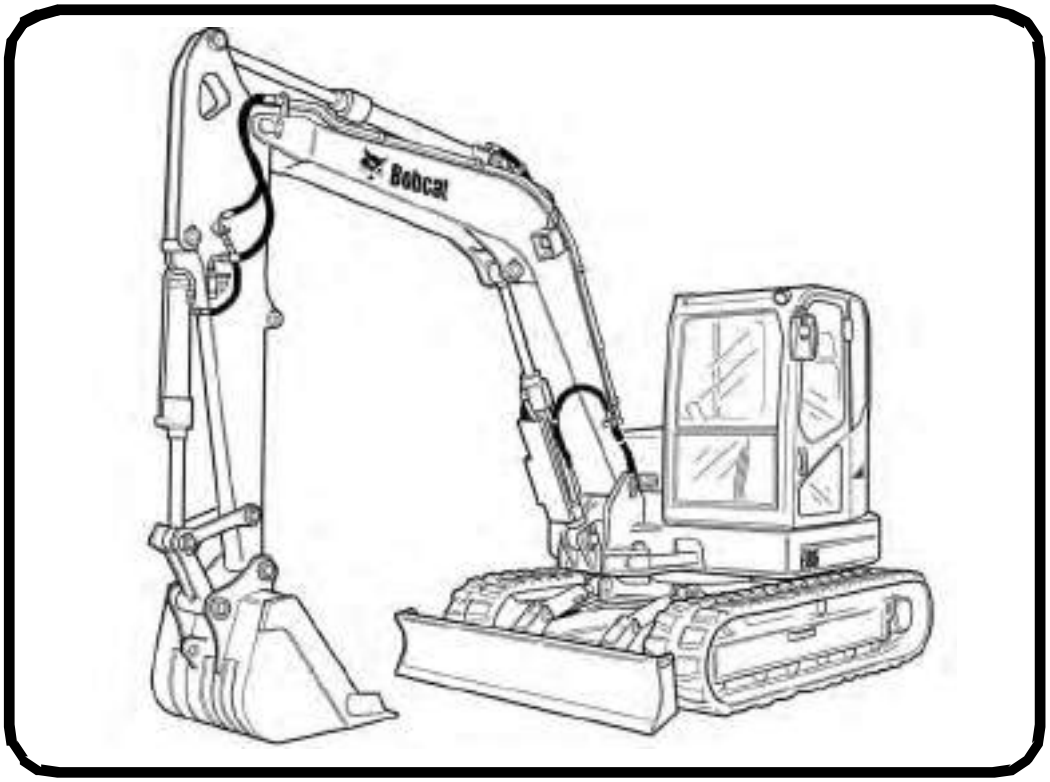
Service Manual
E85 Excavator

S/N B34T11001 & Above
S/N B34S11001 & Above



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Printed in USA

T4-Y S3B

MAINTENANCE SAFETY

WARNING

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

W-2003-0807

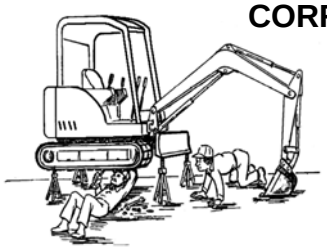
Safety Alert Symbol: This symbol with a warning statement, means: "Warning, be alert! Your safety is involved!" Carefully read the message that follows.

CORRECT

P-90216

Never service the Bobcat Excavator without instructions.

CORRECT



B-19964

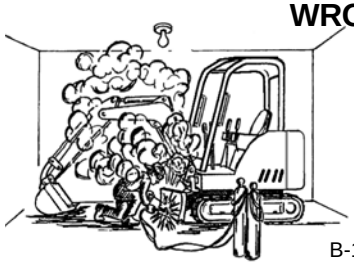
Use the correct procedure to lift and support the excavator.

CORRECT

B-19959

Cleaning and maintenance are required daily.

WRONG



B-19965

Have good ventilation when welding or grinding painted parts.

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

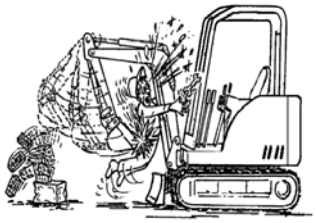
WRONG

B-19960

Vent exhaust to outside when engine must be run for service.

Exhaust system must be tightly sealed. Exhaust fumes can kill without warning.

WRONG



B-19966

Always lower the bucket and blade to the ground before doing any maintenance.

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

WRONG

B-19962

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

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

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

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

WRONG

B-19958

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 protections approved for type of welding.

Keep tailgate closed except for service. Close and latch tailgate before operating the excavator.

WRONG

B-19798

Lead-acid batteries produce flammable and explosive gases.

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

Batteries contain acid which burns eyes or skin on contact.

Wear protective clothing. If acid contacts body, flush well with water. For eye contact flush well and get immediate medical attention.

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

MSW28-0409

CONTENTS

FOREWORD

FOREWORD

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

1. Check that the cab is in good condition and is not modified.

2. Check that the cab mounting hardware is tightened and is Bobcat approved.

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

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

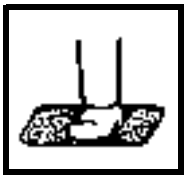
5. Travel levers, control levers and foot pedals must return to neutral. Check that the pedal locks are in working order.

6. Check for correct function of the work lights.

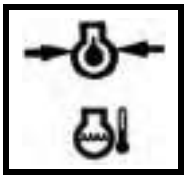
7. Enclosure door latches must open and close freely.

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

9. Safety treads must be in good condition.

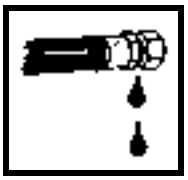


10. Check for correct function of indicator lamps.

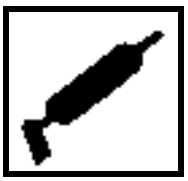


11. Check hydraulic fluid level, engine oil level and fuel supply.

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

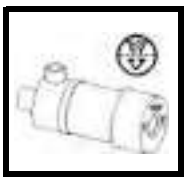


13. Lubricate the excavator.



14. Check the condition of the battery and cables.

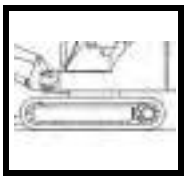
15. Inspect the air cleaner for damage or leaks. Check the condition of the element.



16. Check the electrical charging system.

FW EXC DSN E85 EMEA-1015 SM

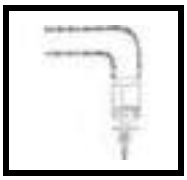
17. Check tracks for wear and tension. Use only approved tracks.



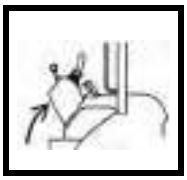
18. Inspect for loose or broken parts or connections.

19. Check for any field modification not completed.

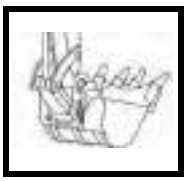
20. Operate the machine and check all functions.



21. Check the control console interlocks for correct function.



22. Inspect the attachment quick coupler for wear or damage. Repair or replace damaged parts.



23. Check function or condition of all equipped options and accessories (examples: special applications kit, motion alarm, etc.).

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

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

AVOID INJURY OR DEATH

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

W-2003-0807

IMPORTANT

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

I-2019-0284

DANGER

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

D-1002-1107

WARNING

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

W-2044-1107

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

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

SI EXC-0913 SM

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

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

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

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

SI EXC-0913 SM

FIRE PREVENTION

Maintenance

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

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

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

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

Operation

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

Electrical

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

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

Hydraulic System

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

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

Fueling

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

Ultra Low Sulfur Diesel (ULSD) poses a greater static ignition hazard than earlier diesel formulations with higher Sulfur content. Avoid death or serious injury from fire or explosion. Consult with your fuel or fuel system supplier to ensure the delivery system is in compliance with fueling standards for proper grounding and bonding practices.

Starting

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

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

Spark Arrester Exhaust System

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

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

FIRE PREVENTION (CONT'D)

Welding And Grinding

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

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

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

Fire Extinguishers

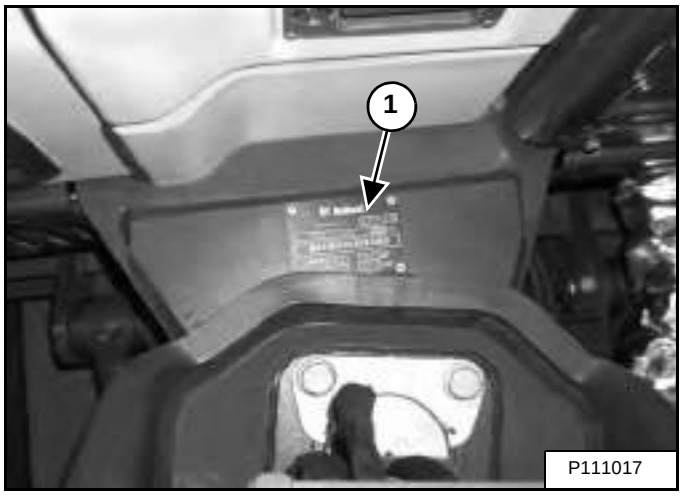
Know where fire extinguishers and first aid kits are located and how to use them. Inspect the fire extinguisher and service the fire extinguisher regularly. Obey the recommendations on the instructions plate.

SERIAL NUMBER LOCATIONS

Always use the serial number of the excavator 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.

Excavator Serial Number

Figure 1



The excavator serial number plate (Item 1) **[Figure 1]** is located on the swing frame on the front of the upperstructure.

Explanation of Excavator Serial Number:

XXXX XXXXX

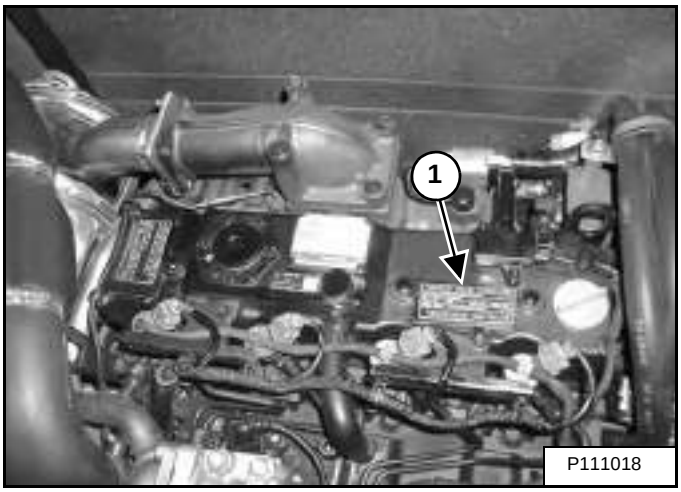
- XXXXX — Module 2. - Production Sequence (Series)
- XXXX — Module 1. - Model / Engine Combination

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 excavator is produced.

Engine Serial Number

Figure 2



The engine serial number (Item 1) **[Figure 2]** is located on the top cover.

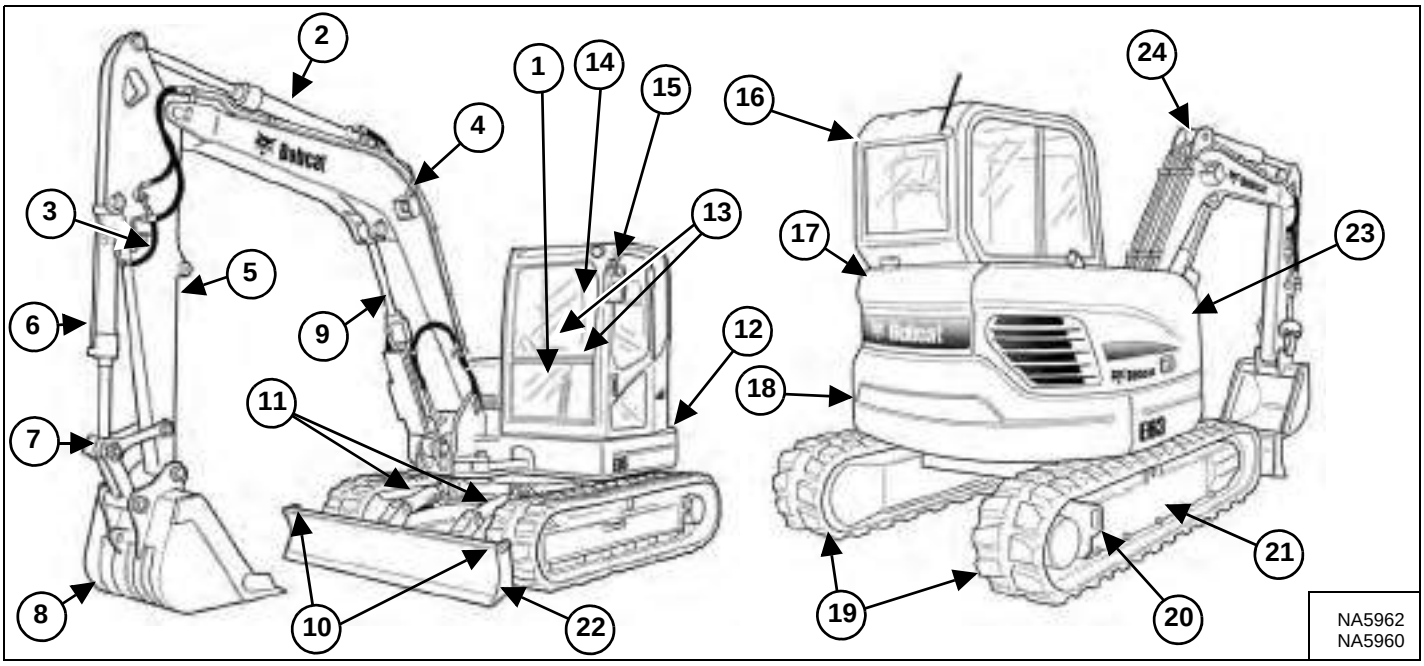
DELIVERY REPORT

Figure 3

The delivery report **[Figure 3]** contains a list of items that must be explained or shown to the owner or operator by the dealer when the Bobcat excavator is delivered.

The delivery report must be reviewed and signed by the owner or operator and the dealer.

EXCAVATOR IDENTIFICATION



ITEM	DESCRIPTION	ITEM	DESCRIPTION
1	Operator's Handbook	**16**	Cab (ROPS / TOPS) **[C]**
2	Arm Cylinder	**17**	Rear Cover
3	Auxiliary Quick Couplers	**18**	Counterweight
4	Boom **[A]**	**19**	Tracks **[D]**
5	Arm	**20**	Tie Downs (Both Sides)
6	Bucket Cylinder	**21**	Track Frames
7	Bucket Link	**22**	Blade
8	Bucket **[B]**	**23**	Right Side Cover
9	Boom Cylinder	**24**	Lift Point
10	Tie Downs / Lift Points		
11	Blade Cylinders		
12	Upperstructure		
13	Control Levers (Joysticks)		
14	Operator's Seat with Seat Belt		
15	Mirrors		

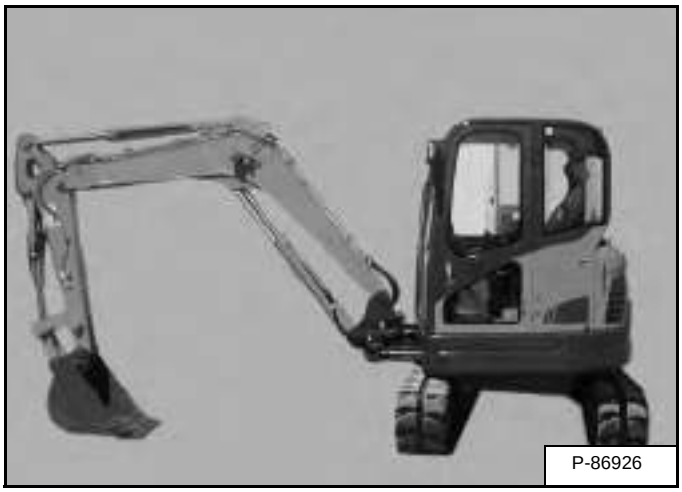
[A] BOOM - Optional articulated boom is available.
[B] BUCKET - Several different buckets and other attachments are available for the Bobcat excavator.
[C] ROPS - (Roll Over Protective Structure) as standard equipment.
The ROPS meets ISO 12117-2; 2008.
[D] TRACKS - Optional tracks are available.

SAFETY AND MAINTENANCE

LIFTING AND BLOCKING THE EXCAVATOR

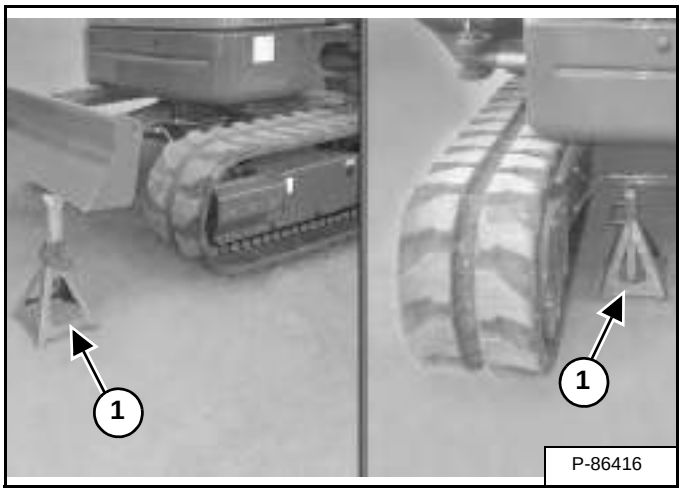
Procedure

Figure 10-10-1



Raise one side of the machine (approximately 101,6 mm [4 in]) using the boom and arm **[Figure 10-10-1]**.

Figure 10-10-2



Fully raise the blade and install jackstands (Item 1) **[Figure 10-10-2]** under the blade and track frame. Lower the boom until all machine weight is on the jackstands.

Stop the engine.

WARNING

AVOID INJURY

Keep fingers and hands out of pinch points when checking the track tension.

W-2142-0903

WARNING

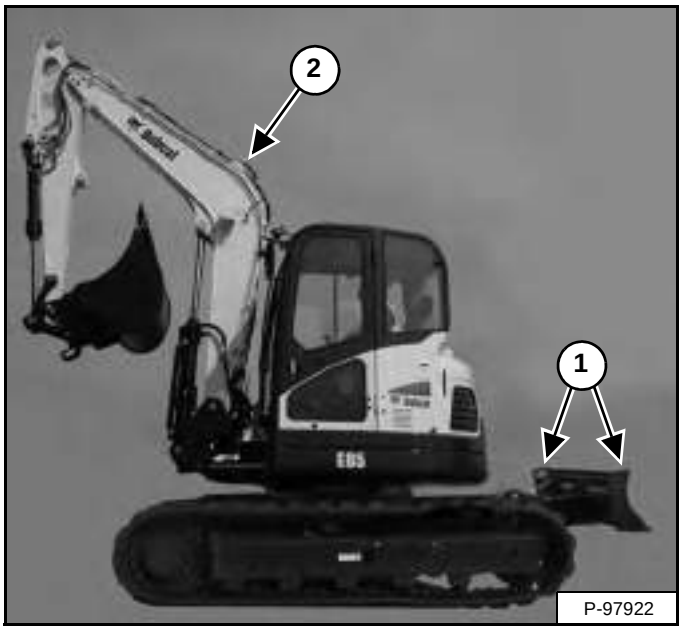
Put jackstands under the blade and rear corners of the undercarriage before working under the machine. Failure to block up the machine may allow it to move or fall and result in injury or death.

W-2218-1195

LIFTING THE EXCAVATOR

Procedure

Figure 10-20-1



Fully extend the cylinders of the bucket, arm, boom and articulated boom (if equipped) so that the excavator is in the position as shown **[Figure 10-20-1]**.

Raise the blade fully.

Put all the control levers in neutral.

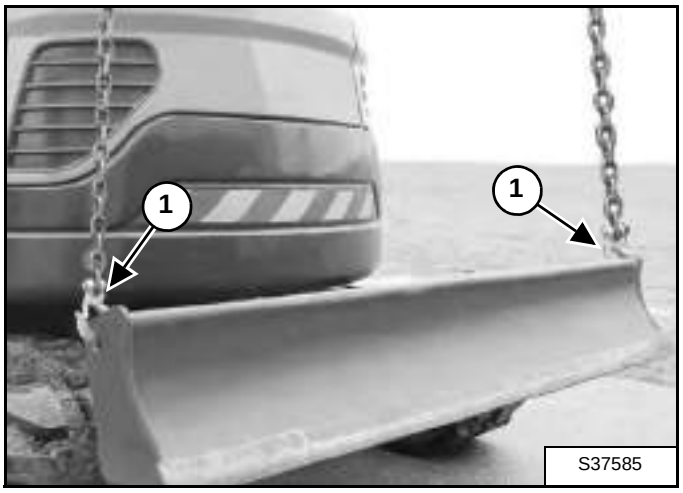
⚠ WARNING

AVOID INJURY OR DEATH

- **Use a lifting fixture with sufficient capacity for the weight of the excavator plus any added attachments.**
- **Maintain center of gravity and balance when lifting.**
- **Do not swing boom or upperstructure.**
- **Never lift with operator on machine.**

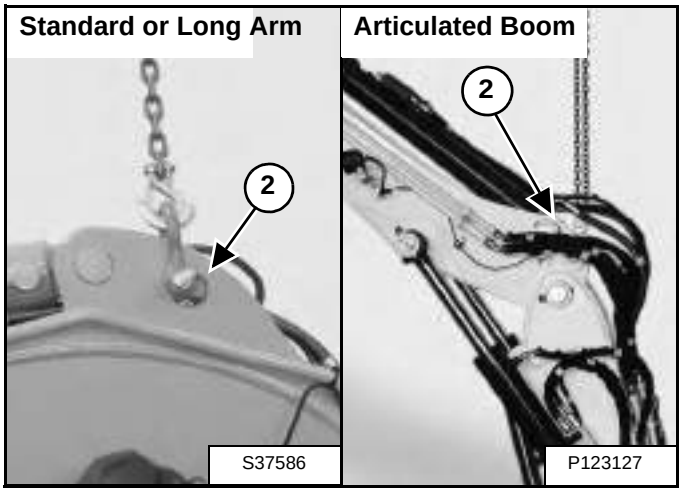
W-2434-0502

Figure 10-20-2



Fasten chains to the ends of the blade (Item 1) **[Figure 10-20-1]** and **[Figure 10-20-2]** and up to a lifting device above the cab. Place protective material between the chains and the cab and the upperstructure to prevent damage.

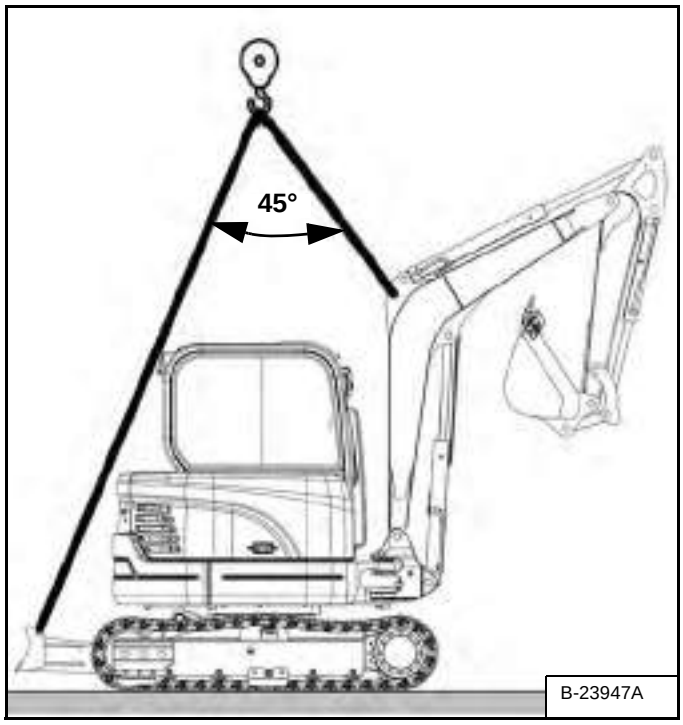
Figure 10-20-3



Fasten chains to the boom (Item 2) **[Figure 10-20-1]** and **[Figure 10-20-3]** and up to a lifting device above the cab. Place protective material between the chains and the cab and the upperstructure to prevent damage.

Procedure (Cont'd)

Figure 10-20-4



The maximum angle between the front and rear chains must not exceed 45° **[Figure 10-20-4]**.

OPERATOR CAB

Description

The Bobcat excavator has an operator cab (ROPS) as standard equipment to provide protection if the excavator is tipped over. The seat belt must be worn for ROPS protection.

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

ROPS - Roll Over Protective Structure per ISO 12117-2: 2008.

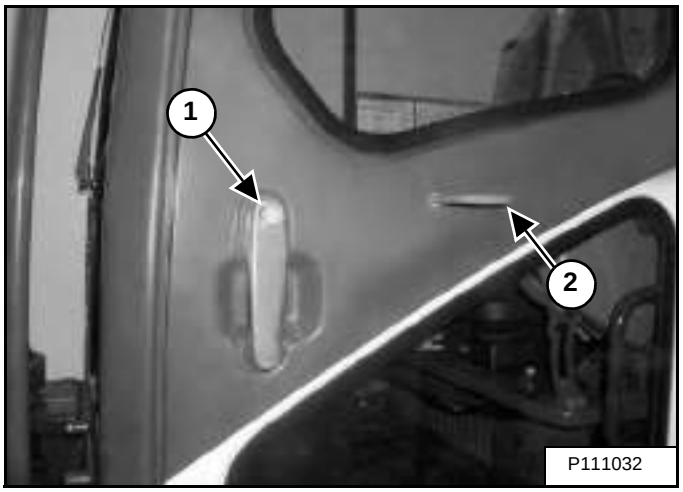
WARNING

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

W-2069-0200

Cab Door

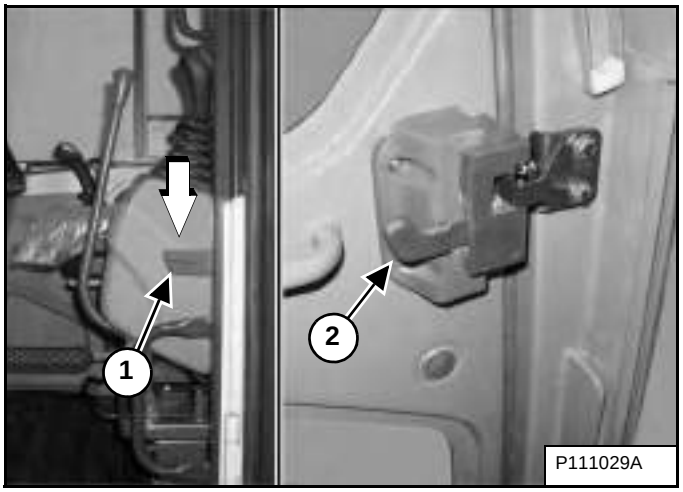
Figure 10-30-1



The cab door can be locked (Item 1) **[Figure 10-30-1]** with the same key as the starter switch.

The door can be held in the open position. Push the door all the way open until the latch (Item 2) **[Figure 10-30-1]** engages to hold the door in the open position.

Figure 10-30-2



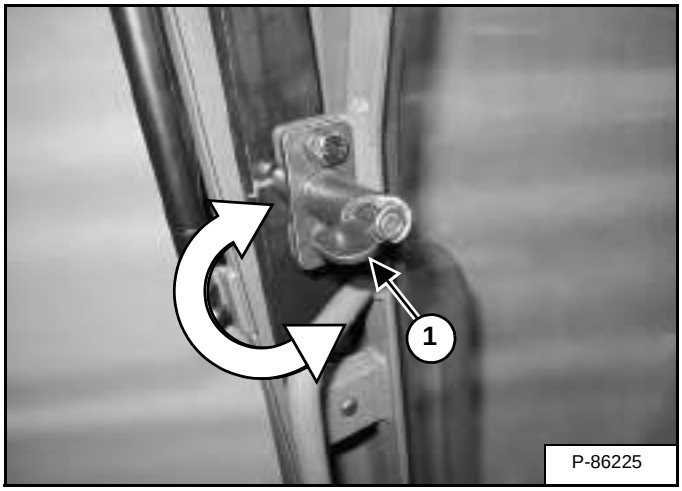
When the door is in the open position, push down on the latch (Item 1) **[Figure 10-30-2]** and close the door.

From inside the cab, open the door using the handle (Item 2) **[Figure 10-30-2]**.

Front Window

Opening The Front Window

Figure 10-30-3



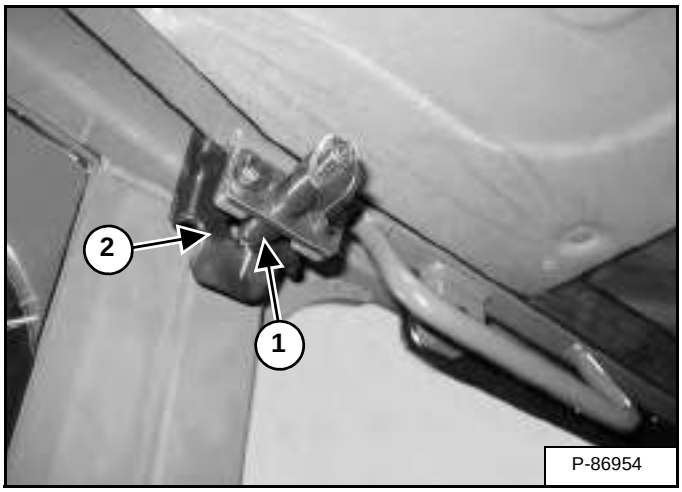
Rotate the front window latch pins (Item 1) **[Figure 10-30-3]** (Both sides).

Figure 10-30-4

Use both window grab handles to pull the top of the window in **[Figure 10-30-4]**.

Continue moving the window in and up over the operator's head until the window is fully raised.

Figure 10-30-5



When the window is fully raised, push up on the window slightly until the two latch pins (Item 1) (both sides) engage into the bracket (Item 2) **[Figure 10-30-5]** to lock the window in the open position. Pull down slightly on the window to make sure the latch pins are properly seated to hold the window securely in the open position.

Closing The Front Window

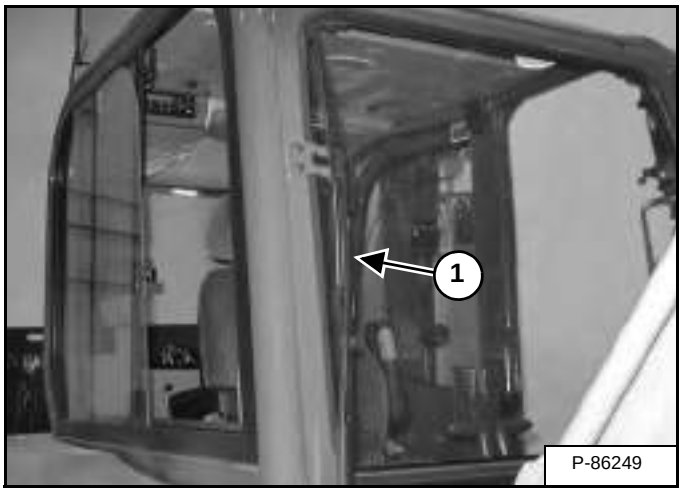
Support the window while rotating both window latch pins (Item 1) **[Figure 10-30-5]** to the unlocked position.

Using both window grab handles, pull the window forward and down to the closed position **[Figure 10-30-4]**.

When the window is fully lowered, push in on the window slightly until the two latch pins (Item 1) **[Figure 10-30-3]** (both sides) engage into the bracket to lock the window in the closed position.

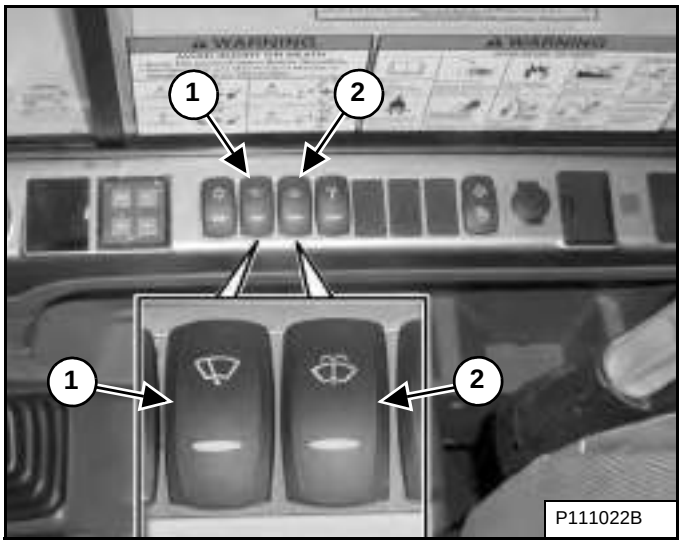
Front Wiper

Figure 10-30-6



The front window is equipped with a wiper (Item 1) **[Figure 10-30-6]** and washer.

Figure 10-30-7

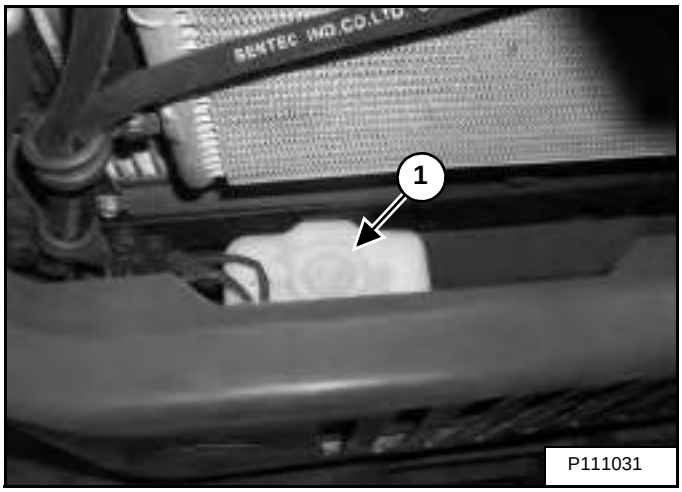


The wiper switch (Item 1) **[Figure 10-30-7]** has three positions, OFF, intermittent wiper mode and full speed.

The window washer switch (Item 2) activates the front window washer. (The wiper switch (Item 1) must be activated before the washer switch (Item 2) **[Figure 10-30-7]** will allow washer fluid to be sprayed on the front window.)

Window Washer Reservoir

Figure 10-30-8

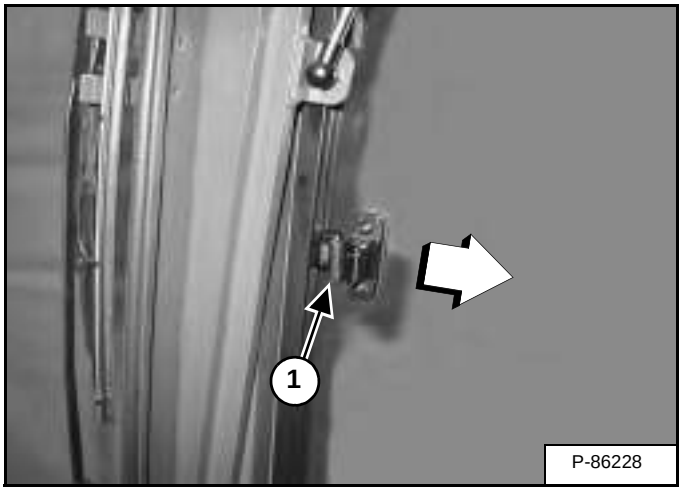


The window washer reservoir (Item 1) **[Figure 10-30-8]** is located under the right side cover, just between the grille and the condenser. (When the temperature is 0°C (32°F) or lower, fill the washer reservoir with washer fluid specified for freezing conditions. If the washer bottle is filled with water, it will freeze and damage the washer reservoir.)

Right Side Window

Opening The Right Front Window

Figure 10-30-9



Press the latch / handle (Item 1) **[Figure 10-30-9]** together and pull back on the latch / handle to open the right side window.

Closing The Right Front Window

Push the latch / handle (Item 1) **[Figure 10-30-9]** forward until the latch / handle lock the window in the closed position.

Heating, Ventilation And Air Conditioning Duct

Figure 10-30-10

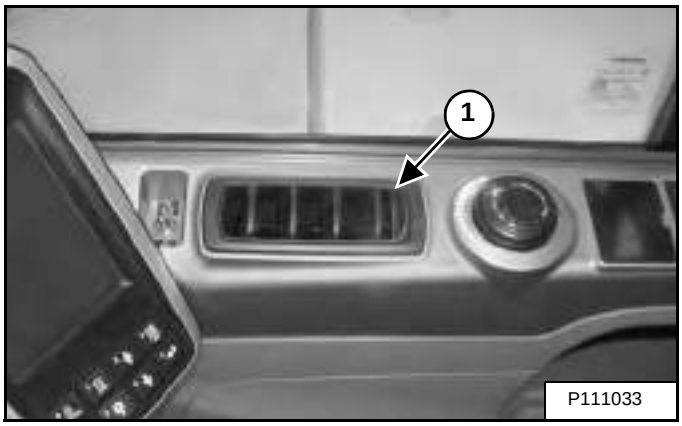


Figure 10-30-11

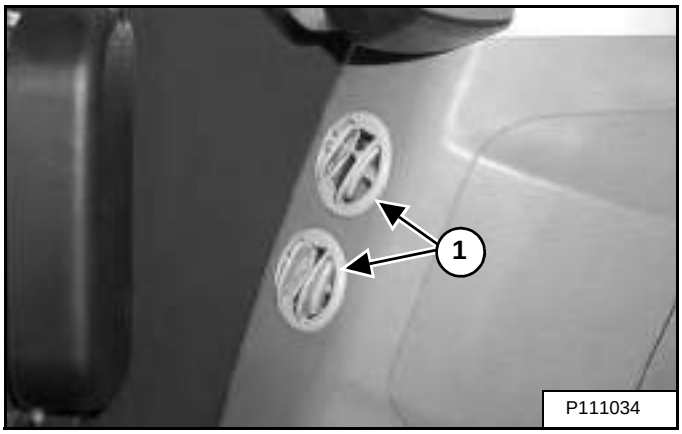
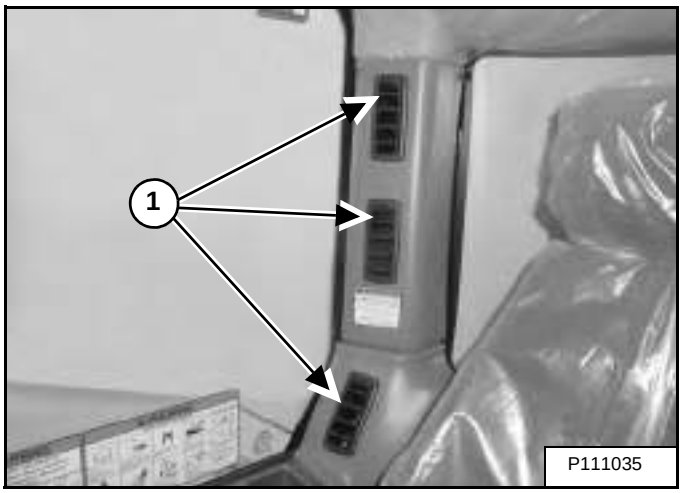
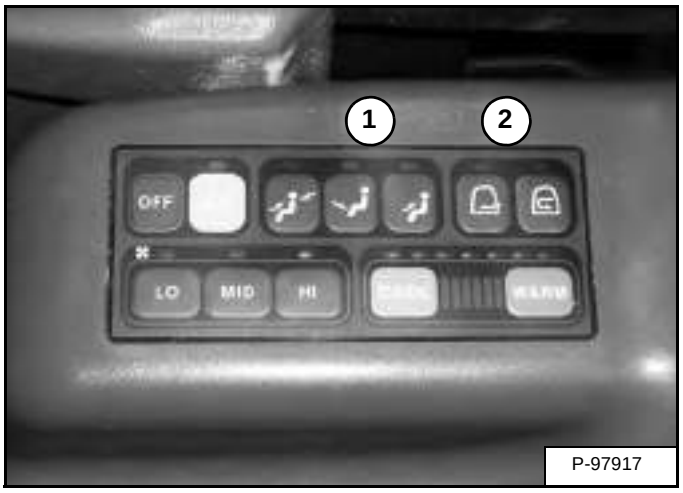


Figure 10-30-12



The excavator is equipped with seven air vents (Item 1) **[Figure 10-30-10]**, **[Figure 10-30-11]** and **[Figure 10-30-12]** that can be adjusted to deflect air flow to the desired area of the cab.

Figure 10-30-13



Use one of the three buttons (Item 1) located in the left console to control which air ducts are active and two buttons (Item 2) **[Figure 10-30-13]** that control fresh air or recirculated air.

Operating Tip: To increase heating or cooling efficiency, move the Recirculation / Fresh Air Control (Item 2) **[Figure 10-30-13]** *to the recirculation position. This will allow the air to recirculate through the HVAC system and improve temperature control. If left in the fresh air position, the HVAC system will also need to heat or cool the ambient air that is drawn in from the outside, slowing and / or reducing the temperature change inside the cab.*

TRANSPORTING THE EXCAVATOR ON A TRAILER

Loading And Unloading

When transporting the machine, observe the rules, motor vehicle laws, and vehicle limit ordinances. Use a transport and towing vehicle of adequate length and capacity.

Secure the parking brakes and block the wheels of the transport vehicle.

Align the ramps with the center of the transport vehicle. Secure the ramps to the truck bed and be sure ramp angle does not exceed 15 degrees.

Use metal loading ramps with a slip resistant surface.

Use ramps that are the correct length and width and can support the weight of the machine.

The rear of the trailer must be blocked or supported when loading or unloading the machine to prevent the front of the transport vehicle from raising.

Determine the direction of the track movement before moving the machine (blade forward).

Figure 10-40-1

NOTE: When loading or unloading the machine, disengage the auto idle feature and place the two-speed travel in low range.

Move the machine forward onto the transport vehicle **[Figure 10-40-1]**.

Do not change direction of the machine while it is on the ramps.

Lower the boom, arm, bucket, and blade to the transport vehicle.

Stop the engine and remove the key.

Put blocks at the front and rear of the tracks.

Fastening

Figure 10-40-2

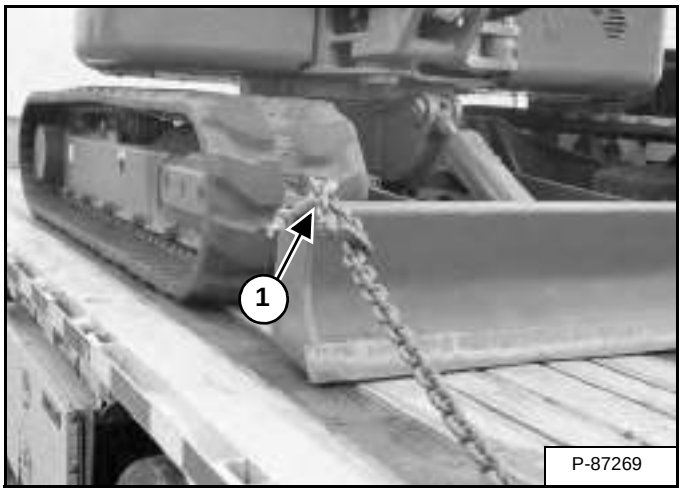
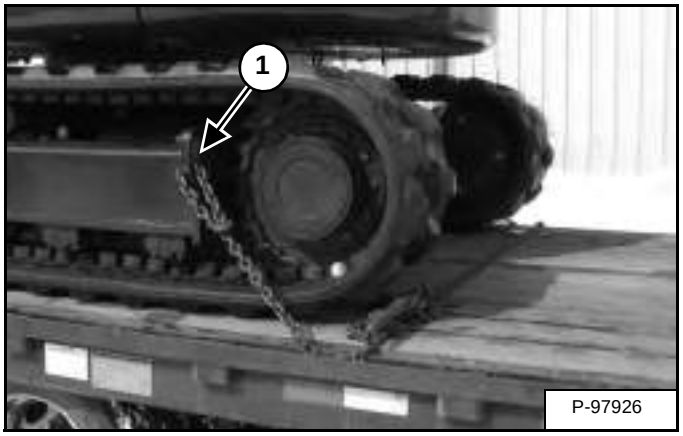


Figure 10-40-3



Fasten chains to both corners of the blade (Item 1) **[Figure 10-40-2]** (both sides) and to the tie down loop at the rear of the track frame (Item 1) **[Figure 10-40-3]** (both sides) to prevent it from moving when going up or down slopes or during sudden stops.

Use chain binders to tighten the chains and then safely tie the chain binder levers to prevent loosening.

⚠ WARNING

AVOID SERIOUS INJURY OR DEATH

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

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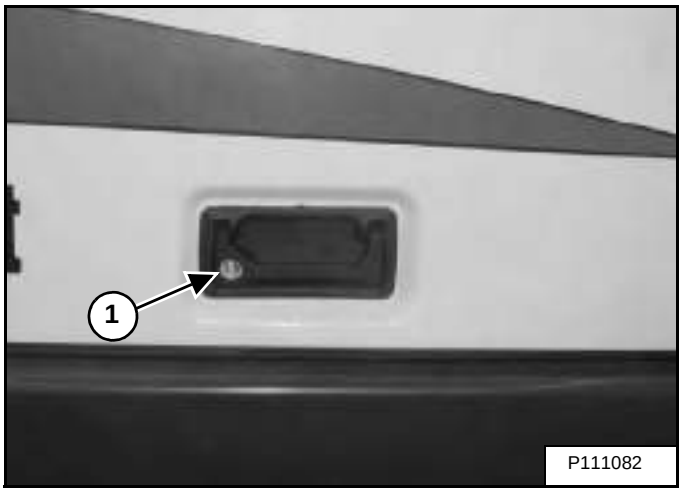
RIGHT SIDE COVER

Opening And Closing

Figure 10-50-1



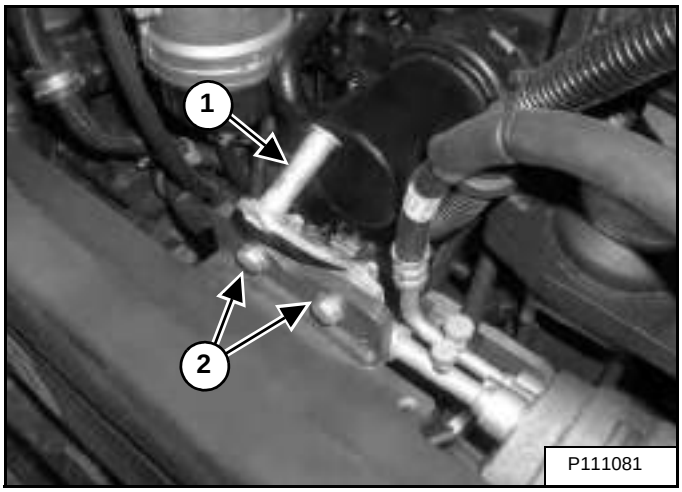
Use the start key (Item 1) **[Figure 10-50-1]** to unlock the latch.

