MT52

Bobcat®

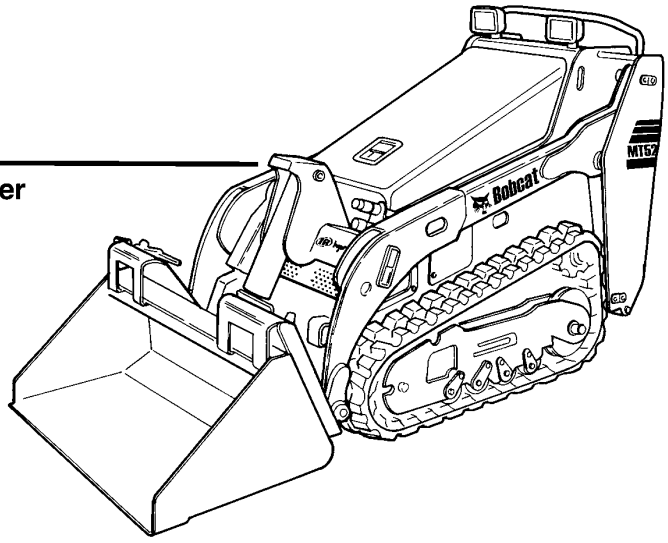
Service Manual

MARCUS CURACA MALITO
1800 Alexander Bell Dr
Suite 200
Reston
VA
20191
United States (US)
mcuracamalito@kbiplaw.com
The Repair Manual
https://therepairmanual.com

S/N 523611001 & Above
S/N 523711001 & Above

Dealer Copy -- Not for Resale

Mini Track Loader



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6902525 (6-12)
Printed in U.S.A.

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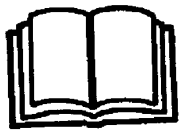
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MAINTENANCE SAFETY

⚠ WARNING

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

CORRECT



B-10731a

⚠ **Never service the B obcat Mini Track Loader without instructions.**

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

WRONG



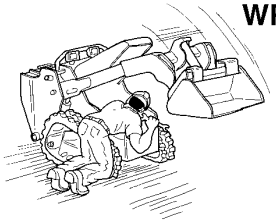
B-23041

⚠ **Have good ventilation when welding or grinding painted parts.**

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

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

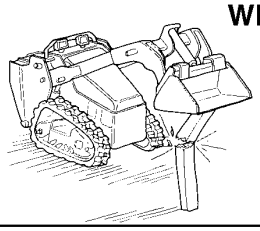
WRONG



B-23035

⚠ **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 a n approved lift arm support device. Replace it if damaged.**

WRONG

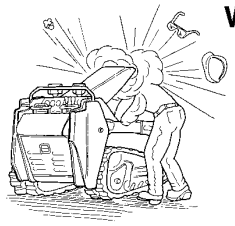


B-23036

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

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

WRONG



B-23039

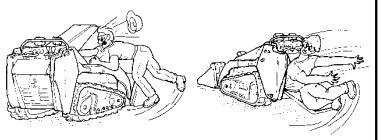
⚠ **Stop, cool and clean engine of flammable materials before checking fluids.**

⚠ **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 c an penetrate the skin or eyes.**

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

WRONG



B-23040
B-23034

⚠ **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 perform ed 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.

MSW29-0805

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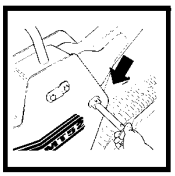
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FOREWORD

This manual is for the Bobcat loader mechanic. It provides necessary servicing and adjustment procedures for the Bobcat Mini 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 lift arm support device, replace if damaged. (Stored Position)



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



3. Controls must return to neutral.



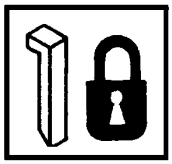
4. (Optional) Check for correct function of the work lights



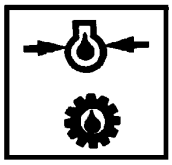
5. The parking brake must function correctly.



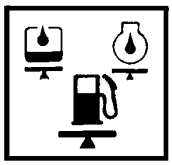
6. Bob-Tach wedges and linkages must function correctly and be in good condition.



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



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



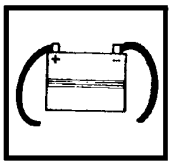
9. Inspect for fuel, oil or hydraulic fluid leaks.



10. Lubricate the loader.



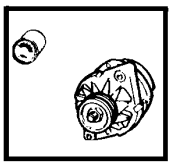
11. Check the condition of the battery and cables.



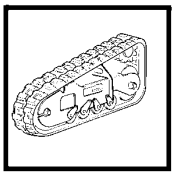
12. Inspect the air cleaner for damage or leaks. Check the condition of the element.



13. Check the electrical charging system.



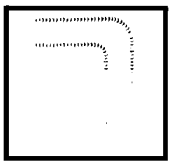
14. Check tracks for wear and pressure.



15. Inspect for loose or broken parts or connections.



16. Operate the loader and check all functions.



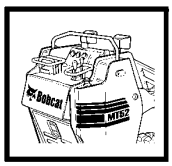
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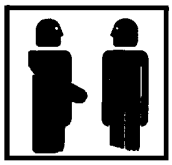
17. Check for any field modification not completed.



18. Check for correct function of lift/tilt lockouts, neutral start interlocks and reverse stop panel.



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 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-2411-1001

WARNING

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

W-2044-1285

IMPORTANT

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

I-2019-0284

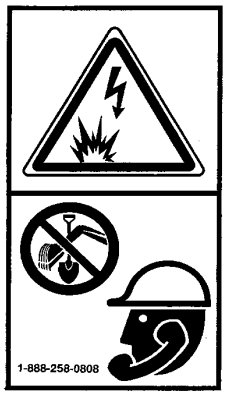
The following publications provide information on the safe use and maintenance of the Bobcat machine and attachments:

- 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.
- The Service Manual and Parts Manual are available from your dealer for use by mechanics to do shop-type service and repair work.
- The Mini 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

1-888-258-0808

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

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SAFETY INSTRUCTIONS (CONT'D)

Fire Prevention

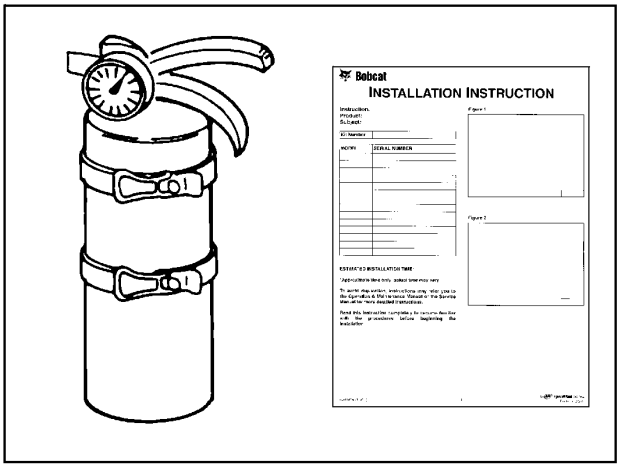
The machine and attachments have components that are at high temperature under normal operating conditions. The primary source of high temperatures is the engine and exhaust system. The electrical system, if damaged or incorrectly maintained, can be a source of arcs or sparks.

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

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

- Do not use the machine where exhaust, arcs, sparks or hot components can contact flammable material, explosive dust or gases.
- The operator cab, engine compartment, and engine cooling system must be inspected every day and cleaned if necessary to prevent fire hazard and overheating.
- Check all electrical wiring and connections for damage. Keep the battery terminals clean and tight. Repair or replace any damaged part.
- Check fuel and hydraulic tubes, hoses and fittings for damage and leakage. Never use open flame or bare skin to check for leaks. Tighten or replace any parts that show leakage. Always clean fluid spills. Do not use gasoline or diesel fuel for cleaning parts. Use commercial nonflammable solvents.
- Do not use ether or starting fluids on any engine which has glow plugs. These starting aids can cause explosion and injure you or bystanders.
- Always clean the machine, disconnect the battery, and disconnect the wiring from the 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 a dust mask when grinding painted parts. Toxic dust or gas can be produced.
- Stop the engine and let it cool before adding fuel. NO SMOKING!
- Use the procedure in the Operation & Maintenance Manual for connecting the battery and for jump starting.
- Use the procedure in the Operation & Maintenance Manual for cleaning the spark arrestor muffler (if equipped).

Figure 1



- Know where fire extinguishers and first aid kits are located and how to use them. Fire extinguishers are available from your Bobcat dealer **[Figure 1]**.

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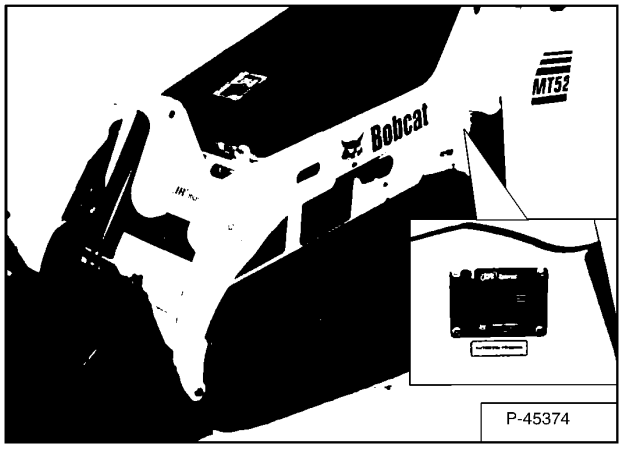
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SERIAL NUMBER LOCATION

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

Loader Serial Number

Figure 2



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

Explanation of loader Serial Number:

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

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

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

Engine Serial Number

Figure 3



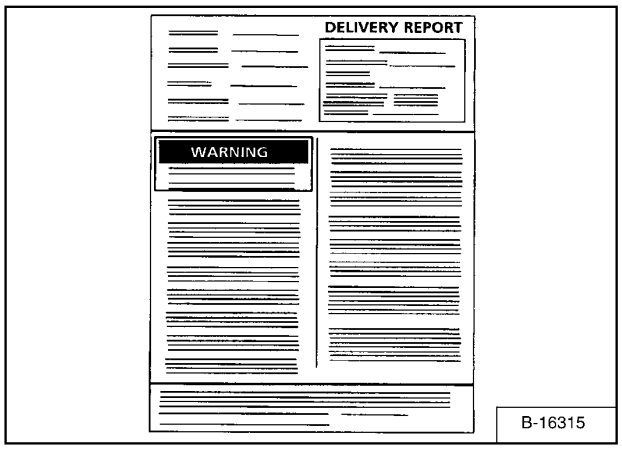
The engine serial number is in the location shown **[Figure 2]**.

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DELIVERY REPORT

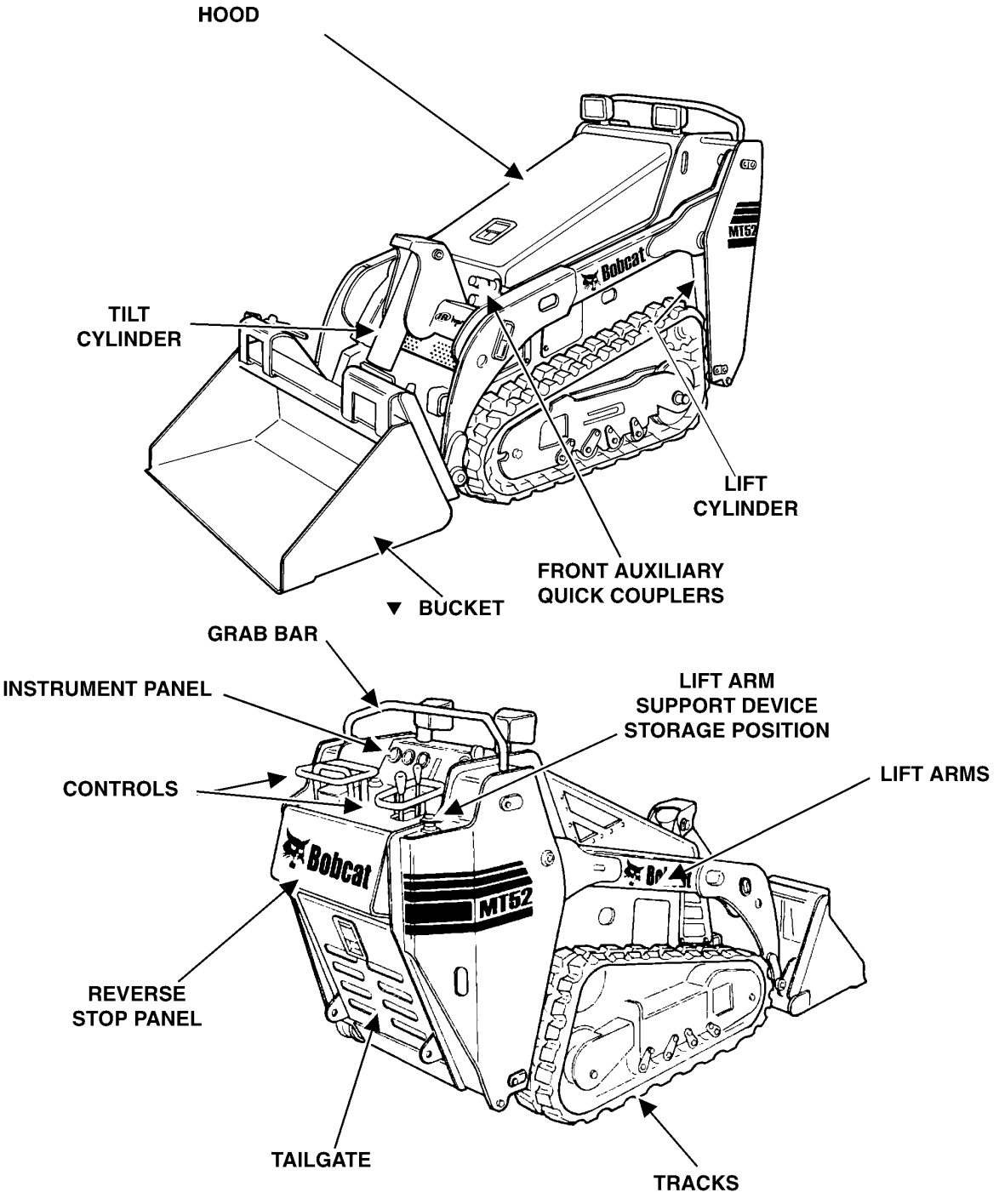
Figure 4



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

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B-19984
B-19999

▼ **BUCKET - A bucket and other attachments are available for the Bobcat Mini Loader.**

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TIGHTEN ALL HARDWARE PER SIZE TO GRADE 5 TORQUE (See TORQUE SPECIFICATIONS FOR BOLTS on Page SPEC-30-1.) UNLESS OTHERWISE SPECIFIED.

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LIFTING AND BLOCKING THE LOADER

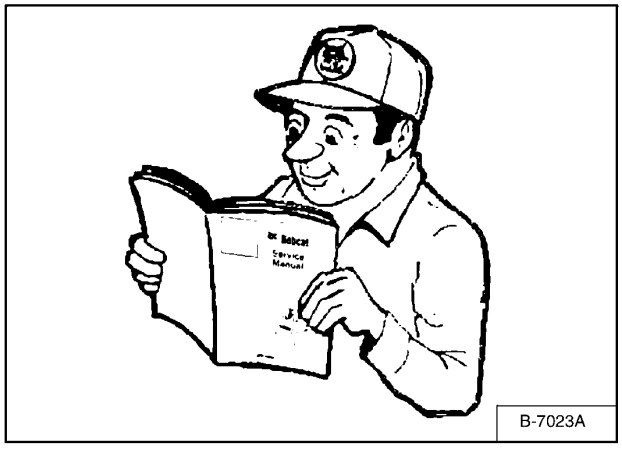
Procedure

⚠ WARNING

Instructions are necessary before operating or servicing machine. Read and understand the Operation & Maintenance Manual 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-2408-0801

Figure 10-10-1



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

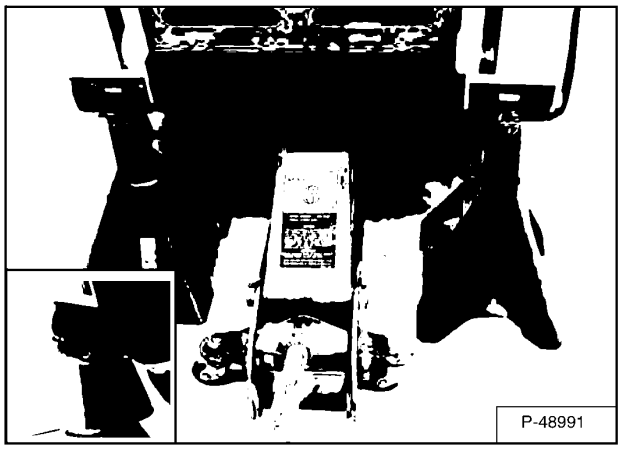
Always park the loader on a level surface.

⚠ WARNING

When the engine is running during service, the steering control lever and hydraulic control levers must be in NEUTRAL and the parking brake engaged.

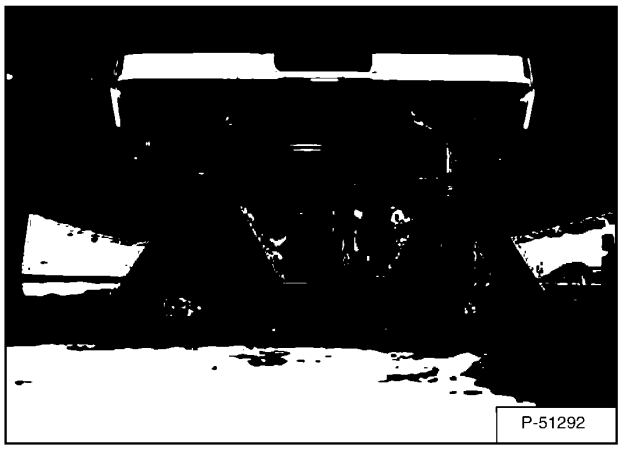
W-2488-1203

Figure 10-10-2



Raise the rear of the machine **[Figure 10-10-2]** and put jackstands under the rear roller wheels (Inset) **[Figure 10-10-2]**. Be sure the jackstands do not touch the tracks. Lower the machine to the jackstands.

Figure 10-10-3



Raise the front of the machine and put jackstands under the front of t he frame. **[Figure 10-10-3]**. Lower the machine to the jackstands.

NOTE: Make sure the jackstands do n ot touch the tracks.

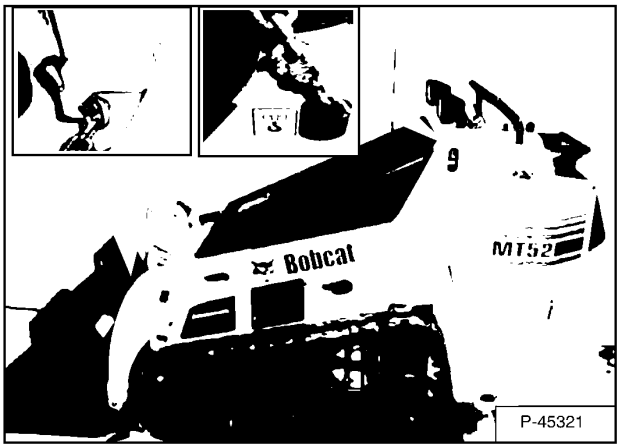
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LIFTING AND BLOCKING THE LOADER (CONT'D)

Four Point Lift

Figure 10-10-4



The loader can be lifted using four attachment points; two at the lower front of the loader frame and two at the upper end of the uprights **[Figure 10-10-4]**.

Be sure the lifting devices are of adequate strength to lift the loader. (See LOADER SPECIFICATIONS (MT52) on Page SPEC-10-1.) for weight of loader.)

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LIFT ARM SUPPORT DEVICE

Installing Lift Arm Support Device

⚠ WARNING

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

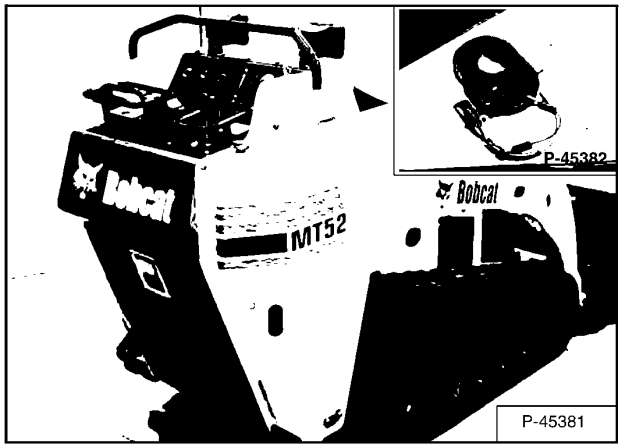
W-2059-0598

⚠ WARNING

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

W-2271-1197

Figure 10-20-1



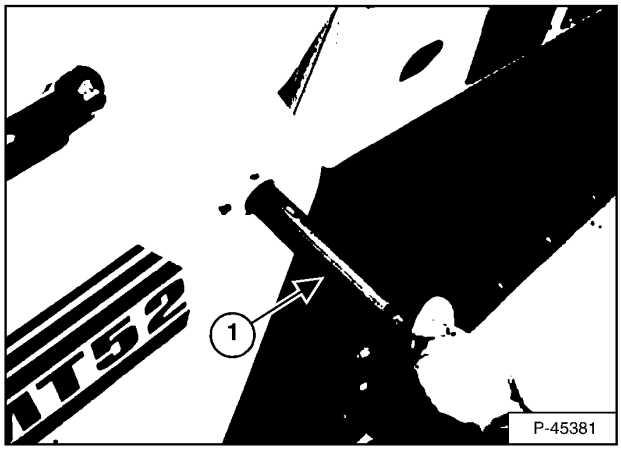
Put the loader on a flat, level surface.

Remove any attachment from the loader.

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

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

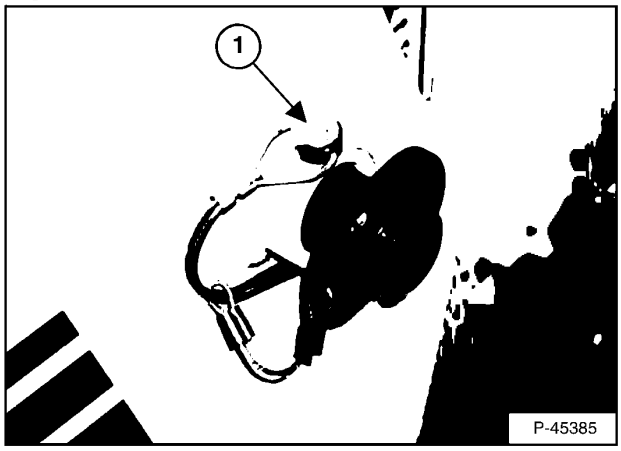
Figure 10-20-2



Install the lift arm support device (Item 1) **[Figure 10-20-2]** into the lift arm support bushings.

Make sure the pin passes through both the outside and inside bushings.

Figure 10-20-3



Install the fastener into the lift arm support device (Item 1) **[Figure 10-20-3]**.

Lower the lift arms slowly until movement stops.

Stop the engine.

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LIFT ARM SUPPORT DEVICE

Removing Lift Arm Support Device

Start the engine and raise the lift arms off the lift arm support device.

Remove the fastener (Item 1) **[Figure 10-20-3]**.

Remove the lift arm support device from the bore.

Lower the lift arms and stop the engine.

Return the lift arm support device to the storage location.

Install the fastener to secure the lift arm support device.

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TRANSPORTING THE BOBCAT LOADER

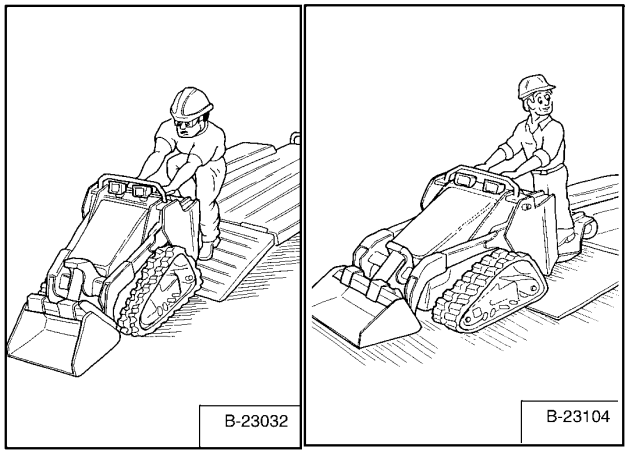
Procedure

⚠ WARNING

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

W-2058-0494

Figure 10-30-1



Be sure the trailer or vehicle and ramps are of adequate size and capacity (See LOADER SPECIFICATIONS (MT52) on Page SPEC-10-1.) for weight of loader.

A mini loader with an empty bucket or no attachment must be loaded backward onto the transport vehicle **[Figure 10-30-1]**.

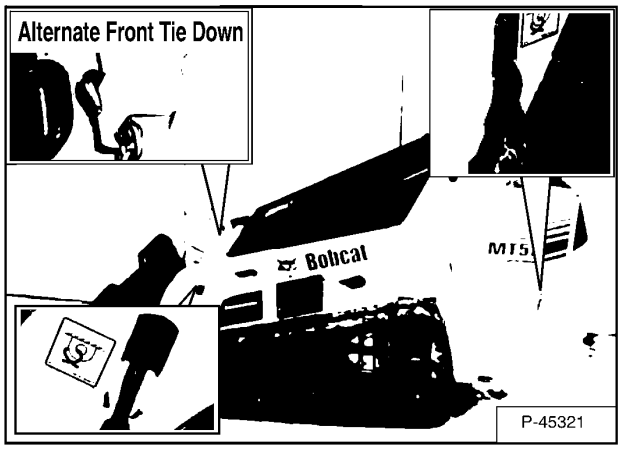
Use a full width ramp when loading a machine with Ride-On Platform **[Figure 10-30-1]**. The platform will pivot as you move up the ramp.

NOTE: Do not load the machine on a trailer with the Ride-On Platform installed unless you have a full width ramp. Remove the platform if a full width ramp is not available.

When using adjustable ramps, be sure the ramp width and spacing adequately cover the tread width. Do not attempt to mount ramps that are spaced too wide or too narrow.

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

Figure 10-30-2



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 10-30-2]**.

- Lower the bucket or attachment all the way.
- Stop the engine and engage the parking brake.
- Install chains at the front and rear loader tie down positions **[Figure 10-30-2]**. (Both sides)
- Fasten each end of the chain to the transport vehicle.

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TOWING THE LOADER

Procedure

TOWING IS NOT RECOMMENDED

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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 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-2408-0801

SERVICE SCHEDULE		HOURS					
ITEM	**SERVICE REQUIRED**	**8-10**	**50**	**100**	**■ 250**	**■ 500**	**■ 1000**
Engine Oil	Check the oil level and add as needed. Do not overfill.						
Engine Air Filter and Air System	Check condition indicator. Service only when required. Check for leaks and damaged components.						
Hydraulic Cooling System	Open hood. Clean debris from oil cooler and electric fan area. Check coolant level in cold. Add premixed coolant as needed.						
Fuel Filter	Remove trapped water.						
Hydraulic Fluid	Check fluid level and add as needed.						
Lift Arms, Cylinders, Bob-Tach Pivot Pins and Wedges	Lubricate with multi-purpose lithium based grease.						
Track Rollers & Idlers	Grease the track rollers & idlers.						
Reverse Stop Panel	Inspect for correct function. Adjust or replace as needed. Clean dirt or debris from moving parts.						
Neutral Start Interlocks	Inspect for correct function. Repair as needed.						
Lift/Tilt Lockouts	Inspect for correct function. Repair as needed.						
Parking Brake	Check operation.						
Safety Signs	Check for damaged signs (decals). Replace any signs that are damaged or worn.						
Gauges, Indicators & Lights (Opt.)	Check for correct operation of all gauges indicators & lights.						
Hydraulic Fluid, Hoses and Tubelines	Check fluid level and add as needed. Check for damage and leaks. Repair or replace as needed.						
Control Levers	Check for correct operation. Repair or adjust as needed.						
Under carriage	Check for loose bolts and nuts.						
Tracks	Check for damaged or worn tracks and correct tension.	*					
Engine Compartment	Check for dirt or debris on the floor of the engine compartment and clean as necessary.						
Battery	Check cables, connections and electrolyte level. Add distilled water as needed.						
Water Pump/Alternator/Fan Belt	Check belt tension and adjust or replace as needed.						
Engine Oil and Filter	Replace oil and filter. Use CD or better grade oil and Bobcat filter.		^				
Spark Arrestor Muffler	Clean the spark chamber.						
Fuel Filter	Replace the filter element. Use a genuine Bobcat filter.						
Lift Arm Lockout	Check function of manual by-pass control.						
Hydraulic Filter	Replace the filter element.		●				
Hydraulic Reservoir Breather Cap	Replace the reservoir breather cap.						
Hydraulic Reservoir	Replace the fluid.						

■ Or every 12 months.
^ First oil and filter change must occur at 50 hours; 100 hours thereafter.
● Replace filter element after the first 50 hours; 500 hours thereafter.
*** Check every 8-10 hours for the first 50 hours of operation; then at 50 hour intervals.**

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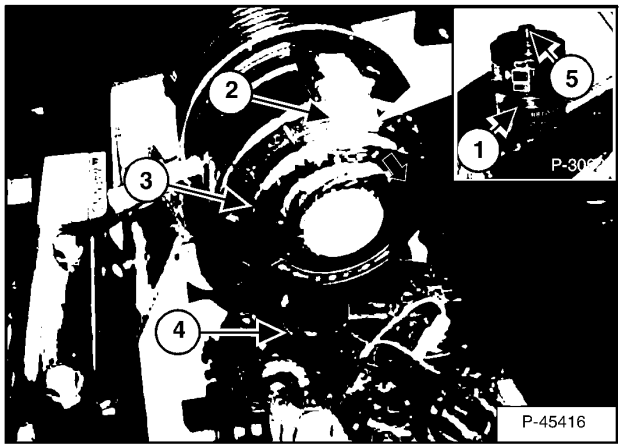
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AIR CLEANER SERVICE

Replacing the Filter Element

Figure 10-60-1



It is important to change the air filter element at regular intervals.

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

Replace the Outer Filter only when the red ring shows in the condition indicator (Item 1) **[Figure 10-60-1]**.

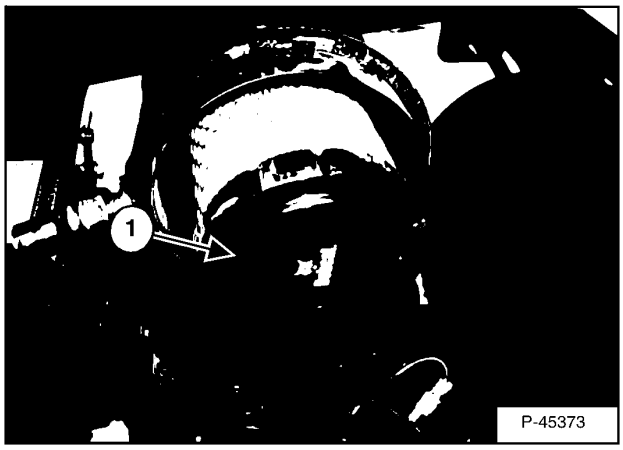
Replace the inner filter every third time the outer filter is replaced or as indicated below.

Outer Filter

Pull the locking tab (Item 2). Turn the dust cover (Item 3) **[Figure 10-60-1]** counterclockwise 1/8 turn.

Remove and clean the dust cover.

Figure 10-60-2



Remove the outer filter element (Item 1) **[Figure 10-60-2]**.

NOTE: Make sure all sealing surfaces are free of dirt and debris. Do not use air pressure to clean.

Install a new outer element.

Install the dust cover. Be sure the air cleaner valve (Item 4) **[Figure 10-60-1]** is down. Turn cover clockwise 1/8 turn and engage the locking tab.

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

Press the button (Item 5) **[Figure 10-60-1]** to remove the red ring on the condition indicator.

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, press the button (Item 5) **[Figure 10-60-1]** on the top of the condition indicator and start the engine. Run at full RPM, then reduce engine speed and stop the engine. If the red ring shows in the condition indicator, replace the inner filter element.

Remove the dust cover, outer filter and inner filter.

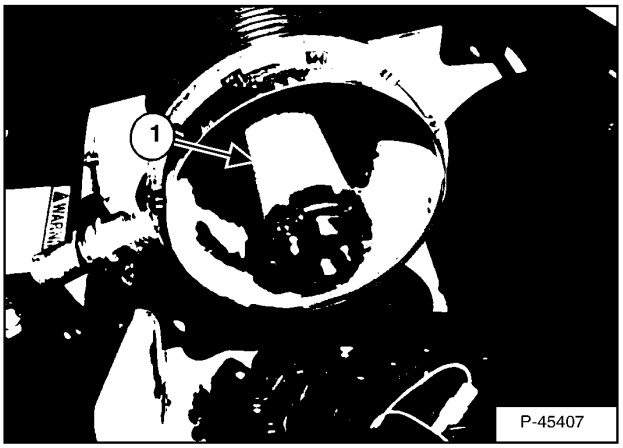
NOTE: Make sure all sealing surfaces are free of dirt and debris.

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Replacing the Filter Element (Cont'd)

Figure 10-60-3



Install the new inner element (Item 1) **[Figure 10-60-3]**.

Install the outer element and the dust cover.

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

Install the dust cover. Be sure the air cleaner valve (Item 4) **[Figure 10-60-1]** is down. Turn cover clockwise 1/8 turn and engage the latch.

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ENGINE COOLING SYSTEM

Checking The Coolant Level

Figure 10-70-1



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

Make sure the engine is cool.

Raise the hood and check the coolant level on the over-flow tank.

The coolant level should be at the Cold level mark on the over-flow tank (Item 1) **[Figure 10-70-1]**.

Cleaning The Cooling System

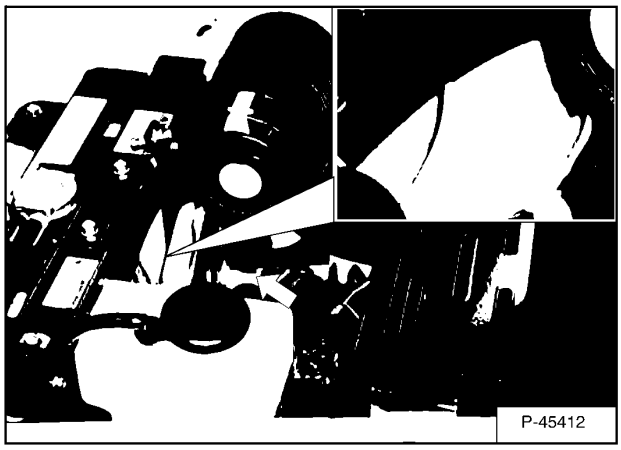
⚠ WARNING

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

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

W-2019-1285

Figure 10-70-2



Open the hood **[Figure 10-70-2]**.

Use air pressure or water pressure to clean the radiator **[Figure 10-70-2]** .

Check cooling system for leaks.

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.

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Replacing The Coolant

Raise the hood.

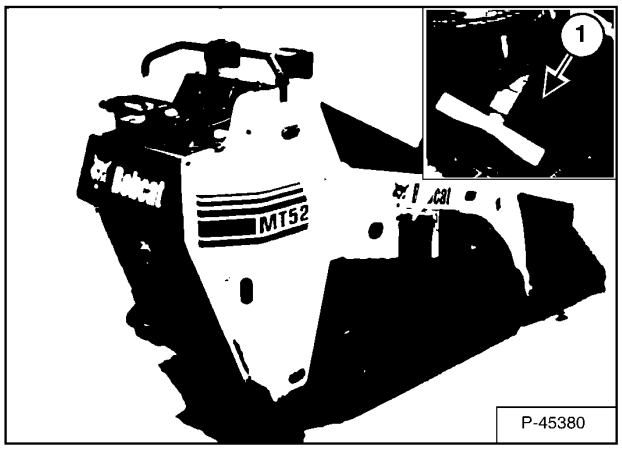
⚠ WARNING

AVOID BURNS

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

W-2070-1203

Figure 10-70-3

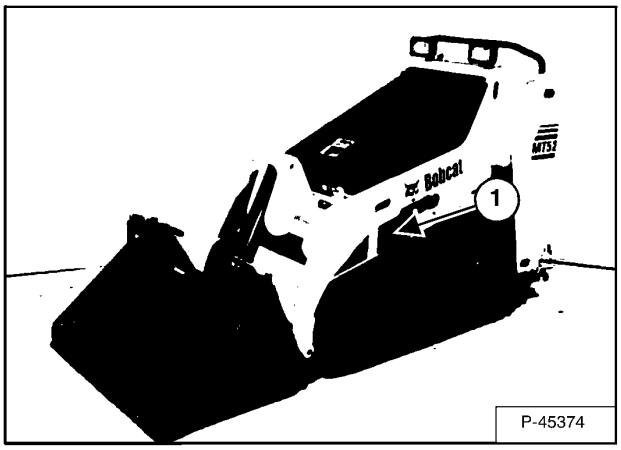


Remove the radiator cap.

Connect a hose to the engine block drain (Item 1) **[Figure 10-70-3]**. Open the drain valve and drain the coolant into a container.

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

Figure 10-70-4



Open the drain valve on the bottom left hand side at the rear of the radiator. Access to the radiator drain is through the left hand side access panel. (Item 1) **[Figure 10-70-4]**.

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

Recycle or dispose of coolant in an environmentally safe manner.

Mix the coolant in a separate container. (See Capacities on Page SPEC-10-4.) for correct capacity.

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

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

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Replacing The Coolant (Cont'd)

IMPORTANT

AVOID ENGINE DAMAGE

Always use the correct ratio of water to antifreeze.

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

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

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

I-2124-0497

One gallon and one pint (4,3 L) of propylene glycol mixed with one gallon (3,8 L) of water is the correct mixture of coolant to provide a -34°F (-37°C) freeze protection.

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

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

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

Close the hood.

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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:

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

Contact your fuel supplier for local recommendations.

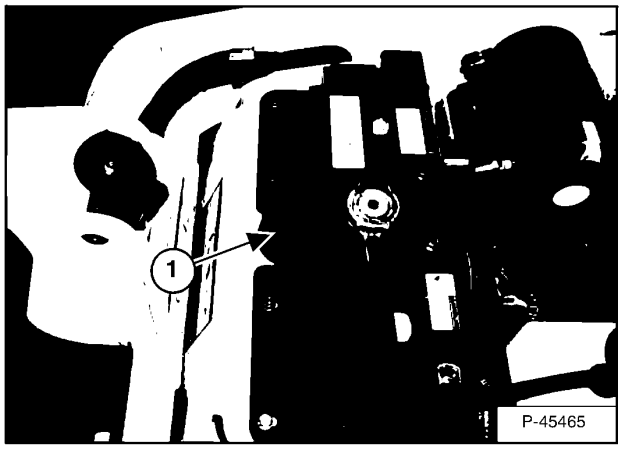
Filling The Fuel Tank

⚠ WARNING

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

W-2103-1285

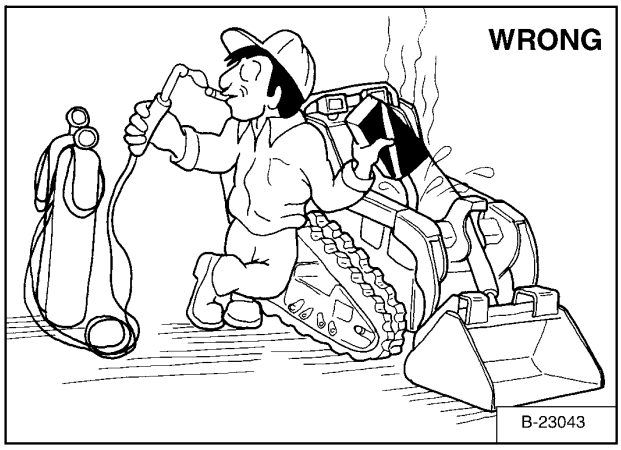
Figure 10-80-1



Open the hood.

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

Figure 10-80-2



Use a clean, approved safety container to add fuel of the correct specifications. Add fuel only in an area that has free movement of air and no open flames or sparks. **NO SMOKING! [Figure 10-80-2]**.

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

Close and latch hood.

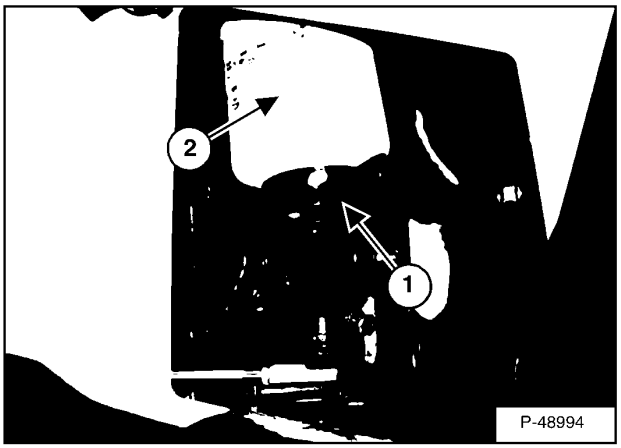
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Fuel Filter

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

Figure 10-80-3



Removing Water

Loosen the drain (Item 1) **[Figure 10-80-3]** at the bottom of the filter element to remove water from the filter. Tighten the drain.

Replacing Element

Remove the filter element (Item 2) **[Figure 10-80-3]**.

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

Remove the air from the fuel system. (See Removing Air From The Fuel System on Page 10-80-2.)

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

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

W-2072-0496

Open the fuel filter vent (Item 1) **[Figure 10-80-4]**.

Operate the hand pump (priming bulb) (Item 2) **[Figure 10-80-4]** until the hand pump feels solid.

Close the vent (Item 1) **[Figure 10-80-4]** on the fuel filter housing.

Figure 10-80-4



Start the engine. It may be necessary to open the vent (Item 1) **[Figure 10-80-4]** (on the fuel injection pump) briefly until the engine runs smoothly.

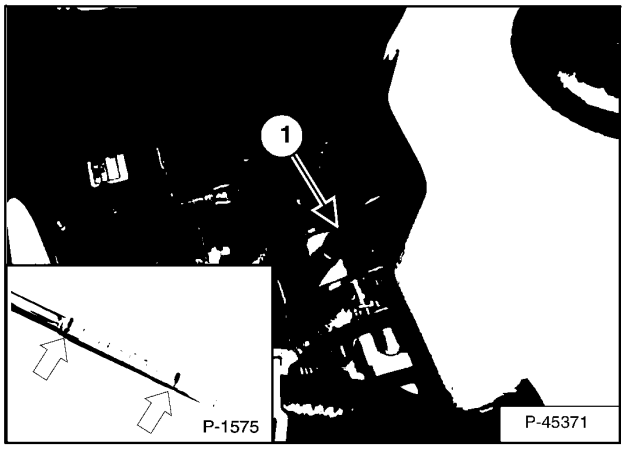
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ENGINE LUBRICATION SYSTEM

Checking Engine Oil

Figure 10-90-1



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

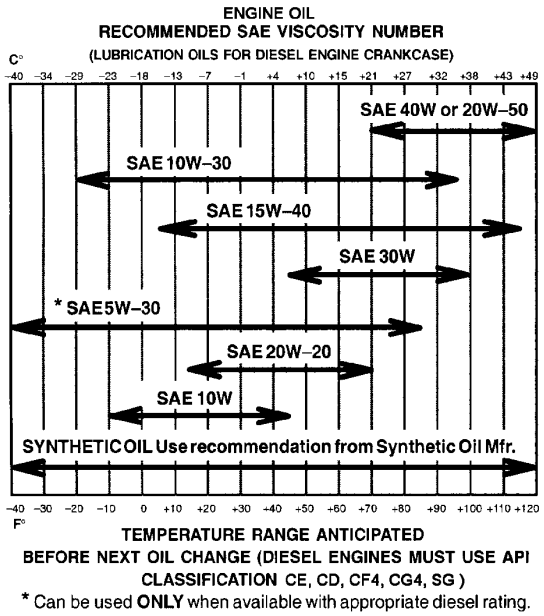
Open the hood and remove the dipstick (Item 1) **[Figure 10-90-1]**.

Keep the oil level between the marks on the dipstick.

Use a good quality motor oil that meets API Service Classification of CD or better (See Oil Chart on Page 10-90-1.).

Install the dipstick and close the hood.

Oil Chart



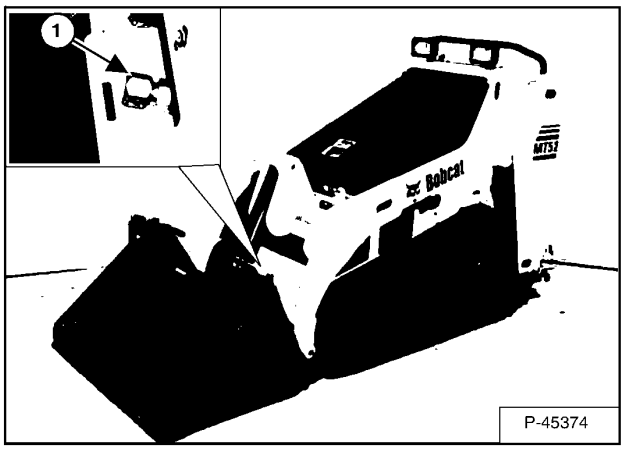
TEMPERATURE RANGE ANTICIPATED BEFORE NEXT OIL CHANGE (DIESEL ENGINES MUST USE API CLASSIFICATION CE, CD, CF4, CG4, SG)

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

Replacing Oil And Filter

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

Figure 10-90-2



Remove the front cover.

Remove the cap (Item 1) **[Figure 10-90-2]** from the drain line.

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

⚠ WARNING

AVOID INJURY OR DEATH

Engines can have hot parts. Wear protective clothing when removing oil filter to avoid burns.

W-2128-0788

The engine and exhaust manifold must be co ol before beginning.

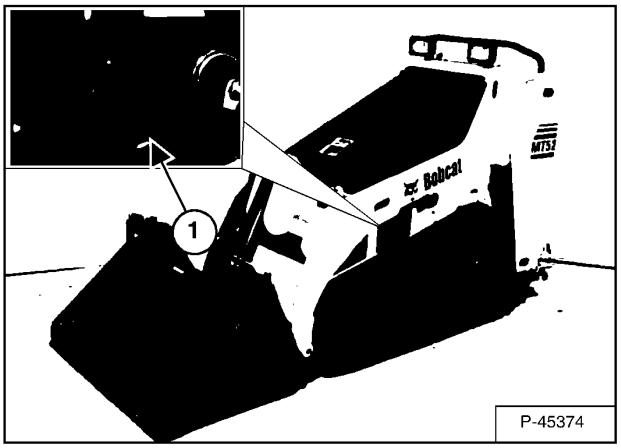
Open the hood.

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Replacing Oil And Filter (Cont'd)

Figure 10-90-3



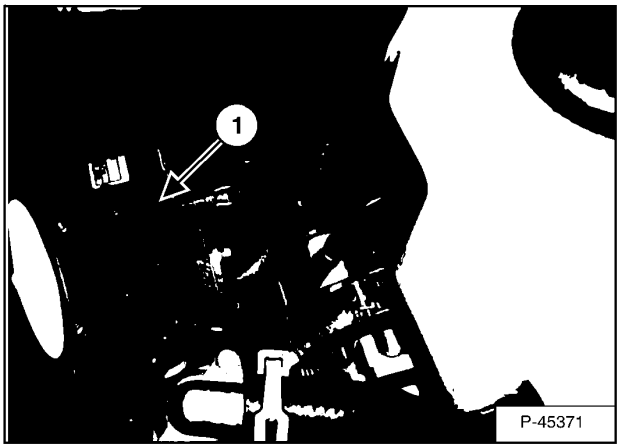
Remove the oil filter (Item 1) **[Figure 10-90-3]** (located under the alternator) and clean the filter housing surface.

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

Install and tighten the drain plug.

Install the front cover.

Figure 10-90-4



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

Put oil in the engine. (See Capacities on Page SPEC-10-4.) for capacity. (See Oil Chart on Page 10-90-1.)

Install the fill cap.

⚠ WARNING

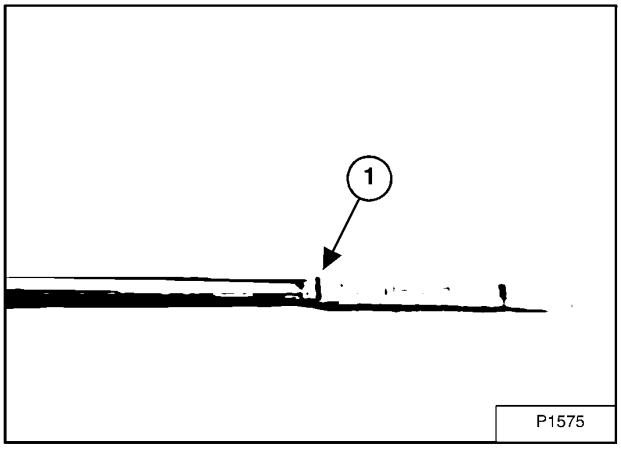
When the engine is running during service, the steering levers and hydraulic control levers must be in neutral and the parking brake engaged. The Operation Mode Selector Lever must be fully engaged.

W-2414-1201

Start the engine and let it run for several minutes.

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

Figure 10-90-5



Remove the dipstick and check the oil level.

Add oil until it reaches the top mark (Item 1) **[Figure 10-90-5]** on the dipstick.

Install the dipstick and close the hood.

⚠ WARNING

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

W-2103-1285

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HYDRAULIC / HYDROSTATIC SYSTEM

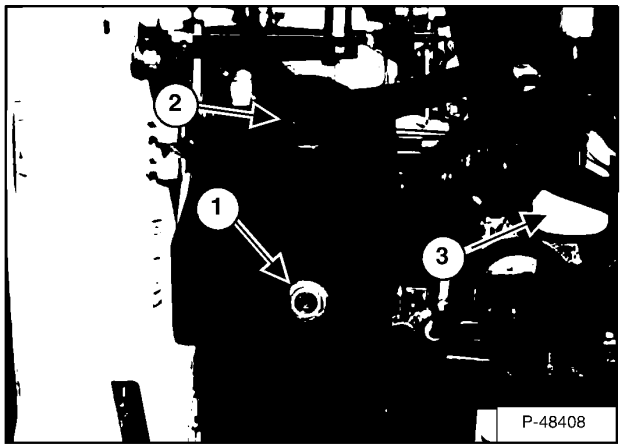
Checking And Adding Fluid

⚠ WARNING

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

W-2072-0496

Figure 10-100-1



Use only recommended fluid in the hydraulic system. (See HYDRAULIC FLUID SPECIFICATIONS on Page SPEC-50-1.)

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

Stop the engine and check the fluid level in the sight gauge (Item 1) **[Figure 10-100-1]**.

Remove the fill cap (Item 2) and add fluid until at the correct level **[Figure 10-100-1]**.

Install the fill cap. Be sure rubber gasket is installed underneath the cap.

Replacing Hydraulic Filter

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

Open the hood.

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

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

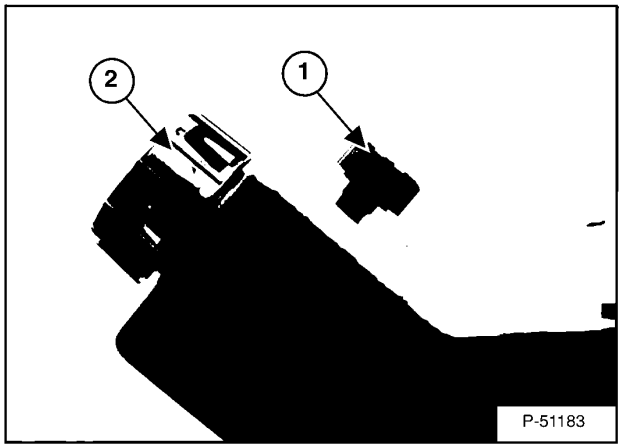
Put clean oil on the seal of the new filter element.

Install and hand tighten the filter element.

Close the hood.

Hydraulic Breather Cap

Figure 10-100-2



The hydraulic breather cap (Item 1) is located behind the hydraulic fill cap (Item 2) **[Figure 10-100-2]**. Replace the breather cap according to the interval given in the SERVICE SCHEDULE, Contents Page 10-01.

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Replacing Hydraulic Fluid

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

The fluid must be replaced if it becomes contaminated or after major repairs. If the fluid is replaced, the hydraulic filter must be replaced.

Remove the reservoir fill cap (Item 2) **[Figure 10-100-1]**. Put a suction hose into the fill tube to remove the hydraulic fluid.

Replace the hydraulic filter element (Item 3) **[Figure 10-100-1]**. (See Above.)

Add the correct fluid to the reservoir until the fluid level is at the correct level (Do not overfill). Install fill cap.

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.

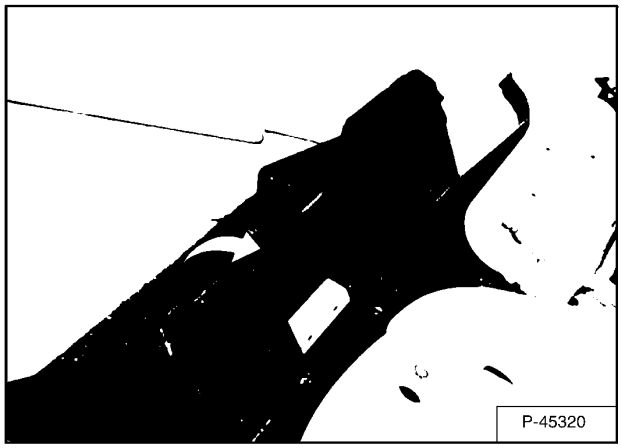
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BOB-TACH

Inspection And Maintenance

Figure 10-110-1



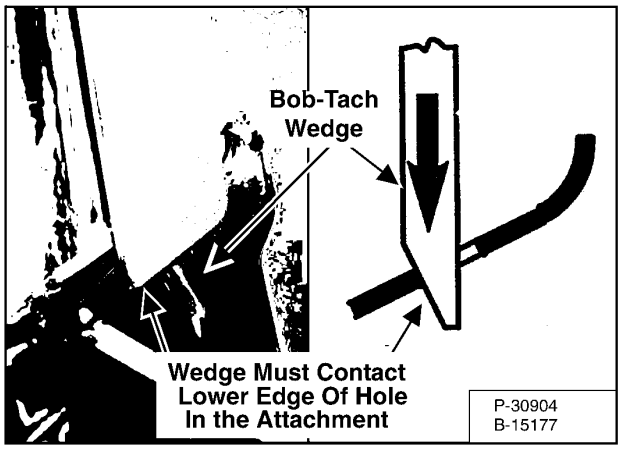
Move the Bob-Tach levers to engage the wedges **[Figure 10-110-1]**. The levers and wedges must move freely.

⚠ WARNING

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

W-2102-0588

Figure 10-110-2



The wedges must extend through the holes in the attachment mounting frame .

The spring loaded wedge must contact the lower edge of the hole in the attachment **[Figure 10-110-2]**.

If the wedge does not contact the lower edge of the hole **[Figure 10-110-2]**, the attachment will be loose and can come off the Bob-Tach.

Inspect the mounting frame on the attachment and the Bob-Tach, linkages and wedges for excessive wear or damage. 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 10-50-1.) and (See LUBRICATION OF THE BOBCAT MINI LOADER on Page 10-120-1.)

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LUBRICATION OF THE BOBCAT MINI LOADER

Procedure

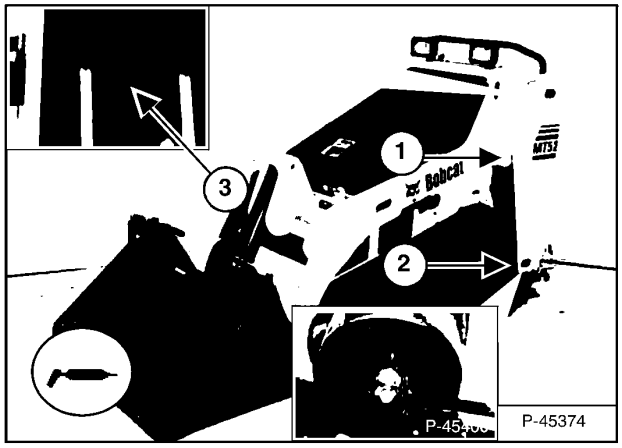
Lubricate the mini loader as specified in the *SERVICE SCHEDULE*, Contents Page 10-01, for the best performance of the loader.

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

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

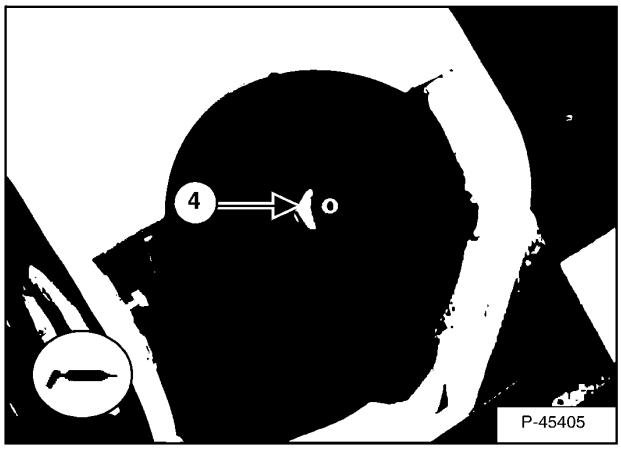
Lubricate the following locations:

Figure 10-120-1



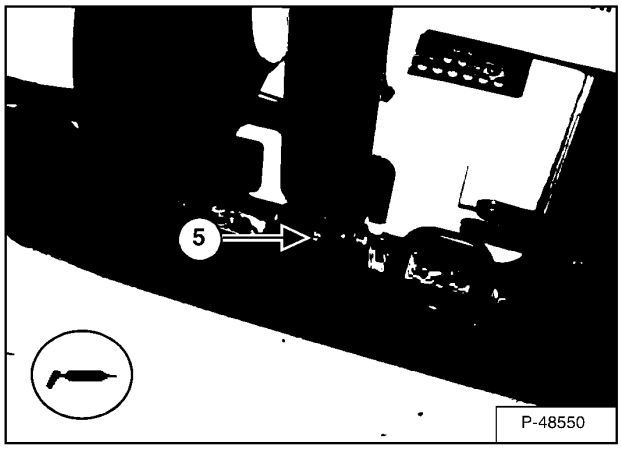
1. Lift Cylinder Rod End (Both Sides) **[Figure 10-120-1]**.
2. Lift Cylinder Base End (Both Sides) **[Figure 10-120-1]**.
3. Lift Arm Pivot (Both Sides) **[Figure 10-120-1]**.

Figure 10-120-2



4. Tilt Cylinder Base End **[Figure 10-120-2]**.

Figure 10-120-3



5. Tilt Cylinder Rod End **[Figure 10-120-3]**.

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Procedure (Cont'd)

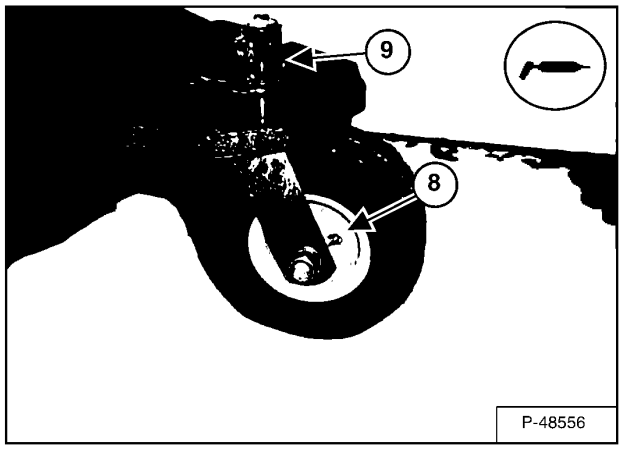
Figure 10-120-4



6. Bob-Tach Pivot Pin (Both Sides) **[Figure 10-120-4]**.

7. Bob-Tach Wedge (Both Sides) **[Figure 10-120-4]**.

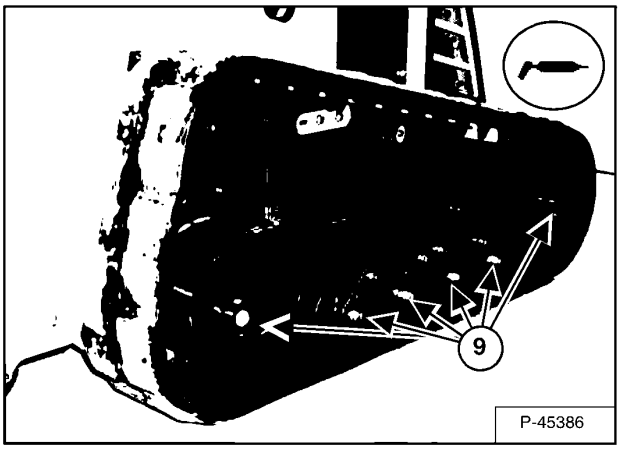
Figure 10-120-5



8. Ride-On Operator Platform Wheel **[Figure 10-120-5]** (If Equipped).

9. Ride-On Operator Platform Caster pivot **[Figure 10-120-5]** (If Equipped).

Figure 10-120-6



10. Track roller and idler lubrication:

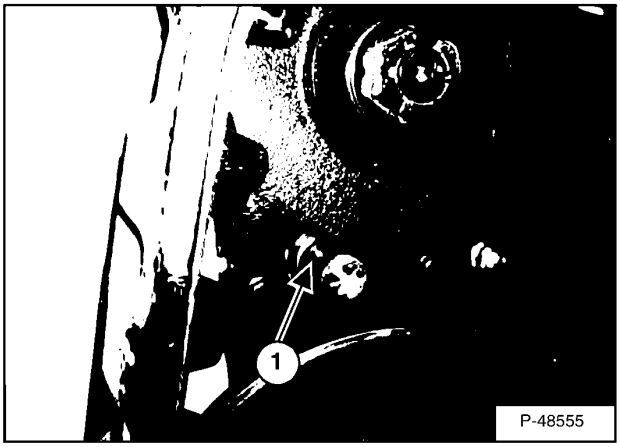
    The track rollers and idlers have grease fittings for lubrication.

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

Add grease to the four rollers and two idlers (both sides of loader). (There are two fittings provided on each wheel for convenience.) **[Figure 10-120-6]**

Parking Brake Lubrication

Figure 10-120-7



Lubricate the parking brake pin (Item 1) **[Figure 10-120-7]** with anti-seize compound only.

Move the parking brake lever back and forth to spread the lubricant over the entire pin area.

Repeat the lubrication for the parking brake pin on the other side.

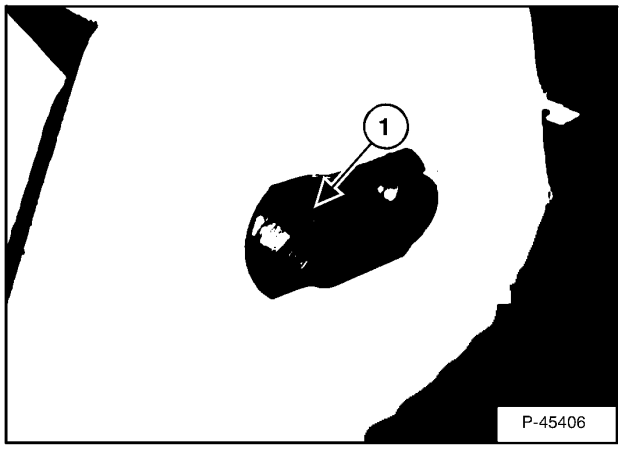
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LUBRICATION OF THE BOBCAT MINI LOADER (CONT'D)

Pivot Pins

Figure 10-120-8



All lift arm and cylinder pivots have a large pin held in position with a retainer and bolt (Item 1) **[Figure 10-120-8]**.

Check that the bolts are tightened to 15-20 ft.-lb. (20-27 N•m) torque.

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SPARK ARRESTOR MUFFLER

Servicing

(See SERVICE SCHEDULE on Page 10-50-1.) for service interval for cleaning the spark arrestor muffler.

Do not operate loader with a defective exhaust system.

⚠ 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

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

W-2050-1285

Figure 10-130-1



Stop the engine and open the hood.

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

⚠ 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

Start the engine.

Have a second person (wearing safety goggles) hold a block of wood over the outlet of the muffler (with the engine running) for about 10 seconds.

This will force contaminants out through the cleanout hole.

Stop the engine and install the plug. Close the hood.

⚠ WARNING

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

W-2006-0284

IMPORTANT

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

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

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

I-2022-0595

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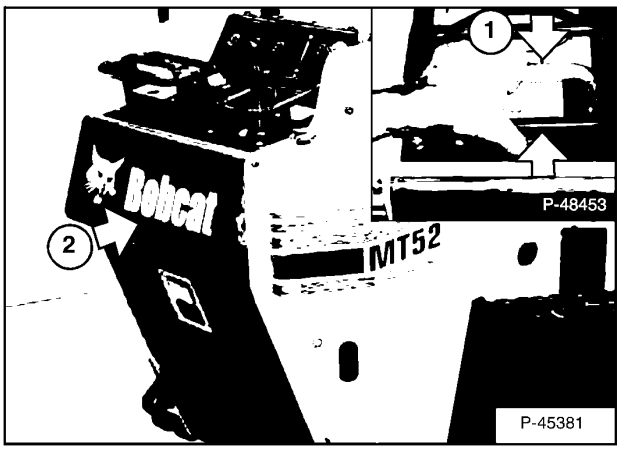
CONTROLS

Reverse Stop Panel

The Reverse Stop Panel will stop the loader from moving backward and when the panel is pushed forward completely, the loader will move forward slowly.

Inspecting Function Of Reverse Stop Panel

Figure 10-140-1



Start the engine and use one hand to drive the machine backward (Item 1) **[Figure 10-140-1]**.

Use your other hand to push the Reverse Stop Panel forward (Item 2) **[Figure 10-140-1]**.

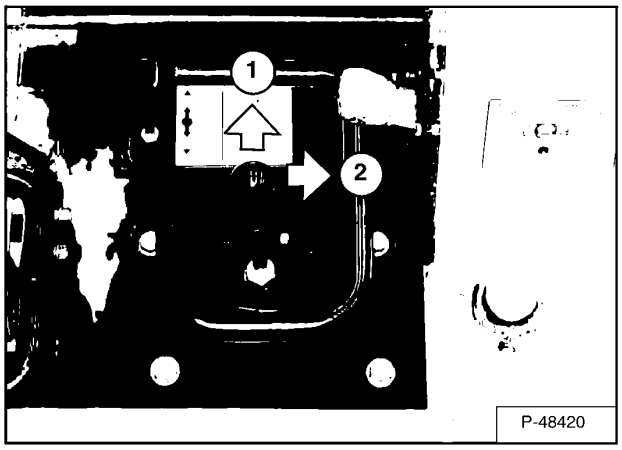
The loader must stop moving backward and begin to move forward slowly when the Reverse Stop Panel is pushed forward completely.

Lift And Tilt Function Lockouts

Inspecting Deactivation of Lift and Tilt Functions

1. Stand at the operator's position behind the loader and start the engine.
2. Raise the lift arms about 3 feet off the ground.
3. Turn the key OFF and wait for the engine to come to a complete stop.

Figure 10-140-2

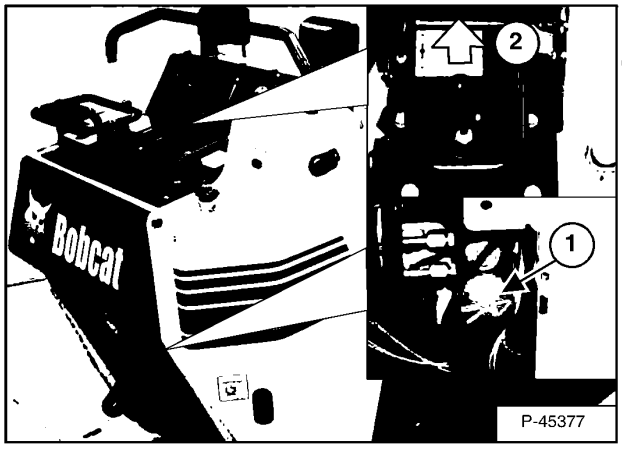


4. Move the control lever (Item 1) **[Figure 10-140-2]** to lower the lift arms. The lift arms should not lower.
5. Move the c ontrol lever to tilt the bucket (or attachment) forward (Item 2) **[Figure 10-140-2]**. The bucket should not tilt forward. See your Bobcat dealer for repair if deactivation does not occur.

Lift Arm By-Pass Controls

Inspecting The Lift Arm By-Pass Control

Figure 10-140-3



1. Stand in the operator's position, start the engine and raise the lift arms about 3 feet off the ground. Stop the engine.
2. Open the tailgate, pull the Lift Arm By-Pass knob (Item 1) **[Figure 10-140-3]**, and move the c ontrol lever forward (Item 2) **[Figure 10-140-3]**. The lift arms should slowly lower. See your Bobcat dealer for repair if by-pass does not function.

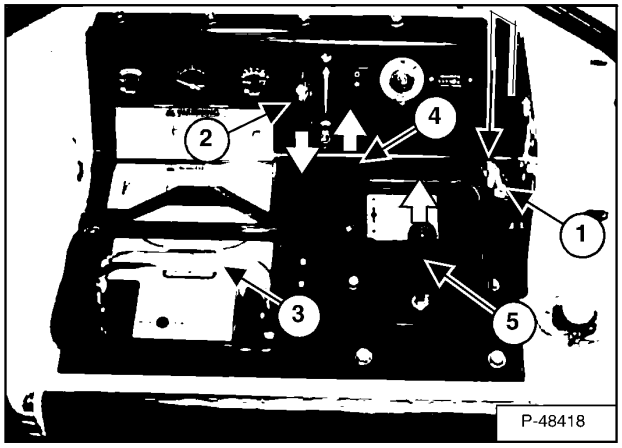
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Neutral Start Interlocks

Inspecting Traction Drive Start Interlocks

Figure 10-140-4



1. Stop the engine and engage the parking brake (Item 1) **[Figure 10-140-4]**.
2. Make sure the area around the machine is clear of bystanders.
3. Set the engine speed to slow (Item 2) **[Figure 10-140-4]**.
4. Partially engage forward drive (Item 3) **[Figure 10-140-4]** and turn the key switch to START position.
5. The starter should not engage.
6. Partially engage rearward drive (Item 3) **[Figure 10-140-4]** and turn the key switch to START position.
7. The starter should not engage.
8. Partially engage a drive turn (Item 3) **[Figure 10-140-4]** and turn the key switch to START position.
9. The starter should not engage.

Inspecting Auxiliary Hydraulic Start Interlock

1. Stop the engine and engage the parking brake (Item 1) **[Figure 10-140-4]**.
2. Make sure the area around the machine is clear of bystanders.
3. Set the engine speed to slow (Item 2) **[Figure 10-140-4]**.
4. Push the auxiliary hydraulic control lever forward (Item 4) **[Figure 10-140-4]** and turn the key switch to START position.
5. The starter should not engage.

⚠ WARNING

The Reverse Stop Panel, Neutral Start Interlocks, and Lift/Tilt Lockouts must function properly.

- **The Reverse Stop Panel must stop mini loader from moving backward when panel is pushed forward.**
- **The Neutral Start Interlocks must prevent engine from starting if Drive / Steering Control, Lift Arm Control or Auxiliary Hydraulic Control are engaged.**
- **The Lift/Tilt Lockouts must deactivate the lift and tilt functions when engine is off.**

If any of these do not function properly, contact your dealer for service. DO NOT modify system.

W-2483-1003

Inspecting Lift Arm Hydraulic Start Interlock

1. Stop the engine and engage the parking brake (Item 1) **[Figure 10-140-4]**.
2. Make sure the area around the machine is clear of bystanders.
3. Set the engine speed to slow (Item 2) **[Figure 10-140-4]**.
4. Make sure the lift arms are lowered all the way. Push the hydraulic control lever (Item 5) **[Figure 10-140-4]** forward into the float position and turn the key switch to START position.
5. The starter should not engage.

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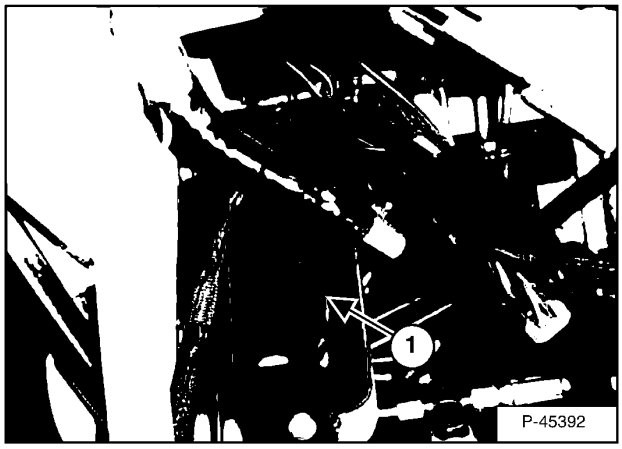
ELECTRICAL SYSTEM

Description

The loader has a 12 volt, negative ground alternator charging system. The electrical system is protected by fuses and relays. The fuses protect the electrical system when there is an electrical overload. The reason for the overload must be found before starting the engine again.

Checking Fuses And Relays

Figure 10-150-1



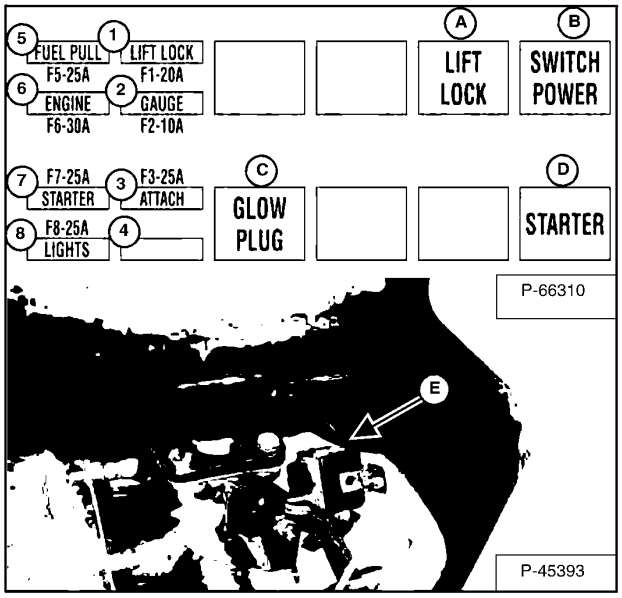
Raise the hood.

The fuse panel is located under the hood at the right rear side of the machine (Item 1) **[Figure 10-150-1]**.

Remove the fuse panel cover.

Fuses

Figure 10-150-2



Refer to **[Figure 10-150-2]**

REF.	DESCRIPTION	AMPS
1	Lift Lock	20
2	Gauges	10
3	Attachment	25
4	Not Used	20
5	Fuel	25
6	Engine	30
7	Starter	25
8	Lights	25

Relays

Refer to **[Figure 10-150-2]**

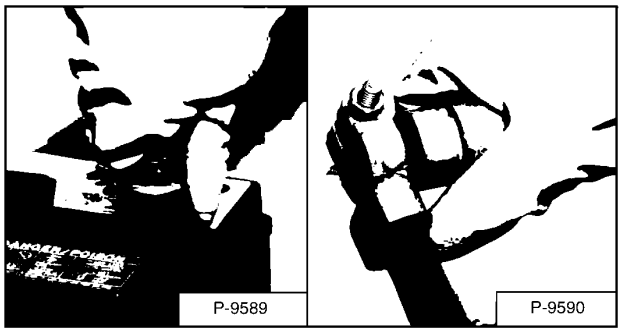
REF.	DESCRIPTION
A	Lift Lock
B	Switch Power
C	Glow Plug
D	Starter
E	Fuel Timer

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Cleaning Battery Terminals

Figure 10-150-3



The battery cables must be clean and tight **[Figure 10-150-3]**. Check the electrolyte level in the battery. Add distilled water as needed. Remove acid or corrosion from the battery and cables with a sodium bicarbonate and water solution.

Put grease on the battery terminals and cable ends to prevent corrosion.

⚠ WARNING

Batteries contain acid which burns eyes and skin on contact. Wear goggles, protective clothing and rubber gloves to keep acid off body.
In case of acid contact, wash immediately with water. In case of eye contact get prompt medical attention and wash eye with clean, cool water for at least 15 minutes. If electrolyte is taken internally, drink large quantities of water or milk! DO NOT induce vomiting. Get prompt medical attention.

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Using A Booster Battery (Jump Starting)

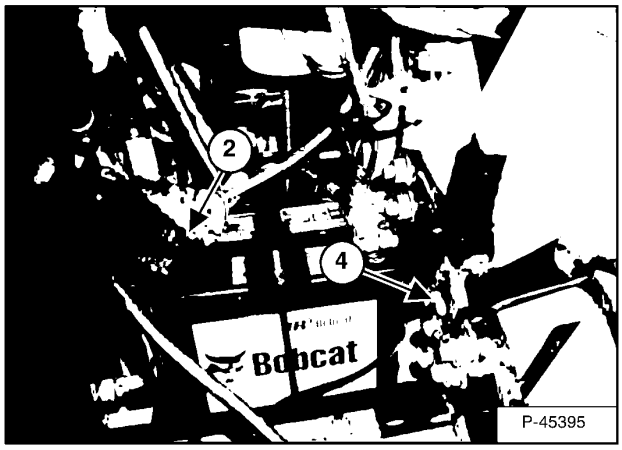
If it is necessary to use a booster battery to start the engine, BE CAREFUL! The key switch must be OFF when connecting jumper cables. The booster battery must be 12 volt.

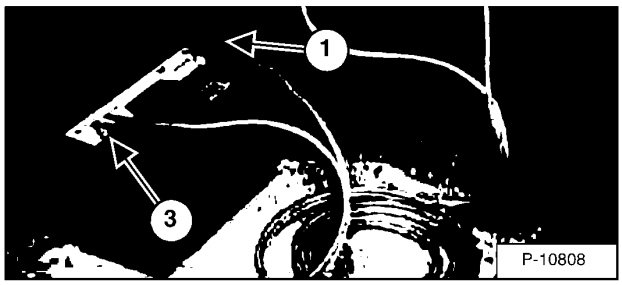
⚠ WARNING

Keep arcs, sparks, flames and lighted tobacco away from batteries. When jumping from booster battery make final connection (negative) at engine frame. Do not jump start or charge a frozen or damaged battery. Warm battery to 60°F. (16°C.) before connecting to a charger. Unplug charger before connecting or disconnecting cables to battery. Never lean over battery while boosting, testing or charging. Battery gas can explode and cause serious injury.

W-2066-1296

Figure 10-150-4





Connect the end of the first cable (Item 1) **[Figure 10-150-4]** to the positive (+) terminal of the booster battery. Connect the other end of the same cable (Item 2) **[Figure 10-150-4]** to the positive terminal on the loader battery.

Connect the end of the second cable (Item 3) **[Figure 10-150-4]** to the negative (-) terminal of the booster battery. Connect the other end of the same cable (Item 4) **[Figure 10-150-4]** to the loader frame.

Keep cables away from moving parts. Start the engine.

After the engine has started, remove the ground (-) cable (Item 4) **[Figure 10-150-4]** first.

Remove the cable from the positive terminal (Item 2) **[Figure 10-150-4]**.

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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Removing And Installing The Battery

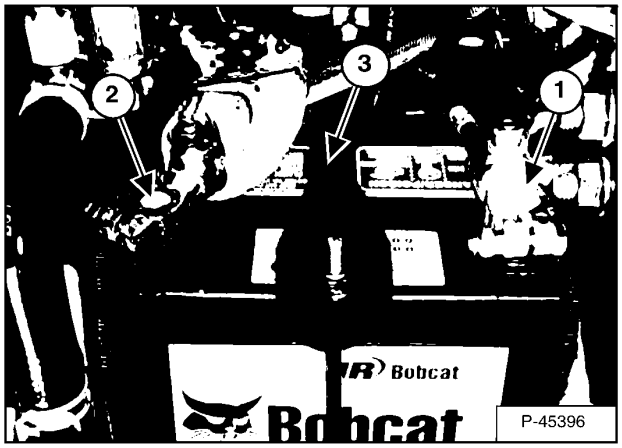
⚠ WARNING

Batteries contain acid which burns eyes and skin on contact. Wear goggles, protective clothing and rubber gloves to keep acid off body.
In case of acid contact, wash immediately with water.
In case of eye contact get prompt medical attention and wash eye with clean, cool water for at least 15 minutes.
If electrolyte is taken internally drink large quantities of water or milk! DO NO T induce vomiting. Get prompt medical attention.

W-2065-1296

Open the tailgate.

Figure 10-150-5



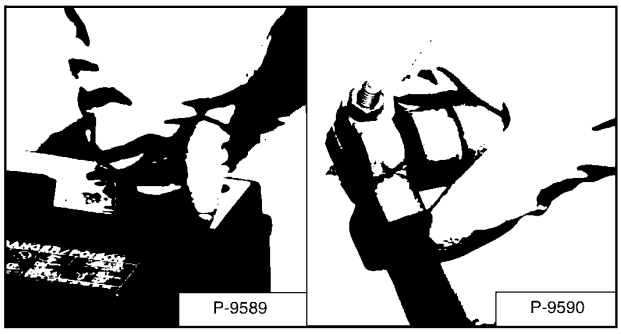
Disconnect the negative (-) battery cable (Item 1) **[Figure 10-150-5]**.

Disconnect the positive (+) battery cable (Item 2) **[Figure 10-150-5]**.

Remove the b attery hold down clamp (Item 3) **[Figure 10-150-5]**.

Remove the battery from the loader.

Figure 10-150-6



Always clean the battery terminals and cable ends when installing a new or used battery **[Figure 10-150-6]**.

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.

Close the tailgate before operating the loader.

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TIGHTEN ALL HARDWARE PER SIZE TO GRADE 5 TORQUE (See TORQUE SPECIFICATIONS FOR BOLTS on Page SPEC-30-1.) UNLESS OTHERWISE SPECIFIED.

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HYDRAULIC SCHEMATIC
MT52 (S/N 523611001 AND ABOVE)
(S/N 523711001 AND ABOVE)

(PRINTED AUGUST 2005)
V-0256legend

LEGEND

(1) RESERVOIR:
Capacity . . . 10,6 Qts. (10 L) (DRY)

(2) HYDRAULIC PUMPS - Gear Type
11.5 GPM (43.5 L/min.) at 3750 Engine RPM

(3) LOAD CHECK VALVE

(4) ORIFICE .059 inch (1.5 mm)

(5) RELIEF VALVE - PORT (WITH ANTICAVITATION VALVE)
See factory bench setting table for calibrated valve settings. These values may not be attainable on the machine due to flow and engine horsepower limitations. 2540 to 2800 (175 to 193 Bar) can be achieved for 1 to 3 seconds on the machine with a proper relief settings.

(6) RELIEF VALVE - MAIN
See factory bench setting table for calibrated valve settings. These values may not be attainable on the machine due to flow and engine horsepower limitations. 2600 to 3000 (179 to 206 Bar) can be achieved for 1 to 3 seconds on the machine with a proper relief settings.

(7) SOLENOID ACTIVATED DIRECTIONAL CONTROL VALVE - Tilt Lock

(8) SOLENOID ACTIVATED DIRECTIONAL CONTROL VALVE - Lift Lock

(9) FILTER - HYDRAULIC (CANISTER)

(10) RELIEF VALVE - Charge Pressure
85 PSI (5.9 Bar)

(11) SWITCH - Charge Pressure - Normally Open

(12) RELIEF/REPLENISHING VALVE
2000 PSI (138 Bar)

(13) VARIABLE CAPACITY DISPLACEMENT BIDIRECTIONAL HYDROSTATIC PUMP

(14) FIXED CAPACITY DISPLACEMENT BIDIRECTIONAL HYDRAULIC/ HYDROSTATIC MOTOR (24 in.^{3}/Rev.)

(15) HYDRAULIC OIL TEMPERATURE SWITCH . . . . . 225-232 degrees F. (108-111 degrees C.)

FACTORY BENCH SETTING		
	PRESSURE	FLOW
(5)	2540 PSI (175 Bar)	10.5 GPM (10 L/min.)
(6)	2900 PSI (200 Bar)	10.5 GPM (10 L/min.)

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

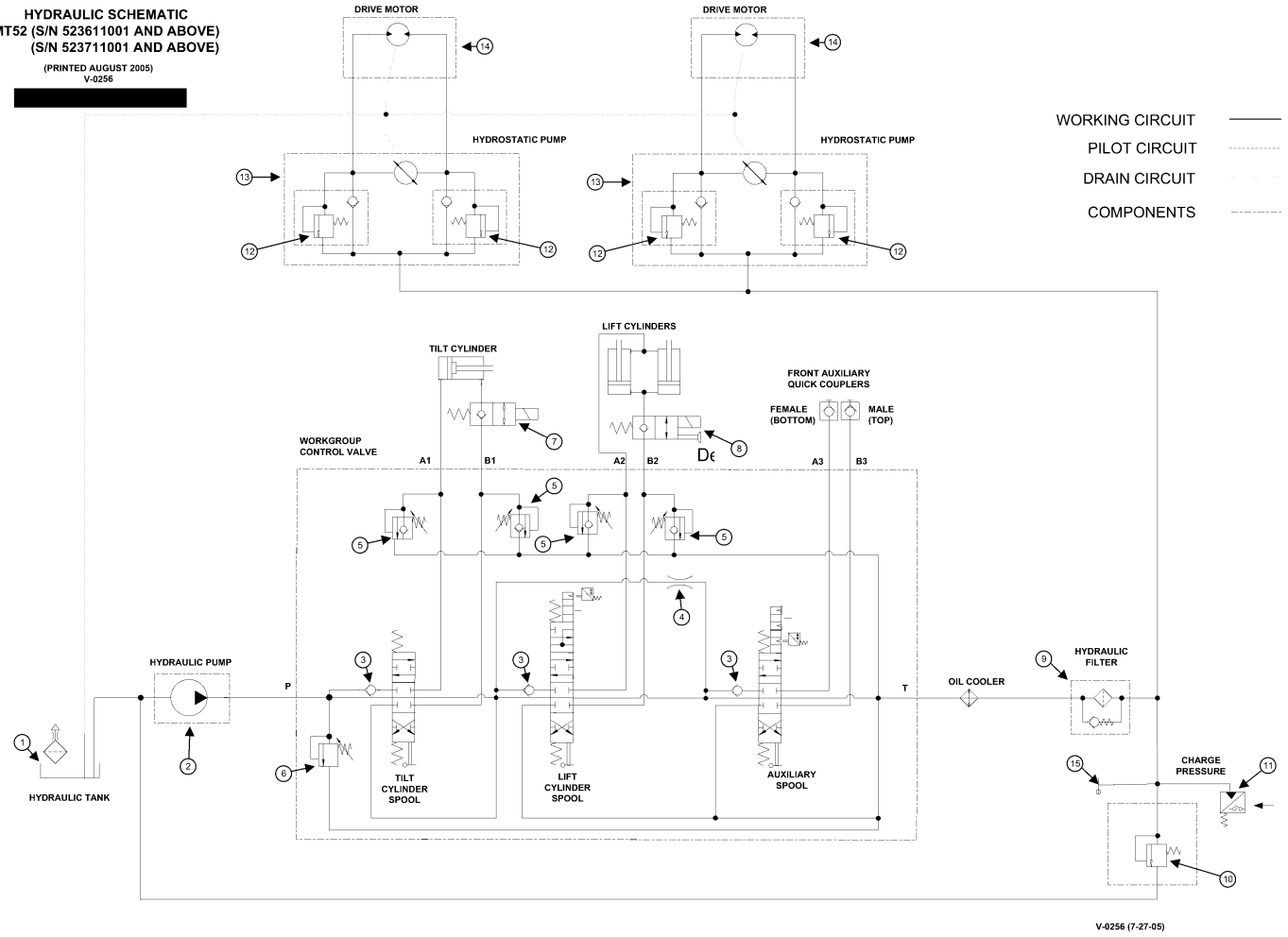
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HYDRAULIC SCHEMATIC
MT52 (S/N 523611001 AND ABOVE)
(S/N 523711001 AND ABOVE)

(PRINTED AUGUST 2005)
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V-0256 (7-27-05)

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GLOSSARY OF HYDRAULIC/HYDROSTATIC SYMBOLS FOR LOADERS

SYMBOL	DESCRIPTION
FLOW LINES and CONNECTIONS	
	WORKING CIRCUITS – Continuous, Solid Line – Working (Main) Line, Return Line (line conducting fluid from working devices to the reservoir) and Feed Line (main line conductor)
	PILOT PRESSURE – Dashed Line – Pilot Line (line which conducts control fluid)
	DRAIN CIRCUITS – Dotted Line – Drain Line (drain or bleed line – line conducting fluid from a component housing to the reservoir)
	COMPONENTS – Long Chain Line – Enclosure outline for several components assembled in one unit
	MECHANICAL CONNECTIONS – Double Line (Shaft, Lever, Piston Rod)
	CONNECTED JUNCTION OF OIL LINES (Flow Line Connection)
	OIL LINES CROSSING (NOT Connected)
	COUPLER – Quick-Acting Coupling (uncoupled, closed by non-return valve)
BASIC and MISCELLANEOUS SYMBOLS	
	RESTRICTION – Line with Fixed Restriction – Affected by Viscosity (property of resistance to flowing fluid)
	VARIABLE ADJUSTMENT RESTRICTION – Regulated or Variable Restriction
	TEMPERATURE CONTROL – (indication of temperature)
	TEMPERATURE INDICATOR – (temperature measurement – thermometer)
	FILTER (strainer or screen) – For fluid conditioning
	VENTED AND FILTERED RESERVOIR (reservoir open to atmosphere)
	OIL COOLER (heat exchanger) – The arrows in the diamond indicate the extraction of heat (heat dissipation)
	PRESSURE SENSOR – Varies electric signal with pressure
	DIFFERENTIAL PRESSURE SWITCH – Switch activates when pressure difference reaches specified level
	PRESSURE SWITCH – Switch activates when pressure reaches specified level
	MUFFLER (silencer) – Reduces noise

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GLOSSARY OF HYDRAULIC/HYDROSTATIC SYMBOLS FOR LOADERS

SYMBOL	DESCRIPTION
	CYLINDER: Equipment to convert hydraulic energy into linear energy and in which the fluid pressure operates alternately in both directions (forward and backward strokes)
	DOUBLE ACTING HYDRAULIC CYLINDER, UNEQUAL DISPLACEMENT - With single piston rod
	DOUBLE ACTING HYDRAULIC CYLINDER, UNEQUAL DISPLACEMENT and CUSHION ON ONE END - With single piston rod
	PUMP: To convert mechanical energy into hydraulic energy
	FIXED CAPACITY DISPLACEMENT HYDRAULIC PUMP - With one direction of flow
	VARIABLE CAPACITY DISPLACEMENT BIDIRECTIONAL HYDRAULIC PUMP - With two directions of flow (bidirectional)
	MOTOR: To convert hydraulic energy into rotary mechanical energy
	FIXED CAPACITY DISPLACEMENT BIDIRECTIONAL HYDRAULIC MOTOR - With two directions of flow (bidirectional)

SYMBOL	DESCRIPTION
	CONTROL MECHANISMS
	CONTROL VALVE WITH DETENT (Holds Valve in Position) - device for maintaining a given position (mechanical)
	CONTROL VALVE ACTIVATED BY A PULL BUTTON (manual)
	CONTROL VALVE ACTIVATED BY A PUSH-PULL BUTTON (manual)
	CONTROL VALVE ACTIVATED BY A LEVER (manual)
	CONTROL VALVE ACTIVATED BY A PEDAL (manual)
	CONTROL VALVE WITH SPRING RETURN (mechanical)
	CONTROL VALVE ACTIVATED BY AN ELECTRIC SOLENOID (electrical)
	CONTROL VALVE ACTIVATED BY PILOT PRESSURE (indirect control, pilot actuated by application of pressure)

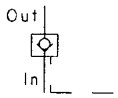
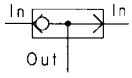
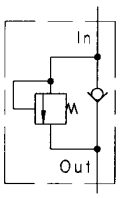
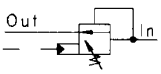
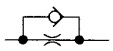
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GLOSSARY OF HYDRAULIC/HYDROSTATIC SYMBOLS FOR LOADERS

SYMBOL	DESCRIPTION
	NON-RETURN VALVE, SHUTTLE VALVE: Valve which allows free flow in one direction only
	NON-RETURN VALVE (Check Valve) - Used as Replenishing Valve, Load Check Valve or Anticavitation Valve - Opens if the Inlet pressure is higher than the Outlet pressure. Often contains internal spring which has NO significant pressure value
	SPRING LOADED VALVE (Bypass Valve) - Opens if the Inlet pressure is greater than the Outlet pressure plus the spring pressure
	PILOT CONTROLLED NON-RETURN VALVE - It is possible to open the valve by pilot pressure
	SHUTTLE VALVE - The Inlet port connected to the higher pressure is automatically connected to the Outlet port while the other Inlet port is closed
	DIRECTIONAL CONTROL VALVE: Valve providing for the opening (fully or restricted) or the closing of one or more flow paths (represented by several squares)
	TWO PORTS and CLOSED FLOW PATHS
	SOLENOID ACTIVATED DIRECTIONAL CONTROL VALVE (Two Position) - controlled by an electric solenoid (with return spring)
	PILOT ACTIVATED DIRECTIONAL CONTROL VALVE (Two Position) - controlled by pressure (with return spring)
	PRESSURE CONTROL VALVE: Valve ensuring the control of pressure
	RELIEF VALVE - When the Inlet pressure overcomes the opposing force of the spring, the valve opens permitting flow from the Outlet port.
	RELIEF/REPLENISHING VALVE or RELIEF/ANTICAVITATION VALVE - When the Inlet pressure overcomes the opposing force of the spring, the valve opens permitting flow from the Outlet port - Allows free flow in the opposite direction
	DUAL PRESSURE RELIEF VALVE - When the inlet pressure overcomes the opposing force of the spring, the valve opens permitting flow from the Outlet port. Pilot pressure provides a second pressure value.
	FLOW CONTROL VALVE: Valve controlling the flow in one or both directions
	ONE WAY RESTRICTOR VALVE (Non-Return Valve with Restriction) - Unit allowing free flow in one direction but restricted flow in the other direction
	TOW VALVE - Normally in closed position

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Workgroup Troubleshooting Chart

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

⚠ WARNING

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

W-2004-1285

PROBLEM	CAUSE
The hydraulic system will not operate.	1, 2, 8, 5, 3, 19
The hydraulic temperature warning light comes ON when hydraulics are operating.	12, 13, 5, 3, 20
Slow hydraulic system action. (Includes Auxiliaries)	1, 8, 4, 7, 17, 12, 5, 3, 6
Hydraulic action is not smooth.	1, 4, 7, 5, 6
Lift arms go up slowly at full engine RPM.	1, 4, 7, 8, 6, 9, 3
The lift arms or Bob-Tach will move when the control levers are in neutral position.	4, 10, 9
The lift arms come down with the lift lever in the neutral position when the engine is running.	4, 10, 9, 11
The lift arms do not raise.	1, 2, 8, 7, 10, 5, 3, 16
Excessive vibration or noise.	14, 1, 6, 19, 22
Auxiliary quick couplers hard to connect or disconnect.	18
Lift Arms do not lower and/or BobTach does not roll out	15, 21

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Workgroup Troubleshooting Chart (Cont'd)

KEY TO CORRECT THE CAUSE
1. The hydraulic fluid level is low or air in the system.
2. The control lever linkage is disconnected.
3. The hydraulic pump has damage.
4. The control lever does not have smooth movement and/or is not returning to neutral position.
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 Spec. Section)
8. Using the loader for more than its rated capacity.
9. Internal leak in the cylinder(s).
10. External leak from the cylinder(s).
11. Damaged lift spool.
12. Excessive auxiliary hydraulics load.
13. Plugged oil cooler. (Air flow restricted)
14. Loose mounting hardware.
15. Lift or tilt lockout circuit or engine or pressure switch circuit failure.
16. Tilt or drive function over relief.
17. Spool not fully stroked.
18. Activate auxiliary control lever in both directions to release pressure.
19. Loose or damaged gear pump to engine coupler. [See Electrical Troubleshooting Chart]
20. Electric cooling fan not operating.
21. Refer to Electrical Service Manual
22. Check Charge Pressure Relief setting

Hydraulic Function Troubleshooting

NOTE: The orifice between the lift and auxiliary valve sections provides flow to the auxiliary while the lift is being actuated. The lift function will be reduced at low flow conditions such as low engine speed.

* Engine OFF - Always engage parking brake.

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CYLINDER (LIFT)

Checking The Lift Cylinder(s)

Fully lower the lift arms.

Stop the engine.

Engage the park brake.

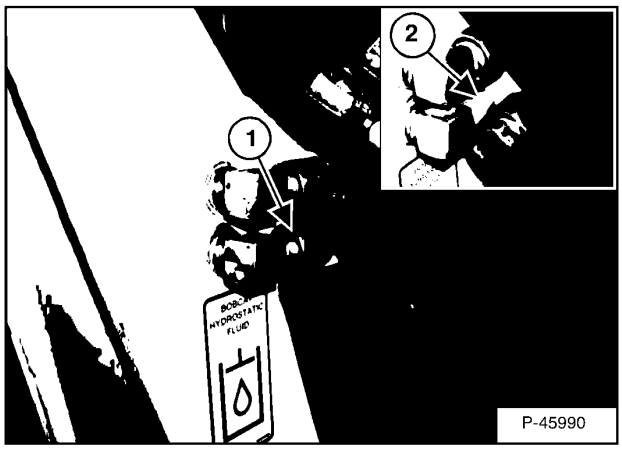
Pull the lift arm by-pass control knob and move the lift lever back and forth to release the hydraulic pressure.

⚠ WARNING

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

W-2145-0290

Figure 20-20-1



Check only one cylinder at a time.

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

Install a plug in the tubeline and tighten the plug.

Start the engine and push the joystick forward until system relief pressure is reached.

There should be no oil leaking from the fitting from the base end port.

If there is leakage from the open base end port of the lift cylinder, remove the lift cylinder for repair.

Figure 20-20-2



Disconnect the hose (Item 1) **[Figure 20-20-2]** from the right lift cylinder base end port fitting.

Install a cap on the fitting and tighten the cap.

Start the engine and push the lift lever forward and until system relief pressure is reached.

There should be no oil leaking from the hose from the base end port.

If there is leakage from the hose on the open base end port of the lift cylinder, remove the right lift cylinder for repair.

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Removal And Installation

Engage the park brake.

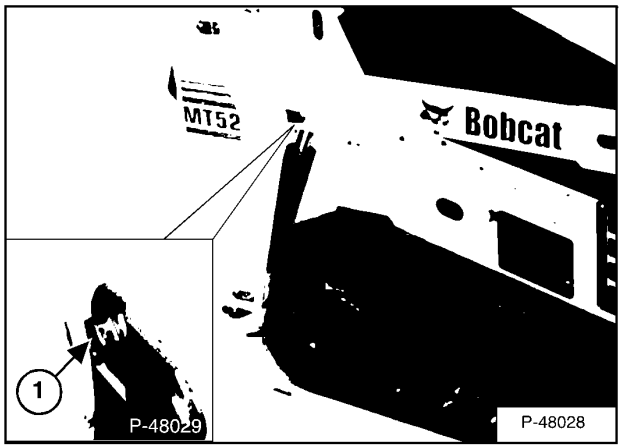
Figure 20-20-3



Raise the lift arms and install jackstands under the lift arms **[Figure 20-20-3]**.

Pull the lift arm by-pass control knob and move the lift lever back and forth to release the hydraulic pressure.

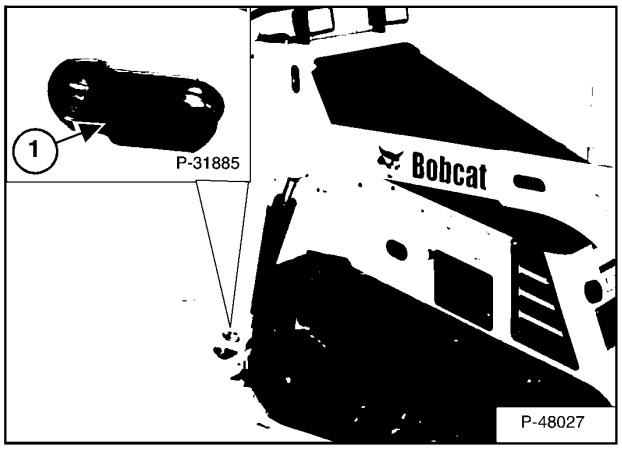
Figure 20-20-4



Remove retainer screw, retainer, and the rod pin (Item 1) **[Figure 20-20-4]** from the lift cylinder.

Installation: Tighten the screw to 15- 20 ft.-lb. (20-27 N•m) torque.

Figure 20-20-5

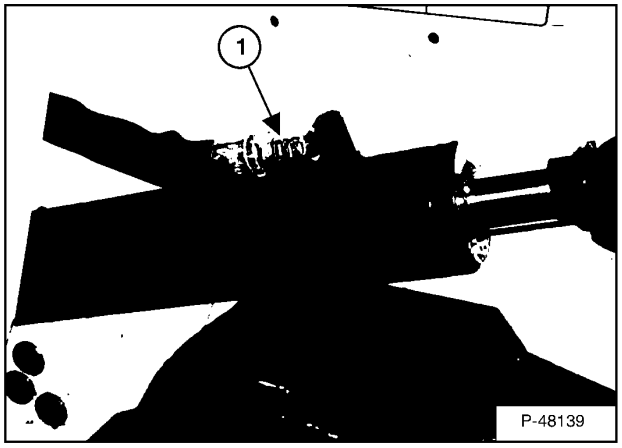


Remove the retainer screw, retainer, and the base pin (Item 1) **[Figure 20-20-5]** from the lift cylinder.

Lower the rod end of the cylinder to the track.

Installation: Tighten the screw to 15- 20 ft.-lb. (20-27 N•m) torque.

Figure 20-20-6



Mark the hoses for correct installation.

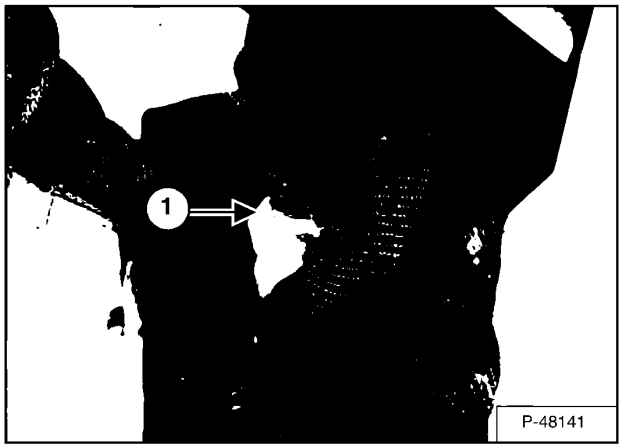
Disconnect the hose (Item 1) **[Figure 20-20-6]** from the rod end of the lift cylinder.

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Removal And Installation (Cont'd)

Figure 20-20-7



Mark the hoses for correct installation.

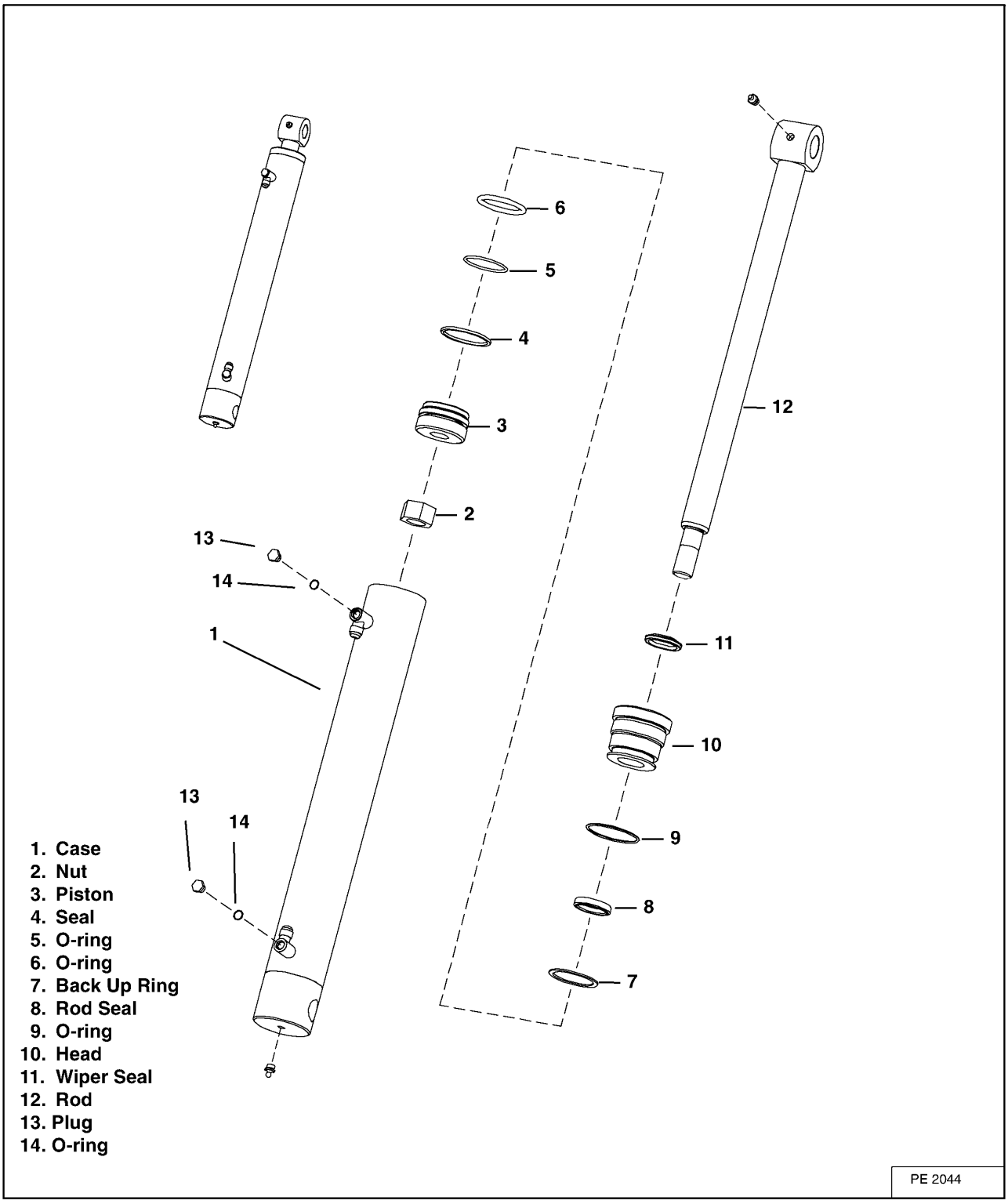
Disconnect the hose (Item 1) **[Figure 20-20-7]** from the base end of the cylinder.

Remove the cylinder from the loader.

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Parts Identification



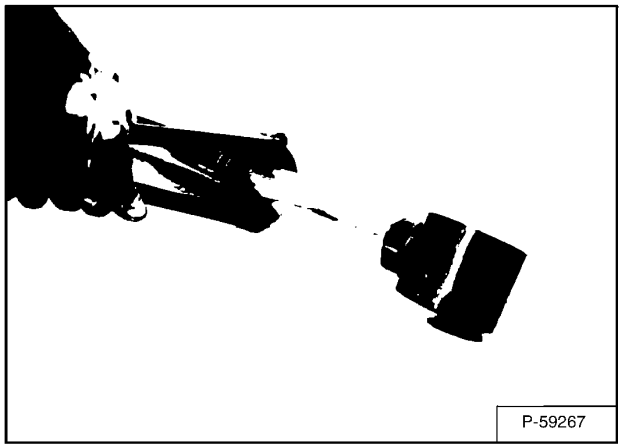
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CYLINDER (LIFT) (CONT'D)

Disassembly And Assembly

Figure 20-20-8



Use the following tools to disassemble and assemble the cylinder:

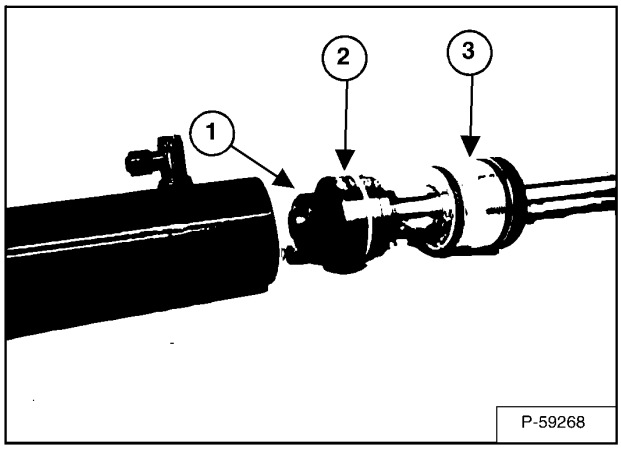
MEL1074 - O-ring Seal Hook
MEL1396 - Seal Installation Tool
MEL1033 - Rod Seal Installation Tool
Piston Ring Compressor
Spanner Wrench

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 20-20-8]**.

Figure 20-20-9



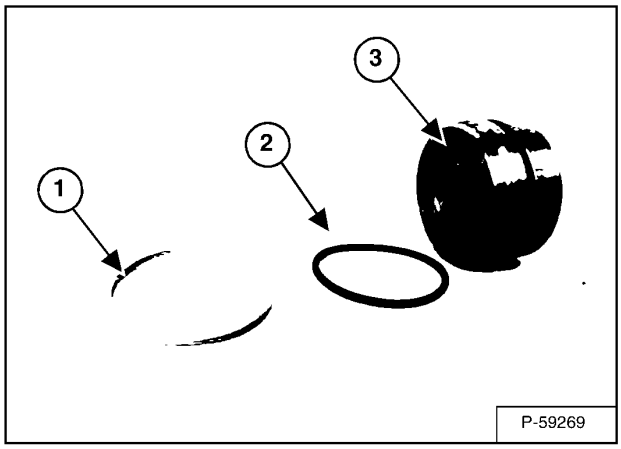
Remove the head and the rod assembly from the cylinder **[Figure 20-20-9]**.

Put the rod end in a vise.

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

Installation: **Lift:** Tighten the nut to 300 ft.-lb. (407 N•m) torque. Apply light grease to the piston before assembly.

Figure 20-20-10



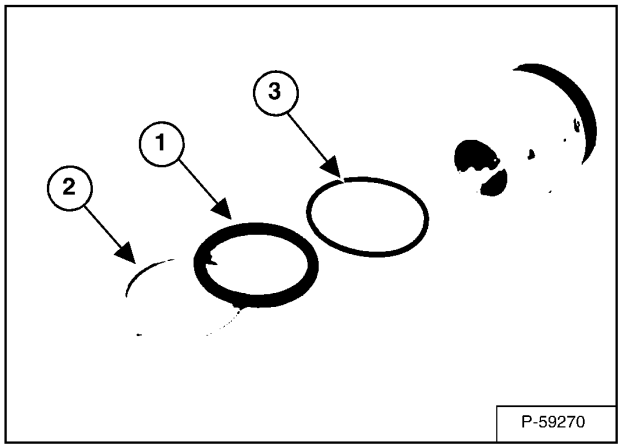
Remove the seal (Item 1) and O-ring (Item 2) from the piston (Item 3) **[Figure 20-20-10]**.

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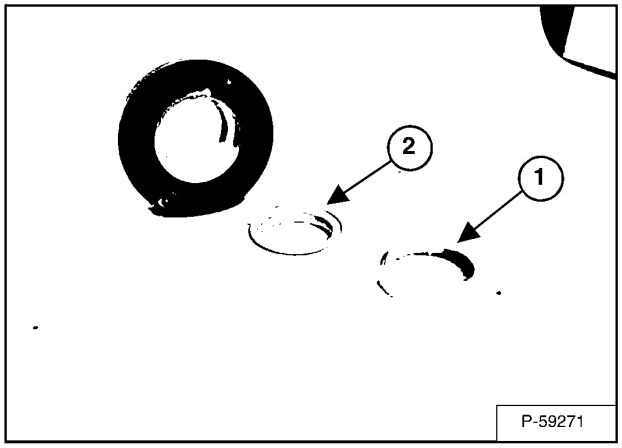
Disassembly And Assembly (Cont'd)

Figure 20-20-11



Remove the thick O-ring (Item 1) and the back-up washer (Item 2) from the groove in the head. Remove the thin O-ring (Item 3) **[Figure 20-20-11]**.

Figure 20-20-12



Remove the wiper seal (Item 1), and the rod seal (Item 2) **[Figure 20-20-12]**.

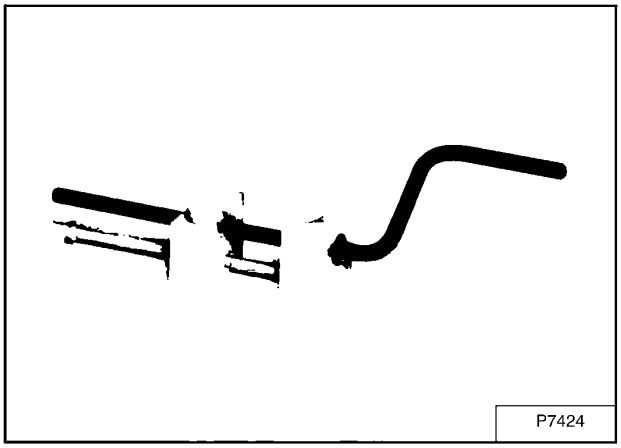
Wash the cylinder parts in solvent and air dry them.

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

Always install new O-rings and seals during assembly.

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

Figure 20-20-13

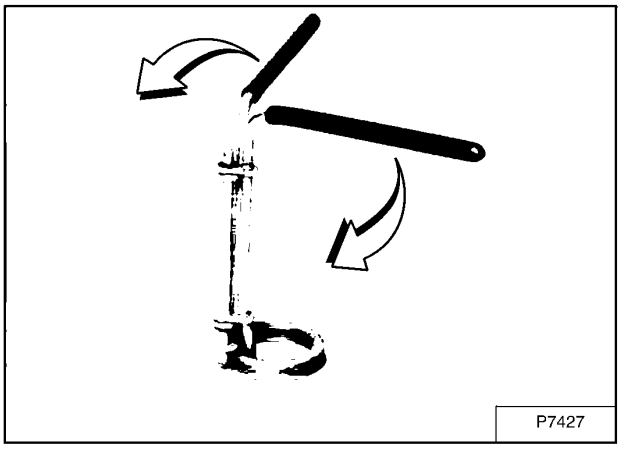


Install the new seal on the tool and slowly stretch it until it fits the piston **[Figure 20-20-13]**.

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

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

Figure 20-20-14



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

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

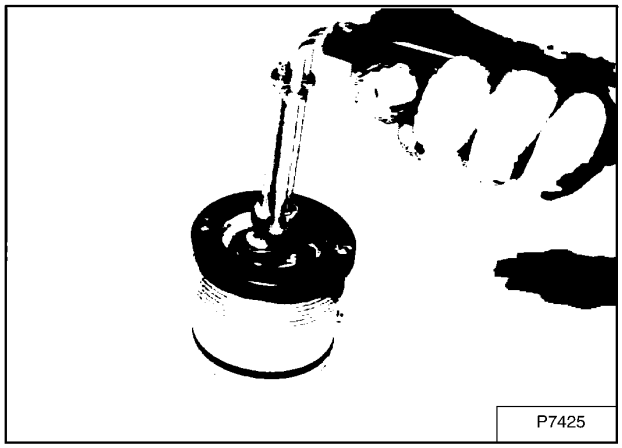
Rotate the handles to collapse the rod seal.

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Disassembly And Assembly (Cont'd)

Figure 20-20-15



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

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

Assemble the cylinder(s) in the reverse order.

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CYLINDER (TILT)

Checking The Tilt Cylinder

Fully lower the lift arms and roll the Bob-Tach back fully.

Engage the park brake.

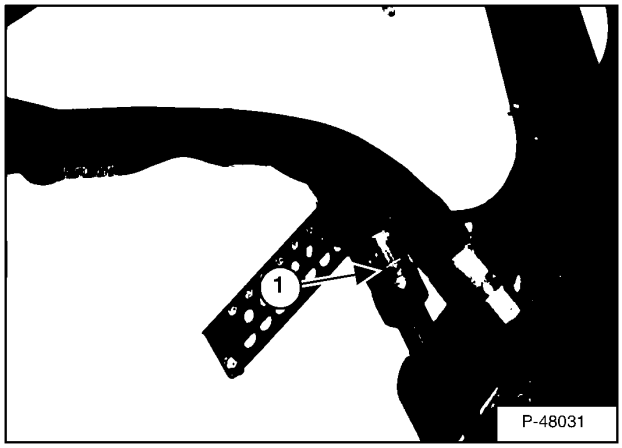
Stop the engine.

⚠ WARNING

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

W-2145-0290

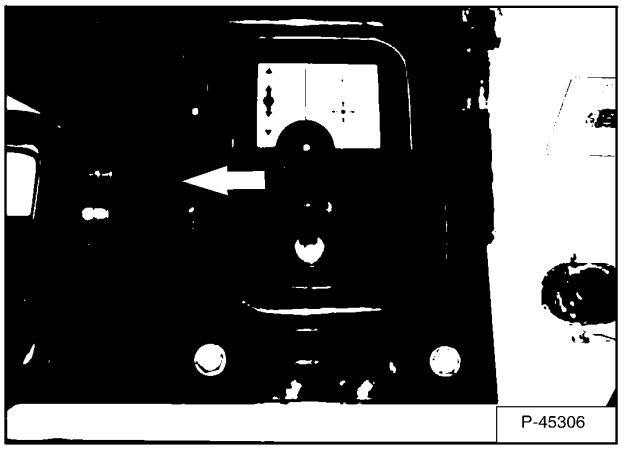
Figure 20-21-1



Disconnect the hose (Item 1) **[Figure 20-21-1]** from the tilt cylinder base end port.

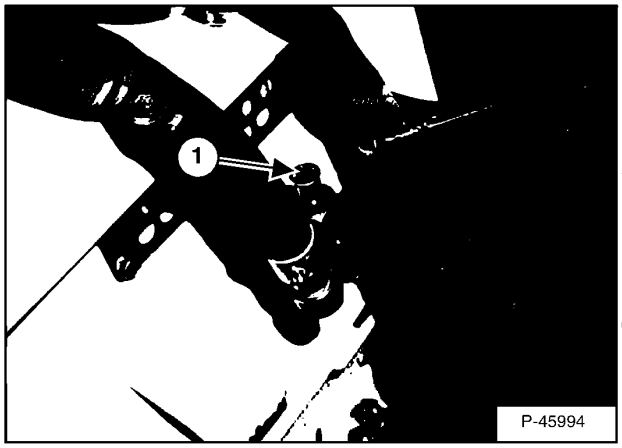
Install a plug in the hose and tighten the plug.

Figure 20-21-2



Start the engine and move the joystick to the left until relief pressure is reached **[Figure 20-21-2]**.

Figure 20-21-3



There should be no oil leaking from the open base end port (Item 1) **[Figure 20-21-3]**.

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

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CYLINDER (TILT) (CONT'D)

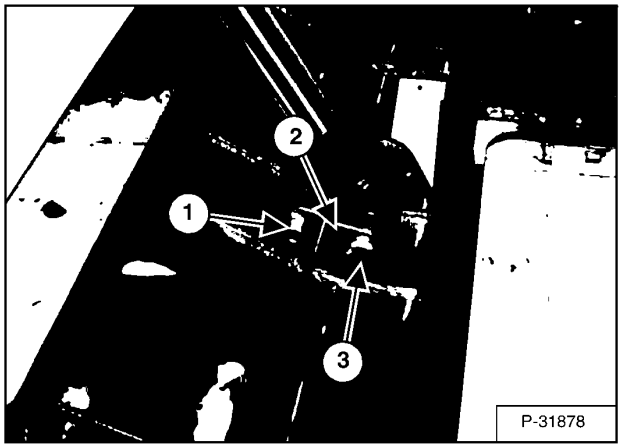
Removal And Installation

Tilt the Bob-Tach fully forward until it rests on the floor.

Stop the engine.

Engage the park brake.

Figure 20-21-4

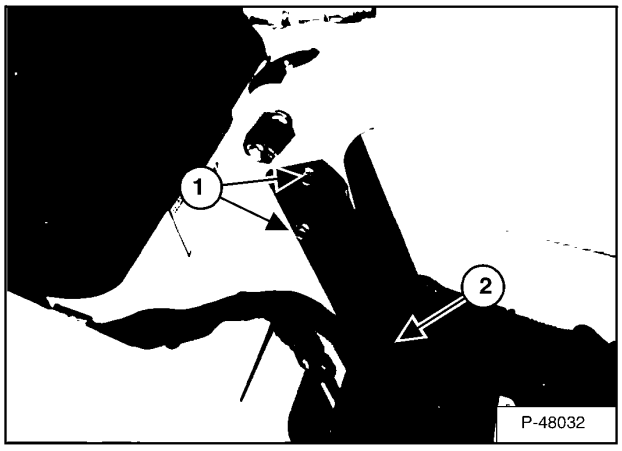


Remove the bolt (Item 1) and retainer (Item 2) **[Figure 20-21-4]** from the Bob-Tach.

Installation: Tighten the bolt to 15-20 ft.-lb. (20-27 N•m) torque.

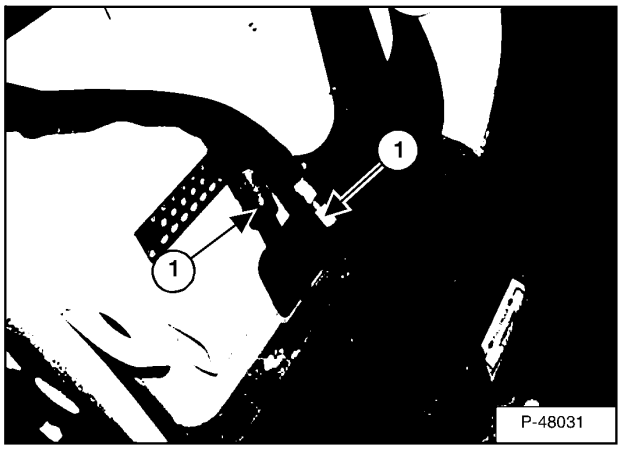
Remove pivot pin (Item 3) **[Figure 20-21-4]** from the Bob-Tach.

Figure 20-21-5



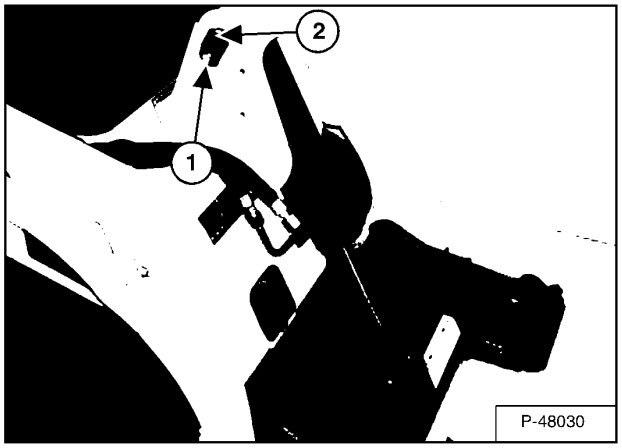
Remove the two bolts (Item 1) and the shield bracket (Item 2) **[Figure 20-21-5]**.

Figure 20-21-6



Remove the hoses (Item 1) **[Figure 20-21-6]** from the tilt cylinder fittings.

Figure 20-21-7



Remove the bolt (Item 1) and retainer (Item 2) **[Figure 20-21-7]** from the base end of the tilt cylinder.

Installation: Tighten the bolt to 15-20 ft.-lb. (20-27 N•m) torque.

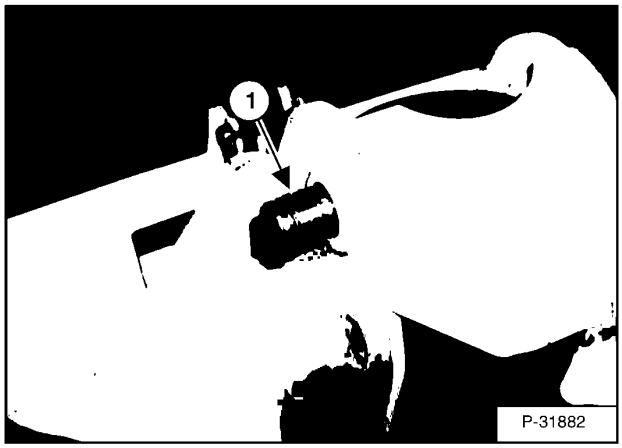
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CYLINDER (TILT) (CONT'D)

Removal And Installation (Cont'd)

Figure 20-21-8



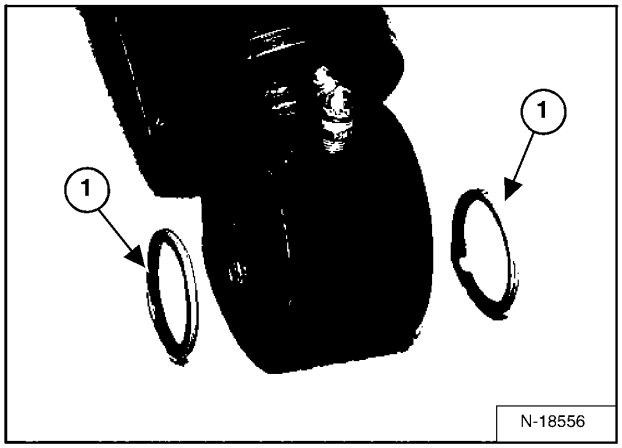
NOTE: Support the tilt cylinder before removing pivot pin.

Remove the pivot pin (Item 1) **[Figure 20-21-8]** from the tilt cylinder base end and the lift arm frame.

Remove the tilt cylinder from the loader.

Rod End Pivot Pin Bushing And Seal Replacement

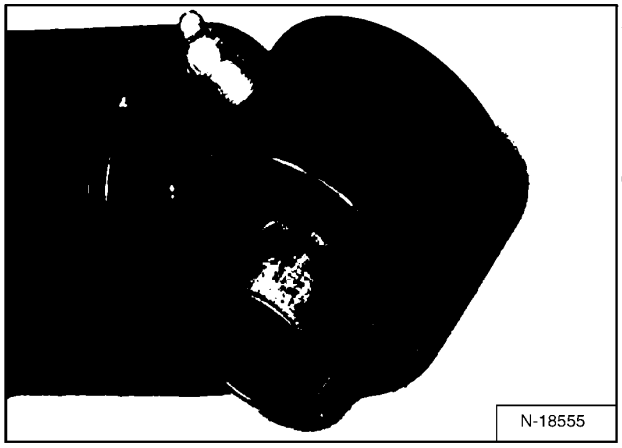
Figure 20-21-9



Remove the rod end of the cylinder from the Bob-Tach. (See Removal And Installation on Page 20-21-2.)

Use a seal pick to remove the seals (Item 1) **[Figure 20-21-9]** on both sides of the pivot bushing.

