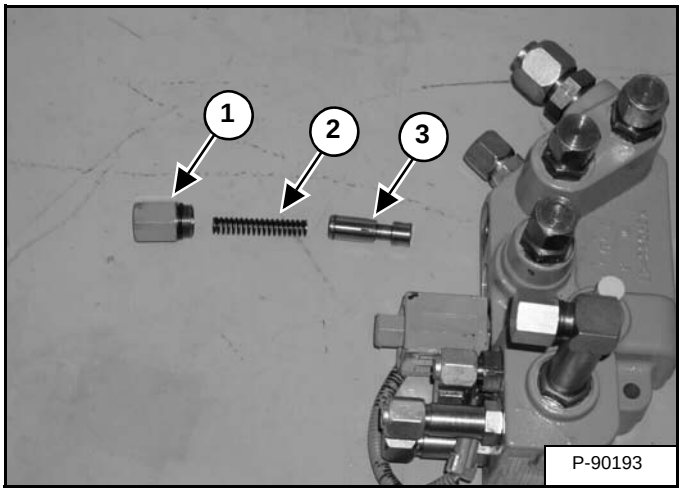
Figure 20-100-12



Remove the tilt cylinder check valve (Item 1), spring (Item 2), and plug (Item 3) **[Figure 20-100-12]**. Inspect for wear, inspect the O-ring and replace as needed.

Assembly: Tighten the plug to 75,9 - 86,8 N•m (56 - 64 ft-lb) torque.

Figure 20-100-13



Remove the plug (Item 1), spring (Item 2) and unloading spool (Item 3) **[Figure 20-100-13]**.

Inspect all parts and replace as needed. Install a new O-ring on the plug before installing.

Assembly: Tighten the plug to torque.

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REAR AUXILIARY DIVERTER VALVE

Description

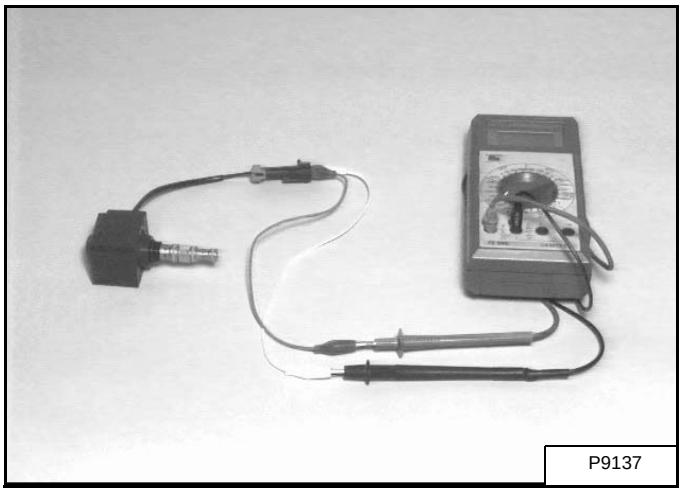
The rear auxiliary diverter valve is an optional valve that diverts oil from the main valve inlet to two sets of rear auxiliary couplers. The couplers are used for rear mounted attachments.The right side auxiliaries are used for older attachments.

The rear couplers are located, one set on each side of the rear frame uprights.

See Hydraulic Schematic for more circuit information.

Solenoid Testing

Figure 20-110-1



Use a test meter to measure coil resistance **[Figure 20-110-1]**. Coil wires do not have polarity. Correct resistance is 8.6 - 9.5 ohm.

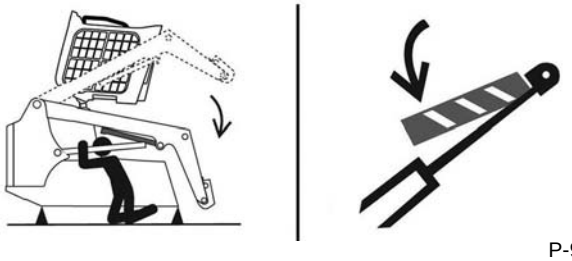
Replace the test meter with 12 volt power. You can see and hear the spool shift.

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REAR AUXILIARY DIVERTER VALVE (CONT'D)

Removal And Installation

DANGER



P-90328

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.**

D-1009-0409

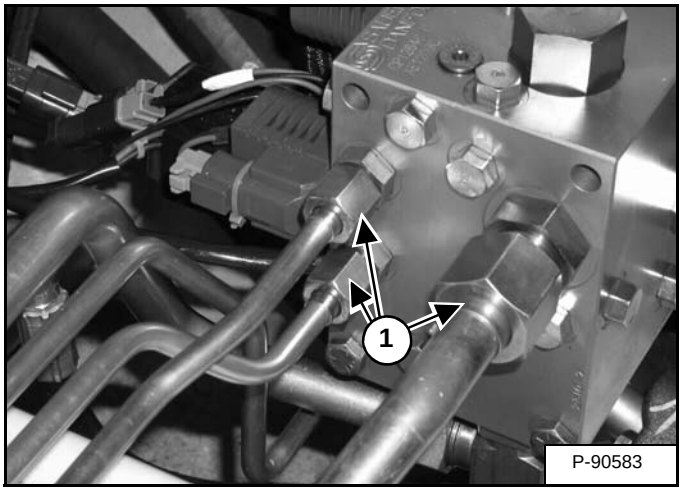
Put jackstands under the rear corners of the loader.

Raise the lift arms and install an approved lift arm support device. (See Installing on Page 10-20-1.)

Raise the operator cab. (See Raising on Page 10-30-2.)

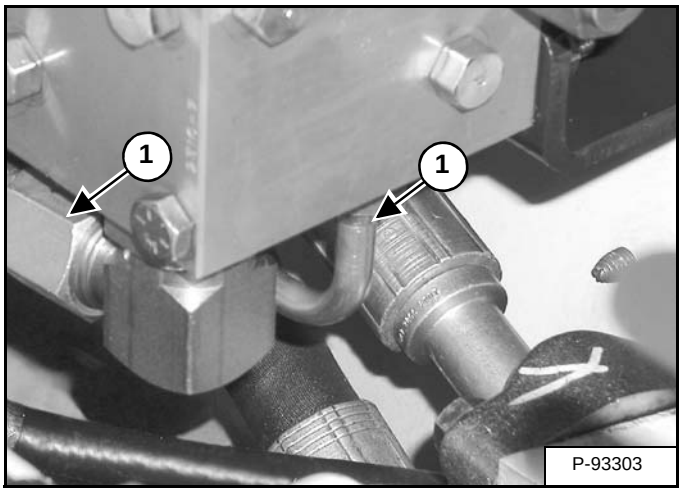
Drain the hydraulic reservoir. (See Removing And Replacing Hydraulic Fluid on Page 10-120-2.)

Figure 20-110-2



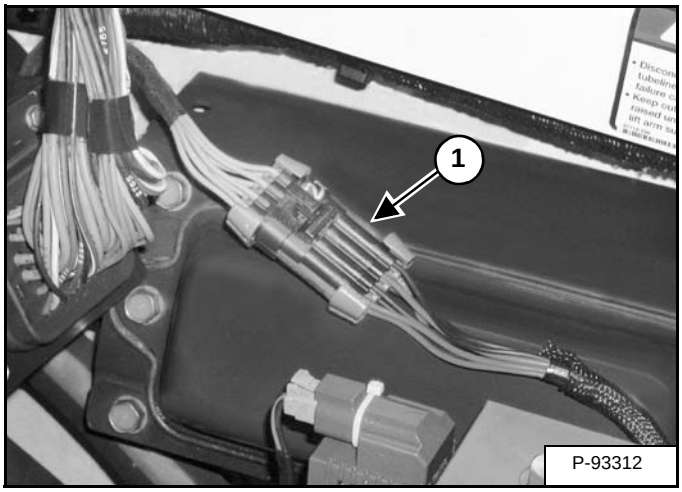
Disconnect and cap the tubelines (Item 1) **[Figure 20-110-2]**

Figure 20-110-3



Disconnect and cap the tubelines (Item 1) **[Figure 20-110-3]**

Figure 20-110-4

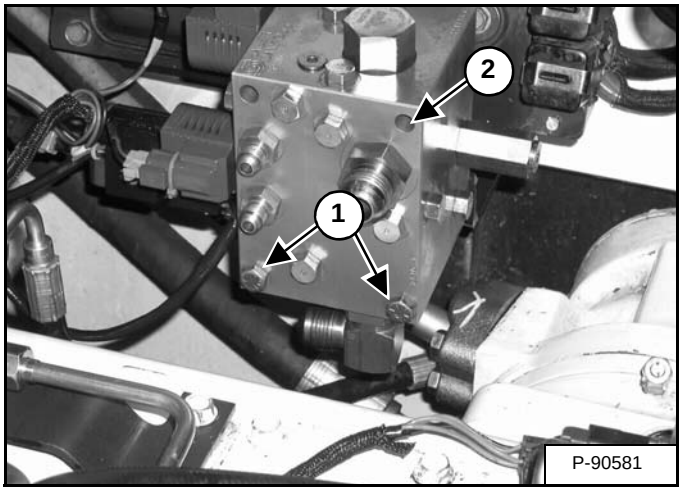


Disconnect the accessory wiring harness (Item 1) **[Figure 20-110-4]** from the main harness.

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Removal And Installation (Cont'd)

Figure 20-110-5



Remove the two bolts (Item 1) and remove the valve (Item 2) **[Figure 20-110-5]**

Disassembly And Assembly

Figure 20-110-6

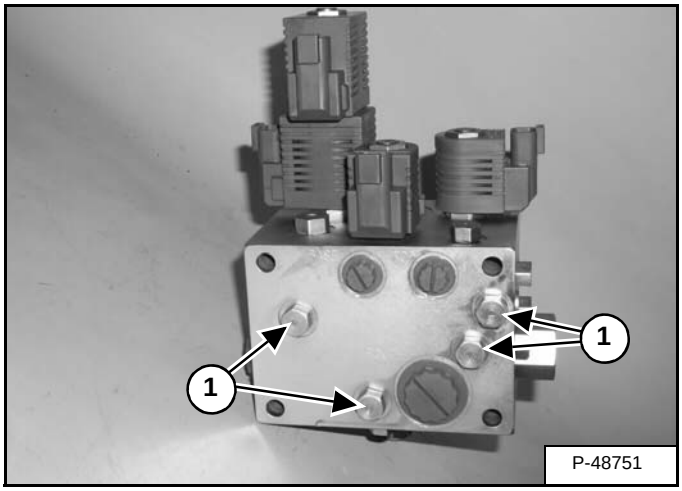
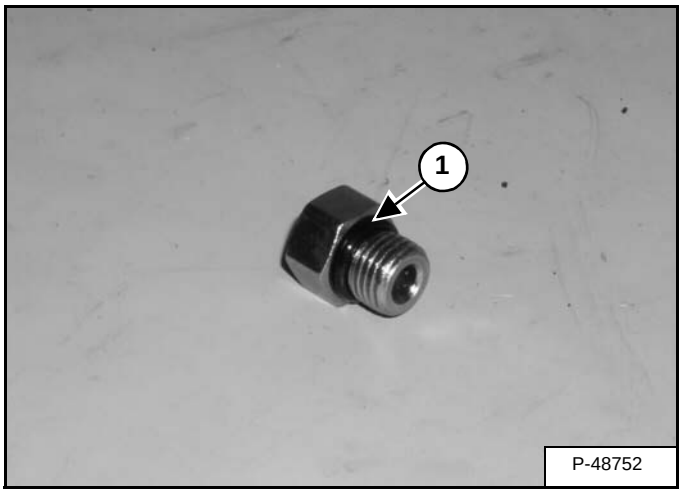


Figure 20-110-7



Clean the diverter valve to remove dirt before disassembly. Valve ports are labeled for correct assembly.

Several plugs (Item 1) **[Figure 20-110-6]** and **[Figure 20-110-7]** are located all over the diverter valve and can be removed for clean out purposes.

Assembly: Put oil on O-rings and back-up washers. Tighten to 13,6 N•m (10 ft-lb) torque.

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Disassembly And Assembly (Cont'd)

IMPORTANT

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

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Figure 20-110-8

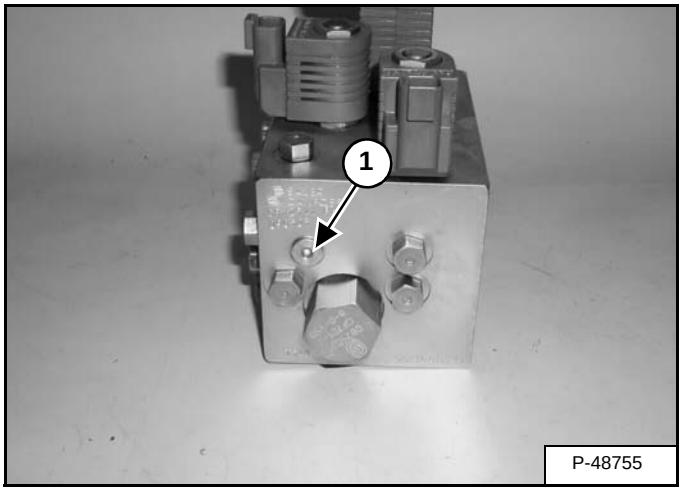
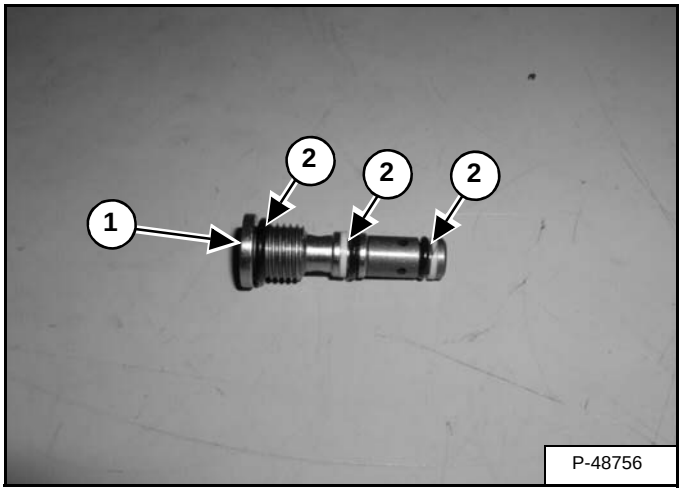


Figure 20-110-9



Remove the shuttle valve (Item 1) **[Figure 20-110-8]** and **[Figure 20-110-9]** from diverter valve and inspect the O-rings and back-up washers (Item 2) **[Figure 20-110-9]** for damage.

Assembly: Put oil on the O-rings and back-up washers. Tighten to 14 - 16 N•m (10 - 12 ft-lb) torque.

Figure 20-110-10

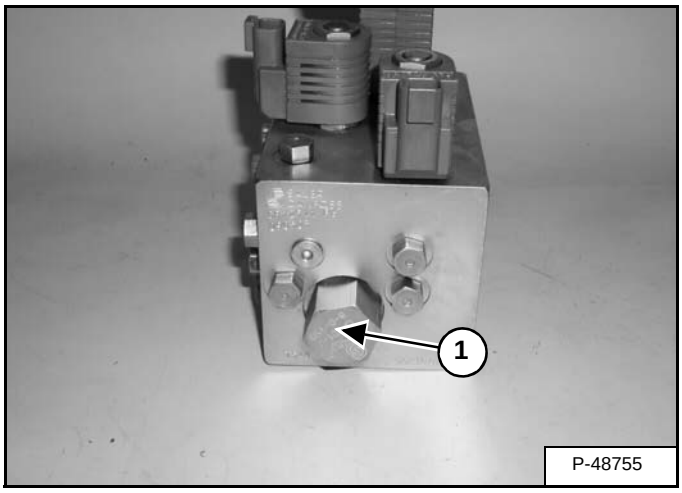
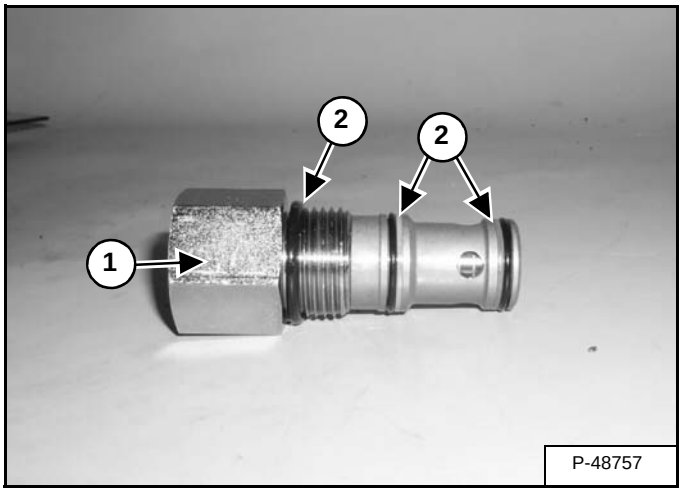


Figure 20-110-11



Remove the differential sensing valve (Item 1) **[Figure 20-110-10]** and **[Figure 20-110-11]** from diverter valve and inspect the O-rings and back-up washers (Item 2) **[Figure 20-110-11]** for damage.

Assembly: Put oil on O-ring and back-up washers. Tighten to 68 - 75 N•m (50 - 55 ft-lb) torque.

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Disassembly And Assembly (Cont'd)

Figure 20-110-12

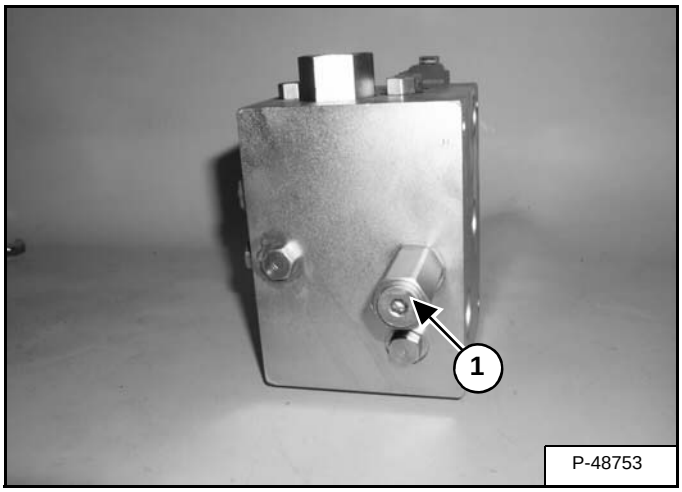
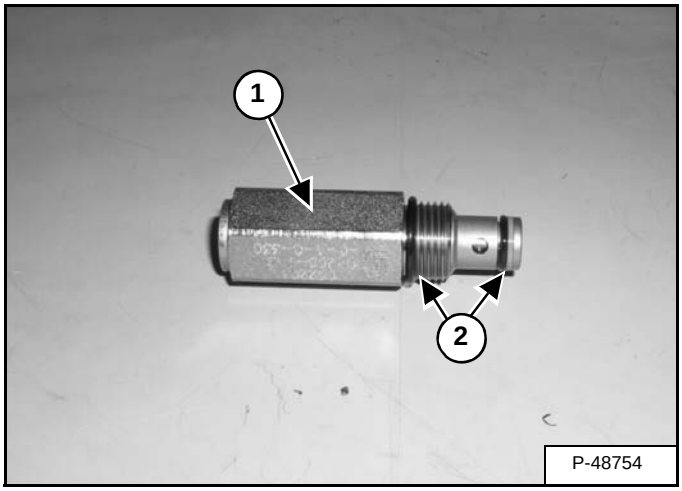


Figure 20-110-13



Remove the relief valve (Item 1) **[Figure 20-110-12]** and **[Figure 20-110-13]** from the diverter valve and inspect the O-rings and back-up washers (Item 2) **[Figure 20-110-13]** for damage.

Assembly: Put oil on O-ring and back-up washers. Tighten to 27 - 34 N•m (20 - 25 ft-lb) torque.

Figure 20-110-14

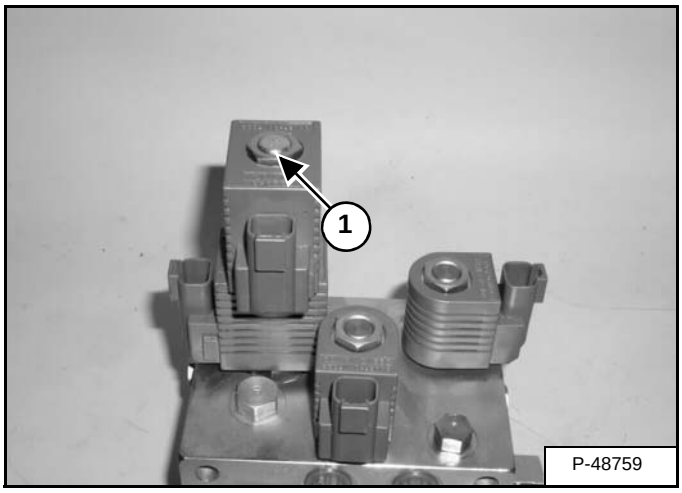
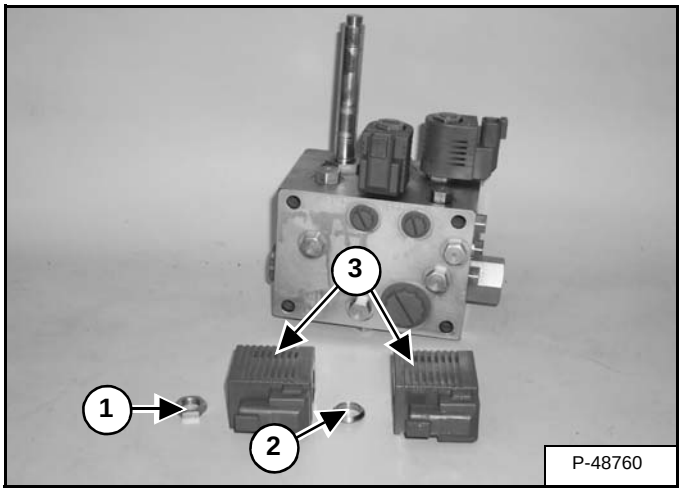


Figure 20-110-15



NOTE: Before removing the solenoid coils mark the coils for proper alignment.

Remove the nut (Item 1) **[Figure 20-110-14]** and **[Figure 20-110-15]** from the solenoid valve stem.

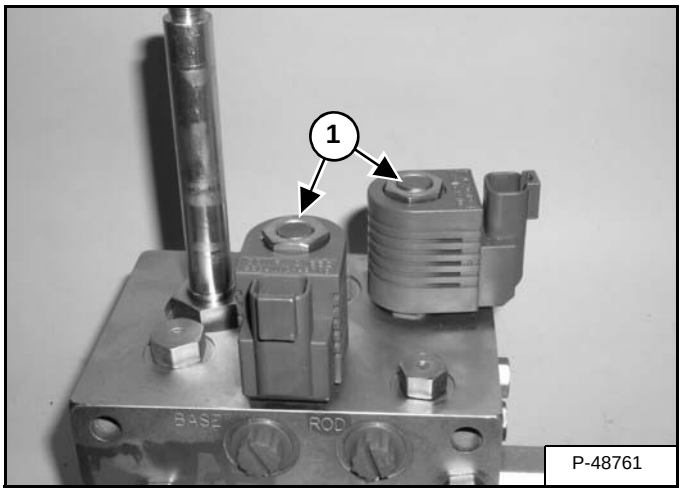
Assembly: Tighten the nut to 5 - 8 N•m (4 - 6 ft-lb) torque.

Remove the spacer (Item 2) and solenoid valve coils (Item 3) **[Figure 20-110-15]**.

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Disassembly And Assembly (Cont'd)

Figure 20-110-16



NOTE: Before removing the solenoid coils mark the coils for proper alignment.

Remove the nuts (Item 1) **[Figure 20-110-16]** from the solenoid valve stems.

Assembly: Tighten the nut to 5 - 8 N•m (4 - 6 ft-lb) torque.

Figure 20-110-17

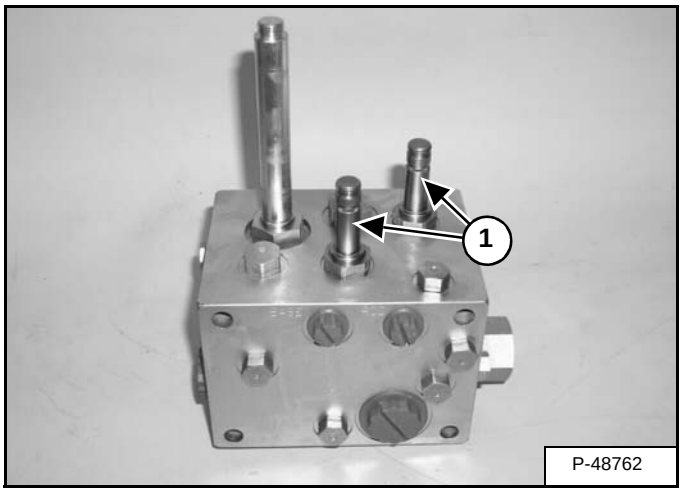
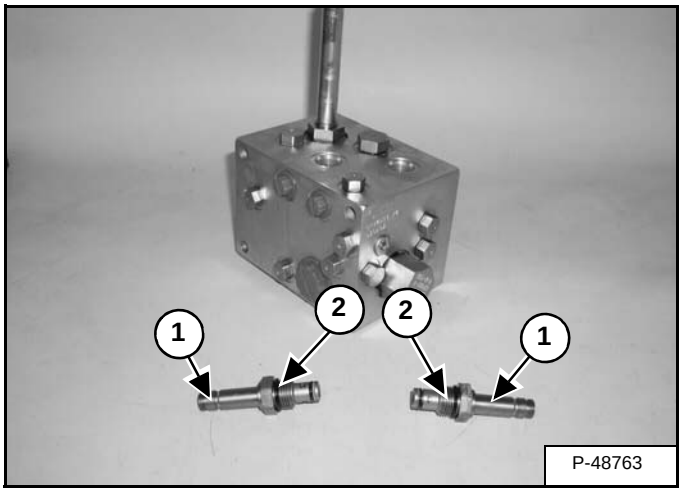


Figure 20-110-18



Remove the solenoid valve stem (Item 1) **[Figure 20-110-17]** and **[Figure 20-110-18]** and inspect the O-rings and back-up washers (Item 2) **[Figure 20-110-18]** for damage.

Assembly: Put oil on O-rings and back-up washers. Tighten to 27 - 34 N•m (20 - 25 ft-lb) torque.

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Disassembly And Assembly (Cont'd)

Figure 20-110-19

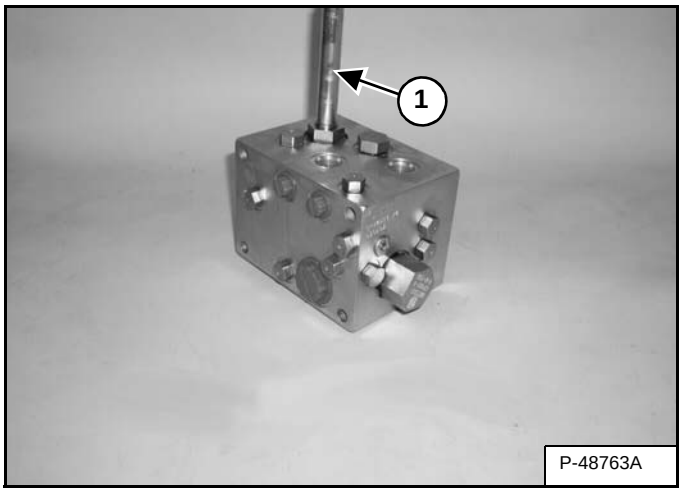
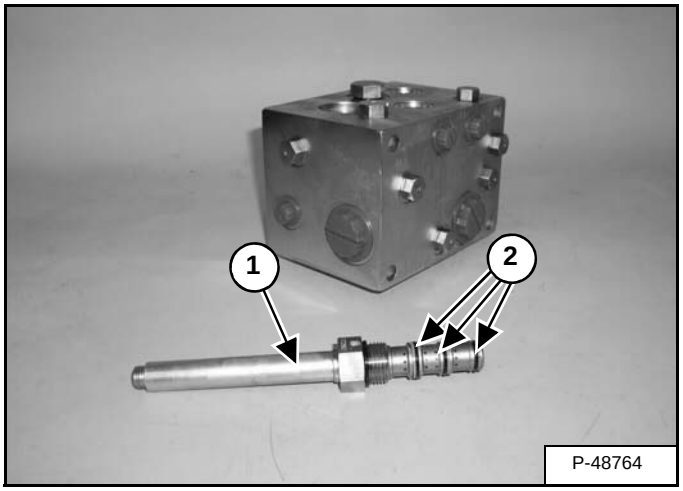


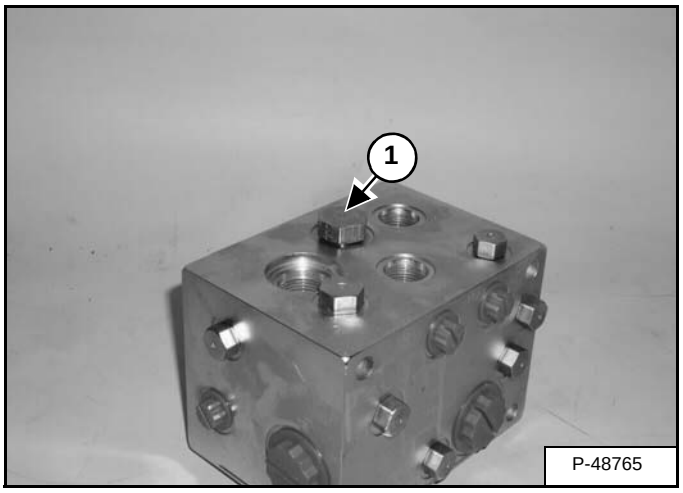
Figure 20-110-20



Remove the solenoid valve stem (Item 1) **[Figure 20-110-19]** & **[Figure 20-110-20]** and inspect the O-rings and back-up washers (Item 2) **[Figure 20-110-20]** for damage.

Assembly: Put oil on O-rings and back-up washers. Tighten to 41 - 47 N•m (30 - 35 ft-lb) torque.

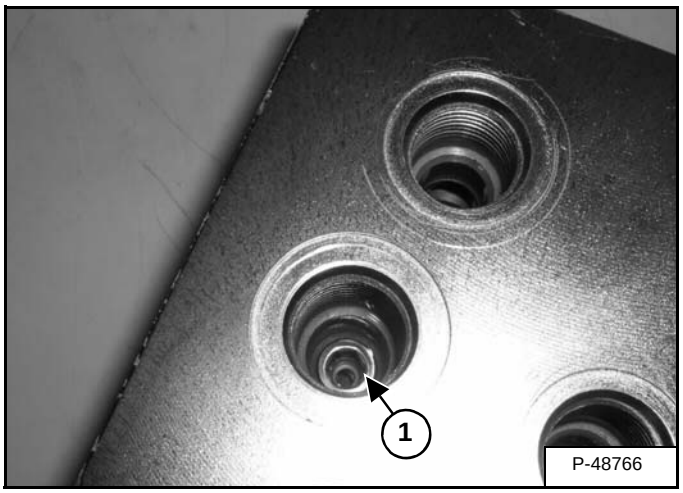
Figure 20-110-21



Remove the plug (Item 1) **[Figure 20-110-21]**.

Assembly: Tighten the plug to 51,5 N•m (38 ft-lb) torque.

Figure 20-110-22



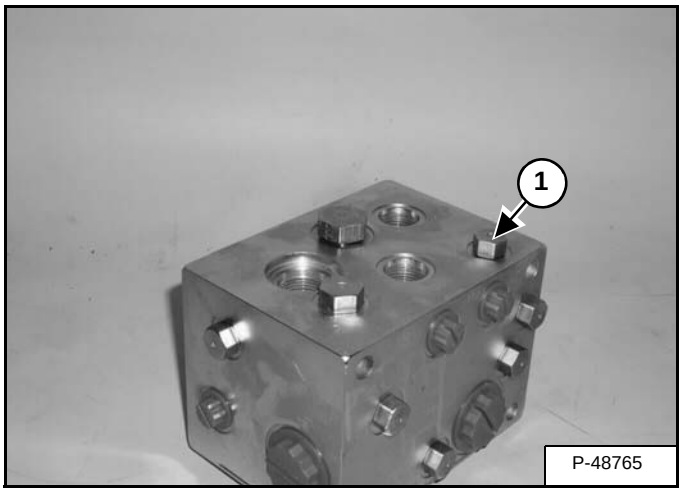
Remove and inspect the orifice (Item 1) **[Figure 20-110-22]** for dirt and debris.

Assembly: Tighten the orifice to 29,8 N•m (22 ft-lb) torque.

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Disassembly And Assembly (Cont'd)

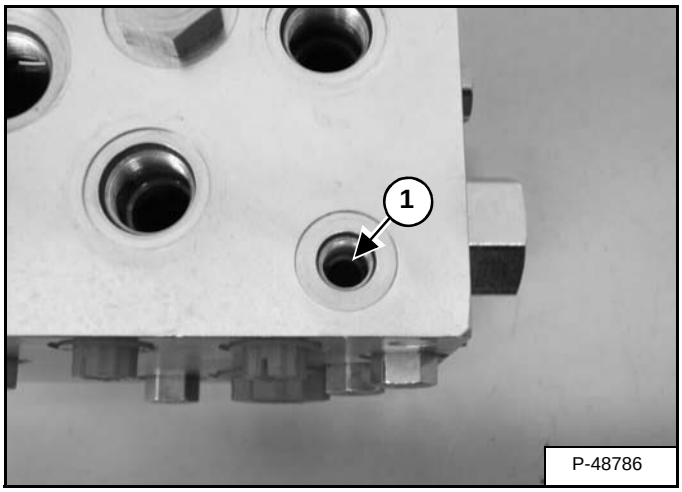
Figure 20-110-23



Remove the plug (Item 1) **[Figure 20-110-23]**.

Assembly: Tighten the plug to 13,6 N•m (10 ft-lb) torque.

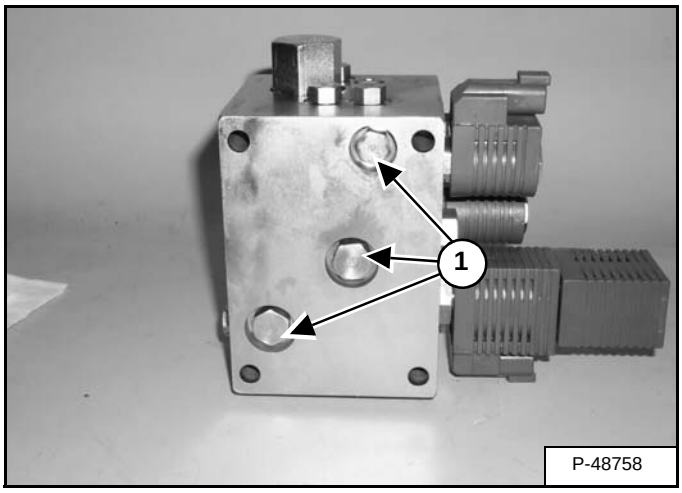
Figure 20-110-24



Remove the orifice (Item 1) **[Figure 20-110-24]**.

Assembly: Tighten the orifice to 4,5 N•m (3.3 ft-lb) torque.

Figure 20-110-25



Remove the plugs (Item 1) **[Figure 20-110-25]**.

Assembly: Tighten the plug to 19 N•m (14 ft-lb) torque.

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.

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BOB-TACH (POWER) BLOCK

Description

The power Bob-Tach is an option that allows the operator to hydraulically control the Bob-Tach levers for mounting and dismounting the attachments.

The power Bob-Tach is operated by a switch on the right switch panel.

The power Bob-Tach block is mounted on the right side of the machine in front of the engine on the back side of the hydraulic pump.

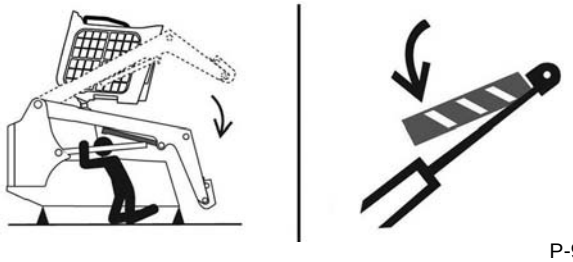
Removal And Installation

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



P-90328

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.**

D-1009-0409

IMPORTANT

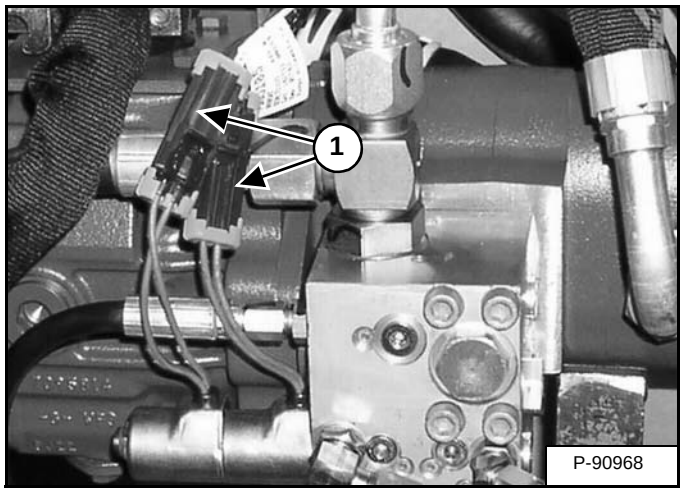
When repairing hydrostatic and hydraulic systems, clean the work area before disassembly and keep all parts clean. Always use caps and plugs on hoses, tubelines and ports to keep dirt out. Dirt can quickly damage the system.

I-2003-0888

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Removal And Installation (Cont'd)

Figure 20-120-1



Lift and block the loader. (See Procedure on Page 10-10-1.)

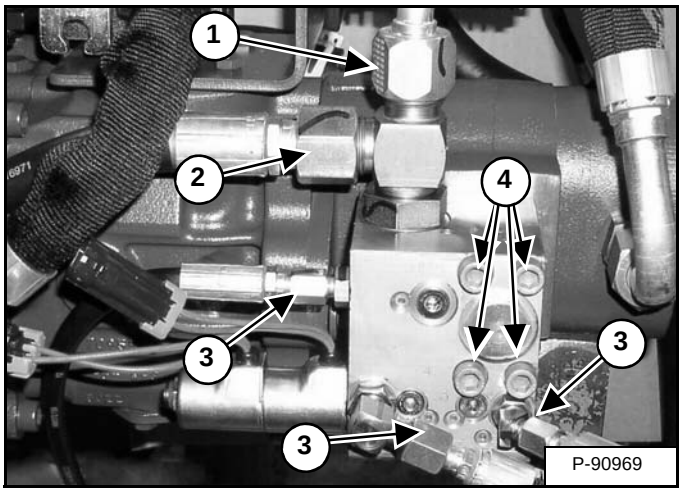
Raise the lift arms and install an approved lift arm support device. (See Installing on Page 10-20-1.)

Raise the operator cab. (See Raising on Page 10-30-2.)

Drain the hydraulic reservoir. (See Removing And Replacing Hydraulic Fluid on Page 10-120-2.)

Disconnect and cap the two electrical solenoid connectors (Item 1) **[Figure 20-120-1]** from the loader electrical harness.

Figure 20-120-2



Mark the hydraulic hoses for proper installation.

Disconnect and cap the outlet hose (Item 1) **[Figure 20-120-2]** from block.

Remove the hydraulic muffler (if equipped) (Item 2) **[Figure 20-120-2]** from block.

Disconnect and cap the hoses (Item 3) **[Figure 20-120-2]** from block.

Remove the four mounting bolts (Item 4) **[Figure 20-120-2]** from block.

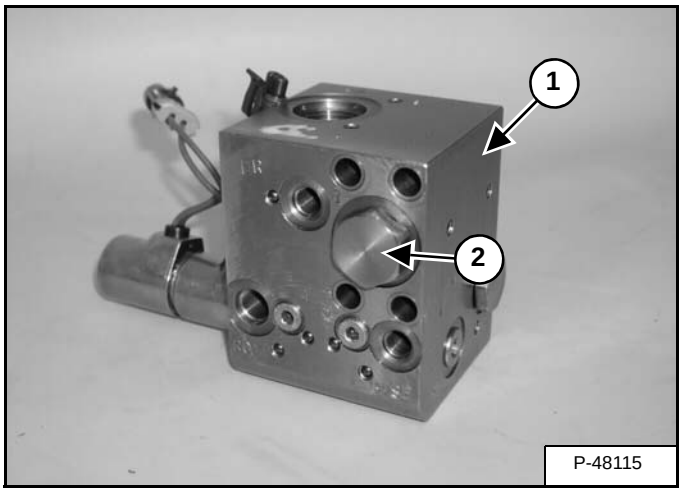
Installation: Tighten the mounting bolts to 48 - 54 N•m (35 - 40 ft-lb) torque.

Remove the power Bob-Tach block.

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Disassembly And Assembly

Figure 20-120-3



Clean the block (Item 1) **[Figure 20-120-3]** to remove dirt before disassembly. Block ports are labeled for correct assembly.

Remove the plug (Item 2) **[Figure 20-120-3]**.

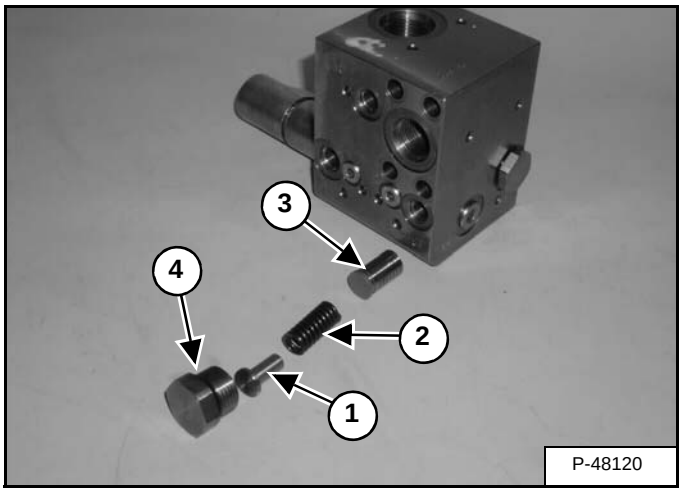
Installation: Tighten the plug to 34 - 40,6 N•m (25 - 30 ft-lb) torque.

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

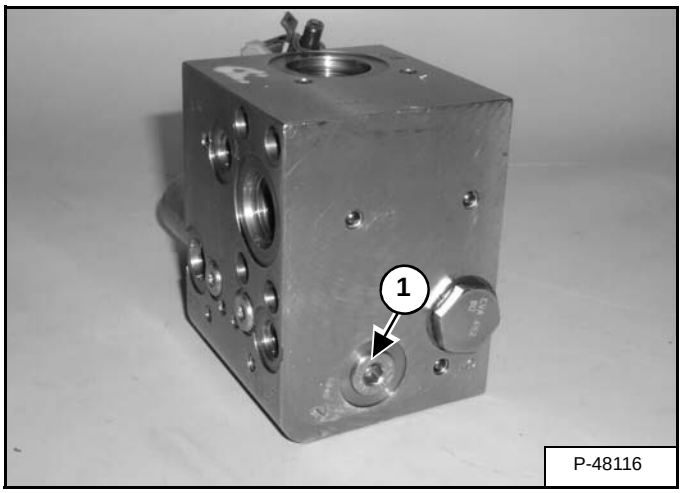
Figure 20-120-4



Remove the spring guide (Item 1), spring (Item 2) and the spool (Item 3) **[Figure 20-120-4]**.

Inspect the O-ring (Item 4) **[Figure 20-120-4]** on the plug and replace as needed.

Figure 20-120-5



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.

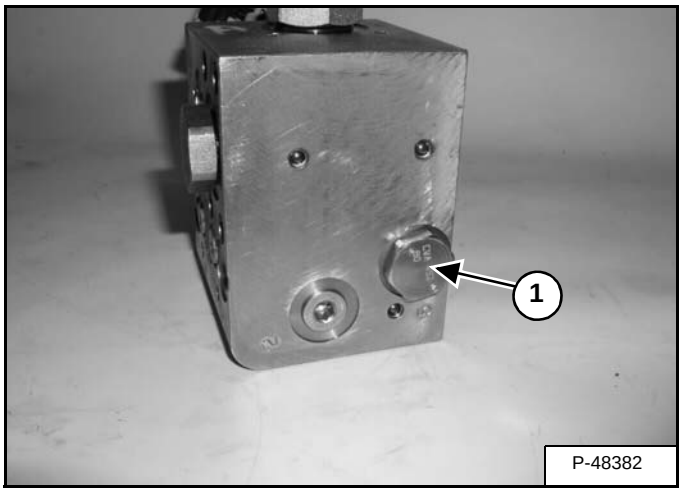
Do not remove the plug (Item 1) **[Figure 20-120-5]**.

Installation: Tighten the plug to 16,3 - 19 N•m (12 - 14 ft-lb) torque.

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Disassembly And Assembly (Cont'd)

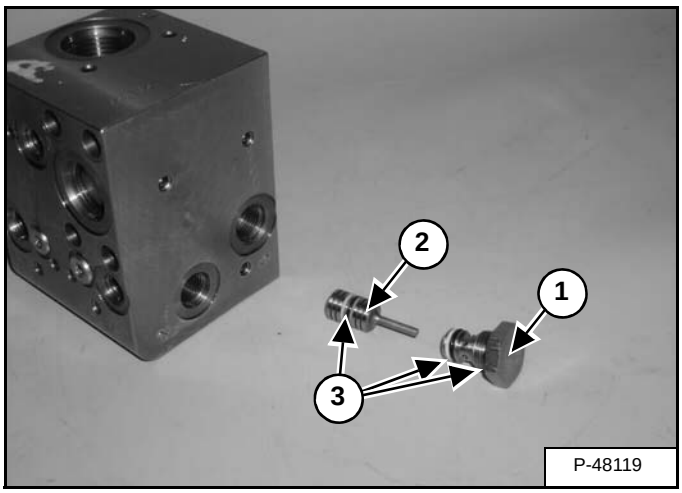
Figure 20-120-6



Remove the check valve (Item 1) **[Figure 20-120-6]**.

Installation: Oil the check valve and O-rings and tighten the check valve to 27,1 - 34 N•m (20 - 25 ft-lb) torque.

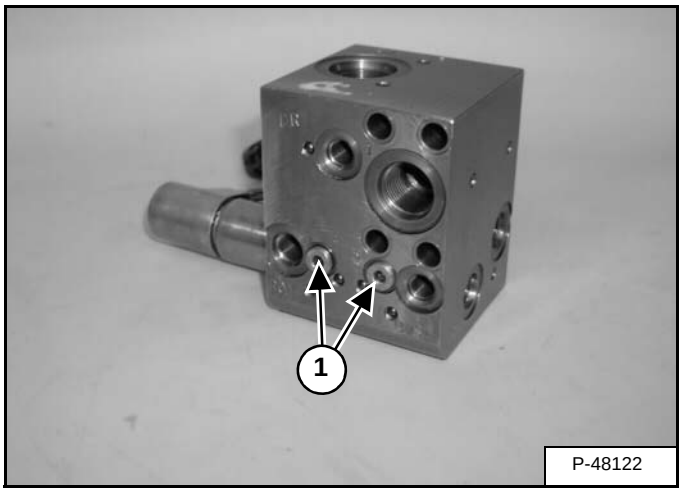
Figure 20-120-7



Inspect the check valve (Item 1) and piston assembly (Item 2) **[Figure 20-120-7]**.

Inspect the O-rings and back-up washers (Item 3) **[Figure 20-120-7]** on the check valve and piston assembly and replace as needed.

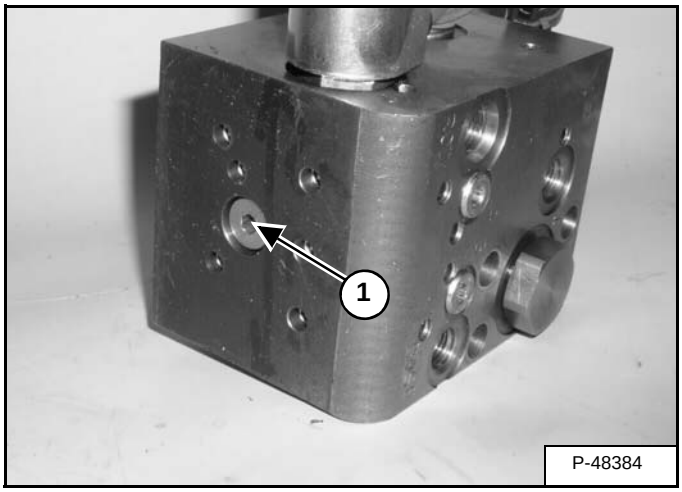
Figure 20-120-8



Do not remove the plugs (Item 1) **[Figure 20-120-8]**.

NOTE: Do not remove plugs. If the plugs are removed the internal pressure relieving spring setting will be altered.

Figure 20-120-9



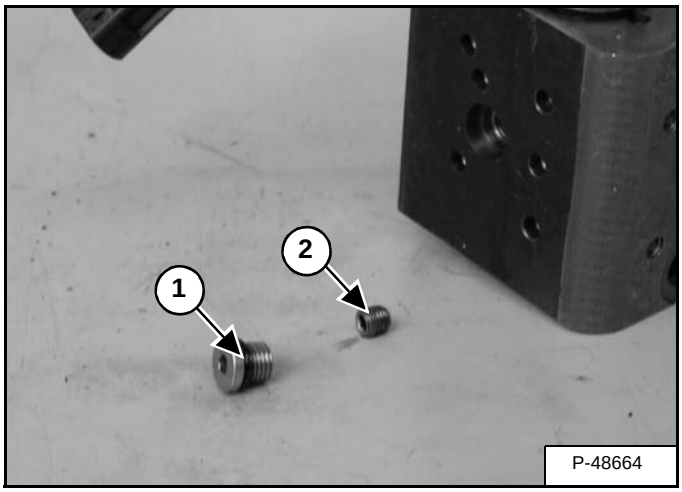
Remove the plug (Item 1) **[Figure 20-120-9]**, inspect the O-ring and replace as needed.

Installation: Tighten the plug (Item 1) **[Figure 20-120-9]** to 16,3 - 19 N•m (12 - 14 ft-lb) torque.

Dealer Copy -- Not for Resale

Disassembly And Assembly (Cont'd)

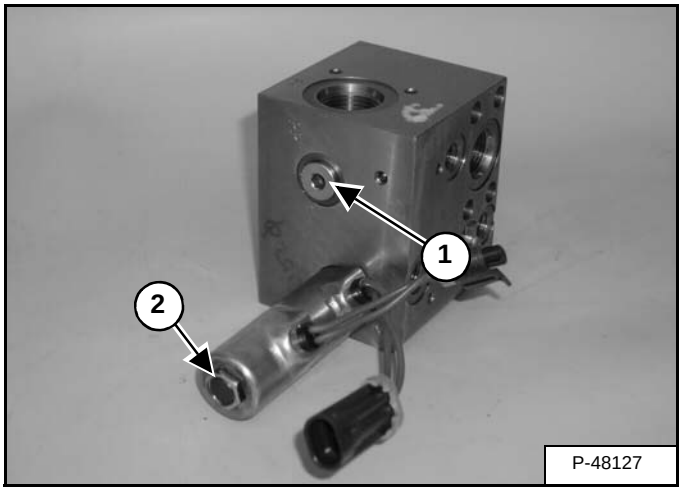
Figure 20-120-10



Remove the orifice screw (Item 2) located behind the plug (Item 1) **[Figure 20-120-10]**.

Installation: Tighten the orifice screw (Item 2) **[Figure 20-120-10]** to 8,1 - 10,8 N•m (6 - 8 ft-lb) torque.

Figure 20-120-11



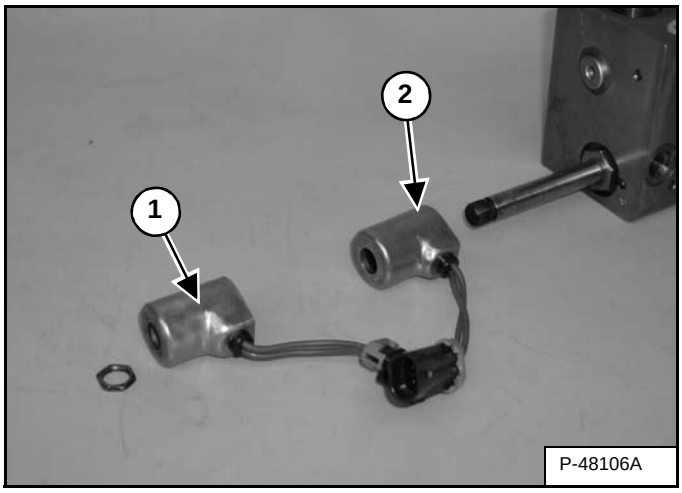
NOTE: This plug is a zero leak plug and should not be removed. If removed damage may occur and the plug and O-ring must be replaced.

Do not remove the plug (Item 1) **[Figure 20-120-11]**.

Remove the solenoid nut (Item 2) **[Figure 20-120-11]**.

Installation: Tighten the solenoid valve stem nut to 1,7 - 5,1 N•m (15 - 45 in-lb) torque.

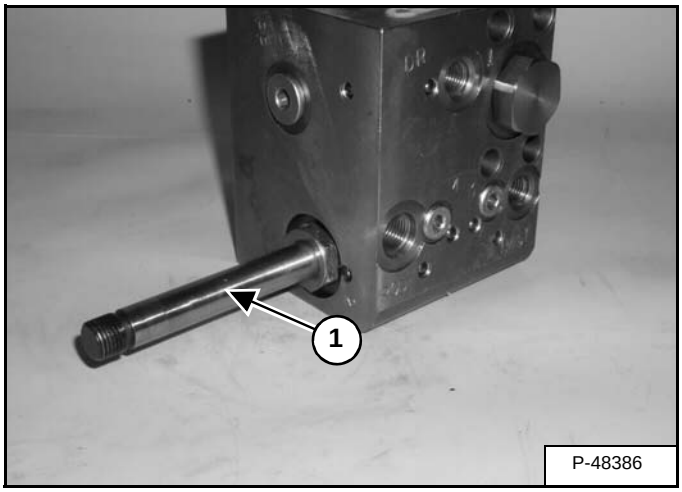
Figure 20-120-12



Remove the first solenoid coil (Item 1) and the second solenoid coil (Item 2) **[Figure 20-120-12]**.

NOTE: Remember the solenoid coil orientation for ease of installation.

Figure 20-120-13



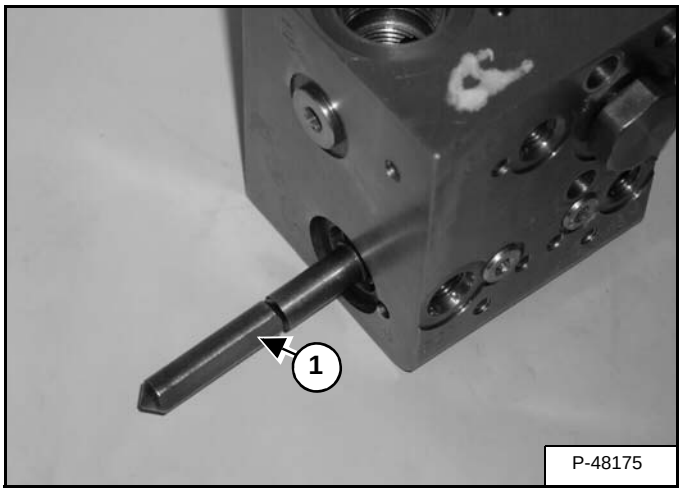
Remove the solenoid stem (Item 1) **[Figure 20-120-13]**.

Installation: Tighten the solenoid stem to 27,1 - 34 N•m (20 - 25 ft-lb) torque.

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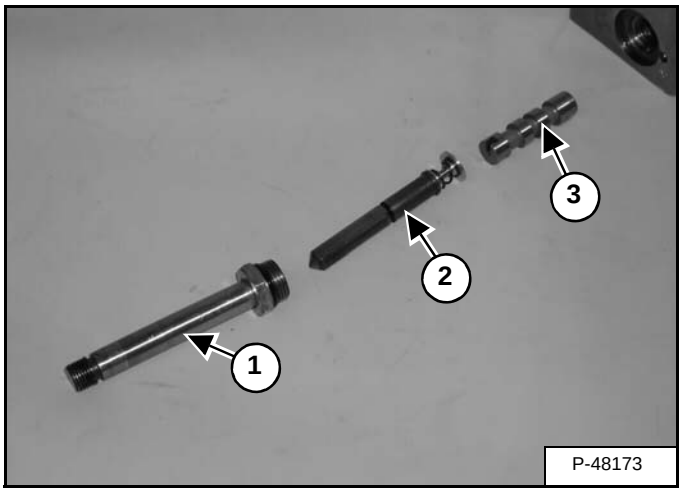
Disassembly And Assembly (Cont'd)

Figure 20-120-14



Remove the armature assembly (Item 1) **[Figure 20-120-14]**.

Figure 20-120-15

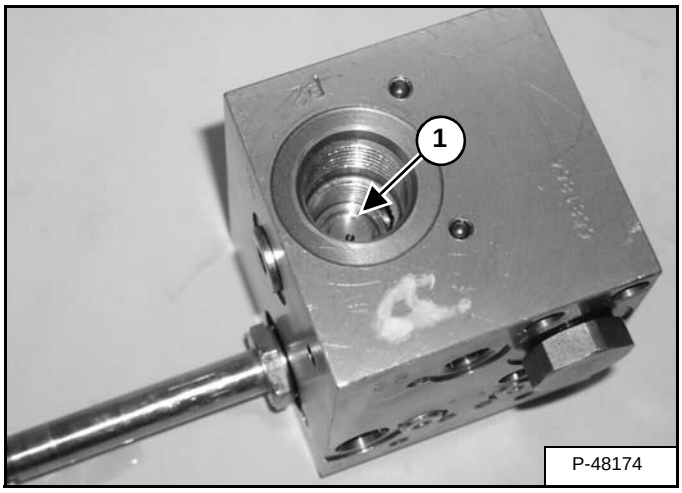


Inspect the solenoid stem (Item 1), armature assembly (Item 2) and the spool (Item 3) for damage **[Figure 20-120-15]**.

NOTE: If the solenoid stem is damaged (Item 1) inspect 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 20-120-15].

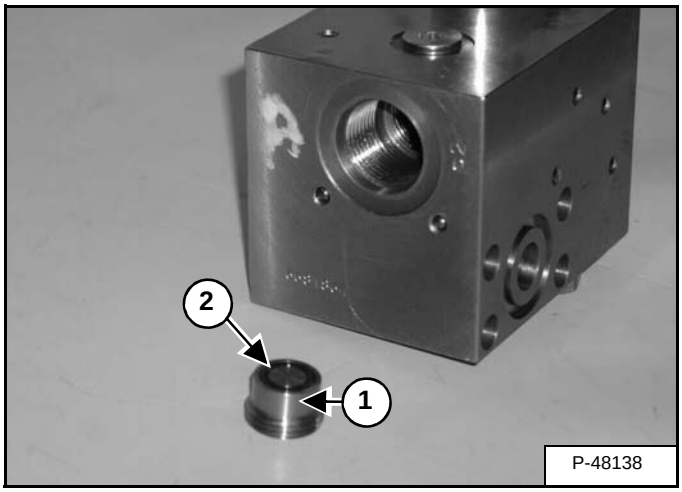
Figure 20-120-16



Remove the screened orifice plug (Item 1) **[Figure 20-120-16]**.

Installation: Tighten the screened orifice plug to 14,9 - 16,3 N•m (11 - 12 ft-lb) torque.

Figure 20-120-17



Inspect the screened orifice plug (Item 1) **[Figure 20-120-17]** for damage replace as needed. If the screened orifice plug is blocked replace with a new plug.

Inspect the O-ring (Item 2) **[Figure 20-120-17]** and replace as needed.

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FRONT AUXILIARY HYDRAULIC COUPLER BLOCK

Description

The front auxiliary hydraulic coupler block is the connection block that houses the two main auxiliary couplers along with a case drain coupler. These couplers are for suppling hydraulic flow for various attachments.

The front auxiliary coupler block is located at the front of the left side lift arm.

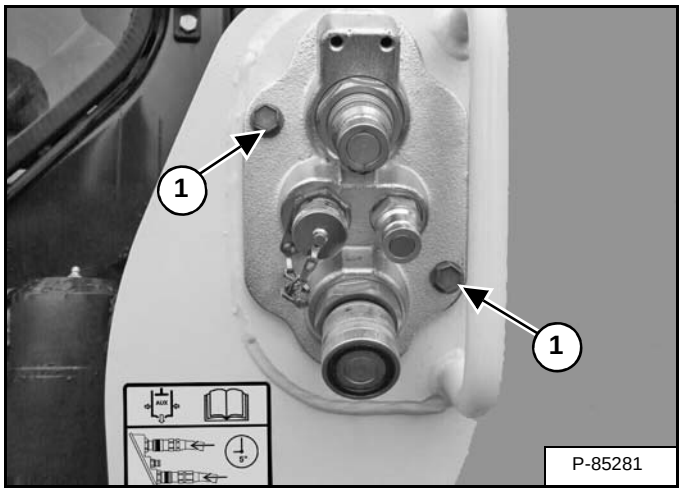
Removal And Installation

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 20-130-1



Remove the two mounting bolts (Item 1) **[Figure 20-130-1]**.

Pull the block away from the lift arms and disconnect the auxiliary hoses from the coupler block **[Figure 20-130-1]**.

Disassembly And Assembly

Figure 20-130-2

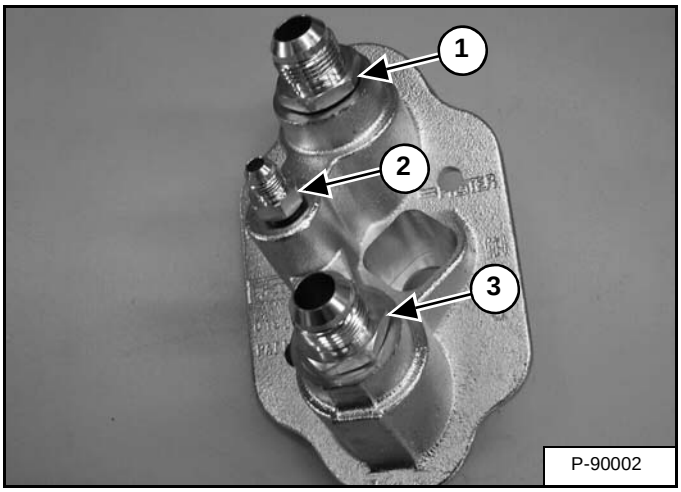
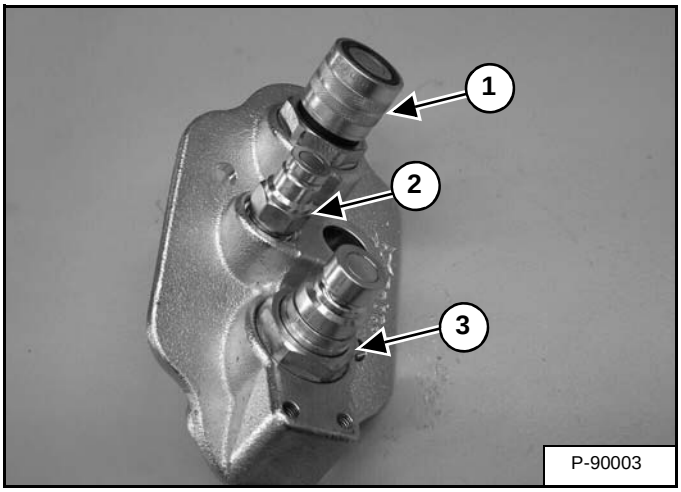


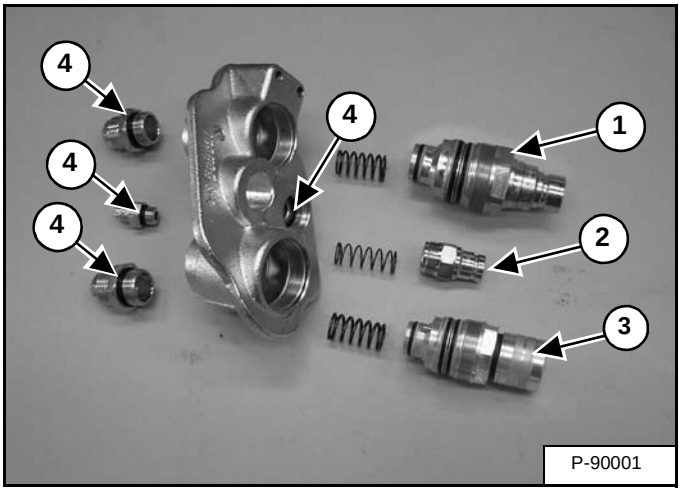
Figure 20-130-3



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Disassembly And Assembly (Cont'd)

Figure 20-130-4



Remove the male coupler, spring, and fitting (Item 1) **[Figure 20-130-2]**, **[Figure 20-130-4]** and **[Figure 20-130-4]**

Assembly: Tighten the male coupler (Item 1) **[Figure 20-130-3]** and **[Figure 20-130-4]** to 80 N•m (59 ft-lb)

Remove the drain coupler, spring, and fitting (Item 2) **[Figure 20-130-2]**, **[Figure 20-130-4]** and **[Figure 20-130-4]**.

Assembly: Tighten the drain coupler (Item 2) **[Figure 20-130-3]** and **[Figure 20-130-4]** to 50 N•m (37 ft-lb)

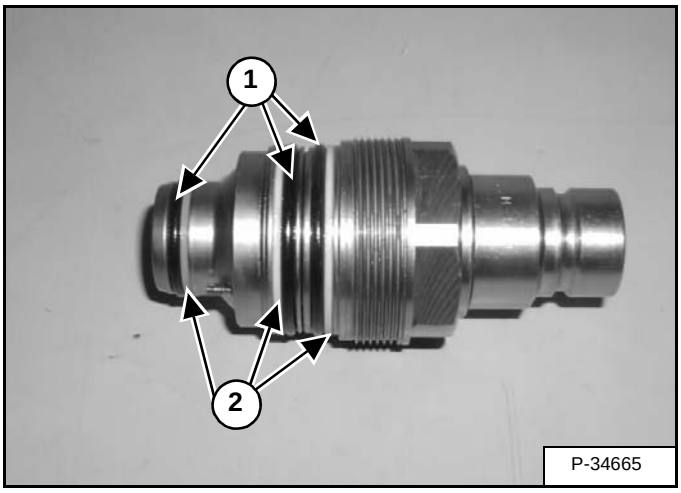
Remove the female coupler, spring, and fitting (Item 3) **[Figure 20-130-2]**, **[Figure 20-130-4]** and **[Figure 20-130-4]**.

Assembly: Tighten the female coupler (Item 3) **[Figure 20-130-3]** and **[Figure 20-130-4]** to 80 N•m (59 ft-lb)

Check the O-rings (Item 4) **[Figure 20-130-4]** and replace as needed.

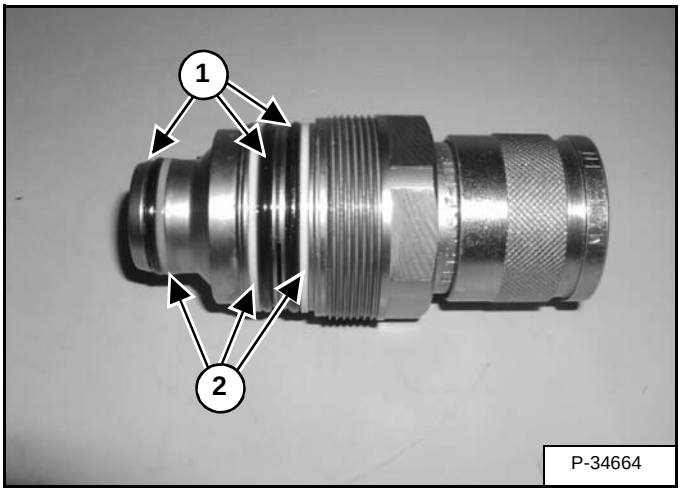
.

Figure 20-130-5



Check the O-rings (Item 1) back-up O-rings (Item 2) for damage and replace as needed **[Figure 20-130-5]**.

Figure 20-130-6



Check the O-rings (Item 1) back-up O-rings (Item 2) for damage and replace as needed **[Figure 20-130-6]**.

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HYDROSTATIC SYSTEM

HYDROSTATIC SYSTEM INFORMATION 30-10-1
Troubleshooting 30-10-1
Description 30-10-2

HYDROSTATIC DRIVE MOTOR 30-20-1
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Parts Identification 30-20-4
Disassembly And Assembly 30-20-5

HYDROSTATIC DRIVE MOTOR (TWO-SPEED) 30-21-1
Description 30-21-1
Removal And Installation 30-21-1
Parts Identification 30-21-4
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HYDROSTATIC MOTOR CARRIER 30-30-1
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Removal And Installation 30-30-2
Parts Identification 30-30-3
Disassembly 30-30-4
Assembly 30-30-5

HYDROSTATIC MOTOR CARRIER (SJC) 30-31-1
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Assembly 30-31-6

CHARGE PRESSURE 30-40-1
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Testing 30-40-1
Sender Removal And Installation 30-40-3
Adjusting 30-40-4

HYDROSTATIC PUMP 30-50-1
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Hydrostatic Pump Startup 30-50-3
Replenishing / High Pressure Relief Valve Removal And Installation 30-50-4
Parts Identification (Left Half) 30-50-5
Parts Identification (Right Half) 30-50-6
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Removal And Installation 30-51-4
Hydrostatic Pump Start Up 30-51-6
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DRIVE BELT 30-60-1
Belt Adjustment 30-60-1
Belt Replacement 30-60-1
Stop Adjustment 30-60-3
Tensioner Pulley Removal And Installation 30-60-4
Tensioner Pulley Disassembly And Assembly 30-60-4

TWO-SPEED / BRAKE VALVE 30-70-1
Description 30-70-1
Valve Block Removal And Installation 30-70-2
Valve Block Disassembly And Assembly 30-70-4

DRAIN MANIFOLD 30-80-1
Description 30-80-1
Drain Manifold Removal And Installation 30-80-1

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HYDROSTATIC SYSTEM INFORMATION

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 a service code appears in the left instrument panel. (See DIAGNOSTIC SERVICE CODES on Page 60-90-1.)

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, 10
The hydrostatic system is overheating.	8, 9

KEY TO CORRECT THE CAUSE	
1.	The hydrostatic pump relief / replenishing valves not seating.
2.	The steering linkage needs adjustment.
3.	The hydrostatic pump has damage.
4.	The final drive chains are broken.
5.	The hydrostatic motor has damage.
6.	The tires do not have the correct tire pressure.
7.	The tires are not the same size.
8.	The hydrostatic fluid is not at the correct level.
9.	The oil cooler has a restriction.
10.	The hydrostatic pump is not properly calibrated, and/or incorrect steering drift compensation setting.

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HYDROSTATIC SYSTEM INFORMATION (CONT'D)

Description

The hydrostatic system consists of a tandem hydrostatic pump and two hydrostatic motors. The hydrostatic system allows forward and reverse motion of the loader.

The hydrostatic pump is connected to the engine by a drive belt and provides fluid to the hydrostatic motors. The charge pressure system assists in replenishing the fluid that is lost due to internal leakage in the components of the hydrostatic system.

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HYDROSTATIC DRIVE MOTOR

Description

The hydrostatic motors are driven by high pressure from the hydrostatic pumps.

The hydrostatic motors do not have an internal brake.

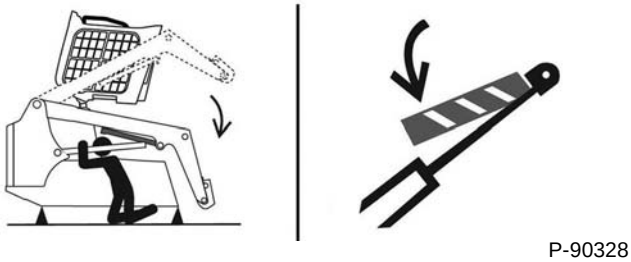
Inside the endcap of the hydrostatic motor, there is a shuttle valve. The shuttle valve helps to keep the motor cool by mixing case drain oil with cooled low pressure oil from the charge circuit. The shuttle valve is shifted by the high pressure oil coming from the hydrostatic pumps. If the shuttle valve sticks, a delay or lack of drive may or may not be felt in the controls and/or an overheated hydrostatic motor will result.

There are two hydrostatic motors mounted to motor carriers. The motor carriers are mounted to the transmission chaincase which houses the drive chains.

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Removal And Installation

⚠ DANGER



P-90328

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.**

D-1009-0409

⚠ WARNING

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

W-2059-0598

IMPORTANT

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

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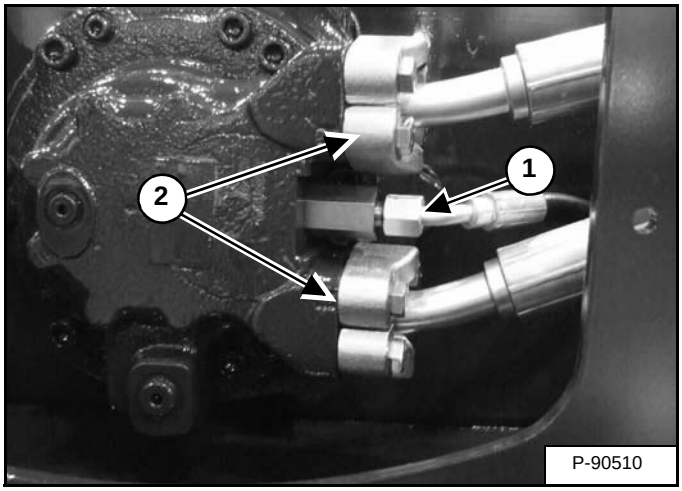
Lift and block the loader. (See Procedure on Page 10-10-1.)

Raise the lift arms and install an approved lift arm support device. (See Installing on Page 10-20-1.)

Raise the operator cab. (See Raising on Page 10-30-2.)

Drain the hydraulic reservoir. (See Removal And Installation on Page 20-90-1.)

Figure 30-20-1



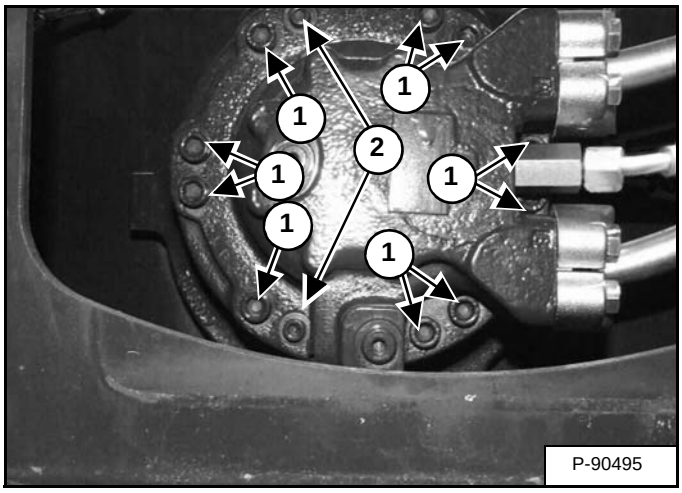
Remove the motor cover.

Mark the hoses for correct installation.

Disconnect the case drain hose (Item 1) **[Figure 30-20-1]**.

Disconnect the high pressure hoses (Item 2) **[Figure 30-20-1]**.

Figure 30-20-2



Remove the ten mounting bolts (Item 1) **[Figure 30-20-2]**.

Installation: Tighten the mounting bolts to 149,2 N•m (110 ft-lb) torque.

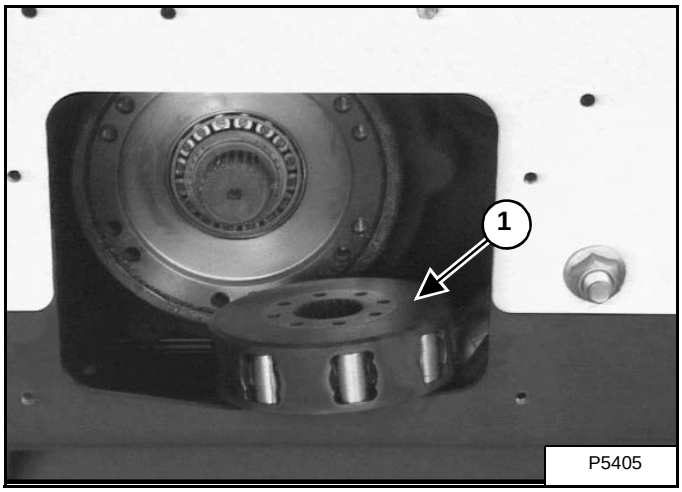
NOTE: The two bolts (Item 2) [Figure 30-20-2] mount the cam ring to the motor, and do not have to be removed, to remove the motor from the loader.

Remove the motor/cam ring section from the loader.

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Removal And Installation (Cont'd)

Figure 30-20-3



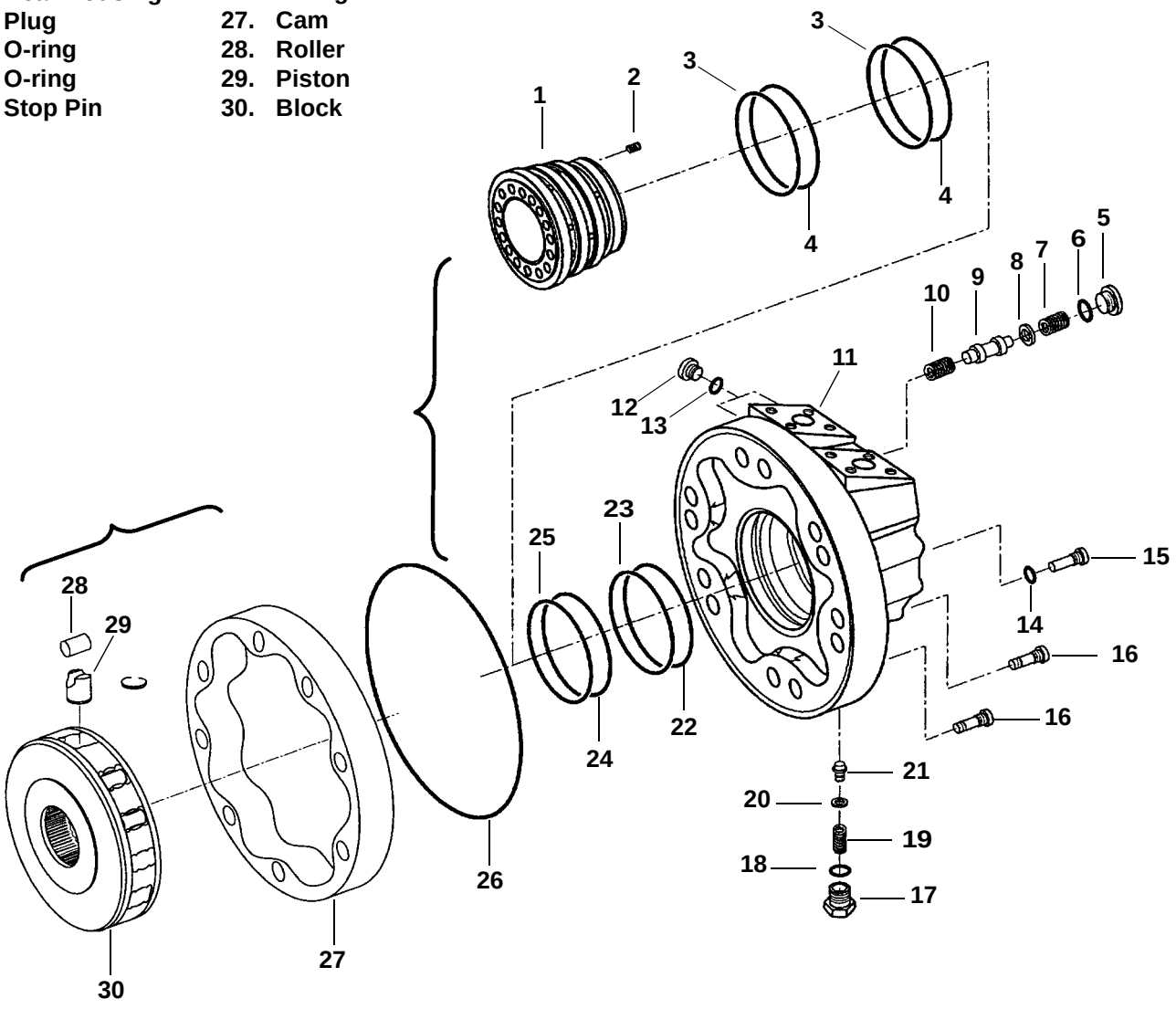
Remove the piston / roller section (Item 1) **[Figure 30-20-3]** from the loader, if it was not removed with the motor/ cam ring.

To remove the motor carrier. (See Removal And Installation on Page 30-30-2.)

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Parts Identification

1. Distributor
2. Spring
3. Seal
4. O-ring
5. Plug
6. O-ring
7. Spring
8. Washer
9. Spool
10. Spring
11. Rear Housing
12. Plug
13. O-ring
14. O-ring
15. Stop Pin
16. Bolt
17. Plug
18. O-ring
19. Spring
20. Shim
21. Poppet
22. O-ring
23. Seal
24. O-ring
25. Seal
26. O-ring
27. Cam
28. Roller
29. Piston
30. Block



B-17125

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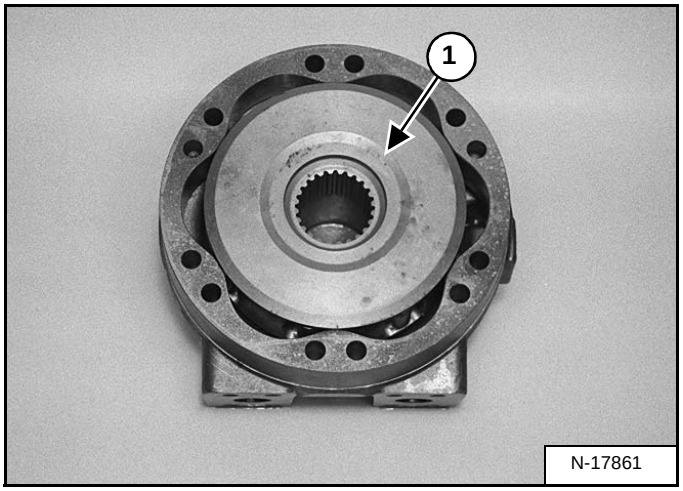
Disassembly And Assembly

IMPORTANT

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

I-2003-0888

Figure 30-20-4

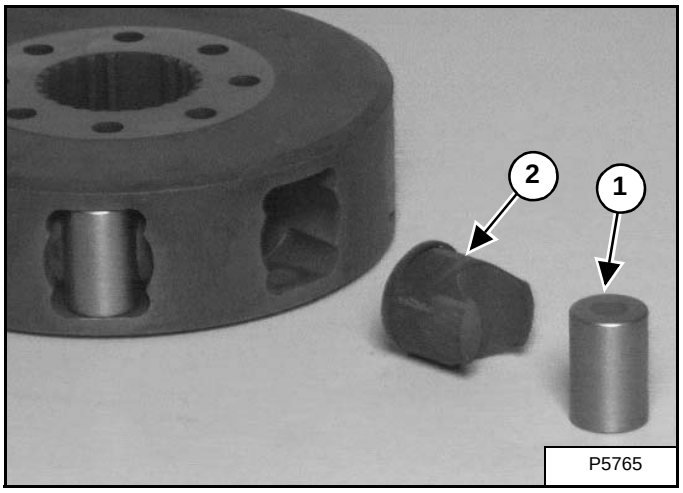


Remove the piston / roller section (Item 1) **[Figure 30-20-4]** from the motor.

Assembly: Install the motor on the loader and tighten the mount bolts to 149,2 N•m (110 ft-lb) torque.

NOTE: Before operating the hydrostatic motor, make sure it is full of oil. There are several methods to fill the motor with oil; (1) with the case drain hose disconnected, fill the motor with oil through the case drain port; (2) with the case drain hose disconnected, BICS] brake locked, engine running, stroke the steering lever until oil comes out of the case drain port.

Figure 30-20-5



Apply low air pressure to each port in the cylinder block to remove the roller (Item 1) and piston/ring assembly (Item 2) **[Figure 30-20-5]**.

Inspect the cylinder block surface and the roller/piston assemblies for scratches or wear.

NOTE: Put all the roller/piston assembly back in their original position.

Assembly: Install the roller (Item 1) in the piston (Item 2) **[Figure 30-20-5]**.

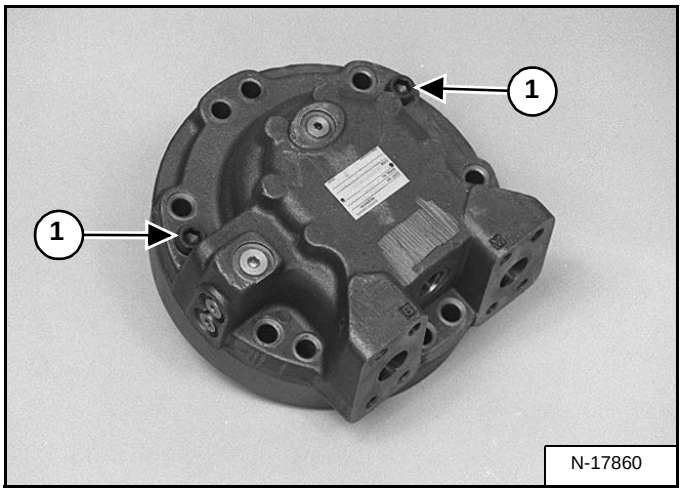
Assembly: Dip the roller / piston assembly into oil and install into the bore in the cylinder.

Repeat for each roller / piston assembly.

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Disassembly And Assembly (Cont'd)

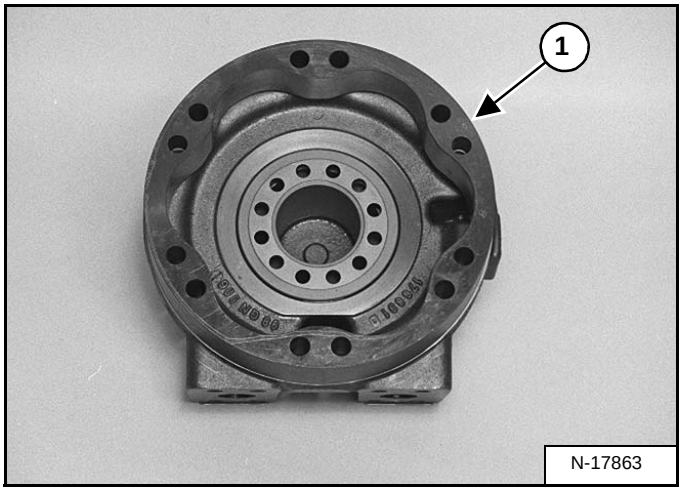
Figure 30-20-6



Remove the two cam ring mounting bolts (Item 1) **[Figure 30-20-6]**.

Assembly: Install the two cam ring mounting bolts (Item 1) **[Figure 30-20-6]** and tighten to 67,8 N•m (50 ft-lb) torque.

Figure 30-20-7

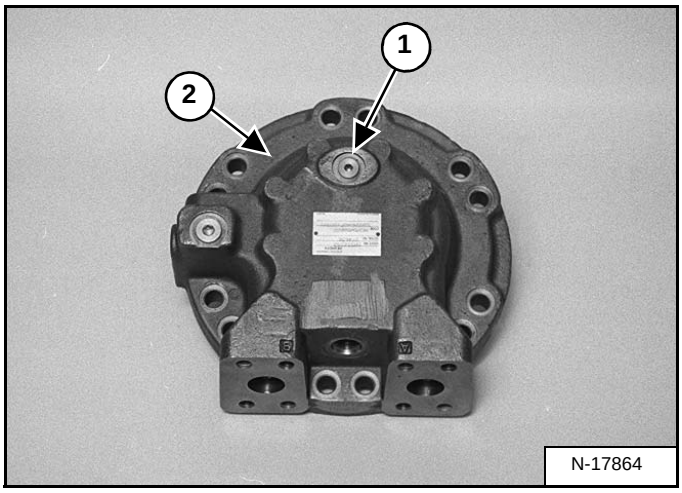


Remove the cam ring (Item 1) **[Figure 30-20-7]** from the motor housing.

Inspect the cam ring for surface scratches or wear.

Assembly: Install the cam ring (Item 1) **[Figure 30-20-7]** and align the mounting bolt holes.

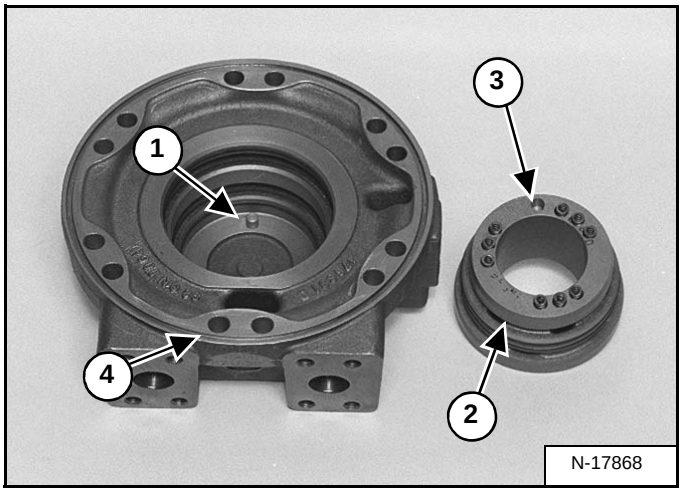
Figure 30-20-8



Remove the stop pin (Item 1) **[Figure 30-20-8]** from the rear motor housing.

Assembly: Install the stop pin (Item 1) **[Figure 30-20-8]** and tighten to 10-12 N•m (7-9 ft-lb) torque.

Figure 30-20-9



NOTE: The distributor removal, is best accomplished by lifting the housing (Item 2) [Figure 30-20-8] 50,8 - 76,2 mm (2 - 3 in) above a wooden surface, and dropping the housing.

Assembly: Install the stop pin (Item 1) **[Figure 30-20-8]** and tighten to 10 - 12 N•m (7 - 9 ft-lb) torque.

Assembly: Install the distributor (Item 2) **[Figure 30-20-9]** into the housing.

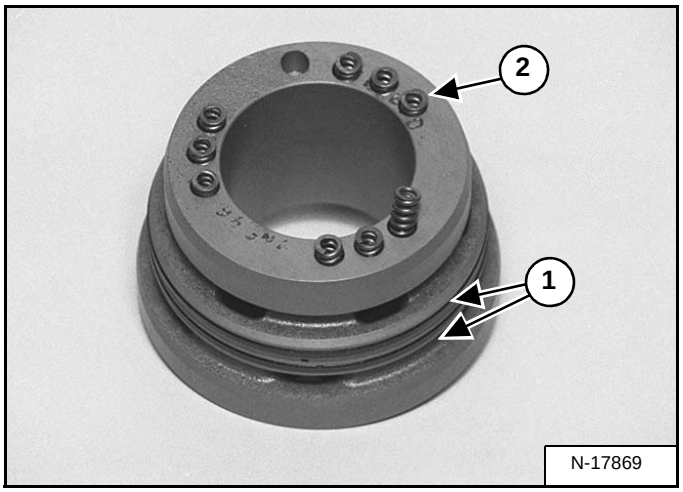
Assembly: Align the distributor hole (Item 3) **[Figure 30-20-9]** with the stop pin. When aligned correctly, the distributor can be depressed slightly.

Assembly: Install and lightly smear grease on the O-ring (Item 4) **[Figure 30-20-9]**.

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Disassembly And Assembly (Cont'd)

Figure 30-20-10



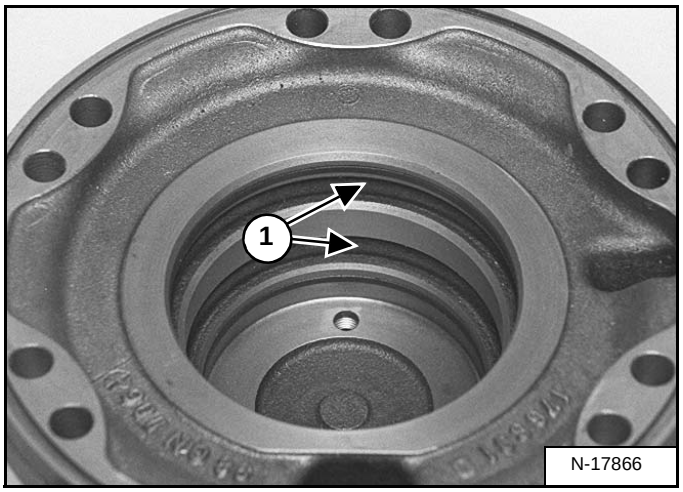
Remove and replace the two seals and back-up O-rings (Item 1) **[Figure 30-20-10]** on the distributor.

Inspect the distributor and springs (Item 2) **[Figure 30-20-10]** for damage or surface scratches.

Assembly: Put grease on the springs to hold them in place.

Assembly: Install the springs into the distributor.

Figure 30-20-11

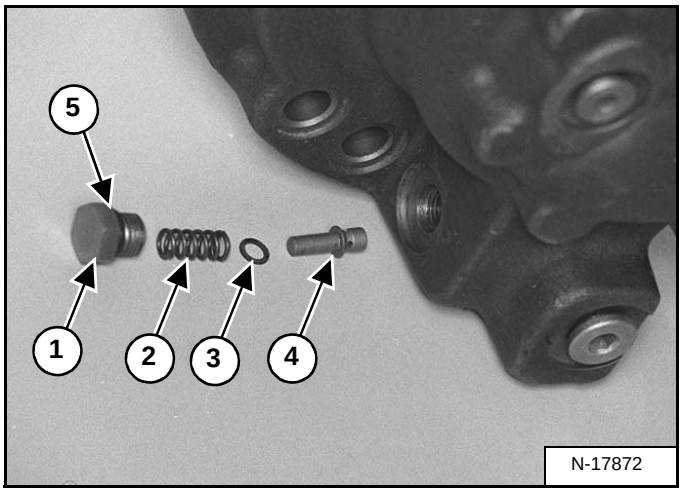


Remove the two seals (Item 1) **[Figure 30-20-11]** from the housing and replace with new seals.

Remove the two O-rings and replace with new O-rings. The O-rings are located under the seals.

Assembly: Lightly smear grease over the seals.

Figure 30-20-12

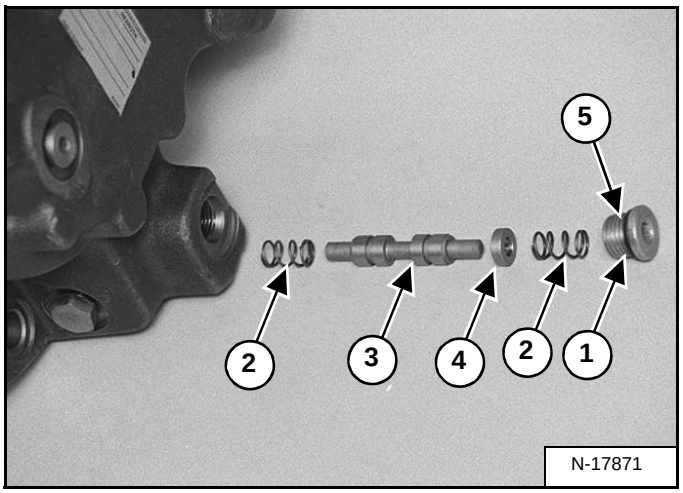


Remove, inspect and install the plug (Item 1), spring (Item 2), shim (Item 3) and poppet (Item 4) **[Figure 30-20-12]**.

Assembly: Remove and replace the O-ring (Item 5) **[Figure 30-20-12]**.

Assembly: Tighten the plug to 12 - 15 N•m (9 - 11 ft-lb) torque.

Figure 30-20-13



Remove, inspect and install the plug (Item 1), springs (Item 2), spool (Item 3) and washer (Item 4) **[Figure 30-20-13]**.

Assembly: Remove and replace the O-ring (Item 5) **[Figure 30-20-13]**.

Assembly: Tighten the plug to 25 - 30 N•m (18 - 22 ft-lb) torque.

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HYDROSTATIC DRIVE MOTOR (TWO-SPEED)

Description

The hydrostatic motors are driven by high pressure from the hydrostatic pumps.

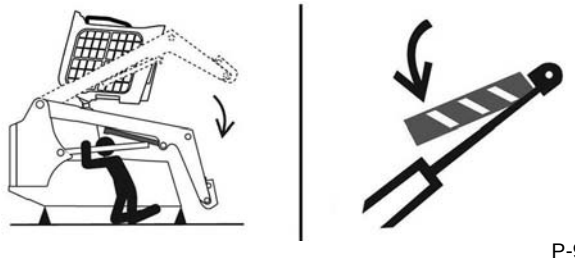
This hydrostatic motor contains a spring applied pressure release braking system to stop the loader. This braking system is located on the end of the hydrostatic motor.

The hydrostatic motor contains a shuttle valve. The shuttle valve helps to keep the motor cool by mixing case drain oil with cooled low pressure oil from the charge circuit. The shuttle valve is shifted by the high pressure oil coming from the hydrostatic pumps. If the shuttle valve sticks, a delay or lack of drive may or may not be felt in the controls and/or an overheated hydrostatic motor will result.

There are two hydrostatic motors mounted to motor carriers. The motor carriers are mounted to the transmission chaincase which houses the drive chains.

Removal And Installation

DANGER



P-90328

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.**

D-1009-0409

WARNING

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

W-2059-0598

IMPORTANT

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

I-2003-0888

Lift and block the loader. (See Procedure on Page 10-10-1.)

Raise the lift arms and install an approved lift arm support device. (See Installing on Page 10-20-1.)

Raise the operator cab. (See Raising on Page 10-30-2.)

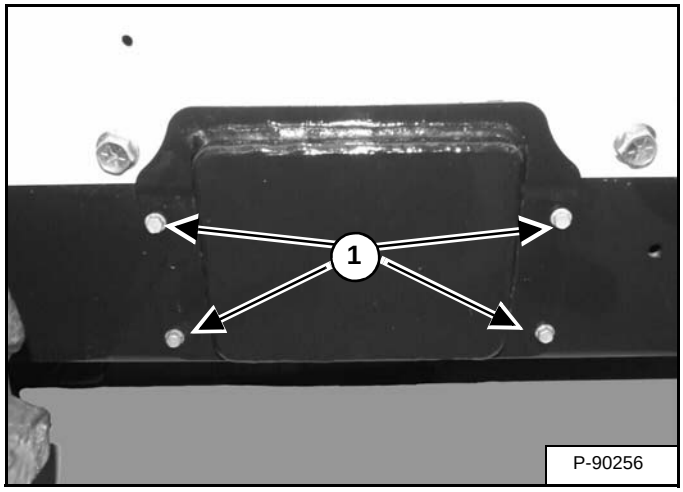
Drain the hydraulic reservoir. (See Removal And Installation on Page 20-90-1.)

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HYDROSTATIC DRIVE MOTOR (TWO-SPEED) (CONT'D)

Removal And Installation (Cont'd)

Figure 30-21-1

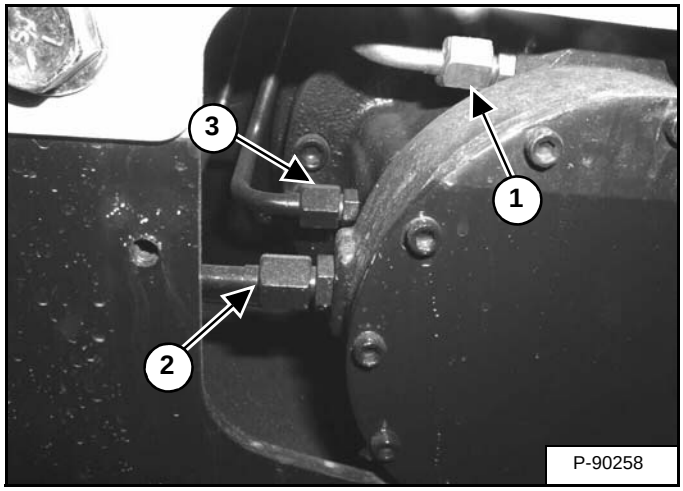


Remove the motor cover mount bolts (Item 1) **[Figure 30-21-1]**.

Remove the motor cover from the loader.

Mark the hoses for correct installation.

Figure 30-21-2

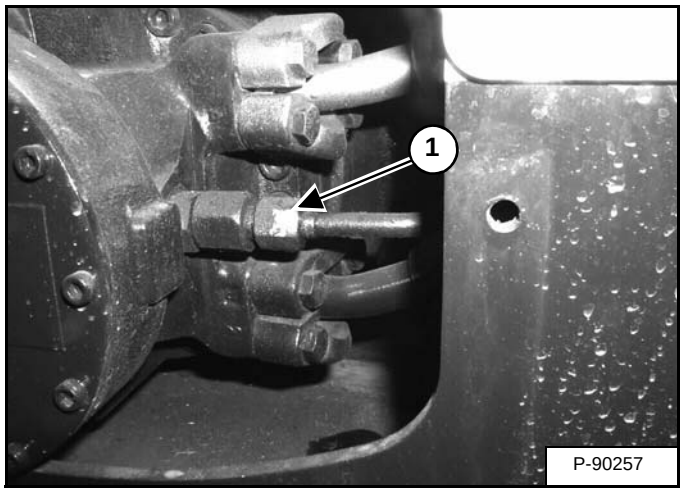


Disconnect the hydraulic hose (Item 1) **[Figure 30-21-2]** that goes to the two-speed port on the two-speed/brake block.

Disconnect the hydraulic hose (Item 2) **[Figure 30-21-2]** that goes to the brake port on the two-speed / brake block.

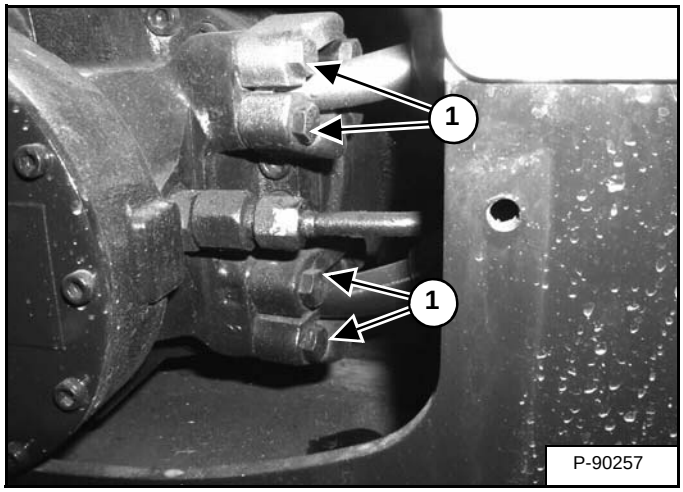
Disconnect the hydraulic hose (Item 3) **[Figure 30-21-2]** that goes to the make-up port on the two-speed / brake block.

Figure 30-21-3



Disconnect the hydraulic hose (Item 1) **[Figure 30-21-3]** that goes to the drain manifold.

Figure 30-21-4



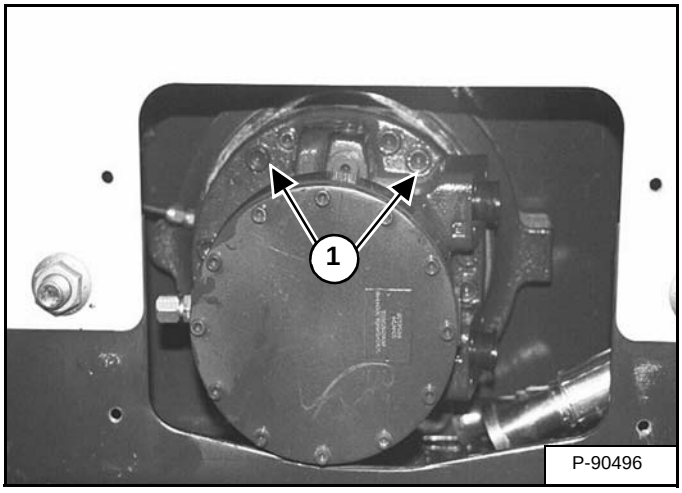
Remove the eight flange bolts (Item 1) **[Figure 30-21-4]** from the high pressure hoses on the motor.

Installation: Install the lower collar to the motor and connect the high pressure hoses behind the collar, then install the upper collar and tighten the bolts to 34 N•m (25 ft-lb) torque.

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Removal And Installation (Cont'd)

Figure 30-21-5

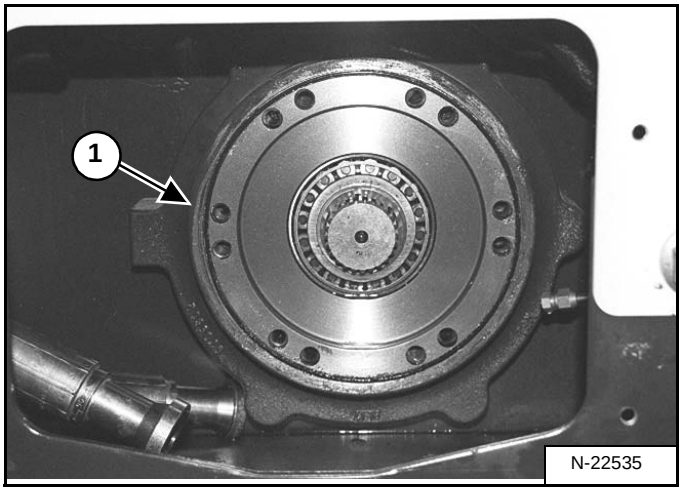


Remove the 10 (12 mm) mount bolts (Item 1) **[Figure 30-21-5]** from the motor.

NOTE: The two smaller diameter bolts (8 mm), hold the cam ring to the motor and do not have to be remove for motor removal.

Remove the motor from the loader.

Figure 30-21-6

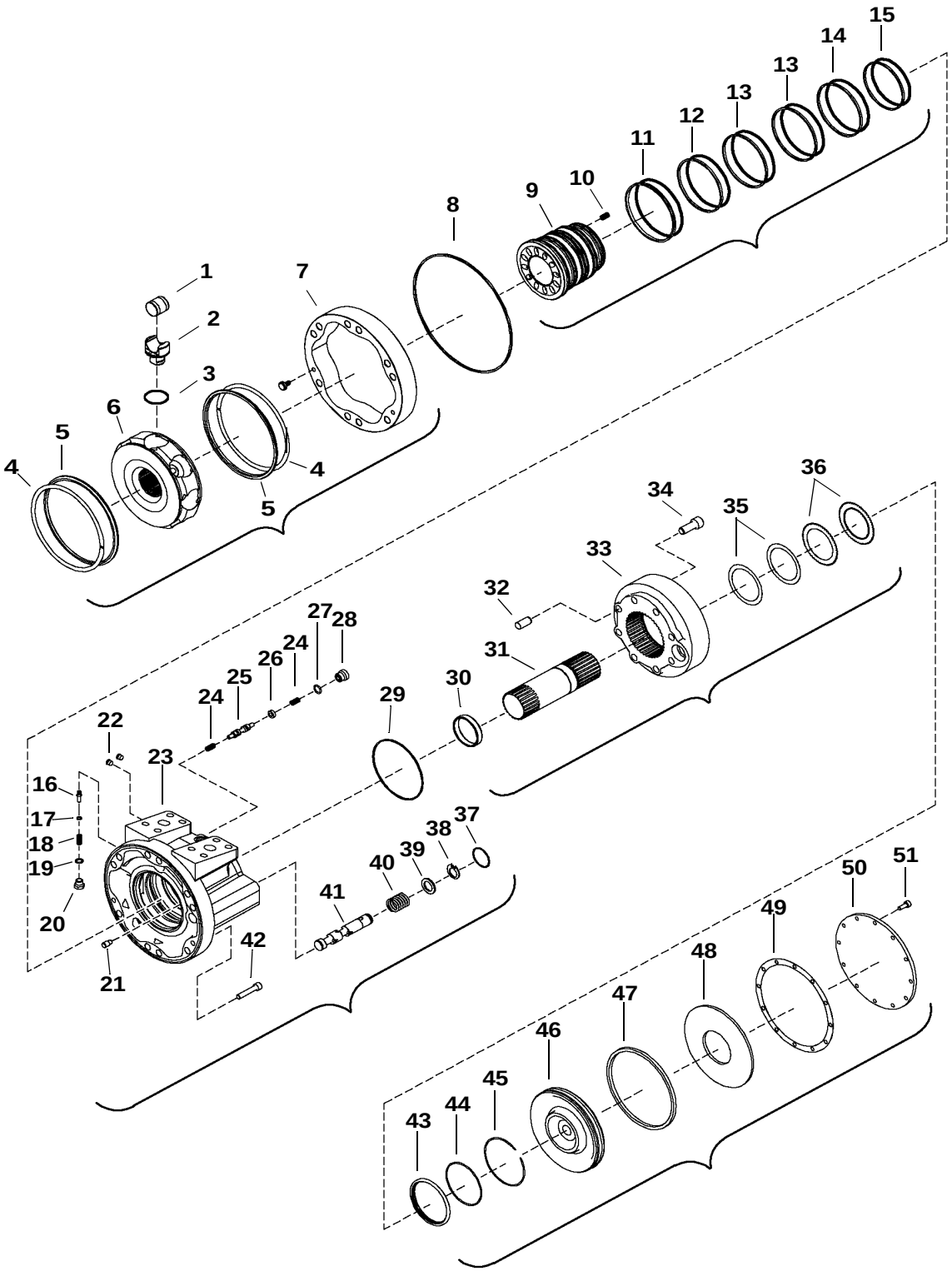


Installation: Replace the O-ring (Item 1) **[Figure 30-21-6]** and hold it in place with a light cover of lithium base grease. Tighten the 10 mounting bolts to 149 N•m (110 ft-lb) torque.

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Parts Identification

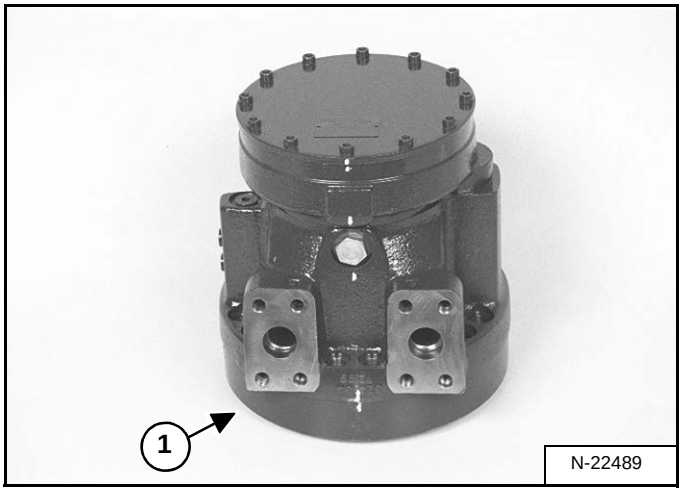
Ref.	Description
1.	Roller
2.	Piston
3.	Ring
4.	Clamp
5.	Ring
6.	Block
7.	Cam
8.	Quad Ring
9.	Distributor
10.	Spring
11.	Seal/O-ring
12.	Seal/O-ring
13.	Seal/O-ring
14.	Seal/O-ring
15.	Seal/O-ring
16.	Poppet
17.	Spool
18.	Spring
19.	O-ring
20.	Plug
21.	Pin
22.	Plug
23.	Housing
24.	Spring
25.	Spool
26.	Washer
27.	O-ring
28.	Plug
29.	Quad Ring
30.	Bushing
31.	Shaft
32.	Dowel
33.	Housing
34.	Bolt
35.	Shim
36.	Brake Disc
37.	O-ring
38.	Snap Ring
39.	Washer
40.	Spring
41.	Spool
42.	Bolt
43.	Seal
44.	O-ring
45.	Clamp
46.	Piston
47.	O-ring
48	Spring
49.	Gasket
50.	Cover
51.	Bolt



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Disassembly

Figure 30-21-7



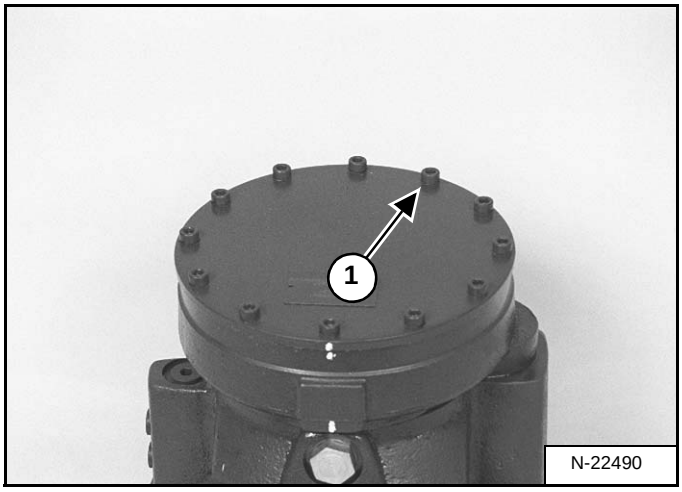
NOTE: Install a mark on the motor, brake, and motor carrier housings for correct assembly [Figure 30-21-7].

NOTE: Always protect any sealing surfaces. Any scratches or marks will cause premature failure.

Place the cam sealing surface (Item 1) **[Figure 30-21-7]** on a protective material.

Drain the oil from the motor casing.

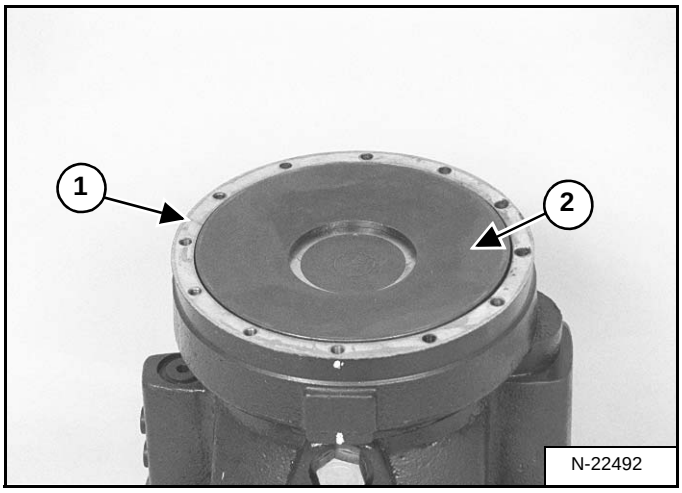
Figure 30-21-8



Remove the twelve mounting bolts (Item 1) **[Figure 30-21-8]** from the brake cover plate.

NOTE: Remove and / or tightened the bolts one turn at a time to maintain equal preload on the end cap and the brake spring.

Figure 30-21-9



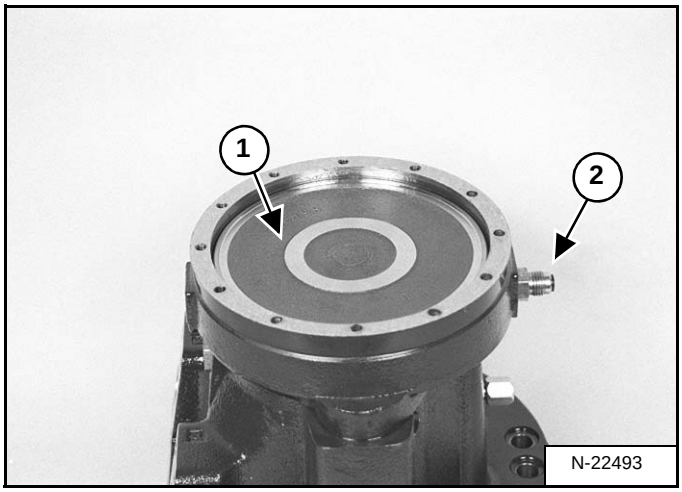
Remove the cover plate from the brake housing.

Remove the cover plate gasket (Item 1) **[Figure 30-21-9]**.

Remove the brake spring (Item 2) **[Figure 30-21-9]** from the brake housing.

NOTE: Mark the top side of the brake spring for proper installation.

Figure 30-21-10



Remove the piston from the brake housing (Item 1) **[Figure 30-21-10]**.

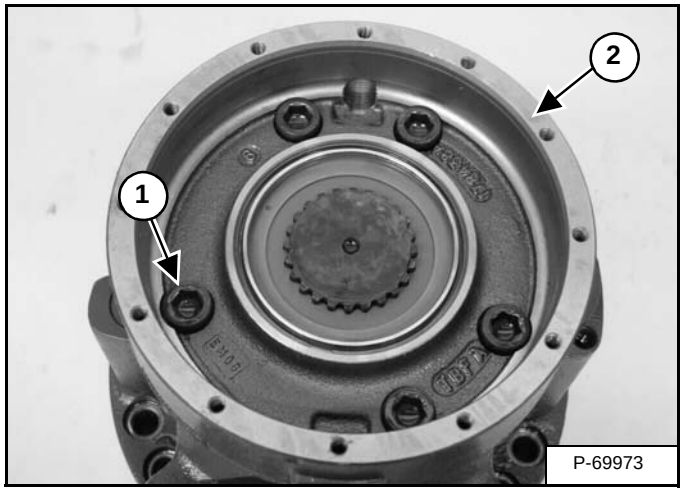
NOTE: The use of air pressure through the brake line connection (Item 2) [Figure 30-21-10] will aid in piston removal.

Check the brake piston for damage and replace the seal.

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Disassembly (Cont'd)

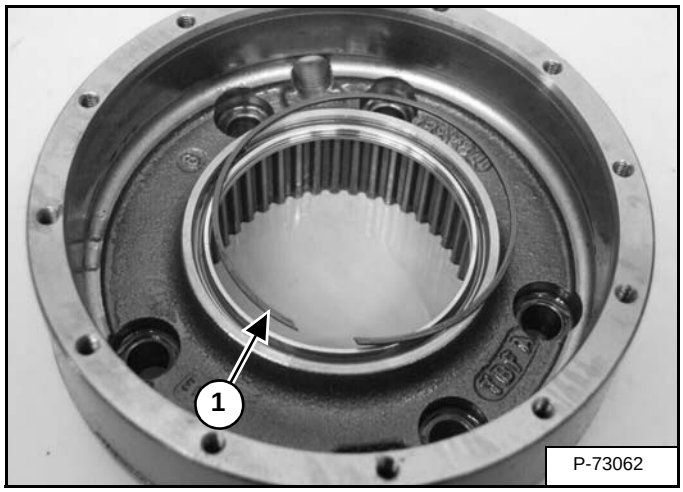
Figure 30-21-11



Remove the five mounting bolts (Item 1) **[Figure 30-21-11]** from the brake housing.

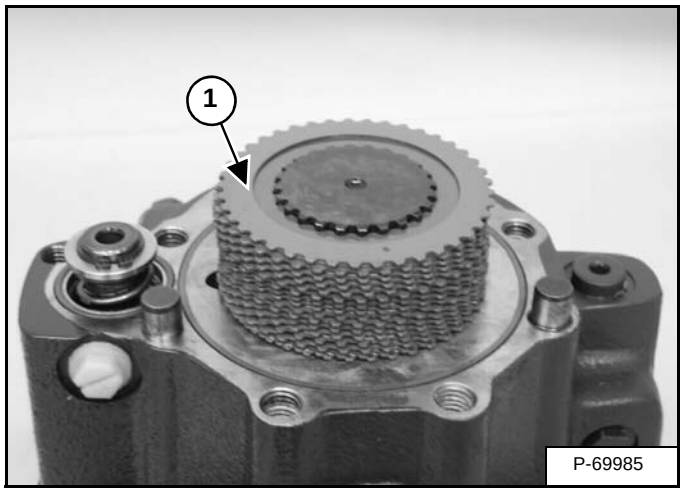
Remove the brake housing (Item 2) **[Figure 30-21-11]** from the rear housing.

Figure 30-21-12



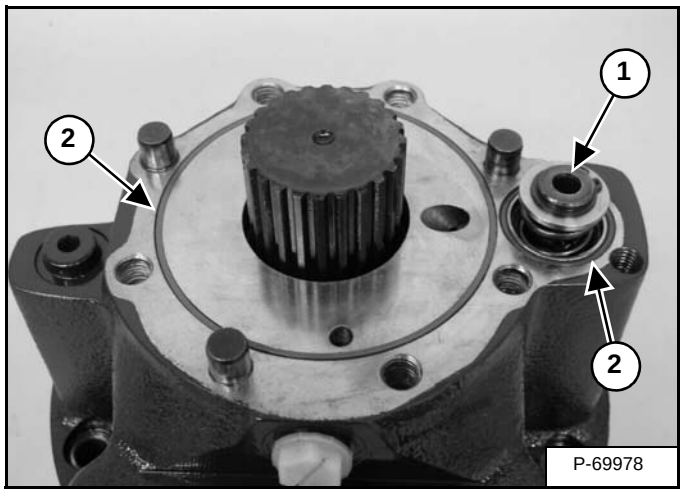
Protect the sealing surface. Remove the snap ring (Item 1) **[Figure 30-21-12]** to remove the seal from the brake housing.

Figure 30-21-13



Remove the brake disks (Item 1) **[Figure 30-21-13]** from the brake shaft. Mark the position of the brake disks and the shims.

Figure 30-21-14



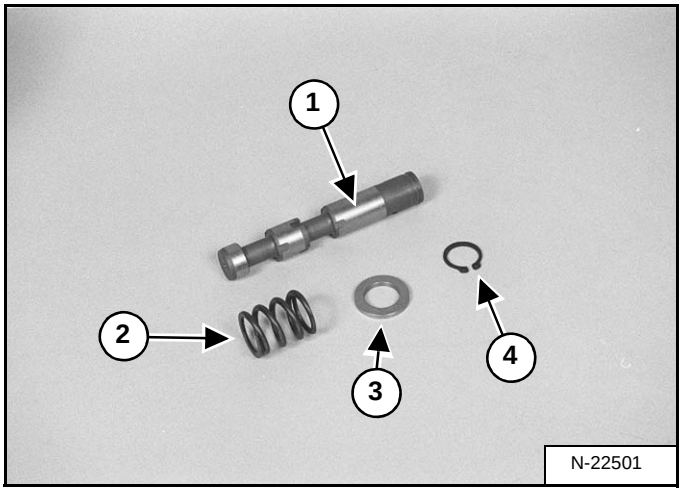
Remove the two-speed spool (Item 1) **[Figure 30-21-14]** from the housing assembly.

Remove and discard the o-rings (Item 2) **[Figure 30-21-14]** on the housing.

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Disassembly (Cont'd)

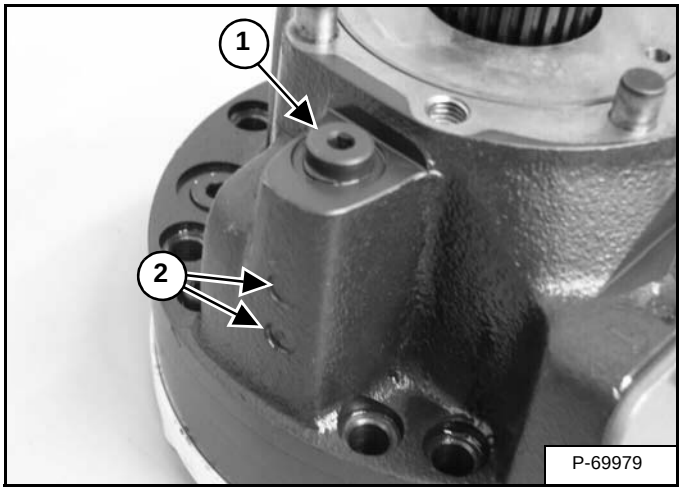
Figure 30-21-15



Inspect the spool (Item 1), the spring (Item 2), washer (Item 3) and the snap ring (Item 4) and replace as needed **[Figure 30-21-15]**.

NOTE: The spool (Item 1) [Figure 30-21-15] is marked with either an A or B. The spool must be replaced with a spool with the same mark.

Figure 30-21-16

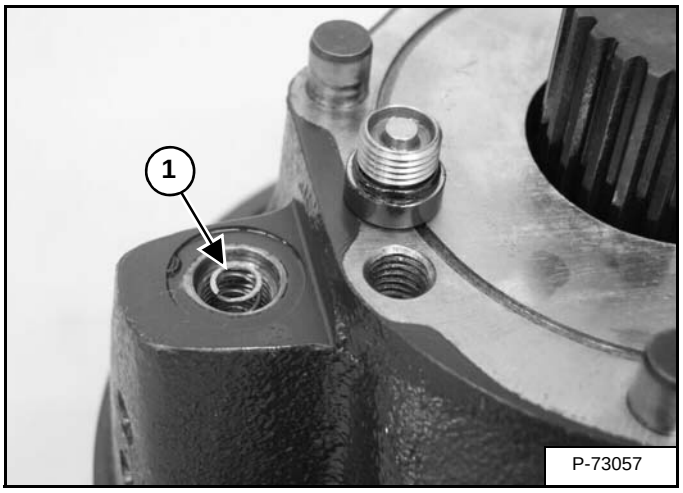


Remove the flushing spool plug (Item 1) **[Figure 30-21-16]** from the housing.

Installation: Tighten the plug to 30 Nm (22 ft-lb) torque.

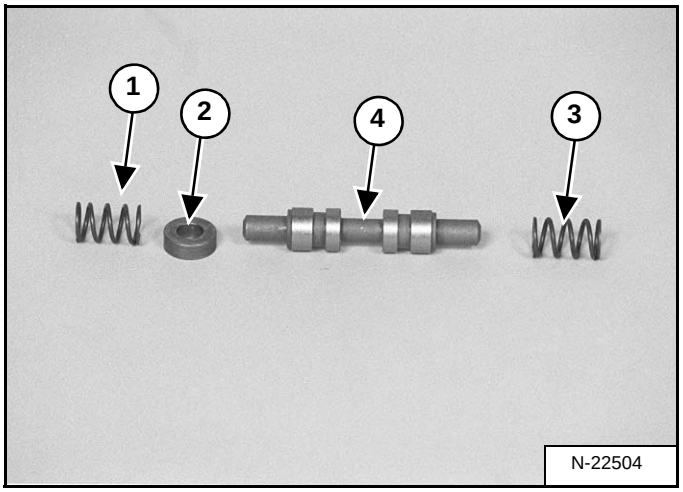
NOTE: Current motor housings are provided with break off plugs (Item 2) [Figure 30-21-16] on the side of the flushing spool housing. Earlier motors were equipped with threaded plugs.

Figure 30-21-17



Remove the flushing spool assembly (Item 1) **[Figure 30-21-17]** from the housing.

Figure 30-21-18



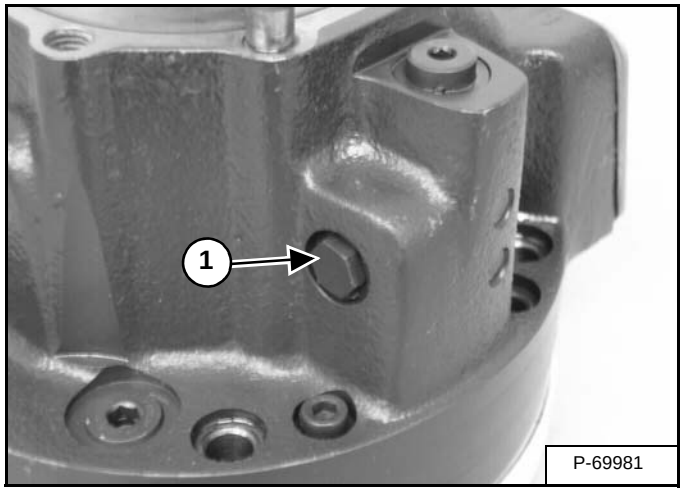
Remove the spring (Item 1), washer (Item 2) and rear spring (Item 3) from the spool (Item 4) **[Figure 30-21-18]**.

Inspect all parts and replace as needed.

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Disassembly (Cont'd)

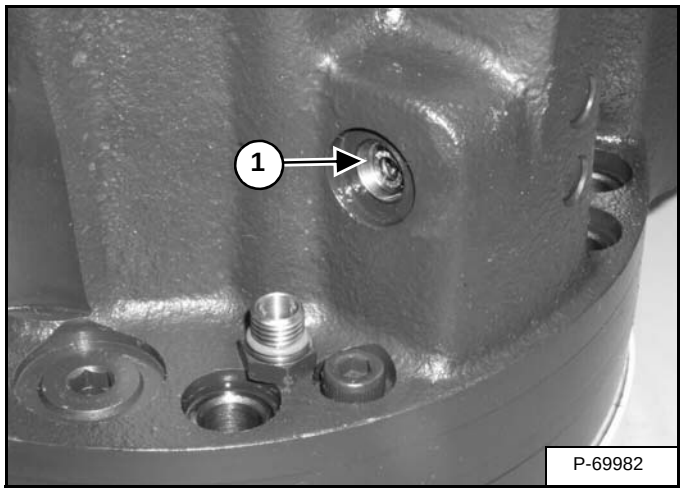
Figure 30-21-19



Remove the plug (Item 1) **[Figure 30-21-19]** from the housing.

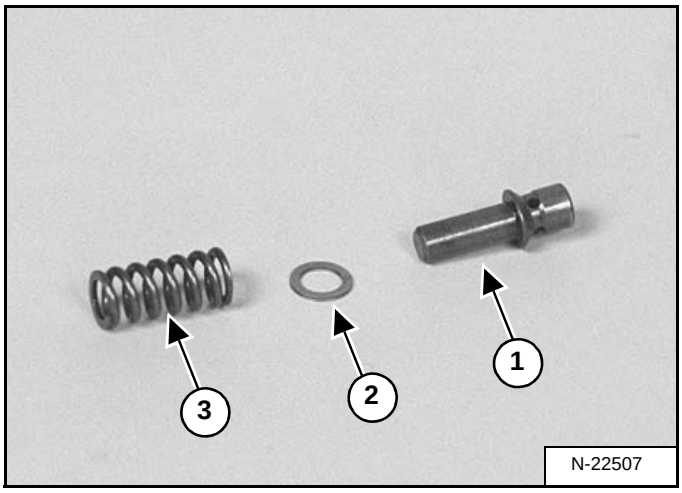
Installation: Tighten the plug to 22 N•m (18 ft-lb) torque.

Figure 30-21-20



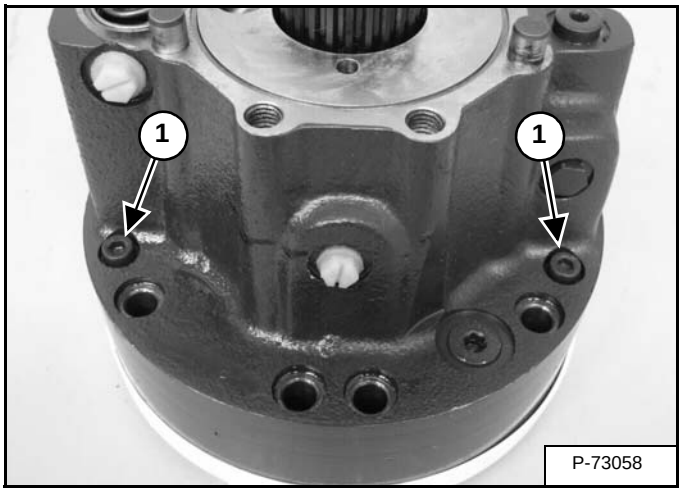
Remove the poppet assembly (Item 1) **[Figure 30-21-20]** from the housing.

Figure 30-21-21



Inspect the poppet (Item 1), shim (Item 2) and spring (Item 3) for wear and replace as needed **[Figure 30-21-21]**.

Figure 30-21-22



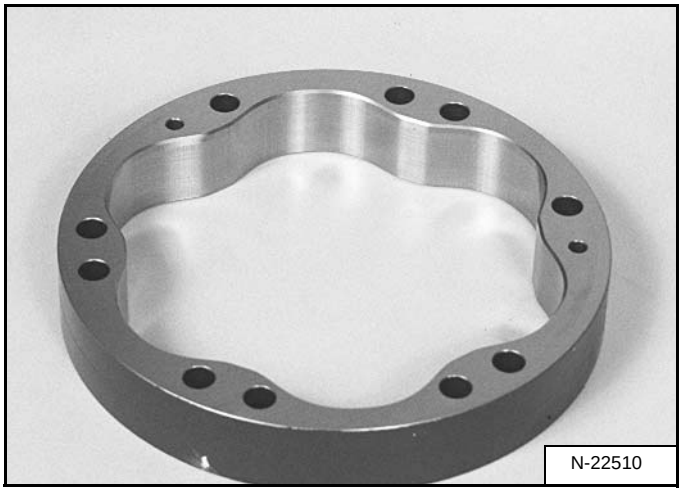
Remove the two (8 mm) cam ring mount bolts (Item 1) **[Figure 30-21-22]**.

Turn the housing, cam ring, and rotating group assembly over and place on a stand. Remove the cam ring from the housing.

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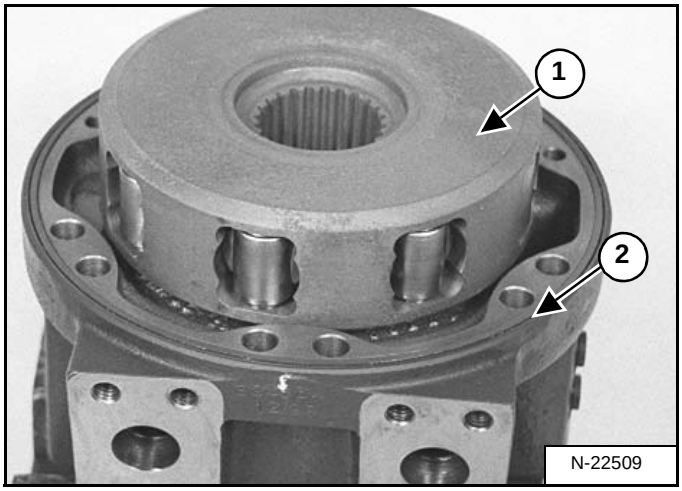
Disassembly (Cont'd)

Figure 30-21-23



Protect the sealing surfaces. Check the cam ring inside surface for wear and scratches **[Figure 30-21-23]**.

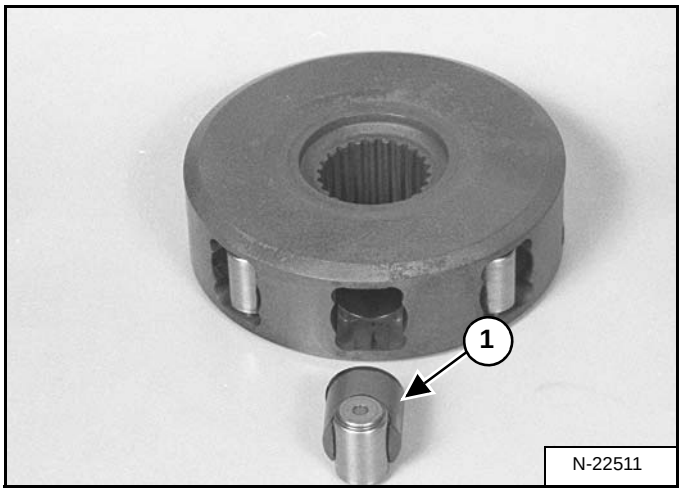
Figure 30-21-24



Remove the cylinder block (Item 1) **[Figure 30-21-24]** from the housing.

Remove the O-ring (Item 2) **[Figure 30-21-24]** from the housing.

Figure 30-21-25

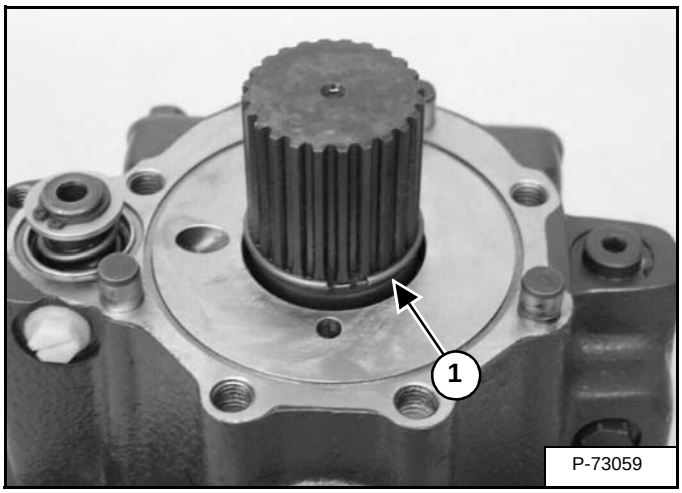


Protect the sealing surfaces. Remove the roller/piston assembly (Item 1) **[Figure 30-21-25]** from the cylinder block.

Check all roller and piston assemblies for wear and replace as needed.

NOTE: Put all roller/piston assembles back in the original bore.

Figure 30-21-26



Remove the shaft from the distributor **[Figure 30-21-26]**.

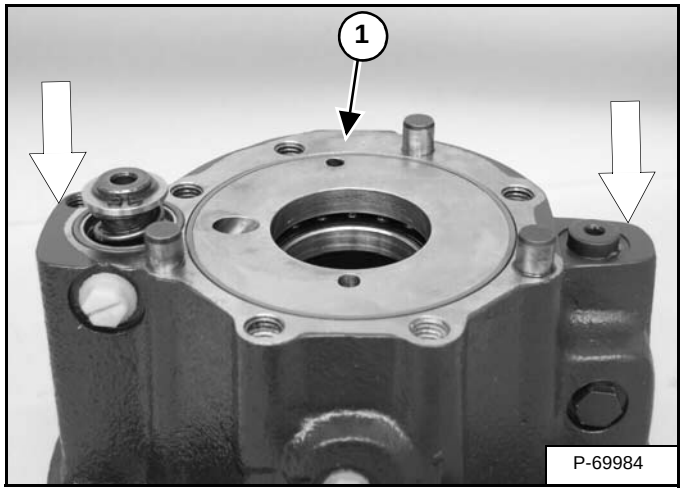
NOTE: The end of the shaft with the snap ring (Item 1) [Figure 30-21-26] must be toward the brake housing during assembly.

Remove the distributor from the housing.

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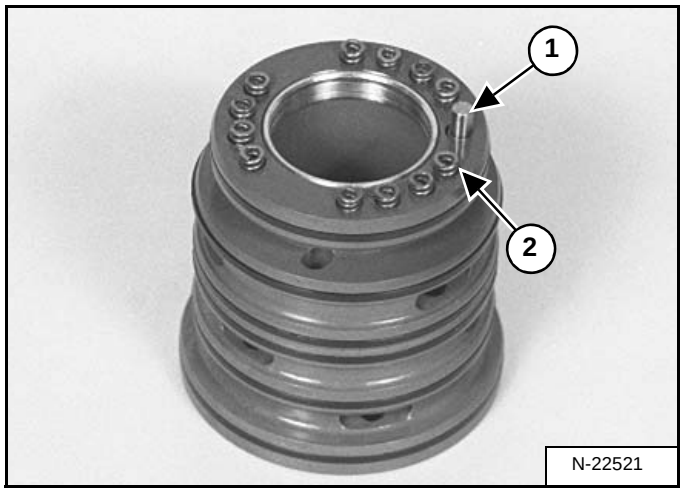
Disassembly (Cont'd)

Figure 30-21-27



NOTE: The distributor removal is best accomplished by lifting the housing (Item 1) [Figure 30-21-27] 2-3 inches above a wooden surface, and dropping the housing [Figure 30-21-27].

Figure 30-21-28

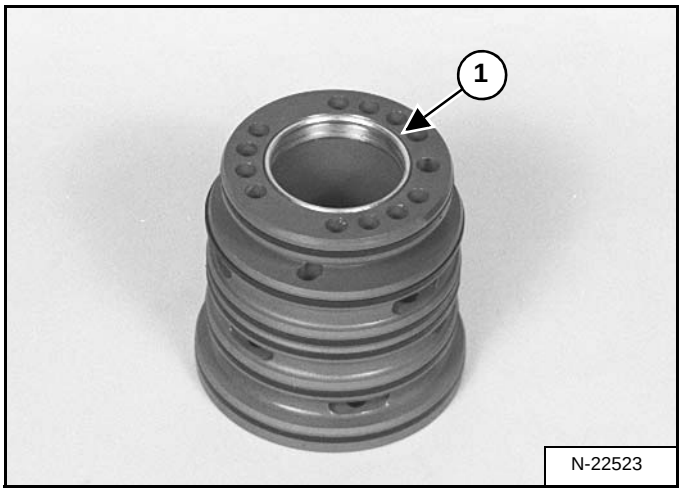


Protect the sealing surfaces. Remove the locating pin (Item 1) **[Figure 30-21-28]** from the distributor.

Remove the springs (Item 1) **[Figure 30-21-28]** from the distributor.

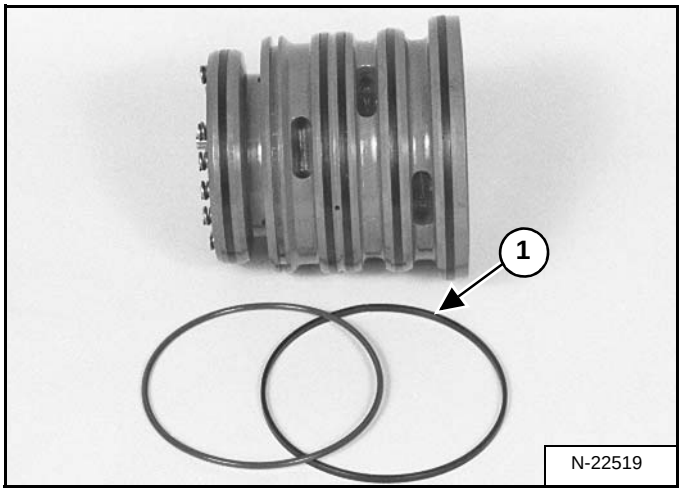
Inspect the springs, distributor surface and bushing for damage or wear and replace as needed.

Figure 30-21-29



Remove the bushing (Item 1) **[Figure 30-21-29]** from the distributor, if worn or scratched.

Figure 30-21-30



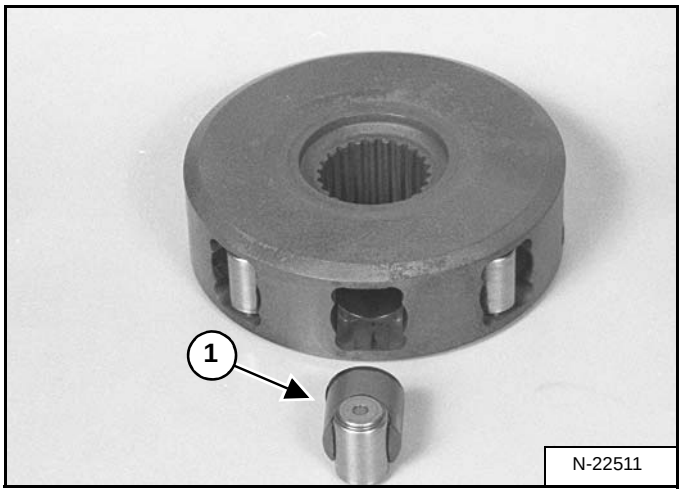
Remove the six seals (Item 1), and six back-up O-rings (Item 2) from the distributor **[Figure 30-21-30]**.

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Assembly

NOTE: Always use new O-rings and seals during motor and brake assembly.

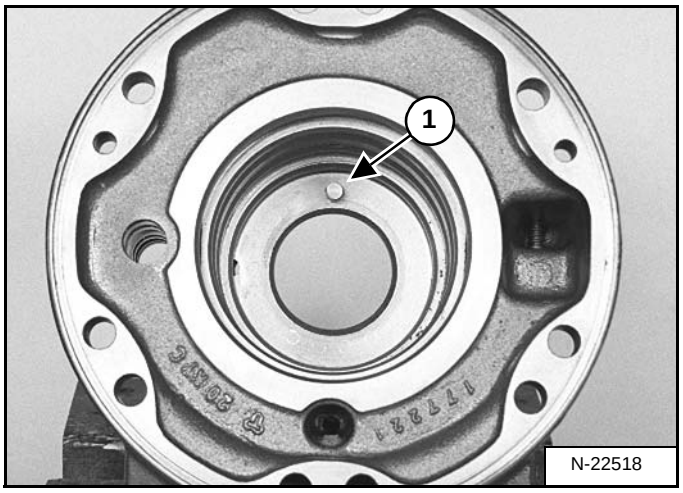
Figure 30-21-31



During installation of pistons in the bore, position the piston ring gap 180° from one piston to the next. One piston installed with the gap to the right, the next piston installed with the gap to the left.

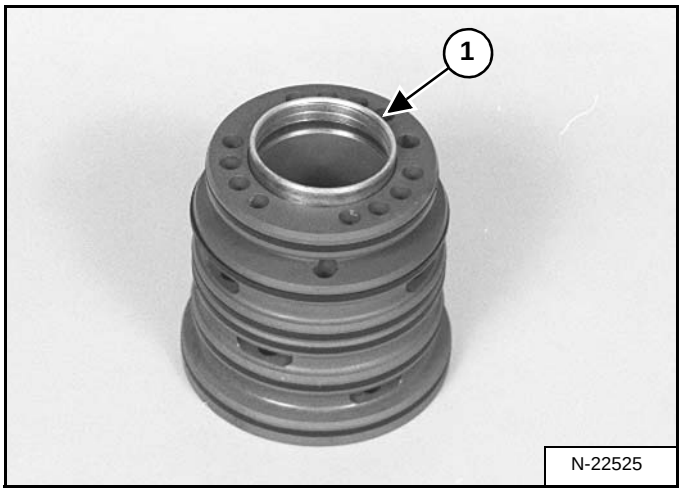
Dip each of the roller/piston assemblies (Item 1) **[Figure 30-21-31]** in oil and replace back its original bore.

Figure 30-21-32



Apply a small amount of grease to the locating pin (Item 1) **[Figure 30-21-32]** and install the locating pin in the housing

Figure 30-21-33

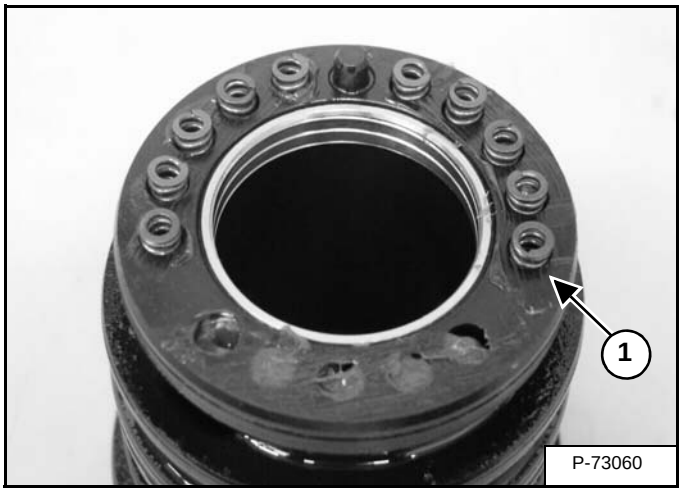


Install a new bushing (Item 1) **[Figure 30-21-33]** in the distributor if the old bushing was removed.

Install new O-rings and seals on the distributor **[Figure 30-21-34]**.

NOTE: When installing seals, apply a light coating of oil to the seal and the mating surfaces of the distributor. Install the O-rings and seals, allow 30 minutes for the seals to set on the distributor before installing the distributor in the housing.

Figure 30-21-34

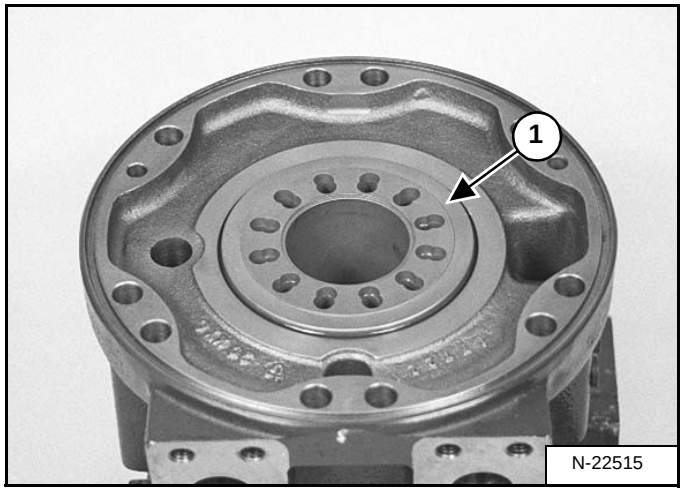


Using a small amount of grease, install the springs into the distributor valve (Item 1) **[Figure 30-21-34]**.

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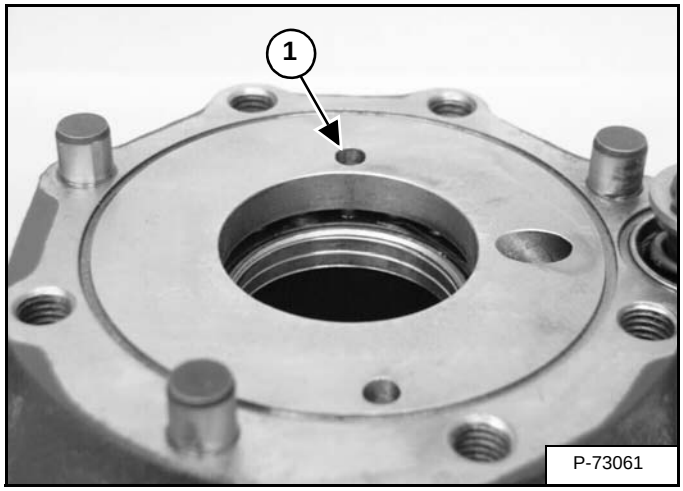
Assembly (Cont'd)

Figure 30-21-35



Install the distributor (Item 1) **[Figure 30-21-35]** in the housing. Protect the sealing surface of the distributor.

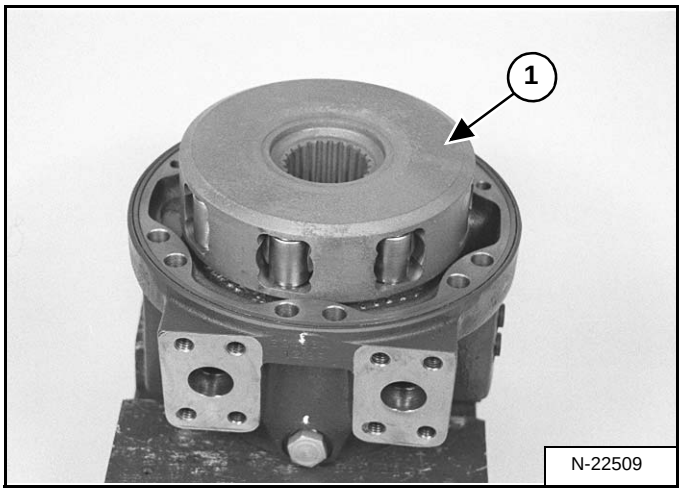
Figure 30-21-36



The pin in the distributor must align with the hole in the housing (Item 1) **[Figure 30-21-36]**. Use a hand press to push the distributor in place.

When installed correctly, the distributor will spring back slightly when pushed by hand into the housing.

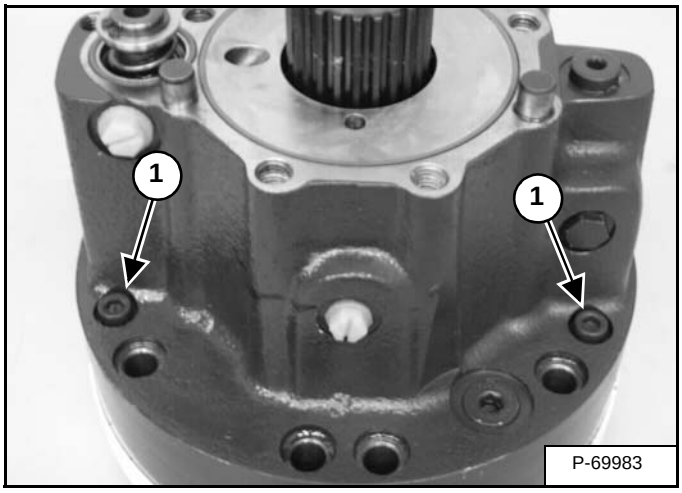
Figure 30-21-37



Install the cylinder block assembly (Item 1) **[Figure 30-21-37]**.

Install the cam ring to the rear housing. Apply liquid adhesive (Loctite® 243) to the two cam ring mounting bolts. Install the bolts finger tight.

Figure 30-21-38



Turn the motor so that it sets on the cam ring, and cylinder block **[Figure 30-21-38]**.

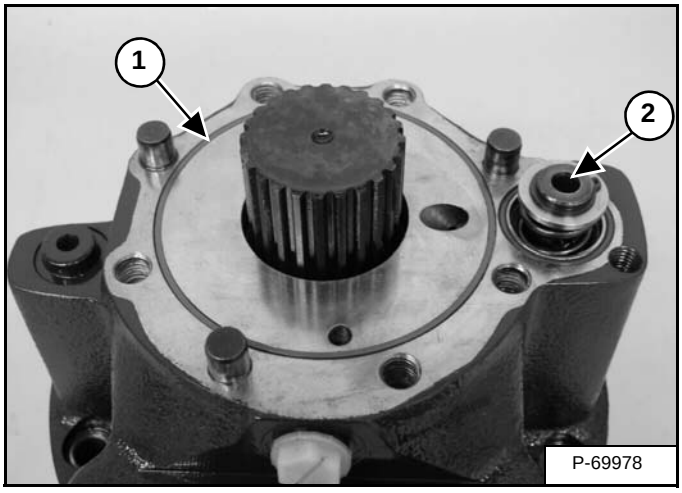
NOTE: Be careful when turning or moving the motor so the cylinder block stays in the motor housing and the sealing surfaces are protected.

Tighten the two cam ring mounting bolts to 35 - 39 N•m (26 - 29 ft-lb) torque.

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Assembly (Cont'd)

Figure 30-21-39

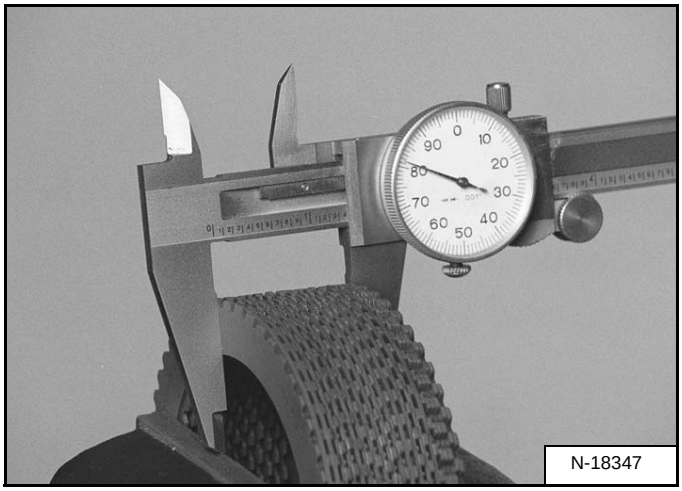


Install new o-rings (Item 1) **[Figure 30-21-39]** on the housing assembly and apply grease to the o-rings.

Install the two speed spool (Item 2) **[Figure 30-21-39]**.

Install the shaft into the distributor **[Figure 30-21-39]**.

Figure 30-21-40

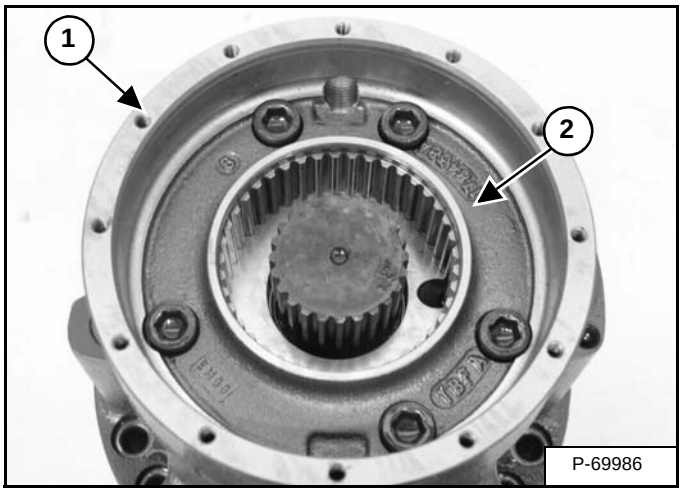


Clamp the disc pack in a vise and measure the height **[Figure 30-21-40]**. The height must be 31,1 mm (1.22 in).

The normal thickness of the individual brake disc is 1 mm (0.039 in).

If any individual disc's thickness is 0,95 mm (0.037 in) or less, replace the complete disc pack.

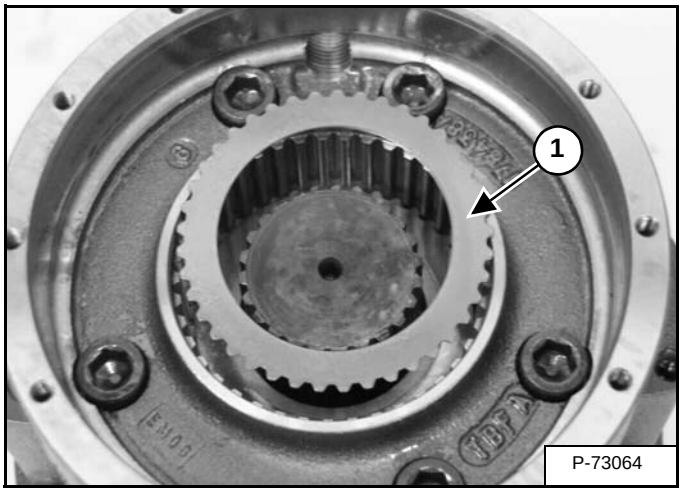
Figure 30-21-41



Install the brake housing (Item 1) **[Figure 30-21-41]** on the motor housing.

Apply liquid adhesive (Loctite® 243) to the five mounting bolts. Install the bolts (Item 2) **[Figure 30-21-41]** and tighten evenly to 117 - 122 N•m (86 - 90 ft-lb) torque.

Figure 30-21-42



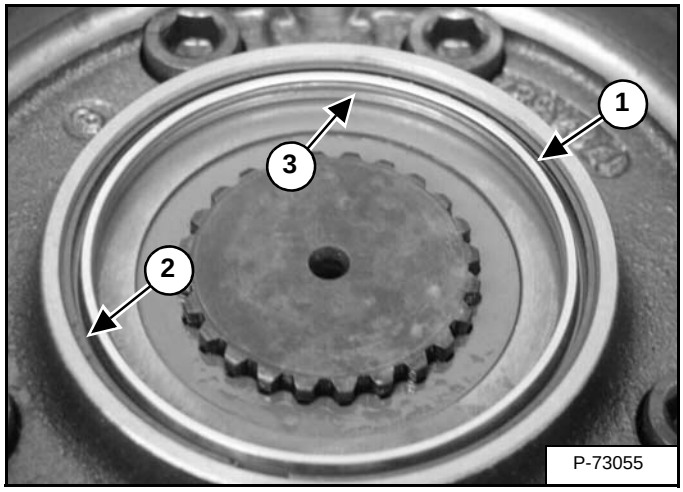
If needed, install the shims first, then install the brake disc pack starting with an outer disc (Item 1) **[Figure 30-21-42]** and alternating with an inner disc, throughout the pack.

End the disc pack with an outer disc.

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Assembly (Cont'd)

Figure 30-21-43



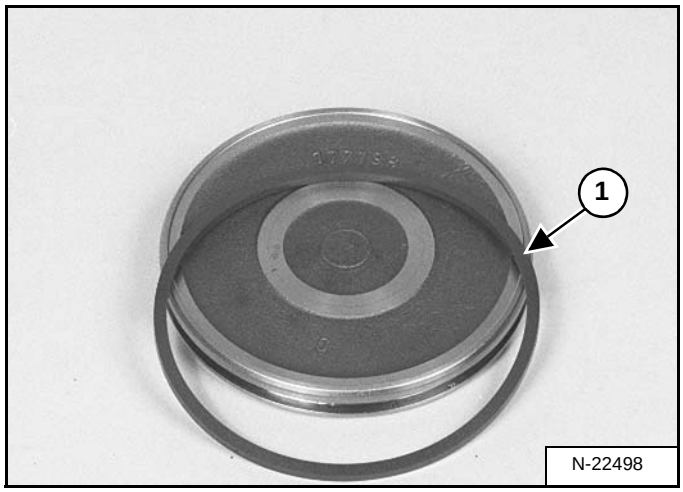
Install the brake seal (Item 1) **[Figure 30-21-43]**.

NOTE: Install the seal with the metal case end towards the brake pack.

Install the snap ring (Item 2) **[Figure 30-21-43]** to secure the seal in the brake housing.

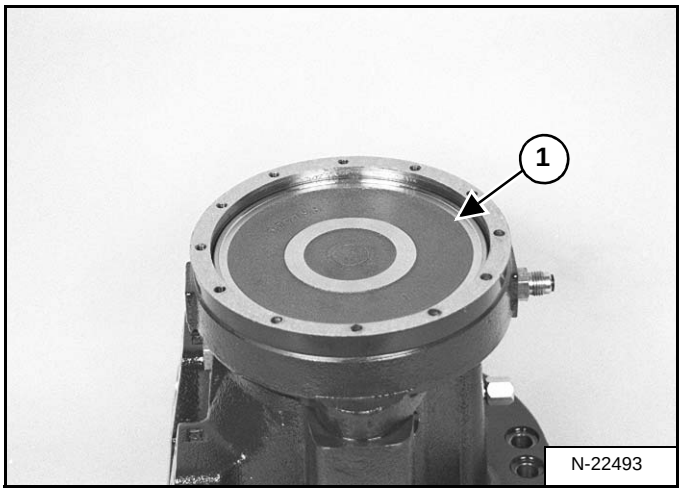
Install a new o-ring (Item 3) **[Figure 30-21-43]** in the seal.

Figure 30-21-44



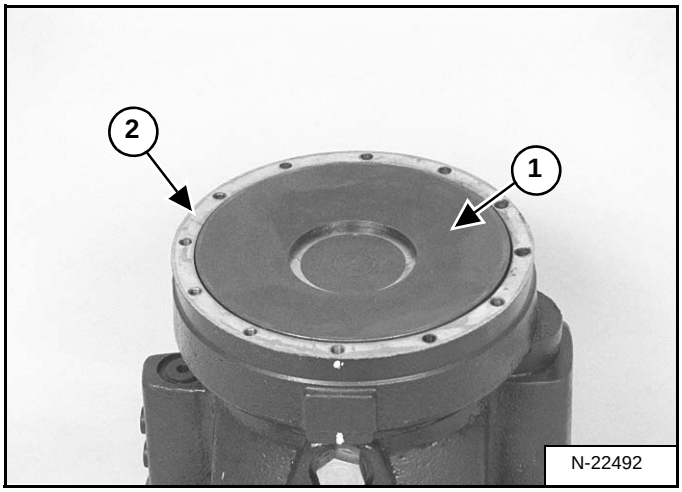
Lightly coat the piston with oil and install a new piston seal (Item 1) **[Figure 30-21-44]**.

Figure 30-21-45



Install the piston (Item 1) **[Figure 30-21-45]** in the brake housing.

Figure 30-21-46



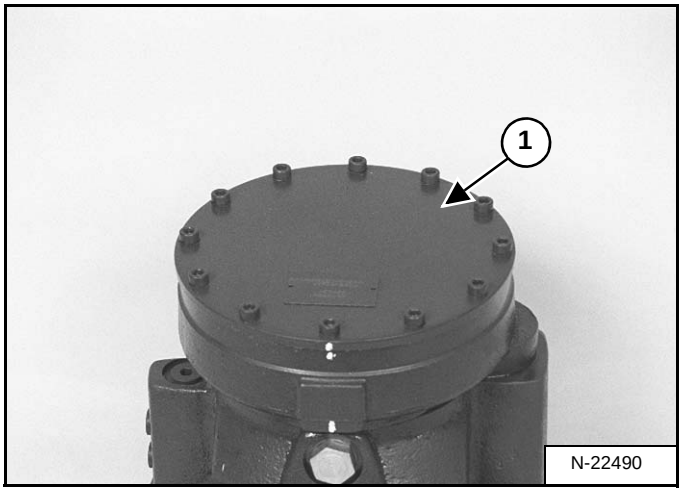
Install the brake spring (Item 1) **[Figure 30-21-46]**.

Install the end plate gasket (Item 2) **[Figure 30-21-46]**.

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Assembly (Cont'd)

Figure 30-21-47



Install the brake end cover (Item 1) **[Figure 30-21-47]**.

Install the twelve end cover mount bolts and tighten evenly to 14 - 16 N•m (10 - 12 ft-lb) torque.

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HYDROSTATIC MOTOR CARRIER

Description

The hydrostatic motor carrier is the mating connection from the hydrostatic drive motor to the transmission chain case.

The hydrostatic motor carrier contains a shaft that rotates on two tapered roller bearings. The shaft has two sprockets that turn the drive chains.

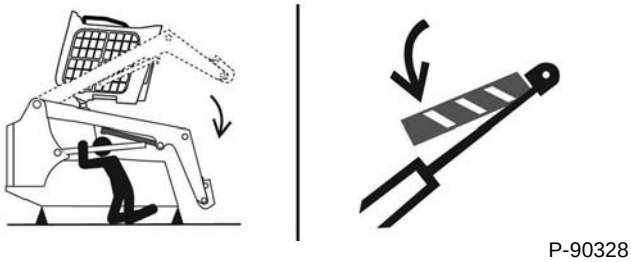
The hydrostatic motor carrier has a seal which isolates the chain case oil from the hydrostatic motor case drain oil.

The hydrostatic motor carriers are made to fit on both the right and left hand side of the loader.

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Removal And Installation

⚠ DANGER



P-90328

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.**

D-1009-0409

⚠ WARNING

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

W-2059-0598

Lift and block the loader. (See Procedure on Page 10-10-1.)

Raise the lift arm and install an approved lift arm support device. (See Installing on Page 10-20-1.)

Raise the operator cab. (See Raising on Page 10-30-2.)

Remove the fluid from the chain case. (See CHAINCASE on Page 40-30-1.)

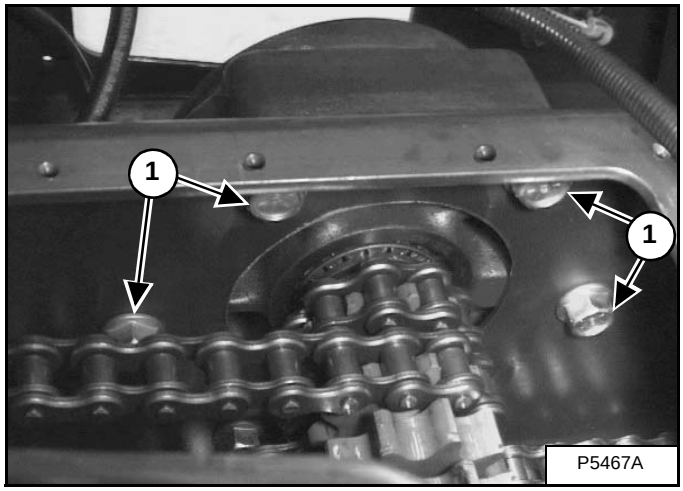
Remove the center chain case cover. (See Center Cover Removal And Installation on Page 40-30-2.)

Remove the front axle sprocket. (See Chain Removal And Installation on Page 40-20-9.)

If the motor carrier is removed from the right side, remove the lift arm bypass valve, (See Removal And Installation on Page 20-50-2.) and remove the control panel. (See Removal And Installation on Page 50-100-2.)

Remove the control pedal linkages. (See Linkage Removal And Installation on Page 50-90-2.)

Figure 30-30-1

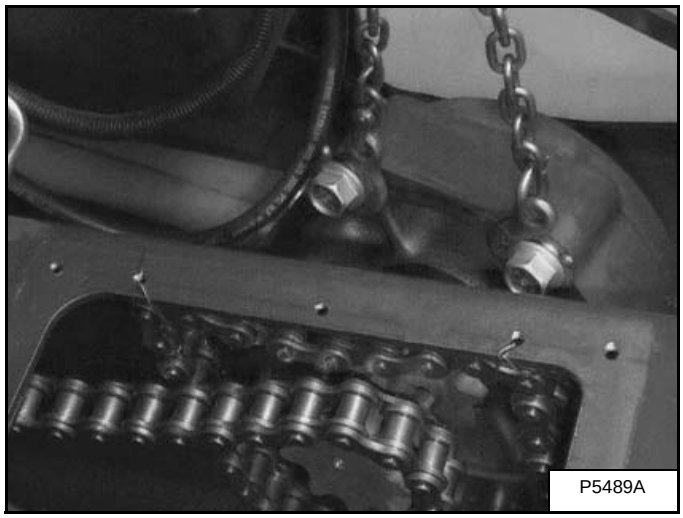


Remove the six mounting bolts (Item 1) **[Figure 30-30-1]** from the carrier.

Installation: Tighten the mounting bolts to 461 - 488 N•m (340 - 360 ft-lb) torque.

Slide the motor carrier toward the rear and remove the rear drive chain.

Figure 30-30-2



NOTE: For easier access for the motor carrier coming out and going into the chain case, tie the front drive chain to the chain case with a wire [Figure 30-30-2].

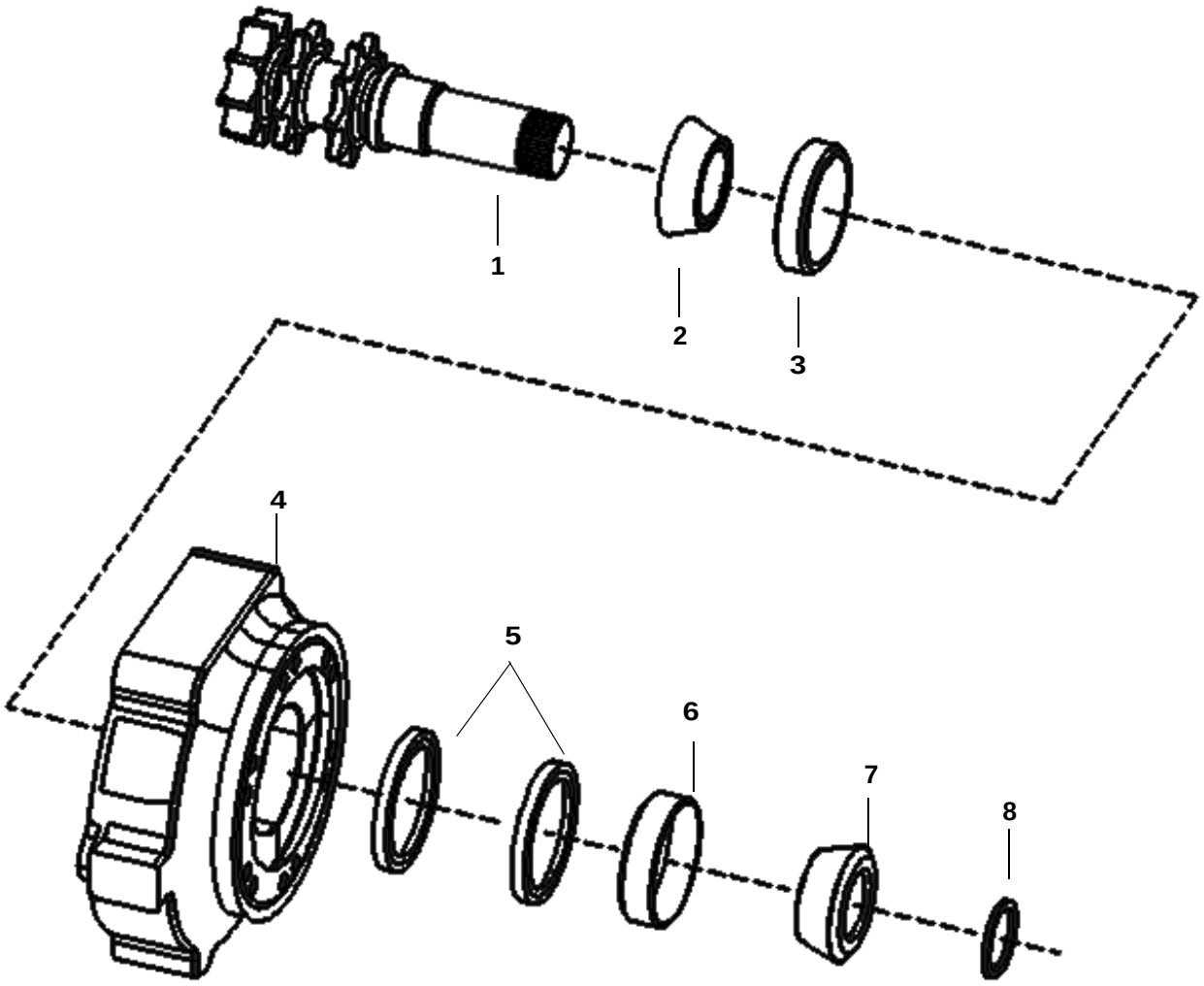
Slide the motor carrier out of the chain case far enough to install a chain and chain hoist to the carrier **[Figure 30-30-2]**.

Pull the motor carrier away from the chain case and out of the loader. **[Figure 30-30-2]**.

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Parts Identification

1. Shaft
2. Bearing
3. Race
4. Housing
5. Seal (2)
6. Race
7. Bearing
8. Snap Ring

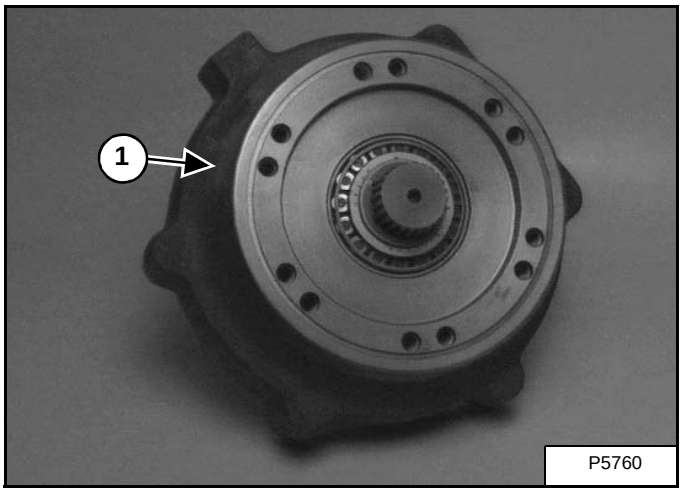


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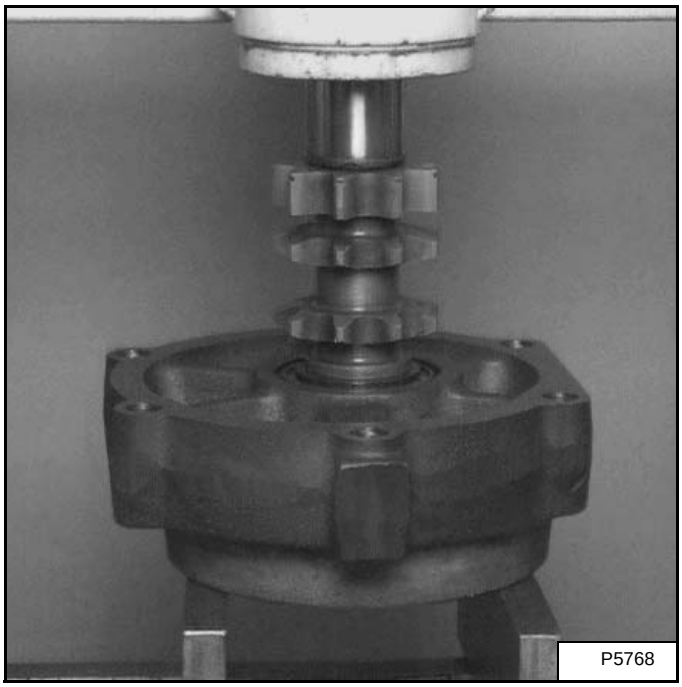
Disassembly

Figure 30-30-3



Remove the large O-ring from the groove (Item 1) **[Figure 30-30-3]** in the housing.

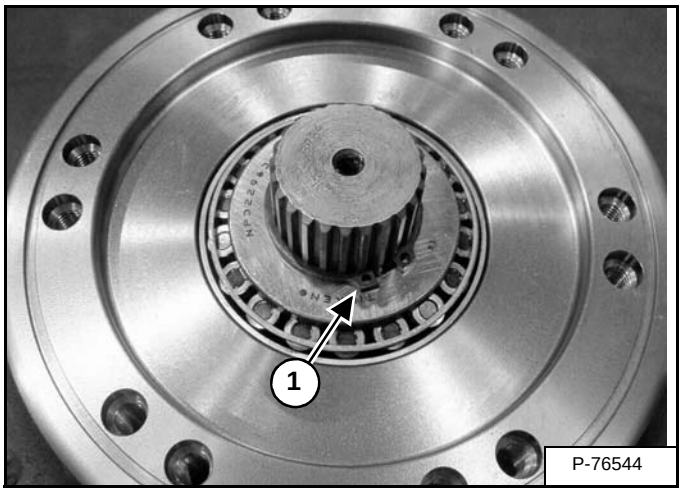
Figure 30-30-4



Put the motor carrier in a hydraulic press **[Figure 30-30-4]**.

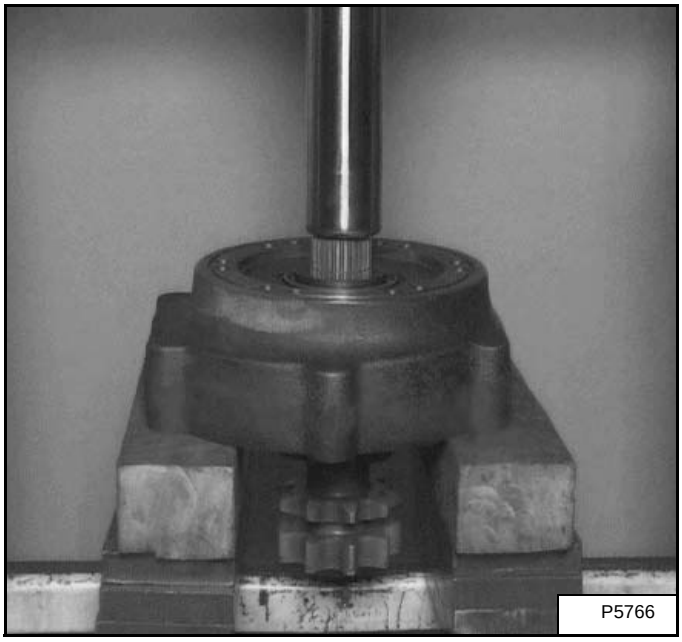
Put a small amount of pressure on the shaft to release the pre-load on the snap ring.

Figure 30-30-5



Remove the snap ring (Item 1) **[Figure 30-30-5]** from the shaft.

Figure 30-30-6

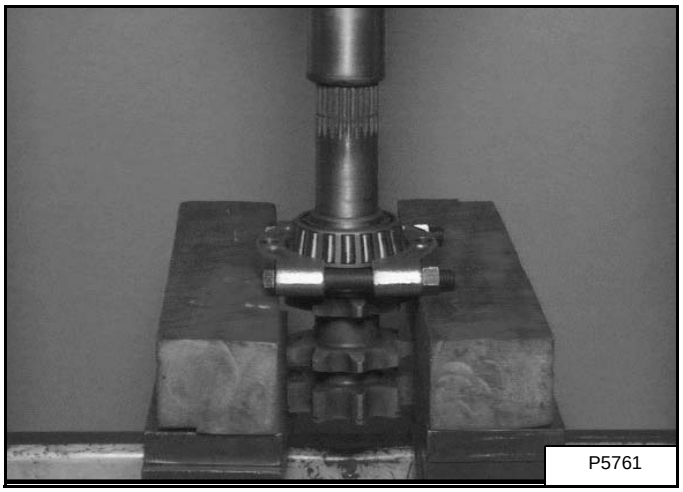


Use a hydraulic press to remove the shaft from the housing **[Figure 30-30-6]**.

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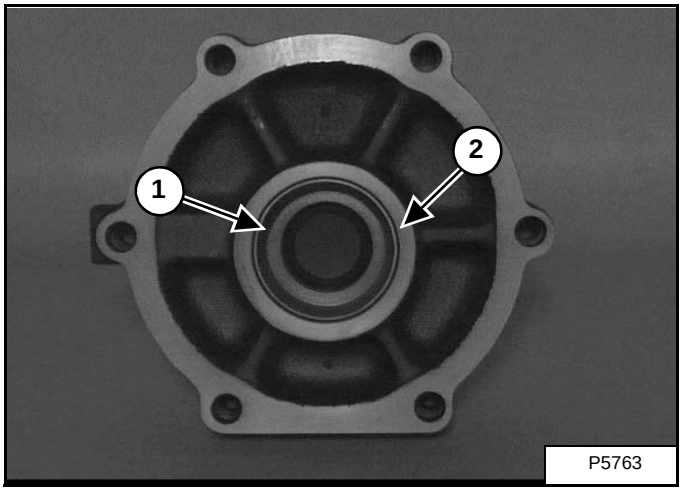
Disassembly (Cont'd)

Figure 30-30-7



Install the bearing puller tool under the bearing flange, use the hydraulic press to remove the bearing from the shaft **[Figure 30-30-7]**.

Figure 30-30-8

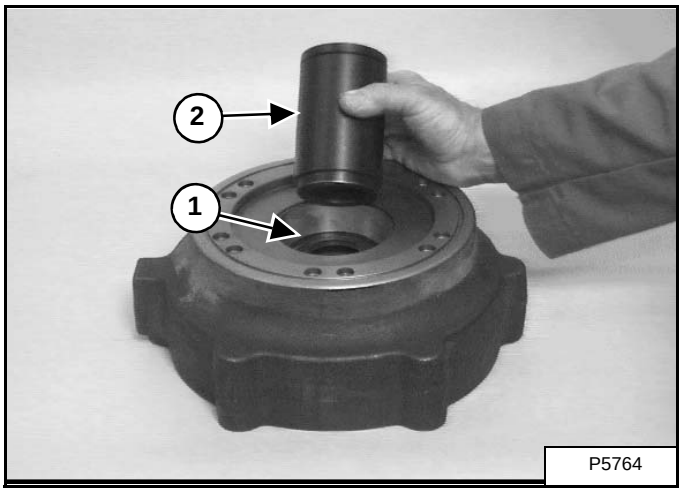


Remove the two seals (Item 1) **[Figure 30-30-8]** from the housing.

Check the bearing cup (Item 2) **[Figure 30-30-8]** (both sides) and replace as needed.

Assembly

Figure 30-30-9



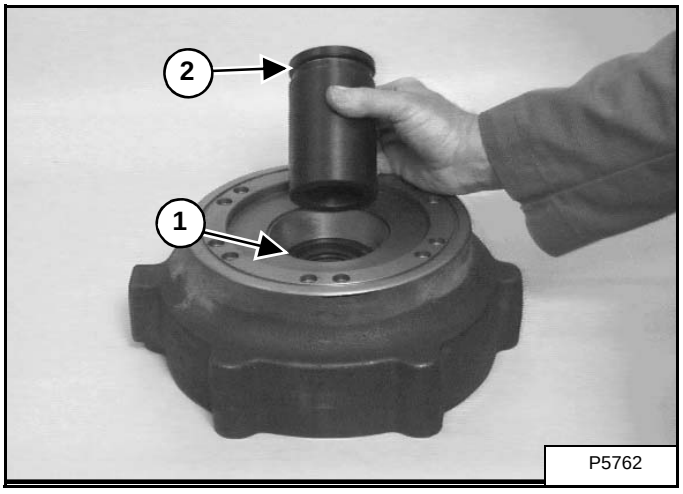
The tool listed will be needed to the following procedure:

MEL1431 - Seal Driver Tool

Install the first seal (Item 1) **[Figure 30-30-9]** into the housing with the seal lip facing away from you.

Use the tool (Item 2) **[Figure 30-30-9]** as shown in the figure.

Figure 30-30-10



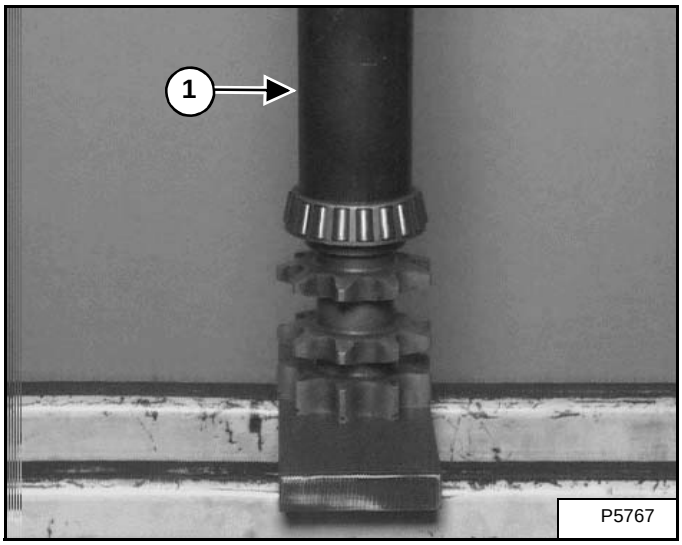
Install the second seal (Item 1) **[Figure 30-30-10]** into the housing with the seal lip facing toward you.

Use the tool (Item 2) **[Figure 30-30-10]** as shown in the figure.

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Assembly (Cont’d)

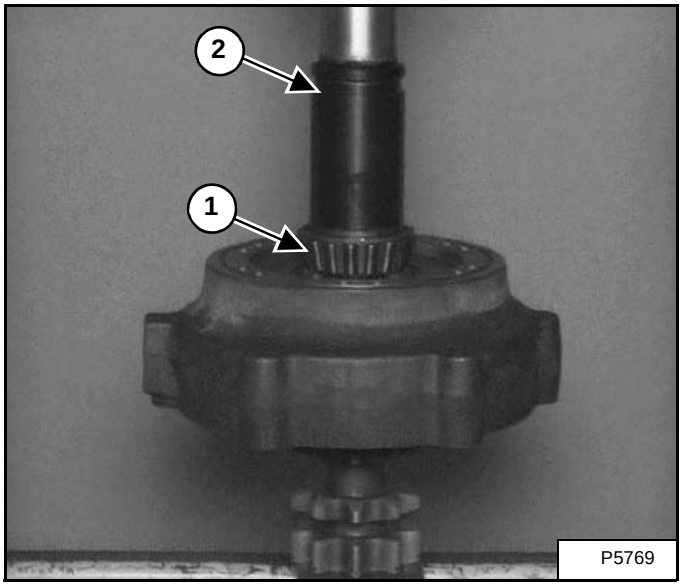
Figure 30-30-11



Install the bearing on the shaft **[Figure 30-30-11]**.

Use a pipe (Item 1) **[Figure 30-30-11]** with O.D. that seats on the I.D. of the bearing.

Figure 30-30-12



install the shaft/bearing assembly into the housing.

Install the bearing (Item 1) using the tool (Item 2) **[Figure 30-30-12]** (MEL1431).

After the bearing is seated. Install the snap ring on the shaft and reposition the motor carrier to allow back press operation.

NOTE: Slight press pressure may be used to preload both bearings. After installation of the snap ring a back press operation may be necessary to reduce the preload and remove the clearance from between the snap ring and the main bearing.

Use the press and apply pressure to the end of the spline shaft to reduce preload and clearance.

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HYDROSTATIC MOTOR CARRIER (SJC)

Description

The hydrostatic motor carrier is the mating connection from the hydrostatic drive motor to the transmission chaincase.

The hydrostatic motor carrier contains a shaft that rotates on two tapered roller bearings. The shaft has two sprockets that turn the drive chains.

The hydrostatic motor carrier has a seal which isolates the chain case oil from the hydrostatic motor case drain oil.

The hydrostatic motor carrier with (SJC) uses a speed sensor installed in the motor carrier housing. The speed sensor senses a disk that is fixed to the shaft in the motor carrier.

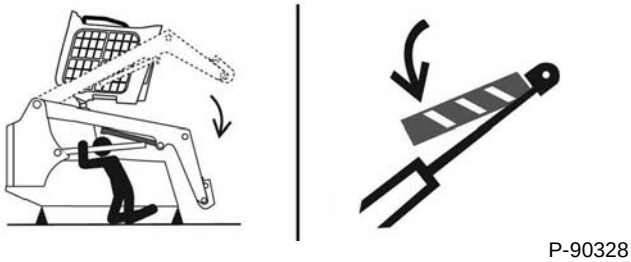
A brake disk is installed on each hydrostatic motor carrier. The brake disk is mounted to the shaft in the motor carrier (single speed loaders only).

The hydrostatic motor carriers are made to fit on both the right and left hand side of the loader.

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Removal And Installation

DANGER



P-90328

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.**

D-1009-0409

WARNING

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

W-2059-0598

Lift and block the loader. (See Procedure on Page 10-10-1.)

Raise the lift arms and install an approved lift arm support device. (See Installing on Page 10-20-1.)

Raise the operator cab. (See Raising on Page 10-30-2.)

Remove the fluid from the chaincase. (See CHAINCASE on Page 40-30-1.)

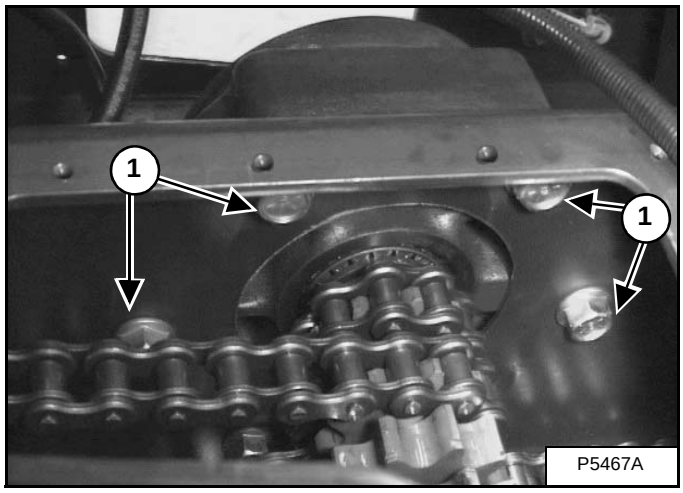
Remove the center chaincase cover. (See Center Cover Removal And Installation on Page 40-30-2.)

Remove the brake disc. (Single speed loaders only) (See Axle, Sprocket And Bearings Removal And Installation on Page 40-20-4.)

Remove the front axle sprocket. (See Axle, Sprocket And Bearings Removal And Installation on Page 40-20-4.)

If the motor carrier is removed from the right side, remove the lift arm bypass valve, (See Removal And Installation on Page 20-50-2.) and remove the control panel. (See Shock Removal And Installation on Page 50-100-18.)

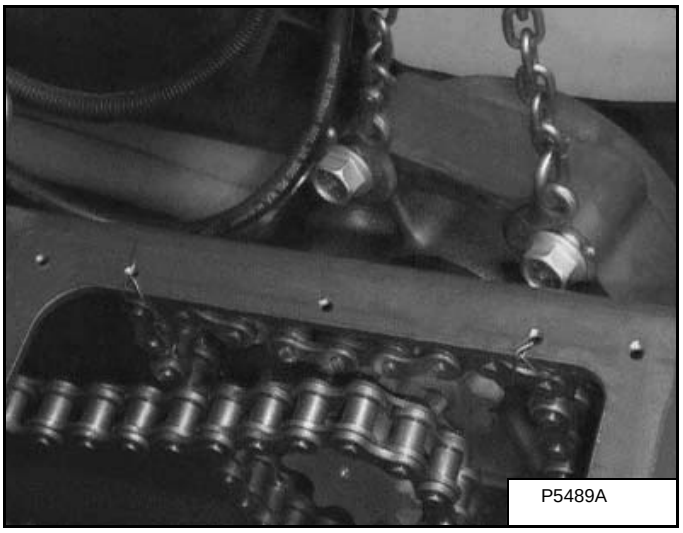
Figure 30-31-1



Remove the six mounting bolts (Item 1) **[Figure 30-31-1]** from the carrier.

Installation: Tighten the mounting bolts to 461 - 488 N•m (340 - 360 ft-lb) torque.

Figure 30-31-2



Slide the motor carrier toward the rear and remove the rear drive chain.

NOTE: For easier access for the motor carrier coming out and going into the chaincase, tie the front drive chain to the chaincase with a wire [Figure 30-31-2].

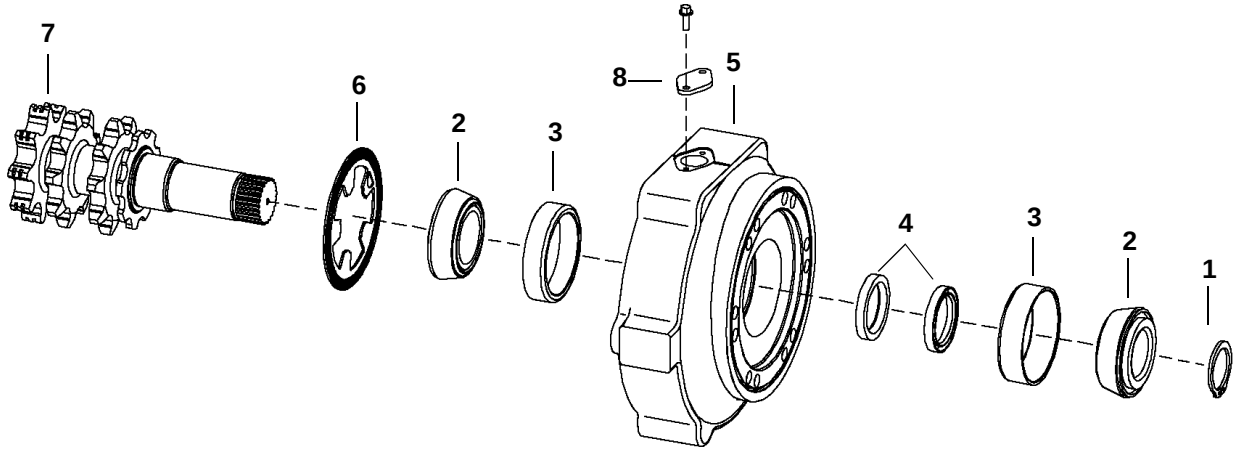
Slide the motor carrier out of the chaincase far enough to install a chain and chain hoist to the carrier **[Figure 30-31-2]**.

NOTE: When installing the motor carrier into the loader, use caution to protect the wheel speed washer from damage.

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Parts Identification

Ref.	Description
1.	Snap Ring
2.	Bearing
3.	Race
4.	Seal
5.	Housing
6.	Speed Washer
7.	Shaft
8.	Cover

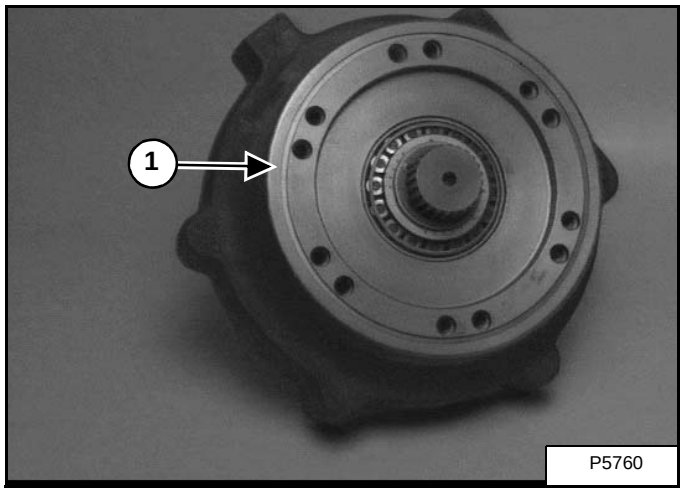


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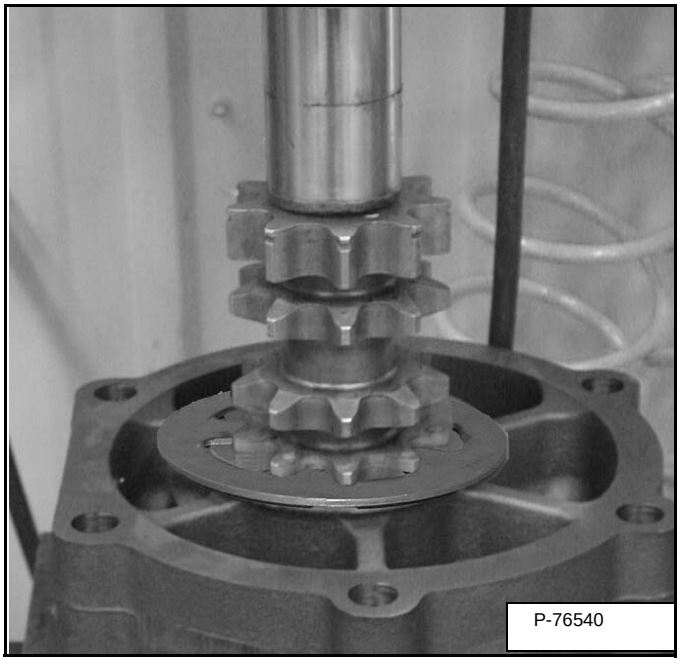
Disassembly

Figure 30-31-3



Remove the large O-ring from the groove (Item 1) **[Figure 30-31-3]** in the housing.

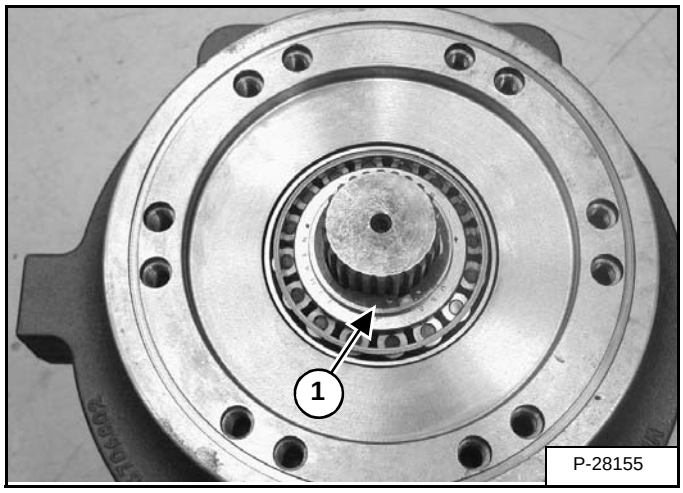
Figure 30-31-4



Put the motor carrier in a hydraulic press **[Figure 30-31-4]**.

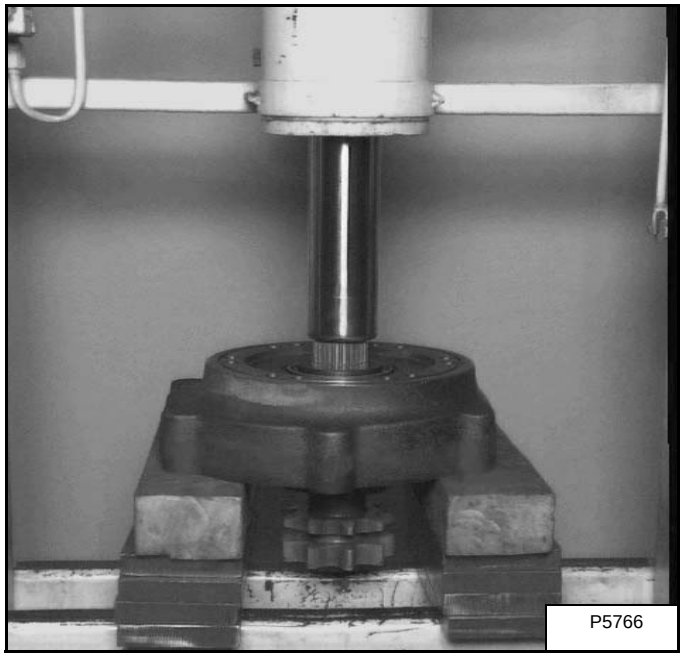
Put a small amount of pressure on the shaft to release the pre-load on the snap ring.

Figure 30-31-5



Remove the snap ring (Item 1) **[Figure 30-31-5]** from the shaft.

Figure 30-31-6

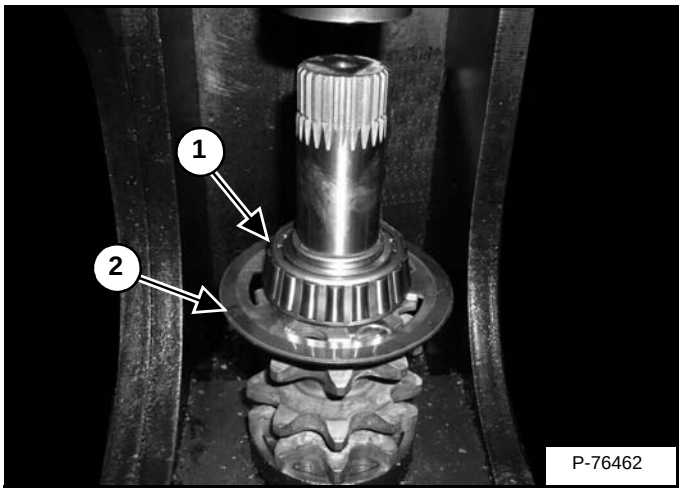


Use a hydraulic press, remove the shaft from the housing **[Figure 30-31-6]**.

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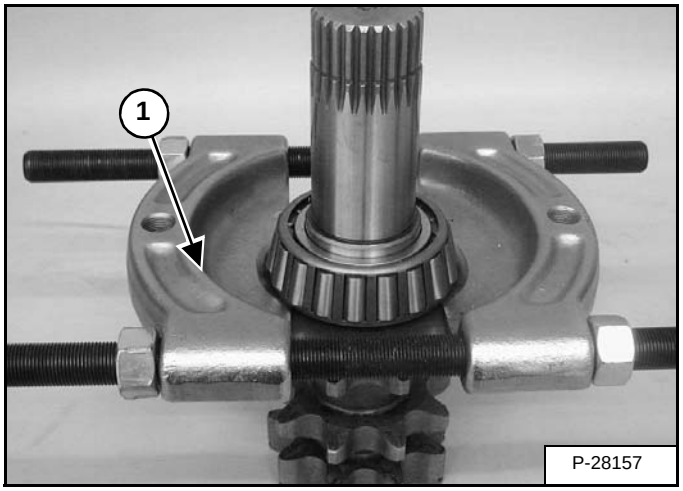
Disassembly (Cont'd)

Figure 30-31-7



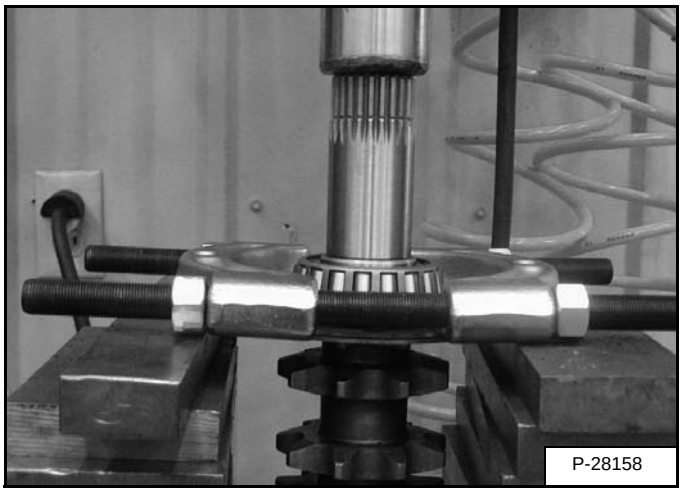
NOTE: The bearing (Item 1) [Figure 30-31-7] and the wheel speed washer (Item 2) [Figure 30-31-7], must both be replaced, due to damage to the wheel speed washer from removing the bearing.

Figure 30-31-8



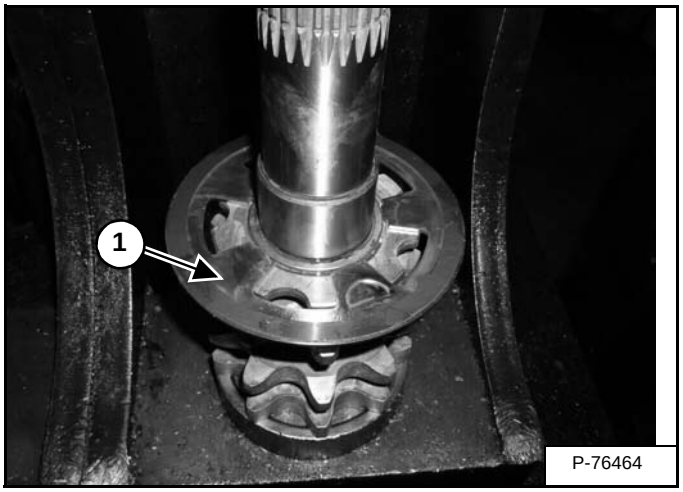
Install the bearing puller tool (Item 1) **[Figure 30-31-8]** under the bearing flange, between the bearing and the speed washer.

Figure 30-31-9



Use the hydraulic press to remove the bearing from the shaft **[Figure 30-31-9]**.

Figure 30-31-10

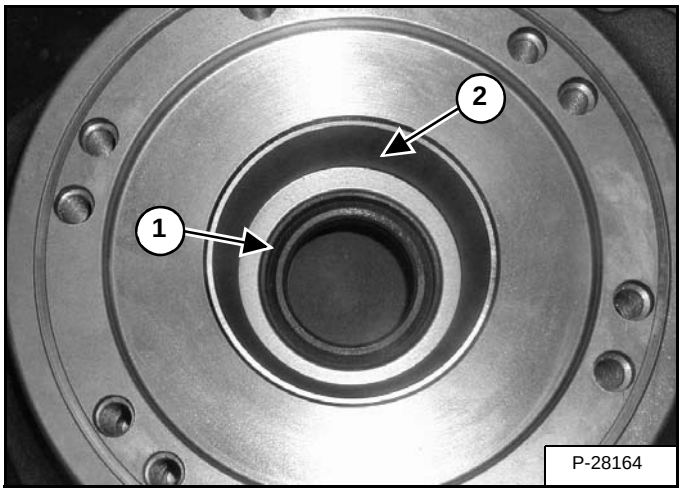


Remove the wheel speed washer (Item 1) **[Figure 30-31-10]** from the shaft.

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Disassembly (Cont'd)

Figure 30-31-11

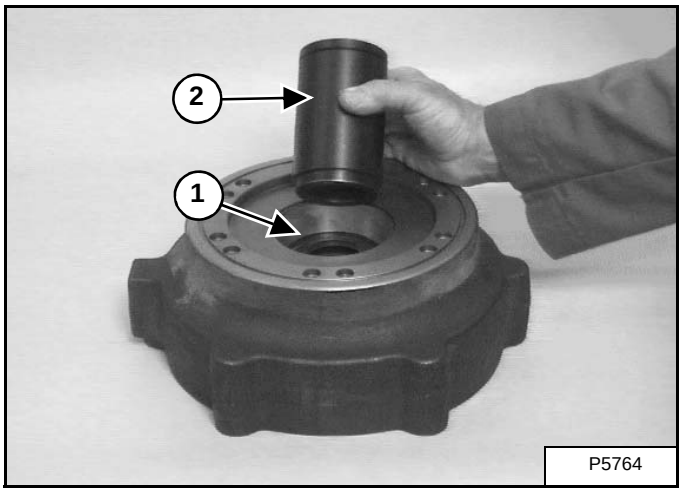


Remove the two seals (Item 1) **[Figure 30-31-11]** from the housing.

Check the bearing cup (Item 2) **[Figure 30-31-11]** (both sides) and replace as needed.

Assembly

Figure 30-31-12



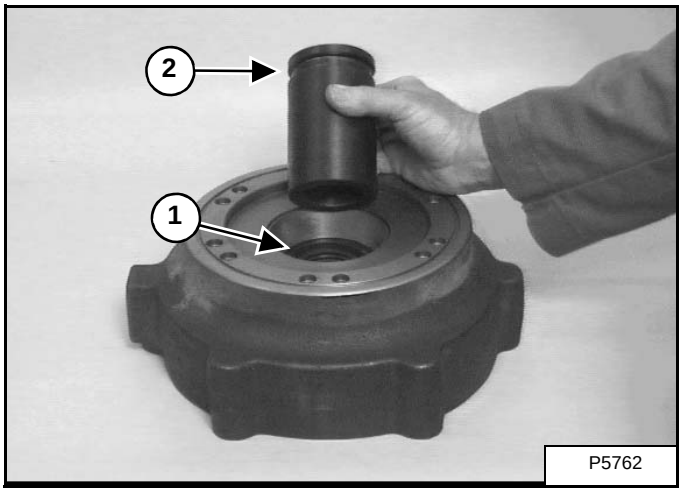
The tool listed will be needed to the following procedure:

MEL1431 - Seal Driver Tool

Install the first seal (Item 1) **[Figure 30-31-12]** into the housing with the seal lip facing away from you.

Use the tool (Item 2) **[Figure 30-31-12]** as shown in the figure.

Figure 30-31-13



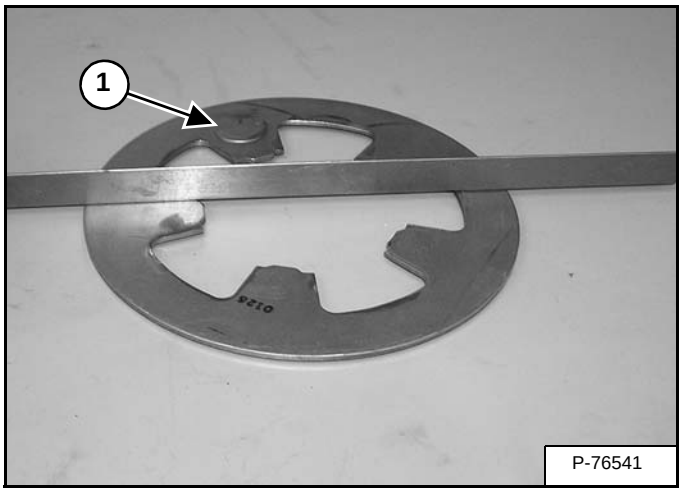
Install the second seal (Item 1) **[Figure 30-31-13]** into the housing with the seal lip facing toward you.

Use the tool (Item 2) **[Figure 30-31-13]** as shown in the figure.

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Assembly (Cont'd)

Figure 30-31-14

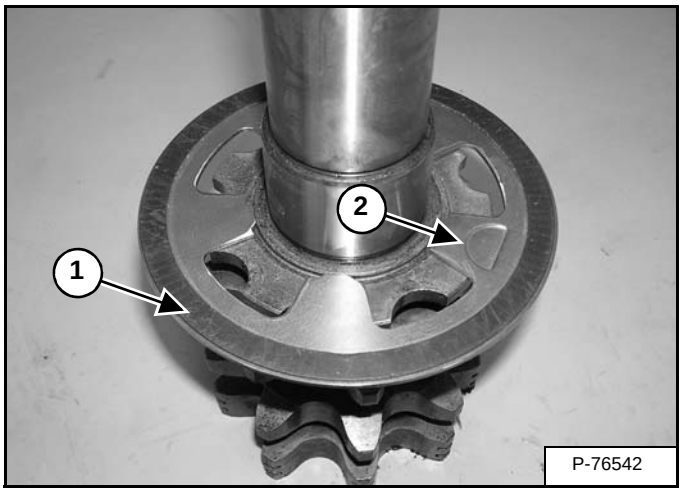


The wheel speed washer, has one alignment pin (Item 1) **[Figure 30-31-14]**.

Check the new wheel speed washer with a straight edge, to be sure it is square **[Figure 30-31-14]**.

If the washer is more than 0.080 (2,03 mm) out of square, it must be replaced.

Figure 30-31-15



Inspect the wheel speed washer for damage to the magnetic surface (Item 1) **[Figure 30-31-15]**.

NOTE: Do not contact the magnetic surface of the wheel speed washer (Item 1) [Figure 30-31-15], with a magnet. This may cause damage to the magnetic surface.

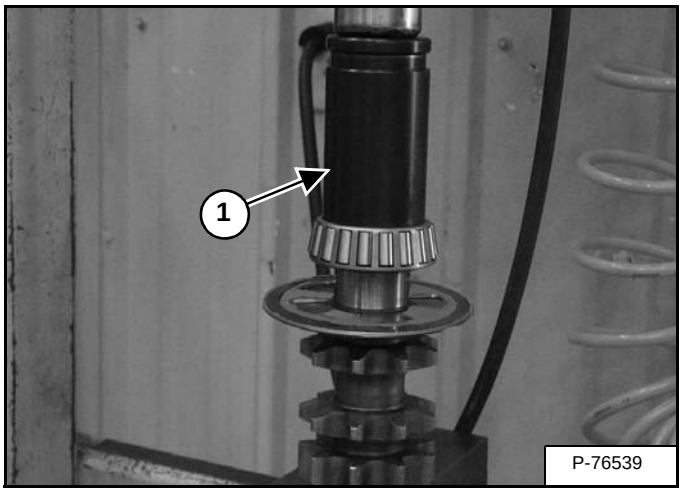
Install the wheel speed washer on the shaft **[Figure 30-31-15]**.

Align the one pin (Item 2) **[Figure 30-31-15]** in the sprocket.

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Assembly (Cont'd)

Figure 30-31-16



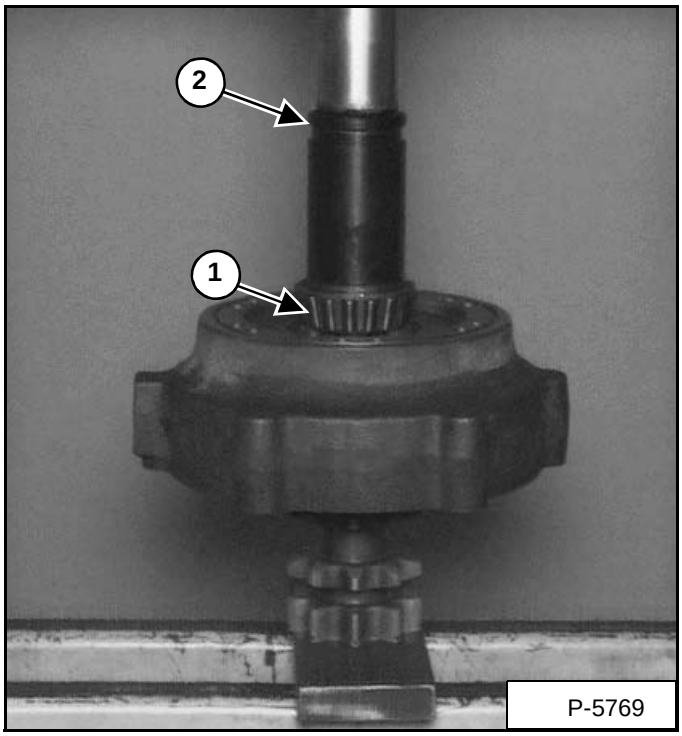
Install the bearing on the shaft **[Figure 30-31-16]**.

Use a pipe (Item 1) **[Figure 30-31-16]** with O.D. that seats on the I.D. of the bearing.

Seat the bearing on the shaft, down against the wheel speed washer.

NOTE: The wheel speed washer should be tight on the shaft.

Figure 30-31-17



Install the shaft/bearing assembly into the housing.

Install the bearing (Item 1) using the tool (MEL1431) (Item 2) **[Figure 30-31-17]**.

After the bearing is seated. Install the snap ring on the shaft and reposition the motor carrier to allow back press operation.

NOTE: Slight press pressure may be used to preload both bearings. After installation of the snap ring a back press operation may be necessary to reduce the preload and remove the clearance from between the snap ring and the main bearing.

Use the press and apply pressure to the end of the spline shaft to reduce preload and clearance.

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CHARGE PRESSURE

Description

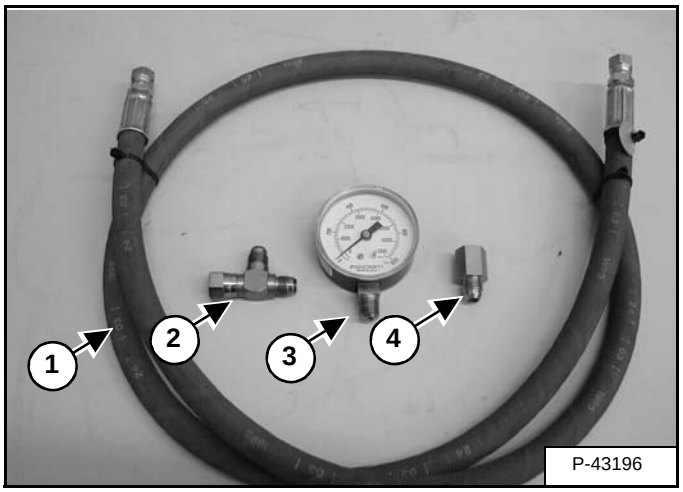
Charge pressure is a supply of oil to the hydrostatic pumps. Charge pressure is regulated by a charge relief valve located inside the hydrostatic pump. Charge pressure is used to replenish hydrostatic fluid removed from the drive circuit, pump and motor “internal leakage” and from the hydrostatic motors shuttle (flushing) valve.

Charge pressure is also used to operate other hydraulic functions, such as shifting the auxiliary spool, and to pilot open the BICS system for the lift and tilt in the main hydraulic control valve.

The charge pressure sender is located on the hydraulic fan motor. Charge pressure alarm settings are pre-programmed into the main controller and are based on loader type and options installed.

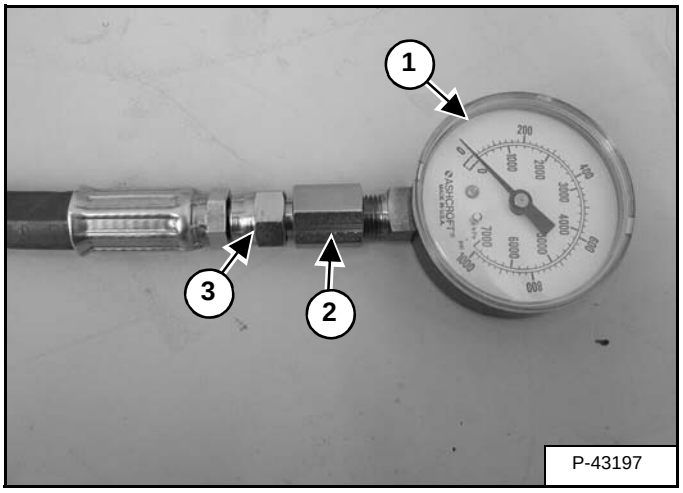
Testing

Figure 30-40-1



The tools needed to check charge pressure, hydraulic hose (Item 1), T fitting (P/N 13K-5) (Item 2), Hydraulic gauge 6,9 MPa (69,0 bar) (1000 psi) (Item 3) and adapter fitting (P/N 93F-5) (Item 4) **[Figure 30-40-1]**.

Figure 30-40-2



Connect the gauge (Item 1), to the adapter fitting (P/N 93F5) (Item 2) **[Figure 30-40-2]**.

Connect the hydraulic hose (Item 3) **[Figure 30-40-2]** to the adapter fitting. Tighten all connections.

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Testing (Cont'd)

⚠ WARNING

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

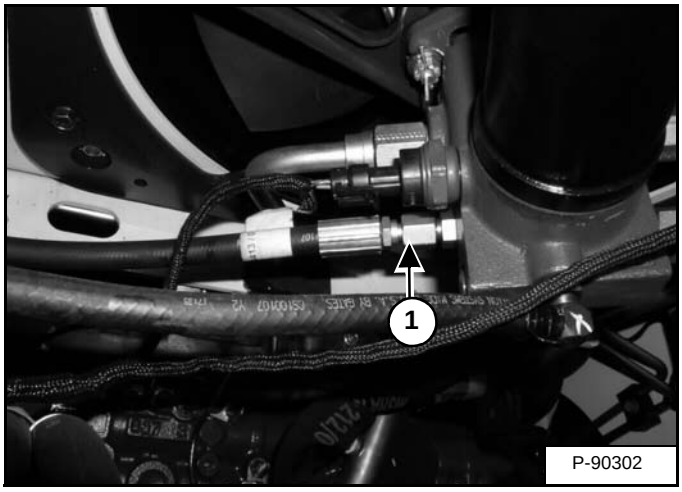
W-2059-0598

Raise the loader lift arms and install an approved lift arm support device. (See Installing on Page 10-20-1.)

Place the loader on jackstands. (See Procedure on Page 10-10-1.)

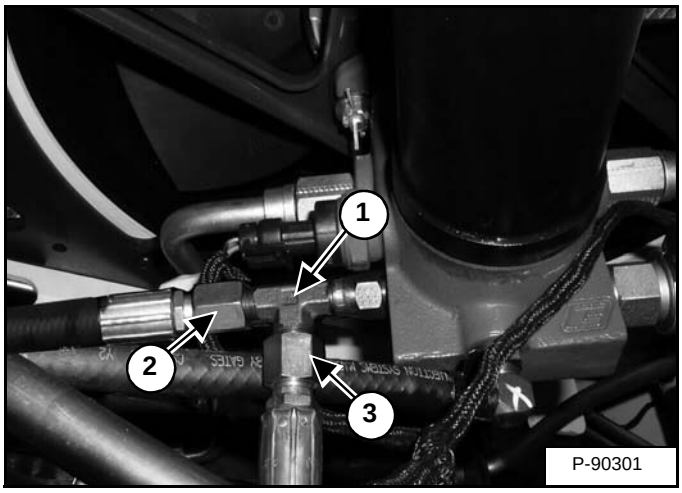
Raise the operator cab. (See Raising on Page 10-30-2.)

Figure 30-40-3



Disconnect the hydraulic hose (Item 1) **[Figure 30-40-3]**.

Figure 30-40-4



Install the T fitting (P/N 13K-5) (Item 1) **[Figure 30-40-4]**.

Install the hose (Item 2) **[Figure 30-40-4]**, that was disconnected from the motor, to the T fitting.

Install the hose (Item 3) **[Figure 30-40-4]**, that is attached to the pressure gauge, to the T fitting.

Tighten the hydraulic fittings.

Connect the remote start tool. (See REMOTE START TOOL KIT-MEL1563 on Page 10-60-1.) or (See REMOTE START TOOL (SERVICE TOOL) KIT - 7003031 on Page 10-61-1.)

Start the loader and warm the hydraulic fluid to 140° F.

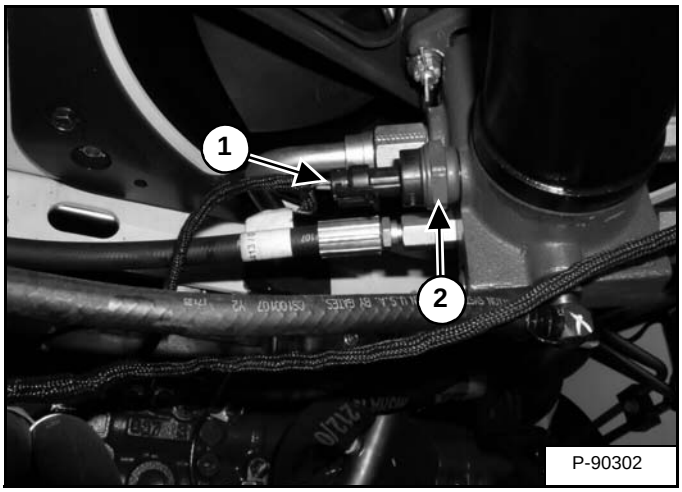
On non-SJC equipped loaders the charge pressure at high idle, with the fluid temperature of 60°C (140°F) is 3,0 - 3,4 MPa (30,0 - 34,1 bar) (435 - 495 psi) with the pump in neutral.

NOTE: If the machine is equipped with SJC option the charge pressure should be set at 2,5 - 2,8 MPa (24,8 - 28,2 bar) (360 - 410 psi) at 60°C (140°F) fluid @ High idle.

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Sender Removal And Installation

Figure 30-40-5



Disconnect the wire (Item 1) **[Figure 30-40-5]** from the sender.

Remove the sender (Item 2) **[Figure 30-40-5]** from the motor.

Installation: Tighten the charge pressure sender to 10 - 10,9 N•m (7.4 - 8.1 ft-lb) torque.

NOTE: Inspect the O-ring on the sender before installation.

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Adjusting

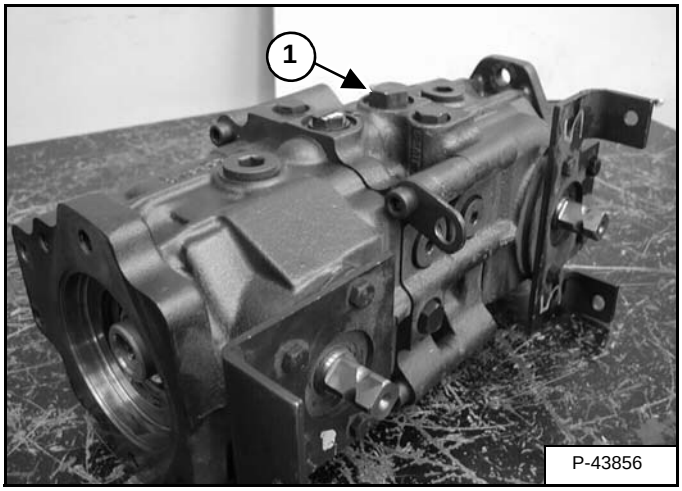
Non SJC Machines

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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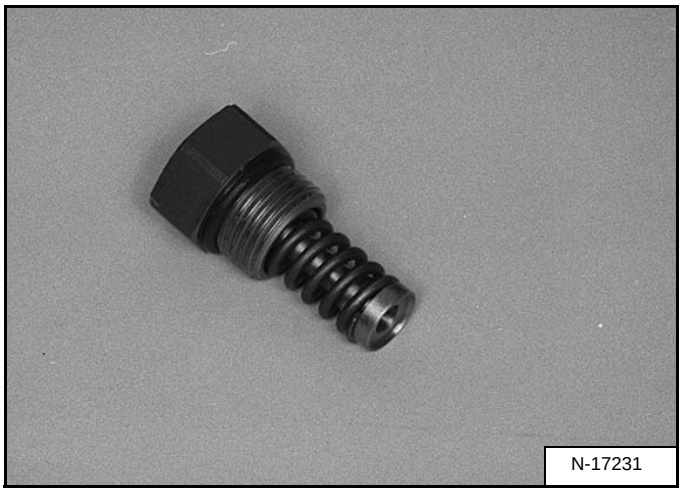
Figure 30-40-6



If the charge pressure is not correct loosen the charge relief valve plug (Item 1) **[Figure 30-40-6]**.

Always use a new O-ring. Tighten the plug to 41 - 68 N•m (30 - 50 ft-lb) torque.

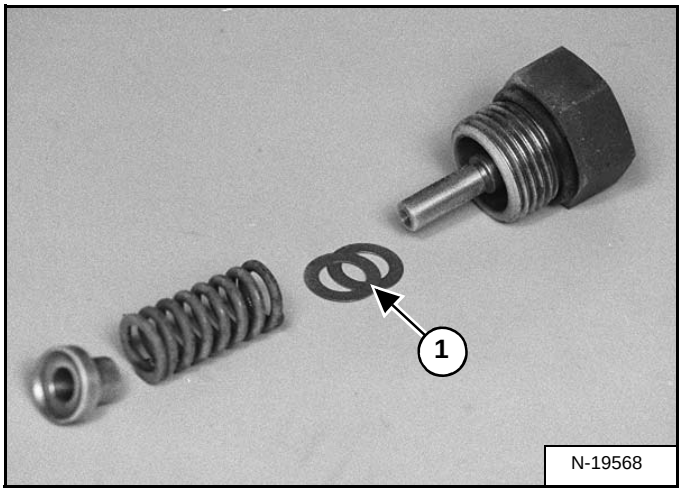
Figure 30-40-7



Remove the plug, spring and poppet **[Figure 30-40-7]**.

Check the poppet, spring and poppet seat for wear or damage.

Figure 30-40-8



There are several different thickness of the shims (Item 1) **[Figure 30-40-8]** and are used to adjust the charge pressure.

NOTE: 0,254 mm (0.010 in) is approximately 55,2 kPa (0,6 bar) (8 psi) increase in pressure. Do not add more than 5 shims without retesting. If testing is still low more shims may be added.

On non-SJC equipped loaders the charge pressure at high idle, with the fluid temperature of 60°C (140°F) is 3,0 - 3,4 MPa (30,0 - 34,1 bar) (435 - 495 psi) with the pump in neutral.

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Adjusting (Cont'd)

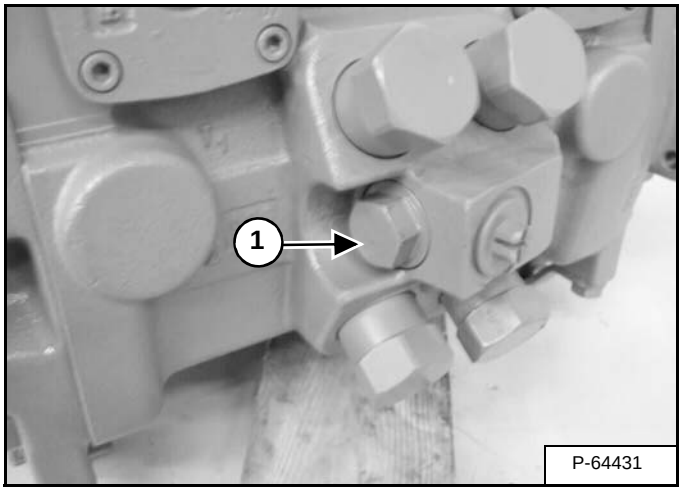
SJC Machines

IMPORTANT

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

I-2003-0888

Figure 30-40-9

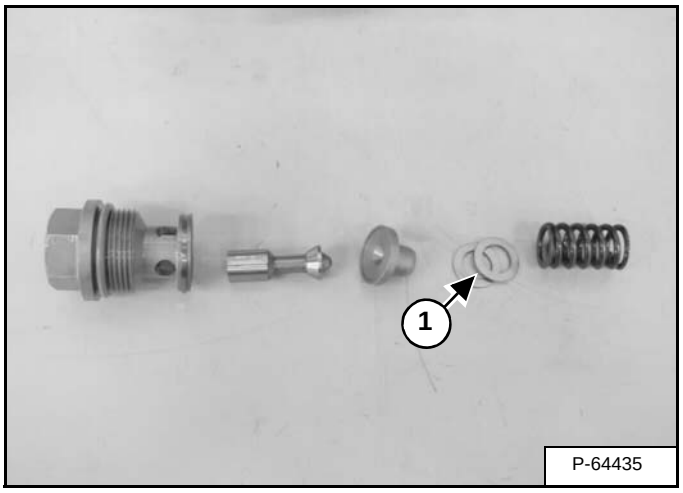


If the charge pressure is not correct remove the charge relief valve (Item 1) **[Figure 30-40-9]**.

NOTE: The pump has been removed for photo clarity. The charge pressure relief valve is located on the engine side of the hydrostatic pump when installed in the loader.

Assembly: Always use a new O-ring. Tighten the plug to 41 - 68 N•m (30 - 50 ft-lb) torque.

Figure 30-40-10



Check the poppet and spring for wear or damage.

Inspect the seat inside the hydrostatic pump case for wear or damage.

There are several different thickness of shims (Item 1) **[Figure 30-40-10]** used to adjust the charge pressure.

NOTE: 1,0 mm shim (Item 1) [Figure 30-40-10] = 300,0 kPa (3 bar) (43.5 PSI) in pressure change. Adding shims increases charge pressure. Removing shims decreases charge pressure.

The charge pressure should be set at 2,5 - 2,8 MPa (24,8 - 28,2 bar) (360 - 410 psi).

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HYDROSTATIC PUMP

Description

The hydrostatic pump is composed of two hydrostatic piston pumps connected together. The pumps provide bi-directional flow to two separate drive motors. The pump flow and direction are controlled by two hand levers, one for each pump.

The hydrostatic pump contains replenishing valves. The function of these valves is 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. Another function of the replenishing valve is to keep high pressure fluid out of the low pressure side of the hydrostatic circuit.

The hydrostatic pump is located in the center of the mainframe mounted to the engine flywheel housing.

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Removal And Installation

Remove the hydrostatic pump / engine assembly from the loader. (See Engine Removal And Installation on Page 70-10-7.)

Remove the Hydraulic Pump. (See Removal And Installation on Page 20-60-6.)

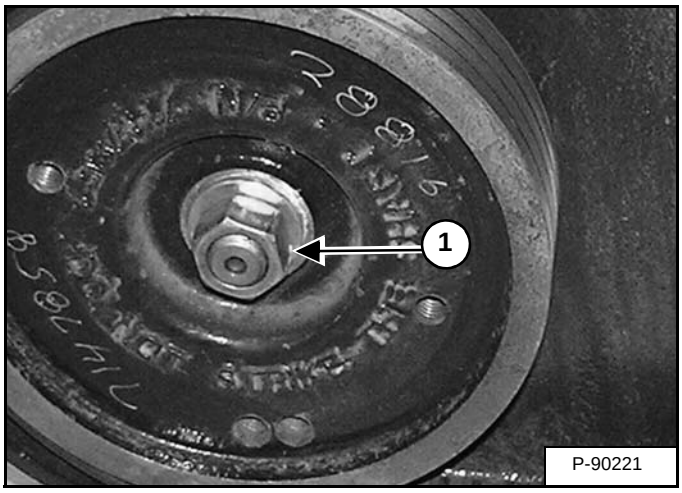
Remove the Drive Belt. (See DRIVE BELT on Page 30-60-1.)

IMPORTANT

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

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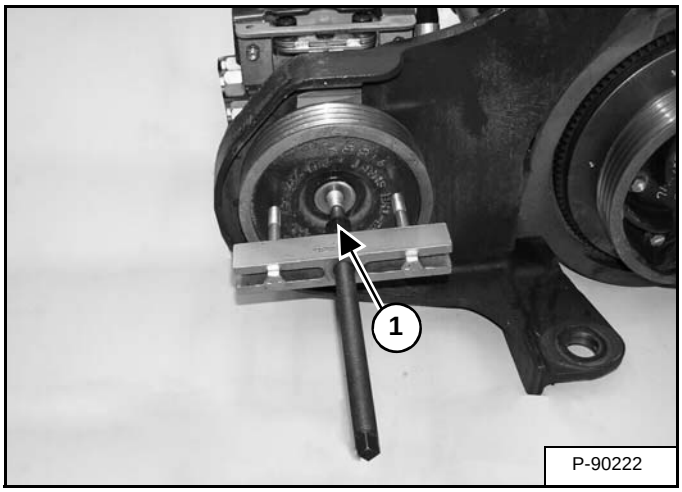
Figure 30-50-1



Loosen the nut (Item 1) **[Figure 30-50-1]** on the hydrostatic pump drive shaft.

Installation: Tighten the nut to 258 - 325 N•m (190 - 240 ft-lb) torque

Figure 30-50-2



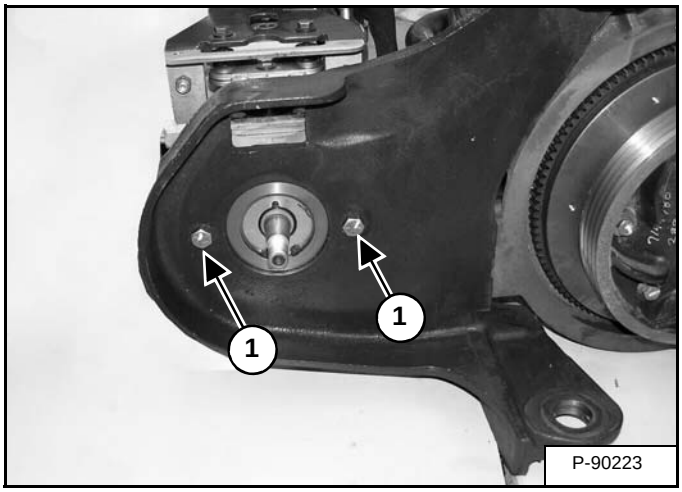
Use a puller (Item 1) **[Figure 30-50-2]** to loosen the pulley from the pump drive shaft.

NOTE: DO NOT strike puller or pump shaft with a hammer. Internal pump damage may result.

Remove the nut and washer from the pump drive shaft.

Remove the pump pulley and key from the pump drive shaft.

Figure 30-50-3



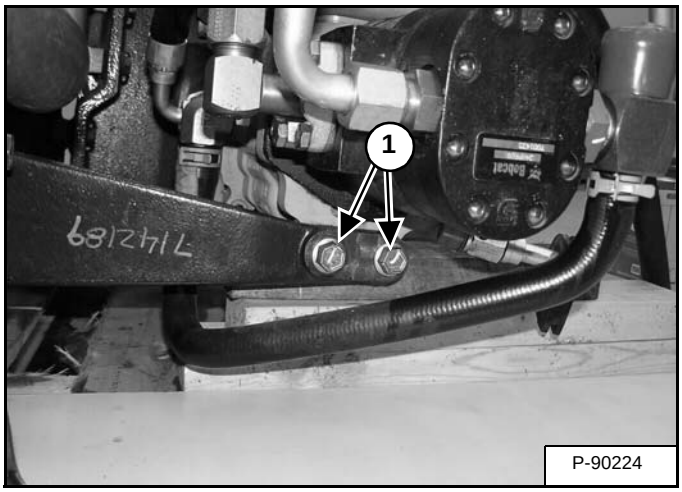
Remove the two mounting bolts and nuts (Item 1) **[Figure 30-50-3]**.

Installation: Tighten the mounting bolts and nuts to 88 - 95 N•m (65 - 70 ft-lb) torque.

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Removal And Installation (Cont'd)

Figure 30-50-4



Remove the two mounting bolts (Item 1) **[Figure 30-50-4]** at the hydraulic pump mounting bracket.

Installation: Tighten mounting bolt to 125 - 135 N•m (90 - 100 ft-lb)

Remove the hydrostatic pump from the mounting bracket and drive belt housing.

BEFORE START UP: Fill the hydrostatic pump with hydraulic oil. This will remove trapped air in the hydrostatic pumps before start up. (See Hydrostatic Pump Startup on Page 30-50-3.)

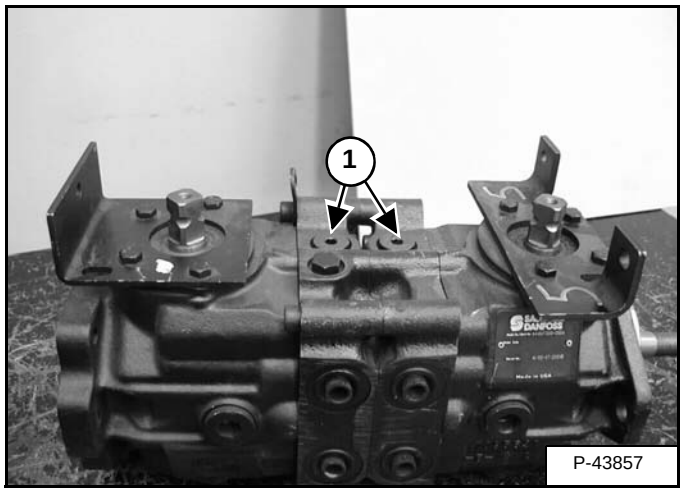
Hydrostatic Pump Startup

Follow the hydraulic pump startup procedure. (See Hydrostatic Pump Startup on Page 30-50-3.)

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Replenishing / High Pressure Relief Valve Removal And Installation

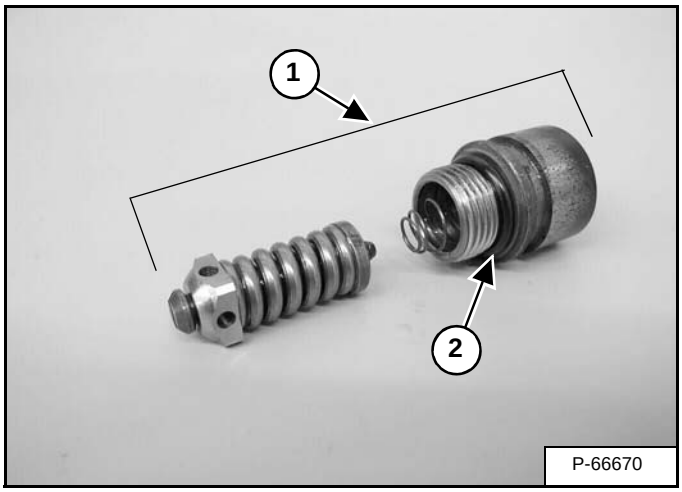
Figure 30-50-5



There are four replenishing / high pressure relief valves (Item 1) **[Figure 30-50-5]** in the hydrostatic pump assembly. Two are located at the top of the pumps and two at the bottom of the pumps 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 30-50-6



Remove the high pressure relief valve (Item 1) **[Figure 30-50-5]** and **[Figure 30-50-6]** from the pump.

Assemble: Tighten the plug to 41 - 68 N•m (30 - 50 ft-lb) torque.

Check for damage and replace as needed.

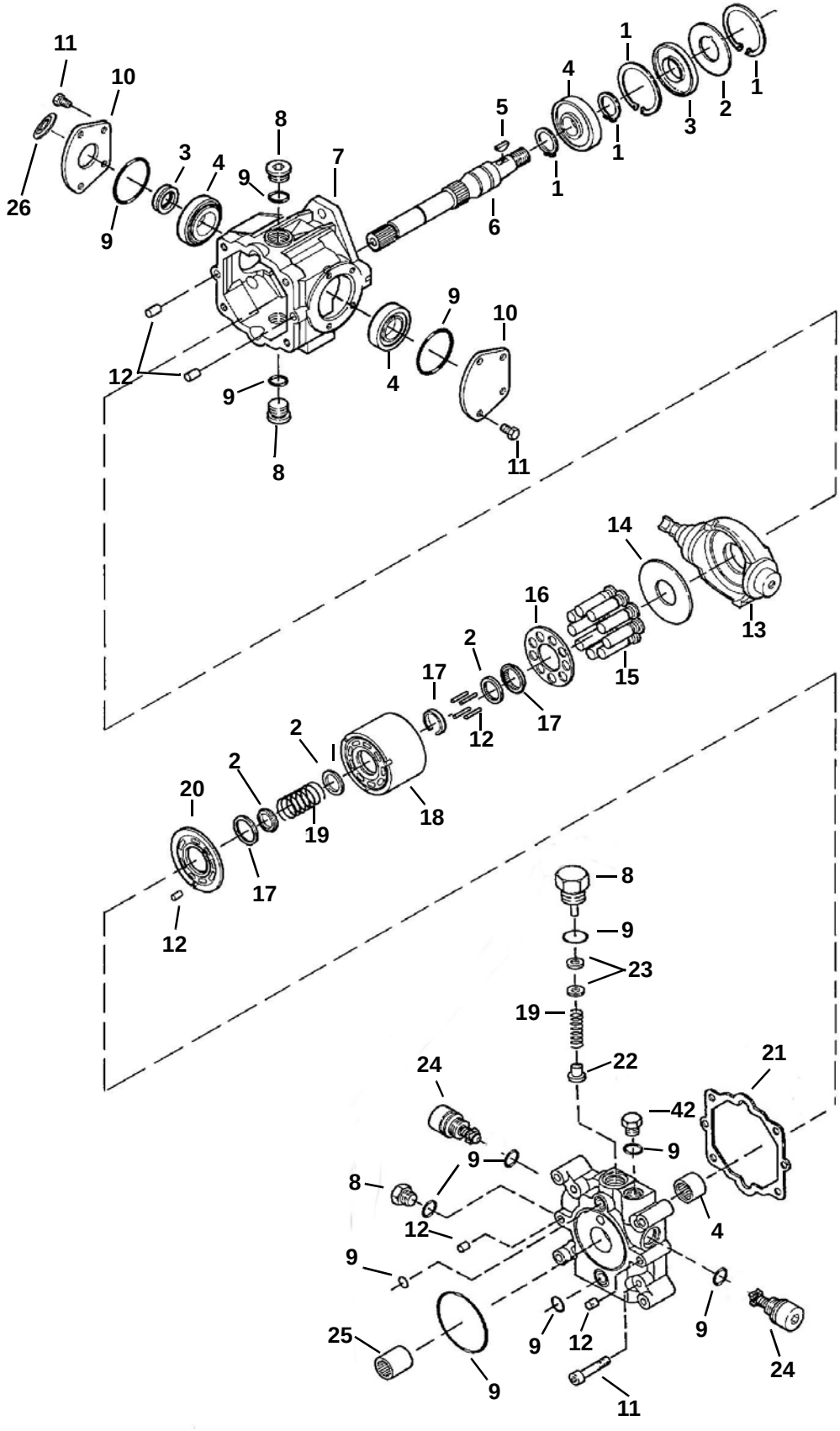
Check the O-ring (Item 2) **[Figure 30-50-6]** for damage and replace as needed.

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 36,2 MPa (362 bar) (5250 PSI).

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Parts Identification (Left Half)



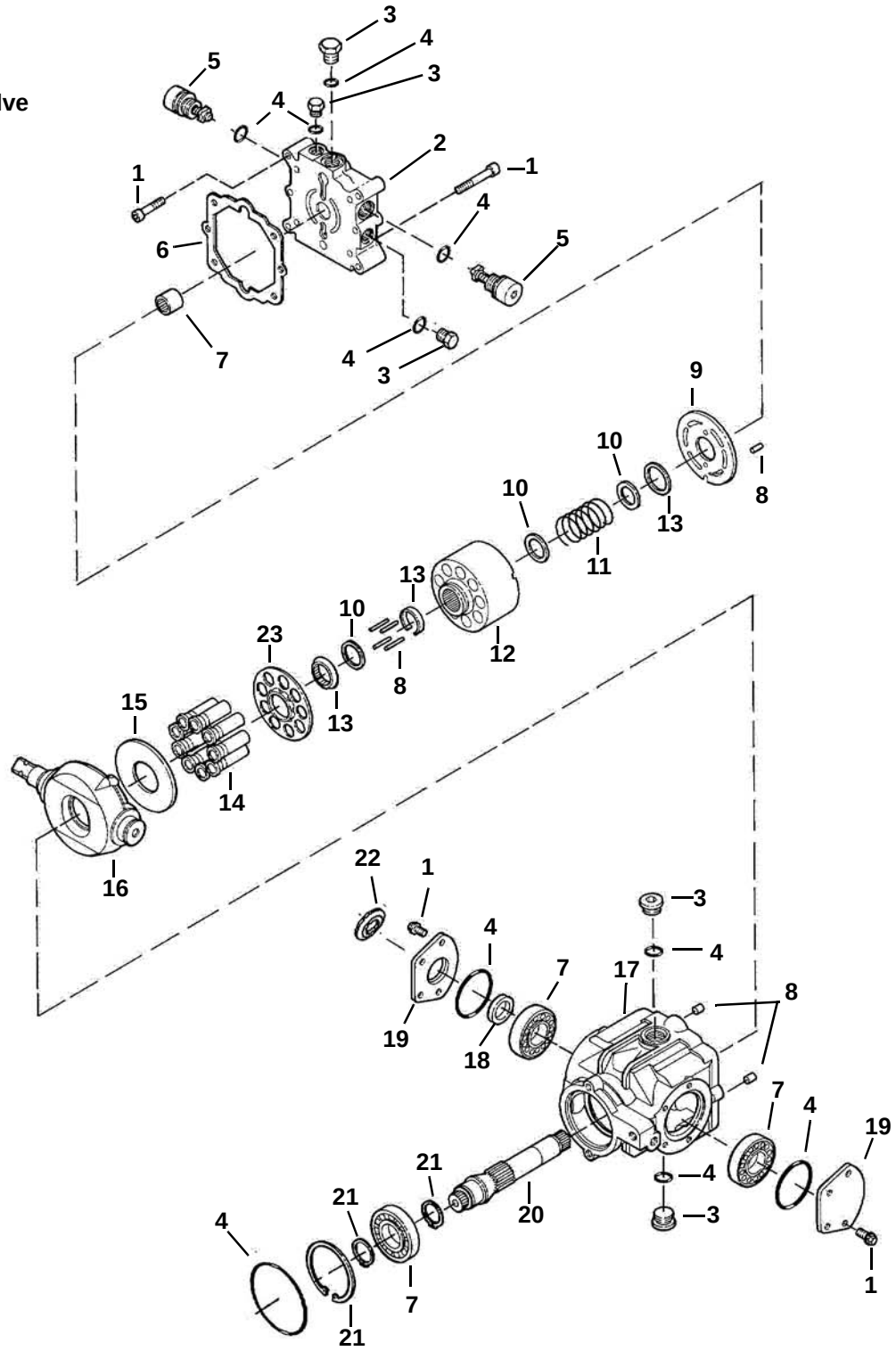
Ref.	Description
1.	Snap Ring
2.	Washer
3.	Seal
4.	Bearing
5.	Key
6.	Shaft
7.	Housing
8.	Plug
9.	O-ring
10.	Cover
11.	Bolt
12.	Pin
13.	Swash Plate
14.	Wear Plate
15.	Piston Assembly
16.	Piston Retainer
17.	Retainer
18.	Block
19.	Spring
20.	Valve Plate
21.	Gasket
22.	Poppet
23.	Shim
24.	Replenishing/High Pressure Relief Valve
25.	Coupler
26.	Dust Seal

D-2428C

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Parts Identification (Right Half)

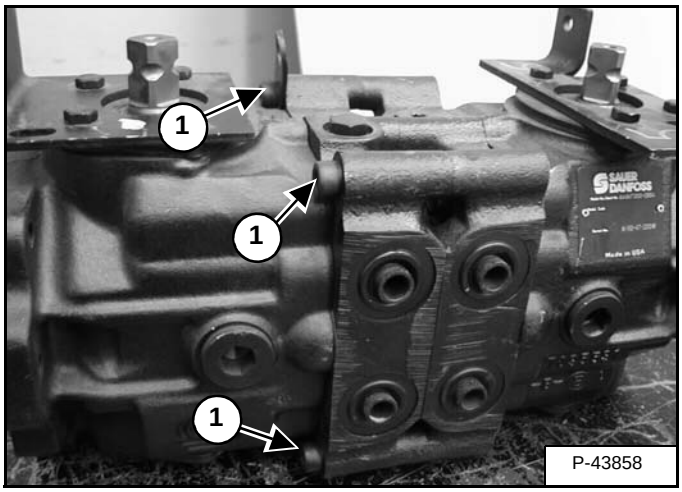
Ref.	Description
1.	Bolt
2.	End Cap
3.	Plug
4.	O-ring
5.	Replenishing/High Pressure Relief Valve
6.	Gasket
7.	Bearing
8.	Pin
9.	Valve Plate
10.	Washer
11.	Spring
12.	Block
13.	Retainer
14.	Piston Assembly
15.	Wear Plate
16.	Swash Plate
17.	Housing
18.	Seal
19.	Cover
20.	Shaft
21.	Snap Ring
22.	Dust Seal
23.	Piston Retainer



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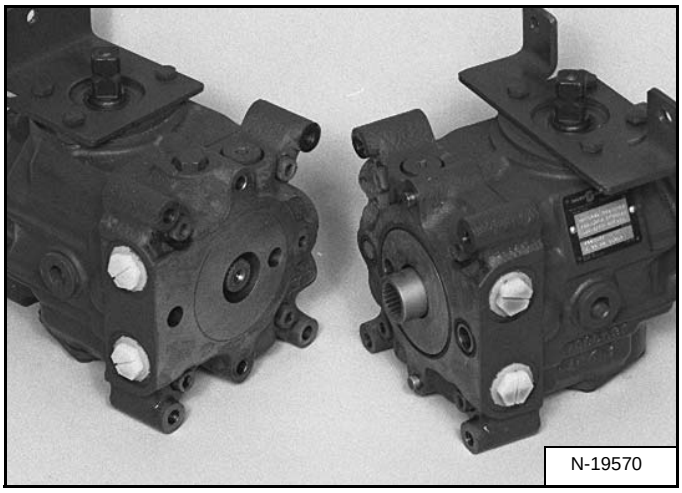
Disassembly

Figure 30-50-7



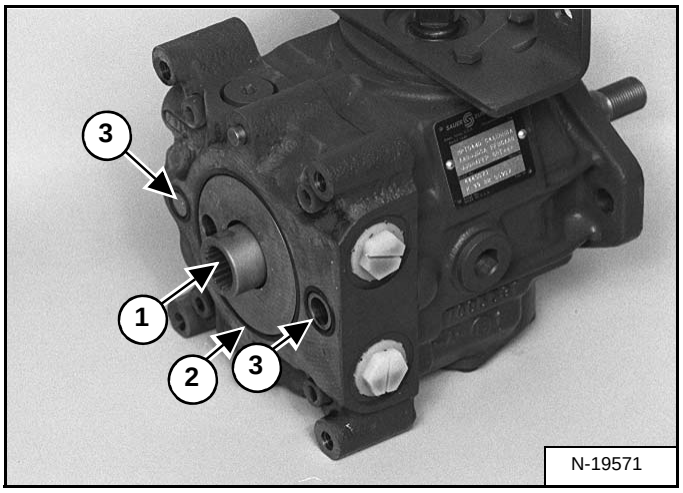
Remove the four mounting bolts (Item 1) **[Figure 30-50-7]**.

Figure 30-50-8



Separate the two hydrostatic pumps **[Figure 30-50-8]**.

Figure 30-50-9

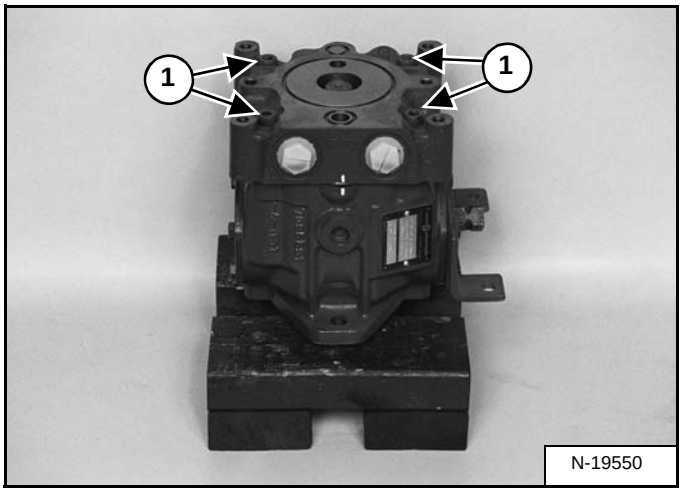


Remove the pump coupler (Item 1) **[Figure 30-50-9]**.

Remove the large O-ring (Item 2) **[Figure 30-50-9]**.

Remove the two small O-rings (Item 3) **[Figure 30-50-9]**.

Figure 30-50-10

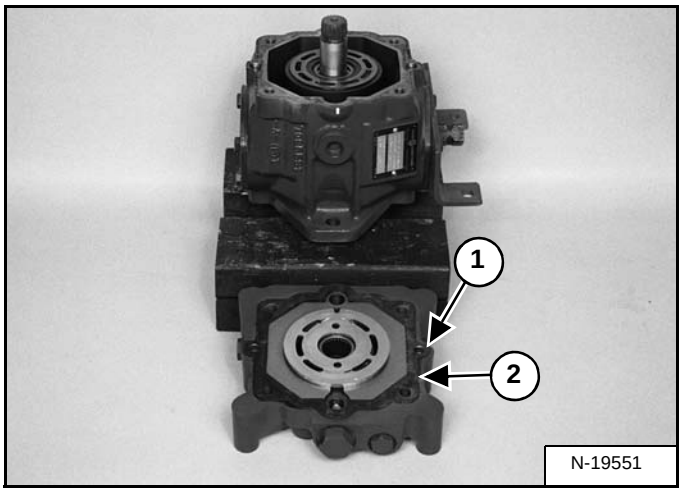


Remove the four bolts (Item 1) **[Figure 30-50-10]** from the pump housing end cap.

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Disassembly (Cont'd)

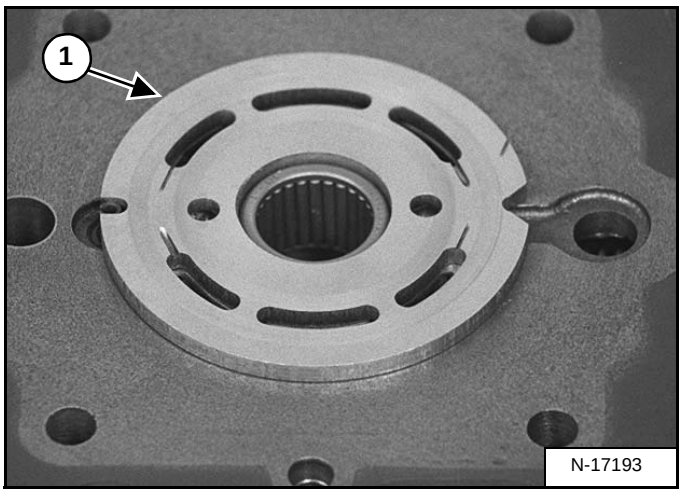
Figure 30-50-11



Remove the pump housing end cap (Item 1) **[Figure 30-50-11]**.

Remove the gasket (Item 2) **[Figure 30-50-11]**.

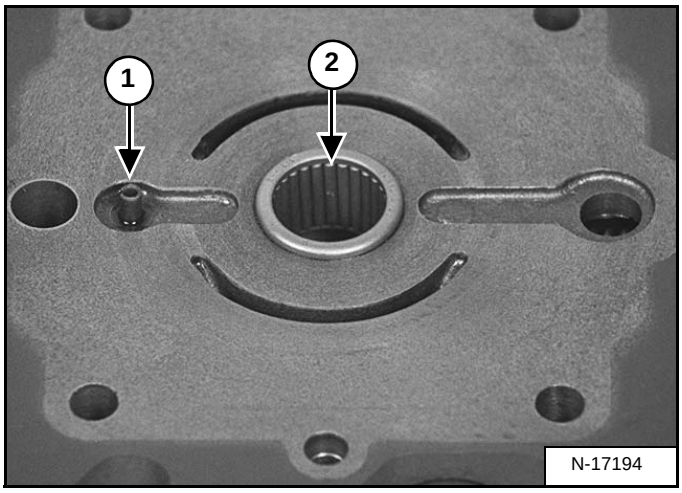
Figure 30-50-12



Remove the valve plate (Item 1) **[Figure 30-50-12]**.

Check the valve plate for wear. (Both Sides.)