Pull the latch (Item 1) **[Figure 10-50-1]** and raise the right side cover.

Close and lock the center cover when the service procedure is completed.

Adjusting The Latch

Figure 10-50-2



The right side cover latch (Item 1) **[Figure 10-50-2]** can be adjusted.

Loosen the bolts and nuts (Item 2) **[Figure 10-50-2]** and adjust the latch. Tighten the nuts after the adjustment is made.

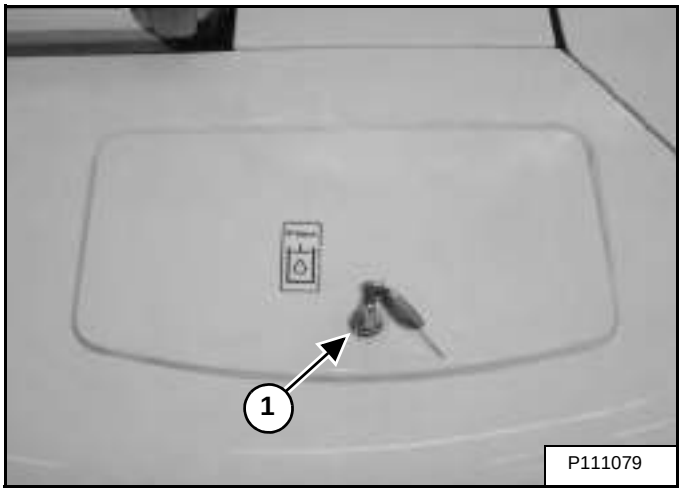
Close the right side cover before operating the excavator.

REAR COVER

Opening And Closing

The hydraulic tank breather / filter and hydraulic oil fill cover is located under the rear cover.

Figure 10-60-1



Use the start key to unlock and open the rear cover (Item 1) **[Figure 10-60-1]**.

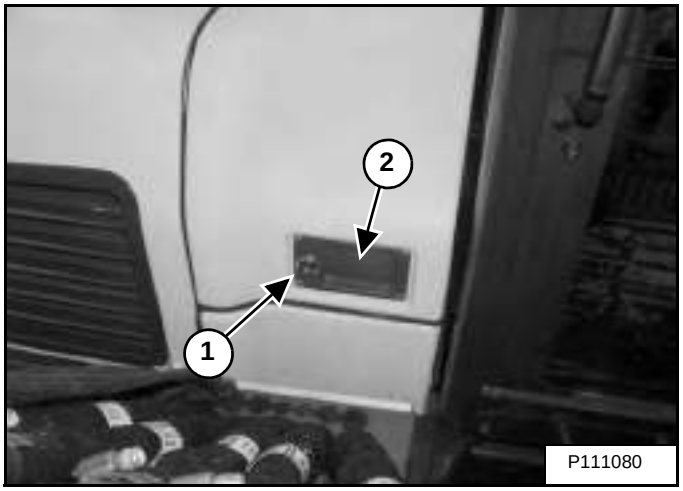
Close and lock the rear cover when the service procedure is completed.

CENTER COVER

Opening And Closing

The battery, circuit breaker, fusible links, some relays and the swing motor are located under the center cover.

Figure 10-70-1



Use the start key (Item 1) **[Figure 10-70-1]** to unlock the latch.

Pull the latch (Item 2) **[Figure 10-70-1]** and raise the cover.

Close and lock the center cover when the service procedure is completed.

SERVICE SCHEDULE

Maintenance Intervals

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 excavator.

⚠ WARNING

AVOID INJURY OR DEATH

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

W-2003-0807

Every 10 Hours (Before Starting The Excavator)

- **Engine Oil** - Check level and add as needed.
- **Engine Air Filters and Air System** - Check display panel. Service only when required. Check for leaks and damaged components.
- **Engine Cooling System** - Check coolant level COLD and add premixed coolant as needed.
- **Fuel Filter** - Check display panel. Remove the trapped water when required.
- **Seat Belt, Seat Belt Retractors, Seat Belt Mounting hardware, Control Console Lockout** - Check the condition of seat belt and mounting hardware. Clean or replace seat belt retractors as needed. Check the control console lockout lever for proper operation. Clean dirt and debris from moving parts.
- **Motion Alarm** - Check for proper function.
- **Operator Cab** - Check the cab condition and mounting hardware.
- **Indicators and Lights** - Check for correct operation of all indicators and lights.
- **Safety Signs** - Check for damaged signs (decals). Replace any signs that are damaged.
- **Hydraulic Fluid** - Check fluid level and add as needed.
- **Track Tension** - Check tension and adjust as needed.
- **Swing Reduction Gearbox** - Check fluid level and add as needed.
- **Swing Bearing** - Grease swing bearing every 10 hours when operating in water.
- **Blade, Boom Swing, Boom Swing Cylinder and Bucket Pivot Points** - Grease pivot points every 10 hours when operating in water.
- **Boom and Arm (Workgroup) Pivot Points** - Grease pivot points every 10 hours when operating in water.

Every 50 Hours

- **Hydraulic Hoses and Tubelines** - Check for damage and leaks. Repair or replace as needed.
- **Steering Levers and Joysticks** - Check for correct operation. Repair as needed.
- **Swing Bearing** - Grease swing bearing.
- **Blade, Boom Swing, Boom Swing Cylinder and Bucket Pivot Points** - Grease pivot points.
- **Battery** - Check cables, connections, and electrolyte level; add distilled water as needed.
- **Fuel Tank** - Drain water and sediment from fuel tank.
- **Drive Belts (Alternator, Air Conditioning, Water Pump)** - Service at first 50 hours, then as scheduled. Check condition. Replace as needed.
- **Engine Oil and Filter** - Service at first 50 hours, then as scheduled. Replace oil and filter.
- **Fuel / Water Separator Screen** - Service at first 50 hours, then as scheduled. Replace as needed.

Every 100 Hours

- **Drive Belts (Alternator, air conditioning, water pump)** - Check condition. Replace as needed.
- **Belts and Idler** - Service at first 100 hours, then as scheduled. Replace as necessary.
- **Alternator and Starter** - Service at first 100 hours, then as scheduled. Check connections.
- **Travel Motors (Final Drive)** - Service at first 100 hours, then as needed. Replace fluid.
- **Swing Reduction Gearbox** - Service at first 100 hours, then as needed. Replace fluid.

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Maintenance Intervals (Cont'd)

Every 250 Hours Or Every 12 Months

- **Boom and Arm (Workgroup) Pivot Points** - Grease pivot points.
- **Engine Oil and Filter** - Replace oil and filter.
- **Fuel / Water Separator Screen** - Replace as needed.
- **Travel Motors (Final Drive)** - Check fluid level and add as needed.
- **Hydraulic Suction Filter** - Service at first 250 hours, then as scheduled. Clean the hydraulic suction filter, replace as needed.
- **Pilot Filter** - Service at first 250 hours, then as scheduled. Replace pilot filter.

Every 500 Hours Or Every 12 Months

- **Swing Pinion** - Grease swing pinion.
- **Cooling System** - Clean debris from radiator, fuel cooler, hydraulic fluid cooler, air conditioning condenser (if equipped), and front and rear grille.
- **Fuel Filter** - Replace filter element.
- **Hydraulic Filter and Hydraulic Reservoir Breather Cap** - Replace the charge filter and the reservoir breather cap.
- **Belts and Idler** - Check condition. Replace as necessary.
- **Alternator and Starter** - Check connections.
- **Heater and Air Conditioning Filters** - Clean or replace filters as needed.

Every 1000 Hours

- **Engine Valves** - Adjust the engine valve clearance.

Every 1000 Hours Or Every 12 Months

- **Swing Reduction Gear** - Grease swing reduction gear.
- **Hydraulic Suction Filter** - Clean the hydraulic suction filter, replace as needed.
- **Travel Motors (Final Drive)** - Replace fluid.
- **Pilot Filter** - Replace the pilot filter.
- **Swing Reduction Gearbox** - Replace fluid.

Every 1500 Hours

- **Fuel Injectors** - Check for proper operation.
- **Exhaust Gas Recirculation (EGR) Cooler** - Test the EGR cooler for leaks.
- **Crankcase Ventilation Filter** - Replace the crankcase ventilation filter.
- **Positive Crankcase Ventilation (PCV) Valve** - Check the PCV valve for free movement.

Every 2000 Hours Or Every 12 Months

- **Hydraulic Reservoir** - Replace the hydraulic fluid.

Every 3000 Hours

- **Diesel Particulate Filter (DPF)** - Disassemble, clean, and reassemble the DPF. Replace the DPF after two cleaning events.
- **Exhaust Gas Recirculation (EGR) System** - Perform an EGR actuation test. Clean the gas and coolant passages.

Every 24 Months

- **Coolant** - Replace the coolant.

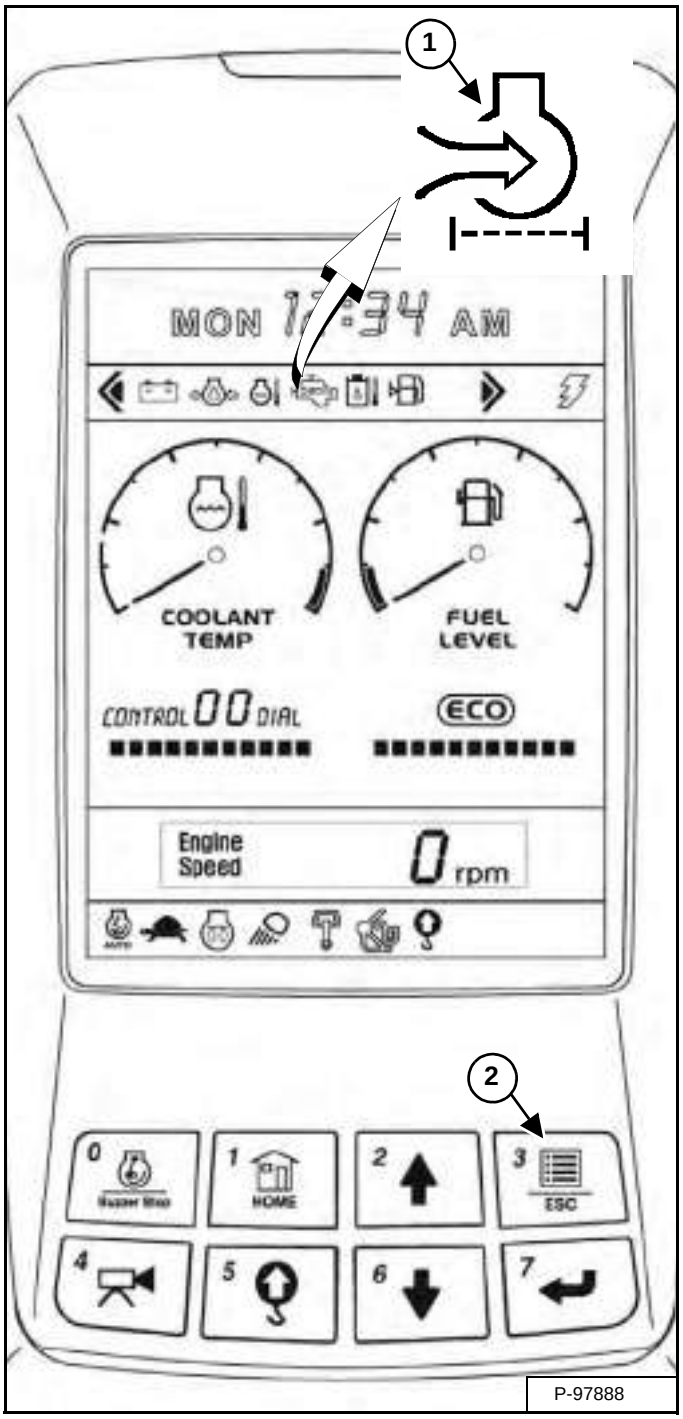
SS EXC E85-0616

AIR CLEANER SERVICE

See the SERVICE SCHEDULE for the correct service interval. (See SERVICE SCHEDULE on Page 10-80-1.)

Daily Check

Figure 10-90-1



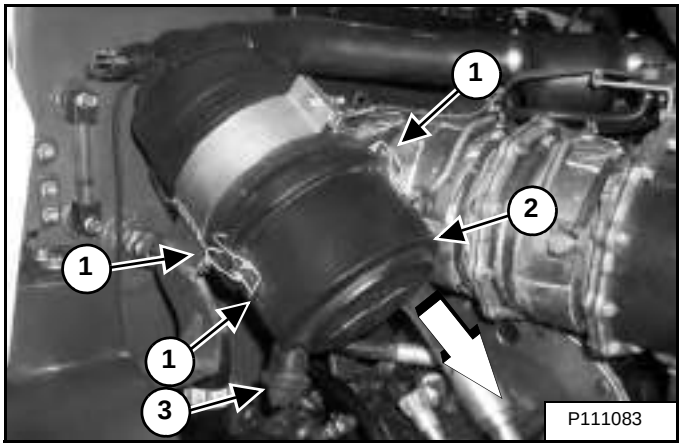
The *Check Air Cleaner Condition Icon* (Item 1) will appear in the top bar of the display panel when it is time to service the air filter. The pop up window can be temporarily inactivated by pressing the MENU / ESC button (Item 2) **[Figure 10-90-1]**. The pop up will reappear each time the engine is started until the filter(s) are serviced.

AIR CLEANER SERVICE (CONT'D)

Replacing The Filters

Open the right side cover to access the air cleaner for service. (See Opening And Closing on Page 10-50-1.)

Figure 10-90-2



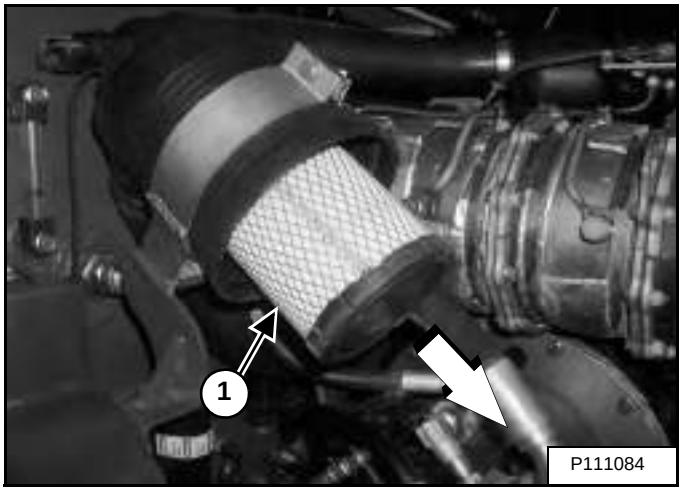
Replace the inner filter every third time the outer filter is replaced or as indicated.

Outer Filter

Pull out on the three fasteners (Item 1) and remove the cover **[Figure 10-90-2]**.

Clean the dust cup (Item 2) **[Figure 10-90-2]**.

Figure 10-90-3



Pull the outer filter (Item 1) **[Figure 10-90-3]** from the air cleaner housing.

Check the housing for damage.

Clean the housing and the seal surface. DO NOT use compressed air.

Install a new filter.

Install the cover (Item 2) and engage the three fasteners (Item 1) **[Figure 10-90-2]**.

Make sure the dust evacuator cup (Item 3) **[Figure 10-90-2]** is in the down position as shown.

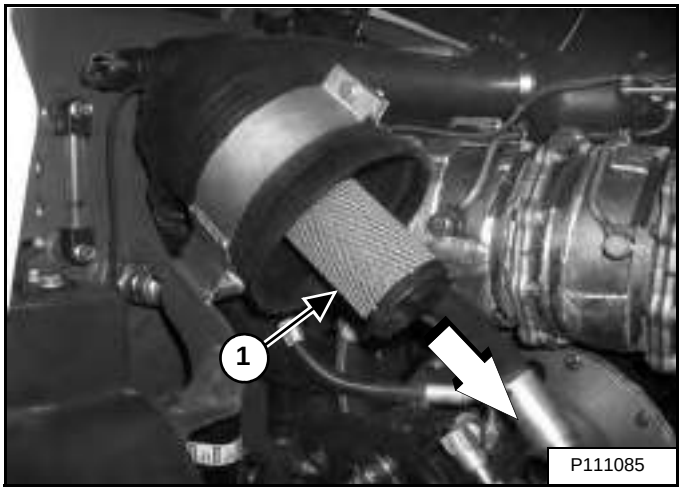
Check the air intake hose and the air cleaner housing for damage. Make sure all connections are tight.

Inner Filter

Only replace the inner filter under the following conditions:

- Replace the inner filter every *third* time the outer filter is replaced.
- After the outer filter has been replaced, start the engine. If the air cleaner condition indicator icon (Item 1) **[Figure 10-90-3]** remains ON, replace the inner filter.

Figure 10-90-4



Remove the air cleaner cover, the outer filter and the inner filter (Item 1) **[Figure 10-90-4]**.

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

Install the new inner filter (Item 1) **[Figure 10-90-4]**.

Install the outer filter and the air cleaner cover.

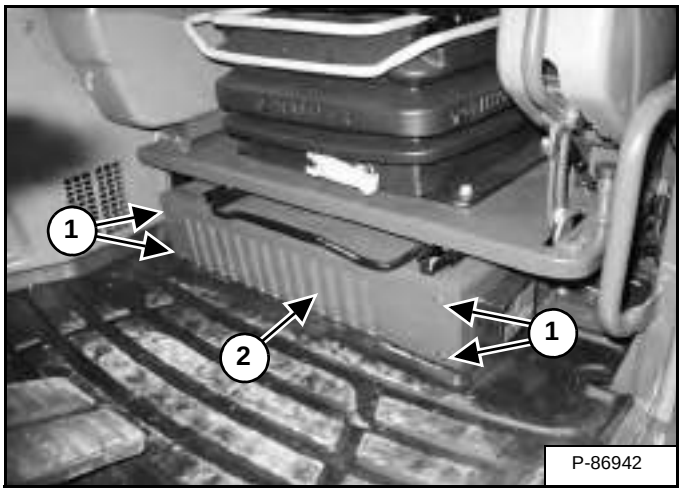
CAB FILTERS

Cleaning And Maintenance

There are two cab air filters that must be cleaned regularly. One filter is located below the operator seat. The second one is located to the left side of the operator seat. (See SERVICE SCHEDULE on Page 10-80-1.)

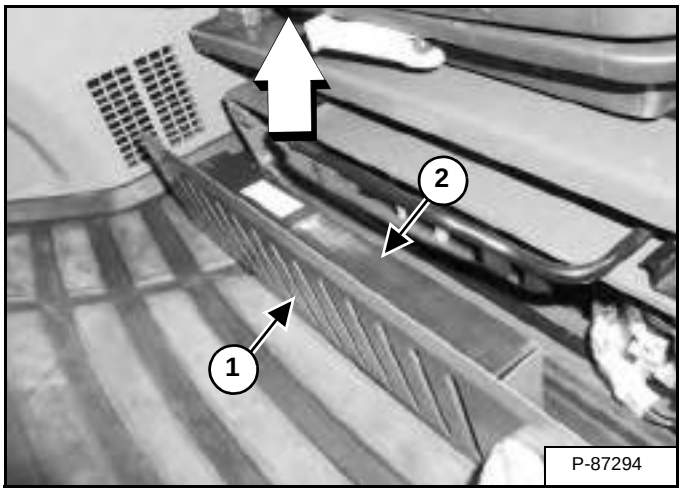
Below Seat Air Filter

Figure 10-100-1



Remove the four bolts (Item 1) from the cover (Item 2) **[Figure 10-100-1]**.

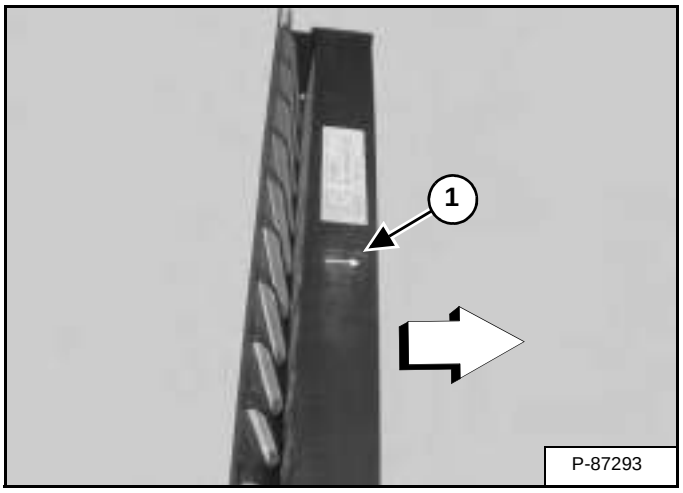
Figure 10-100-2



Remove the cover (Item 1) and pull up the filter (Item 2) **[Figure 10-100-2]** to remove from the cover.

Use low air pressure to clean the filter. Replace the filter when very dirty.

Figure 10-100-3



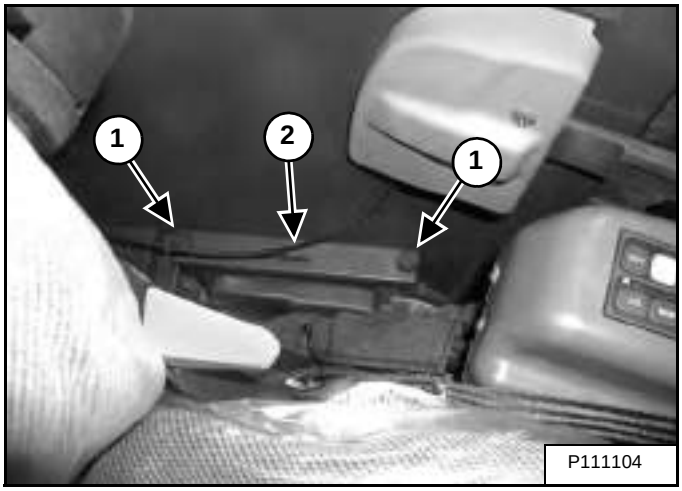
Installation: Install the filter with the arrows that indicate air flow direction (Item 1) **[Figure 10-100-3]** pointing towards the heater / A/C housing.

CAB FILTERS (CONT'D)

Cleaning And Maintenance (Cont'd)

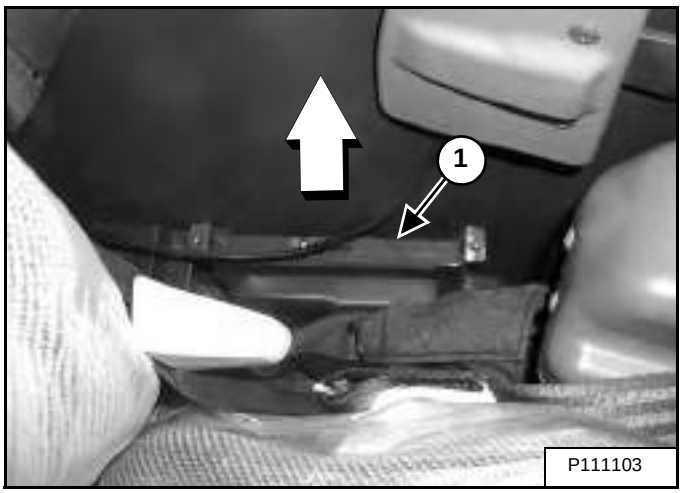
Left Side Of Seat Air Filter

Figure 10-100-4



Remove the two bolts (Item 1) and the cover (Item 2) **[Figure 10-100-4]**.

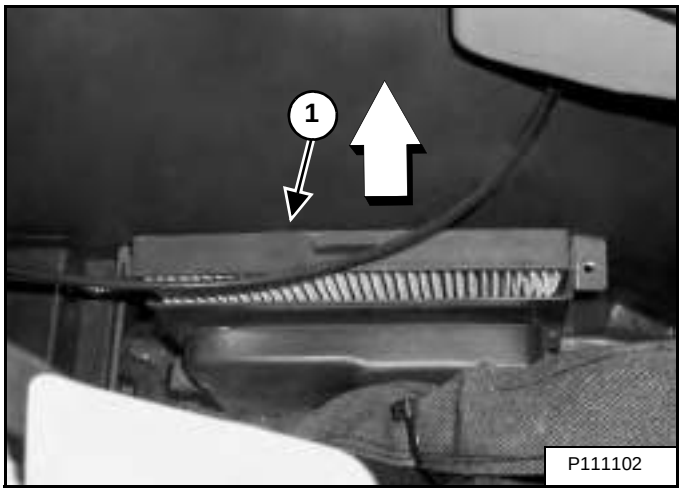
Figure 10-100-5



Pull up on and remove the filter (Item 1) **[Figure 10-100-5]**.

Use low air pressure to clean the filter. Replace the filter when very dirty.

Figure 10-100-6



Installation: Install the filter with the arrows that indicate air flow direction (Item 1) **[Figure 10-100-6]** pointing towards the outside of the cab.

Install the cover (Item 2) and the two bolts (Item 1) **[Figure 10-100-4]**.

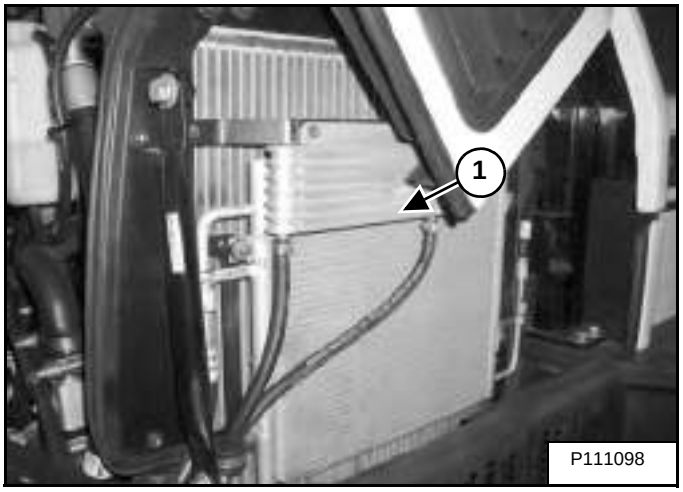
ENGINE COOLING SYSTEM

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

Cleaning

Open the right side cover. (See Opening And Closing on Page 10-50-1.)

Figure 10-110-1



Use air pressure or water pressure to clean the radiator, oil cooler, air conditioning condenser and the fuel cooler (Item 1) **[Figure 10-110-1]**. Be careful not to damage fins when cleaning.

NOTE: Allow the cooling system and engine to cool before servicing or cleaning the cooling system.

Checking Level

WARNING

AVOID BURNS

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

W-2070-1203

WARNING

AVOID INJURY OR DEATH

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

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

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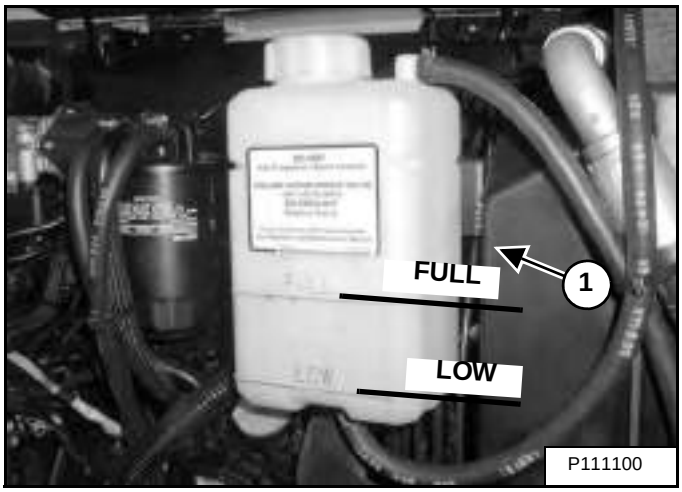
Open the right side cover.

Figure 10-110-2



Check the coolant level in the coolant recovery tank (Item 1) **[Figure 10-110-2]**.

The coolant level must be between the LOW and FULL marks on the coolant recovery tank (Item 1) **[Figure 10-110-2]** when the engine is cold.

NOTE: The cooling system is factory filled with ethylene glycol. DO NOT mix propylene glycol with ethylene glycol.

IMPORTANT

AVOID ENGINE DAMAGE

Always use the correct ratio of water to antifreeze.

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

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

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

I-2124-0497

Removing And Replacing Coolant

See the SERVICE SCHEDULE for correct service intervals. (See SERVICE SCHEDULE on Page 10-80-1.)

Stop the engine. Open the right side cover. (See Opening And Closing on Page 10-50-1.)

⚠ WARNING

AVOID BURNS

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

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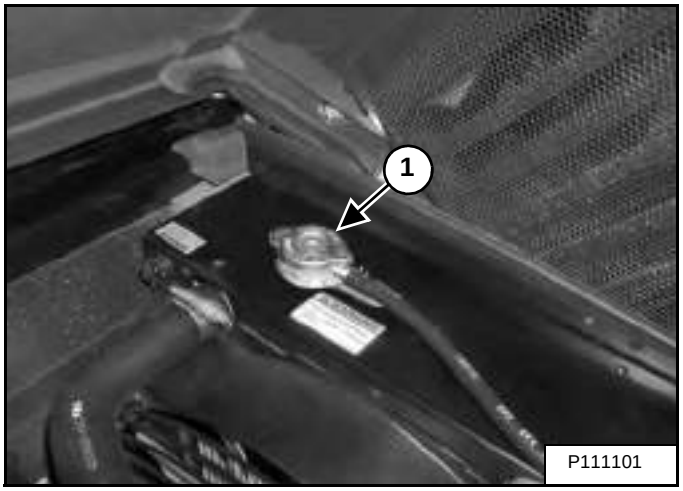
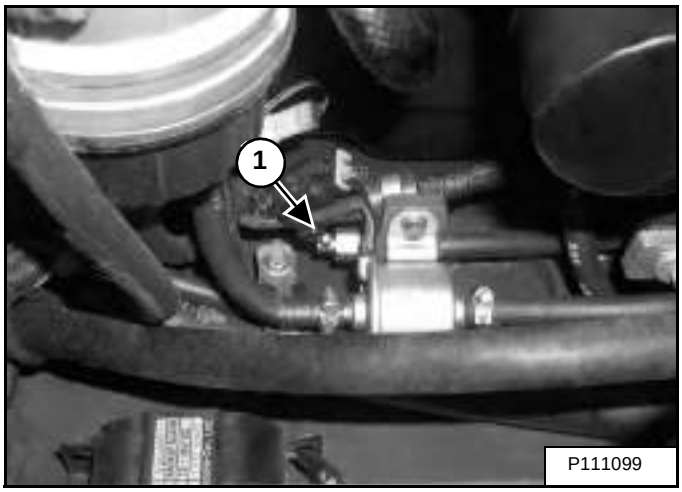
Figure 10-110-3



When the engine is cool, loosen and remove the radiator cap (Item 1) **[Figure 10-110-3]**.

Rotate the upperstructure 90° to access the lower engine access cover. Remove the lower engine access cover so coolant can be drained into a container.

Figure 10-110-4



Open the drain valve (Item 1) **[Figure 10-110-4]** (located below the oil filter) and drain the coolant into the container.

After all the coolant is removed, close the drain valves (Item 1) **[Figure 10-110-4]**.

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

Mix the coolant in a separate container. (See Capacities on Page SPEC-10-8.)

NOTE: The cooling system is factory filled with ethylene glycol. DO NOT mix ethylene glycol with propylene glycol.

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

Add premixed coolant; 50% water and 50% ethylene glycol to the recovery tank if the coolant level is low.

Run the engine until it is at operating temperature. Stop the engine. Check the coolant level and add as needed. Be sure the radiator cap is tight.

Add coolant to the recovery tank as needed.

Reinstall the lower engine access cover.

Close the right side cover.

FUEL SYSTEM

Fuel Specifications

NOTE: Contact your local fuel supplier to receive recommendations for your region.

Ultra low sulfur diesel fuel must be used in this machine. Ultra low sulfur is defined as 15 mg/kg (15 ppm) sulfur maximum.

U.S. Standard (ASTM D975)

Use only clean, high quality diesel fuel, Grade Number 2-D or Grade Number 1-D.

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

TEMPERATURE	GRADE 2-D	GRADE 1-D
Above -9°C (+15°F)	100%	0%
Down to -21°C (-5°F)	50%	50%
Below -21°C (-5°F)	0%	100%

NOTE: Biodiesel blend fuel may also be used in this machine. Biodiesel blend fuel must contain no more than five percent Biodiesel mixed with ultra low sulfur petroleum based diesel. This Biodiesel blend fuel is commonly marketed as B5 blended diesel fuel. B5 blended diesel fuel must meet ASTM specifications.

E.U. Standard (EN590)

Use only clean, high quality diesel fuel that meets the EN590 specifications listed below:

- Ultra low sulfur diesel fuel defined as 10 mg/kg (10 ppm) sulfur maximum
- Diesel fuel with cetane number of 51.0 and above.

NOTE: Biodiesel blend fuel may also be used in this machine. Biodiesel blend fuel must contain no more than seven percent Biodiesel mixed with ultra low sulfur petroleum based diesel. This Biodiesel blend fuel is commonly marketed as B7 blended diesel fuel. B7 blended diesel fuel must meet EN590 specifications.

Biodiesel Blend Fuel

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

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

Apply the following guidelines if Biodiesel blend fuel is used:

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

NOTE: Biodiesel blend fuel does not have long term stability and should not be stored for more than 3 months.

Filling The Fuel Tank

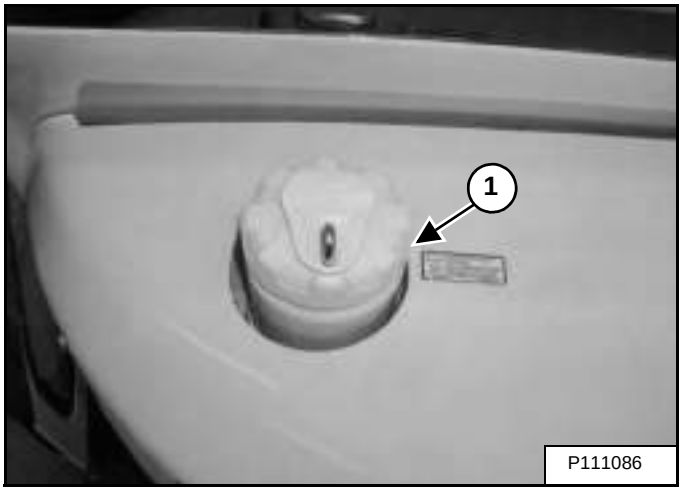
WARNING

AVOID INJURY OR DEATH

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

W-2063-0807

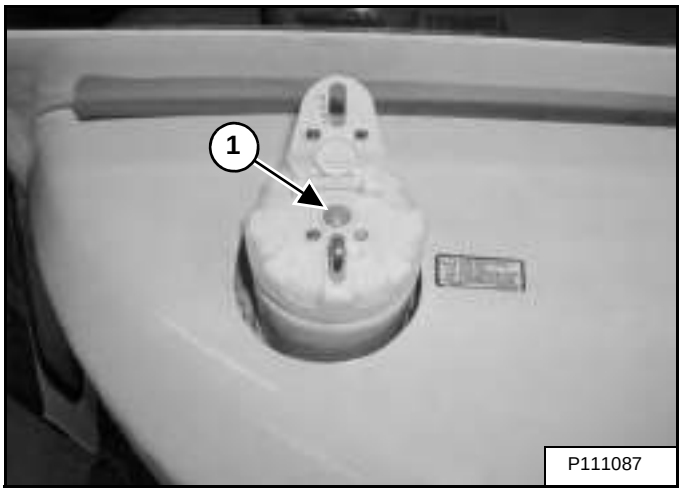
Figure 10-120-1



The fuel cap (Item 1) **[Figure 10-120-1]** is located behind the left corner of the operator cab.

Rotate the fuel fill cap (Item 1) **[Figure 10-120-1]** counterclockwise to remove.

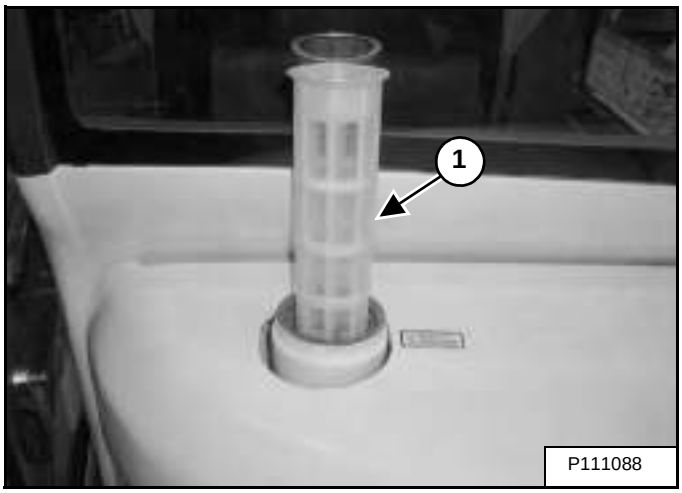
Figure 10-120-2



NOTE: The fuel cap can be locked (Item 1) [Figure 10-120-2] with the start key. The fuel cap does not automatically lock when installed. The key must be used to lock the cap.

NOTE: A paddle lock can also be used on the fuel cap latch to secure the latch closed (covering the fuel cap key lock) and not allow the start key to unlock the fuel cap.

Figure 10-120-3



Inspect the fuel strainer (Item 1) **[Figure 10-120-3]** for damage. Replace if damaged. Always have the fuel strainer installed when filling the fuel tank.

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

Install and tighten the fuel fill cap. (Use the start key to lock the cap, if desired.)

Clean up any spilled fuel.

Fuel Filters

Removing Water

WARNING

AVOID INJURY OR DEATH

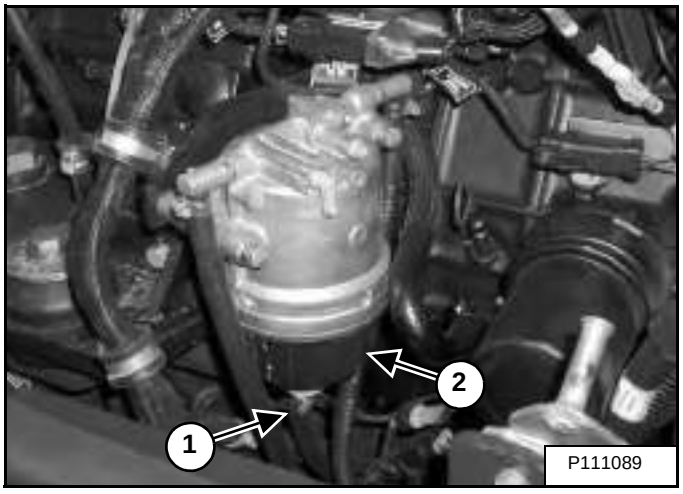
Diesel fuel or hydraulic fluid under pressure can penetrate skin or eyes, causing serious injury or death. Fluid leaks under pressure may not be visible. Use a piece of cardboard or wood to find leaks. Do not use your bare hand. Wear safety goggles. If fluid enters skin or eyes, get immediate medical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

W-2072-0807

See the SERVICE SCHEDULE for the service interval when to remove water from the fuel water separator. (See SERVICE SCHEDULE on Page 10-80-1.)

Open the right side cover. (See Opening And Closing on Page 10-50-1.)

Figure 10-120-4



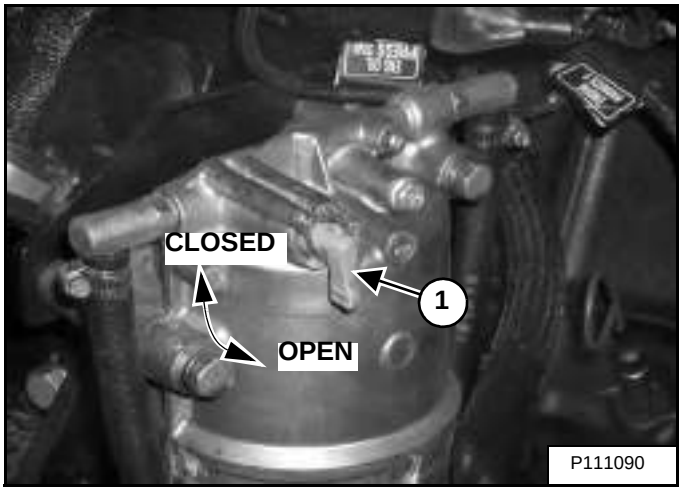
Loosen the drain (Item 1) **[Figure 10-120-4]** at the bottom of the filter (Item 2) **[Figure 10-120-4]** to drain water from the filter into a container.

Clean up any spilled fuel.

Replacing Elements

See the SERVICE SCHEDULE for the service interval when to replace the fuel filter. (See SERVICE SCHEDULE on Page 10-80-1.)

Figure 10-120-5



Fuel Water Separator

Turn the shut off valve (Item 1) **[Figure 10-120-5]** clockwise to the closed position.

Remove the housing (Item 2) **[Figure 10-120-5]** and replace the screen.

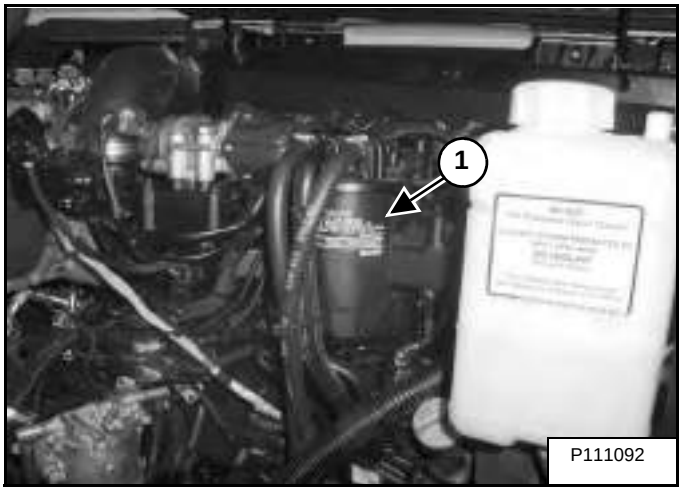
Clean the area around the filter housing. Put clean oil on the seal of the new filter. Install the fuel filter and hand tighten.

Turn the shut off valve (Item 1) **[Figure 10-120-5]** counterclockwise to the open position.

Replacing Elements (Cont'd)

Fuel Filter

Figure 10-120-6



Turn the shut off valve (Item 1) **[Figure 10-120-5]** clockwise to the closed position.

Remove the filter (Item 1) **[Figure 10-120-6]**.

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

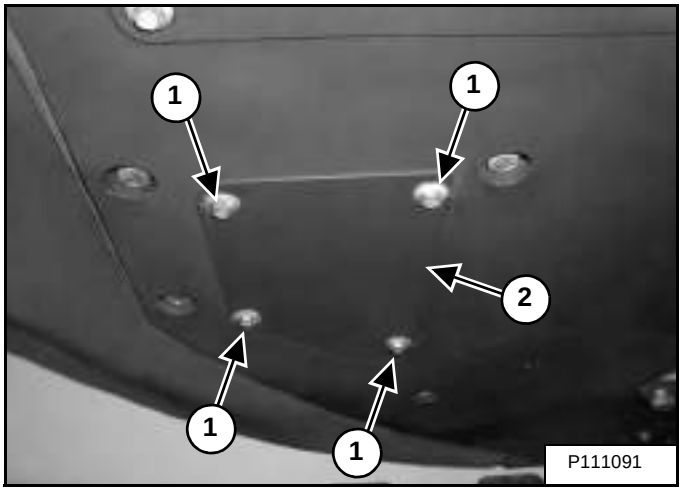
Turn the shut off valve (Item 1) **[Figure 10-120-5]** counterclockwise to the open position.

Remove the air from the fuel system. (See Removing Air From The Fuel System on Page 10-120-5.)

Draining The Fuel Tank

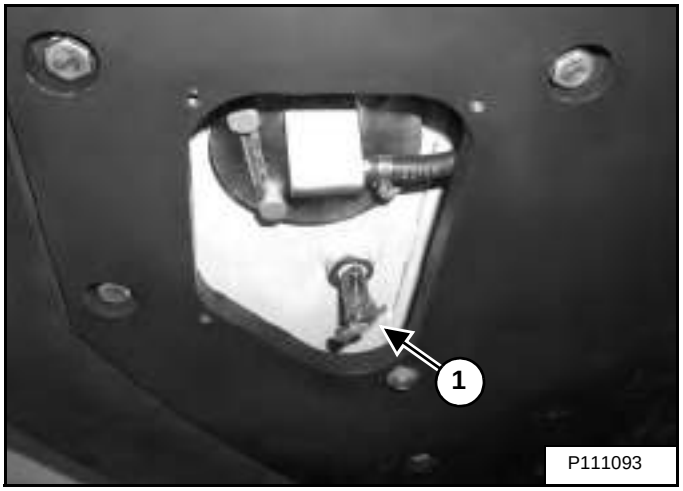
See the SERVICE SCHEDULE for the correct service interval. (See SERVICE SCHEDULE on Page 10-80-1.)

Figure 10-120-7



Remove four bolts / washers (Item 1) and remove the access cover (Item 2) **[Figure 10-120-7]** from below the rear of the excavator.