Figure 20-21-10



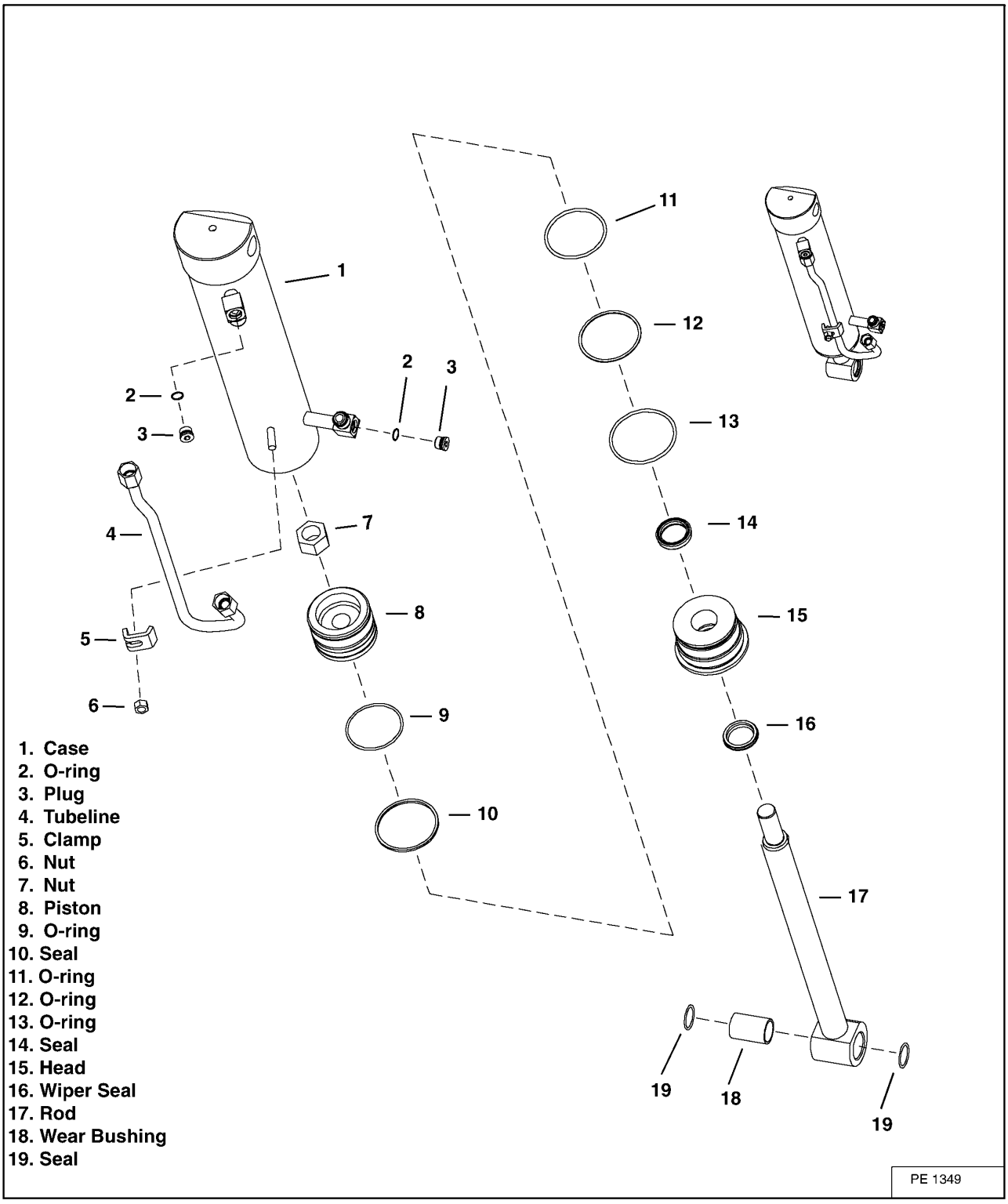
Remove and replace bushing with a driver tool and hammer **[Figure 20-21-10]**.

Reverse the removal procedure to install the pivot pin bushing and seals.

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Parts Identification



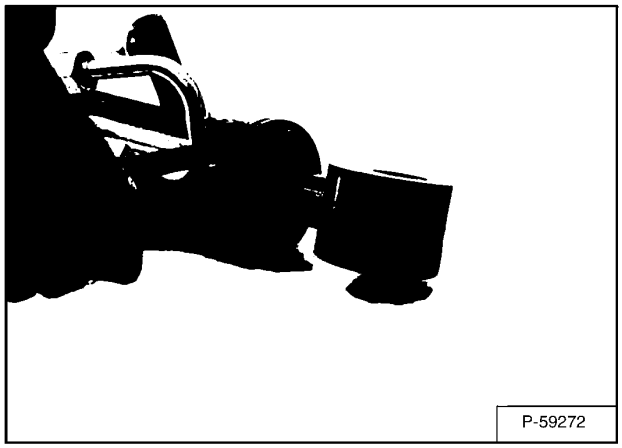
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CYLINDER (TILT) (CONT'D)

Disassembly And Assembly

Figure 20-21-11



Use the following tools to disassemble and assemble the cylinder:

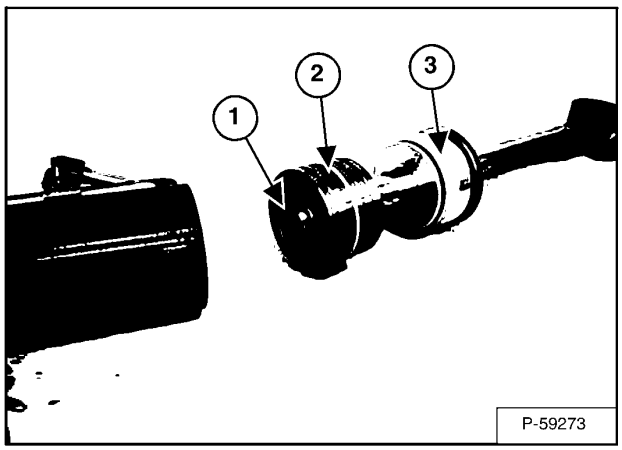
MEL1074 - O-ring Seal Hook
MEL1396 - Seal Installation Tool
MEL1033 - Rod Seal Installation Tool
Piston Ring Compressor
Spanner Wrench

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

Put the base end of the cylinder in a vise.

Use a spanner wrench to loosen the head **[Figure 20-21-11]**.

Figure 20-21-12



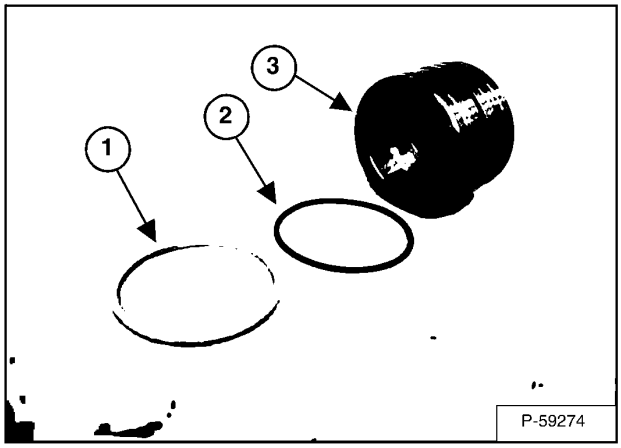
Remove the head and the rod assembly from the cylinder **[Figure 20-21-12]**.

Put the rod end in a vise.

Remove the nut (Item 1), piston (Item 2) and head (Item 3) **[Figure 20-21-12]**.

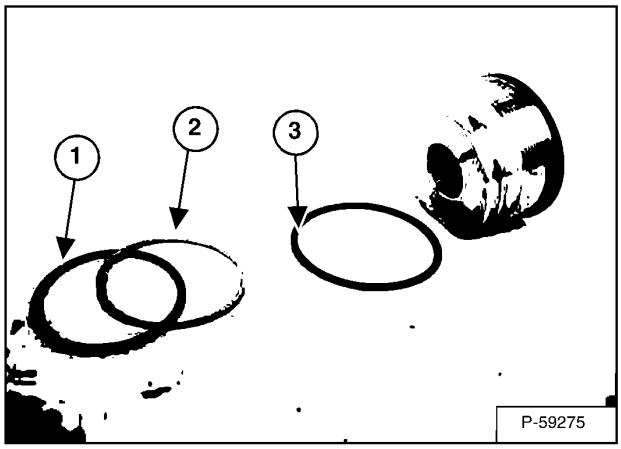
Installation: **Tilt:** Tighten the nut to 300 ft.-lb. (407 N•m) torque. Apply light grease to the piston before assembly.

Figure 20-21-13



Remove the seal (Item 1) and O-ring (Item 2) from the piston (Item 3) **[Figure 20-21-13]**.

Figure 20-21-14



Remove the thick O-ring (Item 1) and the back-up washer (Item 2) from the groove in the head. Remove the thin O-ring (Item 3) **[Figure 20-21-14]**.

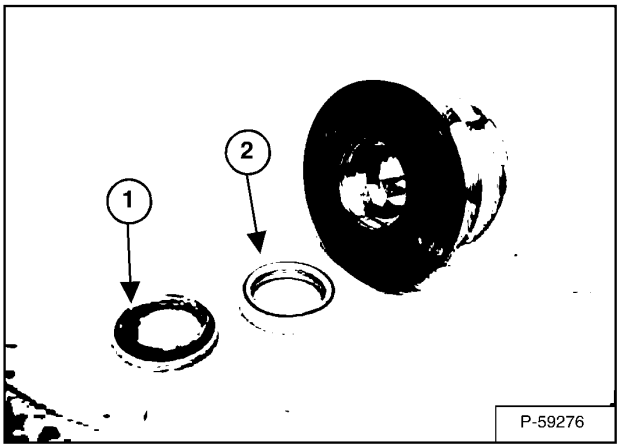
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CYLINDER (TILT) (CONT'D)

Disassembly And Assembly (Cont'd)

Figure 20-21-15



Remove the wiper seal (Item 1) and the rod seal (Item 2) **[Figure 20-21-15]**.

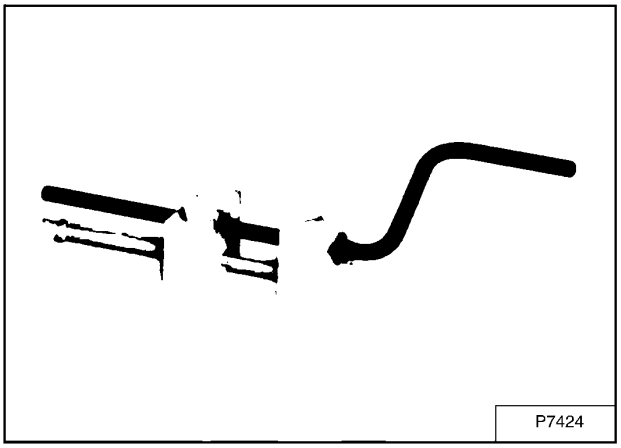
Wash the cylinder parts in solvent and air dry them.

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 20-21-16

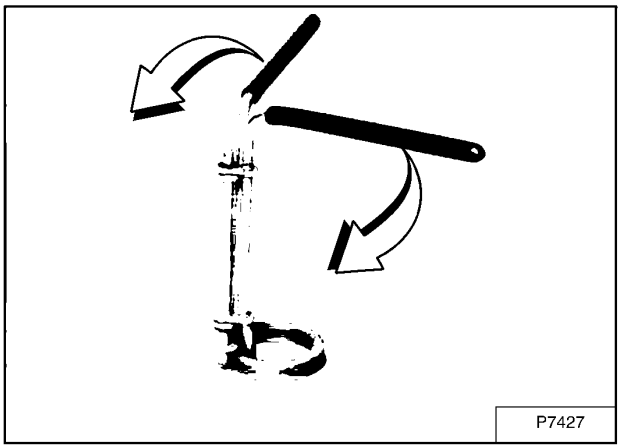


Install the new seal on the tool and slowly stretch it until it fits the piston **[Figure 20-21-16]**.

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

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

Figure 20-21-17

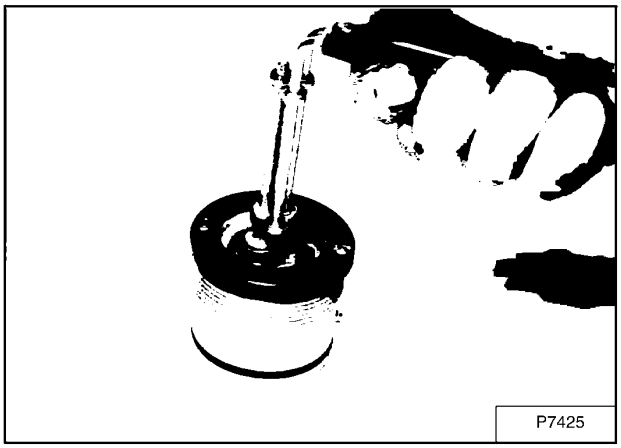


Install the rod seal on the rod seal tool **[Figure 20-21-17]**.

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

Rotate the handles to collapse the rod seal.

Figure 20-21-18



Install the rod seal in the head **[Figure 20-21-18]**.

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

Assemble the cylinder(s) in the reverse order.

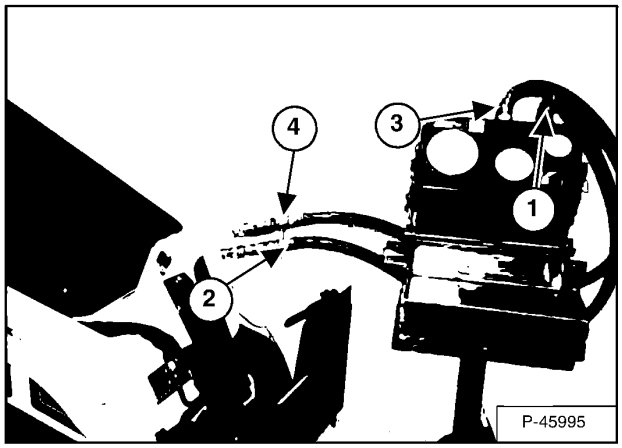
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MAIN RELIEF VALVE

Checking (Hydraulic Control Valve)

Figure 20-30-1



The tools listed will be nee ded to do the fol lowing procedure:

MEL10003 - Hydraulic Tester
MEL10006 - Hydraulic Test Kit

Turn the engine off.

Move the auxiliary hydraulic lever forward and back to release hydraulic pressure. Return lever to neutral position.

IMPORTANT

When the engine is running during service, the steering lever and hydraulic control levers must be in neutral and the parking brake engaged.

W-2482-1003

Connect the IN port (Item 1) of the hydraulic tester to the bottom (female) quick coupler on t he loader (Item 2) **[Figure 20-30-1]**.

Connect the OUT port (Item 3) of the hy draulic tester to the top (male) quick coupler on the loader (Item 4) **[Figure 20-30-1]**.

IMPORTANT

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

I-2024-0284

⚠ 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 no t received immediately.

W-2145-0290

⚠ WARNING

AVOID INJURY OR DEATH

When operating the machine:

- **Operate only from the operator's position at the rear of the loader.**
- **Always keep your hands on the controls.**
- **Stay away from the tracks.**

W-2407-0801

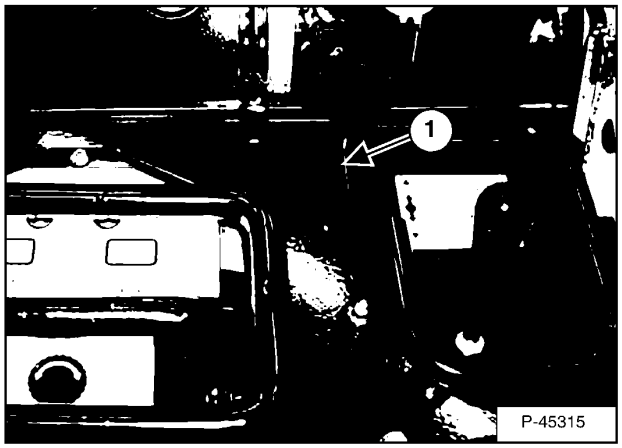
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MAIN RELIEF VALVE (CONT'D)

Checking (Hydraulic Control Valve) (Cont'd)

Figure 20-30-2



Put the controls in neutral position and engage parking brake.

Start the engine and run at low idle.

Push the front auxiliary hydraulics lever (Item 1) **[Figure 20-30-2]** forward to give the front quick couplers a constant flow of fluid. Run the engine until the hydraulic fluid is at 120°F (49°C).

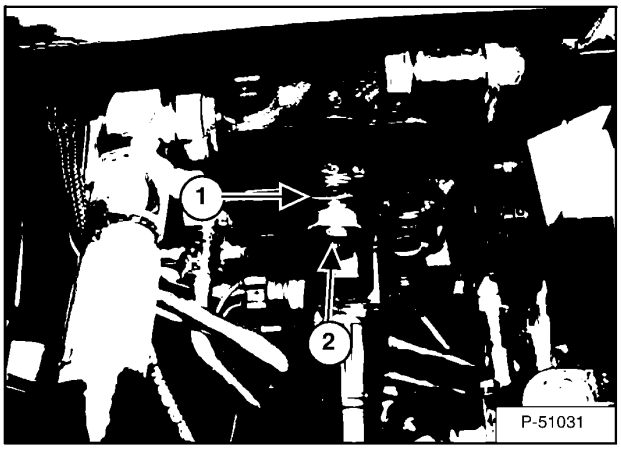
To release from continuous operation, pull the front auxiliary hydraulics lever (Item 1) **[Figure 20-30-2]** back to the neutral position.

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

The free flow should be approximately 11.5 GPM (43.5 L/min.) @ 3750 RPM @ 95.5% efficiency. Quickly turn the restrictor control on the tester until the highest pressure is obtained before the engine shuts off. The factory bench setting pressure for the main relief is 2900 PSI+/- 50 PSI @ 10.5 GPM. This is not achievable on the machine due to engine horsepower and flow limitations.

NOTE: At least 2600 PSI can be achieved on the machine for 1 to 3 seconds with a proper relief setting.

Figure 20-30-3



If the pressure is not correct, adjust the main relief valve. Loosen the jam nut (Item 1) **[Figure 20-30-3]**.

Turn the adjusting screw (Item 2) **[Figure 20-30-3]** clockwise to increase the pressure or counterclockwise to decrease the pressure.

Turn the adjusting screw to the correct pressure.

Tighten the jam nut.

Retest the main relief valve after adjustment.

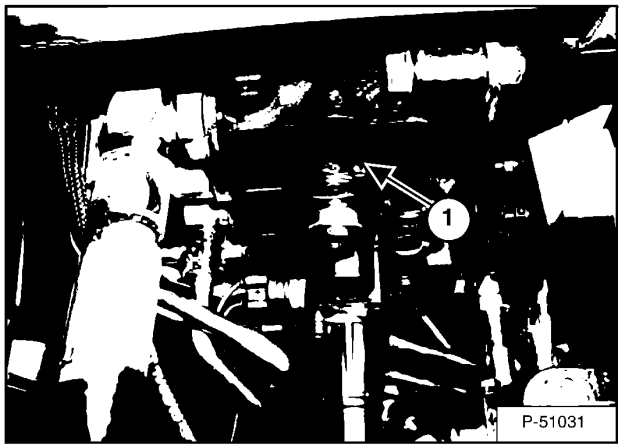
NOTE: If the correct pressure can not be reached, replace the main relief valve. Check the pressure setting of the new relief valve.

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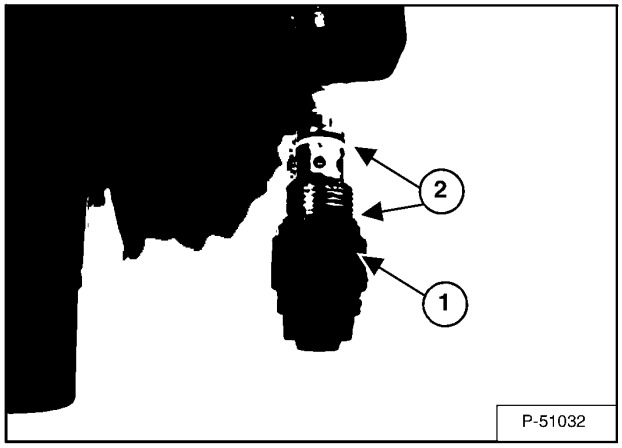
Removal And Installation (Hydraulic Control Valve)

Figure 20-30-4



Clean the area around the control valve. Loosen and remove the main relief valve (Item 1) **[Figure 20-30-4]**.

Figure 20-30-5



Clean the main relief valve (Item 1) **[Figure 20-30-5]** in clean solvent. Use air pressure to dry the valve.

Inspect the O-rings (Item 2) **[Figure 20-30-5]** on the main relief valve. Replace if needed. Check the pressure again. (See Checking (Hydraulic Control Valve) on Page 20-30-1.)

Installation: Tighten the main relief valve to 31 ft.-lb. (42 N•m) torque.

IMPORTANT

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

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PORT RELIEF VALVES

Checking The Port Relief Valves (Lift)

NOTE: Do the following procedure only after the main relief valve has been checked for correct operating pressure. The main relief valve is set at a higher pressure. The port relief valves are set at a lower pressure for the lift and tilt cylinders.

Use the following procedure to check the port relief valves.

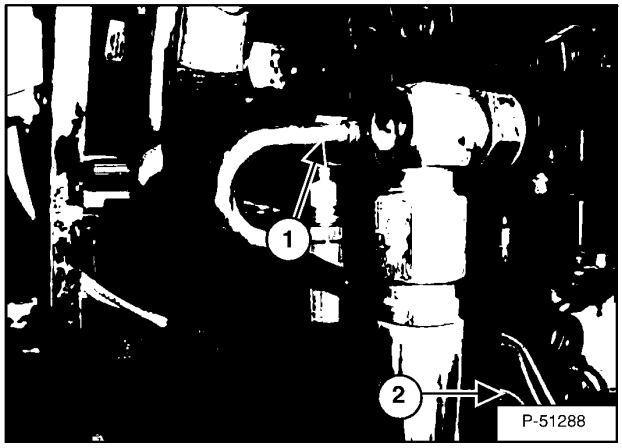
Remove the r everse stop panel (See Removal And Installation on Page 50-80-1.)

Remove Tailgate Striker (See Tailgate Striker Removal And Installation on Page 50-30-2.)

Lower the lift arms to the ground.

Put the controls in neutral position and engage parking brake.

Figure 20-31-1



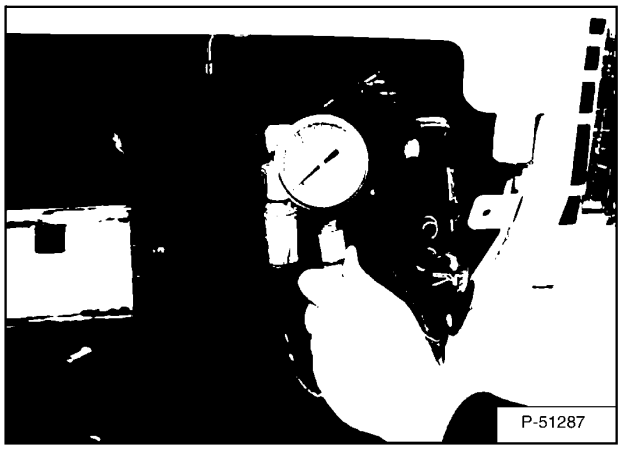
Clean the ar ea around the fit tings on the main control valve and remove the lift tubeline (Item 1) **[Figure 20-31-1]** from the fitting.

⚠ WARNING

When the engine is running during service, the steering levers and hydraulic control levers must be in neutral and the parking brake engaged. The Operation Mode Selector Lever must be fully engaged.

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Figure 20-31-2



Install a 5000 PSI (34475 bar) pressure gauge on the main control valve where you removed the lift tubeline in **[Figure 20-31-1]**.

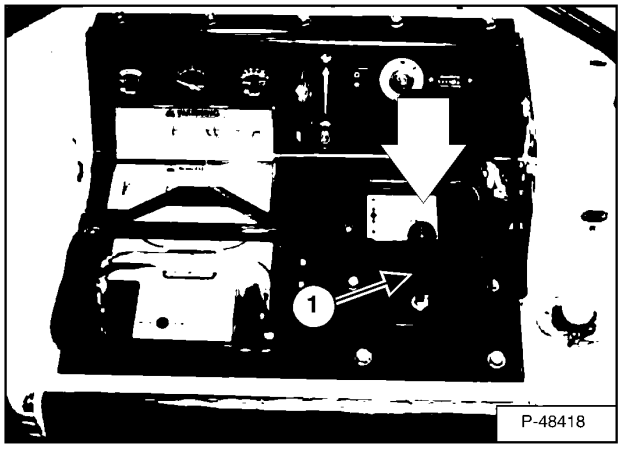
Cap the fitting on the lift lock block (Item 2) **[Figure 20-31-1]** where the lift tubeline was attached.

Secure the gauge during the test **[Figure 20-31-2]** .

Start the engine.

Run the engine at full engine speed.

Figure 20-31-3



Slowly pull the hydraulic control lever (Item 1) **[Figure 20-31-3]** backward until you hear the hydraulics go ov er relief. Record the pressure.

The port relief valve has a pressure setting of 2700 PSI (18616 bar) @ high idle.

NOTE: 2700 PSI can only be reached momentarily.

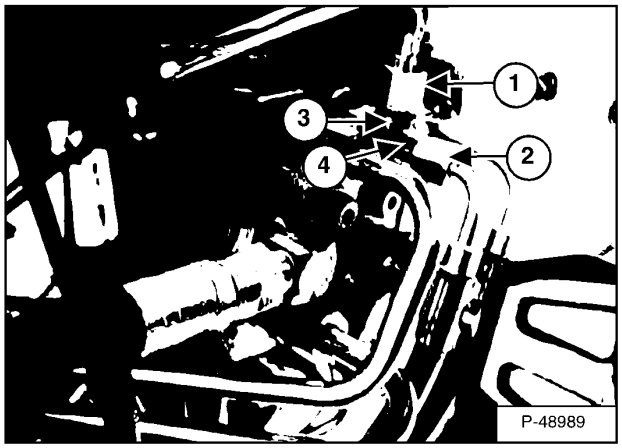
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PORT RELIEF VALVES (CONT'D)

Checking The Port Relief Valves (Lift) (Cont'd)

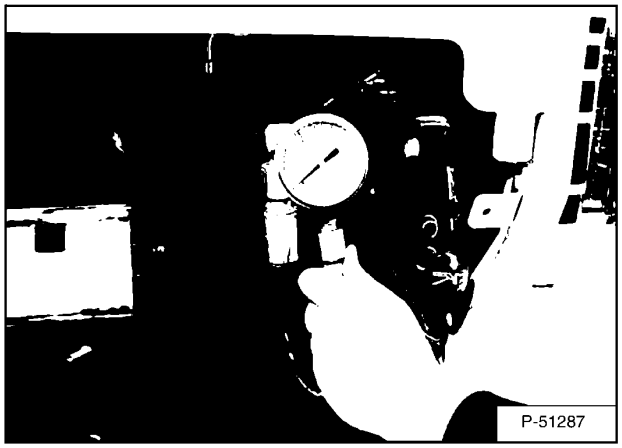
Figure 20-31-4



Disconnect and cap the lift tubeline (Item 1). Cap the fitting (Item 3) **[Figure 20-31-4]**.

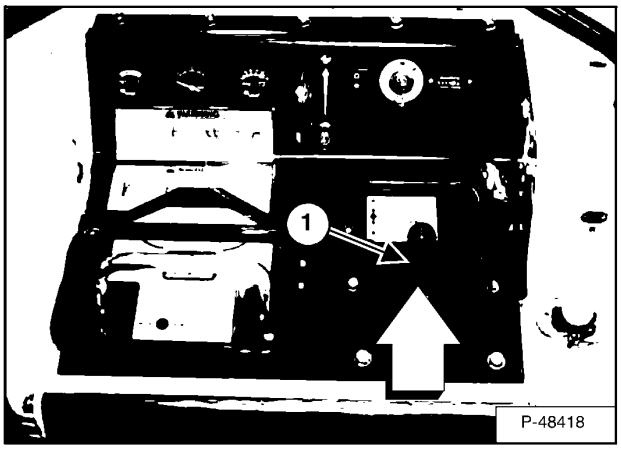
Disconnect and cap the lift hose (Item 2) and connect a 5,000 PSI (34475 bar) pressure gauge to the fitting (Item 4) **[Figure 20-31-4]**.

Figure 20-31-5



Secure the gauge during the test **[Figure 20-31-5]**.

Figure 20-31-6



Start the engine.

Run the e ngine at full engine speed. Slowly push the hydraulic control lever (Item 1) **[Figure 20-31-6]** forward until you hear the hydraulics go over relief. Record the pressure.

NOTE: Do not push the hydraulic control lever all the way forward to the float position.

The port relief valve has a pressure setting of 2700 PSI (18616 bar) @ high idle.

NOTE: 2700 PSI can only be reached momentarily.

Remove pressure gauge and install rod end hose and tubeline to main control valve.

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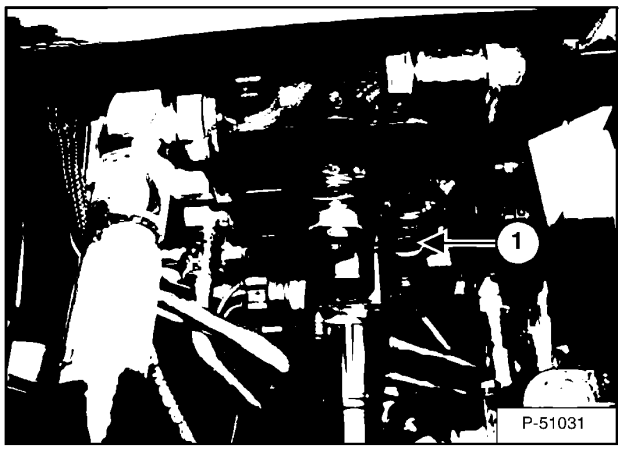
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PORT RELIEF VALVES (CONT'D)

Removal And Installation (Lift)

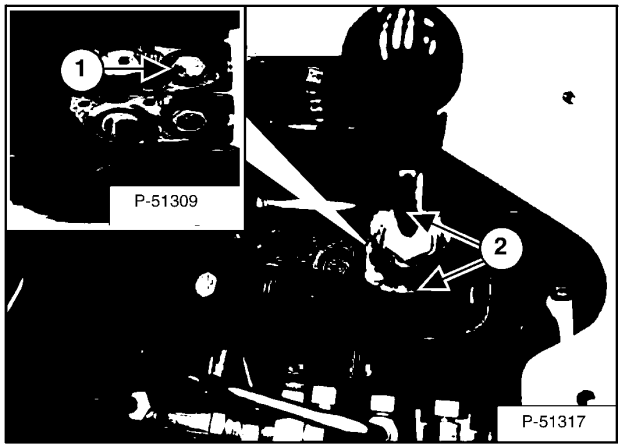
Remove the control panel. (See Removal and Installation on Page 50-50-1.)

Figure 20-31-7



Clean the area around the control valve. Loosen and remove the base port relief valve (Item 1) **[Figure 20-31-7]**.

Figure 20-31-8

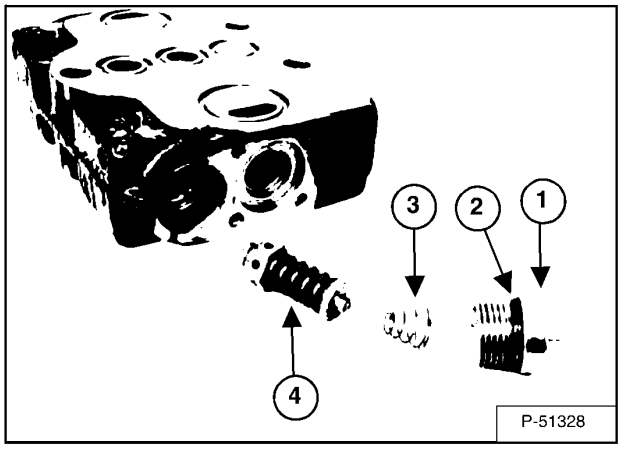


Remove the control lever and boot (Item 2) **[Figure 20-31-8]**. (See Disassembly and Assembly on Page 20-40-7.)

Remove the rod port relief valve (Item 1) **[Figure 20-31-8]**

NOTE: The valve section is removed for visual clarity only.

Figure 20-31-9



Remove the cap (Item 1), O-ring (Item 2), spring (Item 3), and poppet valve (Item 4) **[Figure 20-31-9]** from the valve section.

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

NOTE: The relief valve assemblies are not adjustable.

Install new relief spool seat, relief spool, spring, washer and port relief cap and ti ghten. Check the pressure again. (See Checking The Port Relief Valves (Lift) on Page 20-31-1.)

Installation: Tighten the port relief cap to 17.7 ft.-lb. (24 N•m) torque.

Reverse the removal procedure to install the lift valve.

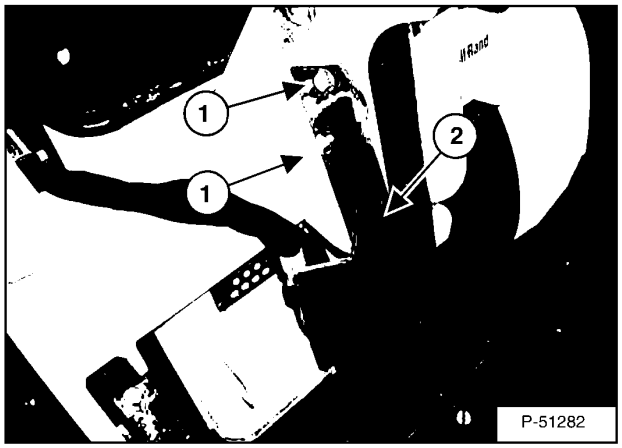
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PORT RELIEF VALVES (CONT'D)

Checking The Port Relief Valves (Tilt)

Figure 20-31-10



NOTE: Do the following procedure only after the main relief valve has been checked for correct operating pressure, and the hydraulic oil has reached 100-140°F (38-49°C).

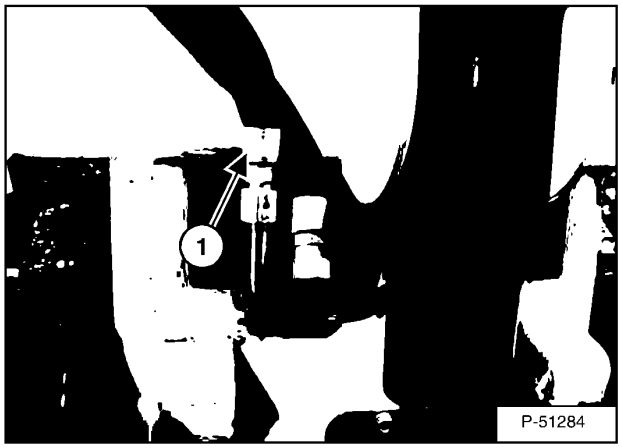
Use the following procedure to check the port relief valves.

Lower the lift arms to the ground and tilt fully retracted.

Put the controls in neutral position and engage parking brake.

Remove the two screws (Item 1) and shield bracket (Item 2) **[Figure 20-31-10]**.

Figure 20-31-11



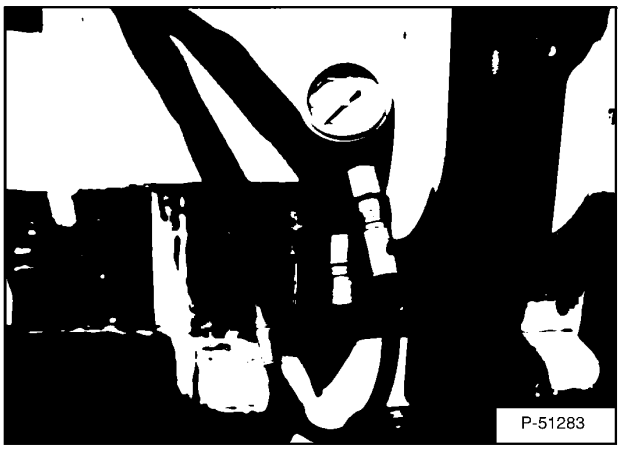
Clean the area around the fittings on the tilt cylinder and remove the base end hose (Item 1) **[Figure 20-31-11]** from the fitting.

⚠ WARNING

When the engine is running during service, the steering levers and hydraulic control levers must be in neutral and the parking brake engaged. The Operation Mode Selector Lever must be fully engaged.

W-2414-1201

Figure 20-31-12



Install a 5000 PSI (34475 bar) pressure gauge on the base end hose and cap the base end cylinder fitting **[Figure 20-31-12]**.

Secure the gauge during the test **[Figure 20-31-12]** .

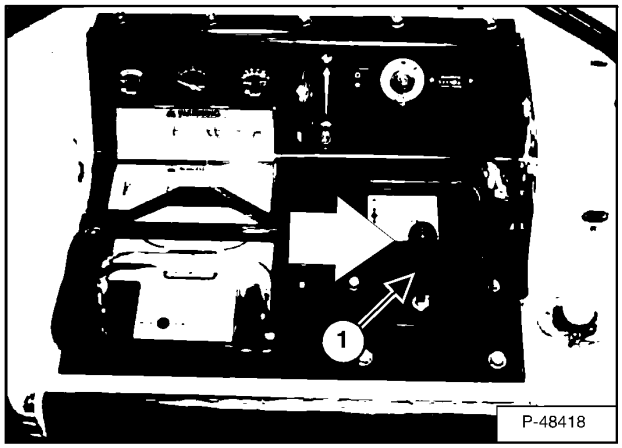
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PORT RELIEF VALVES (CONT'D)

Checking The Port Relief Valves (Tilt) (Cont'd)

Figure 20-31-13



Start the engine.

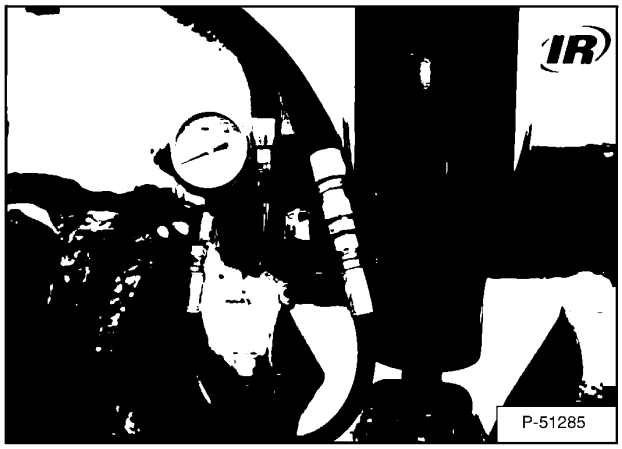
Run the engine at full engine speed.

Slowly push the hydraulic control lever (Item 1) **[Figure 20-31-13]** to the right until you hear the hydraulics go over relief. Record the pressure.

The port relief valve has the pressure setting of 2700 PSI (18616 bar) @ high idle.

NOTE: 2700 PSI can only be reached momentarily.

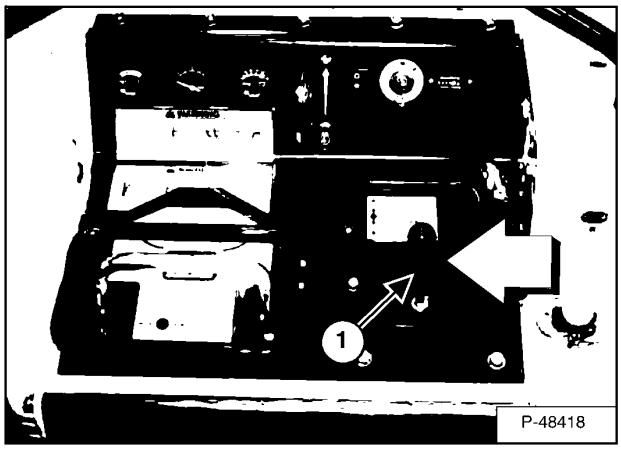
Figure 20-31-14



Install a 5000 PSI (34475 bar) pressure gauge on the rod end hose and cap the rod end cylinder fitting **[Figure 20-31-14]**.

Secure the gauge during the test **[Figure 20-31-14]**.

Figure 20-31-15



Run the engine at full engine speed. Slowly move the hydraulic control lever (Item 1) **[Figure 20-31-15]** to the left until you hear the hydraulics go over relief. Record the pressure.

The port relief valves have a pressure setting of 2700 PSI (18616 bar) @ high idle.

NOTE: 2700 PSI can only be reached momentarily.

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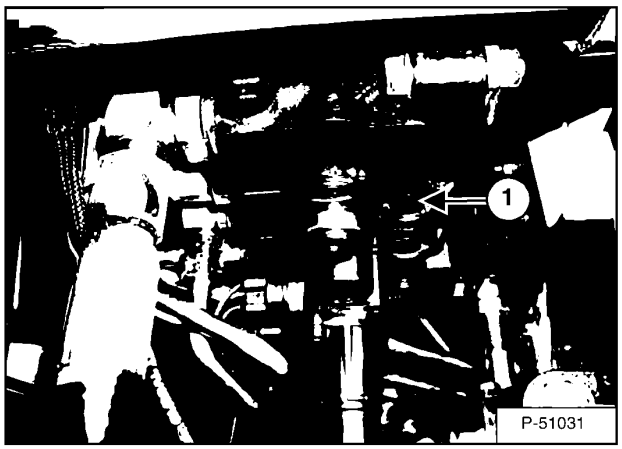
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PORT RELIEF VALVE (CONT'D)

Removal And Installation (Tilt)

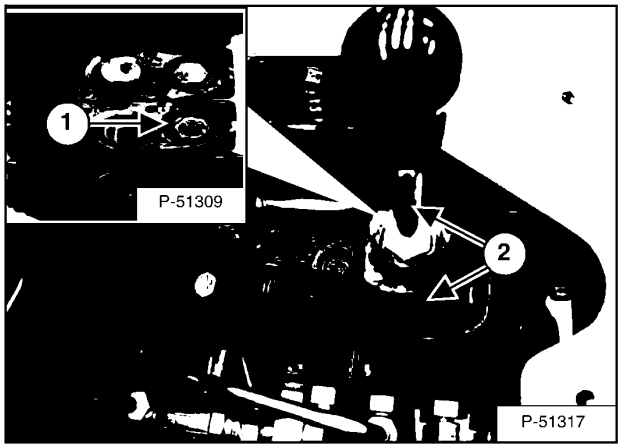
Remove the control panel plate. (See Removal and Installation on Page 50-50-1.)

Figure 20-31-16



Clean the area around the control valve. Loosen and remove the base port relief valve (Item 1) **[Figure 20-31-16]**.

Figure 20-31-17

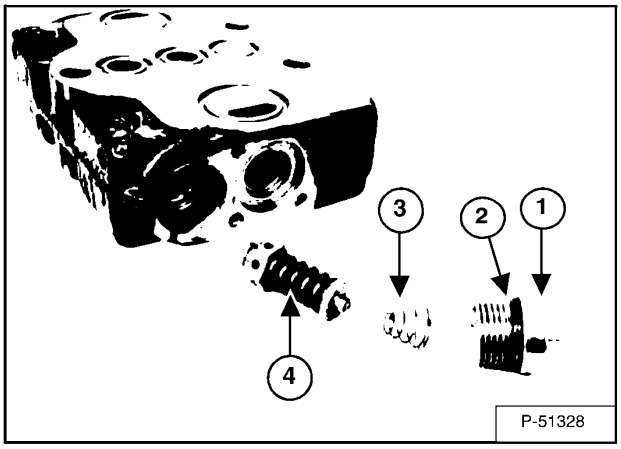


Remove the control lever and boot (Item 2) **[Figure 20-31-17]**. (See Disassembly and Assembly on Page 20-40-7.)

Remove the rod port relief valve (Item 1) **[Figure 20-31-17]**.

NOTE: The valve section is removed for visual clarity only.

Figure 20-31-18



Remove the cap (Item 1), O-ring (Item 2), spring (Item 3), and poppet valve (Item 4) **[Figure 20-31-18]** from both the rod and base valve sections.

NOTE: The relief valve assemblies are not adjustable.

Clean the port relief valves in clean solvent. Use air pressure to dry the valves.

Install new relief spool seats, relief spools, springs, washers and port relief caps and tighten. Check the pressure again. (See Checking The Port Relief Valves (Tilt) on Page 20-31-4.)

Installation: Tighten the port relief caps to 17.7 ft.-lb. (24 N•m) torque.

Reverse the removal procedure to install the tilt relief valve.

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HYDRAULIC CONTROL VALVE

Removal And Installation

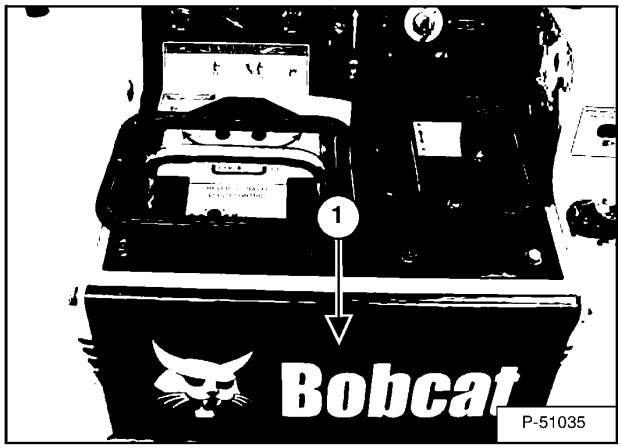
IMPORTANT

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

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Fully lower the lift arms.

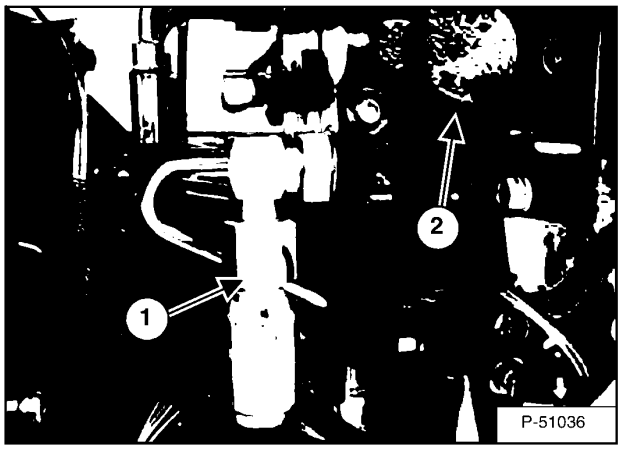
Figure 20-40-1



Remove the reverse stop panel (Item 1) **[Figure 20-40-1]** (See Removal And Installation on Page 50-80-1.)

Remove the tailgate striker. (See Tailgate Striker Removal And Installation on Page 50-30-2.)

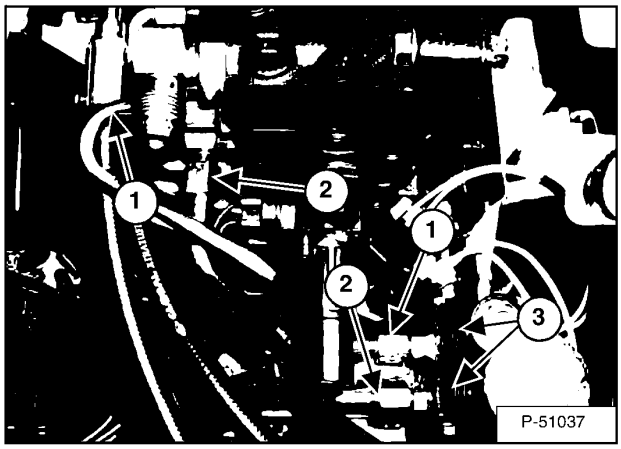
Figure 20-40-2



Mark all hoses and tubelines for ease of assembly.

Disconnect the inlet hose (Item 1) from the control valve (Item 2) **[Figure 20-40-2]**.

Figure 20-40-3



Disconnect the tilt tubeline (Item 1) and the lift tubeline (Item 2) from the control valve and the lock out valves (Item 3) **[Figure 20-40-3]**.

Remove the tubelines.

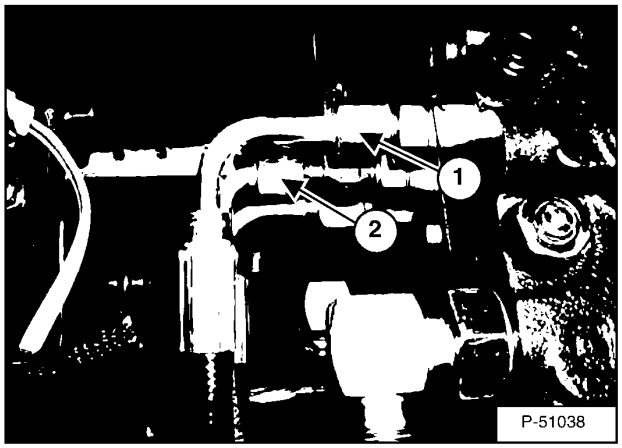
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HYDRAULIC CONTROL VALVE (CONT'D)

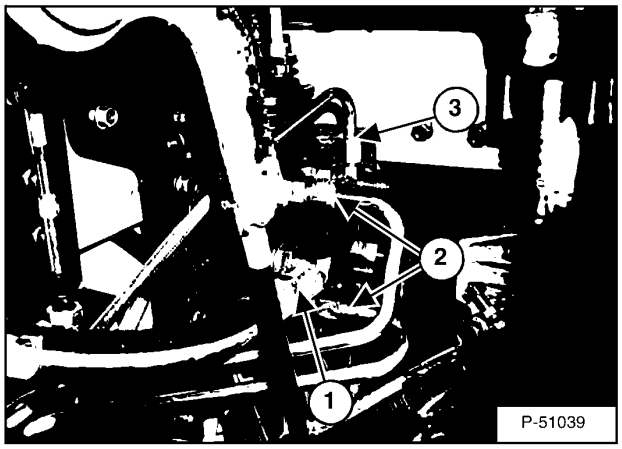
Removal And Installation (Cont'd)

Figure 20-40-4



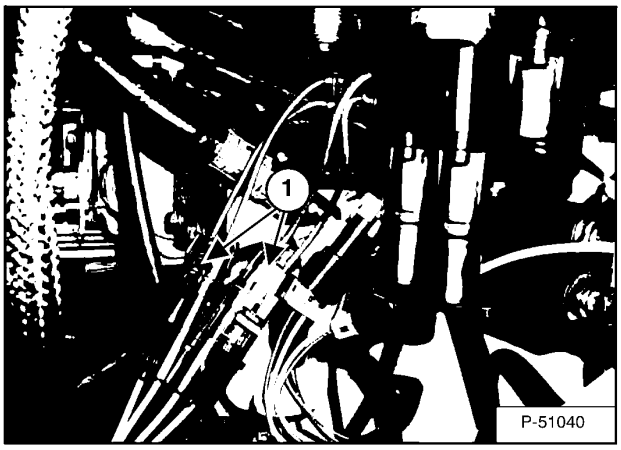
Disconnect the tilt hose (Item 1) and the lift hose (Item 2) **[Figure 20-40-4]** from the control valve.

Figure 20-40-5



Disconnect the outlet hose (Item 1), auxilliary tubelines (Item 2) and the lift tubeline (Item 3) **[Figure 20-40-5]** from the control valve.

Figure 20-40-6



Disconnect the electrical connectors (Item 1) **[Figure 20-40-6]** from the lift and auxilliary neutral sensors.

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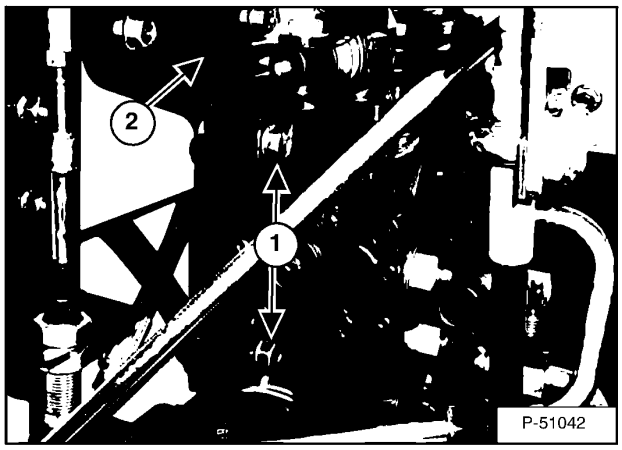
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Removal And Installation (Cont'd)

Figure 20-40-7



Figure 20-40-8



Remove the four bolts and nuts (Item 1) that attach the control valve to the valve mount (Item 2) **[Figure 20-40-7]** and **[Figure 20-40-8]**.

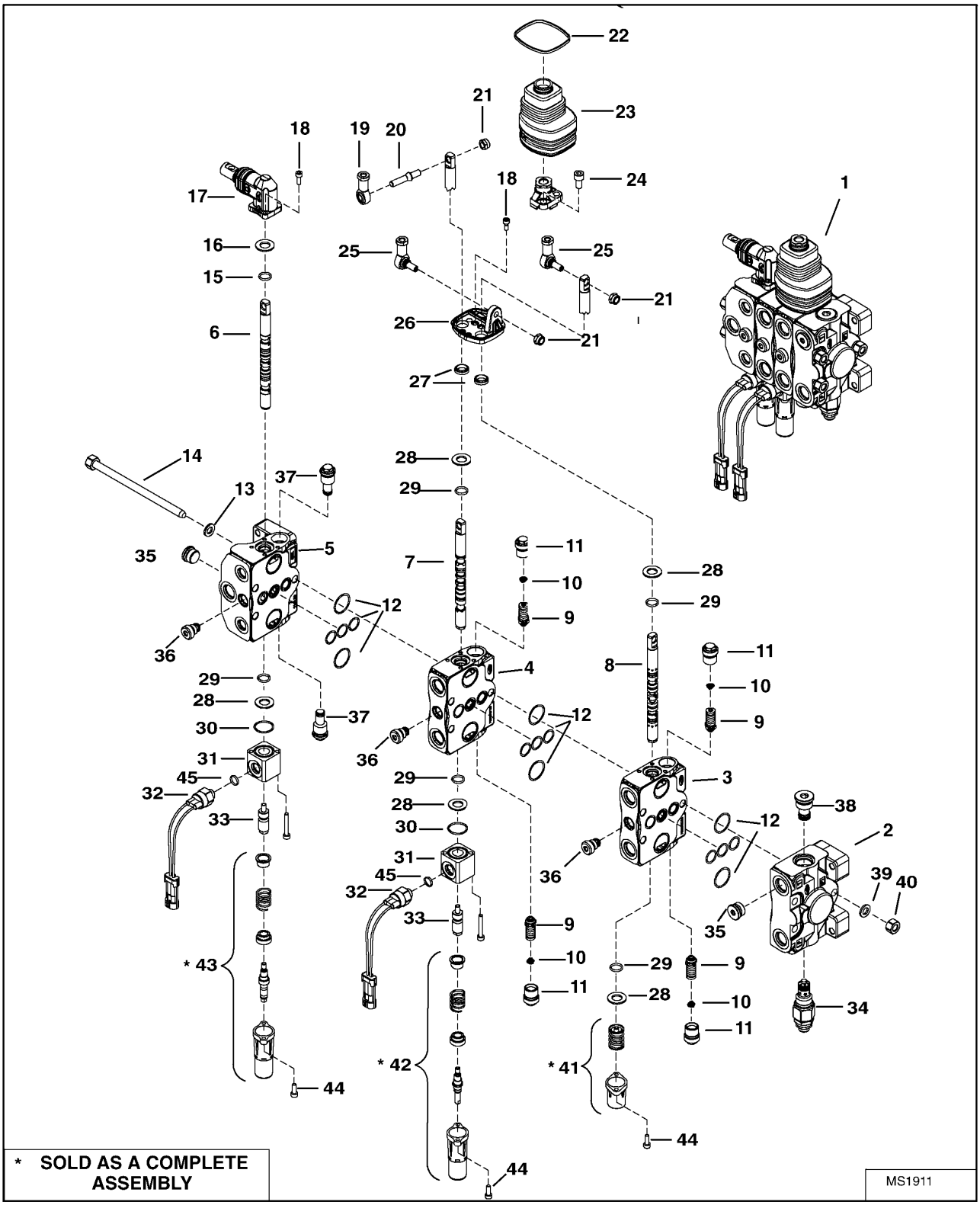
Lower the valve out of the loader.

Reverse the removal procedure to install the control valve.

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Parts Identification



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Parts Identification (Cont'd)

1. Main Valve Assembly
2. Inlet/Return Section
3. Tilt Section
4. Lift Section
5. Auxiliary Section
6. Auxiliary Spool
7. Lift Spool
8. Tilt Spool
9. Poppett Valve
10. Spring
11. Plug
12. O-Rings
13. Washer (Lock)
14. Rod (Tie)
15. O-Ring
16. Washer
17. Lever
18. Screw
19. Joint
20. Pin
21. Nut
22. Tie Strap
23. Rubber Bellow
24. Screw
25. Rod End
26. Fixed Pivot
27. Dust Seals
28. Washer
29. O-Ring
30. O-Ring Seal
31. End Cap
32. Switch
33. Control Pin
34. Main Relief Valve
35. Plug
36. Relief
37. Plug
38. Plug
39. Washer (Lock)
40. Nut (Tierod)
41. Tilt Spool Centering Mechanism
42. Lift Spool Centering Mechanism
43. Auxiliary Spool Centering Mechanism
44. Screw
45. O-Ring Seal

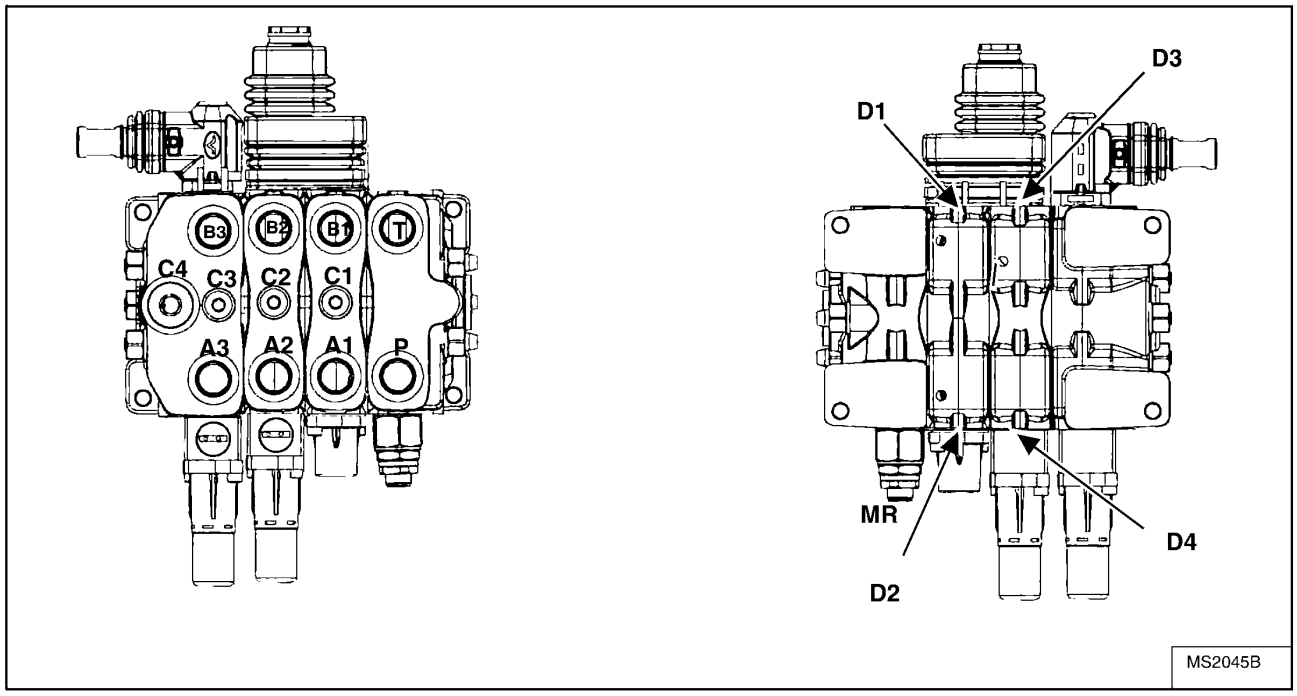
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HYDRAULIC CONTROL VALVE (CONT'D)

Identification Chart

Figure 20-40-9



ITEM	MT52 MINI TRACK LOADER
A1	Tilt Cylinder Base End
A2	Lift Cylinder Base End
A3	Auxiliary Hydraulics Base End
B1	Tilt Cylinder Rod End
B2	Lift Cylinder Rod End
B3	Auxiliary Hydraulic Rod End
C1	Load Check Valve Tilt Function
C2	Load Check Valve Lift Function
C3	Load Check Valve Auxiliary Function
C4	Plug
D1	Tilt Rod Port Relief (2700 PSI)
D2	Tilt Base Port Relief (2700 PSI)
D3	Lift Rod Port Relief (2700 PSI)
D4	Lift Base Port Relief (2700 PSI)
P	Inlet (From Pump)
T	Outlet (To Cooler)
MR	Main Relief (2900 PSI)

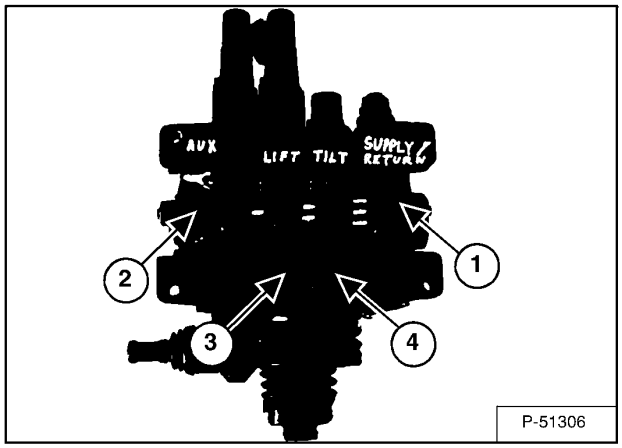
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HYDRAULIC CONTROL VALVE (CONT'D)

Disassembly and Assembly

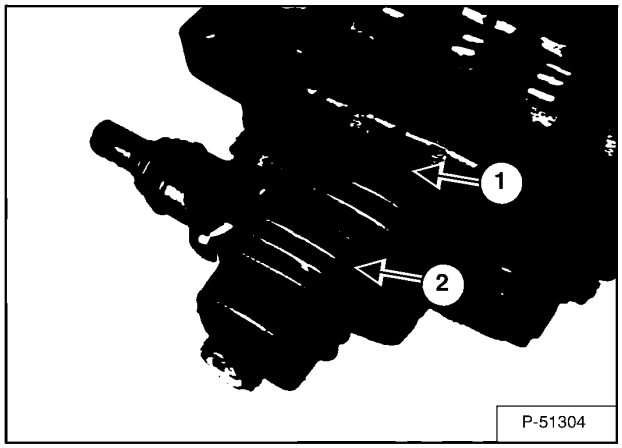
Figure 20-40-10



Mark the valve sections for ease of assembly.

1. Supply/Return Section **[Figure 20-40-10]**
2. Auxiliary Valve Section **[Figure 20-40-10]**
3. Lift Valve Section **[Figure 20-40-10]**
4. Tilt Valve Section **[Figure 20-40-10]**

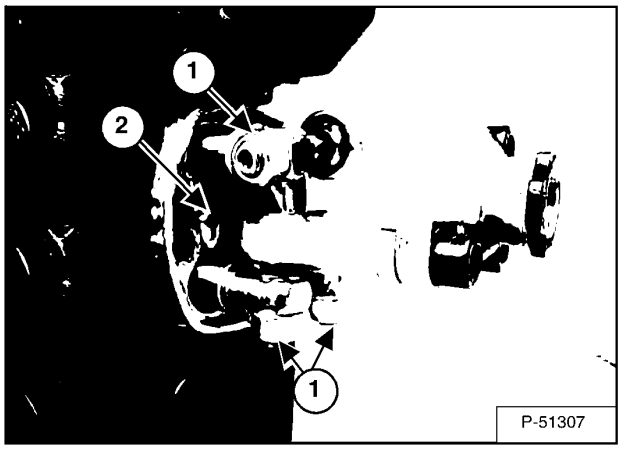
Figure 20-40-11



Remove the zip tie (Item 1) holding the protective boot (Item 2) **[Figure 20-40-11]** onto the main control valve.

Remove the protective boot.

Figure 20-40-12

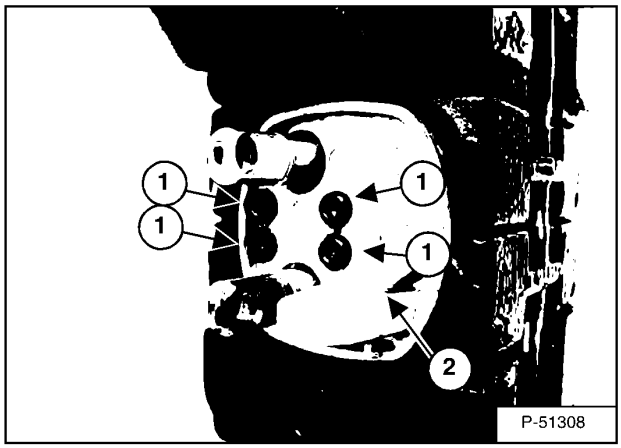


Remove the three tie rod nuts (Item 1) **[Figure 20-40-12]** from the linkage assembly.

Remove linkage assembly from the fixed pivot (Item 2) **[Figure 20-40-12]**.

Assembly: Tighten tie rod nuts to 17.7 ft-lbs (24 N•m) torque. Pack the linkage assembly with grease before installing protective boot (Item 2) **[Figure 20-40-11]**.

Figure 20-40-13



Remove the four screws (Item 1) holding the fixed pivot (Item 2) **[Figure 20-40-13]** to the main control valve.

Assembly: Tighten the screws to 4.8 ft-lbs (6.6 N•m) torque. Apply a medium strength threadlocker to the screws.

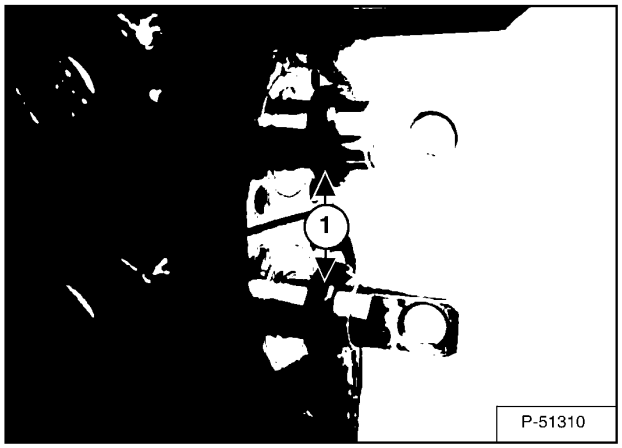
Remove the fixed pivot from the main control valve.

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Disassembly and Assembly (Cont'd)

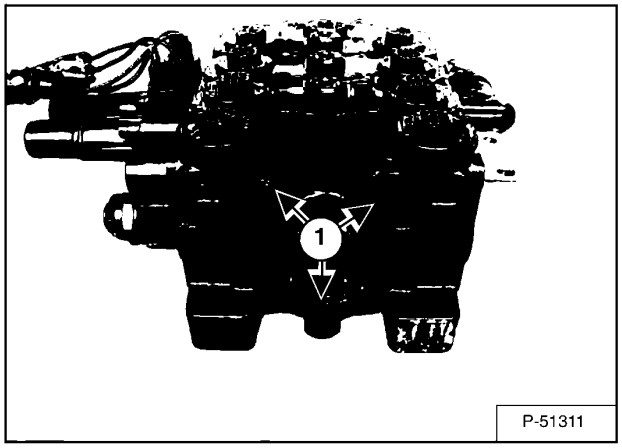
Figure 20-40-14



Remove the two dust seals (Item 1) **[Figure 20-40-14]**.

Inspect dust seals for wear, replace if worn or broken.

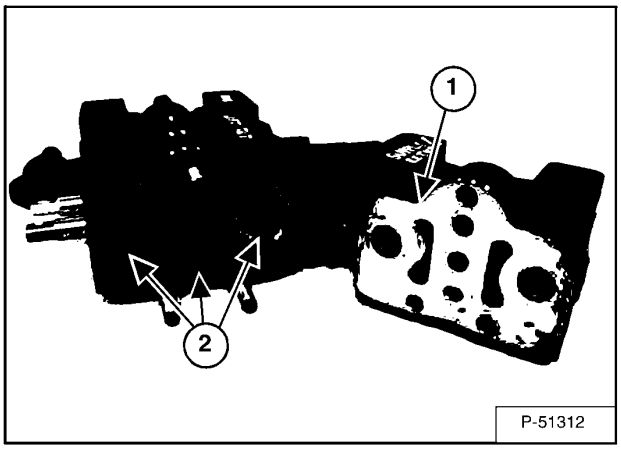
Figure 20-40-15



Remove the three tie rod nuts and lock-washers (Item 1) **[Figure 20-40-15]**.

Assembly: Tighten tie rod nuts to 31 f t-lbs (42 N•m) torque.

Figure 20-40-16

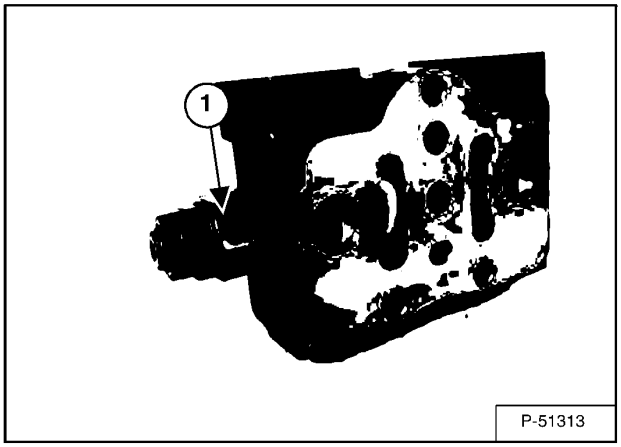


Remove the supply/return section (Item 1) **[Figure 20-40-16]** from the valve assembly.

Remove the five O-rings (Item 2) **[Figure 20-40-16]** from the tilt valve section.

Inspect the O-rings (Item 2) **[Figure 20-40-16]** for damage and replace as needed.

Figure 20-40-17



Remove the main relief valve (Item 1) **[Figure 20-40-17]**.

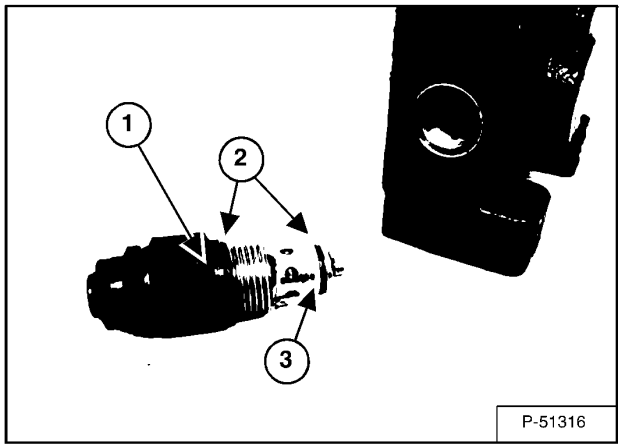
Assembly: Tighten main valve relief to 31 ft-lbs (42 N•m) torque.

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Disassembly and Assembly (Cont'd)

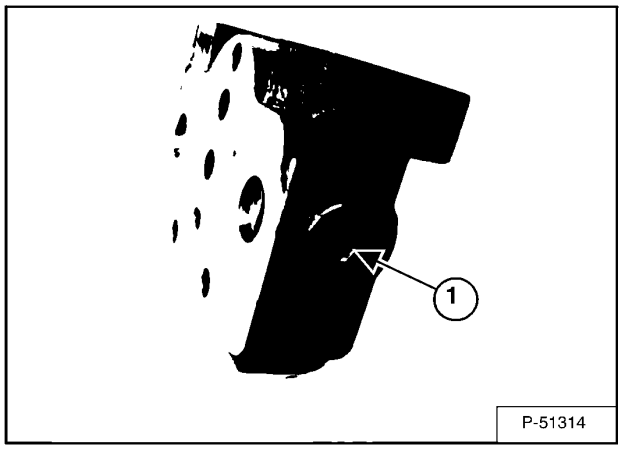
Figure 20-40-18



Inspect the main valve relief (Item 1), o-rings (Item 2) and back-up ring (Item 3) **[Figure 20-40-18]**.

Clean the main relief valve with solvent and dry with compressed air.

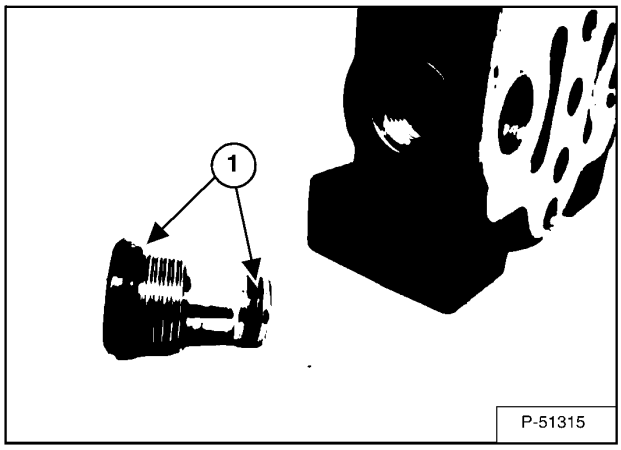
Figure 20-40-19



Remove the plug (Item 1) **[Figure 20-40-19]**.

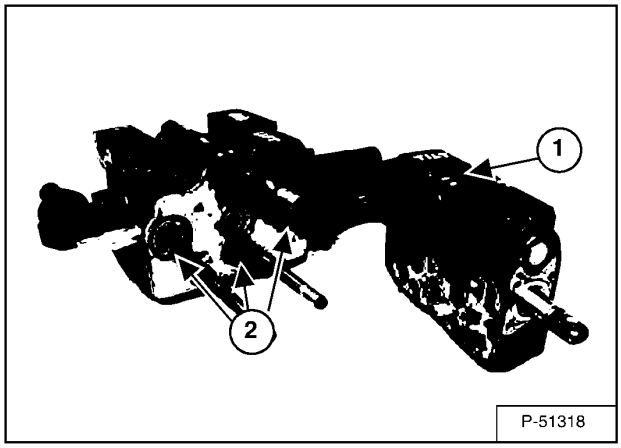
Assembly: Tighten plug to 31 ft-lbs (42 N•m) torque.

Figure 20-40-20



Inspect the o-rings and seals (Item 1) **[Figure 20-40-20]** for damage and replace as needed.

Figure 20-40-21



Remove the tilt section (Item 1) **[Figure 20-40-21]** from the main control valve.

Remove the five O-rings (Item 2) **[Figure 20-40-21]** from the lift valve section.

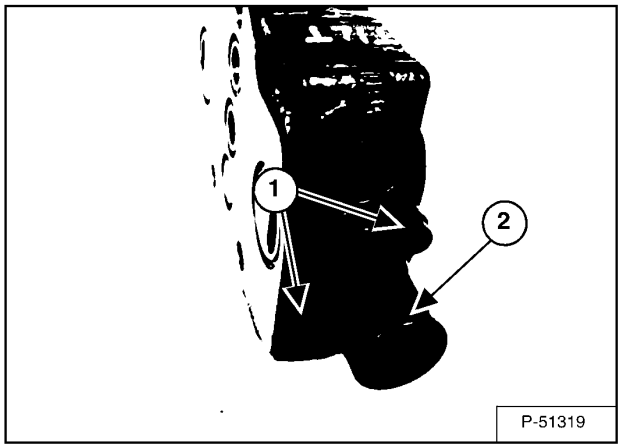
Inspect the O-rings (Item 2) **[Figure 20-40-21]** for damage and replace as needed.

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Disassembly and Assembly (Cont'd)

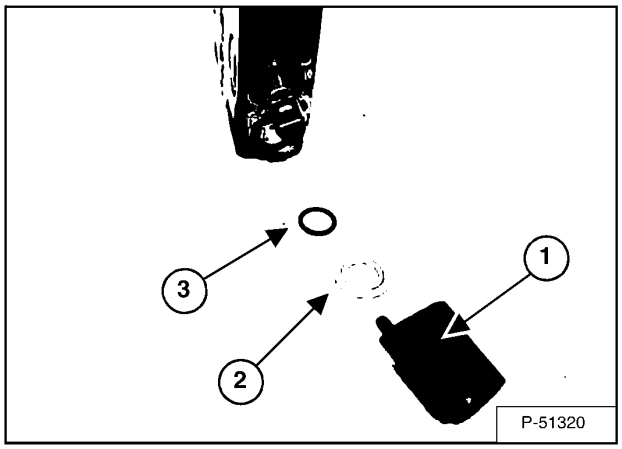
Figure 20-40-22



Remove the two screws (Item 1) from the cap (Item 2) **[Figure 20-40-22]**.

Assembly: Tighten the screws to 4 .8 ft-lbs (6.6 N•m) torque.

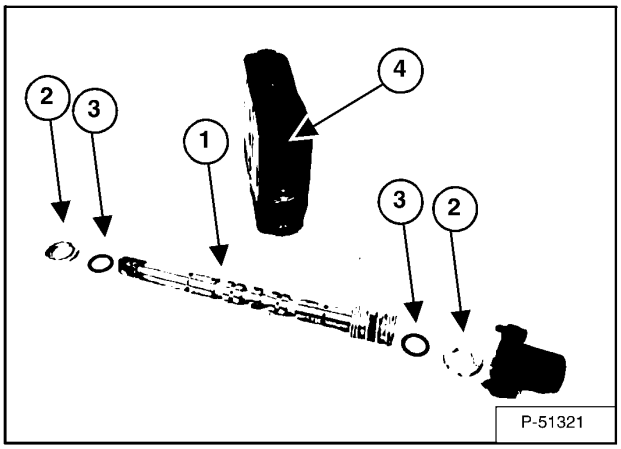
Figure 20-40-23



Remove the cap (Item 1), washer (Item 2) and O-ring (Item 3) **[Figure 20-40-23]**.

Inspect parts for damage and replace as needed.

Figure 20-40-24

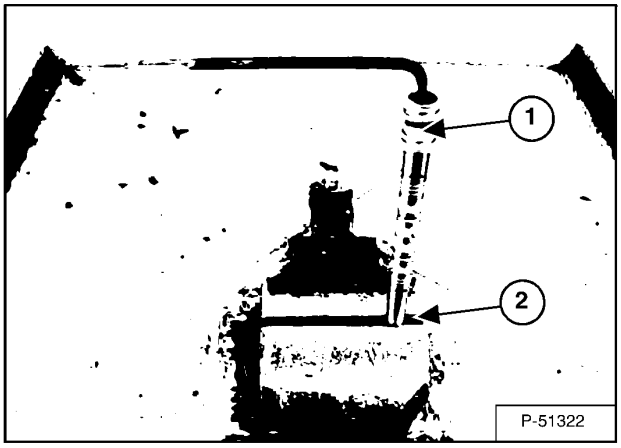


Remove the tilt spool (Item 1), washers (Item 2) and o-rings (Item 3) from the tilt valve section (Item 4) **[Figure 20-40-24]**.

Inspect parts for damage and replace as needed.

Assembly: Lubricate the spool liberally with hydraulic oil.

Figure 20-40-25



The spool centering mechanism (Item 1) can be removed by clamping the spool in a vise at the linkage end (Item 2) **[Figure 20-40-25]**.

Loosen the spool centering mechanism with an al len wrench **[Figure 20-40-25]**.

Assembly: Apply a medium strength threadlocker to the threads on t he spool centering mechanism. Tighten spool centering mechanism to 17.7 ft-lbs (24 N•m) torque.

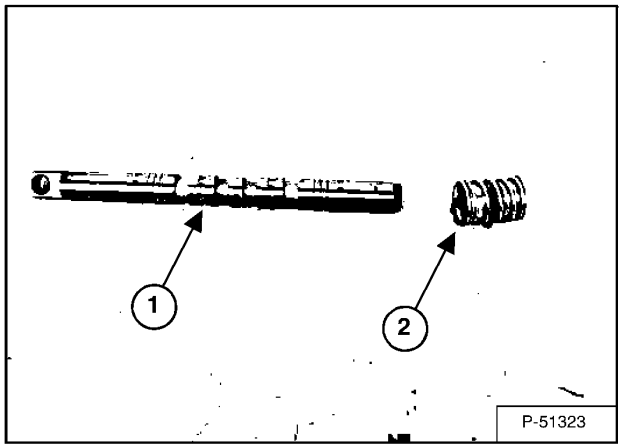
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HYDRAULIC CONTROL VALVE (CONT'D)

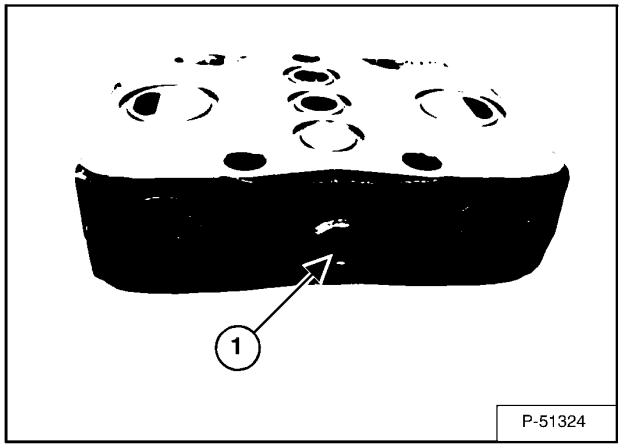
Disassembly and Assembly (Cont'd)

Figure 20-40-26



Inspect the spool (Item 1) and spool centering mechanism (Item 2) **[Figure 20-40-26]** for damage and replace as needed.

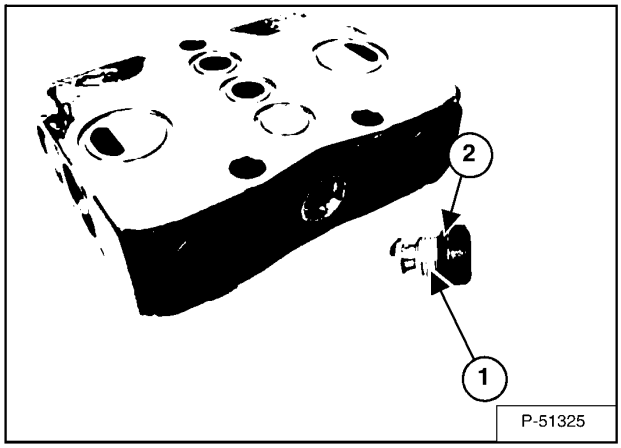
Figure 20-40-27



Remove the check valve (Item 1) **[Figure 20-40-27]** from the tilt valve section.

Assembly: Tighten check valve to 17.7 ft-lbs (24 N•m) torque.

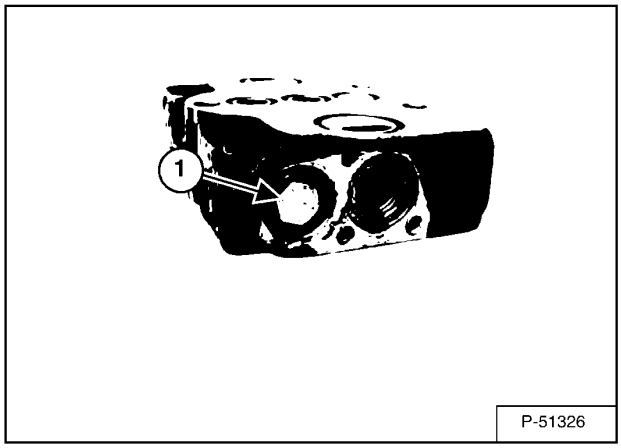
Figure 20-40-28



Inspect the check valve (Item 1) for free movement and inspect o-ring (Item 2) **[Figure 20-40-28]**.

Replace parts as needed.

Figure 20-40-29



Remove the rod end relief valve (Item 1) **[Figure 20-40-29]** from the tilt valve section.

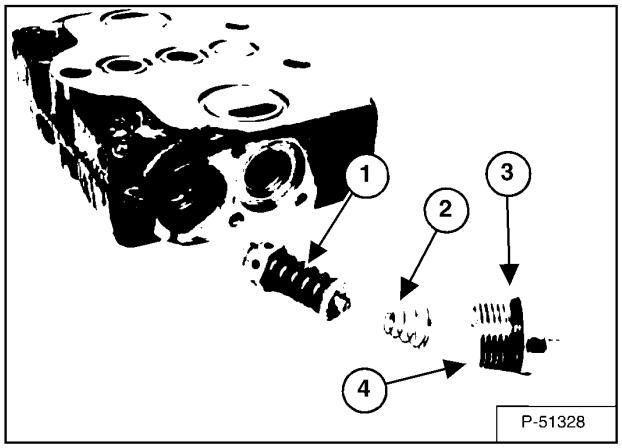
Assembly: Tighten relief valve to 17.7 ft-lbs (24 N•m) torque.

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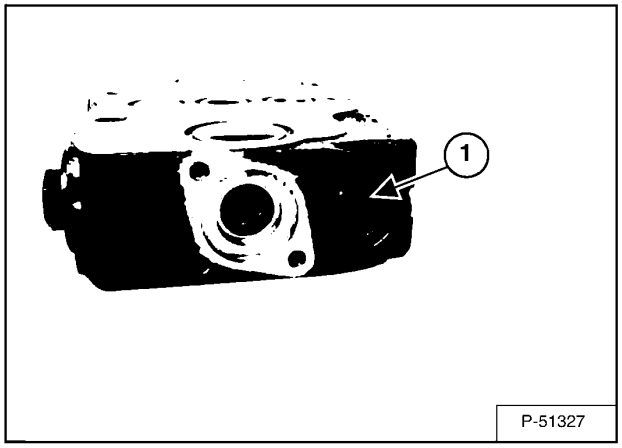
Disassembly and Assembly (Cont'd)

Figure 20-40-30



Inspect the poppet (Item 1), spring (Item 2), O-ring (Item 3) and cap (Item 4) **[Figure 20-40-30]** for wear or damage and replace as needed.

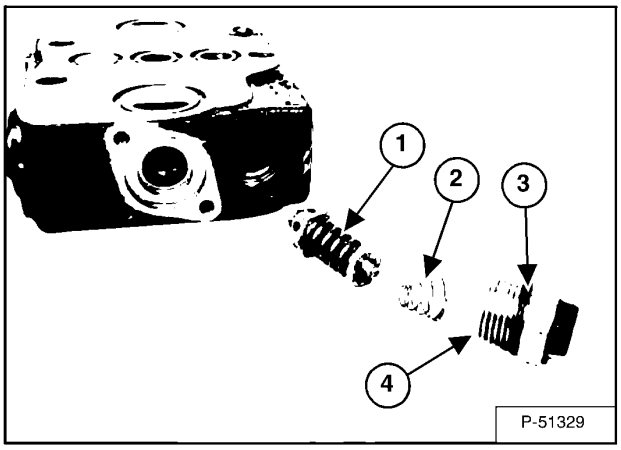
Figure 20-40-31



Remove the base end relief valve (Item 1) **[Figure 20-40-31]** from the tilt valve section.

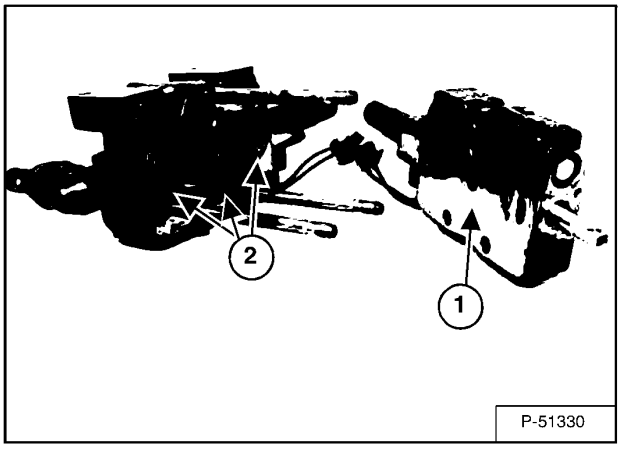
Assembly: Tighten relief valve to 17.7 ft-lbs (24 N•m) torque.

Figure 20-40-32



Inspect the poppet (Item 1), spring (Item 2), O-ring (Item 3) and cap (Item 4) **[Figure 20-40-32]** for wear or damage and replace as needed.

Figure 20-40-33



Remove the lift section (Item 1) **[Figure 20-40-33]** from the main control valve.

Remove the five O-rings (Item 2) **[Figure 20-40-33]** from the auxilliary valve section.

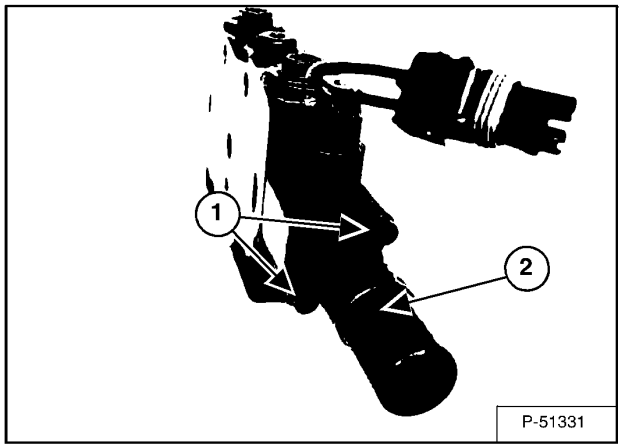
Inspect the O-rings (Item 2) **[Figure 20-40-33]** for damage and replace as needed.

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Disassembly and Assembly (Cont'd)

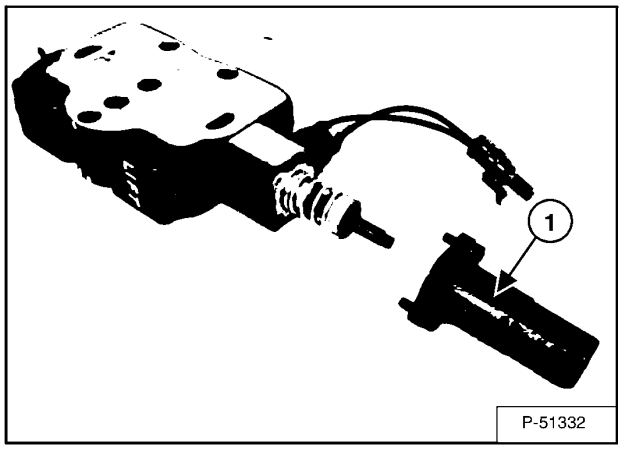
Figure 20-40-34



Remove the tw o screws (Item 1) from the cap/detent assembly (Item 2) **[Figure 20-40-34]**.

Assembly: Tighten the screws to 4 .8 ft-lbs (6.6 N•m) torque.

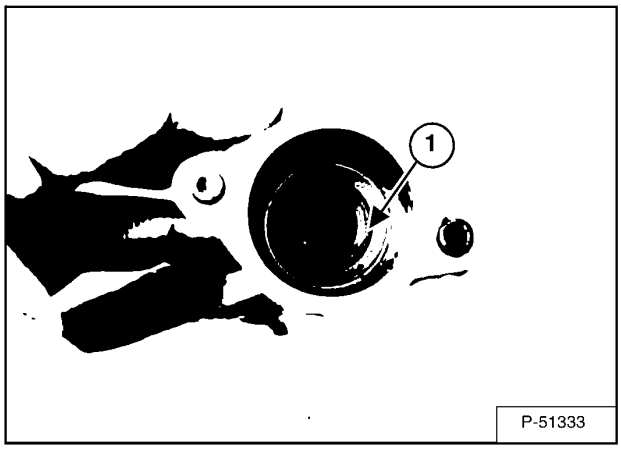
Figure 20-40-35



Remove the cap/detent assembly (Item 1) **[Figure 20-40-35]**.

NOTE: You may have to hold the spool at the linkage end to remove the cap/detent assembly.

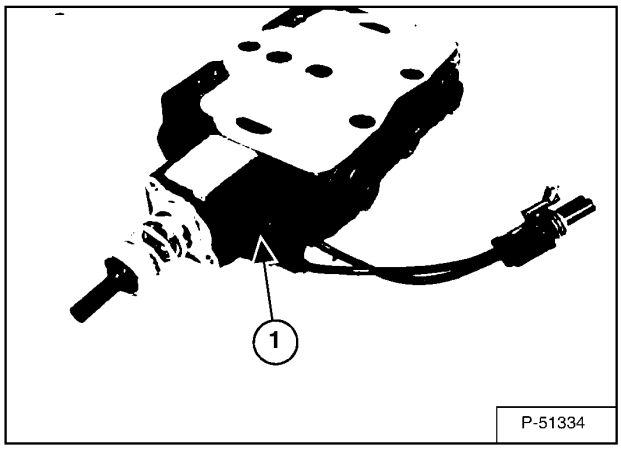
Figure 20-40-36



Inspect detent assembly inside cap (Item 1) **[Figure 20-40-36]**.

Assembly: Pack detent assembly with grease.

Figure 20-40-37



Remove the neutral switch (Item 1) **[Figure 20-40-37]** from the end-cap.

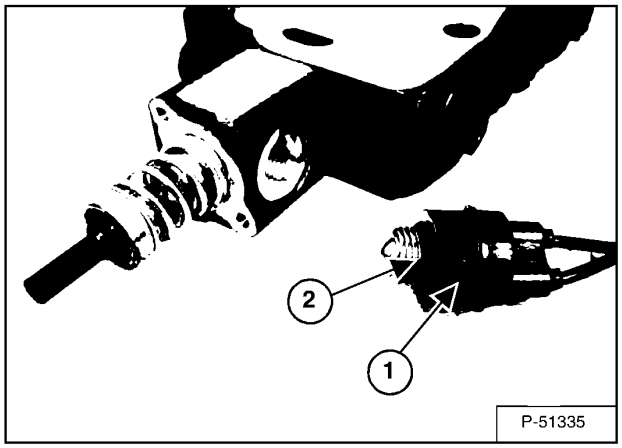
Assembly: Tighten the neutral switch to 7.2 ft-lbs (9.8 N•m) torque.

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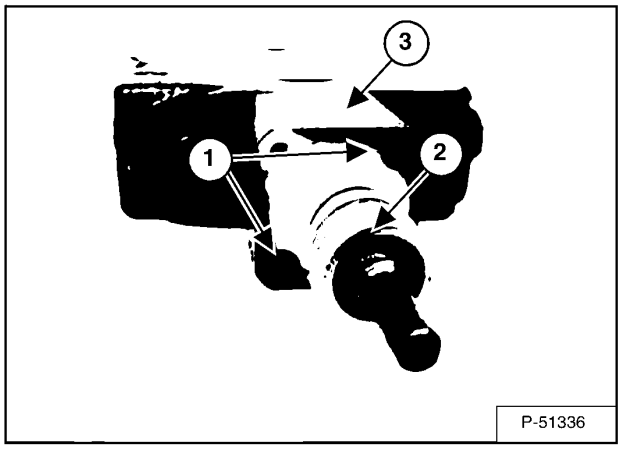
Disassembly and Assembly (Cont'd)

Figure 20-40-38



Inspect the neutral switch (Item 1) and O-ring (Item 2) **[Figure 20-40-38]**.

Figure 20-40-39

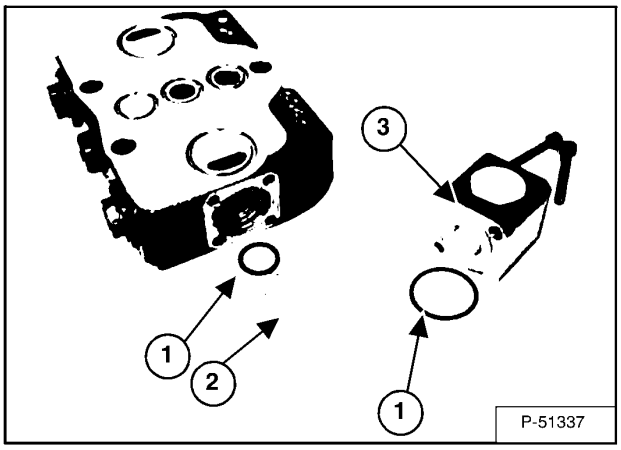


Remove the two screws (Item 1) **[Figure 20-40-39]** from the endcap.

Remove the spool (Item 2) with the endcap (Item 3) **[Figure 20-40-39]**.

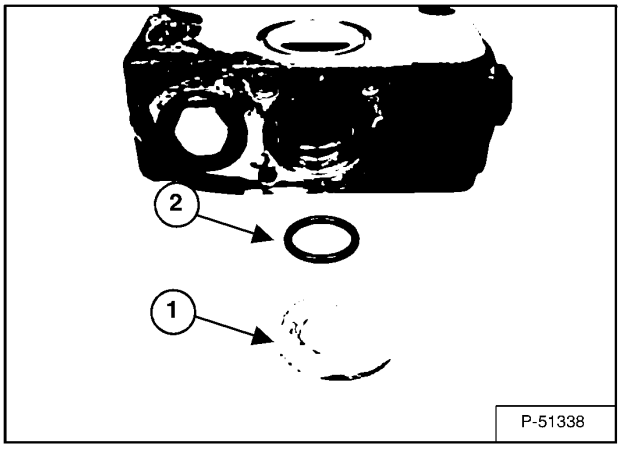
Assembly: Tighten the screws to 4 .9 ft-lbs (6.6 N•m) torque. Lubricate the spool liberally with hydraulic oil.

Figure 20-40-40



Inspect the o-rings (Item 1), washer (Item 2) and endcap (Item 3) **[Figure 20-40-40]** for wear or damage. Replace as needed.

Figure 20-40-41



Remove the washer (Item 1) and o-ring (Item 2) **[Figure 20-40-41]** from the lift valve section.

Inspect parts and replace as needed.

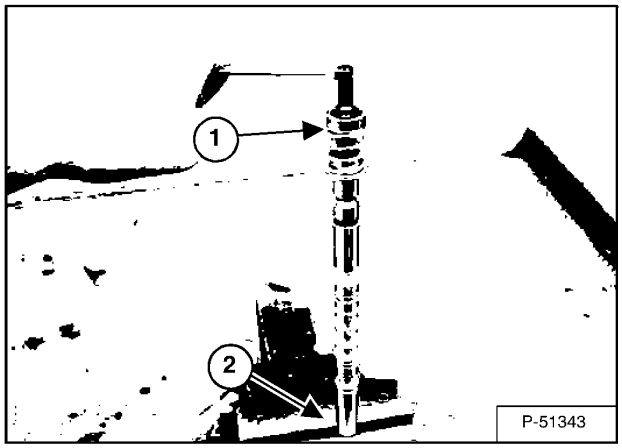
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HYDRAULIC CONTROL VALVE (CONT'D)

Disassembly and Assembly (Cont'd)

Figure 20-40-42

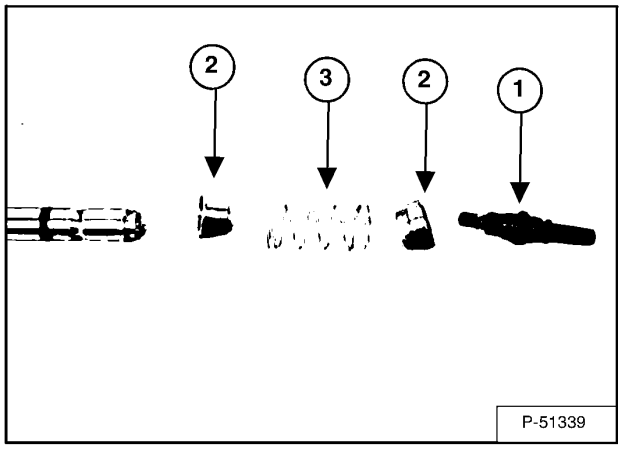


The spool centering mechanism (Item 1) can be removed by clamping the spool in a vise at the linkage end (Item 2) **[Figure 20-40-42]**.

Loosen the spool centering mechanism with a wrench **[Figure 20-40-42]**.

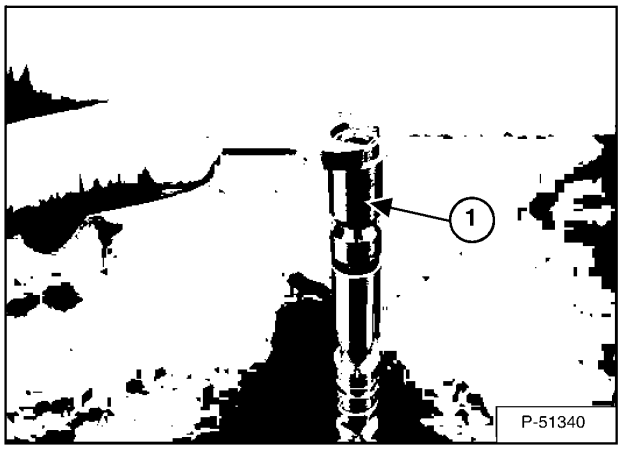
Assembly: Apply a medium strength threadlocker to the threads on the spool centering mechanism. Tighten spool centering mechanism to 17.7 ft-lbs (24 N•m) torque.

Figure 20-40-43



Inspect the positioner pin (Item 1) bushings (Item 2) and spring (Item 3) **[Figure 20-40-43]** for damage. Replace as needed.

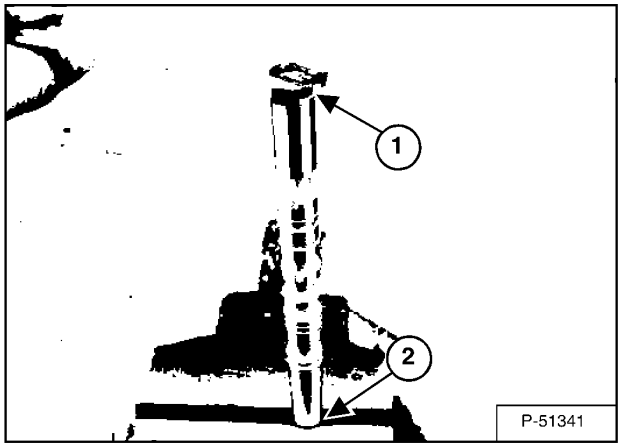
Figure 20-40-44



Remove the centering mechanism adapter (Item 1) **[Figure 20-40-44]** from the lift spool. Clamp spool in vise as shown in **[Figure 20-40-42]**.

Assembly: Tighten centering mechanism adapter to 31 ft-lbs (42 N•m) torque. Apply medium strength threadlocker to threads.

Figure 20-40-45



The spool adapter (Item 1) can be removed by clamping the spool in a vise at the linkage end (Item 2) **[Figure 20-40-45]**.

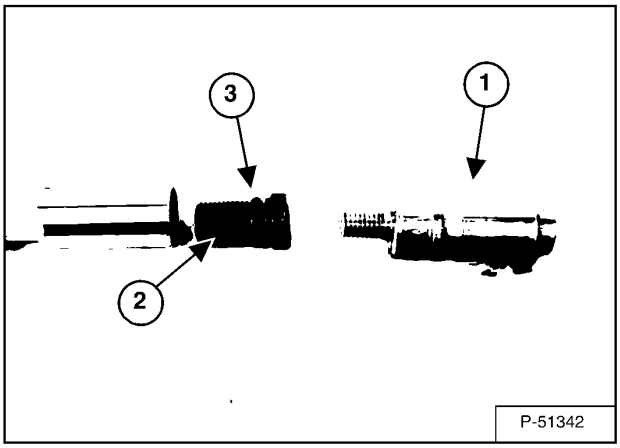
Assembly: Apply a medium strength threadlocker to the threads on the spool adapter. Tighten spool adapter to 31 ft-lbs (42 N•m) torque.

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Disassembly and Assembly (Cont'd)

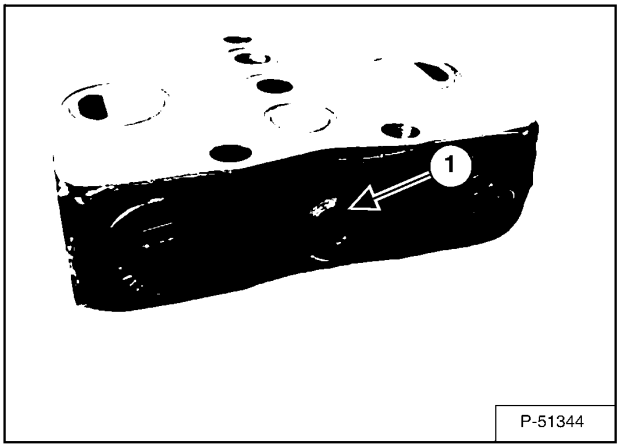
Figure 20-40-46



Inspect the centering mechanism adapter (Item 1), spool adapter (Item 2) and o-ring (Item 3) **[Figure 20-40-46]**.

Replace parts as needed.

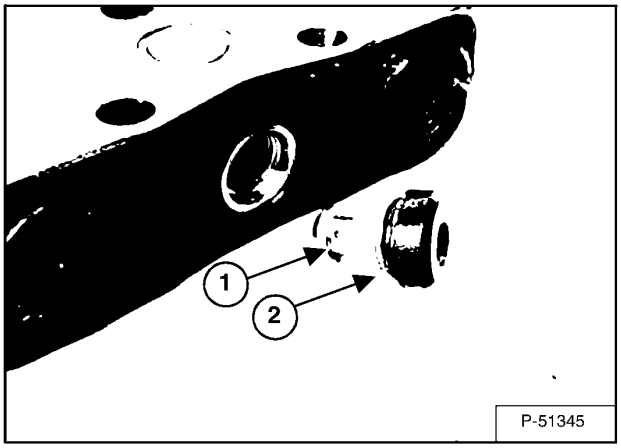
Figure 20-40-47



Remove the check valve (Item 1) **[Figure 20-40-47]** from the lift valve section.

Assembly: Tighten check valve to 17.7 ft-lbs (24 N•m) torque.

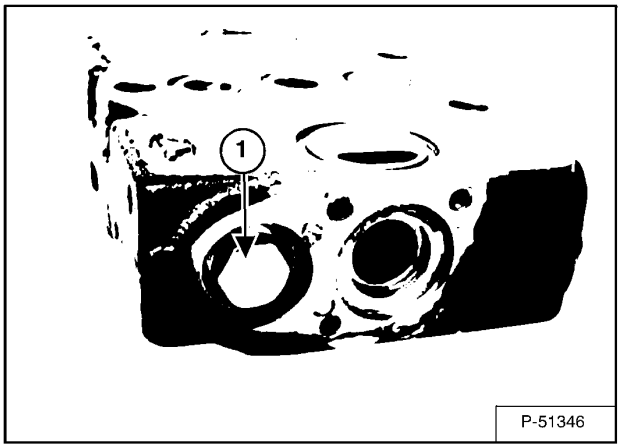
Figure 20-40-48



Inspect the check valve (Item 1) for free movement and inspect o-ring (Item 2) **[Figure 20-40-48]**.

Replace parts as needed.

Figure 20-40-49



Remove the rod end relief valve (Item 1) **[Figure 20-40-49]** from the lift valve section.

Assembly: Tighten relief valve to 17.7 ft-lbs (24 N•m) torque.

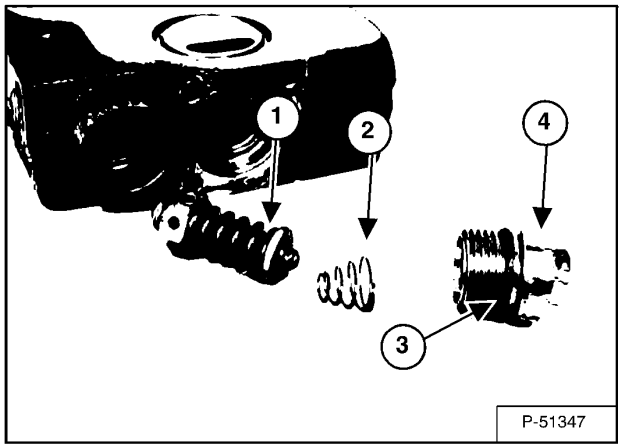
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HYDRAULIC CONTROL VALVE (CONT'D)

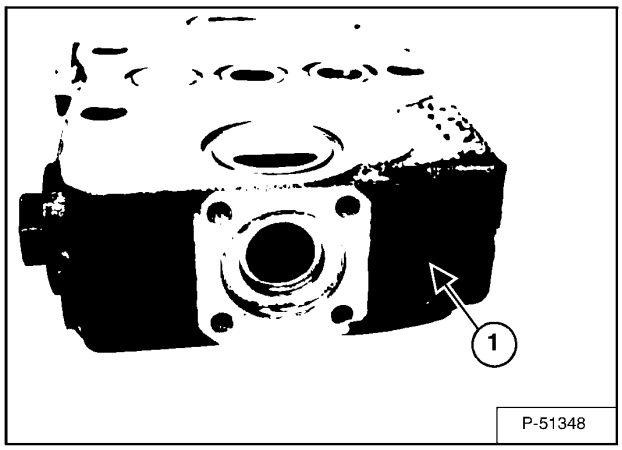
Disassembly and Assembly (Cont'd)

Figure 20-40-50



Inspect the poppet (Item 1), spring (Item 2), o-ring (Item 3) and cap (Item 4) **[Figure 20-40-50]** for wear or damage and replace as needed.

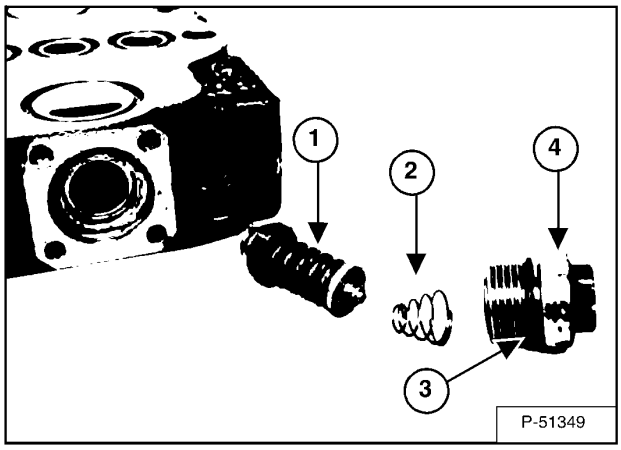
Figure 20-40-51



Remove the base end relief valve (Item 1) **[Figure 20-40-51]** from the lift valve section.

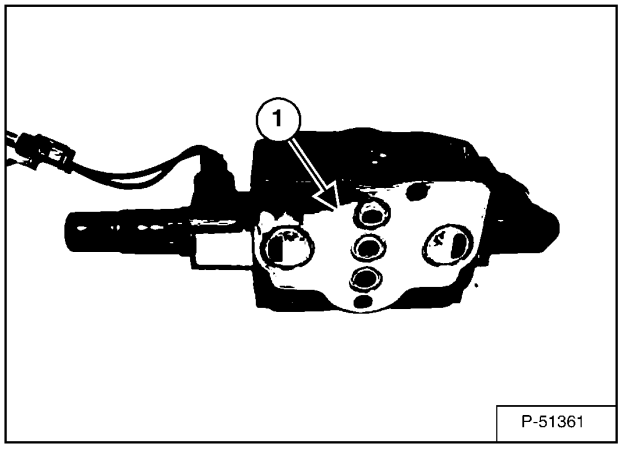
Assembly: Tighten relief valve to 17.7 ft-lbs (24 N•m) torque.

Figure 20-40-52



Inspect the poppet (Item 1), spring (Item 2), O-ring (Item 3) and cap (Item 4) **[Figure 20-40-52]** for wear or damage and replace as needed.

Figure 20-40-53



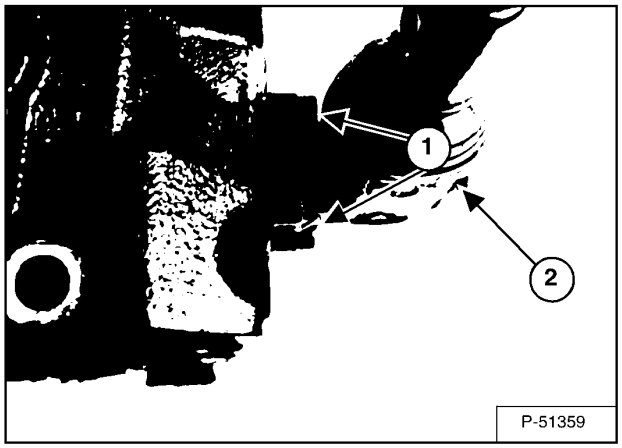
Remove the ti e bolts from the auxiliary valve section (Item 1) **[Figure 20-40-53]**.

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Disassembly and Assembly (Cont'd)

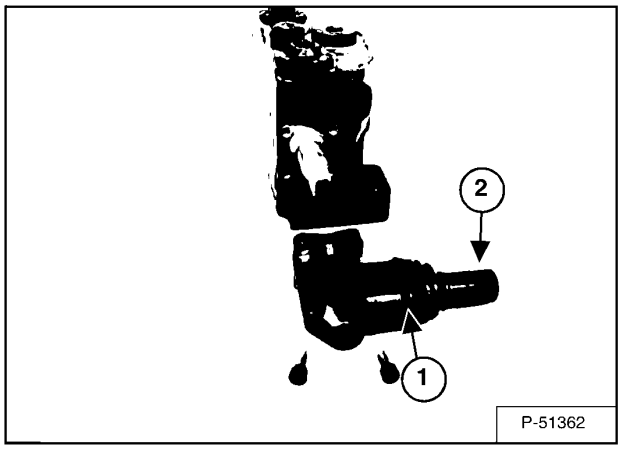
Figure 20-40-54



Loosen the two screws (Item 1) from the lever assembly (Item 2) **[Figure 20-40-54]**.

Assembly: Tighten the screws to 4 .9 ft-lbs (6.6 N•m) torque.

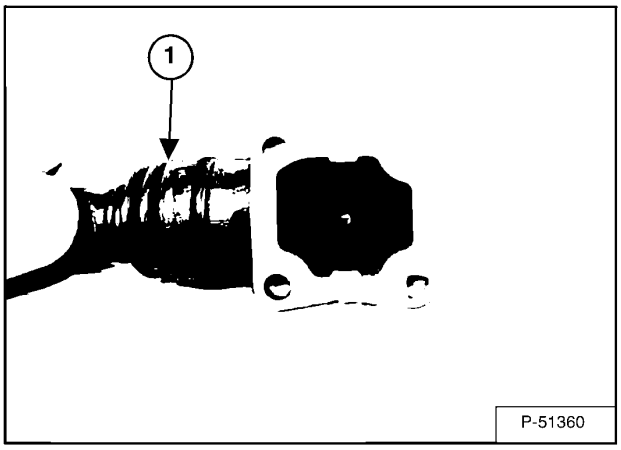
Figure 20-40-55



Remove the lever assembly (Item 2) **[Figure 20-40-55]**.

NOTE: Manually moving the lever (Item 2) on the lever assembly will help unseat the lever from the spool while removing.

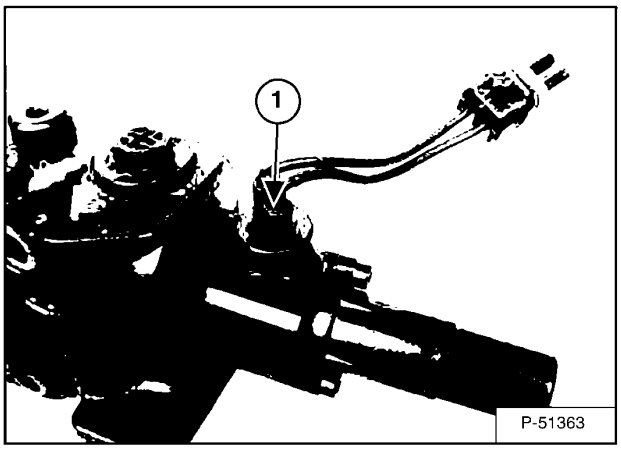
Figure 20-40-56



Remove boot (Item 1) **[Figure 20-40-56]** from lever assembly and i nspect lever assembly for wear or damage, replace as needed.

Assembly: Grease pivot areas liberally and install boot.

Figure 20-40-57



Remove the neutral switch (Item 1) **[Figure 20-40-57]** from the end-cap.

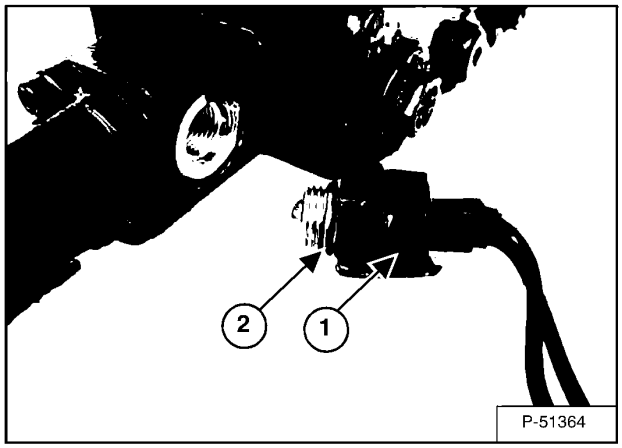
Assembly: Tighten the neutral switch to 7.2 ft-lbs (9.8 N•m) torque.

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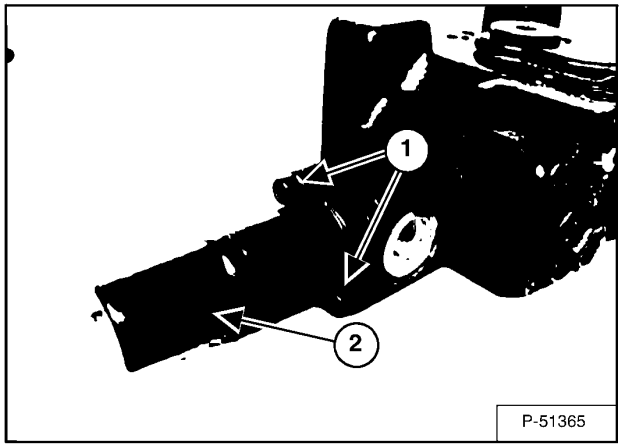
Disassembly and Assembly (Cont'd)

Figure 20-40-58



Inspect the neutral switch (Item 1) and o-ring (Item 2) **[Figure 20-40-58]**.

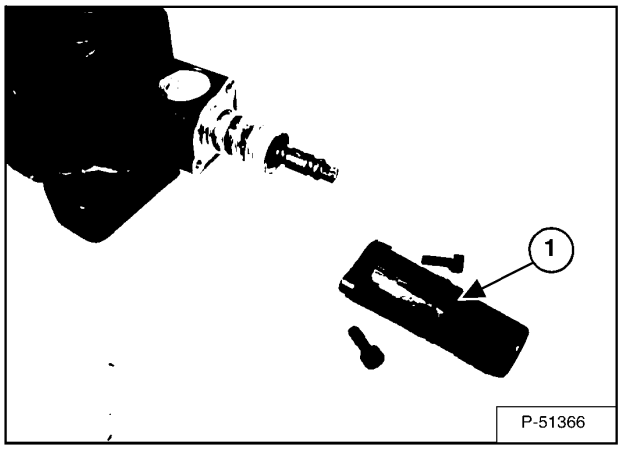
Figure 20-40-59



Remove the two screws (Item 1) from the cap (Item 2) **[Figure 20-40-59]**.

Assembly: Tighten the screws to 4 .8 ft-lbs (6.6 N•m) torque.

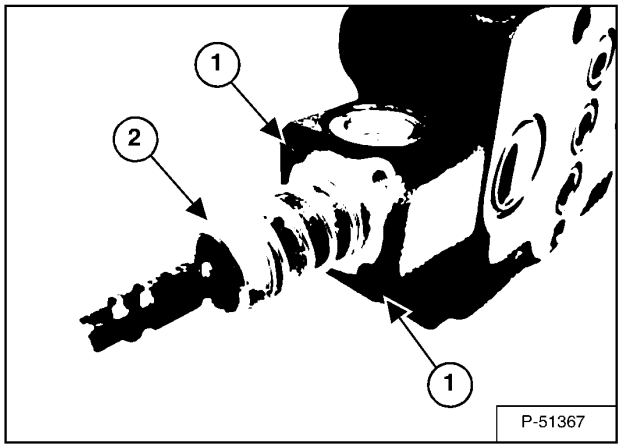
Figure 20-40-60



Remove the cap (Item 1) **[Figure 20-40-60]**.

NOTE: You may have to hold the spool at the linkage end to remove the cap.

Figure 20-40-61



Remove the two screws (Item 1) **[Figure 20-40-61]** from the endcap.

Remove the s pool (Item 2) with the endcap (Item 3) **[Figure 20-40-61]**.

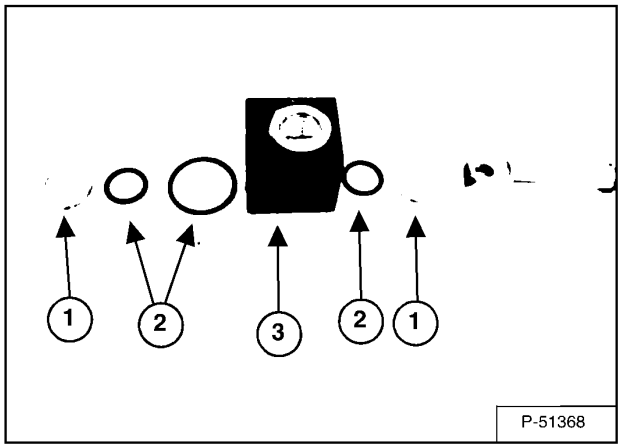
Assembly: Tighten the screws to 4.9 ft-lbs (6.6 N•m) torque. Lubricate the spool liberally with hydraulic oil.

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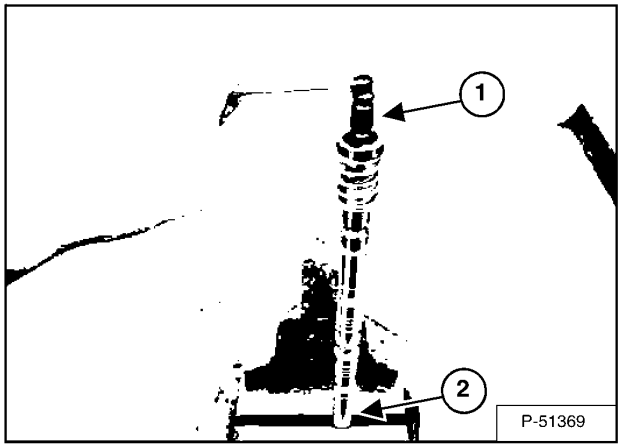
Disassembly and Assembly (Cont'd)

Figure 20-40-62



Inspect the washers (Item 1), o-rings (Item 2) and endcap (Item 3) **[Figure 20-40-62]** for damage. Replace as needed.

Figure 20-40-63

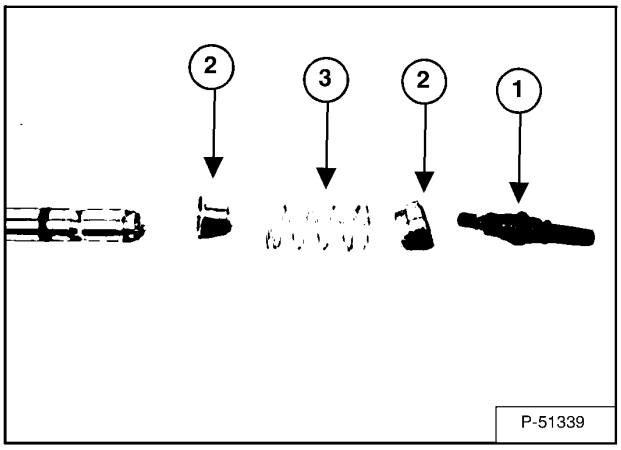


The spool centering mechanism (Item 1) can be removed by clamping the spool in a vise at the linkage end (Item 2) **[Figure 20-40-63]**.

Loosen the spool centering mechanism with a w rench **[Figure 20-40-63]**.

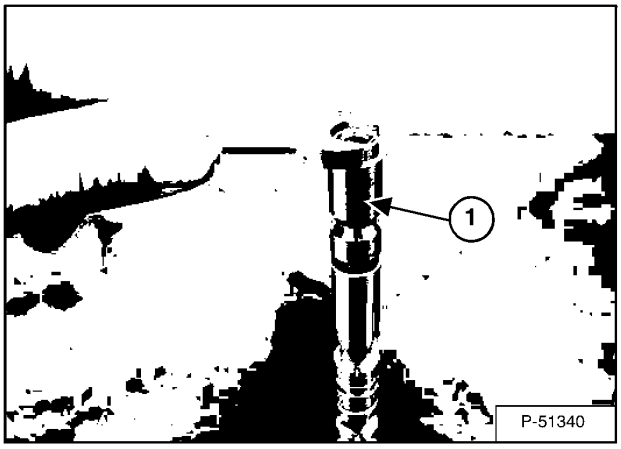
Assembly: Apply a medium strength threadlocker to the threads on t he spool centering mechanism. Tighten spool centering mechanism to 17.7 ft-lbs (24 N•m) torque.

Figure 20-40-64



Inspect the positioner pin (Item 1) bushings (Item 2) and spring (Item 3) **[Figure 20-40-64]** for damage. Replace as needed.

Figure 20-40-65



Remove the centering mechanism adapter (Item 1) **[Figure 20-40-65]** from the lift spool. Clamp spool in vise as shown in **[Figure 20-40-63]**.

Assembly: Tighten centering mechanism adapter to 31 ft-lbs (42 N•m) torque. Apply medium strength threadlocker to threads.

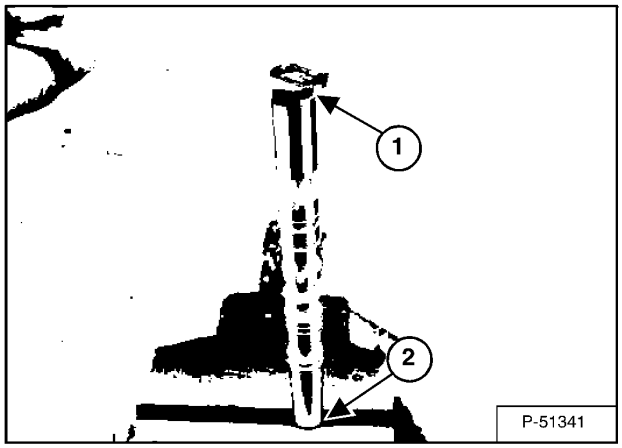
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HYDRAULIC CONTROL VALVE (CONT'D)

Disassembly and Assembly (Cont'd)

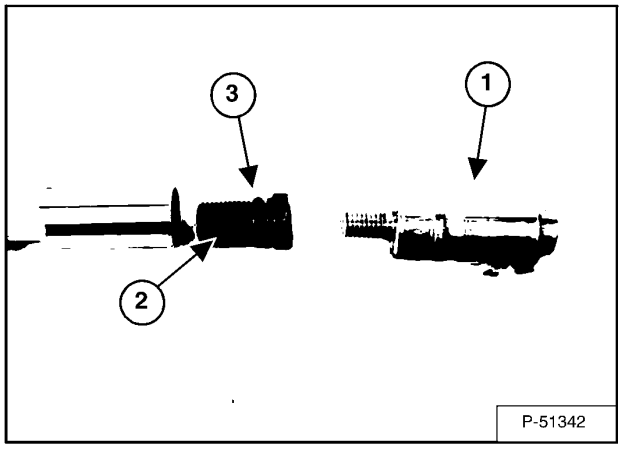
Figure 20-40-66



The spool adapter (Item 1) can be removed by clamping the spool in a vise at the linkage end (Item 2) **[Figure 20-40-66]**.

Assembly: Apply a medium strength threadlocker to the threads on the spool adapter. Tighten spool adapter to 31 ft-lbs (42 N•m) torque.

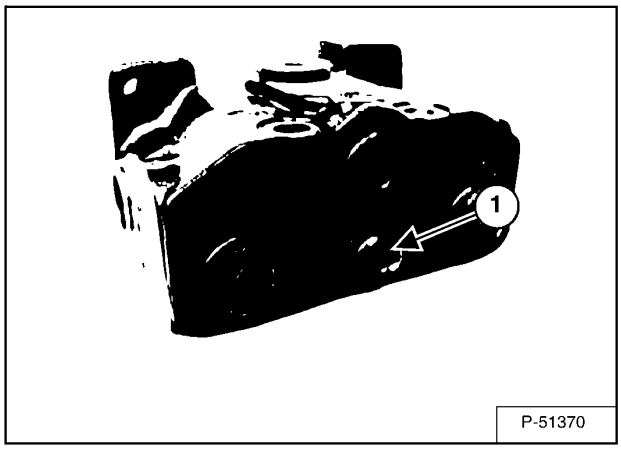
Figure 20-40-67



Inspect the centering mechanism adapter (Item 1), spool adapter (Item 2) and o-ring (Item 3) **[Figure 20-40-67]**.

Replace parts as needed.

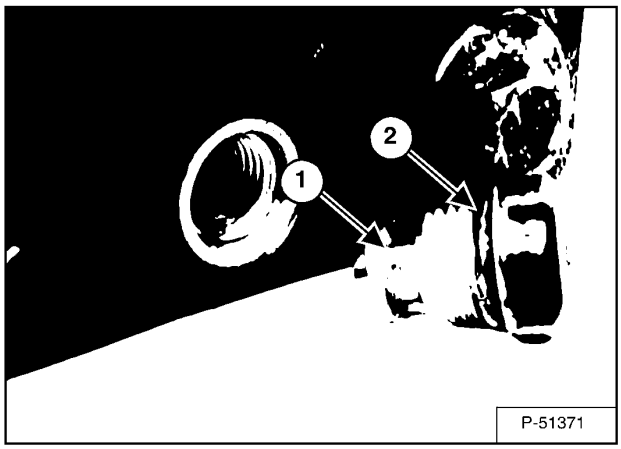
Figure 20-40-68



Remove the check valve (Item 1) **[Figure 20-40-68]** from the auxiliary valve section.