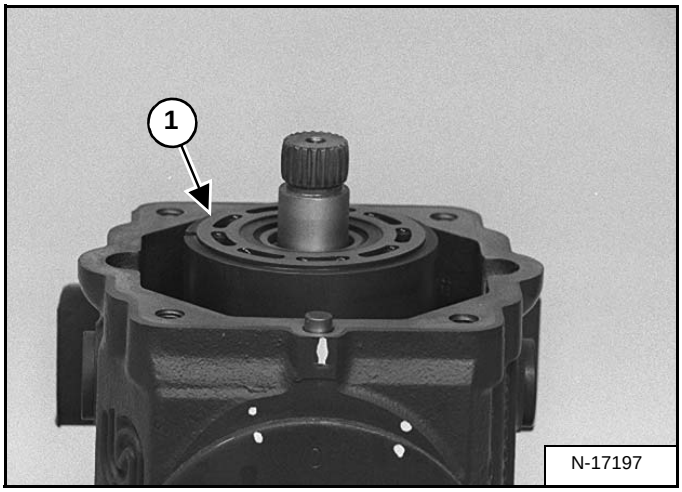
Figure 30-50-13



Check the valve plate locating pin (Item 1) **[Figure 30-50-13]** for wear and replace if needed.

Check the needle bearing (Item 2) **[Figure 30-50-13]** for wear and replace if needed.

Figure 30-50-14

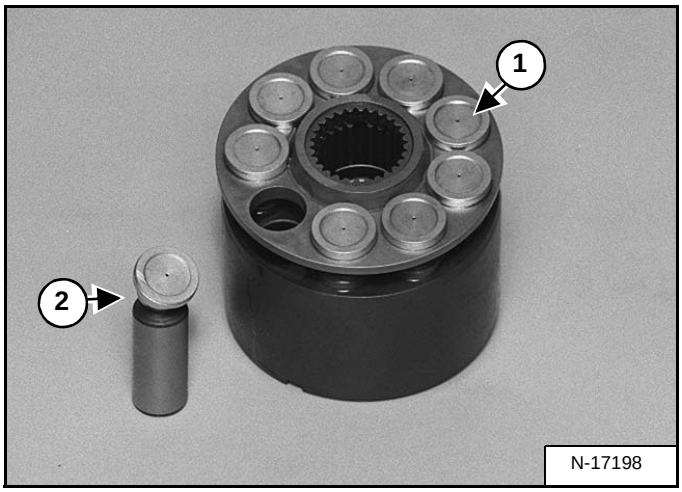


Remove the rotating group (Item 1) **[Figure 30-50-14]** from the pump.

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Disassembly (Cont'd)

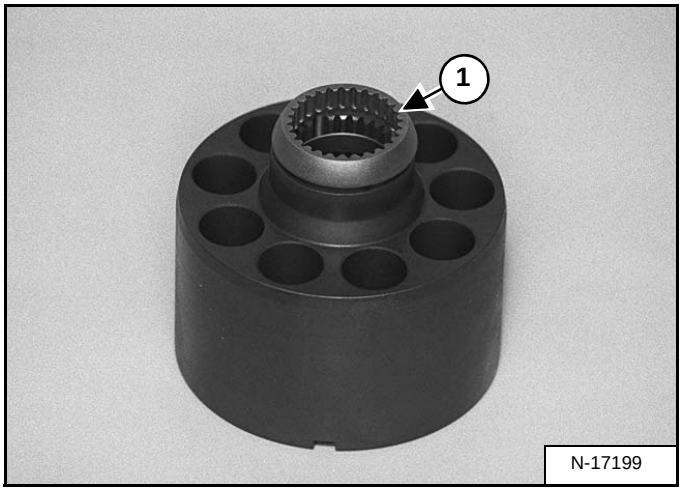
Figure 30-50-15



Remove the slipper guide and pistons (Item 1) **[Figure 30-50-15]** from the cylinder block.

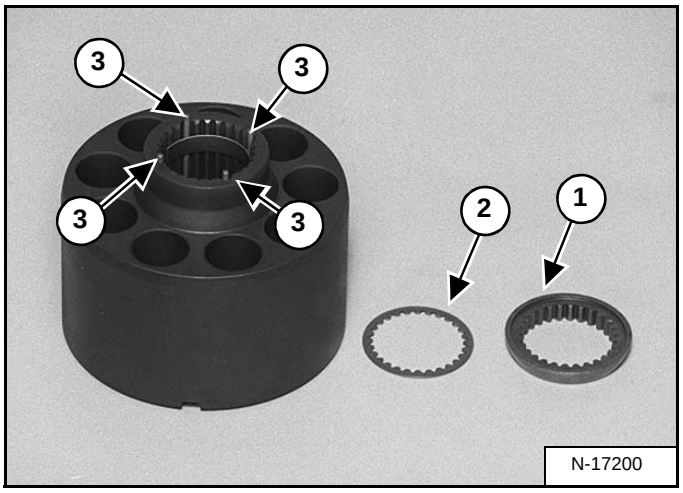
Check all the pistons (Item 2) **[Figure 30-50-15]** for wear and replace the rotating group as needed.

Figure 30-50-16



Remove the ball guide retainer (Item 1) **[Figure 30-50-16]** from the cylinder block.

Figure 30-50-17



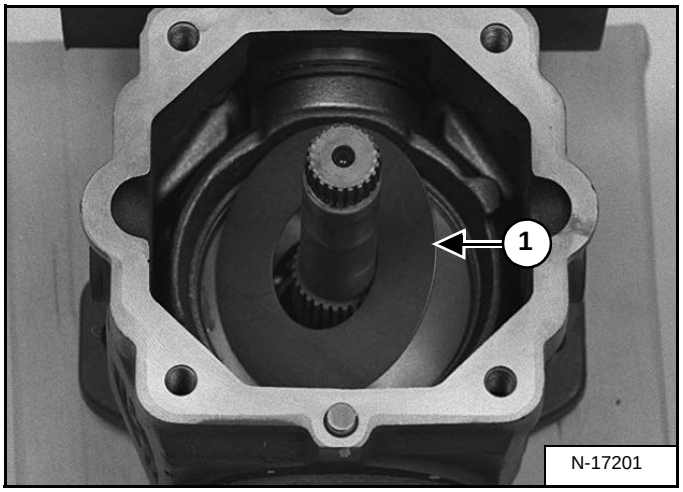
Check the ball guide retainer (Item 1) and washer (Item 2) **[Figure 30-50-17]** for wear and replace as needed.

Remove the four pins (Item 3) **[Figure 30-50-17]** from the cylinder block.

Check the cylinder block for wear and replace as needed.

Check pins (Item 3) **[Figure 30-50-17]** to see if they are all the same length.

Figure 30-50-18

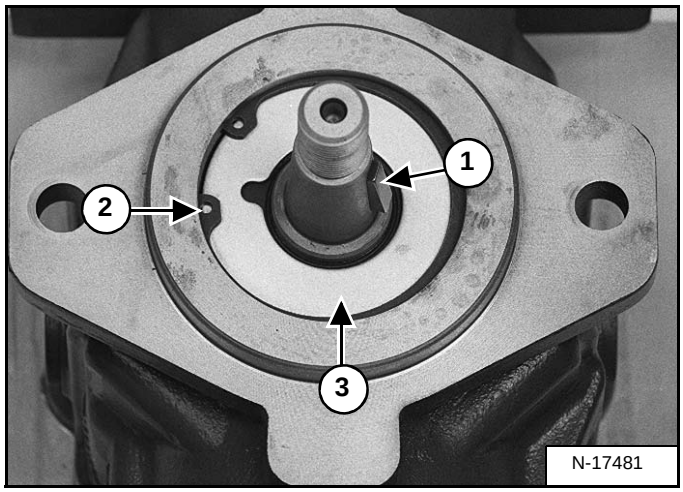


Remove the thrust plate (Item 1) **[Figure 30-50-18]** from the pump housing.

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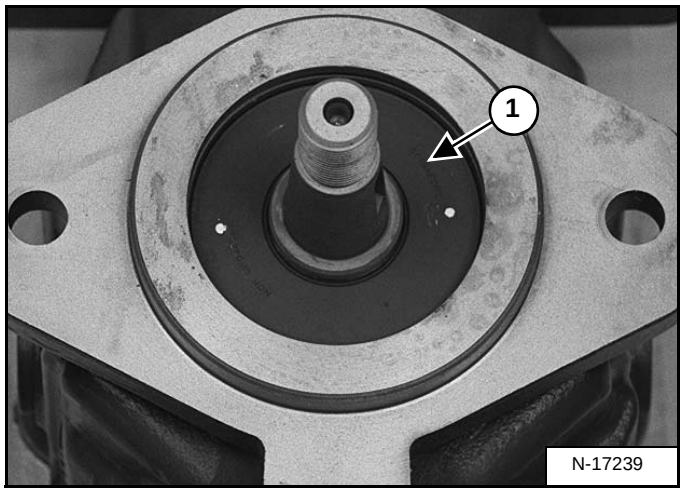
Disassembly (Cont'd)

Figure 30-50-19



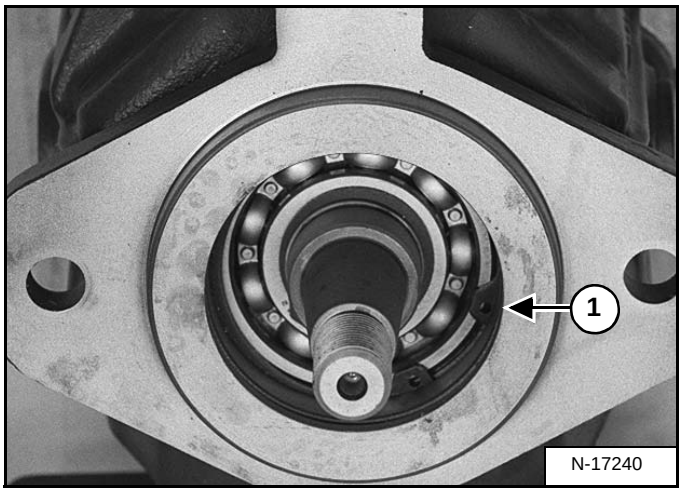
Remove the driveshaft key (Item 1) the snap ring (Item 2) and the support washer (Item 3) **[Figure 30-50-19]** from the drive shaft end of the pump.

Figure 30-50-20



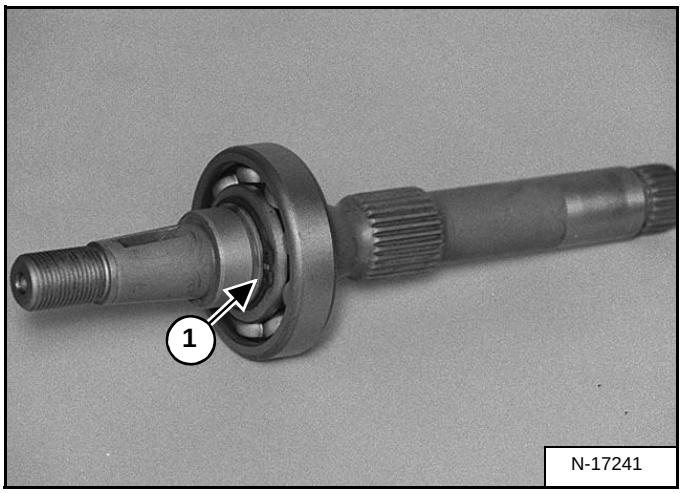
Use a seal puller and remove the seal (Item 1) **[Figure 30-50-20]** from the pump housing.

Figure 30-50-21



Remove the snap ring (Item 1) **[Figure 30-50-21]** from the pump housing and remove the driveshaft and bearing from the housing.

Figure 30-50-22



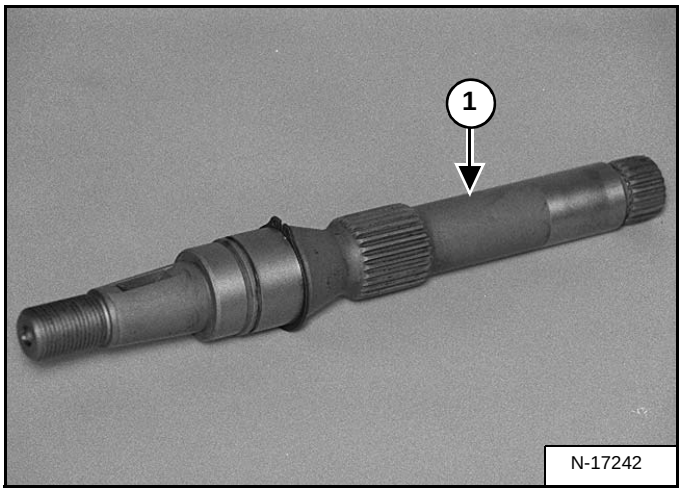
Remove the snap ring (Item 1) **[Figure 30-50-22]** from the driveshaft and remove the bearing.

Check the bearing for wear and replace if worn.

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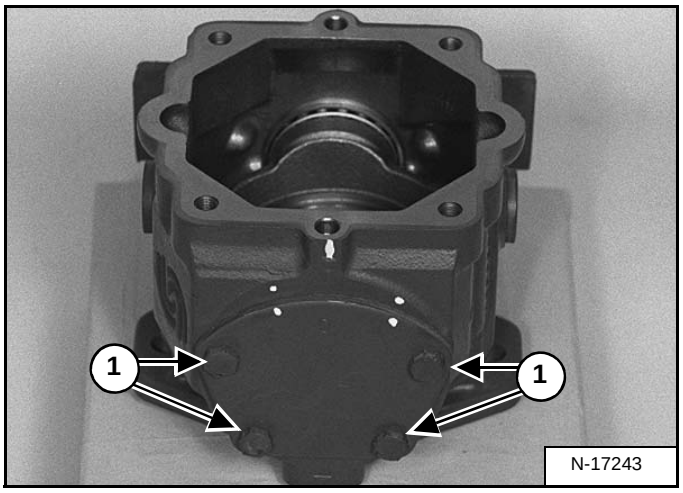
Disassembly (Cont'd)

Figure 30-50-23



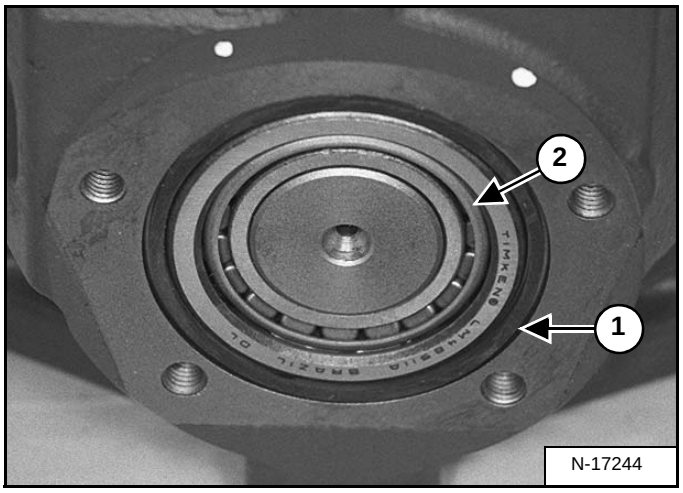
Check the pump shaft (Item 1) **[Figure 30-50-23]** for wear and replace if needed.

Figure 30-50-24



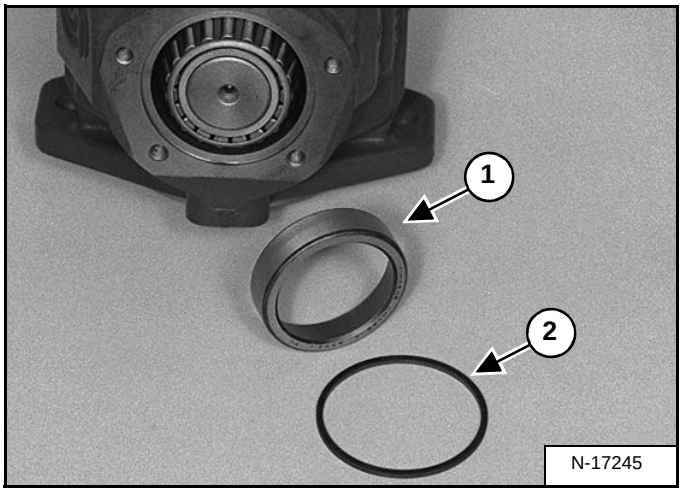
Remove the four mount bolts (Item 1) **[Figure 30-50-24]** from the lower trunnion cover. Remove the cover.

Figure 30-50-25



Remove the O-ring (Item 1) and bearing race (Item 2) **[Figure 30-50-25]** from the pump housing.

Figure 30-50-26

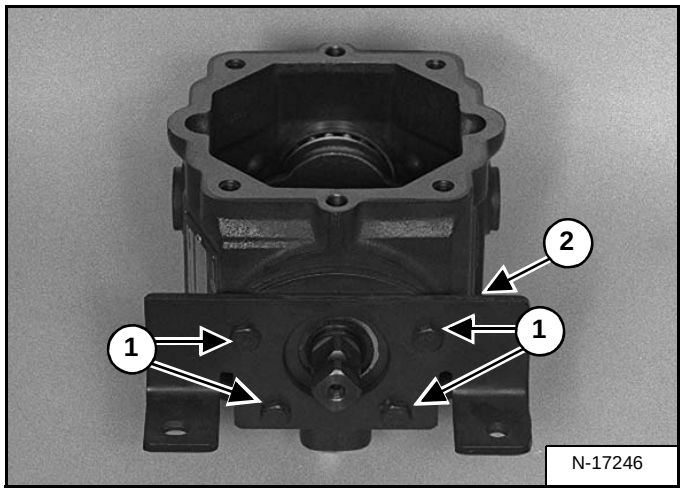


Check the bearing race (Item 1) and O-ring (Item 2) **[Figure 30-50-26]** for wear and replace as needed.

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Disassembly (Cont'd)

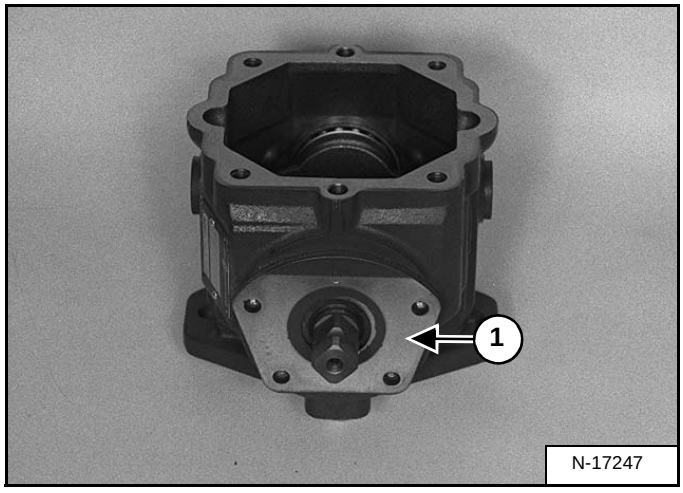
Figure 30-50-27



Inspect the dust seal on the pintle shaft.

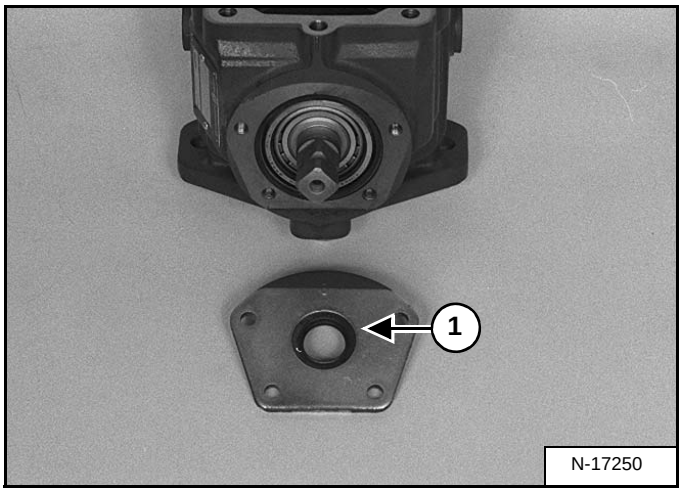
Remove the four mount bolts (Item 1) from the pump housing and remove the linkage bracket (Item 2) **[Figure 30-50-27]**.

Figure 30-50-28



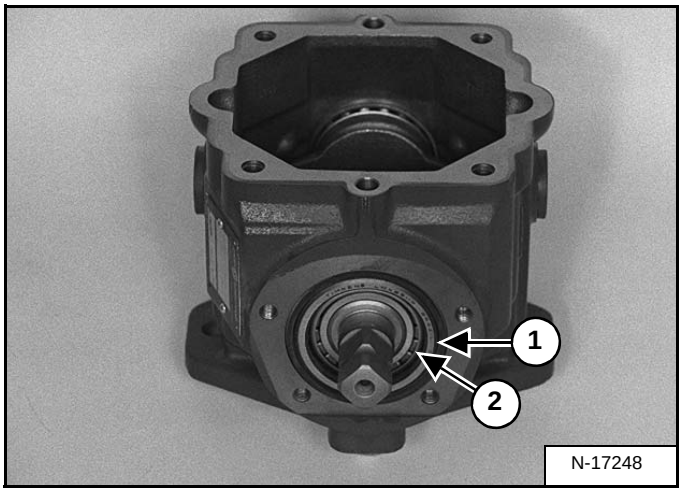
Remove the upper trunnion cover (Item 1) **[Figure 30-50-28]**.

Figure 30-50-29



Inspect the seal (Item 1) **[Figure 30-50-29]** in the upper trunnion cover and replace if needed.

Figure 30-50-30

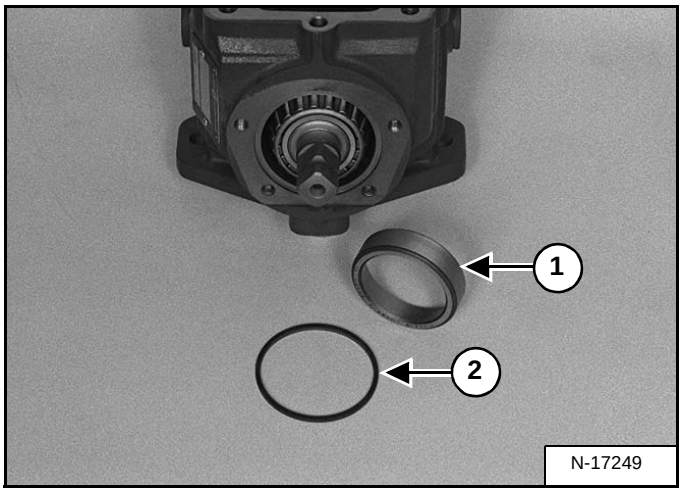


Remove the O-ring (Item 1) and bearing race (Item 2) **[Figure 30-50-30]** from the pump housing.

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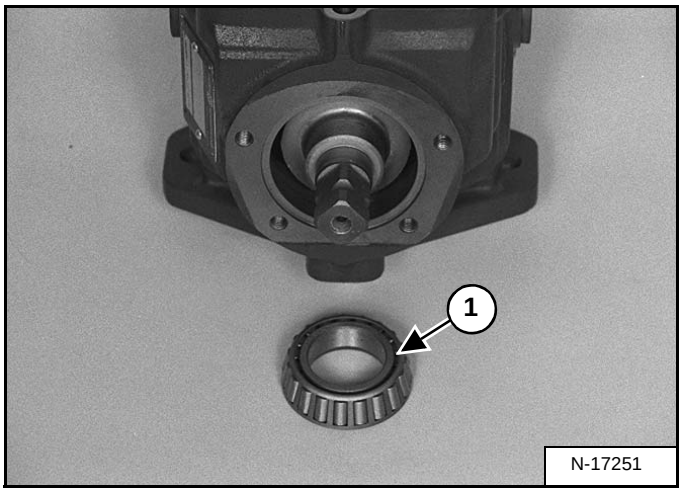
Disassembly (Cont'd)

Figure 30-50-31



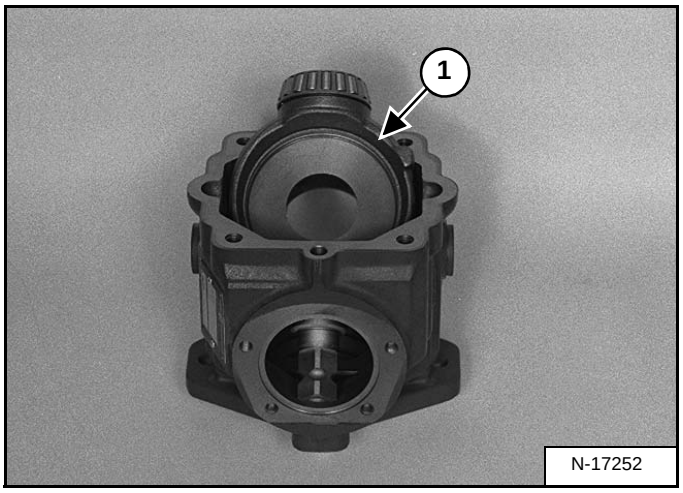
Inspect the bearing race (Item 1) and O-ring (Item 2) **[Figure 30-50-31]** and replace as needed.

Figure 30-50-32



Slide the swash plate from side to side and remove the tapered roller bearing (Item 1) **[Figure 30-50-32]** from the swash plate shaft.

Figure 30-50-33

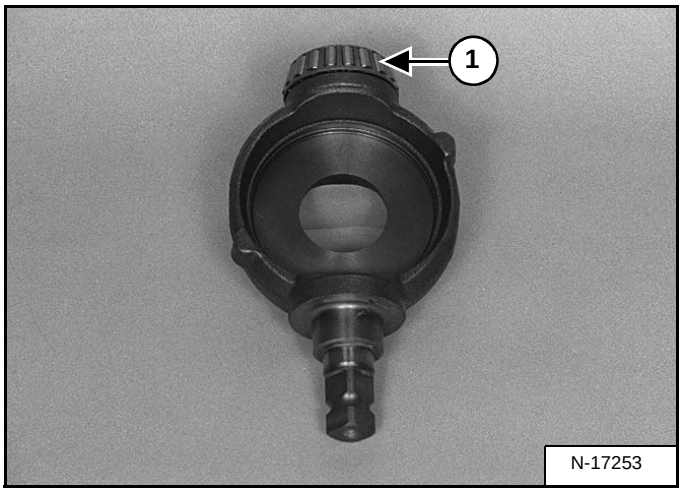


Tilt the swash plate (Item 1) **[Figure 30-50-33]** and remove the swash plate and lower bearing from the pump housing.

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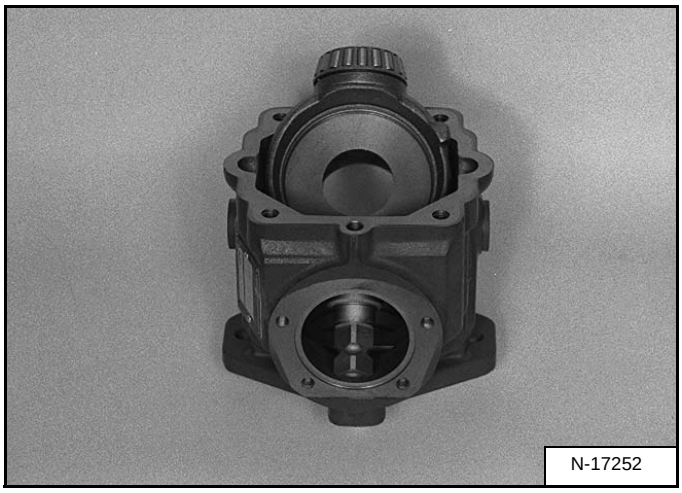
Assembly

Figure 30-50-34



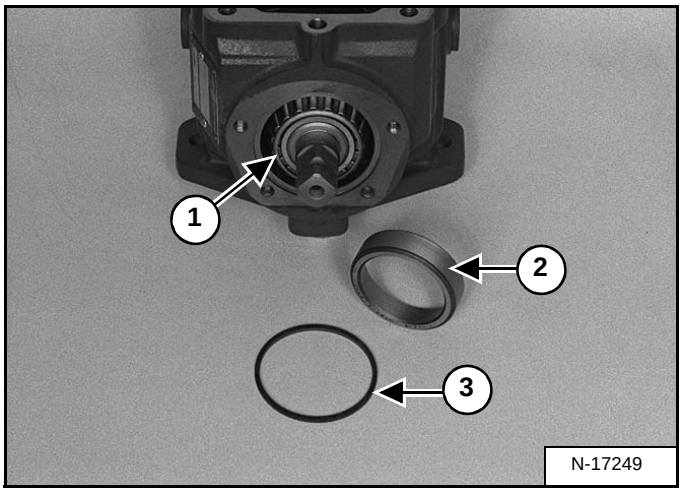
Install the lower bearing (Item 1) **[Figure 30-50-34]** on the swash plate.

Figure 30-50-35



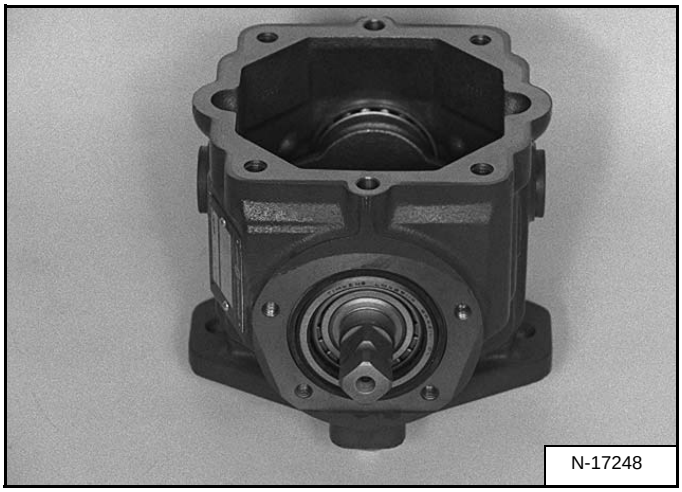
Install the swash plate and bearing into the pump housing **[Figure 30-50-35]**.

Figure 30-50-36



Install the tapered bearing (Item 1) **[Figure 30-50-36]** on the swash plate shaft.

Figure 30-50-37

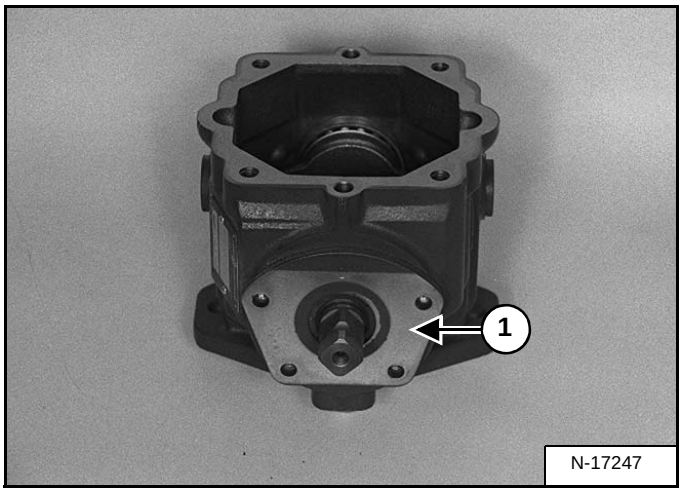


Install the bearing race (Item 2) **[Figure 30-50-36]** and O-ring (Item 3) **[Figure 30-50-36]** as shown in **[Figure 30-50-37]**.

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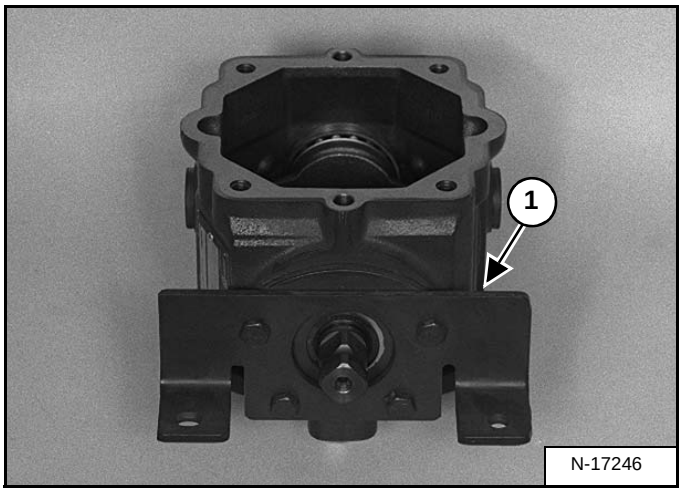
Assembly (Cont'd)

Figure 30-50-38



Install the upper trunnion seal (Item 1) **[Figure 30-50-38]** and cover.

Figure 30-50-39



Install the linkage bracket (Item 1) **[Figure 30-50-39]** and the four mounting bolts and tighten to 24 - 30 N•m (18 - 22 ft-lb) torque.

Install the dust seals onto the pintle shafts

Figure 30-50-40

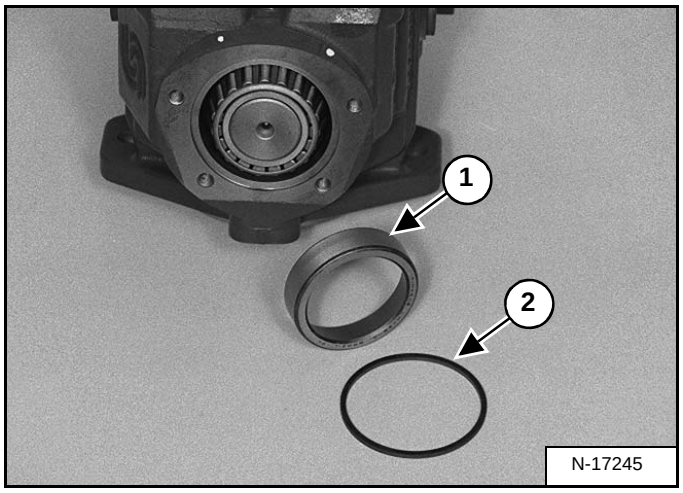
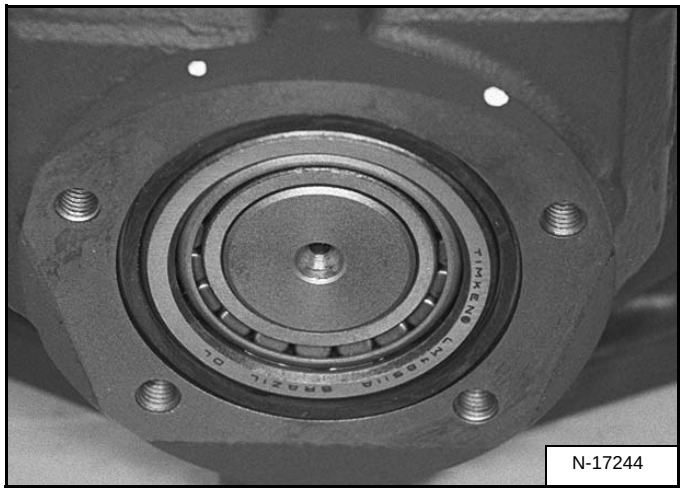


Figure 30-50-41

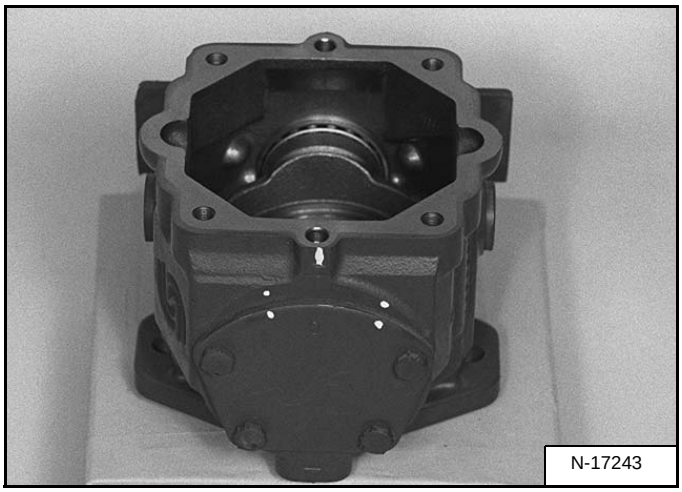


Install the bearing race (Item 1) **[Figure 30-50-40]** and O-ring (Item 2) **[Figure 30-50-40]** at the lower trunnion as shown in **[Figure 30-50-41]**.

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Assembly (Cont'd)

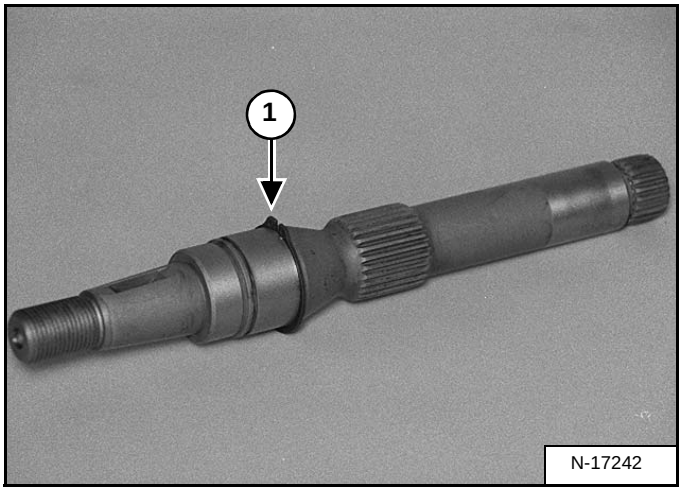
Figure 30-50-42



Align the marks on the lower trunnion cover and pump housing as shown in **[Figure 30-50-42]**.

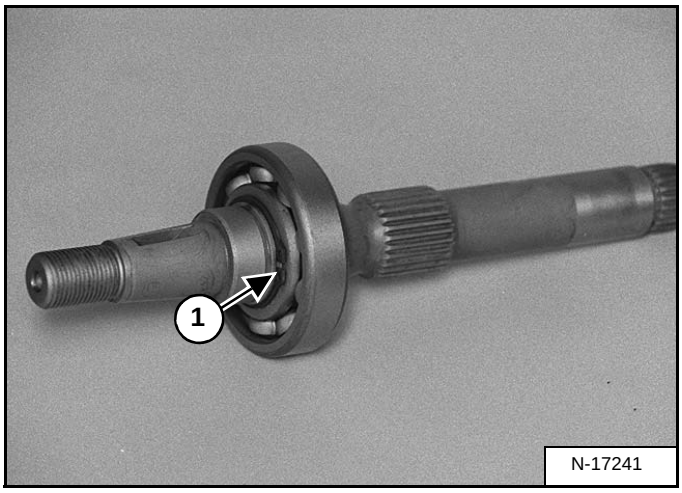
Install the four mounting bolts and tighten to 24 - 30 N•m (18 - 22 ft-lb) torque.

Figure 30-50-43



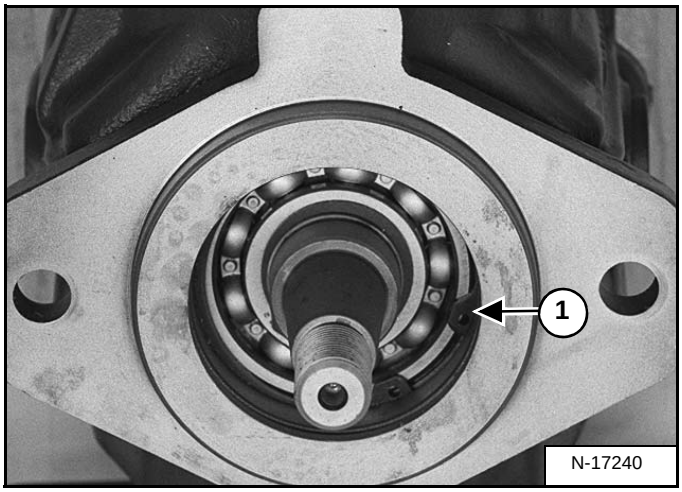
Install the snap ring (Item 1) **[Figure 30-50-43]** on the pump shaft.

Figure 30-50-44



Install the bearing and snap ring (Item 1) **[Figure 30-50-44]** on the pump shaft.

Figure 30-50-45



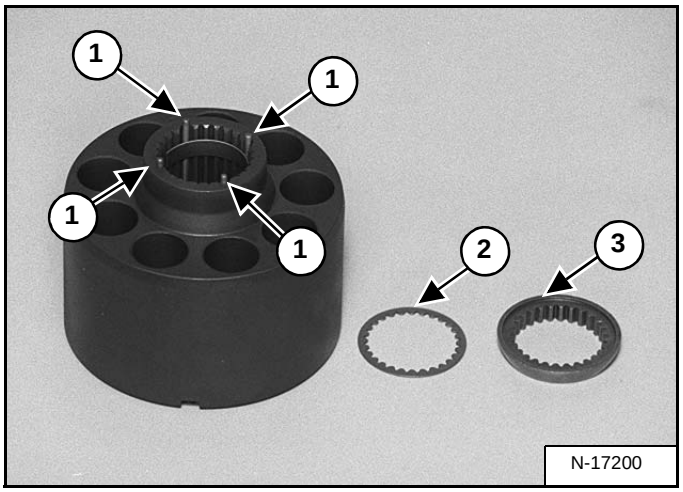
Install the pump shaft into the pump housing **[Figure 30-50-45]**.

Install the snap ring (Item 1) **[Figure 30-50-45]**.

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Assembly (Cont'd)

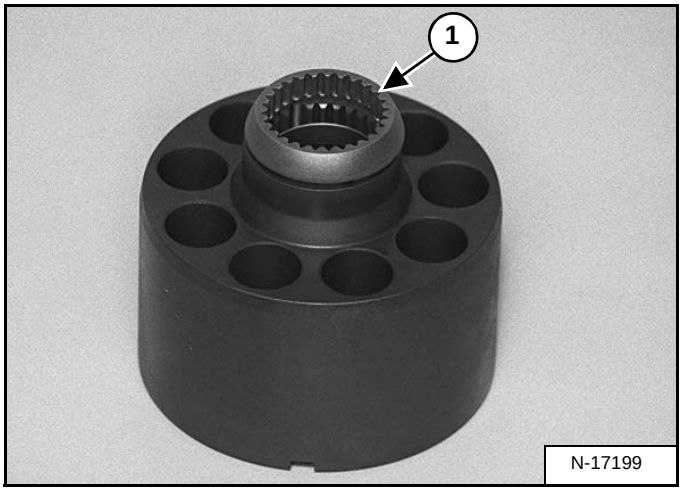
Figure 30-50-46



Install the four slipper pins (Item 1) **[Figure 30-50-46]** into the cylinder block.

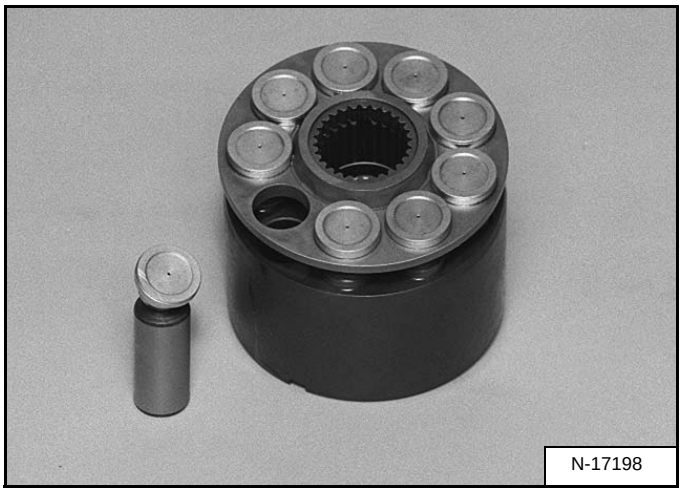
Apply a small amount of grease to the washer (Item 2) and install into the ball guide retainer (Item 3) **[Figure 30-50-46]**.

Figure 30-50-47



Install the ball guide retainer and washer (Item 1) **[Figure 30-50-47]** onto the slipper holddown pins.

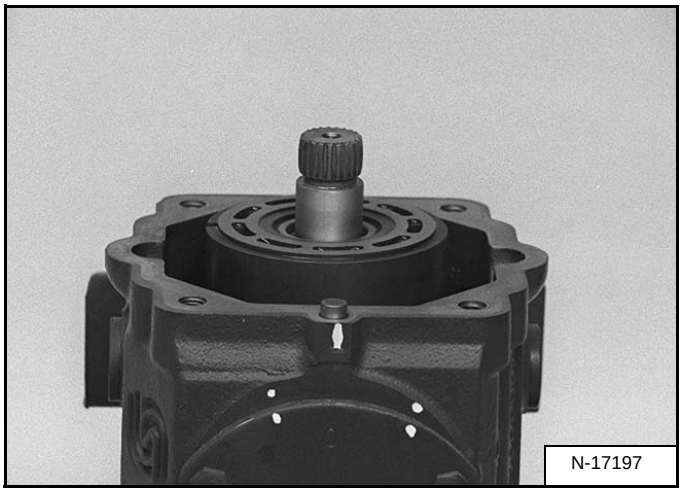
Figure 30-50-48



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 30-50-48]**.

Lay the pump housing on its side and install the cylinder block, piston assembly into the housing.

Figure 30-50-49

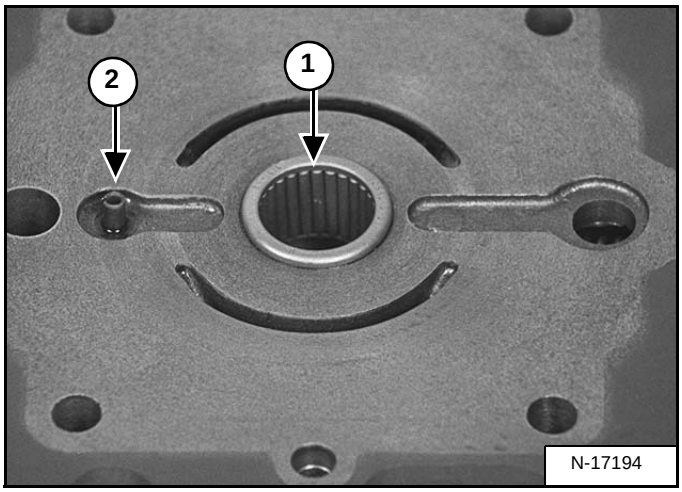


Place the pump on a work surface with the end cap opening up **[Figure 30-50-49]**.

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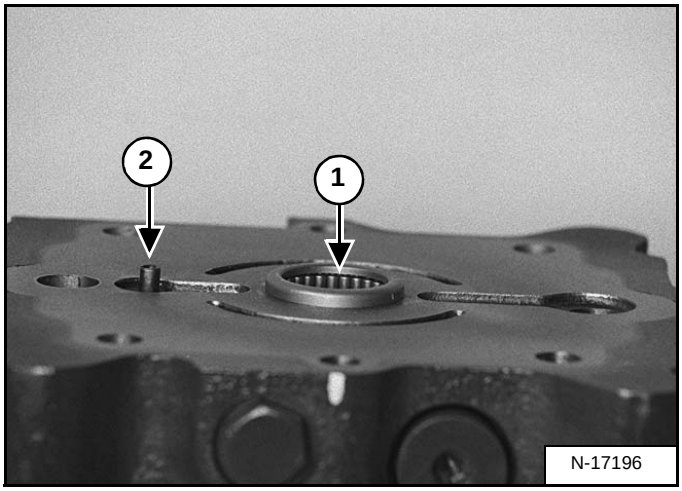
Assembly (Cont'd)

Figure 30-50-50



Replace the needle bearing (Item 1) and valve plate locating pin (Item 2) **[Figure 30-50-50]** in the charge pump.

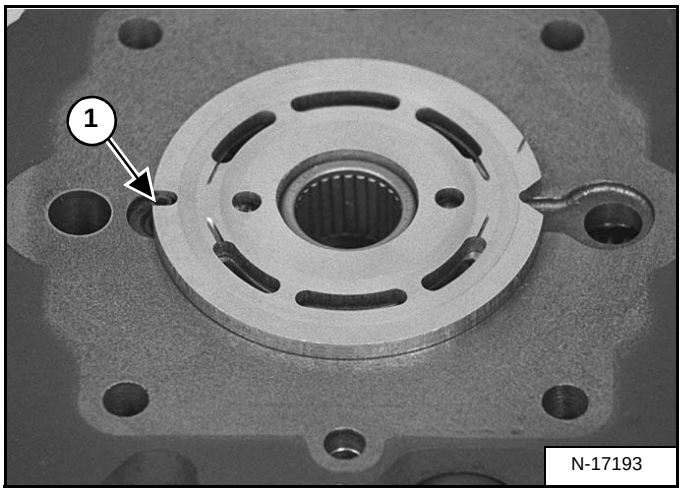
Figure 30-50-51



The bearing cage (Item 1) **[Figure 30-50-51]** will protrude from 2,0 - 2,5 mm (0.08 - 0.10 in) from the surface of the charge pump.

The valve plate locating spring pin (Item 2) **[Figure 30-50-51]** will protrude from 4,19 - 4,70 mm (0.165 - 0.185 in) from the surface of the charge pump.

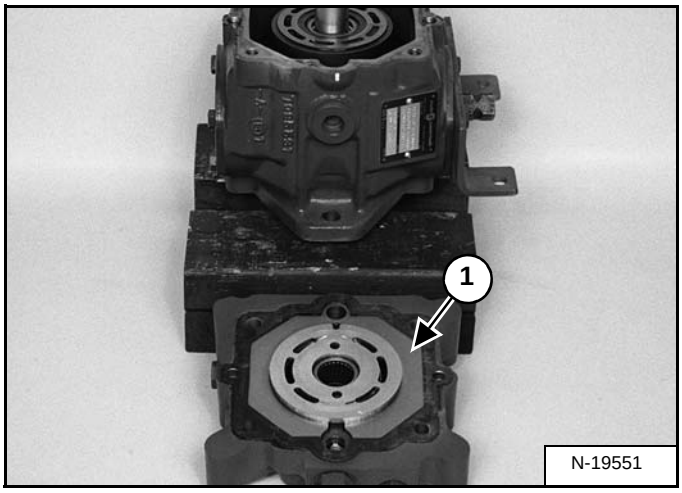
Figure 30-50-52



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 30-50-52]**.

The notch (Item 1) **[Figure 30-50-52]** on the valve plate must engage the locating pin.

Figure 30-50-53

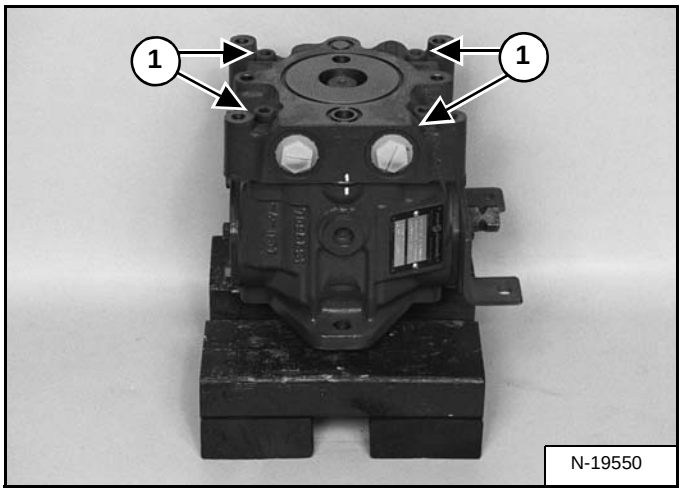


Coat a new end cap gasket (Item 1) **[Figure 30-50-53]** with petroleum jelly and install onto the end cap.

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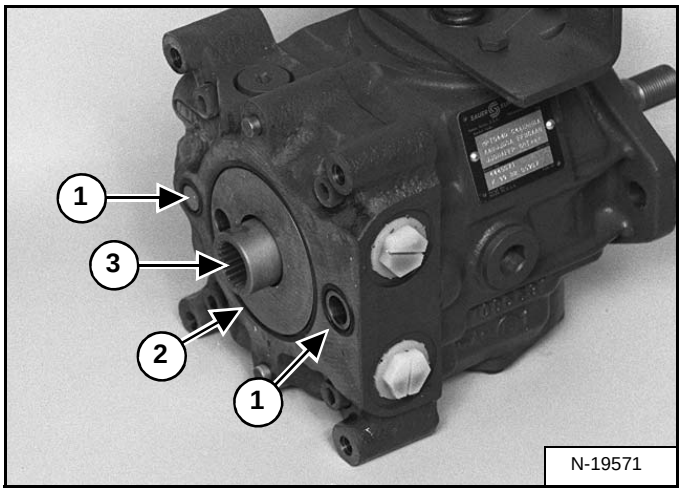
Assembly (Cont'd)

Figure 30-50-54



Install the valve plate and end cap on the pump housing. Tighten the bolts (Item 1) **[Figure 30-50-54]** to 47 - 61 N•m (35 - 45 ft-lb) torque.

Figure 30-50-55

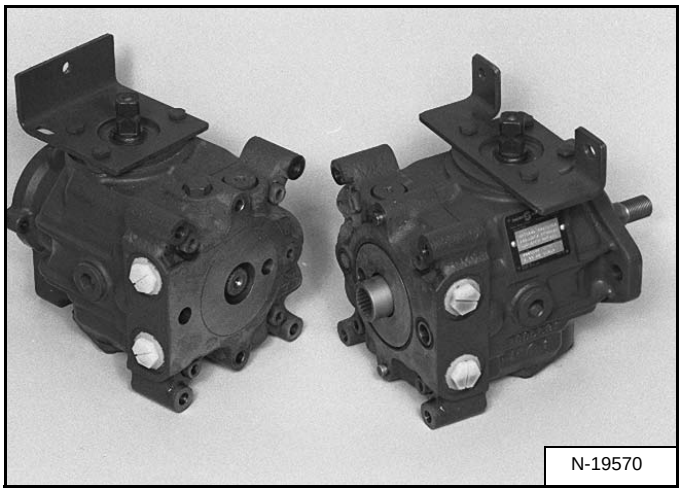


Install the two small O-rings (Item 1) **[Figure 30-50-55]**.

Install the large new O-ring (Item 2) **[Figure 30-50-55]**.

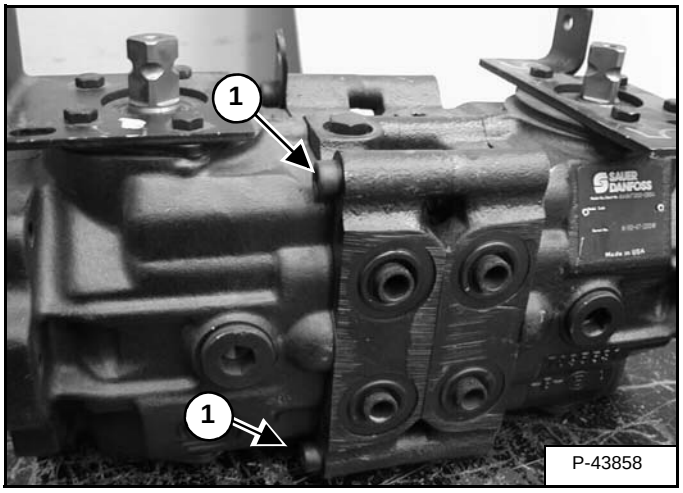
Install the pump coupler (Item 3) **[Figure 30-50-55]**.

Figure 30-50-56



Install the two pumps together **[Figure 30-50-56]**.

Figure 30-50-57



Tighten the four bolts (Item 1) **[Figure 30-50-57]** to 47 - 61 N•m (35 - 45 ft-lb) torque.

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HYDROSTATIC PUMP (SJC)

Description

The SJC hydrostatic pump is a fully proportional dual piston pump in one pump casing. The endcaps are removable to gain access to the rotating assemblies.

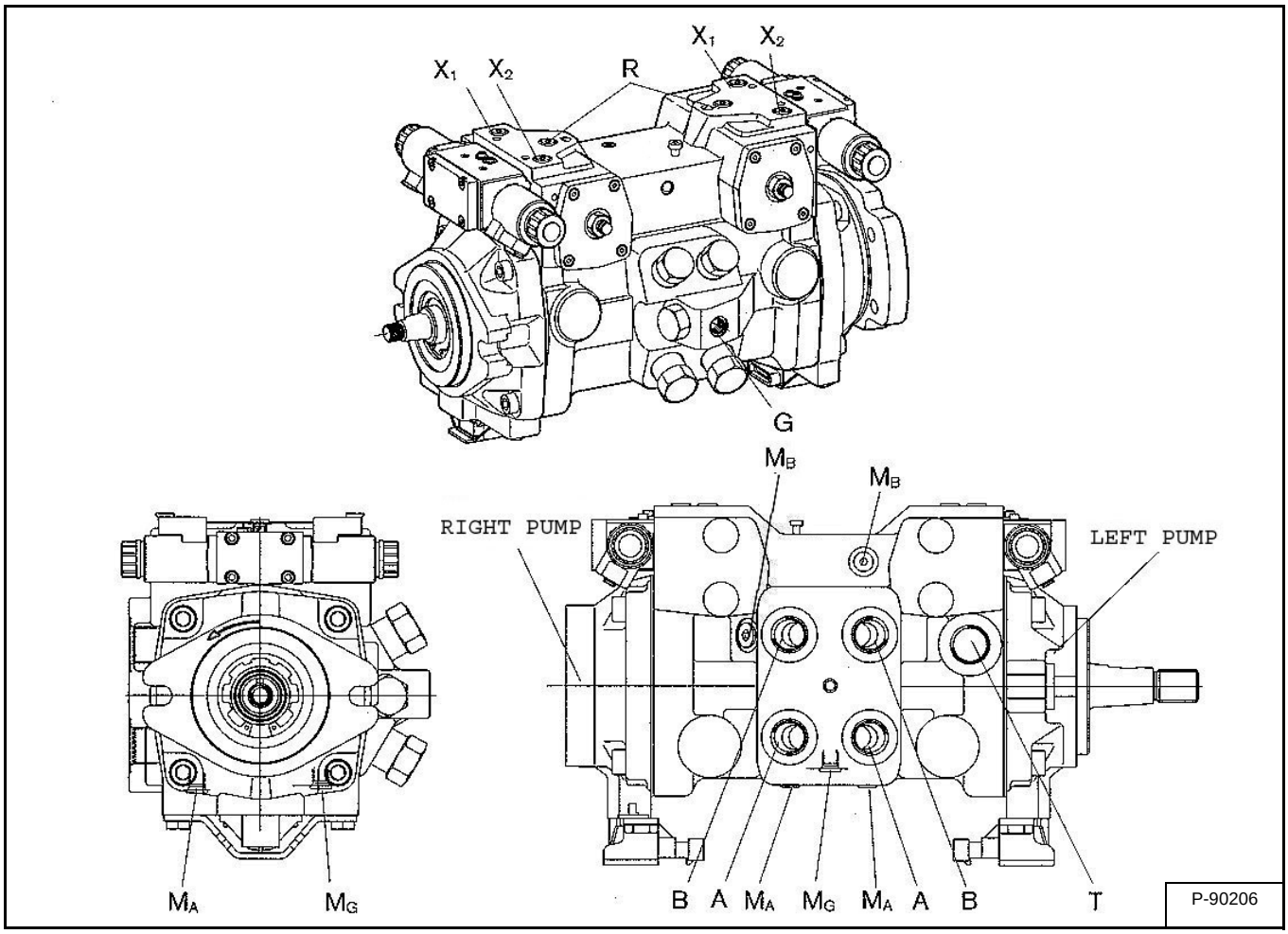
The hydraulic controllers are fed charge pressure from an external charge pump. 12 volt electrical solenoids shift a spool in the hydraulic controller that directs flow to a servo piston.

The servo piston strokes the swash plate in the rotating group. The rotating group generates flow to the A or B ports on the hydrostatic pump. The flow from the A and B ports is sent to the hydrostatic drive motors where forward or reverse drive motor rotation is obtained.

There are swash plate angle sensors on the bottom of the pump that monitor swash plate movement.

Ports are labeled on the hydrostatic pump casting.

Figure 30-51-1



A,B Service Line Ports (High Pressure Outlet Ports to Drive Motors)

T_1 Case Drain Port

M_A Operating Pressure of “A” Port

M_B Operating Pressure of “B” Port

R Air Bleed Port

X_1,X_2 Control Pressure Gauge Port

G Charge Pressure Inlet Port

M_G Gauge Port For Charge Pressure

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Hydraulic Controller Removal And Installation

The loader's right hand side hydraulic controller can be removed with the hydrostatic pump still in the loader. The loader's left hand side hydraulic controller can only be removed when the hydrostatic pump is separated from the engine / hydrostatic pump cast mount.

Controller solenoids can be bled of trapped air in the controller. This should be performed when hydraulic controllers are replaced, removed or uncommanded oscillations in the controls are present.

Raise the lift arms and install an approved lift arm support device. (See Installing on Page 10-20-1.)

Place the loader on jackstands. (See Procedure on Page 10-10-1.)

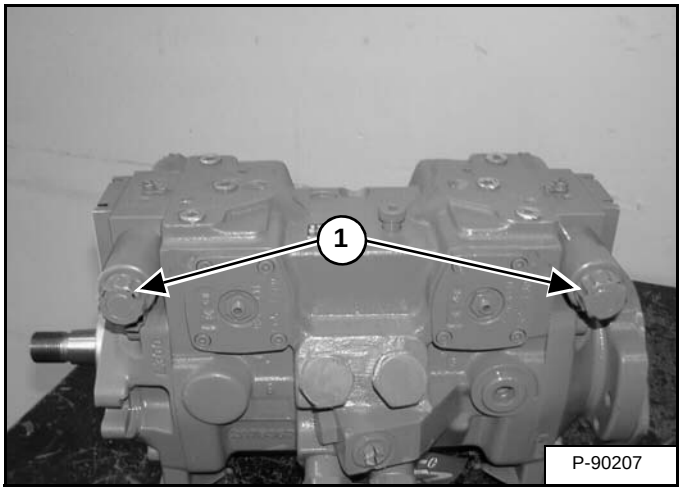
⚠ WARNING

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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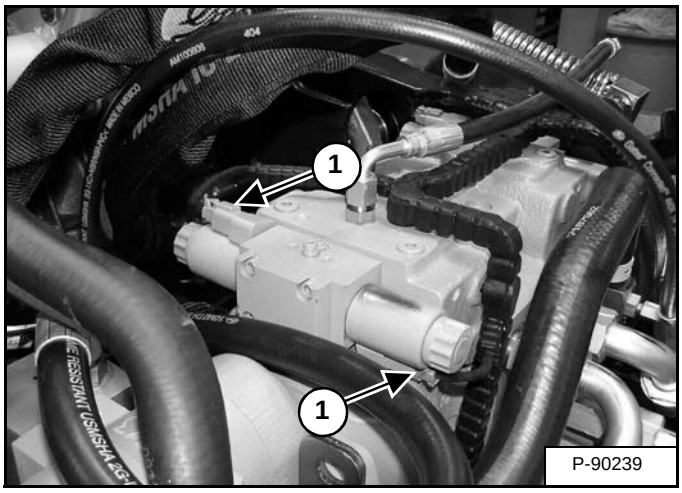
Raise the operator cab. (See Raising on Page 10-30-2.)

Figure 30-51-2



Locate the two hydraulic controllers (Item 1) **[Figure 30-51-2]** on the hydrostatic pumps.

Figure 30-51-3



Disconnect the electrical harness connectors (Item 1) **[Figure 30-51-3]** from both sides of the hydrostatic pump.

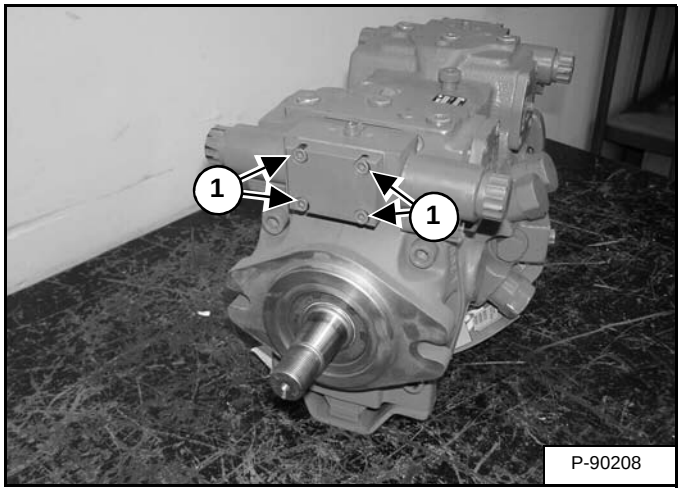
Removal:

IMPORTANT

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

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Figure 30-51-4

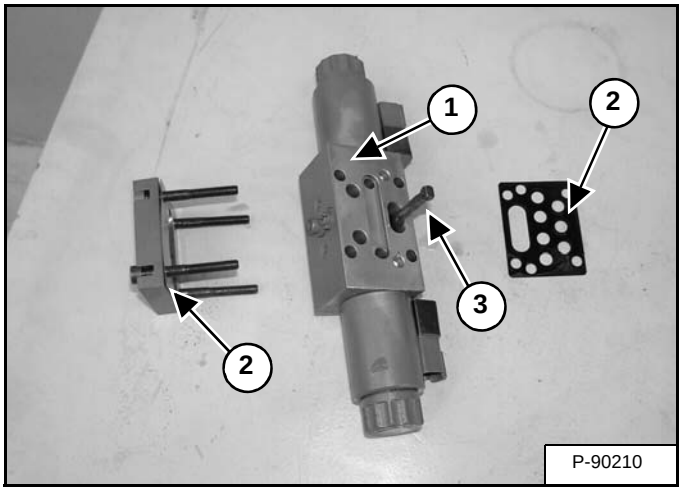


Remove the four mount bolts (Item 1) **[Figure 30-51-4]** from the hydraulic controller.

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Hydraulic Controller Removal And Installation (Cont'd)

Figure 30-51-5

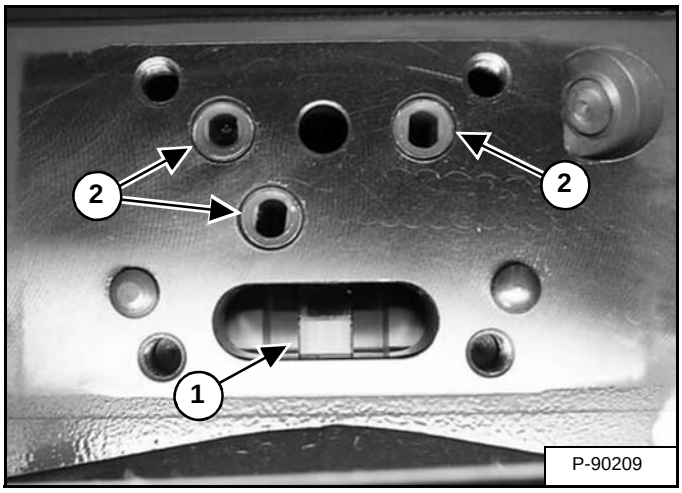


Remove the controller (Item 1) **[Figure 30-51-5]** from the pump.

Remove the controller gaskets (Item 2) **[Figure 30-51-5]** from the pump.

Installation:

Figure 30-51-6

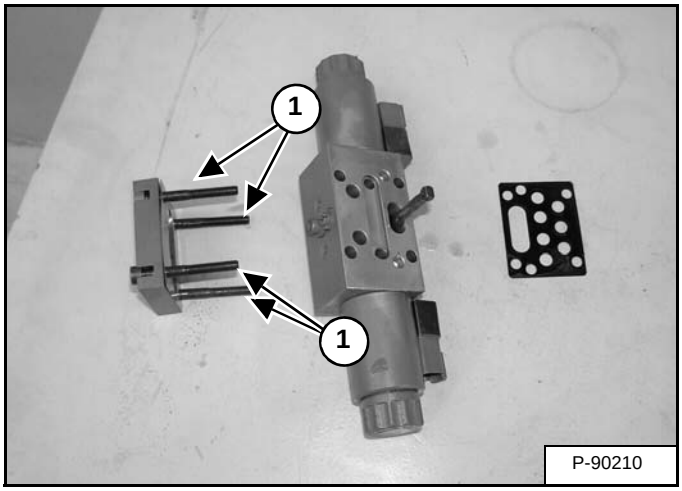


NOTE: Do NOT remove the three screens (Item 2) [Figure 30-51-6] they will be damaged during removal and must be replaced.

Be sure the feedback lever (Item 3) **[Figure 30-51-5]** is in the center of the servo piston groove (Item 1) **[Figure 30-51-6]**.

Use a small amount of grease on a new gasket and install the gasket on the hydraulic controller (Item 1) **[Figure 30-51-5]**.

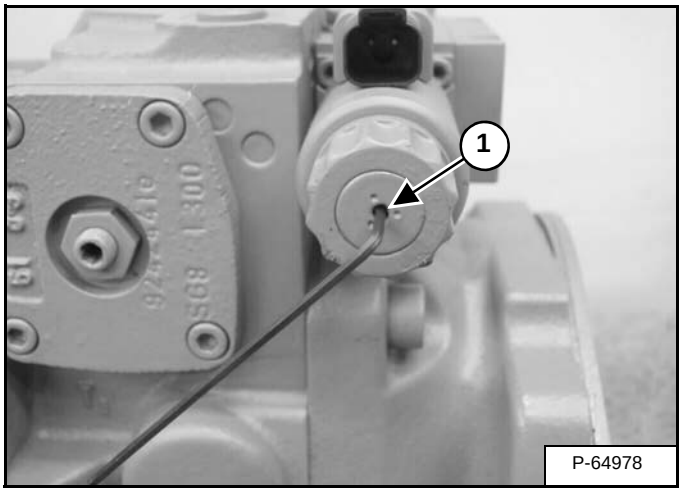
Figure 30-51-7



Alternately tighten bolts (Item 1) **[Figure 30-51-7]** to 10,4 N•m (7.7 ft-lb) torque. Ensure bolts are tightened to specifications.

NOTE: When a hydraulic controller is replaced, the hydrostatic pumps must be calibrated. (See Hydraulic Controller Neutral Adjustment on Page 30-51-26.)

Figure 30-51-8



With the engine running and the loader on jack stands: Bleed the trapped air in the controller by loosening the small set screw (Item 1) **[Figure 30-51-8]** a maximum of 2 turns. Leave the screw loose until oil comes dripping out of the set screw. Tighten set screw to 2 N•m (18 in-lb) torque.

Repeat the bleed procedure for all the solenoids.

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Removal And Installation

Remove the hydrostatic pump / engine assembly from the loader. (See Engine Removal And Installation on Page 70-10-7.)

Remove the Hydraulic Pump. (See Removal And Installation on Page 20-60-6.)

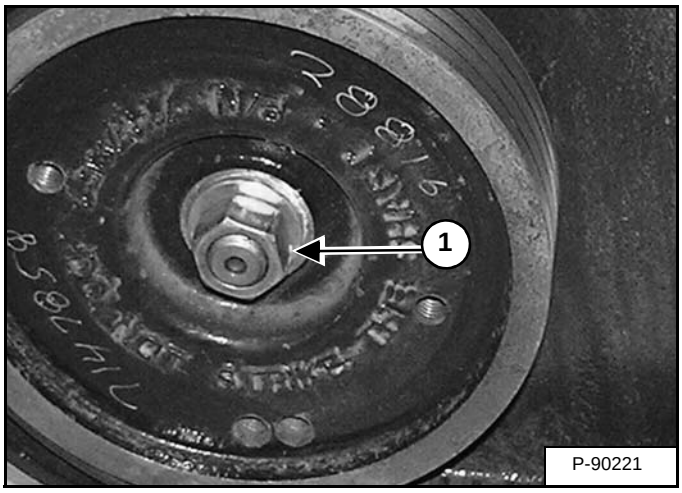
Remove the Drive Belt. (See DRIVE BELT on Page 30-60-1.)

IMPORTANT

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

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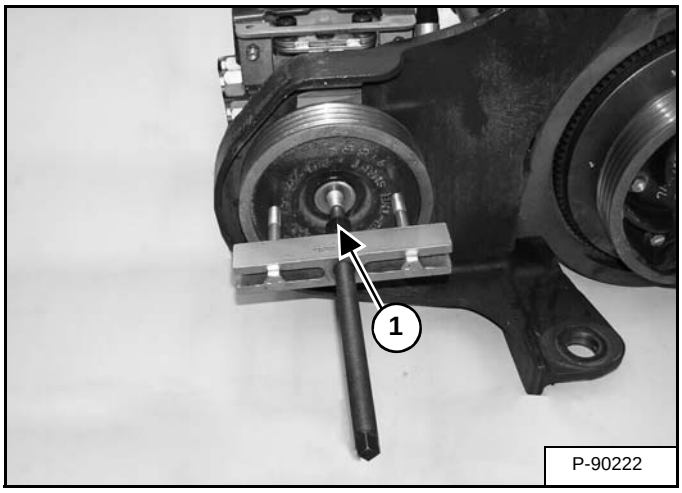
Figure 30-51-9



Loosen the nut (Item 1) **[Figure 30-51-9]** on the hydrostatic pump drive shaft.

Installation: Tighten the nut to 258 - 325 N•m (190 - 240 ft-lb) torque

Figure 30-51-10



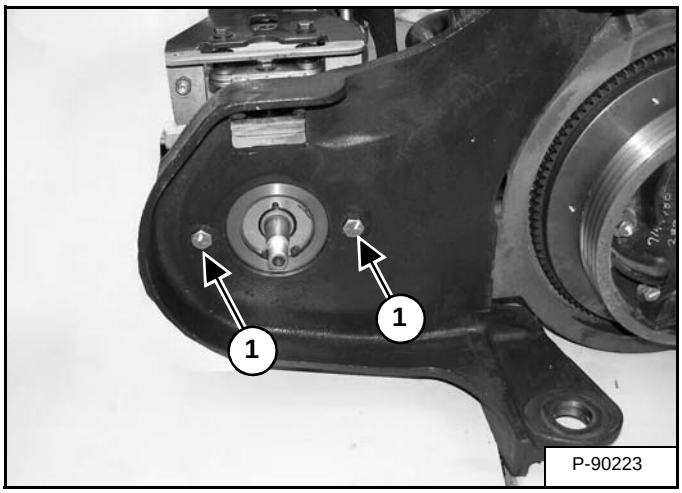
Use a puller (Item 1) **[Figure 30-51-10]** to loosen the pulley from the pump drive shaft.

NOTE: DO NOT strike puller or pump shaft with a hammer. Internal pump damage may result.

Remove the nut and washer from the pump drive shaft.

Remove the pump pulley from the pump drive shaft.

Figure 30-51-11



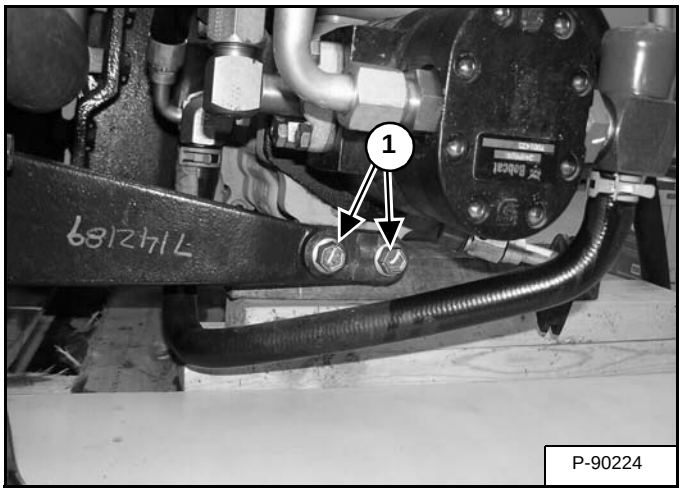
Remove the two mounting bolts and nuts (Item 1) **[Figure 30-51-11]**.

Installation: Tighten the mounting bolts and nuts to 88 - 95 N•m (65 - 70 ft-lb) torque.

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Removal And Installation (Cont'd)

Figure 30-51-12



Remove the two mounting bolts (Item 1) **[Figure 30-51-12]** at the hydraulic pump mounting bracket.

Installation: Tighten mounting bolt to 125 - 135 N•m (90 - 100 ft-lb)

Remove the hydrostatic pump from the mounting bracket and drive belt housing.

BEFORE START UP: Fill the hydrostatic pump with hydraulic oil. This will remove trapped air in the hydrostatic pumps before start up. (See Hydrostatic Pump Start Up on Page 30-51-6.)

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Hydrostatic Pump Start Up

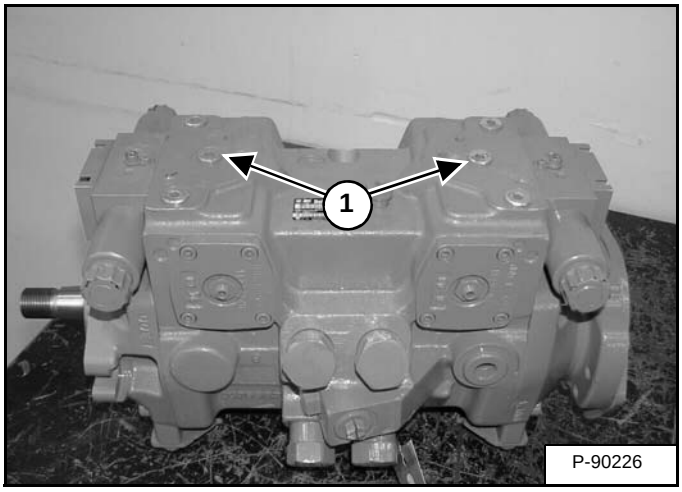
Before putting a hydrostatic pump back into operation, the hydrostatic pump should be filled with hydrostatic fluid. This should be performed when installing a new hydrostatic pump or a pump that has been disassembled.

Starting a hydrostatic pump dry may cause premature wear or permanent pump damage.

Under normal operation, the charge pump will keep the hydrostatic pumps filled.

Filling the hydrostatic pump is best done by removing a plug at the top of the hydrostatic pump. A clean funnel should be used to avoid washing contaminants into the hydrostatic pump. The goal is to fill the hydrostatic pump as much as possible before start up.

Figure 30-51-13



Remove the air bleed plugs (Item 1) **[Figure 30-51-13]**.

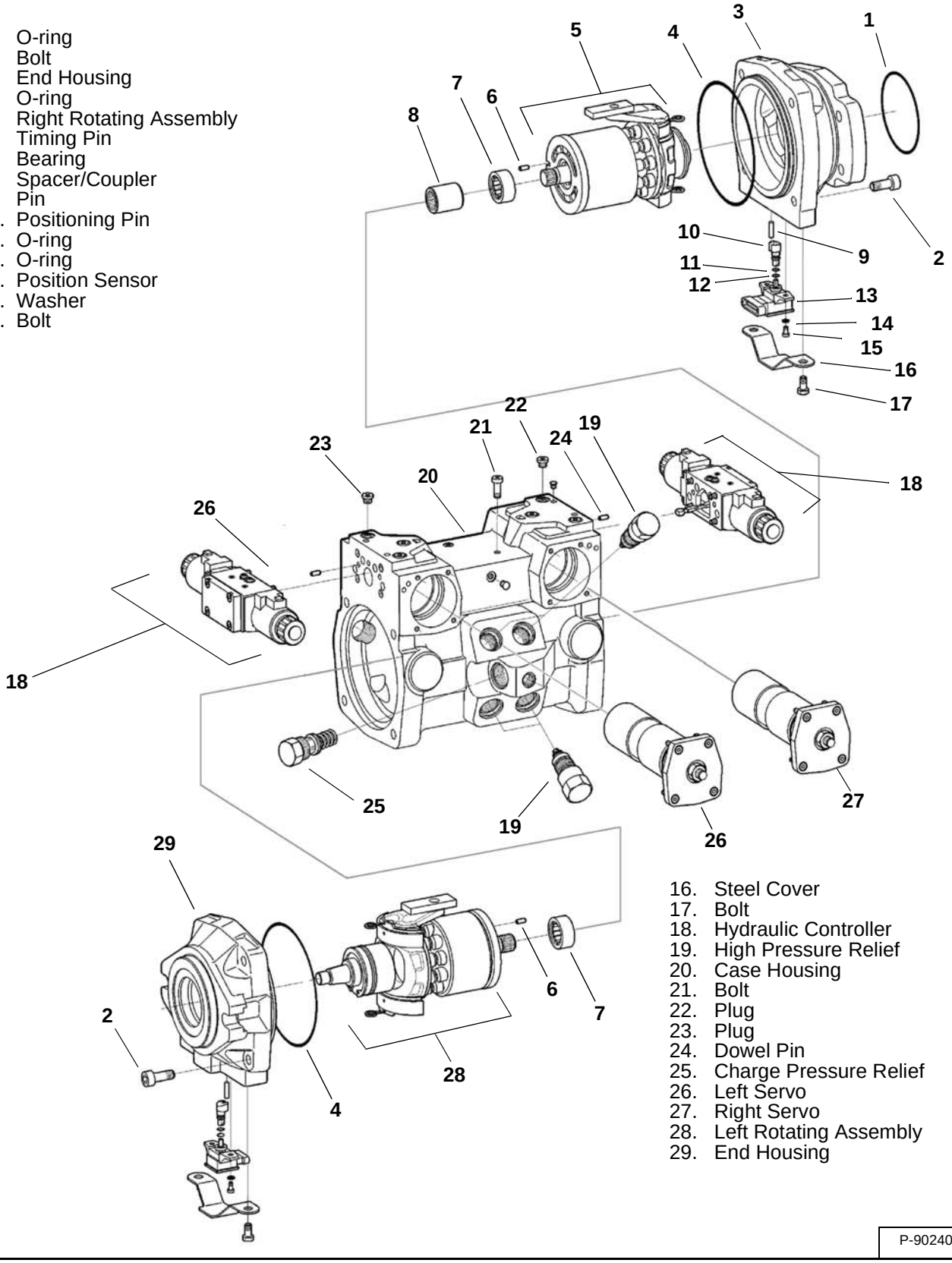
BEFORE START UP: Fill one of the air bleed ports with new hydraulic oil until the hydraulic oil flows out of the other air bleed port. This will remove trapped air in the hydrostatic pumps before start up.

Assembly: Tighten plugs to 25 N•m (18 ft-lb) torque.

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Parts Identification

1. O-ring
2. Bolt
3. End Housing
4. O-ring
5. Right Rotating Assembly
6. Timing Pin
7. Bearing
8. Spacer/Coupler
9. Pin
10. Positioning Pin
11. O-ring
12. O-ring
13. Position Sensor
14. Washer
15. Bolt



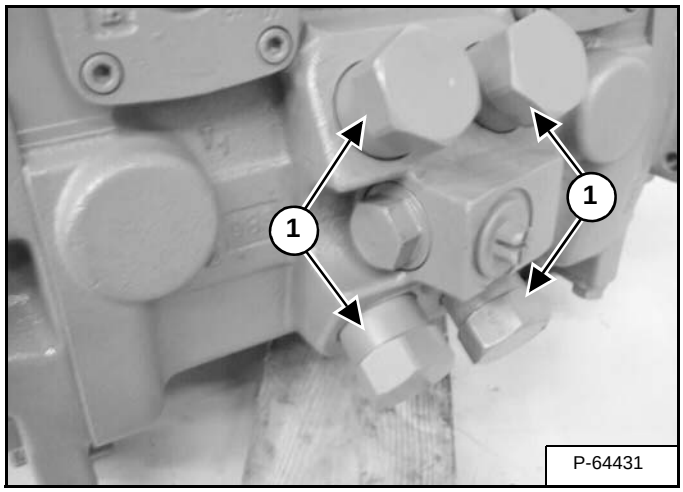
16. Steel Cover
17. Bolt
18. Hydraulic Controller
19. High Pressure Relief
20. Case Housing
21. Bolt
22. Plug
23. Plug
24. Dowel Pin
25. Charge Pressure Relief
26. Left Servo
27. Right Servo
28. Left Rotating Assembly
29. End Housing

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High Pressure Relief And Bypass Valve

Figure 30-51-14

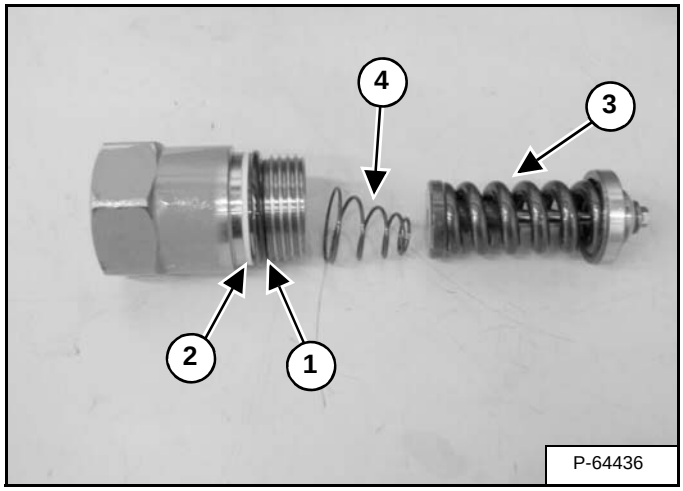


There are four system check relief valves (Item 1) **[Figure 30-51-14]** in the back of the hydrostatic pump.

Remove the relief valve cap (Item 1) **[Figure 30-51-14]**.

Assembly: Tighten cap to 150 - 170 N•m (111 - 125 ft-lb) torque.

Figure 30-51-15

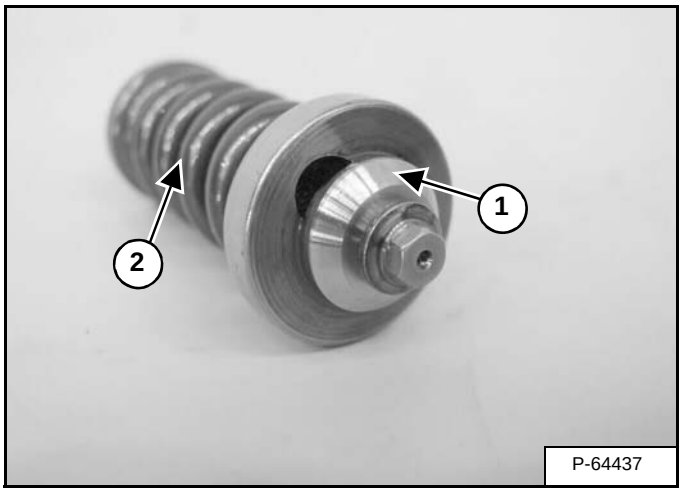


Check the valve cap O-ring (Item 1) and back-up ring (Item 2) **[Figure 30-51-15]**, replace as needed.

Remove relief valve assembly (Item 3) **[Figure 30-51-15]** from the valve cap.

Check the conical spring (Item 4) **[Figure 30-51-15]** to ensure it is not broken or flattened.

Figure 30-51-16



Check the valve seat surface (Item 1) **[Figure 30-51-16]** for scratches and replace as needed.

Inspect the spring (Item 2) **[Figure 30-51-16]** for breakage.

Inspect seats inside case housing.

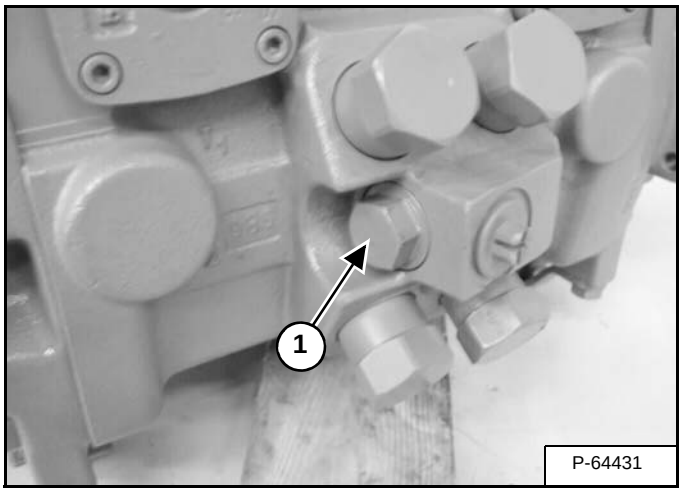
Do not disassemble the relief valve assembly. If replacement is required, replace as an assembly.

Factory setting on the relief valve is 36,2 MPa (362 bar) (5250 PSI).

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Charge Relief Valve

Figure 30-51-17

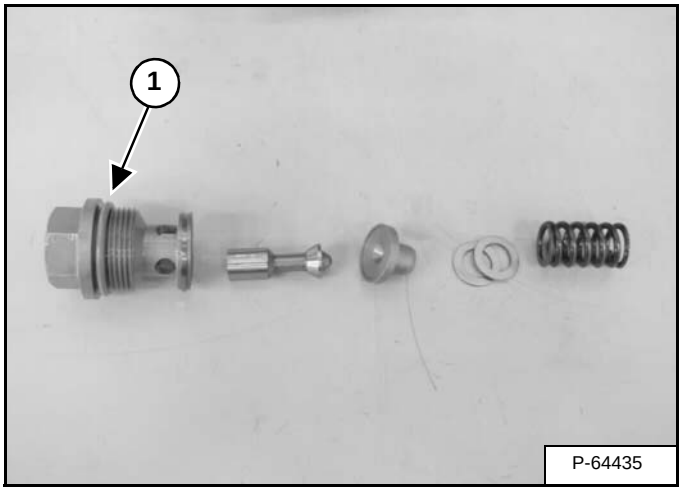


The charge relief valve (Item 1) **[Figure 30-51-17]** is located on the back of the hydrostatic pump.

Remove the charge relief valve.

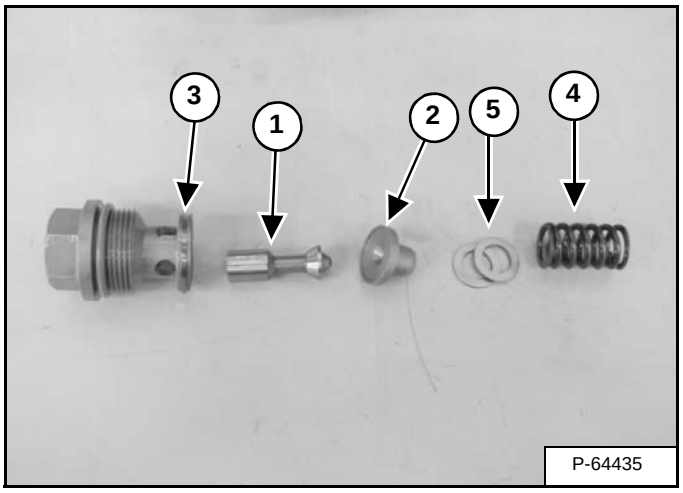
Assembly: Tighten charge relief valve to 70 N•m (52 ft-lb) torque.

Figure 30-51-18



Check and replace the O-ring (Item 1) **[Figure 30-51-18]**.

Figure 30-51-19



Inspect the poppet (Item 1) and the mating seat (Item 2) **[Figure 30-51-19]** for damage or foreign material. Ensure the poppet moves freely in it's bore.

Inspect the sealing ring (Item 3) **[Figure 30-51-19]** and the mating seat in the pump housing for damage or foreign material.

Inspect the spring (Item 4) and the charge relief valve shims (Item 5) **[Figure 30-51-19]**.

NOTE: 1,0 mm shim (Item 5) [Figure 30-51-19] = 296,5 kPa (3 bar) (43.5 psi) in pressure change. Adding shims increases charge pressure. Removing shims decreases charge pressure.

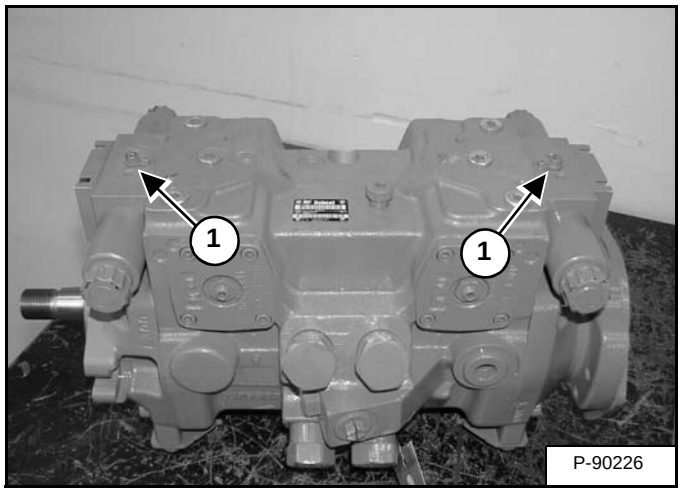
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Disassembly And Assembly

Remove the hydrostatic pump / engine assembly from the loader. (See Engine Removal And Installation on Page 70-10-7.)

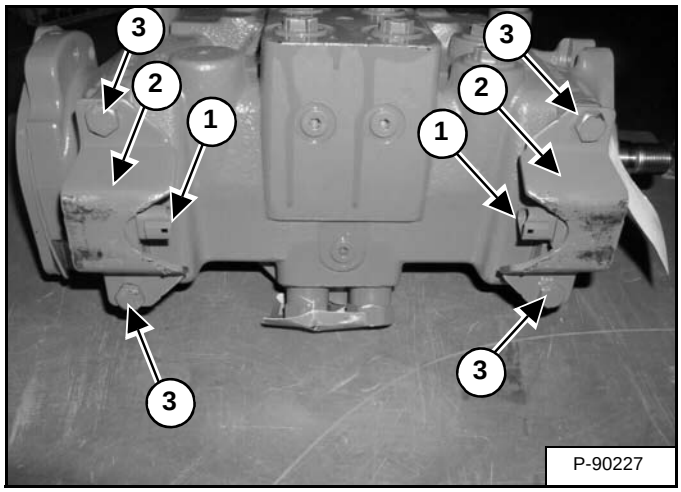
Remove the hydrostatic pump. (See Removal And Installation on Page 30-51-4.)

Figure 30-51-20



Remove the hydraulic controllers (Item 1) **[Figure 30-51-20]**. (See Hydraulic Controller Removal And Installation on Page 30-51-2.)

Figure 30-51-21



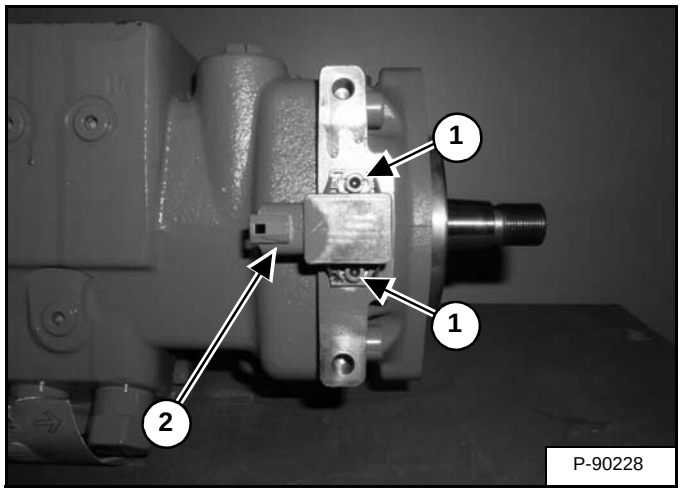
Swash plate angle sensors (Item 1) are mounted on the bottom of the hydrostatic pump. They are protected by steel covers (Item 2) **[Figure 30-51-21]**.

Remove the two bolts (Item 3) and the steel cover (Item 2) **[Figure 30-51-21]** from both sides.

Assembly: Tighten bolts to 51 N•m (38 ft-lb) torque.

Note the connectors facing each other.

Figure 30-51-22



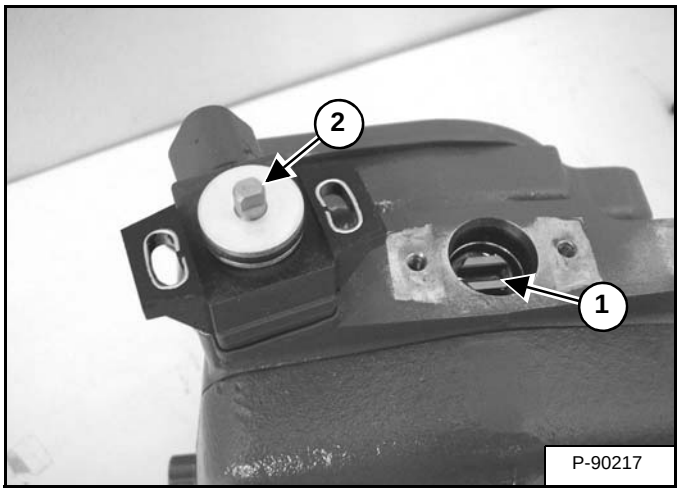
Remove the mounting bolts (Item 1) for the swash plate angle sensor (Item 2) **[Figure 30-51-22]**.

Assembly: Tighten bolts to 3,1 N•m (27.4 in-lb) torque.

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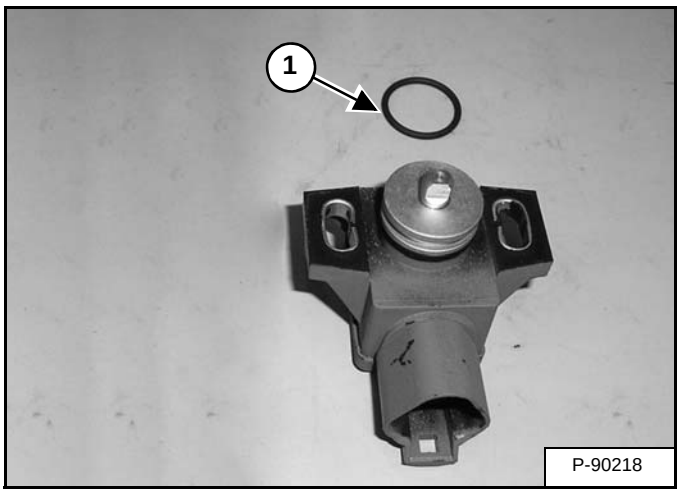
Disassembly And Assembly (Cont'd)

Figure 30-51-23



Assembly: Note the slotted portion (Item 1) of the positioning pin tightly fits the machined section on the swash plate angle sensor shaft (Item 2) **[Figure 30-51-23]**.

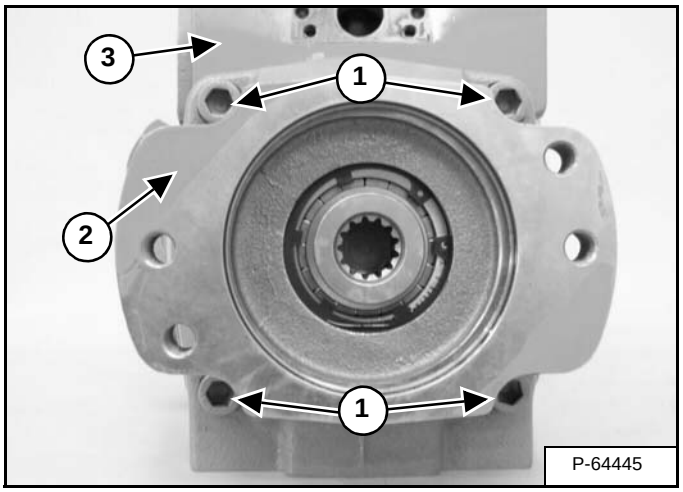
Figure 30-51-24



Check and replace the O-ring (Item 1) **[Figure 30-51-24]**.

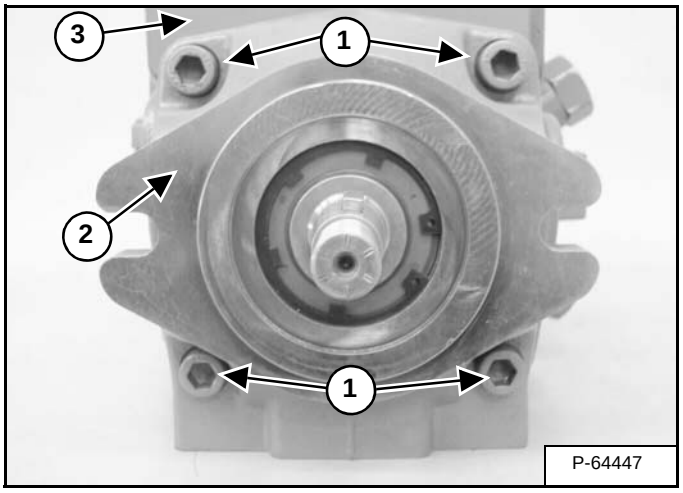
Right End Housing

Figure 30-51-25



Left End Housing

Figure 30-51-26



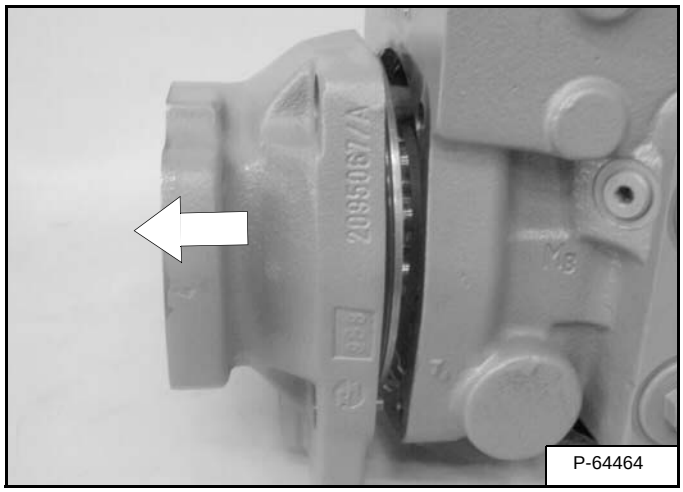
Remove the four mount bolts (Item 1) securing the end housing (Item 2) to the main case housing (Item 3) **[Figure 30-51-25]** and **[Figure 30-51-26]**.

Assembly: Alternately, tighten mount bolts to 130 N•m (96 ft-lb) torque.

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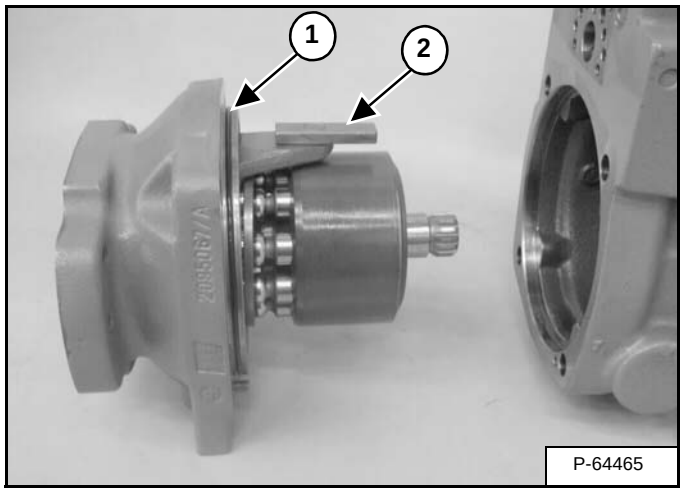
Disassembly And Assembly (Cont'd)

Figure 30-51-27



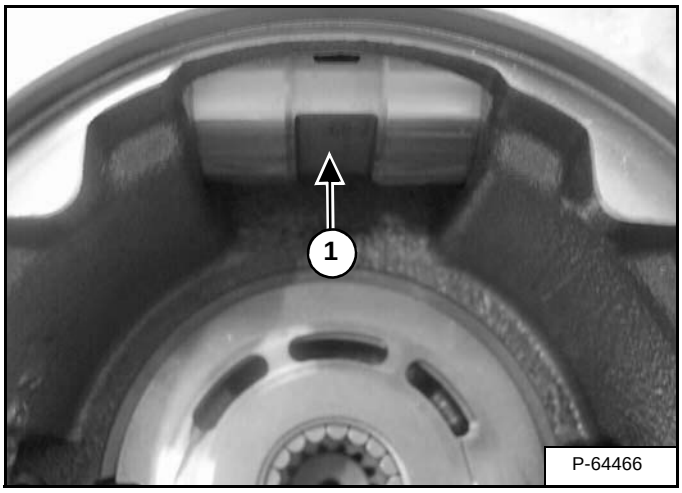
Pull the end housings from the case housing **[Figure 30-51-27]**.

Figure 30-51-28



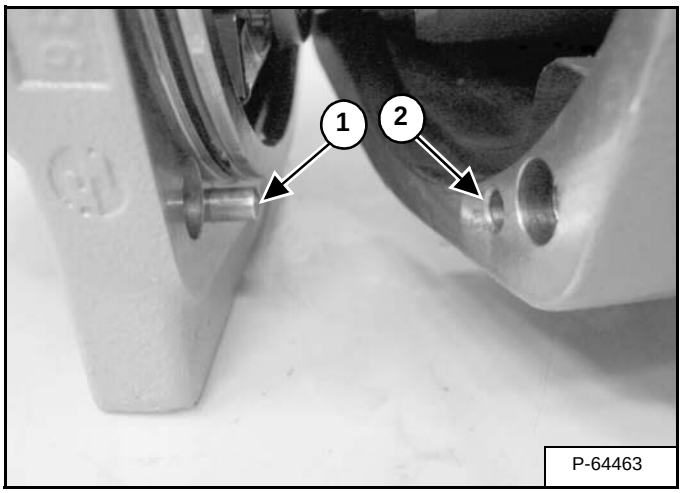
Replace O-ring (Item 1) **[Figure 30-51-28]**.

Figure 30-51-29



Ensure servo follower (Item 2) **[Figure 30-51-28]** is swung out for proper engagement with the notch in the servo piston (Item 1) **[Figure 30-51-29]**.

Figure 30-51-30



Assembly: Ensure dowel pin (Item 1) is aligned with hole in case housing (Item 2) **[Figure 30-51-30]** before tightening screws.

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Disassembly And Assembly (Cont'd)

Figure 30-51-31

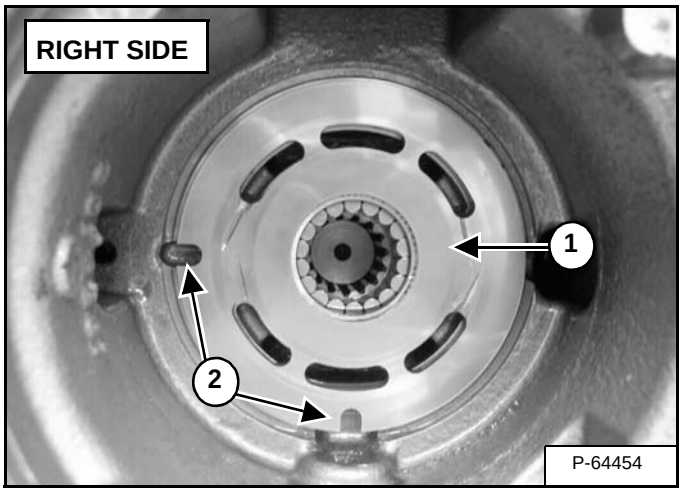
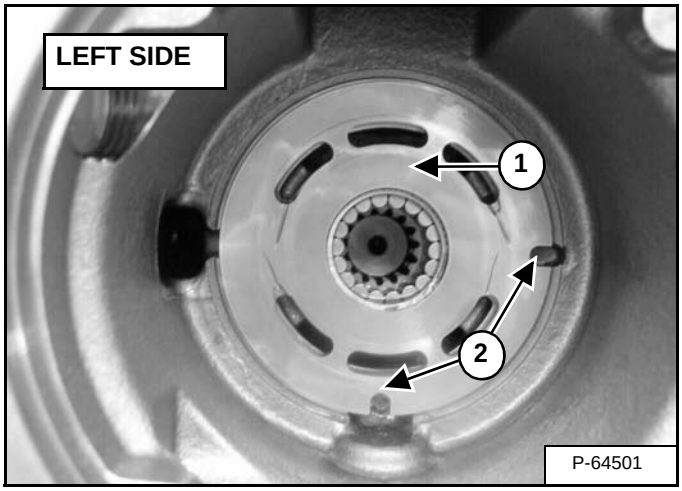


Figure 30-51-32



Remove valve plate (Item 1) **[Figure 30-51-31]** and **[Figure 30-51-32]** from the case housing.

Inspect valve plate for scratches or scoring. Replace a valve plate if the scratches are deep enough to catch with a fingernail.

NOTE: Pay attention to the notches (Item 2) [Figure 30-51-31] and [Figure 30-51-32] in the valve plate for assembly reasons. There are different valve plates for the left and right side. The valve plates are NOT interchangeable.

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Disassembly And Assembly (Cont'd)

Figure 30-51-33

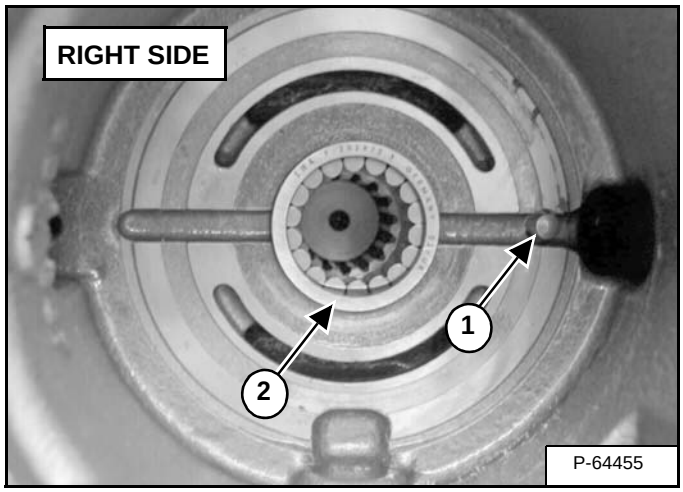


Figure 30-51-34

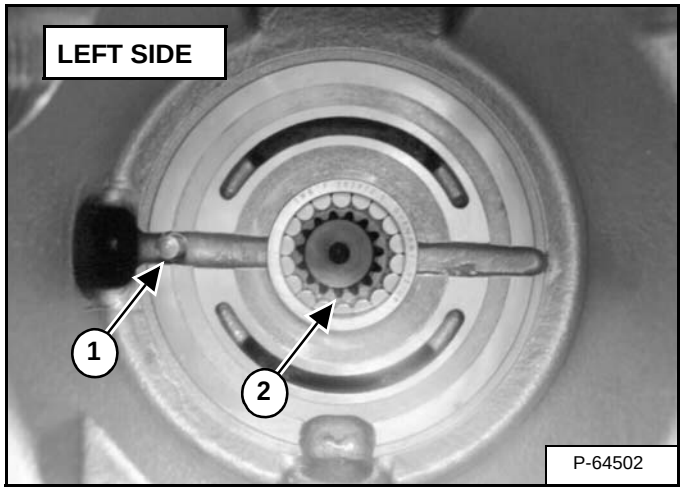


Figure 30-51-35

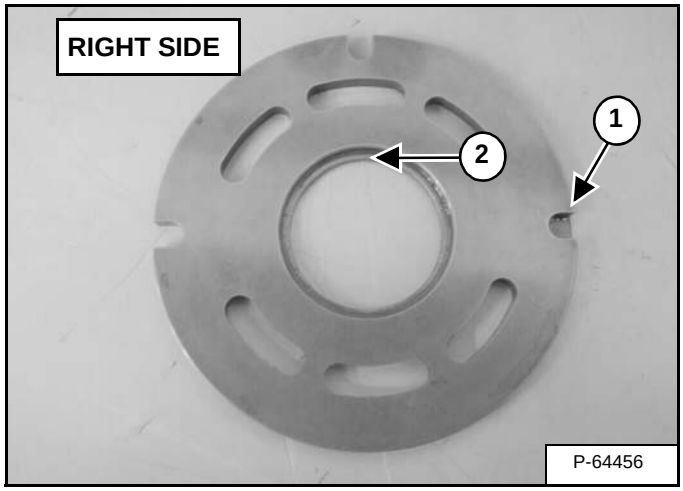
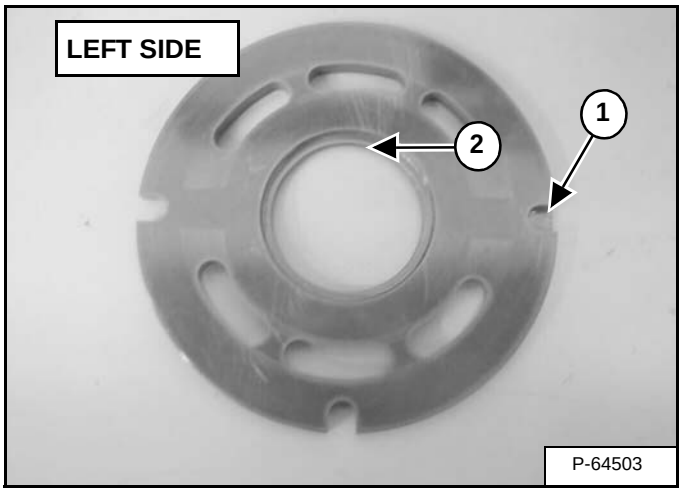


Figure 30-51-36



Assembly: Align the timing pin (Item 1) **[Figure 30-51-33]** and **[Figure 30-51-34]** in the case housing with the notch (Item 1) **[Figure 30-51-35]** and **[Figure 30-51-36]** that does not go through the valve plate.

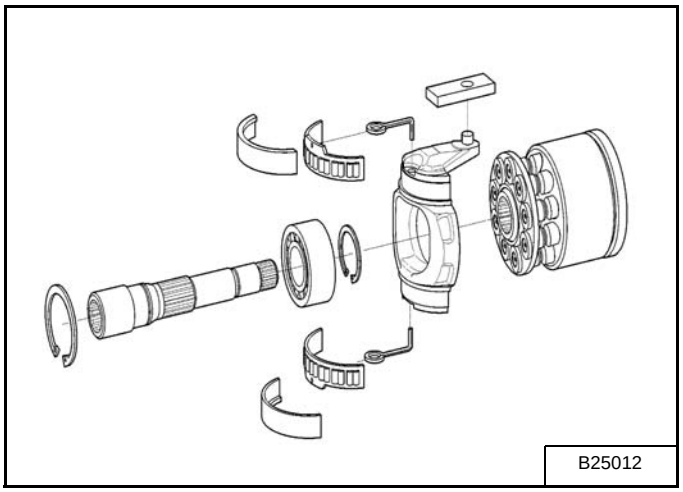
Align the shoulder of the roller bearing (Item 2) **[Figure 30-51-33]** and **[Figure 30-51-34]** with the beveled edge on the valve plate (Item 2) **[Figure 30-51-35]** and **[Figure 30-51-36]**.

NOTE: Valve plate should sit FLUSH with the case housing when properly installed.

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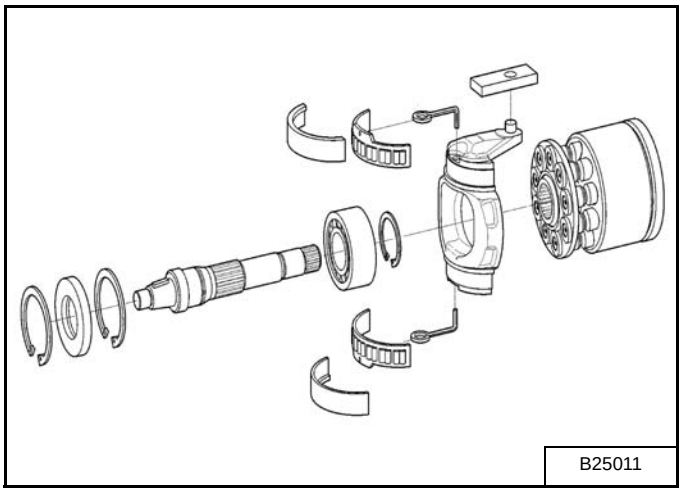
Disassembly And Assembly (Cont'd)

Figure 30-51-37



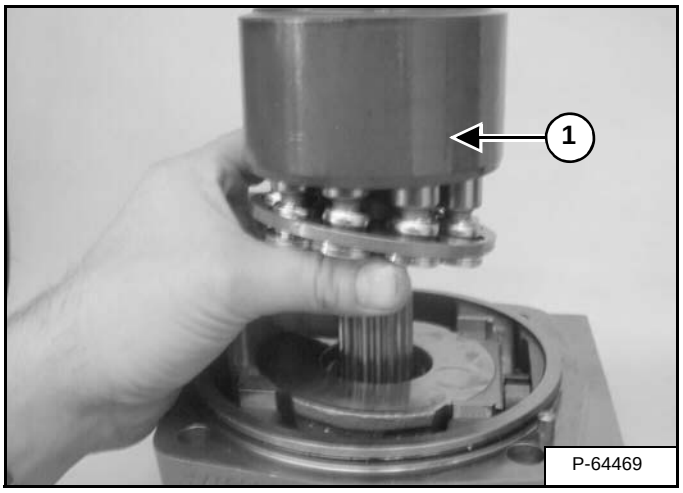
Right Side Rotating Group **[Figure 30-51-37]**.

Figure 30-51-38



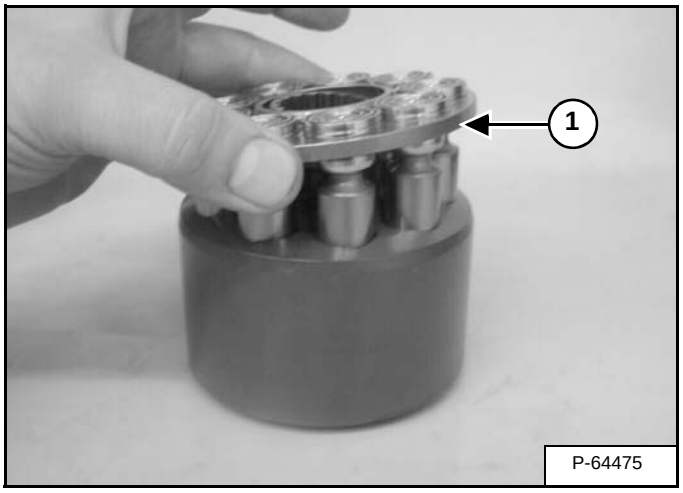
Left Side Rotating Group **[Figure 30-51-38]**.

Figure 30-51-39



Remove the piston assembly (Item 1) **[Figure 30-51-39]**.

Figure 30-51-40

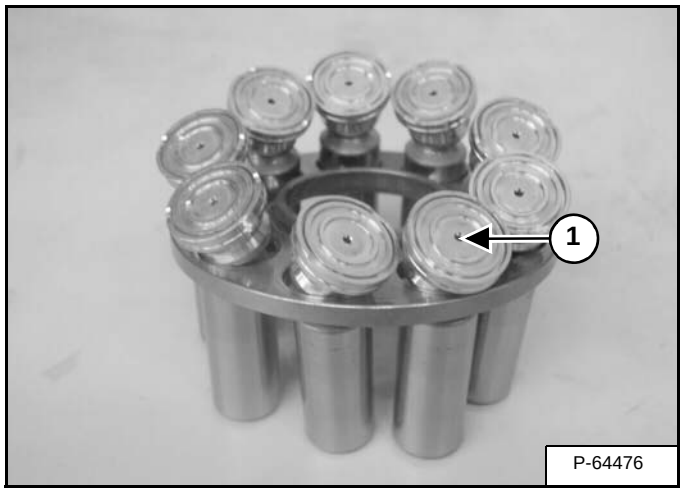


Remove the pistons (Item 1) **[Figure 30-51-40]** from the rotating block.

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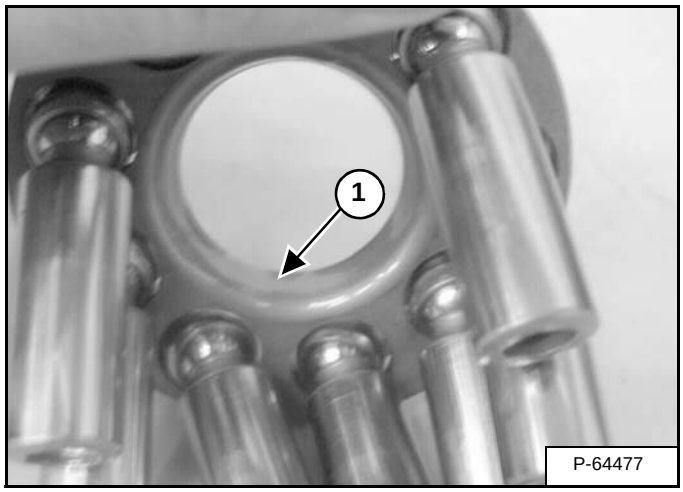
Disassembly And Assembly (Cont'd)

Figure 30-51-41



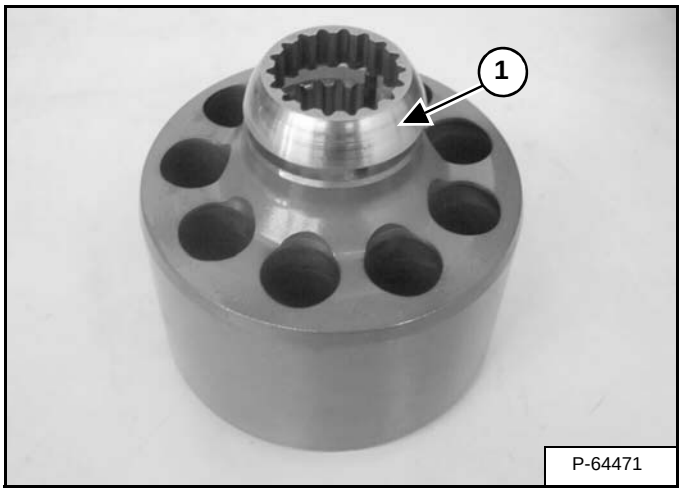
Inspect the pistons, look for scoring and scratches. Ensure the holes (Item 1) **[Figure 30-51-41]** in the slippers, are not plugged.

Figure 30-51-42



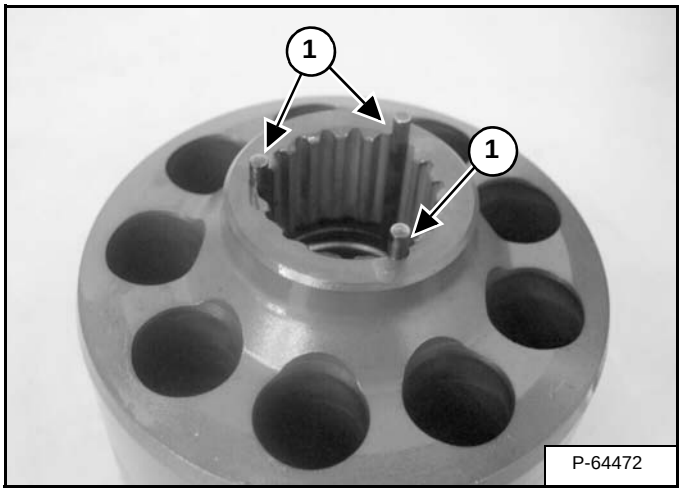
Inspect the mating surface of the spherical washer for scoring or scratches (Item 1) **[Figure 30-51-42]**.

Figure 30-51-43



Remove the spherical washer (Item 1) **[Figure 30-51-43]**.

Figure 30-51-44

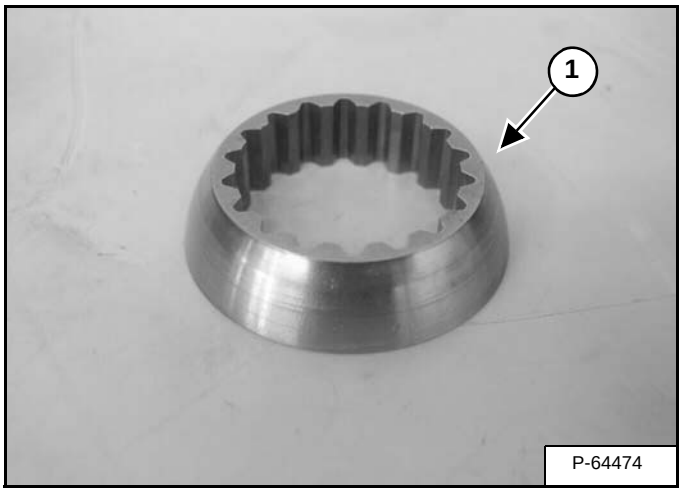


Inspect the pins (Item 1) **[Figure 30-51-44]**. They should be all the same length. Do not remove.

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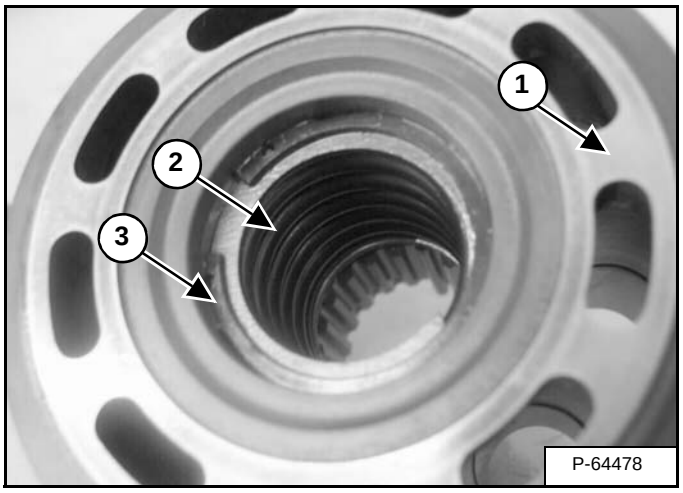
Disassembly And Assembly (Cont'd)

Figure 30-51-45



Inspect the spherical washer for scoring and wear (Item 1) **[Figure 30-51-45]**.

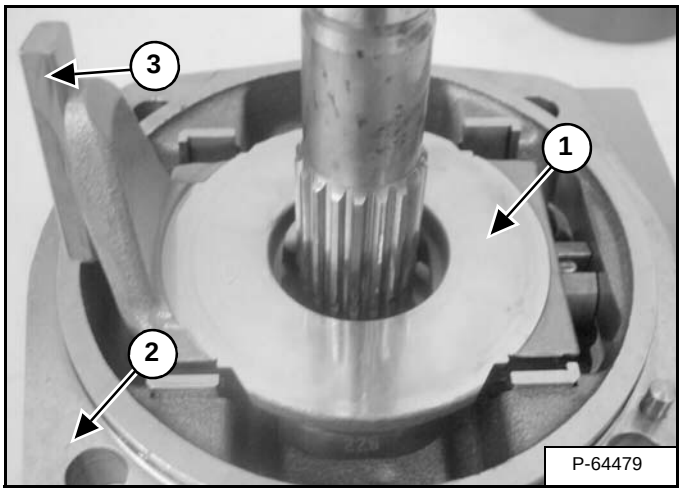
Figure 30-51-46



Inspect the back surface of the rotating block (Item 1) **[Figure 30-51-46]** where the valve plate seals. Ensure there is no scratches or scoring.

Visually ensure spring (Item 2) and c-clip (Item 3) **[Figure 30-51-46]** are not bent or damaged.

Figure 30-51-47

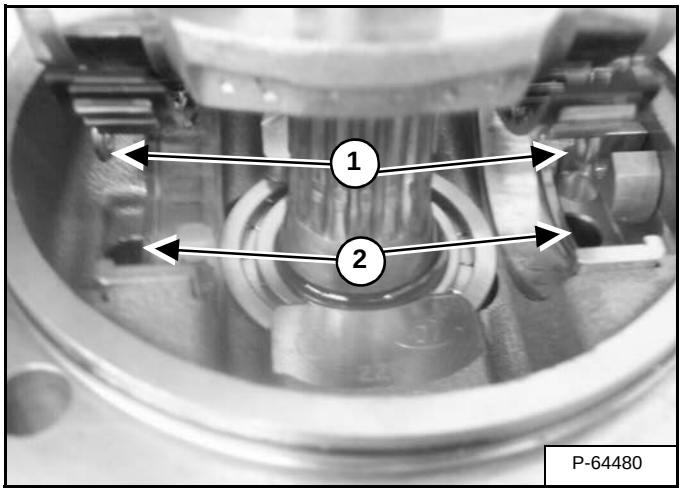


Inspect mating surface for the slippers on the swash plate (Item 1) **[Figure 30-51-47]**.

Remove the swash plate from the endcap housing (Item 2) **[Figure 30-51-47]**.

Remove the slide ring (Item 3) **[Figure 30-51-47]**, ensure it pivots freely.

Figure 30-51-48

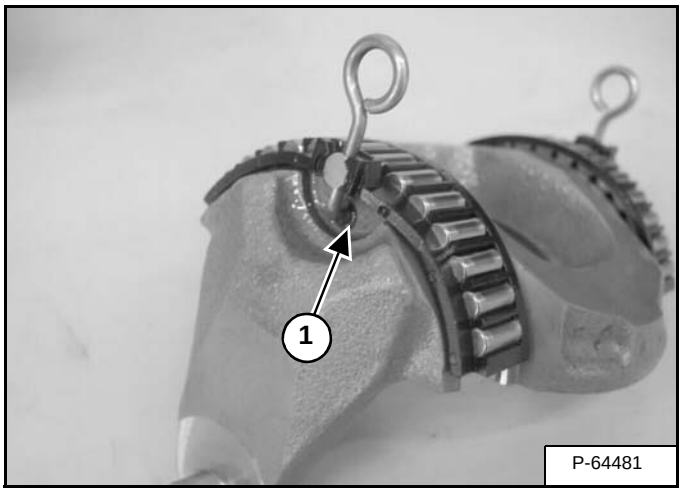


Assembly: Carefully align bearing pin eyelets (Item 1) into holes in endcap housing (Item 2) **[Figure 30-51-48]**.

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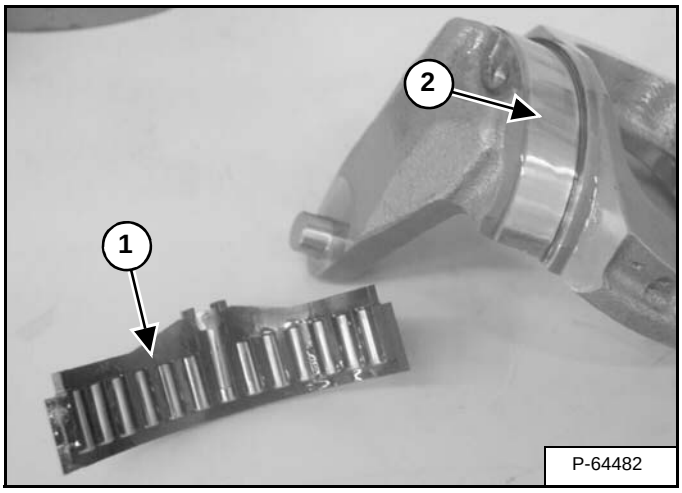
Disassembly And Assembly (Cont'd)

Figure 30-51-49



Assembly: Ensure bearing pins are in the holes of the swash plate (Item 1) **[Figure 30-51-49]**.

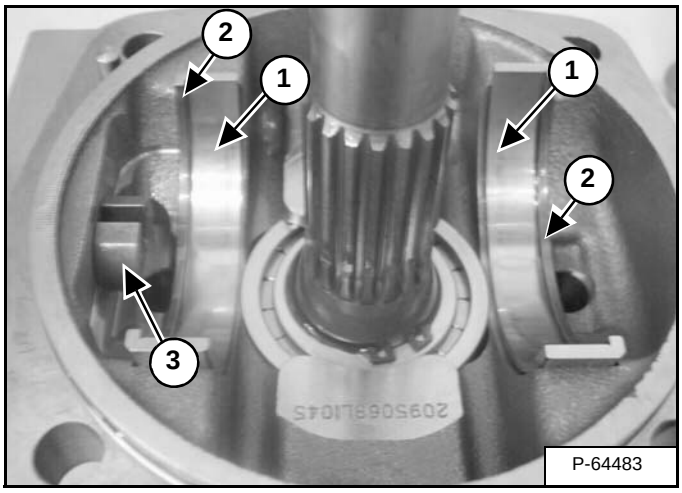
Figure 30-51-50



Remove the shell bearing (Item 1) **[Figure 30-51-50]**.

Inspect individual roller bearings and machined surfaces (Item 2) **[Figure 30-51-50]** on swash plate.

Figure 30-51-51



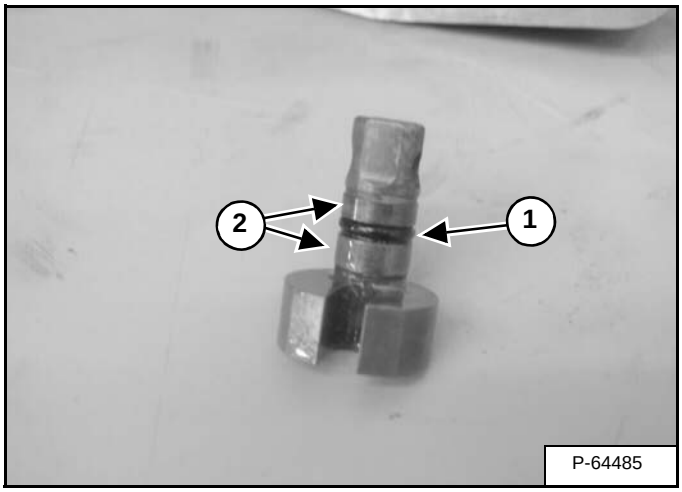
Remove the shell bearing races (Item 1) **[Figure 30-51-51]**.

Assembly: Note shell bearing races have an edge (Item 2) **[Figure 30-51-51]** on them. The edges face towards the outside of the endcap housing

Inspect bearing surfaces for scratches or scoring.

Remove the positioning pin (Item 3) **[Figure 30-51-51]**.

Figure 30-51-52



Replace O-ring (Item 1) **[Figure 30-51-52]**.

Inspect wear surfaces (Item 2) **[Figure 30-51-52]** for scratches or scoring. Ensure positioning pin can rotate smoothly in the end housing without excessive play.

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Disassembly And Assembly (Cont'd)

Figure 30-51-53

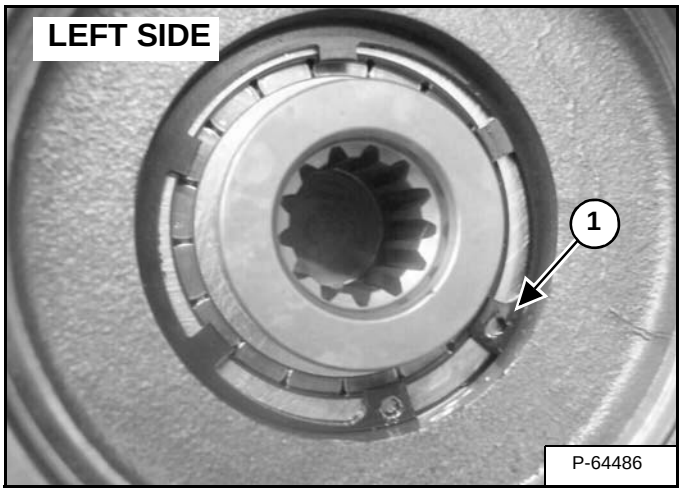
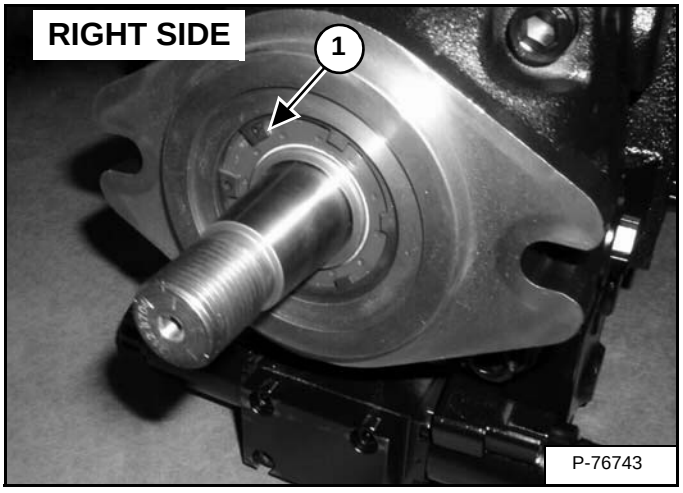
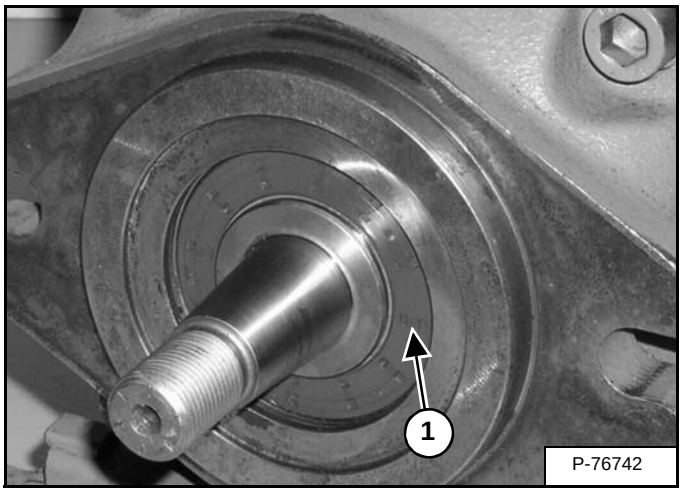


Figure 30-51-54



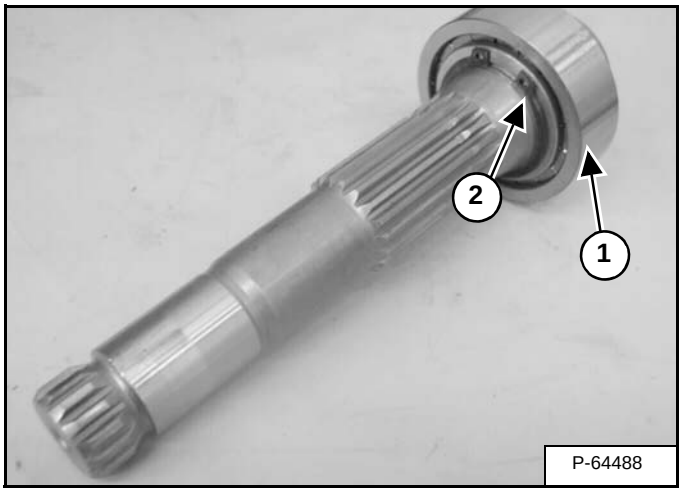
Remove the snap ring (Item 1) **[Figure 30-51-53]** and **[Figure 30-51-54]** from the end housing.

Figure 30-51-55



The pump seal (Item 1) **[Figure 30-51-55]** is removed by inserting a screw into the seal and prying out.

Figure 30-51-56



The drive shaft can be tapped out of the end housing with a rubber mallet.

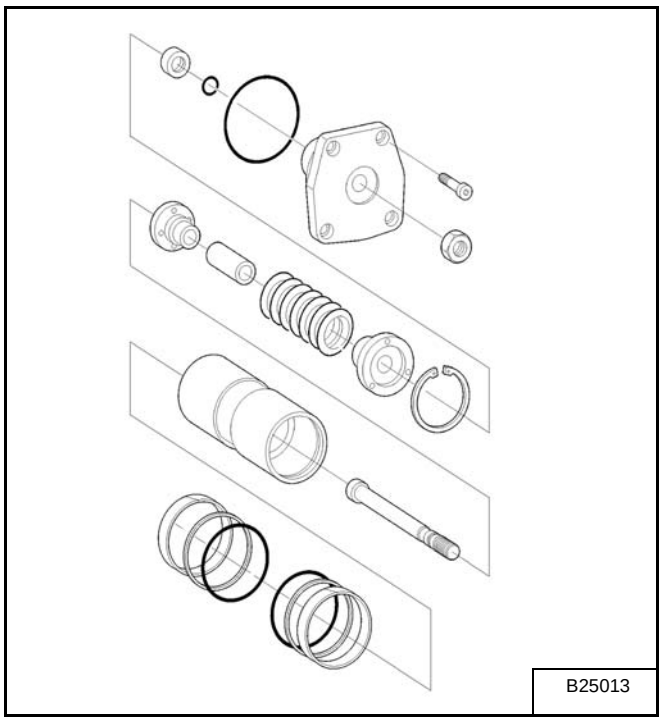
Inspect wear surfaces for scratches, and inspect splines for excessive wear.

Inspect bearing (Item 1); if bearing needs replacement, remove snap ring (Item 2) **[Figure 30-51-56]** and remove bearing.

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Disassembly And Assembly (Cont'd)

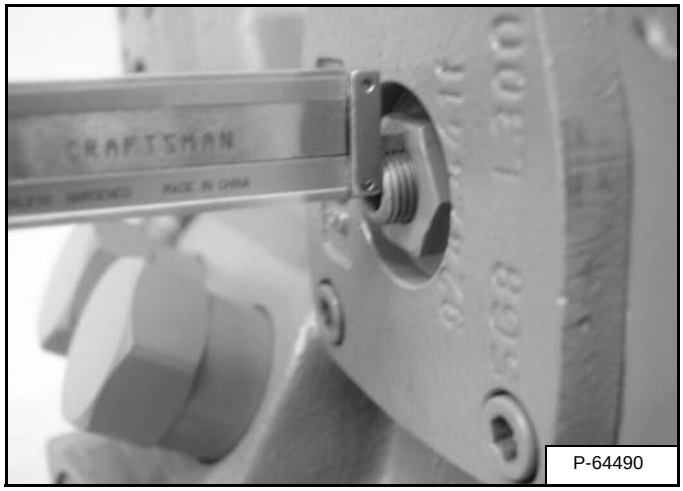
Figure 30-51-57



Servo Piston Assembly **[Figure 30-51-57]**.

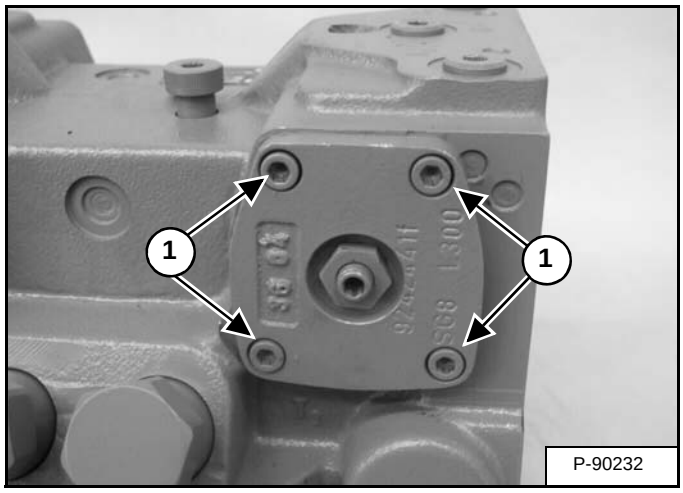
The Servo Piston Assembly **[Figure 30-51-57]** cannot be removed unless the hydraulic controller and rotating group is removed first.

Figure 30-51-58



Measure and record servo piston depth at the adjustment screw **[Figure 30-51-58]**.

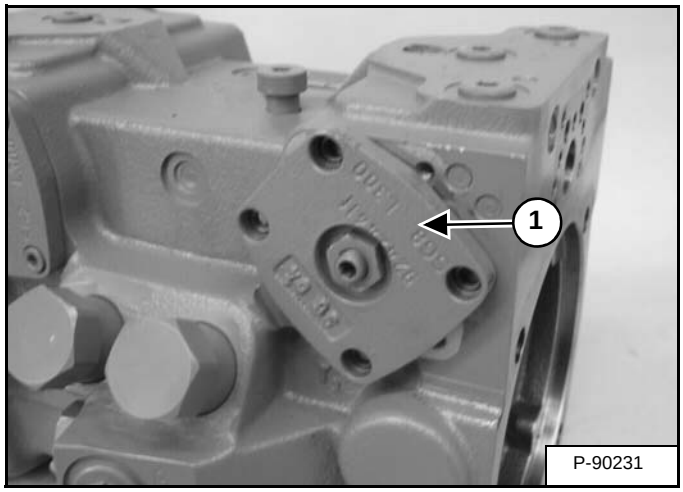
Figure 30-51-59



Remove servo piston mounting bolts (Item 1) **[Figure 30-51-59]**.

Installation: Tighten bolts to 10,4 N•m (7.7 ft-lb) torque.

Figure 30-51-60

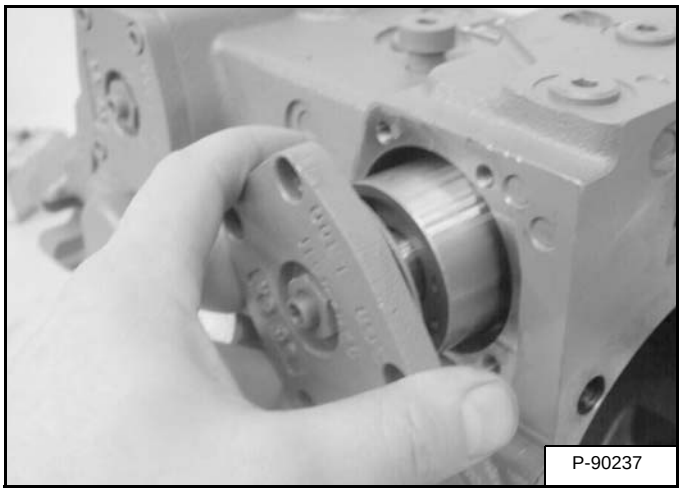


Use a rubber mallet to rotate servo piston cover (Item 1) **[Figure 30-51-60]**.

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Disassembly And Assembly (Cont'd)

Figure 30-51-61



Slide the servo piston assembly out of the bore. **[Figure 30-51-61]**.

Figure 30-51-62

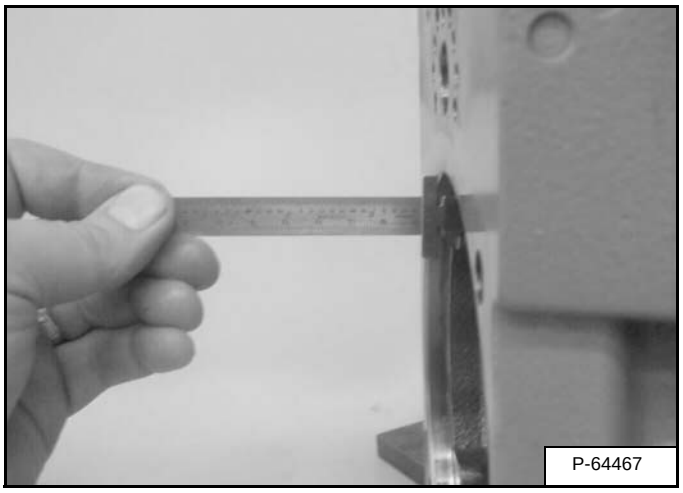
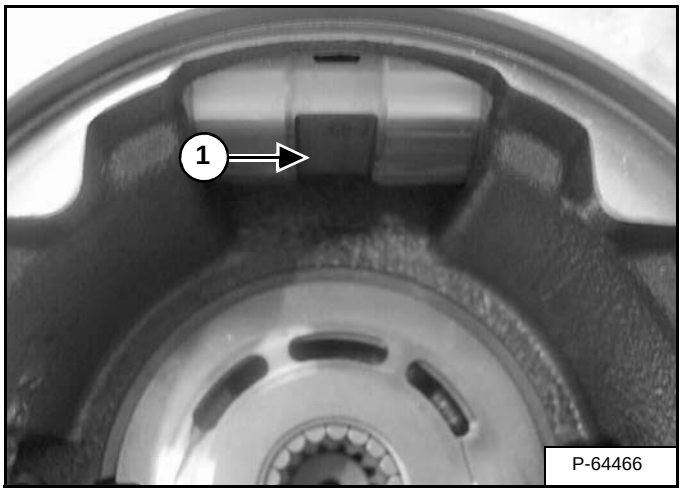
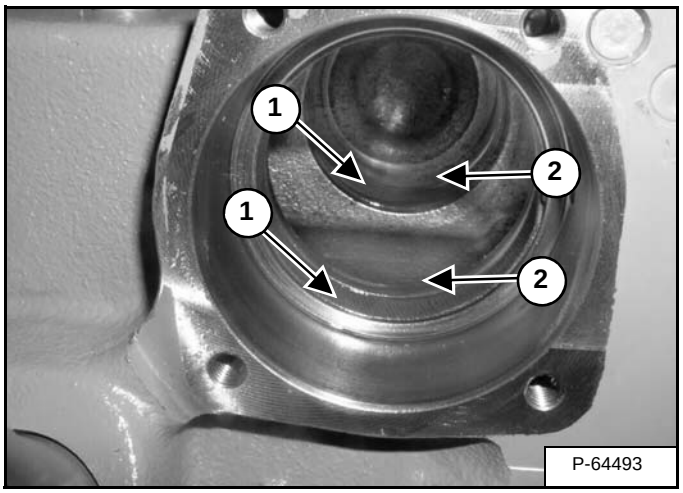


Figure 30-51-63



Assembly: Align the servo piston so the guide slot (Item 1) **[Figure 30-51-63]** is parallel to the driveshaft centerline. Measure with a straight-edge **[Figure 30-51-62]**.

Figure 30-51-64

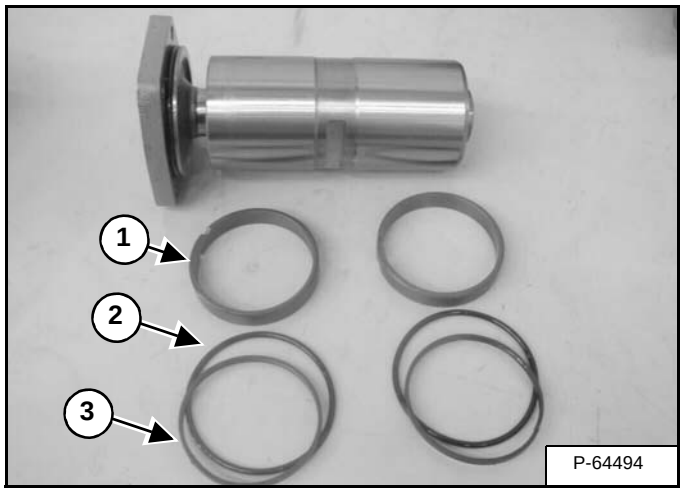


Remove the bushings (Item 1), seals and O-rings (Item 2) **[Figure 30-51-64]** from the pump housing.

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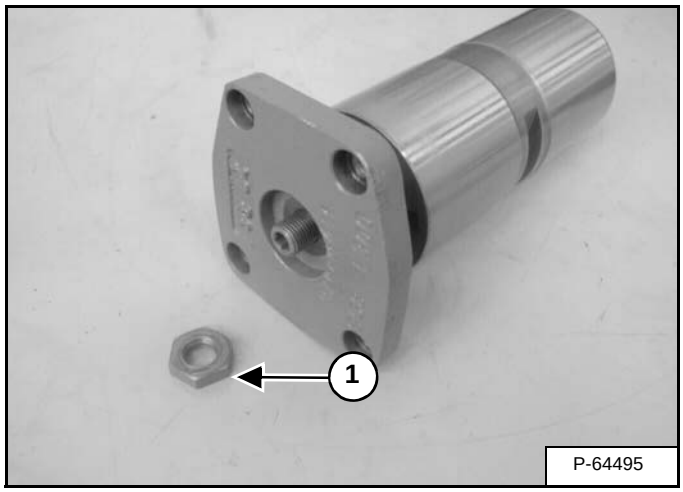
Disassembly And Assembly (Cont'd)

Figure 30-51-65



Each servo has a pair of bushings (Item 1), O-rings (Item 2) and square-cut seals (Item 3) **[Figure 30-51-65]**.

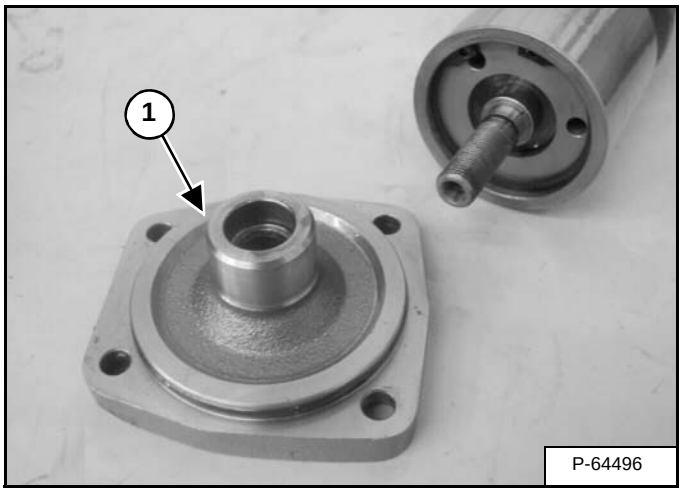
Figure 30-51-66



Remove the lock nut (Item 1) **[Figure 30-51-66]** from the servo piston.

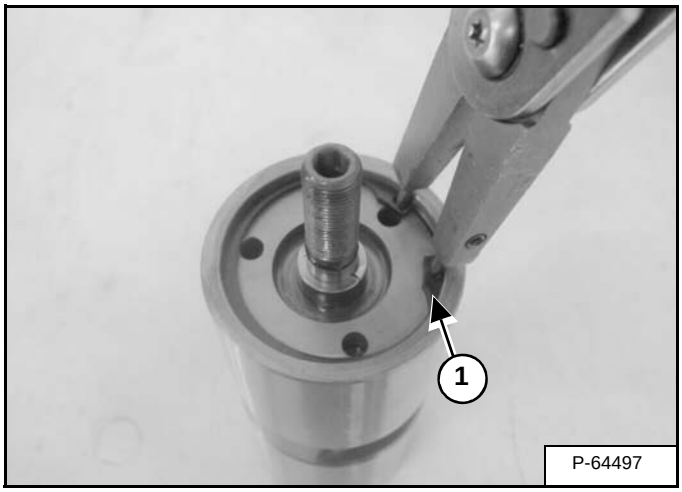
Assembly: Tighten lock nut to 30 N•m (22 ft-lb) torque.

Figure 30-51-67



Remove the servo cover (Item 1) **[Figure 30-51-67]** from the servo piston.

Figure 30-51-68

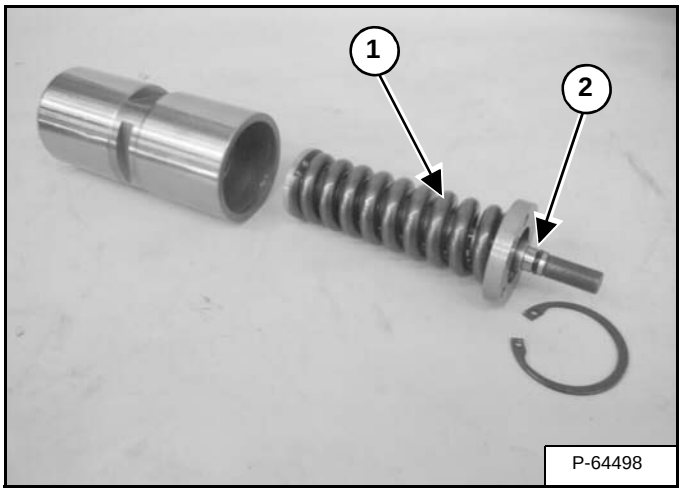


Remove snap ring (Item 1) **[Figure 30-51-68]** from the servo piston.

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Disassembly And Assembly (Cont'd)

Figure 30-51-69

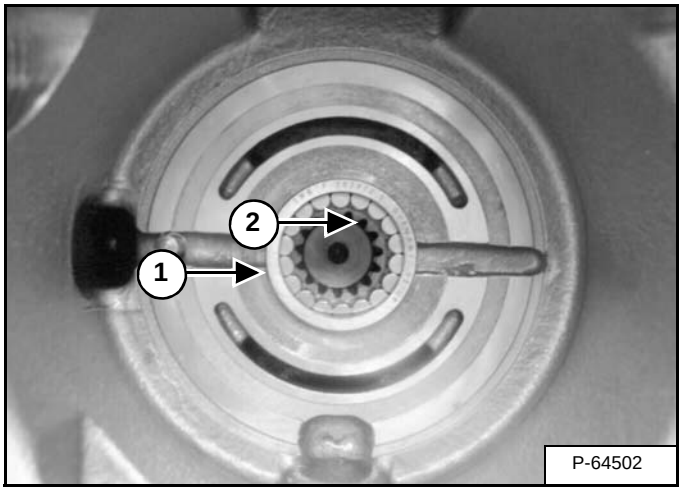


Remove the piston stop adjustment mechanism (Item 1) **[Figure 30-51-69]** from the servo piston.

Inspect mechanism for broken parts.

Replace O-ring (Item 2) **[Figure 30-51-69]**

Figure 30-51-70



Bearings (Item 1) **[Figure 30-51-70]** in case housing are replaced by using a press and bearing driver.

Inspect center coupler (Item 2) **[Figure 30-51-70]**.

Mechanical Neutral Adjustment

The pump mechanical neutral adjustment sets the position of the servo piston and pump swash plate relative to the hydraulic controller. This procedure should be followed if the hydrostatic pump has been disassembled for servicing the servo piston and the setting has been disrupted.

Place the loader on jackstands. (See Procedure on Page 10-10-1.)

⚠ 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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Raise the lift arms, and install an approved lift arm support device. (See Installing on Page 10-20-1.)

Raise the operator cab. (See Raising on Page 10-30-2.)

Connect the remote start tool. (See REMOTE START TOOL KIT-MEL1563 on Page 10-60-1.)

Disconnect the swash plate angle sensors in the electrical harness. This prevents unwanted swash plate movement error codes from occurring during adjustments. Disconnecting the sensors does not have to be done directly at the sensor, follow the harness back to find an accessible connector to disconnect.

Disconnect the speed sensors located on the top of the motor carriers. This prevents uncommanded wheel movement error codes from occurring during adjustments.

⚠ WARNING

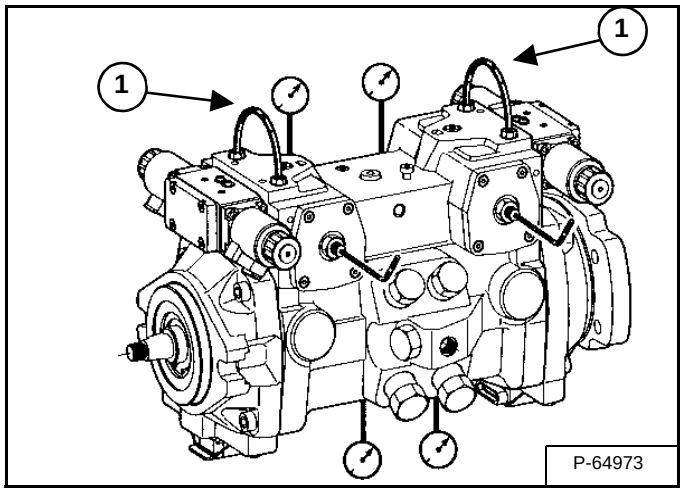
Hydraulic fluid escaping under pressure can have sufficient force to enter a person's body by penetrating the skin. This can cause serious injury and possible death if proper medical treatment by a physician familiar with this injury is not received immediately.

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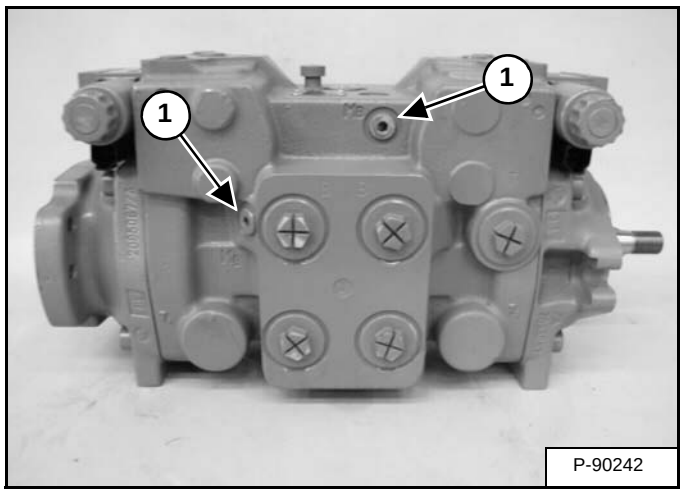
Mechanical Neutral Adjustment (Cont'd)

Figure 30-51-71



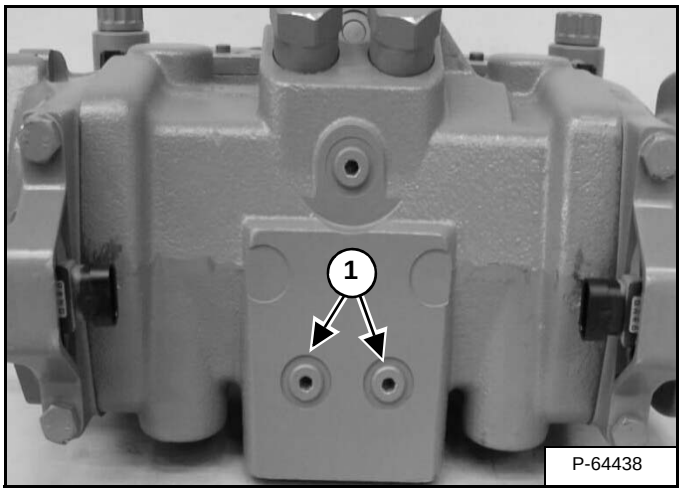
Connect a hydraulic hose (Item 1) **[Figure 30-51-71]** between port X1 and port X2 on each side of the hydrostatic pump, to equalize the pressures on both ends of the servo pistons.

Figure 30-51-72



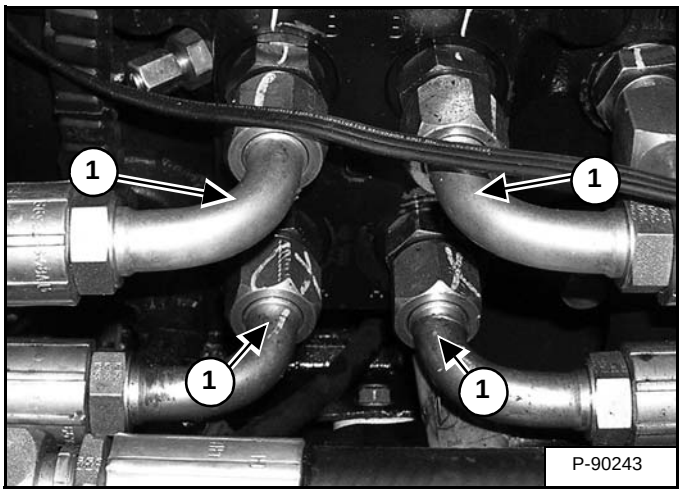
Remove the plugs (Item 1) **[Figure 30-51-72]** from the MB ports on the front side of the pump, and install 51,7 MPa (517 bar) (7500 psi) pressure gauges.

Figure 30-51-73



Remove the plugs (Item 1) **[Figure 30-51-73]** from the MA ports on the bottom of the pump, and install 51,7 MPa (517 bar) (7500 psi) pressure gauges.

Figure 30-51-74

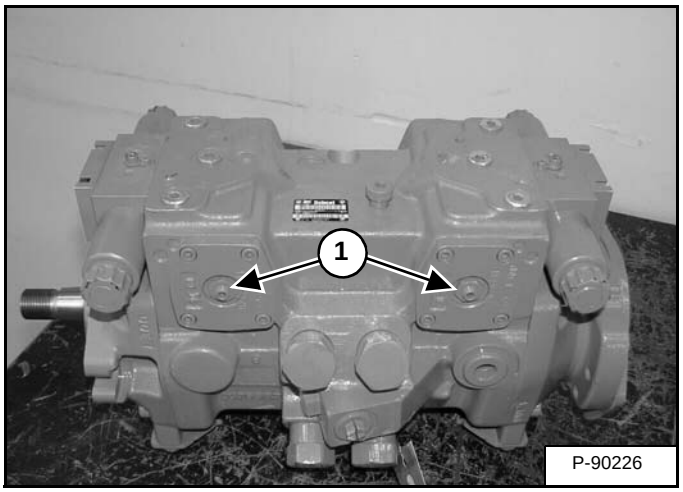


Remove drive hoses from the A and B ports (Item 1) **[Figure 30-51-74]**. Plug the ports with metal caps. The caps must be able to handle at least 51,7 MPa (517 bar) (7500 psi). Plugging the A and B ports eliminates leakage at the drive motors from causing errors in the pump mechanical neutral setting.

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Mechanical Neutral Adjustment (Cont'd)

Figure 30-51-75



Loosen the pump neutral adjustment lock nut (Item 1) **[Figure 30-51-75]**.

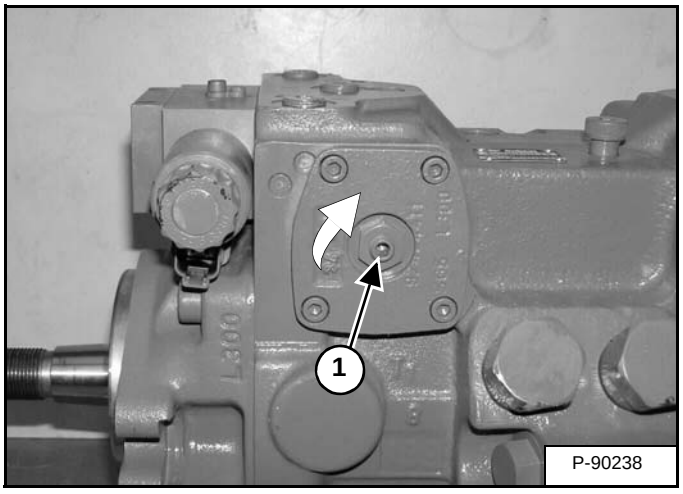
Start the loader using the remote start tool and run at idle.

⚠ WARNING

Stay clear of the loader wheels. They will turn whenever the pump is not centered.

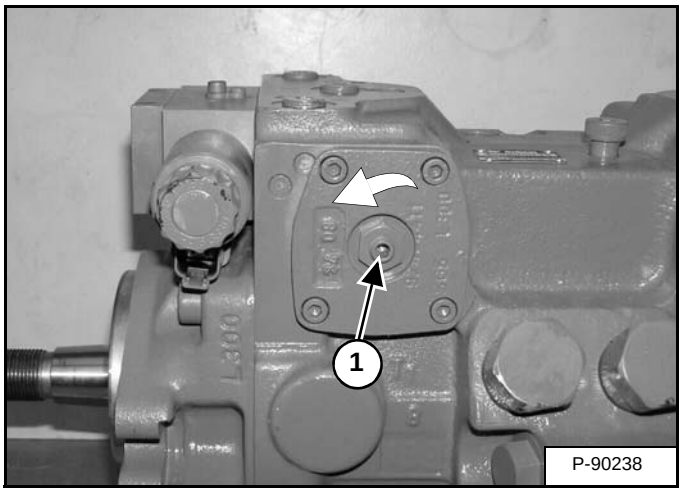
W-2276-1297

Figure 30-51-76



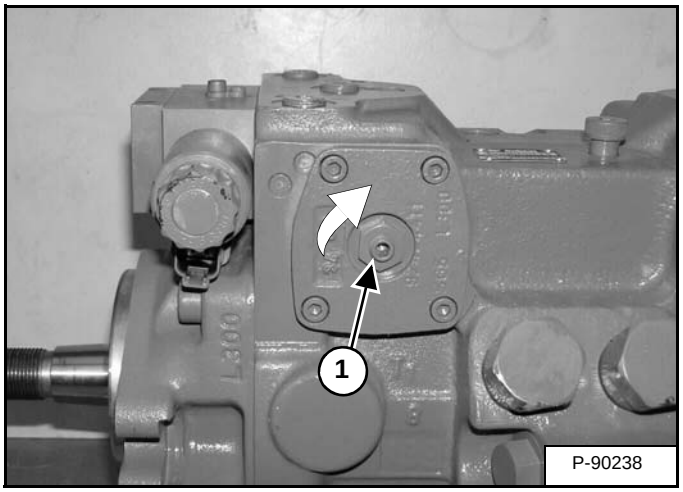
Turn the adjustment screw (Item 1) **[Figure 30-51-76]** clockwise, until one of the gauges registers an increase in system pressure. Mark the position of the adjustment screw.

Figure 30-51-77



Turn the adjustment screw (Item 1) **[Figure 30-51-77]** counterclockwise, until the other gauge registers an increase in system pressure. Mark the position of the adjustment screw.

Figure 30-51-78

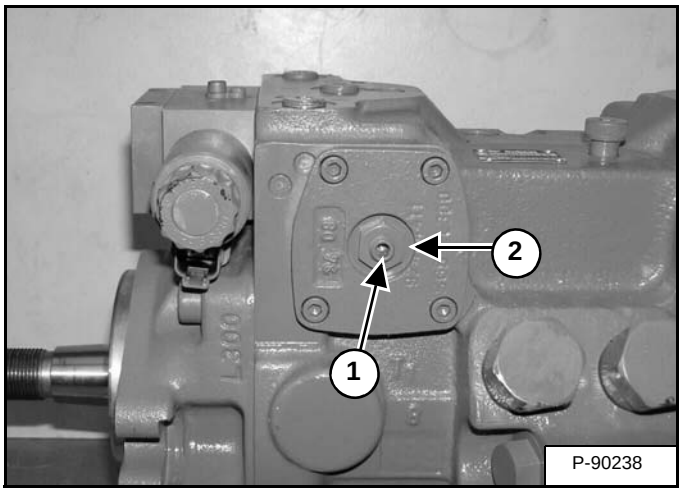


Turn the adjustment screw (Item 1) **[Figure 30-51-78]** clockwise, to a position halfway between the recorded positions. The pressure gauges should read equal pressures.

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Mechanical Neutral Adjustment (Cont'd)

Figure 30-51-79



While holding the adjustment screw (Item 1) in position, tighten the lock nut (Item 2) **[Figure 30-51-79]** to 30 N•m (22 ft-lb) torque.

Shut loader OFF.

Remove the hydraulic hose from the X1 and X2 ports on the pump. Install the plugs and tighten to 25 N•m (18 ft-lb) torque.

Remove the pressure gauges from the MA and MB ports on the pump. Install the plugs and tighten to 25 N•m (18 ft-lb) torque.

NOTE: The Hydraulic Controller Neutral Adjustment must be performed whenever the Mechanical Neutral Adjustment is done. (See Hydraulic Controller Neutral Adjustment on Page 30-51-26.)

Hydraulic Controller Neutral Adjustment

The hydraulic 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 mechanical neutral setting is adjusted. Ensure the pump mechanical neutral setting is correct before performing hydraulic controller neutral adjustments.

NOTE: Procedure is shown for the left side hydraulic controller. Procedure is the same for the right side hydraulic controller, except you disconnect the electrical connectors for the right side hydraulic controller and connect pressure gauges in the X1 and X2 ports on the right side of the pump.

Place the loader on jackstands. (See Procedure on Page 10-10-1.)

⚠ 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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Raise the lift arms, and install an approved lift arm support device. (See Installing on Page 10-20-1.)

Raise the operator cab. (See Raising on Page 10-30-2.)

Connect the remote start tool. (See REMOTE START TOOL KIT-MEL1563 on Page 10-60-1.) or (See REMOTE START TOOL (SERVICE TOOL) KIT - 7003031 on Page 10-61-1.)

⚠ WARNING

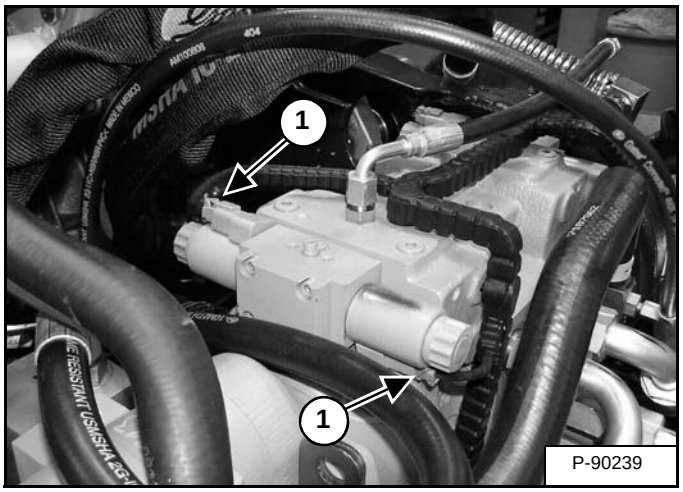
Hydraulic fluid escaping under pressure can have sufficient force to enter a person's body by penetrating the skin. This can cause serious injury and possible death if proper medical treatment by a physician familiar with this injury is not received immediately.

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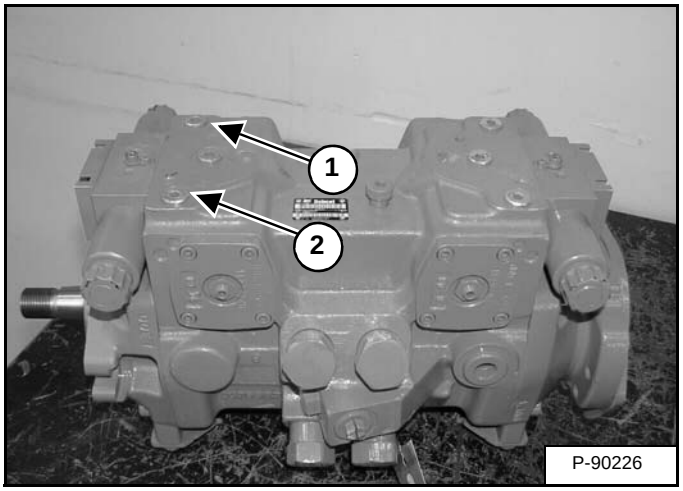
Hydraulic Controller Neutral Adjustment (Cont'd)

Figure 30-51-80



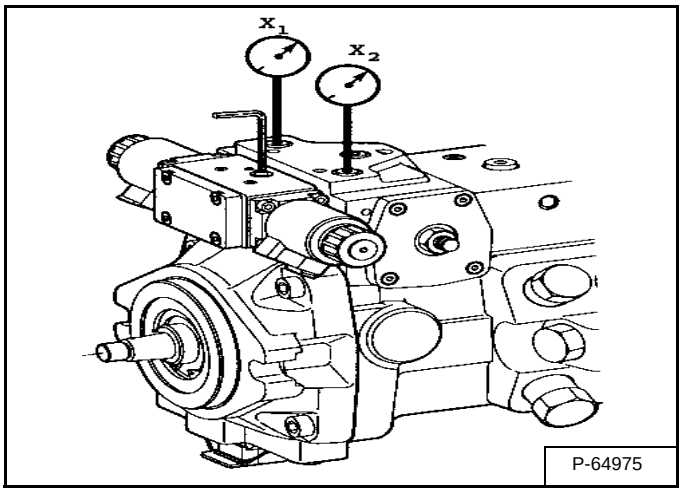
Disconnect the hydraulic controller connectors (Item 1) **[Figure 30-51-80]** from the loader wiring harness for the hydraulic controller you are adjusting.

Figure 30-51-81



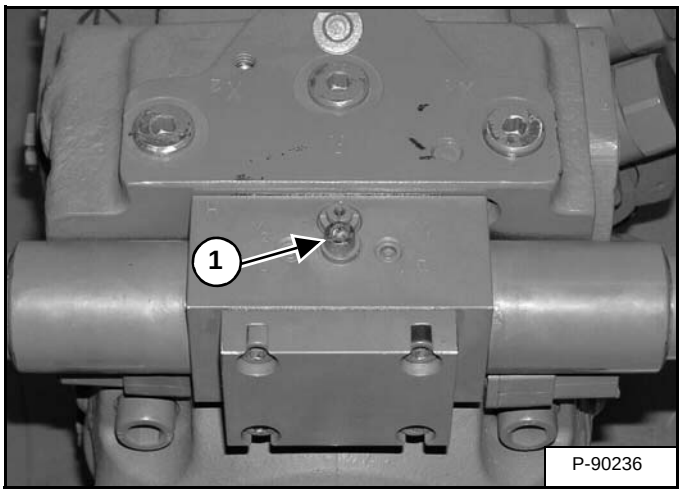
Remove the X1 plug (Item 1) and X2 plug (Item 2) **[Figure 30-51-81]** pertaining to the side of the hydrostatic pump you are adjusting.

Figure 30-51-82



Install 3,4 MPa (34,5 bar) (500 psi) pressure gauges in the X1 and X2 ports pertaining to the side of the hydrostatic pump you are adjusting.

Figure 30-51-83



Loosen the locking screw (Item 1) **[Figure 30-51-83]**.

Start the loader using the remote start tool and run at an idle.

⚠ WARNING

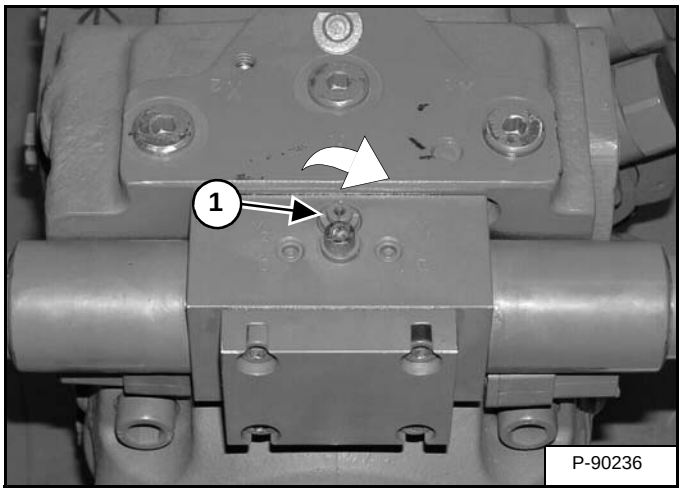
Stay clear of the loader wheels. They will turn whenever the pump is not centered.

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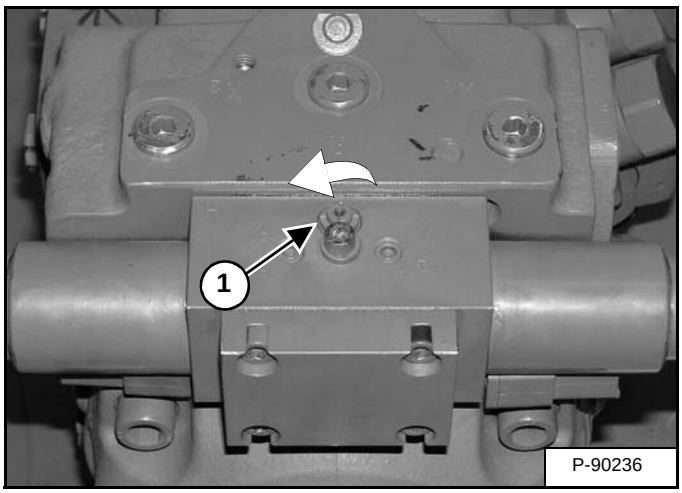
Hydraulic Controller Neutral Adjustment (Cont'd)

Figure 30-51-84



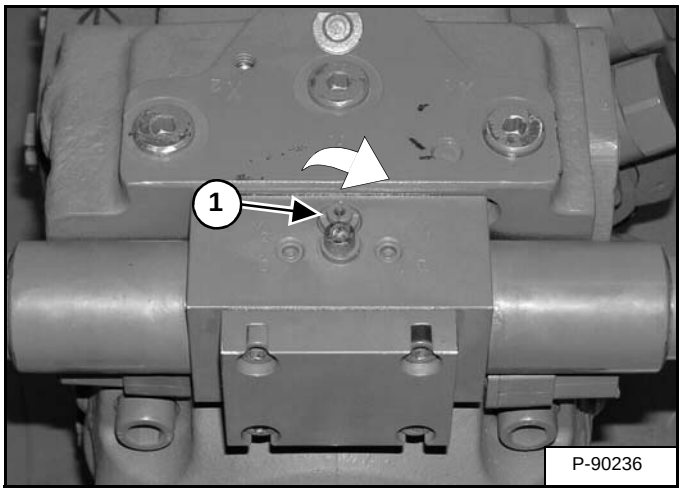
Turn the adjustment screw (Item 1) **[Figure 30-51-84]** clockwise, until one of the gauges registers an increase in system pressure. Mark the position of the adjustment screw.

Figure 30-51-85



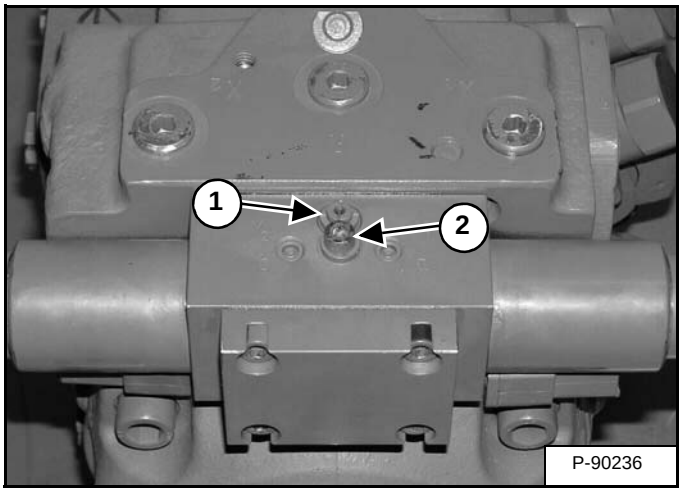
Turn the adjustment screw (Item 1) **[Figure 30-51-85]** counterclockwise, until the other gauge registers an increase in system pressure. Mark the position of the adjustment screw.

Figure 30-51-86



Turn the adjustment screw (Item 1) **[Figure 30-51-86]** clockwise, to a position halfway between the recorded positions. The pressure gauges should read equal pressures.

Figure 30-51-87



While holding the adjustment screw (Item 1) in position, tighten the locking screw (Item 2) **[Figure 30-51-87]** to 6,1 N•m (4.5 ft-lb) torque.

Shut loader OFF.

Remove the pressure gauges from the X1 and X2 ports on the pump. Install the plugs and tighten to 25 N•m (18 ft-lb) torque.

Connect the hydraulic controller wire connectors to the loader wiring harness.

Perform a controller calibration procedure. (See CALIBRATION on Page 60-160-1.)

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DRIVE BELT

Belt Adjustment

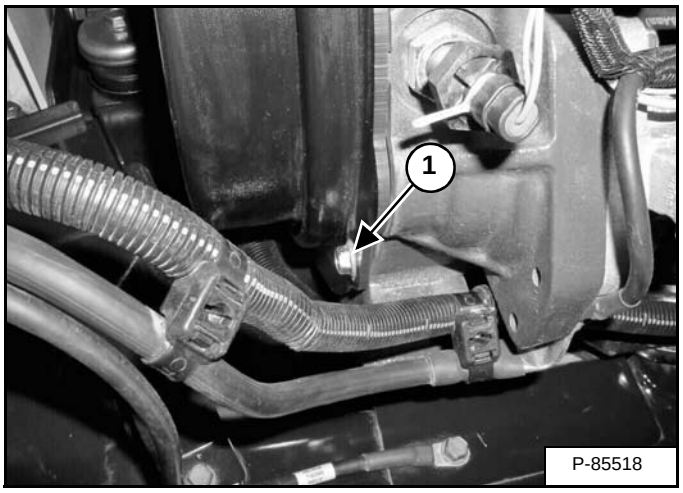
The drive belt does not need adjustment. The belt has a spring loaded idler which constantly maintains the correct belt tension.

Belt Replacement

Stop the engine and open the rear door.

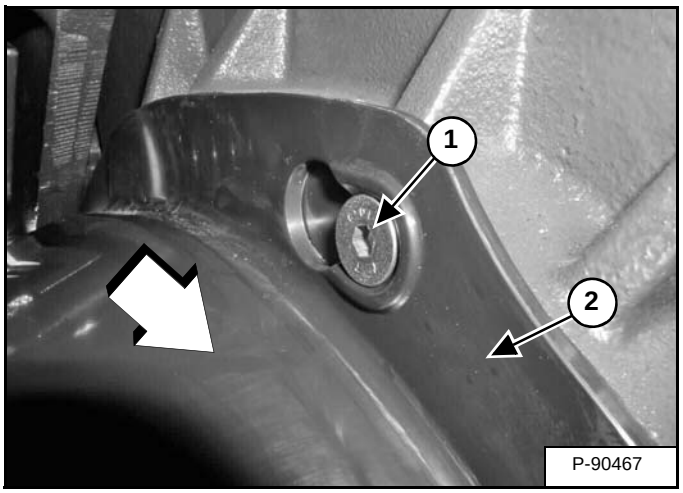
Remove the battery. (See Removal And Installation on Page 60-20-1.)

Figure 30-60-1



Remove the drive belt shield bolt (Item 1) **[Figure 30-60-1]**.

Figure 30-60-2



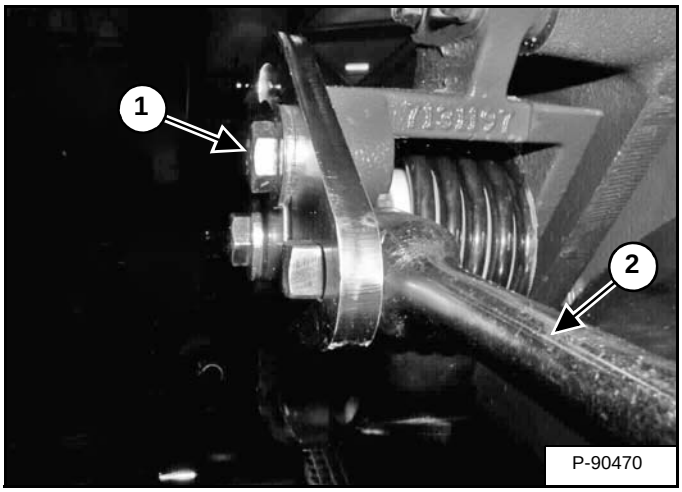
Do **NOT** loosen the drive belt shield mounting bolts (top bolt shown) (Item 1). Slide the drive belt shield (Item 2) toward the back of the loader to unseat the shield from the top and bottom drive belt shield mounting bolts. Remove the drive belt shield (Item 2) **[Figure 30-60-2]**.

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DRIVE BELT (CONT'D)

Belt Replacement (Cont'd)

Figure 30-60-3



Loosen the spring loaded idler adjustment bolt (Item 1). Insert a 12,7 mm (0.50 in). breaker bar (Item 2) **[Figure 30-60-3]** into the slot provided in the stop arm as shown and push breaker bar down to release tension on drive belt.

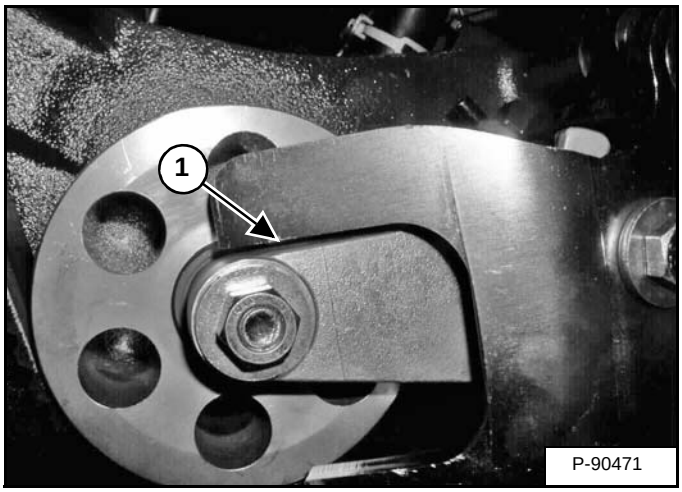
Tighten the adjustment bolt (Item 1) **[Figure 30-60-3]** to hold the spring loaded idler off the drive belt.

Remove the drive belt from the hydrostatic pump pulley and flywheel pulley. Inspect the pulleys for wear.

Install new drive belt.

Loosen the spring loaded idler adjustment bolt (Item 1) **[Figure 30-60-3]** and allow the idler to contact the drive belt.

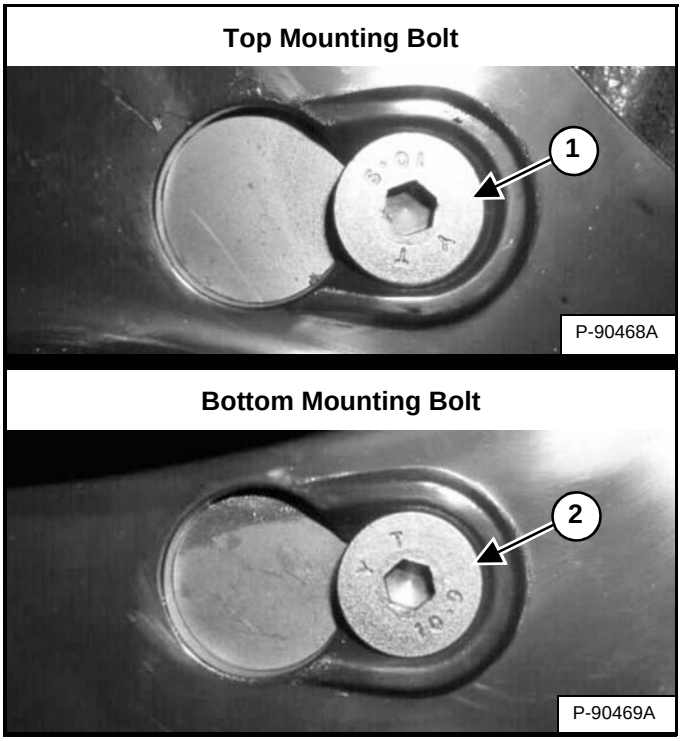
Figure 30-60-4



Move the breaker bar to adjust the stop arm until a gap of 3,2 mm (0.125 in) (Item 1) **[Figure 30-60-4]** is achieved.

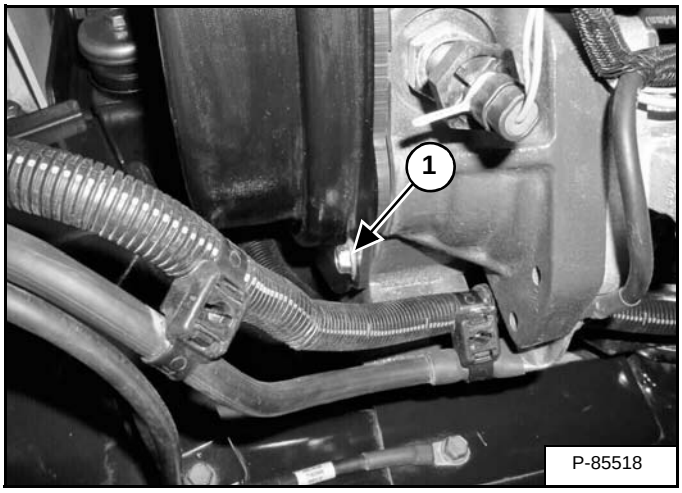
Tighten the spring loaded idler adjustment bolt (Item 1) **[Figure 30-60-3]** to 105 - 115 N•m (78 - 85 ft-lb) torque.

Figure 30-60-5



Position the drive belt shield over the drive belt shield mounting bolts and slide the drive belt shield toward the front of the loader to fully seat the shield onto the top and bottom mounting bolts (Items 1 and 2) **[Figure 30-60-5]**.

Figure 30-60-6



Install the drive belt shield bolt (Item 1) **[Figure 30-60-6]**.

Install the battery. (See Removal And Installation on Page 60-20-1.)

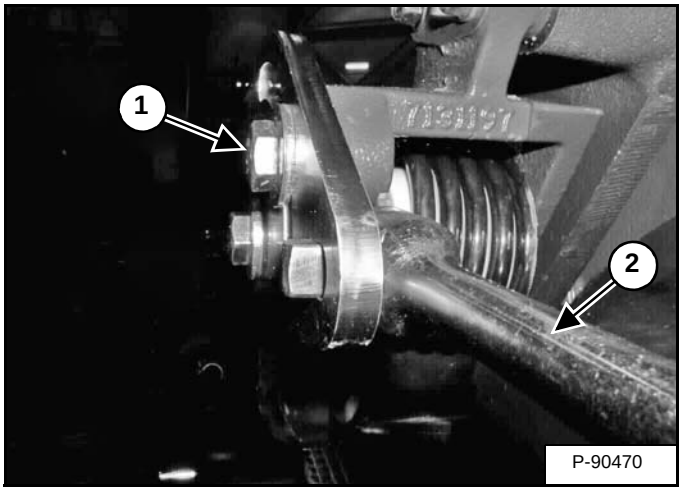
Close the rear door.

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Stop Adjustment

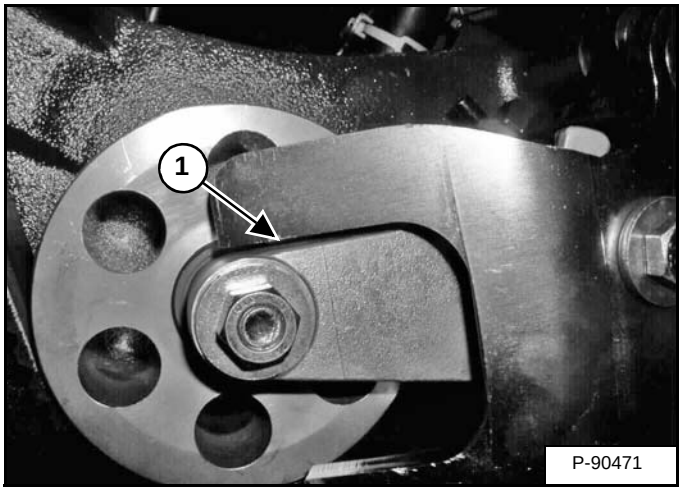
Stop the engine and open the rear door.

Figure 30-60-7



Loosen the spring loaded idler adjustment bolt (Item 1) and insert a 12,7 mm (0.50 in) breaker bar (Item 2) **[Figure 30-60-7]** into the slot provided in the stop arm as shown.

Figure 30-60-8



Move the breaker bar to adjust the stop arm until a gap of 3,2 mm (0.125 in) (Item 1) **[Figure 30-60-8]** is achieved.

Tighten the spring loaded idler adjustment bolt (Item 1) **[Figure 30-60-7]** to 105 - 115 N•m (78 - 85 ft-lb) torque.

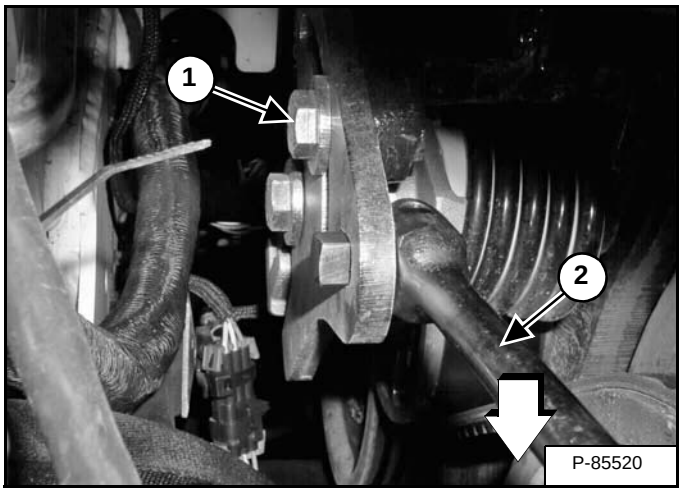
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Tensioner Pulley Removal And Installation

Remove the engine air cleaner. (See Housing Removal And Installation on Page 70-40-1.)

Remove the belt. (See Belt Replacement on Page 30-60-1.)

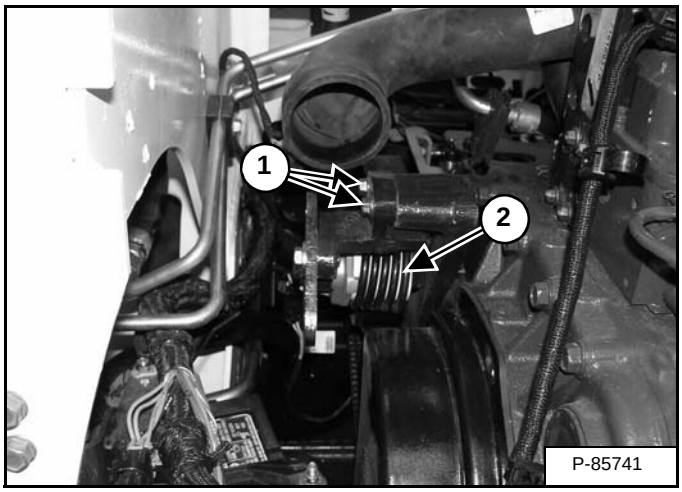
Figure 30-60-9



Loosen the spring loaded idler adjustment bolt (Item 1). Insert a 12,7 mm (0.50 in) breaker bar (Item 2) **[Figure 30-60-9]** into the slot provided in the stop arm as shown and push breaker bar down to release tension on drive belt.

Tighten adjustment bolt (Item 1) **[Figure 30-60-9]** to hold the spring loaded idler off the drive belt.

Figure 30-60-10



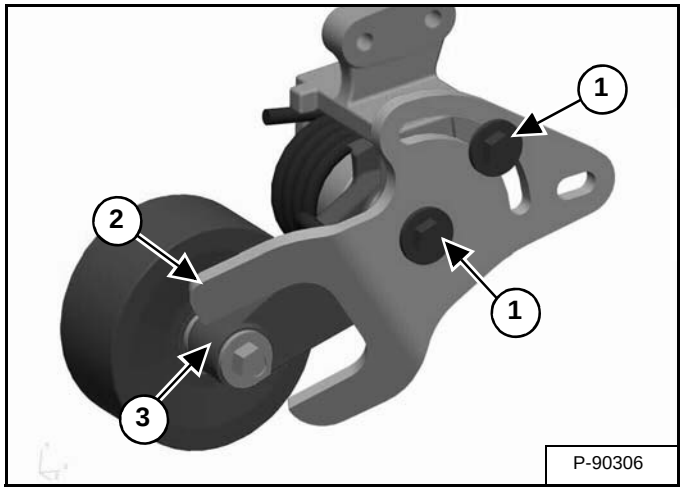
Remove the two mounting bolts (Item 1) **[Figure 30-60-10]**.

Remove the tensioner pulley (Item 2) **[Figure 30-60-10]**.

Installation: Apply Loctite® 242 to the mounting bolts (Item 1) **[Figure 30-60-10]**.

Tensioner Pulley Disassembly And Assembly

Figure 30-60-11

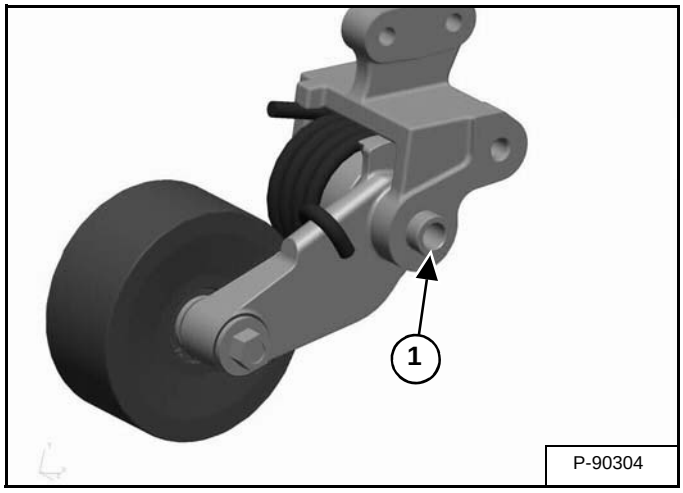


Loosen the two bolts (Item 1) **[Figure 30-60-11]** but do not remove.

Release the spring tension by allowing the adjustment plate (Item 2) to slide past the tensioner pulley stop (Item 3) **[Figure 30-60-11]**.

Remove the two bolts (Item 1) and the adjustment plate (Item 2) **[Figure 30-60-11]**.

Figure 30-60-12

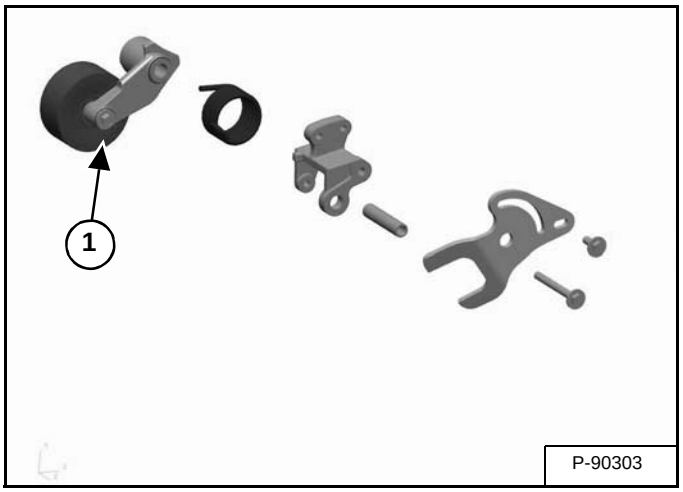


Remove the pivot sleeve (Item 1) **[Figure 30-60-12]**.

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Tensioner Pulley Disassembly And Assembly (Cont'd)

Figure 30-60-13



Disassembly the tensioner pulley as shown **[Figure 30-60-13]**.

Check the parts for wear and replace as needed.

NOTE: The wheel and arm assembly (Item 1) [Figure 30-60-13] are not serviceable and must be replaced as a complete assembly.

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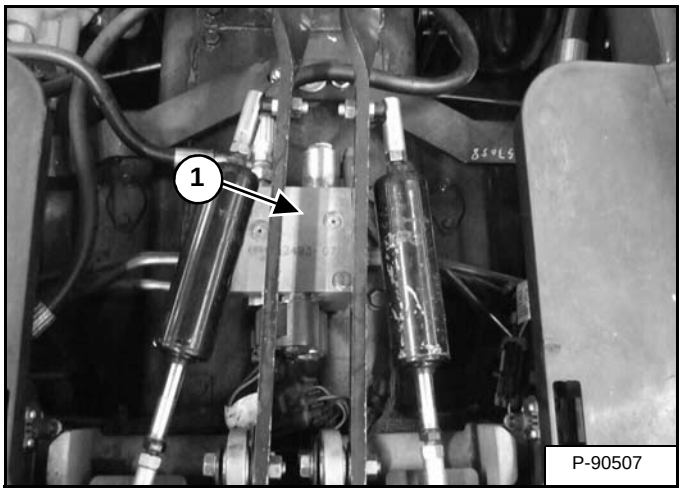


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TWO-SPEED / BRAKE VALVE

Description

Figure 30-70-1



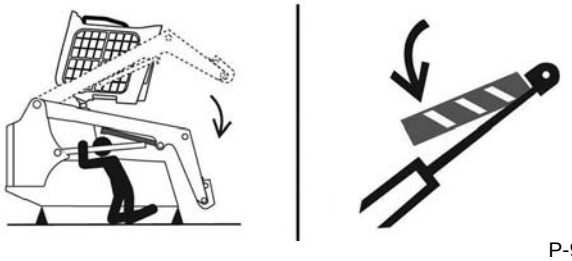
The two-speed / brake valve (Item 1) **[Figure 30-70-1]** is located on top of the chaincase in front of the hydrostatic pump. The high range is selected by a switch located on the right handle for manual loaders and on the left joystick for SJC loaders.

When the high range is selected, the two-speed solenoid is energized by the Bobcat Controller. The valve shifts and directs charge pressure oil to the shift spool in each motor. The charge pressure hydraulic oil shifts the spools allowing the motors to move into high range. When low range is selected, the solenoid is de-energized and the shift spools are spring returned to low range.

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Valve Block Removal And Installation

⚠ DANGER



P-90328

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.**

D-1009-0409

⚠ 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

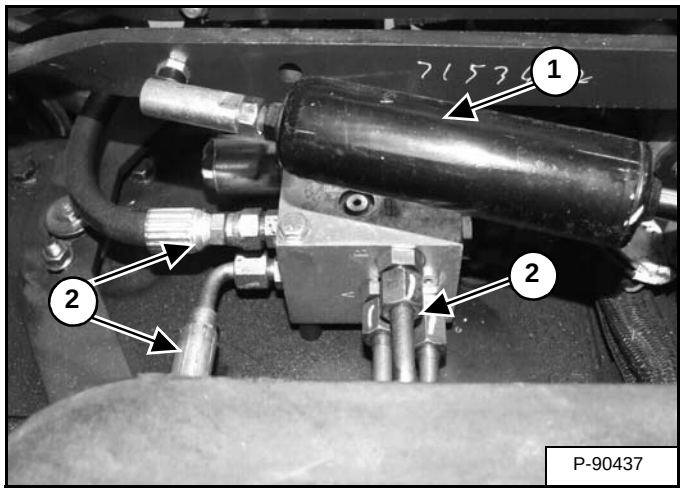
Put jackstands under the front axles and rear corners of the frame before running the engine for service. Failure to use jackstands can allow the machine to fall or move and cause injury or death.

W-2017-0286

Lift and block the loader. (See Procedure on Page 10-10-1.)

Raise the operator cab. (See Raising on Page 10-30-2.)

Figure 30-70-2

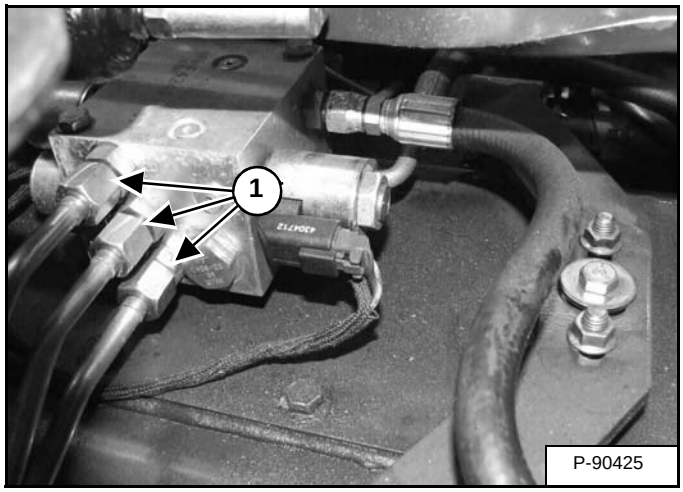


Remove the steering shock (Item 1) **[Figure 30-70-2]**.

Mark all hydraulic hoses for proper installation.

Disconnect the five hydraulic hoses (Item 2) **[Figure 30-70-2]** from the brake / two speed valve block.

Figure 30-70-3

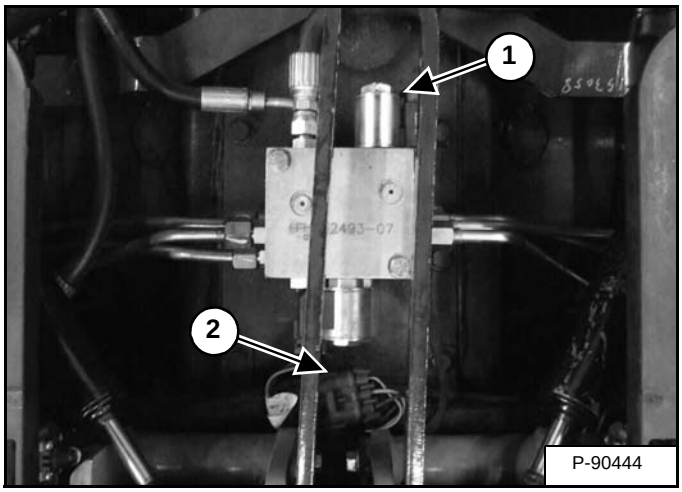


Disconnect the three hydraulic hoses (Item 1) **[Figure 30-70-3]** from the brake / two speed block.

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Valve Block Removal And Installation (Cont'd)

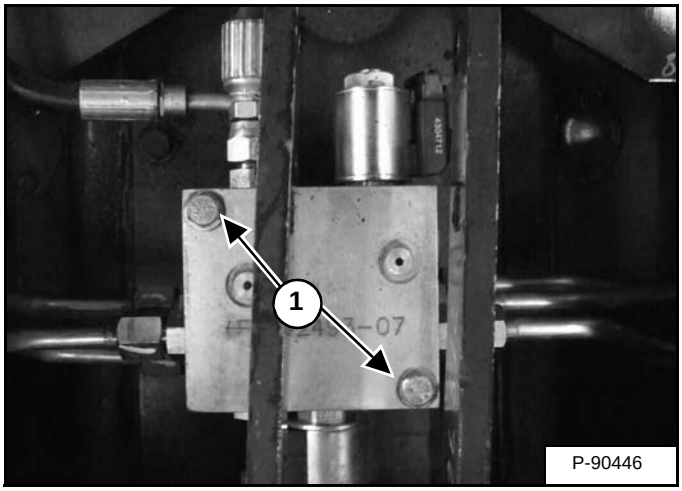
Figure 30-70-4



Disconnect the wire harness connector (Item 1) **[Figure 30-70-4]** from the two speed solenoid.

Disconnect the wire harness connectors (Item 2) **[Figure 30-70-4]** from the brake solenoid and make-up valve.

Figure 30-70-5

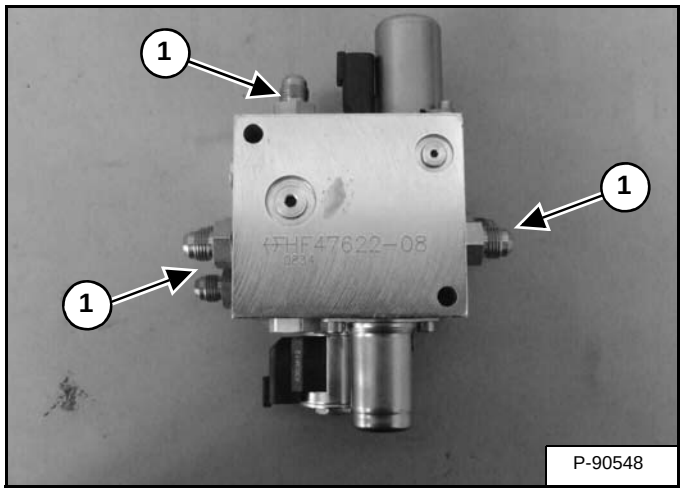


Remove the two mounting bolts (Item 1) **[Figure 30-70-5]** from the valve block.

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Valve Block Disassembly And Assembly

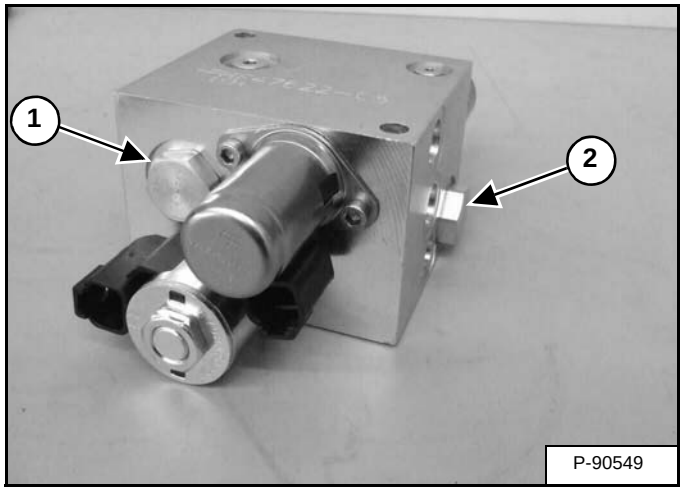
Figure 30-70-6



Mark all hydraulic hoses and fittings for proper installation.

Remove the hydraulic fittings (Item 1) **[Figure 30-70-6]** from the valve block.

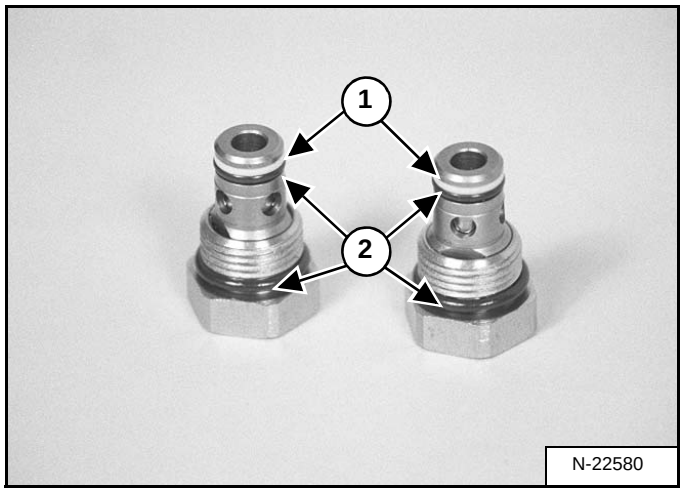
Figure 30-70-7



Remove the check valves (Items 1 and 2) **[Figure 30-70-7]** from the two-speed valve.

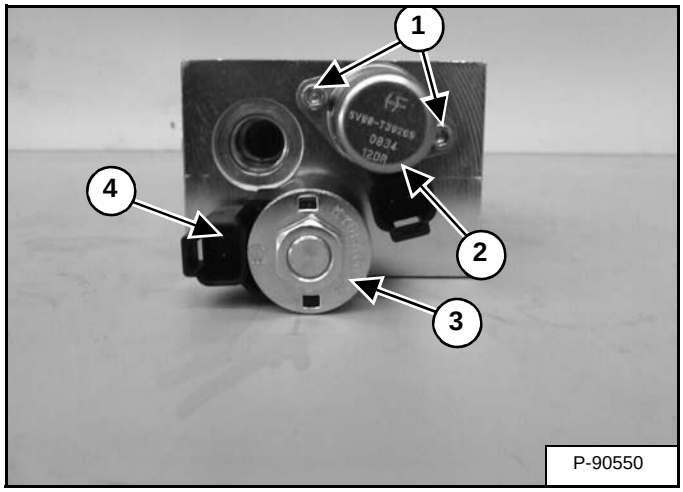
NOTE: The check valves (Items 1 and 2) [Figure 30-70-7] are interchangeable.

Figure 30-70-8



Check the back-up washers (Item 1) and O-rings (Item 2) **[Figure 30-70-8]** for wear and replace as needed.

Figure 30-70-9



Remove the two bolts (Item 1) from the brake valve solenoid (Item 2) **[Figure 30-70-9]**.

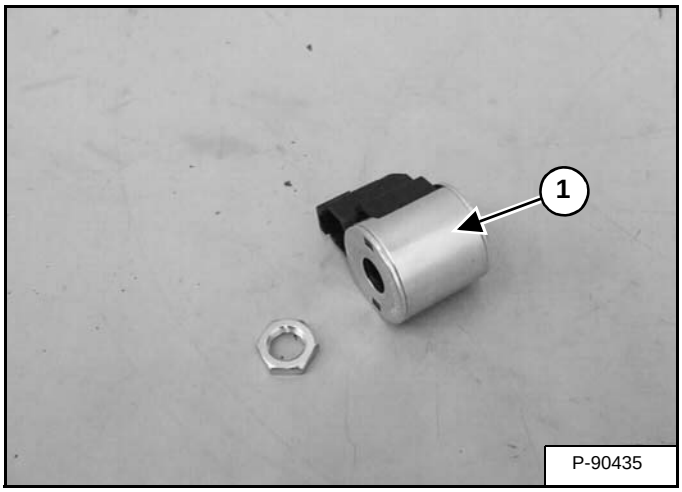
Remove the electrical solenoid nut (Item 3) from the make-up solenoid (Item 4) **[Figure 30-70-9]**.

Assembly: Tighten the nut to 6,78 - 9,49 N•m (60 - 84 in-lb) torque.

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Valve Block Disassembly And Assembly (Cont'd)

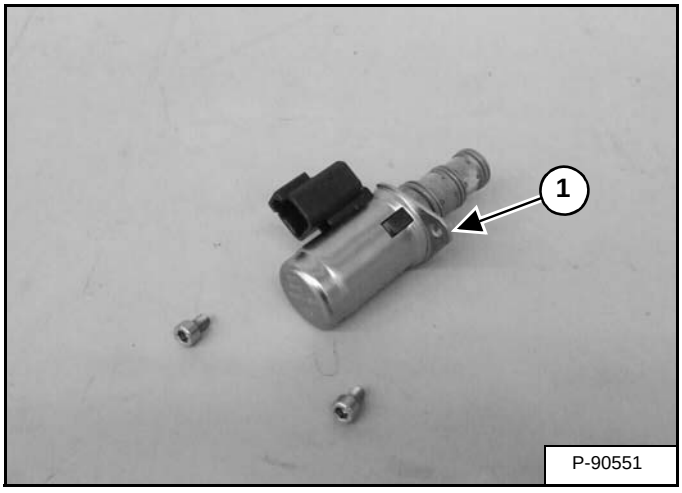
Figure 30-70-10



Use a test meter and test the solenoid coils (Item 1) **[Figure 30-70-10]** for resistance.

The resistance value for the solenoid coil can be found on the electrical schematic.

Figure 30-70-11

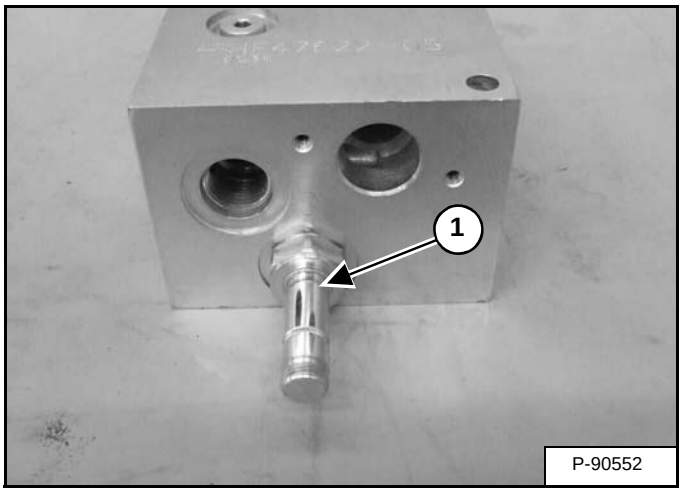


Use a test meter and test the solenoid coils (Item 1) **[Figure 30-70-10]** for resistance.

The resistance value for the solenoid coil can be found on the electrical schematic.

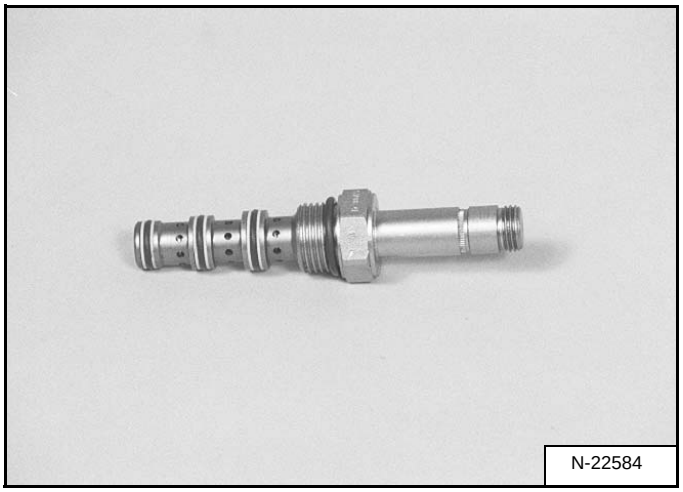
Assembly: Always install new O-rings **[Figure 30-70-10]**.

Figure 30-70-12



Remove the make-up solenoid (Item 1) **[Figure 30-70-12]** from the valve block.

Figure 30-70-13

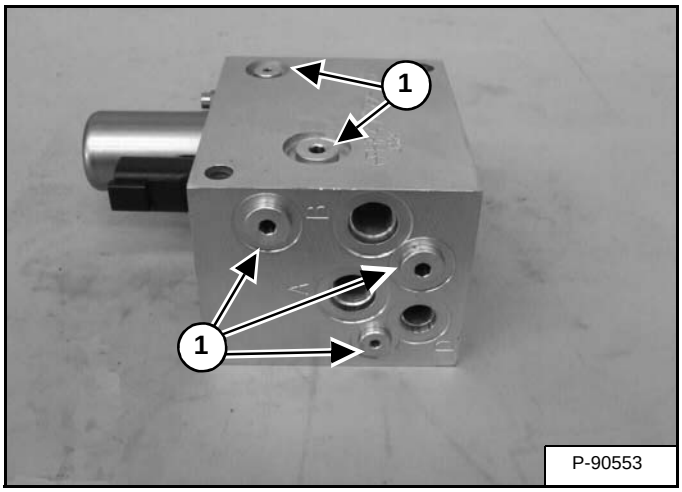


Assembly: Always install new O-rings and back-up washers **[Figure 30-70-13]**. Tighten the solenoid valve to 27,1 N•m (20 ft-lb) torque.

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Valve Block Disassembly And Assembly (Cont'd)

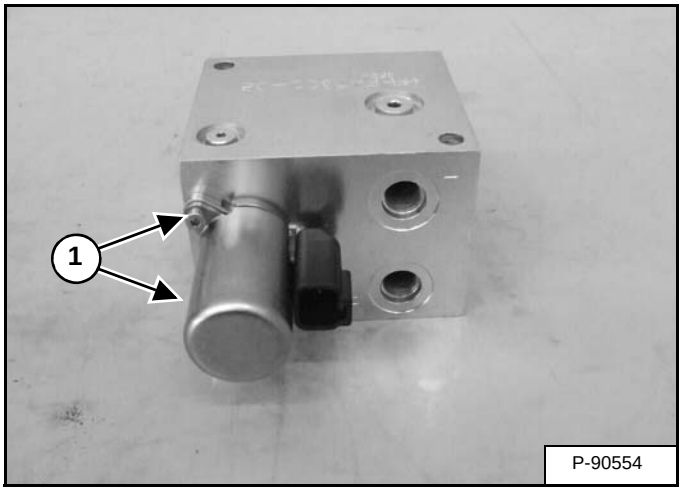
Figure 30-70-14



Remove the plugs (Item 1) **[Figure 30-70-14]** from the brake / two-speed valve block.

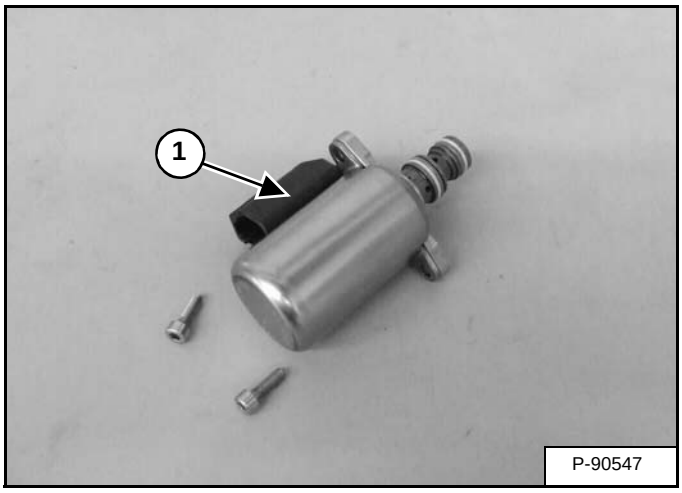
Check the O-ring **[Figure 30-70-14]** on the plugs and replace as needed.

Figure 30-70-15



Remove the two speed solenoid bolts (Item 1) **[Figure 30-70-15]**.

Figure 30-70-16



Use a test meter and test the solenoid (Item 1) **[Figure 30-70-16]** for resistance.

The resistance value for the solenoid coil can be found on the electrical schematic.

Assembly: Always install new O-rings **[Figure 30-70-10]**.

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DRAIN MANIFOLD

Description

The drain manifold is an external assembly in the drain circuit that returns the hydraulic oil to the reservoir.

Drain Manifold Removal And Installation

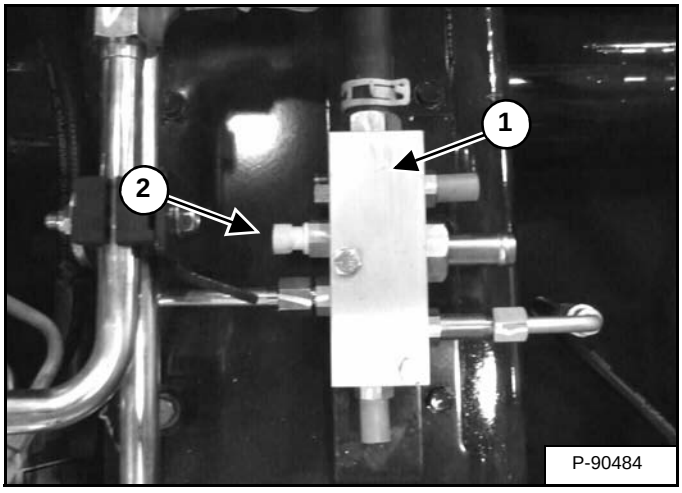
IMPORTANT

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

Drain the hydraulic reservoir. (See Removing And Replacing Hydraulic Fluid on Page 10-120-2.)

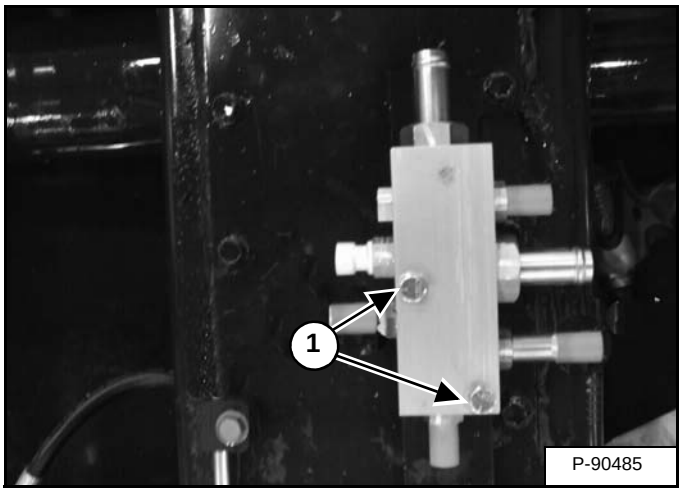
Figure 30-80-1



Remove and plug all hose's from the drain manifold (Item 1) **[Figure 30-80-1]**.

Disconnect the wiring harness from the oil temperature switch (Item 2) **[Figure 30-80-1]**.

Figure 30-80-2



Remove the two bolts (Item 1) **[Figure 30-80-2]**.

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Dealer Copy -- Not for Resale

DRIVE SYSTEM

BRAKE (SINGLE SPEED) 40-10-1
Description 40-10-1
Disc Removal And Installation 40-10-1

BRAKE (TWO-SPEED) 40-11-1
Description 40-11-1

DRIVE COMPONENTS 40-20-1
Description 40-20-1
Axle Seal Removal And Installation 40-20-2
Axle, Sprocket And Bearings Removal And Installation 40-20-4
Chain Removal And Installation 40-20-9

CHAINCASE 40-30-1
Description 40-30-1
Front Cover Removal And Installation 40-30-1
Center Cover Removal And Installation 40-30-2
Rear Cover Removal And Installation 40-30-3

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Dealer Copy -- Not for Resale

BRAKE (SINGLE SPEED)

Description

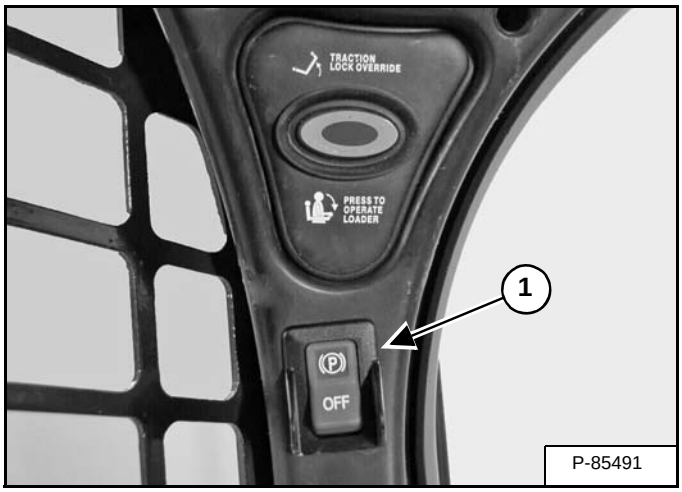
The brake is used to hold the machine in place. The brake is operated by a switch (Item 1) **[Figure 40-10-1]** located on the front accessory panel.

The brake is applied by a spring-loaded wedge that drops into two notched brake discs attached to the motor carrier shafts. An electric solenoid is sent power from a relay to pull the wedge away from the discs. A signal from the main Bobcat controller holds the wedge away from the discs.

The hold signal will be interrupted and the wedge will drop if the engine rpm drops below 700 rpm, the seat bar sensor fails or if there is a break in the wires for the brake solenoid.

For more information on the brake. (See TRACTION LOCK on Page 60-120-1.)

Figure 40-10-1



Disc Removal And Installation

Raise the loader lift arms and install an approved lift arm support device. (See Installing on Page 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

Raise the loader operator cab. (See Raising on Page 10-30-2.)

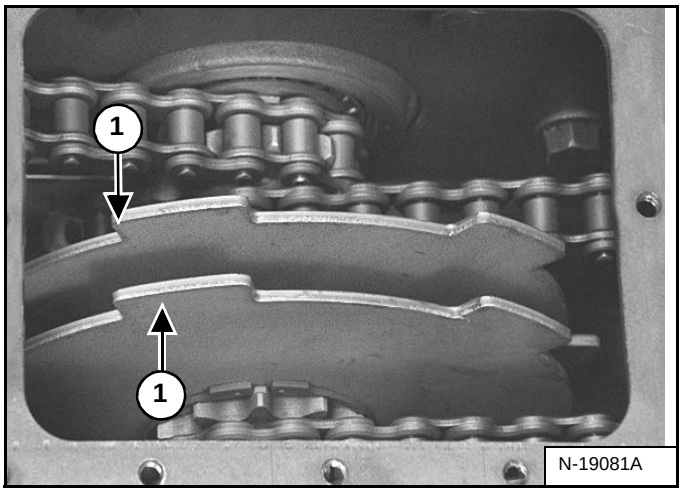
Disconnect and remove the engine speed control. (See Removal And Installation on Page 70-20-1.)

Remove the control panel from the loader. (See Removal And Installation on Page 50-100-2.)

Remove the center chaincase cover. (See Center Cover Removal And Installation on Page 40-30-2.)

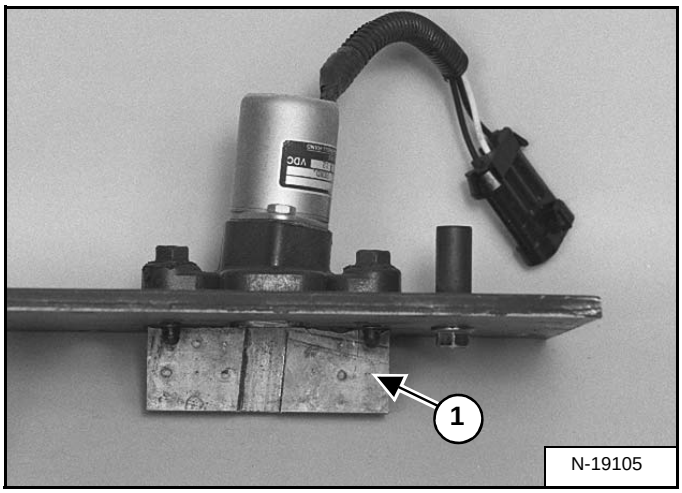
Remove the traction lock assembly.

Figure 40-10-2



The parking brake discs (Item 1) **[Figure 40-10-2]** are located beneath the center chaincase cover.

Figure 40-10-3



Inspect the traction lock guides (Item 1) **[Figure 40-10-3]** and the brake disc for damage or wear and replace as necessary. (See Inspecting on Page 60-120-3.)

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Disc Removal And Installation (Cont'd)

Figure 40-10-4

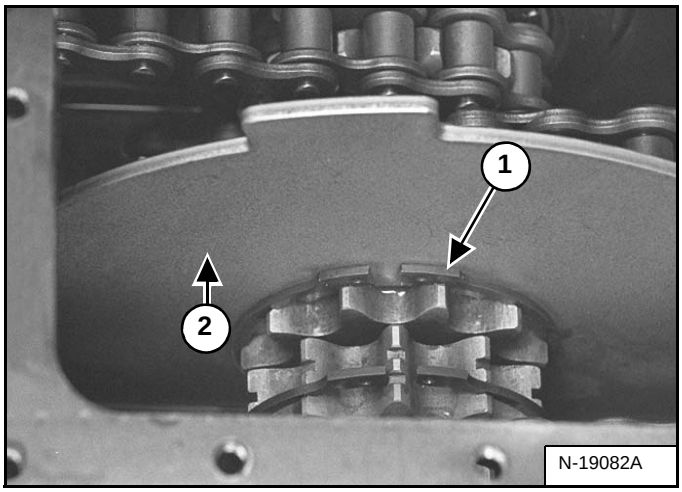
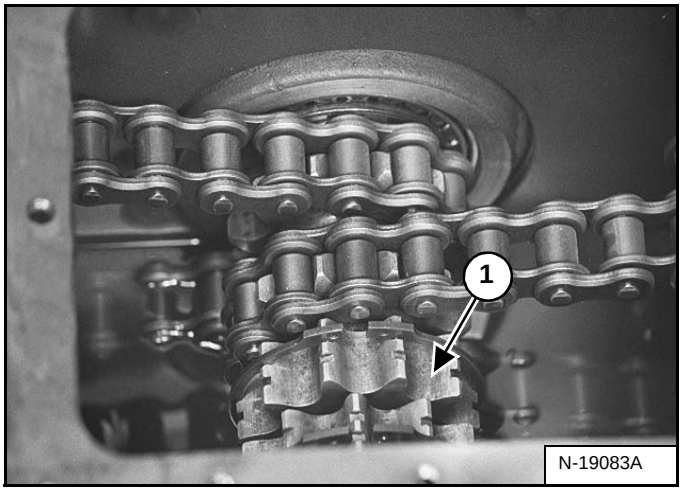


Figure 40-10-5



A snap ring pliers with 90° tips are necessary for removing the parking brake disc.

Remove the snap ring (Item 1) **[Figure 40-10-4]** from the end of the sprocket on the hydrostatic motor carrier.

Slide the disc (Item 2) **[Figure 40-10-4]** off the sprocket (Item 1) **[Figure 40-10-5]** and remove the disc through the front chaincase cover.

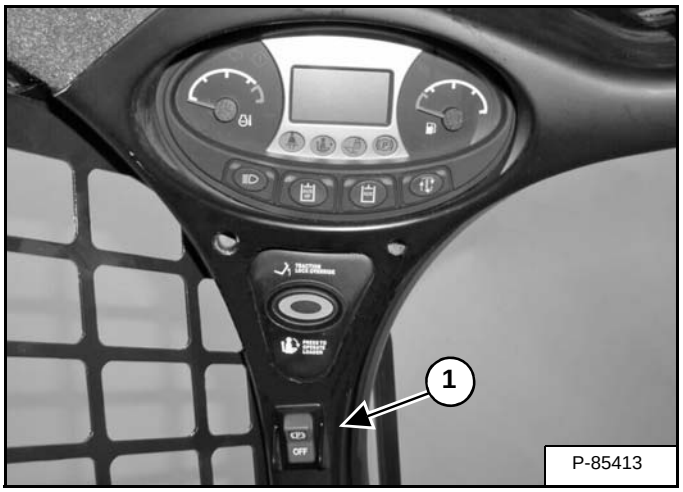
Reverse the removal procedure to install the disc in the loader.

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BRAKE (TWO-SPEED)

Description

Figure 40-11-1



The brake is used to hold the machine in place. The brake is operated by a switch (Item 1) **[Figure 40-11-1]** located on the front accessory panel.

The brake is a spring applied pressure release system, which is self contained on the end of each drive motor.

The brake block solenoid is sent power from a relay to open the circuit which releases the charge pressure oil to the brakes. The charge pressure oil pushes the spring away from the brake discs allowing the drive motor to move.

A signal from the main Bobcat controller holds the brake solenoid open to allow constant flow of the charge pressure oil to hold the spring away from the brake discs.

When the hold signal is interrupted the solenoid will close the circuit and the charge oil will be shut off an the spring will apply the brakes. This will happen if the engine rpm drops below a set rpm, the seat bar sensor fails or if there is a break in the wires for the brake block solenoid.

For more information on the brake. (See TWO-SPEED / BRAKE VALVE on Page 30-70-1.)

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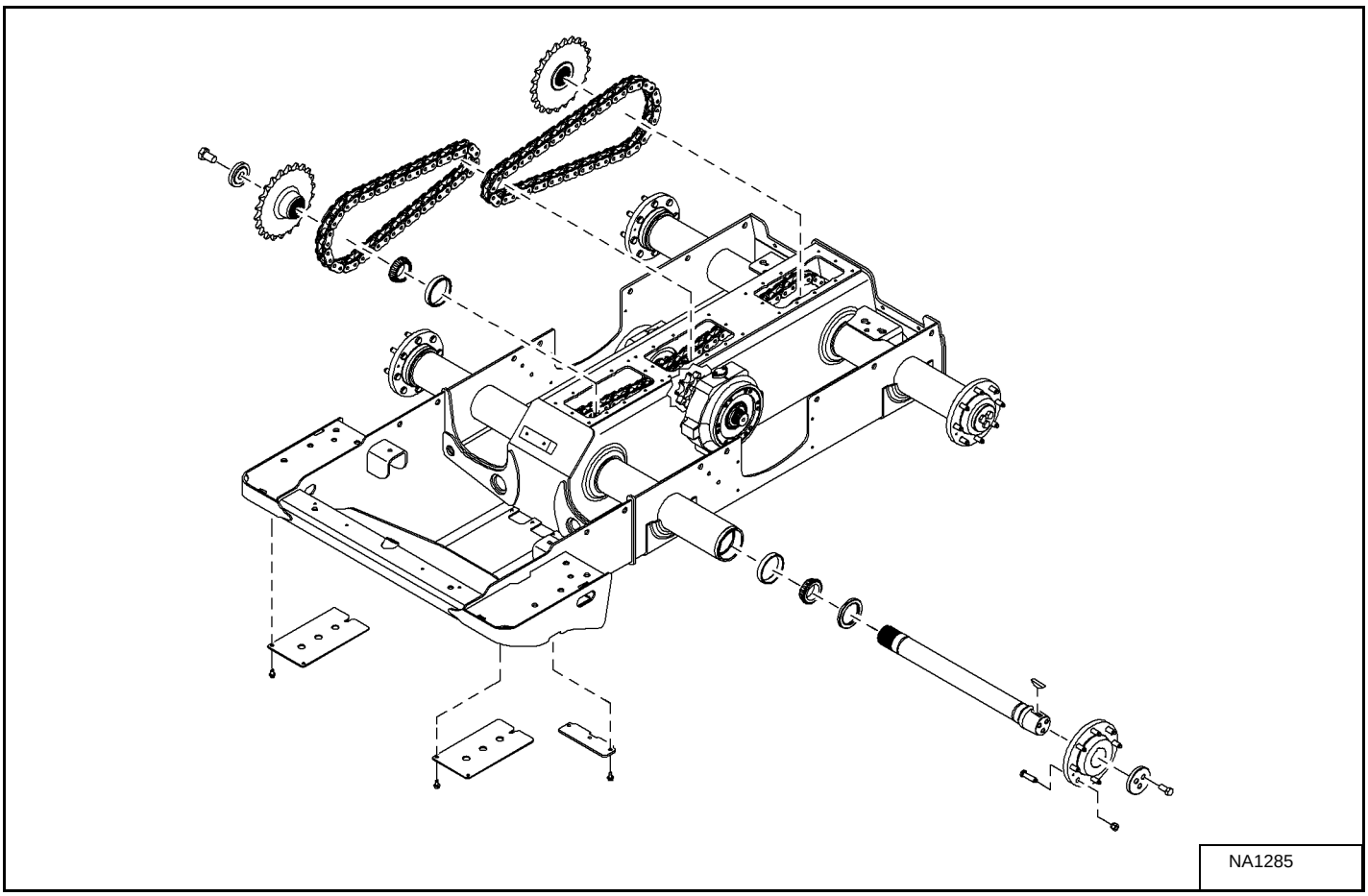
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DRIVE COMPONENTS

Description



The drive components consist of the chaincase, drive chains, sprockets, axleshafts, hubs, drive motor carrier and a brake (Single speed only).

The two speed brake is part of the two speed drive motor.

The chaincase is partially filled with hydraulic fluid to lubricate the chains and bearings.

On the bottom of the chaincase, these is a cover for access to the fuel tank drain plug.

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Axle Seal Removal And Installation

The tools listed are needed for the following procedure:

Axle Hub Puller Tool
MEL1407 - Seal Driver Tool
MEL1242 - Power Ram (may be used if desired)

Lift and block the loader. (See Procedure on Page 10-10-1.)

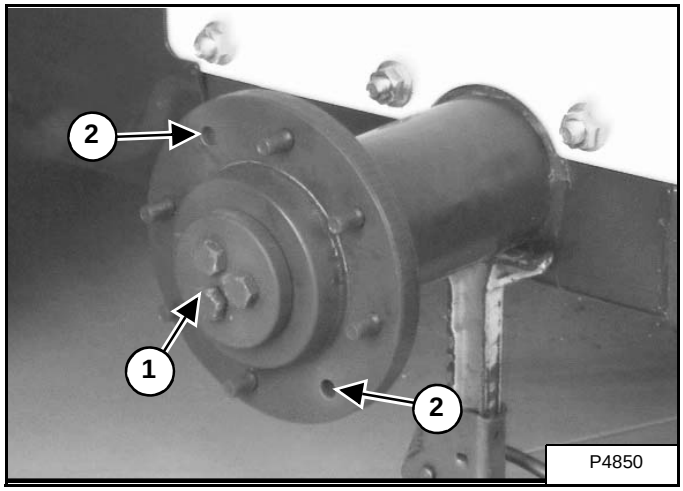
NOTE: If the axle and bearings are being replaced, also loosen the sprocket mounting bolt inside the chaincase before lifting and blocking the loader. (See Axle, Sprocket And Bearings Removal And Installation on Page 40-20-4.)

Remove the tire/wheel assembly. (See Mounting on Page 10-160-1.)

Remove the front chaincase cover. (See Front Cover Removal And Installation on Page 40-30-1.)

Remove the fluid from the chaincase. (See Removing And Replacing Oil on Page 10-130-1.)

Figure 40-20-1

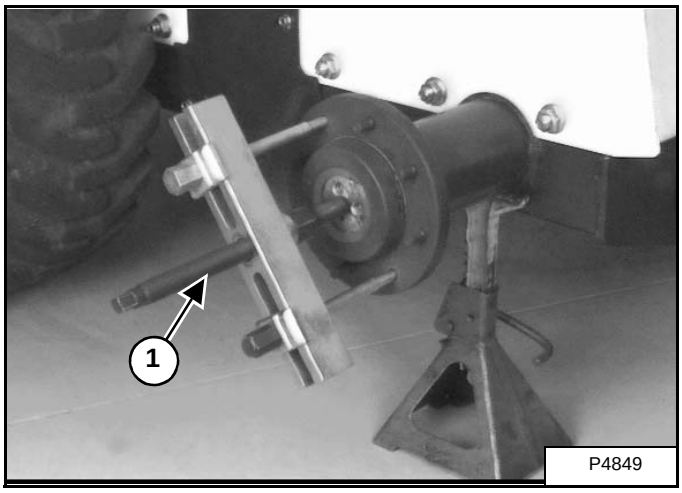


Remove the bolts (Item 1) **[Figure 40-20-1]** and plate.

Installation: Tighten the bolts to 240 - 260 N•m (175 - 190 ft-lb) torque.

Remove the two wheel studs (Item 2) **[Figure 40-20-1]** across from each other.

Figure 40-20-2



Install puller (Item 1) **[Figure 40-20-2]** on the wheel hub.

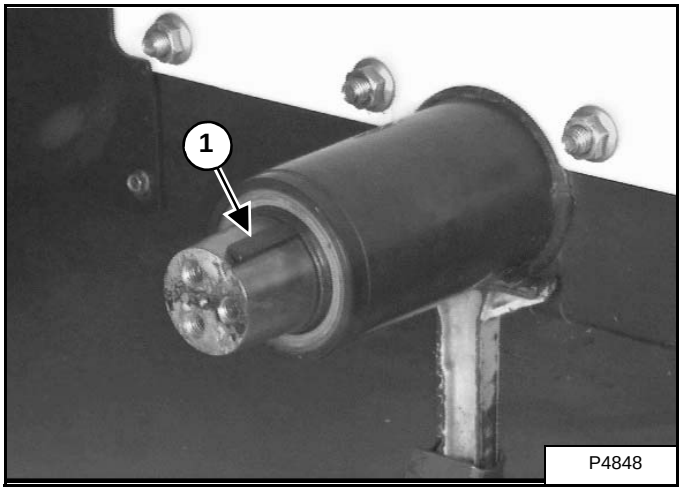
⚠ WARNING

NEVER STAND IN-LINE OF THE HUB WHEN REMOVING A HUB FROM AN AXLE. The hub has a tapered fit on the axle end and can come off the axle with great force and cause serious injury.

W-2186-0395

Remove the hub from the axle.

Figure 40-20-3

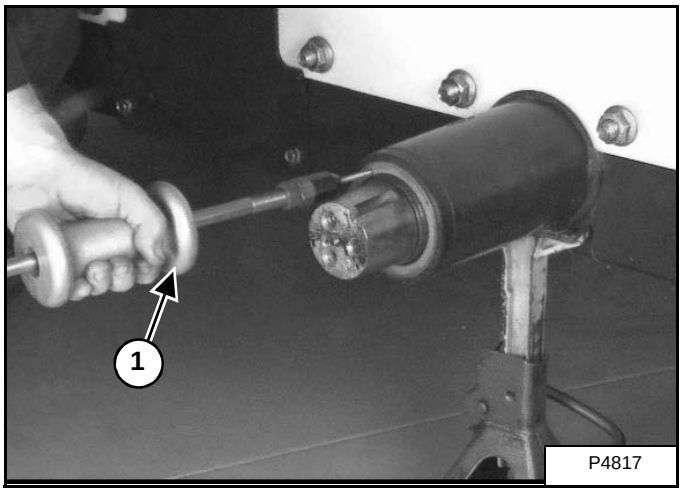


Remove the key (Item 1) **[Figure 40-20-3]** from the axle.

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Axle Seal Removal And Installation

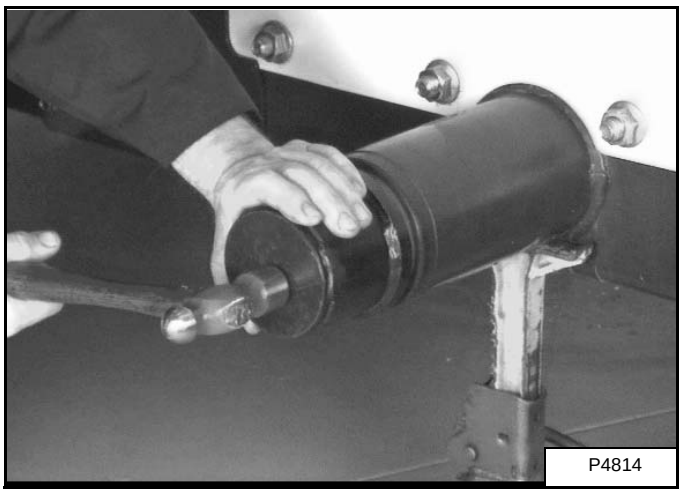
Figure 40-20-4



Install a slide hammer (Item 1) **[Figure 40-20-4]** with a screw tip end into the axle seal.

Remove the axle seal.

Figure 40-20-5



Installation: Place the seal with the lip facing in **[Figure 40-20-5]**.

Installation: Use a hammer, install the new axle seal until the tool (MEL1407) is flush with the edge of the axle tube **[Figure 40-20-5]**.

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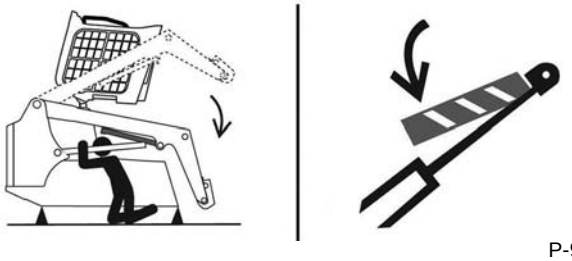
Axle, Sprocket And Bearings Removal And Installation

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

MEL1242 - Port-a-Power
MEL1202B - Axle Bearing Service Set

NOTE: The procedure shown for removal and installation of the axle, sprocket and bearings is for a front axle. This procedure will be the same for the rear axle.

⚠ DANGER



P-90328

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.**

D-1009-0409

⚠ 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 Installing on Page 10-20-1.)

Lift and block the loader. (See Procedure on Page 10-10-1.)

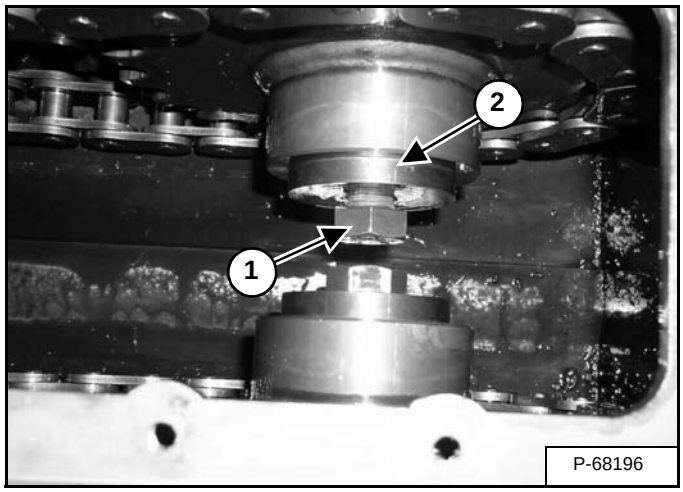
Raise the operator cab. (See Raising on Page 10-30-2.)

Remove the control panel. (See Removal And Installation on Page 50-100-2.)

Remove the front chaincase cover. (See Front Cover Removal And Installation on Page 40-30-1.)

Remove the fluid from the chaincase. (See Removing And Replacing Oil on Page 10-130-1.)

Figure 40-20-6

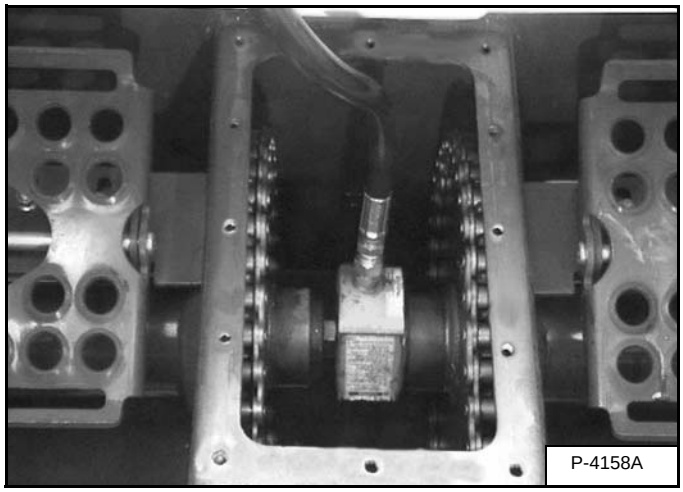


Remove the axle sprocket bolt (Item 1) and backing washer (Item 2) **[Figure 40-20-6]**.

Installation: Tighten the axle sprocket bolt to 699 - 726 N•m (515 - 535 ft-lb) torque.

Remove the axle hub. (See Axle Seal Removal And Installation on Page 40-20-2.)

Figure 40-20-7

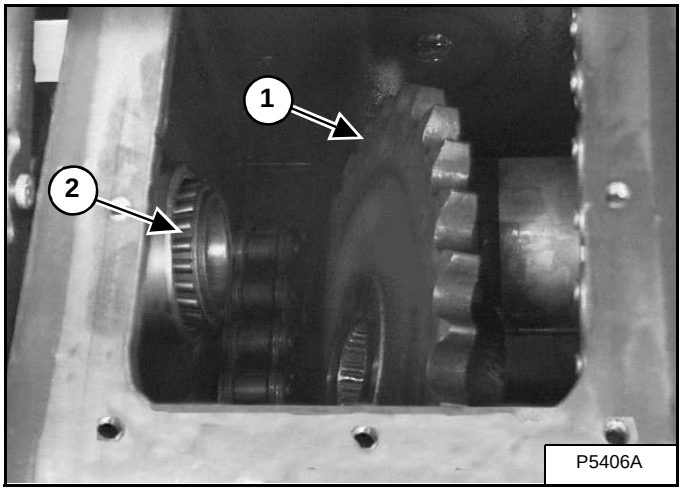


Install a Port-a-Power ram between the two sprockets **[Figure 40-20-7]**.

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Axle, Sprocket And Bearings Removal And Installation (Cont'd)

Figure 40-20-8



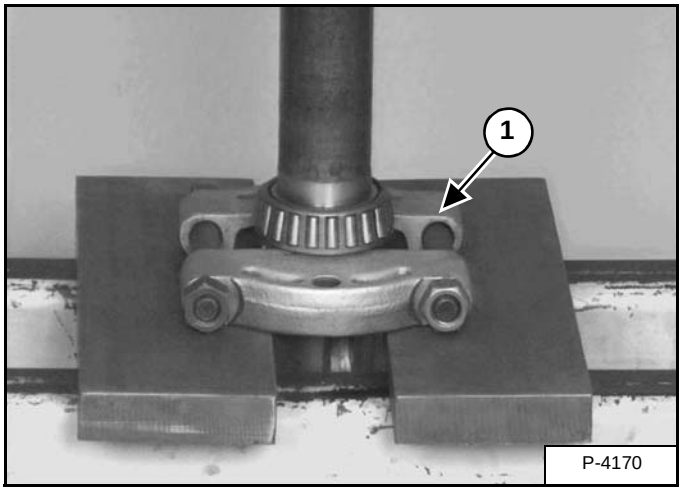
Push the axle out until the ram is at the end of the stroke. Add a spacer and push the axle out again. Repeat this procedure until the axle is out of the sprocket.

Remove the drive chain from the sprocket.

Remove the sprocket (Item 1) and inner bearing (Item 2) **[Figure 40-20-8]**.

Installation: Pack the inner and outer bearing with grease before installing them.

Figure 40-20-9

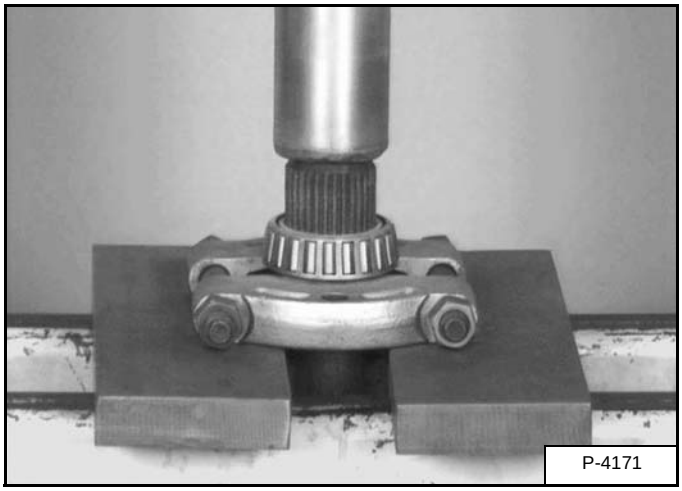


A bearing puller (Item 1) **[Figure 40-20-9]** is needed to do the following procedure:

Be sure the bearing puller makes good contact with the inner race and press the bearing off the mounting surface of the axle **[Figure 40-20-9]**.

NOTE: Hold the axle during removal because it will slide freely after the bearing is removed from the mounting surface.

Figure 40-20-10

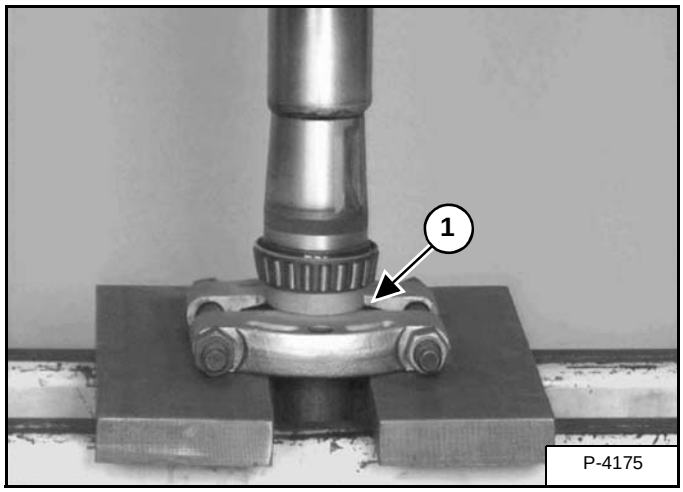


Press the splined end of the axle free from the bearing **[Figure 40-20-10]**.

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Axle, Sprocket And Bearings Removal And Installation (Cont'd)

Figure 40-20-11



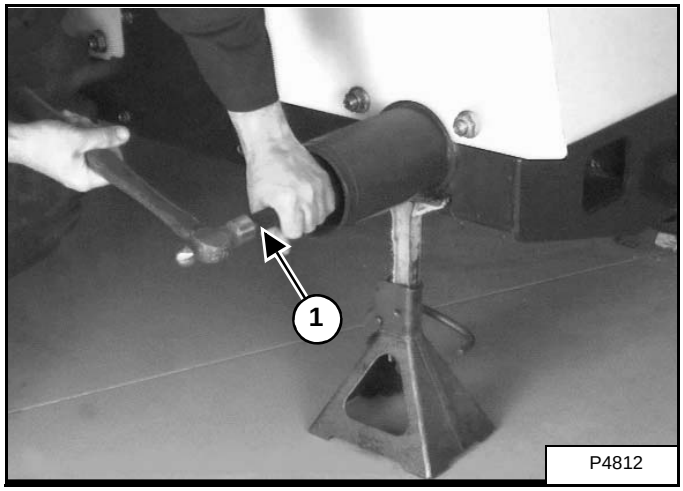
Installation: Put the spline end of the axle shaft into the bearing and press the bearing onto the axle.

NOTE: Hold the axle during installation because it will slide freely after the bearing is pressed over the splined end of the shaft.

Put a piece of tubing over the axle (Item 1) **[Figure 40-20-11]** that contacts inner race of the bearing only.

Press the bearing onto the mounting surface until the bearing is fully seated **[Figure 40-20-11]**.

Figure 40-20-12

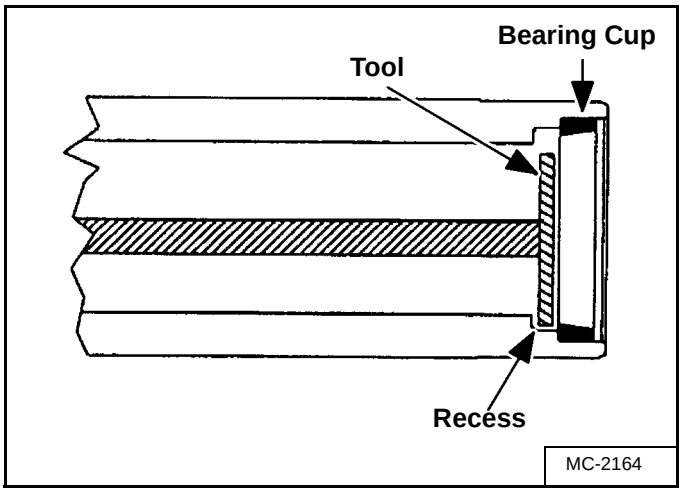


Use the tools provided in the MEL1202B Axle Bearing Service Set. A slide hammer is also needed.