Figure 10-120-8



Install a drain hose on the drain valve (Item 1) **[Figure 10-120-8]** at the bottom of the fuel tank. Route the hose to a container.

Drain the fuel into a container. Tighten the drain valve after the fuel has been removed.

Reuse, recycle or dispose of fuel in an environmentally safe manner.

⚠ WARNING

AVOID INJURY OR DEATH

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

W-2072-0807

Removing Air From The Fuel System

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

Turn the start key to the ON position for 10 - 15 seconds.

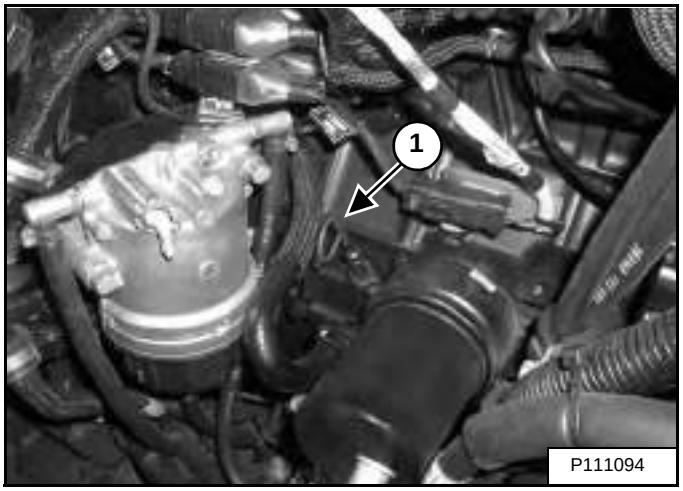
The electric fuel pump will supply fuel under pressure and force air from the system.

ENGINE LUBRICATION SYSTEM

Checking And Adding Engine Oil

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

Figure 10-130-1



Open the right side cover. (See Opening And Closing on Page 10-50-1.)

Remove the dipstick (Item 1) **[Figure 10-130-1]**.

Keep the oil level between the marks on the dipstick.

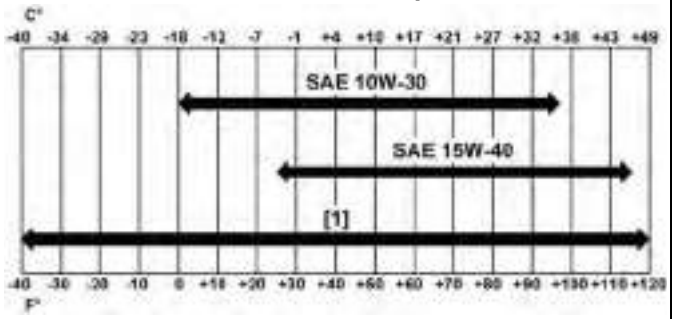
Reinstall the dipstick.

Close the right side cover. (See Opening And Closing on Page 10-50-1.)

Engine Oil Chart

Figure 10-130-2

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



TEMPERATURE RANGE ANTICIPATED BEFORE NEXT OIL CHANGE (DIESEL ENGINES MUST USE API CLASSIFICATION CJ-4 OR BETTER, OR ACEA E9 OR BETTER)

[1] Bobcat Synthetic Oil – 5W-40

Bobcat engine oils are recommended for use in this machine. If Bobcat engine oil is not available, use a good quality engine oil that meets API Service Classification of CJ-4 or better, or ACEA E9 or better **[Figure 10-130-2]**.

WARNING

AVOID INJURY OR DEATH

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

W-2103-0508

WARNING

AVOID INJURY OR DEATH

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

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

W-2019-0907

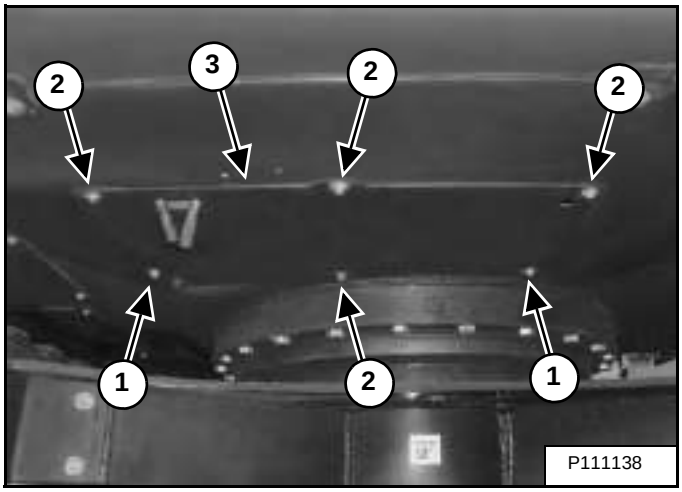
Removing And Replacing Oil And Filter

See the SERVICE SCHEDULE for the service interval for when to replace the engine oil and filter. (See SERVICE SCHEDULE on Page 10-80-1.)

Run the engine until it is at operating temperature. Rotate the upperstructure 90° for access to the bottom engine cover and the engine oil pan drain plug. Stop the engine.

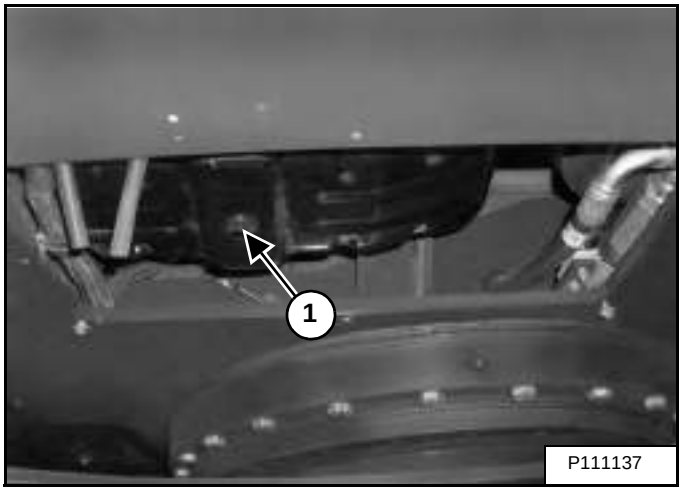
Open the right side cover.

Figure 10-130-3



From under the machine, loosen the two bolts (Item 1) and remove four bolts / washers (Item 2) from the access cover (Item 3) **[Figure 10-130-3]** from below the engine area. Remove the access cover.

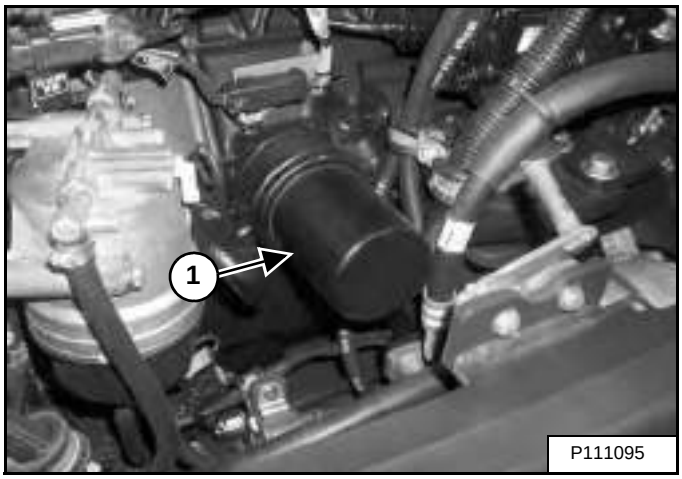
Figure 10-130-4



Remove the plug (Item 1) **[Figure 10-130-4]** from the engine oil pan. Drain the oil into a container.

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

Figure 10-130-5

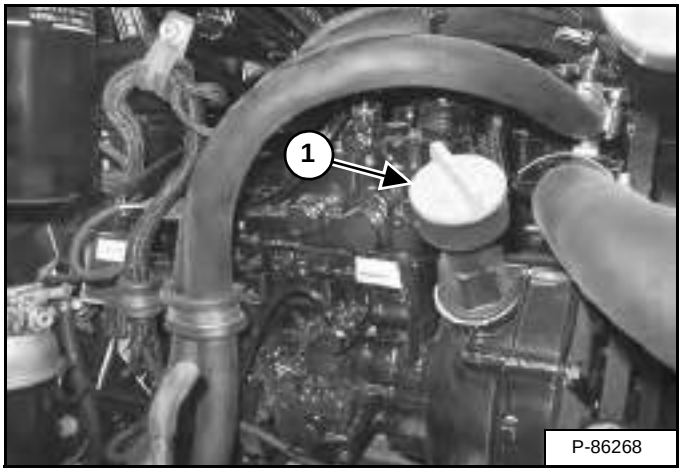


Remove the oil filter (Item 1) **[Figure 10-130-5]** and clean the filter housing surface.

Use a genuine Bobcat replacement filter. Put clean oil on the filter gasket. Install the filter and tighten it by hand.

Install and tighten the plug (Item 1) **[Figure 10-130-4]**.

Figure 10-130-6



Remove the fill cap (Item 1) **[Figure 10-130-6]**.

Put the correct amount of oil in the engine. (See Capacities on Page SPEC-10-8.)

Install the fill cap.

Start the engine and let it run for several minutes.

Stop the engine. Check for leaks at the oil filter. Check the oil level.

Add oil as needed if it is not at the top mark on the dipstick.

Reinstall the access cover (Item 3) **[Figure 10-130-3]** and tighten the bolts.

HYDRAULIC SYSTEM

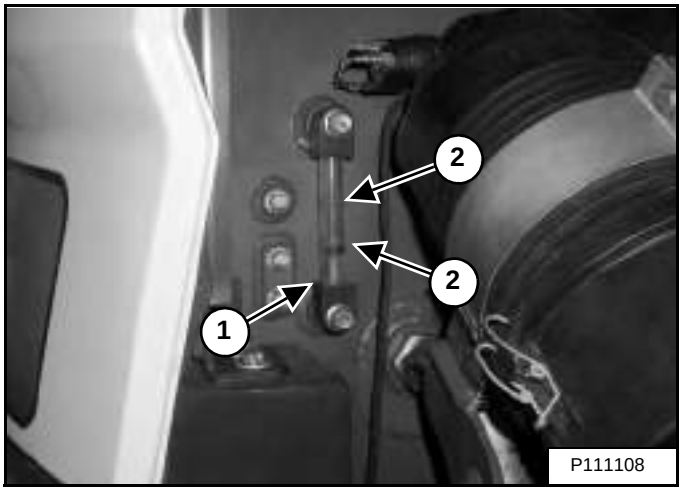
Checking And Adding Fluid

Put the machine on a level surface.

Retract the arm and bucket cylinders, put the bucket on the ground and lower the blade. Stop the engine.

Open the right side cover. (See Opening And Closing on Page 10-50-1.)

Figure 10-140-1



Check the hydraulic fluid level. It must be visible in the sight gauge (Item 1) between the two red lines (Item 2) **[Figure 10-140-1]**.

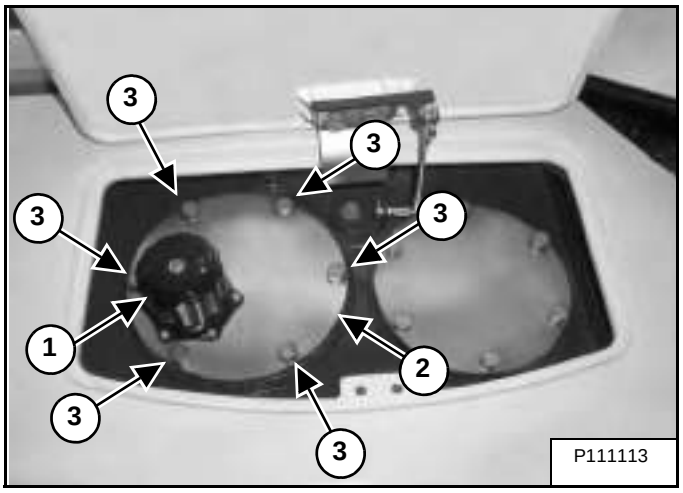
⚠ WARNING

AVOID INJURY OR DEATH

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

W-2103-0508

Figure 10-140-2



Open the rear cover. (See Opening And Closing on Page 10-60-1.)

NOTE: When removing the hydraulic cover (Item 2), there is spring pressure under the cover. Push down on the cover while removing the bolts (Item 3) [Figure 10-140-2].

Clean the surface around the reservoir (breather) cap (Item 1) and cover (Item 2) fully. Press down on the cover (Item 2) and remove the six bolts (Item 3) from the cover (Item 2) **[Figure 10-140-2]**. Remove the cover.

Add the correct fluid to the reservoir until it is visible in the sight gauge.

Check the O-ring under the cover (Item 2) **[Figure 10-140-2]**. Replace the O-ring if damaged.

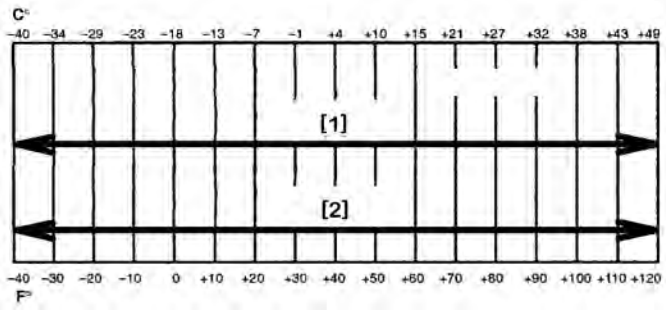
Reinstall the cover and align the bolt holes. Press down on the cover (Item 2) and install the six bolts (Item 3) **[Figure 10-140-2]**. Tighten the bolts.

Close the rear cover.

Hydraulic Fluid Chart

RECOMMENDED ISO VISCOSITY GRADE (VG) AND VISCOSITY INDEX (VI)

Figure 10-140-3



TEMPERATURE RANGE ANTICIPATED DURING MACHINE USE

[1] Synthetic Fluid; VG 46; Minimum VI 150
[2] BOBCAT Hydraulic / Hydrostatic Fluid

Use the correct hydraulic fluid shown in chart **[Figure 10-140-3]**.

Add hydraulic fluid as needed to bring the level to the center of sight gauge (Item 1) **[Figure 10-140-1 on Page 10-140-1]**.

Reinstall the cover and align the bolt holes. Press down on the cover (Item 2) and install the four bolts (Item 3) **[Figure 10-140-2 on Page 10-140-1]**. Tighten the bolts.

Removing And Replacing Hydraulic Filters

Hydraulic Return Filter

WARNING

AVOID INJURY OR DEATH

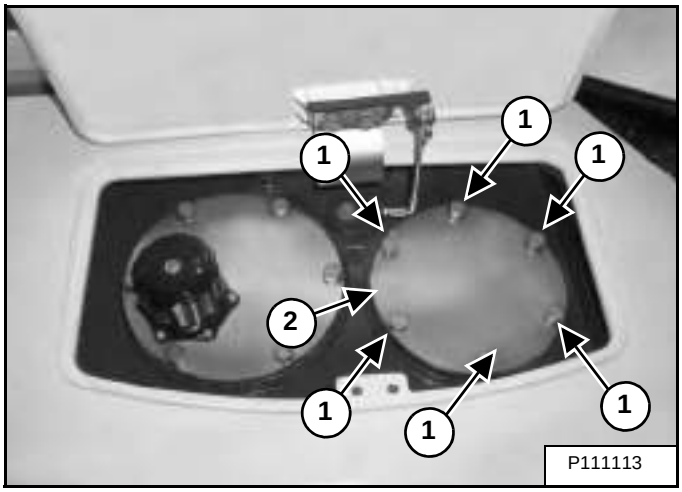
Always clean up spilled fuel or oil. Keep heat, flames, sparks or lighted tobacco away from fuel and oil. Failure to use care around combustibles can cause explosion or fire.

W-2103-0508

See the SERVICE SCHEDULE for the correct service interval. (See SERVICE SCHEDULE on Page 10-80-1.)

Open the rear cover. (See Opening And Closing on Page 10-60-1.)

Figure 10-140-4



NOTE: When removing the cover (Item 2), there is spring pressure under the cover. Push down on the cover while removing the bolts (Item 1) [Figure 10-140-4].

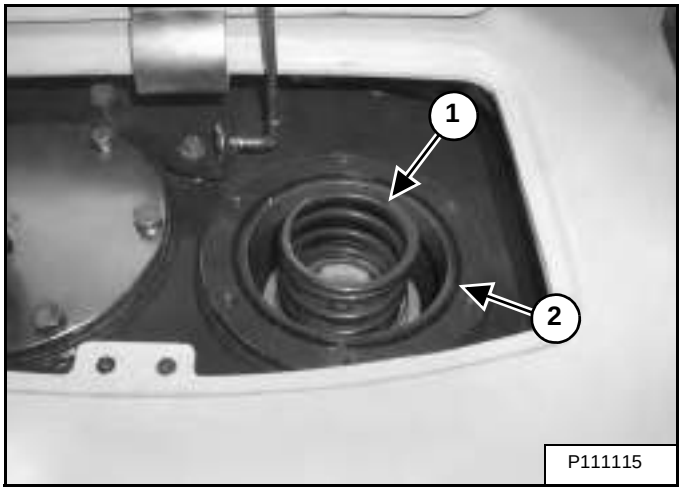
Clean the surface around the cover (Item 2) **[Figure 10-140-4]** fully.

Press down on the cover (Item 2) and remove the six bolts (Item 1) **[Figure 10-140-4]** and cover.

Removing And Replacing Hydraulic Filters (Cont'd)

Hydraulic Return Filter (Cont'd)

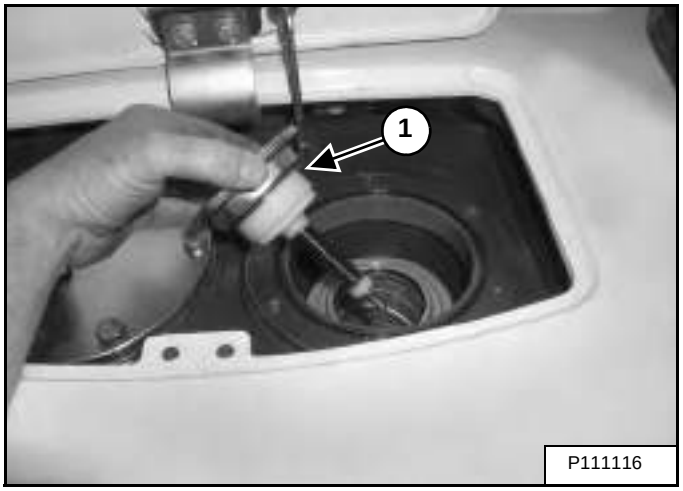
Figure 10-140-5



Remove the spring (Item 1) **[Figure 10-140-5]**.

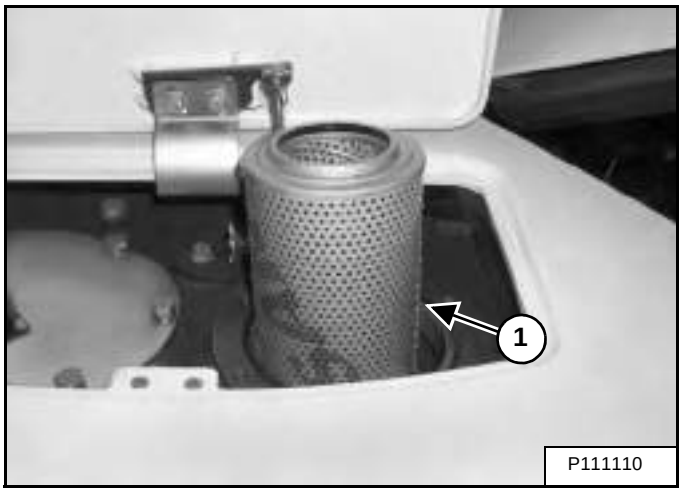
Inspect the O-ring (Item 2) **[Figure 10-140-5]** for damage. Replace if damaged.

Figure 10-140-6



Remove the valve (Item 1) **[Figure 10-140-6]**.

Figure 10-140-7



Remove the return filter (Item 1) **[Figure 10-140-7]**.

Install the new filter (Item 1) **[Figure 10-140-7]**.

Reinstall the valve (Item 1) **[Figure 10-140-6]**.

Reinstall the spring (Item 1) **[Figure 10-140-5]**.

Reinstall the cover and align the bolt holes. Press down on the cover (Item 2) and install the six bolts (Item 1) **[Figure 10-140-4 on Page 10-140-2]** and tighten the bolts.

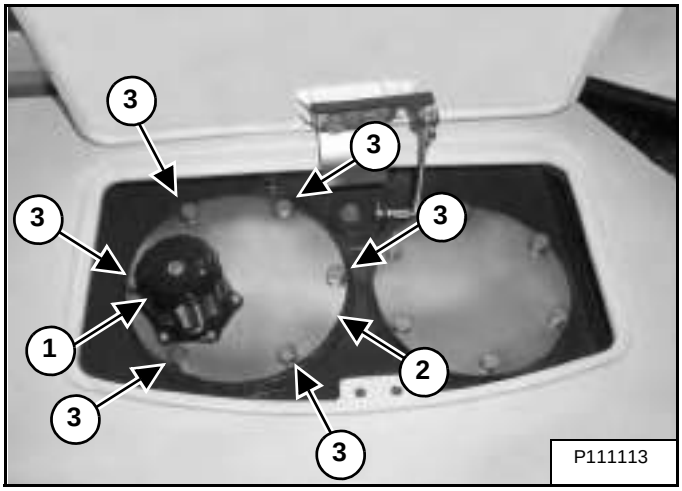
Removing And Replacing Hydraulic Filters (Cont'd)

Hydraulic Suction Filter

See the SERVICE SCHEDULE for the correct service interval. (See SERVICE SCHEDULE on Page 10-80-1.)

Open the rear cover. (See Opening And Closing on Page 10-60-1.)

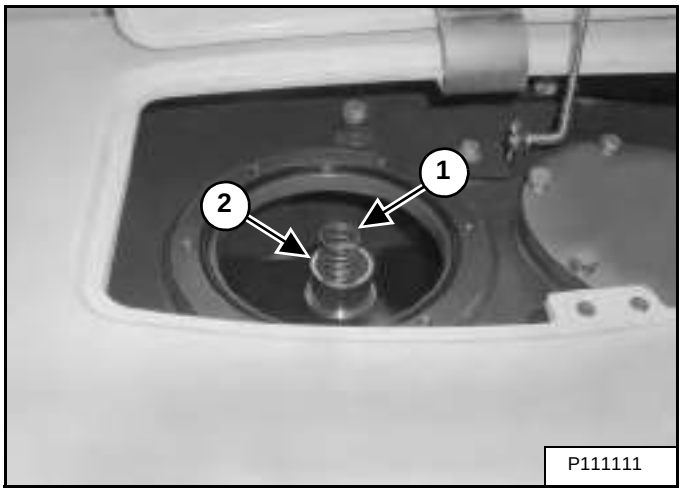
Figure 10-140-8



NOTE: When removing the cover (Item 2), there is spring pressure under the cover. Push down on the cover while removing the bolts (Item 3) [Figure 10-140-8].

Clean the surface around the reservoir (breather) cap (Item 1) and cover (Item 2) fully. Remove the six bolts (Item 3) from the cover (Item 2) **[Figure 10-140-8]** and remove the cover.

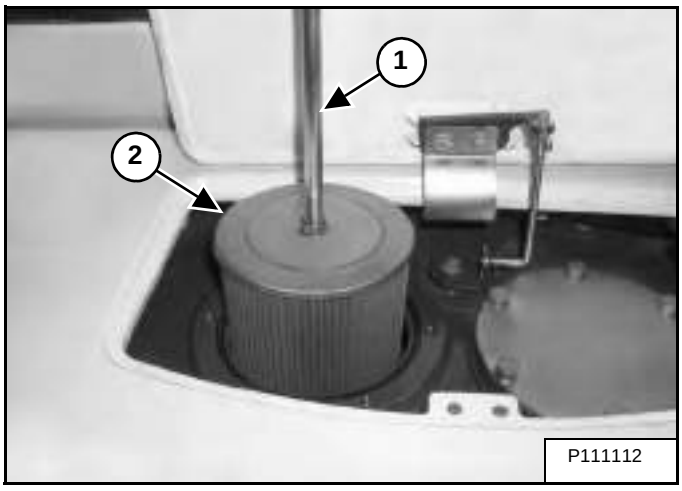
Figure 10-140-9



Remove the spring (Item 1) **[Figure 10-140-9]**.

Lift up on the rod (Item 2) **[Figure 10-140-9]**.

Figure 10-140-10



Continue to lift up on the rod (Item 1) until the filter (Item 2) **[Figure 10-140-10]** is removed from the tank.

NOTE: Before removing the filter (Item 2) [Figure 10-140-10] from the rod (Item 1) [Figure 10-140-10], measure the distance from the end of the rod to the end of the filter. Install the new filter to the same measured distance so that the spring (Item 1) [Figure 10-140-10] pressure will keep the filter installed correctly in the tank.

NOTE: When installing the new filter (Item 2) [Figure 10-140-10] into the hydraulic tank, make sure to get the filter positioned over the outlet port at the bottom of the hydraulic tank.

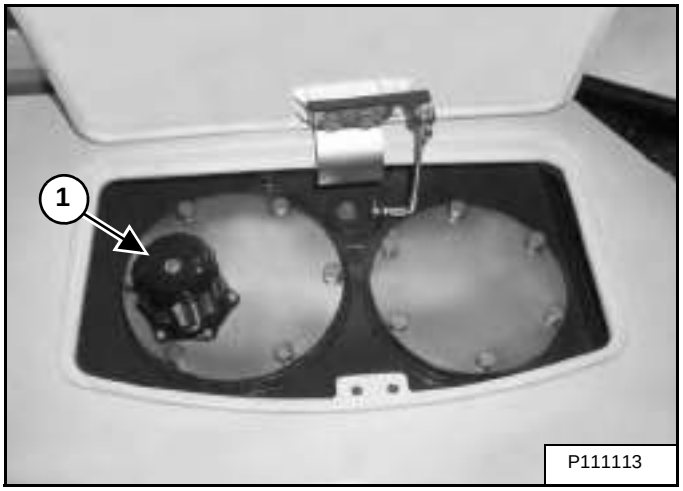
Removing And Replacing Hydraulic Filters (Cont'd)

Hydraulic Breather Filter

See the SERVICE SCHEDULE for the correct service interval. (See SERVICE SCHEDULE on Page 10-80-1.)

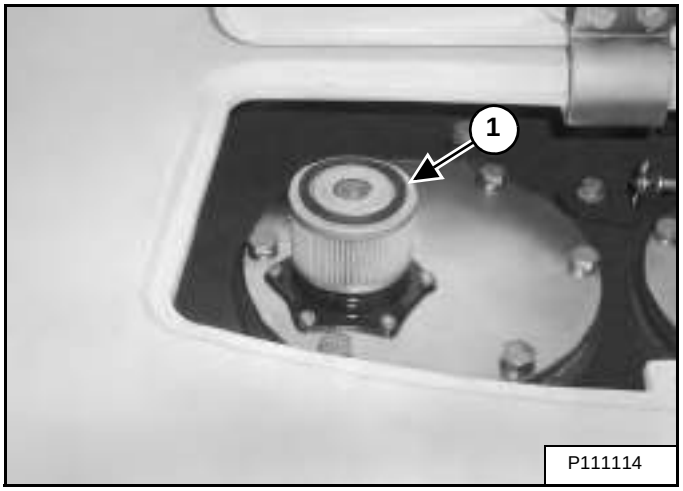
Open the rear cover. (See Opening And Closing on Page 10-60-1.)

Figure 10-140-11



Clean the surface around the reservoir (breather) cap (Item 1) **[Figure 10-140-11]** and remove the cap by turning counterclockwise.

Figure 10-140-12



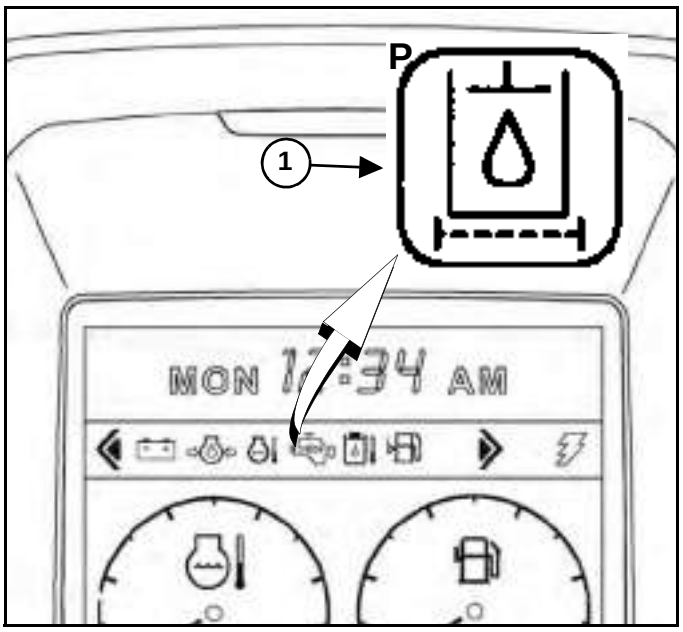
Remove and replace the breather filter (Item 1) **[Figure 10-140-12]**.

Reinstall the cap (Item 1) **[Figure 10-140-11]**.

Hydraulic Pilot Pressure Filter

See the SERVICE SCHEDULE for the correct service interval. (See SERVICE SCHEDULE on Page 10-80-1.)

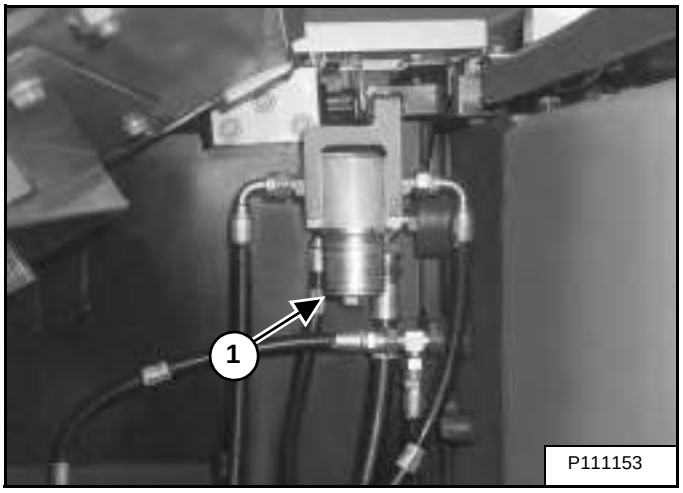
Figure 10-140-13



If the Pilot Filter Icon (Item 1) **[Figure 10-140-13]** is displayed on the instrument panel, the pilot filter will need to be changed sooner than the recommended interval on the Service Schedule.

Raise the operator cab. (See Raising And Lowering on Page 10-210-1.)

Figure 10-140-14

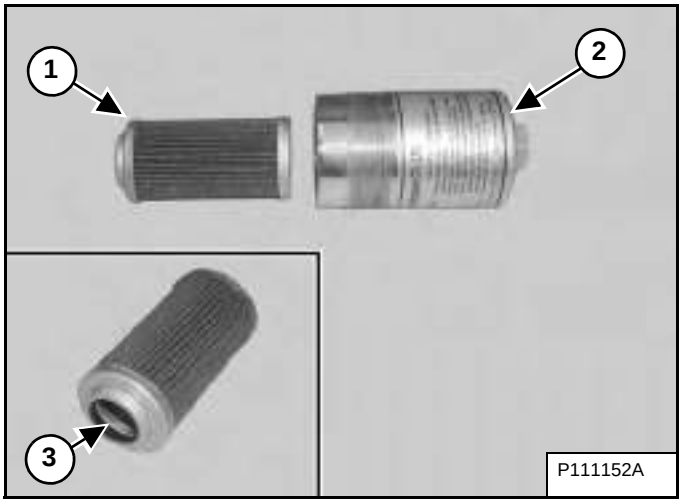


Clean the surface around the filter canister (Item 1) **[Figure 10-140-14]** and remove the canister.

Removing And Replacing Hydraulic Filters (Cont'd)

Hydraulic Pilot Pressure Filter (Cont'd)

Figure 10-140-15



Remove the filter (Item 1) from the canister (Item 2) **[Figure 10-140-15]**.

When installing the new filter, make sure the O-ring (Item 3) **[Figure 10-140-15]** is installed inside the filter. Apply hydraulic oil to the O-ring before reinstalling the filter.

Install the filter (Item 1) inside the canister (Item 2) **[Figure 10-140-15]**.

Install the filter / canister (Item 1) **[Figure 10-140-14]**.

Hand tighten the canister, then torque the canister to 22 - 34 N•m (17 - 25 ft-lb) torque.

Removing And Replacing Hydraulic Fluid

See the SERVICE SCHEDULE for the correct service interval. (See SERVICE SCHEDULE on Page 10-80-1.)

⚠ WARNING

AVOID INJURY OR DEATH

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

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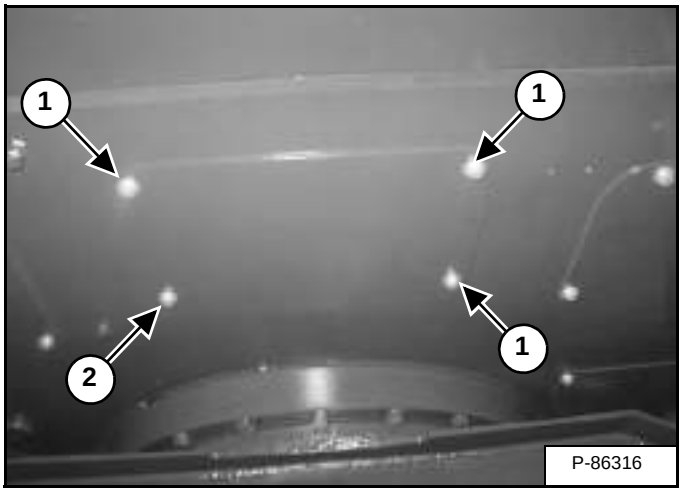
Retract the arm and bucket cylinders, lower the bucket to the ground. Lower the blade to the ground. Stop the engine.

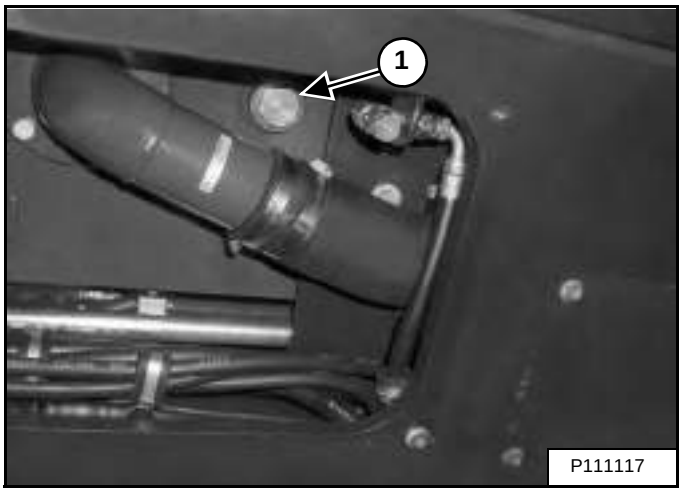
Figure 10-140-16



From below the rear of the excavator upperstructure, remove three bolts (Item 1) and loosen the fourth bolt (Item 2) **[Figure 10-140-16]** and rotate the cover plate to the side to access the bottom of the hydraulic tank.

Removing And Replacing Hydraulic Fluid (Cont'd)

Figure 10-140-17



Remove the drain plug (Item 1) **[Figure 10-140-17]** from the bottom of the hydraulic tank.

Drain the fluid into a container.

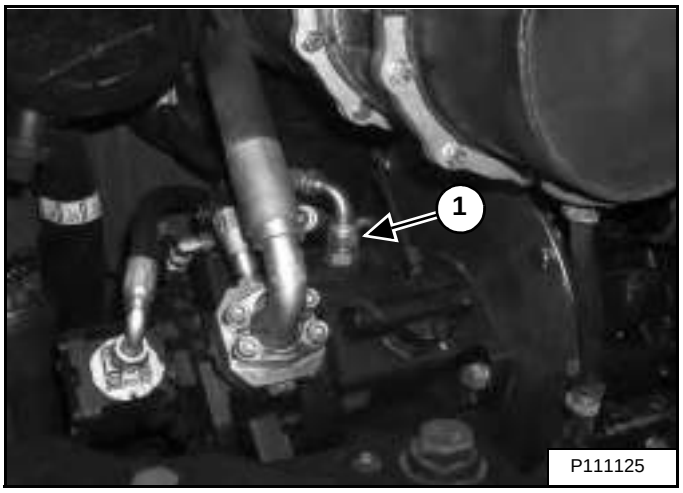
Recycle or dispose of the fluid in an environmentally safe manner.

Reinstall the drain plug (Item 1) **[Figure 10-140-17]**.

Rotate the cover plate (Item 1) back to the original location and install the three bolts (Item 2) **[Figure 10-140-16]**. Tighten the four bolts.

Always replace the filters when changing the hydraulic oil. (See Removing And Replacing Hydraulic Filters on Page 10-140-2.)

Figure 10-140-18



After the hydraulic fluid has been drained from the excavator or after the hydraulic pump has been serviced, the hydraulic pump must be flooded with hydraulic oil. Allow sufficient time for the hydraulic fluid to gravity feed into the hydraulic pump before starting the machine.

Loosen the case drain hose (Item 1) **[Figure 10-140-18]** to see if hydraulic fluid is at the fitting. If oil is present the pump has been flooded. Reinstall the hose.

If fluid is not at the fitting, reinstall the hose (Item 1). Start the engine and run at low idle for one minute. Remove the hose (Item 1) **[Figure 10-140-18]** and verify fluid is at the plug opening. Reinstall hose before operating.

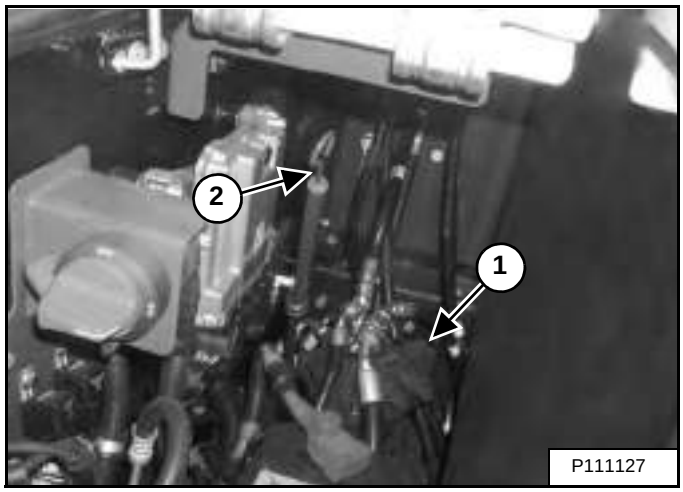
Recycle or dispose of the fluid in an environmentally safe manner.

Start the engine and operate the machine through the hydraulic functions. Stop the engine. Check the fluid level and add as needed.

Install new Bobcat hydraulic fluid. (See Hydraulic Fluid Chart on Page 10-140-2.)

Checking Swing Motor Gear Box Fluid Level

Figure 10-140-19



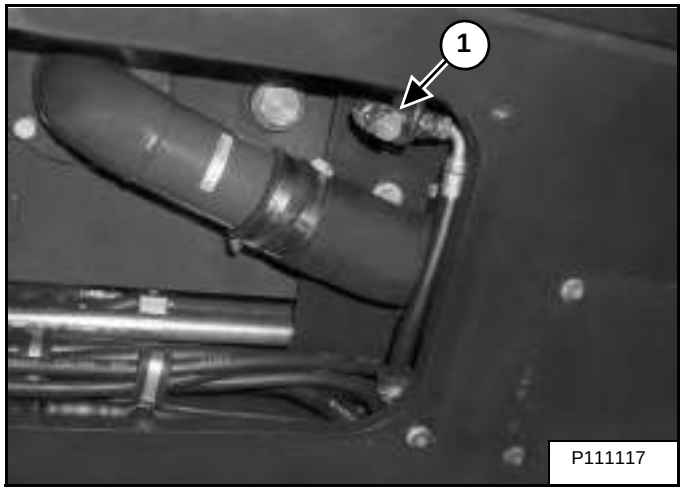
Open the center cover to access the swing motor. (See Opening And Closing on Page 10-70-1.)

The swing motor gear box (Item 1) has a dipstick (Item 2) **[Figure 10-140-19]** for checking the swing motor gear box oil level.

Keep the oil level between the marks on the dipstick.

Removing And Replacing Swing Motor Gear Box Fluid

Figure 10-140-20



The swing motor carrier drain plug is located below the engine area by the hydraulic tank drain plug.

Rotate the cover to access the drain plug. (See Removing And Replacing Hydraulic Fluid on Page 10-140-6.)

Remove the plug (Item 1) **[Figure 10-140-20]** and drain the swing motor carrier. Reinstall the drain plug.

Drain the fluid into a container.

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

Remove the dipstick (Item 2) **[Figure 10-140-19]** and add gear lube (80W-90) until it is at the correct mark on the dipstick. (See Capacities on Page SPEC-10-8.)

LUBRICATING THE EXCAVATOR

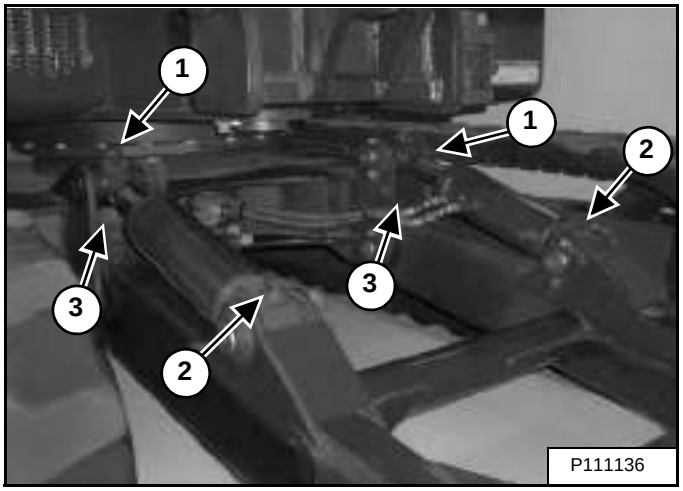
Lubrication Locations

Lubricate the excavator as specified in the SERVICE SCHEDULE for the best performance of the machine. (See SERVICE SCHEDULE on Page 10-80-1.)

Record the operating hours each time you lubricate the excavator.

Always use a good quality lithium based multipurpose grease when lubricating the machine. Apply the lubricant until extra grease shows.