Assembly: Tighten check valve to 17.7 ft-lbs (24 N•m) torque.

Figure 20-40-69



Inspect the check valve (Item 1) for free movement and inspect o-ring (Item 2) **[Figure 20-40-69]**.

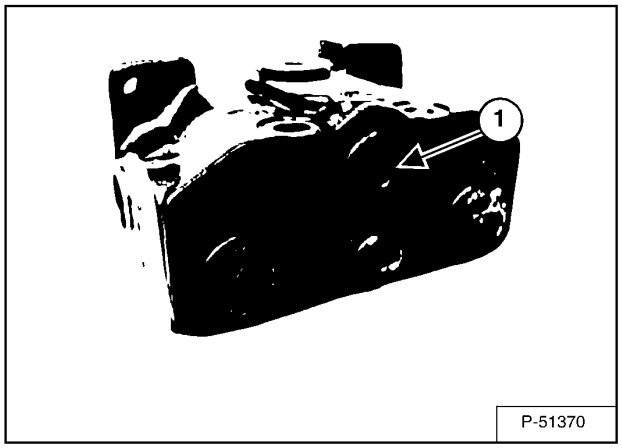
Replace parts as needed.

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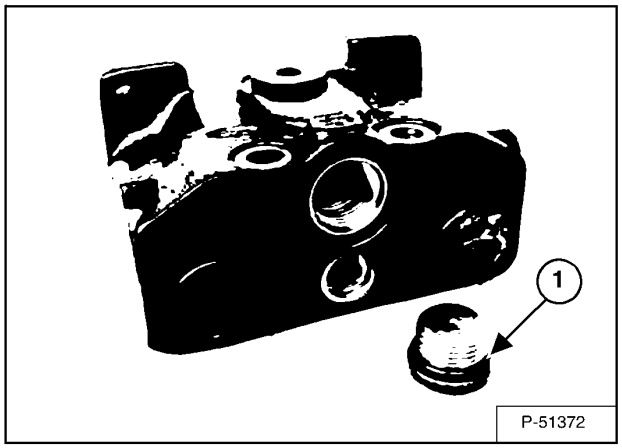
Disassembly and Assembly (Cont'd)

Figure 20-40-70



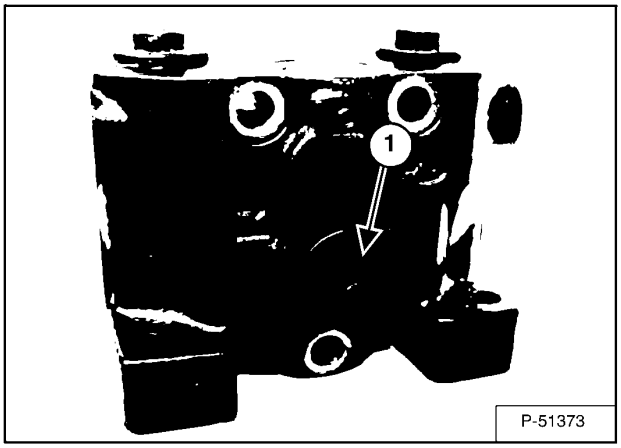
Remove plug (Item 1) **[Figure 20-40-70]**.

Figure 20-40-71



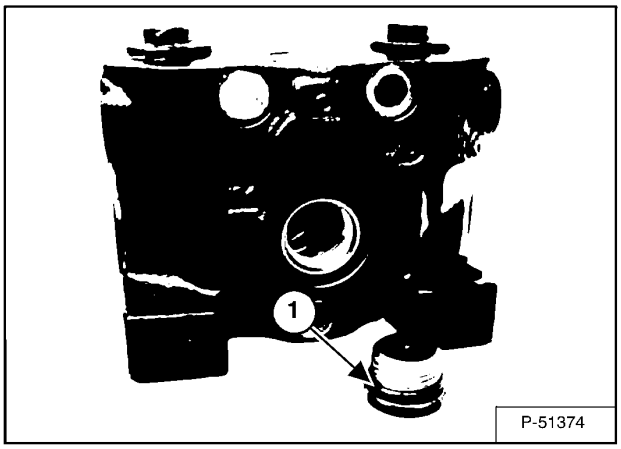
Inspect the o-ring (Item 1) **[Figure 20-40-71]** for damage. Replace as needed.

Figure 20-40-72



Remove the plug (Item 1) **[Figure 20-40-72]**.

Figure 20-40-73



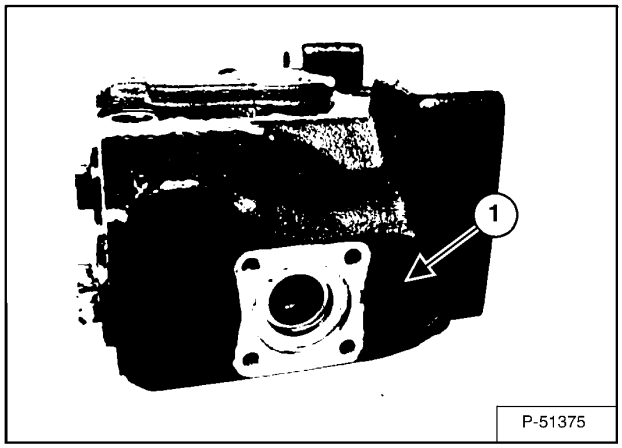
Inspect the o-ring (Item 1) **[Figure 20-40-73]** for damage and replace as needed.

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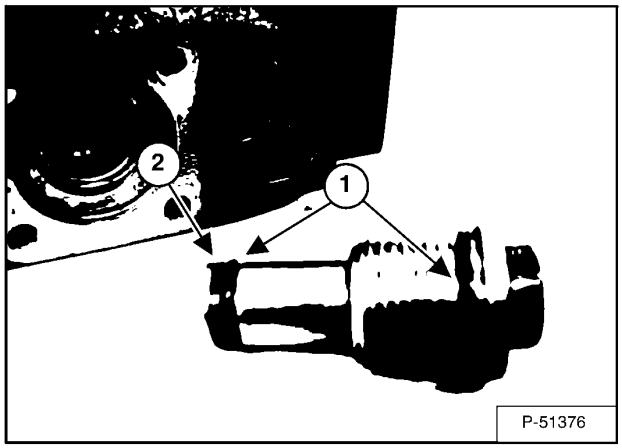
Disassembly and Assembly (Cont'd)

Figure 20-40-74



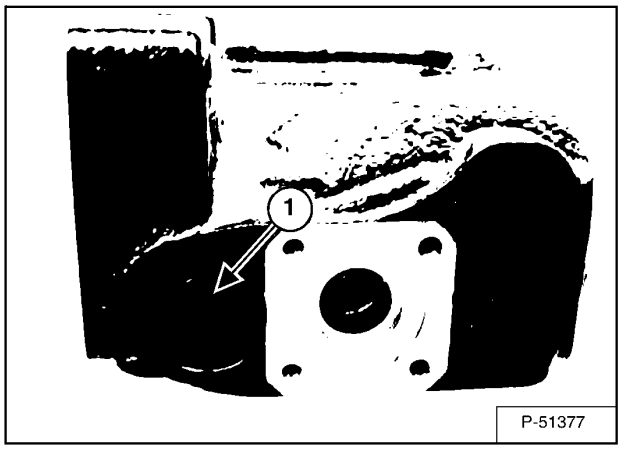
Remove the plug (Item 1) **[Figure 20-40-74]**.

Figure 20-40-75



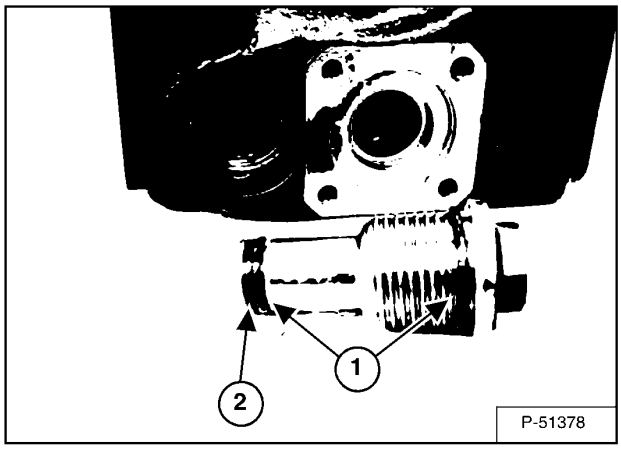
Inspect o-rings (Item 1) and seal (Item 2) **[Figure 20-40-75]**, replace if necessary.

Figure 20-40-76



Remove the plug (Item 1) **[Figure 20-40-76]**.

Figure 20-40-77



Inspect o-rings (Item 1) and seal (Item 2) **[Figure 20-40-77]**, replace if necessary.

Reverse the disassembly procedure to as semble the hydraulic control valve.

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HYDRAULIC PUMP

Check The Output Of The Hydraulic Pump

The tools listed will be nee ded to do the fol lowing procedure:

MEL10003 - Hydraulic Tester
MEL10106 - Hydraulic Test Kit

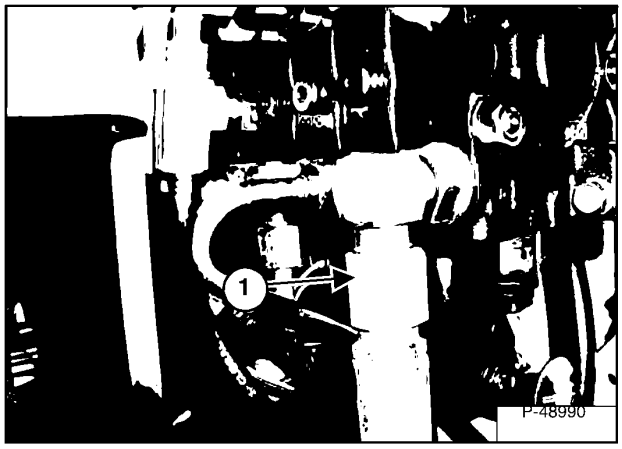
Open the tailgate.

IMPORTANT

When the engine is running during service, the steering lever and hydraulic control levers must be in neutral and the parking brake engaged.

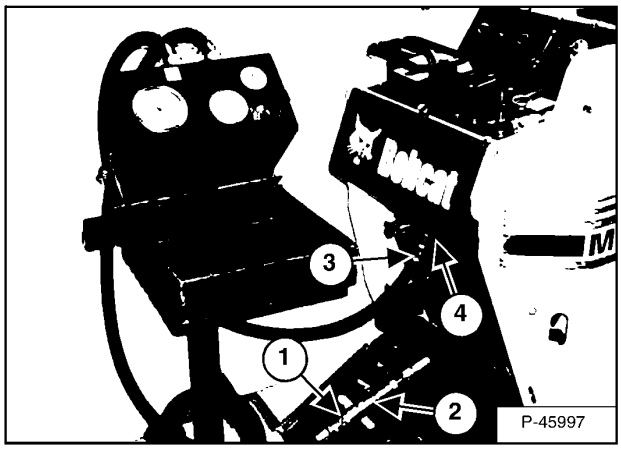
W-2482-1003

Figure 20-50-1



Disconnect the pump OUTLET hose (Item 1) **[Figure 20-50-1]** from the control valve.

Figure 20-50-2



Connect the INLET hose (Item 1) from the tester to the OUTLET hose (Item 2) of the pump. Connect the OUTLET hose (Item 3) from the tester to the control valve fitting (Item 4) **[Figure 20-50-2]**.

IMPORTANT

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

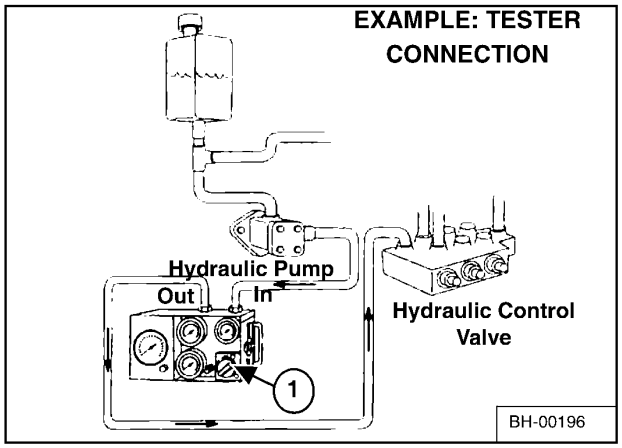
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Check The Output Of The Hydraulic Pump (Cont'd)

Figure 20-50-3



Sample tester connection shown **[Figure 20-50-3]**.

Start the engine and run at low idle RPM. Make sure the tester is connected correctly. If no flow is indicated on the tester, the hoses are connected wrong. With the hoses connected correctly, increase the engine speed to f ull RPM*.

Warm the fluid to 100-140°F. (38-49°C.) by turning the restrictor control (Item 1) **[Figure 20-50-3]** on the tester to about 1000 PSI (6895 bar). **DO NOT exceed system relief pressure.** Open the restrictor control and record the free flow (GPM) at full RPM.

Push the auxiliary hydraulics lever forward to engage the front auxiliary hydraulics (fluid pressure will go over main relief).

NOTE: Due to flow and engine horsepower limitations, the engine RPM will quickly decrease when the auxilliary flow goes over the main relief pressure. Maximum pressure and flow can be obtained for one to thr ee seconds after the auxilliary lever is engaged.

Record the highest pressure (PSI) and flow (GPM). The high pressure flow must be at least 80% of free flow.

$$\% = \frac{\text{HIGH PRESSURE FLOW (GPM)}}{\text{FREE FLOW (GPM)}} \times 100$$

A low percentage may indicate a failed pump.

*Refer to SPECIFICATIONS Contents Page SPEC-01 for system relief pressure and full RPM.

Removal And Installation

⚠ WARNING

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

W-2145-0290

IMPORTANT

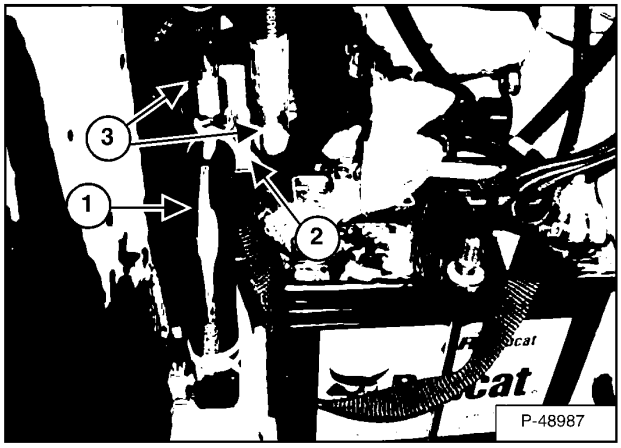
When repairing hydrostatic and hydraulic systems, clean the work area before disassembly and keep all parts clean. Always use caps and plugs on hoses, tubelines and ports to keep dirt out. Dirt can quickly damage the system.

I-2003-0888

Open the tailgate.

Drain the hydraulic reservoir.

Figure 20-50-4



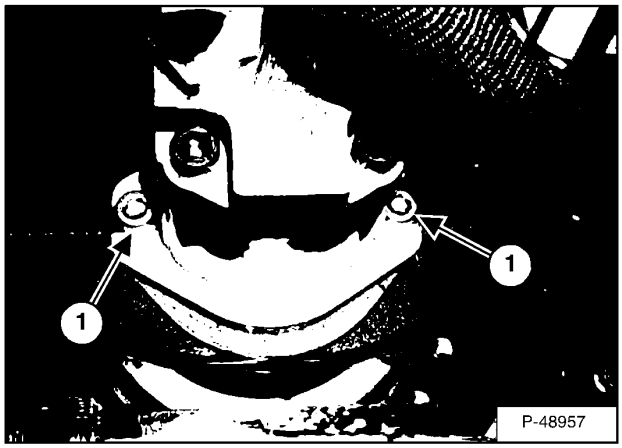
Remove the inlet hose (Item 1) from the hydraulic gear pump (Item 2) **[Figure 20-50-4]**.

Disconnect and cap the two h ydraulic pump hoses (Item 3) **[Figure 20-50-4]**.

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Removal And Installation (Cont'd)

Figure 20-50-5



Remove the two mounting bolts (Item 1) **[Figure 20-50-5]** from the hydraulic gear pump.

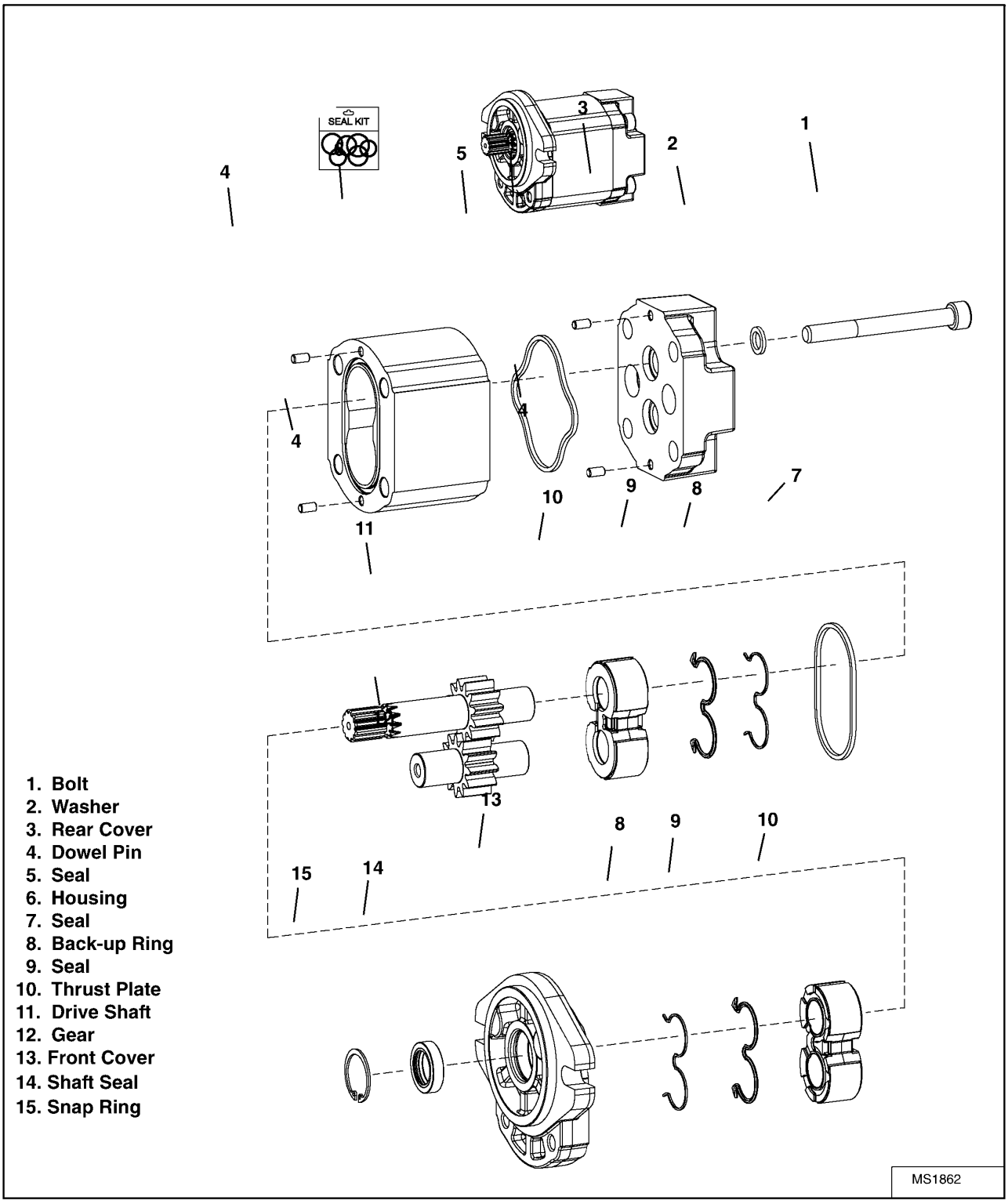
Installation: Tighten the bolts to 52.5-58.5 ft.-lb. (71-79 N•m) torque.

Remove the hydraulic gear pump from the loader.

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Parts Identification



1. Bolt
2. Washer
3. Rear Cover
4. Dowel Pin
5. Seal
6. Housing
7. Seal
8. Back-up Ring
9. Seal
10. Thrust Plate
11. Drive Shaft
12. Gear
13. Front Cover
14. Shaft Seal
15. Snap Ring

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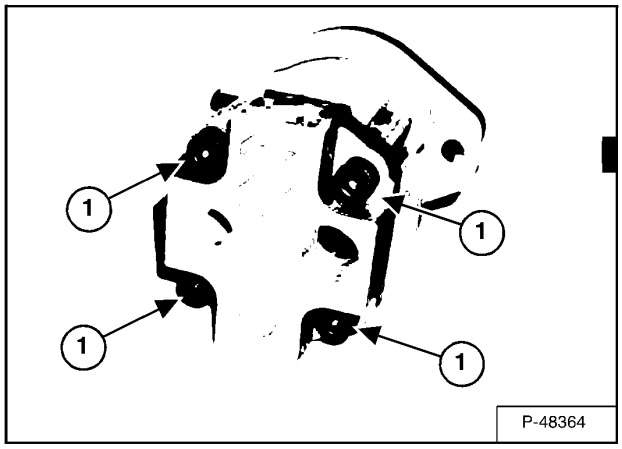
Disassembly And Assembly

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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Figure 20-50-6



Remove the pump housing bolts and washers (Item 1) **[Figure 20-50-6]**.

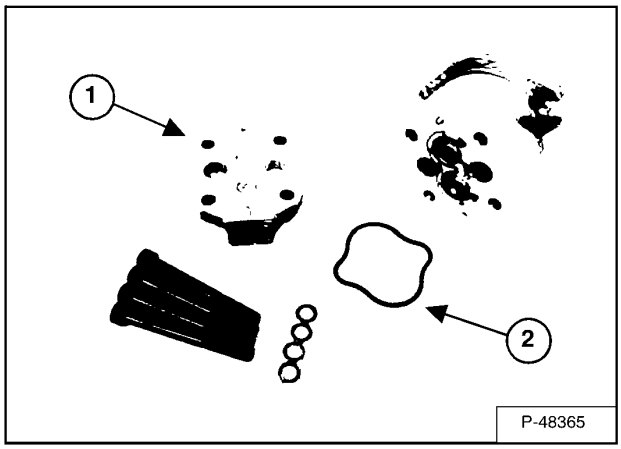
Installation: Tighten bolts to 37 ft.-lb. (50 N•m) torque.

Figure 20-50-7



Mark the pump sections for correct assembly **[Figure 20-50-7]**.

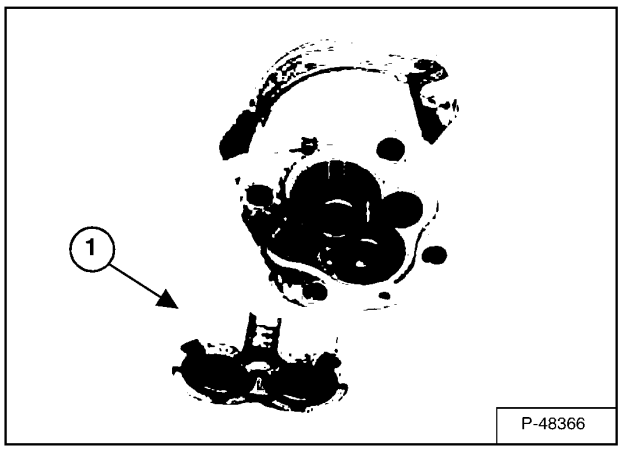
Figure 20-50-8



Remove the rear cover (Item 1) **[Figure 20-50-8]**.

Remove the square seal (Item 2) **[Figure 20-50-8]**.

Figure 20-50-9



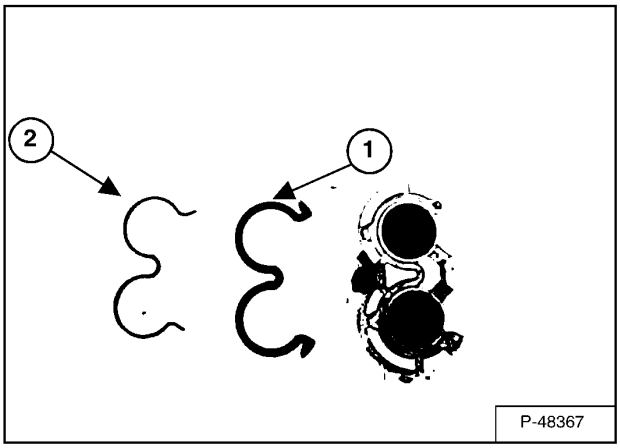
Remove the thrust plate (Item 1) **[Figure 20-50-9]** from the pump body.

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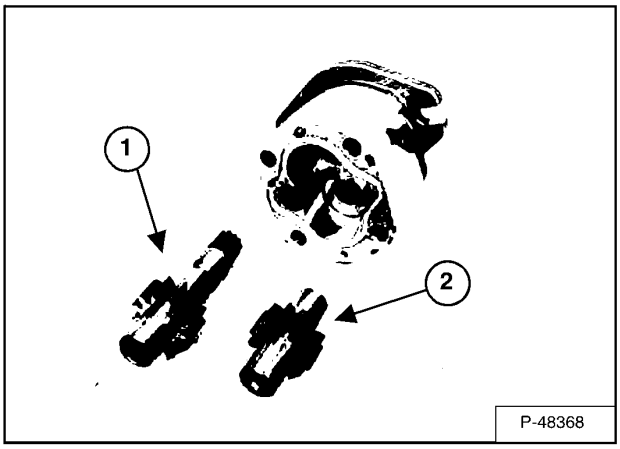
Disassembly And Assembly (Cont'd)

Figure 20-50-10



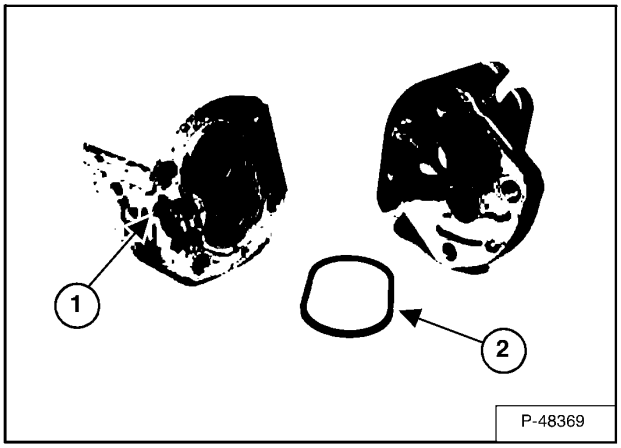
Remove the s eal (Item 1) and back-up ring (Item 2) **[Figure 20-50-10]** from the thrust plate.

Figure 20-50-11



Remove the drive gear (Item 1) and driven gear (Item 2) **[Figure 20-50-11]**.

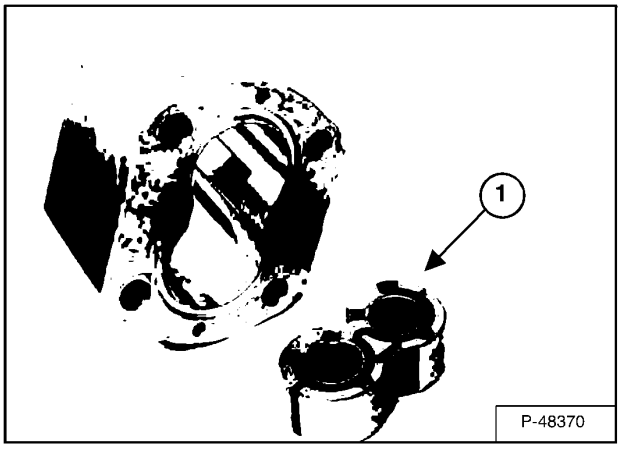
Figure 20-50-12



Remove the pump body (Item 1) **[Figure 20-50-12]**.

Remove the square seal (Item 2) **[Figure 20-50-12]**.

Figure 20-50-13



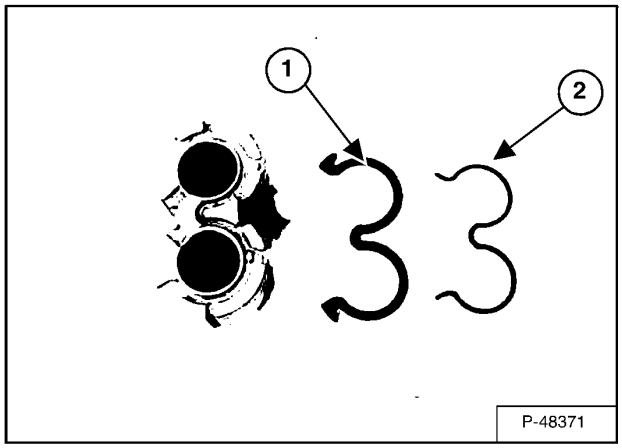
Remove the thrust plate (Item 1) **[Figure 20-50-13]** from the pump body.

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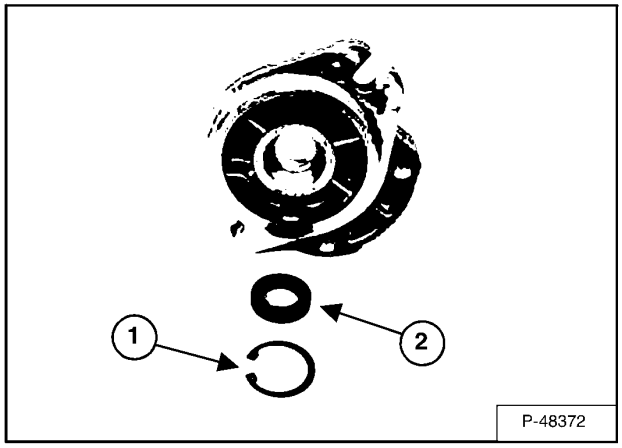
Disassembly And Assembly (Cont'd)

Figure 20-50-14



Remove the seal (Item 1) and back-up (Item 2) **[Figure 20-50-14]** from the thrust plate.

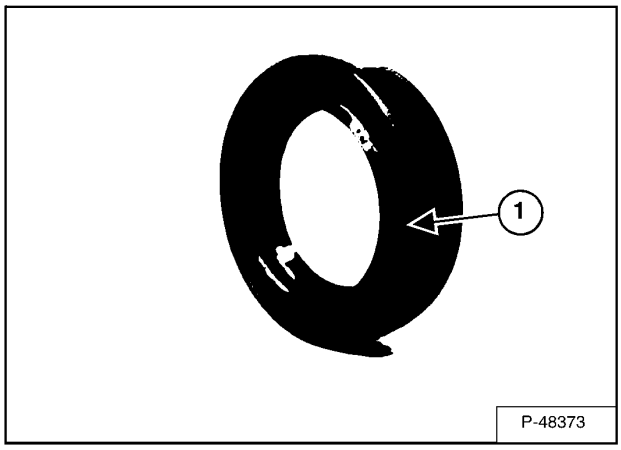
Figure 20-50-15



Rotate the front cover around.

Remove the retaining ring (Item 1) and shaft seal (Item 2) **[Figure 20-50-15]** from the front cover.

Figure 20-50-16



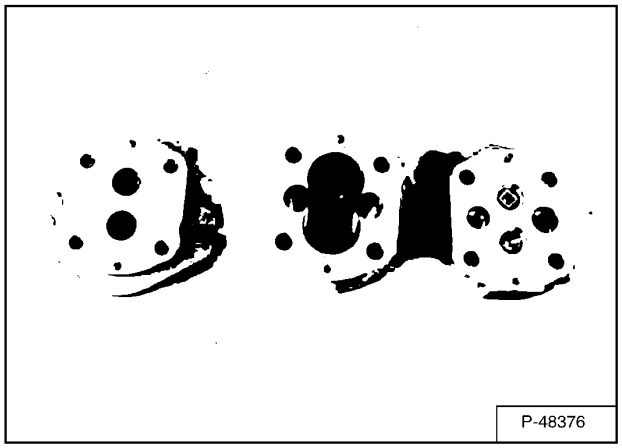
Installation: The shaft seal flush surface (Item 1) **[Figure 20-50-16]** must be facing out away from the pump.

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Inspection

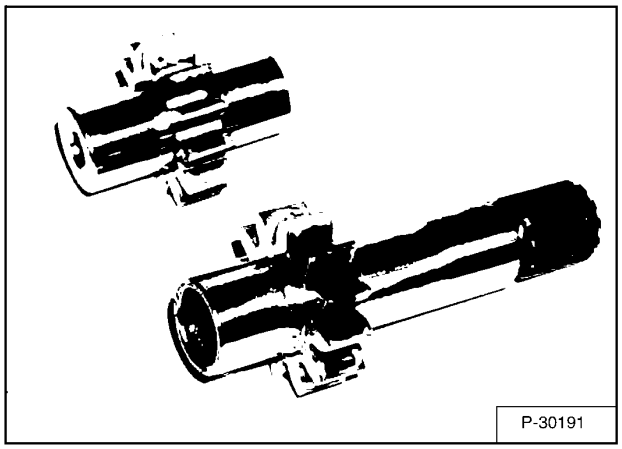
Figure 20-50-17



Wash all parts in clean solvent and use air pressure to dry them

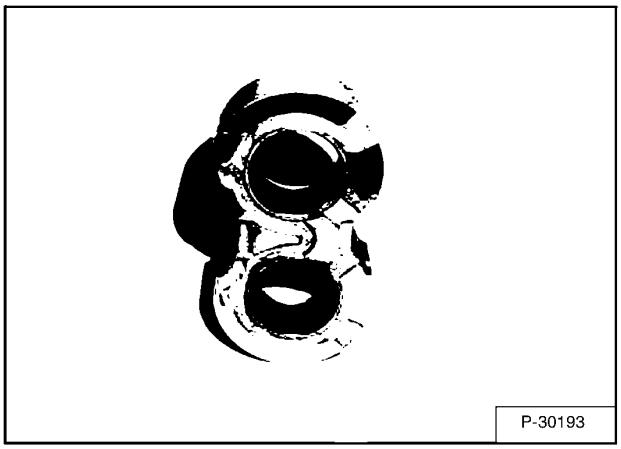
Check the pump body, front cap and rear cap **[Figure 20-50-17]**.

Figure 20-50-18



Check the gear(s) **[Figure 20-50-18]**.

Figure 20-50-19



Check the bushings in the thrust plate **[Figure 20-50-19]**.

If excessive wear or damage is visible on any of th e parts, the parts must be replaced.

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HYDRAULIC FILTER

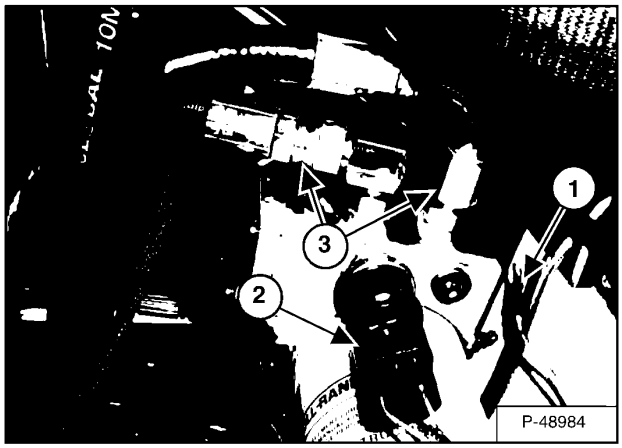
Housing Removal And Installation

⚠ WARNING

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

W-2145-0290

Figure 20-60-1



Open the tailgate.

Disconnect the wire (Item 1) **[Figure 20-60-1]** from hydraulic pressure sensor.

Disconnect electrical connector (Item 2) **[Figure 20-60-1]** from the sender.

Disconnect the inlet and outlet hoses (Item 3) **[Figure 20-60-1]** from the filter housing.

Figure 20-60- 2



Disconnect the two screws (Item 1) **[Figure 20-60- 2]** from the filter housing.

Remove the hydraulic filter housing from the loader.

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HYDRAULIC FLUID RESERVOIR

The hydraulic fluid reservoir is made of a plastic material and the hydraulic fittings are installed into a metal threaded insert. The torque for tightening the fittings is very crucial to p reventing leaks at th e insert. Overtightening fittings may cause the threaded metal insert to move and create a leak.

Removal And Installation

Open the tailgate.

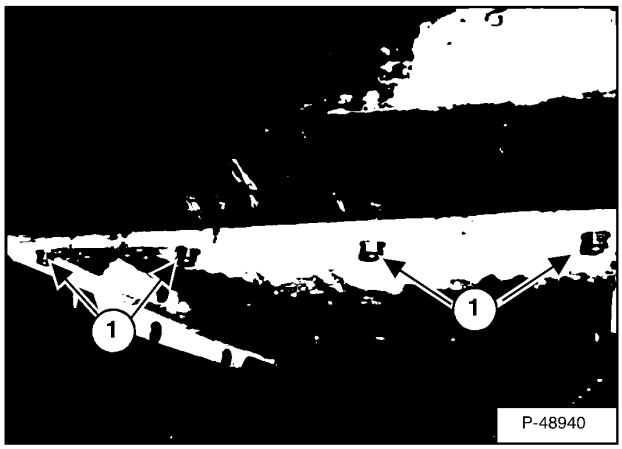
Drain the Hydraulic Fluid Reservoir.

⚠ WARNING

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

W-2103-1285

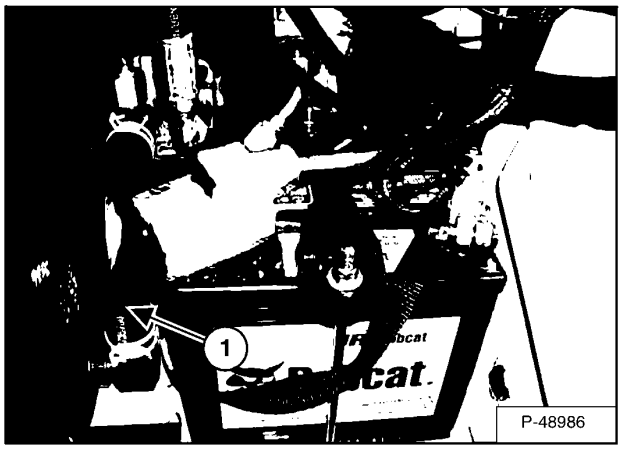
Figure 20-70-1



Remove the screws (Item 1) **[Figure 20-70-2]** that attach the tailgate and rear door panel to the mainframe.

Remove the tailgate and rear door.

Figure 20-70-2



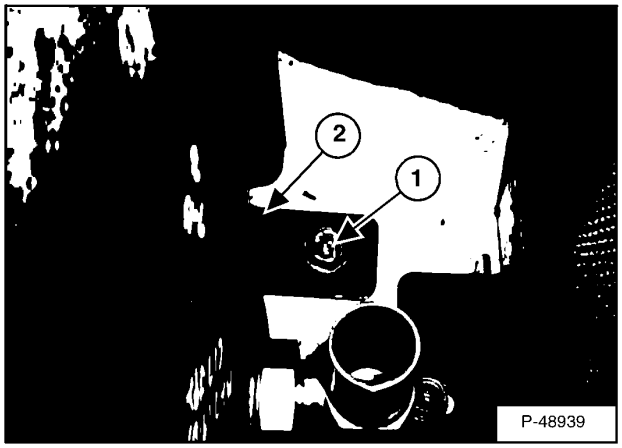
Disconnect and plug the hydraulic return hose (Item 1) **[Figure 20-70-2]** from the hydraulic fluid reservoir.

IMPORTANT

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

I-2003-0888

Figure 20-70-3



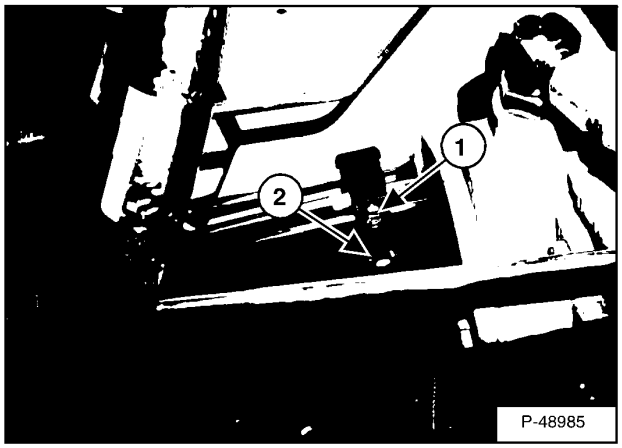
Remove the screw (Item 1) that fastens the lower half of the reservoir bracket (Item 2) **[Figure 20-70-3]** to the mainframe of the loader.

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Removal And Installation (Cont'd)

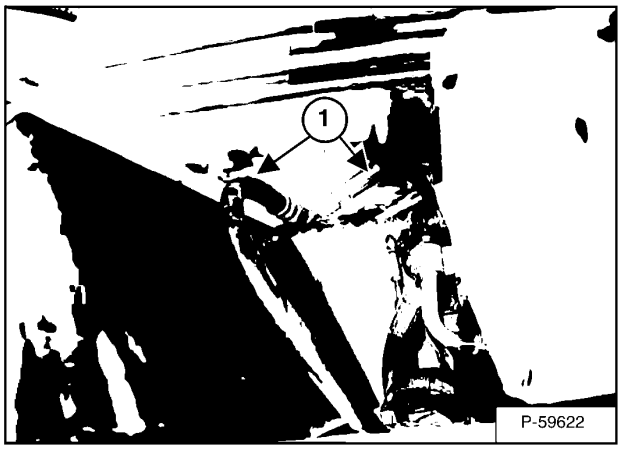
Figure 20-70-4



Remove the screw (Item 1) that fastens the upper half of the reservoir bracket (Item 2) **[Figure 20-70-4]** to th e mainframe of the loader. Remove the reservoir bracket.

Once the reservoir bracket is removed, pull the reservoir part way out of the loader to gain access to the drain hoses at the front of the hydraulic reservoir.

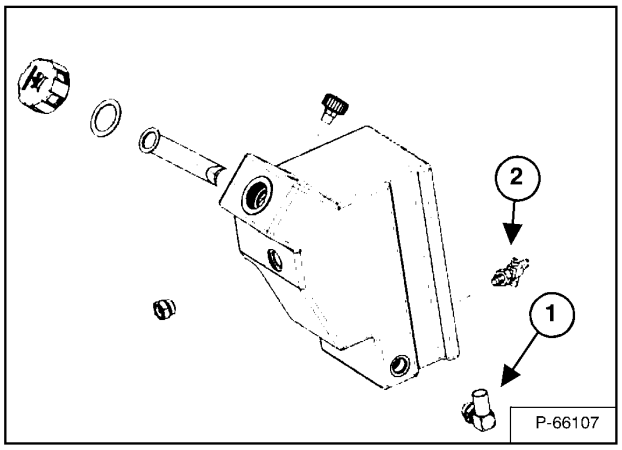
Figure 20-70-5



Disconnect and cap the drain hoses (Item 1) **[Figure 20-70-5]** from the front of the reservoir.

Remove the hydraulic reservoir from the loader.

Figure 20-70-6



The proper torque for the la rger fitting (Item 1) **[Figure 20-70-6]** leading to the gear pump is 40-60 ft.-lb. (54-81 N•m) torque. **DO NOT OVERTIGHTEN FITTING!**

The proper torque for the smaller fitting (Item 2) **[Figure 20-70-6]** leading from the drain hoses is 22-24 ft.-lb. (29-33 N•m) torque. **DO NOT OVERTIGHTEN FITTING!**

Reverse the removal procedure to i nstall the hydraulic reservoir.

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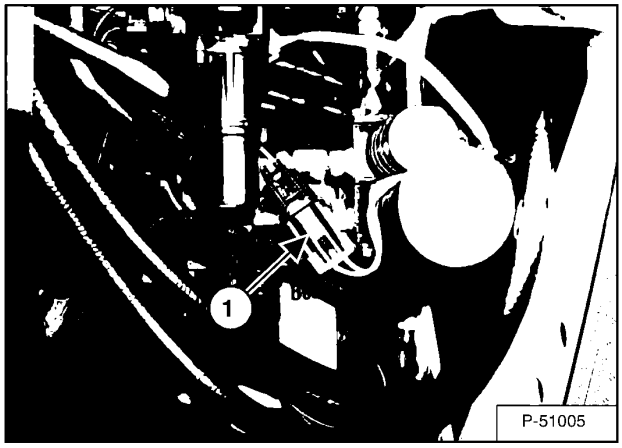
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LIFT LOCK VALVE

Solenoid Testing

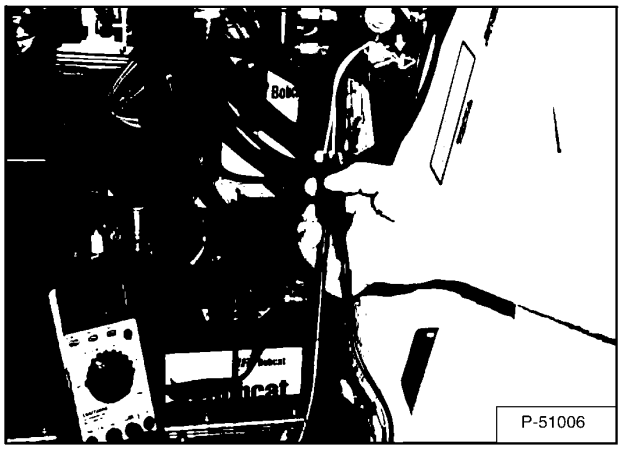
Open the Tailgate.

Figure 20-80-1



Disconnect the lift lock valve power connector (Item 1) **[Figure 20-80-1]**.

Figure 20-80-2



Use a test meter to measure coil resistance **[Figure 20-80-2]**. Coil wires do not have polarity. Correct resistance is 7.5 ± 1 ohms at 70°F.

Test the coil with 12 volt power. You can see and hear the spool shift.

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LIFT LOCK VALVE (CONT'D)

Solenoid Removal And Installation

Fully lower the lift arms.

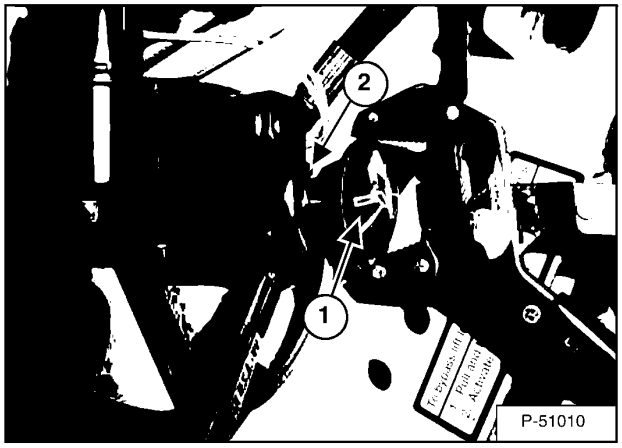
Open the tailgate.

⚠ WARNING

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

W-2103-1285

Figure 20-80-3



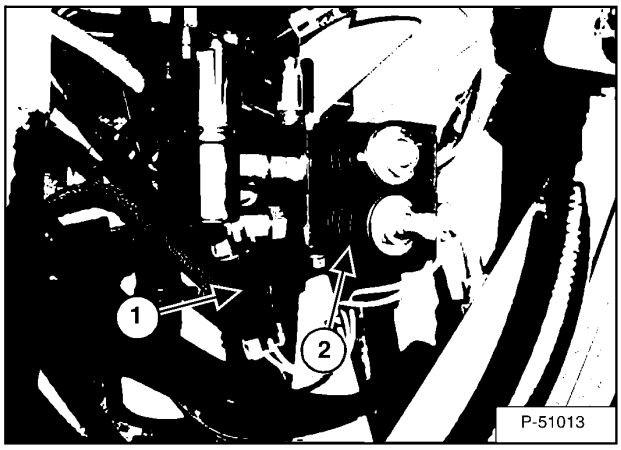
Remove the lift arm by-pass knob (Item 1) **[Figure 20-80-3]**.

NOTE: When removing or installing the bypass knob, hold the knob lock nut firmly with a wrench while tightening or loosening the knob with a pliers. DO NOT hold the solenoid, valve body or solenoid retainer nut to loosen or tighten the knob, as damage to the solenoid stem will result.

Remove the solenoid nut (Item 2) **[Figure 20-80-3]**.

Installation: Tighten nut to 15- 45 in.-lb. (1,7-5,1 N•m) torque. Hold the knob firmly with a pliers.

Figure 20-80-4



Disconnect the lift lock valve power connector (Item 1) **[Figure 20-80-4]**.

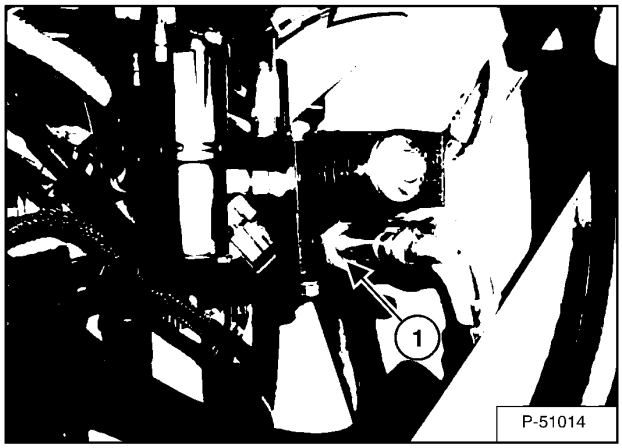
Remove the solenoid (Item 2) **[Figure 20-80-4]** off the solenoid valve stem.

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Solenoid Removal And Installation (Cont'd)

Figure 20-80-5



Remove the solenoid valve stem (Item 1) **[Figure 20-80-5]** from the valve block.

⚠ WARNING

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

W-2145-0290

⚠ WARNING

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

Installation: Put oil on O-rings and back-up washers and tighten the solenoid stem to 30 ft.-lb. (40,7 N•m) torque.

Perform a function check on the lift lock valve. (See Operation & Maintenance Manual.)

Removal And Installation

Open the Rear Door.

⚠ 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 no t received immediately.

W-2145-0290

⚠ WARNING

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

W-2103-1285

⚠ 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.

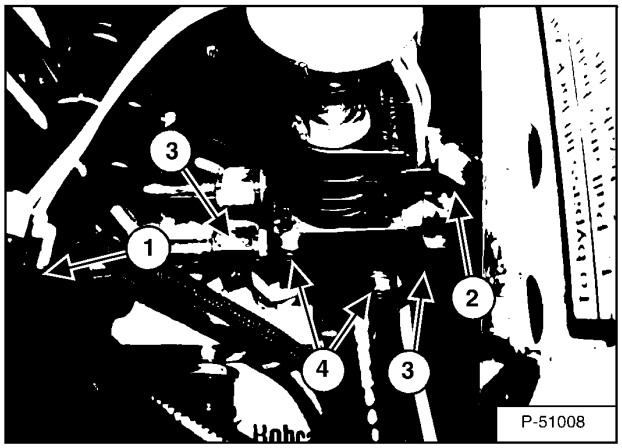
W-2059-0598

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Removal And Installation (Cont'd)

Figure 20-80-6



Disconnect the lift lock valve power connector (Item 1) **[Figure 20-80-6]** from the mainframe electrical harness.

Disconnect and cap the lift cylinders hose (Item 2) and tubelines (Item 3) **[Figure 20-80-6]** from the lift lock valve.

Remove the two nuts and bolts (Item 4) **[Figure 20-80-6]** from the valve and valve mount.

Remove the lift lock valve **[Figure 20-80-6]** from the loader.

Reverse the removal procedure to install the lift lock valve.

Perform a function check on the lift lock valve. (See Operation & Maintenance Manual.)

Disassembly And Assembly

Figure 20-80-7

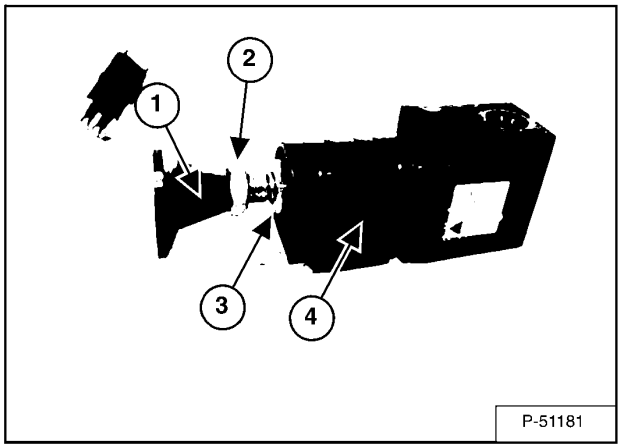
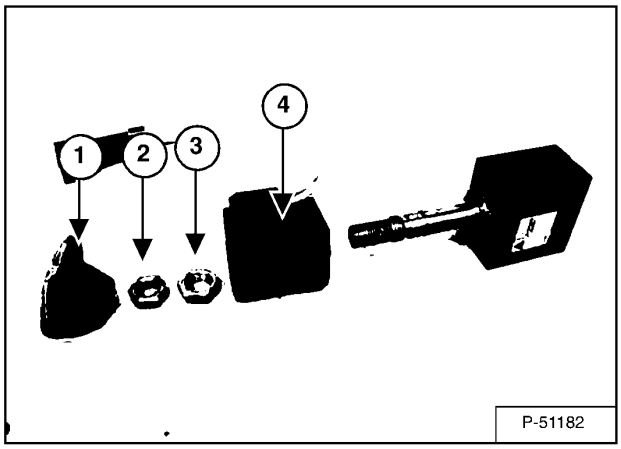


Figure 20-80-8



Remove the lift arm by-pass knob (Item 1) and lock nut (Item 2) **[Figure 20-80-7]** & **[Figure 20-80-8]** from the solenoid.

NOTE: When removing or installing the bypass knob, hold the knob lock nut firmly with a wrench while tightening or loosening the knob with a pliers. DO NOT hold the solenoid, valve body or solenoid retainer nut to loosen or tighten the knob, as damage to the solenoid stem will result.

Remove the solenoid nut (Item 3) **[Figure 20-80-7]** & **[Figure 20-80-8]** from the solenoid.

Installation: Tighten nut to 15-45 in.-lb. (1,7-5,1 N•m) torque.

Remove the solenoid coil (Item 4) **[Figure 20-80-7]** & **[Figure 20-80-8]**.

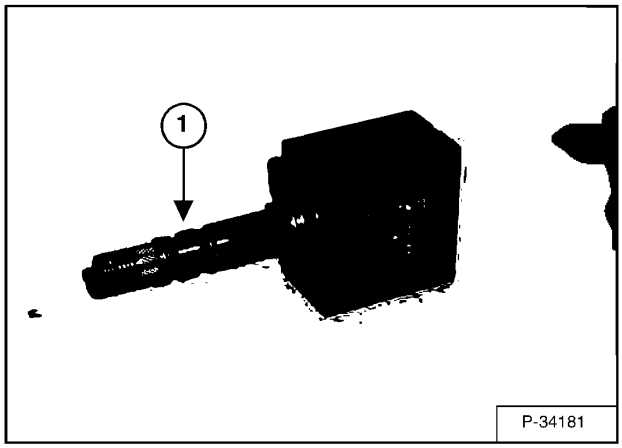
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LIFT LOCK VALVE (CONT'D)

Disassembly And Assembly (Cont'd)

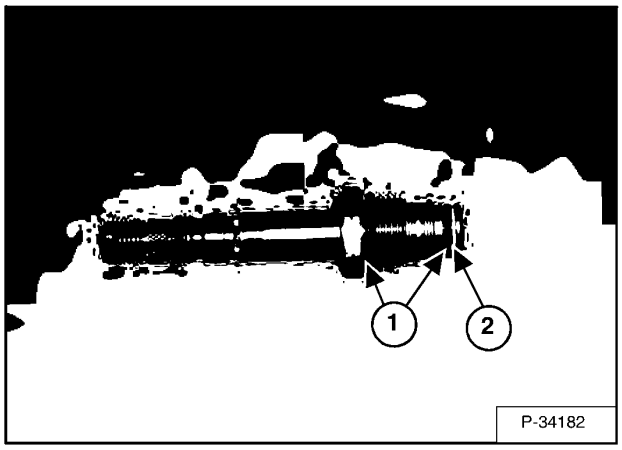
Figure 20-80-9



Remove the solenoid stem (Item 1) **[Figure 20-80-9]**.

Installation: Put oil on O-rings and back-up washers and tighten the solenoid stem to 30 ft.-lb. (40,7 N•m) torque.

Figure 20-80-10



Inspect the solenoid stem and replace the O -rings (Item 1) and the back-up washer (Item 2) **[Figure 20-80-10]** as needed.

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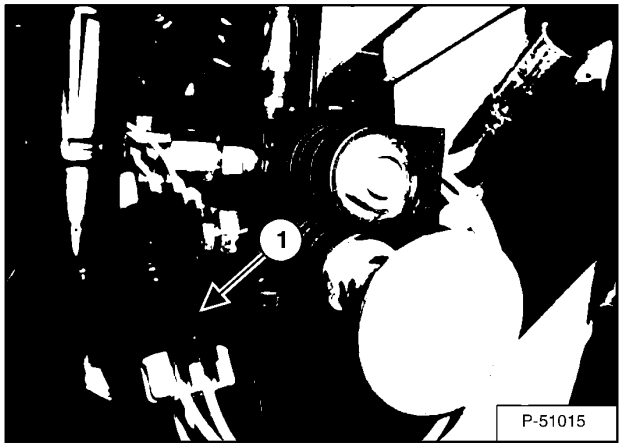
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TILT LOCK VALVE

Solenoid Testing

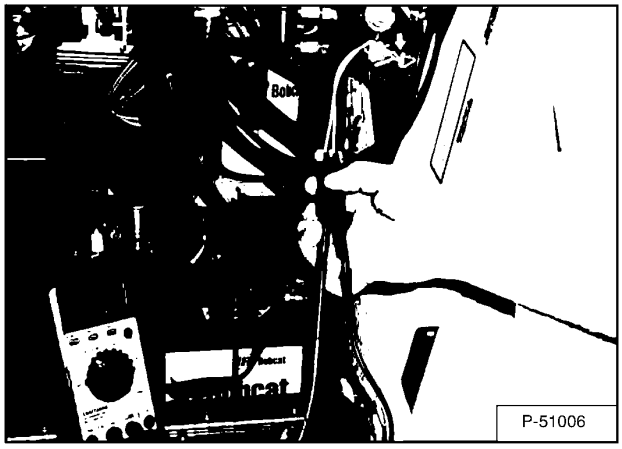
Open the tailgate.

Figure 20-90-1



Disconnect the tilt lock valve power connector (Item 1) **[Figure 20-90-1]**.

Figure 20-90-2



Use a test meter to measure coil resistance **[Figure 20-90-2]**. Coil wires do not have polarity. Correct resistance is 7.5 ± 1 ohms at 70° F.

Test the coil with 12 volt power. You can see and hear the spool shift.

Solenoid Removal And Installation

Remove attachment and fully lower lift arms.

Open the tailgate.

⚠ 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 no t received immediately.

W-2145-0290

⚠ WARNING

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

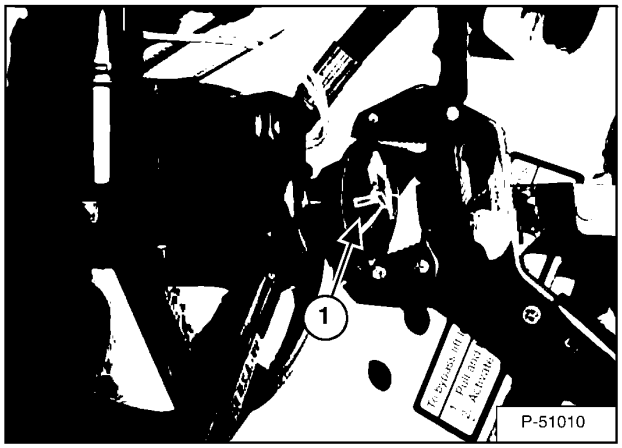
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Solenoid Removal And Installation (Cont'd)

Figure 20-90-3

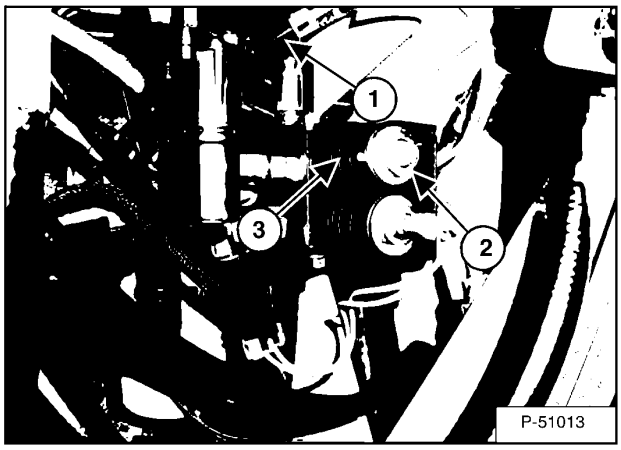


Remove the lift arm by-pass knob (Item 1) **[Figure 20-90-3]**.

Installation: Tighten nut to 15- 45 in.-lb. (1,7-5,1 N•m) torque. Hold the knob firmly with a pliers.

NOTE: When removing or installing the bypass knob, hold the knob lock nut firmly with a wrench while tightening or loosening the knob with a pliers. DO NOT hold the solenoid, valve body or solenoid retainer nut to loosen or tighten the knob, as damage to the solenoid stem will result.

Figure 20-90-4



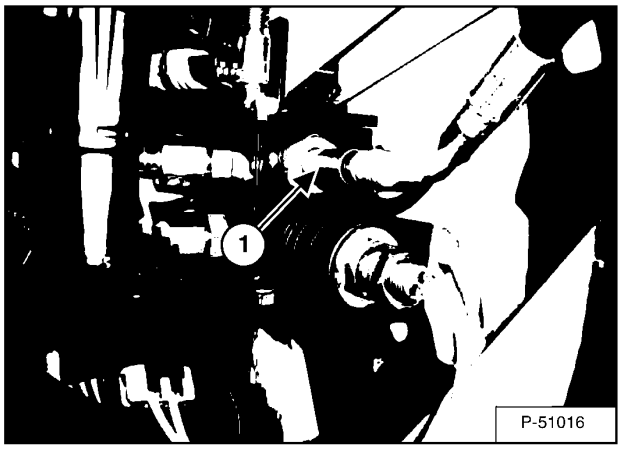
Disconnect the tilt lock valve power connector (Item 1) **[Figure 20-90-4]**.

Remove the solenoid nut (Item 2) **[Figure 20-90-4]**.

Installation: Tighten nut to 15-45 in.-lb. (1,7-5,1 N•m) torque.

Remove the solenoid (Item 3) **[Figure 1]** off the solenoid valve stem.

Figure 20-90-5



Remove the solenoid valve stem (Item 1) **[Figure 20-90-5]** from the valve block.

Installation: Put oil on O-rings and back-up washers and tighten the solenoid stem to 30 ft.-lb. (40,7 N•m) torque.

Perform a function check on the lift lock valve. (See Operation & Maintenance Manual.)

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Removal And Installation

⚠ WARNING

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

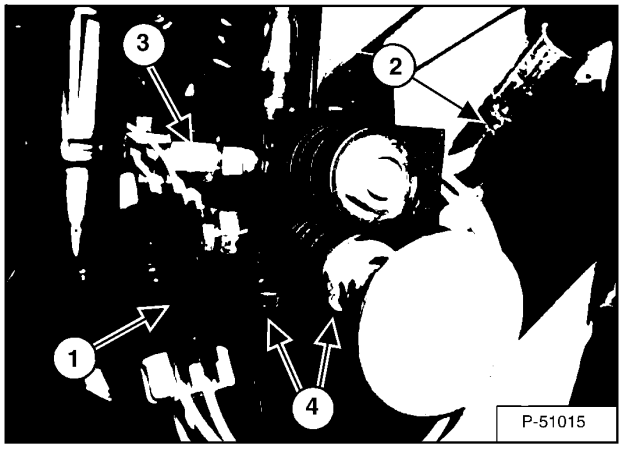
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⚠ WARNING

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

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Figure 20-90-6



Disconnect the tilt lock valve power connector (Item 1) **[Figure 20-90-6]** from the mainframe electrical harness.

Disconnect and cap the tilt cylinders hose (Item 2) and tubeline (Item 3) **[Figure 20-90-6]** from the tilt lock valve.

Remove the two nuts and bolts (Item 4) **[Figure 20-90-6]** from the valve and valve mount.

Remove the tilt lock valve from the loader.

Reverse the procedure to install the tilt lock valve.

Perform a function check on the lift lock valve. (See Operation & Maintenance Manual.)

Disassembly And Assembly

Figure 20-90-7

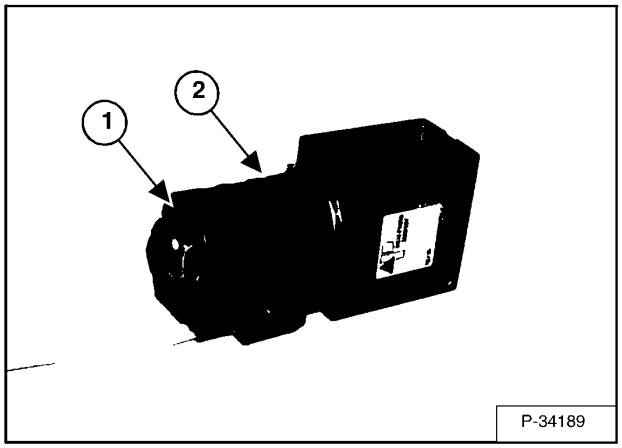
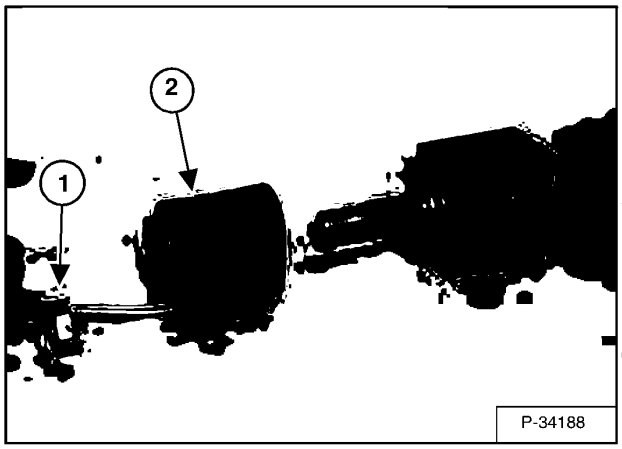


Figure 20-90-8



Remove the solenoid nut (Item 1) **[Figure 20-90-7]** & **[Figure 20-90-8]** from the solenoid.

Installation: Tighten nut to 15-45 in.-lb. (1,7-5,1 N•m) torque.

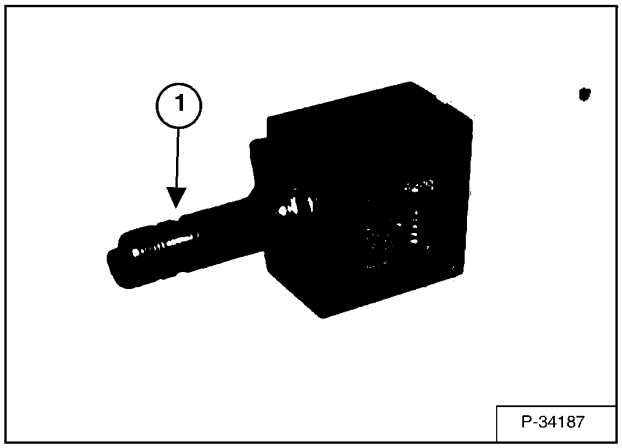
Remove the solenoid coil (Item 2) **[Figure 20-90-7]** & **[Figure 20-90-8]**.

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Disassembly And Assembly (Cont'd)

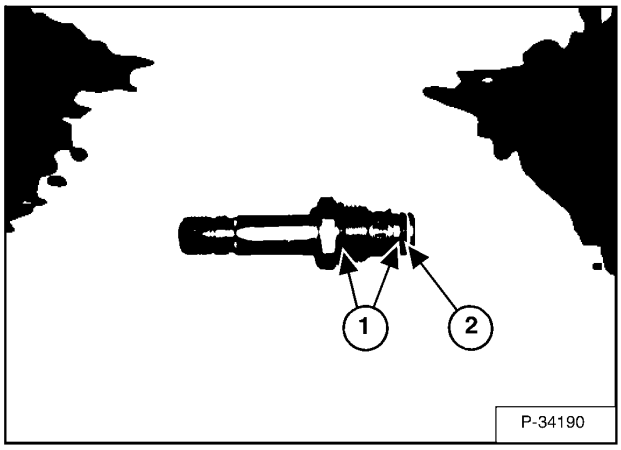
Figure 20-90-9



Remove the solenoid stem (Item 1) **[Figure 20-90-9]**.

Installation: Put oil on O-rings and back-up washers and tighten the solenoid stem to 30 ft.-lb. (40,7 N•m) torque.

Figure 20-90-10



Inspect the solenoid stem and replace the O-rings (Item 1) and the back-up washer (Item 2) **[Figure 20-90-10]** as needed.

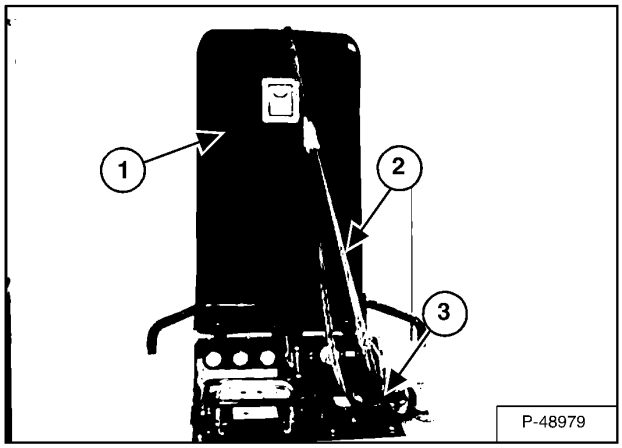
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HYDRAULIC OIL COOLER

Removal And Installation

Figure 20-100-1



Support the hood (Item 1) with a strap (Item 2) to the reference bar (Item 3) **[Figure 20-100-1]** on the control panel.

⚠ WARNING

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

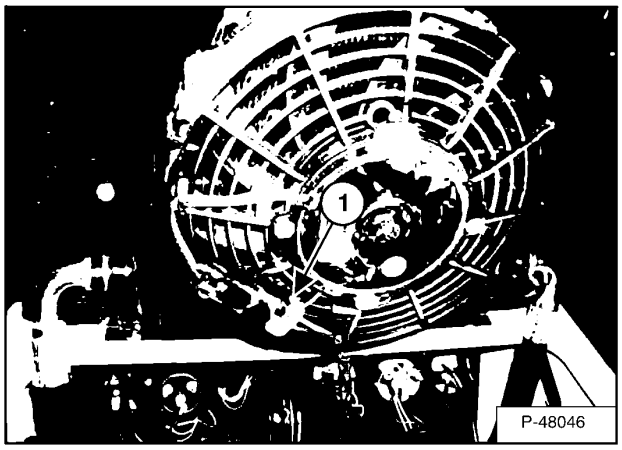
W-2145-0290

⚠ WARNING

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

W-2103-1285

Figure 20-100-2



Disconnect the wire connector (Item 1) **[Figure 20-100-2]** from the hydraulic oil cooler fan.

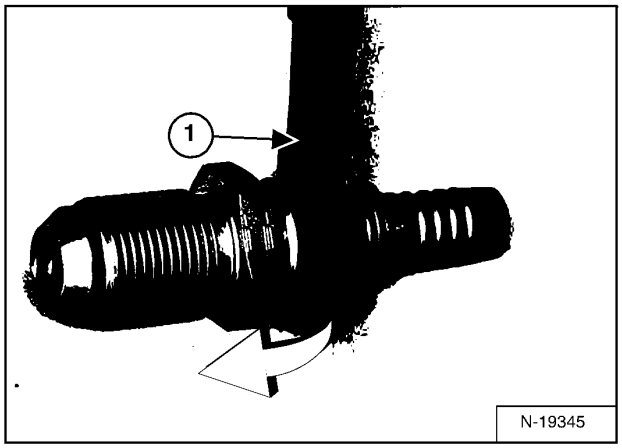
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HYDRAULIC OIL COOLER (CONT'D)

Removal And Installation (Cont'd)

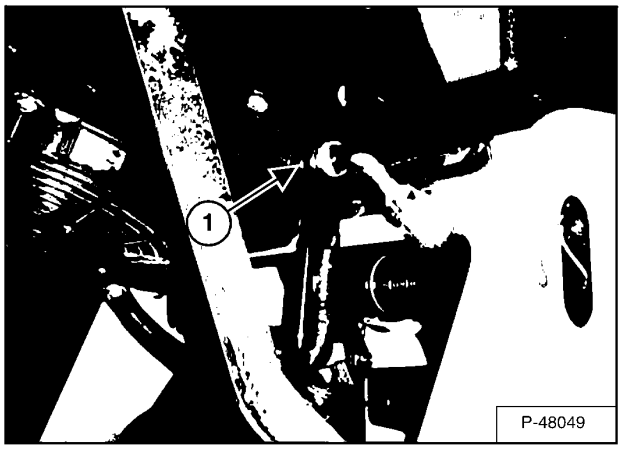
Figure 20-100-3



Disconnect the inlet and outlet hoses from the cooler.

Install tool MEL1558 (Item 1) **[Figure 20-100-3]** to the outside of the rubber seal.

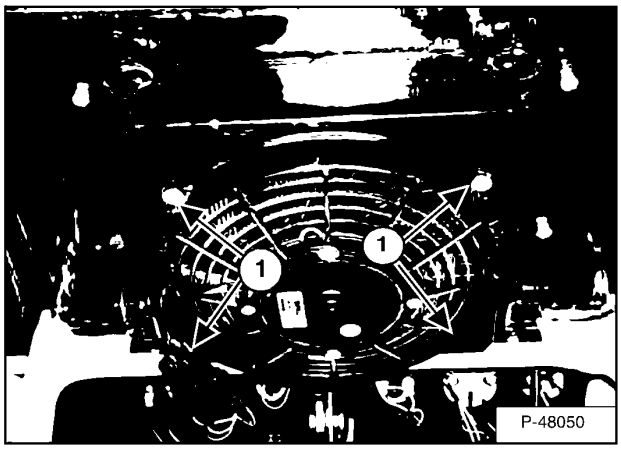
Figure 20-100-4



Slide the rubber sleeve in toward the radiator and the connector will release (Item 1) **[Figure 20-100-4]**.

NOTE: When installing the cooler hoses, the fittings should make a clicking sound when seated.

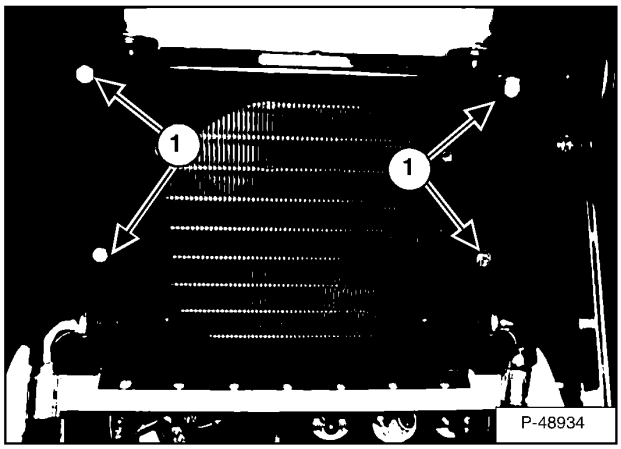
Figure 20-100-5



Remove the four screws (Item 1) **[Figure 20-100-1]** from the oil cooler fan.

Remove the cooling fan.

Figure 20-100-6



Remove the four bolts (Item 1) **[Figure 20-100-6]** from the hydraulic oil cooler.

Remove the hydraulic oil cooler.

Reverse the removal procedure to install the hydraulic oil cooler.

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HYDROSTATIC SYSTEM

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- Drive Belt Alignment 30-40-3
- Drive Belt Replacement 30-40-2
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TIGHTEN ALL HARDWARE PER SIZE TO GRADE 5 TORQUE (See TORQUE SPECIFICATIONS FOR BOLTS on Page SPEC-30-1.) UNLESS OTHERWISE SPECIFIED.

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HYDROSTATIC SYSTEM INFORMATION

Troubleshooting Chart

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

⚠ WARNING

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

W-2004-1285

PROBLEM	CAUSE
No drive function.	1, 2
No drive on one side in both directions.	2, 3, 4, 5, 6, 7, 9
No drive on one side in one direction.	2, 5, 7, 8, 10
Machine does not go reverse.	11, 12
Machine does not move in straight line.	1, 3, 7, 8, 13
Hydrostatic system overheating.	9, 14, 15, 16
Hydraulic/Hydrostatic warning light comes on.	2, 17, 18

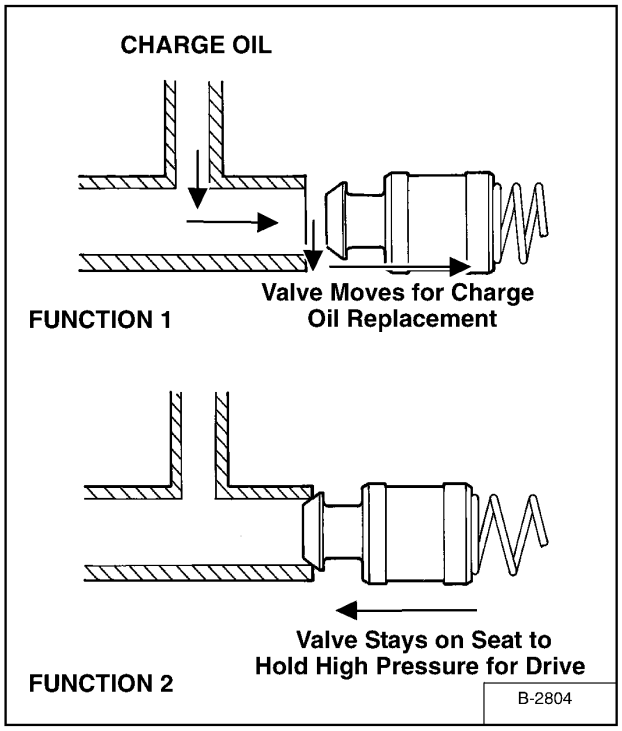
KEY TO CORRECT THE CAUSE
1. Belt slippage.
2. Low or no charge pressure.
3. Sheared key on drive motor and/or loose castle bolt.
4. Hydrostatic system has fluid leak.
5. Steering linkage loose, damaged or needs adjustment.
6. Hydrostatic pressure relief valve is defective.
7. Hydrostatic pump has defect.
8. Hydrostatic more has defect.
9. Hydrostatic fluid not at correct level.
10. Drive relief on hydrostatic pump is stuck open.
11. Inspect reverse speed adjustment.
12. Reverse stop linkage mechanism failure.
13. Steering lever is obstructed.
14. Restricted oil cooler.
15. Plugged case drain.
16. Hydraulic cooling fan not operable (Refer to Electrical Troubleshooting).
17. Electrical defect.
18. Hydraulic oil temp too high.

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Replenishing Valve Function

Figure 30-10-1



The functions of the replenishing valves are:

1. To give replacement fluid to the low pressure side of the hydrostatic circuit. Replacement fluid is needed because of normal internal leakage and the controlled flow to the oil cooler for cooling; Function 1 **[Figure 30-10-1]**.

2. To keep high pressure fluid out of the low pressure side of the hydrostatic circuitry; Function 2 **[Figure 30-10-1]**.

(See HYDROSTATIC PUMP on Page 30-30-1.), for valve location and repair information.)

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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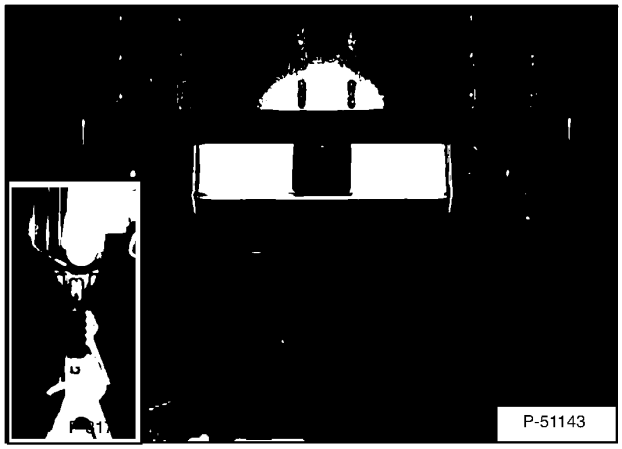
DRIVE MOTOR

Removal And Installation

Lift and block the loader. (See LIFTING AND BLOCKING THE LOADER on Page 10-10-1.)

Remove the engine access plate from under the bottom of the loader. (See Removal and Installation on Page 50-90-1.)

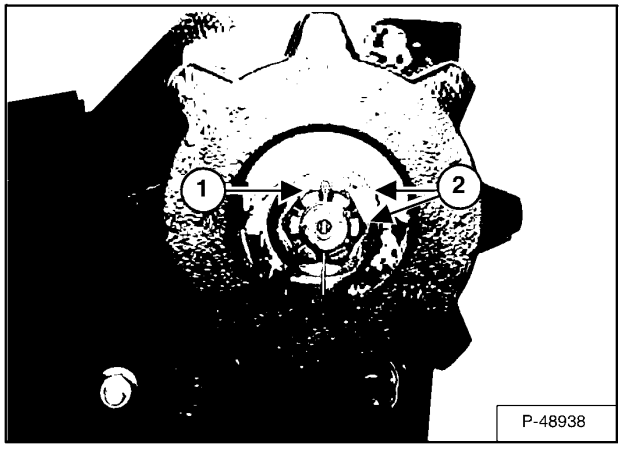
Figure 30-20-1



After the loader has been properly lifted and blocked, raise the lift arms 6 inches and install floor jacks under the Bob-Tach **[Figure 30-20-1]** to provide clearance for track removal.

Remove the track.

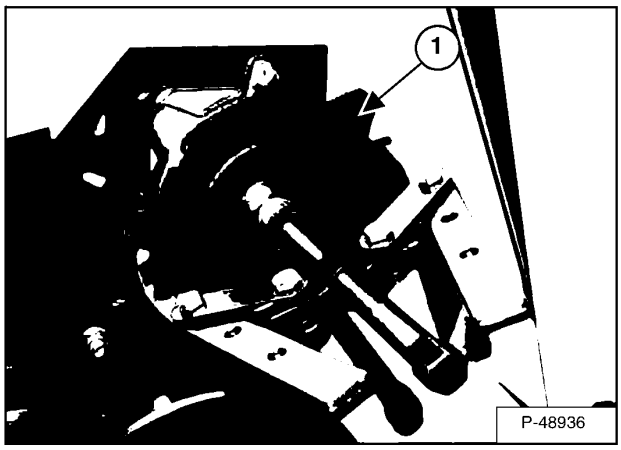
Figure 30-20-2



Remove the cotter pin (Item 1) and nut/spacer (Item 2) **[Figure 30-20-2]** from the drive sprocket shaft.

Installation: Tighten the nut to 27 5 ft.-lb. (644 N•m) torque plus torque required to align slotted nut with shaft cross hole.

Figure 30-20-3



Remove the drive sprocket (Item 1) **[Figure 30-20-3]** from the drive motor shaft using a puller.

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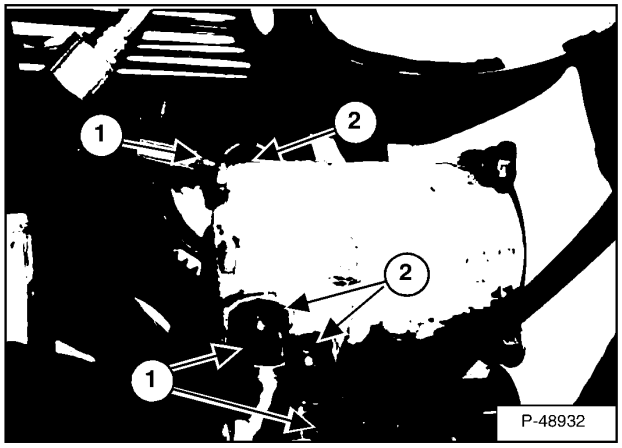
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DRIVE MOTOR (CONT'D)

Removal And Installation (Cont'd)

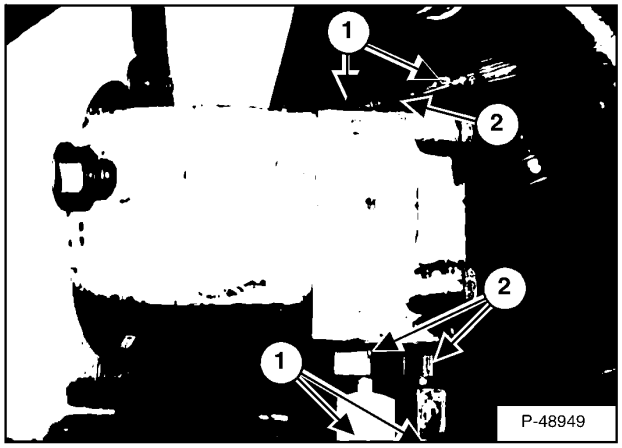
Right Side

Figure 30-20-4



Left Side

Figure 30-20-5



From behind the loader, disconnect and cap the hoses (Item 1) **[Figure 30-20-4]** and (Item 1) **[Figure 30-20-5]** connected to the drive motor.

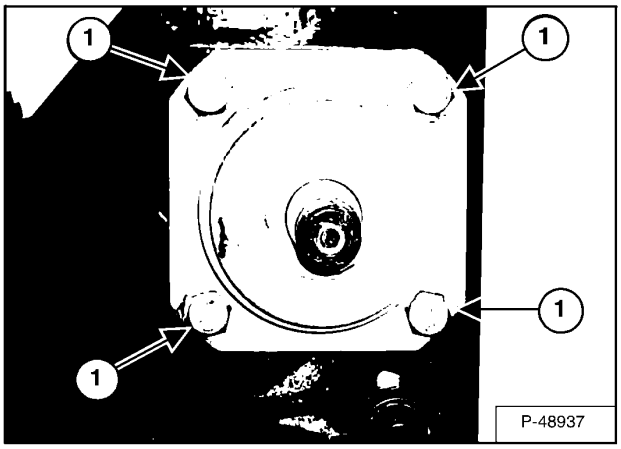
Remove fittings (Item 2) **[Figure 30-20-4]** and (Item 2) **[Figure 30-20-5]** from the drive motor so the drive motor can be removed from outside of frame.

NOTE: When removing the left drive motor you must first remove the hydraulic reservoir. (See HYDRAULIC FLUID RESERVOIR on Page 20-70-1.)

Remove the fittings from the pump so the drive motor can be removed from the outside of the frame (Item 2) **[Figure 30-20-4]**.

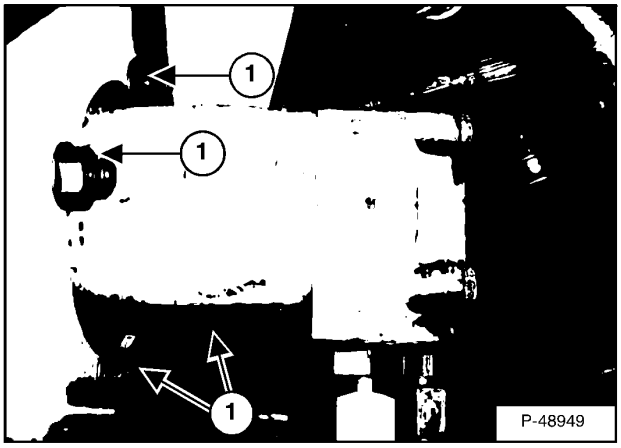
Outside View

Figure 30-20-6



Inside View

Figure 30-20-7



Remove the four bolts and nuts (Item 1) **[Figure 30-20-7]** and (Item 1) **[Figure 30-20-7]** holding the drive motor to the frame.

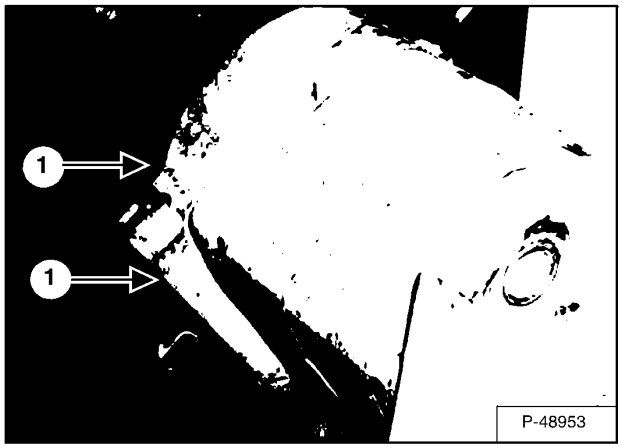
Installation: Tighten the bolts to 100 ft.-lb. (135,6 N•m) torque.

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Removal And Installation (Cont'd)

Figure 30-20-8



Rotate the drive motor until it's shape matches the frame cutout (Item 1) **[Figure 30-20-4]**.

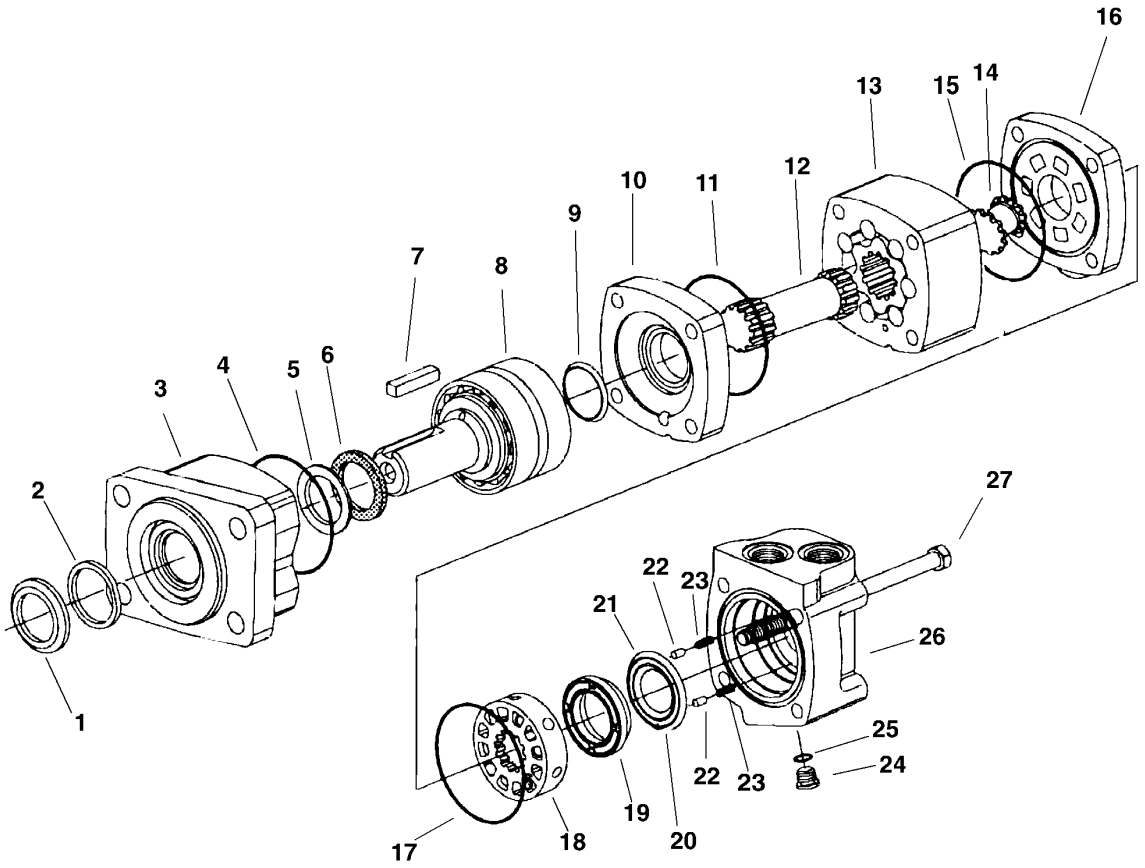
Remove the drive motor.

Reverse removal procedure to install the drive motor.

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Parts Identification



1. Seal Slinger
2. Exclusion Seal
3. Bearing Housing
4. O-ring
5. Back-up Washer
6. Shaft Seal
7. Key
8. Bearing & Shaft Assembly
9. Shaft Face Seal
10. Wear Plate
11. O-ring
12. Drive Shaft
13. Geroler
14. O-ring
15. Valve Drive
16. Valve Plate
17. O-ring
18. Valve
19. Balance Ring
20. Inner Face Seal
21. Outer Face Seal
22. Pin
23. Spring
24. Plug
25. O-ring
26. Valve Housing
27. Bolt

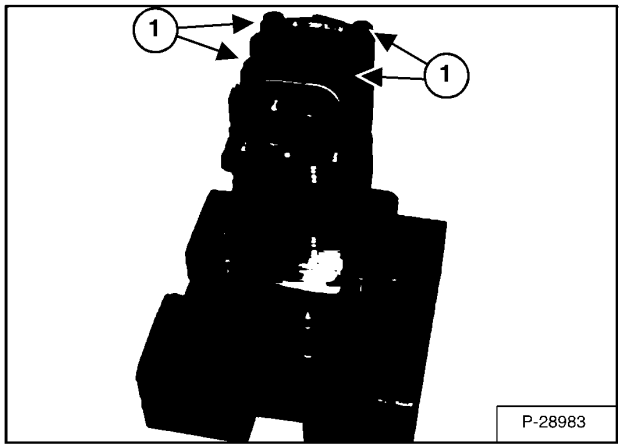
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Disassembly

Figure 30-20-9



IMPORTANT

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

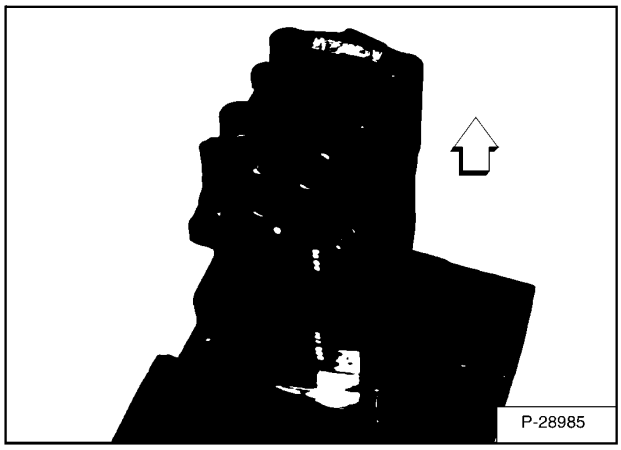
I-2003-0888

NOTE: Clean the outside of the motor before disassembly. Keep all the parts of the motor clean.

Mark the drive motor sections for correct assembly **[Figure 30-20-9]**.

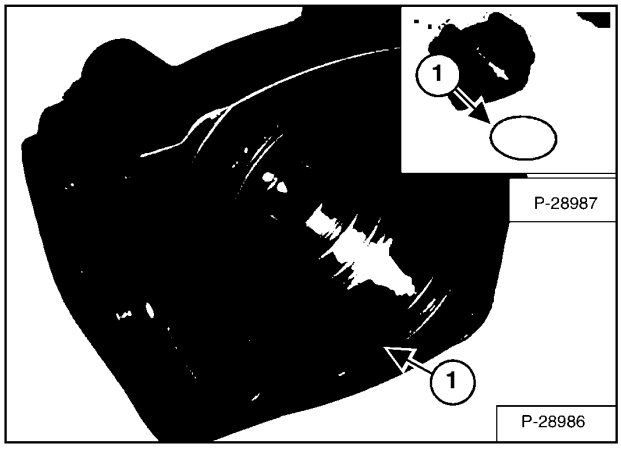
Remove the four bolts (Item 1) **[Figure 30-20-9]** from the motor.

Figure 30-20-10



Lift the valve housing straight up **[Figure 30-20-10]**. If done carefully the balance ring assembly and springs will stay on the valve plate for easy removal.

Figure 30-20-11



Remove the O-rings (Item 1) **[Figure 30-20-11]** from the valve housing.

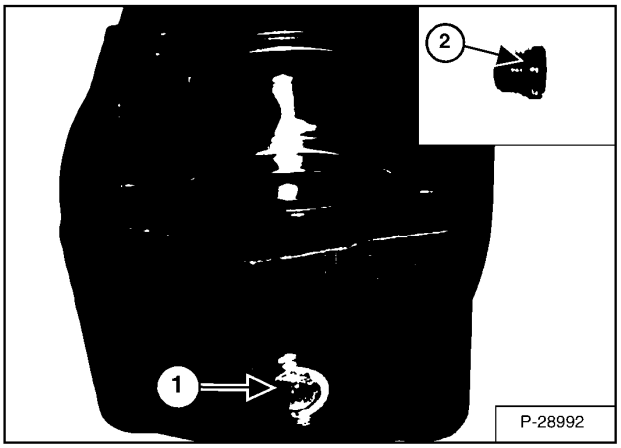
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DRIVE MOTOR (CONT'D)

Disassembly (Cont'd)

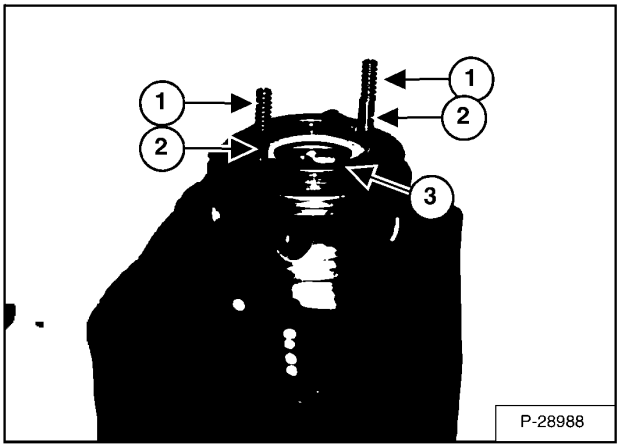
Figure 30-20-12



Remove the plug (Item 1) **[Figure 30-20-12]**.

Inspect the o-ring (Item 2) **[Figure 30-20-12]** and replace as needed.

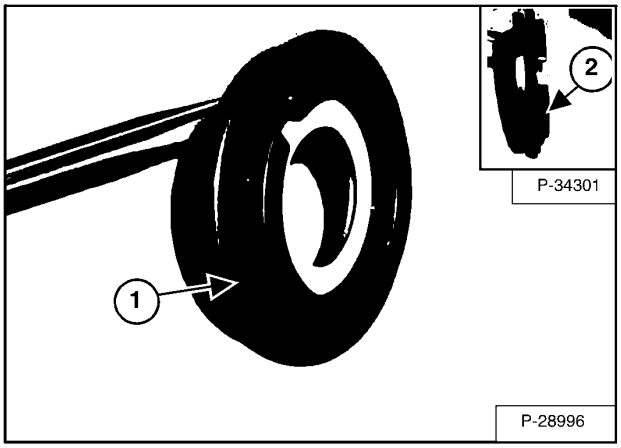
Figure 30-20-13



Remove the two springs (Item 1) and pins (Item 2) **[Figure 30-20-13]** from the valve housing.

Remove the balance ring assembly (Item 3) **[Figure 30-20-13]**.

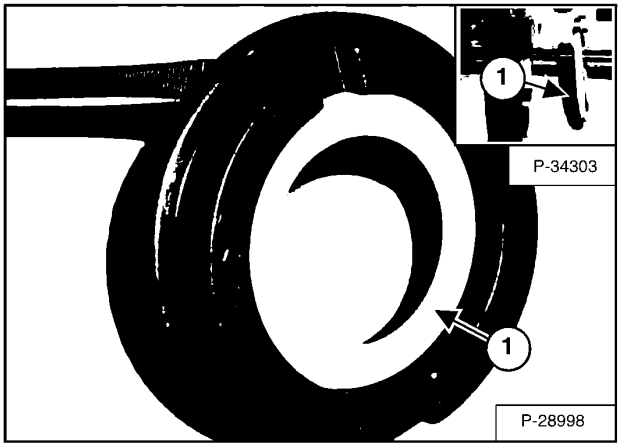
Figure 30-20-14



Remove the outer face seal (Item 1) from the balance ring (Item 2) **[Figure 30-20-14]**.

NOTE: Remember outer face seal orientation for assembly.

Figure 30-20-15



Remove the inner face seal (Item 1) **[Figure 30-20-15]**.

NOTE: Remember inner face seal orientation for assembly.

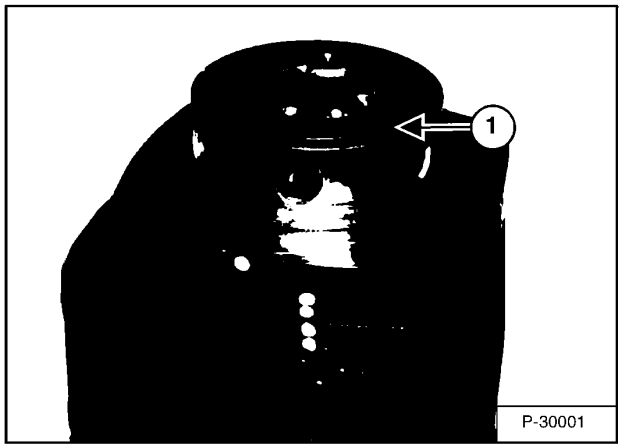
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DRIVE MOTOR (CONT'D)

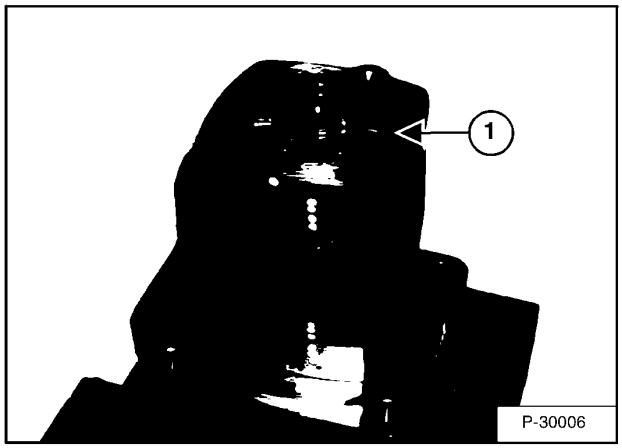
Disassembly (Cont'd)

Figure 30-20-16



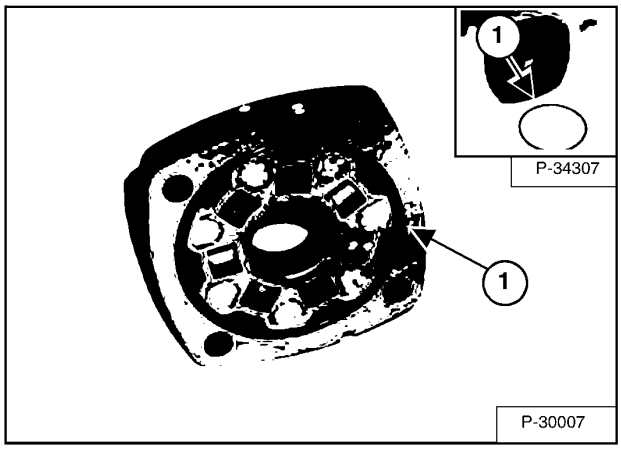
Remove the valve (Item 1) **[Figure 30-20-16]**.

Figure 30-20-17



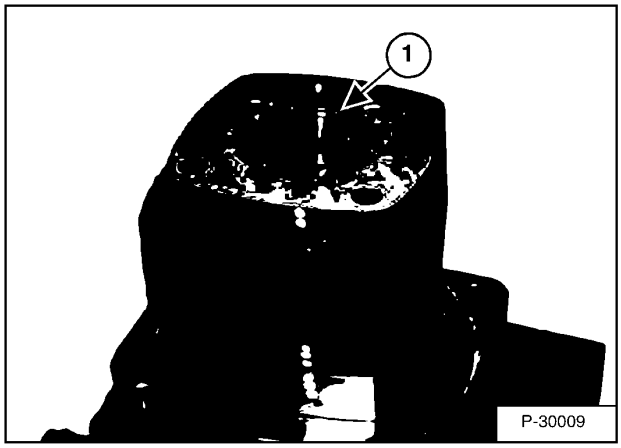
Remove the valve plate (Item 1) **[Figure 30-20-17]**.

Figure 30-20-18



Remove the O-ring (Item 1) **[Figure 30-20-18]** from the valve plate.

Figure 30-20-19



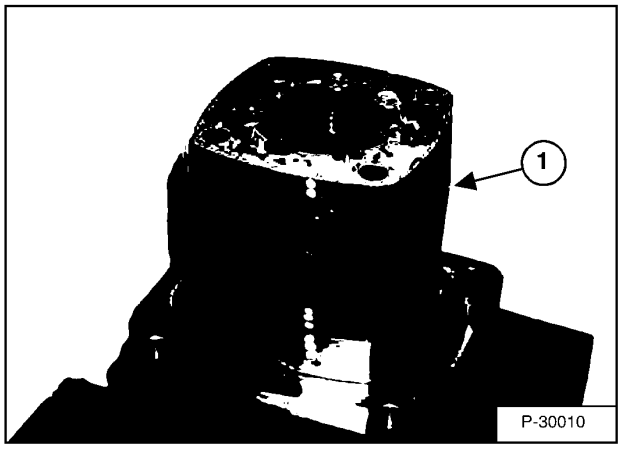
Remove the valve drive (Item 1) **[Figure 30-20-19]**.

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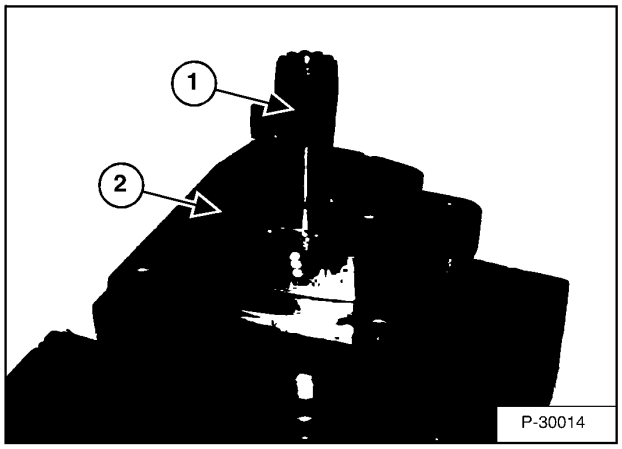
Disassembly (Cont'd)

Figure 30-20-20



Remove the geroler (Item 1) **[Figure 30-20-20]**. Make sure the seven rollers are kept in place.

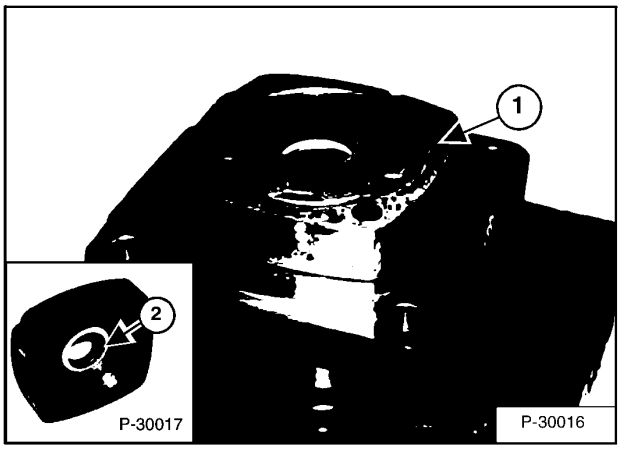
Figure 30-20-21



Remove the drive shaft (Item 1) **[Figure 30-20-21]**.

Remove the O-ring (Item 2) **[Figure 30-20-21]** from the wear plate.

Figure 30-20-22

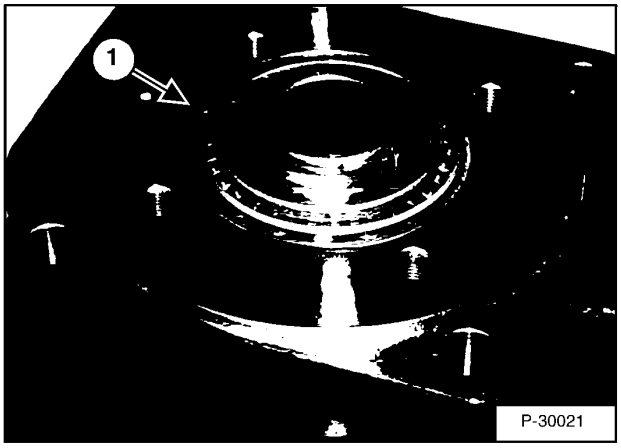


Remove the wear plate (Item 1) **[Figure 30-20-22]**.

Remove the shaft face seal (Item 2) **[Figure 30-20-22]** from the wear plate.

NOTE: Remember shaft face seal orientation for assembly.

Figure 30-20-23



Remove the O-ring (Item 1) **[Figure 30-20-23]** from the bearing housing.

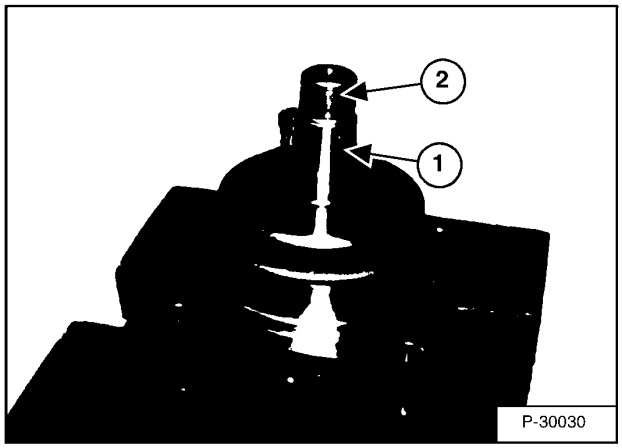
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DRIVE MOTOR (CONT'D)

Disassembly (Cont'd)

Figure 30-20-24

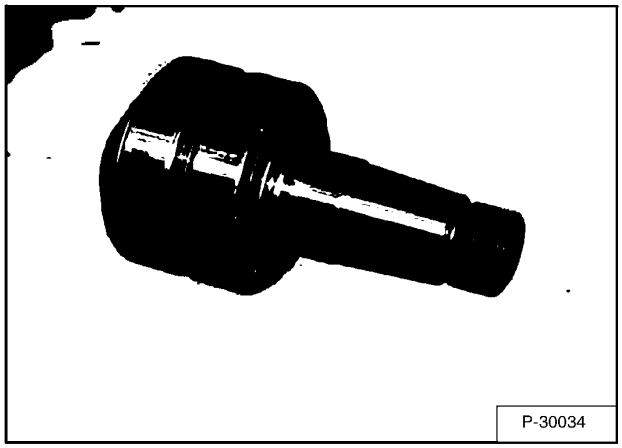


Remove the key (Item 1) **[Figure 30-20-24]** from shaft and bearing assembly.

Remove the shaft and bearing assembly (Item 2) **[Figure 30-20-24]** from the housing.

NOTE: A press may be needed to remove the shaft and bearing assembly from the bearing housing.

Figure 30-20-25



NOTE: The individual parts of the shaft and bearing assembly are not serviced separately. Replace as an assembled unit [Figure 30-20-25].

Figure 30-20-26

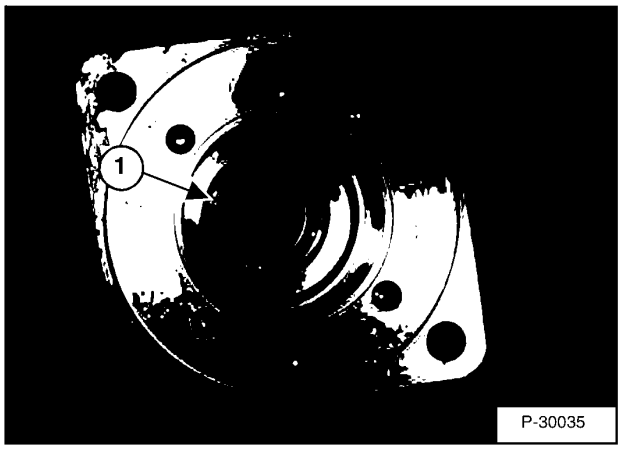
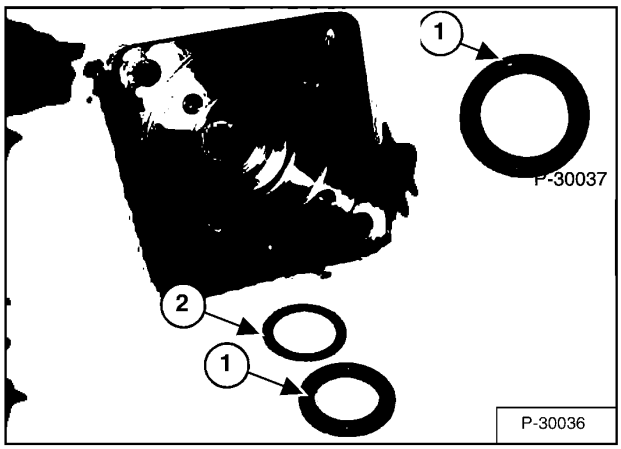


Figure 30-20-27



Remove the shaft seal (Item 1) **[Figure 30-20-26]** & **[Figure 30-20-27]** and back-up washer (Item 2) **[Figure 30-20-27]** from the bearing housing.

NOTE: Do not damage bore or housing and remember shaft seal orientation for assembly.

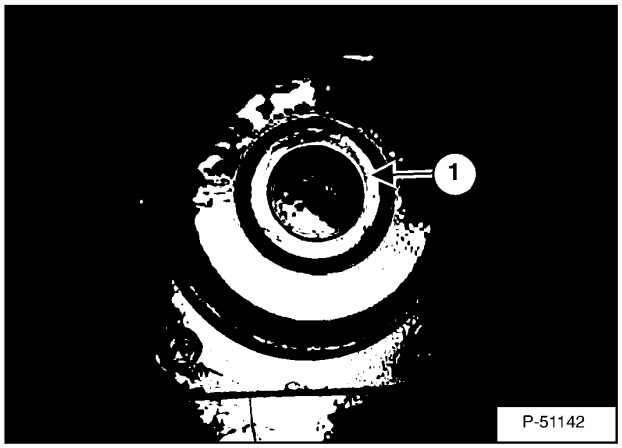
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DRIVE MOTOR (CONT'D)

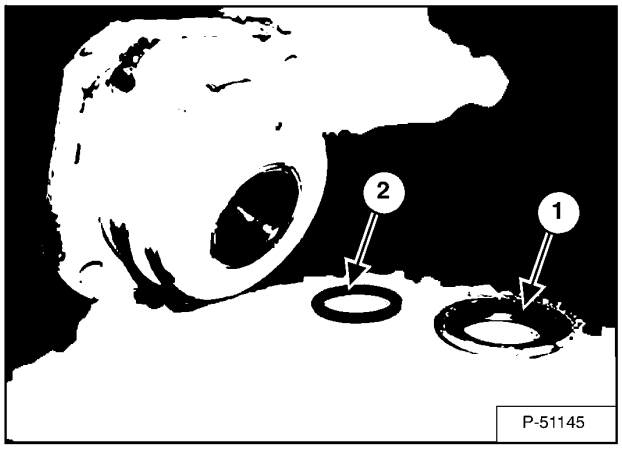
Disassembly (Cont'd)

Figure 30-20-28



Remove the slinger seal (Item 1) **[Figure 30-20-28]** from the bearing housing.

Figure 30-20-29



After removing the slinger seal (Item 1) remove seal (Item 2) **[Figure 30-20-29]** from the bearing housing.

NOTE: Remember the slinger seal orientation for assembly.

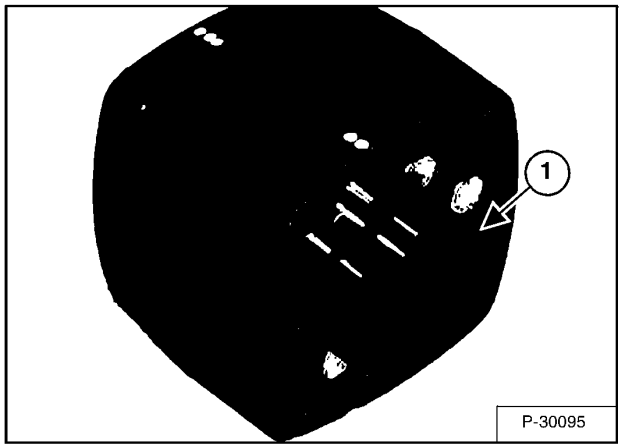
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DRIVE MOTOR (CONT'D)

Inspection

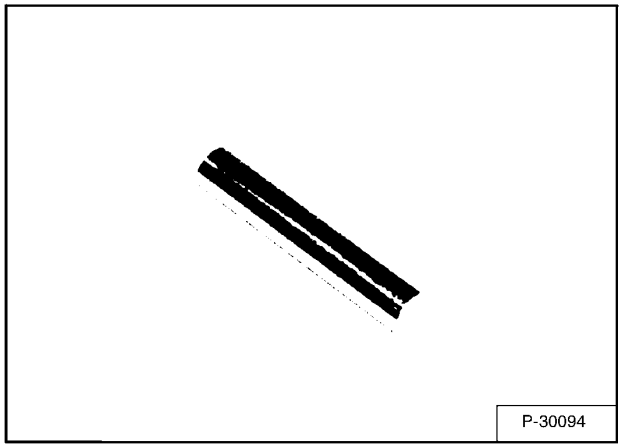
Figure 30-20-30



Before the motor is assembled, check the following items:

Check the geroler (Item 1) **[Figure 30-20-30]** for wear or scratches.

Figure 30-20-31

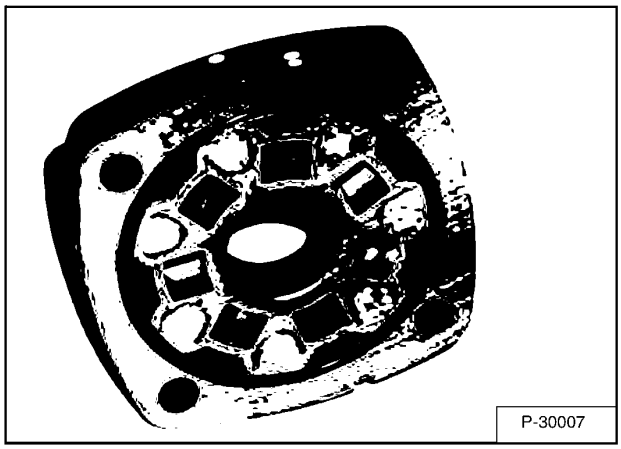


Check the geroler rollers **[Figure 30-20-31]**.

Check the rotor.

NOTE: Put all the rollers back in t heir original position.

Figure 30-20-32



Check the valve plate for wear or scratches **[Figure 30-20-32]**.

Figure 30-20-33



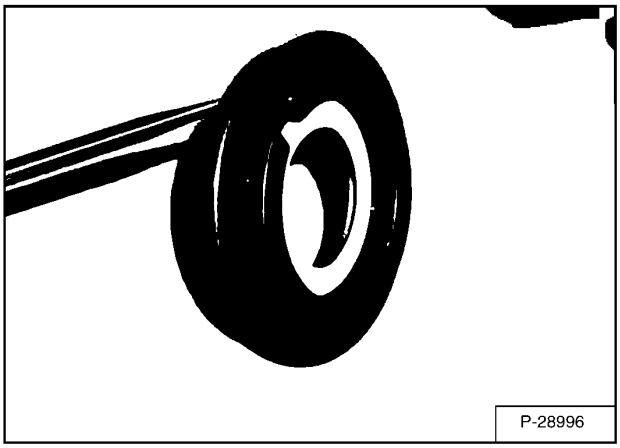
Check the valve **[Figure 30-20-33]**.

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Inspection (Cont'd)

Figure 30-20-34



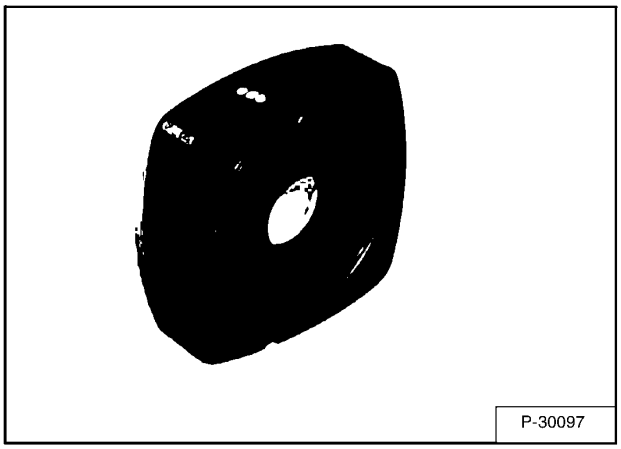
Check the balance plate **[Figure 30-20-34]**.

Check the valve drive shaft and main drive shaft for wear.

Check all the contact surfaces. Replace any parts that have scratches or are worn.

Clean all the parts in solvent and use air pressure to dry the parts. DO NOT use cloth or paper because some material may get into the hydraulic system and cause damage. DO NOT use sandpaper or a file to remove scratches on any of the parts.

Figure 30-20-35



Check the end plate for scratches **[Figure 30-20-35]**.

Check all the contact surfaces. Replace any parts that have scratches or are worn.

Clean all the parts in solvent and use air pressure to dry the parts. DO NOT use cloth or paper because some material may get into the hydraulic system and cause damage. DO NOT use sandpaper or a file to remove scratches on any of the parts.

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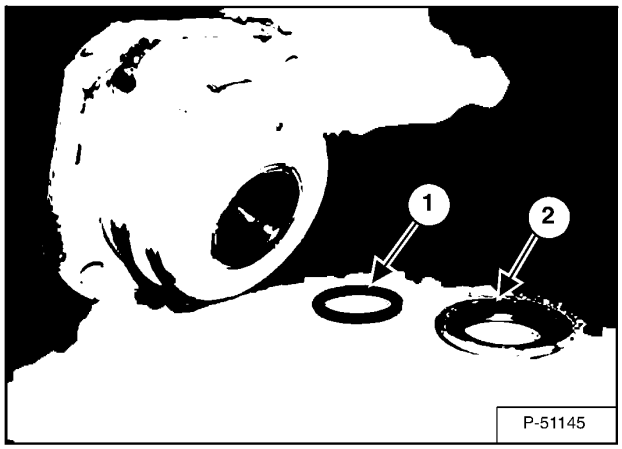
Assembly

IMPORTANT

Use grease such as Dow Corning #44 or Vaseline petroleum jelly to hold seals, O-rings and bearings in position during assembly.

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Figure 30-20-36

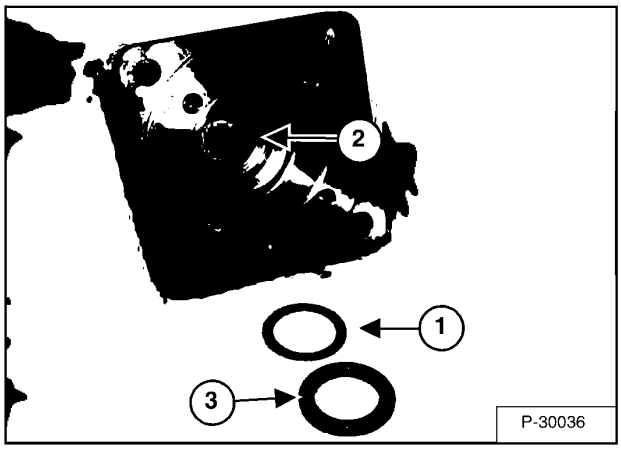


NOTE: Always use a NEW seal kit when assembling the hydraulic drive motor. Lubricate all seals (prior to installation) with petroleum jelly.

Install the seal (Item 1) **[Figure 30-20-36]** into the bearing housing.

Install the slinger seal (Item 2) **[Figure 30-20-36]** onto the bearing housing.

Figure 30-20-37



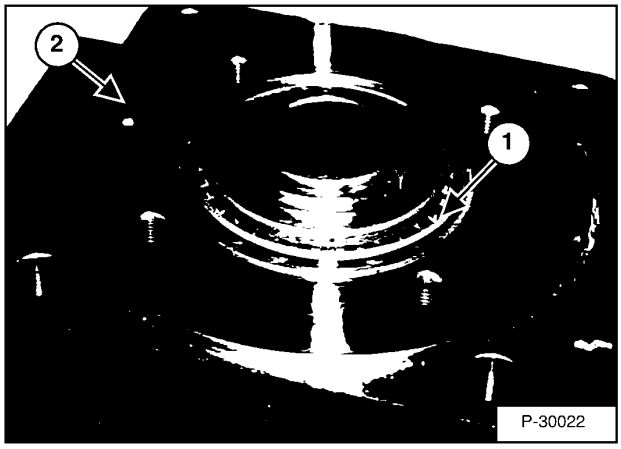
Install the back-up washer (Item 1) into seal bore (Item 2) **[Figure 30-20-37]** of the bearing housing.

Press the shaft seal (Item 3) into the seal bore (Item 2) **[Figure 30-20-37]** of the bearing housing.

NOTE: Shaft seal (Item 1) [Figure 30-20-36] groove must be facing the bearing.

Protect the end of the shaft to pr event seal damage. Apply petroleum jelly to the inside diameter of the shaft seal and exclusion seal.

Figure 30-20-38



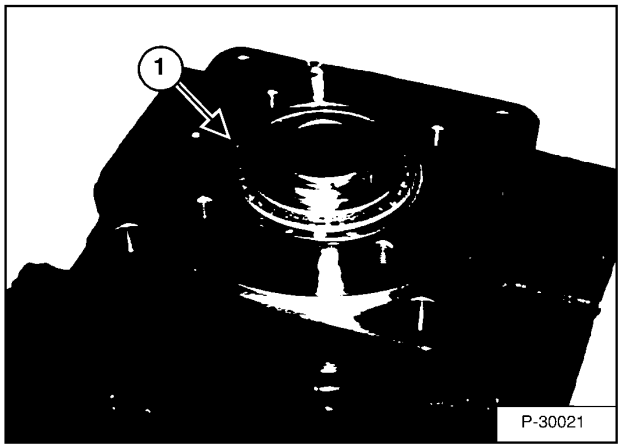
Install the shaft and bearing assembly (Item 1) (a press may be necessary) into the bearing housing (Item 2) **[Figure 30-20-38]**.

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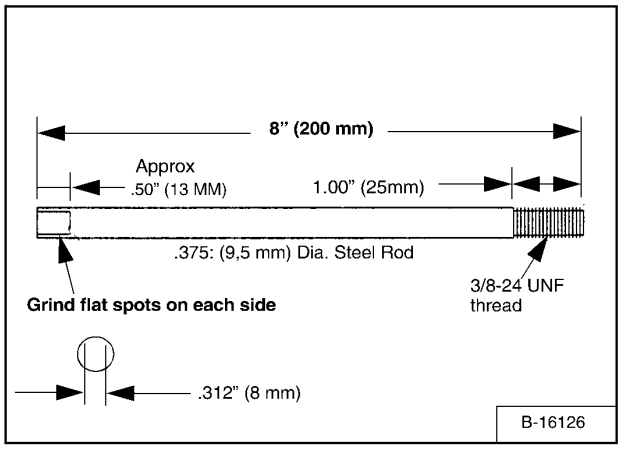
Assembly (Cont'd)

Figure 30-20-39



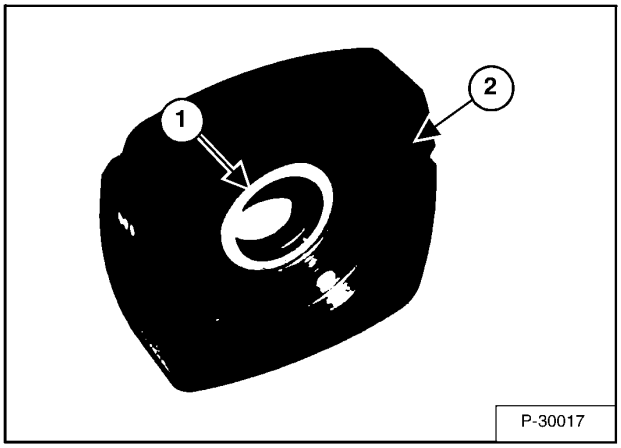
Apply petroleum jelly to the o-ring (Item 1) **[Figure 30-20-39]** and install the o-ring into the bearing housing.