Use the long driver handle (Item 1) **[Figure 40-20-12]** and the bearing cup removal tool to remove the inner bearing cup.

The bearing cup removal tool must fall into the recess behind the bearing cup, drive the cup out of the axle tube **[Figure 40-20-13]**.

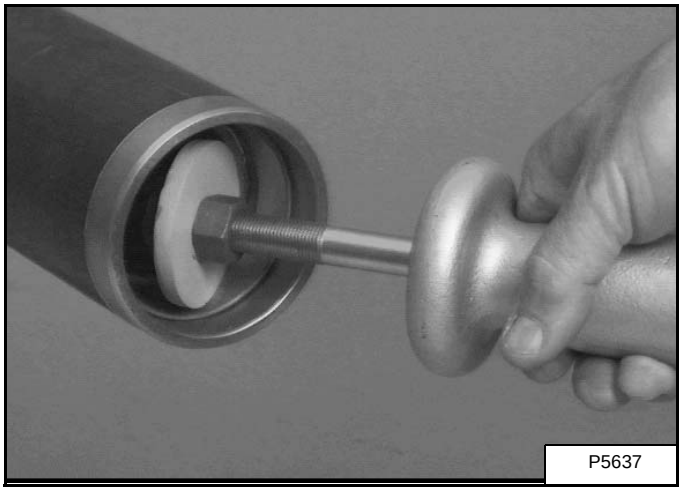
Figure 40-20-13



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Axle, Sprocket And Bearings Removal And Installation (Cont'd)

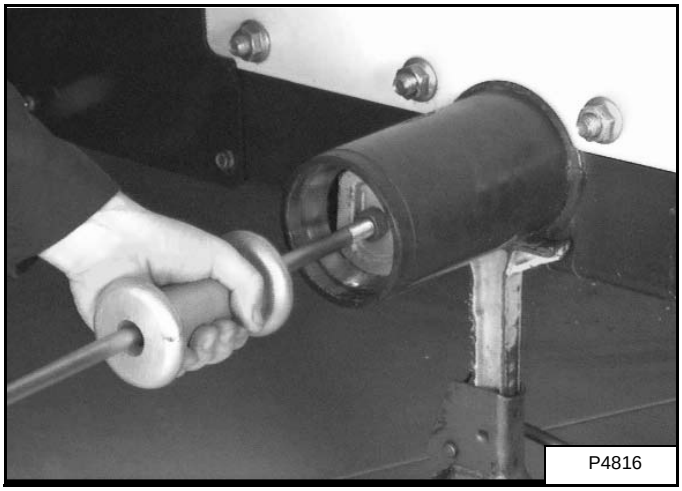
Figure 40-20-14



To remove the outer bearing, install a bearing cup removal tool on the slide hammer.

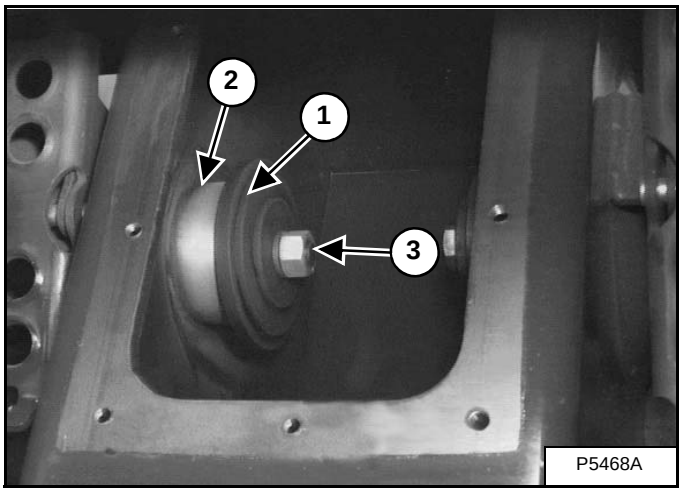
Install the slide hammer/tool assembly behind the bearing cup **[Figure 40-20-14]**.

Figure 40-20-15



Use the slide hammer to remove the bearing cup from the axle tube **[Figure 40-20-15]**.

Figure 40-20-16



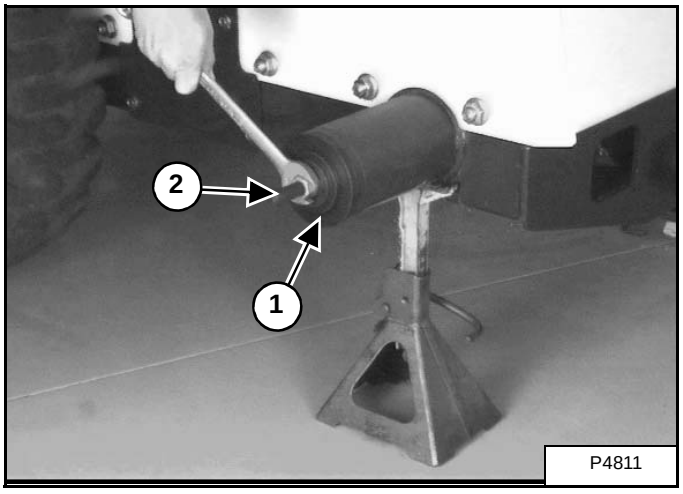
Use the bearing cup installation tool (Item 1) **[Figure 40-20-16]** and (Item 1) **[Figure 40-20-17]**.

Put the inner cup (Item 2) **[Figure 40-20-16]** in the axle tube.

Install the long threaded rod (Item 2) **[Figure 40-20-17]** into the axle tube and through the installation tool (Item 1) **[Figure 40-20-16]**.

Install the nut (Item 3) **[Figure 40-20-16]**.

Figure 40-20-17



Install the installation tool (Item 1) **[Figure 40-20-17]** on the threaded rod. Install the nut.

Hold the inside nut (Item 3) **[Figure 40-20-16]** with a wrench and tighten the outside nut **[Figure 40-20-17]**.

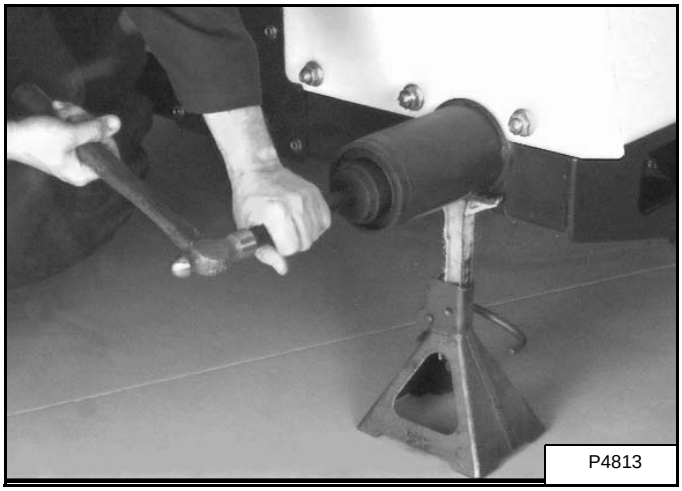
Tighten the nut until the bearing cup is seated.

Remove the installation tool and threaded rod.

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Axle, Sprocket And Bearings Removal And Installation (Cont'd)

Figure 40-20-18



To install the outer bearing cup, install the bearing cup installation tool on the driver handle.

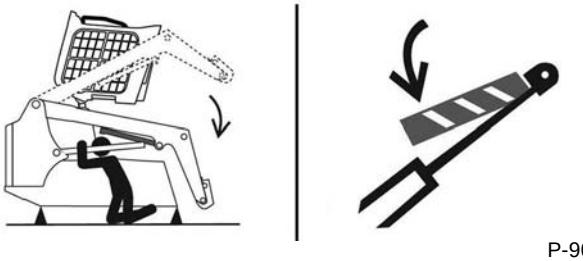
Install the bearing cup into the axle tube, and put the tool into the bearing cup.

Hit the driver handle with a hammer until the bearing cup is seated inside the axle tube **[Figure 40-20-18]**.

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Chain Removal And Installation

DANGER



P-90328

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.**

D-1009-0409

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 Installing on Page 10-20-1.)

Lift and block the loader. (See Procedure on Page 10-10-1.)

Raise the operator cab. (See Raising on Page 10-30-2.)

Remove the control panel. (See Removal And Installation on Page 50-100-2.)

Remove the front or rear chaincase cover. (See Front Cover Removal And Installation on Page 40-30-1.)

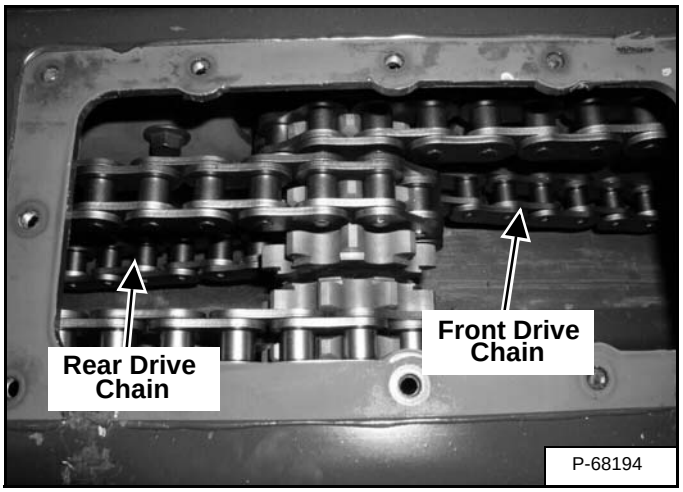
Remove the center chaincase cover. (See Center Cover Removal And Installation on Page 40-30-2.)

Remove the fluid from the chaincase. (See Removing And Replacing Oil on Page 10-130-1.)

Remove the brake disc. (See Disc Removal And Installation on Page 40-10-1.)

Remove the front or rear axle and sprocket. (See Axle, Sprocket And Bearings Removal And Installation on Page 40-20-4.)

Figure 40-20-19



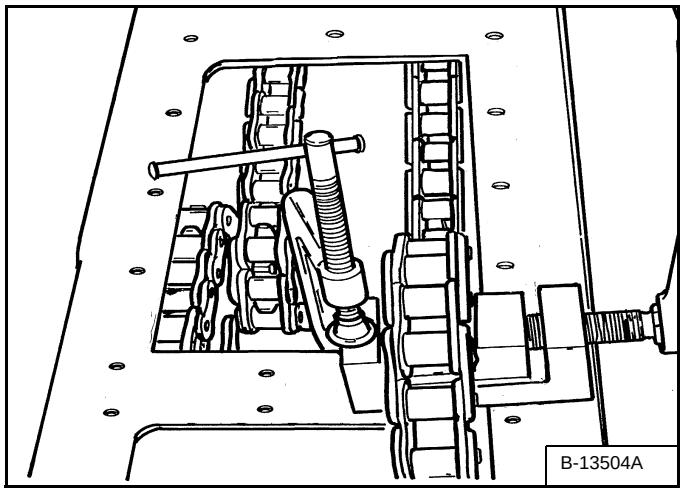
NOTE: It is necessary to remove the rear axle and drive chain if the front chain has to be removed.

Remove the motor carrier. (See Removal And Installation on Page 30-30-2.)

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Chain Removal And Installation (Cont'd)

Figure 40-20-20



The tool listed is needed for the following procedure:

MEL1246 - Chain Link Tool

Installation: If a new chain is installed, a connector link must be used to connect the chain together.

Use MEL1246 Chain Link Tool and #120 chain adapter.

Secure the tool and place the connector link in the tool as shown **[Figure 40-20-20]**.

Turn the threaded rod of the tool and press the connector link together on the chain **[Figure 40-20-20]**. Tighten the threaded rod of the chain link tool to 339 N•m (250 ft-lb) torque.

⚠ WARNING

DO NOT exceed the recommended torque. The tool may fail under too much torque. Put cloth around the tool to protect yourself from flying debris.

W-2233-0307

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CHAINCASE

Description

The chaincase contains the drive components.

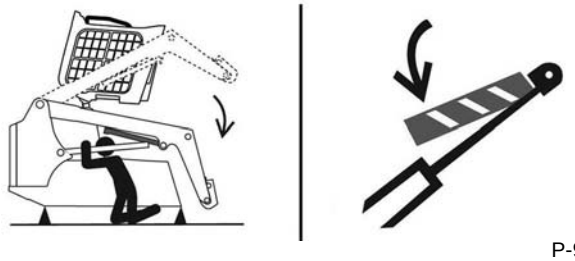
Front Cover Removal And Installation

Raise the loader lift arms and install an approved lift arm support device. (See Installing on Page 10-20-1.)

Raise the loader operator cab. (See Raising on Page 10-30-2.)

Remove the control panel. (See Removal And Installation on Page 50-100-2.)

⚠ DANGER



P-90328

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.**

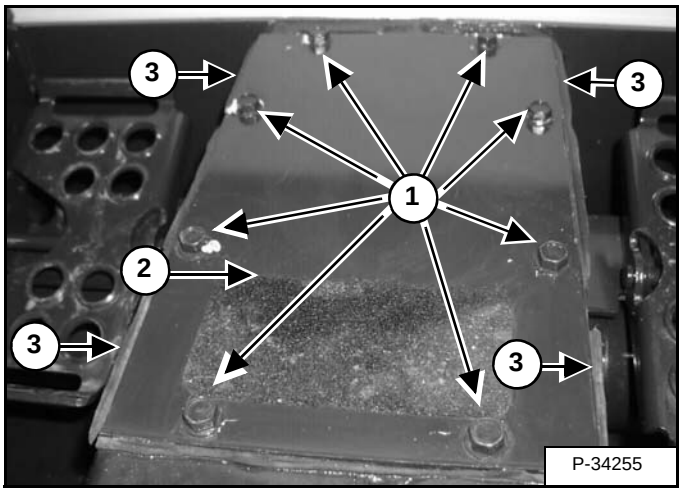
D-1009-0409

⚠ 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 40-30-1



Remove the front chaincase cover mounting screws (Item 1) **[Figure 40-30-1]**.

Remove the front chaincase cover (Item 2) **[Figure 40-30-1]** from the loader.

NOTE: There are tabs (Item 3) [Figure 40-30-1] on the side of the cover to help pry the covers off.

Installation: Apply polyurethane sealer to mating surfaces. Polyurethane sealant should be applied to the screw threads to stop oil leakage. Tighten the mounting screws to 34 - 38 N•m (25 - 28 ft-lb) torque.

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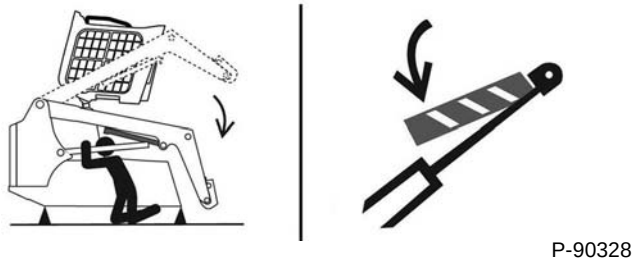
CHAINCASE (CONT'D)

Center Cover Removal And Installation

Raise the loader lift arms and install an approved lift arm support device. (See Installing on Page 10-20-1.)

Raise the loader operator cab. (See Raising on Page 10-30-2.)

⚠ DANGER



P-90328

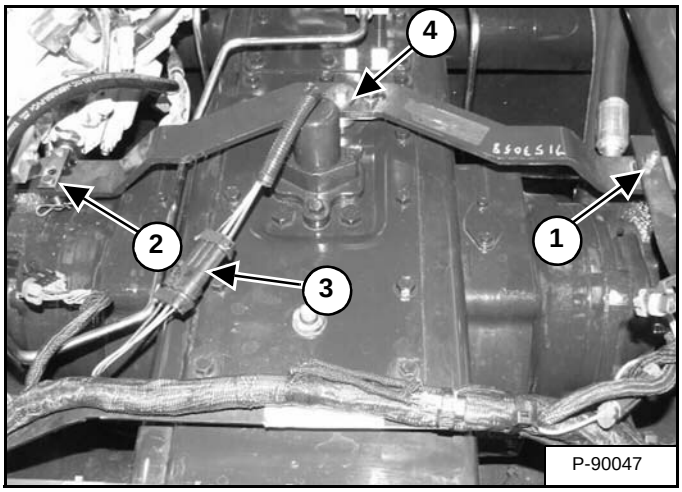
AVOID DEATH

- **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.**

D-1009-0409

Remove the control panel. (See Removal And Installation on Page 50-100-2.)

Figure 40-30-2



If loader is equipped with SJC, skip to **[Figure 40-30-3]**.

Disconnect the lift control cross bar from the lift pedal linkage (Item 1) **[Figure 40-30-2]**.

Disconnect the lift control cross bar (Item 2) **[Figure 40-30-2]** from the lift spool on the main control valve.

Disconnect the electrical connector (Item 3) **[Figure 40-30-2]** from the traction lock solenoid.

Remove the crossbar mounting bolt (Item 4) **[Figure 40-30-2]**.

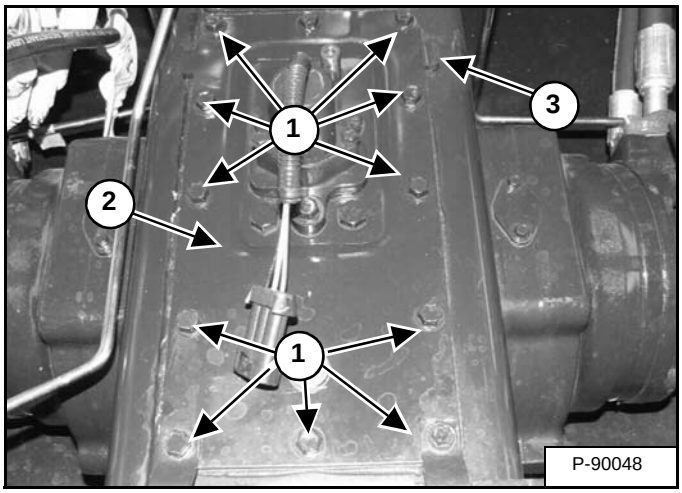
Remove the crossbar and wire harness from the center chaincase cover.

⚠ 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 40-30-3



Remove the chaincase cover mounting screws (Item 1) **[Figure 40-30-3]**.

Remove the center chaincase cover (Item 2) **[Figure 40-30-3]** from the loader.

NOTE: There are tabs (Item 3) [Figure 40-30-3] on the side of the cover to help pry the covers off.

Installation: Apply polyurethane sealer to mating surfaces. Polyurethane sealant should be applied to the screw threads to stop oil leakage. Tighten the mounting screws to 34 - 38 N•m (25 - 28 ft-lb) torque.

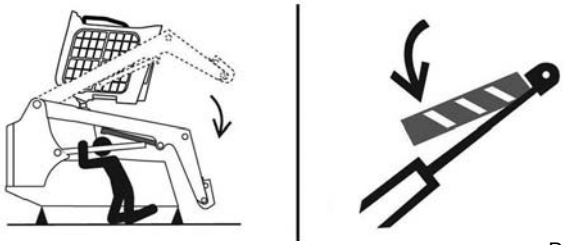
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Rear Cover Removal And Installation

Raise the loader lift arms and install an approved lift arm support device. (See Installing on Page 10-20-1.)

Raise the loader operator cab. (See Raising on Page 10-30-2.)

DANGER



P-90328

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.**

D-1009-0409

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

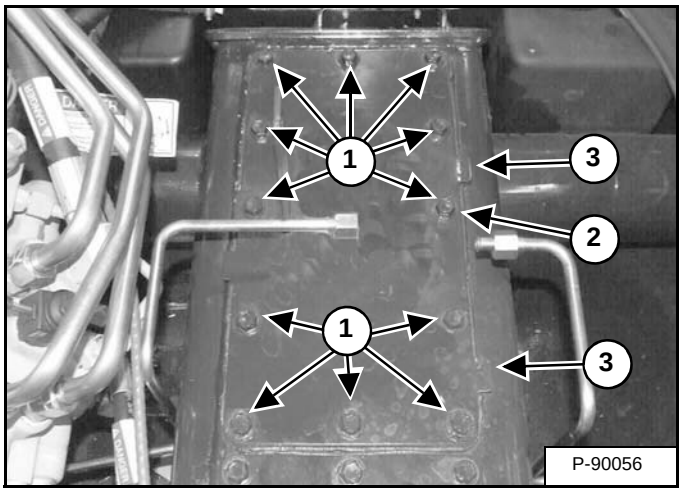
If loader is equipped with two-speed, remove the two-speed valve. (See Valve Block Removal And Installation on Page 30-70-2.)

Remove the drain manifold. (See Drain Manifold Removal And Installation on Page 30-80-1.)

Disconnect the front steering linkage bars from the rear linkage bars. (See Removal And Installation on Page 50-100-2.)

Move the linkage bars to allow adequate space to remove the rear chaincase cover.

Figure 40-30-4



Remove the rear chaincase cover mounting screws (Item 1) **[Figure 40-30-4]**.

Remove chain case cover (Item 2) **[Figure 40-30-4]**.

NOTE: There are tabs (Item 3) [Figure 40-30-4] on the side of the cover to help pry the covers off.

Installation: Apply polyurethane sealer to mating surfaces. Polyurethane sealant should be applied to the screw threads to stop oil leakage. Tighten the mounting screws to 34 - 38 N•m (25 - 28 ft-lb) torque.

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SEAT BAR

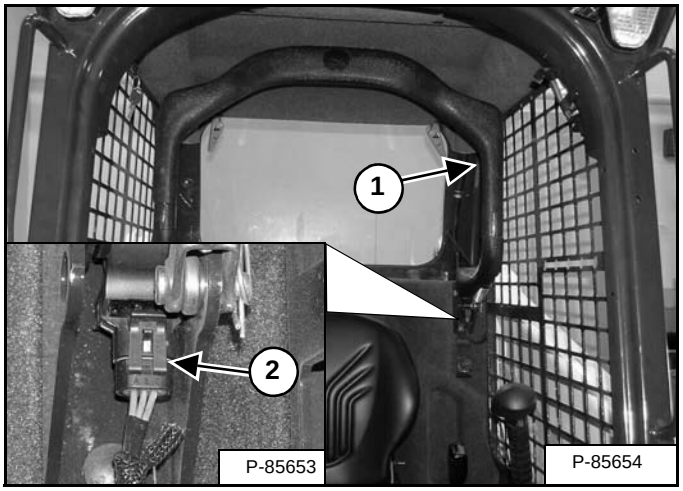
Description

The seat bar is the secondary restraint system that has a sensor that automatically stops the loader functions until the seat bar is lowered.

The seat bar is located in the operator cab.

Removal And Installation

Figure 50-10-1



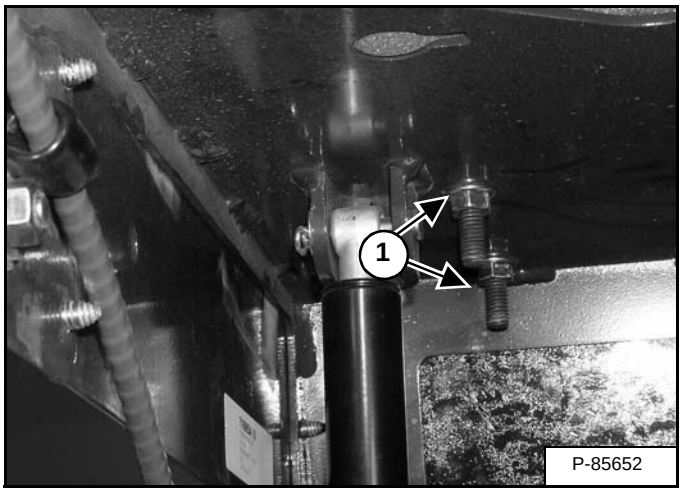
Raise the seat bar (Item 1) **[Figure 50-10-1]**.

Disconnect the seat bar sensor (Item 2) **[Figure 50-10-1]** from the cab harness.

Lower the seat bar.

Raise the operator cab. (See Raising on Page 10-30-2.)

Figure 50-10-2

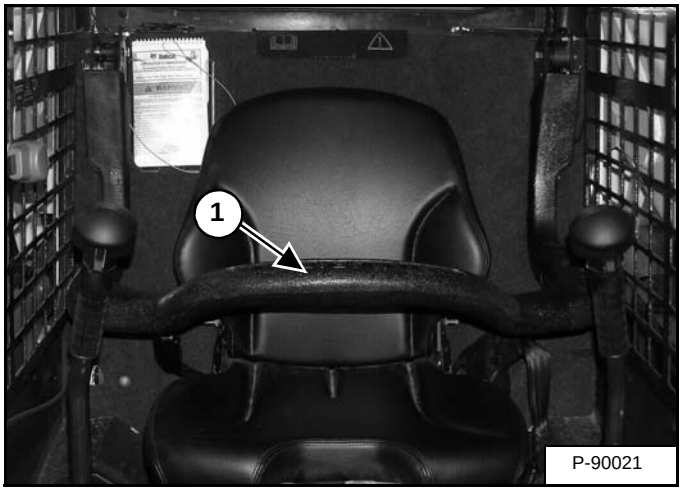


Remove the seat bar mounting nuts (Item 1) **[Figure 50-10-2]** (both sides).

Installation: Tighten the nuts to 34 - 38 N•m (25 - 28 ft-lb) torque.

Lower the operator cab. (See Lowering on Page 10-30-3.)

Figure 50-10-3



Remove the seat bar (Item 1) **[Figure 50-10-3]** from the operator cab.

Reverse the above procedure to install the seat bar into the operator cab.

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SEAT BAR (CONT'D)

Disassembly And Assembly

Figure 50-10-4

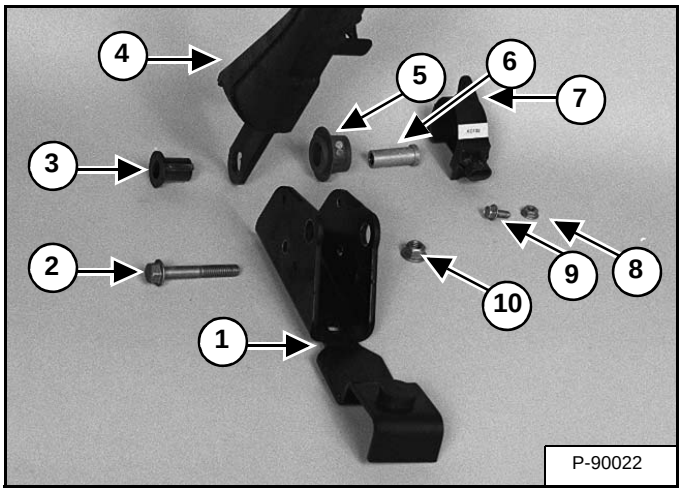
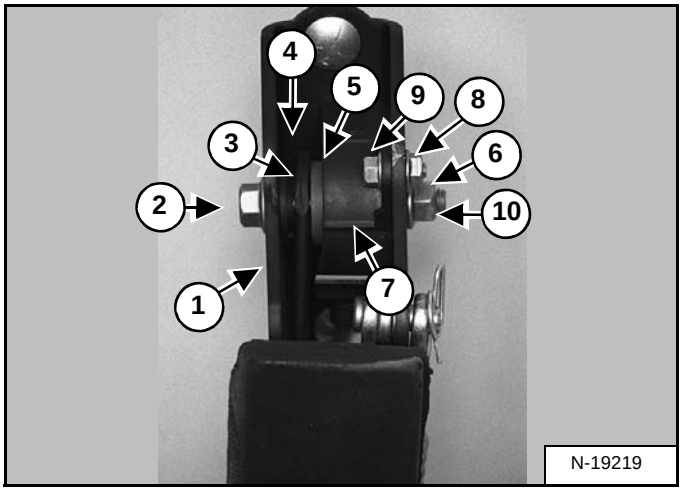


Figure 50-10-5



Assemble the parts as shown for the left side of the seat bar pivot assembly **[Figure 50-10-4]** and **[Figure 50-10-5]**.

Seat Bar Mount (Item 1)
Mounting Bolt (Item 2)
Keyed Plastic Bushing (Item 3)
Seat Bar (Item 4)
Magnetic Bushing Assembly (Item 5)
Pivot Bushing (Item 6)
Sensor Bracket (Item 7)
Sensor Mounting Nut (Item 8)
Sensor Mounting Bolt (Item 9)
Mounting Nut (Item 10)

Installation: Tighten the mounting bolt (Item 9) **[Figure 50-10-4]** and **[Figure 50-10-5]** to 5,6 - 7,9 N•m (50 - 70 in-lb) torque.

Installation: Tighten the mounting bolt (Item 2) **[Figure 50-10-4]** and **[Figure 50-10-5]** to 34 - 38 N•m (25 - 28 ft-lb) torque.

Figure 50-10-6

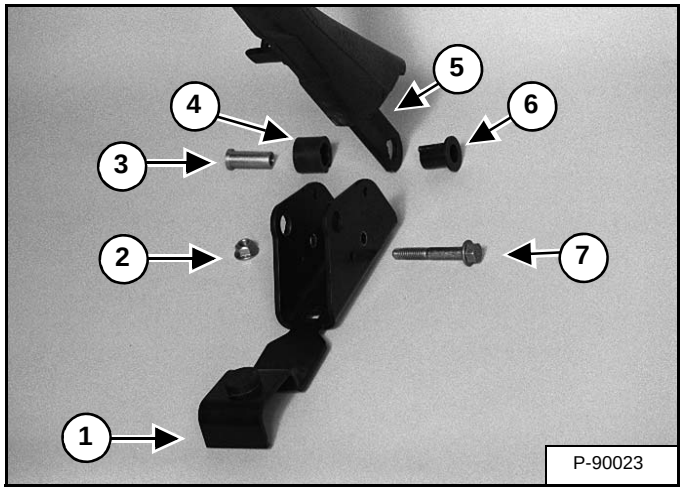
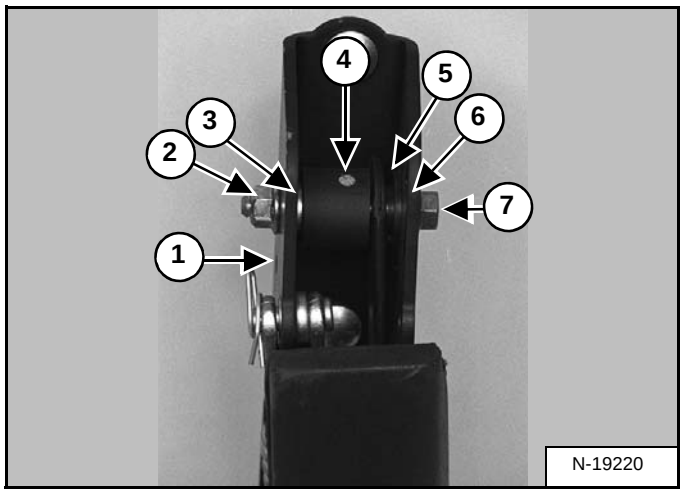


Figure 50-10-7



Assemble the parts as shown for the right side of the seat bar pivot assembly **[Figure 50-10-6]** and **[Figure 50-10-7]**.

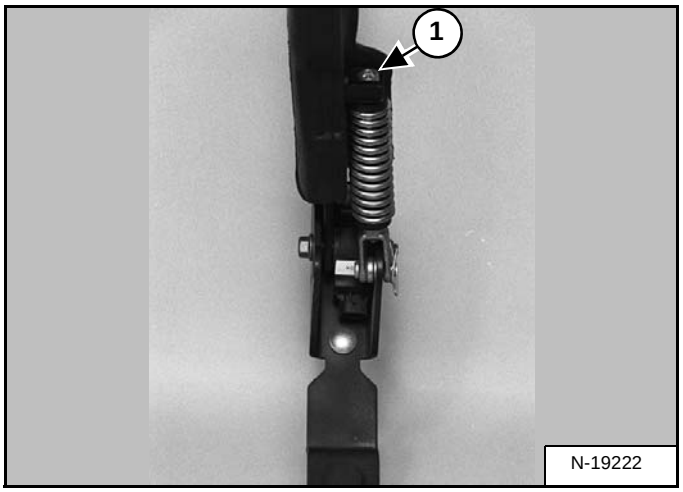
Seat Bar Mount (Item 1)
Mounting Nut (Item 2)
Pivot Bushing (Item 3)
Spacer Bushing (Item 4)
Seat Bar (Item 5)
Keyed Plastic Bushing (Item 6)
Mounting Bolt (Item 7)

Installation: Tighten the mounting bolt (Item 7) **[Figure 50-10-6]** and **[Figure 50-10-7]** to 34 - 38 N•m (25 - 28 ft-lb) torque.

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Compression Spring Disassembly And Assembly

Figure 50-10-8

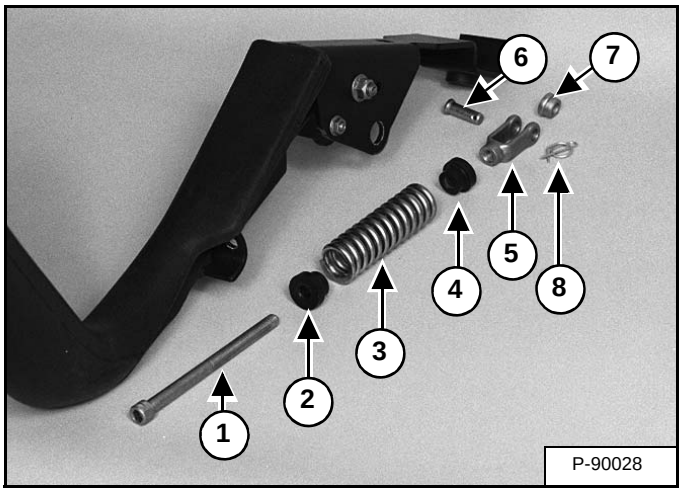


Turn the bolt (Item 1) **[Figure 50-10-8]** and **[Figure 50-10-9]** out of the clevis.

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 50-10-9



Disassemble and assemble the seat bar compression spring and parts as shown in **[Figure 50-10-9]**.

Bolt (Item 1)
Bushing (Item 2)
Spring (Item 3)
Bushing (Item 4)
Clevis (Item 5)
Pin (Item 6)
Bushing (Item 7)
Rue Ring (Item 8)

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Gas Spring 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

Raise the operator cab (See Raising on Page 10-30-2.)

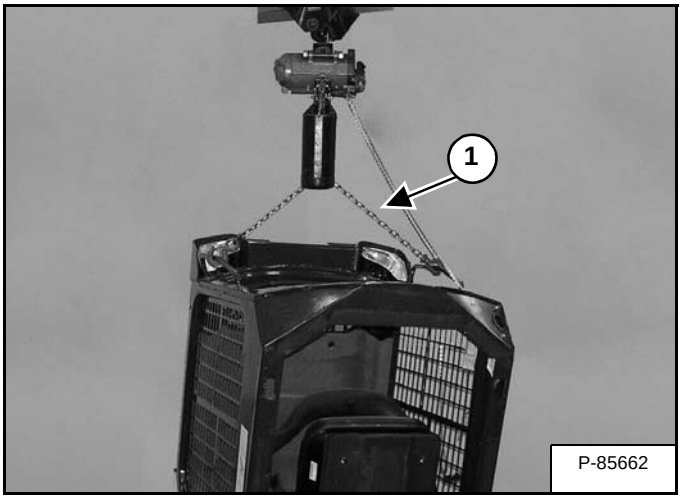
WARNING

AVOID INJURY OR DEATH

Attach a chain hoist to the grab handles of the operator cab before removing the operator cab gas spring(s). If the operator cab is tilted forward without the gas spring(s) operational, the cab will fall and could cause injury or death.

W-2760-0309

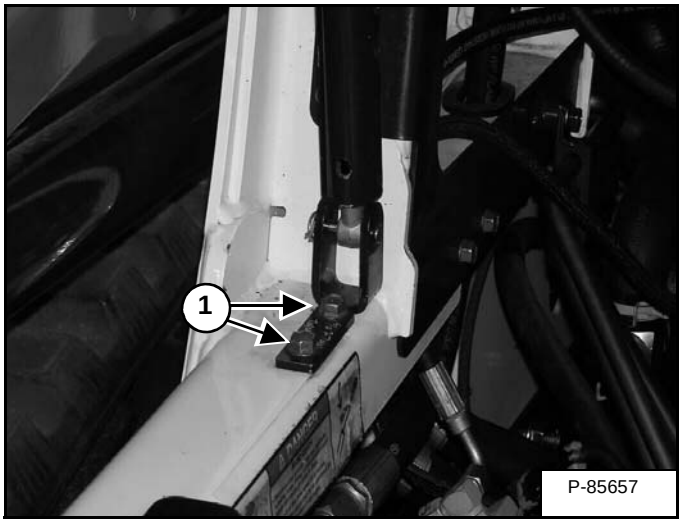
Figure 50-20-1



Install a strap and hoist (Item 1) **[Figure 50-20-1]** to the cab handles.

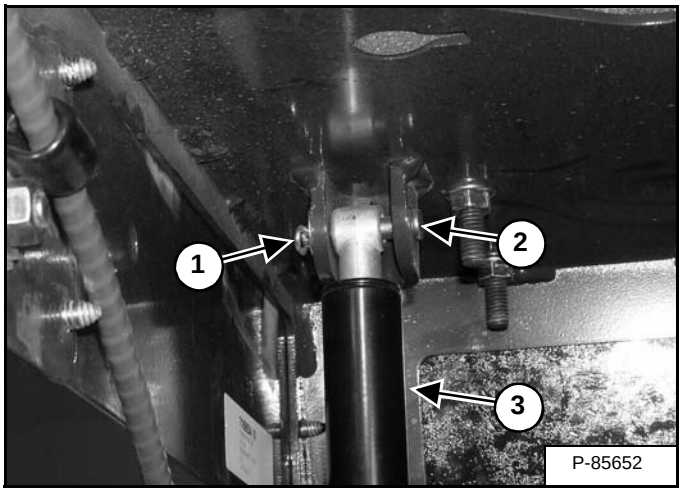
Lift the cab with the hoist to release the pressure on the gas spring(s).

Figure 50-20-2



Remove the two bolts (Item 1) **[Figure 50-20-2]**.

Figure 50-20-3



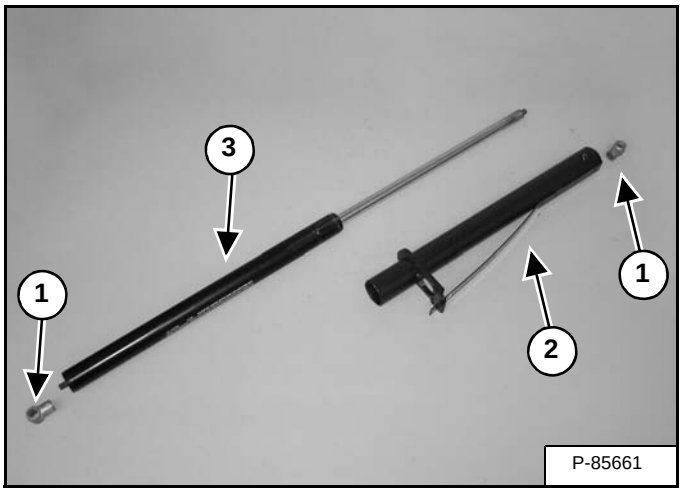
Remove the retaining pin (Item 1), the pin (Item 2), and the gas spring (Item 3) **[Figure 50-20-3]** from the loader.

NOTE: If the loader is equipped with a second gas spring repeat the procedure for the other side.

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Gas Spring Bracket Disassembly And Assembly

Figure 50-20-4



Remove the clevis (Item 1) from both ends, and the outer housing (Item 2) from the gas spring (Item 3) **[Figure 50-20-4]**.

Installation: Apply a small amount of thread-locker on the threads of the gas spring rod before installing the clevis (Item 1) **[Figure 50-20-4]**.

WARNING

AVOID INJURY

Cylinders for raising and lowering operator cab have gas under pressure. Do not open cylinder. Only qualified service personnel can remove the cylinder.

W-2112-0987

Removal And Installation

WARNING

AVOID INJURY OR DEATH

Attach a chain hoist to the grab handles of the operator cab before removing the operator cab gas spring(s). If the operator cab is tilted forward without the gas spring(s) operational, the cab will fall and could cause injury or death.

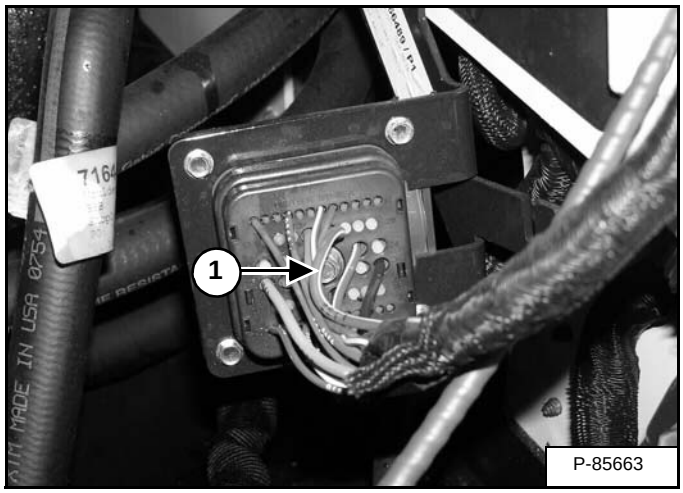
W-2760-0309

Remove the throttle cable from the cab. (See Cable Removal And Installation on Page 70-20-2.)

Remove the operator cab gas spring(s). (See Gas Spring Removal And Installation on Page 50-20-1.)

NOTE: Use the hoist connected to the operator cab grab handles to lower or (raise) the operator cab when the gas spring(s) are disconnected.

Figure 50-20-5



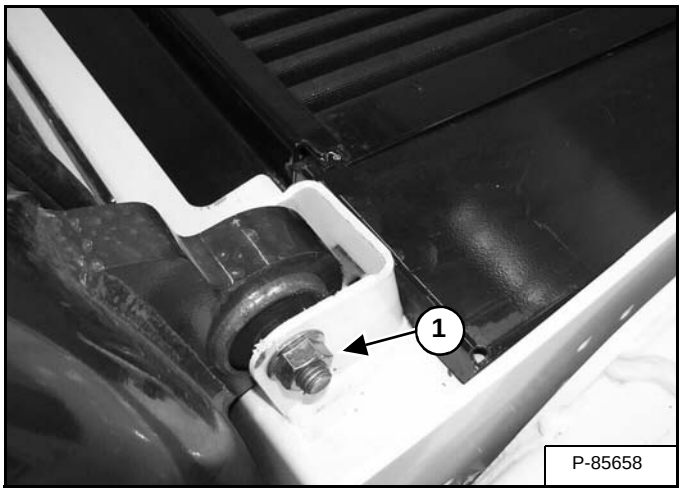
Disconnect the cab harness connector screw (Item 1) **[Figure 50-20-5]**.

Installation: Tighten the connector screw to 3,39 - 3,96 N•m (30 - 35 in-lb) torque.

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Removal And Installation (Cont'd)

Figure 50-20-6



Remove the two cab mount bolts and nuts (Item 1) **[Figure 50-20-6]** from both sides of the cab.

Installation: Tighten the cab mount bolts and nuts to 24,4 - 29,8 N•m (18 - 22 ft-lb) torque.

Figure 50-20-7



Using a strap and a hoist remove the cab from the loader.

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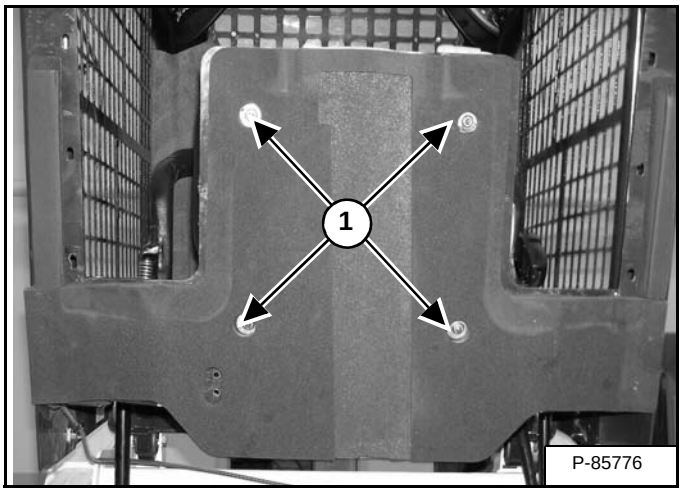


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OPERATOR SEAT

Removal And Installation

Figure 50-30-1



Raise the operator cab. (See Raising on Page 10-30-2.)

Remove the four seat mounting nuts (Item 1) **[Figure 50-30-1]** and washers from the operator seat mounting studs.

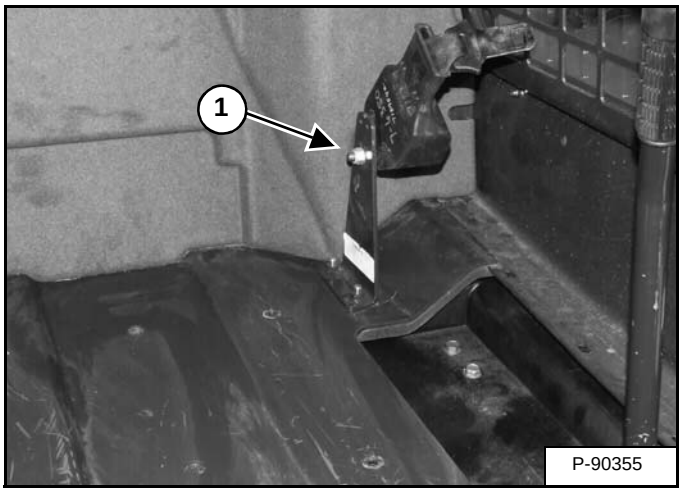
Lower the operator cab. (See Lowering on Page 10-30-3.)

Remove the seat.

NOTE: With the seat removed, the cab may raise.

Seat Belt Removal And Installation (Retractable)

Figure 50-30-2



Remove the mounting nut (Item 1) **[Figure 50-30-2]**.

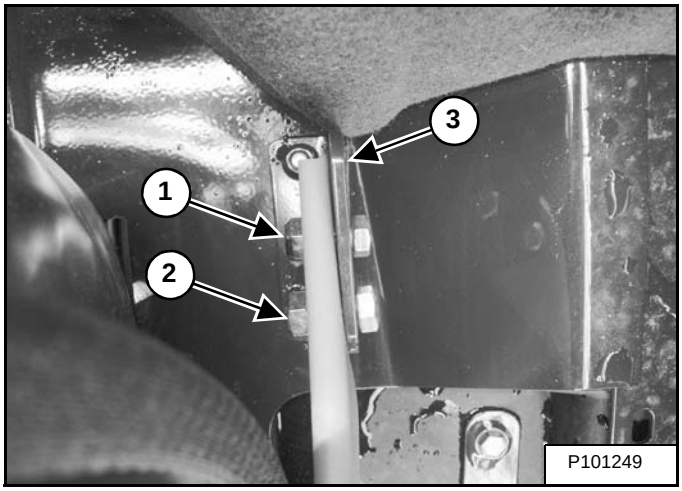
Remove the seat belt.

Installation: Tighten the mounting nut to 73 N•m (54 ft-lb) torque.

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Seat Belt And Bracket Removal And Installation (Standard)

Figure 50-30-3



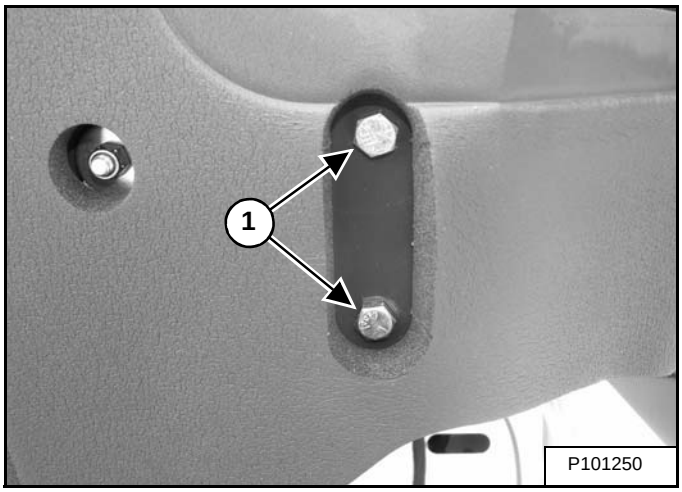
Remove the lower mounting bolt, washer and nut (Item 1). Remove the upper mounting bolt and nut (Item 2) **[Figure 50-30-3]**.

Remove the seat belt.

Installation: Tighten the mounting bolts to 73 N•m (54 ft-lb) torque.

Seat Belt Bracket Removal And Installation

Figure 50-30-4



Raise the operator cab. (See Raising on Page 10-30-2.)

Remove the bracket mounting bolts (Item 1) **[Figure 50-30-4]**.

Remove the bracket (Item 3) **[Figure 50-30-3]**.

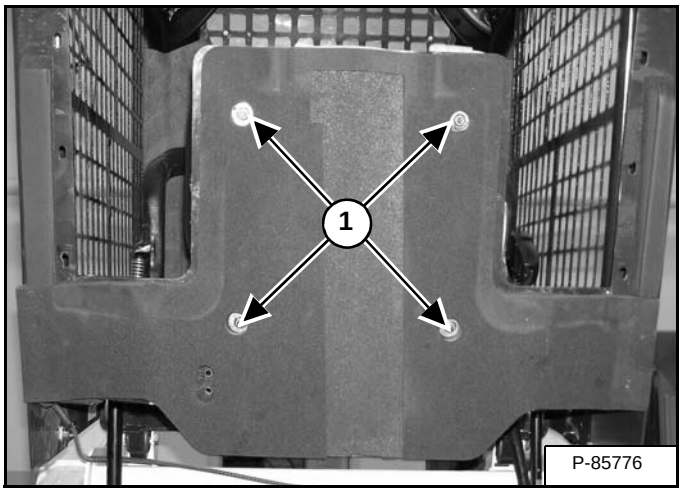
Installation: Tighten the mounting bolts to torque.

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OPERATOR SEAT (SUSPENSION)

Removal And Installation

Figure 50-31-1



Raise the operator cab. (See Raising on Page 10-30-2.)

Remove the four seat mounting nuts (Item 1) **[Figure 50-31-1]** and washers from the operator seat mounting studs.

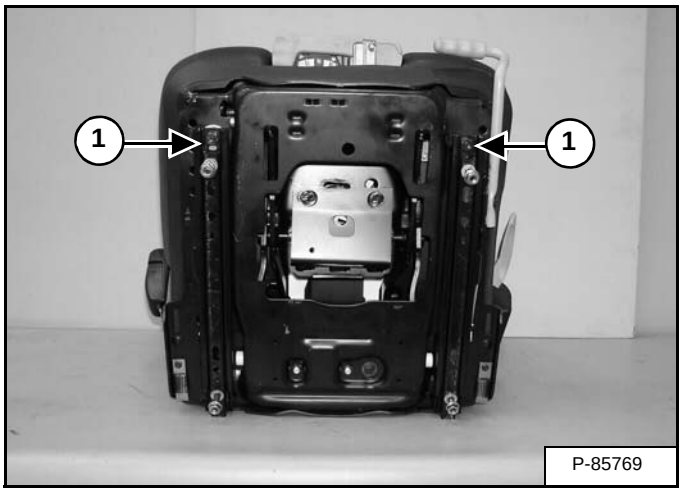
Lower the operator cab. (See Lowering on Page 10-30-3.)

Remove the seat.

NOTE: With the seat removed, the cab may raise.

Slide Rail Removal And Installation

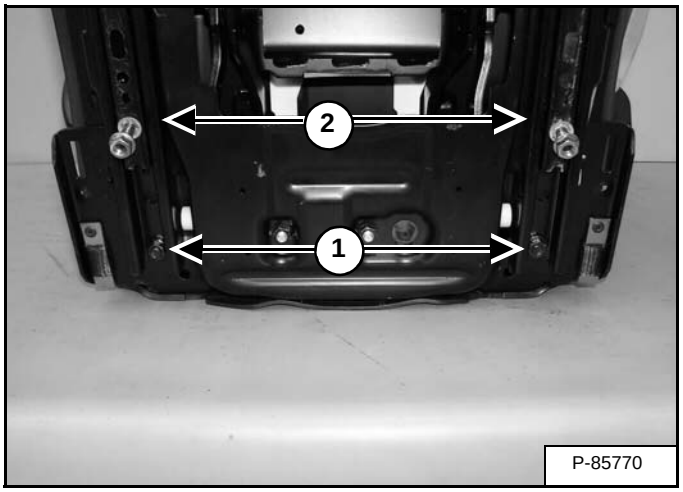
Figure 50-31-2



Remove the operator seat. (See Removal And Installation on Page 50-31-1.)

Remove the two slide rail mounting bolts (Item 1) **[Figure 50-31-2]**.

Figure 50-31-3



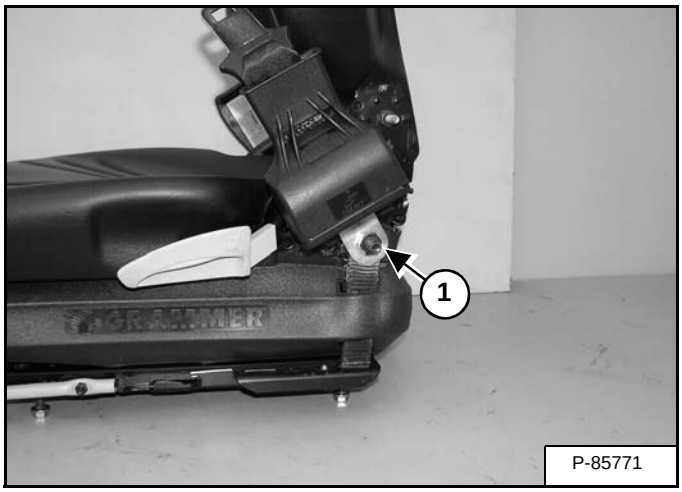
Remove the two slide rails mounting bolts (Item 1) **[Figure 50-31-3]**.

Remove the slide rail (Item 2) **[Figure 50-31-3]** from the bottom of the seat frame.

Dealer Copy -- Not for Resale

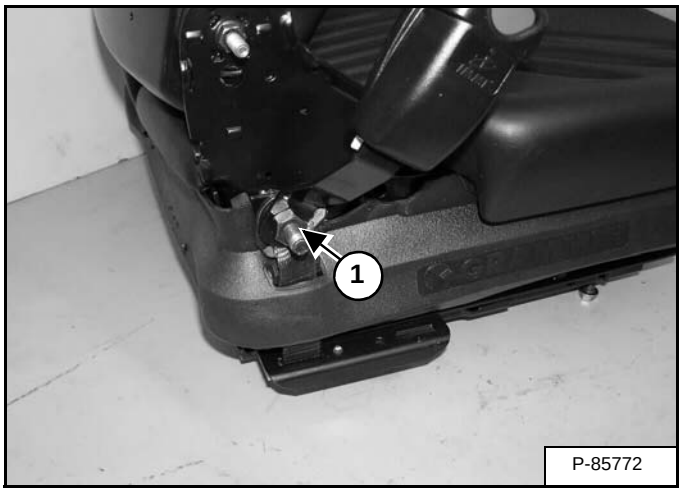
Seat Belt Removal And Installation

Figure 50-31-4



Remove the nut (Item 1) **[Figure 50-31-4]** from the seat belt mount.

Figure 50-31-5

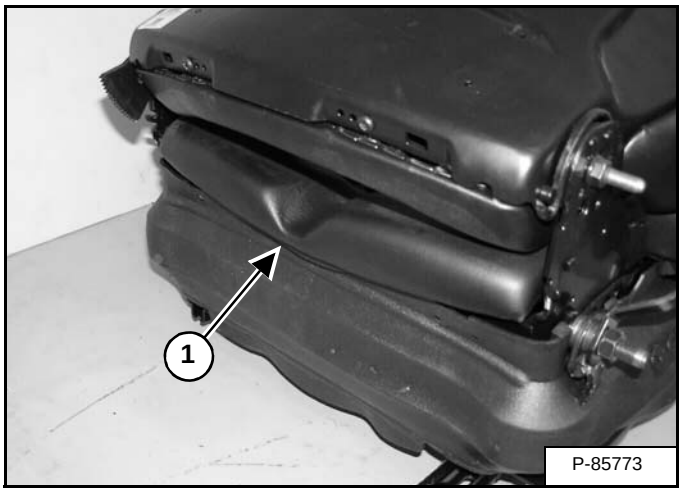


Remove the nut (Item 1) **[Figure 50-31-5]** from the seat belt mount.

Remove the seat belt.

Lower Cushion Removal

Figure 50-31-6

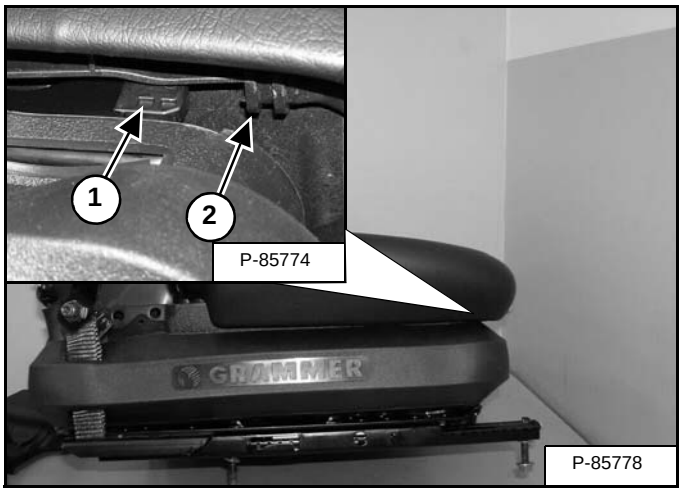


Lift up and push forward on the rear of the seat cushion (Item 1) **[Figure 50-31-6]**.

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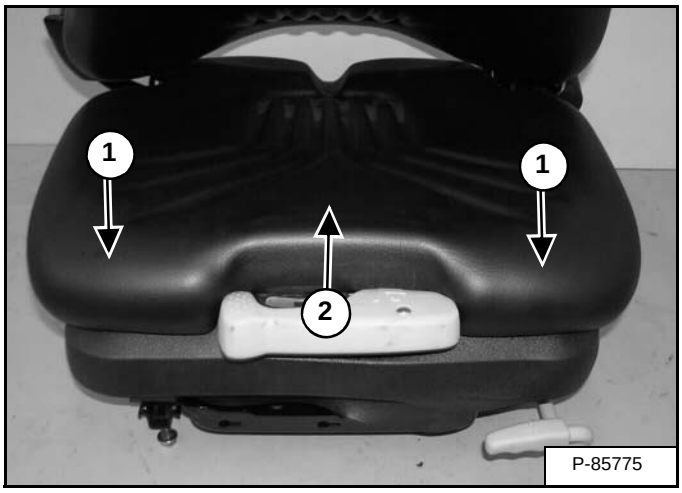
Lower Cushion Installation

Figure 50-31-7



Insert the tab (Item 1) into the slot (Item 2) **[Figure 50-31-7]**.

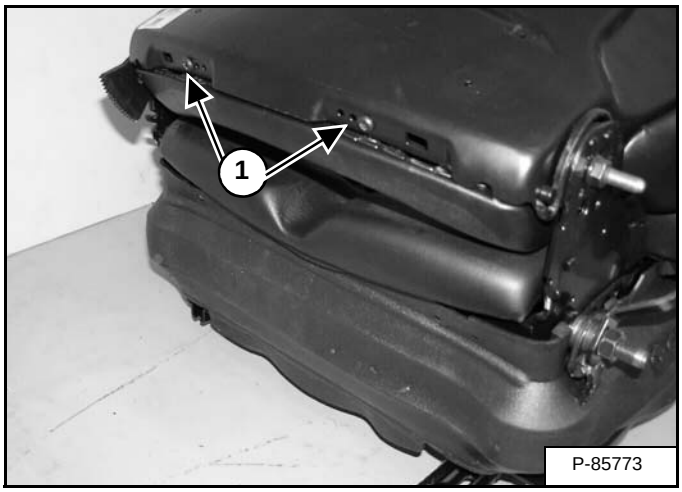
Figure 50-31-8



Push down on the front of the seat (Item 1) and push back (Item 2) **[Figure 50-31-8]** to lock the seat into position.

Back Cushion Removal And Installation

Figure 50-31-9



Tilt the seat all the way forward.

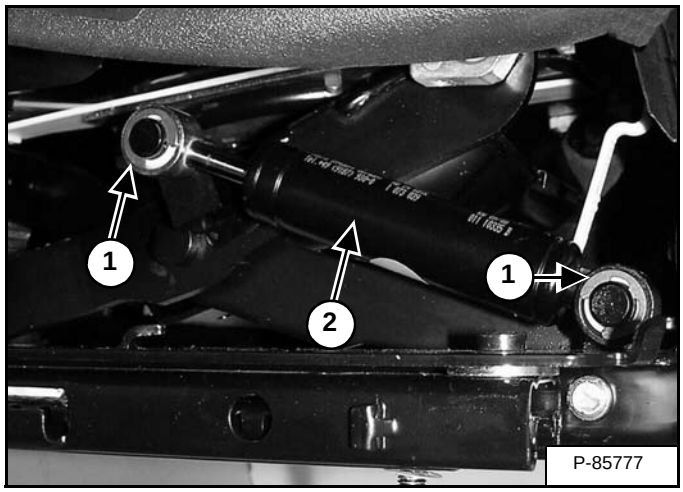
Remove the two screws (Item 1) **[Figure 50-31-9]** and tilt the seat back to the upright position.

Remove the back cushion from the seat

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Shock Removal And Installation

Figure 50-31-10



Remove the operator seat. (See Removal And Installation on Page 50-31-1.)

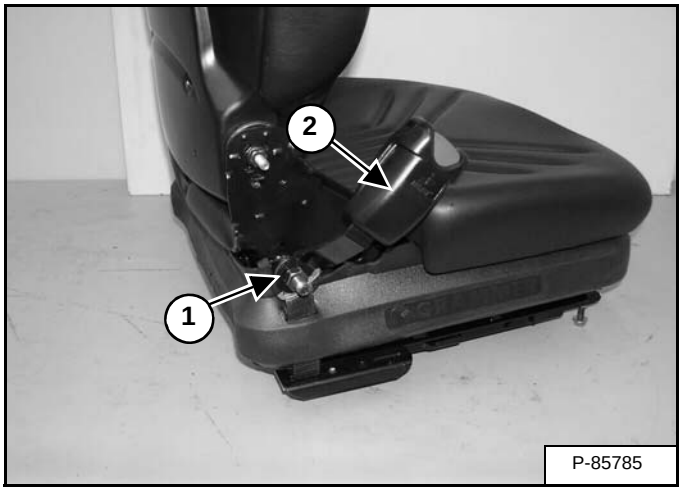
Remove the seat shock clips (Item 1) **[Figure 50-31-10]**. (Both ends.)

Remove the seat shock (Item 2) **[Figure 50-31-10]**.

3-Point Seat Belt Removal And Installation

Remove the operator seat. (See Removal And Installation on Page 50-31-1.)

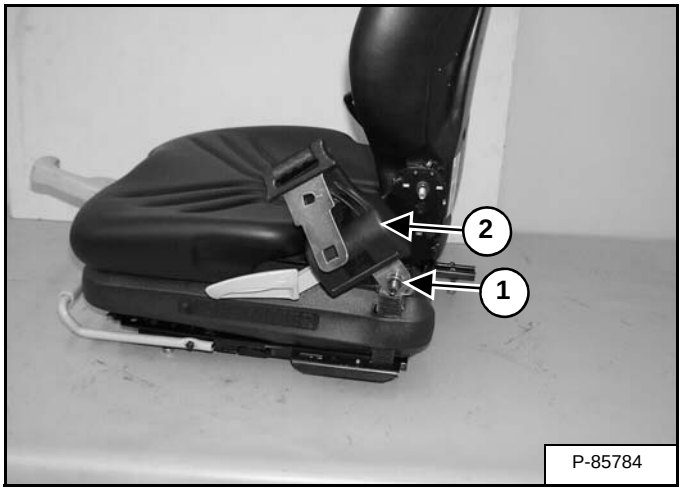
Figure 50-31-11



Remove the mounting nut (Item 1) **[Figure 50-31-11]**.

Remove the end release buckle (Item 2) **[Figure 50-31-11]**.

Figure 50-31-12



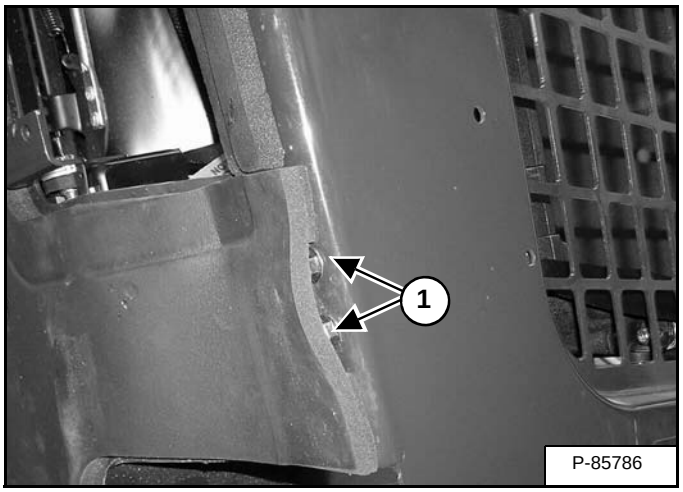
Remove the mounting nut (Item 1) **[Figure 50-31-12]**.

Remove the seat belt retractor (Item 2) **[Figure 50-31-12]**.

Dealer Copy -- Not for Resale

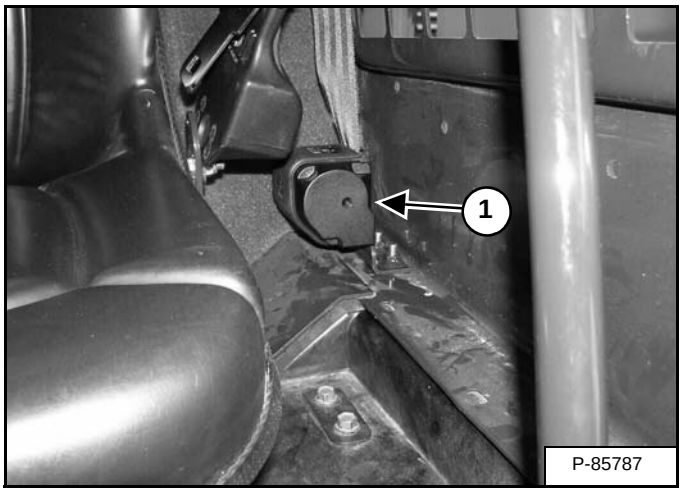
3-Point Seat Belt Removal And Installation (Cont'd)

Figure 50-31-13



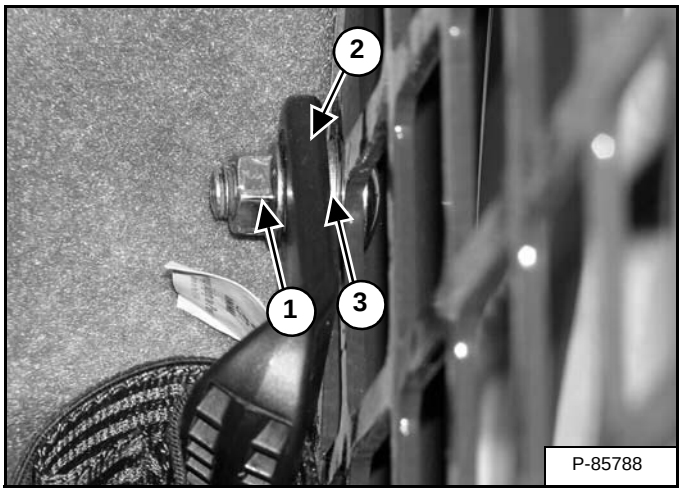
Remove the two mounting bolts (Item 1) **[Figure 50-31-13]**.

Figure 50-31-14



Remove the shoulder harness retractor (Item 1) **[Figure 50-31-14]**.

Figure 50-31-15



Remove the nut (Item 1) **[Figure 50-31-15]**.

Remove the shoulder harness guide and bushing (Item 2) and hardened washer (Item 3) **[Figure 50-31-15]**.

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BOB-TACH (HAND LEVER)

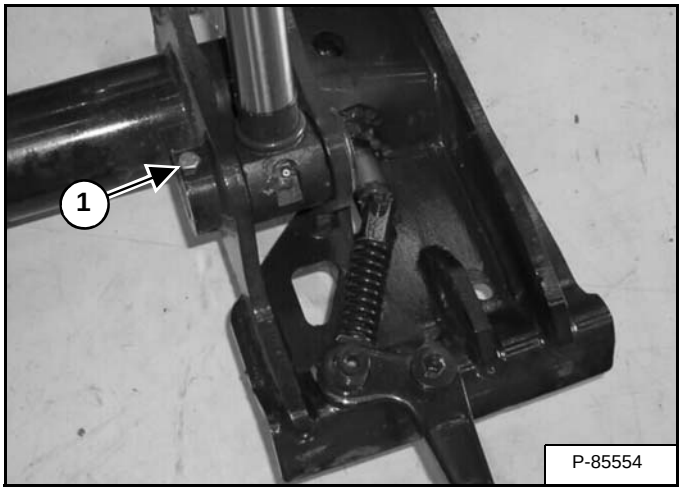
Description

The Bob-Tach is the section of the loader lift arm that attachments mount to. The Hand Lever Bob-Tach uses two manually operated, spring assisted, locking wedge and lever assemblies to secure the attachment the Bob-Tach.

The Bob-Tach is located on the front of the loader connected to the loader lift arms.

Removal And Installation

Figure 50-40-1



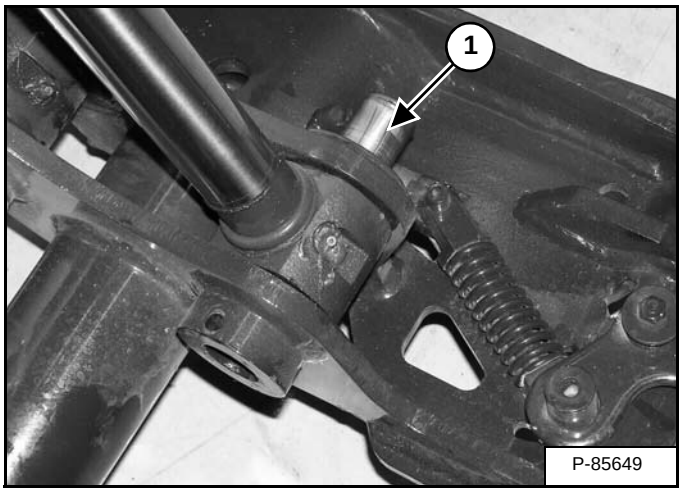
Tilt the Bob-Tach forward, so it is parallel to the floor. Put blocks (approximately 76,2 mm (3 in)) under each side of the Bob-Tach **[Figure 50-40-1]**.

Lower the Bob-Tach onto the blocks.

Remove the retainer bolt and nut (Item 1) **[Figure 50-40-1]** from the rod end pivot pin.

Installation: Tighten the retainer nut to 48 - 54 N•m (35 - 40 ft-lb) torque.

Figure 50-40-2

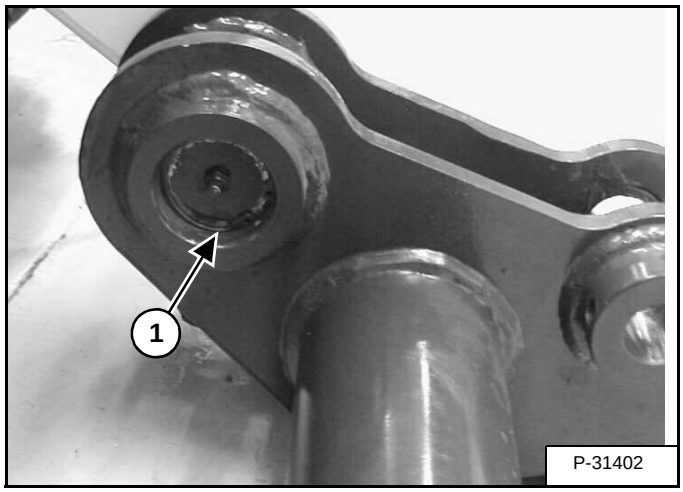


Remove the rod end pivot pin (Item 1) **[Figure 50-40-2]**.

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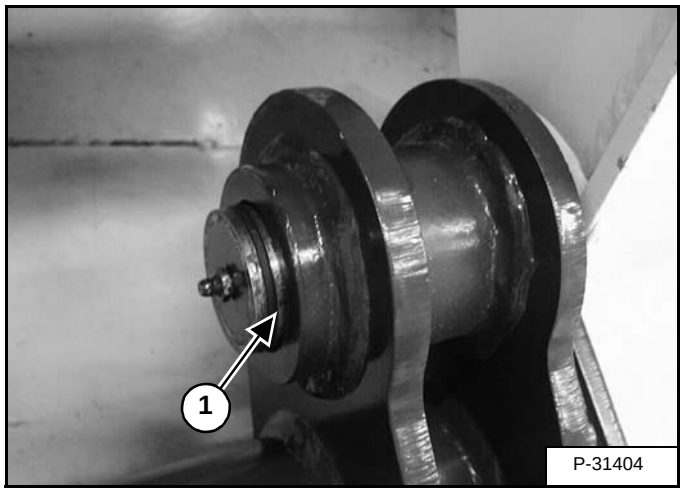
Removal And Installation (Cont'd)

Figure 50-40-3



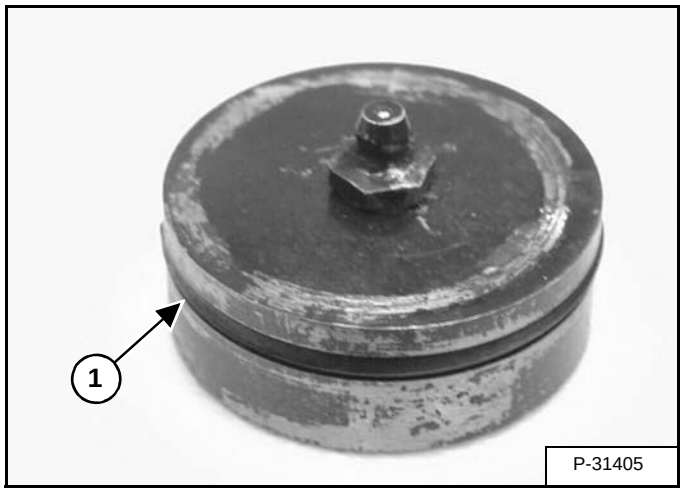
Remove the snap ring (Item 1) **[Figure 50-40-3]** from the Bob-Tach pivot pin grease plug (both sides).

Figure 50-40-4



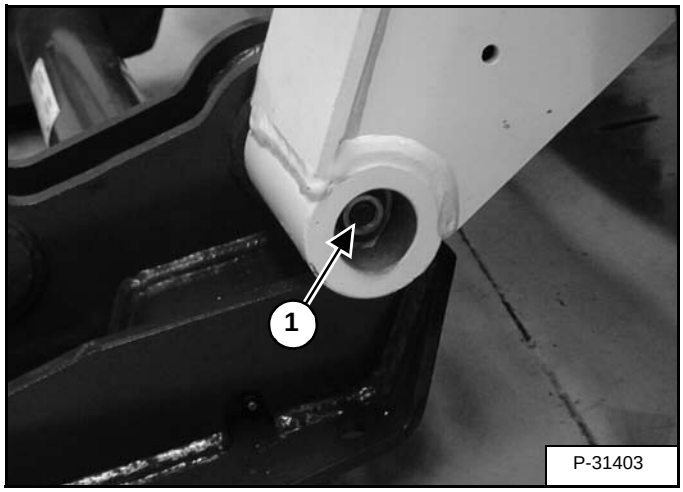
Use a grease gun and pump grease into the pivot pin forcing the grease plug out of the Bob-Tach (Item 1) **[Figure 50-40-4]**.

Figure 50-40-5



Check and replace O-ring (Item 1) **[Figure 50-40-5]** on the grease plug.

Figure 50-40-6

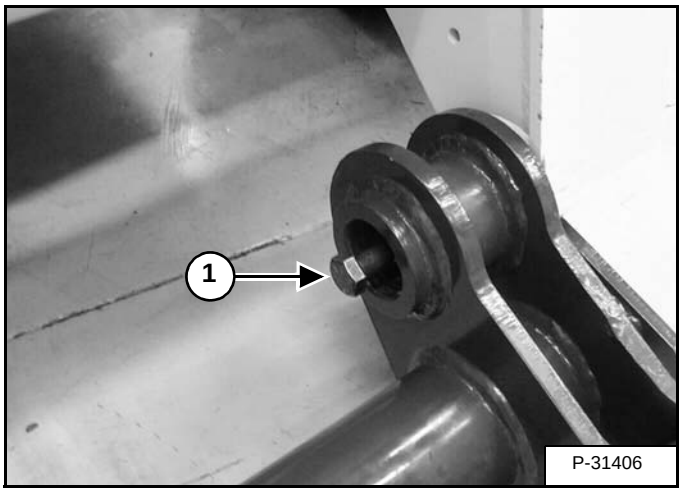


Remove the nut (Item 1) **[Figure 50-40-6]** from the Bob-Tach pivot pin retaining bolt (both sides).

Dealer Copy -- Not for Resale

Removal And Installation (Cont'd)

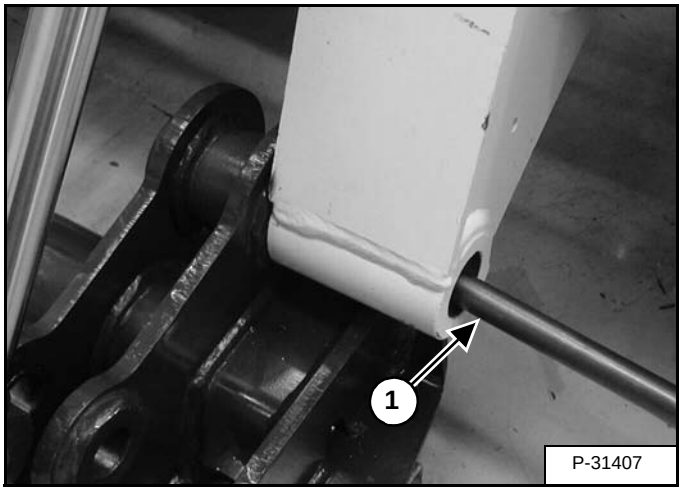
Figure 50-40-7



Remove the retainer bolt (Item 1) **[Figure 50-40-7]** from the Bob-Tach pin.

Installation: Tighten the retainer nut and bolt (Item 1) **[Figure 50-40-6]** and **[Figure 50-40-7]** to 446 N•m (330 ft-lb) torque.

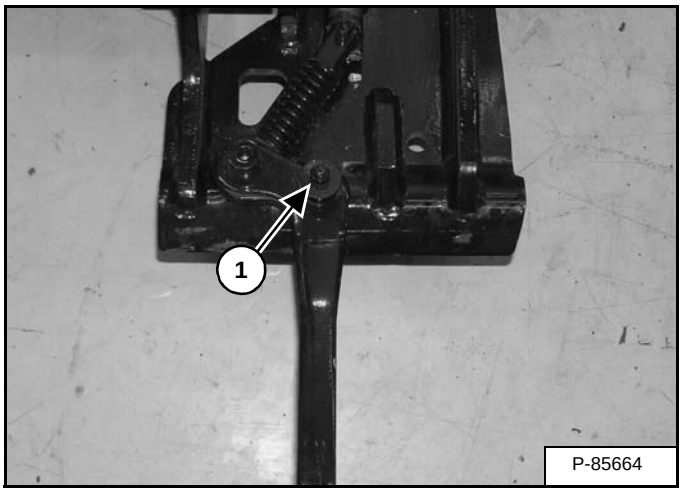
Figure 50-40-8



With a punch (Item 1) **[Figure 50-40-8]** and a hammer, drive the pivot pin out of the lift arm and Bob-Tach.

Lever And Wedge Disassembly And Assembly

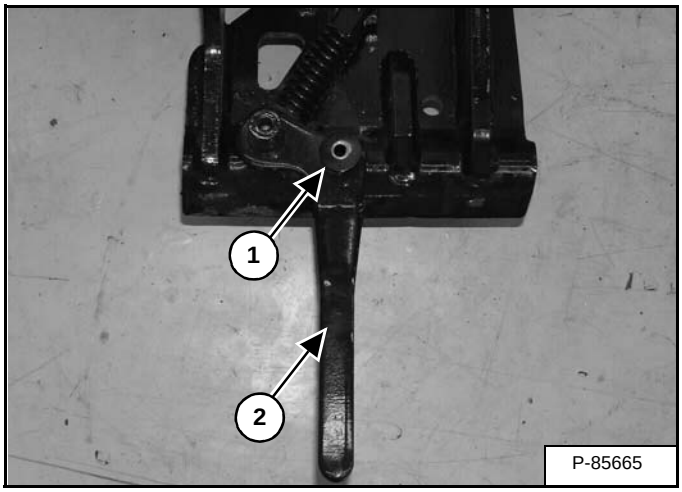
Figure 50-40-9



Remove the lever mounting nut (Item 1) **[Figure 50-40-9]**.

Installation: Tighten the nut to 48 - 54 N•m (35 - 40 ft-lb) torque.

Figure 50-40-10

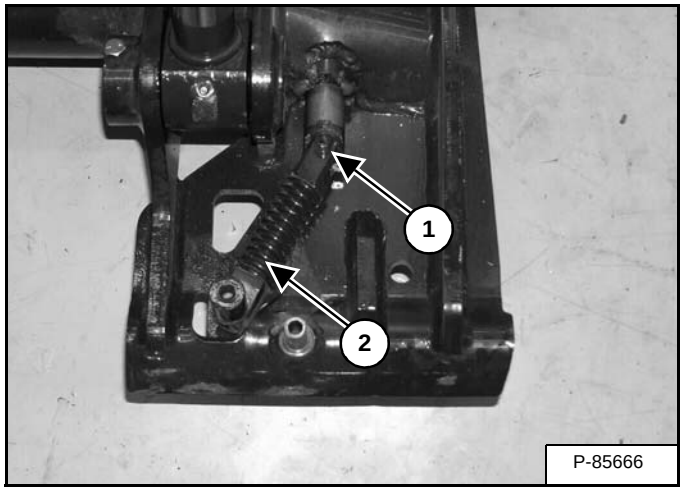


Remove the washer and spring, (Item 1) and the lever assembly (Item 2) **[Figure 50-40-10]**.

Dealer Copy -- Not for Resale

Lever And Wedge Disassembly And Assembly (Cont'd)

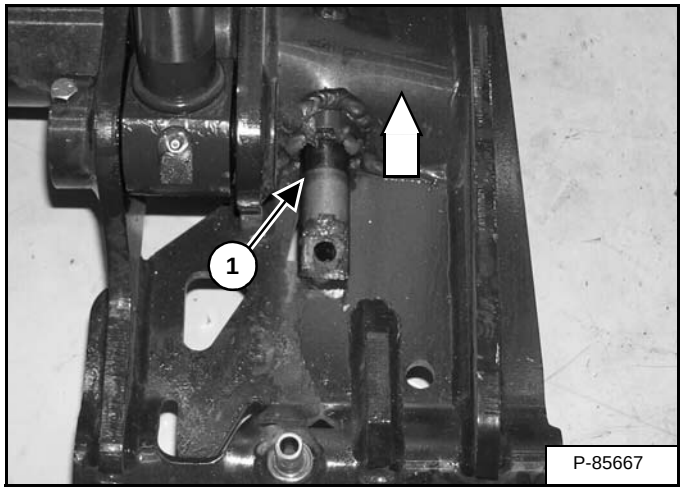
Figure 50-40-11



Use a punch and hammer to remove the roll pin (Item 1) **[Figure 50-40-11]** from the Bob-Tach wedge and spring clevis.

Remove the spring clevis assembly (Item 2) **[Figure 50-40-11]**.

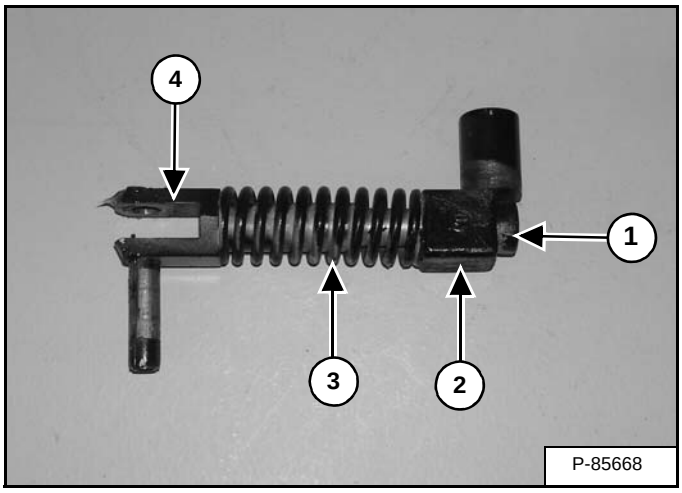
Figure 50-40-12



Remove the wedge (Item 1) **[Figure 50-40-12]** out the bottom of the Bob-Tach.

Always replace bent or broken wedges.

Figure 50-40-13



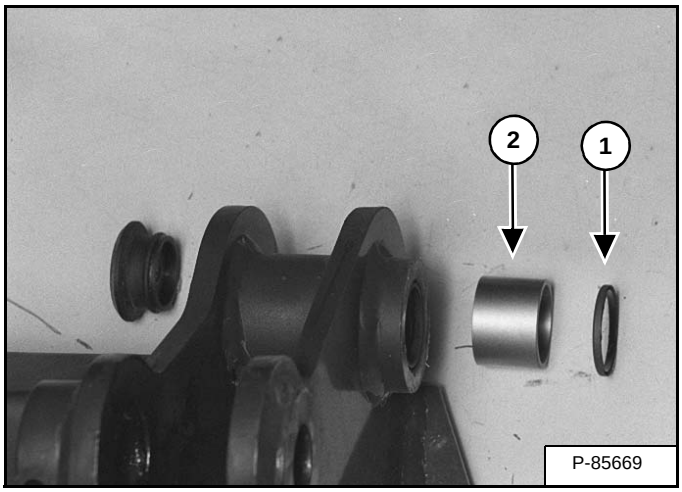
If the bolt (Item 1), handle pivot (Item 2), spring (Item 3), or clevis (Item 4) **[Figure 50-40-13]** are damaged, put the assembly in a vise.

Remove the bolt and replace the damaged parts as needed.

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Pivot Pin Bushing And Seal Removal And Installation

Figure 50-40-14



Remove the Bob-Tach. (See Removal And Installation on Page 50-40-1.)

Use a seal pick to remove seal (Item 1) **[Figure 50-40-14]** from the Bob-Tach.

Remove and replace bushing (Item 2) **[Figure 50-40-14]** with a driver tool and hammer.

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BOB-TACH (POWER)

Description

The Bob-Tach is the section of the loader lift arm that attachments mount to. The Power Bob-Tach option uses two hydraulically operated, spring assisted, locking wedge and lever assemblies to secure the attachment to the Bob-Tach.

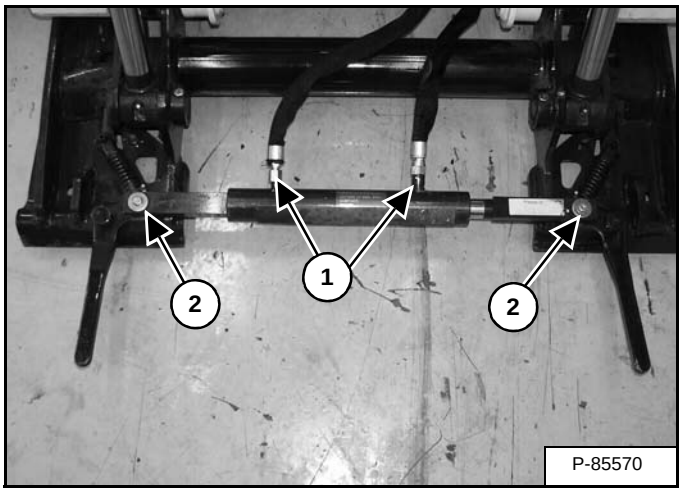
The hydraulically operated Power Bob-Tach has a hydraulic cylinder that opens and closes both wedge and lever assemblies by pressing a switch on the right switch panel. The switch activates the Power Bob-Tach block to allow flow into or out of the hydraulic cylinder connected to the levers on the Bob-Tach.

The Power Bob-Tach block is located on the rear of the gear pump.

The Bob-Tach is located on the front of the loader connected to the loader lift arms.

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 and cap the hoses from the cylinder.

Remove the washers and bolts (Item 2) **[Figure 50-41-1]** from the cylinder (both ends).

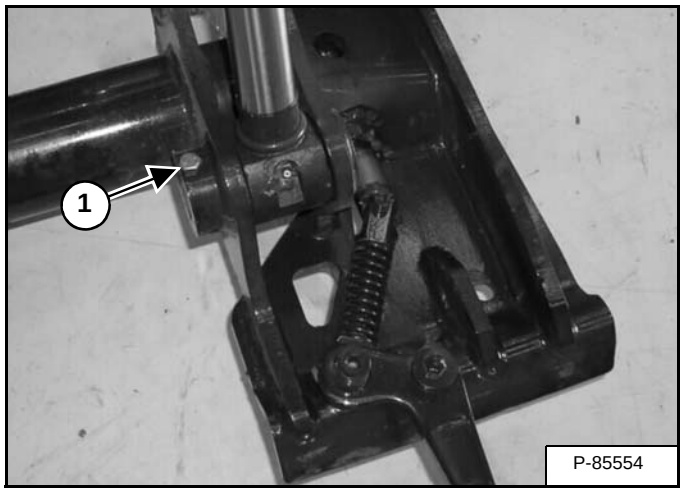
Installation: Tighten the retainer nut to 48 - 54 N•m (35 - 40 ft-lb) torque.

Remove the cylinder from the Bob-Tach.

Dealer Copy -- Not for Resale

Removal And Installation (Cont'd)

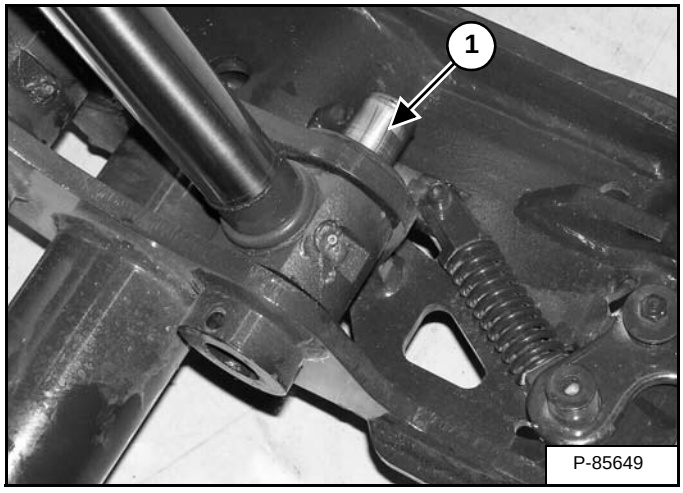
Figure 50-41-2



Remove the retainer bolt and nut (Item 1) **[Figure 50-41-2]** from the rod end pivot pin.

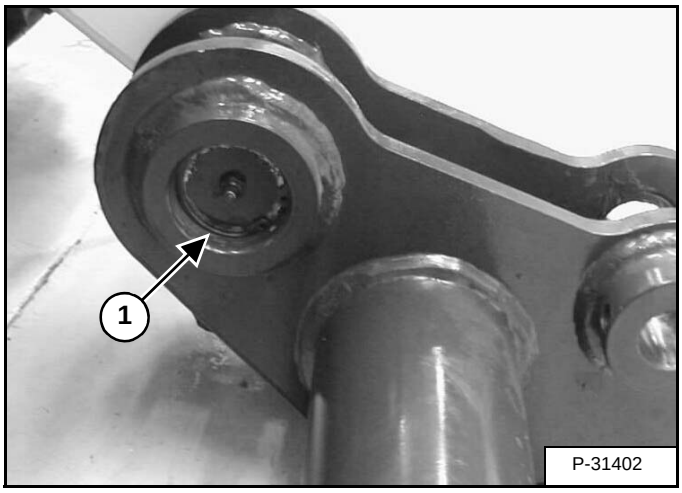
Installation: Tighten the retainer nut to 48 - 54 N•m (35 - 40 ft-lb) torque.

Figure 50-41-3



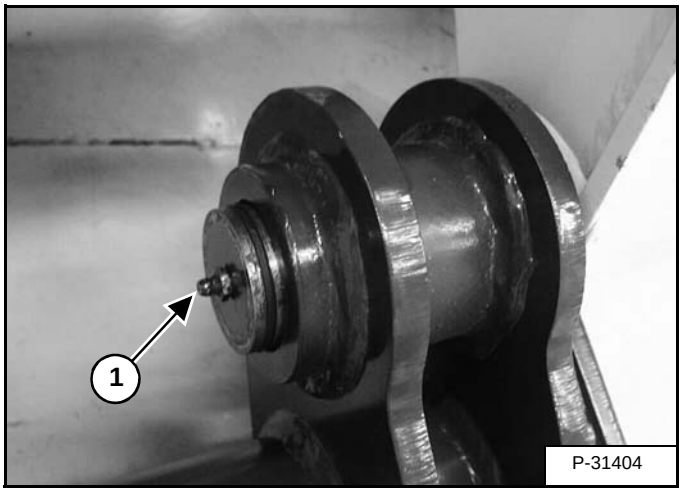
Remove the rod end pivot pin (Item 1) **[Figure 50-41-3]**.

Figure 50-41-4



Remove the snap ring (Item 1) **[Figure 50-41-4]** at the Bob-Tach pivot pin grease plug (both sides).

Figure 50-41-5

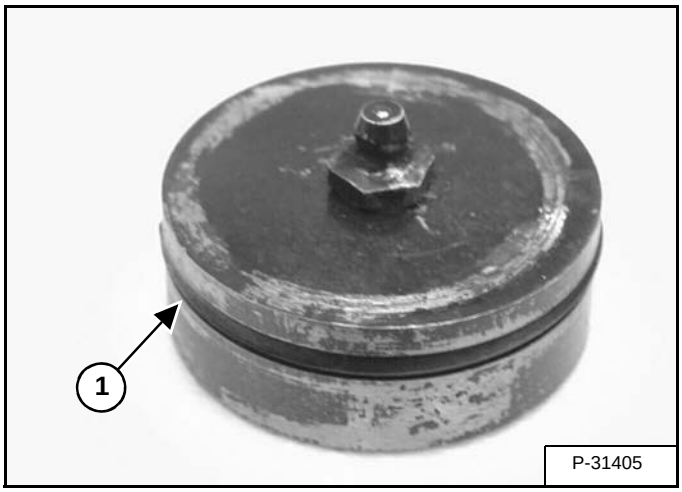


Use a grease gun and pump grease into the pivot pin forcing the grease plug out of the Bob-Tach (Item 1) **[Figure 50-41-5]** (both sides).

Dealer Copy -- Not for Resale

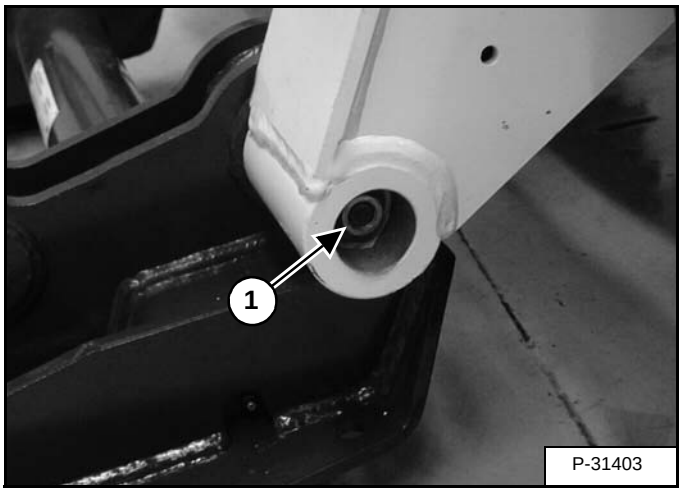
Removal And Installation (Cont'd)

Figure 50-41-6



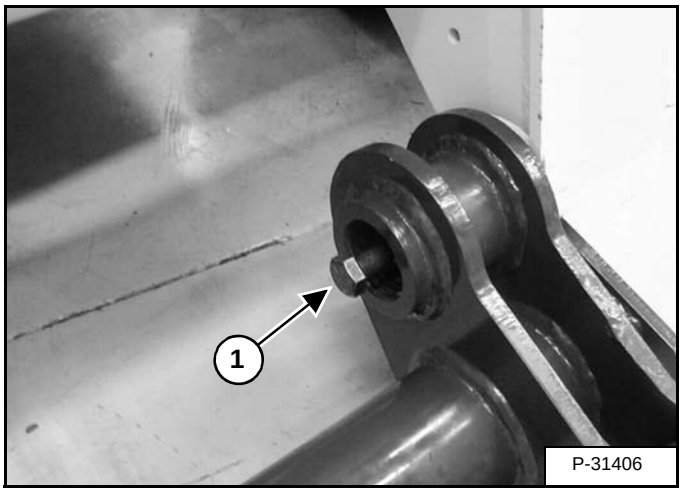
Check and replace the O-ring (Item 1) **[Figure 50-41-6]** on the grease plug.

Figure 50-41-7



Remove the nut (Item 1) **[Figure 50-41-7]** from the Bob-Tach pivot pin retaining bolt (both sides).

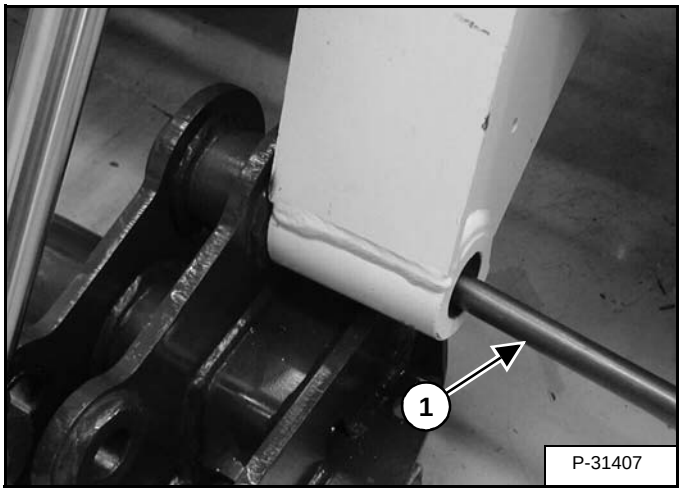
Figure 50-41-8



Remove the retainer bolt (Item 1) **[Figure 50-41-8]** from the Bob-Tach pivot pin (both sides).

Installation: Tighten the retainer nut and bolt (Item 1) **[Figure 50-41-7]** and **[Figure 50-41-8]** to 446 N•m (330 ft-lb) torque.

Figure 50-41-9



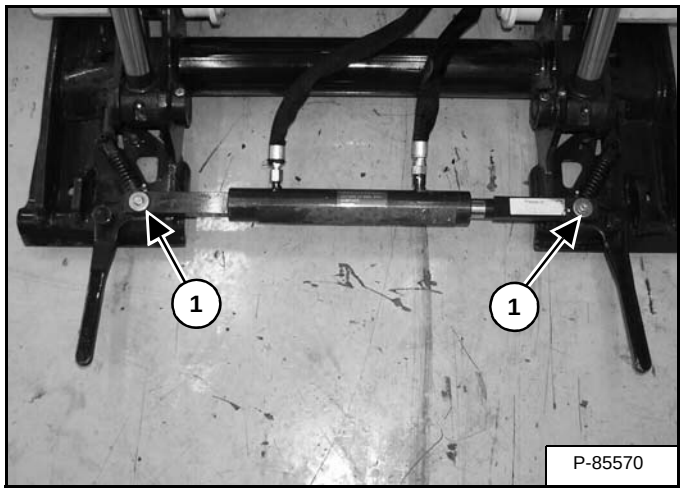
With a punch (Item 1) **[Figure 50-41-9]** and a hammer, drive the pivot pin out of the lift arm and Bob-Tach (both sides).

Remove the Bob-Tach from the loader.

Dealer Copy -- Not for Resale

Lever And Wedge Disassembly And Assembly

Figure 50-41-1

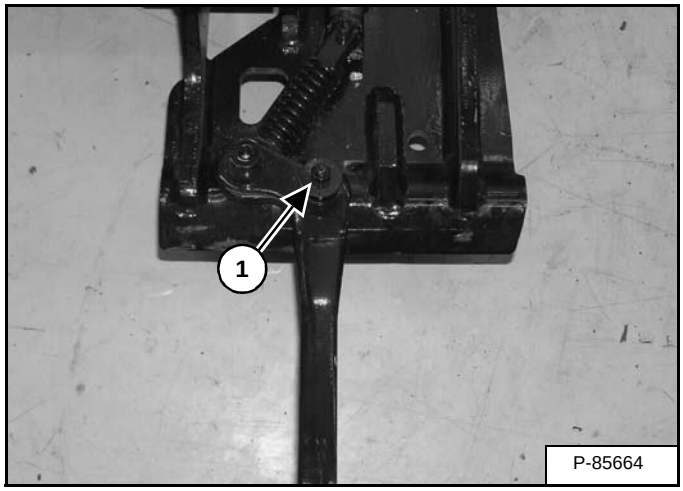


Remove the washers and bolts (Item 1) **[Figure 50-41-1]** from the cylinder (both ends).

Installation: Tighten the bolts to 48 - 54 N•m (35 - 40 ft-lb) torque.

Remove the cylinder from the lever pivots.

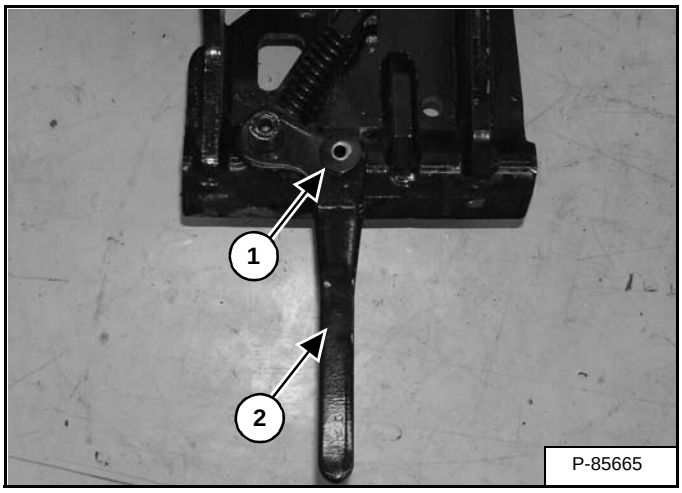
Figure 50-41-2



Remove the lever mounting nut (Item 1) **[Figure 50-41-2]**.

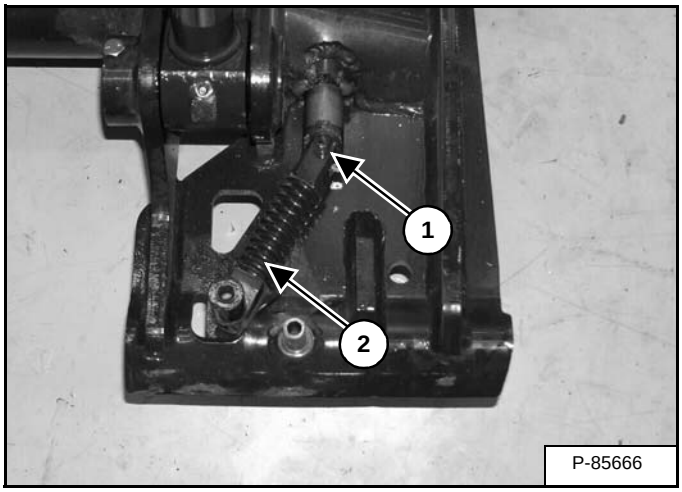
Installation: Tighten the nut to 48 - 54 N•m (35 - 40 ft-lb) torque.

Figure 50-41-3



Remove the washer and spring, (Item 1) and the lever assembly (Item 2) **[Figure 50-41-3]**.

Figure 50-41-4



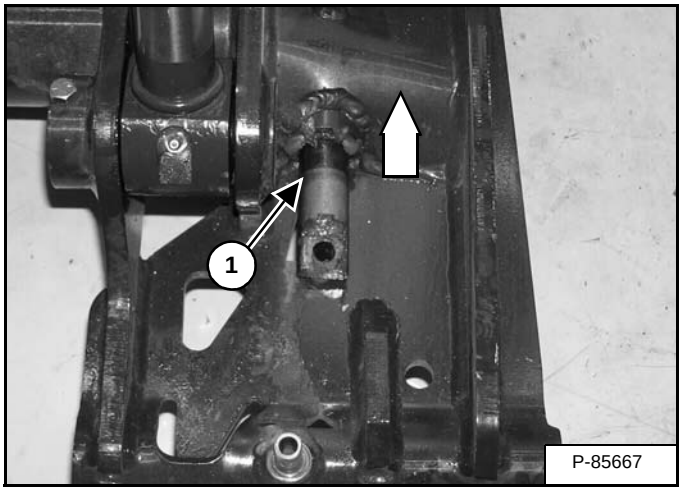
Use a punch and hammer to remove the roll pin (Item 1) **[Figure 50-41-4]** from the Bob-Tach wedge and spring clevis.

Remove the spring clevis assembly (Item 2) **[Figure 50-41-4]**.

Dealer Copy -- Not for Resale

Lever And Wedge Disassembly And Assembly (Cont'd)

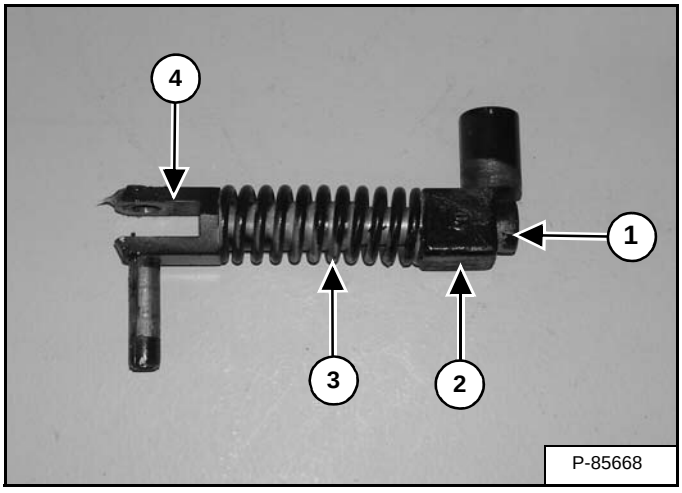
Figure 50-41-5



Remove the wedge (Item 1) **[Figure 50-41-5]** out the bottom of the Bob-Tach.

Always replace bent or broken wedges.

Figure 50-41-6

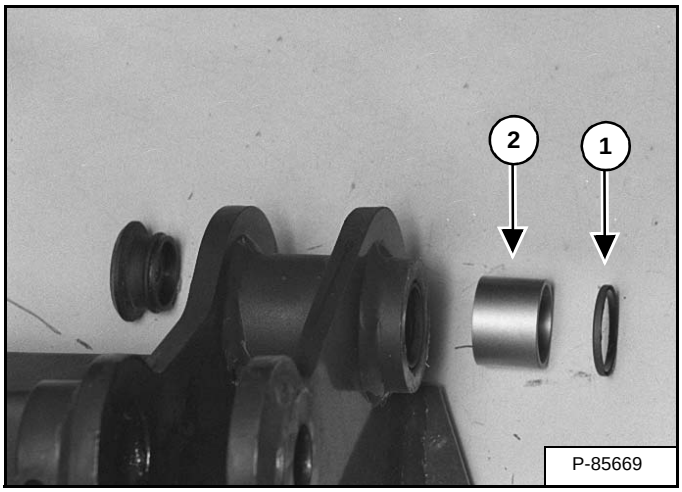


If the bolt (Item 1), handle pivot (Item 2), spring (Item 3), or clevis (Item 4) **[Figure 50-41-6]** are damaged, put the assembly in a vise.

Remove the bolt and replace the damaged parts as needed.

Pivot Pin Bushing And Seal Removal And Installation

Figure 50-41-7



Remove the Power Bob-Tach. (See Removal And Installation on Page 50-41-1.)

Use a seal pick to remove seal (Item 1) **[Figure 50-41-7]** from the Bob-Tach.

Remove and replace bushing (Item 2) **[Figure 50-41-7]** with a driver tool and hammer.

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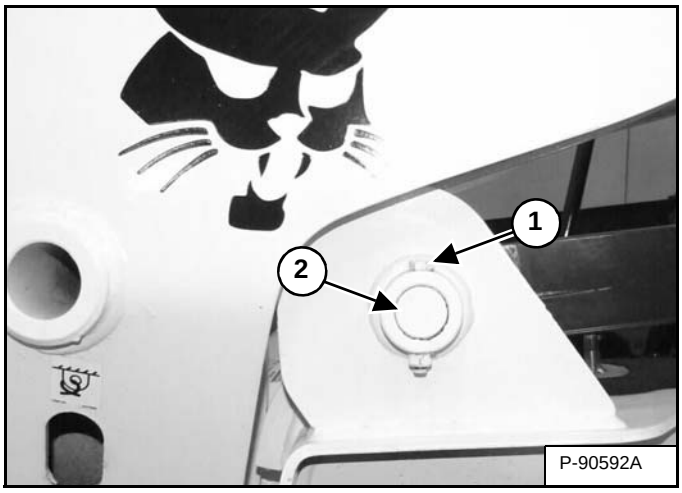
LIFT ARMS

Stabilizer Bar Removal And Installation

Raise the operator cab. (See Raising on Page 10-30-2.)

NOTE: Remove the lift arm stabilizer bar from one side of the loader at a time.

Figure 50-50-1

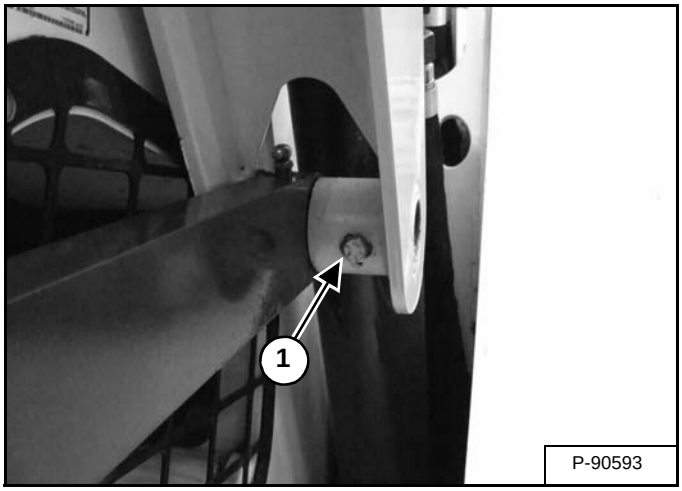


Remove the retainer bolt (Item 1) **[Figure 50-50-1]** and nut from the front stabilizer bar pivot pin.

Remove the stabilizer bar pivot pin (Item 2) **[Figure 50-50-1]**.

Installation: Tighten the retainer bolt and nut to 48 - 54 N•m (35 - 40 ft-lb) torque.

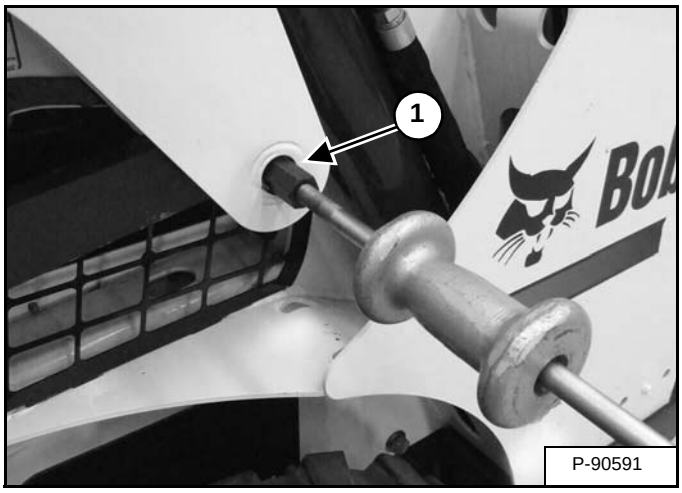
Figure 50-50-2



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 and nut to 48 - 54 N•m (35 - 40 ft-lb) torque.

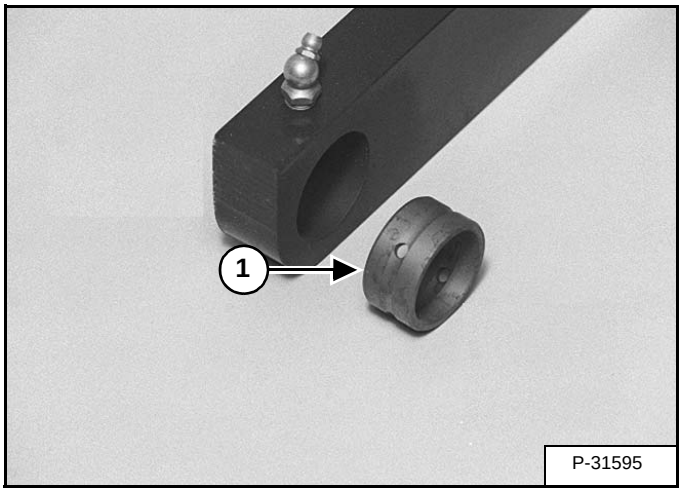
Figure 50-50-3



With a slide hammer, remove the rear lift arm stabilizer pin (Item 1) **[Figure 50-50-3].**

Remove the stabilizer bar from the loader.

Figure 50-50-4



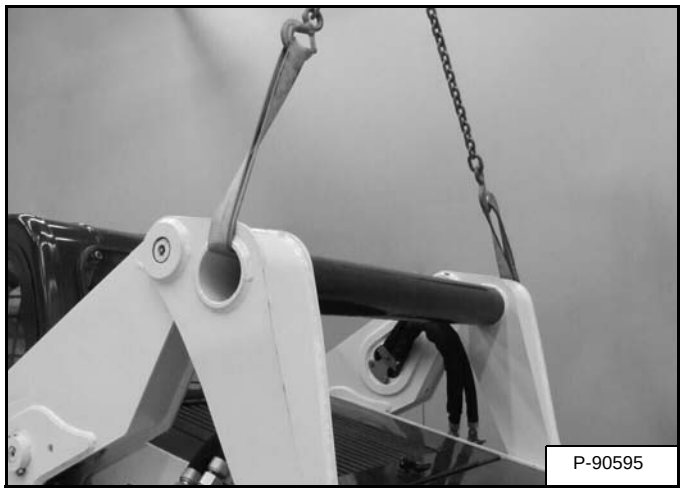
Remove the bushings (Item 1) **[Figure 50-50-4]** from the stabilizer bar (both ends).

Inspect the bushings and replace as needed.

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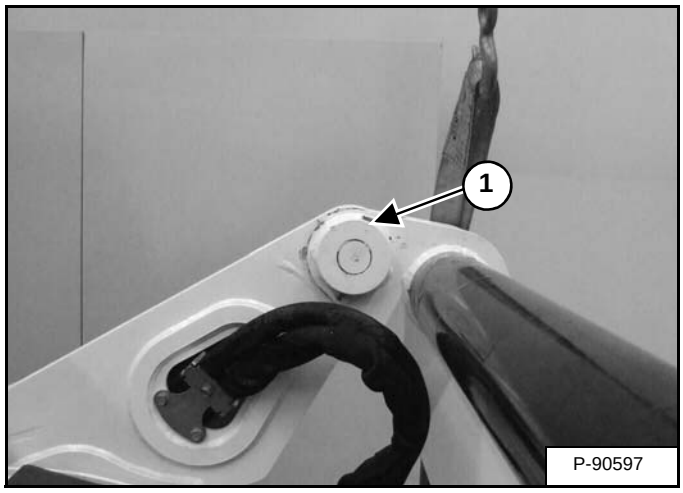
Link Removal And Installation

Figure 50-50-5



Install a sling and chain hoist on the lift arm link **[Figure 50-50-5]**.

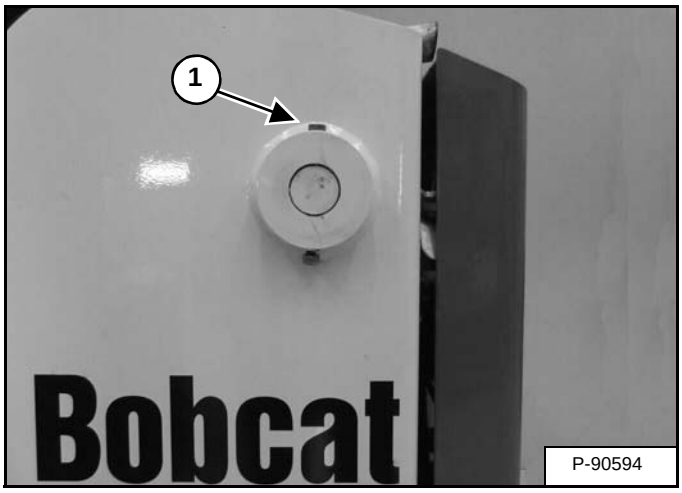
Figure 50-50-6



Remove the retainer bolt and nut (Item 1) **[Figure 50-50-6]** from the lift arm pivot pin (both sides).

Installation: Tighten the retainer bolt and nut to 48 - 54 N•m (35 - 40 ft-lb) torque.

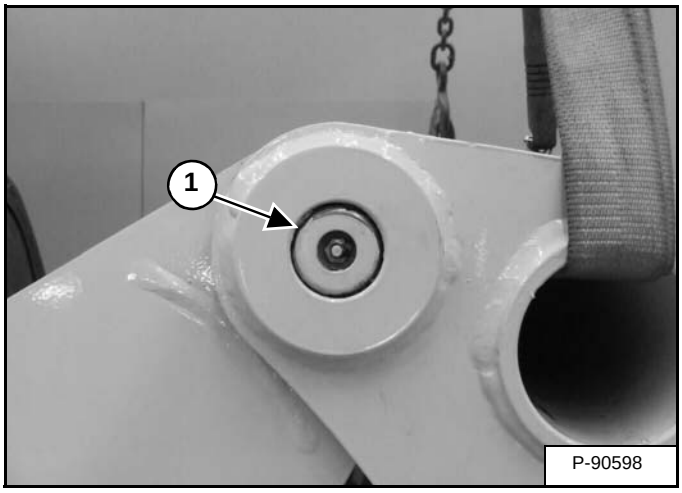
Figure 50-50-7



Remove the retainer bolt and nut (Item 1) **[Figure 50-50-7]** from the lift arm link pivot pin (both sides).

Installation: Tighten the retainer bolt and nut to 48 - 54 N•m (35 - 40 ft-lb) torque.

Figure 50-50-8

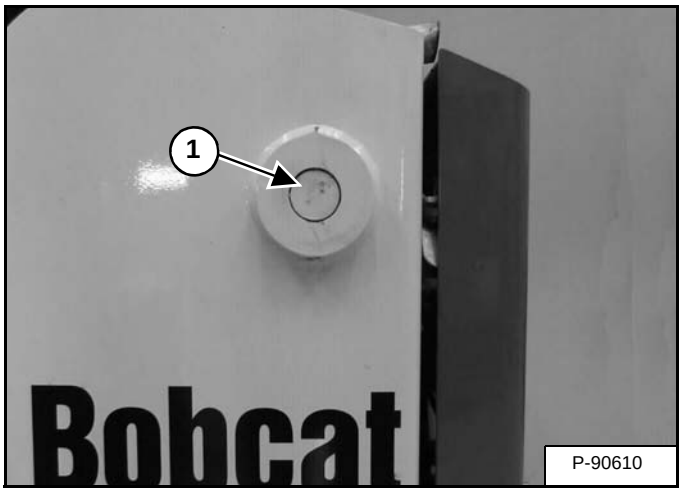


Remove the lift arm pivot pin (Item 1) **[Figure 50-50-8]** (both sides).

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Link Removal And Installation (Cont'd)

Figure 50-50-9



Remove the lift arm link pivot pin (Item 1) **[Figure 50-50-9]** (both sides).

Installation: Tighten the retainer bolt and nut to 48 - 54 N•m (35 - 40 ft-lb) torque.

Remove the lift arm link from the loader.

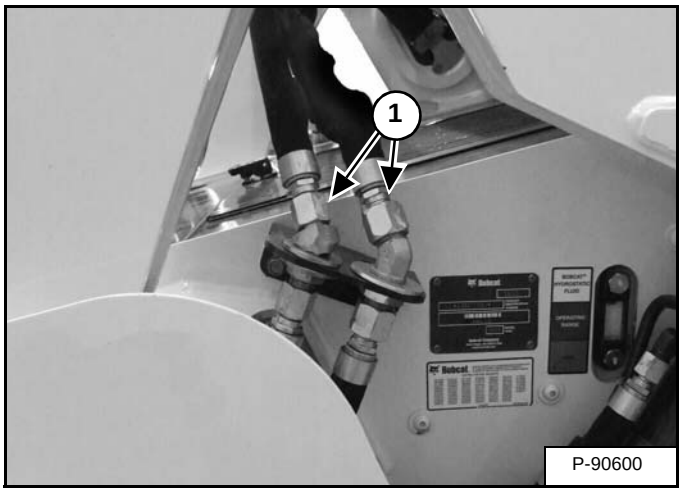
Removal And Installation

Put jackstands under the rear corners of the loader.

Raise the operator cab. (See Raising on Page 10-30-2.)

Drain the hydraulic reservoir. (See Removing And Replacing Hydraulic Fluid on Page 10-120-2.)

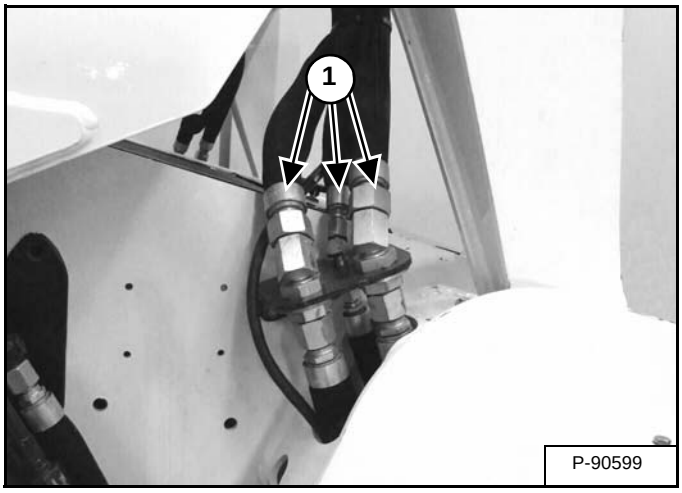
Figure 50-50-10



At the right side upright disconnect and cap the two tilt cylinder hoses (Item 1) **[Figure 50-50-10]**.

NOTE: Mark the hoses for proper installation.

Figure 50-50-11



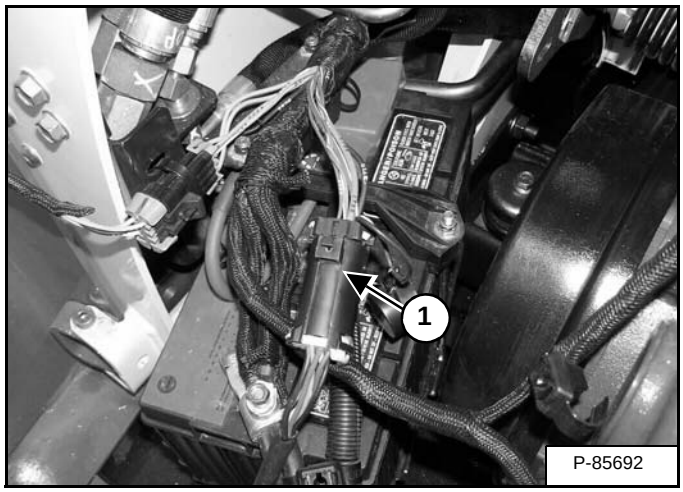
At the left side upright disconnect and cap the three auxiliary hydraulic hoses (Item 1) **[Figure 50-50-11]**.

NOTE: Mark the hoses for proper installation.

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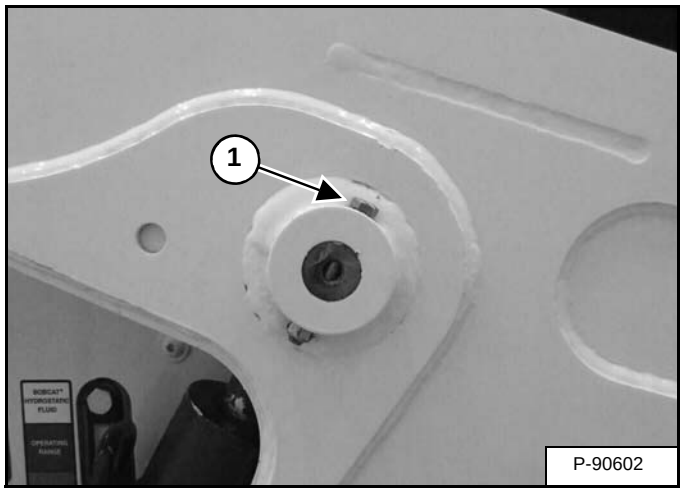
Removal And Installation (Cont'd)

Figure 50-50-12



Disconnect the electrical controls harness (Item 1) **[Figure 50-50-12]**. (If equipped.)

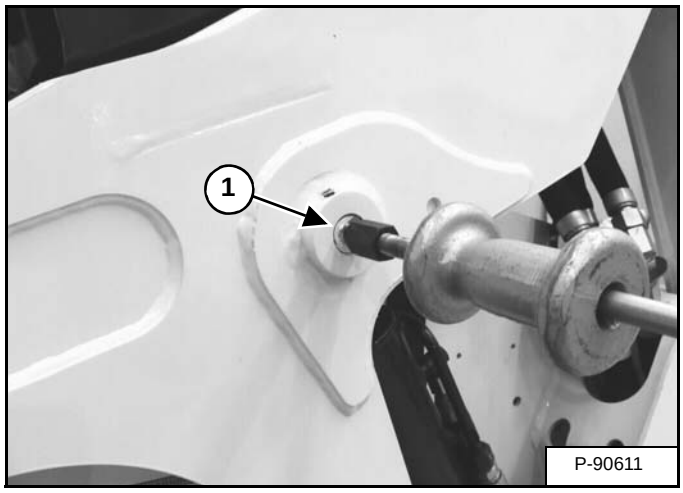
Figure 50-50-13



Remove the retaining bolt and nut (Item 1) **[Figure 50-50-13]** from the pin on the rod end of the lift cylinder (both sides).

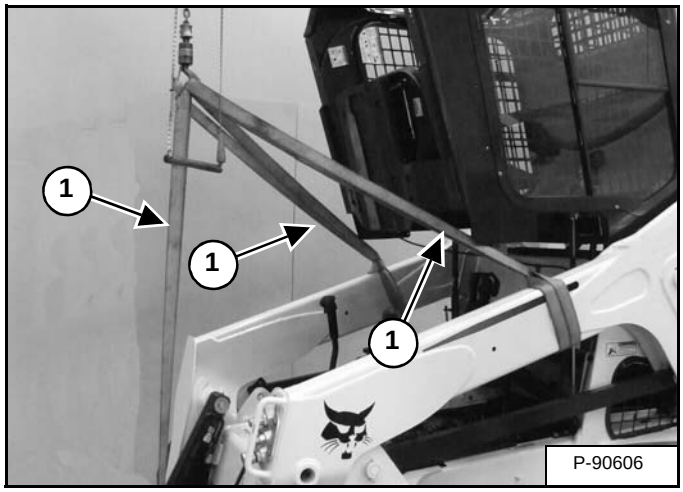
Installation: Tighten the retainer bolt and nut to 48 - 54 N•m (35 - 40 ft-lb) torque.

Figure 50-50-14



With a slide hammer, remove the pin (Item 1) **[Figure 50-50-14]** from the rod end of the lift cylinder (both sides).

Figure 50-50-15

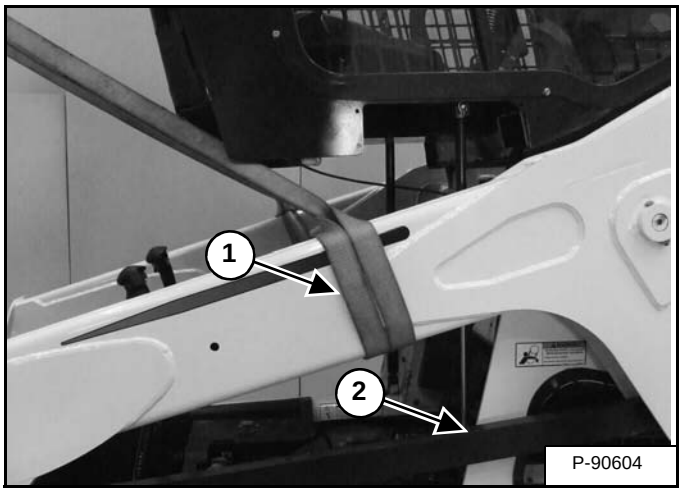


Install slings (Item 1) **[Figure 50-50-15]** on the lift arms and connect to a chain hoist.

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Removal And Installation (Cont'd)

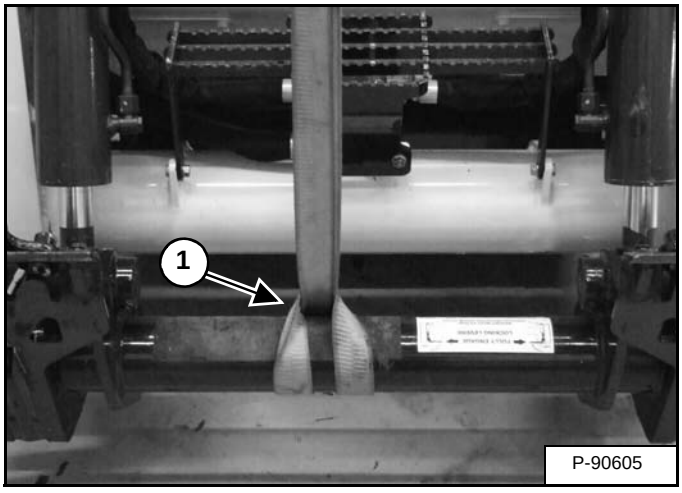
Figure 50-50-16



NOTE: Be sure the slings on the lift arms are in a position to balance the lift arms when being removed. See (Item 1) [Figure 50-50-16].

Disconnect the stabilizer bar from both sides of the lift arms (Item 2) **[Figure 50-50-16]**.

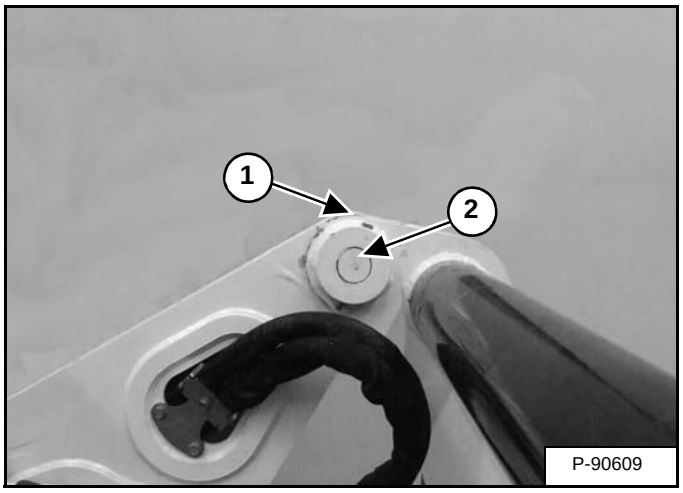
Figure 50-50-17



Position the front sling in the middle of the Bob-Tach as shown in (Item 1) **[Figure 50-50-17].**

Support the lift arms with the chain hoist.

Figure 50-50-18



Remove the retaining bolt and nut (Item 1) and the pin (Item 2) **[Figure 50-50-18]** (both sides).

Installation: Tighten the retainer bolt and nut to 48 - 54 N•m (35 - 40 ft-lb) torque.

Remove the lift arms from the loader.

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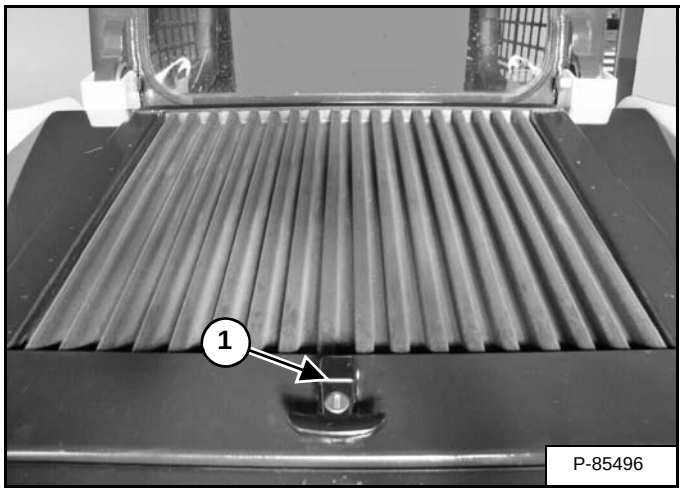


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REAR GRILLE

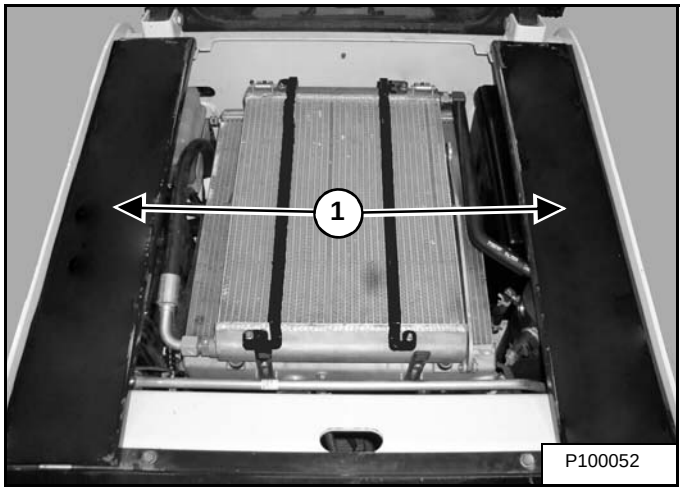
Removal And Installation

Figure 50-60-1



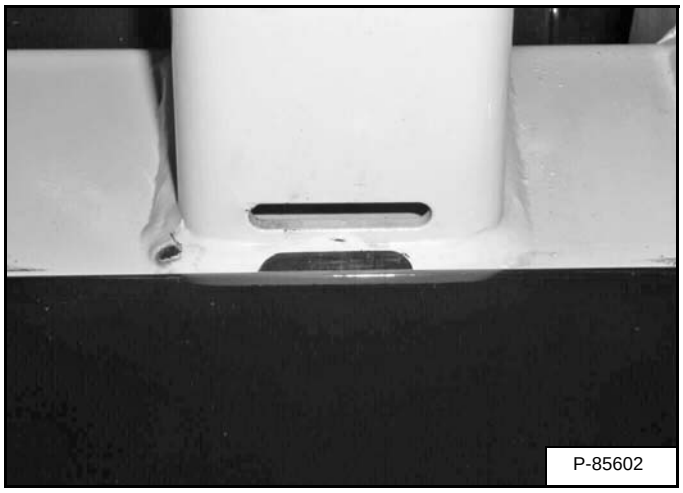
Flip up the lockable handle (Item 1) **[Figure 50-60-1]** and turn the handle a quarter turn counter-clockwise. Lift and pull the rear grille to remove it from the loader.

Figure 50-60-2



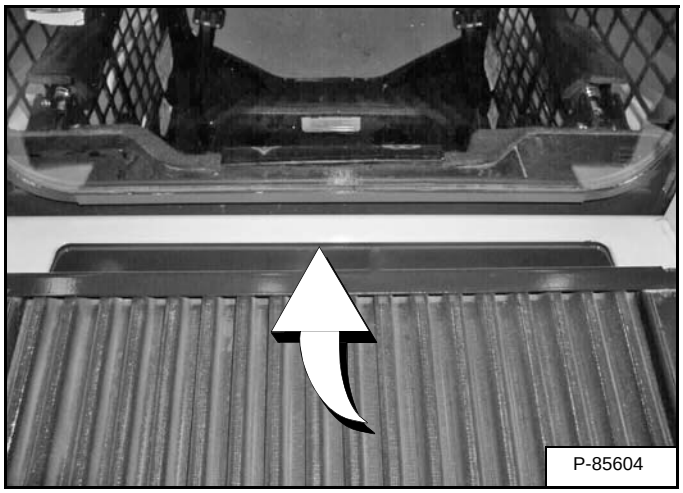
Lift and remove the two side covers (Item 1) **[Figure 50-60-2]**.

Figure 50-60-3



Align the tabs of the two side covers into the slots in the loader frame and lower **[Figure 50-60-3]**.

Figure 50-60-4



Align the edge of the rear grille under the loader frame and slide rear grille in while lowering **[Figure 50-60-4]**.

Turn the lockable handle a quarter turn clockwise and fold the handle down.

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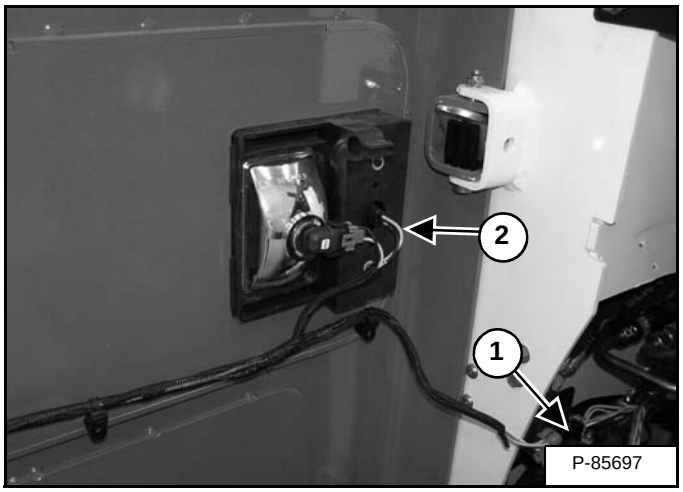


Dealer Copy -- Not for Resale

REAR DOOR (TAILGATE)

Removal And Installation

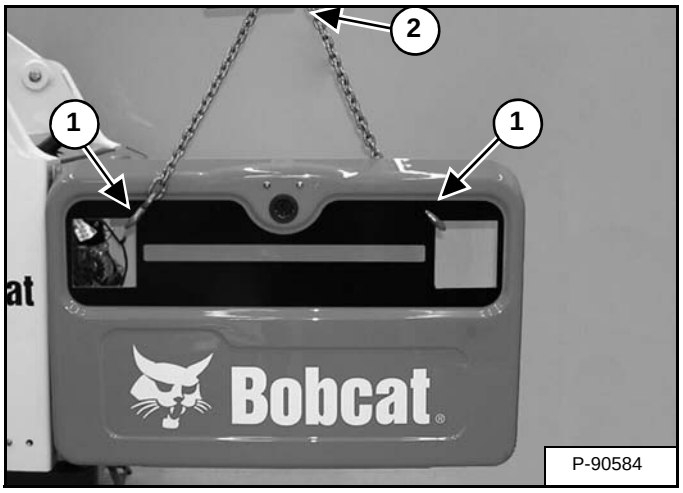
Figure 50-70-1



Disconnect the light harness connector (Item 1) **[Figure 50-70-1]** from the main frame harness.

Remove both rear lights (Item 2) **[Figure 50-70-1]** from the door. (See Rear Removal And Installation on Page 60-60-2.)

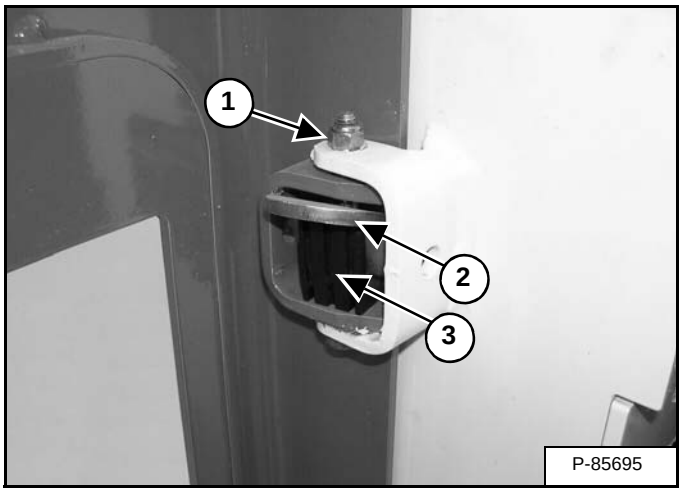
Figure 50-70-2



Secure the chain hooks (Item 1) **[Figure 50-70-2]** to the door as shown.

Connect a chain hoist (Item 2) **[Figure 50-70-2]** to the lifting chain.

Figure 50-70-3



Remove the top and bottom door hinge mounting bolts and nuts (Item 1) **[Figure 50-70-3]**.

NOTE: Install the door stop (Item 2) and the door stop retainer (Item 3) in the top hinge as shown [Figure 50-70-3].

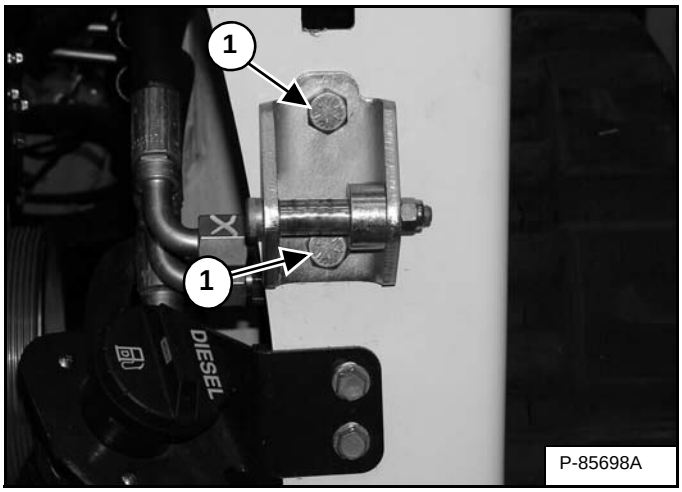
Installation: Tighten the mounting bolts and nuts to 34 - 38 N•m (25 - 28 ft-lb) torque.

Lift the door away from the loader frame and put the door flat on the floor.

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Striker Removal And Installation

Figure 50-70-4

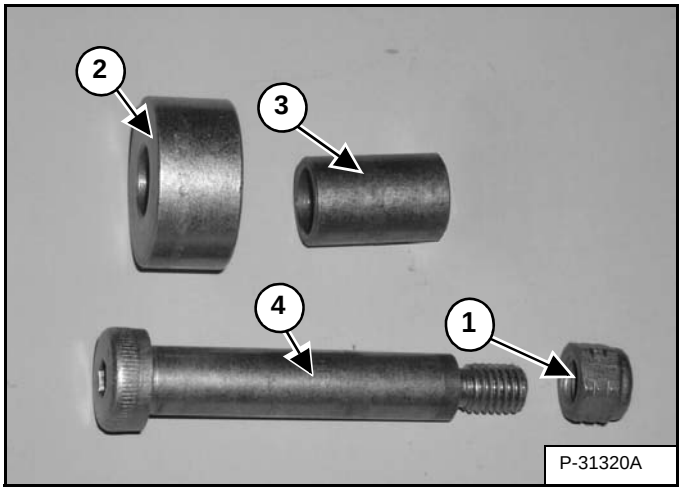


Remove the two striker mount bolts (Item 1) **[Figure 50-70-4]**.

Remove the striker assembly from the loader.

Striker Disassembly And Assembly

Figure 50-70-5



Remove the lock nut (Item 1) **[Figure 50-70-5]**.

Remove the rollers (Item 2) and the spacer (Item 3) from the bolt (Item 4) **[Figure 50-70-5]**.

Check the parts for wear and replace as needed.

Installation: Tighten the bolt (Item 4) and nut (Item 1) to 34 - 38 N•m (25 - 28 ft-lb) torque.

Striker (Adjusting)

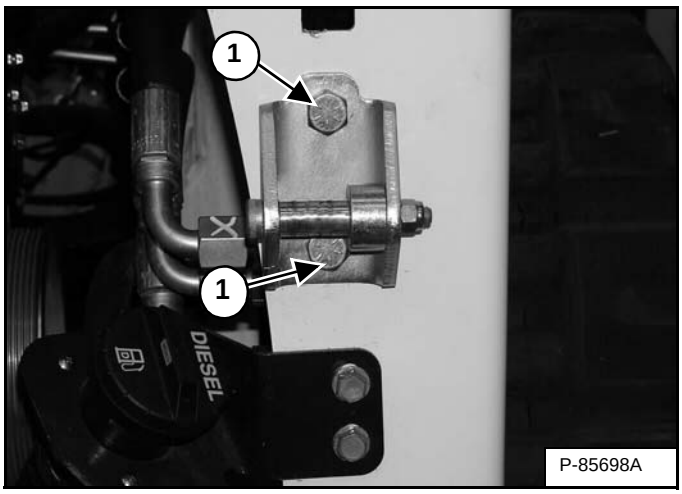
WARNING

AVOID INJURY OR DEATH

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

W-2012-0497

Figure 50-70-6



Loosen the striker assembly mount bolts (Item 1) **[Figure 50-70-6]**.

Align the striker assembly in the center of the mounting holes.

NOTE: Tighten the striker assembly, top mount bolt only, until it will hold the striker assembly in the center of the mounting slots.

Close the rear door. (This will align the striker assembly to the correct position.)

Open the door.

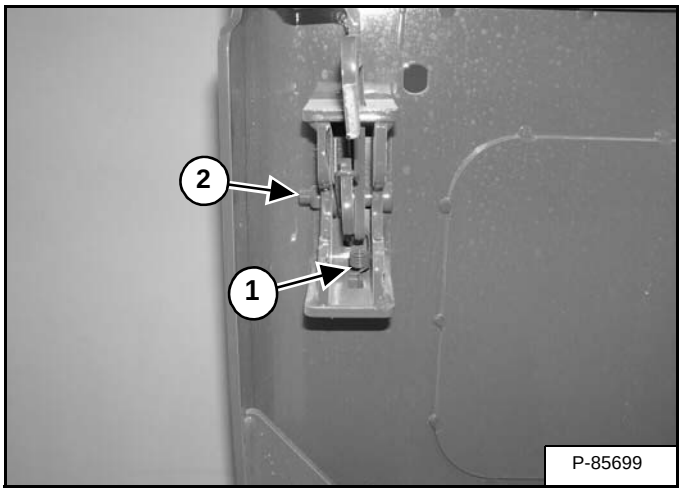
Tighten both striker mount bolts (Item 1) **[Figure 50-70-6]** to 125 - 135 N•m (90 - 100 ft-lb) torque.

Close the rear door.

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Latch Removal And Installation

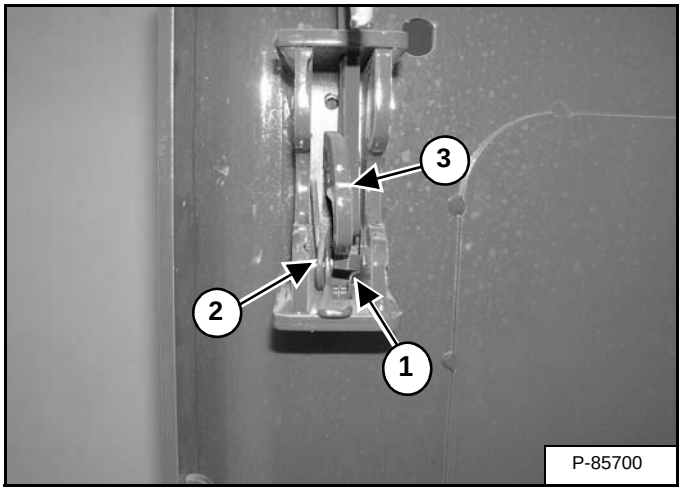
Figure 50-70-7



Disconnect the spring (Item 1) **[Figure 50-70-7]** from the rear door.

Remove the bolt and nut (Item 2) **[Figure 50-70-7]** from the latch.

Figure 50-70-8

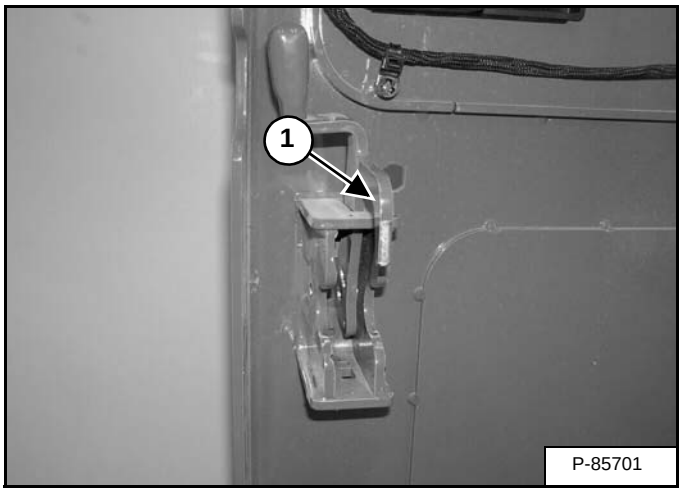


Remove the spring (Item 1) **[Figure 50-70-8]** from the door handle.

Remove the spring (Item 2) **[Figure 50-70-8]** from the door latch.

Remove the door latch (Item 3) **[Figure 50-70-8]** from the door handle.

Figure 50-70-9



Remove the door handle (Item 1) **[Figure 50-70-9]** from the rear door.

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Dealer Copy -- Not for Resale

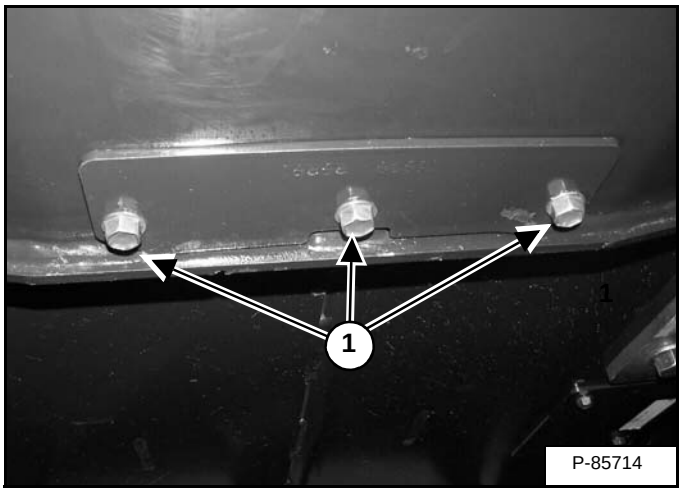
FUEL TANK

Removal And Installation

Lift and block the loader. (See Procedure on Page 10-10-1.)

Remove the engine / hydrostatic pump assembly from the loader. (See Engine Removal And Installation on Page 70-10-7.)

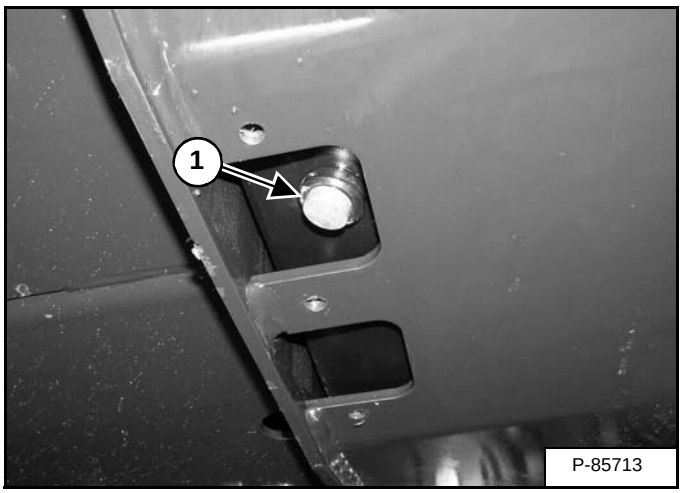
Figure 50-80-1



Remove the three mount bolts (Item 1) **[Figure 50-80-1]** from the access cover at the rear of the loader frame.

Remove the access cover.

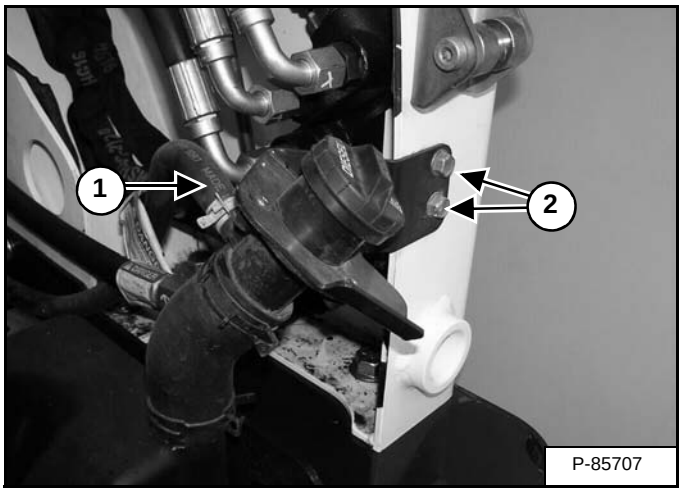
Figure 50-80-2



Remove the drain plug (Item 1) **[Figure 50-80-2]**.

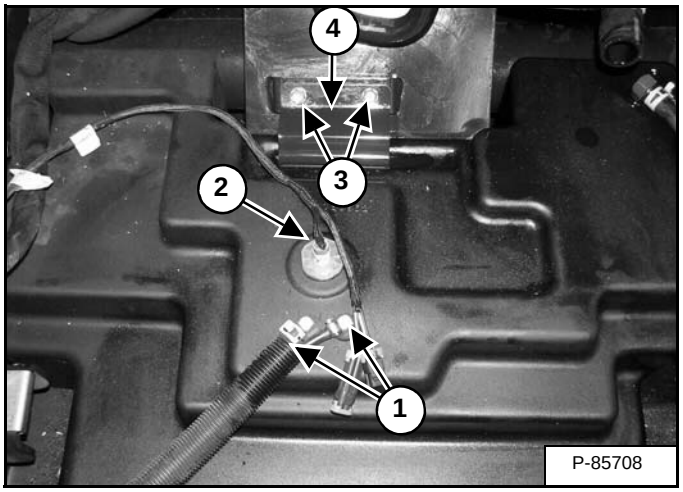
Drain the fuel into a container.

Figure 50-80-3



Disconnect the fuel vent hose (Item 1) and remove the two bolts (Item 2) **[Figure 50-80-3]**.

Figure 50-80-4



Disconnect the two fuel lines (Item 1) **[Figure 50-80-4]**.

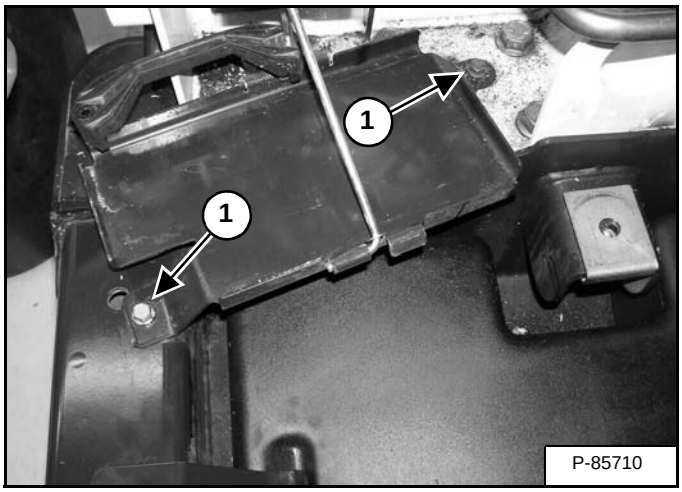
Disconnect the wire harness connector (Item 2) **[Figure 50-80-4]** from the fuel level sender.

Remove the two mounting bolts (Item 3) and remove the bracket (Item 4) **[Figure 50-80-4]**.

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Removal And Installation (Cont'd)

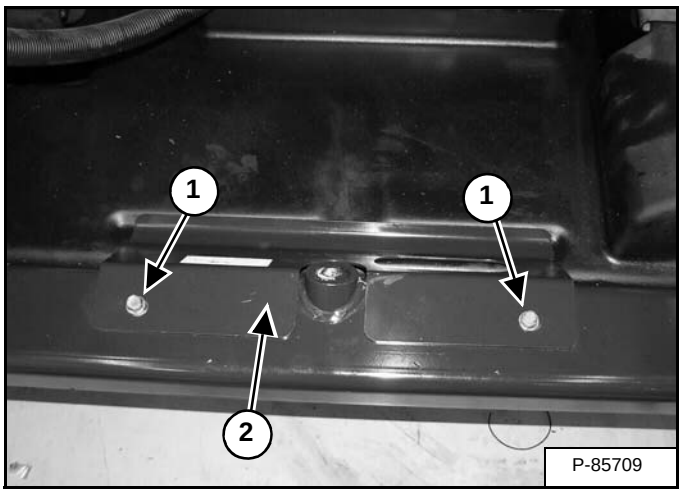
Figure 50-80-5



Remove the bolts (Item 1) **[Figure 50-80-5]** from the battery hold down plate.

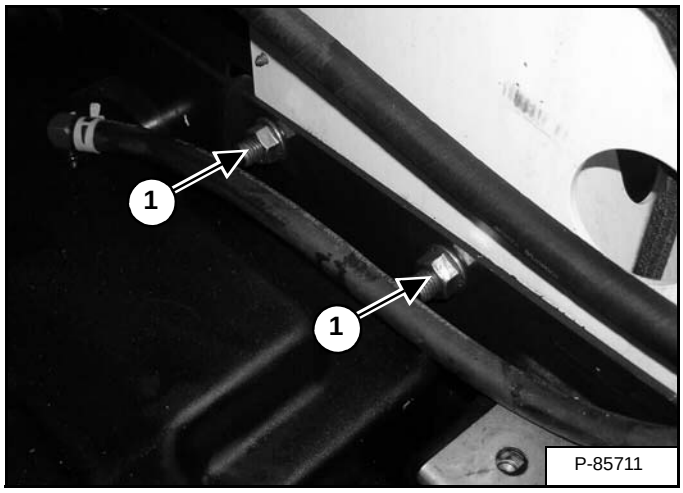
Remove the hold down plate from the loader.

Figure 50-80-6



Remove the two mounting bolts (Item 1) and the bracket (Item 2) **[Figure 50-80-6]**.

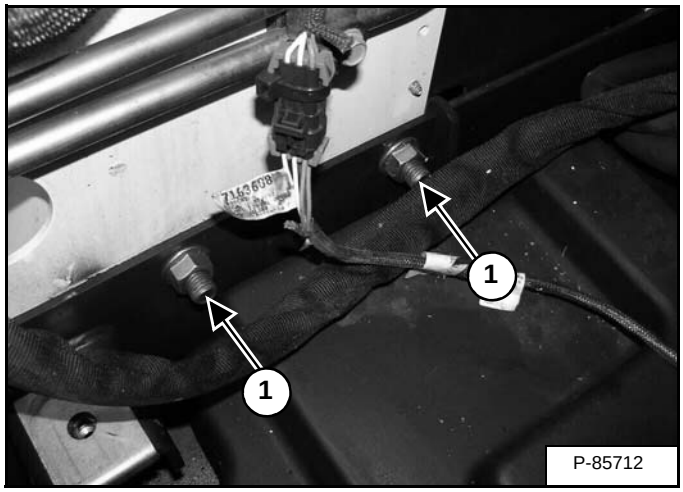
Figure 50-80-7



At the right side of the loader, remove the two main frame mount bolts and nuts (Item 1) **[Figure 50-80-7]**.

Installation: Tighten the main frame mount bolts to 542 - 583 N•m (400 - 430 ft-lb) torque.

Figure 50-80-8



At the left side of the loader, remove the two main frame mount bolts and nuts (Item 1) **[Figure 50-80-7]**.

Installation: Tighten the main frame mount bolts to 542 - 583 N•m (400 - 430 ft-lb) torque.

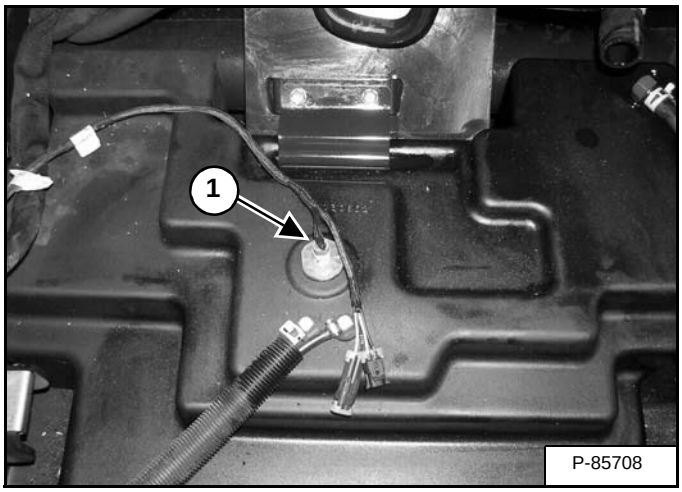
Lift the fuel tank and remove it from the loader frame.

NOTE: When installing the fuel tank, avoid striking the tank with heavy objects to prevent damage.

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Fuel Level Sender Removal And Installation

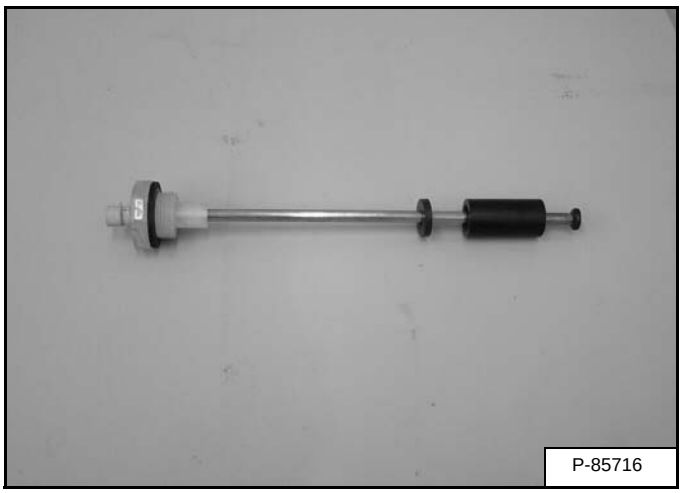
Figure 50-80-9



Disconnect the wire harness connector (Item 1) **[Figure 50-80-9]** from the fuel level sender.

Remove the fuel level sender.

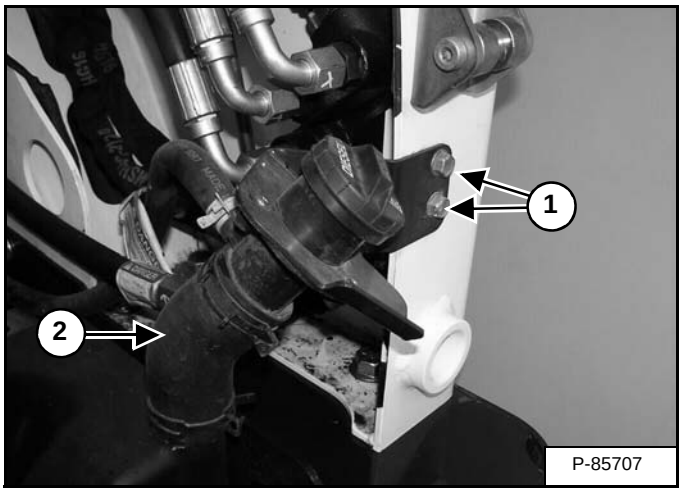
Figure 50-80-10



Inspect the fuel level sender and replace if worn or damaged.

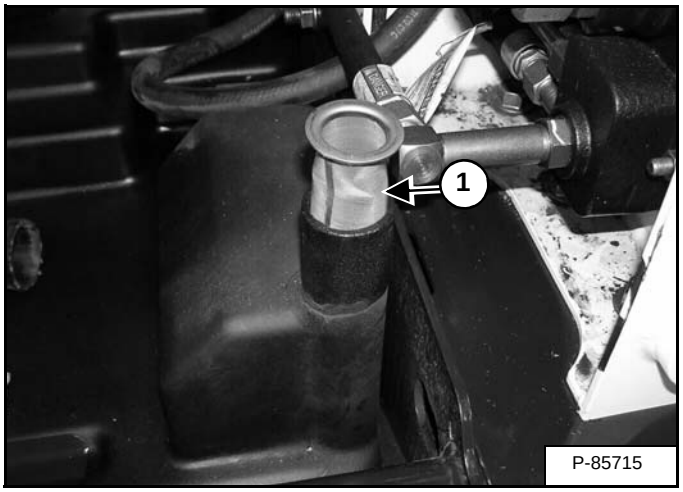
Fuel Fill Screen Removal And Installation

Figure 50-80-11



Remove the two bolts (Item 1) and disconnect the fuel fill hose (Item 2) **[Figure 50-80-11]**.

Figure 50-80-12



Remove the fuel fill screen (Item 1) **[Figure 50-80-12]**.

Inspect and replace as needed.

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CONTROL PEDALS AND LINKAGES

Description

The control pedals and linkages are connected to the control valve. The control pedals will mechanically move the lift and tilt spools on the control valve.

The control pedals and linkages are located on the lower mainframe at the operators feet.

Pedal Removal And Installation

⚠ WARNING

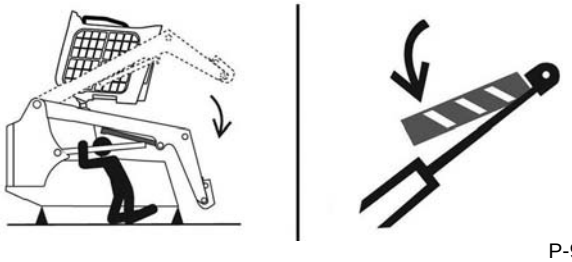
Never work on a machine with the lift arms up unless the lift arms are secured by an approved lift arm support device. Failure to use an approved lift arm support device can allow the lift arms or attachment to fall and cause injury or death.

W-2059-0598

Raise the lift arms and install an approved lift arm support device.(See Installing on Page 10-20-1.)

Raise the operator cab.(See Raising on Page 10-30-2.)

⚠ DANGER



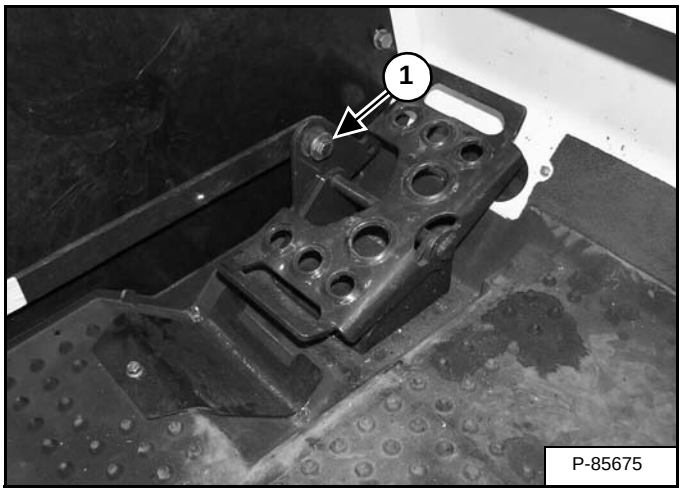
P-90328

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.**

D-1009-0409

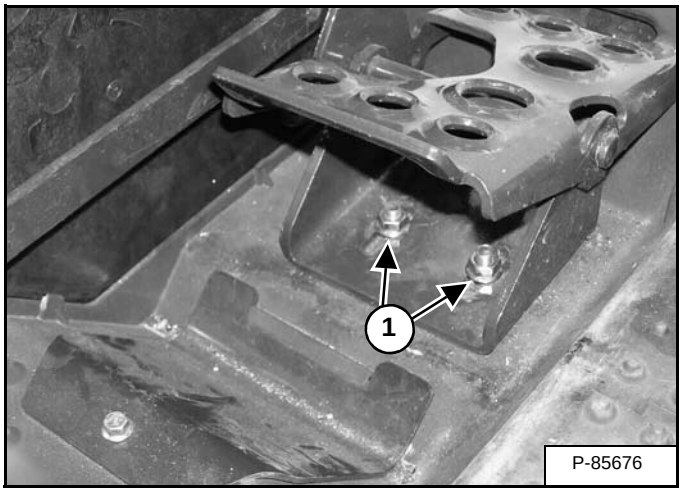
Figure 50-90-1



Remove the bolt (Item 1) **[Figure 50-90-1]** and nut from the pedal linkage.

Check the bushing in the pedal for wear and replace as needed.

Figure 50-90-2



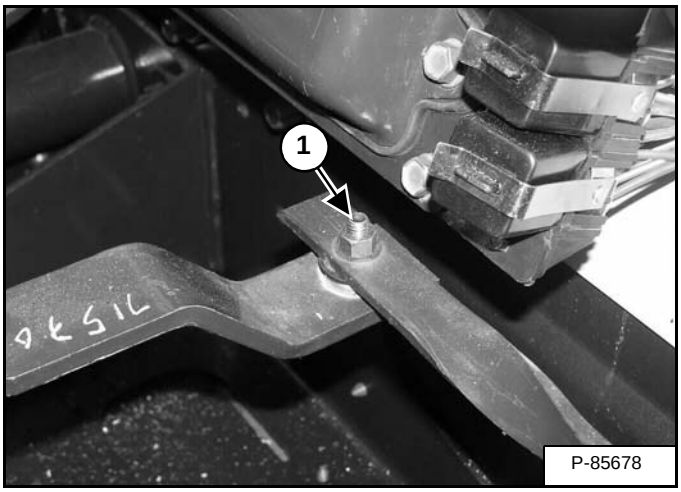
Remove the two nuts (Item 1) **[Figure 50-90-2]** from the pedal mounting bracket.

Remove the pedal assembly from the loader.

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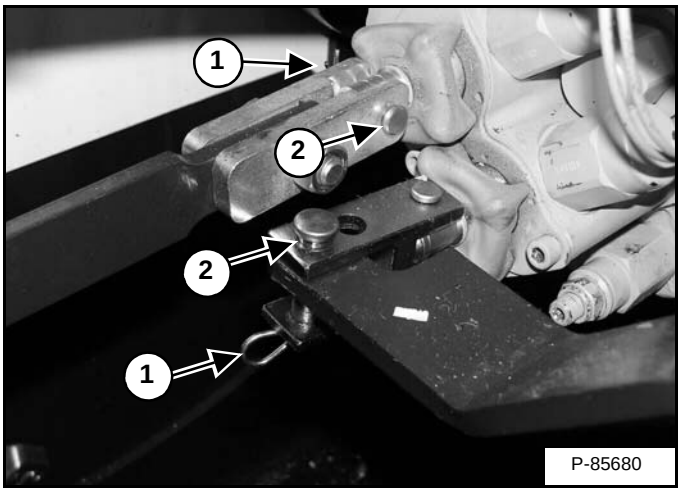
Linkage Removal And Installation

Figure 50-90-3



Remove the bolt and nut (Item 1) **[Figure 50-90-3]** to disconnect the lift pedal linkage from the crossbar.

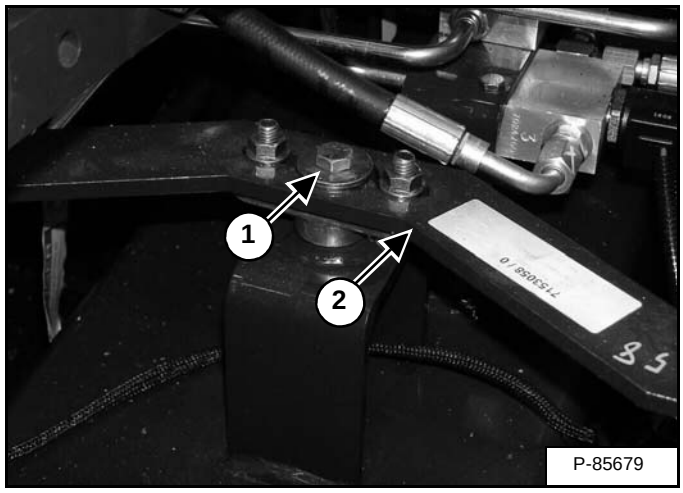
Figure 50-90-4



Remove the hairpin clips (Item 1) and cross-pins (Item 2) **[Figure 50-90-4]** from the control valve lift spool.

Disconnect the crossbar from the control valve.

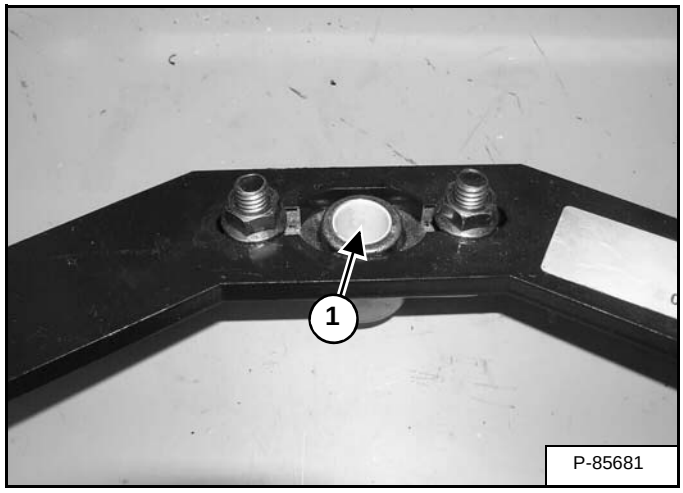
Figure 50-90-5



Remove the crossbar pivot bolt (Item 1) **[Figure 50-90-5]**.

Remove the crossbar from the pivot (Item 2) **[Figure 50-90-6]**.

Figure 50-90-6

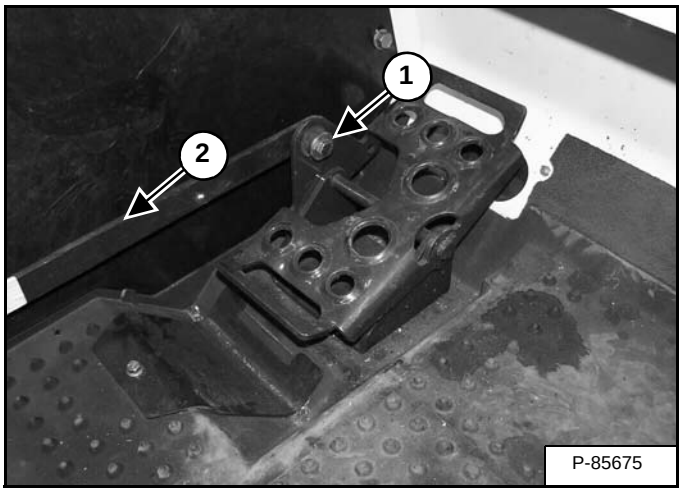


Installation: Check the nylon bushing (Item 1) **[Figure 50-90-6]** for wear and replace as needed.

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Linkage Removal And Installation (Cont'd)

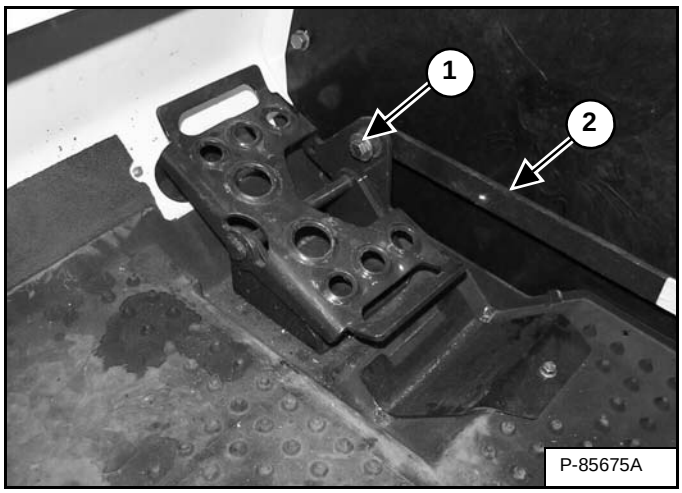
Figure 50-90-7



Remove the bolt (Item 1) **[Figure 50-90-7]** and nut from the pedal linkage.

Remove the linkage (Item 2) **[Figure 50-90-7]**.

Figure 50-90-8



Remove the bolt (Item 1) **[Figure 50-90-8]** and nut from the pedal linkage.

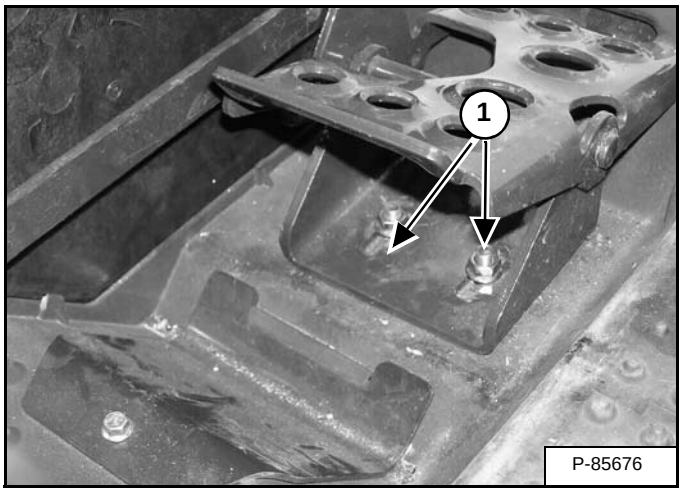
Remove the linkage (Item 2) **[Figure 50-90-8]**.

Pedal (Adjusting)

After installing the pedal, adjust the pedal angle so that there is clearance under the rear of the pedal. The valve spool must travel full stroke without the pedal hitting the floor panel.

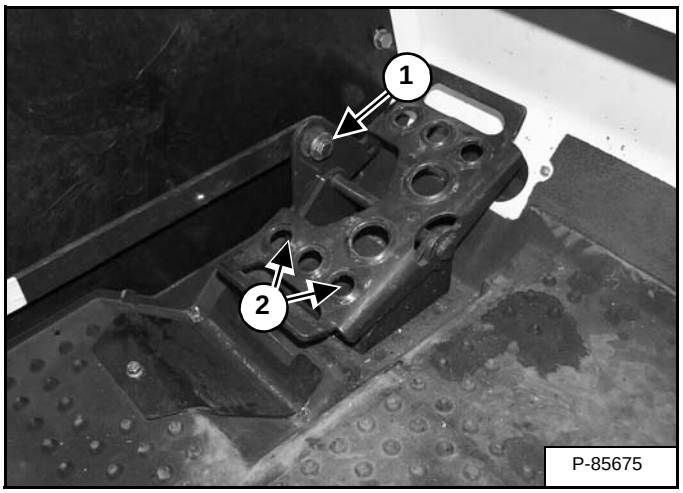
The pedals should be positioned at a comfortable angle so full movement of the pedal can be reached easily while properly sitting in the loader seat.

Figure 50-90-9



Loosen the two mounting bolts (Item 1) **[Figure 50-90-9]** from the pedal mounting bracket.

Figure 50-90-10



Loosen the bolt (Item 1) **[Figure 50-90-10]** and nut on the pedal linkage.

Check the bushing in the pedal for wear and replace as needed.

Tilt the pedal back and forth until an acceptable "neutral" angle is achieved on the pedal.

Tighten the two nuts (Item 2) and pivot bolt (Item 1) **[Figure 50-90-10]** on the pedal assembly to standard torque.

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Floor Pan Removal And Installation

Remove the control panel. (See Removal And Installation on Page 50-100-2.)

Remove the pedals. (See Pedal Removal And Installation on Page 50-90-1.)

Remove the access panels. (See ACCESS PANEL (INSIDE) on Page 50-120-1.)

Figure 50-90-11

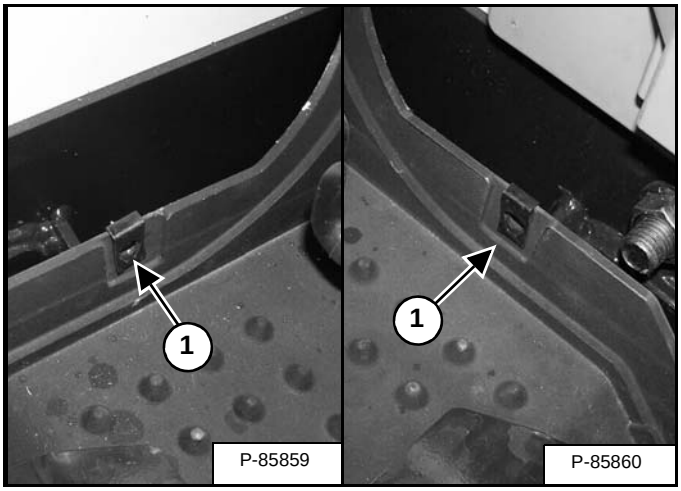
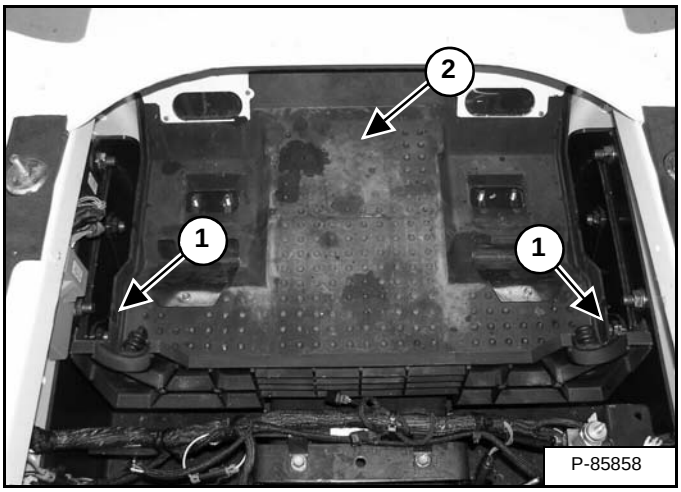


Figure 50-90-12



Remove the clips (Item 1) **[Figure 50-90-11]** and **[Figure 50-90-12]** from the sides of the floor pan.

Remove the floor pan (Item 2) **[Figure 50-90-12]**.

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CONTROL PEDALS AND LINKAGES (ACS)

Description

The control pedals are connected to foot sensors located behind the control panel. The foot sensors send an electronic pulse to the actuators on the control valve. The electronic pulse tells the actuators to move the lift or tilt spools on the control valve.

The control pedals and linkages are located on the lower mainframe at the operators feet.

Pedal Removal And Installation

⚠ WARNING

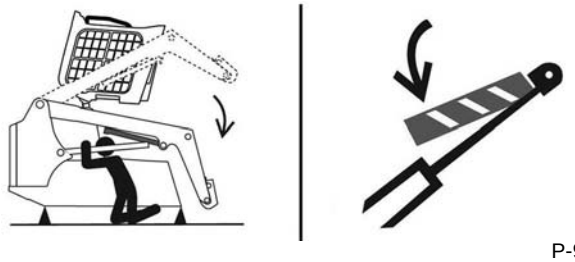
Never work on a machine with the lift arms up unless the lift arms are secured by an approved lift arm support device. Failure to use an approved lift arm support device can allow the lift arms or attachment to fall and cause injury or death.

W-2059-0598

Raise the lift arms and install an approved lift arm support device.(See Installing on Page 10-20-1.)

Raise the operator cab.(See Raising on Page 10-30-2.)

⚠ DANGER



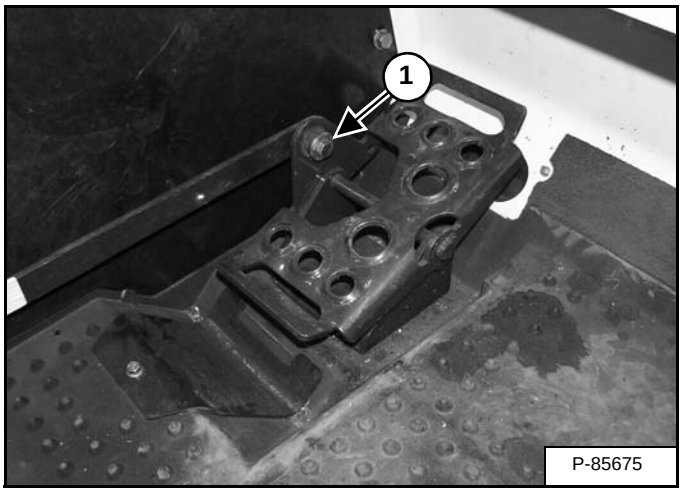
P-90328

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.**

D-1009-0409

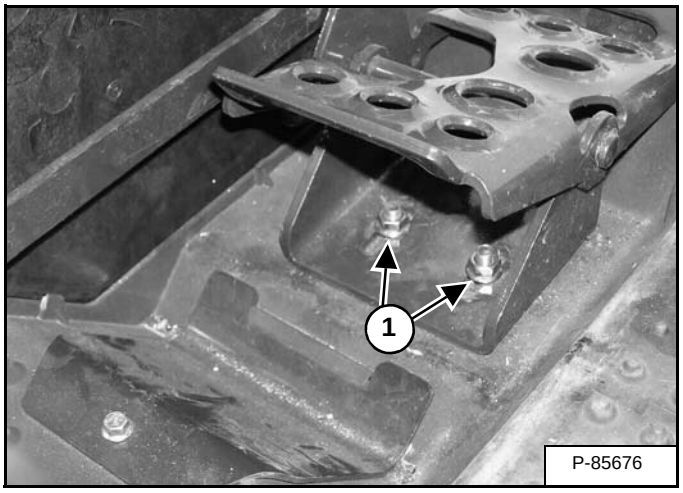
Figure 50-91-1



Remove the bolt (Item 1) **[Figure 50-91-1]** and nut from the pedal linkage.

Check the bushing in the pedal for wear and replace as needed.

Figure 50-91-2



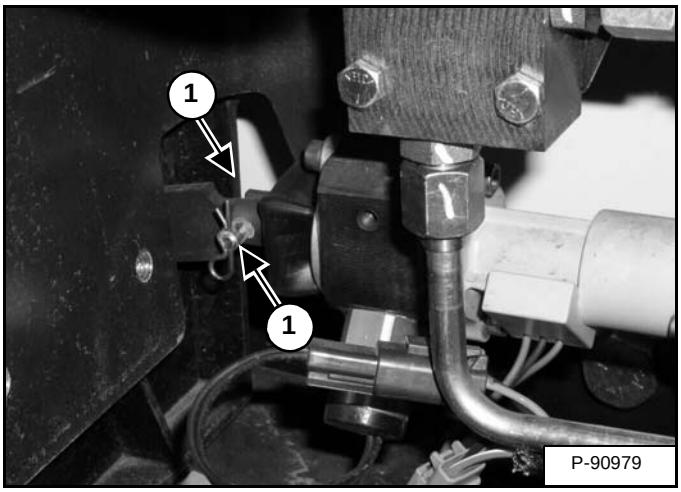
Remove the two nuts (Item 1) **[Figure 50-91-2]** from the pedal mounting bracket.

Remove the pedal assembly from the loader.

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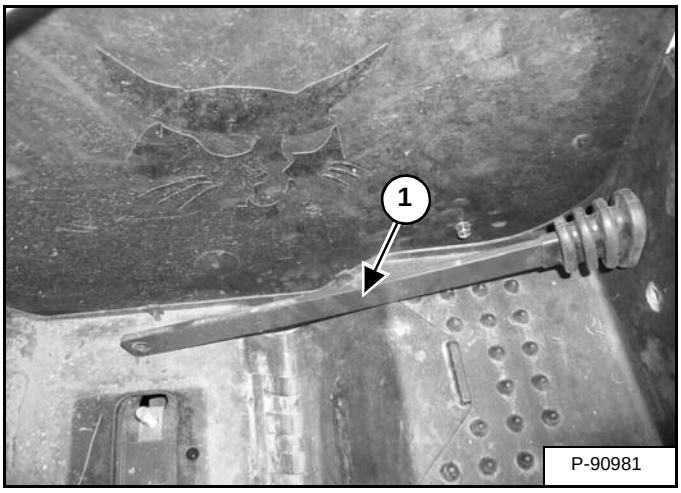
Linkage Removal And Installation

Figure 50-91-3



Remove the hairpin clip and the pin (Item 1) **[Figure 50-91-3]** from the foot sensor.

Figure 50-91-4



Remove the linkage (Item 1) **[Figure 50-91-4]** and the rubber boot.

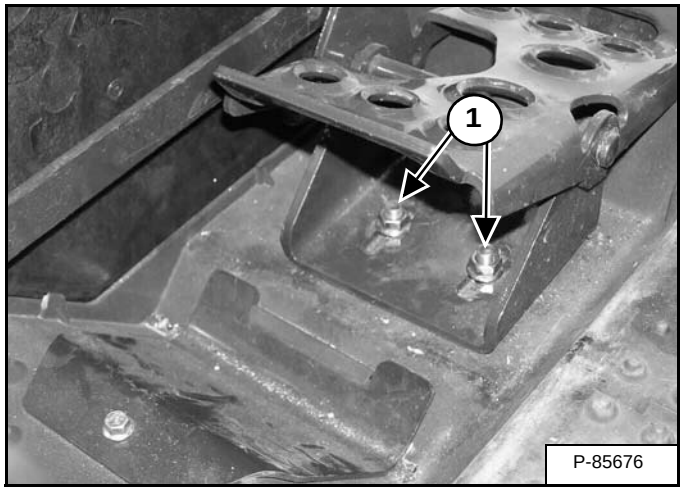
Repeat for other side.

Pedal (Adjusting)

After installing the pedal, adjust the pedal angle so that there is clearance under the rear of the pedal. The valve spool must travel full stroke without the pedal hitting the floor panel.

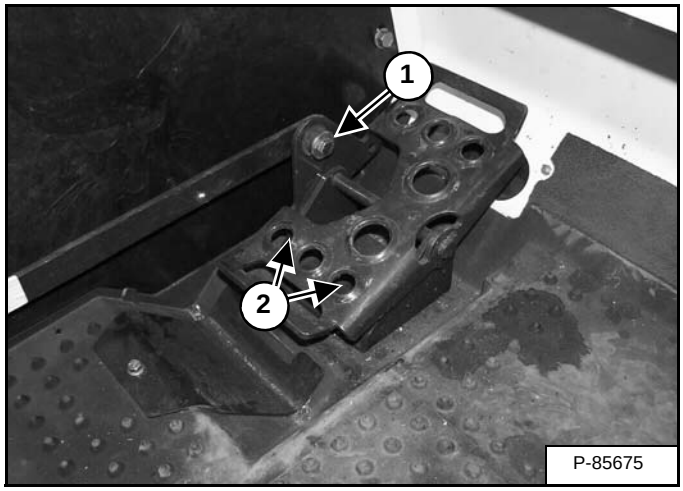
The pedals should be positioned at a comfortable angle so full movement of the pedal can be reached easily while properly sitting in the loader seat.

Figure 50-91-5



Loosen the two mounting nuts (Item 1) **[Figure 50-91-5]** from the pedal mounting bracket.

Figure 50-91-6



Loosen the bolt (Item 1) **[Figure 50-91-6]** and nut on the pedal linkage.

Check the bushing in the pedal for wear and replace as needed.

Tilt the pedal back and forth until an acceptable "neutral" angle is achieved on the pedal.

Tighten the two nuts (Item 2) and pivot bolt (Item 1) **[Figure 50-91-6]** on the pedal assembly to standard torque.

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Floor Pan Removal And Installation

Remove the control panel. (See Removal And Installation on Page 50-100-2.)

Remove the pedals. (See Pedal Removal And Installation on Page 50-91-1.)

Remove the access panels. (See ACCESS PANEL (INSIDE) on Page 50-120-1.)

Figure 50-91-7

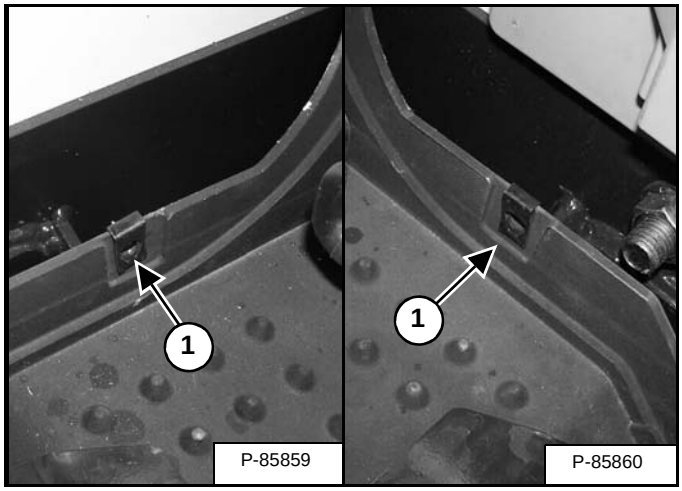
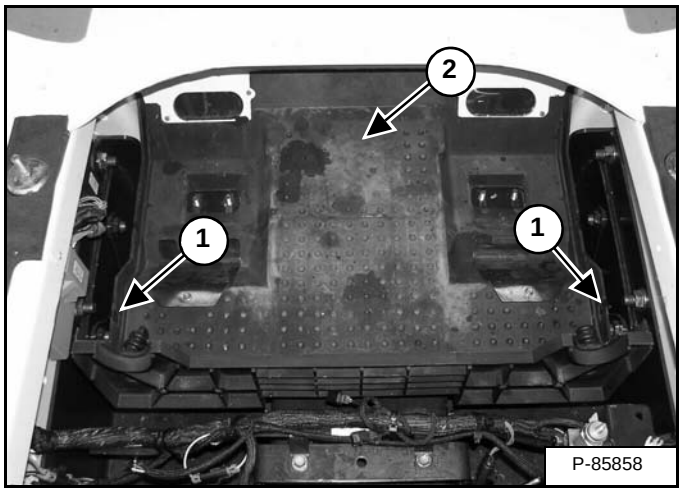


Figure 50-91-8



Remove the clips (Item 1) **[Figure 50-91-7]** and **[Figure 50-91-8]** from the sides of the floor pan.

Remove the floor pan (Item 2) **[Figure 50-91-8]**.

Dealer Copy -- Not for Resale

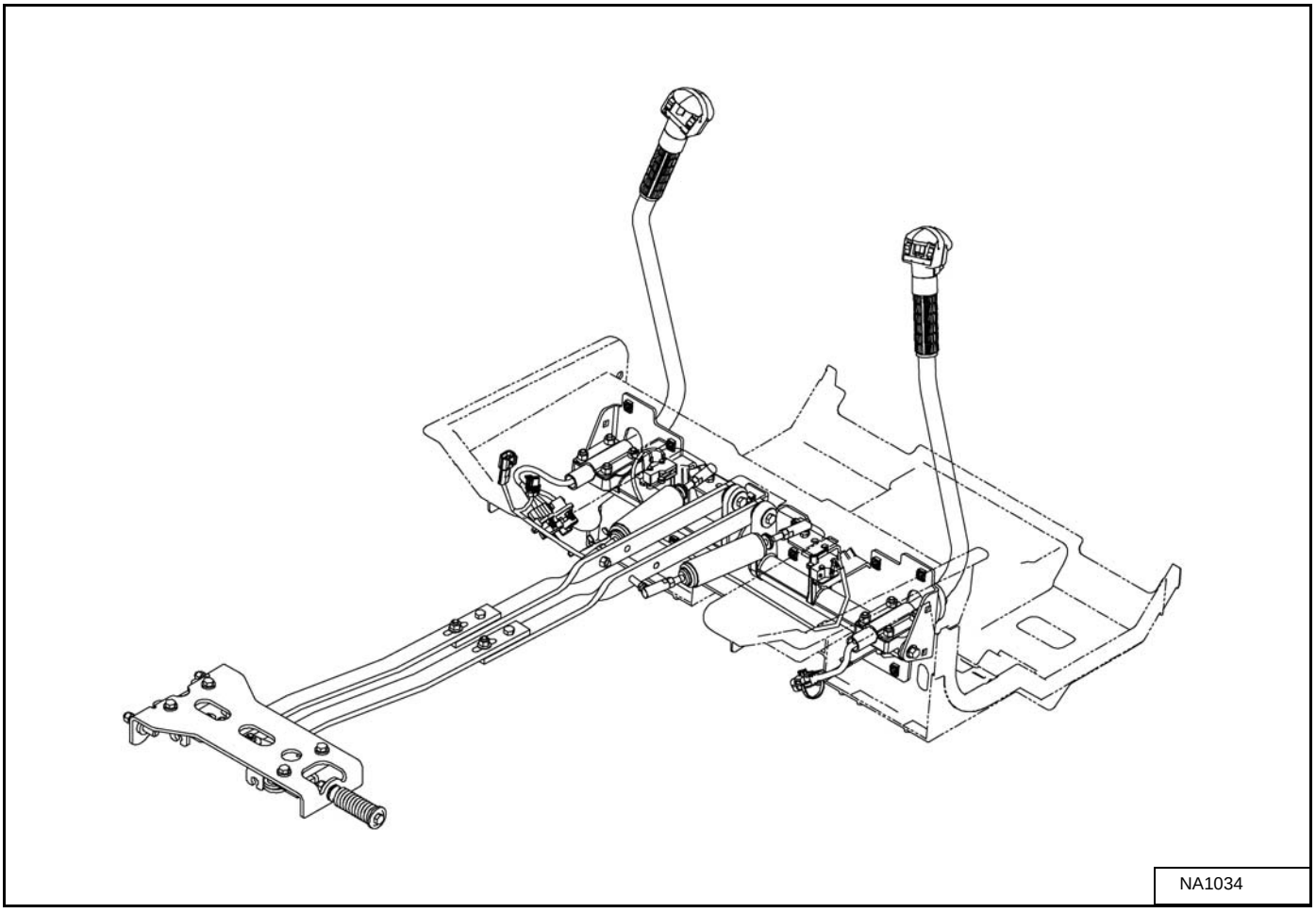


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CONTROL PANEL

Description

Figure 50-100-1



The steering system consists of independent steering levers the operator uses to provide steering input to the loader.

The steering levers are attached to pivoting bellcranks that pivot on a steering shaft and plastic bushings.

The forward travel is adjusted by drift adjustment bolts.

The bellcranks are attached to steering linkage bars with torsion bushings pressed into the bellcranks. Bellcranks mount to the control handle assembly and mount to the control panel.

Steering linkage bars are a two-piece design. Steering linkage bars are adjustable in length for “full travel adjustment”.

Steering linkage bars attach to the pintle arms where a rubber torsion bushing is pressed into the pintle arms.

Pintle arms are of a two-piece design that allow easy adjustment of the neutral or “creep”.

The steering system returns the levers to their starting position by means of the centering spring and the returning force of the torsion bushings.

NOTE: Torsion bushings need to be replaced if torn or rotating in the housing. Loosen torsion bushing bolts slightly before adjustments are made.

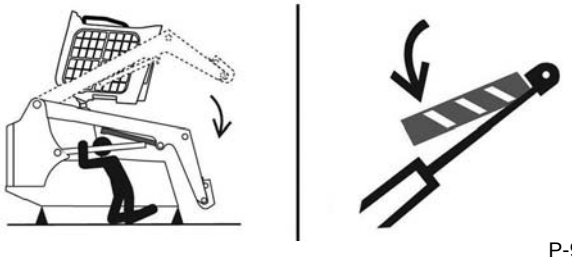
Sequence of steering adjustments:

1. Set neutral of pintle arms, “creep”
2. Set full travel at steering linkage bars
3. Set drift at drift adjustment bolts

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Removal And Installation

DANGER



P-90328

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.**

D-1009-0409

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

Lift and block the loader. (See Procedure on Page 10-10-1.)

Raise the lift arms and install an approved lift arm support device. (See Installing on Page 10-20-1.)

Raise the operator cab. (See Raising on Page 10-30-2.)

Figure 50-100-2

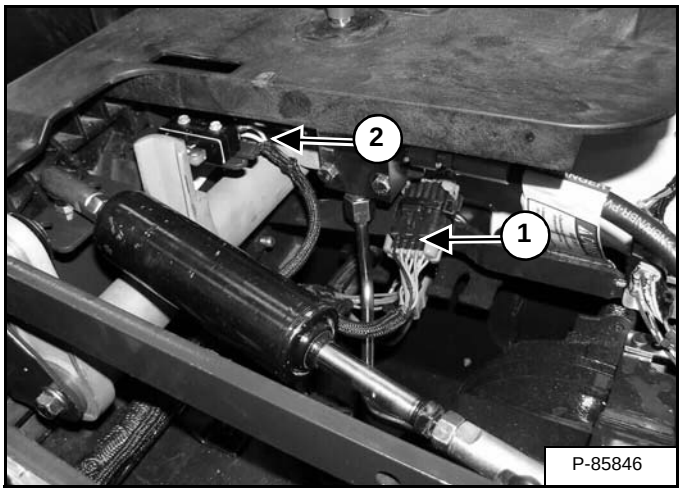
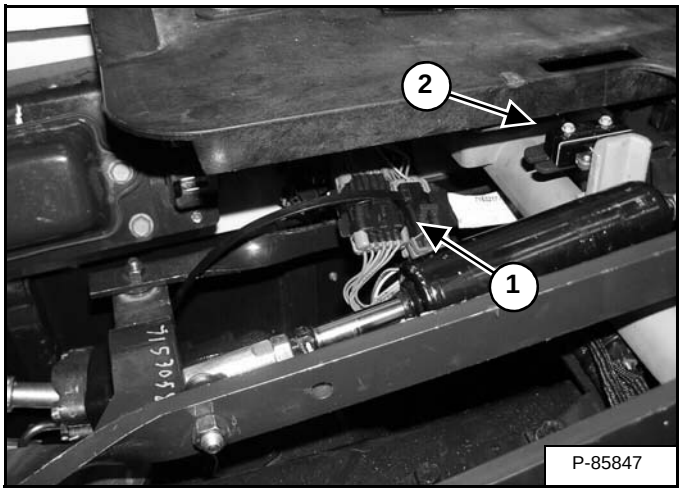


Figure 50-100-3

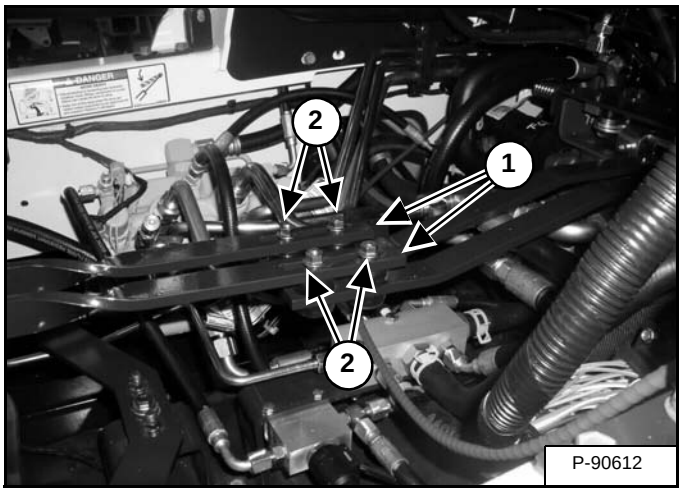


Disconnect the control harness connectors (Item 1) and the back-up alarm wires (Item 2) **[Figure 50-100-2]** & **[Figure 50-100-3]** from the control levers.

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Removal And Installation (Cont'd)

Figure 50-100-4



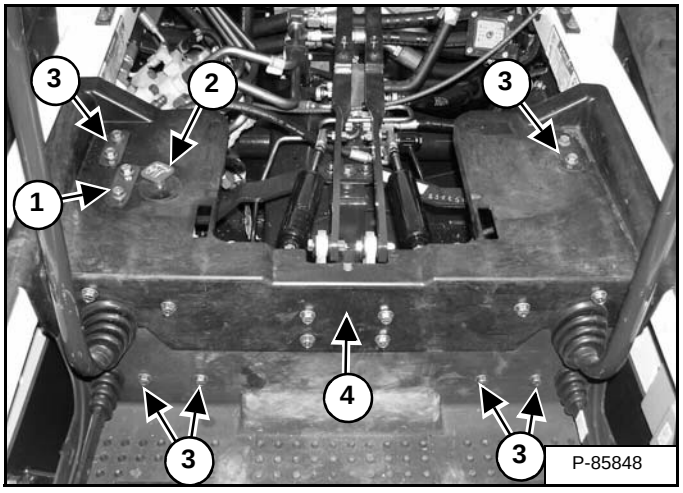
Scribe a mark across the top of the steering linkage bars (Item 1) **[Figure 50-100-4]** which are connected to the steering shaft on the control panel.

Remove the four steering linkage mounting bolts, nuts and rubber isolators (Item 2) **[Figure 50-100-4]**.

Inspect and replace any damaged parts.

Installation: Align the marks on the steering linkage bars. Tighten the steering linkage mounting bolts to 47,5 - 54,2 N•m (35 - 40 ft-lb) torque.

Figure 50-100-5



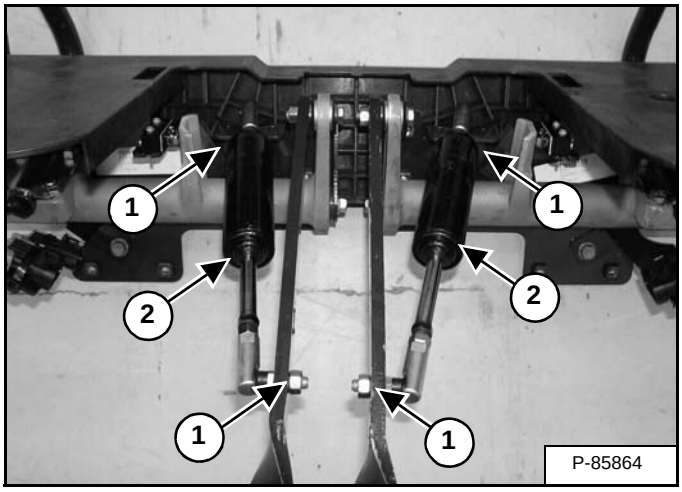
Remove the two bracket mounting bolts (Item 1) and the knob (Item 2) **[Figure 50-100-5]** from the lift arm bypass valve.

Remove the eight control panel bolts (Item 3) and the control panel assembly (Item 4) **[Figure 50-100-5]**.

Disassembly And Assembly

Remove Control Panel. (See Removal And Installation on Page 50-100-2.)

Figure 50-100-6



Remove the nuts (Item 1) and the steering stabilizers (Item 2) **[Figure 50-100-6]**.

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Disassembly And Assembly (Cont'd)

Figure 50-100-7

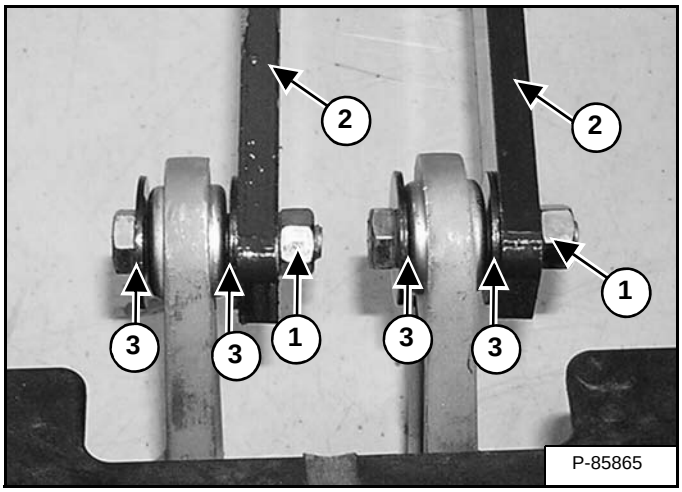
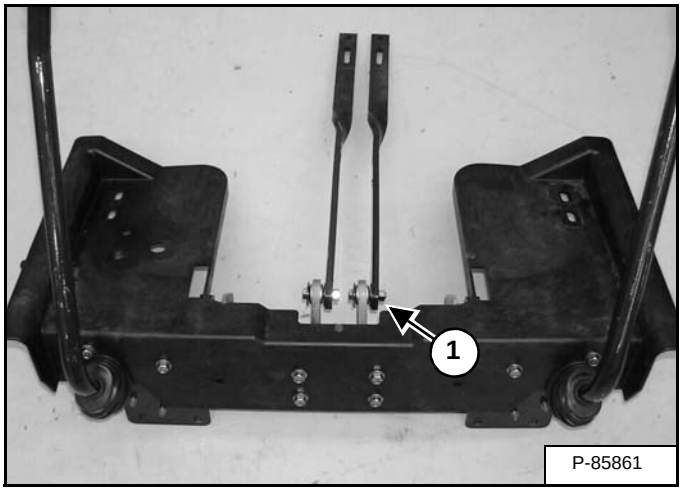


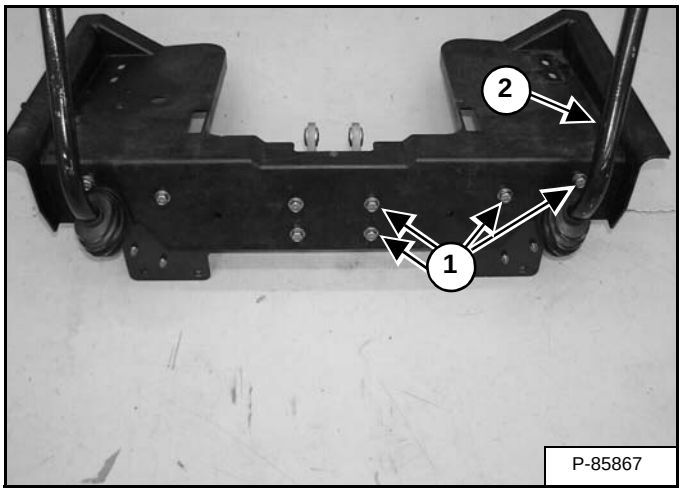
Figure 50-100-8



Remove the bolt and nut (Item 1), steering link, (Item 2), and washers (Item 3) **[Figure 50-100-7]** and **[Figure 50-100-8]**.

Installation: Verify correct orientation of components **[Figure 50-100-7]** and **[Figure 50-100-8]**.

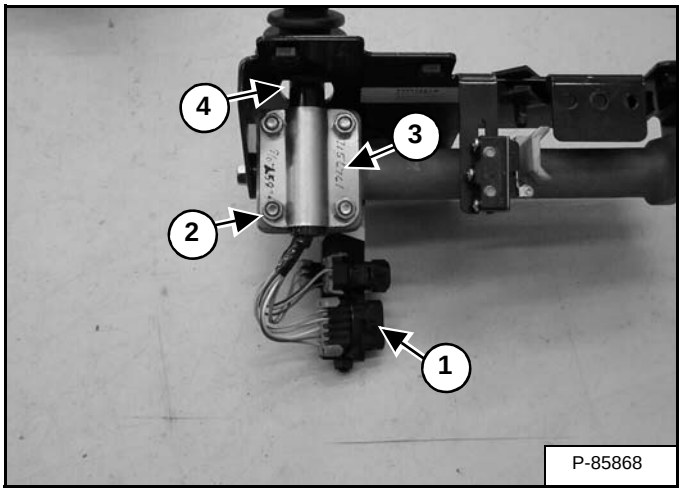
Figure 50-100-9



Remove the four bolts (Item 1) **[Figure 50-100-9]** from the control panel.

Remove the control handle assembly (Item 2) **[Figure 50-100-9]**.

Figure 50-100-10



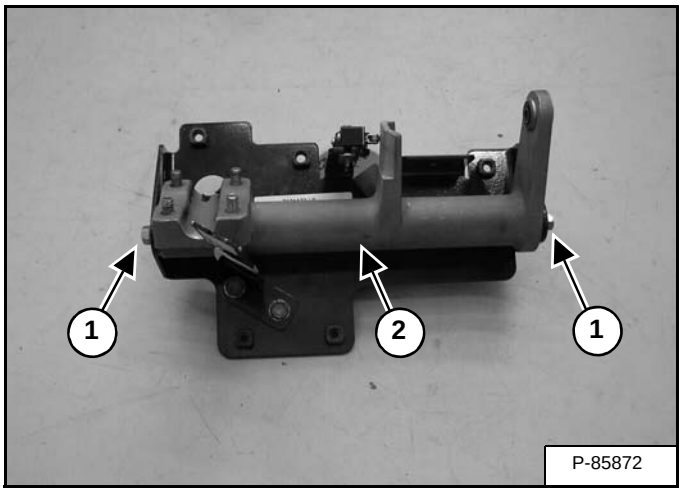
Remove the tie straps (Item 1), the four nuts (Item 2), and the plate (Item 3) **[Figure 50-100-10]**.

Remove the control handle (Item 4) **[Figure 50-100-10]**.

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Disassembly And Assembly (Cont'd)

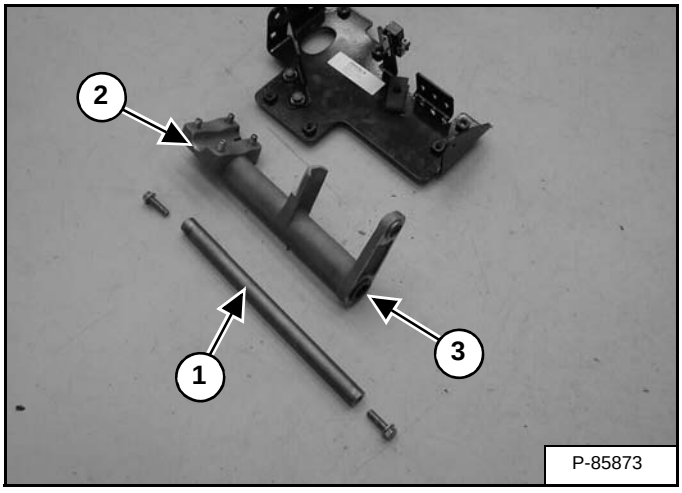
Figure 50-100-11



Remove the two bolts (Item 1) from the bellcrank (Item 2) **[Figure 50-100-11]**.

Remove the bellcrank from the bracket **[Figure 50-100-11]**.

Figure 50-100-12



Inspect the shaft (Item 1), the bellcrank (Item 2), and the bushings (Item 3) **[Figure 50-100-11]** for wear and replace as need.

Repeat the procedure for the other control handle assembly.

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

Lift and block the loader. (See Procedure on Page 10-10-1.)

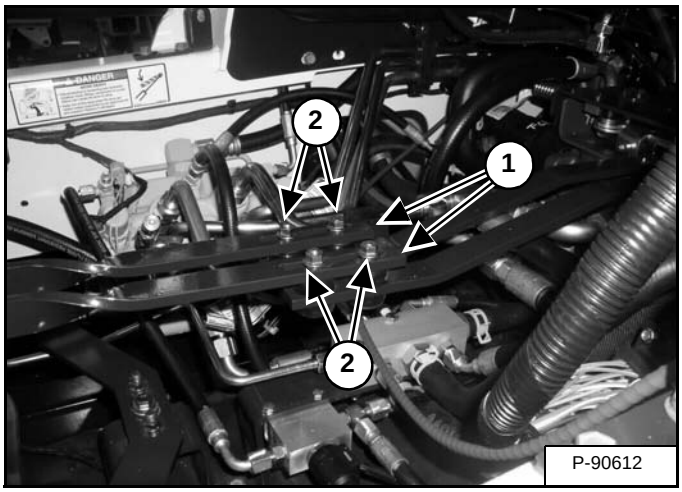
Raise the lift arms and install an approved lift arm support device. (See Installing on Page 10-20-1.)

Raise the operator cab. (See Raising on Page 10-30-2.)

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Linkage Removal And Installation (Cont'd)

Figure 50-100-13



Scribe a mark across the top of the steering linkage bars (Item 1) **[Figure 50-100-13]** which are connected to the steering shaft on the control panel.

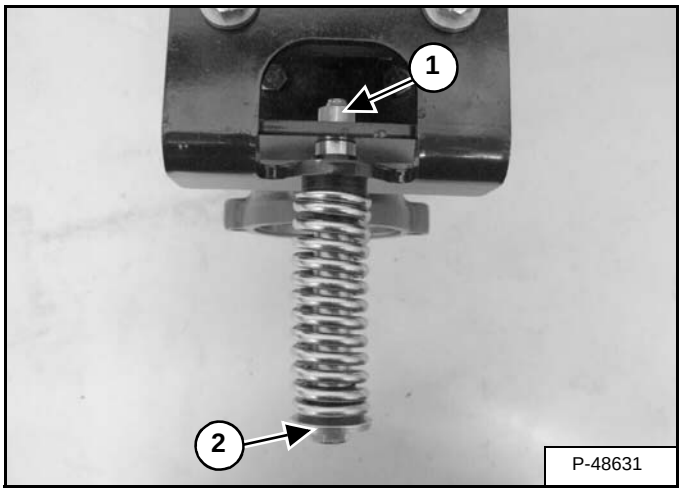
Remove the four steering linkage mounting bolts, nuts and rubber isolators (Item 2) **[Figure 50-100-13]**.

Inspect and replace any damaged parts.

Installation: Align the marks on the steering linkage bars. Tighten the steering linkage mounting bolts to 47,5 - 54,2 N•m (35 - 40 ft-lb) torque.

NOTE: After removal and installation of the linkage, the linkage neutral adjusting procedure must be performed. (See Linkage Neutral (Adjusting) on Page 50-100-10.)

Figure 50-100-14

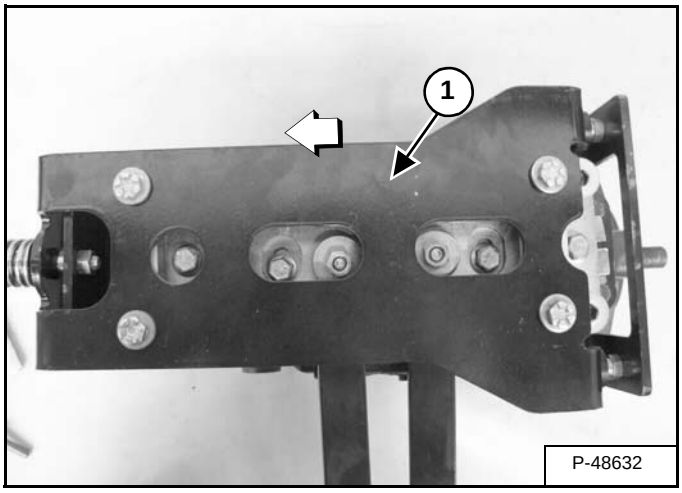


Remove the nut (Item 1) from the end of the centering spring shoulder bolt (Item 2) **[Figure 50-100-14]**.

Remove the bolt / spring assembly.

Installation: Tighten the centering spring bolt and a NEW lock nut to 34 - 38 N•m (25 - 28 ft-lb) torque.

Figure 50-100-15



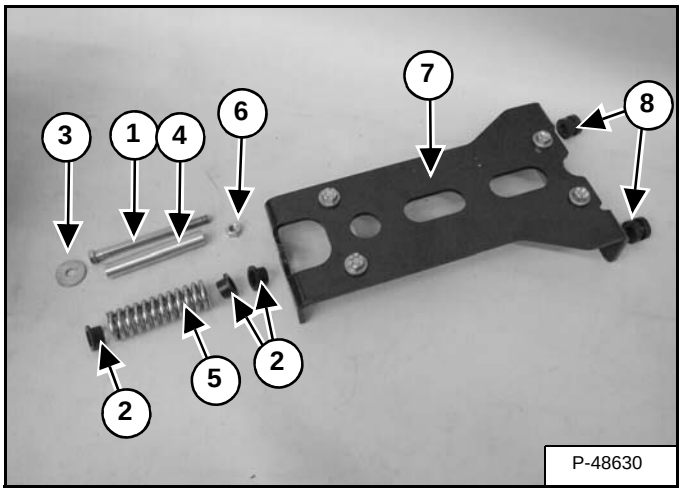
Slide the centering plate (Item 1) **[Figure 50-100-15]** to the right to remove it from the hydrostatic pumps.

NOTE: Directions are shown and stated as if you were sitting in the operator's seat.

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Linkage Removal And Installation (Cont'd)

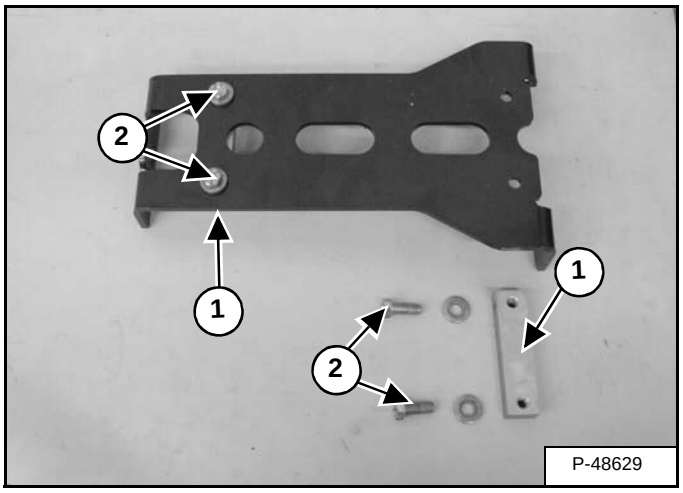
Figure 50-100-16



The centering plate / centering spring assembly consists of the following parts:

ITEM	DESCRIPTION
1	Bolt
2	Bushings
3	Washer
4	Bushing Spacer
5	Spring
6	Lock Nut
7	Centering Plate
8	Guide Bushings

Figure 50-100-17



Check the wear on the centering blocks (Item 1) **[Figure 50-100-17]**.

If the centering blocks need replacement, remove the bolts (Item 2) **[Figure 50-100-17]**. Remove the centering blocks.

Installation: Tighten the centering block bolts to 47,5 - 54,2 N•m (35 - 40 ft-lb) torque.

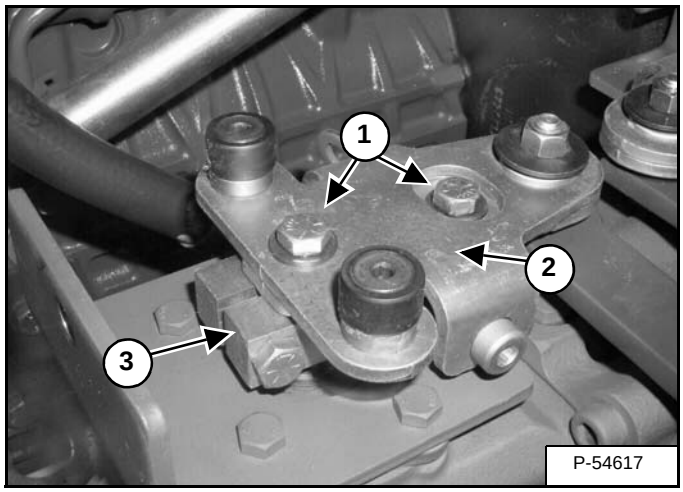
NOTE: The washers go between the bolts and the centering plate.

NOTE: If the centering blocks are worn, they can be removed and rotated 180 degrees and reinstalled.

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Linkage Removal And Installation (Cont'd)

Figure 50-100-18

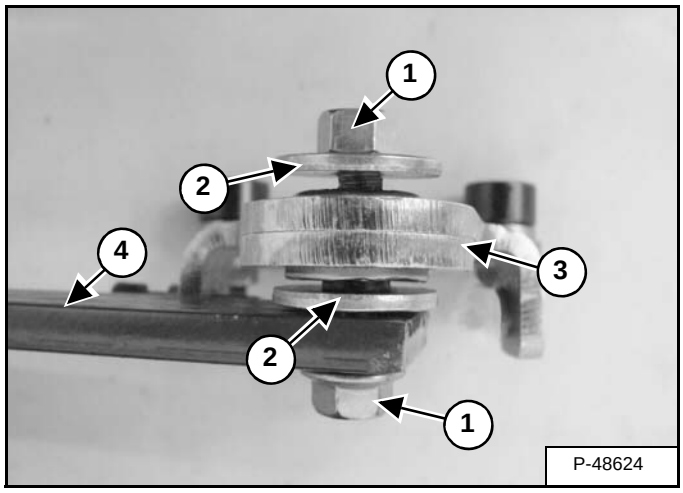


Remove the bolts and washers (Item 1) **[Figure 50-100-18]** from the pintle.

Installation: Tighten the bolts to 47,5 - 54,2 N•m (35 - 40 ft-lb) torque.

Remove the pintle arm (Item 2) from the pintle base (Item 3) **[Figure 50-100-18]**.

Figure 50-100-19

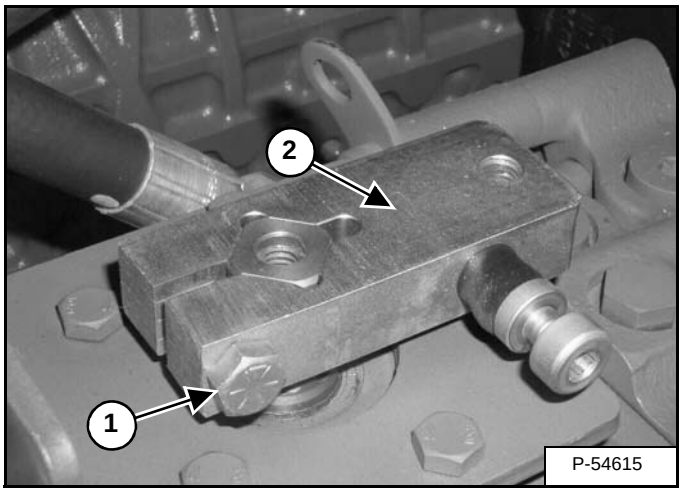


Remove the bolt and nut (Item 1) **[Figure 50-100-19]**.

Inspect the washers (Item 2), pintle arm (Item 3) and the steering control lever (Item 4) for damage and replace as needed **[Figure 50-100-19]**.

NOTE: The washers (Item 2) [Figure 50-100-19] are hardened, and should only be replaced through Bobcat Parts.

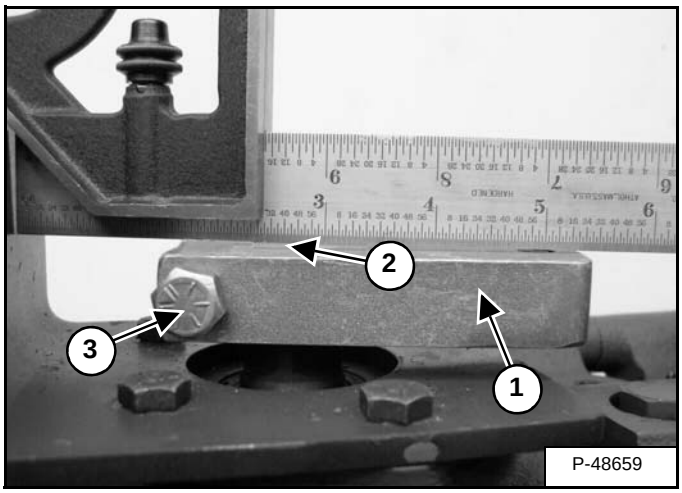
Figure 50-100-20



Loosen the bolt (Item 1) **[Figure 50-100-20]**.

Remove the pintle base (Item 2) **[Figure 50-100-20]**.

Figure 50-100-21



NOTE: When installing the pintle base (Item 1) onto the pump shaft, the cutouts on the pump shaft will not line up with the bolt (Item 3) [Figure 50-100-21].

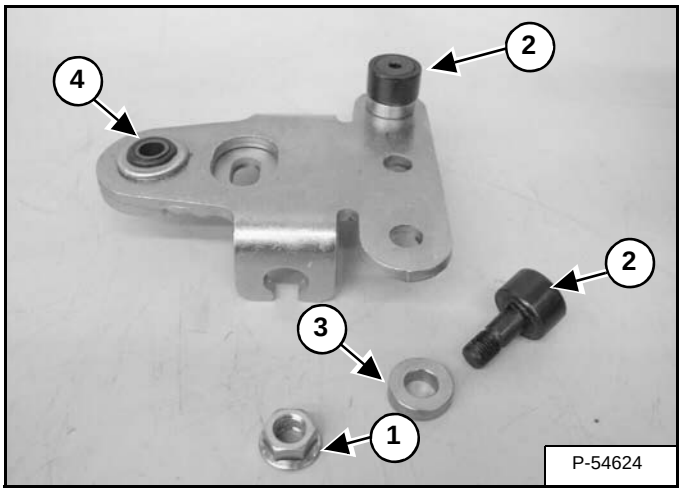
Installation: Install the pintle base (Item 1) onto the pump shaft (Item 2) **[Figure 50-100-21]**. The top of the pintle base should be level with the top of the pump shaft. Tighten the bolts to 47,5 - 54,2 N•m (35 - 40 ft-lb) torque.

NOTE: After installing the linkage onto the hydrostatic pumps the linkage neutral adjusting procedure must be performed. (See Linkage Neutral (Adjusting) on Page 50-100-10.)

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Pintle Arm Disassembly And Assembly

Figure 50-100-22

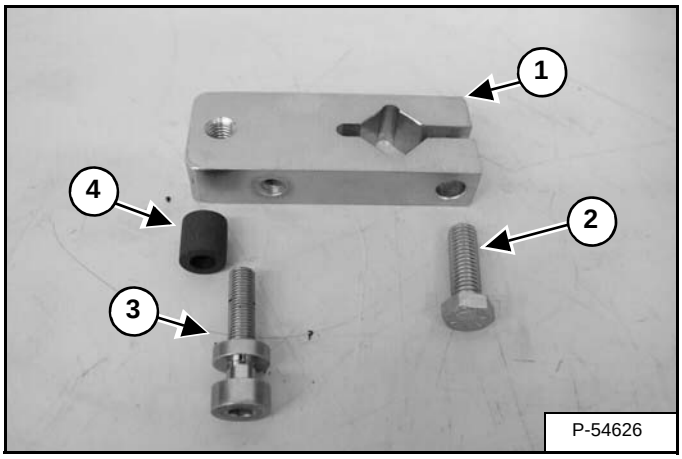


Remove the nut (Item 1) from the pintle roller cams (Item 2) and inspect the pintle roller cams and washers (Item 3) for damage **[Figure 50-100-22]**.

Inspect the torsion bushing (Item 4) **[Figure 50-100-22]** for damage and replace as needed.

Installation: Tighten the nuts to 47,5 - 54,2 N•m (35 - 40 ft-lb) torque.

Figure 50-100-23



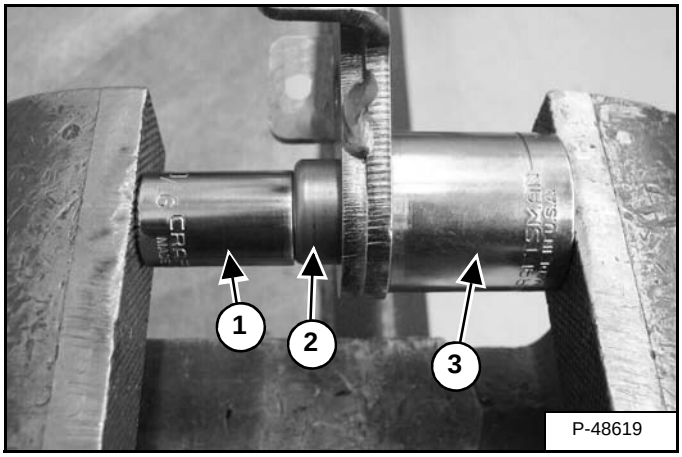
Remove the base pintle (Item 1) **[Figure 50-100-23]** from the pump shaft.

Remove the retaining bolt (Item 2), adjusting screw (Item 3) and neoprene dampener (Item 4) from the base pintle **[Figure 50-100-23]**.

Inspect parts for wear and damage, replace as needed **[Figure 50-100-23]**.

NOTE: Anti-seize should be used on the adjusting screw to prevent corrosion and allow free movement while adjusting.

Figure 50-100-24



Using a bushing driver (Item 1) remove the torsion bushing (Item 2) by pressing the bushing through the pintle arm into an oversized socket (Item 3) to catch the torsion bushing **[Figure 50-100-24]**.

Installation: Install the torsion bushing (Item 2) **[Figure 50-100-24]** 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.

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Linkage Neutral (Adjusting)

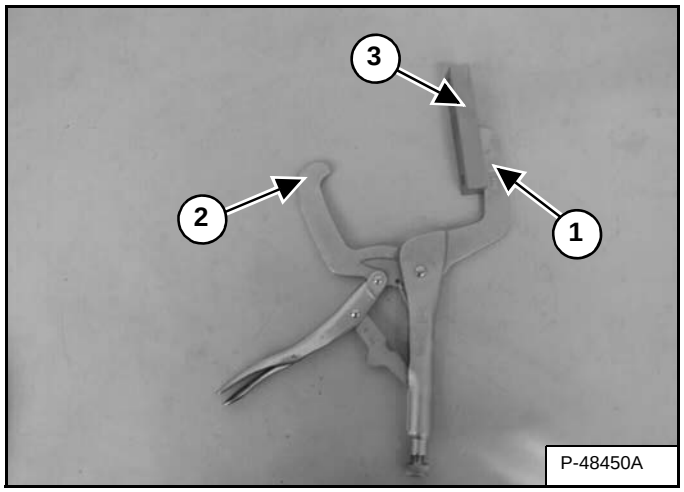
The following tool listed will be needed to do the following procedure:

Kit - 6689778 Remote Start Tool (Service Tool) or MEL1563 Remote Start Tool.

Connect the Remote Start Tool (Service Tool) to the loader. (See REMOTE START TOOL KIT-MEL1563 on Page 10-60-1.) OR (See REMOTE START TOOL (SERVICE TOOL) KIT - 7003031 on Page 10-61-1.)

Lift and block the loader. (See Procedure on Page 10-10-1.)

Figure 50-100-25



Tool that may assist in the neutral adjustment **[Figure 50-100-25]**.

To make this tool use a locking grip C-Clamp and grind one edge flat (Item 1) and grind the other edge (Item 2) **[Figure 50-100-25]** to a small rounded edge.

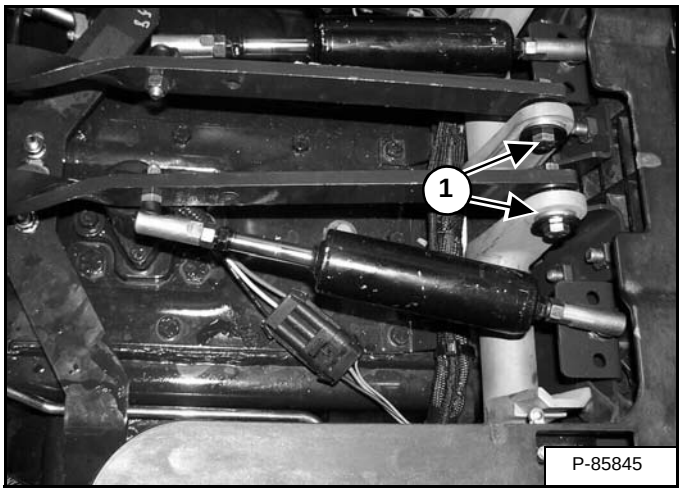
A steering centering block (Item 3) **[Figure 50-100-25]** is also needed. The centering block can be placed as shown and welded to the C-clamp if desired.

⚠ WARNING

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

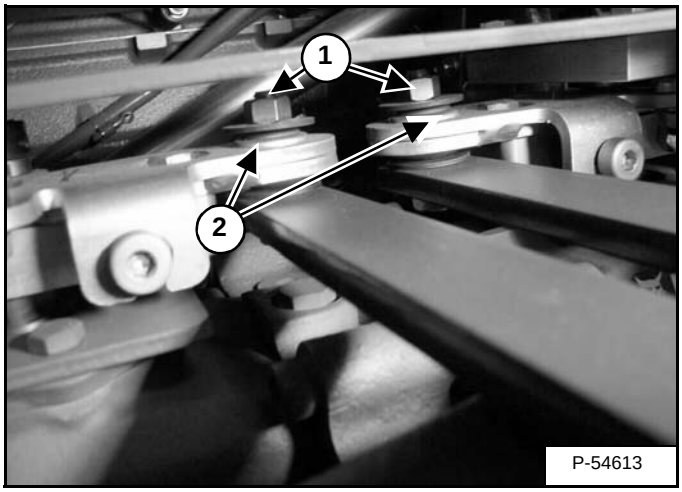
W-2017-0286

Figure 50-100-26



Loosen the bolt / nut (Item 1) **[Figure 50-100-26]** only until the tension is released from the torsion bushing.

Figure 50-100-27



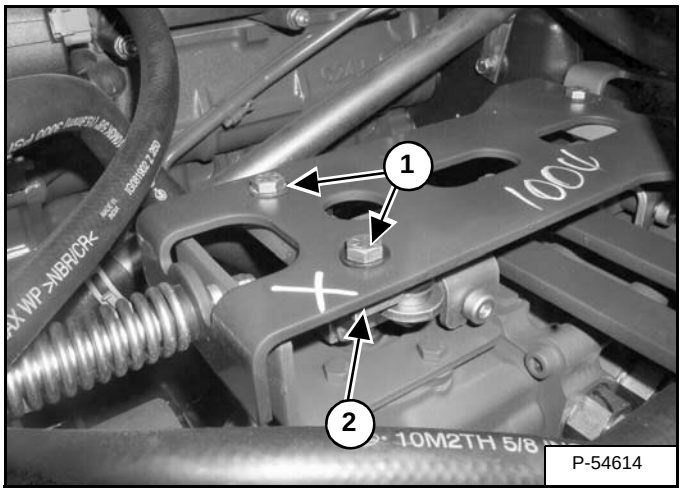
Loosen the nut (Item 1) only until the tension is released from the torsion bushing (Item 2) **[Figure 50-100-27]**.

NOTE: The bolt must be loose enough to allow the torsion bushing (Item 2) [Figure 50-100-27] to turn freely between the torsion bushing and the steering linkage bar.

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Linkage Neutral (Adjusting) (Cont'd)

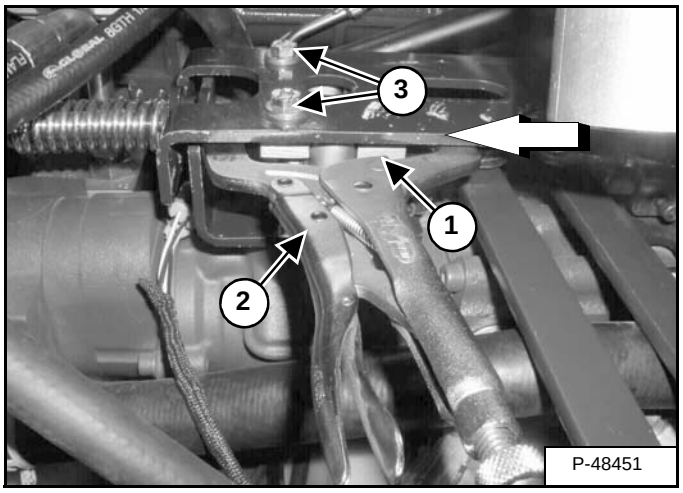
Figure 50-100-28



Loosen the two bolts (Item 1) holding the right centering block. Move the right hand centering block (Item 2) **[Figure 50-100-28]** until both pintle cams contact the centering block.

NOTE: The left centering block is not adjustable. By adjusting the right centering block the left centering block will also become aligned properly.

Figure 50-100-29



A modified locking grip C-Clamp and steering block shown in **[Figure 50-100-25]** may be used to help in aligning the centering blocks.

Install the centering block (Item 1) on the inside of the pintle cams and the C-Clamp (Item 2) **[Figure 50-100-29]** around both centering blocks.

Lock the C-Clamp in place.

⚠ 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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Connect the Remote Start Tool (Service Tool) to the loader. (See REMOTE START TOOL KIT-MEL1563 on Page 10-60-1.) OR (See REMOTE START TOOL (SERVICE TOOL) KIT - 7003031 on Page 10-61-1.)

Start the engine and run at low idle.

Move the traction lock override switch so the traction function is unlocked. 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.

Tighten bolts (Item 3) **[Figure 50-100-29]** to 47,5 - 54,2 N•m (35 - 40 ft-lb).

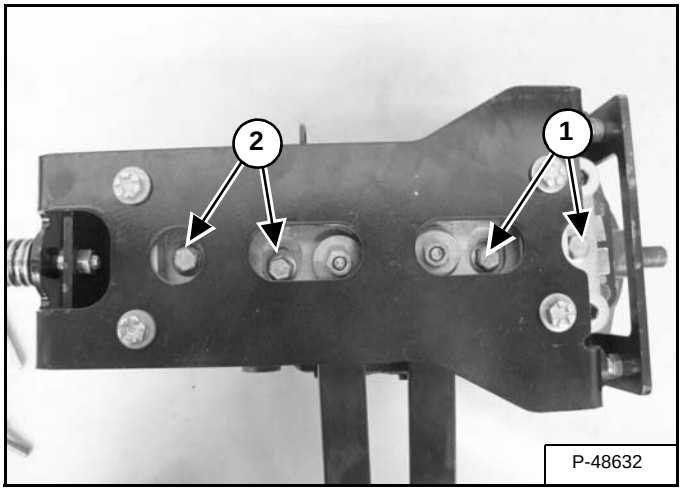
NOTE: Check for slack between centering blocks and pintle cams. If there is excessive slack repeat above steps [Figure 50-100-28] & [Figure 50-100-29].

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Linkage Neutral (Adjusting) (Cont'd)

Start the neutral adjustment procedure with the left pump first and complete the neutral adjustment for the left pump before adjusting the right pump.

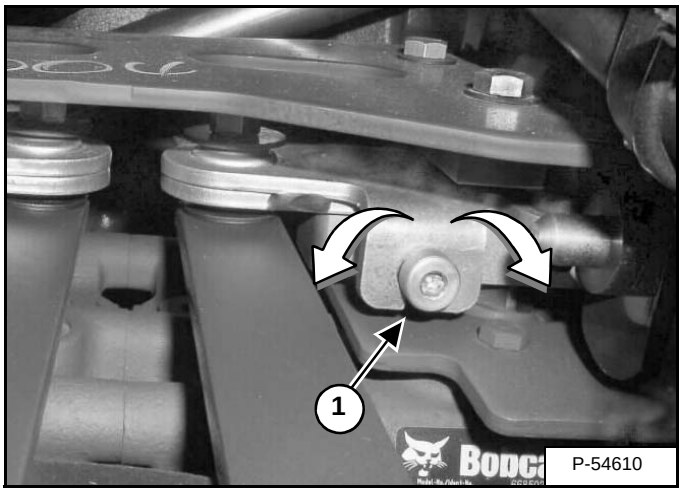
Figure 50-100-30



Loosen the left pump pintle adjustment lock bolts (Item 1). (The right pump pintle adjustment lock bolts are (Item 2) **[Figure 50-100-30]**.) Loosen the bolts enough to allow free movement between the pintle arm and the pintle base.

NOTE: If the bolts are too loose or too tight, the neutral adjustment may be affected.

Figure 50-100-31



Move the engine speed control to high idle.

NOTE: The neutral range (dead-band) will vary between the hydrostatic pumps.

NOTE: This procedure is shown for neutral adjustment on the left side of the loader. The procedure is the same for the right side neutral adjustment.

Turn the adjustment screw (Item 1) **[Figure 50-100-31]** counterclockwise until forward creep is seen.

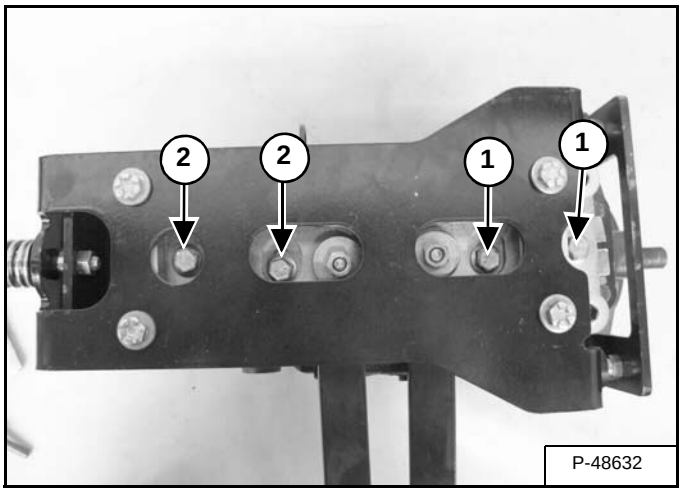
Turn the adjustment screw (Item 1) **[Figure 50-100-31]** to a point between forward and reverse where there is zero creep.

Stroke the left steering lever to forward and allow the lever to return to neutral. Stroke the left steering lever to reverse and allow the lever to return to neutral. Check that there is zero creep when the lever returns from either direction, on the left side. Turn the adjustment screw (if necessary) until zero creep is obtained.

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Linkage Neutral (Adjusting) (Cont'd)

Figure 50-100-32



Torque the left pump pintle adjustment lock bolts (Item 1) **[Figure 50-100-32]** to 47,5 - 54,2 N•m (35 - 40 ft-lb).

Repeat the adjustment procedure for the right pump.

Torque the right pump pintle adjustment lock bolts (Item 2) **[Figure 50-100-32]** to 47,5 - 54,2 N•m (35 - 40 ft-lb).

Test both levers by moving them backward and forward and letting them return to neutral by the return spring force.

If the levers do not return to neutral and the wheels / tracks do not come to a complete stop, repeat the adjustment procedure again.

Stop the engine.

Remove one pintle adjustment bolt (Item 1) **[Figure 50-100-32]** at a time and apply Loctite® #242 or equivalent thread locker to the bolt and re-install the bolt. Torque the bolt to 47,5 - 54,2 N•m (35 - 40 ft-lb). Repeat for the three remaining pintle adjustment lock bolts.

NOTE: To maintain proper adjustment setting, remove and reinstall only one bolt at a time. New bolts can be installed with pre-applied Loctite®.

Remove the Remote Start Tool (Service Tool).

NOTE: After the neutral adjustment is completed on both pumps, the linkage travel adjustment MUST be completed. (See Linkage Travel (Adjusting) on Page 50-100-14.)

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Linkage Travel (Adjusting)

NOTE: When the linkage travel adjusting procedure is being done as part of the loader neutral adjusting procedure, check the torsion bushings at the pump and at the bell cranks to be sure they are not binding or too loose, which will affect the procedure.

⚠ WARNING

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

W-2059-0598

⚠ 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

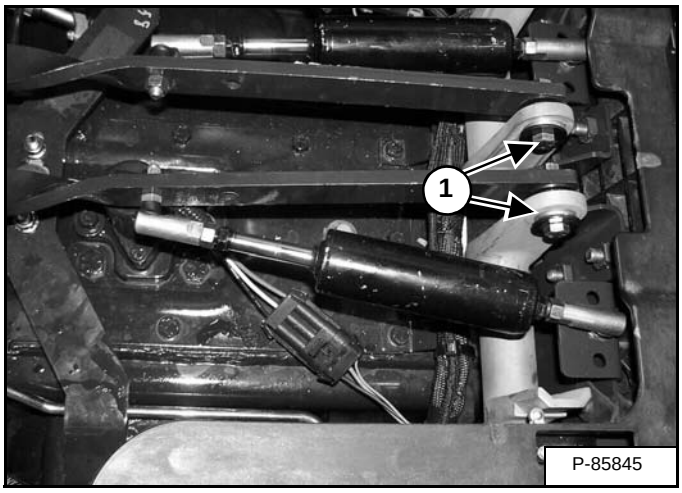
Lift and block the loader. (See Procedure on Page 10-10-1.)

Raise the lift arms and install an approved lift arm support device. (See Installing on Page 10-20-1.)

Raise the operator cab. (See Raising on Page 10-30-2.)

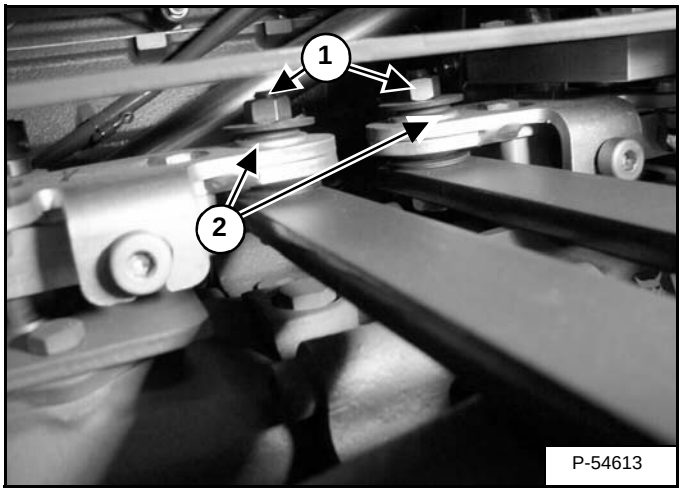
Pre-load tension in the torsion bushings must be removed before adjusting the steering linkage.

Figure 50-100-33



Loosen the bolt / nut (Item 1) **[Figure 50-100-33]** only until the tension is released from the torsion bushing.

Figure 50-100-34



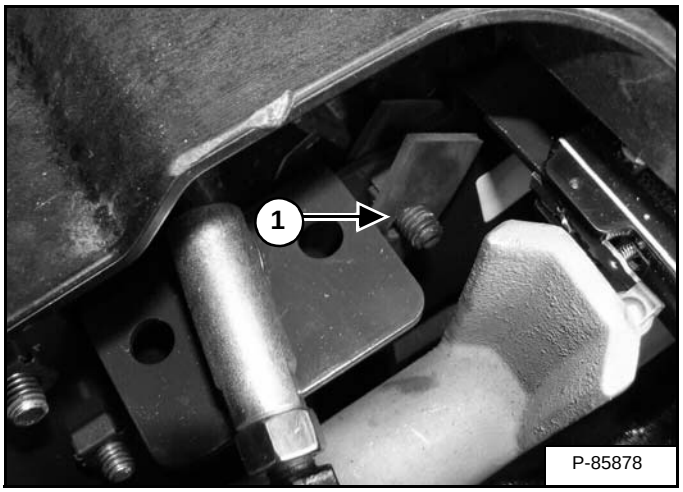
Loosen the nuts (Item 1) only until the tension is released from the torsion bushings (Item 2) **[Figure 50-100-34]**.

The bolts must be loose enough to allow the torsion bushing (Item 2) **[Figure 50-100-34]** to turn freely between the torsion bushing and the linkage bar.

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Linkage Travel (Adjusting) (Cont'd)

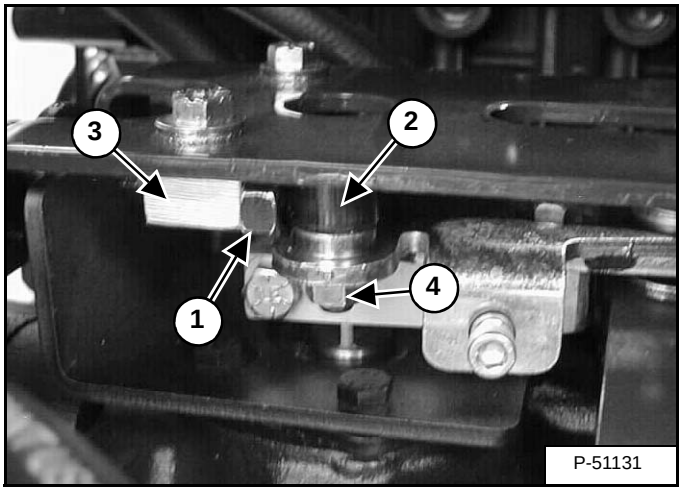
Figure 50-100-35



Locate the control lever drift adjustment access hole in the front of the control panel.

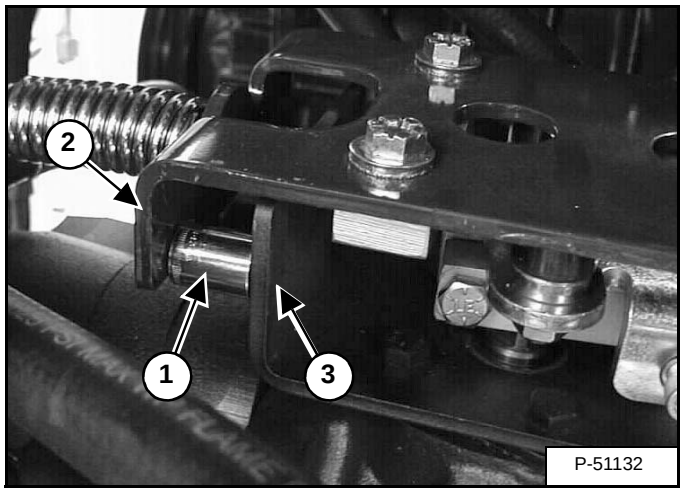
Turn the control lever drift adjustment bolts (Item 1) **[Figure 50-100-35]** (one on each control lever) out until they no longer contact the bellcrank.

Figure 50-100-36



Move the right side steering lever to the rear and install a 10 mm (3/8 in) thick spacer (Item 1) between the pintle arm cam (Item 2) and the centering block (Item 3) **[Figure 50-100-36]**.

Figure 50-100-37

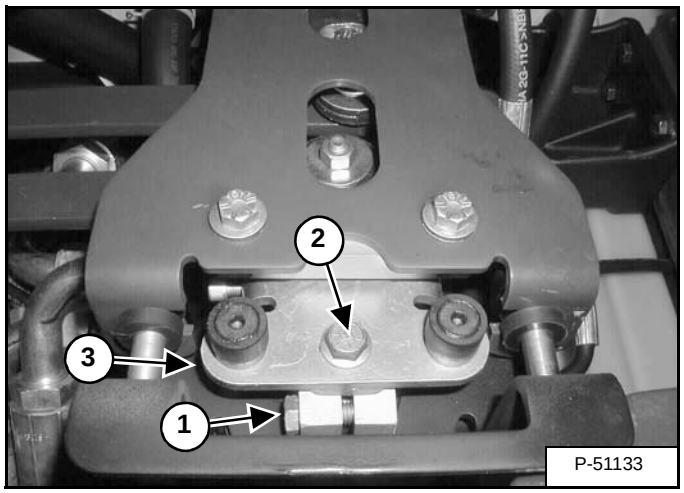


Move the right side steering lever forward and install a 24 mm (15/16 in) thick spacer (Item 1) between the center plate (Item 2) and the mounting plate (Item 3) **[Figure 50-100-37]**.

This will allow the pintle arms to move freely while adjusting the steering linkage for full forward travel speed.

Remove the 10 mm (3/8 in) thick spacer.

Figure 50-100-38



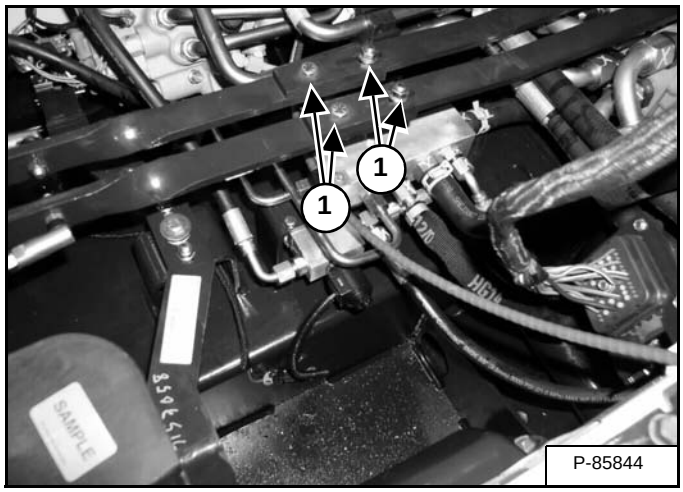
Before adjusting the linkage, verify the base pintle arm mounting bolt (Item 1) and both of the upper pintle mount bolts (Item 2) are tightened to 48 - 54 N•m (35 - 40 ft-lb) torque. There should be no play between the pintle arm and the square pump shaft **[Figure 50-100-38]**.

Verify the cam mounting nuts (Item 4) **[Figure 50-100-36]** are tightened to 48 - 54 N•m (35 - 40 ft lb) torque.

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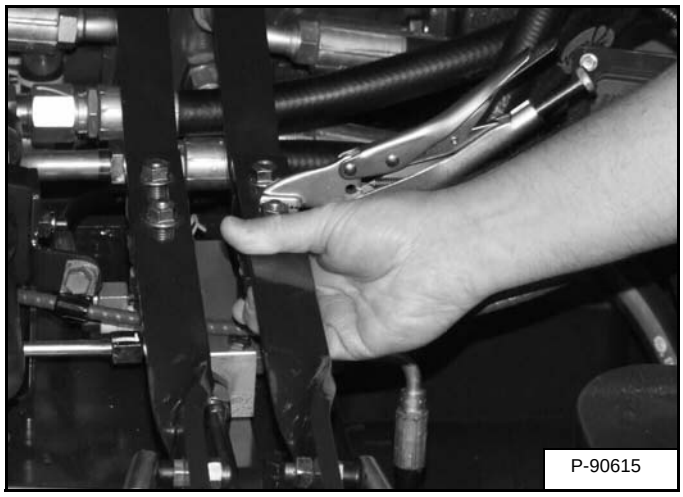
Linkage Travel (Adjusting) (Cont'd)

Figure 50-100-39



Loosen the two bolts and nuts (Item 1) **[Figure 50-100-39]** on each steering linkage bar.