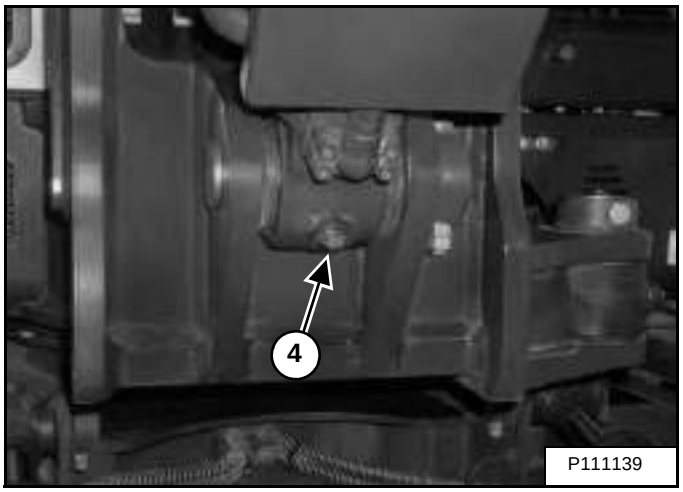
Figure 10-150-1



Ref Description (# of Fittings)

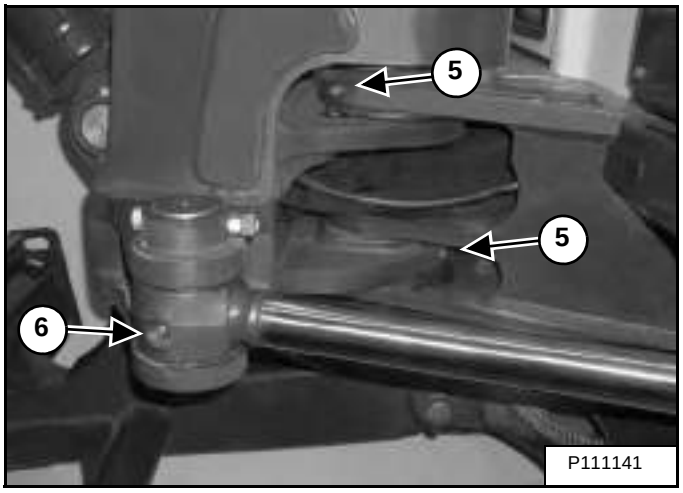
1. Blade Cylinder Rod End (1)
2. Blade Cylinder Base End (1)
3. Blade Pivots (2) **[Figure 10-150-1]**

Figure 10-150-2



4. Boom Cylinder Rod End (1) **[Figure 10-150-2]**

Figure 10-150-3



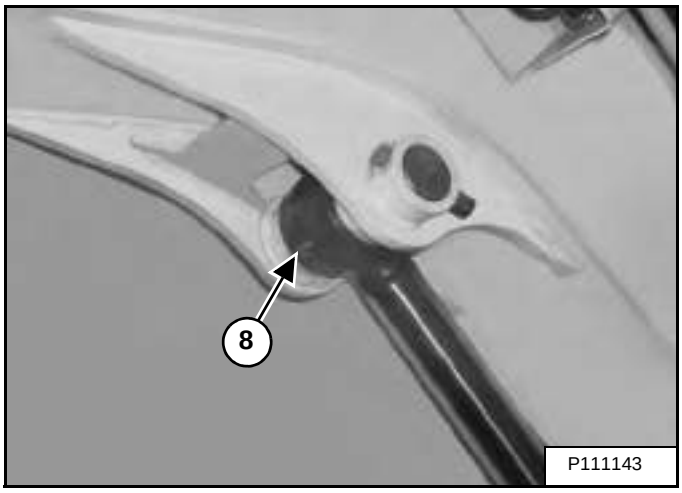
5. Boom Swing Pin (2)
6. Boom Swing Cylinder Base End (1) **[Figure 10-150-3]**

Lubrication Locations (Cont'd)

Figure 10-150-4

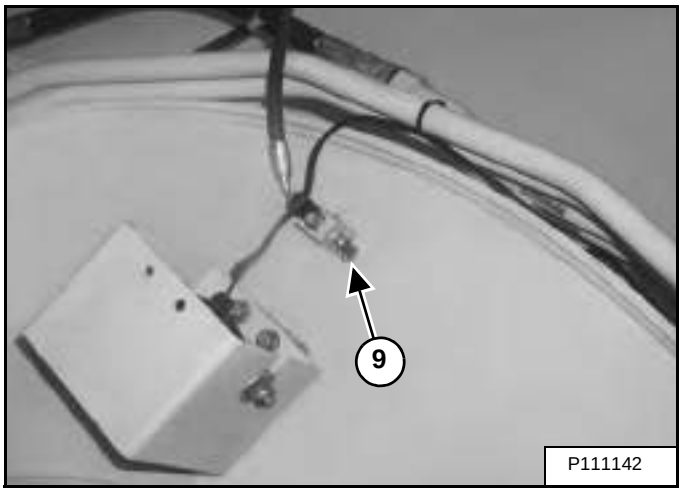
7. Boom Pivot (1) **[Figure 10-150-4]**

Figure 10-150-5



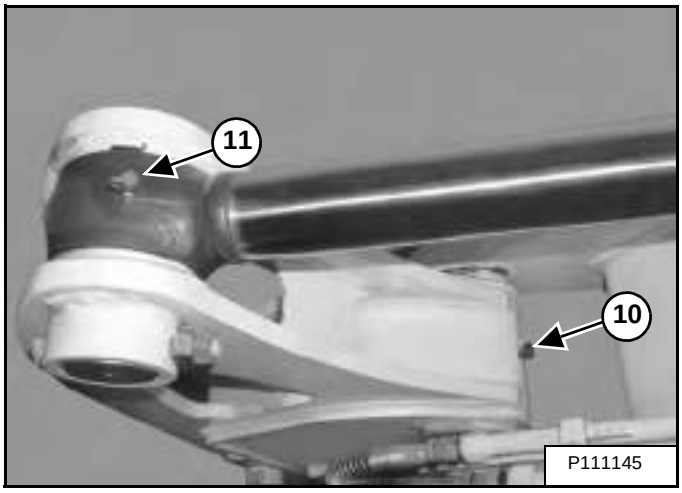
8. Boom Cylinder Rod End (1) **[Figure 10-150-5]**

Figure 10-150-6



9. Arm Cylinder Base End (1) **[Figure 10-150-6]**

Figure 10-150-7

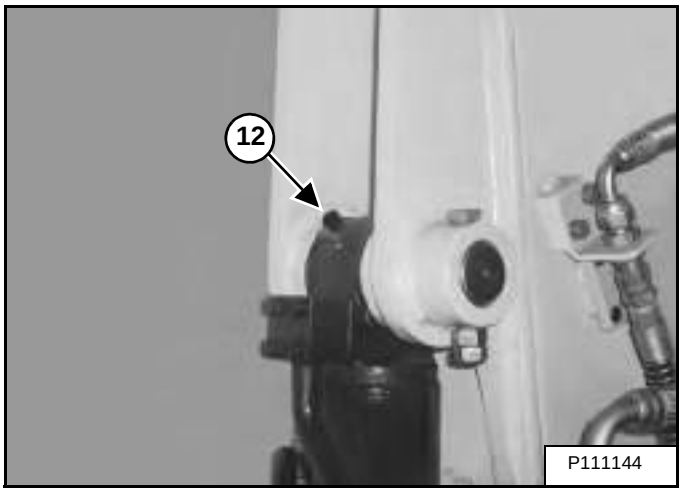


10. Arm Pivot (1) **[Figure 10-150-7]**

11. Arm Cylinder Rod End (1)

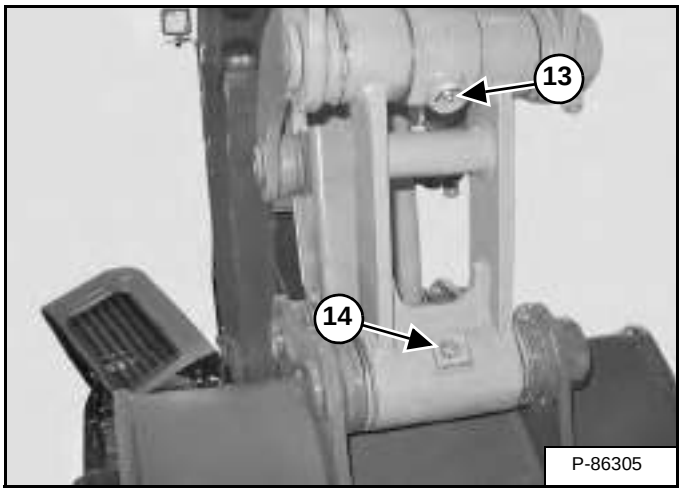
Lubrication Locations (Cont'd)

Figure 10-150-8



12. Bucket Cylinder Base End (1) **[Figure 10-150-8]**

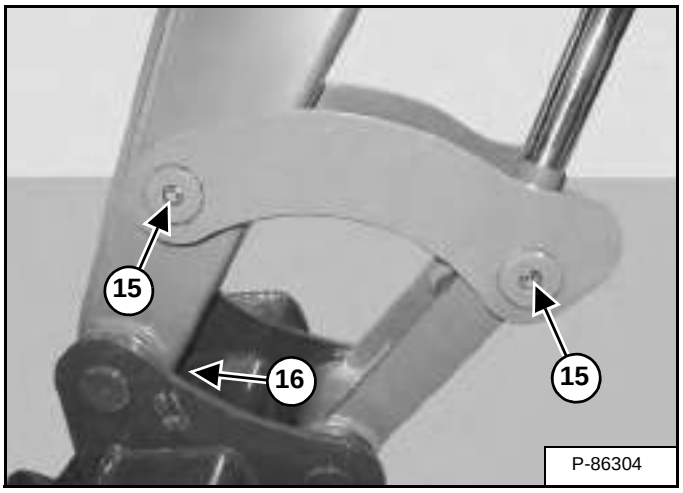
Figure 10-150-9



13. Bucket Cylinder Rod End (1)

14. Bucket Link (1) **[Figure 10-150-9]**

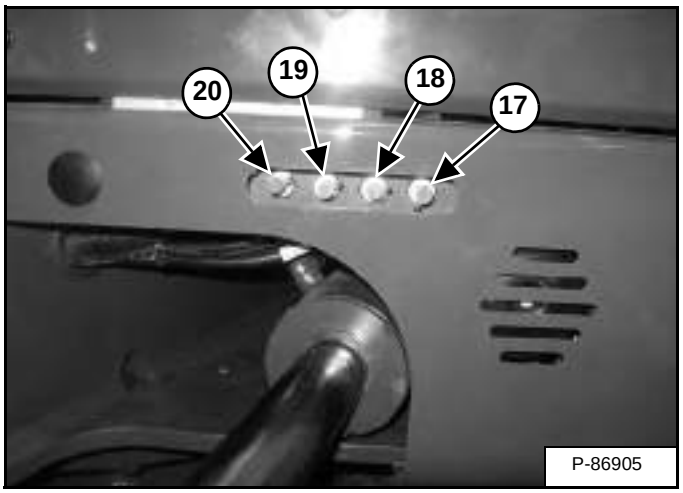
Figure 10-150-10



15. Link Pivot Pin (2)

16. Arm (1) **[Figure 10-150-10]**

Figure 10-150-11



Lubricate the following locations on the hydraulic Excavator per the SERVICE SCHEDULE for the correct lubrication intervals. (See SERVICE SCHEDULE on Page 10-80-1.)

17. Boom Swing Cylinder Base End (1)

18. Swing Motor Reduction Gear (1)

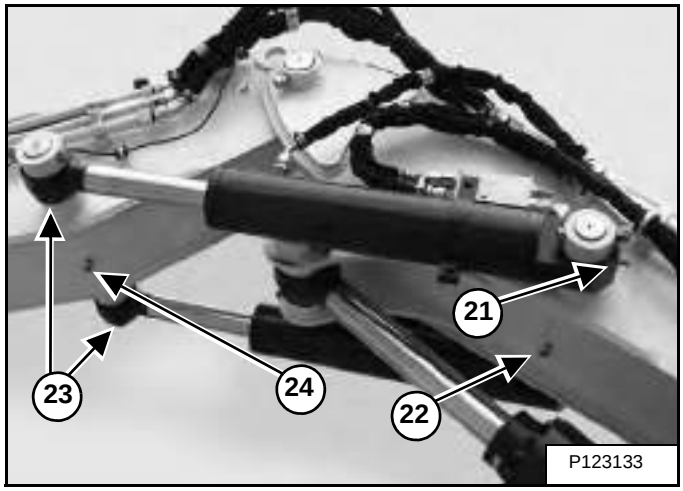
19. Slew Circle Bearing (1)

20. Slew Pinion (1). (Install 3 to 4 pumps of grease then rotate the upperstructure 90°. Install 3 to 4 pumps of grease and again rotate the upperstructure 90°. Repeat this until the slew pinion has been greased at four positions.) **[Figure 10-150-11]**.

Lubrication Locations (Cont'd)

Articulated Boom (If Equipped)

Figure 10-150-12



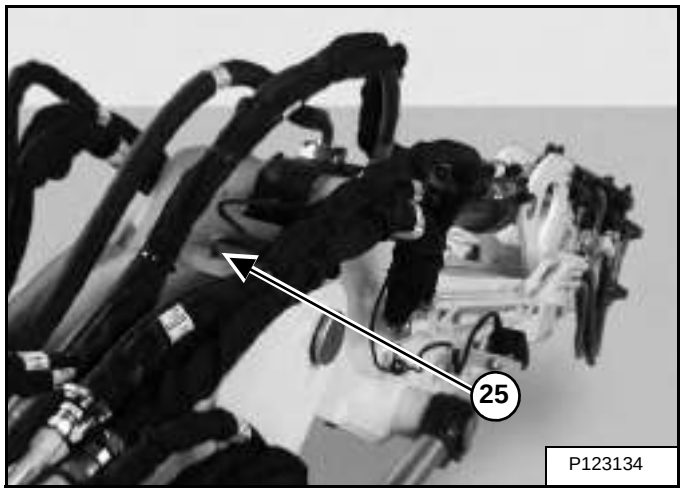
21. Articulated Boom Cylinders Base End (2).

22. Articulated Boom Cylinders Base End Pivot (1).

23. Articulated Boom Cylinders Rod End (2).

24. Articulated Boom Cylinders Rod End Pivot (1). **[Figure 10-150-12]**

Figure 10-150-13

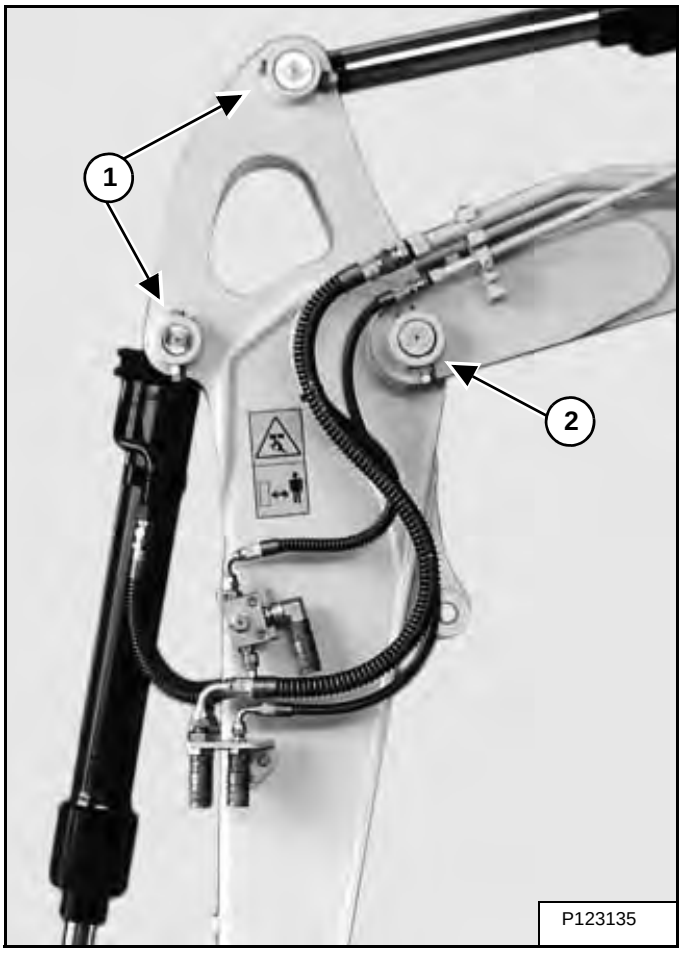


25. Articulated Boom Pivot (1) **[Figure 10-150-13]**.

PIVOT PINS

Inspection And Maintenance

Figure 10-160-1



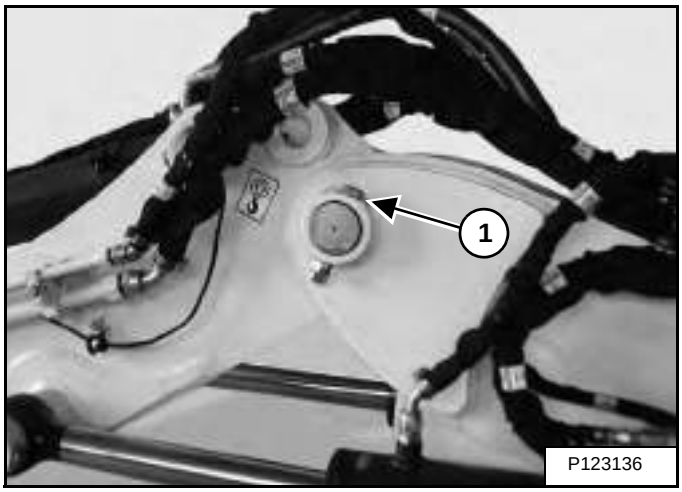
The bucket and arm cylinder pivots (Item 1) and the boom / arm pivot (Item 2) **[Figure 10-160-1]** have a large pin held in position with a bolt and two nuts.

The two nuts are used as jam nuts to hold the bolt without tightening the bolt to the pin boss. After the nuts are tightened together, the bolt should be free to spin.

Check that all pivot bolts and nuts are securely tightened and are not damaged. See your dealer for replacement parts.

Articulated Boom (If Equipped)

Figure 10-160-2



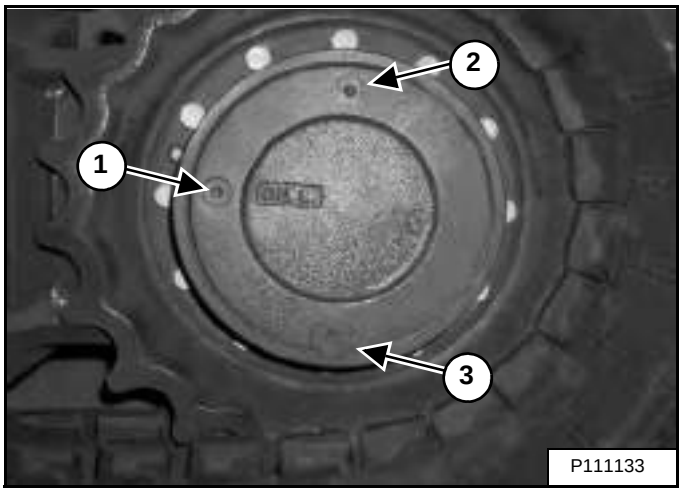
The articulated boom pivot has a large pin (Item 1) **[Figure 10-160-2]** held in position with a bolt and two nuts.

Check that all pivot bolts and nuts are securely tightened and are not damaged. See your dealer for replacement parts.

TRAVEL MOTOR

Checking And Adding Oil

Figure 10-170-1



Park the excavator on a level surface with the plugs (Item 1, 2 and 3) **[Figure 10-170-1]** in the position as shown.

Remove the plug (Item 1) **[Figure 10-170-1]**. The lube level must be at the bottom edge of the hole.

Add lubricant (80W-90) through hole (Item 2) **[Figure 10-170-1]** if the lube level is low.

Removing And Replacing Oil

For the correct service interval. (See SERVICE SCHEDULE on Page 10-80-1.)

Park the excavator on a level surface with plugs (Item 1, 2 and 3) in the position shown. Remove plugs (Item 2 and 3) **[Figure 10-170-1]** and drain the lubricant into a container.

WARNING

AVOID INJURY OR DEATH

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

W-2103-0508

Install the bottom plug (Item 3). Add lubricant (80W-90) through the top plug (Item 2) until the lube level is at the bottom edge of the plug hole (Item 1) **[Figure 10-170-1]**.

Install the plugs (Item 1 and 2) **[Figure 10-170-1]**.

Repeat the procedure for the opposite travel motor.

DIESEL PARTICULATE FILTER (DPF) SYSTEM

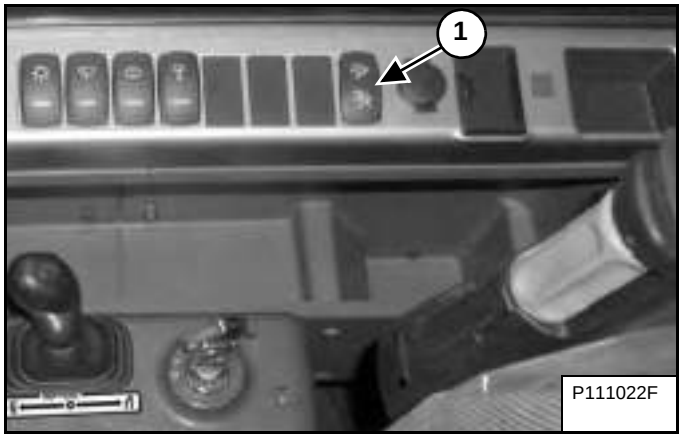
Description

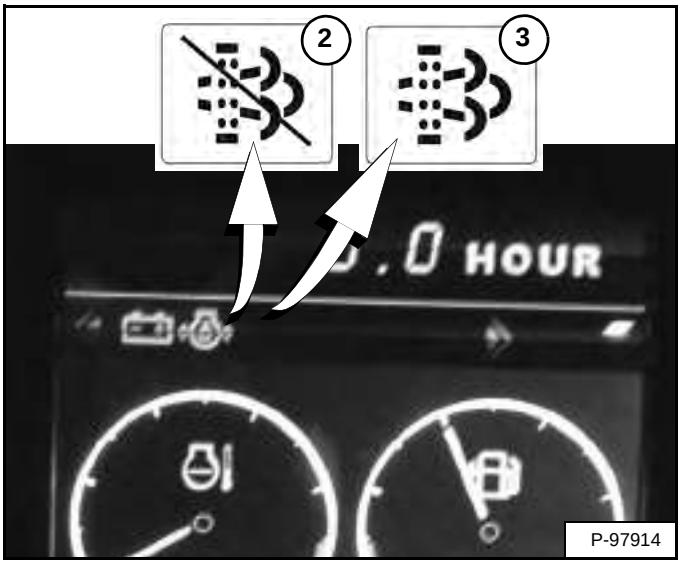
The engine exhaust system is equipped with a diesel particulate filter (DPF). The DPF is an emissions reduction device that removes diesel particulate matter (soot) from the exhaust gases of the diesel engine. The DPF will trap and collect the soot until it is burned off. The process of burning off the collected soot is called regeneration.

Ash residue will remain after the regeneration process is complete. The ash must be periodically removed from the DPF. (See DPF Ash Cleaning on Page 10-180-4.)

Forced (Stationary) Regeneration

Figure 10-180-1





This excavator is equipped with a DPF inhibited / forced regeneration switch (Item 1) **[Figure 10-180-1]** on the right console.

A forced (stationary) regeneration cycle may be required if too much soot is allowed to accumulate in the DPF. This can occur in the following situations:

1. The excavator is often operated for brief periods (less than 30 minutes) that do not allow sufficient time for the DPF to complete an automatic regeneration cycle.

2. The excavator is used with low load during extended period of time.

3. When DPF inhibited / forced regeneration switch (Item 1) is in the inhibited enabled position for an extended period of time. This will inhibit the DPF from actively regenerating and burning off the collected soot. The inhibited ICON (Item 2) will be ON when the inhibited / forced switch (Item 1) **[Figure 10-180-1]** is enabled.

When forced (stationary) regeneration is required, the red Warning LED will flash ON and OFF in the instrument panel (See Operation & Maintenance Manual for the exact location) and the pop-up message “Forced Regeneration Status” will appear.

NOTE: Failure to perform a forced (stationary) regeneration when required can result in the soot level exceeding the maximum allowable level and the engine being derated. Continued excavator operation will require exhaust system service by your dealer.

Ensure the excavator has enough fuel to operate for 30 minutes minimum.

⚠ WARNING

AVOID SERIOUS INJURY OR DEATH

Exhaust gas temperature and exhaust system components are hot during regeneration. Keep flammable material, explosive dust, and explosive gases away from exhaust system.

W-2936-0412

DIESEL PARTICULATE FILTER (DPF) SYSTEM (CONT'D)

Forced (Stationary) Regeneration (Cont'd)

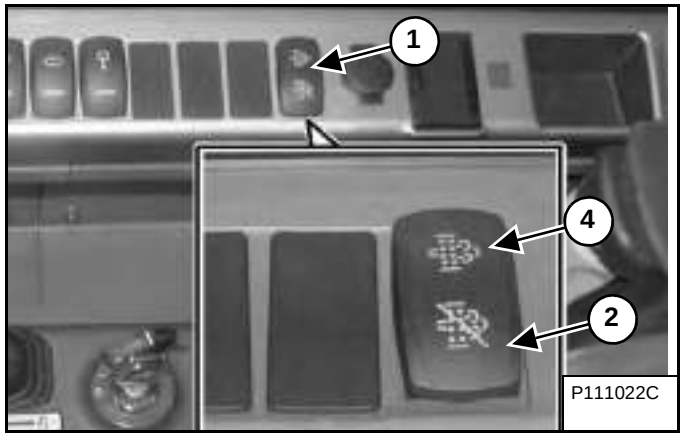
⚠ WARNING

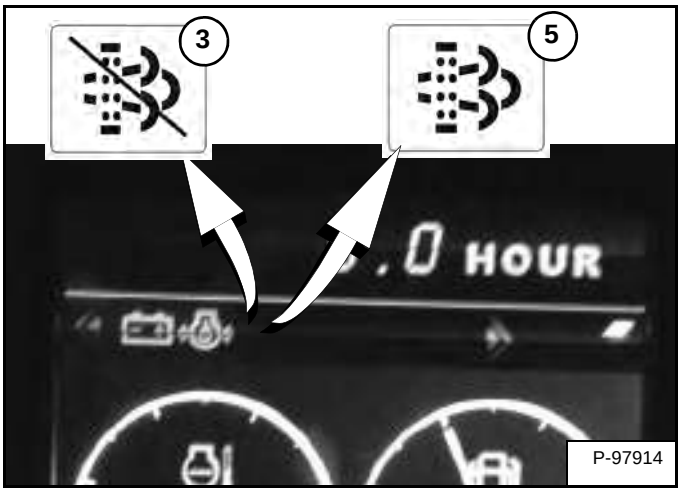
AVOID INJURY OR DEATH

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

W-2050-0807

Figure 10-180-2





1. Park the machine on flat level ground and in an open area with good ventilation. Lower the boom and blade fully.
2. Run the engine until the coolant temperature is at a minimum of 60°C (140°F).
3. Activate the auxiliary hydraulics with nothing connected to the couplers and run the engine at high idle for about 2 minutes. This will raise the DPF inlet exhaust to the necessary temperature.
4. Move engine speed control to low idle and deactivate the auxiliary hydraulics.
5. Raise the left console to the locked out position. (See Operation & Maintenance Manual for the correct procedure.)
6. When the ECU verifies the left console is raised to the locked out position, the engine is at low idle, the coolant and DPF temperatures are at operating temperatures; then the forced (stationary) regeneration cycle can be activated.
7. Press the DPF inhibited / forced regeneration switch (Item 1) to the inhibited position (Item 2) for approximately 5 seconds. The pop-up message "DPF Active Regeneration Inhibit Status" will appear. The inhibited icon (Item 3) **[Figure 10-180-2]** will turn ON. Press the inhibited / forced switch a second time to turn the inhibited icon OFF.
8. Now press and hold the DPF inhibited / forced regeneration switch (Item 1) to the regenerate position (Item 4) for approximately 15 seconds (or until the red Warning LED in the instrument panel is flashing) to start regeneration. The DPF Regeneration icon (Item 5) **[Figure 10-180-2]** will turn ON (amber colored) and the pop-up message "Regeneration Is Ready" will appear. The regeneration process will start in a few seconds.
9. Release the DPF inhibit / forced regeneration switch (Item 1) **[Figure 10-180-2]** so it returns to the center position.

Forced (Stationary) Regeneration (Cont'd)

After the regeneration cycle starts, the engine will idle for a brief period. The engine speed will gradually increase to approximately 1950 rpm.

The regeneration cycle will take approximately 30 minutes to complete. DO not stop this cycle unless absolutely necessary.

If the regeneration cycle must be stopped, press the DPF inhibited / forced regeneration switch (Item 2) **[Figure 10-180-2]**, or rotate the speed control knob above the low idle position, or lower the lock lever or turn the start key to the OFF position. Any of above actions will cause the regeneration cycle to be aborted.

NOTE: If the forced (stationary) regeneration cycle is not completed for two consecutive times (manually stopped), the engine check light will turn ON and engine power will be reduced. Error code P2463 "Service Regeneration Required will be displayed in the instrument panel.

IMPORTANT

Stopping the engine during the regeneration cycle may cause severe damage to the DPF.

I-2352-0412

10. After the DPF regeneration is complete, the engine will return to low idle and will continue to operate for a cool down period. Once the DPF Icon (Item 5) **[Figure 10-180-2]** turns OFF, the regeneration cycle is complete. The engine can now be stopped.

Service Regeneration

Your machine will indicate the need for service regeneration by displaying one of the following service codes:

- **[P1421]** Forced (Stationary) Regeneration Required
- **[P1424] or [P2463]** Service Regeneration Required
- **[P2458]** Regeneration Defect (stationary regeneration failure)
- **[P2459]** Regeneration Defect (stationary regeneration not performed)

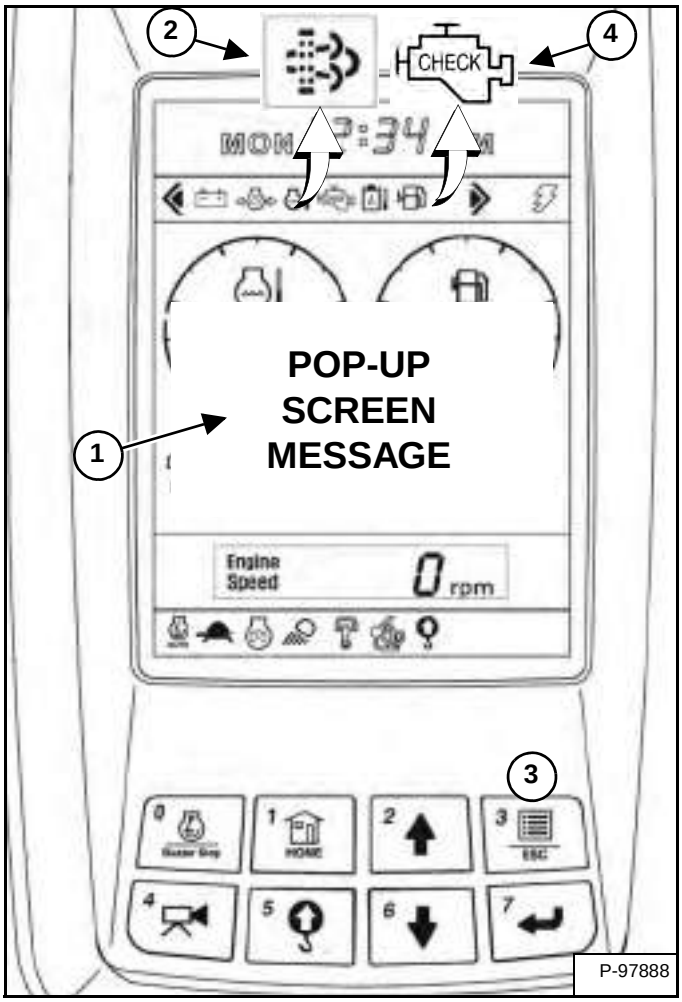
Service regeneration requires the use of specialized equipment. See your dealer for service regeneration.

NOTE: The operator can perform a forced (stationary) regeneration (Service Code P1421) but if service regeneration is requested, regeneration must be performed by your dealer. (See Forced (Stationary) Regeneration on Page 10-180-1.)

DPF Ash Cleaning

See the SERVICE SCHEDULE for the correct service interval. (See SERVICE SCHEDULE on Page 10-80-1.)

Figure 10-180-3



Clean the DPF at the specified interval or when indicated on the instrument panel.

A pop-up box (Item 1) will appear on the screen, the DPF icon (Item 2) and the engine check light (Item 4) icons will FLASH. Press the MENU / ESC button (Item 3) **[Figure 10-180-3]** until the display screen shows the service codes. (See DIAGNOSTIC SERVICE CODES on Page 50-80-1.) Service code **[P1420]** (DPF Service Required) will show in the display screen when DPF cleaning is necessary.

The DPF is a critical component of the engine exhaust system and must be properly maintained. Specialized equipment is required to clean the ash from the DPF. See your dealer for DPF cleaning.

EMERGENCY EXITS

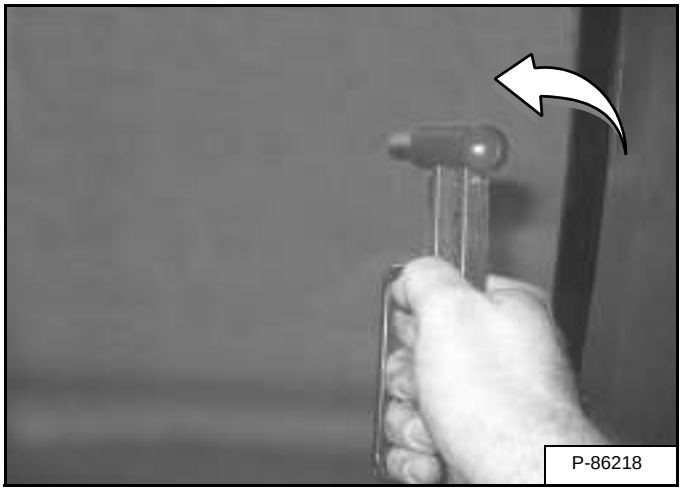
The door, the right side rear window and the front window provide emergency exits.

Right Rear Side Window

Figure 10-190-1

If emergency exit requires breaking a window, use the supplied hammer (Item 1) **[Figure 10-190-1]** located on the left side of the operator cab.

Figure 10-190-2



Remove the hammer from the storage position and strike the glass with the pointed end of the hammer **[Figure 10-190-2]**.

Use the hammer to remove broken glass from the edge of the window before exiting.

Figure 10-190-3

Exit through the right rear side window **[Figure 10-190-3]**.

Front Window

Figure 10-190-4

Open the front window and exit **[Figure 10-190-4]**.

NOTE: If the excavator has a Front Guard Kit installed, the front window is NOT an emergency exit.

Inspection And Maintenance

WARNING

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

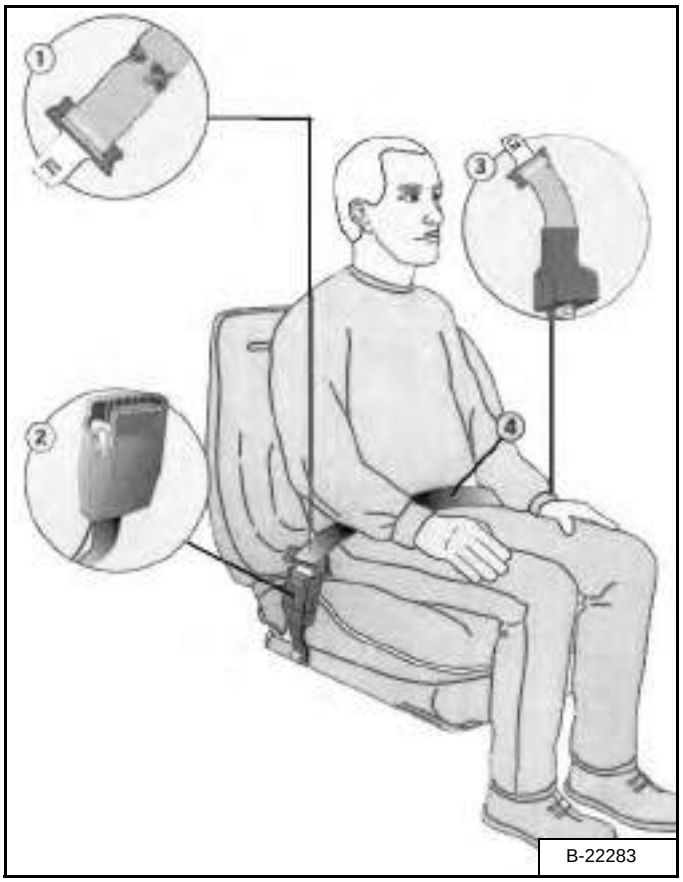
W-2466-0703

Check the seat belt daily for correct function.

Inspect the seat belt system thoroughly yearly or more often if the machine is exposed to severe environmental conditions or applications.

The seat belt system should be repaired or replaced if it shows cuts, fraying, extreme or unusual wear, significant discolorations due to ultraviolet (UV) rays from the sun, dusty / dirty conditions, abrasion to the seat belt webbing, or damage to the buckle, latch plate, retractor (if equipped), or hardware.

Figure 10-200-1



The items below are referenced in **[Figure 10-200-1]**.

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

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

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

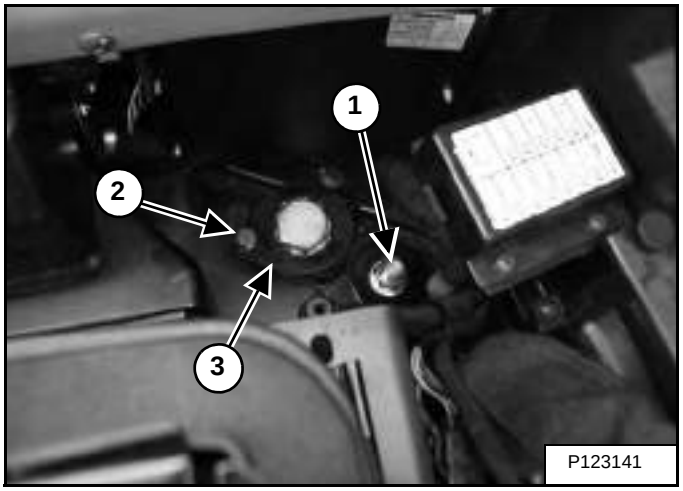
4. Check webbing in areas exposed to ultraviolet (UV) rays from the sun or extreme dust or dirt. If the original color of the webbing in these areas is extremely faded and / or the webbing is packed with dirt, the webbing strength may have deteriorated.

CAB TILT PROCEDURE

Raising And Lowering

Raising The Cab

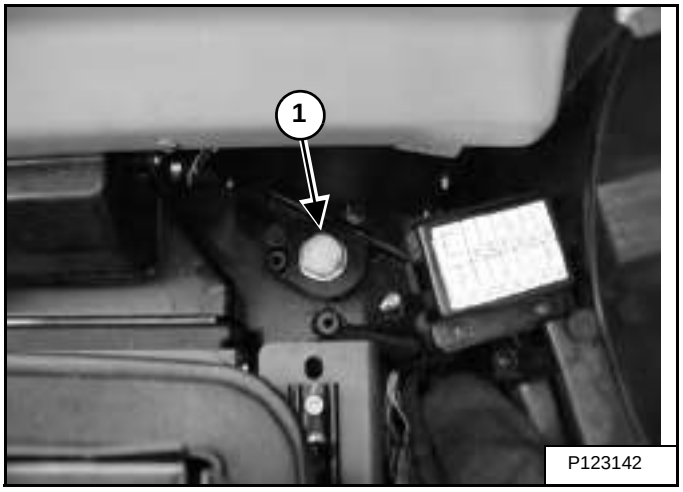
Figure 10-210-1



Remove the two nuts and washers (Item 1) **[Figure 10-210-1]** from the right and left rear corners of the cab.

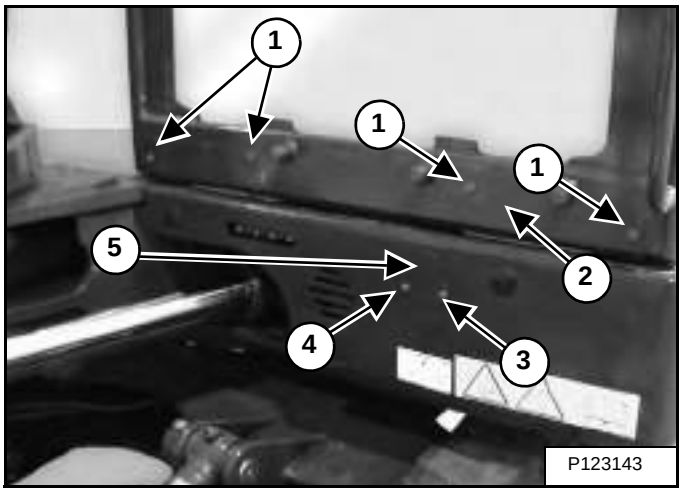
Remove the bolt (Item 2) and retaining ring (Item 3) **[Figure 10-210-1]**.

Figure 10-210-2



Remove the bolt and washer (Item 1) **[Figure 10-210-2]**.

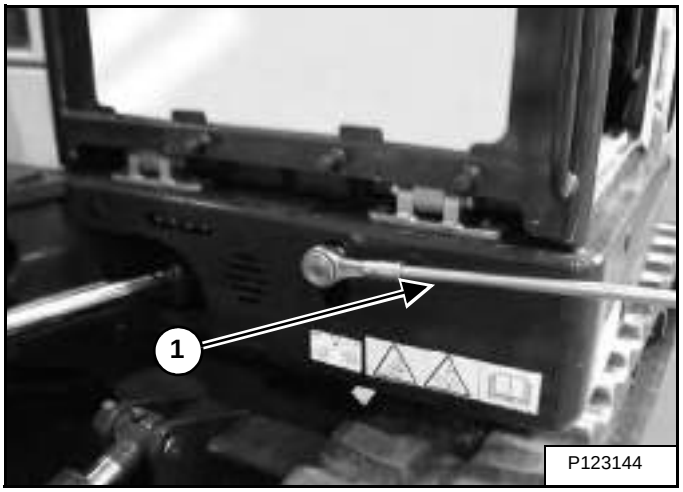
Figure 10-210-3



Remove the four bolts (Item 1) and remove the cover (Item 2) **[Figure 10-210-3]**.

Remove the bolt (Item 3), loosen the bolt (Item 4) and pivot the cover (Item 5) **[Figure 10-210-3]** down for access to the cab tilt assembly.

Figure 10-210-4



Install a wrench (Item 1) **[Figure 10-210-4]** and rotate the cab tilt assembly clockwise to raise the cab.

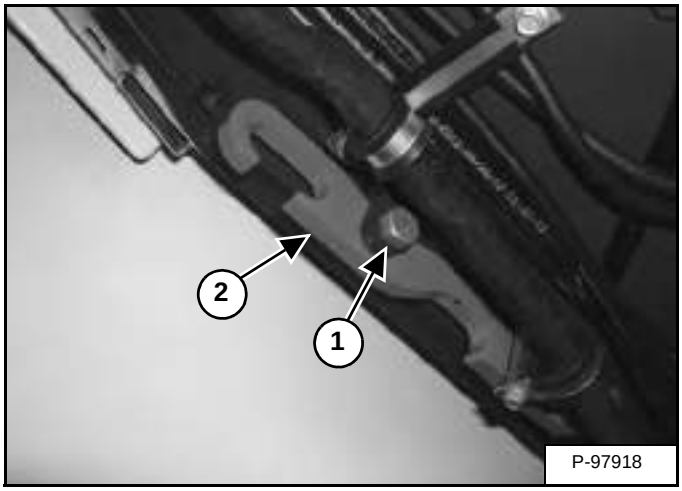
NOTE: Do Not use any type of air or electrically operated wrench. Only use a hand operated wrench. Turning the tilt assembly at higher speeds can damage the tilt assembly.

CAB TILT PROCEDURE (CONT'D)

Raising And Lowering (Cont'd)

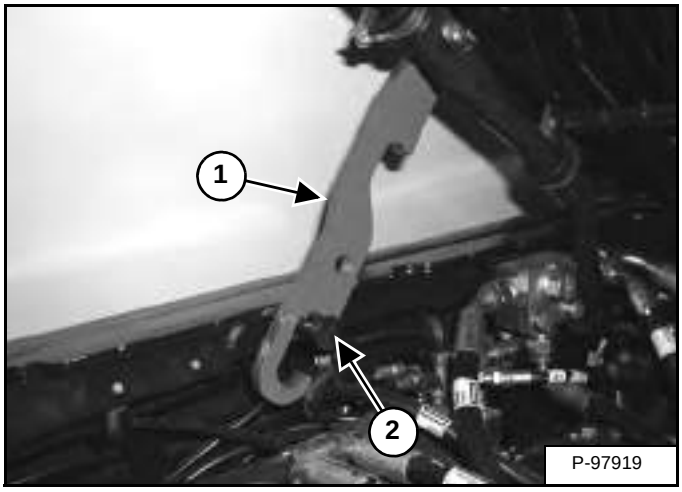
Raising The Cab (Cont'd)

Figure 10-210-5



Remove the bolt (Item 1) from the cab support device (Item 2) **[Figure 10-210-5]**.

Figure 10-210-6



Rotate the cab support device (Item 1) down to the support post (Item 2) **[Figure 10-210-6]**.

Slowly lower the cab until it is supported by the cab support device.

⚠ WARNING

AVOID INJURY OR DEATH

Never work under the excavator cab without installing an approved cab support device.

W-2435-0502

Lowering The Cab

Raise the cab slightly and rotate the cab support device (Item 1) **[Figure 10-210-6]** to the storage position **[Figure 10-210-5]**.

Install the bolt (Item 1) **[Figure 10-210-5]**.

Slowly lower the cab completely **[Figure 10-210-4]**.

Install the two washers and nuts (item 1) **[Figure 10-210-1]** on the left and right side of the rear of the cab.

Install the bolt and washer (Item 1) **[Figure 10-210-2]** at the left rear corner of the cab. Install the retaining ring (Item 3) and Tighten bolt (Item 2) **[Figure 10-210-1]**.

Pivot the cover (Item 5) up and install the bolt (Item 3) **[Figure 10-210-3]**.

Tighten the bolts (Item 3 and 4) **[Figure 10-210-3]**.

Install the cover (Item 2) and the four bolts (Item 1) **[Figure 10-210-3]**.

CONTROL CONSOLE LOCKOUT

Inspection And Maintenance

Figure 10-220-1

When the left console is raised **[Figure 10-220-1]** the hydraulic control levers (joysticks and traction system) must not function.

Sit in the operator's seat, fasten the seat belt and start the engine.

Raise the left console.

Move the joystick control levers. There should be no movement of the boom, arm, slew or bucket.

Move the travel control levers. There should be no movement of the excavator.

Service the system if these controls do not deactivate when the left control console is raised.

TOWING THE EXCAVATOR

Procedure

There is not a recommended towing procedure for the excavators.

- The excavator can be lifted onto the transport vehicle.
- The excavator can be skidded a short distance for service (EXAMPLE: Move onto a transport vehicle) without damage to the hydraulic system. (The tracks will not turn.) There might be slight wear to the tracks when the excavator is skidded.
- The towing chain (or cable) must be rated at 1.5 times the weight of the excavator. (See Capacities on Page SPEC-10-8.)