Figure 30-20-40



NOTE: Alignment studs can be very helpful in reassembly of the motor, but are not necessary. The alignment stud [Figure 30-20-40] can be made to help in the assembly alignment process. If the alignment studs are used, install the two studs diagonally opposed in bearing housing.

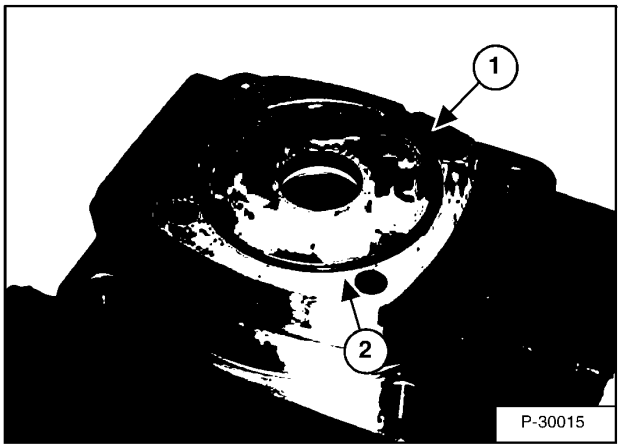
Figure 30-20-41



Install the shaft face seal (Item 1) in the wear plate (Item 2) **[Figure 30-20-41]**.

NOTE: Do not distort the seal. Shaft face seal taper must face away from the wear plate and towards the bearing.

Figure 30-20-42



Install the wear plate (Item 1) **[Figure 30-20-42]**.

Apply a light film of petroleum jelly on the O-ring and install the O-ring (Item 2) **[Figure 30-20-42]** in the wear plate.

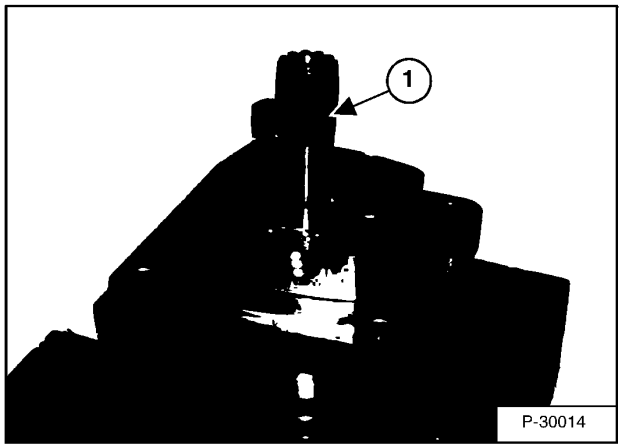
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DRIVE MOTOR (CONT'D)

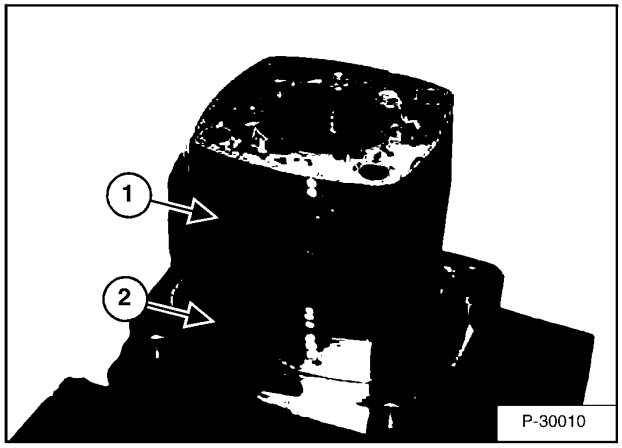
Assembly (Cont'd)

Figure 30-20-43



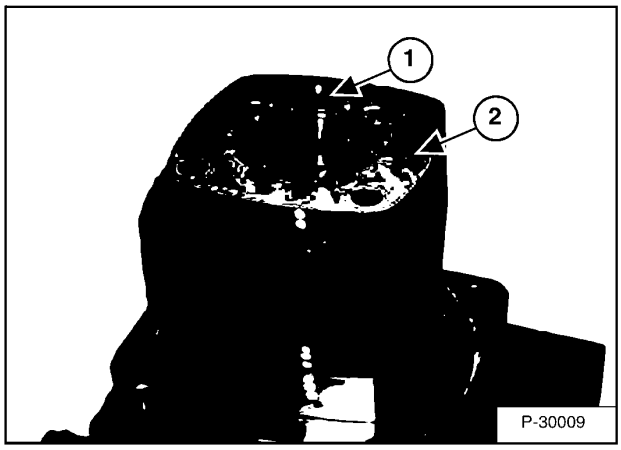
Install the drive (Item 1) **[Figure 30-20-43]** into the bearing housing.

Figure 30-20-44



Align the notch on the outside of the geroler with the notch on the wear plate. Install the ge roler (Item 1) against the wear plate (Item 2) **[Figure 30-20-44]**. Hold the rollers in the geroler while installing it.

Figure 30-20-45



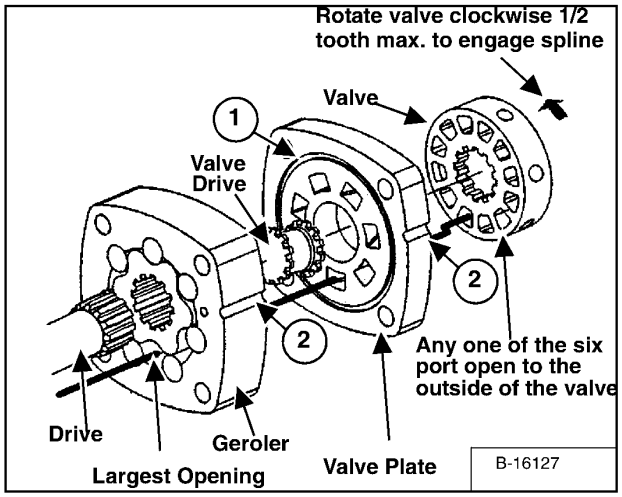
Install the valve drive (Item 1) into the geroler (Item 2) **[Figure 30-20-45]**.

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Assembly (Cont'd)

Figure 30-20-46



The timing of the motor controls the direction of the rotation of the drive shaft of the motor. The timing parts are as follows **[Figure 30-20-46]**:

1. Geroler
2. Valve Drive
3. Valve Plate
4. Valve

Locate the largest open pocket in the geroler and mark the outside of the geroler at that location **[Figure 30-20-46]**.

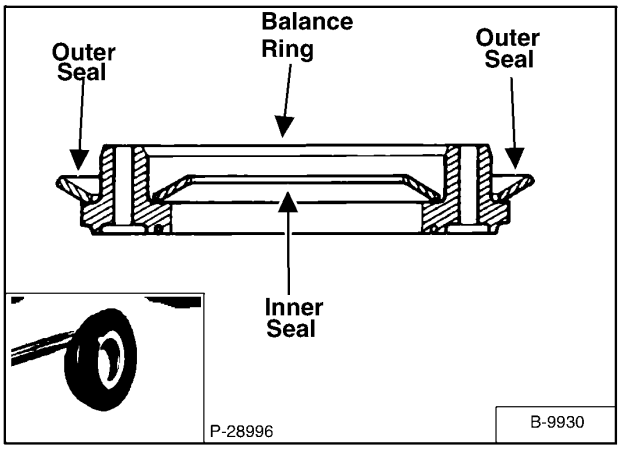
Apply petroleum jelly to the o-ring (Item 1) **[Figure 30-20-46]** and install the o-ring on the valve plate.

Align the notch on the outside of the valve plate with the notch (Item 2) **[Figure 30-20-46]** on the geroler. Install the valve plate (o-ring side toward the geroler) on the geroler.

Align the slot opening in the valve plate with the largest opening of the geroler.

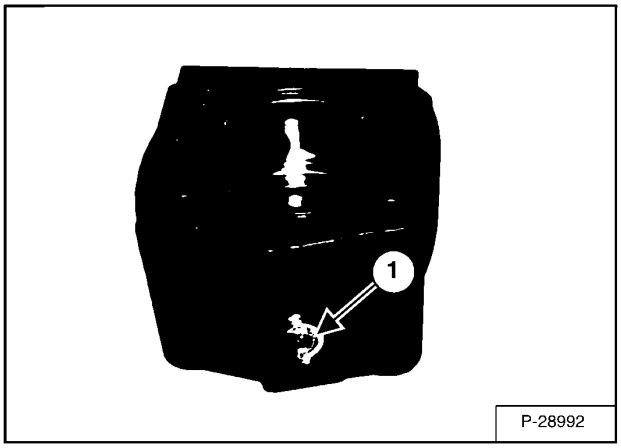
Align the valve on the valve plate so that any one of the openings is in alignment with the open slot in the valve plate that is inline with the largest opening of the geroler **[Figure 30-20-46]**. Turn the valve CLOCKWISE 1/2 tooth to engage the drive. This will provide the proper rotation when pressurized

Figure 30-20-47



Apply petroleum jelly on the inner and outer seals and install the seals on the balance ring **[Figure 30-20-47]**.

Figure 30-20-48



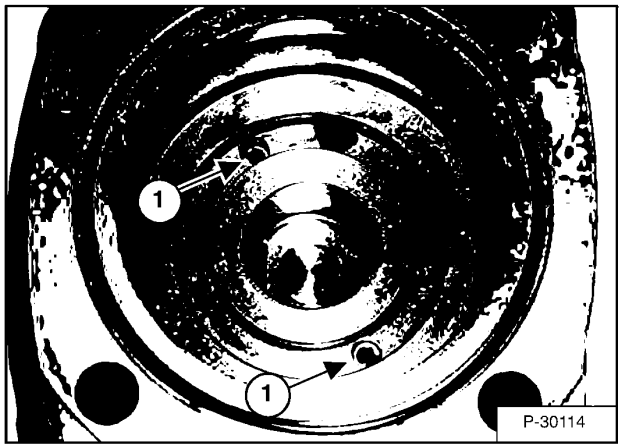
Install the plug and o-ring (Item 1) **[Figure 30-20-48]** on the valve housing and tighten to 50 in.-lb. (6 N•m) torque.

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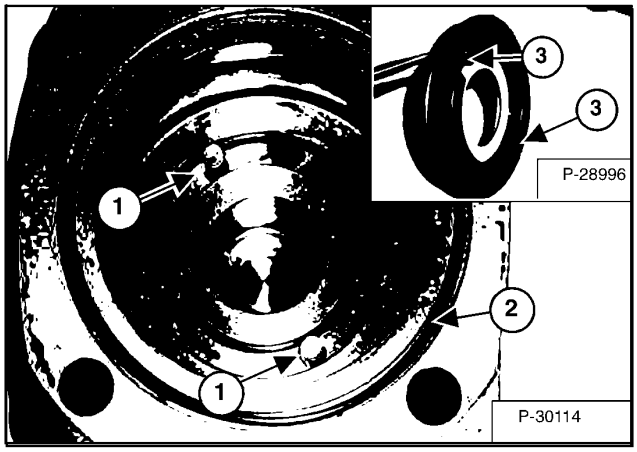
Assembly (Cont'd)

Figure 30-20-49



Install the springs (Item 1) **[Figure 30-20-50]** in the valve housing.

Figure 30-20-50

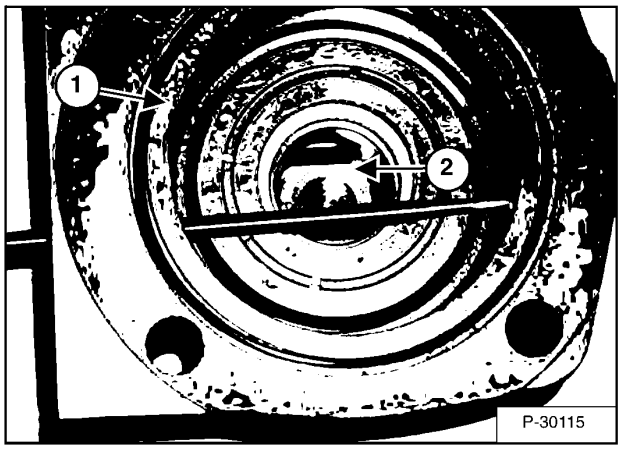


Install the pins (Item 1) **[Figure 30-20-50]** in the valve housing.

Apply petroleum jelly to the o-ring (Item 2) **[Figure 30-20-50]** and install on the valve housing.

Align the pin notches (Item 3) **[Figure 30-20-50]** in the balance ring with the pins and springs in the valve housing and Install the balance ring assembly in the housing.

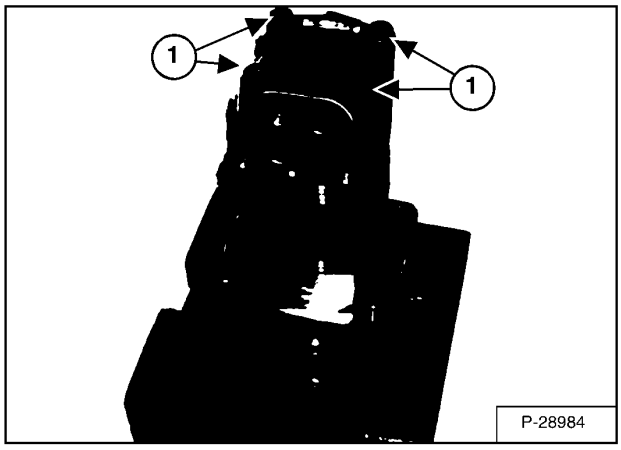
Figure 30-20-51



Slide an object through the port in the valve housing to hold the balance ring in position **[Figure 30-20-51]**. Hold the balance ring in position until the valve housing is in place against the valve plate.

NOTE: After installing the valve housing on the valve plate check for proper placement by pushing down on the valve housing. You should get a slight spring action.

Figure 30-20-52



Install the tie bolts (Item 1) **[Figure 30-20-52]** and tighten all four bolts alternately to 42 ft.-lbs (50 N•m).

NOTE: If alignment studs were used, install two bolts opposite the studs and tighten bolts finger tight. Remove the alignment studs and replace with bolts. Tighten bolts to the above torque.

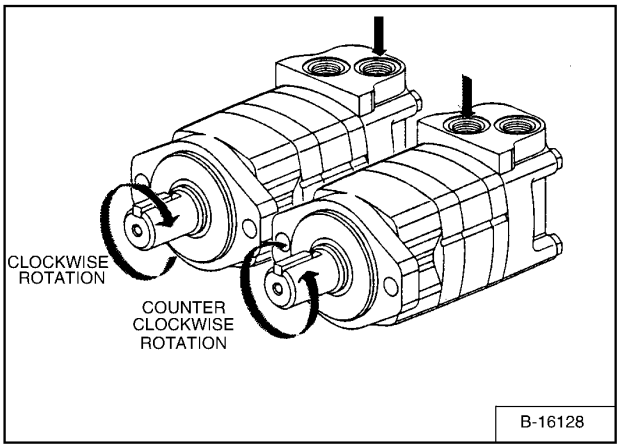
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DRIVE MOTOR (CONT'D)

Assembly (Cont'd)

Figure 30-20-53



Verify that the motor has proper rotation when pressurized **[Figure 30-20-53]**.

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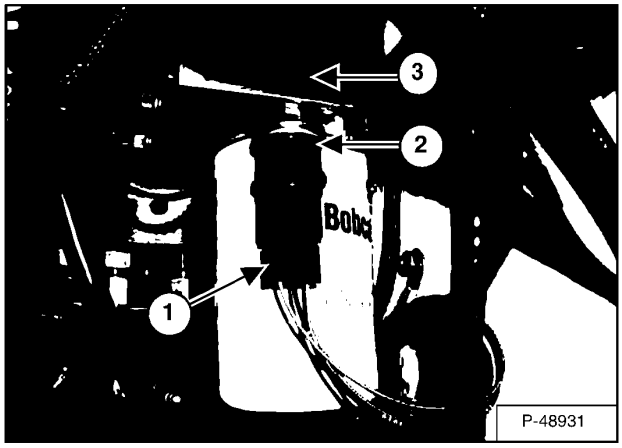
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HYDROSTATIC PUMP

Charge Pressure Sender Removal And Installation

Open tailgate. (See TAILGATE on Page 50-30-1.)

Figure 30-30-54



Disconnect the c onnector (Item 1) from the charge pressure sender (Item 2) **[Figure 30-30-54]**.

Remove the c harge pressure sender (Item 2) from the port block (Item 3) **[Figure 30-30-54]**.

Checking Charge Pressure

IMPORTANT

When the engine is running during service, the steering lever and hydraulic control levers must be in neutral and the parking brake engaged.

W-2482-1003

Open the tail gate.

Disconnect the c onnector (Item 1) **[Figure 30-30-54]** from the charge pressure sender.

Remove the charge pressure sender (Item 2) **[Figure 30-30-54]** from the fitting

Install a gauge in charge pressure sender fitting.

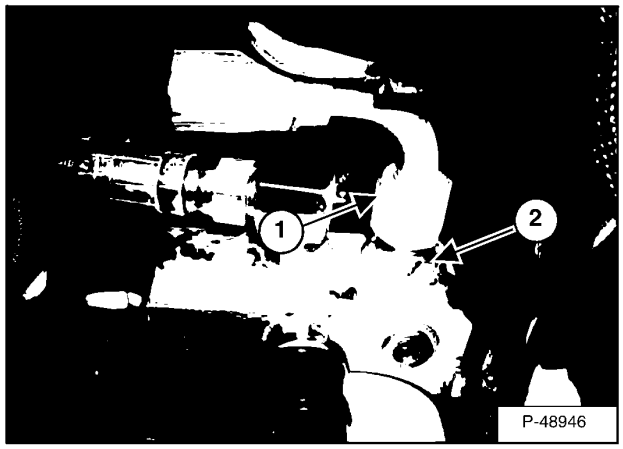
Start the engine.

If the charge pressure does not read at least 85 P SI, remove and inspect the valve poppet and spring assembly and replace if needed.

NOTE: The charge pressure sensor is electrically closed at 27 PS I and above, the sensor is electrically open at 25 PSI and below.

Replacing Poppet Assembly

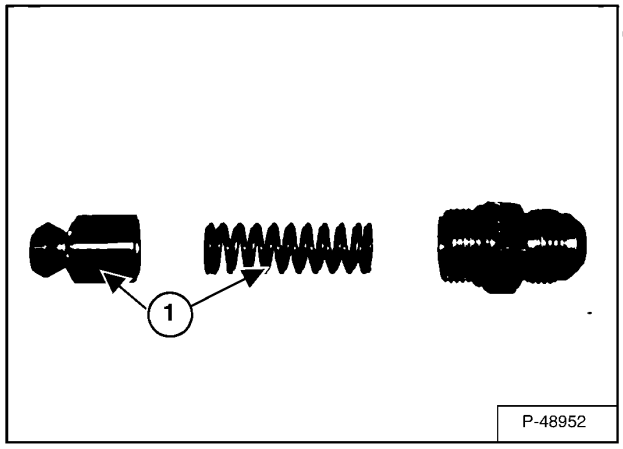
Figure 30-30-55



If the charge pressure is not correct remove hose (Item 1) from the connector bypass fitting (Item 2) **[Figure 30-30-55]**.

Remove the connector bypass fitting (Item 2) **[Figure 30-30-55]**

Figure 30-30-56



Remove the valve poppet and spring assembly (Item 1) **[Figure 30-30-56]** and replace with a new one if needed.

Assemble: Always use a new O-ring. Tighten the plug to 60 ft.-lb. torque (81 N•m) torque.

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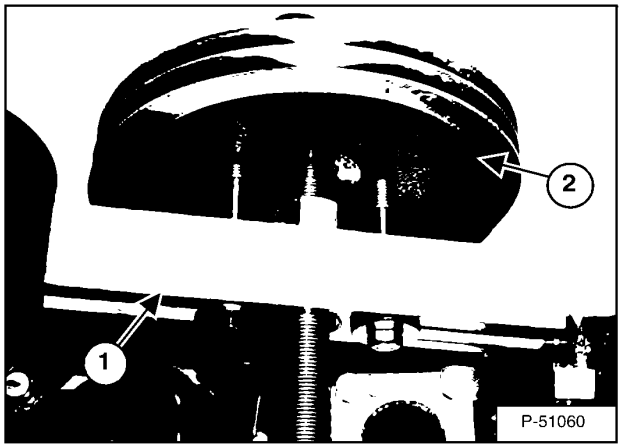
HYDROSTATIC PUMP (CONT'D)

Removal And Installation

Remove muffler shield. (See MUFFLER on Page 70-30-1.)

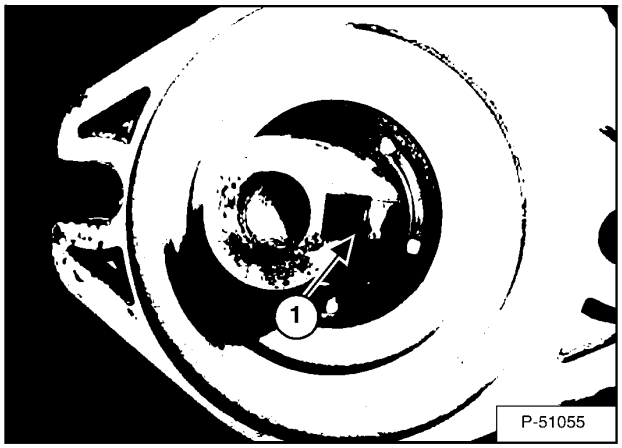
Remove muffler. (See Removal And Installation on Page 70-30-1.)

Figure 30-30-57



Install a puller (Item 1) on the hydrostatic pump drive pulley (Item 2) **[Figure 30-30-57]** and remove the pulley from the pump shaft.

Figure 30-30-58

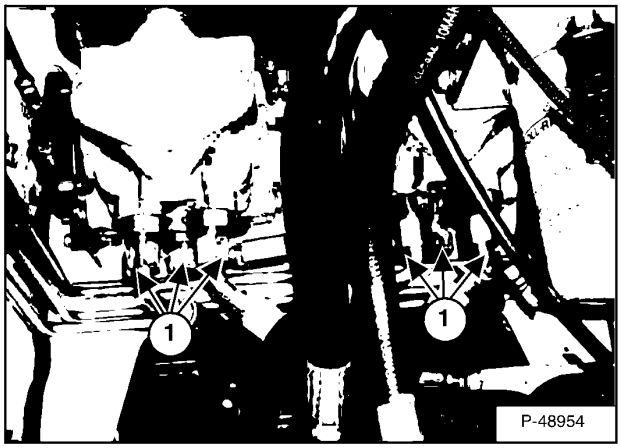


Installation: Install the key in the hydrostatic pump shaft (Item 1) **[Figure 30-30-58]** before installing the pump drive pulley.

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

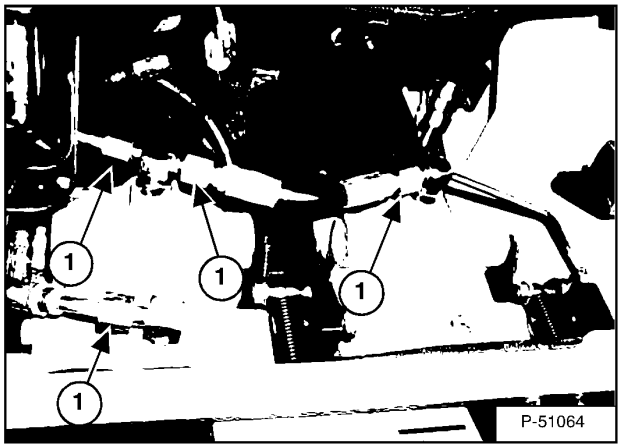
Bottom View

Figure 30-30-59



Top View

Figure 30-30-60



Disconnect and cap all the hoses on the pump (Item 1) **[Figure 30-30-59]** and (Item 1) **[Figure 30-30-60]**.

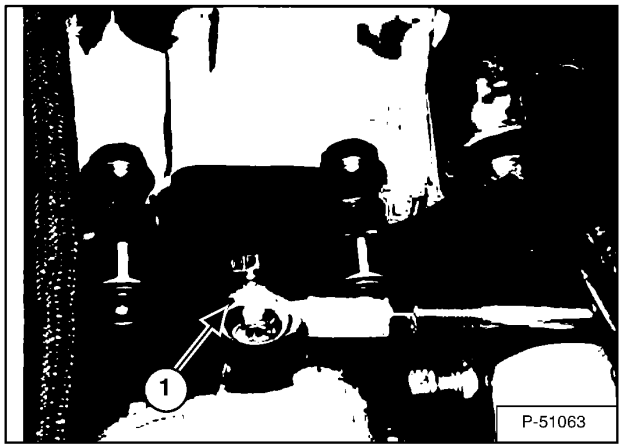
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HYDROSTATIC PUMP (CONT'D)

Removal And Installation (Cont'd)

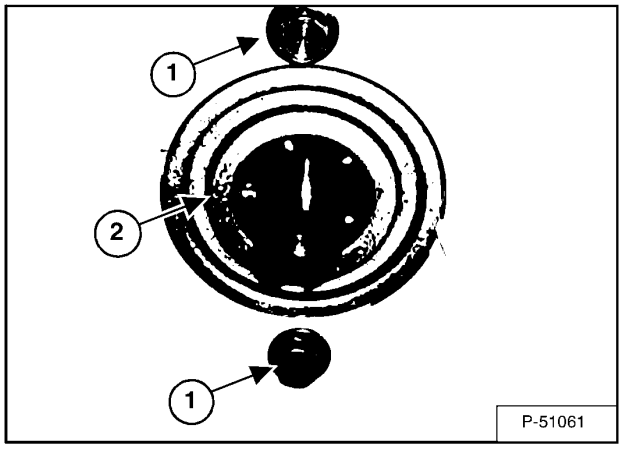
Figure 30-30-61



Remove connecting rod (Item 1) **[Figure 30-30-61]** from right side pump.

NOTE: The left pump mus t be removed before removing the connecting rod, and the connecting rod must be reattached before installing the pump.

Figure 30-30-62



Remove the two mounting bolts (Item 1) **[Figure 30-30-62]** holding the hydrostatic pump to frame.

Remove the hydrostatic pump (Item 2) **[Figure 30-30-62]** from the loader.

Reverse the removal procedure to install the hydrostatic pump.

Replenishing/High Pressure Relief Valve

Figure 30-30-63



Figure 30-30-64



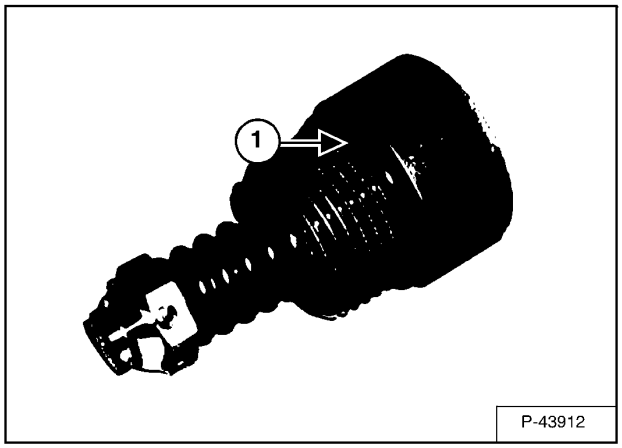
Remove the two relief valves (Item 1) **[Figure 30-30-63]** & **[Figure 30-30-64]** from the pump housing.

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Replenishing/High Pressure Relief Valve (Cont'd)

Figure 30-30-65



Inspect the o-ring (Item 1) **[Figure 30-30-65]** for damage. Replace as needed.

Installation: Torque the replenishing/high pressure relief valve to 95-105 ft.-lb. (128,8 - 142,4 N•m).

If the replenishing/high pressure relief valve must be replaced, it must be replaced as a unit.

The pressure setting for a new high pressure relief valve is 2000 psi.

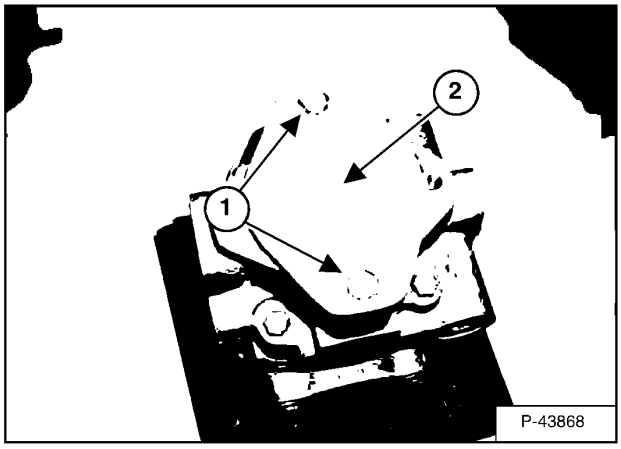
Disassembly

IMPORTANT

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

I-2003-0888

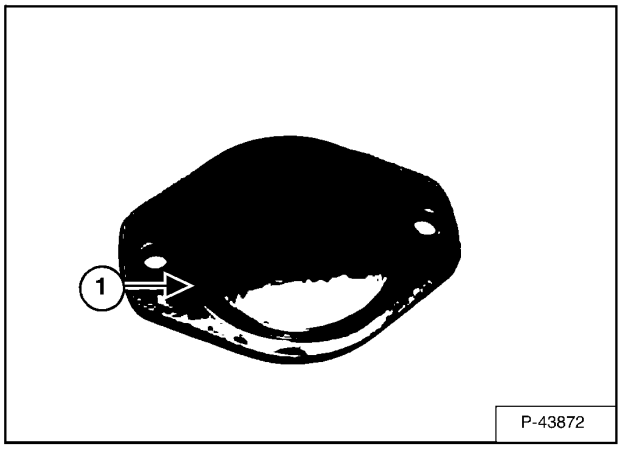
Figure 30-30-66



Remove the two bolts (Item 1) **[Figure 30-30-66]** from the pump housing.

Remove the cover (Item 2) **[Figure 30-30-66]** from the pump housing.

Figure 30-30-67



Remove and inspect the o-ring (Item 1) **[Figure 30-30-67]** for damage. Replace as needed.

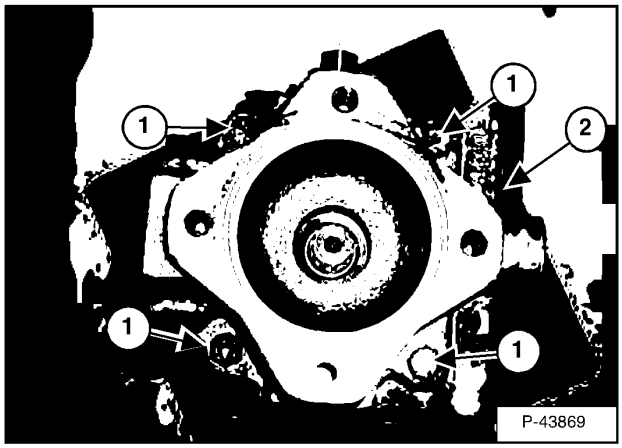
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HYDROSTATIC PUMP (CONT'D)

Disassembly (Cont'd)

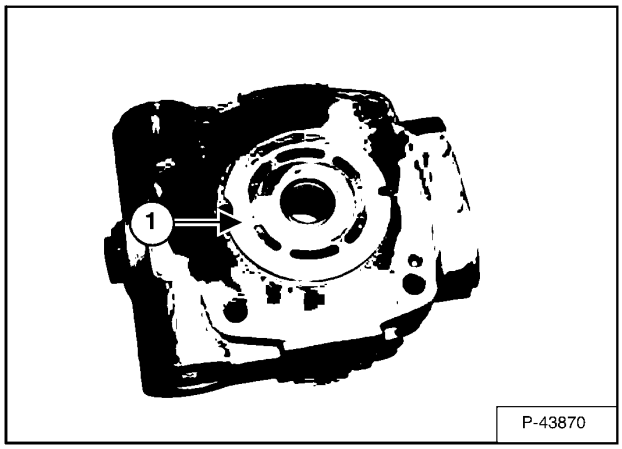
Figure 30-30-68



Remove the four bolts (Item 1) **[Figure 30-30-68]** from the pump housing.

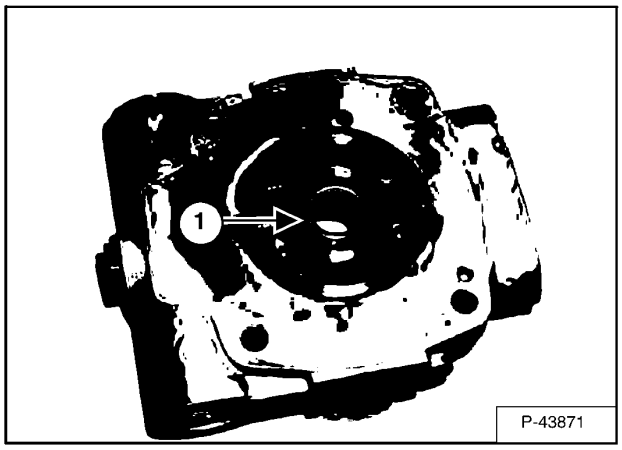
Remove the end housing from the pump (Item 2) **[Figure 30-30-68]**.

Figure 30-30-69



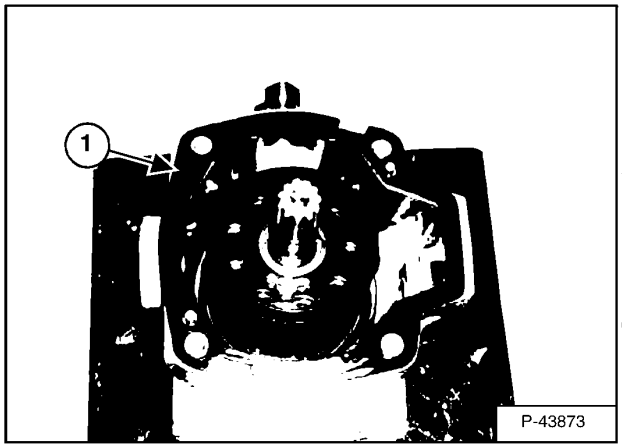
Remove and inspect the wear plate (Item 1) **[Figure 30-30-69]** for damage. Replace as needed.

Figure 30-30-70



Remove and inspect the bearing (Item 1) **[Figure 30-30-70]** for damage. Replace as needed.

Figure 30-30-71



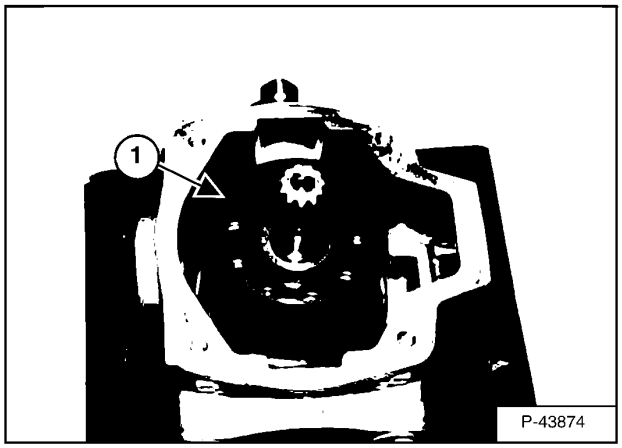
Remove the gasket (Item 1) **[Figure 30-30-71]** from the pump housing.

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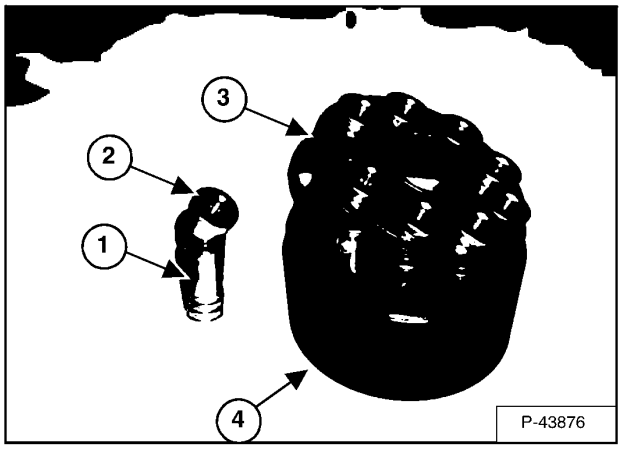
Disassembly (Cont'd)

Figure 30-30-72



Remove the piston assembly (Item 1) **[Figure 30-30-72]** from the pump housing.

Figure 30-30-73



Check that each piston moves freely in its bore **[Figure 30-30-73]**.

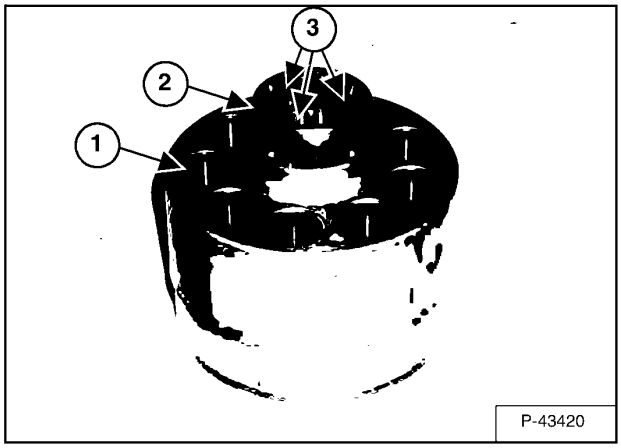
Remove and inspect each piston (Item 1) and piston shoe (Item 2) **[Figure 30-30-73]** for wear or scratches.

Inspect the shoe plate (Item 3) **[Figure 30-30-73]**, the shoe plate must be flat with no signs of cracks or wear.

Inspect the end of the cylinder block (Item 4) **[Figure 30-30-73]**, the surface must be s mooth and free of scratches.

Remove the shoe plate (Item 3) **[Figure 30-30-73]** and pistons from the cylinder block.

Figure 30-30-74



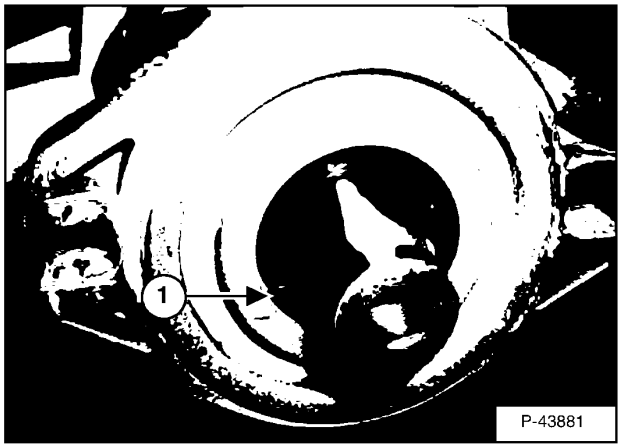
Check the cylinder block bores for wear and scratches (Item 1) **[Figure 30-30-74]**.

Check the spherical washer (Item 2) **[Figure 30-30-74]** for wear or damage.

Inspect the three pins (Item 3) **[Figure 30-30-74]**, the pins must not be bent and the same length.

If there is any defect in the piston assembly, the complete unit must be replaced.

Figure 30-30-75



Remove the snap ring (Item 1) **[Figure 30-30-75]** from the pump housing.

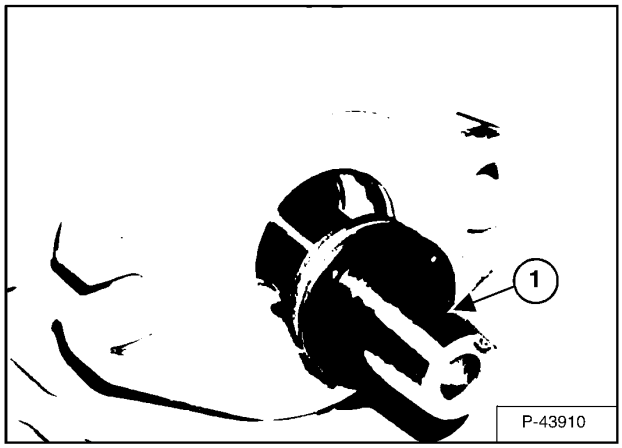
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HYDROSTATIC PUMP (CONT'D)

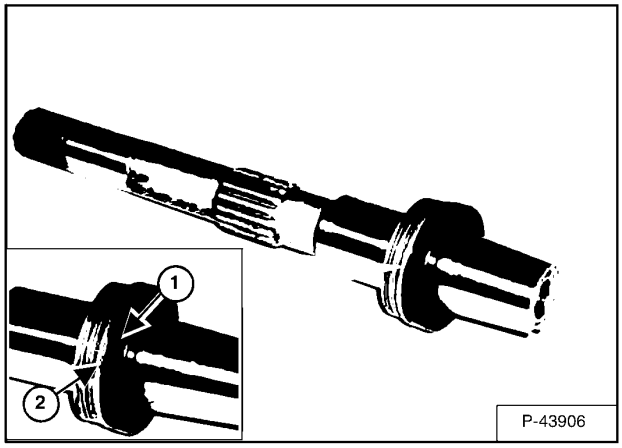
Disassembly (Cont'd)

Figure 30-30-76



Remove the shaft (Item 1) **[Figure 30-30-76]** from the pump housing.

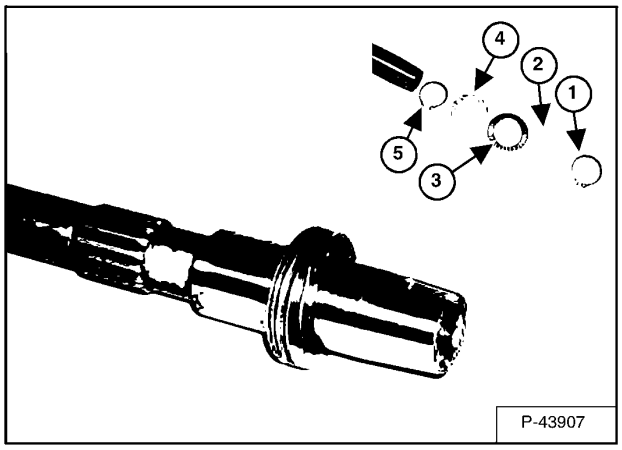
Figure 30-30-77



Remove and inspect the seal (Item 1) **[Figure 30-30-77]** for damage. Replace as needed.

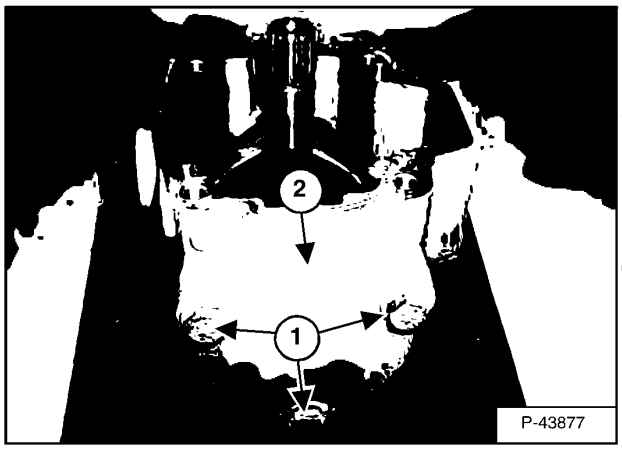
Remove spacer (Item 2) **[Figure 30-30-77]** from the shaft.

Figure 30-30-78



Remove and inspect the snap ring (Item 1), thrust washer (Item 2), thrust bearing (Item 3), thrust washer (Item 4), and snap ring (Item 5) **[Figure 30-30-78]** for damage. Replace as needed.

Figure 30-30-79



Remove the three bolts (Item 1) **[Figure 30-30-79]** from the pump housing.

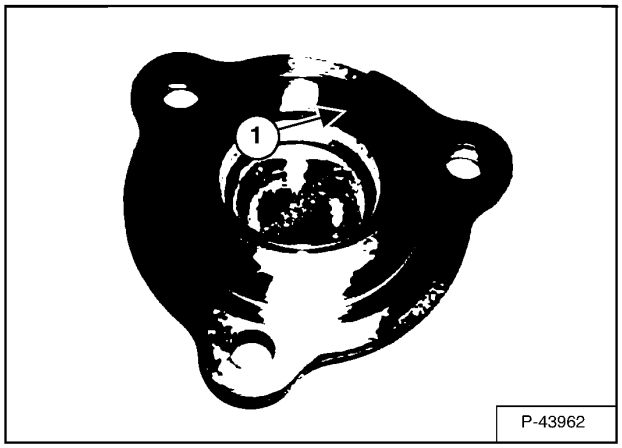
Remove the cover (Item 2) **[Figure 30-30-79]** from the pump housing.

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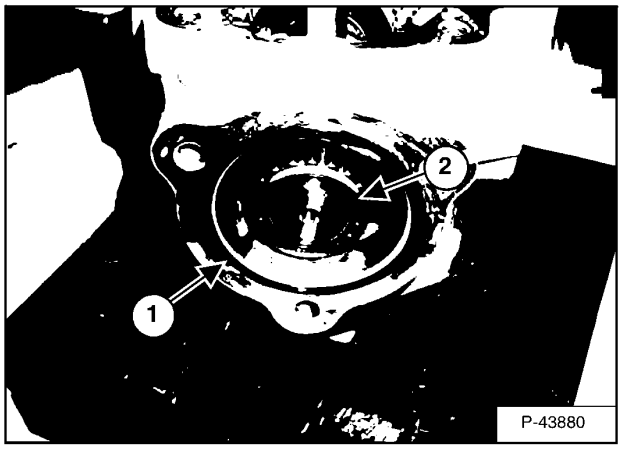
Disassembly (Cont'd)

Figure 30-30-80



Remove and inspect the bearing race (Item 1) **[Figure 30-30-80]** for damage. Replace as needed.

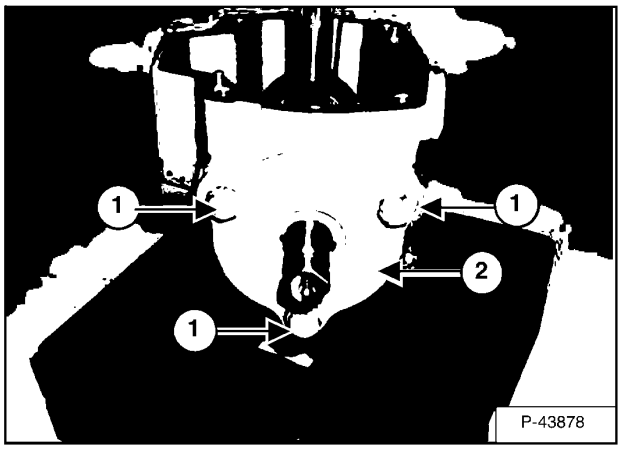
Figure 30-30-81



Remove the O-ring (Item 1) **[Figure 30-30-81]** from the pump housing.

Remove the bearing (Item 2) **[Figure 30-30-81]** from the swash plate.

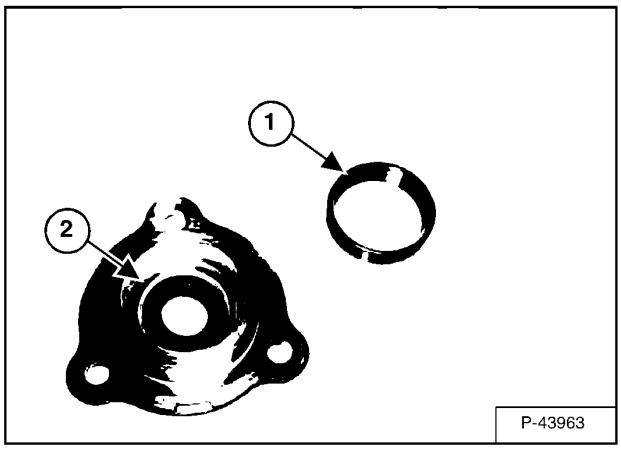
Figure 30-30-82



Remove the three bolts (Item 1) **[Figure 30-30-82]** from the pump housing.

Remove the cover (Item 2) **[Figure 30-30-82]** from the pump housing.

Figure 30-30-83



Remove and inspect the bearing race (Item 1) **[Figure 30-30-83]** for damage. Replace as needed.

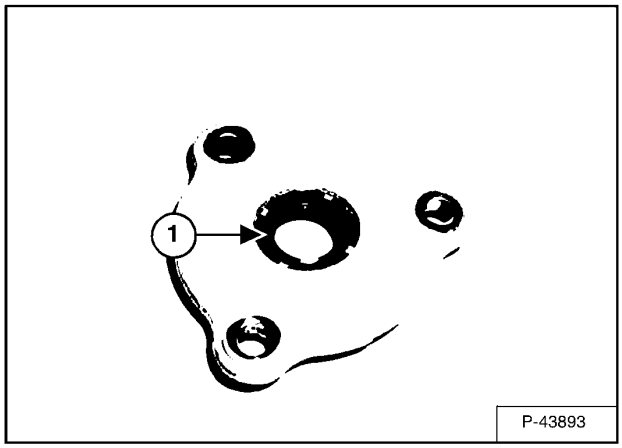
The crush ring (Item 2) **[Figure 30-30-83]** does not need to be removed. The only time that the crush ring will be removed is when the cover, swash plate, or the pump housing is replaced. A shim kit is then required in the crush ring's place.

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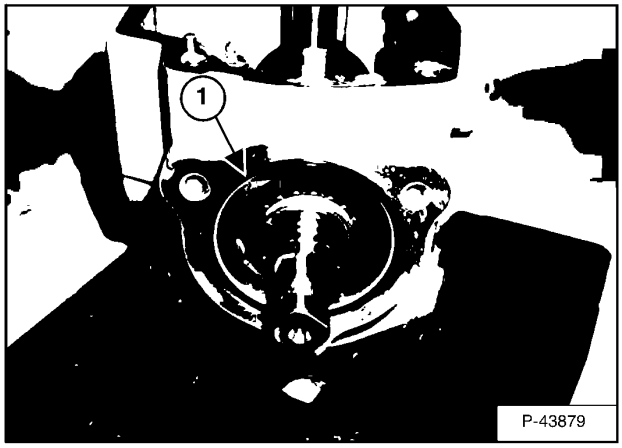
Disassembly (Cont'd)

Figure 30-30-84



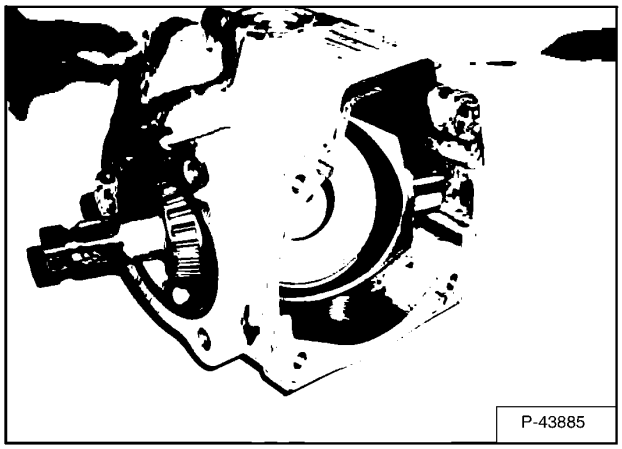
Remove and inspect the seal (Item 1) **[Figure 30-30-84]** for damage. Replace as needed.

Figure 30-30-85



Remove and inspect the O-ring (Item 1) **[Figure 30-30-85]** for damage. Replace as needed.

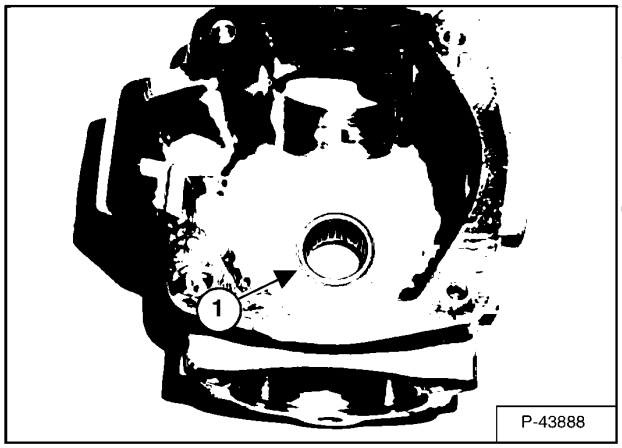
Figure 30-30-86



NOTE: Be sure to note on which side of the housing the control shaft protrudes before removing the swash plate.

Remove the swash plate from the pump housing **[Figure 30-30-86]**.

Figure 30-30-87



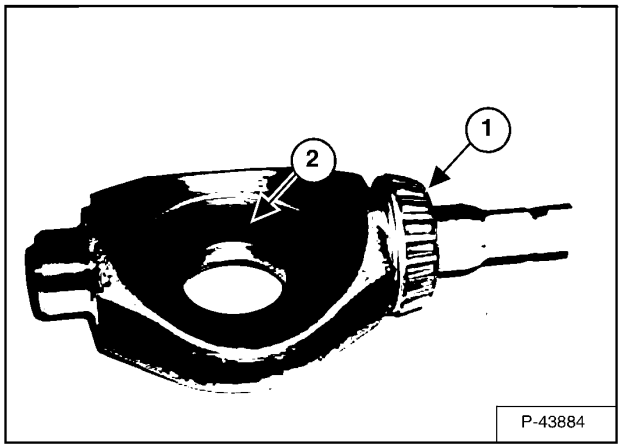
Inspect the bearing (Item 1) **[Figure 30-30-87]** for damage. Replace as needed.

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Disassembly (Cont'd)

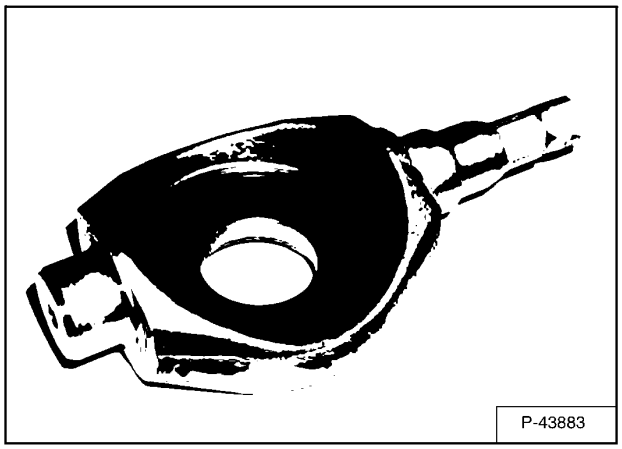
Figure 30-30-88



Remove and inspect the bearing (Item 1) **[Figure 30-30-88]** for damage. Replace as needed.

Remove and inspect the wear plate (Item 2) **[Figure 30-30-88]** for damage. Replace as needed.

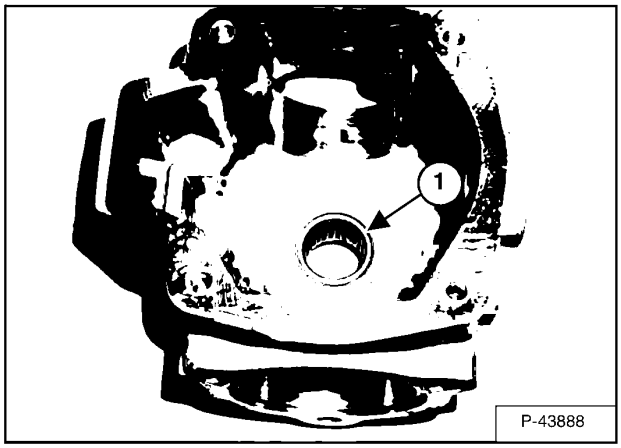
Figure 30-30-89



Inspect the swash plate for damage **[Figure 30-30-89]**. Replace as needed.

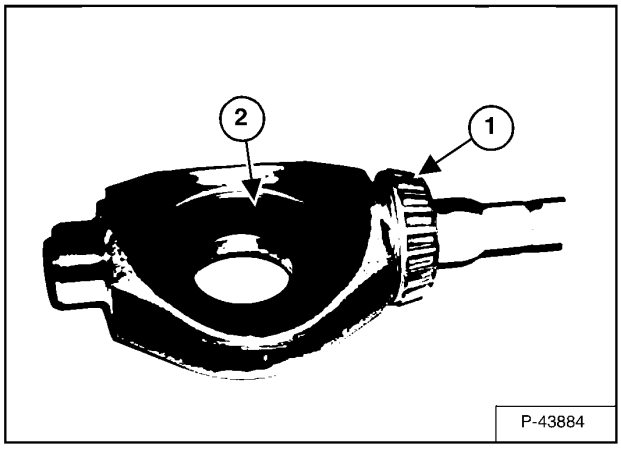
Assembly

Figure 30-30-90



Install the bearing (Item 1) **[Figure 30-30-90]** into the pump housing.

Figure 30-30-91



Lubricate and install the bearing (Item 1) and the wear plate (Item 2) **[Figure 30-30-91]** onto the swash plate.

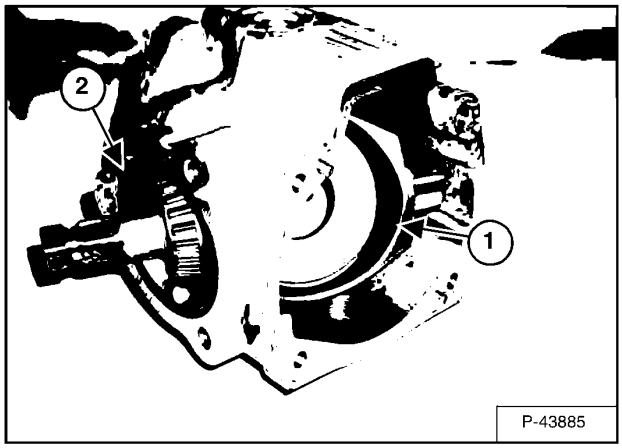
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HYDROSTATIC PUMP (CONT'D)

Assembly (Cont'd)

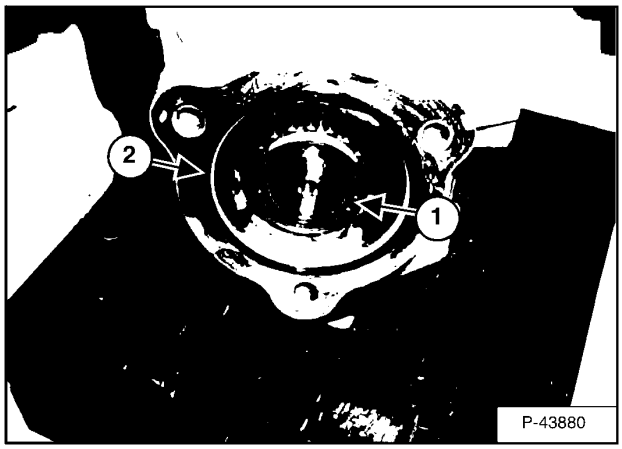
Figure 30-30-92



Install the swash plate (Item 1) **[Figure 30-30-92]** into the pump housing.

Lubricate and install the o-ring (Item 2) **[Figure 30-30-92]** into the pump housing.

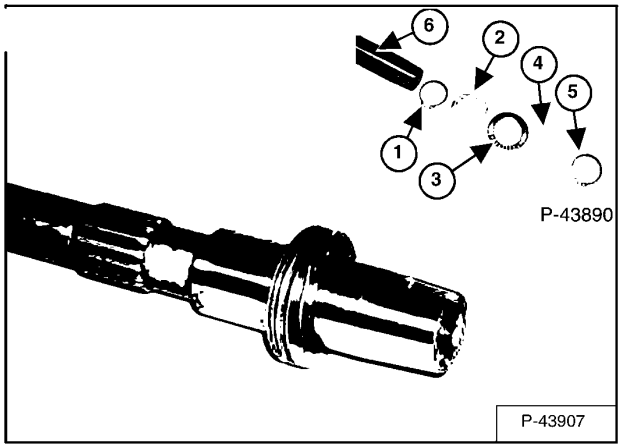
Figure 30-30-93



Lubricate and install the bearing (Item 1) **[Figure 30-30-93]** onto the swash plate.

Lubricate and install the o-ring (Item 2) **[Figure 30-30-93]** into the pump housing.

Figure 30-30-94

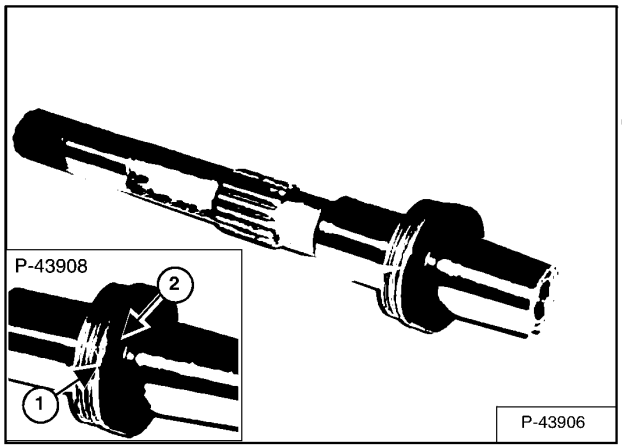


Install the snap ring (Item 1) into the second groove (Item 6) **[Figure 30-30-94]** from the end of the shaft.

Install the thrust washer (Item 2), thrust bearing (Item 3), and thrust washer (Item 4) **[Figure 30-30-94]** onto the shaft.

Install the snap ring (Item 5) **[Figure 30-30-94]** into the first groove on the shaft.

Figure 30-30-95



Install the spacer (Item 1) **[Figure 30-30-95]** onto the shaft.

Install the seal (Item 2) **[Figure 30-30-95]** onto the shaft.

NOTE: The lip of the shaft seal must face the inside of the pump.

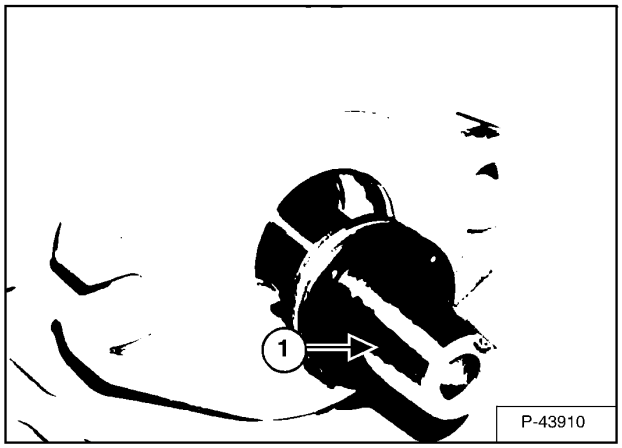
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HYDROSTATIC PUMP (CONT'D)

Assembly (Cont'd)

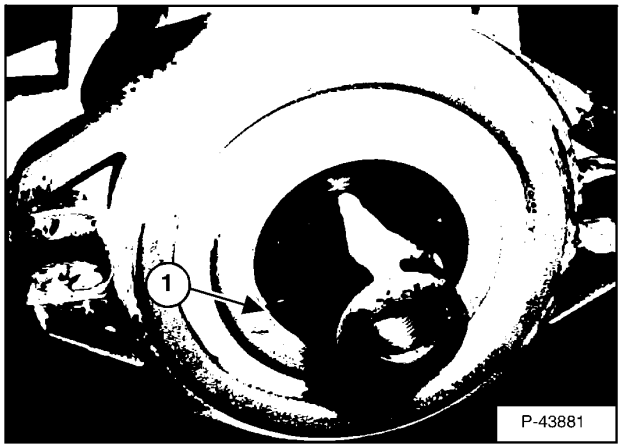
Figure 30-30-96



Install the shaft (Item 1) **[Figure 30-30-96]** into the pump housing.

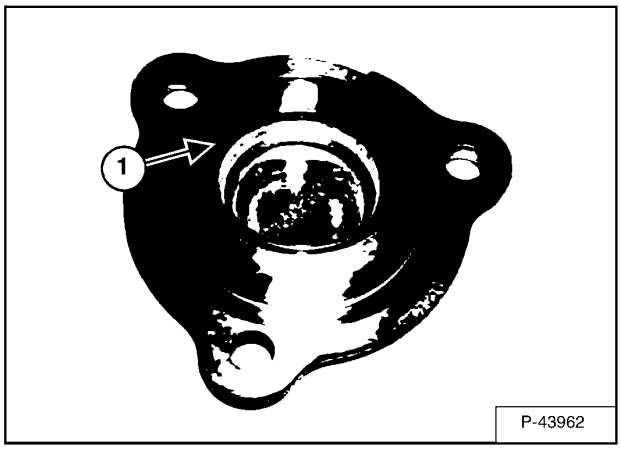
NOTE: A seal driver may be needed to press the seal inward until the snap ring w ill fit into the groove.

Figure 30-30-97



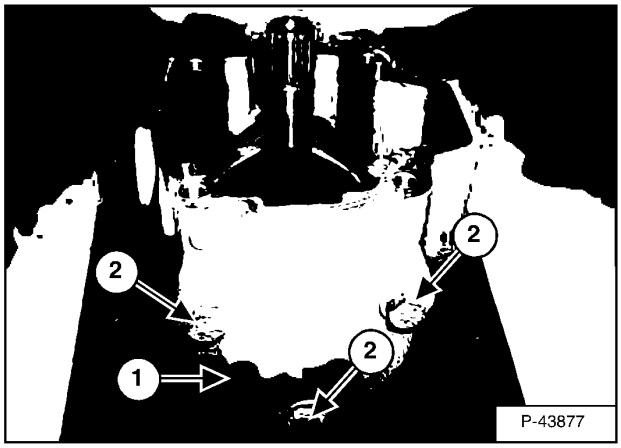
Install the snap ring (Item 1) **[Figure 30-30-97]** into the housing.

Figure 30-30-98



Install the bearing race (Item 1) **[Figure 30-30-98]** into the cover.

Figure 30-30-99



Install the co ver (Item 1) **[Figure 30-30-99]** onto the pump housing.

Install and torque the three bolts (Item 2) **[Figure 30-30-99]** to 29 ft.-lb. (39,3 N•m) .

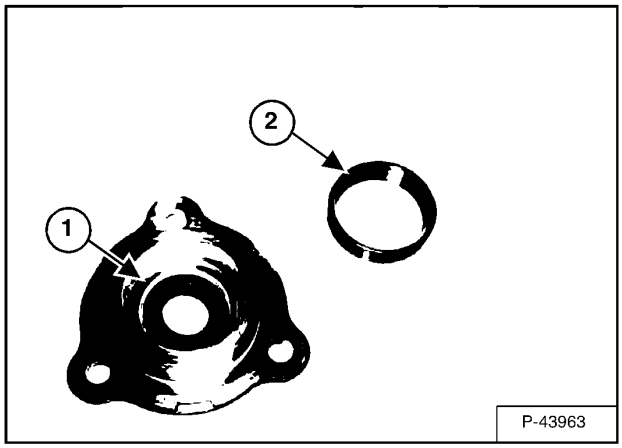
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HYDROSTATIC PUMP (CONT'D)

Assembly (Cont'd)

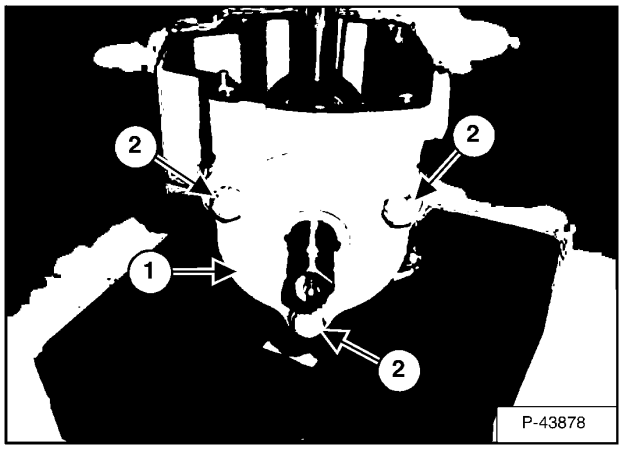
Figure 30-30-100



Install the seal (Item 1) **[Figure 30-30-100]** with the lip of the seal facing the inside of the pump.

Install the bearing race (Item 2) **[Figure 30-30-100]** into the cover.

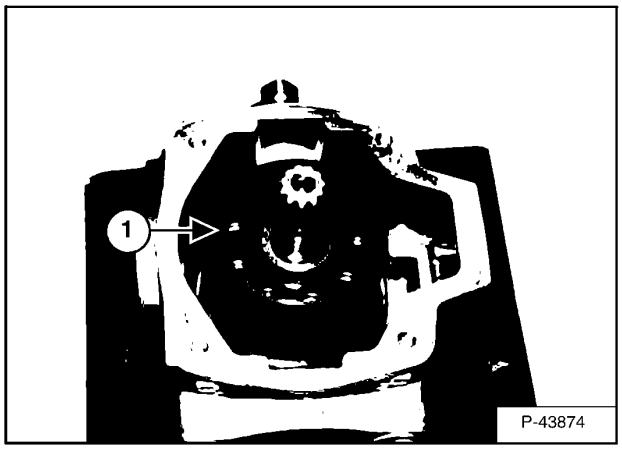
Figure 30-30-101



Install the cover (Item 1) **[Figure 30-30-101]** onto the pump housing.

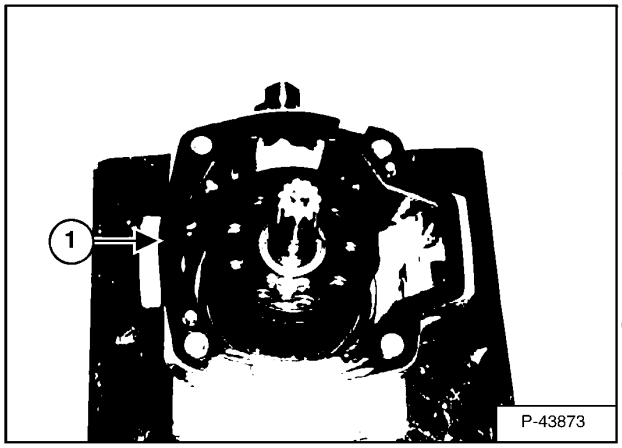
Install and torque the three bolts (Item 2) **[Figure 30-30-101]** to 29 ft.-lb. (39,3 N•m).

Figure 30-30-102



Install the piston assembly (Item 1) **[Figure 30-30-102]** into the pump housing.

Figure 30-30-103



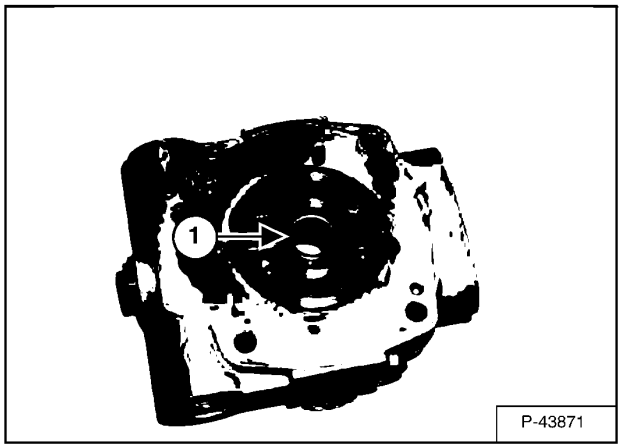
Install the new gasket (Item 1) **[Figure 30-30-103]** onto the pump housing.

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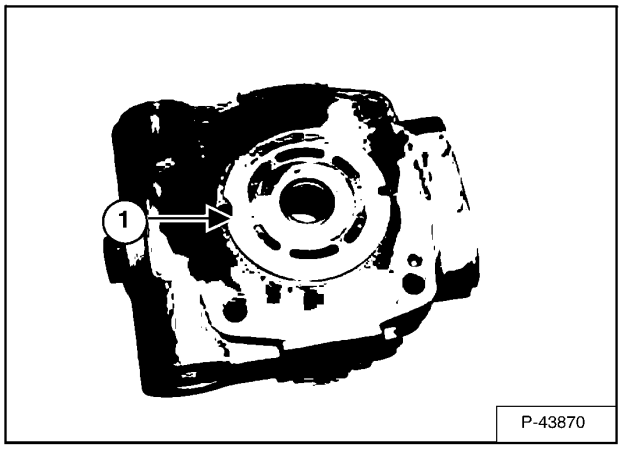
Assembly (Cont'd)

Figure 30-30-104



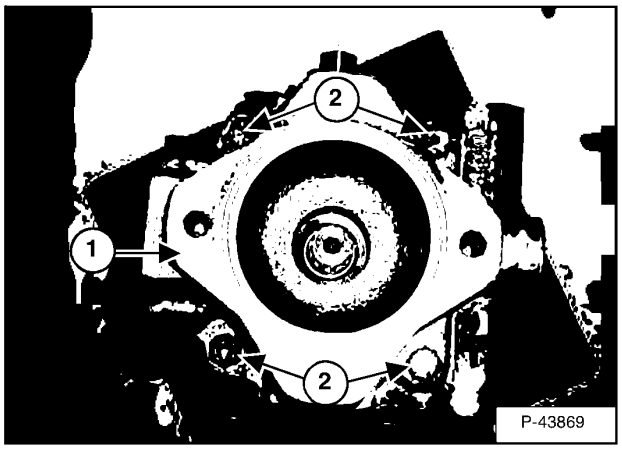
Install the bearing (Item 1) **[Figure 30-30-104]** into the pump end section.

Figure 30-30-105



Install the wear plate (Item 1) **[Figure 30-30-105]** onto the pump end section.

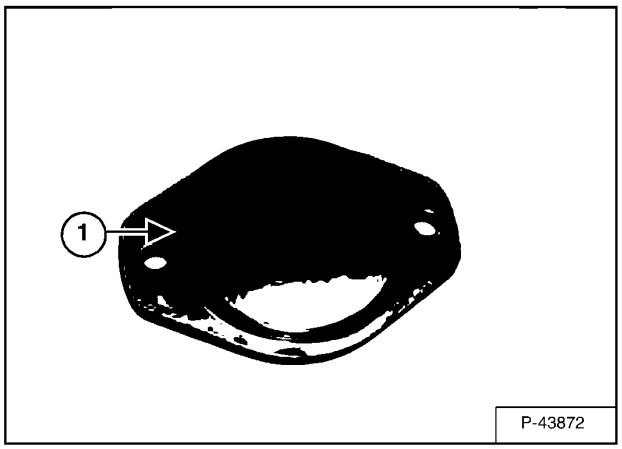
Figure 30-30-106



Install the pump end section (Item 1) **[Figure 30-30-106]** onto the pump housing.

Install and torque the four bolts (Item 2) **[Figure 30-30-106]** to 18.5 ft.-lb. (25 N•m).

Figure 30-30-107



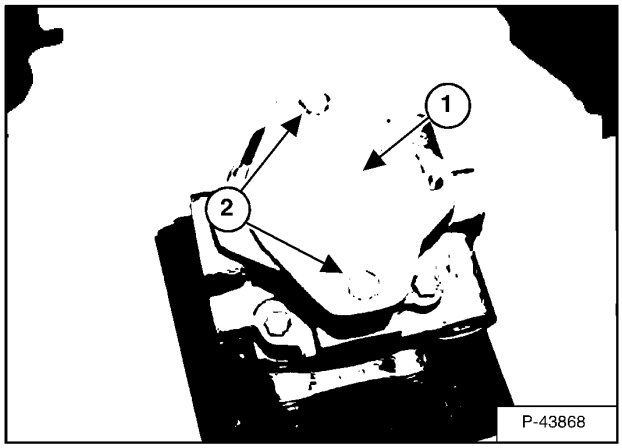
Lubricate and install the O-ring (Item 1) **[Figure 30-30-107]** onto the cap.

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Assembly (Cont'd)

Figure 30-30-108



Install the cap (Item 1) and two bolts (Item 2) **[Figure 30-30-108]** onto the pump end section.

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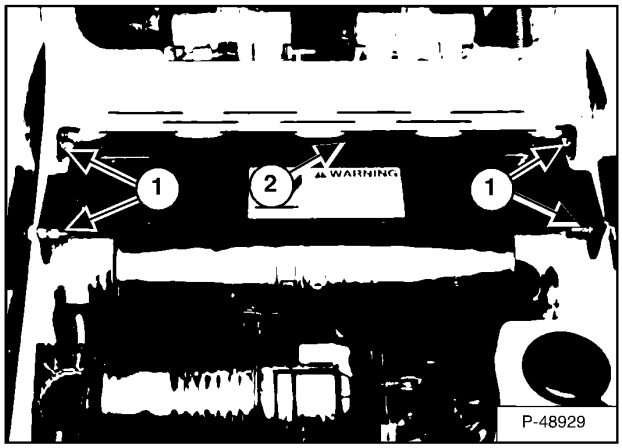
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DRIVE BELT

Removing Drive Belt Shield

Figure 30-40-1



Loosen the fou r drive belt shield fasteners (Item 1) **[Figure 30-40-1]**.

Remove the drive belt shield (Item 2) **[Figure 30-40-1]**.

Installation: Ensure the drive belt shield is not resting directly on the drive belt or the drive belt pulleys.

Adjusting The Drive Belt Tension

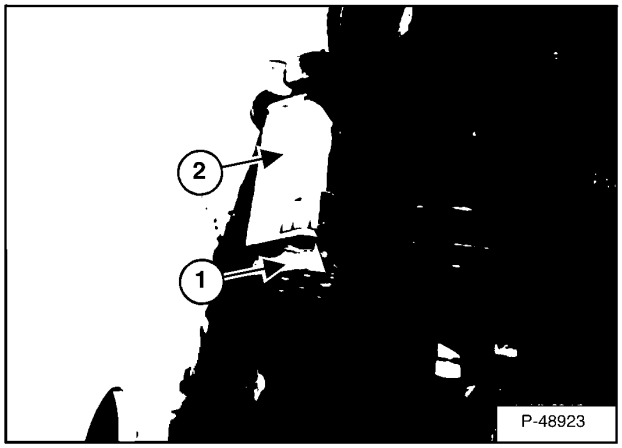
To adjust the drive belt tension, use the following procedure:

Stop the engine and raise the hood.

Disconnect the negative (-) battery cable.

Remove the drive belt shield.

Figure 30-40-2



The pulley tensioner is located just under the right hydrostat pulley **[Figure 30-40-2]**.

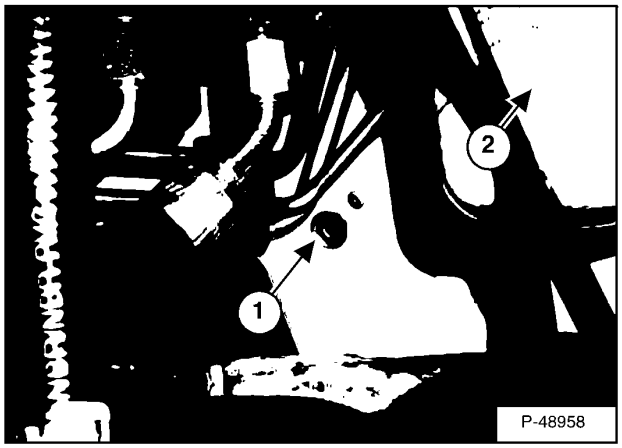
Open the tailgate. (See TAILGATE on Page 50-30-1.)

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Adjusting The Drive Belt Tension (Cont'd)

Figure 30-40-3



NOTE: Removing the hydraulic filter (Item 2) allows better access to the idler mounting bolt (Item 1) [Figure 30-40-3].

Loosen bolt (Item 1) **[Figure 30-40-3]** located on the back side of idler pulley .

While facing the idler pulley place a wrench on the square base portion (Item 2) **[Figure 30-40-2]** of the idler pulley

Rotate wrench until the pointer (Item 1) **[Figure 30-40-2]** reaches 25° .

While holding the pointer (Item 1) **[Figure 30-40-2]** at the proper position, tighten the mounting bolt (Item 1) **[Figure 30-40-3]** to 25-28 ft.-lb. (34-38 N•m) torque.

NOTE: The pointer (Item 1) [Figure 30-40-2] will be set at 25° when under tension.

Install the belt shield and four fasteners.

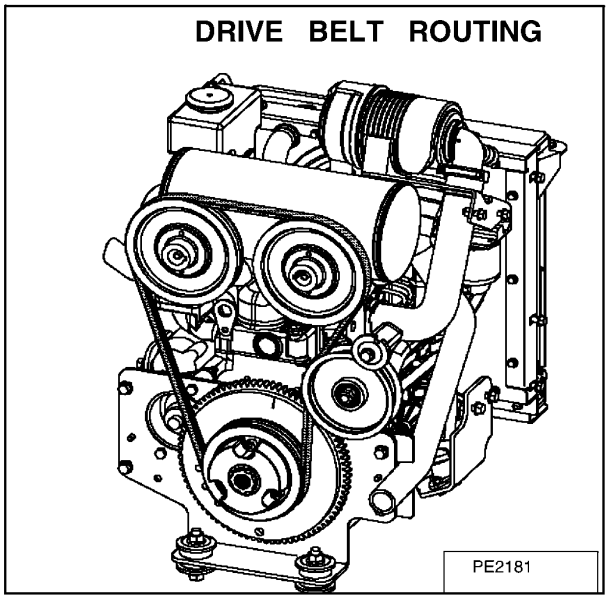
Reconnect the negative (-) battery cable.

Run the engine and recheck the pointer position.

Readjust if necessary.

Drive Belt Replacement

Figure 30-40-4



Stop the engine. Open the hood.

Remove the negative (-) cable from the battery.

Loosen the four fasteners (Item 1) and remove belt shield (Item 2) **[Figure 30-40-1]**.

Remove the muffler. (See Removal And Installation on Page 70-30-1.)

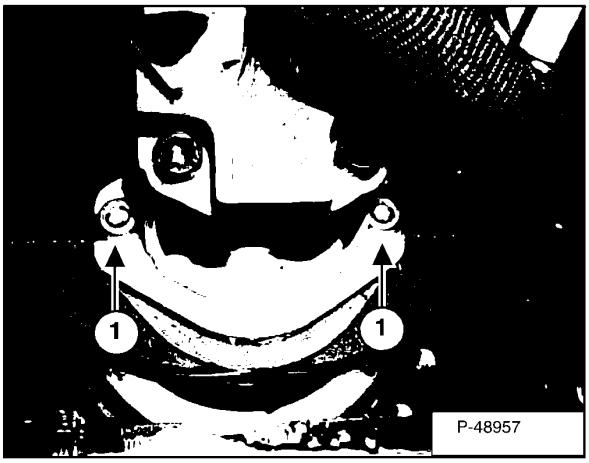
Loosen idler mounting bolt (Item 1) **[Figure 30-40-2]**.

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Drive Belt Replacement (Cont'd)

Figure 30-40-5



Loosen the two bolts holding the gear pump (Item 1) **[Figure 30-40-5]** and slide the gear pump back.

Install the new drive belt (See Drive Belt Routing Diagram) **[Figure 30-40-4]**.

(See Adjusting The Drive Belt Tension on Page 30-40-1.)

Install the belt shield and mounting bolts.

Install the negative (-) battery cable.

Tensioner Pulley Removal And Installation

Remove the drive belt shield. (See Removing Drive Belt Shield on Page 30-40-1.)

Remove muffler. (See Removal And Installation on Page 70-30-1.)

To remove tensioner pulley, remove the mounting bolt securing the tensioner pulley to the mainframe.

Drive Belt Alignment

Alignment of the drive belt is adjustable only at the pulley tensioner and the engine mounts. The goal is to align the tensioner pulley and the engine flywheel pulley groove with the pump pulleys which are not adjustable.

The mainframe of the loader has slots for the engine mounts making them adjustable.

By loosening the 4 rubber engine mounts, 2 rear and 2 side mounts; the engine can be moved forward and backward in the frame slots to align the flywheel with the hydrostatic pump pulleys.

(See ENGINE on Page 70-70-1.) for information on the engine mounts.

NOTE: If alignment of the flywheel pulley is still unacceptable, check the rubber engine mounts for damage.

The tensioner pulley can be aligned with the pump pulleys by using washers as shims.

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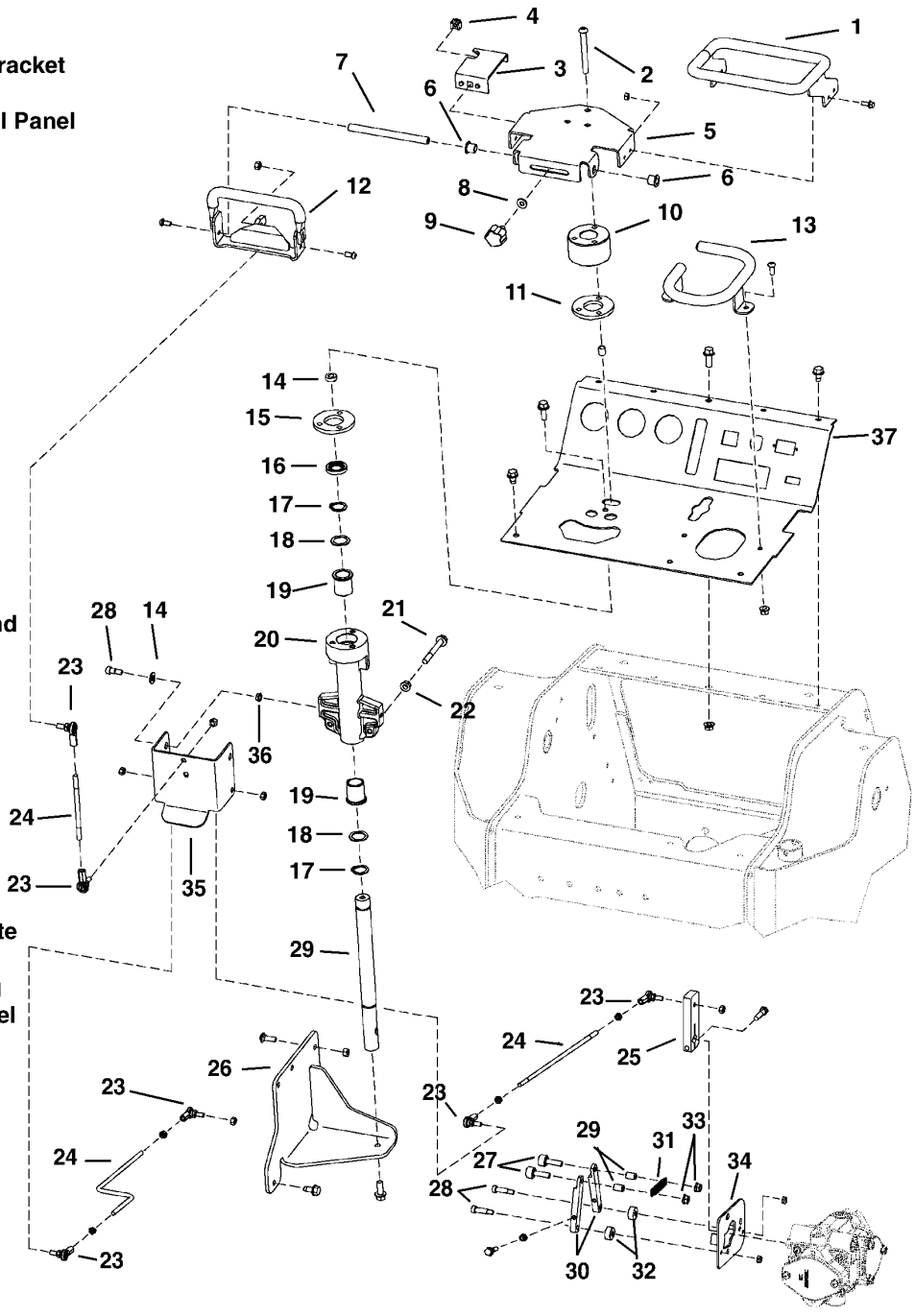
Bobcat®

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Steering Assembly Identification

1. Bracket
2. Bolt
3. Reverse Stop Bracket
4. Nut
5. Steering Control Panel
6. Bushing
7. Sleeve
8. Washer
9. Knob
10. Spacer
11. Spacer
12. Handle Assy.
13. Reference Bar
14. Washer
15. Spacer
16. Seal
17. Snap ring
18. Washer
19. Bushing
20. Housing
21. Bolt
22. Nut
23. Linkage Rod End
24 Linkage Rod
25 Pintle Arm
26. Bracket
27. Roller Bearing
28. Shoulder Bolt
29. Spring Spacer
30. Pintle Follower
31. Spring
32. Pivot Bushing
33. Nut
34. Adjustment Plate
35. Swivel Plate
36. Plastic Bushing
37. Instrument Panel



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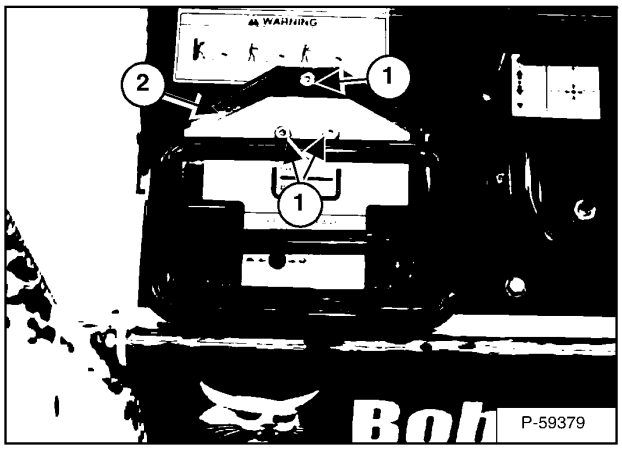
HYDROSTATIC CONTROLS (CONT'D)

Steering Assembly Removal And Installation

The steering assembly should be di sassembled and inspected if stiff steering is felt or the machine creeps along with the steering controls in neutral and the engine running.

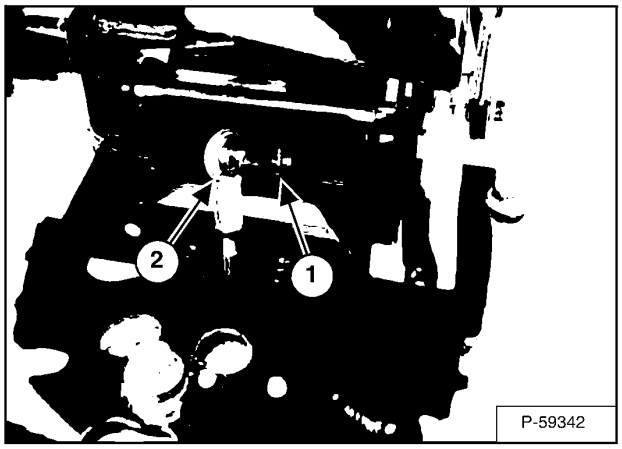
All pivoting mechanisms in the steering assembly should operate without binding.

Figure 30-50-6



Remove the thr ee bolts (Item 1) holding the steering control panel (Item 2) **[Figure 30-50-6]** to the steering shaft assembly.

Figure 30-50-7

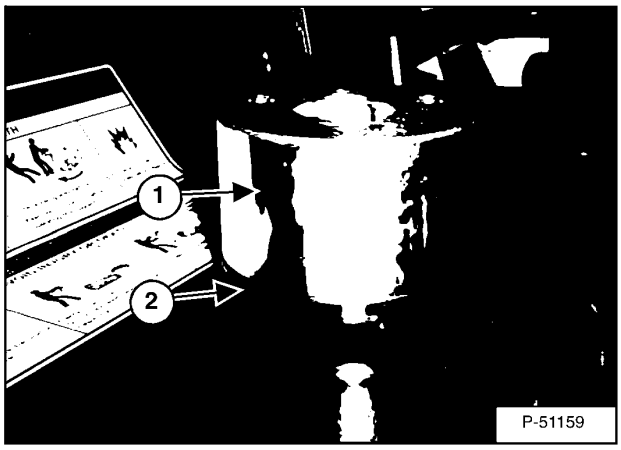


Lift the steering control panel (Item 2) **[Figure 30-50-6]**.

Remove the nut (Item 1) from the linkage rod end (Item 2) **[Figure 30-50-7]** .

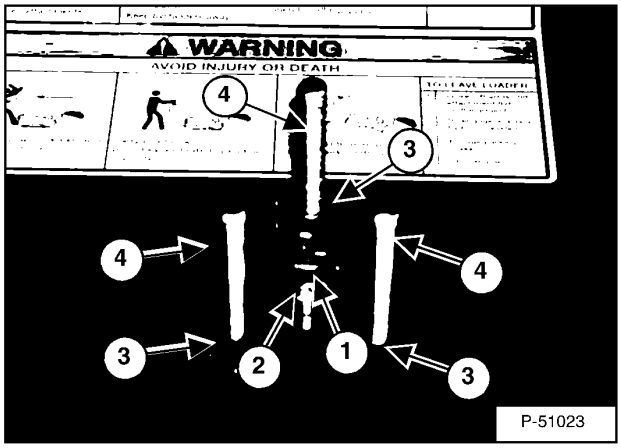
Remove the steering control panel.

Figure 30-50-8



Remove spacer (Item 1) and spacer (Item 2) **[Figure 30-50-8]** from the assembly.

Figure 30-50-9



Remove bolt (Item 1) and washer (Item 2) **[Figure 30-50-9]** holding the steering shaft assembly to i nstrument panel.

Remove the three spacers (Item 3) **[Figure 30-50-9]**.

Installation: The three threaded rods (Item 4) **[Figure 30-50-9]** are used to ho ld the spacer bushing and spacers in alignment when installing the steering assembly. The threaded rods are not necessary, but greatly aid the procedure. If the spacer bushings do not get installed properly, the steering panel may not operate freely.

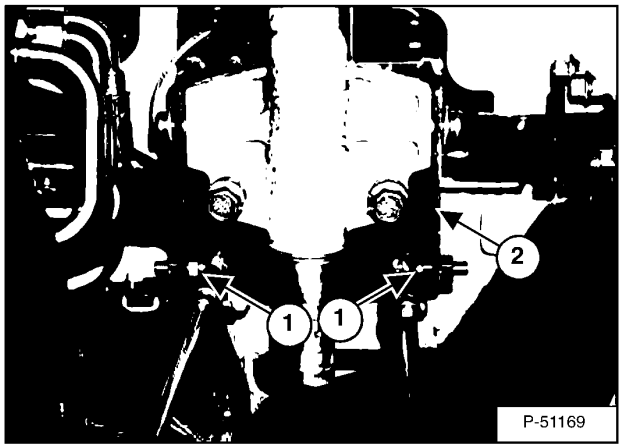
NOTE: The rod used for the alignment bolts is 3/8-16 NC thread by 3.5 inches (89 mm) long.

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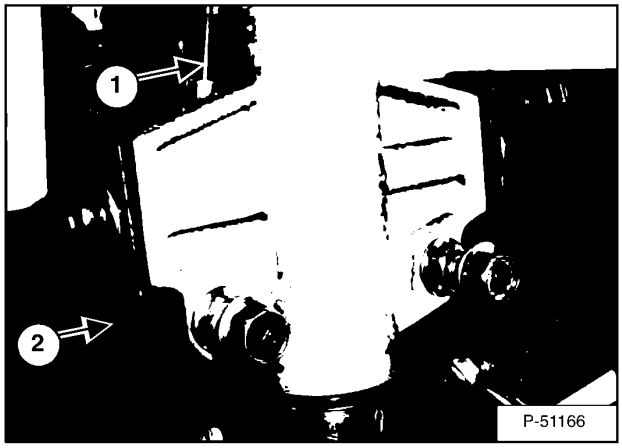
Steering Assembly Removal And Installation (Cont'd)

Figure 30-50-10



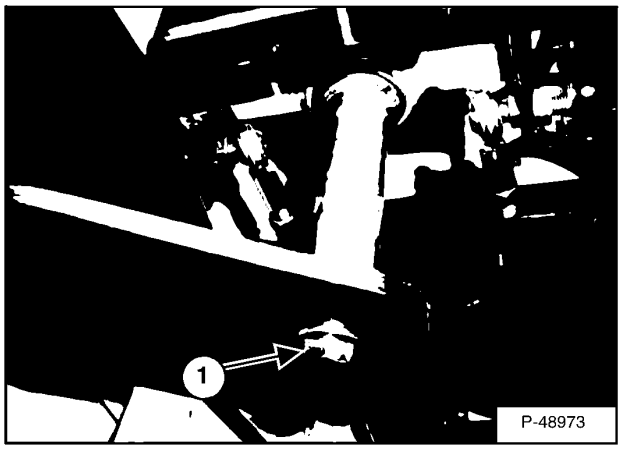
Disconnect the horizontal linkage rod ends (Item 1) from the swivel plate (Item 2) **[Figure 30-50-10]**.

Figure 30-50-11



Disconnect the vertical linkage rod (Item 1) (located just behind the steering assembly) from the swivel plate (Item 2) **[Figure 30-50-11]**.

Figure 30-50-12



Remove bolt (Item 1) **[Figure 30-50-12]** holding steering shaft to bracket.

Remove steering shaft assembly from machine.

Reverse the removal procedure to install the ste ering assembly.

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Steering Linkage Adjustment

NOTE: Carefully and completely read the adjustment procedures, before starting any adjustments.

Adjustments to the steering linkage may be required if components are replaced, the loader is creeping or if the neutral start sensor is not activating. For information on the neutral start sensor (See NEUTRAL START SENSOR on Page 60-60-1.).

NOTE: Linkage rods are not right and left hand threaded like a turnbuckle. In order to adjust the length of the linkage rods, one of the linkage rod ends must be removed first.

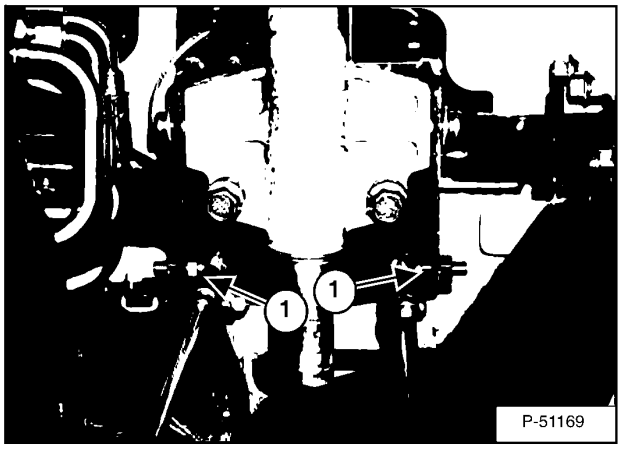
NOTE: Whenever the two horizontal linkage rods are adjusted, the single vertical linkage rod will need to be checked/adjusted also, and vice-versa.

NOTE: If the loader is not creeping, skip to [Figure 30-50-18].

Lift And Block The Loader.

Open the tailgate.

Figure 30-50-13



Remove horizontal linkage rods (Item 1) **[Figure 30-50-13]** from steering bracket. This will free up the pintle arms on the hydrostatic pumps from the steering shaft.

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Steering Linkage Adjustment (Cont'd)

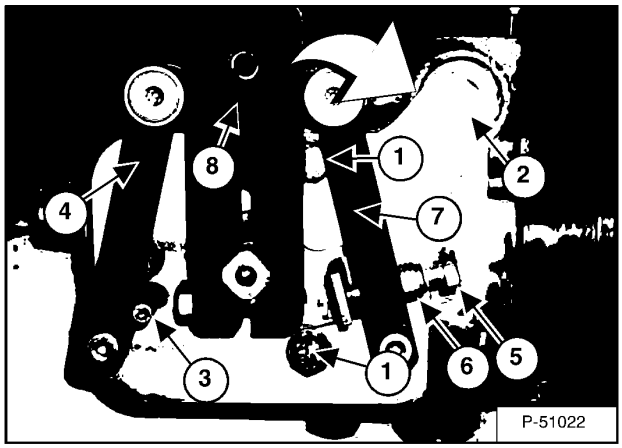
⚠ WARNING

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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NOTE: Hydrostatic pump removed for clarity, removal not needed for actual procedure.

Figure 30-50-14



Disengage the parking brake and start the engine from the operators area behind the machine.

With the engine running, observe which way the track is creeping.

NOTE: Use caution to avoid rotating track when making the adjustments.

Loosen bolts (Item 1) **[Figure 30-50-14]**.

The adjustment plate (Item 2) **[Figure 30-50-14]** is slotted in the mounting holes to allow the adjustment plate to rotate.

As the adjustment plate rotates, the pin (Item 3) pushes against the pintle follower (Item 4) **[Figure 30-50-14]**.

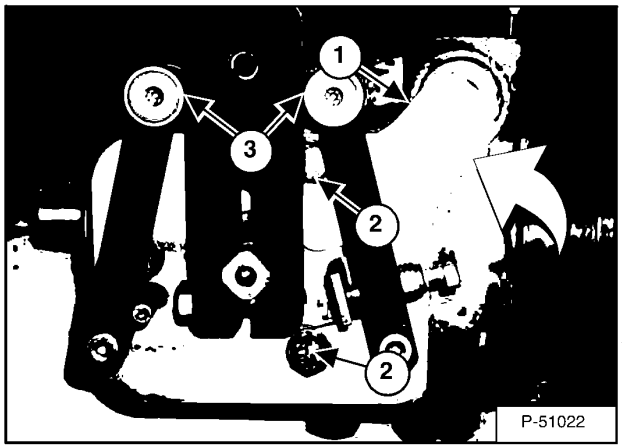
A spring (Item 1) **[Figure 30-50-16]** keeps the pintle followers pulled together.

The adjustment screw (Item 5) keeps the other pintle follower (Item 7) against the pintle arm (Item 8). The adjustment screw has a locking nut (Item 6) **[Figure 30-50-14]**.

NOTE: As creep adjustments are made, make sure rollers on pint le followers are always in contact with the pintle arm. If rollers are not touching pintle arm, play in the steering handle may b e felt and creep will be intermittent.

If the track is creeping forward rotate the plate (Item 2) **[Figure 30-50-14]** backward.

Figure 30-50-15



If the track is creeping backward rotate the adjustment plate (Item 1) **[Figure 30-50-15]** forward.

Rotate the adj ustment plate back or forward until the track doesn't move.

Turn off the engine.

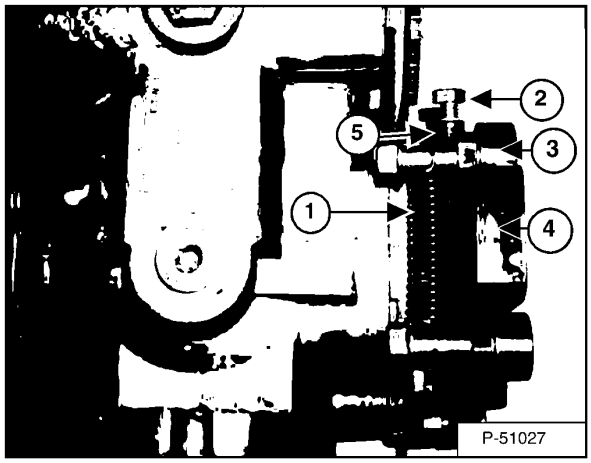
Tighten bolts (Item 1) **[Figure 30-50-14]** and (Item 2) **[Figure 30-50-15]** when the adjustments are completed.

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Steering Linkage Adjustment (Cont'd)

Figure 30-50-16



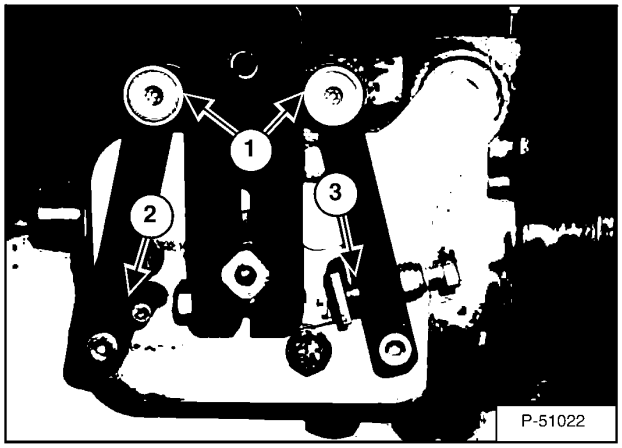
Loosen lock nut (Item 5) **[Figure 30-50-16]**.

With the spring (Item 1) removed, turn the bolt (Item 2) until the roller (Item 3) touches the pintle arm (Item 4). With the spring removed, light finger pressure may need to be applied to the rollers to hold them against the pintle arm (Item 4) **[Figure 30-50-16]** during adjustment.

Tighten lock nut (Item 5) **[Figure 30-50-16]**.

Reinstall the spring (Item 1) **[Figure 30-50-16]**.

Figure 30-50-17

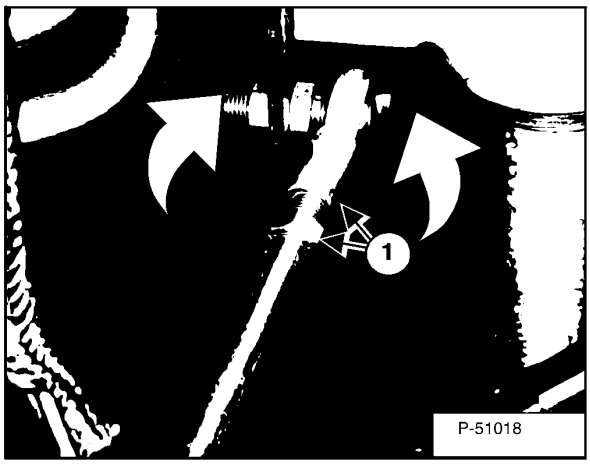


NOTE: When the hydrostatic creep has been set properly:

1. Neither tracks will move while the engine is running and the steering panel is in its neutral position.

2. Both rollers on each hydrostatic pump will be touching the pintle arm at (Item 1). The pintle followers will be contacting the pin on the adjustment plate at (Item 2) and the set screw at (Item 3) **[Figure 30-50-17]**.

Figure 30-50-18



Adjust the horizontal linkage rod end so it is about half-way on the threads (Item 1) **[Figure 30-50-18]** for a good starting point.

NOTE: Only the right pump linkage rod end can be removed from the PINTLE ARM without removing the pump. (Swivel plate linkage rod end shown in picture above)

Figure 30-50-19



(This adjustment/check is m ade while the steering controls are in the neutral position.)

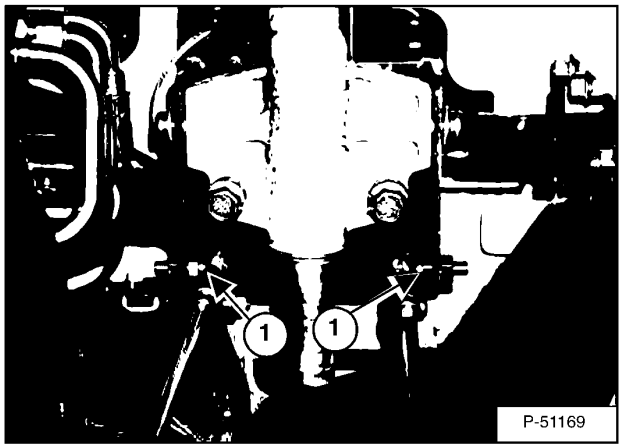
Turn the rod ends in or out until the edge of the swivel plate (Item 1) is parallel with the edge of th e steering housing (Item 2) **[Figure 30-50-19]**.

Check neutral start sensor adjustment. (See NEUTRAL START SENSOR on Page 60-60-1.)

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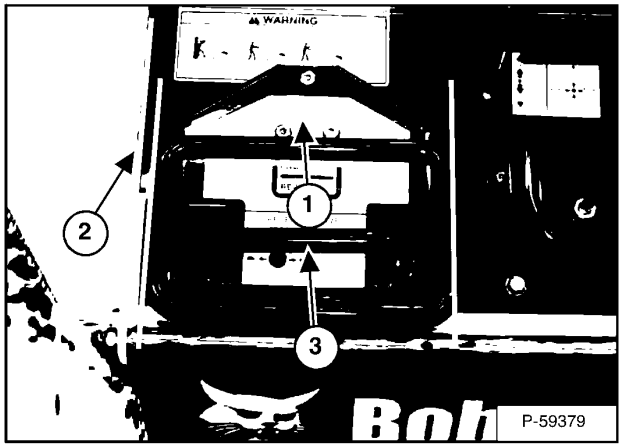
Steering Linkage Adjustment (Cont'd)

Figure 30-50-20



Tighten the horizontal rod ends (Item 1) **[Figure 30-50-20]** to the bracket.

Figure 30-50-21



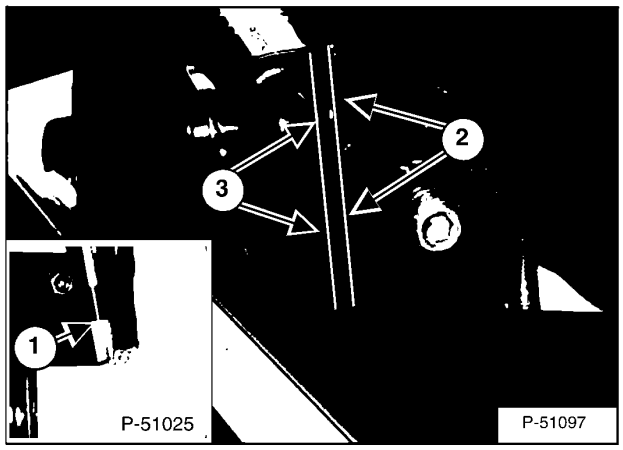
(This adjustment/check is ma de while the steering controls are in the neutral position.)

The steering control panel (Item 1) should be pointing straight ahead and be parallel with the mainframe edge (Item 2) **[Figure 30-50-21]**. If the steering control panel is not parallel with the mainframe edge, adjust the horizontal linkage rods to point the steering control panel straight.

NOTE: When trying to a lign the steering control panel, both horizontal linkage rods will have to be adjusted to avoid making one of the hydrostatic pumps start to creep. (One will have to be lengthened and the other will have to be shortened the same distance.)

By adjusting the length of the vertical linkage rod (Item 1) **[Figure 30-50-22]** you adjust the position of the speed control handle (Item 3) **[Figure 30-50-21]**.

Figure 30-50-22



(This adjustment/check is made while the steering controls are in the neutral position.)

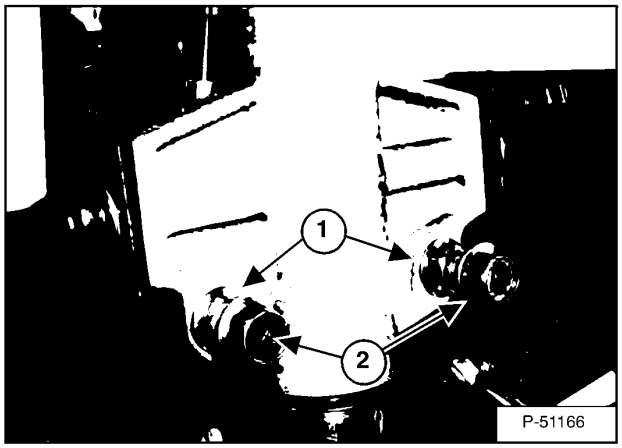
If adjustments are made to the length of the two horizontal linkage rods connected to t he hydrostatic pumps, as in **[Figure 30-50-18]**, adjust the vertical linkage rod (Item 1) **[Figure 30-50-22]** until the edge of the handle (Item 2) **[Figure 30-50-22]** is parallel with the edge of the steering panel (Item 3) **[Figure 30-50-22]**.

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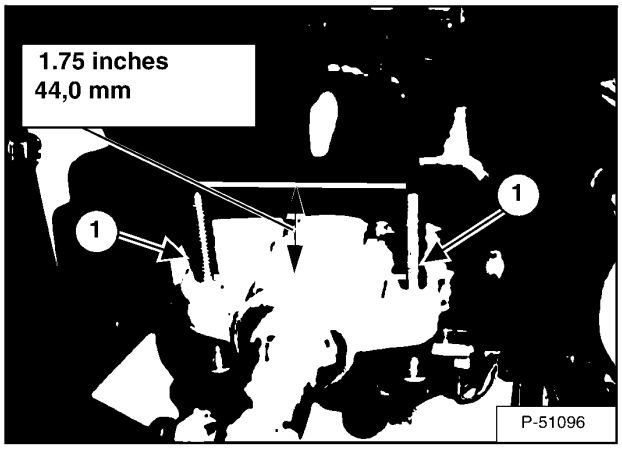
Adjusting Forward Speed Control

Figure 30-50-23



Loosen the two nuts (Item 1) then turn bolts (Item 2) **[Figure 30-50-23]** in or out to adjust full forward speed.

Figure 30-50-24

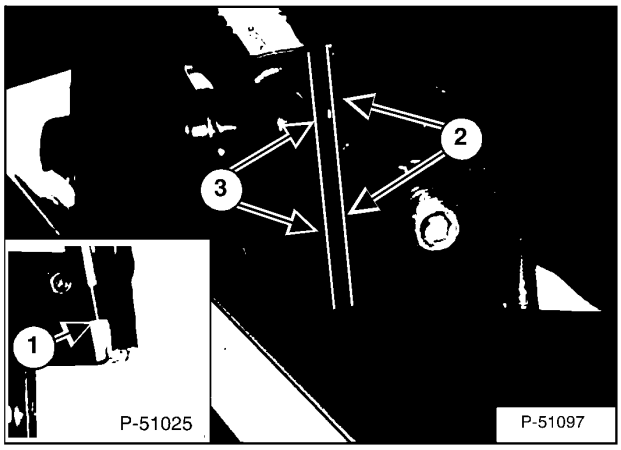


The bolt threads (Item 1) **[Figure 30-50-24]** should protrude out the back 1.75 inches (44 mm) for proper setting.

Tighten the two lock nuts (Item 1) **[Figure 30-50-23]** when the bolts are properly adjusted.

NOTE: If the bolts (Item 1) [Figure 30-50-24] are protruding less than 1.75 inches (44,0 mm), the loader's ability to steer is reduced when driving at maximum forward speed.

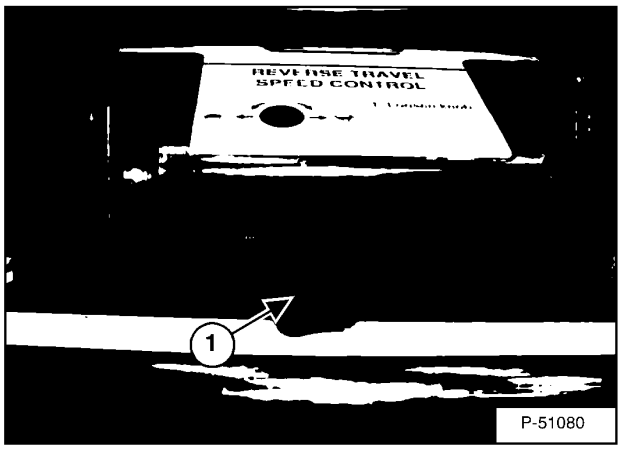
Figure 30-50-25



Adjust the vertical rod (Item 1) until the edge of the handle (Item 2) is parallel with the edge of the steering control panel (Item 3) **[Figure 30-50-25]**.

Adjusting Reverse Speed Control

Figure 30-50-26



The reverse speed adjustment is made by loosening and sliding the knob (Item 1) **[Figure 30-50-26]** right or left until proper speed is achieved.

After the proper reverse speed adjustment is made tighten the control knob (Item 1) **[Figure 30-50-26]**.

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DRIVE SYSTEM

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- Adjusting The Tracks (SN 523611010 & Above) 40-20-1
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- Track Roller Disassembly and Assembly. 40-20-11
- Track Roller Removal and Installation 40-20-9
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TIGHTEN ALL HARDWARE PER SIZE TO GRADE 5 TORQUE (See TORQUE SPECIFICATIONS FOR BOLTS on Page SPEC-30-1.) UNLESS OTHERWISE SPECIFIED.

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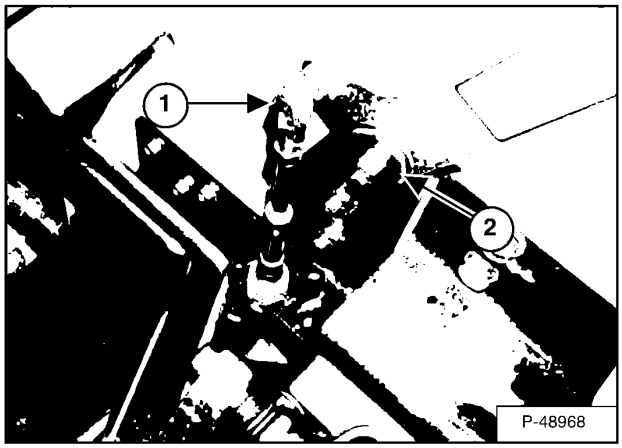
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PARKING BRAKE

Handle Removal And Installation

Figure 40-10-1



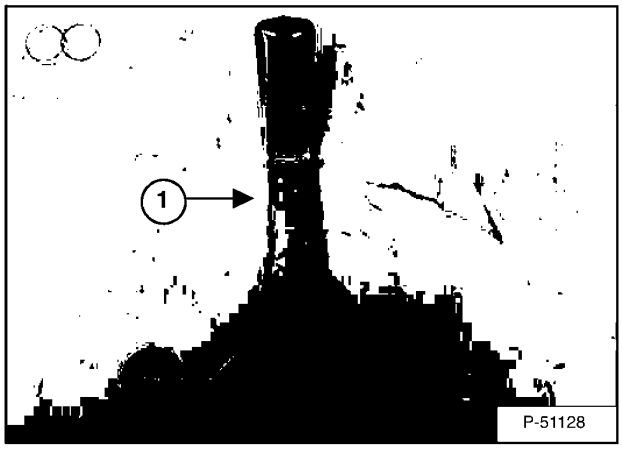
Remove the instrument panel. (See Removal and Installation on Page 50-50-1.)

Remove the rod end (Item 1) **[Figure 40-10-1]** from the brake handle.

Remove the nut and washer (Item 2) **[Figure 40-10-1]** from the brake handle.

Installation: Tighten the nut to 108 in.-lb. (12 N•m) torque.

Figure 40-10-2



Remove the brake handle assembly (Item 1) **[Figure 40-10-1]** from the loader.

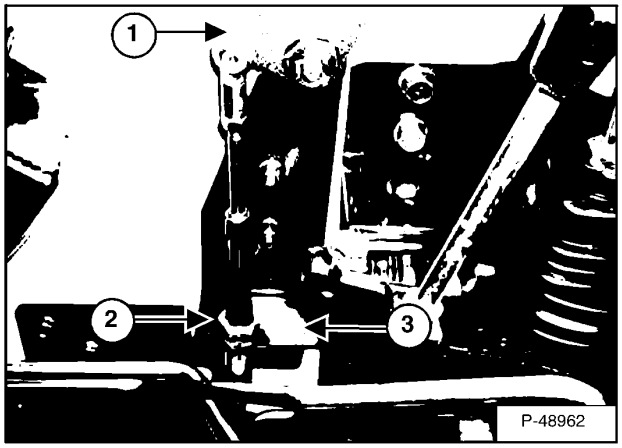
Reverse the r emoval procedure to in stall the parking brake handle.

Cable Removal And Installation

Remove the hydraulic resevoir. (See Removal And Installation on Page 20-70-1.)

Remove the instrument panel. (See Removal and Installation on Page 50-50-1.)

Figure 40-10-3

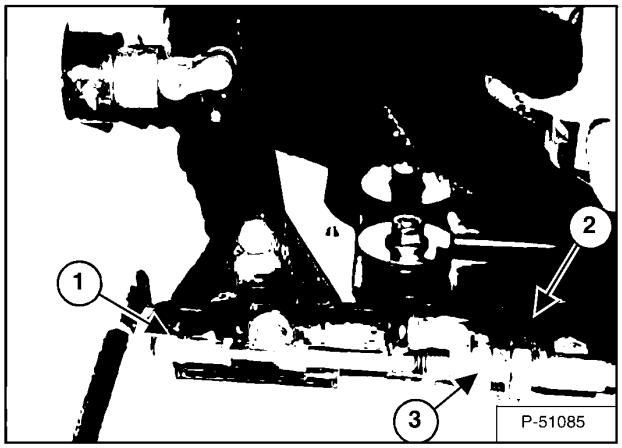


Remove the rod end (Item 1) **[Figure 40-10-3]** from the brake handle.

Loosen jambnut (Item 2) holding cable to up per cable mount (Item 3) **[Figure 40-10-3]**.

Remove cable from the upper cable mount.

Figure 40-10-4



Remove the rod end (Item 1) from the lower cable mount (Item 2) **[Figure 40-10-4]**.

Loosen jambnut (Item 3) holding cable to lower cable mount (Item 2) **[Figure 40-10-4]**.

Remove the cable.

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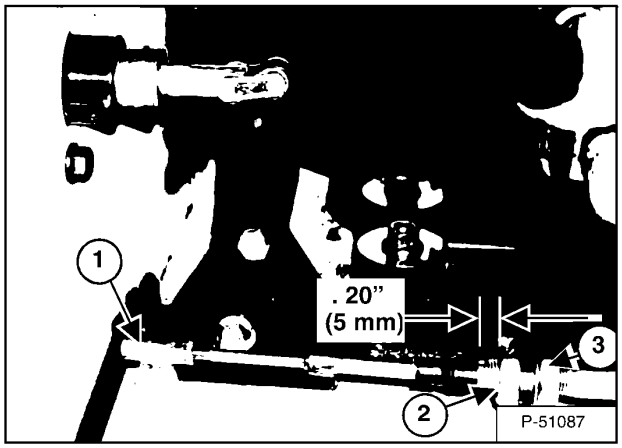
Cable Removal And Installation (Cont'd)

NOTE: When replacing the cable with a new one position the jambnuts and rod ends at approximately the same position that they were on the old one.

Reverse the removal procedure to install the cable.

Cable Adjustment

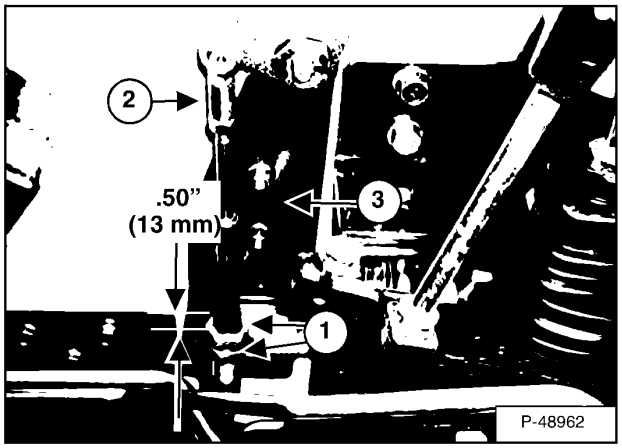
Figure 40-10-5



Turn the rod end (Item 1) all the way onto the bottom cable and turn the jamb nut (Item 2) **[Figure 40-10-5]** untill .20 inch (5 mm) of threads are showing on the outer edge.

Install the cable and tighten the inner jambnut (Item 3) **[Figure 40-10-5]**.

Figure 40-10-6

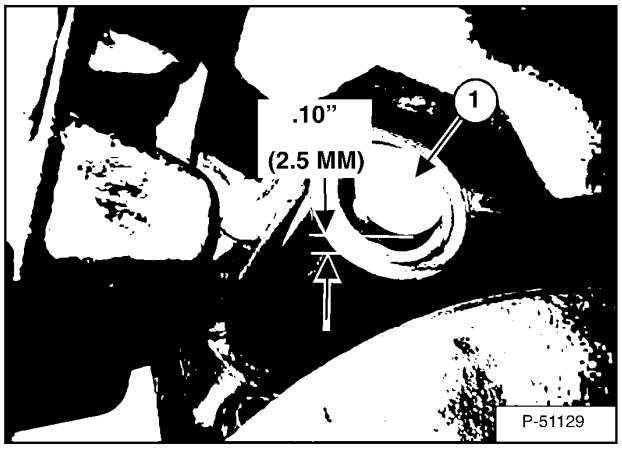


Install the two jumbnuts (Item 1) onto the upper cable end and turn the rod end (Item 2) **[Figure 40-10-6]** completely onto the cable end .

Adjust the jambnuts (Item 1) **[Figure 40-10-6]** untill .50 inch (13 mm) of threads are showing **[Figure 40-10-6]**.

Install cable onto upper cable mount (Item 3) and snug the jambnuts (Item 1) **[Figure 40-10-6]**, finger tight.

Figure 40-10-7



Adjust the cable by moving the jambnuts (Item 1) **[Figure 40-10-6]** up or down until the brake pins (Item 1) **[Figure 40-10-7]** protrude .10 inch when the brake handle is in the retracted position.

Tighten jambnuts (Item 1) **[Figure 40-10-6]** when the adjustments are completed.

NOTE: If while operating machine you hear a ticking sound emitting from the brake pin area you may need to recheck the brake cable adjustment.

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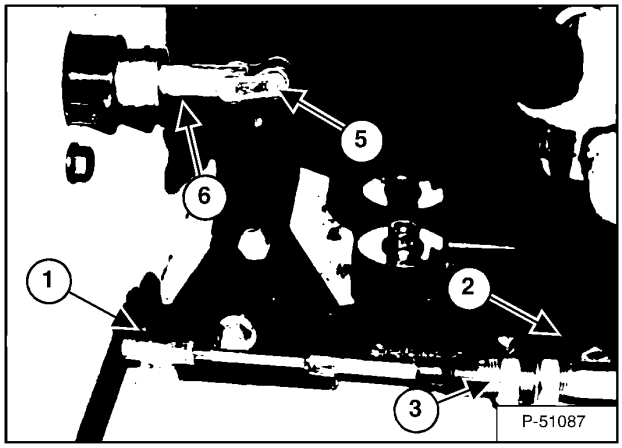
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Removing The Linkage Assembly

Remove the hydraulic reservoir. (See Removal And Installation on Page 20-70-1.)

Remove battery. (See Removal and Installation on Page 60-20-1.)

Figure 40-10-8

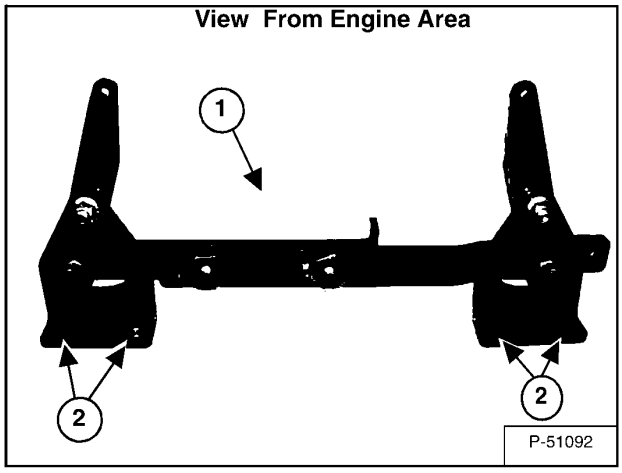


Remove the rod end (Item 1) from the lower cable mount (Item 2) **[Figure 40-10-8]**.

Loosen jambnut (Item 3) holding cable to lower cable mount (Item 2) **[Figure 40-10-8]** and remove the cable.

Remove the linkage retainer and linkage (Item 5) from the brake pin (Item 6) **[Figure 40-10-8]**.

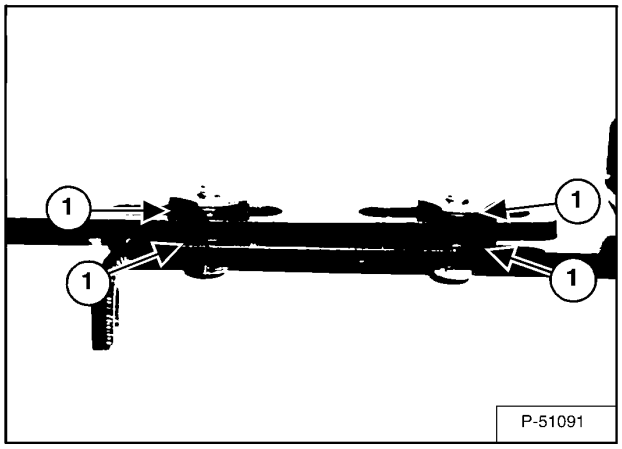
Figure 40-10-9



To remove the entire assembly (Item 1) remove the four bolts from the linkage mounting holes (Item 2) **[Figure 40-10-9]**.

NOTE: The removed view is shown for visual clarity you do not need to r emove the entire assembly for inspection.

Figure 40-10-10



Inspect the nylon bushings (Item 1) **[Figure 40-10-10]** for wear and replace if needed.

Figure 40-10-11



Inspect levers (Item 1) **[Figure 40-10-11]** for unrestricted movement, lubricate or replace parts as needed.