Figure 50-100-40



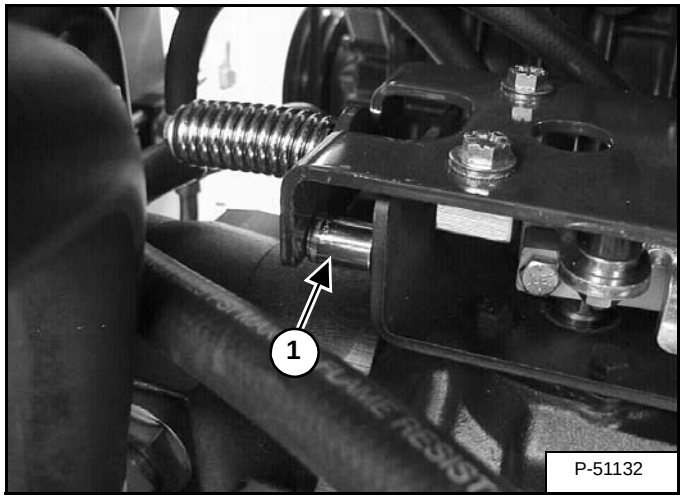
Move the left control lever to the full forward position, then pull forward on the left rear linkage bar until the pintle arm is rotated to the front as far as possible **[Figure 50-100-40]**. Use a locking plier, clamp the two linkage bars together.

Installation: Tighten the nuts and bolts to 47,5 - 54,2 N•m (35 - 40 ft-lb) torque.

Check the lever movement to make sure that the pintle arm and the control lever are both at full stroke at the same time. This will allow for maximum forward speed.

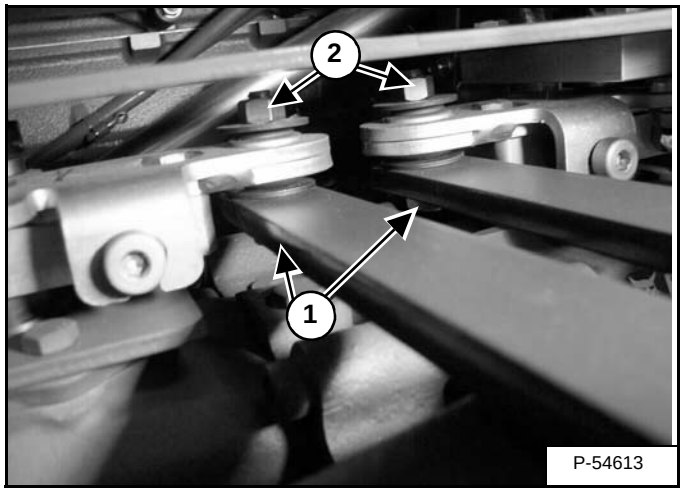
Repeat the linkage travel adjustment procedure for the right side linkage.

Figure 50-100-41



Remove the spacer (Item 1) **[Figure 50-100-41]**.

Figure 50-100-42



Tighten the two bolts (Item 1) and nuts (Item 2) to 47,5 - 54,2 N•m (35 - 40 ft-lb) **[Figure 50-100-42]**.

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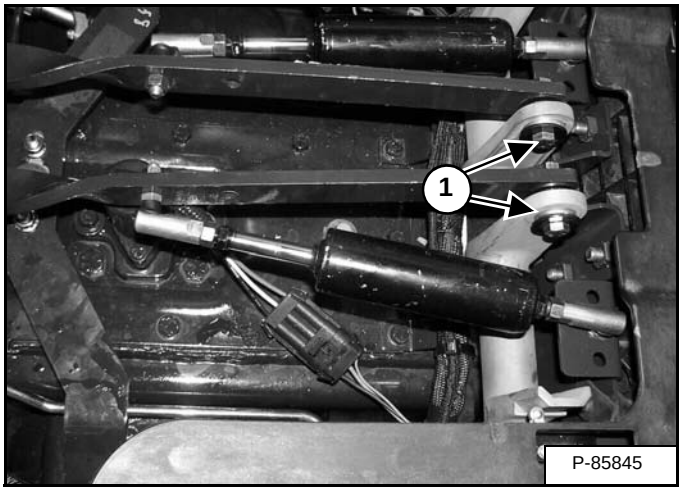
Linkage Travel (Adjusting) (Cont'd)

⚠ WARNING

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

W-2017-0286

Figure 50-100-43



Tighten the two bolts and nuts (Items 1) **[Figure 50-100-43]** to 47,5 - 54,2 N•m (35 - 40 ft-lb) torque at the steering bell cranks.

Installation: After removal, installation, and adjusting of the linkage, the Back-up Alarm must be inspected. (See Inspecting on Page 60-210-1.)

Figure 50-100-44

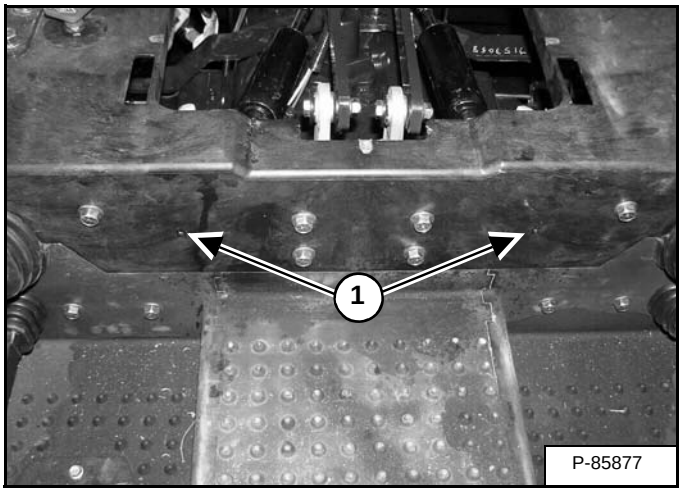
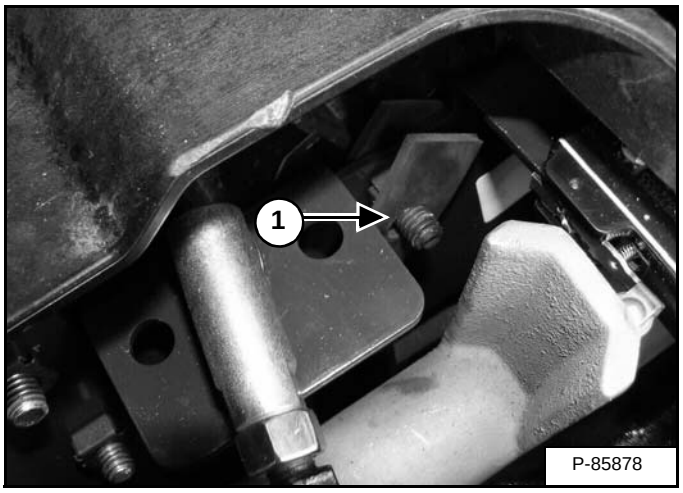


Figure 50-100-45



Push the control lever to full stroke and turn drift adjustment bolt (Item 1) **[Figure 50-100-44]** and **[Figure 50-100-45]** in until it contacts the bellcrank.

Repeat steps on the other control lever.

Drive the loader forward and check for drift.

The traditional benchmark for drift is less than 3 m (10 ft) of “drift” in 30,5 m (100 ft) of travel distance.

If the drift is excessive to the left, turn the right adjustment bolt (Item 1) **[Figure 50-100-44]** and **[Figure 50-100-45]** in.

If the drift is excessive to the right, turn the left adjustment bolt in.

NOTE: When using the drift adjustment bolts, only adjust one bolt for each test drive.

In addition, only move each bolt a maximum of one turn for each test drive. This will help prevent over-correction and excessive reduction in travel speed.

Drift adjustment is for forward travel only.

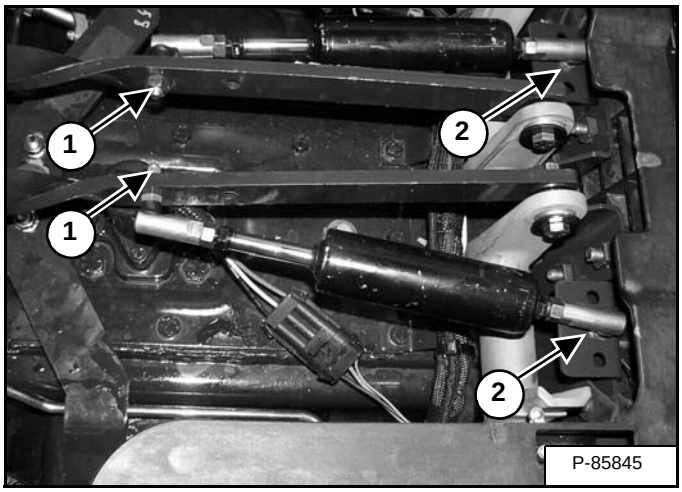
Adjust the drift to an acceptable level.

Reinstall the plug in the drift bolt access hole after adjustment.

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Shock Removal And Installation

Figure 50-100-46



Remove the mounting nuts (Item 1) **[Figure 50-100-46]** from the end of the shocks connected to the steering linkages.

Remove the mounting nuts (Item 2) **[Figure 50-100-46]** from the other end of the shocks connected to the brackets on the control panel.

Installation: Tighten the nuts to torque.

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CONTROL PANEL (SJC)

Description

The control panel is connected to the lower main frame and wraps around the operator seat. There are no mechanical linkages connecting to the hydrostatic pumps or the control valve.

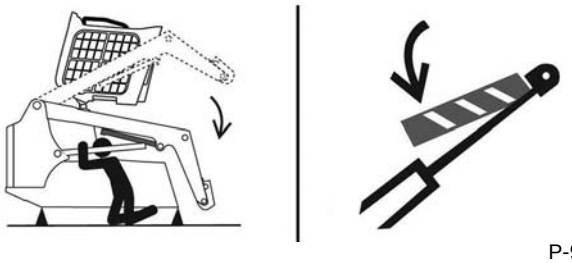
Removal And Installation

⚠ 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

⚠ DANGER



P-90328

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.**

D-1009-0409

⚠ WARNING

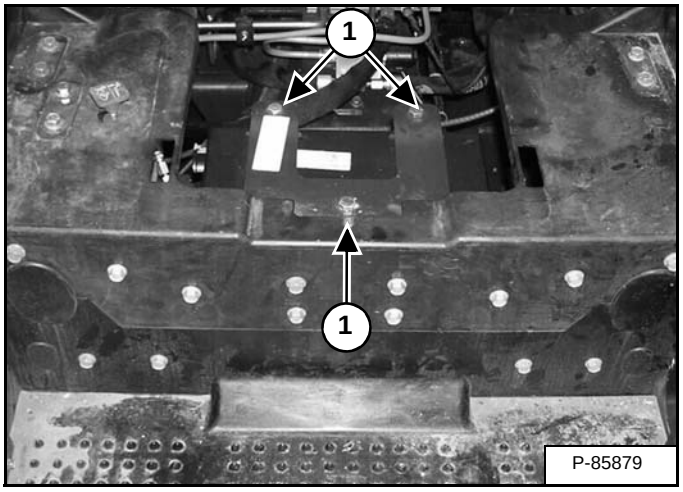
Never work on a machine with the lift arms up unless the lift arms are secured by an approved lift arm support device. Failure to use an approved lift arm support device can allow the lift arms or attachment to fall and cause injury or death.

W-2059-0598

Raise the lift arms and install an approved lift arm support device. (See Installing on Page 10-20-1.)

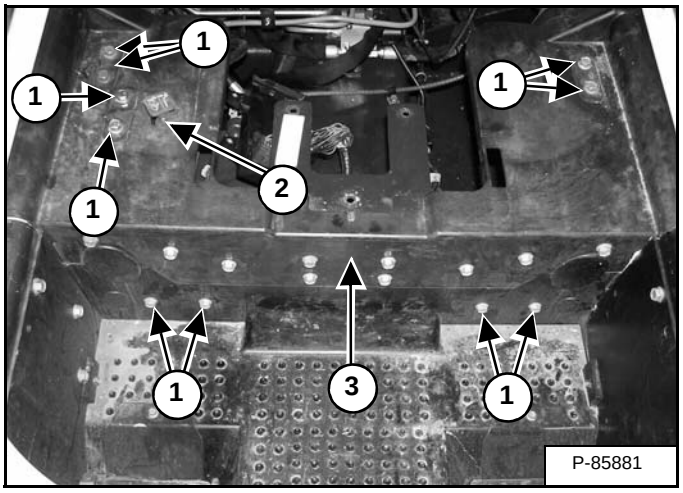
Raise the operator cab. (See Raising on Page 10-30-2.)

Figure 50-101-1



Remove the three mount bolts (Item 1) **[Figure 50-101-1]** that secure the controller.

Figure 50-101-2



Remove the 10 panel mount bolts (Item 1) **[Figure 50-101-2]**.

Remove the lift arm bypass knob and rubber washer (Item 2) **[Figure 50-101-2]**.

Remove the control panel (Item 3) **[Figure 50-101-2]**.

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CONTROL HANDLE / LEVER

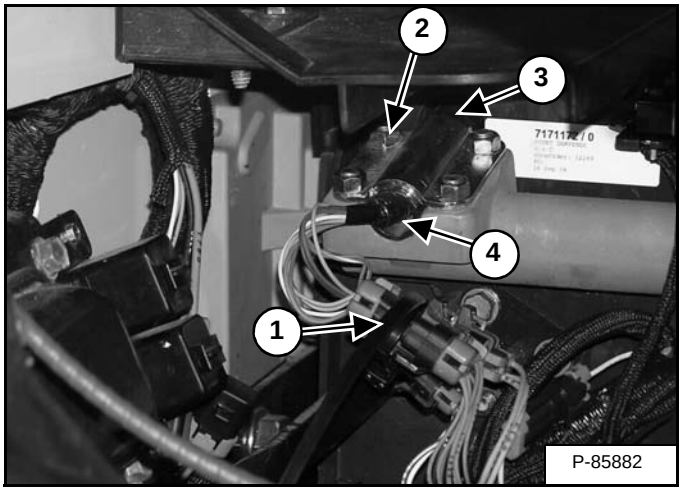
Description

The control handles / levers are used to control the forward and reverse travel.

The control handles / levers are mounted to the control panel assembly.

Lever Removal And Installation

Figure 50-110-1



Remove the tie strap and disconnect the electrical connectors (Item 1) **[Figure 50-110-1]** from the control lever.

Remove the four nuts (Item 2) and the plate (Item 3) **[Figure 50-110-1]** used to mount the control lever.

Remove the control lever (Item 4) **[Figure 50-110-1]** by sliding the lever through the control panel.

Installation: Tighten the four nuts to the plate so the lever cannot be moved either right or left when seated in the operator's seat.

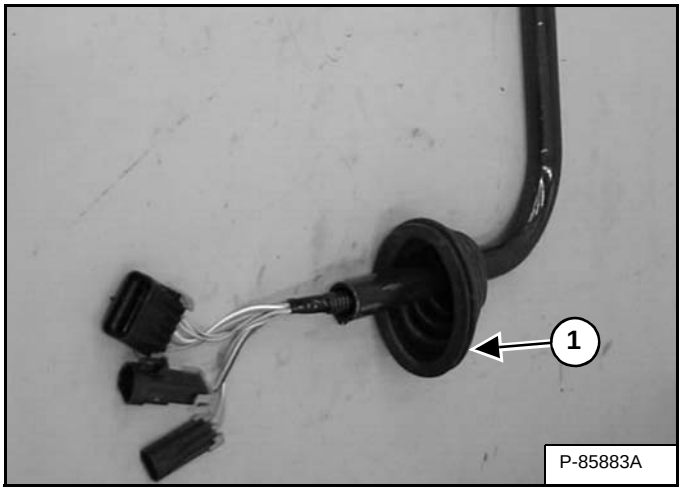
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CONTROL HANDLE/LEVER (CONT'D)

Boot Removal And Installation

Remove the control handle / lever. (See Lever Removal And Installation on Page 50-110-1.)

Figure 50-110-2



Remove the rubber boot (Item 1) **[Figure 50-110-2]**.

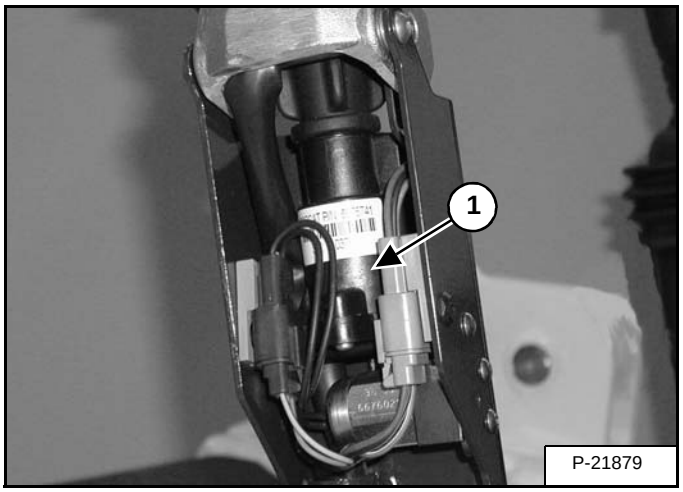
Install the new boot and reinstall the steering lever.

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CONTROL HANDLE / LEVER (ACS)

Description

Figure 50-111-1

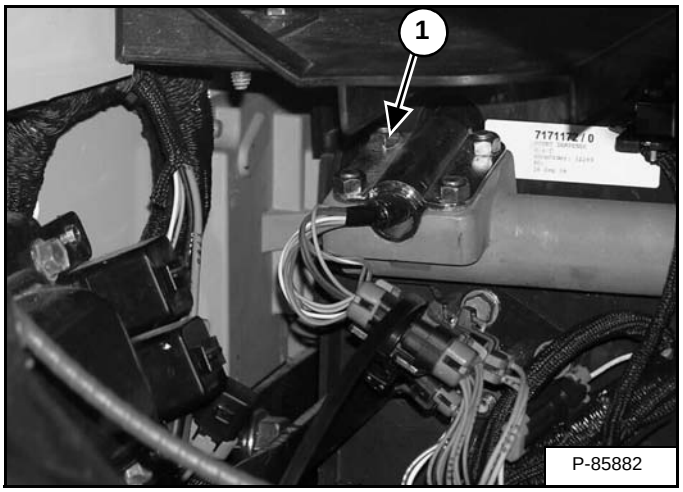


The control handles / levers are used to control the forward and reverse travel and the lift and tilt functions.The lift and tilt functions can be controlled by handle sensors (Item 1) **[Figure 50-111-1]** that are located in the base of the control handle / levers.

The control handles / levers are mounted to the control panel.

Handle Sensor Removal And Installation

Figure 50-111-2



NOTE: The calibration procedure must be followed when replacing handle sensor, foot pedal sensor, actuator or ACS Controller. (See Lift And Tilt Calibration (ACS) on Page 60-160-11.)

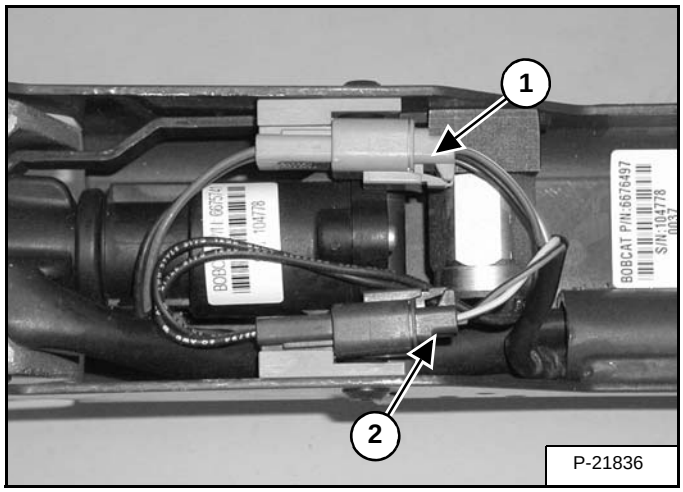
Loosen the nuts (Item 1) **[Figure 50-111-2]**.

Installation: Tighten the nuts so the lever cannot be moved either right or left when seated in the operator seat.

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Handle Sensor Removal And Installation (Cont'd)

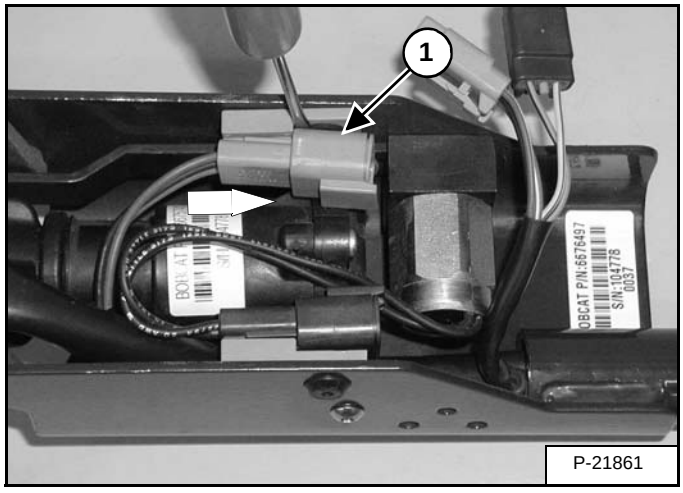
Figure 50-111-3



Disconnect the harness connector (Item 1) from the handle sensor connector.**[Figure 50-111-3]**.

Disconnect the harness connector (Item 2) **[Figure 50-111-3]** from the handle lock solenoid connector.

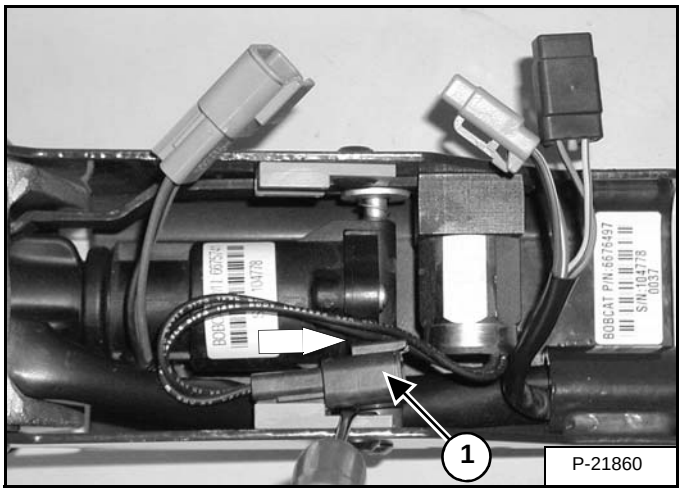
Figure 50-111-4



Remove the handle sensor connector (Item 1) **[Figure 50-111-4]** from the clip.

NOTE: Pry out with a small screwdriver and push the connector down.

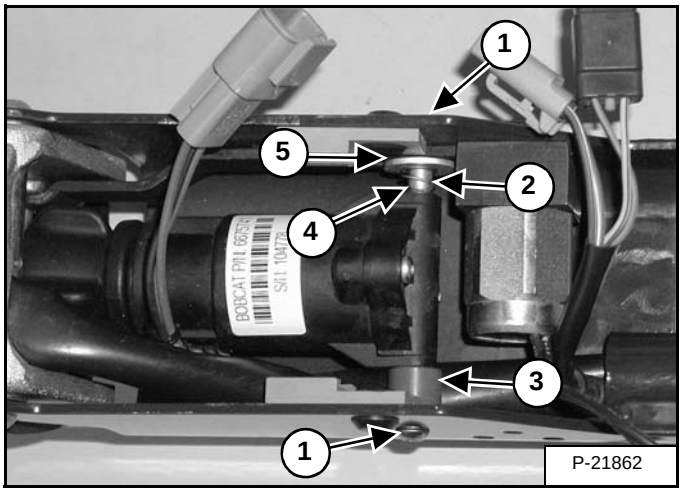
Figure 50-111-5



Remove the handle lock solenoid connector (Item 1) **[Figure 50-111-5]** from the clip.

NOTE: Pry out with a small screwdriver and push the connector down.

Figure 50-111-6



Remove one of the two mounting screws (Item 1) **[Figure 50-111-6]** from the handle sensor.

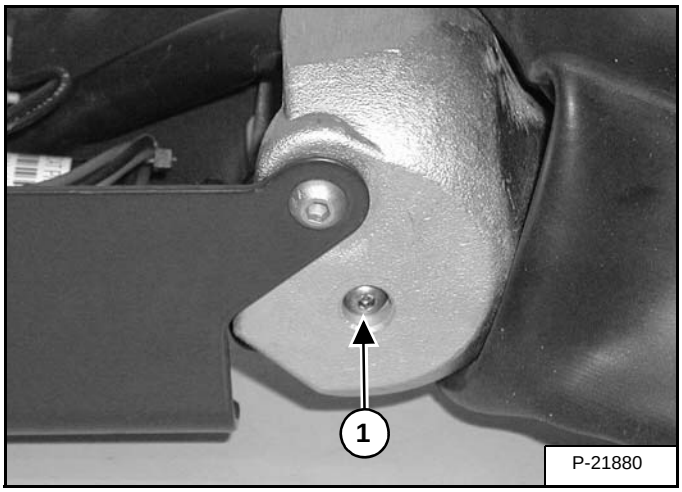
Installation: Tighten screws to 3,6 - 4,3 N•m (32 - 38 in-lb) torque.

While removing the mounting pin (Item 2) from the handle sensor, remove the plastic spacer (Item 3), the spring (Item 4) and washer (Item 5) **[Figure 50-111-6]**.

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Handle Sensor Removal And Installation (Cont'd)

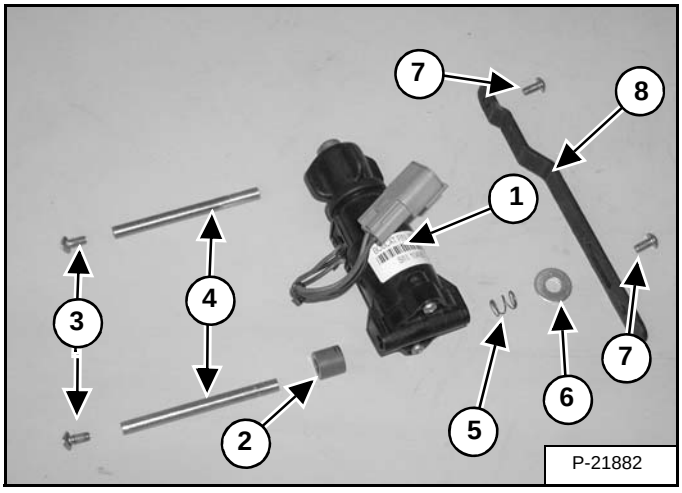
Figure 50-111-7



Remove one of the two mounting screws (Item 1) **[Figure 50-111-7]** from the handle sensor.

Installation: Tighten bolt to 3,6 - 4,3 N•m (32 - 38 in-lb) torque.

Figure 50-111-8



Remove the handle sensor (Item 1) **[Figure 50-111-8]** from the handle assembly.

NOTE: The handle sensor (Item 1) [Figure 50-111-8] can only be replaced as a complete assembly.

Check the spacer (Item 2), screws (Item 3), mounting pins (Item 4), spring (Item 5), washer (Item 6), bolt / nut (Item 7), and stop strap (Item 8) **[Figure 50-111-8]** and replace as needed.

Figure 50-111-9

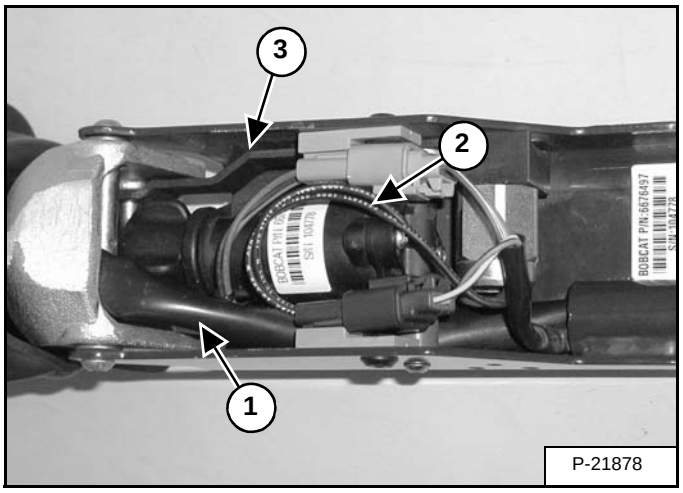
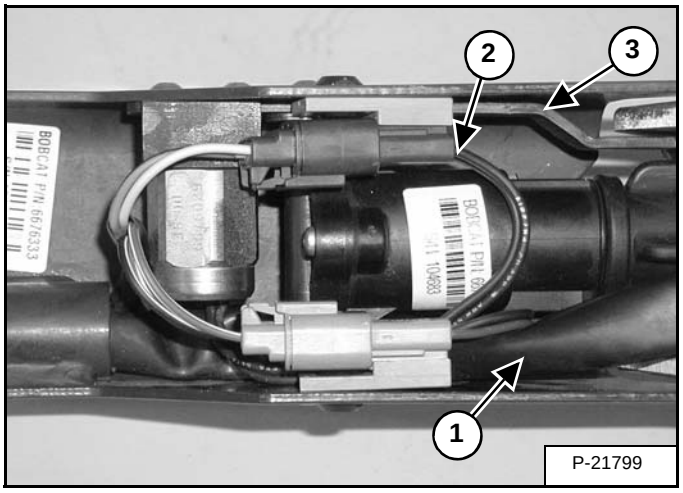


Figure 50-111-10



Installation: When installing the handle sensor into the control handle, check the routing of the switch handle wire harness (Item 1) **[Figure 50-111-9]** and **[Figure 50-111-10]** to assure proper return of the control handle to neutral and minimize harness movement.

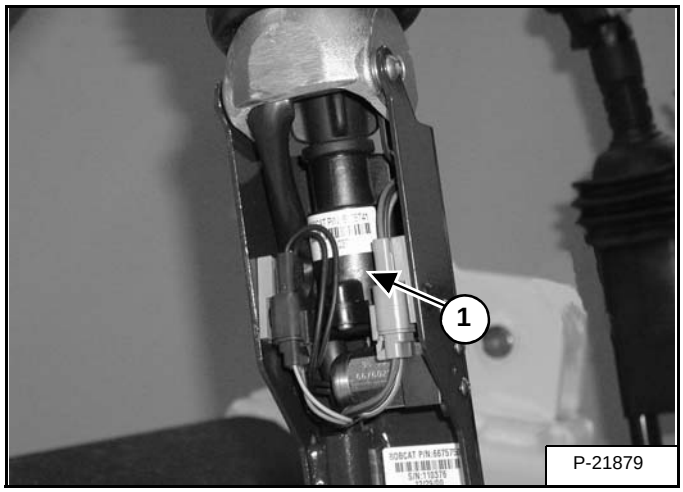
NOTE: Route wires (Item 2) [Figure 50-111-9] and [Figure 50-111-10] as shown away from stop strap (Item 3) [Figure 50-111-9] and [Figure 50-111-10] to avoid wire damage.

NOTE: The calibration procedure must be followed when replacing handle sensor, foot pedal sensor, actuator or ACS Controller. (See Lift And Tilt Calibration (ACS) on Page 60-160-11.)

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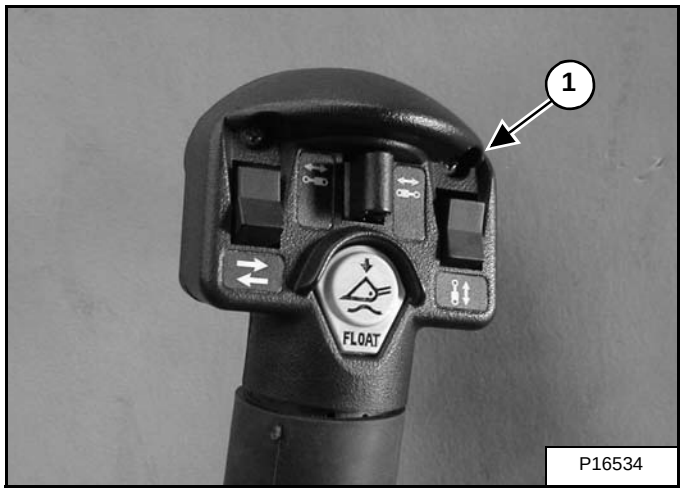
Handle Removal And Installation

Figure 50-111-11



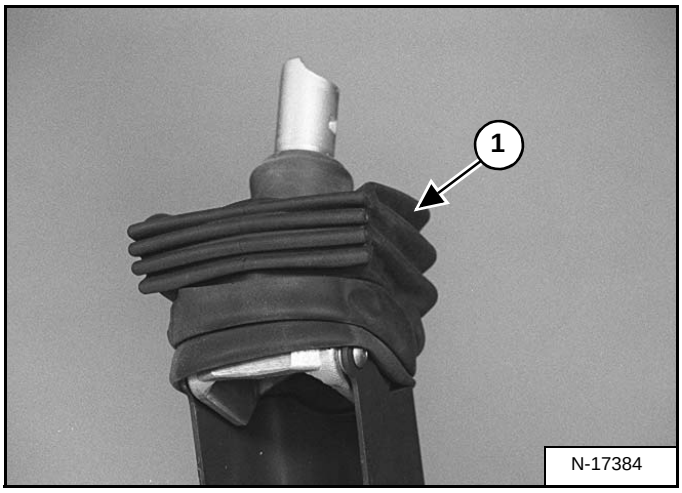
Remove the handle sensor (Item 1) **[Figure 50-111-11]**. (See Handle Sensor Removal And Installation on Page 50-111-1.)

Figure 50-111-12



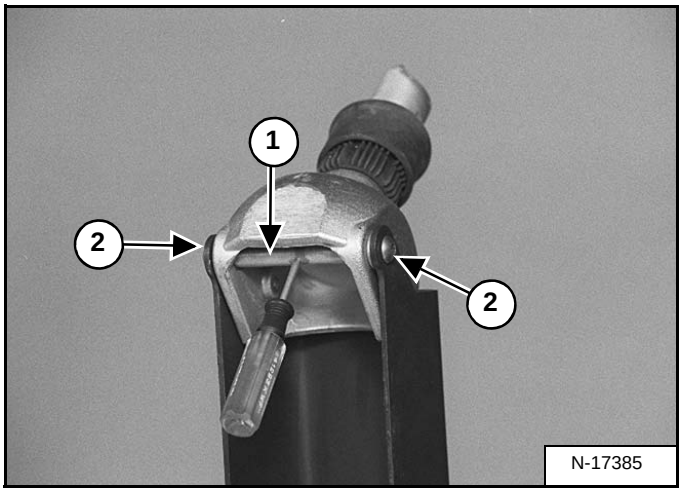
Remove the switch handle (Item 1) **[Figure 50-111-12]**. (See Switch Handle Removal on Page 60-130-4.)

Figure 50-111-13



Remove the rubber handle cover (Item 1) **[Figure 50-111-13]** from the handle.

Figure 50-111-14



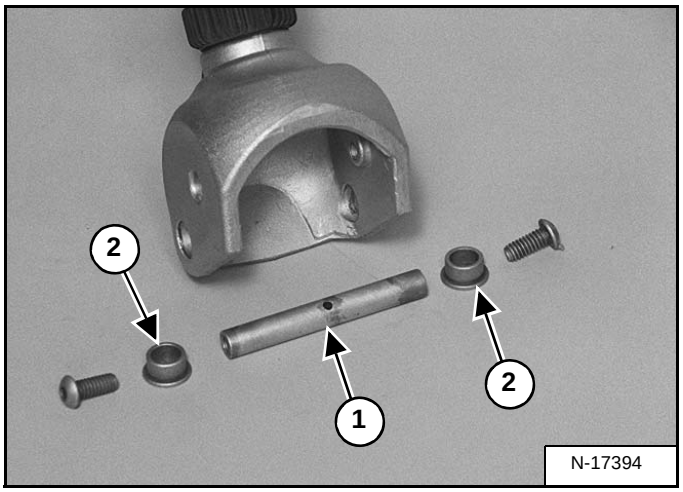
Using a small screwdriver, hold the handle spacer (Item 1) and remove the allen head screws (Item 2) **[Figure 50-111-14]** from the handle assembly.

Installation: Tighten the allen head screws to 4 N•m (35 in-lb) torque.

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Handle Disassembly And Assembly

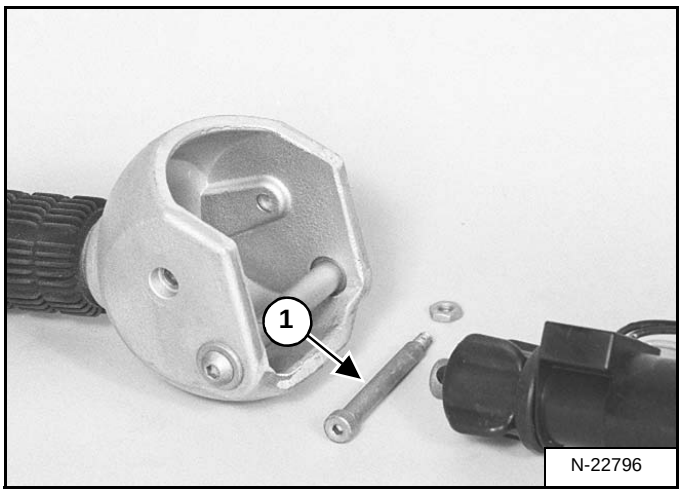
Figure 50-111-15



Remove the handle sleeve (Item 1) and bushings (Item 2) **[Figure 50-111-15]** from the handle.

Check all parts for wear and replace as needed.

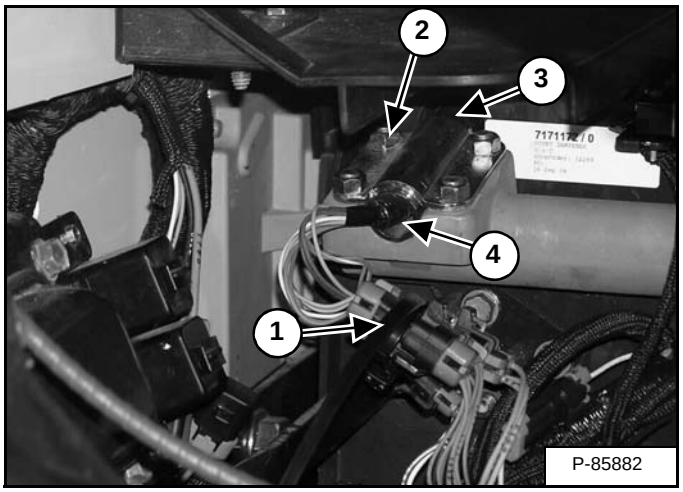
Figure 50-111-16



Check the mounting bolt (Item 1) **[Figure 50-111-16]** that connects the handle to the handle sensor unit for wear, replace as needed.

Lever Removal And Installation

Figure 50-111-17



Remove the tie strap and disconnect the electrical connectors (Item 1) **[Figure 50-111-17]** from the control lever.

Remove the four nuts (Item 2) and the plate (Item 3) **[Figure 50-111-17]** used to mount the control lever.

Remove the control lever (Item 4) **[Figure 50-111-17]** by sliding the lever through the control panel.

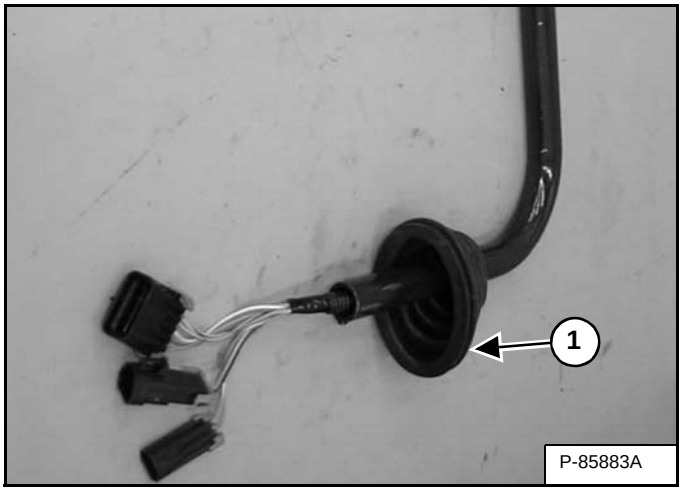
Installation: Tighten the four nuts to the plate so the lever cannot be moved either right or left when seated in the operator's seat.

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Boot Removal And Installation

Remove the control handle / lever. (See Lever Removal And Installation on Page 50-111-5.)

Figure 50-111-18



Remove the rubber boot (Item 1) **[Figure 50-111-18]**.

Install the new boot and reinstall the steering lever.

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CONTROL HANDLE / LEVER (SJC)

Description

The control panel has two electronic handles that control the steering, lift, and tilt functions. There are no mechanical connections to the hydrostatic pumps or the control valve.

Joystick Testing

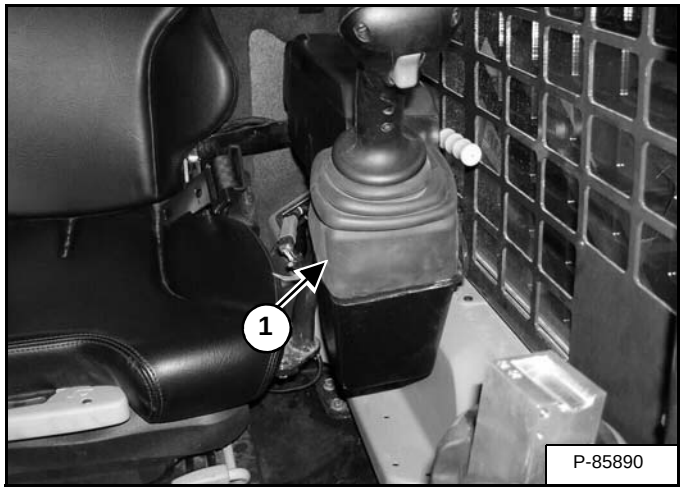
See Bobcat Advanced Troubleshooting System (B.A.T.S.) or connect to service analyzer to check function.

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Joystick Removal And Installation

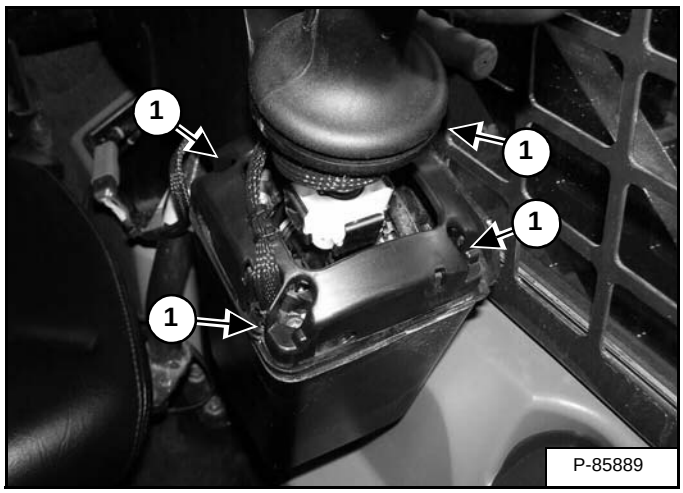
Raise the lift arms and install an approved lift arm support device. (See Installing on Page 10-20-1.)

Figure 50-112-1



Lift the rubber boot (Item 1) **[Figure 50-112-1]**.

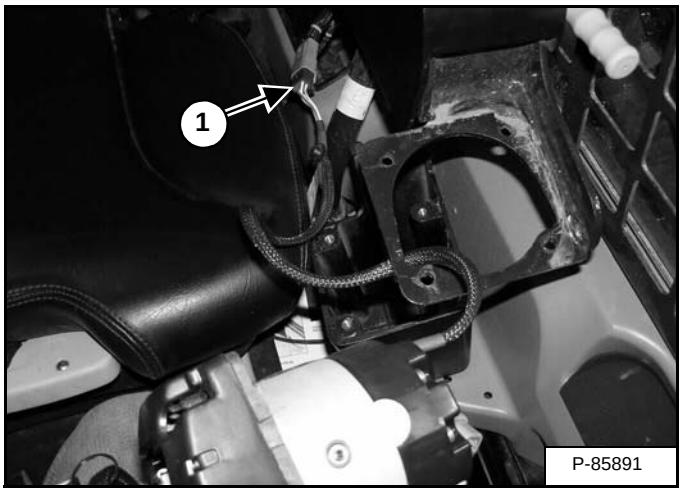
Figure 50-112-2



Remove the four screws (Item 1) **[Figure 50-112-2]** and lift the joystick control from the base.

Installation: Tighten the four screws to 4,0 - 4,5 N•m (35 - 40 in-lb) torque.

Figure 50-112-3



Disconnect the joystick connector (Item 1) **[Figure 50-112-3]** from the harness connector.

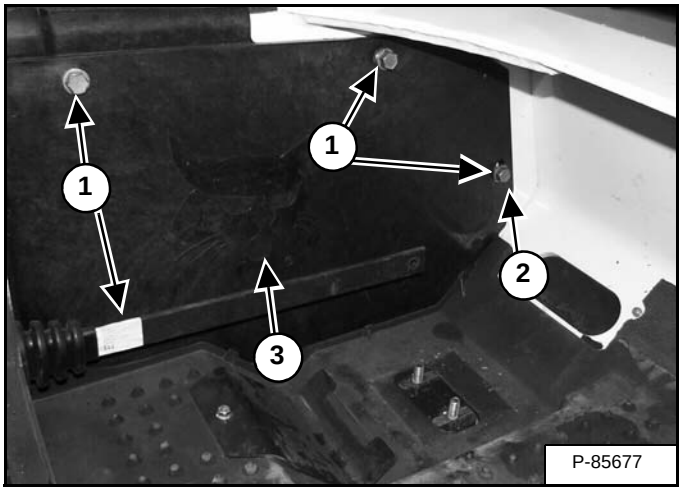
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ACCESS PANEL (INSIDE)

Removal And Installation (Left)

Remove the control pedal. (See Pedal Removal And Installation on Page 50-90-1.)

Figure 50-120-1



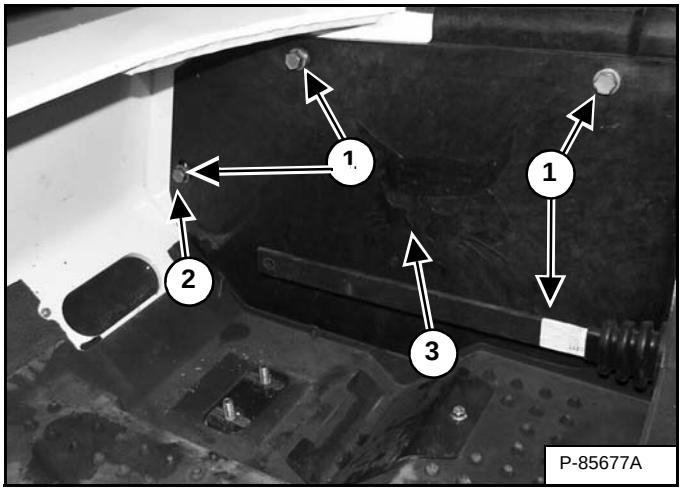
Remove the four mounting screws, (Item 1), washer (Item 2), and remove the left access panel (Item 3) **[Figure 50-120-1]**.

Remove the front access panel from the loader.

Removal And Installation (Right)

Remove the control pedal. (See Pedal Removal And Installation on Page 50-90-1.)

Figure 50-120-2



Remove the top mounting screw (Item 1), washer (Item 2), and loosen the two bottom mounting screws (Item 3) **[Figure 50-120-2]** from the front access panel.

Remove the front access panel from the loader.

Dealer Copy -- Not for Resale

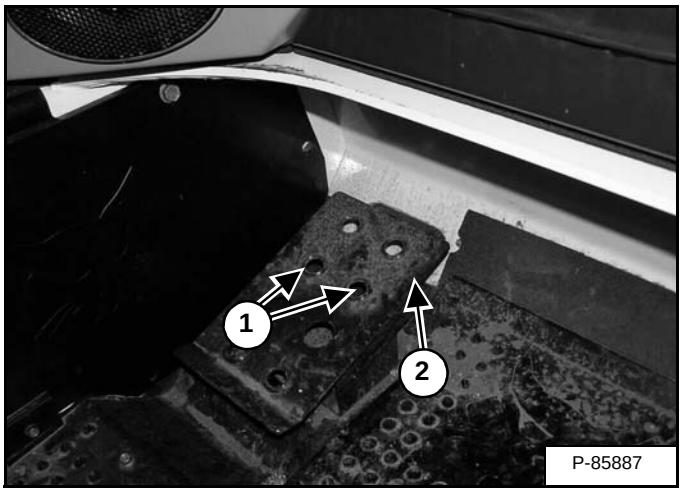


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ACCESS PANEL (INSIDE) (SJC)

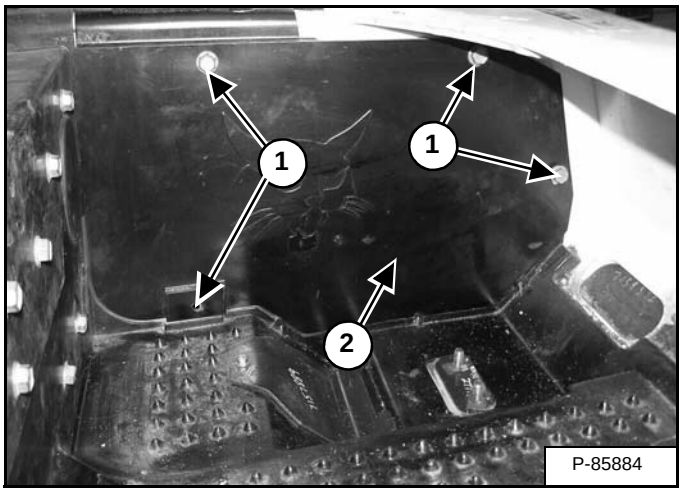
Removal And Installation (Left)

Figure 50-121-1



Remove the two mounting nuts (Item 1), and remove the foot rest (Item 2) **[Figure 50-121-1]**.

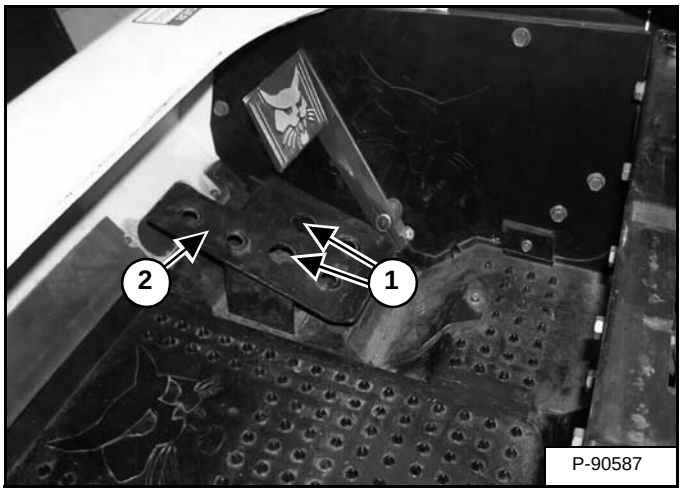
Figure 50-121-2



Remove the mounting screws (Item 1), and remove the inside left access panel (Item 2) **[Figure 50-121-2]**.

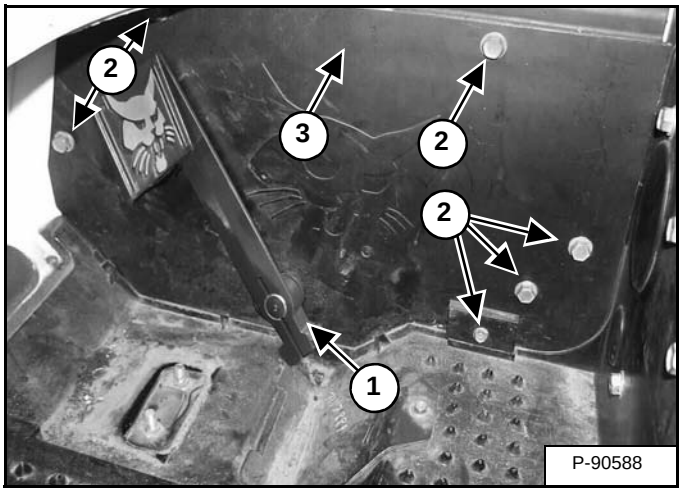
Removal And Installation (Right)

Figure 50-121-3



Remove the two mounting nuts (Item 1), and remove the foot rest (Item 2) **[Figure 50-121-3]**.

Figure 50-121-4



Remove the bolt and throttle pedal (Item 1), and remove the mounting screws (Item 2) **[Figure 50-121-4]**.

Remove the right inside access panel (Item 3) **[Figure 50-121-4]**.

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WINDOW (REAR)

Removal And Installation

WARNING

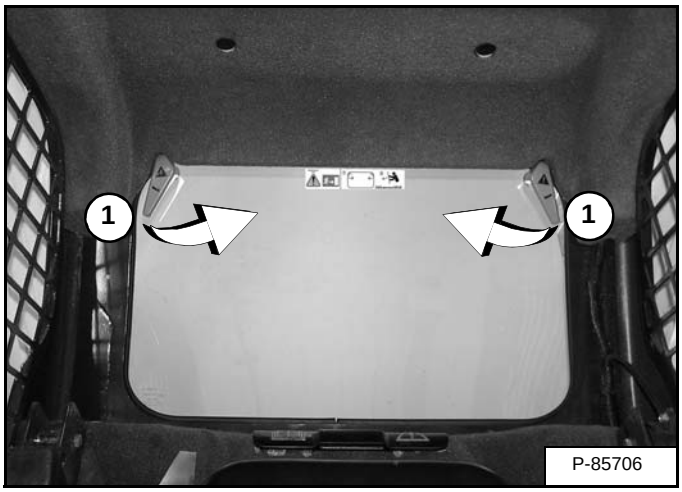
AVOID INJURY OR DEATH

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

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

W-2019-0907

Figure 50-130-1



Remove the rear window assembly by turning the two latches (Item 1) **[Figure 50-130-1]** in until they disengage from the window frame.

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

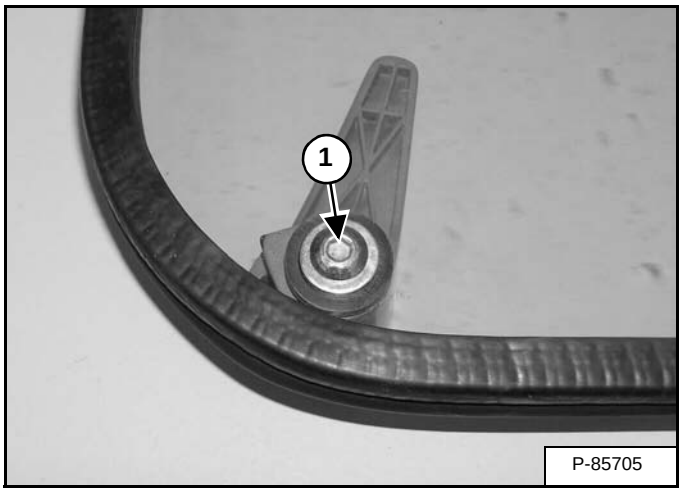
NOTE: If rear window is broken, remove all glass fragments from the rubber molding before installing a new window.

Clean the area before installing the rear window assembly.

Reverse the procedure to install the rear window.

Disassembly And Assembly

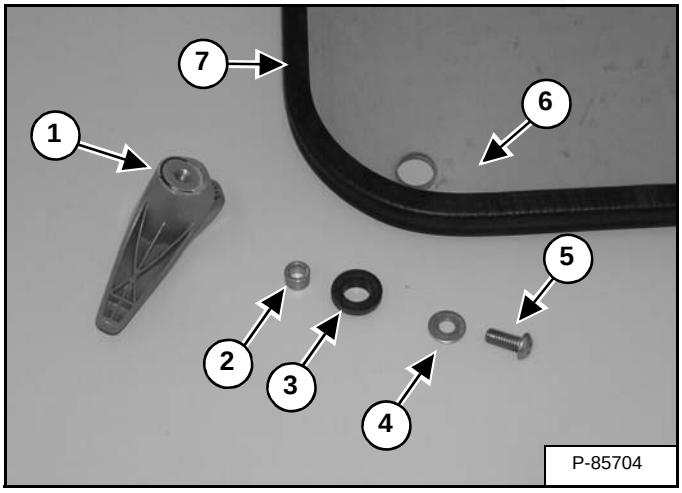
Figure 50-130-2



Remove the screw (Item 1) from the latch **[Figure 50-130-2]**.

Installation: Tighten the screw (Item 1) **[Figure 50-130-2]** to 21 - 23 N•m (180 - 200 in-lb) torque.

Figure 50-130-3



Inspect and replace any damaged parts.

The items listed below refer to **[Figure 50-130-3]**.

1. Latch
2. Spacer
3. Bushing
4. Washer
5. Screw
6. Rear Window
7. Seal

Dealer Copy -- Not for Resale

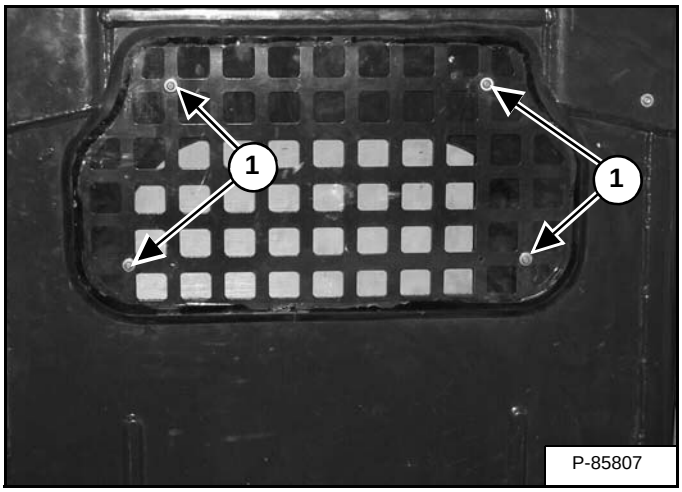


Dealer Copy -- Not for Resale

WINDOW (TOP)

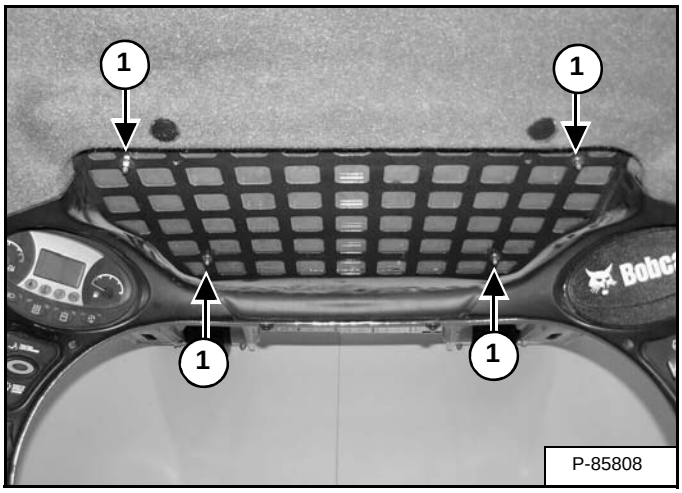
Removal And Installation

Figure 50-131-1



Install the bolts (Item 1) **[Figure 50-131-1]** through the window grommets and through the cab holes.

Figure 50-131-2



From inside the operator cab, install and tighten the four nuts (Item 1) **[Figure 50-131-2]** on the window bolts.

Tighten the nuts (Item 1) **[Figure 50-131-2]** to 9 - 10 N•m (80 - 90 in-lb) torque.

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WINDOW (SIDE)

Removal And Installation

Raise the lift arms and install an approved lift arm support device. (See Installing on Page 10-20-1.)

Figure 50-132-1

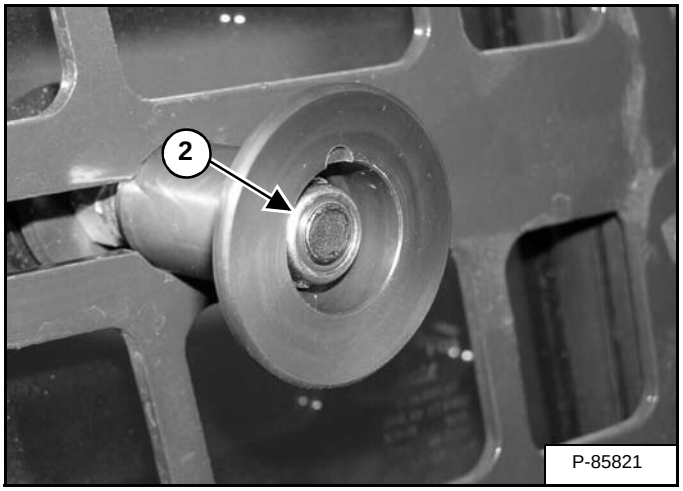
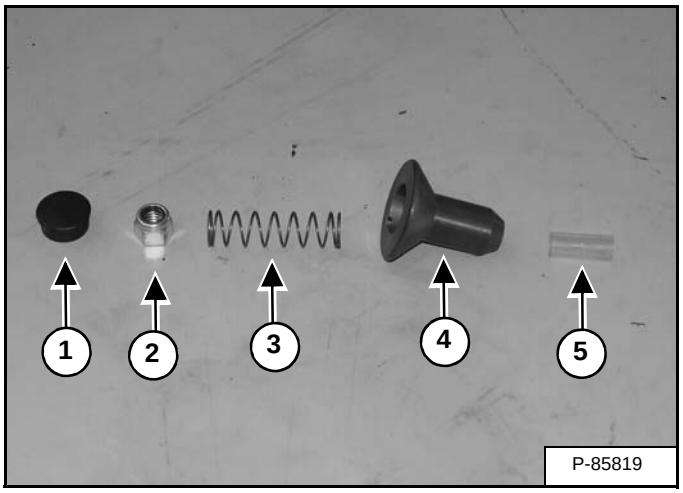


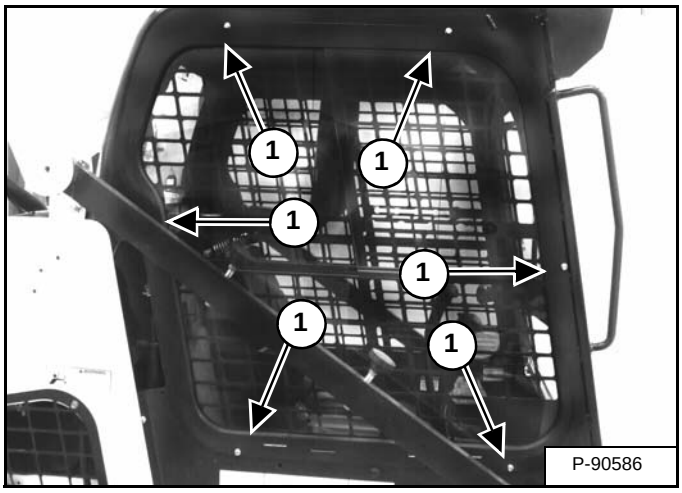
Figure 50-132-2



From inside the operator cab, remove the plastic cap (Item 1), nut (Item 2), spring (Item 3), knob (Item 4), and sleeve (Item 5) **[Figure 50-132-1]** and **[Figure 50-132-2]** from the window assembly.

Installation: Tighten the nut (Item 2) **[Figure 50-132-1]** flush to the end of the bolt.

Figure 50-132-3



Support the window assembly and remove the six bolts (Item 1) **[Figure 50-132-3]** from the window frame and the operator cab.

Installation: Tighten the six bolts (Item 1) **[Figure 50-132-3]** to 9 - 10 N•m (80 - 90 in-lb) torque.

Remove the window assembly.

NOTE: The window assembly can only be replaced as a complete unit.

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Dealer Copy -- Not for Resale

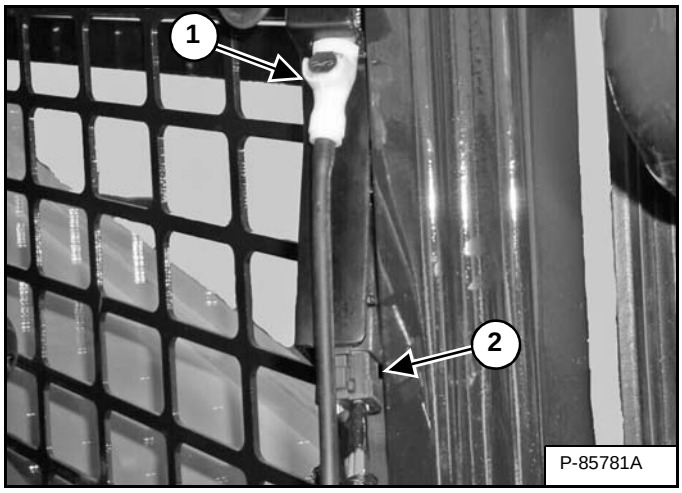
CAB DOOR

Description

The standard cab door is available as an option or dealer installed kit.

Removal And Installation

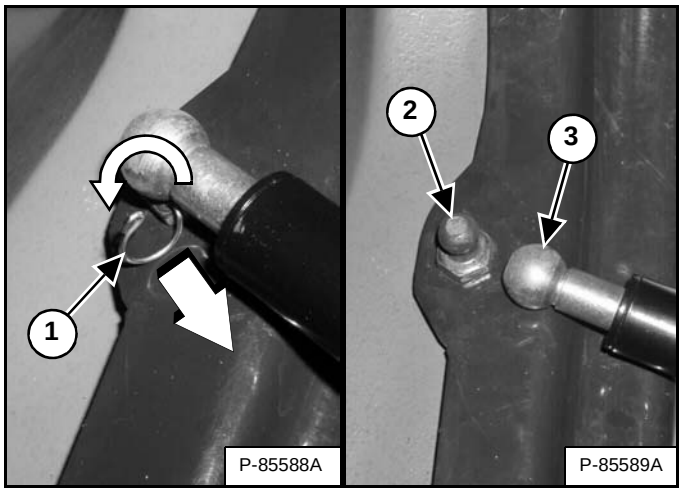
Figure 50-140-1



Open the cab door.

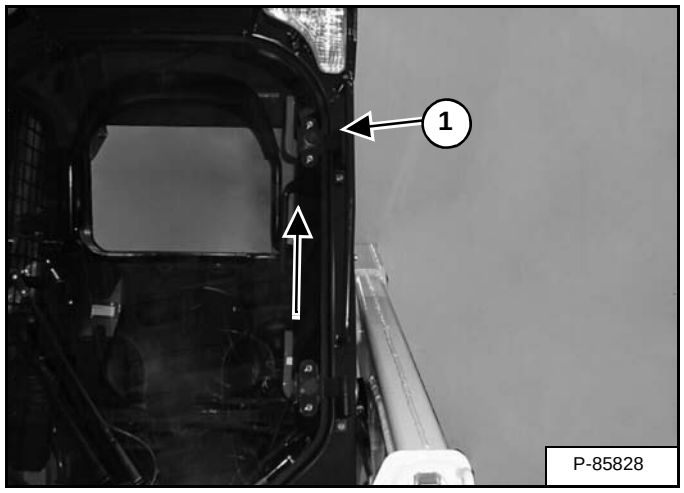
Disconnect electrical connector (Item 2) and washer fluid hose (Item 1) **[Figure 50-140-1]**.

Figure 50-140-2



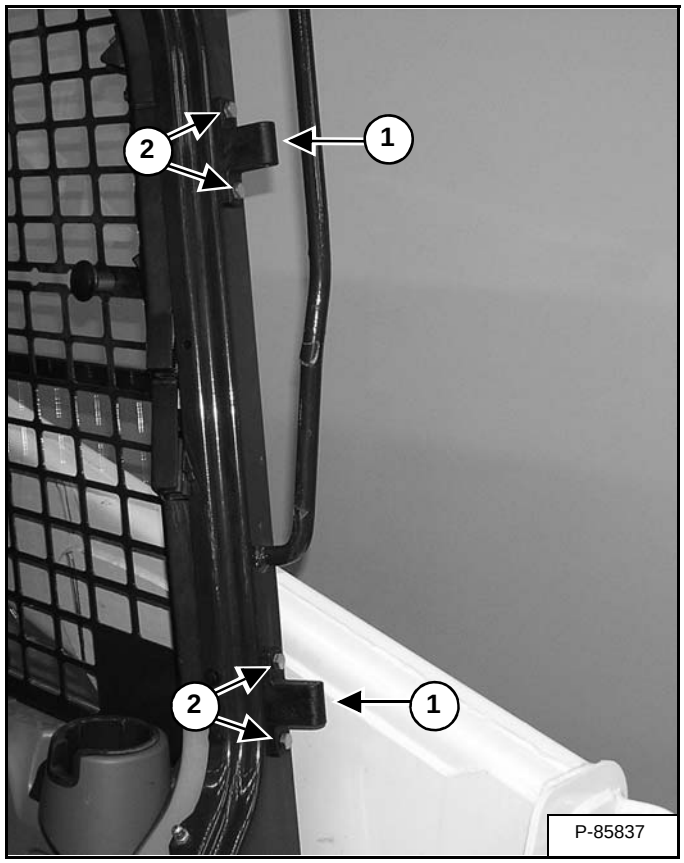
Rotate and pull the clip (Item 1) out of the gas spring socket. Pull the gas spring socket (Item 3) straight off the ball stud fitting (Item 2) **[Figure 50-140-2]**.

Figure 50-140-3



Lift the door (Item 1) **[Figure 50-140-3]** off the hinges.

Figure 50-140-4



Remove the four bolts and nuts (Item 2) **[Figure 50-140-4]** from the cab.

Remove the hinges (Item 1) **[Figure 50-140-4]** from the cab.

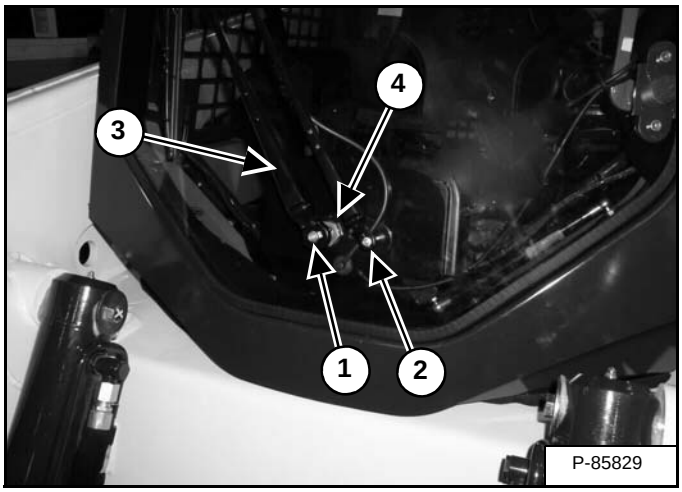
Installation: Install the hinges (Item 1) on the cab and use the bolts and nuts (Item 2) **[Figure 50-140-4]** to secure the hinges. Tighten to 9,6 - 10,7 N•m (85 - 90 in-lb) torque.

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CAB DOOR (CONT'D)

Disassembly And Assembly

Figure 50-140-5



Remove the nuts (Items 1 and 2) and the wiper arms (Item 3) **[Figure 50-140-5]**.

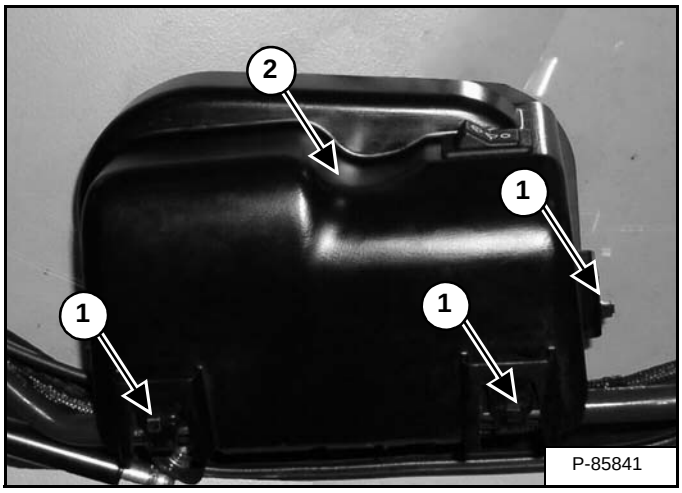
Installation: Tighten the nut (Item 1) to 20 - 24 N•m (177 - 212 in-lb) torque and nut (Item 2) to 9 - 11 N•m (80 - 97 in-lb) torque.

Remove the wiper motor shaft nut (Item 4) **[Figure 50-140-5]**.

Installation: Tighten the nut (Item 4) to 9,9 - 14 N•m (88 - 124 in-lb) torque.

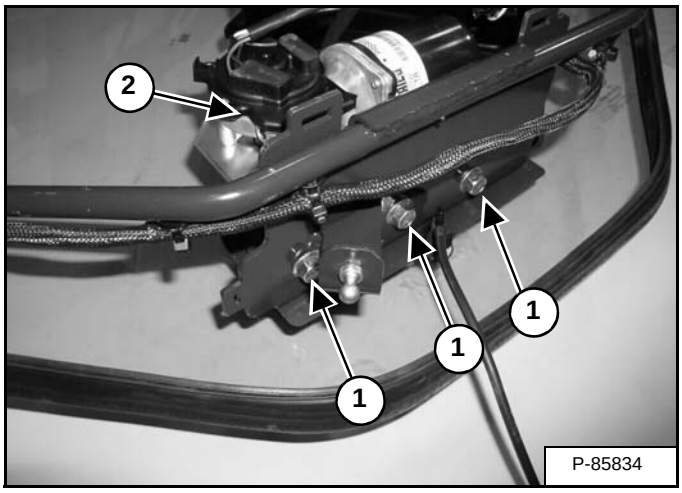
Remove the door from the loader. (See Removal And Installation on Page 50-140-1.)

Figure 50-140-6



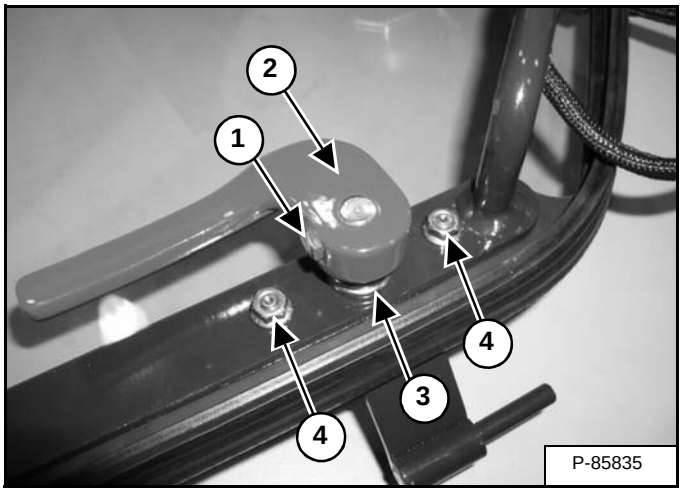
Remove the three tie straps (Item 1) and the wiper motor assembly cover (Item 2) **[Figure 50-140-6]**.

Figure 50-140-7



Remove the three bolts (Item 1) and the wiper motor assembly (Item 2) **[Figure 50-140-7]**.

Figure 50-140-8



Remove the bolt (Item 1), the latch (Item 2), and spring (Item 3) **[Figure 50-140-8]**.

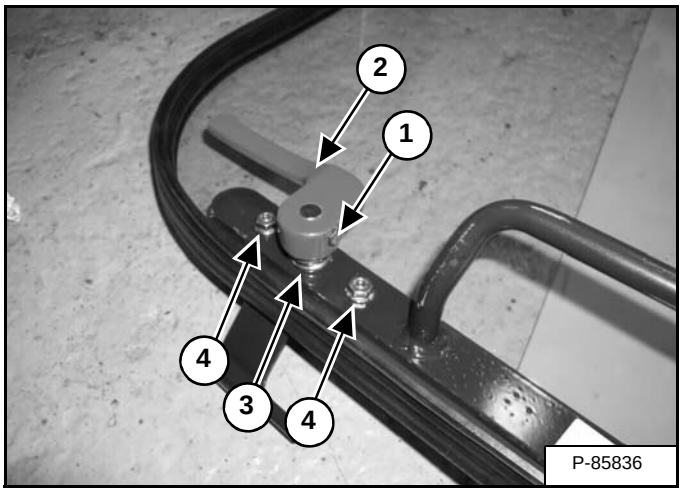
Remove the two nuts and bolts (Item 4) **[Figure 50-140-8]**.

Installation: Tighten the nuts (Item 4) to 31 - 34 N•m (270 - 300 in-lb) torque.

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Disassembly And Assembly (Cont'd)

Figure 50-140-9

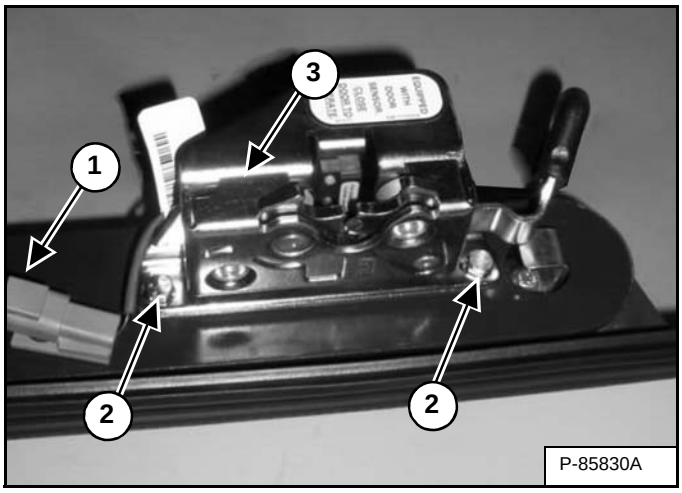


Remove the bolt (Item 1), the latch (Item 2), and spring (Item 3) **[Figure 50-140-9]**.

Remove the two nuts and bolts (Item 4) **[Figure 50-140-9]**.

Installation: Tighten the nuts (Item 4) to 31 - 34 N•m (270 - 300 in-lb) torque.

Figure 50-140-10



Disconnect the harness (Item 1) **[Figure 50-140-10]**.

Remove the two bolts (Item 2), and the latch assembly (Item 3) from the cab door **[Figure 50-140-10]**.

Remove the glass from the frame.

Aligning

Figure 50-140-11

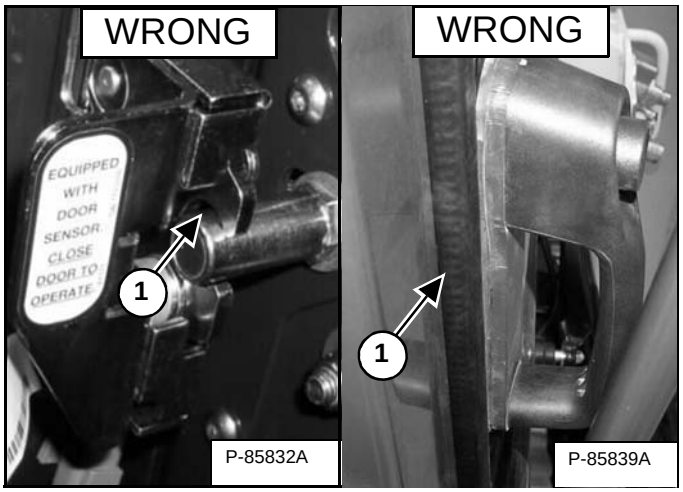
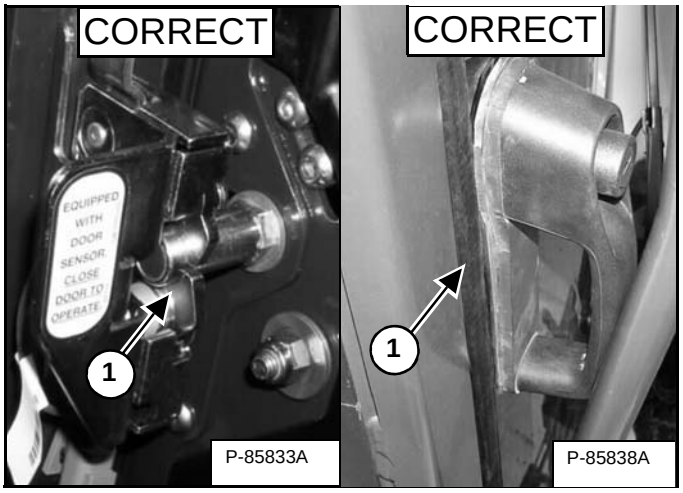


Figure 50-140-12



When the striker or latch is NOT adjusted properly there will be a gap (Item 1) **[Figure 50-140-11]** between the door and the cab or the striker and the latch.

If adjustment is needed. (See Adjusting on Page 50-140-4.)

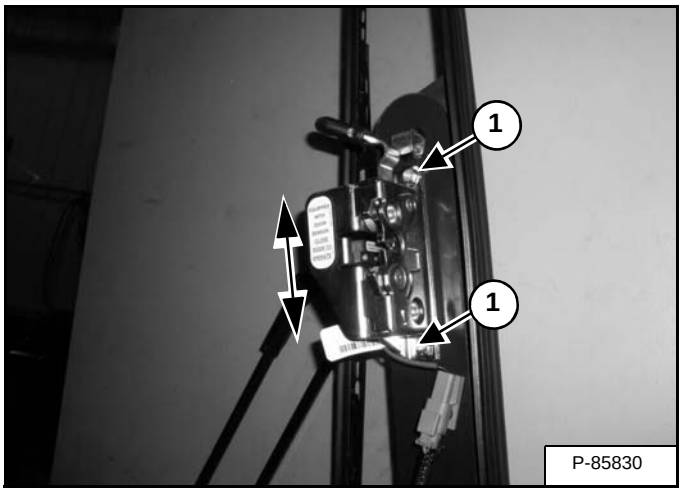
When the striker or latch is adjusted properly there will be no gap (Item 1) **[Figure 50-140-12]** between the door and the cab or the striker and the latch.

After verifying alignment check for proper operation. (See Checking Operation on Page 50-140-4.)

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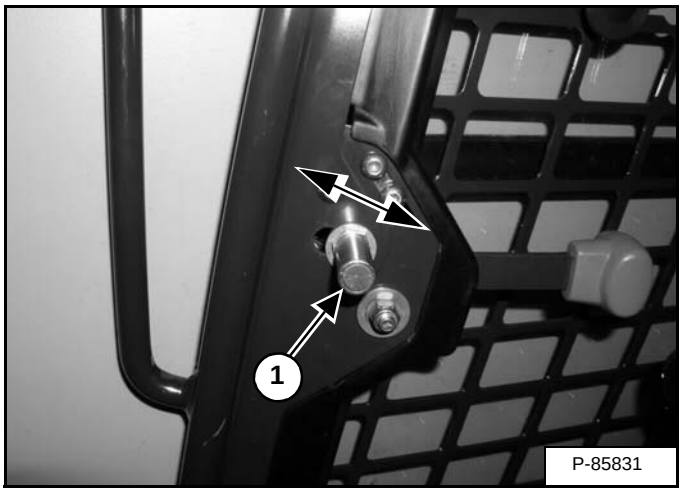
Adjusting

Figure 50-140-13



Loosen the two bolts (Item 1) **[Figure 50-140-13]** and adjust the latch as needed.

Figure 50-140-14

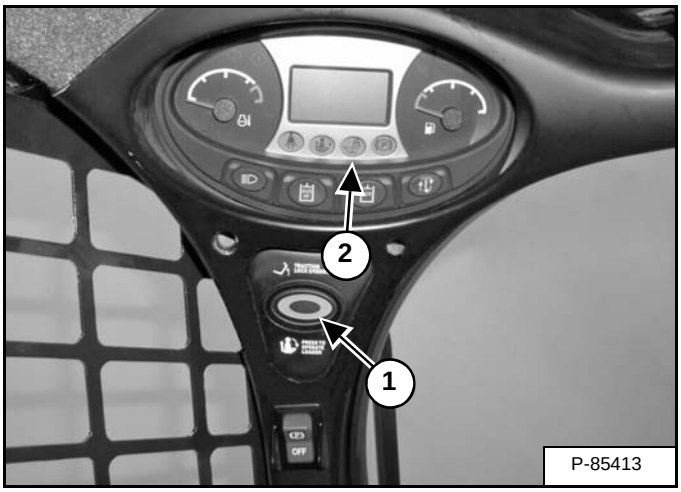


Loosen the striker and adjust as needed (Item 1) **[Figure 50-140-14]**.

After adjusting the striker and latch recheck the alignment of the door sensor. (See Aligning on Page 50-140-3.)

Checking Operation

Figure 50-140-15



Sit in operator's seat. Turn key ON, lower seat bar and close the door. Press the PRESS TO OPERATE LOADER button (Item 1) **[Figure 50-140-15]**.

Open the door. The LIFT & TILT VALVE light (Item 2) **[Figure 50-140-15]** will flash, an audible tone will sound, and the message [DOOR] will appear in the display.

Close the door and the LIFT & TILT VALVE light (Item 2) **[Figure 50-140-15]** will go out and the display will return to machine hours.

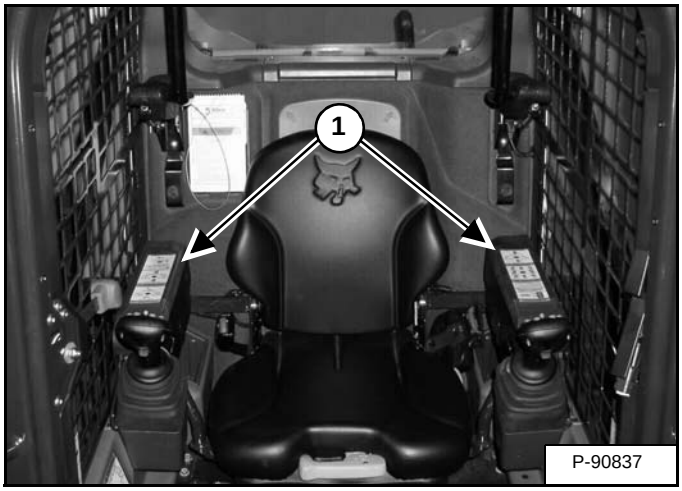
Dealer Copy -- Not for Resale

ARMREST

Description

The armrests are located on each side of the seat. They are adjustable for comfort.

Figure 50-150-1



Adjustable armrests (Item 1) **[Figure 50-150-1]**.

Dealer Copy -- Not for Resale

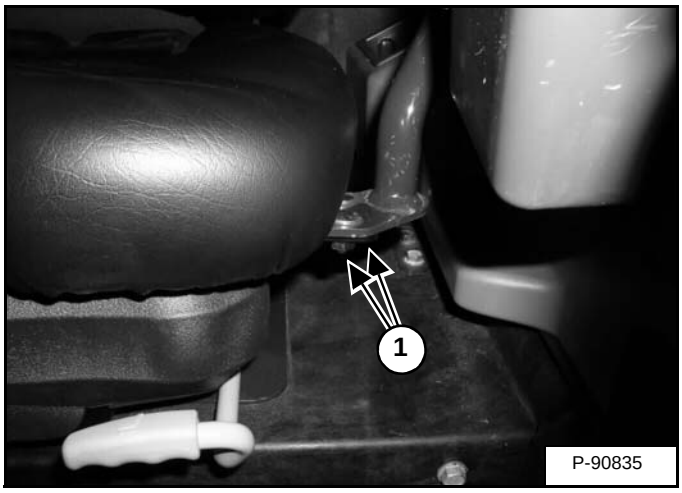
ARMREST (CONT'D)

Removal And Installation

Slide the seat and the backrest all the way forward.

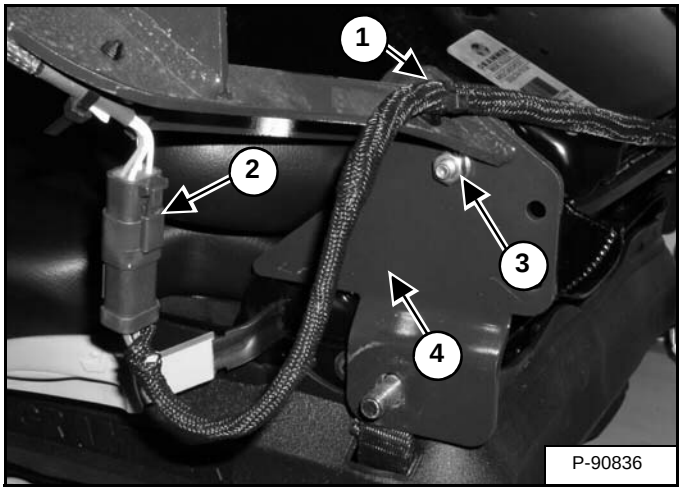
Remove the seat belt (See Seat Belt Removal And Installation on Page 50-31-2.)

Figure 50-150-2



Remove the two nuts and bolts (Item 1) **[Figure 50-150-2]**.

Figure 50-150-3

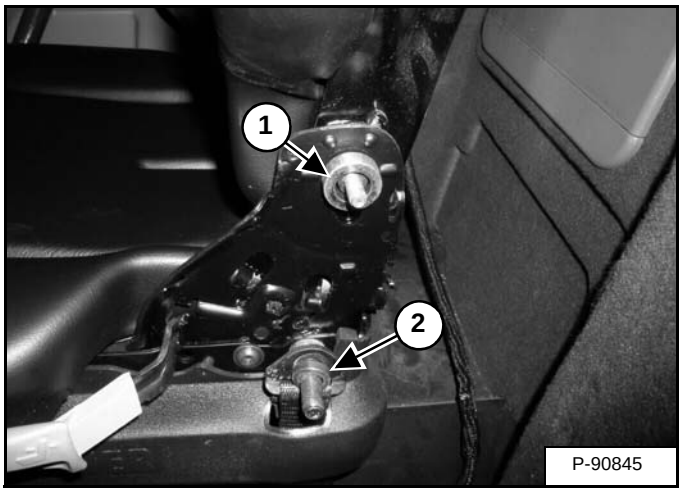


Remove the tie strap (Item 1) and disconnect the wire harness connector (Item 2) **[Figure 50-150-3]**.

Remove the nut (Item 3) **[Figure 50-150-3]**.

Remove the armrest (Item 4) **[Figure 50-150-3]** from the seat.

Figure 50-150-4



Remove the top spacer (Item 1) and the bottom spacer (Item 2) **[Figure 50-150-4]** from the seat.

Repeat for the other side.

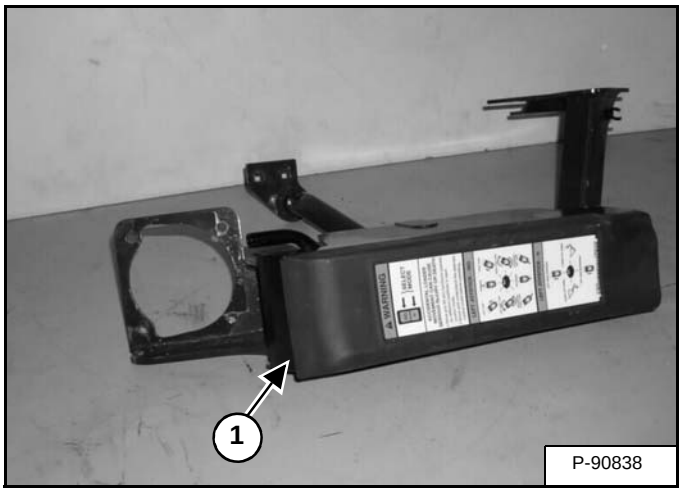
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Disassembly And Assembly

Remove the Joystick. (See Joystick Removal And Installation on Page 50-112-2.)

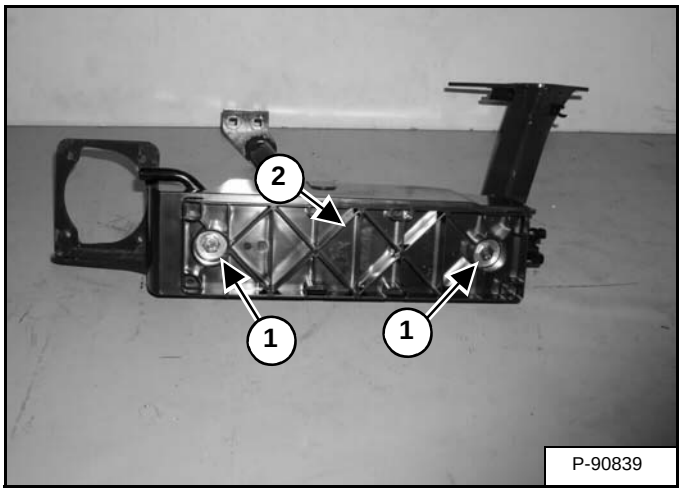
Remove the armrest. (See Removal And Installation on Page 50-150-2.)

Figure 50-150-5



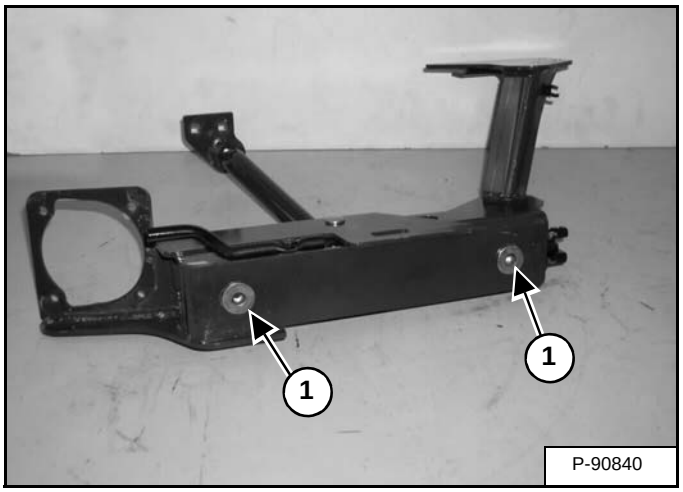
Lift up on one edge and remove armrest cover (Item 1) **[Figure 50-150-5]**.

Figure 50-150-6



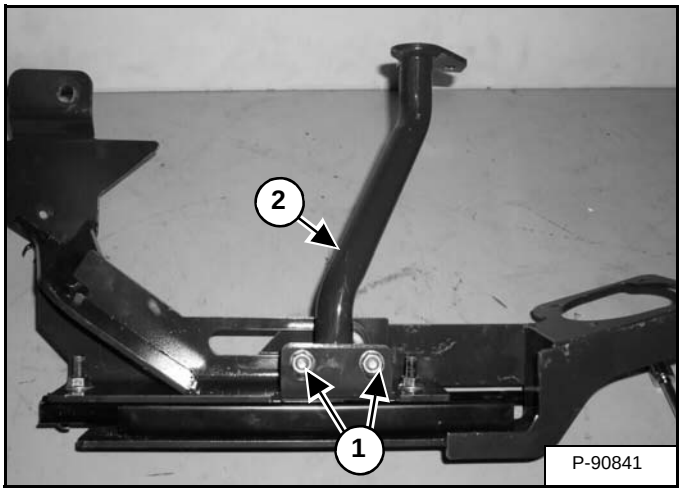
Remove the two bolts and washers (Item 1) and the armrest shell (Item 2) **[Figure 50-150-6]**.

Figure 50-150-7



Remove the two washers (Item 1) **[Figure 50-150-7]**.

Figure 50-150-8



Remove the two nuts and bolts (Item 1) and the support tube (Item 2) **[Figure 50-150-8]**.

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Disassembly And Assembly (Cont'd)

Figure 50-150-9

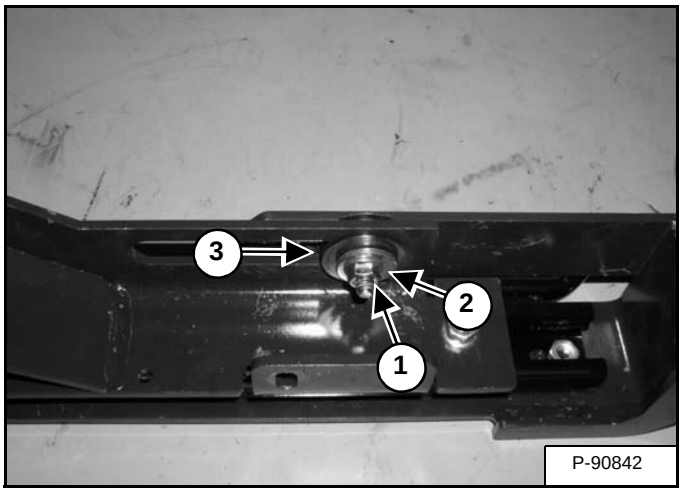
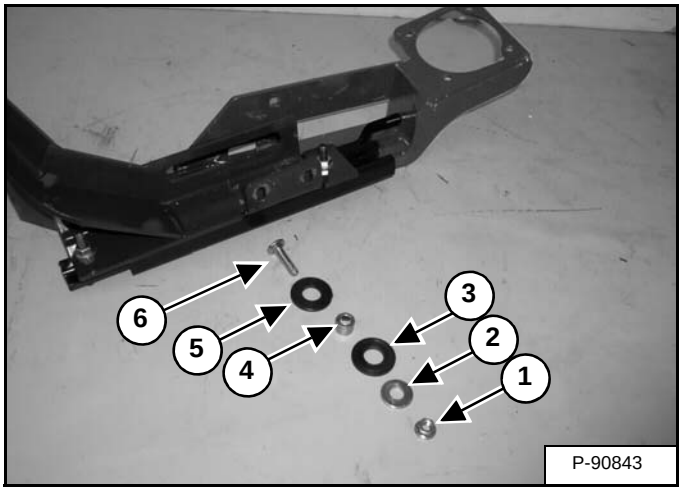


Figure 50-150-10

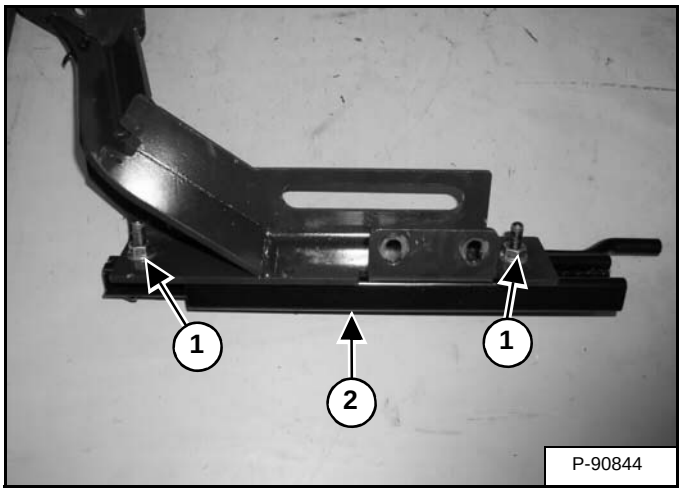


Remove the nut (Item 1), washer (Item 2), and the plastic washer (Item 3) **[Figure 50-150-9]** and **[Figure 50-150-10]**.

Remove the spacer (Item 4), plastic washer (Item 5), and the bolt (Item 6) **[Figure 50-150-10]**.

Installation: Tighten the nut to 21 - 23 N•m (180 - 200 in-lb) torque.

Figure 50-150-11



Remove the two nuts (Item 1) and the slide rail (Item 2) **[Figure 50-150-11]** from the armrest mount.

Repeat for the other side.

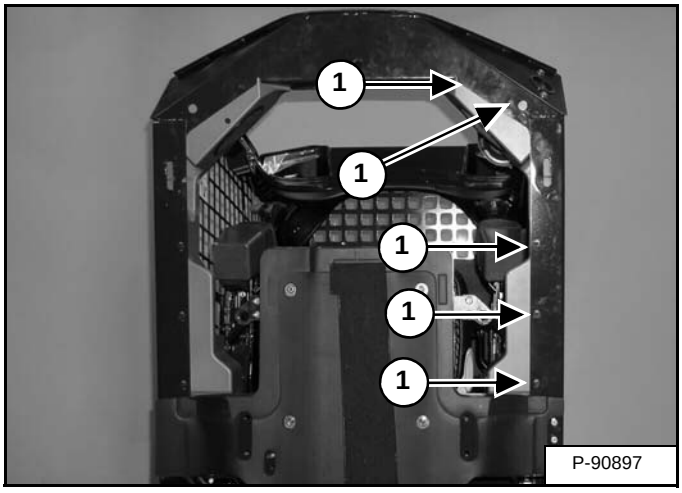
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LEFT SIDE LOWER PANEL

Removal And Installation

Raise the operator's cab.

Figure 50-160-1



Remove the five plastic rivets (Item 1) **[Figure 50-160-1]**.

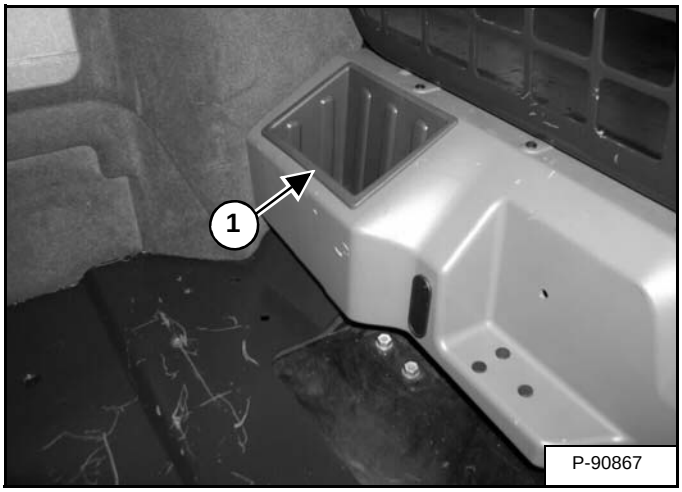
Remove the seat. (See Removal And Installation on Page 50-30-1.)

Remove the 3-Point seat belt retractor (If equipped). (See 3-Point Seat Belt Removal And Installation on Page 50-31-4.)

Lower the operator's cab.

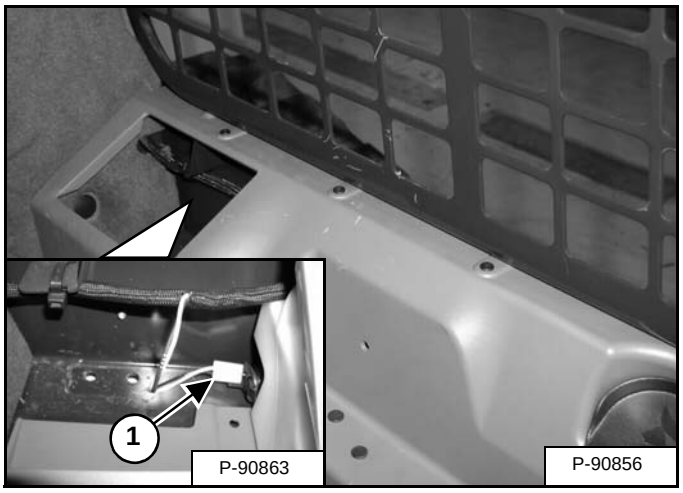
NOTE: With the seat removed, the cab may raise.

Figure 50-160-2



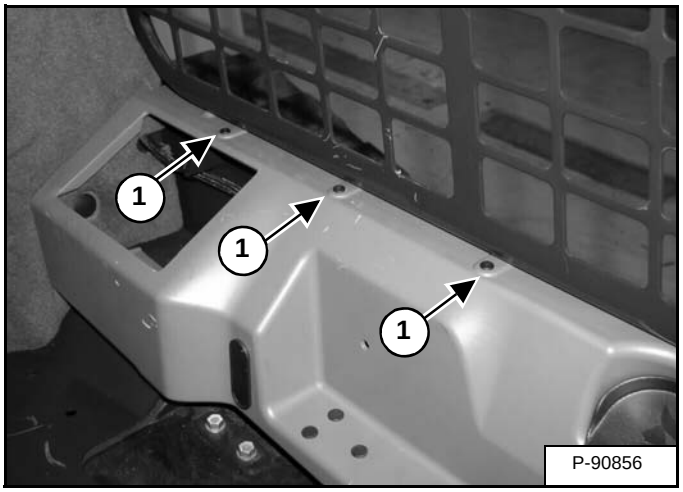
Remove the storage compartment (Item 1) (if equipped) **[Figure 50-160-3]** from the left side lower panel.

Figure 50-160-3



Disconnect the wiper washer pump (Item 1) (if equipped) **[Figure 50-160-3]** from the left side lower panel.

Figure 50-160-4

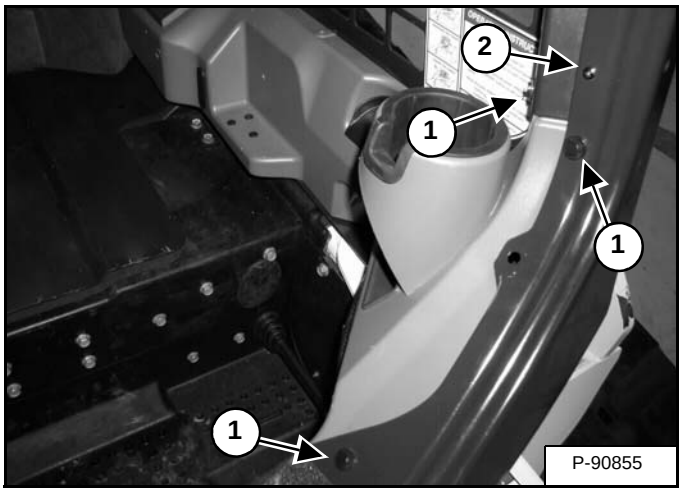


Remove three plastic screws and the anchors (Item 1) **[Figure 50-160-4]** from the left side lower panel.

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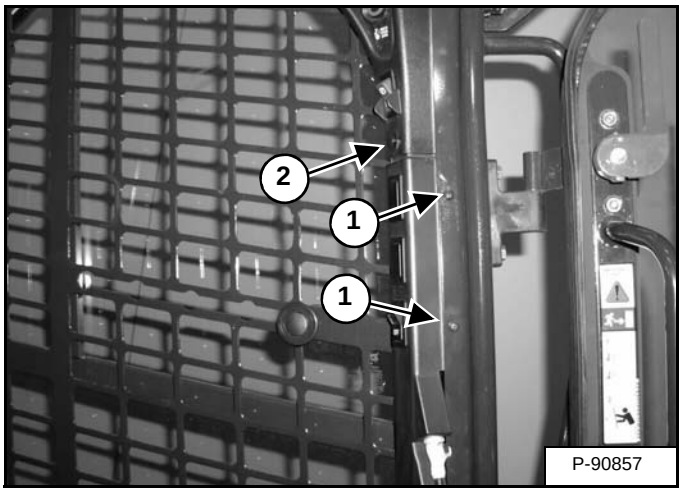
Removal And Installation (Cont'd)

Figure 50-160-5



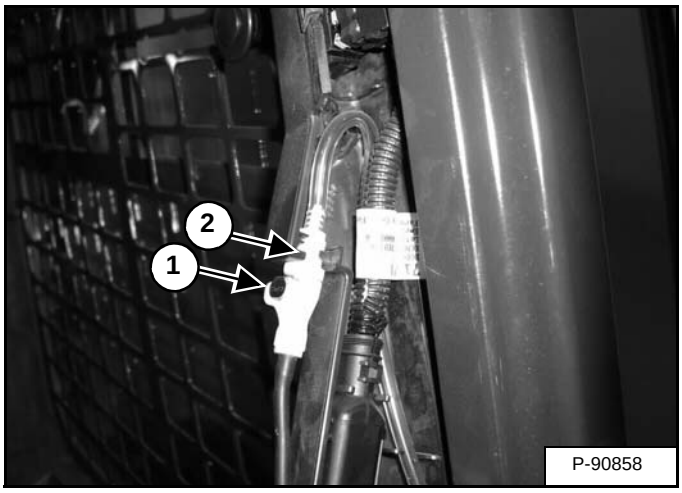
Remove the three plastic rivets and anchors (Item 1) and the screw (Item 2) **[Figure 50-160-5]**.

Figure 50-160-6



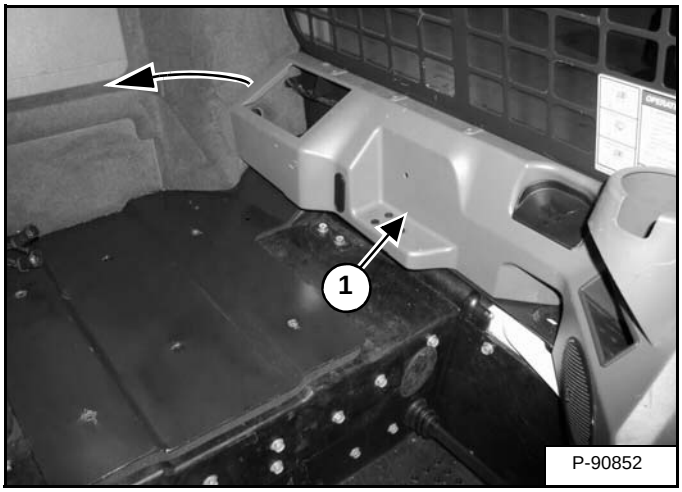
Remove the two screws (Item 1) and the plastic rivet (Item 2) **[Figure 50-160-6]**.

Figure 50-160-7



Disconnect the hose (if equipped) (Item 1) and remove the hose (Item 2) **[Figure 50-160-7]** from the panel.

Figure 50-160-8



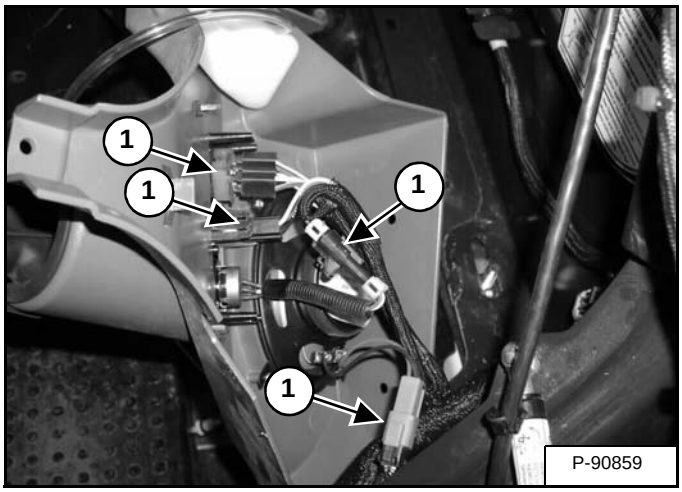
Pull the left side lower panel (Item 1) **[Figure 50-160-8]** rear out and away from the side of the cab.

NOTE: Pull the left side lower panel away from the side of the cab far enough to access the wire harness.

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Removal And Installation (Cont'd)

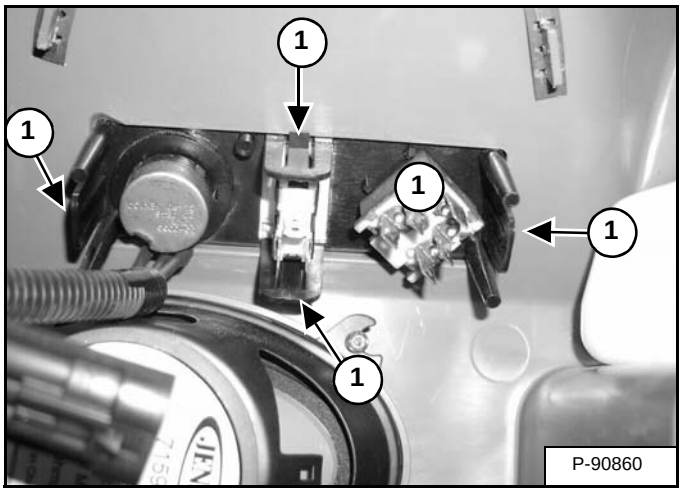
Figure 50-160-9



Disconnect the HVAC or radio wire harnesses (Item 1) **[Figure 50-160-9]** (if equipped).

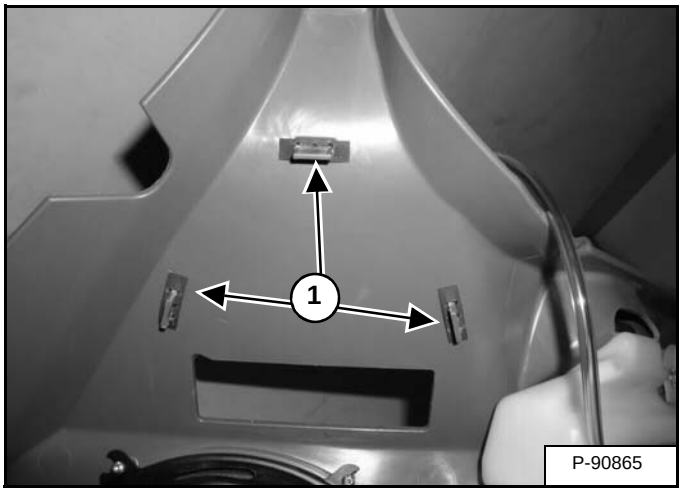
Disassembly And Assembly

Figure 50-160-10



Press the four tabs (Item 1) **[Figure 50-160-10]** and remove the HVAC control out of the left side lower panel.

Figure 50-160-11

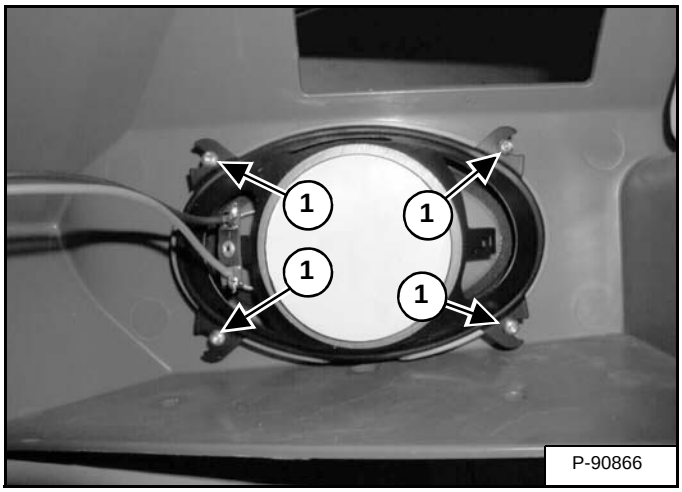


NOTE: If the three clips (Item 1) [Figure 50-160-11] are removed the cup holder will need to be replaced.

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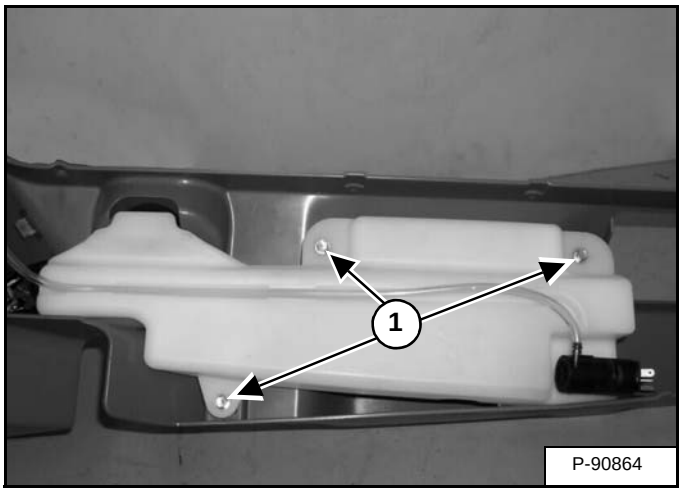
Disassembly And Assembly (Cont'd)

Figure 50-160-12



Remove the four screws (Item 1) **[Figure 50-160-12]** and remove the speaker from the left side lower panel.

Figure 50-160-13



Remove the three screws (Item 1) **[Figure 50-160-13]** and remove the washer tank from the left side lower panel.

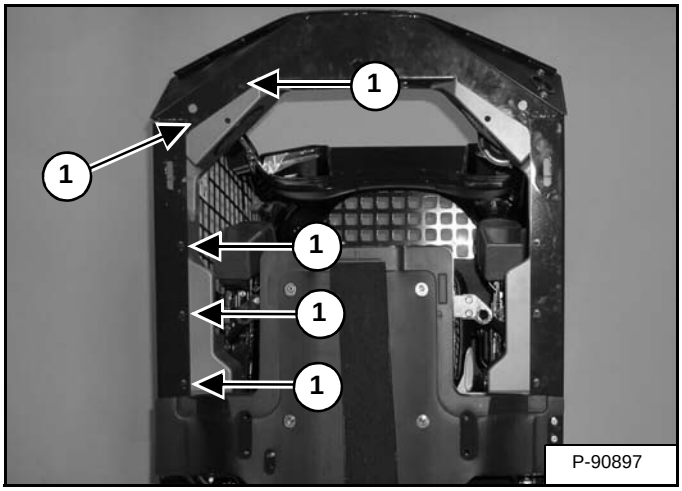
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RIGHT SIDE LOWER PANEL

Removal And Installation

Raise the operator's cab.

Figure 50-170-1



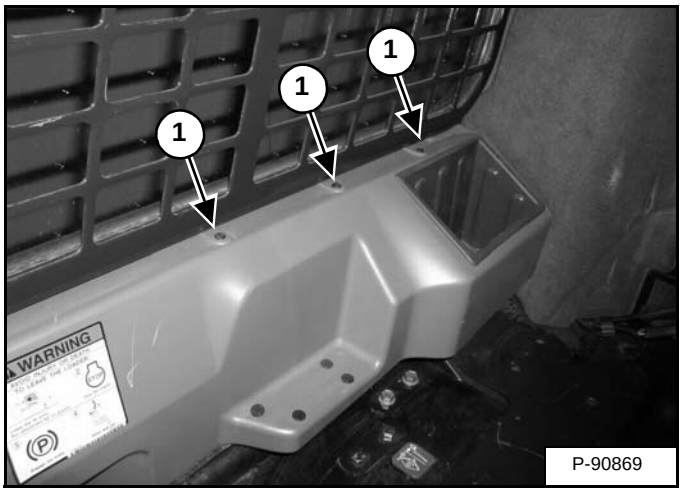
Remove the five plastic rivets (Item 1) **[Figure 50-170-1]**.

Remove the seat. (See Removal And Installation on Page 50-30-1.)

Lower the operator's cab.

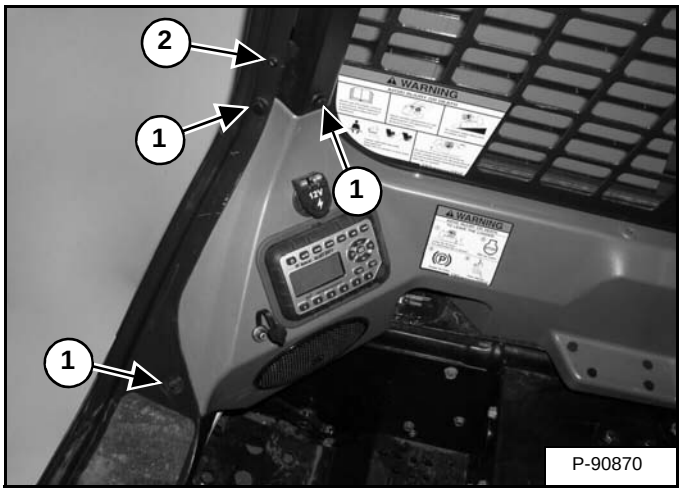
NOTE: With the seat removed, the cab may raise.

Figure 50-170-2



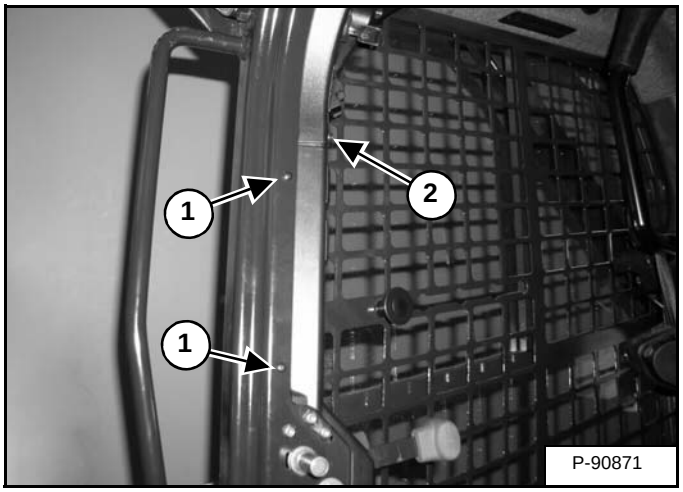
Remove the three plastic screws and the anchors (Item 1) **[Figure 50-170-2]** from the right side lower panel.

Figure 50-170-3



Remove the three plastic rivets and anchors (Item 1) and the screw (Item 2) **[Figure 50-170-3]**.

Figure 50-170-4

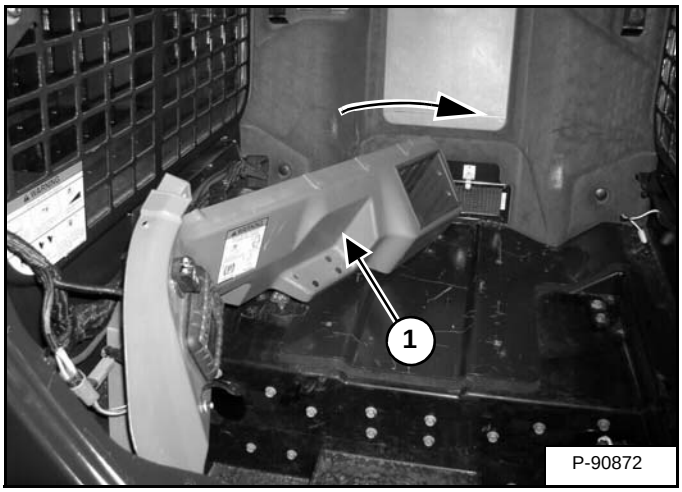


Remove the two screws (Item 1) and the plastic rivet (Item 2) **[Figure 50-170-4]**.

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Removal And Installation (Cont'd)

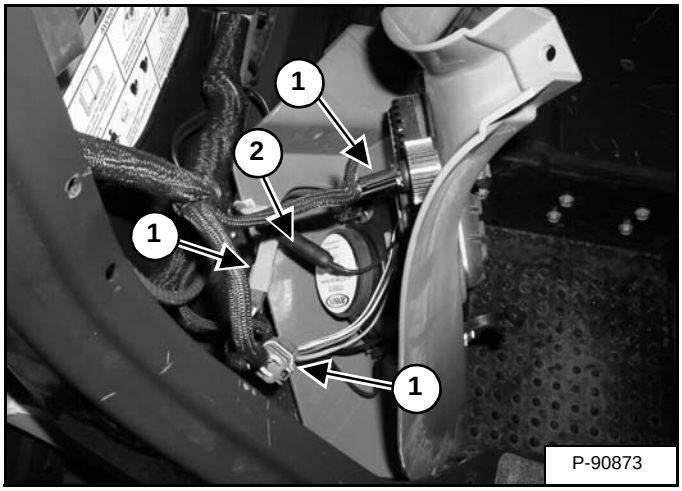
Figure 50-170-5



Pull the right side lower panel (Item 1) **[Figure 50-170-5]** rear out and away from the side of the cab.

NOTE: Pull the right side lower panel away from the side of the cab far enough to access the wire harness.

Figure 50-170-6

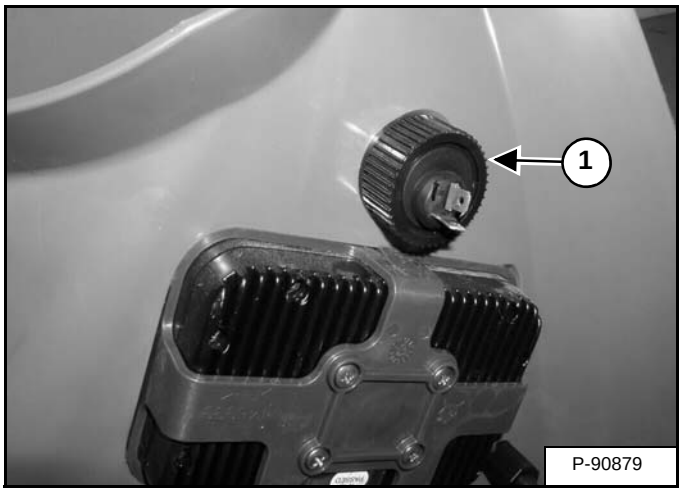


Disconnect the wire harnesses (Item 1) and the antenna (Item 2) **[Figure 50-170-6]** (if equipped with radio).

NOTE: Install the right side lower panel with the radio removed to assist in connecting the power port wire.

Disassembly And Assembly

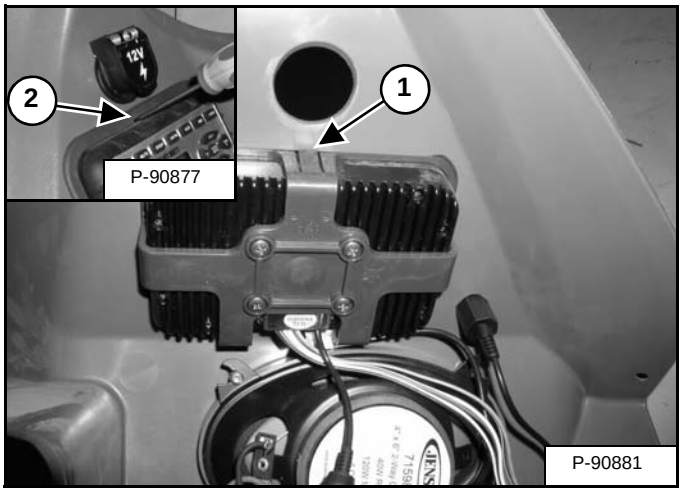
Figure 50-170-7



Remove the plastic nut and the lock washer (Item 1) **[Figure 50-170-7]** from power port and remove the power port from the right side lower panel.

NOTE: The power port lock washer must be replaced with a new when it has been removed.

Figure 50-170-8



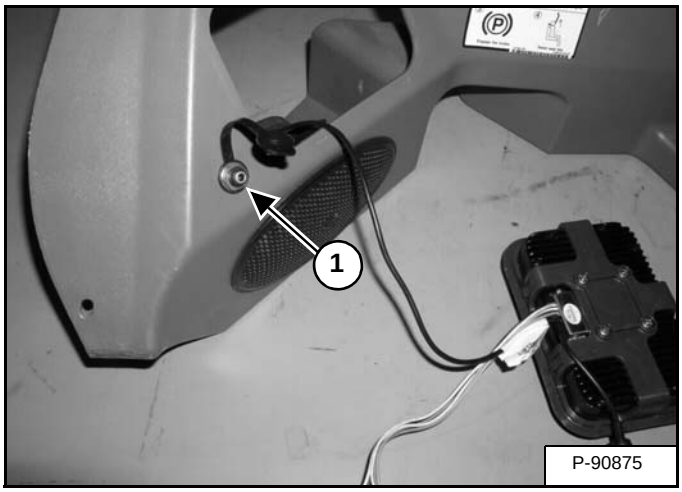
Depress the tab (Item 1) **[Figure 50-170-8]** and remove the radio from the right side lower panel.

Installation: Insert a screwdriver into the slot (Item 2) **[Figure 50-170-8]** to lock the tab into place.

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Disassembly And Assembly (Cont'd)

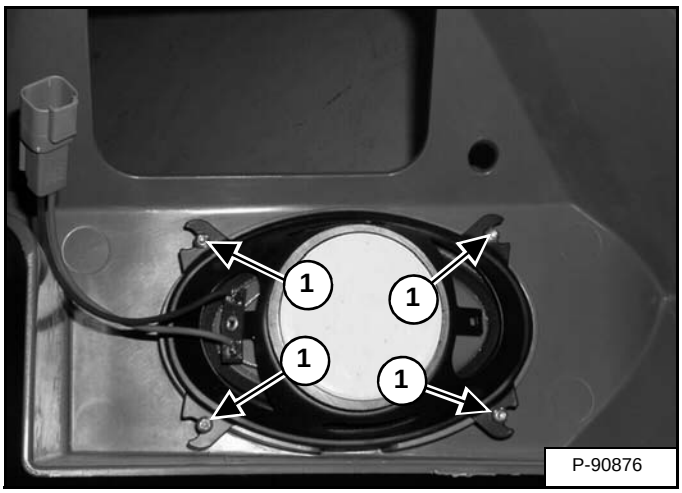
Figure 50-170-9



Remove the nut, washer, and cover, (Item 1) **[Figure 50-170-9]** from the input.

Remove the input from the right side lower panel.

Figure 50-170-10



Remove the four screws (Item 1) **[Figure 50-170-10]** and remove the speaker from the right side lower panel.

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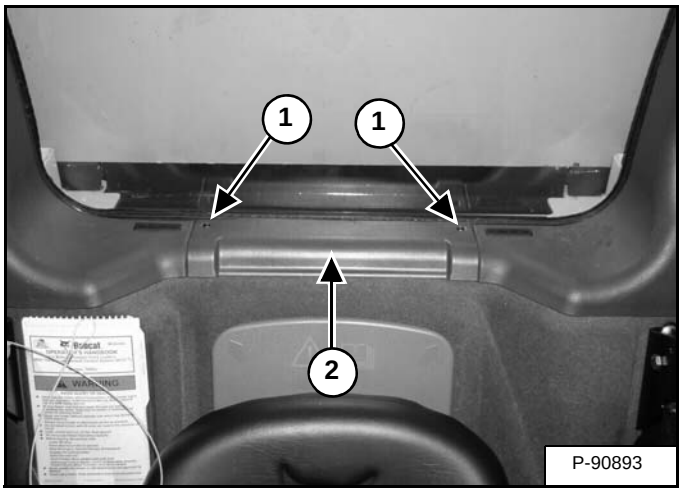
Bobcat®

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HEADLINER

Removal And Installation

Figure 50-180-1

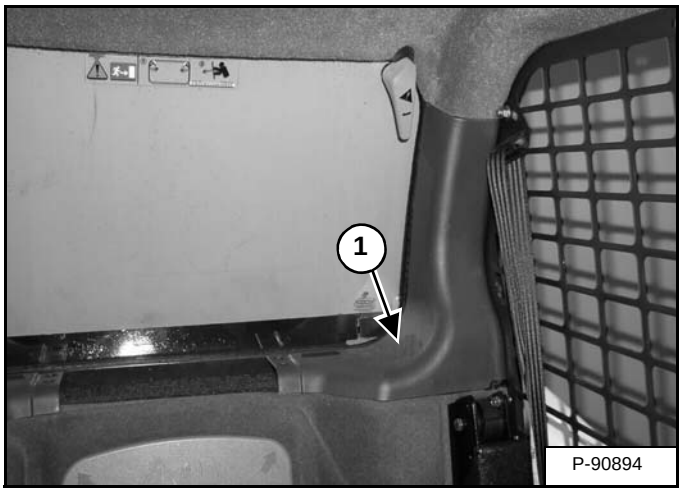


Remove the two screws (Item 1) and the rear shelf (Item 2) **[Figure 50-180-1]** (if equipped).

NOTE: The rear shelf has two panel clips on the underneath side, lift vertically to disengage.

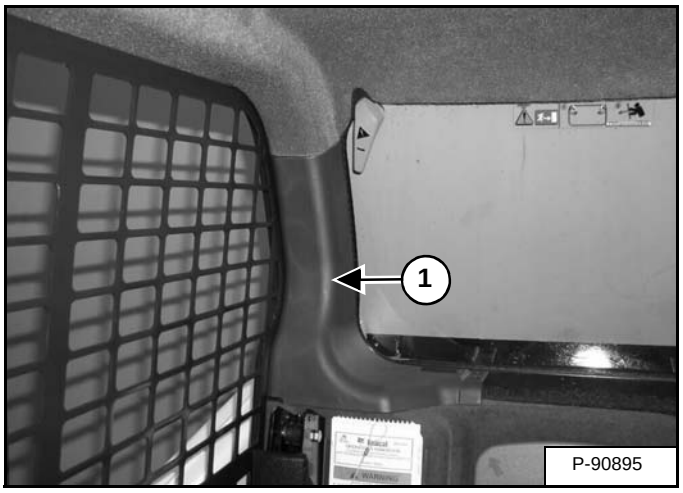
Installation: Tighten the screws to 2,3 N•m (20 in-lb) torque.

Figure 50-180-2



Remove the air duct (Item 1) **[Figure 50-180-2]** (if equipped).

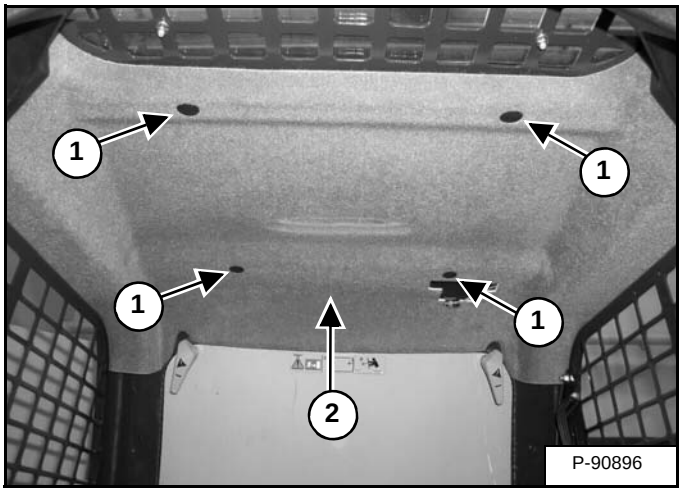
Figure 50-180-3



Remove the air duct (Item 1) **[Figure 50-180-3]** (if equipped).

Remove the cab light (if equipped). (See Cab Light Removal And Installation on Page 60-60-2.)

Figure 50-180-4



Remove the four retainers (Item 1) and remove the headliner (Item 2) **[Figure 50-180-4]**.

Installation: Route the cab light wire harness in the grove on the topside of the headliner (if equipped with HVAC).

NOTE: Replace the retainers if needed.

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CONNECTOR ASSIGNMENTS											
CONN	DESCRIPTION	NUM OF PINS	SHEET	CONN	DESCRIPTION	NUM OF PINS	SHEET	CONN	DESCRIPTION	NUM OF PINS	SHEET
C101	FUEL SHUTOFF SOLENOID	3	6	C421	TILT SPOOL LOCK	3	10	FC1	FUSE CENTER 1		3
C103	TAILGATE	8	4,10,11,13	C422	LIFT SPOOL LOCK	3	10	FC2	FUSE CENTER 2		3
C104	ENGINE COOLANT SENSOR	2	6	C423	BUCKET POSITION	2	13	FRC1	FUSE RELAY CENTER		3,6,7,11,12
C105	HYD CHARGE PRESSURE	3	7	C425	BRAKE SOLENOID	3	7				
C106	ENGINE SPEED SENSOR	2	6	C426	CAN (Remote Start Tool, ACD)	7	5				
C107	ENGINE OIL PRESSURE	3	6	C434-1	LEFT WORKLIGHT 1	2	11				
C108	HYD TEMPERATURE SENDER	2	7	C434-2	LEFT WORKLIGHT 2	2	11	T1	BATT GROUND		4
C109	S/R ADAPTER HARNESS	2	6	C435-1	RIGHT WORKLIGHT 1	2	11	T2	BUZZER GROUND		8
C110	ALTERNATOR	2	6	C435-2	RIGHT WORKLIGHT 2	2	11	T3	FLASHER		13
C112	HYD OIL FILTER SWITCH	2	7	C437	TWO SPEED MAKEUP	2	7	T6	BATT GROUND		4
C126	HORN	2	13	C441	TWO SPEED	2	7	T8	BATT GROUND		4
C129	ACCESSORY	3	9	C446	HYDRAULIC FAN	2	7	T13	BUZZER POWER		8
C209	DOME LIGHT	3	9	C449	LEFT JOYSTICK	4	5	T14	PRE HEATER		6
C212	POWER SOCKET	2	9	C450	RIGHT JOYSTICK	4	5	T15	RIGHT REAR WORK LIGHT(+)		11
C250	DOOR SENSOR	2	9	C479	LEFT PANEL(BLACK)	12	5,8	T16	RIGHT REAR WORK LIGHT(-)		11
C251	WIPER	5	9	C480	LEFT PANEL(GRAY)	12	8	T17	LEFT REAR WORK LIGHT (+)		11
C252	WASHER	2	9	C482	SEATBAR SENSOR	3	9	T18	LEFT REAR WORK LIGHT (-)		11
C277	AIR RIDE SEAT	6	9	C483	TEMP CONTROL SWITCH	3	12	T19	BACKUP ALARM		10
C278	RIGHT SPEAKER	2	9	C486	AC COMPRESSOR	2	12	T20	BACKUP ALARM (GND)		10
C279	LEFT SPEAKER	2	9	C489	ACCESSORY	2	3,4				
C308	BRAKE SOLENOID	2	7	C499	PTOL	4	8				
C350	AC EVAPORATOR SWITCH	2	12	C500	RH KEY SWITCH	6	8				
C355	DLX or STD FUEL HARNESS	6	6,12,13	C503	RH DLX PANEL	6	5,8				
C362	REAR AUX SOLENOID	8	7	C602	LEFT REAR TAIL LIGHT	2	11				
C404	BACKUP ALARM	2	3,10	C603	RIGHT REAR TAIL LIGHT	2	11				
C405	AIR FILTER SWITCH	2	6	C606	POWER BOBTACH OPEN	2	13				
C406	FUEL SENDER	2	6	C607	POWER BOBTACH CLOSE	2	13				
C408	CAB CONNECTOR	48	3-5, 8-13	C611	BLOWER MOTOR	4	12				
C409	RIGHT HANDLE	10	10	C630	THERMOSTAT	3	12	SW1	BRAKE SWITCH		9
C410	LEFT HANDLE	10	10	C635	HEATER VALVE	6	12	SW2	BEACON SWITCH		13
C411	LEFT HANDLE 5 WAY	5	10,13	C667	DOOR KIT	6	9	SW3	HAZARD SWITCH		13
C412	HANDLE(HORN)	2	10,13	C670	EXTERIOR BEACON	6	13	SW4	HAND/FOOT, H/ISO SWITCH		9
C413	REAR ROD	2	7	C676	RADIO	6	9	SW5	POWER BOBTACH SWITCH		13
C414	REAR BASE	2	7					SW6	BUCKET POSITION SWITCH		13
C415	HIGH FLOW SOLENOID	2	7					SW8	FRONT WIPER SWITCH		9
C416	DIVERTER SOLENOID	2	7					SW9	TRAVEL CONTROL SWITCH		8
C417	REAR AUX RELIEF	2	7	J1A	GATEWAY COTROLLER	34		SW10	BLOWER SWITCH		12
C418	FRONT ROD	2	7	J1B	GATEWAY CONTOLLER	26		SW11	AC SWITCH		12
C419	FRONT BASE	2	7	J2A	AUX CONTROLLER	34					
C420	HYD LOCK	2	7	J2B	AUX CONTROLLER	26					

WIRE CATEGORIES FOR COLORS AND NUMBER RANGE			
GROUP DESCRIPTION	GROUP NUMBER RANGE	WIRE COLOR	COLOR CODE
BATT FEED, GENERAL	1000 THROUGH 1499	RED	RED
BATT FEED, FUSED	1000 THROUGH 1499	RED/WHITE	RED/WHT
BATT FEED, SWITCHED	1500 THROUGH 1999	ORANGE/WHITE	RNG/WHT
GROUNDING	2000 THROUGH 2999	BLACK	BLK
MONITORING	3000 THROUGH 3999	LIGHT BLUE	LBL
HYDRAULIC	4000 THROUGH 4999	LIGHT GREEN	LGN
ATTACHMENT CONTROLS	5000 THROUGH 5999	YELLOW	YEL
LIGHTS	6000 THROUGH 6999	PINK	PNK
ACCESSORIES	7000 THROUGH 7999	WHITE	WHT
ENGINE	8000 THROUGH 8999	TAN	TAN
COMMUNICATION	9000 THROUGH 9999	PURPLE	PUR
COMMUNICATION	9000 THROUGH 9999	PURPLE/WHITE	PUR/WHT

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WIRING SCHEMATIC
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(S/N A3NW11001 AND ABOVE

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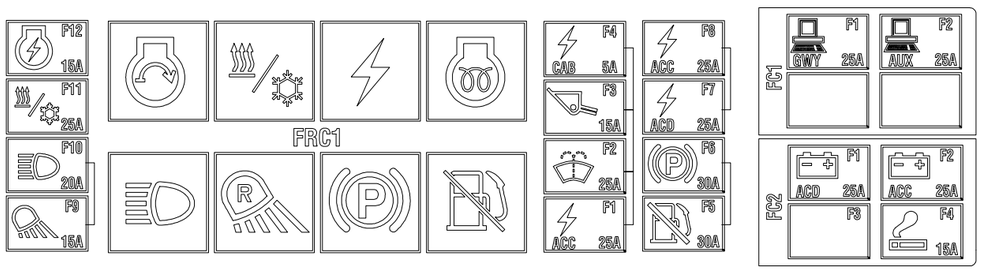
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J1 CONNECTOR ASSIGNMENTS(GATEWAY CONTROLLER)			
PIN	FUNCTION	PIN	FUNCTION
A-1	HYDRAULIC LOCK RETURN	B-1	HYD CHARGE PRESS
A-2	LIFT SPOOL LOCK RETURN	B-2	UNSW BATT
A-3	FUEL PULL RELAY	B-3	UNSW BATT
A-4	SWITCHED POWER OUT RELAY	B-4	FUEL HOLD
A-5	LIGHT 1 RELAY	B-5	LIFT SPOOL LOCK
A-6	GLOW PLUG RELAY	B-6	TRACTION LOCK HOLD
A-7	STARTER RELAY	B-7	TILT SPOOL LOCK
A-8	TRACTION PULL RELAY	B-8	CAN LO 1
A-9	FAN 1 RELAY	B-9	CAN HI 1
A-10	TILT SPOOL LOCK RETURN	B-10	SPOOL LOCK SENSOR 2
A-11	SPARE DIGITAL, ECU SINKS	B-11	SEAT BAR
A-12	SPARE DIGITAL, ECU SOURCES	B-12	FUEL LEVEL
A-13	TRACTION PULL RELAY FDBK	B-13	BICS HYD LOCK HOLD
A-14	GLOW PLUG RELAY FDBK	B-14	CAN HI 2
A-15	ENGINE SPEED	B-15	GROUND P1
A-16	AIR FILTER SWITCH	B-16	GROUND P2
A-17	LIGHT 2 RELAY	B-17	GROUND P3, SENSOR
A-18	FAN 2 RELAY	B-18	ENGINE COOLANT TEMP
A-19	PTOL LED	B-19	FAN 2 OUTPUT
A-20	PTOL SWITCH	B-20	CAN LO 2
A-21	SWITCHED POWER OUT RELAY FDBK	B-21	REMOTE KEY
A-22	STATER RELAY FDBK	B-22	RUN/ENTER
A-23	HYD OIL FILTER SW2	B-23	SENSOR SUPPLY 8V
A-24	START ENGINE	B-24	SENSOR SUPPLY 5V
A-25	ENGINE OIL PRESS	B-25	TWO SPEED MAKEUP
A-26	SPARE	B-26	TWO SPEED COIL
A-27	SPARE		
A-28	LIGHT 2 RELAY FDBK		
A-29	FAN 1 RELAY FDBK		
A-30	FUEL PULL RELAY FDBK		
A-31	LIGHT 1 RELAY FDBK		
A-32	HYD OIL TEMP		
A-33	SPARE ANALOG		
A-34	HYD OIL FILTER SW1		

J2 CONNECTOR ASSIGNMENTS(AUXILLIARY CONTROLLER)			
PIN	FUNCTION	PIN	FUNCTION
A-1	FRONT AUX (F) RETURN	B-1	
A-2	REAR AUX (F) RETURN	B-2	UNSW BATT
A-3	LEFT BLINKER RELAY	B-3	UNSW BATT
A-4	RIGHT BLINKER RELAY	B-4	DIVERTED SOLENOID
A-5	HORN RELAY	B-5	REAR AUX (F)
A-6		B-6	RELIEF SOLENOID
A-7	OUTPUT SPARE	B-7	REAR AUX (M)
A-8		B-8	CAN LO 1
A-9		B-9	CAN HI 1
A-10	REAR AUX (M) RETURN	B-10	
A-11	LH PADDLE RIGHT	B-11	
A-12	LH PADDLE LEFT	B-12	
A-13	RH RIGHT BUTTON UP	B-13	FRONT AUX (F)
A-14	DIGITAL INPUT SPARE	B-14	CAN HI 2
A-15		B-15	GROUND
A-16		B-16	GROUND
A-17		B-17	HANDLE POT GND
A-18	FRONT AUX (M) RETURN	B-18	RH PVM POT SIGNAL
A-19		B-19	FRONT AUX (M)
A-20	LH FLOAT BUTTON	B-20	CAN LO 2
A-21	HYDRAULIC DETENT	B-21	RH TRIGGER
A-22	LH RIGHT BUTTON DOWN	B-22	SWITCHED POWER
A-23	RH CENTER BUTTON	B-23	HANDLE POT POWER
A-24	DIGITAL INPUT SPARE	B-24	
A-25		B-25	BUCKET POSITION (SPARE)
A-26	HIGH FLOW RETURN	B-26	HIGH FLOW
A-27	BUCKET POSITION(SPARE) RETURN		
A-28	LH RIGHT BUTTON		
A-29	RH RIGHT BUTTON DOWN		
A-30	RH LEFT UP		
A-31	RH LEFT DOWN		
A-32			
A-33			
A-34	DIGITAL INPUT SPARE		

HARNESS PART NUMBER	
MAIN FRAME	7174782
STD CAB	7165991
DLX CAB	7176098
DLX FUEL	7175293
STD FUEL	7149219
DOOR	7155024
S/R	6733370
TAILGATE DOM	7175271
TAILGATE EUR	7175287
2 SPD ADP	7159366
BACKUP ALARM	7175017
BRAKE ADAPTER	7165061



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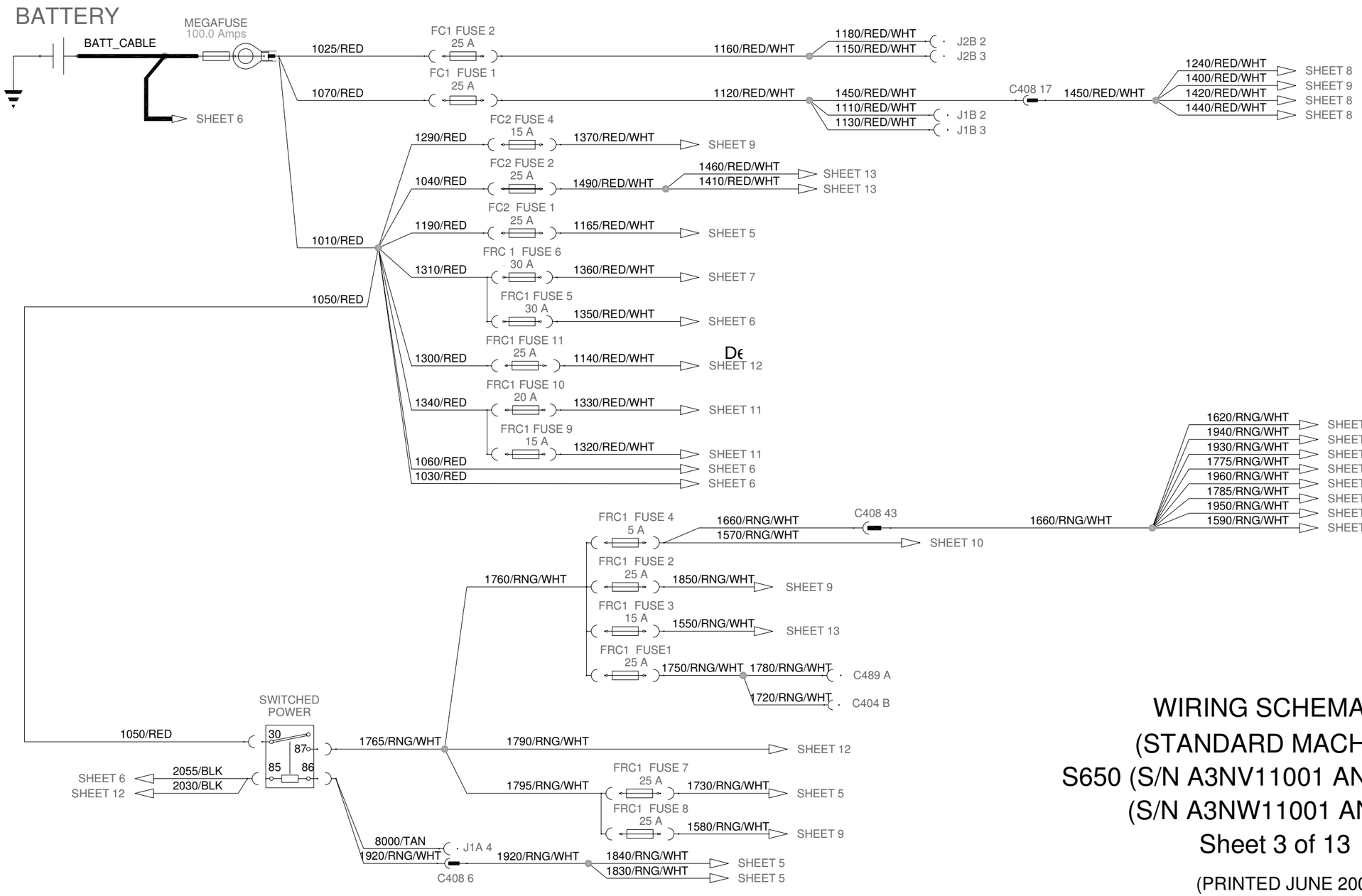
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POWER

WIRE CATEGORIES FOR COLORS AND NUMBER RANGE			
GROUP DESCRIPTION	GROUP NUMBER RANGE	WIRE COLOR	COLOR CODE
BATT FEED, GENERAL	1000 THROUGH 1499	RED	RED
BATT FEED, FUSED	1000 THROUGH 1499	RED/WHITE	RED/WHT
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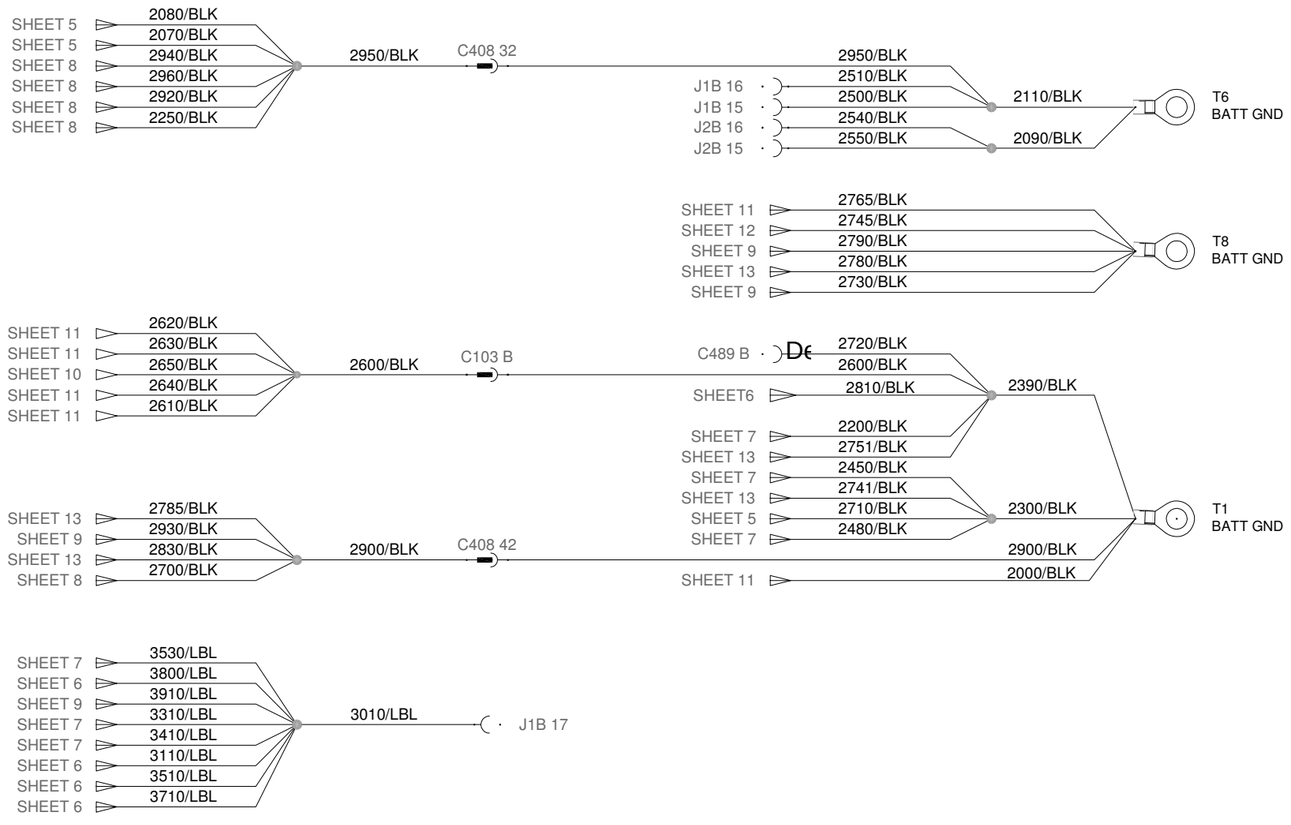
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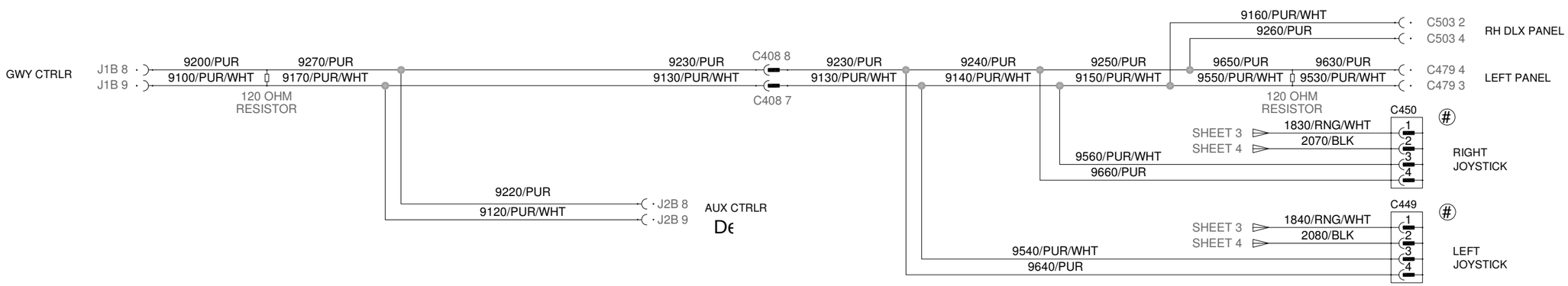
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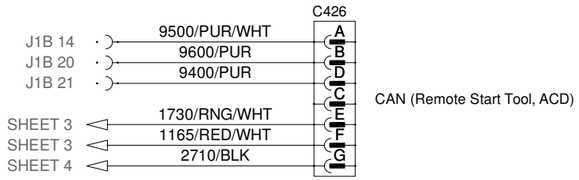
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CAN BUS





CONNECTOR DOES NOT EXIST IN 716599

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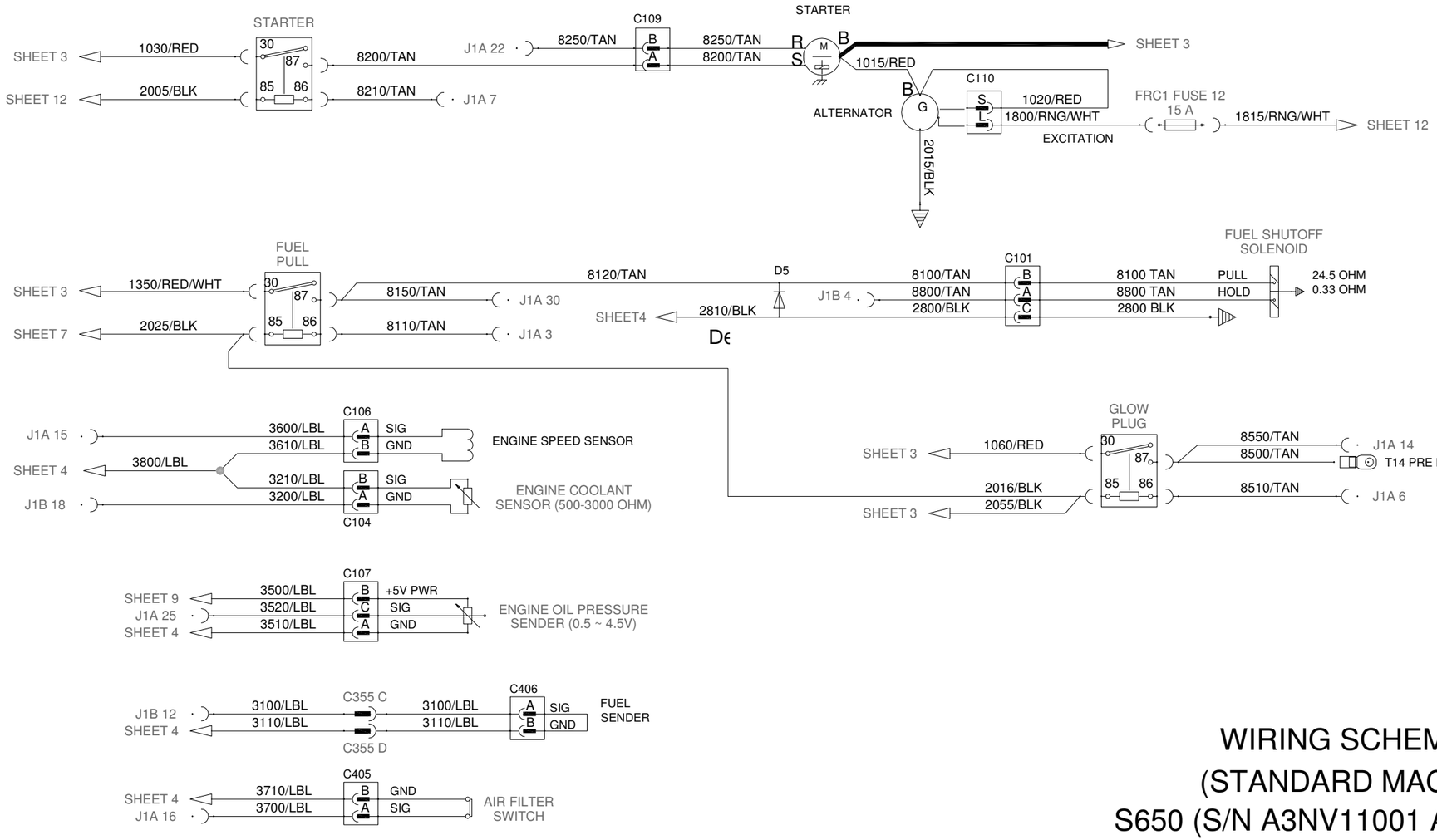
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ENGINE



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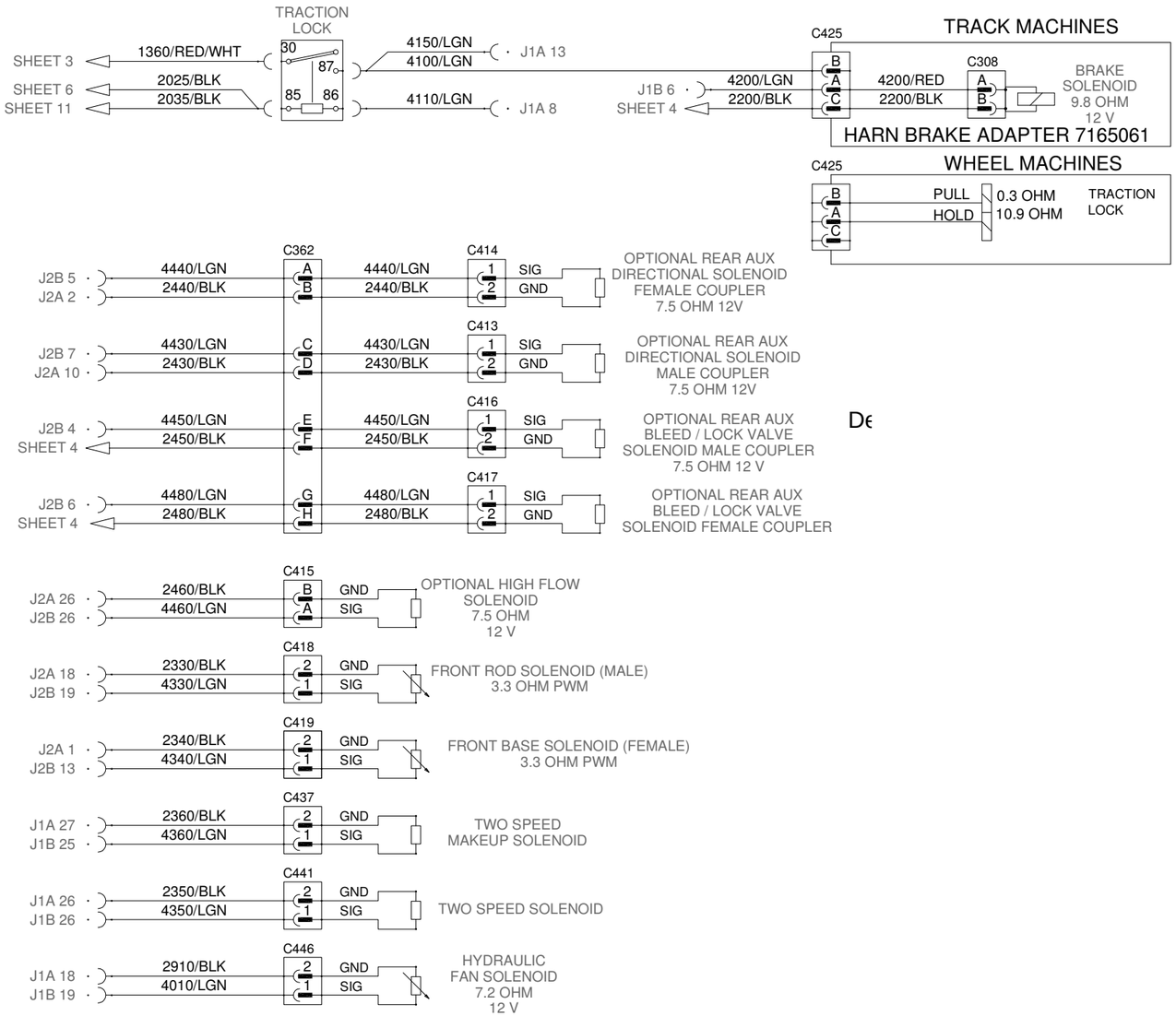
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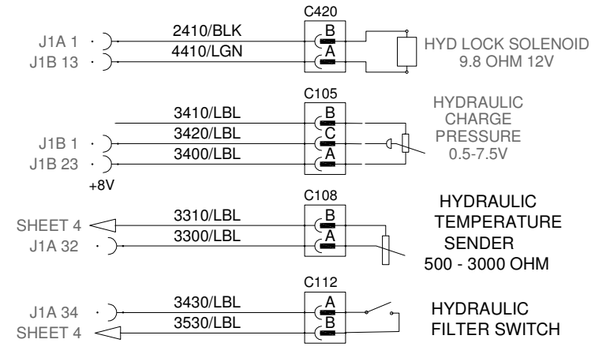
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ENGINE	8000 THROUGH 8999	TAN	TAN
COMMUNICATION	9000 THROUGH 9999	PURPLE	PUR
COMMUNICATION	9000 THROUGH 9999	PURPLE/WHITE	PUR/WHT

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HYDRAULICS





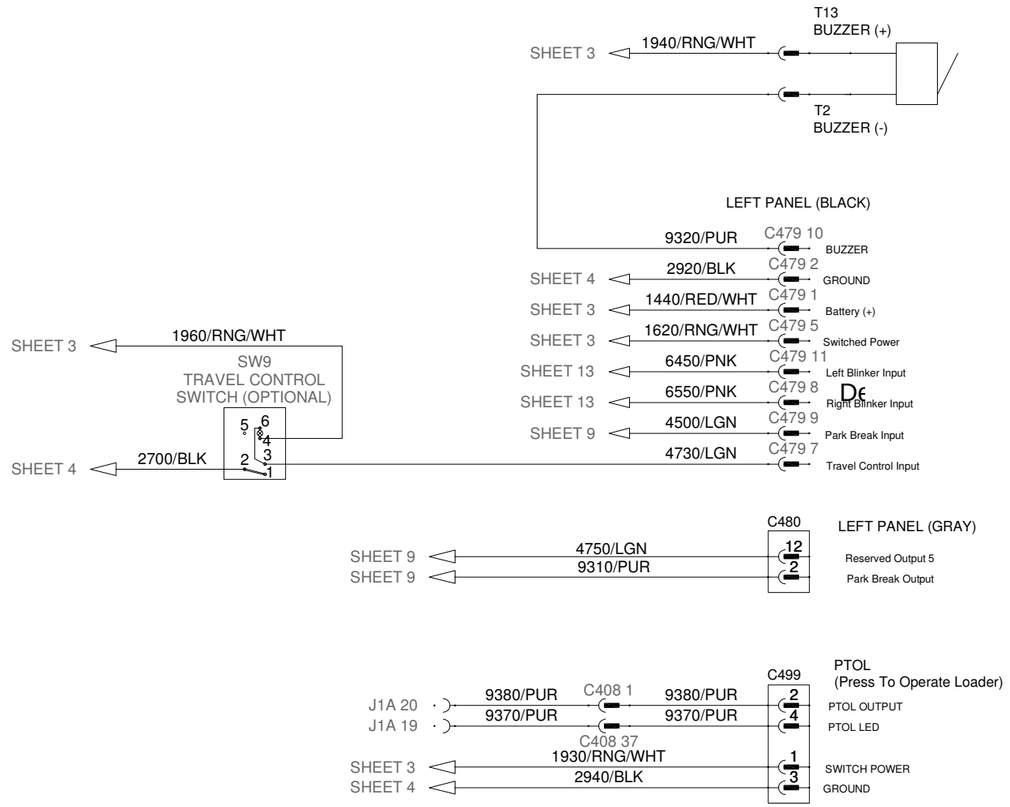
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(STANDARD MACHINE)
S650 (S/N A3NV11001 AND ABOVE)
(S/N A3NW11001 AND ABOVE)
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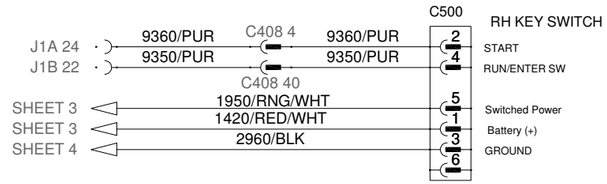
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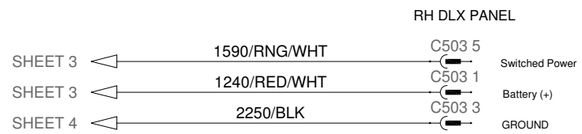
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WIRE CATEGORIES FOR COLORS AND NUMBER RANGE			
GROUP DESCRIPTION	GROUP NUMBER RANGE	WIRE COLOR	COLOR CODE
BATT FEED, GENERAL	1000 THROUGH 1499	RED	RED
BATT FEED, FUSED	1000 THROUGH 1499	RED/WHITE	RED/WHT
BATT FEED, SWITCHED	1500 THROUGH 1999	ORANGE/WHITE	RNG/WHT
GROUNDING	2000 THROUGH 2999	BLACK	BLK
MONITORING	3000 THROUGH 3999	LIGHT BLUE	LBL
HYDRAULIC	4000 THROUGH 4999	LIGHT GREEN	LGN
ATTACHMENT CONTROLS	5000 THROUGH 5999	YELLOW	YEL
LIGHTS	6000 THROUGH 6999	PINK	PNK
ACCESSORIES	7000 THROUGH 7999	WHITE	WHT
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CAB DISPLAY

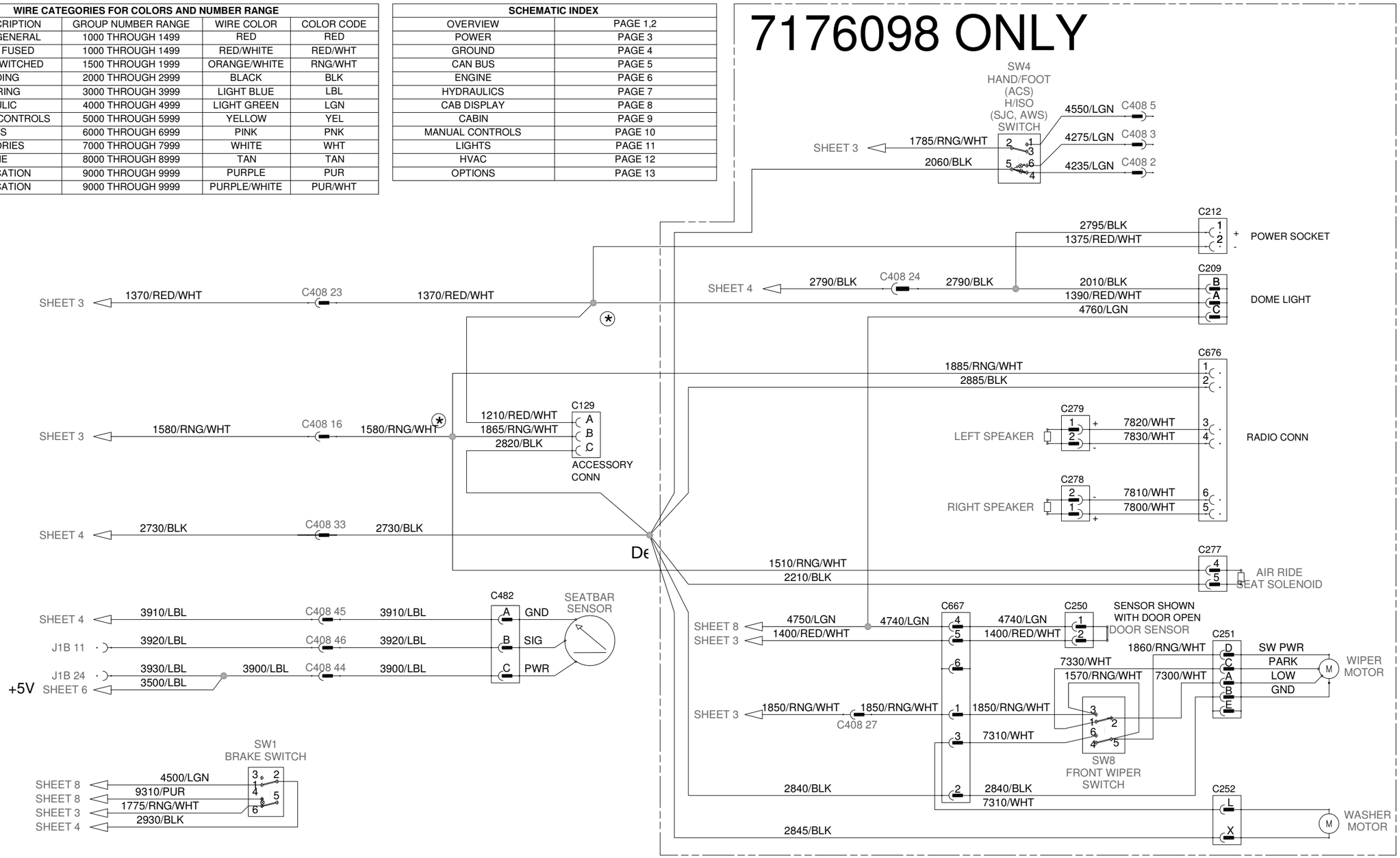
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7165991 Standard Cab Harness
7176098 Deluxe Cab Harness

WIRING SCHEMATIC
(STANDARD MACHINE)
S650 (S/N A3NV11001 AND ABOVE)
(S/N A3NW11001 AND ABOVE)

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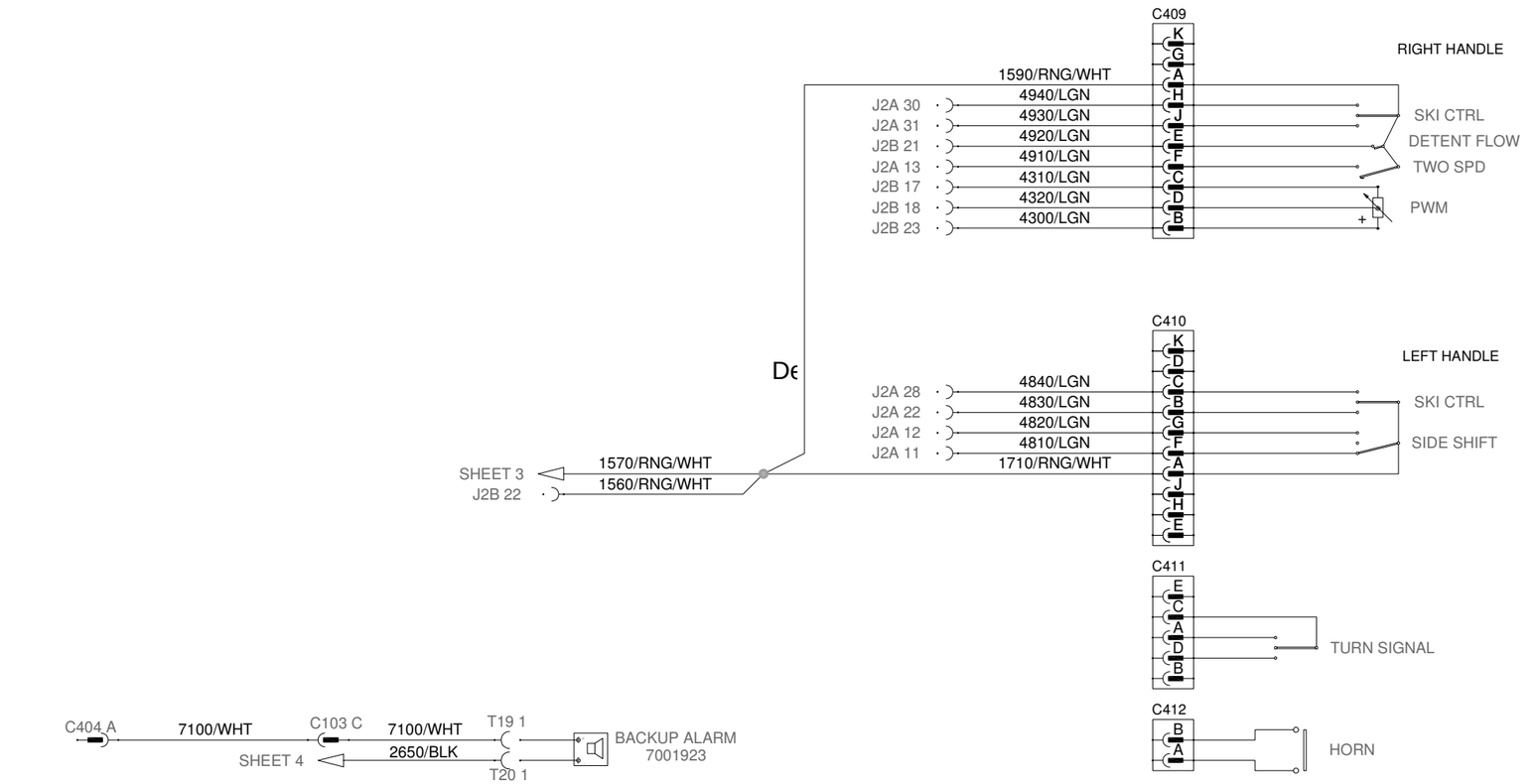
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* SPLICE DOES NOT EXIST IN 7165991

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MANUAL CONTROLS



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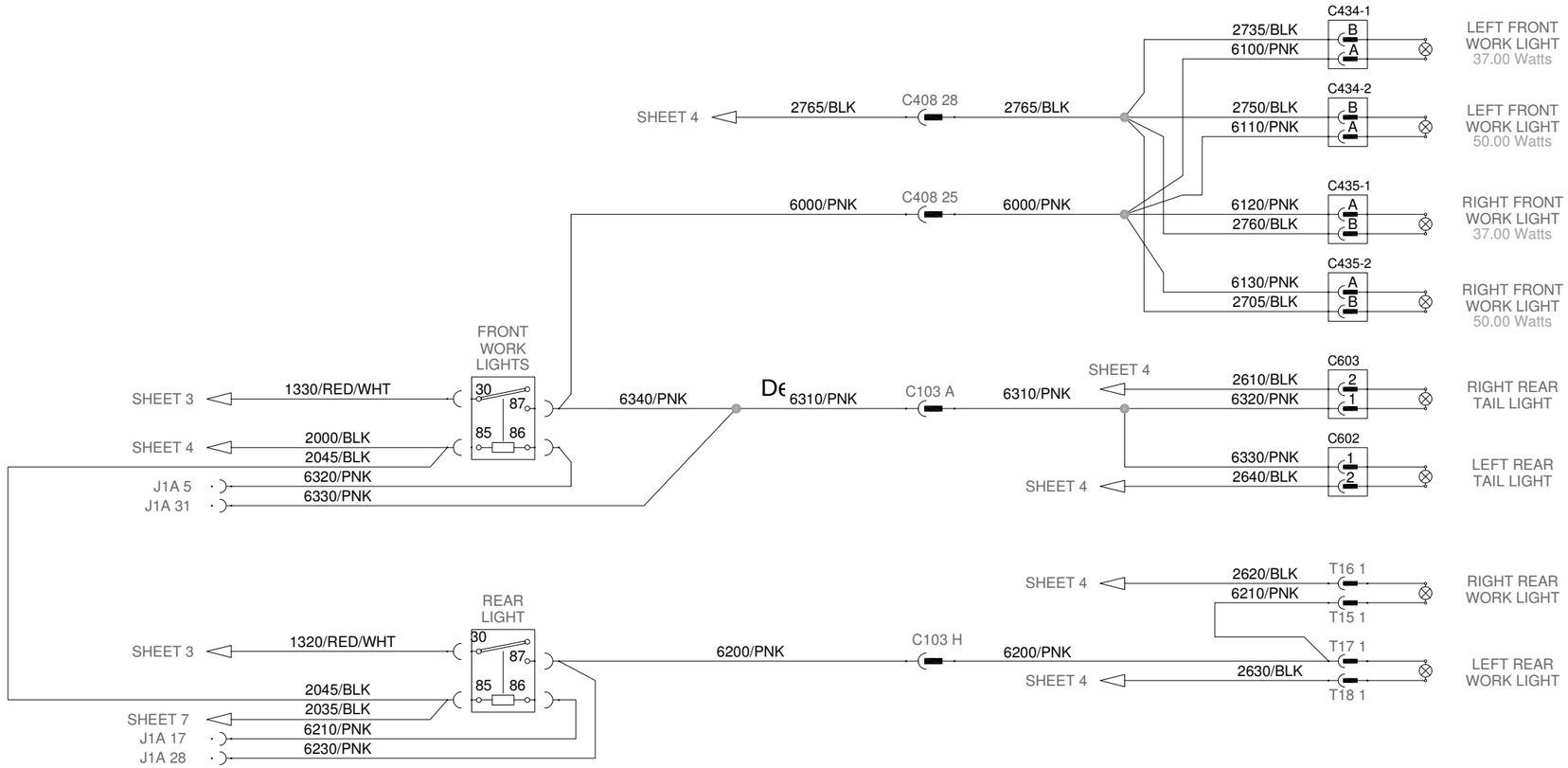
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LIGHTS



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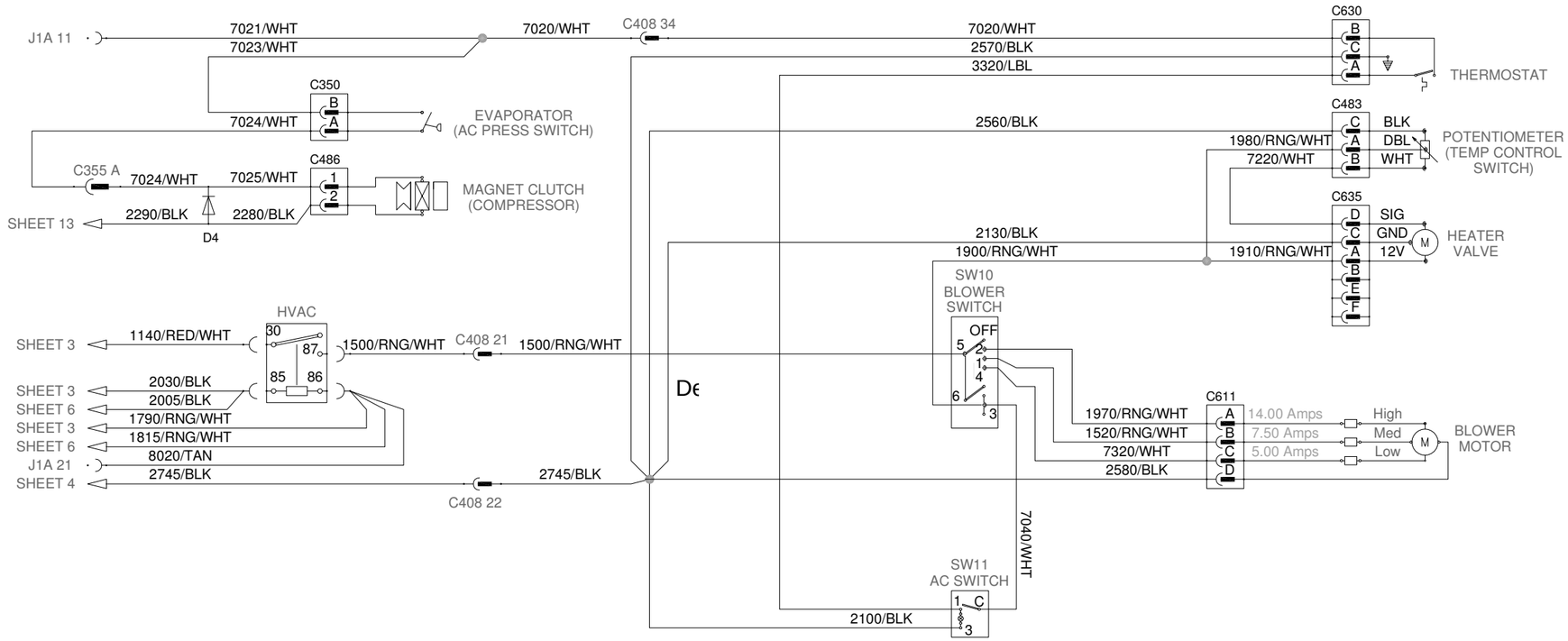
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HVAC



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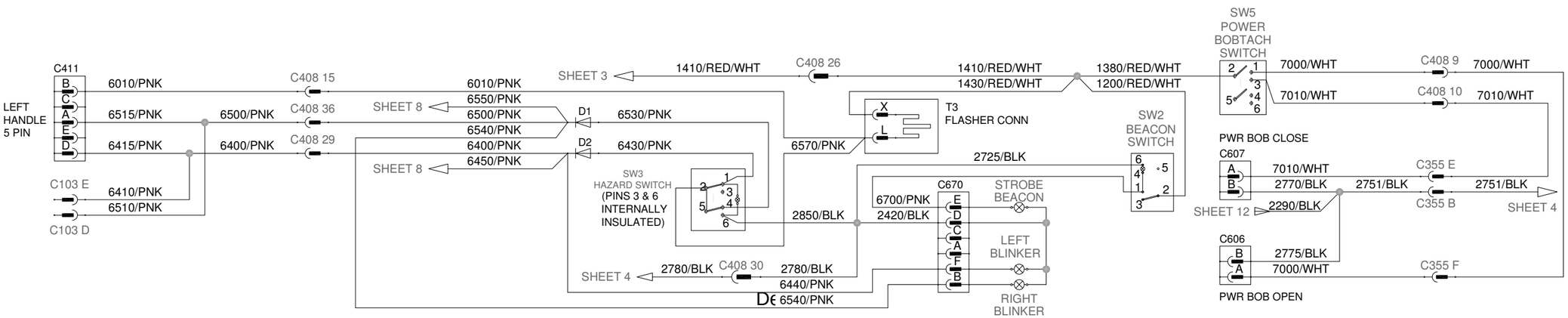
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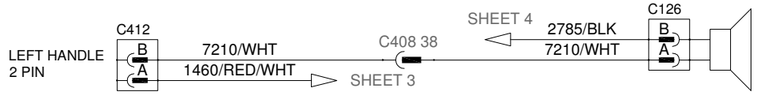
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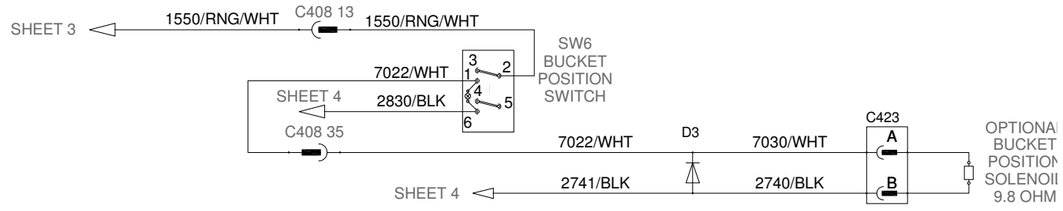
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OPTIONS







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CONNECTOR ASSIGNMENTS

CONN	DESCRIPTION	NUM OF PINS	SHEET	CONN	DESCRIPTION	NUM OF PINS	SHEET	CONN	DESCRIPTION	NUM OF PINS	SHEET
C101	FUEL SHUTOFF SOLENOID	3	6	C421	TILT SPOOL LOCK	3	10	J1A	GATEWAY COTROLLER	34	
C103	TAILGATE	8	4,10,11,13	C422	LIFT SPOOL LOCK	3	10	J1B	GATEWAY CONTOLLER	26	
C104	ENGINE COOLANT SENSOR	2	6	C423	BUCKET POSITION	2	13	J2A	AUX CONTROLLER	34	
C105	HYD CHARGE PRESSURE	3	7	C425	BRAKE SOLENOID	3	7	J2B	AUX CONTROLLER	26	
C106	ENGINE SPEED SENSOR	2	6	C426	CAN (Remote Start Tool, ACD)	7	5	J1-ACS	ACS CONTROLLER	8	
C107	ENGINE OIL PRESSURE	3	6	C434-1	LEFT WORKLIGHT 1	2	11	J2-ACS	ACS CONTROLLER	10	
C108	HYD TEMPERATURE SENDER	2	7	C434-2	LEFT WORKLIGHT 2	2	11	J3-ACS	ACS CONTROLLER	10	
C109	S/R ADAPTER HARNESS	2	6	C435-1	RIGHT WORKLIGHT 1	2	11	J5	DRIVE CONTROLLER	50	
C110	ALTERNATOR	2	6	C435-2	RIGHT WORKLIGHT 2	2	11				
C112	HYD OIL FILTER SWITCH	2	7	C437	TWO SPEED MAKEUP	2	7				
C126	HORN	2	13	C441	TWO SPEED	2	7	FC1	FUSE CENTER 1		3
C129	ACCESSORY	3	9	C446	HYDRAULIC FAN	2	7	FC2	FUSE CENTER 2		3
C209	DOME LIGHT	3	9	C449	LEFT JOYSTICK	4	5,15	FRC1	FUSE RELAY CENTER		3,6,7,11,12
C212	POWER SOCKET	2	9	C450	RIGHT JOYSTICK	4	5,15				
C250	DOOR SENSOR	2	9	C459	LEFT JOYSTICK	4	15				
C251	WIPER	5	9	C460	RIGHT JOYSTICK	4	15	T1	BATT GROUND		4
C252	WASHER	2	9	C479	LEFT PANEL(BLACK)	12	5,8	T2	BUZZER GROUND		8
C277	AIR RIDE SEAT	6	9	C480	LEFT PANEL(GRAY)	12	8	T3	FLASHER		13
C278	RIGHT SPEAKER	2	9	C482	SEATBAR SENSOR	3	9	T6	BATT GROUND		4
C279	LEFT SPEAKER	2	9	C483	TEMP CONTROL SWITCH	3	12	T8	BATT GROUND		4
C308	BRAKE SOLENOID	2	7	C486	AC COMPRESSOR	2	12	T13	BUZZER POWER		8
C350	AC EVAPORATOR SWITCH	2	12	C489	ACCESSORY	2	3,4	T14	PRE HEATER		6
C355	DLX or STD FUEL HARNESS	6	6,12,13	C492	ACS/SJC/AWS 1	8	3,5,9,14,15	T15	RIGHT REAR WORK LIGHT(+)		11
C362	REAR AUX SOLENOID	8	7	C493	ACS/SJC/AWS 2	4	3,4,14,15	T16	RIGHT REAR WORK LIGHT(-)		11
C404	BACKUP ALARM	2	3,10	C497	SJC HORN/BLINKER	3	13	T17	LEFT REAR WORK LIGHT (+)		11
C405	AIR FILTER SWITCH	2	6	C499	PTOL	4	8	T18	LEFT REAR WORK LIGHT (-)		11
C406	FUEL SENDER	2	6	C500	RH KEY SWITCH	6	8	T19	BACKUP ALARM		10
C408	CAB CONNECTOR	48	3-5, 8-13	C503	RH DLX PANEL	6	5,8	T20	BACKUP ALARM (GND)		10
C409	RIGHT HANDLE	10	10	C602	LEFT REAR TAIL LIGHT	2	11				
C410	LEFT HANDLE	10	10	C603	RIGHT REAR TAIL LIGHT	2	11				
C411	LEFT HANDLE 5 WAY	5	10,13	C606	POWER BOBTACH OPEN	2	13	SW1	BRAKE SWITCH		9
C412	HANDLE(HORN)	2	10,13	C607	POWER BOBTACH CLOSE	2	13	SW2	BEACON SWITCH		13
C413	REAR ROD	2	7	C611	BLOWER MOTOR	4	12	SW3	HAZARD SWITCH		13
C414	REAR BASE	2	7	C630	THERMOSTAT	3	12	SW4	HAND/FOOT, H/ISO SWITCH		9
C415	HIGH FLOW SOLENOID	2	7	C635	HEATER VALVE	6	12	SW5	POWER BOBTACH SWITCH		13
C416	DIVERTER SOLENOID	2	7	C667	DOOR KIT	6	9	SW6	BUCKET POSITION SWITCH		13
C417	REAR AUX RELIEF	2	7	C670	EXTERIOR BEACON	6	13	SW8	FRONT WIPER SWITCH		9
C418	FRONT ROD	2	7	C676	RADIO	6	9	SW9	TRAVEL CONTROL SWITCH		8
C419	FRONT BASE	2	7					SW10	BLOWER SWITCH		12
C420	HYD LOCK	2	7					SW11	AC SWITCH		12

CONNECTOR ASSIGNMENTS (ACS)

CONN	DESCRIPTION	NUM OF PINS	SHEET
C428	TILT ACTUATOR	8	14
C429	LIFT ACTUATOR	8	14
C467	LIFT PEDAL LOCK	3	14
C468	TILT PEDAL LOCK	3	14
C469	TILT HANDLE	3	14
C470	TILT PEDAL	3	14
C471	LIFT PEDAL	3	14
C472	LIFT HANDLE	3	14

CONNECTOR ASSIGNMENTS (SJC)

CONN	DESCRIPTION	NUM OF PINS	SHEET
C536	RIGHT SWASHPLATE	4	15
C537	LEFT SWASHPLATE	4	15
C428	TILT ACTUATOR	8	15
C429	LIFT ACTUATOR	8	15
C453	RIGHT QUAD A DRIVE	4	15
C454	LEFT QUAD DIRVE	4	15
C474	BRAKE LIGHT	1	15
C501	A22 PUMP HARNESS	8	15
C544	LEFT FORWARD DRIVE	2	15
C545	LEFT REVERSE DRIVE	2	15
C546	RIGHT FORWARD DRIVE	2	15
C547	RIGHT REVERSE DRIVE	2	15
C542	LEFT SWASHPLATE	3	15
C543	RIGHT SWASHPLATE	3	15
C707	OBW STOP BRAKE LIGHT	3	15

WIRE CATEGORIES FOR COLORS AND NUMBER RANGE

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J1 CONNECTOR ASSIGNMENTS(GATEWAY CONTROLLER)			
PIN	FUNCTION	PIN	FUNCTION
A-1	HYDRAULIC LOCK RETURN	B-1	HYD CHARGE PRESS
A-2	LIFT SPOOL LOCK RETURN	B-2	UNSW BATT
A-3	FUEL PULL RELAY	B-3	UNSW BATT
A-4	SWITCHED POWER OUT RELAY	B-4	FUEL HOLD
A-5	LIGHT 1 RELAY	B-5	LIFT SPOOL LOCK
A-6	GLOW PLUG RELAY	B-6	TRACTION LOCK HOLD
A-7	STARTER RELAY	B-7	TILT SPOOL LOCK
A-8	TRACTION PULL RELAY	B-8	CAN LO 1
A-9	FAN 1 RELAY	B-9	CAN HI 1
A-10	TILT SPOOL LOCK RETURN	B-10	SPOOL LOCK SENSOR 2
A-11	SPARE DIGITAL, ECU SINKS	B-11	SEAT BAR
A-12	SPARE DIGITAL, ECU SOURCES	B-12	FUEL LEVEL
A-13	TRACTION PULL RELAY FDBK	B-13	BICS HYD LOCK HOLD
A-14	GLOW PLUG RELAY FDBK	B-14	CAN HI 2
A-15	ENGINE SPEED	B-15	GROUND P1
A-16	AIR FILTER SWITCH	B-16	GROUND P2
A-17	LIGHT 2 RELAY	B-17	GROUND P3, SENSOR
A-18	FAN 2 RELAY	B-18	ENGINE COOLANT TEMP
A-19	PTOL LED	B-19	FAN 2 OUTPUT
A-20	PTOL SWITCH	B-20	CAN LO 2
A-21	SWITCHED POWER OUT RELAY FDBK	B-21	REMOTE KEY
A-22	STATER RELAY FDBK	B-22	RUN/ENTER
A-23	HYD OIL FILTER SW2	B-23	SENSOR SUPPLY 8V
A-24	START ENGINE	B-24	SENSOR SUPPLY 5V
A-25	ENGINE OIL PRESS	B-25	TWO SPEED MAKEUP
A-26	SPARE	B-26	TWO SPEED COIL
A-27	SPARE		
A-28	LIGHT 2 RELAY FDBK		
A-29	FAN 1 RELAY FDBK		
A-30	FUEL PULL RELAY FDBK		
A-31	LIGHT 1 RELAY FDBK		
A-32	HYD OIL TEMP		
A-33	SPARE ANALOG		
A-34	HYD OIL FILTER SW1		

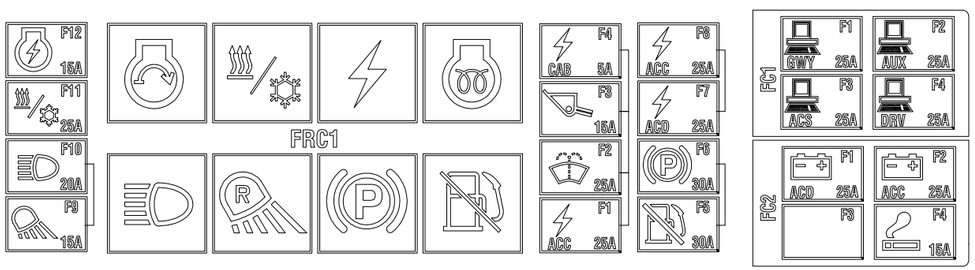
J2 CONNECTOR ASSIGNMENTS(AUXILLIARY CONTROLLER)			
PIN	FUNCTION	PIN	FUNCTION
A-1	FRONT AUX (F) RETURN	B-1	
A-2	REAR AUX (F) RETURN	B-2	UNSW BATT
A-3	LEFT BLINKER RELAY	B-3	UNSW BATT
A-4	RIGHT BLINKER RELAY	B-4	DIVERTED SOLENOID
A-5	HORN RELAY	B-5	REAR AUX (F)
A-6		B-6	RELIEF SOLENOID
A-7	OUTPUT SPARE	B-7	REAR AUX (M)
A-8		B-8	CAN LO 1
A-9		B-9	CAN HI 1
A-10	REAR AUX (M) RETURN	B-10	
A-11	LH PADDLE RIGHT	B-11	
A-12	LH PADDLE LEFT	B-12	
A-13	RH RIGHT BUTTON UP	B-13	FRONT AUX (F)
A-14	DIGITAL INPUT SPARE	B-14	CAN HI 2
A-15		B-15	GROUND
A-16		B-16	GROUND
A-17		B-17	HANDLE POT GND
A-18	FRONT AUX (M) RETURN	B-18	RH PVM POT SIGNAL
A-19		B-19	FRONT AUX (M)
A-20	LH FLOAT BUTTON	B-20	CAN LO 2
A-21	HYDRAULIC DETENT	B-21	RH TRIGGER
A-22	LH RIGHT BUTTON DOWN	B-22	SWITCHED POWER
A-23	RH CENTER BUTTON	B-23	HANDLE POT POWER
A-24	DIGITAL INPUT SPARE	B-24	
A-25		B-25	BUCKET POSITION (SPARE)
A-26	HIGH FLOW RETURN	B-26	HIGH FLOW
A-27	BUCKET POSITION(SPARE) RETURN		
A-28	LH RIGHT BUTTON		
A-29	RH RIGHT BUTTON DOWN		
A-30	RH LEFT UP		
A-31	RH LEFT DOWN		
A-32			
A-33			
A-34	DIGITAL INPUT SPARE		

J5 DRIVE CONTROLLER	
PIN	FUNCTION
1	SAFETY IN
2	TWO SPEED SWITCH
3	SPARE DIGITAL INPUT 2
4	H PAT SWITCH
5	ISO PAT SWITCH
6	ISO LITE
7	L SWASH PLATE ANGLE
8	R SWASH PLATE ANGLE
9	SPARE ANALOG 4
10	SPARE ANALOG 5
11	L FWD RETURN
12	CAN HIGH
13	LF ANGLE
14	RF ANGLE
15	LR ANGLE
16	H PAT LITE
17	RR ANGLE
18	L JOYSTICK X
19	L JOYSTICK Y
20	R JOYSTICK X
21	L FWD DRIVE
22	CAN LOW
23	R QUAD A DRIVE
24	R QUAD B DRIVE
25	TWO SPEED 1
26	BRAKE LIGHT OUTPUT
27	GROUND
28	GROUND
29	SENSOR GROUND
30	SENSOR SUPPLY 2 +5V
31	L REV DRIVE
32	CAN SHIELD
33	L QUAD A DRIVE
34	L QUAD B DRIVE
35	SAFETY OUT
36	BACKUP ALARM
37	R JOYSTICK Y
38	SPARE ANALOG 1
39	SPARE PWM COIL 7
40	SENSOR SUPPLY 1 +5V
41	L REV RETURN
42	R FWD RETURN
43	R FWD DRIVE
44	R REV DRIVE
45	R REV RETURN
46	TWO SPEED 2
47	UNSWITCHED BATTERY
48	UNSWITCHED BATTERY
49	SPARE PWN COIL 6
50	SWITCHED BATTERY

ACS CONTROLLER					
CONNECTOR J1-ACS		CONNECTOR J2-ACS		CONNECTOR J3-ACS	
PIN	FUNCTION	PIN	FUNCTION	PIN	FUNCTION
A	+5V TO SENSORS	A	LIFT CYLINDER SENSOR-SPARE	A	TILT MOTOR 1
B	SWITCHED POWER	B	FLOAT-SPARE	B	UNSWITCHED POWER
C	HAND/FOOT INPUT	C	RESPONSE SELECTOR-SPARE	C	UNSWITCHED POWER
D	CAN HIGH	D	TILT CYLINDER SENSOR-SPARE	D	LIFT MOTOR 2
E	CAN LOW	E	TILT ACTUATOR FEEDBACK	E	HANDLE ENABLE
F		F	LIFT HANDLE	F	LIFT MOTOR 1
G	GROUND	G	TILT HANDLE	G	PEDAL ENABLE
H	GROUND	H	LIFT ACTUATOR FEEDBACK	H	GROUND
		J	LIFT PEDAL	J	GROUND
		K	TILT PEDAL	K	TILT MOTOR 2

HARNESS PART NUMBER	
MAINFRAME	7175625
STD CAB	7165991
DLX CAB	7176098
DLX FUEL	7175293
STD FUEL	7149219
DOOR	7155024
S/R	6733370
TAILGATE DOM	7175271
TAILGATE EUR	7175287
2 SPD ADP	7159366
ACS	7164144
SJC WHEEL	7159325

HARNESS PART NUMBER	
SJC TRACK	7159458
A22 PUMP	7169309
SUSP JSTK	7163706
BACKUP ALARM	7175017
BRAKE ADAPTER	7165061



WIRING SCHEMATIC
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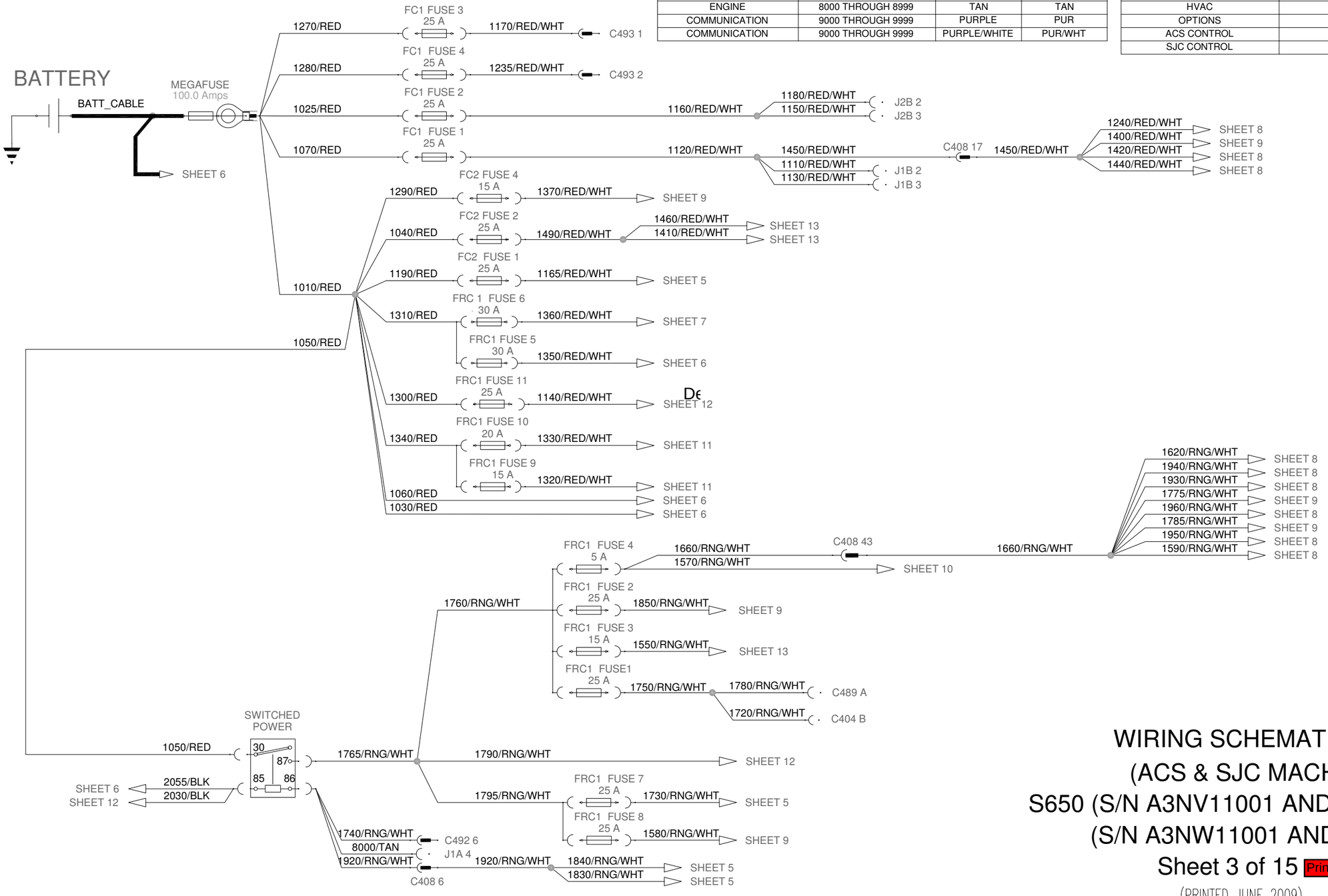
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POWER

WIRE CATEGORIES FOR COLORS AND NUMBER RANGE			
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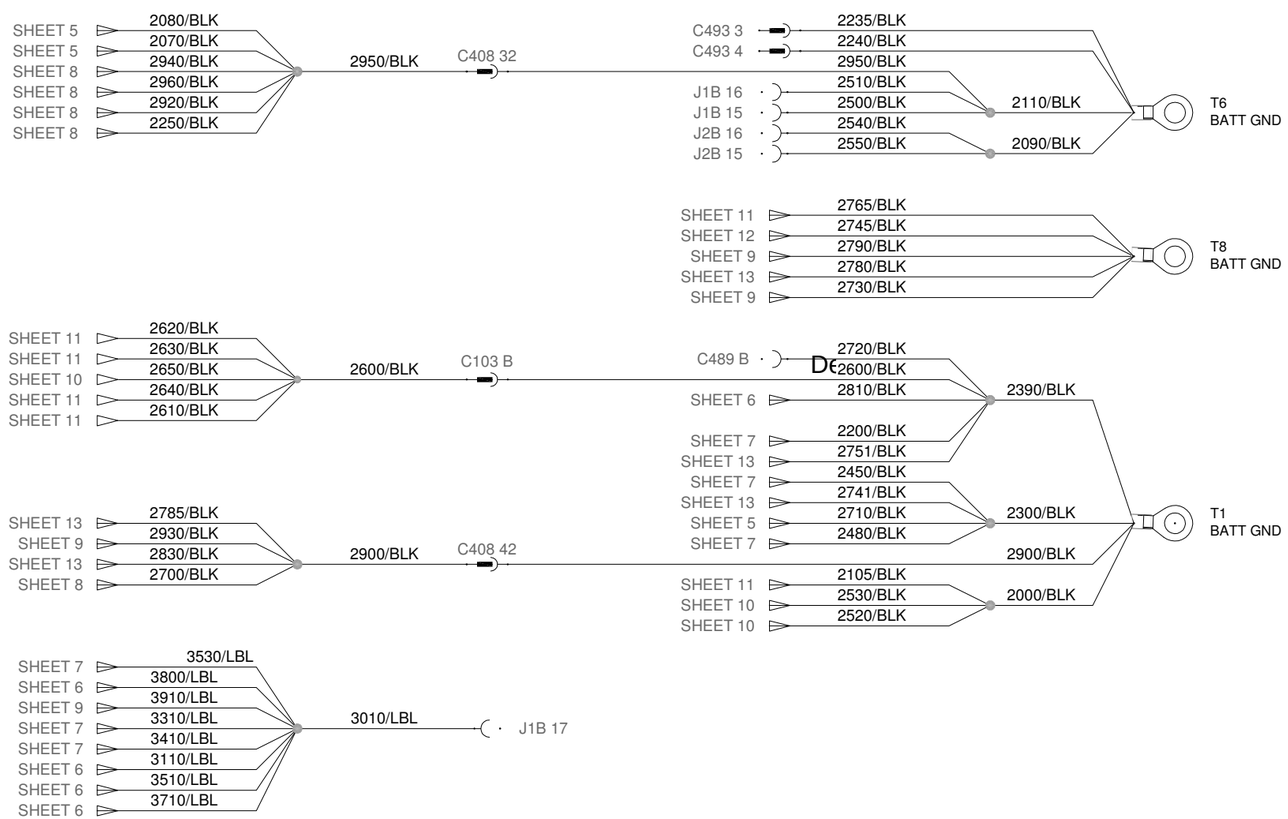
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GROUND



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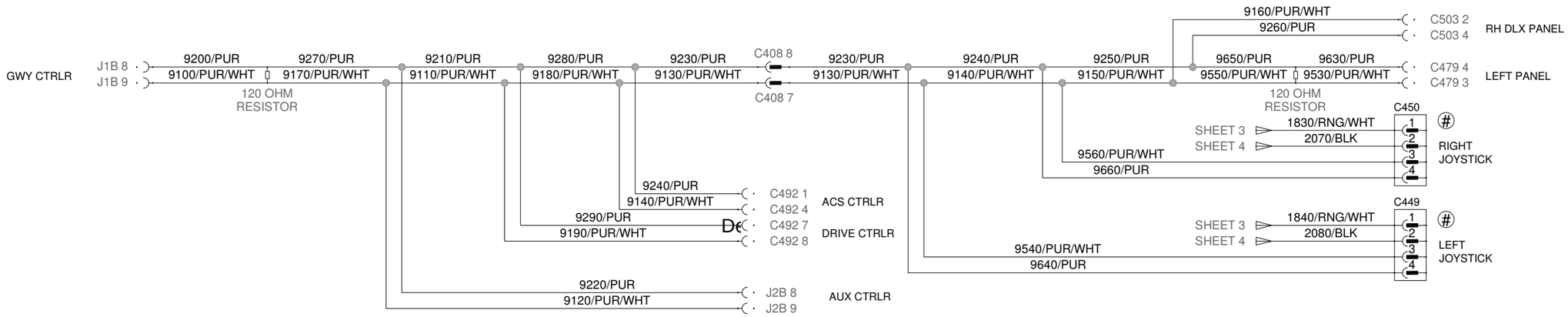
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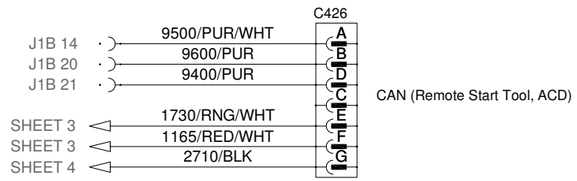
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CAN BUS





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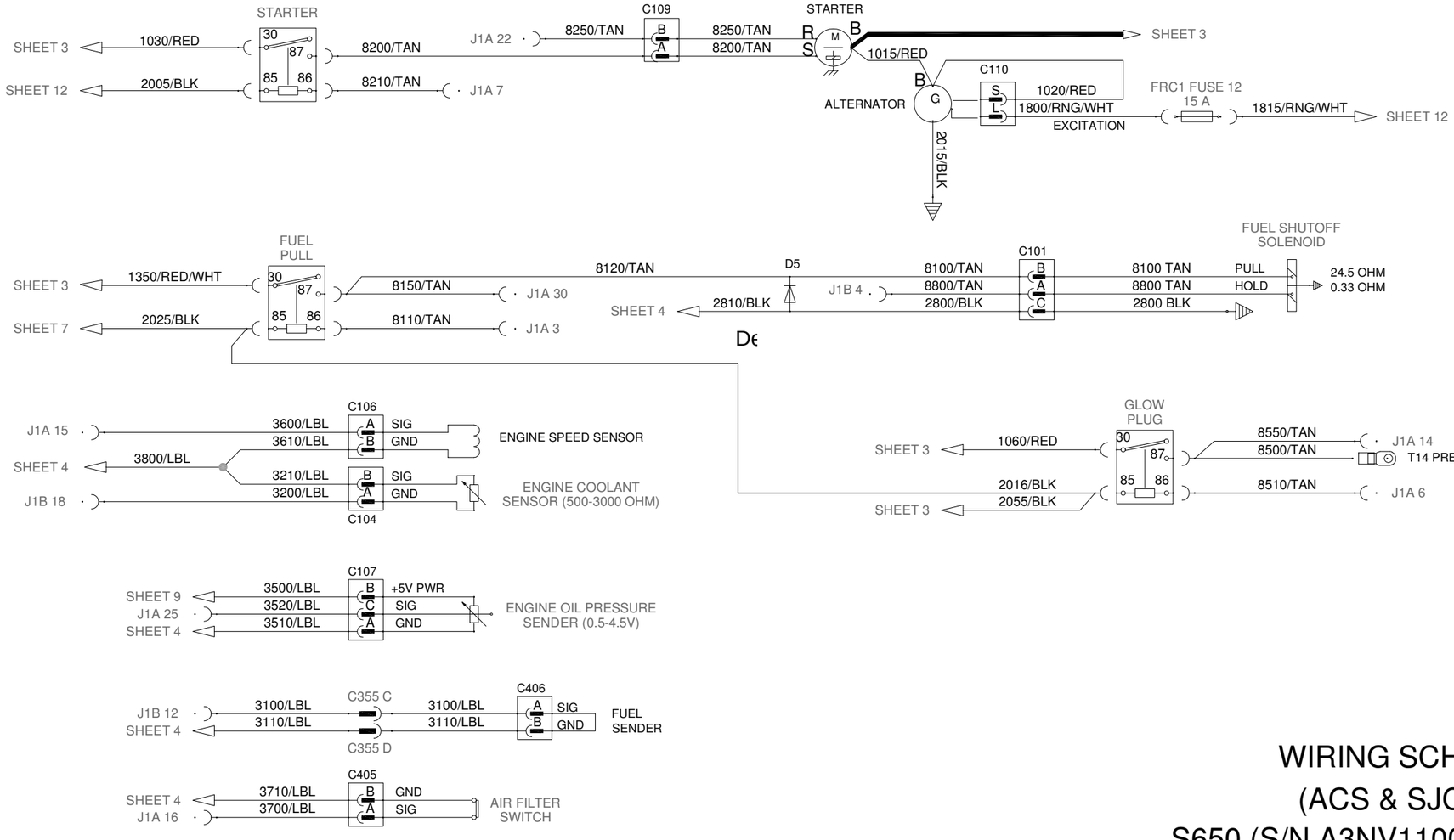
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ENGINE



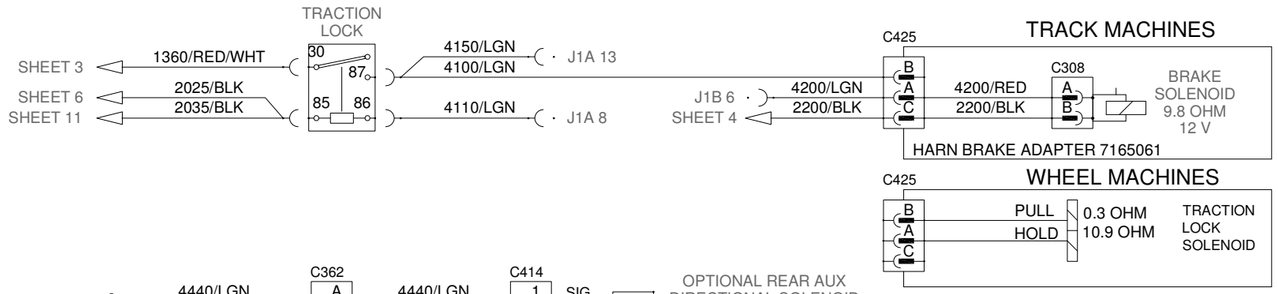
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(S/N A3NW11001 AND ABOVE)
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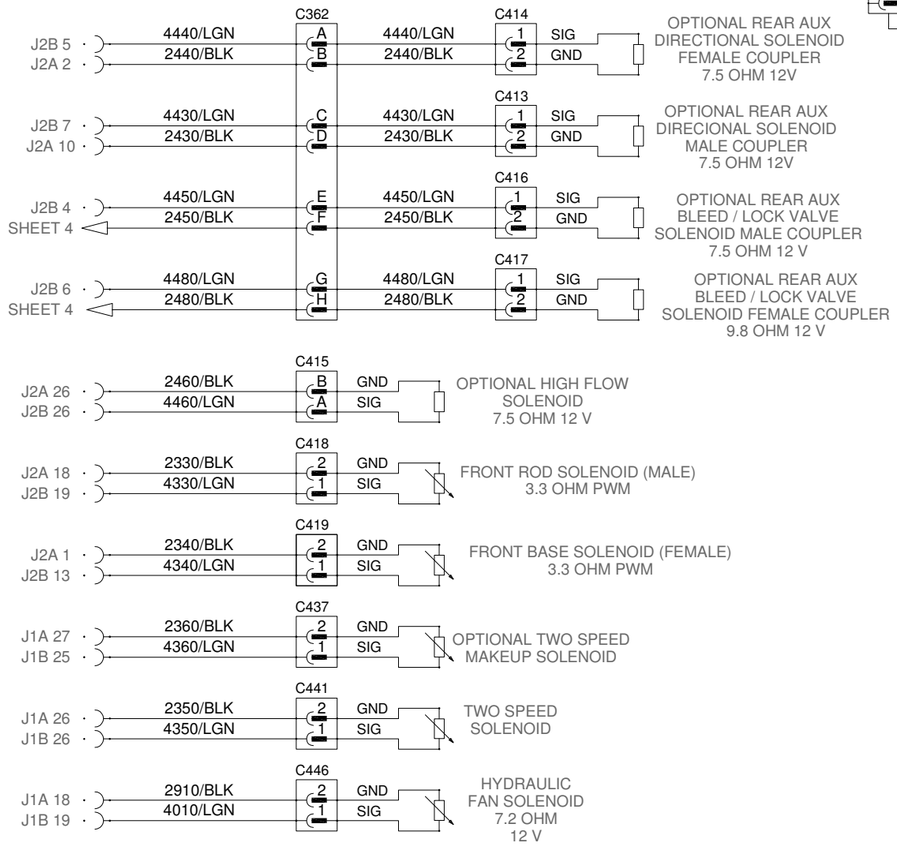
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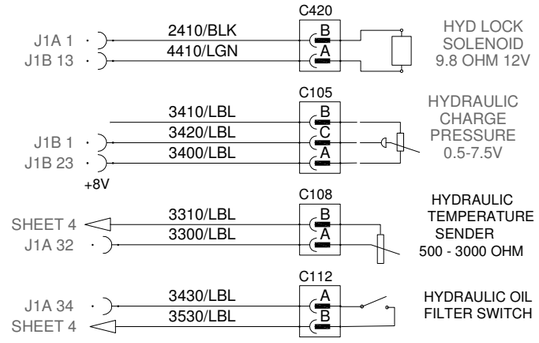
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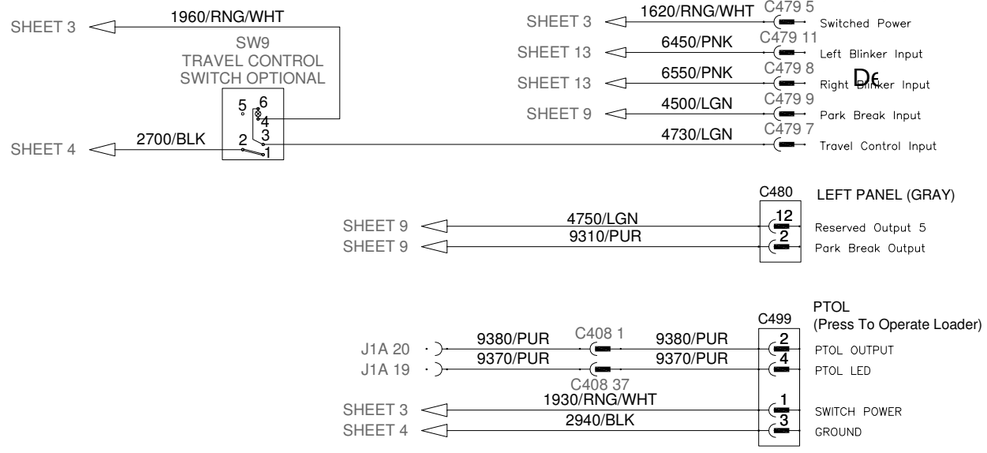
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CAB DISPLAY

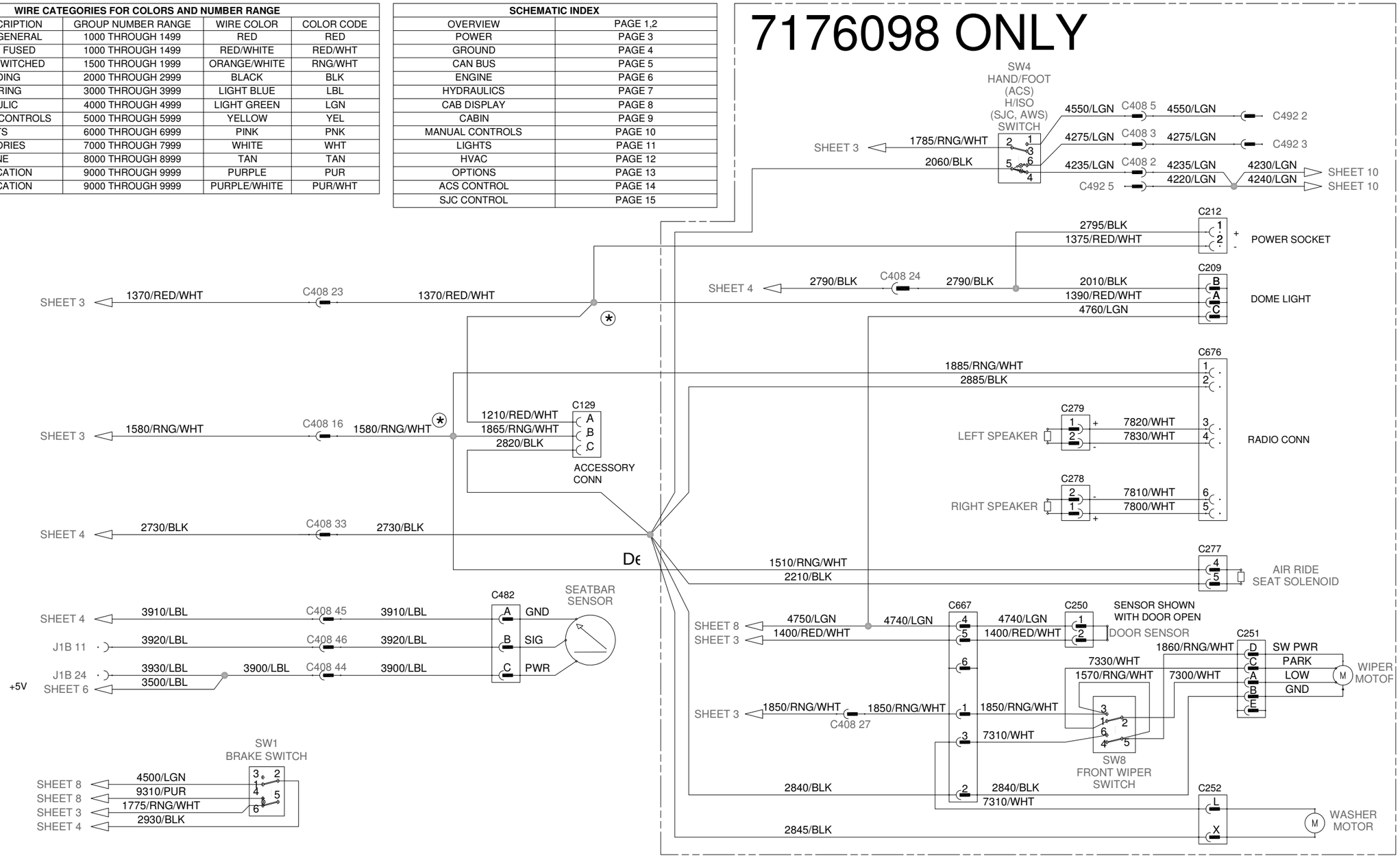
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7165991 Standard Cab
7176098 Deluxe Cab

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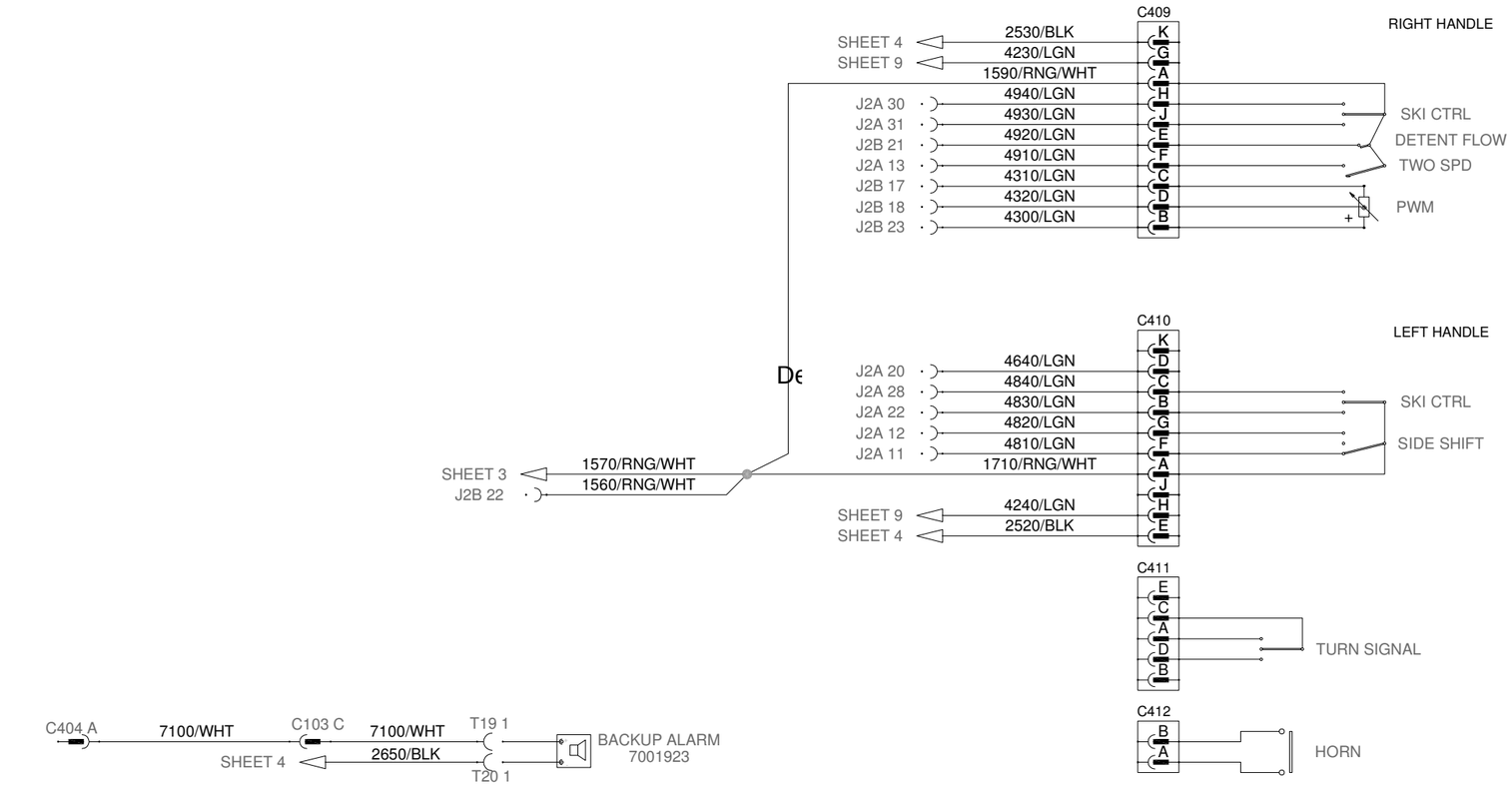
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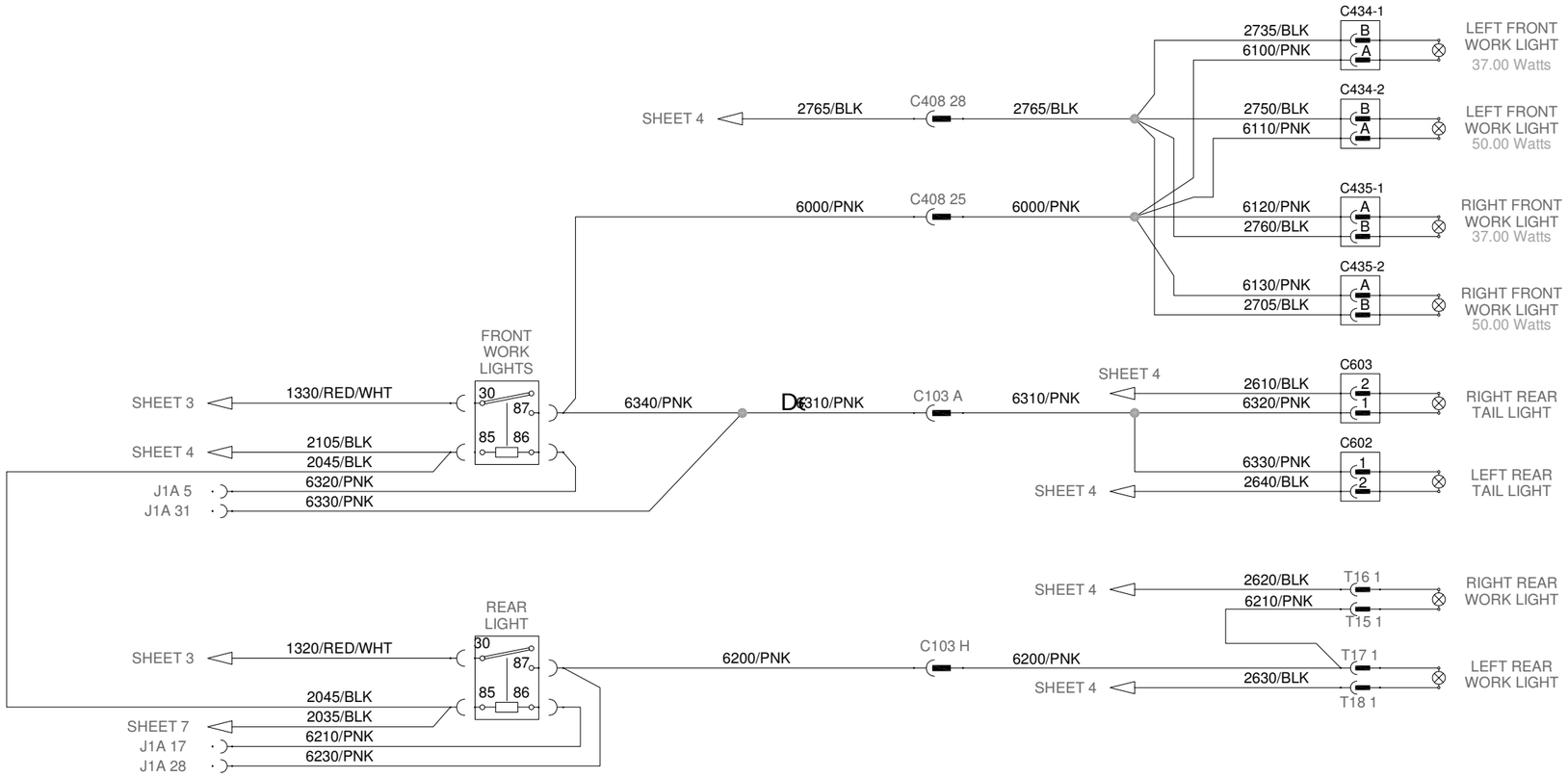
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LIGHTS



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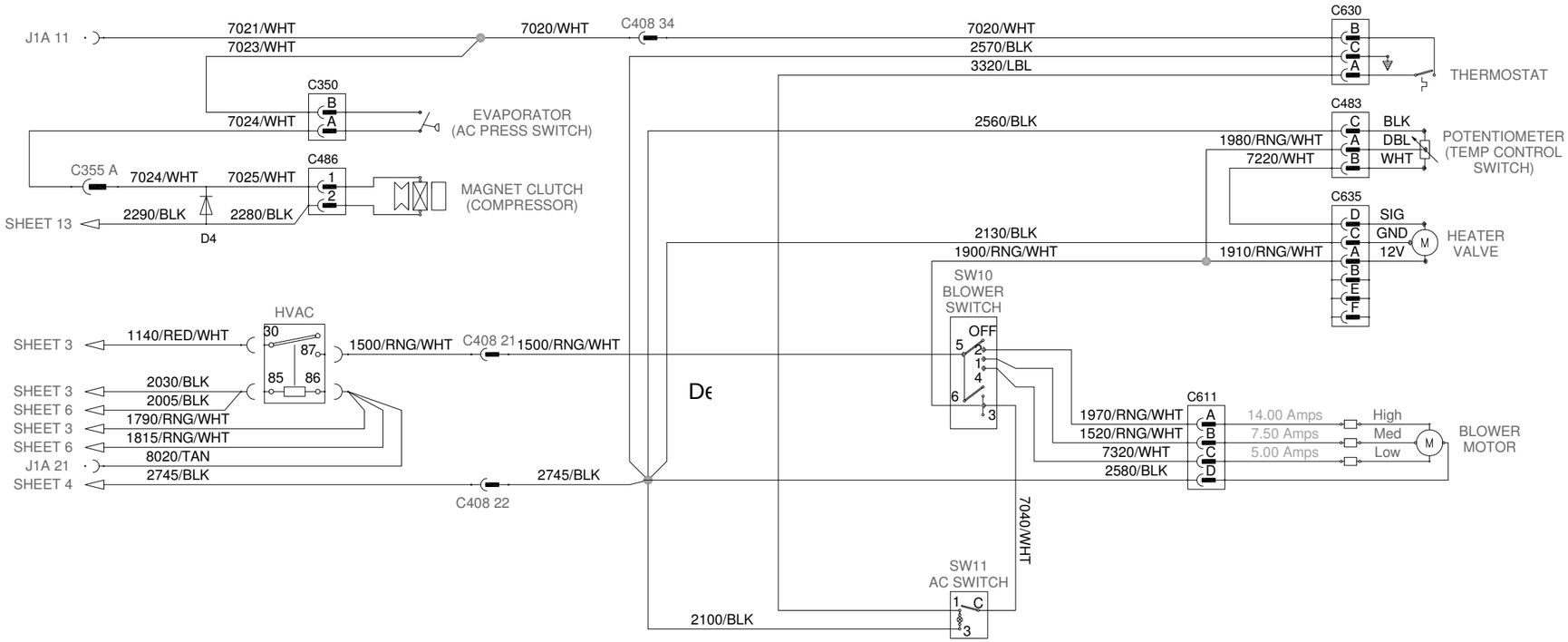
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HVAC



WIRING SCHEMATIC
(ACS & SJC MACHINE)
S650 (S/N A3NV11001 AND ABOVE)
(S/N A3NW11001 AND ABOVE)

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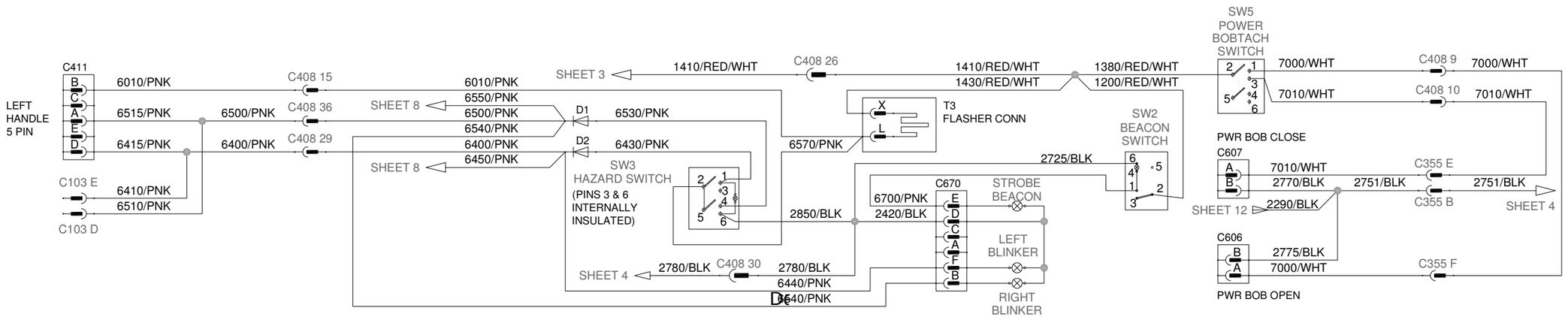
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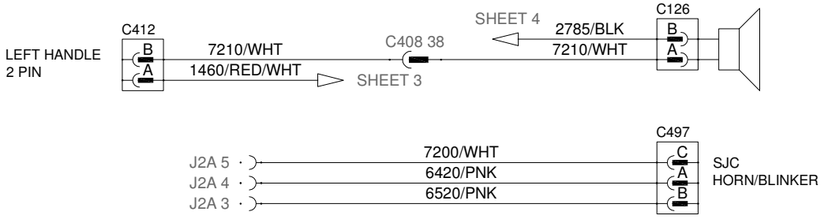
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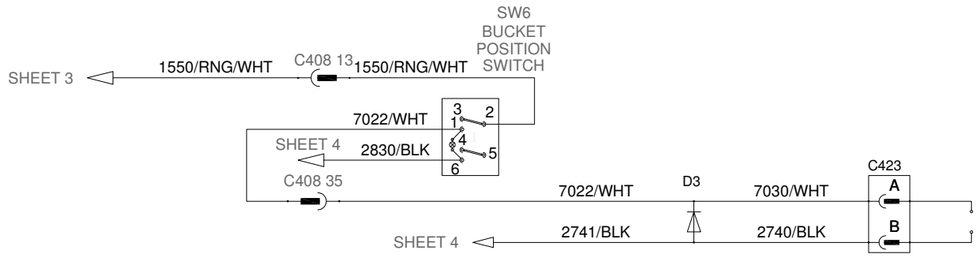
WIRE CATEGORIES FOR COLORS AND NUMBER RANGE			
GROUP DESCRIPTION	GROUP NUMBER RANGE	WIRE COLOR	COLOR CODE
BATT FEED, GENERAL	1000 THROUGH 1499	RED	RED
BATT FEED, FUSED	1000 THROUGH 1499	RED/WHITE	RED/WHT
BATT FEED, SWITCHED	1500 THROUGH 1999	ORANGE/WHITE	RNG/WHT
GROUNDING	2000 THROUGH 2999	BLACK	BLK
MONITORING	3000 THROUGH 3999	LIGHT BLUE	LBL
HYDRAULIC	4000 THROUGH 4999	LIGHT GREEN	LGN
ATTACHMENT CONTROLS	5000 THROUGH 5999	YELLOW	YEL
LIGHTS	6000 THROUGH 6999	PINK	PNK
ACCESSORIES	7000 THROUGH 7999	WHITE	WHT
ENGINE	8000 THROUGH 8999	TAN	TAN
COMMUNICATION	9000 THROUGH 9999	PURPLE	PUR
COMMUNICATION	9000 THROUGH 9999	PURPLE/WHITE	PUR/WHT

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OPTIONS







WIRING SCHEMATIC
(ACS & SJC MACHINE)
S650 (S/N A3NV11001 AND ABOVE)
(S/N A3NW11001 AND ABOVE

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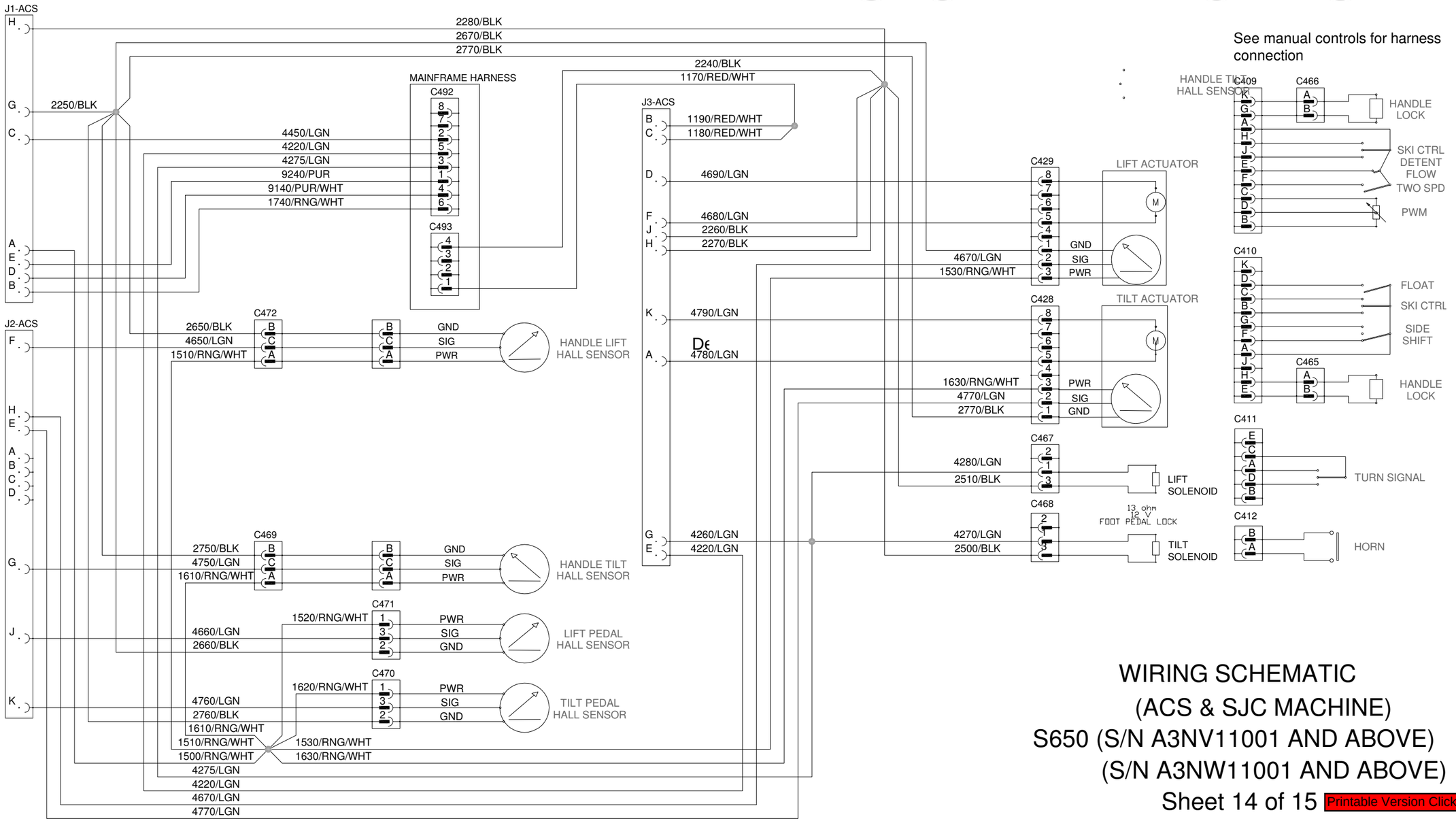
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ACS CONTROLS



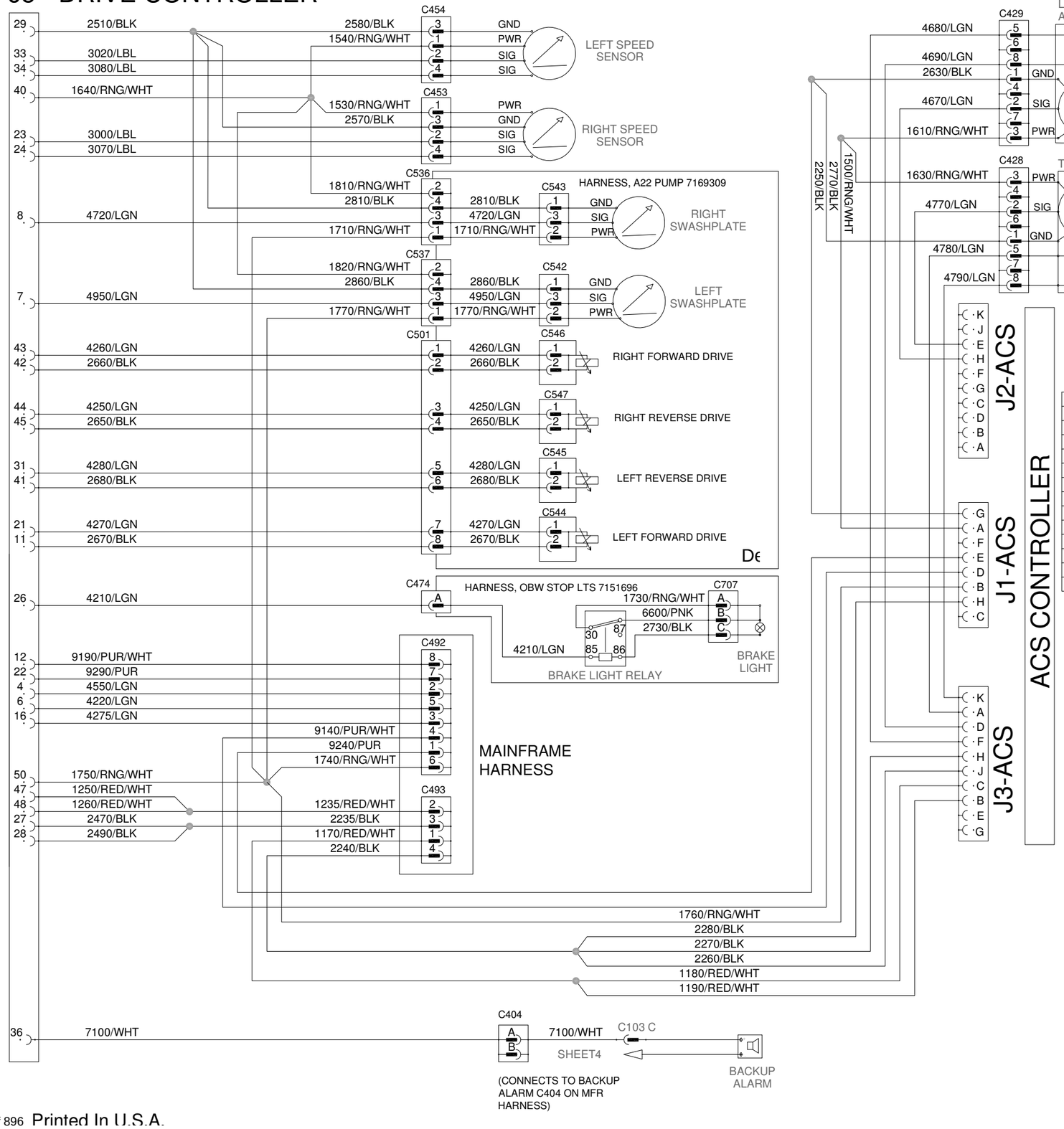
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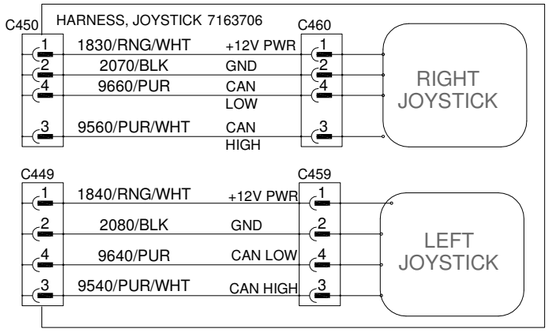
J5 - DRIVE CONTROLLER



SJC CONTROLS

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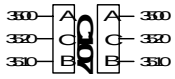
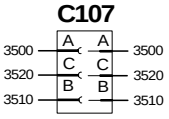
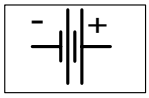


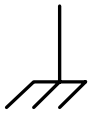
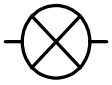
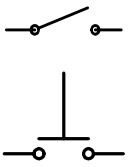
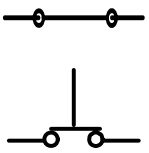
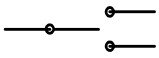
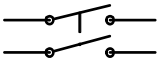
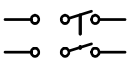
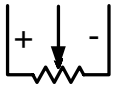
WIRING SCHEMATIC
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(S/N A3NW11001 AND ABOVE)

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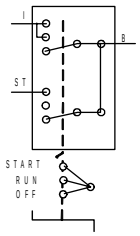
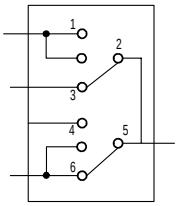
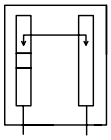
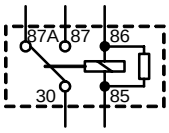
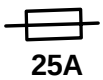
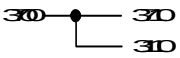
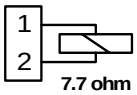
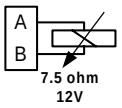
Glossary Of Electrical Symbols

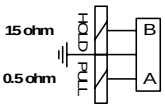
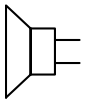
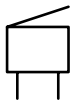
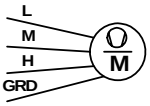
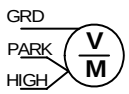
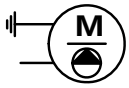
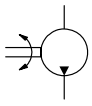
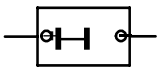
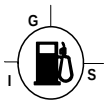
SYMBOL	DESCRIPTION
	CONNECTIONS
	CONNECTOR - Harness - Used for connecting 2 harnesses together or a harness to a component. The connector can vary from a single pin to any number of pins (Example: 3 pin connectors shown). The connector pins can be numbered alphabetical (shown) or numerical (1, 2, 3 etc.). The harness wires numbers are called out next to the connector (Example: 3500).
	The connector number is called out next to the connector (Example: C107). These connector numbers are used for schematic identification only and do not appear on the harness or connector.
	COMPONENTS
	BATTERY - Used for supplying and storing electrical power for the machine.
	POSITIVE ELECTRICAL CIRCUIT - Indicates positive battery circuit.
	NEGATIVE ELECTRICAL CIRCUIT - Indicates battery ground circuit.
	ALTERNATOR - Used to create the electrical current to supply voltage to the battery and components.
	STARTER - Uses battery current to start the machine engine.
	GROUND - Used to represent an external ground connection.

SYMBOL	DESCRIPTION
	COMPONENTS
	GROUND - Frame - Used to represent an component that is internally grounded.
	LIGHT -
	SWITCH - Single Pole - Single Throw (ON-OFF) Normally Open
	SWITCH - Single Pole - Single Throw (ON-OFF) Normally Closed.
	SWITCH - Single Pole - Double Throw (ON-OFF-ON) - This switch can be in any of three positions. (Some switches are spring activated to return them to a certain position when released.)
	SWITCH - Double Pole - Single Throw (ON-OFF) Open and Closed positions will be specified depending on switch application.)
	SWITCH - Double Pole - Double Throw (ON-OFF) Open and Closed positions will be specified depending on switch application.
	POTENTIOMETER - Variable resistance - Provides variable resistance.

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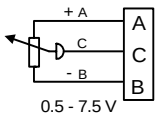
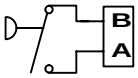
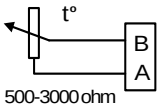
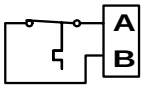
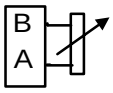
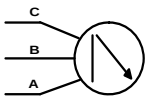
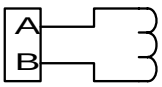
Glossary Of Electrical Symbols (Cont'd)

SYMBOL	DESCRIPTION
	COMPONENTS
	SWITCH - Ignition - Multi position switch to activate various start functions at different positions.
	SWITCH - Light - Multi position switch to activate various lights at different positions.
	ROTARY CONTROL - Provides variable voltage proportional to position.
	RELAY - Uses a low amp switch to control a high amp component.
 **25A**	FUSE - Used to protect the wire harness from an overloaded circuit. (The fuse rating is listed next to the fuse.)
	SPLICE (•) - Used to show when multiple wires are connected together on the schematic.
	SOLENOID - ON / OFF - Electrically activated coil that controls movement magnetically. (The ohm rating of the solenoid coil is listed next to the component [if available]).
	SOLENOID - VARIABLE - Electrically activated coil that controls movement magnetically. (The ohm rating and voltage of the solenoid coil is listed next to the component [if available]).

SYMBOL	DESCRIPTION
	SOLENOID - Fuel and Traction Lock - Dual solenoids. (The ohm rating of the solenoid coils are listed next to the component [if available]). The pull solenoid is energized for a short time.
	HORN - Audible alarm. Sound is activated manually by a switch.
	BUZZER - Audible alarm. Sounds at a predetermined setting to warn the operator of a component condition.
	RESISTOR - Limits current flow.
	DIODE - Allows electrical current to flow in 1 direction only.
	MOTOR - HVAC - Multi speed motor.
	MOTOR - Wiper - Single or multi speed motor.
	MOTOR - Washer - Single speed.
	PUMP - FUEL
	HOURMETER - Records the time the engine is running.
	POWER PLUG - Supplies 12 volt power for customer supplied accessories.
	GAUGE - Instrument - Indicates certain engine or other component conditions. (The different types of gauge are marked with a icon that represents what function the gauge is monitoring. Example: the gauge shown is for fuel.)

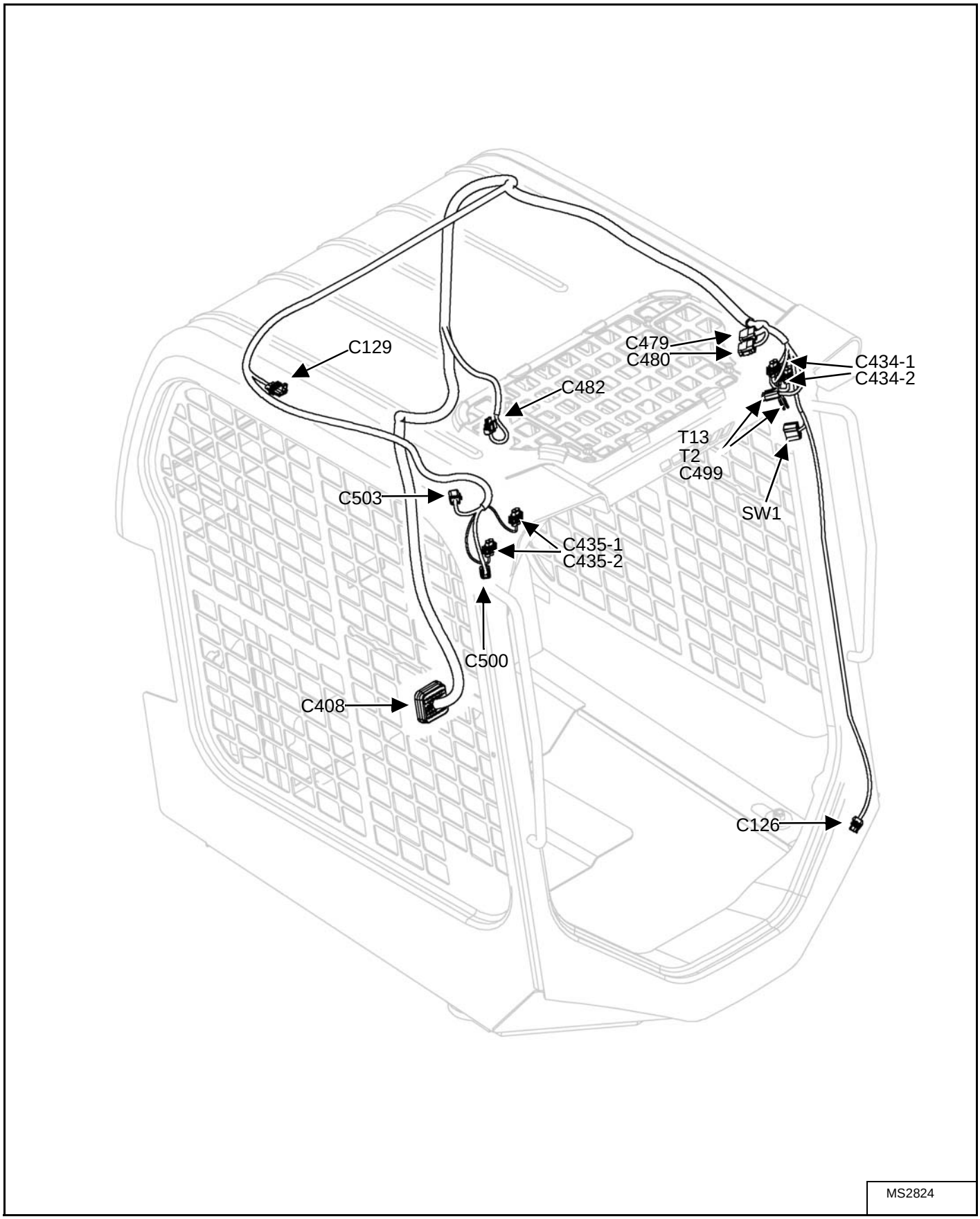
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Glossary Of Electrical Symbols (Cont'd)

SYMBOL	DESCRIPTION
	SENDERS AND SENSORS
	PRESSURE SENDER - Provides a variable voltage proportional to pressure. (Sender voltage rating is listed to show volts at high and low setting.)
	PRESSURE SWITCH - Switch opens or closes at a predetermined pressure to active a function or to turn on a warning light. (Switch is shown in the open position.)
	TEMPERATURE SENDER - Provides a variable resistance (ohm) signal proportional to temperature. (Sender ohm rating is listed to show ohms at high and low setting.)
	TEMPERATURE SWITCH - The switch opens or closes at a predetermined temperature to active a function or to turn on a warning light. (Switch is shown in the closed position.)
 **30-270 ohm**	FUEL SENDER - Provides a variable resistance, based on the fuel level in the tank. (Sender ohm rating is listed to show ohms at full and empty setting.)
	HALL EFFECT SENSOR - Detects linear or rotary position and provides a proportional variable voltage.
	SPEED SENSOR - magnetic pickup - detects RPM.