HYDRAULIC SYSTEM

HYDRAULIC/HYDROSTATIC SCHEMATIC
E85 (S/N B34T11001 AND ABOVE)

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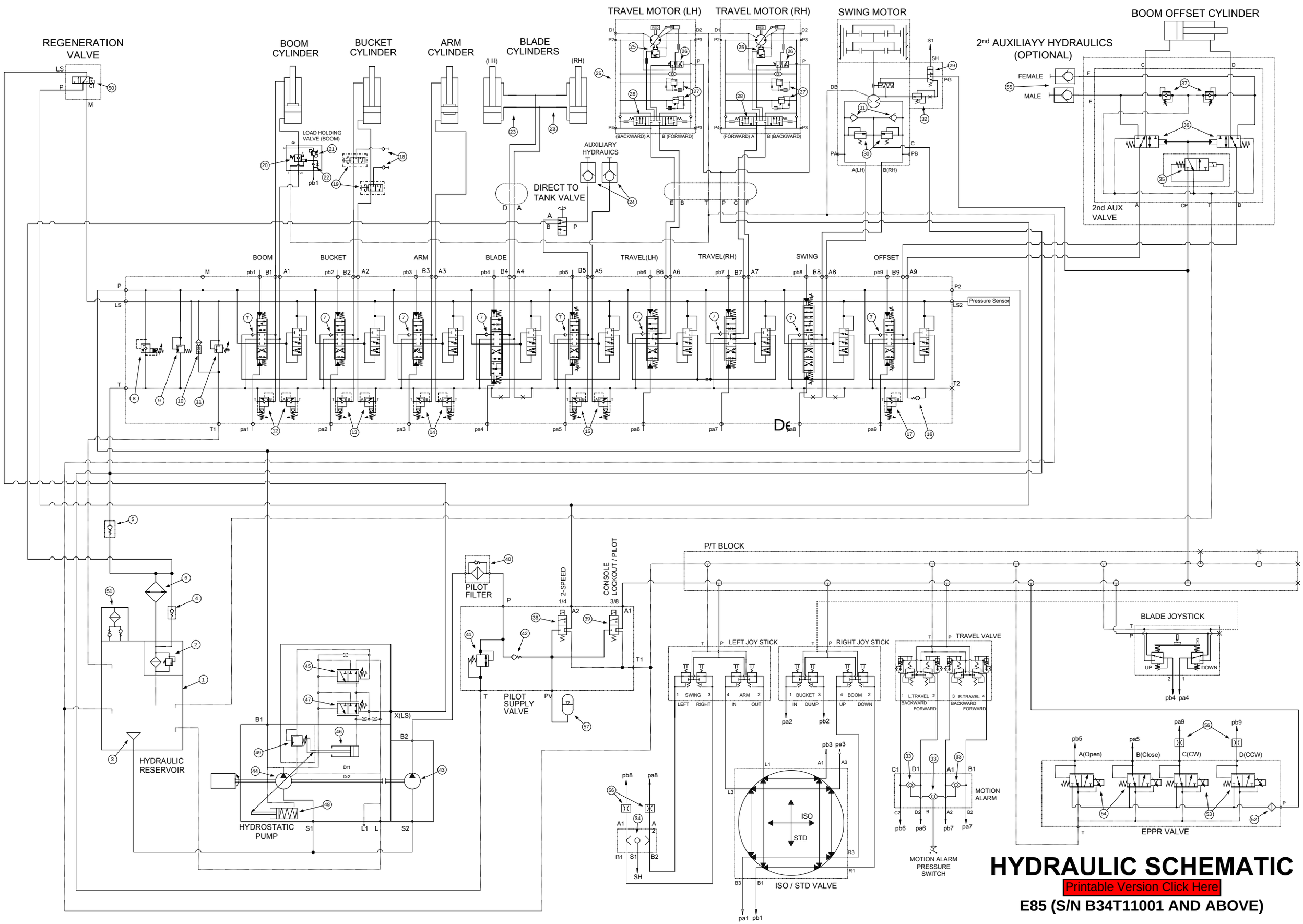
(PRINTED AUGUST 2015)
V-1559legend

1. HYDRAULIC RESERVOIR (PRESSURIZED)
   Reservoir – 87 L (23 U.S. gal)
   System – 127 L (39.1 U.S. gal)
2. MAIN FILTER - 10 MICRON
   With 250 kPa (2,5 bar) (36 psi) By-Pass Valve
3. SUCTION FILTER - 150 MICRON
4. CHECK VALVE – 259 kPa (2.5 bar) (36 psi)
5. CHECK VALVE – 300 kPa (3 bar) (44 psi)
6. OIL COOLER
7. LOAD CHECK
8. BACK-UP RELIEF VALVE:
   34000 kPa (340 bar) (4931 psi)
9. FLUSHING VALVE: 2500 kPa (25 bar) (362 psi)
10. LOAD SENSE BLEED VALVE
11. LOAD SENSE RELIEF VALVE:
    28000 kPa (280 bar) (4060 psi)
12. PORT RELIEF / ANTI-CAVITATION VALVE (2) - (Boom Cylinder) - 31000 kPa (310 bar) (4496 psi)
13. PORT RELIEF / ANTI-CAVITATION VALVE (2) - (Bucket Cylinder) - 31000 kPa (310 bar) (4496 psi)
14. PORT RELIEF / ANTI-CAVITATION VALVE (2) - (Arm Cylinder) - 31000 kPa (310 bar) (4496 psi)
15. PORT RELIEF / ANTI-CAVITATION VALVE - (Continuous Flow / Auxiliary Hydraulics -
    31000 kPa (310 bar) (4496 psi)
16. ANTI-CAVITATION VALVE
17. PORT RELIEF / ANTI-CAVITATION VALVE – (2nd Auxiliary – If Equipped) -
    31000 kPa (310 bar) (4496 psi)
18. 3rd AUXILIARY QUICK COUPLERS –
    Male / Female (If Equipped)
19. MANUAL DIRECTIONAL CONTROL VALVE (Bucket Cylinder – 3rd Auxiliary Couplers) – (If Equipped)
20. PILOT ACTIVATED DIRECTIONAL CONTROL VALVE (Load Holding valve) – Boom
21. RELIEF VALVE - (Load Holding valve) – Boom
22. CHECK VALVE With Restriction - (Load Holding valve) – Boom
23. NOT USED ON THIS MODEL
24. AUXILIARY QUICK COUPLERS – Male / Female
25. BRAKE RELEASE VALVE – Travel Motor
    630 kPa (6,3 bar) (91 psi)
26. TWO SPEED SHIFT SPOOL – Travel Motor
27. CROSS PORT RELIEF VALVE (Travel Motor)
    28000 kPa (280 bar) (4061 psi)
28. COUNTERBALANCE SPOOL (Travel Motor)
29. BRAKE RELEASE VALVE - Slew Motor
    1900 kPa (19 bar) (276 psi)
30. CROSS PORT RELIEF VALVE - Slew Motor
    22000 kPa (220 bar) (3190 psi)
31. ANTI-CAVITATION VALVE – Slew Motor
32. RELIEF VALVE – Slew Motor Brake
33. SHUTTLE VALVE (Motion Alarm – If Equipped)
34. SHUTTLE VALVE (Slew Motor Brake Valve)
35. SOLENOID ACTIVATED DIRECTIONAL CONTROL VALVE (2nd Auxiliary)
36. PILOT ACTIVATED DIRECTIONAL CONTROL VALVE (2) (2nd Auxiliary)
37. PORT RELIEF VALVE –(2nd Auxiliary – If Equipped) 25000 kPa (250 bar) (3626 psi)
38. SOLENOID ACTIVATED DIRECTIONAL CONTROL VALVE (Two Speed)
39. SOLENOID ACTIVATED DIRECTIONAL CONTROL VALVE - (Console Lockout / Pilot Cut off)
40. FILTER - Pilot Witn By-Pass Valve
    170 kPa (1,7 bar) (25 psi)
41. PRESSURE REDUCING VALVE -
    3200 kPa (32 bar) (464 psi)
42. CHECK VALVE: 50 kPa (0,5 bar) (7.25 psi)
43. HYDRAULIC GEAR PUMP
    22 L/min (5.8 U.S. gpm) at High Idle
44. HYDRAULIC PISTON PUMP
    144 L/min (38 U.S. gpm) at High Idle
45. TORQUE LIMITER SUPPLY SPOOL
    2000 kPa (20 bar) (290 psi)
46. DESTROKE PISTON
47. PUMP MARGIN SPOOL:
    1500 kPa (15 bar) (218 psi)
48. MINIMUM PUMP DISPLACEMENT
    (On Stroke Piston)
49. TORQUE LIMITER 28000 kPa (280 bar) (4061 psi)
50. SOLENOID ACTIVATED DIRECTIONAL CONTROL VALVE (Regeneration)
51. HYDRAULIC FILL CAP With Breather Filter
52. FILTER
53. SOLENOID ACTIVATED DIRECTIONAL CONTROL VALVE (2) (Boom Swing)
54. SOLENOID ACTIVATED DIRECTIONAL CONTROL VALVE (2nd Auxiliary)
55. 2nd AUXILIARY QUICK COUPLERS –
    Male / Female (If Equipped)
56. ORIFICE – 0,8 mm (0.031 in)
57. ACCUMULATOR - Nitrogen 1020 kPa (10.2 bar) (148 psi) Precharged

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



HYDRAULIC SCHEMATIC

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E85 (S/N B34T11001 AND ABOVE)

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HYDRAULIC/HYDROSTATIC SCHEMATIC
Without Articulated Boom
E85 (S/N B34S11001 AND ABOVE)

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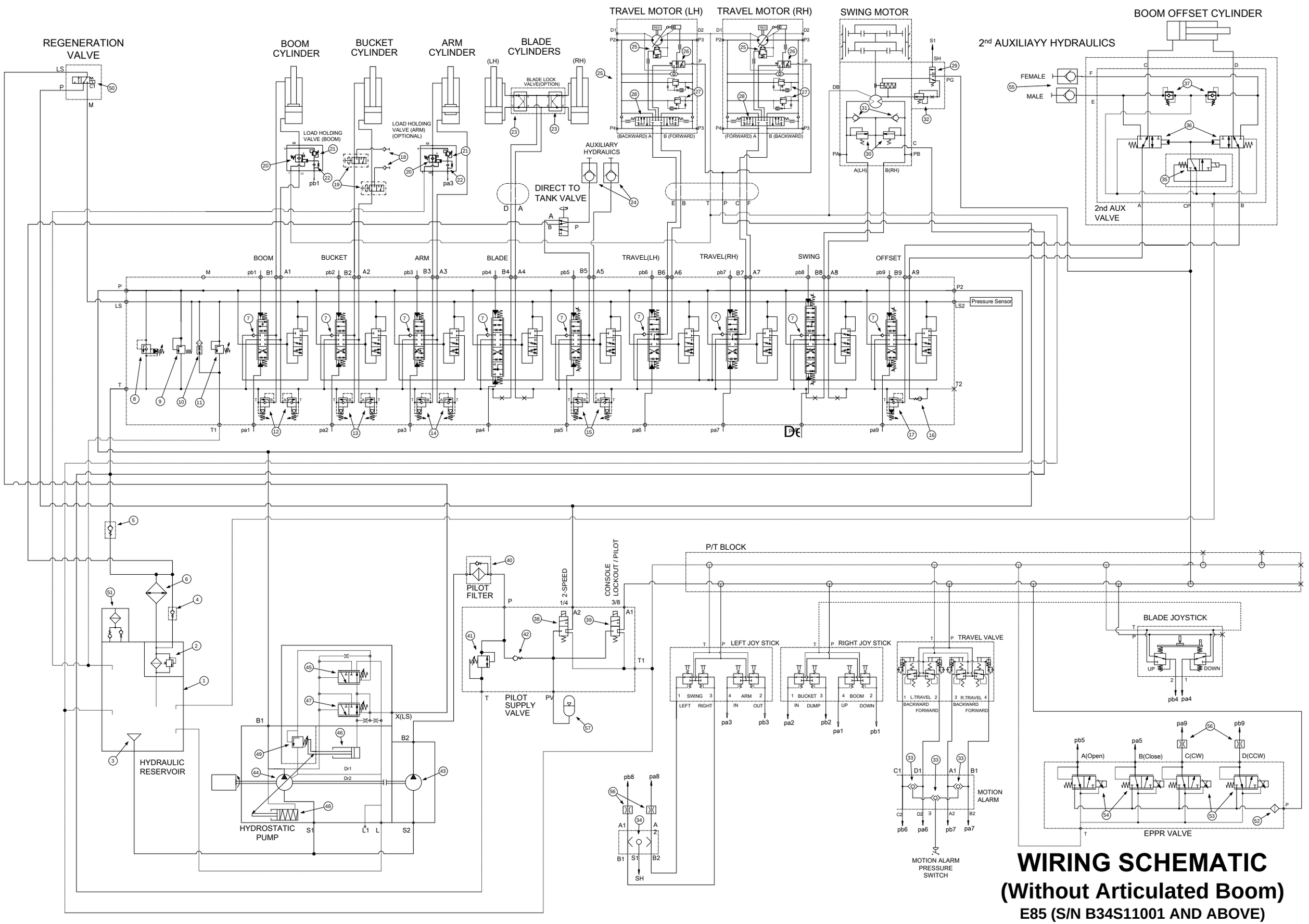
1. HYDRAULIC RESERVOIR (PRESSURIZED)
   Reservoir – 87 L (23 U.S. gal)
   System – 127 L (39.1 U.S. gal)
2. MAIN FILTER - 10 MICRON
   With 250 kPa (2,5 bar) (36 psi) By-Pass Valve
3. SUCTION FILTER - 150 MICRON
4. CHECK VALVE – 259 kPa (2.5 bar) (36 psi)
5. CHECK VALVE – 300 kPa (3 bar) (44 psi)
6. OIL COOLER
7. LOAD CHECK
8. BACK-UP RELIEF VALVE:
   34000 kPa (340 bar) (4931 psi)
9. FLUSHING VALVE: 2500 kPa (25 bar) (362 psi)
10. LOAD SENSE BLEED VALVE
11. LOAD SENSE RELIEF VALVE:
    28000 kPa (280 bar) (4060 psi)
12. PORT RELIEF / ANTI-CAVITATION VALVE (2) - (Boom Cylinder) - 31000 kPa (310 bar) (4496 psi)
13. PORT RELIEF / ANTI-CAVITATION VALVE (2) - (Bucket Cylinder) - 31000 kPa (310 bar) (4496 psi)
14. PORT RELIEF / ANTI-CAVITATION VALVE (2) - (Arm Cylinder) - 31000 kPa (310 bar) (4496 psi)
15. PORT RELIEF / ANTI-CAVITATION VALVE - (Continuous Flow / Auxiliary Hydraulics -
    31000 kPa (310 bar) (4496 psi)
16. ANTI-CAVITATION VALVE
17. PORT RELIEF / ANTI-CAVITATION VALVE – (2nd Auxiliary – If Equipped) -
    31000 kPa (310 bar) (4496 psi)
18. 3rd AUXILIARY QUICK COUPLERS –
    Male / Female (If Equipped)
19. MANUAL DIRECTIONAL CONTROL VALVE (Bucket Cylinder – 3rd Auxiliary Couplers) – (If Equipped)
20. PILOT ACTIVATED DIRECTIONAL CONTROL VALVE (Load Holding valve) – Boom
21. RELIEF VALVE - (Load Holding valve) – Boom
22. CHECK VALVE With Restriction - (Load Holding valve) – Boom
23. LOCK VALVES – BLADE CYLINDER (2)
    (If Equipped)
24. AUXILIARY QUICK COUPLERS – Male / Female
25. BRAKE RELEASE VALVE – Travel Motor
    630 kPa (6,3 bar) (91 psi)
26. TWO SPEED SHIFT SPOOL – Travel Motor
27. CROSS PORT RELIEF VALVE (Travel Motor)
    28000 kPa (280 bar) (4061 psi)
28. COUNTERBALANCE SPOOL (Travel Motor)
29. BRAKE RELEASE VALVE - Slew Motor
    1900 kPa (19 bar) (276 psi)
30. CROSS PORT RELIEF VALVE - Slew Motor
    22000 kPa (220 bar) (3190 psi)
31. ANTI-CAVITATION VALVE – Slew Motor
32. RELIEF VALVE – Slew Motor Brake
33. SHUTTLE VALVE (Motion Alarm – If Equipped)
34. SHUTTLE VALVE (Slew Motor Brake Valve)
35. SOLENOID ACTIVATED DIRECTIONAL CONTROL VALVE (2nd Auxiliary)
36. PILOT ACTIVATED DIRECTIONAL CONTROL VALVE (2) (2nd Auxiliary)
37. PORT RELIEF VALVE –(2nd Auxiliary – If Equipped) 25000 kPa (250 bar) (3626 psi)
38. SOLENOID ACTIVATED DIRECTIONAL CONTROL VALVE (Two Speed)
39. SOLENOID ACTIVATED DIRECTIONAL CONTROL VALVE - (Console Lockout / Pilot Cut off)
40. FILTER - Pilot Witn By-Pass Valve
    170 kPa (1,7 bar) (25 psi)
41. PRESSURE REDUCING VALVE -
    3200 kPa (32 bar) (464 psi)
42. CHECK VALVE: 50 kPa (0,5 bar) (7.25 psi)
43. HYDRAULIC GEAR PUMP
    22 L/min (5.8 U.S. gpm) at High Idle
44. HYDRAULIC PISTON PUMP
    144 L/min (38 U.S. gpm) at High Idle
45. TORQUE LIMITER SUPPLY SPOOL
    2000 kPa (20 bar) (290 psi)
46. DESTROKE PISTON
47. PUMP MARGIN SPOOL:
    1500 kPa (15 bar) (218 psi)
48. MINIMUM PUMP DISPLACEMENT
    (On Stroke Piston)
49. TORQUE LIMITER 28000 kPa (280 bar) (4061 psi)
50. SOLENOID ACTIVATED DIRECTIONAL CONTROL VALVE (Regeneration)
51. HYDRAULIC FILL CAP With Breather Filter
52. FILTER
53. SOLENOID ACTIVATED DIRECTIONAL CONTROL VALVE (2) (Boom Swing)
54. SOLENOID ACTIVATED DIRECTIONAL CONTROL VALVE (2nd Auxiliary)
55. 2nd AUXILIARY QUICK COUPLERS –
    Male / Female
56. ORIFICE – 0,8 mm (0.031 in)
57. ACCUMULATOR - Nitrogen 1020 kPa (10.2 bar) (148 psi) Precharged

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



WIRING SCHEMATIC
(Without Articulated Boom)
E85 (S/N B34S11001 AND ABOVE)

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HYDRAULIC/HYDROSTATIC SCHEMATIC
With Articulated Boom
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7. LOAD CHECK
8. BACK-UP RELIEF VALVE:
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14. PORT RELIEF / ANTI-CAVITATION VALVE (2) - (Arm Cylinder) - 31000 kPa (310 bar) (4496 psi)
15. PORT RELIEF / ANTI-CAVITATION VALVE - (Continuous Flow / Auxiliary Hydraulics -
    31000 kPa (310 bar) (4496 psi)
16. ANTI-CAVITATION VALVE
17. PORT RELIEF / ANTI-CAVITATION VALVE – (2nd Auxiliary – If Equipped) -
    31000 kPa (310 bar) (4496 psi)
18. 3rd AUXILIARY QUICK COUPLERS –
    Male / Female (If Equipped)
19. MANUAL DIRECTIONAL CONTROL VALVE (Bucket Cylinder – 3rd Auxiliary Couplers) – (If Equipped)
20. PILOT ACTIVATED DIRECTIONAL CONTROL VALVE (Load Holding valve) – Boom
21. RELIEF VALVE - (Load Holding valve) – Boom
22. CHECK VALVE With Restriction - (Load Holding valve) – Boom
23. LOCK VALVES – BLADE CYLINDER (2)
    (If Equipped)
24. AUXILIARY QUICK COUPLERS – Male / Female
25. BRAKE RELEASE VALVE – Travel Motor
    630 kPa (6,3 bar) (91 psi)
26. TWO SPEED SHIFT SPOOL – Travel Motor
27. CROSS PORT RELIEF VALVE (Travel Motor)
    28000 kPa (280 bar) (4061 psi)
28. COUNTERBALANCE SPOOL (Travel Motor)
29. BRAKE RELEASE VALVE - Slew Motor
    1900 kPa (19 bar) (276 psi)
30. CROSS PORT RELIEF VALVE - Slew Motor
    22000 kPa (220 bar) (3190 psi)
31. ANTI-CAVITATION VALVE – Slew Motor
32. RELIEF VALVE – Slew Motor Brake
33. SHUTTLE VALVE (Motion Alarm – If Equipped)
34. SHUTTLE VALVE (Slew Motor Brake Valve)
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36. PILOT ACTIVATED DIRECTIONAL CONTROL VALVE (2) (2nd Auxiliary)
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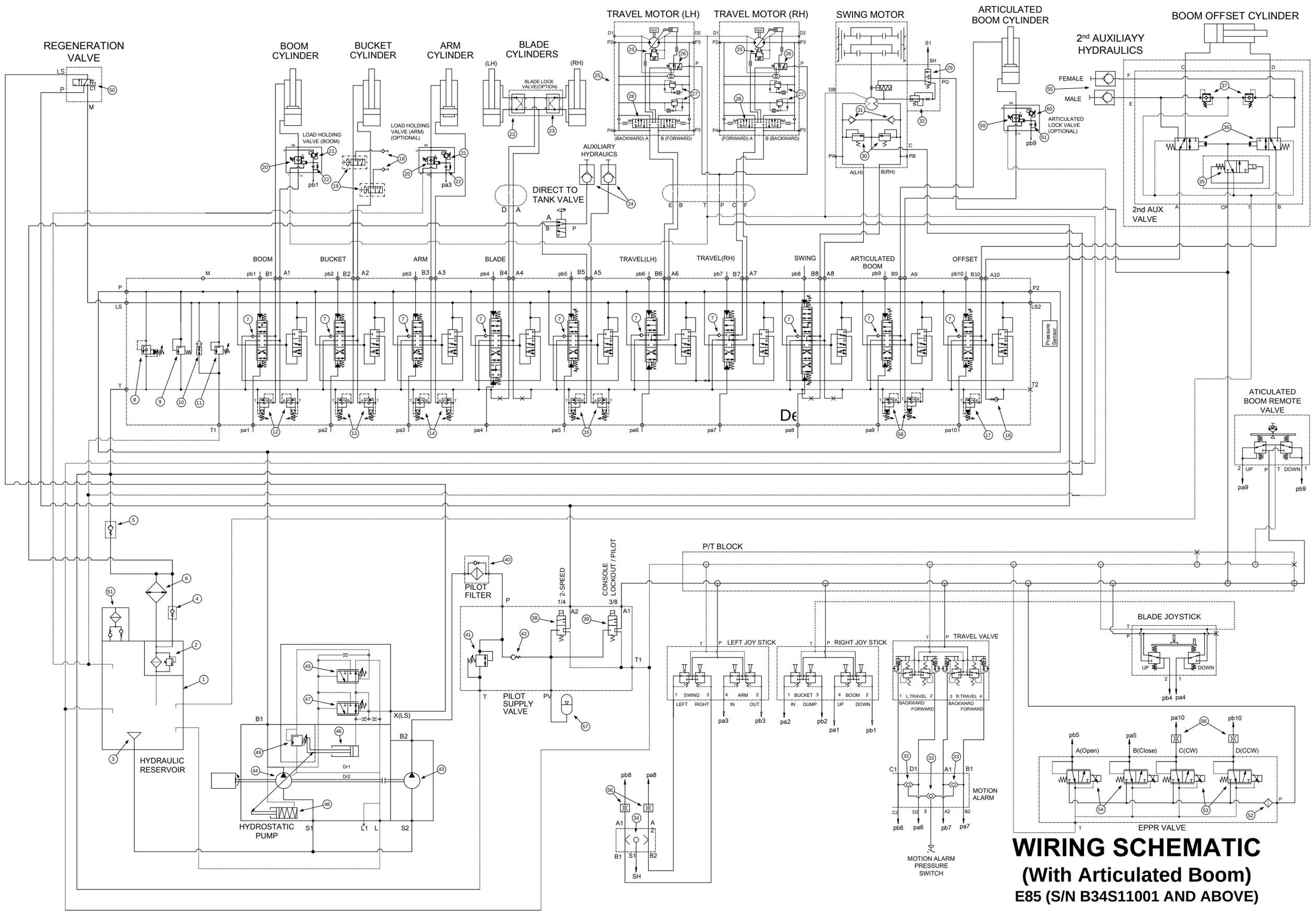
38. SOLENOID ACTIVATED DIRECTIONAL CONTROL VALVE (Two Speed)
39. SOLENOID ACTIVATED DIRECTIONAL CONTROL VALVE - (Console Lockout / Pilot Cut off)
40. FILTER - Pilot Witn By-Pass Valve
    170 kPa (1,7 bar) (25 psi)
41. PRESSURE REDUCING VALVE -
    3200 kPa (32 bar) (464 psi)
42. CHECK VALVE: 50 kPa (0,5 bar) (7.25 psi)
43. HYDRAULIC GEAR PUMP
    22 L/min (5.8 U.S. gpm) at High Idle
44. HYDRAULIC PISTON PUMP
    144 L/min (38 U.S. gpm) at High Idle
45. TORQUE LIMITER SUPPLY SPOOL
    2000 kPa (20 bar) (290 psi)
46. DESTROKE PISTON
47. PUMP MARGIN SPOOL:
    1500 kPa (15 bar) (218 psi)
48. MINIMUM PUMP DISPLACEMENT
    (On Stroke Piston)
49. TORQUE LIMITER 28000 kPa (280 bar) (4061 psi)
50. SOLENOID ACTIVATED DIRECTIONAL CONTROL VALVE (Regeneration)
51. HYDRAULIC FILL CAP With Breather Filter
52. FILTER
53. SOLENOID ACTIVATED DIRECTIONAL CONTROL VALVE (2) (Boom Swing)
54. SOLENOID ACTIVATED DIRECTIONAL CONTROL VALVE (2nd Auxiliary)
55. 2nd AUXILIARY QUICK COUPLERS –
    Male / Female
56. ORIFICE – 0,8 mm (0.031 in)
57. ACCUMULATOR - Nitrogen 1020 kPa (10.2 bar) (148 psi) Precharged
58. PORT RELIEF / ANTI-CAVITATION VALVE – (Articulated Boom) - 31000 kPa (310 bar) (4496 psi)
59. PILOT ACTIVATED DIRECTIONAL CONTROL VALVE (Load Holding valve) – Articulated Boom
60. RELIEF VALVE - (Load Holding valve) – Articulated Boom
61. CHECK VALVE With Restriction - (Load Holding valve) – Articulated Boom

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



WIRING SCHEMATIC

(With Articulated Boom)

E85 (S/N B34S11001 AND ABOVE)

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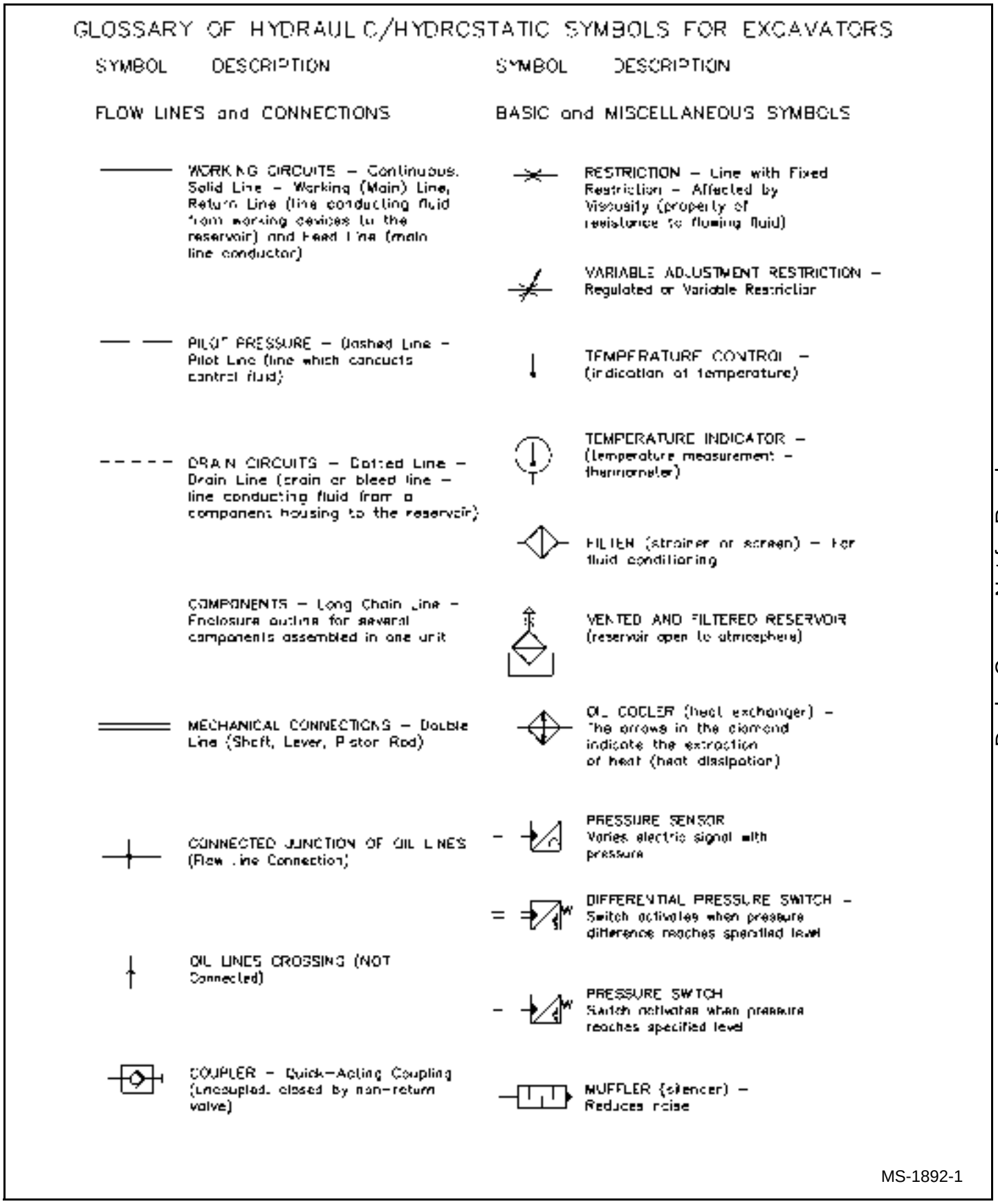
(PRINTED AUGUST 2015)
V-1559A

Glossary Of Hydraulic / Hydrostatic Symbols



Glossary Of Hydraulic / Hydrostatic Symbols (Cont'd)

GLOSSARY OF HYDRAULIC/HYDROSTATIC SYMBOLS FOR EXCAVATORS

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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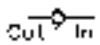
Glossary Of Hydraulic / Hydrostatic Symbols (Cont'd)

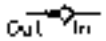
GLOSSARY OF HYDRAULIC/HYDROSTATIC SYMBOLS FOR EXCAVATORS

SYMBOL DESCRIPTION

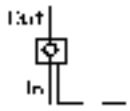
NON-RETURN VALVE, SHUTTLE VALVE: Valve which allows free flow in one direction only



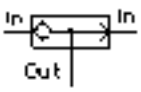
NON RETURN VALVE (Check Valve) – Used as Replenishing Valve, Load Check Valve or Anticavitation Valve – Opens if the inlet pressure is higher than the Outlet pressure. Offer contains internal spring which has NO significant pressure value



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



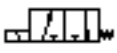
PILOT CONTROLLED NON-RETURN VALVE – It is possible to open the valve by pilot pressure



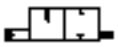
SHUTTLE VALVE The inlet port connected to the higher pressure is automatically connected to the outlet port while the other inlet port is closed

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

TWO PORTS and CLOSED FLOW PATHS



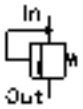
SOLENOID ACTIVATED DIRECTIONAL CONTROL VALVE (Two Position) – controlled by an electric solenoid (with return spring)



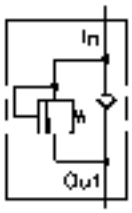
PILOT ACTIVATED DIRECTIONAL CONTROL VALVE (Two Position) – controlled by pressure (with return spring)

SYMBOL DESCRIPTION

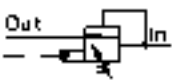
PRESSURE CONTROL VALVE: Valve ensuring the control of pressure



RELIEF VALVE – When the inlet pressure overcomes the opposing force of the spring, the valve opens permitting flow from the Outlet port.



RELIEF/REPLENISHING VALVE or RELIEF/ANTICAVITATION VALVE – When the inlet pressure overcomes the opposing force of the spring, the valve opens permitting flow from the Outlet port – Allows free flow in the opposite direction



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

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

ONE WAY RESTRICTOR VALVE (Non-Return Valve with Restriction) Unit allowing free flow in one direction but restricted flow in the other direction

TOW VALVE – Normally in closed position

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Troubleshooting The Hydraulic Circuit

PROBLEM	CAUSE	CORRECTION
No hydraulic operation at one or more circuits.	Hydraulic oil level low.	Refill with correct oil.
	Hydraulic pump drive coupling damaged.	Replace
	Hydraulic pump defective.	Repair or replace.
	Pump pressure too low.	Readjust or replace.
Hydraulic power insufficient to one or more circuits.	Pump pressure setting incorrect.	Readjust or replace.
All hydraulic speed too slow.	Torque limiter supply spool set too low.	Readjust.
	Hydraulic oil level or viscosity incorrect.	Fill to correct level. Use correct viscosity oil.
	Pump margin too low.	Test and adjust.
	Engine rpm reduced.	Readjust or replace.
	Torque limiter set too low / high.	Test and adjust.
	Hydraulic pump volume low.	Check repair or replace.
Oil temperature too high.	Oil cooler or radiator fins plugged.	Clean oil cooler external surface.
	Hydraulic oil level low.	Fill to correct level.
	Non recommended hydraulic oil.	Replace.
	One or more port relief valves not set correctly.	Readjust or replace.
	Extreme operating conditions. High ambient temperature. (IE: Enclosed structure).	
	Fan belt loose.	Tighten fan belt.
	Piston pump margin too high.	
Pump (Piston) response slow.	Pump minimum displacement set too low.	Readjust.

Troubleshooting The Cylinder Circuit

PROBLEM	CAUSE	CORRECTION
Cylinder inoperable.	Pump torque limiter supply spool not shifting.	Repair or replace.
	Control console raised.	Lower control console.
	Loose fittings or broken hoses.	Repair or replace.
	Low psi at joystick.	Check, repair or replace pressure reducing valve.
	Control console lockout switch.	Readjust or replace.
	Cylinder internal leakage excessive.	Repair or replace.
	Joystick pressure reducing valve defective.	Repair or replace.
	Joystick internal leakage excessive.	Repair or replace.
	Pump margin spool not shifting.	Repair or replace.
	Load sense relief valve set too low.	Repair or replace.
Cylinder force insufficient. .	Lever linkage incorrectly adjusted.	Readjust.
	Pump pressure too low.	Readjust or replace.
	Pump torque limiter too low.	Readjust or replace.
Cylinder speed too slow.	Engine rpm low.	Check rpm or increase engine speed.
	Cylinder internal leakage excessive.	Repair or replace.
	Joystick pressure reducing valve defective.	Repair or replace.
	Control valve internal leakage excessive.	Repair or replace.
	Joystick internal leakage excessive.	Repair or replace.
	Low or dirty fluid.	Add or replace the hydraulic fluid.
	Load sense relief valve malfunctioning.	Readjust or replace.
	Pump margin too low.	Repair or replace.
	Pump torque limiter too low.	Readjust or replace.

Troubleshooting The Swing (Slew) Circuit

PROBLEM	CAUSE	CORRECTION
Swing not operating.	Swing brake not releasing.	Repair or replace.
	Lower control console.	Lower control console.
	Control console lockout switch incorrectly adjusted or defective.	Readjust or replace.
	Swing motor gear defective.	Repair or replace.
	Joystick internal leakage excessive.	Repair or replace.
	Swing motor defective.	Repair or replace.
Swing force.	Pump pressure set too low.	Readjust or replace.
	Swing motor relief valve pressure too low.	Readjust or replace.
Swing speed too slow.	Swing brake not releasing.	Repair, replace or adjust.
	Engine rpm low.	Adjust.
	Pump flow low. (Gear pump)	Check, repair or adjust.
	Blocked or restricted line to swing motor.	Replace.
	Joystick internal leakage excessive.	Repair or replace.
	Control valve internal leakage excessive. (Three spool valve)	Repair or replace.
	Swing motor internal leakage excessive.	Repair or replace.
Swing over run excessive.	Control valve spool sticking.	Repair or replace.
	Joystick spool sticking.	Repair or replace.
	Swing motor relief valve set too low.	Repair or replace.
	Swing motor internal leakage excessive.	Repair or replace.
Swing motor seal leakage.	Return line plugged.	Inspect, clean or replace.

Troubleshooting The Travel Circuit

PROBLEM	CAUSE	CORRECTION
Travel system inoperable.	Pilot pressure too low.	Repair or readjust.
	Console switch not closed.	Repair or replace.
	Track tension too tight.	Readjust.
	Defective pump. (Piston pump)	Check, repair or replace.
	Travel motor counter balance spool sticking.	Repair or replace.
	Travel motor internal leakage excessive.	Repair or replace.
	Travel motor defective.	Repair or replace.
	Travel motor gears defective.	Repair or replace.
	Swivel joint defective.	Repair or replace.
	Pump pressure too low.	Readjust.
Travel power.	Track tension too tight.	Readjust.
	Travel motor check valve leaking.	Readjust or replace.
	Pump pressure too low.	Readjust.
	Torque limiter too low.	Readjust.
	Swivel joint leaking.	Repair or replace.
	Travel motor counterbalance spool sticking.	Repair or replace.
Travel speed too slow.	Engine rpm low.	Readjust.
	Pilot pressure low.	Readjust.
	Pump margin too low.	Readjust.
	Swivel joint internal leakage excessive.	Repair or replace.
	Control valve internal leakage excessive.	Repair or replace.
	Low pump pressure.	Check, repair or replace.
	Travel motor internal leakage excessive.	Repair or replace.
Travel motor seal leakage.	Case drain line plugged.	Inspect, clean or replace.

Troubleshooting The Travel Circuit (Cont'd)

PROBLEM	CAUSE	CORRECTION
Machine not running straight.	Track tension not equal.	Readjust.
	Travel motor internal leakage not equal.	Repair or replace.
	Travel motor counter balance spool sticking.	Repair or replace.
	Pump pressure set too low.	Repair or replace.
	Swivel joint internal leakage excessive.	Repair or replace.
	Control valve internal leakage not equal.	Repair or replace.
Machine will not hold on slope or while digging.	Valve compensators not equal.	Repair or replace.
	Travel motor counterbalance valve leakage excessive.	Repair or replace.
Blade drops while machine is moving.	Cylinder internal leakage excessive.	Repair or replace.
	Control valve internal leakage excessive.	Repair or replace.
	Swivel joint internal leakage from travel motor pressure circuit into blade cylinder circuit.	Repair or replace.
High / low gear switch inoperative (two-speed).	Control valve defective.	Replace.
	Torque limiter set too low.	Readjust.
	Pump pressure set too low.	Readjust.
	Switch defective.	Replace.
	Faulty pressure reducing valve.	Repair or replace.
	Bad solenoid.	Replace.

Description

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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The hydraulic system has two separate hydraulic circuits.

The piston pump circuit supplies fluid to the hydraulic control valve.

The hydraulic control valve contains the boom, bucket, arm, blade, auxiliary, left and right travel, boom swing and upperstructure swing valve sections.

Figure 20-10-1

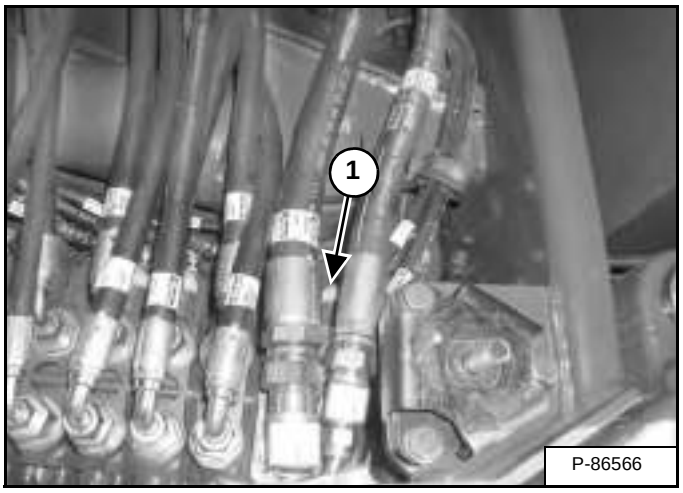
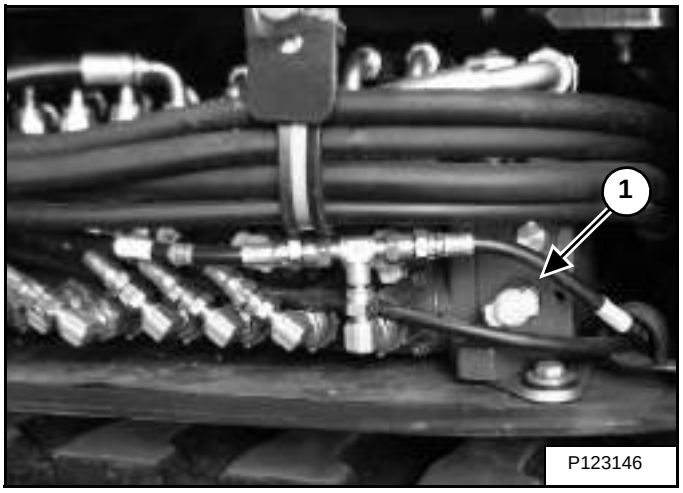


Figure 20-10-2



A load sense relief valve (Item 1) **[Figure 20-10-1]** and safety relief valve (Item 1) **[Figure 20-10-2]** protect the valve from high pressure.

The gear pump circuit supplies fluid to the manifold assembly / accumulator.

CYLINDER (BOOM)

Testing

Lower the boom / bucket and blade to the ground.

With the engine off, turn the key to the ON position and move both hydraulic control levers to relieve hydraulic pressure.

Remove both articulated boom cylinders. (See Removal And Installation on page 20-25-3.) (Optional)

Figure 20-20-1

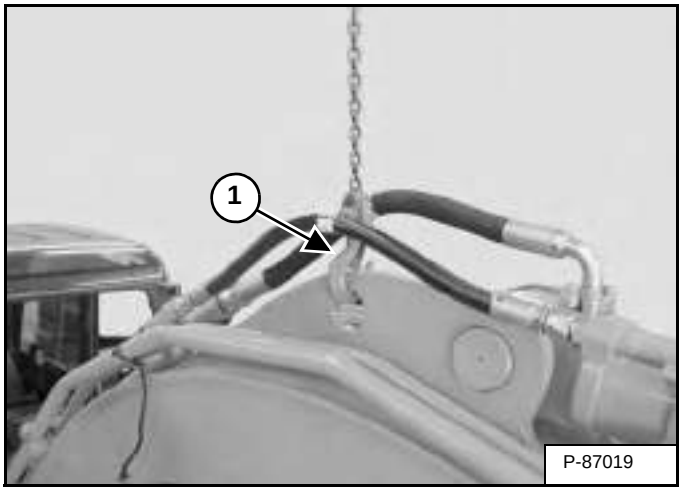
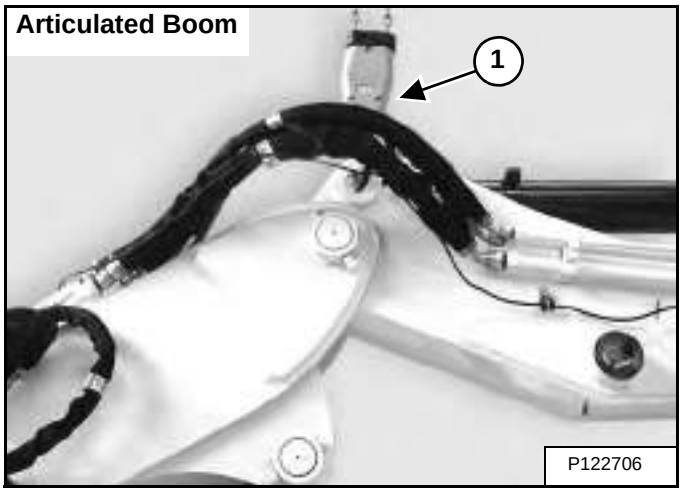


Figure 20-20-2



Support the boom with a chain hoist (Item 1) **[Figure 20-20-1]** or **[Figure 20-20-2]**.

Figure 20-20-3

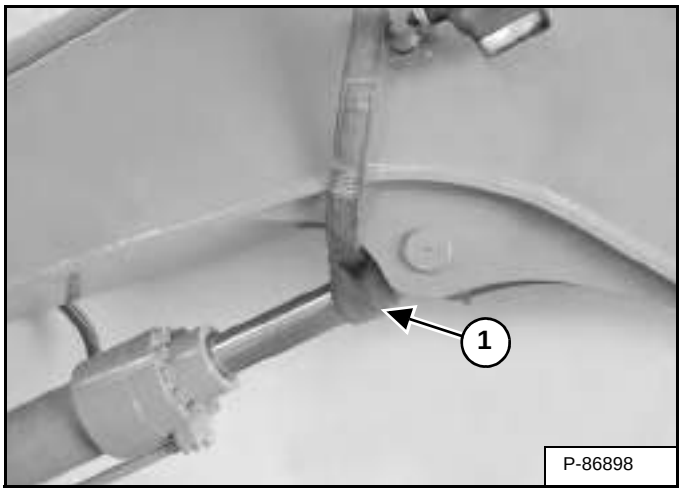
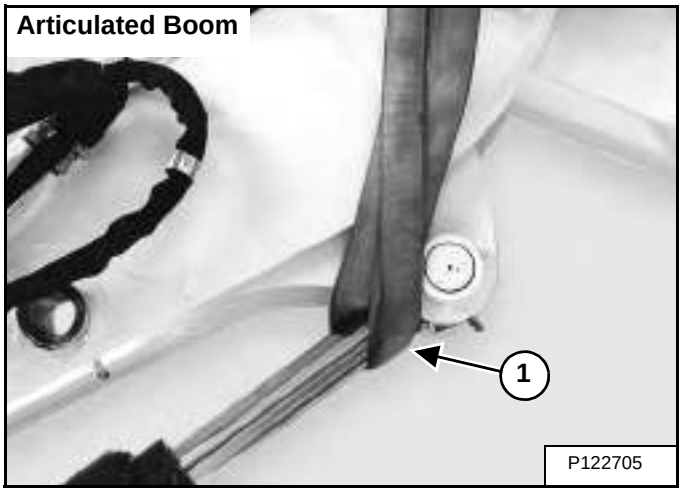


Figure 20-20-4



Install a sling (Item 1) **[Figure 20-20-3]** or **[Figure 20-20-4]** and a lifting device to the rod end of the boom cylinder.