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PARKING BRAKE (CONT'D)

Brake Pin Lubrication

Figure 40-10-12

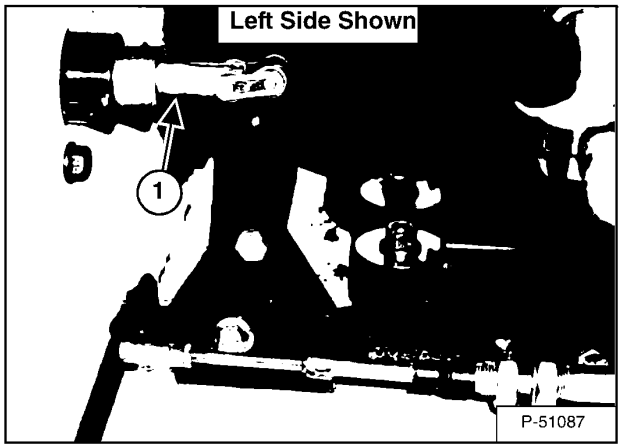
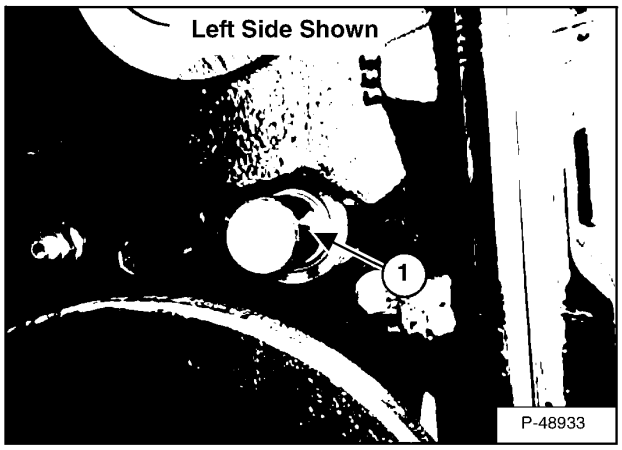


Figure 40-10-13



Lubricate the parking brake pin (Item 1) **[Figure 40-10-12]** & **[Figure 40-10-13]** with anti-sieze only and move the parking brake lever back and forth to lubricate the entire pin area.

Repeat the lubrication for the parking brake pin on the other side.

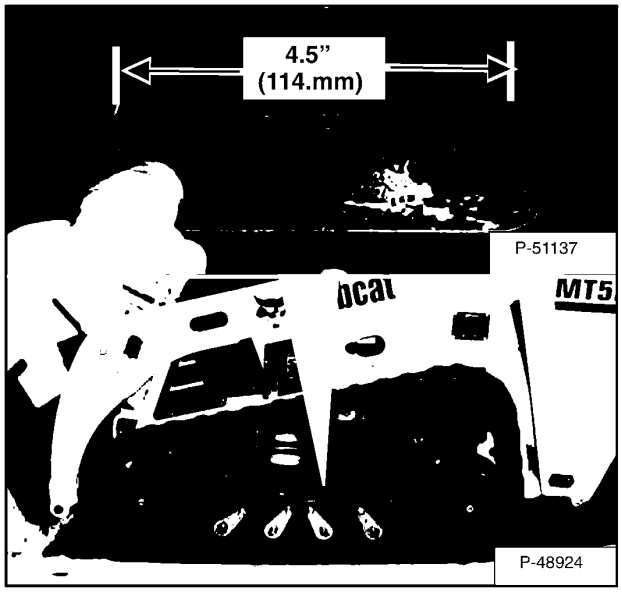
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DRIVE COMPONENTS

Track Tension Checking (SN 523611010 & Above)

Figure 40-20-1

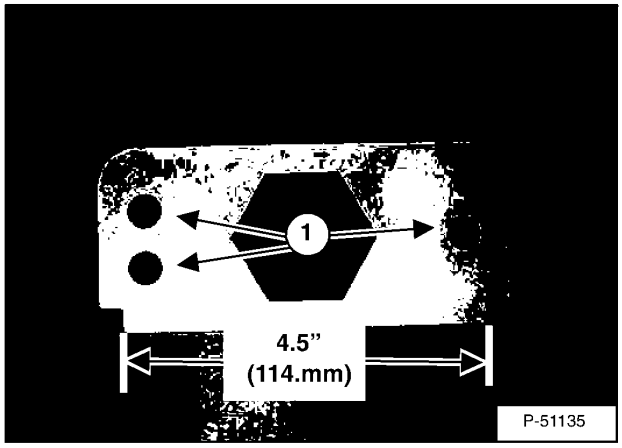


Track tension is important for good performance and to prevent the tracks from coming off.

NOTE: The track wear and roller wear will vary with the working conditions and different types of soil conditions.

The tracks are adjusted correctly when the measurement from the front end of the slot to the block is 4.5 inches (114 mm) **[Figure 40-20-1]**.

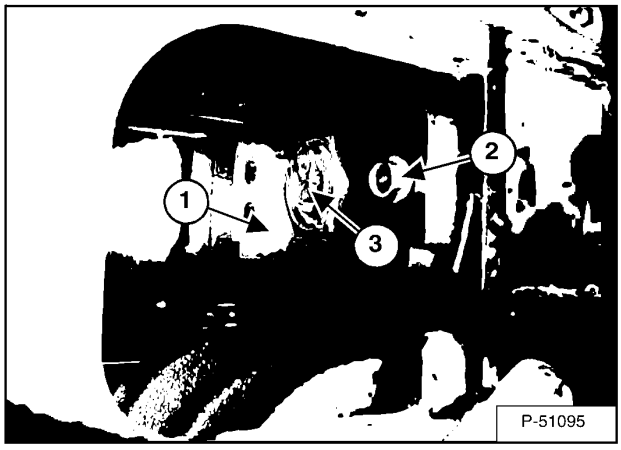
Figure 40-20-2



The adjusting bolt retainer plate doubles as a track tension adjustment check tool **[Figure 40-20-2]**.

Adjusting The Tracks (SN 523611010 & Above)

Figure 40-20-3



Park the loader on a level surface.

Remove the bolt retainer plate (Item 1) by removing the retaining bolt (Item 2) **[Figure 40-20-3]**.

Turn the adjustment bolt (Item 3) **[Figure 40-20-3]** counterclockwise to tig hten the tr ack. (Increase the distance from the slot to the block **[Figure 40-20-1]**.)

Turn adjustment bolt clockwise to loosen the track. (Decrease the distance from the slot to the block **[Figure 40-20-1]**.)

Turn until the correct measurement is obtained **[Figure 40-20-1]**

NOTE: On a new track, the initial tension setting is achieved by tightening the adjusment bolt (Item 3) [Figure 40-20-3] to 200 ft.-lb. (270N•m) torque.

Turn bolt slightly if needed until one of the holes (Item 1) **[Figure 40-20-2]** is aligned and install the bolt (Item 2) **[Figure 40-20-3]**.

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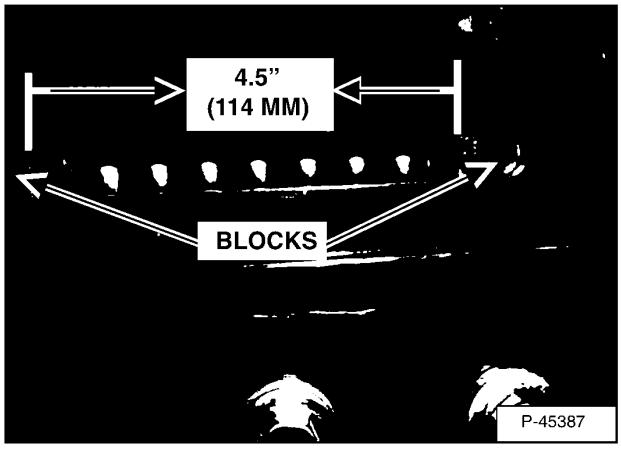
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Track Tension Checking (SN 523611009 & Below)

Track tension is important for good performance and to prevent the tracks from coming off.

NOTE: The wear of track rollers vary with the working conditions and different types of s oil conditions.

Figure 40-20-4



The tracks are adjusted correctly when the measurement between the blocks is 4.5 inches (114 mm) **[Figure 40-20-4]**.

Adjusting The Tracks (SN 523611009 & Below)

Park the loader on a level surface.

Figure 40-20-5



Remove the locking bolt (Item 1) **[Figure 40-20-5]**

Turn the adjustment bolt (Item 2) **[Figure 40-20-5]** counterclockwise to tig hten the tr ack. (Increase the distance from the slot to the block **[Figure 40-20-4]**.)

Turn clockwise to loosen the track. (Decrease the distance from the slot to the block **[Figure 40-20-4]**.)

NOTE: On a new track, the initial tension setting is achieved by tightening the adjusment bolt (Item 2) **[Figure 40-20-5] to 200 ft.-lb. (270N•m) torque.**

Turn until the correct measurement is obtained **[Figure 40-20-4]** and the nearest notch (Item 1) **[Figure 40-20-5]** is aligned with the hole for the locking bolt. Install the locking bolt and tighten.

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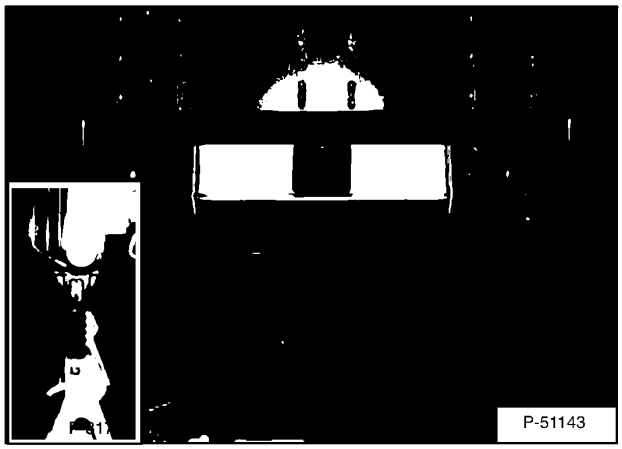
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Track Removal and Installation

Park the loader on a level surface.

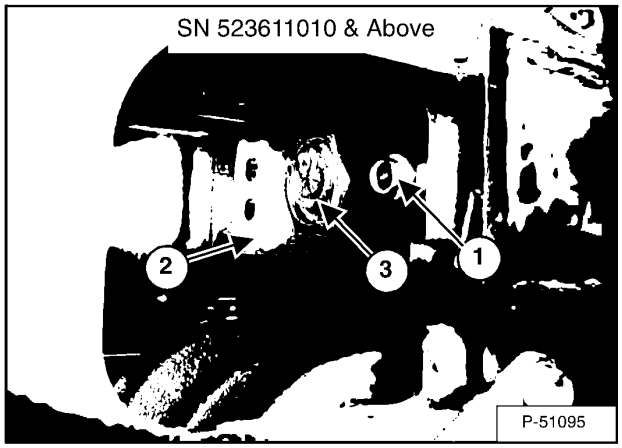
Lift and block the loader. (See LIFTING AND BLOCKING THE LOADER on Page 10-10-1.)

Figure 40-20-6



Raise the lift arms 6 inches and install floor jacks under the Bob-Tach **[Figure 40-20-6]** to provide clearance for track removal.

Figure 40-20-7

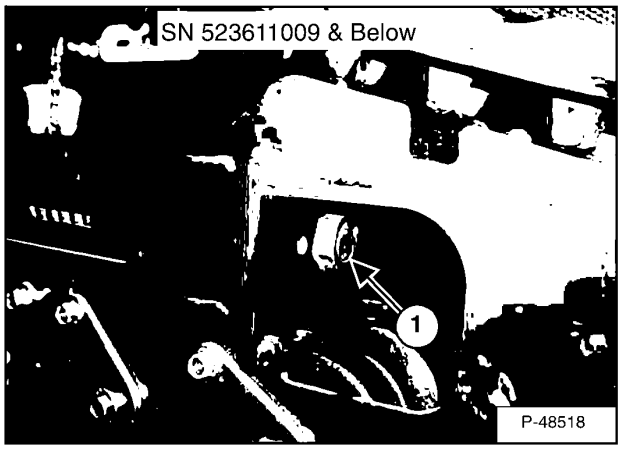


Remove the bo lt holding the retainer plate (Item 1) **[Figure 40-20-7]**

Remove the retainer plate (Item 2) **[Figure 40-20-7]**

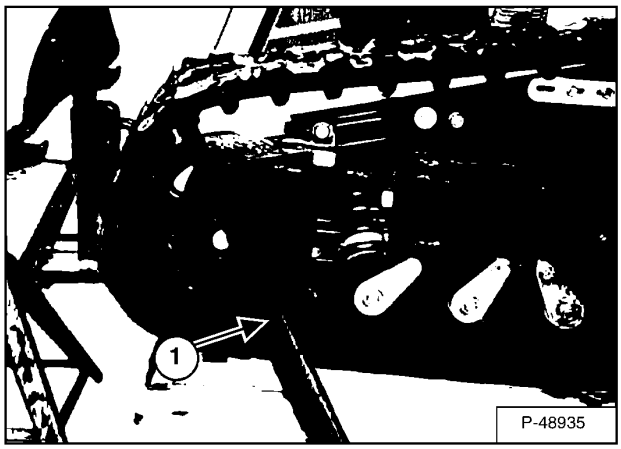
Turn the adjustment bolt (Item 3) **[Figure 40-20-7]** clockwise to loosen the track and the track tension spring has no tension. (Decrease the distance from the slot to the block **[Figure 40-20-1]** See Page 30-20-1.)

Figure 40-20-8



Turn the adjustment bolt (Item 3) **[Figure 40-20-8]** clockwise to loosen the track and the track tension spring has no tension. (Decrease the distance from the slot to the block **[Figure 40-20-1]** See Page 30-20-1.

Figure 40-20-9



NOTE: To protect your hands from injury always wear gloves before removal and installation of the track.

With a pry bar (Item 1) **[Figure 40-20-9]** pry the track up over the front idler assembly.

Completely remove the track from the loader track frame and drive sprocket.

Reverse the removal procedure to install the track.

After re-installing the track, follow the A djusting Tracks procedure to set the correct track tension. (See Adjusting The Tracks (SN 523611010 & Above) on Page 40-20-1.)

NOTE: When installing a new track, the track tension should be readjusted after 8 hours of use.

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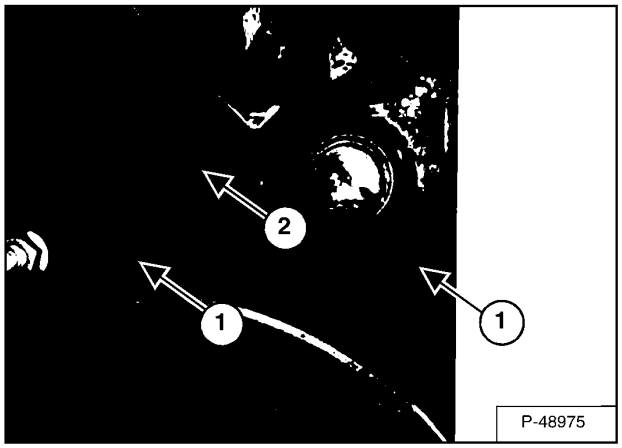
Track Frame Removal and Installation

Lift and block the loader. (See LIFTING AND BLOCKING THE LOADER on Page 10-10-1.)

Remove the track. (See Track Removal and Installation on Page 40-20-3.)

Remove the drive motor. (See Removal And Installation on Page 30-20-1.)

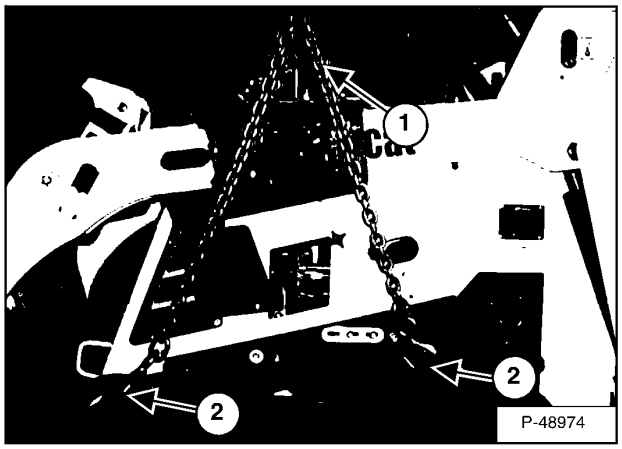
Figure 40-20-10



Remove the two bolts (Item 1) from the brake pin housing (Item 2) **[Figure 40-20-10]**.

Remove the brake pin housing.

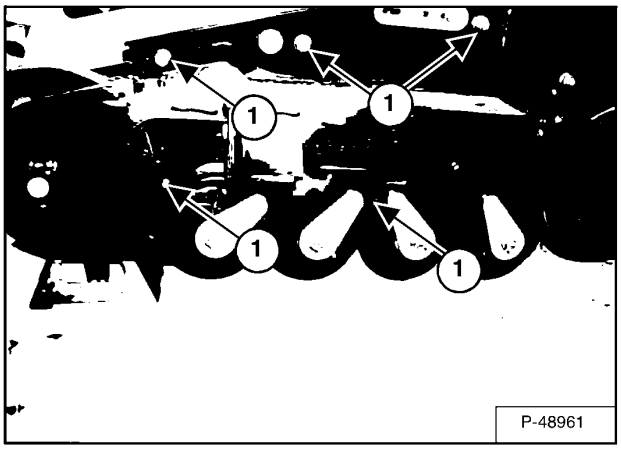
Figure 40-20-11



Install a chain and hoist (Item 1) onto the carriage assembly at the points shown (Item 2) **[Figure 40-20-11]**.

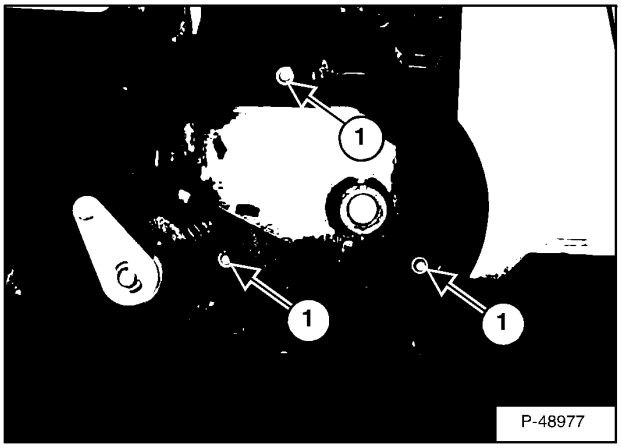
Protect the boom from scratches using a cloth or other item.

Figure 40-20-12



Remove the five nuts (Item 1) **[Figure 40-20-12]** from the carriage bolts.

Figure 40-20-13



NOTE: Make sure the track is supported properly before removing the three bolts.

Remove the three remaining nuts (Item 1) **[Figure 40-20-13]** from the carriage assembly.

Remove the track frame from the side of the loader.

Reverse the removal procedure to install track assembly.

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DRIVE COMPONENTS (CONT'D)

Rear Idler Removal and Installation

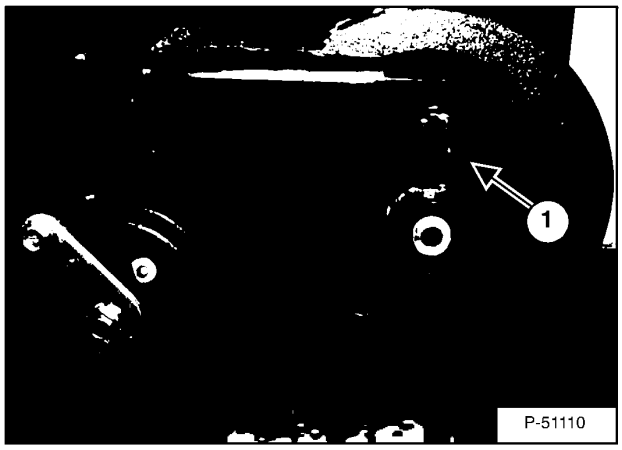
Lift and block the loader. (See LIFTING AND BLOCKING THE LOADER on Page 10-10-1.)

Remove the track. (See Track Removal and Installation on Page 40-20-3.)

Remove the track frame assembly from the frame. (See Track Frame Removal and Installation on Page 40-20-4.)

NOTE: The idler assembly can be removed from the track while drive motor hoses are still connected. This eliminates the need to remove the hydraulic hoses from drive motor. Swing assembly out far enough to r emove idler assembly after removing track mounting bolts.

Figure 40-20-14



Remove the idler assembly (Item 1) **[Figure 40-20-14]** from the frame by sliding it out of the track frame.

NOTE: To protect your hands from injury always wear gloves before removal and installation of the track idler.

NOTE: The track idler contains the track tension (spring) assembly.

NOTE: The tear drop of the track idler (Item 1) [Figure 40-20-14] is facing down towards the ground for installation.

Reverse the removal procedure to install the rear idler.

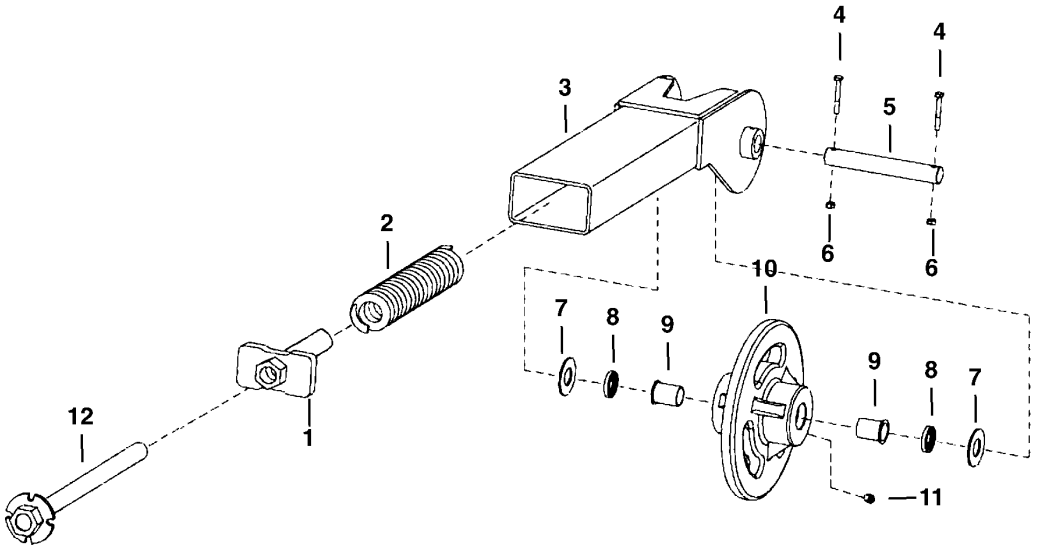
Install the track. (See Track Removal and Installation on Page 40-20-3.)

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Parts Identification (Rear Track Idler)

1. Idler Plate
2. Compression Spring
3. Idler Arm
4. Bolt
5. Idler Pin
6. Nut
7. Thrust Washer
8. Shaft Seal
9. Bushing
10. Idler
11. Grease Zerk
12. Tensioner Rod



PE1426C

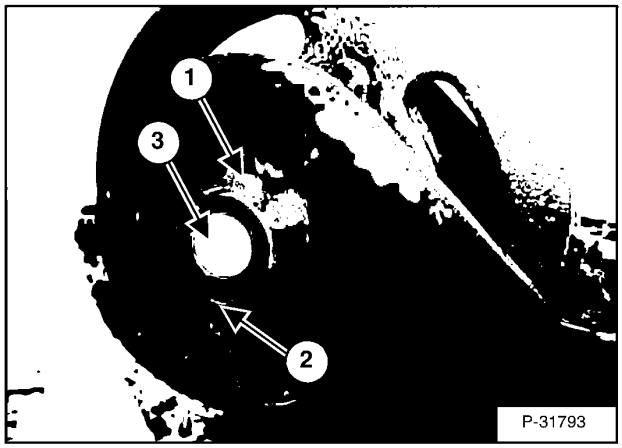
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DRIVE COMPONENTS (CONT'D)

Rear Idler Disassembly and Assembly

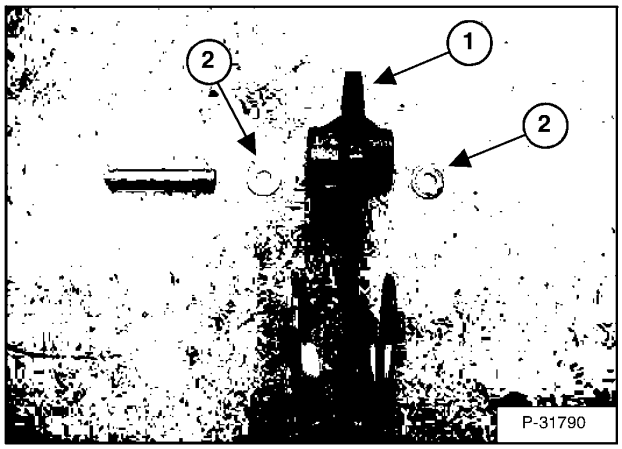
Figure 40-20-15



Remove the nut (Item 1) and bolt (Item 2) **[Figure 40-20-15]** from both sides of the track idler assembly.

Remove the idler pin (Item 3) **[Figure 40-20-15]** from the idler frame.

Figure 40-20-16



Remove the idler (Item 1) and washers (Item 2) **[Figure 40-20-16]** from the idler frame.

Figure 40-20-17

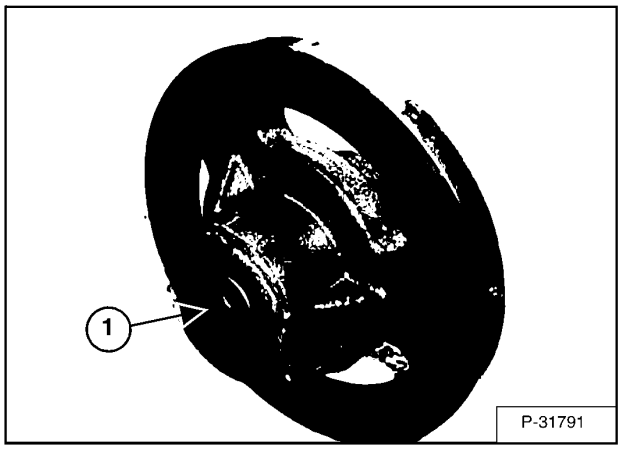
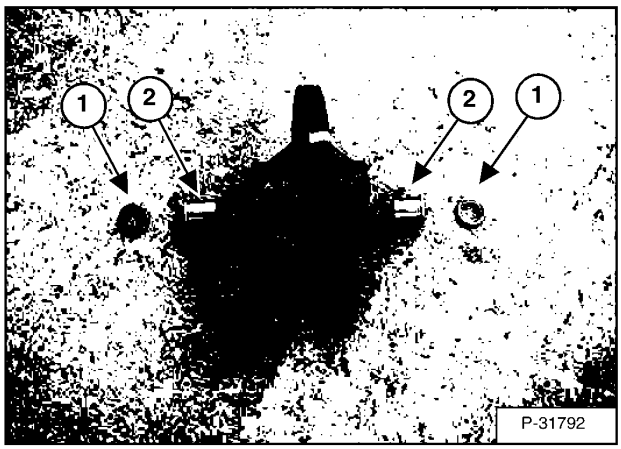


Figure 40-20-18



Remove the shaft seals (both sides) (Item 1) **[Figure 40-20-17]** & **[Figure 40-20-18]** from the idler.

Remove the bushings (both sides) (Item 2) **[Figure 40-20-18]** from the idler.

NOTE: The shaft seal must be installed with the rubber seal facing in and the metal case facing out.

Reverse the disassembly procedure to assemble the rear idler.

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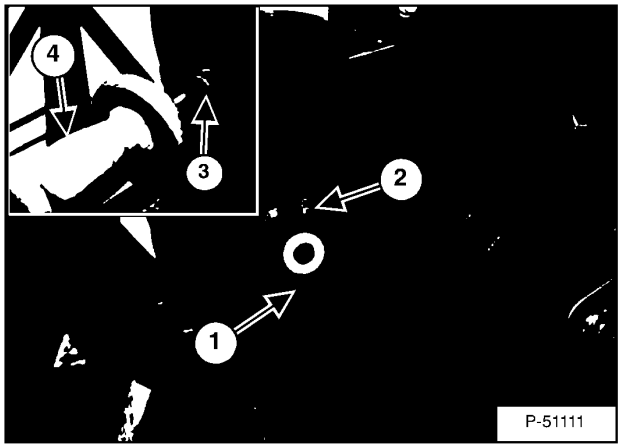
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Front Idler Disassembly And Assembly

Lift and block the loader. (See LIFTING AND BLOCKING THE LOADER on Page 10-10-1.)

Remove the track. (See Track Removal and Installation on Page 40-20-3.)

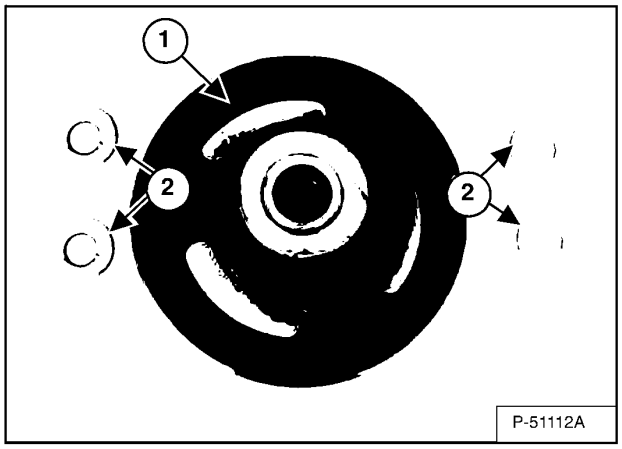
Figure 40-20-19



Remove the nut (Item 1) and bolt (Item 2) **[Figure 40-20-19]** from the idler assembly.

Remove the idler pin (Item 3) from the track frame using a slide hammer (Item 4) **[Figure 40-20-19]**

Figure 40-20-20



Remove the idler (Item 1) and washers (Item 2) **[Figure 40-20-20]** from track frame.

Figure 40-20-21

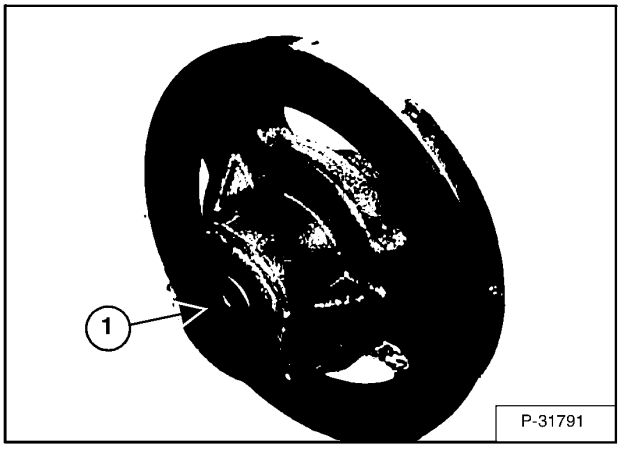
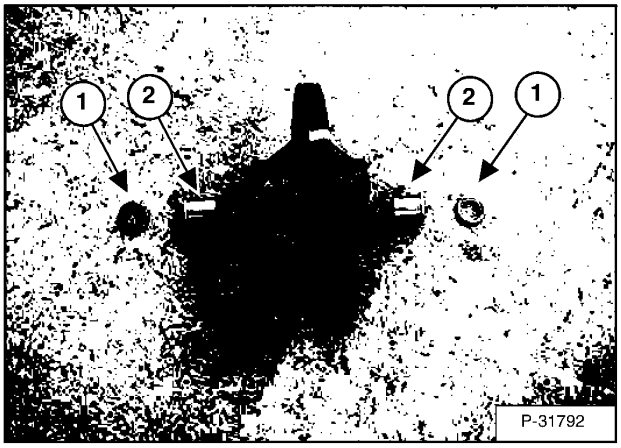


Figure 40-20-22



Remove the shaft seals (both sides) (Item 1) **[Figure 40-20-21]** & **[Figure 40-20-22]** from the idler.

Remove the bushings (both sides) (Item 2) **[Figure 40-20-22]** from the idler.

NOTE: The shaft seal must be installed with the rubber seal facing in and the metal case facing out.

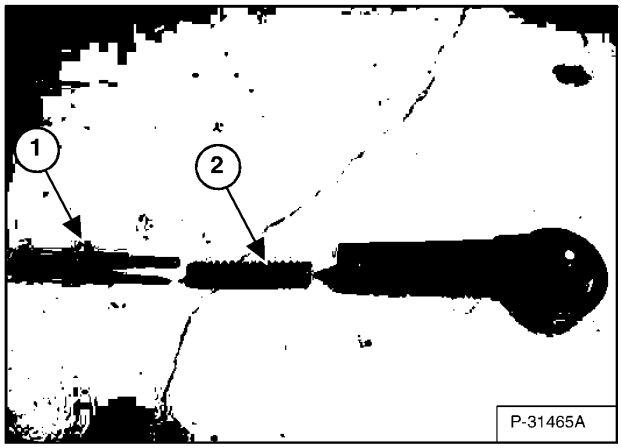
Reverse the disassembly procedure to assemble the rear idler.

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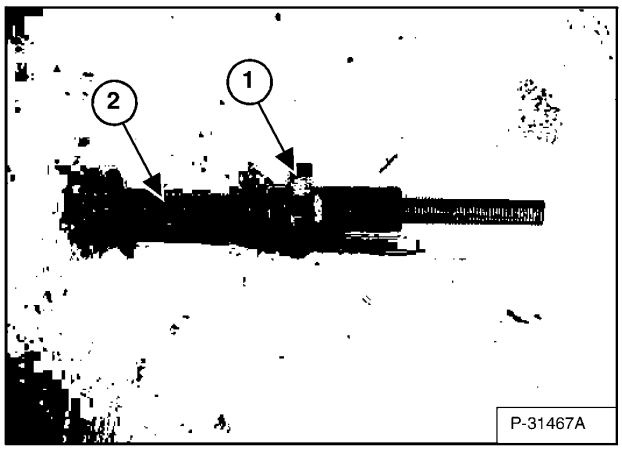
Track Tensioner Disassembly and Assembly

Figure 40-20-23



Remove the tensioner rod assembly (Item 1) and compression spring (Item 2) **[Figure 40-20-23]** from the idler assembly.

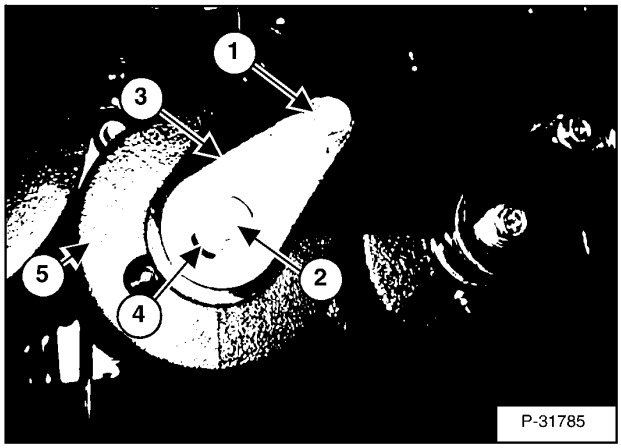
Figure 40-20-24



Thread (spin) the idler plate (Item 1) off the rod tensioner (Item 2) **[Figure 40-20-24]**.

Track Roller Removal and Installation

Figure 40-20-25



Remove the track. (See Track Removal and Installation on Page 40-20-3.)

Remove the pin lock plate bolt (Item 1) **[Figure 40-20-25]**.

Remove the keyed pin bolt (Item 2) **[Figure 40-20-25]**.

Remove the two pin lock plates (Item 3) **[Figure 40-20-25]**.

Remove the keyed pin (Item 4) **[Figure 40-20-25]** from the track roller and track frame.

Remove the track roller (Item 5) **[Figure 40-20-25]** from the track frame.

NOTE: There are thrust washers between the idler and track frame.

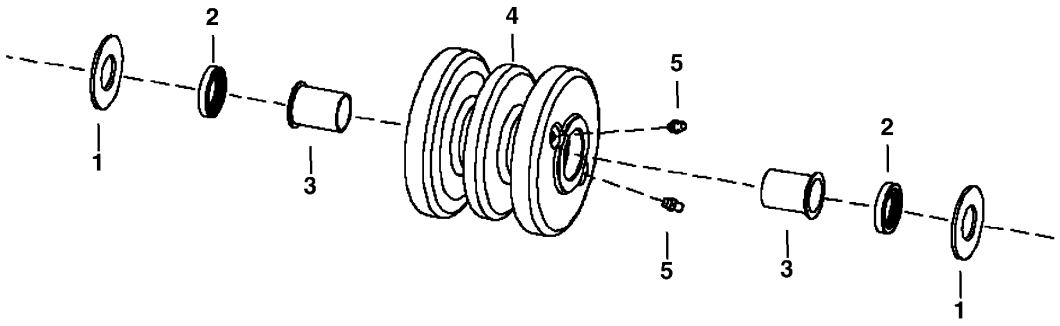
Reverse the disassembly procedure to as semble the track roller.

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Parts Identification (Track Roller)

1. Thrust Washer
2. Shaft Seal
3. Bushing
4. Idler
5. Grease Zerk



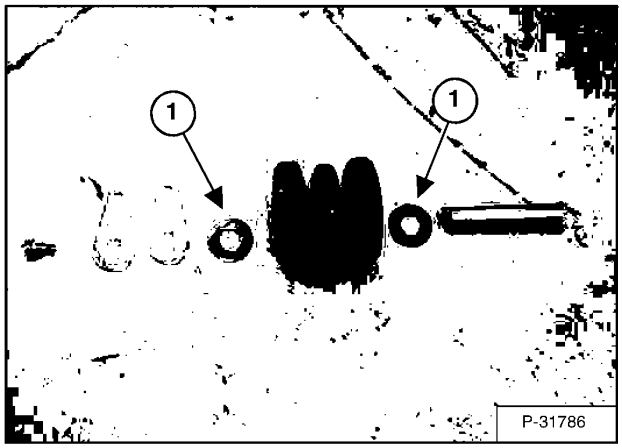
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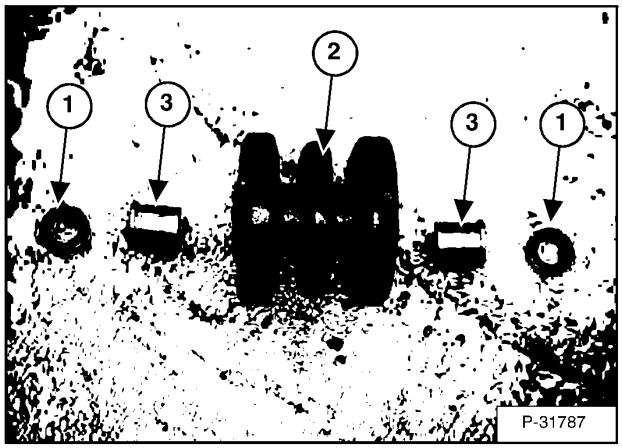
Track Roller Disassembly and Assembly

Figure 40-20-26



Remove the washers (Item 1) **[Figure 40-20-26]**.

Figure 40-20-27



Remove the shaft seals (both sides) (Item 1) from the track roller (Item 2) **[Figure 40-20-27]**.

Remove the bushings (both sides) (Item 3) **[Figure 40-20-27]** from the idler.

NOTE: The shaft seal must be installed with the rubber seal facing in and the metal case facing out.

Reverse the disassembly procedure to assemble the track roller.

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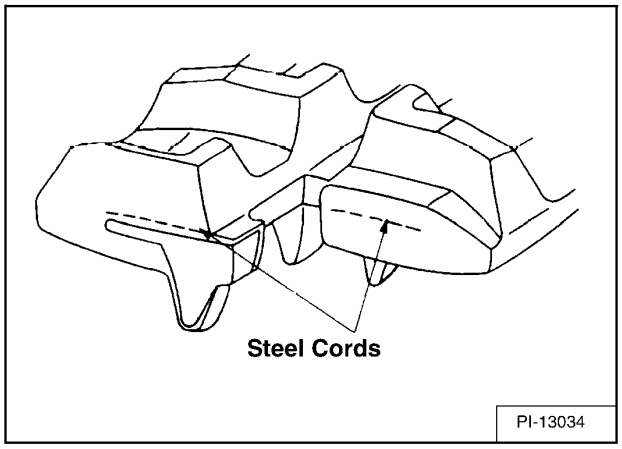
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Track Damage Identification

Figure 40-20-28



Figure 40-20-29



Cutting Of Steel Cords

The following pages show photos and illustrations of track damage and the probable cause of the damage. It is intended to be used for identifying the reason for track damage and how to avoid future track damage.

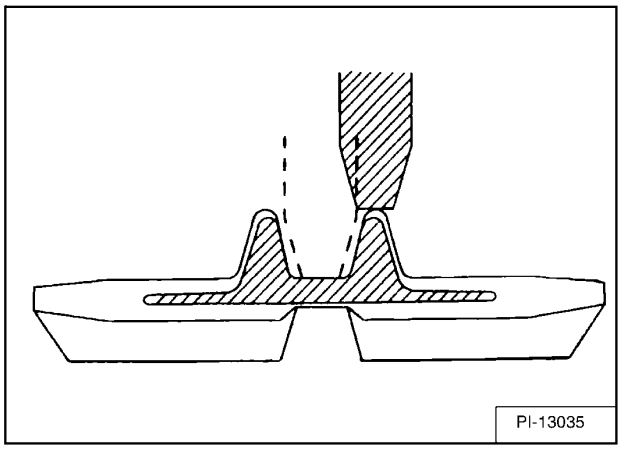
Damage:

Embedded steel cords are cut off **[Figure 40-20-28]** & **[Figure 40-20-29]**.

Replacement:

Replacement is required **[Figure 40-20-28]** & **[Figure 40-20-29]**.

Figure 40-20-30



Causes of the damage:

When applied to rubber tracks under the following circumstances, tension in excess of the breaking strength of the embedded steel cords causes steel cords to be cut:

When the rubber track is detracking, the idler or sprocket rides on the projections of the embedded metal **[Figure 40-20-30]**.

When the rubber track is detracked, projections of rubber tracks get stuck between the frame of the undercarriage.

The rubber track is clogged with stones or foreign obstacles.

Furthermore, when moisture invades through a cut on the lug side rubber surface, the embedded steel cords will corrode. The deterioration of the design strength may lead to the breaking off of the steel cords.

Prevention:

The following preventions should be taken to minimize the risk of this damage:

Periodical checking on site of the recommended track tension. (See Track Tension Checking (SN 523611009 & Below) on Page 40-20-2.) and (See Track Tension Checking (SN 523611010 & Above) on Page 40-20-1.)

Avoiding quick turns on bumpy and rocky fields.

Drive carefully to avoid having stones and other articles clog the rubber tracks.

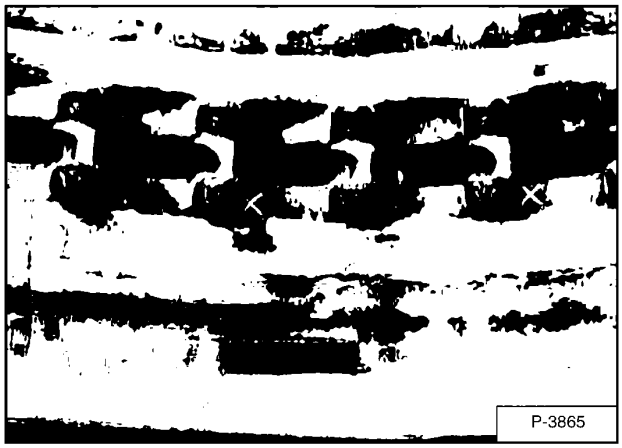
Driving over sharp objects should be avoided. If this is impossible, do not make turns while driving over sharp objects.

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Track Damage Identification (Cont'd)

Figure 40-20-31

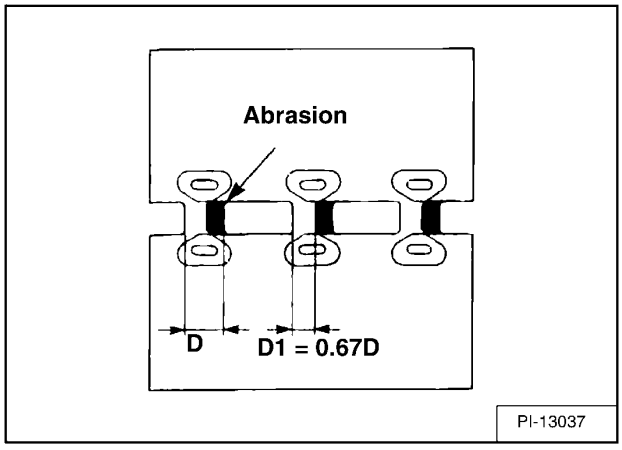


Abrasion Of Embedded Metals

Damage:

In proportion to the service time, embedded metals will gradually wear away by friction **[Figure 40-20-31]**.

Figure 40-20-32



Replacement:

Replacement is required when the width of the embedded metals (D1) becomes 67% of their original width (D) **[Figure 40-20-32]**.

Causes of the damage:

When the track rollers, sprockets and idler gears roll over the embedded metals, abrasion of embedded metals is inevitable. The following cases sometimes accelerate their abrasion:

Rubber tracks are driven with an extraordinary heavy load on them.

Rubber tracks are used on sandy fields.

Prevention:

As long as rubber tracks are used under normal operating conditions, abnormal abrasion is unlikely to occur. The level of abrasion should be carefully checked when the machines are used for dozing which generate a heavy load for rubber tracks, and when they are operated under a sandy field condition for a long time.

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Track Damage Identification (Cont'd)

Figure 40-20-33



Separation Of Embedded Metals

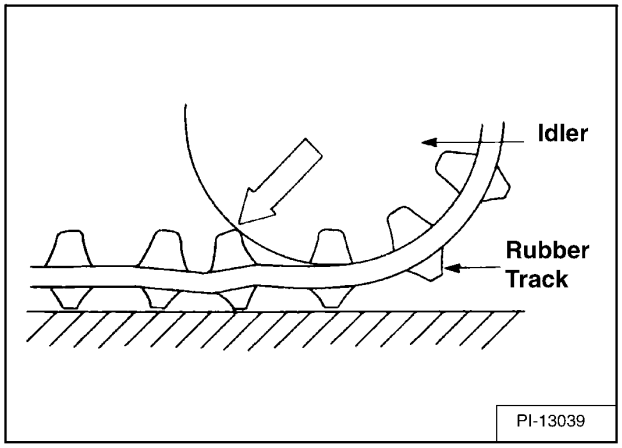
Damage:

Extraordinary outer forces applied to embedded metals cause their separation from the rubber track's body **[Figure 40-20-33]**.

Replacement:

Even a partial separation of embedded metals requires replacement of the track.

Figure 40-20-34

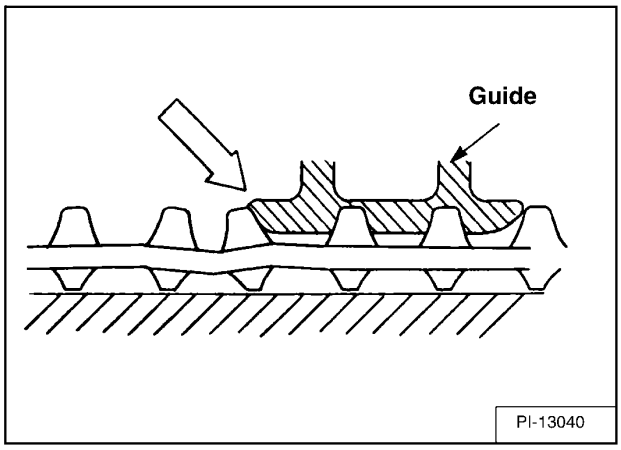


Causes of the damage:

Embedded metals are adhered between the steel cords and the rubber body. The following cases generate external forces greater than the adhesion strength, causing separation of the embedded metals:

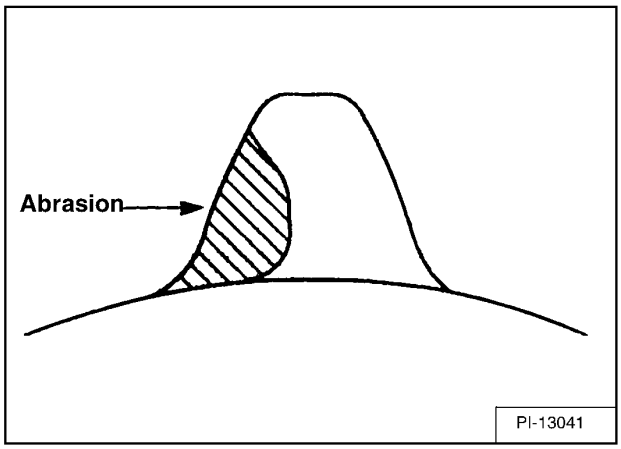
When the idler continually rides on the projections of embedded metals, the embedded metals will eventually peel off **[Figure 40-20-34]**.

Figure 40-20-35



When a rubber track is detracked, it becomes stuck between the guide or the undercarriage frame, causing the separation of embedded metals **[Figure 40-20-35]**.

Figure 40-20-36



Abnormally worn sprockets as shown will pull embedded metals out **[Figure 40-20-36]**.

Prevention:

Similar to the prevention against the cutting of the steel cords:

Recommended track tension should be periodically checked. (See Track Tension Checking (SN 523611010 & Above) on Page 40-20-1.)

Quick turns on bumpy and rocky fields should be avoided.

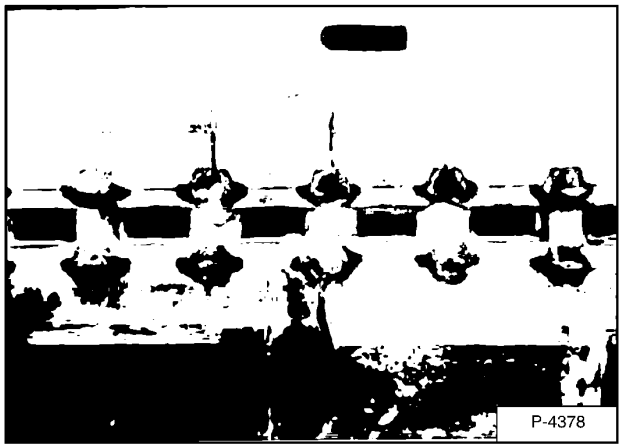
If abnormal wear of sprockets is observed, they should be immediately replaced.

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Track Damage Identification (Cont'd)

Figure 40-20-37



Separation Of Embedded Metals Due To Corrosion

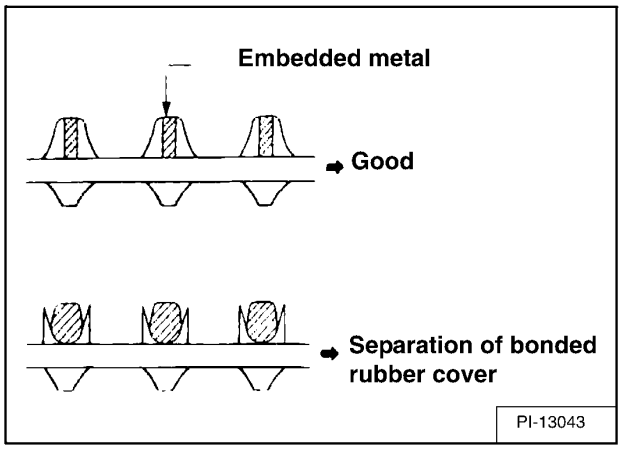
Damage:

Due to corrosion of embedded metals, the adhesion to the rubber body deteriorates, resulting in complete separation **[Figure 40-20-37]**.

Replacement:

Even a partial separation of embedded metals requires a rubber track replacement.

Figure 40-20-38



Causes of the damage:

Embedded metals are bonded to the rubber body. The following operating conditions cause embedded metals to corrode, causing deterioration of the bonding, and finally resulting in separation of the embedded metals from the rubber body **[Figure 40-20-38]**.

Excessively salty fields, like the sea shore.

Strong acidic or alkali soil conditions

Compost spread grounds

On tracks that are out of adjustment, the track rollers, idlers and sprockets will gradually wear the rubber surface at track roller side, causing exposure of the embedded metals. Consequently the embedded metals will corrode resulting in their separation from the rubber body.

Prevention:

If rubber tracks are used under such field conditions as described under (Causes of the damage), they should be washed with plenty of water. After being completely dried, they should be stored correctly.

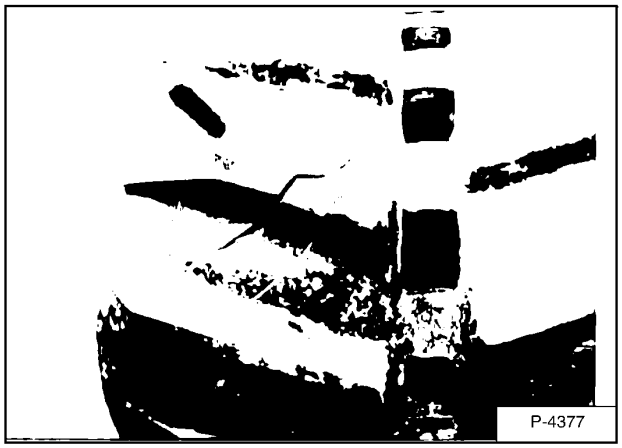
When the bonded rubber cover is separated from the embedded metal projections and the metals in the rubber body become loose, it is time to consider replacement of the rubber track.

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Track Damage Identification (Cont'd)

Figure 40-20-39



Cuts On The Lug Side Rubber

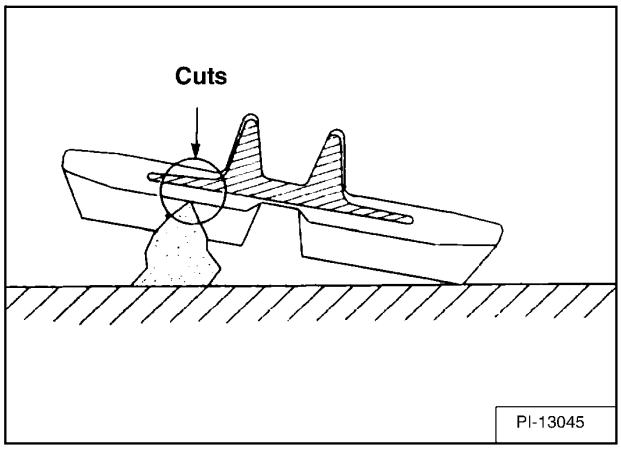
Damage:

Cuts on the lug side rubber often occurs as one of the most typical failure modes **[Figure 40-20-39]**

Replacement:

When a cut on the lug side rubber reaches the embedded steel cords, it should be immediately repaired with cold vulcanization rubber.

Figure 40-20-40



Causes of the damage:

When rubber tracks drive over projections or sharp stones in the fields, the concentrated forces applied cause cuts on the lug side rubber surface. In case of making turns on projections, the lug side rubber surface will have an even higher chance to be cut. If the cuts run through the embedded steel cords, it might result in the steel cords' breakage due to their corrosion. It is highly recommended to repair the cuts with cold vulcanization rubber as soon as they are observed **[Figure 40-20-40]**.

Prevention:

Machine operators are requested to drive with great attention to the ground's surface especially in terrains of the following type:

Construction sites

Demolition sites

Paths covered with rocks and wood

Concrete ridges

Stumpy fields

When operating on terrains as mentioned above, high speed, quick turns and overloading should be avoided.

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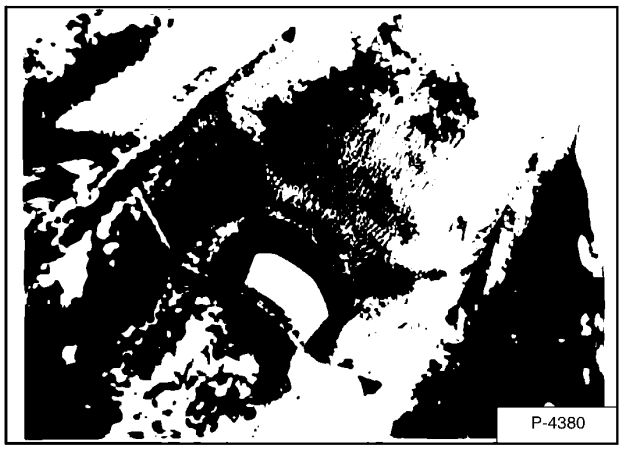
DRIVE COMPONENTS (CONT'D)

Track Damage Identification (Cont'd)

Figure 40-20-41



Figure 40-20-42



Cracks On The Lug Side Rubber Due To Fatigue

Damage:

Small cracks around the root of the lug as a result from operation fatigue **[Figure 40-20-41]** & **[Figure 40-20-42]**.

Replacement:

When the cracks reach so deep that they expose the steel cords, track replacement is required.

Causes of the damage:

Because of wound stress applied to rubber tracks around the undercarriage parts during operation, the fatigue especially causes cracks on the lug side rubber surface. Once the cracks occur, they gradually deteriorate with even small external cracks. Also when operating near seashores or under cold temperatures, rubber tracks are MORE likely to suffer from ozone cracks.

Prevention:

Rubber tracks are designed with special rubber compounds to prevent cracks due to fatigue. However, external injuries on the lug side rubber sometimes cause more chance of cracking. Machine operators should observe soil conditions when driving, so as not to cause external injuries to the lug side rubber. In order to minimize the occurrence of ozone cracks, attention should be paid to the following instructions for maintenance:

Avoid exposing stored tracks to direct sun light.

Avoid exposing stored tracks to direct rain and snow fall.

Store tracks in well ventilated warehouses.

Use the tracks at least once a month.

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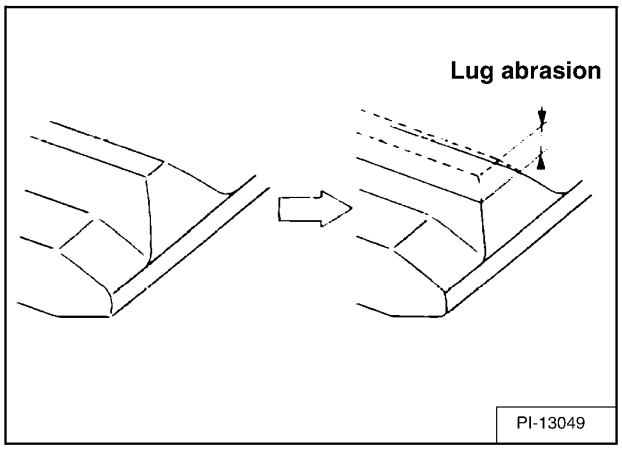
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Track Damage Identification (Cont'd)

Figure 40-20-43



Figure 40-20-44



Lug Abrasion

Damage:

As its service time proceeds, the lug side inevitably undergoes abrasion **[Figure 40-20-43]** & **[Figure 40-20-44]**.

Replacement:

No replacement is required.

Causes of the damage:

Lug abrasion is more or less inevitable. Even if lug abrasion is proceeding, the rubber track can be used. However, as the traction performance deteriorates accordingly, it is highly recommended to replace the abraded tracks with new ones when the lug height becomes less than 5 mm.

Prevention:

In order to prevent the rubber track from abnormal or premature abrasion, following operating conditions should be avoided:

Making quick and repeated turns on concrete and asphalt roads

Driving up and down hilly paths with slippage

Making frequent turns on paths covered with rocks and wood

Figure 40-20-45



Cracks And Cuts On The Lug Side Rubber

Damage:

Sometimes cracks and cuts on the lug side rubber at the edges of the embedded metals can be observed **[Figure 40-20-45]**.

Replacement:

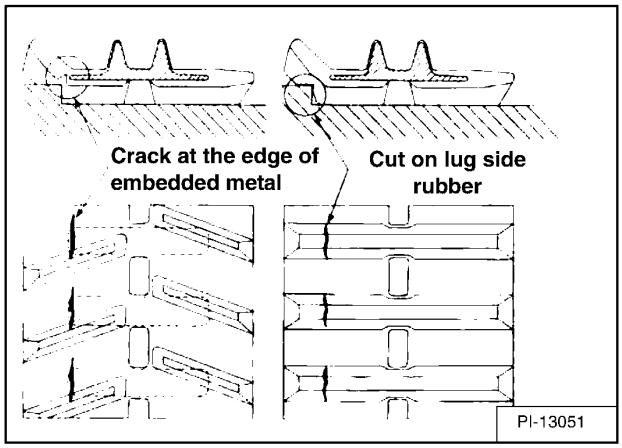
Basically, no replacement is required unless the cuts on the lug side rubber are discovered all around the edges of the embedded metals, as this will result in a complete cut off.

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Track Damage Identification (Cont'd)

Figure 40-20-46



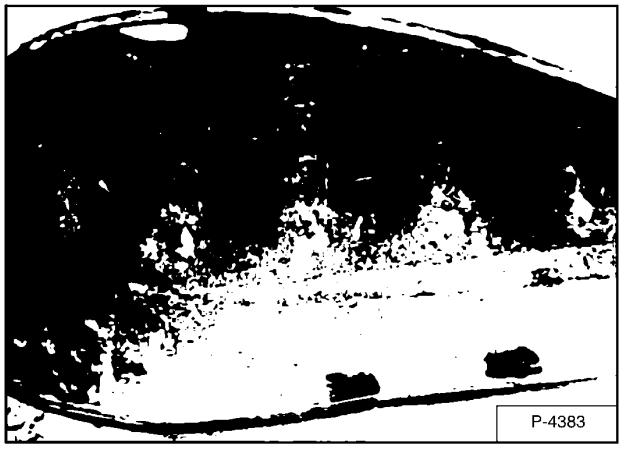
Causes of the damage:

When rubber tracks drive over sharp projections, intensive stress is applied to the lug side rubber surface, especially at the edges of embedded metals, causing cracks and cuts in the area around the embedded metals **[Figure 40-20-46]**.

Prevention:

To avoid extensive stress applied to the lug root where metals are embedded, machine operators are requested to avoid driving over stumps and ridges.

Figure 40-20-47



Abrasion Of The Track Roller Side

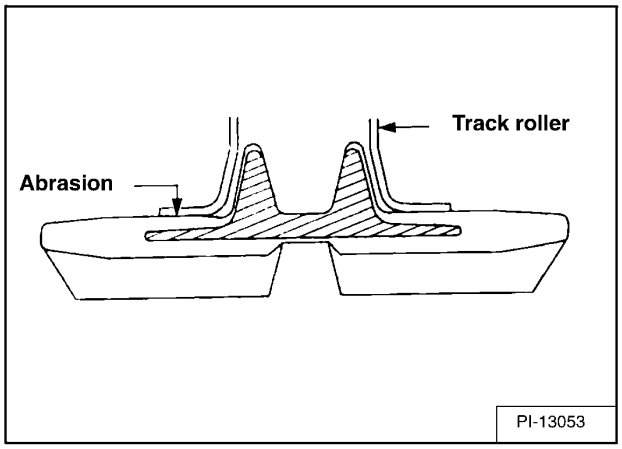
Damage:

The rubber surface on which track rollers run is gradually abraded. It will end in the exposure of the embedded metals **[Figure 40-20-47]**.

Replacement:

It is recommended to replace the rubber track when more than half of the embedded metals are completely exposed.

Figure 40-20-48



Causes of the damage:

The abrasion of the track roller side rubber surface occurs because of sand and gravel being clogged between the rubber and the outside surface of the track rollers. The stress pushes the sand and gravel against the side of the rubber track to cause the abrasion **[Figure 40-20-48]**.

The level of abrasion is highly dependent on terrain conditions. A higher level of abrasion will occur when the rubber tracks are operated in fields covered with many stones and gravel. Small stones hardened with mud, stuck to the track rollers increase the abrasion level. After an extended period of abrasion, it will be more likely for exposed embedded metals to catch moisture through the inside steel cords, which can cause breakage of steel cords and separation of the metals from the rubber body.

Prevention:

After operation in wet fields containing many small stones, wash off the mud that is stuck to the track rollers completely. When operating on gravel paths and stony grounds, machines should be driven slowly and the turning radius should be big enough to prevent stones and gravel from getting stuck to the track roller side rubber.

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Track Damage Identification (Cont'd)

Figure 40-20-49

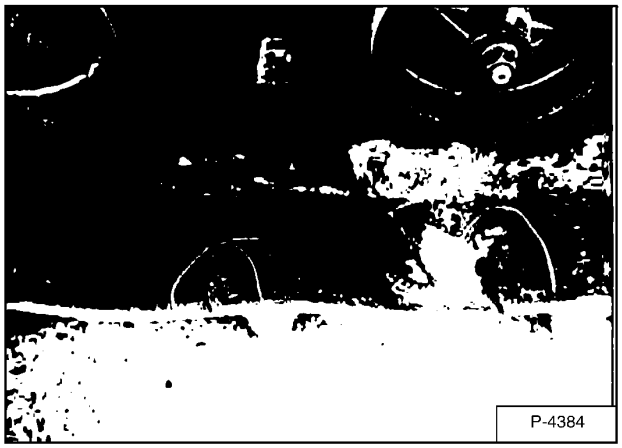
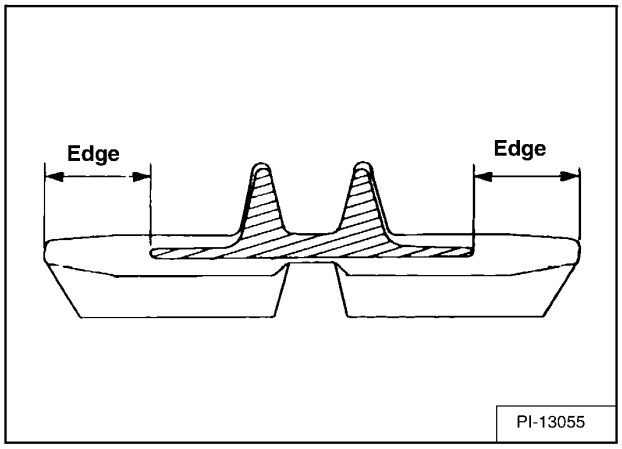


Figure 40-20-50



Cuts On The Edges Of Track Roller Side

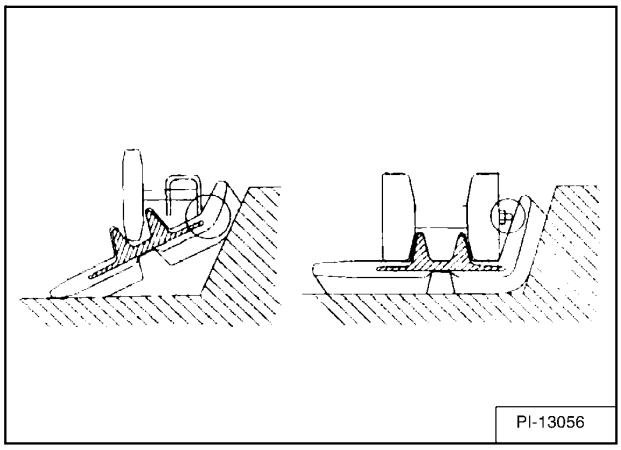
Damage:

Both edges of a rubber track have no special reinforcements. It sometimes occurs during operation that they are cut or torn off **[Figure 40-20-49]** & **[Figure 40-20-50]**.

Replacement:

In such case, the rubber track does not have to be replaced.

Figure 40-20-51



Causes of the damage:

This damage is caused by objects on the field or by interference with the machine frame.

In case of damage by objects on the operating ground:

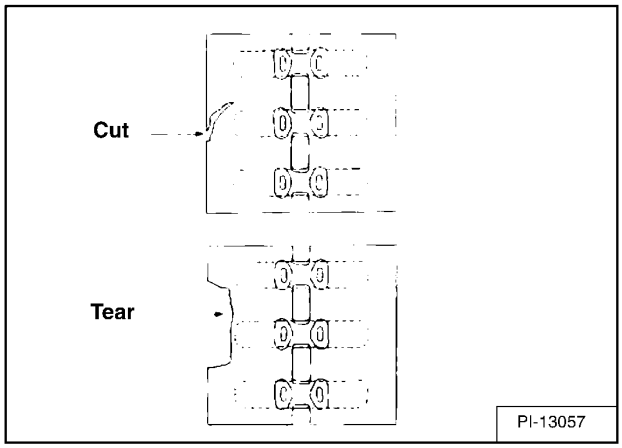
The edges of rubber track are often deformed largely due to a bumpy ground surface, stones and other objects, which cause extensive stress on the edges resulting in the damage. Especially, when a machine drives over concrete ridges, this type of damage easily occurs **[Figure 40-20-51]**.

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Track Damage Identification (Cont'd)

Figure 40-20-52



In case of damage by in terference with the machine frame

If a mac hine continues operating with rubber tracks being detracked, the rubber tracks may get caught up in the machine frame or undercarriage parts resulting in damage. Furthermore, when a ma chine travels along side slopes, the rubber tracks are deformed so much that they come into contact with the machine frame and undercarriage parts, which causes cutting, gouging and rubbing of rubber tracks in the end **[Figure 40-20-52]**.

Prevention:

When traveling, a machine operator should be careful not to drive over any projections on the ground. He should also prevent rubber tracks from coming into contact with concrete walls, ditches and ridges. If rubber tracks are detracked, the machine should be stopped immediately for retracting.

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MAIN FRAME

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Lever And Wedge Removal 50-10-3
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Seal Removal And Installation 50-10-3

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Removal and Installation 50-90-1

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Removal and Installation 50-50-1

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Removal And Installation 50-40-1

GRAB BAR 50-60-1
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TIGHTEN ALL HARDWARE PER SIZE TO GRADE 5 TORQUE (See TORQUE SPECIFICATIONS FOR BOLTS on Page SPEC-30-1.) UNLESS OTHERWISE SPECIFIED.



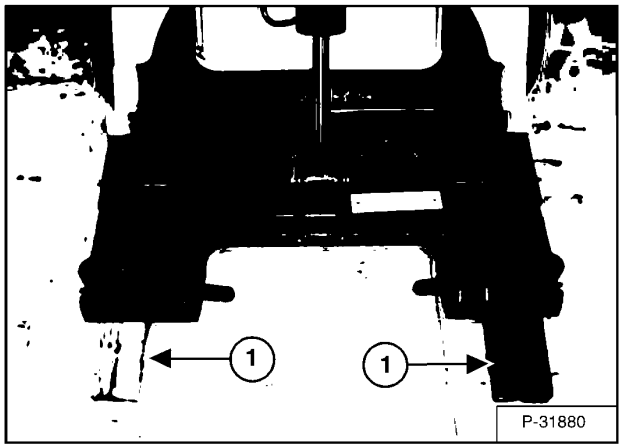
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BOB-TACH

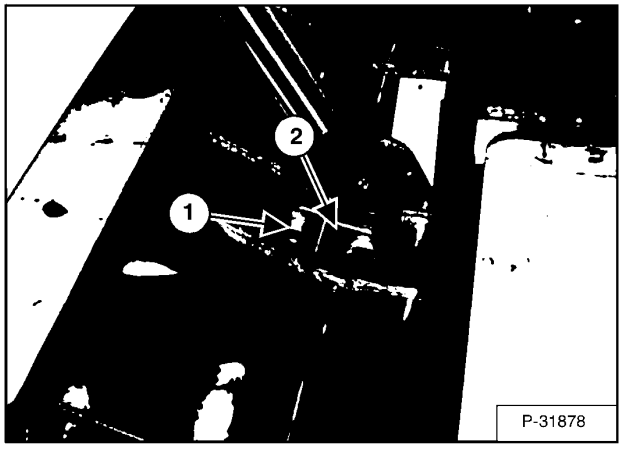
Removal

Figure 50-10-1



Tilt the Bob-Tach forward so it is parallel to the floor. Put blocks under the Bob-Tach and lower the Bob-Tach onto the blocks (Item 1) **[Figure 50-10-1]**.

Figure 50-10-2

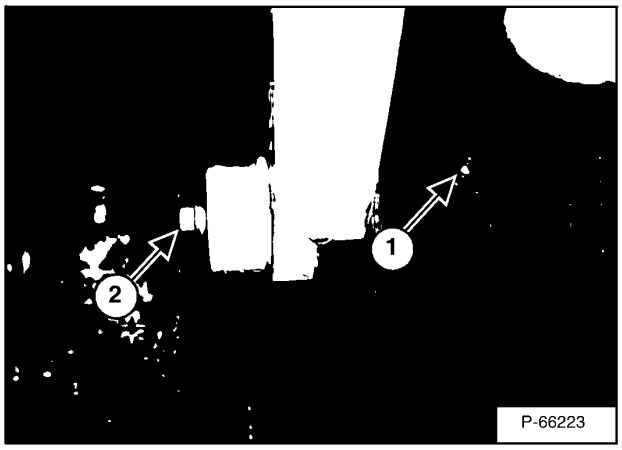


Remove the screw (Item 1) and retainer (Item 2) **[Figure 50-10-2]** from the rod end pivot pin.

Remove the Pin.

Remove the pivot pin from the tilt cylinder and the Bob-Tach.

Figure 50-10-3



Remove the grease fitting (Item 1) and slightly loosen the bolt (Item 2) **[Figure 50-10-3]**.

Cover the grease fitting hole with a rag and strike the pivot pin bolt with a hammer to loosen the tapered pin.

Repeat the procedure for the other side.

Remove bolts and washers from lift arms and Bob-Tach.

Remove the Bob-Tach.

NOTE: Use t apered ream MEL1233 to clean the tapered hole in the lift arms. The tapered hole must be clean and free of debris to provide a good contact surface for the pivot pin.

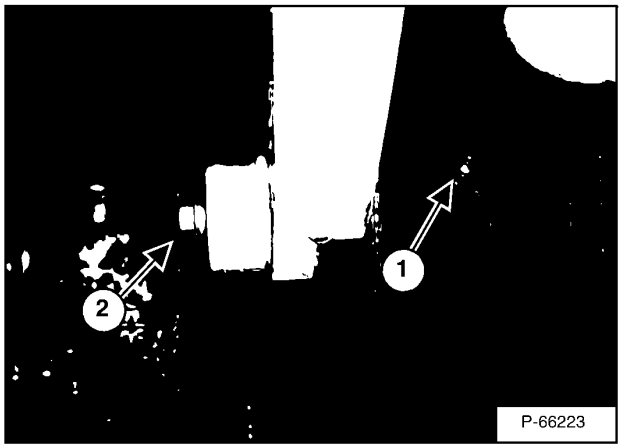
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BOB-TACH (CONT'D)

Installation

Figure 50-10-4

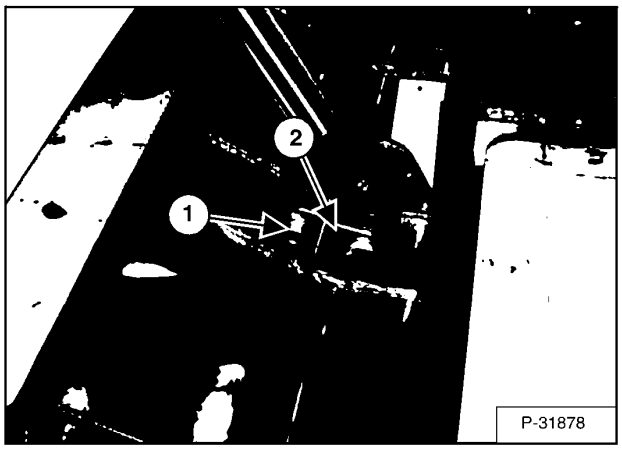


Install the grease fitting and align the Bob-Tach pivot pin with the lift arm hole (both sides).

Add grease to the fi tting (Item 1) **[Figure 50-10-4]** to force pivot pin into the lift arm hole.

Install the bolt (Item 2) **[Figure 50-10-4]** in the pivot pin. Tighten the bolt to 90-100 ft.-lb. (125-135 N•m) torque.

Figure 50-10-5



Install the pivot pin from the tilt cylinder and the Bob-Tach.

Install the screw (Item 1) and retainer (Item 2) **[Figure 50-10-5]** from the rod end pivot pin.

Tighten the retainer screw to 15- 20 ft.-lb. (20-27 N•m) torque.

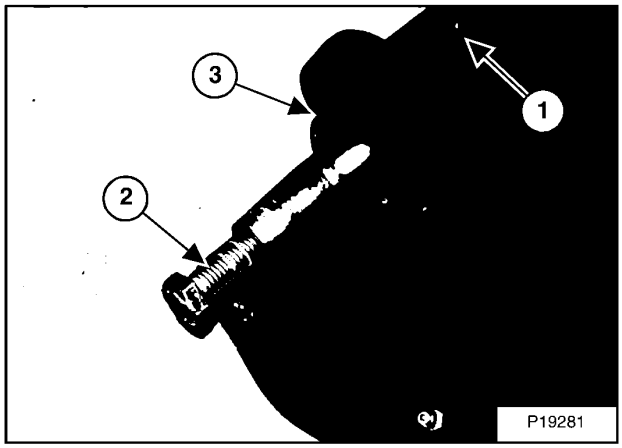
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BOB-TACH (CONT'D)

Seal Removal And Installation

Figure 50-10-6



Remove the Bob-Tach. (See Removal on Page 50-10-1.)

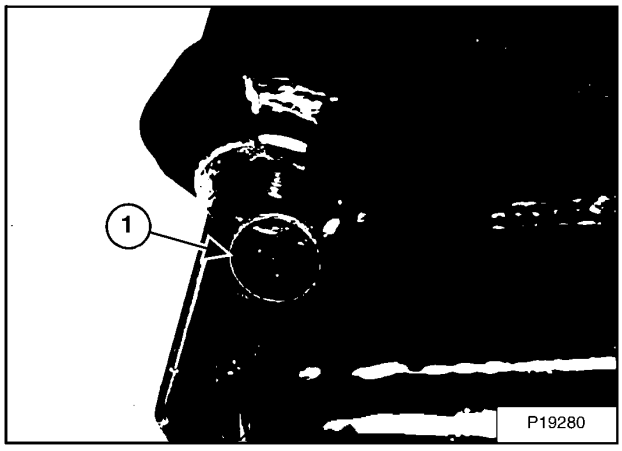
Remove the grease fitting (Item 1) **[Figure 50-10-6]** from the pivot pin grease chamber.

Install the Bob-Tach mounting bolt (Item 2) **[Figure 50-10-6]** in the pivot pin and remove the pivot pin.

Check for wear and damage. Replace the pivot pins as needed.

Installation: Push the pivot pin into the Bob-Tach frame. Position the end of the pin flush with the end of the Bob-Tach bushing (Item 3) **[Figure 50-10-6]**.

Figure 50-10-7



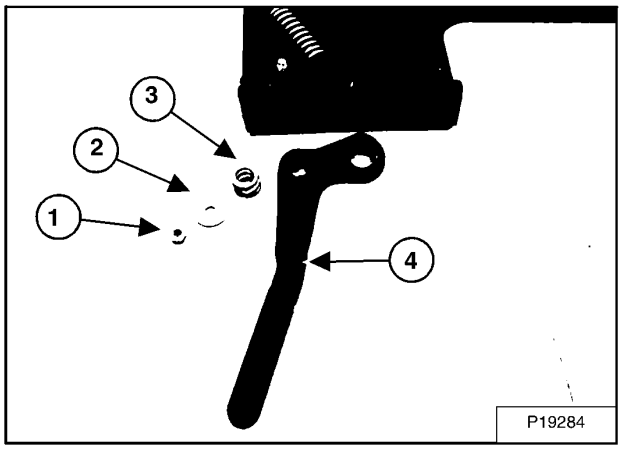
Remove the seal (Item 1) **[Figure 50-10-7]** from the Bob-Tach. Check the condition of the seal and replace as needed.

NOTE: Install the seal with the lip facing outward.

NOTE: There is a plug located at the bottom of the bore in each Bob-Tach bushing. The plug helps contain the grease inside the bushing and is a very low service item. See your dealer if service is required.

Lever And Wedge Removal

Figure 50-10-8

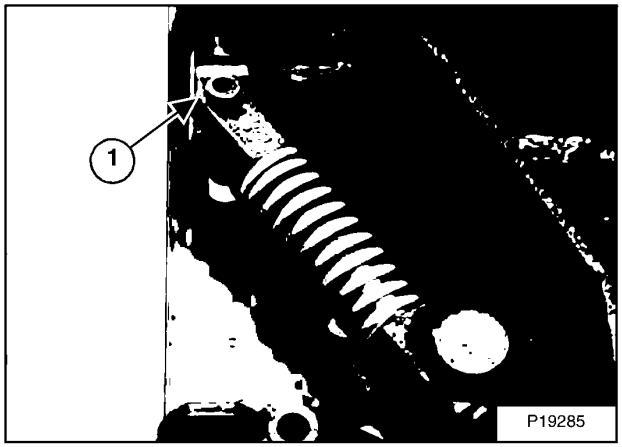


Use the following procedure to remove and install the Bob-Tach lever, spring, and wedge.

Remove the lever mounting bolt and nut (Item 1), washer (Item 2), spring (Item 3), and lever (Item 4) **[Figure 50-10-8]**.

Installation: Tighten the nut to 25-28 ft.-lb. (34-38 N•m) torque.

Figure 50-10-9



Use a punch and hammer, remove the roll pin (Item 1) **[Figure 50-10-9]** from the Bob-Tach wedge and spring, bolt and clevis assembly.

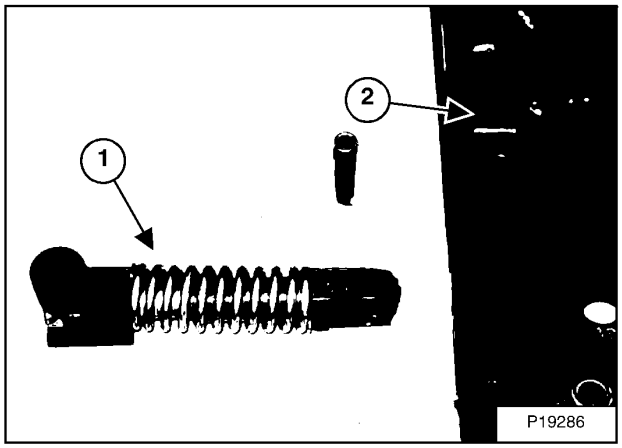
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BOB-TACH (CONT'D)

Lever And Wedge Removal (Cont'd)

Figure 50-10-10

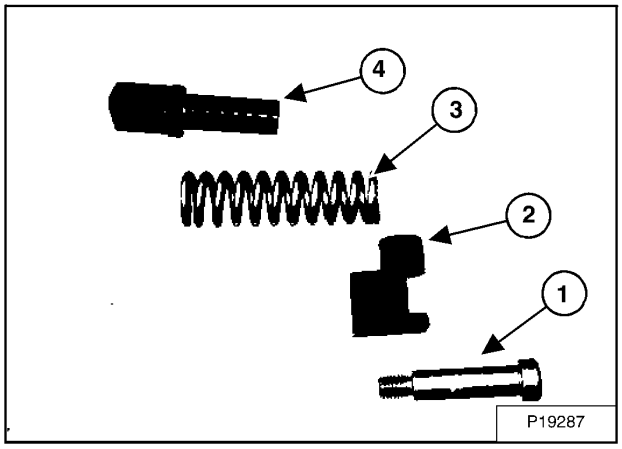


Remove the spring, bolts, and clevis assembly (Item 1) **[Figure 50-10-10]**.

Remove the wedge (Item 2) **[Figure 50-10-10]** from the Bob-Tach frame.

Always replace bent or broken wedges.

Figure 50-10-11



If the bolt (Item 1), handle pivot (Item 2), spring (Item 3), or clevis (Item 4) are damaged, put the assembly in the vise. Loosen and remove the bolt (Item 1) **[Figure 50-10-11]** with a 5/16 inch allen wrench.

Replace the worn or damaged parts as needed.

Reverse the removal procedure to install the Bob-Tach Lever and Wedge.

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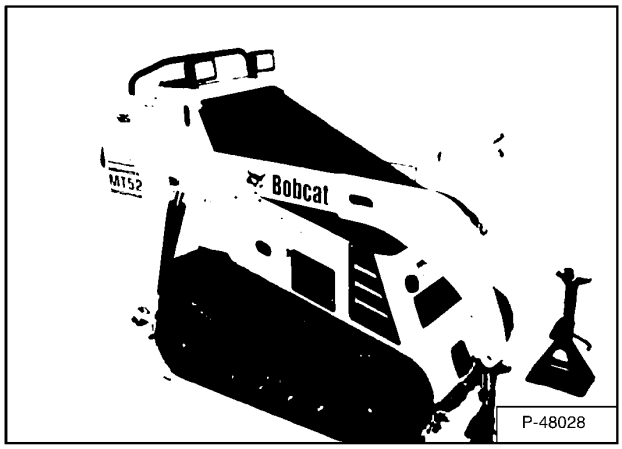
LIFT ARM

Removal And Installation

Remove the Bob-Tach. (See Removal on Page 50-10-1.)

Remove the tilt cylinder. (See Removal And Installation on Page 20-21-2.)

Figure 50-20-1

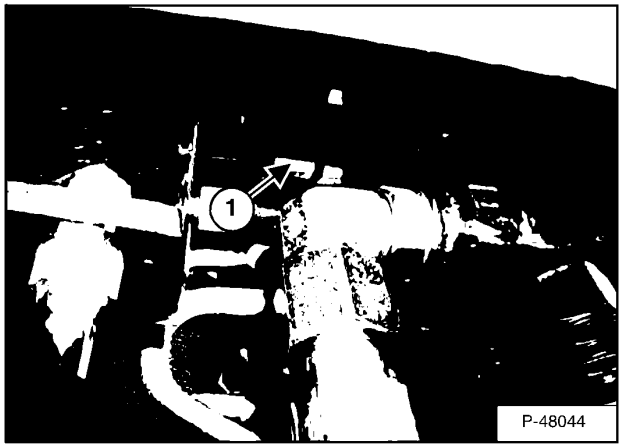


Raise the lift arms and install jackstands under the boom **[Figure 50-20-1]**.

Remove the Rear Stop Panel. (See Removal And Installation on Page 50-80-1.)

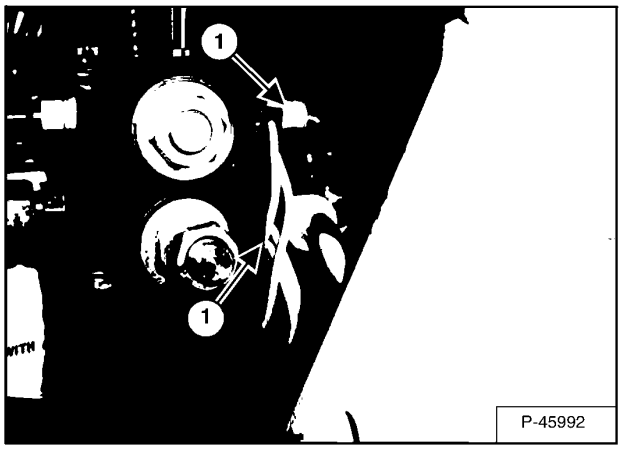
Remove the Tailgate Striker. (See Tailgate Striker Removal And Installation on Page 50-30-2.)

Figure 50-20-2



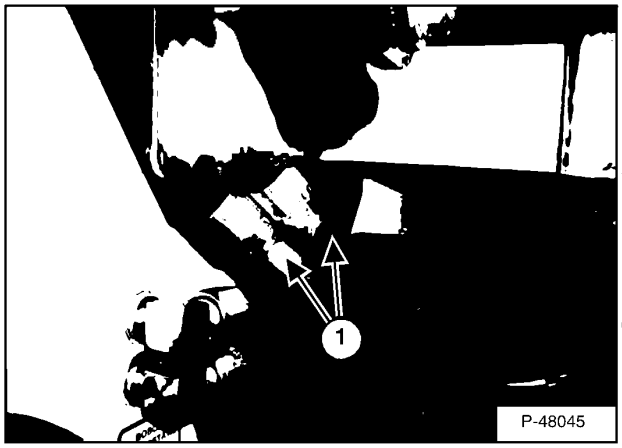
Disconnect and plug the tilt cylinder hose (Item 1) **[Figure 50-20-2]**.

Figure 50-20-3



Disconnect and cap the tilt cylinder hose (Item 1) **[Figure 50-20-3]** from the fitting.

Figure 50-20-4



Disconnect the auxiliary hoses (Item 1) **[Figure 50-20-4]** from the tubelines.

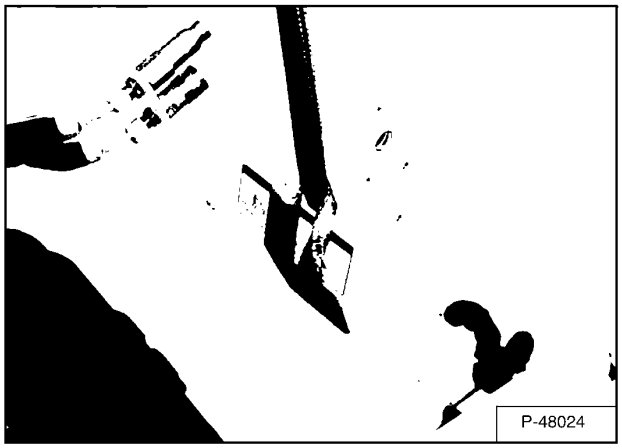
NOTE: Mark the auxiliary hoses (Item 1) [Figure 50-20-4] for ease of assembly.

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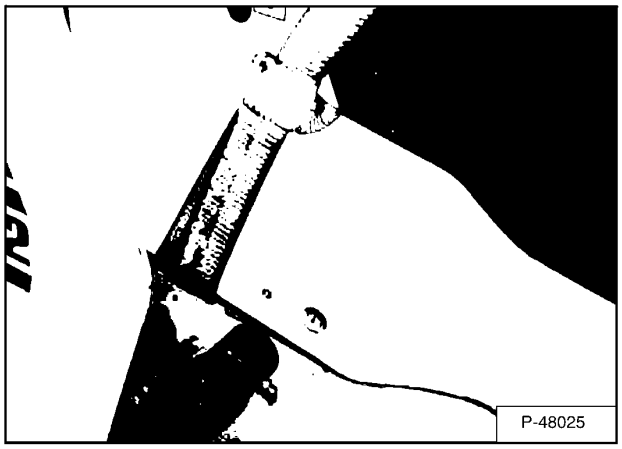
Removal And Installation (cont'd)

Figure 50-20-5



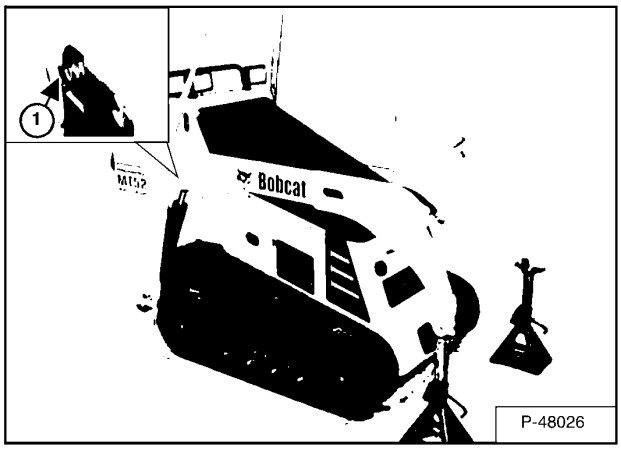
Wrap the lifting strap around the lift arm as shown **[Figure 50-20-5]** and attach to a chain hoist.

Figure 50-20-6



Wrap the lifting strap around the lift arm as shown **[Figure 50-20-6]** (both sides) and attach to a chain hoist.

Figure 50-20-7

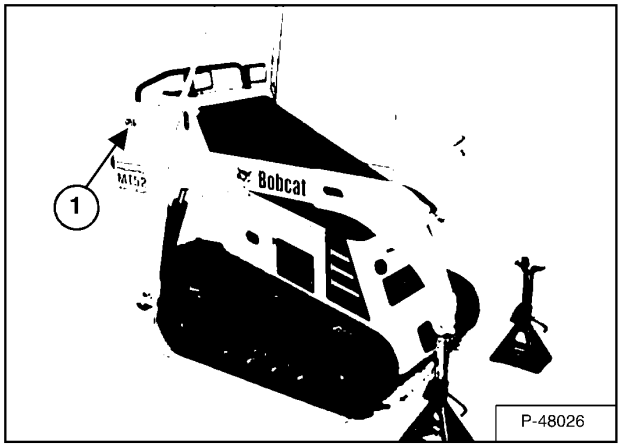


Remove the screw (Item 1) **[Figure 50-20-7]** from the lift cylinder pivot pin retainer (both sides).

Installation: Tighten the retainer screw to 18-20 ft.-lb. (24-27 N•m) torque.

Remove the pin retainer and the pin attaching the lift cylinder to the lift arms (both sides).

Figure 50-20-8



Remove the screw (Item 1) **[Figure 50-20-8]** from the upright pivot pin retainer (both sides).

Installation: Tighten the retainer screw to 18-20 ft.-lb. (24-27 N•m) torque.

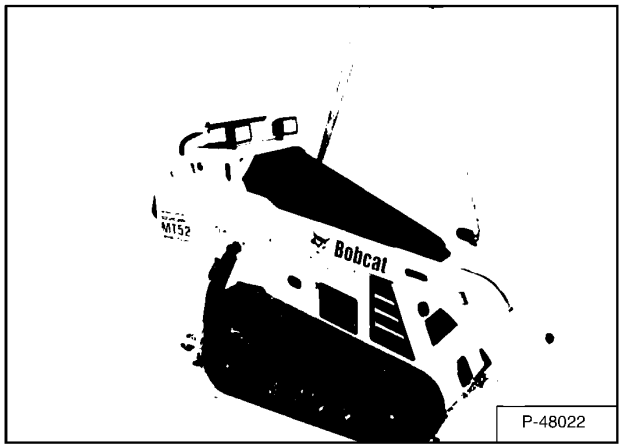
Remove the pin retainer and th e pivot pin from the upright (both sides).

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Removal And Installation (cont'd)

Figure 50-20-9



Use the chain hoist to remove the lift arms from the loader **[Figure 50-20-9]**.

NOTE: Guide the tilt hoses and auxiliary hoses out of the loader as the lift arms are removed.

Reverse the removal procedure to install the lift arms on the loader.

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TAILGATE

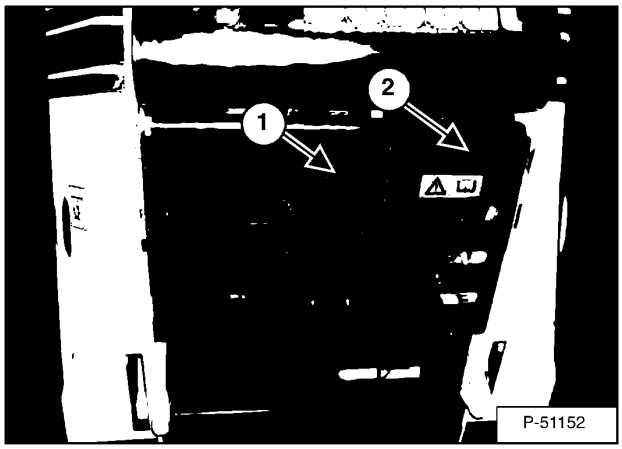
Removal And Installation

⚠ WARNING

Keep the tailgate closed when operating the machine. Failure to do so could cause serious injury.

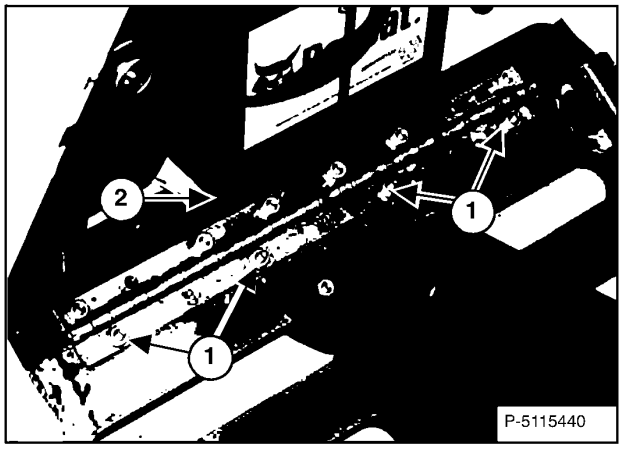
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Figure 50-30-1



Pull the latch (Item 1) and open the tailgate (Item 2) **[Figure 50-30-1]** .

Figure 50-30-2



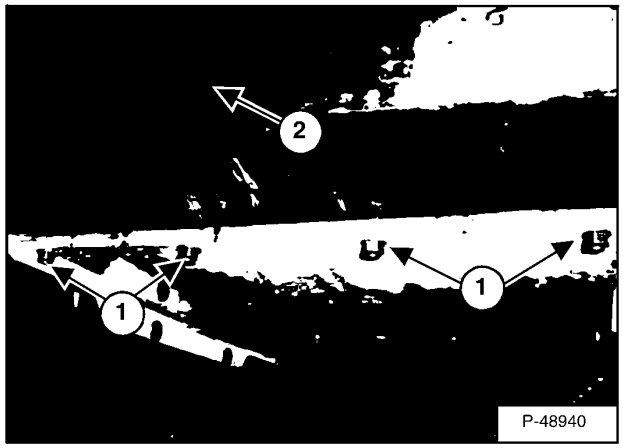
Remove the four bolts (Item 1) holding the tailgate to the rear door panel (Item 2) **[Figure 50-30-2]**.

Remove the tailgate.

Reverse the removal procedure to install the tailgate.

Rear Door Panel Removal And Installation

Figure 50-30-3



Remove the four screws (Item 1) holding the rear door panel (Item 2) **[Figure 50-30-3]** to the frame.

Installation: Tighten the screws to 15-20 ft.-lb. (20-27 N•m) torque.

Reverse the removal procedure to install the rear door panel.

NOTE: The the rear door panel and the tailgate can be removed without separating the two pieces.

NOTE: Do not operate the loader without the tailgate installed and closed.

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TAILGATE (CONT'D)

Tailgate Striker Removal And Installation

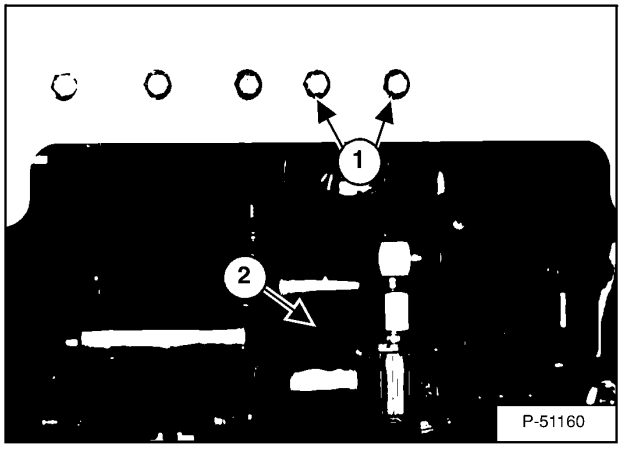
Open the tailgate.

Figure 50-30-4



Remove the reverse stop panel (Item 1) **[Figure 50-30-4]**. (See Removal And Installation on Page 50-80-1.)

Figure 50-30-5



Remove the two bolts (Item 1) holding the striker (Item 2) **[Figure 50-30-5]** to the frame.

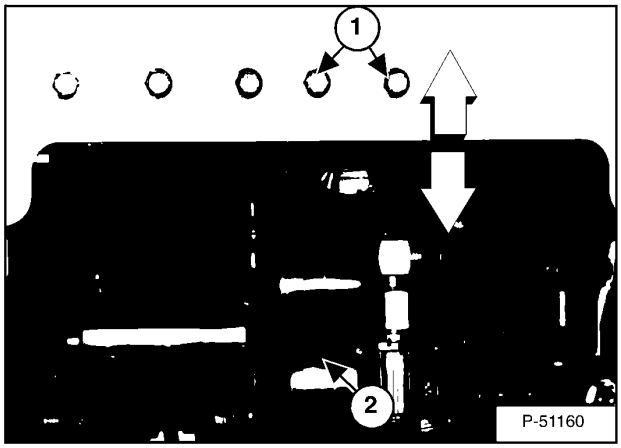
NOTE: The striker mounting bolts (Item 1) [Figure 50-30-5] are also secured with nuts on the backside of the striker.

Remove the striker.

Reverse the removal procedure to install the striker.

Tailgate Striker Adjustment

Figure 50-30-6



Loosen the two bolts (Item 1) and reposition the striker (Item 2) **[Figure 50-30-6]** until the tail gate latches properly.

NOTE: The striker mounting bolts (Item 1) [Figure 50-30-6] are also secured with nuts on the backside of the striker.

NOTE: The striker has slots that allow movement up or down to achieve proper engagement of the tail gate latch.

With the striker at the proper position tighten the two bolts (Item 1) **[Figure 50-30-6]**.

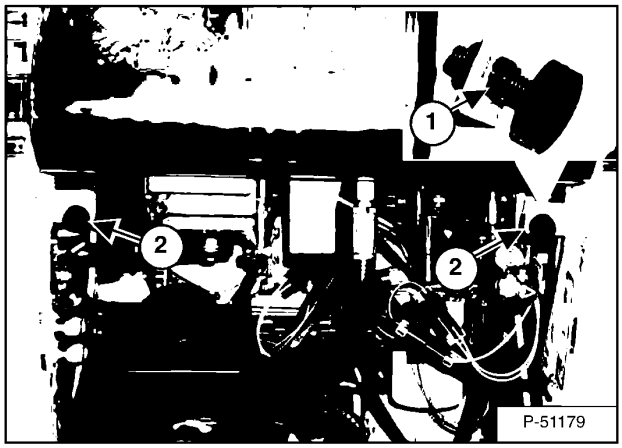
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TAILGATE (CONT'D)

Tailgate Bumper Adjustment

Figure 50-30-7



Loosen jambnut (Item 1) **[Figure 50-30-7]**.

Adjust the bumpers (Item 2) **[Figure 50-30-7]** until the tailgate latches properly and there is no movement after the tailgate is closed.

When the adjustments are completed, tighten the jambnut (Item 1) **[Figure 50-30-7]**.

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FUEL TANK

The fuel tank is made of a plastic material and the fuel fittings are installed into a metal threaded insert. The torque for tightening the fittings is very crucial to preventing leaks at the insert. Overtightening fittings may cause the threaded metal insert to move and create a leak. Leak testing the fuel tank with fittings installed is highly recommended before installing the fuel tank in the loader.

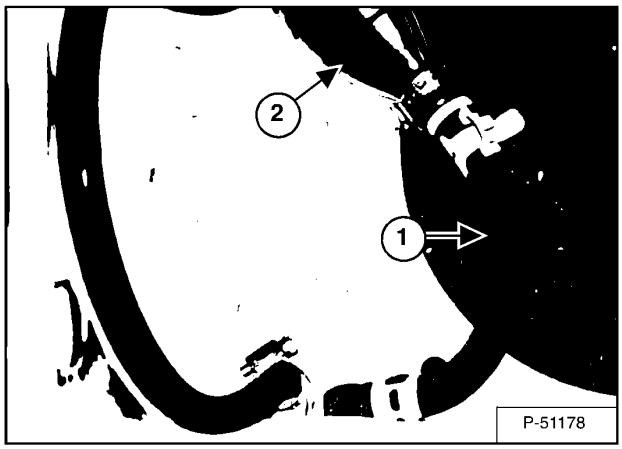
Removal And Installation

Remove the lower access panel. (See Removal and Installation on Page 50-90-1.)

Remove the Radiator. (See Removal And Installation on Page 70-50-1.)

Remove the Engine. (See Removal And Installation on Page 70-70-1.)

Figure 50-40-1



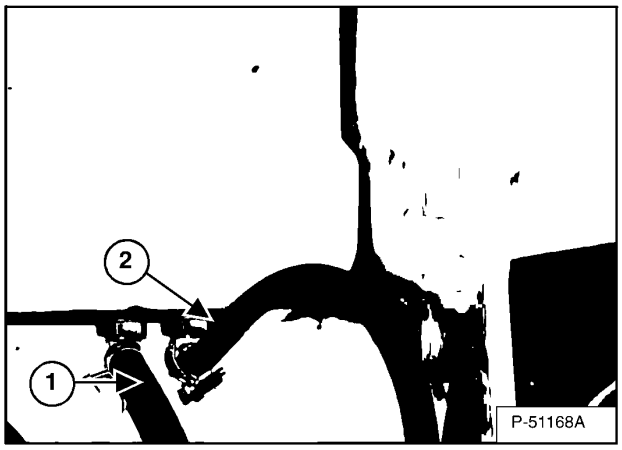
Remove the supply line (Item 1) from the primer bulb (Item 2) **[Figure 50-40-1]** and drain the fuel into a container.

⚠ WARNING

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

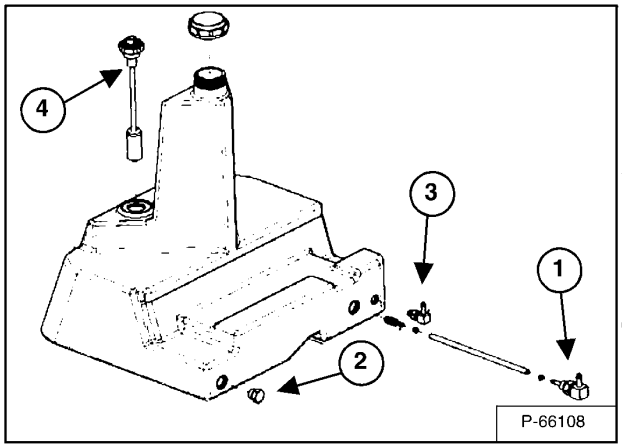
W-2103-1285

Figure 50-40-2



Remove the fuel supply line (Item 1) and the fuel return line (Item 2) **[Figure 50-40-2]** from the fuel tank.

Figure 50-40-3



Proper torque for the threaded boss style fitting (Item 1) and drain plug (Item 2) **[Figure 50-40-3]** is: 15 ft.-lb. (69 N•m) torque. **DO NOT OVERTIGHTEN FITTINGS!**

Proper torque for the threaded boss style fitting (Item 3) **[Figure 50-40-3]** is: 11 ft.-lb. (15 N•m) torque. **DO NOT OVERTIGHTEN FITTING!**

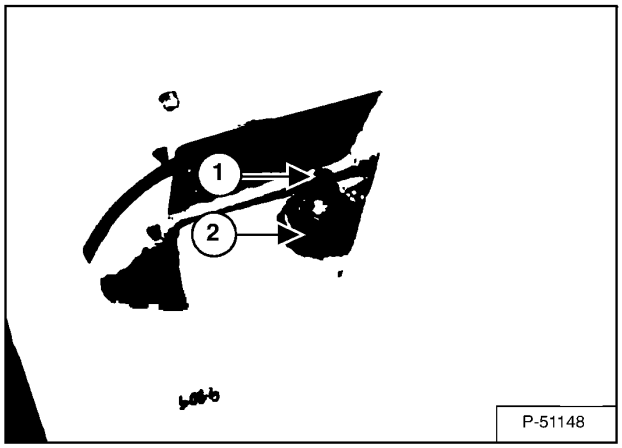
Proper torque for the fuel sender (Item 4) **[Figure 50-40-3]** is: 5 ft.-lb. (6,8 N•m) torque. **DO NOT OVERTIGHTEN SENDING UNIT!**

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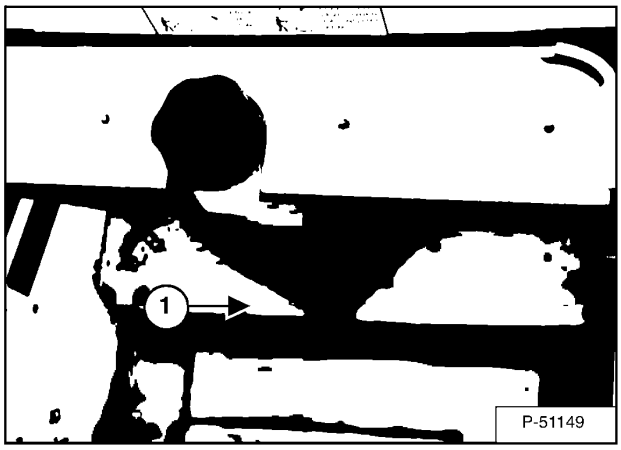
Removal And Installation (Cont'd)

Figure 50-40-4



Disconnect the harness connector (Item 1) from the sending unit (Item 2) **[Figure 50-40-4]**.

Figure 50-40-5



Remove the fuel tank (Item 1) **[Figure 50-40-5]** from the loader.

Reverse the removal procedure to install the fuel tank.

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INSTRUMENT PANEL

Removal and Installation

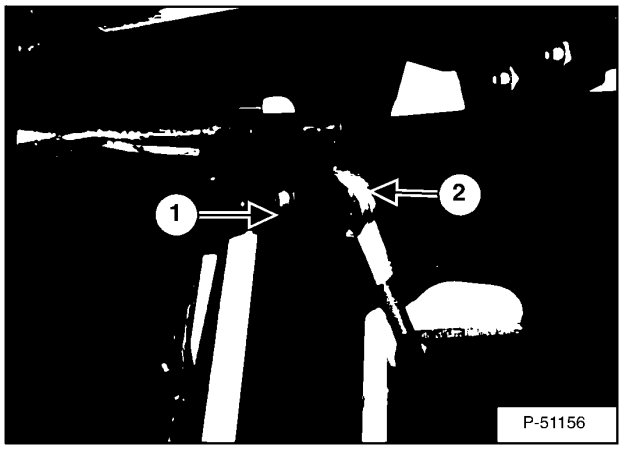
Figure 50-50-1



Remove the three bolts (Item 1) from the steering control panel (Item 2) **[Figure 50-50-1]**.

Installation: For proper assembly. (See Steering Assembly Removal And Installation on Page 30-50-2.)

Figure 50-50-2

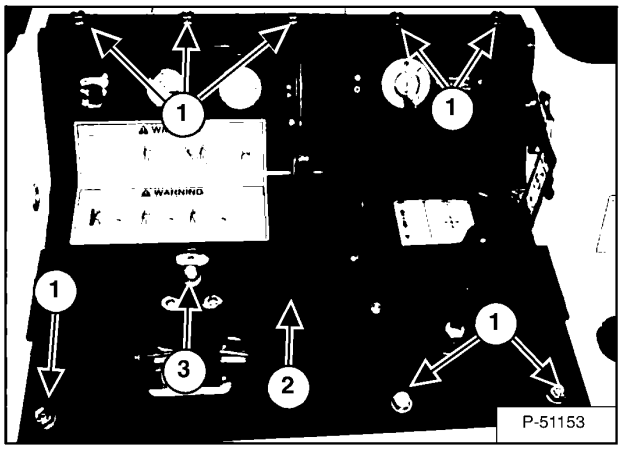


Lift the steering control panel (Item 2) **[Figure 50-50-1]**.

Remove the nut (Item 1) from the control rod end (Item 2) **[Figure 50-50-2]** .

Remove the steering control panel.

Figure 50-50-3



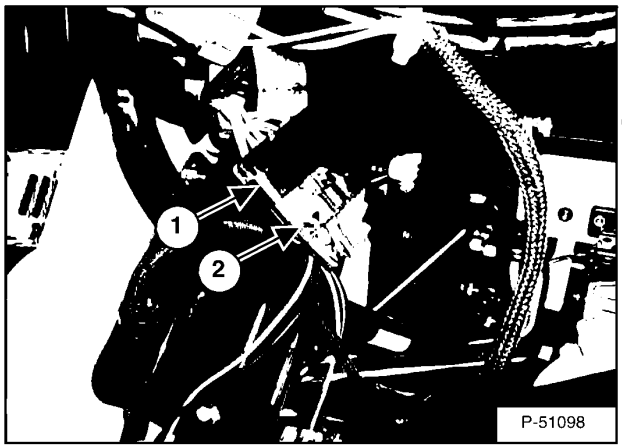
Remove the eight bolts (Item 1) from the instrument panel (Item 2) **[Figure 50-50-3]**.

Installation: Tighten the bolts to 15-20 ft.-lb. (20-27 N•m) torque.

Remove bolt (Item 3) **[Figure 50-50-3]**.

Open the hood.

Figure 50-50-4



Disconnect the instrument harness connector (Item 1) from the main harness connector (Item 2) **[Figure 50-50-4]**.

Remove the instrument panel (Item 2) **[Figure 50-50-3]** from the loader.

Reverse removal procedure to ins tall the instrument panel.

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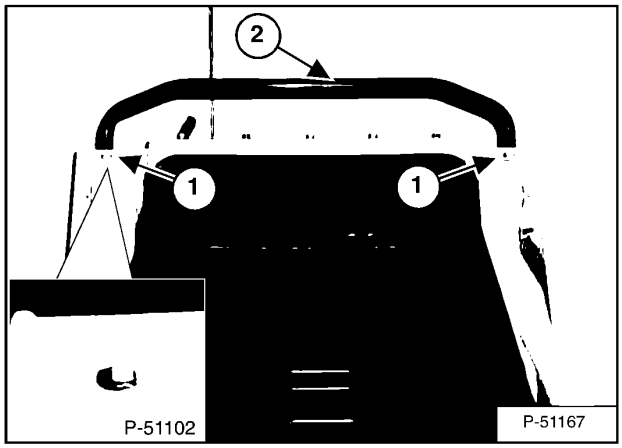
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GRAB BAR

Removal and Installation

Figure 50-60-1



Remove the two bolts (Item 1) holding the grab bar (Item 2) **[Figure 50-60-1]** to the frame.

Remove the grab bar.

Reverse the removal procedure to install the grab bar.

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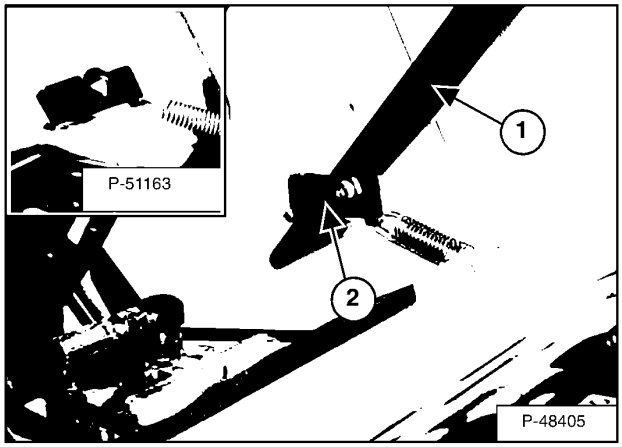
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HOOD

Removal and Installation

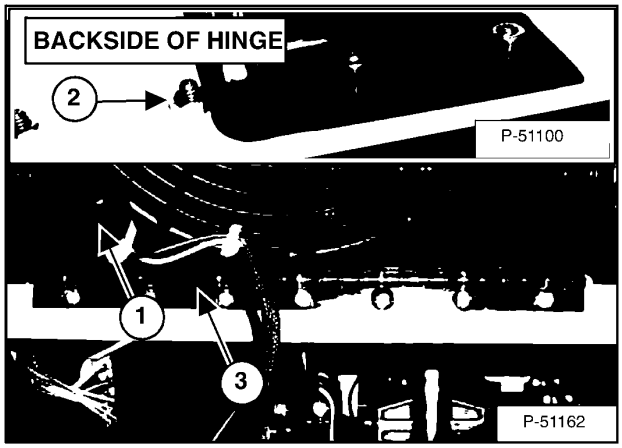
Disconnect hydraulic oil cooler connections. (See Removal And Installation on Page 20-100-1.)

Figure 50-70-1



Raise the hood high enough to remove the hood prop (Item 1) from the latching mechanism (Item 2) **[Figure 50-70-1]**.

Figure 50-70-2



Disconnect electrical connector (Item 1) **[Figure 50-70-2]** for the electric cooling fan.

Remove the seven nuts (Item 2) from the backside of the hood hinge (Item 3) **[Figure 50-70-2]**.

Remove the hood.

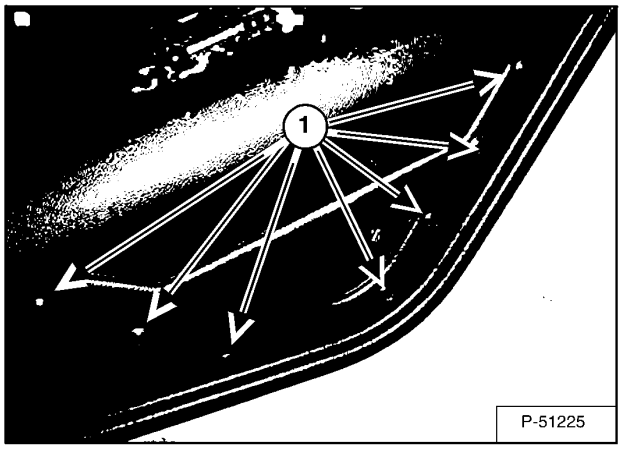
Reverse the removal procedure to install the hood.

Disassembly And Assembly

Remove the hood.

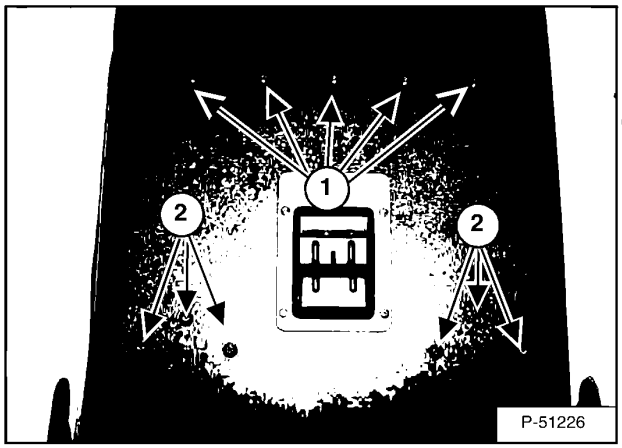
Remove the hydraulic oil cooler and electric fan.

Figure 50-70-3



Remove the seven screws (Item 1) **[Figure 50-70-3]** from the hood and the hood support (on both sides) to remove the hood/hydraulic oil cooler support.

Figure 50-70-4



Remove the five screws (Item 1) **[Figure 50-70-4]** from the hood and the hood support to r emove the hood/ hydraulic oil cooler.

Remove the hood/hydraulic oil cooler support from the hood.

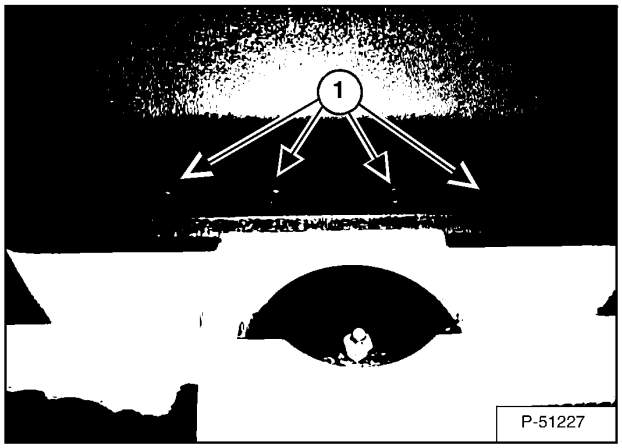
Remove the six screws (Item 2) **[Figure 50-70-4]** from the hood and the latch support to remove the latch support.

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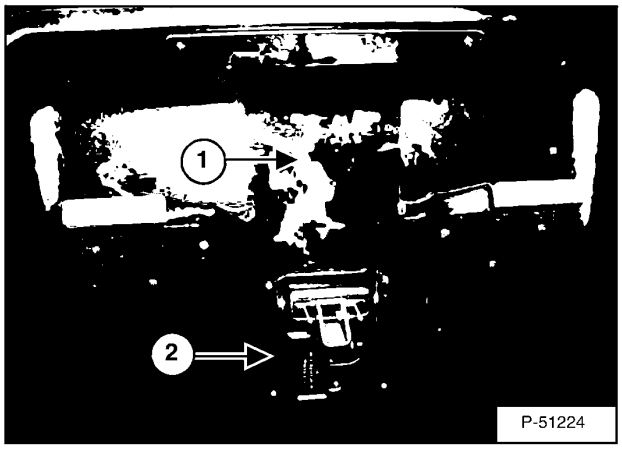
Disassembly And Assembly (Cont'd)

Figure 50-70-5



Remove the four screws (Item 1) **[Figure 50-70-5]** from the hood to remove the latch support.

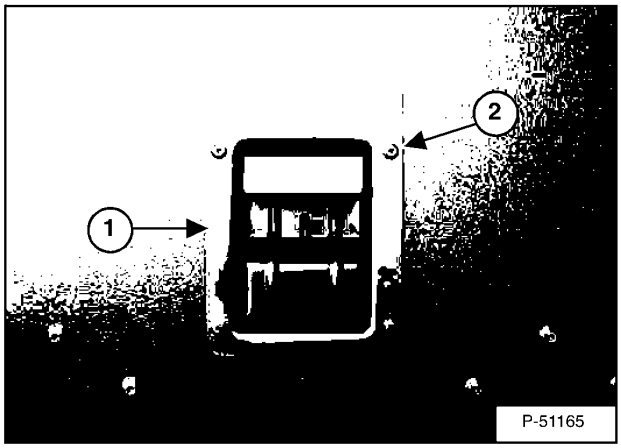
Figure 50-70-6



The latch support (Item 1) can be removed from the hood once the latch (Item 2) **[Figure 50-70-6]** is removed.

Hood Latch Removal

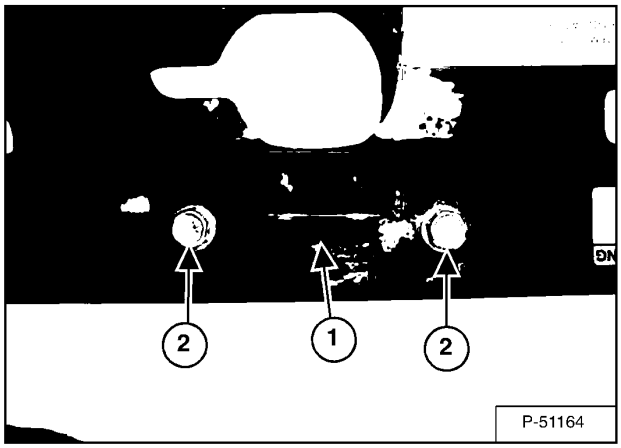
Figure 50-70-7



To remove the latch (Item 1) from the hood. Drill out the four rivets (Item 2) **[Figure 50-70-7]** and remove latch.

Hood Latch Striker Adjustment

Figure 50-70-8



The hood latch striker (Item 1) is adjusted by loosening the 2 screws (Item 2) **[Figure 50-70-8]** and sliding the striker forward and back until the proper engagement is obtained.

When the proper engagement is obtained, tighten the screws.

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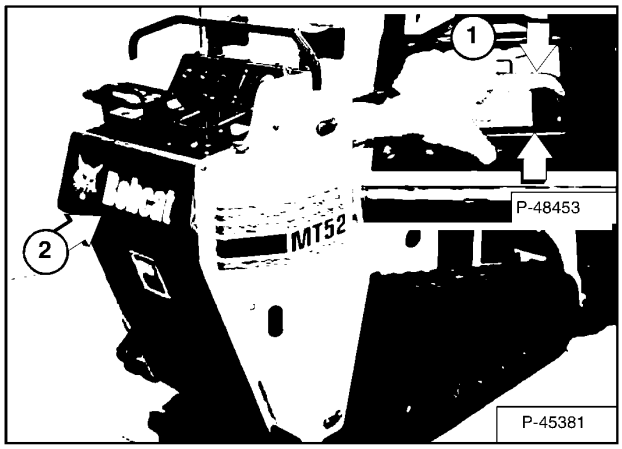
REVERSE STOP PANEL

Description

The Reverse Stop Panel will stop the loader from moving backward when the panel is pushed forward.

Inspecting Function

Figure 50-80-1



Start the engine and use one hand to move the machine in reverse direction (Item 1) **[Figure 50-80-1]**.

Use your other hand to push the Reverse Stop Panel forward (Item 2) **[Figure 50-80-1]**.

The machine must come to a complete stop and move forward slowly when the Reverse Stop Panel is pushed forward completely.

If the machine does not stop and roll forward slowly, do not operate the machine until the problem is corrected.

To correct the problem perform the linkage adjustment. (See Steering Linkage Adjustment on Page 30-50-4.)

NOTE: The reverse Stop Panel must push the steering levers to the neutral position and the loader must stop and move forward slowly, this is a safety precaution in the event some one is pinned behind the loader.

⚠ WARNING

The Reverse Stop Panel, Neutral Start Interlocks, and Lift/Tilt Lockouts must function properly.

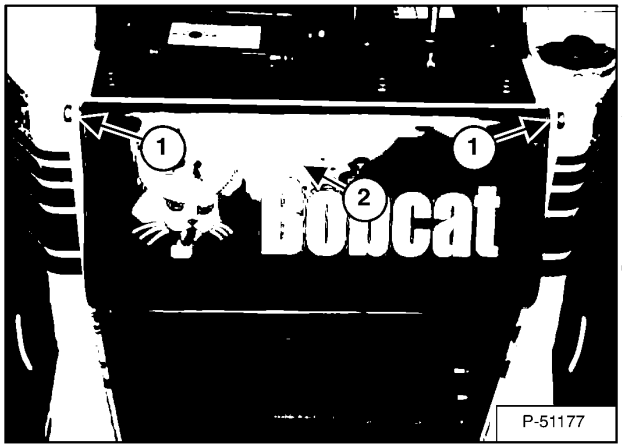
- **The Reverse Stop Panel must stop mini loader from moving backward when panel is pushed forward.**
- **The Neutral Start Interlocks must prevent engine from starting if Drive / Steering Control, Lift Arm Control or Auxiliary Hydraulic Control are engaged.**
- **The Lift/Tilt Lockouts must deactivate the lift and tilt functions when engine is off.**

If any of these do not function properly, contact your dealer for service. DO NOT modify system.

w-2483-1003

Removal And Installation

Figure 50-80-2



Remove the two bolts (Item 1) from the reverse stop panel (Item 1) **[Figure 50-80-2]**.

Installation: Medium strength threadlocker should be used on the bolts upon installation. Tighten the bolts to 25-28 ft.-lb. (34-38 N•m) torque.

Remove the reverse stop panel.

Reverse the removal procedure to install the reverse stop panel.

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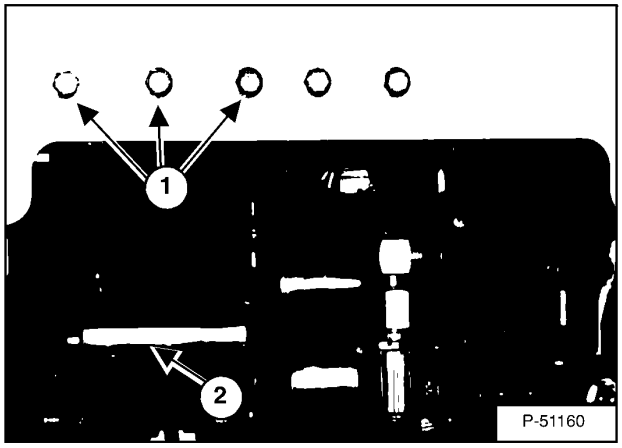
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REVERSE STOP PANEL (CONT'D)

Reverse Stop Mechanism Removal And Installation

Remove the reverse stop panel.

Figure 50-80-3

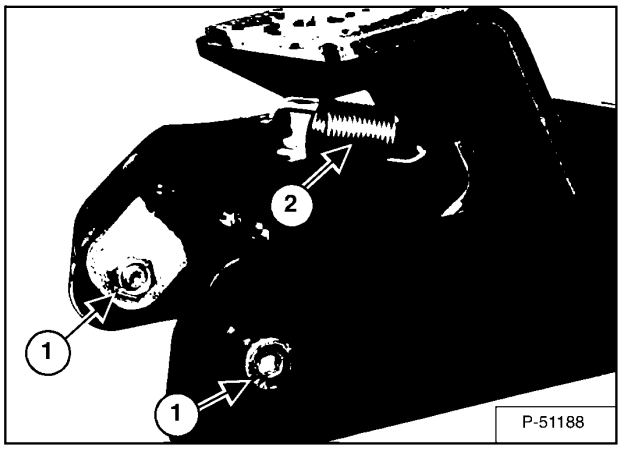


Remove the three bolts (Item 1) holding the reverse stop mechanism (Item 2) **[Figure 50-80-3]** to the main frame.

Installation: Apply a m edium strength threadlocker to the threads of the bolts before installing.

Remove the reverse stop mechanism.

Figure 50-80-4



Remove the nuts and bolts (Item 1) **[Figure 50-80-4]** and replace if needed.

Disconnect the spring (Item 2) **[Figure 50-80-4]** and replace if needed.

Reverse the removal procedure to install the reverse stop mechanism.

Check the operation of the reverse stop panel. (See Inspecting Function on Page 50-80-1.)