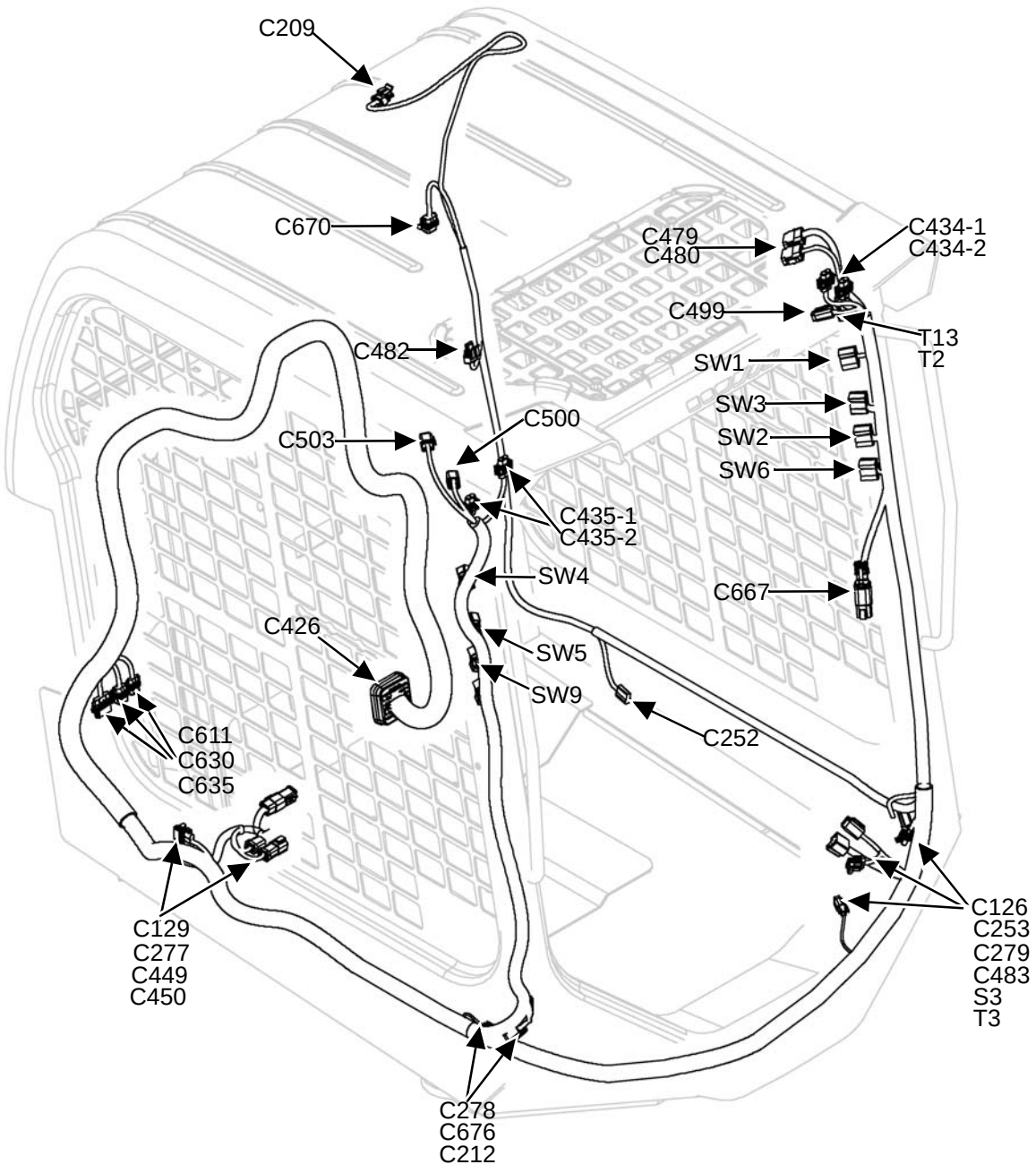
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Standard Cab Harness Connectors



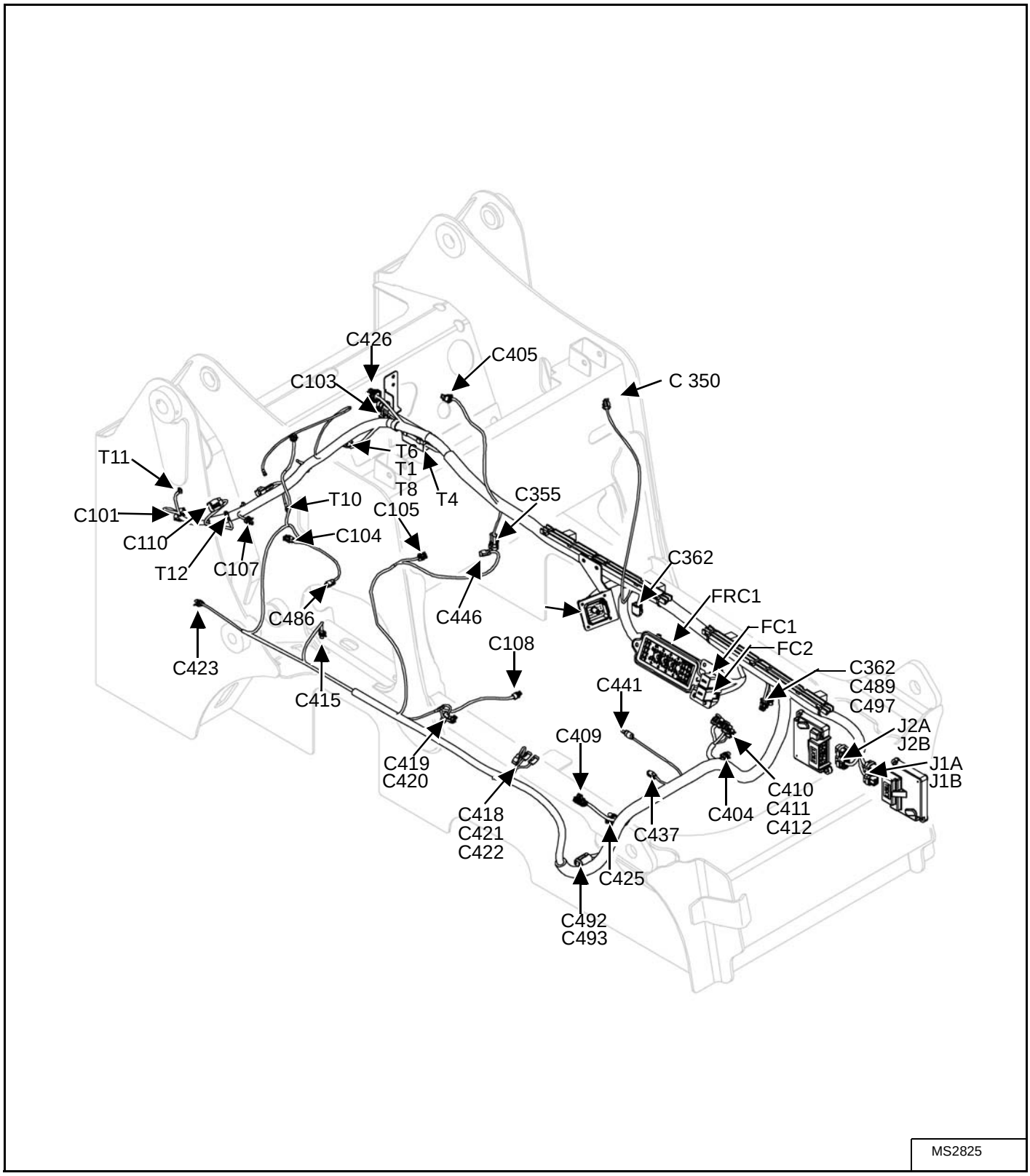
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Deluxe Cab Harness Connectors



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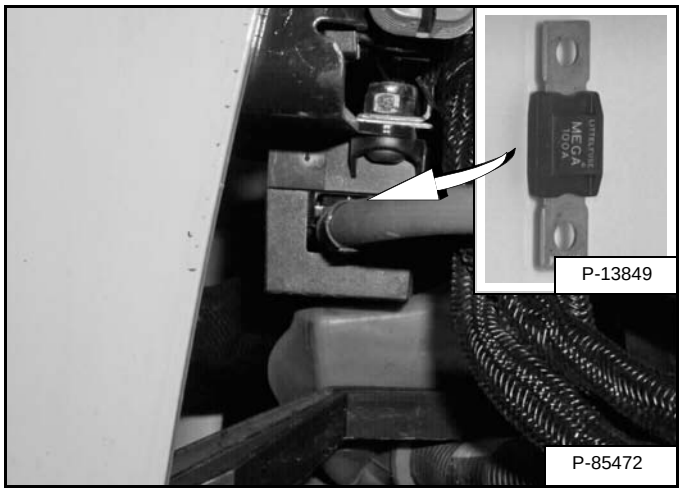
Mainframe Harness Connectors



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Description

Figure 60-10-1



The loader has a 12 volt, negative ground, alternator charging system.

The electrical system is protected by fuses located in the operator cab (located under the operator cab in earlier models) and a 100 ampere master fuse **[Figure 60-10-1]** located under the air cleaner in the engine compartment.

The fuses will protect the electrical system when there is an electrical overload. The reason for the overload must be found before starting the engine again.

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Troubleshooting

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

WARNING

AVOID INJURY OR DEATH

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-2003-0807

PROBLEM	CAUSE
Battery will not take a charge.	1, 2, 3, 4, 5
Alternator will not charge.	1, 2, 5
Starter will not turn the engine.	2, 3, 4, 6, 7, 8, 9

KEY TO CORRECT THE CAUSE
1. Alternator belt is loose or damaged.
2. Battery connections are dirty or loose.
3. Battery is damaged.
4. The ground connection is not making a good contact.
5. The alternator is damaged.
6. The engine is locked.
7. The starter is damaged.
8. The wiring or solenoid is damaged.
9. Check the fuses.

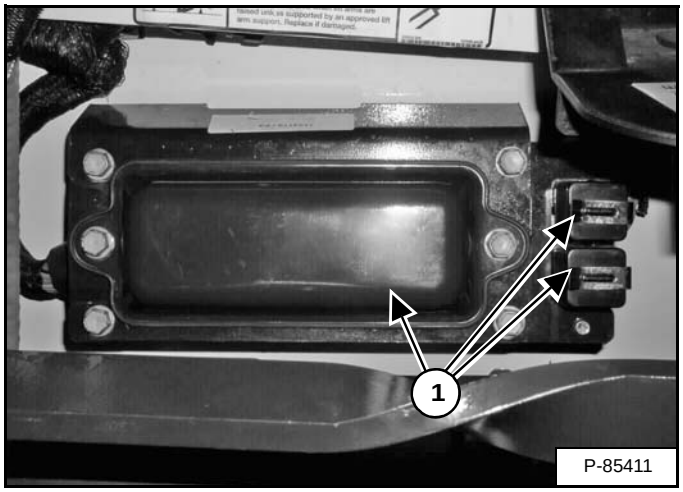
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Fuse And Relay Location / Identification

Earlier Models

Raise the operator cab. (See Raising on Page 10-30-2.)

Figure 60-10-2



The electrical system is protected from overload by fuses and relays located under three fuse panel covers (Item 1) **[Figure 60-10-2]**.

Figure 60-10-3



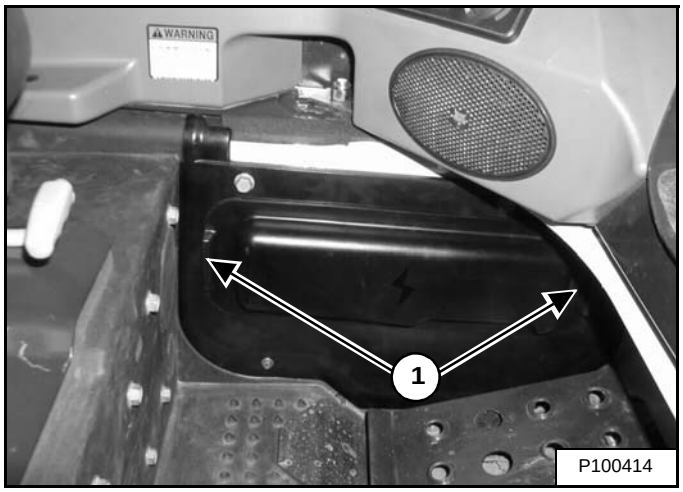
Remove the covers to check or replace the fuses **[Figure 60-10-3]**.

A decal is located inside the large cover to show location and amp ratings.

A table is provided with details on amperage ratings and circuits affected by each fuse and relay. (See Fuse And Relay Location / Identification (Cont'd) on Page 60-10-11.)

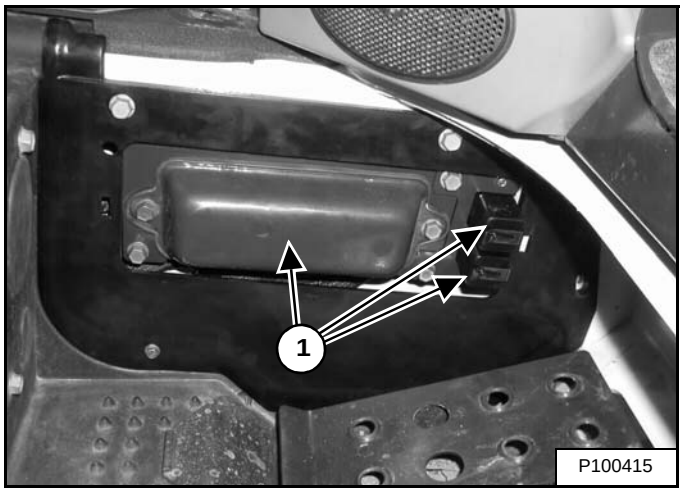
Later Models

Figure 60-10-4



The fuse / relay panels are located behind an access panel near the left foot pedal / footrest. Pull the panel at each end (Item 1) **[Figure 60-10-4]** to remove.

Figure 60-10-5



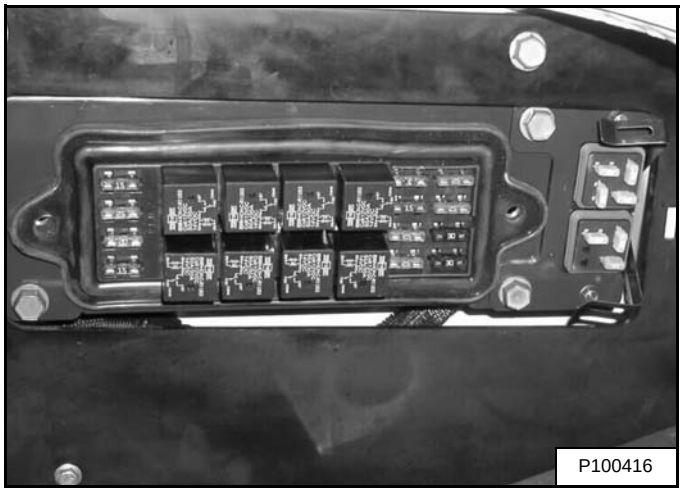
The electrical system is protected from overload by fuses and relays located under three fuse panel covers (Item 1) **[Figure 60-10-5]**.

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Fuse And Relay Location / Identification (Cont'd)

Later Models (Cont'd)

Figure 60-10-6



Remove the covers to check or replace the fuses **[Figure 60-10-6]**.

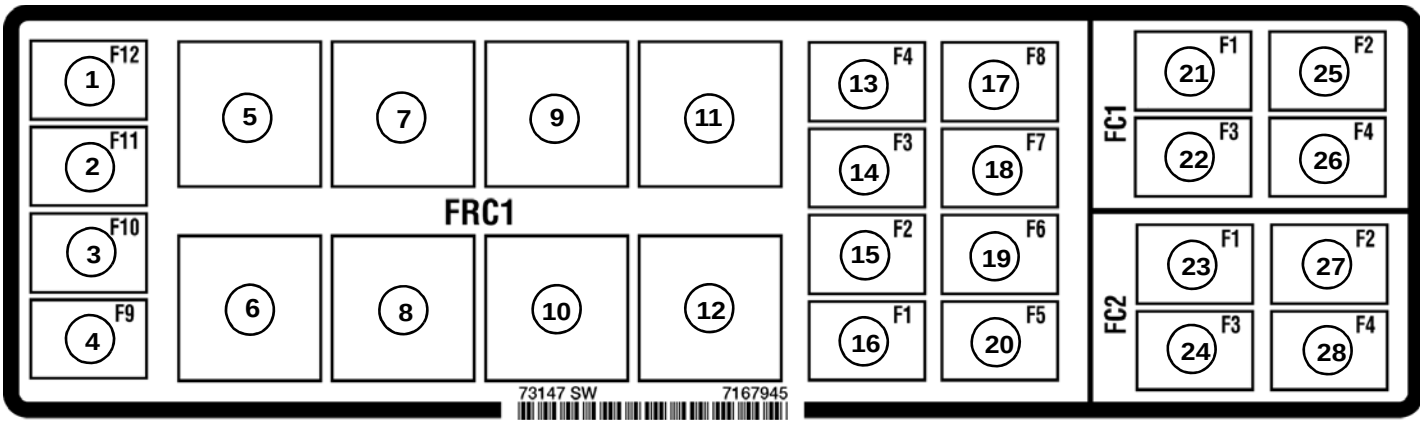
A decal is located inside the access panel to show location and amperage ratings.

Line up the clips on the back of the access panel with the slots provided and push the panel into place when finished **[Figure 60-10-4]**. A locating pin prevents the panel from being installed upside down.

A table is provided with details on amperage ratings and circuits affected by each fuse and relay. (See Fuse And Relay Location / Identification (Cont'd) on Page 60-10-11.)

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Fuse And Relay Location / Identification (Cont'd)



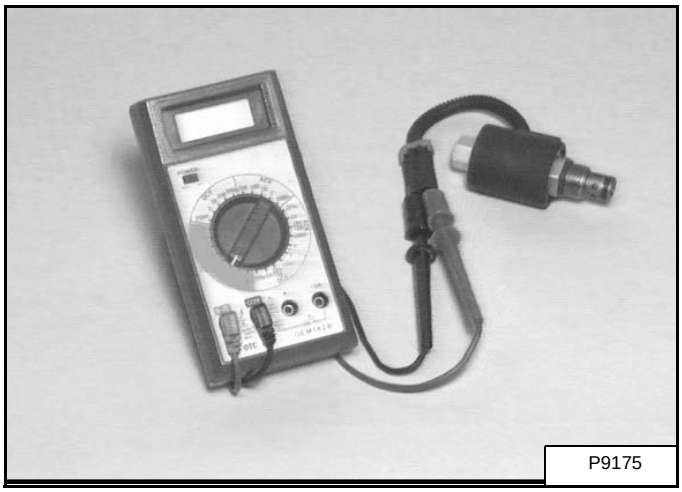
The location and amperage ratings are shown in the table below and on the decal above. Relays are identified by the letter "R" in the AMP column.

REF	ICON	DESCRIPTION	AMP	REF	ICON	DESCRIPTION	AMP	REF	ICON	DESCRIPTION	AMP
1		Alternator	15	11		Glow Plugs	R	21	GWY	Bobcat Controller	25
2		Heater / HVAC	25	12		Fuel Shutoff	R	22	ACS	ACS Controller	25
3		Front Lights	20	13	CAB	Cab Switched Power	5	23	ACD	Attachments	25
4		Rear Lights	15	14		Bucket Position	15	24		Not Used	- -
5		Starter	R	15		Wiper / Washer	25	25	AUX	Auxiliary Controller	25
6		Front Lights	R	16	ACC	Switched Power & Back-up Alarm (Standard/ACS)	25	26	DRV	Drive Controller & Back-up Alarm (SJC)	25
7		Heater / HVAC	R	17	ACC	Switched Power	25	27	ACC	Accessories & Front Horn	25
8	R	Rear Lights	R	18	ACD	Switched Power	25	28		Power Port	15
9		Switched Power	R	19	P	Traction	30				
10	P	Traction	R	20		Fuel Shutoff	30				

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Solenoid Testing

Figure 60-10-7



Use a test meter to measure coil resistance **[Figure 60-10-7]**. Coil wires do not have polarity. Correct resistance for the pressure relief (small) coil is 7 - 10 ohm and the other coils 5 - 8 ohm.

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

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BATTERY

Removal And Installation

WARNING

AVOID INJURY OR DEATH

Batteries contain acid which burns eyes and skin on contact. Wear goggles, protective clothing and rubber gloves to keep acid off body.

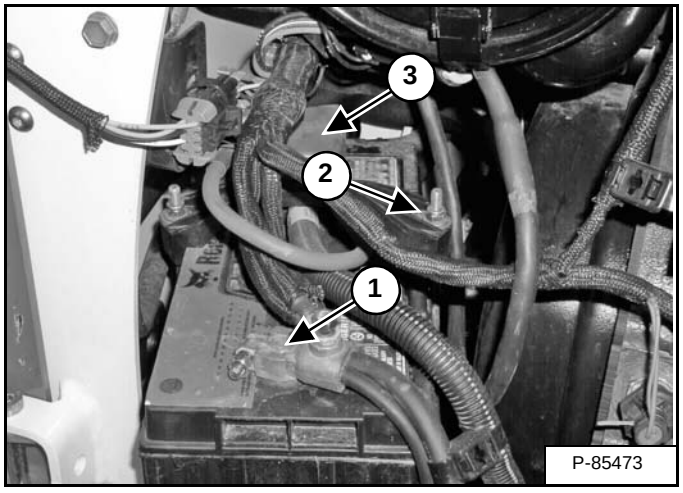
In case of acid contact, wash immediately with water. In case of eye contact get prompt medical attention and wash eye with clean, cool water for at least 15 minutes.

If electrolyte is taken internally drink large quantities of water or milk! DO NOT induce vomiting. Get prompt medical attention.

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Open the rear door.

Figure 60-20-1



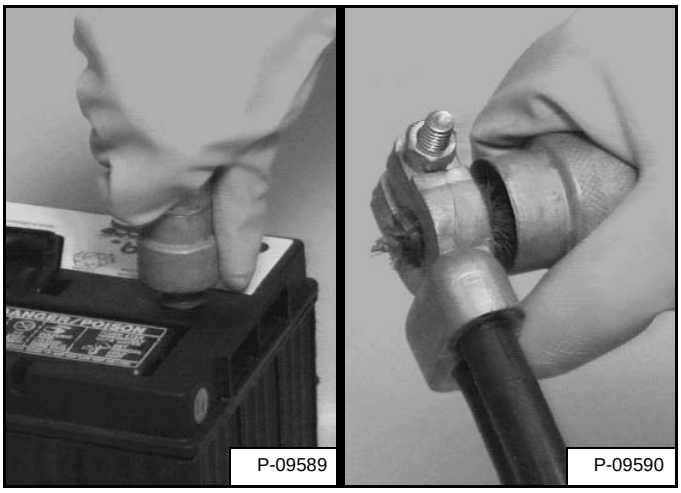
Disconnect the negative (-) cable (Item 1) **[Figure 60-20-1]**.

Remove the battery hold down clamp (Item 2) **[Figure 60-20-1]**.

Disconnect the positive (+) cable (Item 3) **[Figure 60-20-1]** from the battery.

Remove the battery from the loader.

Figure 60-20-2



Always clean the battery terminals and cable ends when installing a new or used battery **[Figure 60-20-2]**.

When installing the battery in the loader, do not touch any metal parts with the battery terminals.

Connect the negative (-) cable last to prevent sparks.

Connect and tighten the battery cables.

Install and tighten the battery hold down.

WARNING

AVOID INJURY OR DEATH

Keep arcs, sparks, flames and lighted tobacco away from batteries. When *jumping* from booster battery make final connection (negative) at machine frame.

Do not jump start or charge a frozen or damaged battery. Warm battery to 60°F (16°C) before connecting to a charger. Unplug charger before connecting or disconnecting cables to battery. Never lean over battery while boosting, testing or charging.

Battery gas can explode and cause serious injury.

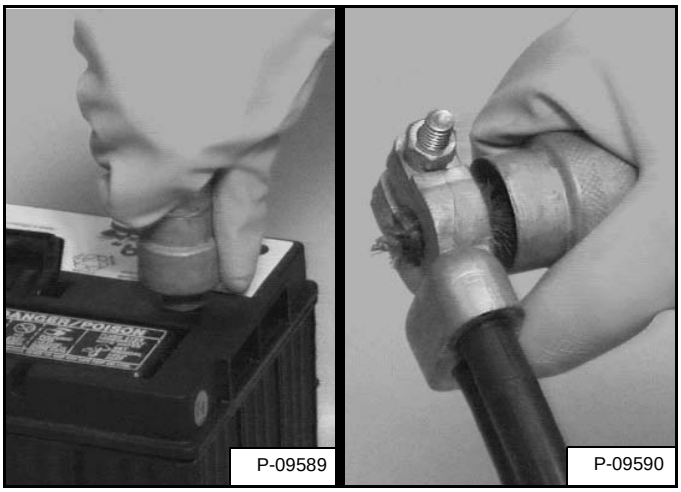
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BATTERY (CONT'D)

Servicing

Figure 60-20-3



The battery cables must be clean and tight **[Figure 60-20-3]**. Check electrolyte level in the battery. Add distilled water as needed. Remove acid or corrosion from battery and cables with sodium bicarbonate (baking soda) and water solution.

Put Bobcat Battery Saver or grease on the battery terminals and cable ends to prevent corrosion.

⚠ WARNING

AVOID INJURY OR DEATH

Batteries contain acid which burns eyes and skin on contact. Wear goggles, protective clothing and rubber gloves to keep acid off body.

In case of acid contact, wash immediately with water. In case of eye contact get prompt medical attention and wash eye with clean, cool water for at least 15 minutes.

If electrolyte is taken internally drink large quantities of water or milk! DO NOT induce vomiting. Get prompt medical attention.

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Using A Booster Battery (Jump Starting)

If it is necessary to use a booster battery to start the engine, BE CAREFUL! There must be one person in the operator's seat and one person to connect and disconnect the battery cables.

The key switch must be OFF or the STOP button must be pressed. The booster battery must be 12 volt.

⚠ WARNING

AVOID INJURY OR DEATH

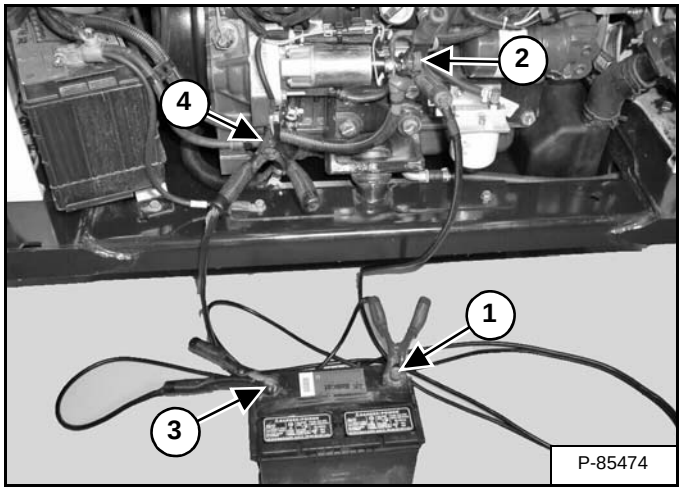
Keep arcs, sparks, flames and lighted tobacco away from batteries. When *jumping* from booster battery make final connection (negative) at machine frame.

Do not jump start or charge a frozen or damaged battery. Warm battery to 60°F (16°C) before connecting to a charger. Unplug charger before connecting or disconnecting cables to battery. Never lean over battery while boosting, testing or charging.

Battery gas can explode and cause serious injury.

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Figure 60-20-4



Connect the end of the first cable (Item 1) **[Figure 60-20-4]** to the positive (+) terminal of the booster battery. Connect the other end of the same cable (Item 2) **[Figure 60-20-4]** to the positive terminal on the loader starter.

Connect the end of the second cable (Item 3) **[Figure 60-20-4]** to the negative terminal of the booster battery. Connect the other end of the same cable (Item 4) **[Figure 60-20-4]** to the engine.

Keep cables away from moving parts. Start the engine.

After the engine has started, remove the ground (-) cable (Item 4) **[Figure 60-20-4]** first. Remove the cable from the positive terminal (Item 2) **[Figure 60-20-4]**.

IMPORTANT

Damage to the alternator can occur if:

- **Engine is operated with battery cables disconnected.**
- **Battery cables are connected when using a fast charger or when welding on the loader. (Remove both cables from the battery.)**
- **Extra battery cables (booster cables) are connected wrong.**

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ALTERNATOR

Belt Adjustment

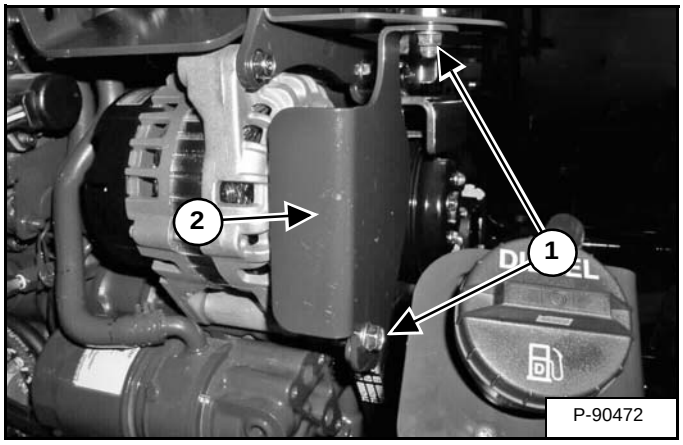
The alternator belt is a special maintenance free type that is pretensioned over the pulleys. This belt eliminates the need for a tensioning device and does not require periodic adjustment. Contact your Bobcat dealer for replacement parts.

Belt Replacement

Stop the engine and open the rear door.

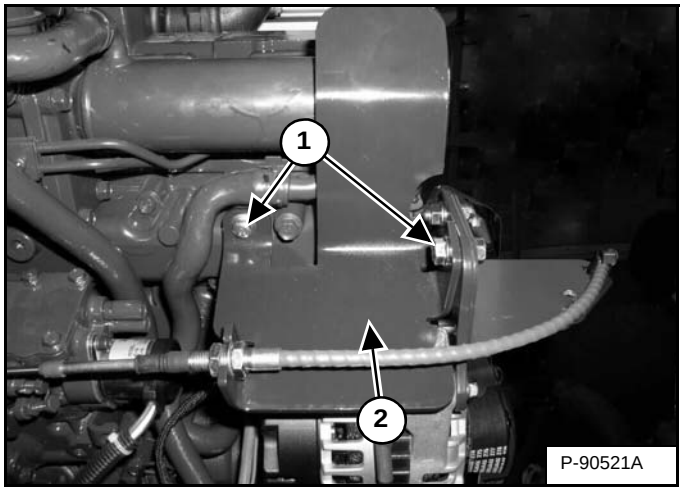
Remove the air conditioning belt. (See REGULAR MAINTENANCE on Page 80-20-1.)

Figure 60-30-1



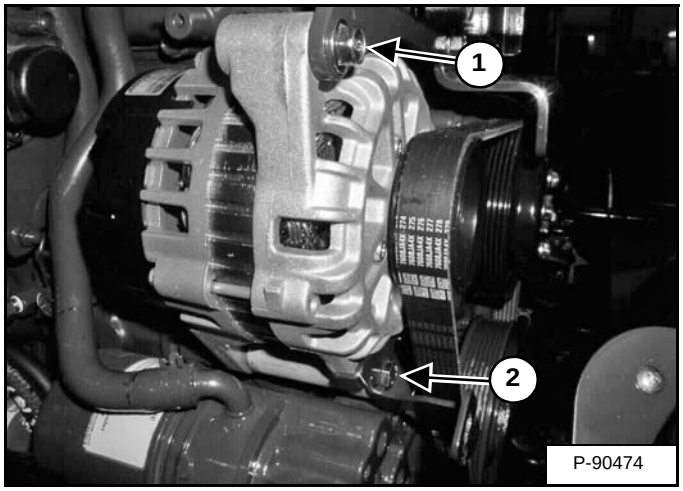
Remove the belt shield mounting nuts and bolts (Item 1) and remove the belt shield (Item 2) **[Figure 60-30-1]**.

Figure 60-30-2



Remove the cable bracket mounting nut and bolts (Item 1) and move the cable bracket (Item 2) **[Figure 60-30-2]** up slightly.

Figure 60-30-3

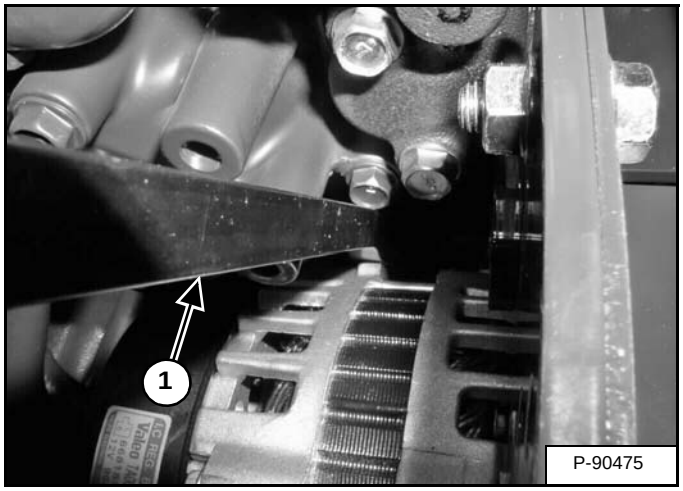


Remove the top alternator mounting bolt (Item 1) and loosen the bottom alternator mounting bolt (Item 2) **[Figure 60-30-3]**.

Move the alternator toward the engine as far as it will go and remove the belt from the pulleys. Inspect the pulleys for wear.

Install new belt.

Figure 60-30-4



Use a prybar (Item 1) **[Figure 60-30-4]** to move the alternator until the top alternator mounting bolt (Item 1) **[Figure 60-30-3]** can be installed.

Tighten the top and bottom alternator mounting bolts (Items 1 and 2) **[Figure 60-30-3]**.

Install the air conditioning belt. (See REGULAR MAINTENANCE on Page 80-20-1.)

Install the cable bracket and belt shield.

Close the rear door.

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Charging System Inspection

⚠ WARNING

AVOID INJURY OR DEATH

Batteries contain acid which burns eyes and skin on contact. Wear goggles, protective clothing and rubber gloves to keep acid off body.

In case of acid contact, wash immediately with water. In case of eye contact get prompt medical attention and wash eye with clean, cool water for at least 15 minutes.

If electrolyte is taken internally drink large quantities of water or milk! DO NOT induce vomiting. Get prompt medical attention.

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⚠ WARNING

AVOID INJURY OR DEATH

Keep arcs, sparks, flames and lighted tobacco away from batteries. When *jumping* from booster battery make final connection (negative) at machine frame.

Do not jump start or charge a frozen or damaged battery. Warm battery to 60°F (16°C) before connecting to a charger. Unplug charger before connecting or disconnecting cables to battery. Never lean over battery while boosting, testing or charging.

Battery gas can explode and cause serious injury.

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IMPORTANT

Damage to the alternator can occur if:

- **Engine is operated with battery cables disconnected.**
- **Battery cables are connected when using a fast charger or when welding on the loader. (Remove both cables from the battery.)**
- **Extra battery cables (booster cables) are connected wrong.**

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If the charging system malfunctions check the following:

Check the condition and tension of the alternator belt. (See Belt Adjustment on Page 60-30-1.) Replace belt if worn or deteriorated.

Inspect the alternator wiring harness and connectors at alternator. Harness and connectors must be clean and tight.

Check the fuse for the alternator in the fuse panel. If fuse is burned, find the cause and repair / replace. If fuse is in doubt, remove it and check for continuity.

Check the electrolyte level in the battery. Add distilled water as needed. (Does not apply to maintenance free batteries.)

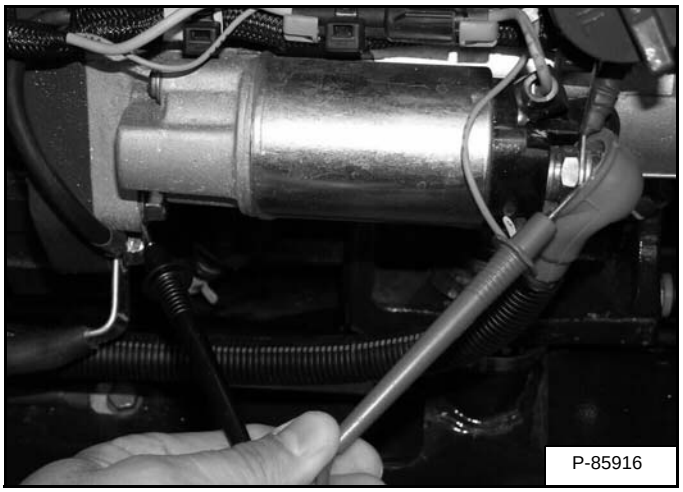
Verify the charge of the battery. Make sure battery is fully charged.

Disconnect the battery cables (negative first, then positive). Inspect the cable clamps and battery posts for corrosion. Remove acid or corrosion from the battery and cables with a sodium bicarbonate and water solution. Put grease on the cable ends and battery terminals to prevent corrosion. Reconnect the cable to the positive terminal.

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Alternator Voltage Testing

Figure 60-30-5



Open rear door.

Connect the remote start tool to the loader. (See REMOTE START TOOL KIT-MEL1563 on Page 10-60-1.)

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]**.

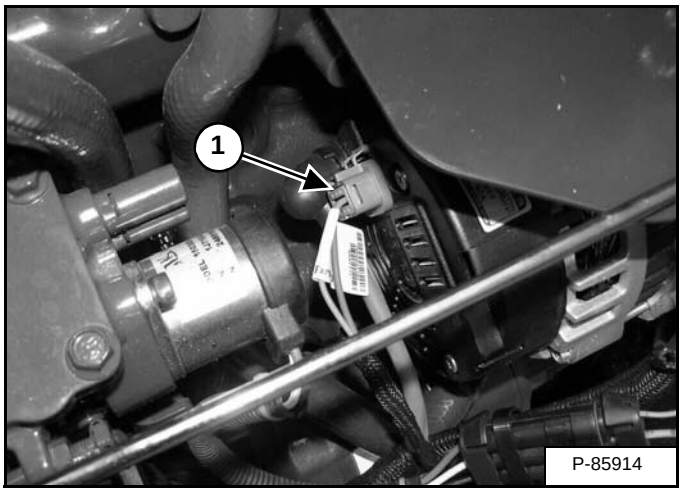
The voltage must be higher than 13.5 volts but lower than 14.7 volts at 21°C (70°F) (Alternator Temperature).

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 Testing

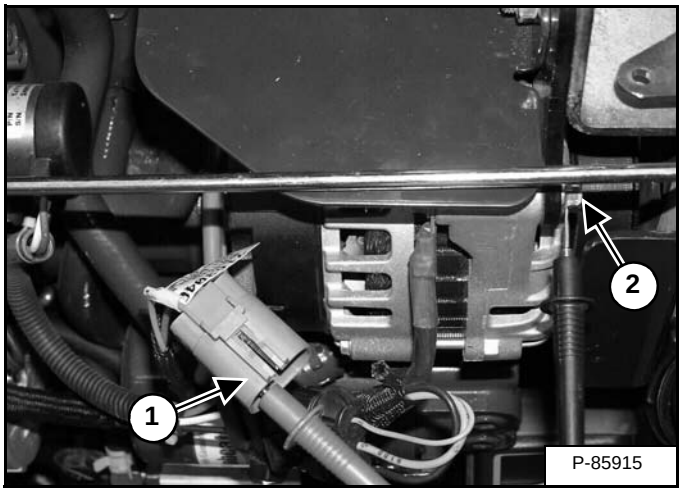
Figure 60-30-6



Turn engine OFF and remove the L & S terminal connector (Item 1) **[Figure 60-30-6]** from the alternator.

Turn the remote start tool key to the ON position.

Figure 60-30-7

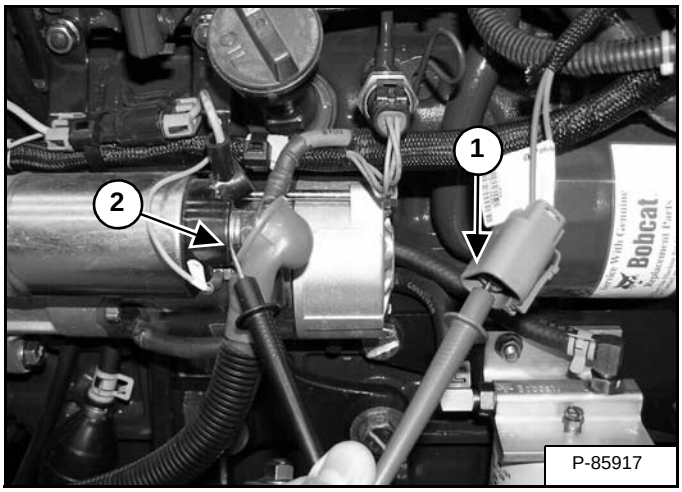


Check the voltage across the "L" terminal (Item 1) and ground (Item 2) **[Figure 60-30-7]**. The voltage should be what the battery voltage is. If not, check wire harness, relay and fuses. If the wire harness, relay and fuses are okay remove alternator for replacement or repair.

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High Voltage Testing

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 21°C (70°F) (Alternator Temperature), then remove alternator for replacement or repair.

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Removal And Installation

Remove the air conditioning belt. (See Compressor Drive Belt Replacement on Page 80-20-2.)

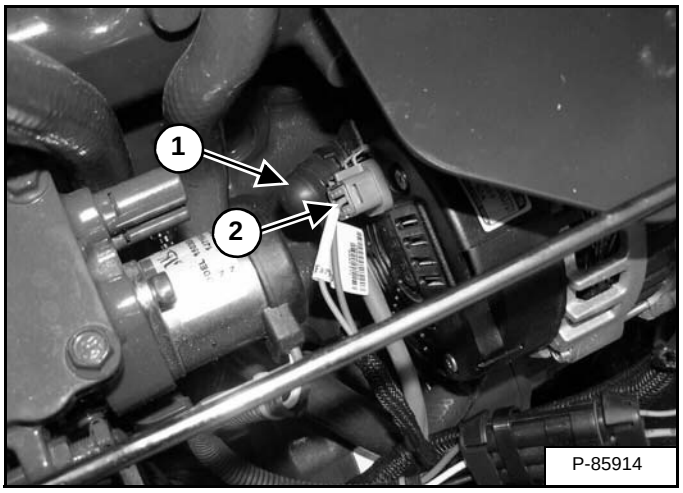
IMPORTANT

Damage to the alternator can occur if:

- **Engine is operated with battery cables disconnected.**
- **Battery cables are connected when using a fast charger or when welding on the loader. (Remove both cables from the battery.)**
- **Extra battery cables (booster cables) are connected wrong.**

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Figure 60-30-9

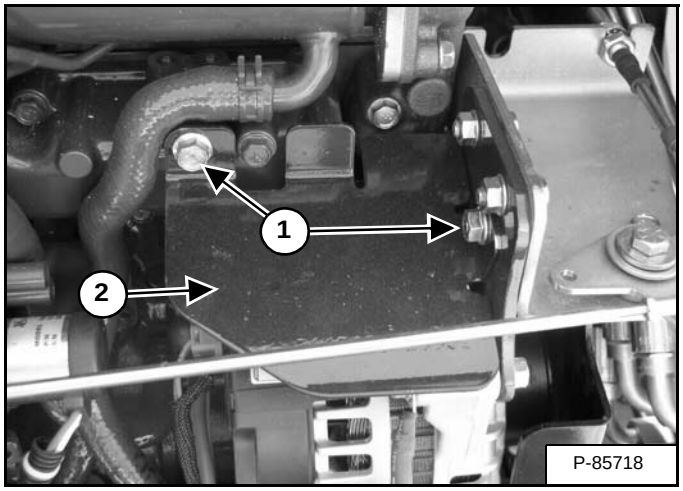


Disconnect the negative (-) cable from the battery.

Disconnect the red wire (Item 1) **[Figure 60-30-9]** from the alternator which comes from the battery.

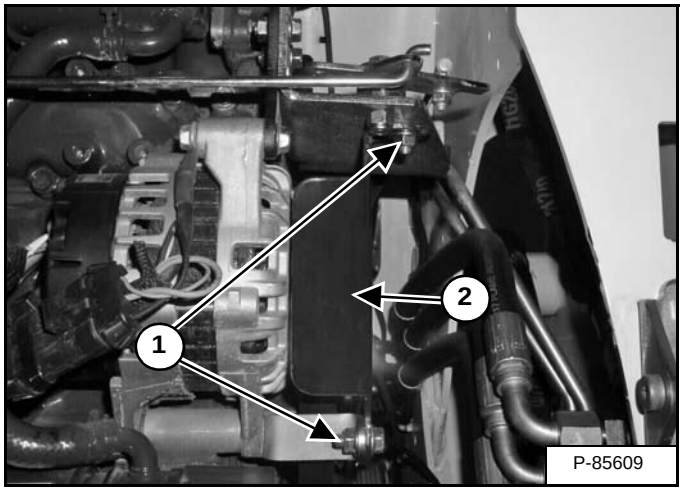
Disconnect the wiring harness connector (Item 2) **[Figure 60-30-9]** from the alternator.

Figure 60-30-10



Remove the alternator rain shield mounting nut and bolts (Item 1) and remove the alternator rain shield (Item 2) **[Figure 60-30-10]**.

Figure 60-30-11

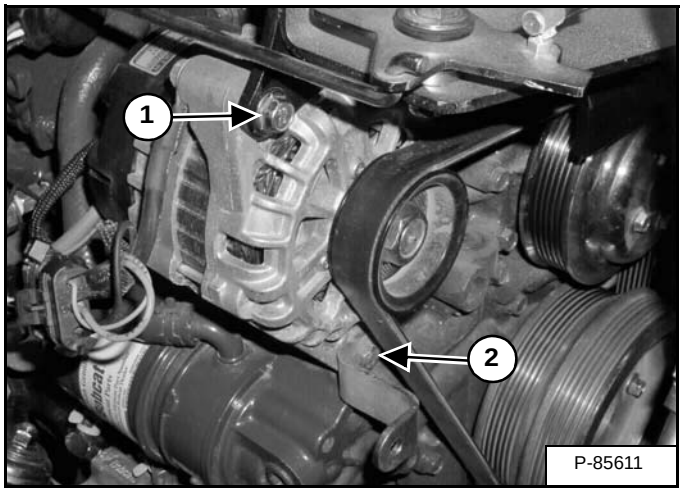


Remove the belt shield mounting nuts and bolts (Item 1) and remove the belt shield (Item 2) **[Figure 60-30-11]**.

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Removal And Installation (Cont'd)

Figure 60-30-12

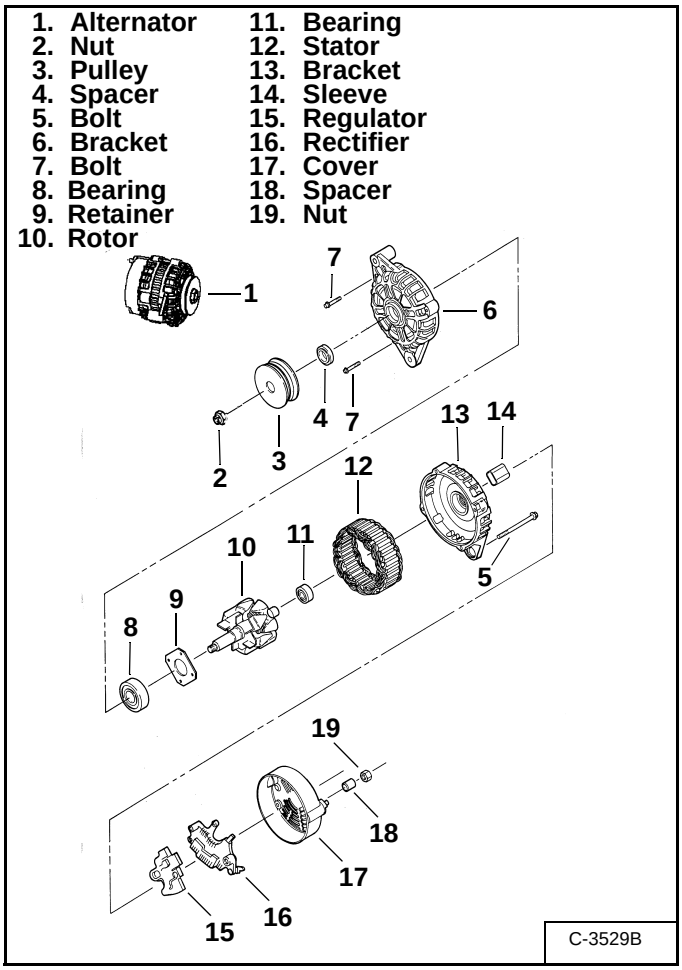


Remove the top alternator mounting bolt (Item 1) and the bottom alternator mounting bolt (Item 2) **[Figure 60-30-12]**.

Remove the belt and alternator from the loader.

Parts Identification

Figure 60-30-13

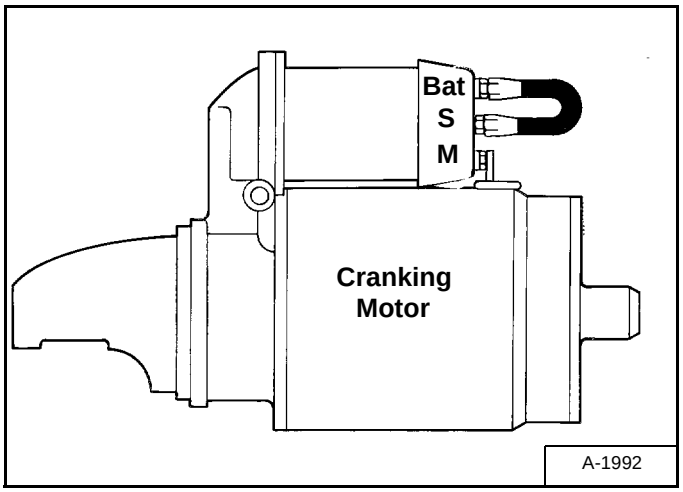


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STARTER

Testing

Figure 60-40-1



The key switch must be in the OFF position.

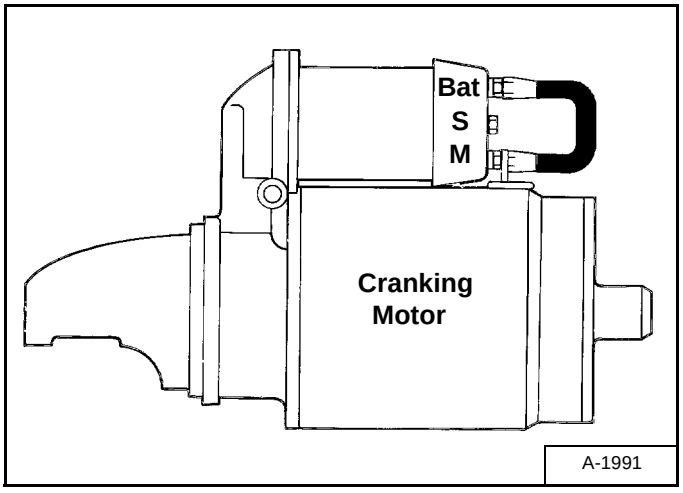
The battery must be at full charge.

The cable connections on the battery must be clean and tight.

Connect a jumper wire between S terminal and BAT terminal **[Figure 60-40-1]**.

If the starter turns but does not turn the engine, the starter drive has a defect.

Figure 60-40-2



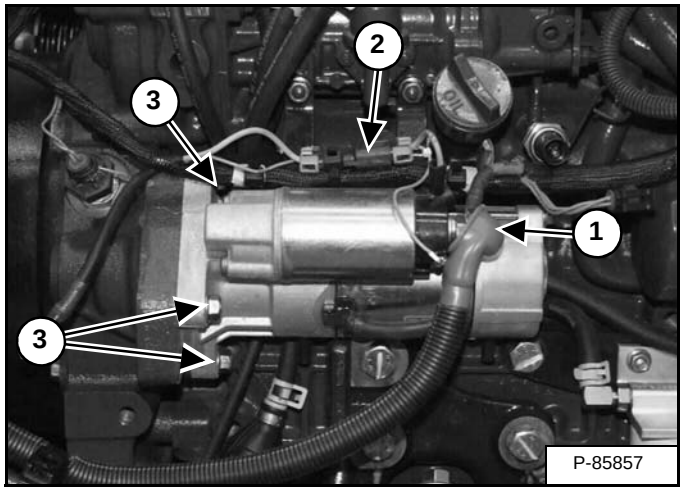
Connect a jumper wire (of at least 4 gauge in size) between the M terminal and the BAT terminal **[Figure 60-40-2]**.

If the starter turns, the defect is in the solenoid.

If the starter does not turn, the starter is defective.

Removal And Installation

Figure 60-40-3



Open the rear door.

Disconnect the negative (-) cable from the battery.

Disconnect the wires and positive (+) cable (Item 1) **[Figure 60-40-3]** from the starter solenoid.

Installation: Tighten the nut to 14,7 - 16,7 N•m (10.8 - 12.3 ft-lb) torque.

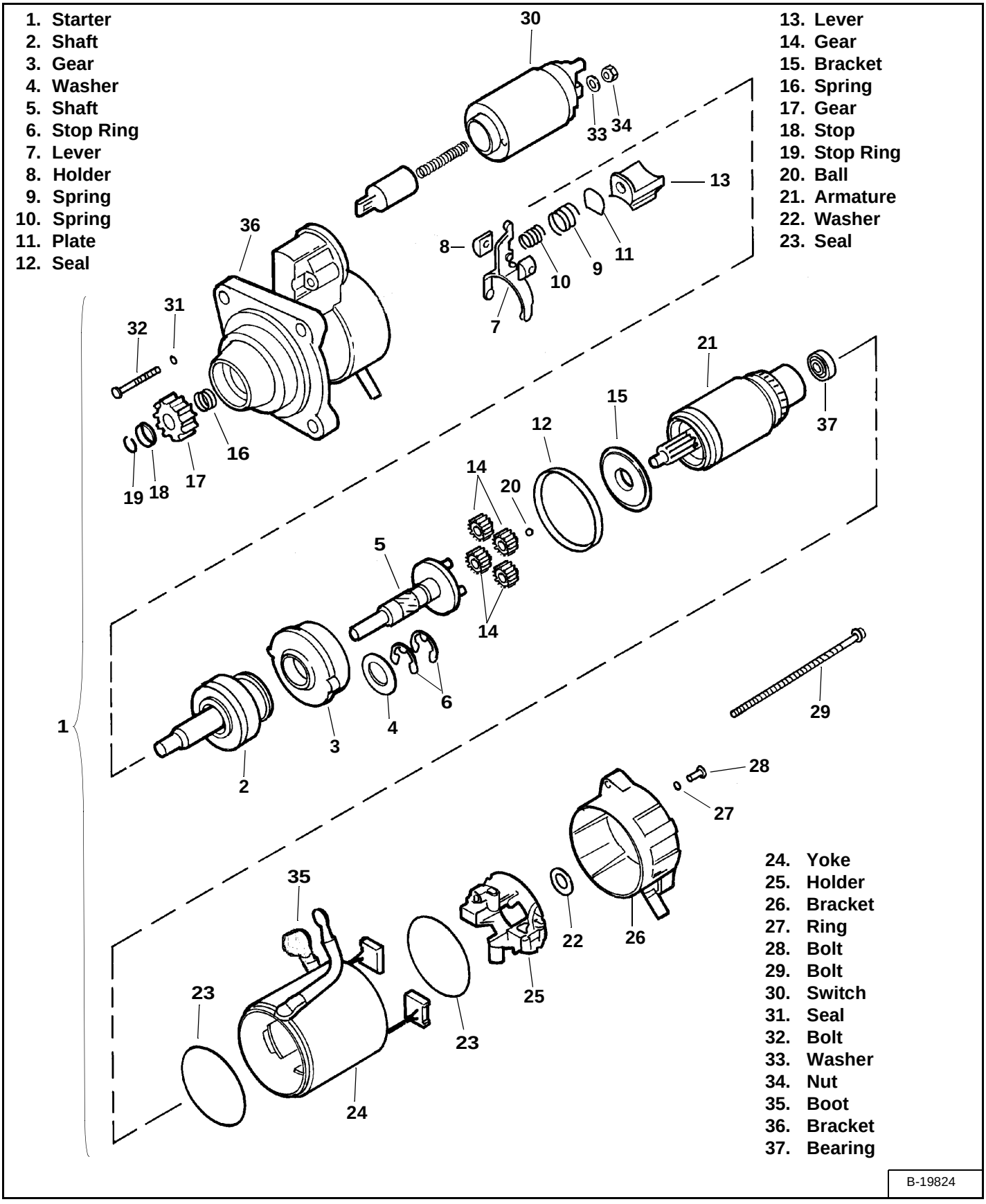
Disconnect the wire connector (Item 2) **[Figure 60-40-3]** from the two solenoid wires.

Remove the three mounting bolts (Item 3) **[Figure 60-40-3]**.

Remove the starter from the engine.

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Parts Identification



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INSTRUMENT PANELS

Left Panel

Figure 60-50-1



The left instrument panel **[Figure 60-50-1]** is the same for Standard Key Panel, Keyless Start Panel and Deluxe Instrumentation Panel equipped machines.

The table on the facing page shows the DESCRIPTION and FUNCTION / OPERATION for each of the components of the left panel.

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INSTRUMENT PANELS (CONT'D)

Left Panel (Cont'd)

REF. NO.	DESCRIPTION	FUNCTION / OPERATION
1	ENGINE TEMPERATURE GAUGE	Shows the engine coolant temperature.
2	LEFT DIRECTION INDICATOR (Option)	Indicates left flasher signals are ON.
3	GENERAL WARNING	Malfunction with one or more machine functions. (See Service Codes*)
4	TWO-SPEED (Option)	High range selected.
5	ENGINE MALFUNCTION	Engine malfunction or failure. (See Service Codes*)
6	ENGINE COOLANT TEMPERATURE	Engine coolant temperature high or sensor error.
7	DISPLAY SCREEN	Displays information. (See Display Screen in this manual.)
8	SEAT BELT	Instructs operator to fasten seat belt. Remains lit for 45 seconds.
9	SEAT BAR	The light comes on when the seat bar is UP.
10	LIFT & TILT VALVE	The light comes on when the lift and tilt functions cannot be operated.
11	PARKING BRAKE	The light comes on when the loader cannot be driven.
12	RIGHT DIRECTION INDICATOR (Option)	Indicates right flasher signals are ON.
13	SHOULDER BELT (Option)	Instructs operator to fasten shoulder belt when operating in high range. Remains lit while in high range.
14	HYDRAULIC SYSTEM MALFUNCTION	Hydraulic system malfunction or failure. (See Service Codes*)
15	FUEL	Fuel level low or sensor error.
16	FUEL GAUGE	Shows the amount of fuel in the tank.
17	LIGHTS	Press once for FRONT work lights and REAR taillights. (Left green LED will light.) Press a second time to add REAR work lights. (Left and right green LEDs will light.) Press a third time to turn all lights off. (Left and right green LEDs will be off.)
		Press and hold five seconds to display software version in display screen.
18	HIGH-FLOW (Option)	Press once to engage the HIGH-FLOW auxiliary hydraulics. (Left green LED will light.) Press a second time to disengage.
19	AUXILIARY HYDRAULICS	Press once to activate the auxiliary hydraulic system. (Left green LED will light.) Press a second time to deactivate the system.
20	INFORMATION	Cycles through (after each button press): • Hourmeter (On start up) • Engine RPM • Battery voltage • Maintenance clock (Press and hold for seven seconds when displayed to reset the maintenance clock.) • Service codes*
21	TRACTION LOCK OVERRIDE	Functions only when the seat bar is raised and the engine is running. Press once to unlock the brakes. Allows you to use the steering levers or joystick(s) to move the loader forward or backward when using the backhoe attachment or for service. (See TRACTION LOCK OVERRIDE in this manual.) Press a second time to lock the brakes.
22	PRESS TO OPERATE LOADER	Press to activate the BICS™ System when the seat bar is down and operator is seated in operating position. Button will light.
		Press and hold three seconds to engage Drive Response and Steering Drift Compensation. (See DRIVE RESPONSE and STEERING DRIFT COMPENSATION in this manual.)
23	PARKING BRAKE (Standard on all loaders)	Press the top to engage the Parking Brake. Press the bottom to disengage. (See PARKING BRAKE in this manual.)

* See SYSTEM SETUP & ANALYSIS for Service Code description. (See DIAGNOSTIC SERVICE CODES on Page 60-90-1.)

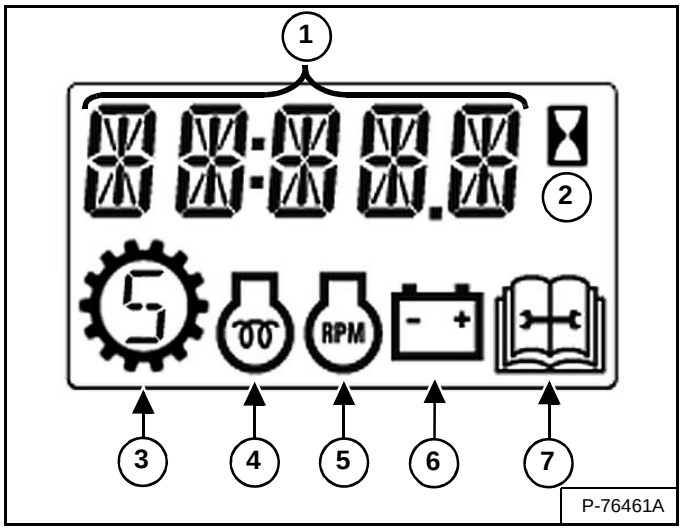
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Display Screen

The display screen can display the following information:

- Operating hours.
- Engine revolutions per minute (RPM).
- Speed management setting.
- Maintenance clock countdown.
- Battery voltage.
- Service codes.
- Engine preheat countdown.
- Steering drift compensation setting.
- Drive response setting.

Figure 60-50-2



The display screen is shown in **[Figure 60-50-2]**. The data display will show operating hours upon startup.

1. **Data Display**
2. **Hourmeter**
3. **Speed Management**
4. **Engine Preheat**
5. **Engine Revolutions Per Minute**
6. **Battery / Charging Voltage**
7. **Service**

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INSTRUMENT PANELS (CONT'D)

Right Panel (Standard Key Panel)

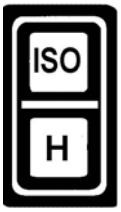
Figure 60-50-3



This machine may be equipped with a Standard Key Panel **[Figure 60-50-3]**.

The Standard Key Panel has a key switch (Item 1) **[Figure 60-50-9]** used to turn the loader's electrical system on and off, and to start and stop the engine.

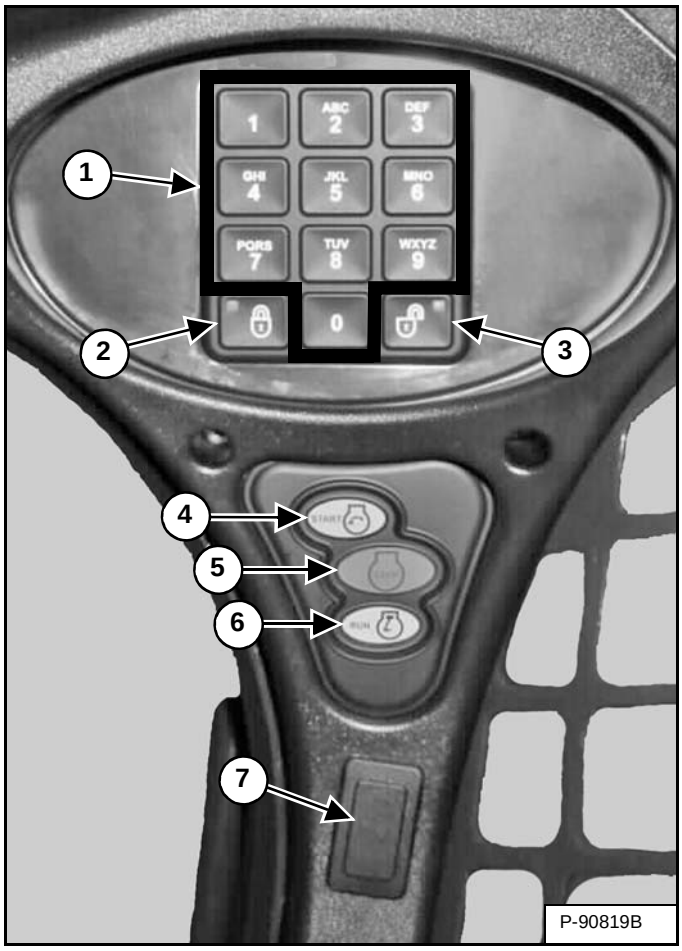
The switch location (Item 2) **[Figure 60-50-3]** can have different functions depending on machine configuration. See the following table for more information.

REF.	DESCRIPTION	FUNCTION / OPERATION
	ADVANCED CONTROL SYSTEM (ACS) (Option)	Press the top to select Hand Controls; bottom to select Foot Controls.
	SELECTABLE JOYSTICK CONTROLS (SJC) (Option)	Press the top to select 'ISO' Control Pattern; bottom to select 'H' Control Pattern.
	FOUR-WAY FLASHER LIGHTS (Option)	Press the top to turn lights ON; bottom to turn OFF.
	ROTATING BEACON (Option) or STROBE LIGHT (Option)	Press the top to turn light ON; bottom to turn OFF.

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Right Panel (Keyless Start Panel)

Figure 60-50-4



1. **Keypad (keys 1 through 0):** Used to enter a number code (password) to allow starting the engine. An asterisk will show in the left panel display screen for each key press.

2. **LOCK Key:** Used to lock keypad. The lock key will display a red light to indicate a password is required to start the loader. (See Password Lockout Feature on Page 60-191-1.)

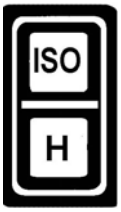
3. **UNLOCK Key:** Used to unlock keypad. The unlock key will display a green light to indicate the loader can be started without a password. (See Password Lockout Feature on Page 60-191-1.)

4. **START Button:** Used to start the engine.

5. **STOP Button:** Used to stop the engine and shut down the loaders electrical system.

6. **RUN Button:** Used to turn on the loaders electrical system.

The switch location (Item 7) **[Figure 60-50-4]** can have different functions depending on machine configuration. See the following table for more information.

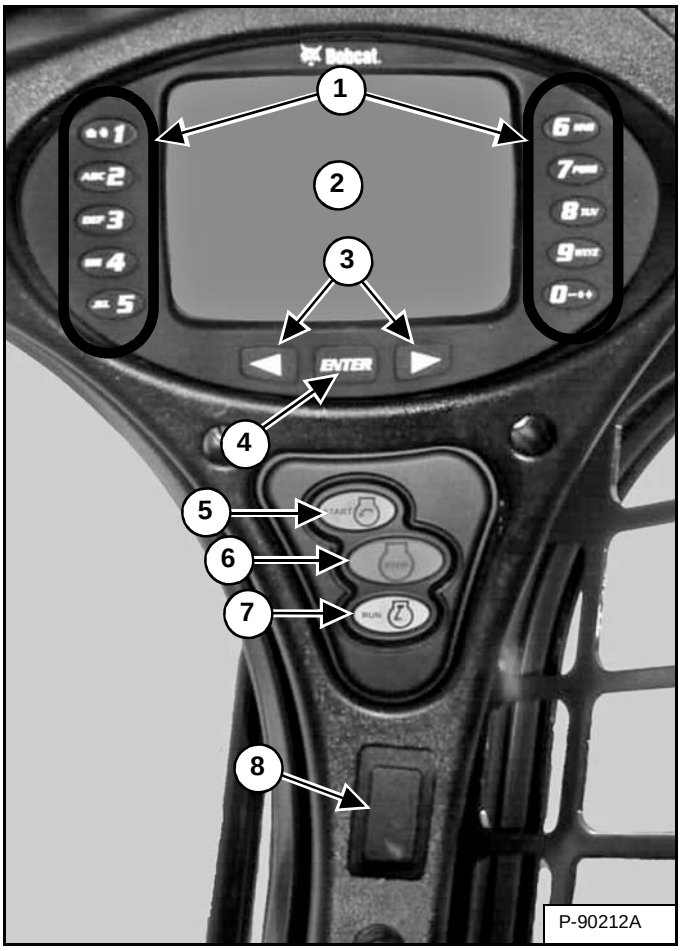
REF.	DESCRIPTION	FUNCTION / OPERATION
	ADVANCED CONTROL SYSTEM (ACS) (Option)	Press the top to select Hand Controls; bottom to select Foot Controls.
	SELECTABLE JOYSTICK CONTROLS (SJC) (Option)	Press the top to select 'ISO' Control Pattern; bottom to select 'H' Control Pattern.
	FOUR-WAY FLASHER LIGHTS (Option)	Press the top to turn lights ON; bottom to turn OFF.
	ROTATING BEACON (Option) ***or*** STROBE LIGHT (Option)	Press the top to turn light ON; bottom to turn OFF.

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INSTRUMENT PANELS (CONT'D)

Right Panel (Deluxe Instrumentation Panel)

Figure 60-50-5



This machine may be equipped with a Deluxe Instrumentation Panel **[Figure 60-50-5]**.

1. **Keypad (1 through 0):** The keypad has two functions:

   - To enter a number code (password) to allow starting the engine.

   - To enter a number as directed for further use of the display screen.

2. **Display Screen:** The Display Screen is where all system setup, monitoring and error conditions are displayed.

3. **Scroll Buttons:** Used to scroll through display screen choices.

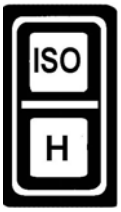
4. **ENTER Button:** Used to make selections on the display screen.

5. **START Button:** Used to start the engine.

6. **STOP Button:** Used to stop the engine and shut down the loader's electrical system.

7. **RUN Button:** Used to turn on the loader's electrical system.

The switch location (Item 8) **[Figure 60-50-5]** can have different functions depending on machine configuration. See the following table for more information.

REF.	DESCRIPTION	FUNCTION / OPERATION
	ADVANCED CONTROL SYSTEM (ACS) (Option)	Press the top to select Hand Controls; bottom to select Foot Controls.
	SELECTABLE JOYSTICK CONTROLS (SJC) (Option)	Press the top to select 'ISO' Control Pattern; bottom to select 'H' Control Pattern.
	FOUR-WAY FLASHER LIGHTS (Option)	Press the top to turn lights ON; bottom to turn OFF.
	ROTATING BEACON (Option) or STROBE LIGHT (Option)	Press the top to turn light ON; bottom to turn OFF.

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Right Panel (Deluxe Instrumentation Panel) (Cont'd)

Figure 60-50-6



The first screen you will see on your new loader will be as shown in **[Figure 60-50-6]**.

When this screen is on the display you can enter the password and start the engine or change the default language.

NOTE: Your new loader (with Deluxe Instrumentation Panel) will have an 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. Keep your password in a safe place for future needs.

Change Language:

Press the left or right scroll button to cycle through the languages. The language that is stopped on will be the default language used for the deluxe instrumentation panel **[Figure 60-50-6]**.

The language can be changed at any time. (See CONTROL PANEL SETUP on Page 60-180-1.)

Enter The Password:

Use the numbers on the keypad to enter the password. Then press the **[Enter]** button a symbol will appear on the display screen for each number entered **[Figure 60-50-6]**. The left scroll button can be used to backspace if an incorrect number is entered.

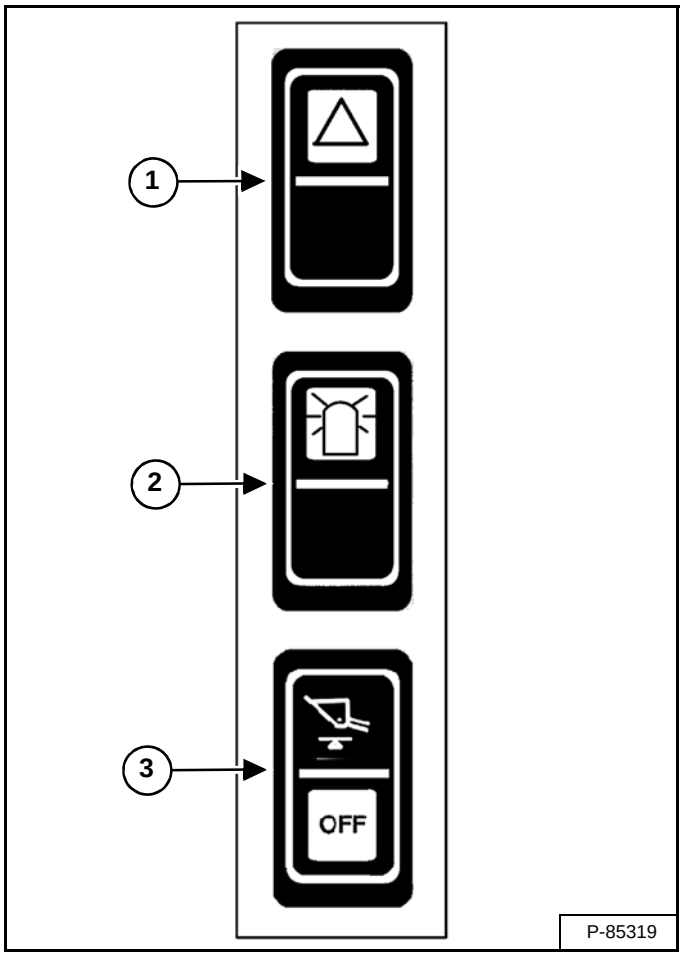
If the correct password is not entered, **[INVALID PASSWORD TRY AGAIN]** will appear on the display screen and the password will have to be reentered.

See CONTROL PANEL SETUP for further description of screens to setup the system for your use. (See CONTROL PANEL SETUP on Page 60-180-1.)

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Left Switch Panel

Figure 60-50-7

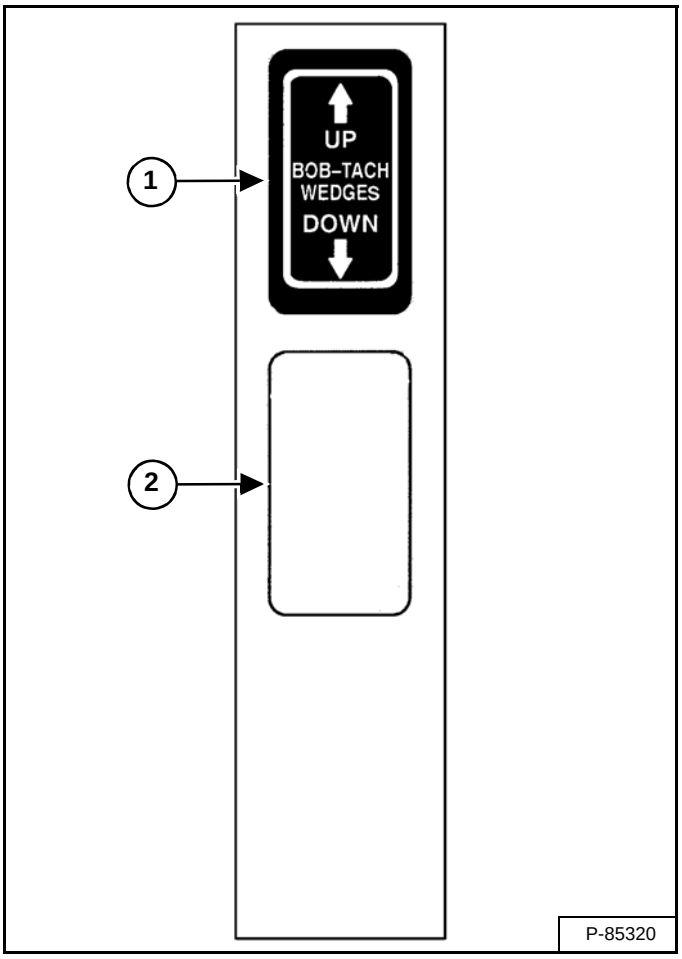


This machine may be equipped with a Left Switch Panel **[Figure 60-50-7]**.

REF. NO.	DESCRIPTION	FUNCTION / OPERATION
1	FOUR-WAY FLASHER LIGHTS (Option)	Press the top to turn lights ON; bottom to turn OFF.
2	ROTATING BEACON (Option) or STROBE LIGHT (Option)	Press the top to turn light ON; bottom to turn OFF.
3	HYDRAULIC BUCKET POSITIONING (Option)	Press the top to engage Hydraulic Bucket Positioning; bottom to disengage.

Right Switch Panel

Figure 60-50-8



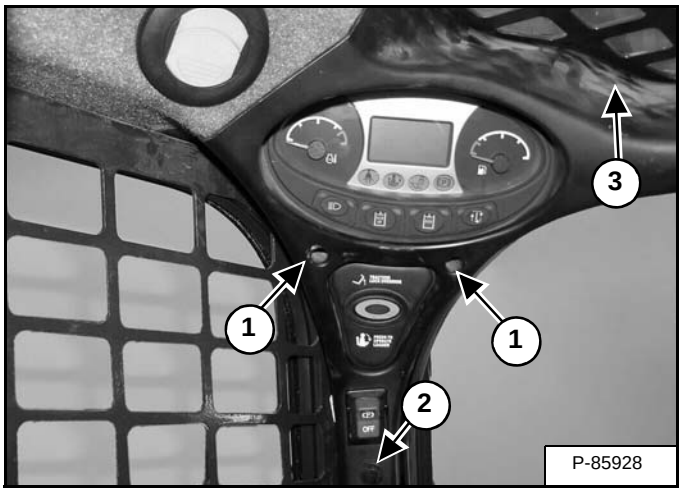
This machine may be equipped with a Right Switch Panel **[Figure 60-50-8]**.

REF. NO.	DESCRIPTION	FUNCTION / OPERATION
1	POWER BOB-TACH (Option)	Press and hold the up arrow to disengage the Bob-Tach wedges. Press and hold the down arrow to engage the Bob-Tach wedges into the attachment mounting frame holes.
2	NOT USED	- - -

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Left Panel Removal And Installation

Figure 60-50-9

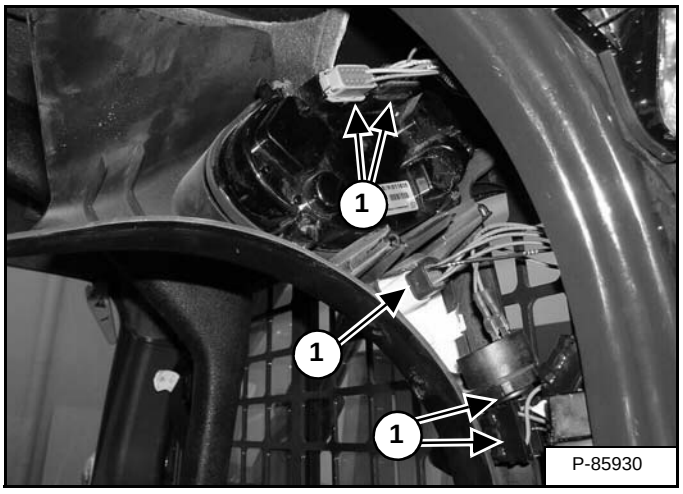


Remove the two mounting bolts (Item 1) and the fastener (Item 2) **[Figure 60-50-9]**.

Installation: Be careful to not overtighten the instrument panel mounting bolts to prevent stripping of the threaded holes in the panels. Tighten the panel screws to 3 - 4 N•m (25 - 35 in-lb) torque.

NOTE: Inspect and replace the seal as needed (Item 3) [Figure 60-50-9].

Figure 60-50-10

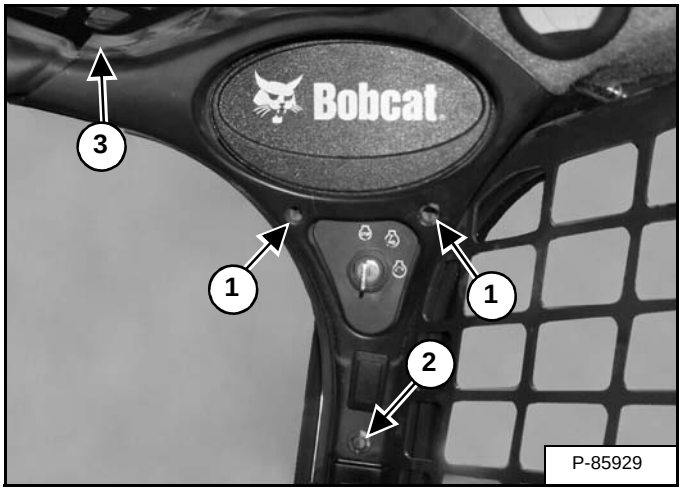


Pull the right instrument panel down and disconnect the wire harness connectors (Item 1) **[Figure 60-50-10]** from the panel.

Remove the panel from the loader cab.

Right Panel (Standard Key Panel) Removal And Installation

Figure 60-50-11

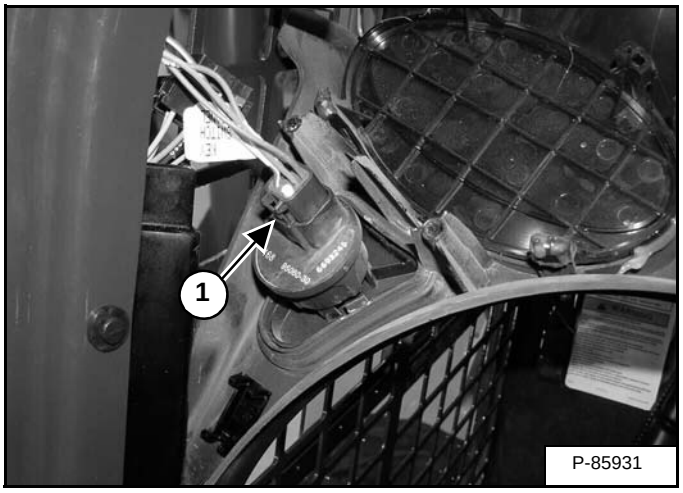


Remove the two mounting bolts (Item 1) and the fastener (Item 2) **[Figure 60-50-11]**.

Installation: Be careful to not overtighten the instrument panel mounting bolts to prevent stripping of the threaded holes in the panels. Tighten the panel screws to 3 - 4 N•m (25 - 35 in-lb) torque.

NOTE: Inspect and replace the seal as needed (Item 3) [Figure 60-50-11].

Figure 60-50-12



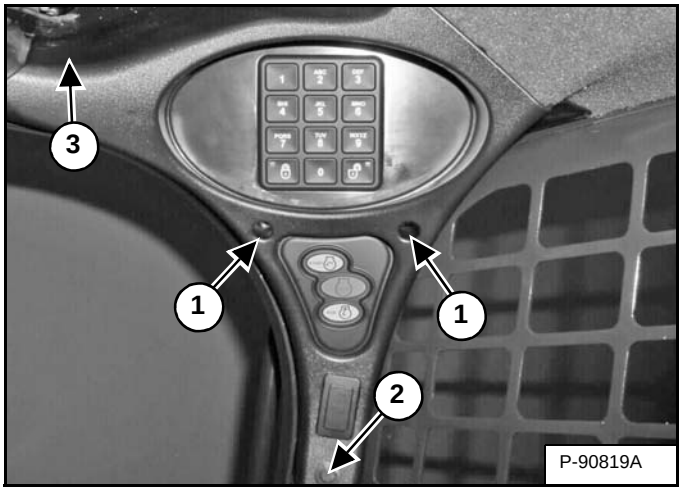
Pull the right instrument panel down and disconnect the wire harness connector (Item 1) **[Figure 60-50-12]**.

Remove the panel from the loader cab.

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Right Panel (Keyless Start Panel) Removal And Installation

Figure 60-50-13

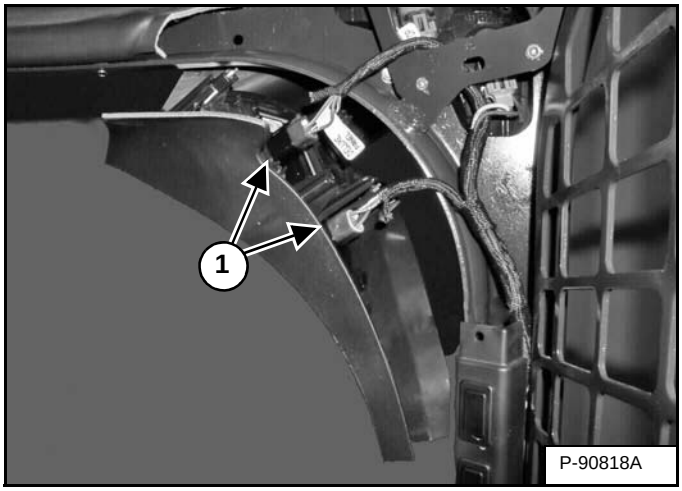


Remove the two mounting bolts (Item 1) and the fastener (Item 2) **[Figure 60-50-13]**.

Installation: Be careful to not overtighten the instrument panel mounting bolts to prevent stripping of the threaded holes in the panels. Tighten the panel screws to 3 - 4 N•m (25 - 35 in-lb) torque.

NOTE: Inspect and replace the seal as needed (Item 3) [Figure 60-50-13].

Figure 60-50-14

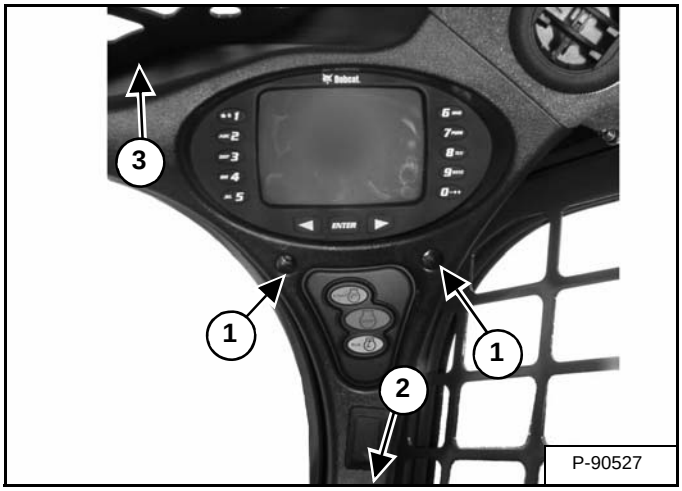


Pull the right instrument panel down and disconnect the wire harness connector (Item 1) **[Figure 60-50-14]**.

Remove the panel from the loader cab.

Right Panel (Deluxe Instrumentation Panel) Removal And Installation

Figure 60-50-15

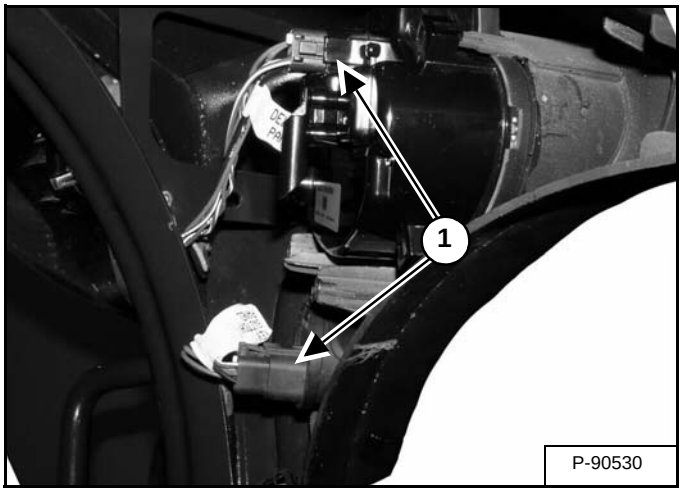


Remove the two mounting bolts (Item 1) and the fastener (Item 2) **[Figure 60-50-15]**.

Installation: Be careful to not overtighten the instrument panel mounting bolts to prevent stripping of the threaded holes in the panels. Tighten the panel screws to 3 - 4 N•m (25 - 35 in-lb) torque.

NOTE: Inspect and replace the seal as needed (Item 3) [Figure 60-50-15].

Figure 60-50-16



Pull the right instrument panel down and disconnect the wire harness connector (Item 1) **[Figure 60-50-16]**.

Remove the panel from the loader cab.

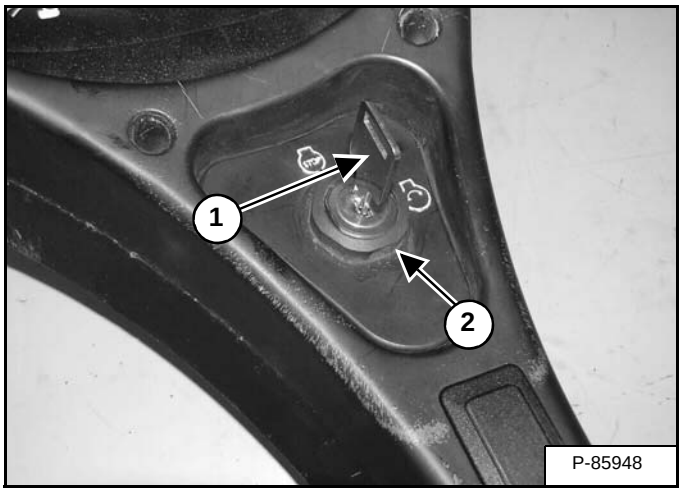
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Key Switch Disassembly And Assembly

Remove the right instrument panel. (See INSTRUMENT PANELS on Page 60-50-1.)

Disconnect the key switch wiring harness.

Figure 60-50-17



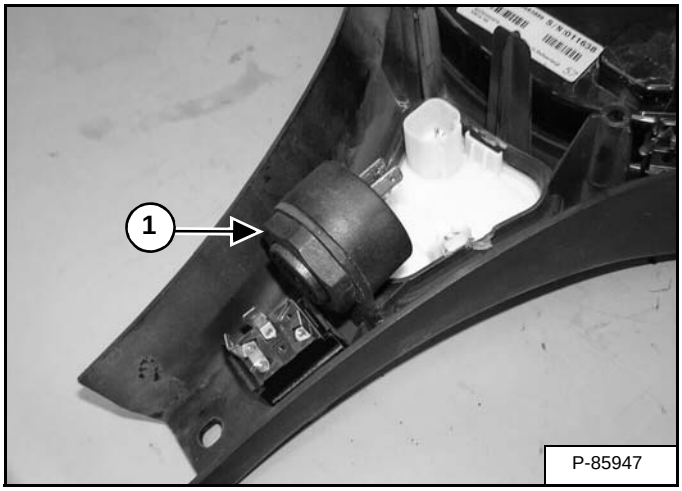
Remove the ignition key (Item 1) from the switch. Remove the ignition switch retaining nut (Item 2) **[Figure 60-50-17]** from the switch.

Remove the ignition switch from the control panel.

Alarm Disassembly And Assembly

Remove the left instrument panel. (See Left Panel Removal And Installation on Page 60-50-9.)

Figure 60-50-18



Remove the left side instrument panel.

Remove the retaining nut (Item 1) **[Figure 60-50-18]** from the loader alarm.

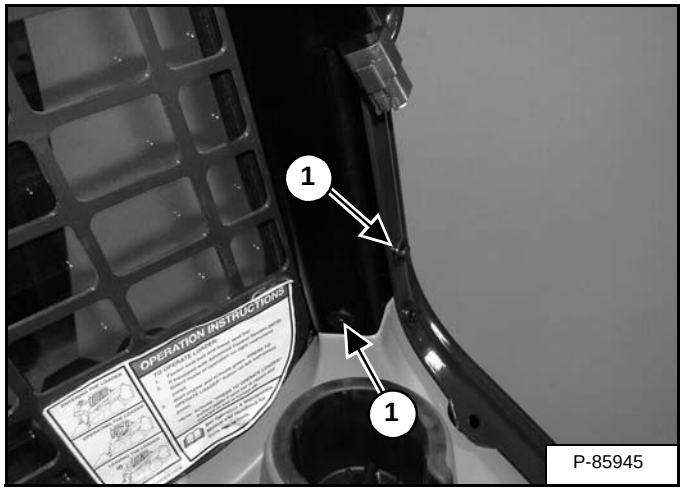
Remove the alarm from the loader instrument panel.

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Left Switch Panel Removal And Installation

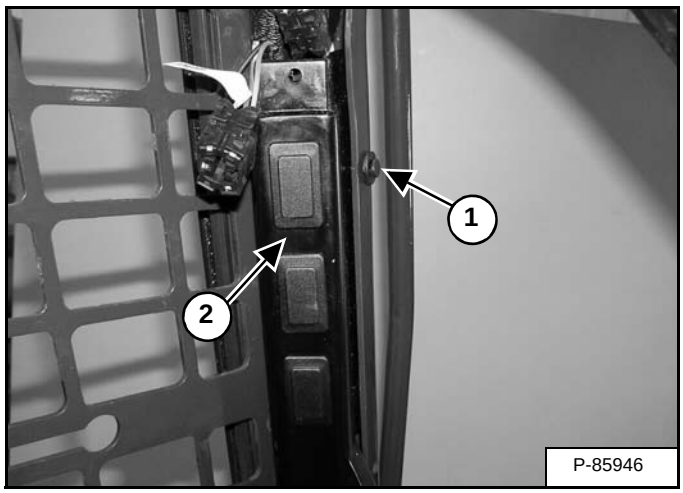
Remove the left panel. (See Left Panel Removal And Installation on Page 60-50-9.)

Figure 60-50-19



Remove the two fasteners (Item 1) **[Figure 60-50-19]**.

Figure 60-50-20

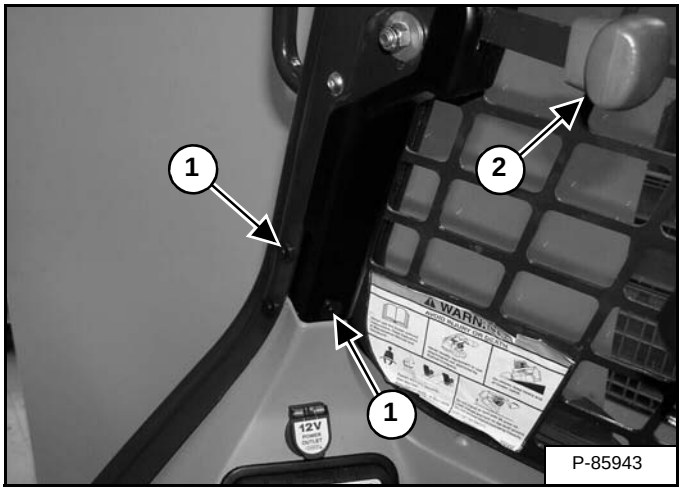


Remove the fastener (Item 1) and the left side panel (Item 2) **[Figure 60-50-20]**.

Right Switch Panel Removal And Installation

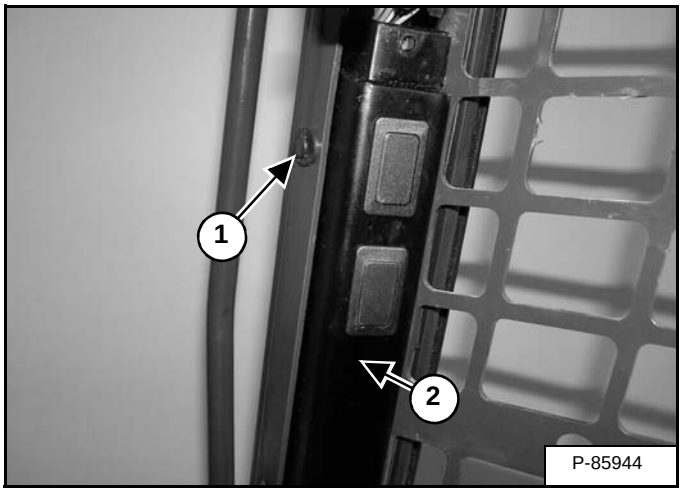
Remove the right panel. (See Right Panel (Standard Key Panel) on Page 60-50-4.)

Figure 60-50-21



Remove the two fasteners (Item 1) and the knob (item 2) **[Figure 60-50-21]**.

Figure 60-50-22



Remove the fastener (Item 1) and the left side panel (Item 2) **[Figure 60-50-22]**.

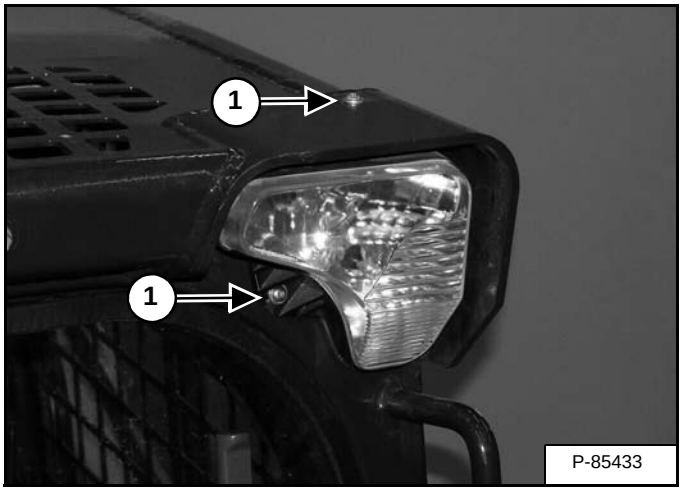
Dealer Copy -- Not for Resale

LIGHTS

Front Removal And Installation

Disconnect the negative(-) cable from the battery. (See Removal And Installation on Page 60-20-1.)

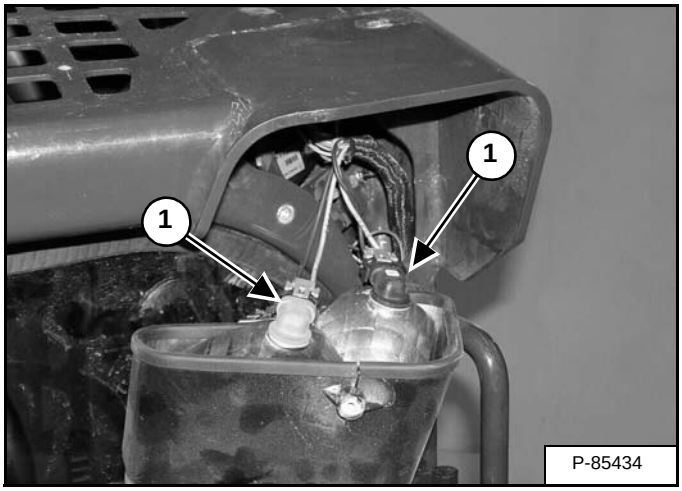
Figure 60-60-1



Remove the two bolts (Item 1) **[Figure 60-60-1]**.

Installation: Tighten the two bolts to 22 - 27 N•m (40 - 45 in-lb) torque.

Figure 60-60-2



Disconnect the bulbs (Item 1) **[Figure 60-60-2]** from the wire harness connectors.

Figure 60-60-3

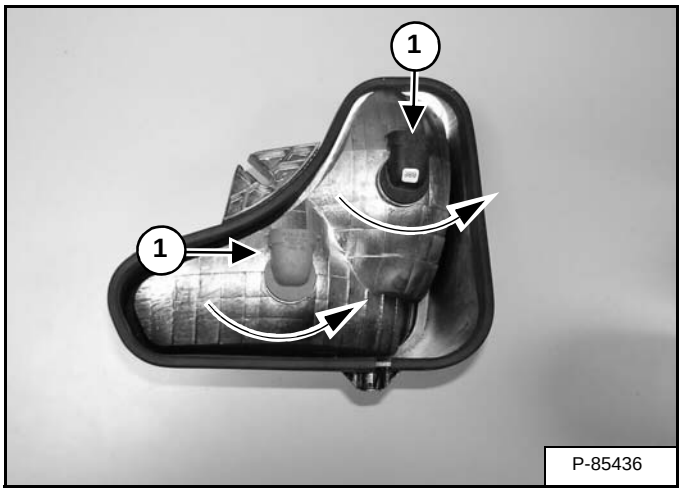
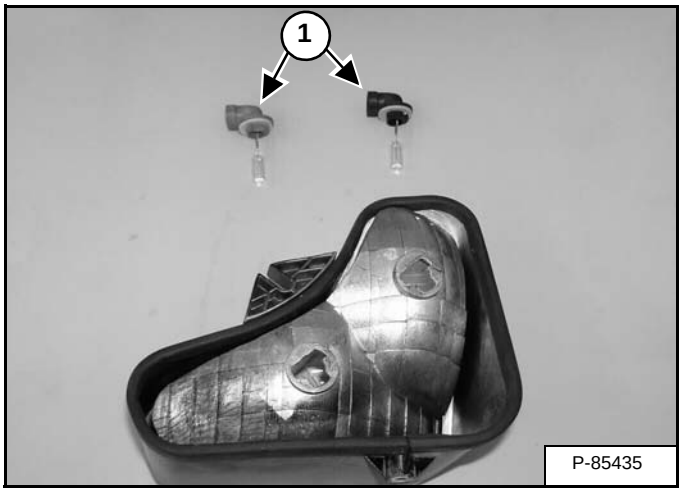


Figure 60-60-4



Remove the two bulbs (Item 1) **[Figure 60-60-3]** and **[Figure 60-60-4]** from the housing by turning bulb a 1/4 turn.

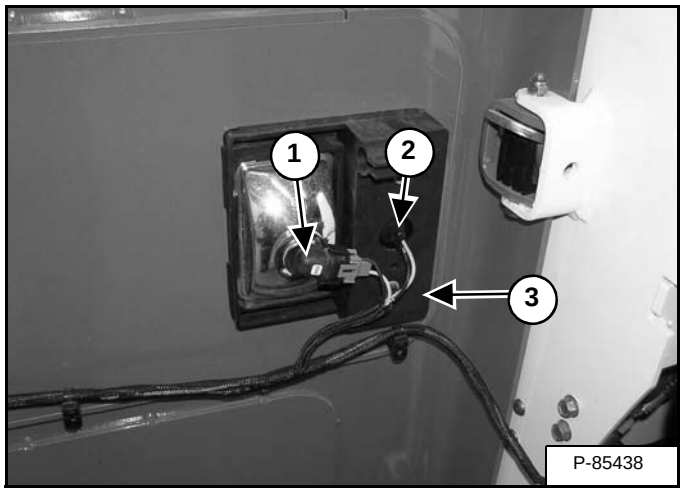
NOTE: Two different light bulbs are used, take note when removing to assure correct installation.

Reverse the above procedure to install the bulb.

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Rear Removal And Installation

Figure 60-60-5



Remove the bulb assembly (Items 1 and 2) from the light housing (Item 3) **[Figure 60-60-5]** by turning bulb assembly a 1/4 turn.

Figure 60-60-6

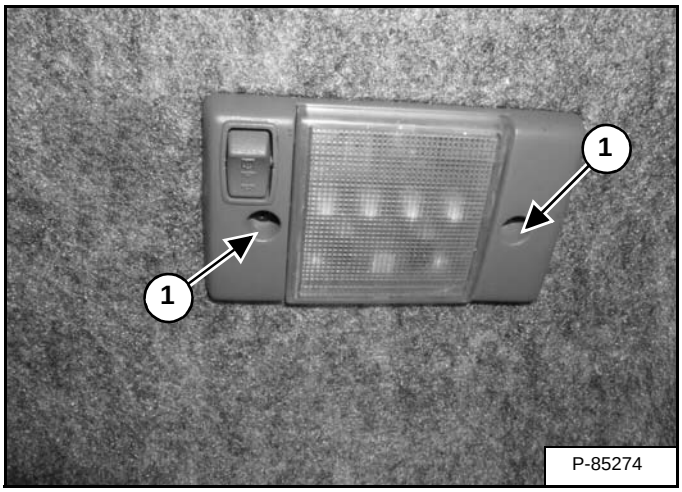


Using care press the rear light and housing from the door **[Figure 60-60-6]**.

Reverse this procedure for installation.

Cab Light Removal And Installation

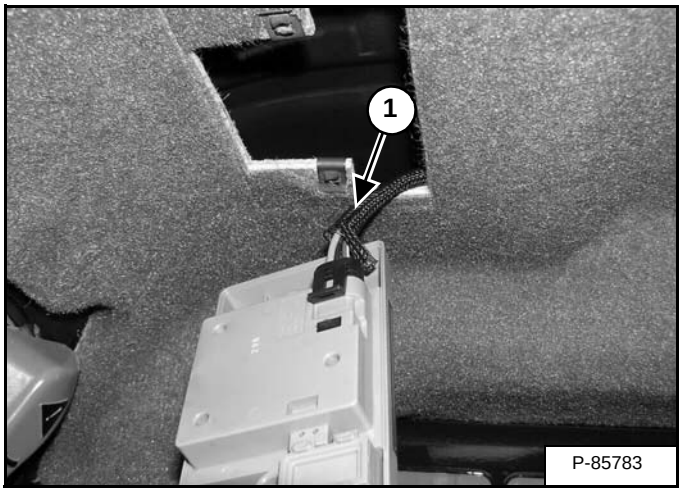
Figure 60-60-7



Remove the screws (Items 1) **[Figure 60-60-7]** from the cab light.

NOTE: Do not pull the cab light to far away from the headliner to prevent damage to the wires.

Figure 60-60-8



Disconnect the cab light (Item 1) **[Figure 60-60-8]**.

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BOBCAT CONTROLLERS (GATEWAY AND AUXILIARY)

Description

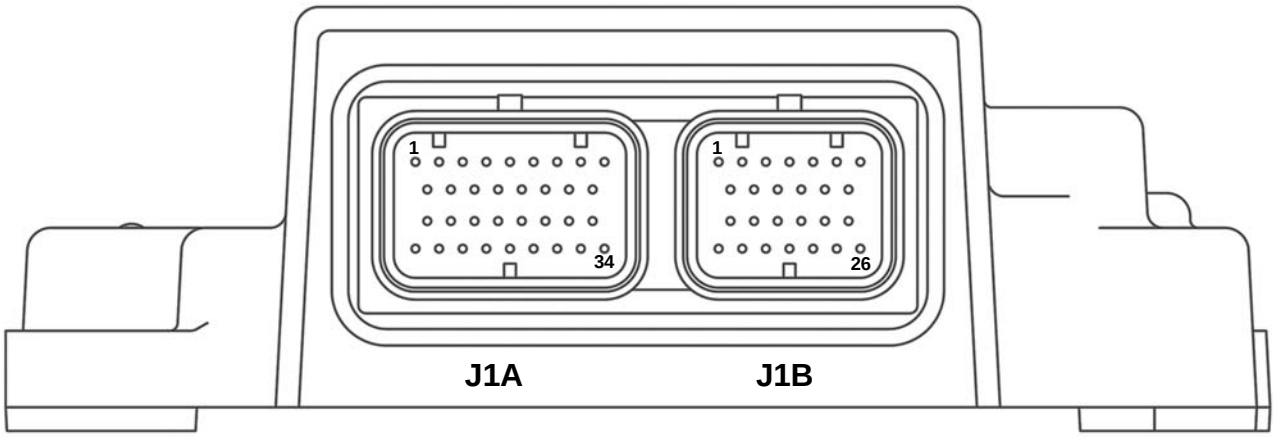
The Gateway controller is the main controller, it provides information to all other controllers. All loaders have a Gateway and Auxiliary controller.

The Gateway and Auxiliary controller are located behind the access panel near the operators left foot.

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Connector Identification

Gateway Controller

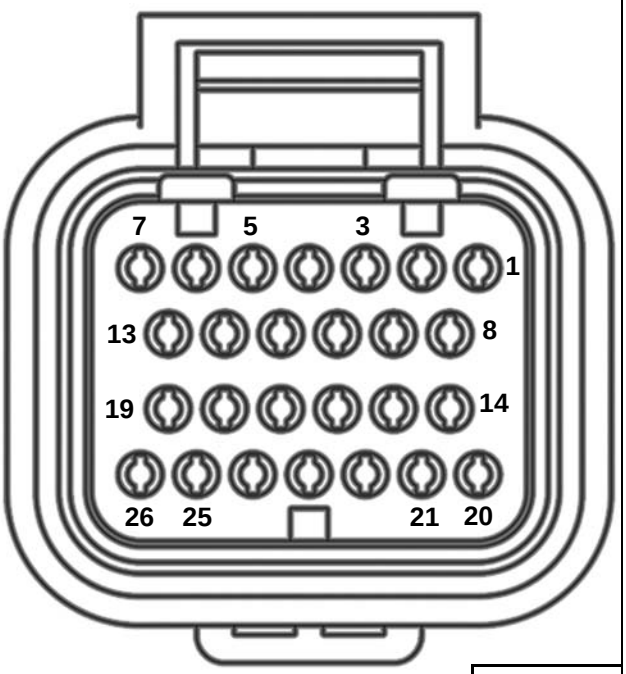


Harness Connector View



J1A

Harness Connector View



J1B

P-76622
P-76623
P-76624

Dealer Copy -- Not for Resale

Connector Identification (Cont'd)

J1A

PIN	WIRE NUMBER	COLOR	DESCRIPTION
1	2410	BLACK	HYD LOCK VALVE SOLENOID GROUND
2	2380	BLACK	LIFT SPOOL SOLENOID GROUND
3	8110	TAN	FUEL RELAY SIGNAL
4	8000	TAN	SWITCHED POWER RELAY SIGNAL
5	6320	PINK	MRKR LIGHT PWR RELAY SIGNAL
6	8510	TAN	GLOW PLUG RELAY SIGNAL
7	8210	TAN	STARTER RELAY SIGNAL
8	4110	LGN	TRACTION LOCK RELAY SIGNAL
9	OPEN	NA	NA
10	2370	BLACK	TILT SPOOL LOCK SOLENOID GROUND
11	7023	WHITE	AC SIGNAL MONITOR
12	OPEN	NA	NA
13	4150	LGN	TRACTION LOCK RELAY FEEDBACK
14	8550	TAN	GLOW PLUG RELAY FEEDBACK
15	3600	LBL	ENGINE SPEED SENSOR SIGNAL
16	3700	LBL	AIR FILTER SENDER SIGNAL
17	6210	PINK	REAR LIGHT RELAY SIGNAL
18	2910	BLACK	HYDRAULIC FAN GROUND
19	9370	PURPLE	PTOL LED
20	9380	PURPLE	PTOL SWITCH
21	8020	TAN	SWITCHED POWER RELAY FEEDBACK
22	8250	TAN	STARTER RELAY FEEDBACK
23	3440	LBL	HYD FAN DIFF PRESS SWITCH SIGNAL
24	9360	PURPLE	START ENGINE
25	3520	LBL	ENGINE OIL PRESS SENDER POWER
26	2350	BLACK	TWO SPEED GROUND
27	2360	BLACK	TWO SPEED MAKEUP GROUND
28	6230	PINK	REAR LIGHT RELAY FEEDBACK
29	OPEN	NA	NA
30	8150	TAN	FUEL RELAY FEEDBACK
31	6330	PINK	MRKR LIGHT PWR RELAY FEEDBACK
32	3300	LBL	HYD TEMP SIGNAL
33	OPEN	NA	NA
34	3430	LBL	HYD FILTER DIFF PRESS

Dealer Copy -- Not for Resale

Connector Identification (Cont'd)

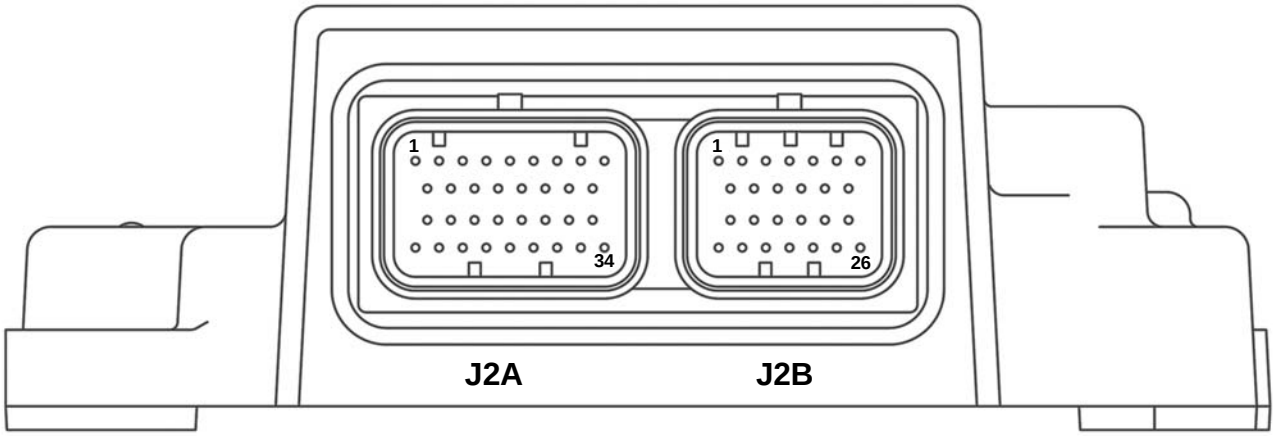
J1B

PIN	WIRE NUMBER	COLOR	DESCRIPTION
1	3420	LBL	HYD CHARGE PRESS SENDER SIGNAL
2	1110	RED/WHT	COMPUTER FUSE POWER OUT
3	1130	RED/WHT	COMPUTER FUSE POWER OUT
4	8800	TAN	FUEL SHUTOFF SOLENOID HOLD
5	4380	LGN	LIFT SPOOL LOCK SOLENOID SIGNAL
6	4200	LGN	TRACTION SOLENOID OUTPUT
7	4370	LGN	TILT SPOOL LOCK SOLENOID SIGNAL
8	9210	PUR/WHT	CAN LO 0
9	9110	PUR/WHT	CAN HI 0
10	OPEN	NA	NA
11	3920	LBL	SEATBAR SENSOR SIGNAL
12	3100	LBL	FUEL SENDER SIGNAL
13	4410	LGN	HYD LOCK SOLENOID SIGNAL
14	9500	PUR/WHT	CAN HIGH 1
15	2500	BLACK	COMPUTER GROUND
16	2510	BLACK	COMPUTER GROUND
17	3010	LBL	SENSOR GROUND
18	3200	LBL	ENGINE COOLANT SENSOR SIGNAL
19	4010	LGN	HYDRAULIC FAN SIGNAL
20	9600	PURPLE	CAN LOW 1
21	9800	PURPLE	REMOTE ATTACHMENT SIGNAL
22	9350	PURPLE	RUN / ENTER
23	3400	LBL	HYDRAULIC CHARGE PRESSURE
24	3930	LBL	+5V SUPPLY
25	4360	LGN	TWO SPEED MAKEUP
26	4350	LGN	TWO SPEED SIGNAL

Dealer Copy -- Not for Resale

Connector Identification

Auxiliary Controller

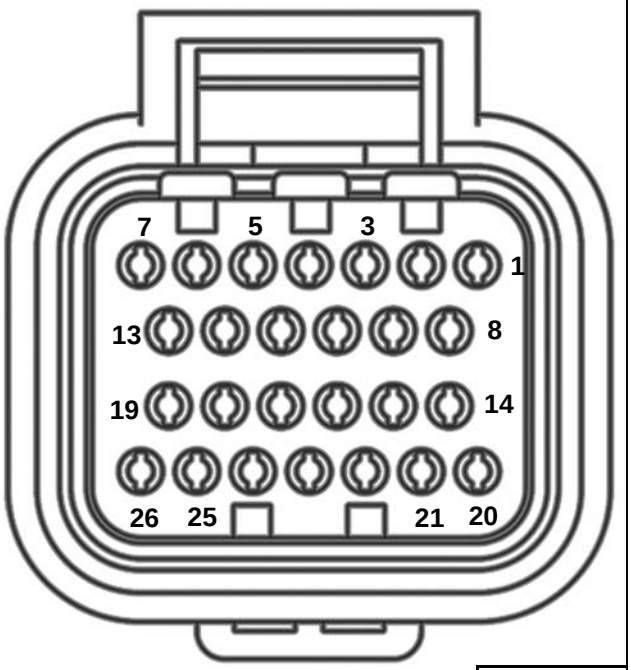


Harness Connector View



J2A

Harness Connector View



J2B

P-76647
P-76646
P-76645

Dealer Copy -- Not for Resale

Connector Identification (Cont'd)

J2A

PIN	WIRE NUMBER	COLOR	DESCRIPTION
1	2340	BLACK	FRONT BASE SOLENOID GROUND
2	2440	BLACK	JEM BLOCK REAR BASE SOLENOID GROUND
3	6520	PINK	LEFT BLINKER SIGNAL
4	6420	PINK	RIGHT BLINKER SIGNAL
5	7200	WHITE	HORN SIGNAL
6	OPEN	NA	NA
7	OPEN	NA	NA
8	OPEN	NA	NA
9	OPEN	NA	NA
10	2430	BLACK	JEM BLOCK REAR ROD SOLENOID GROUND
11	4810	LGN	LEFT HANDLE PADDLE RIGHT
12	4820	LGN	LEFT HANDLE PADDLE LEFT
13	4910	LGN	RIGHT HANDLE RIGHT ROCKER UP
14	OPEN	NA	NA
15	OPEN	NA	NA
16	OPEN	NA	NA
17	OPEN	NA	NA
18	2330	BLACK	FRONT ROD SOLENOID GROUND
19	OPEN	NA	NA
20	4640	LGN	FLOAT SIGNAL
21	OPEN	NA	NA
22	4830	LGN	LEFT HANDLE RIGHT ROCKER DOWN
23	OPEN	NA	NA
24	OPEN	NA	NA
25	OPEN	NA	NA
26	2460	BLACK	HIGH FLOW SOLENOID GROUND
27	OPEN	NA	NA
28	4840	LGN	LEFT HANDLE RIGHT ROCKER UP
29	OPEN	NA	NA
30	4940	LGN	RIGHT HANDLE LEFT ROCKER UP
31	4930	LGN	RIGHT HANDLE LEFT ROCKER DOWN
32	OPEN	NA	NA
33	OPEN	NA	NA
34	OPEN	NA	NA

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Connector Identification (Cont'd)

J2B

PIN	WIRE NUMBER	COLOR	DESCRIPTION
1	OPEN	NA	NA
2	1180	RED/WHT	COMPUTER FUSE POWER OUT
3	1150	RED/WHT	COMPUTER FUSE POWER OUT
4	4450	LGN	DIVERTER SOLENOID SIGNAL
5	4440	LGN	REAR BASE SIGNAL
6	4480	LGN	FRONT / REAR AUXILIARY SIGNAL
7	4430	LGN	REAR ROD SIGNAL
8	9220	PURPLE	CAN LO 0
9	9120	PUR/WHT	CAN HI 0
10	OPEN	NA	NA
11	OPEN	NA	NA
12	OPEN	NA	NA
13	4340	LGN	FRONT BASE SOLENOID SIGNAL
14	OPEN	NA	NA
15	2550	BLACK	AUXILIARY CONTROLLER GROUND
16	2540	BLACK	AUXILIARY CONTROLLER GROUND
17	4310	LBL	RIGHT HANDLE PWM LOW
18	4320	LBL	RIGHT HANDLE PWM SIGNAL
19	4330	LGN	FRONT ROD SOLENOID SIGNAL
20	OPEN	NA	NA
21	4920	LGN	RIGHT HANDLE TRIGGER RETURN
22	1560	RNG	SWITCHED INPUT POWER
23	4300	LGN	RIGHT HANDLE PWM HIGH
24	OPEN	NA	NA
25	OPEN	NA	NA
26	4460	LGN	HIGH FLOW SOLENOID SIGNAL

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Removal And Installation

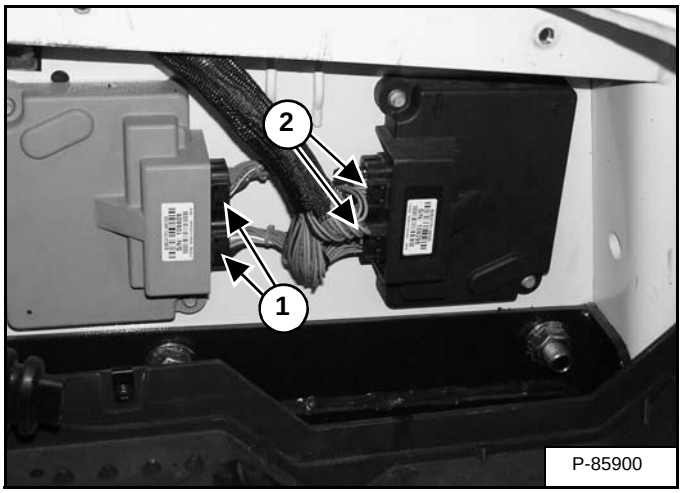
Raise the lift arms and install an approved lift arm support device. (See Installing on Page 10-20-1.)

Lift and block the loader. (See Procedure on Page 10-10-1.)

Raise the operator cab. (See Raising on Page 10-30-2.)

Remove the left inside access panel. (See Removal And Installation (Left) on Page 50-120-1.)

Figure 60-70-1

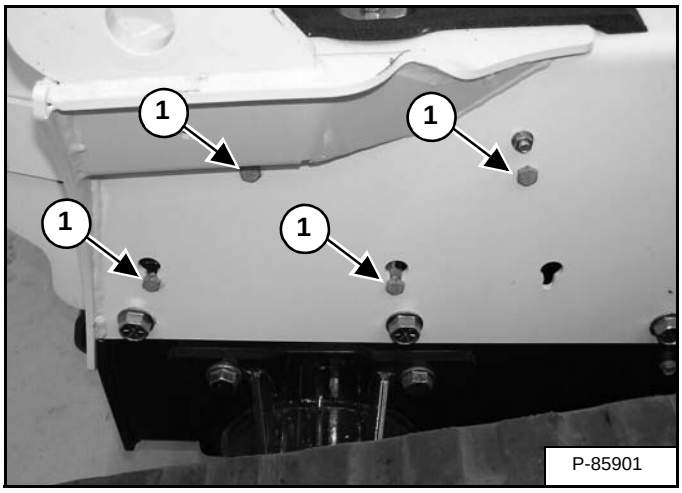


Unplug the two harness connectors (Item 1) **[Figure 60-70-1]** from the Gateway controller.

Unplug the two harness connectors (Item 2) **[Figure 60-70-1]** from the Auxiliary controller.

NOTE: The connectors are keyed and will only plug in one way.

Figure 60-70-2



Remove the controller mounting bolts (Item 1) **[Figure 60-70-2]** from the left fender.

Installation: Tighten the controller mounting bolts to 16 - 19 N•m (12 - 14 ft-lb) torque.

Remove the Gateway and Auxiliary controllers from the loader.

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BOBCAT CONTROLLER (ACS)

Description

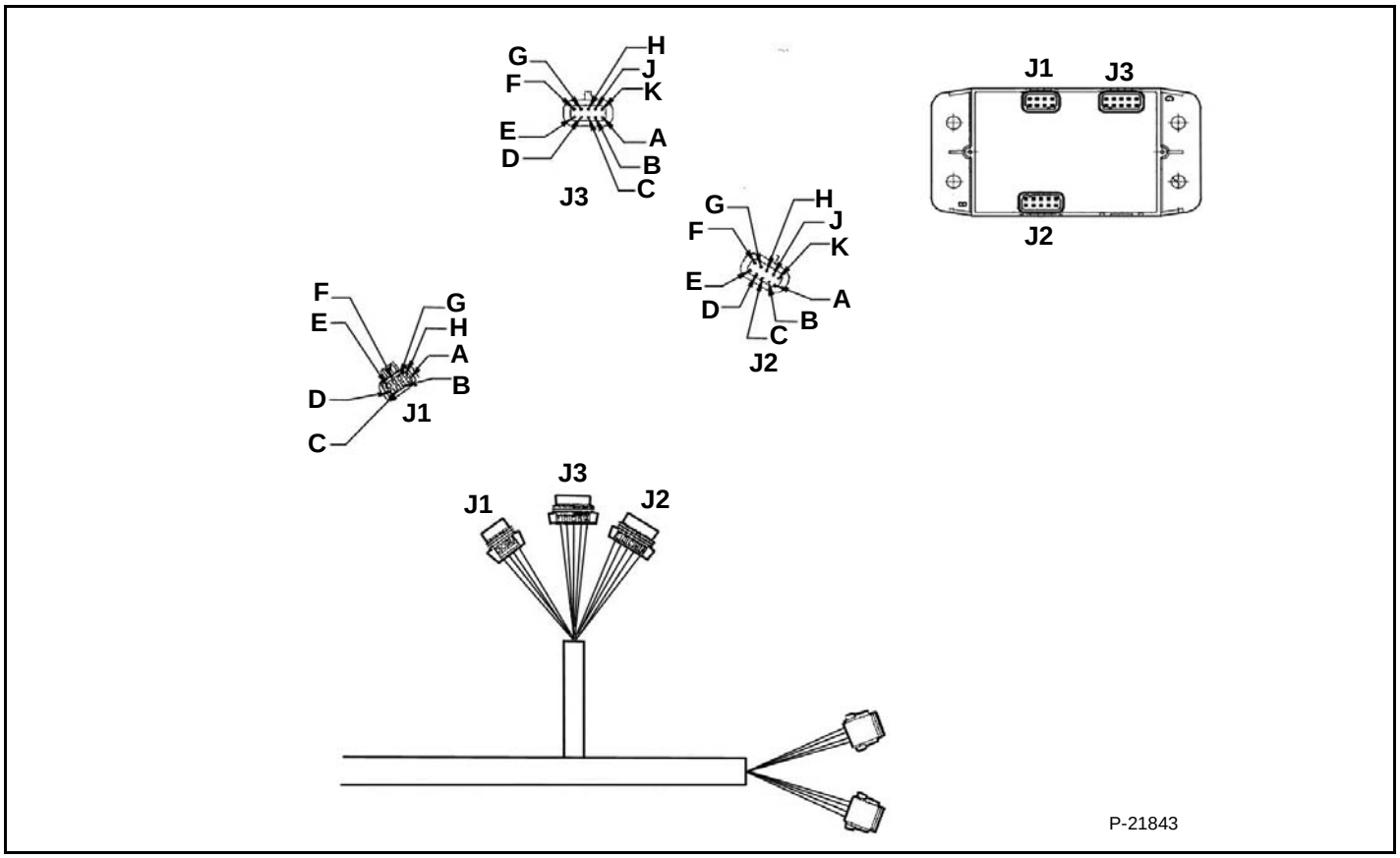
The ACS controller is on loaders equipped with the ACS or the SJC option. This controller processes information for the lift and tilt functions.

The ACS controller is housed in a grey colored plastic shell with black potting. The ACS controller communicates with the Bobcat Gateway Controller by CAN communication wires. The ACS controller is capable of receiving upgrades to the software.

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BOBCAT CONTROLLER (ACS) (CONT'D)

Connector And Wire Identification



P/N	PIN	DESCRIPTION
J1		CONNECTOR, METRI-PACK
Orange	A	5V HALL EFFECT SUPPLY
Orange	B	SWITCHED ACS POWER
Green	C	HAND/FOOT INPUT
Purple	D	CAN SIGNAL HIGH ACS
Purple	E	CAN SIGNAL LOW ACS
Purple	F	CAN SHIELD ACS
Black	G	ACS GROUND
Black	H	ACS 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 ACS POWER
Red/White	C	UNSWITCHED ACS POWER
Black	D	LIFT ACTUATOR REVERSE
Green	E	HANDLE LOCK POWER
Red	F	LIFT ACTUATOR FORWARD
Green	G	PEDAL LOCK POWER
Black	H	ACS GROUND
Black	J	ACS GROUND
Black	K	TILT ACTUATOR REVERSE

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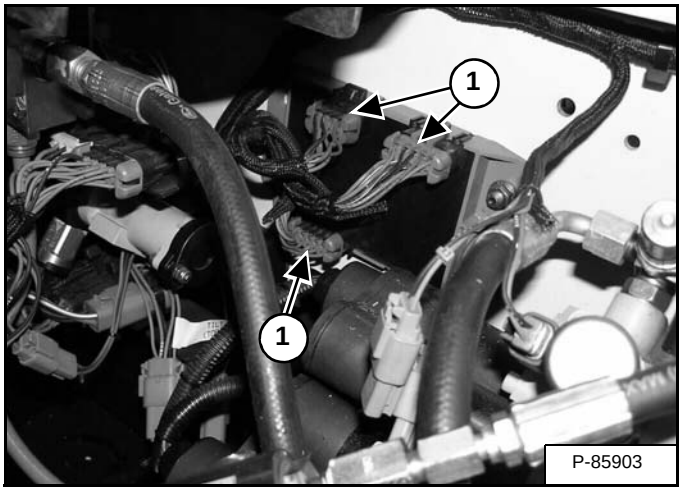
Removal And Installation

Raise the lift arms and install an approved lift arm support device. (See Installing on Page 10-20-1.)

Lift and block the loader. (See Procedure on Page 10-10-1.)

Raise the operator cab. (See Raising on Page 10-30-2.)

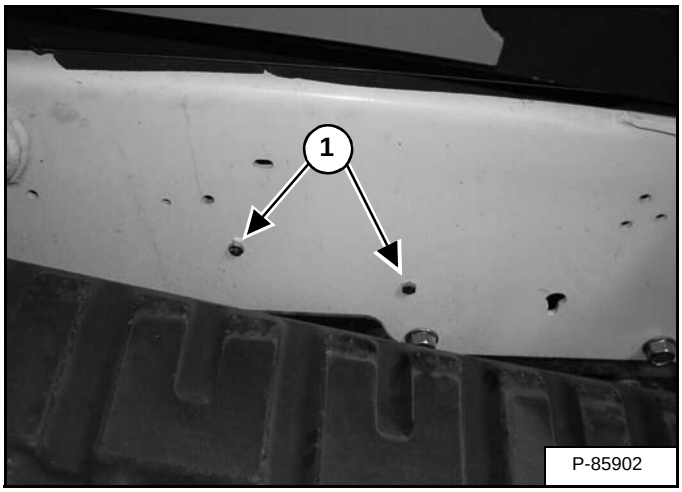
Figure 60-71-1



Unplug the harness connectors (Item 1) **[Figure 60-71-1]** from the controller.

NOTE: The connectors are keyed and will only plug in one way.

Figure 60-71-2



Remove the two mounting bolts (Item 1) **[Figure 60-71-2]** from the controller.

Remove the controller from the loader.

NOTE: The calibration procedure must be followed when replacing a controller. (See Lift And Tilt Calibration (ACS) on Page 60-160-11.)

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BOBCAT CONTROLLER (SJC) (DRIVE)

Description

The drive controller is only on loaders equipped with the SJC option. This controller processes information for the drive functions.

The drive controller is located behind the right side access panel near the operator's right foot.

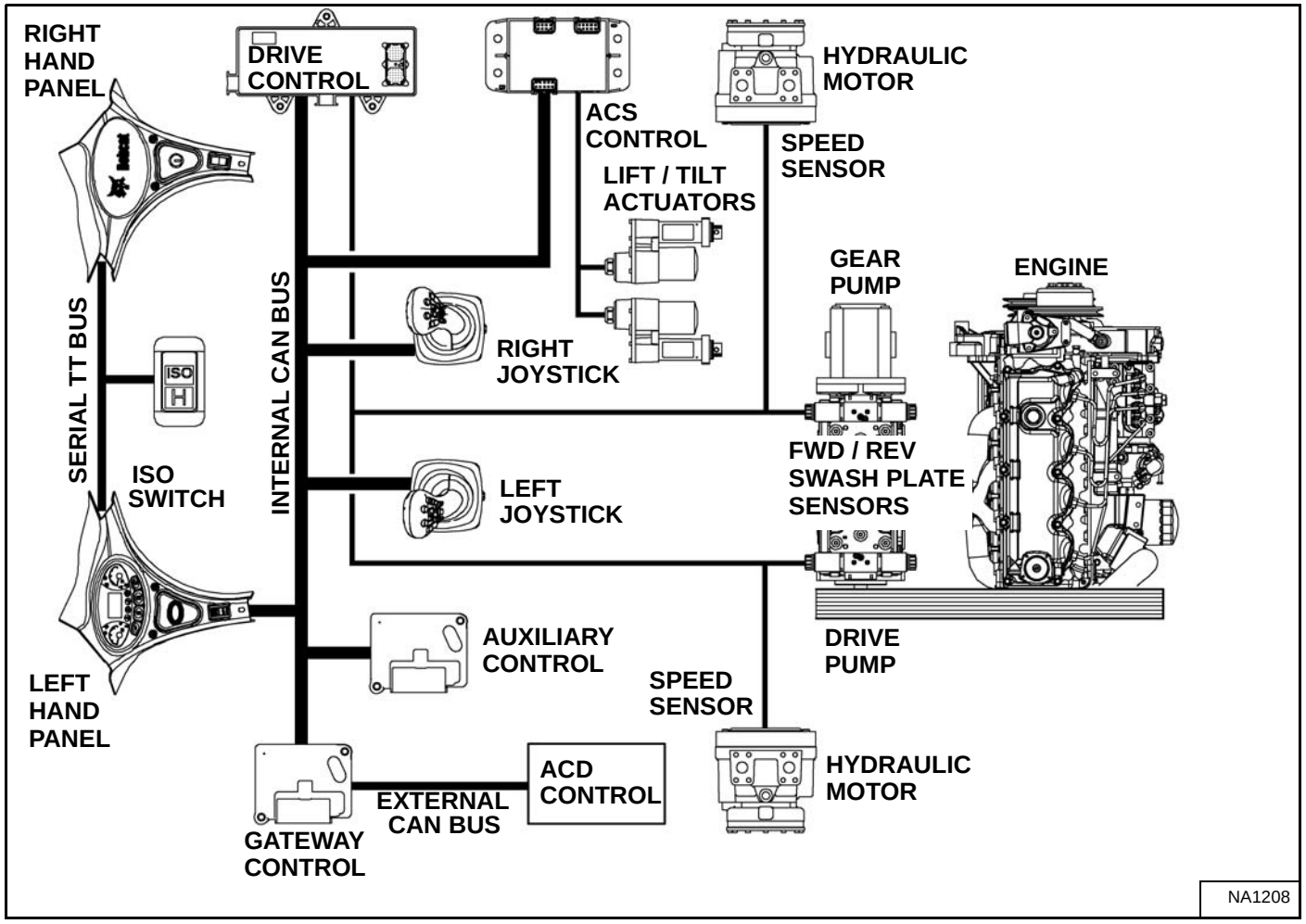
The drive controller monitors the position of the left joystick, pump swash plate angles and the output of the wheel speed sensors.

The drive controller works along with the ACS controller and communicates with the main Bobcat controller in an SJC system. All these controllers are capable of software upgrades.

The SJC system uses electronic joysticks to control both of the workgroups (lift and tilt) and the drive functions of the loader. The control can be switched from ISO and H-Pattern drive control layouts.

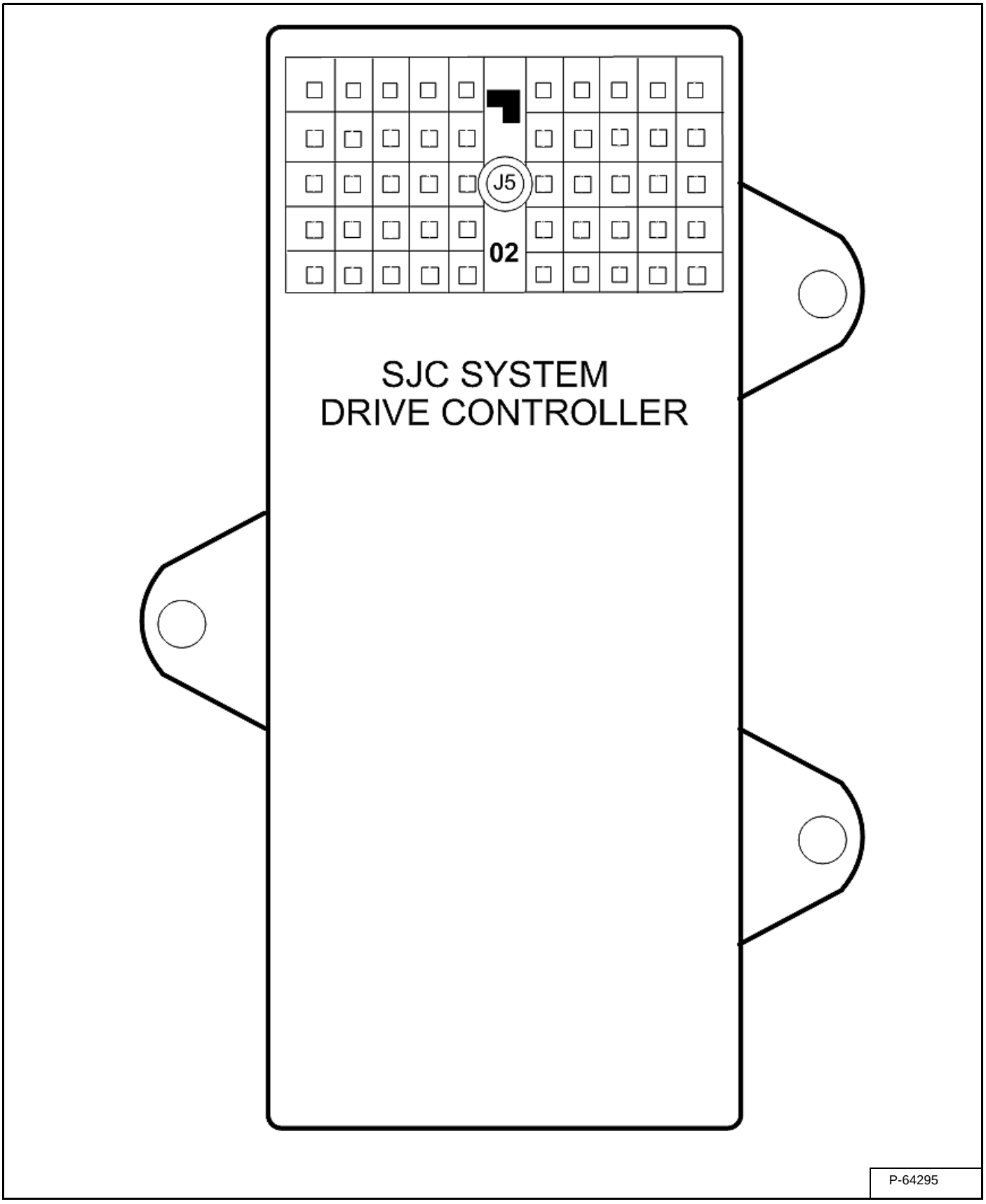
The workgroup actuators are the same as those used on the ACS system.

The hydrostatic drive pump is a Rexroth A22 unit. It has two electromagnetic coils on each of the two pumps to control the drive of the loader. The coils will direct the forward and reverse outputs of the pump to the drive motors. The Rexroth pump is equipped with position sensors mounted to the bottom of the swash plates to provide feedback to the controllers to sense uncommanded swash plate movement.



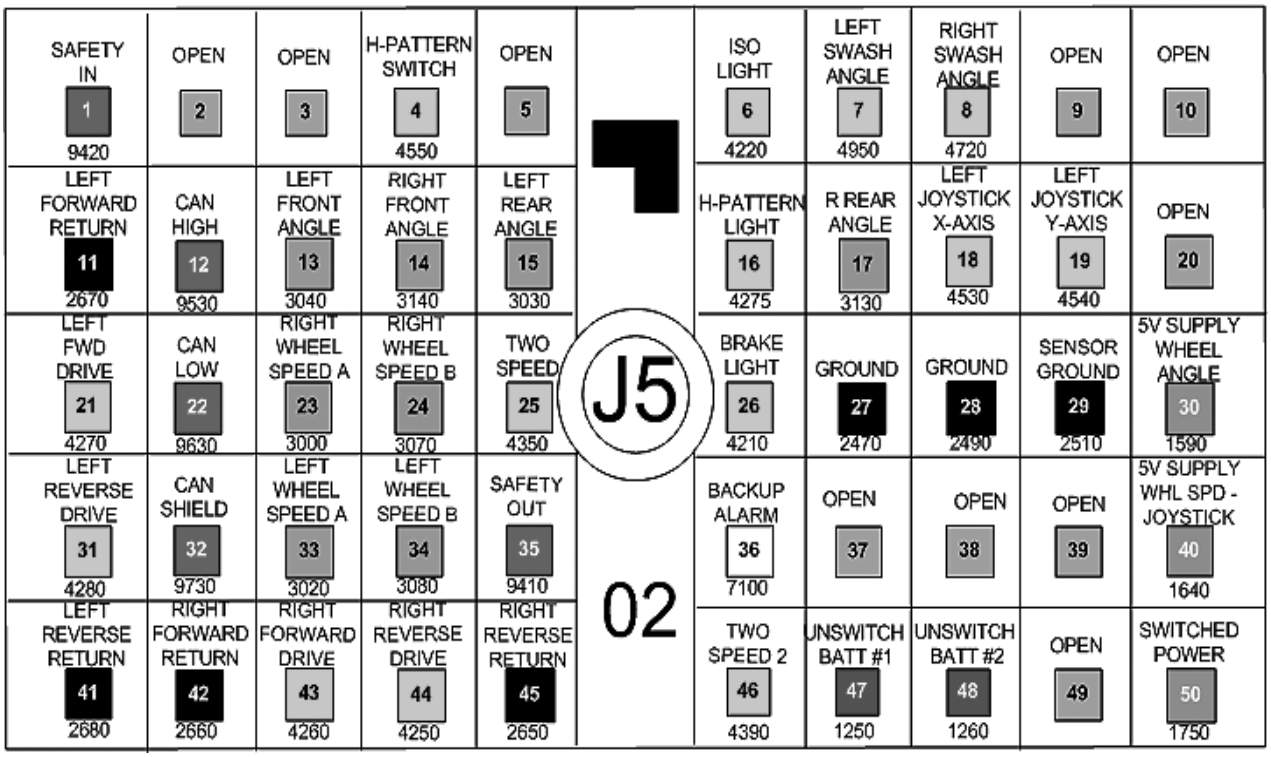
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Connector Identification



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Connector Identification (Cont'd)



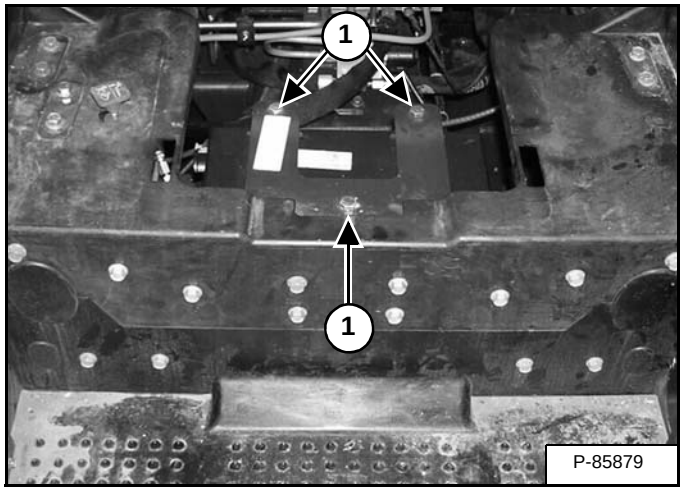
P-64296

Dealer Copy -- Not for Resale

Removal And Installation

Raise the operator cab. (See Raising on Page 10-30-2.)

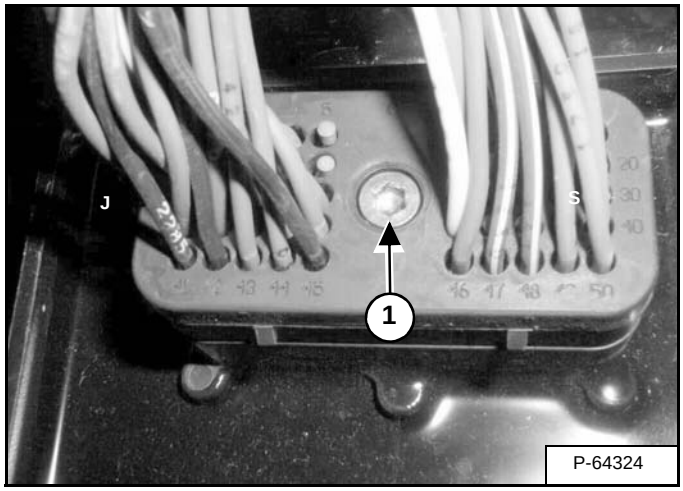
Figure 60-72-1



Remove the three bolts (Item 1) **[Figure 60-72-1]** that secure the controller.

Installation: Tighten the mounting bolts to 16 - 19 N•m (12 - 14 ft-lb) torque.

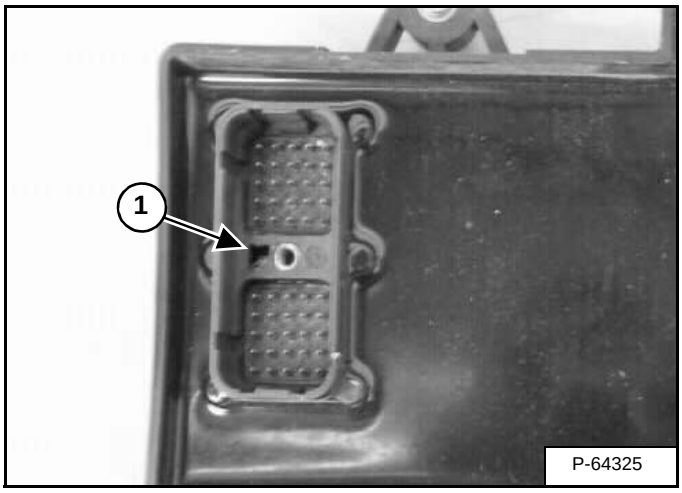
Figure 60-72-2



Remove the screw and wire harness (Item 1) **[Figure 60-72-2]**.

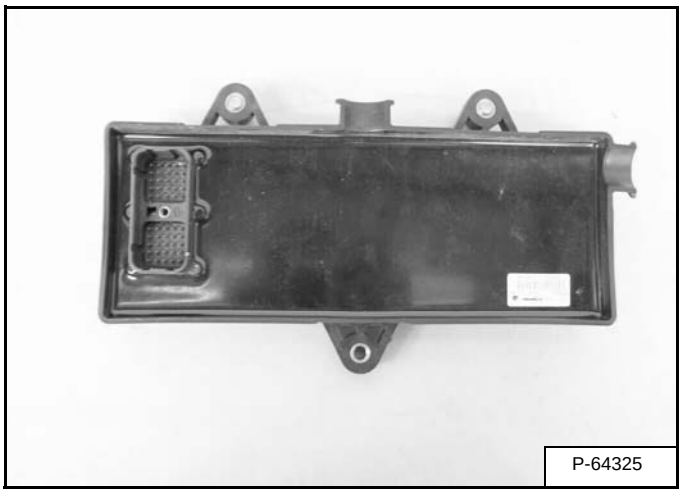
Installation: Tighten the connector screw to 3,39 - 3,96 N•m (30 - 35 in-lb) torque. DO NOT OVERTIGHTEN!

Figure 60-72-3



Installation: Note the keyed hole in the controller socket. (Item 1) **[Figure 60-72-3]**. The keyed hole matches a tab on the connector on the wire harness.

Figure 60-72-4



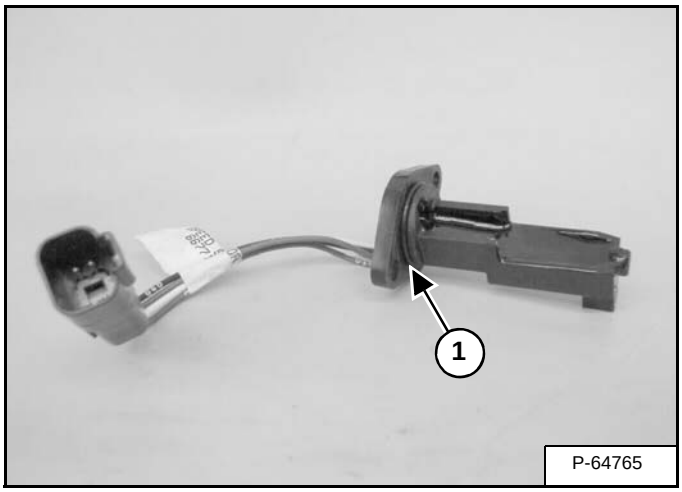
Remove the drive controller **[Figure 60-72-4]**.

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SPEED SENSORS (SJC)

Description

Figure 60-80-1

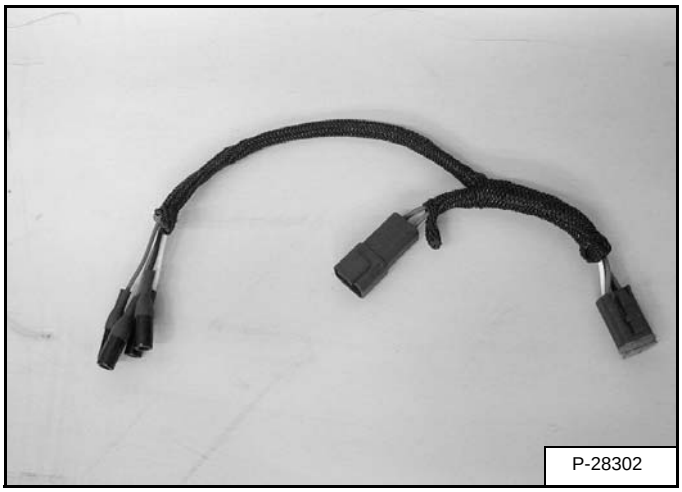


On SJC equipped loaders, the speed sensor **[Figure 60-80-1]** is used by the loader's controllers to sense if the drive motor is rotating. The end of the sensor is magnetic and counts the magnetic pulses as a rotating disc, attached to the motor carrier shaft, rotates by the sensor end.

The speed sensor is sealed with an O-ring (Item 1) **[Figure 60-80-1]** to keep hydraulic oil inside the motor carrier and dirt out.

Testing

Figure 60-80-2



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

MEL1609-Wheel Speed Sensor Test Harness **[Figure 60-80-2]**

MEL1563 or 7003031-Remote Start Tool Kit

Multimeter

Raise the lift arms and install an approved lift arm support device. (See Installing on Page 10-20-1.)

Raise the operator cab. (See Raising on Page 10-30-2.)

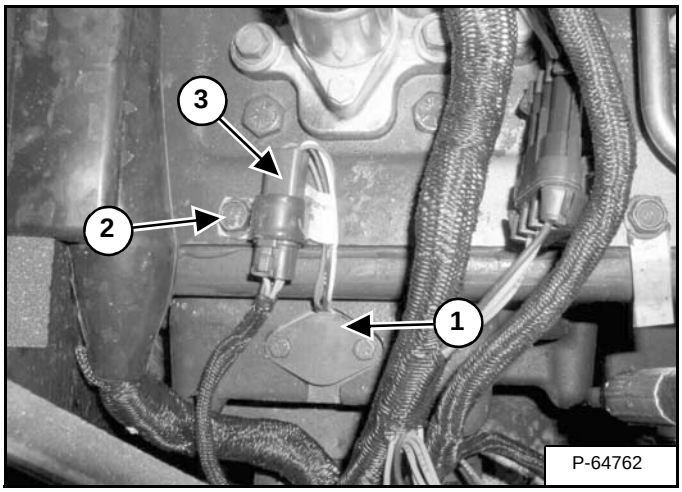
Connect the remote start tool to the loader. (See REMOTE START TOOL KIT-MEL1563 on Page 10-60-1.) or (See REMOTE START TOOL (SERVICE TOOL) KIT - 7003031 on Page 10-61-1.)

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SPEED SENSORS (SJC) (CONT'D)

Testing (Cont'd)

Figure 60-80-3



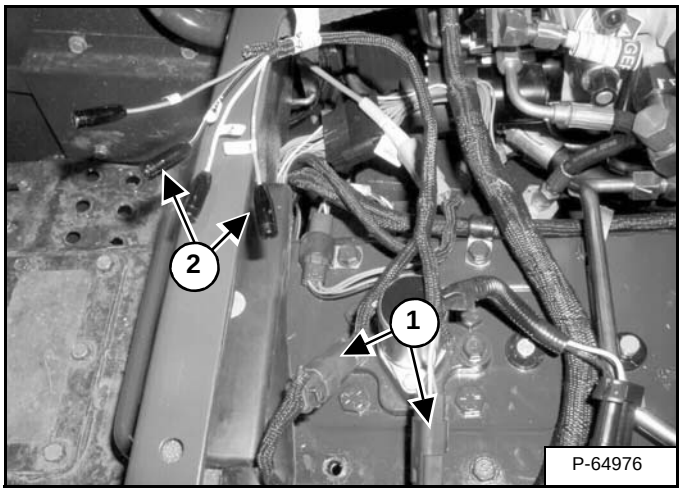
Locate the speed sensor (Item 1) **[Figure 60-80-3]** on the top of the right or left hydrostatic motor carrier.

Remove the transmission cover screw (Item 2) **[Figure 60-80-3]**, to loosen the connector clamp.

Installation: Tighten screw to 20 - 27 N•m (15 - 20 ft-lb) torque.

Disconnect the speed sensor wire connector (Item 3) **[Figure 60-80-3]** from the loader harness wire connector.

Figure 60-80-4



Connect the 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 2) **[Figure 60-80-4]**.

The voltage should be approximately 5 volts.

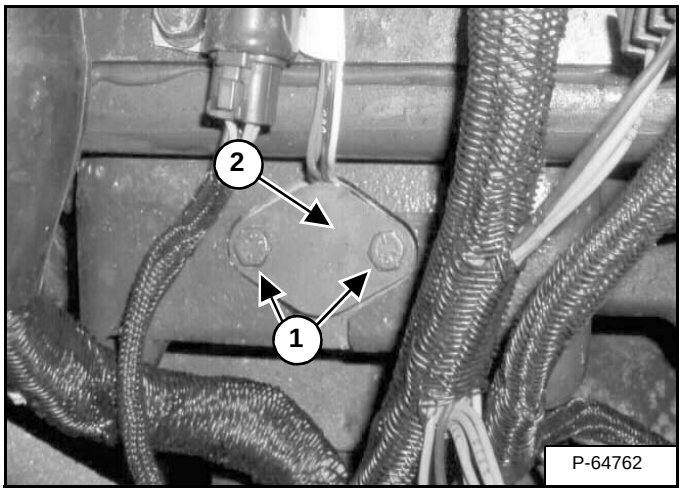
Repeat the procedure for the opposite side speed sensor. (If needed.)

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SPEED SENSORS (SJC) (CONT'D)

Removal And Installation

Figure 60-80-5



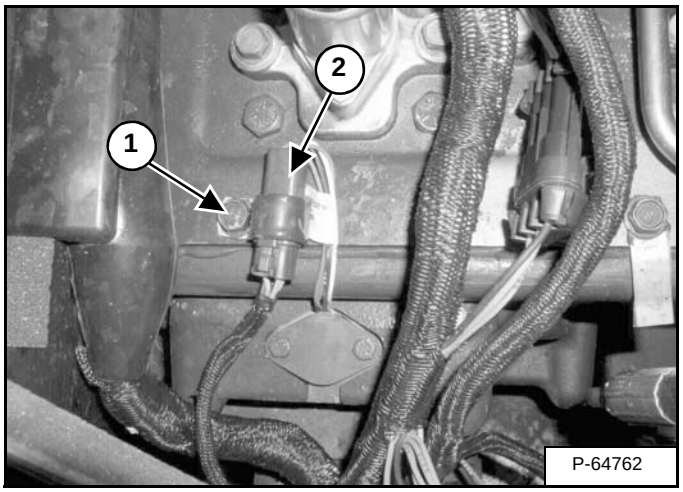
Raise the lift arms and install an approved lift arm support device. (See Installing on Page 10-20-1.)

Raise the operator cab. (See Raising on Page 10-30-2.)

Remove the two, speed sensor mount bolts (Item 1) **[Figure 60-80-5]** from the top of the hydrostatic motor carrier.

Remove the mount plate (Item 2) **[Figure 60-80-5]**.

Figure 60-80-6

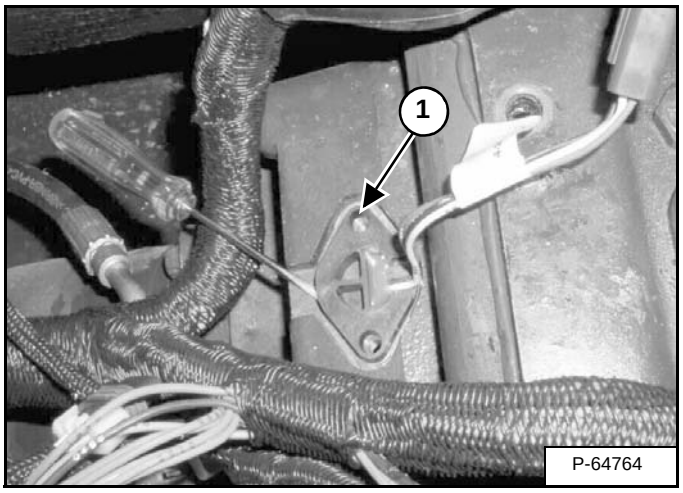


Remove the transmission cover screw (Item 1) **[Figure 60-80-6]**, to loosen the connector clamp.

Installation: Tighten screw to 20 - 27 N•m (15 - 20 ft-lb) torque.

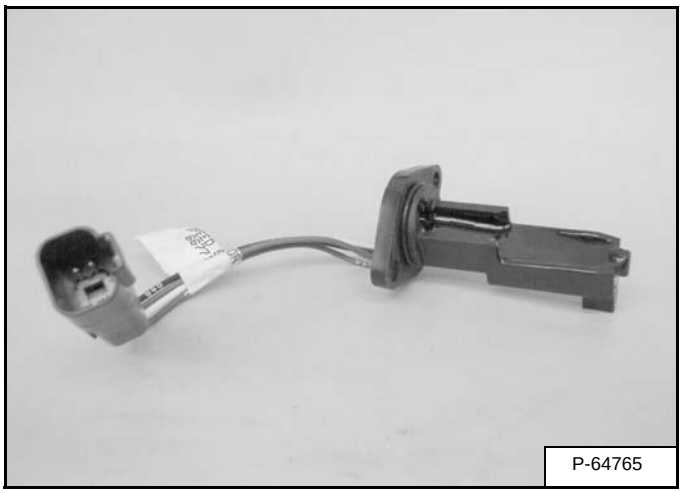
Disconnect the speed sensor electrical harness connector (Item 2) **[Figure 60-80-6]**.

Figure 60-80-7



Lift the speed sensor (Item 1) **[Figure 60-80-7]** out from the motor carrier. DO NOT pull on the wires, gently pry up with a screwdriver if necessary.

Figure 60-80-8

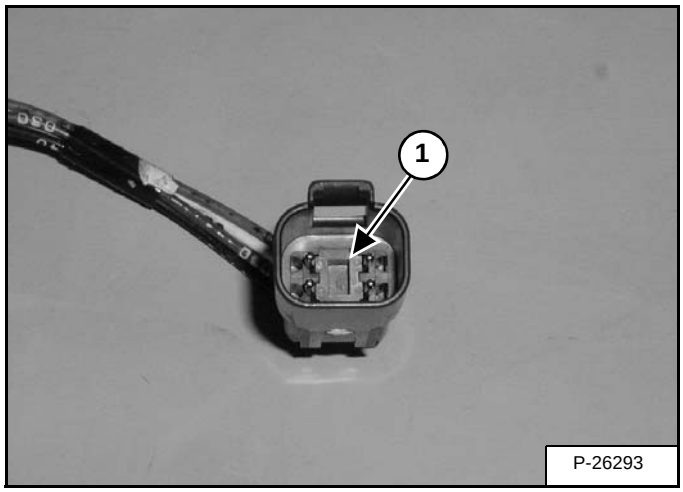


Remove the speed sensor **[Figure 60-80-8]**.

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Removal And Installation (Cont'd)

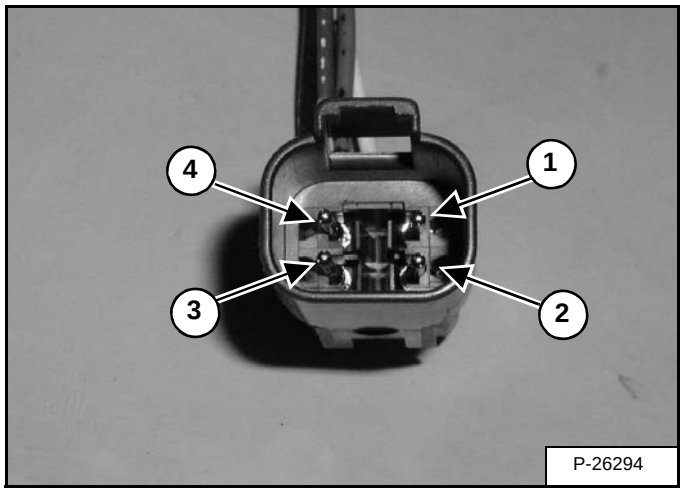
Figure 60-80-9



The electrical connector can be replaced.

Remove the connector wedge (Item 1) **[Figure 60-80-9]**.

Figure 60-80-10

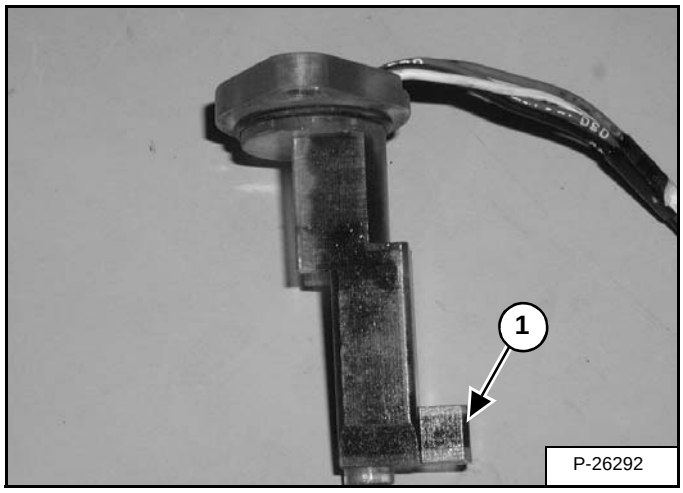


With a thin screwdriver lift the tabs and remove the wires from the connector **[Figure 60-80-10]**.

Wire Code

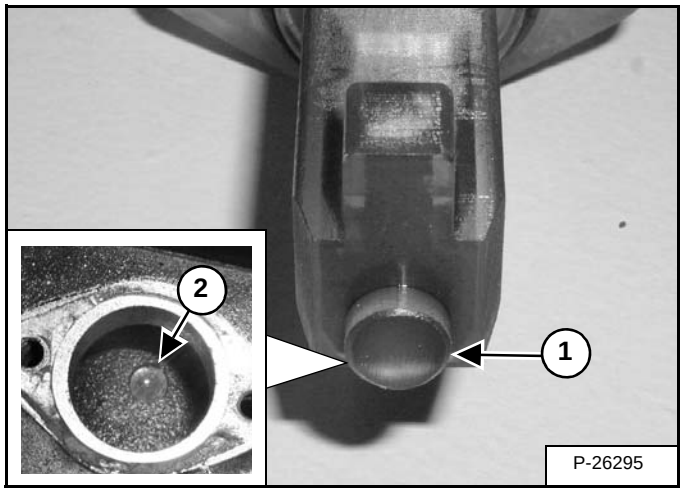
1 Red
2 White
3 Black
4 Blue

Figure 60-80-11



Installation: Be sure to install the speed sensor (Item 1) **[Figure 60-80-11]** pointing toward the transmission case.

Figure 60-80-12



Installation: The alignment pin (Item 1) at the bottom of the speed sensor must be installed in the hole (Item 2) **[Figure 60-80-12]** in the motor carrier.

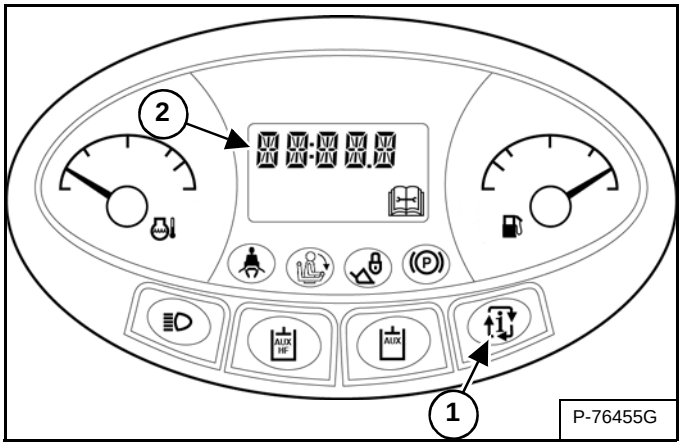
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DIAGNOSTIC SERVICE CODES

Viewing Service Codes

The Service Codes will aid your dealer in diagnosing conditions which can damage your machine.

Figure 60-90-1



Press the INFORMATION button (Item 1) to cycle the DATA DISPLAY (Item 2) **[Figure 60-90-1]** until the service code screen is displayed. If more than one SERVICE CODE is present, the codes will scroll on the DATA DISPLAY.

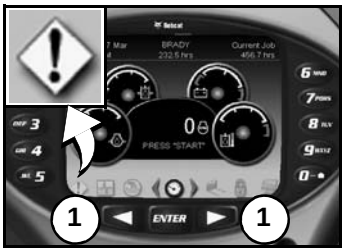
NOTE: Corroded or loose grounds can cause multiple service codes and / or abnormal symptoms. All instrument panel lights flashing, alarm sounding, headlights and taillights flashing, could indicate a bad ground. The same symptoms could apply if the voltage is low, such as loose or corroded battery cables. If you observe these symptoms, check grounds and positive leads first.

Deluxe Instrumentation Panel

The optional Deluxe Instrumentation Panel offers an additional view of service codes that includes a brief description.

The last 40 codes stored in history can also be viewed using the Deluxe Instrumentation Panel.

Figure 60-90-2



Press a scroll button (Item 1) repeatedly until the Active Warnings screen icon (Inset) is highlighted.



The ACTIVE WARNINGS screen displays active service codes. Press **[9]** to view the next service code if more than one is present. Press **[4]** to display a history of service codes.



The WARNINGS HISTORY screen will list the Service Code Number **(CODE)**, Hourmeter reading when the error occurred **(HOUR)**, and the User **(USER)** who was logged in to operate the machine when the error occurred.

Press **[9]** to view the next eight Service Codes.

A total of 40 Codes can be stored. When more than 40 codes occur, the oldest code will disappear and the newest code will be in the number 1 position.



Press the list number next to the service code for more detail.

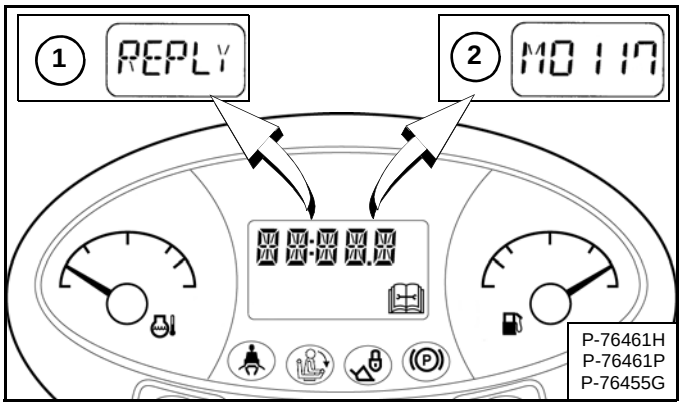
Press left scroll button to back up one screen.

P-90378 / NA3025 / NA3000 / NA3038 / NA3035

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Service Codes List

Figure 60-90-3



Service Codes may be either a word (Item 1) or a number (Item 2) **[Figure 60-90-3]**.

The following word errors may be displayed:

[REPLY] One or both instrument panel(s) not communicating with the controller.

[CODE] The controller is asking for a password. (Keyless Start and Deluxe Instrumentation Panels only.)

[ERROR] The wrong password was entered. (Keyless Start and Deluxe Instrumentation Panels only.)

[SHTDN] A shutdown condition exists.

[DOOR] Operator cab door is open. (Lift and Tilt functions will not operate.)

CODE	DESCRIPTION	CODE	DESCRIPTION
A3623	ACD not programmed	A8503	ACD output 'F' error OFF
A8002	ACD output 'A' error ON	A8505	ACD output 'F' short to battery
A8003	ACD output 'A' error OFF	A8506	ACD output 'F' short to ground
A8005	ACD output 'A' short to battery	A8507	ACD output 'F' open circuit
A8006	ACD output 'A' short to ground	A8532	ACD output 'F' overcurrent
A8007	ACD output 'A' open circuit	A8602	ACD output 'G' error ON
A8032	ACD output 'A' overcurrent	A8603	ACD output 'G' error OFF
A8102	ACD output 'B' error ON	A8605	ACD output 'G' short to battery
A8103	ACD output 'B' error OFF	A8606	ACD output 'G' short to ground
A8105	ACD output 'B' short to battery	A8607	ACD output 'G' open circuit
A8106	ACD output 'B' short to ground	A8702	ACD output 'H' error ON
A8107	ACD output 'B' open circuit	A8703	ACD output 'H' error OFF
A8132	ACD output 'B' overcurrent	A8705	ACD output 'H' short to battery
A8202	ACD output 'C' error ON	A8706	ACD output 'H' short to ground
A8203	ACD output 'C' error OFF	A8707	ACD output 'H' open circuit
A8205	ACD output 'C' short to battery		
A8206	ACD output 'C' short to ground	D3905	Left joystick X-axis not in neutral
A8207	ACD output 'C' open circuit	D3907	Left joystick Y-axis not in neutral
A8232	ACD output 'C' overcurrent	D4007	Right joystick Y-axis not in neutral
A8302	ACD output 'D' error ON	D7501	CAN joystick communication error
A8303	ACD output 'D' error OFF	D7504	No communication from drive controller
A8305	ACD output 'D' short to battery	D7505	Left joystick X-axis not in neutral
A8306	ACD output 'D' short to ground	D7507	Left joystick Y-axis not in neutral
A8307	ACD output 'D' open circuit	D7508	Right joystick Y-axis not in neutral
A8332	ACD output 'D' overcurrent	D7509	Operating mode switch short to ground or battery
A8402	ACD output 'E' error ON	D7513	Right front wheel angle sensor unresponsive
A8403	ACD output 'E' error OFF	D7514	Left front wheel angle sensor unresponsive
A8405	ACD output 'E' short to battery	D7515	Right rear wheel angle sensor unresponsive
A8406	ACD output 'E' short to ground	D7516	Left rear wheel angle sensor unresponsive
A8407	ACD output 'E' open circuit	D7517	Left swash plate not in neutral
A8432	ACD output 'E' overcurrent	D7518	Right swash plate not in neutral
A8502	ACD output 'F' error ON	D7519	Left joystick X-axis out of range high

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Service Codes List (Cont'd)

CODE	DESCRIPTION	CODE	DESCRIPTION
D7521	Left joystick Y-axis out of range high	D7572	Drive pump not calibrated
D7522	Right joystick Y-axis out of range high	D7573	Operating mode switch flipped while operating
D7523	Right front wheel angle sensor out of range high	D7574	Right wheel speed uncommanded motion
D7524	Left front wheel angle sensor out of range high	D7575	Left wheel speed uncommanded motion
D7525	Right rear wheel angle sensor out of range high	D7576	No communication from ACS controller
D7526	Left rear wheel angle sensor out of range high	D7577	Left speed sensor out of range high
D7527	Left swash plate out of position	D7578	Right speed sensor out of range high
D7528	Right swash plate out of position	D7579	Left speed sensor out of range low
D7529	Left joystick X-axis out of range low	D7580	Right speed sensor out of range low
D7531	Left joystick Y-axis out of range low	D7581	Right front steer retract short to battery
D7532	Right joystick Y-axis out of range low	D7582	Left front steer retract short to battery
D7533	Right front wheel angle sensor out of range low	D7583	Right rear steer retract short to battery
D7534	Left front wheel angle sensor out of range low	D7584	Left rear steer retract short to battery
D7535	Right rear wheel angle sensor out of range low	D7585	Sensor supply 1 out of range high
D7536	Left rear wheel angle sensor out of range low	D7586	Sensor supply 2 out of range high
D7537	Sensor supply 1 out of range low	D7587	Software update required
D7538	Sensor supply 2 out of range low	D7588	Switched power stuck ON
D7539	Left swash plate sensor out of range high	D7589	Switched power error OFF
D7540	Left swash plate sensor out of range low	D7591	Left swash plate sensor reversed
D7541	Right swash plate sensor out of range high	D7592	Right swash plate sensor reversed
D7542	Right swash plate sensor out of range low	D7593	Right speed sensor unresponsive
D7543	Left forward drive solenoid error ON	D7594	Left speed sensor unresponsive
D7544	Left reverse drive solenoid error ON	D7595	Left speed sensor reversed
D7545	Right forward drive solenoid error ON	D7596	Right speed sensor reversed
D7546	Right reverse drive solenoid error ON	D7597	Controller programmed
D7547	Right front steer extend short to battery	D7598	In drive calibration mode
D7548	Left front steer extend short to battery	D7599	In angle calibration mode
D7549	Right rear steer extend short to battery		
D7550	Left rear steer extend short to battery	H1221	Right Primary out of range high
D7551	Steer pressure short to battery	H1222	Right Primary out of range low
D7552	Back-up alarm error ON	H1224	Right Primary not in neutral
D7553	Left forward drive solenoid error OFF	H1321	Left Primary out of range high
D7554	Left reverse drive solenoid error OFF	H1322	Left Primary out of range low
D7555	Right forward drive solenoid error OFF	H1324	Left Primary not in neutral
D7556	Right reverse drive solenoid error OFF	H2005	Boost solenoid short to battery
D7557	Right front steer extend short to ground	H2006	Boost solenoid short to ground
D7558	Right front steer retract short to ground	H2007	Boost solenoid open circuit
D7559	Left front steer extend short to ground	H2032	Boost solenoid overcurrent
D7560	Left front steer retract short to ground	H2205	Pressure control solenoid short to battery
D7561	Right rear steer extend short to ground	H2206	Pressure control solenoid short to ground
D7562	Right rear steer retract short to ground	H2207	Pressure control solenoid open circuit
D7563	Left rear steer extend short to ground	H2232	Pressure control solenoid overcurrent
D7564	Left rear steer retract short to ground	H2305	Rear base solenoid short to battery
D7565	Steer pressure short to ground	H2306	Rear base solenoid short to ground
D7566	Back-up alarm error OFF	H2307	Rear base solenoid open circuit
D7567	No communication from Gateway controller	H2332	Rear base solenoid overcurrent
D7568	Angle sensors not calibrated	H2405	Rear rod solenoid short to battery
D7569	Battery voltage out of range high	H2406	Rear rod solenoid short to ground
D7570	Interrupted power	H2407	Rear rod solenoid open circuit
D7571	Battery voltage out of range low	H2432	Rear rod solenoid overcurrent

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Service Codes List (Cont'd)

CODE	DESCRIPTION	CODE	DESCRIPTION
H2505	Rear aux relief short to battery	M0116	Air filter not connected
H2506	Rear aux relief short to ground	M0117	Air filter plugged
H2507	Rear aux relief open circuit	M0216	Hydraulic/Hydrostatic filter not connected
H2605	Front base solenoid short to battery	M0217	Hydraulic/Hydrostatic filter plugged
H2606	Front base solenoid short to ground	M0309	Battery voltage low
H2607	Front base solenoid open circuit	M0310	Battery voltage high
H2632	Front base solenoid overcurrent	M0311	Battery voltage extremely high
H2705	Front rod solenoid short to battery	M0314	Battery voltage extremely low
H2706	Front rod solenoid short to ground	M0322	Battery voltage out of range low
H2707	Front rod solenoid open circuit	M0409	Engine oil pressure low
H2732	Front rod solenoid overcurrent	M0414	Engine oil pressure extremely low
H2805	Diverter rod solenoid short to battery	M0415	Engine oil pressure shutdown
H2806	Diverter rod solenoid short to ground	M0421	Engine oil pressure out of range high
H2807	Diverter rod solenoid open circuit	M0422	Engine oil pressure out of range low
H2905	High-flow solenoid short to battery	M0509	Hydraulic charge pressure low
H2906	High-flow solenoid short to ground	M0510	Hydraulic charge pressure high
H2907	High-flow solenoid open circuit	M0511	Hydraulic charge pressure extremely high
H2932	High-flow solenoid overcurrent	M0514	Hydraulic charge pressure extremely low
H3028	Controller memory failure	M0515	Hydraulic charge pressure shutdown
H3128	Interrupted power failure	M0521	Hydraulic charge pressure out of range high
H3648	ACD multiple	M0522	Hydraulic charge pressure out of range low
H3913	Left joystick grip no communication	M0610	Engine speed high
H3916	Left joystick not connected	M0611	Engine speed extremely high
H3928	Left joystick failure	M0613	Engine speed no signal
H3948	Left joystick multiple	M0615	Engine speed shutdown
H4013	Right joystick grip no communication	M0618	Engine speed out of range
H4016	Right joystick not connected	M0710	Hydraulic oil temperature high
H4028	Right joystick failure	M0711	Hydraulic oil temperature extremely high
H4048	Right joystick multiple	M0715	Hydraulic oil temperature shutdown
H4302	Horn error ON	M0721	Hydraulic oil temperature out of range high
H4303	Horn error OFF	M0722	Hydraulic oil temperature out of range low
H4423	Auxiliary not programmed	M0810	Engine coolant temperature high
H4502	Right signal error ON	M0811	Engine coolant temperature extremely high
H4503	Right signal error OFF	M0815	Engine coolant temperature shutdown
H4602	Left signal error ON	M0821	Engine coolant temperature out of range high
H4603	Left signal error OFF	M0822	Engine coolant temperature out of range low
H4721	Sensor supply 1 out of range high	M0909	Fuel level low
H4722	Sensor supply 1 out of range low	M0921	Fuel level out of range high
H7314	Remote control failure	M0922	Fuel level out of range low
H7328	Remote control no signal	M1016	Hydraulic charge filter not connected
H7404	Main controller no communication	M1017	Hydraulic charge filter plugged
H7604	Left hand panel no communication	M1121	Seat bar sensor out of range high
		M1122	Seat bar sensor out of range low
L0102	Left panel button 1 error ON	M1305	Fuel hold solenoid short to battery
L0202	Left panel button 2 error ON	M1306	Fuel hold solenoid short to ground
L0302	Left panel button 3 error ON	M1307	Fuel hold solenoid open circuit
L0402	Left panel button 4 error ON	M1402	Fuel pull output error ON
L7404	Left panel main controller no communication	M1403	Fuel pull output error OFF
L7672	Left panel programming error	M1407	Fuel pull output open circuit
		M1428	Fuel pull output failure

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Service Codes List (Cont'd)

CODE	DESCRIPTION	CODE	DESCRIPTION
M1502	Traction lock pull output error ON	M3805	Auxiliary hydraulic lock short to battery
M1503	Traction lock pull output error OFF	M3806	Auxiliary hydraulic lock short to ground
M1507	Traction lock pull output open circuit	M3807	Auxiliary hydraulic lock open circuit
M1528	Traction lock pull output failure	M3832	Auxiliary hydraulic lock overcurrent
M1605	Traction lock hold solenoid short to battery	M4109	Alternator low
M1606	Traction lock hold solenoid short to ground	M4110	Alternator high
M1607	Traction lock hold solenoid open circuit	M4304	Keyless panel no communication
M1705	Hydraulic lock valve solenoid short to battery	M4404	Auxiliary no communication
M1706	Hydraulic lock valve solenoid short to ground	M4621	5 volt sensor supply out of range high
M1707	Hydraulic lock valve solenoid open circuit	M4622	5 volt sensor supply out of range low
M1732	Hydraulic lock valve solenoid overcurrent	M4721	8 volt sensor supply out of range high
M1805	Lift spool lock short to battery	M4722	8 volt sensor supply out of range low
M1806	Lift spool lock short to ground	M4802	Front light relay error ON
M1807	Lift spool lock open circuit	M4803	Front light relay error OFF
M1832	Lift spool lock overcurrent	M4807	Front light relay open circuit
M2005	Two-speed primary short to battery	M4902	Rear light relay error ON
M2006	Two-speed primary short to ground	M4903	Rear light relay error OFF
M2007	Two-speed primary open circuit	M4907	Rear light relay open circuit
M2032	Two-speed primary overcurrent	M5002	Front light output error ON
M2102	Glow plug output error ON	M5003	Front light output error OFF
M2103	Glow plug output error OFF	M5007	Front light output open circuit
M2107	Glow plug output open circuit	M5028	Front light output failure
M2128	Glow plug output failure	M5102	Rear light output error ON
M2202	Starter output error ON	M5103	Rear light output error OFF
M2203	Starter output error OFF	M5107	Rear light output open circuit
M2207	Starter output open circuit	M5128	Rear light output failure
M2228	Starter output failure	M5202	PTOL switch error ON
M2302	Starter relay error ON	M5221	PTOL switch out of range high
M2303	Starter relay error OFF	M5222	PTOL switch out of range low
M2402	Fuel pull relay error ON	M5305	PTOL LED short to battery
M2403	Fuel pull relay error OFF	M5306	PTOL LED short to ground
M2502	Traction pull relay error ON	M5405	Tilt spool lock short to battery
M2503	Traction pull relay error OFF	M5406	Tilt spool lock short to ground
M2602	Glow plug relay error ON	M5407	Tilt spool lock open circuit
M2603	Glow plug relay error OFF	M5432	Tilt spool lock overcurrent
M2721	Throttle primary out of range high	M6402	Switched power relay error ON
M2722	Throttle primary out of range low	M6403	Switched power relay error OFF
M2821	Throttle secondary out of range high	M6505	EEC power short to battery
M2822	Throttle secondary out of range low	M6506	EEC power short to ground
M3128	Interrupted power failure	M6507	EEC power open circuit
M3204	Workgroup no communication	M6604	EEC power no communications
M3304	Deluxe panel no communication	M7002	Switched power output error ON
M3505	Hydraulic fan short to battery	M7003	Switched power output error OFF
M3506	Hydraulic fan short to ground	M7007	Switched power output open circuit
M3507	Hydraulic fan open circuit	M7028	Switched power output failure
M3532	Hydraulic fan overcurrent	M7102	Electric fan 1 output error ON
M3705	Two-speed secondary short to battery	M7103	Electric fan 1 output error OFF
M3706	Two-speed secondary short to ground	M7128	Electric fan 1 output failure
M3707	Two-speed secondary open circuit	M7202	Electric fan 1 relay error ON
M3732	Two-speed secondary overcurrent	M7203	Electric fan 1 relay error OFF

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Service Codes List (Cont'd)

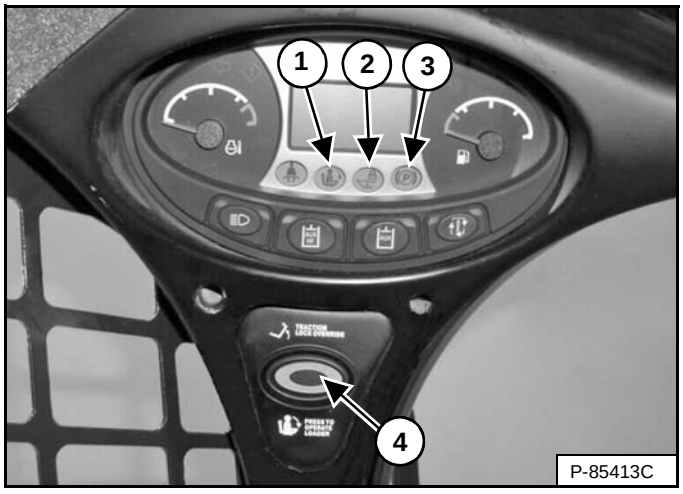
CODE	DESCRIPTION	CODE	DESCRIPTION
M7207	Electric fan 1 relay open circuit	W3251	Lift actuator short to battery
M7304	Remote control no communication	W3252	Tilt actuator short to battery
M7316	Remote control no signal from transmitter	W3253	Lift handle / pedal short to ground
M7423	Main controller not programmed	W3254	Tilt handle / pedal short to ground
M7472	Main controller in boot code	W3255	Lift handle / pedal short to battery
M7497	Main controller software updated	W3256	Tilt handle / pedal short to battery
M7504	Drive no communication	W3257	Lift actuator reduced performance
M7604	Left display panel no communication	W3258	Tilt actuator reduced performance
M7748	Key switch multiple	W3259	Lift actuator wrong direction
M7839	Hourmeter changed	W3260	Tilt actuator wrong direction
M7974	Door open	W3261	Handle lock short to ground
		W3262	Handle lock short to battery
W3223	ACS calibration required	W3263	Pedal lock short to ground
W3224	ACS calibration failed	W3264	Pedal lock short to battery
W3231	Tilt actuator fault	W3265	Sensor supply voltage out of range
W3232	Tilt actuator wiring fault	W3266	Battery voltage out of range
W3233	Tilt handle wiring fault	W3267	Handle/pedal switch flipped while operating
W3234	Tilt actuator not in neutral	W3268	Lift handle information error
W3235	Tilt handle / pedal not in neutral	W3270	Right hand drive short to ground
W3236	Lift actuator fault	W3271	Right hand drive short to battery
W3237	Lift actuator wiring fault	W3274	Left joystick X-axis out of range
W3238	Lift handle wiring fault	W3275	Interrupted unswitched power
W3239	Lift actuator not in neutral	W3276	CAN joystick information error
W3240	Lift handle / pedal not in neutral	W3277	Remote control information error
W3241	No communication	W3905	Left joystick X-axis not in neutral
W3249	Lift actuator short to ground	W4005	Right joystick X-axis not in neutral
W3250	Tilt actuator short to ground	W4007	Right joystick Y-axis not in neutral

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BOBCAT INTERLOCK CONTROL SYSTEM (BICS)

Description

Figure 60-100-1



The Bobcat Interlock Control System is an electronic system that is used to protect the operator. The system consists of the traction lock, seat bar sensor and the lift and tilt lockouts solenoid.

These all have indicator lights on the left panel (Items 1, 2, 3) **[Figure 60-100-1]** of the loader cab.

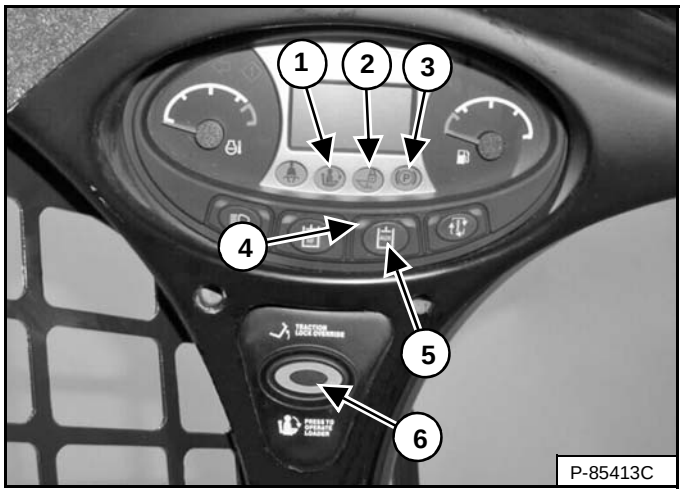
The Press To Operate button (Items 4) **[Figure 60-100-1]** activates the system and allows the operator to function the loader.

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BOBCAT INTERLOCK CONTROL SYSTEM (BICS) (CONT'D)

Inspecting The BICS (Engine STOPPED - Key ON)

Figure 60-100-2



1. Sit in operator's seat. Turn key to RUN or press RUN button. Lower seat bar and disengage parking brake. Press the PRESS TO OPERATE LOADER button (Item 6). Two BICS™ lights (Items 1 and 2) **[Figure 60-100-2]** [SEAT BAR AND LIFT & TILT VALVE] on left instrument panel must be OFF. The PRESS TO OPERATE LOADER button will light.

2. Raise seat bar fully. All three BICS™ lights (Items 1, 2 and 3) **[Figure 60-100-2]** [SEAT BAR, LIFT & TILT VALVE and PARKING BRAKE] on left instrument panel must be ON. The PRESS TO OPERATE LOADER button light will turn OFF.

Inspecting Deactivation Of The Auxiliary Hydraulics System (Engine STOPPED - Key ON)

3. Sit in operator's seat, lower seat bar and press the PRESS TO OPERATE LOADER button (Item 6). Press the auxiliary hydraulics button (Item 5). The auxiliary hydraulics light will be ON (Item 4) **[Figure 60-100-2]**. Raise the seat bar. The light must be OFF.

Inspecting The Seat Bar Sensor (Engine RUNNING)

4. Sit in operator's seat, lower seat bar, engage parking brake and fasten seat belt.

5. Start 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 must stop. Repeat using the tilt function.

Inspecting The Traction Lock (Engine RUNNING)

6. Fasten seat belt, disengage parking brake, press the PRESS TO OPERATE LOADER button and raise seat bar fully. Move steering levers or joystick(s) slowly forward and backward. The TRACTION lock must be engaged. Lower the seat bar. Press the PRESS TO OPERATE LOADER button.

7. Engage parking brake and move steering levers or joystick(s) slowly forward and backward. The TRACTION lock must be engaged.

NOTE: The PARKING BRAKE light on the left instrument panel will remain ON until the engine is started, the PRESS TO OPERATE LOADER button is pressed and the parking brake is disengaged.

Inspecting The Lift Arm Bypass Control

8. Raise the lift arms 2 m (6 ft) off the ground. Stop engine. Turn lift arm bypass control knob clockwise 1/4 turn. Pull up and hold lift arm bypass control knob until lift arms slowly lower.

Inspecting Deactivation Of Lift And Tilt Functions (ACS And SJC)

9. Sit in operator's seat and fasten seat belt. Lower seat bar, start engine and press the PRESS TO OPERATE LOADER button.

10. Raise lift arms about 2 m (6 ft) off the ground.

11. Turn key OFF or press STOP button and wait for the engine to come to a complete stop.

12. Turn key ON or press RUN button. Press the PRESS TO OPERATE LOADER button, move the control (foot pedal, hand control or joystick) to lower the lift arms. Lift arms must not lower.

13. Move the control (foot pedal, hand control or joystick) to tilt the bucket (or attachment) forward. The bucket (or attachment) must not tilt forward.

⚠ 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.

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Troubleshooting

The following troubleshooting guide is provided for assistance in locating and correcting BICS system problems. It is recommended that these procedures be done by authorized Bobcat Service Personnel only.

⚠ WARNING

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

W-2004-1285

PROBLEM	SOLUTION#
All indicator lights flashing.	5
One of the indicator lights flashing.	1
Intermittent indicator lights.	2, 3, 4

SOLUTION SUGGESTIONS
1. Refer to BICS troubleshooting chart.
2. Check wire connections on Bobcat controller to make sure connectors are locked into place.
3. Check pins in connectors for pins pushed back or bent.
4. Use seatbar sensor tester MEL1428 to isolate problem between sensor and controller and wiring.
5. Possible low or high voltage.

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SEAT BAR SENSOR

Description

The seat bar sensor is part of the BICS system. The seat bar sensor sends a signal that indicates whether the seat bar is in the down or up position.

The sensor is located on the left side of seat bar.

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	SOLUTION #
Indicator light does not come ON when seat bar is lowered.	1, 2, 3, 4, 5

SOLUTION SUGGESTIONS

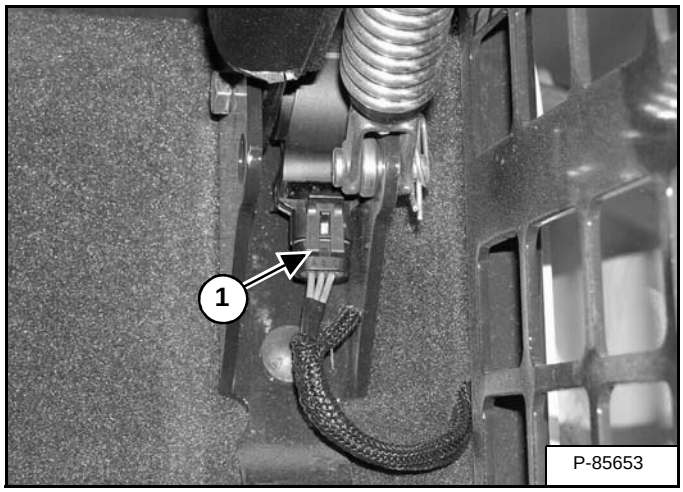
1. Check sensor wire connection.
2. Use the BICS sensor tester MEL1428 with seat bar adapter MEL1567 to check sensor and controller.
3. Check for loose hardware.
4. Check keyed bushing to make sure magnet collar rotates with seat bar.
5. Check magnet collar magnets for contamination such as metal particles.

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SEAT BAR SENSOR (CONT'D)

Testing

Figure 60-110-1

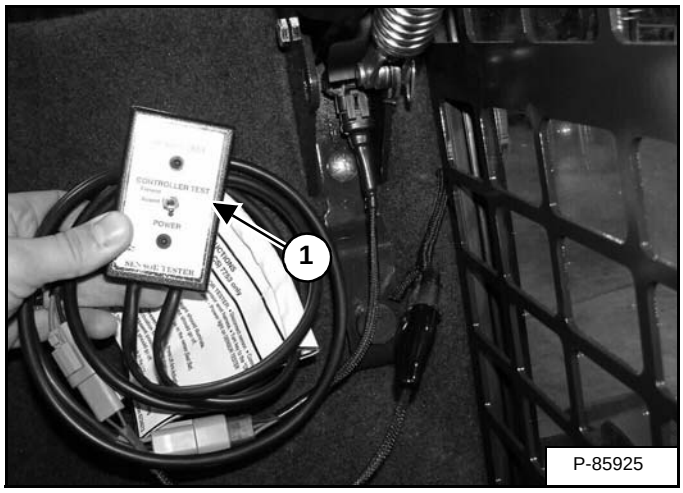


Use Sensor Tester (MEL1428) and seat bar sensor tester adapter (MEL1567) for the following procedure:

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

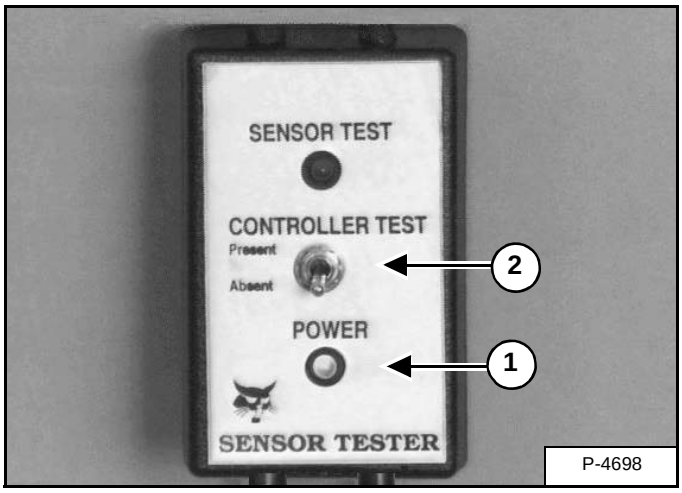


Connect the Sensor Tester (Item 1) **[Figure 60-110-2]** inline, to the seat bar sensor connectors. **[Figure 60-110-2]**.

Turn the key to the ON position. **DO NOT START THE ENGINE**.

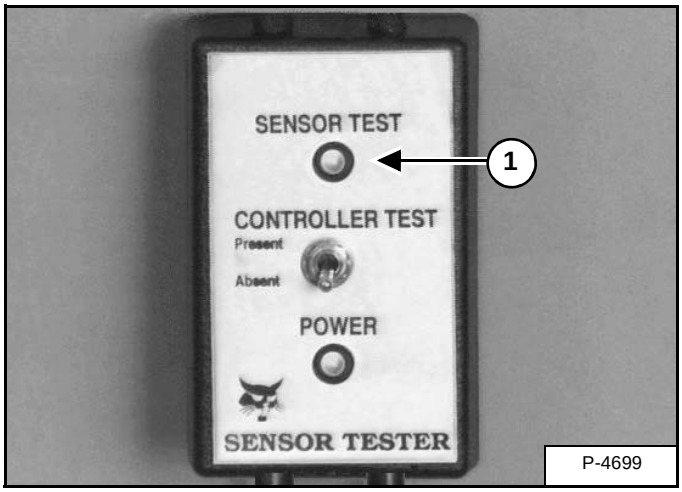
The toggle switch (Item 2) **[Figure 60-110-3]** can be in either the ***Absent*** or ***Present*** position.

Figure 60-110-3



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 60-110-3.)

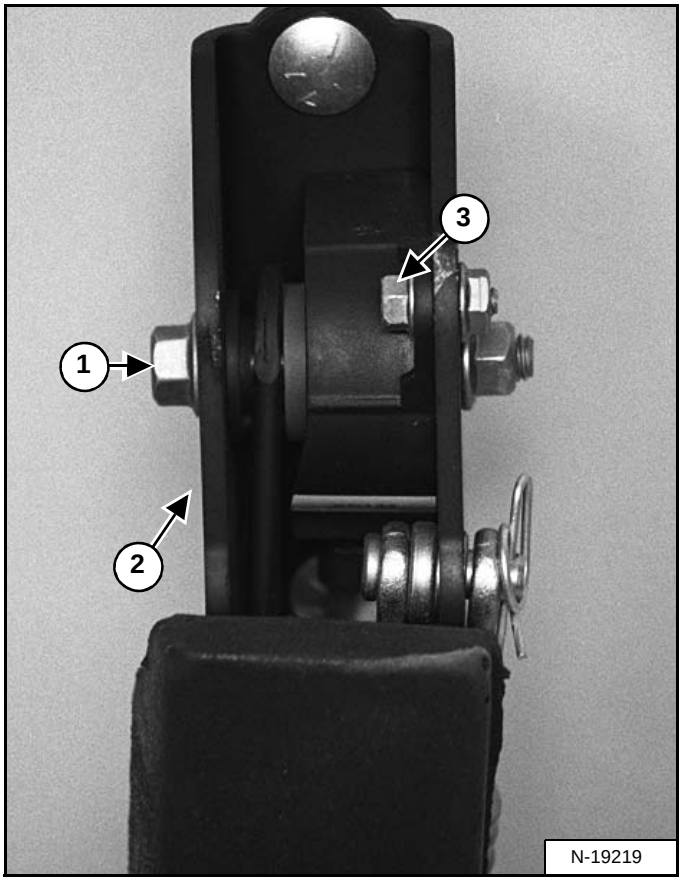
If the above test passes, run the seat bar sensor BICS circuit test. (See Bobcat Interlock Control System (BICS) Circuit Test on Page 60-110-4.)

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Removal And Installation

Remove the seat bar from the loader. (See Removal And Installation on Page 50-10-1.)

Figure 60-110-5

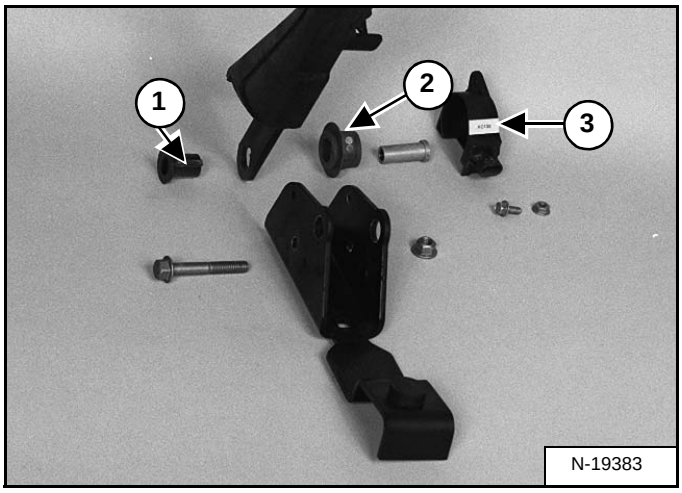


Remove the mounting bolt (Item 1) from the seat bar mount (Item 2) **[Figure 60-110-5]**.

Installation: Tighten the mounting bolt to 5,6 - 7,9 N•m (50 - 70 in-lb) torque.

Remove the sensor mounting bolt (Item 3) **[Figure 60-110-5]** and nut.

Figure 60-110-6



Remove the keyed plastic bushing (Item 1) magnetic bushing assembly (Item 2) and sensor bracket (Item 3) **[Figure 60-110-6]**.

IMPORTANT

Be careful to not overtighten the sensor mounting bolt and nut to prevent breakage of the sensor.

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Installation: Be sure the tabs on the pivot bushing are positioned in the slotted hole (Item 1) **[Figure 60-110-6]** of the seat bar.

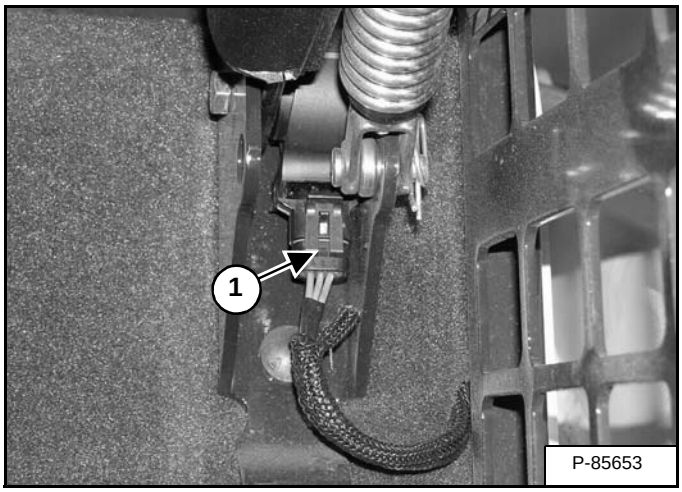
Inspect all parts for damage and wear and replace if necessary.

Reverse the removal procedure to install the seat bar sensor.

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Bobcat Interlock Control System (BICS) Circuit Test

Figure 60-110-7

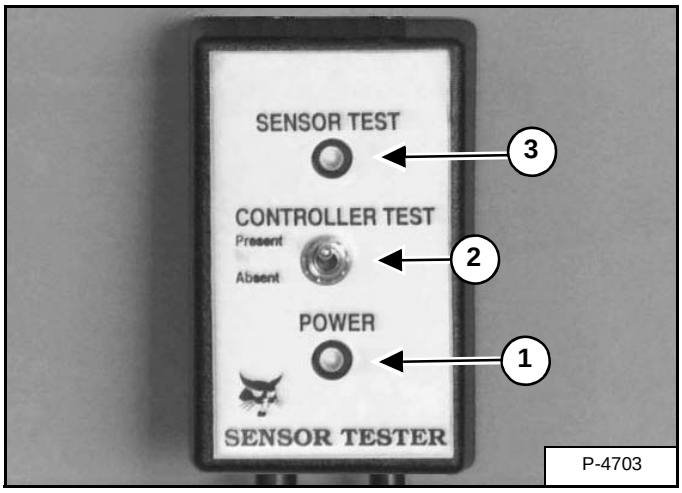


Use Sensor Testers (MEL1428) and seat bar sensor tester adapter (MEL1567) for the following procedure:

Connect the seat bar sensor tester adapter MEL1567 to the sensor tester.

Disconnect the seat bar sensor connector (Item 1) **[Figure 60-110-7]**.

Figure 60-110-8



Connect Sensor Tester (Item 1) **[Figure 60-110-8]** 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.

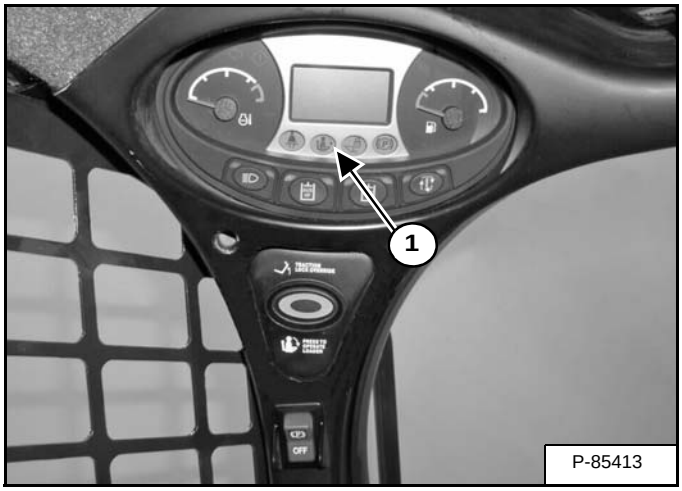
When the power light is illuminated, move the toggle switch (Item 2) **[Figure 60-110-8]** on the sensor tester to the ***Present*** position.

NOTE: The sensor test light (Item 3) [Figure 60-110-8] is only activated by the seat bar. It will be off with the seat bar up or on with the seat bar down.

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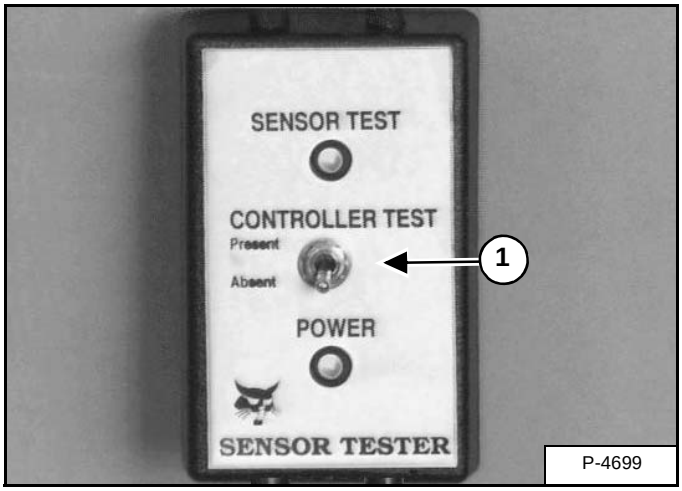
Bobcat Interlock Control System (BICS) Circuit Test (Cont'd)

Figure 60-110-9



The BICS seat bar indicator light (Item 1) **[Figure 60-110-9]** should illuminate.

Figure 60-110-10



Move the toggle switch (Item 1) **[Figure 60-110-10]** on the sensor tester to the ***Absent*** position.

The Seat Bar light (Item 1) **[Figure 60-110-9]** should go off.

If the above test fails, there is a problem with the Bobcat controller or the wiring harness.

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TRACTION LOCK

Description

The Traction Lock Control System will lock the traction drive system when the engine stops. The Traction Lock Control System is incorporated into the Bobcat Interlock Control System (BICS).

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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

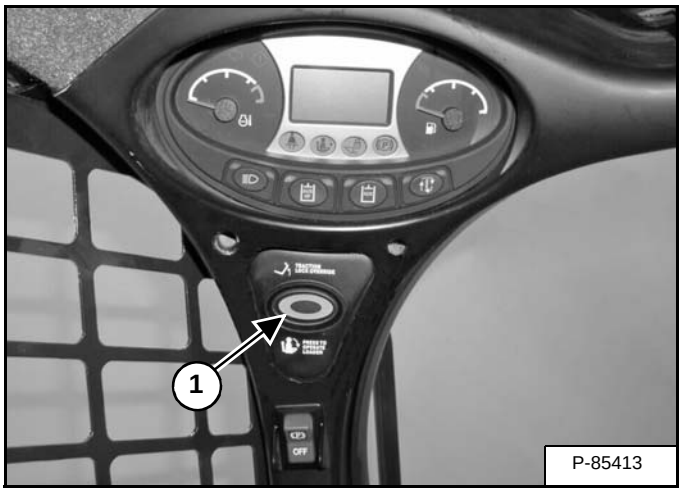
PROBLEM	SOLUTION #
Brake stays engaged.	1, 2, 3, 4, 5, 6, 7,11
Intermittent activation of brake.	8, 9, 10,11

SOLUTION SUGGESTIONS
1. Make sure brake switch is not engaged.
2. Check the display for an error code.
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 ohm.
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 RPM sensor and wiring.

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Inspecting

Figure 60-120-1

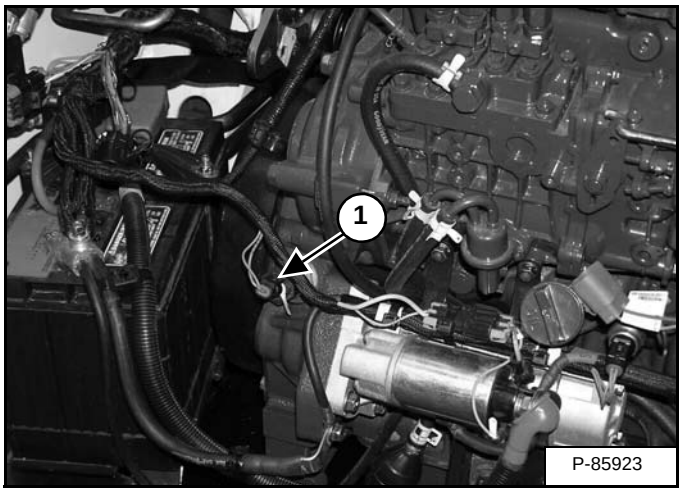


Fasten the seat belt, disengage the parking brake button, press the PRESS TO OPERATE LOADER Button (Item 1) and raise the Seat Bar fully. Move the steering levers slowly forward and backward. The TRACTION lock (Item 4) should be engaged. Lower the Seat Bar. Press the PRESS TO OPERATE LOADER Button (Item 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 ON 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 Adjustment on Page 60-170-2.)

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.

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CONTROL SYSTEM (ACS)

Description

The ACS option allows the operator to quickly switch between foot and hand control modes. It uses the electric actuators to control the lift and tilt spools, foot sensors, handle sensors and a specially designed control handle.

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Troubleshooting

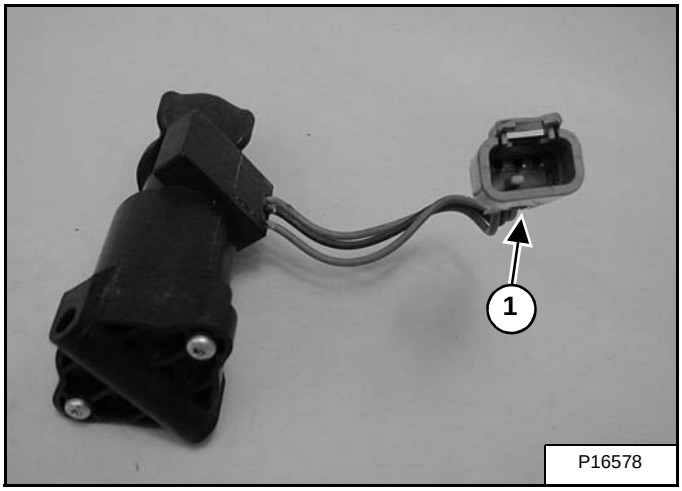
The Advanced Control System (ACS) has a built-in diagnostic function to indicate the condition of the ACS controller. The ACS controller continually monitors the lift handle sensor, lift actuator, tilt handle sensor, and the tilt actuator. The controller also records alarm condition(s) as service code(s).

To see what error occurred. (See DIAGNOSTIC SERVICE CODES on Page 60-90-1.)

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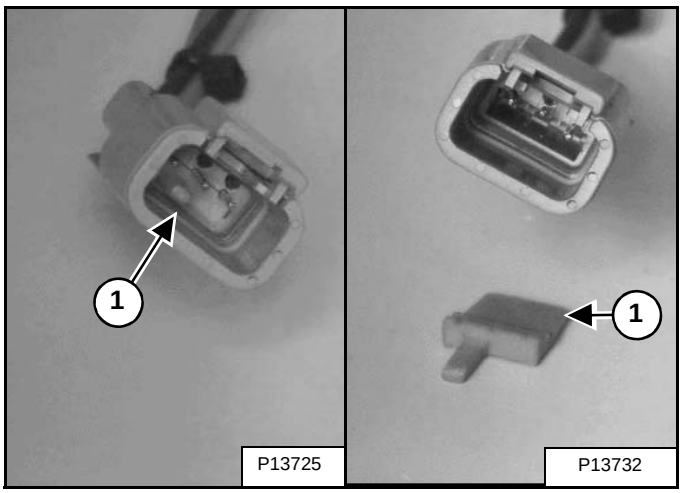
Handle Sensor Connector Disassembly And Assembly

Figure 60-130-1



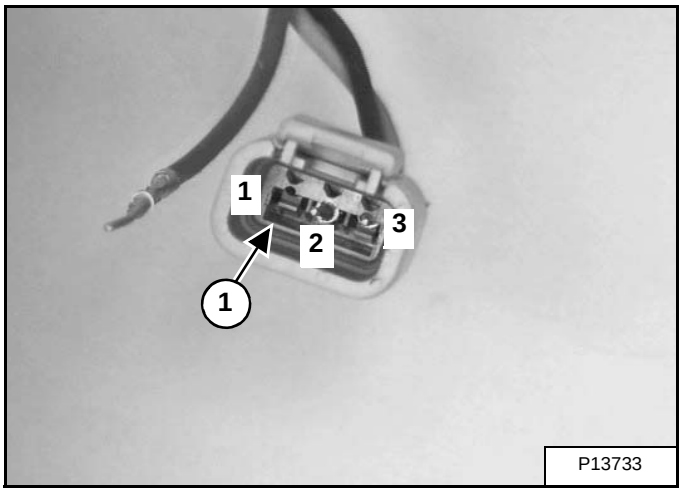
The wire connector (Item 1) **[Figure 60-130-1]** can be removed from the handle sensor wires, use the following procedure.

Figure 60-130-2



Remove the wedge (Item 1) **[Figure 60-130-2]** from the connector.

Figure 60-130-3



With a pointed tool, lift the tab (Item 1) **[Figure 60-130-3]** and pull the wire from the connector.

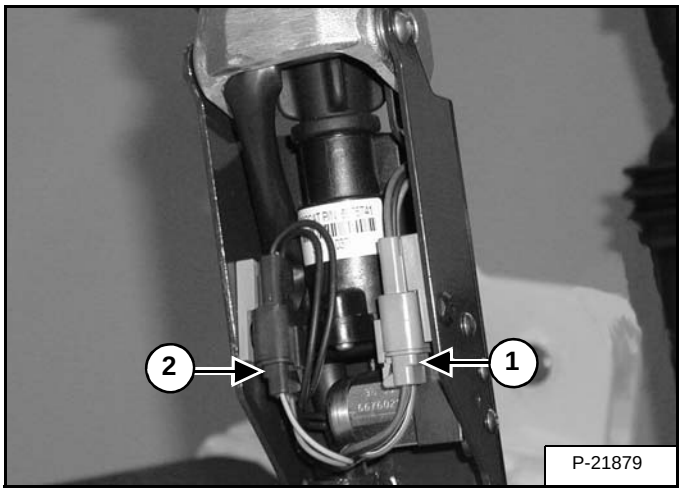
Installation: Install the wires into the connector as listed below **[Figure 60-130-3]**:

1-Terminal - Red
2-Terminal - Black
3-Terminal - Green

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Switch Handle Removal

Figure 60-130-4

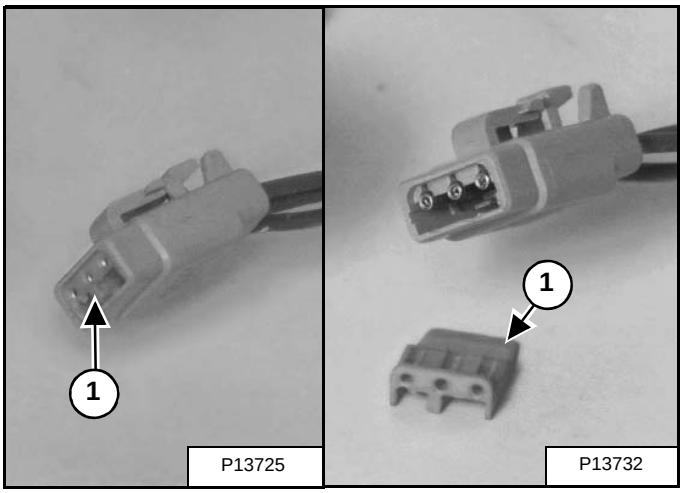


NOTE: Switch handle can be removed and installed while in loader.

Disconnect the harness connector (Item 1) **[Figure 60-130-4]** from the handle sensor connector.

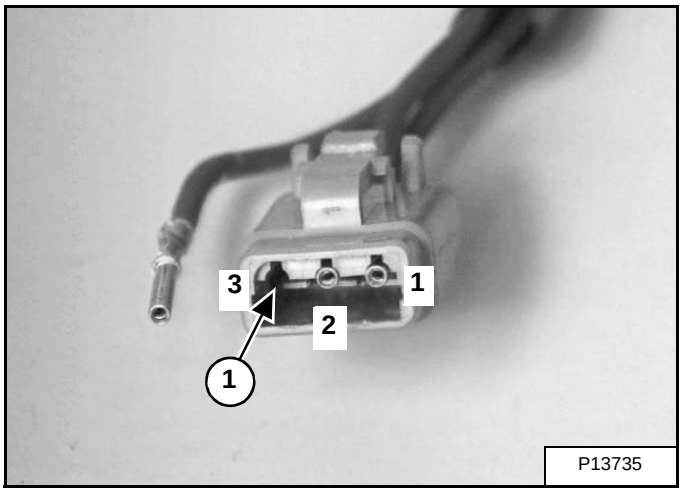
Disconnect the harness connector (Item 2) **[Figure 60-130-4]** from the handle lock solenoid connector.

Figure 60-130-5



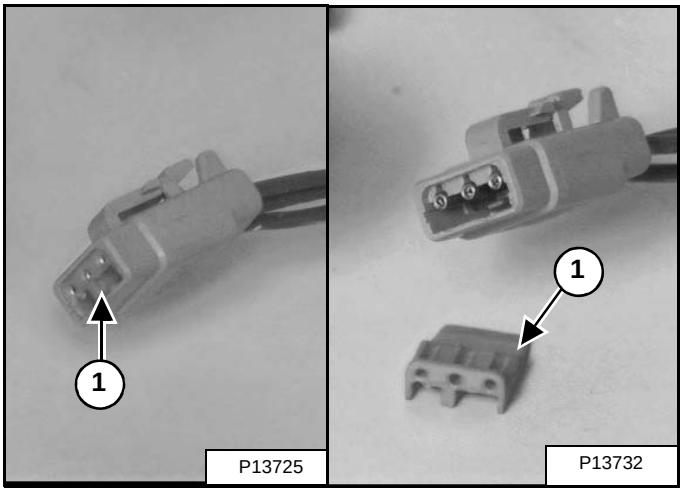
Remove the wedge (Item 1) **[Figure 60-130-5]** from the harness connector (Gray) that connects to the handle sensor connector.

Figure 60-130-6



Using a pointed tool, press down on the tab (Item 1) **[Figure 60-130-6]** and pull the wire from the connector.

Figure 60-130-7

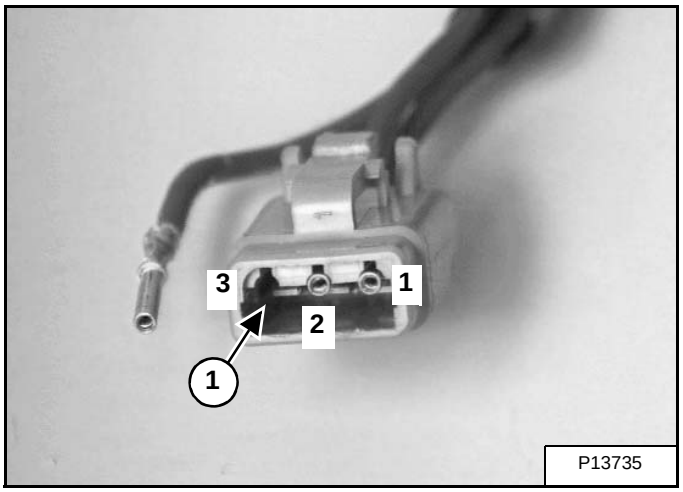


Remove the wedge (Item 1) **[Figure 60-130-7]** from the harness connector (Black) that connects to the handle lock solenoid connector.

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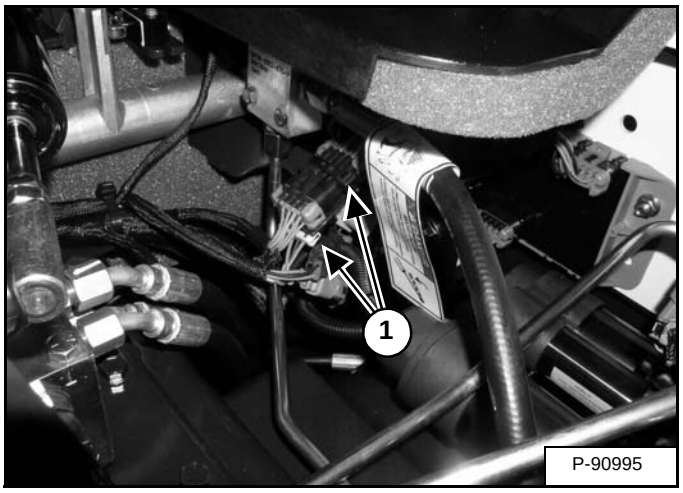
Switch Handle Removal (Cont'd)

Figure 60-130-8



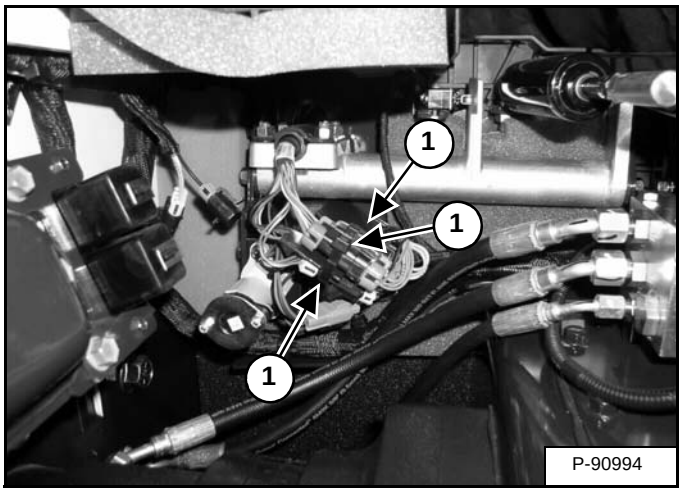
Use a pointed tool, press down on the tab (Item 1) **[Figure 60-130-8]** and pull the wire from the connector.

Figure 60-130-9



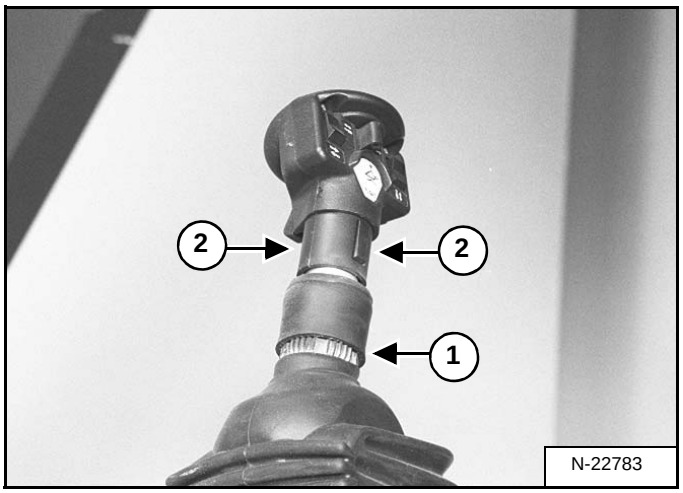
Disconnect the right switch handle connectors (Item 1) **[Figure 60-130-9]** from the loader wiring harness connectors.

Figure 60-130-10



Disconnect the left switch handle connectors (Item 1) **[Figure 60-130-10]** from the loader wiring harness connectors.

Figure 60-130-11



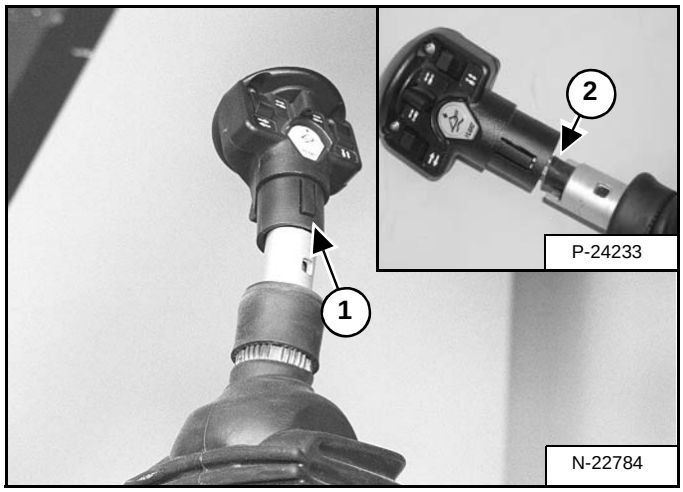
Roll the pistol grip handle cover (Item 1) **[Figure 60-130-11]** down.

Using a small screwdriver, lift the handle tabs (Item 2) **[Figure 60-130-11]** and slightly rotate the switch handle.

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Switch Handle Removal (Cont'd)

Figure 60-130-12

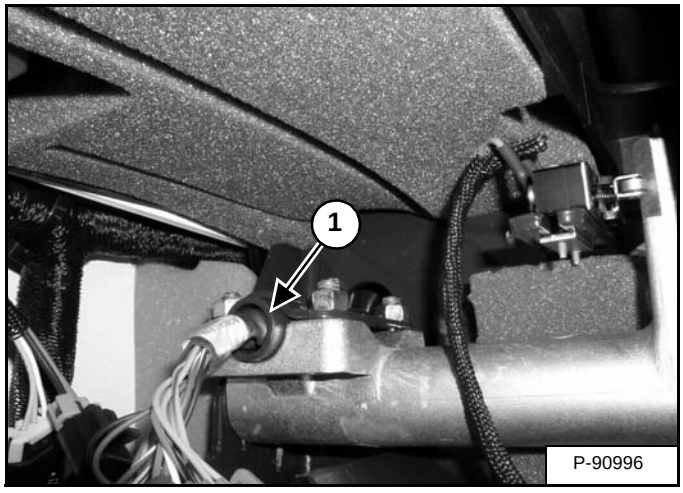


Pull the switch handle and wiring harness assembly (Item 1) **[Figure 60-130-12]** from the control lever.

Cut the wires (Item 2) **[Figure 60-130-12]** 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.

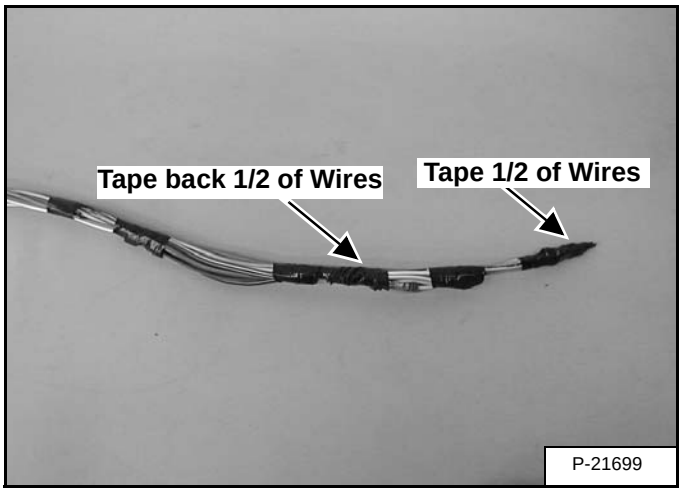
Figure 60-130-13



Pull harness (Item 1) **[Figure 60-130-13]** out the bottom of the control lever tube.

Switch Handle Installation

Figure 60-130-14



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.

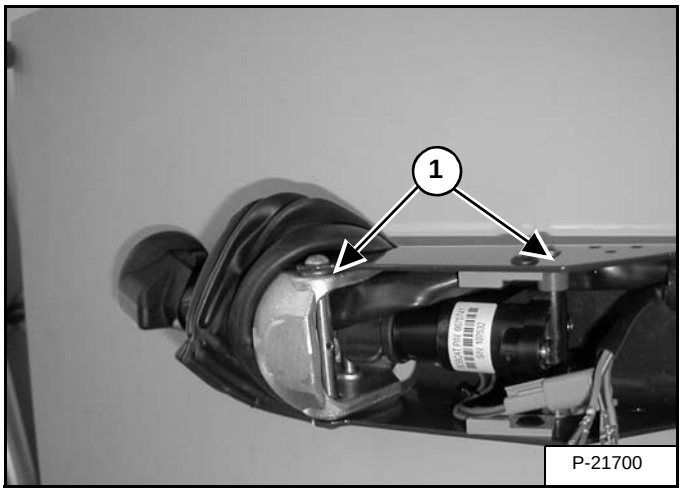
NOTE: Leave all the other heat shrink tube on the wires for protection.

Tape half of the wires back and half forward **[Figure 60-130-14]** to keep the harness small enough to route through the control lever tube.

Dealer Copy -- Not for Resale

Switch Handle Installation (Cont'd)

Figure 60-130-15

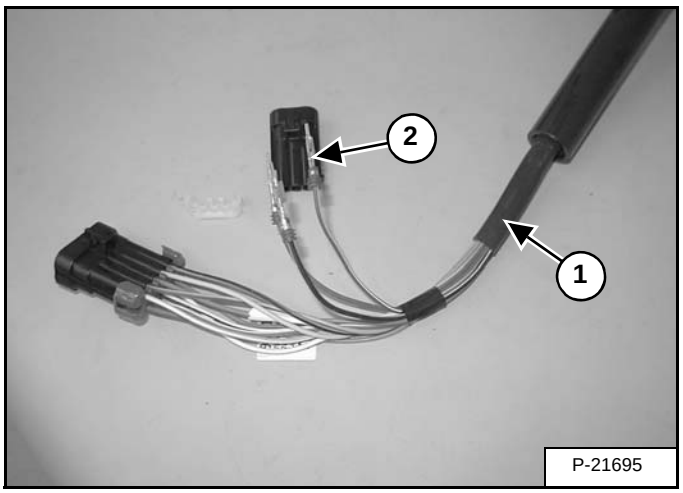


Install the new switch handle and wires from the top of the control lever.

Route wire (Item 1) **[Figure 60-130-15]** 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 60-130-16



Remove tape from wires for installation and install the 6 inches of heat shrink tube (Item 1) **[Figure 60-130-16]** approximately 3 inches into the control lever. Apply heat to the exposed heat shrink tube.

Inspect the wire terminal tabs (Item 2) **[Figure 60-130-16]** 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

Dealer Copy -- Not for Resale

Switch Handle Installation (Cont'd)

Figure 60-130-17

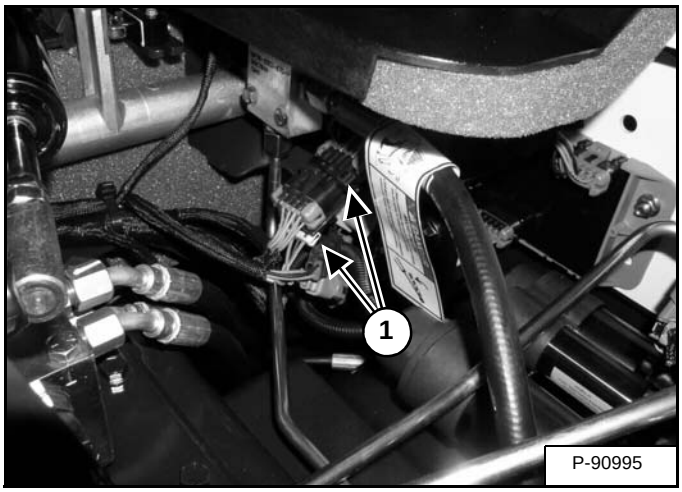
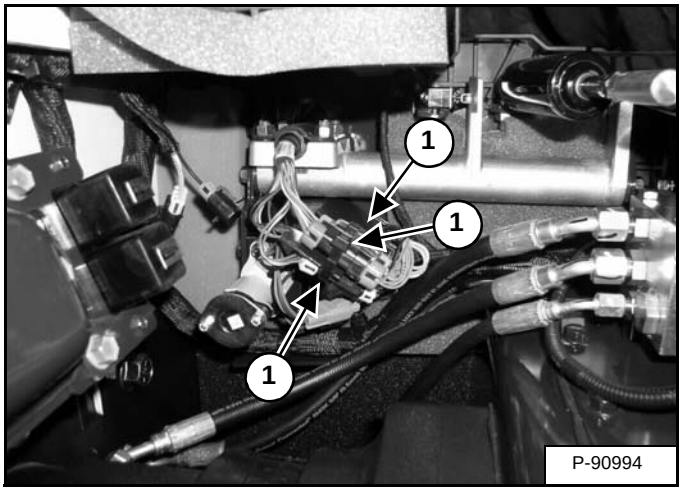
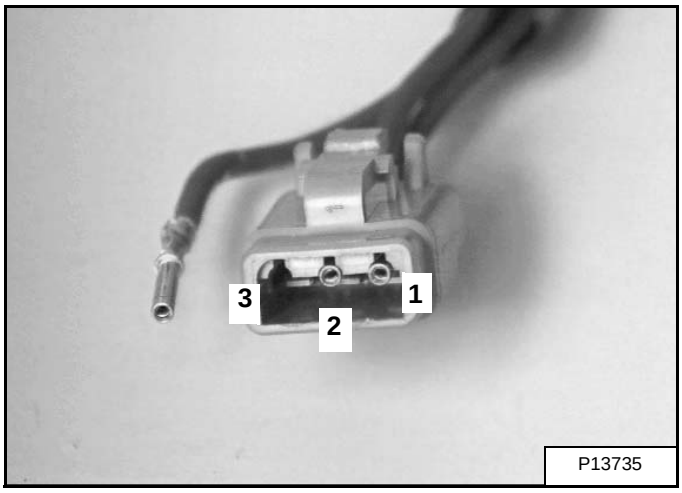


Figure 60-130-18



Connect the handle harness connectors (Item 1) **[Figure 60-130-17]** and **[Figure 60-130-18]** to the loader harness connectors.

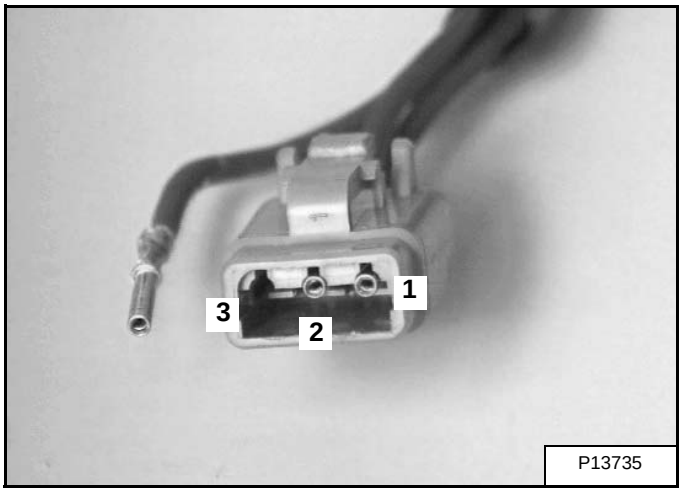
Figure 60-130-19



Install the wires into the connectors as listed below:

Left and Right Control Lever Switch Handle **[Figure 60-130-19]**
1-Terminal - Red/White
2-Terminal - Black/White
3-Terminal - Purple/White

Figure 60-130-20

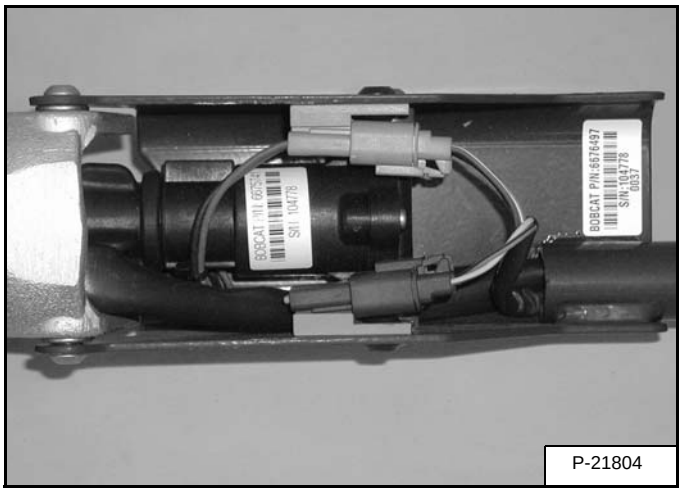


Left and Right Control Lever Switch Handle **[Figure 60-130-20]**
1-Terminal - Yellow/Red
2-Terminal - Open
3-Terminal - Orange/Black

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Switch Handle Installation (Cont'd)

Figure 60-130-21

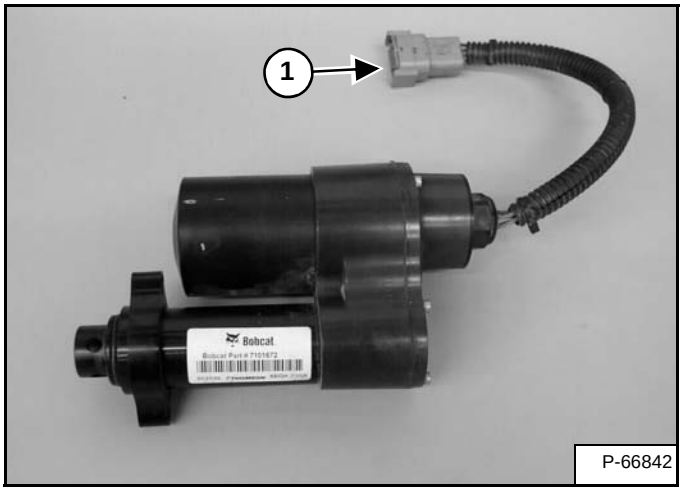


Connect the handle harness connectors to the sensor and lock solenoid connectors **[Figure 60-130-21]**.

Actuator Connector Disassembly And Assembly

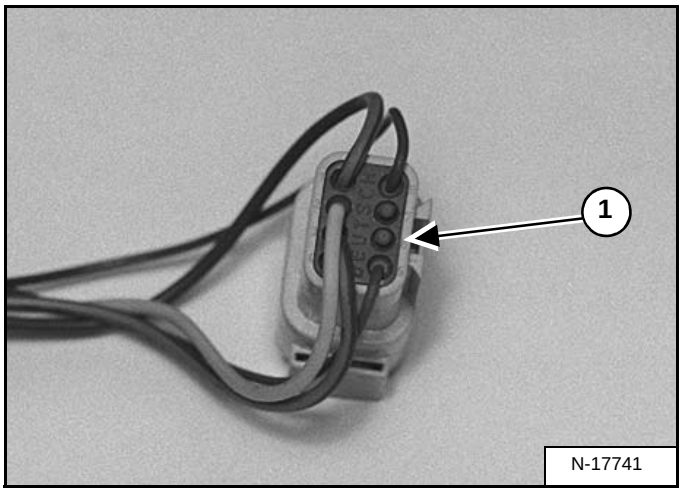
NOTE: Actuator shown removed for clarity. Not necessary for procedure.

Figure 60-130-22



Check the actuator wiring harness connector (Item 1) **[Figure 60-130-22]** and replace if broken.

Figure 60-130-23



Installation: Install the wires into the connector as listed below. The terminal numbers are written on the back of the connector (Item 1) **[Figure 60-130-23]**.

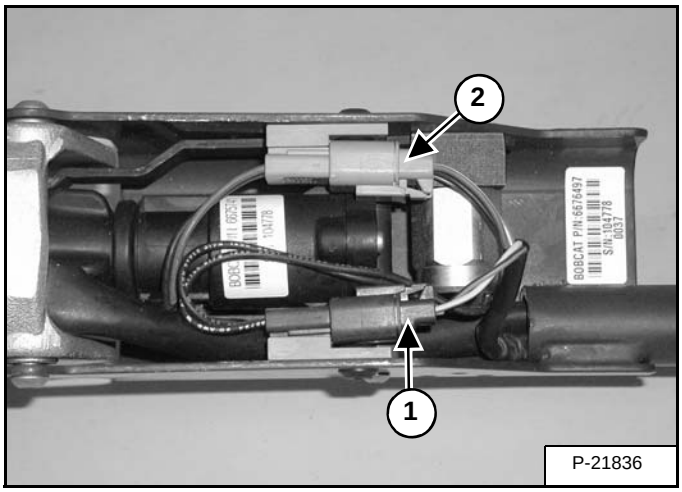
Lift and Tilt Actuator

1. Terminal-Black/Green-Larger diameter wire (16 gauge)
2. Terminal-Green-Larger diameter wire (16 gauge)
3. Terminal-Red/Green-Larger diameter wire (16 gauge)
4. Terminal-Open
5. Terminal-Red-Smaller diameter wire (18 gauge)
6. Terminal-Open
7. Terminal-Open
8. Terminal-Black-Smaller diameter wire (18 gauge)

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Handle Lock Solenoid Removal And Installation

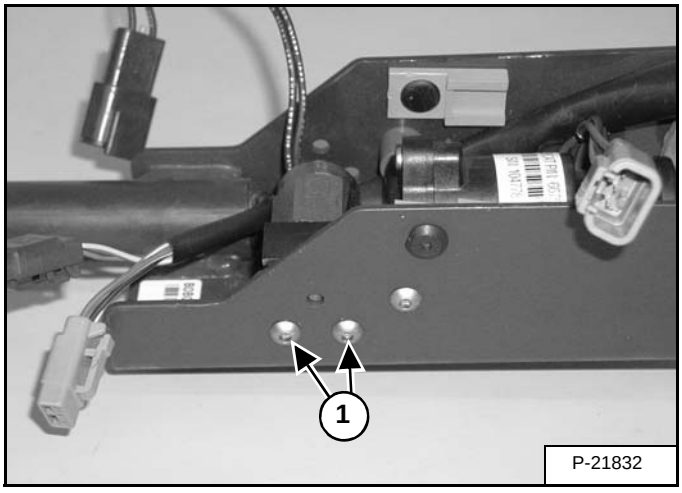
Figure 60-130-24



Disconnect the harness connector (Item 1) **[Figure 60-130-24]** from the handle sensor connector.

Disconnect the harness connector (Item 2) **[Figure 60-130-24]** from the handle lock solenoid connector.

Figure 60-130-25



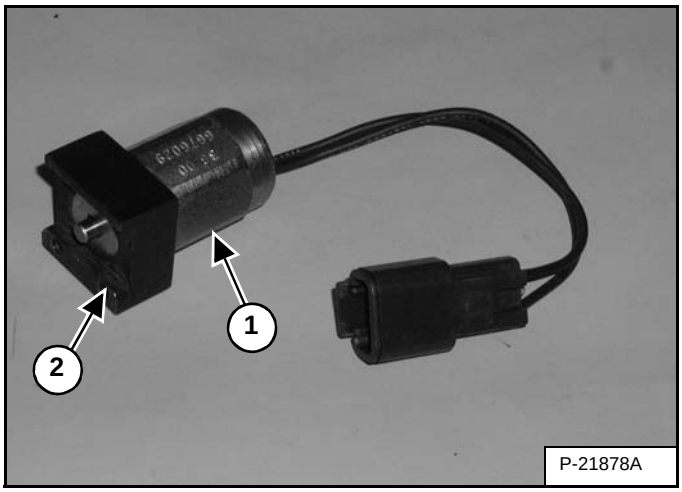
Remove the two screws (Item 1) **[Figure 60-130-25]** holding the handle lock solenoid to the handle.

Installation: Tighten the screws to 3,6 - 4,3 N•m (32 - 38 in-lb) torque.

Remove handle lock solenoid assembly from handle.

Handle Lock Solenoid Disassembly And Assembly

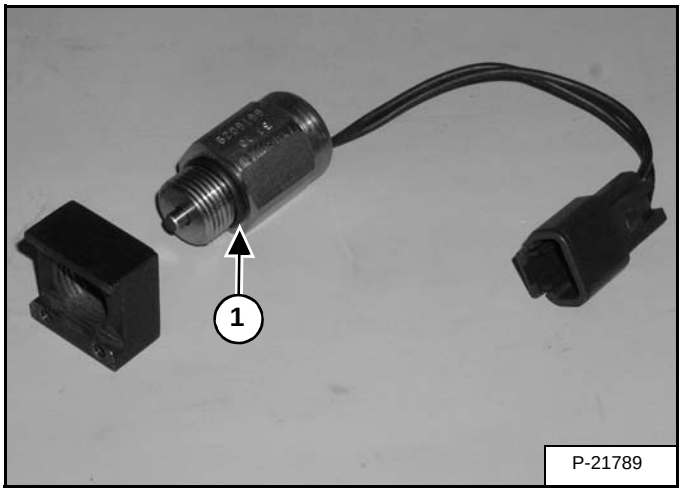
Figure 60-130-26



Remove solenoid (Item 1) from the solenoid mount (Item 2) **[Figure 60-130-26]**.

Installation: Apply a drop of oil to the solenoid threads and tighten solenoid to 47 - 54 N•m (35 - 40 ft-lb) torque.

Figure 60-130-27

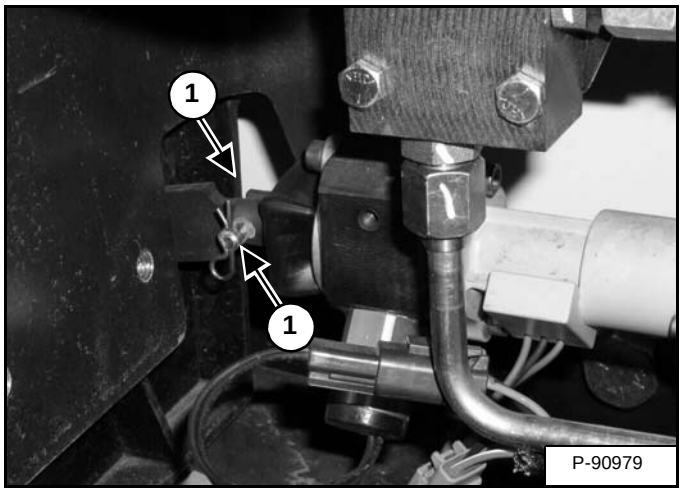


Check the O-ring (Item 1) **[Figure 60-130-27]** for damage. Replace as necessary.

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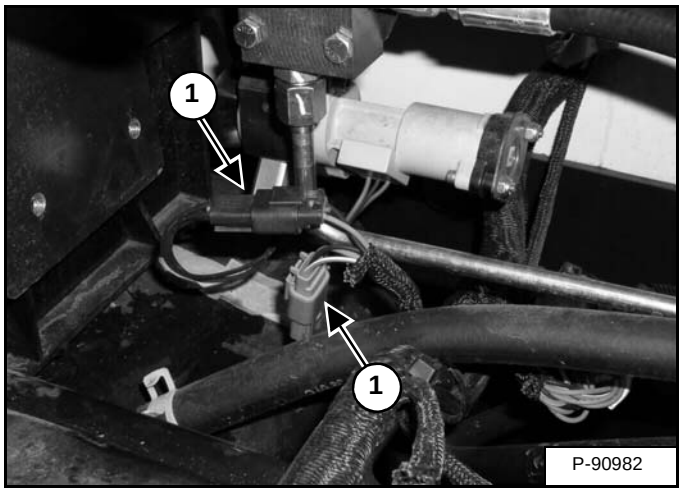
Foot Sensor Removal And Installation

Figure 60-130-28



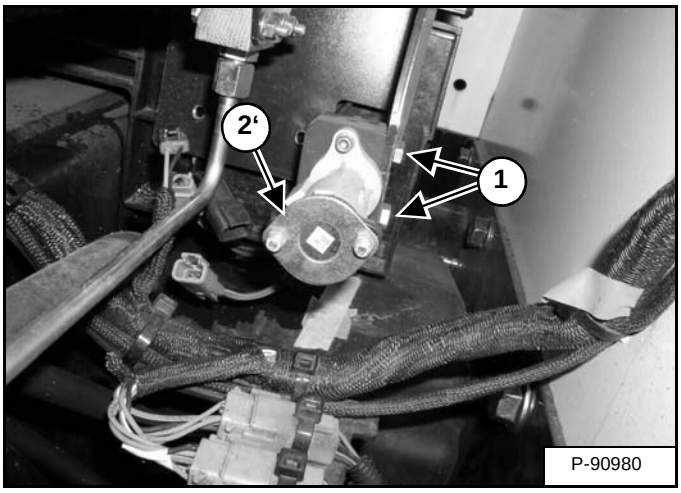
Remove the hairpin clip and the pin (Item 1) **[Figure 60-130-28]** from the foot sensor.

Figure 60-130-29



Disconnect the wire harness (Item 1) **[Figure 60-130-29]** from the foot sensor.

Figure 60-130-30



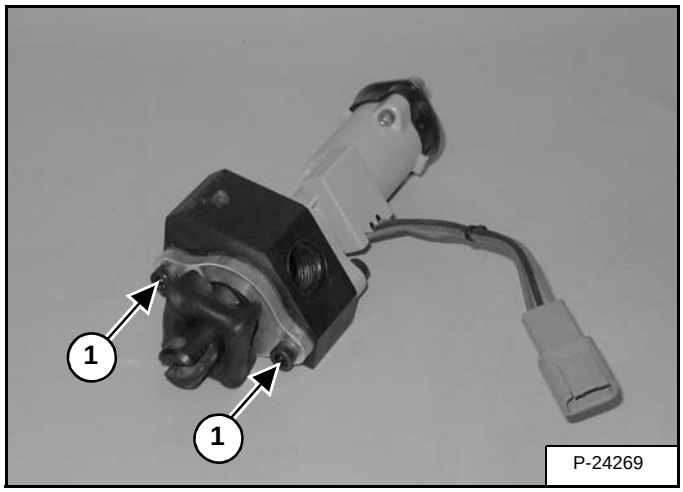
Remove the two bolts (Item 1) and the foot sensor (Item 2) **[Figure 60-130-30]**.

Repeat for other side.

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Foot Sensor Disassembly And Assembly

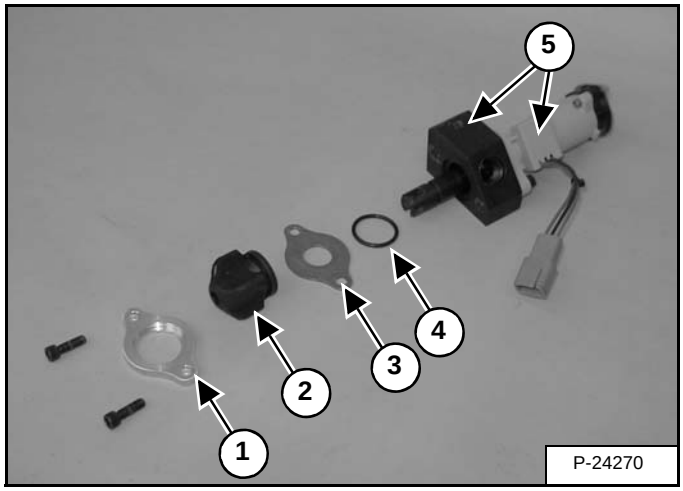
Figure 60-130-31



Remove the two bolts (Item 1) **[Figure 60-130-31]** from the end of the foot sensor.

Installation: Tighten the bolts to 10,2 N•m (90 in-lb) torque. Apply Loctite® #242 to the threads.

Figure 60-130-32

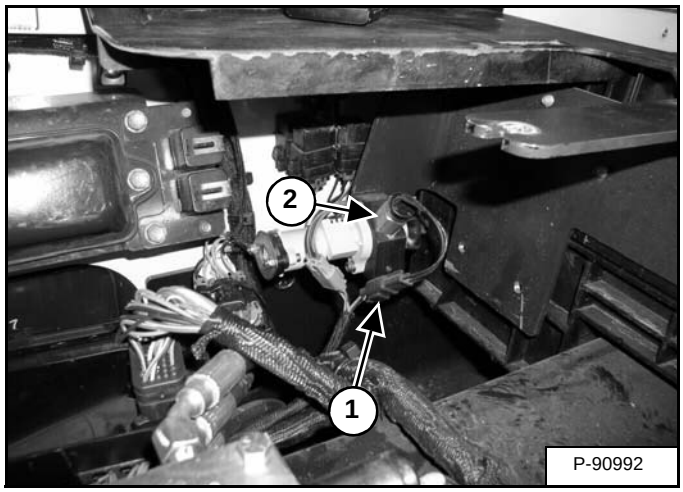


Remove the boot retainer (Item 1), boot (Item 2), spool stop plate (Item 3) and O-ring (Item 4) **[Figure 60-130-32]**.

NOTE: Do not disassemble the sensor assembly (Item 5) [Figure 60-130-32]. The sensor assembly is a calibrated assembly and cannot be serviced. Order through Bobcat Parts.

Foot Sensor Lock Solenoid Removal And Installation

Figure 60-130-33

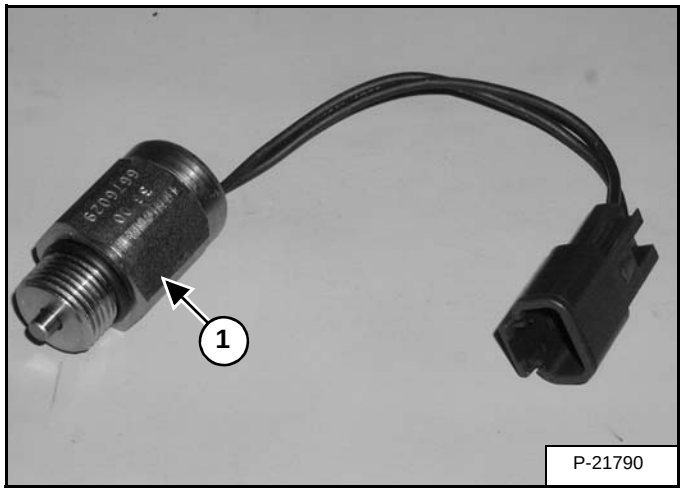


Disconnect the wire harness (Item 1) **[Figure 60-130-33]** from the foot sensor shield lock solenoid.

Remove foot lock solenoid (Item 2) **[Figure 60-130-33]**.

Installation: Apply a drop of oil on the solenoid threads and tighten the solenoid to 47 - 54 N•m (35 - 40 ft-lb) torque.

Figure 60-130-34

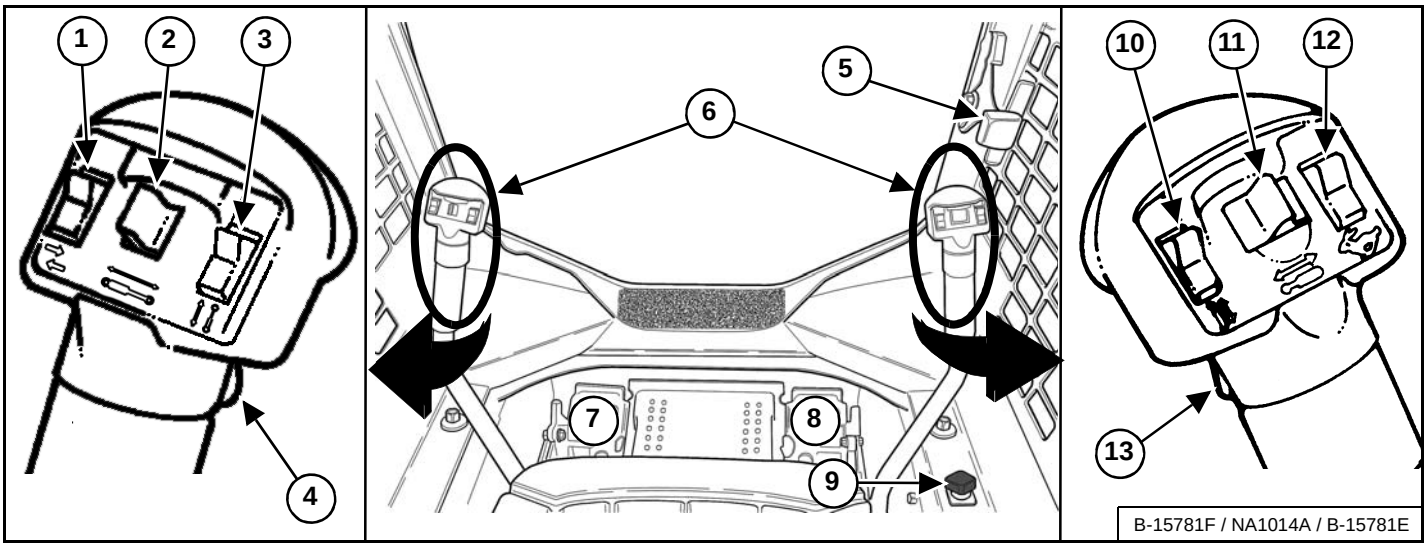


Check the O-ring (Item 1) **[Figure 60-130-34]** for damage. Replace as necessary.

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ELECTRICAL / HYDRAULIC CONTROLS

Identification Chart



REF. NO.	DESCRIPTION
1	TURN SIGNALS (Option)
2	REAR AUXILIARY HYDRAULICS (Option) Also: ATTACHMENT FUNCTION CONTROL
3	ATTACHMENT FUNCTION CONTROL
4	FRONT HORN
5	ENGINE SPEED CONTROL
6	STEERING LEVERS
7	LIFT ARM PEDAL
8	TILT PEDAL
9	LIFT ARM BYPASS CONTROL
10	ATTACHMENT FUNCTION CONTROL
11	FRONT AUXILIARY HYDRAULICS
12	NOT USED
13	CONTINUOUS FLOW CONTROL FOR AUXILIARY HYDRAULICS

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Description

The Attachment Control Device (ACD) uses a 7 or 14 pin connector to communicate between the loader and the attachment.

Attachments with a 14 pin connector use four different groups to control operations and hydraulic flow. Use service Analyzer to determine what group is being used and to troubleshoot the attachment / loader functions. If service analyzer is not available use a Ohmmeter to check for jumpers on the attachment harness.

Group 0 = No Jumpers

Group 1 = Pins K,L

Group 2 = Pins K,P

Group 3 = Pins C,D

Refer to the Identification Chart ACD Group 0,1,2, or 3 for more detailed information.

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Identification Chart ACD Group 0

Left side Control Handle Switches	Switch Number	Solenoid Number Activated				Attachment Harness Terminal Activated	Attachment Harness Connector	RIght Side Control Handle Switches
		STD	RH	HFH	RH / HFH		Fourteen Pin Connector Viewed from front (pin side of connector) of loader.	
	1	1	1	1, 7	1,7	K		
	2	2	2	2	2	K		
	3	1	1	1, 7	1,7	K		
	4	2	3,5,6	2	3,5,6	K,A,D		
	5	1	4,5,6	1	4,5,6	K,A,C		
	6	1	4,5,6	1	4,5,6	K,E		
	7	1	4,5,6	1	4,5,6	K,F		
	8	1	4,5,6	1	4,5,6	K,G		
	9	1	4,5,6	1	4,5,6	K,H		
	10, 11, 12, 13, 14	-	--	--		K	No Jumpers	
B-16447								B-16448

RH - Loaders with Rear Hydraulics Option.
HFH - Loaders with High Flow Hydraulics Option.
RH / HFH - Loaders with Rear Hydraulics and High Flow Hydraulics Option.
Terminal K is activated with Key switch ON.

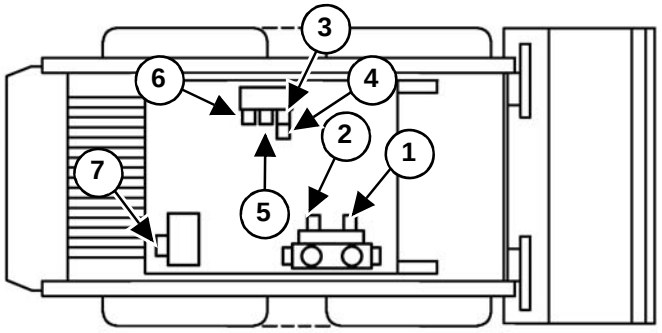
NOTE: For diagnostics and troubleshooting connect the Service PC (See SERVICE PC (LAPTOP COMPUTER) on Page 60-150-1.)

The ACD (Attachment Control Device) automatically recognizes the use of the seven or fourteen pin connector when connected.

Pressing the auxiliary hydraulics button and moving the rear auxiliary hydraulic switch to the right and left several times activates solenoid numbers 3,4,5, and 6 at the diverter valve.

Front Auxiliary Pressure Release is accomplished by manually pushing the male and female couplers in at the front auxiliary block.

The High Flow Button in the left side instrument panel must be pushed ON to activate solenoid number seven at the gear pump.