Testing (Cont'd)

Figure 20-20-5

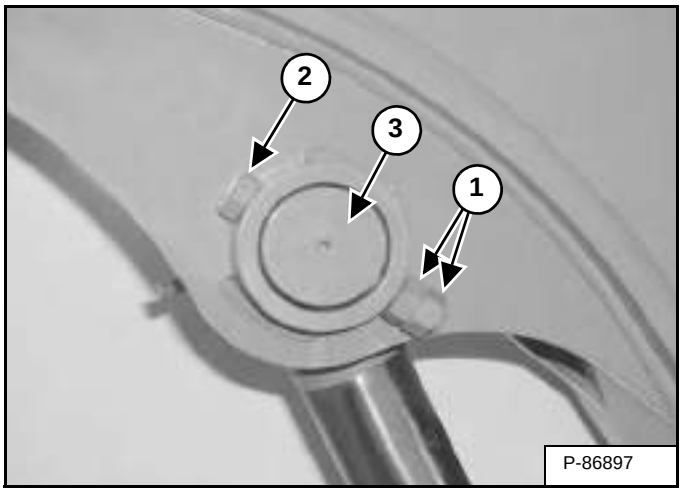
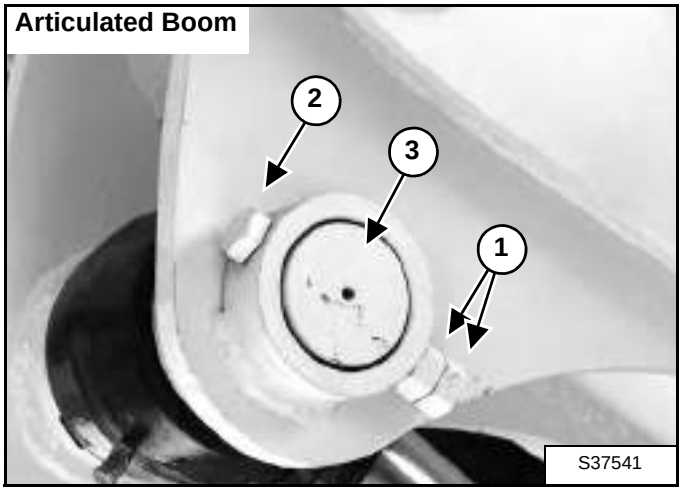


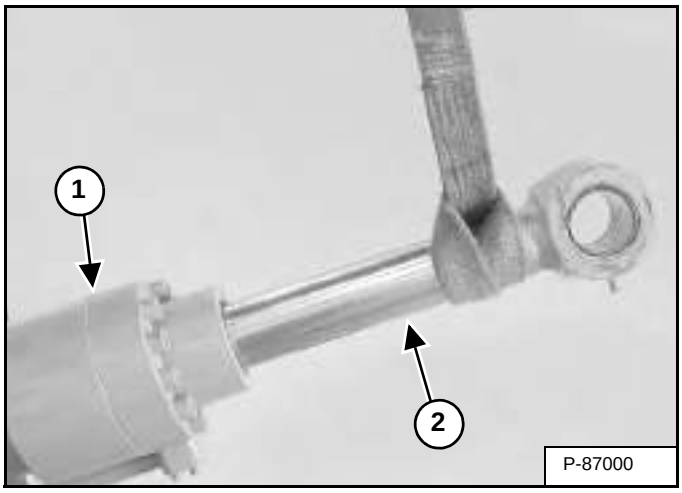
Figure 20-20-6



Remove the nuts (Item 1) and bolt (Item 2) **[Figure 20-20-5]** or **[Figure 20-20-6]**.

Remove the rod end pivot pin (Item 3) **[Figure 20-20-5]** or **[Figure 20-20-6]**.

Figure 20-20-7



Lower the cylinder (Item 1) **[Figure 20-20-7]**.

Start the engine and fully retract the cylinder rod (Item 2) **[Figure 20-20-7]**.

Stop the engine. Relieve hydraulic pressure.

⚠ WARNING

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

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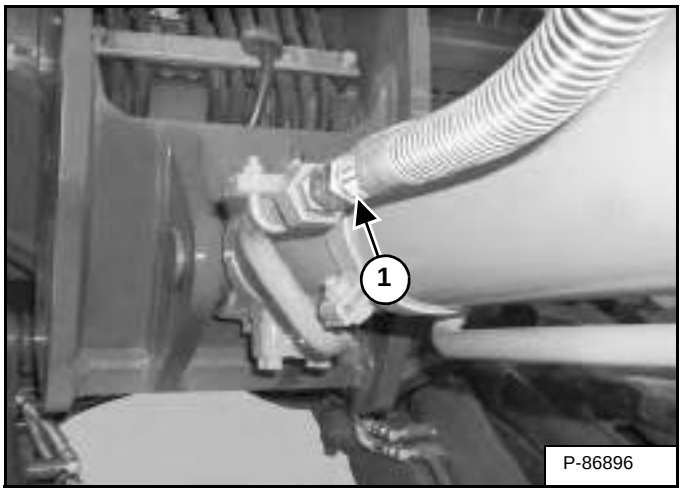
Testing (Cont'd)

Figure 20-20-8



Remove the hose from the base end of the cylinder. Cap the hose (Item 1) **[Figure 20-20-8]**.

Start the engine and move the hydraulic control lever to the boom cylinder retract position.

If there is any oil leakage from the base end fitting (Item 1) **[Figure 20-20-8]**, remove the cylinder for repair or replacement.

CYLINDER (BOOM) (CONT'D)

Removal And Installation

Lower the boom / bucket and blade to the ground.

With the engine off, turn the key to the ON position and move both hydraulic control levers to relieve hydraulic pressure.

Remove both articulated boom cylinders. (See Removal And Installation on page 20-25-3.) (Optional)

Figure 20-20-9

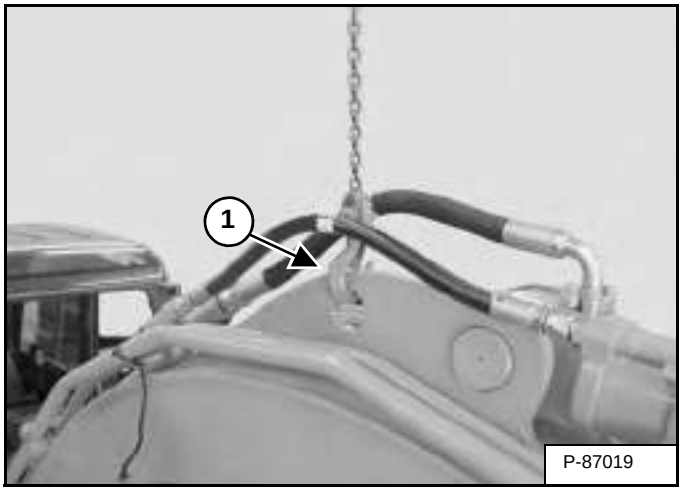
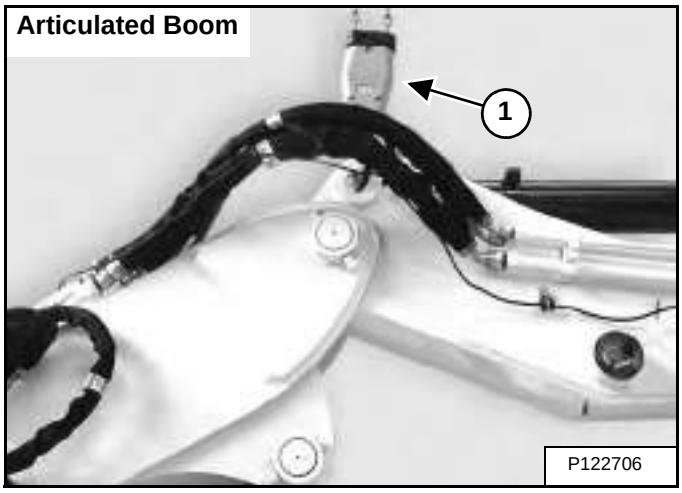


Figure 20-20-10



Support the boom with a chain hoist (Item 1) **[Figure 20-20-9]** or **[Figure 20-20-10]**.

Figure 20-20-11

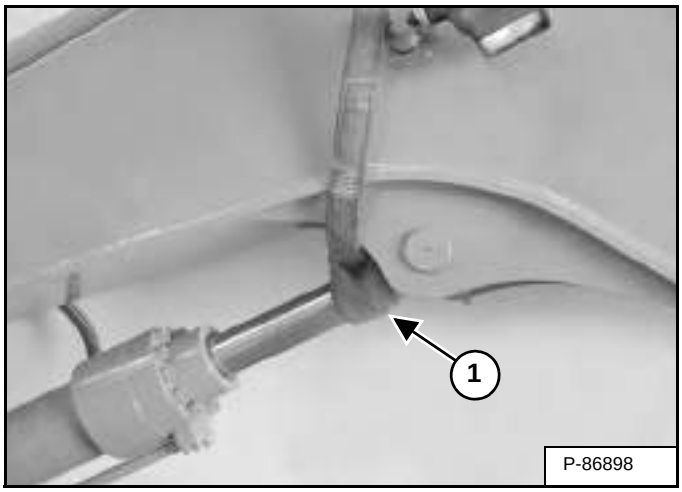
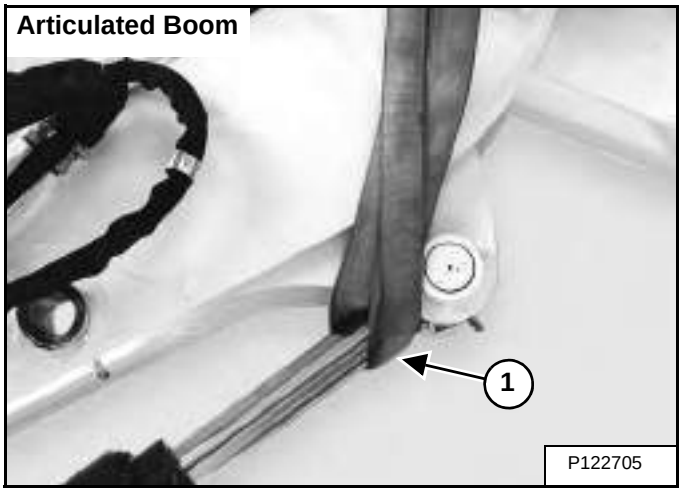


Figure 20-20-12



Install a sling (Item 1) **[Figure 20-20-11]** or **[Figure 20-20-12]** and a lifting device to the rod end of the boom cylinder.

Removal And Installation (Cont'd)

Figure 20-20-13

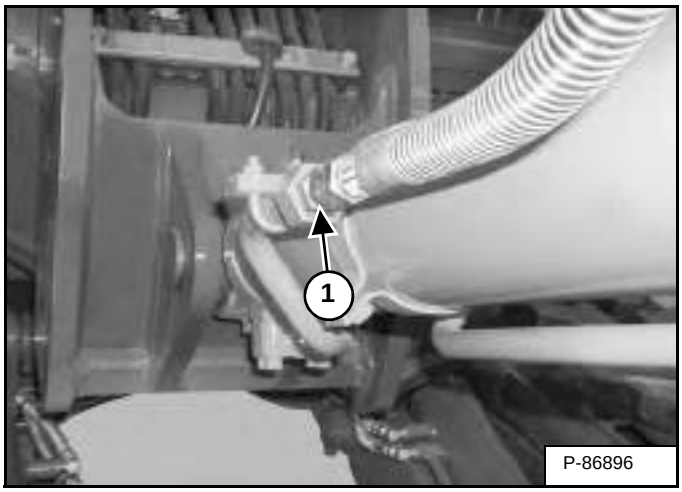
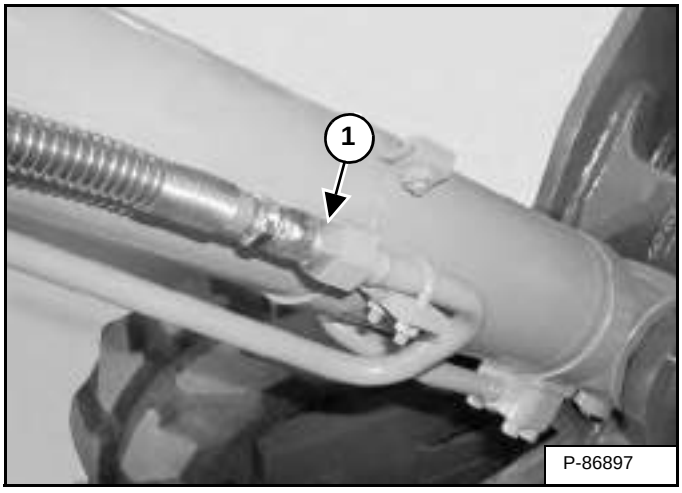


Figure 20-20-14



Remove the hoses (Item 1) **[Figure 20-20-13]** and **[Figure 20-20-14]**.

Figure 20-20-15

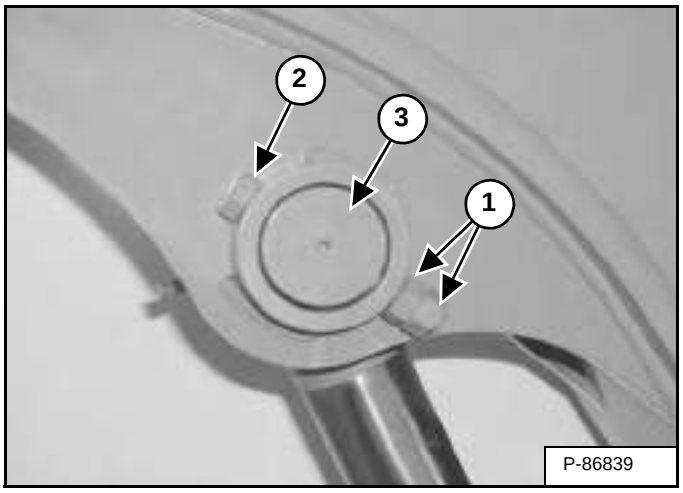
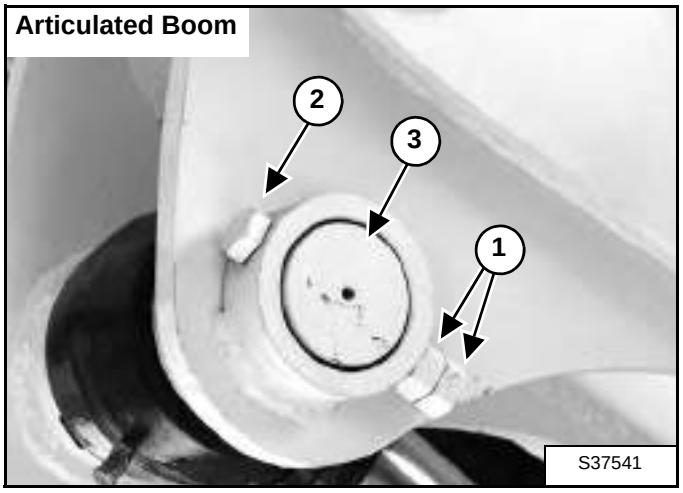


Figure 20-20-16

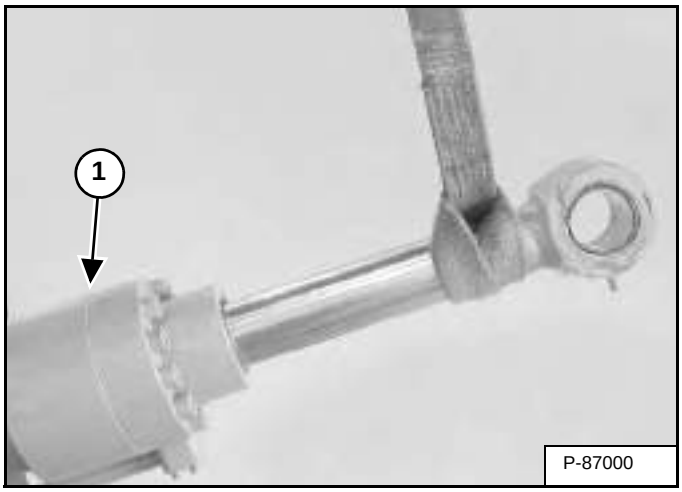


Remove the nuts (Item 1) and bolt (Item 2) **[Figure 20-20-15]**.

Remove the rod end pivot pin (Item 3) **[Figure 20-20-15]**.

Removal And Installation (Cont'd)

Figure 20-20-17



Lower the cylinder (Item 1) **[Figure 20-20-17]** until it rests on the blade.

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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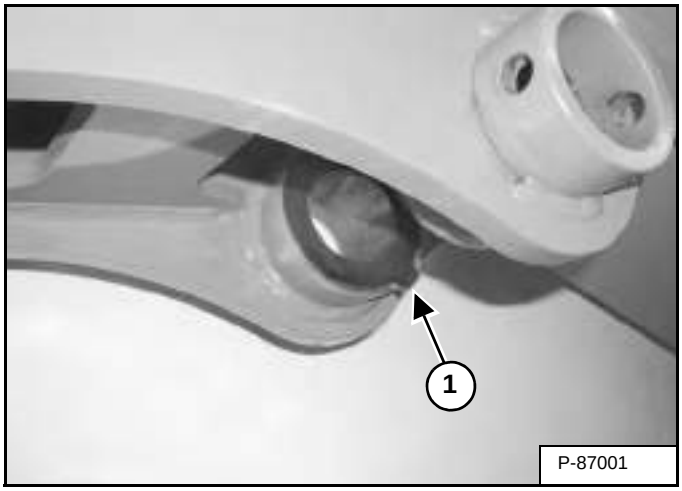
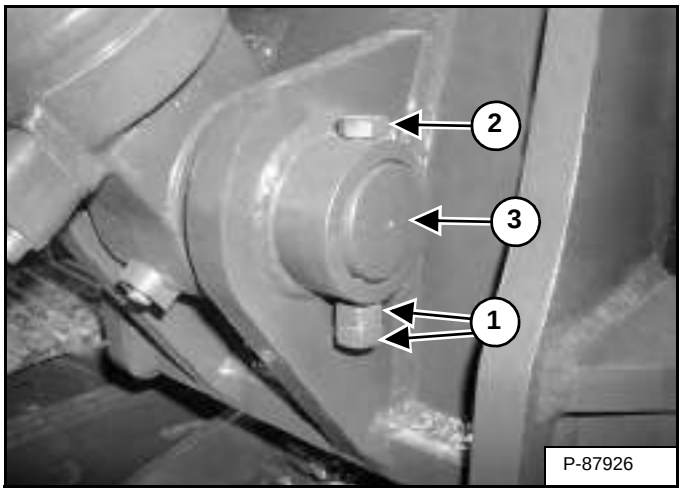
Figure 20-20-18



Remove the shims (Item 1) **[Figure 20-20-18]** from both sides.

Figure 20-20-19



Remove the nuts (Item 1) and bolt (Item 2) **[Figure 20-20-19]**.

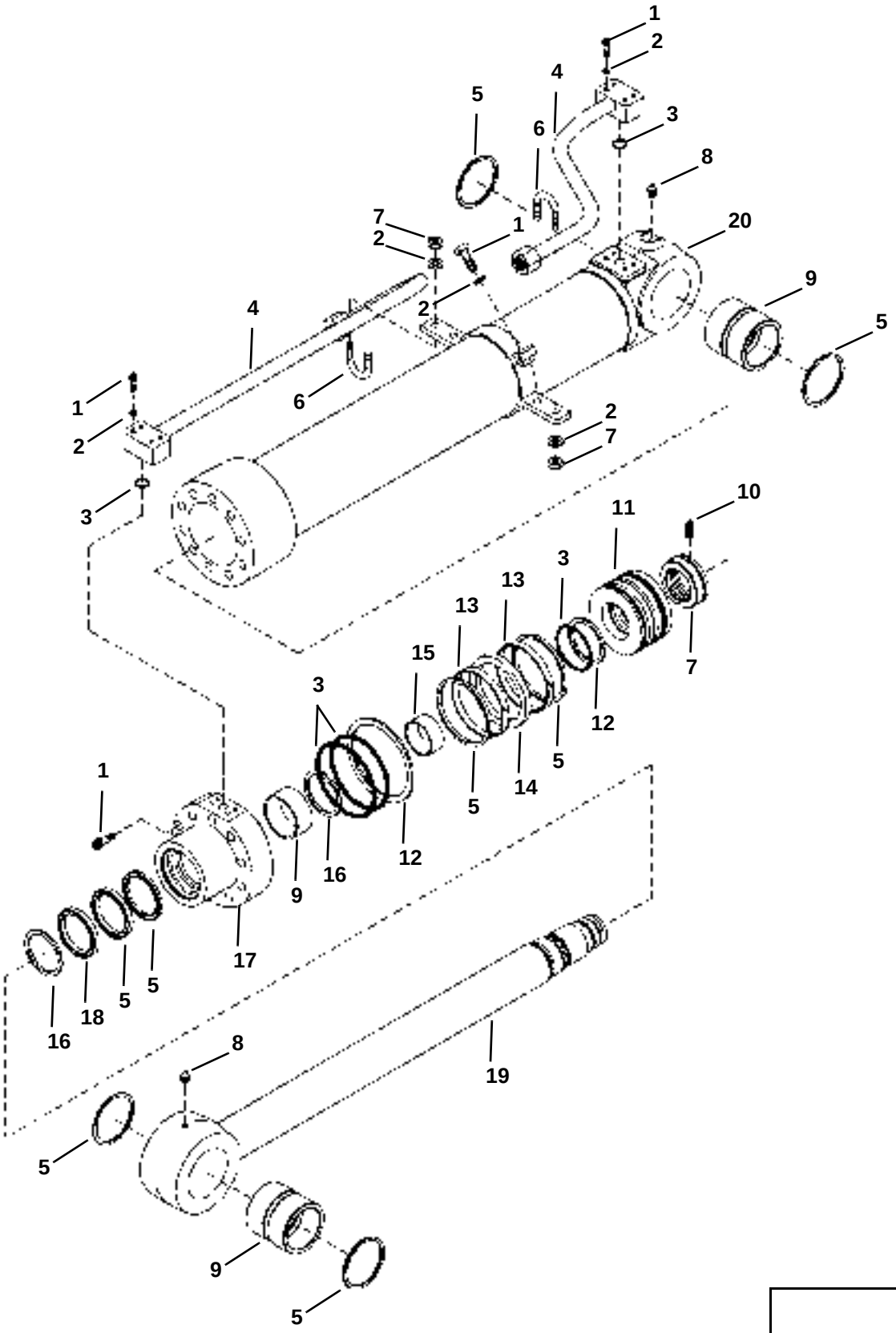
Remove the base end pivot pin (Item 3) **[Figure 20-20-19]**.

Figure 20-20-20

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

Parts Identification

1. Bolt
2. Washer
3. O-ring
4. Tubeline
5. Seal
6. U-bolt
7. Nut
8. Grease Fitting
9. Bushing
10. Set Screw
11. Piston
12. Back-up Ring
13. Wear Ring
14. Seal Assembly
15. Cushion Ring
16. Snap Ring
17. Head
18. Wiper Seal
19. Rod
20. Housing



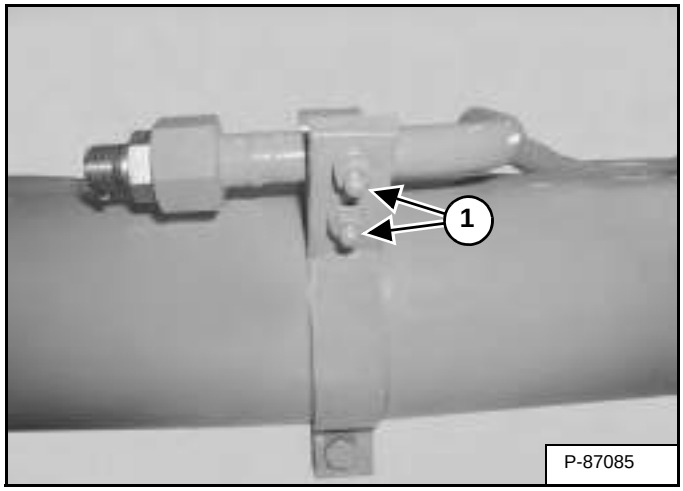
Disassembly

Use the following tools to disassemble the cylinder:

MEL1074 - O-ring Seal Hook

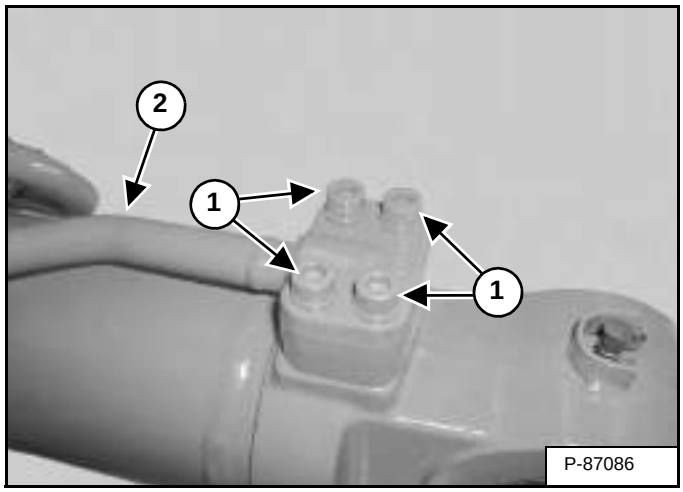
Hold the hydraulic cylinder over a drain pan and slowly move the rod in and out to remove the fluid from the cylinder.

Figure 20-20-21



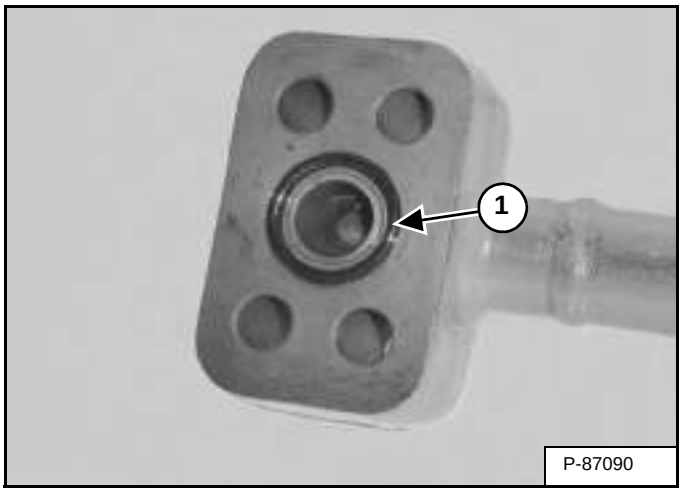
Remove the two nuts (Item 1) **[Figure 20-20-21]**, lock washers and U-bolt.

Figure 20-20-22



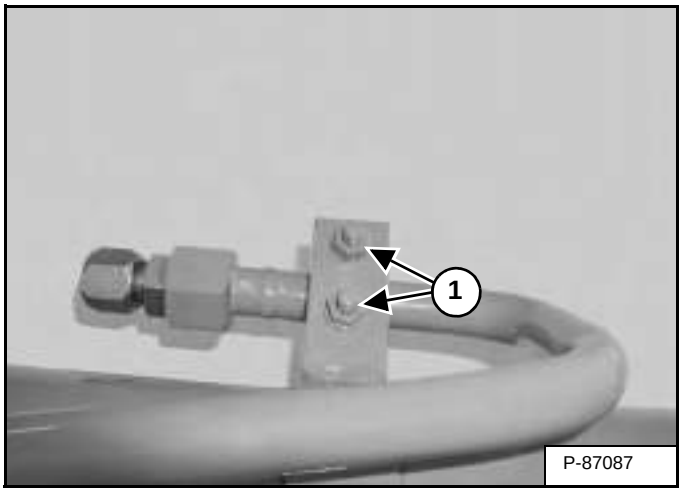
Remove the four bolts (Item 1) and the tubeline (Item 2) **[Figure 20-20-22]**.

Figure 20-20-23



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

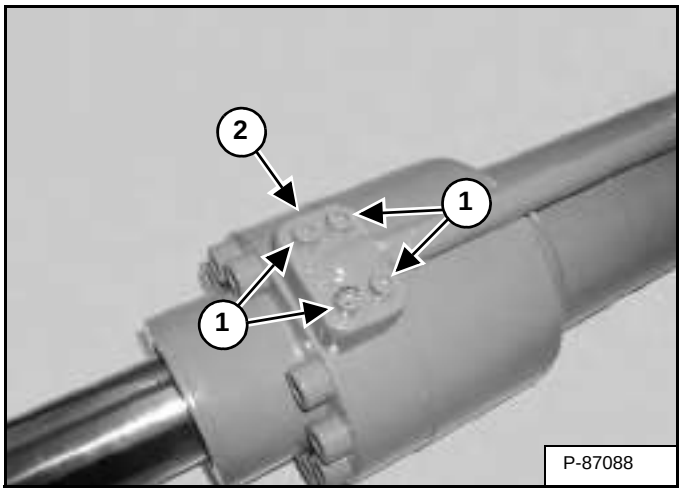
Figure 20-20-24



Remove the two nuts (Item 1) **[Figure 20-20-24]**, lock washers and U-bolt.

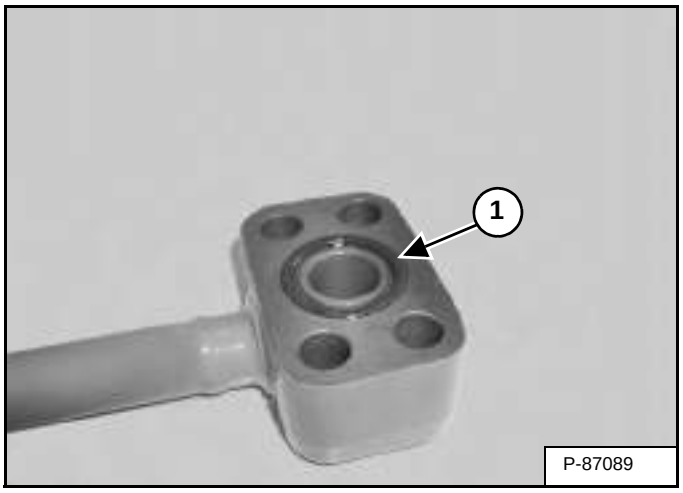
Disassembly (Cont'd)

Figure 20-20-25



Remove the four bolts (Item 1), lock washers and tubeline (Item 2) **[Figure 20-20-25]**.

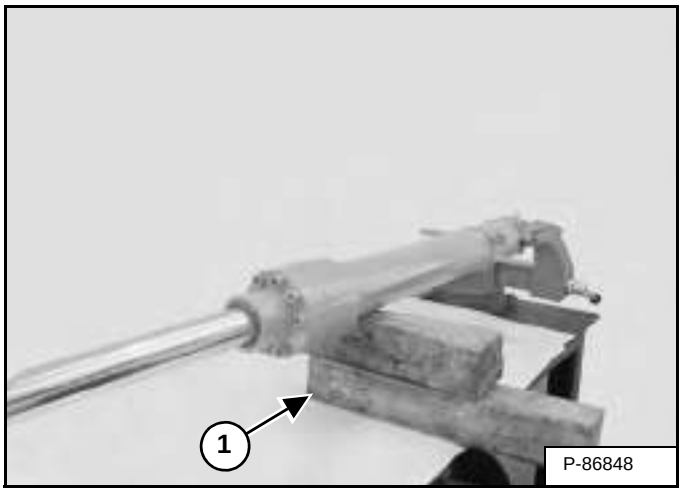
Figure 20-20-26



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

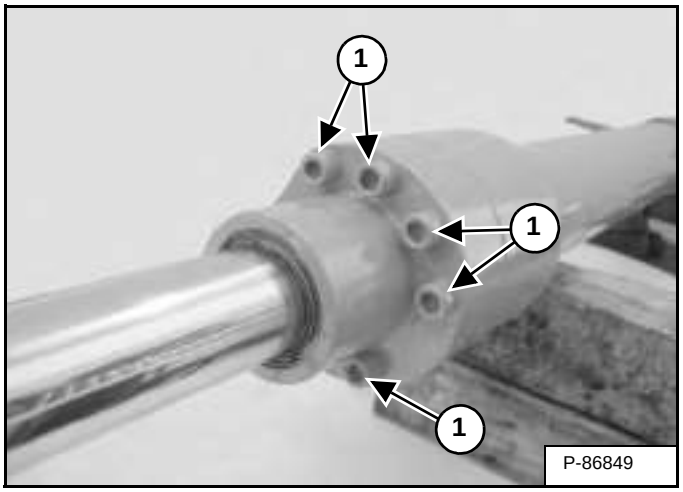
Clamp the base end of the cylinder in a vise.

Figure 20-20-27



Support the cylinder with a block (Item 1) **[Figure 20-20-27]**.

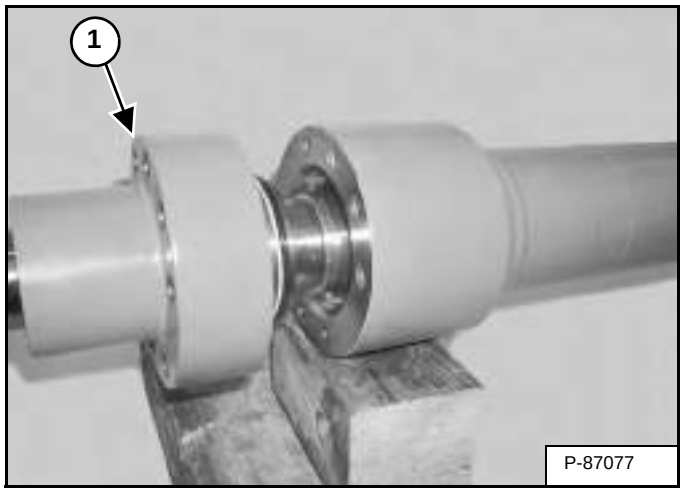
Figure 20-20-28



Remove the eight bolts (Item 1) **[Figure 20-20-28]**.

Disassembly (Cont'd)

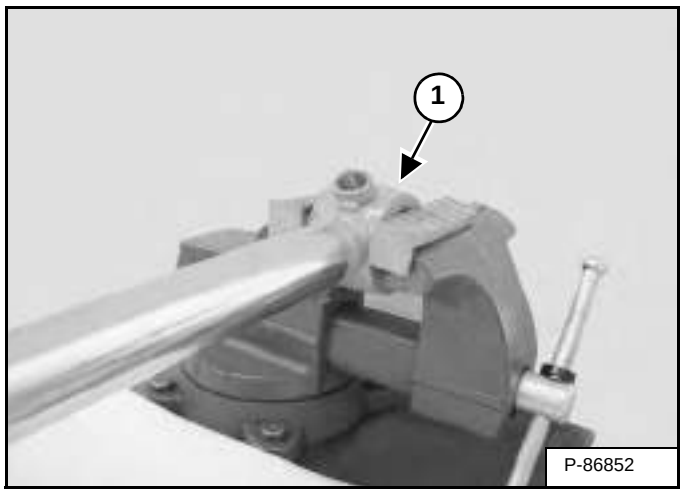
Figure 20-20-29



Remove the rod assembly (Item 1) **[Figure 20-20-29]** from the cylinder housing.

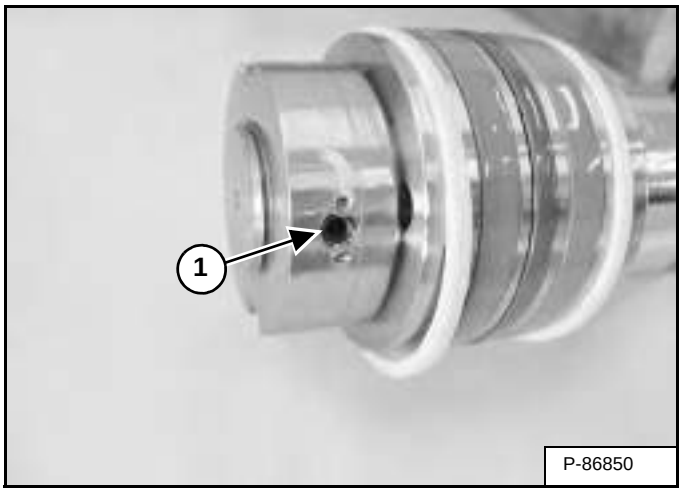
Remove the cylinder housing from the vise.

Figure 20-20-30



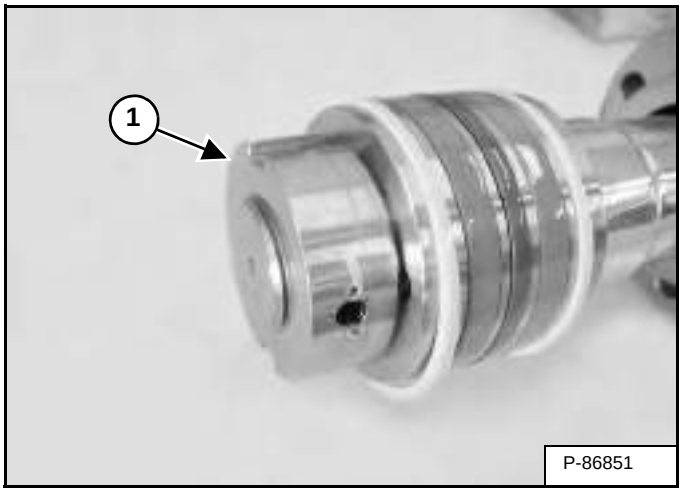
Clamp the rod end (Item 1) in a vise **[Figure 20-20-30]**.

Figure 20-20-31



Remove the set screw (Item 1) **[Figure 20-20-31]**.

Figure 20-20-32

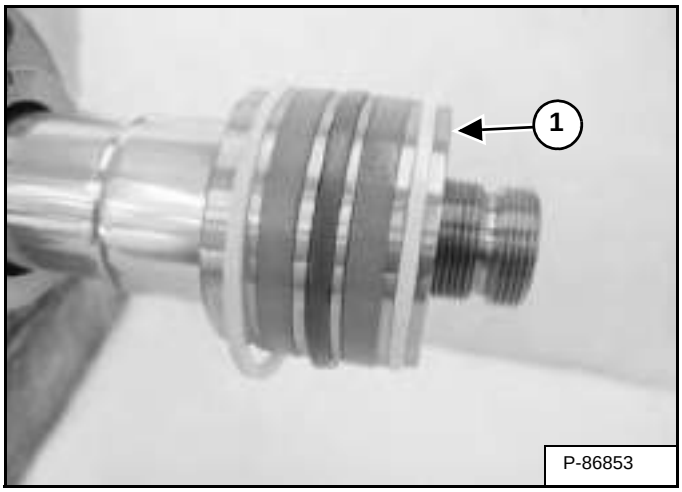


Apply moderate heat to the nut (Item 1) **[Figure 20-20-32]**.

Remove the nut.

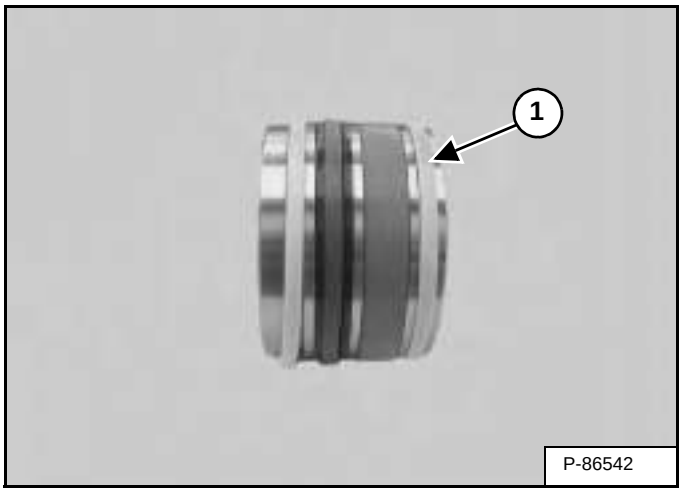
Disassembly (Cont'd)

Figure 20-20-33



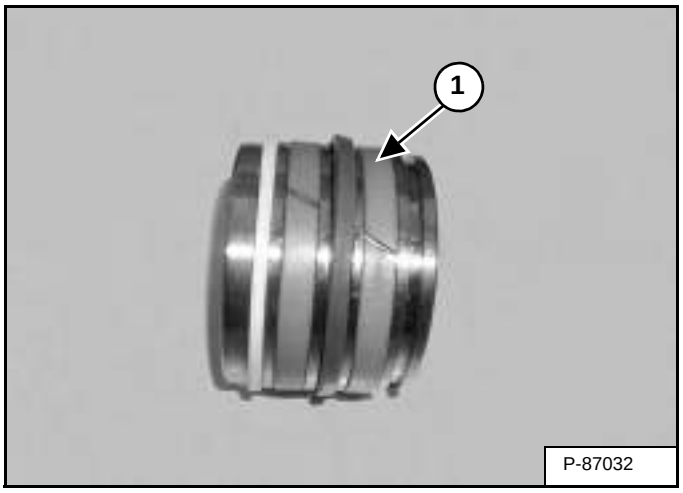
Remove the piston (Item 1) **[Figure 20-20-33]**.

Figure 20-20-34



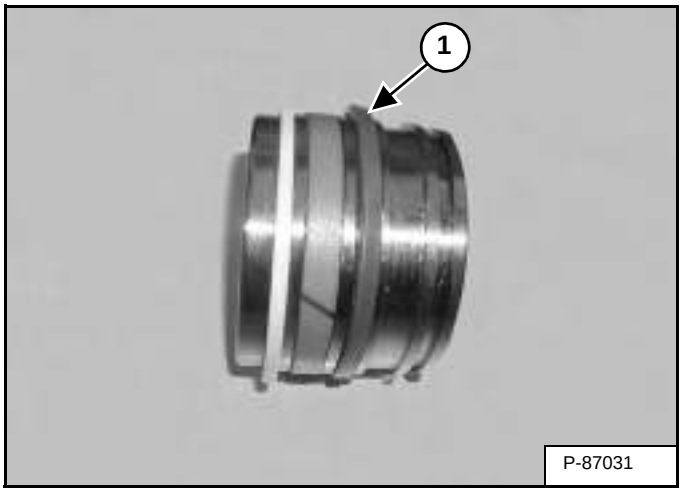
Remove the seal (Item 1) **[Figure 20-20-34]** from the piston.

Figure 20-20-35



Remove the wear ring (Item 1) **[Figure 20-20-35]** from the piston.

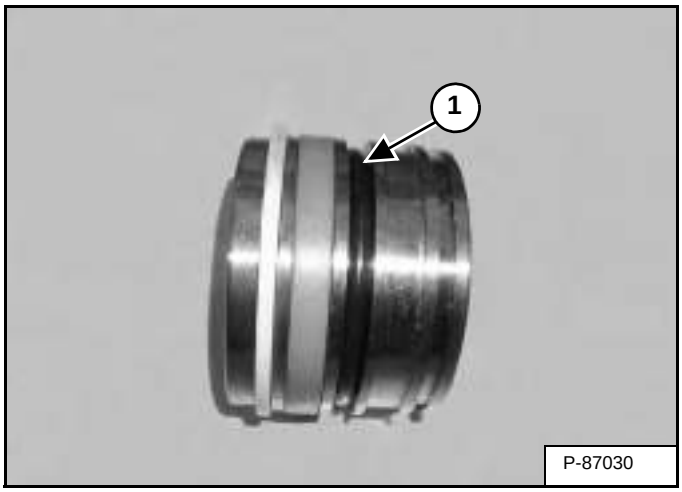
Figure 20-20-36



Remove the seal (Item 1) **[Figure 20-20-36]**.

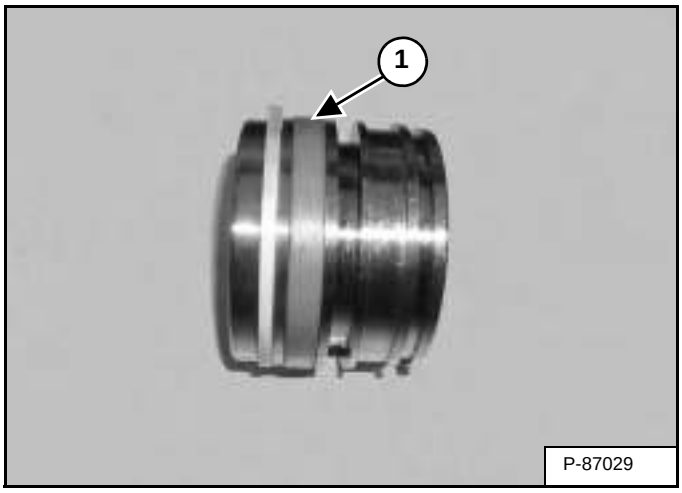
Disassembly (Cont'd)

Figure 20-20-37



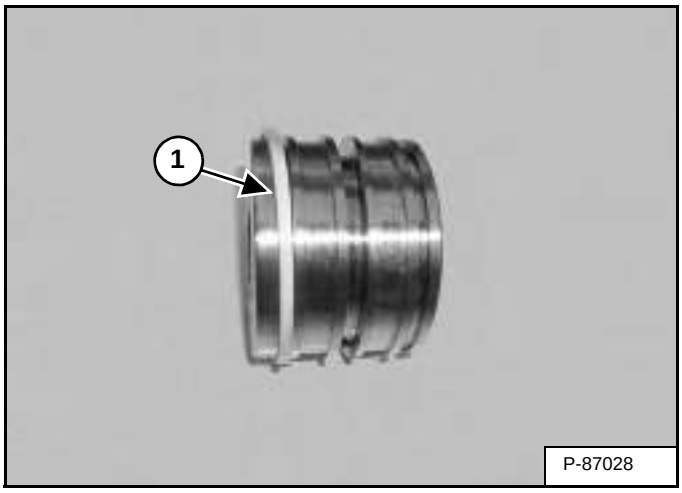
Remove O-ring (Item 1) **[Figure 20-20-37]** from the piston.

Figure 20-20-38



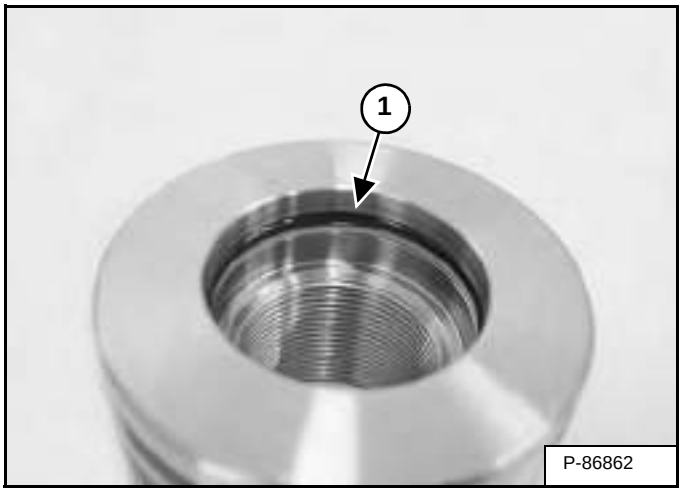
Remove the wear ring (Item 1) **[Figure 20-20-38]** from the piston.