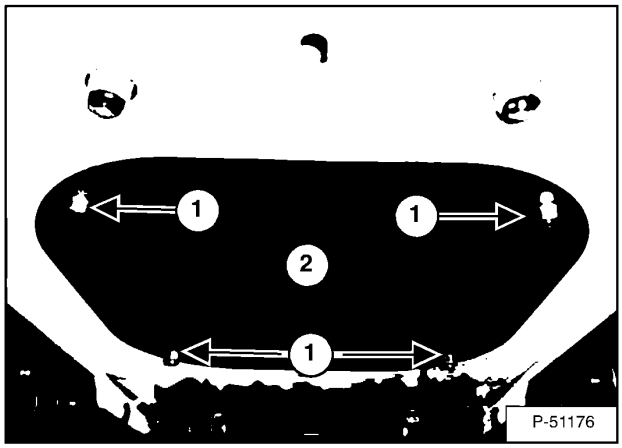
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BOTTOM ACCESS PANEL

Removal and Installation

Figure 50-90-1



Remove the four screws (Item 1) holding the bottom access panel (Item 2) **[Figure 50-90-1]** to the frame.

Installation: Tighten the screws to 15-20 ft.-lb. (20-27 N•m) torque.

Remove the bottom access panel from the frame.

Reverse the removal procedure to install the bottom access panel.

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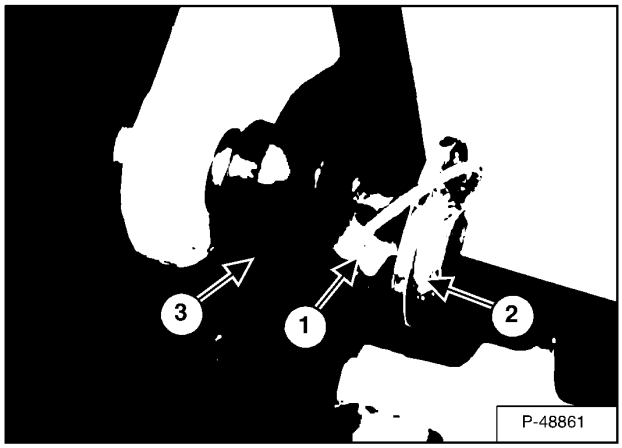
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RIDE-ON PLATFORM

Removal and Installation

Figure 50-100-1



Remove the two ring lock pins (Item 1) and pins (Item 2) holding the platform (Item 3) **[Figure 50-100-1]** to the frame.

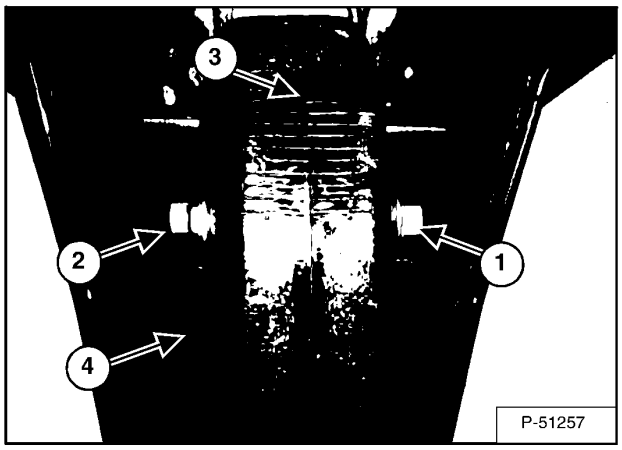
Remove the platform.

Reverse the removal procedure to install the platform.

Tire Removal and Installation

Remove the platform and turn it upside down.

Figure 50-100-2

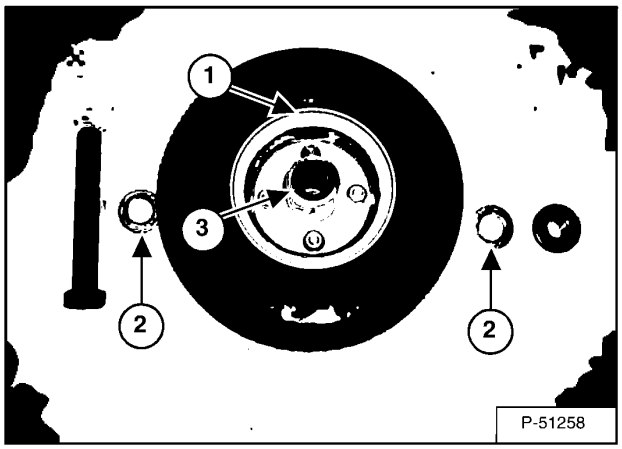


Remove the nut (Item 1) and bolt (Item 2) holding the tire assembly (Item 3) to the caster (Item 4) **[Figure 50-100-2]** .

Installation: Tighten the bolt down snug, over tightening will disfigure the caster and restrict tire assembly movement.

NOTE: There are washers between the caster and the tire assembly.

Figure 50-100-3



Remove the tire assembly (Item 1) and washers (Item 2) **[Figure 50-100-3]** from the caster.

Inspect the bearings (Item 3) **[Figure 50-100-3]** and replace if needed.

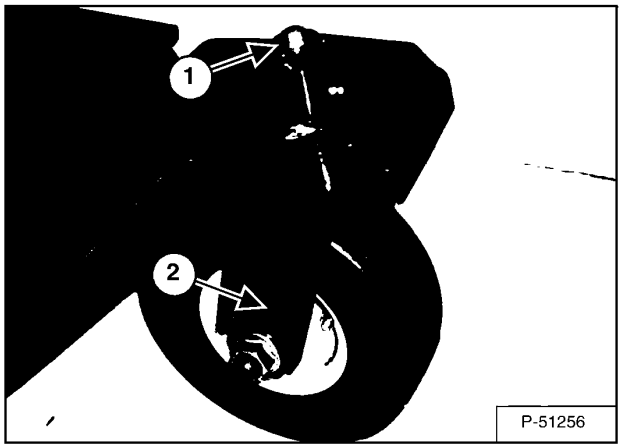
Reverse the removal procedure to install the tire assembly.

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Caster Removal and Installation

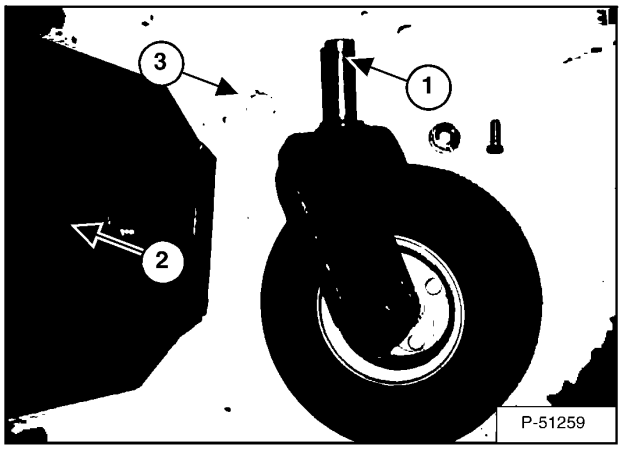
Figure 50-100-4



Remove the bolt and washer (Item 1) holding the caster (Item 2) **[Figure 50-100-4]** to the platform.

NOTE: There is a t hrust washer between the caster and platform.

Figure 50-100-5



Visually inspect the caster shaft, (Item 1) platform bushing (Item 2) and thrust washer (Item 3) **[Figure 50-100-5]** for wear and replace as needed.

Reverse the removal procedure to install the caster.

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ELECTRICAL SYSTEM & ANALYSIS

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- Removal And Installation 60-40-1

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TIGHTEN ALL HARDWARE PER SIZE TO GRADE 5 TORQUE (See TORQUE SPECIFICATIONS FOR BOLTS on Page SPEC-30-1.) UNLESS OTHERWISE SPECIFIED.

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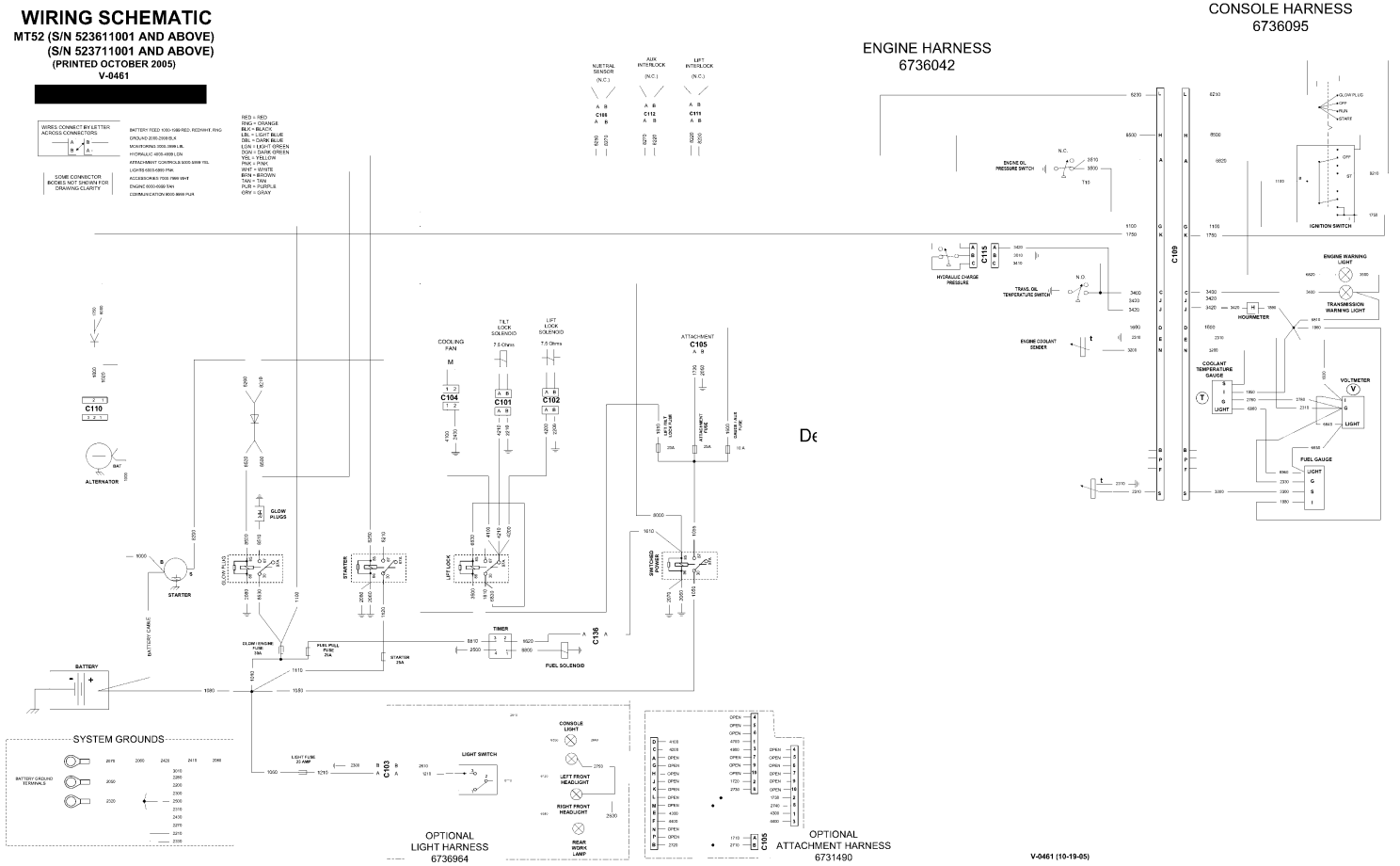
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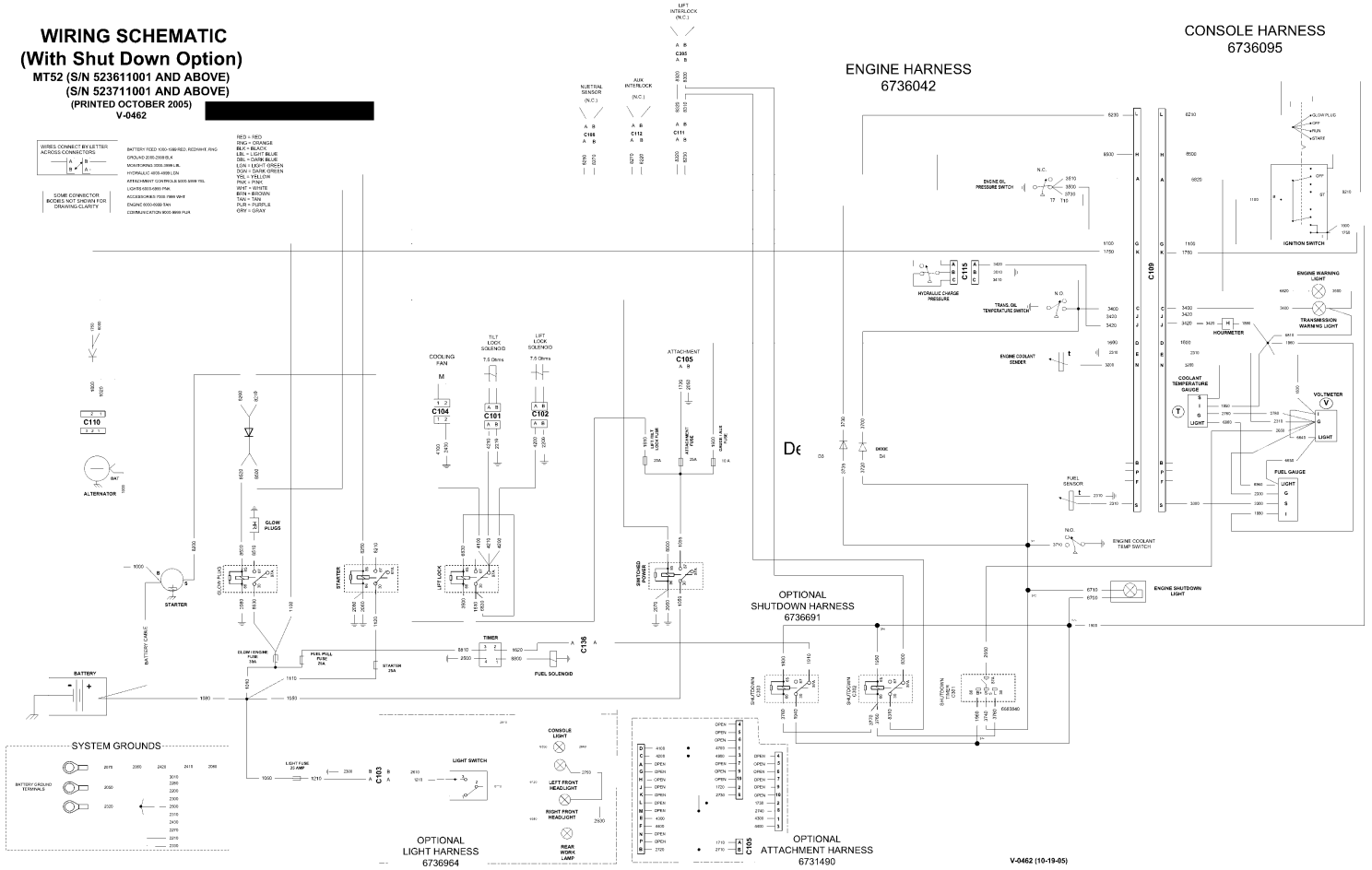
WIRING SCHEMATIC

MT52 (S/N 523611001 AND ABOVE)
(S/N 523711001 AND ABOVE)
(PRINTED OCTOBER 2005)
V-0461

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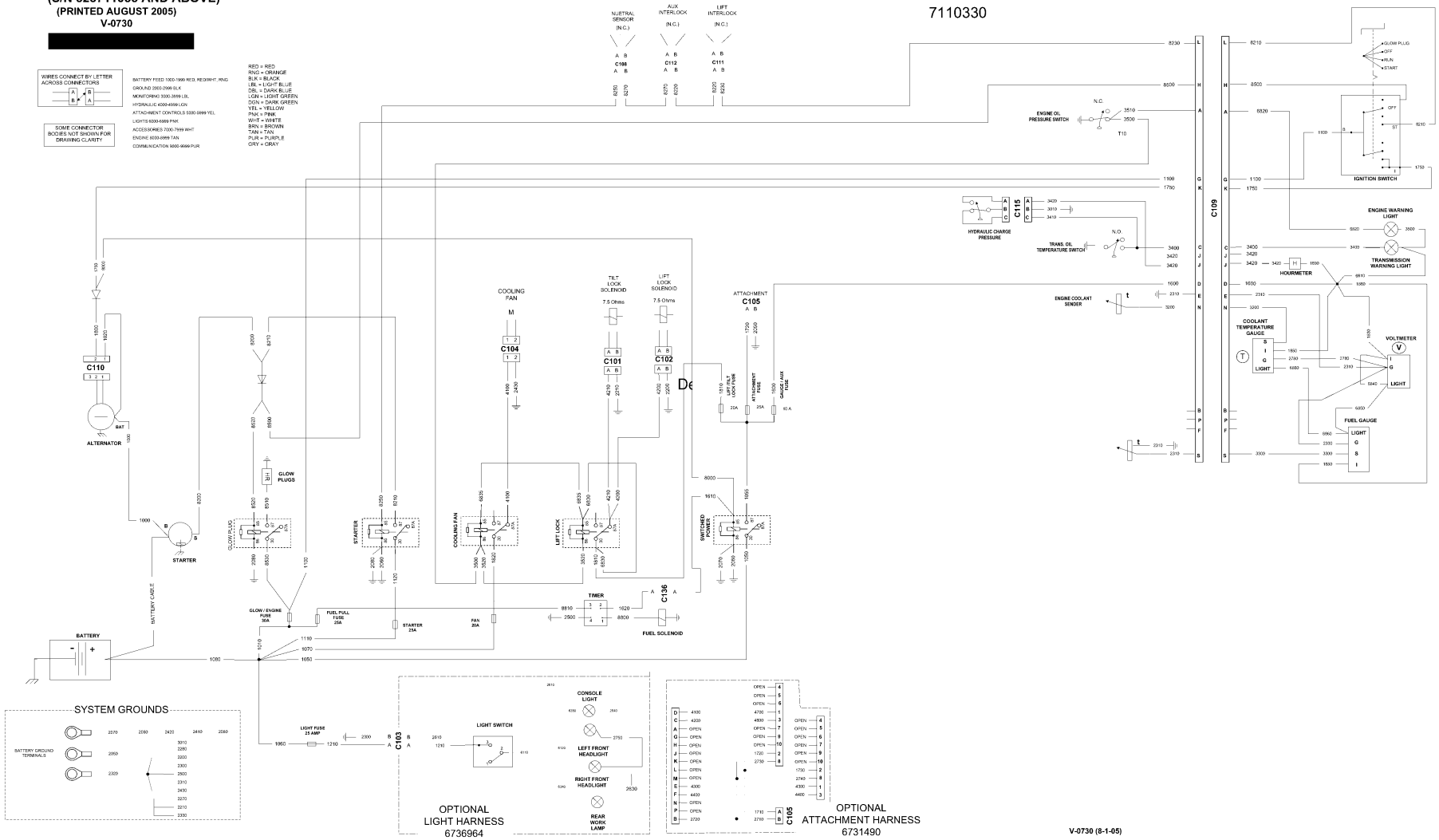
WIRING SCHEMATIC

MT52 (S/N 523612277 AND ABOVE)
(S/N 523711055 AND ABOVE)
(PRINTED AUGUST 2005)
V-0730

[redacted]

CONSOLE HARNESS
6736095

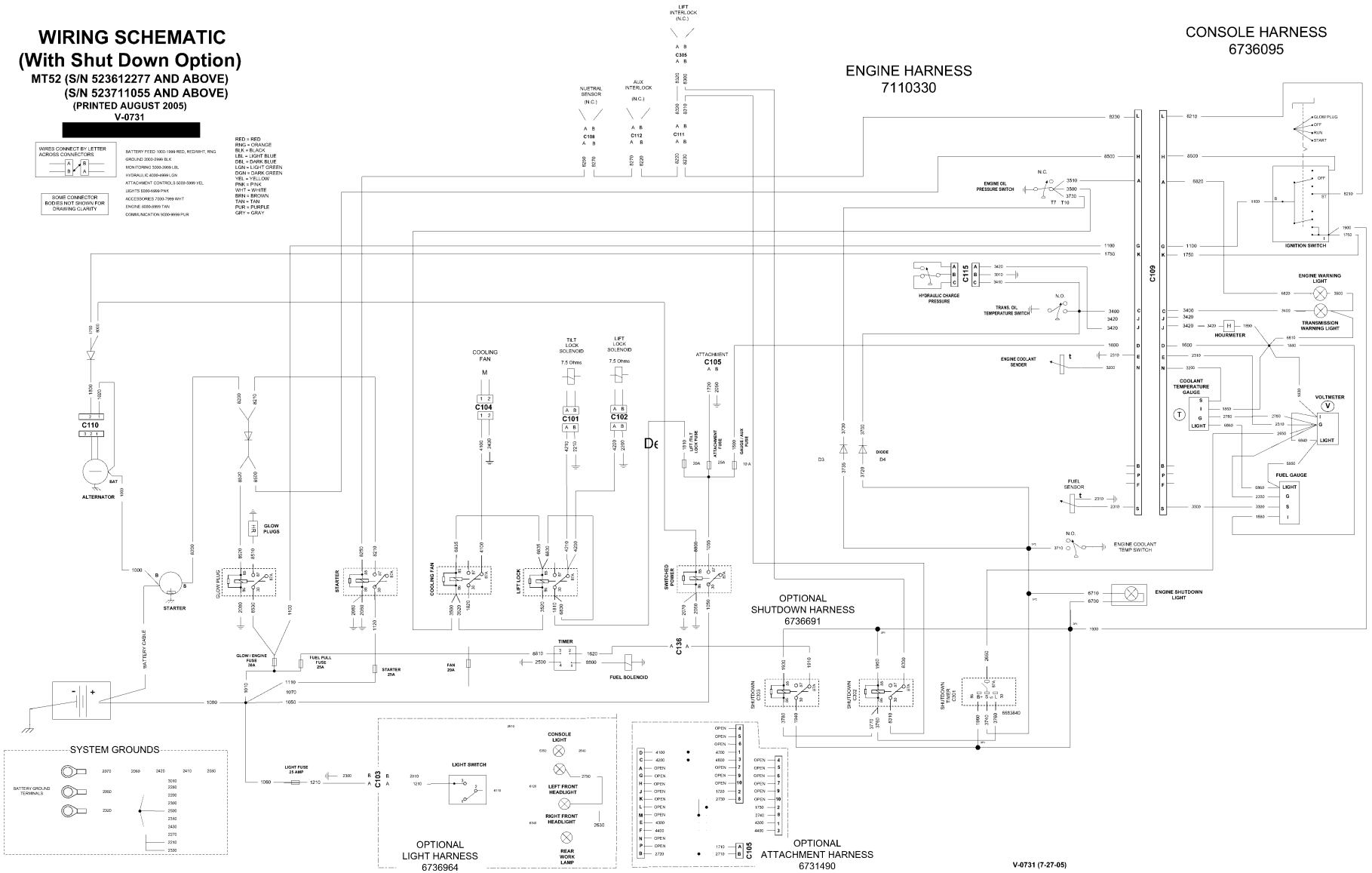
ENGINE HARNESS
7110330



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WIRING SCHEMATIC
(With Shut Down Option)
MT52 (S/N 523612277 AND ABOVE)
(S/N 523711055 AND ABOVE)
(PRINTED AUGUST 2005)
V-0731

[redacted]



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ELECTRICAL SYSTEM INFORMATION

Electrical Troubleshooting Chart

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

⚠ WARNING

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

W-2004-1285

PROBLEM	CAUSE
Battery looses charge.	1,2,3,4,5,18
Alternator will not charge.	1,2,5,18
Starter will not turn the engine.	10,11,18,19,2,3,4,9,12,7,6
Auxiliary blower fan will not run when auxiliaries are engaged.	13,14,18
Lift arm does not lower with the engine running and activation of the lift lever.	15,16,17,18
Electric fan not operating with engine running.	17,18,9,13,14,8

KEY TO CORRECT THE CAUSE
1. Alternator belt is loose or damaged.
2. Battery connections are dirty or loose.
3. Battery is weak or failed.
4. The ground is not correct in the electrical system.
5. The alternator has a failure.
6. Engine seizure.
7. Starter has a failure.
8. Neutral start circuit failure. (wiring, relay, solenoid, connectors)
9. Fuse had a failure.
10. Auxiliary lever engaged.
11. Left or right drive lever engaged.
12. Starter relay has a failure.
13. Electric fan circuitry failure.
14. Electric fan motor.
15. Lift arm circuit has a failure. (fuse, relay, solenoid)
16. Engine oil pressure circuit has a failure. (fuse, relay, solenoid, switch)
17. Low engine oil pressure.
18. Loose, disconnected or damaged wiring.
19. Lift control lever, not in neutral position.

NOTE: Engine oil pressure controls lift a nd tilt lockout functions, and the electric cooling fan.

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BATTERY

Removal and Installation

⚠ WARNING

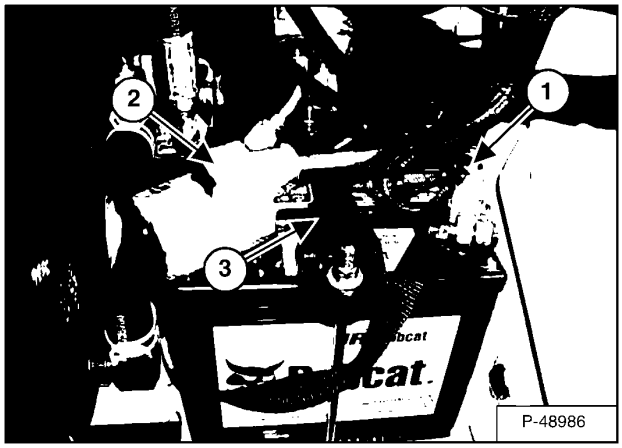
Batteries contain acid which burns eyes and skin on contact. Wear goggles, protective clothing and rubber gloves to keep acid off body.

In case of acid contact, wash immediately with water. In case of eye contact get prompt medical attention and wash eye with clean, cool water for at least 15 minutes.

If electrolyte is taken internally drink large quantities of water or milk! DO NO T induce vomiting. Get prompt medical attention.

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Figure 60-20-1



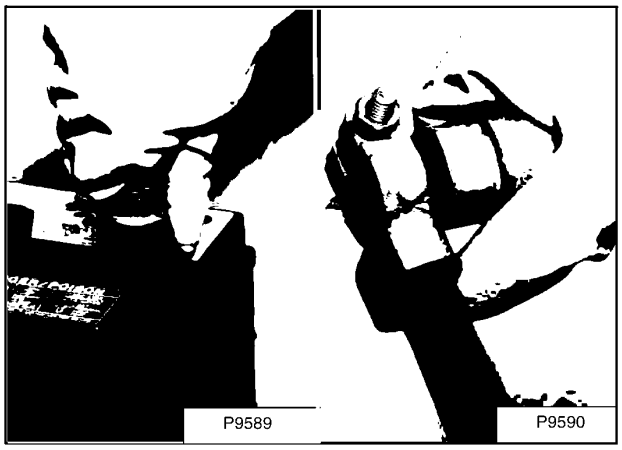
Open rear door. (See TAILGATE on Page 50-30-1.)

Disconnect the negative (-) battery cable (Item 1) **[Figure 60-20-1].**

Disconnect the positive (+) battery cable (Item 2) **[Figure 60-20-1]**.

Remove the b attery hold down clamp (Item 3) **[Figure 60-20-1]**.

Figure 60-20-2



Remove the battery from the loader.

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 (-) ca ble last to prevent sparks. Connect and tighten the battery cables.

Close the rear door before operating the loader.

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Servicing

⚠ WARNING

Batteries contain acid which burns eyes and skin on contact. Wear goggles, protective clothing and rubber gloves to keep acid off body.

In case of acid contact, wash immediately with water. In case of eye contact get prompt medical attention and wash eye with clean, cool water for at least 15 minutes.

If electrolyte is taken internally drink large quantities of water or milk! DO NO T induce vomiting. Get prompt medical attention.

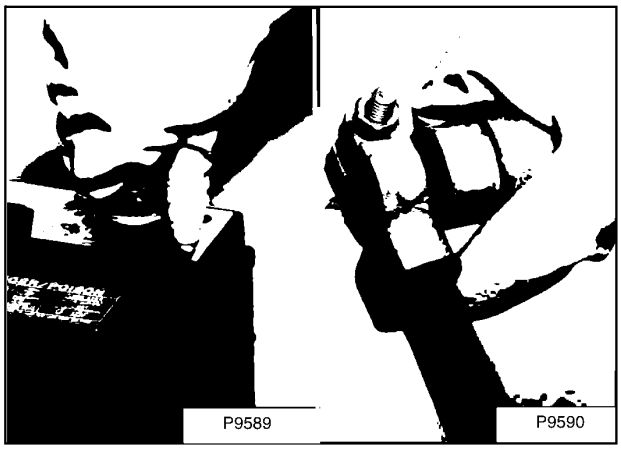
W-2065-1296

Figure 60-20-3



The battery cables must be clean and the connections tight. Remove acid or corrosion from the battery and cables with a s odium bicarbonate (baking soda) and water solution **[Figure 60-20-3]**.

Figure 60-20-4



Clean the terminals and cable ends as shown in **[Figure 60-20-4]**.

Check the electrolyte level in the battery. Add distilled water as needed.

Put battery saver P/N (6664458) or grease on the battery terminals and cable ends to prevent corrosion.

Using A Booster Battery (Jump Starting)

If it is necessary to use a booster battery to start the engine, BE CAREFUL!

The key switch must be OFF. The booster battery must be 12 volt.

⚠ WARNING

Batteries contain acid which burns eyes and skin on contact. Wear goggles, protective clothing and rubber gloves to keep acid off body.

In case of acid contact, wash immediately with water. In case of eye contact get prompt medical attention and wash eye with clean, cool water for at least 15 minutes.

If electrolyte is taken internally drink large quantities of water or milk! DO NOT induce vomiting. Get prompt medical attention.

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Using A Booster Battery (Jump Starting) (Cont'd)

⚠ WARNING

Keep arcs, sparks flames and lighted tobacco away from batteries. When *jumping* from booster battery make final connection (negative) at engine frame.

Do not jump s tart or charge a frozen or damaged battery. Warm battery to 6 0°F (16°C) before connecting to a charger. Unplug c harger before connecting or disconnecting cables to battery. Never lean over battery while boosting, testing or charging.

Battery gas can explode and cause serious injury.

W-2066-1296

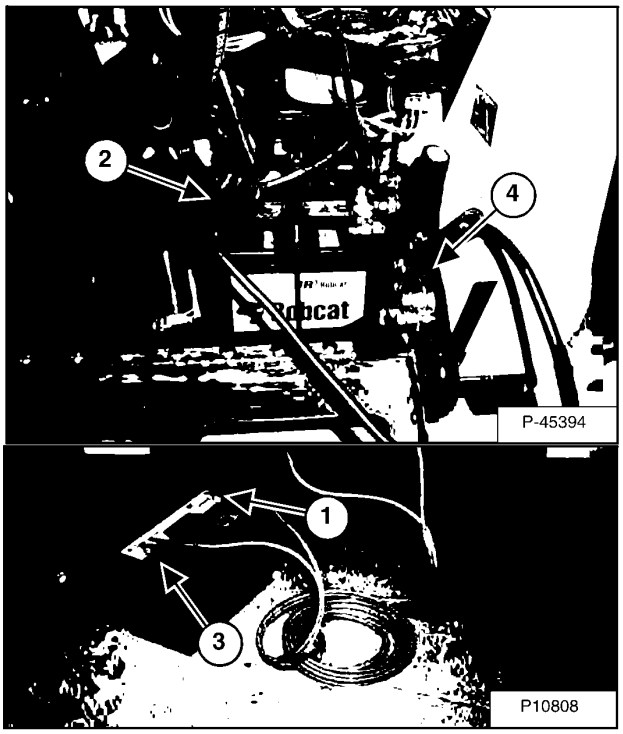
IMPORTANT

Damage to the alternator can occur if:

- **Engine is operated with battery cables disconnected.**
- **Battery cables are connected when using a fast charger or when welding on the loader. (Remove both cables from the battery.)**
- **Extra battery cables (booster cables) are connected wrong.**

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Figure 60-20-5



Connect the end of the first cable (Item 1) to the positive (+) terminal of the booster battery. Connect the other end of the same cable (Item 2) **[Figure 60-20-5]** to th e positive terminal on the loader battery.

Connect the end of the second cable (Item 3) to the negative (-) terminal of the booster battery. Connect the other end of the same cable (Item 4) **[Figure 60-20-5]** to the loader frame.

Keep cables away from moving parts. Start the engine.

After the engine has started, remove the ground (-) cable (Item 4) **[Figure 60-20-5]** first.

Remove the cable from the p ositive terminal (Item 2) **[Figure 60-20-5]**.

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ALTERNATOR

Removal and Installation

IMPORTANT

Damage to the alternator can occur if:

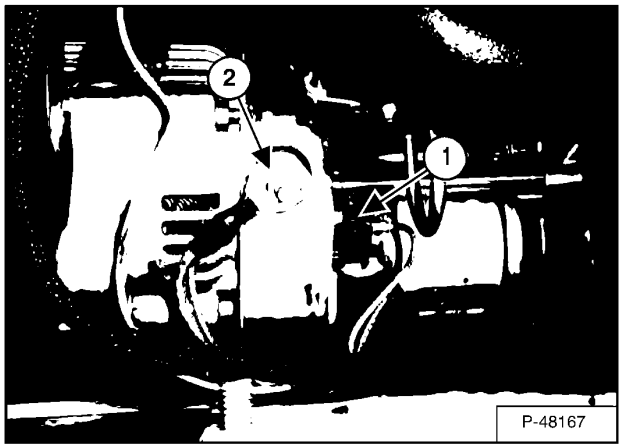
- **Engine is operated with battery cables disconnected.**
- **Battery cables are connected when using a fast charger or when welding on the loader. (Remove both cables from the battery.)**
- **Extra battery cables (booster cables) are connected wrong.**

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Open the hood.

Open the rear door. Disconnect the negative (-) battery cable.

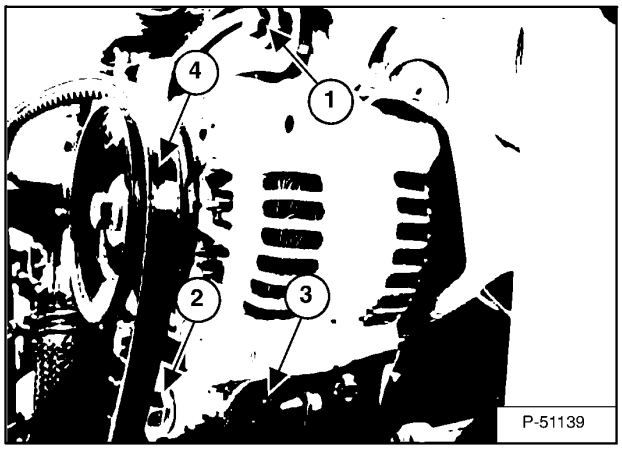
Figure 60-30-1



Disconnect the wiring harness connector (Item 1) **[Figure 60-30-1]** from the alternator.

Disconnect the r ed wires from the a lternator (Item 2) **[Figure 60-30-1]**.

Figure 60-30-2



Remove the upper alternator bolt (Item 1) **[Figure 60-30-2]**.

Remove the lower alternator bolt (Item 2) and nut (Item 3) **[Figure 60-30-2]**.

Remove the be lt (Item 4) **[Figure 60-30-2]** from the alternator pulley.

NOTE: Medium strength threadlocker should be used on mounting bolts and nuts.

Remove the alternator from the loader.

Reverse the removal procedure to install the alternator.

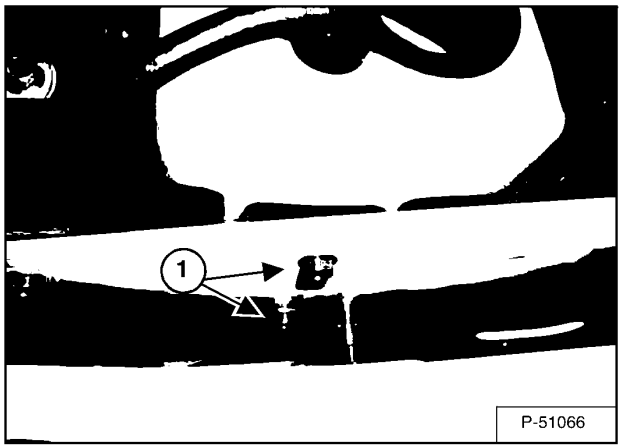
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Adjusting The Alternator Belt

Stop the engine.

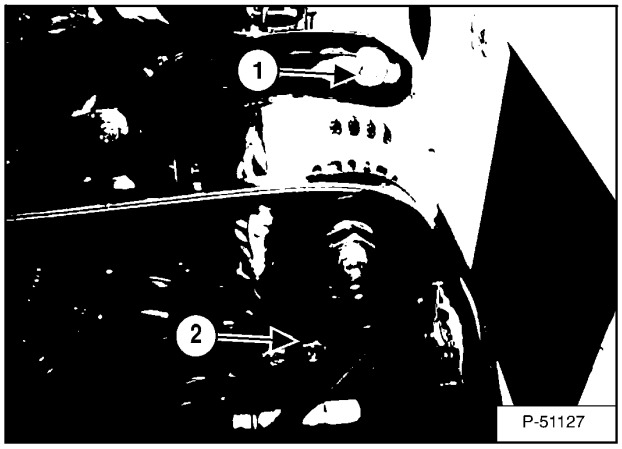
Open the engine cover.

Figure 60-30-3



Remove the two coolant recovery tank mounting bolts (Item 1) **[Figure 60-30-3]** and move the coolant recovery tank out of the way.

Figure 60-30-4



Loosen the two alternator bolts (Item 1) and (Item 2) **[Figure 60-30-4]**.

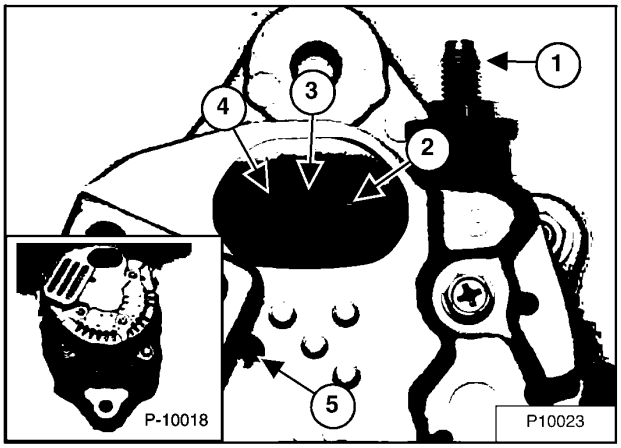
Move the alternator until the belt has 5/16 inch (8,0 mm) movement at the middle of the belt span with 15 lbs. (66 N) of force.

Tighten the adjustment bolt and mounting bolts.

Re-install the coolant recovery tank.

Description

Figure 60-30-5



The output terminal (Item 1) **[Figure 60-30-5]**.

The battery or power sensing terminal (Item 2) **[Figure 60-30-5]**.

The ignition terminal (Item 3) **[Figure 60-30-5]**.

Open terminal not used in the loader harness (Item 4) **[Figure 60-30-5]**.

Access hole for full field test (Item 5) **[Figure 60-30-5]**.

Tests

Perform the following alternator tests in this order:

Alternator Output Test: Tests the alternator and regulator output.

Full Field Test: Tests the maximum amperage output of the alternator.

Alternator Regulator Test: Tests the regulator voltage output.

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ALTERNATOR (CONT'D)

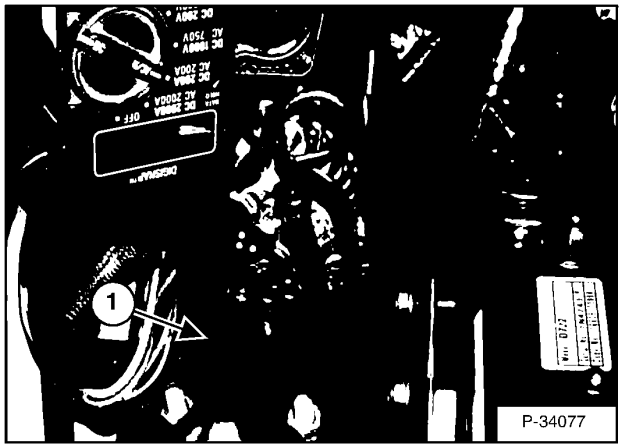
Alternator Output Test

⚠ WARNING

When the engine is running during service, the steering lever and hydraulic control levers must be in neutral and the parking brake engaged.

W-2484-1003

Figure 60-30-6



Check battery and battery connections. (See Servicing on Page 60-20-2.)

Turn the lights on (if equipped) or discharge the battery.

Use an induction meter and loop it around the positive wires (Item 1) **[Figure 60-30-6]** at the alternator.

Start the engine and run at full RPM.

The ammeter reading should be be tween 35 and 40 amps.

If the ammeter reading is less than 35 amps do the full field test.

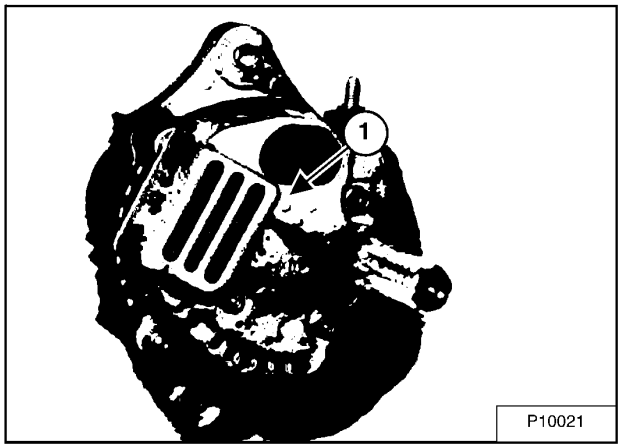
⚠ WARNING

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

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Full Field Test

Figure 60-30-7



Start the engine and run at full RPM.

Place a small screw driver in the test port (Item 1) **[Figure 60-30-7]** to provide a ground to the alternator case. This will give maximum amperage output from the alternator.

NOTE: The Full Field Test should only last long enough to get ammeter reading to prevent damage to the alternator.

The ammeter reading should be above 35 amps.

If the amm eter reading is low, repair or replace the alternator.

⚠ WARNING

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

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ALTERNATOR (CONT'D)

Alternator Regulator Test

Turn the lights (if equipped) on for 5-10 minutes or discharge the battery in a similar method to remove the surface charge in the battery.

⚠ WARNING

When the engine is running during service, the steering lever and hydraulic control levers must be in neutral and the parking brake engaged.

W-2484-1003

Start the engine and run at full RPM.

The ammeter reading should be around 35 amps and slowly decrease with alternator output.

If ammeter reading is low or does not decrease with time, replace the alternator's regulator.

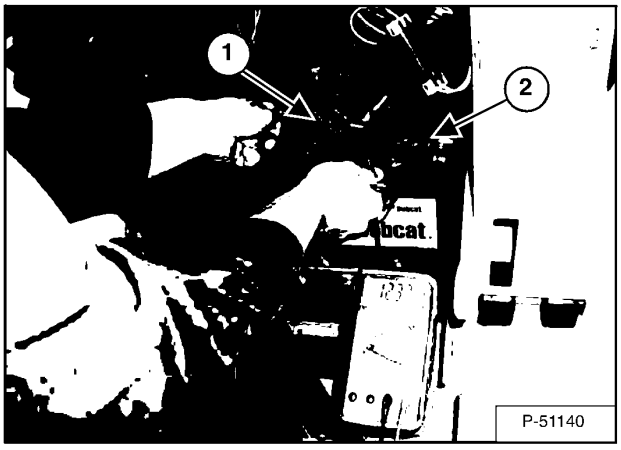
Disconnect the negative (-) cable from the battery.

Reconnect the alternator wires.

Reconnect the negative (-) cable from the battery.

Alternator Regulator Test Using Voltmeter

Figure 60-30-8



Connect the positive (+) voltmeter lead to the positive (+) battery terminal (Item 1) **[Figure 60-30-8]**.

Connect the negative (-) voltmeter lead to the negative (-) battery terminal (Item 2) **[Figure 60-30-8]**.

⚠ WARNING

When the engine is running during service, the steering lever and hydraulic control levers must be in neutral and the parking brake engaged.

W-2484-1003

Start the engine and run at full RPM.

The voltmeter should read between 13.9 and 14.7 volts.

If the voltmeter reading is not within this range, replace the alternator's regulator.

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STARTER

Removal And Installation

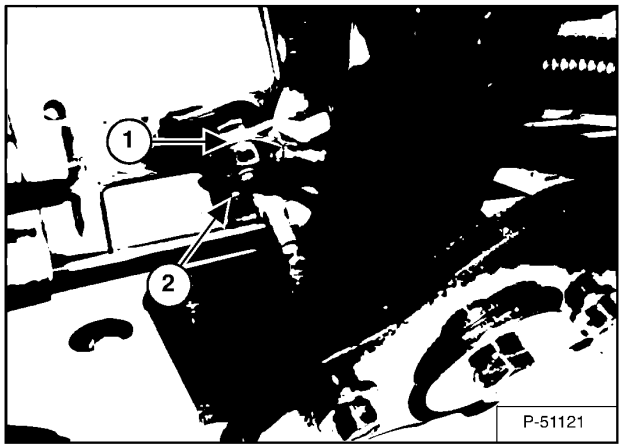
Raise the loader and put on jackstands. (See LIFTING AND BLOCKING THE LOADER on Page 10-10-1.)

Remove the lower access panel on the bottom of the loader. (See Removal and Installation on Page 50-90-1.)

Raise the hood.

Remove the negative battery cable from the battery.

Figure 60-40-1



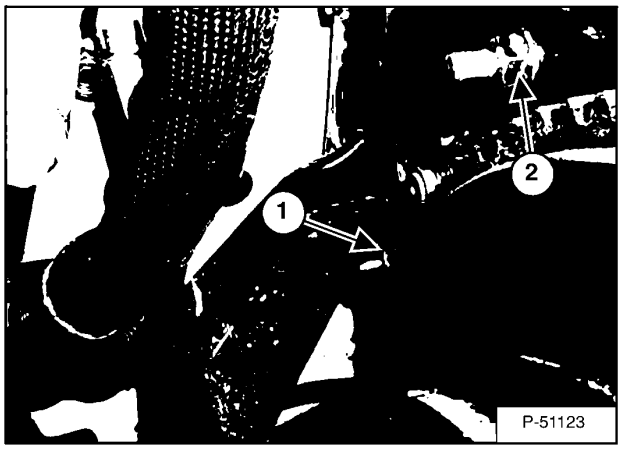
Remove the positive (+) battery cable (Item 1) **[Figure 60-40-1]** from the starter.

Remove the wire (Item 2) **[Figure 60-40-1]** from the (S) terminal on the starter.

Figure 60-40-2



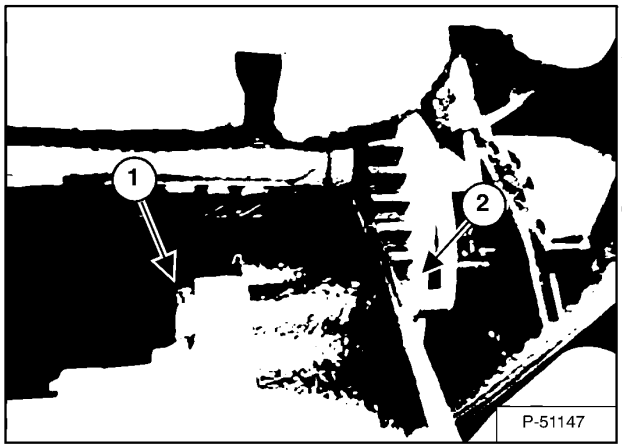
Figure 60-40-3



Remove the bolt (Item 1) **[Figure 60-40-2]** and locknut (Item 1) **[Figure 60-40-3]** from the starter.

NOTE: An assistant may be necessary to hold the locknut from the top while the bolt is loosened from the bottom of the loader.

Figure 60-40-4



Remove the top starter mounting bolt (Item 1) **[Figure 60-40-4]** and locknut (Item 2) **[Figure 60-40-3]** and **[Figure 60-40-4]**.

NOTE: Always use new locknuts

Remove the starter from the loader.

Reverse the removal procedure to install the starter.

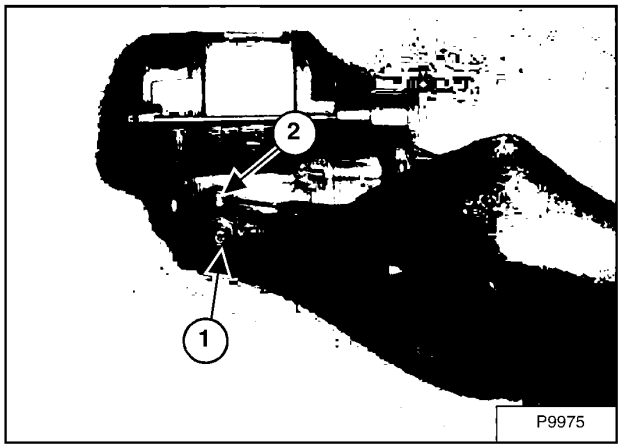
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STARTER (CONT'D)

Checking The Starter In The Loader

Figure 60-40-5



NOTE: The starter is removed from the loader for clarity.

⚠ WARNING

When the engine is running during service, the steering lever and hydraulic control levers must be in neutral and the parking brake engaged.

W-2484-1003

The key switch must be in the OFF position.

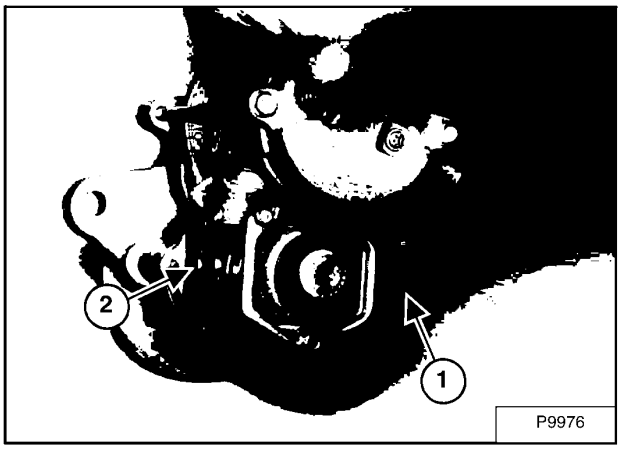
The battery must be at full charge.

The cable connections on the battery must be clean and tight.

Connect a jumper wire between battery terminal (Item 1) and the solenoid terminal (Item 2) **[Figure 60-40-5]**.

If the starter turns but does not turn the engine, the starter drive has a defect.

Figure 60-40-6



Connect a jumper wire **(of at least 4 gauge in size)** between the battery terminal (Item 1) and the motor terminal (Item 2) **[Figure 60-40-6]**.

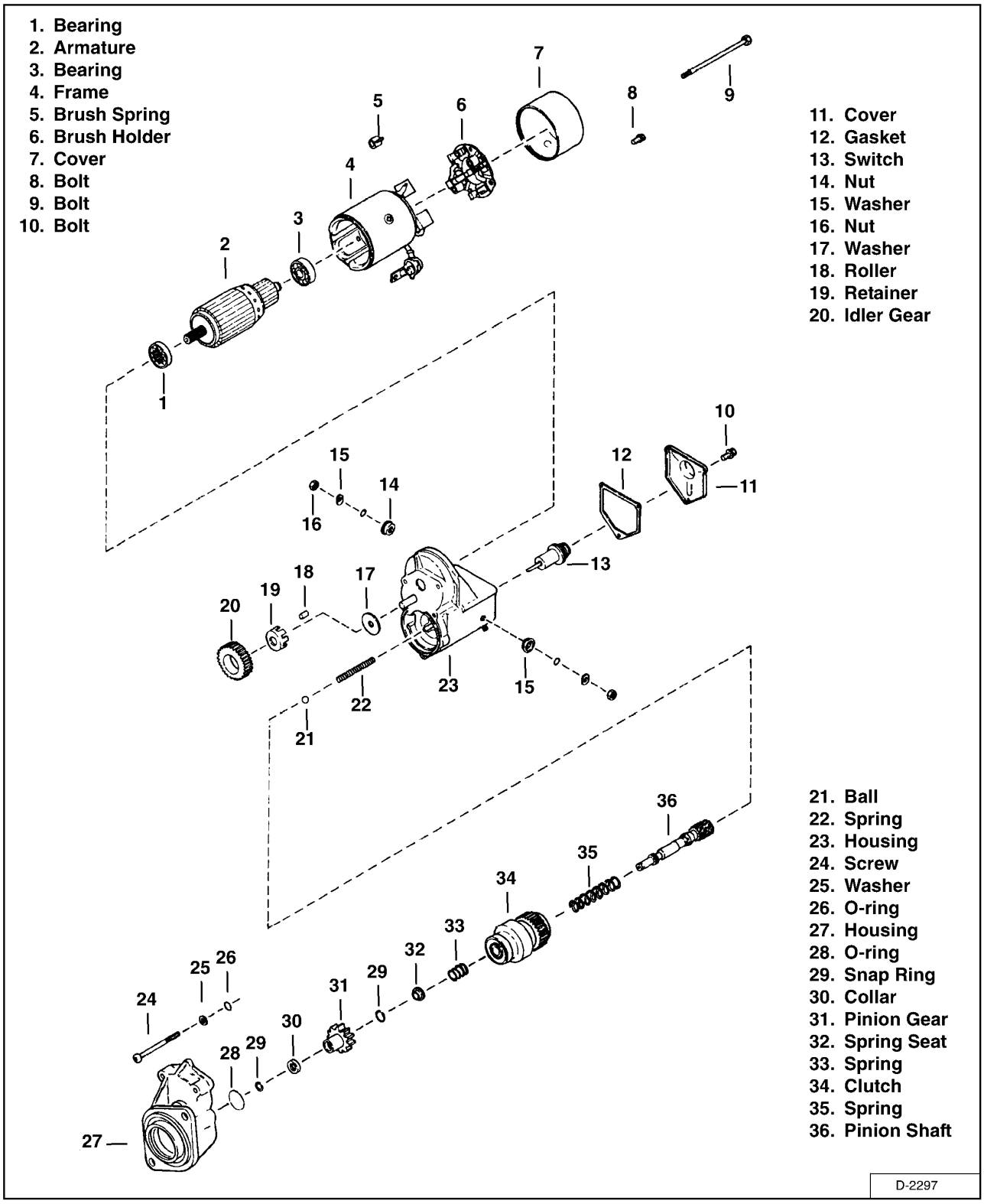
If the starter turns, the defect is in the solenoid.

If the starter does not turn, the starter is defective.

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Parts Identification

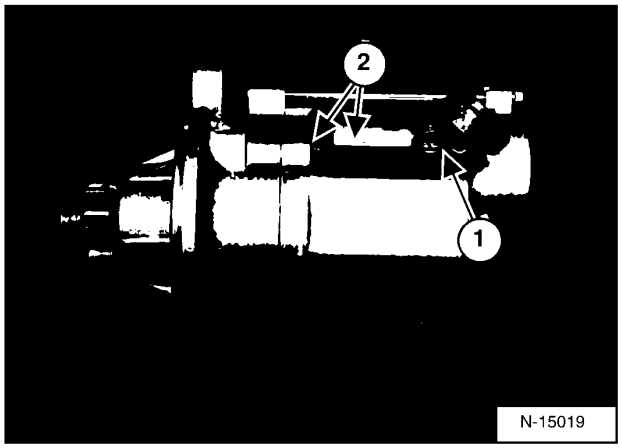


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Disassembly

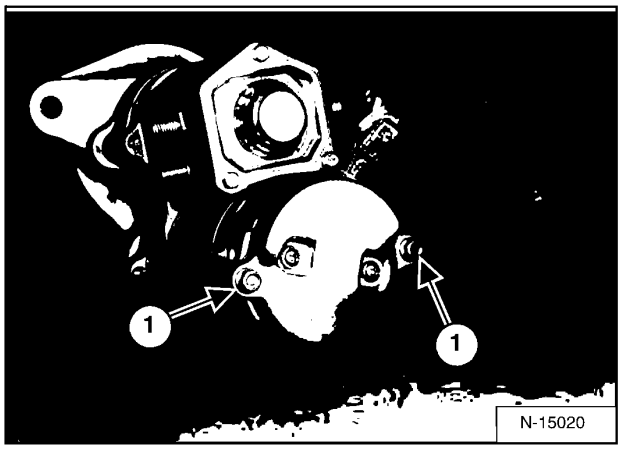
Figure 60-40-7



Remove the cable (Item 1) **[Figure 60-40-7]** from the magnetic switch.

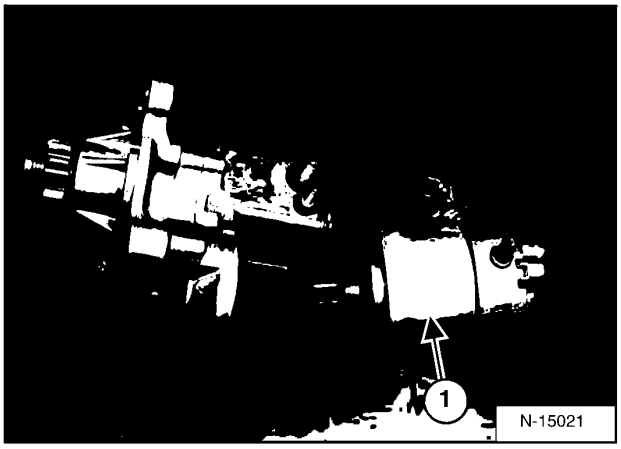
Mark the frame and magnetic switch (Item 2) **[Figure 60-40-7]** for ease of assembly.

Figure 60-40-8



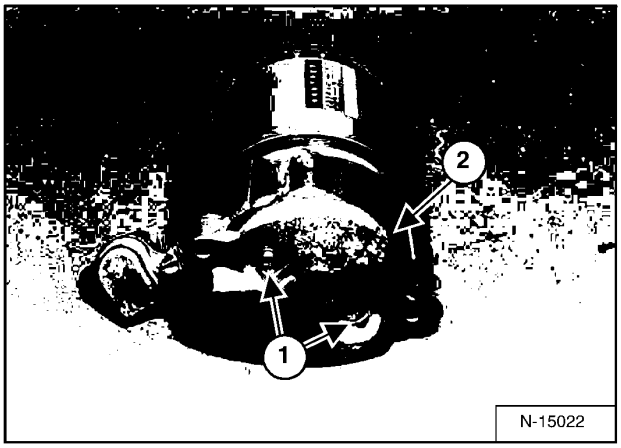
Remove the bolts (Item 1) **[Figure 60-40-8]**.

Figure 60-40-9



Remove the frame (Item 1) **[Figure 60-40-9]** from the magnetic switch.

Figure 60-40-10



Remove the screws (Item 1) from the brush cover (Item 2) **[Figure 60-40-10]**.

Remove the cover (Item 2) **[Figure 60-40-10]**.

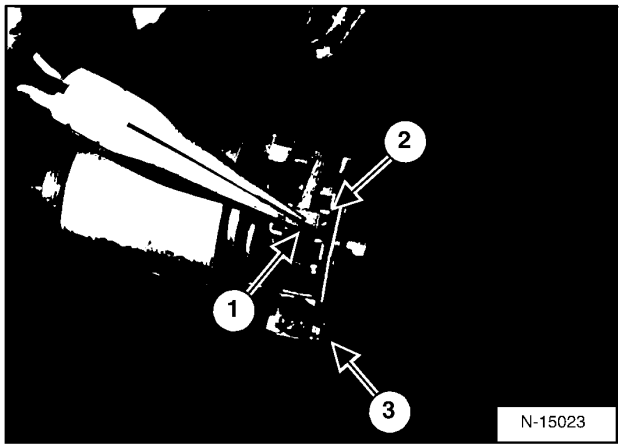
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STARTER (CONT'D)

Disassembly (Cont'd)

Figure 60-40-11

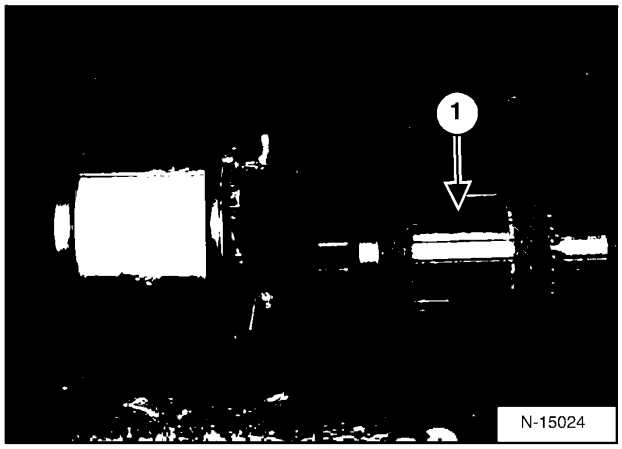


Using a n eedle nose pliers, pull the brush springs (Item 1) back and remove the brushes (Item 2) **[Figure 60-40-11]**.

NOTE: The brushes are non-replaceable, If the brushes are worn order a new brush holder (for the negative brushes) and yolk (for the positive brushes).

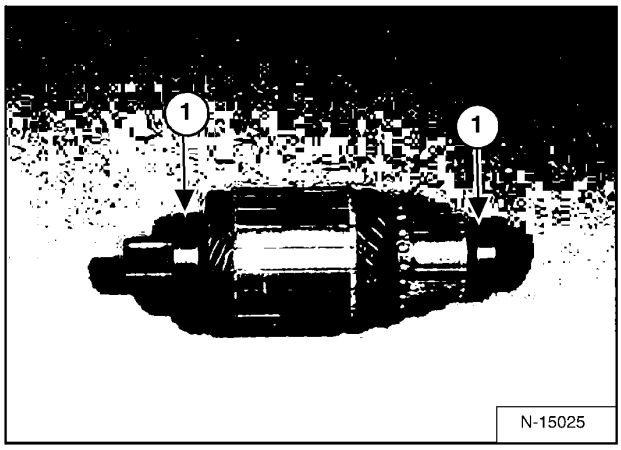
Remove the brush holder (Item 3) **[Figure 60-40-11]** from the end of the armature.

Figure 60-40-12



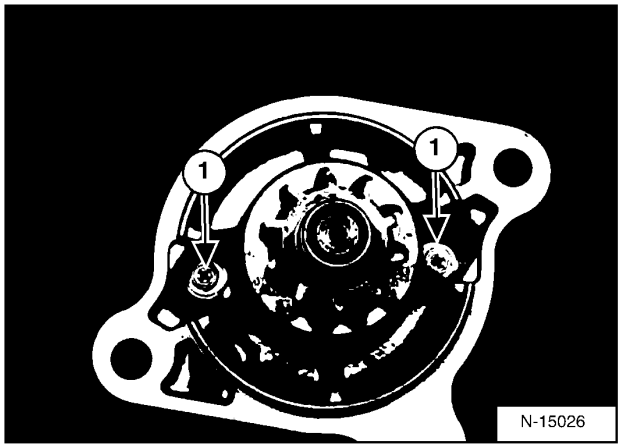
Remove the armature (Item 1) **[Figure 60-40-12]** from the frame.

Figure 60-40-13



Remove the bearings (Item 1) **[Figure 60-40-13]** from both ends of the armature.

Figure 60-40-14



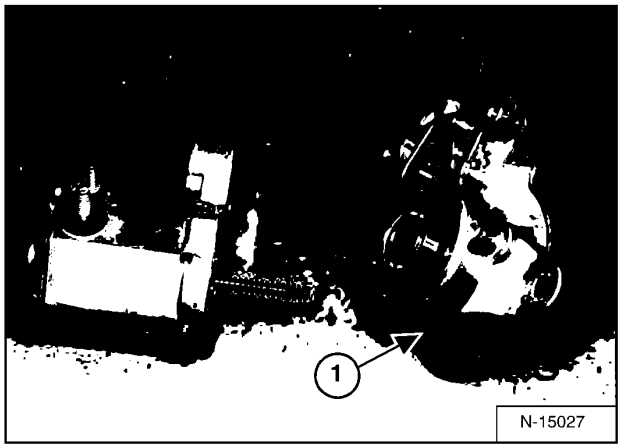
Remove the bolts (Item 1) **[Figure 60-40-14]** from the starter housing.

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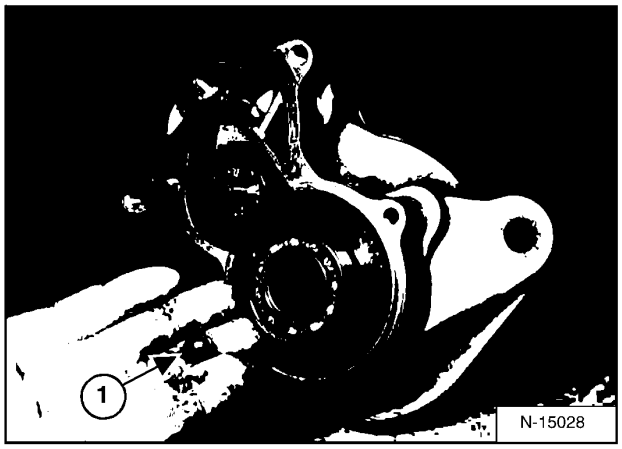
Disassembly (Cont'd)

Figure 60-40-15



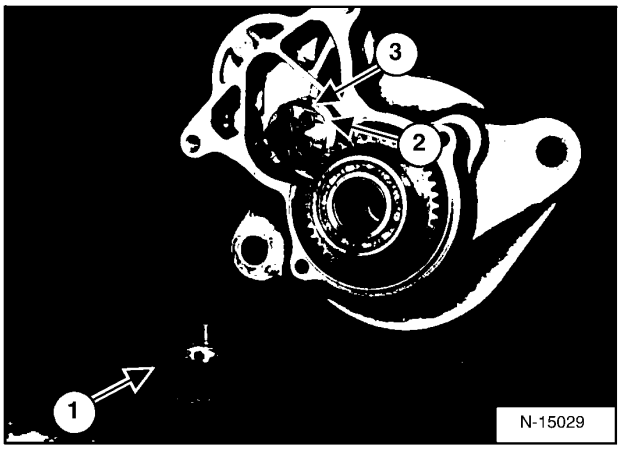
Remove the starter housing (Item 1) **[Figure 60-40-15]** from the magnetic switch housing.

Figure 60-40-16



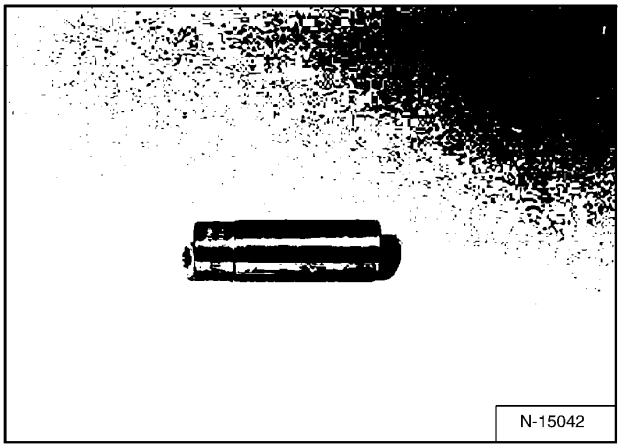
Remove the ball (Item 1) **[Figure 60-40-16]** from the pinion shaft.

Figure 60-40-17



Remove the idler gear (Item 1), rollers (Item 2) and retainer (Item 3) **[Figure 60-40-17]**.

Figure 60-40-18



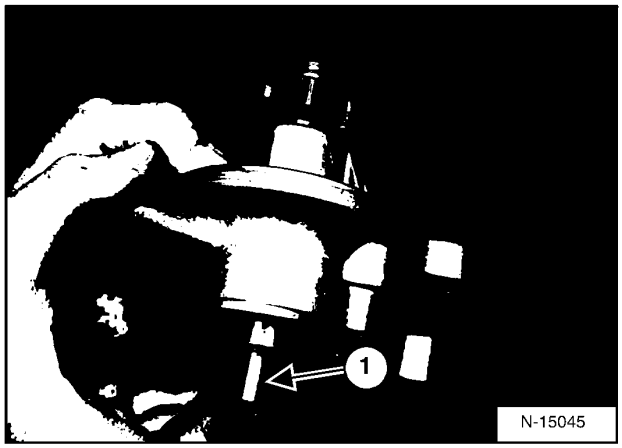
In order to remove the snap ring from the pinion shaft, a tube 0.605 inches (15,4 mm) in diameter by 2.0 inches (50,8 mm) in length is needed **[Figure 60-40-18]**.

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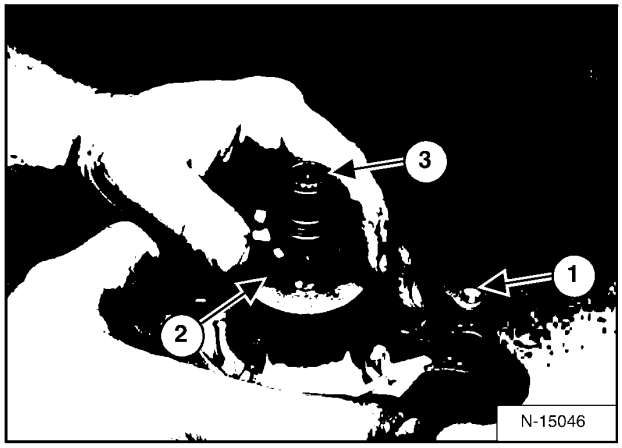
Disassembly (Cont'd)

Figure 60-40-19



Install the tube (Item 1) **[Figure 60-40-19]** in the ov er running clutch.

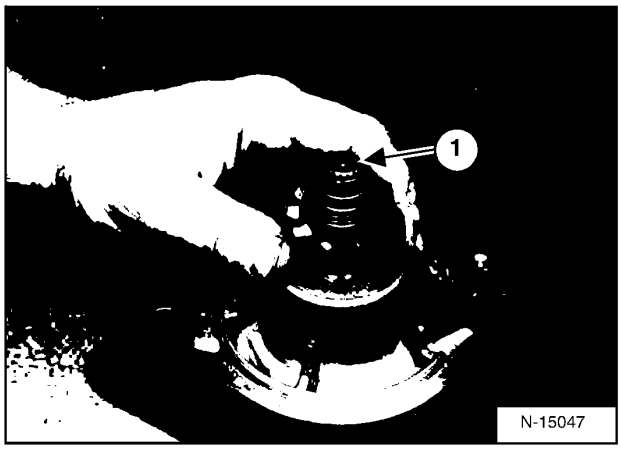
Figure 60-40-20



Press down on the starter carrier (Item 1) to extend the pinion shaft. Press down on the pinion (Item 2) **[Figure 60-40-20]**.

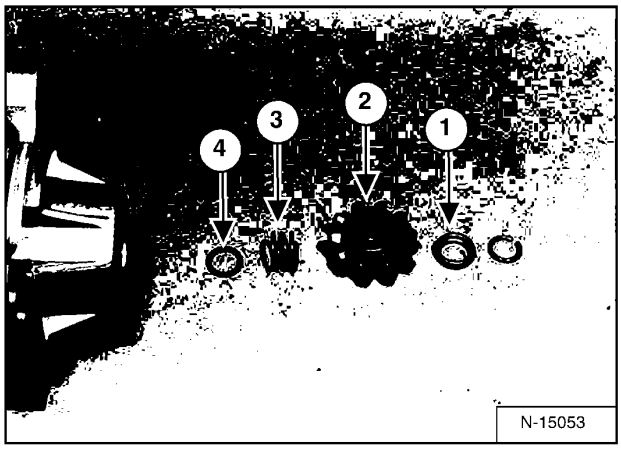
Press the collar (Item 3) **[Figure 60-40-20]** down to gain access to the snap ring.

Figure 60-40-21



Remove the snap ring (Item 1) **[Figure 60-40-21]**.

Figure 60-40-22



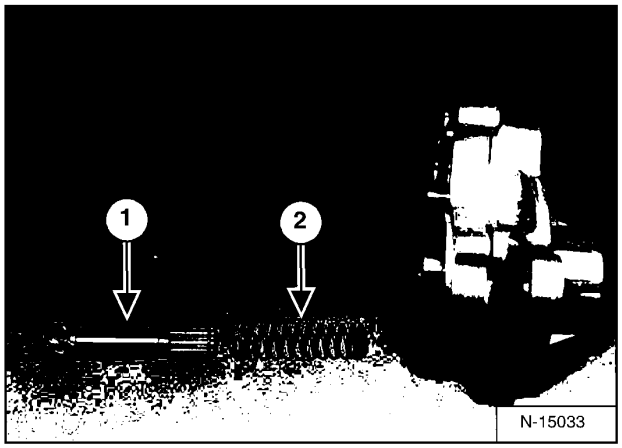
Remove the collar (Item 1), pinion (Item 2), spring (Item 3), and spring seat (Item 4) **[Figure 60-40-22]**.

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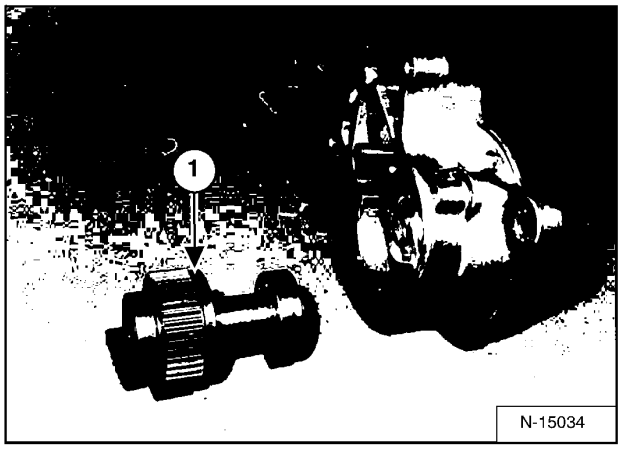
Disassembly (Cont'd)

Figure 60-40-23



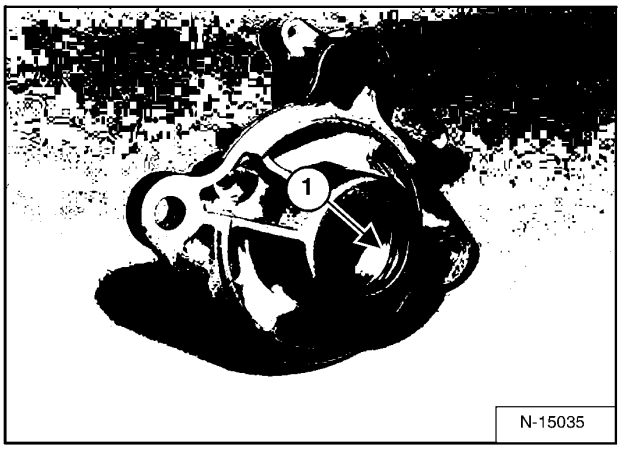
Remove the pinion shaft (Item 1) and spring (Item 2) **[Figure 60-40-23]** from the starter drive.

Figure 60-40-24



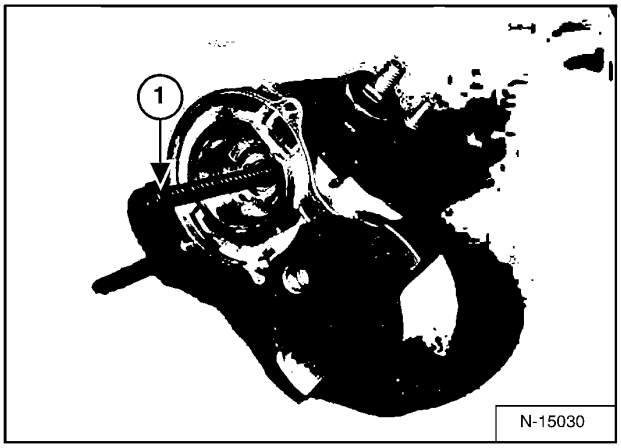
Remove the over running clutch (Item 1) **[Figure 60-40-24]**.

Figure 60-40-25



Remove the O-ring (Item 1) **[Figure 60-40-25]** from the starter housing.

Figure 60-40-26



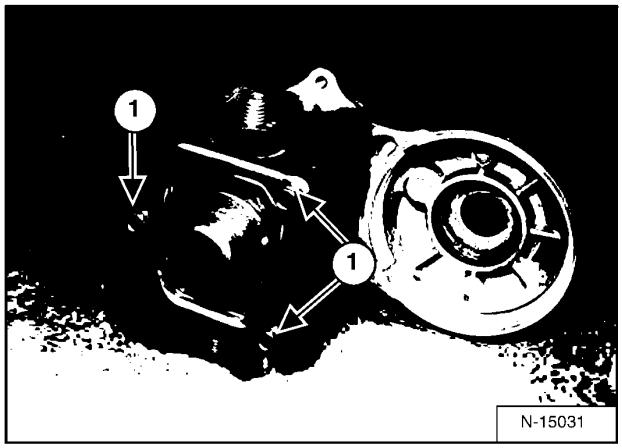
Remove the spring (Item 1) **[Figure 60-40-26]** from the magnetic switch.

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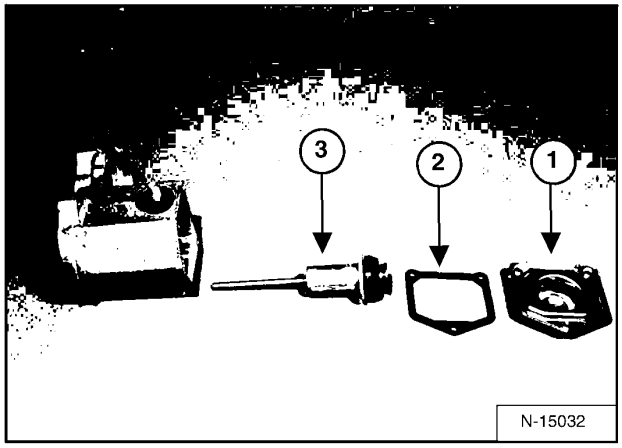
Disassembly (Cont'd)

Figure 60-40-27



Remove the bolts (Item 1) **[Figure 60-40-27]** from the magnetic switch cover.

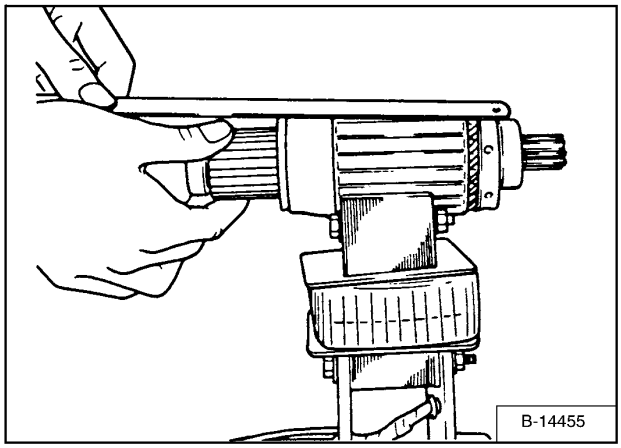
Figure 60-40-28



Remove the cover (Item 1), gasket (Item 2) and switch (Item 3) **[Figure 60-40-28]**.

Inspection And Repair

Figure 60-40-29

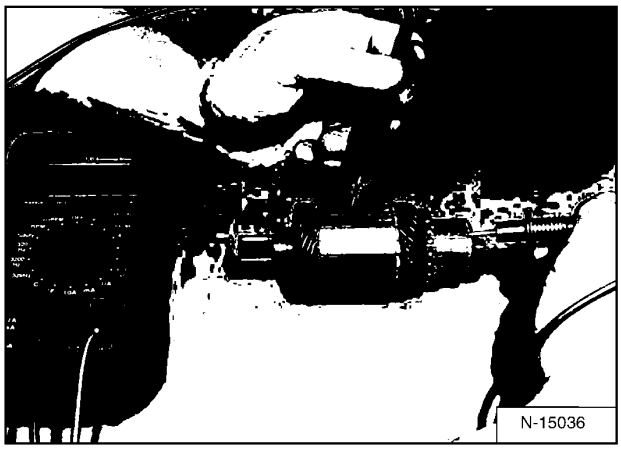


Inspect the brush cover for discoloration, indicating the starter has been overheated.

Inspect the pinion teeth for wear and damage.

Armature Short-Circuit Test: Use a growler tester, put the armature on the growler and hold a hack saw blade against the armature core while slowly rotating the armature **[Figure 60-40-29]**. A short circuited armature causes the blade to vibrate and be attracted to the core. An armature which is short-circuited must be replaced.

Figure 60-40-30



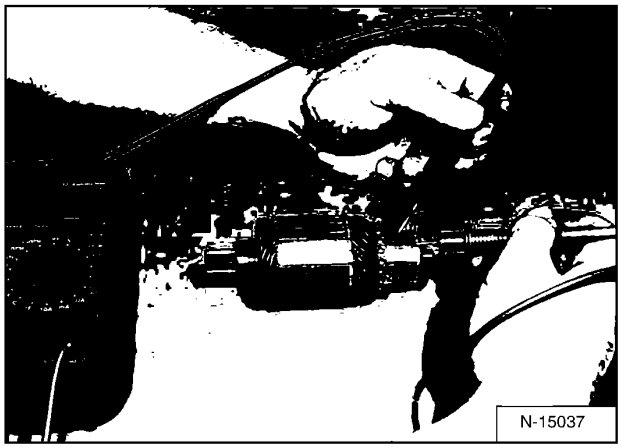
Armature Winding Ground Test: Use a circuit tester, touch one probe to a commutator segment and the other probe to the armature core **[Figure 60-40-30]**. There should be no continuity. If there is continuity, the armature is grounded and must be replaced.

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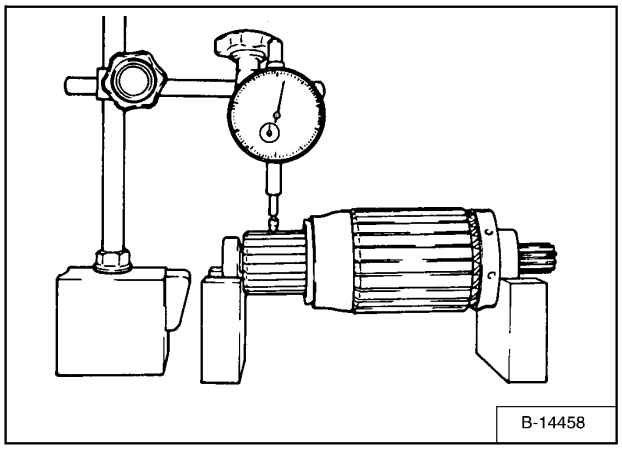
Inspection And Repair (Cont'd)

Figure 60-40-31



Armature Winding Continuity Test: Use a c ircuit tester, touch the probes to two commutator segments **[Figure 60-40-31]**. There must be continuity at any point. If there is no continuity, the winding is open-circuited, replace the armature.

Figure 60-40-32

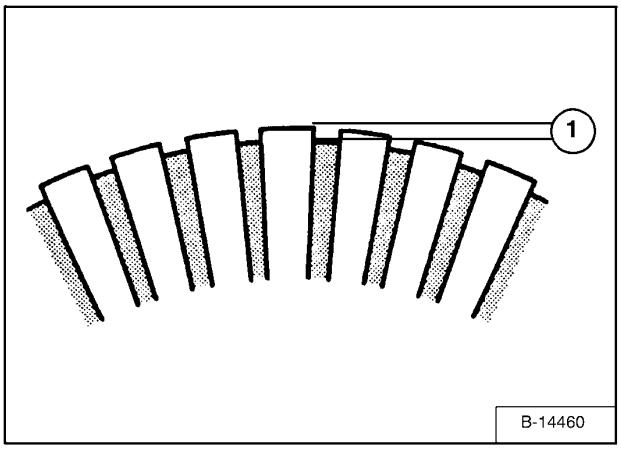


Commutator Run-Out Test: Check the commutator run-out as shown in **[Figure 60-40-32]**.

Service Limit - 0.020 inch (0,4 mm)

If the commutator exceeds the service limit, repair as needed.

Figure 60-40-33



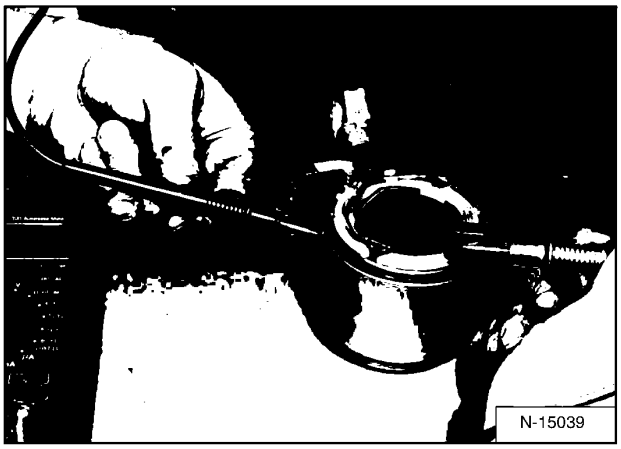
Measure the segment mica depth (Item 1) **[Figure 60-40-33]**.

Service Limit - 0.008 inch (0,2 mm)

If it is worn, replace the armature.

Check the commutator surface for burned spots which usually indicates an open -circuit, and c orrect it us ing #400 sand paper.

Figure 60-40-34



Check the field windings for wear and damage.

Check all the connections for clean and tight solder joints.

Field Winding Ground Test: Use a circuit tester, touch one probe to the field winding end of the brush and the other probe to the surface of the frame **[Figure 60-40-34]**. There should be no continuity. If there is continuity, the field windings are grounded.

Replace the field windings.

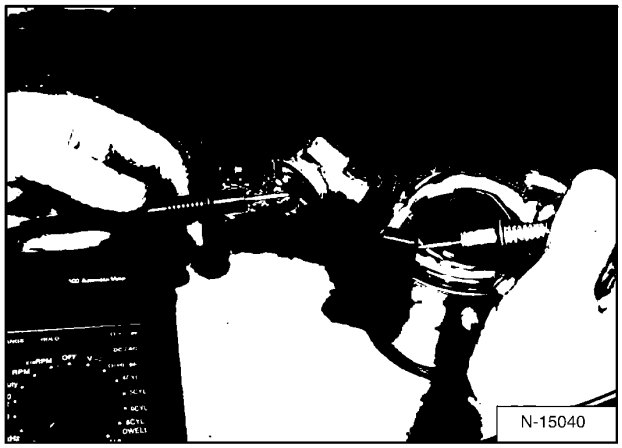
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Inspection And Repair (Cont'd)

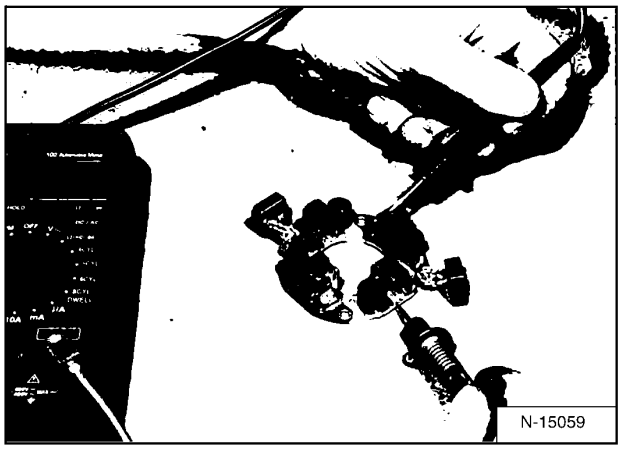
Figure 60-40-35



Field Windings Continuity Test: Use a circuit tester, touch one probe to the wire and the other probe to the brush **[Figure 60-40-35]**. There must be continuity. If there is no continuity, the field windings are open-circuited. Replace the yoke if the field windings have an open circuit.

Inspect the brushes for wear and damage.

Figure 60-40-36

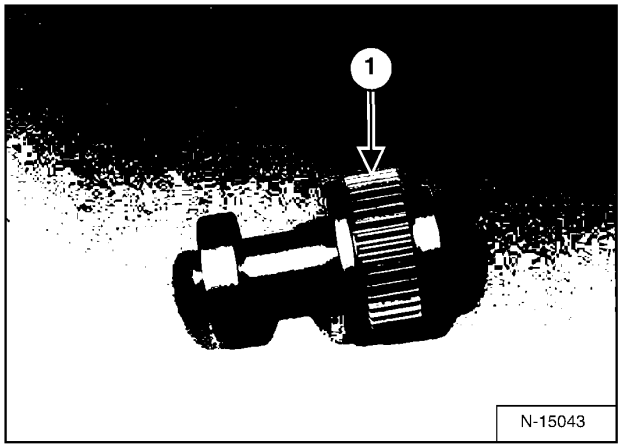


Replace the brush holder or yoke assembly if the brushes are worn or damaged.

Check brush springs, for damage or rust. Replace as needed.

Brush Holder Insulation Test: Use a circuit tester, touch one probe to the positive brush holder plate and the other probe to the holder plate **[Figure 60-40-36]**. There should be no continuity. If there is continuity, replace or repair.

Figure 60-40-37



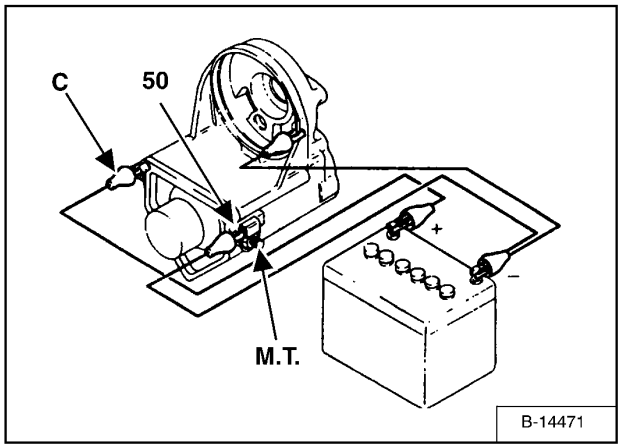
Inspect the over running clutch (Item 1) **[Figure 60-40-37]**, it must rotate freely in the direction of the starter rotation and lock in the opposite rotation.

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Inspection And Repair (Cont'd)

Figure 60-40-38



The following tests should be done without the armature assembly.

M.T. ..... Main Terminal to which the main cable from the battery is connected.

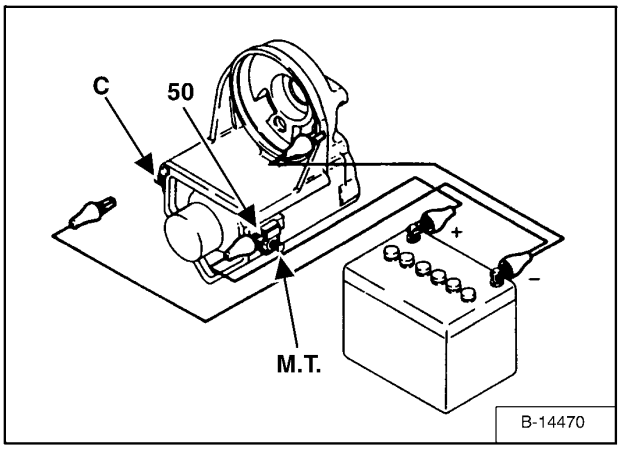
C ..... C-Terminal to which the wire from the field windings is connected.

50 ..... 50-Terminal to which the wire from the starting switch or stator relay is connected.

NOTE: Each test should be performed a short time (3 to 5 seconds) to prevent the magnetic switch winding from burning. Each test should be performed with 12 volts.

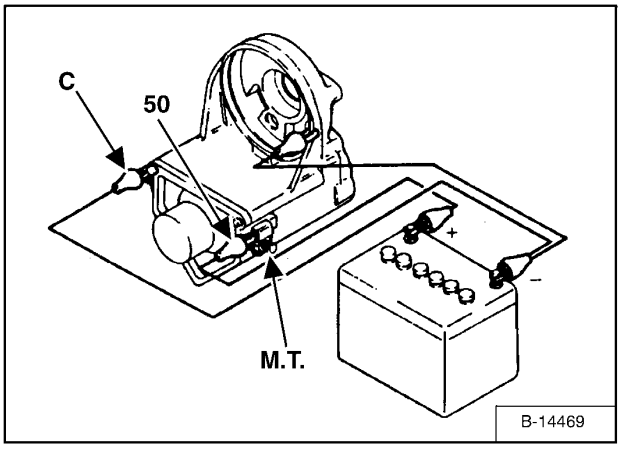
Pull-In Test: Connect the wires as shown in **[Figure 60-40-38]**. When connecting Terminal C and M.T. are closed, the pinion should engage.

Figure 60-40-39



Hold-In Test: With the same conditions as in the pull-in test, open the connecting Terminal C **[Figure 60-40-39]**. The pinion should remain in the engaged position.

Figure 60-40-40



Return Test: With the same conditions as in the hold-in test, open the connecting Terminal 50 **[Figure 60-40-40]**. The pinion should return immediately.

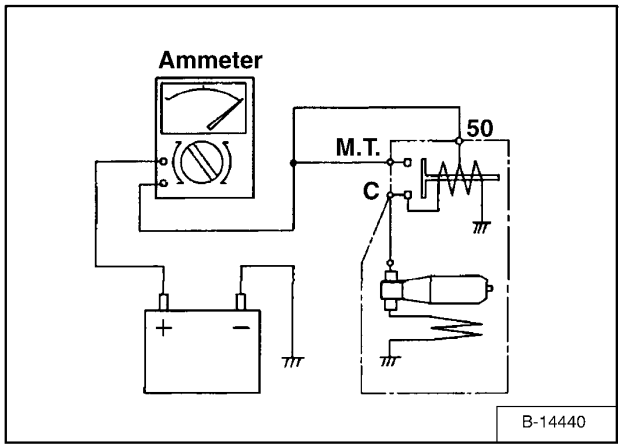
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STARTER (CONT'D)

No Load Test

Figure 60-40-41



The following test should be done after reassembling the starter:

Clamp the starter in a vise. Using a 12 volt battery and ammeter, connect the positive wire of the battery, and the ammeter to the 50 terminal **[Figure 60-40-41]**. Connect the negative wire to the starter body. Using a jumper wire, connect the 50 terminal to the main terminal.

The starter should show smooth and steady rotation immediately after the pinion is engaged, it should draw less than the specified current.

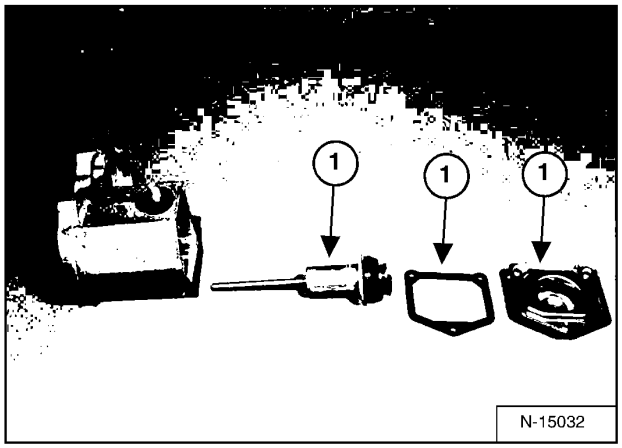
Service Limit - 220 Amp. Maximum Draw

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Assembly

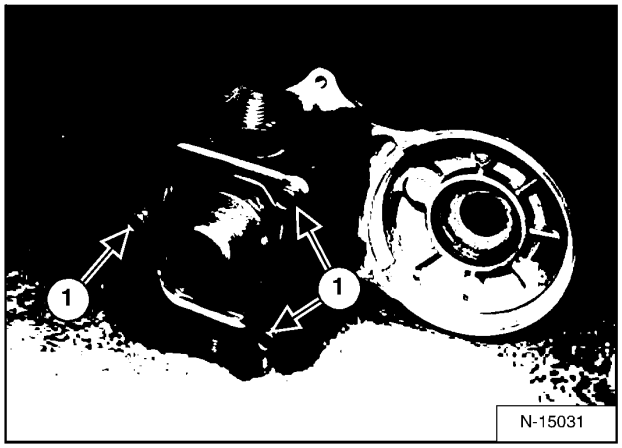
Figure 60-40-42



Clean all parts and apply high temperature grease to the armature bearing, return spring, steel ball, over running clutch, and idler gear rollers.

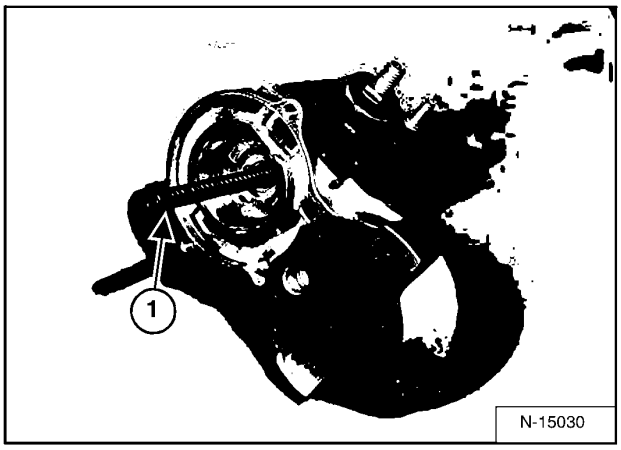
Install the switch plunger (Item 1), gasket (Item 2) and cover (Item 3) **[Figure 60-40-42]** on the switch housing.

Figure 60-40-43



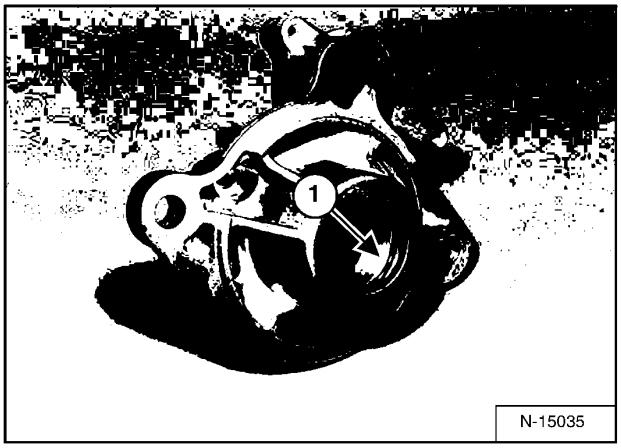
Install the bolts (Item 1) **[Figure 60-40-43]**.

Figure 60-40-44



Install the spring (Item 1) **[Figure 60-40-44]** on the magnetic switch.

Figure 60-40-45



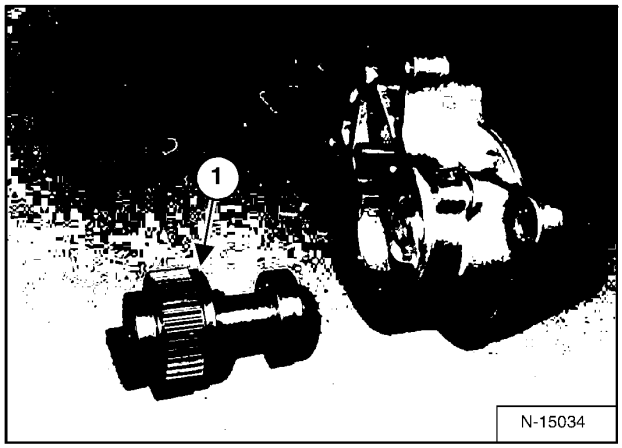
Install the O-ring (Item 1) **[Figure 60-40-45]** in the starter housing.

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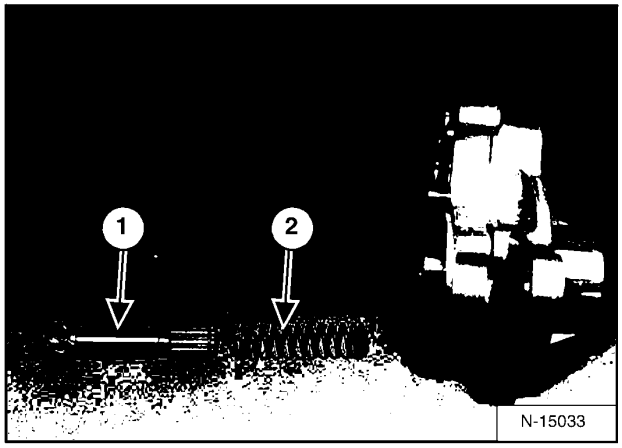
Assembly (Cont'd)

Figure 60-40-46



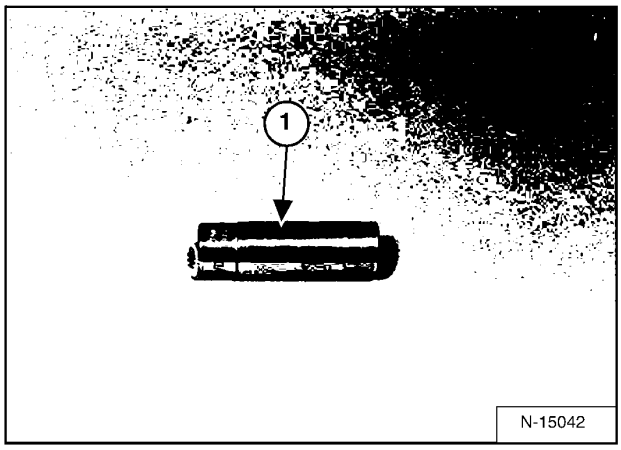
Install the over running clutch (Item 1) **[Figure 60-40-46]** in the starter housing.

Figure 60-40-47



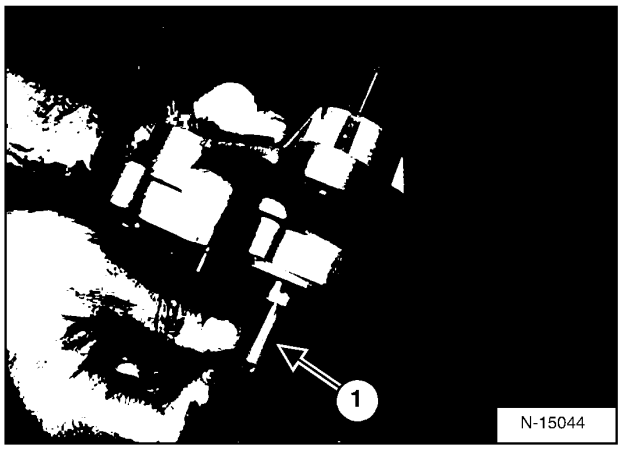
Install the s pring (Item 1) and pinion shaft (Item 2) **[Figure 60-40-47]** in the over running clutch.

Figure 60-40-48



In order to install the pinion and snap ring on the pinion shaft, a tube (Item 1) **[Figure 60-40-48]** 0.605 inch (15,4 mm) in diameter by 2.0 inches (50,8 mm) in length is needed.

Figure 60-40-49



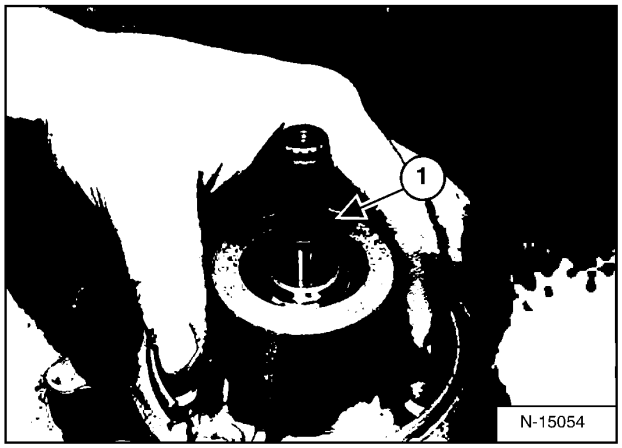
Install the tube (Item 1) **[Figure 60-40-49]** in the ov er running clutch.

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Assembly (Cont'd)

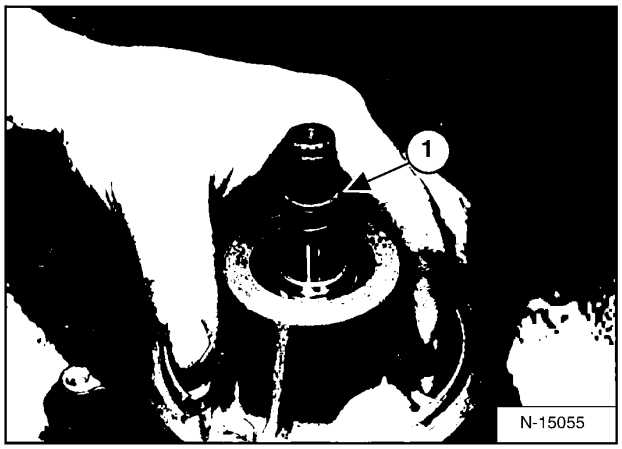
Figure 60-40-50



Place the starter drive on the bench, and press down on the starter drive housing.

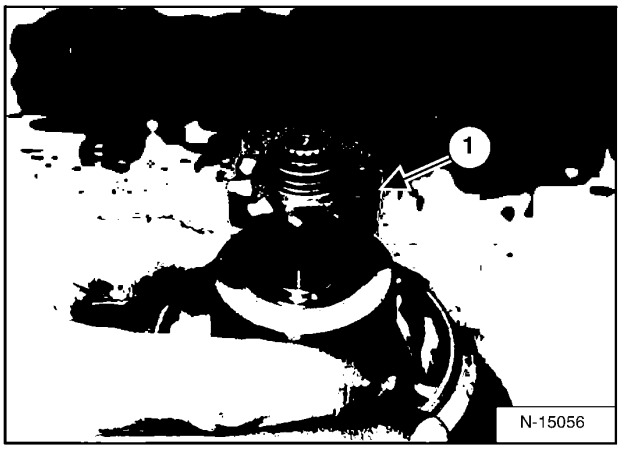
Install the spring seat (Item 1) **[Figure 60-40-50]** on the pinion shaft.

Figure 60-40-51



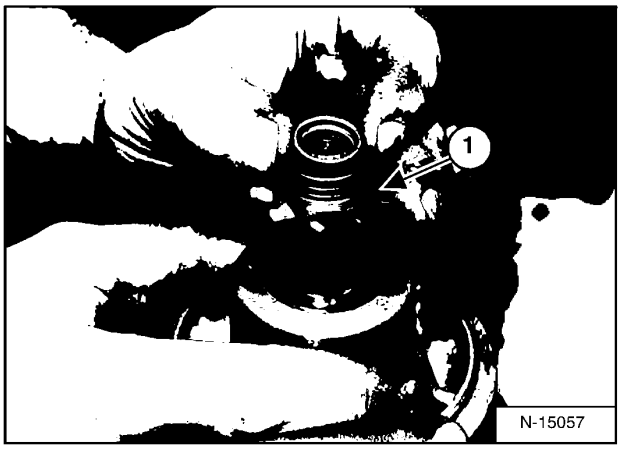
Install the spring (Item 1) **[Figure 60-40-51]**.

Figure 60-40-52



Install the pinion (Item 1) **[Figure 60-40-52]**.

Figure 60-40-53



Install the collar (Item 1) **[Figure 60-40-53]**.

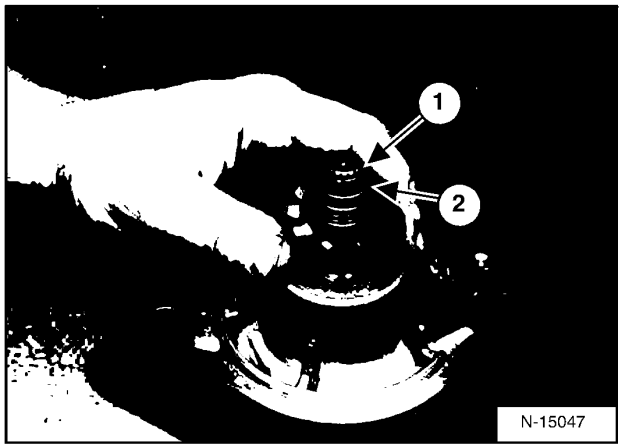
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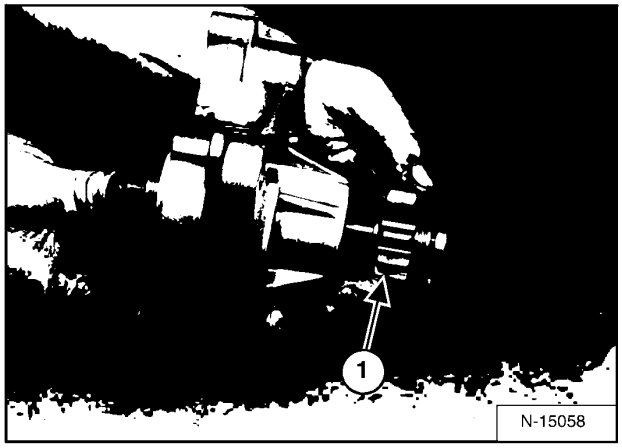
Assembly (Cont'd)

Figure 60-40-54



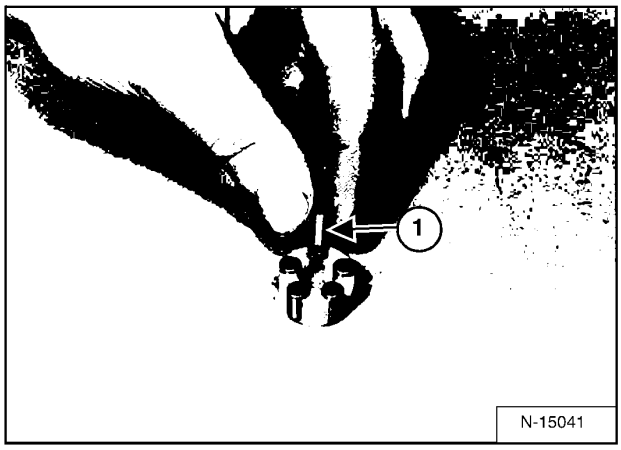
Install the sn ap ring (Item 1). Pull the collar (Item 2) **[Figure 60-40-54]** over the snap ring.

Figure 60-40-55



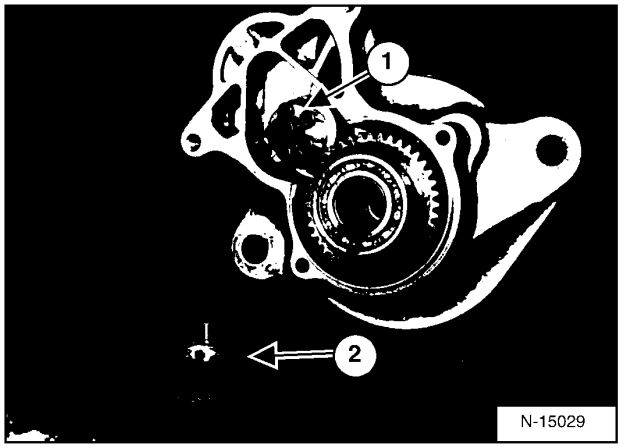
With the pinion shaft extended, extend and release the pinion (Item 1) **[Figure 60-40-55]**. The pinion must return to the fully retracted position.

Figure 60-40-56



Install the rollers (Item 1) **[Figure 60-40-56]** in th e retainer.

Figure 60-40-57



Install the roller/retainer assembly (Item 1) **[Figure 60-40-57]** on the starter housing.

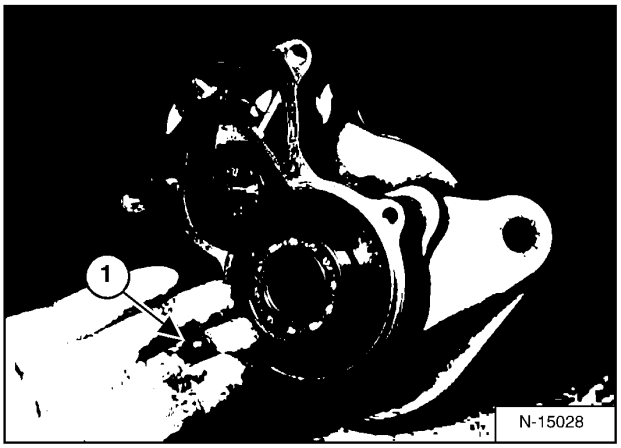
Install the idler gear (Item 2) **[Figure 60-40-57]** over the roller/retainer assembly.

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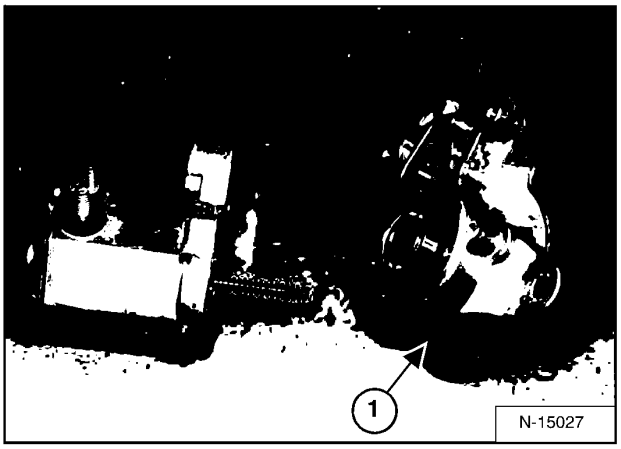
Assembly (Cont'd)

Figure 60-40-58



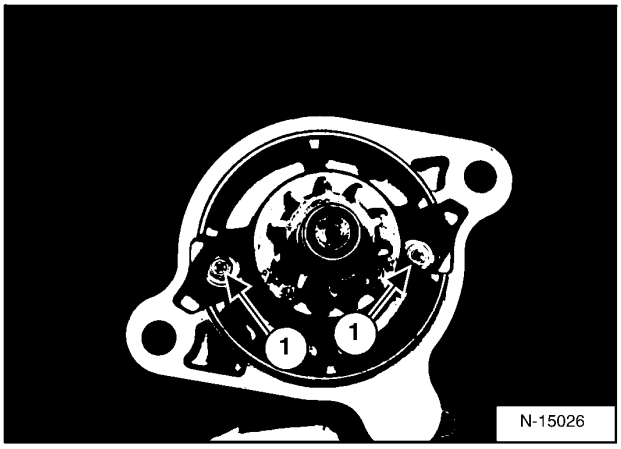
Install the ball (Item 1) **[Figure 60-40-58]** in the pinion shaft.

Figure 60-40-59



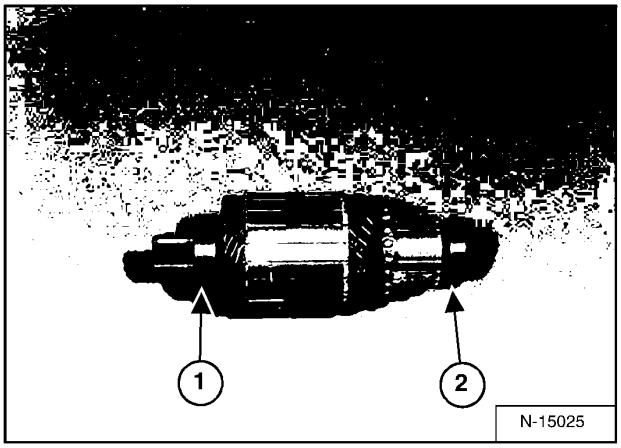
Install the starter drive (Item 1) **[Figure 60-40-59]** on the magnetic switch.

Figure 60-40-60



Install the two bolts (Item 1) **[Figure 60-40-60]**. Tighten the bolts to 60-104 in.-lbs. (7-12 N•m) torque.

Figure 60-40-61



Install the bearings (Items 1 & 2) **[Figure 60-40-61]** on both ends of the armature.

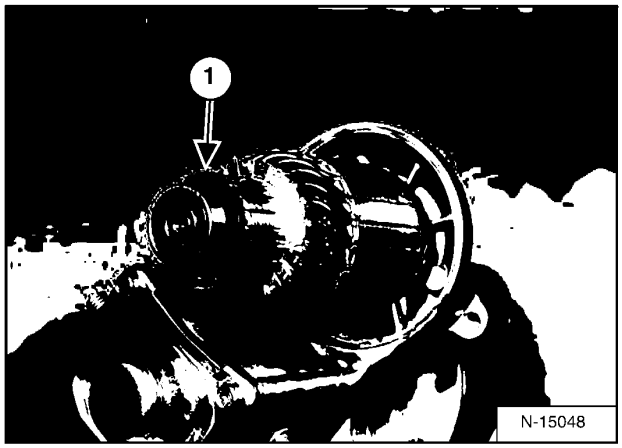
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STARTER (CONT'D)

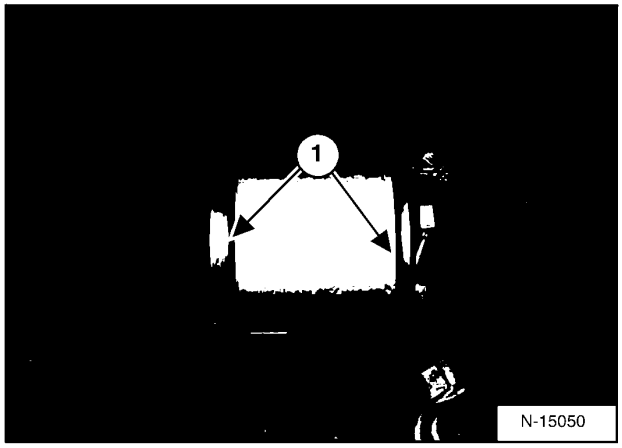
Assembly (Cont'd)

Figure 60-40-62



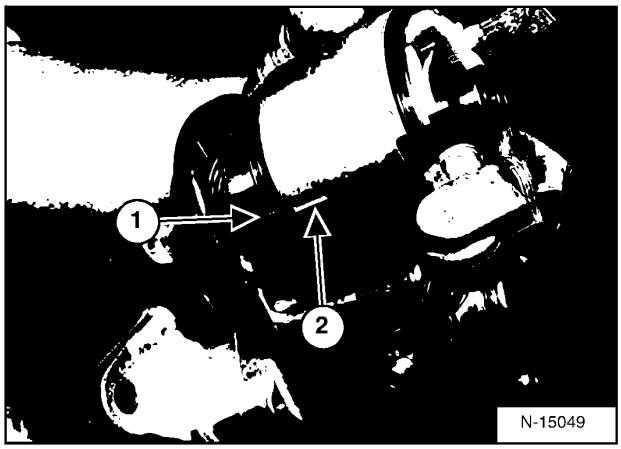
Install the ar mature (Item 1) **[Figure 60-40-62]** in the magnetic switch housing.

Figure 60-40-63



Install the new O -rings (Item 1) **[Figure 60-40-63]** on both ends of the frame.

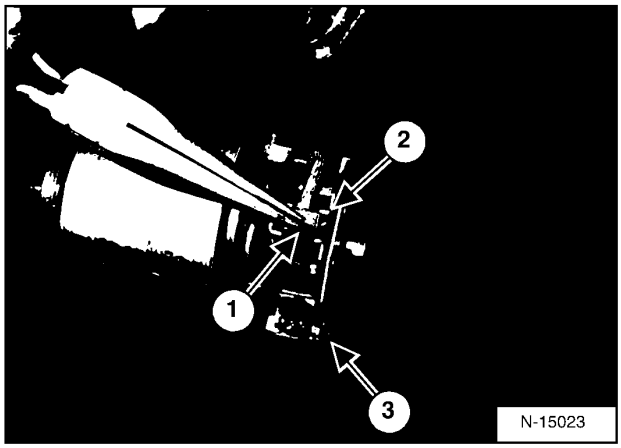
Figure 60-40-64



Install the fr ame (Item 1) **[Figure 60-40-64]** over the armature.

NOTE: Make sure the tab (Item 2) [Figure 60-40-64] on the frame is aligned with t he slot in the magnetic switch housing.

Figure 60-40-65



Install the brush holder (Item 1) **[Figure 60-40-65]** on the armature.

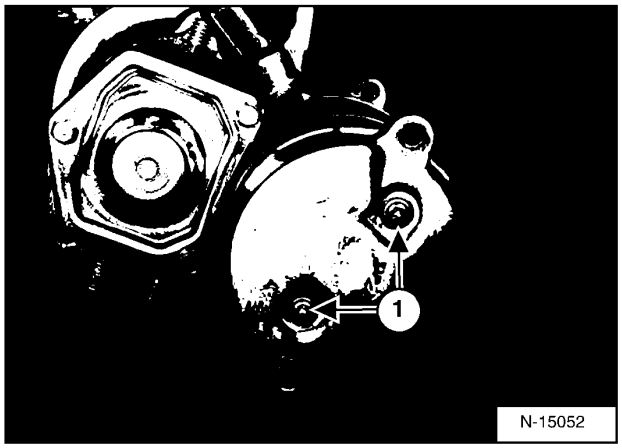
Using a needle nose pliers, pull the spring (Item 2) back and install the brushes (Item 3) **[Figure 60-40-65]**.

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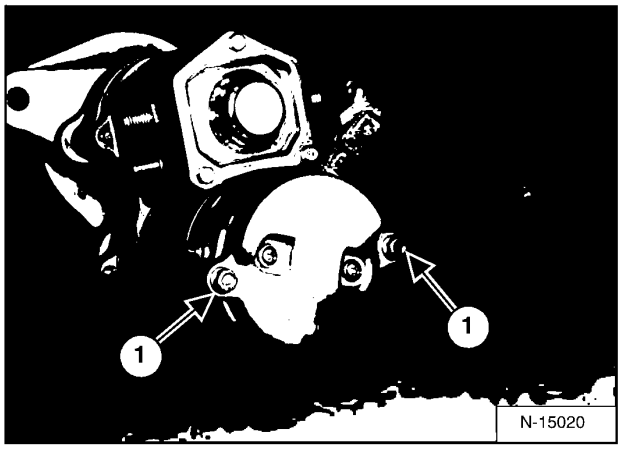
Assembly (Cont'd)

Figure 60-40-66



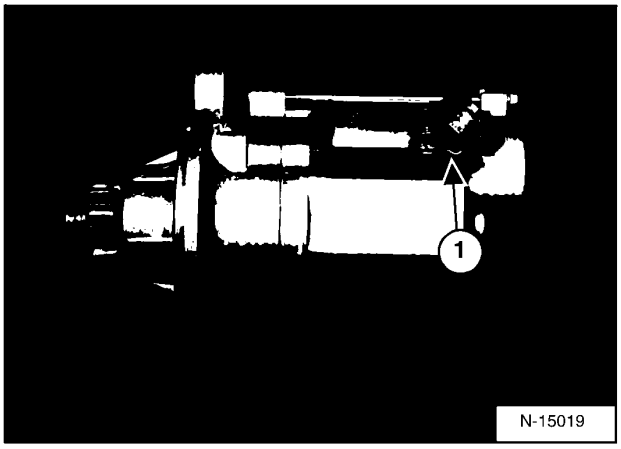
Install the brush cover and screws (Item 1) **[Figure 60-40-66]**.

Figure 60-40-67



Install the thru bolts (Item 1) **[Figure 60-40-67]**. Tighten the bolts to 60-104 in.-lbs. (7-12 N•m) torque.

Figure 60-40-68



Install the cable (Item 1) **[Figure 60-40-68]** on th e terminal. Tighten the terminal nut to 4-7 ft.-lb. (5-9 N•m) torque.

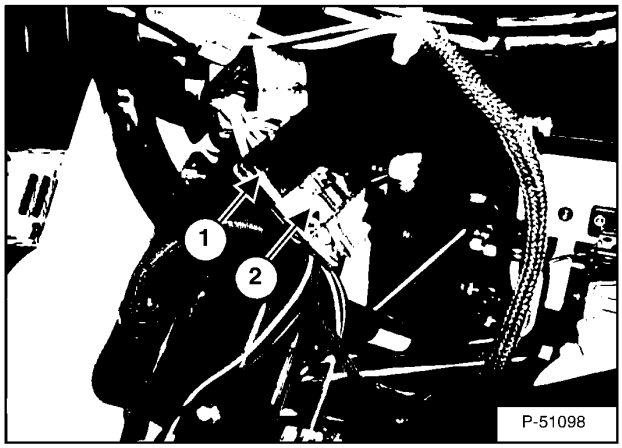
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INSTRUMENT PANEL

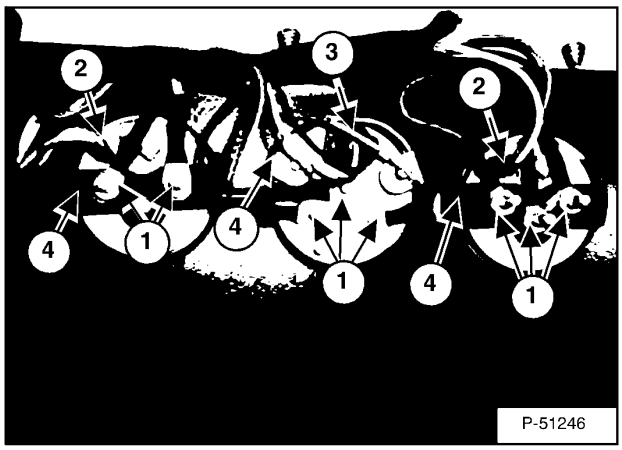
Component Removal And Installation

Figure 60-50-1



Disconnect the instrument harness connector (Item 1) from the main harness connector (Item 2) **[Figure 60-50-1]**.

Figure 60-50-2



Mark all wires for ease of assembly.

Remove the three nuts and wires (Item 1) and remove the remaining wire (Item 2) **[Figure 60-50-2]** from the temperature gauge.

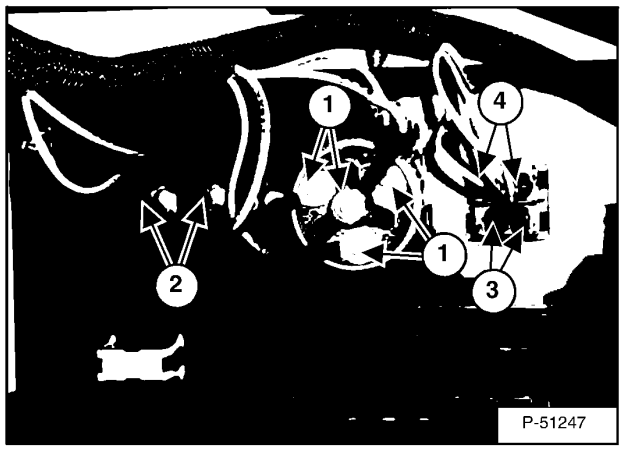
Remove the three nuts and wires (Item 1) and unplug the bulb (Item 3) **[Figure 60-50-2]** from the fuel gauge by rotating and pulling it out.

Remove the two nuts and wires (Item 1) and disconnect the remaining wire (Item 2) **[Figure 60-50-2]** from the voltmeter.

Remove the three retainers (Item 4) **[Figure 60-50-2]** holding the gauges to the instrument panel.

Remove the gauges from the instrument panel.

Figure 60-50-3



Remove the nuts and four wires (Item 1) **[Figure 60-50-3]** from the key switch.

Disconnect the two wires (Item 2) **[Figure 60-50-3]** from the hour meter.

Disconnect the two wires (Item 3) **[Figure 60-50-3]** from the engine temperature warning lite.

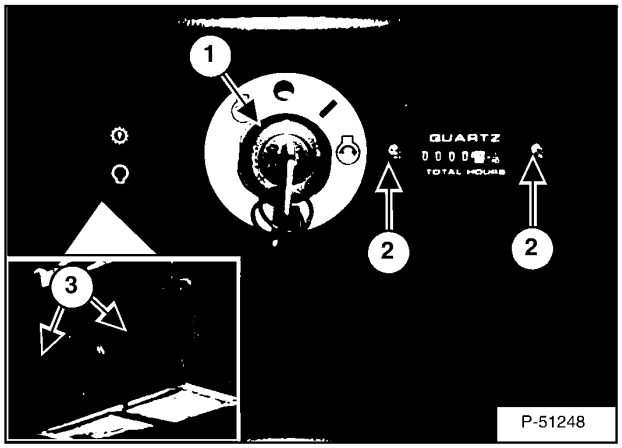
Disconnect the two wires (Item 4) **[Figure 60-50-3]** from the hydraulic temperature warning lite.

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Component Removal And Installation (Cont'd)

Figure 60-50-4



Remove the retainer ring (Item 1) **[Figure 60-50-4]** holding the switch to the panel and remove the switch from the panel.

Remove the bolts, nuts and washers (Item 2) **[Figure 60-50-4]** and remove the hourmeter.

Push the tabs (Item 3) **[Figure 60-50-4]** in and remove the warning lite from the panel.

Reverse the removal procedure on all components to install.