NA1892

Solenoid Number	Hydraulic Coupler	Wiring Number
1	Front Male (Rod)	4330
2	Front Female (Base)	4340
3	Diverter Rear (Rod)	4430
4	Diverter Rear (Base)	4440
5	Bleed / Lock Valve (Base)	4480
6	Bleed / Lock Valve (Rod)	4450
7	High Flow on Pump	4460

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Identification Chart ACD Group 1

Left side Control Handle Switches	Switch Number	Solenoid Number Activated				Attachment Harness Terminal Activated	Attachment Harness Connector	RIght Side Control Handle Switches
		STD	RH	HFH	RH / HFH		Fourteen Pin Connector Viewed from front (pin side of connector) of loader.	
	1	1	1	1, 7	1,7	K		
	2	2	2	2	2	K		
	3	1	1	1, 7	1,7	K		
	4	1	1	1	1	K,M,D		
	5	1	1	1	1	K,M,C		
	6	1	1	1	1	K,M,E		
	7	1	1	1	1	K,M,F		
	8	1	1	1	1	K,M,G		
	9	1	1	1	1	K,M,H		
	10, 11, 12, 13, 14	-	--	--		K	Jumpers K,L	
B-16447								B-16448

RH - Loaders with Rear Hydraulics Option.
HFH - Loaders with High Flow Hydraulics Option.
RH / HFH - Loaders with Rear Hydraulics and High Flow Hydraulics Option.
Terminal K is activated with Key switch ON.

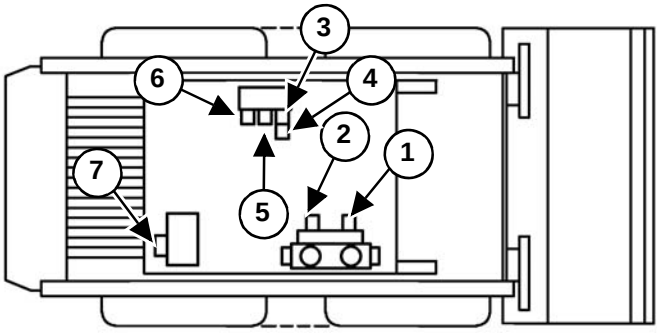
NOTE: For diagnostics and troubleshooting connect the Service PC (See SERVICE PC (LAPTOP COMPUTER) on Page 60-150-1.)

The ACD (Attachment Control Device) automatically recognizes the use of the seven or fourteen pin connector when connected.

Pressing the auxiliary hydraulics button and moving the rear auxiliary hydraulic switch to the right and left several times activates solenoid numbers 3,4,5, and 6 at the diverter valve.

Front Auxiliary Pressure Release is accomplished by manually pushing the male and female couplers in at the front auxiliary block.

The High Flow Button in the left side instrument panel must be pushed ON to activate solenoid number seven at the gear pump.



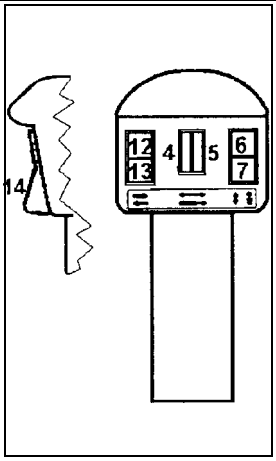
NA1892

Solenoid Number	Hydraulic Coupler	Wiring Number
1	Front Male (Rod)	4330
2	Front Female (Base)	4340
3	Diverter Rear (Rod)	4430
4	Diverter Rear (Base)	4440
5	Bleed / Lock Valve (Base)	4480
6	Bleed / Lock Valve (Rod)	4450
7	High Flow on Pump	4460

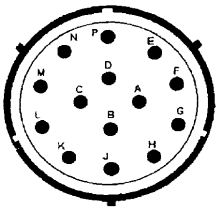
Dealer Copy -- Not for Resale

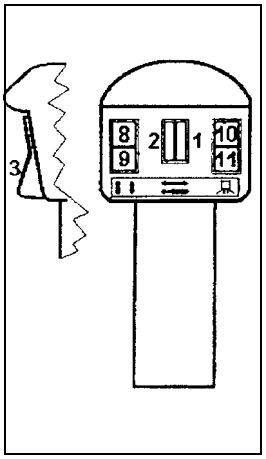
Identification Chart ACD Group 2

Left side Control Handle Switches	Switch Number	Solenoid Number Activated				Attachment Harness Terminal Activated	Attachment Harness Connector	RIght Side Control Handle Switches
		STD	RH	HFH	RH / HFH		Fourteen Pin Connector Viewed from front (pin side of connector) of loader.	
	1	1	1	1, 7	1,7	K		
	2	2	2	2	2	K		
	3	1	1	1, 7	1,7	K		
	4	2	2	2	2	K,A		
	5	1	1	1,7	1,7	K,A		
	6	-	-	-	-	K,E		
	7	-	-	-	-	K,F		
	8	-	-	-	-	K,G		
	9	-	-	-	-	K,H		
	10, 11, 12, 13, 14	-	--	--		K	Jumpers K,P	



B-16447





B-16448

RH - Loaders with Rear Hydraulics Option.
HFH - Loaders with High Flow Hydraulics Option.
RH / HFH - Loaders with Rear Hydraulics and High Flow Hydraulics Option.
Terminal K is activated with Key switch ON.

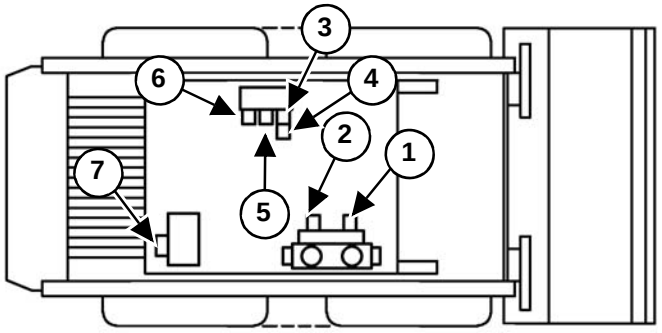
NOTE: For diagnostics and troubleshooting connect the Service PC (See SERVICE PC (LAPTOP COMPUTER) on Page 60-150-1.)

The ACD (Attachment Control Device) automatically recognizes the use of the seven or fourteen pin connector when connected.

Pressing the auxiliary hydraulics button and moving the rear auxiliary hydraulic switch to the right and left several times activates solenoid numbers 3,4,5, and 6 at the diverter valve.

Front Auxiliary Pressure Release is accomplished by manually pushing the male and female couplers in at the front auxiliary block.

The High Flow Button in the left side instrument panel must be pushed ON to activate solenoid number seven at the gear pump.



NA1892

Solenoid Number	Hydraulic Coupler	Wiring Number
1	Front Male (Rod)	4330
2	Front Female (Base)	4340
3	Diverter Rear (Rod)	4430
4	Diverter Rear (Base)	4440
5	Bleed / Lock Valve (Base)	4480
6	Bleed / Lock Valve (Rod)	4450
7	High Flow on Pump	4460

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Identification Chart ACD Group 3

Left side Control Handle Switches	Switch Number	Solenoid Number Activated				Attachment Harness Terminal Activated	Attachment Harness Connector	RIght Side Control Handle Switches
		STD	RH	HFH	RH / HFH		Fourteen Pin Connector Viewed from front (pin side of connector) of loader.	
	1	1	1	-	-	K		
	2	2	2	-	-	K		
	3	1	1	-	-	K		
	4	-	-	-	-	K,A,D		
	5	-	-	-	-	K,A,C		
	6	-	-	-	-	K,E		
	7	-	-	-	-	K,F		
	8	-	-	-	-	K,G		
	9	-	-	-	-	K,H		
	10, 11, 12, 13, 14	-	--	--		K	Jumpers C,D	
B-16447								B-16448

RH - Loaders with Rear Hydraulics Option.
HFH - Loaders with High Flow Hydraulics Option.
RH / HFH - Loaders with Rear Hydraulics and High Flow Hydraulics Option.
Terminal K is activated with Key switch ON.

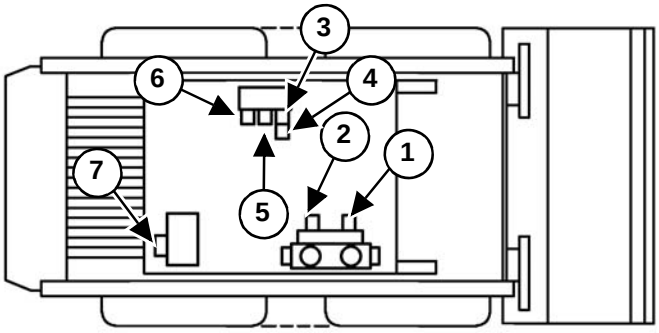
NOTE: For diagnostics and troubleshooting connect the Service PC (See SERVICE PC (LAPTOP COMPUTER) on Page 60-150-1.)

The ACD (Attachment Control Device) automatically recognizes the use of the seven or fourteen pin connector when connected.

Pressing the auxiliary hydraulics button and moving the rear auxiliary hydraulic switch to the right and left several times activates solenoid numbers 3,4,5, and 6 at the diverter valve.

Front Auxiliary Pressure Release is accomplished by manually pushing the male and female couplers in at the front auxiliary block.

The High Flow Button in the left side instrument panel must be pushed ON to activate solenoid number seven at the gear pump.



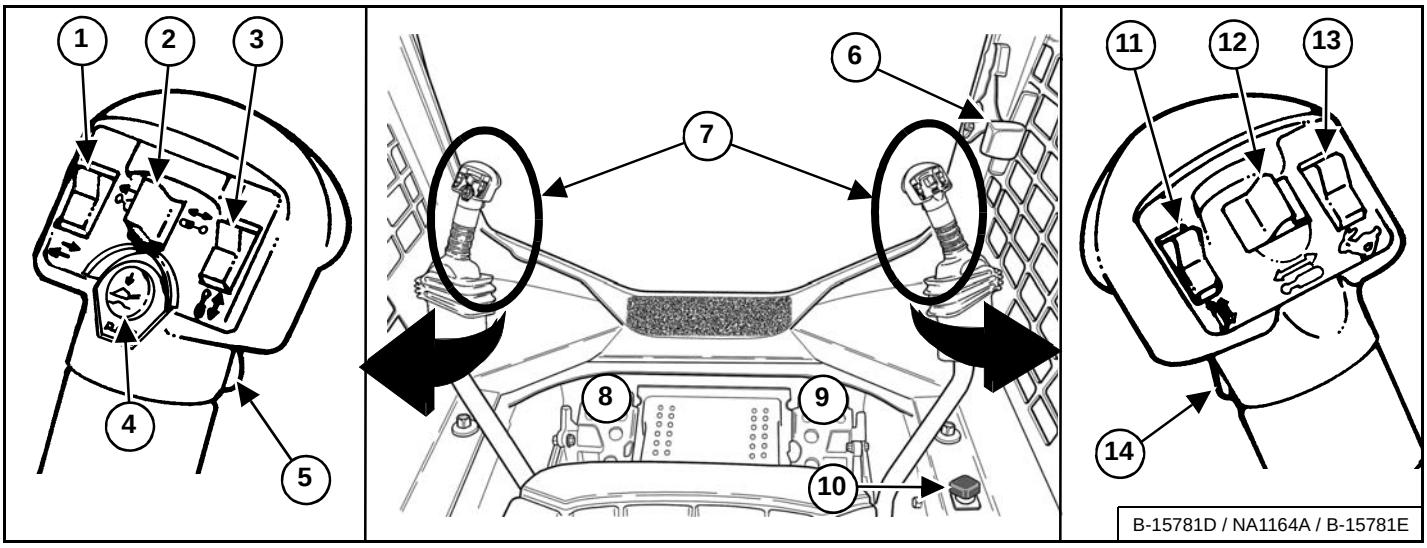
NA1892

Solenoid Number	Hydraulic Coupler	Wiring Number
1	Front Male (Rod)	4330
2	Front Female (Base)	4340
3	Diverter Rear (Rod)	4430
4	Diverter Rear (Base)	4440
5	Bleed / Lock Valve (Base)	4480
6	Bleed / Lock Valve (Rod)	4450
7	High Flow on Pump	4460

Dealer Copy -- Not for Resale

ELECTRICAL / HYDRAULIC CONTROLS (ACS)

Identification Chart



REF. NO.	DESCRIPTION
1	TURN SIGNALS (Option)
2	REAR AUXILIARY HYDRAULICS (Option) Also: ATTACHMENT FUNCTION CONTROL
3	ATTACHMENT FUNCTION CONTROL
4	FLOAT CONTROL
5	FRONT HORN
6	ENGINE SPEED CONTROL
7	STEERING LEVERS AND LIFT / TILT HANDLES
8	LIFT ARM PEDAL
9	TILT PEDAL
10	LIFT ARM BYPASS CONTROL
11	ATTACHMENT FUNCTION CONTROL
12	FRONT AUXILIARY HYDRAULICS
13	NOT USED
14	CONTINUOUS FLOW CONTROL FOR AUXILIARY HYDRAULICS

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Description

The Attachment Control Device (ACD) uses a 7 or 14 pin connector to communicate between the loader and the attachment.

Attachments with a 14 pin connector use four different groups to control operations and hydraulic flow. Use service Analyzer to determine what group is being used and to troubleshoot the attachment / loader functions. If service analyzer is not available use a Ohmmeter to check for jumpers on the attachment harness.

Group 0 = No Jumpers

Group 1 = Pins K,L

Group 2 = Pins K,P

Group 3 = Pins C,D

Refer to the Identification Chart ACD Group 0,1,2, or 3 for more detailed information.

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Identification Chart ACD Group 0

Left side Control Handle Switches	Switch Number	Solenoid Number Activated				Attachment Harness Terminal Activated	Attachment Harness Connector	RIght Side Control Handle Switches
		STD	RH	HFH	RH / HFH		Fourteen Pin Connector Viewed from front (pin side of connector) of loader.	
	1	1	1	1, 7	1,7	K		
	2	2	2	2	2	K		
	3	1	1	1, 7	1,7	K		
	4	2	3,5,6	2	3,5,6	K,A,D		
	5	1	4,5,6	1	4,5,6	K,A,C		
	6	1	4,5,6	1	4,5,6	K,E		
	7	1	4,5,6	1	4,5,6	K,F		
	8	1	4,5,6	1	4,5,6	K,G		
	9	1	4,5,6	1	4,5,6	K,H		
P-90898 P-90900	10, 11, 12, 13, 14	-	--	--		K	No Jumpers	P-90899 P-90900A

RH - Loaders with Rear Hydraulics Option.
HFH - Loaders with High Flow Hydraulics Option.
RH / HFH - Loaders with Rear Hydraulics and High Flow Hydraulics Option.
Terminal K is activated with Key switch ON.

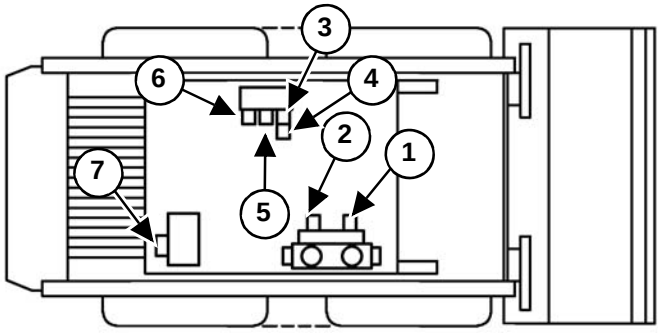
NOTE: For diagnostics and troubleshooting connect the Service PC (See SERVICE PC (LAPTOP COMPUTER) on Page 60-150-1.)

The ACD (Attachment Control Device) automatically recognizes the use of the seven or fourteen pin connector when connected.

Pressing the auxiliary hydraulics button and moving the rear auxiliary hydraulic switch to the right and left several times activates solenoid numbers 3,4,5, and 6 at the diverter valve.

Front Auxiliary Pressure Release is accomplished by manually pushing the male and female couplers in at the front auxiliary block.

The High Flow Button in the left side instrument panel must be pushed ON to activate solenoid number seven at the gear pump.



NA1892

Solenoid Number	Hydraulic Coupler	Wiring Number
1	Front Male (Rod)	4330
2	Front Female (Base)	4340
3	Diverter Rear (Rod)	4430
4	Diverter Rear (Base)	4440
5	Bleed / Lock Valve (Base)	4480
6	Bleed / Lock Valve (Rod)	4450
7	High Flow on Pump	4460

Dealer Copy -- Not for Resale

Identification Chart ACD Group 1

Left side Control Handle Switches	Switch Number	Solenoid Number Activated				Attachment Harness Terminal Activated	Attachment Harness Connector	RIght Side Control Handle Switches
		STD	RH	HFH	RH / HFH		**Fourteen Pin Connector Viewed from front (pin side of connector) of loader.**	
	1	1	1	1, 7	1,7	K		
	2	2	2	2	2	K		
	3	1	1	1, 7	1,7	K		
	4	1	1	1	1	K,M,D		
	5	1	1	1	1	K,M,C		
	6	1	1	1	1	K,M,E		
	7	1	1	1	1	K,M,F		
	8	1	1	1	1	K,M,G		
	9	1	1	1	1	K,M,H		
	10, 11, 12, 13, 14	-	--	--		K	Jumpers K,L	
P-90898 P-90900								P-90899 P-90900A

RH - Loaders with Rear Hydraulics Option.
HFH - Loaders with High Flow Hydraulics Option.
RH / HFH - Loaders with Rear Hydraulics and High Flow Hydraulics Option.
Terminal K is activated with Key switch ON.

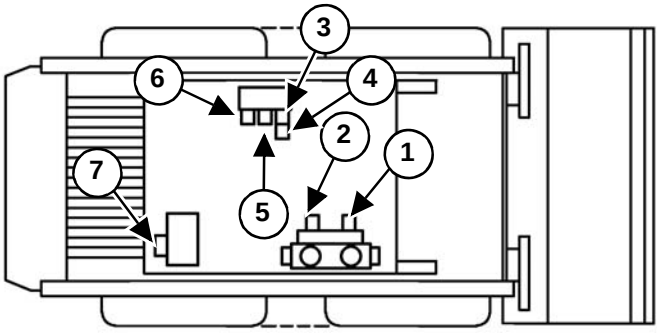
NOTE: For diagnostics and troubleshooting connect the Service PC (See SERVICE PC (LAPTOP COMPUTER) on Page 60-150-1.)

The ACD (Attachment Control Device) automatically recognizes the use of the seven or fourteen pin connector when connected.

Pressing the auxiliary hydraulics button and moving the rear auxiliary hydraulic switch to the right and left several times activates solenoid numbers 3,4,5, and 6 at the diverter valve.

Front Auxiliary Pressure Release is accomplished by manually pushing the male and female couplers in at the front auxiliary block.

The High Flow Button in the left side instrument panel must be pushed ON to activate solenoid number seven at the gear pump.



NA1892

Solenoid Number	Hydraulic Coupler	Wiring Number
1	Front Male (Rod)	4330
2	Front Female (Base)	4340
3	Diverter Rear (Rod)	4430
4	Diverter Rear (Base)	4440
5	Bleed / Lock Valve (Base)	4480
6	Bleed / Lock Valve (Rod)	4450
7	High Flow on Pump	4460

Dealer Copy -- Not for Resale

Identification Chart ACD Group 2

Left side Control Handle Switches	Switch Number	Solenoid Number Activated				Attachment Harness Terminal Activated	Attachment Harness Connector	RIght Side Control Handle Switches
		STD	RH	HFH	RH / HFH		Fourteen Pin Connector Viewed from front (pin side of connector) of loader.	
	1	1	1	1, 7	1,7	K		
	2	2	2	2	2	K		
	3	1	1	1, 7	1,7	K		
	4	2	2	2	2	K,A		
	5	1	1	1,7	1,7	K,A		
	6	-	-	-	-	K,E		
	7	-	-	-	-	K,F		
	8	-	-	-	-	K,G		
	9	-	-	-	-	K,H		
P-90898 P-90900	10, 11, 12, 13, 14	-	--	--		K	Jumpers K,P	P-90899 P-90900A

RH - Loaders with Rear Hydraulics Option.
HFH - Loaders with High Flow Hydraulics Option.
RH / HFH - Loaders with Rear Hydraulics and High Flow Hydraulics Option.
Terminal K is activated with Key switch ON.

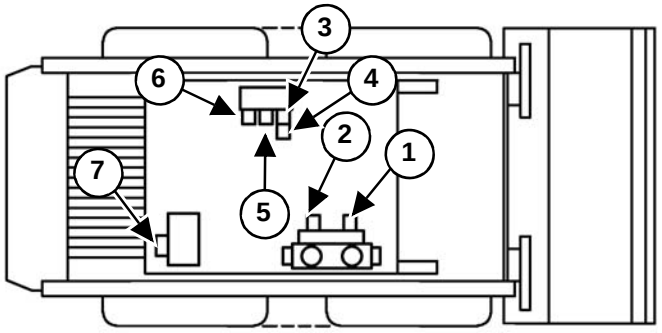
NOTE: For diagnostics and troubleshooting connect the Service PC (See SERVICE PC (LAPTOP COMPUTER) on Page 60-150-1.)

The ACD (Attachment Control Device) automatically recognizes the use of the seven or fourteen pin connector when connected.

Pressing the auxiliary hydraulics button and moving the rear auxiliary hydraulic switch to the right and left several times activates solenoid numbers 3,4,5, and 6 at the diverter valve.

Front Auxiliary Pressure Release is accomplished by manually pushing the male and female couplers in at the front auxiliary block.

The High Flow Button in the left side instrument panel must be pushed ON to activate solenoid number seven at the gear pump.



NA1892

Solenoid Number	Hydraulic Coupler	Wiring Number
1	Front Male (Rod)	4330
2	Front Female (Base)	4340
3	Diverter Rear (Rod)	4430
4	Diverter Rear (Base)	4440
5	Bleed / Lock Valve (Base)	4480
6	Bleed / Lock Valve (Rod)	4450
7	High Flow on Pump	4460

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Identification Chart ACD Group 3

Left side Control Handle Switches	Switch Number	Solenoid Number Activated				Attachment Harness Terminal Activated	Attachment Harness Connector	RIght Side Control Handle Switches
		STD	RH	HFH	RH / HFH		Fourteen Pin Connector Viewed from front (pin side of connector) of loader.	
	1	1	1	-	-	K		
	2	2	2	-	-	K		
	3	1	1	-	-	K		
	4	-	-	-	-	K,A,D		
	5	-	-	-	-	K,A,C		
	6	-	-	-	-	K,E		
	7	-	-	-	-	K,F		
	8	-	-	-	-	K,G		
	9	-	-	-	-	K,H		
	10, 11, 12, 13, 14	-	--	--		K	Jumpers C,D	
P-90898 P-90900								P-90899 P-90900A

RH - Loaders with Rear Hydraulics Option.
HFH - Loaders with High Flow Hydraulics Option.
RH / HFH - Loaders with Rear Hydraulics and High Flow Hydraulics Option.
Terminal K is activated with Key switch ON.

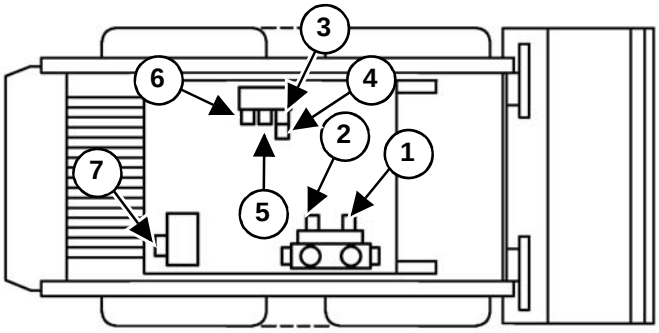
NOTE: For diagnostics and troubleshooting connect the Service PC (See SERVICE PC (LAPTOP COMPUTER) on Page 60-150-1.)

The ACD (Attachment Control Device) automatically recognizes the use of the seven or fourteen pin connector when connected.

Pressing the auxiliary hydraulics button and moving the rear auxiliary hydraulic switch to the right and left several times activates solenoid numbers 3,4,5, and 6 at the diverter valve.

Front Auxiliary Pressure Release is accomplished by manually pushing the male and female couplers in at the front auxiliary block.

The High Flow Button in the left side instrument panel must be pushed ON to activate solenoid number seven at the gear pump.



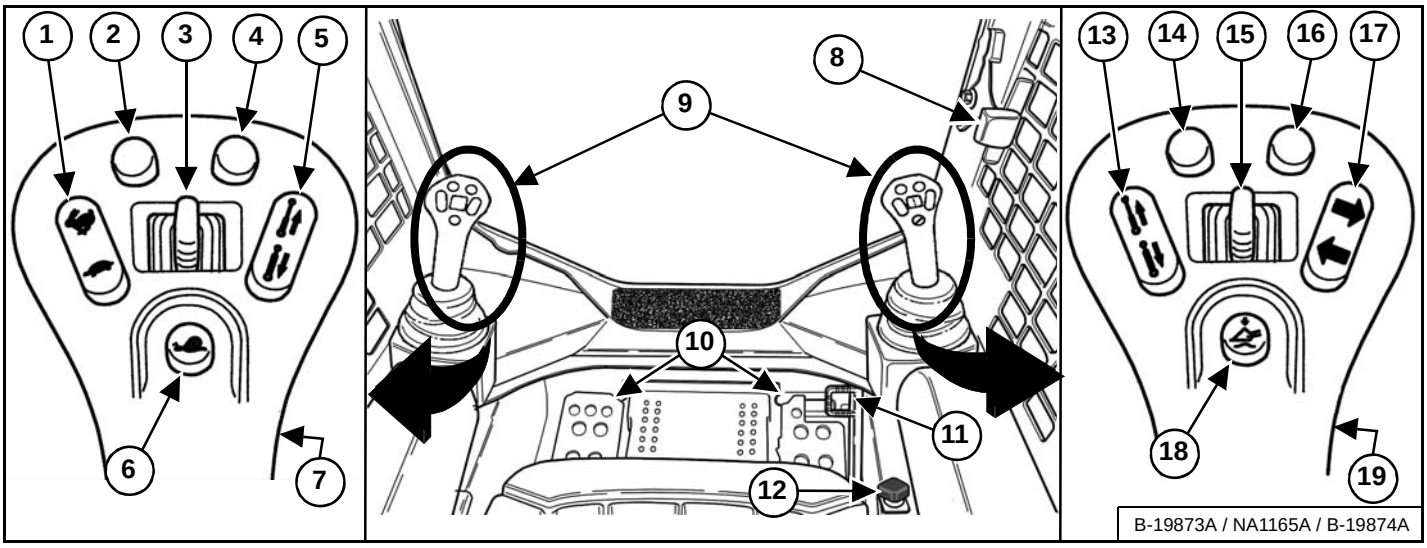
NA1892

Solenoid Number	Hydraulic Coupler	Wiring Number
1	Front Male (Rod)	4330
2	Front Female (Base)	4340
3	Diverter Rear (Rod)	4430
4	Diverter Rear (Base)	4440
5	Bleed / Lock Valve (Base)	4480
6	Bleed / Lock Valve (Rod)	4450
7	High Flow on Pump	4460

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ELECTRICAL / HYDRAULIC CONTROLS (SJC)

Identification Chart



REF. NO.	DESCRIPTION
1	SPEED MANAGEMENT
2	STEERING DRIFT COMPENSATION Also: DRIVE RESPONSE
3	REAR AUXILIARY HYDRAULICS (Option) Also: ATTACHMENT FUNCTION CONTROL
4	STEERING DRIFT COMPENSATION Also: DRIVE RESPONSE
5	ATTACHMENT FUNCTION CONTROL
6	SPEED MANAGEMENT
7	FRONT HORN
8	ENGINE SPEED CONTROL (HAND)
9	JOYSTICKS
10	FOOTRESTS
11	ENGINE SPEED CONTROL (FOOT)
12	LIFT ARM BYPASS CONTROL
13	ATTACHMENT FUNCTION CONTROL
14	NOT USED
15	FRONT AUXILIARY HYDRAULICS
16	NOT USED
17	TURN SIGNALS (Option)
18	FLOAT CONTROL
19	CONTINUOUS FLOW CONTROL FOR AUXILIARY HYDRAULICS

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Description

The Attachment Control Device (ACD) uses a 7 or 14 pin connector to communicate between the loader and the attachment.

Attachments with a 14 pin connector use four different groups to control operations and hydraulic flow. Use service Analyzer to determine what group is being used and to troubleshoot the attachment / loader functions. If service analyzer is not available use a Ohmmeter to check for jumpers on the attachment harness.

Group 0 = No Jumpers

Group 1 = Pins K,L

Group 2 = Pins K,P

Group 3 = Pins C,D

Refer to the Identification Chart ACD Group 0,1,2, or 3 for more detailed information.

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Identification Chart ACD Group 0

Left side Control Handle Switches	Switch Number	Solenoid Number Activated				Attachment Harness Terminal Activated	Attachment Harness Connector	RIght Side Control Handle Switches
		STD	RH	HFH	RH / HFH		Fourteen Pin Connector Viewed from front (pin side of connector) of loader.	
	1	1	1	1, 7	1,7	K		
	2	2	2	2	2	K		
	3	1	1	1, 7	1,7	K		
	4	2	3,5,6	2	3,5,6	K,A,D		
	5	1	4,5,6	1	4,5,6	K,A,C		
	6	1	4,5,6	1	4,5,6	K,E		
	7	1	4,5,6	1	4,5,6	K,F		
	8	1	4,5,6	1	4,5,6	K,G		
	9	1	4,5,6	1	4,5,6	K,H		
P-24820A P-28316A	10, 11, 12, 13, 14	-	--	--		K	No Jumpers	P-24802A P-28316A

RH - Loaders with Rear Hydraulics Option.
HFH - Loaders with High Flow Hydraulics Option.
RH / HFH - Loaders with Rear Hydraulics and High Flow Hydraulics Option.
Terminal K is activated with Key switch ON.

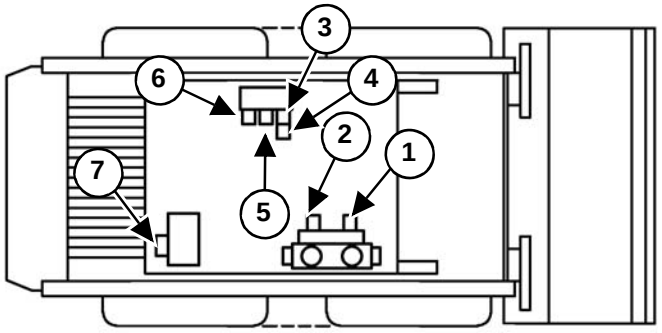
NOTE: For diagnostics and troubleshooting connect the Service PC (See SERVICE PC (LAPTOP COMPUTER) on Page 60-150-1.)

The ACD (Attachment Control Device) automatically recognizes the use of the seven or fourteen pin connector when connected.

Pressing the auxiliary hydraulics button and moving the rear auxiliary hydraulic switch to the right and left several times activates solenoid numbers 3,4,5, and 6 at the diverter valve.

Front Auxiliary Pressure Release is accomplished by manually pushing the male and female couplers in at the front auxiliary block.

The High Flow Button in the left side instrument panel must be pushed ON to activate solenoid number seven at the gear pump.



NA1892

Solenoid Number	Hydraulic Coupler	Wiring Number
1	Front Male (Rod)	4330
2	Front Female (Base)	4340
3	Diverter Rear (Rod)	4430
4	Diverter Rear (Base)	4440
5	Bleed / Lock Valve (Base)	4480
6	Bleed / Lock Valve (Rod)	4450
7	High Flow on Pump	4460

Dealer Copy -- Not for Resale

Identification Chart ACD Group 1

Left side Control Handle Switches	Switch Number	Solenoid Number Activated				Attachment Harness Terminal Activated	Attachment Harness Connector	RIght Side Control Handle Switches
		STD	RH	HFH	RH / HFH		Fourteen Pin Connector Viewed from front (pin side of connector) of loader.	
	1	1	1	1, 7	1,7	K		
	2	2	2	2	2	K		
	3	1	1	1, 7	1,7	K		
	4	1	1	1	1	K,M,D		
	5	1	1	1	1	K,M,C		
	6	1	1	1	1	K,M,E		
	7	1	1	1	1	K,M,F		
	8	1	1	1	1	K,M,G		
	9	1	1	1	1	K,M,H		
P-24820A P-28316A	10, 11, 12, 13, 14	-	--	--		K	Jumpers K,L	P-24802A P-28316A

RH - Loaders with Rear Hydraulics Option.
HFH - Loaders with High Flow Hydraulics Option.
RH / HFH - Loaders with Rear Hydraulics and High Flow Hydraulics Option.
Terminal K is activated with Key switch ON.

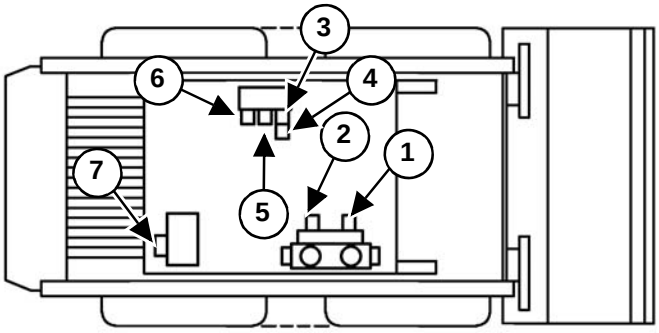
NOTE: For diagnostics and troubleshooting connect the Service PC (See SERVICE PC (LAPTOP COMPUTER) on Page 60-150-1.)

The ACD (Attachment Control Device) automatically recognizes the use of the seven or fourteen pin connector when connected.

Pressing the auxiliary hydraulics button and moving the rear auxiliary hydraulic switch to the right and left several times activates solenoid numbers 3,4,5, and 6 at the diverter valve.

Front Auxiliary Pressure Release is accomplished by manually pushing the male and female couplers in at the front auxiliary block.

The High Flow Button in the left side instrument panel must be pushed ON to activate solenoid number seven at the gear pump.



NA1892

Solenoid Number	Hydraulic Coupler	Wiring Number
1	Front Male (Rod)	4330
2	Front Female (Base)	4340
3	Diverter Rear (Rod)	4430
4	Diverter Rear (Base)	4440
5	Bleed / Lock Valve (Base)	4480
6	Bleed / Lock Valve (Rod)	4450
7	High Flow on Pump	4460

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Identification Chart ACD Group 2

Left side Control Handle Switches	Switch Number	Solenoid Number Activated				Attachment Harness Terminal Activated	Attachment Harness Connector	RIght Side Control Handle Switches
		STD	RH	HFH	RH / HFH		Fourteen Pin Connector Viewed from front (pin side of connector) of loader.	
	1	1	1	1, 7	1,7	K		
	2	2	2	2	2	K		
	3	1	1	1, 7	1,7	K		
	4	2	2	2	2	K,A		
	5	1	1	1,7	1,7	K,A		
	6	-	-	-	-	K,E		
	7	-	-	-	-	K,F		
	8	-	-	-	-	K,G		
	9	-	-	-	-	K,H		
P-24820A P-28316A	10, 11, 12, 13, 14	-	--	--		K	Jumpers K,P	P-24802A P-28316A

RH - Loaders with Rear Hydraulics Option.
HFH - Loaders with High Flow Hydraulics Option.
RH / HFH - Loaders with Rear Hydraulics and High Flow Hydraulics Option.
Terminal K is activated with Key switch ON.

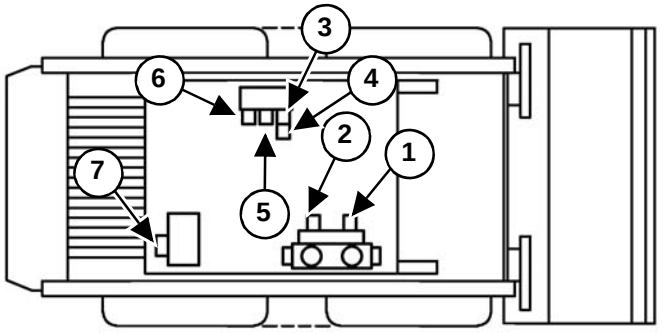
NOTE: For diagnostics and troubleshooting connect the Service PC (See SERVICE PC (LAPTOP COMPUTER) on Page 60-150-1.)

The ACD (Attachment Control Device) automatically recognizes the use of the seven or fourteen pin connector when connected.

Pressing the auxiliary hydraulics button and moving the rear auxiliary hydraulic switch to the right and left several times activates solenoid numbers 3,4,5, and 6 at the diverter valve.

Front Auxiliary Pressure Release is accomplished by manually pushing the male and female couplers in at the front auxiliary block.

The High Flow Button in the left side instrument panel must be pushed ON to activate solenoid number seven at the gear pump.



NA1892

Solenoid Number	Hydraulic Coupler	Wiring Number
1	Front Male (Rod)	4330
2	Front Female (Base)	4340
3	Diverter Rear (Rod)	4430
4	Diverter Rear (Base)	4440
5	Bleed / Lock Valve (Base)	4480
6	Bleed / Lock Valve (Rod)	4450
7	High Flow on Pump	4460

Dealer Copy -- Not for Resale

Identification Chart ACD Group 3

Left side Control Handle Switches	Switch Number	Solenoid Number Activated				Attachment Harness Terminal Activated	Attachment Harness Connector	RIght Side Control Handle Switches
		STD	RH	HFH	RH / HFH		Fourteen Pin Connector Viewed from front (pin side of connector) of loader.	
	1	1	1	-	-	K		
	2	2	2	-	-	K		
	3	1	1	-	-	K		
	4	-	-	-	-	K,A,D		
	5	-	-	-	-	K,A,C		
	6	-	-	-	-	K,E		
	7	-	-	-	-	K,F		
	8	-	-	-	-	K,G		
	9	-	-	-	-	K,H		
P-24820A P-28316A	10, 11, 12, 13, 14	-	--	--		K	Jumpers C,D	P-24802A P-28316A

RH - Loaders with Rear Hydraulics Option.
HFH - Loaders with High Flow Hydraulics Option.
RH / HFH - Loaders with Rear Hydraulics and High Flow Hydraulics Option.
Terminal K is activated with Key switch ON.

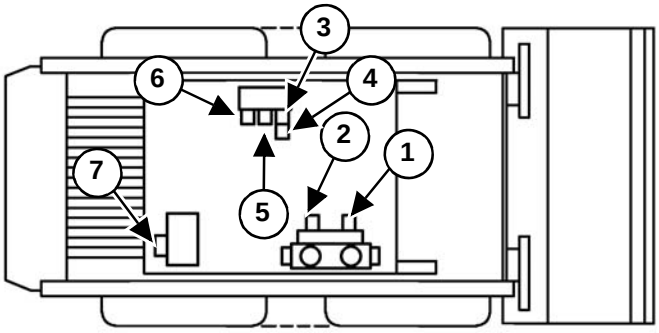
NOTE: For diagnostics and troubleshooting connect the Service PC (See SERVICE PC (LAPTOP COMPUTER) on Page 60-150-1.)

The ACD (Attachment Control Device) automatically recognizes the use of the seven or fourteen pin connector when connected.

Pressing the auxiliary hydraulics button and moving the rear auxiliary hydraulic switch to the right and left several times activates solenoid numbers 3,4,5, and 6 at the diverter valve.

Front Auxiliary Pressure Release is accomplished by manually pushing the male and female couplers in at the front auxiliary block.

The High Flow Button in the left side instrument panel must be pushed ON to activate solenoid number seven at the gear pump.



NA1892

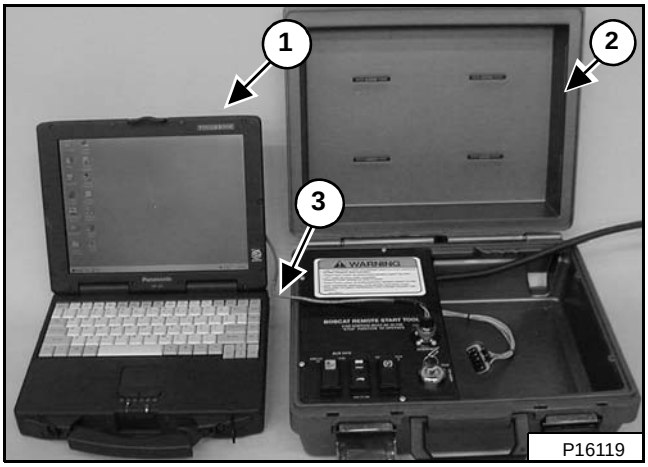
Solenoid Number	Hydraulic Coupler	Wiring Number
1	Front Male (Rod)	4330
2	Front Female (Base)	4340
3	Diverter Rear (Rod)	4430
4	Diverter Rear (Base)	4440
5	Bleed / Lock Valve (Base)	4480
6	Bleed / Lock Valve (Rod)	4450
7	High Flow on Pump	4460

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SERVICE PC (LAPTOP COMPUTER)

Connecting Remote Start Tool

Figure 60-150-1



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

MEL1563 or 7003031 - 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 diagnostics, and upgrade 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.

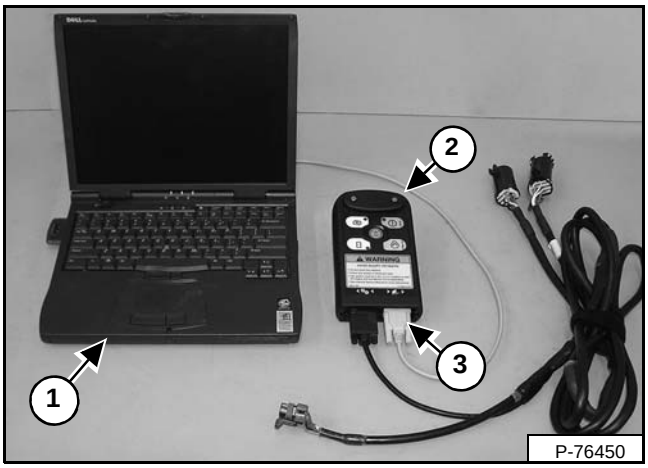
Connect the other end to the connector on the Remote Start Tool.

Connect the remote start tool to the loader. (See REMOTE START TOOL KIT-MEL1563 on Page 10-60-1.)

NOTE: Refer to BobcatNET for PC requirements and the latest Service Analyzer software.

Connecting Remote Start Tool (Service Tool)

Figure 60-150-2



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

Order from Bobcat Parts P/N: 7003031 - Remote Start Tool (Service Tool) Kit

Kit Includes:

7003030 - Remote Start Tool (Service Tool)
6689747 - Loader Service Tool Harness
6689746 - Computer Service Tool Harness
6689745 - BOSS® Service Tool Harness

NOTE: Make all connections with the key in the OFF position.

The Service PC (Item 1) with the Remote Start Tool (Service Tool) (Item 2) **[Figure 60-150-2]**. When connected to the loader, the Service PC is used to monitor, conduct diagnostics, and upgrade software.

Connect the Remote Start Tool (Service Tool) Computer Service Tool Harness (Item 3) **[Figure 60-150-2]** 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 (Service Tool).

Connect the Remote Start Tool (Service Tool) to the loader. (See REMOTE START TOOL (SERVICE TOOL) KIT - 7003031 on Page 10-61-1.)

NOTE: Refer to BobcatNET for PC requirements and the latest Service Analyzer software.

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CALIBRATION

Description

Calibration procedures must be followed when replacing a hydraulic control valve, actuator, Drive / Drive+ Controller, ACS Controller, pump controller, hydrostatic pump, or hydrostatic motor. Failure to calibrate after component replacement may result in poor performance or reduced life of actuator(s).

The Actuator Test is performed with the Service PC. The Actuator Test should be used if reduced performance codes are present or when replacing a controller or actuator.

NOTE: The Actuator Test should be used as the preferred method of actuator and valve spool calibration.

The Lift and Tilt Calibration (ACS) provides set points to the ACS controller to actuate the lift and tilt valve. The Lift and Tilt Calibration (ACS) should be used if reduced performance codes are present or when replacing a controller or actuator.

The Lift and Tilt Calibration (SJC) provides set points to the ACS controller to actuate the lift and tilt valve. The Lift and Tilt Calibration (SJC) should be used if reduced performance codes are present or when replacing a controller or actuator.

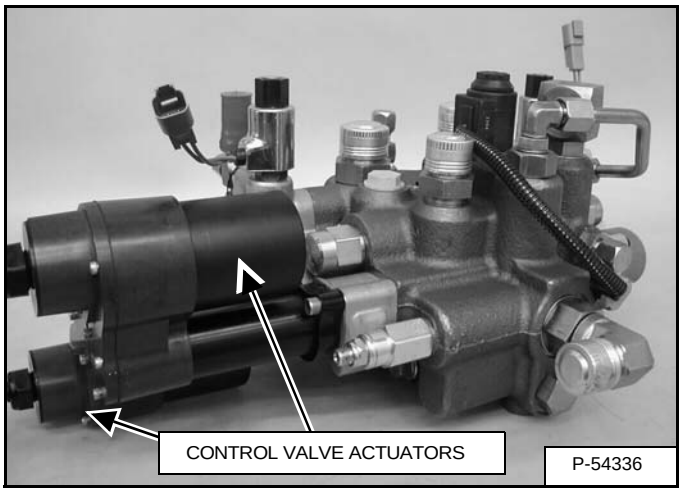
The Hydrostatic Pump Calibration (SJC) provides set points to the Drive controller to actuate the hydrostatic controller that directs flow to a servo piston. Hydrostatic Pump Calibration (SJC) should be performed when a desired travel path cannot be attained or replacing the hydrostatic pump, hydrostatic motor, or controller. After Performing a Hydrostatic Pump Calibration (SJC), Steering Drift Compensation can be used to fine tune the hydrostatic pump control.

For more information on Steering Drift Compensation (See STEERING DRIFT COMPENSATION on Page 60-161-1.)

NOTE: The Actuator Test is the only test that uses a Service PC. The Lift and Tilt Calibration (ACS or SJC) does not need to be performed if the Actuator Testing is being performed with the Service PC. The Hydrostatic Pump Calibration does not need to be performed with the Actuator Test or Lift and Tilt Calibration (SJC).

Actuator Testing

Figure 60-160-1



[Figure 60-160-1] Excessive actuator loading can occur if the actuator and valve spool components are misaligned. Misalignment may reduce spool stroke performance and reduce the life of the actuator. Starting with software version 36, the Bobcat Service Analyzer will be able to perform tests to diagnose actuator and valve spool misalignment.

Connect the Service PC. (See SERVICE PC (LAPTOP COMPUTER) on Page 60-150-1.)

If a Service PC is not available, (See Lift And Tilt Calibration (SJC) on Page 60-160-4.) or (See Lift And Tilt Calibration (ACS) on Page 60-160-11.).

NOTE: Warm the hydraulic oil to room temperature 22°C (72°F), stop the engine and clear all active service codes before running the test.

Once the test is initiated, an automatic calibration sequence will start. When calibration is complete, the test will be performed and the results can be viewed on the Service PC (Laptop) monitor.

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CALIBRATION (CONT'D)

Actuator Testing (Cont'd)

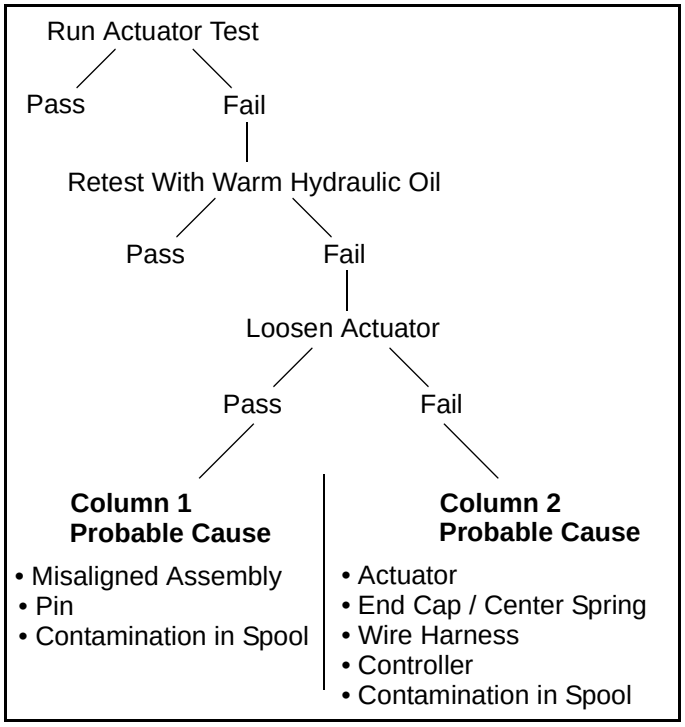
This test will engage both actuators to fully stroke the spools then allow the centering springs to return the spools to neutral. Next, both actuators are engaged to move the spools just past the neutral points then allow the centering springs to return the spools to neutral.

When complete, the Actuator Test will show a pass mode or fail mode. The pass mode indicates that no problems were detected. The fail mode indicates one or a combination of three problems below.

- Actuator slow return to neutral. The spool returns to neutral too slowly.
- Actuator did not fully extend / retract. During the test, the spool was not able to fully stroke in both directions.
- Actuator out of neutral. The spool did not return to the neutral window during the test.

NOTE: A time out will occur if the test cannot be completed within 8 seconds. If this happens, retry the test.

Figure 60-160-2



[Figure 60-160-2] If the initial Actuator Test results in a fail mode due to a slow return to neutral, follow the troubleshooting tree to pinpoint the probable cause.

If the Actuator Test fails after the hydraulic oil is warmed, go to the next step and loosen the bolts that mount the actuator to the control valve. Loosen the bolts just enough so the actuator can be moved slightly up / down or side / side.

Rerun the Actuator Test, if the test passes, check the following probable causes in Column 1 **[Figure 60-160-2]**. Check the probable causes in the order they are listed. Repairing one cause may be all that is required. Re-run the test to verify.

NOTE: Actuator and spool misalignment. Re-tighten the two bolts evenly, turn the first bolt one turn, then turn the other bolt one turn until both bolts are tight.

If the Actuator Test failed due to a slow return to neutral after checking the probable causes in Column 1 **[Figure 60-160-2]**, check the following probable causes in Column 2 **[Figure 60-160-2]**.

- Contamination in the spool.
- The spool end cap may be defective or the centering spring may be broken. Inspect the end cap and the centering spring, replace if necessary.
- The wire harness or connectors may have an intermittent short. Check the connections and wire harnesses.
- The controller may be defective, replace the controller.

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CALIBRATION (CONT'D)

Actuator Testing (Cont'd)

If the initial Actuator Test results in the fail mode actuator did not fully extend / retract, check the following.

- The actuator connectors may be reversed between the lift and tilt actuator. Reverse the connectors and rerun the Actuator Test.
- The actuator may be weak, replace the actuator.
- The spool end cap may be defective or the centering spring may be broken. Inspect the end cap and the centering spring, replace if necessary.
- Contamination in the spool.

If the initial Actuator Test results in the fail mode actuator out of neutral, check the following.

- The actuator may be defective, replace the actuator.
- The spool end cap may be defective or the centering spring may be broken. Inspect the end cap and the centering spring, replace if necessary.
- Contamination in the spool.

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CALIBRATION (CONT'D)

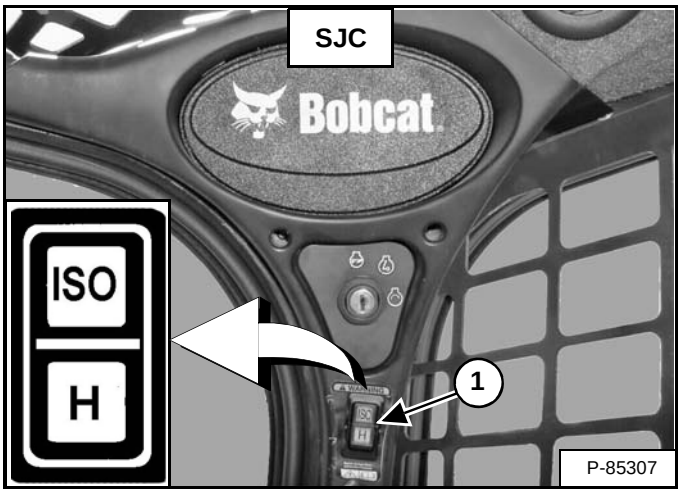
Lift And Tilt Calibration (SJC)

The 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 and resets the calibration points in the controller.

NOTE: The Actuator Test is the preferred method to calibrate the lift and tilt actuator. (See Actuator Testing on Page 60-160-1.)

NOTE: This calibration procedure must be followed when replacing the hydraulic control valve, lift or tilt actuator. Failure to calibrate after component replacement may result in poor performance or reduced life of actuator(s).

Figure 60-160-3

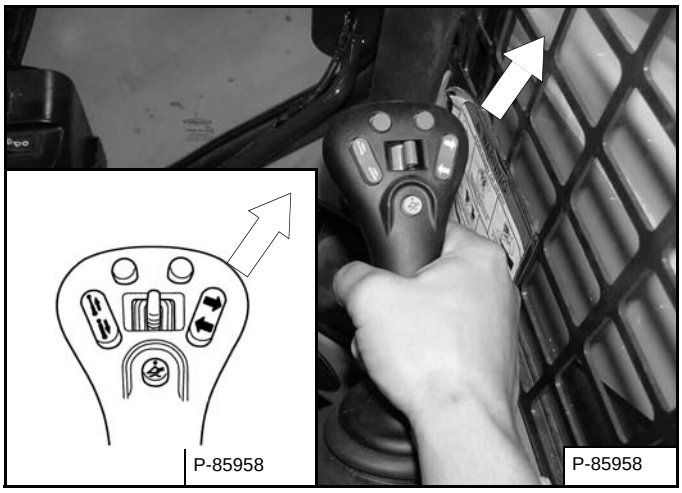


With an operator in the seat and the seat bar down.

Close the cab door. (If loader is equipped.)

Place the loader Control Pattern Switch (Item 1) **[Figure 60-160-3]** in the ISO position.

Figure 60-160-4



Move the right joystick to the forward-right corner position **[Figure 60-160-4]** and hold in position.

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Lift And Tilt Calibration (SJC) (Cont'd)

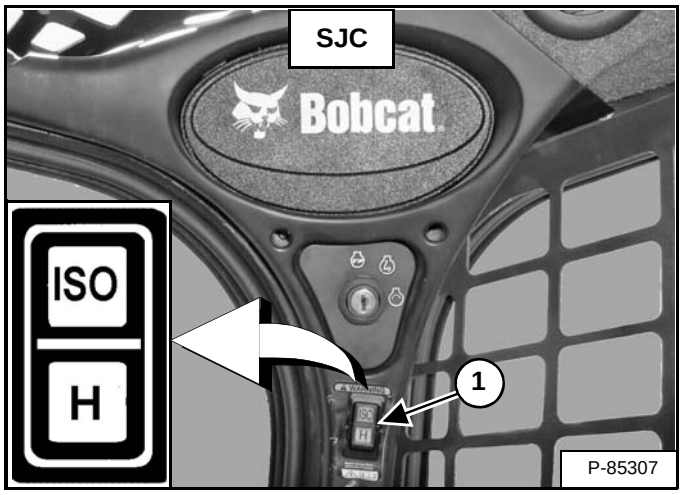
Figure 60-160-5



With the seat bar down, turn the ignition key ON **[Figure 60-160-5]**.

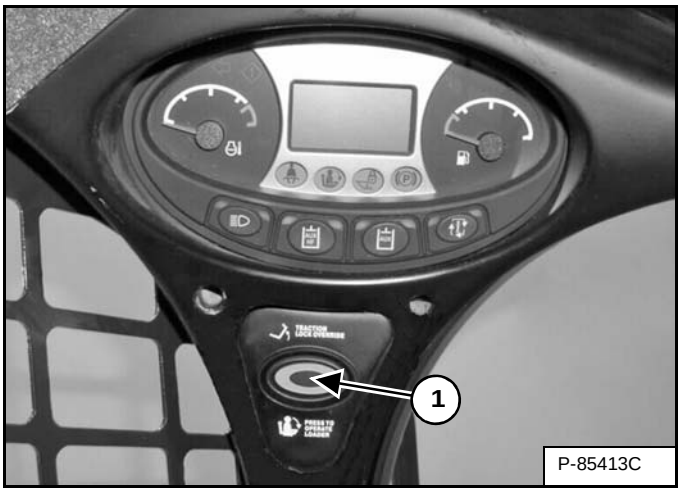
NOTE: Do not start the engine.

Figure 60-160-6



The loader Control Pattern Switch (Item 1) **[Figure 60-160-6]** will start flashing and will continue to flash until the calibration procedure is completed.

Figure 60-160-7



At the left panel, press the PRESS TO OPERATE Button (Item 1) **[Figure 60-160-7]** while holding the right joystick in position.

Release the joystick.

NOTE: During the calibration cycle, the system will beep three times. Once the calibration is complete, code W3224 (Calibration Performed) will be generated.

The *ACS* controller will cycle the actuators.

The lift and tilt calibration is complete.

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Hydrostatic Pump Calibration (SJC)

⚠ WARNING

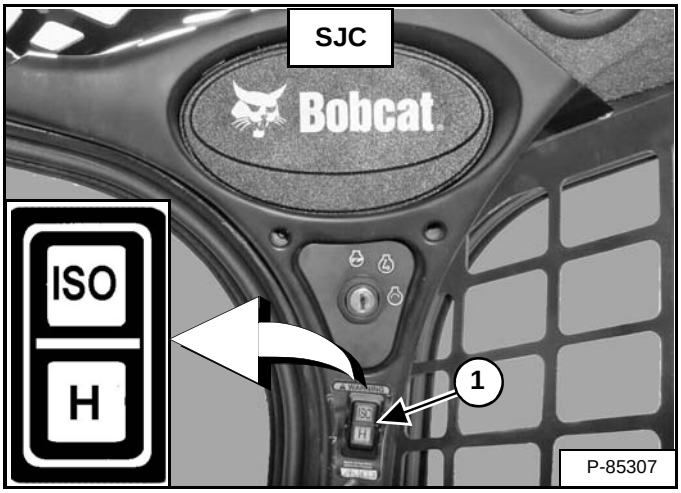
Put jackstands under the front axles and rear corners of the frame before running the engine for service. Failure to use jackstands can allow the machine to fall or move and cause injury or death.

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Place the loader on jackstands. (See Procedure on Page 10-10-1.)

Operator must be in the seat and the seat bar down.

Figure 60-160-8

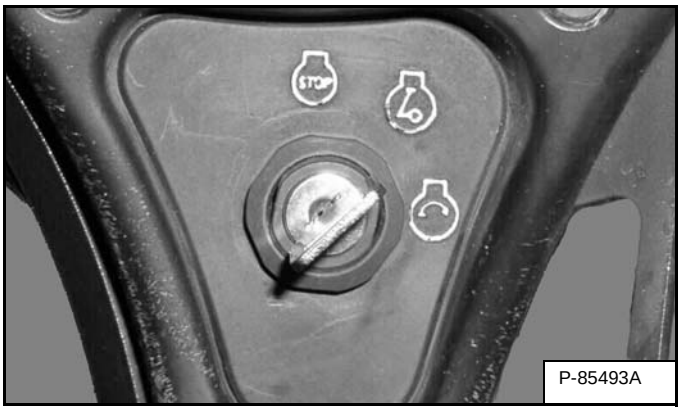


Close the cab door. (If loader is so equipped.)

Place the loader Control Pattern Switch (Item 1) **[Figure 60-160-8]** in the ISO position.

Verify the parking brake.

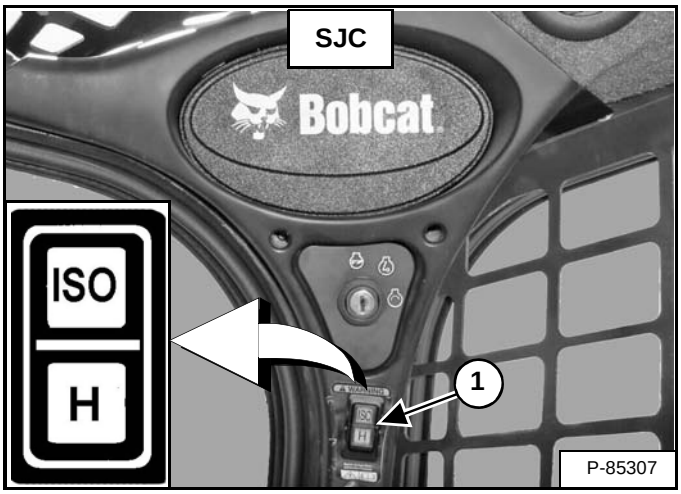
Figure 60-160-9



With the seat bar down, turn the ignition key ON **[Figure 60-160-9]**.

NOTE: Do not start the engine.

Figure 60-160-10

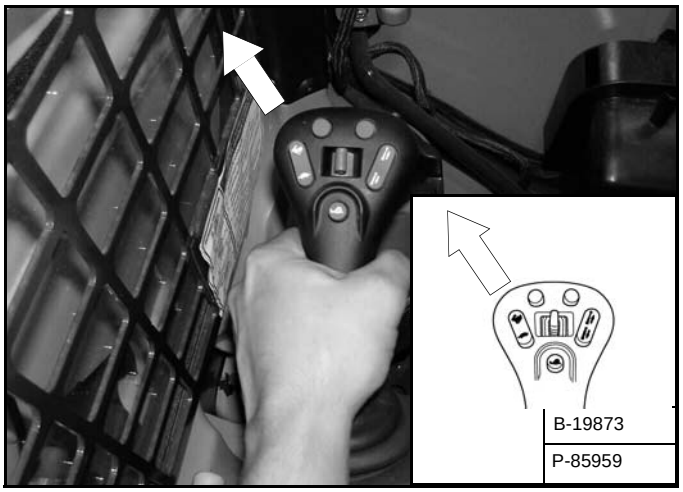


The Control Pattern ISO Switch (Item 1) **[Figure 60-160-10]** will start flashing.

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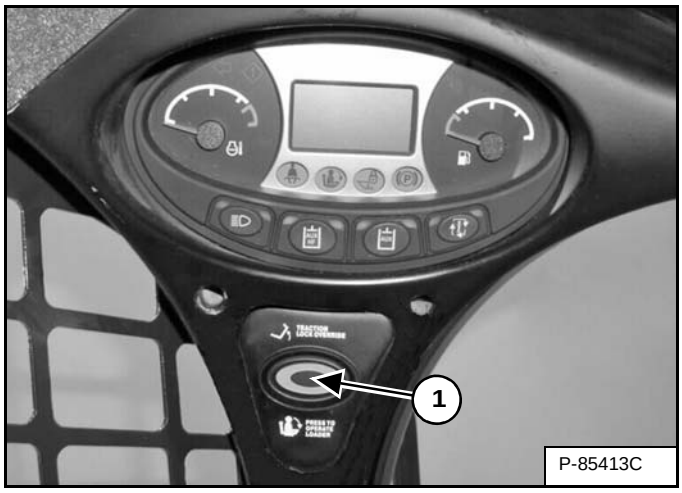
Hydrostatic Pump Calibration (SJC) (Cont'd)

Figure 60-160-11



Move the left joystick to the forward-left corner position **[Figure 60-160-11]** and hold in position.

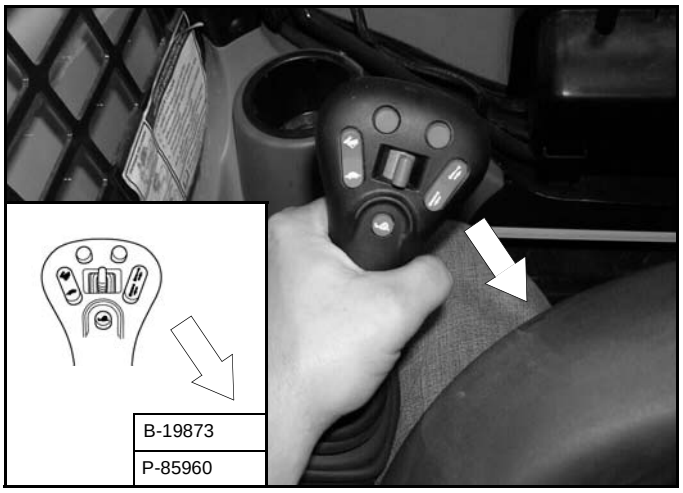
Figure 60-160-12



Press the *PRESS TO OPERATE LOADER* Button (Item 1) **[Figure 60-160-12]** while holding the left joystick in position.

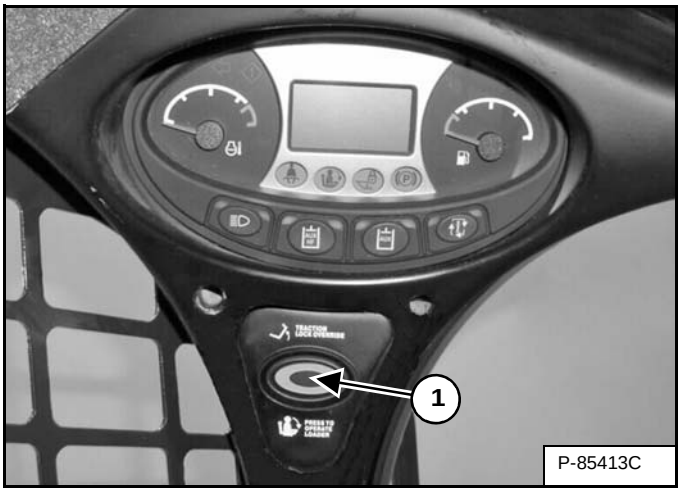
Three audible beeps will sound.

Figure 60-160-13



Move the left joystick to the reverse-right corner position **[Figure 60-160-13]** and hold in position.

Figure 60-160-14



Press the *PRESS TO OPERATE LOADER* Button (Item 1) **[Figure 60-160-14]** while holding the left joystick in position.

Three audible beeps will sound.

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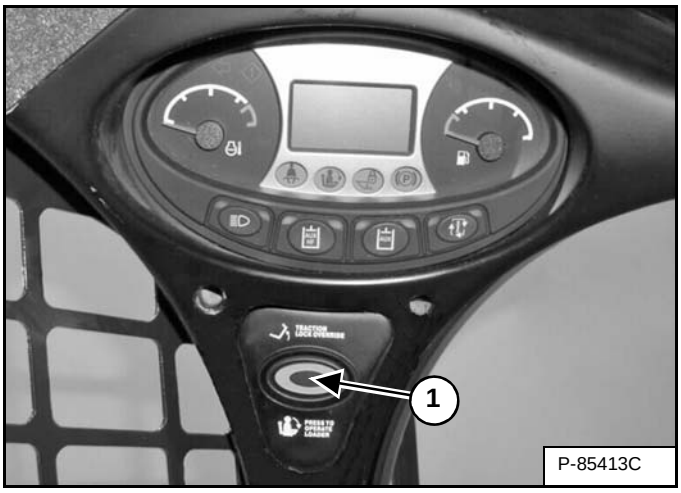
Hydrostatic Pump Calibration (SJC) (Cont'd)

Figure 60-160-15



Allow the left joystick to go to the neutral position **[Figure 60-160-15]**.

Figure 60-160-16

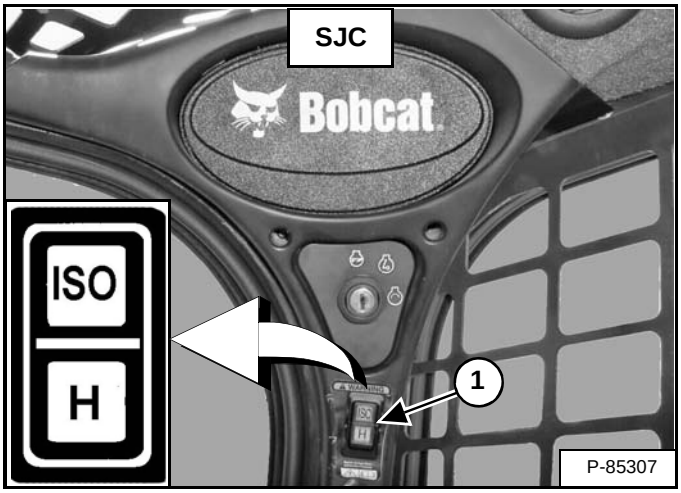


Press the *PRESS TO OPERATE LOADER* Button (Item 1) **[Figure 60-160-16]**.

Three audible beeps will sound.

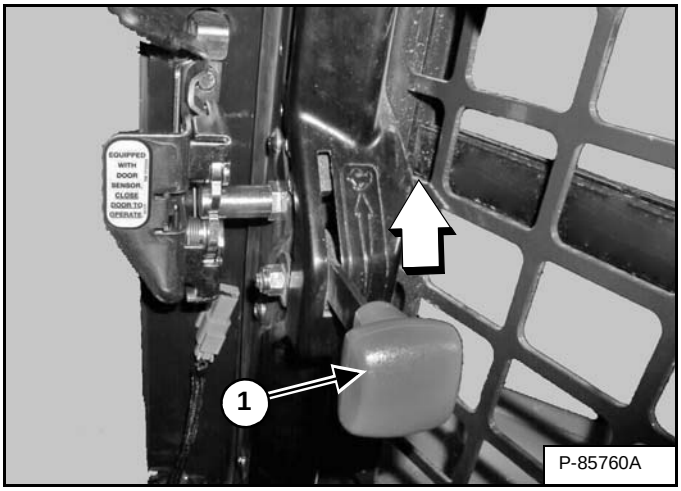
Start the engine from the *RUN, RUN / ENTER* position. **DO NOT TURN TO OFF POSITION**. This would cancel the calibration mode and the procedure would have to be repeated.

Figure 60-160-17



The Control Pattern ISO Switch (Item 1) **[Figure 60-160-17]** will stop flashing, and will remain ON for the rest of the calibration procedure.

Figure 60-160-18



Move the throttle (Item 1) **[Figure 60-160-18]** 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.

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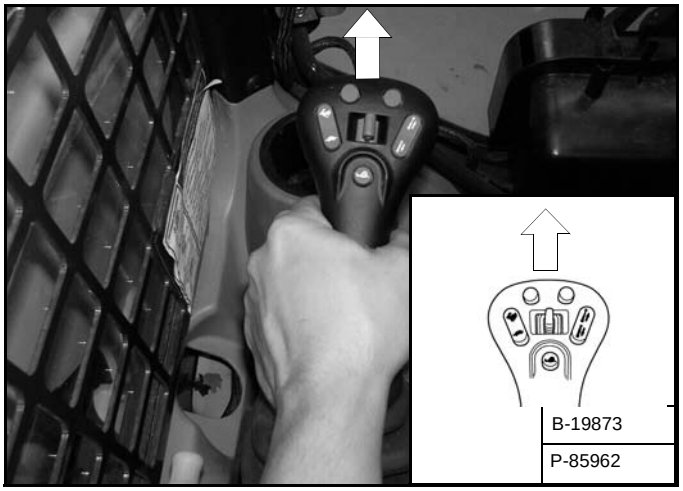
Hydrostatic Pump Calibration (SJC) (Cont'd)

⚠ 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 60-160-19

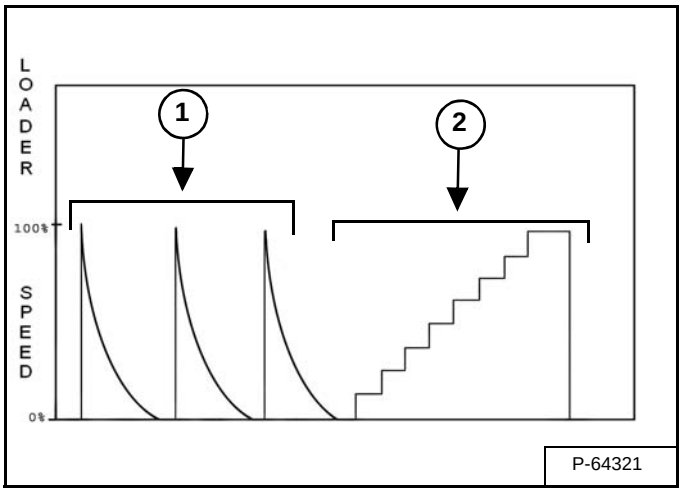


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P-85962

Move and hold the left joystick to the forward position **[Figure 60-160-19]** until the forward calibration is completed.

Figure 60-160-20



P-64321

The loader speed will “ramp up” quickly (Item 1) **[Figure 60-160-20]** and slow down 3 times in a row.

The loader will then “stair step” the speed (Item 2) **[Figure 60-160-20]** until it reaches full speed and then come to a stop.

Continue to hold the left joystick in the forward position until the loader wheels or tracks come to a stop and an audible beep is heard.

Forward calibration is complete.

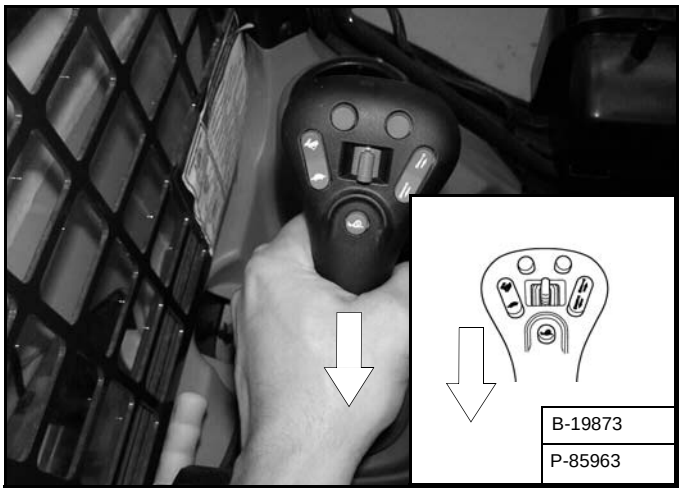
NOTE: If the wheels or tracks do not stop moving in Full Speed Forward in 2 minutes or less, there was an error in the calibration procedure. The operator must shut the loader OFF, and start the calibration procedure from the beginning.

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CALIBRATION (CONT'D)

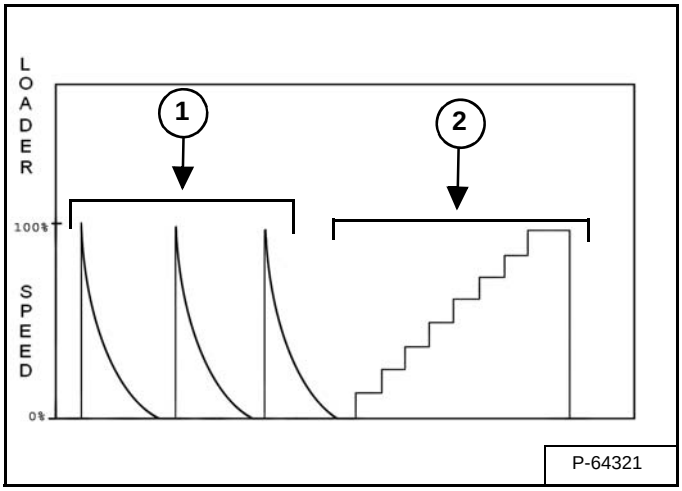
Hydrostatic Pump Calibration (SJC) (Cont'd)

Figure 60-160-21



Move and hold the left joystick to the reverse position **[Figure 60-160-21]** until the reverse calibration is completed.

Figure 60-160-22



The loader speed will “ramp up” quickly (Item 1) **[Figure 60-160-22]** and slow down 3 times in a row.

The loader will then “stair step” the speed (Item 2) **[Figure 60-160-22]** until it reaches full speed and then come to a stop.

Continue to hold the left joystick in the reverse position until the loader wheels or tracks come to a stop and an audible beep is heard.

Reverse calibration is complete.

NOTE: If the wheels or tracks do not stop moving 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, the PRESS TO OPERATE LOADER button light will remain on. The TRACTION light will illuminate, the SEAT BAR, and LIFT AND TILT lights will be off. The D7598 error code will clear. There should be no other codes in the display area.

Allow the joystick to go to the neutral position.

Once the calibration procedure is complete the Steering Drift Compensation values will be reset to [S----] or neutral.

Press the *PRESS TO OPERATE LOADER* button. Move the left joystick to forward position **[Figure 60-160-19]** and check for normal forward wheel or track rotation.

Move the left joystick to the reverse position **[Figure 60-160-21]** and check for normal reverse wheel or track rotation.

Stop the engine, and remove the loader from jackstands.

The calibration procedure is completed.

After calibration is complete, use Steering Drift Compensation for fine tuning or if an acceptable line of drift cannot be achieved. (See STEERING DRIFT COMPENSATION on Page 60-161-1.)

If loader does not maintain a desired travel path with Steering Drift Compensation at maximum setting [S-R10] or [S-L10], see the electrical and hydrostatic troubleshooting. (See Troubleshooting on Page 30-10-1.) or (See Troubleshooting on Page 60-10-8.)

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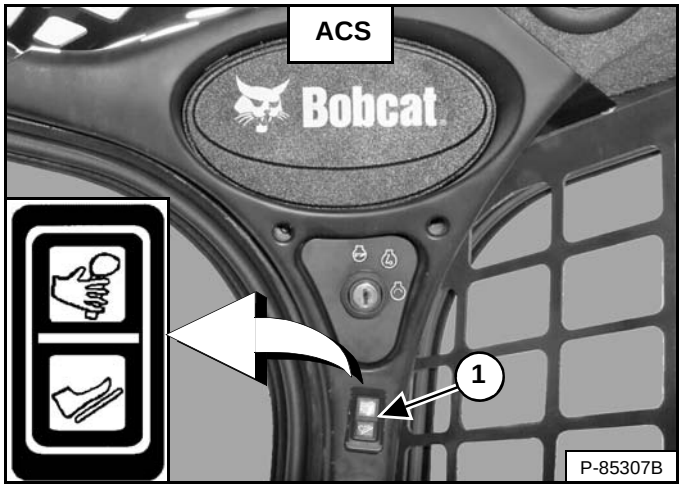
Lift And Tilt Calibration (ACS)

The 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 and resets the calibration points in the controller.

NOTE: The Actuator Test is the preferred method to calibrate the lift and tilt actuator. (See Actuator Testing on Page 60-160-1.)

NOTE: This calibration procedure must be followed when replacing a hydraulic control valve, actuator or ACS controller. Failure to calibrate after component replacement may result in poor performance or reduced life of actuator(s).

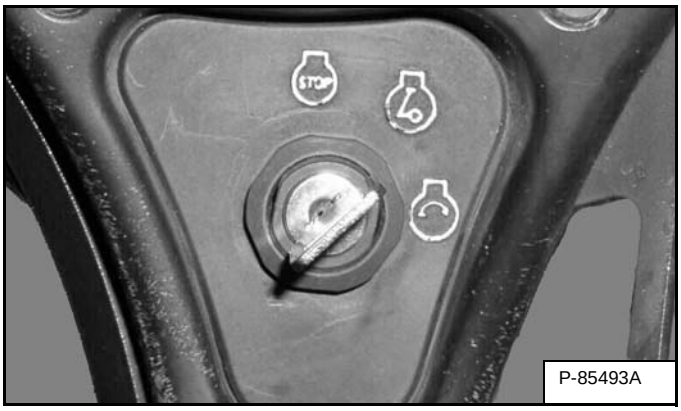
Figure 60-160-23



Update the loader service software to the latest version.

Place the rocker switch (Item 1) **[Figure 60-160-23]** in the hand control mode.

Figure 60-160-24

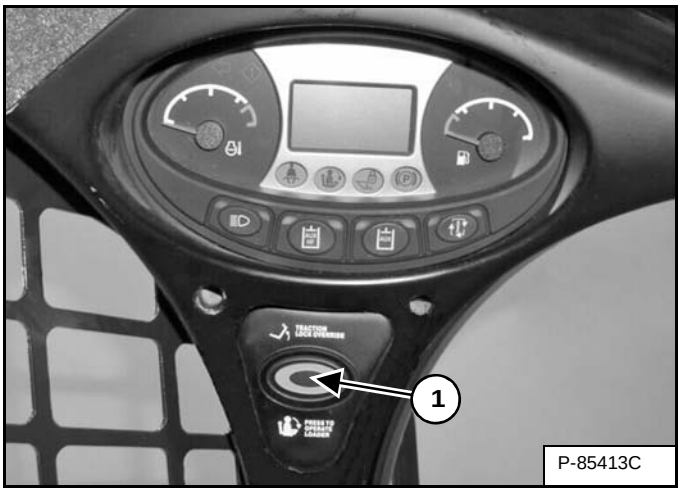


Close the cab door. (If loader is equipped.)

With the seat bar down, turn the ignition key ON (Deluxe Instrumentation Panel press RUN / ENTER) (Item 1) **[Figure 60-160-24]**.

NOTE: Do not start the engine.

Figure 60-160-25

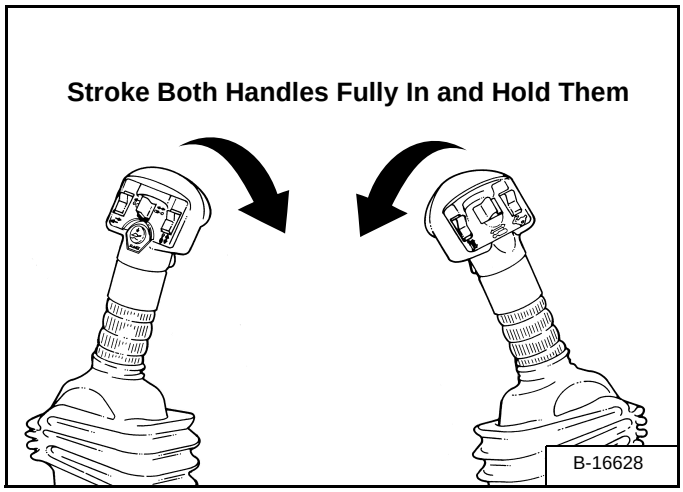


Push the PRESS TO OPERATE button (Item 1) **[Figure 60-160-25]** to unlock the hand controls.

Dealer Copy -- Not for Resale

Lift And Tilt Calibration (ACS) (Cont'd)

Figure 60-160-26

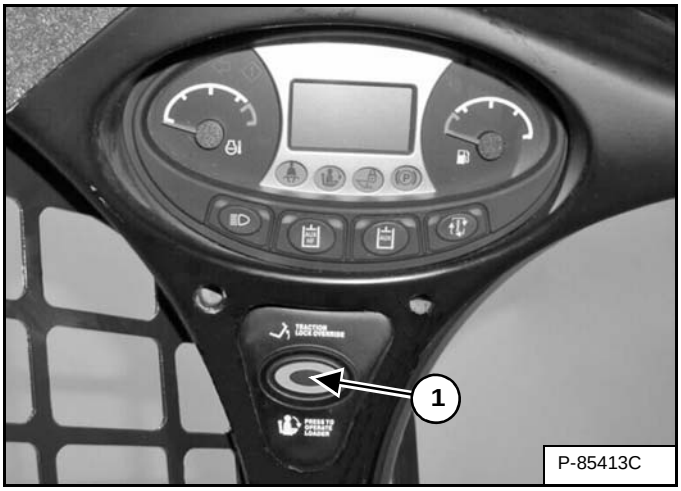


Fully stroke both control handles in toward the center of the cab and hold the handles **[Figure 60-160-26]**.

Lift the seat bar, high enough for the PRESS TO OPERATE light (Item 1) **[Figure 60-160-27]** to go OFF.

Lower the seat bar.

Figure 60-160-27



Push the PRESS TO OPERATE button (Item 1) **[Figure 60-160-27]** 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. Once the calibration is complete, code W3224 (Calibration Performed) will be generated.

Release the control handles.

Calibration is complete.

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STEERING DRIFT COMPENSATION

Steering Drift Compensation is available on SJC equipped machines.

Description

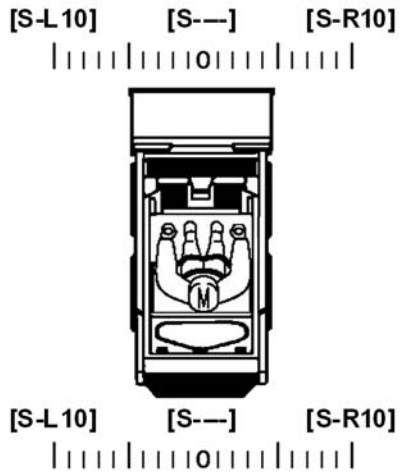
Steering Drift Compensation can be used to reduce steering drift to maintain a desired travel path in both forward and reverse directions.

Examples of applications where this feature can be used:

- To compensate for normal variations such as tire inflation pressure, track tension, tire wear and track wear.
- Using side shift attachments such as trenchers, planers and silt fence installers.
- Driving on uneven terrain such as crowned road surfaces.

Figure 60-161-1

STEERING DRIFT COMPENSATION



Steering drift compensation contains a total of 21 settings. Steering drift compensation can be set to any point from neutral to **[S-L10]** left and from neutral to **[S-R10]** right. **[S----]** is displayed when set for neutral **[Figure 60-161-1]**.

Operation

NOTE: Changes CANNOT be performed until the seat bar is lowered, the engine is started and the PRESS TO OPERATE LOADER button is pressed to activate the BICS.

Perform pre-starting and starting procedures:

1. Fasten seat belt.
2. Lower seat bar.
3. Place joysticks in neutral position.
4. Start the engine.
5. Press the PRESS TO OPERATE LOADER button.
6. Current drive response setting will be displayed briefly in the data display.

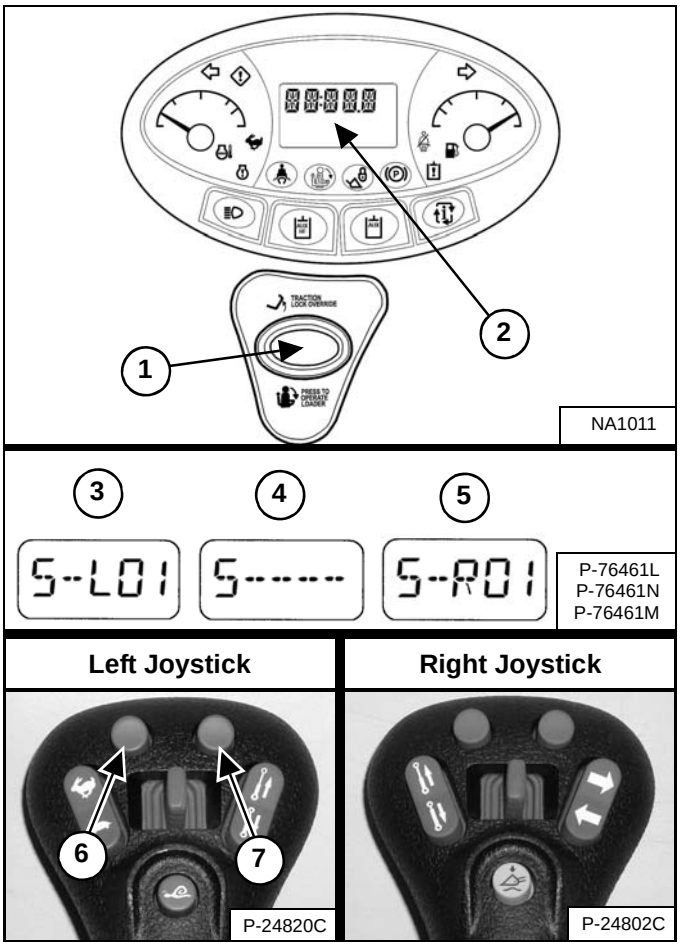
NOTE: Raising the seat bar or changing control mode (ISO / H) will cause the machine to disengage from steering drift compensation. The last displayed setting will remain in effect until the machine is turned OFF.

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STEERING DRIFT COMPENSATION (CONT'D)

Operation (Cont'd)

Figure 60-161-2

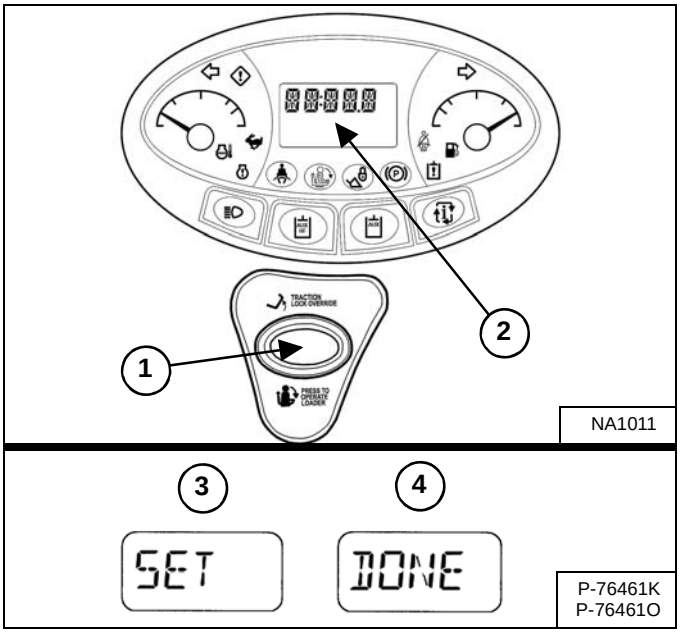


Press and hold the PRESS TO OPERATE LOADER button (Item 1) for **three seconds** to enter the drive response adjustment menu. Press the PRESS TO OPERATE LOADER button (Item 1) again to adjust the loader's steering drift compensation setting. The current steering drift compensation setting will appear in the data display (Item 2) **[Figure 60-161-2]**.

Press the upper left button (Item 6) on the left joystick to adjust the machine left. **[S-L01]** (Item 3) through a maximum of **[S-L10]** will appear in the data display (Item 2) **[Figure 60-161-2]**. The number will increase by one each time you press the button. The higher the number, the greater the amount of steering drift compensation to the left. Adjustments to steering drift compensation will be effective immediately.

Press the upper right button (Item 7) on the left joystick to adjust back toward center. The display will decrease down to neutral displayed as **[S----]** (Item 4). Another press of the upper right button will cause **[S-R01]** (Item 5) to appear in the data display (Item 2) **[Figure 60-161-2]**. The number will increase by one each time you press the button up to a maximum of **[S-R10]**. The higher the number, the greater the amount of steering drift compensation to the right. Adjustments to steering drift compensation will be effective immediately.

Figure 60-161-3



Saving The Steering Drift Compensation Setting:

The current steering drift compensation setting can be saved by pressing and holding the PRESS TO OPERATE LOADER button (Item 1) for **three seconds**. **[SET]** (Item 3) will appear in the data display (Item 2) **[Figure 60-161-3]** and the machine will exit from the steering drift compensation adjustment menu.

OR

Press the PRESS TO OPERATE LOADER button to exit from the steering drift compensation adjustment menu without saving the current setting. **[DONE]** (Item 4) will appear in the data display (Item 2) **[Figure 60-161-3]** and the upper left and upper right buttons on the left joystick will no longer make changes to steering drift compensation.

NOTE: The last displayed steering drift compensation setting will remain in effect until the machine is turned OFF. The machine will revert back to the last saved setting the next time it is started.

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FLYWHEEL RPM SENSOR

Description

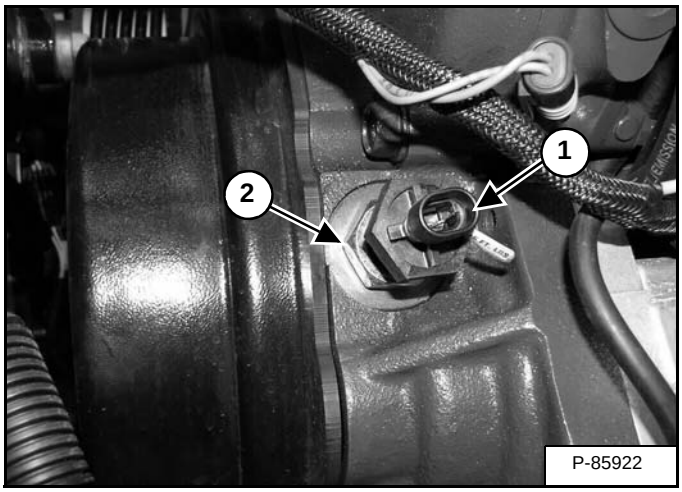
The flywheel rpm sensor has a magnet located on the end of the sensor which senses breaks between the ring gear teeth, the sensor relays this information back to the controller which registers the rpm of the engine.

The flywheel rpm sensor is located just above the starter on the left side of the engine.

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Adjustment

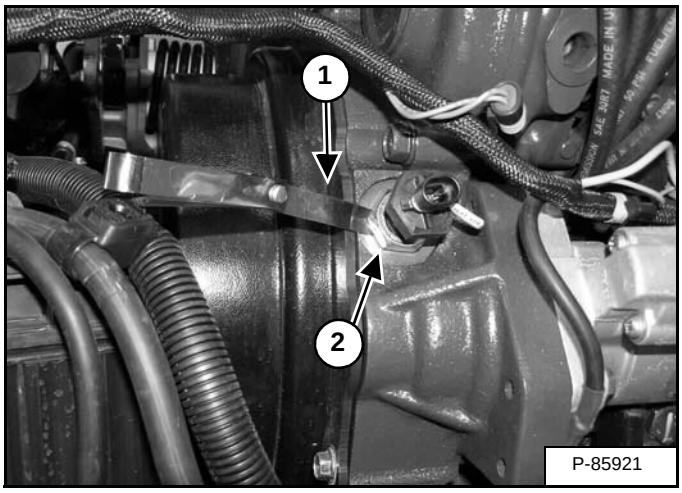
Figure 60-170-1



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 1,27 mm (0.050 in) 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 16 - 23 N•m (12 - 17 ft-lb) 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.

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CONTROL PANEL SETUP

Right Panel Setup (Deluxe Instrumentation Panel)

Icon Identification

Figure 60-180-1

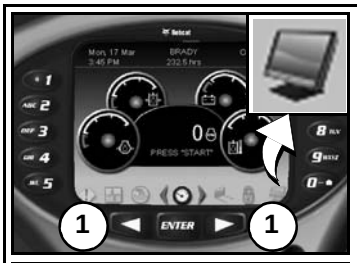


ICON	DESCRIPTION
Mon, 17 Mar 3:45 PM	DATE / TIME
BRADY 232.5 hrs	USER / HOURMETER
Current Job 456.7 hrs	CURRENT JOB HOURS
	ACTIVE WARNINGS screen icon
	VITALS screen icon
	SERVICE screen icon
	MAIN screen icon
	ATTACHMENTS screen icon
	SECURITY screen icon
	DISPLAY screen icon
	LEFT SCROLL button RIGHT SCROLL button
ENTER	ENTER button

Example

Languages

Figure 60-180-2



Press a scroll button (Item 1) repeatedly until the Display screen icon (Inset) is highlighted.



Select **[2. LANGUAGES]**.



Select the desired language.

P-90385 / NA3025 / NA3012 / NA3023

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CONTROL PANEL SETUP (CONT'D)

Right Panel Setup (Deluxe Instrumentation Panel) (Cont'd)

More Examples

Clocks

Select …
DISPLAY screen icon
[1. CLOCKS]

SET TIME AND DATE
Select **[1. TIME]**
Use the keypad to enter date.
Press ENTER to continue.
Use the keypad to enter time.
Select AM / PM / 24hr.
Press ENTER to continue.

RESET JOB CLOCK
(Owner password required if Job Clock is locked.)
Select **[2. JOB CLOCK]**
Press **[4]** to cycle between lock and unlock.
Press **[9]** to reset.

SET ALARM
Select **[3. ALARM CLOCK]**
Select alarm 1, 2 or 3.
Press **[1]** to cycle between ON and OFF.
Press **[2]** and use the keypad to enter alarm time.
Select AM / PM / 24hr.
Press ENTER to continue.
Press **[3]** to cycle between ONCE, DAILY and WEEKLY.
Selecting WEEKLY will prompt for a day selection using number **[4]**.
Press ENTER to continue.

Vitals (Monitor the engine, hydraulic / hydrostatic, electrical functions when engine is running.)

Select …
VITALS screen icon
Press **[6]** to cycle between METRIC or ENGLISH **(M / E)** readouts.

You can monitor real-time readouts of:
Engine Speed
Engine Oil Pressure
Engine Coolant Temperature
System Voltage
Hydraulic Charge Pressure
Hydraulic Oil Temperature

The Deluxe Instrumentation Panel is easy to use. Continue to set your own preferences for running / monitoring your Bobcat loader.

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PASSWORD SETUP (DELUXE INSTRUMENTATION PANEL)

Password Setup is available on machines with a Deluxe Instrumentation Panel.

Password Description

All new machines with a Deluxe Instrumentation Panel arrive at Bobcat dealerships with the keypad in locked mode. This means that a password must be used to start the engine.

For security purposes, your dealer may change the password and also set it in the locked mode. Your dealer will provide you with the password.

Master Password:

A permanent, randomly selected password set at the factory which cannot be changed. This password is used for service by the Bobcat dealer if the owner password is not known; or to change the owner password.

Owner Password:

Allows for full use of the loader and to setup the Deluxe Instrumentation Panel. There is only one owner password. It must be used to change the owner or user passwords. Owner should change the password as soon as possible for security of the loader.

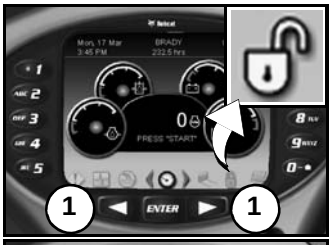
User Password:

Allows starting and operating the loader; cannot change password or any of the other setup features.

For the procedures to change passwords (See Changing The Owner Password on Page 60-190-1.) and (See Changing The User Passwords on Page 60-190-2.)

Changing The Owner Password

Figure 60-190-1



Press a scroll button (Item 1) repeatedly until the Security screen icon (Inset) is highlighted.



Enter owner password and press **[ENTER]**.



Select **[1. USER SETTINGS]**.



Select **[1. OWNER]**.



Select **[2. CHANGE PASSWORD]**.



Enter new owner password and press **[ENTER]**.

You will be prompted to reenter the new owner password.



Press **[ENTER]**.

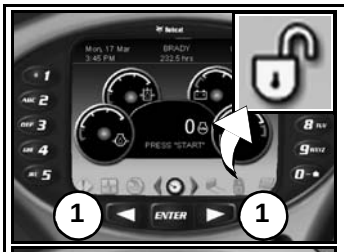
P-90399/NA3025/NA3016/NA3031/NA3033/NA3028/NA3015/NA3027

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PASSWORD SETUP (DELUXE INSTRUMENTATION PANEL) (CONT'D)

Changing The User Passwords

Figure 60-190-2



Press a scroll button (Item 2) repeatedly until the Security screen icon (Inset) is highlighted.



Enter owner password and press **[ENTER]**.



Select **[1. USER SETTINGS]**.



Select user.



Select **[2. CHANGE PASSWORD]**.



Enter new user password and press **[ENTER]**.



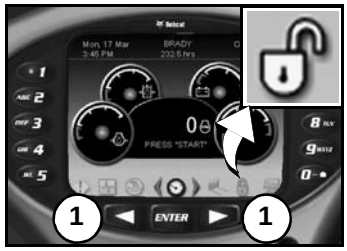
Press **[ENTER]**.

P-90399/NA3025/NA3016/NA3031/NA3033/NA3026/NA3010/NA3027

Password Lockout Feature

This feature allows the owner to unlock the password feature so that a password does not need to be used every time the engine is started.

Figure 60-190-3



Press a scroll button (Item 2) repeatedly until the Security screen icon (Inset) is highlighted.



Enter owner password and press **[ENTER]**.



Select **[2. MACHINE LOCK]**.

P-90399 / NA3025 / NA3016 / NA3031

NOTE: The procedure above can be followed to reset the machine lock so that the machine requires a password to start the engine.

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PASSWORD SETUP (KEYLESS START PANEL)

Password Description

Master Password:

A permanent, randomly selected password set at the factory which cannot be changed. This password is used for service by the Bobcat dealer if the owner password is not known; or to change the owner password.

Owner Password:

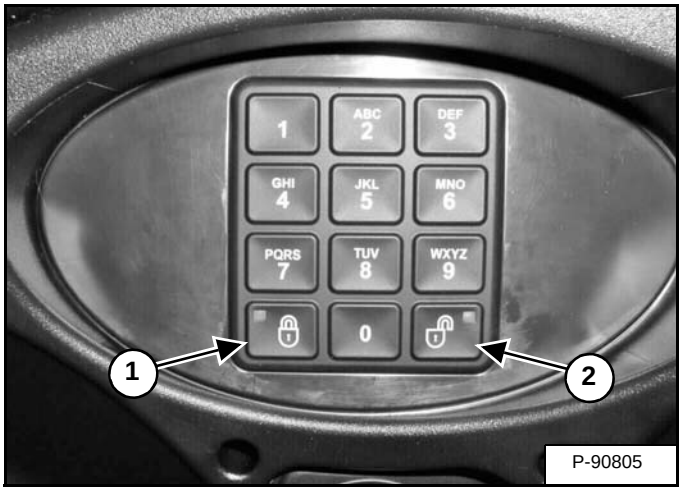
Allows for full use of the loader. It must be used to change the owner password.

Changing The Owner Password

Press the RUN button to turn on the loaders electrical system.

Enter the five digit owner password using the number keys (1 through 0) if locked.

Figure 60-191-1



Press and hold the lock (Item 1) and unlock (Item 2) **[Figure 60-191-1]** keys for two seconds.

The lock key red light will flash and the left panel display screen will show **[ENTER]**.

Enter a new five digit password using the number keys (1 through 0). An asterisk will show in the left panel display screen for each key press.

The left panel display screen will show **[AGAIN]**.

Enter the new five digit password again.

The lock key red light will become solid.

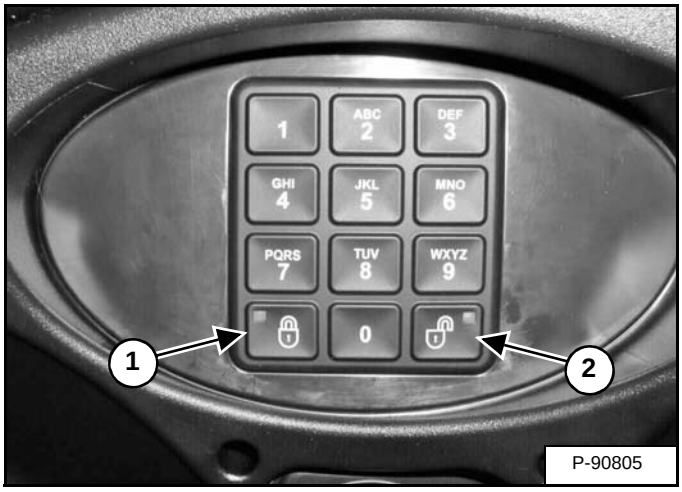
Password Lockout Feature

This feature allows the owner to unlock the password feature so that a password does not need to be used every time the engine is started.

Press the RUN button to turn on the loaders electrical system.

Enter the five digit owner password using the number keys (1 through 0).

Figure 60-191-2



Press the unlock key (Item 2) **[Figure 60-191-2]**.

The left panel display screen will show **[CODE]**.

Enter the five digit owner password using the number keys (1 through 0). The unlock key green light will flash, then become solid.

The loader can now be started without using a password.

NOTE: Use the following procedure to reset the machine lock so that the loader requires a password to start the engine.

Press the RUN button to turn on the loaders electrical system.

Press the lock key (Item 1) **[Figure 60-191-2]**.

The lock key red light will flash and the left panel display screen will show **[CODE]**.

Enter the five digit owner password using the number keys (1 through 0). The unlock key green light will flash, then the lock key red light will become solid.

You must now enter the password every time to start the loader.

Dealer Copy -- Not for Resale



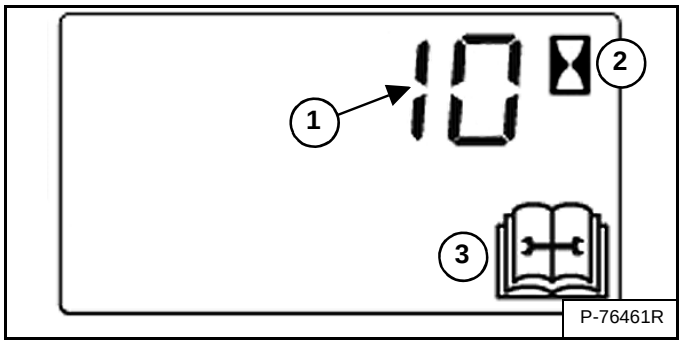
Dealer Copy -- Not for Resale

MAINTENANCE CLOCK

Description

The Maintenance Clock alerts the operator when the next service interval is due. *EXAMPLE:* The Maintenance Clock can be set to a 500 hour interval as a reminder for the next 500 hour planned maintenance.

Figure 60-200-1



During machine operation, a two beep alarm will sound when there are less than 10 hours until the next planned maintenance.

The remaining hours before maintenance is required will appear in the data display (Item 1) for five seconds while the service icon (Item 3) and hourmeter icon (Item 2) **[Figure 60-200-1]** flash.

NOTE: The display will show negative numbers after counting down to zero.

The display will then revert back to the previous display and will appear for five seconds every time the machine is started until the maintenance clock is reset.

Figure 60-200-2



The Deluxe Instrumentation Panel, if equipped, will display a message (Item 1) **[Figure 60-200-2]** alerting the operator to service the machine.

This message will remain for 10 seconds and will appear for 10 seconds every time the machine is started until the maintenance clock is reset.

Figure 60-200-3



The Deluxe Instrumentation Panel, if equipped, will display a bar (Item 1) **[Figure 60-200-3]** showing time remaining until next service. This bar will turn red when service is past due. NEXT MAINTENANCE DUE will change to MAINTENANCE PAST DUE and display the number of hours past due.

Keys **[4]** and **[9]** can be used to adjust the service interval when the owner is logged in **[Figure 60-200-3]**.

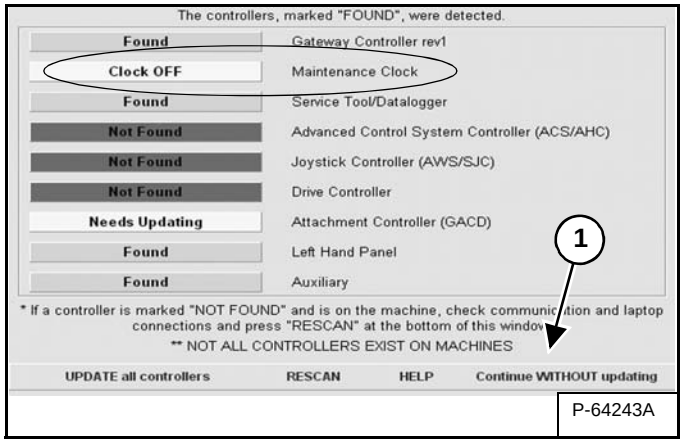
NOTE: Loaders equipped with a Standard Key Panel or Keyless Start Panel will not display the BobCARE PM^{SM} message or NEXT MAINTENANCE TYPE on the right panel.

Dealer Copy -- Not for Resale

MAINTENANCE CLOCK (CONT'D)

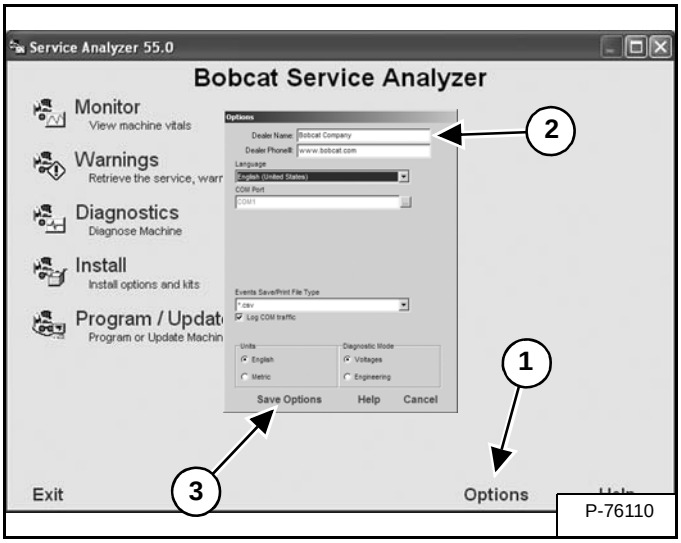
Setup

Figure 60-200-4



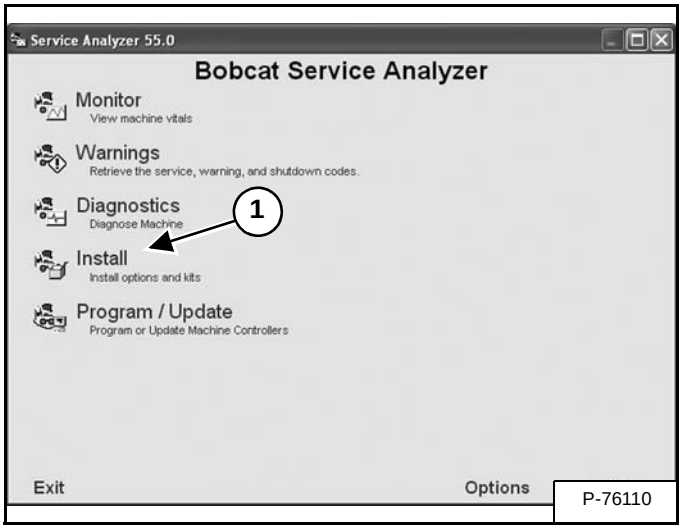
The first analyzer screen has an added bar for the Maintenance Clock. The clock will remain OFF until activated. Click Continue (Item 1) **[Figure 60-200-4]** to view the next analyzer screen.

Figure 60-200-5



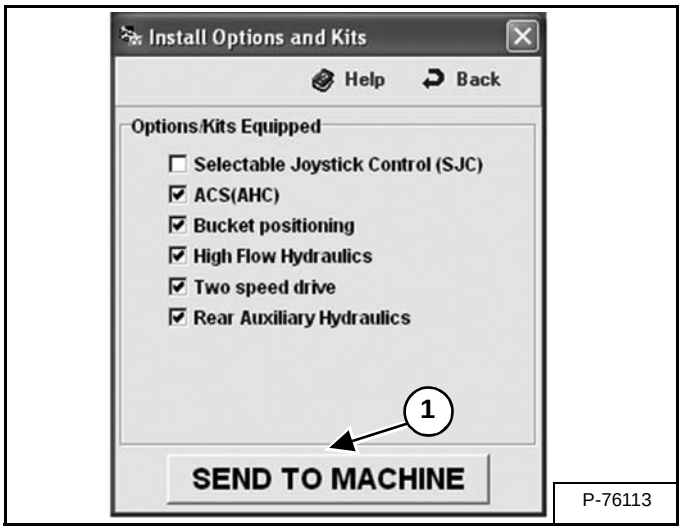
Click Options (Item 1) and add your dealer name and phone number (Item 2). Click Save Options (Item 3) **[Figure 60-200-5]** the information is now stored.

Figure 60-200-6



Select Install (Item 1) **[Figure 60-200-6]** to begin sending the dealer information to the controller.

Figure 60-200-7



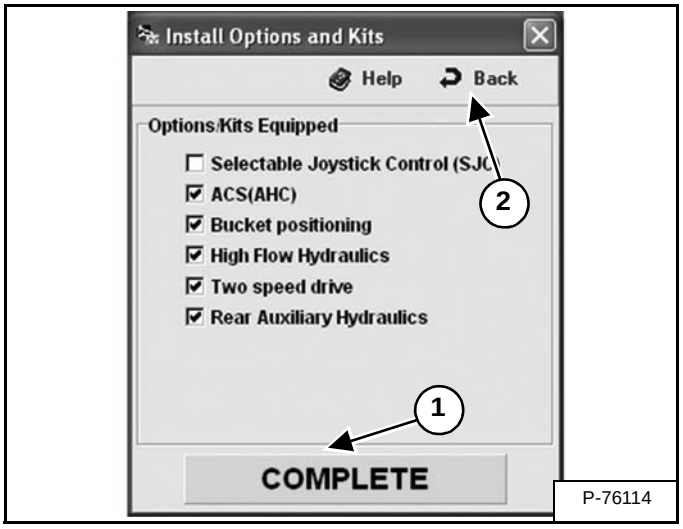
Click SEND TO MACHINE (Item 1) **[Figure 60-200-7]** to send the dealer information to the machine controller.

NOTE: Verify that all correct option and kits are selected before clicking SEND TO MACHINE.

Dealer Copy -- Not for Resale

Setup (Cont'd)

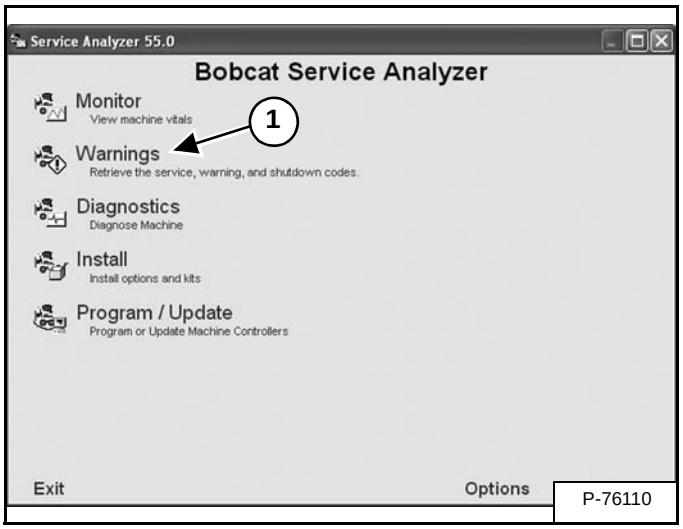
Figure 60-200-8



A green COMPLETE (Item 1) **[Figure 60-200-8]** message will be displayed when the dealer information has been transferred to the machine controller.

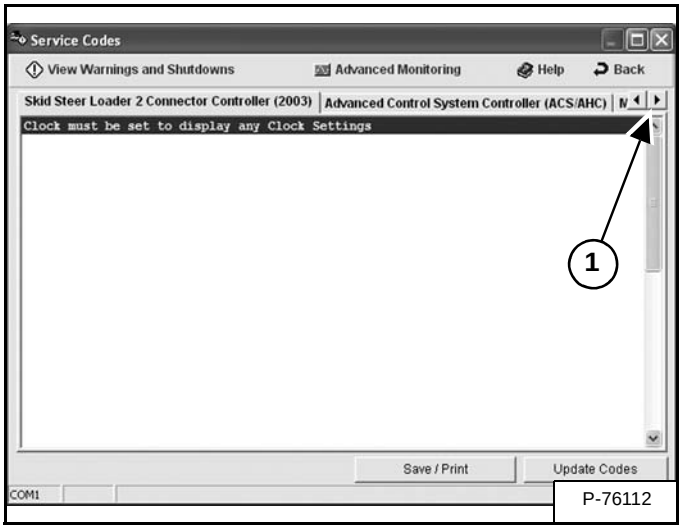
Click Back (Item 2) **[Figure 60-200-8]** to return to the Bobcat Service Analyzer screen.

Figure 60-200-9



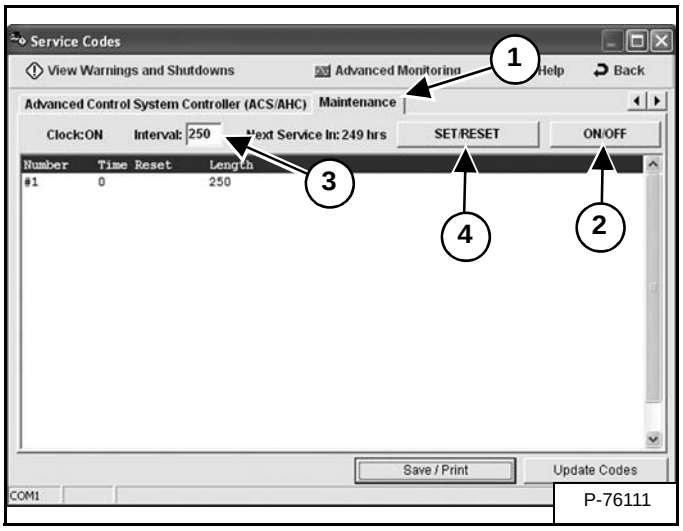
Select Warnings (Item 1) **[Figure 60-200-9]**.

Figure 60-200-10



Click the right arrow (Item 1) **[Figure 60-200-10]** to scroll through the tabs.

Figure 60-200-11



Click the Maintenance tab (Item 1) **[Figure 60-200-11]** to view the maintenance clock screen.

Click ON/OFF (Item 2) to turn the maintenance clock on or off **[Figure 60-200-11]**.

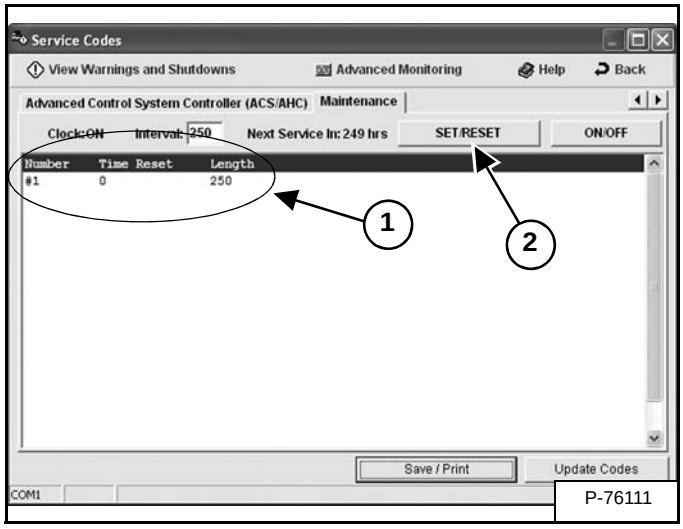
The default Interval (Item 3) is 250 hours, it can also be changed by placing the cursor in the box and typing the new interval. Click SET/RESET (Item 4) **[Figure 60-200-11]** to reset and set the maintenance clock.

Dealer Copy -- Not for Resale

MAINTENANCE CLOCK (CONT'D)

Setup (Cont'd)

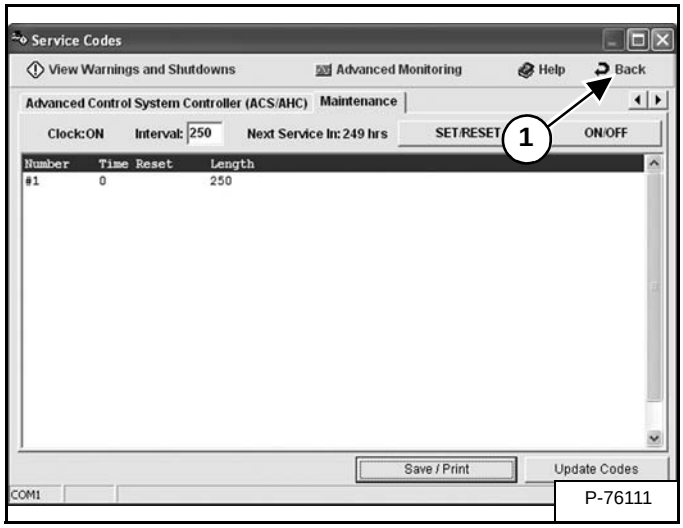
Figure 60-200-12



The current maintenance clock Length (Interval) and Time Reset will be displayed (Item 1). This screen will also store the most recent 20 entries of history. Once an entry is added, it cannot be changed. If an entry is made and the interval is not correct, make another entry and click SET/RESET (Item 2) **[Figure 60-200-12]**.

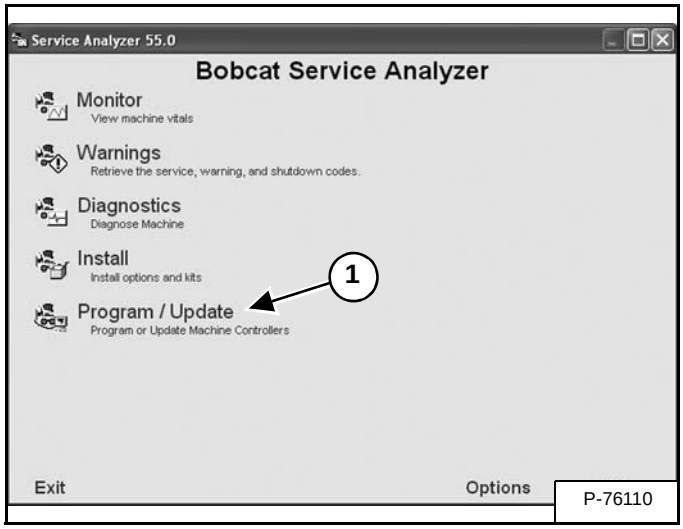
NOTE: If the interval is set to 10 hours or less, the maintenance clock will reset and log a reset time but the wrench icon, hour interval and service icon will NOT be removed from the left display screen.

Figure 60-200-13



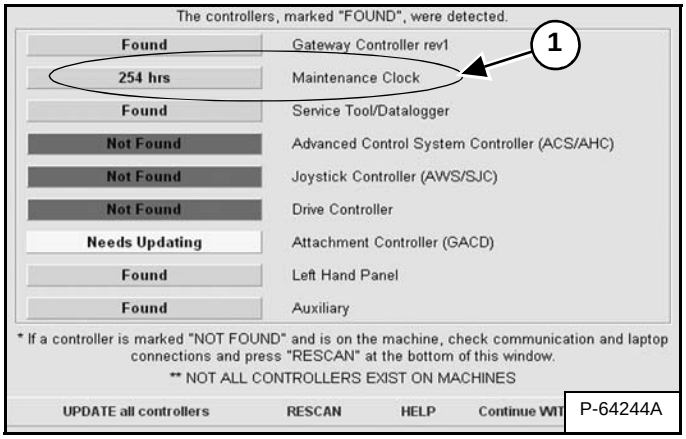
Select Back (Item 1) **[Figure 60-200-13]** to return to the main menu.

Figure 60-200-14



Select Program / Update (Item 1) **[Figure 60-200-14]** to view the maintenance clock.

Figure 60-200-15

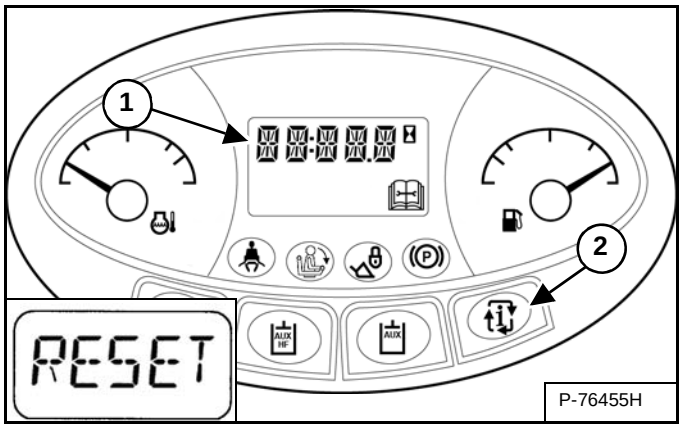


After the maintenance clock has been activated, the first analyzer screen shows the hours remaining on current maintenance interval (Item 1) **[Figure 60-200-15]**. If past the interval, the number will reflect negative hours.

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Reset

Figure 60-200-16



Press the information button (Item 2) until the display screen (Item 1) **[Figure 60-200-16]** shows the maintenance clock.

Press and hold the information button (Item 2) for seven seconds until **[RESET]** (Inset) appears in the display screen (Item 1) **[Figure 60-200-16]**.

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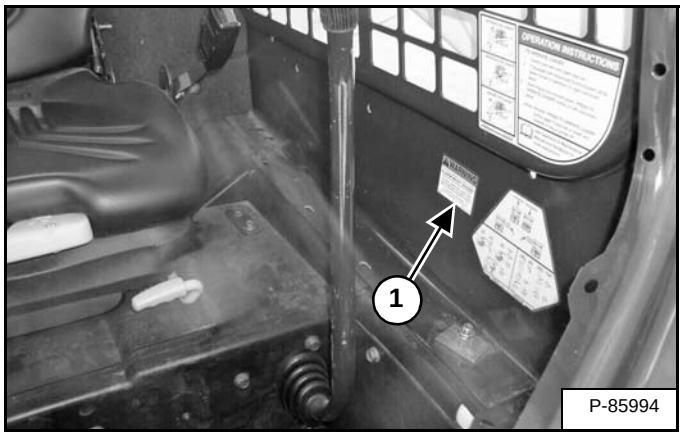
BACK-UP ALARM SYSTEM

Description

The back-up alarm will sound when the operator moves both steering levers or joystick(s) into the reverse position. Slight movement of the steering levers into the reverse position is required with hydrostatic transmissions, before the back-up alarm will sound.

Inspecting

Figure 60-210-1



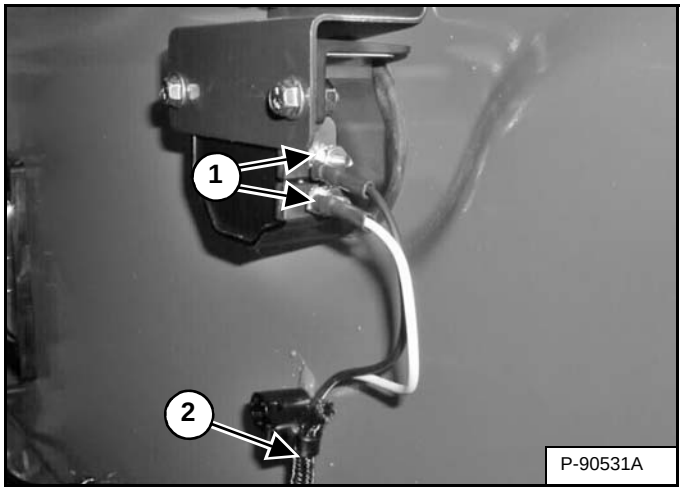
Inspect for damaged or missing back-up alarm decal (Item 1) **[Figure 60-210-1]**. Replace if required.

Sit in the seat and fasten the seat belt. Engage the parking brake. Pull the seat bar all the way down. Start the engine. Press the PRESS TO OPERATE LOADER button. Disengage the parking brake.

Move both steering levers or joystick(s) into the reverse position. The back-up alarm must sound when all wheels or both tracks are moving in reverse.

The back-up alarm is located on the inside of the rear door.

Figure 60-210-2



Inspect the back-up alarm electrical connections (Item 1) **[Figure 60-210-2]**, wire harness (Item 2) **[Figure 60-210-2]** and back-up alarm switches (if equipped) (Item 1) **[Figure 60-210-3]** for tightness and damage. Repair or replace any damaged components.

If the back-up alarm switches require adjustment, (See Adjusting Switch Position on Page 60-210-2.)

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BACK-UP ALARM SYSTEM (CONT'D)

Adjusting Switch Position

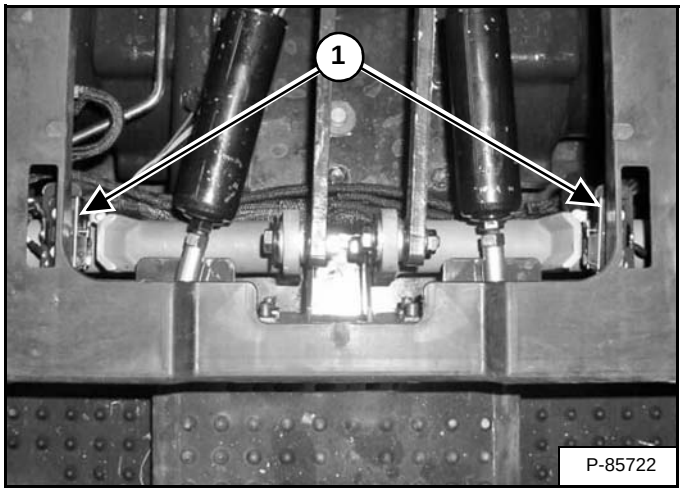
NOTE: Joystick equipped machines do not have back-up alarm switches and cannot be adjusted. See your Bobcat dealer for service if your back-up alarm does not sound.

Standard Controls and ACS (If Equipped)

Stop the engine and raise the operator cab. (See Raising on Page 10-30-2.)

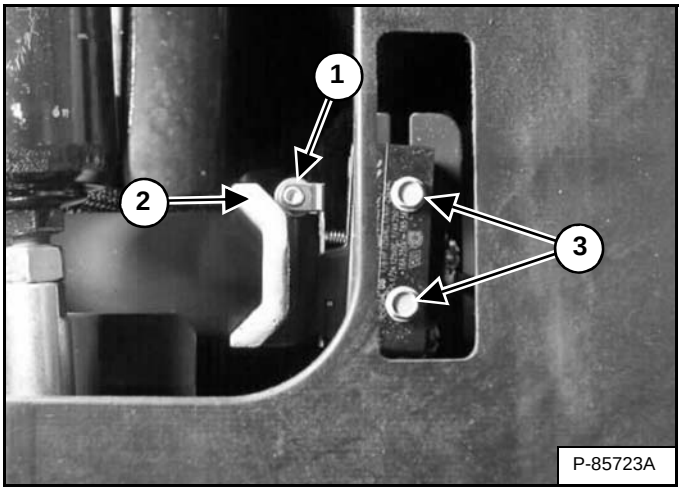
Place the steering levers in the neutral position.

Figure 60-210-3



The back-up alarm switches (Item 1) **[Figure 60-210-3]** are located alongside the steering bellcranks. Both switches must be adjusted properly for the back-up alarm to operate correctly.

Figure 60-210-4



Loosen the screws (Item 3) **[Figure 60-210-4]** securing the back-up alarm switch. (Left side shown)

Position the back-up alarm switch so that the roller (Item 1) just makes contact with the bellcrank (Item 2) **[Figure 60-210-4]** without compressing the switch spring.

Torque the screws (Item 3) **[Figure 60-210-4]** securing the switch to the bracket to 1,6 - 2,1 N•m (14 - 19 in-lb).

Repeat adjustment procedure for the other switch.

Lower the operator cab. (See Lowering on Page 10-30-3.)

Inspect back-up alarm system for proper function. (See Inspecting on Page 60-210-1.)

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Troubleshooting (Standard And ACS)

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

AVOID INJURY OR DEATH

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-2003-0807

PROBLEM	CAUSE
Back-up alarm will not sound when the operator moves both steering levers into the reverse position.	1, 2, 3, 4, 5, 6, 7
Back-up alarm sounds when steering levers in neutral / forward position.	2, 6, 7

KEY TO CORRECT THE CAUSE
1. The ground connection is not making a good contact.
2. The back-up alarm switches are damaged.
3. The alarm is damaged.
4. The back-up alarm or switch wires are disconnected.
5. Check the fuses.
6. The wiring is damaged.
7. The back-up alarm switches need adjusting.

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Troubleshooting (Joystick)

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

AVOID INJURY OR DEATH

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-2003-0807

PROBLEM	CAUSE
Back-up alarm will not sound when the operator moves joystick(s) into the reverse position.	1, 2, 3, 4, 5, 6
Back-up alarm sounds when joystick(s) in neutral / forward position.	5, 6

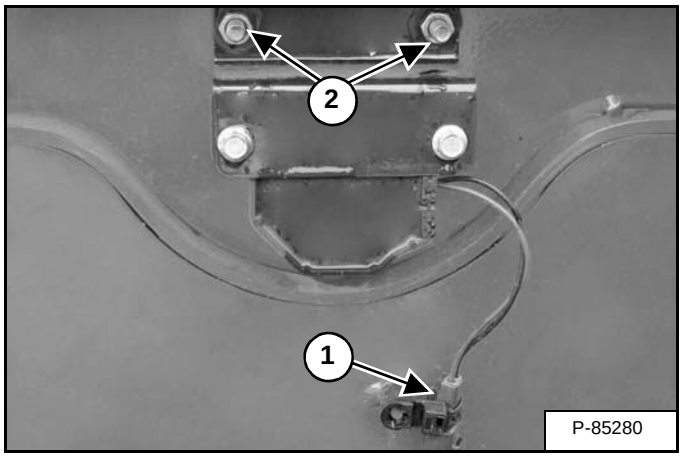
KEY TO CORRECT THE CAUSE
1. The ground connection is not making a good contact.
2. The alarm is damaged.
3. The alarm wires are disconnected.
4. Check the fuses.
5. The wiring is damaged.
6. The joystick controller is not working correctly.

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Alarm Removal And Installation

Stop the engine and open the rear door.

Figure 60-210-5



Disconnect the alarm connector (Item 1) **[Figure 60-210-5]** from the alarm.

Remove the two nuts (Item 2) **[Figure 60-210-5]**.

Remove the alarm and bracket from the loader.

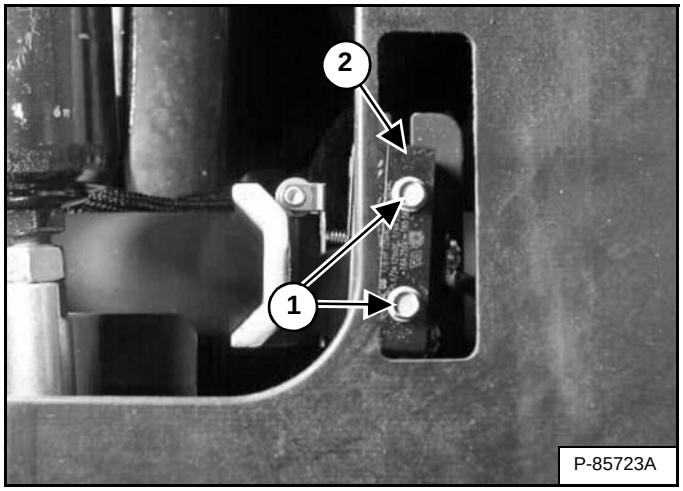
Switch Removal And Installation

NOTE: Joystick equipped machines do not have back-up alarm switches.

Standard Controls and ACS (If Equipped)

Stop the engine and raise the operator cab. (See Raising on Page 10-30-2.)

Figure 60-210-6



Place the steering levers in the neutral position.

Loosen the screws (Item 1) securing the back-up alarm switches. Slide the switch (Item 2) **[Figure 60-210-6]** off the mounting bracket.

Mark the wires for ease of assembly and disconnect them from the switch.

Repeat for other side.

Installation: Slide the alarm switches onto the mounting bracket so the threaded plates are under the mounting bracket. The rollers will face to the inside. During installation of switches, adjust the switches (See Adjusting Switch Position on Page 60-210-2.) and inspect back-up alarm operation (See Inspecting on Page 60-210-1.) are required.

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FRONT HORN

Removal And Installation

NOTE: Two different style horns are used.

Remove the left side lower panel. (See Removal And Installation on Page 50-160-1.)

Figure 60-220-1

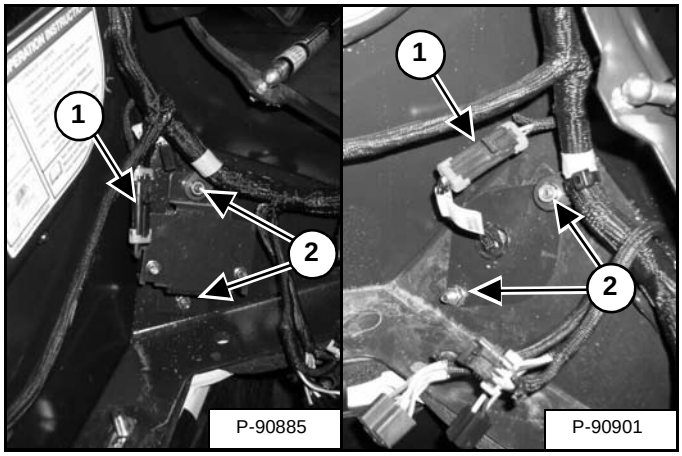
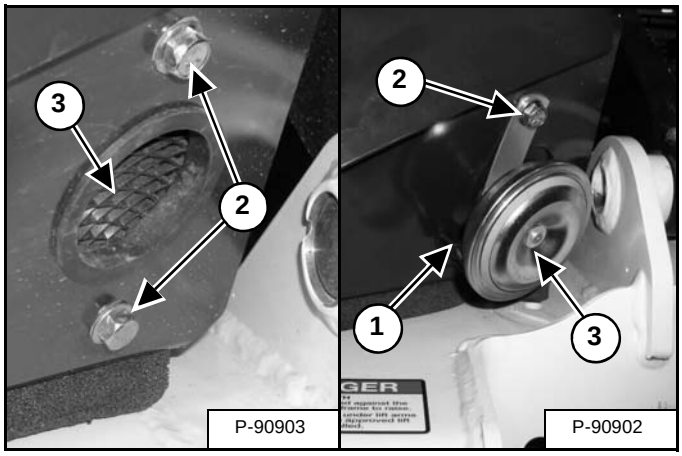


Figure 60-220-2

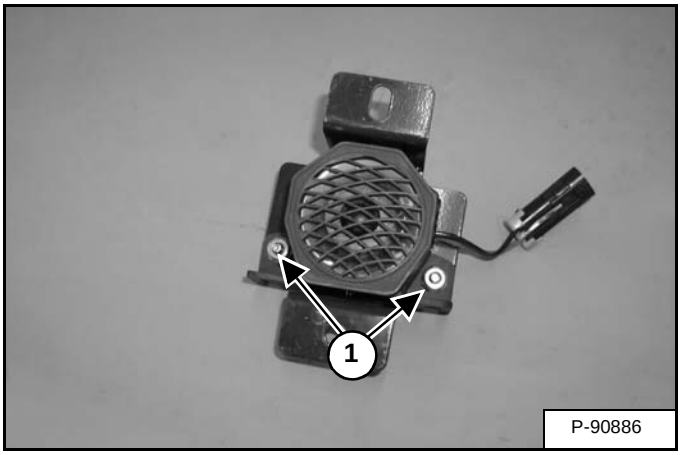


Disconnect wire harness (Item 1) **[Figure 60-220-1]** and **[Figure 60-220-2]** from the front horn.

Remove the two bolts and nuts (Item 2) **[Figure 60-220-1]** and **[Figure 60-220-2]**.

Remove the front horn and bracket from the loader (Item 3) **[Figure 60-220-2]**.

Figure 60-220-3



Remove the two bolts and nuts (Item 1) **[Figure 60-220-3]**.

Remove the front horn from the bracket.

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ENGINE INFORMATION

Description

The S650 has a Kubota direct injected V3307-DI-T turbo diesel engine with a displacement of 3,3 L (203 in^3). The engine is rated at an SAE Gross 55,4 kW (74.3 hp) and has a closed breather system **[Figure 70-10-1]**.

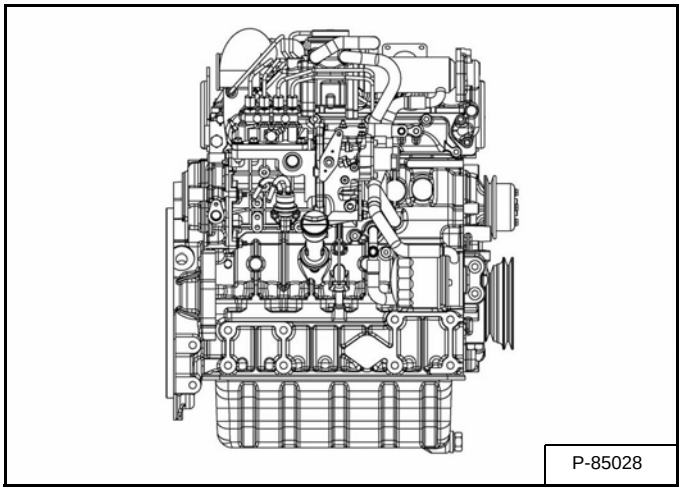
The engine has 4 cylinders and the rotation is counter-clockwise (viewed from the flywheel side). It is equipped with glow plugs for assisting in cold starts. Engine block heaters are also available from Bobcat Parts.

To meet emission regulations it is also equipped with an Exhaust Gas Recirculation (EGR) system to reduce Nitrogen Oxide (NOx).

The engine serial number is stamped on the engine and is located near the injection pump. The model number is located on the valve cover. Use these numbers to obtain the correct service parts.

The engine is liquid cooled with a propylene glycol/water mixture in a radiator. Coolant flow is controlled by a thermostat. The cooling fan is driven by a hydraulic motor. The speed of the fan is determined by the engine coolant temperature sensor and the hydraulic/hydrostatic fluid temperature sensor.

Figure 70-10-1



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Specifications

All dimensions are shown in millimeters. Respective imperial dimensions are given in inches enclosed by parentheses.

Valve Springs

Free Length (Intake and Exhaust)	35,1 - 35,6 (1.39 - 1.40)
Allowable Limit	34,6(1.36)
Fitted Length (Intake and Exhaust)	31,5 (1.24)
Setting Load/ Setting Length (Intake and Exhaust)	63,5 N/31,5mm (14.3 lb./1.24in)
Allowable Limit	45,9 N/31,5mm (10.3 lb./1.24in)
Tilt Allowable Limit (Intake and Exhaust)	1,0 (0.039)

Valve Timing

Intake Valve (Open)	14 degrees B.T.D.C.
(Close)	40 degrees A.B.D.C.
Exhaust Valve (Open)	50 degrees B.B.D.C.
(Close)	14 degrees A.T.D.C.

Rocker Arms

O.D. of Rocker Arm Shaft	14,973 - 14,984 (0.58949 - 0.58992)
I.D. of Rocker Arm Bushings	15,000 - 15,018 (0.59056 - 0.59125)
Oil Clearance Between Rocker Arm & Bushing	0,016 - 0,045 (0.00063 - 0.0017)
Allowable Limit	0,15 (0.0059)

Camshaft

Journal O.D. 1	34.934 - 34,950 (1.3754 - 1.3759)
Bearing I.D. 1	35,0 - 35,025 (1.3780 - 1.3789)
Journal O.D. 2	43,934 - 43,950 (1.7297 - 1.7303)
Bearing I.D. 2	44,000 - 44,025 (1.7323 - 1.7332)
Oil Clearance	0,050 - 0,091 (0.002 - 0.0035)
Allowable Limit	0,15 (0.0059)
Alignment Allowable Limit	0,01 (0.0004)
Cam Lobe Height (Intake)	37,50 (1.476)
Allowable Limit (Intake)	37,00 (1.457)
Cam Lobe Height (Exhaust)	37,90 (1.492)
Allowable Limit (Exhaust)	37,40 (1.472)
Side Clearance Allowable Limit	0,10 (0.0039)

Tappet

Oil Clearance Between Tappet & Guide	0,020 - 0,050 (0.0079 - 0.0019)
Allowable Limit	0,07 (0.003)
Tappet O.D.	9,965 - 9,980 (0.3924 - 0.3929)
Tappet Guide I.D.	10,000 - 10,015 (0.39370 - 0.39429)

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Specifications (Cont'd)

All dimensions are shown in millimeters. Respective imperial dimensions are given in inches enclosed by parentheses.

Cylinder Liner

Cylinder Bore I.D.	94,000 - 94,022 (3.7008 - 3.7016)
Allowable Limit	87,15 (3.431)
Oversized Cylinder Liner (Bore) I.D.	94,500 - 94,522 (3.7205 - 3.7213)
Allowable Limit	94,65 (3.726)

Piston Rings

Ring Gap (Top Ring)	0,25 - 0,40 (0.0099 - 0.015)
Allowable Limit	1,25 (0.0492)
Ring Gap (2nd Ring)	0,30 - 0,45 (0.012 - 0.017)
Allowable Limit	1,25 (0.0492)
Ring Gap (Oil Ring)	0,25 - 0,45 (0.0099 - 0.017)
Allowable Limit	1,25 (0.0492)
Side Clearance of Ring Groove:	
Top Ring	0,050 - 0,090 (0.0020 - 0.0035)
Allowable Limit	0,15 (0.0059)
Second Ring	0,090 - 0,12 (0.0035 - 0.0047)
Allowable Limit	0,0079 (0.20)
Oil Ring	0,020 - 0,060 (0.00079 - 0.0023)
Allowable Limit	0,15 (0.0059)

Pistons

Piston Pin Bore	28,000 - 28,013 (1.1024 - 1.1028)
Allowable Limit	28,05 (0.0059)

Connecting Rod

Piston Pin O.D.	28,006 - 28,011 (1.1026 - 1.1027)
Small End Bushing I.D.	28,031 - 28,046 (1.1036 - 1.1041)
Oil Clearance Between Piston Pin & Small End Bushing	0,020 - 0,040 (0.00079 - 0.0015)
Allowable Limit	0,15 (0.0059)
Connecting Rod Alignment Allowable Limit	0,05 (0.002)

Oil Pump

Oil Pressure Rated RPM	193,1 - 393,0 kPa (1,9 - 3,9 bar) (28 - 57 psi)
Allowable Limit	144,8 kPa (1,4 bar) (21 psi)
Idle Speed Allowable Limit	48,3 kPa (0,48 bar) (7 psi)
Clearance Between Inner Rotor & Outer Rotor	0,030 - 0,090 (0.002 - 0.003)
Clearance Between Outer Rotor & Pump Body	0,100 - 0,184 (0.00394 - 0.00724)
End Clearance Between Inner Rotor & Cover	0,025 - 0,075 (0.00099 - 0.0029)

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Specifications (Cont'd)

All dimensions are shown in millimeters. Respective imperial dimensions are given in inches enclosed by parentheses.

Crankshaft

Crankshaft Alignment Limit Permitted	0,02 (0.0008)
Oil Clearance Between Journal & Bearing	0,030 - 0,073 (0.0012 - 0.0028)
Limit Permitted	0,020 (0.0079)
Journal O.D.	79,977 - 79,990 (3.1487 - 3.1492)
Oil Clearance Between Crank Pin & Bearing	0,017 - 0,048 (0.00067 - 0.0018)
Limit Permitted	0,20 (0.0079)
Crank Pin O.D.	49,980 - 49,991 (1.9678 - 1.9681)
Crank Pin I.D. (Blue)	53,010 - 53,020 (2.0870 - 2.0874)
Crank Pin I.D. (No Color)	53,000 - 53,010 (2.0867 - 2.0870)
Crankshaft Side Clearance	0,15 - 0,35 (0.0059 - 0.013)
Limit Permitted	0,50 (0.020)

Timing Gear

Timing Gear Backlash:	
Crank Gear-Cam Gear	0,0410 - 0,139 (0.00162 - 0.00547)
Allowable Limit	0,22 (0.0087)
Idle Gear-Cam Gear	0,0410 - 0,134 (0.00162 - 0.00527)
Allowable Limit	0,22 (0.0087)
Idle Gear-Injection Pump Gear	0,0410 - 0,134 (0.00162 - 0.00527)
Allowable Limit	0,22 (0.0087)
Oil Clearance Between Idle Gear Shaft & Idle Gear Bushing:	0,050 - 0,091 (0.0020 - 0.0035)
Idle Gear Bushing I.D.	35,025 - 35,050 (1.3790 - 1.3799)
Idle Gear Shaft O.D.	34,959 - 34,975 (1.3764 - 1.3769)
Idle Gear Side Clearance	0,15 - 0,25 (0.0059 - 0.0098)
Allowable Limit	0,90 (0.035)

Thermostat

Valve Opening Temperature	74,5 - 78,5°C (166.1 - 173°F)
Valve Fully Open	90°C (194°F)

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All dimensions are shown in millimeters. Respective imperial dimensions are given in inches enclosed by parentheses.

Torque Values

Thread Size (Dia. x Pitch)	Material		
	Head Mark 4	**Head Mark 7**	**Head Mark 10**
M5 x 0.8		4 - 5 N•m (3 - 4 ft-lb)	
M6 x 1.0		8 - 9 N•m (6 - 7 ft-lb)	8 - 12 N•m (6 - 9 ft-lb)
M8 x 1.25	8 - 12 N•m (6 - 9 ft-lb)	15 - 22 N•m (11 - 16 ft-lb)	24 - 34 N•m (18 - 25 ft-lb)
M10 x 1.25	18 - 24 N•m (13 - 18 ft-lb)	30 - 41 N•m (22 - 30 ft-lb)	49 - 68 N•m (36 - 50 ft-lb)
M12 x 1.25	30 - 41 N•m (22 - 30 ft-lb)	54 - 73 N•m (40 - 54 ft-lb)	94 - 118 N•m (69 - 87 ft-lb)
M14 x 1.5	49 - 68 N•m (36 - 50 ft-lb)	79 - 108 N•m (58 - 80 ft-lb)	157 - 186 N•m (116 - 137 ft-lb)

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.

PROBLEM	CAUSE
Slow cranking speed.	1, 2, 3, 54
Engine will not start.	2, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 19, 27, 28, 29
Difficult to start.	1, 2, 5, 7, 8, 9, 10, 11, 12, 13, 15, 16, 17, 18, 19, 20, 25, 27, 28, 29,54
No power for engine.	8, 9, 10, 11, 12, 13, 15, 16, 17, 18, 20, 21, 22, 23, 27, 28, 29
Engine is mis-firing.	8, 9, 11, 12, 13, 15, 16, 17, 21, 22, 24, 25, 26, 28
Too much fuel consumption.	10, 12, 13, 15, 16, 17, 19, 20, 21, 23, 24, 25, 27, 28, 29
Black exhaust.	10, 12, 13, 15, 16, 17, 19, 20, 21, 23, 24, 25, 27, 28, 29
Blue/white exhaust.	4, 10, 15, 16, 17, 21, 23, 27, 29, 30, 50
Low oil pressure.	4, 31, 32, 33, 34, 35, 37, 38, 39, 52
Engine knocking.	13, 15, 16, 19, 22, 24, 25, 27, 29, 31, 40, 41, 53
Engine running rough.	7, 8, 9, 10, 11, 12, 13, 17, 18, 22, 24, 25, 26, 29, 40, 53
Vibration.	12, 13, 17, 21, 22, 25, 26, 29, 40, 42, 43
High oil pressure warning.	4, 33, 36
Overheating.	10, 12, 13, 15, 16, 20, 21, 40, 44, 45, 46, 47, 48, 51
Too much crankcase pressure.	22, 27, 29, 30, 40, 49
Poor compression.	10, 16, 21, 24, 25, 27, 28, 29, 30, 41, 53
Start and stop.	9, 10, 11

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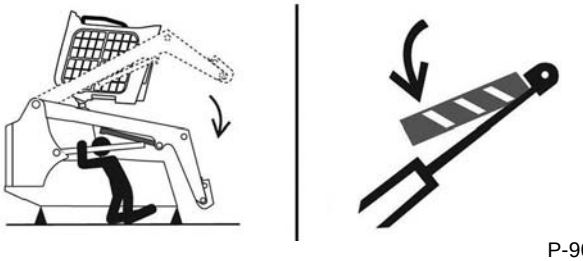
Troubleshooting (Cont'd)

KEY TO CORRECT THE CAUSE	
1. Alternator belt is loose or damaged.	28. Worn valve and seats.
2. Bad electrical connections.	29. Broken or worn piston rings.
3. Faulty starter motor.	30. Worn valve stems or guides.
4. Incorrect grade of oil.	31. Worn or damaged bearings.
5. Low cranking speed.	32. Not enough oil in the crankcase.
6. Fuel tank empty.	33. Switch/sensor is defective.
7. Faulty stop control operation.	34. Oil pump worn.
8. Plugged fuel line.	35. Relief valve is sticking open.
9. Plugged fuel filter.	36. Relief valve is sticking closed.
10. Restriction in the air cleaner.	37. Broken relief valve spring.
11. Air in the fuel system.	38. Faulty suction pipe.
12. Faulty fuel injection pump.	39. Plugged oil filter.
13. Faulty fuel injectors.	40. Piston seizure.
14. Broken injection pump drive.	41. Incorrect piston height.
15. Incorrect injection pump timing.	42. Faulty engine mounting.
16. Incorrect valve timing.	43. Incorrect flywheel alignment.
17. Poor compression.	44. Faulty thermostat.
18. Plugged fuel tank vent.	45. Restriction in water jacket.
19. Incorrect grade of fuel.	46. Loose alternator belt.
20. Exhaust pipe restriction.	47. Plugged radiator.
21. Cylinder head gasket leaking.	48. Faulty water pump.
22. Overheating.	49. Plugged breather pipe.
23. Cold running.	50. Damaged valve stem deflectors.
24. Incorrect tappet adjustment.	51. Coolant level to low.
25. Sticking valves.	52. Plugged oil pump pipe strainer.
26. Incorrect fuel lines.	53. Broken valve spring.
27. Worn cylinder bores.	54. Damaged Battery

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Engine Removal And Installation

DANGER



P-90328

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.**

D-1009-0409

WARNING

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

W-2059-0598

Put jackstands under the rear corners of the loader.

Raise the lift arms and install an approved lift arm support device. (See Installing on Page 10-20-1.)

Raise the operator cab. (See Raising on Page 10-30-2.)

Drain the hydraulic reservoir. (See Removing And Replacing Hydraulic Fluid on Page 10-120-2.)

Disconnect the steering linkage.

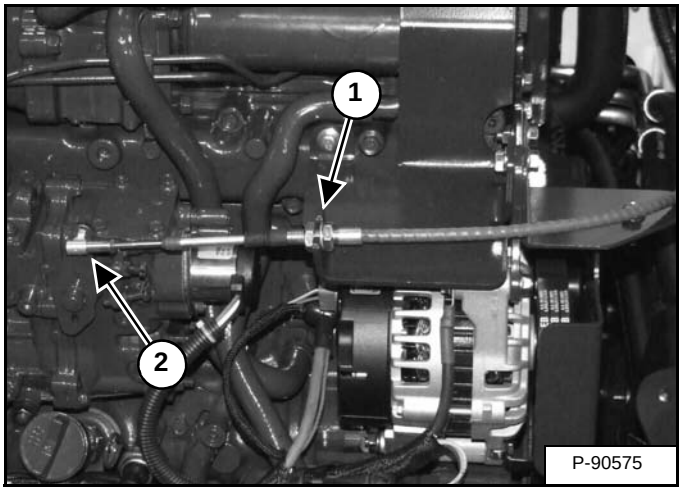
Remove the battery from the loader. (See Removal And Installation on Page 60-20-1.)

Drain the engine coolant from the cooling system. (See Removing And Replacing Coolant on Page 10-90-3.)

Remove the air cleaner. (See Housing Removal And Installation on Page 70-40-1.)

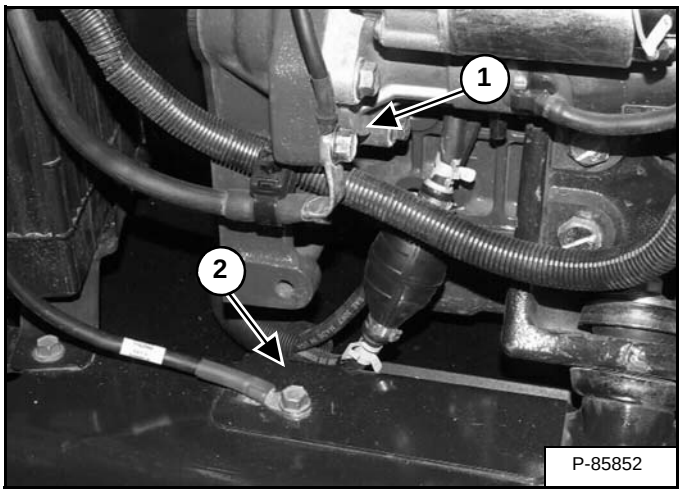
Remove the muffler. (See Removal And Installation on Page 70-30-1.)

Figure 70-10-2



Loosen the engine speed control cable adjustment nuts (Item 1) and remove the engine speed control cable from the ball pivot (Item 2). **[Figure 70-10-2]**.

Figure 70-10-3

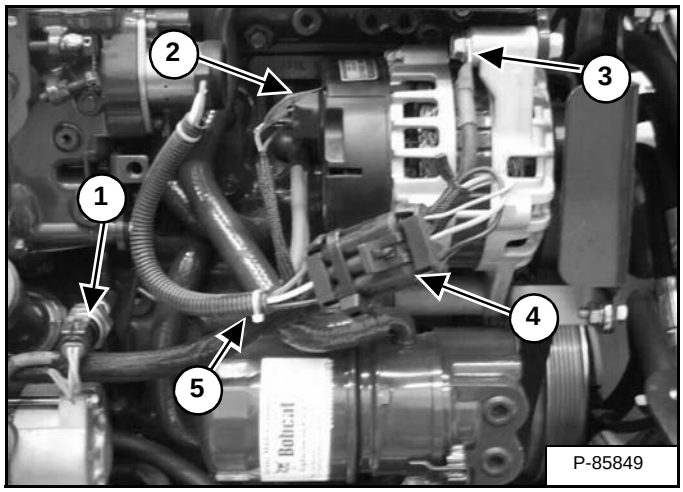


Disconnect engine ground cable (Item 1) and chassis ground cable (Item 2) **[Figure 70-10-3]**.

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Engine Removal And Installation (Cont'd)

Figure 70-10-4



Disconnect engine oil pressure sender connector (Item 1) **[Figure 70-10-4]**.

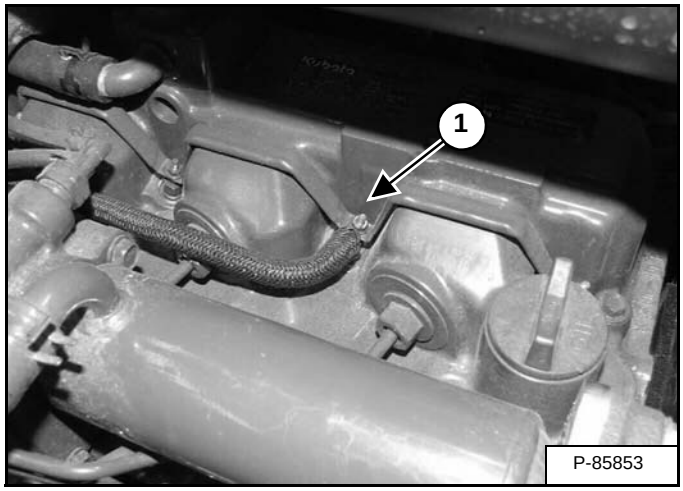
Disconnect the alternator wiring (Item 2) **[Figure 70-10-4]**.

Disconnect the engine ground cable (Item 3) **[Figure 70-10-4]**.

Disconnect fuel shut-off solenoid connector (Item 4) **[Figure 70-10-4]**.

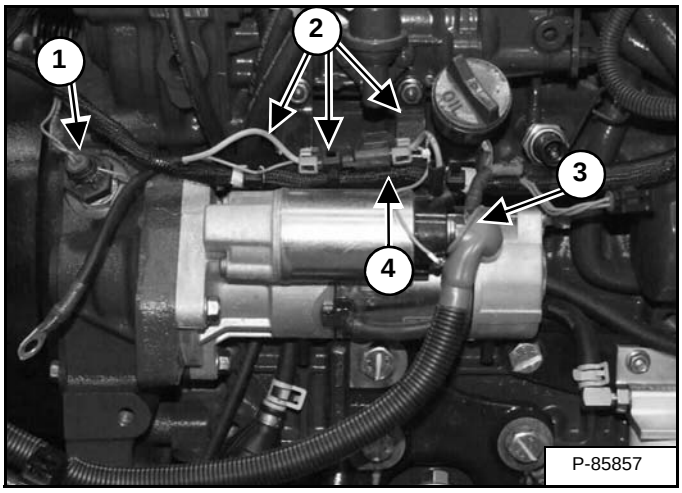
Cut cable tie (Item 5) **[Figure 70-10-4]**.

Figure 70-10-5



Disconnect glow plug wiring (Item 1) **[Figure 70-10-5]**.

Figure 70-10-6



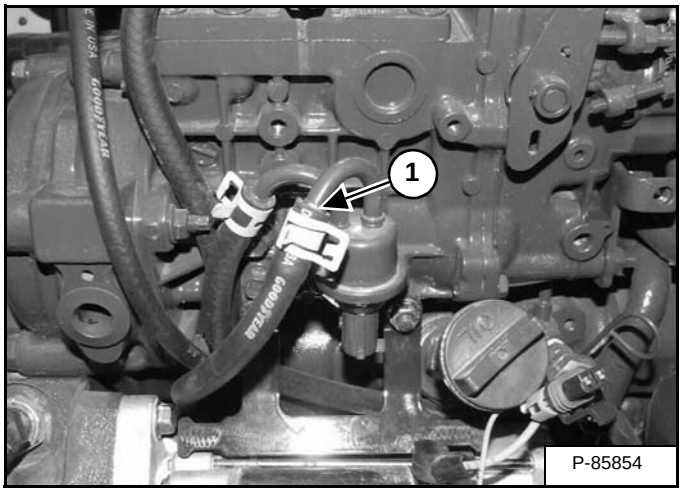
Disconnect flywheel rpm sensor (Item 1) **[Figure 70-10-6]**.

Cut cable ties (Item 2) **[Figure 70-10-6]**.

Disconnect the engine starter positive cable (Item 3) **[Figure 70-10-6]**.

Disconnect the starter wiring harness connector (Item 4) **[Figure 70-10-6]**.

Figure 70-10-7

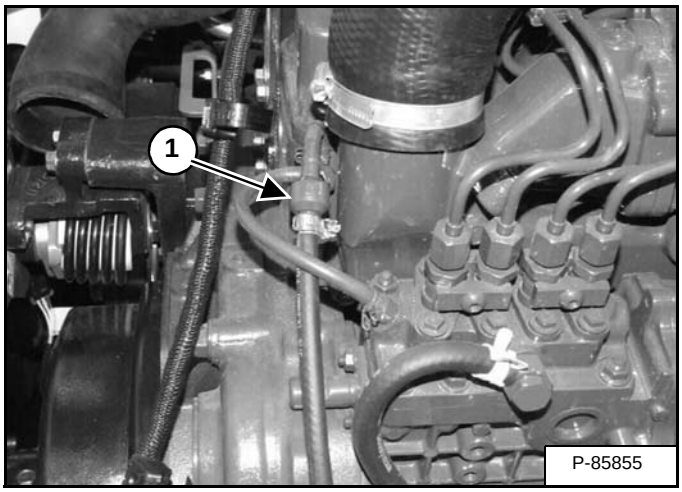


Disconnect fuel line (Item 1) **[Figure 70-10-10]** for lift pump and plug.

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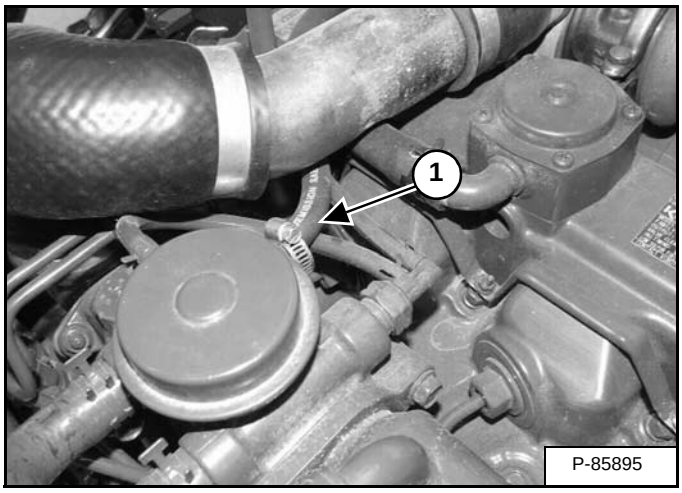
Engine Removal And Installation (Cont'd)

Figure 70-10-8



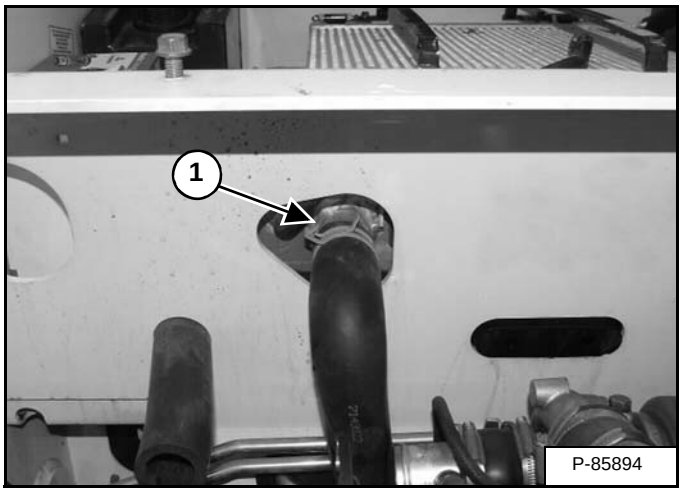
Disconnect and plug fuel return line (Item 1) **[Figure 70-10-8]**.

Figure 70-10-9



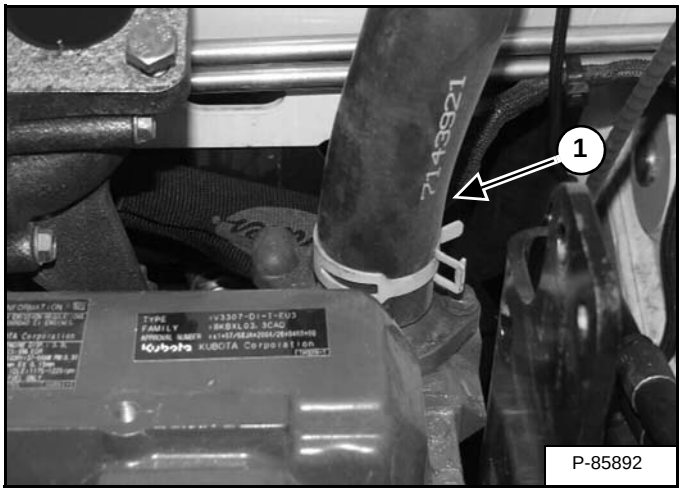
Disconnect coolant return line (Item 1) **[Figure 70-10-13]**.

Figure 70-10-10



Disconnect radiator hose (Item 1) **[Figure 70-10-10]**.

Figure 70-10-11

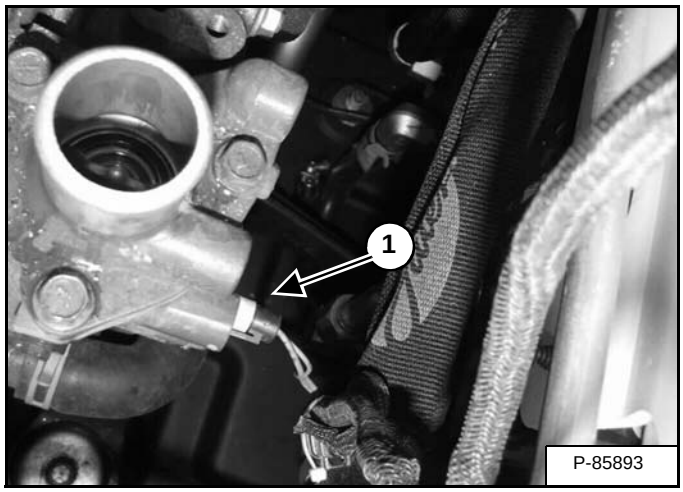


Disconnect radiator hose (Item 1) **[Figure 70-10-11]** from the thermostat housing.

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Engine Removal And Installation (Cont'd)

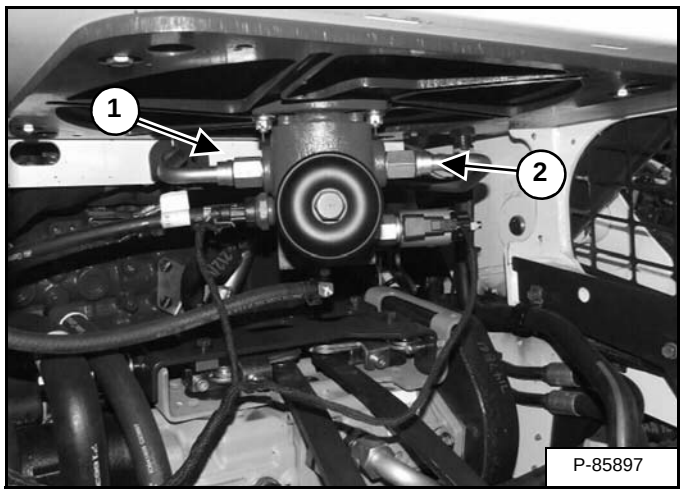
Figure 70-10-12



Disconnect coolant temperature connector (Item 1) **[Figure 70-10-12]** from thermostat housing.

Cap or plug all hoses and fittings.

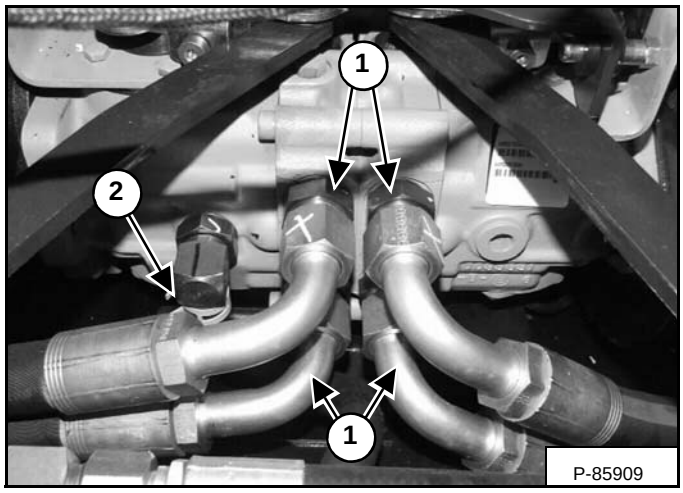
Figure 70-10-13



Remove and cap fan inlet hose (Item 1) **[Figure 70-10-13]**.

Remove and cap fan outlet hose (Item 2) **[Figure 70-10-13]**.

Figure 70-10-14



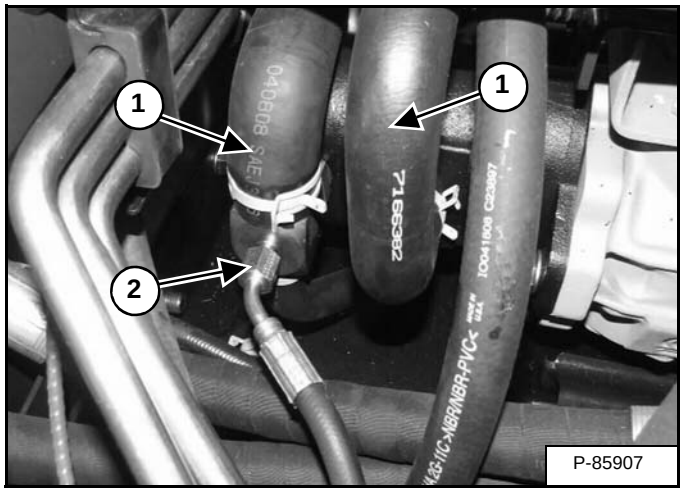
Mark and disconnect the drive motor hoses (Item 1) **[Figure 70-10-14]**.

Disconnect the tandem pump case drain hose (Item 2) **[Figure 70-10-14]**.

Cap or plug all hoses and fittings.

NOTE: The hydraulic fittings (Item 1) [Figure 70-10-17] on the hydrostatic pump must be tightened to 156 - 170 N•m (115 - 125 ft-lb) torque.

Figure 70-10-15



Disconnect tandem pump suction hoses (Item 1) **[Figure 70-10-15]**.

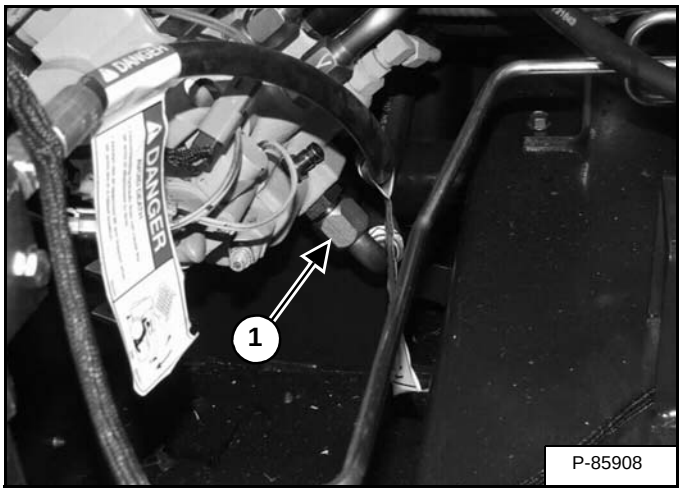
Disconnect the charge pump inlet hose (Item 2) **[Figure 70-10-15]**.

Cap or plug all hoses and fittings.

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Engine Removal And Installation (Cont'd)

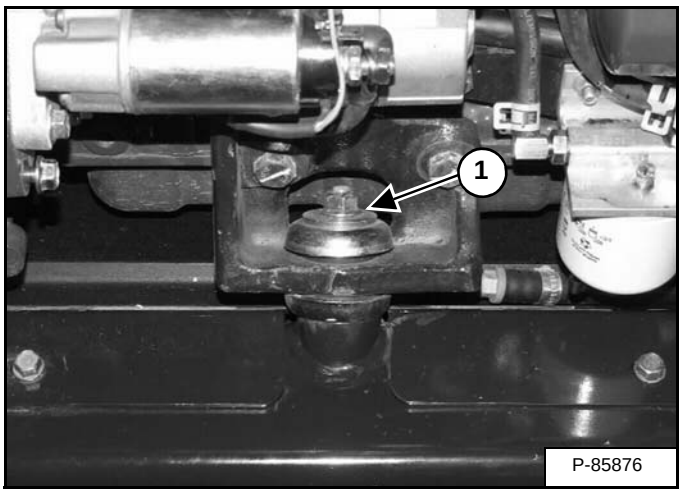
Figure 70-10-16



Disconnect hydraulic control valve inlet hose (Item 1) **[Figure 70-10-16]**.

Cap or plug all hoses and fittings.

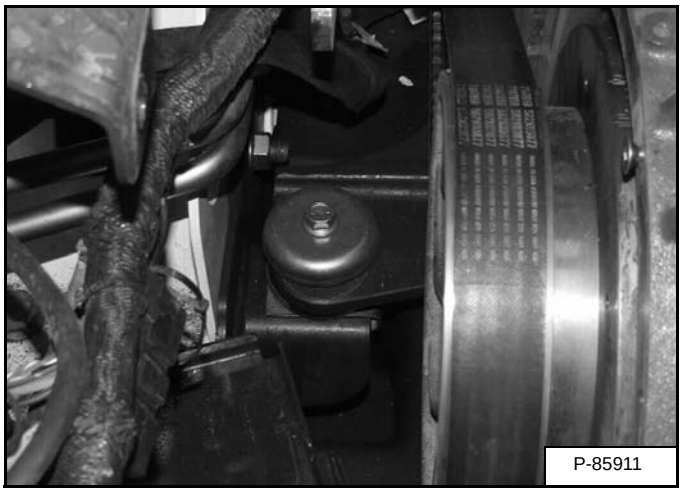
Figure 70-10-17



Remove rear engine mounting bolt (Item 1) **[Figure 70-10-17]**.

Installation: Tighten the mounting bolt to 135 N•m (100 ft-lb) torque.

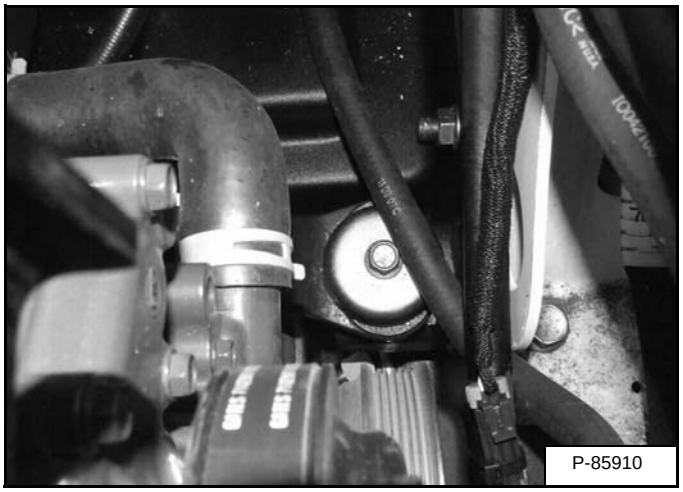
Figure 70-10-18



Remove the mounting bolt (Item 1) **[Figure 70-10-18]** from the left engine mount.

Installation: Tighten the mounting bolt (Item 1) **[Figure 70-10-18]** to 135 N•m (100 ft-lb) torque.

Figure 70-10-19



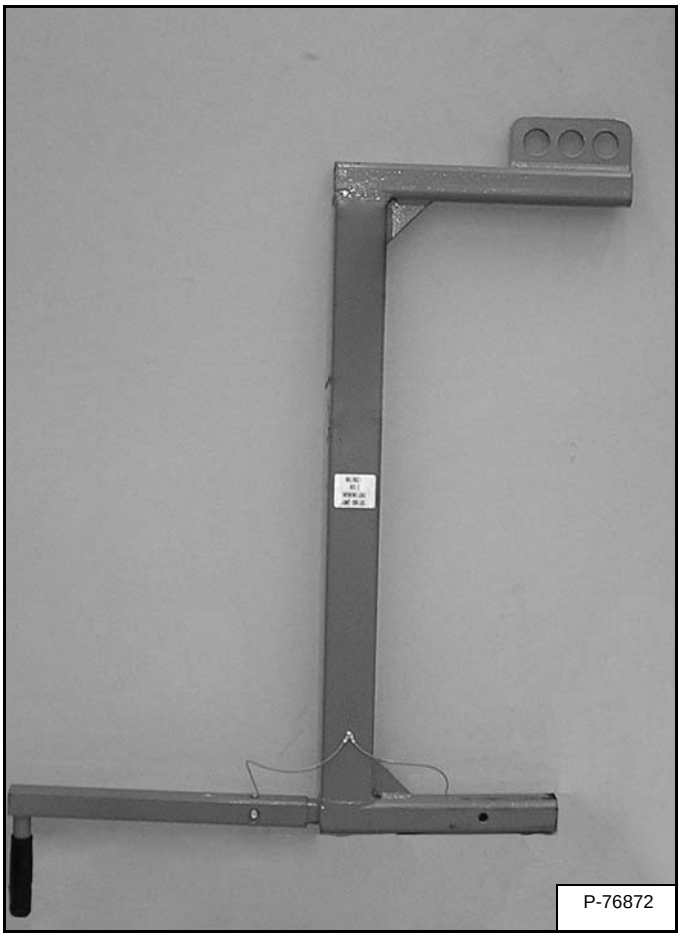
Remove the mounting bolt (Item 1) **[Figure 70-10-19]** from the right engine mount.

Installation: Tighten the mounting bolt to 135 N•m (100 ft-lb) torque.

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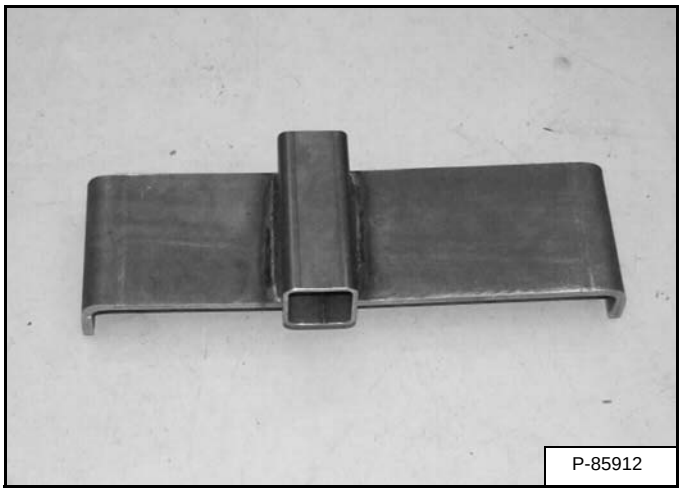
Engine Removal And Installation (Cont'd)

Figure 70-10-20



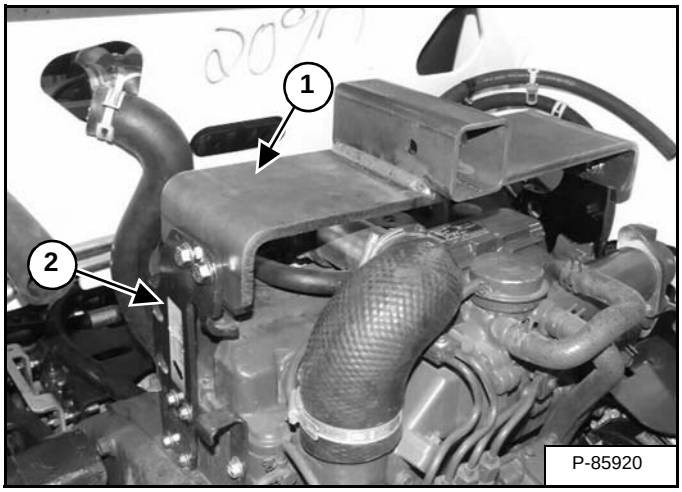
Use the engine removal tool (MEL 1653-1) **[Figure 70-10-20]** and the attachment (MEL 1653-5) **[Figure 70-10-21]** to aid in the removal and installation of the engine.

Figure 70-10-21



Install the engine removal attachment (MEL1653-5) **[Figure 70-10-21]** on the engine.

Figure 70-10-22



Install the engine removal attachment (Item 1) on the left hand muffler support bracket (Item 2) **[Figure 70-10-22]**.

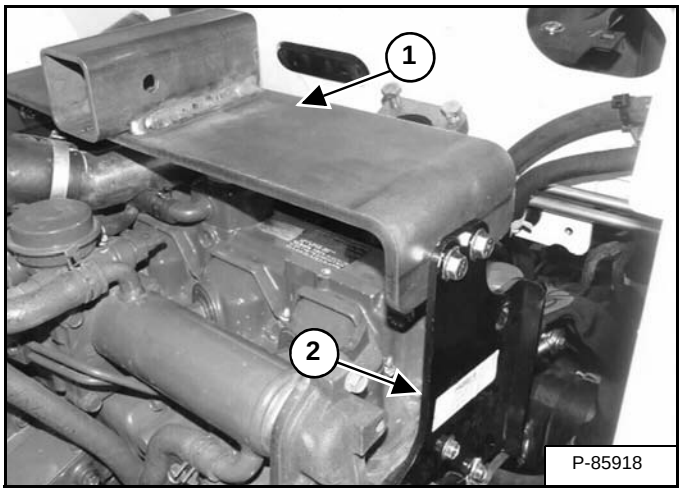
Installation: Use 9,525 x 38,1mm (0.375 x 1.5 in) bolts and nuts grade 5 minimum.

Tighten the all bolts and nuts that hold the engine removal attachment onto the engine.

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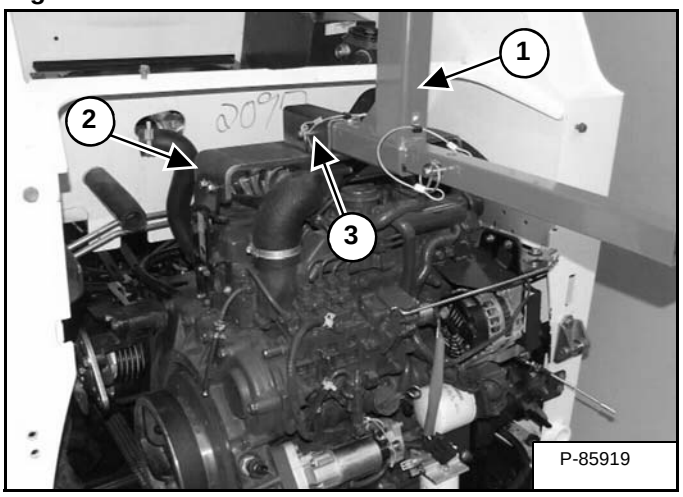
Engine Removal And Installation (Cont'd)

Figure 70-10-23



Install the engine removal attachment (Item 1) on the right hand muffler support bracket (Item 2) **[Figure 70-10-22]**.

Figure 70-10-24



Install the engine removal tool (Item 1) into the attachment (Item 2) and insert the pin (Item 3) **[Figure 70-10-24]**.

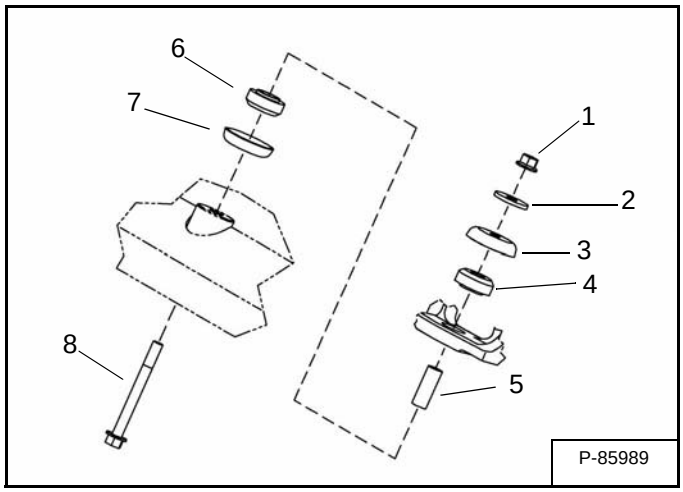
Install the chain hoist on the eyelet **[Figure 70-10-24]** of the removal tool.

Remove the engine/hydrostatic pump assembly from the loader.

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Engine Mount Replacement

Figure 70-10-25



Use the following procedure to install new rear engine mount:

Remove the existing mount from the engine. Refer to engine removal and installation for engine mount locations.

Replace all three engine mounts one rear and two sides.

Use the parts shown to install the new engine mounts **[Figure 70-10-25]**:

Hex Nut - (Item 1)

Washer - (Item 2)

Cup Washer - (Item 3)

Engine Mount - (Item 4)

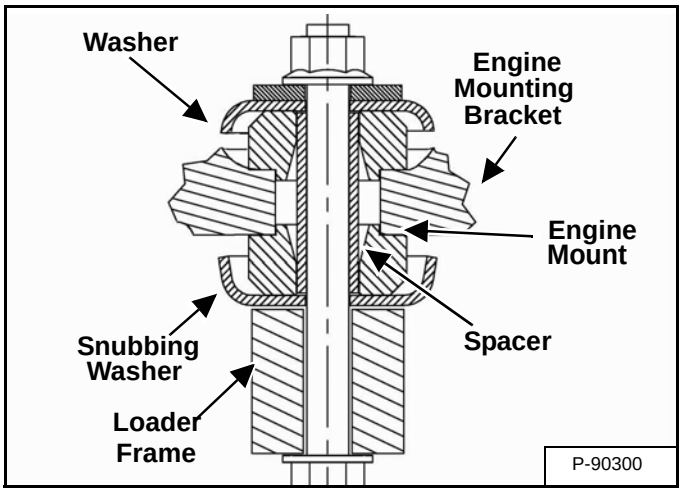
Tube Spacer - (Item 5)

Engine Mount - (Item 6)

Cup Washer - (Item 7)

Mounting Bolt - (Item 8)

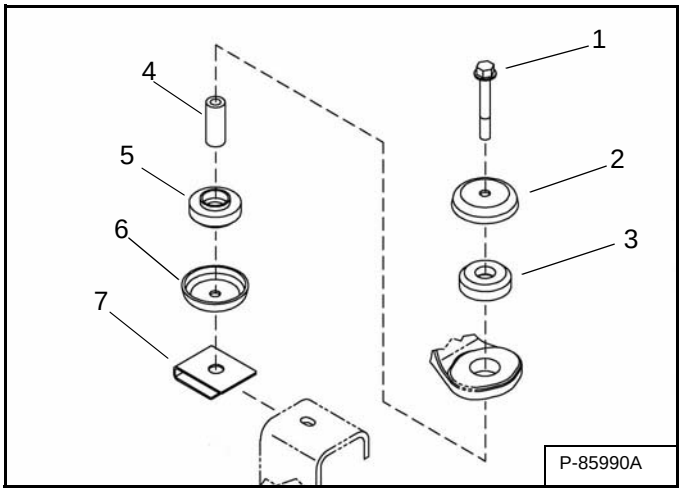
Figure 70-10-26



Install the new engine mount as shown in the cut away side view **[Figure 70-10-27]**.

Tighten the mounting bolts to 135 N•m (100 f.-lb) torque.

Figure 70-10-27



Use the parts shown to install the new side engine mounts **[Figure 70-10-25]**.

Mounting Bolt - (Item 1)

Cup Washer - (Item 2)

Engine Mount - (Item 3)

Tube Spacer - (Item 4)

Engine Mount - (Item 5)

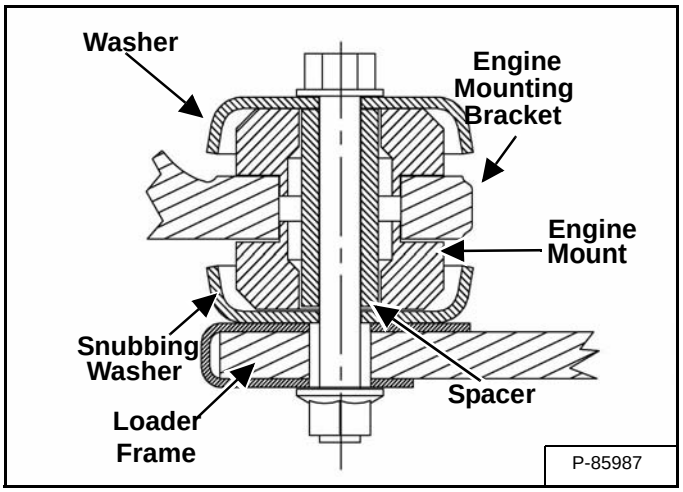
Cup Washer - (Item 6)

Retaining Nut - (Item 7)

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Engine Mount Replacement (Cont'd)

Figure 70-10-28

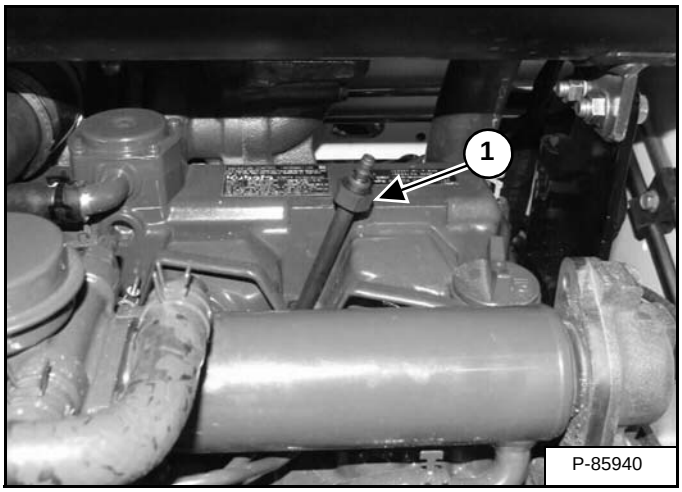


Install the new engine mount as shown in the cut away side view **[Figure 70-10-27]**.

Tighten the mounting bolts to 135 N•m (100 ft-lb) torque.

Compression - Checking

Figure 70-10-29



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

MEL10630 - Engine Compression Kit
MEL1655 - Compression Adapter

The engine must be at operating temperature.

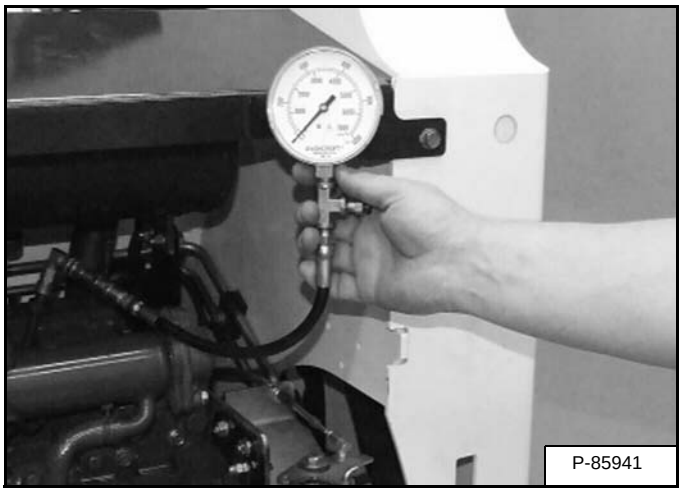
Remove the glow plugs. (See CYLINDER HEAD on Page 70-80-1.)

Install the correct compression adapter (Item 1) **[Figure 70-10-29]** into the cylinder head.

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Compression - Checking (Cont'd)

Figure 70-10-30



Connect the compression gauge to the adapter **[Figure 70-10-30]**.

Make sure the engine speed control is fully backward (engine idle).

Disconnect the fuel stop solenoid.

Crank the engine with the starter cranking rpm.

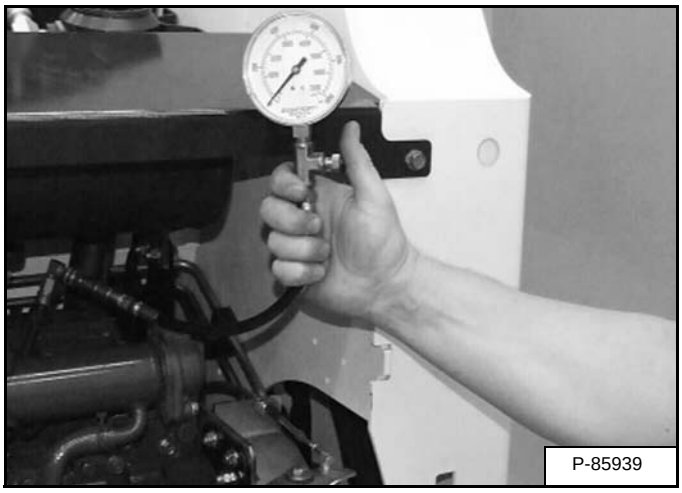
If the measurement is below the allowable limit, check the cylinder, piston ring, top clearance, valve and cylinder head.

Compression Pressure should be 3,9 MPa (39,2 bar) (569 psi)

Allowable Limit (minimum) is 2,9 MPa (29,0 bar) (421 psi)

No more than 10% variance among cylinders.

Figure 70-10-31



Push the button on the compression gauge to release pressure **[Figure 70-10-31]**.

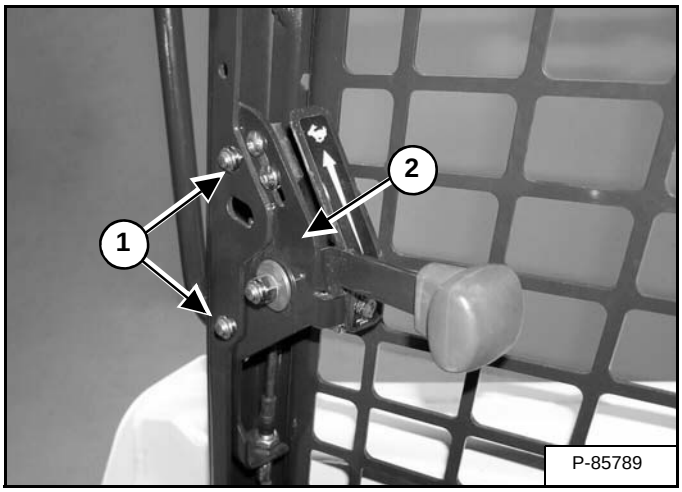
Connect the fuel stop solenoid.

Dealer Copy -- Not for Resale

ENGINE SPEED CONTROL

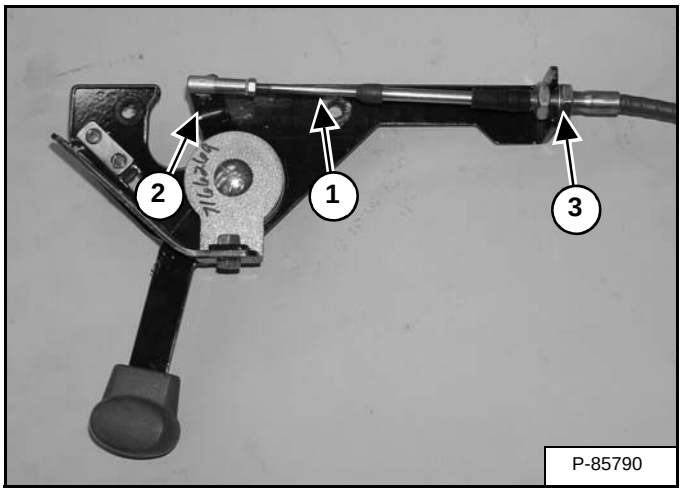
Removal And Installation

Figure 70-20-1



Remove the two nuts (Item 1) **[Figure 70-20-1]**.

Figure 70-20-2



The speed control cable (Item 1) is connected to the speed control handle (Item 2) by a ball and socket end **[Figure 70-20-2]**.

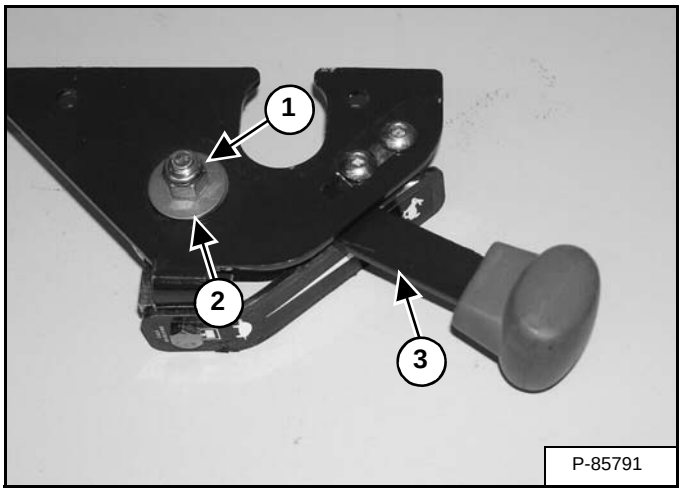
Disconnect the speed control cable (Item 1) from the speed control handle (Item 2) **[Figure 70-20-2]**.

Loosen the jam nut (Item 3) **[Figure 70-20-2]** from the speed control cable.

Remove the cable from the speed control handle.

Disassembly And Assembly

Figure 70-20-3



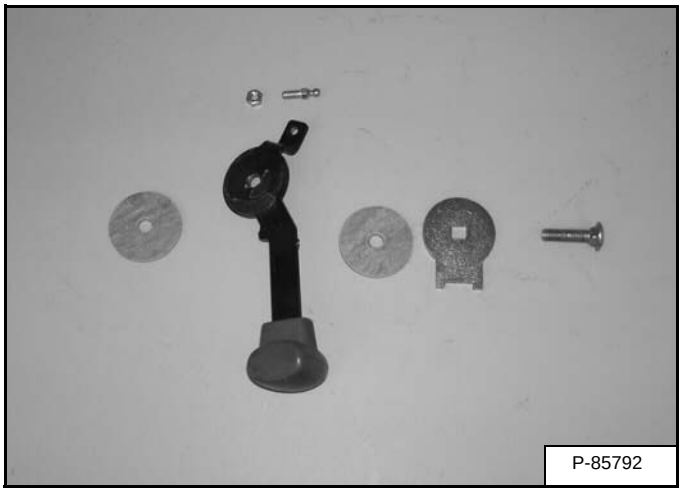
Remove the nut (Item 1) and remove the two conical washers (Item 2) **[Figure 70-20-3]**.

Remove the handle (Item 3) **[Figure 70-20-3]**.

Installation: Install the two conical washers with the concave surfaces facing each other (Item 2) **[Figure 70-20-3]**.

Installation: Tighten the nut (Item 1) **[Figure 70-20-3]** until the speed control lever moves backward and forward at a comfortable tension.

Figure 70-20-4



Inspect and replaced any damaged parts **[Figure 70-20-4]**.

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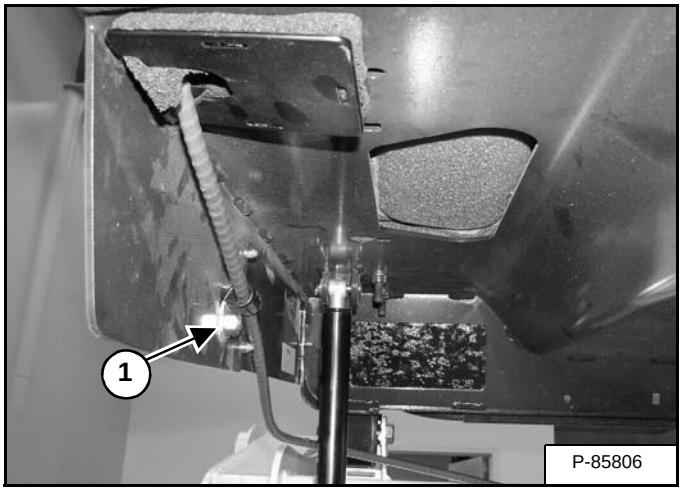
Cable Removal And Installation

Raise the lift arms and install an approved lift arm support device. (See Installing on Page 10-20-1.)

Remove the speed control lever. (See Removal And Installation on Page 70-20-1.)

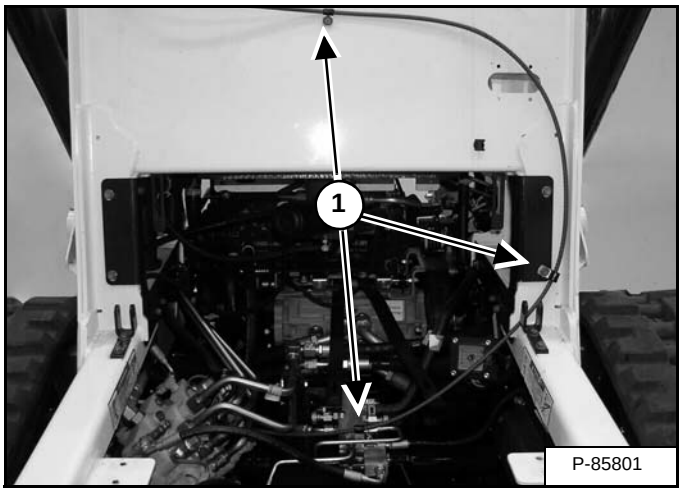
Raise the operator cab. (See Raising on Page 10-30-2.)

Figure 70-20-5



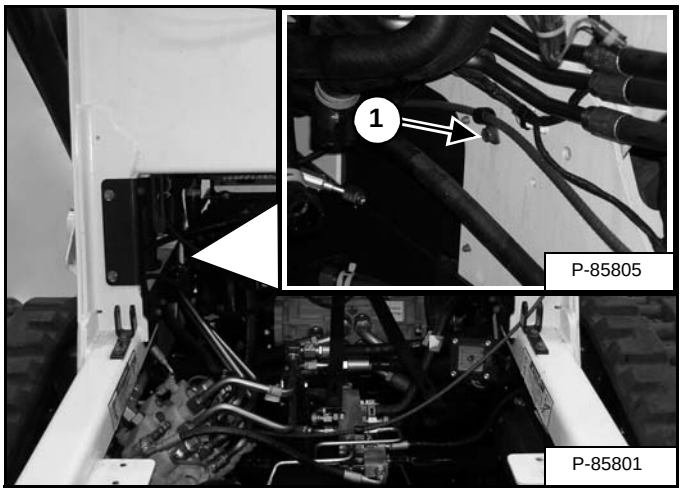
Remove the bolt (Item 1) **[Figure 70-20-5]** from the clamp that secures the cable.

Figure 70-20-6



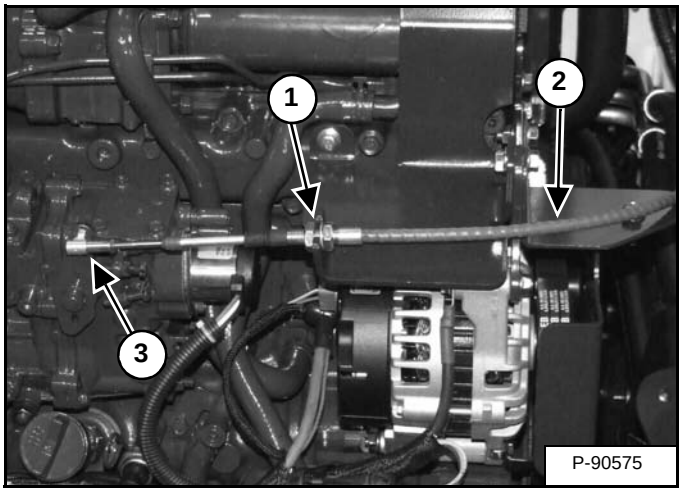
Remove the three bolts (Item 1) **[Figure 70-20-6]** from the clamps that secure the cable.

Figure 70-20-7



Remove the bolt (Item 1) **[Figure 70-20-7]** from the clamp that secures the cable.

Figure 70-20-8



The speed control cable is connected to the linkage by a ball and socket end **[Figure 70-20-8]**.

Loosen the jam nut (Item 1) **[Figure 70-20-8]** from the speed control cable.

Disconnect the speed control cable (Item 2) from the linkage (Item 3) by rolling the cable away from the engine **[Figure 70-20-8]**.

Remove the speed control cable.

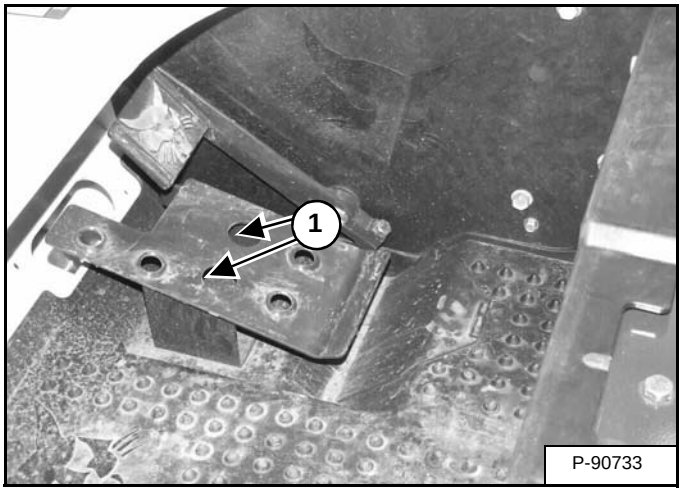
Dealer Copy -- Not for Resale

ENGINE SPEED CONTROL (SJC) S/N A3NV12469 AND BELOW & S/N A3NW11130 AND BELOW

Removal And Installation

Raise the operator cab. (See Raising on Page 10-30-2.)

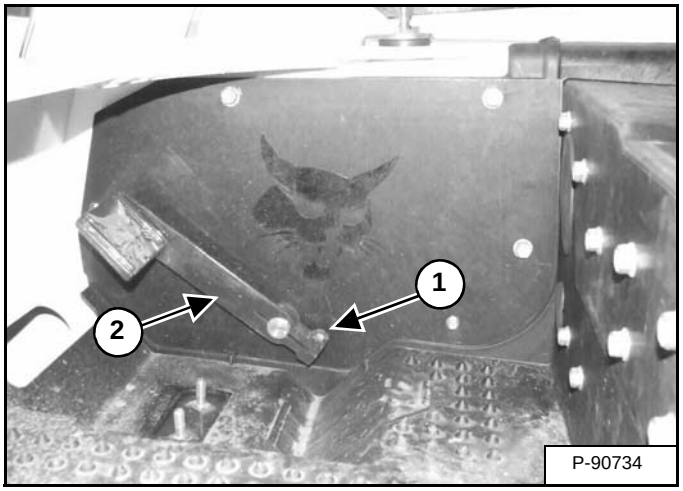
Figure 70-21-1



Remove the two mounting nuts (Item 1) **[Figure 70-21-1]** from the right side foot rest.

Remove the foot rest from the loader.

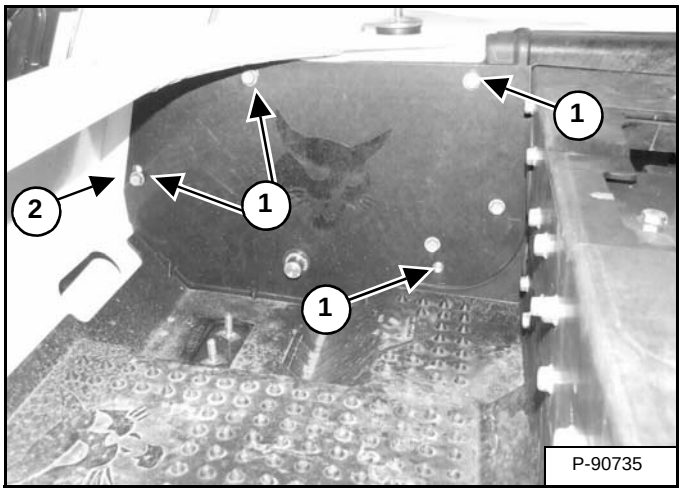
Figure 70-21-2



Loosen the clamping bolt (Item 1) and remove the engine speed control foot pedal (Item 2) **[Figure 70-21-2]**.

Installation: Install the engine speed foot pedal (Item 2) but do not tighten the clamping bolt. Set the hand throttle to high idle then place the foot pedal to high idle and tighten the clamping bolt (Item 1) **[Figure 70-21-2]**.

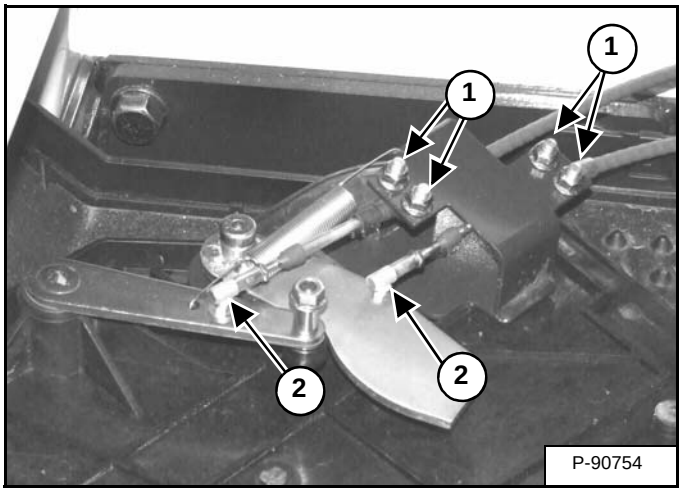
Figure 70-21-3



Remove the four bolts (Item 1) and washer (Item 2) **[Figure 70-21-3]**.

Lay the assembly down.

Figure 70-21-4



Loosen the engine speed control cable u-bolt nuts (Item 1) and remove the engine speed control cables from the ball pivots (Item 2) **[Figure 70-21-4]**.

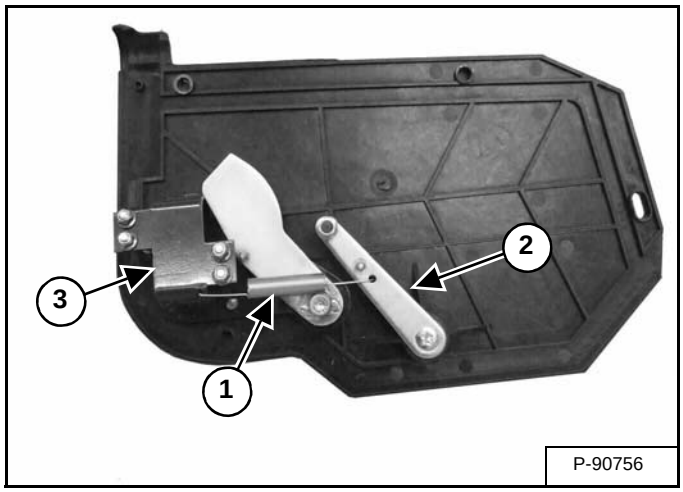
Remove panel assembly from the loader.

Dealer Copy -- Not for Resale

ENGINE SPEED CONTROL (SJC) S/N A3NV12469 AND BELOW & S/N A3NW11130 AND BELOW (CONT'D)

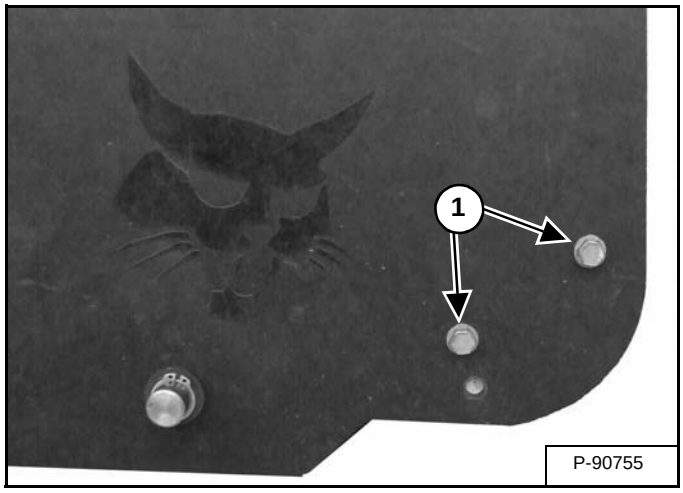
Disassembly And Assembly

Figure 70-21-5



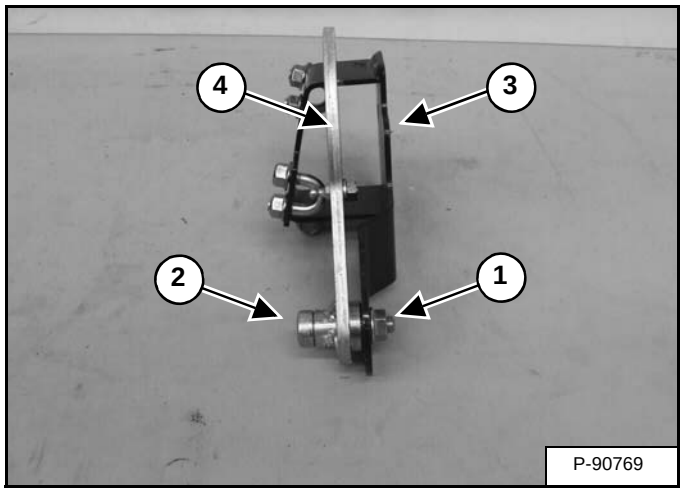
Remove the spring (Item 1) from the engine speed control foot pedal pivot assembly (Item 2) and the engine speed control hand throttle bracket (Item 3) **[Figure 70-21-5]**

Figure 70-21-6



Remove the two bolts (Item 1) **[Figure 70-21-6]** from the engine speed control hand assembly.

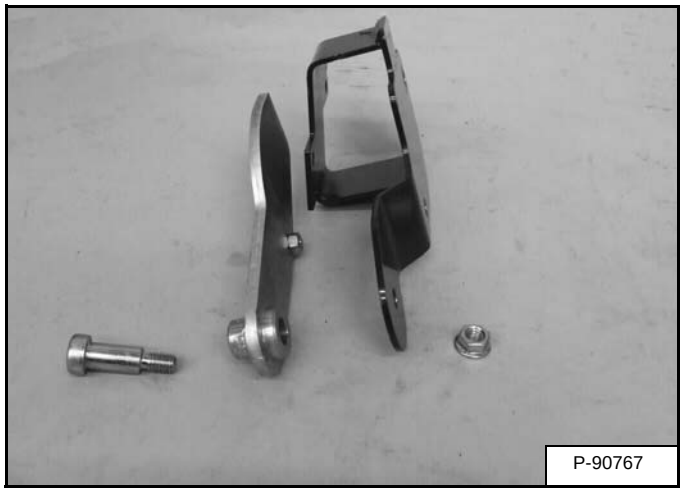
Figure 70-21-7



Remove the nut (Item 1) and pivot bolt (Item 2) from the engine speed control hand bracket assembly (Item 3) **[Figure 70-21-7]**.

Remove the engine speed control hand throttle cam lever (Item 4) **[Figure 70-21-7]**.

Figure 70-21-8



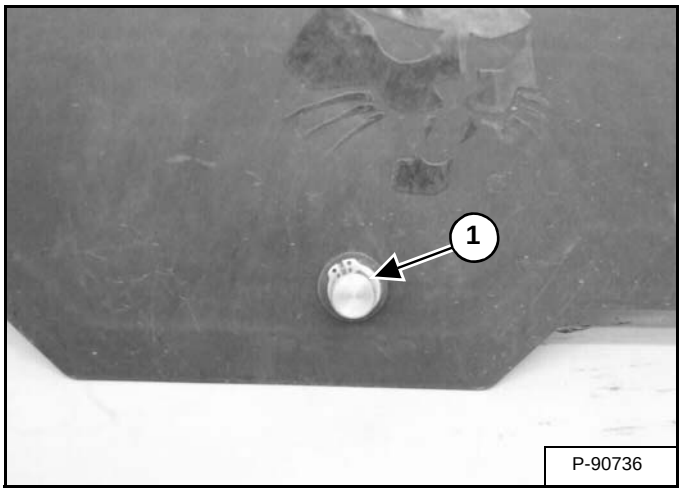
The pivot assembly shown disassembled **[Figure 70-21-8]**.

NOTE: No lubrication is necessary or recommended on the engine speed control.

Dealer Copy -- Not for Resale

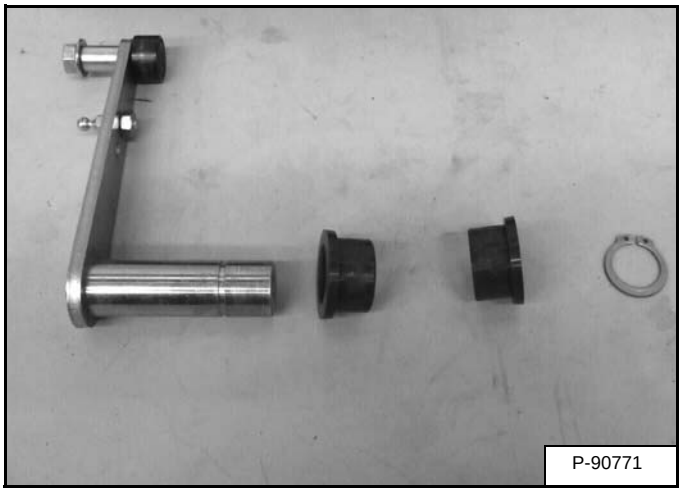
Disassembly And Assembly (Cont'd)

Figure 70-21-9



Remove the snap ring (Item 1) **[Figure 70-21-9]** from the engine speed control foot pedal pivot.

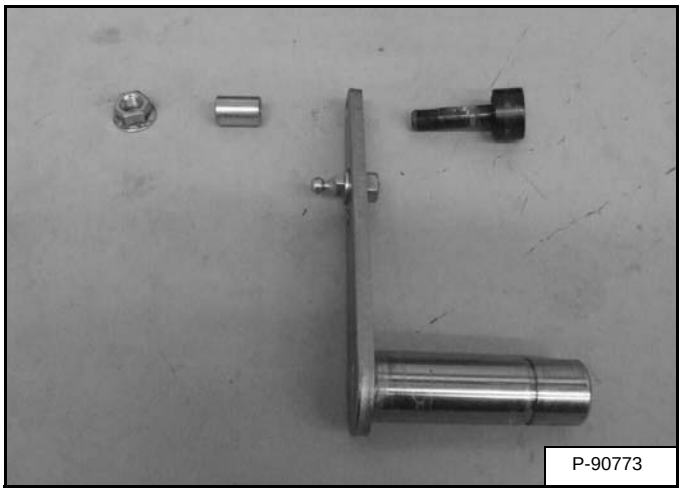
Figure 70-21-10



The engine speed control foot pedal pivot assembly shown disassembled, **[Figure 70-21-10]** replace worn parts as needed.

NOTE: No lubrication is necessary or recommended on the engine speed control.

Figure 70-21-11



The engine speed control foot pedal pivot assembly roller bearing **[Figure 70-21-11]** shown disassembled.

Dealer Copy -- Not for Resale



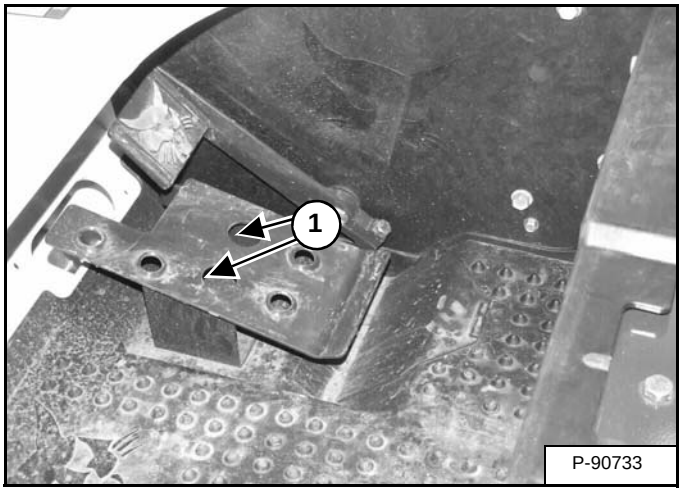
Dealer Copy -- Not for Resale

ENGINE SPEED CONTROL (SJC) S/N A3NV12470 AND ABOVE & S/N A3NW11131 AND ABOVE

Removal And Installation

Raise the operator cab. (See Raising on Page 10-30-2.)

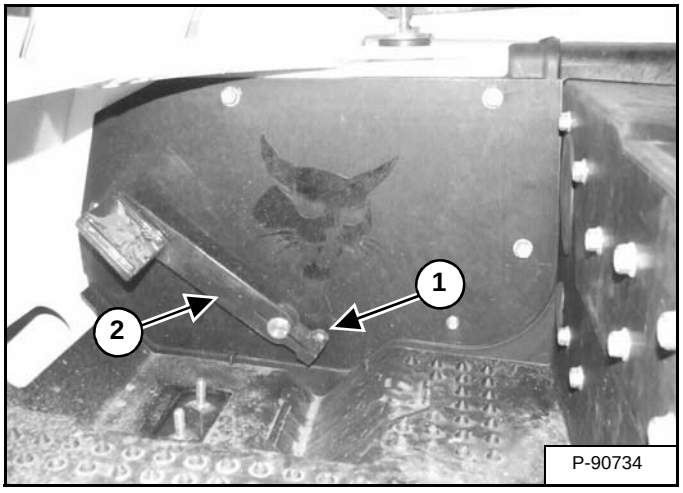
Figure 70-22-1



Remove the two mounting nuts (Item 1) **[Figure 70-22-1]** from the right side foot rest.

Remove the foot rest from the loader.

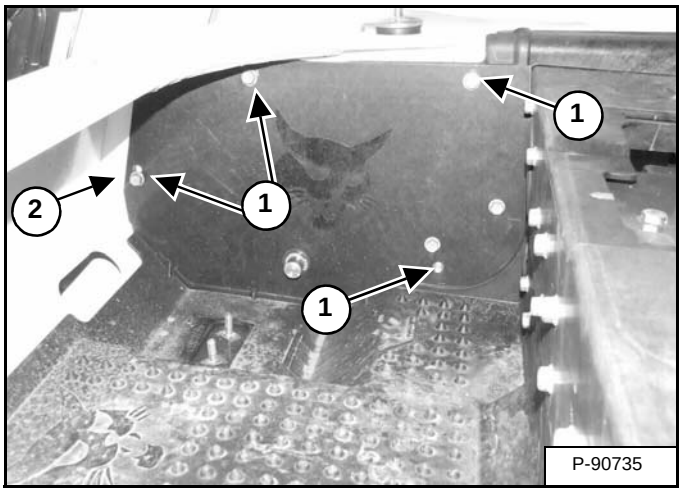
Figure 70-22-2



Loosen the clamping bolt (Item 1) and remove the engine speed control foot pedal (Item 2) **[Figure 70-22-2]**.

Installation: Install the engine speed foot pedal (Item 2) but do not tighten the clamping bolt. Set the hand throttle to high idle then place the foot pedal to high idle and tighten the clamping bolt (Item 1) **[Figure 70-22-2]**.

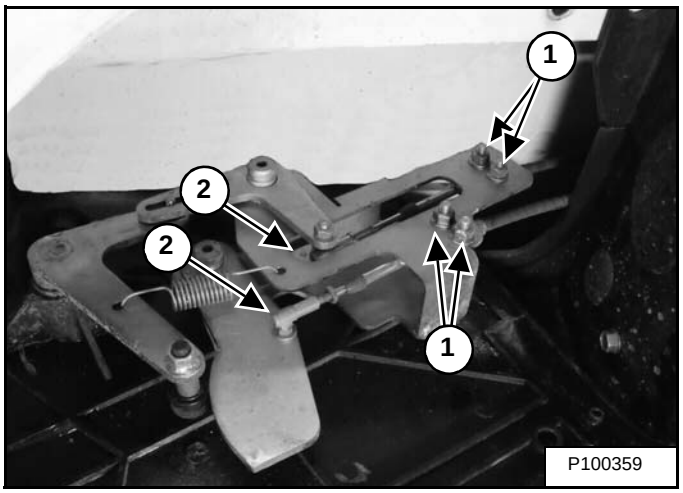
Figure 70-22-3



Remove the four bolts (Item 1) and washer (Item 2) **[Figure 70-22-3]**.

Lay the assembly down.

Figure 70-22-4



Loosen the engine speed control cable u-bolt nuts (Item 1) and remove the engine speed control cables from the ball pivots (Item 2) **[Figure 70-22-4]**.

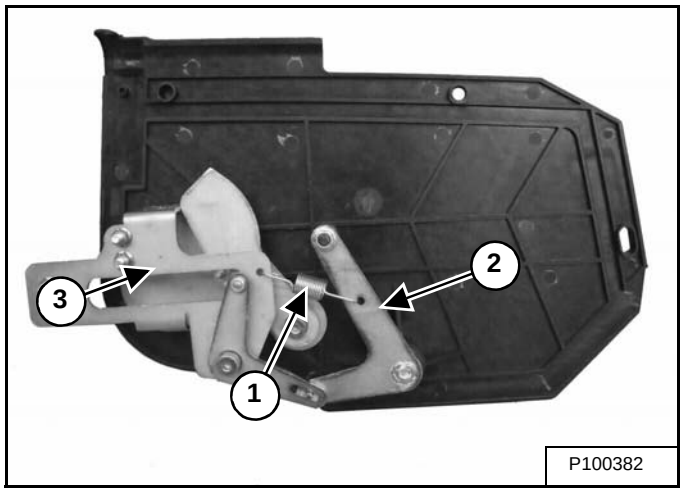
Remove panel assembly from the loader.

Dealer Copy -- Not for Resale

ENGINE SPEED CONTROL (SJC) S/N A3NV12470 AND ABOVE & S/N A3NW11131 AND ABOVE (CONT'D)

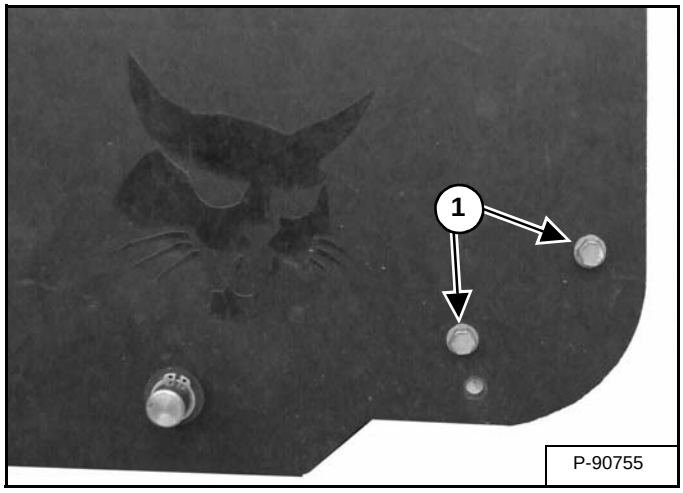
Disassembly And Assembly

Figure 70-22-5



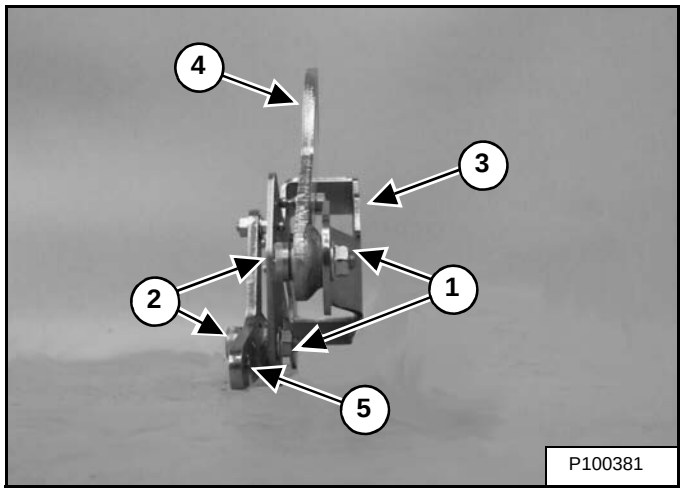
Remove the spring (Item 1) from the engine speed control foot pedal pivot assembly (Item 2) and the engine speed control hand throttle bracket (Item 3) **[Figure 70-22-5]**

Figure 70-22-6



Remove the two bolts (Item 1) **[Figure 70-22-6]** from the engine speed control hand assembly.

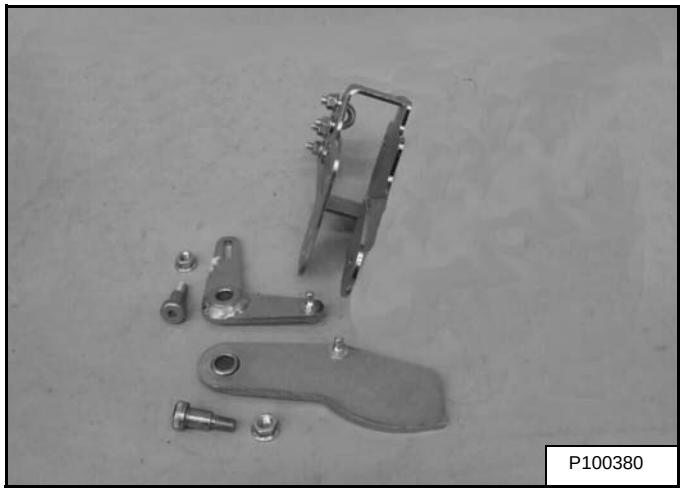
Figure 70-22-7



Remove the nuts (Item 1) and pivot bolts (Item 2) from the engine speed control hand bracket assembly (Item 3) **[Figure 70-22-7]**.

Remove the engine speed control hand throttle cam lever (Item 4) and engine throttle cable lever Item 5) **[Figure 70-22-7]**.

Figure 70-22-8



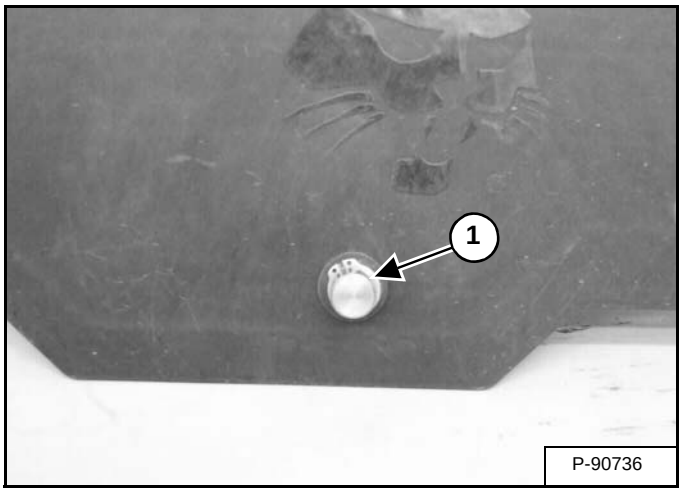
The pivot assemblies shown disassembled **[Figure 70-22-8]**.

NOTE: No lubrication is necessary or recommended on the engine speed control.

Dealer Copy -- Not for Resale

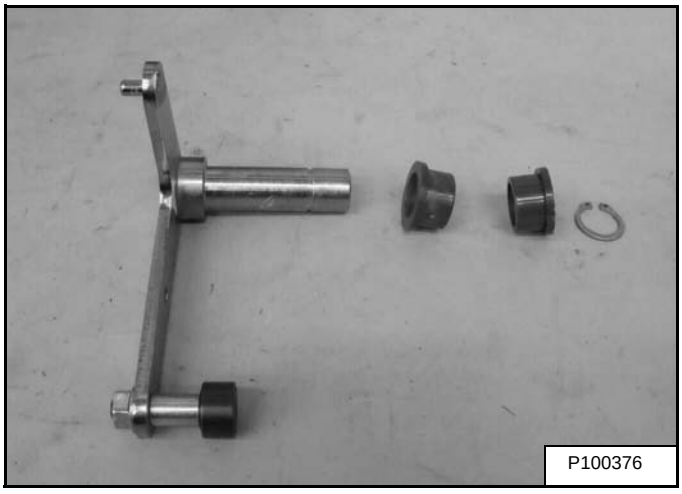
Disassembly And Assembly (Cont'd)

Figure 70-22-9



Remove the snap ring (Item 1) **[Figure 70-22-9]** from the engine speed control foot pedal pivot.

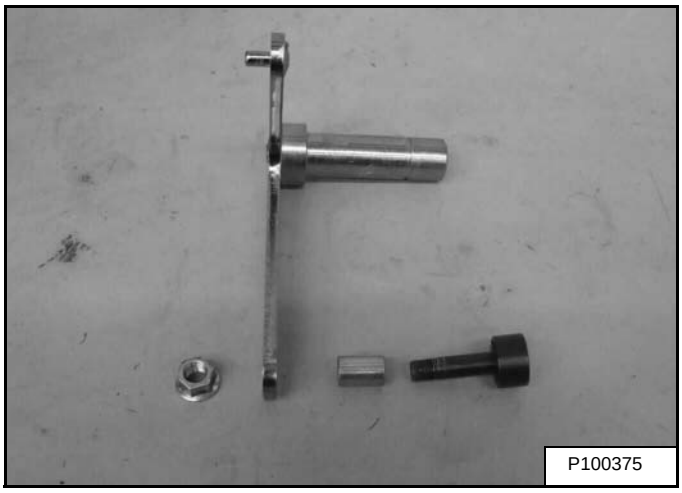
Figure 70-22-10



The engine speed control foot pedal pivot assembly shown disassembled, **[Figure 70-22-10]** replace worn parts as needed.

NOTE: No lubrication is necessary or recommended on the engine speed control.

Figure 70-22-11



The engine speed control foot pedal pivot assembly roller bearing **[Figure 70-22-11]** shown disassembled.

Dealer Copy -- Not for Resale

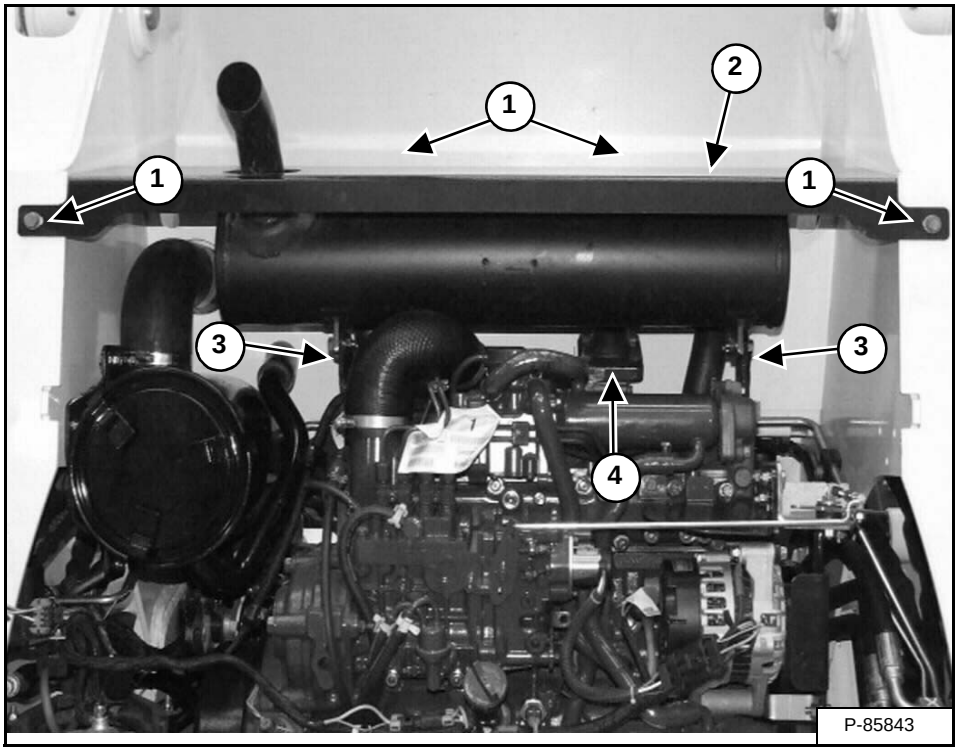


Dealer Copy -- Not for Resale

MUFFLER

Removal And Installation

Figure 70-30-1



Open the rear door and remove the rear grille and side panels. (See Removal And Installation on Page 50-60-1.)

Remove the bolts (Item 1) from the engine cover (Item 2) **[Figure 70-30-1]** and remove engine cover.

Remove the muffler mounting bolts (Item 3) **[Figure 70-30-1]**.

Remove exhaust manifold to muffler mounting bolts (Item 4) **[Figure 70-30-1]**.

Remove the muffler from the loader.

Installation: Tighten the muffler mounting bolts to 43 - 47 N•m (32 - 35 ft-lb) torque.

Dealer Copy -- Not for Resale



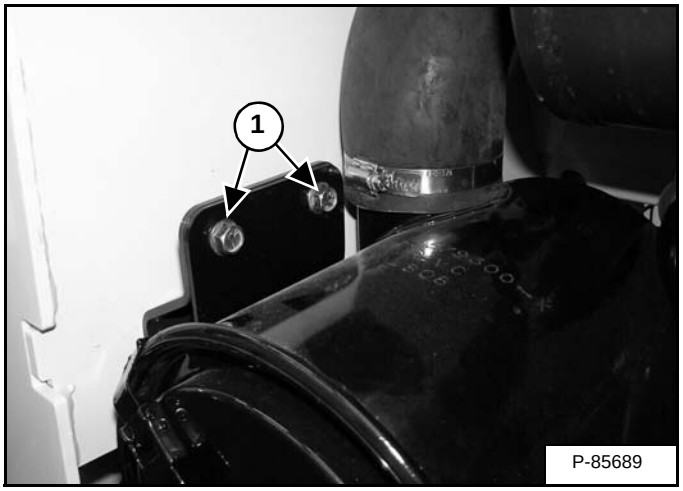
Dealer Copy -- Not for Resale

AIR CLEANER

Housing Removal And Installation

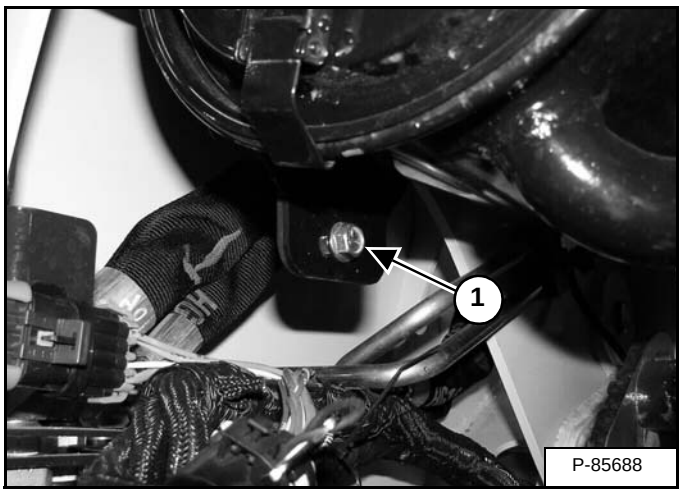
Open the rear door.

Figure 70-40-1



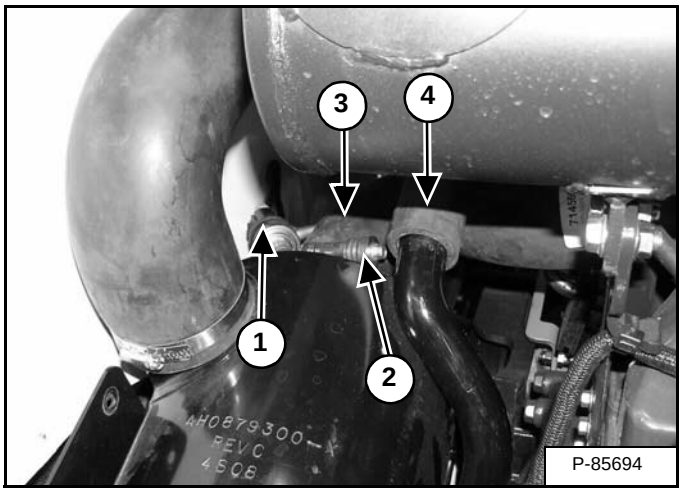
Remove the top two mounting bolts (Item 1) **[Figure 70-40-1]** from the air cleaner mount bracket.

Figure 70-40-2



Remove the bottom mounting bolt (Item 1) **[Figure 70-40-2]** from the air cleaner mount bracket.

Figure 70-40-3



Disconnect the wire connector (Item 1) **[Figure 70-40-3]** from the air cleaner sender.

Loosen the hose clamp (Item 2) and disconnect the hose (Items 3) **[Figure 70-40-3]** from the air cleaner.

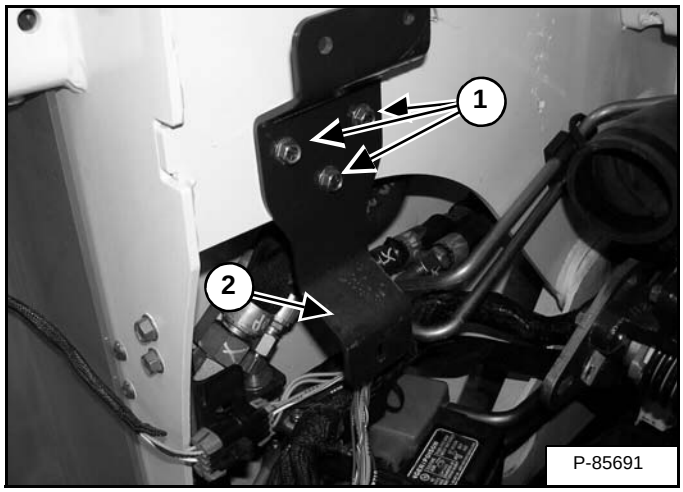
NOTE: Disconnect the scavenger hose (Item 4) [Figure 70-40-3] if equipped.

Remove the air cleaner from the loader.

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Housing Bracket Removal And Installation

Figure 70-40-4



Remove the three bolts (Item 1) and remove the air cleaner bracket (Item 2) **[Figure 70-40-4]**.

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Radiator Removal And Installation

Stop the engine and open the rear door.

Remove the rear grille and side panels. (See Removal And Installation on Page 50-60-1.)

Remove the oil cooler. (See Removal And Installation on Page 20-90-1.)

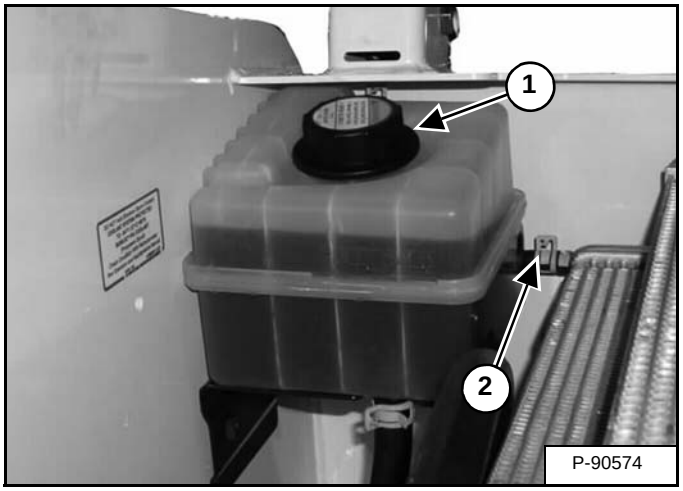
⚠ WARNING

AVOID BURNS

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

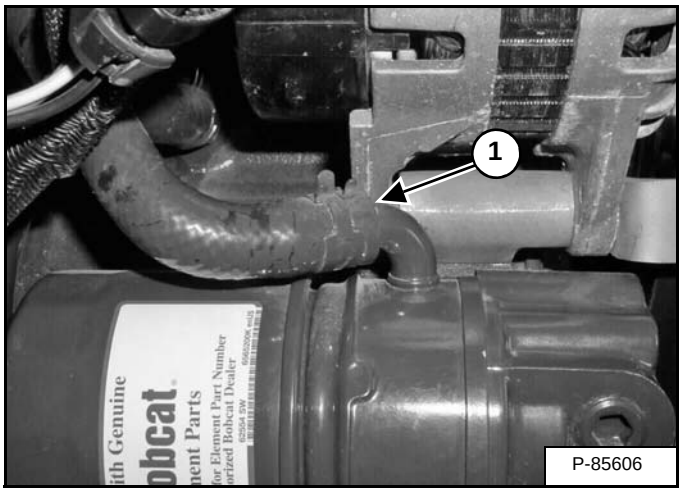
W-2070-1203

Figure 70-50-1



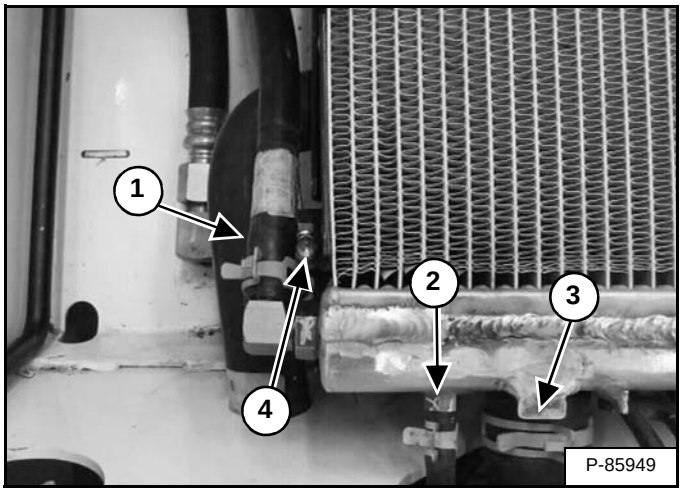
Loosen the radiator cap (Item 1) from the pressurized expansion tank. Disconnect and plug radiator air bleed hose (Item 2) **[Figure 70-50-1]**.

Figure 70-50-2



Remove hose (Item 1) **[Figure 70-50-2]** on the engine oil cooler and drain the coolant into a container.

Figure 70-50-3



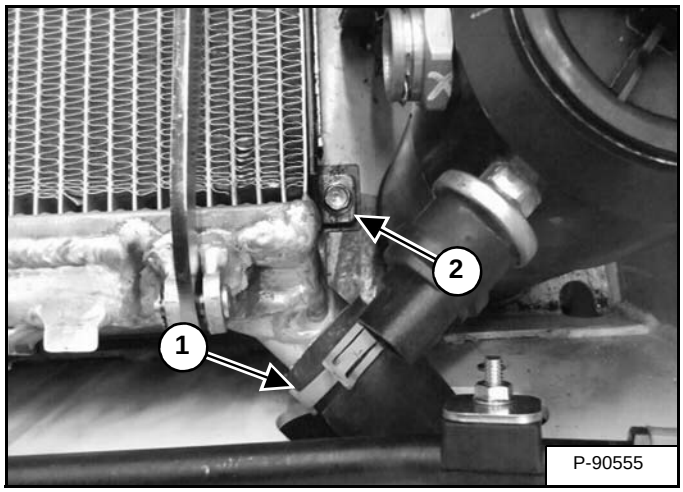
Disconnect the pressurized expansion tank fill hose (Item 1), disconnect the coolant air bleed hose (Item 2) and the radiator hose (Item 3) **[Figure 70-50-3]**.

Remove the radiator hold down bolt (Item 4) **[Figure 70-50-3]**.

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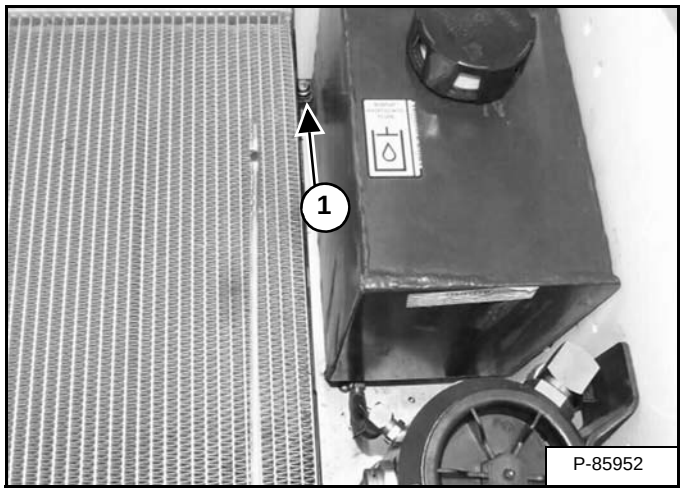
Radiator Removal And Installation (Cont'd)

Figure 70-50-4



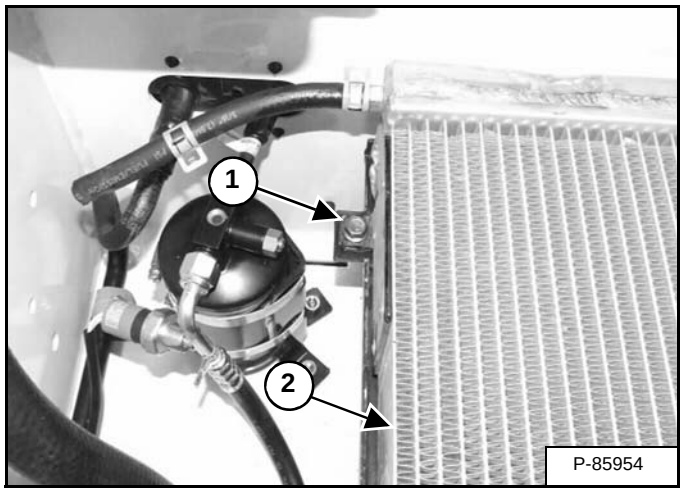
Disconnect the radiator hose (Item 1) and remove the radiator hold down bolt (Item 2) **[Figure 70-50-4]**.

Figure 70-50-5



Remove radiator hold down bolt (Item 1) **[Figure 70-50-5]**.

Figure 70-50-6



Remove radiator hold down bolt (Item 1) **[Figure 70-50-6]**.

Remove the radiator (Item 2) **[Figure 70-50-6]**.

Lift the radiator up and remove it from the loader.

NOTE: Coolant recovery tank removed for photo clarity

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Hydraulic Fan Description

The proportioning valve meters the flow through the fan motor. The proportioning valve receives signals from the controller which gathers information from both the engine and hydraulic temperature sensors.

The hydraulic fan is used to cool the engine and hydraulic / hydrostatic systems. The hydraulic fan consists of a fan and hydraulic motor that is controlled by a proportioning valve.

NOTE: The proportioning valve is factory set and can not be adjusted accurately in the field due to the adjustment being tamper proof.

The fan speed is determined by the engine coolant temperature and the hydraulic fluid temperature. Depending on these temperatures the fan speed (rpms) can range from 0 - 4000 rpms.

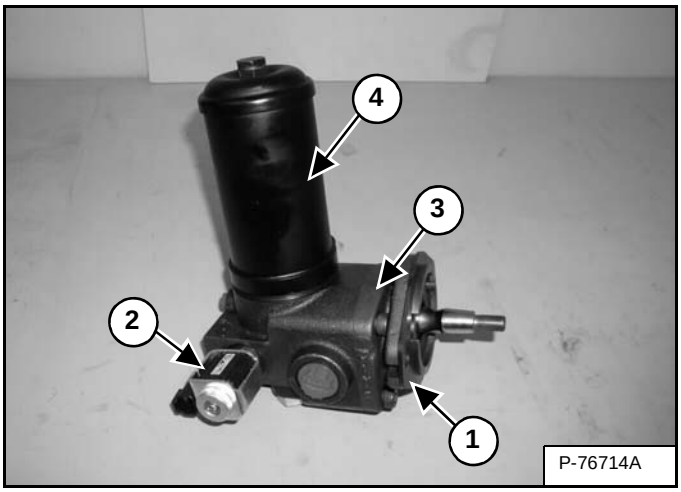
The hydraulic fan speed at cold engine startup will range from 0 to 500 rpms until the engine coolant and the hydraulic fluid reach normal operating temperatures.

During normal operating temperatures the fan speed may range from approximately 1900 - 3500 rpms.

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Hydraulic Fan Disassembly And Assembly

Figure 70-50-7

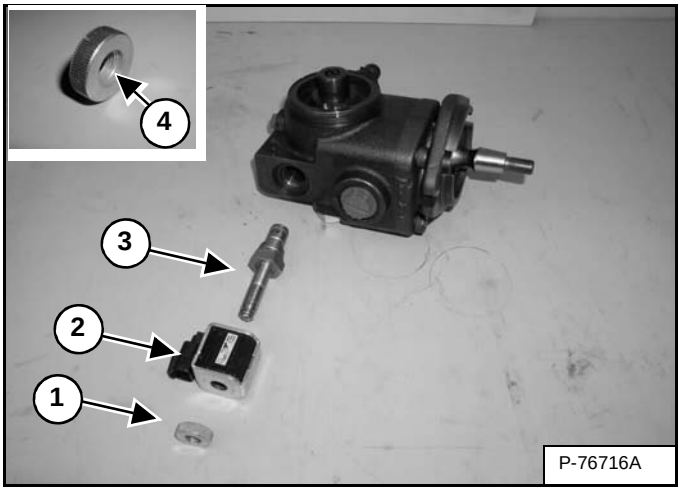


NOTE: The mounting gasket (Item 1), proportioning valve, and proportioning valve O-rings, back up washer and coil mounting nut (Item 2) are available from Bobcat Parts. The fan motor (Item 3) [Figure 70-50-7] must be replaced as an assembly if damaged.

Remove the filter cover (Item 4) **[Figure 70-50-7]**.

Installation: Tighten filter cover (Item 4) **[Figure 70-50-7]** to 47,5 - 54 N•m (35 - 40 ft-lb) torque.

Figure 70-50-8



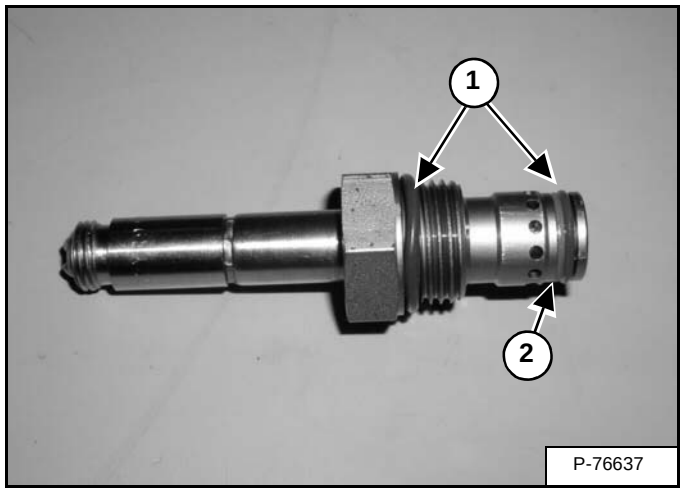
Remove coil mounting nut (Item 1), the coil (Item 2), and the coil valve stem (Item 3) **[Figure 70-50-8]**.

NOTE: Coil mounting nut must be replaced each time it is removed. Coil mounting nuts are available from Bobcat Parts.

Installation: Install coil mounting nut with the counterbored space (Item 4) **[Figure 70-50-8]** facing towards the coil and tighten securely by hand.

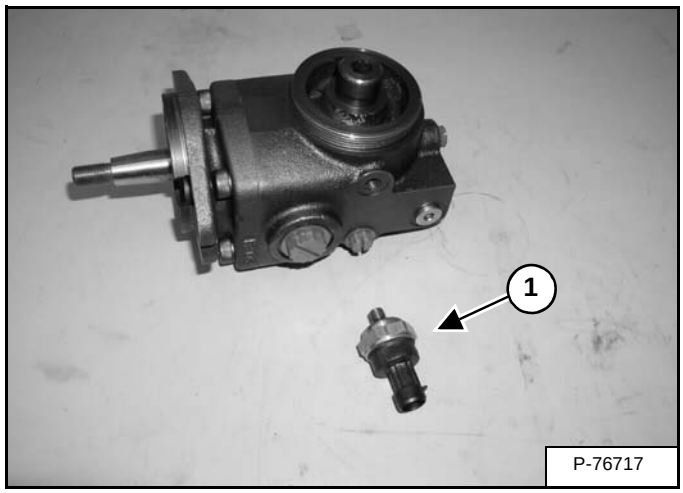
Installation: Tighten coil valve stem (Item 3) **[Figure 70-50-8]** to 28 - 34 N•m (21 - 25 ft-lb) torque.

Figure 70-50-9



Inspect and replace O-rings (Item 1) and back up washer (Item 2) **[Figure 70-50-9]** if necessary.

Figure 70-50-10



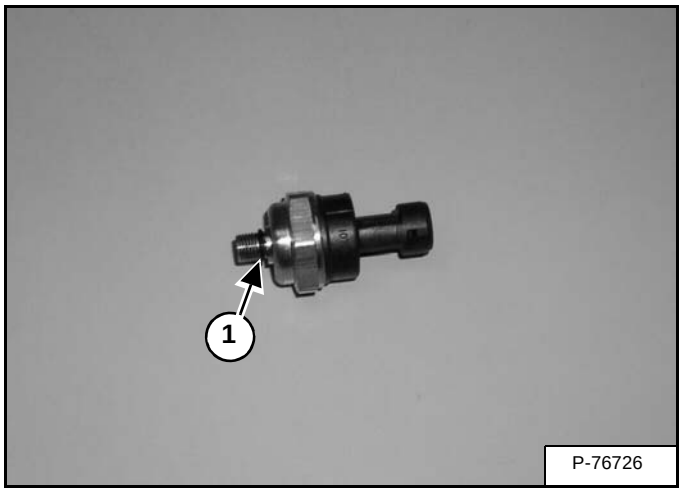
Remove the pressure transducer (Item 1) **[Figure 70-50-10]**.

Installation: Tighten the pressure transducer (Item 1) **[Figure 70-50-10]** to 10 - 10,9 N•m (7.4 - 8.1 ft-lb) torque.

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Hydraulic Fan Disassembly And Assembly (Cont'd)

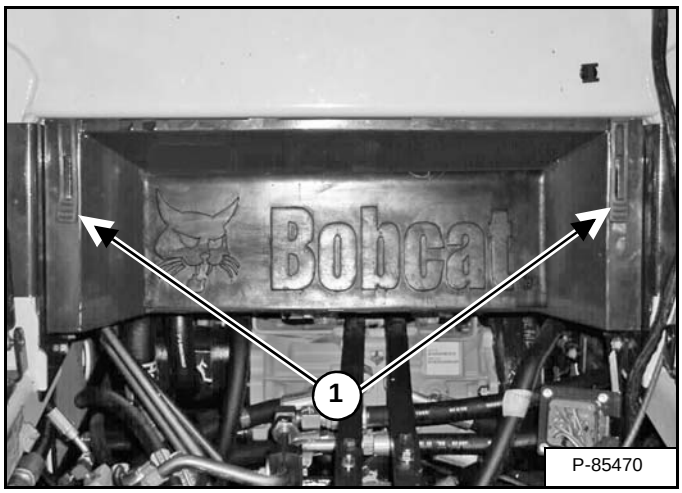
Figure 70-50-11



Inspect and replace the O-ring (Item 1) **[Figure 70-50-11]** if necessary.