Figure 20-20-39



Remove the seal (Item 1) **[Figure 20-20-39]** from the piston.

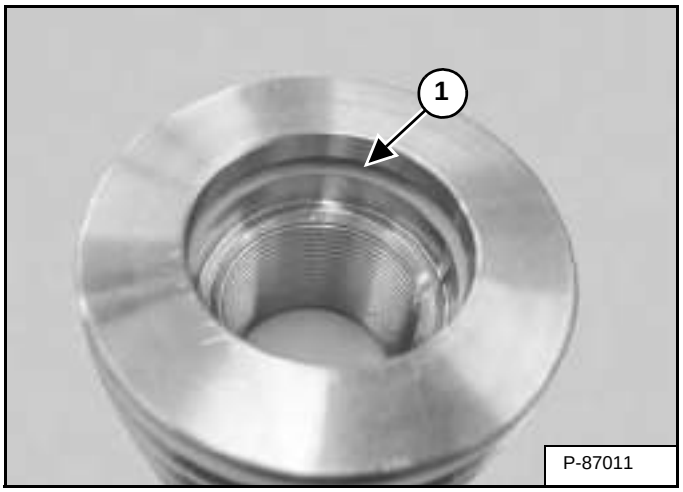
Figure 20-20-40



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

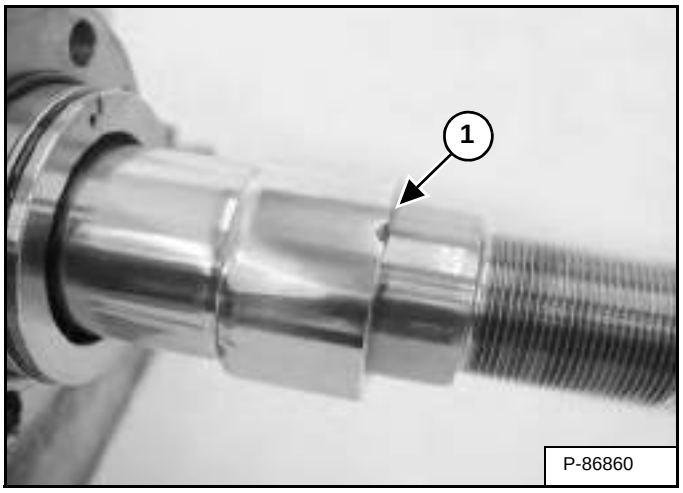
Disassembly (Cont'd)

Figure 20-20-41



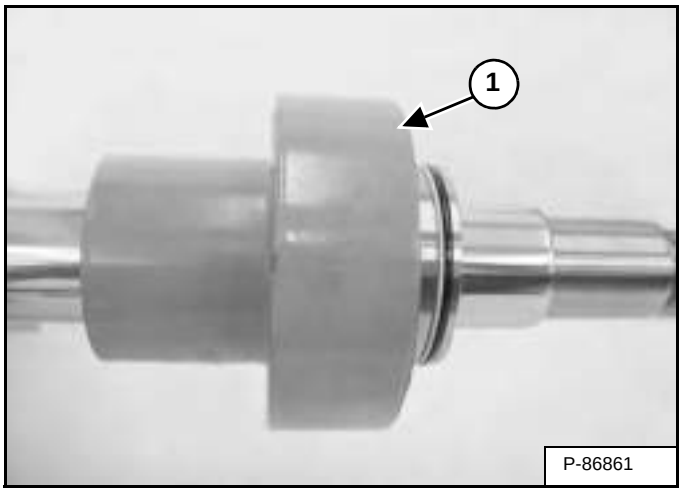
Remove the back-up ring (Item 1) **[Figure 20-20-41]** from the piston.

Figure 20-20-42



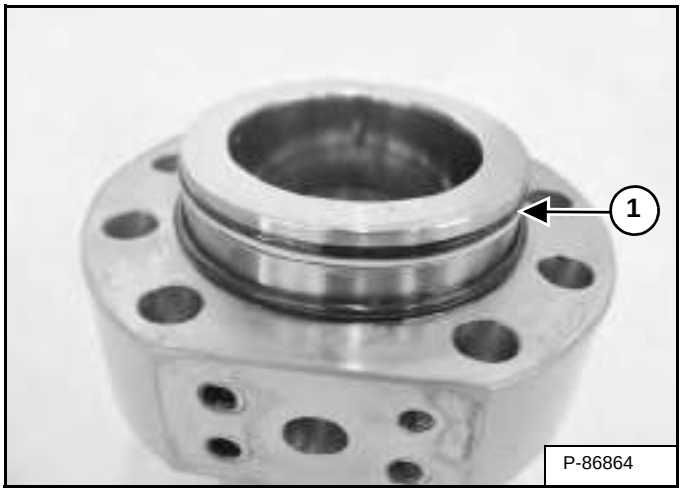
Remove the cushion ring (Item 1) **[Figure 20-20-42]** from the rod.

Figure 20-20-43



Remove the head (Item 1) **[Figure 20-20-43]** from the rod.

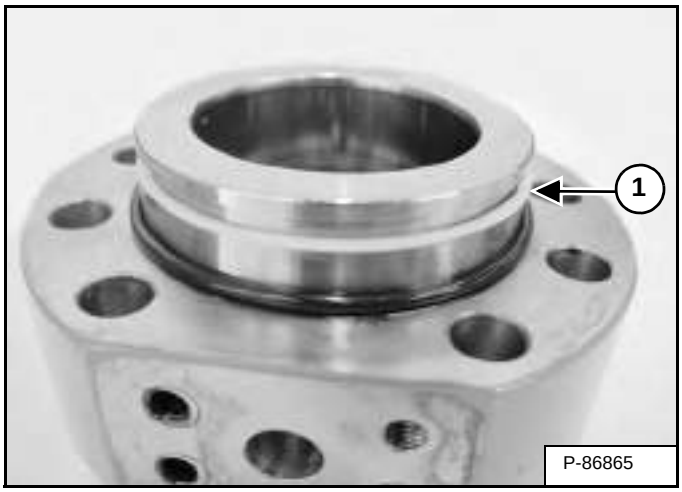
Figure 20-20-44



Remove the O-ring (Item 1) **[Figure 20-20-44]**.

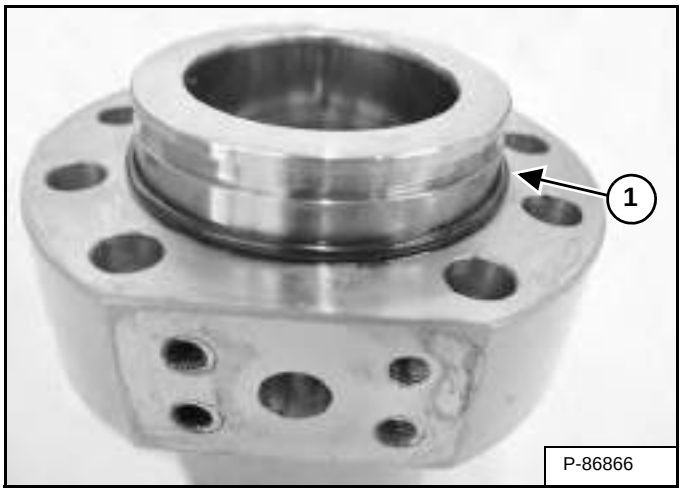
Disassembly (Cont'd)

Figure 20-20-45



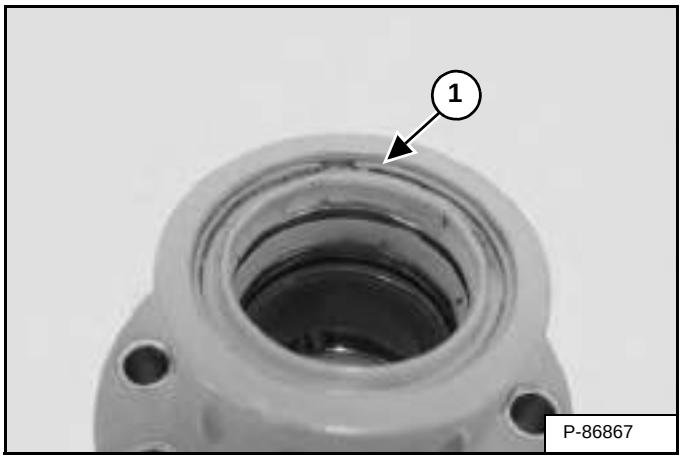
Remove the back-up ring (Item 1) **[Figure 20-20-45]**.

Figure 20-20-46



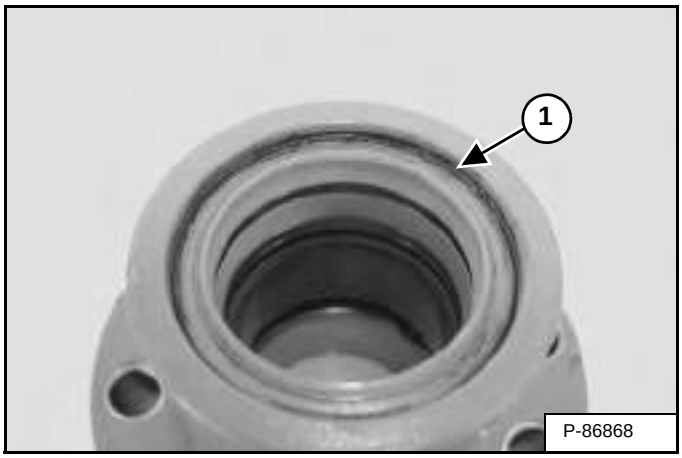
Remove the O-ring (Item 1) **[Figure 20-20-46]**.

Figure 20-20-47



Remove the snap ring (Item 1) **[Figure 20-20-47]**.

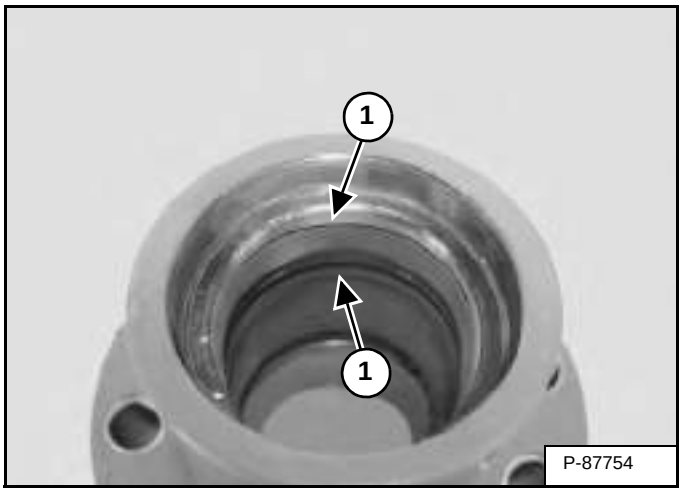
Figure 20-20-48



Remove the wiper seal (Item 1) **[Figure 20-20-48]**.

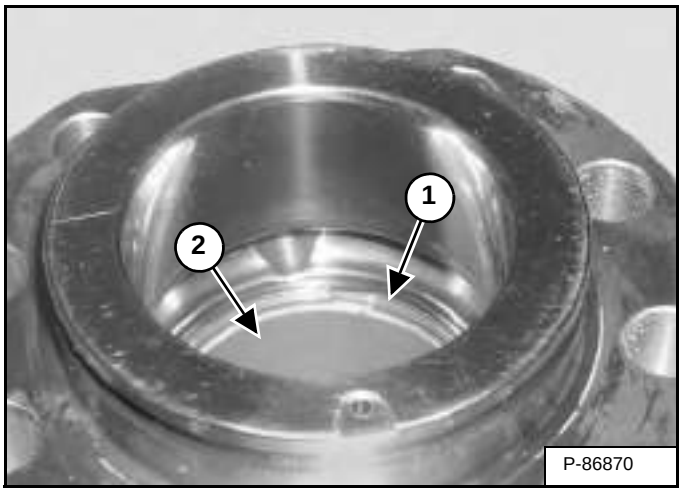
Disassembly (Cont'd)

Figure 20-20-49



Remove the two seals (Item 1) **[Figure 20-20-49]**.

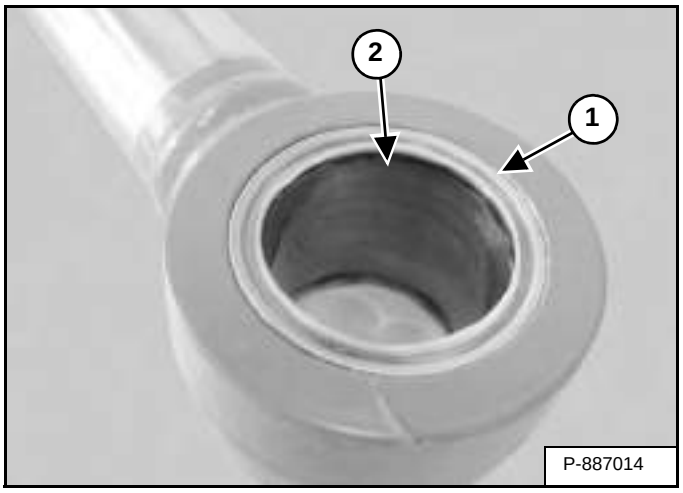
Figure 20-20-50



Remove the snap ring (Item 1) and bushing (Item 2) **[Figure 20-20-50]**.

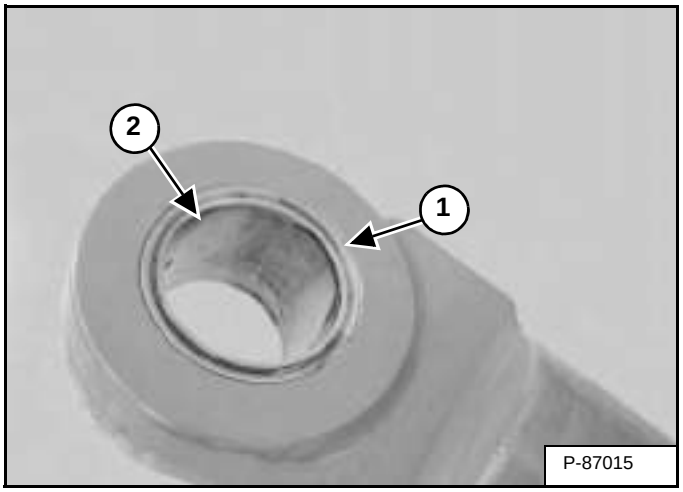
Remove the rod from the vise.

Figure 20-20-51



Remove the seal (Item 1) (both sides) and bushing (Item 2) **[Figure 20-20-51]** from the rod end.

Figure 20-20-52



Remove the seal (Item 1) (both sides) and bushing (Item 2) **[Figure 20-20-52]** from the base end.

Assembly

Use the following tools to assemble the cylinder:

MEL1396 - Universal Seal Expander
MEL1033 - Rod Seal Installation Tool
MEL1369-2 - Piston Ring Compressor

Wash the cylinder parts in clean solvent and dry with compressed air.

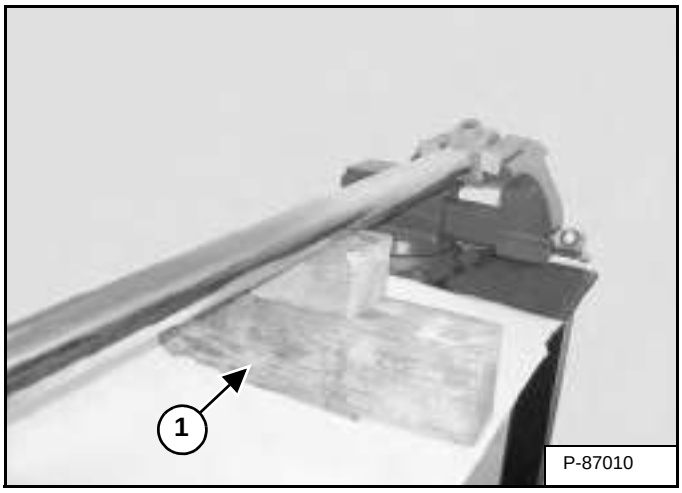
Inspect the cylinder parts for nicks, scratches and other damage. Replace any damaged parts.

Always install new O-rings and seals during assembly.

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

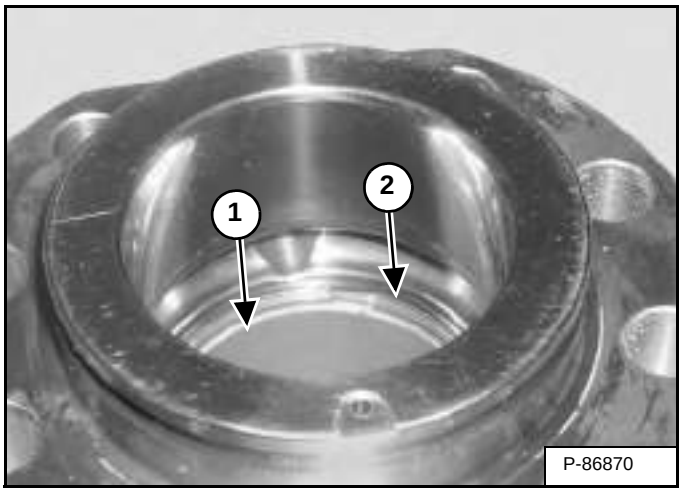
Clamp the rod end in a vise.

Figure 20-20-53



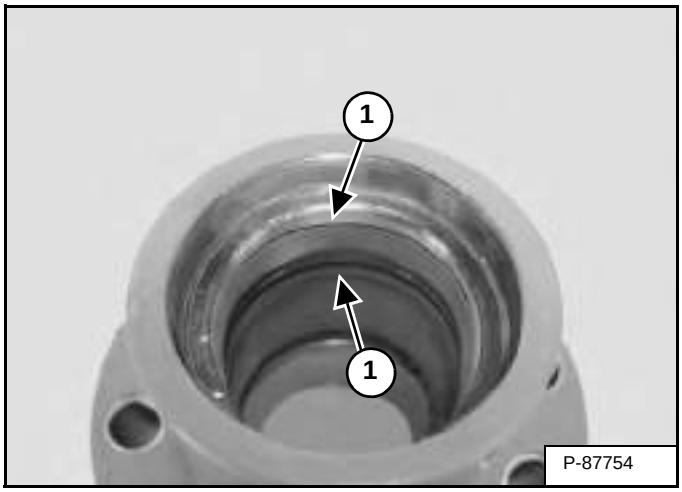
Support the end of the rod with a block (Item 1) **[Figure 20-20-53]**.

Figure 20-20-54



Install the bushing (Item 1) and snap ring (Item 2) **[Figure 20-20-54]** into the head.

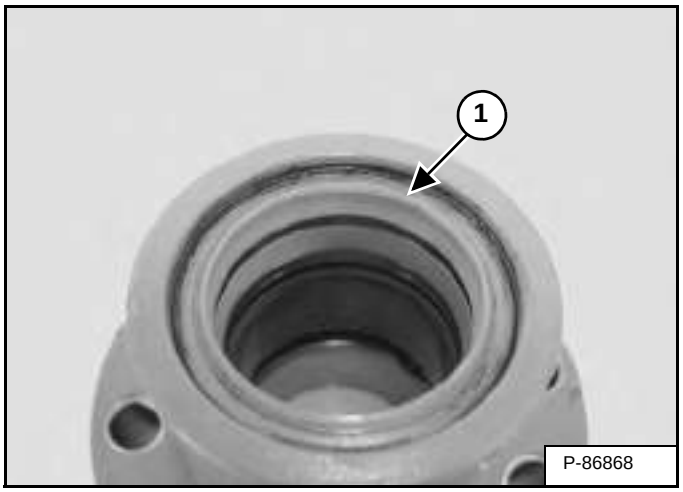
Figure 20-20-55



Install the two seals (Item 1) **[Figure 20-20-55]** into the head.

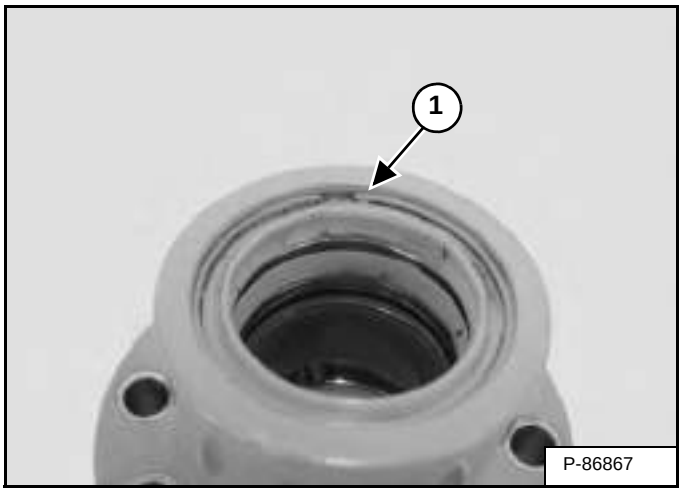
Assembly (Cont'd)

Figure 20-20-56



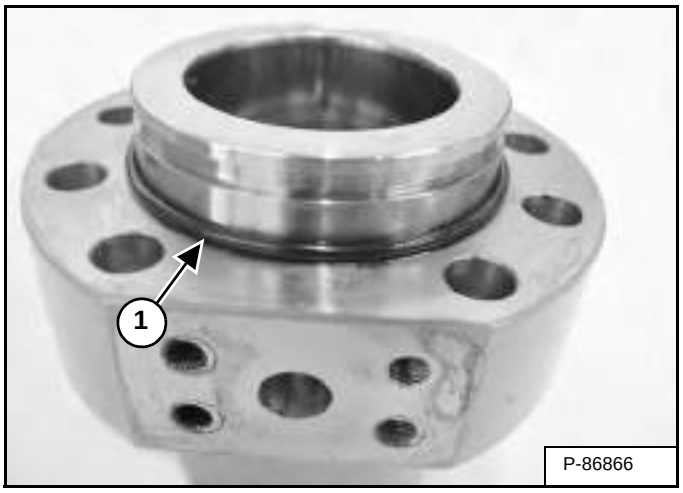
Install the wiper seal (Item 1) **[Figure 20-20-56]** into the head.

Figure 20-20-57



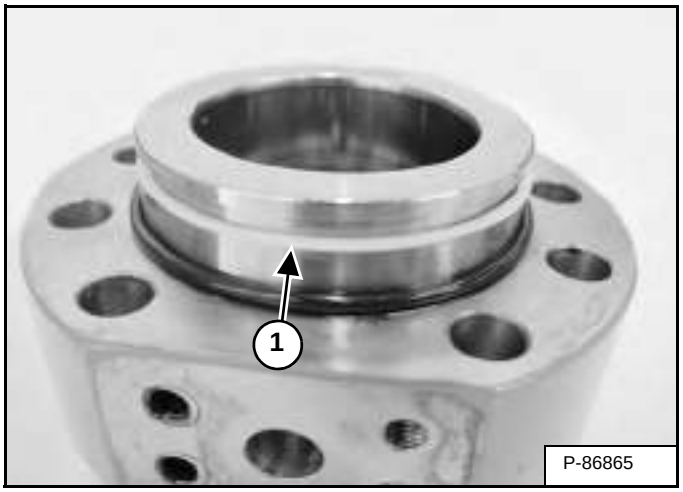
Install the snap ring (Item 1) **[Figure 20-20-57]** into the head.

Figure 20-20-58



Install the O-ring (Item 1) **[Figure 20-20-58]** onto the head.

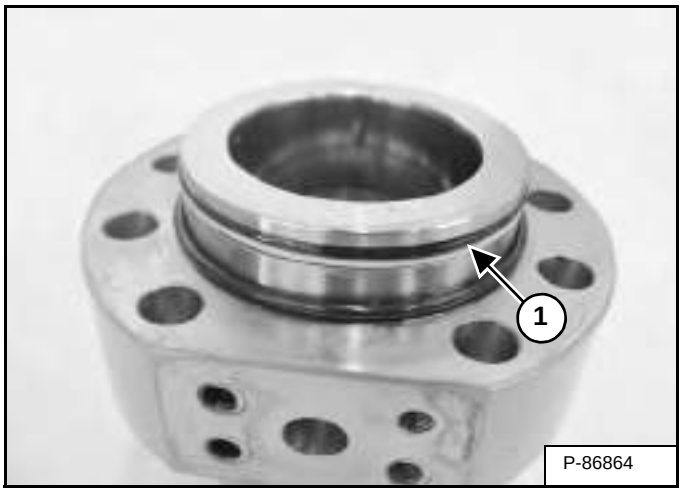
Figure 20-20-59



Install the back-up ring (Item 1) **[Figure 20-20-59]** onto the head.

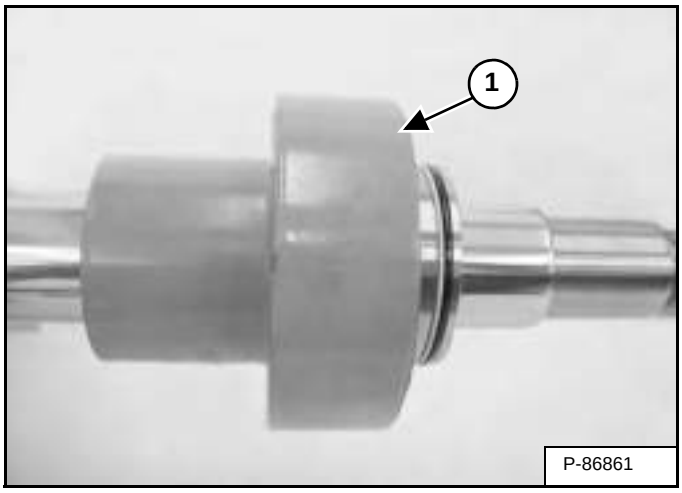
Assembly (Cont'd)

Figure 20-20-60



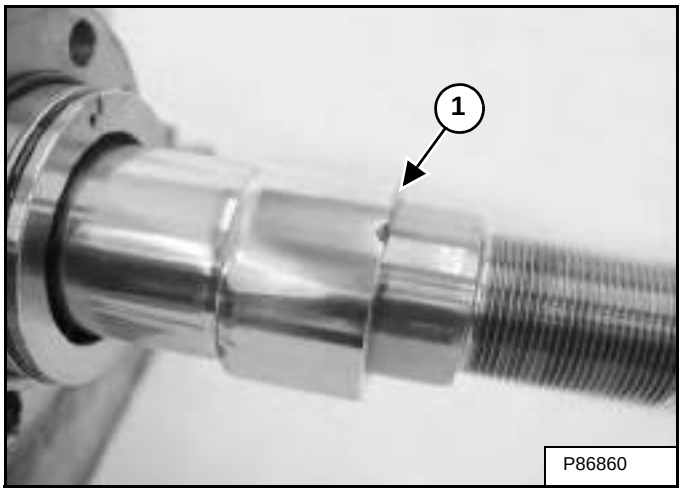
Install the O-ring (Item 1) **[Figure 20-20-60]**.

Figure 20-20-61



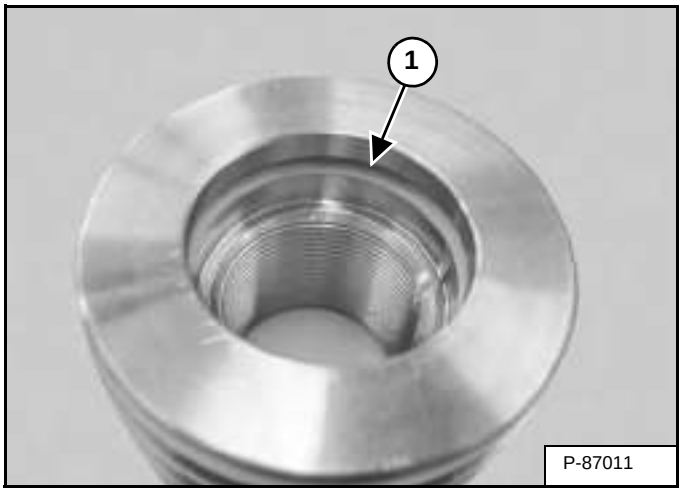
Install the head (Item 1) **[Figure 20-20-61]** onto the rod.

Figure 20-20-62



Install the cushion ring (Item 1) **[Figure 20-20-62]** onto the rod.

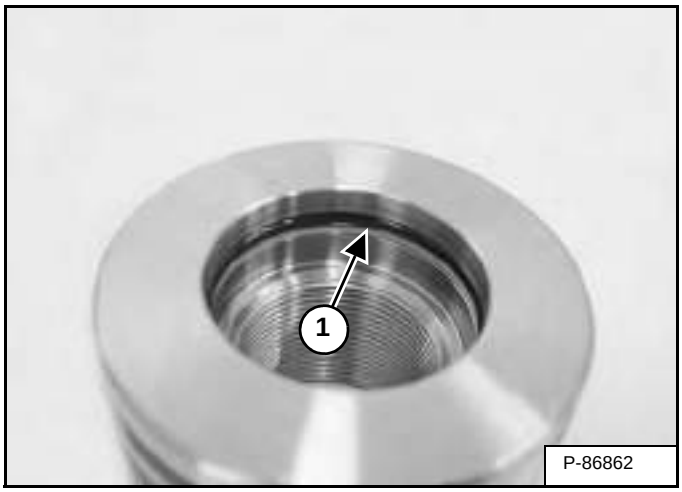
Figure 20-20-63



Install the back-up ring (Item 1) **[Figure 20-20-63]** into the piston.

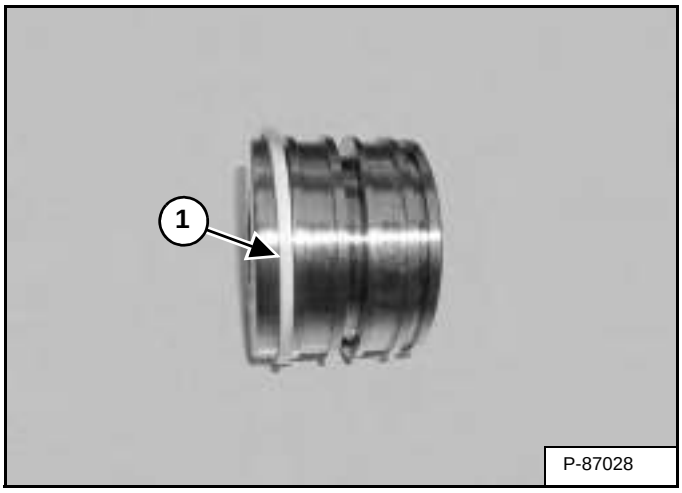
Assembly (Cont'd)

Figure 20-20-64



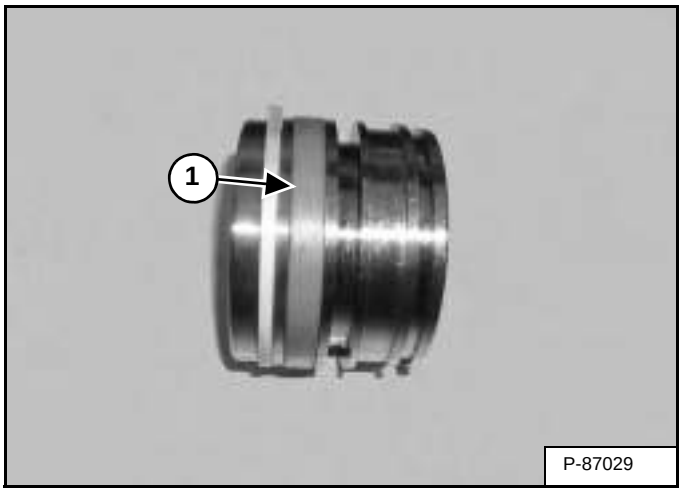
Install the O-ring (Item 1) **[Figure 20-20-64]** into the piston.

Figure 20-20-65



Install the seal (Item 1) **[Figure 20-20-65]** onto the piston.

Figure 20-20-66



Install the wear ring (Item 1) **[Figure 20-20-66]** onto the piston.

Figure 20-20-67

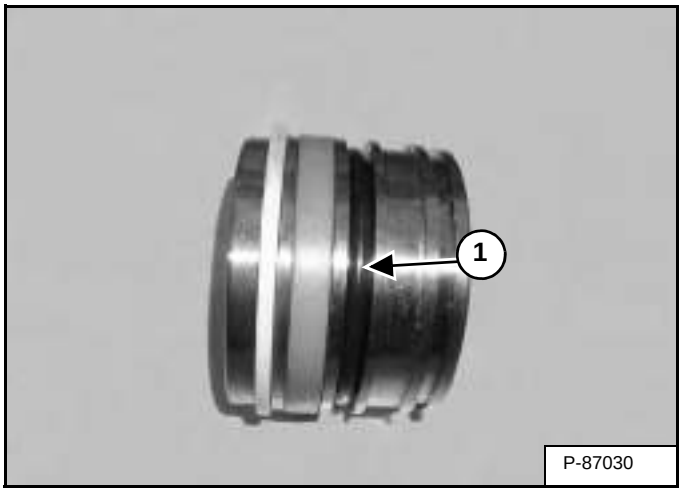
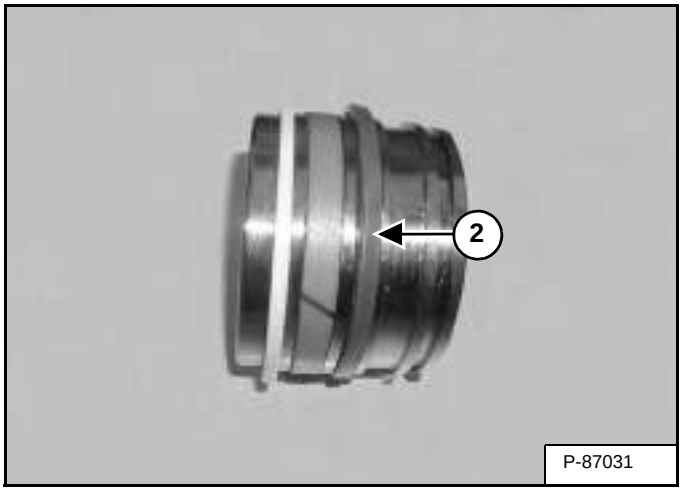


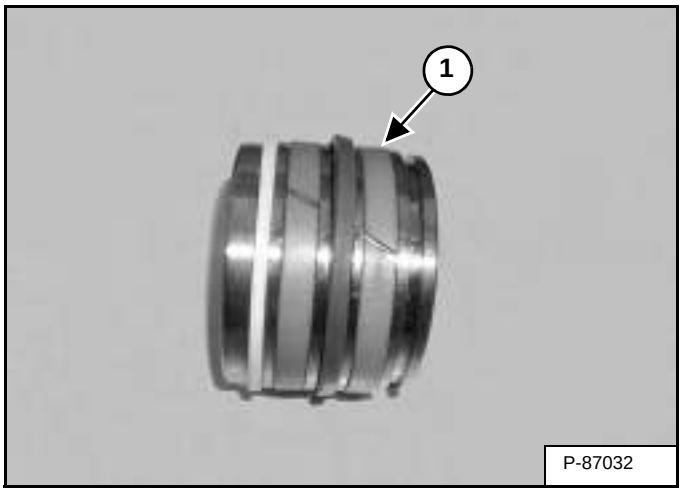
Figure 20-20-68



Install the O-ring (Item 1) **[Figure 20-20-67]** and seal (Item 2) **[Figure 20-20-68]** onto the piston.

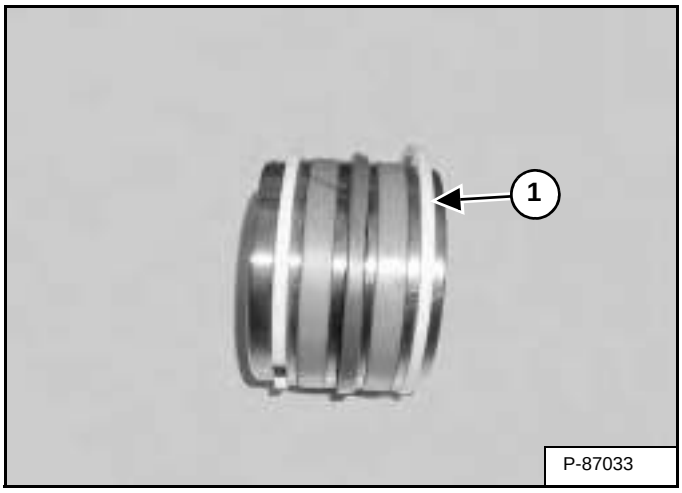
Assembly (Cont'd)

Figure 20-20-69



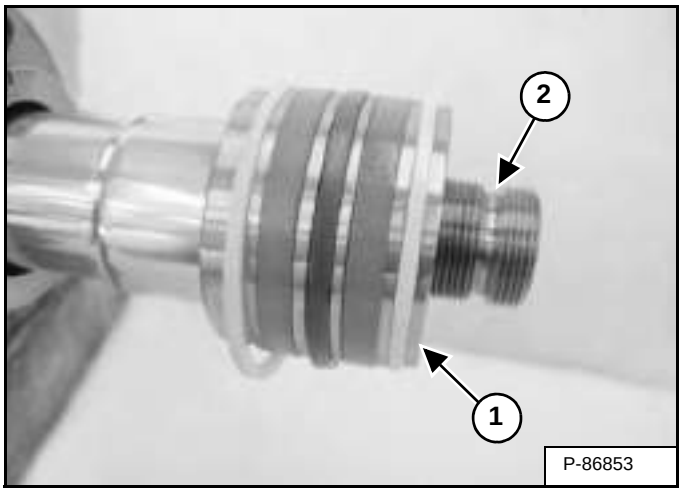
Install the wear ring (Item 1) **[Figure 20-20-69]** onto the piston.

Figure 20-20-70



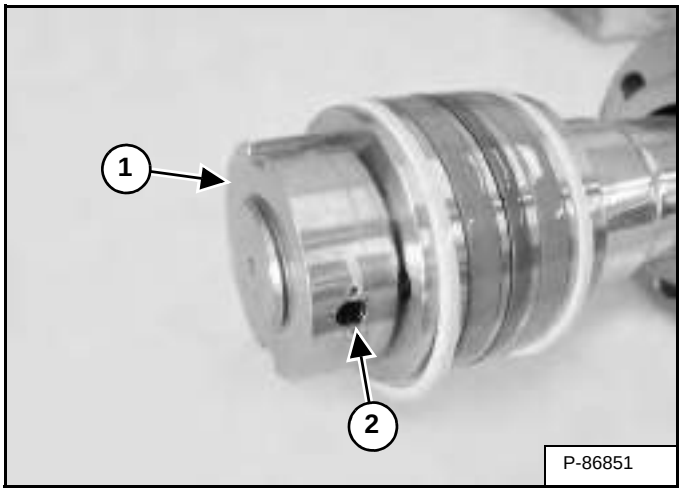
Install the seal (Item 1) **[Figure 20-20-70]** onto the piston.

Figure 20-20-71



Install the piston (Item 1) **[Figure 20-20-71]** onto the rod.

Figure 20-20-72

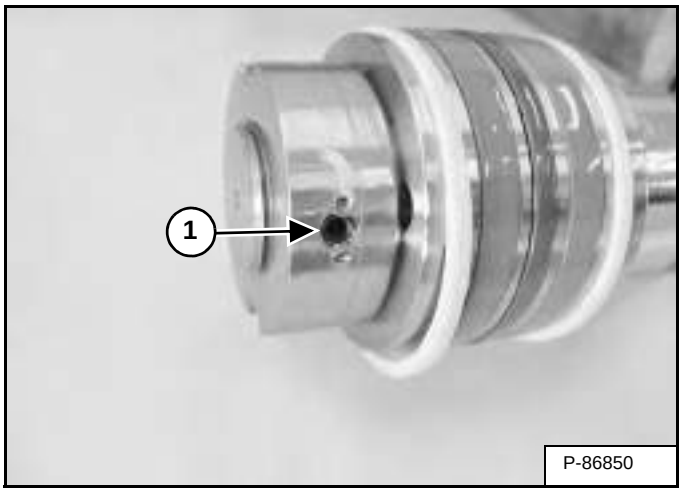


Install the nut (Item 1) **[Figure 20-20-72]**.

Tighten the nut until the bore (Item 2) **[Figure 20-20-72]** of the set screw is aligned with the groove (Item 2) **[Figure 20-20-71]** of the rod.

Assembly (Cont'd)

Figure 20-20-73

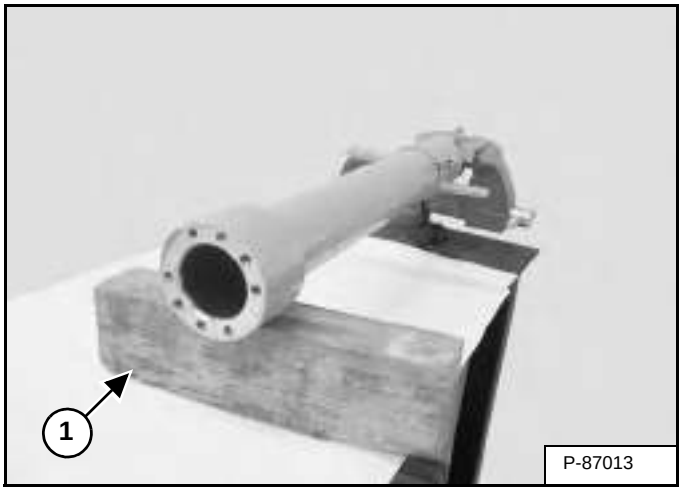


Install the set screw (Item 1) **[Figure 20-20-73]** into the nut.

Use a center punch to deform the threads of the set screw bore.

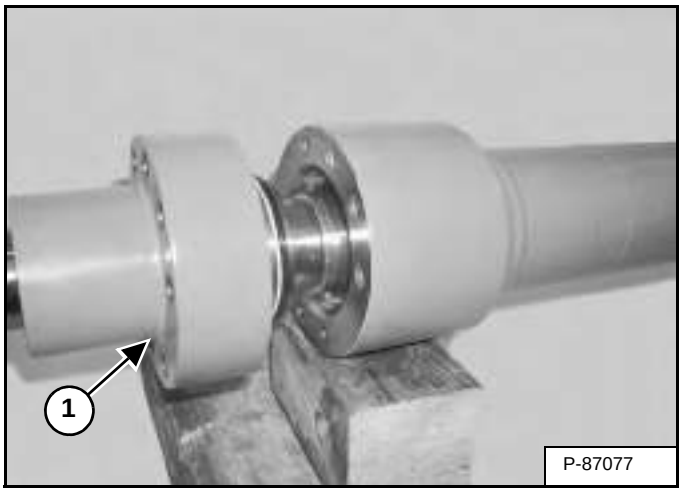
Remove the rod end from the vise.

Figure 20-20-74



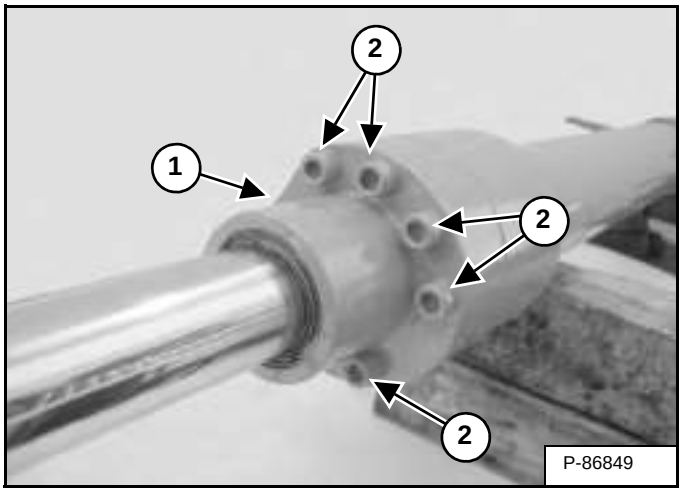
Support the housing with a block (Item 1) **[Figure 20-20-74]**.

Figure 20-20-75



Install the rod assembly (Item 1) **[Figure 20-20-75]** into the cylinder housing.

Figure 20-20-76

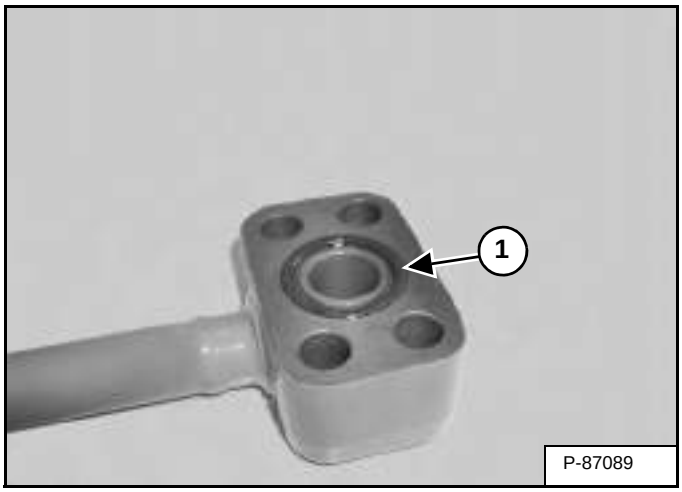


Install the head (Item 1) using the eight bolts (Item 2) **[Figure 20-20-76]**.

Tighten the bolts to 190 - 210 N•m (140 - 155 ft-lb) torque.