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NEUTRAL START SENSOR

Description

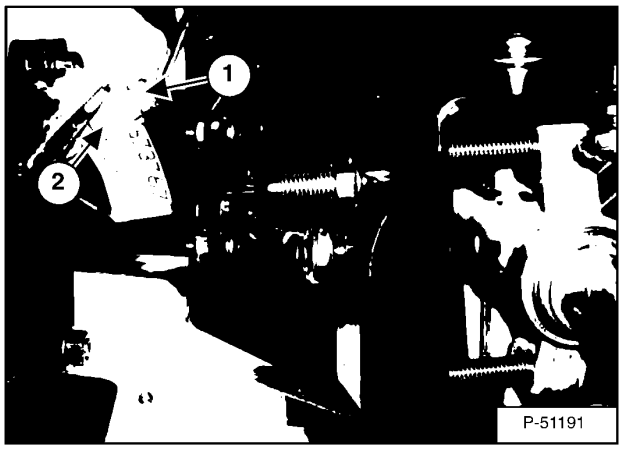
The neutral start sensor allows the machine to be started only when the drive controls are in the neutral position.

Adjustments are made at the drive control linkage for the distance to sensor activation bolt. The neutral start sensor is only adjustable up and down up to .25 inch (6.4 mm).

If a neutral start sensor circuit problem is suspected; check for the proper distance from the sensor to the sensor activation bolt, horizontal alignment of the sensor and alignment bolt or a missing magnet in the end of the sensor activation bolt.

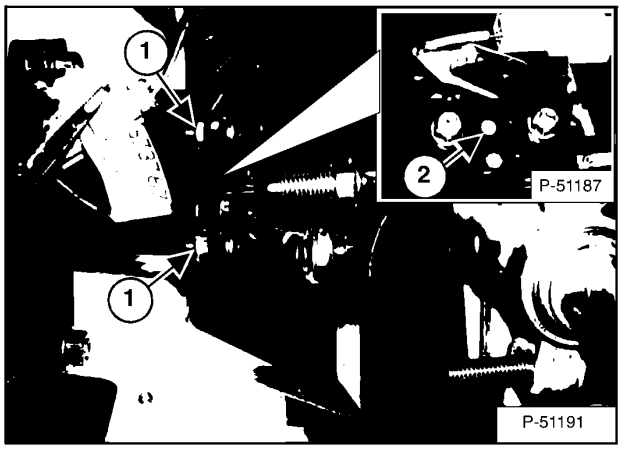
Removal And Installation

Figure 60-60-1



Disconnect the wire harness (Item 1) from the neutral start sensor connector (Item 2) **[Figure 60-60-1]**.

Figure 60-60-2

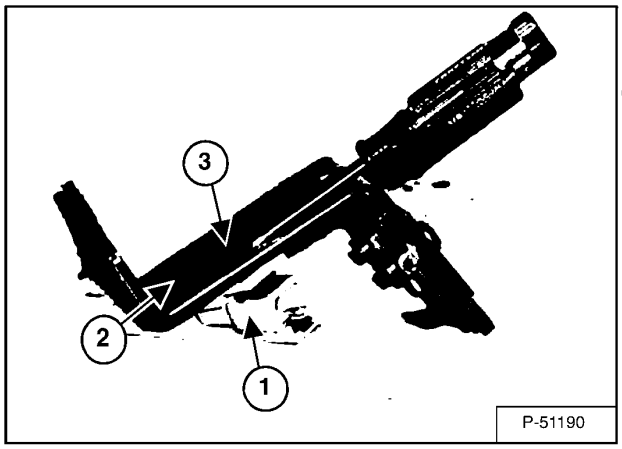


Remove the nuts and screws (Item 1) holding the neutral start sensor (Item 2) **[Figure 60-60-2]** to the mounting bracket.

Installation: DO NOT overtighten the screws because the sensor body is made of plastic.

NOTE: The neutral start mounting bracket is removed for clarity, removal is not needed for the actual procedure.

Figure 60-60-3



Remove the connector (Item 1) from the mounting bracket (Item 2) using a screwdriver to pry the plastic rivet (Item 3) **[Figure 60-60-3]** apart.

Reverse the removal procedure to install the neutral start sensor.

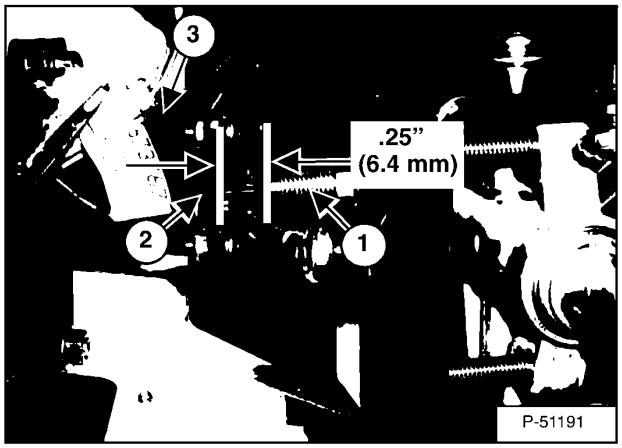
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NEUTRAL START SENSOR (CONT'D)

Sensor Activation Adjustment

Figure 60-60-4



NOTE: The steering and drive controls must be in the neutral position to check the adjustment.

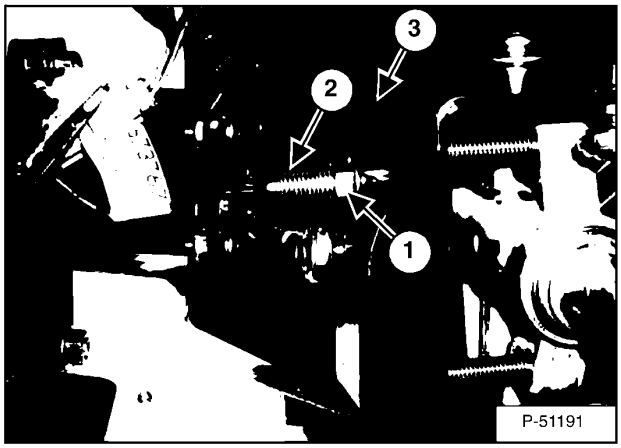
The activation bolt (Item 1) has to be WITHIN a distance of .25 inch (6.4 mm) from the neutral start sensor (Item 2) [Figure 60-60-4] for the neutral start sensor to activate. If the neutral start sensor is further than .25 inch (6.4 mm) from the activation bolt, the loader WILL NOT START.

The adjustment to make the activation bolt closer is made at the steering controls, not at the bolt itself. (See Steering Linkage Adjustment on Page 30-50-4.)

The mounting bracket (Item 3) **[Figure 60-60-4]** for the neutral start sensor has slots for the mounting screws. This will allow up to .25 inch (6.3 mm) of up and down adjustment to the neutral start sensor. **The proper setting is to have the activation bolt pointing at the middle of the neutral start sensor.**

Sensor Activation Bolt Removal

Figure 60-60-5



Remove the nut (Item 1) from the bolt (Item 2) **[Figure 60-60-5]**.

Remove the bolt (Item 2) from the steering pivot link (Item 3) **[Figure 60-60-5]**.

Reverse the removal procedure to install the sensor activation bolt.

NOTE: The activation bolt is used to activate the neutral start sensor. It has a magnet glued inside the tip and care should be used when removing and installing it.

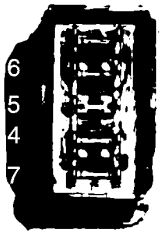
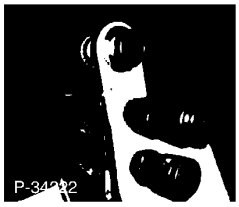
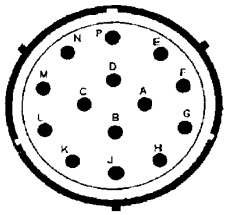
NOTE: The magnet is secured to the bolt tip with a press fit and Loctite Adhesive 609, Bobcat part number 6649654. If the magnet is coming out, reapply loctite to the magnet and reinstall.

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ELECTRICAL ATTACHMENT CONTROL REFERENCE

Attachment Control Identification Chart

Flipper Control Switch / Chute Control Switch	Control Switch Number	Switch Terminal Activated	Attachment Harness Terminal Activated	Attachment Harness Connector
	1	3	C	Fourteen Pin Connector Viewed from front (pin side of connector) of loader.
	2	1	D	
	3	3	F	
	4	1	E	
				 B-16449

NOTE: Control switch terminals #8 are ground and the pin B on the 14 pin connector is also ground. Control switch terminals #2 are power.

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ENGINE SERVICE

AIR CLEANER 70-40-1
Housing Removal and Installation 70-40-1

ENGINE. 70-70-1
Engine Mount Replacement. 70-70-5
Removal And Installation 70-70-1

ENGINE COMPONENTS AND TESTING. 70-60-1
Engine Compression Test Procedure 70-60-9
Fuel Injection Pump Check 70-60-2
Fuel Injection Pump Removal And Installation 70-60-3
Fuel Lift Pump Removal And Installation 70-60-3
Fuel Injection Pump Timing 70-60-10
Fuel Injector Nozzles Checking 70-60-5
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Fuel Injector Nozzles Installation 70-60-8
Glow Plugs Checking. 70-60-8
Valve Clearance Adjustment 70-60-1

ENGINE INFORMATION AND TESTING 70-10-1
Engine Troubleshooting Chart 70-10-1

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Engine Mounting Bracket Removal And Installation 70-100-1

ENGINE SPEED CONTROL. 70-20-1
Cable Removal and Installation 70-20-2
Disassembly And Assembly. 70-20-2
Removal And Installation 70-20-1

FLYWHEEL 70-80-1
Flywheel Removal And Installation 70-80-1
Flywheel Ring Gear Removal And Installation. 70-80-1

HYDRAULIC GEAR PUMP MOUNTING BRACKET 70-110-1
Hydraulic Gear Pump Coupler Removal And Installation 70-110-2
Hydraulic Gear Pump Mounting Bracket Removal And Installation. 70-110-1

MUFFLER 70-30-1
Removal And Installation 70-30-1

RADIATOR 70-50-1
Removal And Installation 70-50-1

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ENGINE SERVICE (CONT'D)

RECONDITIONING THE ENGINE 70-90-1
- Connecting Rod Alignment 70-90-20
- Checking Engine Oil Pressure 70-90-16
- Checking Timing Gear Backlash 70-90-13
- Crankshaft And Bearings Removal And Installation 70-90-21
- Crankshaft Gear Removal And Installation 70-90-15
- Cylinder Bore Inspection 70-90-25
- Cylinder Head Inspection 70-90-2
- Cylinder Head Removal And Installation 70-90-1
- Cylinder Head Top Clearance 70-90-3
- Energize To Stop Solenoid 70-90-27
- Fuel Camshaft Removal And Installation 70-90-14
- Governor 70-80-14
- Idler Gear And Camshaft Removal And Installation 70-90-10
- Inspection Of Crankshaft And Bearings 70-90-22
- Oil Pump Removal And Installation 70-90-15
- Oil Pump Service 70-90-15
- Piston And Connecting Rod Removal And Installation . . 70-90-17
- Piston And Connecting Rod Servicing 70-90-19
- Reconditioning The Valve And Valve Seat 70-90-7
- Relief Valve 70-90-16
- Rocker Arm And Shaft Checking 70-90-3
- Servicing The Idler Gear And Shaft 70-90-12
- Testing The Thermostat 70-90-26
- Thermostat Removal And Installation 70-90-25
- Timing Gearcase Cover Removal And Installation 70-90-8
- Valve Guide Checking 70-90-6
- Valve Removal 70-90-4
- Valve Spring Checking 70-90-5
- Water Pump Disassembly And Assembly 70-90-27
- Water Pump Removal And Installation 70-90-26

TIGHTEN ALL HARDWARE PER SIZE TO GRADE 5 TORQUE (See TORQUE SPECIFICATIONS FOR BOLTS on Page SPEC-30-1.) UNLESS OTHERWISE SPECIFIED.

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Engine Troubleshooting Chart

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

⚠ WARNING

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

W-2004-1285

PROBLEM	CAUSE
Slow cranking speed.	1, 2, 3, 4
Engine will not start. (Also see Electrical Troubleshooting Chart)	5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 22, 30, 31, 32, 58
Difficult to start.	5, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 18, 19, 20, 21, 22, 23, 28, 30, 31, 32, 58
No power from the engine.	8, 9, 10, 11, 12, 13, 14, 18, 19, 20, 21, 22, 23, 24, 25, 26, 30, 31, 32, 58
Engine is mis-firing.	8, 9, 10, 11, 12, 13, 14, 16, 18, 19, 20, 24, 25, 27, 28, 30, 31, 32
Too much fuel consumption.	11, 13, 14, 16, 18, 20, 22, 23, 24, 26, 27, 28, 30, 31, 32
Black exhaust.	11, 13, 14, 16, 18, 19, 20, 22, 23, 24, 26, 27, 28, 30, 31, 32
Blue/White exhaust.	4, 16, 18, 19, 20, 24, 26, 30, 32, 33, 34, 44, 54
Low oil pressure.	4, 35, 36, 37, 38, 39, 41, 42, 32, 56
Engine knocking.	9, 14, 16, 18, 19, 22, 25, 27, 28, 30, 32, 34, 35, 44, 45, 57
Engine running rough.	7, 8, 9, 10, 11, 12, 13, 14, 16, 20, 21, 25, 27, 28, 29, 32, 34, 44, 57
Vibration.	13, 14, 20, 24, 25, 28, 29, 32, 44, 47
High oil pressure.	4, 37, 40
Engine Overheating.	11, 13, 14, 16, 18, 19, 23, 24, 44, 46, 48, 49, 50, 51, 52, 55
Too much crankcase pressure.	24, 30, 32, 33, 44, 53
Poor compression.	11, 19, 24, 27, 28, 30, 31, 32, 33, 45, 57
Engine starts but does not stay running.	10, 11, 12
Engine does not shut off.	59

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Engine Troubleshooting Chart (Cont'd)

KEY TO CORRECT THE CAUSE	
1. Battery capacity low.	31. Worn valves and seats.
2. Bad electrical connection.	32. Broken, worn or sticking piston rings.
3. Faulty starter motor.	33. Worn valve stems and guides.
4. Incorrect grade of oil.	34. Overly full air cleaner.
5. Low cranking speed.	35. Worn or damaged bearings.
6. Fuel tank empty.	36. Not enough oil in the oil pan.
7. Faulty stop control operation.	37. Gauge is not correct.
8. Plugged fuel line.	38. Oil pump worn.
9. Faulty fuel lift pump.	39. Pressure relief valve is open.
10. Plugged fuel filter.	40. Pressure relief valve is sticking closed.
11. Restriction in the air cleaner.	41. Broken relief valve spring.
12. Air in the fuel system.	42. Faulty suction pipe.
13. Faulty fuel injection pump.	43. Plugged oil filter.
14. Faulty fuel injectors.	44. Piston seizure.
15. Incorrect use of the glow plugs	45. Incorrect piston height.
16. Glow plugs not working.	46. Damaged fan.
17. Broken fuel injection pump drive.	47. Faulty engine mounting or loose mounting.
18. Incorrect fuel pump timing.	48. Faulty thermostat.
19. Incorrect valve timing.	49. Restriction in the water jacket.
20. Poor compression.	50. Loose fan belt.
21. Plugged fuel tank vent.	51. Plugged radiator.
22. Incorrect type or grade of fuel.	52. Faulty water pump.
23. Exhaust pipe restriction.	53. Plugged breather pipe.
24. Cylinder head gasket leaking.	54. Valve stem seals damaged.
25. Overheating.	55. Coolant level low.
26. Cold running.	56. Plugged oil pump pipe strainer.
27. Incorrect valve tappet adjustment.	57. Broken valve spring.
28. Sticking valves.	58. Hydraulics in Detent position or drive engaged.
29. Incorrect high pressure tubelines.	59. Faulty shut-down circuit. (See Electrical Troubleshooting)
30. Worn engine cylinder bores.	

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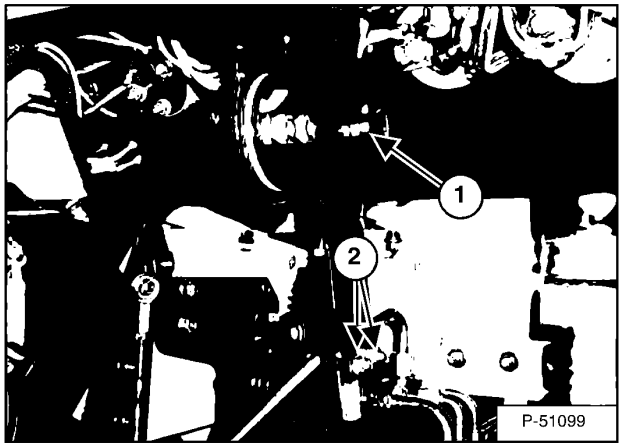
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ENGINE SPEED CONTROL

Removal And Installation

Raise the hood.

Figure 70-20-1



Remove the speed control cable nut (Item 1) **[Figure 70-20-1]** from the speed control lever.

Remove the two bolts, nuts and spacer (Item 2) **[Figure 70-20-1]** from the speed control bracket.

Figure 70-20-2

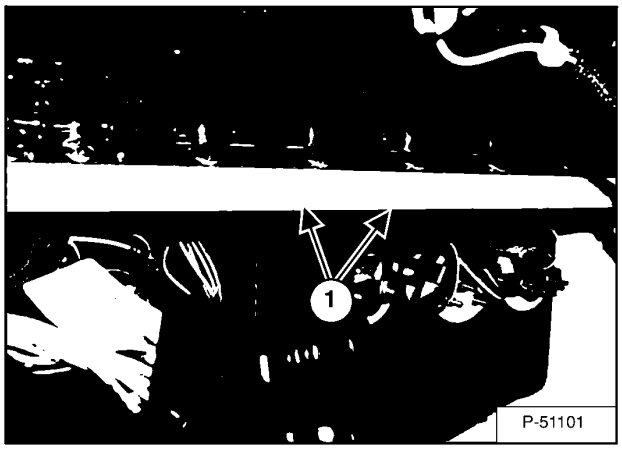
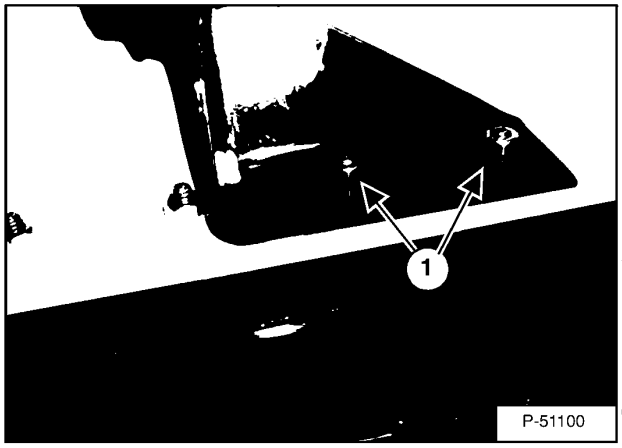


Figure 70-20-3



Remove the two nu ts (Item 1) **[Figure 70-20-2]** and **[Figure 70-20-3]** from the throttle bracket.

Remove the throttle bracket assembly.

Reverse the removal procedure to install the engine speed control.

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Disassembly And Assembly

Figure 70-20-4

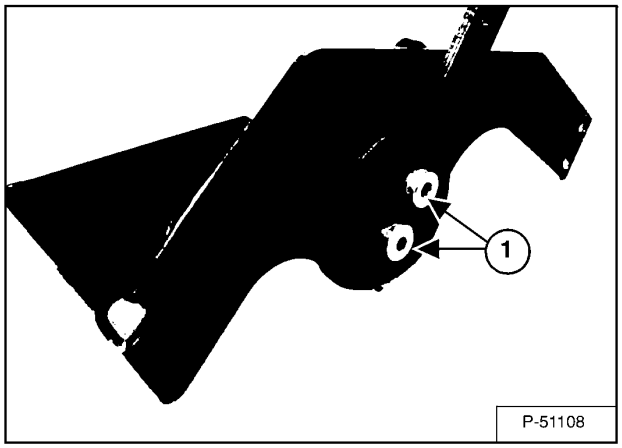
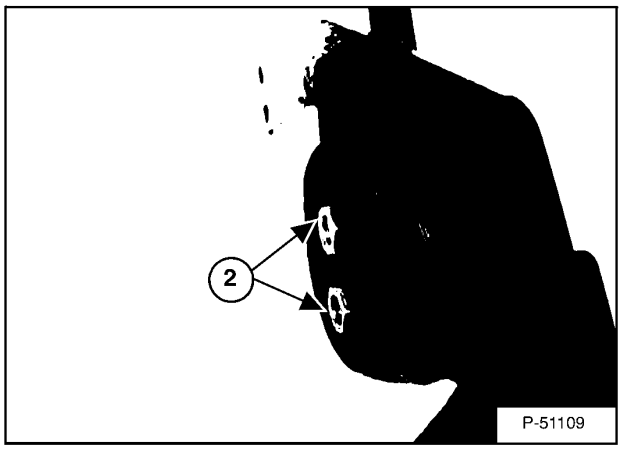


Figure 70-20-5



Loosen the two control lever mounting bolts (Item 1) **[Figure 70-20-4]** and remove the mounting nuts (Item 2) **[Figure 70-20-5]**.

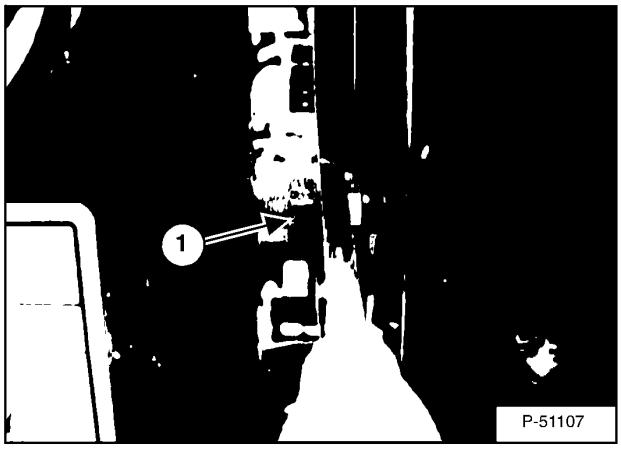
Assembly: Do not lubricate the engine speed control. Tighten bolts (Item 1) **[Figure 70-20-4]** evenly until a comfortable tension is obtained whilt moving the lever back and forth.

Replace any worn or damged parts if necessary.

Cable Removal and Installation

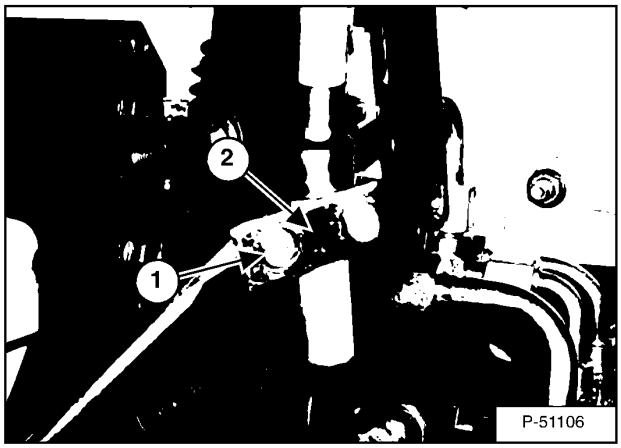
Raise the hood.

Figure 70-20-6



Remove the nut (Item 1) **[Figure 70-20-6]** from the throttle cable and throttle bracket.

Figure 70-20-7



Remove the two nuts from the u-bolt (Item 1) **[Figure 70-20-7]** on the throttle cable and throttle bracket.

NOTE: The spacer (Item 2) [Figure 70-20-7] is needed to align the cable when the u-bolt is tightened.

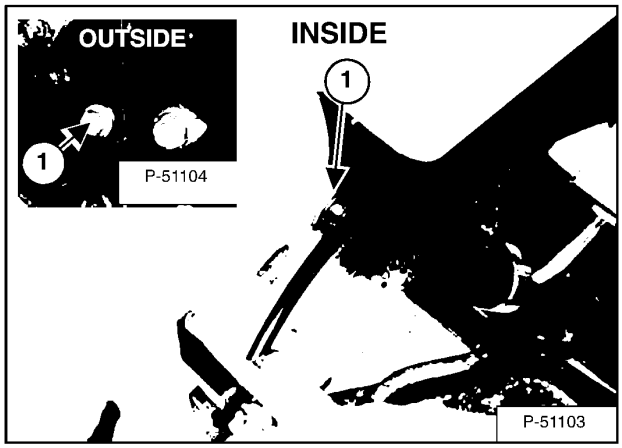
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ENGINE SPEED CONTROL (CONT'D)

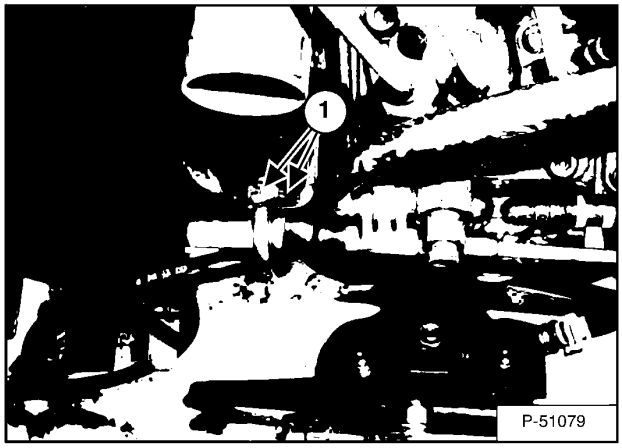
Cable Removal And Installation (Cont'd)

Figure 70-20-8



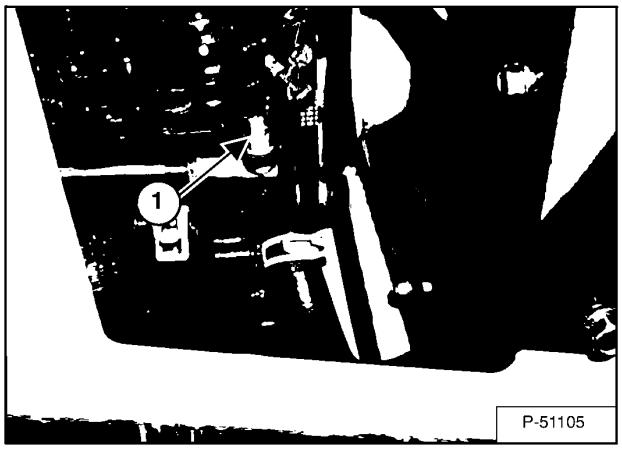
Remove the bolt and nut (Item 1) **[Figure 70-20-8]** from the throttle cable mounted to the mainframe.

Figure 70-20-9



Remove the two nuts (Item 1) **[Figure 70-20-9]** from the u-bolt on the throttle cable.

Figure 70-20-10



Remove the speed control cable nut (Item 1) **[Figure 70-20-10]** from the speed control lever.

Remove the throttle cable from the loader.

Reverse the removal procedure to i nstall the throttle cable.

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MUFFLER

Removal And Installation

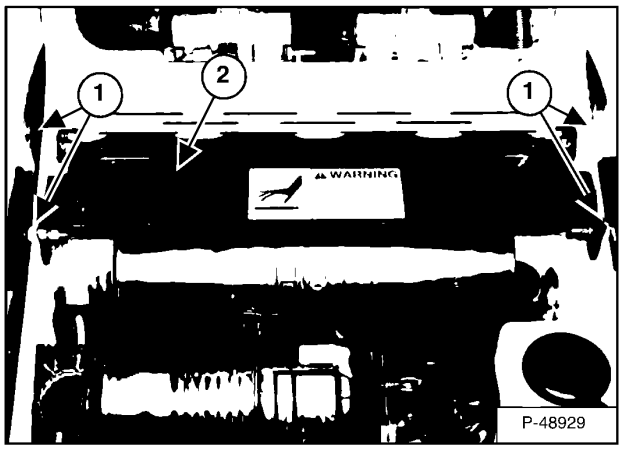
Raise the hood.

⚠ 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

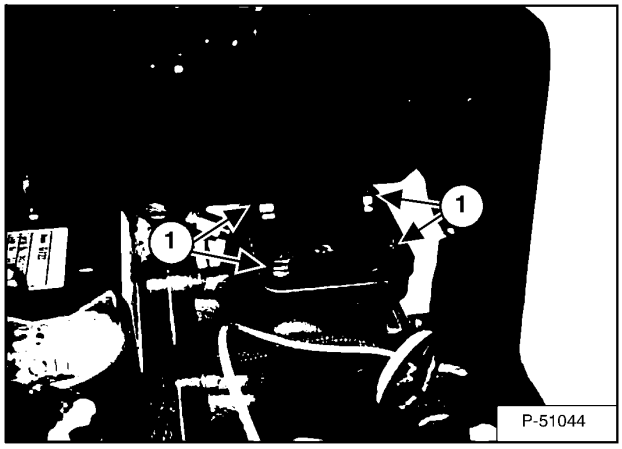
Figure 70-30-1



Loosen the muffler shield mounting bolts (Item 1) **[Figure 70-30-1]**.

Remove the muffler shield (Item 2) **[Figure 70-30-1]** from the loader.

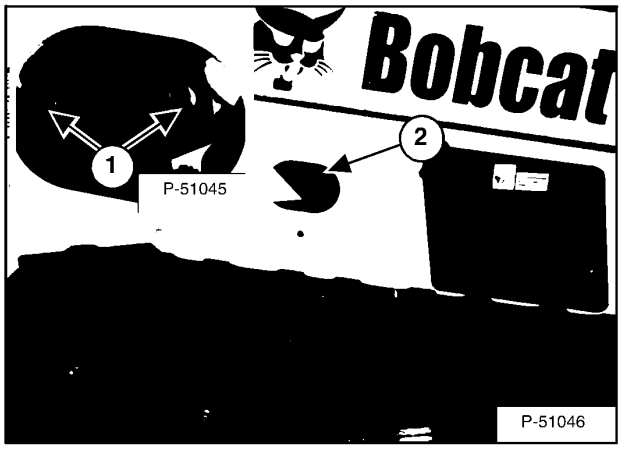
Figure 70-30-2



Remove the four muffler mounting bolts (Item 1) **[Figure 70-30-2]** from the muffler flange and exhaust manifold.

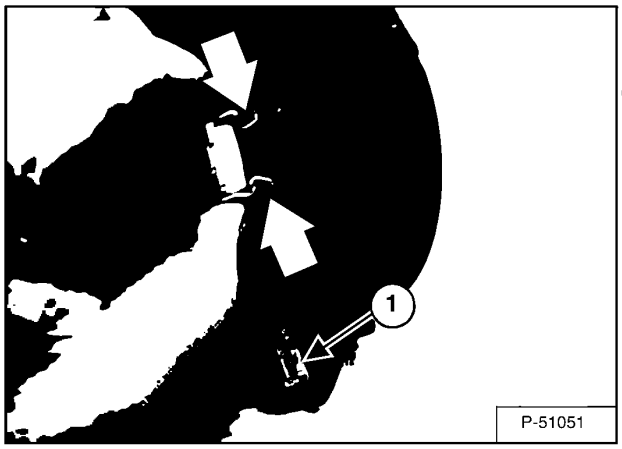
Installation: Tighten bolts to 18- 19 ft.-lb. (24-26 N•m) torque.

Figure 70-30-3



Remove the two muffler mounting bolts (Item 1) from the muffler mount. The bolts can be accessed through the side access panel (Item 2) **[Figure 70-30-3]** on the loader.

Figure 70-30-4



The muffler mounting bolts (Item 1) **[Figure 70-30-3]** fasten the muffler to the engine by using self retaining nuts (Item 1) **[Figure 70-30-4]**.

The self retaining nuts do not need to be changed unless they have thread damage. Squeeze the tabs together to insert them into the square holes in the muffler if installing.

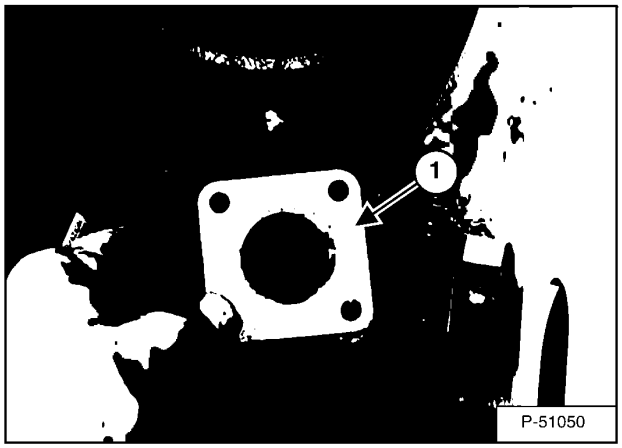
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MUFFLER (CONT'D)

Removal And Installation (Cont'd)

Figure 70-30-5



Check the muffler gasket (Item 1) **[Figure 70-30-5]** for damage and replace if needed.

Remove muffler from the loader.

Reverse the removal procedure to install the muffler.

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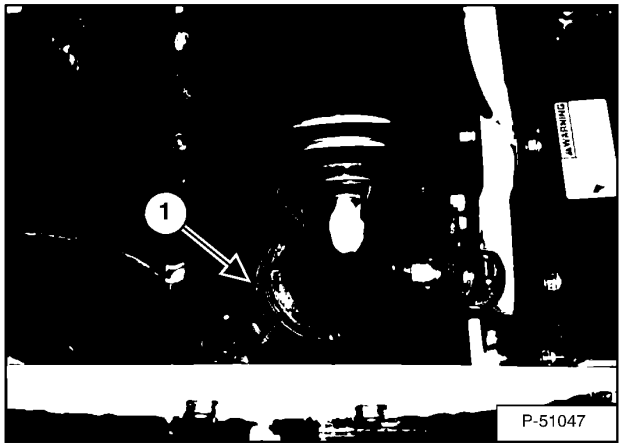
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AIR CLEANER

Housing Removal and Installation

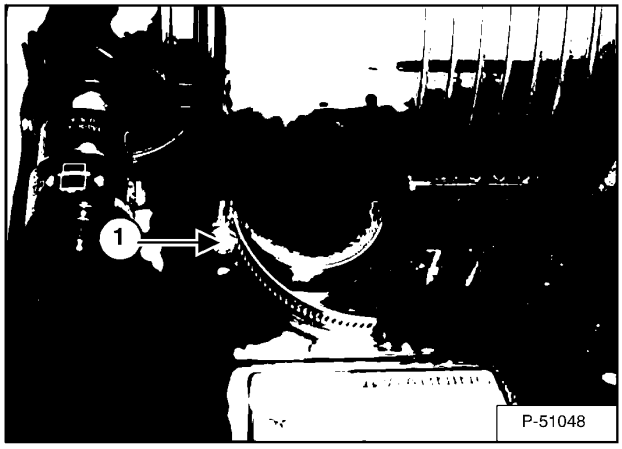
Open the hood.

Figure 70-40-1



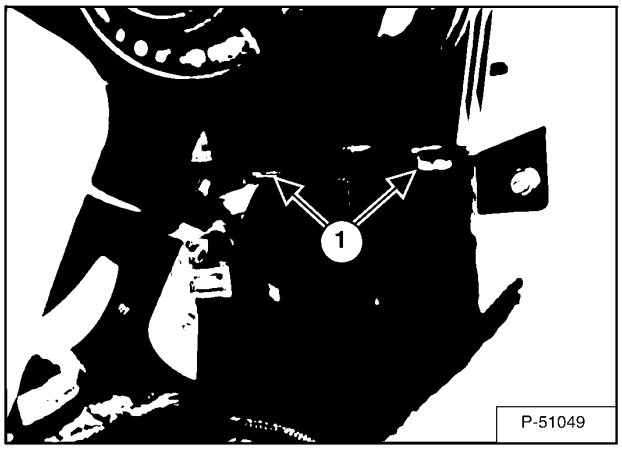
Loosen the outlet hose clamp (Item 1) **[Figure 70-40-1]**.

Figure 70-40-2



Loosen the inlet hose clamp (Item 1) **[Figure 70-40-2]**.

Figure 70-40-3



Remove the two bolts (Item 1) **[Figure 70-40-3]** that mount the air cleaner housing to the mounting bracket.

Remove the air cleaner housing from the loader.

Reverse the removal procedure to install the air cleaner housing.

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RADIATOR

Removal And Installation

Disconnect the Battery. (See Removal and Installation on Page 60-20-1.)

Drain the coolant from the radiator. (See Replacing The Coolant on Page 10-70-2.)

NOTE: Make sure the radiator is cool.

⚠ WARNING

AVOID BURNS

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

W-2070-1203

⚠ WARNING

Wear safety glasses to prevent eye injury when any of the following conditions exist:
When fluids are under pressure.
Flying debris or loose material is present.
Engine is running.
Tools are being used.

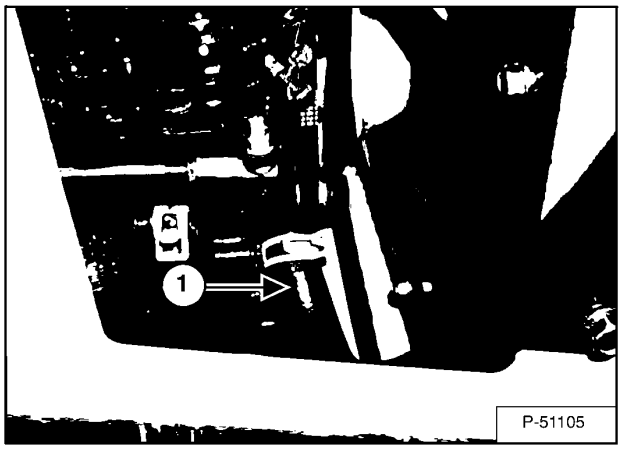
W-2019-1285

Figure 70-50-1



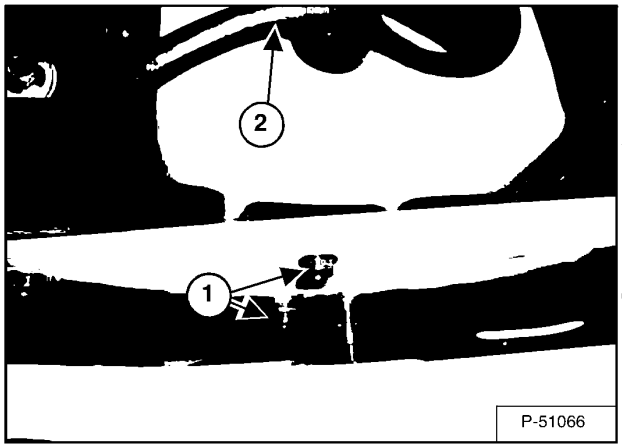
Disconnect the upper radiator hose (Item 1) **[Figure 70-50-1]** from the thermostat housing on the engine.

Figure 70-50-2



Disconnect the lower radiator hose (Item 1) **[Figure 70-50-2]** from the bottom of the radiator through the access hole on the side of the machine.

Figure 70-50-3



Remove the coolant recovery tank mounting screws (Item 1) **[Figure 70-50-3]**.

Disconnect the overflow hose (Item 2) **[Figure 70-50-3]** from the coolant recovery tank.

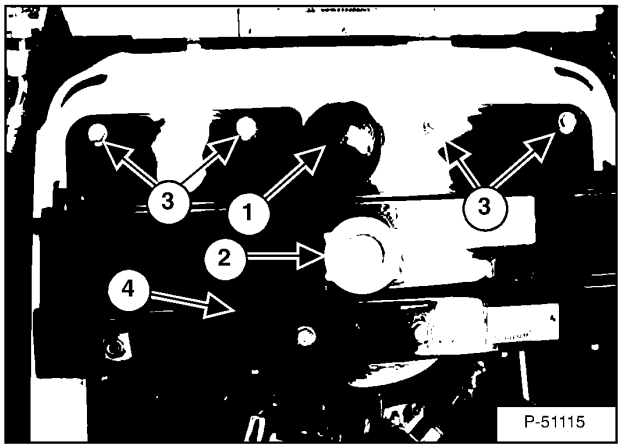
Remove the coolant recovery tank from the loader.

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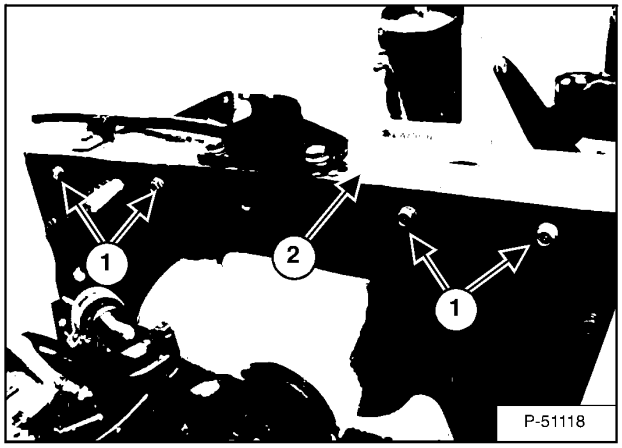
Removal And Installation (Cont'd)

Figure 70-50-4



Remove the fuel cap (Item 1), radiator cap (Item 2) and the four mounting screws (Item 3) for the upper cooler shield (Item 4) **[Figure 70-50-4]**.

Figure 70-50-5



Remove the four top and four bottom shroud mounting bolts (Item 1) **[Figure 70-50-5]**.

Remove the upper cooler shield (Item 2) **[Figure 70-50-5]**.

Figure 70-50-6

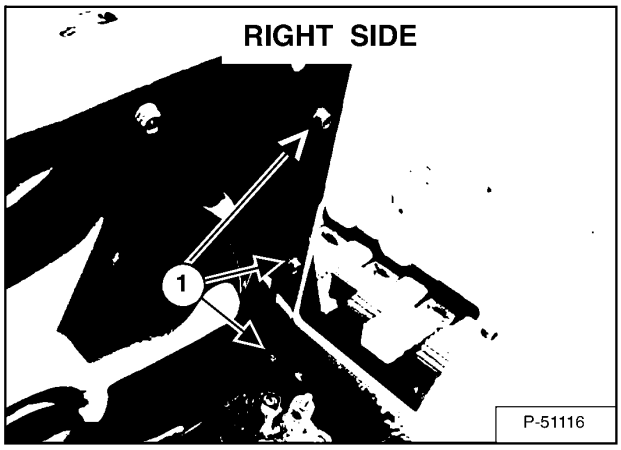
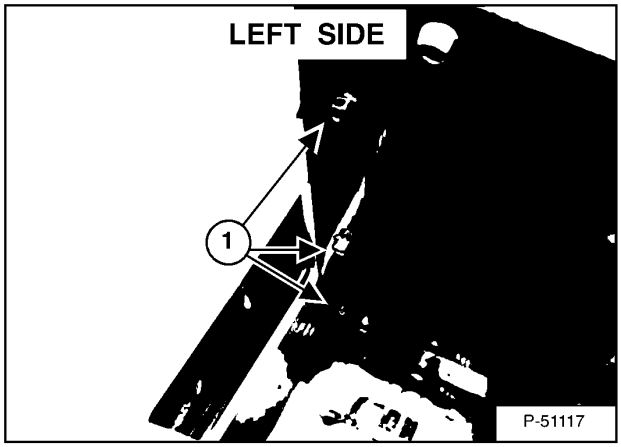


Figure 70-50-7



Remove the 6 side shroud mounting bolts (Item 1) **[Figure 70-50-6]** and **[Figure 70-50-7]**.

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Removal And Installation (Cont'd)

Figure 70-50-8

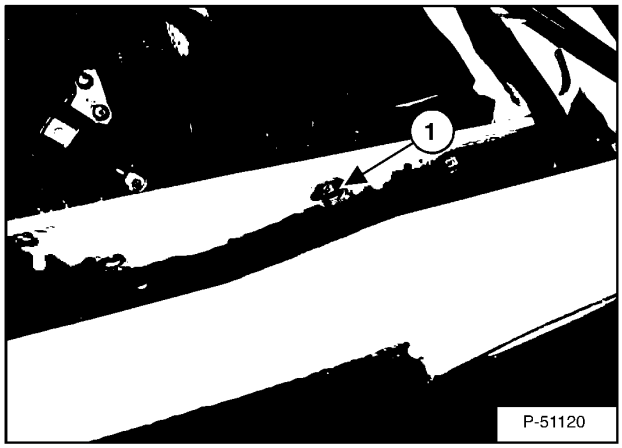
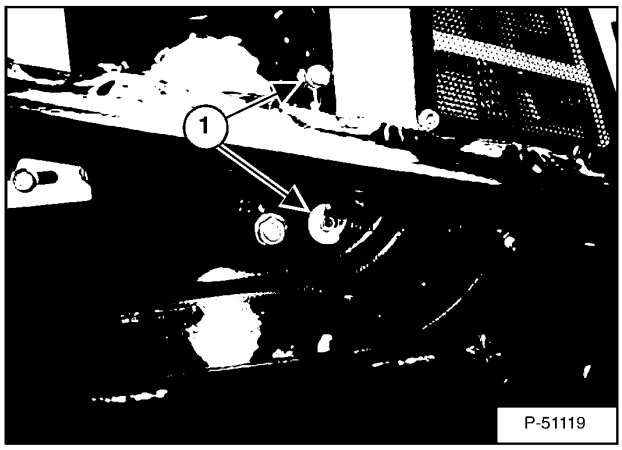
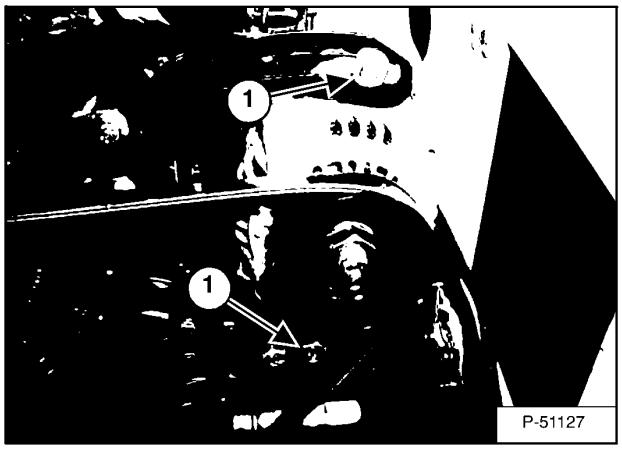


Figure 70-50-9



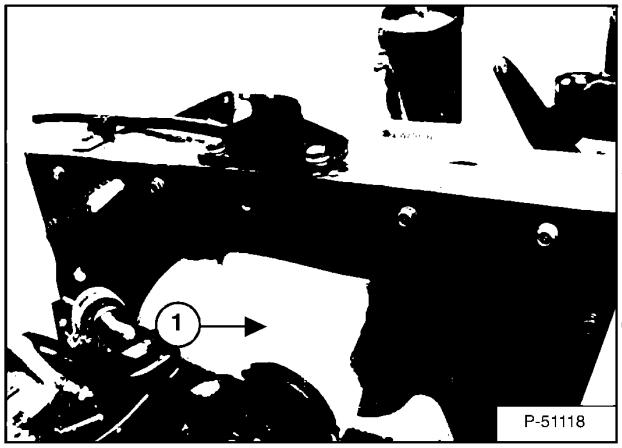
Remove the 3 side mounting bolts (Item 1) **[Figure 70-50-8]** and **[Figure 70-50-9]** for the cooler mount. (Both Sides)

Figure 70-50-10



Loosen the alternator mounting bolts (Item 1) **[Figure 70-50-10]** to remove tension from the alternator belt.

Figure 70-50-11



Remove the cooling fan blade (Item 1) **[Figure 70-50-11]** from the water pump.

Lift the radiator from the loader together with the cooler mount straight up and out of the loader.

Reverse the removal procedure to install the radiator.

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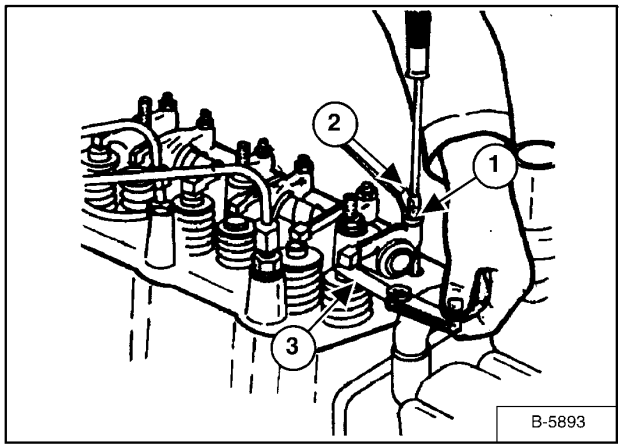
Bobcat®

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Valve Clearance Adjustment

Figure 70-60-1



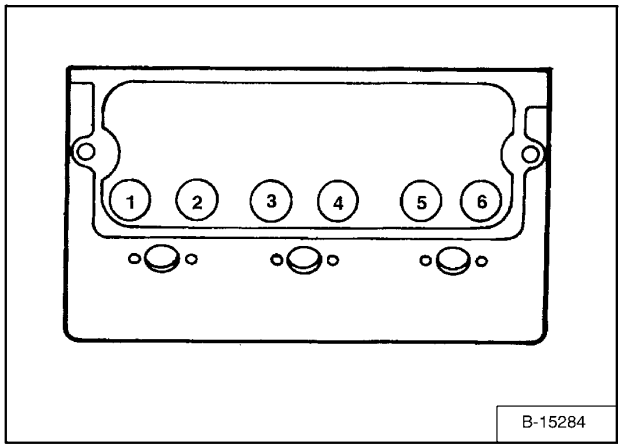
Adjust the valve clearance as follows:

Loosen the lock nut (Item 1) **[Figure 70-60-1]**.

Turn the adjustment screw (Item 2) **[Figure 70-60-1]** until the correct clearance is obtained.

NOTE:The clearance is measured between the rocker arm and valve stem tip (Item 3) **[Figure 70-60-1]**.

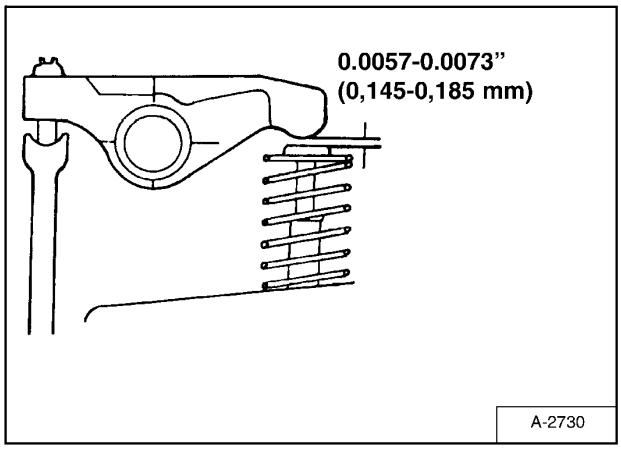
Figure 70-60-2



With No. 1 piston at TDC (compression) both the intake and exhaust valves are up. Set valves 1, 2, 4 & 5 **[Figure 70-60-2]**.

Rotate the flywheel 3605, No. 1 piston on exhaust stroke (overlap position) intake valve open, exhaust valve closed. Set valves 3 & 6 **[Figure 70-60-2]**.

Figure 70-60-3



Make sure the piston is at TDC when adjusting the clearance at the valves. The correct clearance is 0.0057-0.0073 inch (0,145-0,185 mm) cold clearance **[Figure 70-60-3]**.

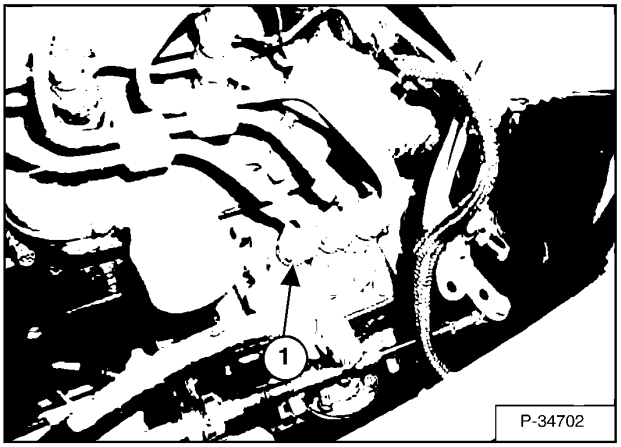
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Fuel Injection Pump Check

Remove the air cleaner housing. (See Housing Removal and Installation on Page 70-40-1.)

Figure 70-60-4



The tools listed will be nee ded to do the fol lowing procedure:

MEL1237 - Adapter Fuel Line
MEL1173-1 - Pressure Gauge

⚠ WARNING

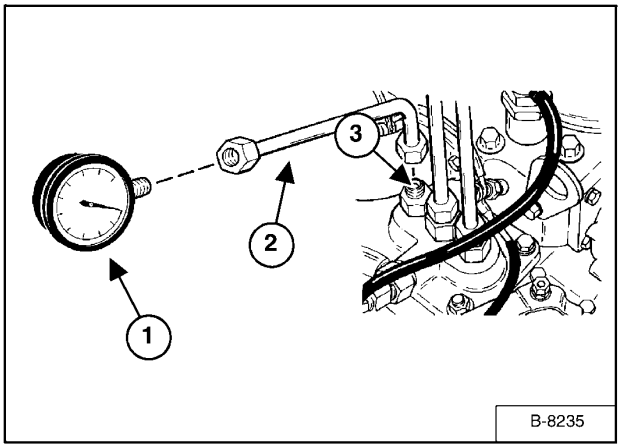
Diesel fuel or hydraulic fluid unde r pressure can penetrate skin or eyes, causing serious injury or death. Fluid leaks under pressure may not be visible. Use a piece of cardboard or wood to find leaks. Do not use your bare hand. Wear safety goggles. If fluid enters skin or eyes, get immediate medical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

W-2072-0496

To check the initial discharge pressure, remove a high pressure tubeline (Item 1) **[Figure 70-60-4]** from the fuel injection pump.

Loosen the other end of the tubeline at the injector, so that the tubeline can be turned away from the fitting.

Figure 70-60-5



Connect a pressure gauge (Item 1) to the long leg of the test tubeline (Item 2) **[Figure 70-60-5]** and tighten.

Connect the short leg of the tubeline to the fitting at the fuel injection pump (Item 3) **[Figure 70-60-5]**.

With the starter, rotate the engine to increase the pressure to 2133 PSI (14707 bar). Align the plunger with TDC.

The pressure should hold at 2133 PSI (14707 bar), for 5 seconds or more.

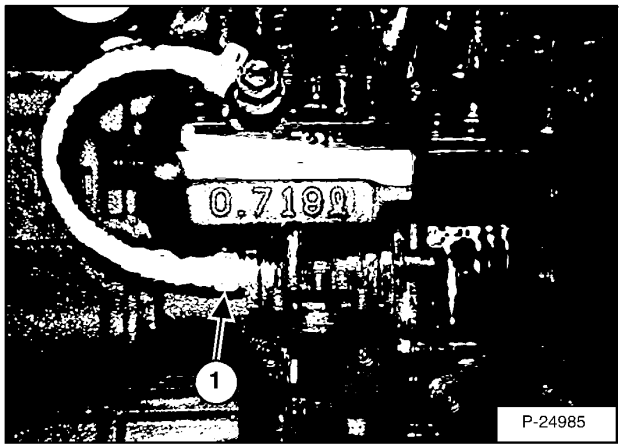
If the time is less than the allowable limit, replace the injection pump.

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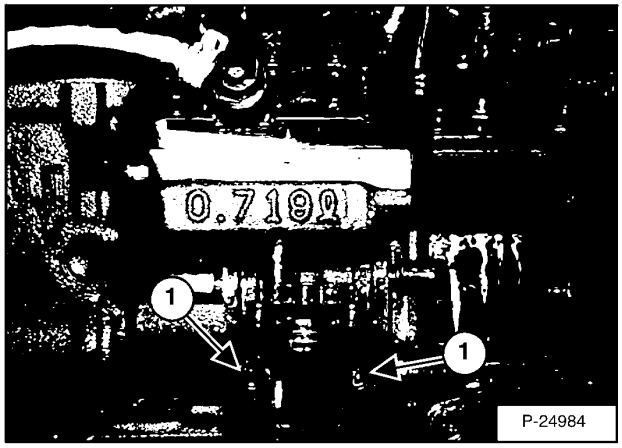
Fuel Lift Pump Removal And Installation

Figure 70-60-6



Remove the fuel line (Item 1) **[Figure 70-60-6]** from the fuel lift pump.

Figure 70-60-7



Remove the two mounting bolts (Item 1) **[Figure 70-60-7]** from the lift pump and remove the pump from the engine.

Fuel Injection Pump Removal And Installation

Remove the air cleaner housing. (See Housing Removal and Installation on Page 70-40-1.)

IMPORTANT

Do not attempt to maintain or adjust unless you are trained and have the correct equipment.

I-2028-0289

Clean the injection pump and area around it with a cleaning solvent or steam cleaning.

IMPORTANT

Never steam clean or put cold water on an injection pump while the engine is running or while it is hot. If you do it will cause serious damage to the injection pump.

I-2135-0997

IMPORTANT

Do not bend the high pressure fuel injection tubes when removing or installing them.

I-2029-0289

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Fuel Injection Pump Removal And Installation (Cont'd)

Figure 70-60-8

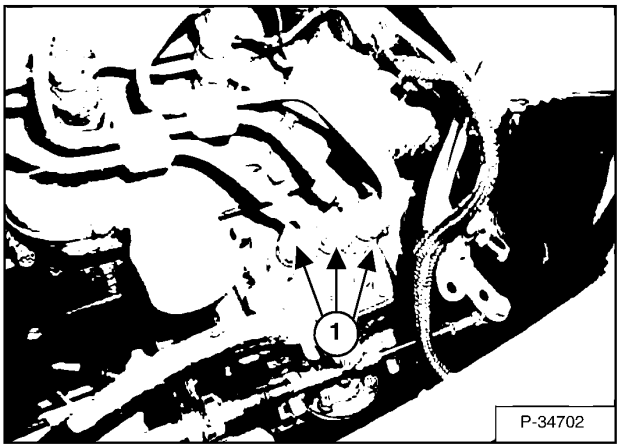
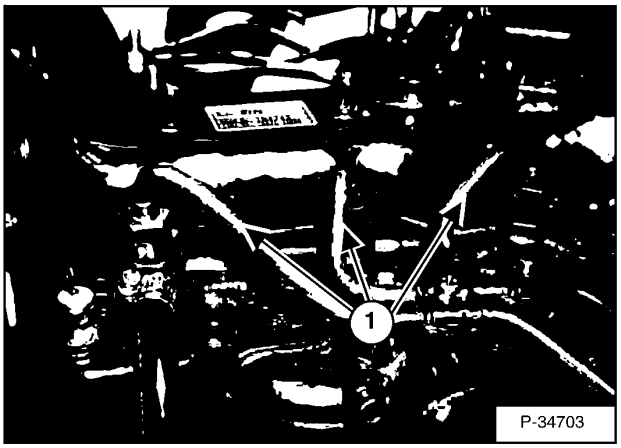


Figure 70-60-9



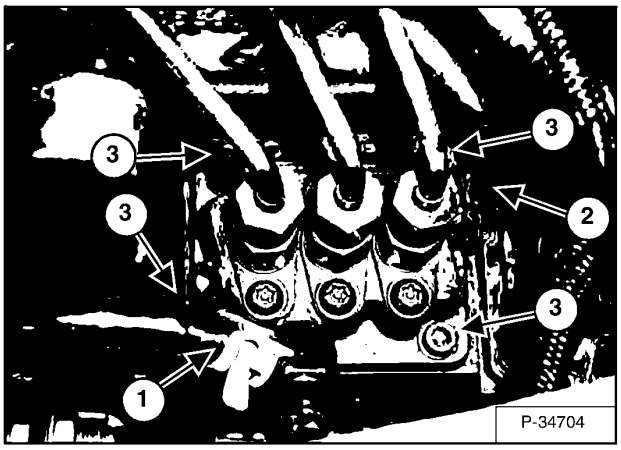
Use these tools for the following procedure:

MEL1270 - Fuel Line Removal Tool
MEL1271 - Delivery Valve Removal Tool

Remove the injector nozzle tubelines (Item 1) **[Figure 70-60-8]** & **[Figure 70-60-9]** from the injection pump and the injectors.

Installation: Tighten the tubelines to 11-19 ft.-lbs (15-26 N•m) torque.

Figure 70-60-10



Disconnect the fuel inlet hose (Item 1) and the fuel return hose (Item 2) **[Figure 70-60-10]**.

Remove the four bolts (Item 3) **[Figure 70-60-10]** from the injection pump.

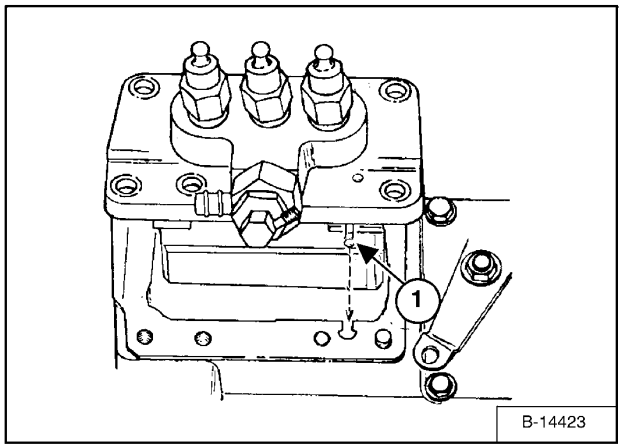
Installation: Tighten the four bolts to 17-20 ft.-lb. (23-27 N•m) torque.

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Fuel Injection Pump Removal And Installation (Cont'd)

Figure 70-60-11



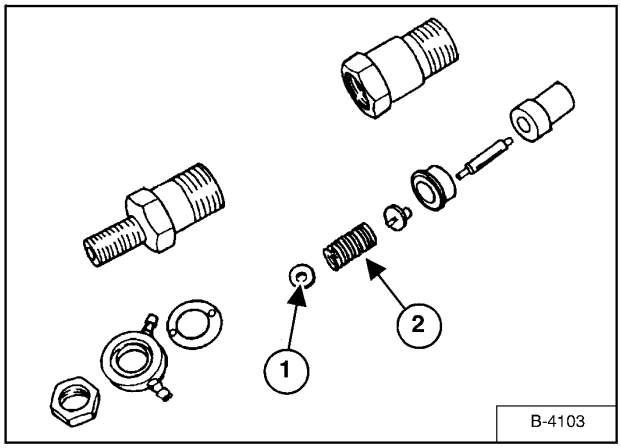
Lift the injection pump while moving it to align the pin (Item 1) **[Figure 70-60-11]** in the control rack with the slot in the engine block to remove the pump.

Installation: When the injection pump is installed, make sure the pin (Item 1) **[Figure 70-60-11]** on the control rack is correctly installed in the fork lever. If the slot is not installed correctly, the engine will run over maximum speed and serious damage can result.

NOTE: Make sure the same number shims are installed under the injection pump. The shims are used for engine timing.

Fuel Injector Nozzles Checking

Figure 70-60-12



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

OEM1064 - Injector Nozzle Tester
OEM1065 - Accessory Set

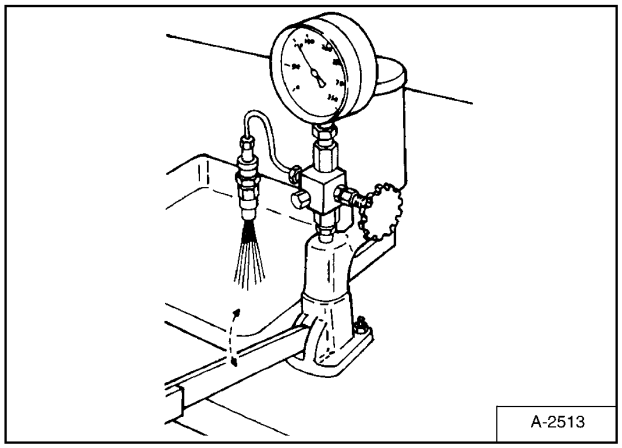
NOTE: You can adjust the release pressure of the injector nozzle by adding or removing spacers (Item 1) [Figure 70-60-12] from the top of the nozzle spring (Item 2) [Figure 70-60-12]. Each spacer will change the release pressure about 142 PSI (980 bar). The release pressure must be 1990-2133 PSI (13721-14707 bar).

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Fuel Injector Nozzles Checking (Cont'd)

Figure 70-60-13



Connect the injector nozzle to the tester with the nozzle in the down position **[Figure 70-60-13]**.

Slowly operate the hand lever of the test pump until the injector nozzle valve opens. The pressure must be 1990-2133 PSI (13721-14707 bar).

If the pressure is not correct, disassemble the injector nozzle and add or remove spacers (Item 1) **[Figure 70-60-12]**.

NOTE: When assembling the injector nozzle, tighten the retainer nut (Item 3) [Figure 70-60-12] to 43-58 ft.-lb. (59-79 N•m) torque. Any higher torque will cause slow action of the valve.

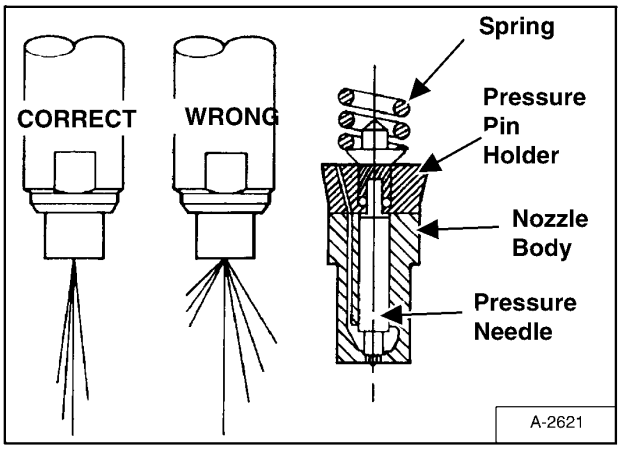
Check for inside leakage. Operate the hand lever until the pressure is almost enough to open the injector valve. Make a record of the pressure. Release the hand lever. Check the pressure decrease to 10 seconds. The nozzle has damage if the pressure decrease is more than 740 PSI (5162 bar) in 10 seconds.

⚠ WARNING

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

W-2072-0496

Figure 70-60-14



Check the spray pattern of the nozzle for the following conditions **[Figure 70-60-14]**:

Does not come out the side of the nozzle.

Does not have drops coming from the nozzle.

Does not have a flow (solid stream) coming from the nozzle.

Any of the above conditions show a defect or a dirty injector nozzle. Clean the nozzle that does not operate correctly and check again.

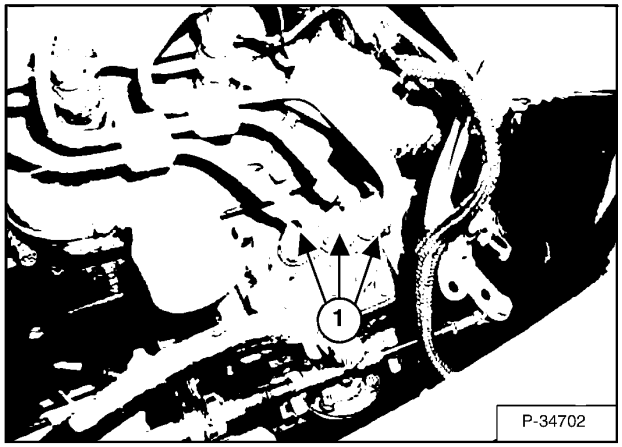
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Fuel Injector Nozzles Removal

Remove the air cleaner housing. (See Housing Removal and Installation on Page 70-40-1.)

Figure 70-60-15



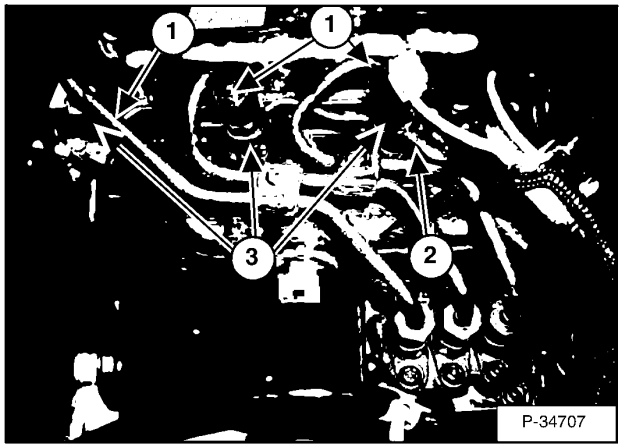
The tool listed will be needed to do the following procedure:

MEL1485 - Socket

To remove the injector nozzles, use the following procedure:

Remove the injector tubelines (Item 1) **[Figure 70-60-15]** from the injector pump.

Figure 70-60-16

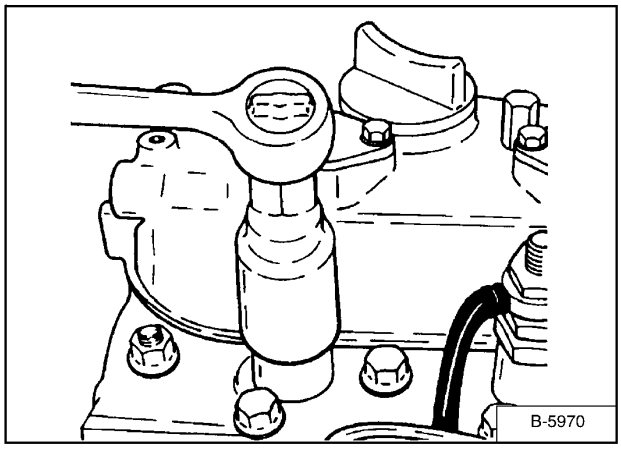


Remove the injector tubelines (Item 1) **[Figure 70-60-16]** from the injectors.

Remove the fuel return hoses (Item 2) **[Figure 70-60-16]** from the banjo fittings.

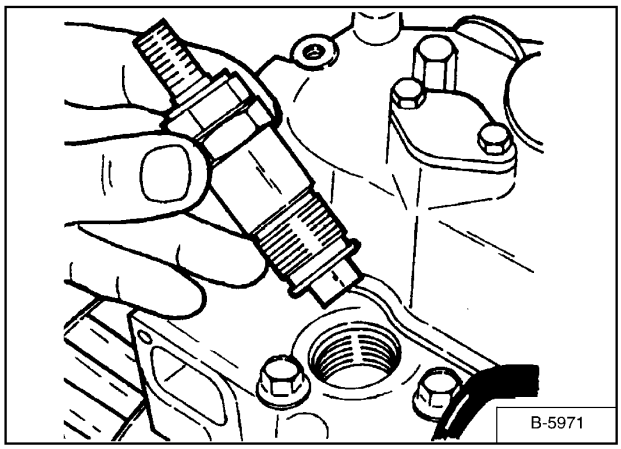
Remove the banjo fittings (Item 3) **[Figure 70-60-16]** from the fuel injector nozzles.

Figure 70-60-17



Loosen the fuel injector with a special socket **[Figure 70-60-17]**.

Figure 70-60-18



Remove the fuel injector nozzle from the engine **[Figure 70-60-18]**.

IMPORTANT

Do not disassemble or test the fuel injector nozzles unless you have the correct service and testing tools.

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Fuel Injector Nozzles Installation

Install the injector nozzle in the cylinder head and tighten to 21-36 ft.-lb. (29-49 N•m) torque.

Install the banjo fitting on the injector nozzle and tighten.

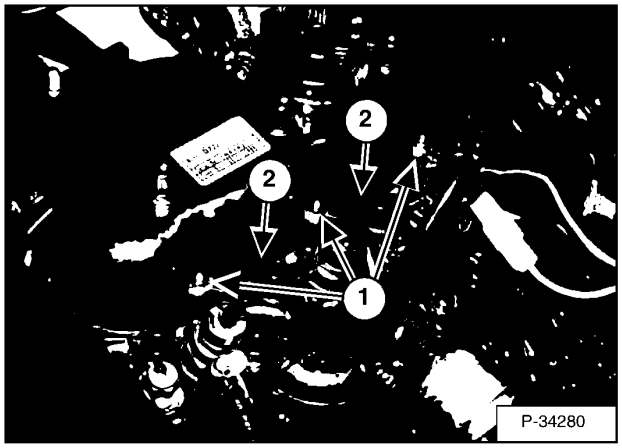
Connect the return fuel line to the banjo fittings.

Install the high pressure tubelines at the injectors and tighten.

Remove the air from the fuel system. (See Removing Air From The Fuel System on Page 10-80-2.)

Glow Plugs Checking

Figure 70-60-19



Disconnect the three nuts (Item 1) **[Figure 70-60-19]** that hold the glow plug electrical bar to the glow plugs.

Remove the electrical bar (Item 2) **[Figure 70-60-19]** from the glow plugs.

Test the glow plugs by touching one probe to the end of the glow plug and the other probe to the body of the glow plug.

Glow plug resistance must be approximately 1.6 Ohms. If the resistance is zero ohms the glow plug has a short circuit.

If the resistance is infinite the coil of the glow plug is broken.

Figure 70-60-20



Replace the glow plug as needed **[Figure 70-60-20]**.

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ENGINE COMPONENTS AND TESTING (CONT'D)

Engine Compression Test Procedure

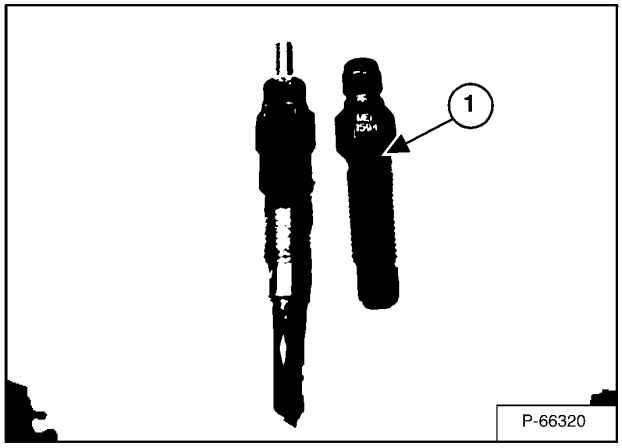
The tool listed will be needed to do the following procedure:

MEL10630 - Engine Compression Test Kit
MEL 1594 - Engine Compression Test Adapter

Warm the engine.

Remove the glow plugs, muffler and air cleaner from the engine.

Figure 70-60-21



Install the compression adapter (Item 1) **[Figure 70-60-21]** in the glow plug hole.

Figure 70-60-22



Connect the compression gauge to the adapter **[Figure 70-60-22]**.

Ensure the speed control lever is set at the low idle setting.

Turn the engine with the starter at 200 to 300 RPM. Run the test for each cylinder more than twice for 5 to 10 seconds each time and take the average reading. Make sure you are using a fully charged battery.

The correct compression for the engine is 327-469 PSI (2255-3234 bar) with no more than 10% difference between the cylinders.

If the pressures are not within 10% of each other, apply a small amount of oil in the cylinders and retest.

If the pressures increase after applying oil, check cylinder walls and piston rings.

If the pressures do not increase after applying oil, check top clearance, valve clearance and cylinder head.

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Fuel Injection Pump Timing

Remove the air cleaner housing. (See Housing Removal and Installation on Page 70-40-1.)

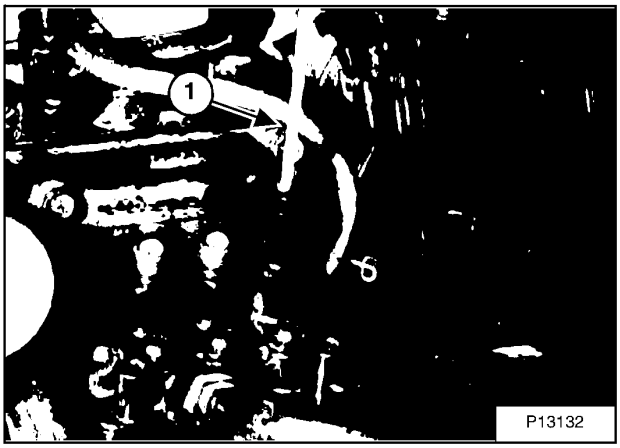
Remove the hydraulic reservoir. (See Removal And Installation on Page 20-70-1.)

Figure 70-60-23



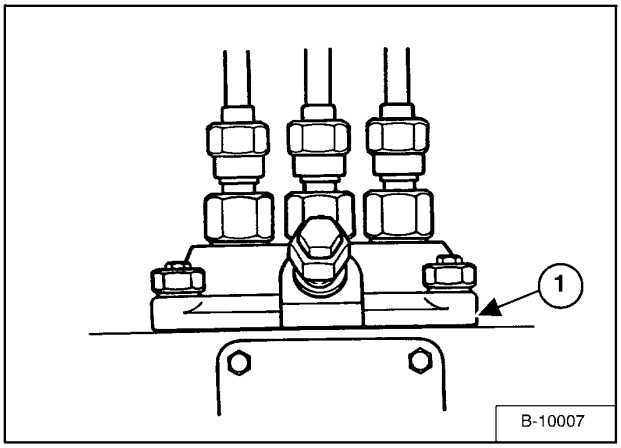
Remove the high pressure tubelines (Item 1) **[Figure 70-60-23]** from the injection pump and the injectors.

Figure 70-60-24



Install a short plastic tube (Item 1) **[Figure 70-60-24]** in the fitting of the number 1 cylinder port. Point the tube up.

Figure 70-60-25



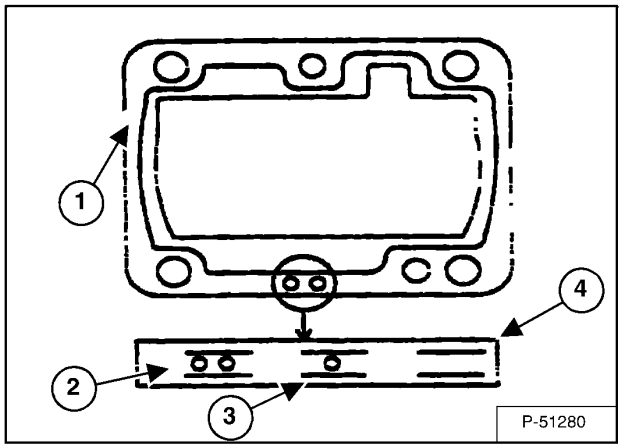
Timing the fuel injection pump is done by changing the number of shims between the injection pump and the injection pump mounting surface (Item 1) **[Figure 70-60-25]**.

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Fuel Injection Pump Timing (Cont'd)

Figure 70-60-26



Shims (Item 1) are available in thickness of 0.20 mm (2 holes) (Item 2) , 0.25 mm (1 hole) (Item 3) and 0.30 mm (without hole) (Item 4) **[Figure 70-60-26]**. Combine these shims for adjustment.

The sealant is applied to both sides of the soft metal gasket shim. Liquid sealant is not required for assembly.

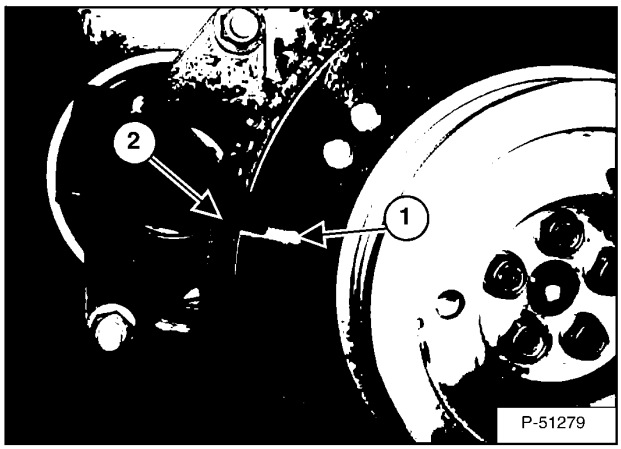
Addition or reduction of a shim of 0.20 mm will delay or advance the injection timing by approximatly 2.0°. The timing of the pump will be later when a shim is added, and earlier when a shim is removed.

NOTE: Fuel must be visible in the tube (Item 1) [Figure 70-60-24] before attempting timing.

Move the fuel lever on the injection pump to full fuel position (or full throttle).

Turn the flywheel counter-clockwise slowly until the fuel starts to rise in the plastic tube (Item 1) **[Figure 70-60-24]**.

Figure 70-60-27



At this point look at the timing mark (Item 1) **[Figure 70-60-27]** (located on the flywheel) for proper alignment. When the timing mark is aligned with the bottom edge of the marker (Item 2) **[Figure 70-60-27]**, the injection pump timing is correct.

The correct engine timing for all Kubota D722-BE engines is 20-22° B.T.D.C. Add or subtract shims (Item 1) **[Figure 70-60-25]** or **[Figure 70-60-26]** to achieve the correct timing.

NOTE: Adding or reducing the shim thickness by 0.05 mm r etards or advances the injection timing by approximately 0.5°.

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Bobcat®

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ENGINE

Removal And Installation

Put the loader on jackstands. (See LIFTING AND BLOCKING THE LOADER on Page 10-10-1.)

Remove the Battery. (See Removal and Installation on Page 60-20-1.)

Raise the Hood.

Remove the A ir Cleaner and mounting bracket. (See Housing Removal and Installation on Page 70-40-1.) and (See Engine Mounting Bracket Removal And Installation on Page 70-100-1.)

Remove the Muffler. (See Removal And Installation on Page 70-30-1.)

Remove the Hydraulic Tank. (See Removal And Installation on Page 20-70-1.)

Remove the Radiator. (See Removal And Installation on Page 70-50-1.)

Remove the lo wer service panel underneath the loader. (See Removal and Installation on Page 50-90-1.)

⚠ WARNING

AVOID BURNS

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

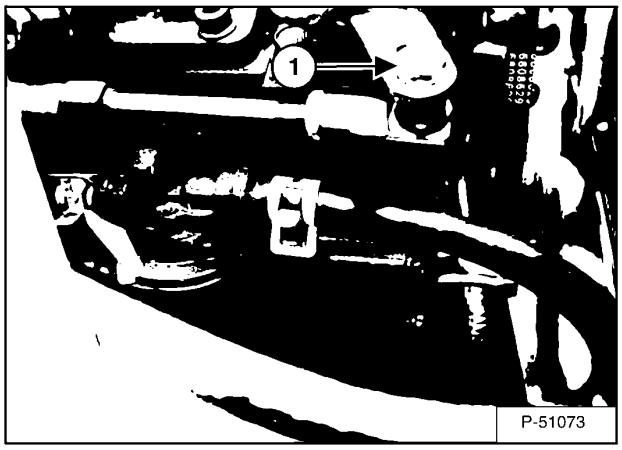
W-2070-1203

⚠ WARNING

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

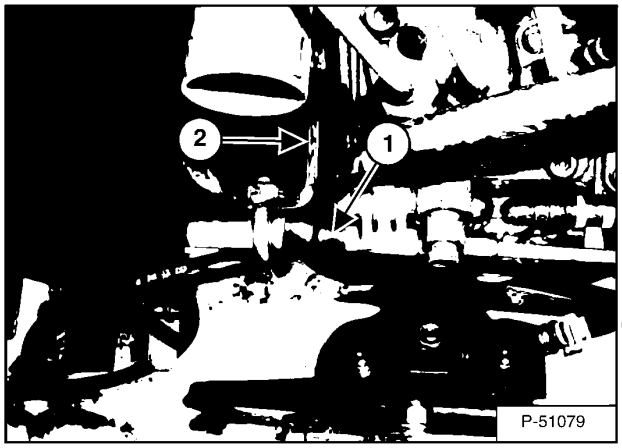
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Figure 70-70-1



Remove the throttle cable (Item 1) **[Figure 70-70-1]** from the fuel pump.

Figure 70-70-2



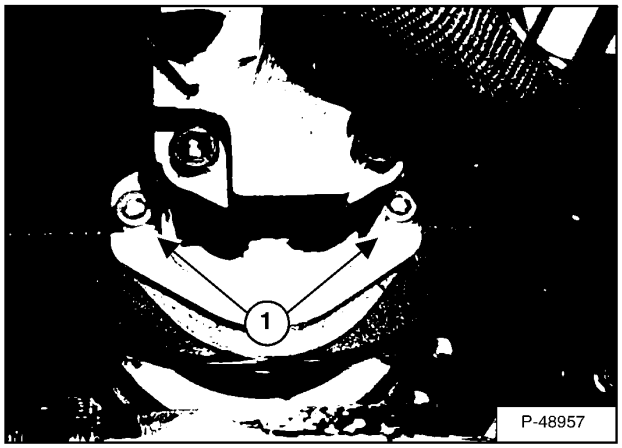
Remove the throttle cable (Item 1) from the bracket (Item 2) **[Figure 70-70-2]**.

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Removal And Installation (Cont'd)

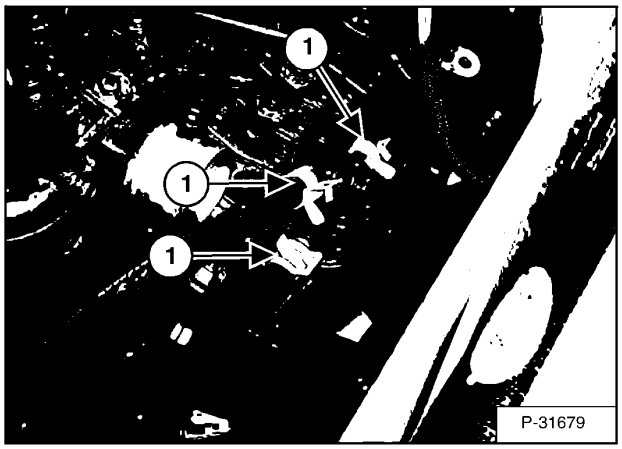
Figure 70-70-3



Remove the gear pump mounting bolts (Item 1) **[Figure 70-70-3]** from the hydraulic gear pump.

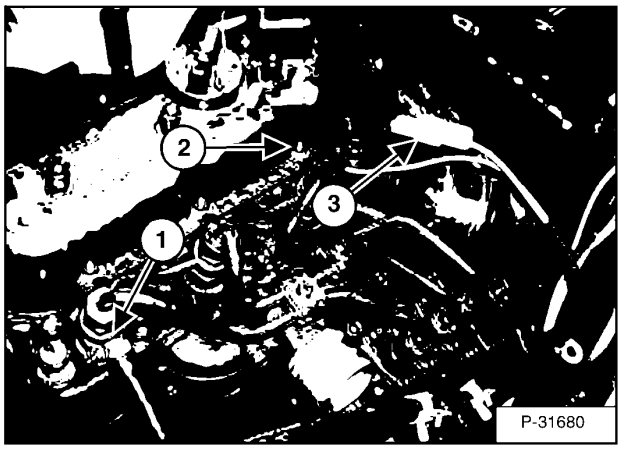
Slide the gear pump away from the engine assembly. The hydraulic hoses do not need to be removed.

Figure 70-70-4



Remove the fuel lines (Item 1) **[Figure 70-70-4]** from the fuel pump.

Figure 70-70-5

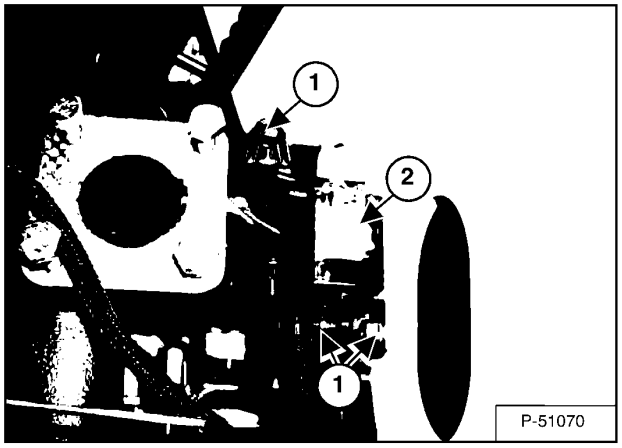


Remove the fuel bypass line (Item 1) **[Figure 70-70-5]** from the Injector.

Remove the power connector (Item 2) **[Figure 70-70-5]** from the glow plugs.

Disconnect the fuel shut off solenoid connector (Item 3) **[Figure 70-70-5]**.

Figure 70-70-6



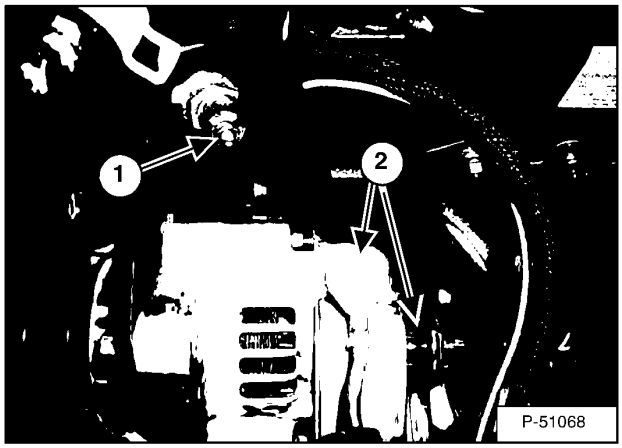
Remove the bolts (Item 1) fastening the wiring harness and fuel timer (Item 2) **[Figure 70-70-6]** to the mainframe.

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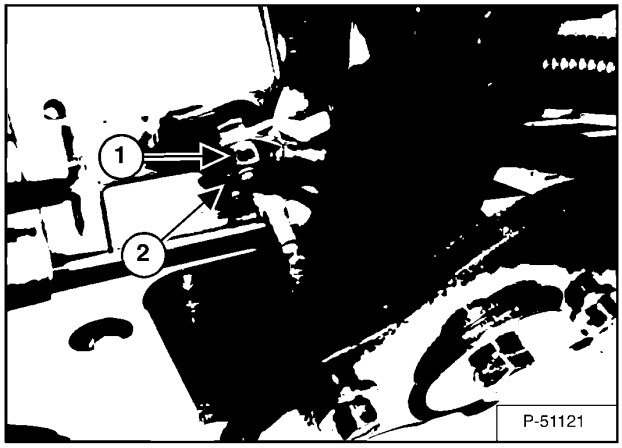
Removal And Installation (Cont'd)

Figure 70-70-7



Disconnect the coolant temperature sender (Item 1) and alternator connections (Item 2) **[Figure 70-70-7]**.

Figure 70-70-8



Disconnect the positive battery cable (Item 1) **[Figure 70-70-8]** from the starter.

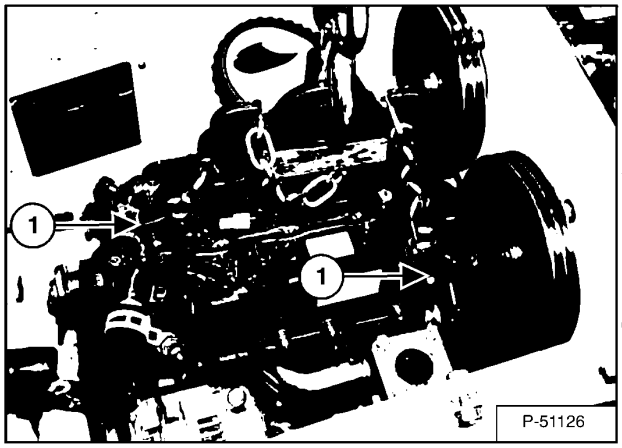
Disconnect the wire (Item 2) **[Figure 70-70-8]** from the (S) terminal on the starter.

Figure 70-70-9



Remove the ground cable (Item 1) **[Figure 70-70-9]** from the starter housing.

Figure 70-70-10



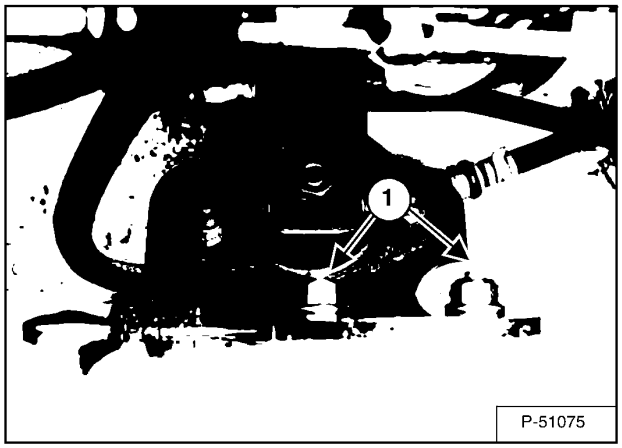
Install a chain hoist to the engine lifting eyes (Item 1) **[Figure 70-70-10]**.

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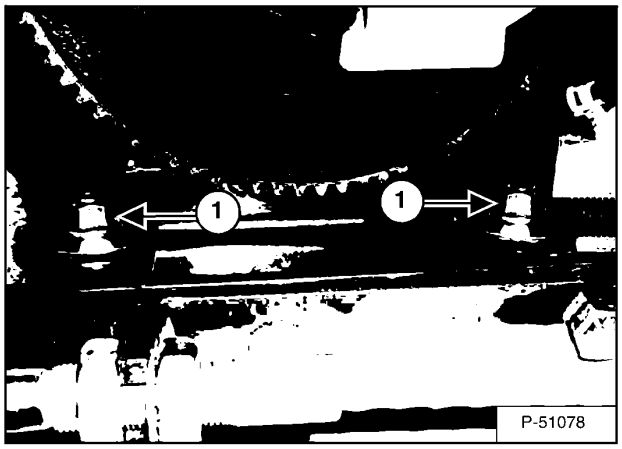
Removal And Installation (Cont'd)

Figure 70-70-11



Remove the two side mounting bolts and nuts (Item 1) **[Figure 70-70-11]** from each side of the loader.

Figure 70-70-12



Remove the rear mounting bolts (Item 1) **[Figure 70-70-12]** from the loader.

Lift the engine out of the loader.

Reverse the removal procedure to install the engine.

Once the engine is placed back in the loader, check the drive belt alignment of the flywheel pulley, belt tensioner and the hydrostatic pump pulleys. Adjustments can be made to align the drive belt properly. For more information on drive belt alignment: (See Drive Belt Alignment on Page 30-40-3.)

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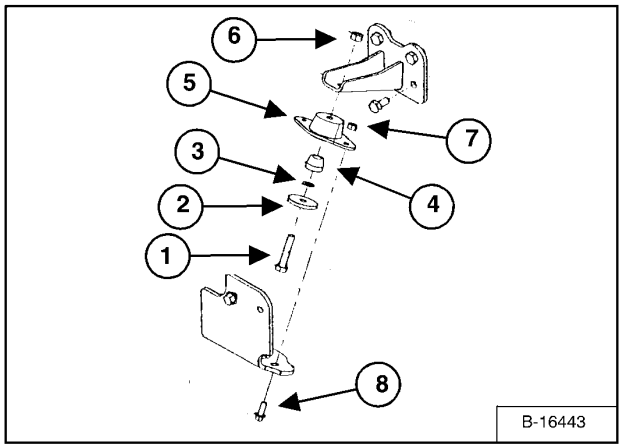
Engine Mount Replacement

Use the following procedure to install new engine mounts:

Remove the existing mount from the engine. Refer to engine removal and installation for engine mount locations.

Replace all four engine mounts, two rear and one on each side.

Figure 70-70-13



Use the parts shown to install the new side engine mounts **[Figure 70-70-13]**:

Mounting Bolt - (Item 1)

Mount Washer - (Item 2)

Plain Flat Washer - (Item 3)

Spacer - (Item 4)

Engine Mount - (Item 5)

Hex Nut - (Item 6)

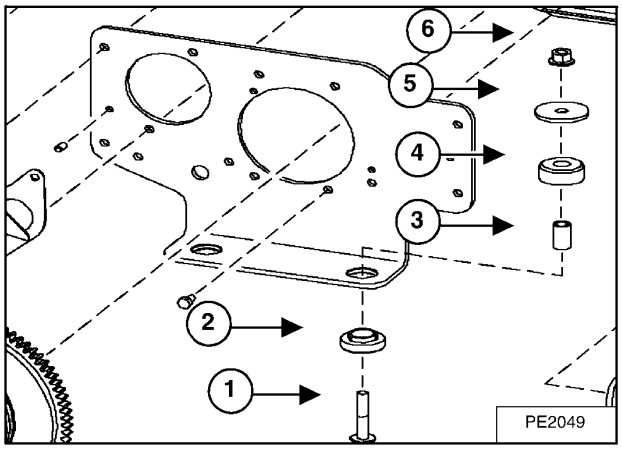
Hex Nut - (Item 7)

Mounting Bolt - (Item 8)

Tighten the mounting bolt (Item 1) **[Figure 70-70-13]** to 32-35 ft.-lb. (43-47 N•m) torque.

Tighten the mounting bolt (Item 8) **[Figure 70-70-13]** to 18-19 ft.-lb. (24-26 N•m) torque.

Figure 70-70-14



Use the parts shown to install the new rear engine mounts **[Figure 70-70-14]**:

Mounting Bolt - (Item 1)

Engine Mount - (Item 2)

Spacer - (Item 3)

Engine Mount - (Item 4)

Mount Washer - (Item 5)

Hex Nut - (Item 6)

Tighten the mounting bolt (Item 1) **[Figure 70-70-14]** to 65-70 ft.-lb. (88-95 N•m) torque.

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FLYWHEEL

Flywheel Removal And Installation

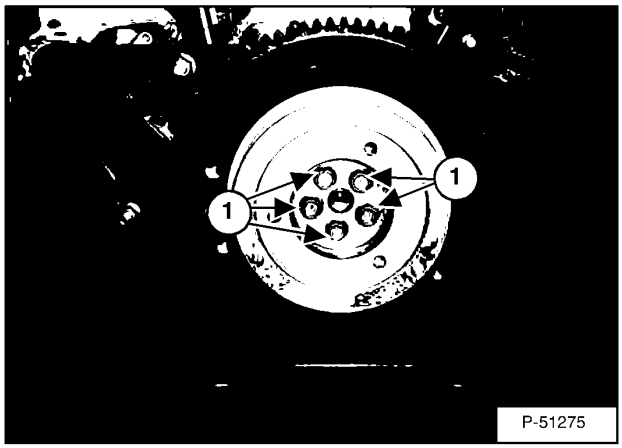
Remove the Hydraulic Gear Pump. (See Removal And Installation on Page 20-50-2.)

Remove the Hydraulic Gear Pump Mounting Bracket. (See Hydraulic Gear Pump Mounting Bracket Removal And Installation on Page 70-110-1.)

Remove the Hydraulic Gear Pump Coupler. (See Hydraulic Gear Pump Coupler Removal And Installation on Page 70-110-2.)

NOTE: The engine is removed for visual clarity only.

Figure 70-80-1



Remove the five flywheel bolts (Item 1) **[Figure 70-80-1]** from the crankshaft.

Installation: Tighten the bolts to 40-44 ft.-lb. (54-60 N•m) torque.

Remove the flywheel.

Reverse the removal procedure to install the flywheel.

⚠ WARNING

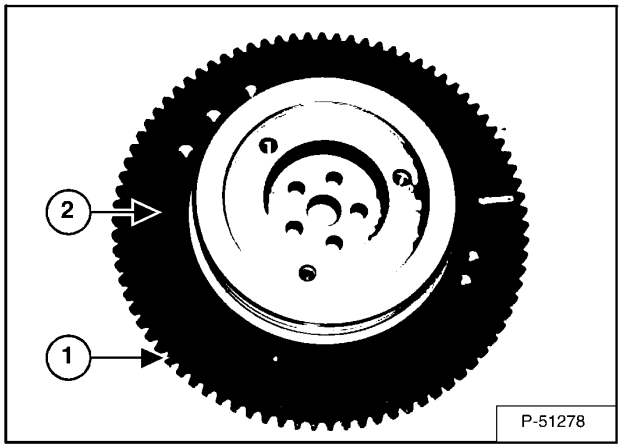
Wear safety glasses to prevent eye injury when any of the following conditions exist:

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

W-2019-1285

Flywheel Ring Gear Removal And Installation

Figure 70-80-2



The ring gear (Item 1) is installed on the flywheel (Item 2) **[Figure 70-80-2]** with an interference fit. Heat the ring gear enough to expand it. Then hit it evenly with a hammer to remove it.

Clean the ring gear mounting surface of the flywheel to give a smooth fit.

Clean the new ring gear and heat it to a temperature of 450-500°F (232-260°C).

Fit the ring gear over the flywheel. Make sure the gear is fully seated **[Figure 70-80-2]**.

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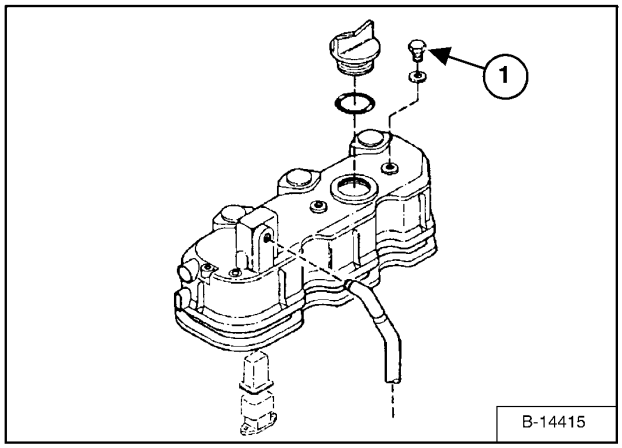
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RECONDITIONING THE ENGINE

Cylinder Head Removal And Installation

Figure 70-90-1



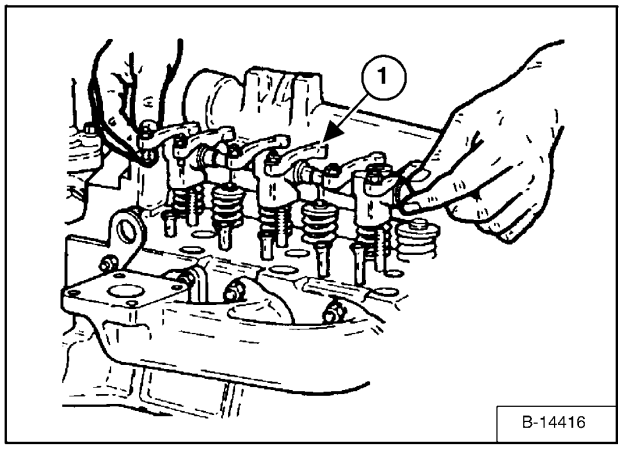
Remove the bolts (Item 1) **[Figure 70-90-1]** from the valve cover and remove the valve cover and gasket.

Remove the fu el injector nozzles. (See Fuel Injector Nozzles Removal on Page 70-60-7.)

Remove the glow plugs. (See Glow Plugs Checking on Page 70-60-8.)

Remove the alternator. (See Removal and Installation on Page 60-30-1.)

Figure 70-90-2

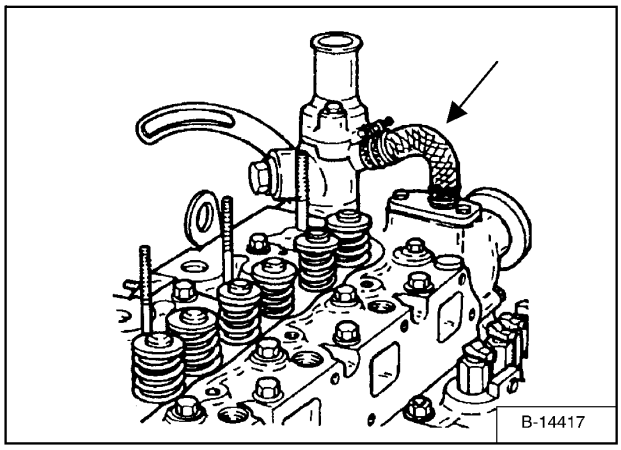


Remove the r ocker arm and shaft assembly (Item 1) **[Figure 70-90-2]**.

Installation: Tighten the nuts to 7-8 ft.-lb. (9,8-11,3 N•m) torque.

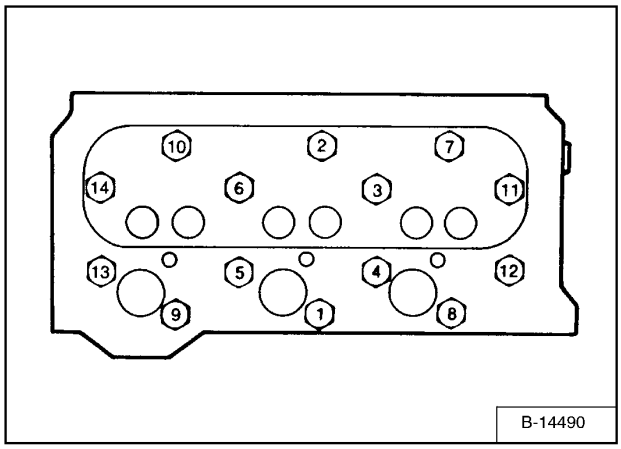
Remove the intake and exhaust manifolds.

Figure 70-90-3



Remove the water return hose **[Figure 70-90-3]**.

Figure 70-90-4



Remove the c ylinder head bolts in order of #14 to #1 **[Figure 70-90-4]**.

Installation: Put oil on the bolt threads. Tighten the bolts in the sequence of #1 to #14 to 29-33 ft.-lb. (39-44 N•m) torque.

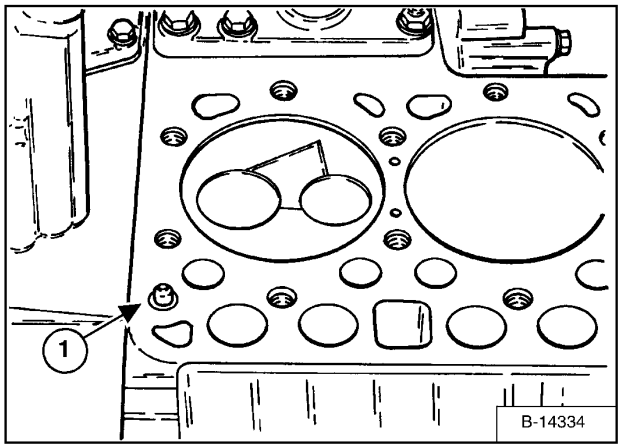
NOTE: Re-tighten the cylinder head bolts in the correct sequence after the engine has been run for 30 minutes.

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Cylinder Head Removal And Installation (Cont'd)

Figure 70-90-5

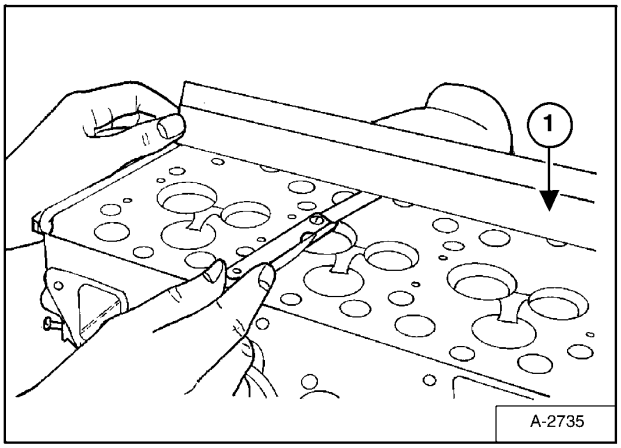


Remove the cylinder head from the engine block.

Installation: Always use a new head gasket and new O-ring. Make sure the O-ring (Item 1) **[Figure 70-90-5]** is seated over the dowel.

Cylinder Head Inspection

Figure 70-90-6



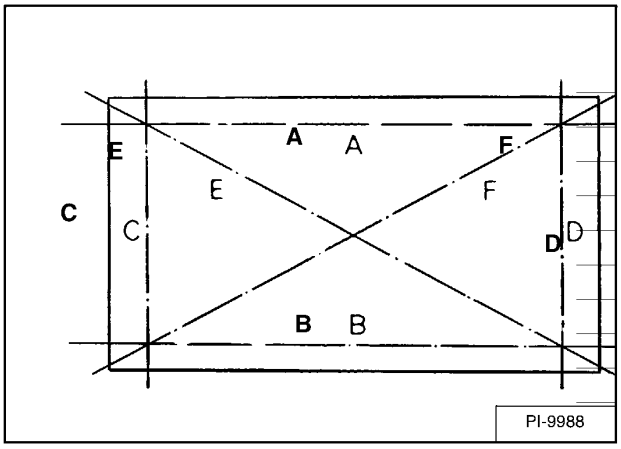
Clean the surface of the cylinder head.

Put a straight edge (Item 1) **[Figure 70-90-6]** on the cylinder head.

NOTE: Do not put the straight edge across combustion chambers.

Put a feeler gauge (Item 2) **[Figure 70-90-6]** between the straight edge and the surface of the cylinder head.

Figure 70-90-7



Put the straight edge on the cylinder head's four sides and two diagonal as shown in figure **[Figure 70-90-7]**.

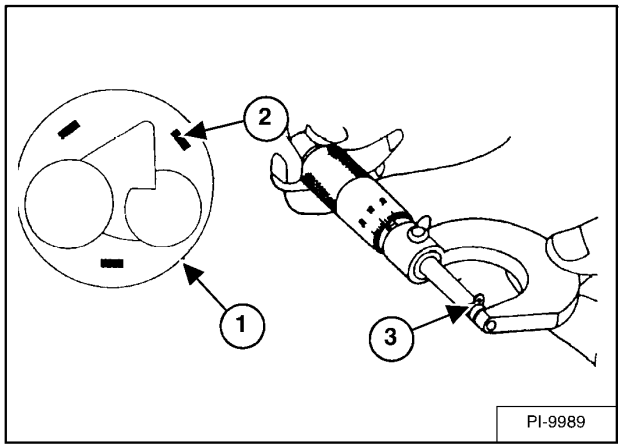
The maximum distortion of the head surface ± 0.002 in. (± 0,05 mm). If the measurement exceeds the specification, replace the cylinder head.

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Cylinder Head Top Clearance

Figure 70-90-8



Install the cylinder head gasket. Put the piston (Item 1) **[Figure 70-90-8]** being checked at T.D.C.

Put 3 pieces of 0.06 in. (1,5 mm) diameter solder (Item 2) **[Figure 70-90-8]** on the top 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 70-90-1.)

Turn the crankshaft until the piston exceeds T.D.C. Remove the cylinder head.

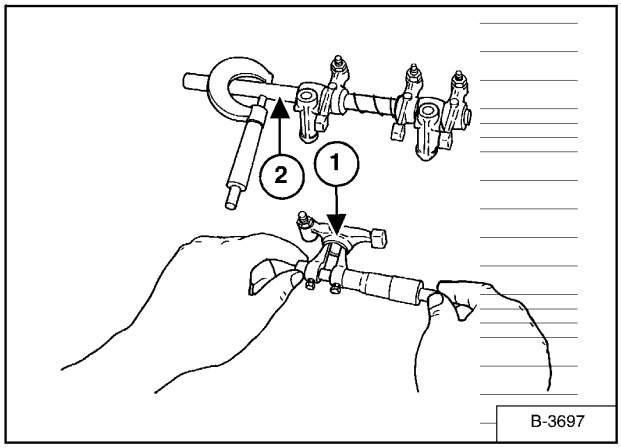
Remove the solder wire (Item 3) **[Figure 70-90-8]** and measure it.

If the measurement exceeds the specifications, check the oil clearance of the crank pin journal or the piston pin.

Top Clearance	0.0197-0.0256 in. (0,50-0,65 mm)

Rocker Arm And Shaft Checking

Figure 70-90-9



Measure the rocker arm I.D. (Item 1) **[Figure 70-90-9]** with an inside micrometer.

Measure the rocker shaft O.D. (Item 2) **[Figure 70-90-9]** with an outside micrometer.

If the clearance exceeds the allowable limit, replace the bushing.

If the clearance still exceeds the allowable limit after the bushing is replaced, replace the rocker arm shaft.

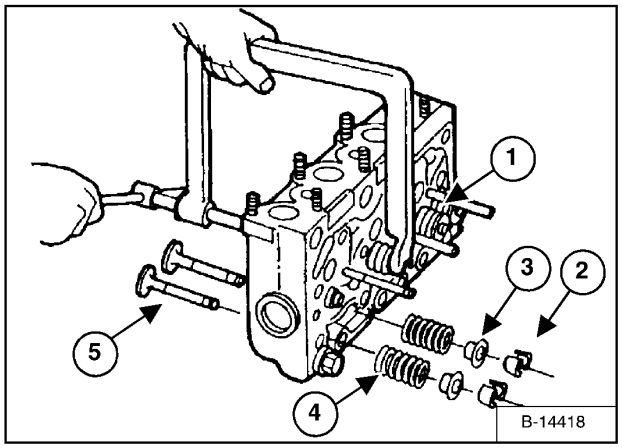
Oil Clearance Between Rocker Arm & Shaft	0.0006-0.0018 inch (0,016-0,045 mm)
Allowable Limit	0.0059 inch (0,15 mm)
Rocker Arm Shaft O.D.	0.4123-0.4128 inch (10,47-10,48 mm)
Rocker Arm I.D.	0.4134-0.4141 inch (10,5-10,52 mm)

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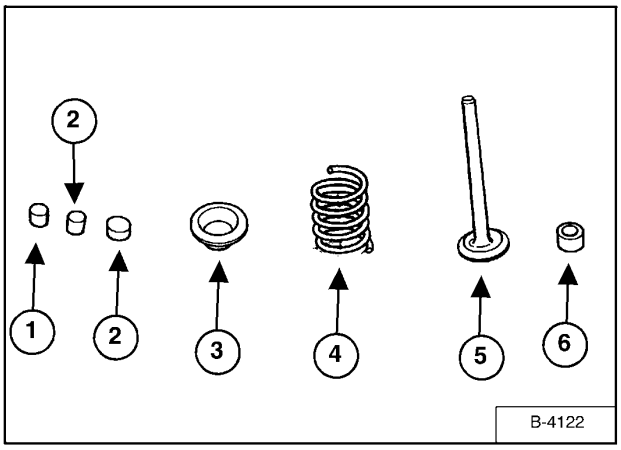
Valve Removal

Figure 70-90-10



Use a valve spring compressor to compress the valve spring (Item 1) **[Figure 70-90-10]**.

Figure 70-90-11



Remove the valve cap (Item 1) **[Figure 70-90-11]** and valve spring collet (Item 2) **[Figure 70-90-10]** & **[Figure 70-90-11]**.

Remove the valve spring retainer (Item 3) **[Figure 70-90-10]** & **[Figure 70-90-11]** and the spring (Item 4) **[Figure 70-90-10]** & **[Figure 70-90-11]**.

Remove the valve (Item 5) **[Figure 70-90-10]** & **[Figure 70-90-11]**.

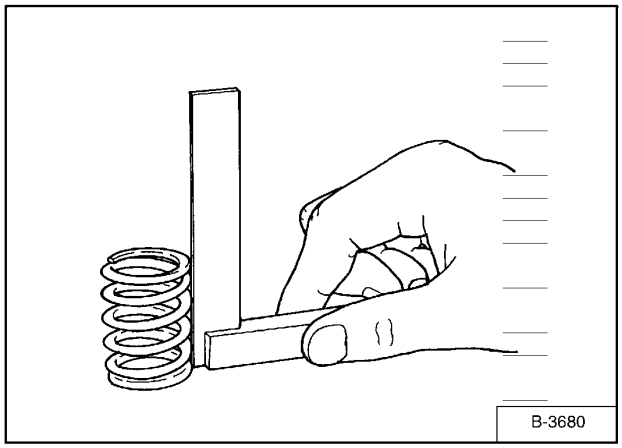
Remove the seal (Item 6) **[Figure 70-90-11]**.

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Valve Spring Checking

Figure 70-90-12



Measure the length of the valve spring. If the measurement is less than the allowable limit, replace the spring **[Figure 70-90-12]**.

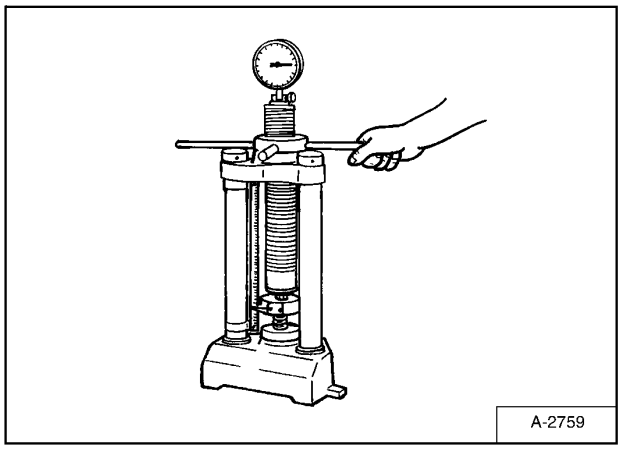
Free Length	1.244 inch (31,6 mm)
Allowable Limit	1.118 inch (28,4 mm)

Put the spring on a flat surface, place a square on the side of the spring **[Figure 70-90-12]**.

Rotate the spring and measure the maximum tilt. If the measurement is in excess of the allowable limit, replace the spring.

Tilt	0.047 inch (1,2 mm)

Figure 70-90-13



Put the spring on a tester and compress to specified length **[Figure 70-90-13]**.

Read the compressed load on the gauge. If the measurement exceeds allowable limit, replace the spring.

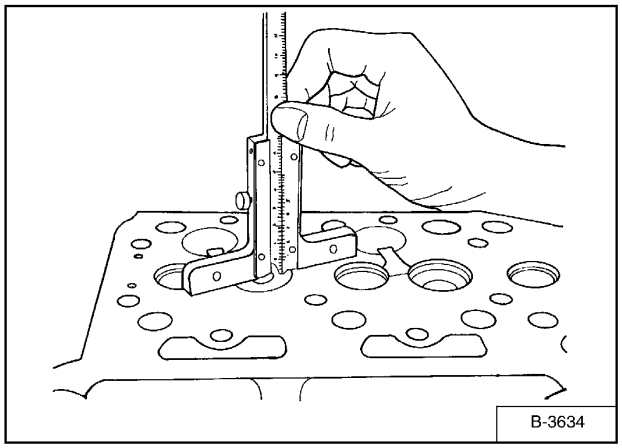
Setting Length	1.063 inch (27 mm)
Setting Load	14.6 lbs. (64.7 N)
Allowable Limit (setting load)	12.3 lbs. (54.9 N)

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Valve Guide Checking

Figure 70-90-14

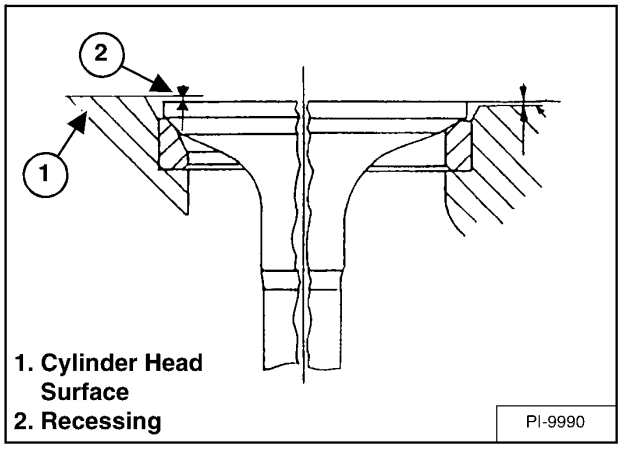


Remove the valve and spring from the c ylinder head. (See Page 70-90-5.)

Clean the valve seat and combustion chamber.

Install the valve into the guide. Measure the valve recessing with a depth gauge **[Figure 70-90-14]**.

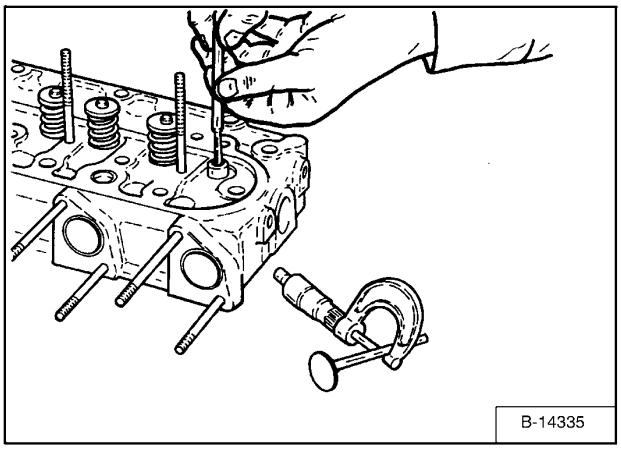
Figure 70-90-15



If the measurement exceeds the allowable limit, replace the valve or cylinder head **[Figure 70-90-15]**.

Recessing	0.004 inch (0,10 mm)
Allowable Limit (Recessing)	0.012 inch (0,3 mm)

Figure 70-90-16



Remove the carbon from the valve guide.

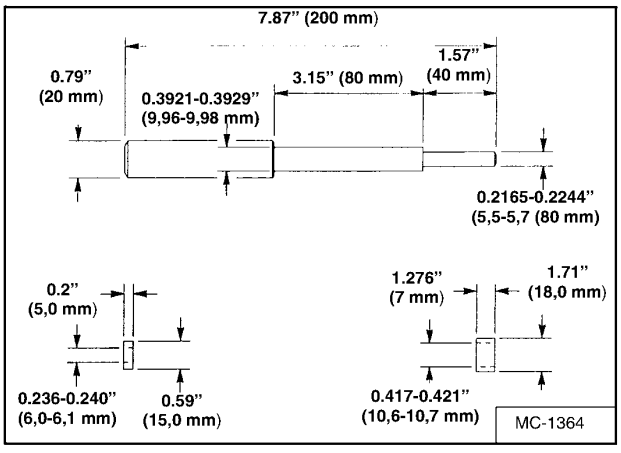
Measure the valve stem O.D. **[Figure 70-90-16]**.

Measure the valve guide I.D. **[Figure 70-90-16]**.

Calculate the clearance. If the clearance exceeds the allowable limit, replace the valve and/or valve guide.

Valve Guide I.D	0.2366-0.2372 inch (6,01-6,025 mm)
Valve Stem O.D	0.2350-0.2354 inch (5,9168-5,980 mm)
Clearance Between Valve Stem and guide	0.0012-0.0022 inch (0,030-0,057 mm)
Allowable Limit	0.0039 inch (0,1 mm)

Figure 70-90-17



To remove and replace the valve guide, make the driver tools as shown in figure **[Figure 70-90-17]**.

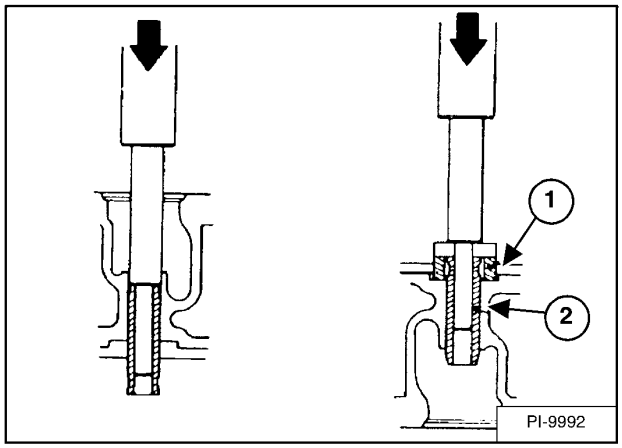
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RECONDITIONING THE ENGINE (CONT'D)

Valve Guide Checking (Cont'd)

Figure 70-90-18



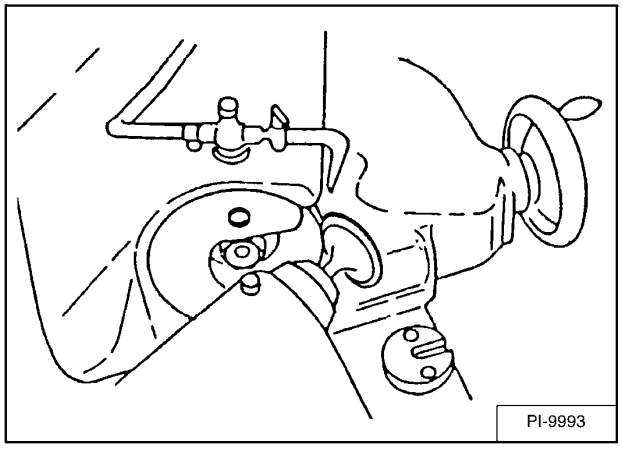
Press the used valve guide out of the cylinder head using the special driver tool **[Figure 70-90-18]**. (See previous page for tool dimensions.)

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 (Item 1 & 2) **[Figure 70-90-18]**, press the new guide until the tools contact the cylinder head.

Ream the valve guide to the correct specifications.

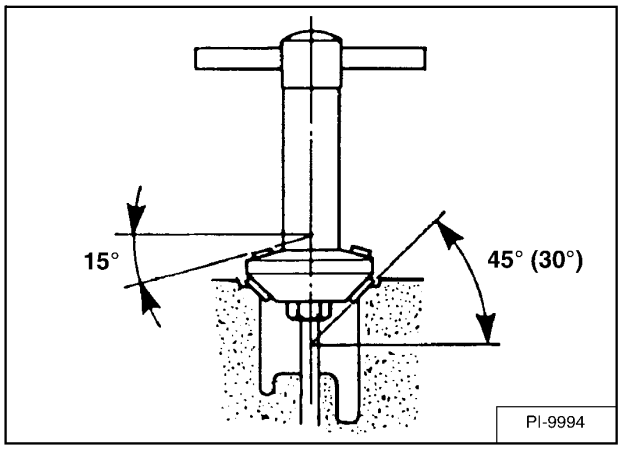
Reconditioning The Valve And Valve Seat

Figure 70-90-19



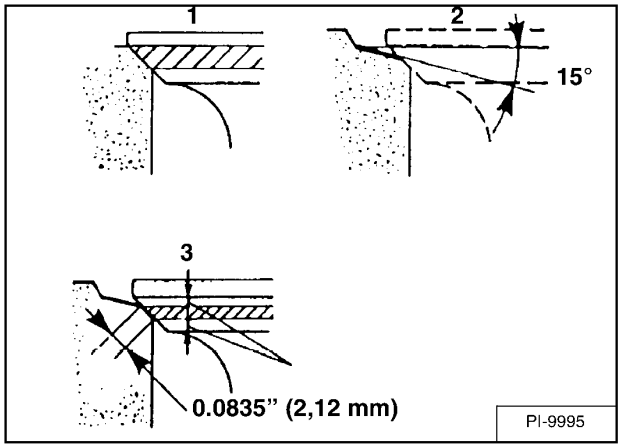
Grind the valve face to the correct angle using a valve refacer **[Figure 70-90-19]**.

Figure 70-90-20



Grind the valve surface in the cylinder head to the correct angle **[Figure 70-90-20]**.

Figure 70-90-21



Check the seat surface and valve face (Item 1) **[Figure 70-90-21]**.

If the seat surface is too wide, use a 15° cutter (Item 2) to get the correct width (Item 3) **[Figure 70-90-21]**.

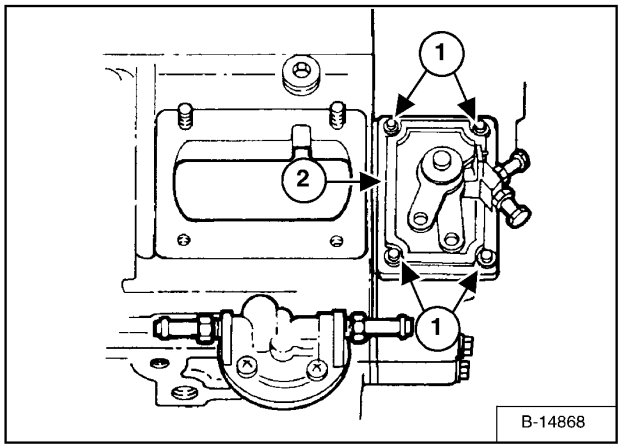
Valve Seat Width Intake	0.0835 inch (2,12 mm)
Exhaust	0.0835 inch (2,12 mm)
Valve Seat & Face Angle Intake	45°
Exhaust	45°

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Timing Gearcase Cover Removal And Installation

Figure 70-90-22

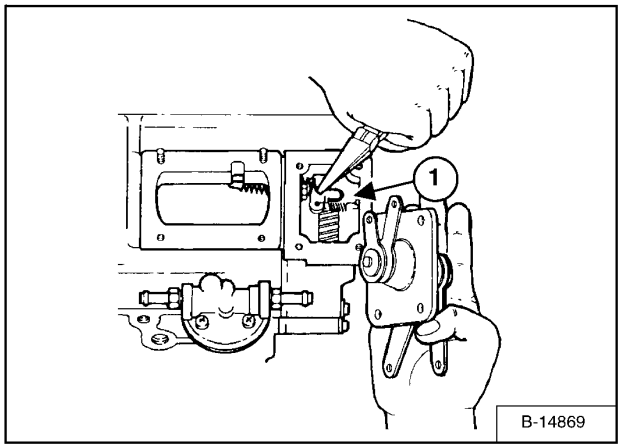


Remove the fue l injection pump. (See Fuel Injection Pump Removal And Installation on Page 70-60-3.)