Lower Fan Duct Removal And Installation

Figure 70-50-12



Unhook the rubber straps (Item 1) **[Figure 70-50-11]** and remove lower fan duct.

Blower Housing Removal And Installation

IMPORTANT

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

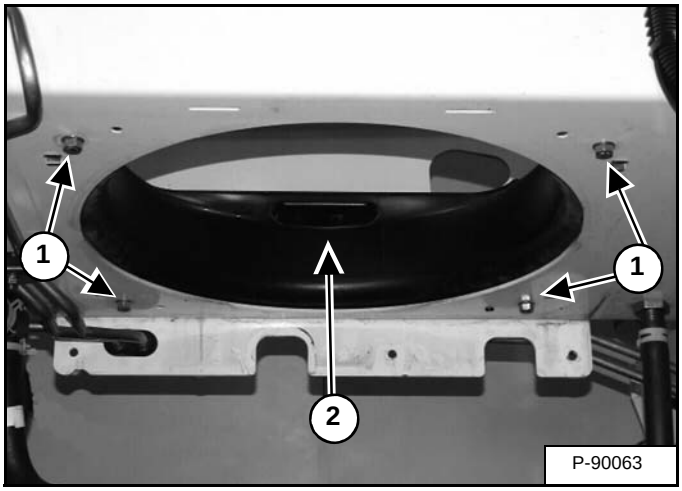
I-2003-0888

Remove the air conditioning condenser if equipped. (See Removal And Installation on Page 80-60-1.)

Remove the oil cooler. (See Removal And Installation on Page 20-90-1.)

Remove the radiator. (See Radiator Removal And Installation on Page 70-50-1.)

Figure 70-50-13



Remove the four bolts (Item 1)**[Figure 70-50-13]**.

Remove the blower housing (Item 2)**[Figure 70-50-13]** from the loader.

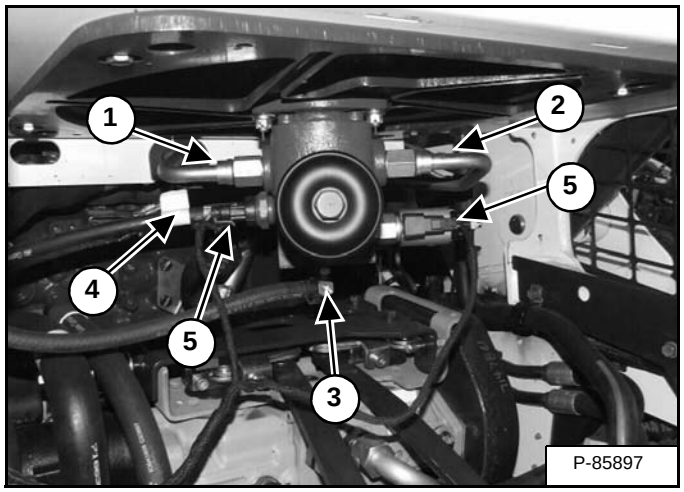
NOTE: Engine and hydraulic fan assembly removed for photo clarity.

NOTE: Line up the bushings and bolts thru the fan shroud

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Hydraulic Fan Motor Assembly Removal And Installation

Figure 70-50-14



Remove the fan motor inlet hose (Item 1) and outlet hose (Item 2) **[Figure 70-50-14]**.

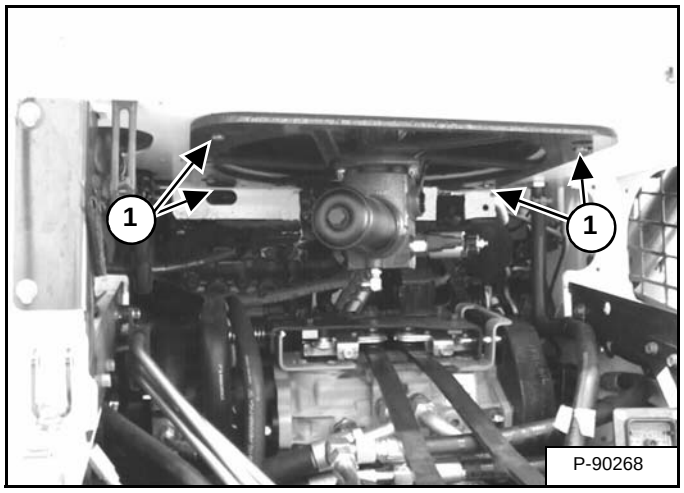
Remove the fan case drain hose (Item 3) **[Figure 70-50-14]**.

Remove the charge pressure hose (Item 4) **[Figure 70-50-14]**.

Cap and plug all hose's.

Disconnect the electrical connectors (Item 5) **[Figure 70-50-14]**.

Figure 70-50-15

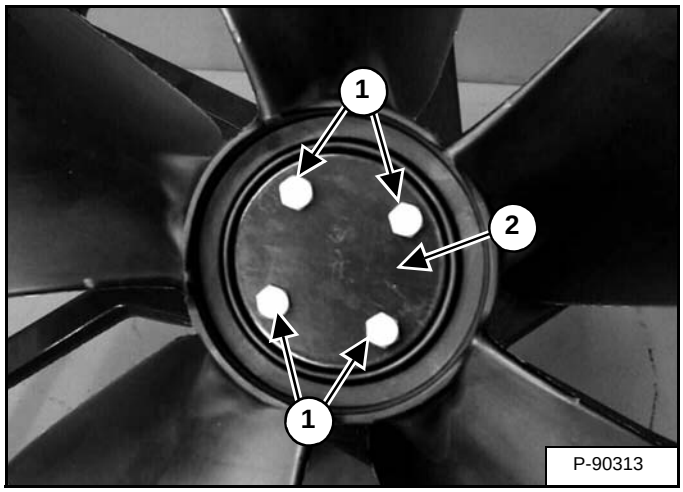


Remove the four bolts (Item 1) **[Figure 70-50-15]**.

Remove fan assembly (Item 2) **[Figure 70-50-15]**.

Fan Removal And Installation

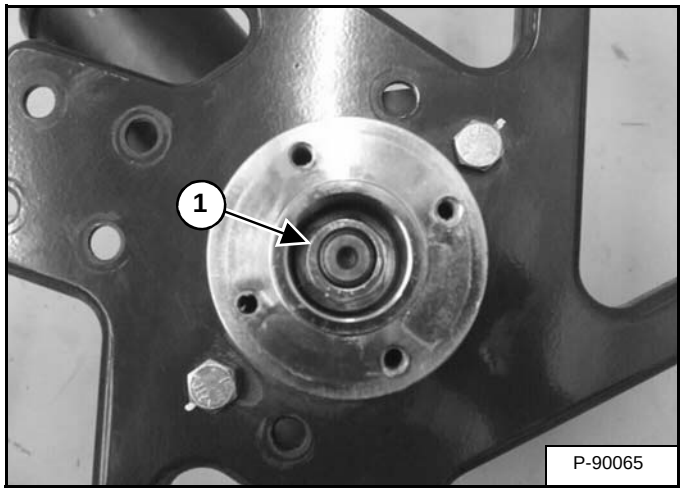
Figure 70-50-16



Remove the four bolts (Item 1) and the cover plate (Item 2) **[Figure 70-50-16]**.

Installation: Tighten the bolts to 10,2 N•m (7.5 ft-lb) torque.

Figure 70-50-17



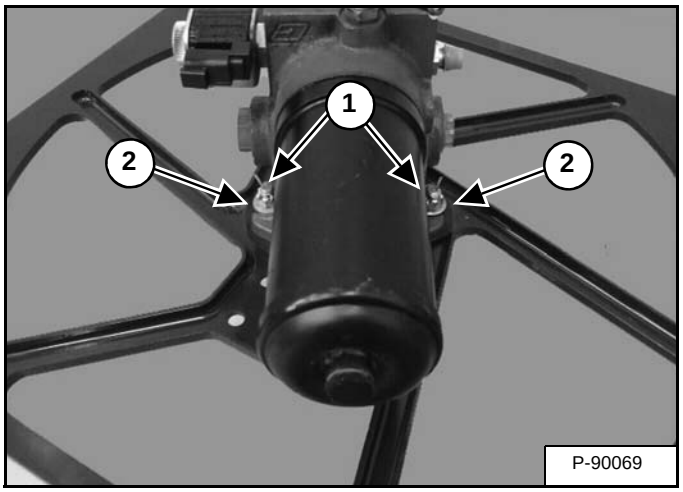
Remove the nut (Item 1) **[Figure 70-50-17]** and washer from the motor shaft.

Installation: Tighten the nut to 61 - 75 N•m (45 - 55 ft-lb) torque.

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Hydraulic Fan Motor Removal And Installation

Figure 70-50-18

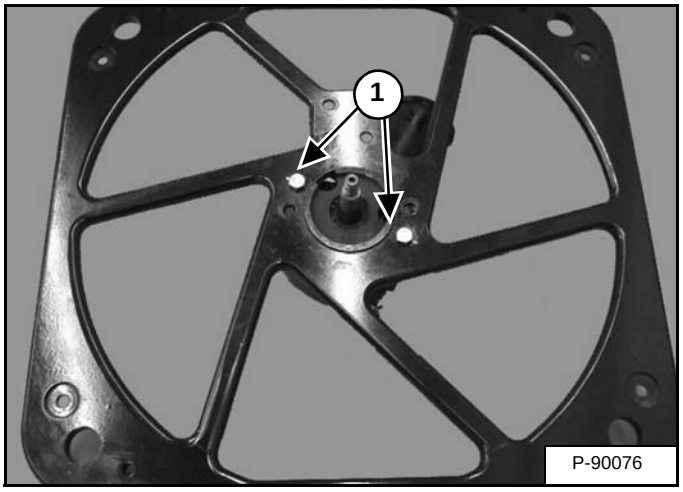


Remove and discard the two nuts and cotter pins (Item 1) **[Figure 70-50-18]**.

Remove the two washers (Item 2) **[Figure 70-50-18]**.

Installation: Tighten the nuts to 10,2 N•m (7.5 ft-lb) torque.

Figure 70-50-19

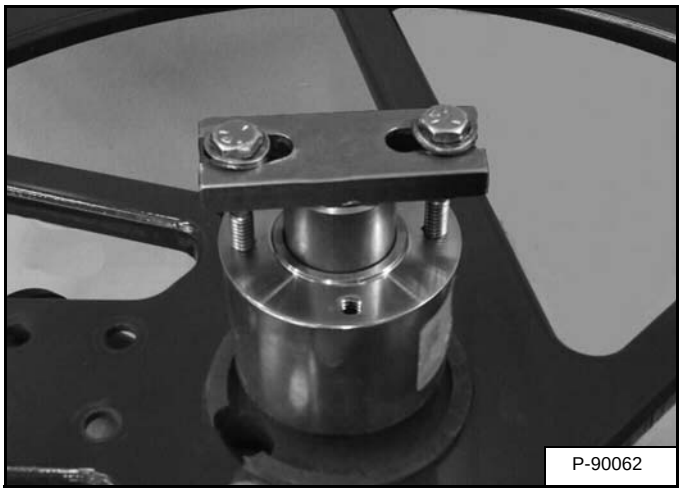


Remove and discard the two bolts (Item 1) **[Figure 70-50-19]** then remove motor.

Installation: Tighten the bolts to 10,2 N•m (7.5 ft-lb) torque.

NOTE: Always install new bolts, nuts, cotter pins, and rubber gasket when installing the fan motor.

Figure 70-50-20



Use the following procedure to remove the fan hub from the fan motor shaft:

Install a bushing (Item 1) **[Figure 70-50-20]** in the hub to protect the fan motor shaft and threads during removal.

Use two bolts to position a puller (Item 2) on the bushing (Item 1) as shown **[Figure 70-50-20]**.

NOTE: If a puller is not available one can be made if needed to remove the hub from the shaft.

Tighten the bolts and strike the puller with a hammer to loosen the hub from the motor shaft.

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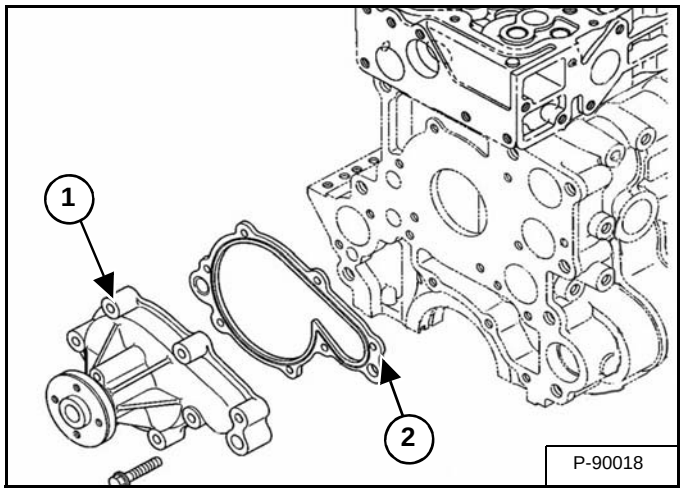
Water Pump Removal And Installation

Drain the cooling system.

Remove the alternator belt.

Remove the water pump bolts.

Figure 70-50-21

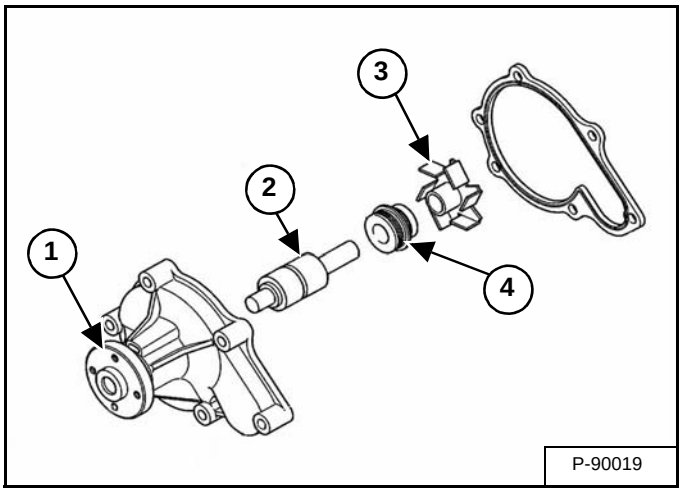


Remove the water pump (Item 1) **[Figure 70-50-21]**.

Installation: Always use a new gasket (Item 2) **[Figure 70-50-21]** when installing the water pump.

Water Pump Disassembly And Assembly

Figure 70-50-22



Remove the flange (Item 1) **[Figure 70-50-22]**.

Press the shaft (Item 2) and impeller (Item 3) **[Figure 70-50-22]** out the impeller side of the water pump.

Remove the impeller (Item 3) **[Figure 70-50-22]** from the shaft.

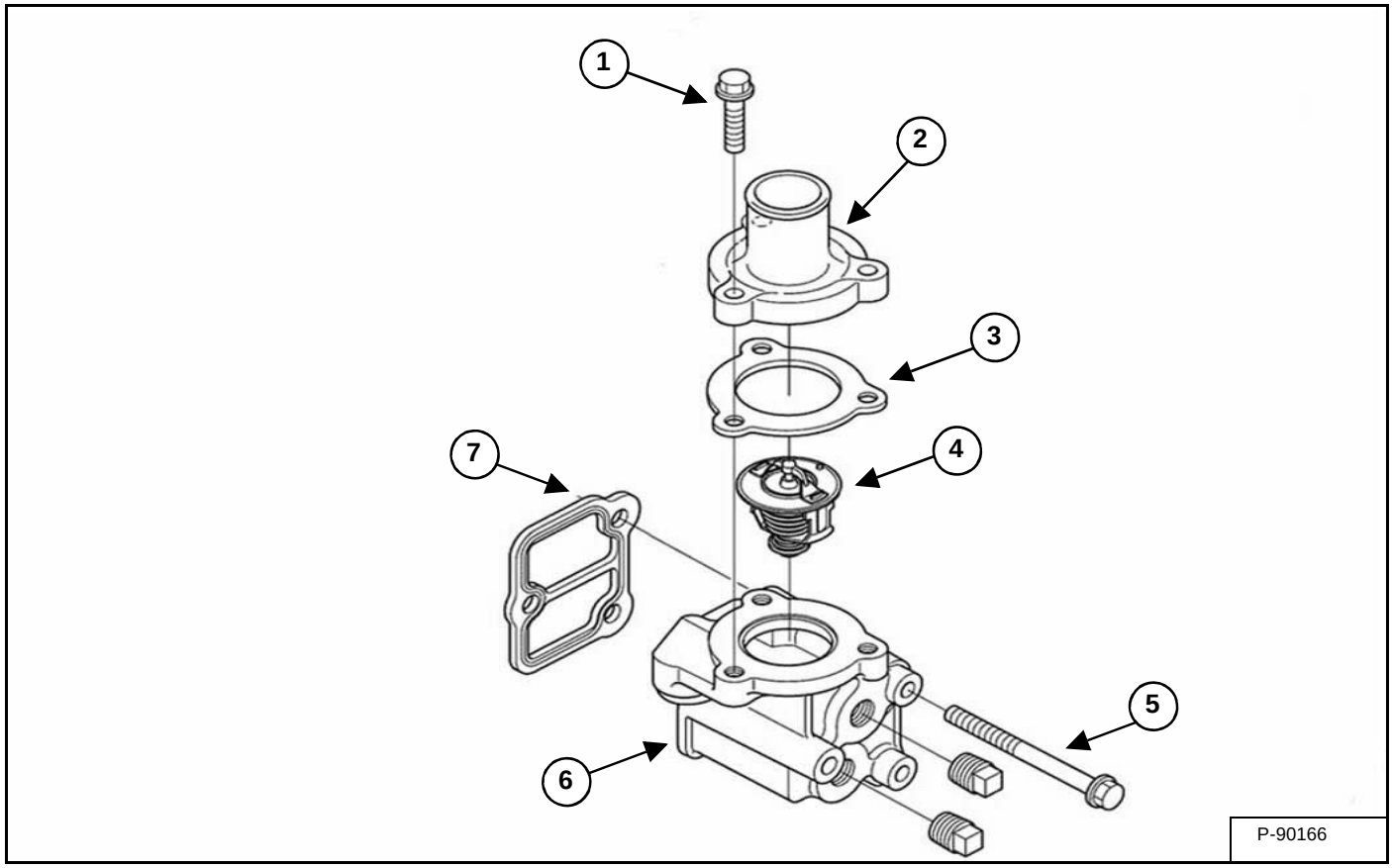
Remove the seal (Item 4) **[Figure 70-50-22]**.

Install a new seal (Item 4) **[Figure 70-50-22]** when assembling the water pump.

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Thermostat Housing Removal And Installation

Figure 70-50-23



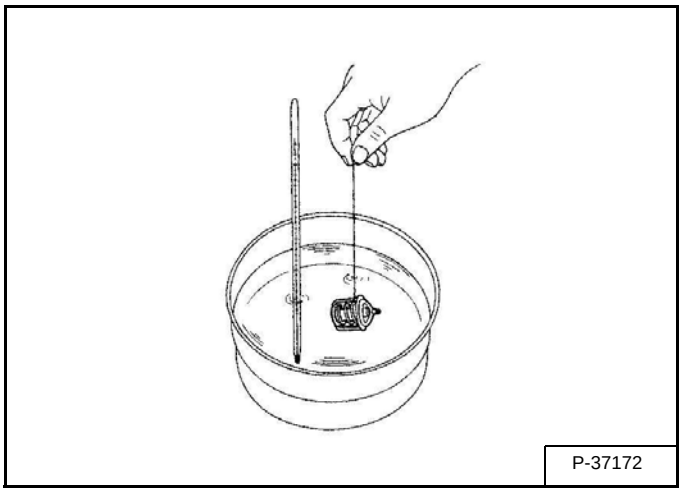
Remove the bolts (Item 1), housing (Item 2), gasket (Item 3) and thermostat (Item 4) **[Figure 70-50-23]**.

Remove bolts (Item 5), housing (Item 6), and gasket (Item 7) from the cylinder head **[Figure 70-50-23]**.

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Thermostat - Checking

Figure 70-50-24



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 70-50-24]**.

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 - 78,5°C 166.1 - 173°F
Temperature at which thermostat completely opens	Factory spec.	90°C 194°F

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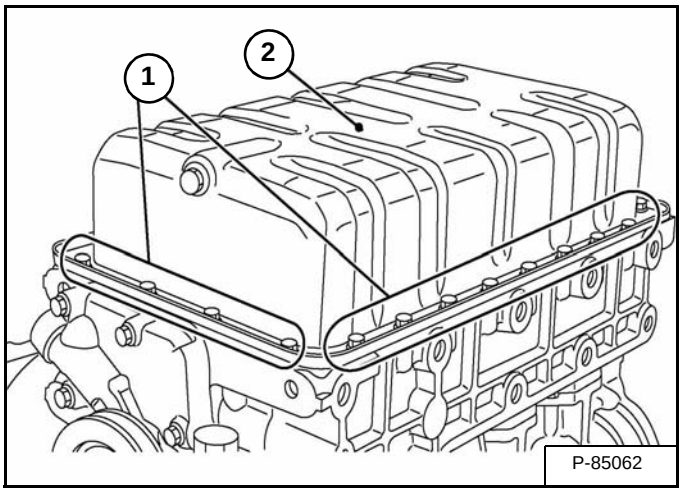
LUBRICATION SYSTEM

Oil Pan Removal And Installation

Remove the engine and hydrostatic pump assembly from the loader. (See Engine Removal And Installation on Page 70-10-7.)

The engine will have to be on an engine stand or suspended in the air safely to remove the oil pan.

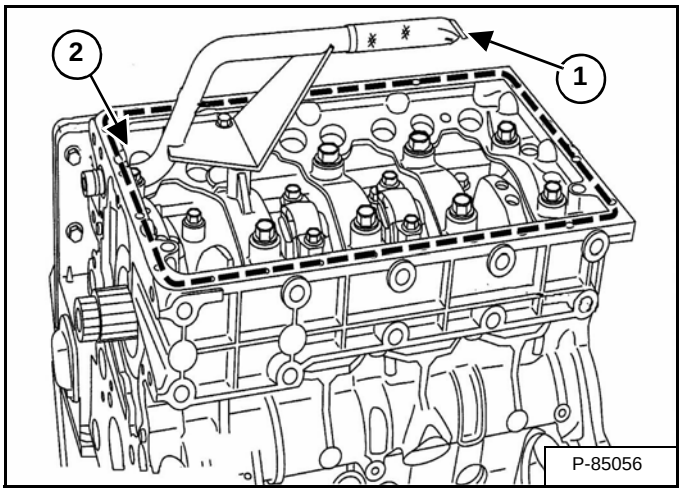
Figure 70-60-1



Remove oil pan bolts (Item 1) securing oil pan (Item 2) **[Figure 70-60-2]**. Slightly tapping on the oil pan with a soft mallet will break loose the oil pan from the engine block.

Installation: Use a liquid gasket adhesive to the oil pan side of the oil pan gasket. Tighten oil pan bolts to 39 - 75 N•m (29 - 33 ft-lb) torque.

Figure 70-60-2

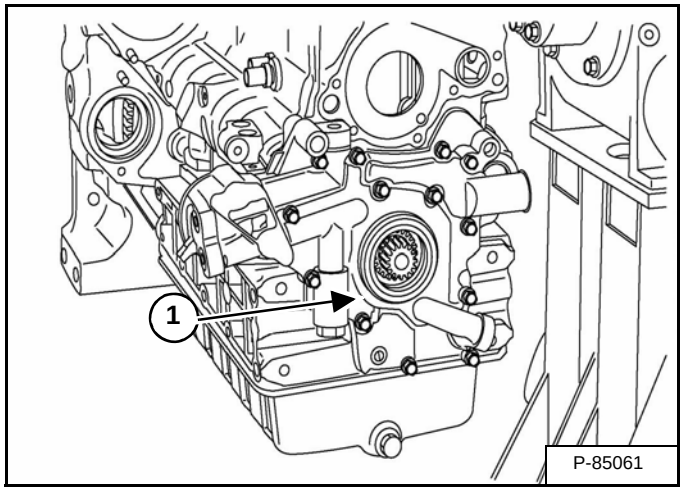


Remove the oil strainer (Item 1) and O-ring (Item 2) **[Figure 70-60-2]** from the engine block.

Installation: Apply oil to O-ring.

Oil Pump Removal And Installation

Figure 70-60-3



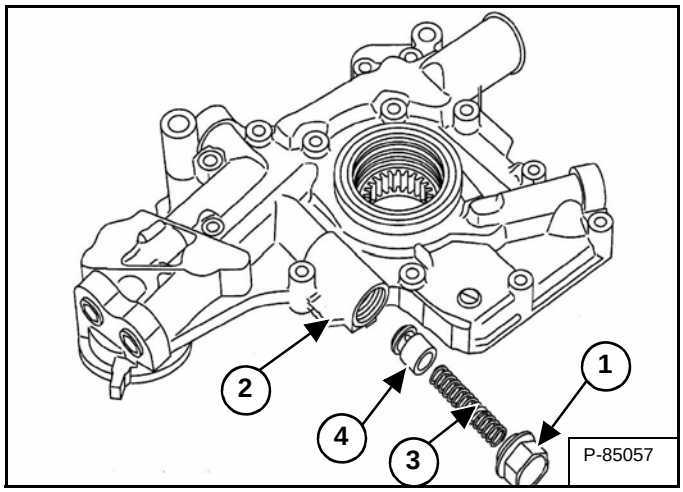
Remove the bolts from the front cover / oil pump (Item 1) **[Figure 70-60-3]**.

Installation: Use a liquid gasket adhesive.Tighten the front cover / oil pump mounting bolts to 24 - 27 N•m (18 - 20 ft-lb) torque.

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Relief Valve - Testing

Figure 70-60-4



Remove the relief valve retaining screw (Item 1) from the front cover / oil pump (Item 2) and remove the relief valve spring (Item 3) and relief valve (Item 4) **[Figure 70-60-4]**.

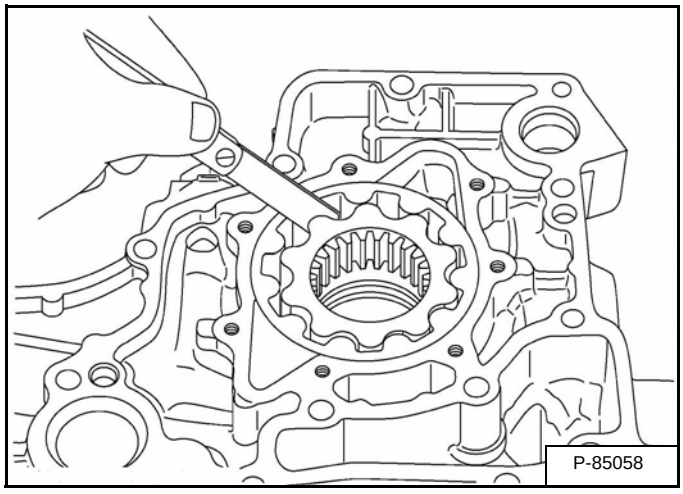
Measure free length of relief valve spring (Item 3) **[Figure 70-60-4]** and check the entire surface of spring for any scratches. Replace if out of spec or any scratches.

Free Length	60,0 - 60,5 mm (2.37 - 2.38 in)
Allowable Limit	55,0 mm (2.17 in)

Installation: Tighten relief valve retaining screw (Item 1) **[Figure 70-60-4]** 69 - 78 N•m (51 - 57 ft-lb) torque.

Oil Pump Inspection

Figure 70-60-5



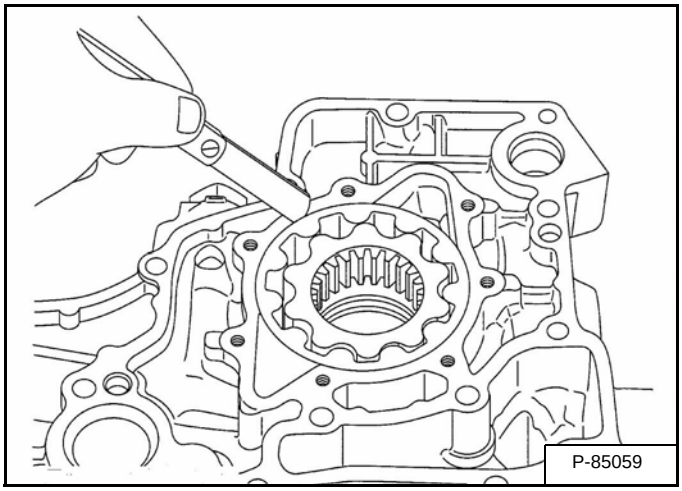
Remove oil pump cover screws. Measure the clearance between the lobes of the inner rotor and outer rotor **[Figure 70-60-5]**.

Installation: Tighten cover screws to 7,9 - 9,3 N•m (5.8 - 6.8 ft-lb)

Clearance Between Inner & Outer Rotor	0,030 - 0,090 mm (0.0012 - 0.0035 in)
Allowable limit	0,30 mm (0.012 in.)

If the clearance exceeds the allowable limit, replace the oil pump.

Figure 70-60-6



Measure the clearance between the outer rotor and pump body **[Figure 70-60-6]**.

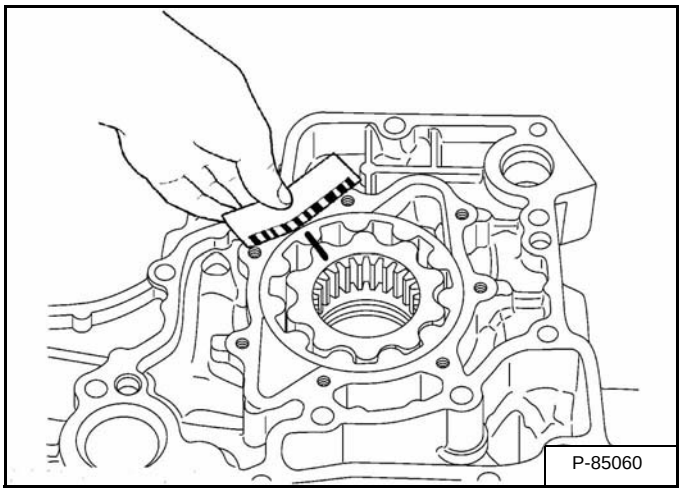
Clearance Between Outer Rotor & Body	0,100 - 0,184 mm (0.00394 - 0.00724 in)
Allowable limit	0,30 mm (0.012 in)

If the clearance exceeds the allowable limit, replace the oil pump.

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Oil Pump Inspection (Cont'd)

Figure 70-60-7



Put a piece of press gauge on the rotor face **[Figure 70-60-7]**.

Install the cover and tighten the bolts.

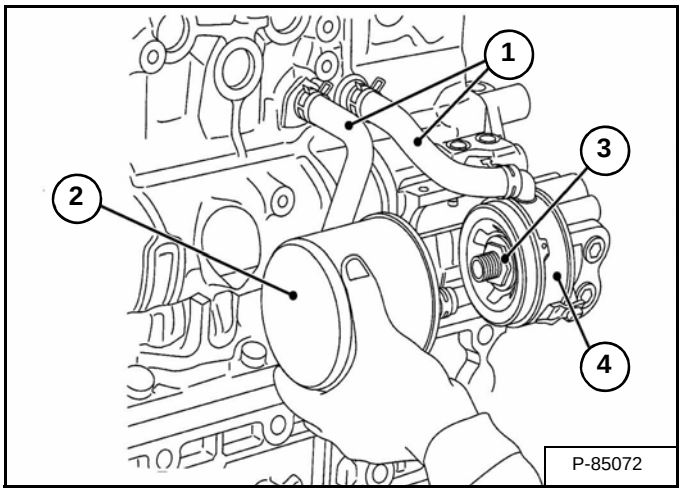
Remove the cover carefully. Measure the width of the press gauge **[Figure 70-60-7]**.

If the clearance exceeds the allowable limit replace the oil pump.

End Clearance	0,25 - 0,75 mm (0.00099 - 0.0029 in)
Allowable limit	0,225 mm (0.00886 in)

Oil Filter Cooler Removal And Installation

Figure 70-60-8



Remove the cooling hose's (Item 1) **[Figure 70-60-8]**.

Remove oil filter cartridge (Item 2) and the oil cooler joint screw (Item 3) **[Figure 70-60-8]**.

Remove oil cooler (Item 4) **[Figure 70-60-8]**.

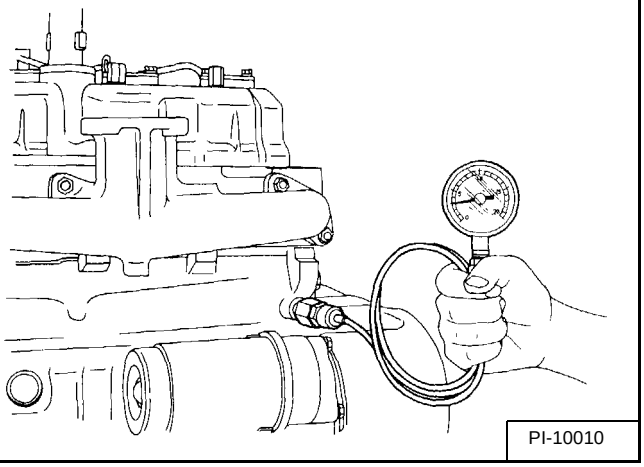
Installation: Tighten oil cooler joint screw (Item 3) **[Figure 70-60-8]** 64 - 73 N•m (47 - 54 ft-lb) torque.

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Engine Oil Pressure - Testing

Remove the oil pressure sender.

Figure 70-60-9



Install a pressure gauge **[Figure 70-60-9]**.

Start the engine and run until it is at operating temperature.

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

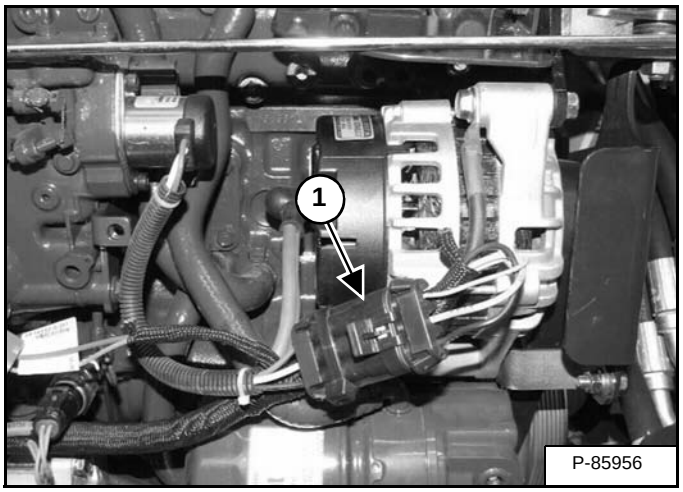
* Engine Oil Level Low
* Oil Pump Defective
* Oil Galley Plugged
* Oil Strainer Plugged
* Excessive Clearance at the Rod & Main Bearings
* Oil Pump Relief Valve Stuck

At Idle Speed Allowable Limit	48,3 kPa (0.49 bar) (7 psi)
At Rated Speed	193,0 - 393,0 kPa (1,9 - 3,9 bar) (28 - 57 psi)
Allowable Limit	144,8 kPa (1,4 bar) (21 psi)

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Fuel Shutoff Solenoid - Checking

Figure 70-70-1

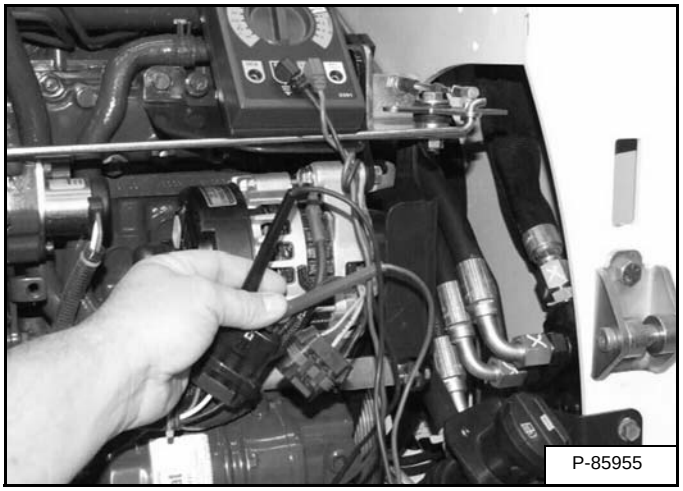


Stop the engine and open the rear door **[Figure 70-70-1]**.

Disconnect the connector (Item 1) **[Figure 70-70-1]** from the fuel shutoff solenoid.

Use an ohmmeter to check the fuel shutoff solenoid.

Figure 70-70-2

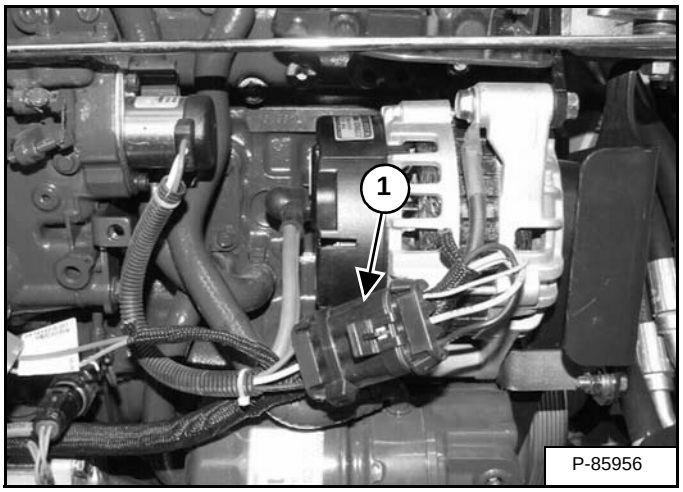


The reading between electrical connector terminal C and terminal A must be between approximately 0.33 ohm **[Figure 70-70-2]**.

The reading between electrical connector terminal C and terminal B must be between approximately 24.5 ohm.

Fuel Shutoff Solenoid Removal And Installation

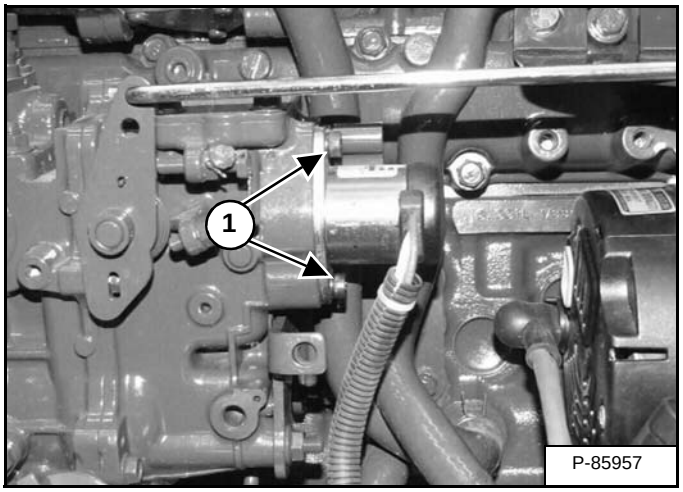
Figure 70-70-3



Stop the engine and open the rear door.

Disconnect the connector (Item 1) **[Figure 70-70-3]**.

Figure 70-70-4



Remove the mounting screws (Item 1) **[Figure 70-70-4]** of the fuel shutoff solenoid.

Reverse the above procedure to install the fuel shutoff solenoid.

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Fuel Injection Pump - Checking

The injection pump contains parts which have a very close tolerance and its operation has a direct effect on the performance of the engine.

⚠ WARNING

AVOID INJURY OR DEATH

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

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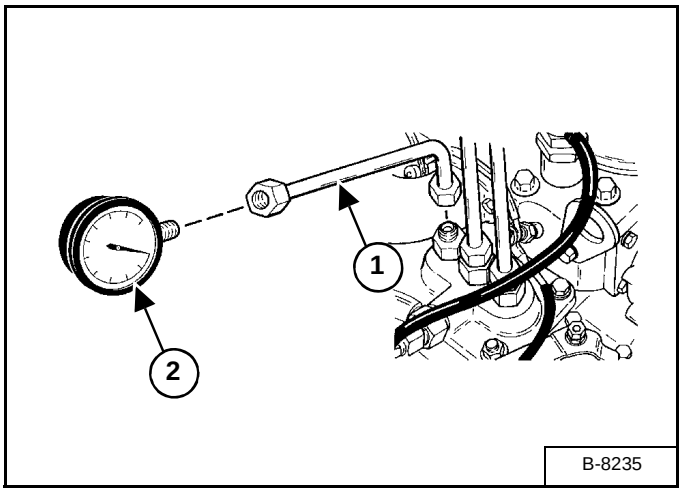
The tools listed will be needed to do the following procedure:

MEL 1237 - Adapter Fuel Line
MEL 1173-1 Pressure Gauge

To check the discharge pressure at the fuel injection pump, use the following procedure:

Disconnect a high pressure fuel line from the injection pump. Loosen the other end of the same fuel line so it can be turned away from the fitting.

Figure 70-70-5



Connect the adapter fuel line (Item 1) to the fitting and connect the pressure gauge (Item 2) **[Figure 70-70-5]**.

Move the speed control lever to the high engine idle position.

Turn the flywheel to increase the pressure. If the pressure can not reach the allowable limit, replace the injection pump assembly.

Fuel Tightness of Pump Element Allowable Limit	18,6 MPa (186,3 bar) (2702 psi)

With the speed control lever at the low engine idle position, turn the flywheel until the pressure is at 18,6 MPa (186,3 bar) (2702 psi).

Turn the flywheel back approximately one-half turn. Keep the flywheel at this position, and measure the time it takes the pressure to decrease from 17,7 MPa (176,5 bar) (2560 psi).

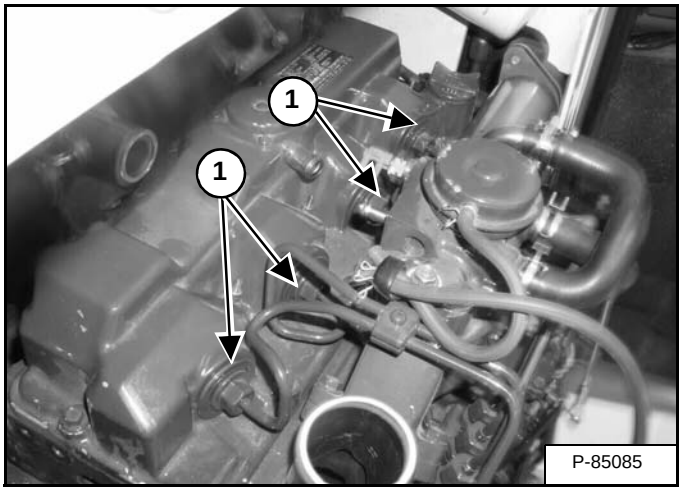
Fuel Tightness of Delivery Valve Allowable Limit	5 Seconds

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Fuel Injection Pump Assembly Removal And Installation

Remove the alternator. (See Removal And Installation on Page 60-30-5.)

Figure 70-70-6



Clean the area around the injection pump thoroughly.

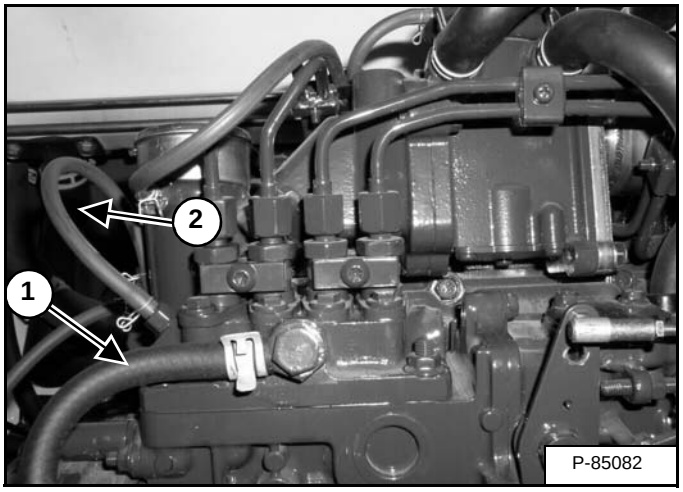
Disconnect the high pressure fuel lines (Item 1) **[Figure 70-70-6]** from the fuel injectors.

IMPORTANT

Do not bend the high pressure fuel injection tubes when removing or installing them.

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Figure 70-70-7

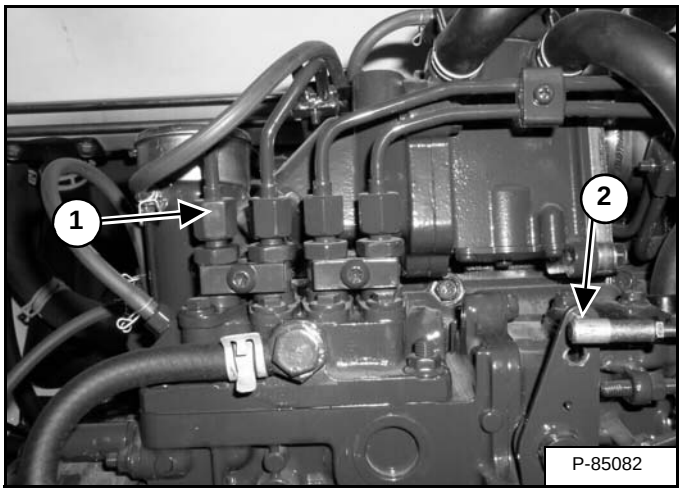


Disconnect the fuel inlet hose (Item 1) and the fuel return hose (Item 2) **[Figure 70-70-7]** from the injection pump vent.

Cap the inlets on the injection pump vent where the hoses were removed **[Figure 70-70-7]**.

.

Figure 70-70-8



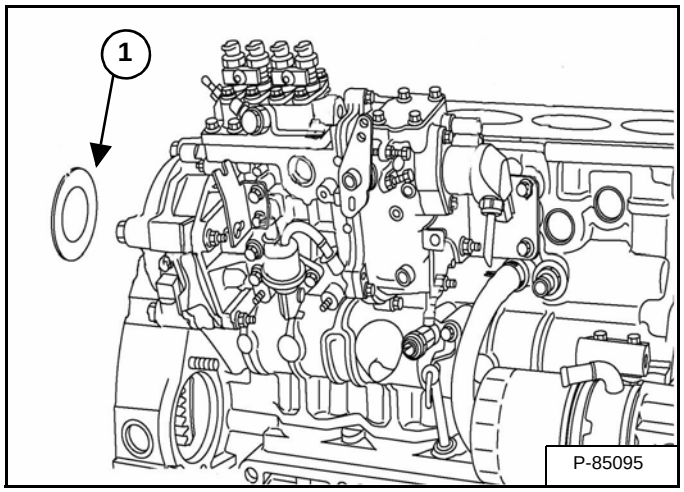
Remove the high pressure fuel lines (Item 1) **[Figure 70-70-8]** from the injection pump.

Remove the engine speed control linkage (Item 2) **[Figure 70-70-8]**.

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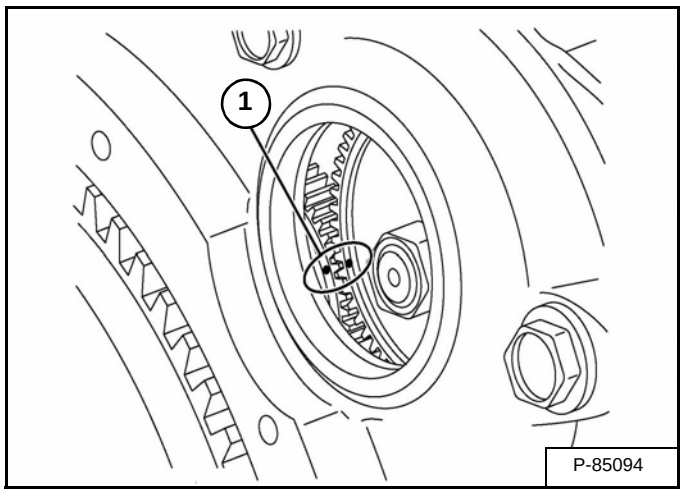
Fuel Injection Pump Assembly Removal And Installation (Cont'd)

Figure 70-70-9



Remove the window cover for the fuel injection pump assembly (Item 1) **[Figure 70-70-9]** from the flywheel housing.

Figure 70-70-10

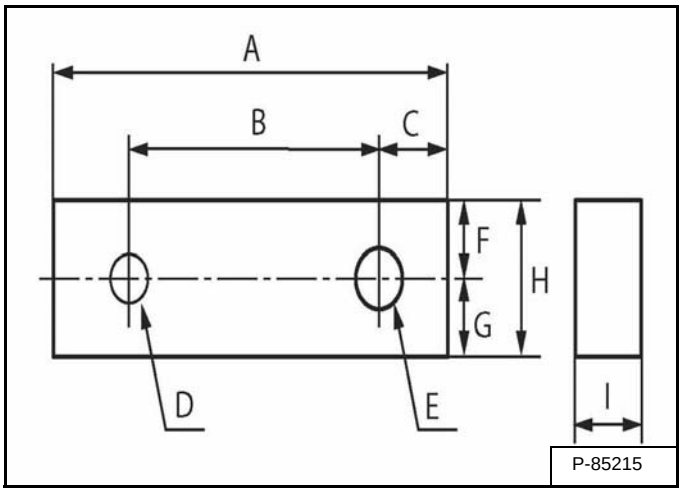


Place the number four piston at top dead center on the compression stroke and lock the flywheel in place using the flywheel stopper tool as described below.

Look for the alignment mark on the idler gear and injection pump gear (Item 1)**[Figure 70-70-10]** then using a white marking pen or the like put a alignment mark to help reassemble these gears in mesh later.

NOTE: When the already existing marks align with each other, there is no need to put another alignment mark.

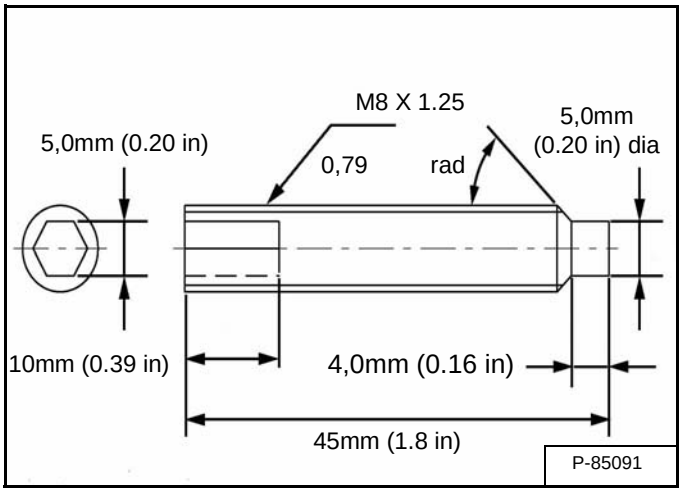
Figure 70-70-11



Make flywheel stop tool as shown above in **[Figure 70-70-11]**.

A	144 mm (5.67 in)
B	104 mm (4.09 in)
C	20,0 mm (0.787 in)
D	10,0 mm dia. (0.394 in dia.)
E	12,0 mm dia. (0.472 in dia.)
F	16,0 mm dia. (0.630 in dia.)
G	16,0 mm dia. (0.630 in dia.)
H	32,0 mm (1.26 in)
I	16,0 mm (0.630 in)

Figure 70-70-12

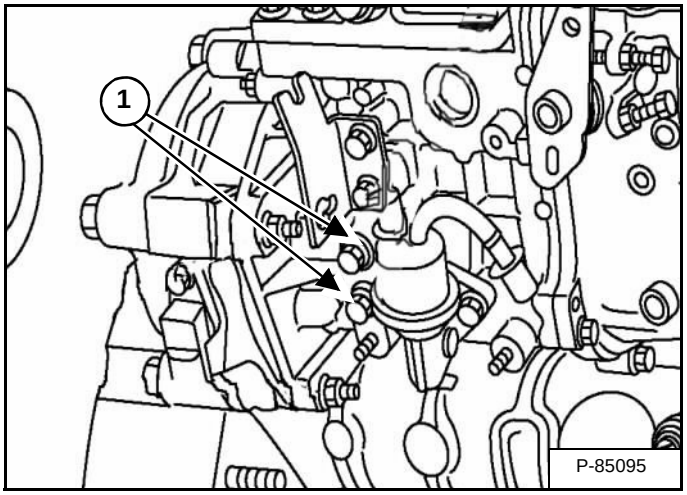


Construct two fuel camshaft lock screws as shown above **[Figure 70-70-12]**

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Fuel Injection Pump Assembly Removal And Installation (Cont'd)

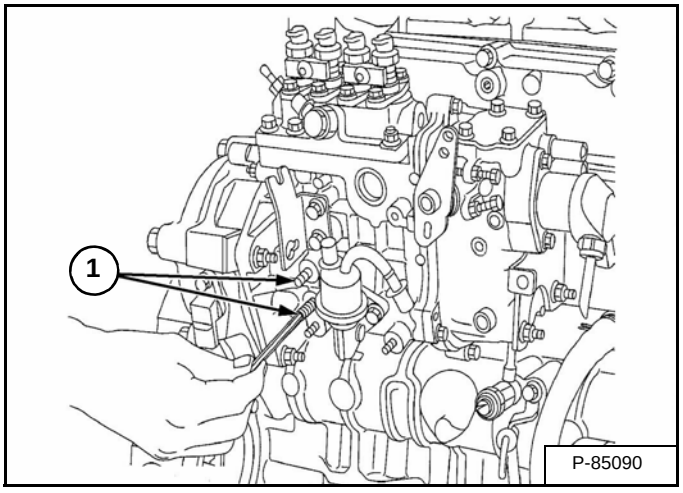
Figure 70-70-13



Remove the two plugs (Item 1) **[Figure 70-70-13]**.

Installation: Tighten the plugs to 9,81 - 11,2 N•m (7.24 - 8.31 ft-lb) torque.

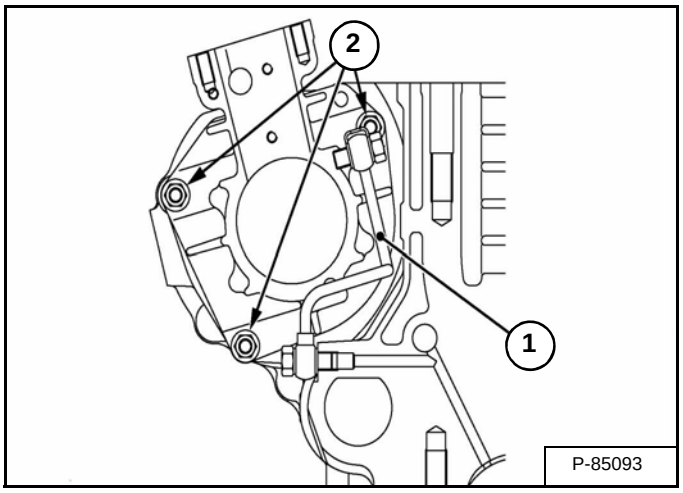
Figure 70-70-14



Install one lock tool in the upper plug opening (Item 1) and tighten until it comes in contact with the fuel camshaft. Make sure the fuel camshaft is not moving. Install second lock tool in lower opening (Item 1) **[Figure 70-70-14]** and repeat the process.

NOTE: Do not over tighten the lock screws after they have contacted the fuel camshaft. Otherwise the injection pump may become damaged.

Figure 70-70-15



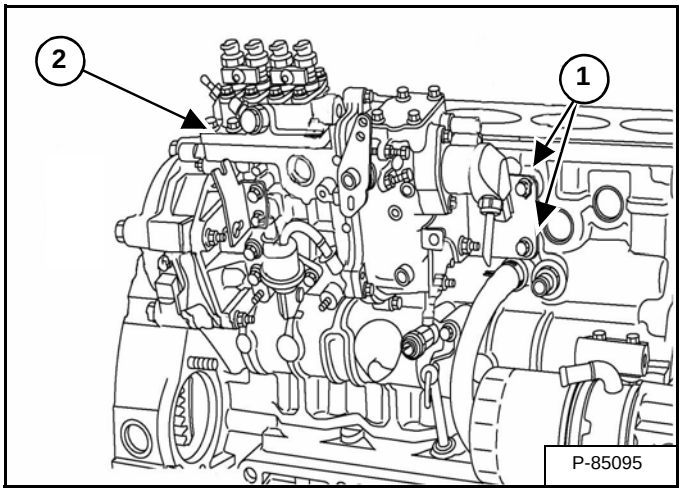
Remove the lubricating oil pipe (Item 1) **[Figure 70-70-15]**.

Remove the three injection pump mounting nuts (Item 2) **[Figure 70-70-15]**

Installation: Tighten the lubricating oil pipe to 16 - 19 N•m (12 - 14 ft-lb) torque.

Installation: Tighten the injection pump mounting nuts to 18 - 20 N•m (13 - 15 ft-lb) torque.

Figure 70-70-16



Remove injection pump support (Item 1) **[Figure 70-70-16]**.

Remove injection pump assembly (Item 2) **[Figure 70-70-16]**.

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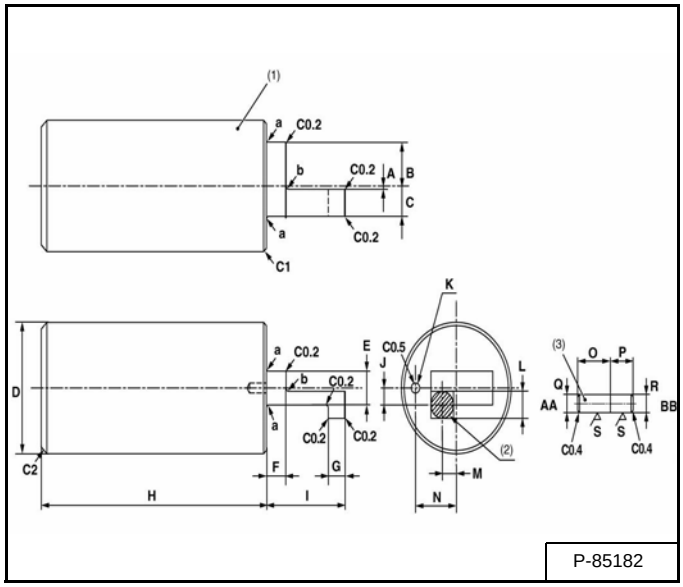
Governor Housing Disassembly And Assembly

The governor serves to keep the engine speed constant by automatically adjusting the amount of fuel supplied to the engine according to changes in the engine load.

Disassemble and assemble the governor and fuel camshaft as shown in figure.

Check all the parts for wear or damage and replace as needed.

Figure 70-70-17



Jig for Governor Connecting Rod

Application: Use this tool for connecting the governor connecting rod to the rack pin of the fuel injection pump assembly.

A	0,50 mm (0.020 in)
B	12,7 - 13,0 mm (0.500 - 0.511 in)
C	8,70 - 9,00 mm (0.343 - 0.354 in)
D	39 mm dia (1.54 in dia.)
E	10,0 ‘mm (0.394 in)
F	7,0 mm (0.28 in)
G	6,0 mm (0.24 in)
H	80,0 mm (3.15 in)
I	27,95 - 28,05 mm (1.101 - 1.104 in)
J	5,0 mm (0.20 in)
K	3,000 - 3,010 mm dia, 6,0 mm depth (0.1182 - 0.1185 in dia, 0.24 in depth)
L	9,0 mm (0.35 in)
M	5,0 mm (0.020 in)
N	14,45 - 14,55 mm (0.5689 - 0.5728 in)
O	5,0 mm (0.020 in)
P	4,0 mm (0.16 in)
Q	2,955 - 2,965 mm dia. (0.1164 - 0.1167 in dia.)
R	3,020 - 3,030 mm dia. (0.1189 - 0.1192 in dia.)
S	Ra = 1.6a
AA	Governor housing side
BB	Press in side
a	0,60 mm radius (0.024 in radius)
b	1,0 mm radius (0.039 in radius)
C0.2	Chamfer 0,20 mm (0.0079 in)
C0.4	Chamfer 0,40 mm (0.016 in)
C0.5	Chamfer 0,50 mm (0.020 in)
C1	Chamfer 1,0 mm (0.039 in)
C2	Chamfer 2,0 mm (0.079 in)

Make the tool as shown in figure **[Figure 70-70-17]** or purchase part number below to connect the governor connecting rod to the rack pin of the fuel injection pump.

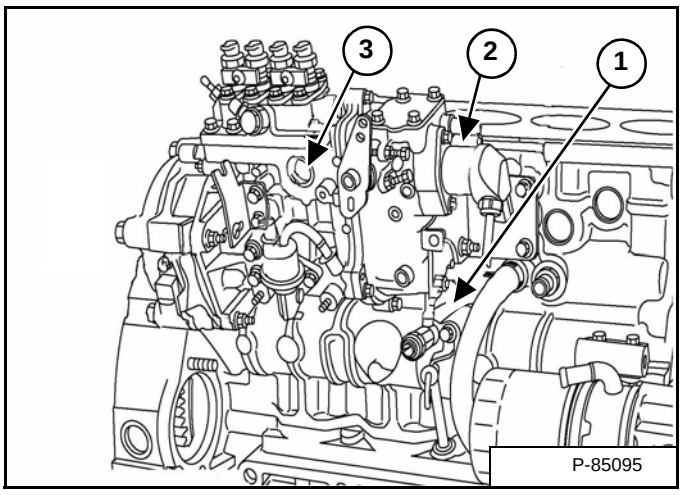
MEL1667 - Jig for Governor Connecting Rod

(Item 1) **[Figure 70-70-17]** Material: S43C-D
(Item 2) **[Figure 70-70-17]** Permanent Magnet: 8 mm dia. (0.31 in dia.) Thickness: 3 mm (0.12 in)

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Governor Housing Disassembly And Assembly (Cont'd)

Figure 70-70-18



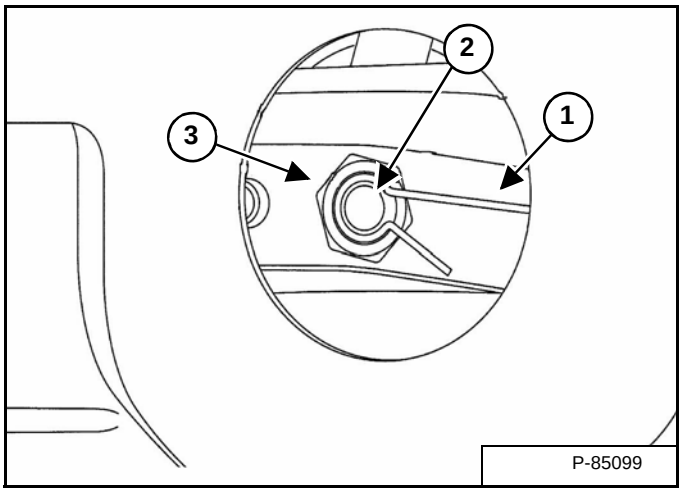
Remove the fuel injection pump assembly. (See Fuel Injection Pump Assembly Removal And Installation on Page 70-70-3.)

Remove the governor lubricating pipe (Item 1) **[Figure 70-70-18]**.

Remove the stop solenoid (Item 2) **[Figure 70-70-18]**.

Remove the sight cover (Item 3) **[Figure 70-70-18]** from the injection pump unit.

Figure 70-70-19



Unhook the start spring (Item 1) from the rack pin (Item 2) **[Figure 70-70-19]** of injection pump assembly.

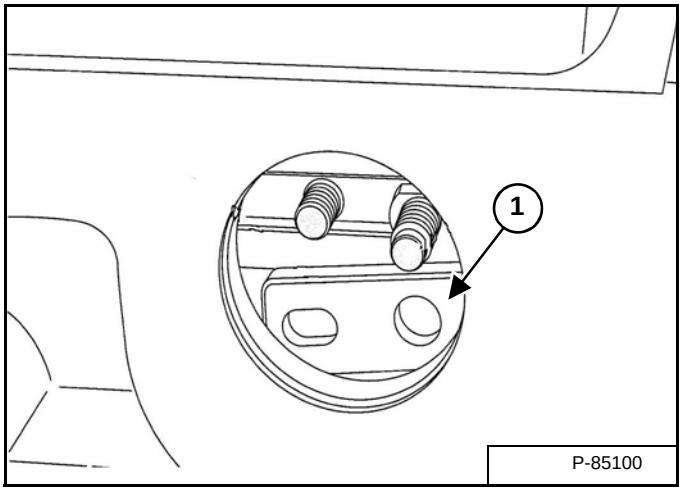
Remove the nut (Item 3) **[Figure 70-70-19]**.

Installation: Reverse procedure to install. Tighten the nut to 2.9 - 4,0 N•m (2.1 - 2.9 ft-lb) torque.

NOTE: Be careful not to drop the nut inside.

NOTE: (See Fuel Injection Pump Removal And Installation on Page 70-70-12.) for proper alignment of the governor connection rod procedure. The procedure will require a special tool as shown on page 70-70-6.

Figure 70-70-20



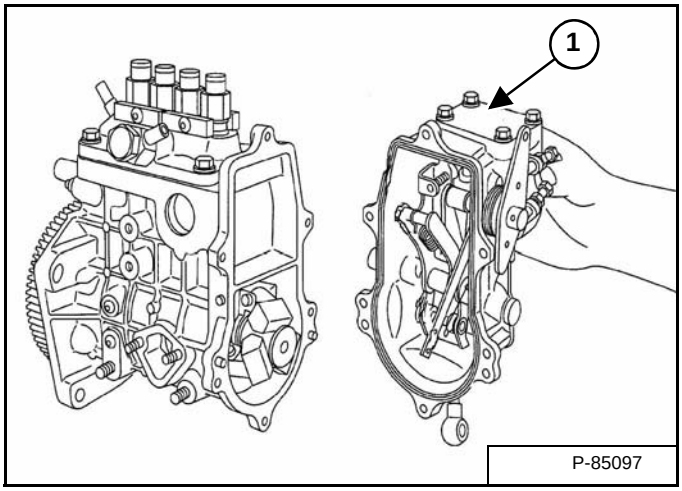
Slide off the governor connecting rod (Item 1) **[Figure 70-70-19]** from the rack pin of injection pump assembly.

For convenient sake, temporarily hook the start spring on the rack pin hole of the governor connecting rod.

Remove the governor housing mounting bolts.

Installation: Tighten the governor housing bolts to 9,81 - 11,2 N•m (7.24 - 8.31 ft-lb) torque.

Figure 70-70-21



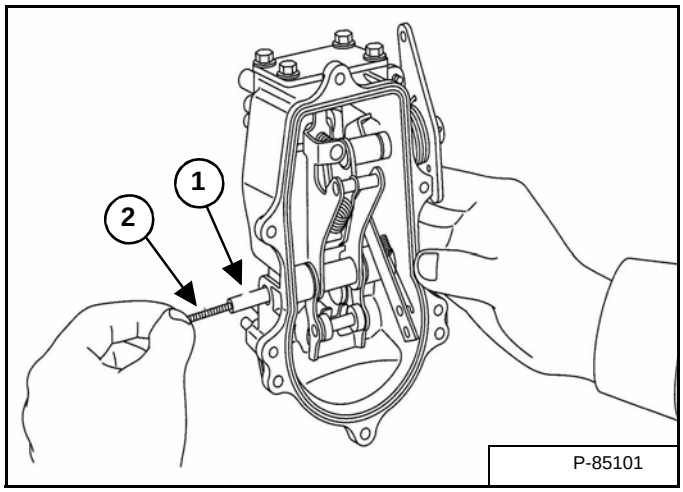
Remove the governor housing assembly (Item 1) **[Figure 70-70-21]** from the injection pump unit.

NOTE: The injection pump unit is lubricated with engine oil. Oil will leak when the governor housing is removed from the injection pump.

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Governor Disassembly And Assembly

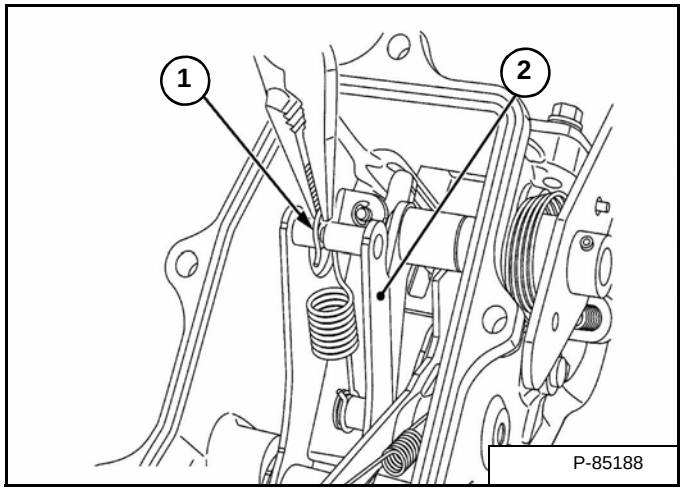
Figure 70-70-22



Remove the governor fork shaft lever (Item 1) using a bolt 4 mm dia. (0.16 in dia.), pitch 0,7 mm (0.03 in) at least a inch long (Item 2) **[Figure 70-70-22]**.

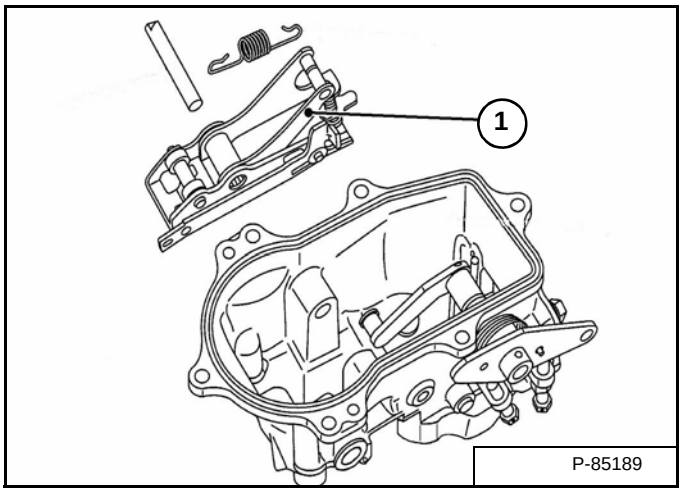
NOTE: When assembling the inside parts, lightly put oil on each inside part.

Figure 70-70-23



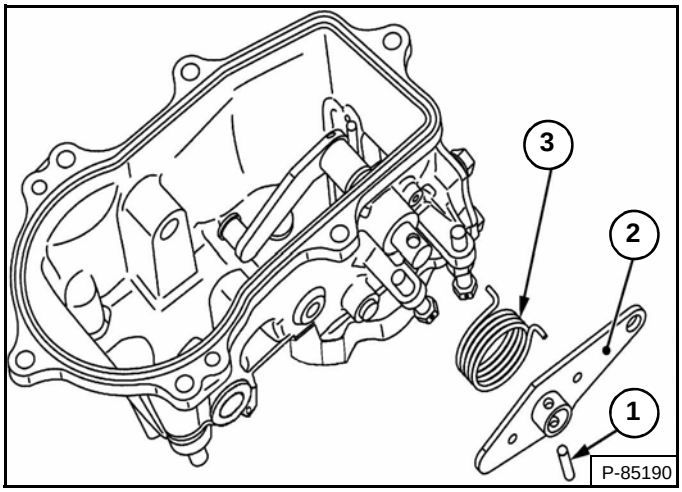
Unhook the governor spring (Item 1) at the fork lever (Item 2) **[Figure 70-70-23]**.

Figure 70-70-24



Remove the governor fork lever assembly (Item 1) from the housing **[Figure 70-70-24]**.

Figure 70-70-25

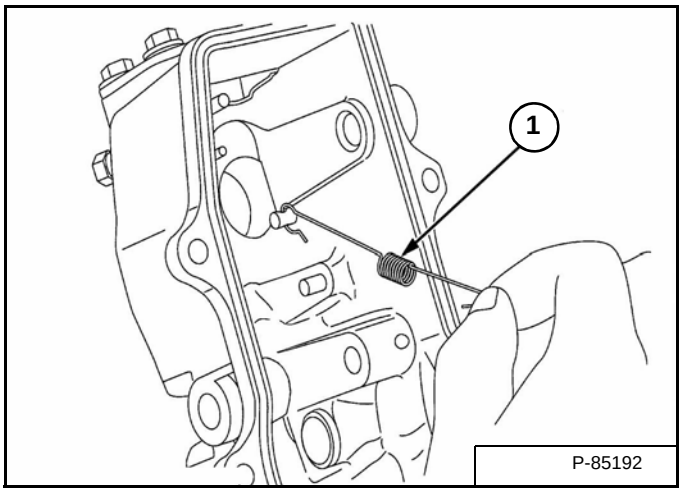


Remove the spring pin (Item 1), then remove speed control lever (Item 2) and the return spring (Item 3) **[Figure 70-70-25]**.

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Governor Disassembly And Assembly (Cont'd)

Figure 70-70-26



Remove the start spring (Item 1) **[Figure 70-70-26]** from the governor housing.

After reassembling the governor housing assembly, check the movement of the governor fork lever (Item 2), the speed control lever, stop lever, governor spring (Item 3) and governor fork lever shaft (item 4) **[Figure 70-70-26]**.

NOTE: When assembling the inside parts, lightly put oil on each inside part.

NOTE: Be careful not to deform the start spring.

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Fuel Camshaft Removal And Installation

Remove the fuel injection pump assembly. (See Fuel Injection Pump Assembly Removal And Installation on Page 70-70-3.)

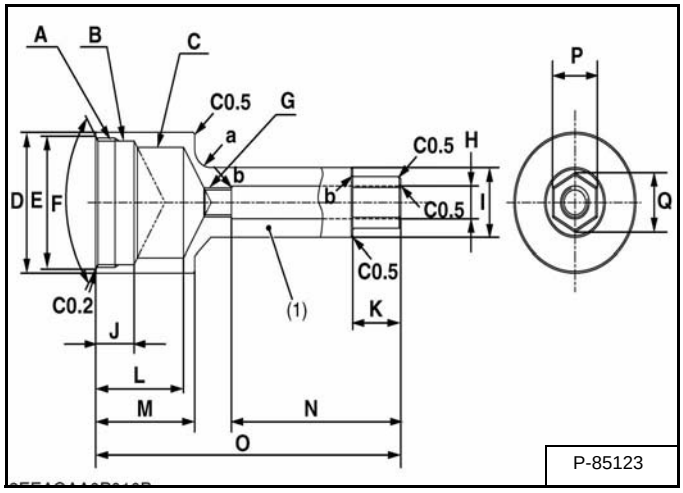
Remove the fuel injection pump unit. (See Fuel Injection Pump Assembly Removal And Installation on Page 70-70-3.)

WARNING

Eye and body protection is required when welding or grinding. Wear approved goggles, helmet and clothing. Failure to wear eye and body protection can result in serious injury.

W-2009-1285

Figure 70-70-27



A	M35 x P1.5, 6,0 mm depth (0.24 in depth)
B	35,0 mm dia.,12,0 mm depth (1.38 in dia., 0.472 in depth)
C	30,0 mm dia.,27,5 mm depth (1.18 in dia., 1.08 in depth)
D	40,00 - 40,20 mm dia. (1.575 - 1.582 in dia.)
E	35,90 - 36,10 mm dia. (1.414 - 1.421 in dia.)
F	2.09 rad (120 degrees)
G	M8 x P1.25
H	9,0 mm dia (0.35 in dia.)
I	19,0 mm dia. (0.748 in dia.)
J	12,0 mm (0.472 in)
K	15,0 mm (0.591 in)
L	27,5 mm (1.08 in)
M	31,0 mm (1.22 in)
N	2.26 in. (57,5 mm)
O	3.94 in. (100 mm)
P	3,75 - 4,00 mm (0.148 - 0.157 in)
Q	16,17 mm (0.6366 in)
a	5,0 mm radius (0.20 in radius)
b	0,40 mm radius (0.016 in radius)
C0.2	Chamfer 0,20 mm (0.0079 in)
C0.5	Chamfer 0,50 mm (0.020 in)

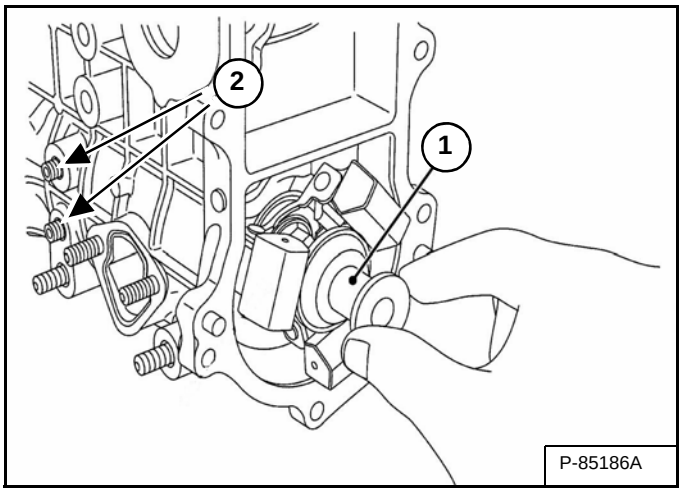
To remove and replace the fuel camshaft, make the tool as shown in figure **[Figure 70-70-27]** or purchase part number below.

MEL1666 - Injection Pump Gear Puller

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Fuel Camshaft Removal And Installation (Cont'd)

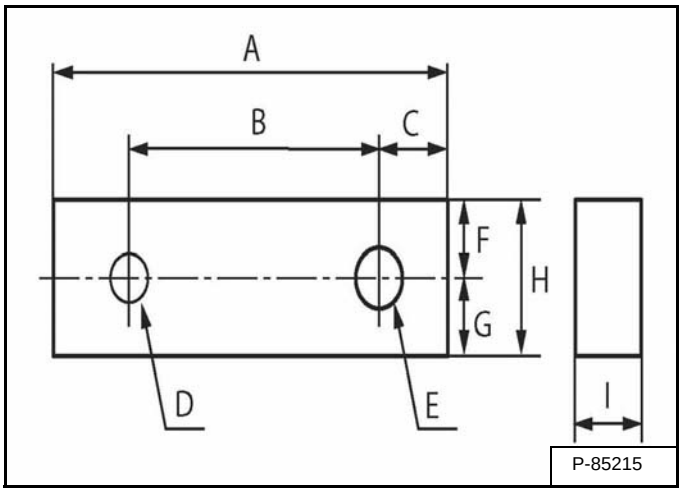
Figure 70-70-28



Remove the governor sleeve (Item 1) and remove the two fuel camshaft lock allen screws (Item 2) **[Figure 70-70-28]**.

NOTE: Do not use the fuel camshaft locks screws when removing governor weight, otherwise damage may occur to the allen screws or the governor housing.

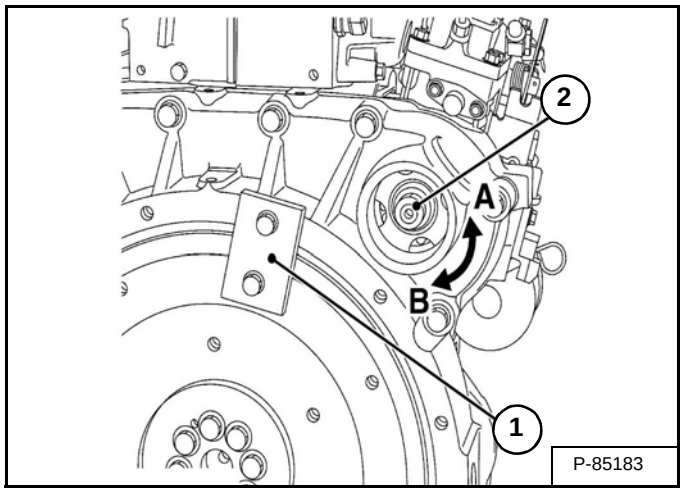
Figure 70-70-29



Make flywheel stop tool as shown above in **[Figure 70-70-29]**.

A	144 mm (5.67 in)
B	104 mm (4.09 in)
C	20,0 mm (0.787 in)
D	10,0 mm dia. (0.394 in dia.)
E	12,0 mm dia. (0.472 in dia.)
F	16,0 mm dia. (0.630 in dia.)
G	16,0 mm dia. (0.630 in dia.)
H	32,0 mm (1.26 in)
I	16,0 mm (0.630 in)

Figure 70-70-30



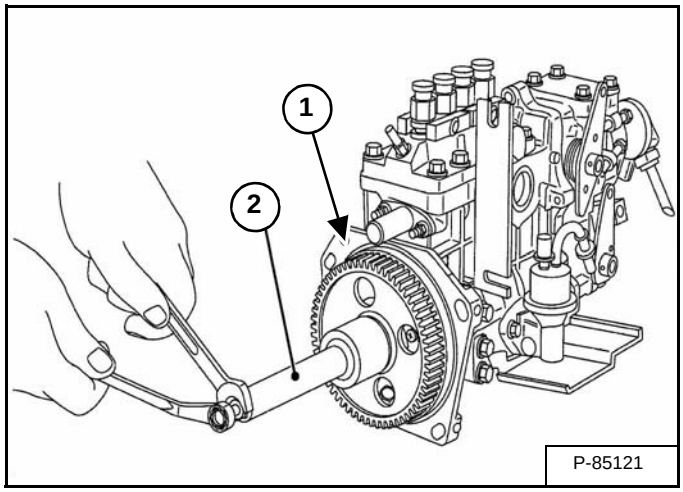
Install injection pump housing to the engine and tighten. Fix the flywheel with the flywheel stop tool (Item 1) **[Figure 70-70-32]**.

Loosen the injection pump gear mounting nut (Item 2) **[Figure 70-70-32]**.

Installation: Tighten injection pump gear mounting nut to 138 - 156 N•m (102 - 115 ft-lb).

NOTE: The injection pump gear mounting nut is a left hand thread to loosen turn towards B and to tighten turn towards A as seen from the flywheel side

Figure 70-70-31

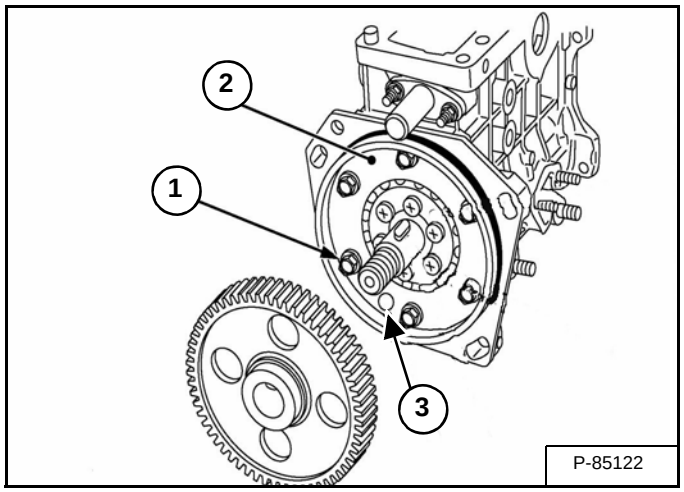


Remove the fuel injection pump gear (Item 1) using the tool (Item 2) **[Figure 70-70-31]**.

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Fuel Camshaft Removal And Installation (Cont'd)

Figure 70-70-32

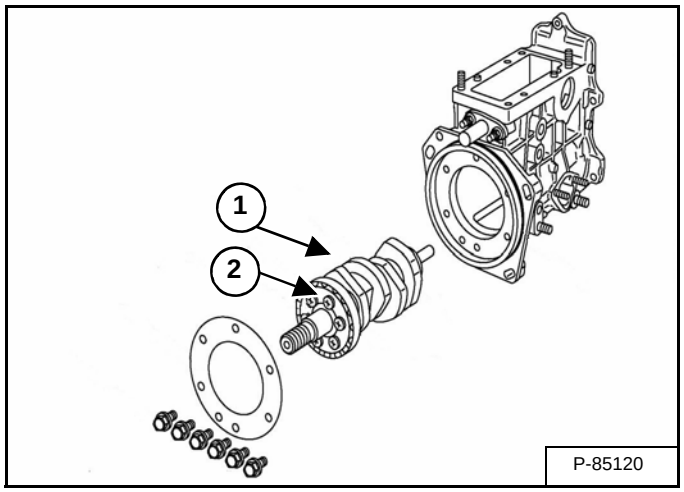


Loosen fuel camshaft stopper mounting bolts (Item 1) and remove camshaft stopper (Item 2) **[Figure 70-70-32]**.

Installation: Tighten fuel camshaft stopper mounting bolts to 9,81 - 11,2 N•m (7.24 - 8.37 ft-lb).

NOTE: When reassembling fuel camshaft stopper make sure the oil path hole (Item 3) [Figure 70-70-32] is the proper alignment.

Figure 70-70-33

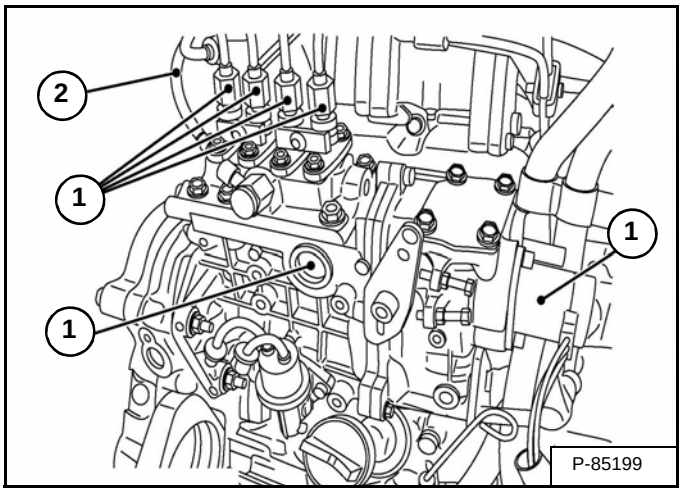


Remove fuel camshaft (Item 1), then remove fuel camshaft stopper bearing screws (Item 2) **[Figure 70-70-33]**.

If replacing the fuel camshaft bearings tighten the fuel camshaft stopper bearing plate screws (item 2) **[Figure 70-70-33]** to 3,9 - 4,2 N•m (2.9 - 3.1 ft-lb) torque.

Fuel Injection Pump Removal And Installation

Figure 70-70-34



Remove all injection pipes (Item 1) **[Figure 70-70-34]**.

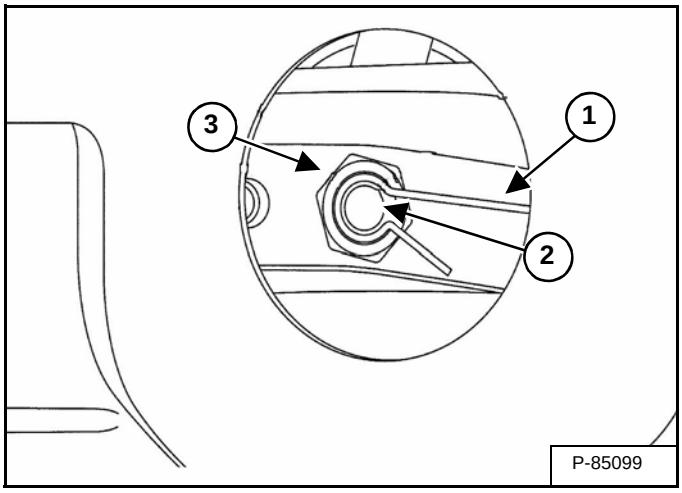
Remove overflow hose (Item 2) **[Figure 70-70-34]**.

Remove fuel stop solenoid (Item 3) **[Figure 70-70-34]**.

Remove sight cover from housing (Item 4) **[Figure 70-70-34]**.

NOTE: The injection pump can be removed and installed with the crankshaft at any position.

Figure 70-70-35



Unhook the start spring (Item 1) from the rack pin (Item 2) **[Figure 70-70-35]** of injection pump assembly.

Remove the nut (Item 3) **[Figure 70-70-35]**.

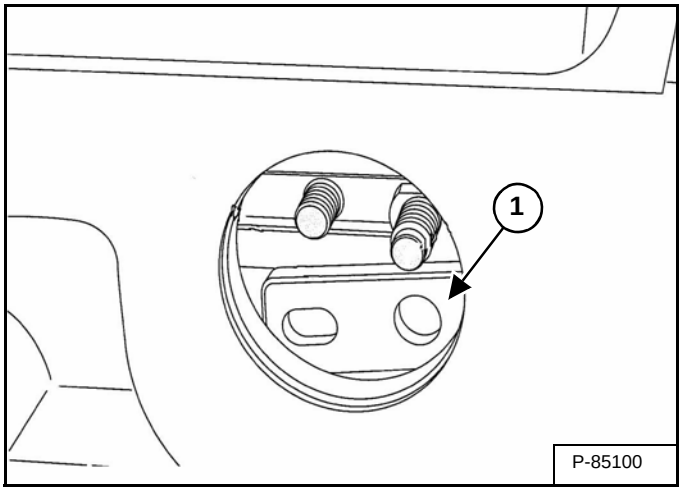
Installation: Reverse procedure to install. Tighten the nut to 2.9 - 4,0 N•m (2.1 - 2.9 ft-lb) torque.

NOTE: Be careful not to drop the nut inside.

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Fuel Injection Pump Removal And Installation (Cont'd)

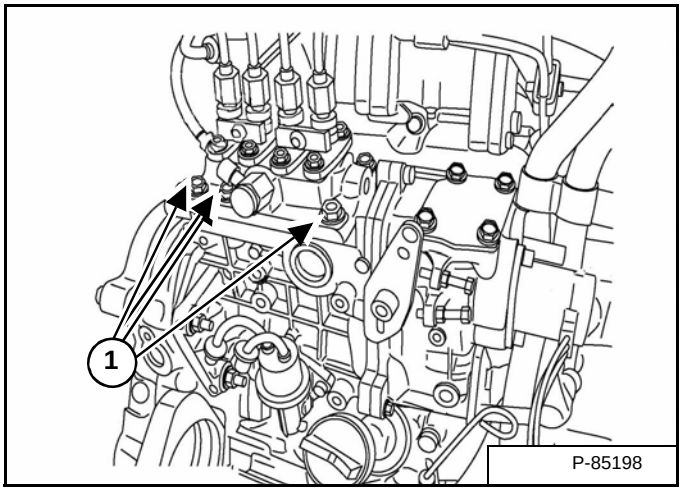
Figure 70-70-36



Slide off the governor connecting rod (Item 1) **[Figure 70-70-36]** from the rack pin of injection pump assembly.

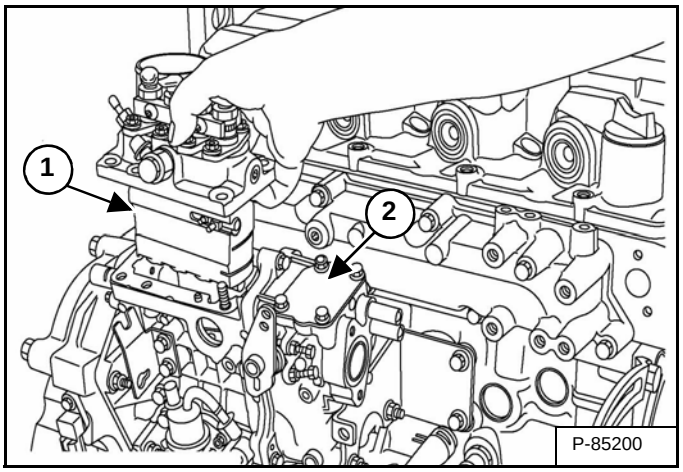
For convenient sake, temporarily hook the start spring on the rack pin hole of the governor connecting rod.

Figure 70-70-37



Remove all of the mounting bolts and nuts (Item 1) **[Figure 70-70-37]** from the fuel injection pump.

Figure 70-70-38

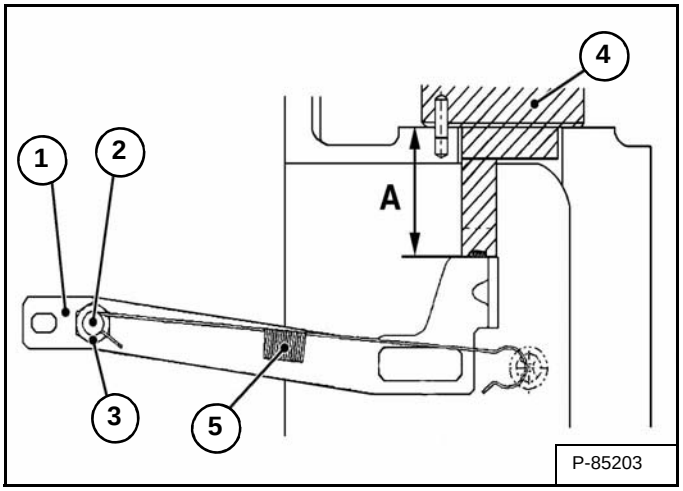


Remove the fuel injection pump (Item 1) **[Figure 70-70-38]**.

Installation: Reverse procedure to install. Tighten the bolts to 24 - 27 N•m (18 - 20 ft-lb) torque.Tighten nuts to 18 - 20 N•m (13 - 15 ft-lb)

Remove top cover (Item 2) **[Figure 70-70-38]** for adjusting the governor connecting rod.

Figure 70-70-39



Hook the governor connecting rod (Item 1) to the rack pin (Item 2) and hand tighten the nut (Item 3) **[Figure 70-70-39]**.

Place service jig (Item 4) (Refer to page 70-70-6) in place of top cover and make sure the magnet is contacting the governor connecting rod (Item 1) **[Figure 70-70-39]**. Holding down the service jig tighten the nut to specified torque.

Hook starter spring (Item 5) to rack pin (Item 2) **[Figure 70-70-39]**.

Installation: Tighten the nut (Item 3) **[Figure 70-70-39]** to 2,9 - 4,0 N•m (2.1 - 2.9 ft-lb) torque.

NOTE: A = 27,95 - 28,05 mm (1.100 - 1.104 in)

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Fuel Injection Pump - Timing

IMPORTANT

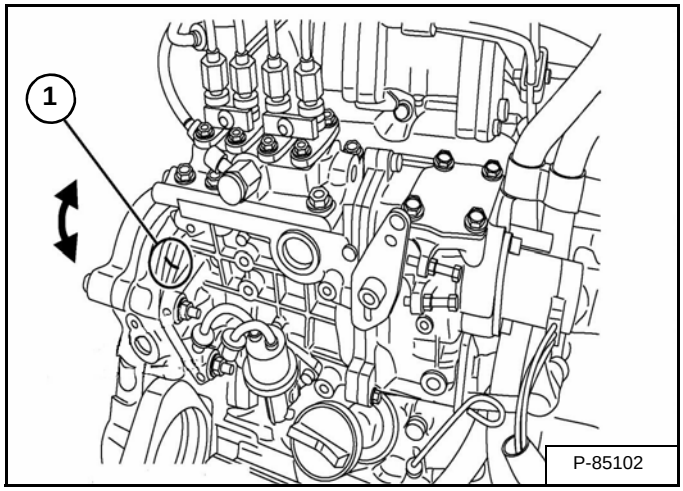
Do not attempt to maintain or adjust unless you are trained and have the correct equipment.

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Remove fuel injection high pressure lines.

Remove the fuel shutoff solenoid. (See Fuel Shutoff Solenoid Removal And Installation on Page 70-70-1.)

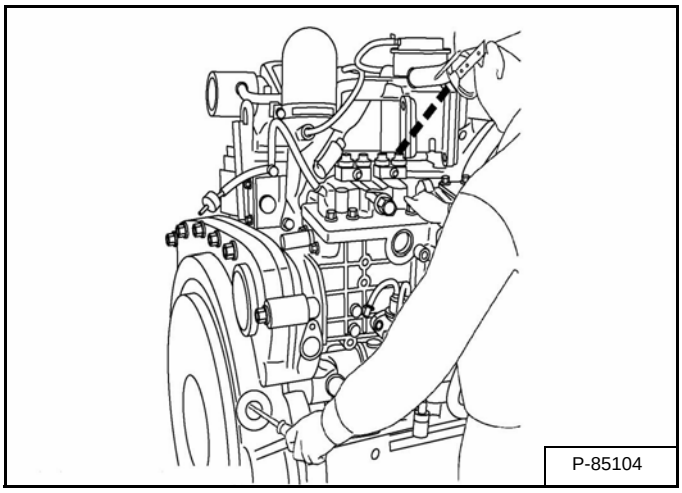
Figure 70-70-40



Align timing mark between the injection pump assembly and the flywheel housing (Item 1) **[Figure 70-70-40]**.

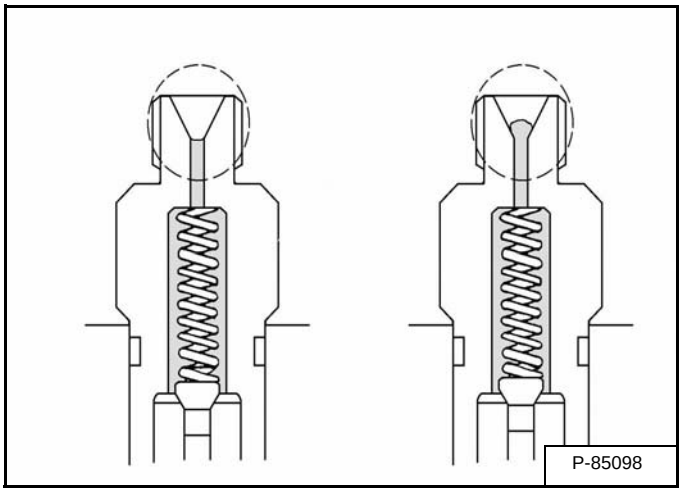
NOTE: Timing the injection pump is done by rotating the injection pump assembly up for advance, down for retard.

Figure 70-70-41



Rotate the flywheel counterclockwise (viewed from the flywheel side) until fuel fills up the hole of the delivery valve holder for the number one cylinder as shown in **[Figure 70-70-41]** below.

Figure 70-70-42



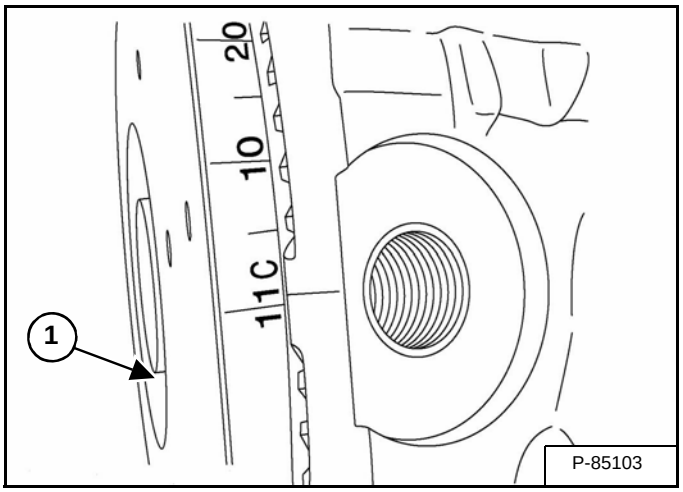
After fuel fills up the hole of the number one cylinder delivery valve holder (Item 1) **[Figure 70-70-42]** turn back the flywheel clockwise 1,6 rad (90°) then turn counterclockwise to 0,17 rad (10°) before top dead center.

Slowly turn the flywheel counterclockwise and stop turning when the fuel begins to come up to get the present injection timing (Item 1) **[Figure 70-70-42]**.

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Injection Pump - Timing (Cont'd)

Figure 70-70-43



Check to see the degree marks on the flywheel (Item 1) **[Figure 70-70-43]**. The flywheel has a 1TC mark for the crank angle before the top dead center of cylinder number one.

NOTE: If the injection pump timing is not within the specification, then rotate the injection pump assembly upwards for advancing, downwards for retarding injection pump timing.

The injection timing is 0,00960 - 0,0357 rad. (0.550 - 2.05°) before T.D.C.

Fuel Injector Removal And Installation

WARNING

AVOID INJURY OR DEATH

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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IMPORTANT

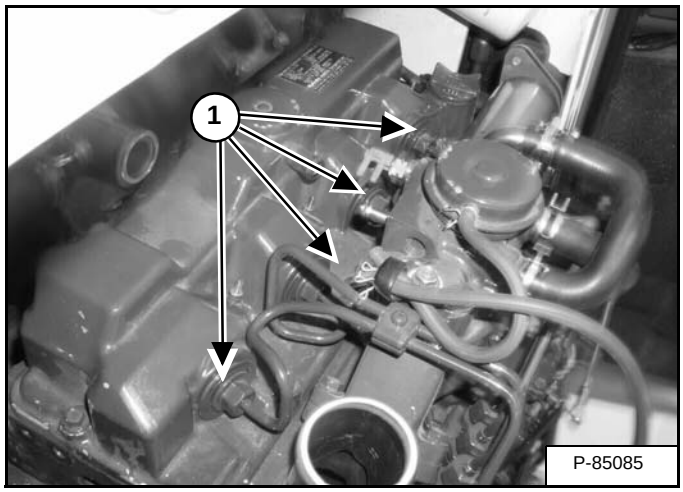
Do not bend the high pressure fuel injection tubes when removing or installing them.

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Fuel Injector Removal And Installation (Cont'd)

Figure 70-70-44



The following are some problems caused by faulty injectors:

-Engine is hard to start or will not start
-Rough engine operation and idle
-Engine will not have full power
-Excessive exhaust smoke

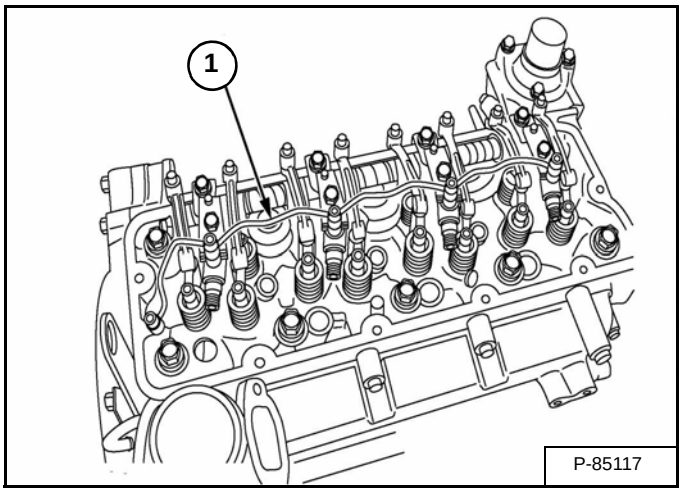
Disconnect the high pressure fuel lines (Item 1) **[Figure 70-70-44]** from the fuel injectors and from the injection pump.

Remove the high pressure fuel lines from the engine.

Remove the glow plugs. (See Glow Plugs Removal And Installation on Page 70-80-1.)

Remove the cylinder head valve cover (See Cylinder Head Removal And Installation on Page 70-80-4.)

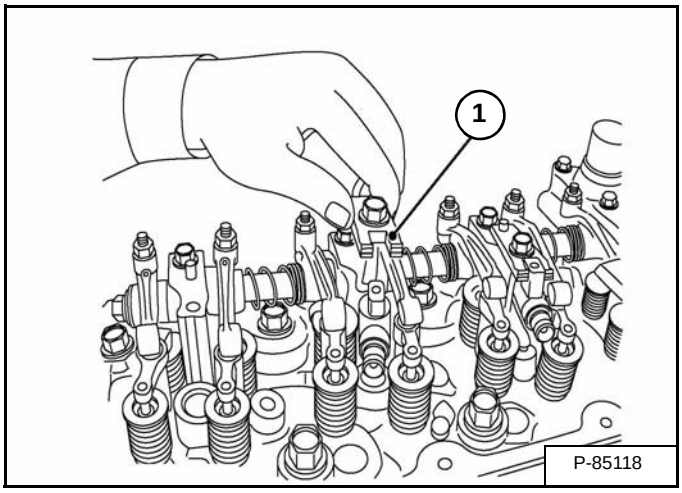
Figure 70-70-45



Remove the overflow pipe (Item 1) **[Figure 70-70-45]**.

Installation: Tighten the overflow pipe assembly retaining screws to 9,81 - 11,2 N•m (7.24 - 8.31 ft-lb) torque.

Figure 70-70-46



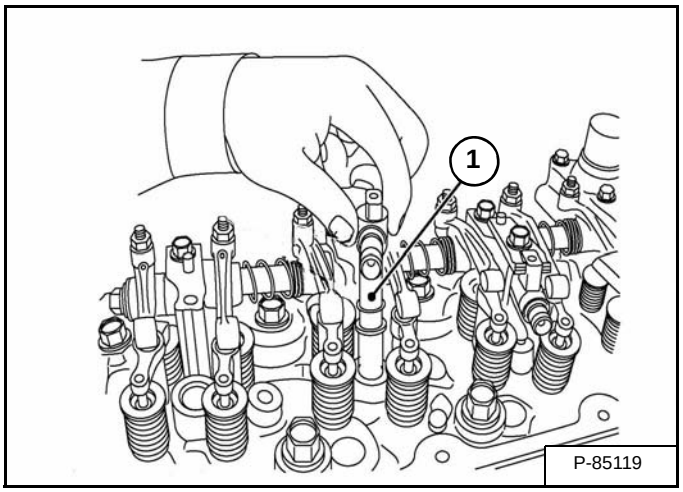
Remove the nozzle holder clamps (Item 1) **[Figure 70-70-46]**.

Installation: Tighten the nozzle holder clamp screws to 24 - 27 N•m (18 - 20 ft-lb) torque.

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Fuel Injector Removal And Installation (Cont'd)

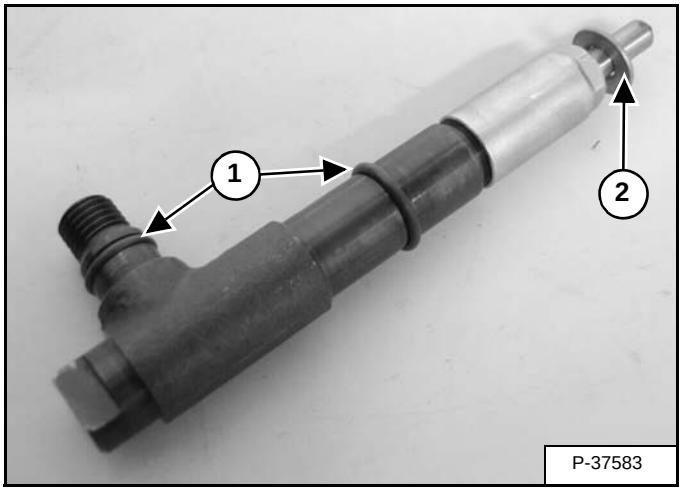
Figure 70-70-47



Remove the injector nozzle (Item 1) **[Figure 70-70-47]** from the cylinder head.

Pull on the injector nozzle to remove the injector nozzle from the cylinder head.

Figure 70-70-48



[Figure 70-70-48] shows the injector nozzle removed from the cylinder. Inspect the injector and replace if necessary.

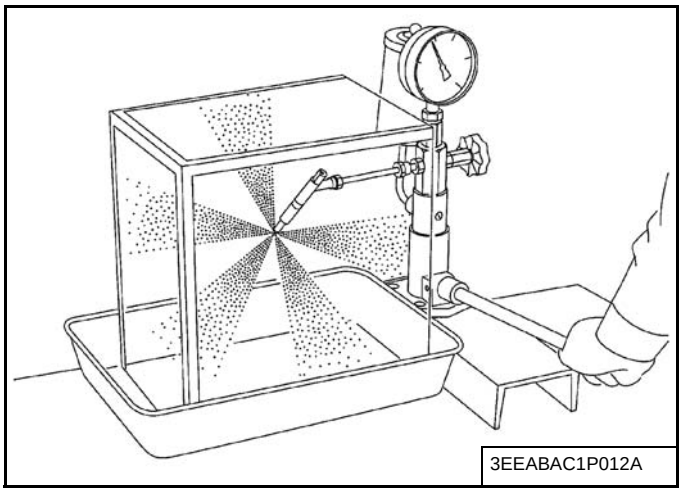
Check and replace the injector nozzle O-rings (Item 1) and the nozzle washer (Item 2) before installing new or used injectors. **[Figure 70-70-48]**.

Fuel Injector Nozzle Pressure - Checking

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

OEM1064 - Injector Nozzle Tester

Figure 70-70-49



Set the injection nozzle to the nozzle tester.

Slowly move the tester handle to measure the pressure at which fuel begins jetting out from the nozzle.

If the measurement is not within the factory specifications, replace or repair the injection nozzle assembly.

NOTE: Injection nozzle gasket must be replaced when the injection nozzle is removed for checking.

Injection pressure	Factory spec.	18,6 -19,6 MPa (186,4 - 96 bar) (2703 - 2844 psi)

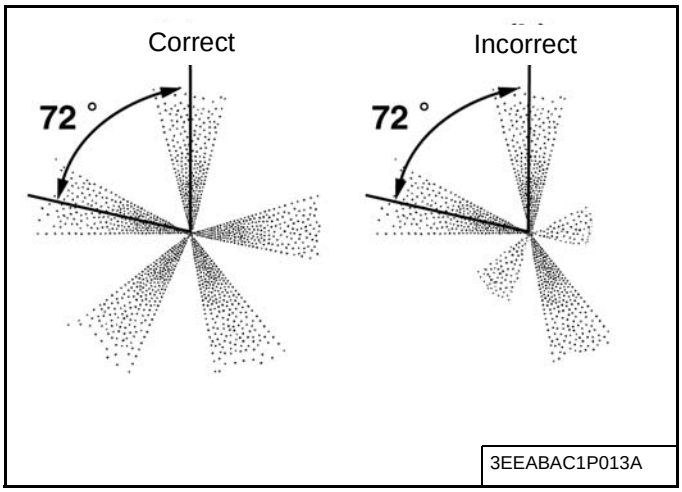
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Nozzle Spray Condition

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

OEM1064 - Injector Nozzle Tester

Figure 70-70-50



Set the injection nozzle to a nozzle tester, and check the nozzle spraying condition.

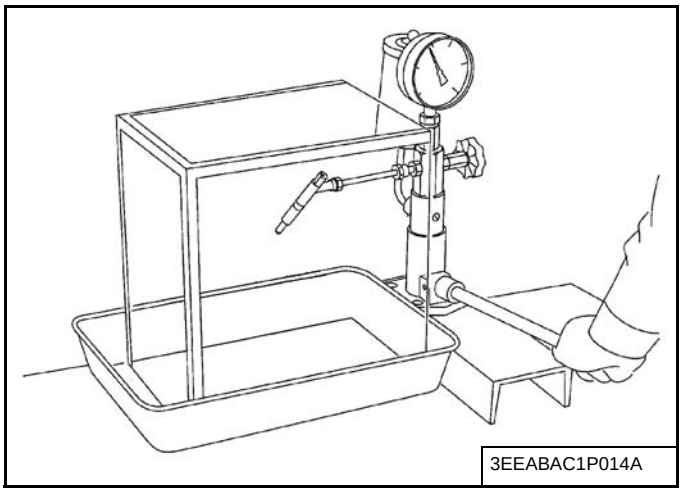
If the spraying condition is defective, replace or repair the injection nozzle assembly.

Valve Seat Tightness

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

OEM1064 - Injector Nozzle Tester

Figure 70-70-51



Set the injection nozzle to a nozzle tester.

Raise the fuel pressure, and keep at 16,7 MPa (166,7 bar) (2418 psi) for 10 seconds.

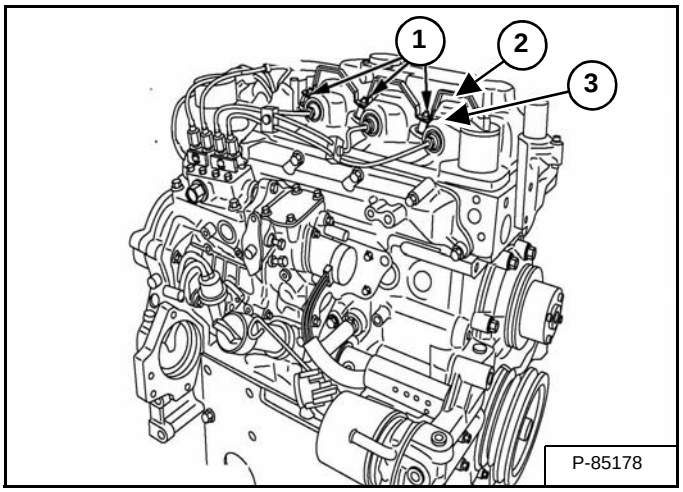
If any fuel leak is found, replace or repair the injection nozzle assembly.

Valve seat tightness	Factory spec	No fuel leak at 16,7 MPa (166,7 bar) (2418 psi)

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Glow Plugs - Testing

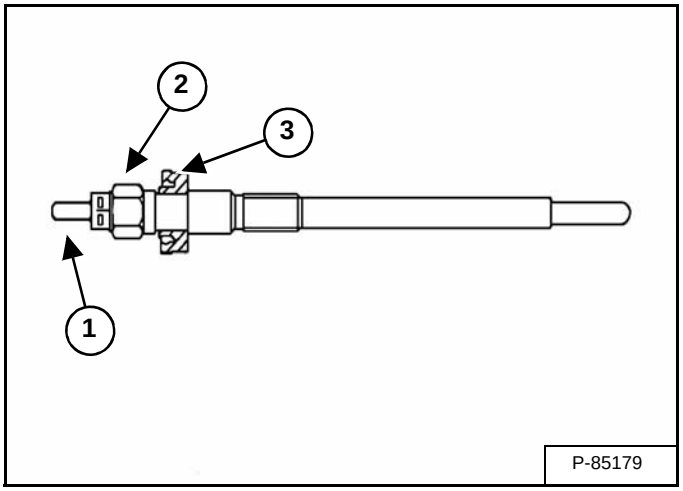
Figure 70-80-1



Disconnect the glow plug nuts (Item 1), remove glow plug connecting strap (Item 2) and glow plugs (Item 3) **[Figure 70-80-1]**.

Installation: Tighten the glow plug to 7,7 - 9,3 N•m (5.7 - 6.8 ft-lb) torque.

Figure 70-80-2



Touch one probe to the end of the glow plug (Item 1) and the other probe to the body of glow plug (Item 2) **[Figure 70-80-2]**.

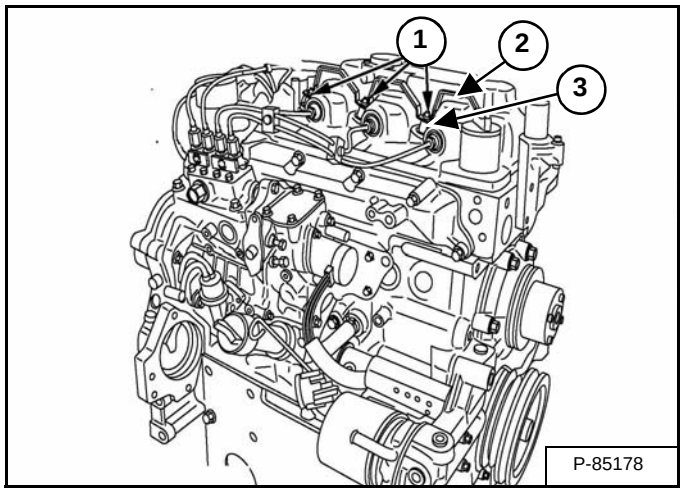
Use an ohmmeter to check the glow plugs.The resistance should be approximately one ohm.

Repeat the procedure for each glow plug.

NOTE: Adjust the direction of the ditch (Item 3) [Figure 70-80-2] to the terminal side when the seal is installed on the glow plug.

Glow Plugs Removal And Installation

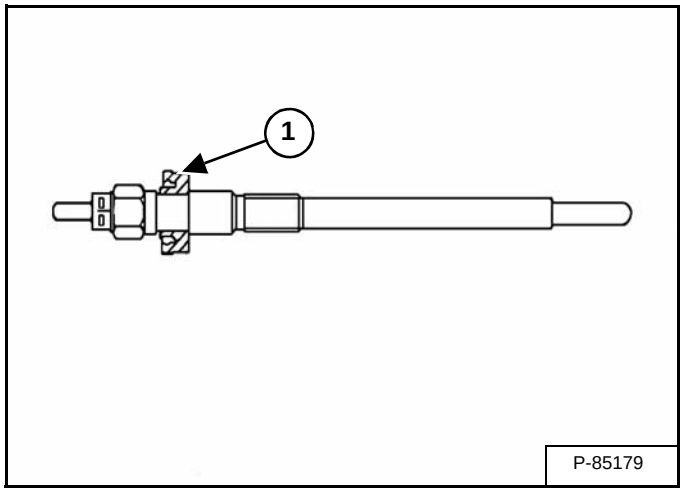
Figure 70-80-3



Disconnect the glow plug nuts (Item 1),remove glow plug connecting strap (Item 2) and glow plugs (Item 3) **[Figure 70-80-3]**.

Installation: Tighten the glow plug to 7,7 - 9,3 N•m (5.7 - 6.8 ft-lb) torque.

Figure 70-80-4



NOTE: Adjust the direction of the ditch (Item 1) [Figure 70-80-4] to the terminal side when the seal is installed on the glow plug.

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Glow Plugs Removal And Installation (Cont'd)

Figure 70-80-5

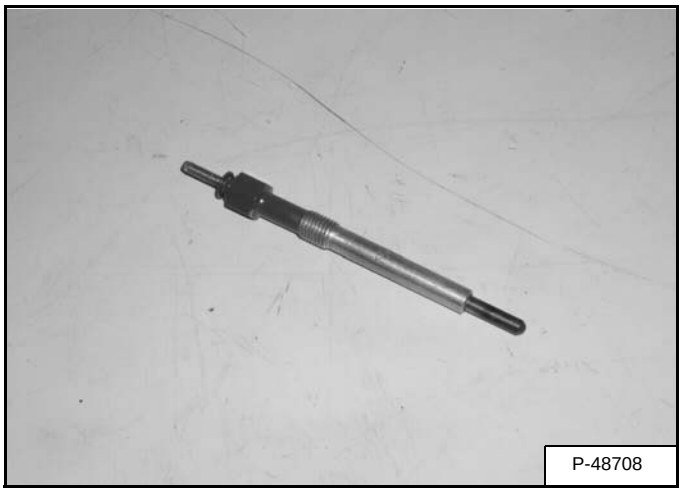
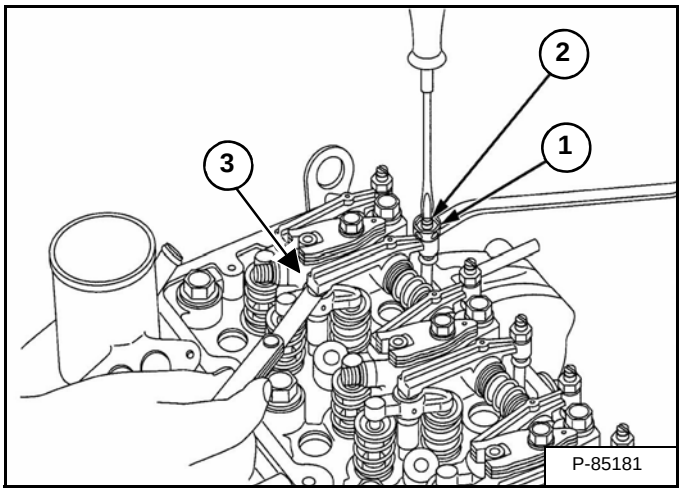


Photo **[Figure 70-80-5]** shows the glow plug removed from the engine. Inspect the glow plugs and replace when necessary.

Valve Clearance Adjustment

Figure 70-80-6



Adjust the valve clearance as follows:

Loosen the lock nut (Item 1) **[Figure 70-80-6]**.

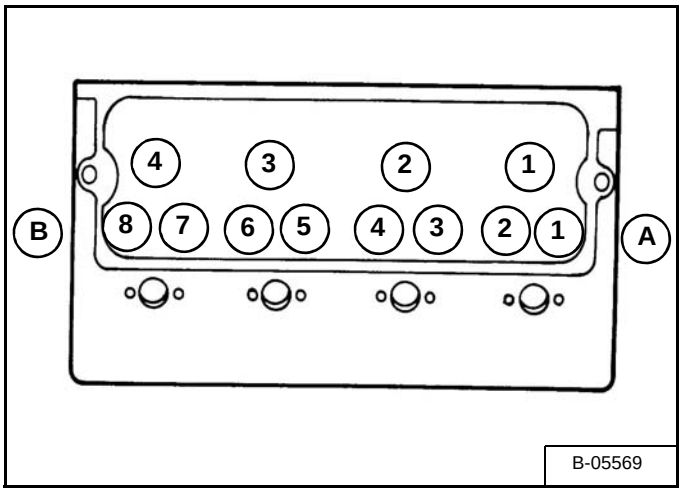
Turn the adjustment screw (Item 2) **[Figure 70-80-6]** until the correct clearance is obtained.

NOTE: The clearance is measured between the rocker arm and bridge head (Item 3) [Figure 70-80-6].

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Valve Clearance Adjustment (Cont'd)

Figure 70-80-7



NOTE: (A) is the front cover side, (B) is the flywheel housing side.

Figure 70-80-8

Cylinder Number	1		2		3		4	
Valve Number	1	2	3	4	5	6	7	8
Valve I=Intake E=Exhaust	I	E	I	E	I	E	I	E

Adjust the valve clearance cold as follows:

0,13 - 0,17 mm (0.0052 - 0.0068 in) Intake & Exhaust

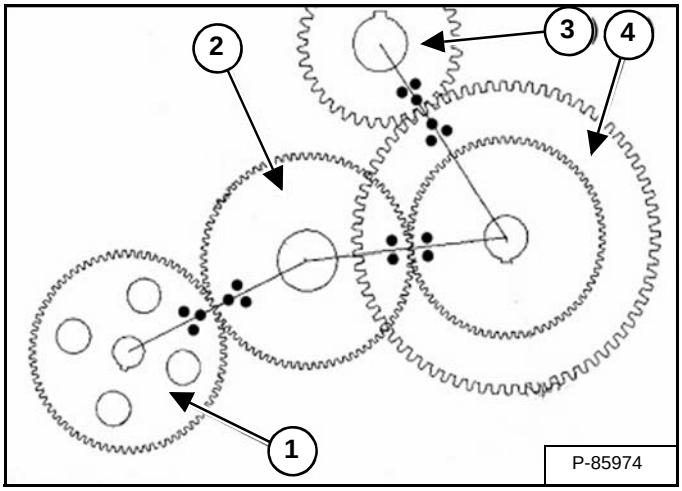
Use the following sequence to set the valves **[Figure 70-80-7]** & **[Figure 70-80-8]**:

1. With the No. 1 cylinder set at compression top dead center set valves 1,2,3 and 6.

2. With the No. 1 cylinder at overlap position set valves 4,5,7 and 8.

Valve Timing - Checking

Figure 70-80-9



Stop the engine and open the rear door.

Remove the engine / hydrostatic pump package from the loader. (See Engine Removal And Installation on Page 70-10-7.)

Remove the flywheel. (See Flywheel Removal And Installation on Page 70-120-1.)

Remove the timing gearcase cover. (See Timing Gearcase Cover Removal on Page 70-100-1.)

Make sure timing marks are in correct alignment **[Figure 70-80-9]**.

Injection Pump Gear (Item 1) **[Figure 70-80-9]**.

Idle Gear (Item 2) **[Figure 70-80-9]**.

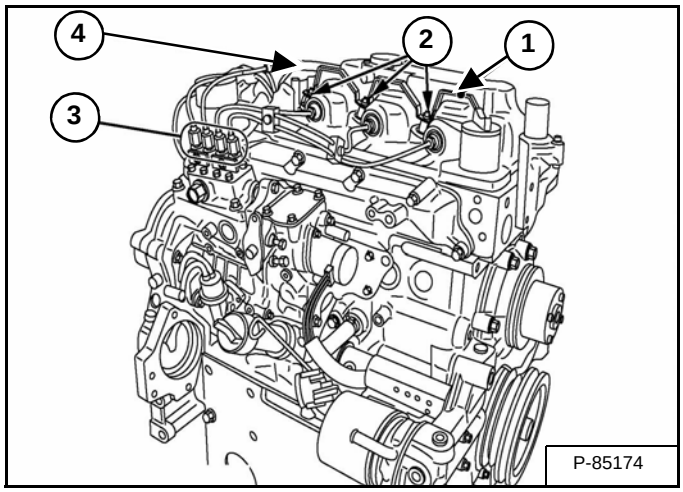
Crank Gear (Item 3) **[Figure 70-80-9]**.

Cam Gear (Item 4) **[Figure 70-80-9]**.

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Cylinder Head Removal And Installation

Figure 70-80-10



Remove the glow plug connecting strap (Item 1), glow plugs (Item 2), and injection pipes (Item 3) **[Figure 70-80-10]**.

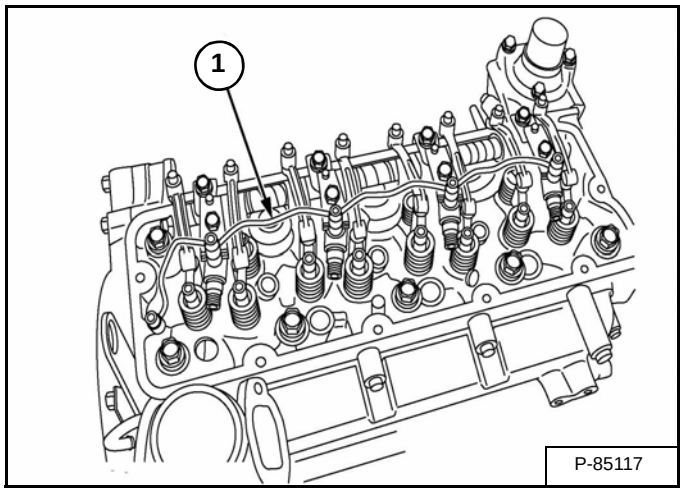
Remove the valve cover (Item 4) **[Figure 70-80-10]** and gasket.

Installation: Gradually tighten the valve cover bolts to 9,81 - 11,2 N•m (7 - 8 ft-lb) torque. Tighten center bolts first, then work your way to the front and back of the valve cover.

Installation: Tighten injection pipe retaining nuts to 23 - 36 N•m (17 - 26 ft-lb) torque.

Installation: Tighten glow plugs to 7,7 - 9,3 N•m (5.7 - 6.8 ft-lb) torque.

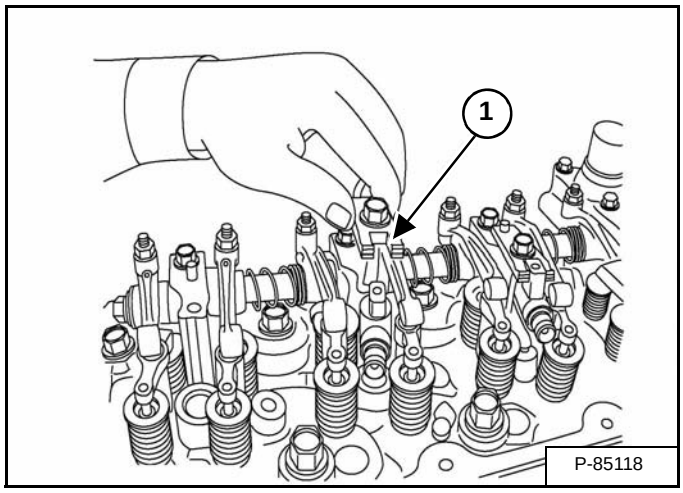
Figure 70-80-11



Remove the overflow pipe (Item 1) **[Figure 70-80-11]**.

Installation: Tighten overflow pipe to 9,81 - 11,2 N•m (7 - 8 ft-lb) torque.

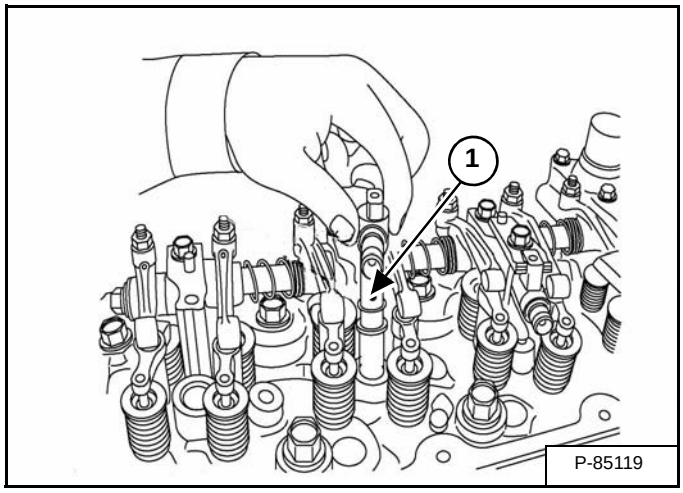
Figure 70-80-12



Remove the nozzle holder clamps (Item 1) **[Figure 70-80-12]**.

Installation: Tighten the nozzle holder clamp bolts to 24 - 27 N•m (18 - 20 ft-lb) torque.

Figure 70-80-13



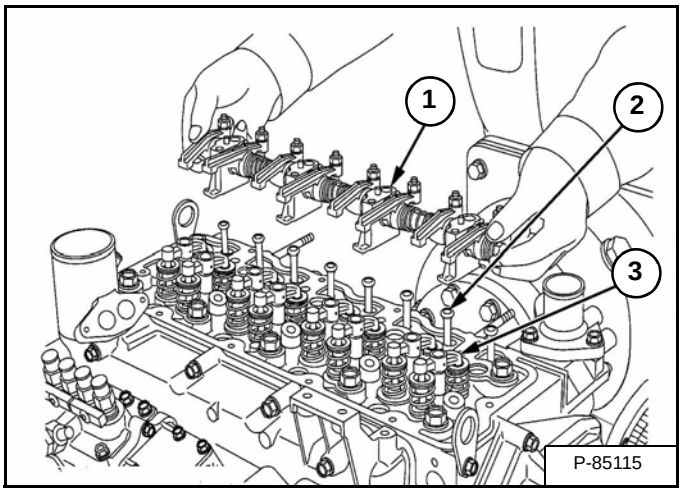
Remove the nozzle holder assembles and nozzle gaskets (Item 1) **[Figure 70-80-12]**.

Installation: Tighten the nozzle holder clamp bolts to 24 - 27 N•m (18 - 20 ft-lb) torque.

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Cylinder Head Removal And Installation (Cont'd)

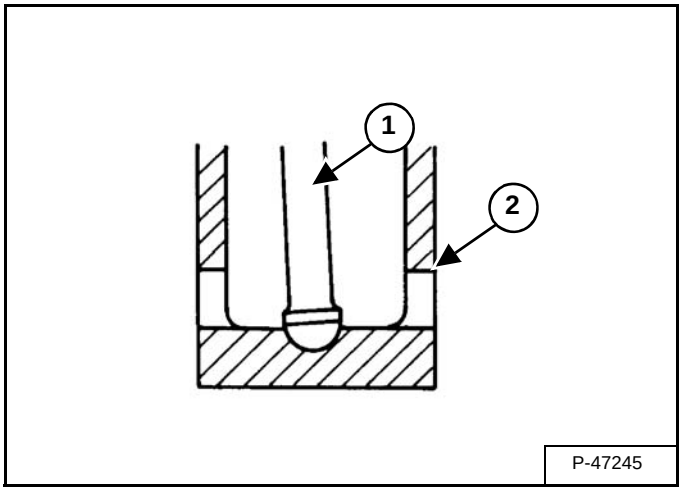
Figure 70-80-14



Remove rocker arm assembly (Item 1)**[Figure 70-80-14]** as a unit.

Remove push rods (Item 2) and bridge arms (Item 3) **[Figure 70-80-14]**.

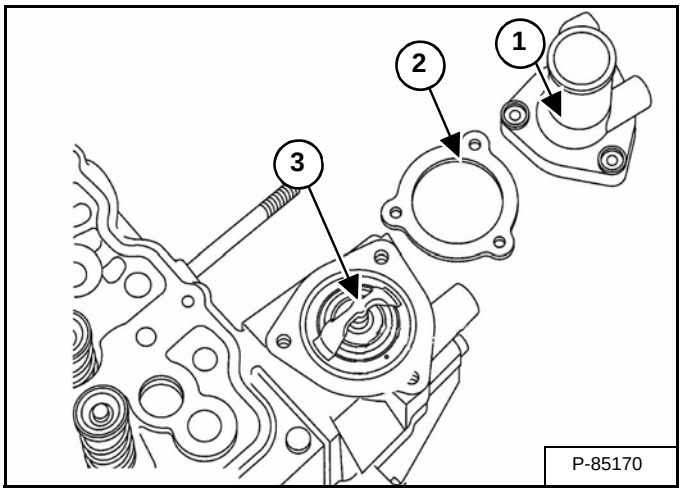
Figure 70-80-15



Installation: The push rod (Item 1) must be seated in the tappet (Item 2) **[Figure 70-80-15]** correctly or the push rods will be damaged.

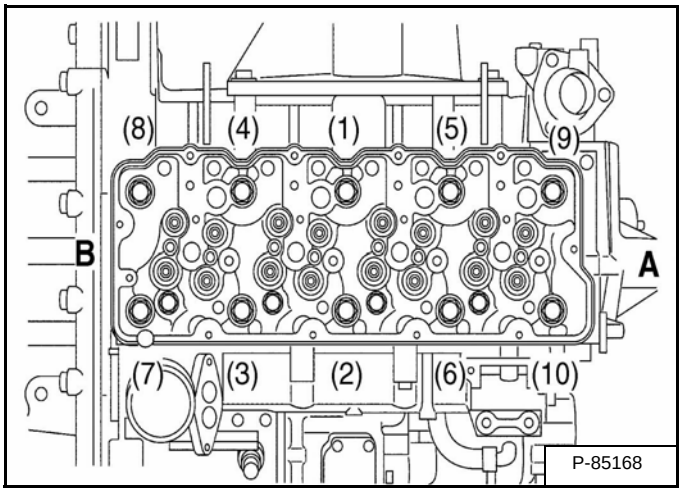
After installing the rocker arm assembly and push rods, the valve lash must be adjusted. (See Valve Clearance Adjustment on Page 70-80-2.)

Figure 70-80-16



Remove the thermostat housing bolts and then remove the housing (Item 1), gasket (Item 2) and thermostat (Item 3) **[Figure 70-80-16]**.

Figure 70-80-17



Remove the cylinder head bolts in order of #10 to #1 **[Figure 70-80-17]**.

NOTE: (A) is the front cover side, (B) is the flywheel housing side.

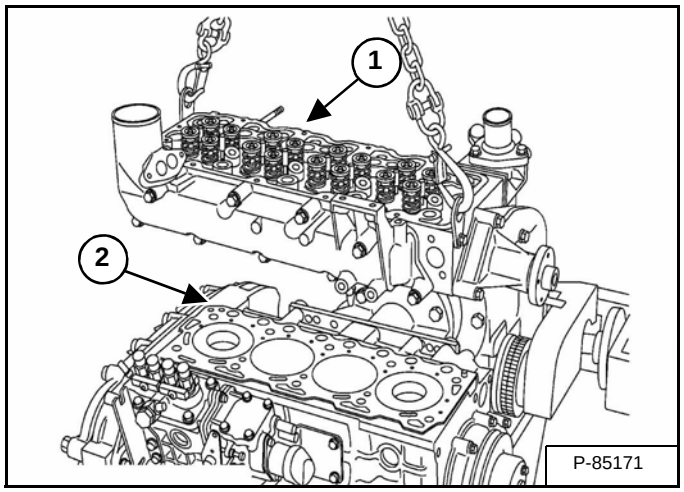
Installation: Put oil on the bolt threads. Tighten the bolts in the correct sequence in order of #1 - #10 to 187 - 196 N•m (138 - 144 ft-lb).

NOTE: It is not necessary to retighten the cylinder head bolts after the engine has been run for 30 minutes.

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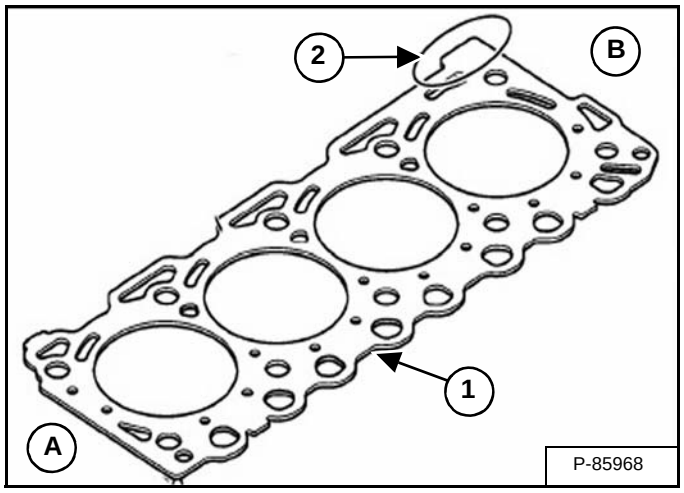
Cylinder Head Removal And Installation (Cont'd)

Figure 70-80-18



Remove the cylinder head (Item 1) and gasket (Item 2) **[Figure 70-80-18]**.

Figure 70-80-19



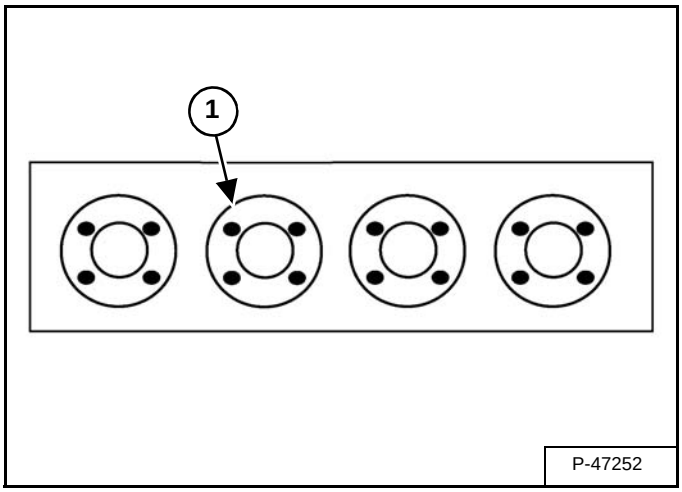
When replacing just the head gasket (Item 1), use a new gasket that has the same mark (Item 2) **[Figure 70-80-19]** as the original gasket.

When replacing the gasket after an engine rebuild, the piston protrusion must be measured.

(See Cylinder Head Top Clearance on Page 70-80-8.)

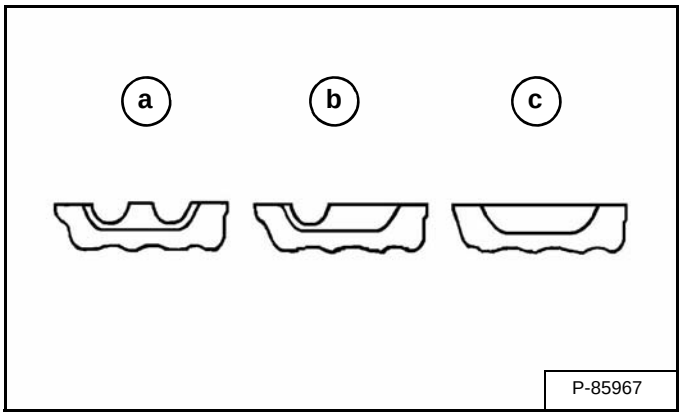
NOTE: (A) is the front cover side, (B) is the flywheel housing side.

Figure 70-80-20



Find the average measurement of the highest piston protrusion and the lowest piston protrusion (recorded earlier) for each piston (Item 1) **[Figure 70-80-20]**.

Figure 70-80-21



When identifying which head gasket you need **[Figure 70-80-21]** shows the correct number of notches and how they should look (a) 2 notches, (b) 1 notch and (c) no notch.

Figure 70-80-22

Gasket Size (Number)	Piston Protrusion
2 notches	**0,0775 - 0,150 mm 0.00306 - 0.00590 in**
1 notch	**0,150 - 0,250 mm 0.00591 - 0.00984 in**
no notches	**0,2500 - 0,3425 mm 0.009843 - 0.01348 in**

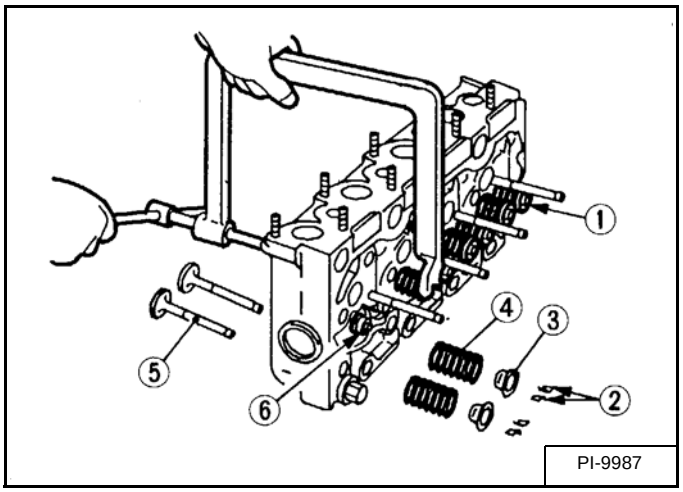
Select the correct gasket size (thickness) from the chart **[Figure 70-80-22]**.

After the gasket and cylinder head have been installed, turn the crankshaft by hand to be sure there is no interference between the piston, cylinder, and valves.

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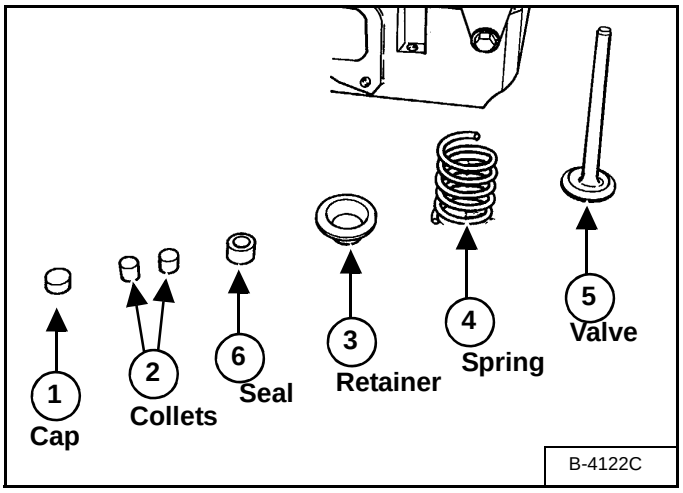
Cylinder Head Disassembly And Assembly

Figure 70-80-23



Use a valve spring compressor to compress the valve spring **[Figure 70-80-23]**.

Figure 70-80-24



Remove the valve cap (Item 1) and valve spring collet (Item 2) **[Figure 70-80-23]** and **[Figure 70-80-24]**.

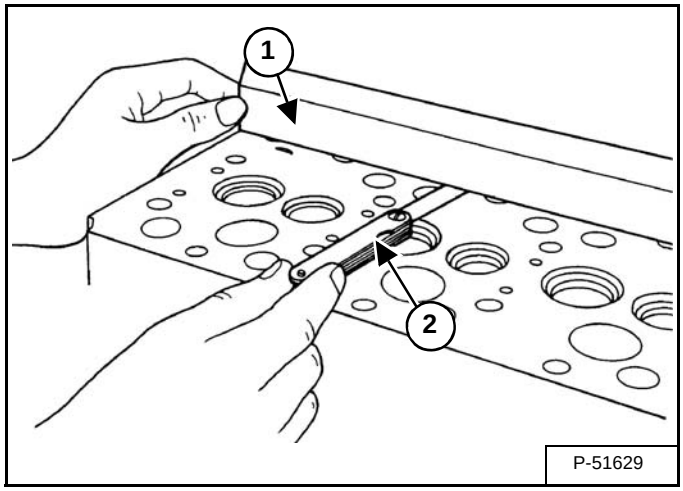
Remove the valve spring retainer (Item 3) and the spring (Item 4) **[Figure 70-80-23]** and **[Figure 70-80-24]**.

Remove the seal (Item 6) and the valve (Item 5) **[Figure 70-80-23]** and **[Figure 70-80-24]**.

Cylinder Head - Servicing

Clean the surface of the cylinder head.

Figure 70-80-25

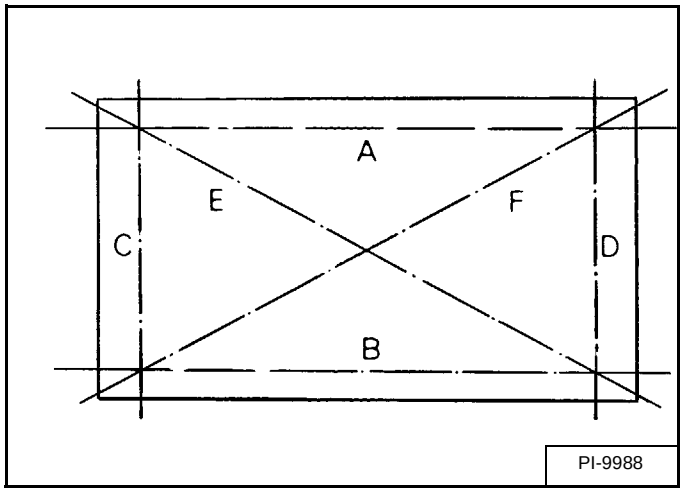


Put a straight edge (Item 1) **[Figure 70-80-25]** on the cylinder head.

NOTE: Do not put the straight edge across combustion chambers.

Put a feeler gauge (Item 2) **[Figure 70-80-25]** between the straight edge and the surface of the cylinder head.

Figure 70-80-26



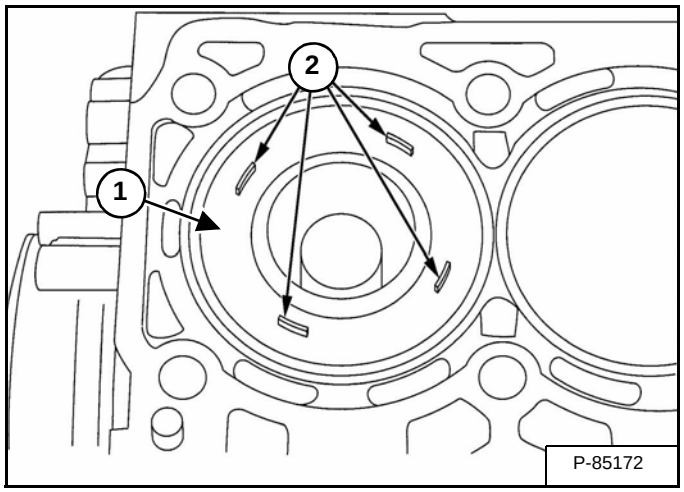
Put the straight edge on the cylinder head's four sides and two diagonal as shown in figure **[Figure 70-80-26]**.

The maximum distortion of the head surface is ± 0,05 mm (± 0.002 in). If the measurement exceeds the specification, replace the cylinder head.

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Cylinder Head Top Clearance

Figure 70-80-27



Install the cylinder head gasket. Put the piston (Item 1) **[Figure 70-80-27]** being checked at T.D.C.

Put 4 pieces of 1,5 mm (0.06 in) diameter solder (Item 2) **[Figure 70-80-27]** on the top of the piston. Use grease to hold them in position.

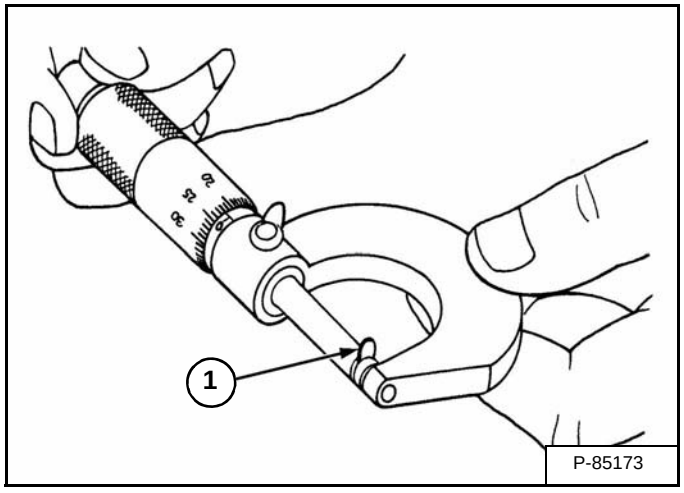
NOTE: Put the solder in position so they do not touch the valves.

Turn the piston to bottom dead center.

Install the cylinder head and tighten to the correct torque in the correct sequence. (See Cylinder Head Removal And Installation on Page 70-80-4.)

Turn the crankshaft until the piston exceeds T.D.C. Remove the cylinder head.

Figure 70-80-28



Remove the solder (Item 1) **[Figure 70-80-28]** and measure it.

If the measurement exceeds the specifications, check the oil clearance of the crank pin journal or the piston pin.

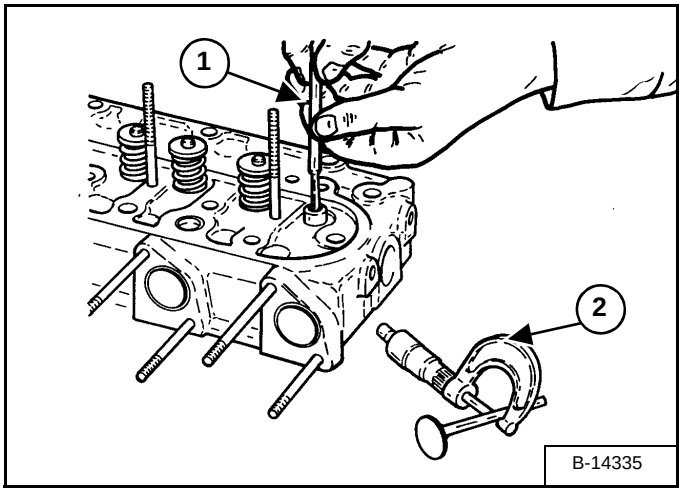
Top Clearance	0,6 - 0,8 mm (0.024 - 0.031 in)

Valve Guide - Checking

Remove the valve and spring from the cylinder head. (See Cylinder Head Disassembly And Assembly on Page 70-80-7.)

Remove the carbon from the valve guide.

Figure 70-80-29



Measure the valve stem O.D. (Item 1) **[Figure 70-80-29]**.

Measure the valve guide I.D. (Item 2) **[Figure 70-80-29]**.

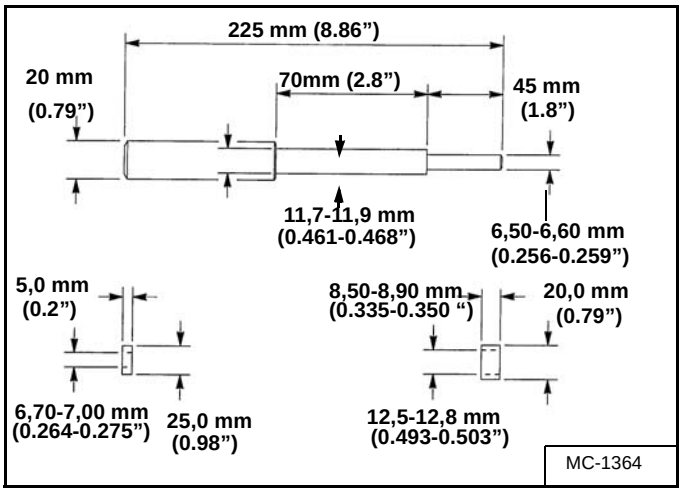
Calculate the clearance. If the clearance exceeds the allowable limit, replace the valve and/or valve guide.

Valve Guide I.D.	7,030 - 7,045 mm (0.2768 - 0.2773 in)
Valve Stem O.D.	6,960 - 6,975 mm (0.2741 - 0.2746 in)
Clearance Between Valve Stem and Guide	0,055 - 0,085 mm (0.0022- 0.0033 in)
Allowable Limit	0,10 mm (0.0039 in)

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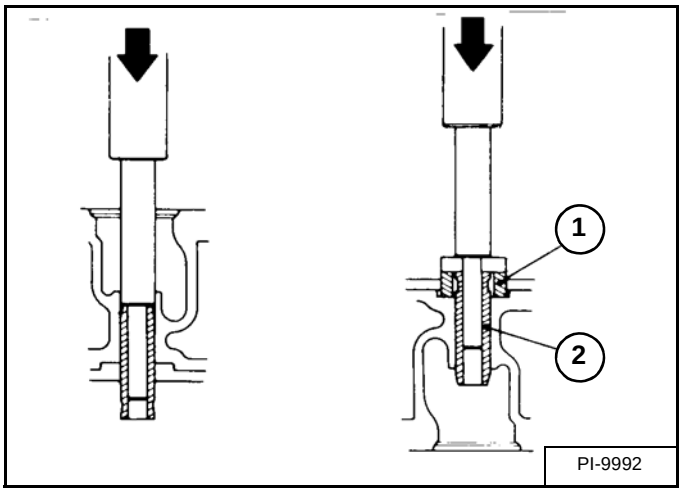
Valve Guide Removal And Installation

Figure 70-80-30



To remove and replace the valve guide, make the driver tools as shown in figure **[Figure 70-80-30]**.

Figure 70-80-31



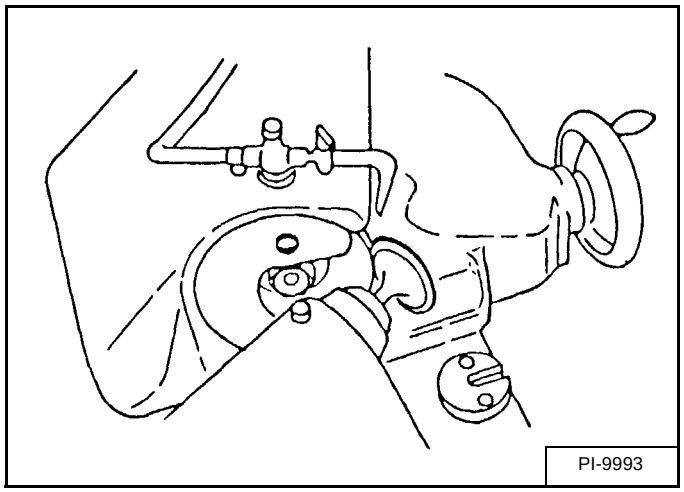
Press the used valve guide out of the cylinder head using the special driver tool **[Figure 70-80-31]**.

Put oil on the outside diameter of the new valve guide. Press the new valve guide into the cylinder head from the top side. Use the special driver tools (Items 1 and 2) **[Figure 70-80-31]**, press the new guide until the tool contacts the cylinder head.

Ream the valve guide to the correct specifications.

Reconditioning The Valve And Valve Seat

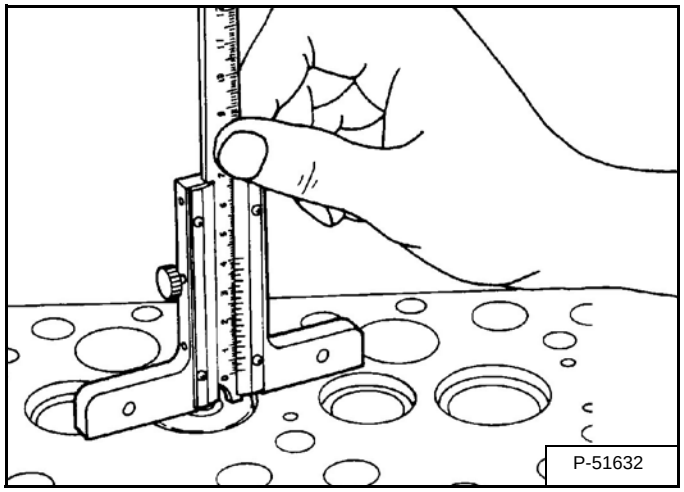
Figure 70-80-32



Grind the valve face to the correct angle using a valve refacer **[Figure 70-80-32]**.

Clean the valve seat and combustion chamber.

Figure 70-80-33

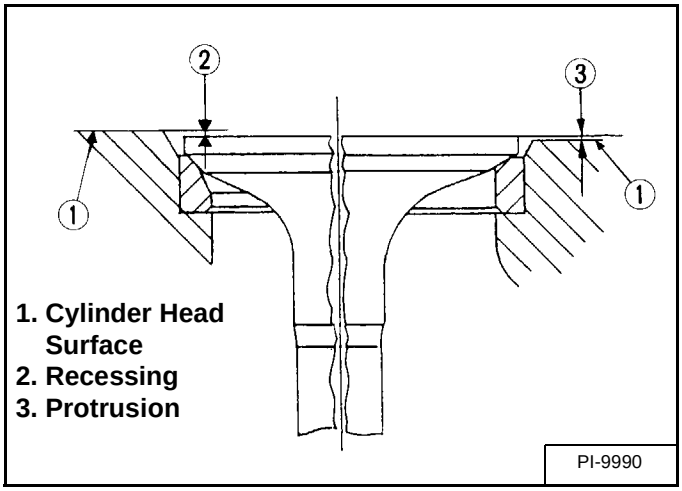


Install the valve into the guide. Measure the valve recessing with a depth gauge **[Figure 70-80-33]**.

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Reconditioning The Valve And Valve Seat (Cont'd)

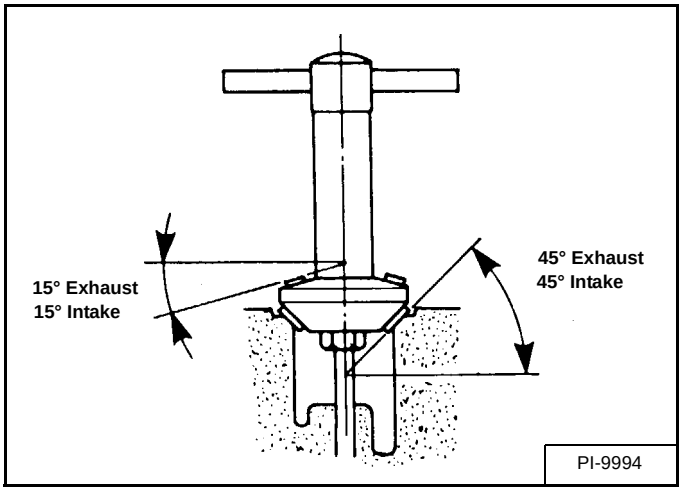
Figure 70-80-34



If the measurement exceeds the allowable limit, replace the valve or cylinder head **[Figure 70-80-34]**.

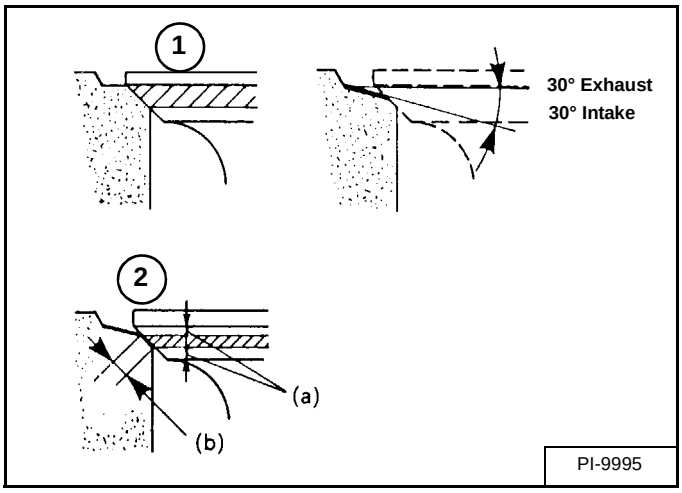
Recessing	0,65 - 0,85 mm (0.026 - 0.33 in)
Allowable Limit (Recessing)	1,20 mm (0.0472 in.)

Figure 70-80-35



Grind the valve seat surface in the cylinder head to the correct angle **[Figure 70-80-35]**.

Figure 70-80-36



Check the seat surface and valve face (Item 1) **[Figure 70-80-36]**.

(a) identical dimensions above and below the valve seat

If the seat surface (b) needs correction, slightly correct the seat using a 45 degree cutter and then resurface the seat surface with a 15 degree cutter to get the correct width (Item 2) **[Figure 70-80-36]**.

Valve Seat Width

Intake & Exhaust	3,3 - 3,6 mm (0.13 - 0.14 in)

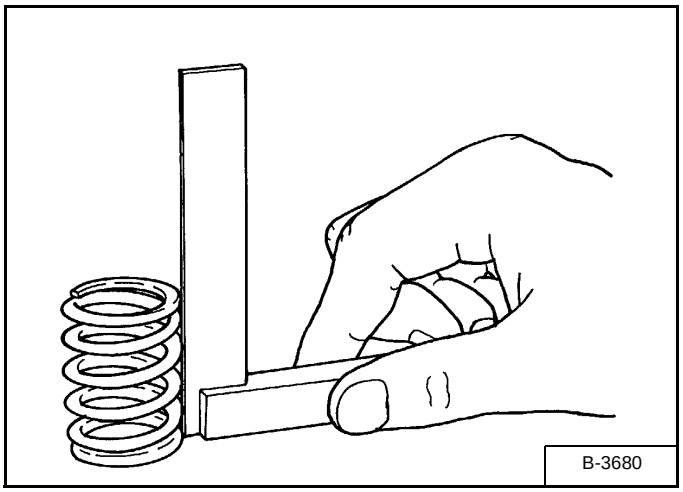
Valve Seat & Face Angle

Intake	45 degrees
Exhaust	45 degrees

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Valve Spring

Figure 70-80-37



Measure the length of the valve spring. If the measurement is less than the allowable limit, replace the spring **[Figure 70-80-37]**.

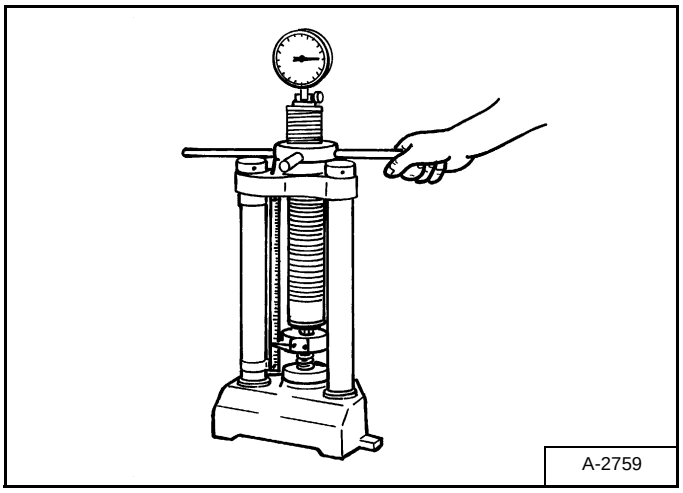
Free Length	35,1 - 35,6 mm (1.39 - 1.40 in)
Allowable Limit	34,6 mm (1.36 in)

Put the spring on a flat surface, place a square on the side of the spring **[Figure 70-80-37]**.

Rotate the spring and measure the maximum tilt. If the measurement exceeds the allowable limit, replace the spring.

Tilt Allowable Limit	1,0 mm (0.039 in)

Figure 70-80-38



Put the spring on a tester and compress to specified length **[Figure 70-80-38]**.

Read the compressed load on the gauge. If the measurement exceeds allowable limit, replace the spring.

Setting Length	31,5 mm (1.24 in)
Setting Load	60,8 N (14.3 lb)
Allowable Limit	45,9 N (10.3 lb)

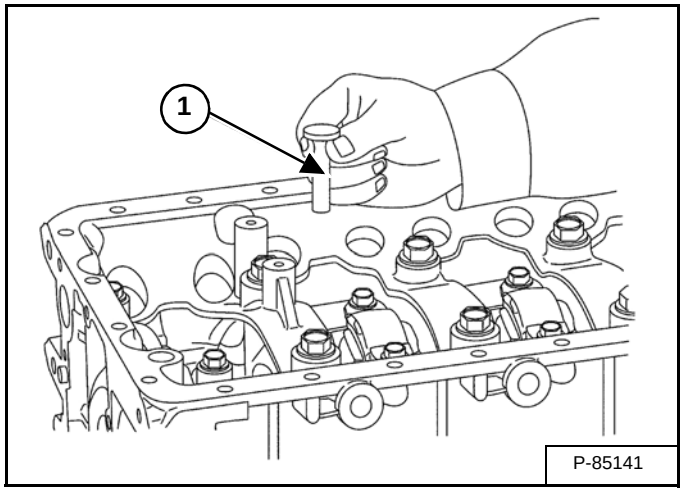
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Valve Tappets

Remove the oil pan and oil pump strainer. (See Oil Pan Removal And Installation on Page 70-60-1.)

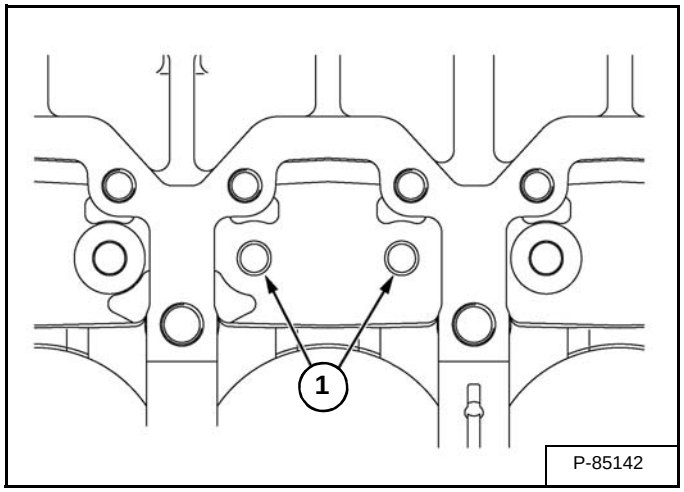
Remove the idler gear and camshaft. (See Idler Gear And Camshaft Removal And Installation on Page 70-100-5.)

Figure 70-80-39



Turn engine with the crankshaft facing up and remove the valve tappets (Item 1) **[Figure 70-80-39]**.

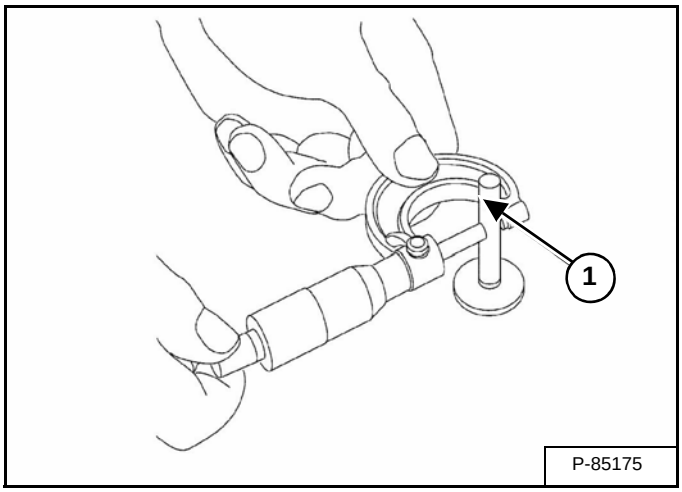
Figure 70-80-40



Measure the ID of the tappet bore (Item 1) **[Figure 70-80-40]**.

Tappet Bore ID	10,000 -10,015 mm (0.39370 - 0.39429 in)
Clearance Between Tappet and Tappet Bore	0,020 - 0,050 mm (0.00079 - 0.0019 in)
Allowable limit	0,07 mm (0.003 in)

Figure 70-80-41



Measure the OD of the tappet (Item 1) **[Figure 70-80-41]**.

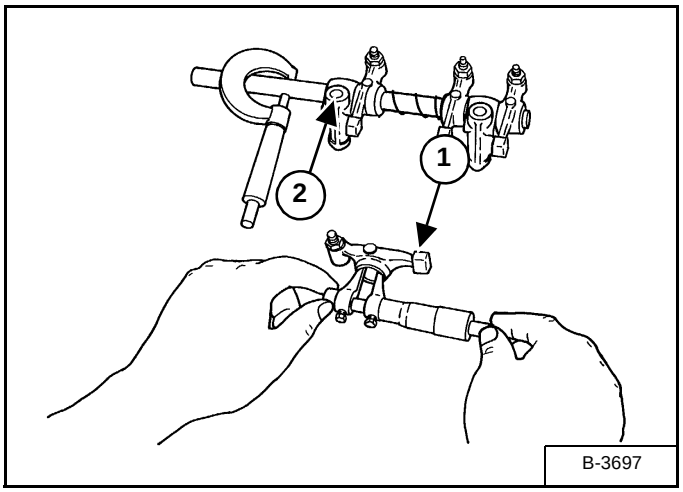
If the clearance exceeds the allowable limit, replace the tappets.

Tappet OD	9,965 - 9,980mm (0.3924 - 0.3929 in)
Clearance Between Tappet and Tappet Bore	0,020 - 0,050 mm (0.00079 - 0.0019 in)
Allowable limit	0,07 mm (0.003 in)

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Rocker Arm And Shaft - Checking

Figure 70-80-42



Measure the rocker arm I.D. (Item 1) **[Figure 70-80-42]** with an inside micrometer.

Measure the rocker arm shaft O.D. (Item 2) **[Figure 70-80-42]** with an outside micrometer.

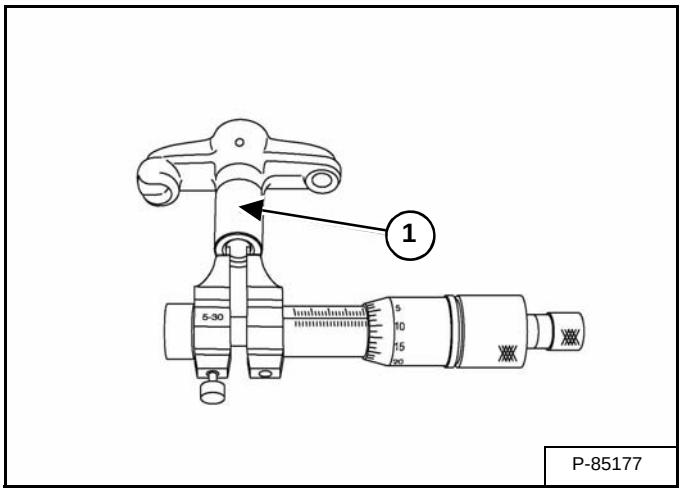
If the clearance exceeds the allowable limit, replace the bushing.

If the clearance still exceeds the allowable limit after the bushing is replace, replace the rocker arm shaft.

Oil Clearance Between Rocker Arm	
& Shaft	0,016 - 0,045 mm (0.00063 - 0.0017 in)
Allowable Limit	0,15 mm (0.0059 in)
Rocker Arm Shaft O.D.	14,973 - 14,984 mm (0.58949 - 0.58992 in)
Rocker Arm I.D.	15,0 - 15,018 mm (0.59056 - 0.59125 in)

Bridge Arm And Bridge Arm Shaft - Checking

Figure 70-80-43

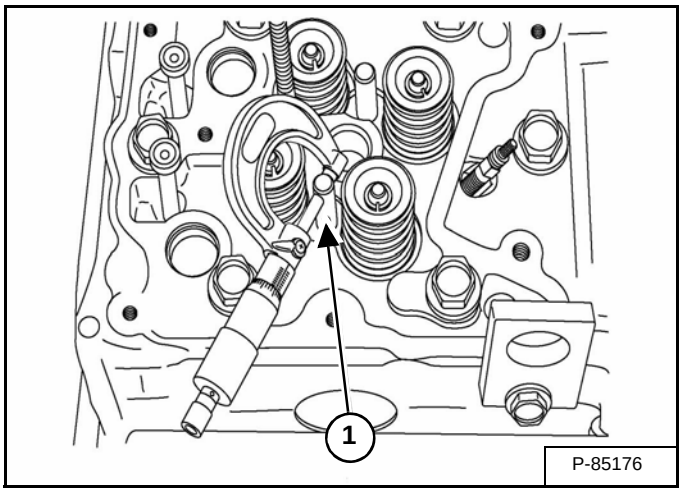


Measure the bridge arm ID (Item 1) **[Figure 70-80-43]**.

If the clearance exceeds the allowable limit, replace the bridge arm (Item 1) **[Figure 70-80-43]**.

Bridge arm ID.	9,050 - 9,065 mm (0.3170 - 0.3181 in)

Figure 70-80-44



Measure the bridge arm shaft OD (Item 1) **[Figure 70-80-44]**.

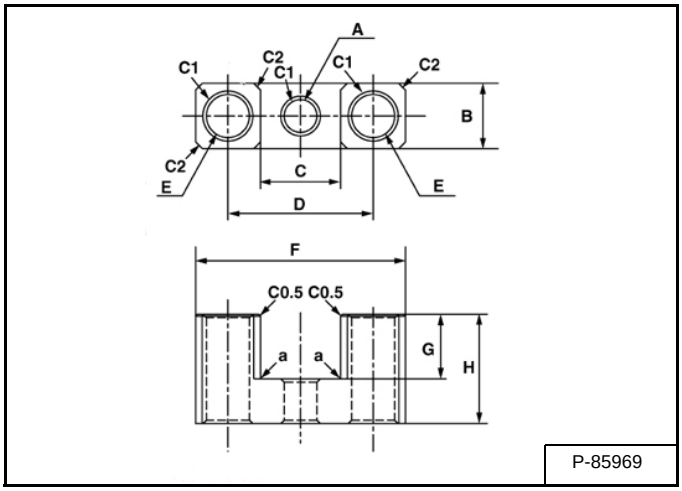
If the clearance exceeds the allowable limit, replace the bridge arm shaft (item 1) **[Figure 70-80-44]**.

Oil Clearance between Bridge arm and Bridge arm shaft.	0,018 - 0,042 mm (0.0.00071 - 0.0016 in)
Bridge arm shaft OD.	9,023 - 9,8032 mm (0.3553 - 0.3555 in)
Allowable Limit	0,15 mm (0.0059 in)

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Bridge Arm Shaft - Removal And Installation

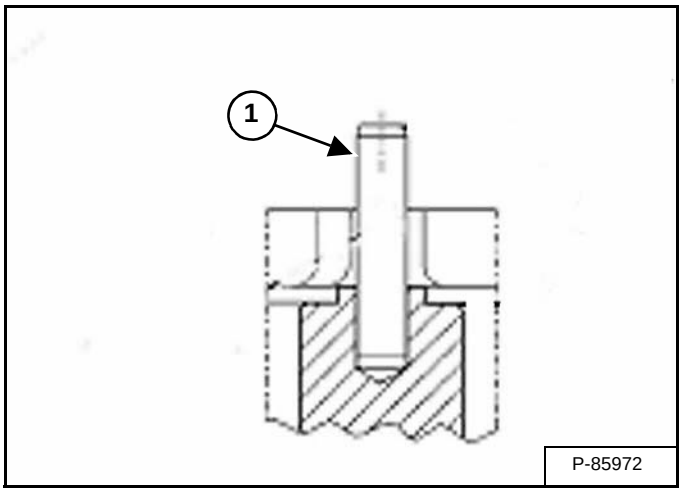
Figure 70-80-45



Make valve bridge arm shaft replacement tool as shown above **[Figure 70-80-45]**.

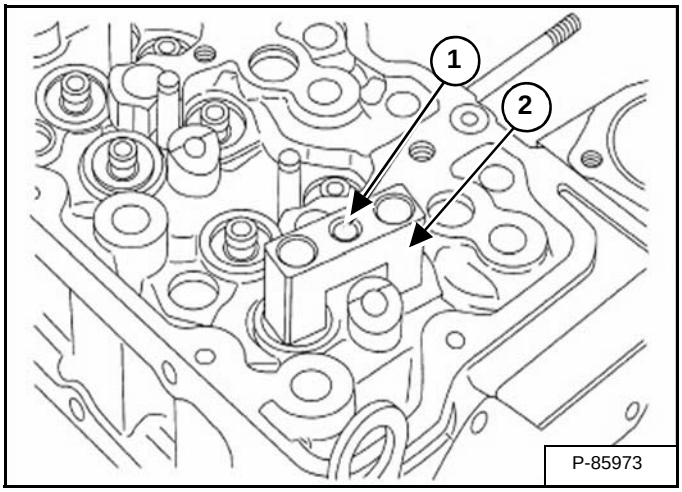
A	9,50 mm (0.374 in)
B	19,0 mm (0.748 in)
C	23,2 mm (0.913 in)
D	42,00 - 42,40 mm (1.654 - 1.669 in)
E	12,5 mm dia. (0.492 in dia.) through hole
F	61,0 mm (2.40 in)
G	18,7 mm (0.736 in)
H	30,90 - 31,70 mm (1.217 - 1.248 in)
a	0,30 mm radius (0.012 in radius)
C0.5	Chamfer 0,50 mm (0.020 in)
C1	Chamfer 1,0 mm (0.039 in)
C5	Chamfer 2,0 mm (0.079 in)

Figure 70-80-46



Remove the used valve bridge arm shaft (Item 1), then clean valve bridge arm shaft mounting hole. Use the valve bridge arm replacing tool to press in new shaft **[Figure 70-80-46]**.

Figure 70-80-47

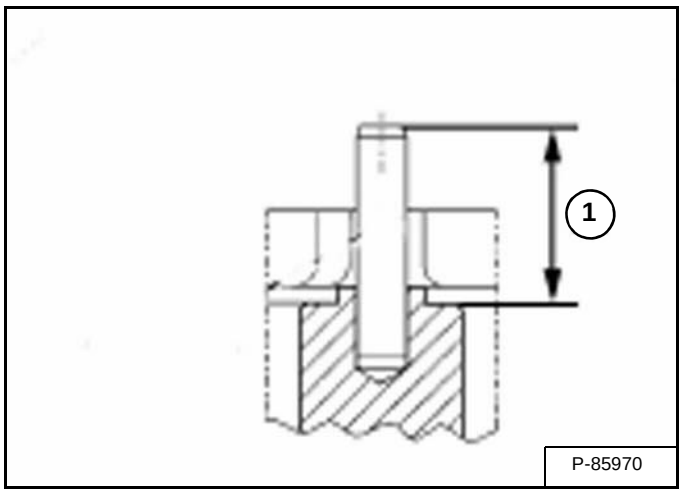


Install bridge arm shaft (Item 1) using the valve bridge shaft replacing tool (Item 2) **[Figure 70-80-47]** to the proper depth in **[Figure 70-80-48]**.

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Bridge Arm Shaft - Removal And Installation (Cont'd)

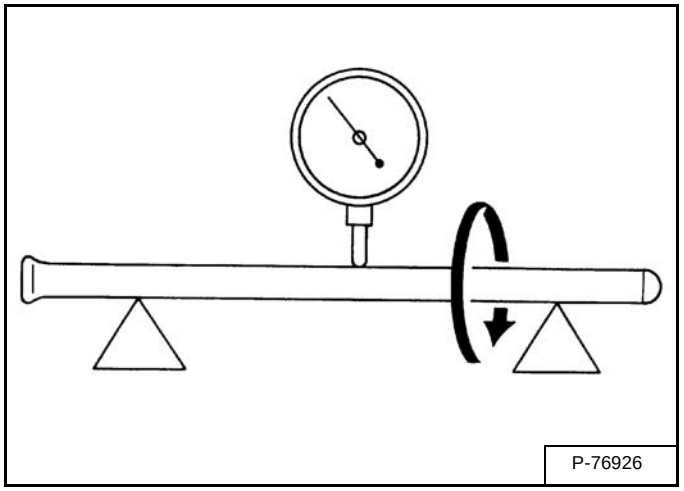
Figure 70-80-48



Set the depth of the bridge arm shaft (Item 1) to 31,1 - 31,7 mm (1.23 - 1.24 in) **[Figure 70-80-48]**.

Push Rod Alignment - Checking

Figure 70-80-49



Place the push rod on V blocks **[Figure 70-80-49]**.

Measure the push rod alignment **[Figure 70-80-49]**.

If the push rod exceeds the allowable limit, replace the push rod.

Push Rod Alignment	Allowable Limit	0,25 mm (0.0098 in)

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Piston And Connecting Rod Removal And Installation

Remove the cylinder head. (See Cylinder Head Removal And Installation on Page 70-80-4.)

Remove the top edge from the cylinder bore with a ridge reamer.

Remove the oil pan and oil pump strainer. (See Oil Pan Removal And Installation on Page 70-60-1.)

Figure 70-90-1

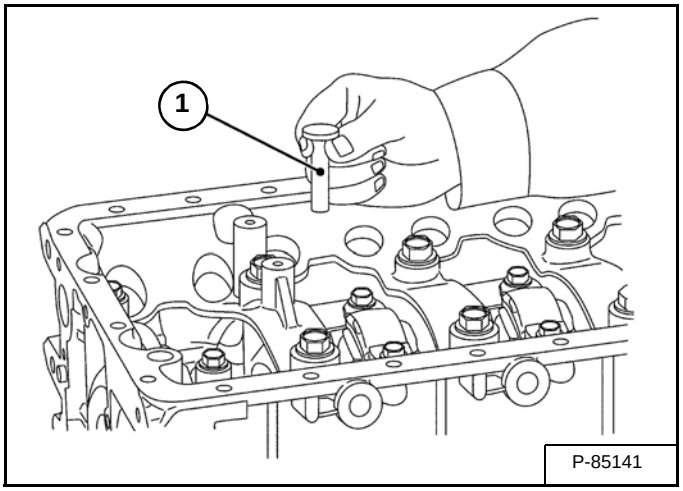
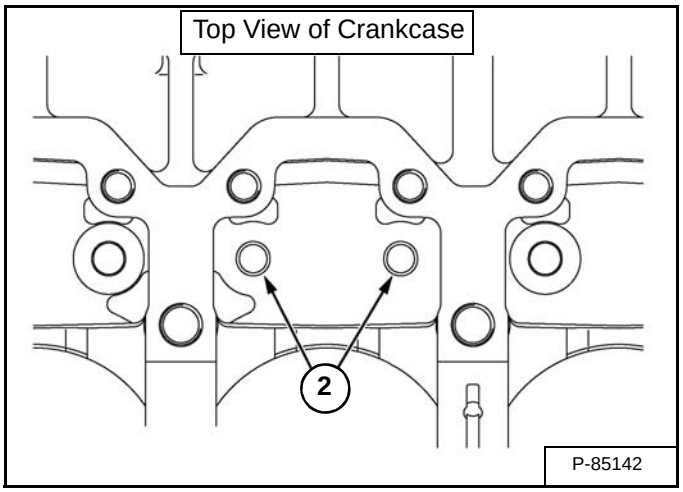


Figure 70-90-2

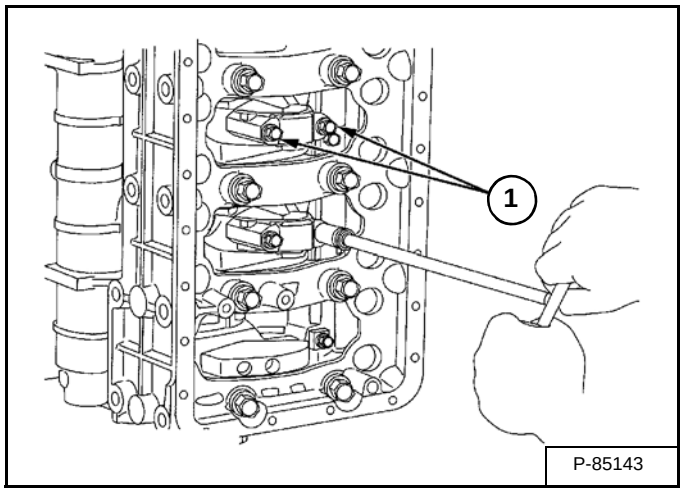


Remove the tappet (Item 1) **[Figure 70-90-1]** from the tappet bore (Item 2) **[Figure 70-90-2]** using a magnetic tool.

Installation: Apply engine oil to the tappet during installation.

NOTE: Mark the location of the tappets to prevent them from becoming interchanged.

Figure 70-90-3



Remove the connecting rod bolts (Item 1) **[Figure 70-90-3]**.

NOTE: Mark the location of the rod bearings to prevent them from becoming interchanged.

Installation: Tighten the connecting rod bolts to 69 - 73 N•m (51 - 54 ft-lb) torque.

Installation: Apply engine oil to the connecting rod bolts and lightly screw in by hand.

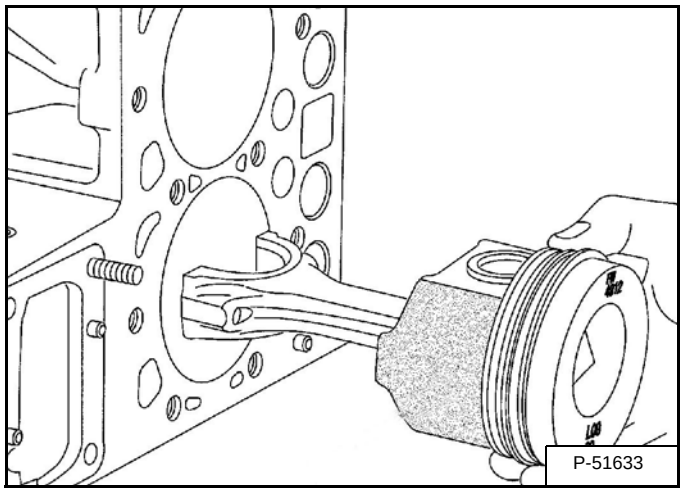
Installation: Install the rod bearing with the centrally lined groove towards the connecting rod, and the non grooved side towards the cap.

Installation: Make sure the marks on the connecting rod and bearing are aligned and facing the injection pump when installing the bearing cap.

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Piston And Connecting Rod Removal And Installation (Cont'd)

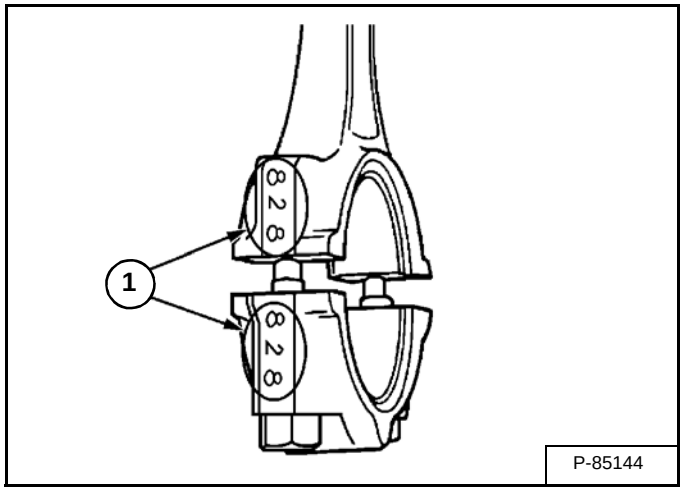
Figure 70-90-4



Use a hammer handle and push the piston / connecting rod assembly out of the cylinder bore **[Figure 70-90-4]**.

NOTE: Make sure the pistons are marked so they will be returned to the same cylinder bore.

Figure 70-90-5

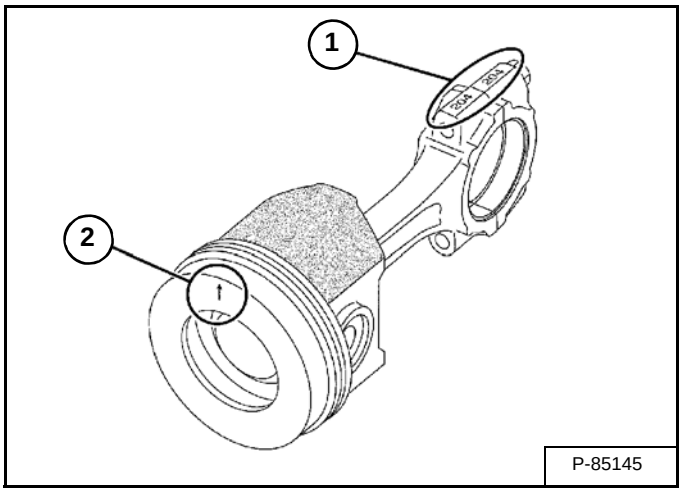


Installation: Make sure the marks on the connecting rod and bearing (Item 1) **[Figure 70-90-5]** are aligned and facing the injection pump when installing the bearing cap.

Repeat the procedure to remove the other piston / connecting rod assemblies from the engine block.

Piston And Connecting Rod - Servicing

Figure 70-90-6



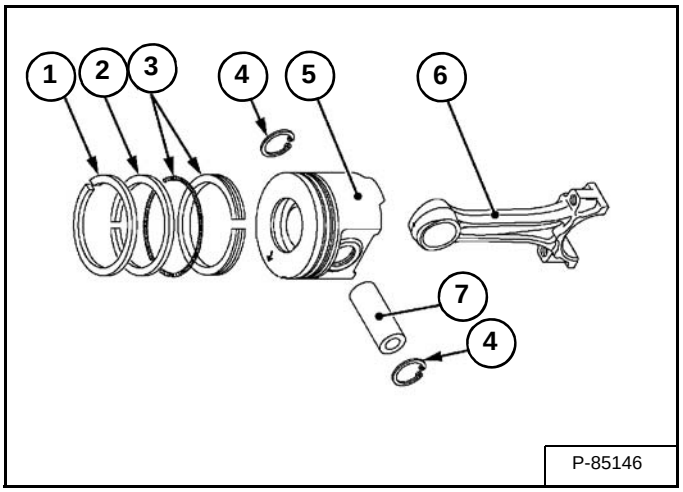
Installation: When reassembling, align the marks (Item 1) on the connecting rod and piston (Item 2) **[Figure 70-90-6]**.

NOTE: Assemble the piston to the connecting rod with the mark (Item 2) and the connecting rod mark (Item 1) [Figure 70-90-6] facing the injection pump side.

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Piston And Connecting Rod - Servicing (Cont'd)

Figure 70-90-7



Remove the top ring (Item 1), the second ring (Item 2) and the oil ring (Item 3) **[Figure 70-90-7]**.

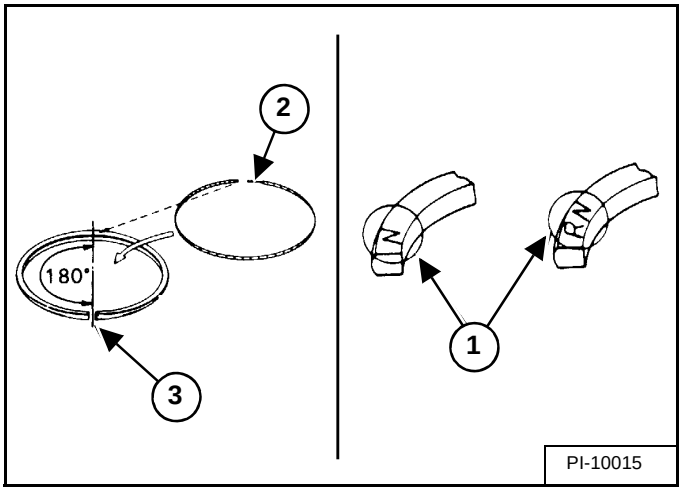
Remove the snap rings (Item 4) and piston pin (Item 7) **[Figure 70-90-7]**.

Separate the piston (Item 5) from the connecting rod (Item 6) **[Figure 70-90-7]**.

Installation: Heat the piston in clean engine oil to 80°C (176°F) and tap the piston pin into position. Place the piston rings so that there are gaps every 120 degrees with no gap facing the piston pin in the cylinder.

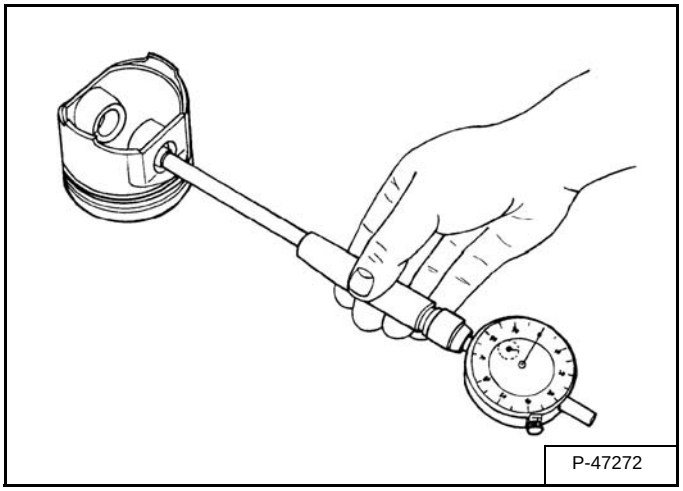
NOTE: Mark the piston (Item 5) and connecting rod (Item 6) [Figure 70-90-7] with the same number to ensure correct installation and proper cylinder placement.

Figure 70-90-8



Installation: When installing new rings, assemble the ring so the mark (Item 1) near the gap faces the top of the piston. When installing the oil ring, place the expander joint (Item 2) on the opposite side of the oil ring gap (Item 3) **[Figure 70-90-8]**.

Figure 70-90-9



Measure the I.D. of the piston pin bore in both horizontal and vertical directions **[Figure 70-90-9]**.

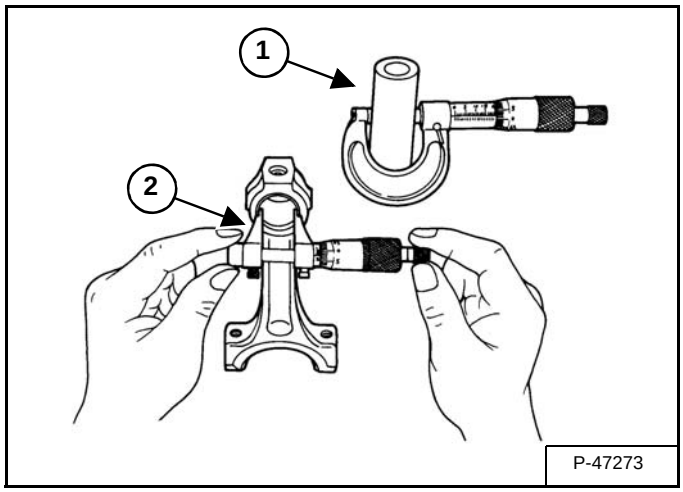
If the measurement exceeds the allowable limit, replace the piston.

Piston Bore I.D.	28,0 - 28,013 mm (1.1024 - 1.1028 in)
Allowable Limit	28,05 mm (1.104 in)

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Piston And Connecting Rod - Servicing (Cont'd)

Figure 70-90-10



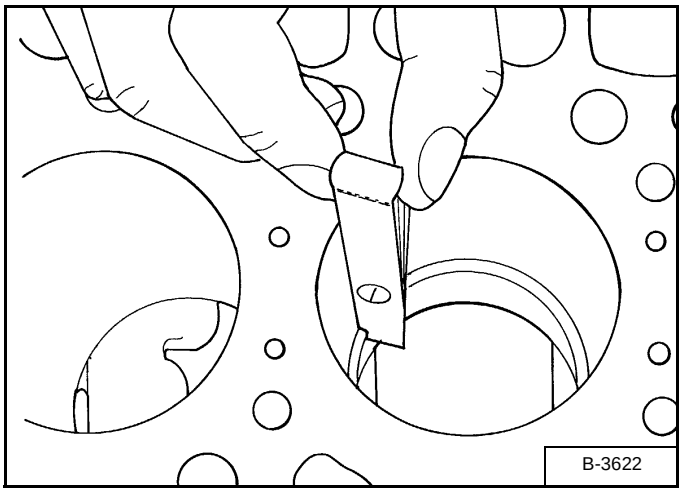
Measure the O.D. of the piston pin (Item 1) **[Figure 70-90-10]**.

Measure the I.D. of the connecting rod small end bushing (Item 2) **[Figure 70-90-10]**.

Calculate the oil clearance. If the clearance exceeds the allowable limit, replace the connecting rod. If it still exceeds the specifications, replace the piston pin.

Piston Pin O.D.	28,006 - 28,011 mm (1.1026 - 1.1027 in)
Bushing I.D.	28,031 - 28,046 mm (1.1036 - 1.1041 in)
Oil Clearance Between Piston Pin & Bushing	0,020 - 0,040 mm (0.00079 - 0.0015 in)
Allowable Limit	0,15 mm (0.0059 in)

Figure 70-90-11



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

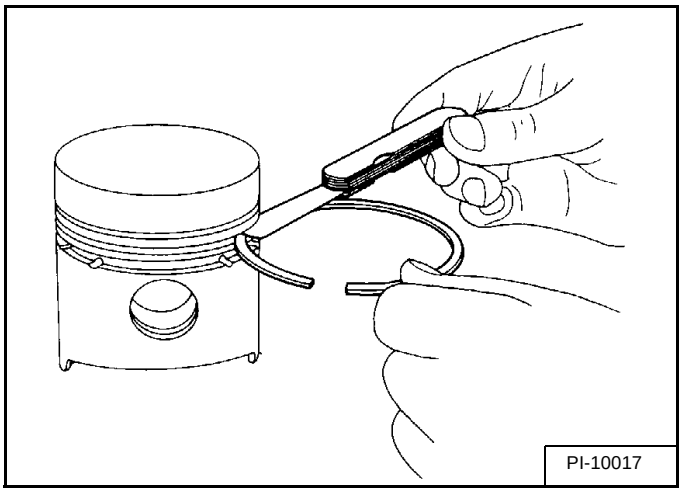
If the gap exceeds the allowable limit, replace the ring.

Top Ring Gap	0,25 - 0,40 mm (0.0099 - 0.015 in)
Oil Ring Gap	0,25 - 0,45 mm (0.0099 - 0.017 in)
Allowable Limit	1,25 mm (0.0492 in)
Second Ring Gap	0,30 - 0,45 mm (0.012 - 0.017 in)

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Piston And Connecting Rod - Servicing (Cont'd)

Figure 70-90-12



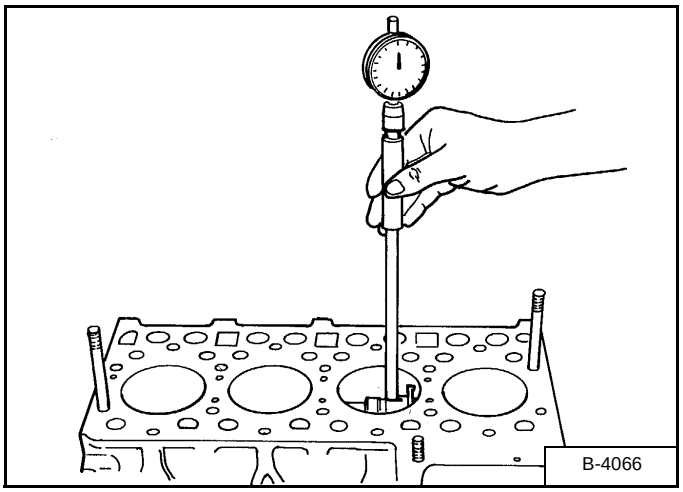
Remove the carbon from the ring grooves. Measure the clearance between the ring and groove with a feeler gauge **[Figure 70-90-12]**.

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

Top Ring	0,050 - 0,090 mm (0.0020 - 0.0035 in)
Allowable Limit	0,15 mm (0.0059 in)
Second Ring	0,090 - 0,12 mm (0.0036 - 0.0047 in)
Allowable Limit	0,20 mm (0.0079 in)
Oil Ring	0,020 - 0,060 mm (0.0079 - 0.0023 in)
Allowable Limit	0,15 mm (0.0059 in)

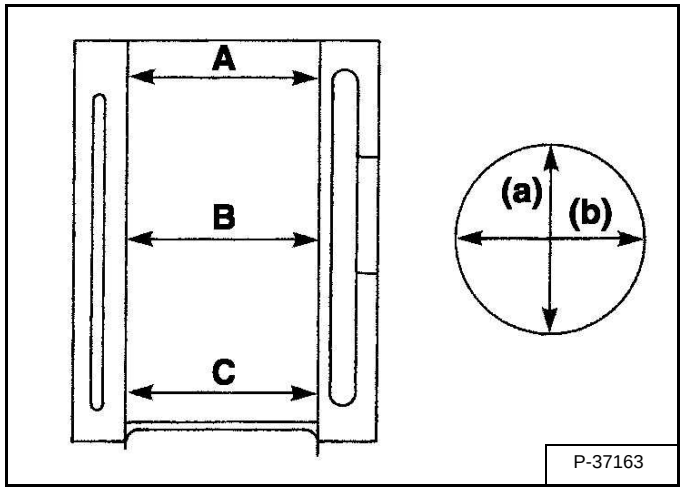
Cylinder Bore - Checking

Figure 70-90-13



Use a gauge to check the inside measurement of the cylinder bore **[Figure 70-90-13]**.

Figure 70-90-14



Measure the six points as shown in figure **[Figure 70-90-14]** to find the maximum wear.

The factory specifications are:

94 - 94,022 mm (3.7008 - 3.7016 in).

The allowable limit is 94,15 mm (3.707 in).

If the cylinder bore is not within specifications, bore and hone to oversize dimension.

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Connecting Rod Alignment

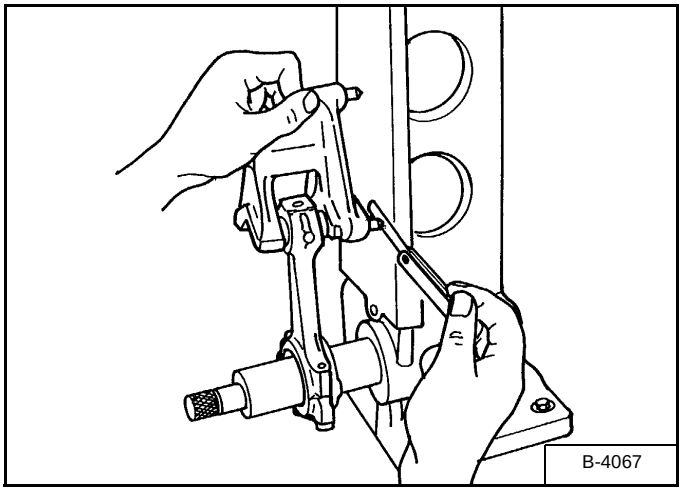
NOTE: The small end bushing is the basis of this check, check the bushing for wear before doing this check.

Install the piston pin into the connecting rod.

Install the connecting rod on an alignment tool.

Put the gauge over the piston pin and move it against the face plate.

Figure 70-90-15



If the gauge does not fit squarely against the face plate, measure the space between the gauge and face plate **[Figure 70-90-15]**.

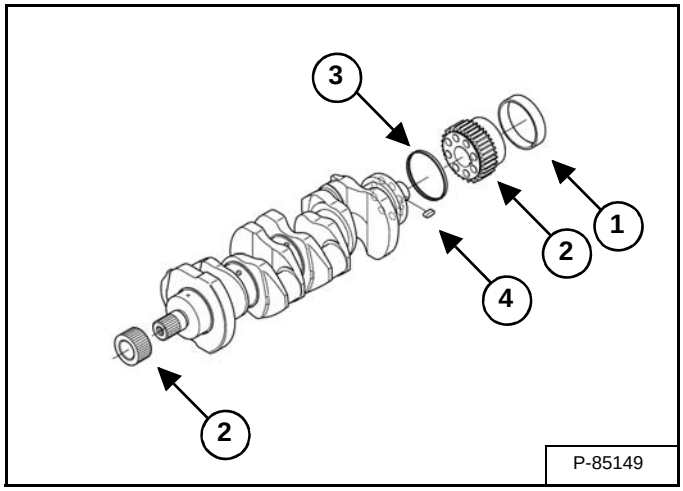
If the measurement exceeds the allowable limit, replace the connecting rod.-

Rod Alignment	0,05 mm (0.002 in)

Crankshaft Gear Removal And Installation

Remove the crankshaft. (See Crankshaft And Bearings Removal And Installation on Page 70-90-7.)

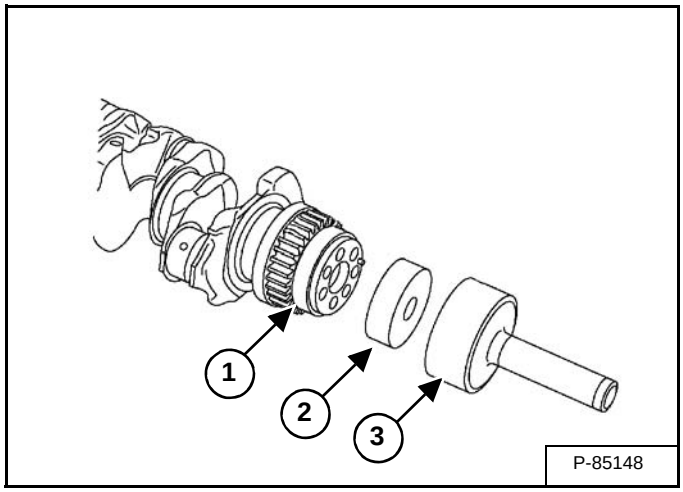
Figure 70-90-16



Remove the crankshaft sleeve (Item 1), the crankshaft gears (Item 2), the seal (Item 3) and the key (Item 4) **[Figure 70-90-16]**.

Installation: Install a new seal (Item 3) when servicing **[Figure 70-90-16]**.

Figure 70-90-17



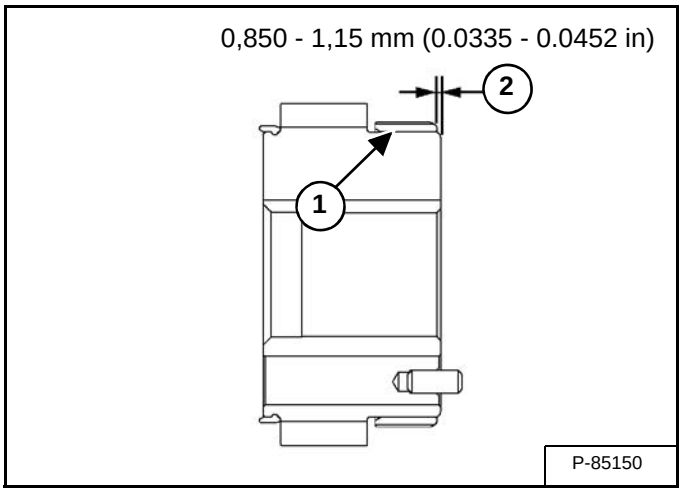
Installation: Heat the crankshaft sleeve (Item 1) **[Figure 70-90-16]** and **[Figure 70-90-17]** to 150 - 200°C (302 - 392°F). Install the crankshaft sleeve onto the crankshaft using the crankshaft sleeve guide (Item 2) and the crankshaft replacing tool (Item 3) MEL - 1660 **[Figure 70-90-17]**.

Installation: Install the crankshaft sleeve (Item 1) with the chamfered surface facing outward **[Figure 70-90-17]**.

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Crankshaft Gear Removal And Installation (Cont'D)

Figure 70-90-18

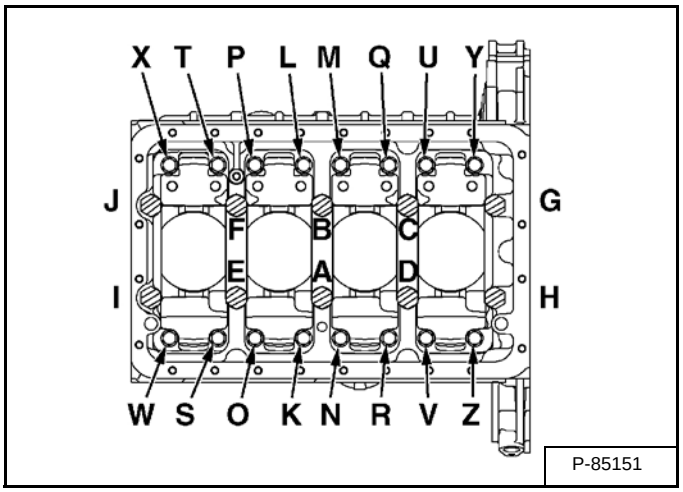


Installation: When installing the crankshaft sleeve (Item 1) allow for a space (Item 2) **[Figure 70-90-18]** from the end of the crankshaft to the edge of the crankshaft sleeve.

Crankshaft And Bearings Removal And Installation

Remove the piston and connecting rod assemblies. (See Piston And Connecting Rod Removal And Installation on Page 70-90-1.)

Figure 70-90-19

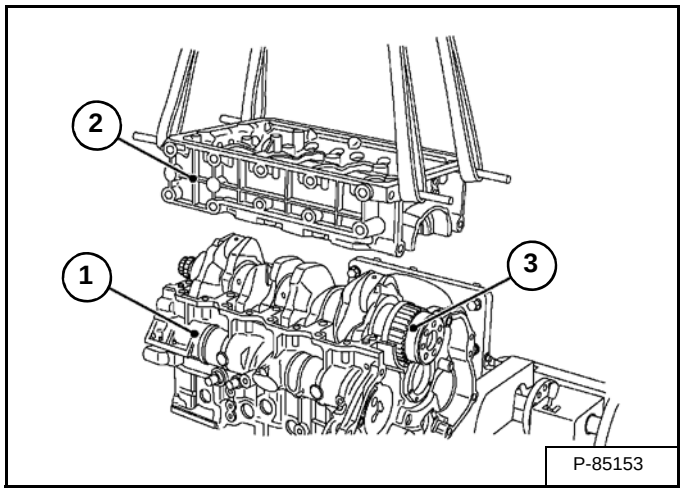


Remove the crankcase mounting screws in order from Z to A **[Figure 70-90-19]**.

Installation: Tighten the crankcase mounting bolts from A to J to 138 - 147 N•m (102 - 108 ft-lb)

Installation: Tighten the crankcase mounting bolts from K to Z to 59 - 63 N•m (44 - 47 ft-lb).

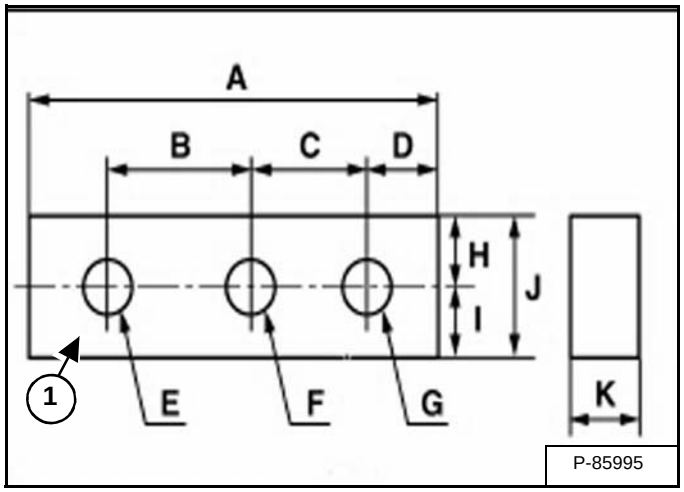
Figure 70-90-20



Remove crankcase 2 (Item 2) from crankcase 1 (Item 1) **[Figure 70-90-20]**.

Remove the crankshaft (Item 3) **[Figure 70-90-20]**.

Figure 70-90-21



This tool is used for aligning the crankcase 1 and crankcase 2. Make two of these tools.

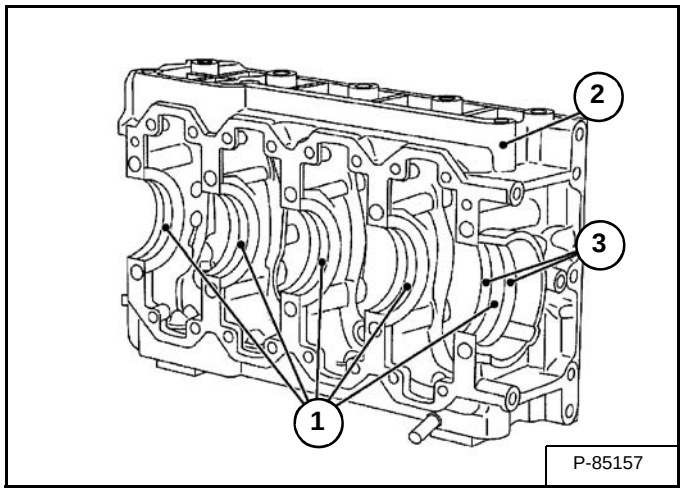
A	126,6 mm (4.984 in)
B	49,1 mm (1.93 in)
C	37,5 mm (1.48 in)
D	20 mm (0.79 in)
E	14 mm dia. (0.55 in dia.)
F	14 mm dia. (0.55 in dia.)
G	14 mm dia. (0.55 in dia.)
H	17,5 mm (0.689 in)
I	17,5 mm (0.689 in)
J	35 mm (1.4 in)
K	19 mm (0.75 in)

Material (Item 1) **[Figure 70-90-21]**: SS400

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Crankshaft And Bearings Removal And Installation (Cont'd)

Figure 70-90-22

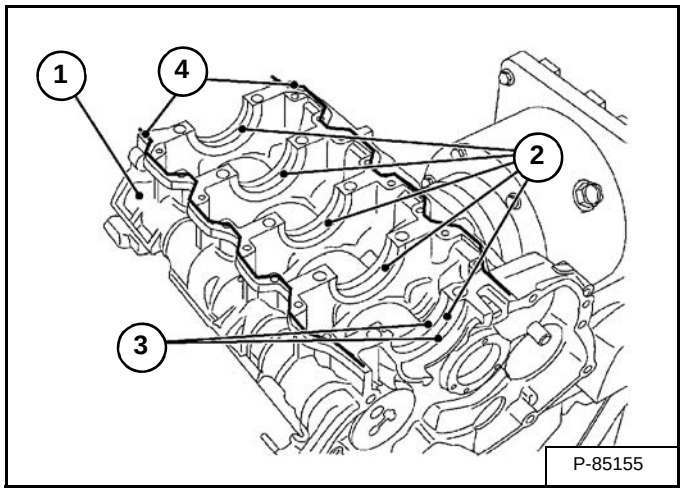


NOTE: Make sure both crankcases are clean and dry before assembling.

Install the bearings (Item 1) into the crankcase 2 (Item 2) **[Figure 70-90-22]**.

Install the thrust bearings (Item 3) **[Figure 70-90-22]** with the groove facing out.

Figure 70-90-23

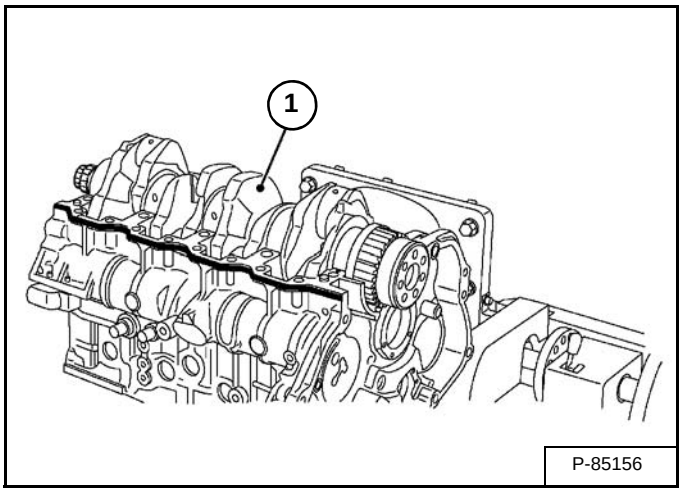


Install the bearings (Item 2) into the crankcase 1 (Item 1) **[Figure 70-90-23]**.

Install the thrust bearings (Item 3) **[Figure 70-90-23]** with the groove facing out.

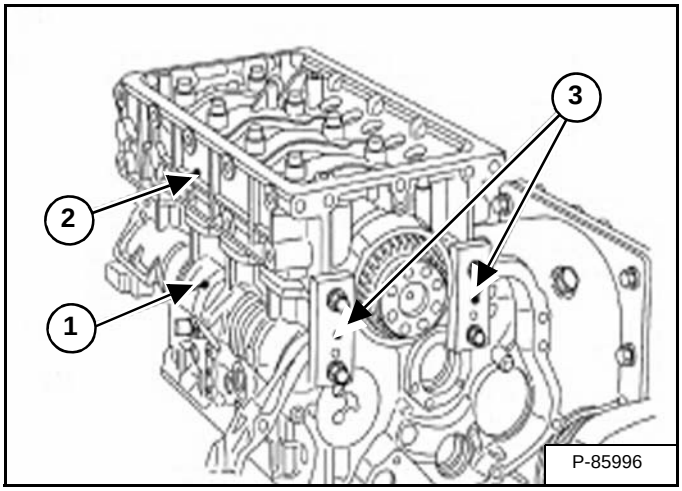
Carefully apply liquid gasket evenly (Item 4) to the crankcase 1 (Item 1) **[Figure 70-90-23]**.

Figure 70-90-24



Apply oil to the thrust bearings and install the crankshaft (Item 1) **[Figure 70-90-24]**.

Figure 70-90-25



Align and install crankcase 2 (Item 2) to crankcase 1 (Item 1) **[Figure 70-90-25]**.

Apply engine oil to the crankcase mounting bolts and hand tighten from A to J and then K to Z **[Figure 70-90-19]**.

Install the jig (Item 3) **[Figure 70-90-25]** and tighten to 78 - 90 N•m (58 - 66 ft-lb)

NOTE: The jig helps to minimize the level difference between the crankcase 1 and crankcase 2 at the flywheel side. The gap must be 0,05 mm (0.002 in) or smaller.

Tighten the crankcase mounting bolts from A to J to 138 - 147 N•m (102 - 108 ft-lb)

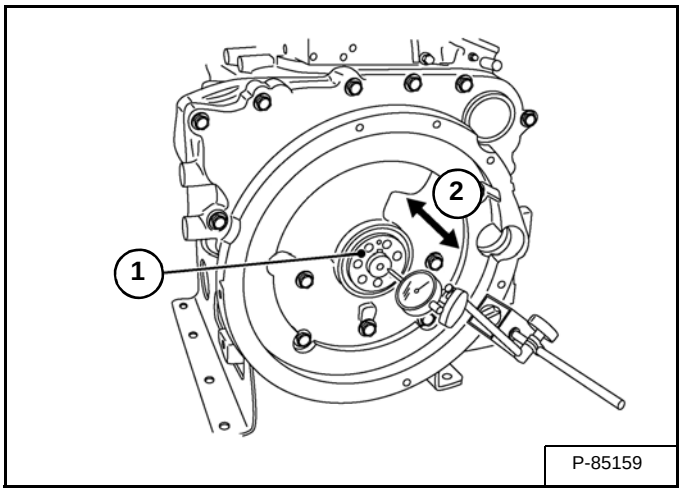
Tighten the crankcase mounting bolts from K to Z to 59 - 63 N•m (44 - 47 ft-lb).

Remove the jig (Item 3) **[Figure 70-90-25]**.

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Crankshaft And Bearings - Servicing

Figure 70-90-26



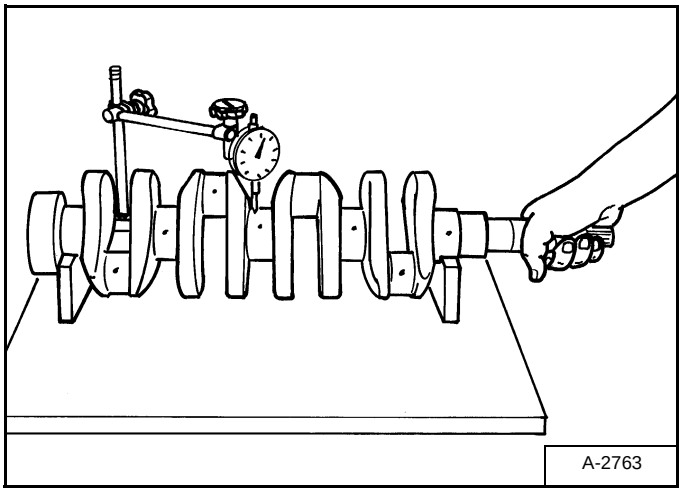
Set a dial indicator with its tip on the end of the crankshaft (Item 1) **[Figure 70-90-26]**.

Measure the side clearance by moving the crankshaft side to side (Item 2) **[Figure 70-90-26]**.

If the misalignment exceeds the allowable limit, replace the crankshaft.

Side clearance of crankshaft	Factory Spec.	0,15 - 0,35 mm (0.0059 - 0.013 in)
	Allowable limit	0,50 mm (0.020 in.)

Figure 70-90-27



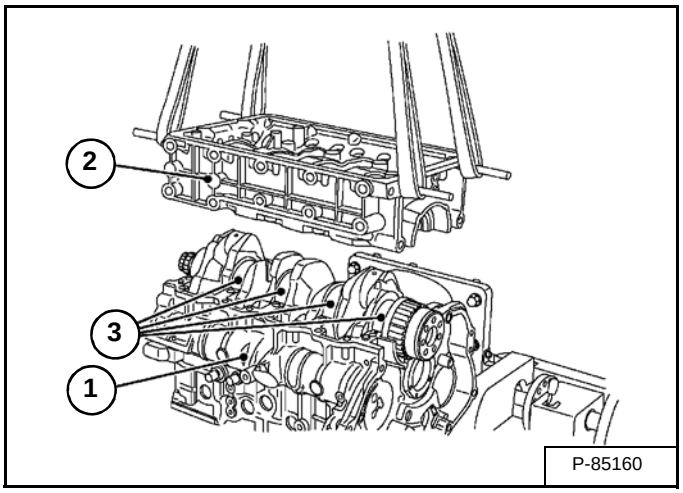
Put the crankshaft on V-blocks. Install a dial indicator on the center journal **[Figure 70-90-26]**.

Turn the crankshaft at a slow rate to obtain the misalignment (one half of the alignment measurement).

If the misalignment exceeds the allowable limit, replace the crankshaft.

Alignment	0,02 mm (0.0008 in)

Figure 70-90-28



Place plastigage on the crankshaft (Item 3) **[Figure 70-90-28]**.

Place crankcase 2 (Item 2) on crankcase 1 (Item 1) **[Figure 70-90-28]** and torque the bolts.

Torque the bolts A to Z **[Figure 70-90-19]**. (See Crankshaft And Bearings Removal And Installation on Page 70-90-7.)

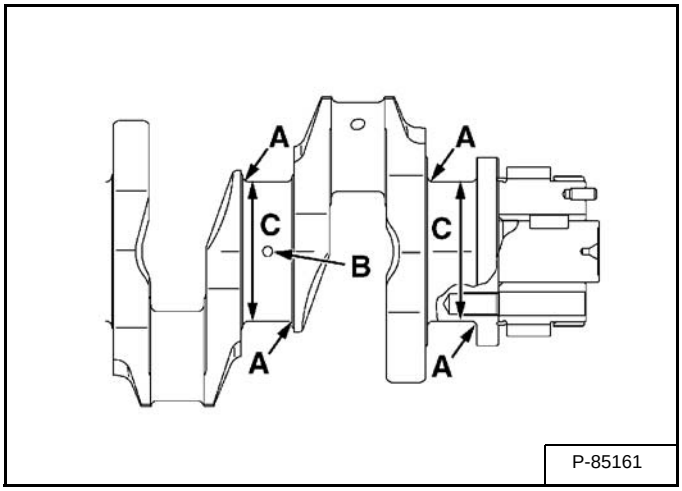
Remove crankcase 2 (Item 2) **[Figure 70-90-28]** and measure the amount of the flattening with the scale to determine the oil clearance.

Crankshaft Journal O.D.	Factory Spec.	79,977 - 79,990 mm (3.1487 - 31.1492 in)
Oil clearance between crankshaft journal and crankshaft bearing	Factory Spec.	0,030 - 0,073 mm (0.0012 - 0.0028 in)
	Allowable limit	0,20 mm (0.079 in)

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Crankshaft And Bearings - Servicing (Cont'd)

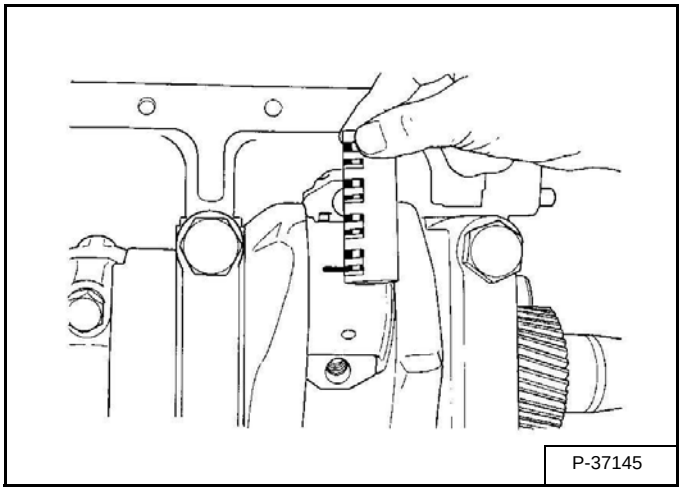
Figure 70-90-29



Reference of undersize dimensions of crankshaft journal **[Figure 70-90-29]**.

Undersize	0,2 mm (0.0079 in)	0,4 mm (0.016 in)
Dimension A	2,8 - 3,2 mm radius (0.11 - 0.12 in radius)	2,8 - 3,2 mm radius (0.11 - 0.12 in radius)
*Dimension B	1,0 - 1,5 mm relief (0.040 - 0.059 in relief)	1,0 - 1,5 mm relief (0.040 - 0.059 in relief)
Dimension C	79,777 - 79,790 mm dia. (3.1409 - 3.1413 in dia.)	79,577 - 79,590 mm dia. (3.1330 -3.1334 in dia.)
The crankshaft journal must be fine-finished to higher than ————(0.8-S) *Holes are to be de-burred and edges rounded with relief 1.0 - 1.5 mm (0.040 - 0.059 in)		

Figure 70-90-30



Clean the crank pin and crank pin bearing.

Put a strip of plastigage **[Figure 70-90-30]** on the center of the crank pin.

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.

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 cannot be used because of the crank pin wear, replace it with an undersized one referring to the table.

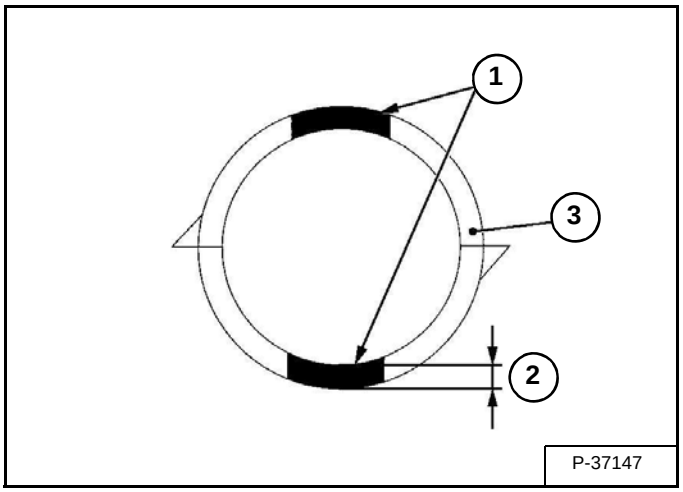
Crankpin O.D.	Factory spec.	49,980 - 49,991 mm (1.9678 - 1.9681 in)

Oil clearance between crank pin and crank pin bearing	Factory spec.	0,011 - 0,058 mm (0.00067 - 0.0018 in)
	Allowable limit	0,20 mm (0.0079 in)

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Crankshaft And Bearings - Servicing (Cont'd)

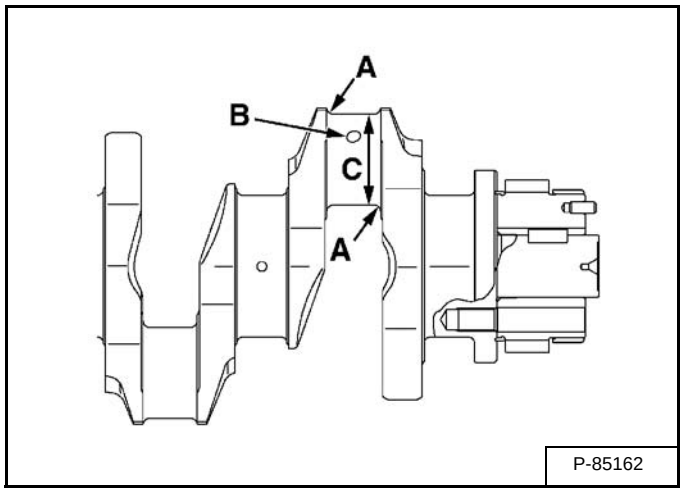
Figure 70-90-31



NOTE: 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 70-90-31].

ID Color	Connecting rod	Crank pin bearing	
	Large-end in. dia.	Class	Center wall thick
Blue	53,010 - 53,010 mm (2.0870 - 2.0874 in)	L	1,496 - 1,501 mm (0.05890 - 0.05909 in)
without Color	53,000 - 53,010 mm (2.0867 - 2.0870 in)	S	1,491 - 1,496 mm (0.05870 - 0.05889 in)

Figure 70-90-32



Undersize dimensions of crankpin.

Undersize	0,20 mm (0.0079 in)	0,40 mm (0.016 in)
Dimension A	3,3 - 3,7 mm radius (0.13 - 0.14 in radius)	3,3 - 3,7 mm radius (0.13 - 0.14 in radius)
*Dimension B	1,0 - 1,5 mm relief (0.040 - 0.059 in relief)	1,0 - 1,5 mm relief (0.040 - 0.059 in relief)
Dimension C	49,780 - 49,791 mm dia. (1.9599 - 1.9602 in dia.)	49,580 - 49,591 mm dia. (1.9520 - 1.9524 in dia.)

(0.8-S)

The crank pin must be fine-finished to higher than ——

*Holes to be de-burred and edges rounded with relief. 1,0 -1,5 mm (0.040 - 0.059 in)

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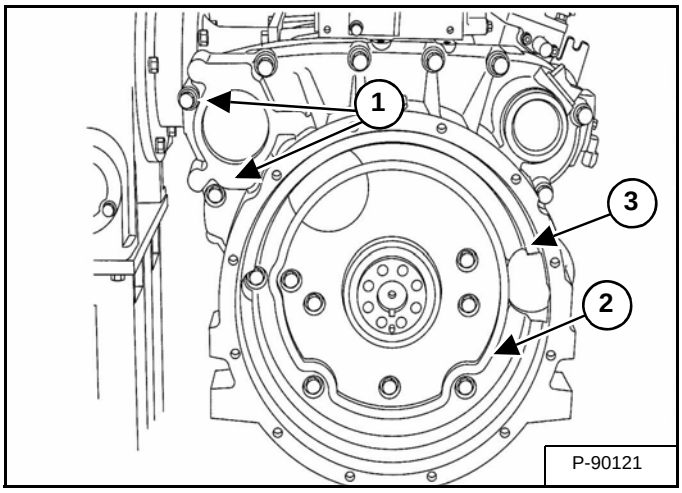
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Timing Gearcase Cover Removal

Remove the flywheel. (See Flywheel Removal And Installation on Page 70-120-1.)

Remove the housing. (See Housing Removal And Installation on Page 70-120-3.)

Figure 70-100-1



Remove the eight outside timing gearcase cover mounting bolts (Item 1) **[Figure 70-100-1]**.

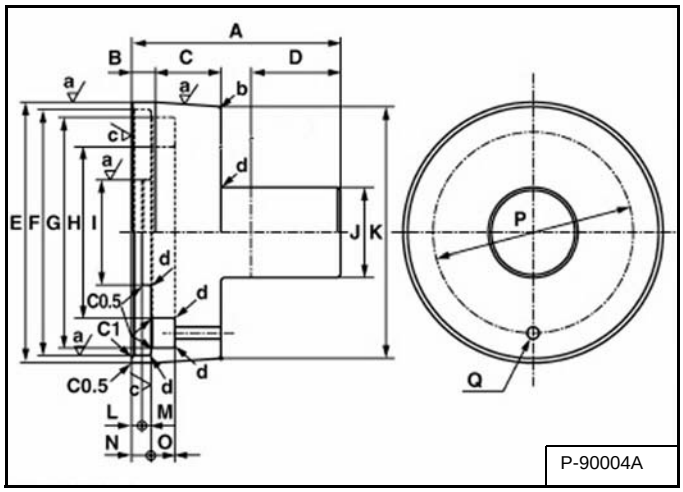
Remove the eight inside timing gearcase cover mounting bolts (Item 2) **[Figure 70-100-1]**.

Remove the timing gearcase cover (Item 3) **[Figure 70-100-1]**.

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Timing Gearcase Cover Installation

Figure 70-100-2



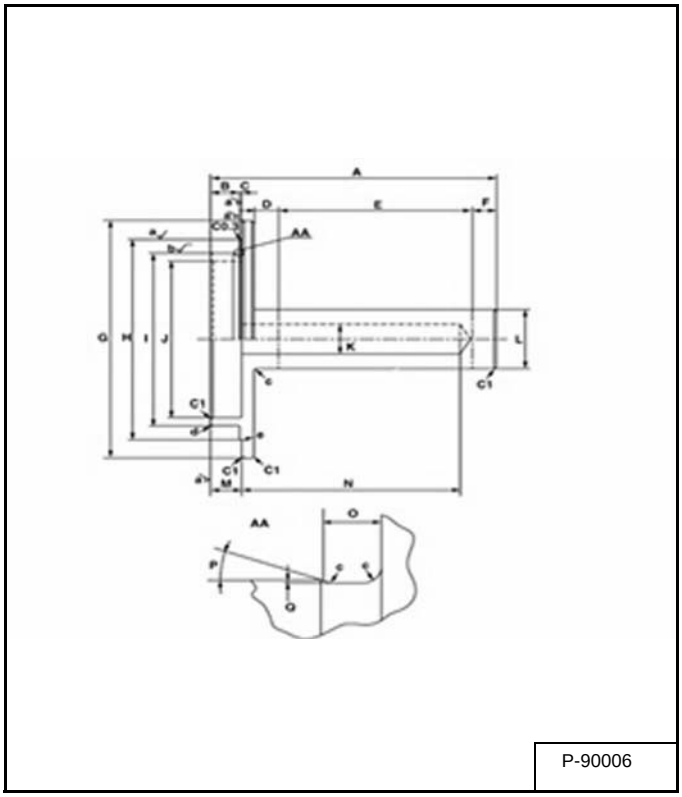
A	70,0 mm (2.76 in)
B	8,0 mm (0.31 in)
C	22,0 mm (0.866 in)
D	30,0 mm (1.18 in)
E	87,0 mm dia. (3.43 in dia.)
F	82,036 - 82,071 mm dia. (3.2298 - 3.2311 in dia.)
G	77,0 mm dia. (3.03 in dia.)
H	57,0 mm dia. (2.24 in dia.)
I	35,0 mm dia. (1.38 in dia.)
J	30,0 mm dia. (1.18 in dia.)
K	84,0 mm (3.31 in)
L	3,5 mm (0.14 in)
M	3,0 mm (0.12 in)
N	6,60 - 6,80 mm (0.260 - 0.267 in)
O	8,0 mm (0.31 in)
P	67,0 mm dia. (2.64 in dia.)
Q	4,0 mm dia. (0.16 in) through hole
a	Ra = 1.6 a
b	1,5 mm radius (0.059 in radius)
c	Ra = 3.2 a
d	0,80 mm radius (0.031 in radius)
C0.5	Chamfer 0,50 mm (0.020 in)
C1.0	Chamfer 1,0 mm (0.039 in)

Make timing gearcase cover guide tool **[Figure 70-100-2]**.

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Timing Gearcase Cover Installation (Cont'd)

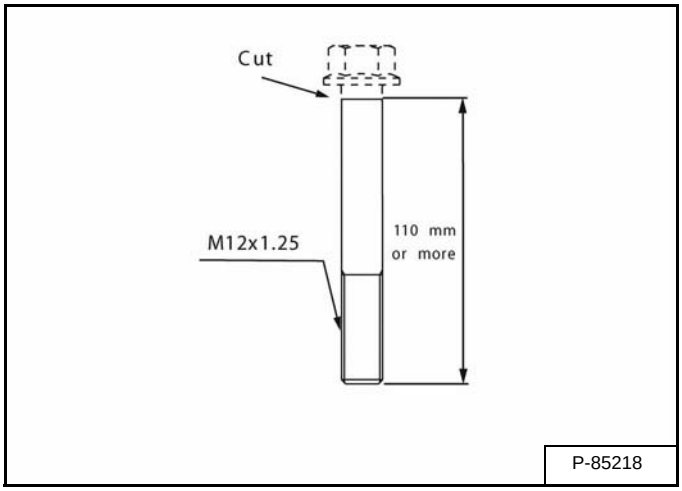
Figure 70-100-3



A	118 mm (4.65 in)
B	12,0 mm (0.472 in)
C	0,90 - 1,0 mm (0.36 - 0.039 in)
D	10,0,0 mm (0.394 in)
E	80,0 mm (3.15 in)
F	10,0,0 mm (0.394 in)
G	120 mm dia. (4.72 in dia.)
H	100,90 - 101,10 mm dia. (3.9725 - 3.9803 in dia.)
I	86,966 - 86,988 mm dia .(3.4239 - 3.4247 in dia.)
J	79,0 mm dia. (3.11 in dia.)
K	15,0 mm dia. (0.591 in dia.)
L	30,0 mm dia. (1.18 in dia.)
M	13,0 mm (0.512 in)
N	90,00 mm (3.54 in)
O	2,50 mm (0.0984 in)
P	0,35 rad (20 degrees)
Q	0,15 - 0,25 mm (0.0059 - 0.0098 in)
a	Ra = 3.2 a
b	Ra = 1.6 a
c	0,80 mm radius (0.031 in radius)
d	1,5 mm radius (0.059 in radius)
e	0,20 mm radius (0.0079 in radius)
C0.3	Chamfer 0,30 mm (0.012 in)
C1	Chamfer 1,0 mm (0.039 in)

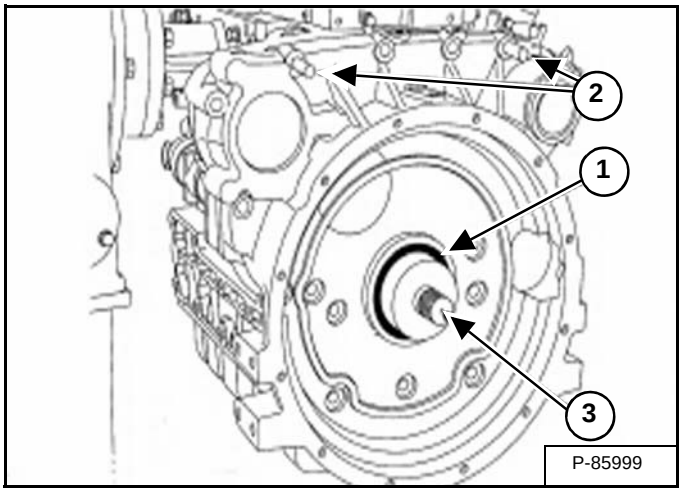
Make timing gearcase oil seal replacing tool **[Figure 70-100-3]**.

Figure 70-100-4



Make timing gearcase guide screws as shown above **[Figure 70-100-4]**.

Figure 70-100-5



Apply engine oil to the timing gearcase oil seal (Item 1) **[Figure 70-100-5]**.

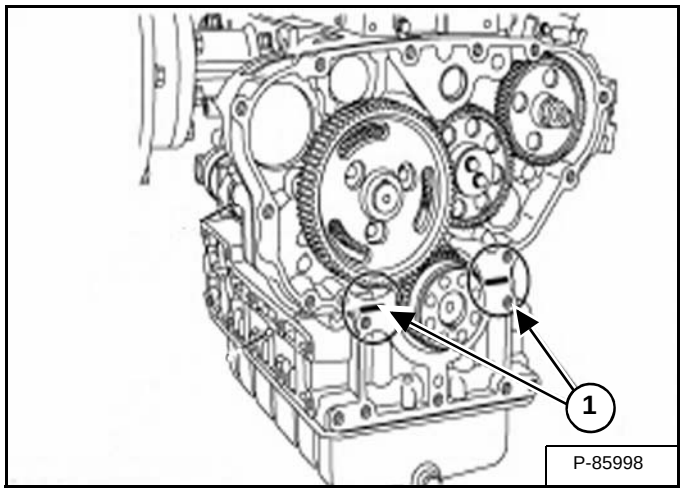
Install timing gearcase guide screws (Item 2) **[Figure 70-100-5]**.

Install timing gearcase using the guide (Item 3) **[Figure 70-100-5]**.

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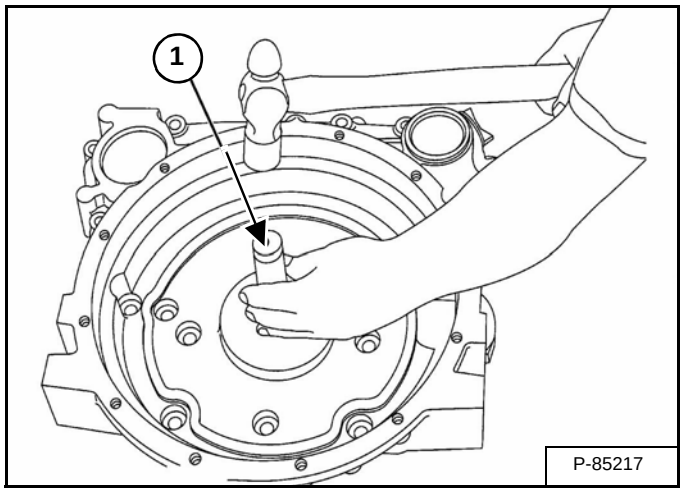
Timing Gearcase Cover Installation (Cont'd)

Figure 70-100-6



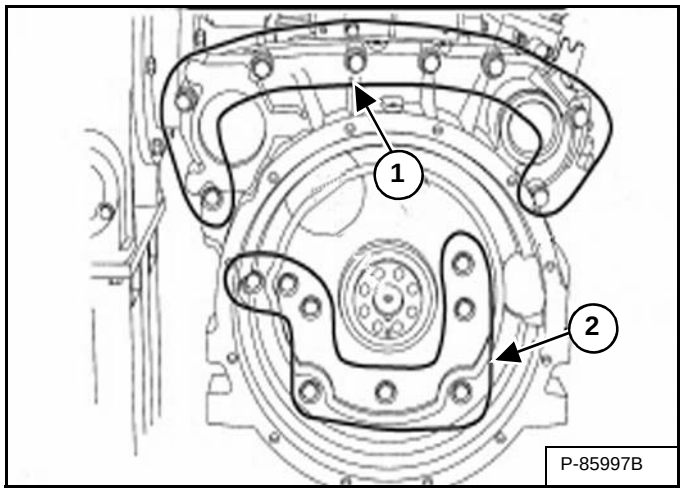
Apply a liquid gasket (Three Bond 1217H) (Item 1) **[Figure 70-100-6]** to the two crankcase seams.

Figure 70-100-7



Install timing gearcase oil seal using the timing gearcase oil seal replacing tool (Item 1) **[Figure 70-100-7]**.

Figure 70-100-8



Tighten the seven outside timing gearcase cover mounting bolts (Item 1) **[Figure 70-100-8]**.

Tighten the six inside timing gearcase cover mounting bolts (Item 2) **[Figure 70-100-8]**.

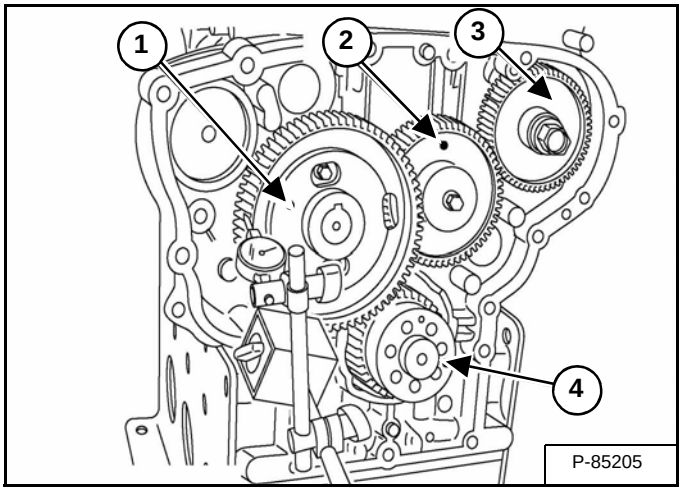
Installation: Tighten the timing gearcase cover bolts to 103 - 117N•m (76 - 86 ft-lb) **[Figure 70-100-8]**.

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Timing Gears Backlash - Checking

When the gears are installed, check the backlash of the gears.

Figure 70-100-9



Install a dial indicator to individually check backlash for cam gear (Item 1), idle gear (Item 2), injection pump gear (Item 3) and crank gear (Item 4) **[Figure 70-100-9]**.

Hold one gear while turning the other gear **[Figure 70-100-9]**.

If the backlash exceeds the allowable limit, check the oil clearance of the shaft and gear. If the oil clearance is correct, replace the gear.

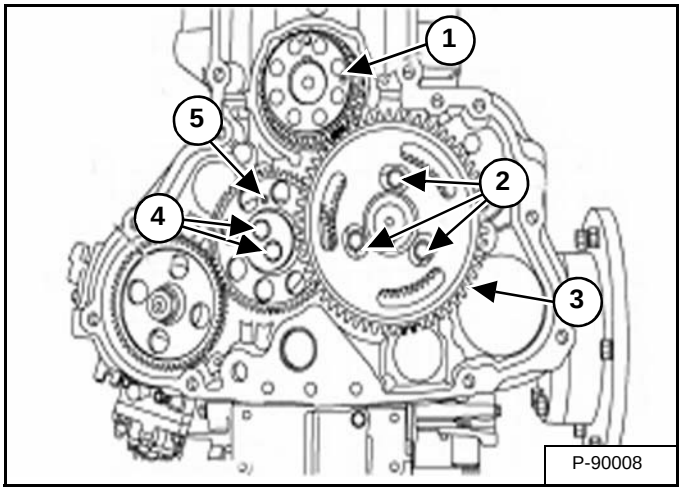
Crank Gear & Cam Gear	0,0410 - 0,139 mm (0.00162 - 0.00547 in)
Allowable Limit	0,22 mm (0.0087 in)
Cam Gear & Idler Gear	0,0410 - 0,134 mm (0.00162 - 0.00527 in)
Allowable Limit	0,22 mm (0.0087 in)
Injection Pump Gear & Idler Gear	0,0410 - 0,134 mm (0.00162 - 0.00527 in)
Allowable Limit	0,22 mm (0.0087 in)

Idler Gear And Camshaft Removal And Installation

Remove the timing gearcase cover. (See Timing Gearcase Cover Removal on Page 70-100-1.)

Remove the valve tappets. (See Valve Tappets on Page 70-80-12.)

Figure 70-100-10



Rotate entire engine with the crankshaft (Item 1) **[Figure 70-100-10]** facing up to remove the tappets

Remove the three camshaft set bolts (Item 2) and remove the cam (Item 3) **[Figure 70-100-10]**.

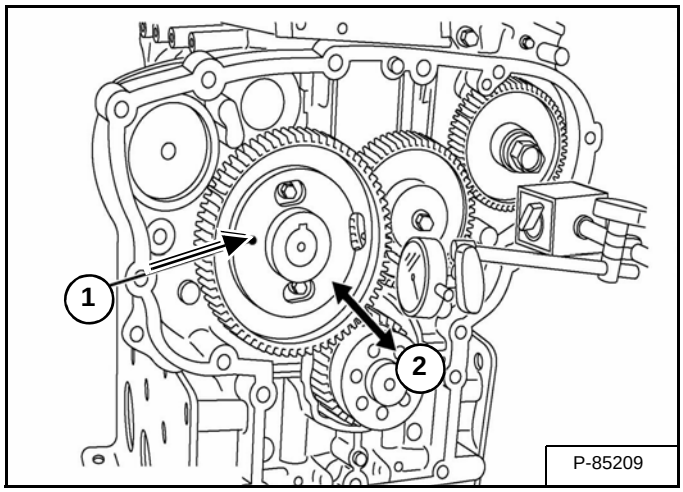
Remove the idle gear mounting bolts (Item 4) and remove idle gear (Item 5) **[Figure 70-100-10]**.

Installation: Make sure the timing marks are in correct alignment when installing the timing gears.

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Camshaft - Servicing

Figure 70-100-11

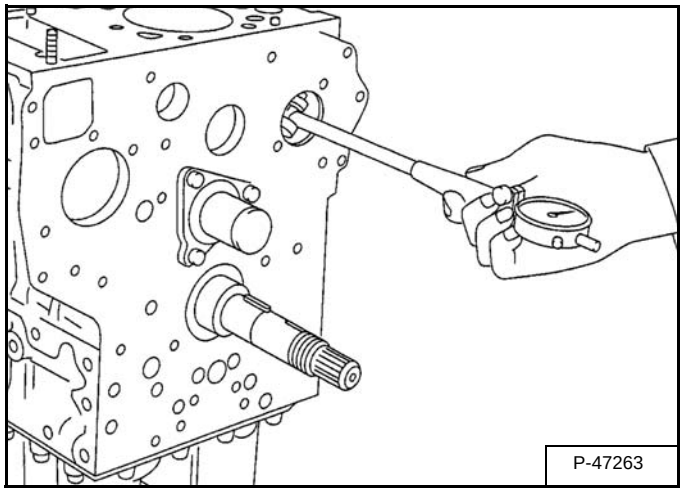


Mount a dial indicator and check cam gear (Item 1) end play (Item 2) **[Figure 70-100-11]**.

Installation: Check the camshaft end play. If clearance exceeds the allowable limit, replace the camshaft retainer plate **[Figure 70-100-11]**.

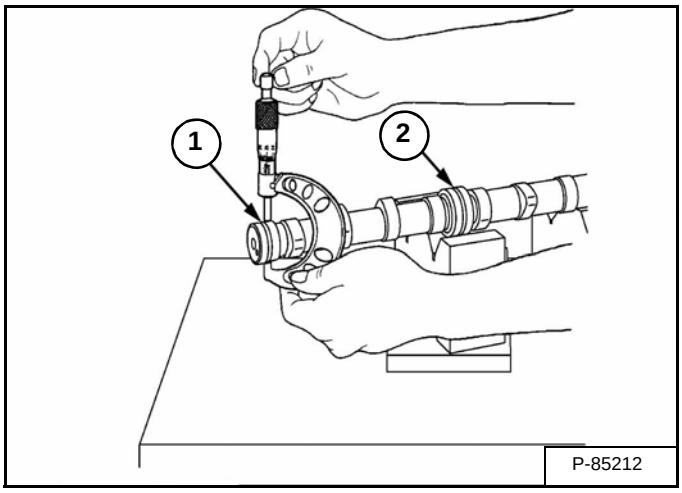
Camshaft End Play Allowable Limit	0,10 mm (0.0039 in)

Figure 70-100-12



Measure the cylinder block bore in the engine block **[Figure 70-100-12]**.

Figure 70-100-13



Measure the camshaft journal (Item 1) and journal (Item 2) **[Figure 70-100-13]**.

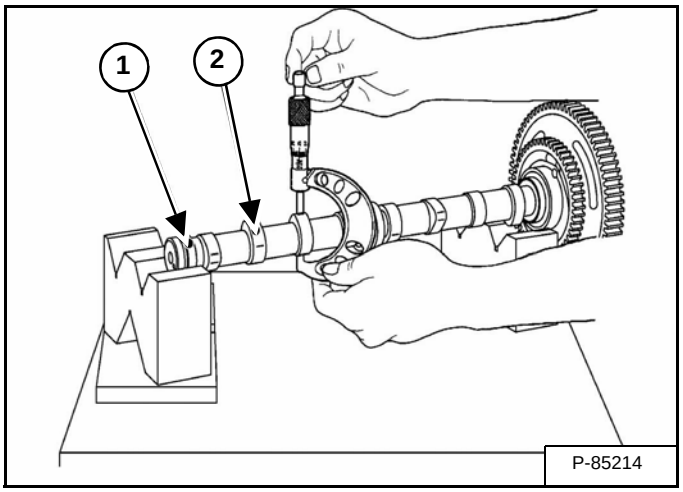
Calculate the oil clearance. If the clearance exceeds the allowable limit, replace the camshaft.

Cylinder Block Bore 1 I.D.	35,000 - 35,025 mm (1.3780 - 1.3789 in)
Cylinder Block Bore 2 I.D.	44,000 - 44,025 mm (1.7323 - 1.7332 in)
Camshaft Journal 1 O.D.	34,934 - 34,950 mm (1.3754 - 1.3759 in)
Camshaft Journal 2 O.D.	43,934 - 43,950 mm (1.7297 - 1.7303 in)
Oil Clearance of Camshaft Journal	0,050 - 0,091 mm (0.0020 - 0.0035 in)
Allowable Limit	0,15 mm (0.0059 in)

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Camshaft - Servicing (Cont'd)

Figure 70-100-14

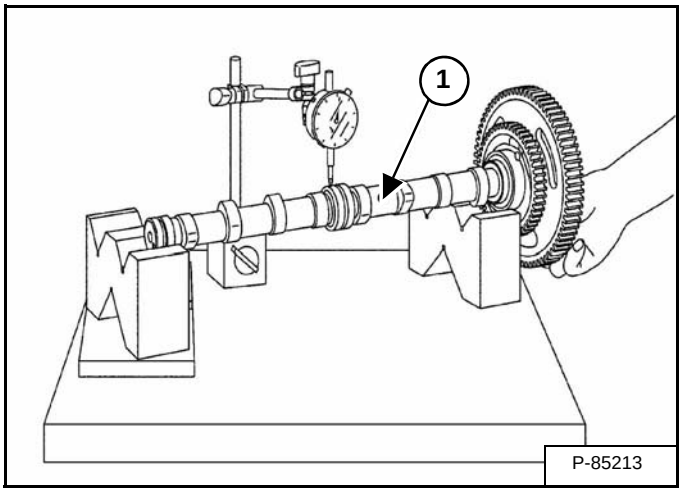


Measure the cam lobes at their highest point (Item 2) **[Figure 70-100-14]**.

If the measurement is less than the allowable limit, replace the camshaft (Item 1) **[Figure 70-100-14]**.

Cam Lobe Height Intake	37,50 mm (1.476 in)
Cam Lobe Height Exhaust	37,90 mm (1.492 in)
Allowable Limit Intake	37,00 mm (1.457 in)
Allowable Limit Exhaust	37,40 mm (1.472 in)

Figure 70-100-15



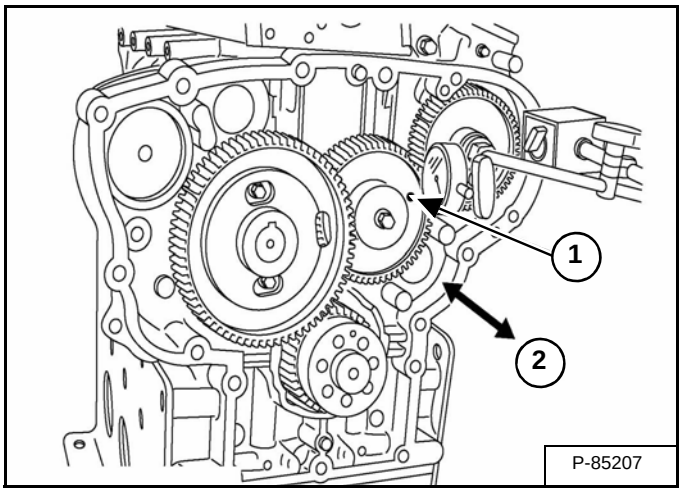
Put the camshaft (Item 1) in V-blocks. Install a dial indicator **[Figure 70-100-15]**.

Turn the camshaft at a slow rate. If the misalignment exceeds the allowable limit, replace the camshaft.

Camshaft Alignment Allowable Limit	0,01 mm (0.0004 in)

Idler Gear And Shaft - Servicing

Figure 70-100-16



Mount a dial indicator and check idle gear (Item 1) end play (Item 2) **[Figure 70-100-16]**.

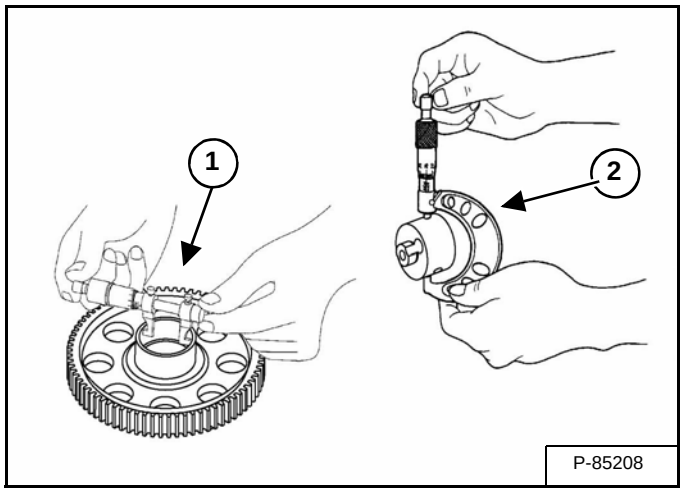
Installation: Check the idler gear end play. If the clearance exceeds the allowable limit, replace the gear collar.

Idler Gear End Play	0,15 - 0,25 mm (0.0059 - 0.0098 in)
Allowable Limit	0,90 mm (0.035 in)

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Idler Gear And Shaft - Servicing (Cont'd)

Figure 70-100-17

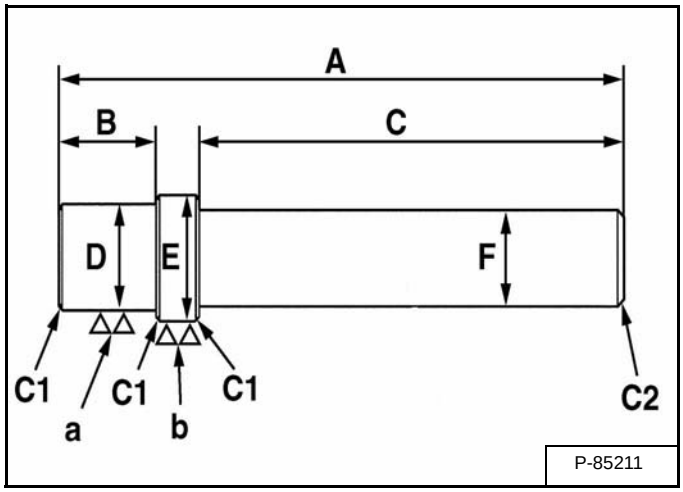


Measure idle gear bushing ID (Item 1) and idle gear shaft OD (Item 2) **[Figure 70-100-17]**.