Remove the cylinder head, rocker arms and push rods. (See Page 70-90-1.)

Remove the screws (Item 1) from the speed control plate (Item 2) **[Figure 70-90-22]**.

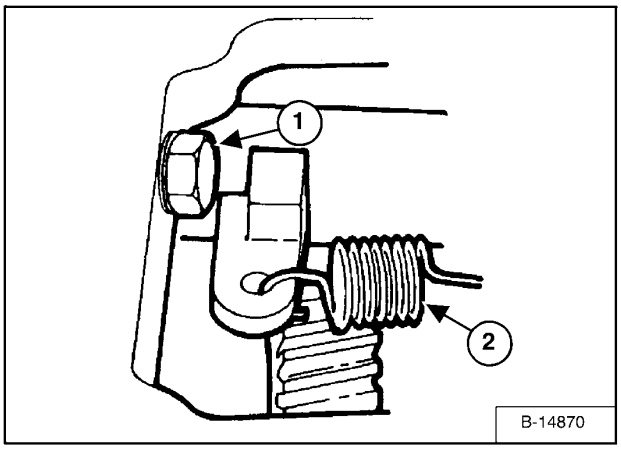
Figure 70-90-23



Separate the speed control plate from the engine and remove the spring (Item 1) **[Figure 70-90-23]**.

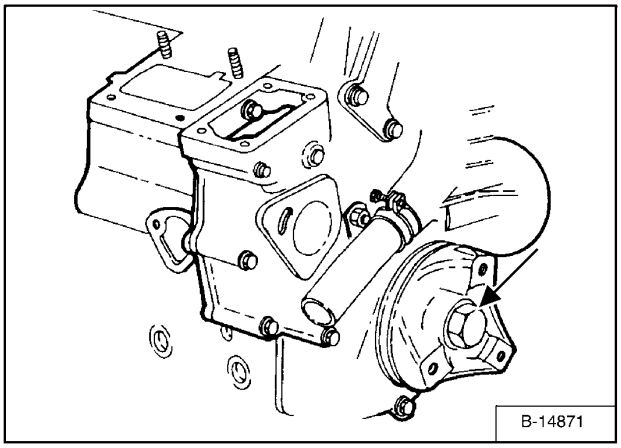
Remove the speed control plate.

Figure 70-90-24



Remove the bolt (Item 1) and disconnect the shaft spring (Item 2) **[Figure 70-90-24]**.

Figure 70-90-25



Remove the crankshaft pulley bolt.

Installation: Tighten the bolt 72-80 ft.-lb. (98-108 N•m) torque.

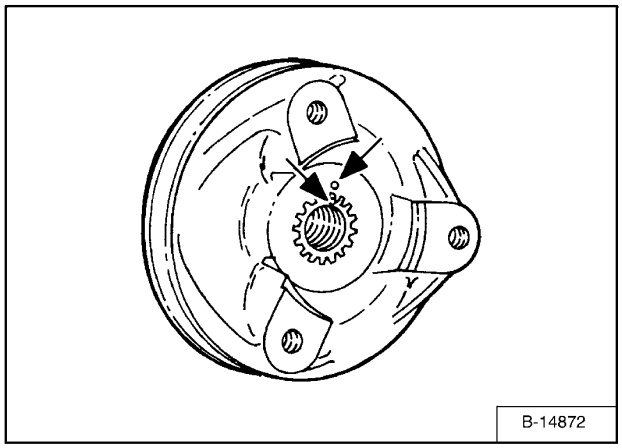
Use a pu ller and remove the crankshaft pulley **[Figure 70-90-25]**.

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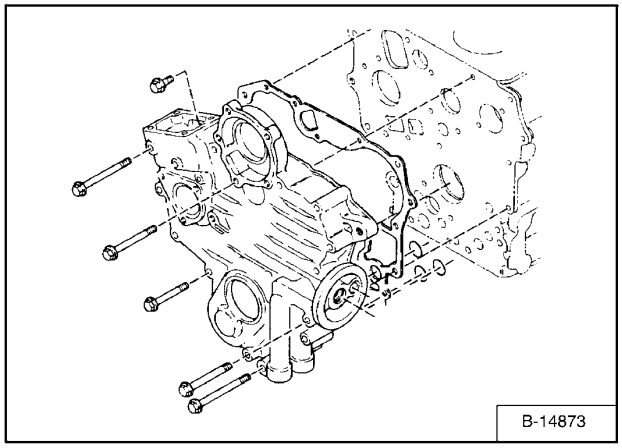
Timing Gearcase Cover Removal And Installation (Cont'd)

Figure 70-90-26



When installing the crank shaft pulley, make sure to align the marks **[Figure 70-90-26]**.

Figure 70-90-27

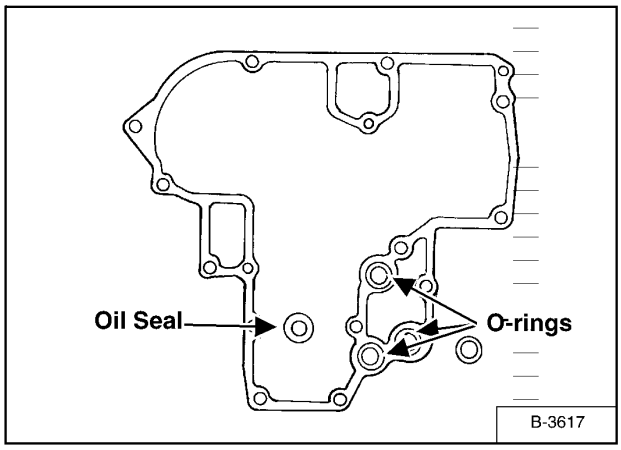


Remove the timing gear case cover bolts.

Installation: Tighten the bolts to 7-8 ft.-lb. (10-11 N•m) torque.

Remove the timing gear case **[Figure 70-90-27]**.

Figure 70-90-28



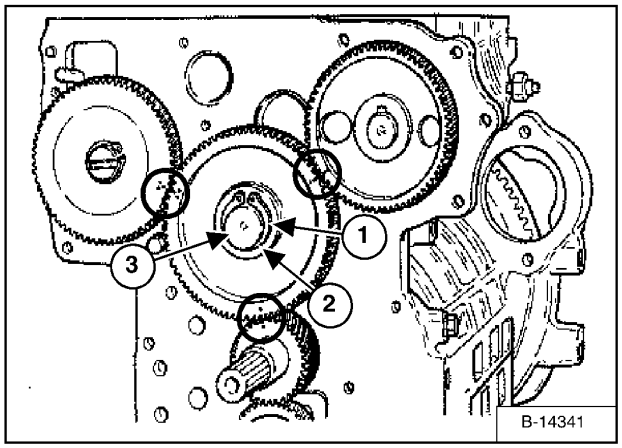
Installation: Install three new O-rings and the oil seal into the timing gear case cover **[Figure 70-90-28]**.

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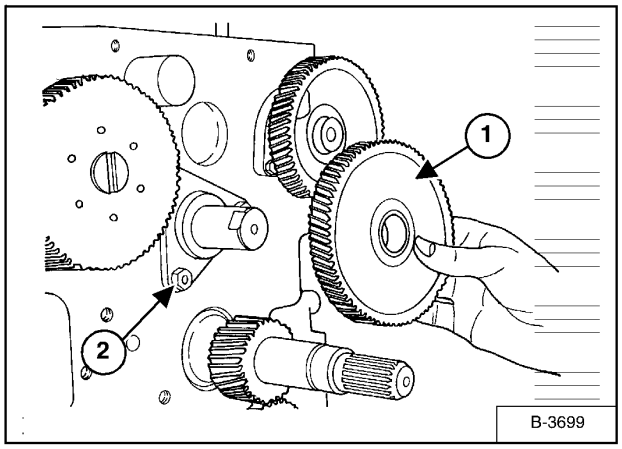
Idler Gear And Camshaft Removal And Installation

Figure 70-90-29



Remove the snap ring (Item 1) and collar (Item 2) from the idler gear shaft (Item 3) **[Figure 70-90-29]**.

Figure 70-90-30

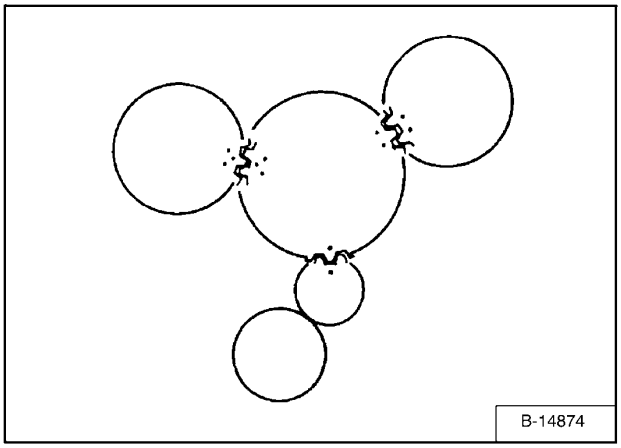


Remove the idler gear (Item 1) **[Figure 70-90-30]**.

Remove the idler gear mounting bolts (Item 2) **[Figure 70-90-30]**.

Installation: Tighten bolts to 7.2-8.3 ft.-lb. (9,8-11,3 N•m) torque.

Figure 70-90-31



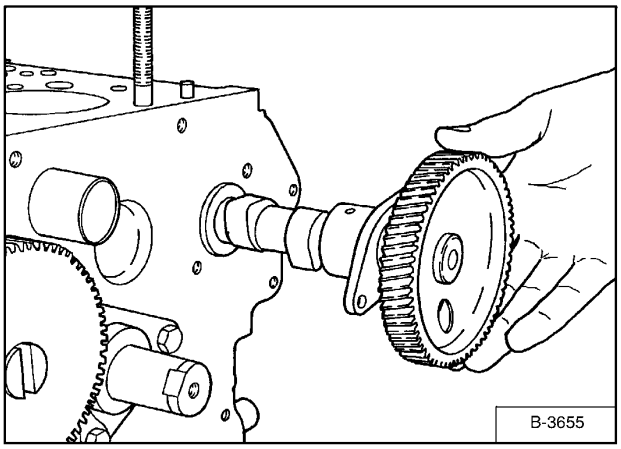
Installation: Make sure the timing marks are aligned when installing the timing gears **[Figure 70-90-31]**.

Align the holes on the camshaft gear with the camshaft retainer plate bolts.

Remove the bolts.

Installation: Tighten the camshaft retainer bolts to 14-15 ft.-lb. (18-21 N•m) torque.

Figure 70-90-32



Remove the camshaft from the engine block **[Figure 70-90-32]**.

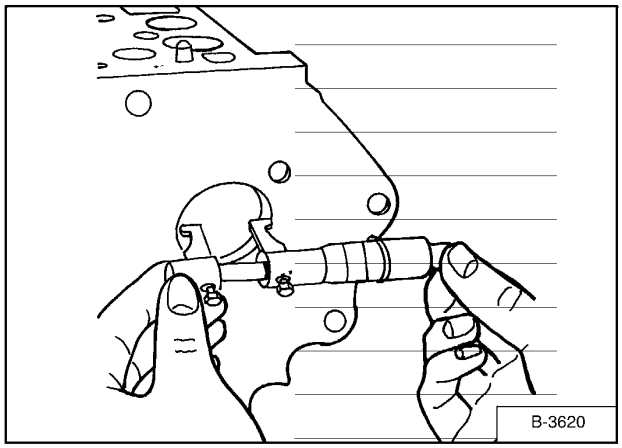
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RECONDITIONING THE ENGINE (CONT'D)

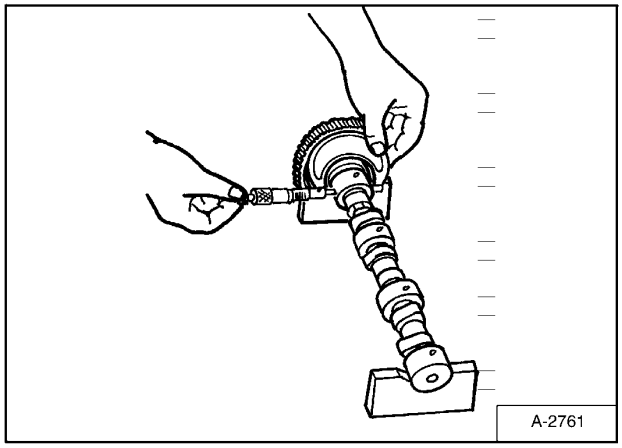
Idler Gear And Camshaft Removal And Installation (Cont'd)

Figure 70-90-33



Measure the camshaft bearing in the engine block **[Figure 70-90-33]**.

Figure 70-90-34

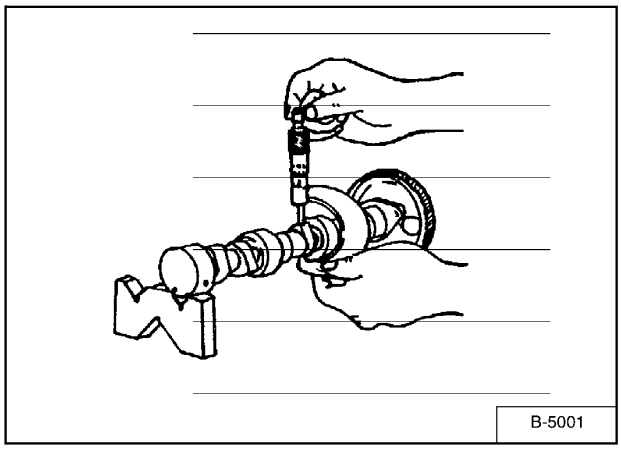


Measure the camshaft journal **[Figure 70-90-34]**.

Calculate the oil clearance. If the clearance exceeds the allowable limit, replace the camshaft.

Bearing I.D.	1.2992-1.3002 inch (33,00-33,025 mm)
Journal O.D.	1.2966-1.2972 inch (32,934-32,95 mm)
Clearance of Camshaft Journal	0.002-0.0036 inch (0,05-0,09 mm)
Allowable Limit	0.0059 inch (0,15 mm)

Figure 70-90-35

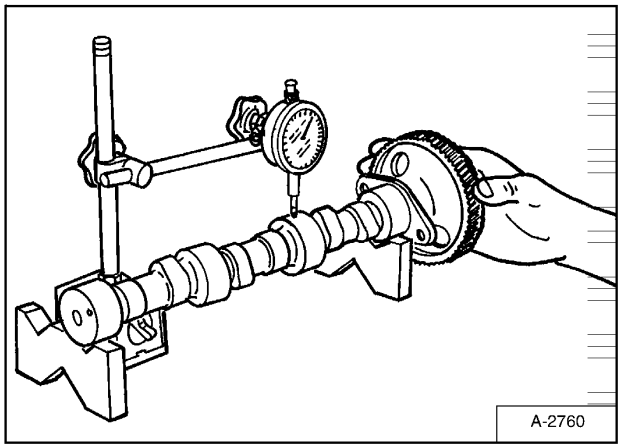


Measure the cam lobes at their highest point **[Figure 70-90-35]**.

If the measurement is less than the allowable limit, replace the camshaft.

Cam Lobe Height	1.0583 inch (26.88 mm)
Allowable Limit	1.0563 inch (26,83 mm)

Figure 70-90-36



Put the camshaft in V-blocks. Install a dial indicator **[Figure 70-90-36]**.

Turn the camshaft at a slow rate. If the misalignment exceeds the allowable limit, replace the camshaft.

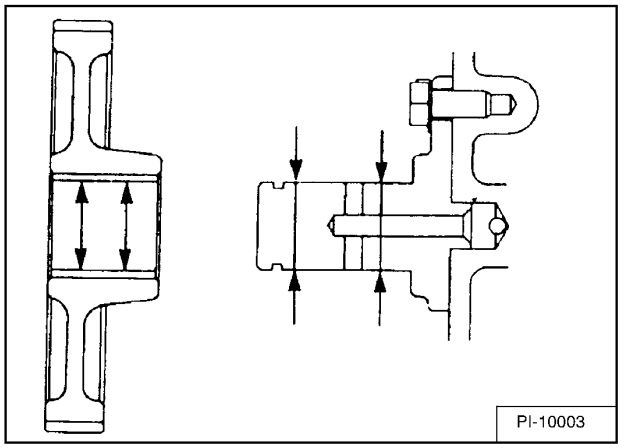
Camshaft Alignment Allowable Limit	0.0004 inch (0,01 mm)

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Servicing The Idler Gear And Shaft

Figure 70-90-37



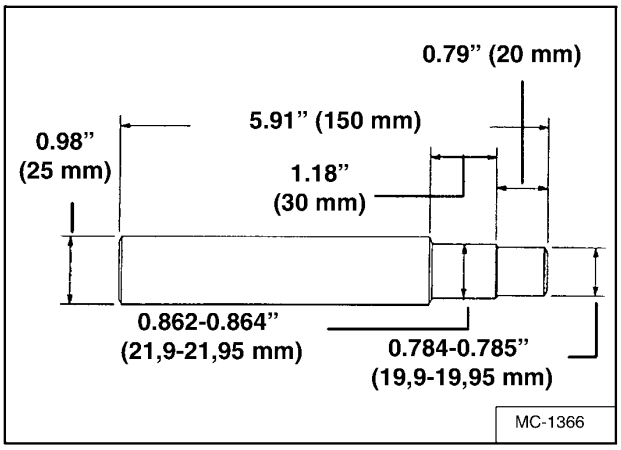
Measure the O.D. of the idler gear shaft **[Figure 70-90-37]**.

Measure the I.D. of the idler gear bushing **[Figure 70-90-37]**.

If the clearance exceeds the allowable limit, replace the bushing.

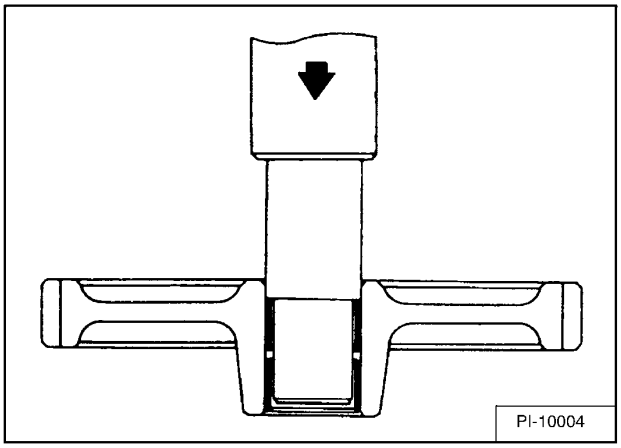
Idler Gear Shaft O.D	0.7861-0.7866 inch (19.967-19.980 mm)
Idler Gear Bushing I.D	0.7874-0.7894 inch (20,000-20,051 mm)
Oil Clearance between Idler Shaft & Idler Gear Bushing	0.0008-0.0033 inch (0,020-0,084 mm)
Allowable Limit	0.0039 inch (0,10 mm)

Figure 70-90-38



To replace the idler gear bushing, make a driver tool as shown in figure **[Figure 70-90-38]**.

Figure 70-90-39



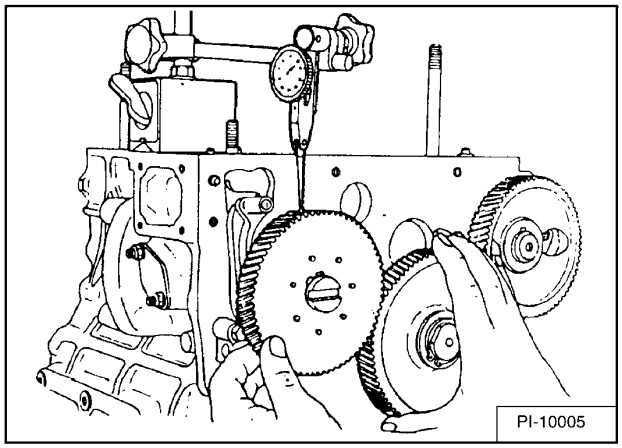
Use a press and special driver tool, to remove the old bushing and install the new bushing **[Figure 70-90-39]**.

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Checking Timing Gear Backlash

Figure 70-90-40



When the gears are installed, check the backlash as follows:

Install a dial indicator **[Figure 70-90-40]**.

Hold one gear while turning the other gear **[Figure 70-90-40]**.

If the backlash exceeds the allowable limit, check the oil clearance of the shaft and gear. If the oil clearance is correct, replace the gear.

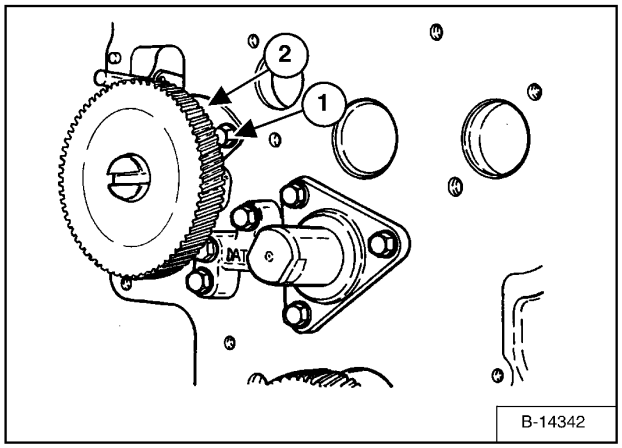
Crank Gear & Idler Gear	0.0017-0.0049 inch (0,043-0,124 mm)
Allowable Limit	0.0059 inch (0,15 mm)
Cam Gear & Idler Gear	0.0018-0.0048 inch (0,047-0,123 mm)
Allowable Limit	0.0059 inch (0,15 mm)
Injection Pump Gear & Idler Gear	0.0018-0.0049 inch (0,046-0,124 mm)
Allowable Limit	0.0059 inch (0,15 mm)
Oil Pump Gear & Crankshaft Gear	0.0016-0.0048 inch (0,041-0,123 mm)
Allowable Limit	0.0059 inch (0,15 mm)

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Fuel Camshaft Removal And Installation

Figure 70-90-41



Remove the timing gearcase cover. (See Page 70-90-8.)

Remove the idler gear. (See Page 70-90-10.)

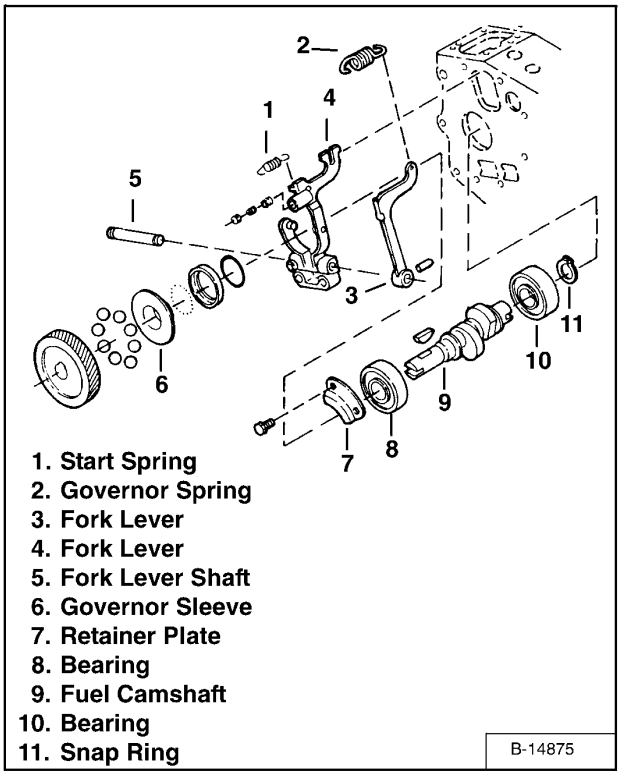
Remove the bolt (Item 1) from the retainer plate (Item 2) **[Figure 70-90-41]**.

Remove the fuel camshaft retainer plate (Item 2) **[Figure 70-90-41]**.

Remove the fuel camshaft and fork lever assembly at the same time.

Governor

Figure 70-90-42



1. Start Spring
2. Governor Spring
3. Fork Lever
4. Fork Lever
5. Fork Lever Shaft
6. Governor Sleeve
7. Retainer Plate
8. Bearing
9. Fuel Camshaft
10. Bearing
11. Snap Ring

The governor serves to keep the engine speed constant by automatically adjusting the amount of fuel supplied to the engine according to changes in the load.

Disassemble and assemble the governor and fuel camshaft as shown in figure **[Figure 70-90-42]**.

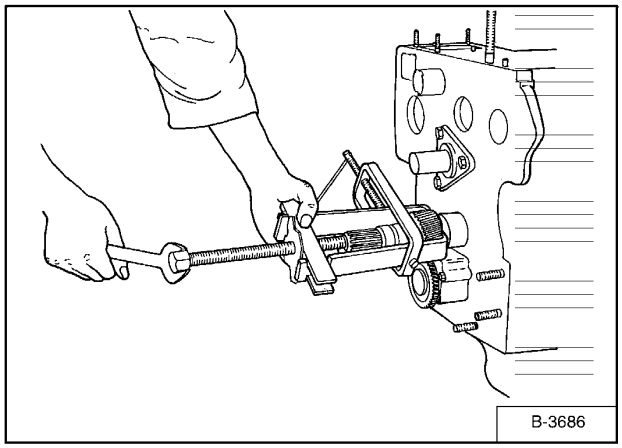
Check all the parts for wear or damage and replace as needed.

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Crankshaft Gear Removal And Installation

Figure 70-90-43



Remove the timing gearcase cover. (See Page 70-90-8.)

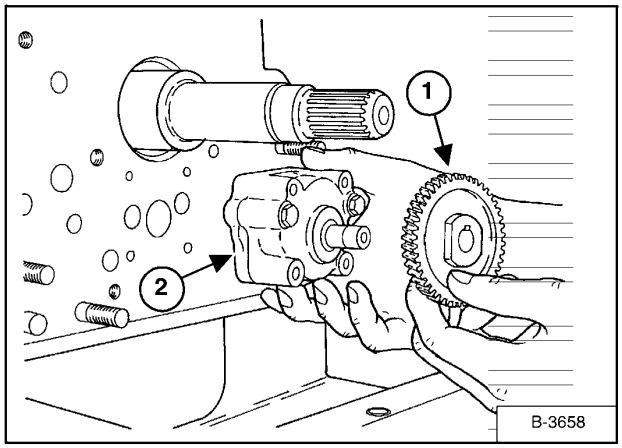
Remove the idler gear. (See Page 70-90-10.)

Remove the crankshaft gear with a puller **[Figure 70-90-43]**.

Remove the crankshaft key.

Oil Pump Removal And Installation

Figure 70-90-44



Remove the timing gearcase cover. (See Page 70-90-8.)

Remove the crankshaft gear.

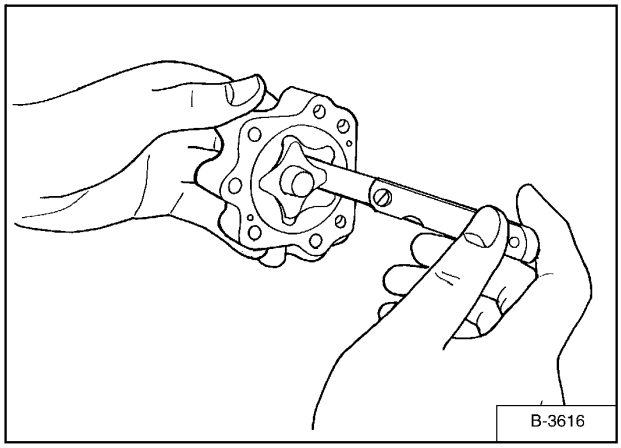
Remove the nut from the oil pump shaft. Use a puller to remove the oil pump gear (Item 1) **[Figure 70-90-44]**.

Remove the oil pump mounting bolts. Remove the oil pump (Item 2) **[Figure 70-90-44]**.

Installation: Tighten the oil pump mounting bolts to 60-72 in.-lb. (6,9-8,1 N•m) torque.

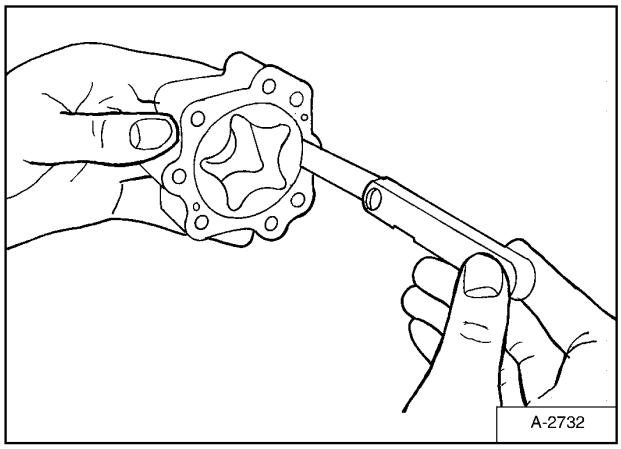
Oil Pump Service

Figure 70-90-45



Measure the clearance between the lobes of the inner rotor and outer rotor **[Figure 70-90-45]**.

Figure 70-90-46



Measure the clearance between the outer rotor and pump body **[Figure 70-90-46]**.

If the clearance exceeds the factory limit, replace the oil pump.

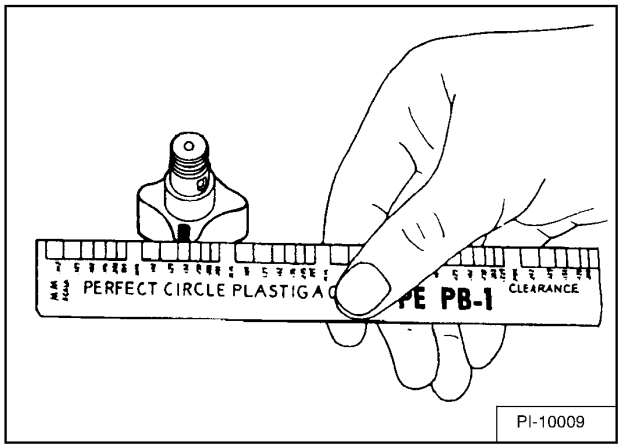
Clearance Between Inner & Outer Rotor	0.001-0.006 inch (0,03-0,14 mm)
Clearance Between Outer rotor & Body	0.003-0.006 inch (0,07-0,15 mm)

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Oil Pump Service (Cont'd)

Figure 70-90-47



Put a piece of press gauge on the rotor face **[Figure 70-90-47]**.

Install the cover and tighten the bolts.

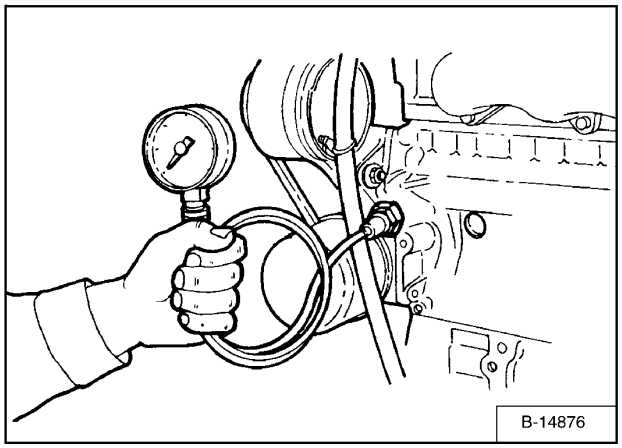
Remove the cover carefully. Measure the width of the press gauge **[Figure 70-90-47]**.

If the clearance exceeds the factory limit replace the oil pump.

End Clearance	0.003-0.005 (0,075-0,135)

Checking Engine Oil Pressure

Figure 70-90-48



Remove the oil pressure sensor.

Install a pressure gauge **[Figure 70-90-48]**.

Start the engine and run until it is at operating temperature.

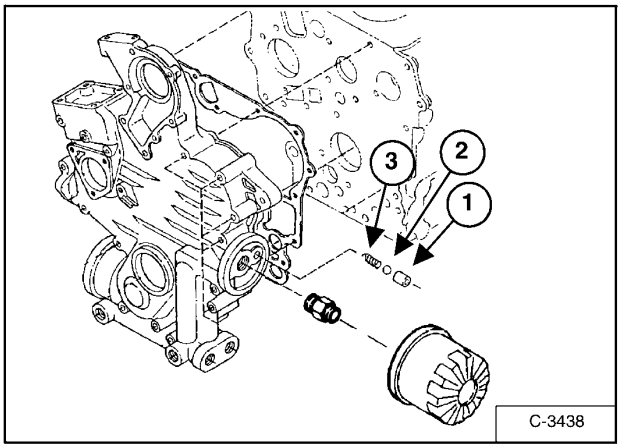
If the oil pressure is less than the allowable limit, check the following item:

- Engine Oil Level Low
- Oil Pump Defective
- Oil Galley Plugged
- Oil Strainer Plugged
- Excessive Clearance at the Rod & Main Bearings
- Relief Valve Stuck

At Idle Speed	14 PSI (98 bar)
At Rated Speed	28-64 PSI (196-441 bar)
At Rated Speed Allowable Limit	14 PSI (98 bar)

Relief Valve

Figure 70-90-49



The relief valve prevents damage of the lubricating system due to high pressure. This relief valve is a ball type.

Remove the valve seat (Item 1), ball (Item 2) and spring (Item 3) **[Figure 70-90-49]**.

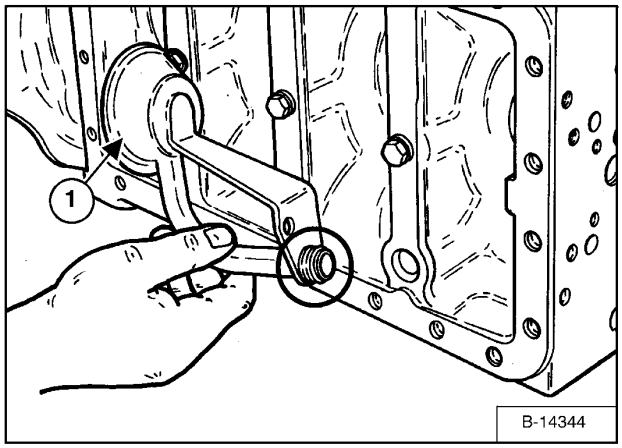
Check the parts for wear or damage and replace as needed.

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Piston And Connecting Rod Removal And Installation

Figure 70-90-50



Remove the cylinder head. (See Page 70-90-1.)

Remove the top edge from the cylinder bore with a ridge reamer.

Remove the oil pan.

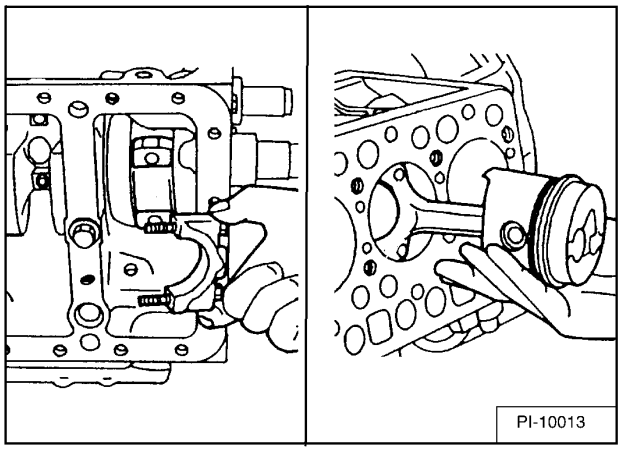
Remove the oil pump strainer (Item 1) **[Figure 70-90-50]**.

Turn the flywheel and put a pair of connecting rods at bottom dead center.

Remove the connecting rod bolts.

Installation: Tighten the connecting rod bolts to 20-22 ft.-lb. (27-30 N•m) torque.

Figure 70-90-51

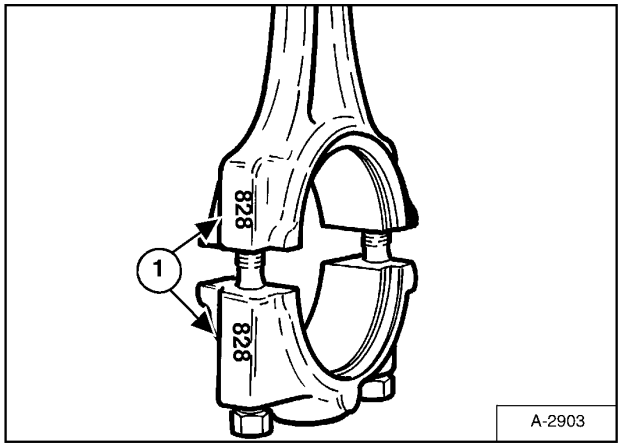


Remove the rod cap and bearing **[Figure 70-90-51]**.

Use a hammer handle and push the piston connecting rod assembly out of the cylinder bore **[Figure 70-90-51]**.

NOTE: Make sure the pistons are marked so they will be returned to the same cylinder bore.

Figure 70-90-52



Installation: Make sure the marks (Item 1) on the connecting rod and bearing are aligned when installing the bearing cap **[Figure 70-90-52]**.

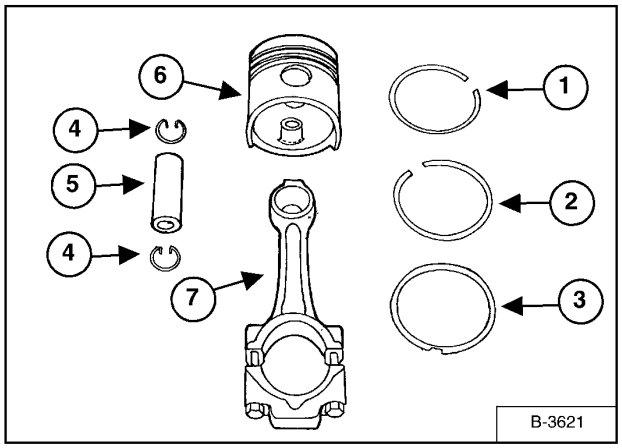
Repeat the procedure to remove the other piston/ connecting rod assemblies from the engine block.

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Piston And Connecting Rod Removal And Installation (Cont'd)

Figure 70-90-53



Remove the first compression ring (Item 1) **[Figure 70-90-53]**.

Remove the second compression ring (Item 2) **[Figure 70-90-53]**.

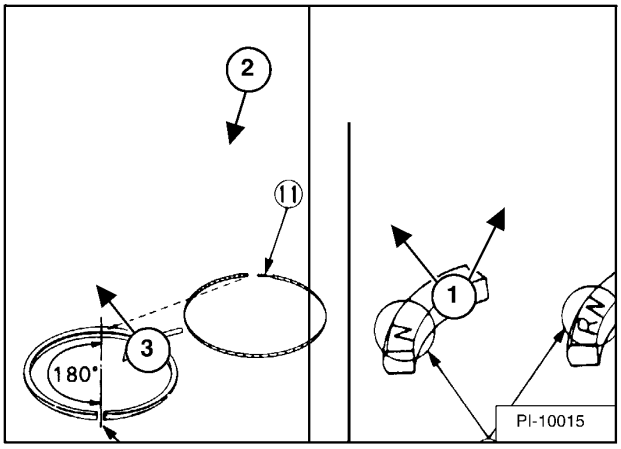
Remove the oil ring (Item 3) **[Figure 70-90-53]**.

Remove the snap ring (Item 4) and piston pin (Item 5) **[Figure 70-90-53]**.

Separate the piston (Item 6) from the connecting rod (Item 7) **[Figure 70-90-53]**.

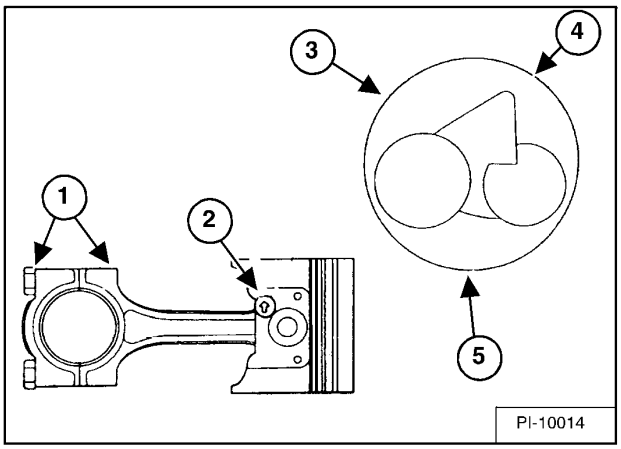
NOTE: Make sure the piston and rod assembly is marked so as not to change the piston rod assembly with another piston or connecting rod.

Figure 70-90-54



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 gap (Item 2) 180° from the oil ring gap (Item 3) **[Figure 70-90-54]**.

Figure 70-90-55



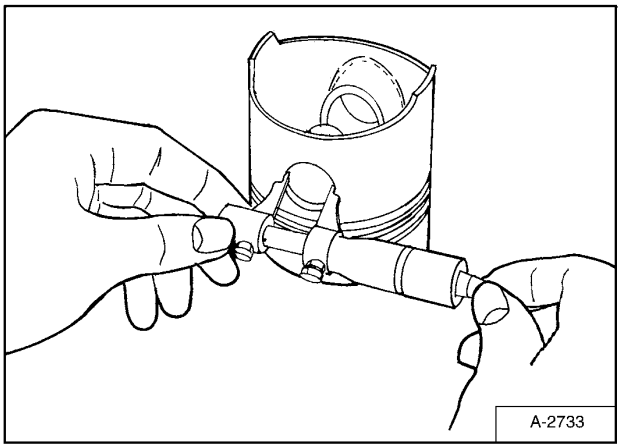
Installation: When reassembling, align the marks (Item 1) on the connecting rod and piston (Item 2). Heat the piston in oil to 176° F (80° C) for 10 to 15 minutes and tap the piston pin into position. Place the piston ring gaps every 120° (Item 3, 4 & 5) **[Figure 70-90-55]** with no gap facing the piston pin in the cylinder.

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Piston And Connecting Rod Servicing

Figure 70-90-56

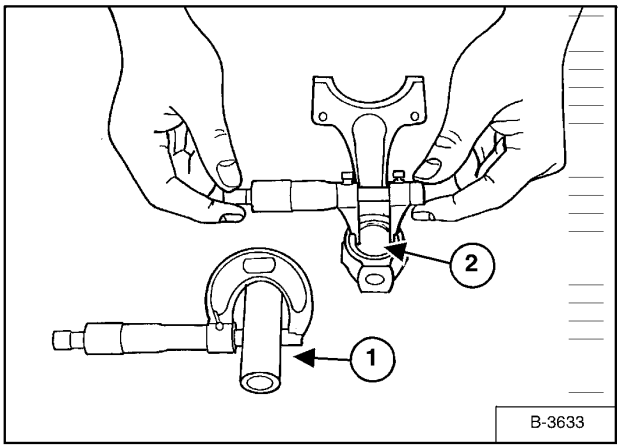


Measure the I.D. of the piston pin bore in both horizontal and vertical direction **[Figure 70-90-56]**.

If the measurement exceeds the allowable limit, replace the piston.

Piston Pin Bore I.D.	0.7874-0.7879 inch (20,0-20,013 mm)
Allowable Limit	0.7894 inch (20,05 mm)

Figure 70-90-57



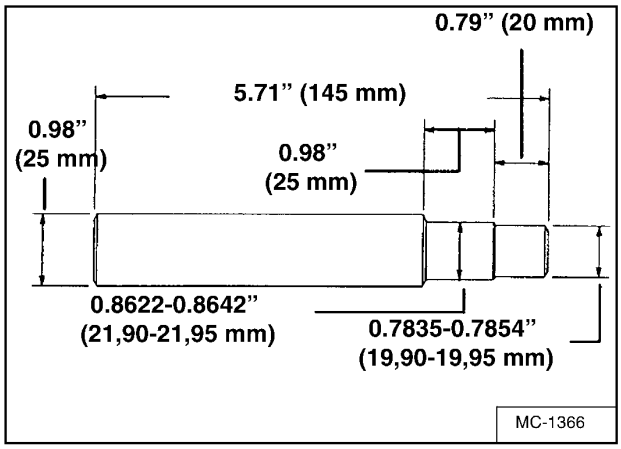
Measure the O.D. of the piston pin (Item 1) **[Figure 70-90-57]**.

Measure the I.D. of the connecting rod small end (Item 2) **[Figure 70-90-57]**.

Calculate the oil clearance. If the clearance exceeds the allowable limit, replace the bushing. If it still exceeds the specifications, replace the piston pin.

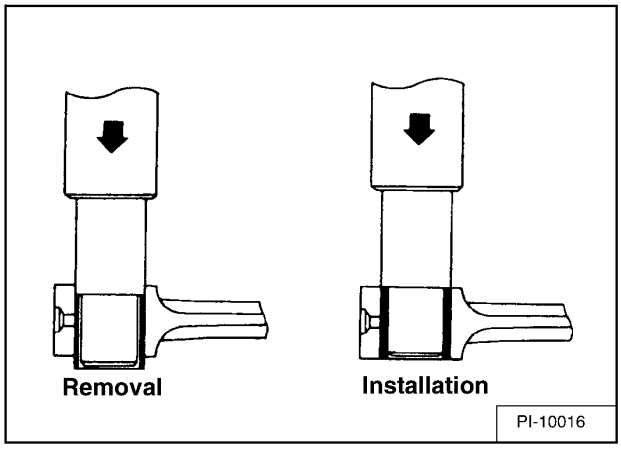
Piston Pin O.D.	0.7875-0.7878 inch (20,002-20,011 mm)
Bushing I.D.	0.7884-0.7890 inch (20,025-20,04 mm)
Oil Clearance between Piston Pin & Bushing	0.0006-0.0015 inch (0,014-0,038 mm)
Allowable Limit	0.004 inch (0,10 mm)

Figure 70-90-58



To replace the connecting rod small end bushing, make a driver tool as shown in figure **[Figure 70-90-58]**.

Figure 70-90-59



Use a press and special driver tool to remove the small end bushing **[Figure 70-90-59]**.

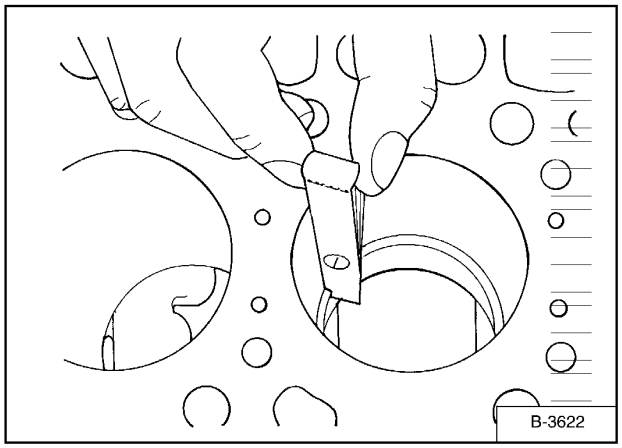
Installation: Clean the small end bushing and bore. Put oil on the bushing and press into the connecting rod until it is flush **[Figure 70-90-59]**.

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Piston And Connecting Rod Servicing (Cont'd)

Figure 70-90-60

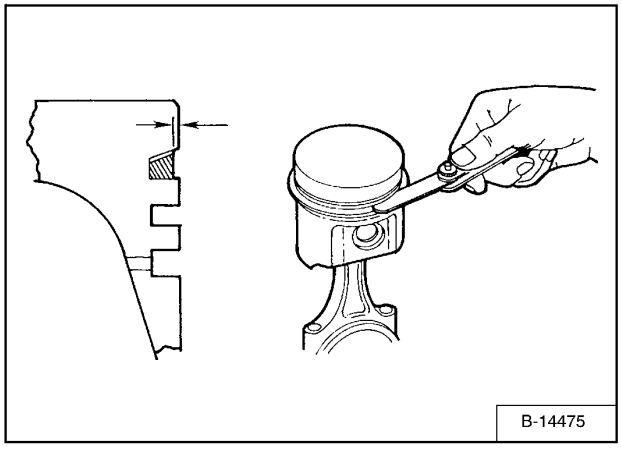


Install a new piston ring into the lower part of the cylinder bore. Measure the ring gap with a feeler gauge **[Figure 70-90-60]**.

If the gap exceeds the allowable limit, replace the ring.

Top Compression Ring & Oil Ring	0.0059-0.0118 inch (0,15-0,30 mm)
Second Compression Ring	0.0118-0.0177 inch (0,30-0,45 mm)
Allowable Limit	0.0472 inch (1,2 mm)

Figure 70-90-61



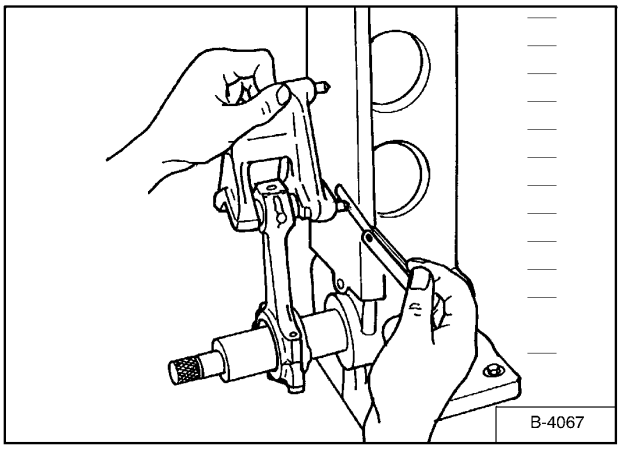
Remove the carbon from the ring grooves. Measure the clearance between the ring and groove with a feeler gauge **[Figure 70-90-61]**.

If the clearance exceeds the allowable limit, replace the piston.

Second ring	0.0035-0.0047 inch (0,09-0,12 mm)
Oil ring	0.0016-0.0031 inch (0,04-0,08 mm)
Allowable limit second ring	0.0059 inch (0,15 mm)
Allowable limit oil ring	0.0059 inch (0,15 mm)

Connecting Rod Alignment

Figure 70-90-62



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.

If the gauge does not fit squarely against the face place, measure the space between the gauge and face plate **[Figure 70-90-62]**.

If the measurement exceeds the allowable limit, replace the connecting rod.

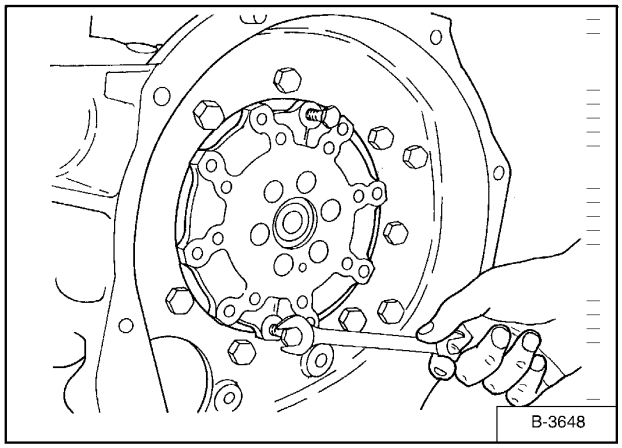
Rod Alignment Allowable Limit	0.002 inch (0,05 mm)

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Crankshaft And Bearings Removal And Installation

Figure 70-90-63



Remove the piston and connecting rod assemblies. (See Page 70-90-17.)

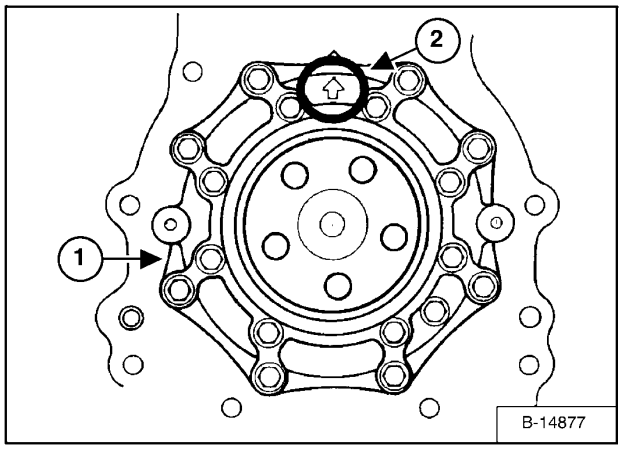
Remove the engine flywheel. (See Flywheel Removal And Installation on Page 70-80-1.)

Remove the bolts which fasten the bearing case cover to the block.

Installation: Tighten the bearing case cover bolts to 7-8 ft.-lb. (10-11 N•m) torque.

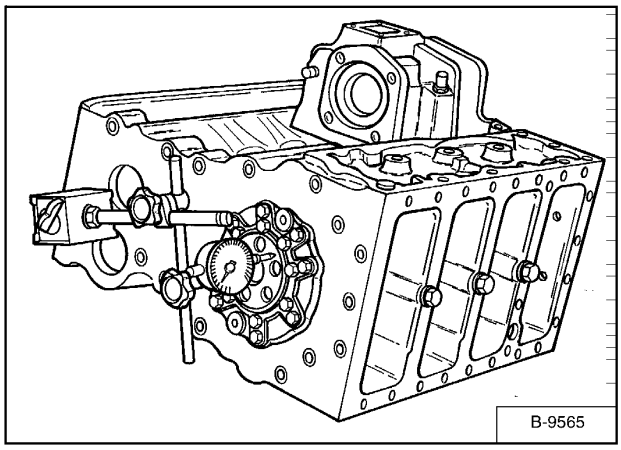
Install two bolts into the bearing case cover and pull the cover out **[Figure 70-90-63]**.

Figure 70-90-64



Installation: When installing the co ver (Item 1), make sure the casting mark (Item 2) **[Figure 70-90-64]** is in the up position.

Figure 70-90-65

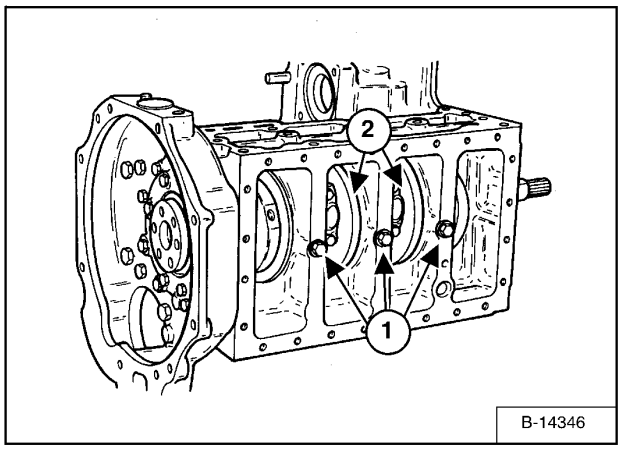


Before removing the crankshaft/main bearings, check the end play. Install a dial indicator. Measure the end play by moving the crankshaft back and forth **[Figure 70-90-65]**.

If the measurement exceeds the allowable limit, replace the thrust washers.

End Play	0.006-0.012 inch (0,15-0,31 mm)
Allowable Limit	0.020 inch (0,5 mm)

Figure 70-90-66



Remove the main bearing case bolt (Item 1) **[Figure 70-90-66]**.

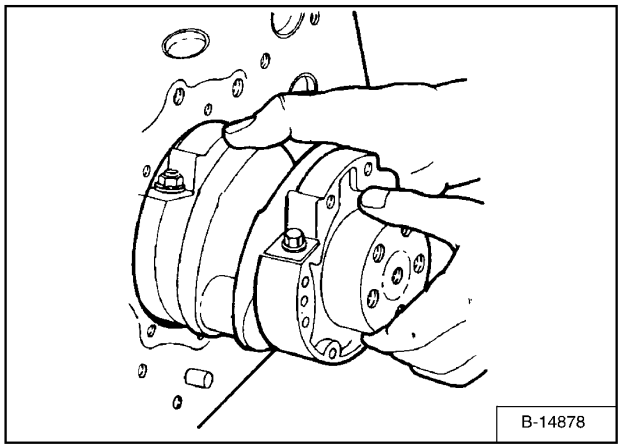
Installation: Align the bearing case hole (Item 2) **[Figure 70-90-66]** with the hole in the block. Put oil on the bolt threads and tighten to 20-22 ft.-lb. (27-30 N•m) torque.

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Crankshaft And Bearings Removal And Installation (Cont'd)

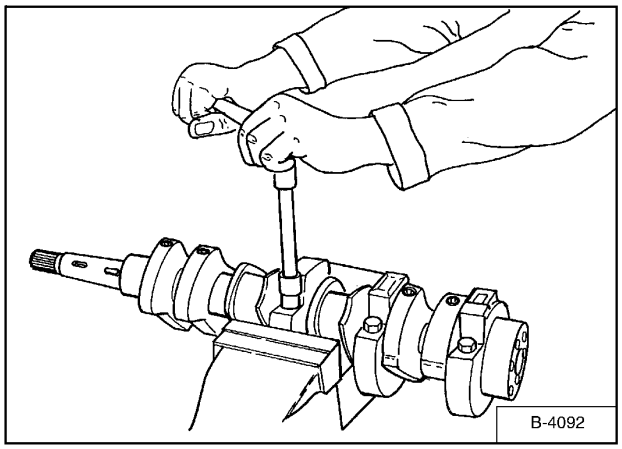
Figure 70-90-67



Remove the crankshaft/main bearing assembly from the engine block **[Figure 70-90-67]**.

Mark the bearing case halves for correct installation.

Figure 70-90-68

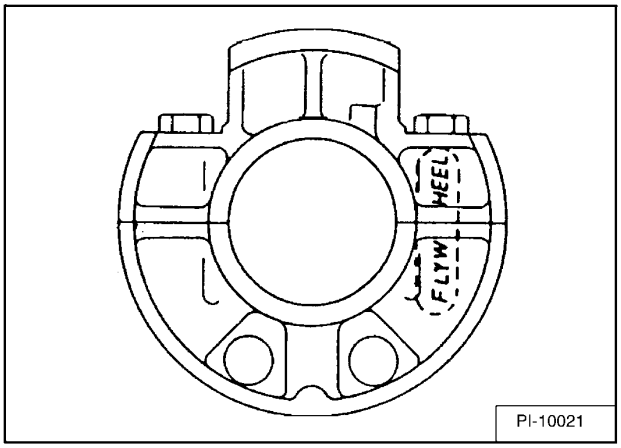


Remove the two bearing case bolts **[Figure 70-90-68]**.

Remove the bearing case and bearing.

Installation: Tighten the bearing case bolts to 9-12 ft.-lb. (13-16 N•m) torque.

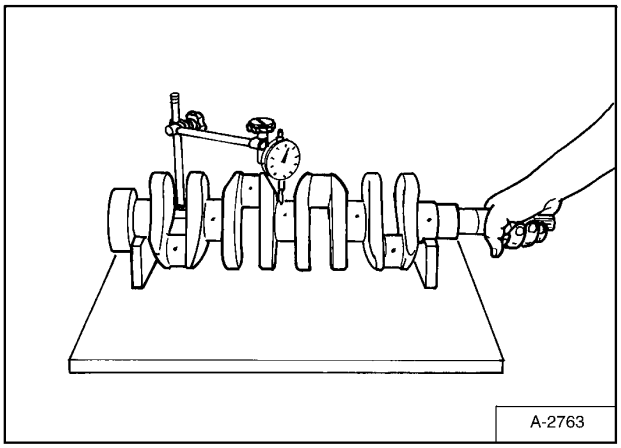
Figure 70-90-69



Installation: When installing the main bearing case assemblies, face the mark FLYWHEEL to the flywheel side of the engine block **[Figure 70-90-69]**. Be sure the thrust washer with its oil grooves face outward.

Inspection Of Crankshaft And Bearings

Figure 70-90-70



Put the crankshaft on V-blocks. Install a dial indicator on the center journal **[Figure 70-90-70]**.

Turn the crankshaft at a slow rate.

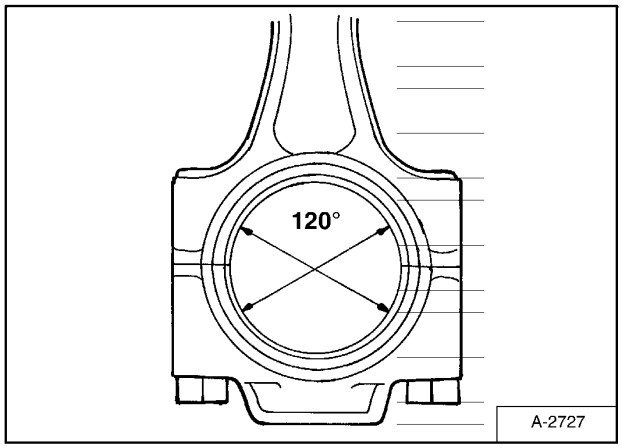
If the misalignment exceeds the allowable limit, replace the crankshaft.

Alignment	0.0008 inch (0,02 mm)

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Inspection Of Crankshaft And Bearings (Cont'd)

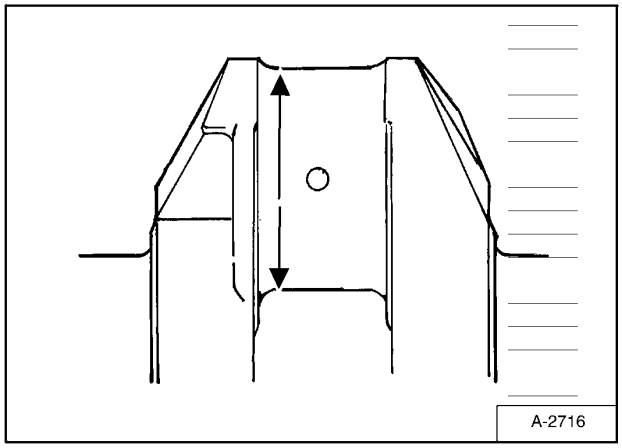
Figure 70-90-71



Tighten the connecting rod cap bolts 20-22 ft.-lb. (27-30 N•m) torque.

Measure the crankpin bearing I.D. **[Figure 70-90-71]**.

Figure 70-90-72



Measure the crankpin O.D. **[Figure 70-90-72]**.

Calculate the oil clearance.

Crankpin Bearing I.D.	1.3384-1.3402 inch (33,99-34,04 mm)
Crankpin O.D.	1.3370-1.3376 inch (33,96-33,98 mm)
Oil Clearance	0.0008-0.0032 inch (0,019-0,081 mm)
Allowable limit	0.0059 inch (0,15 mm)

Figure 70-90-73

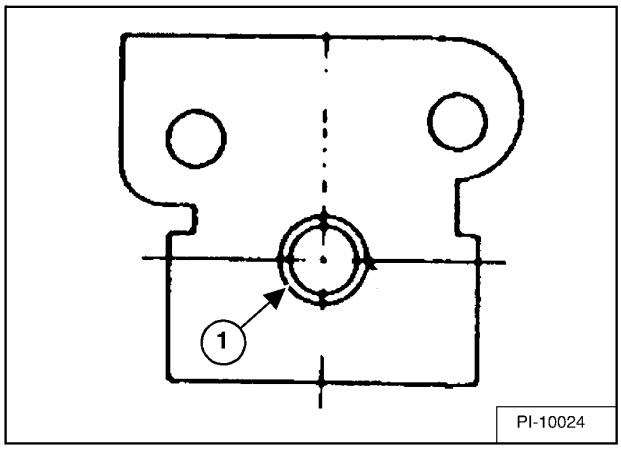
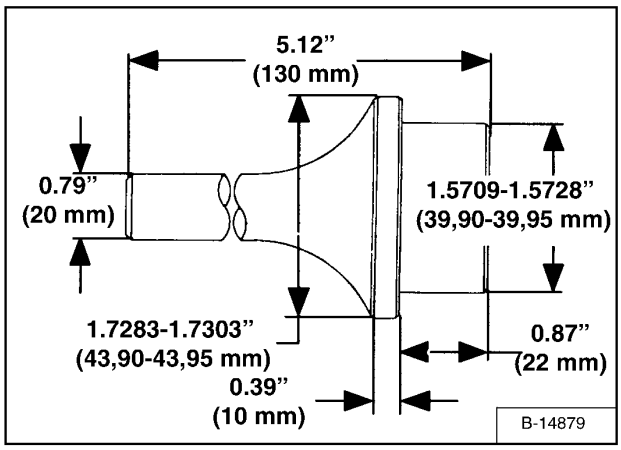


Figure 70-90-74



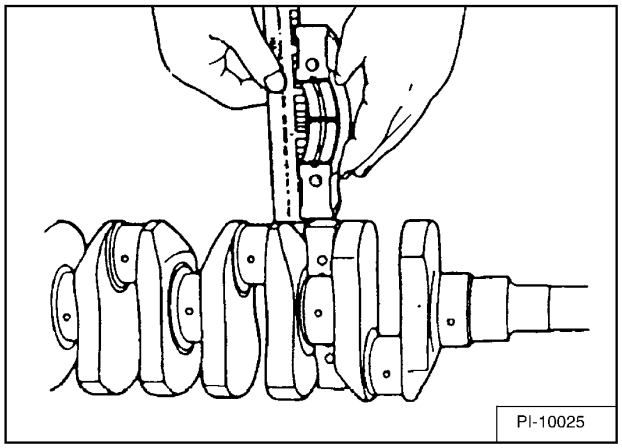
Remove the bearing (Item 1) **[Figure 70-90-73]** from the front of the engine block with the removal tool shown in **[Figure 70-90-74]**.

Installation: Clean the new bearing and bore and apply oil to them. Install the new bearing with the installation driver tool **[Figure 70-90-74]**.

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Inspection Of Crankshaft And Bearings (Cont'd)

Figure 70-90-75



Clean the crankshaft journal and bearing. Put a strip of press gauge on the center journal.

Install the main bearing case halves and tighten the bolts. Remove the bearing case halves.

Measure the flattened press gauge **[Figure 70-90-75]**.

If the clearance exceeds the allowable limit, replace the crankshaft bearing.

NOTE: Make sure you use the correct size bearing when installing. Oversize bearings are generally marked.

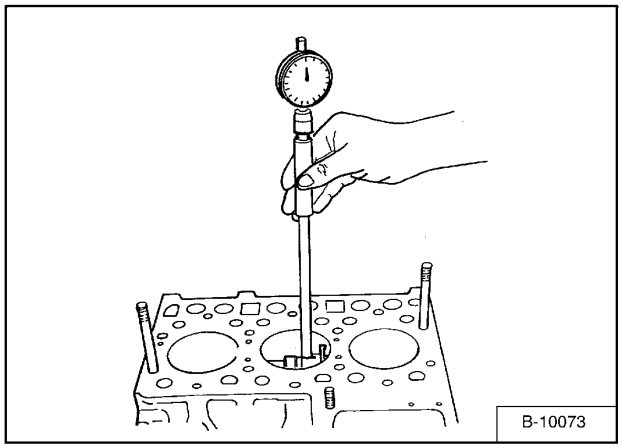
#1 Crankshaft Journal O.D. (Front)	1.5722-1.5728 inch (39,93-39,95 mm)
Bearing I.D.	1.5742-1.5764 inch (39,98-40,04 mm)
Oil Clearance	0.0013-0.0041 inch (0,034-0,106 mm)
Oil Clearance Allowable Limit	0.0079 inch (0,2 mm)
#2 Crankshaft Journal O.D. (Flywheel side)	1.7297-1.7303 inch (43,93-43,95 mm)
Bearing I.D.	1.7317-1.7333 inch (43,98-44,03 mm)
Oil Clearance	0.0013-0.0036 inch (0,034-0,092 mm)
Oil Clearance Allowable Limit	0.0079 inch (0,2 mm)
#3 Crankshaft Journal O.D. (Middle)	1.5722-1.5728 inch (39,93-39,95 mm)
Bearing I.D.	1.5742-1.5758 inch (39,98-40,03 mm)
Oil Clearance	0.0013-0.0036 inch (0,034-0,092 mm)
Oil Clearance Allowable Limit	0.0079 inch (0,2 mm)

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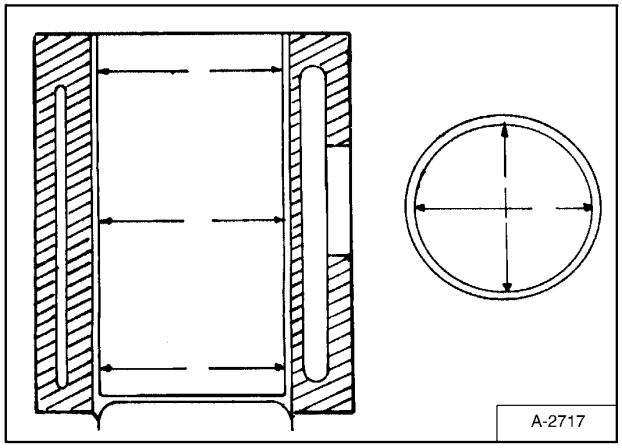
Cylinder Bore Inspection

Figure 70-90-76



Check the inside diameter of the cylinder bore **[Figure 70-90-76]**.

Figure 70-90-77



To find the maximum wear, check the inside diameter in six different locations **[Figure 70-90-77]**.

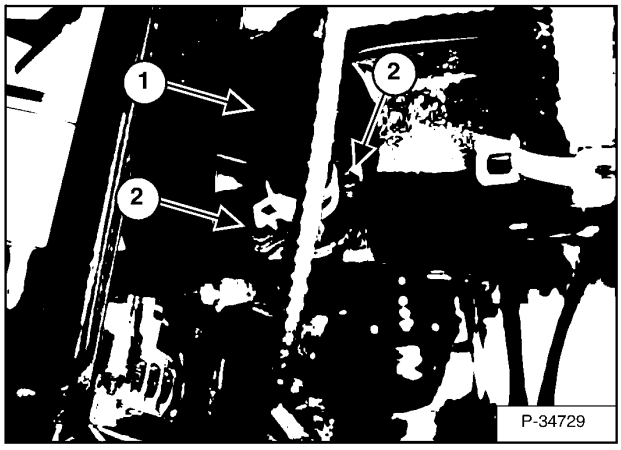
When the cylinder bore is not within specifications, bore the cylinder for an oversize piston.

Cylinder Bore I.D	2.6378-2.6385 inch (67,00-67,019 mm)
Allowable Limit	2.6444 inch (67,169 mm)
Oversize Cylinder Bore I.D	2.6476-2.6484 inch (67,250-67,269 mm)
Allowable Limit	2.6543 inch (67,419 mm)

NOTE: Make sure you use the correct size pistons and rings.

Thermostat Removal And Installation

Figure 70-90-78



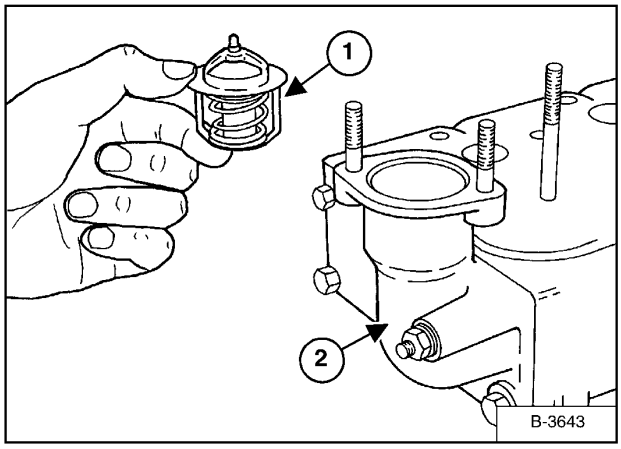
Drain the engine coolant until it is below the thermostat level.

Remove the hose (Item 1) **[Figure 70-90-78]**.

Remove the bolts (Item 2) **[Figure 70-90-78]** and thermostat housing.

Installation: Make sure all gasket surfaces are clean. Replace the gasket before installing the thermostat housing.

Figure 70-90-79



Remove the housing and thermostat (Item 1) **[Figure 70-90-79]**.

Remove the four mounting bolts at the coolant housing (Item 2) **[Figure 70-90-79]**.

Remove coolant housing from the engine block.

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Testing The Thermostat

Hang the thermostats in a suitable container filled with coolant.

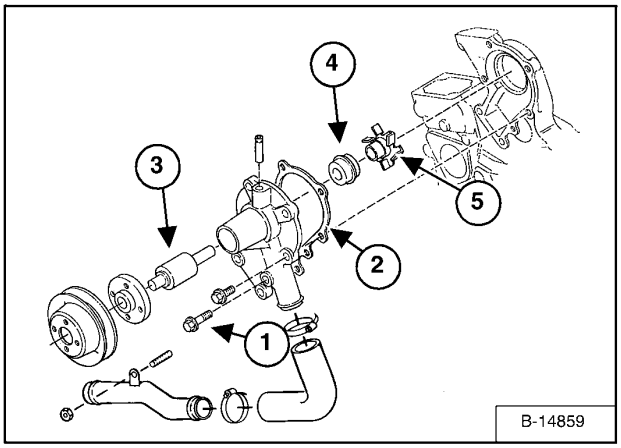
Heat the coolant gradually. Use a thermometer to check the temperature when it starts to open and when it's fully open.

If the thermostats do not operate correctly they must be replaced.

NOTE: (See Thermostat on Page SPEC-20-4.) for specifications on the thermostat.

Water Pump Removal And Installation

Figure 70-90-80



Drain the cooling system.

Remove the radiator. (See Removal And Installation on Page 70-50-1.)

Remove the alternator belt.

Remove the fan.

Remove the water pump bolts (Item 1) **[Figure 70-90-80]**.

Remove the water pump.

Installation: Always use a new gasket (Item 2) **[Figure 70-90-80]** when installing the water pump.

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Water Pump Disassembly And Assembly

Put the water pump in a vise.

Remove the pulley.

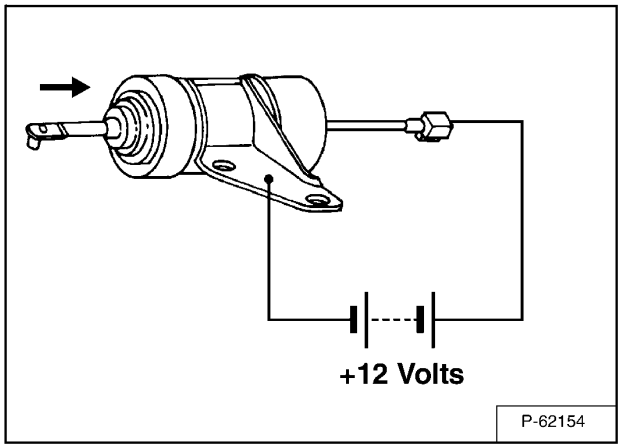
Press the shaft (Item 3) **[Figure 70-90-80]** out of th e pulley side of the water pump.

Remove the seal (Item 4) and impeller (Item 5) **[Figure 70-90-80]**.

Install a new seal when assembling the water pump.

Energize To Stop Solenoid

Figure 70-90-81



The energize to s top solenoid does not have 12 volts applied to it while the engine is running.

The solenoid is energized for a brief period with 12 volts when the ignition key is turned off.

The length of time 12 volts is applied is controlled by a timer in the electrical harness.

To test the solenoid, directly apply 12 volts to the electrical lead of the solenoid. The solenoid arm should pull back into the solenoid housing until the 12 volt power supply is removed.

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ENGINE MOUNTING BRACKET

Engine Mounting Bracket Removal And Installation

Remove the Hydraulic Gear Pump. (See Removal And Installation on Page 20-50-2.)

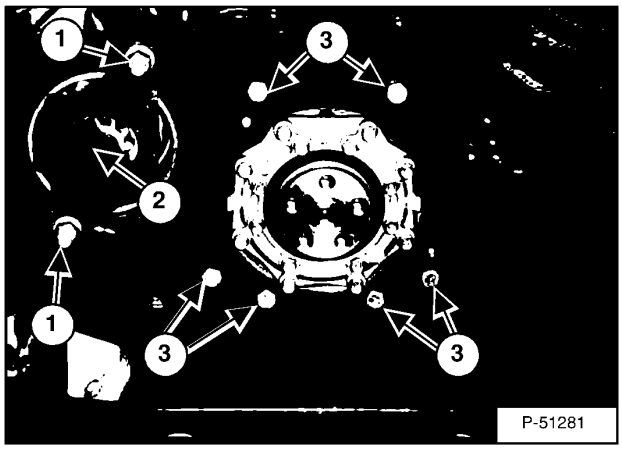
Remove the Engine. (See Removal And Installation on Page 70-70-1.)

Remove the Hydraulic Gear Pump Mounting Bracket. (See Hydraulic Gear Pump Mounting Bracket Removal And Installation on Page 70-110-1.)

Remove the Hydraulic Gear Pump Coupler. (See Hydraulic Gear Pump Coupler Removal And Installation on Page 70-110-2.)

Remove the Flywheel. (See Flywheel Removal And Installation on Page 70-80-1.)

Figure 70-100-1



Remove the two bolts (Item 1) holding timing plate (Item 2) **[Figure 70-100-1]** to engine mounting bracket.

Remove the six bolts (Item 3) **[Figure 70-100-1]** holding engine mounting bracket to the engine block.

Installation: Tighten the bolts to 18-19 ft.-lb. (24-26 N•m) torque.

Remove the engine mounting bracket.

Reverse the removal procedure to install the engine mounting bracket.

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HYDRAULIC GEAR PUMP MOUNTING BRACKET

Hydraulic Gear Pump Mounting Bracket Removal And Installation

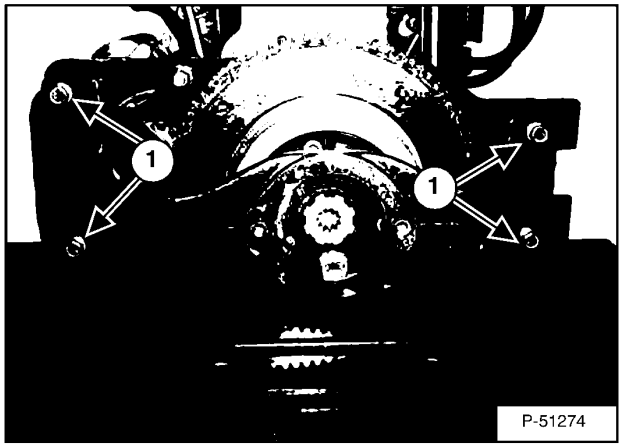
Remove the Battery. (See Removal and Installation on Page 60-20-1.)

Remove the Hydraulic Gear Pump. (See Removal And Installation on Page 20-50-2.)

Remove the Hydraulic Reservoir. (See Removal And Installation on Page 20-70-1.)

NOTE: The engine is removed for visual clarity only.

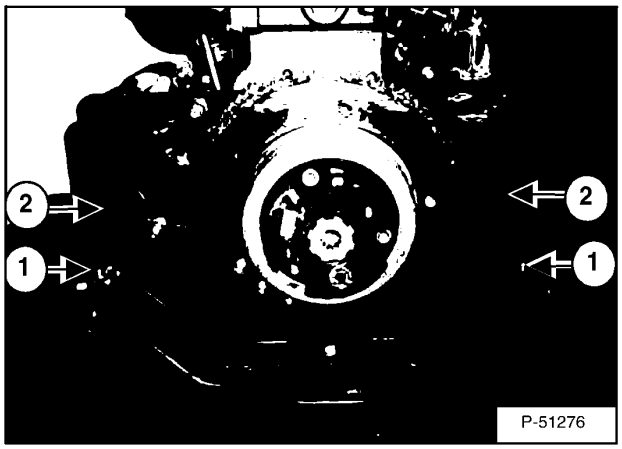
Figure 70-110-1



Remove the four bolts (Item 1) **[Figure 70-110-1]** from the hydraulic gear pump mounting bracket.

Remove the hydraulic gear pump mounting bracket.

Figure 70-110-2



Installation: There are alignment studs (Item 1), on the hydraulic gear pump mount, that fit into holes (Item 2) **[Figure 70-110-2]**, in the engine mounting bracket.

Reverse the removal procedure to install the hydraulic gear pump mounting bracket.

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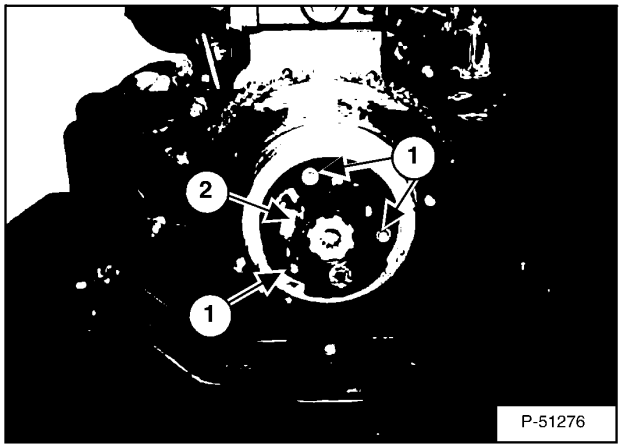
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HYDRAULIC GEAR PUMP MOUNTING BRACKET (CONT'D)

Hydraulic Gear Pump Coupler Removal And Installation

NOTE: The engine is removed for visual clarity only.

Figure 70-110-3



Remove the three bolts (Item 1) holding the hydraulic gear pump coupler (Item 2) **[Figure 70-110-3]** to the flywheel.

Installation: Apply medium strength threadlocker to bolts and tighten the bolts to 29-37 ft.-lb. (40-50 N•m) torque. Apply anti-sieze to the splines on the hydraulic gear pump coupler.

Remove the hydraulic gear pump coupler.

Reverse the removal procedure to install the hydraulic gear pump coupler.

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SPECIFICATIONS

CONVERSIONS SPEC-60-1
Decimal And Millimeter Equivalents. SPEC-60-1

ENGINE SPECIFICATIONS SPEC-20-1
Camshaft SPEC-20-2
Crankshaft SPEC-20-3
Cylinders SPEC-20-2
Cylinder Head SPEC-20-1
Engine SPEC-20-1
Engine Bolt Torque. SPEC-20-5
Fuel Injector Nozzles SPEC-20-1
Fuel Injection Pump SPEC-20-1
Oil Pump SPEC-20-3
Pistons SPEC-20-3
Piston Rings. SPEC-20-2
Rocker Arms SPEC-20-2
Thermostat. SPEC-20-4
Timing Gear SPEC-20-4
Valves SPEC-20-1
Valve Springs SPEC-20-1

HYDRAULIC CONNECTION SPECIFICATIONS SPEC-40-1
Flare Fitting SPEC-40-2
O-ring Face Seal Connection. SPEC-40-1
O-ring Flare Fitting SPEC-40-3
Port Seal Fitting SPEC-40-5
Straight Thread O-ring Fitting SPEC-40-2
Tubelines And Hoses SPEC-40-2

HYDRAULIC FLUID SPECIFICATIONS SPEC-50-1
Specifications SPEC-50-1

LOADER SPECIFICATIONS (MT52) SPEC-10-1
Capacities SPEC-10-4
Controls SPEC-10-2
Drive System SPEC-10-3
Electrical SPEC-10-3
Engine SPEC-10-2
Ground Pressure SPEC-10-4
Hydraulic System. SPEC-10-3
Loader Dimensions SPEC-10-1
Performance SPEC-10-2
Tracks SPEC-10-4

Continued On Next Page

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SPECIFICATIONS (CONT'D)

TORQUE SPECIFICATIONS FOR BOLTS SPEC-30-1
Torque For General Metric Bolts SPEC-30-2
Torque For General SAE Bolts. SPEC-30-1
Torque For Kubota Metric Engine Bolts SPEC-30-3

TIGHTEN ALL HARDWARE PER SIZE TO GRADE 5 TORQUE (See TORQUE SPECIFICATIONS FOR BOLTS on Page SPEC-30-1.) UNLESS OTHERWISE SPECIFIED.

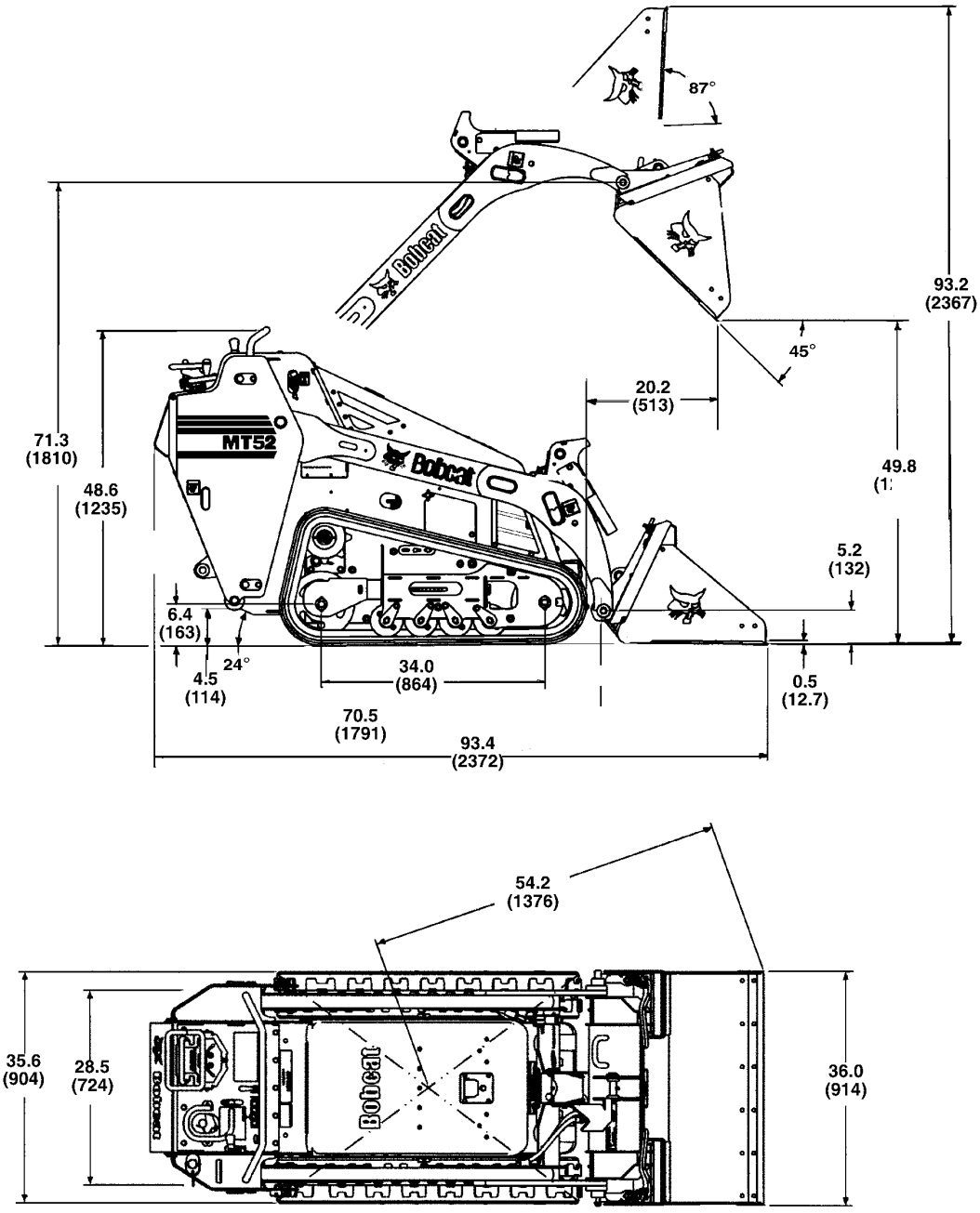
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LOADER SPECIFICATIONS (MT52)

Loader Dimensions

- Dimensions are given for loader equipped with standard tracks and dirt bucket. All dimensions are shown in inches. Respective metric dimensions are given in millimeters inclosed by parentheses.
- Where applicable, specification conform to SAE or ISO standards and are subject to change without notice.



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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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LOADER SPECIFICATIONS (MT52) (CONT'D)

Performance

Rated Operating Capacity (SAE)	520 lbs. (236 kg.)
Tipping Load (SAE)	1584 lbs. (718 kg.)
Operating Weight (SAE)	2506 lbs. (1137 kg.)
SAE Breakout Force - Lift	1490 lbf. (676 N)
- Tilt	1490 lbf. (676 N)
Travel Speed - Forward	0-3.5 mph (0-5,6 km/hr)
- Reverse	0-1.43 mph (0-2,3 km/hr)

Controls

Vehicle Steering	Direction and speed controlled by a single multi-function handle.
Loader Hydraulics	
-Lift and Tilt	Controlled by single joystick
-Front Auxiliary (Std.)	Controlled by single control lever
Auxiliary Pressure Release	Fore and aft movement of hand lever after engine has been shut off.
Engine	Hand lever throttle: Key-type starter switch and shutdown
Parking Brake (Std.)	Hand lever on right side of control panel
Secondary Brake	One of the hydrostatic transmissions
Service Brake	Two independent hydraulic circuits controlled by steering control device

Engine

Make/Model	KUBOTA D722-EB-BOBCAT-4
Fuel/Cooling	Diesel/Liquid
Horsepower (SAE Net) @ 3600 RPM	18.8 HP (14,0 kW)
Torque, Net @ 2600 RPM (SAE Net)	32.4 ft.–lbs. (43,9 N•m)
Number of Cylinders	3
Displacement	44.0 cu. in. (0,72 L)
Bore/Stroke	2.64/2.68 (67)/(68)
Lubrication	Gear Pump Pressure with filter
Crankcase Ventilation	Open
Air Cleaner	Dry replaceable cartridge with safety element
Ignition	Diesel-Compression
Engine Coolant	Propylene glycol/water mix (53%-47%) with freeze protection to -34°F (-37°C)
Starting Aid	Glow plugs
Low Idle	1100-1200 RPM
High Idle	3750-3800 RPM
Maximum Governed RPM	3600 RPM

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LOADER SPECIFICATIONS (MT52) (CONT'D)

Hydraulic System

Pump Type	Engine driven, Gear type
Pump Capacity	11.5 GPM (43,5 L/min) @ 3750 RPM @ 95.5% efficiency
System Relief at Quick Couplers	2700 PSI (186 Bar)
Charge Pressure	at least 85 PSI
Hydraulic Filter	Full flow replaceable, 10 micron synthetic media element
Control Valve	3-Spool, open center series with float detent on lift
Hydraulic Cylinders	Double-acting, tilt cylinders have cushioning feature on dump and rollback
Bore Diameter: Lift Cylinder (2)	2.25 (57,2)
Tilt Cylinder (1)	3.00 (76,2)
Rod Diameter: Lift Cylinder (2)	1.25 (31,8)
Tilt Cylinder (1)	1.25 (31,8)
Stroke: Lift Cylinder (2)	14.16 (359,6)
Tilt Cylinder (1)	10.56 (268,2)
Fluid Type	BOBCAT FLUID, Hydraulic/Hydrostatic 6903117 - (Two - 2.5 gal. containers) 6903118 - (5 gal.) 6903119 - (55 gal.)
Fluid Lines	SAE standard tubelines, hoses and fittings.
Hydraulic Function Time:	
Raise Lift Arms	3.1 Seconds
Lower Lift Arms	2.1 Seconds
Bucket Dump	1.9 Seconds
Bucket Rollback	1.6 Seconds

Electrical

Alternator	Belt Driven; 40 amps; Open
Battery	12 volt; 530 cold cranking amps @ 0°F (-18°C); 75 minute reserve capacity
Starter	12 volt; Gear Reduction Type; 3.62 HP (2,7 kW)
Instrumentation (Standard)	Gauges: Engine Coolant Temperature, Fuel, Hourmeter, System Voltage Warning lights: Engine Oil Pressure, Engine Coolant Temperature

Drive System

Main Drive	Fully hydraulic rubber track drive
Transmission	Infinitely variable tandem hydrostatic piston pumps, driving two fully reversing hydrostatic motors

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Capacities

Cooling Systen	5 qts. (4,7 L)
Fuel Tank	7 gals. (26,5 L)
Engine Oil W/Filter	3.4 qts. (3,2 L)
Hydraulic Reservoir	2.5 gals. (9,5 L)
Hydraulic System (incl. reservoir)	5.3 gals. (20,0 L)

Tracks

Standard	7.0" (178 mm) wide, compression spring with triple flange rollers

Ground Pressure

7.0" (178 mm) Wide Rubber Track Loader at Operating Weight	5.2 PSI (.36 Bar)

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ENGINE SPECIFICATIONS

All dimensions are given in inches. Respective metric dimensions are given in millimeters enclosed by parentheses.

Engine

Compression (At Operating Temperature)	412-469 PSI (2839-3231 bar)
Limit Permitted	327 PSI (2253 bar)

Fuel Injector Nozzles

Opening Pressure	1990-2133 PSI (13721-14705 bar)
Fuel Tightness Nozzle Seat	1849 PSI (12,747 bar)

Fuel Injection Pump

Fuel Tightness of Plunger Limit Permitted	8 Sec. Initital Pressure Drop From 2133-1990 PSI (14708-13721 bar)
Fuel Tightness of Delivery Valve Limit Permitted	5 Sec. Initital Pressure Drop From 2133-1990 PSI (14708-13721 bar)
Injection Timing	20-22 degrees B.T.D.C.

Cylinder Head

Cylinder Distortion Limit	0.002 (0,05) in 3.9 (100) of the length of the cylinder head
Thickness of Gasket Free	0.0415-0.0512 (1,15-1,30)
Thickness of Gasket Tightened	0.0413-0.0453 (1,05-1,15)
Top Clearance	0.0197-0.0256 (0,50-0,65)

Valves

Valve Seat Angle	45 degrees
Valve Seat Width	0.0835 (2,12)
O.D. of Valve Stem	0.2350-0.2354 (5,917-5,980)
I.D. of Valve Guide	0.2366-0.2372 (6,01-6,025)
Clearance between Valve Stem & Guide	0.0012-0.0022 (0,030-0,057)
Limit Permitted	0.0039 (0,1)
Depth of Valve	-0.004-0.004 (-0,10-0,10)
Limit Permitted	0.0118 (0,30)
Valve Clearance (Cold) (Intake & Exhaust)	0.006-0.007 (0,145-0,185)

Valve Springs

Free Length	1.244 (31,6)
Limit Permitted	1.118 (28,4)
Fitted Length	1.063 (27,0)
Load to Compress to Fitted Length	14.6 lbs (64,7 N)
Limited Permitted	12.3 lbs (54,9 N)
Limited Permitted for Spring Tilt	0.047 (1,2)

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ENGINE SPECIFICATIONS

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Rocker Arms

O.D. of Rocker Arm Shaft	0.4123-0.4128 (10,47-10,48)
I.D. of Rocker Arm Bushing	0.4134-0.4141 (10,50-10,52)
Clearance between Rocker Arm Shaft & Bushing	0.0006-0.0018 (0,016-0,045)
Limit Permitted	0.0059 (0,15)

Camshaft

O.D. of Camshaft Bearing Journal	1.2966-1.2972 (32,93-32,95)
I.D. of Camshaft Bearing	1.2992-1.3002 (33,00-33,025)
Clearance between Camshaft Bearing & Journal	0.002-0.0036 (0,05-0,91)
Limit Permitted	0.0059 (0,15)
Alignment of the Camshaft Limit Permitted	0.0004 (0,01)
Cam Lobe Height	1.0583 (26,88)
Limit Permitted	1.0563 (26,83)

Cylinders

I.D. of Cylinder Liner	2.6378-2.6385 (67,00-67,019)
Limit Permitted	2.6444 (67,169)
I.D. of Oversize Cylinder Liner	2.6476-2.6484 (67,250-67,269)
Limit Permitted	2.6543 (67,419)

Piston Rings

Ring Gap, Top & Oil	0.0059-0.0118 (0,15-0,30)
Ring Gap, 2nd	0.0118-0.0177 (0,30-0,45)
Limit Permitted	0.0472 (1,2)
Side Clearance of Ring in Groove;	
Top Ring	Beacuse of top ring design, measurement does not apply
2nd Ring	0.0035-0.0047 (0,09-0,12)
Oil Ring	0.0016-0.0031 (0,04-0,08)
Limit Permitted	0.0059 (0,15)
Oversize of Piston Rings	+0.0098 (+0,25)

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ENGINE SPECIFICATIONS

All dimensions are given in inches. Respective metric dimensions are given in millimeters enclosed by parentheses.

Pistons

I.D. of Piston Bosses	0.7874-0.7879 (20,00-20,013)
Limit Permitted	0.7894 (20,05)
O.D. of Piston Pin	0.7875-0.7878 (20,002-20,011)
I.D. of Connecting Rod Bushing (Small End, Fitted)	0.7884-0.7890 (20,025-20,04)
Clearance between Piston Pin & Bushing	0.0006-0.0015 (0,014-0,0398)
Clearance between Piston Pin & Bushing Limit Permitted	0.004 (0,10)
Connecting Rod Alignment Limit Permitted	0.002 (0,05)

Crankshaft

Crankshaft Alignment Limit Permitted	0.0008 (0,02)
O.D. of Crankshaft Journal No. 1 (Front Side)	1.5722-1.5728 (39,93-39,95)
I.D. of Crankshaft Bearing No. 1	1.5742-1.5764 (39,98-40,04)
Clearance between No. 1 Crankshaft Journal and Bearing	0.0013-0.0042 (0,034-0,106)
Limit Permitted	0.0079 (0,20)
O.D. of Crankshaft Journal No. 2 (Flywheel Side)	1.7297-1.7303 (43,93-43,95)
I.D. of Crankshaft Bearing No. 2	1.7317-1.7333 (43,98-44,03)
Clearance between No. 2 Crankshaft Journal Bearing	0.0013-0.0036 (0,034-0,092)
Limit Permitted	0.0079 (0,20)
O.D. of Crankshaft Journal No. 3 (Middle)	1.5722-1.5728 (39,93-39,95)
I.D. of Crankshaft Bearing No. 3	1.5742-1.5758 (39,98-40,03)
Clearance between No. 3 Crankshaft Journal and Bearing	0.0013-0.0036 (0,034-0,092)
Limit Permitted	0.0079 (0,20)
O.D. of Connecting Rod Journals	1.3370-1.3376 (33,96-33,98)
I.D. of Connecting Rod Bearings	1.3384-1.3402 (33,99-34,04)
Clearance between Connecting Rod Journals and Bearings	0.0008-0.0032 (0,019-0,081)
Limit Permitted	0.0059 (0,15)
Crankshaft End Play	0.006-0.012 (0,15-0,31)
Limit Permitted	0.020 (0,50)

Oil Pump

Oil Pressure @ Rated RPM	28-64 PSI (196-441 bar)
Limit Permitted	14 PSI (98 bar)
Oil Pressure @ Idle Speed	14 PSI (98 bar)
Clearance between Outer Rotor & Pump Body	0.003-0.006 (0,07-0,15)
End Clearance between Inner Rotor & Cover	0.003-0.005 (0,075-0,135)
Clearance between Inner Rotor and Outer Rotor	0.001-0.006 (0,03-0,14)

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ENGINE SPECIFICATIONS

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Timing Gear

Timing Gear Backlash:	
Crank Gear-Idle Gear	0.0017-0.0049 (0,043-0,124)
Allowable Limit	0.0059 (0,15)
Idle Gear-Cam Gear	0.0018-0.0048 (0,047-0,123)
Allowable Limit	0.0059 (0,15)
Idle Gear-Injection Pump Gear	0.0018-0.0049 (0,046-0,124)
Allowable Limit	0.0059 (0,15)
Crank Gear-Oil Pump Gear	0.0016-0.0048 (0,041-0,123)
Allowable Limit	0.0059 (0,15)
Clearance Between Idle Gear Shaft & Idle Gear Bushing:	0.0008-0.0033 (0,020-0,084)
Allowable Limit	0.0039 (0,10)
Idle Gear Bushing I.D.	0.7874-0.7894 (20,000-20,051)
Idle Gear Shaft O.D.	0.7861-0.7866 (19.967-19.980)
Idle Gear Side Clearance	0.0079-0.0201 (0,20-0,51)
Allowable Limit	0.0236 (0,60)

Thermostat

Opening Temperature	
Starting	157-163°F (70-73°C)
Full Open	185°F (85°C)

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Engine Bolt Torque

PUNCHED NUMBER	BOLT MATERIAL GRADE	
None	Standard Bolts	SS41, S20C
7	Special Bolts	S43C, 248C (Refined)
9	Special Bolts	SCM3, SCR3 (Refined)

BOLT TORQUES			
MATERIAL GRADE	STANDARD BOLT	SPECIAL BOLT	SPECIAL BOLT
NOMINAL DIAMETER	SS42, S20C	243, S48C (Refined)	SCR3, SCM3 (Refined)
M6	6 to 7 ft.-lb. (8 to 9 N•m)	7 to 8 ft.-lb. (9 to 11 N•m)	9 to 11 ft.-lb. (12 to 15 N•m)
M8	13 to 15 ft.-lb. (18 to 20 N•m)	17 to 20 ft.-lb. (23 to 27 N•m)	22 to 25 ft.-lb. (30-34 N•m)
M10	29 to 33 ft.-lb. (39 to 45 N•m)	35 to 41 ft.-lb. (47 to 56 N•m)	45 to 52 ft.-lb. (61 to 71 N•m)
M12	46 to 54 ft.-lb. (62 to 73 N•m)	57 to 67 ft.-lb. (77 to 91 N•m)	76 to 87 ft.-lb. (103 to 118 N•m)
M14	80 to 93 ft.-lb. (108 to 126 N•m)	91 to 109 ft.-lb. (123 to 148 N•m)	123 to 145 ft.-lb. (167 to 197 N•m)
M16	123 to 141 ft.-lb. (167 to 191 N•m)	145 to 166 ft.-lb. (197 to 225 N•m)	192 to 224 ft.-lb. (160 to 304 N•m)
M18	181 to 210 ft.-lb. (245 to 285 N•m)	203 to 235 ft.-lb. (275 to 319 N•m)	253 to 197 ft.-lb. (343 to 403 N•m)
M20	246 to 289 ft.-lb. (334 to 392 N•m)	271 to 318 ft.-lb. (367 to 431 N•m)	362 to 420 ft.-lb. (491 to 578 N•m)

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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
INCH. LBS. (N•m)	.250	80-90 (9-10)	110-120 (13-14)
	.3125	180-200 (21-23)	215-240 (24-27)
FOOT LBS. (N•m)	.375	25-28 (34-38)	35-40 (48-54)
	.4375	40-45 (54-61)	60-65 (82-88)
	.500	65-70 (88-95)	90-100 (125-135)
	.5625	90-100 (125-135)	125-140 (170-190)
	.625	125-140 (170-190)	175-190 (240-190)
	.750	220-245 (300-330)	300-330 (410-450)
	.875	330-360 (450-490)	475-525 (645-710)
	1.000	475-525 (645-710)	725-800 (985-1085)
	1.125	650-720 (880-975)	1050-1175 (1425-1600)
	1.250	900-1000 (1200-1360)	1475-1625 (2000-2200)
	1.375	1200-1350 (1630-1830)	2000-2200 (2720-2980)
	1.500	1500-1650 (2040-2240)	2600-2850 (3530-3870)
	1.625	2000-2800 (2720-2980)	3450-3800 (4680-5150)
	1.750	2500-2750 (3390-3730)	4300-4800 (5830-6500)
	1.875	3150-3500 (4270-4750)	5500-6100 (7450-8300)
	2.000	3800-4200 (5150-5700)	6500-7200 (8800-9800)

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TORQUE SPECIFICATIONS FOR BOLTS (CONT'D)

Torque For General Metric Bolts

Thread Size (Dia.)	Material		
	8.8	10.9	12.9
M4	2.0-2.5 ft.-lb. (2,5-3,5 N•m)	2.8-3.1 ft.-lb. (3,8-4,2 N•m)	3.5-3.9 ft.-lb. (4,7-5,3 N•m)
M5	4.0-5.0 ft.-lb. (5,5-6,5 N•m)	5.6-6.2 ft.-lb. (8,4-7,6 N•m)	6.2-7.0 ft.-lb. (8,5-9,5 N•m)
M6	7.0-7.5 ft.-lb. (9,5-10,5 N•m)	9.1-10.1 ft.-lb. (12,2-13,7 N•m)	10.4-11.6 ft.-lb. (14,2-15,8 N•m)
M7	11.0-12.5 ft.-lb. (15-17 N•m)	16.2-14.7 ft.-lb. (20-22 N•m)	17.5-19.5 ft.-lb. (23,7-26,3 N•m)
M8	18-19 ft.-lb. (24-26 N•m)	21.7-24.0 ft.-lb. (29,4-32,6 N•m)	25.5-28.5 ft.-lb. (35-39 N•m)
M10	32-35 ft.-lbs (43-47 N•m)	42.0-46.5 ft.-lb. (57-63 N•m)	52.5-58.5 ft.-lb. (71-79 N•m)
M12	55-60 ft.-lb. (75-85 N•m)	78-85 ft.-lb. (105-115 N•m)	91-110 ft.-lb. (91-110 N•m)
M14	100-90 ft.-lb. (125-140 N•m)	118-133 ft.-lb. (118-133 N•m)	140-155 ft.-lb. (140-155 N•m)
M16	140-155 ft.-lb. (190-210 N•m)	188-210 ft.-lb. (255-285 N•m)	225-245 ft.-lb. (300-330 N•m)
M18	190-215 ft.-lb. (260-290 N•m)	255-285 ft.-lb. (345-385 N•m)	210-340 ft.-lb. (420-460 N•m)
M20	275-300 ft.-lb. (370-410 N•m)	360-405 ft.-lb. (490-550 N•m)	440-490 ft.-lb. (590-650 N•m)
M22	370-400 ft.-lb. (500-550 N•m)	554-560 ft.-lb. (740-760 N•m)	590-650 ft.-lb. (800-880 N•m)
M24	470-520 ft.-lb. (640-700 N•m)	625-700 ft.-lb. (850-950 N•m)	730-830 ft.-lb. (1000-1120 N•m)
M27	680-760 ft.-lb. (930-1030 N•m)	900-1000 ft.-lb. (1230-1370 N•m)	1100-1200 ft.-lb. (1470-1630 N•m)
M30	930-1030 ft.-lb. (1260-1400 N•m)	1250-1400 ft.-lb. (1700-1900 N•m)	1500-1600 ft.-lb. (2000-2200 N•m)
M33	1270-1400 ft.-lb. (1720-1900 N•m)	2300-2500 ft.-lb. (2300-2500 N•m)	2000-2300 ft.-lb. (2700-3100 N•m)
M36	1620-1800 ft.-lb. (200-2450 N•m)	2200-2400 ft.-lb. (2900-3200 N•m)	2600-2900 ft.-lb. (3500-3900 N•m)

NOTE: Use the torque value for the part having the lesser property class when a fastener and nut are used together but have a different property class.

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TORQUE SPECIFICATIONS FOR BOLTS (CONT'D)

Torque For Kubota Metric Engine Bolts

Thread Size (Dia. x Pitch)	Material		
	Head Mark 4	Head Mark 7	Head Mark 10
M5 x 0.8		3-4 ft.-lb. (4-5 N•m)	
M6 x 1.0		6-7 ft.-lb. (8-9 N•m)	6-9 ft.-lb. (8-12 N•m)
M8 x 1.25	6-9 ft.-lb. (8-12 N•m)	11-16 ft.-lb. (15-22 N•m)	18-25 ft.-lb. (24-34 N•m)
M10 x 1.25	13-18 ft.-lb. (18-24 N•m)	22-30 ft.-lb. (30-41 N•m)	36-50 ft.-lb. (49-68 N•m)
M12 x 1.25	22-30 ft.-lb. (30-41 N•m)	40-54 ft.-lb. (54-73 N•m)	69-87 ft.-lb. (94-118 N•m)
M14 x 1.5	36-50 ft.-lbs (49-68 N•m)	58-80 ft.-lb. (79-108 N•m)	116-137 ft.-lb. (157-186 N•m)

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HYDRAULIC CONNECTION SPECIFICATIONS

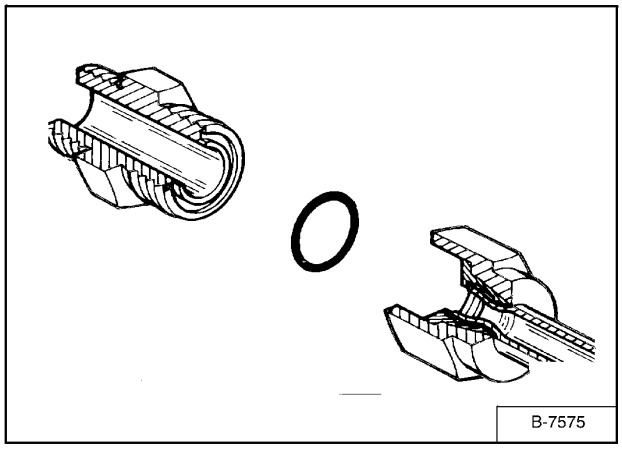
O-ring Face Seal Connection

IMPORTANT

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

I-2003-0888

Figure SPEC-40-1



When the fitting is tightened, you can feel when the fitting is tight to eliminate leakage caused by under or over torqued fittings. Use vaseline petroleum jelly to hold the O-ring in position until the fittings are assembled **[Figure SPEC-40-1]**.

Figure SPEC-40-2

O-ring Face Seal Tightening Torque		
Tubeline Outside Diameter	**Thread Size**	*** TORQUE ft.-lb. (N•m)**
1/4”	9/16” - 18	13 (18)
3/8”	11/16” - 16	22 (30)
1/2”	13/16” - 16	40 (54)
5/8”	1” - 14	60 (81)
3/4”	1-3/16” - 12	84 (114)
7/8”	1-3/16” - 12	98 (133)
1”	1-7/16” - 12	118 (160)
1-1/4”	1-11/16” - 12	154 (209)
1-1/2”	2” - 12	163 (221)

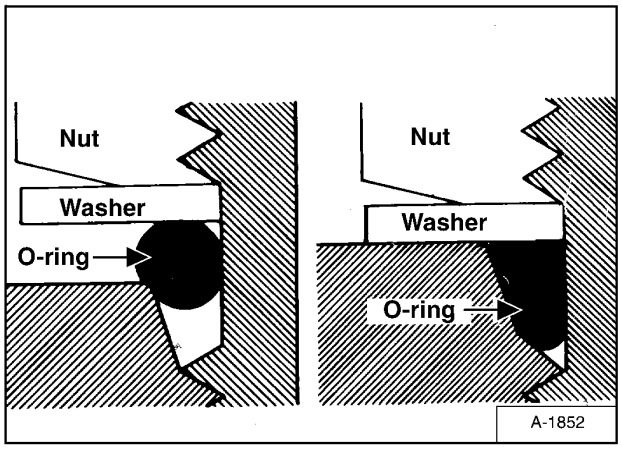
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HYDRAULIC CONNECTION SPECIFICATIONS (CONT'D)

Straight Thread O-ring Fitting

Figure SPEC-40-3



Lubricate the O-ring before installing the fitting. Loosen the jam nut and install the fitting. Tighten the jam nut until the washer is tight against the surface **[Figure SPEC-40-3]**.

Tubelines And Hoses

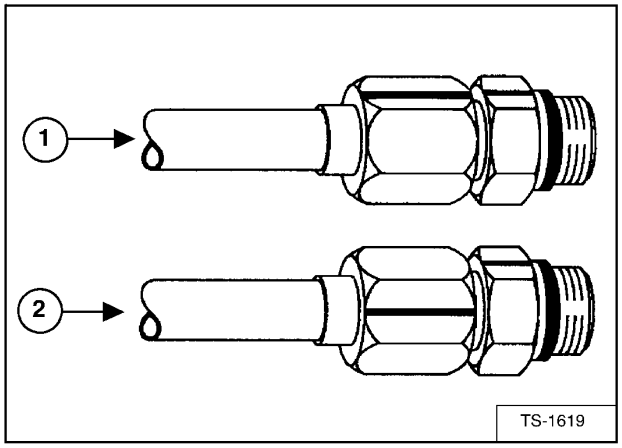
Replace any tubelines that are bent or flattened. They will restrict flow, which will slow hydraulic action and cause heat.

Replace hoses which show signs of wea r, damage or weather cracked rubber.

Always use two wrenches when loosening and tightening hose or tubeline fittings.

Flare Fitting

Figure SPEC-40-4



Use the following procedure to tighten the flare fitting:

Tighten the nut until it makes contact with the seat. Make a mark across the flats of both the male and female parts of the connection (Item 1) **[Figure SPEC-40-4]**

Use the chart **[Figure SPEC-40-5 on Page 3]** to find the correct tightness needed (Item 2) **[Figure SPEC-40-4]**. If the fitting leaks after tightening, disconnect it and inspect the seat area for damage.

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HYDRAULIC CONNECTION SPECIFICATIONS (CONT'D)

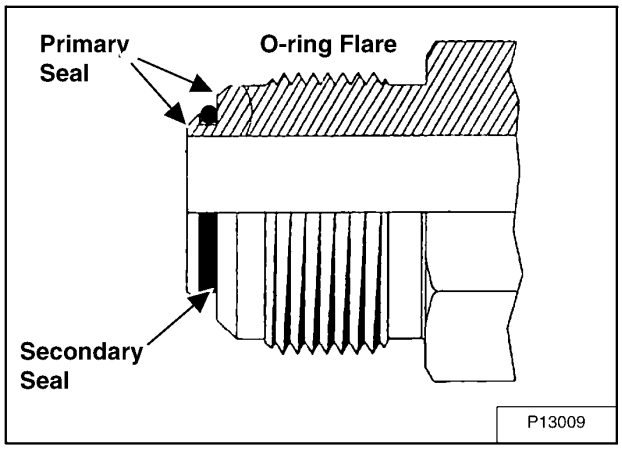
Flare Fitting (Cont'd)

Figure SPEC-40-5

Flare Fitting Tightening Torque		
Tubeline Outside Diameter	Thread Size	TORQUE ft.-lb. (N•m)
1/4"	7/16" - 20	13 (18)
5/16"	1/2" - 20	17 (23)
3/8"	9/16" - 18	22 (30)
1/2"	3/4" - 16	40 (54)
5/8"	7/8" - 14	60 (81)
3/4"	1-1/16" - 12	84 (114)
7/8"	1-3/16" - 12	98 (133)
1"	1-5/16" - 12	118 (160)
1-1/4"	1-5/8" - 12	154 (209)
1-1/2"	1-7/8" - 12	163 (221)
2"	2-1/2" - 12	252 (342)

O-ring Flare Fitting

Figure SPEC-40-6

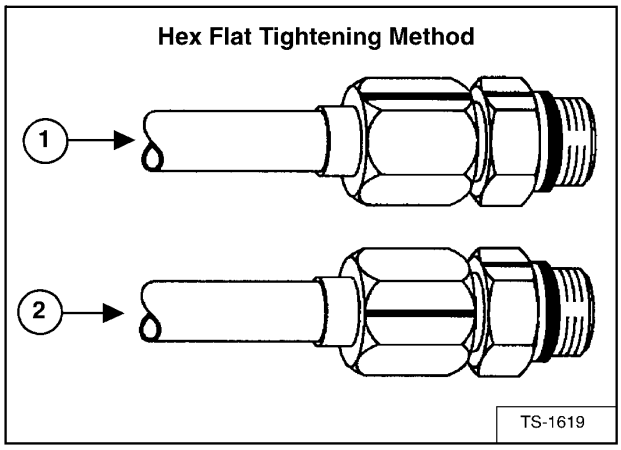


The flare is the primary seal, the O-ring is the secondary seal and helps absorb vibration and pressure pulses at the connection **[Figure SPEC-40-6]**.

If necessary, the O-ring-flare fitting can be used without an O-ring.

Use the following procedure to tighten the O-ring flare fitting.

Figure SPEC-40-7



Tighten the nut until it contacts with the seat. Make a mark across the flats of both the male and female parts of the connection (Item 1) **[Figure SPEC-40-7]**.

Use the chart **[Figure SPEC-40-8 on Page 4]** to find the correct tightness needed (Item 2) **[Figure SPEC-40-7]**. If the fitting leaks after tightening, disconnect it and inspect the seat area for damage.

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HYDRAULIC CONNECTION SPECIFICATIONS (CONT'D)

O-ring Flare Fitting (Cont'd)

Figure SPEC-40-8

O-ring Flare Fitting Tightening Torque		
Tubeline Outside Diameter	Thread Size	* TORQUE ft.-lb. (N•m)
1/4"	7/1" - 20	13 (18)
5/16"	1/2" - 20	17 (23)
3/8"	9/16" - 18	22 (30)
1/2"	3/4" - 16	40 (54)
5/8"	7/8" - 14	60 (81)
3/4"	1-1/16" - 12	84 (114)
7/8"	1-3/16 - 12	98 (133)
1"	1-5/16" - 12	118 (160)
1-1/4"	1-5/8" - 12	154 (209)
1-1/2"	1-7/8" - 12	163 (221)
2"	2-1/2" - 12	252 (342)

* If a torque wrench is used to tighten a new fitting to a used hose/tubeline.

* If a toque wrench is used to tighten a used fittng to a new hose/tubeline.

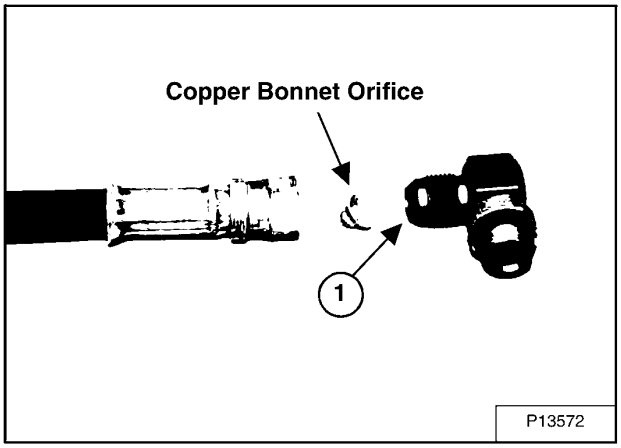
* If a torque wrench is used to tighten a new fitting to a new hose/tubeline.

** If using the hex flat tightening method to tighten a new fitting to a new hose/tubeline.

** If using the hex flate tighening method to tighten a new fitting to a used hose/tubeline.

*** If using the hex flat tightening method to tighten a used fitting to a new hose/tubeline.

Figure SPEC-40-9



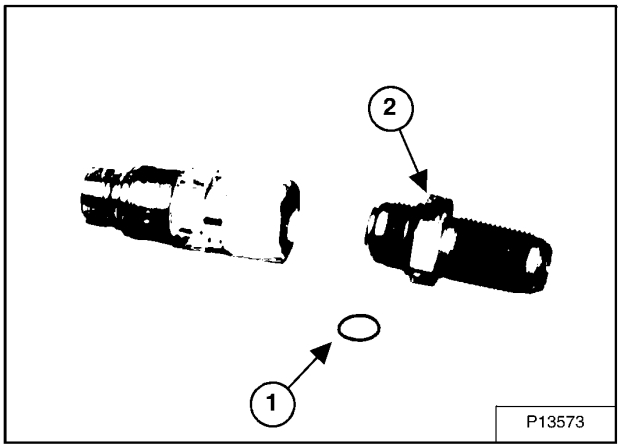
NOTE: O-ring flare fittings are not recommended in all applications. Use the standard flare fittings in these applications.

Do not use a O-ring flare fitting when a copper bonnet orifice is used. When tightened the connection at th e bonnet may distort the flare face and prevent it from sealing.

Use a standard flare fitting (Item 1) **[Figure SPEC-40-9]** as shown.

When a O-ring flare fitting is used as a straight thread port adapter the O-ring flare face is not used to seal. The O-ring may come off the fitting and enter the system.

Figure SPEC-40-10



NOTE: Always remove the O-ring (Item 1) [Figure SPEC-40-10] from the flare face as shown.

An O-ring (Item 2) **[Figure SPEC-40-10]** is added to the flat boss of the fitting to seal the connection in this application.

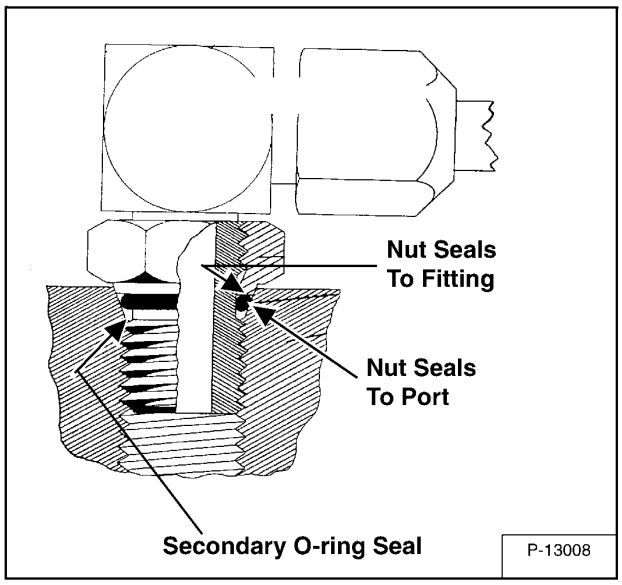
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HYDRAULIC CONNECTION SPECIFICATIONS (CONT'D)

Port Seal Fitting

Figure SPEC-40-11



The nut is the primary seal, the O-ring is the secondary seal and helps absorb vibration and pressure pulses at the connection **[Figure SPEC-40-11]**.

The hex portion of the nut does not contact the surface of the component when the nut is tight.

Figure SPEC-40-12

Port Seal and O-ring Boss Tightening Torque	
Thread Size	**TORQUE ft.-lb. (N•m)**
7/16" - 20	13 18)
9/16" - 18	22 (30)
3/4" -1 6	40 (54)
7/8" - 14	60 (81)
1-1/16" - 12	84 (114)
1-3/16" - 12	98 (133)
1-5/16" - 12	118 (160)
1-7/16" - 12	154 (209)
1-5/8" - 12	163 (221)

Use the fo llowing procedure to tighten the port seal fitting:

Port seal and nut, wa sher and O-ring (O-ring Boss) fittings use the same tightening torque valve chart.

If a torque wrench cannot be us ed, use the fol lowing method.

Tighten the nut until it just makes metal to metal contact, you can feel the resistance.

Tighten the nut with a wrench no more than one hex flat maximum.

Do not over tighten the port seal fitting.

NOTE: If a torque wrench cannot be used, use the hex flat tightening method as an approximate guideline.

NOTE: Port seal fittings are not recommended in all applications. Use O-ring boss fittings in these applications.

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HYDRAULIC FLUID SPECIFICATIONS

Specifications

Use Bobcat hydraulic fluid (P/N 6903117 -2, 2-1/2 Gal., (P/N 6903118 - 5 Gal.), (P/N 6903119 - 55 Gal.).

DO NOT use automatic transmission fluids in the loader or permanent damage to the transmission will result.

⚠ WARNING

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

W-2072-0496

When temperatures below zero degree F (-18°C) are common, the loader must be kept in a warm building. Extra warm-up time must be used each time the loader is started during cold temperature conditions. Cold fluid will not flow easily and it makes action on the hydraulic function slower.

⚠ 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 Equivalents

FRACTIONS	DECIMALS	MM
1/64	0.015625	0.397
1/32	0.03125	0.794
3/64	0.046875	1.191
1/16	0.0625	1.588
5/64	0.078125	1.984
3/32	0.09375	2.381
7/64	0.109375	2.778
1/8	0.1250	3.175
9/64	0.140625	3.572
5/32	0.15625	3.969
11/64	0.171875	4.366
3/16	0.1876	4.762
13/64	0.203125	5.159
7/32	0.21875	5.556
15/64	0.234375	5.953
1/4	0.2500	6.350
17/64	0.265625	6.747
9/32	0.28125	7.144
19/64	0.296875	7.541
5/16	0.3125	7.938
21/64	0.328125	8.334
11/32	0.34375	8.731
23/64	0.359375	9.128
3/8	0.3750	9.525
25/64	0.390625	9.922
13/32	0.40625	10.319
27/64	0.421875	10.716
7/16	0.4375	11.112
29/64	0.453125	11.509
15/32	0.46875	11.906
31/64	0.484375	12.303
1/2	0.5000	12.700

FRACTIONS	DECIMALS	MM
33/64	0.515625	13.097
17/32	0.53125	13.494
35/64	0.546875	13.891
9/16	0.5625	14.288
37/64	0.578125	14.684
19/32	0.59375	15.081
39/64	0.609375	15.478
5/8	0.6250	15.875
41/64	0.640625	16.272
21/32	0.65625	16.669
43/64	0.671875	17.066
11/16	0.6875	17.462
45/64	0.703125	17.859
23/32	0.71875	18.256
47/64	0.734375	18.653
3/4	0.7500	19.050
49/64	0.765625	19.447
25/32	0.78125	19.844
51/64	0.796875	20.241
13/16	0.8125	20.638
53/64	0.828125	21.034
27/32	0.84375	21.431
55/64	0.859375	21.828
7/8	0.8750	22.225
57/64	0.890625	22.622
29/32	0.90625	23.019
59/64	0.921875	23.416
15/16	0.9375	23.812
61/64	0.953125	24.209
31/32	0.96875	24.606
63/64	0.984375	25.003
1	1.000	25.400

1 mm = 0.03937"

0.001 = 0.0254 mm

U.S. To Metric Conversion

	TO CONVERT	INTO	MULTIPLY BY
LINEAR MEASUREMENT	Miles	Kilometers	1.609
	Yards	Meters	0.9144
	Feet	Meters	0.3048
	Feet	Centimeters	30.48
	Inches	Meters	0.0254
	Inches	Centimeters	2.54
	Inches	Millimeters	25.4
AREA	Square Miles	Square Kilometers	2.59
	Square Feet	Square Meters	0.0929
	Square Inches	Square Centimeters	6.452
	Acre	Hectare	0.4047
VOLUME	Cubic Yards	Cubic Meters	0.7646
	Cubic Feet	Cubic Meters	0.02832
	Cubic Inches	Cubic Centimeters	16.39
WEIGHT	Tons (Short)	Metric Tons	0.9078
	Pounds	Kilograms	0.4536
	Ounces (Avdp.)	Grams	28.3495
PRESSURE	Pounds/Sq. In.	Kilopascal	6.895
WORK	Foot–Pounds	Newton–Meter	1.356
LIQUID VOLUME	Quarts	Liters	0.9463
	Gallons	Liters	3.785
LIQUID FLOW	Gallons/Minute	Liters/Minute	3.785
TEMPERATURE	Fahrenheit	Celsius	1.Subtract 32° 2. Multiply by 5/9

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SERVICE MANUAL REVISION

ROUTE TO ATTENTION	
PARTS MANAGER	☐
SERVICE MANAGER	☒
SALES MANAGER	☐

NOTICE **Insert This Sheet With The Below Listed Manual For Future Reference.**

Revision No: MT52-1
Date: 11 August 2005
Product: Mini Track Loader
Model: MT52
Manual No: 6902525 (1-04)

Please discard your old MT52 Service Manual (P/N 6902525) DATED 1-04 and replace it with the revised MT52 Service Manual (P/N 6902525) Dated 8-05.

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SERVICE MANUAL REVISION

ROUTE TO ATTENTION	
PARTS MANAGER	☐
SERVICE MANAGER	☒
SALES MANAGER	☐

NOTICE **Insert This Sheet With The Below Listed Manual For Future Reference.**

Revision No: **MT52-2**
Date: **18 October 2005**
Product: **Mini Track Loader**
Model: **MT52**
Manual No: **6902525 (1-04)**

The following sections are a revision to the above Service Manual.

Take out existing sections and put in the new sections as listed below:

TAKE OUT	PUT IN	REVISION DECRIPTION
10-01 Section 10-150	10-01 Section 10-150	Revised Text Revised Text
ALL ELECTRICAL SCHEMATICS	WIRING SCHEMATIC MT52 (S/N 523611001 AND ABOVE) (S/N 523711001 AND ABOVE) (PRINTED OCTOBER 2005) 0461	
	WIRING SCHEMATIC (With Shut Down Option) MT52 (S/N 523611001 AND ABOVE) (S/N 523711001 AND ABOVE) (PRINTED OCTOBER 2005) 0462	

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SERVICE MANUAL REVISION

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SERVICE MANAGER	☒
SALES MANAGER	☐

NOTICE Insert This Sheet With The Below Listed Manual For Future Reference.

Revision No: MT52-3
Date: 23 March 2006
Product: Bobcat Loader
Model: MT52
Manual No: 6902525 (8-05)

MT52 Service Manual (P/N 6902525) Dated (3-06) co ntains updated service information which replaces the previous MT52 Service Manual (P/N 6902525) Dated (8-05).

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SERVICE MANUAL REVISION

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SERVICE MANAGER	X
SALES MANAGER	☐

NOTICE **Insert This Sheet With The Below Listed Manual For Future Reference.**

Revision No: **MT52-4**
Date: **15 June 2012**
Product: **Bobcat Loader**
Model: **MT52**
Manual No: **6902525 (3-06)**

The following Sections are a revision to the above Service Manual.

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