Idler Gear Shaft O.D.	34,959 - 34,975 mm 1.3764 - 1.3769 in)
Idler Gear Bushing I.D.	35,025 - 35,050 mm (1.3790 - 1.3799 in)
Oil Clearance Between Idler Shaft & Gear Bushing	0,050 - 0,091 mm (0.0020 - 0.0035 in)
Allowable Limit	0,10 mm (0.0039 in)

Installation: If the oil clearance exceeds the allowable limit, replace the idle gear bushing.

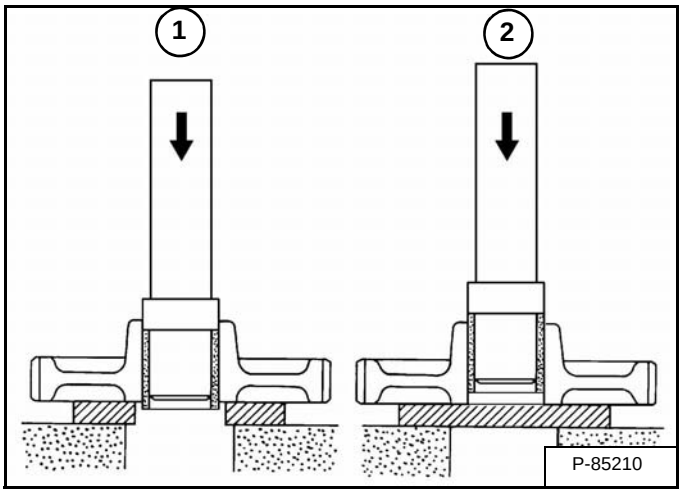
Figure 70-100-18



Make this idle gear bushing replacing tool as shown above **[Figure 70-100-18]**.

A	196 mm (7.72 in)
B	25,00 mm (0.984 in)
C	150 mm (5.91 in)
D	34,5 mm dia. (1.36 in dia.)
E	38,075 - 38,100 mm dia. (1.4991 - 1.5000 in dia.)
F	20 mm dia. (0.79 in dia.)
a	0,0063 mm (0.000248 in)
b	0,0063 mm (0.000248 in)
C1	Chamfer 1,0 mm (0.039 in)
C2	Chamfer 1,0 mm (0.039 in)

Figure 70-100-19



When removing idle gear bushing, press out bushing as shown above (item 1) **[Figure 70-100-19]**.

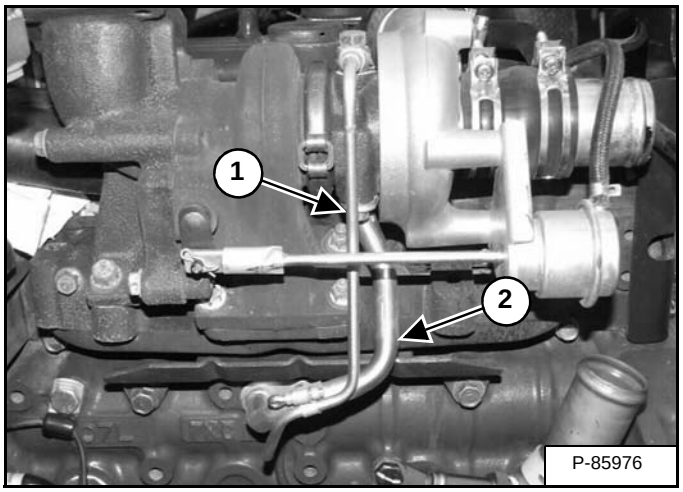
When replacing idle gear bushing, press in bushing as shown above (item 2) **[Figure 70-100-19]**.

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TURBOCHARGER

Description

Figure 70-110-1



The turbocharger is placed between the exhaust and intake manifolds. It is driven by hot exhaust gases and supplies air at more than atmospheric pressure to the intake. It is lubricated by oil from the main galley. The location of the turbo is between the engine and the blower housing.

The oil flows to the turbo by a tubeline (Item 1) and returns to the engine block through another tubeline (Item 2) **[Figure 70-110-1]**.

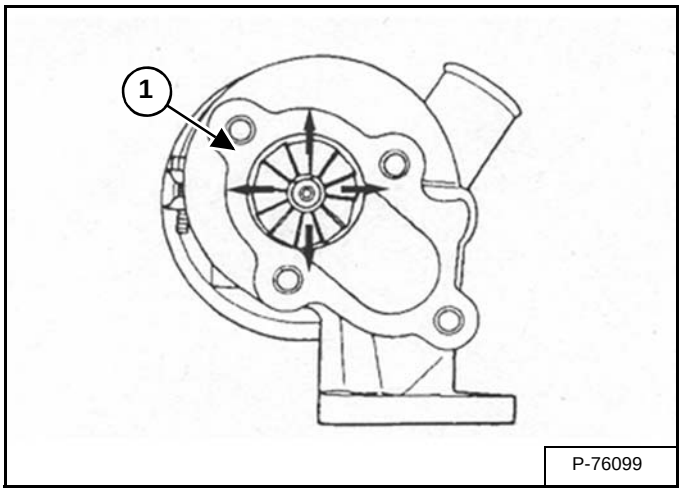
The turbocharger internal components are not serviceable.

Testing

Remove the turbocharger. (See Removal And Installation on Page 70-110-2.)

Radial Clearance

Figure 70-110-2



Move the compressor / turbine wheel (up and down / right and left) (Item 1) **[Figure 70-110-2]**.

If the wheel contacts the housing, replace the turbocharger assembly with a new one.

Check the oil tubelines for leaks.

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Removal And Installation

⚠ WARNING

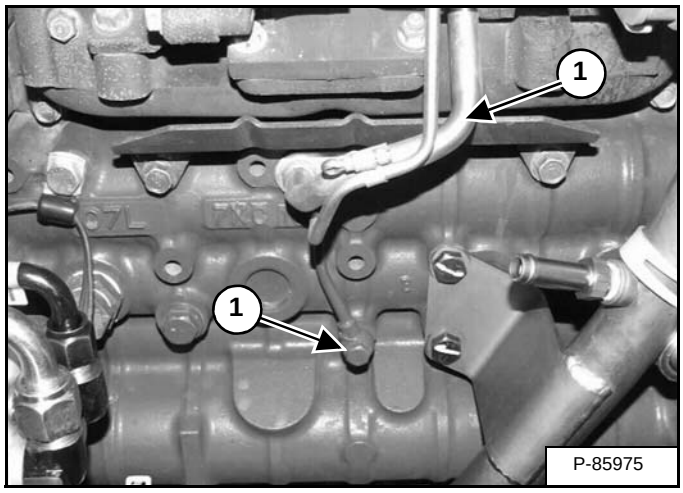
Turbochargers, operate at high speed and high temperatures. Keep fingers, tools and other objects away from the inlet and outlet ports. Avoid contact with hot surfaces.

W-2257-1196

Remove the muffler. (See Removal And Installation on Page 70-30-1.)

Remove the air cleaner. (See Housing Removal And Installation on Page 70-40-1.)

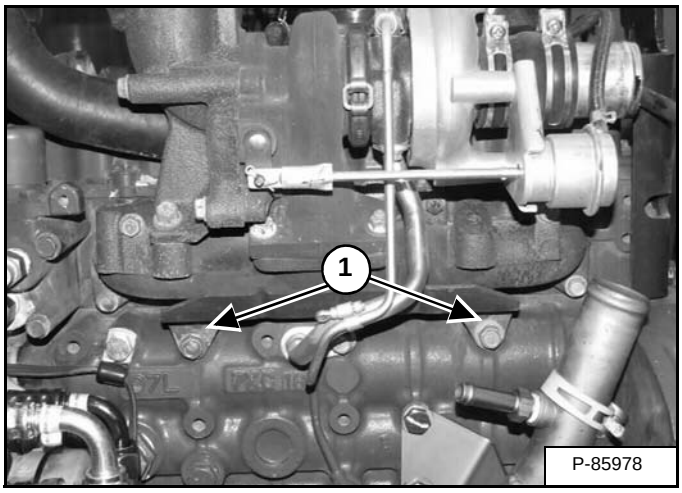
Figure 70-110-3



Disconnect the two oil pipes (Item 1) **[Figure 70-110-3]**.

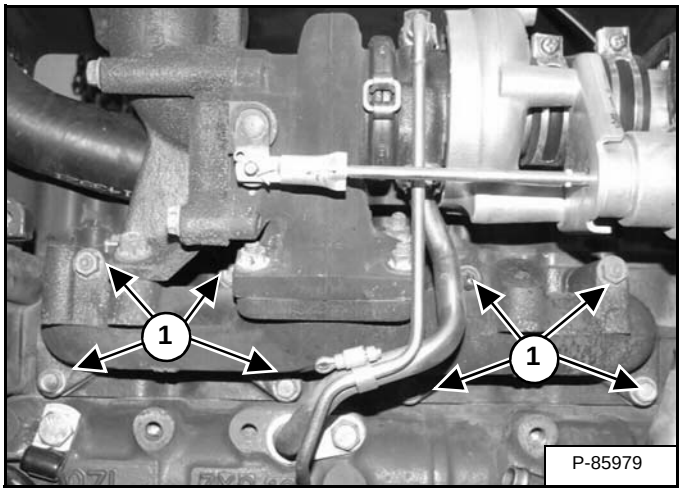
Installation: Tighten the two tubelines (Item 1) **[Figure 70-110-3]** to 16 - 19 N•m (12 - 14 ft-lb) torque.

Figure 70-110-4



Remove the two exhaust manifold cover bolts (Item 1) **[Figure 70-110-4]**.

Figure 70-110-5



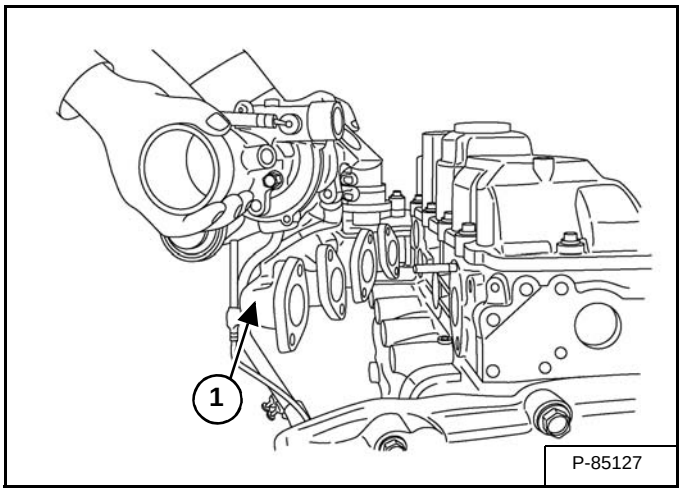
Remove the eight exhaust manifold bolts (Item 1) **[Figure 70-110-4]**.

Installation: Tighten the eight bolts (Item 1) **[Figure 70-110-3]** to 24 - 27 N•m (17.7 - 19.9 ft-lb) torque.

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Removal And Installation (Cont'd)

Figure 70-110-6



Remove the turbocharger assembly (Item 1) **[Figure 70-110-6]**.

Installation: During installation replace all gaskets with new ones.

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FLYWHEEL AND HOUSING

Flywheel Removal And Installation

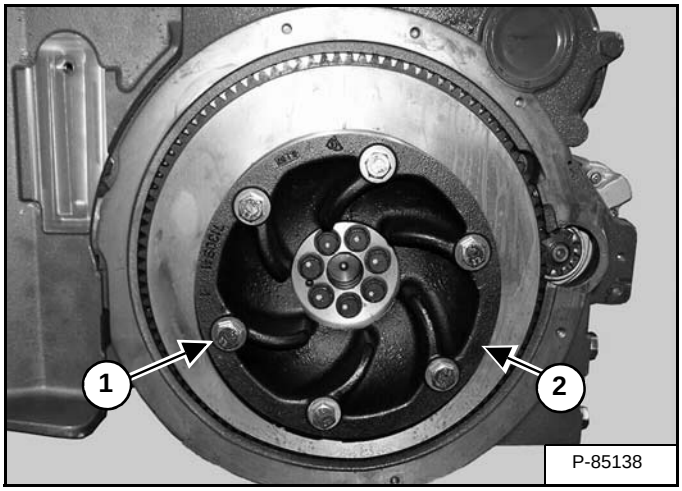
Remove the engine / hydrostatic pump package from the loader. (See Engine Removal And Installation on Page 70-10-7.)

Remove the drive belt shield. (See DRIVE BELT on Page 30-60-1.)

Remove the drive belt tension pulley. (See Tensioner Pulley Removal And Installation on Page 30-60-4.)

Remove the drive belt. (See DRIVE BELT on Page 30-60-1.)

Figure 70-120-1

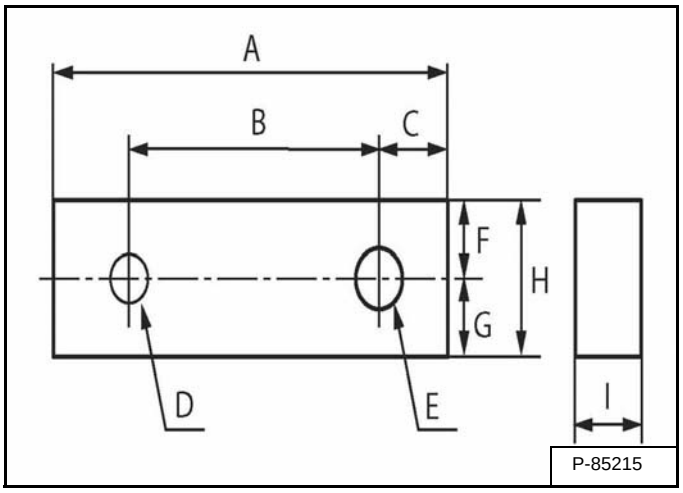


Remove the six mounting bolts (Item 1) from the pulley (Item 2) **[Figure 70-120-1]**.

Remove the pulley (Item 2) **[Figure 70-120-1]**.

Installation: Tighten to 43 - 47 N•m (32 - 35 ft-lb) torque.

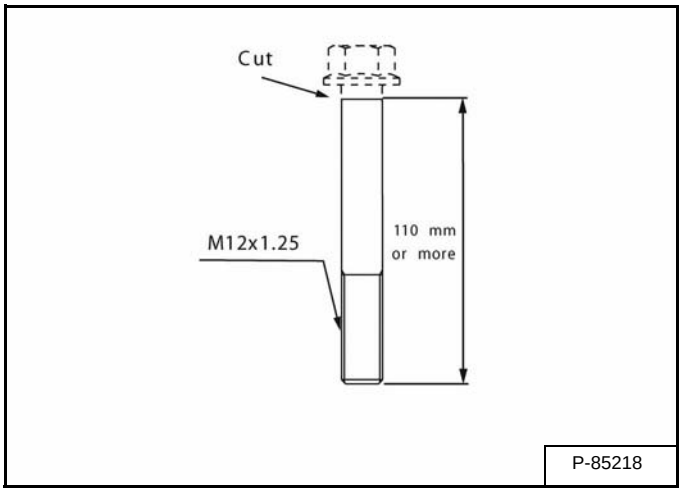
Figure 70-120-2



Make flywheel stop tool as shown above in **[Figure 70-120-2]**.

A	144 mm (5.67 in)
B	104 mm (4.09 in)
C	20,0 mm (0.787 in)
D	10,0 mm dia. (0.394 in dia.)
E	12,0 mm dia. (0.472 in dia.)
F	16,0 mm dia. (0.630 in dia.)
G	16,0 mm dia. (0.630 in dia.)
H	32,0 mm (1.26 in)
I	16,0 mm (0.630 in)

Figure 70-120-3

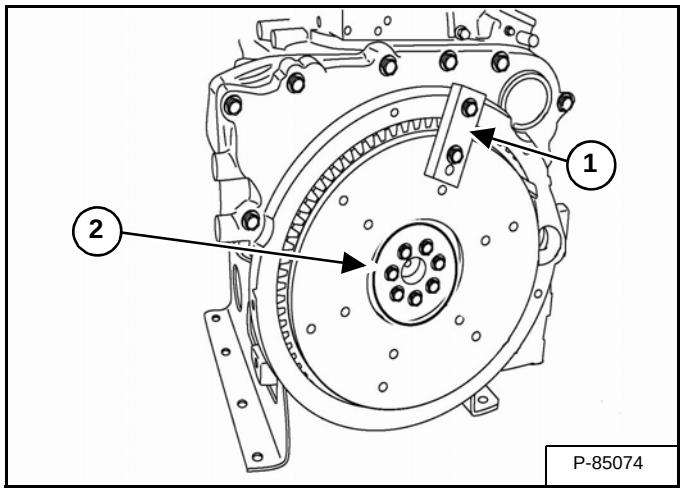


Make flywheel guide bolts as shown above to aid in removal and installation of flywheel **[Figure 70-120-3]**.

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Flywheel Removal And Installation (Cont'd)

Figure 70-120-4



Install flywheel stop tool (Item 1) **[Figure 70-120-4]**.

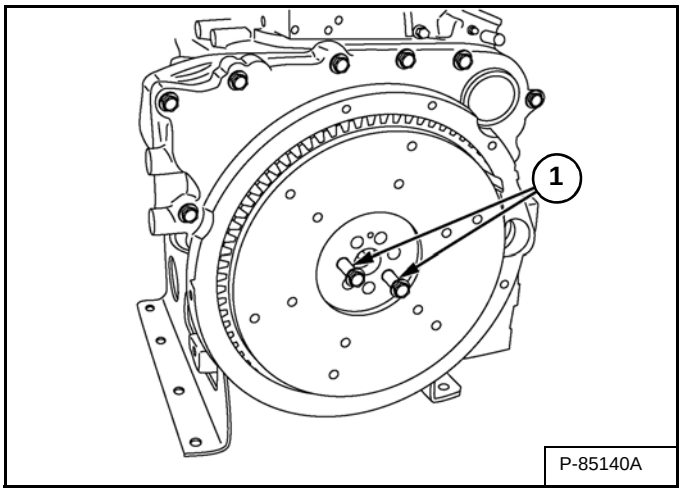
Remove two flywheel bolts and replace them with the flywheel guides bolts to aid in removal (Item 1) **[Figure 70-120-3]**.

Remove the seven mounting bolts (Item 2)**[Figure 70-120-4]** from the flywheel.

Installation: Apply engine oil to the bolts and tighten to 98,1 - 107 N•m (72.4 - 79.5 ft-lb) torque.

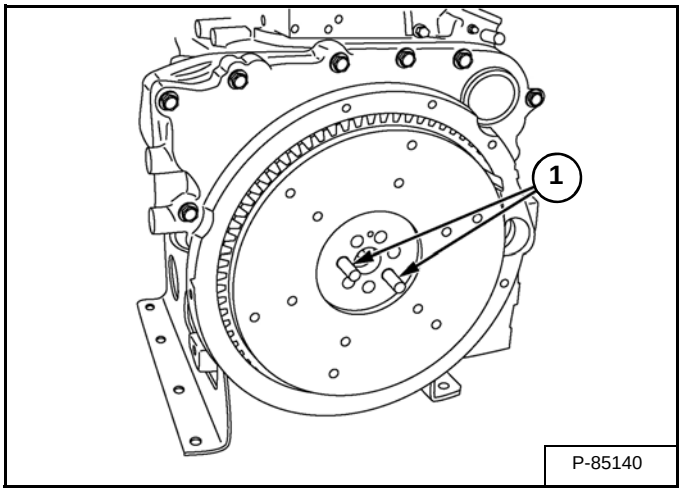
NOTE: Do not use a impact wrench. Serious damage will occur. There is one positioning pin in the crankshaft gear and it is installed in the flywheel.

Figure 70-120-5



Install two bolts (Item 1) **[Figure 70-120-5]** into the threaded holes on the flywheel and tighten to remove flywheel.

Figure 70-120-6

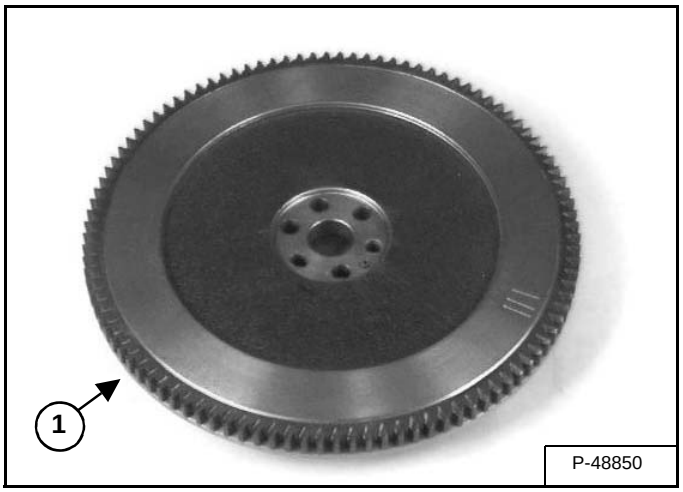


Install two guide bolts (Item 1) **[Figure 70-120-6]** to aid in installation of the flywheel.

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Ring Gear Removal And Installation

Figure 70-120-7



The ring gear (Item 1) **[Figure 70-120-7]** on the flywheel is an interference fit. Heat the ring gear enough to expand the gear. Hit the ring gear evenly around the gear to remove it from the flywheel.

Clean the outer surface of the flywheel thoroughly so the new ring gear will fit smoothly onto the flywheel.

Clean the new ring gear and heat it to a temperature of 232 - 260°C (450 - 500°F).

Fit the ring on the flywheel and be sure the gear is seated correctly.

Housing Removal And Installation

Remove the engine / hydrostatic pump package from the loader. (See Engine Removal And Installation on Page 70-10-7.)

Remove the drive belt shield. (See DRIVE BELT on Page 30-60-1.)

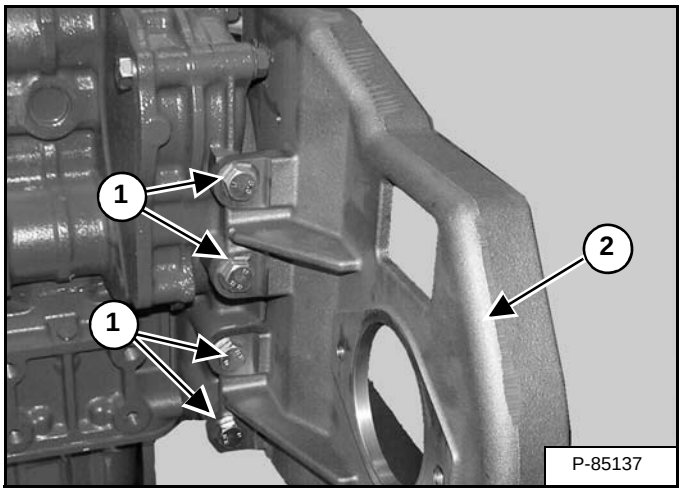
Remove the drive belt tension pulley. (See Tensioner Pulley Removal And Installation on Page 30-60-4.)

Remove the drive belt. (See DRIVE BELT on Page 30-60-1.)

Remove the starter. (See Removal And Installation on Page 60-40-1.)

Remove the flywheel. (See Flywheel Removal And Installation on Page 70-120-1.)

Figure 70-120-8



Remove the four mounting bolts (Item 1) and the housing (Item 2) **[Figure 70-120-8]**.

Installation: Tighten the mounting bolts to 80 - 84 N•m (56 - 62 ft-lb) torque.

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EXHAUST GAS RECIRCULATION (EGR) SYSTEM

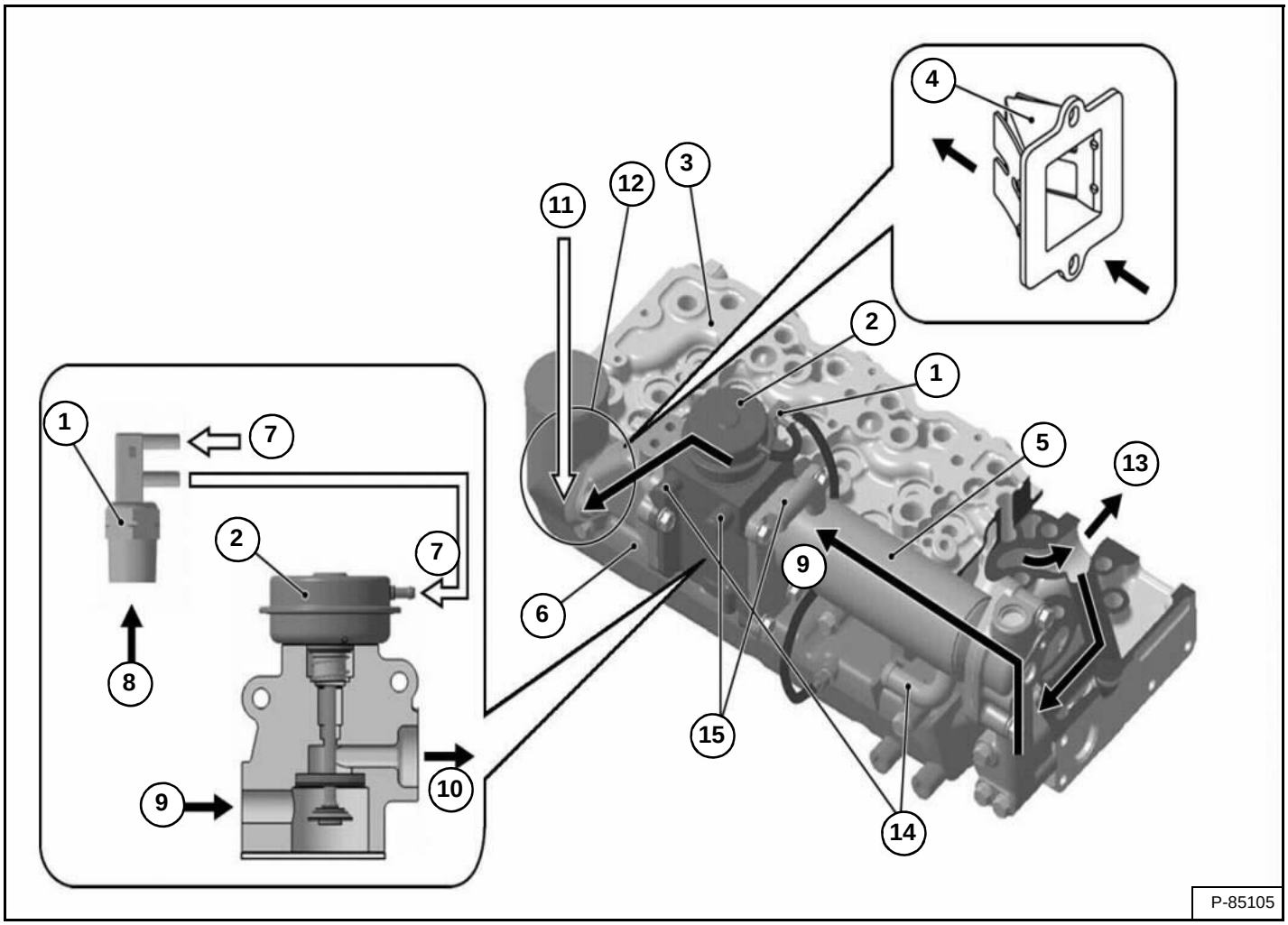
Description

Exhaust Gas Recirculation (EGR) is a system in which the exhaust gas with lean oxygen is cooled and returned to the cylinders again in order to lower the combustion temperature.

An External / Mechanical EGR consists of a water cooled EGR cooler, mechanical EGR valve, reed valve and thermo valve. When the coolant temperature is high and the boost pressure is low, the EGR valve will not open. If the coolant temperature is high and the boost pressure is also high, the EGR valve will open allowing cooled gas back into the intake manifold.

The reed valve between the EGR valve and the intake manifold prevents fresh air from flowing into EGR system.

Figure 70-130-1



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The items listed below refer to **[Figure 70-130-1]**.

1. Thermo Valve
2. Mechanical EGR Valve
3. Cylinder Head
4. Reed Valve
5. EGR Cooler
6. Intake Manifold
7. Boost Pressure
8. Coolant Temperature
9. Cooled EGR Gas
10. To The Intake Manifold
11. Fresh Air
12. Cooled EGR Gas Merges With Fresh Air
13. Exhaust Gas
14. Coolant Inlet
15. Coolant Outlet

Testing

There are two tests for checking the EGR system. Both tests will need to be performed and the coolant temperature must be monitored through the Service Analyzer.

The Cold Engine Coolant Temperature Test will need to be performed with the engine coolant below 55°C (131°F). The Hot Engine Coolant Temperature Test will need to be performed with the engine coolant above 70°C (158°F).

⚠ WARNING

AVOID INJURY OR DEATH

When the engine is running during service, the steering levers or joysticks must be in neutral and the parking brake engaged.

W-2717-0208

⚠ WARNING

MACHINE FALLING OR MOVING CAN CAUSE SERIOUS INJURY OR DEATH

Put jackstands under the front and rear of the machine before running engine for service.

W-2718-0208

Lift and block the loader. (See Procedure on Page 10-10-1.)

Open the rear door.

Connect the Service PC (See SERVICE PC (LAPTOP COMPUTER) on Page 60-150-1.)

⚠ WARNING

AVOID INJURY OR DEATH

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

W-2050-0807

Cold Engine Coolant Temperature Test

Start the engine and run at low idle.

Start Service Analyzer and select [Monitor].

Select [Engine Temperature].

⚠ WARNING

AVOID BURNS

Some surfaces of the Exhaust Gas Recirculation system can be hot. Use caution when conducting diagnostic tests.

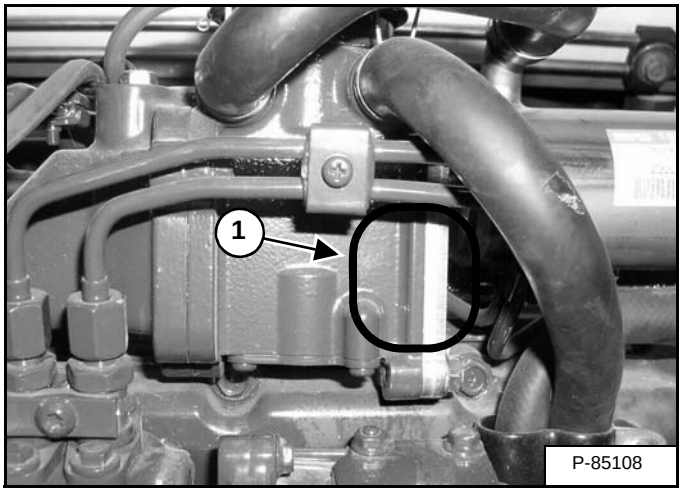
Allow the engine to cool before servicing.

W-2716-0208

NOTE: Verify the engine temperature is below 55°C (131°F). If the engine temperature is above 55°C (131°F), let the engine cool down and restart the Cold Engine Coolant temperature Test.

NOTE: Monitor the engine coolant temperature using the Service Analyzer.

Figure 70-130-2



Measure the surface temperature of the EGR system (Item 1) **[Figure 70-130-2]** with an Infrared Thermometer.

If the engine coolant temperature is below 55°C (131°F) and the surface temperature of the EGR system is 150°C (302°F) or below, the EGR system is OK, Continue with the Hot Engine Coolant temperature Test.

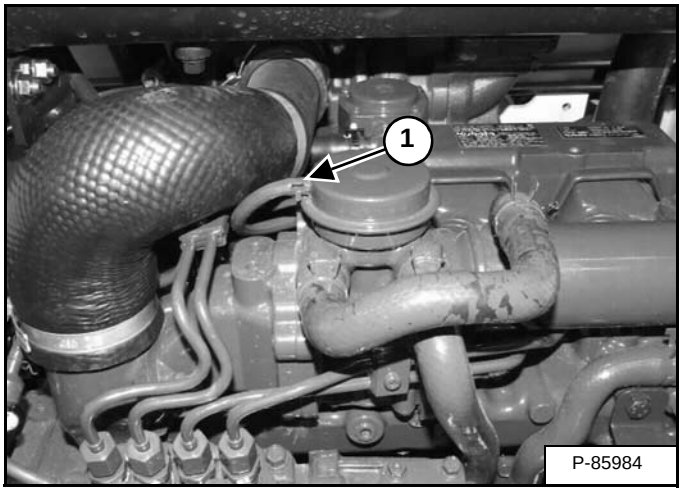
If the surface temperature of the EGR system reads 150°C (302°F) or above continue this Cold Engine Coolant Temperature Test.

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EXHAUST GAS RECIRCULATION (EGR) SYSTEM (CONT'D)

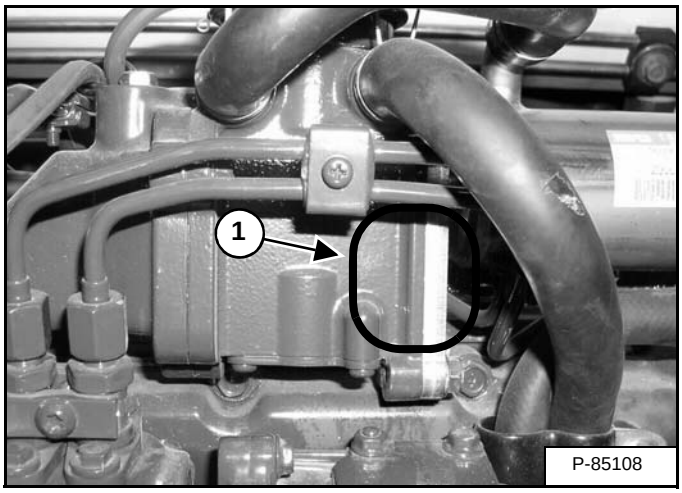
Testing (Cont'd)

Figure 70-130-3



Disconnect the boost hose (Item 1) **[Figure 70-130-3]** from the EGR valve.

Figure 70-130-4



Measure the surface temperature of the EGR system (Item 1) **[Figure 70-130-4]** with an Infrared Thermometer.

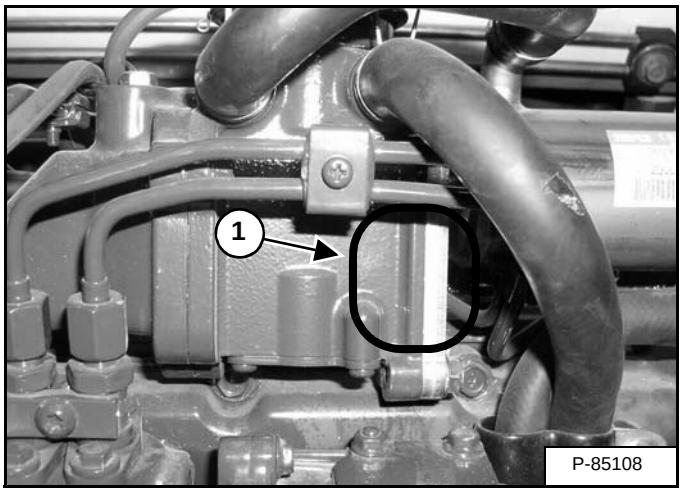
If the surface temperature of the EGR system declines, the thermo valve has failed.

If the surface temperature of the EGR system stays above 150°C (302°F), the EGR valve has failed.

Hot Engine Coolant Temperature Test

Verify the engine temperature is above 70°C (158°F), if the engine temperature is below 70°C (158°F) run the engine to bring the temperature above 70°C (158°F) then continue with the Hot Engine Coolant Temperature Test.

Figure 70-130-5

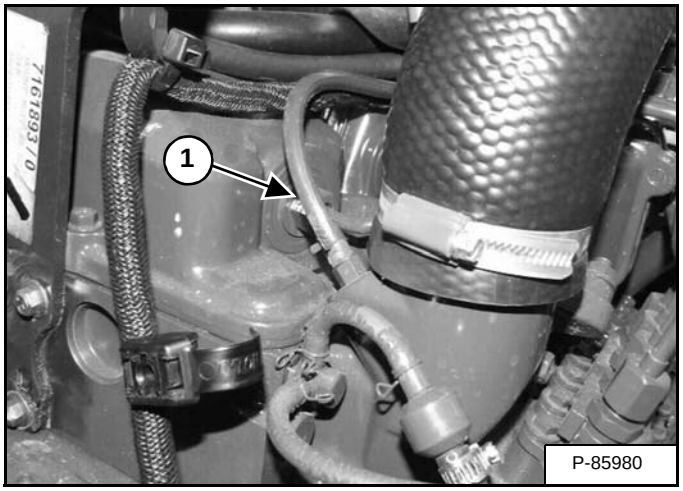


Measure the surface temperature of the EGR system (Item 1) **[Figure 70-130-5]** with an Infrared Thermometer.

With the engine coolant temperature above 70°C (158°F) and the surface temperature of the EGR system 150°C (302°F) or above, the EGR system is OK.

If the surface temperature of the EGR system is 150°C (302°F) or below continue this Hot Engine Coolant Temperature Test.

Figure 70-130-6

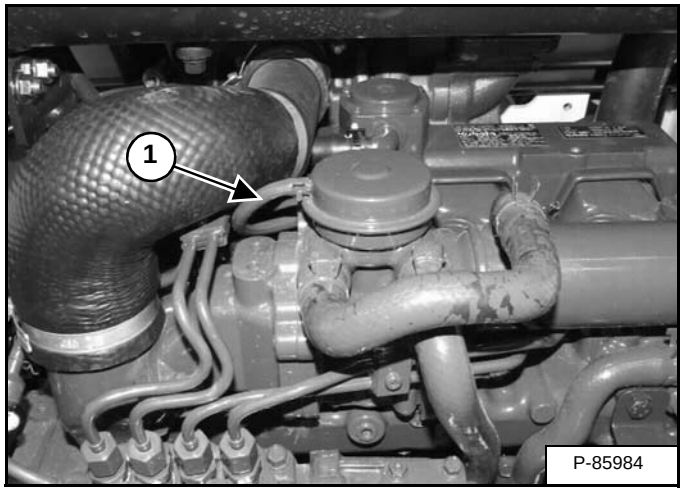


Disconnect the intake hose (Item 1) **[Figure 70-130-6]**.

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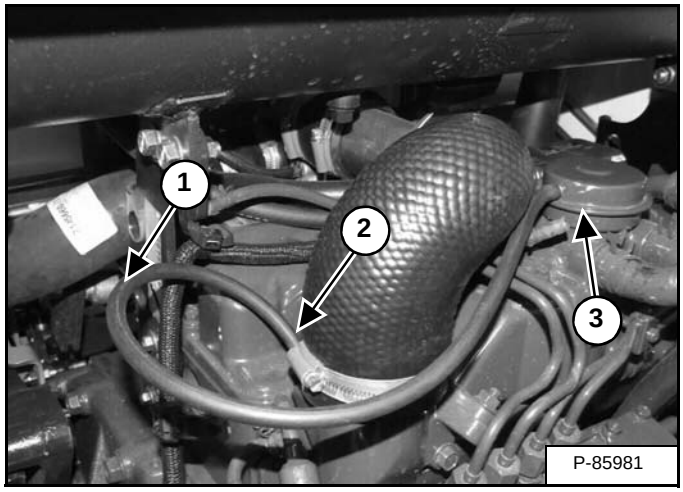
Testing (Cont'd)

Figure 70-130-7



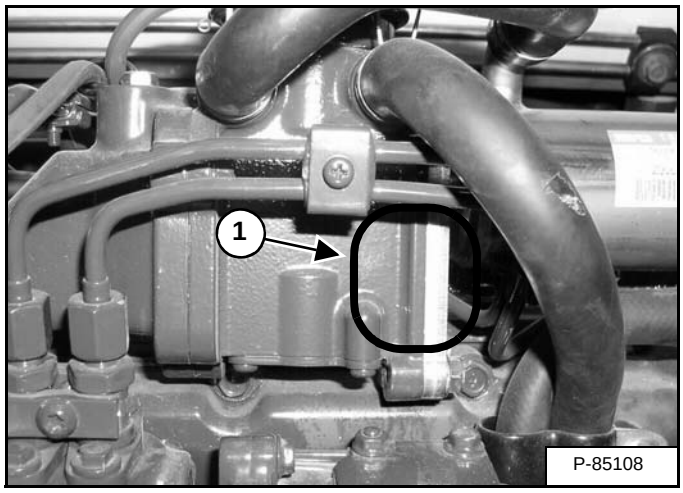
Disconnect the EGR hose (Item 1) **[Figure 70-130-6]**.

Figure 70-130-8



Connect a hose (Item 1) directly between the intake manifold (Item 2) and the EGR valve (Item 3) **[Figure 70-130-8]**.

Figure 70-130-9



Measure the surface temperature of the EGR system (Item 1) **[Figure 70-130-9]** with an Infrared Thermometer.

If the surface temperature of the EGR system increases, the thermo valve has failed.

If the surface temperature of the EGR system is 150°C (302°F) or below, the EGR valve has failed.

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Removal And Installation

WARNING

AVOID BURNS

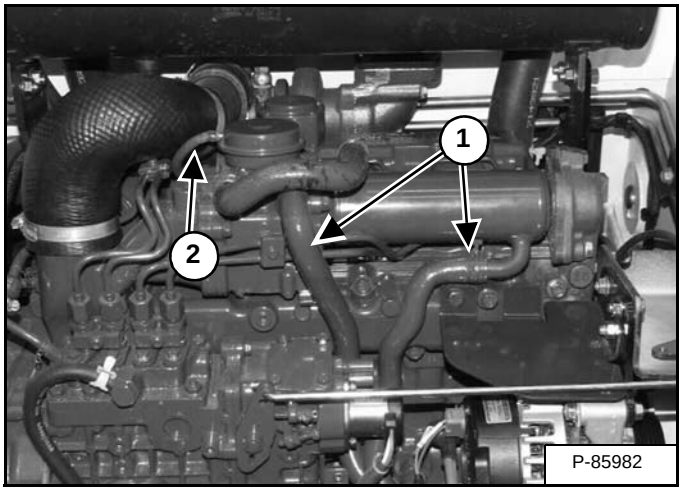
Some surfaces of the Exhaust Gas Recirculation system can be hot. Use caution when conducting diagnostic tests.

Allow the engine to cool before servicing.

W-2716-0208

Allow the engine to cool before working on the EGR system.

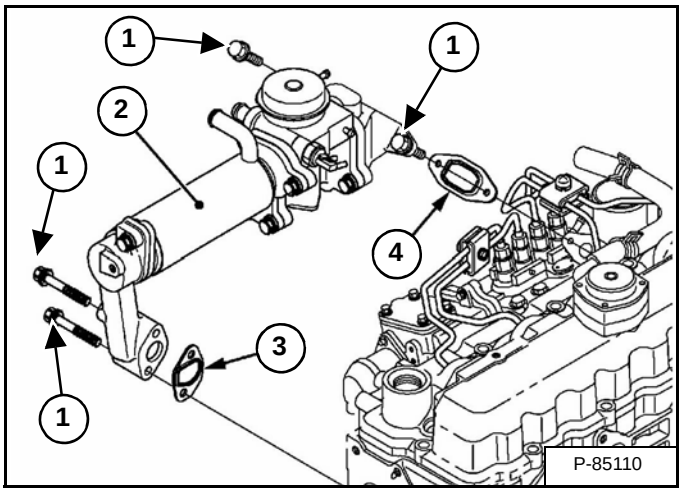
Figure 70-130-10



Disconnect and cap the EGR valve coolant hoses (Item 1) **[Figure 70-130-10]**.

Disconnect the boost pressure hose (Item 2) **[Figure 70-130-10]**.

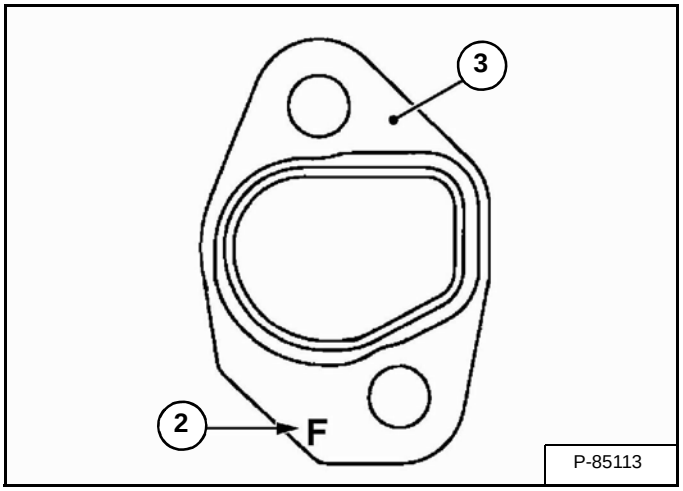
Figure 70-130-11



Remove the four EGR cooler mounting bolts (Item 1) and the EGR system assembly (Item 2) **[Figure 70-130-11]**.

Installation: Replace the gaskets (Items 3 and 4) **[Figure 70-130-11]** with new ones.

Figure 70-130-12

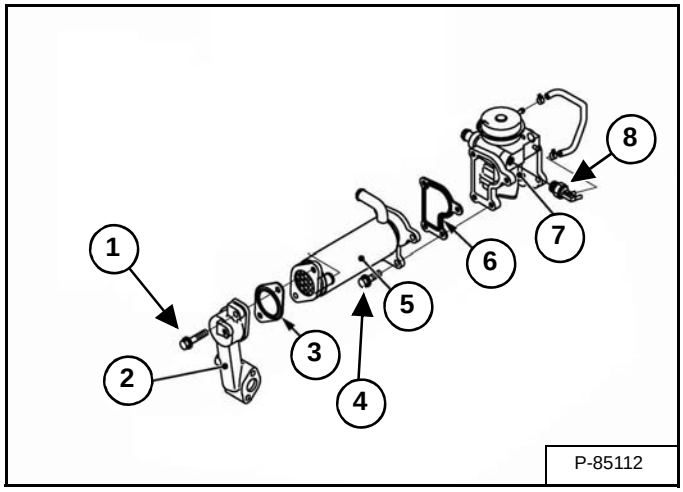


NOTE: The gasket (Item 3) [Figure 70-130-11] and [Figure 70-130-12] is marked with the letter "F" and must be installed downward.

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Disassembly And Assembly

Figure 70-130-13



Remove the two mounting bolts (Item 1) from the EGR cooler flange (Item 2) **[Figure 70-130-13]**.

Remove and replace the gasket (Item 3) **[Figure 70-130-13]**.

Remove the four bolts (Item 4) from the EGR cooler (Item 5) and the EGR valve (Item 7) **[Figure 70-130-13]**.

Remove and replace the gasket (Item 6) **[Figure 70-130-13]**.

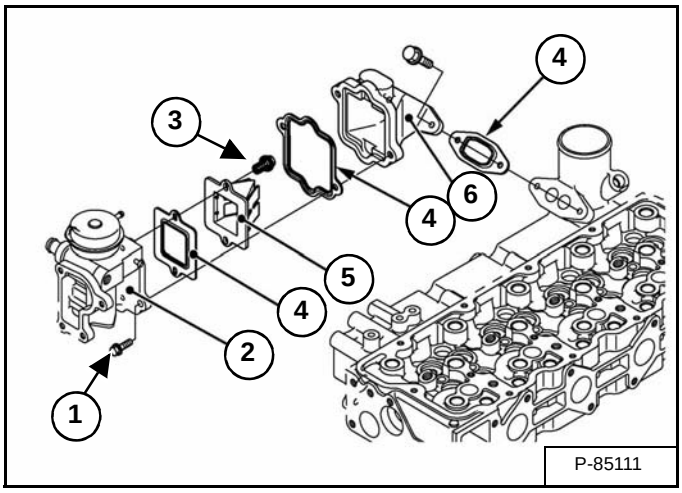
Remove the thermo valve (Item 8) **[Figure 70-130-13]**.

Installation: When reassembling replace with new gaskets.

NOTE: If the thermo valve is dropped it must be replaced with a new one.

Installation: Tighten the thermo valve to 30 - 39 N•m (22 - 28 ft-lb) torque.

Figure 70-130-14



Remove the two mounting bolts (Item 1) from the EGR valve (Item 2) and EGR valve flange (Item 6) **[Figure 70-130-14]**.

Remove the two mounting bolts (Item 3) from the reed valve (Item 5) **[Figure 70-130-14]**.

Remove and replace the gaskets (Item 4) **[Figure 70-130-14]**.

Installation: When reassembling replace with new gaskets.

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HEATING, VENTILATION, AIR CONDITIONING

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AIR CONDITIONING SYSTEM FLOW

Description

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 80-10-2.) takes in low temperature, low pressure refrigerant gas through the suction valve (low pressure side) and as the name indicates, pressurizes the refrigerant and forces it through the discharge valve (high pressure side) and to the condenser (Item 2) (See Chart on Page 80-10-2.)

Ambient air passing through the condenser removes the heat from refrigerant resulting in physical state change in the refrigerant from a gas to a liquid.

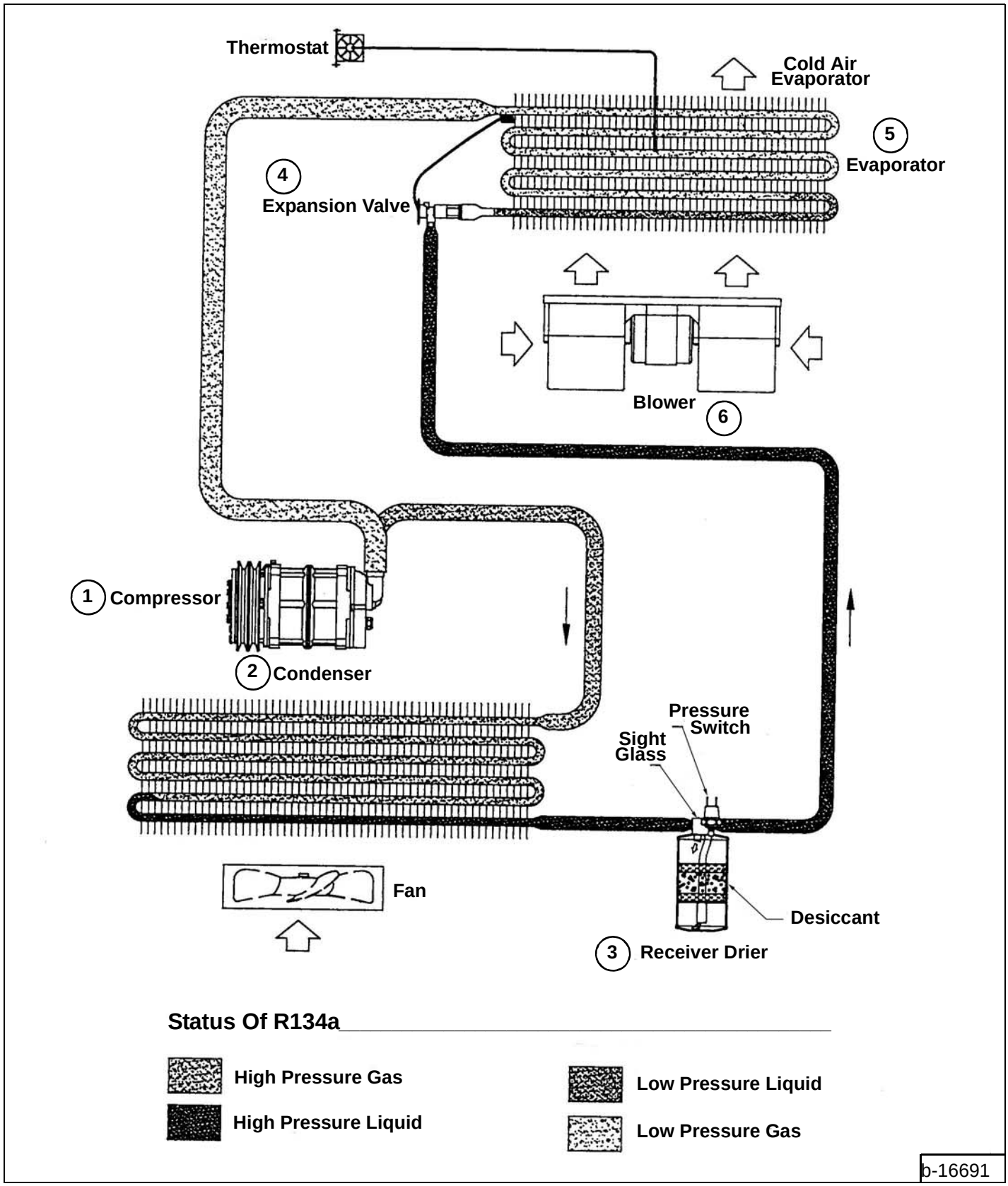
The liquid refrigerant moves on to the receiver / drier (Item 3) (See Chart on Page 80-10-2.) where impurities such as moisture and dirt are filtered out. The receiver / drier also serves as the storage tank for the liquid refrigerant. The liquid refrigerant (still under high pressure) flows to the expansion valve (Item 4) (See Chart on Page 80-10-2.)

The expansion valve meters the amount of refrigerant entering the evaporator coil (Item 5) (See Chart on Page 80-10-2.) As the refrigerant passes through the expansion valve, it again changes its physical state. It becomes a low temperature, low-pressure liquid and saturated vapor. The low pressure liquid immediately starts to boil and vaporize as it enters the evaporator. The hot humid air of the machine's cab is drawn through or blown across the evaporator by the evaporator fan (Item 6) (See Chart on Page 80-10-2.) Since the refrigerant is colder than the air, it absorbs the heat from the air which results in cooled air, which is pushed into the cab by the blower. 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 low temperature low pressure gas is again drawn into the compressor.

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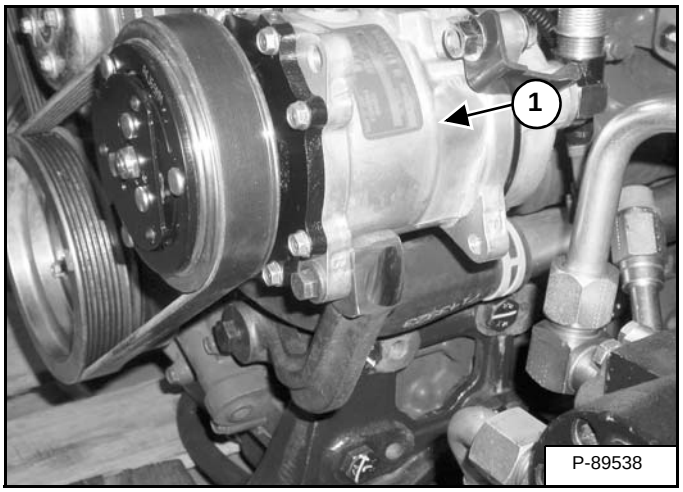
Chart



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Components

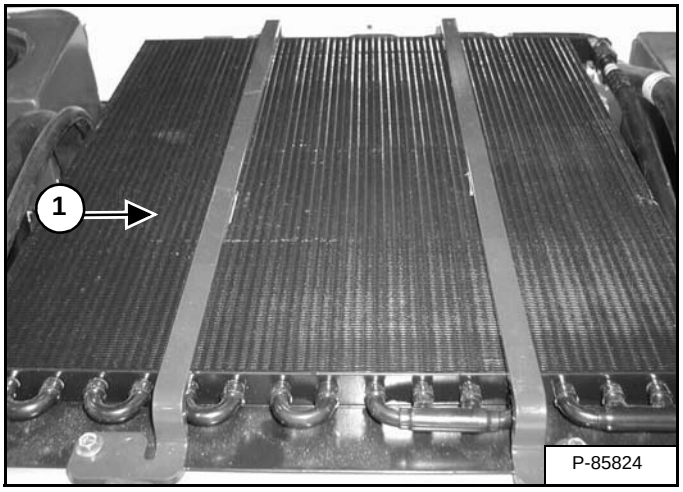
Figure 80-10-1



Compressor: The compressor (Item 1) **[Figure 80-10-1]** 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.

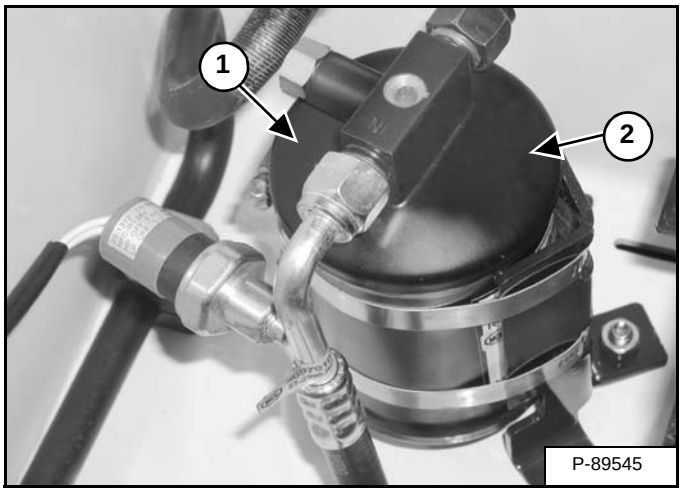
NOTE: The A/C system (Compressor) is recommended to be turned on for at least 5 minutes weekly throughout the year to lubricate the internal components.

Figure 80-10-2



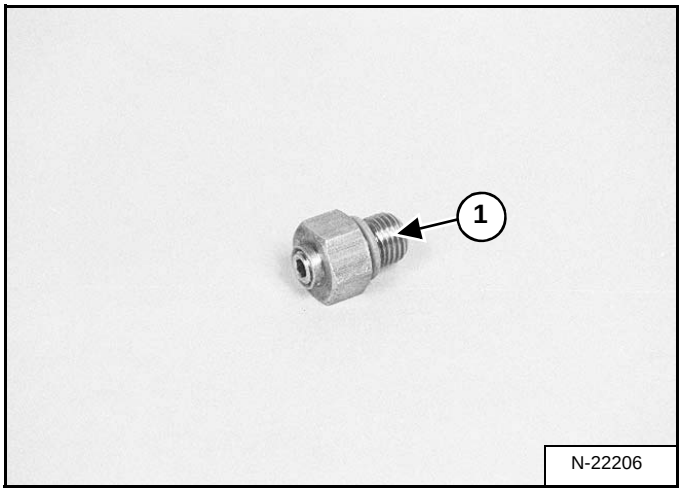
Condenser: The condenser (Item 1) **[Figure 80-10-2]** is the unit that receives the high pressure, high temperature refrigerant vapor from the compressor and condenses it into a high temperature liquid.

Figure 80-10-3



Receiver/Drier: The receiver / drier (Item 1) **[Figure 80-10-3]** 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 80-10-4

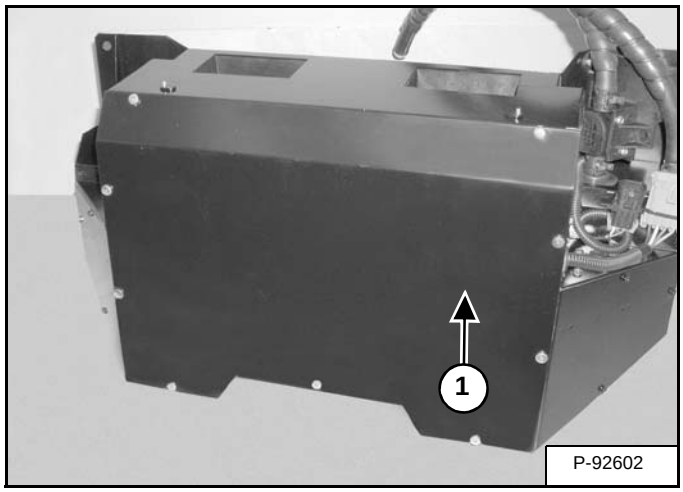


Pressure Relief Valve: The pressure relief valve (Item 2) **[Figure 80-10-3]** is located on the receiver drier assembly. This small brass valve (Item 1) **[Figure 80-10-4]** is a safety feature that is designed to open and release the A/C charge if the pressure reaches 3,7 MPa (36,9 bar) (535 psi).

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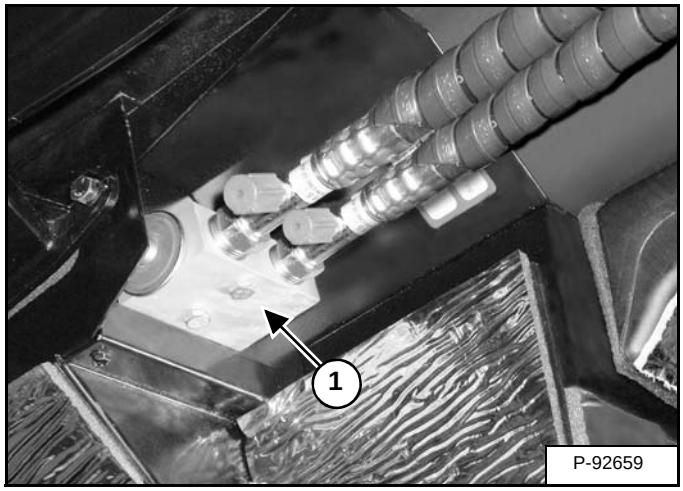
Components (Cont'd)

Figure 80-10-5



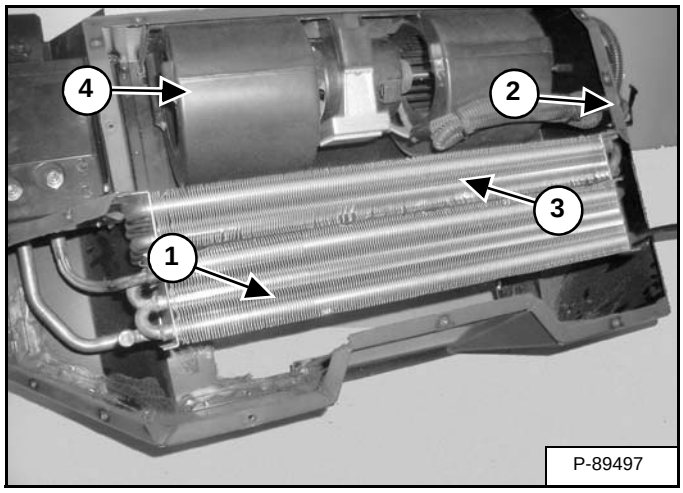
Heater / Evaporator Unit: The heater / evaporator unit (Item 1) **[Figure 80-10-5]** is located behind the loader cab. The unit delivers the cold air for the A/C and warm air for heat into the cab. The unit contains the blower, heat & A/C coils, thermostat and expansion valve.

Figure 80-10-6



Expansion Valve: The expansion valve (Item 1) **[Figure 80-10-6]** controls the amount of refrigerant entering the evaporator coil.

Figure 80-10-7



Evaporator Coil: The evaporator coil (Item 1) **[Figure 80-10-7]** cools and dehumidifies the air before it enters the cab.

Thermostat: The thermostat (Item 2) **[Figure 80-10-7]** controls the temperature of the evaporator coil.

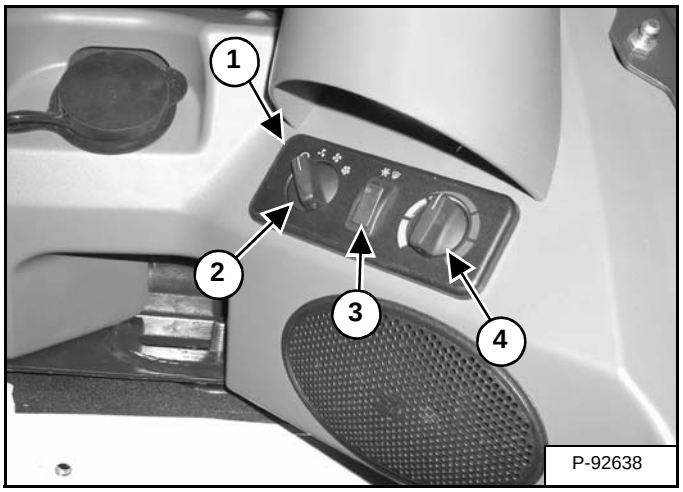
Heater Coil: The heater coil (Item 3) **[Figure 80-10-7]** supplies the warm air into the cab by passing air through the coil.

Heater / Evaporator Blower: The blower (Item 4) **[Figure 80-10-7]** is used to push air through the heater and evaporator coils and into the cab.

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Components (Cont'd)

Figure 80-10-8



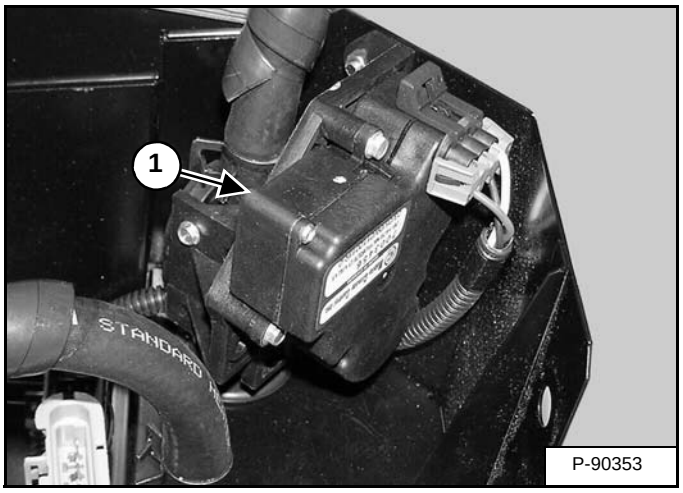
Control Panel: The panel (Item 1) **[Figure 80-10-8]** has three separate components.

Fan Switch: This is a four position rotary switch (Item 2) **[Figure 80-10-8]**. 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 80-10-8]** will be illuminated when the A/C is engaged.

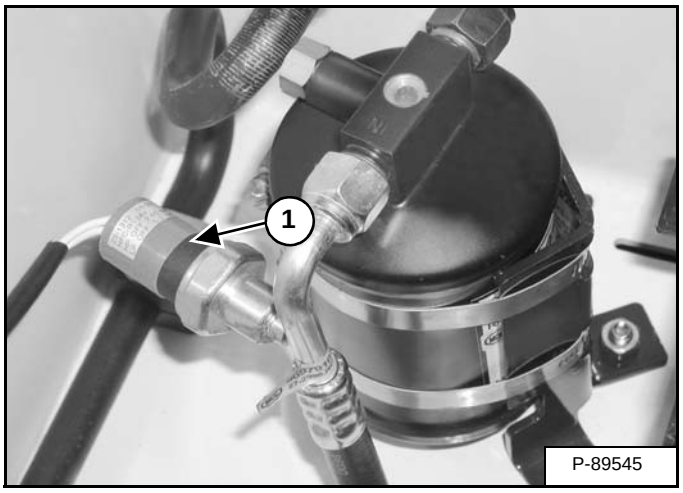
Potentiometer: The potentiometer (Item 4) **[Figure 80-10-8]** controls the Heat Valve from fully Off to fully On. This can be used in conjunction with the A/C for defrost of the windows and temperature control.

Figure 80-10-9



Heater Valve: The heater valve (Item 1) **[Figure 80-10-9]** is used to control the amount of engine coolant that flows to the heater coil.

Figure 80-10-10



Pressure Switch: The pressure switch (Item 1) **[Figure 80-10-10]** will disengage the compressor clutch at high pressure readings over 2647,6 kPa (26,5 bar) (384 psi.) on the high side, or at very low pressure of 193,0 kPa (1,9 bar) (28 psi) or less on the high side, which indicates loss of refrigerant.

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Safety Equipment

Figure 80-10-11

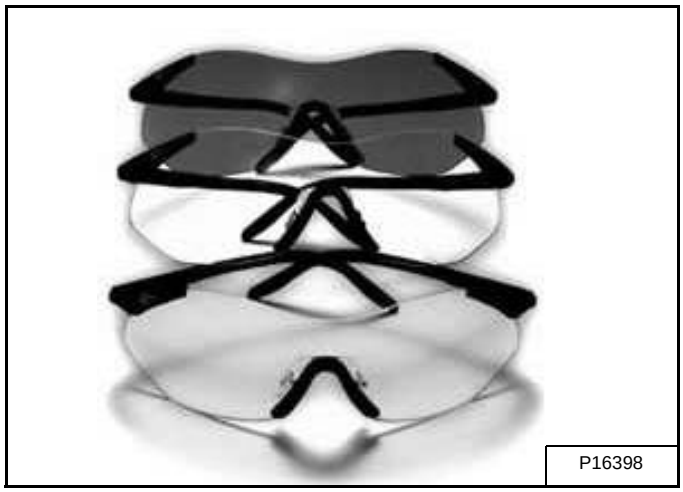


Figure 80-10-12



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 80-10-11]** 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.

⚠ WARNING

In the event of a leak, wear safety goggles. Escaping refrigerant can cause severe injuries to eyes. In contact with a flame, R134a refrigerant gives a toxic gas.

W-2371-0500

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 -5.8°C (21.6°F) "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 80-10-12]** to prevent frost bite if you should get refrigerant on your hands.

⚠ WARNING

HFC 134A refrigerant can be dangerous if not properly handled. Liquid 134A may cause blindness if it contacts the eyes and may cause serious frostbite if it contacts the skin.

- **Gaseous 134A becomes lethal (phosgene) gas when it contacts open flame or very hot substances.**
- **NEVER SMOKE when there is the possibility of even small amounts of 134A in the air.**

Any servicing work that involves release or addition of 134A to the system must be done by a competent refrigeration dealer who has the proper equipment, knowledge, and experience to service refrigeration equipment.

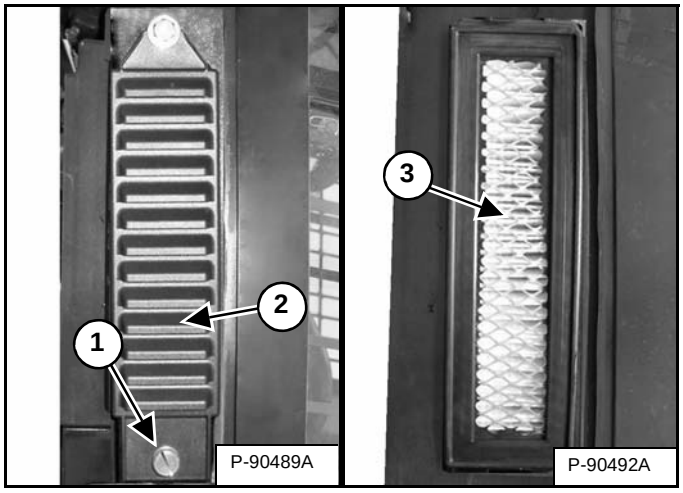
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Filters

Fresh Air Filters

Figure 80-20-1

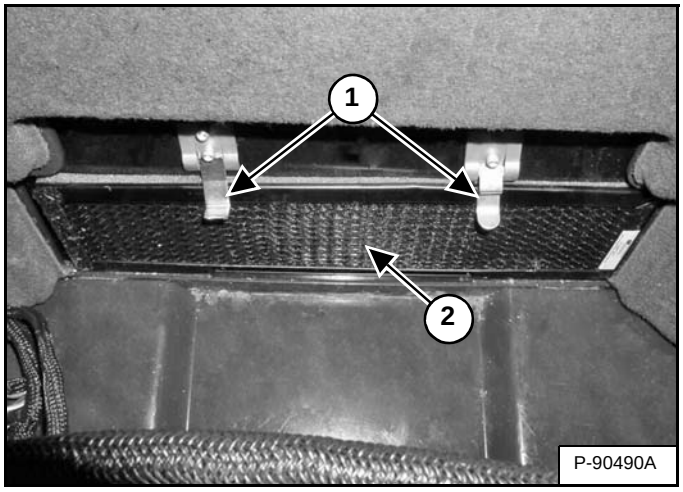


The fresh air filters are located behind the side windows outside the operators cab. (Right side shown) Remove the clamping knob (Item 1) and filter cover (Item 2) **[Figure 80-20-1]**.

Shake the filter (Item 3) **[Figure 80-20-1]** or use low pressure air to remove dirt. This can be done several times before replacement is required. Install the filter, filter cover and clamping knob.

Recirculation Filter (Earlier Models)

Figure 80-20-2



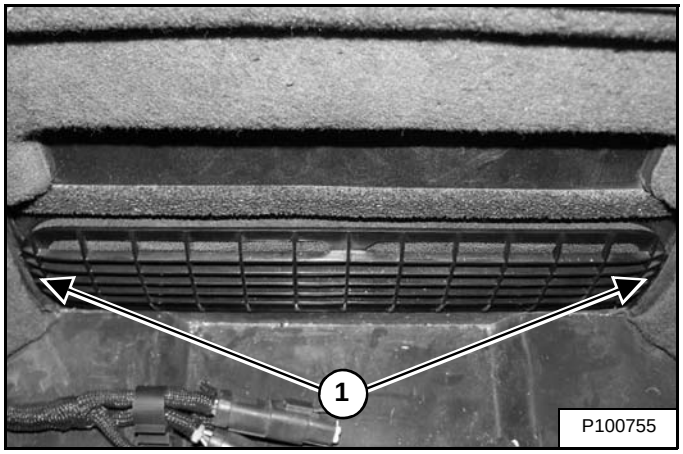
The recirculation filter is located behind the operators seat inside the operators cab. Flip the clamps (Item 1) holding the filter up and remove the filter (Item 2) **[Figure 80-20-2]**.

Shake the filter or use a vacuum to clean. This can be done several times before replacement is required.

Install the filter into the opening and flip the clamps down to hold the filter in place.

Recirculation Filter (Later Models)

Figure 80-20-3



The recirculation filter is located behind the operator's seat inside the operator cab. The filter cover is held in place with three clips. Pull the cover at each end (Item 1) **[Figure 80-20-3]** to remove.

Rinse the filter elements with water or use a vacuum to clean. Do not use solvents.

Line up the clips on the filter cover with the slots provided and push the cover into place.

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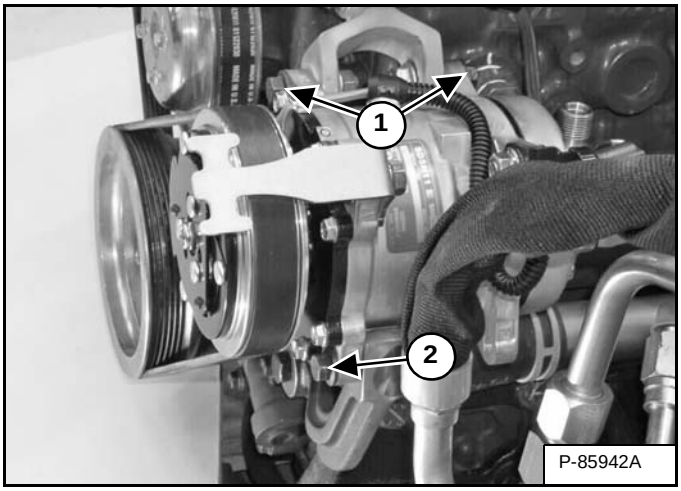
Compressor Drive Belt Adjustment

The air conditioning belt is a special maintenance free type that is pretensioned over the pulleys. This belt eliminates the need for a tensioning device and does not require periodic adjustment. Contact your Bobcat dealer for replacement parts.

Compressor Drive Belt Replacement

Stop the engine and open the rear door.

Figure 80-20-4



NOTE: The engine is shown removed for visual clarity.

Loosen the top air conditioning pump mounting bolts (Item 1) **[Figure 80-20-4]**.

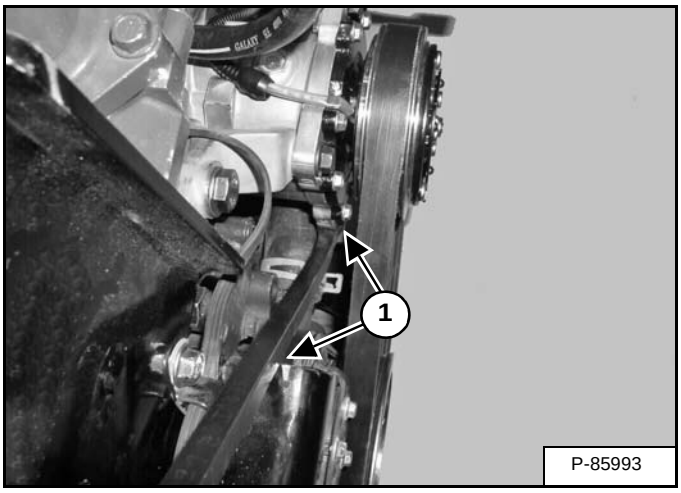
Remove the bottom air conditioning pump mounting bolt (Item 2) **[Figure 80-20-4]**.

Move the air conditioning pump toward the engine as far as it will go and remove the belt from the pulleys.

Inspect the pulleys for wear.

Install new belt.

Figure 80-20-5



Use a prybar at the two leverage points (Item 1) **[Figure 80-20-5]** to move the air conditioning pump until the bottom air conditioning pump mounting bolt (Item 2) **[Figure 80-20-4]** can be installed.

Tighten the three mounting bolts (Items 1 and 2) **[Figure 80-20-4]**.

Close the rear door.

Condenser

The condenser should be cleaned with the oil cooler and the radiator.

Air Conditioning Lubrication

Run the air conditioning for about five minutes every week to lubricate the internal components.

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Air Conditioning Service 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 at Head Position:			
Temperature Into Condenser:			
High Side Pressure			
Low Side Pressure			
Ambient Humidity			
Observations:			

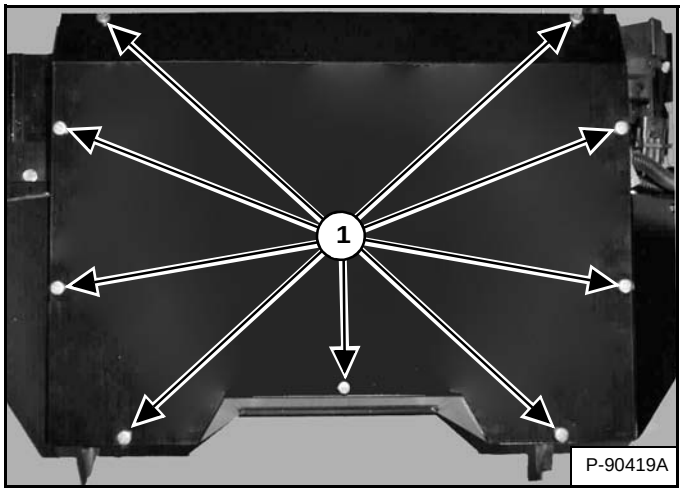
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Evaporator / Heater Coil

Earlier Models

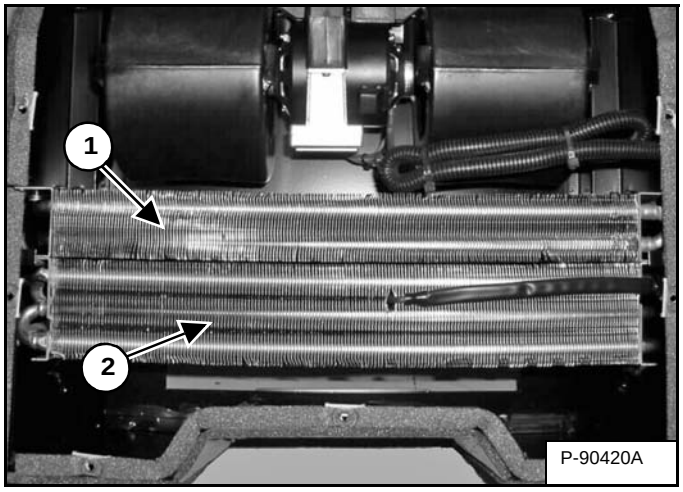
Raise the operator cab. (See Raising on Page 10-30-2.)

Figure 80-20-6



Remove cover screws (Item 1) **[Figure 80-20-6]** and remove the cover.

Figure 80-20-7



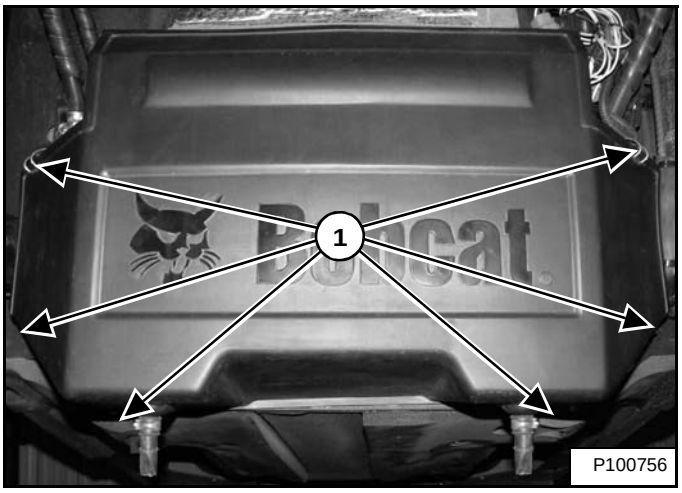
Use low pressure air or water to remove debris from the heater coil (Item 1) and evaporator (Item 2) **[Figure 80-20-7]**.

Install the cover and lower the operator cab. (See Lowering on Page 10-30-3.)

Later Models

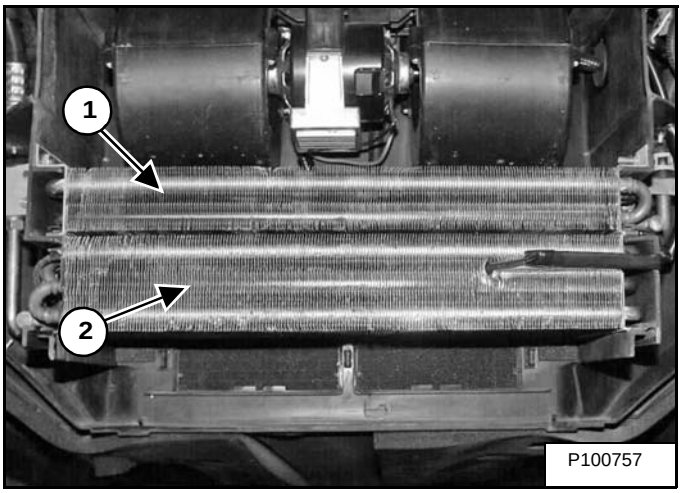
Raise the operator cab. (See Raising on Page 10-30-2.)

Figure 80-20-8



Unhook cover latches (Item 1) **[Figure 80-20-8]** and remove the cover.

Figure 80-20-9



Use low pressure air or water to remove debris from the heater coil (Item 1) and evaporator (Item 2) **[Figure 80-20-9]**.

Install the cover and lower the operator cab. (See Lowering on Page 10-30-3.)

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TROUBLESHOOTING

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 ducts are properly connected and seals are not damaged.	Repair or adjust.
3. Defective thermo. switch (frozen evaporator).	Check thermostat using a circuit tester.	Replace thermostat.
4. Plugged cab filters	Check cab recirculation and fresh air filters.	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 belt.	The belt is vibrating or oscillating.	Replace belt.
2. Internal compressor malfunction.	The compressor is locked up and the belt slips.	Replace compressor.
	Magnetic clutch related	
3. Low battery voltage.	Clutch slips.	Recharge the battery.
4. Faulty coil.	Clutch slips.	Replace the magnetic clutch.
5. Oil on the clutch surface.	Clutch slips.	Replace or clean the clutch surface.
6. Open coil.	Clutch does not engage and there is 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 / thermostat LED status.

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Gauge Pressure Related Troubleshooting

Normal compressor suction (low side) and discharge (high side) pressure at ambient temperatures of 30 - 38°C (86 - 96°F) and compressor speed of approximately 3200 RPM are:

High pressure side pressure: 1447,9 - 1827,1 kPa (14,5 - 18,3 bar) (210 - 265 psi)

Low pressure side pressure: 103,4 - 227,5 (1,0 - 2,3 bar) (15 - 33 psi)

As a rule of thumb the high side pressure will be around eight times greater then the low side pressure.

Possible Cause	Inspection	Solution
Low pressure side Too high.	The low pressure side pressure normally becomes too high when the high pressure side pressure is too high. As this is explained below, the following inspection is only used when the low pressure side is too high.	
1. Expansion valve opens too far.	Frost is present on the suction hose.	Replace expansion valve.
2. Defective compressor.	The high and low pressure side gauge pressures equalize when the magnetic clutch is 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 receiver drier.	Repair any leaks and recharge the refrigerant to the correct level.
2. Clogged or closed expansion valve.	The expansion valve's inlet side is frosted. Moisture or other contaminants can be the cause.	Clean or replace the expansion Valve.
3. Restriction between drier and expansion valve.	Frost on the line between drier and expansion valve. A Negative low pressure reading may be shown.	Flush system or replace hose.
4. Thermostat malfunction.	The evaporator is frozen.	Adjust thermostat's temperature setting or probe placement or replace thermostat.
5. Restriction in receiver drier.	Excessive frost on receiver drier.	Replace receiver 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.

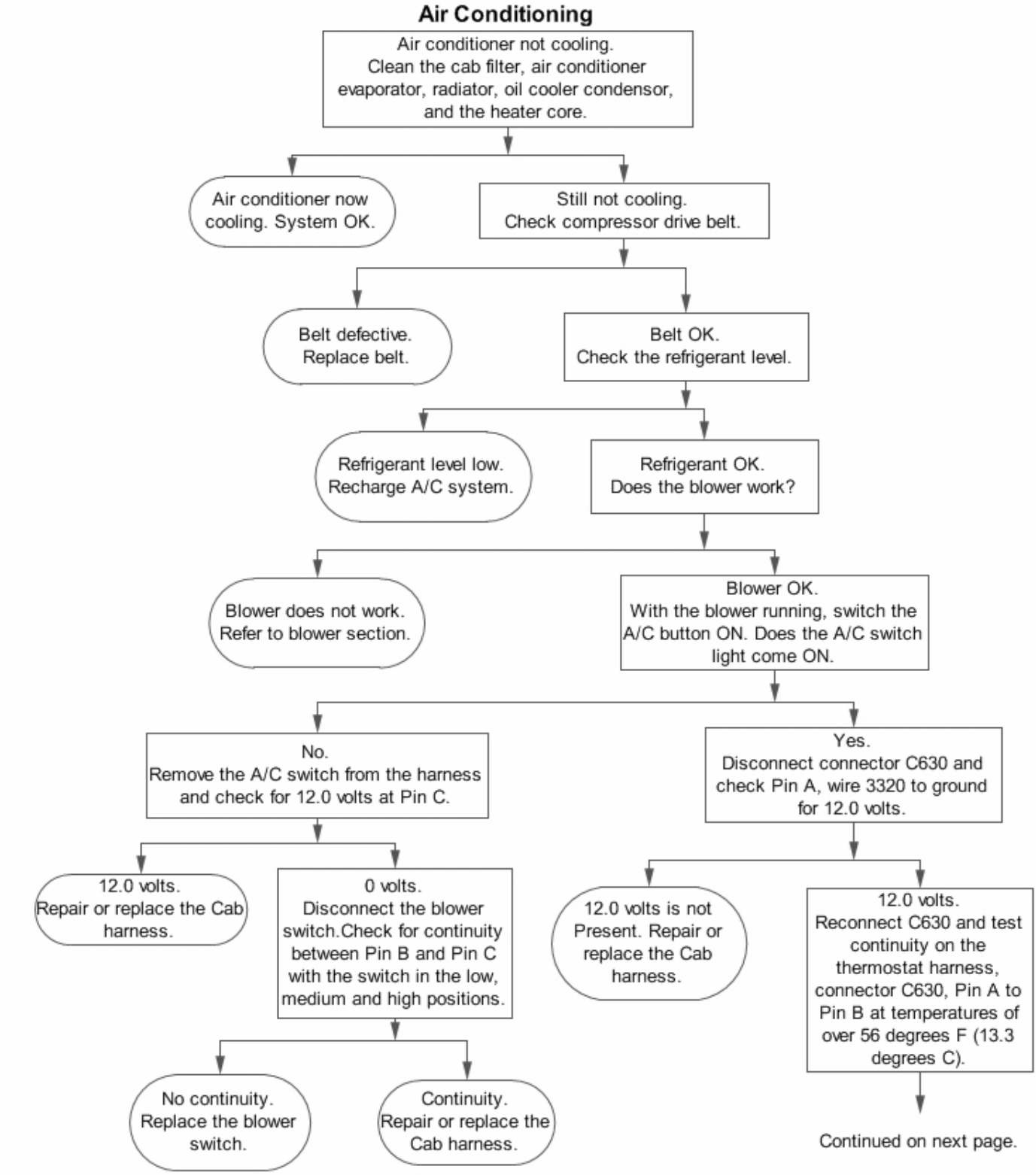
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Gauge Pressure Related Troubleshooting (Cont'd)

Possible Cause	Inspection	Solution
High pressure side Too low.		
1. Low refrigerant charge.	The high side pressure will be low.	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.

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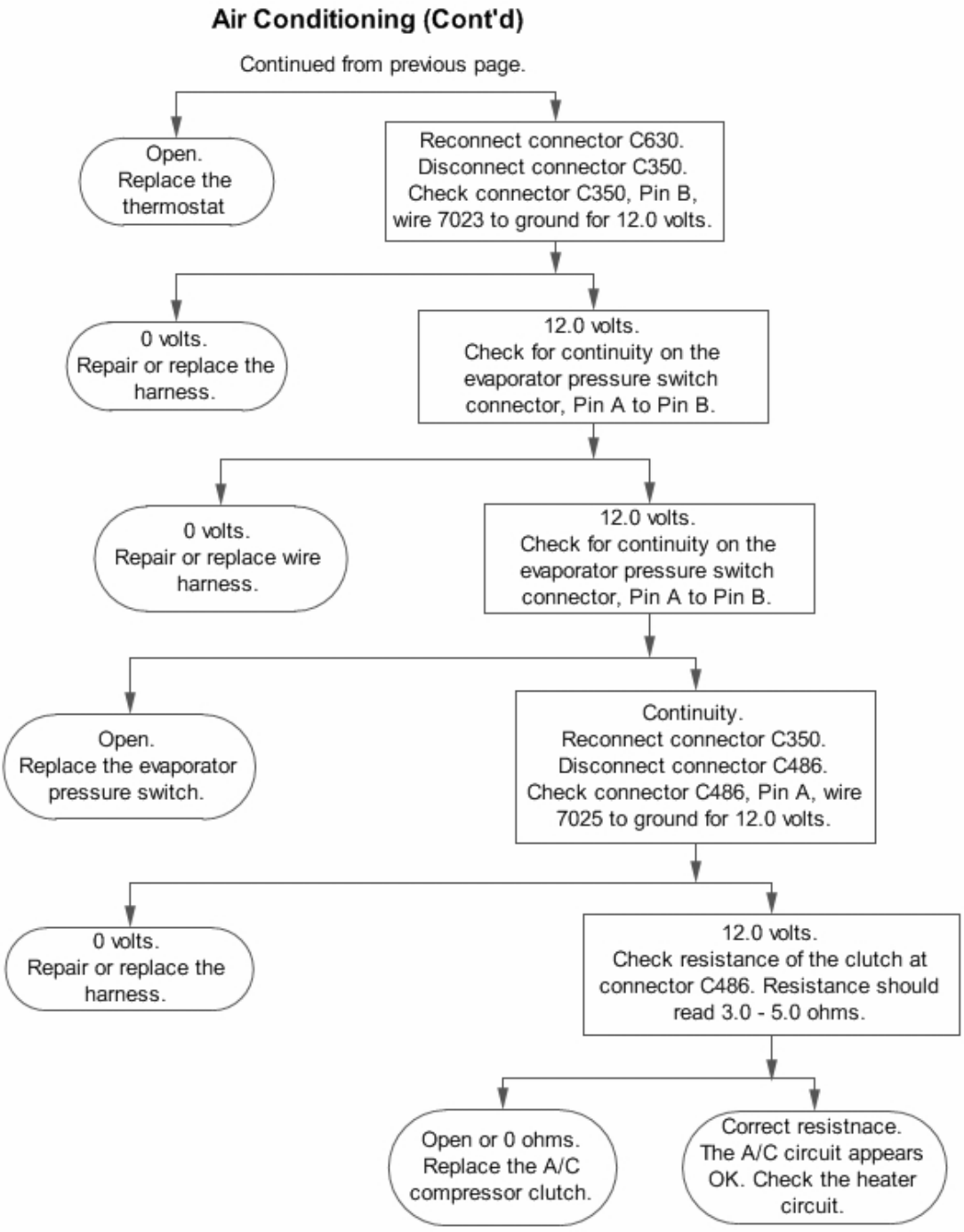
Troubleshooting Tree



P-90410

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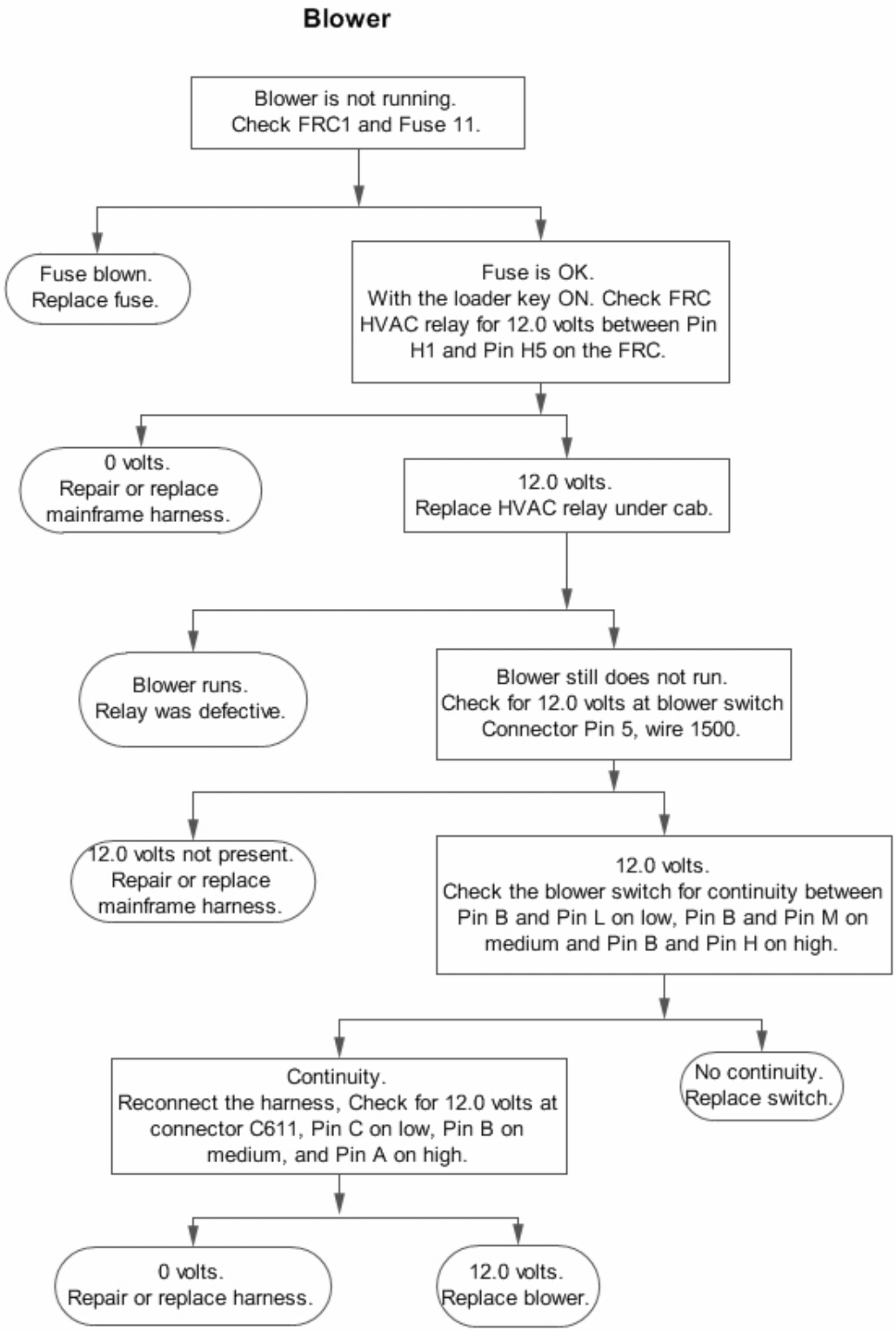
Troubleshooting Tree (Cont'd)



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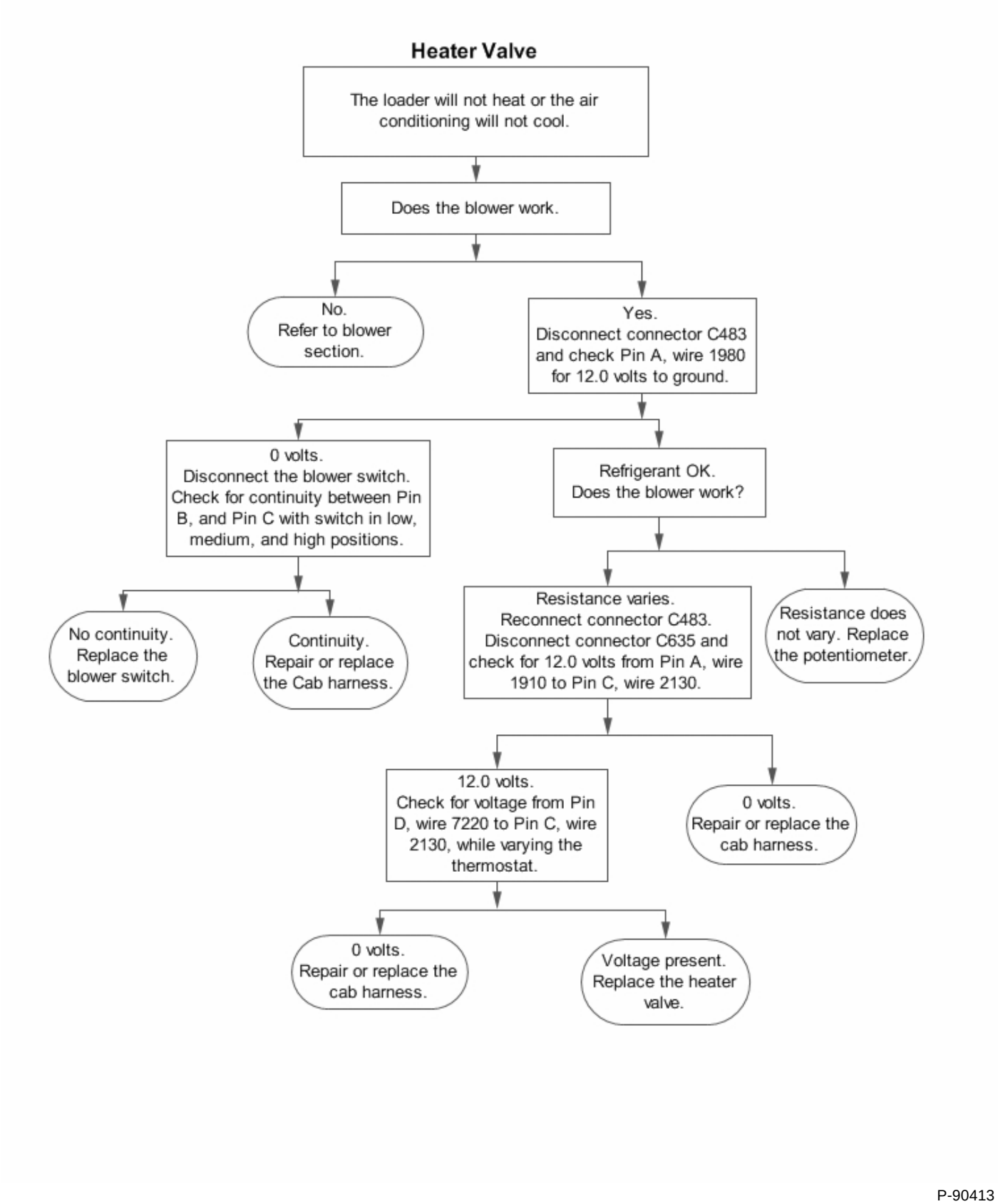
Troubleshooting Tree (Cont'd)



P-90412

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Troubleshooting Tree (Cont'd)



P-90413

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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

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Temperature / Pressure 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 -13 - -12°C (8 - 10°F) to the temperature on the chart.

Condenser

Temperatures are not ambient temperatures but condensing temperatures. Add 4.4°C (40°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°F
90°F
+40°F
130°F condenser temperature=200 psig

Conditions and pressures will vary from system to system. Check with MCC for system specifications.

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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 80-30-1

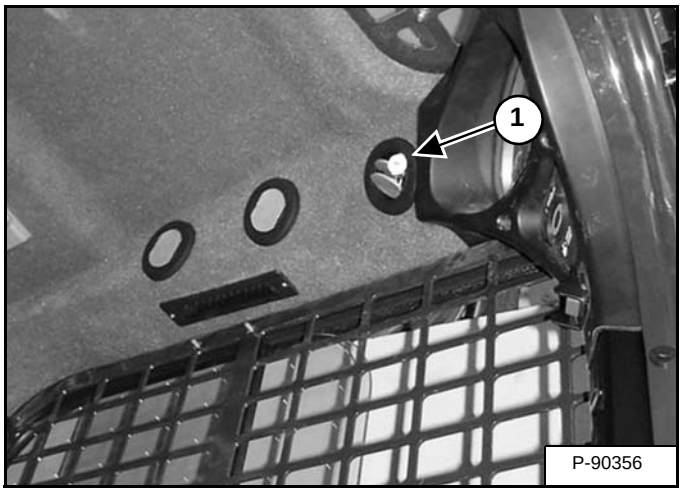
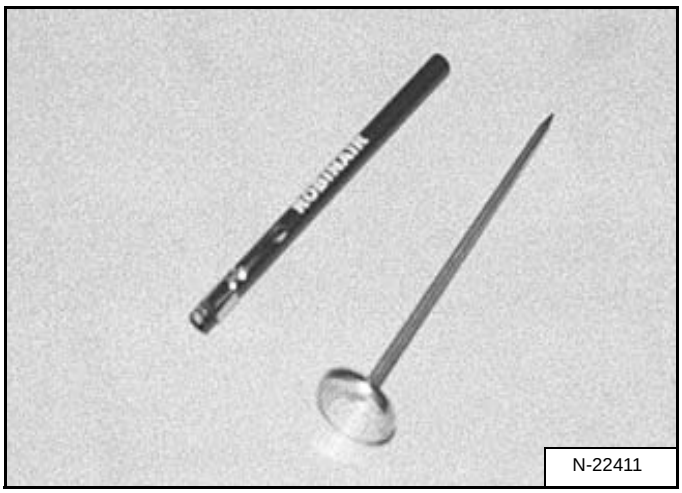


Figure 80-30-2



Check the temperature at the louvers (Item 1) **[Figure 80-30-1]** with a thermometer **[Figure 80-30-2]**.

The louver temperature should be between 2,2 - 11,6°C (45 - 53°F.) depending on the amount of humidity in the air and ambient temperature.

If louver temperature is too high. (See Troubleshooting Tree on Page 80-30-4.)

Check the blower for proper operation, or noise, and replace if necessary. (See Removal And Installation on Page 80-130-1.)

Check the A/C condenser for dirt or mud and clean if necessary. (See Removal And Installation on Page 80-60-1.)

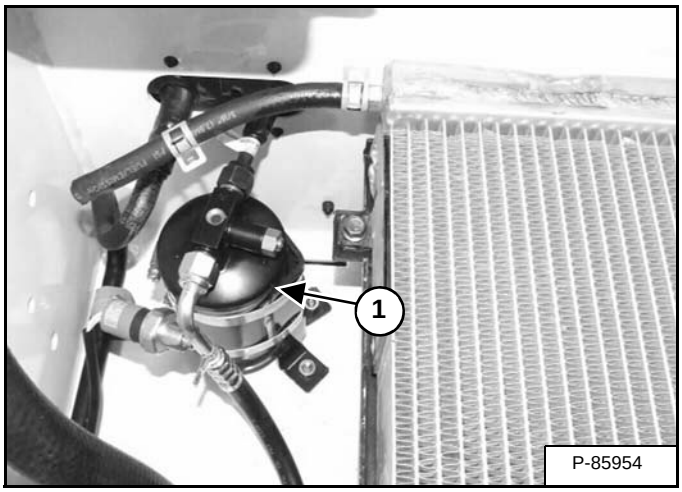
Check the A/C evaporator coil for dirt or mud and clean if necessary. (See Removal And Installation on Page 80-110-1.)

Check the engine coolant to see if it is bypassing the heater valve. (See Engine Coolant Bypassing The Heater Valve on Page 80-30-18.)

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HVAC Repair And Leaks

Figure 80-30-3



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 80-30-3]** must be changed.

Never leave hose fittings, compressor fittings or components uncapped while working on the A/C system.

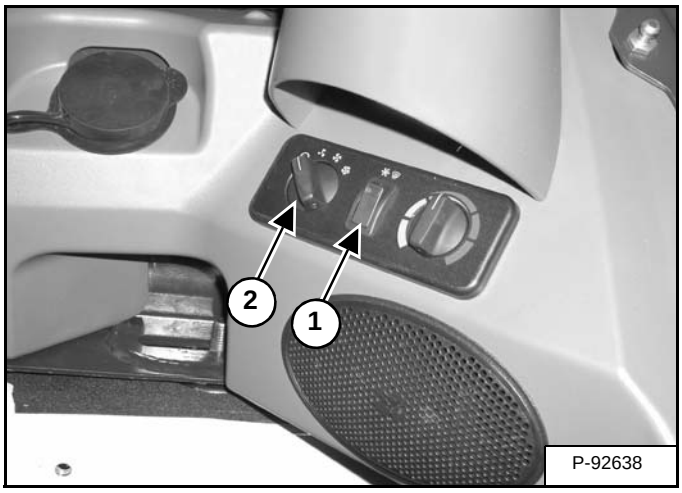
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Electrical System

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 OR press the RUN Button, without starting the loader.

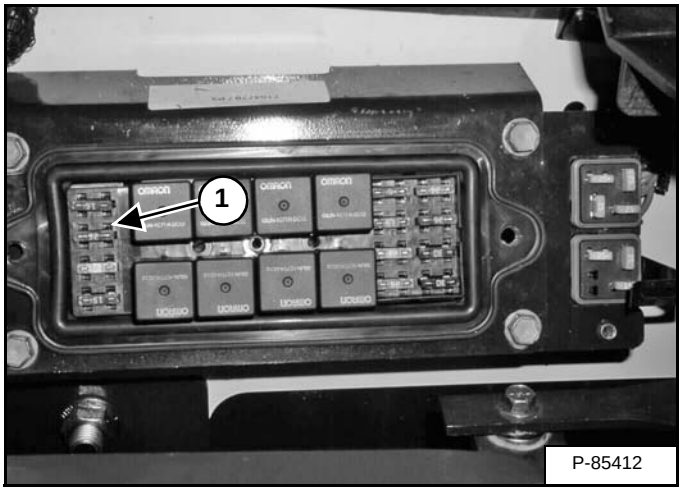
Figure 80-30-4



Push the A/C switch (Item 1) to the ON position. Turn the blower switch (Item 2) **[Figure 80-30-4]** to the first ON position.

The compressor clutch should make a click sound, which indicates the clutch is engaging.

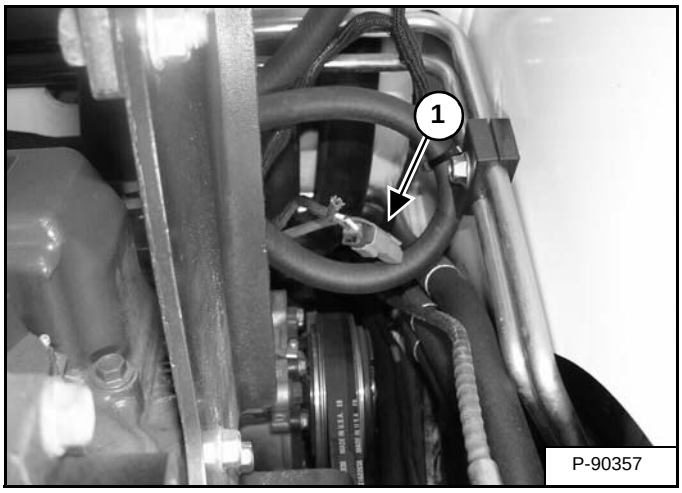
Figure 80-30-5



If the compressor clutch does not engage, check the HVAC fuse (Item 1) **[Figure 80-30-5]** located in the fuse panel.

Open the rear door (tailgate).

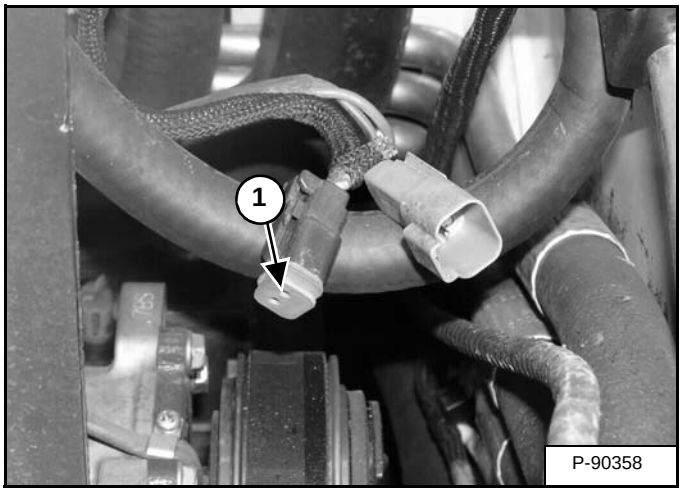
Figure 80-30-6



Locate the loader harness and the compressor clutch wire (Item 1) **[Figure 80-30-6]**.

Disconnect the loader harness (Item 1) **[Figure 80-30-6]** from the compressor clutch wire.

Figure 80-30-7



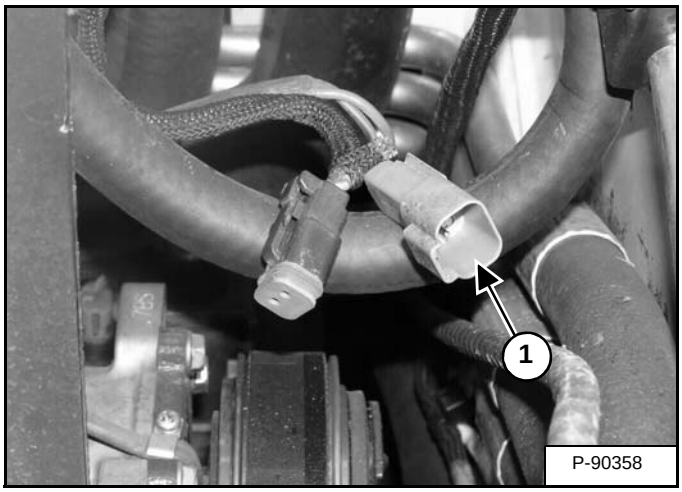
With a multi meter, check the resistance to the compressor clutch (Item 1) **[Figure 80-30-7]**.

If there is no resistance value, replace the compressor clutch.

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Electrical System (Cont'd)

Figure 80-30-8



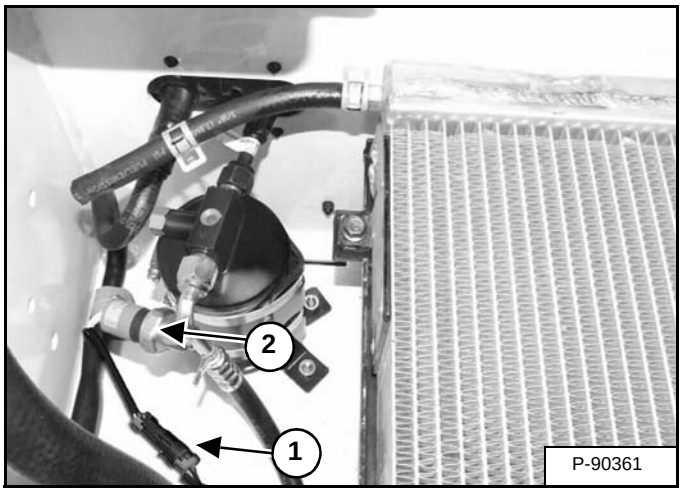
With a multi meter, check the voltage to the compressor clutch at the loader harness (Item 1) **[Figure 80-30-8]**.

The voltage reading should be around 12 volts.

If there is no power at the clutch, check the wiring harness for broken wires.

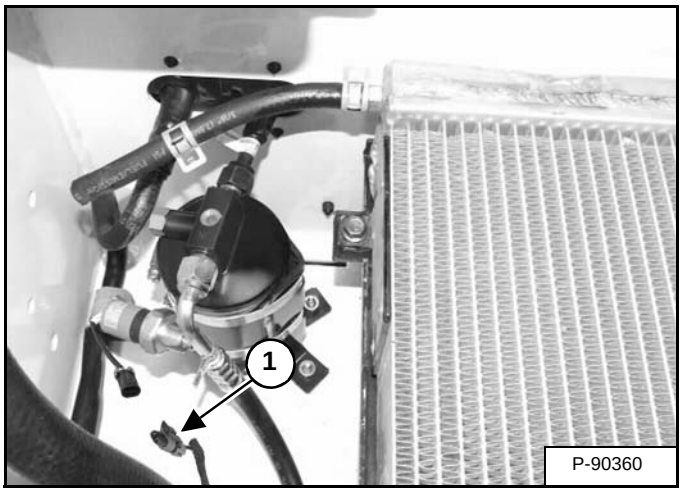
If there is power at the clutch, reconnect the wiring harness to the compressor clutch.

Figure 80-30-9



Disconnect the loader harness (Item 1) from the pressure switch (Item 2) **[Figure 80-30-9]**.

Figure 80-30-10

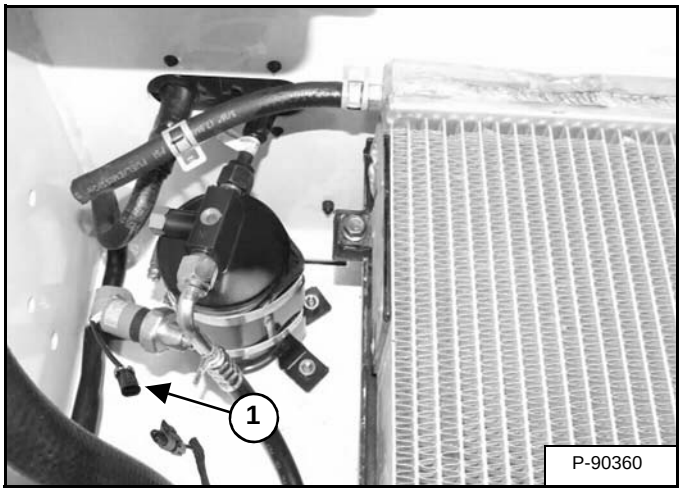


Using a multi meter check the loader wiring harness (Item 1) **[Figure 80-30-10]** for voltage.

The voltage should be around 12 volts.

If there is no voltage at the wiring harness, check the harness for broken wires.

Figure 80-30-11



If there is voltage at the harness, check the resistance at the pressure switch (Item 1) **[Figure 80-30-11]**.

If there is no resistance value, check for low refrigerant level. (See Reclamation And Charging With Recovery / Charging Unit on Page 80-40-2.)

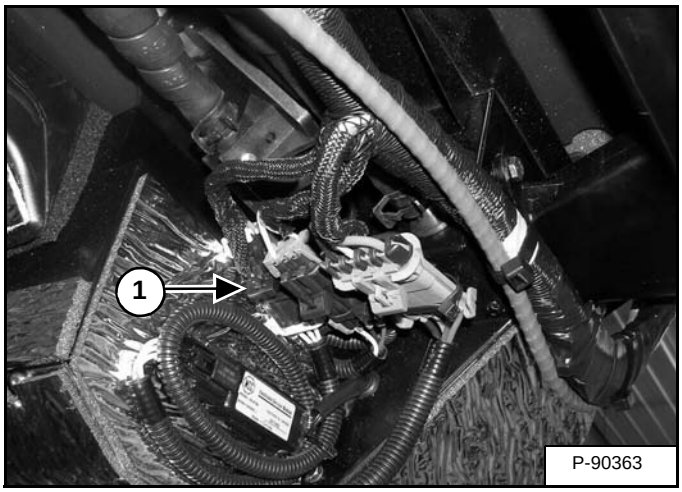
If a resistance value is seen, the pressure switch is good.

Reconnect the loader harness to the pressure switch.

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Electrical System (Cont'd)

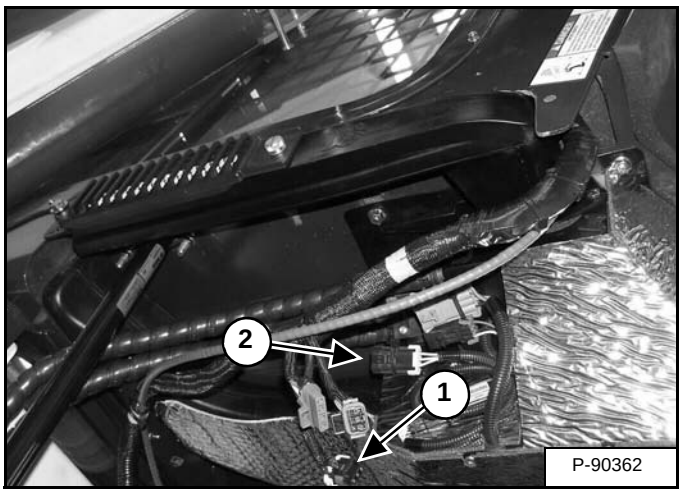
Figure 80-30-12



Raise the operator cab. (See Raising on Page 10-30-2.)

Disconnect the thermostat wiring connector (Item 1 **[Figure 80-30-12]** from the loader wiring harness.

Figure 80-30-13



Check the loader harness (Item 1) **[Figure 80-30-13]** for voltage. The voltage should be 12 volts.

If there is no voltage at the wiring harness, check the harness for broken wires.

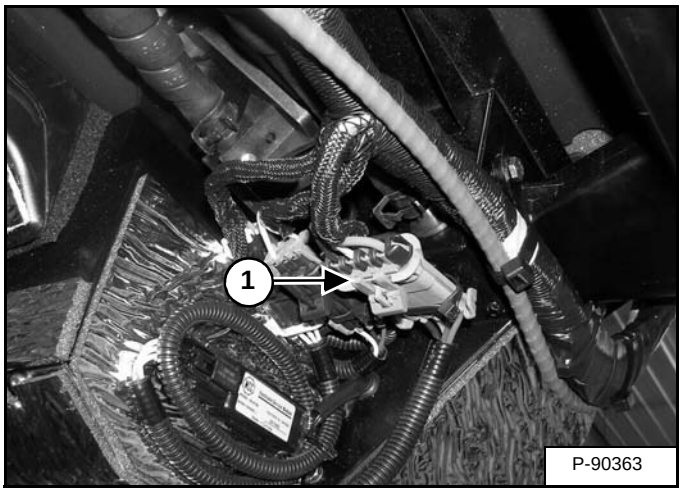
If there is voltage at the wiring harness, check the thermostat (Item 2) **[Figure 80-30-13]** for resistance.

The resistance value of the thermostat should be 10 Ohm at 20°C (68°F).

If there is no resistance value, replace the thermostat. (See Removal And Installation on Page 80-90-2.)

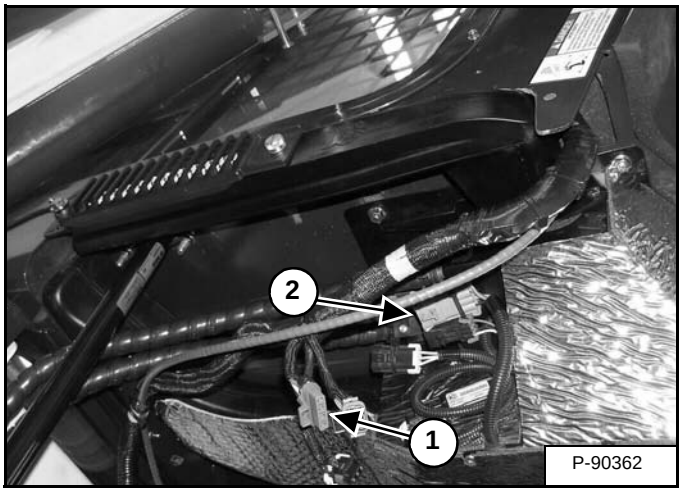
If there is a resistance value, check the blower.

Figure 80-30-14



Disconnect the blower wiring connector (Item 1) **[Figure 80-30-14]** from the loader wiring harness.

Figure 80-30-15



Check the loader harness (Item 1) **[Figure 80-30-15]** for voltage. The voltage should be 12 volts.

If there is no voltage at the wiring harness, check the harness for broken wires.

If there is voltage at the wiring harness, check the resistance to the blower at the blower wiring connector (Item 2) **[Figure 80-30-15]**.

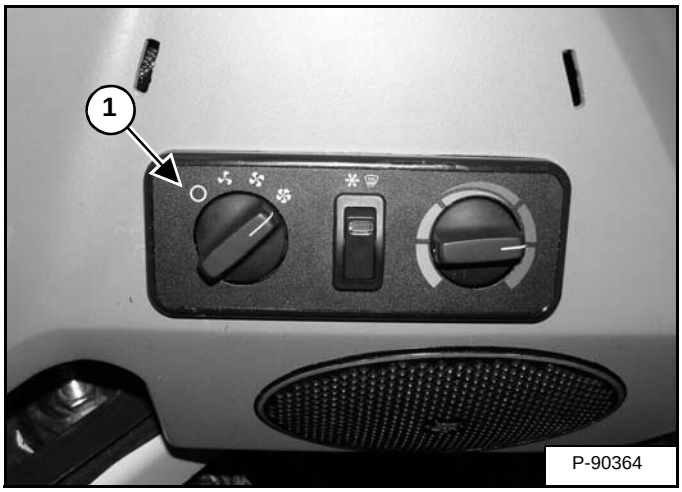
If there is no resistance value replace the blower. (See Removal And Installation on Page 80-130-1.)

If there is a resistance value check the climate controls at the control panel inside the loader cab.

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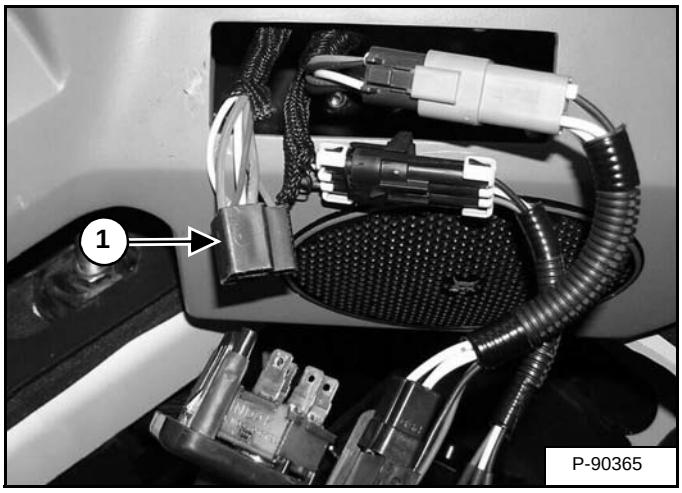
Electrical System (Cont'd)

Figure 80-30-16



Remove the control panel (Item 1) **[Figure 80-30-16]** from the left side lower panel.

Figure 80-30-17

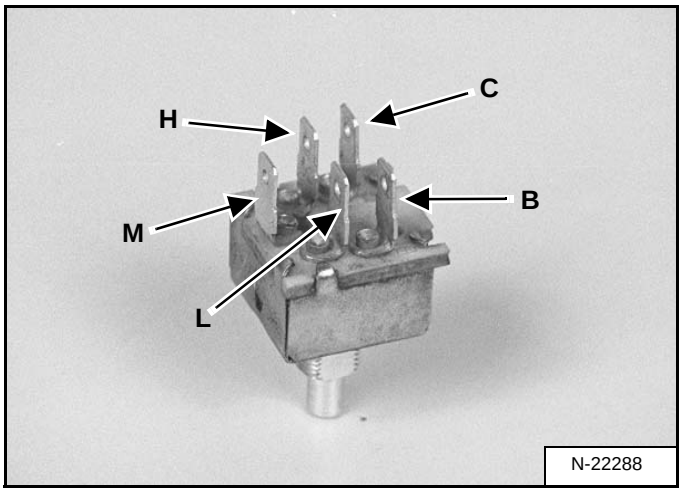


Disconnect the loader wiring harness (Item 1) **[Figure 80-30-17]** from the blower switch.

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.

Figure 80-30-18



If there is voltage at the wiring harness, check the blower switch **[Figure 80-30-18]** for resistance.

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 80-30-18]**.

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 80-30-18]**.

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 80-30-18]**.

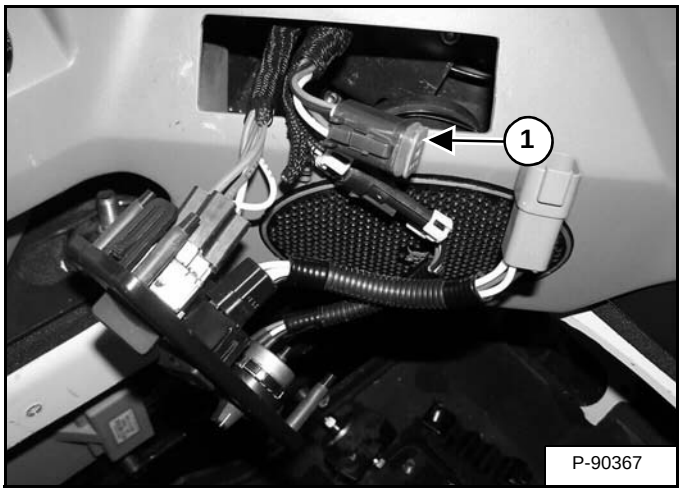
If any of the above resistance tests fail, replace the blower switch.

If the above resistance tests are good, check the A/C switch.

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Electrical System (Cont'd)

Figure 80-30-19

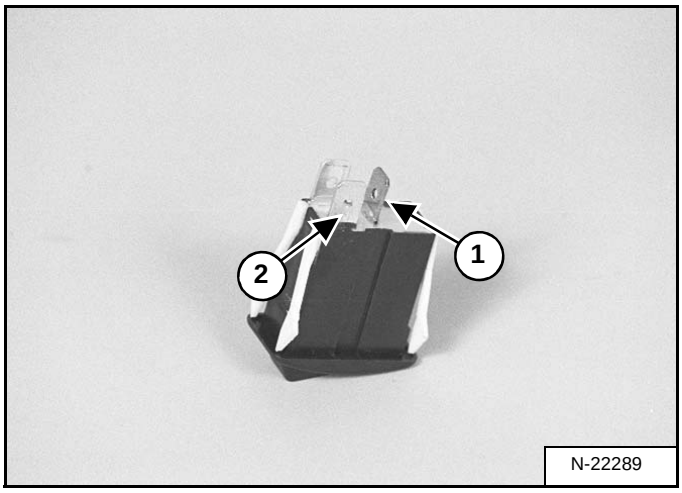


At the loader cab, disconnect the loader harness (Item 1) **[Figure 80-30-19]** from the A/C switch.

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.

Figure 80-30-20



If there is voltage at the wiring harness, check the A/C switch **[Figure 80-30-20]** 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 80-30-20]**.

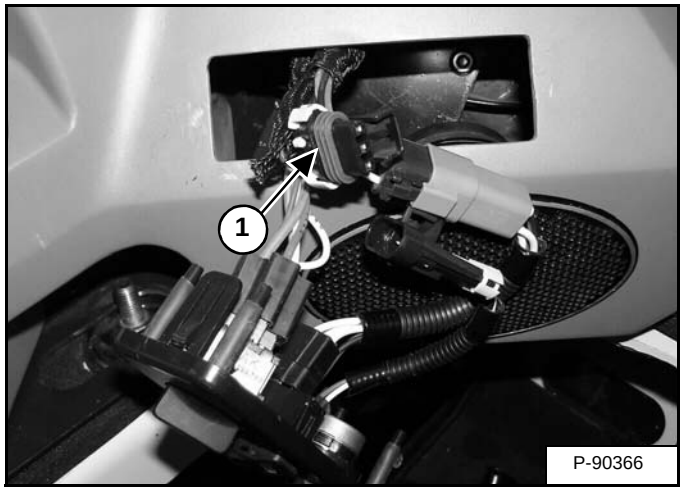
If no resistance value is found, replace the A/C switch.

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 80-30-21



At the loader cab, disconnect the loader harness (Item 1) **[Figure 80-30-21]** from the potentiometer.

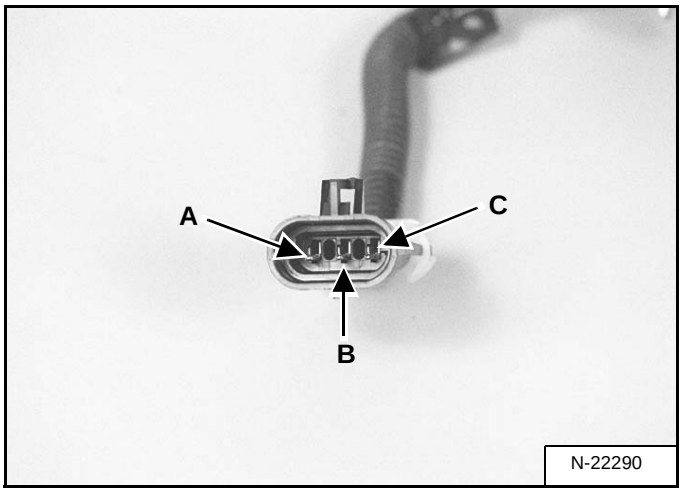
Check the loader harness (Item 1) **[Figure 80-30-21]** for voltage. The voltage should be 12 volts.

If there is no voltage at the wiring harness, check the harness for broken wires.

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Electrical System (Cont'd)

Figure 80-30-22

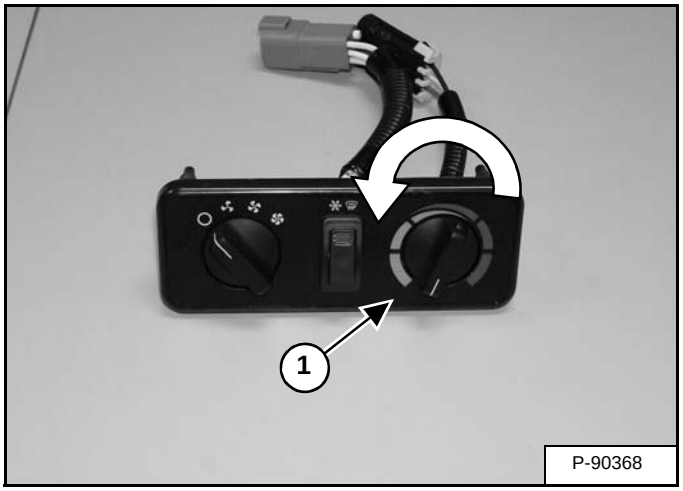


If there is voltage at the wiring harness, check the potentiometer **[Figure 80-30-22]** for resistance.

The resistance should be 10K Ohm between wire pin **A** and wire pin **C** frame **[Figure 80-30-22]**.

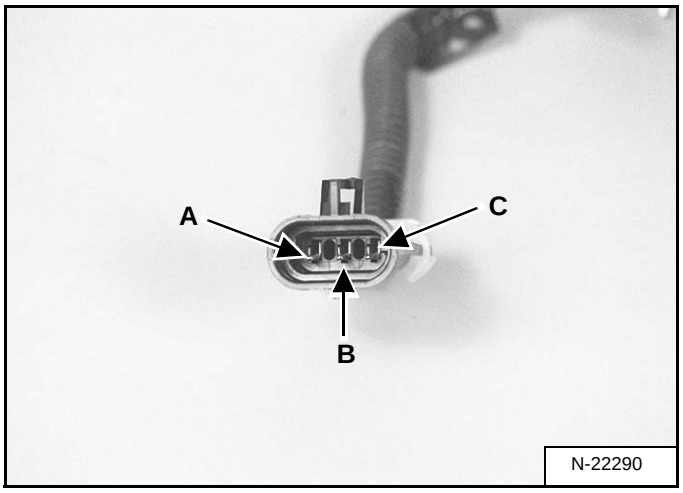
If no resistance is found replace the potentiometer.

Figure 80-30-23



To check the resistance of the white wire, turn the potentiometer control (Item 1) **[Figure 80-30-23]** counterclockwise to the full A/C position.

Figure 80-30-24



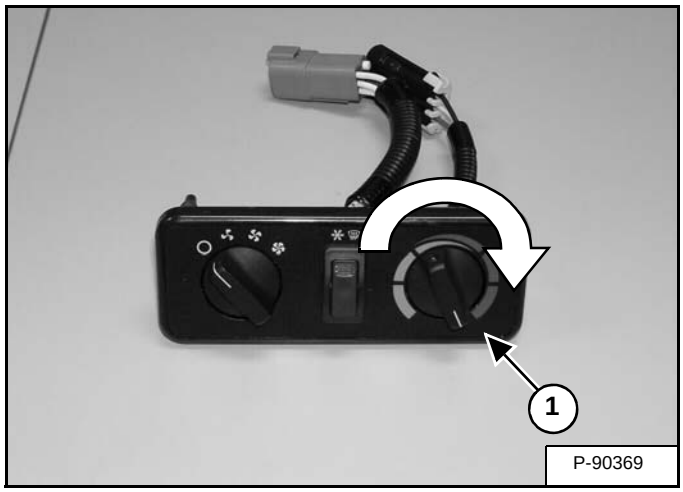
The resistance between the wire terminal **A** and wire terminal **B** frame **[Figure 80-30-24]** should be around 0 K Ohm.

Check the resistance between the wire terminal **C** and wire terminal **B** frame **[Figure 80-30-24]** should be around 10 K Ohm.

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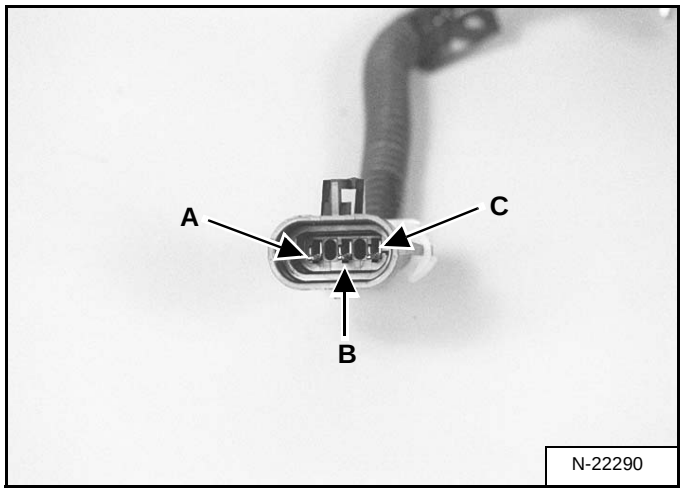
Electrical System (Cont'd)

Figure 80-30-25



To check the resistance of the white wire, turn the potentiometer control (Item 1) **[Figure 80-30-25]** clockwise to the full Heater position.

Figure 80-30-26



Check the resistance between the wire terminal **A** and wire terminal **B** frame **[Figure 80-30-26]** should be around 10 K Ohm.

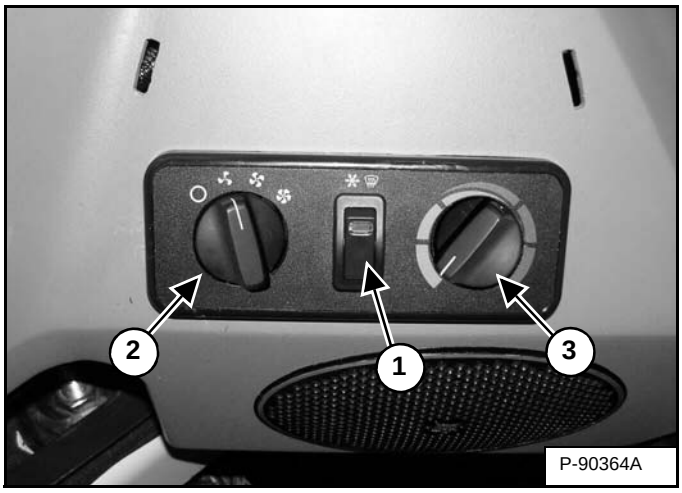
Check the resistance between the wire terminal **C** and wire terminal **B** frame **[Figure 80-30-26]** should be around 0 K Ohm.

If the resistance is not found replace the potentiometer.

Engine Coolant Bypassing The Heater Valve

Raise the lift arms and install an approved lift arm support device. (See Installing on Page 10-20-1.)

Figure 80-30-27



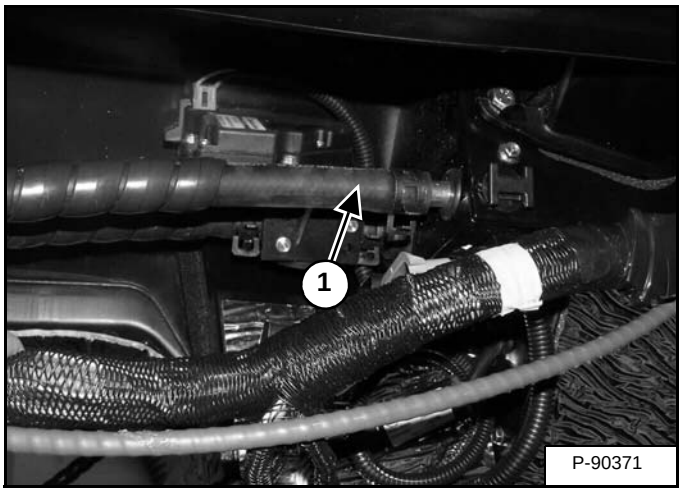
Push the A/C switch (Item 1) to the OFF position, turn the blower switch (Item 2) to position **1**, then turn the temperature control (Item 3) **[Figure 80-30-27]** counterclockwise to the full A/C position, with the loader ignition switch OFF.

Raise the operator cab. (See Raising on Page 10-30-2.)

Connect the remote start tool to the loader. (See REMOTE START TOOL KIT-MEL1563 on Page 10-60-1.)

Start the loader and run at high idle, for ten minutes.

Figure 80-30-28



Check the heater hose (Item 1) **[Figure 80-30-28]** for temperature.

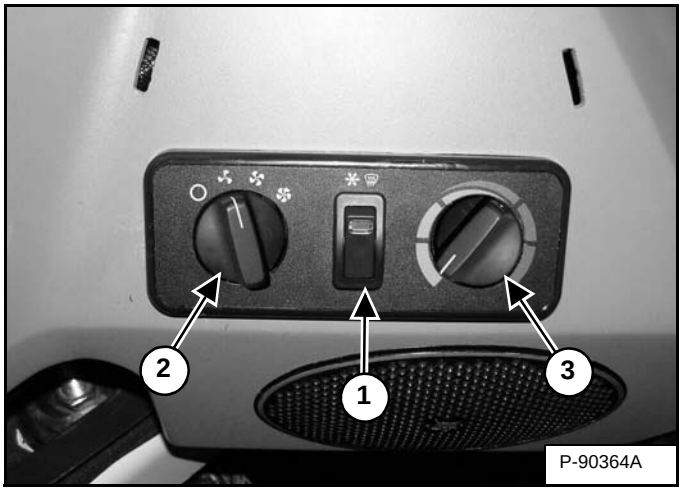
If the hose is hot, the heater valve is leaking by, and needs to be replace.

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Heater Valve Not Opening Or Closing

Raise the lift arms and install an approved lift arm support device. (See Installing on Page 10-20-1.)

Figure 80-30-29

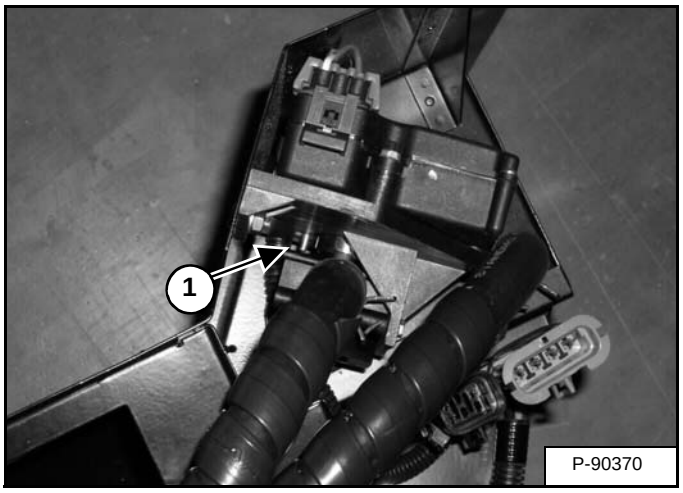


Push the A/C switch (Item 1) to the OFF position, turn the blower switch (Item 2) to position **1** and turn the temperature control (Item 3) **[Figure 80-30-29]** to the High A/C position, with the loader ignition switch OFF.

Raise the operator cab. (See Raising on Page 10-30-2.)

Connect the remote start tool to the loader. (See REMOTE START TOOL KIT-MEL1563 on Page 10-60-1.)

Figure 80-30-30



NOTE: The HVAC assembly is removed for photo clarity.

Place the remote start tool on the left fender of the loader, so the heater valve can be clearly seen. Watch the valve shaft (Item 1) **[Figure 80-30-30]**, 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 80-30-29]** to the High Heater position, with the loader ignition switch OFF.

Raise the operator cab.

Place the remote start tool on the left fender of the loader, so the heater valve can be clearly seen. Watch the valve shaft (Item 1) **[Figure 80-30-30]**, 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 Electrical System on Page 80-30-12.)

Replace the heater valve. (See Removal And Installation on Page 80-140-1.)

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Dealer Copy -- Not for Resale

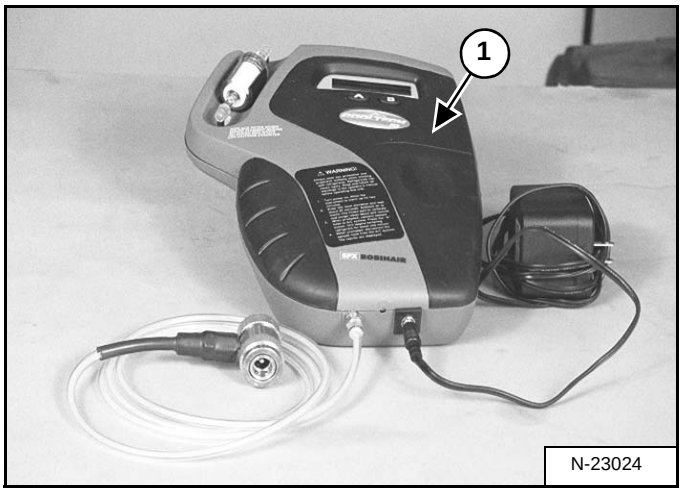
Refrigerant Identification

WARNING

In the event of a leak, wear safety goggles. Escaping refrigerant can cause severe injuries to eyes. In contact with a flame, R134a refrigerant gives a toxic gas.

W-2371-0500

Figure 80-40-1



NOTE: 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 80-40-1] 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.

NOTE: This test is run with the loader engine OFF, and the A/C switch in the OFF position.

Raise the lift arms and install an approved lift arm support device. (See Installing on Page 10-20-1.)

Raise the operator cab. (See Raising on Page 10-30-2.)

Connect the Refrigerant Identifier to the low pressure hose.

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.

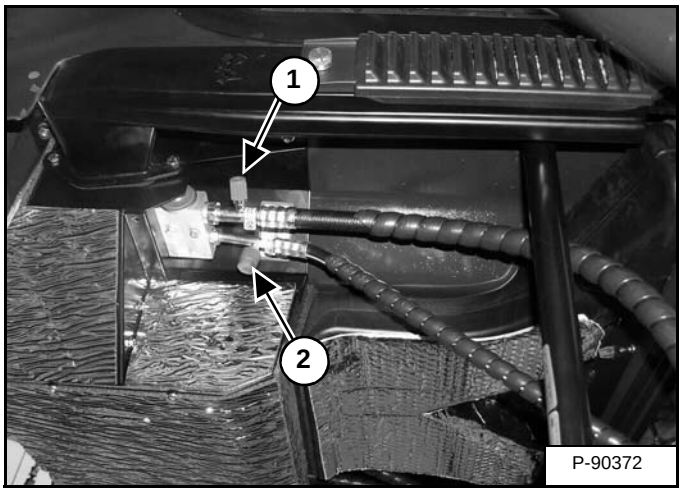
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Reclamation And Charging With Recovery / Charging Unit

Raise the lift arms and install an approved lift arm support device. (See Installing on Page 10-20-1.)

Raise the operator cab. (See Raising on Page 10-30-2.)

Figure 80-40-2



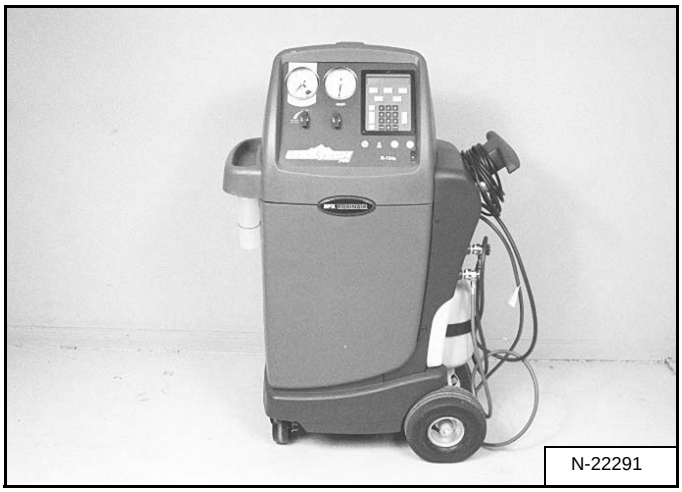
Locate the low pressure port (Item 1), and high pressure port (Item 2) **[Figure 80-40-2]**.

⚠ WARNING

In the event of a leak, wear safety goggles. Escaping refrigerant can cause severe injuries to eyes. In contact with a flame, R134a refrigerant gives a toxic gas.

W-2371-0500

Figure 80-40-3



IMPORTANT: Only trained technicians should perform the reclaiming and recharging.

⚠ WARNING

HFC 134A refrigerant can be dangerous if not properly handled. Liquid 134A may cause blindness if it contacts the eyes and may cause serious frostbite if it contacts the skin.

- **Gaseous 134A becomes lethal (phosgene) gas when it contacts open flame or very hot substances.**
- **NEVER SMOKE when there is the possibility of even small amounts of 134A in the air.**

Any servicing work that involves release or addition of 134A to the system must be done by a competent refrigeration dealer who has the proper equipment, knowledge, and experience to service refrigeration equipment.

W-2373-0500

Use an approved recovery / charging unit **[Figure 80-40-3]** to evacuate the system.

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Reclamation And Charging With Recovery / Charging Unit (Cont'd)

Figure 80-40-4

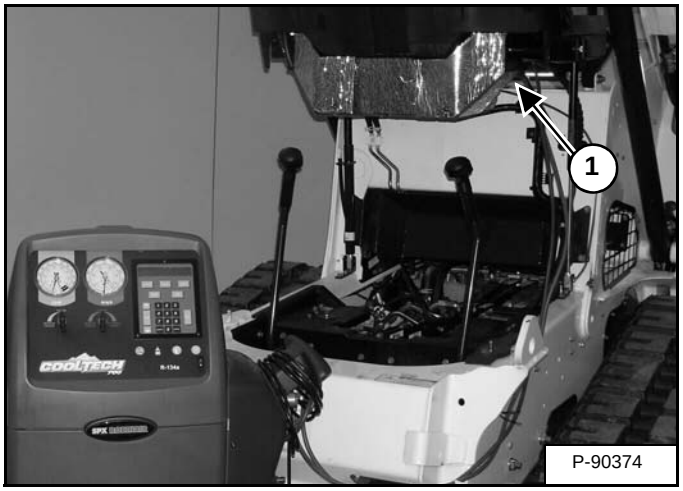
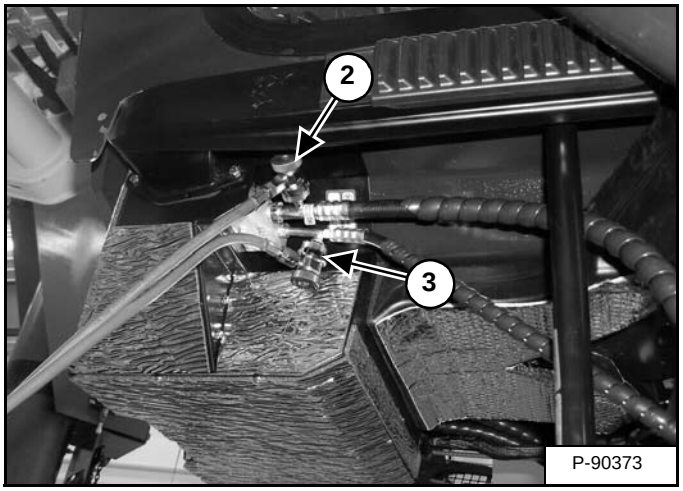


Figure 80-40-5

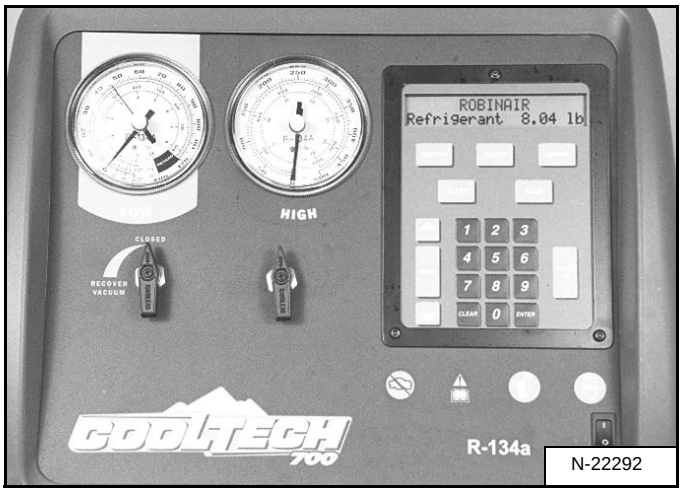


Connect the reclaimer to the loader A/C charge ports (Item 1) **[Figure 80-40-4]**.

Connect the Blue hose (Item 2) **[Figure 80-40-5]** to the low pressure port and open the valve.

Connect the Red hose (Item 3) **[Figure 80-40-5]** to the high pressure port and open the valve.

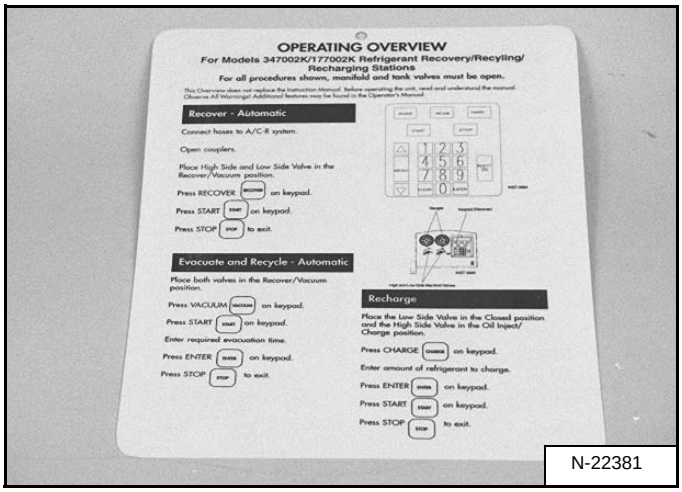
Figure 80-40-6



Turn the reclaimer unit **[Figure 80-40-6]** to the ON position and follow the on screen instructions.

NOTE: The A/C system holds 0,68 kg (1.5 lb) of refrigerant.

Figure 80-40-7



NOTE: The reclaimer unit, has a complete step by step set of instructions [Figure 80-40-7] to follow for reclamation and recharging of the A/C system. A trained technician should follow these instructions as they may vary slightly depending on the model and brand of reclaimer used.

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COMPRESSOR

Removal And Installation

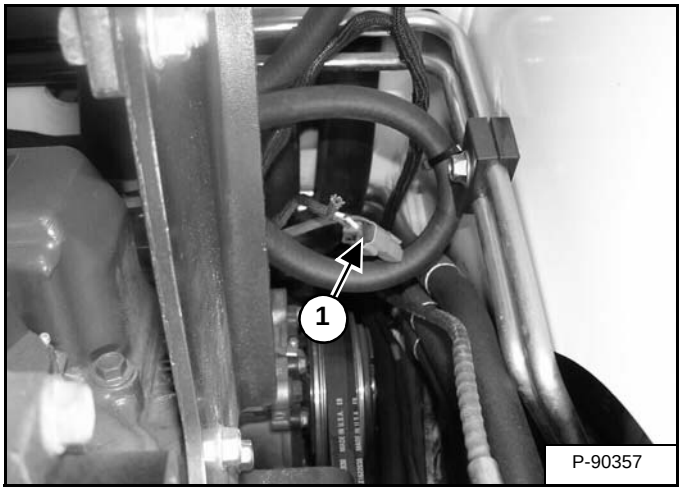
Raise the lift arms and install an approved lift arm support device. (See Installing on Page 10-20-1.)

Raise the operator cab. (See Raising on Page 10-30-2.)

Evacuate the A/C system. (See Reclamation And Charging With Recovery / Charging Unit on Page 80-40-2.)

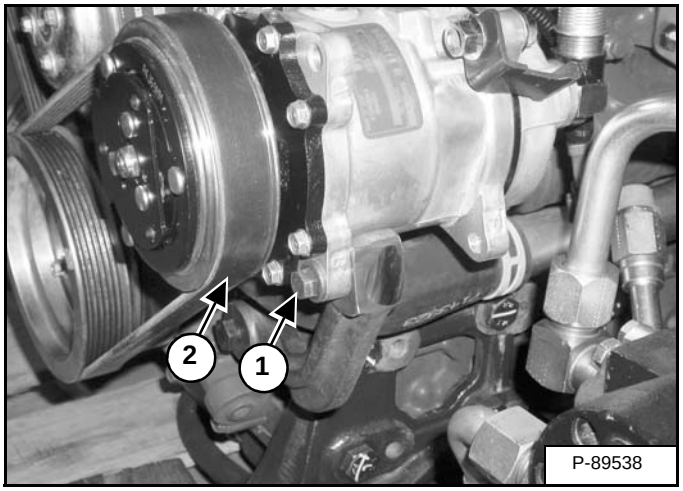
Open the rear door.

Figure 80-50-1



Disconnect the loader harness (Item 1) **[Figure 80-50-1]** from the compressor clutch wire.

Figure 80-50-2



Remove the compressor mount bolt (Item 1) and the belt (Item 2) **[Figure 80-50-2]**.

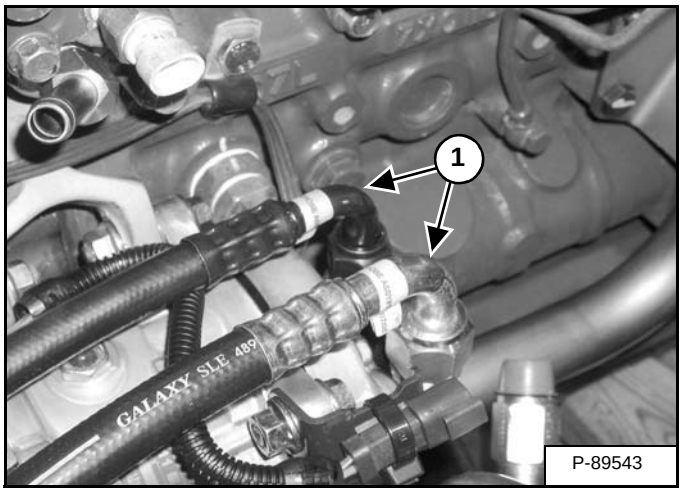
Installation: Tighten the compressor mount bolt to 46 N•m (34 ft-lb) torque.

WARNING

In the event of a leak, wear safety goggles. Escaping refrigerant can cause severe injuries to eyes. In contact with a flame, R134a refrigerant gives a toxic gas.

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Figure 80-50-3

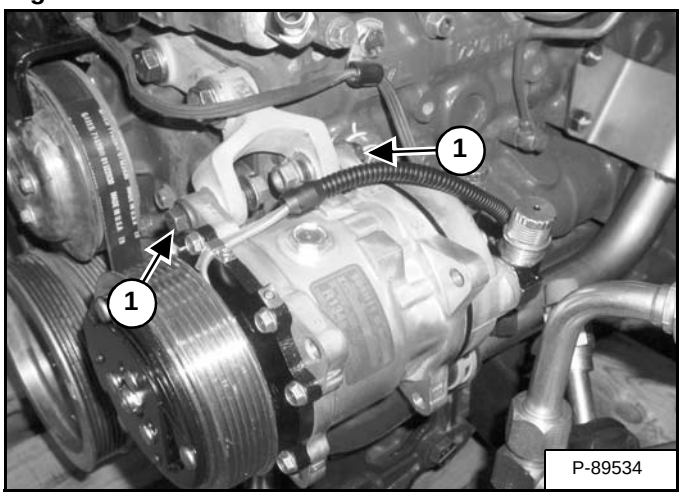


Remove the compressor hoses (Item 1) **[Figure 80-50-3]** from the compressor.

Installation: Tighten the compressor hoses to 29,8 N•m (22 ft-lb) torque.

Cap and plug the compressor hoses and the fittings with with the proper A/C caps and plugs.

Figure 80-50-4



Remove the compressor mount bolts and nuts (Item 1) **[Figure 80-50-4]**.

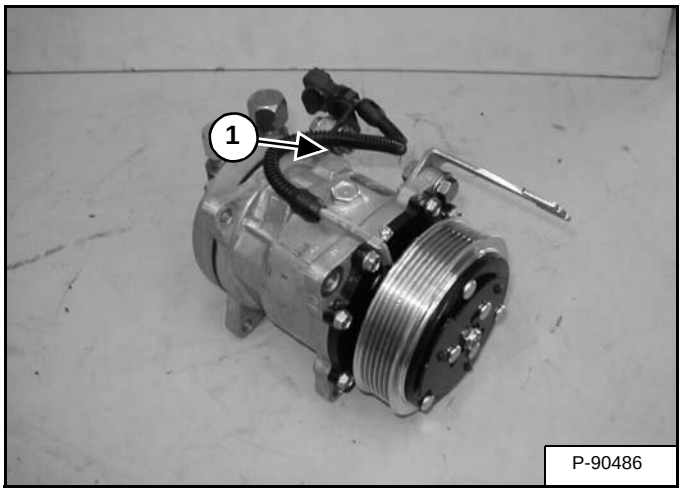
Remove the compressor from the loader.

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COMPRESSOR (CONT'D)

Oil

Figure 80-50-5



The compressor (Item 1) **[Figure 80-50-5]** is factory filled with **150 - 170 cc's** of PAG 100 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.

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 100 oil should be used, and never mix R-12 and R-134a Oils.

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 ensure return of oil to the compressor.

If the amount of refrigerant in the system has decreased, charge the system. (See SYSTEM CHARGING AND RECLAMATION on Page 80-40-1.)

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 Removal And Installation on Page 80-50-1.)

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Oil Check

Figure 80-50-6

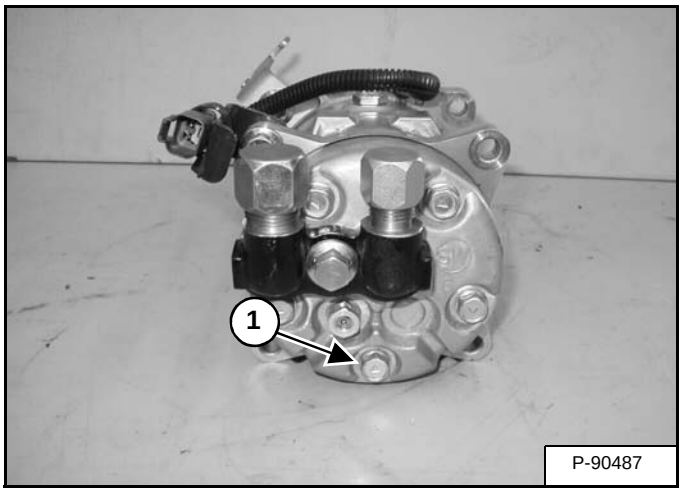
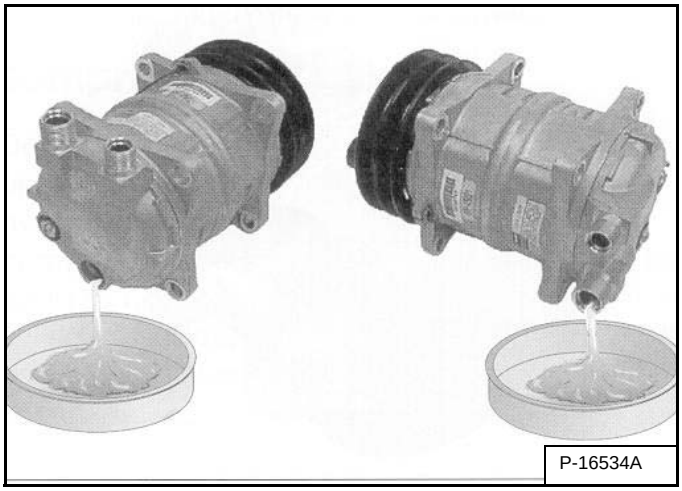


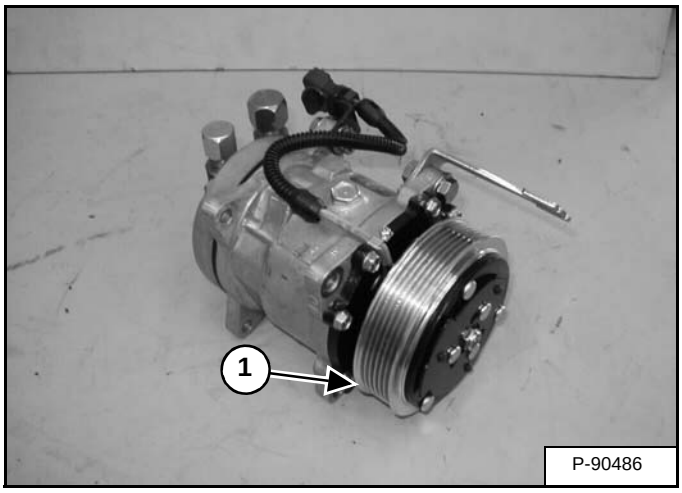
Figure 80-50-7



Remove the oil drain plug (Item 1) **[Figure 80-50-6]** and drain the oil through the connectors and the oil drain hole **[Figure 80-50-7]**.

Installation: Tighten the oil drain plug to 13 - 15 N•m (9.4 - 10.8 ft-lb) torque.

Figure 80-50-8



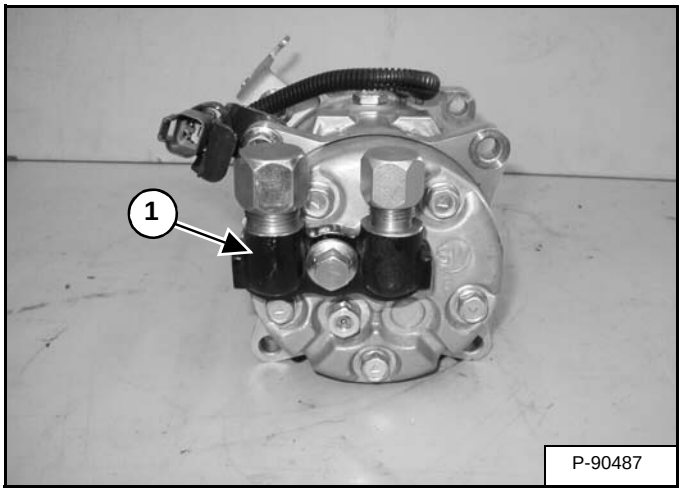
NOTE: After draining the oil through the drain hole and the connectors, extract the remaining oil through the discharge-side connector by rotating the drive pulley (Item 1) [Figure 80-50-8] several times by hand.

Measure the drained oil in a measuring cylinder.

Check the oil for contamination, dirt, metal shavings, or varnish color, discard the oil if contaminated.

NOTE: If metal shavings are found in the compressor oil, replace the complete compressor assembly.

Figure 80-50-9



Add new compressor oil through the suction side connector (Item 1) **[Figure 80-50-9]**.

Installation: **Add 150 - 170 cc's of PAG 100 oil.**

NOTE: The suction port on the compressor is marked with an SUC and is the larger port on the compressor.

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CONDENSER

Removal And Installation

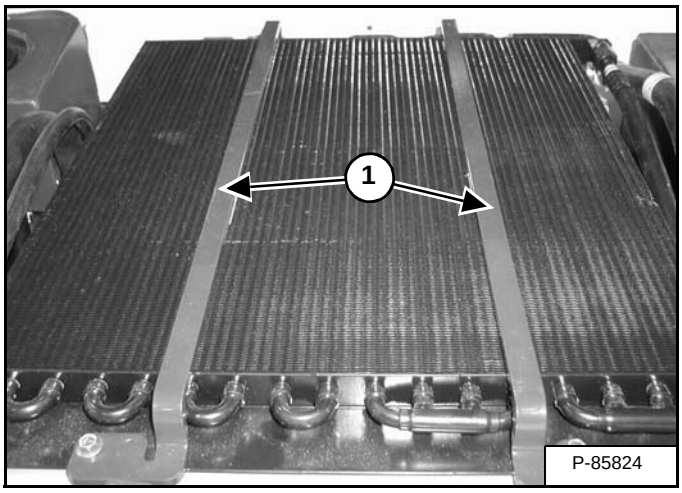
Raise the lift arms and install an approved lift arm support device. (See Installing on Page 10-20-1.)

Raise the operator cab. (See Raising on Page 10-30-2.)

Remove the rear grille. (See Removal And Installation on Page 50-60-1.)

Remove the refrigerant from the A/C system. (See Reclamation And Charging With Recovery / Charging Unit on Page 80-40-2.)

Figure 80-60-1



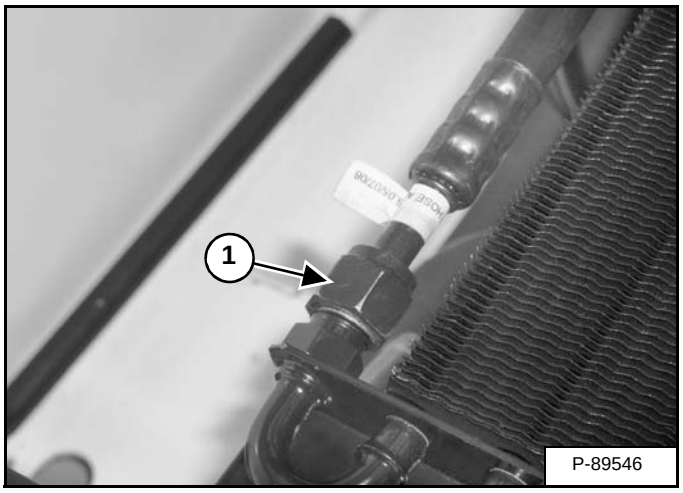
Remove the two brackets (Item 1) **[Figure 80-60-1]**.

⚠ WARNING

In the event of a leak, wear safety goggles. Escaping refrigerant can cause severe injuries to eyes. In contact with a flame, R134a refrigerant gives a toxic gas.

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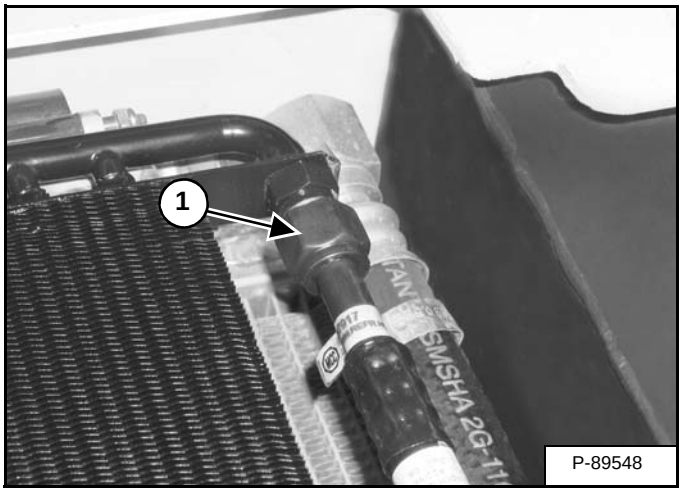
Figure 80-60-2



Disconnect the hose (Item 1) **[Figure 80-60-2]** that routes from the condenser to the receiver / dryer.

Cap and plug the hose and the condenser fittings with the proper A/C caps and plugs.

Figure 80-60-3



Disconnect the hose (Item 1) **[Figure 80-60-3]** that routes from the condenser to the compressor.

Cap and plug the hose and the condenser fittings with the proper A/C caps and plugs.

Remove the condenser.

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RECEIVER / DRIER

Receiver / Drier 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.

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Remove the rear grille. (See Removal And Installation on Page 50-60-1.)

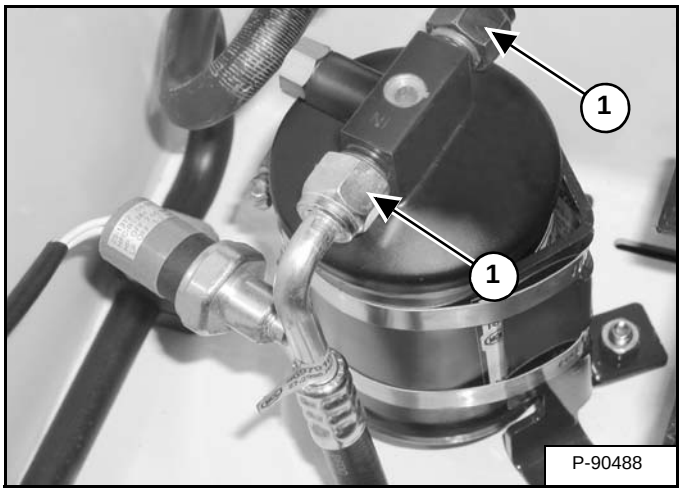
Remove the refrigerant from the A/C system. (See Reclamation And Charging With Recovery / Charging Unit on Page 80-40-2.)

⚠ WARNING

In the event of a leak, wear safety goggles. Escaping refrigerant can cause severe injuries to eyes. In contact with a flame, R134a refrigerant gives a toxic gas.

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Figure 80-70-1



NOTE: Mark the A/C hoses (Item 1) [Figure 80-70-1] for proper installation.

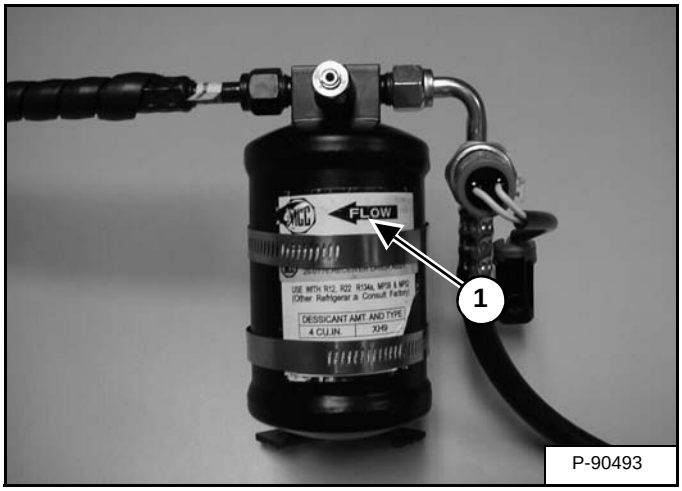
Remove the two A/C hoses (Item 1) **[Figure 80-70-1]** from the receiver / drier.

Both fittings on the drier are the same size, so the hoses can be hooked up incorrectly.

Cap and plug the hoses and the receiver / drier fittings with the proper A/C caps and plugs.

NOTE: When replacing a receiver / drier in an A/C system 30 in^3 (1 fl oz) of PAG 100 oil must be added to the system when recharging.

Figure 80-70-2

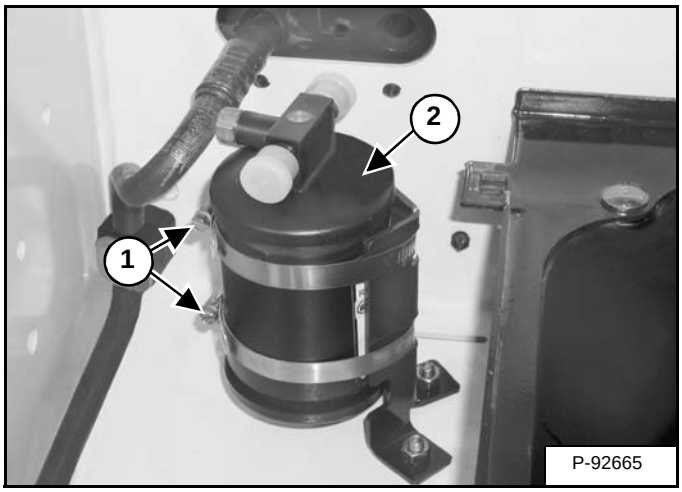


Note the flow direction on the receiver / drier (Item 1) **[Figure 80-70-2]** for proper installation.

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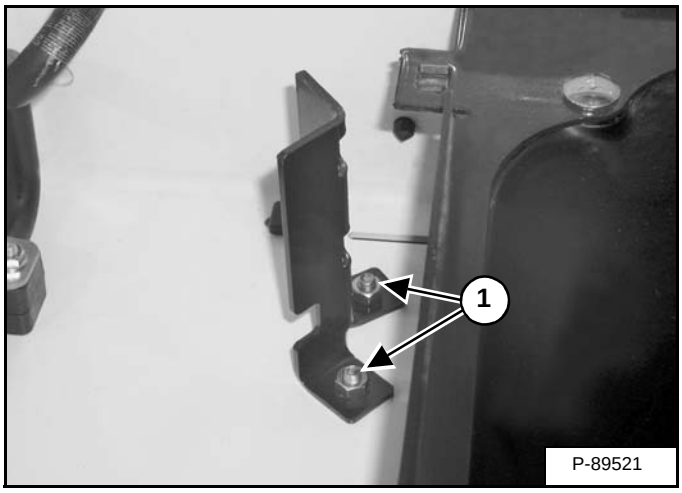
Receiver / Drier Removal And Installation (Cont'd)

Figure 80-70-3



Loosen the two clamps (Item 1) and remove the receiver / drier (Item 2) **[Figure 80-70-3]**.

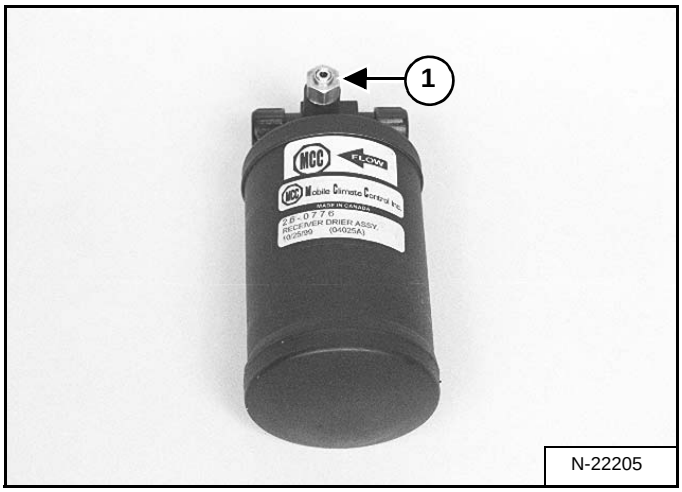
Figure 80-70-4



Remove the two mount bolts (Item 1) **[Figure 80-70-4]** from the receiver / drier mount bracket.

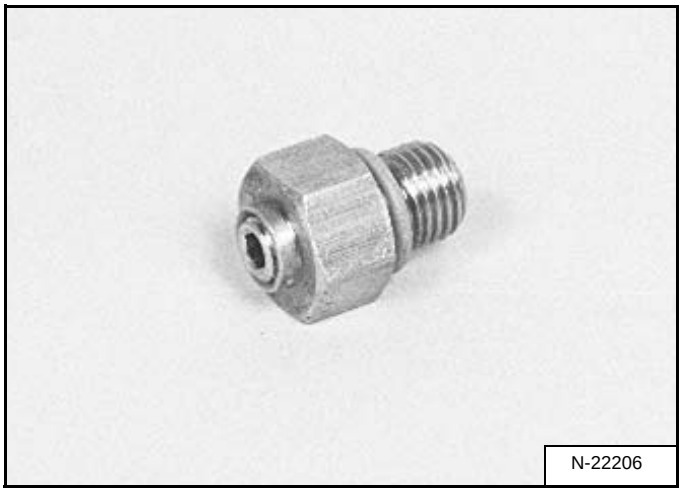
Pressure Relief Valve Removal And Installation

Figure 80-70-5



The pressure relief valve (Item 1) **[Figure 80-70-5]** is located on the receiver / drier.

Figure 80-70-6



The pressure relief valve **[Figure 80-70-6]** is designed to open and release the A/C charge if the pressure reaches 3,7 MPa (36,9 bar) (535 psi).

This will cause the A/C system to shut down, saving the compressor.

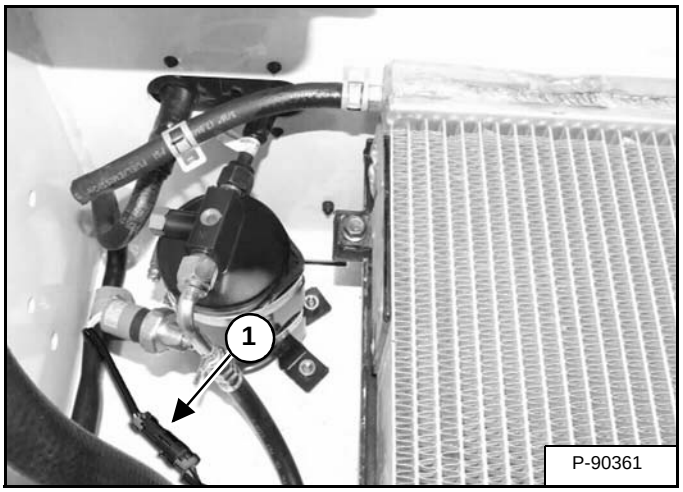
The pressure relief valve is a secondary protection device in the A/C system, with the pressure switch shutting down the system at 2,6 MPa (26,5 bar) (384 psi).

NOTE: If a pressure relief valve is found open, check the A/C system for problems. Replace the complete receiver / drier unit.

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Pressure Switch Removal And Installation

Figure 80-70-7



Disconnect the loader wire harness (Item 1) **[Figure 80-70-7]** from the pressure switch wire harness.

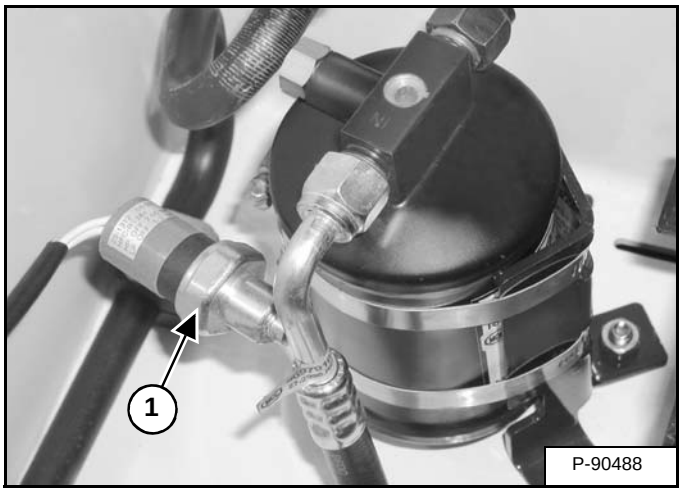
NOTE: The pressure switch can be changed without evacuating the A/C system.

⚠ WARNING

In the event of a leak, wear safety goggles. Escaping refrigerant can cause severe injuries to eyes. In contact with a flame, R134a refrigerant gives a toxic gas.

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Figure 80-70-8



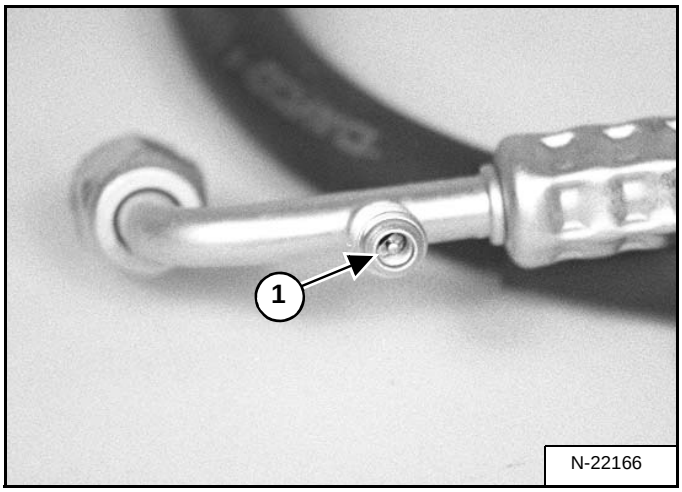
Remove the pressure switch (Item 1) **[Figure 80-70-8]** from the A/C high pressure hose.

Remove the pressure switch from the loader.

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Schraeder Valve Removal And Installation

Figure 80-70-9



The schraeder valve (Item 1) **[Figure 80-70-9]** is located in the A/C high pressure hose and is located under the pressure switch.

Remove the refrigerant from the A/C system. (See Reclamation And Charging With Recovery / Charging Unit on Page 80-40-2.)

Remove the pressure switch.

With a schraeder valve removal tool, remove the valve from the hose.

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EVAPORATOR / HEATER UNIT

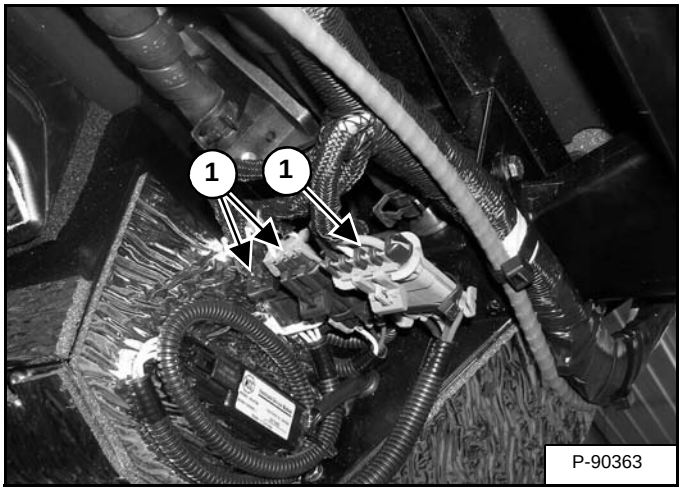
Removal And Installation

Raise the lift arms and install an approved lift arm support device. (See Installing on Page 10-20-1.)

Raise the operator cab. (See Raising on Page 10-30-2.)

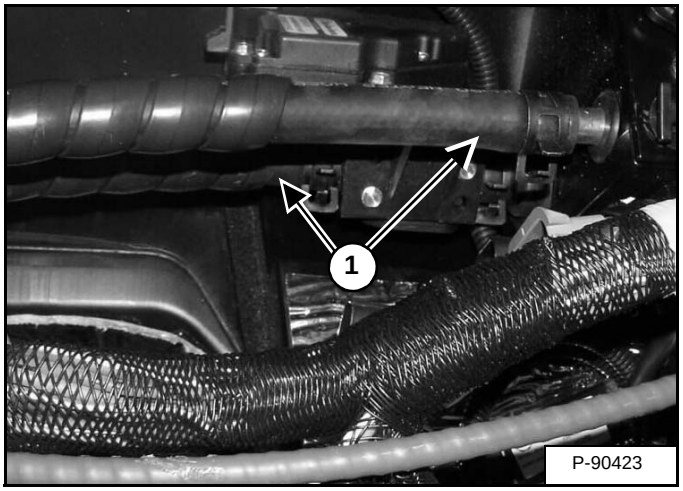
Evacuate the A/C system. (See Reclamation And Charging With Recovery / Charging Unit on Page 80-40-2.)

Figure 80-80-1



Disconnect the expansion / heater unit wiring (Item 1) **[Figure 80-80-1]**.

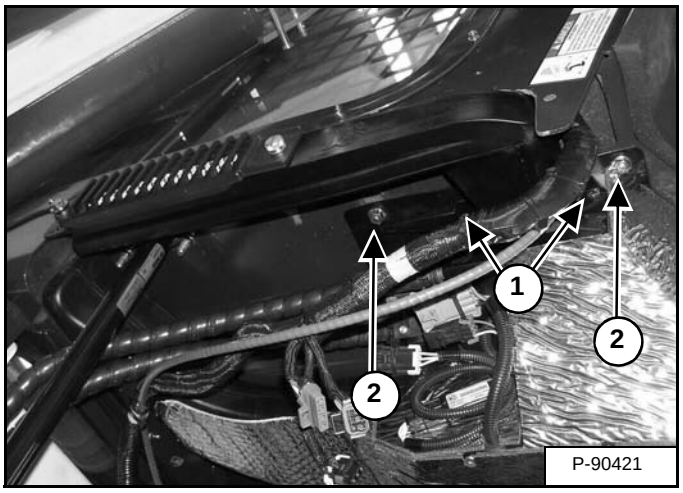
Figure 80-80-2



NOTE: Cap the heater hoses and the heater valve with plugs to prevent coolant loss from the system.

Remove the two hoses (Item 1) **[Figure 80-80-2]**.

Figure 80-80-3

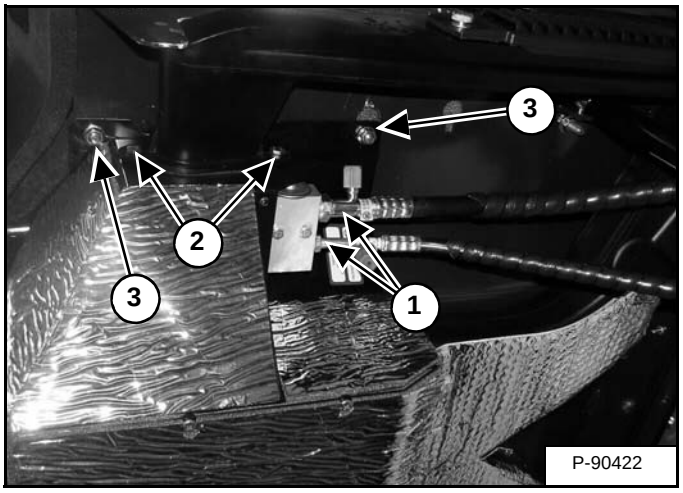


NOTE: Support the evaporator / heater unit before removing the mounting hardware.

Remove the two bolts (Item 1) **[Figure 80-80-3]**.

Remove the two nuts (Item 2) **[Figure 80-80-3]**.

Figure 80-80-4



Disconnect the two A/C hoses (Item 1) **[Figure 80-80-4]**.

Cap and plug the hoses and the expansion valve fittings with the proper A/C caps and plugs.

Installation: Tighten the A/C hoses to 29,8 N•m (22 ft-lb) torque.

Remove the two bolts (Item 2) **[Figure 80-80-4]**.

Remove the two nuts (Item 3) **[Figure 80-80-4]**.

Remove evaporator / heater unit from the loader.

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THERMOSTAT

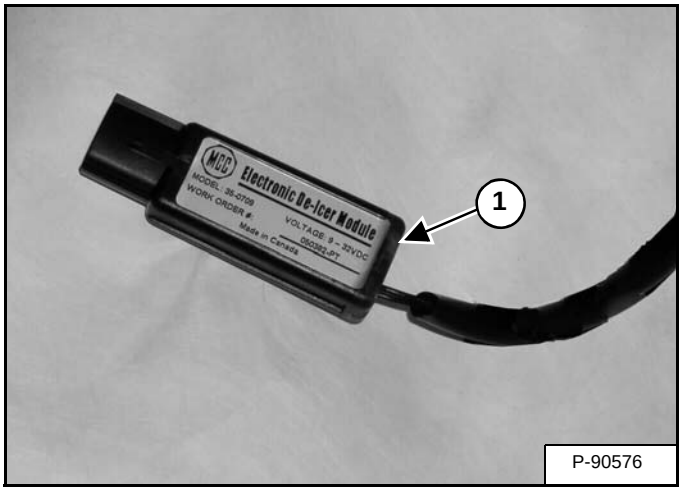
Description

The Electronic De-icing Thermostat (EDT) is a micro controller based module that measures evaporator coil temperature and cycles the compressor clutch to maintain a constant evaporator pressure. Onboard circuit protection and diagnostics are also built into the module.

NOTE: The EDT has a six second delay before start up to protect the compressor clutch.

The EDT will turn the clutch on when the evaporator coil temperature is above 2°C (35.6°F). If the EDT does not detect any malfunction, it will continue to operate and the status LED will be lit continuously. When the evaporator temperature is below -2°C (28.4°F), the EDT will turn off the clutch and status LED.

Figure 80-90-1



When the EDT detects an open or short from the temperature sensor, the status LED (Item 1) **[Figure 80-90-1]** will blink once per second and the output signal to the clutch will be turned off. The status LED will flash two times per second when EDT detects an open circuit (current draw less than 200 mA), short circuit or over current (current draw greater than 7A) from the clutch output. The status LED will flash three times per second when the compressor clutch is shorted to ground.

NOTE: The EDT will attempt to restart every 20 seconds until the fault is repaired.

The EDT has the following protection built in:

1. Over temperature
2. Over current from clutch output
3. Voltage (Above and below operational limits or reverse voltage)
4. Short circuit protection (Output shorted to ground)
5. Temperature sensor open and short detection

MALFUNCTION	DETECTION INTERVAL	STATUS LED
Temperature sensor	Continuous	1x per second
Temperature sensor open and short detection	At A/C start up	2x per second
Compressor clutch short to battery	Continuous	3x per second

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THERMOSTAT (CONT'D)

Removal And Installation

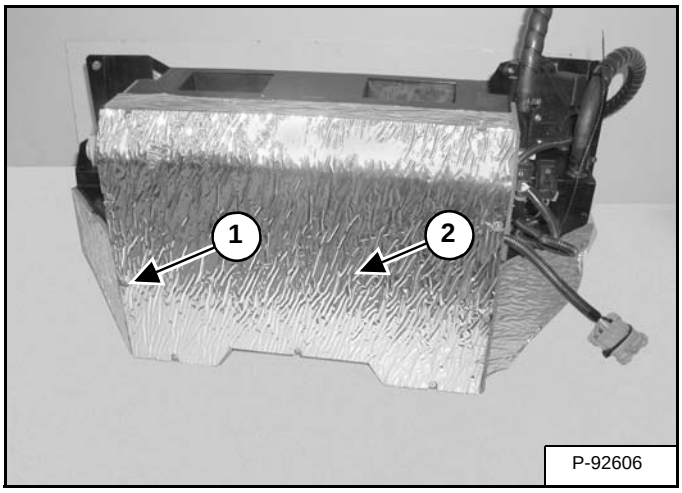
Raise the lift arms and install an approved lift arm support device. (See Installing on Page 10-20-1.)

Raise the operator cab. (See Raising on Page 10-30-2.)

NOTE: The thermostat can be changed without evacuating the A/C system, or removing the evaporator / heater unit from the loader.

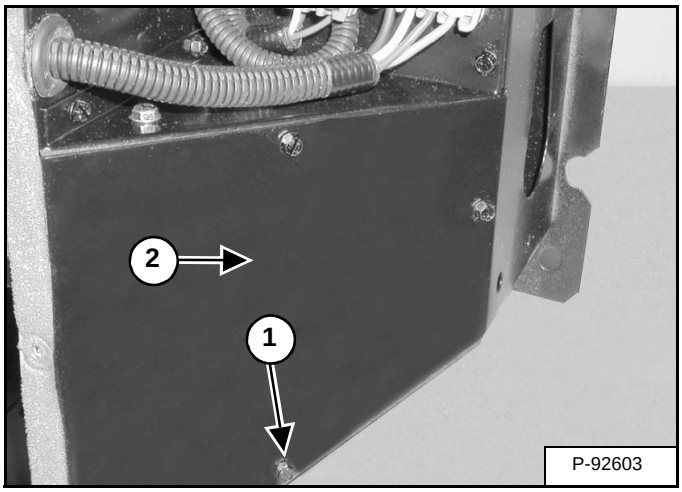
NOTE: The evaporator / heater unit is shown removed for photo clarity.

Figure 80-90-2



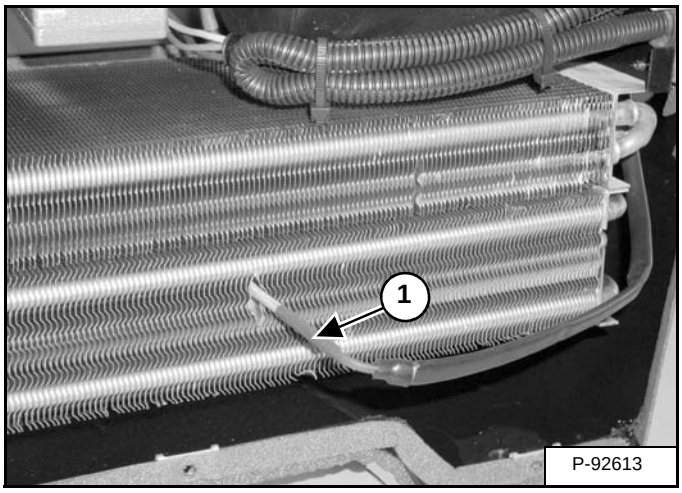
Remove the nine screws (Item 1) and cover (Item 2) **[Figure 80-90-2]**.

Figure 80-90-3



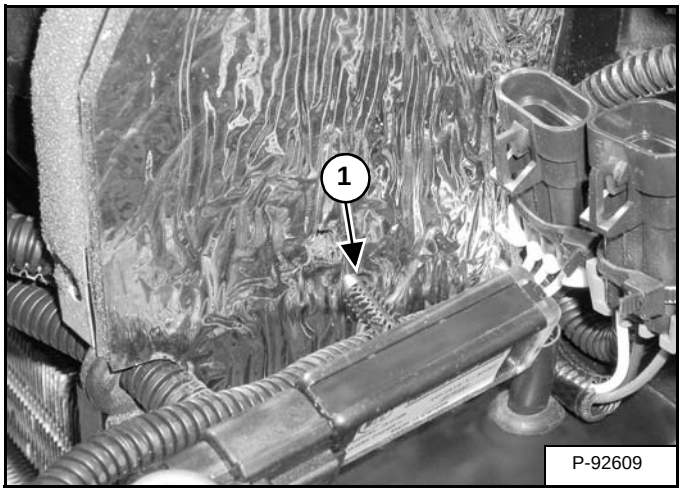
Remove the three screws (Item 1) and left cover (Item 2) **[Figure 80-90-3]**.

Figure 80-90-4



Remove the thermostat probe (Item 1) **[Figure 80-90-4]** from the A/C evaporator coil.

Figure 80-90-5



Remove the thermostat (Item 1) from the evaporator / heater unit **[Figure 80-90-5]**.

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EXPANSION VALVE

Removal And Installation

Raise the lift arms and install an approved lift arm support device. (See Installing on Page 10-20-1.)

Raise the operator cab. (See Raising on Page 10-30-2.)

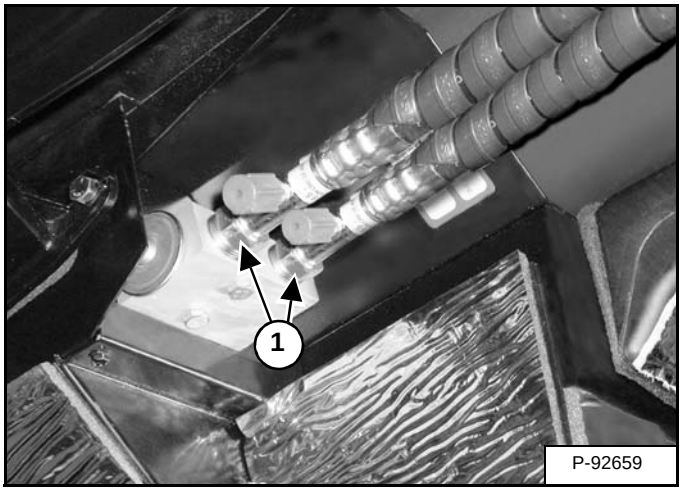
Evacuate the A/C system. (See Reclamation And Charging With Recovery / Charging Unit on Page 80-40-2.)

⚠ WARNING

In the event of a leak, wear safety goggles. Escaping refrigerant can cause severe injuries to eyes. In contact with a flame, R134a refrigerant gives a toxic gas.

W-2371-0500

Figure 80-100-1

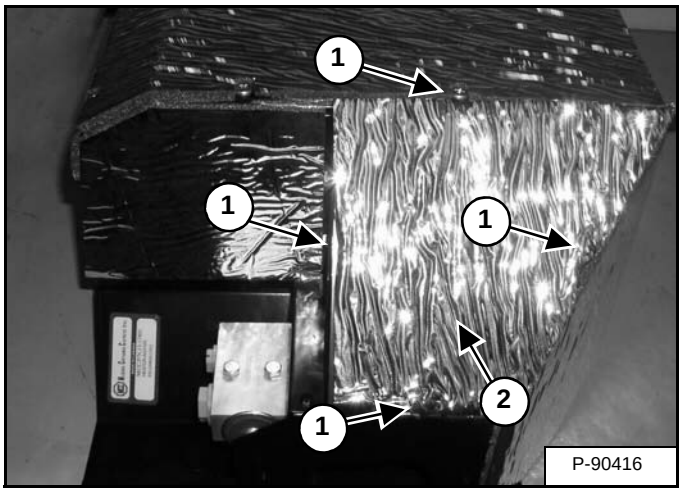


Remove the two A/C hoses (Item 1) **[Figure 80-100-1]** from the expansion valve.

Installation: Tighten the two A/C hose fittings to 29,8 N•m (22 ft-lb) torque.

Cap and plug the hoses and the expansion valve fittings with the proper A/C caps and plugs.

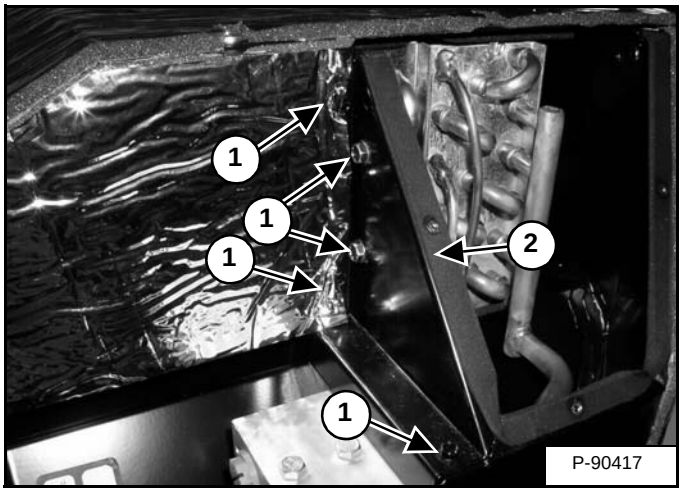
Figure 80-100-2



NOTE: The evaporator / heater unit is removed for photo clarity.

Remove the four screws (Item 1) and the cover (Item 2) **[Figure 80-100-2]**.

Figure 80-100-3



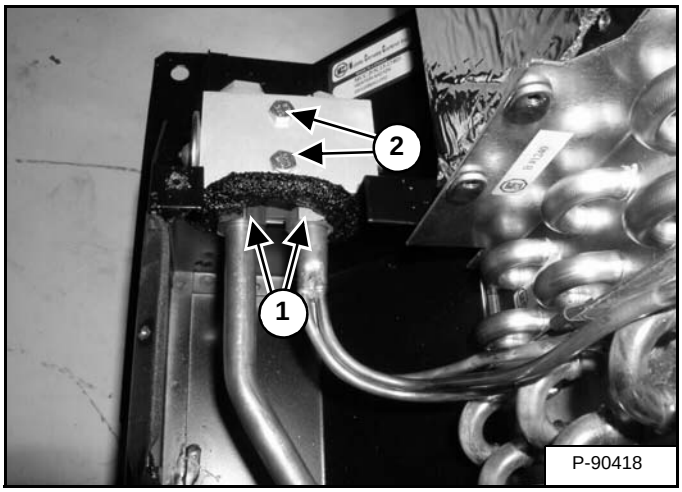
Remove the five screws (Item 1) and the cover (Item 2) **[Figure 80-100-3]**.

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EXPANSION VALVE (CONT'D)

Removal And Installation (Cont'd)

Figure 80-100-4



Remove the two evaporator fittings (Item 1) **[Figure 80-100-4]** from the expansion valve.

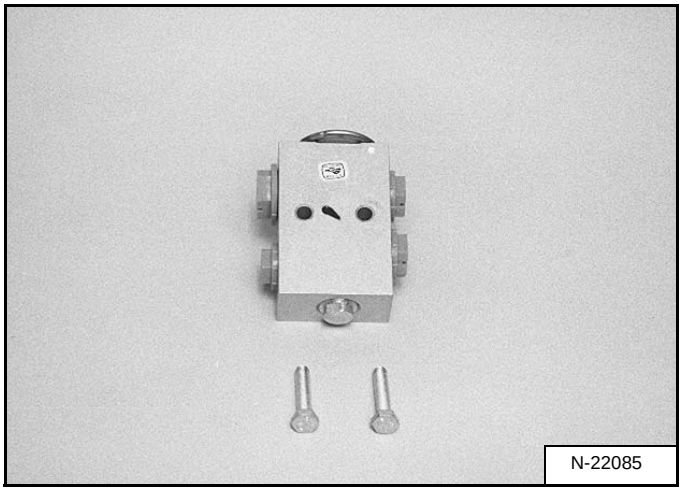
Installation: Tighten the two evaporator fittings to 29,8 N•m (22 ft-lb) torque.

Remove the two mount bolts (Item 2) **[Figure 80-100-4]**.

Remove the expansion valve from the loader.

Cap and plug the evaporator tubelines (Item 1) **[Figure 80-100-4]** and the expansion valve fittings with the proper A/C caps and plugs.

Figure 80-100-5



The expansion valve **[Figure 80-100-5]** is replaced as a complete unit.

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EVAPORATOR COIL

Removal And Installation

Raise the lift arms and install an approved lift arm support device. (See Installing on Page 10-20-1.)

Raise the operator cab. (See Raising on Page 10-30-2.)

Evacuate the A/C system. (See Reclamation And Charging With Recovery / Charging Unit on Page 80-40-2.)

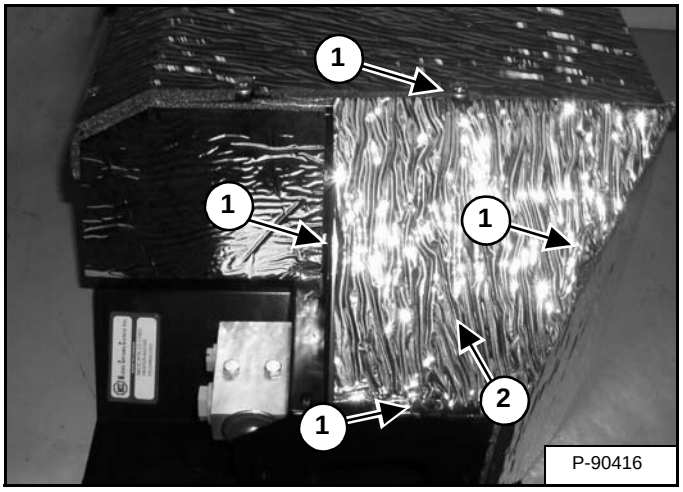
NOTE: The evaporator / heater unit is removed for photo clarity.

⚠ WARNING

In the event of a leak, wear safety goggles. Escaping refrigerant can cause severe injuries to eyes. In contact with a flame, R134a refrigerant gives a toxic gas.

W-2371-0500

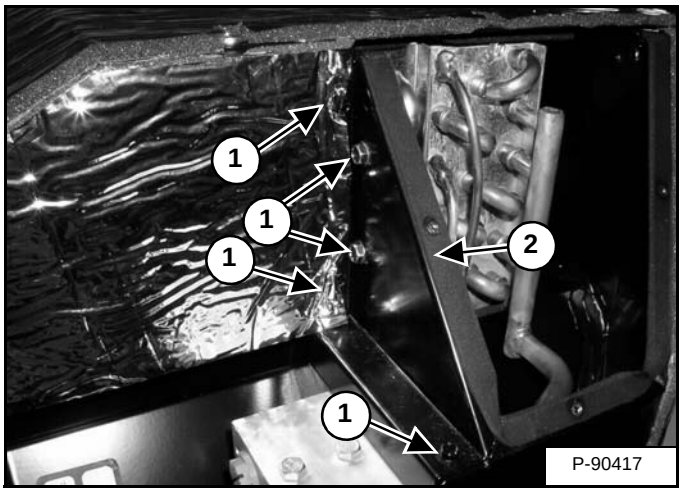
Figure 80-110-1



NOTE: The evaporator / heater unit is removed for photo clarity.

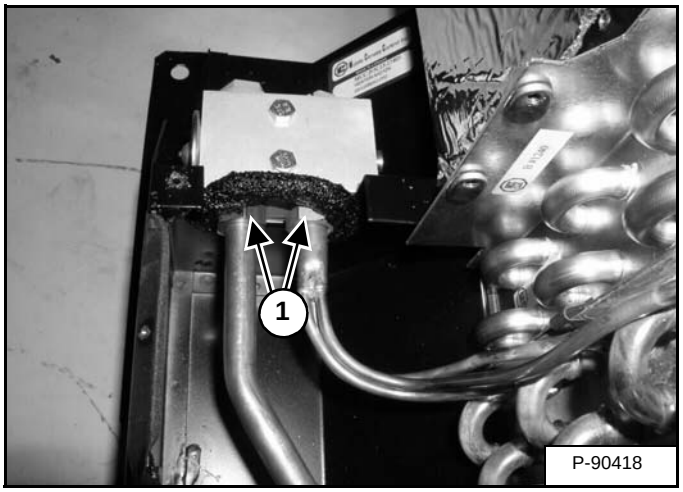
Remove the four screws (Item 1) and the cover (Item 2) **[Figure 80-110-1]**.

Figure 80-110-2



Remove the five screws (Item 1) and the cover (Item 2) **[Figure 80-110-2]**.

Figure 80-110-3



Disconnect the two evaporator fittings (Item 1) **[Figure 80-110-3]** from the expansion valve.

Installation: Tighten the two evaporator fittings to 29,8 N•m (22 ft-lb) torque.

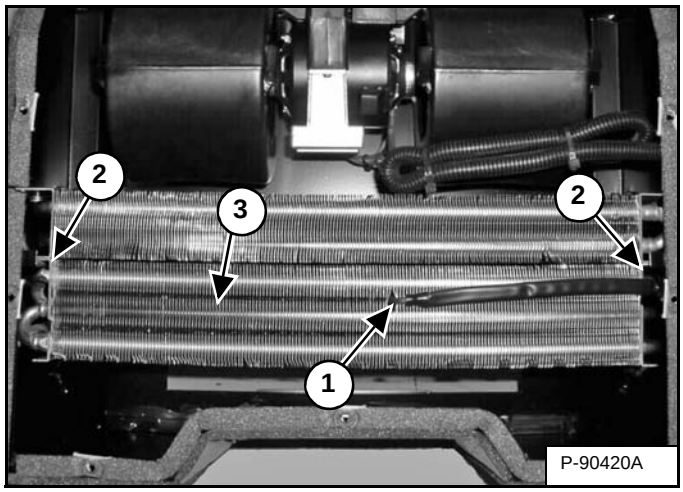
Cap and plug the evaporator tubelines (Item 1) **[Figure 80-110-3]** and the expansion valve fittings with the proper A/C caps and plugs.

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EVAPORATOR COIL (CONT'D)

Removal And Installation (Cont'd)

Figure 80-110-4

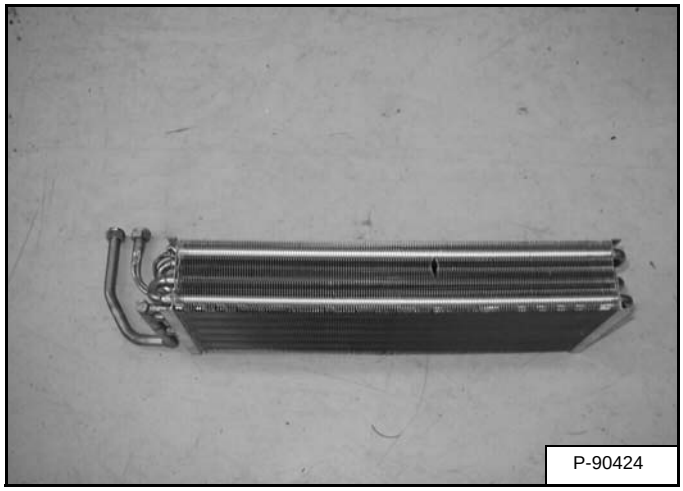


Remove the thermostat probe (Item 1) **[Figure 80-110-4]** from the evaporator coil.

Remove the two retaining clips (Item 2) **[Figure 80-110-4]** that connect the evaporator coil, to the heater coil.

Remove the evaporator coil (Item 3) **[Figure 80-110-4]**.

Figure 80-110-5



Inspect the evaporator coil **[Figure 80-110-5]** for leaks, and replace as needed.

Clean with low pressure water or air.

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HEATER COIL

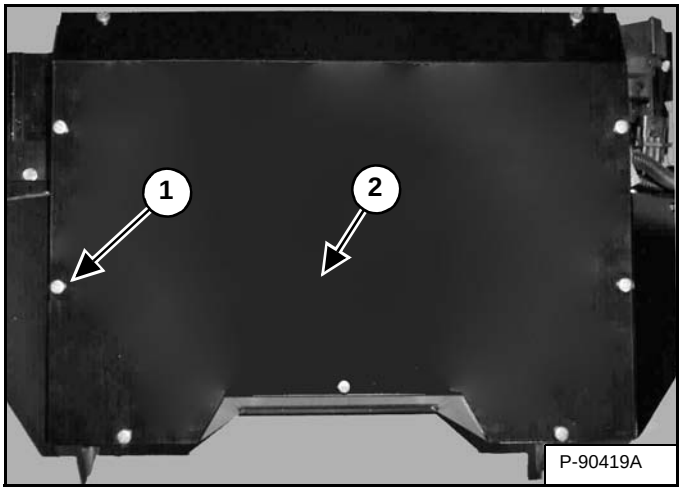
Removal And Installation

Remove the evaporator coil (If equipped with A/C). (See Removal And Installation on Page 80-110-1.)

Remove the heater valve. (See Removal And Installation on Page 80-140-1.)

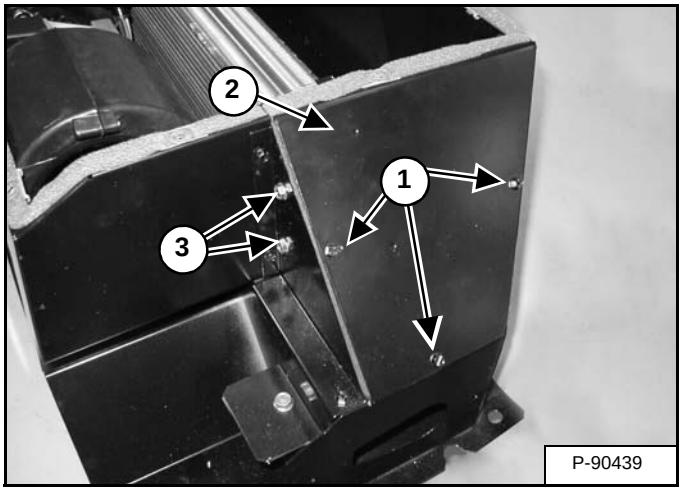
NOTE: The evaporator / heater unit is removed for photo clarity.

Figure 80-120-1



Remove the nine screws (Item 1) and the cover (Item 2) **[Figure 80-120-1]**.

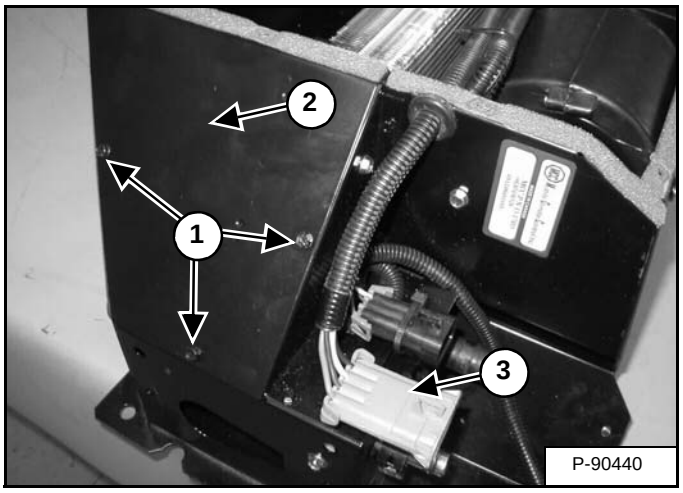
Figure 80-120-2



Remove the three screws (Item 1) and cover (Item 2) **[Figure 80-120-2]**.

Remove the two screws (Item 3) **[Figure 80-120-2]**.

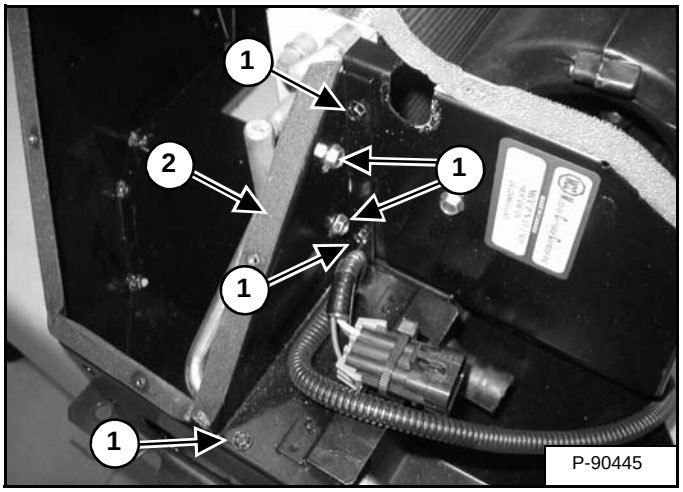
Figure 80-120-3



Remove the three screws (Item 1) and cover (Item 2) **[Figure 80-120-3]**.

Remove the tie strap and move the wire harness (Item 3) **[Figure 80-120-3]** off to the side.

Figure 80-120-4

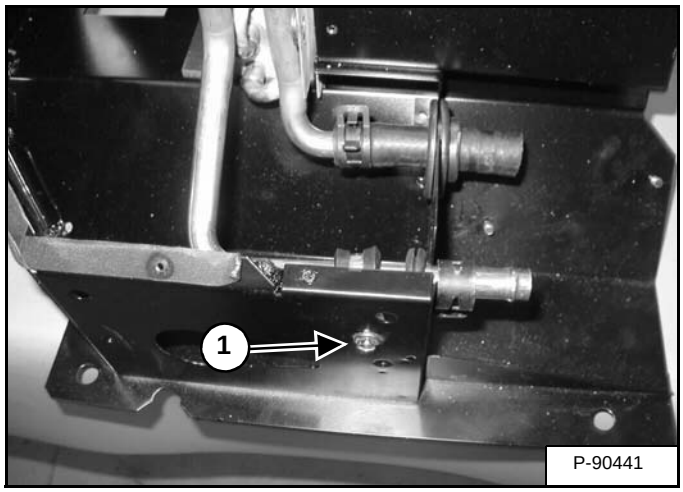


Remove the five screws (Item 1) and cover (Item 2) **[Figure 80-120-4]**.

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Removal And Installation (Cont'd)

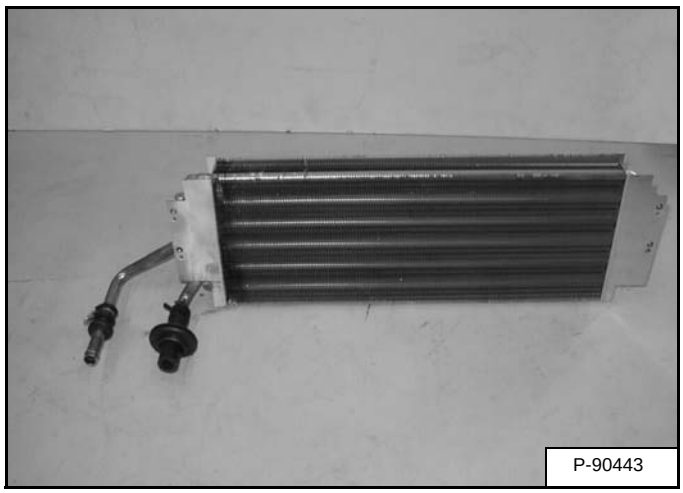
Figure 80-120-5



Remove the bolt, spacer, and nut (Item 1) **[Figure 80-120-5]**.

Remove the heater coil from the unit.

Figure 80-120-6



The heater coil **[Figure 80-120-6]** can be cleaned with low pressure air or water.

Dealer Copy -- Not for Resale

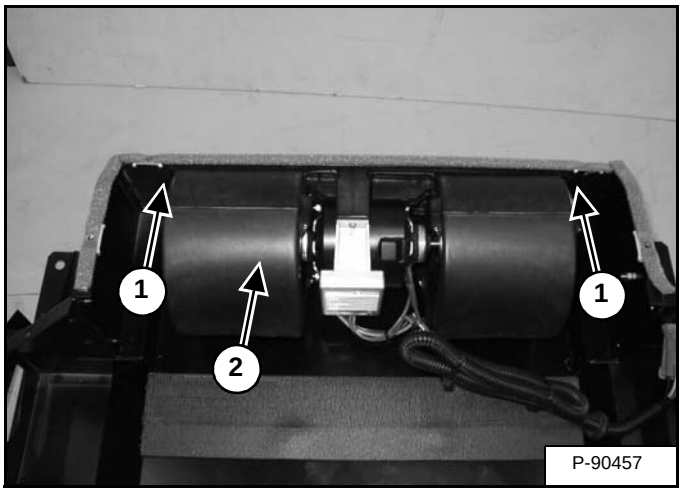
BLOWER FAN

Removal And Installation

Remove the evaporator / heater unit. (See Removal And Installation on Page 80-120-1.)

Remove the heater coil. (See Removal And Installation on Page 80-120-1.)

Figure 80-130-1

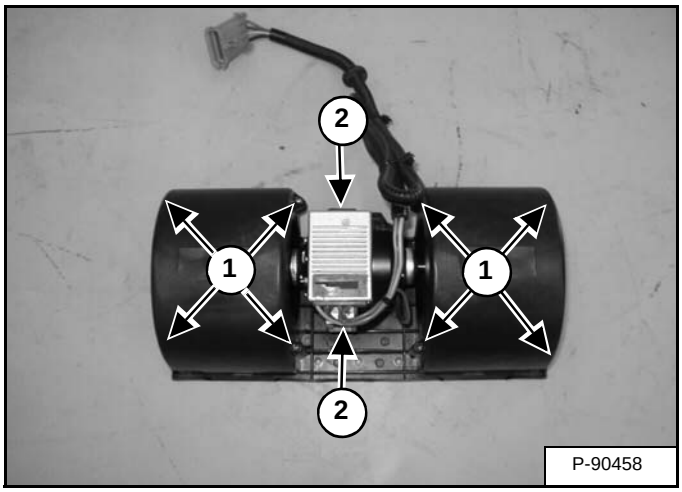


Remove the two screws (Item 1) **[Figure 80-130-1]**.

Remove the blower fan (Item 2) **[Figure 80-130-1]** from the evaporator / heater unit.

Disassembly And Assembly

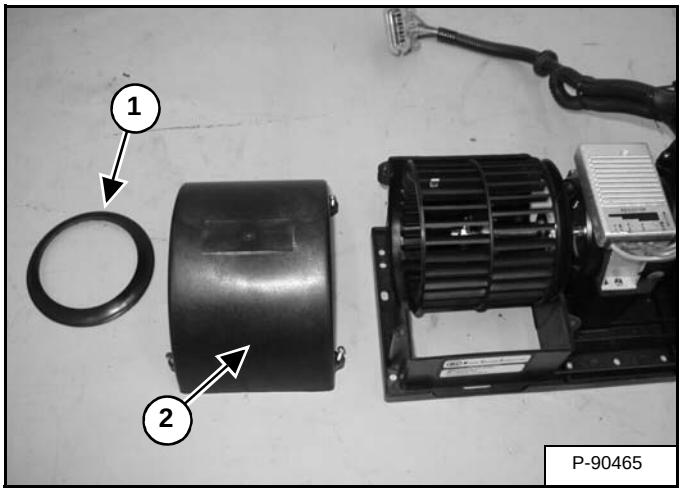
Figure 80-130-2



Remove the eight screws (Item 1) **[Figure 80-130-2]** from the blower wheel cover.

Remove the two screws (Item 2) **[Figure 80-130-2]** from the resistor.

Figure 80-130-3



Remove the outside rings (Item 1) and the blower wheel cover (Item 2) **[Figure 80-130-3]**.

Repeat for other side.

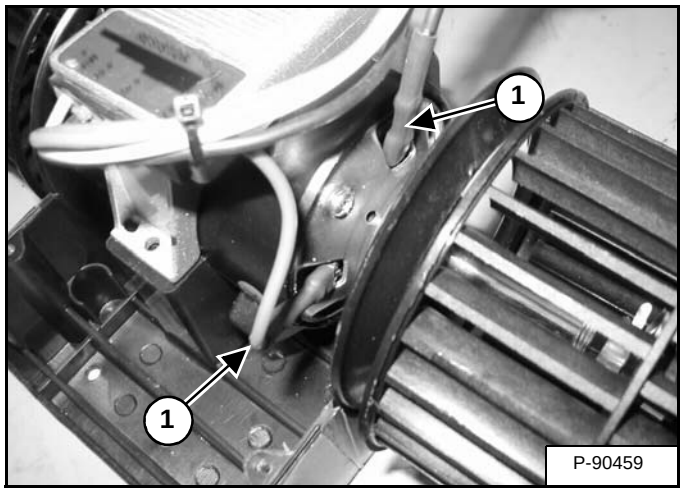
Inspect the outside rings and blower wheel covers for wear and replace as needed **[Figure 80-130-3]**.

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BLOWER FAN (CONT'D)

Disassembly And Assembly (Cont'd)

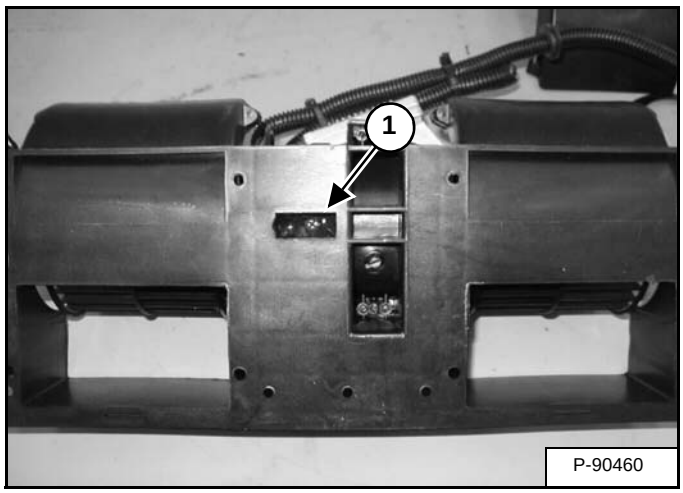
Figure 80-130-4



NOTE: Mark the wires for proper installation.

Remove the two wires (Item 1) **[Figure 80-130-4]** from the blower motor.

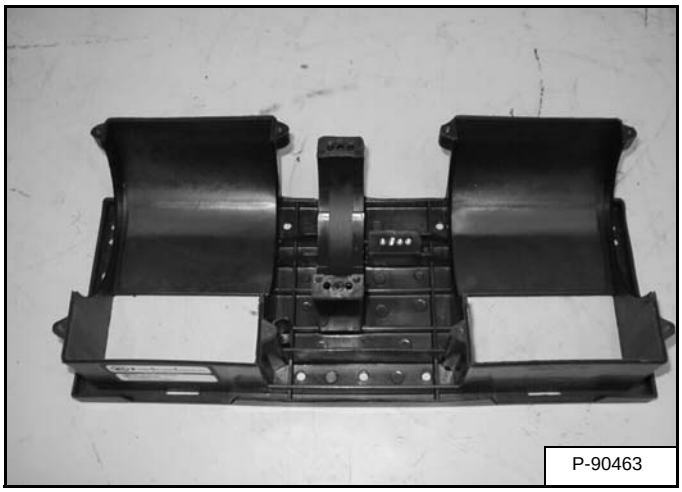
Figure 80-130-5



Remove the screw (Item 1) **[Figure 80-130-5]** from the bottom side of the blower motor.

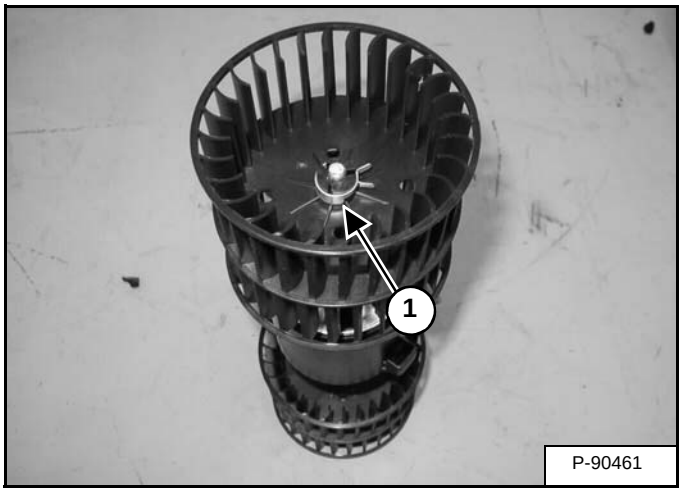
Remove the blower motor from the blower housing.

Figure 80-130-6



Check the blower housing and blower motor mount for wear and replace as needed **[Figure 80-130-6]**.

Figure 80-130-7

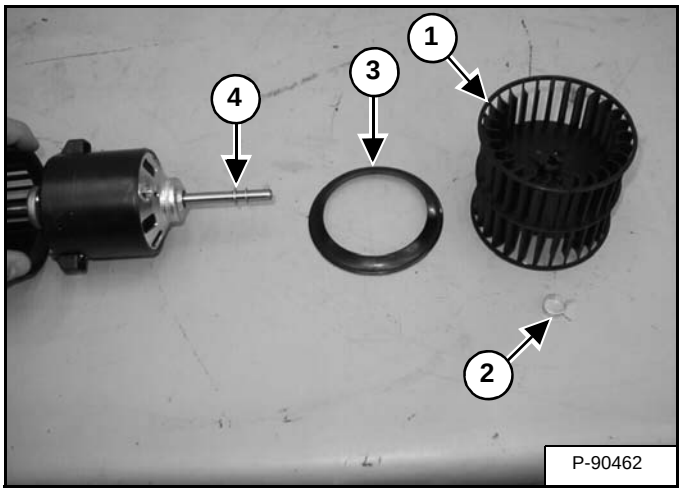


Remove the blower wheel outside clamp (Item 1) **[Figure 80-130-7]** from the blower wheel.

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Disassembly And Assembly (Cont'd)

Figure 80-130-8



Remove the blower wheel (Item 1), inside clamp (Item 2), inside ring (Item 3), and spacers (Item 4) **[Figure 80-130-8]** from the blower motor shaft and inspect for wear.

NOTE: The number and size of spacers (Item 4) [Figure 80-130-8] may vary.

Repeat the procedure for the other blower wheel.

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HEATER VALVE

Removal And Installation

Raise the lift arms and install an approved lift arm support device. (See Installing on Page 10-20-1.)

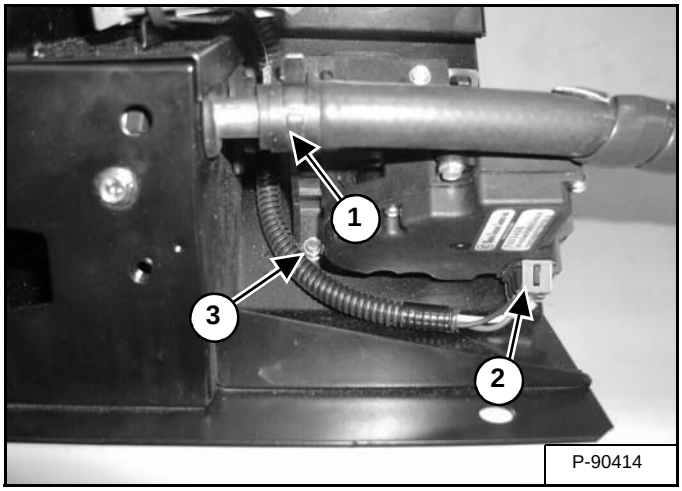
Raise the operator cab. (See Raising on Page 10-30-2.)

NOTE: The heater valve is not serviceable and must be replaced as a complete assembly.

Remove any tie-straps that hold the heater hoses.

NOTE: The evaporator / heater unit is shown removed for photo clarity.

Figure 80-140-1



NOTE: Cap the heater hoses and the heater valve with plugs to prevent coolant loss from the system.

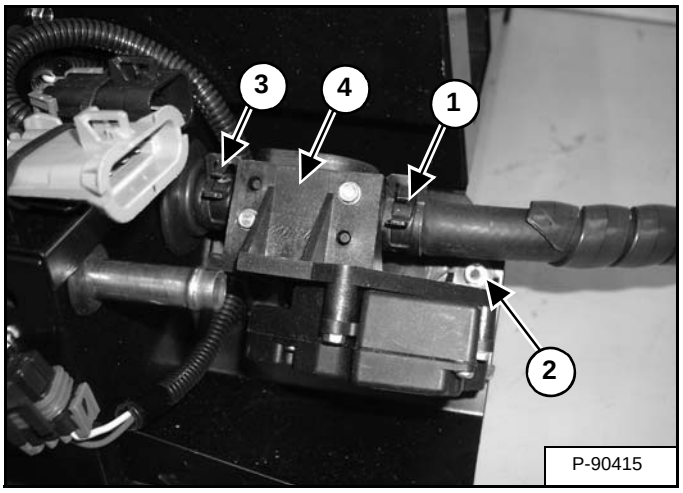
Remove the heater hose clamp (Item 1) **[Figure 80-140-1]**.

Remove the heater hose.

Disconnect the loader wiring harness (Item 2) **[Figure 80-140-1]** from the heater valve.

Remove the nut (Item 3) **[Figure 80-140-1]** from the heater valve mount.

Figure 80-140-2



NOTE: Cap the heater hoses and the heater valve with plugs to prevent coolant loss from the system.

Remove the heater hose clamp (Item 1) **[Figure 80-140-2]**.

Remove the heater hose from the heater valve.

Remove the nut (Item 2) **[Figure 80-140-2]** from the heater valve mount.

Remove heater hose clamp (Item 3) and the heater valve (Item 4) **[Figure 80-140-2]** from the evaporator / heater unit.

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SPECIFICATIONS

(S650) LOADER SPECIFICATIONS SPEC-10-1
Machine Dimensions SPEC-10-1
Performance SPEC-10-2
Engine SPEC-10-2
Drive System SPEC-10-2
Controls SPEC-10-3
Hydraulic System SPEC-10-3
Electrical System SPEC-10-4
Capacities SPEC-10-4
Tires SPEC-10-4

TORQUE SPECIFICATIONS FOR BOLTS SPEC-20-1
Torque For General SAE Bolts SPEC-20-1
Torque For General Metric Bolts SPEC-20-2

HYDRAULIC CONNECTION SPECIFICATIONS SPEC-30-1
Straight Thread O-ring Fitting SPEC-30-1
Flare Fitting SPEC-30-2
Tubelines And Hoses SPEC-30-2

HYDRAULIC / HYDROSTATIC FLUID SPECIFICATIONS SPEC-40-1
Specifications SPEC-40-1

CONVERSIONS SPEC-50-1
Decimal And Millimeter Equivalent Chart SPEC-50-1
U.S. To Metric Conversion Chart SPEC-50-1

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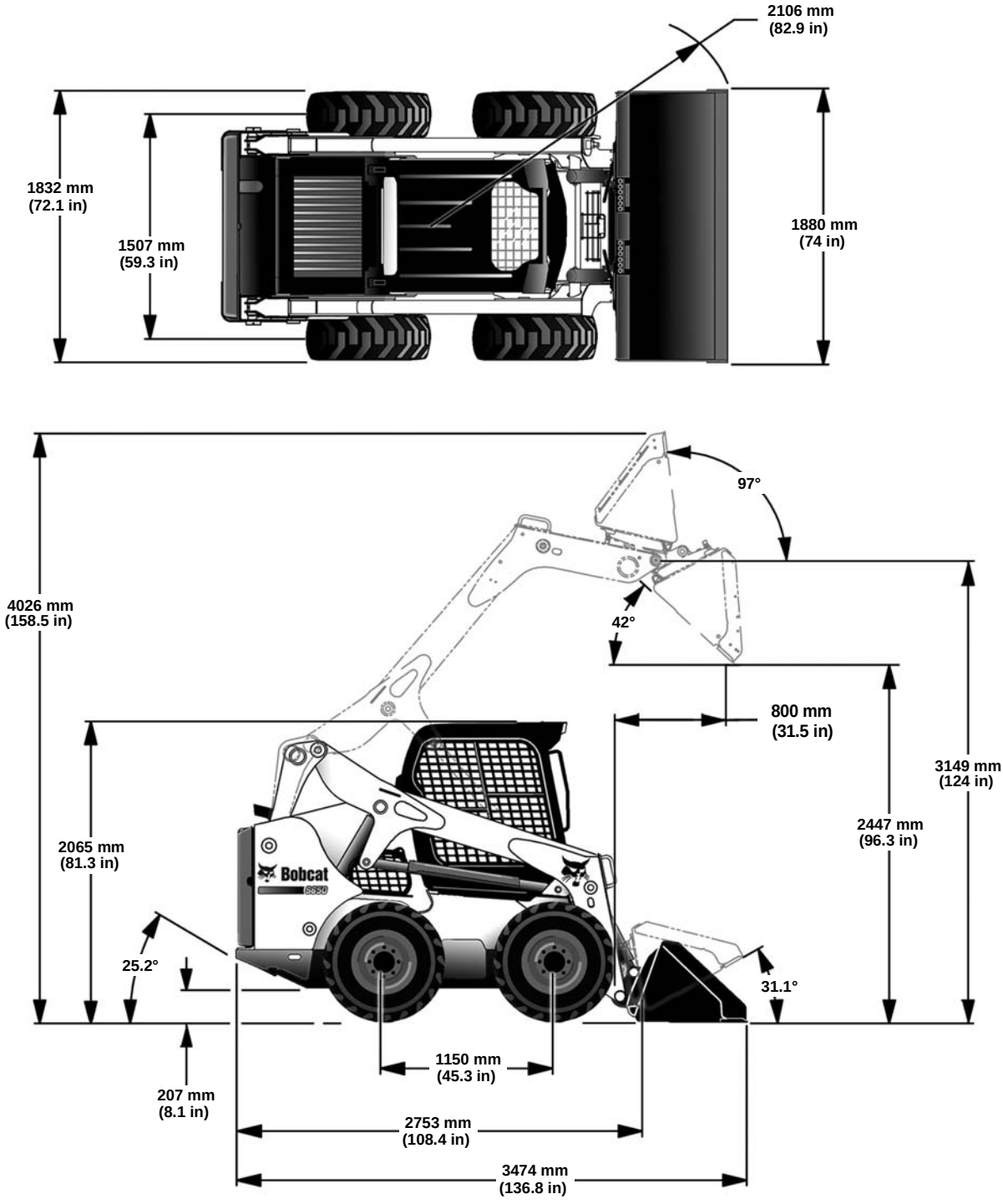
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(S650) LOADER SPECIFICATIONS

Machine Dimensions

- Dimensions are given for loader equipped with standard tires and 74 inch Construction & Industrial bucket and may vary with other bucket types. All dimensions are shown in millimeters. Respective imperial dimensions are given in inches enclosed by parentheses.

- Where applicable, specifications conform to SAE or ISO standards and are subject to change without notice.



NA-1660

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.

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(S650) LOADER SPECIFICATIONS (CONT'D)

Performance

Rated Operating Capacity	1220 kg (2690 lb)
with 200 Pound Frame Mounted Counterweight Kit	1288 kg (2840 lb)
with 300 Pound Frame Mounted Counterweight Kit	1311 kg (2890 lb)
Tipping Load	2440 kg (5380 lb)
Operating Weight	3777 kg (8327 lb)
Breakout Force - Lift	2177 kg (4800 lb)
Breakout Force - Tilt	2313 kg (5100 lb)
Push Force	2087 kg (4600 lb)
Travel Speed - Single Speed Loader - Two-Speed Loader (Opt.) Low/High	 0 - 11,4 km/h (0 - 7.1 mph) 0 - 11,4 km/h (0 - 7.1 mph) / 0 - 19,8 km/h (0 - 12.3 mph)

Engine

Make / Model	Kubota / V3307-DI-TE3 Interim Tier IV
Fuel / Cooling	Diesel / Liquid
Horsepower - ISO 9249 EEC / SAE J1349 Net - ISO 14396 Gross - SAE 1995 Gross	 52,4 kW (70.3 hp) @ 2400 rpm 54,6 kW (73.2 hp) @ 2400 rpm 55,4 kW (74.3 hp) @ 2400 rpm
Torque - ISO 9249 EEC / SAE J1349 Net - SAE 1995 Gross	 253,1 N•m (186.7 lb-ft) @ 1600 rpm 264,4 N•m (195.0 lb-ft) @ 1600 rpm
Low Idle RPM	1250 - 1450
High Idle RPM	2525 - 2650
Number of Cylinders	4
Displacement	3,3 L (203 in^3)
Bore / Stroke	94 / 120 mm (3.70 / 4.72 in)
Lubrication	Gear Pump Pressure System with Filter
Crankcase Ventilation	Closed Breathing
Air Cleaner	Dry replaceable paper cartridge with separate safety element
Ignition	Diesel - Compression
Air Induction	Turbo-Charged
Engine Coolant	Propylene Glycol / Water Mixture
Starting Aid	Glow Plugs - Automatically activated as needed in RUN position.

Drive System

Main Drive	Fully hydrostatic, 4-wheel drive
Transmission	Infinitely variable tandem hydrostatic piston pumps, driving two fully reversing hydrostatic motors
Final Drive	Pre-stressed #120 HSOC endless roller chain (no master link) and sprockets in sealed chaincase with oil lubrication (Chains do not require periodic adjustments) Two chains per side with no idler sprocket
Axle Size	68,6 mm (2.70 in), Heat treated
Wheel Bolts	Eight - 9/16 in Wheel bolts fixed to axle hubs

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Controls

Vehicle Steering	Direction and speed controlled by two hand operated steering levers or optional joystick(s)
Loader Hydraulics - Lift and Tilt - Front Auxiliary - Rear Auxiliary (Option)	 Controlled by separate foot pedals or optional Advanced Control System (ACS) or optional Selectable Joystick Controls (SJC) Controlled by electrical switch on Right Hand steering lever or joystick Controlled by electrical switch on Left Hand steering lever or joystick
Auxiliary Pressure Release	Pressure relieved through quick couplers; Push couplers in, hold for 5 seconds
Engine	Hand lever speed control, additional foot operated speed control pedal with SJC option, key-type start switch or optional keyless start panel or optional Deluxe Instrumentation Panel and function error shutdown.
Starting Aid	Glow plugs automatically activated as needed by Instrument Panel
Service Brake	Two independent hydrostatic systems controlled by two hand operated steering levers or optional joystick(s)
Secondary Brake	One of the hydrostatic transmissions
Parking Brake (Standard)	Mechanical disc, manually operated switch on left instrument panel
Parking Brake (Two-Speed Option)	Spring applied pressure release multi-disk brake activated by manually operated switch on left instrument panel

Hydraulic System

Pump Type	Engine driven, gear type
Pump Capacity - Standard	87,1 L/min (23.0 U.S. gpm)
Pump Capacity - High-Flow Option	115,5 L/min (30.5 U.S. gpm)
System Relief at Quick Couplers	23,8 - 24,5 MPa (237,8 - 244,7 bar) (3450 - 3550 psi)
Filter (Hydraulic / Hydrostatic)	Replaceable beta 10 micron = 200, drop in element
Filter (Charge)	Replaceable beta 10 micron = 200, drop in element
Hydraulic Cylinders Bore Diameter:Lift Cylinder (2) Tilt Cylinder (2) Rod Diameter:Lift Cylinder (2) Tilt Cylinder (2) Stroke:Lift Cylinder (2) Tilt Cylinder (2)	Double-acting; tilt cylinders have cushioning feature on dump and rollback 63,5 mm (2.50 in) 76,2 mm (3.00 in) 44,5 mm (1.75 in) 41,4 mm (1.63 in) 860,3 mm (33.87 in) 354,8 mm (13.97 in)
Control Valve - Standard	3-Spool, open center, manually operated with spring detent for lift float and electrically controlled auxiliary spool
Control Valve - ACS and SJC	3-Spool, open center with electric actuator controlled lift with float and tilt. Electrically controlled auxiliary spool
Fluid Lines	SAE Standard tubelines, hoses and fittings
Fluid Type	BOBCAT FLUID, Hydraulic / Hydrostatic 6903117 - (Two - 2.5 U.S. gal) 6903118 - (5 U.S. gal) 6903119 - (55 U.S. gal)
Hydraulic Function Time: Raise Lift Arms Lower Lift Arms Bucket Dump Bucket Rollback	 3.4 Seconds 3.0 Seconds 2.3 Seconds 1.7 Seconds

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Electrical System

Alternator	Belt driven, 90 amps, open frame
Battery	12 volts, 950 cold cranking amps @ -18°C (0°F), 180 Minute reserve capacity @ 25 amps
Starter	12 volts, gear type, 3,0 kW (4.02 hp)
Instrumentation	**Gauges:** Engine Coolant Temperature, Fuel Level. **Warning lights:** Fuel Level, Seat Belt, Engine Coolant Temperature, Engine Malfunction, Hydraulic System Malfunction, General Warning. **Indicators:** BICS Functions, Two-Speed, 3-Point Shoulder Belt, Turn Signals, Engine Preheat. **Data Display:** Operating Hours, Engine rpm, Speed Management Setting, Maintenance Clock Countdown, Battery Voltage, Service Codes, Engine Preheat Countdown, Steering Drift Compensation Setting, Drive Response Setting. **Other:** Audible Alarm, Lights, Option / Accessory Switches. **Optional Deluxe Instrumentation Panel:** *Additional displays for: Engine rpm, Coolant Temperature and Oil Pressure; System Voltage, Hydrostatic Charge Pressure and Hydraulic Oil Temperature. *Additional Features Included: Keyless Start, Digital Clock, Job Clock, Attachment Control Information, Password Lockout, Multi-language Display, Help Screens, Diagnostic Capability and Engine / Hydraulic Systems Shutdown Function.

Capacities

Fuel	103,1 L (27.2 U.S. gal)
Engine Oil with Filter Change	11,4 L (12.0 qt.)
Engine Cooling System with Heater without Heater	 11,4 L (3.0 U.S. gal) 11,7 L (3.1 U.S. gal)
Hydraulic / Hydrostatic Reservoir	10,2 L (2.7 U.S. gal)
Hydraulic / Hydrostatic System	45,0 L (11.9 U.S. gal)
Chaincase Reservoir	39,2 L (10.35 U.S. gal)

Tires

Heavy Duty (Standard)	12.00 x 16.5, 12 Ply Rating
Heavy Duty Offset (Option)	12.00 x 16.5, 12 Ply Rating
Heavy Duty Poly Fill (Option)	12.00 x 16.5, 12 Ply Rating
Severe Duty (Option)	12.00 x 16.5, 12 Ply Rating
Severe Duty Poly Fill (Option)	12.00 x 16.5, 12 Ply Rating
Solidflex (Option)	33 x 6 x 11
Super Float Offset (Option)	33 x 15.50 - 16.5, 12 Ply Rating
Recommended Pressure	Inflate tires to MAXIMUM pressure shown on the side wall of the tire. DO NOT mix brands of tires used on the same loader.

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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
N•m (in-lb)	0.250	9,0 - 10,2 (80 - 90)	12,4 - 13,6 (110 - 120)
	0.3125	20,3 - 22,6 (180 - 200)	24,2 - 27,1 (215 - 240)
N•m (ft-lb)	0.375	34 - 38 (25 - 28)	47 - 54 (35 - 40)
	0.4375	54 - 61 (40 - 45)	81 - 88 (60 - 65)
	0.500	88 - 95 (65 - 70)	122 - 136 (90 - 100)
	0.5625	122 - 136 (90 - 100)	170 - 190 (125 - 140)
	0.625	170 - 190 (125 - 140)	240 - 260 (175 - 190)
	0.750	300 - 330 (220 - 245)	410 - 450 (300 - 330)
	0.875	450 - 490 (330 - 360)	645 - 710 (475 - 525)
	1.000	645 - 710 (475 - 525)	985 - 1085 (725 - 800)
	1.125	880 - 975 (650 - 720)	1425 - 1600 (1050 - 1175)
	1.250	1200 - 1360 (900 - 1000)	2000 - 2200 (1475 - 1625)
	1.375	1630 - 1830 (1200 - 1350)	2720 - 2980 (2000 - 2200)
	1.500	2040 - 2240 (1500 - 1650)	3530 - 3870 (2600 - 2850)
	1.625	2720 - 2980 (2000 - 2800)	4680 - 5150 (3450 - 3800)
	1.750	3390 - 3730 (2500 - 2750)	5830 - 6500 (4300 - 4800)
	1.875	4270 - 4750 (3150 - 3500)	7450 - 8300 (5500 - 6100)
	2.000	5150 - 5700 (3800 - 4200)	8800 - 9800 (6500 - 7200)

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TORQUE SPECIFICATIONS FOR BOLTS (CONT'D)

Torque For General Metric Bolts

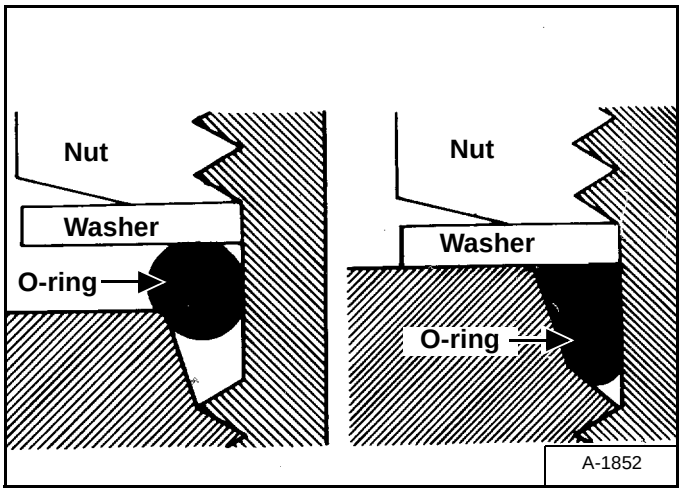
THREAD SIZE (DIA. X PITCH)	MATERIAL		
	HEAD MARK 4	HEAD MARK 7	HEAD MARK 10
M 5 x 0.8		4 - 5 N•m (3 - 4 ft-lb)	
M 6 x 1.0		8 - 9 N•m (6 - 7 ft-lb)	8 - 12 N•m (6 - 9 ft-lb)
M 8 x 1.25	8 - 12 N•m (6 - 9 ft-lb)	15 - 22 N•m (11 - 16 ft-lb)	24 - 34 N•m (18 - 25 ft-lb)
M 10 x 1.25	18 - 24 N•m (13 - 18 f.-lb)	30 - 41 N•m (22 - 30 ft-lb)	49 - 68 N•m (36 - 50 ft-lb)
M 12 x 1.25	30 - 41 N•m (22 - 30 ft-lb)	54 - 73 N•m (40 - 54 ft-lb.	94 - 118 N•m (69 - 87 ft-lb)
M 14 x 1.25	49 - 68 N•m (36 - 50 ft-lb)	79 - 108 N•m (58 - 80 ft-lb)	157 - 186 N•m (116 - 137 ft-lb)

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HYDRAULIC CONNECTION SPECIFICATIONS

Straight Thread O-ring Fitting

Figure SPEC-30-1



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-30-1]**.

Figure SPEC-30-2

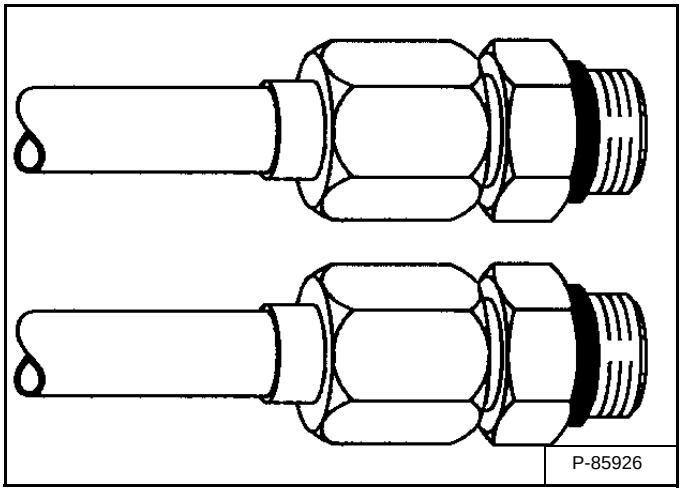
O-ring Boss Tightening Torque	
Thread Size	**TORQUE N•m (ft-lb)**
7/16” - 20	18 (13)
9/16” - 18	30 (22)
3/4” -1 6	54 (40)
7/8” - 14	81 (60)
1-1/16” - 12	114 (84)
1-3/16” - 12	133 (98)
1-5/16” - 12	160 (118)
1-7/16” - 12	209 (154)
1-5/8” - 12	221 (163)

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HYDRAULIC CONNECTION SPECIFICATIONS (CONT'D)

Flare Fitting

Figure SPEC-30-3



Use the following procedure to tighten the flare fitting:

Tighten the nut until it makes contact with the seat.

Use the chart **[Figure SPEC-30-4]** to find the correct tightness needed. If the fitting leaks after tightening, disconnect it and inspect the seat area for damage.

Figure SPEC-30-4

Flare Fitting Tightening Torque		
Tubeline Outside Diameter	**Thread Size**	**TORQUE N•m (ft.-lb.)**
1/4”	7/16” - 20	18 (13)
5/16”	1/2” - 20	23 (17)
3/8”	9/16” - 18	30 (22)
1/2”	3/4” - 16	54 (40)
5/8”	7/8” - 14	81 (60)
3/4”	1-1/16” - 12	114 (84)
7/8”	1-3/16” - 12	133 (98)
1”	1-5/16” - 12	160 (118)
1-1/4”	1-5/8” - 12	209 (154)
1-1/2”	1-7/8” - 12	221 (163)
2”	2-1/2” - 12	342 (252)

Tubelines And Hoses

Replace any tubelines that are bent or flattened. They will restrict flow and cause heat.

Replace hoses which show signs of wear, damage or weather cracked rubber.

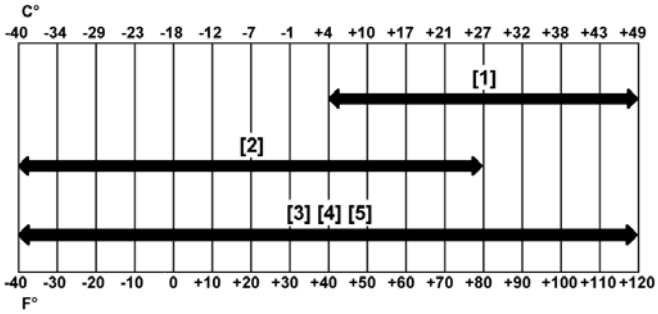
Always use two wrenches when loosening and tightening hose or tubeline fittings.

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HYDRAULIC / HYDROSTATIC FLUID SPECIFICATIONS

Specifications

HYDRAULIC / HYDROSTATIC FLUID RECOMMENDED ISO VISCOSITY GRADE (VG) AND VISCOSITY INDEX (VI)



TEMPERATURE RANGE ANTICIPATED DURING MACHINE USE

[1] VG 100; Minimum VI 130
[2] VG 46; Minimum VI 150
[3] BOBCAT All-Season Fluid
[4] BOBCAT Synthetic Fluid
[5] BOBCAT Biodegradable Hydraulic / Hydrostatic Fluid (Unlike biodegradable fluids that are vegetable based, Bobcat biodegradable fluid is formulated to prevent oxidation and thermal breakdown at operating temperatures.)

DO NOT use automatic transmission fluids in the loader or permanent damage to the transmission will result.

WARNING

AVOID INJURY OR DEATH

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

W-2072-0807

When temperatures below -18°C (0°F) 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 of 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.

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CONVERSIONS

Decimal And Millimeter Equivalent Chart

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
33/64	0.515625	13.097
17/32	0.53125	13.494
35/64	0.546875	13.891
9/16	0.5625	14.288
37/64	0.578125	14.684
19/32	0.59375	15.081
39/64	0.609375	15.478
5/8	0.6250	15.875
41/64	0.640625	16.272
21/32	0.65625	16.669
43/64	0.671875	17.066
11/16	0.6875	17.462
45/64	0.703125	17.859
23/32	0.71875	18.256
47/64	0.734375	18.653
3/4	0.7500	19.050
49/64	0.765625	19.447
25/32	0.78125	19.844
51/64	0.796875	20.241
13/16	0.8125	20.638
53/64	0.828125	21.034
27/32	0.84375	21.431
55/64	0.859375	21.828
7/8	0.8750	22.225
57/64	0.890625	22.622
29/32	0.90625	23.019
59/64	0.921875	23.416
15/16	0.9375	23.812
61/64	0.953125	24.209
31/32	0.96875	24.606
63/64	0.984375	25.003
1	1.000	25.400

1 mm = 0.03937”

0.001 = 0.0254 mm

U.S. To Metric Conversion Chart

	TO CONVERT	INTO	MULTIPLY BY
LINEAR MEASUREMENT	Miles	Kilometers	1.609
	Yards	Meters	0.9144
	Feet	Meters	0.3048
	Feet	Centimeters	30.48
	Inches	Meters	0.0254
	Inches	Centimeters	2.54
	Inches	Millimeters	25.4
AREA	Square Miles	Square Kilometers	2.59
	Square Feet	Square Meters	0.0929
	Square Inches	Square Centimeters	6.452
	Acre	Hectare	0.4047
VOLUME	Cubic Yards	Cubic Meters	0.7646
	Cubic Feet	Cubic Meters	0.02832
	Cubic Inches	Cubic Centimeters	16.39
WEIGHT	Tons (Short)	Metric Tons	0.9078
	Pounds	Kilograms	0.4536
	Ounces (Avdp.)	Grams	28.3495
PRESSURE	Pounds/Sq. In.	Kilopascal	6.895
WORK	Foot–Pounds	Newton–Meter	1.356
LIQUID VOLUME	Quarts	Liters	0.9463
	Gallons	Liters	3.785
LIQUID FLOW	Gallons/Minute	Liters/Minute	3.785
TEMPERATURE	Fahrenheit	Celsius	1.Subtract 32° 2. Multiply by 5/9

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SERVICE MANUAL REVISION

ROUTE TO ATTENTION	
PARTS MANAGER	☐
SERVICE MANAGER	X
SALES MANAGER	☐

NOTICE **Insert This Sheet With The Below Listed Manual For Future Reference.**

Revision No: **S650 - 1**
Date: **15 July 2009**
Product: **Bobcat Loader**
Model: **S650**
Manual No: **6987168 (7-09)**

The following Sections are a revision to the above Service Manual.

COVER	
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SERVICE MANUAL REVISION

ROUTE TO ATTENTION	
PARTS MANAGER	☐
SERVICE MANAGER	X
SALES MANAGER	☐

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Revision No: S650 - 2
Date: 15 August 2009
Product: Bobcat Loader
Model: S650
Manual No: 6987168 (8-09)

S630 Service Manual (P/N 6987168) Dated 8-09 contains updated service information which replaces the previous S630 Service Manual (P/N 6987168) Dated 7-09.

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SERVICE MANUAL REVISION

ROUTE TO ATTENTION	
PARTS MANAGER	☐
SERVICE MANAGER	X
SALES MANAGER	☐

NOTICE **Insert This Sheet With The Below Listed Manual For Future Reference.**

Revision No: **S650 - 3**
Date: **15 September 2009**
Product: **Bobcat Loader**
Model: **S650**
Manual No: **6987168 (9-09)**

The following Sections are a revision to the above Service Manual.

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SERVICE MANUAL REVISION

ROUTE TO ATTENTION	
PARTS MANAGER	☐
SERVICE MANAGER	X
SALES MANAGER	☐

NOTICE **Insert This Sheet With The Below Listed Manual For Future Reference.**

Revision No: **S650 - 4**
Date: **15 October 2009**
Product: **Bobcat Loader**
Model: **S650**
Manual No: **6987168 (10-09)**

The following Sections are a revision to the above Service Manual.

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SERVICE MANUAL REVISION

ROUTE TO ATTENTION	
PARTS MANAGER	☐
SERVICE MANAGER	X
SALES MANAGER	☐

NOTICE **Insert This Sheet With The Below Listed Manual For Future Reference.**

Revision No: **S650 - 5**
Date: **15 December 2009**
Product: **Bobcat Loader**
Model: **S650**
Manual No: **6987168 (12-09)**

The following Sections are a revision to the above Service Manual.

COVER	
10-100	
20-120	
30-20 30-21	
50-70 50-91 50-120	
60-50 60-60 60-130	
70-20 70-21 ADDED 70-70	
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SERVICE MANUAL REVISION

ROUTE TO ATTENTION	
PARTS MANAGER	☐
SERVICE MANAGER	X
SALES MANAGER	☐

NOTICE **Insert This Sheet With The Below Listed Manual For Future Reference.**

Revision No: **S650 - 6**
Date: **15 June 2010**
Product: **Bobcat Loader**
Model: **S650**
Manual No: **6987168 (6-10)**

The following Sections are a revision to the above Service Manual.

FRONT COVER

10-20
10-40
10-80
10-90
10-110
10-120
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60-90

70-90

SPEC-40

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SERVICE MANUAL REVISION

ROUTE TO ATTENTION	
PARTS MANAGER	☐
SERVICE MANAGER	X
SALES MANAGER	☐

NOTICE	Insert This Sheet With The Below Listed Manual For Future Reference.

Revision No: S650 - 7
Date: 15 October 2010
Product: Bobcat Loader
Model: S650
Manual No: 6987168 (10-10)

S630 Service Manual (P/N 6987168) Dated 10-10 contains updated service information which replaces the previous S630 Service Manual (P/N 6987168) Dated 6-10.

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