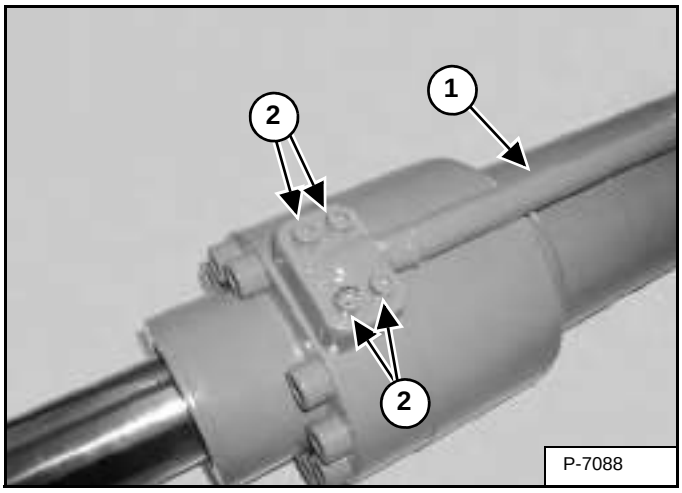
Assembly (Cont'd)

Figure 20-20-77



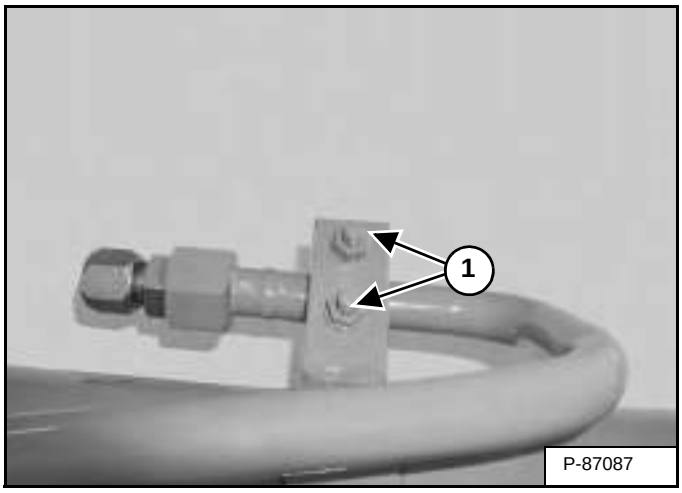
Install the O-ring (Item 1) **[Figure 20-20-77]** into the tubeline.

Figure 20-20-78



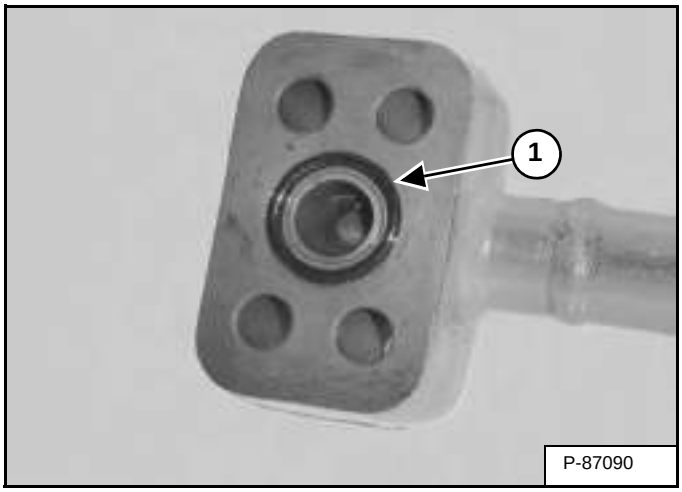
Install the tubeline (Item 1), lock washers and bolts (Item 2) **[Figure 20-20-78]** onto the cylinder housing.

Figure 20-20-79



Install the U-bolt, lock washers and nuts (Item 1) **[Figure 20-20-79]**.

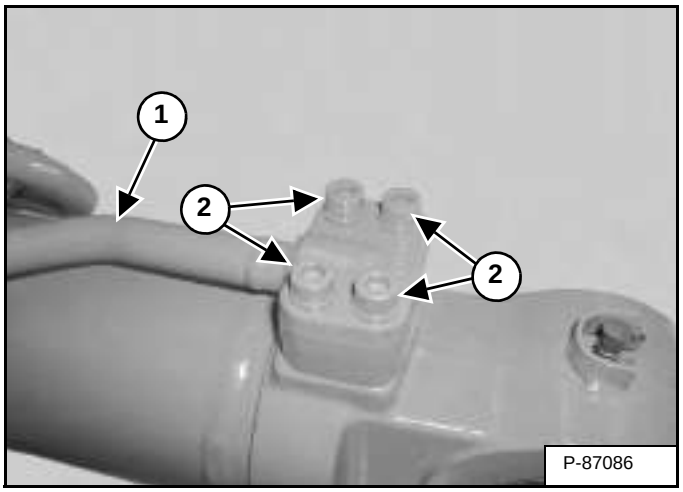
Figure 20-20-80



Install the O-ring (Item 1) **[Figure 20-20-80]** into the tubeline.

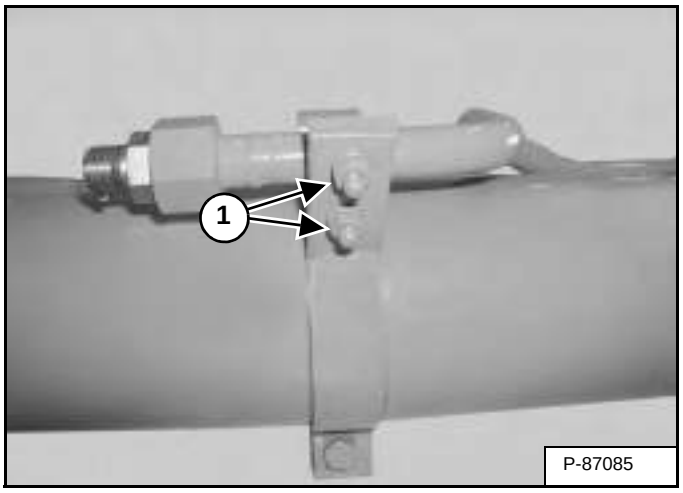
Assembly (Cont'd)

Figure 20-20-81



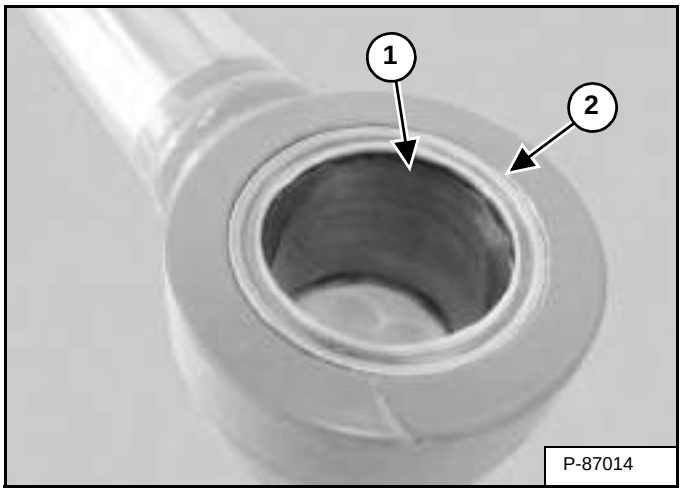
Install the tubeline (Item 1), using the four bolts (Item 2) **[Figure 20-20-81]** and lock washers.

Figure 20-20-82



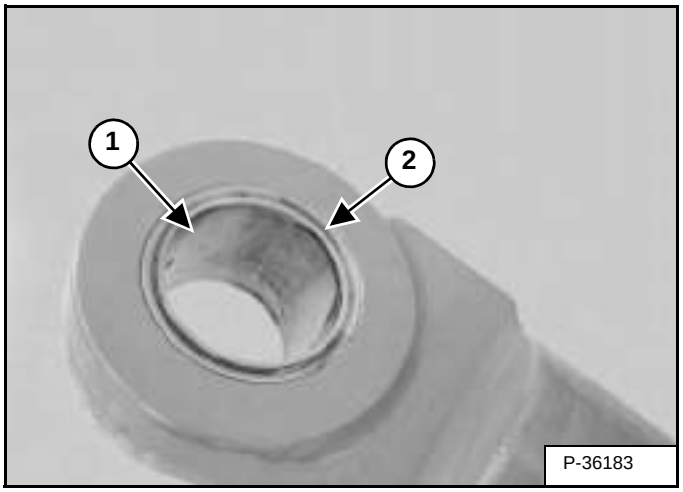
Install the U-bolt, washers and nuts (Item 1) **[Figure 20-20-82]**.

Figure 20-20-83



Install the bushing (Item 1) and seal (Item 2) **[Figure 20-20-83]** into both sides of the rod end of the cylinder.

Figure 20-20-84



Install the bushing (Item 1) and seal (Item 2) **[Figure 20-20-84]** into both sides of the base end of the cylinder.

CYLINDER (ARM)

Testing

Lower the boom / bucket and blade to the ground.

With the engine off, turn the key to the ON position and move both hydraulic control levers to relieve hydraulic pressure.

Figure 20-21-1

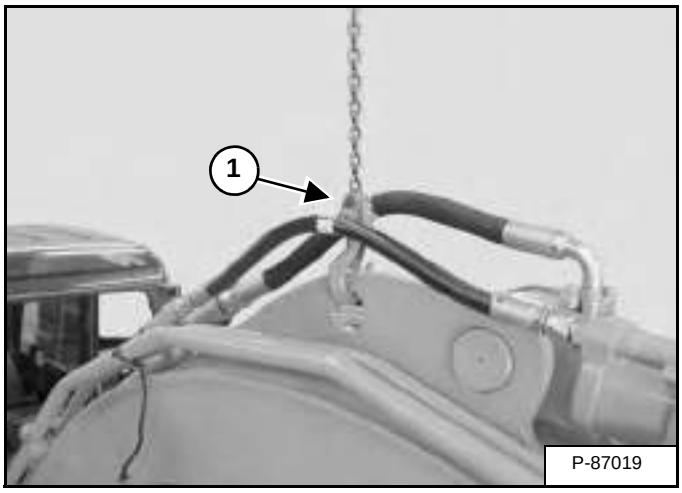
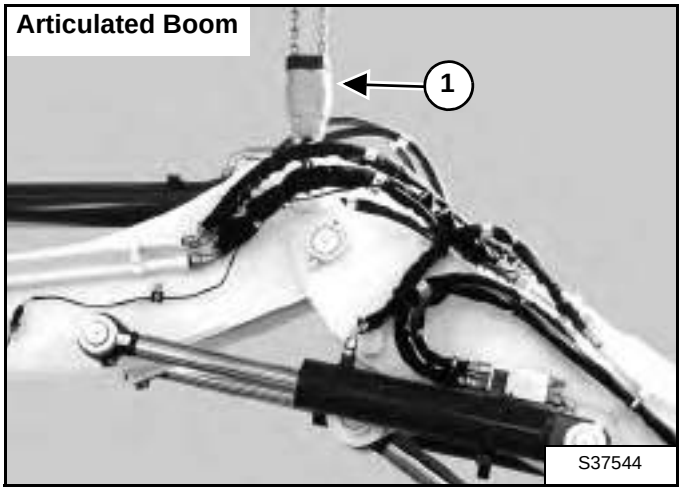
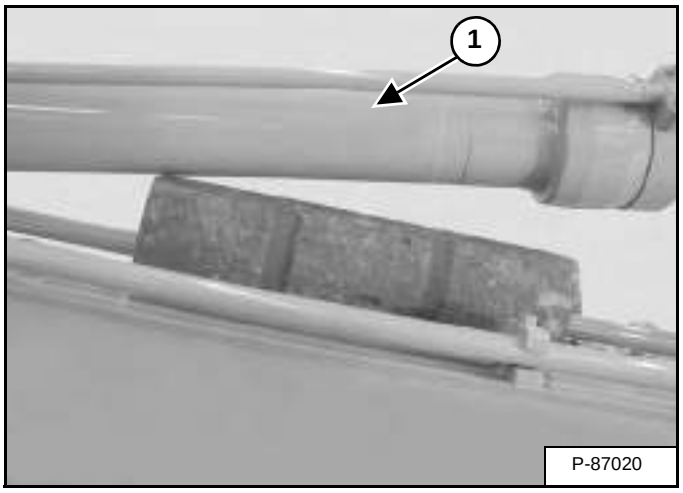


Figure 20-21-2



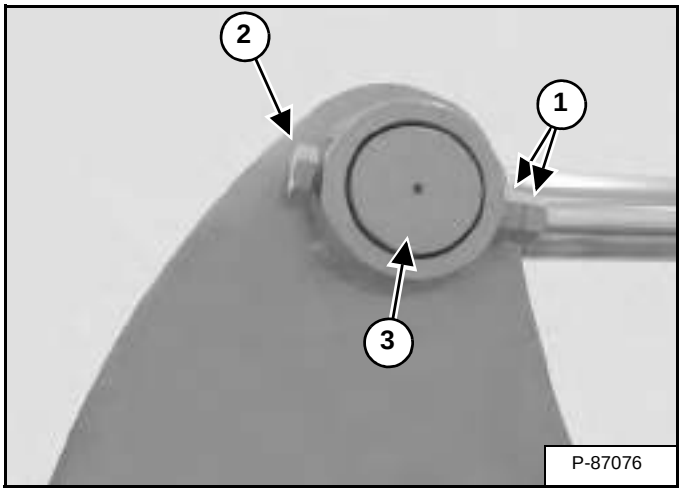
Support the boom with a chain hoist (Item 1) **[Figure 20-21-1]** or **[Figure 20-21-2]**.

Figure 20-21-3



Support the arm cylinder (Item 1) **[Figure 20-21-3]**.

Figure 20-21-4



Remove the nuts (Item 1) and bolt (Item 2) **[Figure 20-21-4]** from the rod end pivot pin.

Remove the rod end pivot pin (Item 3) **[Figure 20-21-4]**.

Start the engine and fully retract the cylinder rod.

Testing (Cont'd)

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 20-21-5

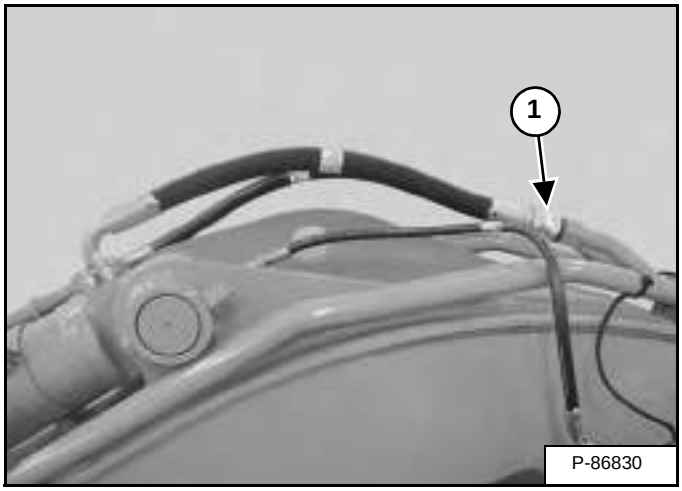
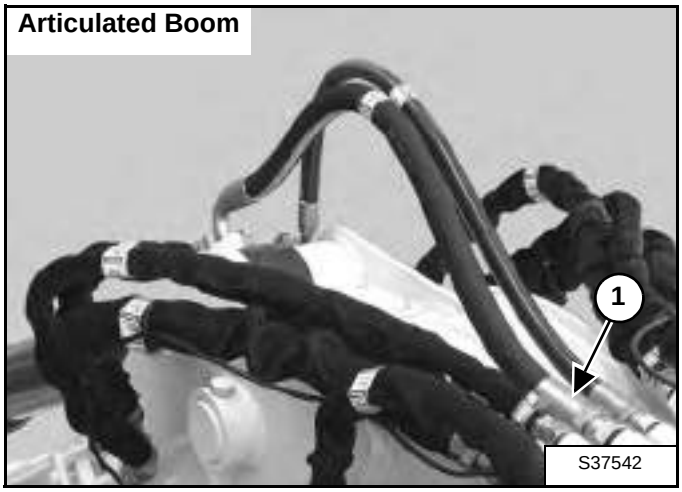
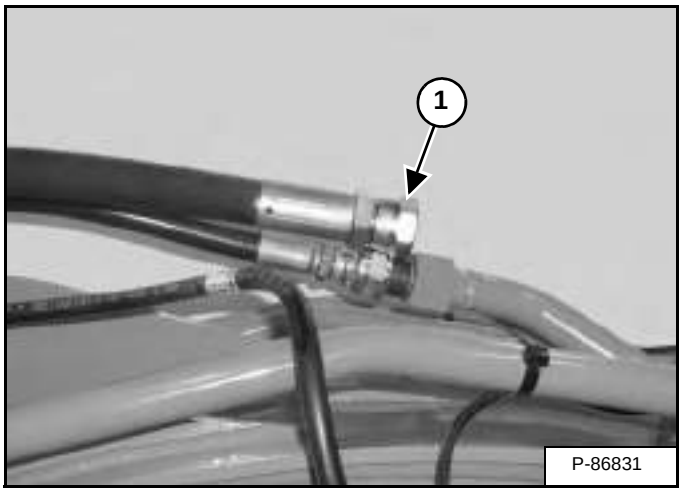


Figure 20-21-6



Remove the hose (Item 1) **[Figure 20-21-5]** or **[Figure 20-21-5]** from the base end of the cylinder.

Figure 20-21-7



Install a plug (Item 1) **[Figure 20-21-7]** on the hose.

Start the engine and retract the cylinder.

If there is any leakage from the base end fitting, remove the cylinder for repair or replacement.

CYLINDER (ARM) (CONT'D)

Removal And Installation

Lower the boom / bucket and blade to the ground.

With the engine off, turn the key to the ON position and move both hydraulic control levers to relieve hydraulic pressure.

Figure 20-21-8

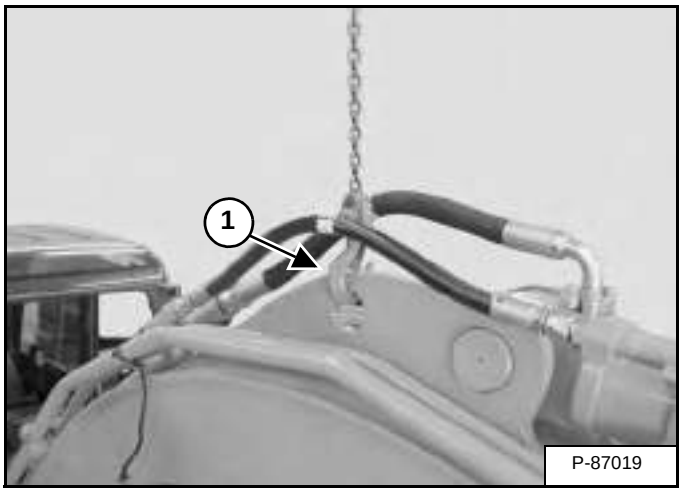
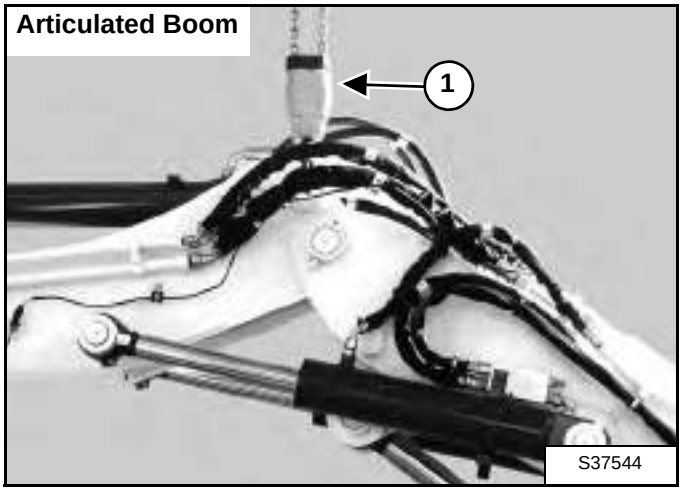
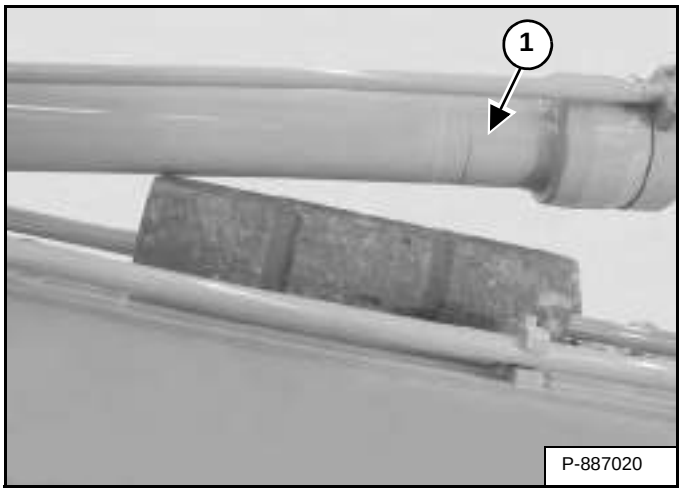


Figure 20-21-9



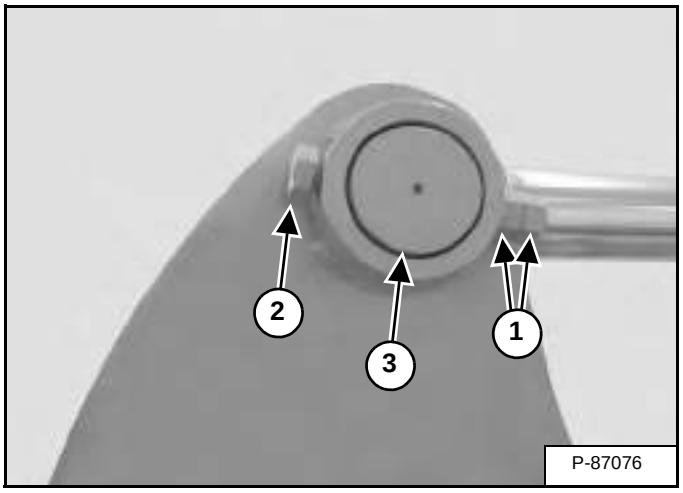
Support the boom with a chain hoist (Item 1) **[Figure 20-21-8]** or **[Figure 20-21-9]**.

Figure 20-21-10



Support the arm cylinder (Item 1) **[Figure 20-21-10]**.

Figure 20-21-11



Remove the nuts (Item 1) and bolt (Item 2) **[Figure 20-21-11]**.

Remove the rod end pivot pin (Item 3) **[Figure 20-21-11]**.

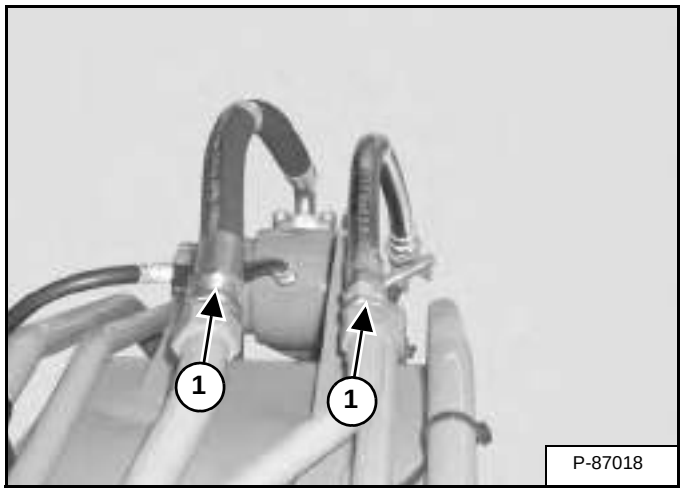
IMPORTANT

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

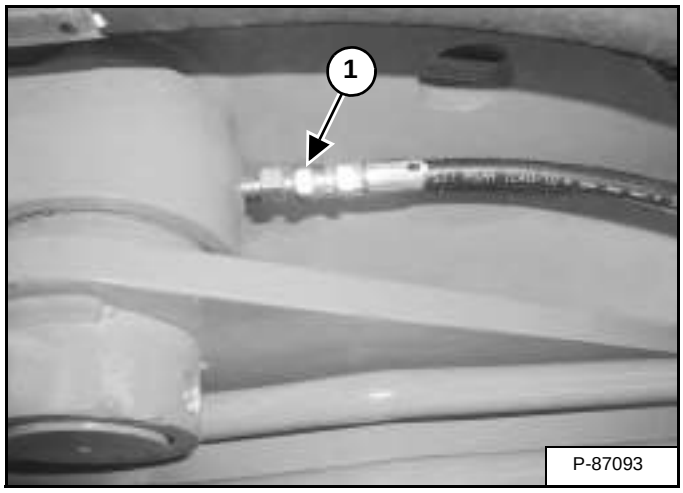
Removal And Installation (Cont'd)

Figure 20-21-12



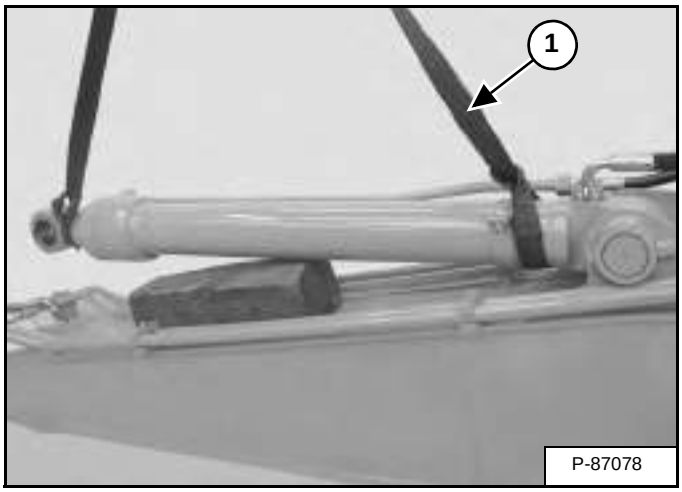
Remove the hoses (Item 1) **[Figure 20-21-12]**.

Figure 20-21-13



Remove the hose (Item 1) **[Figure 20-21-13]**.

Figure 20-21-14



Install a sling (Item 1) **[Figure 20-21-14]** on both ends of the cylinder.

Figure 20-21-15

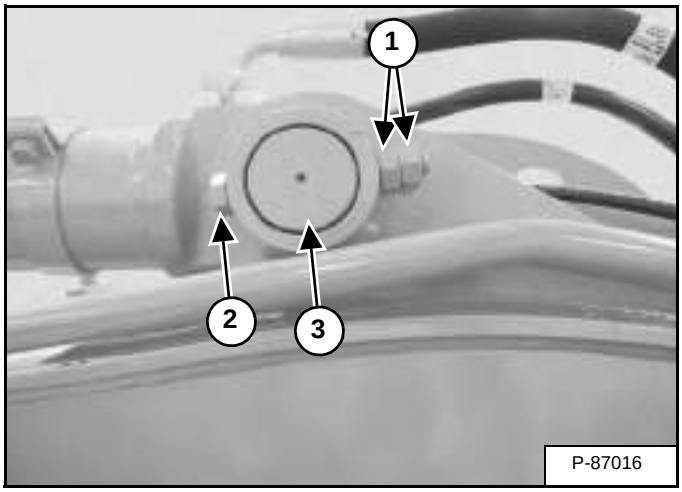
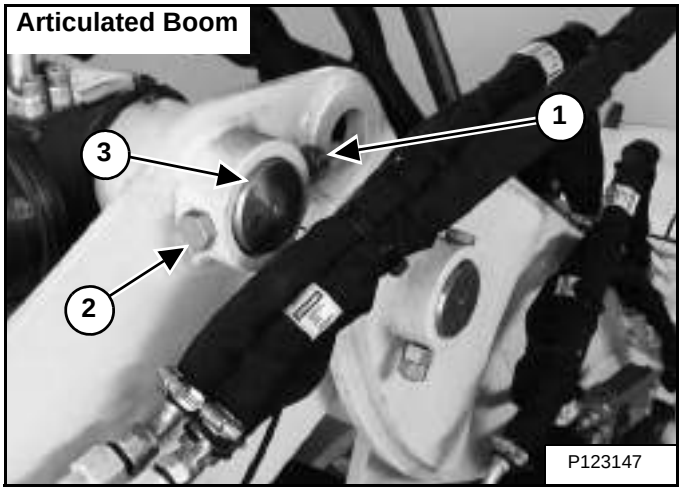


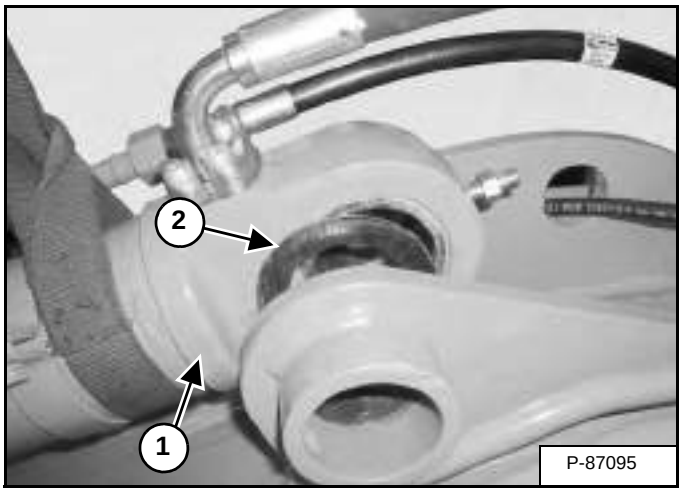
Figure 20-21-16



Remove the nuts (Item 1), bolt (Item 2) and base end pivot pin (Item 3) **[Figure 20-21-15]** or **[Figure 20-21-16]**.

Removal And Installation (Cont'd)

Figure 20-21-17

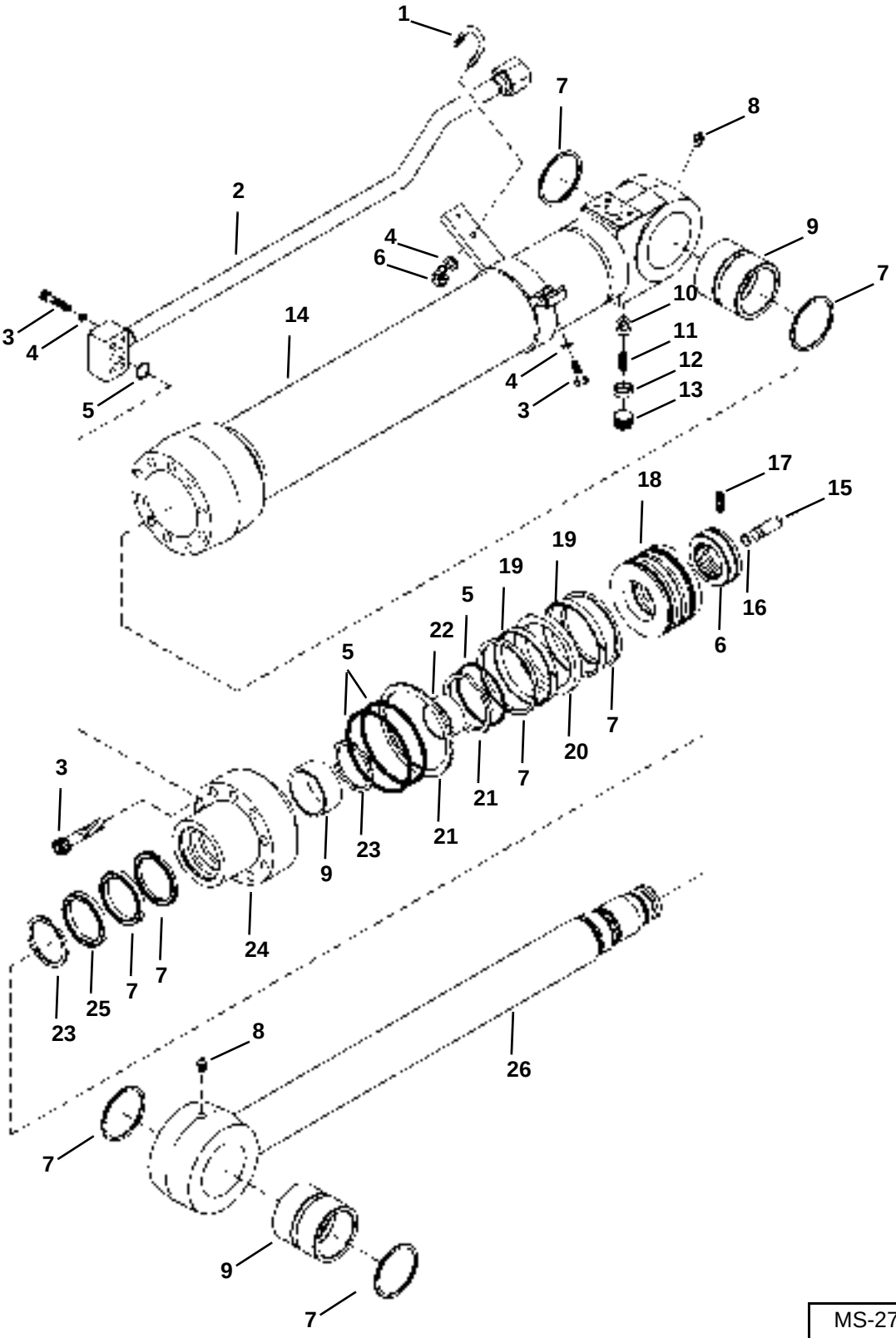


Remove the cylinder (Item 1) **[Figure 20-21-17]**.

Remove the shims (Item 2) **[Figure 20-21-17]** from both sides of the base end of the cylinder.

Parts Identification

1. U-Bolt
2. Tubeline
3. Bolt
4. Washer
5. O-ring
6. Nut
7. Seal
8. Grease Fitting
9. Bushing
10. Check Valve
11. Spring
12. Spring Support
13. Plug
14. Housing
15. Cushion Plunger
16. Ring Stop
17. Set Screw
18. Piston
19. Wear Ring
20. Seal Assembly
21. Back-up Ring
22. Cushion Ring
23. Snap Ring
24. Head
25. Wiper Seal
26. Rod



MS-2793S

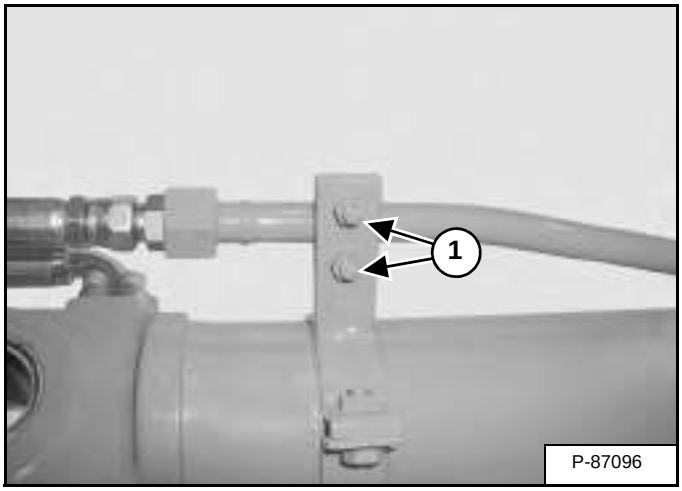
Disassembly

Use the following tools to disassemble the cylinder:

MEL1074 - O-ring Seal Hook

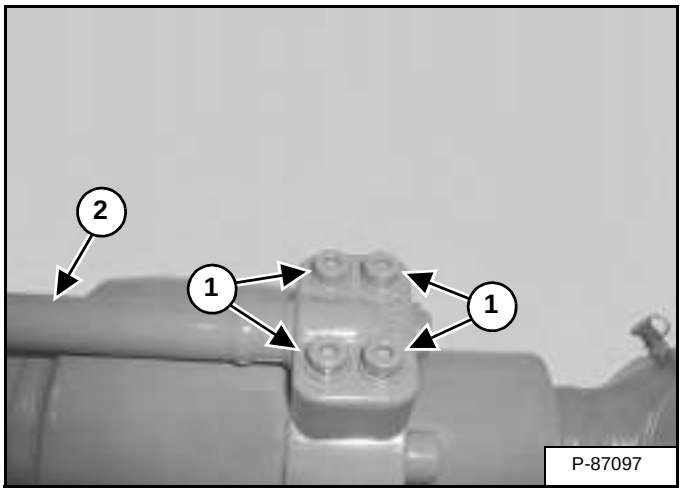
Hold the hydraulic cylinder over a drain pan and slowly move the rod in and out to remove the fluid from the cylinder.

Figure 20-21-18



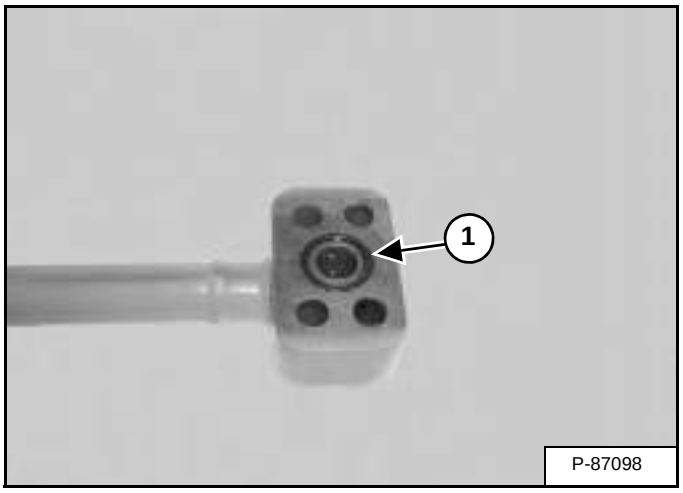
Remove the two nuts (Item 1) **[Figure 20-21-18]**, lock washers and U-bolt.

Figure 20-21-19



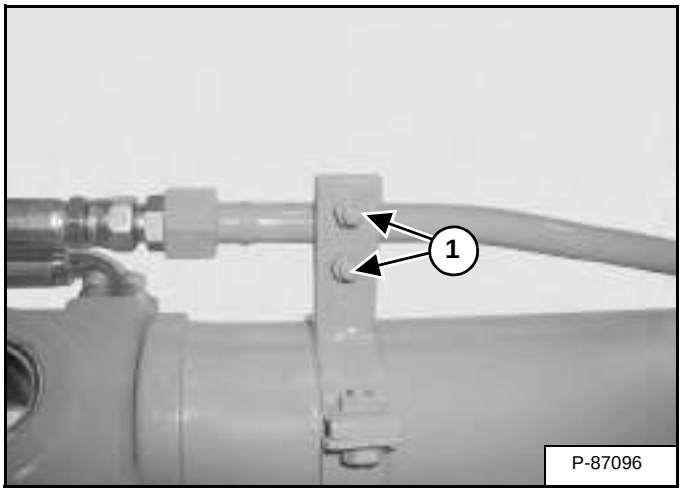
Remove the four bolts (Item 1) and tubeline (Item 2) **[Figure 20-21-19]**.

Figure 20-21-20



Remove the O-ring (Item 1) **[Figure 20-21-20]** from the tubeline.

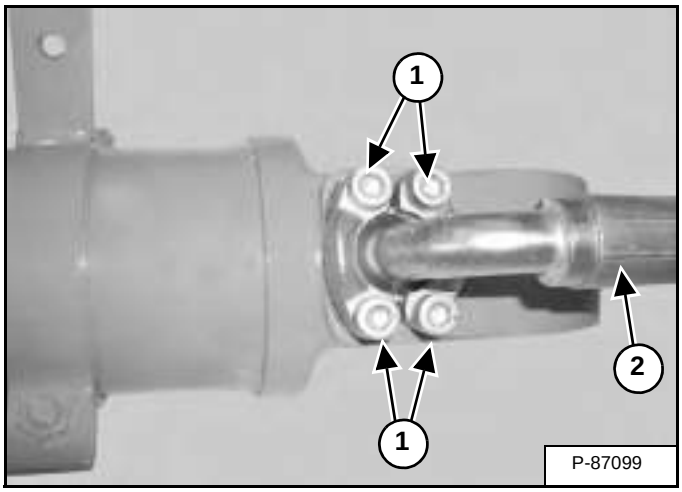
Figure 20-21-21



Remove the two nuts (Item 1) **[Figure 20-21-21]**, lock washers and U-bolt.

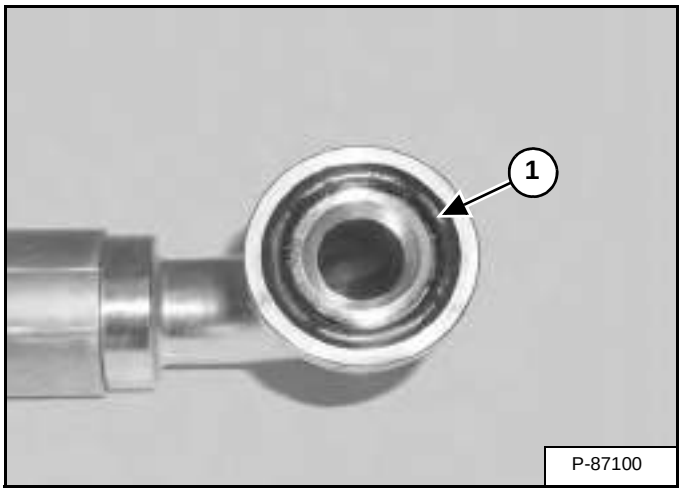
Disassembly (Cont'd)

Figure 20-21-22



Remove the four bolts (Item 1), lock washers and hose (Item 2) **[Figure 20-21-22]**.

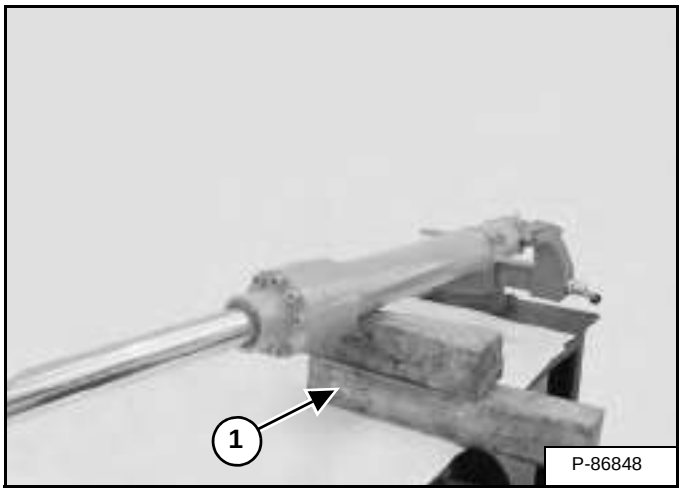
Figure 20-21-23



Remove the O-ring (Item 1) **[Figure 20-21-23]** from the tubeline.

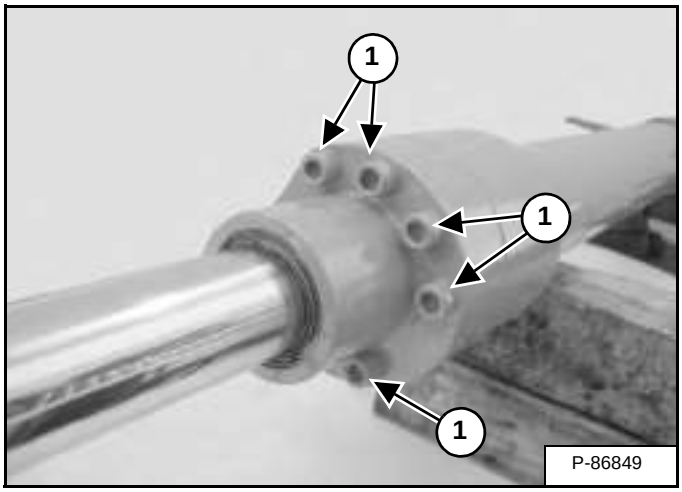
Clamp the base end of the cylinder in a vise.

Figure 20-21-24



Support the cylinder with a block (Item 1) **[Figure 20-21-24]**.

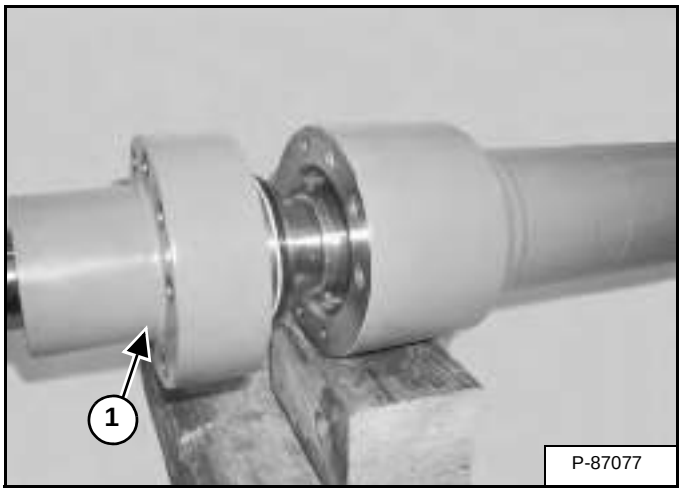
Figure 20-21-25



Remove the eight bolts (Item 1) **[Figure 20-21-25]**.

Disassembly (Cont'd)

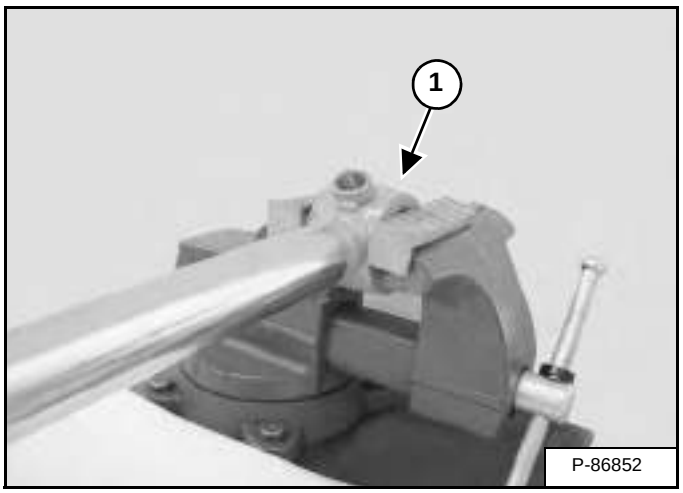
Figure 20-21-26



Remove the rod assembly (Item 1) **[Figure 20-21-26]** from the cylinder housing.

Remove the cylinder housing from the vise.

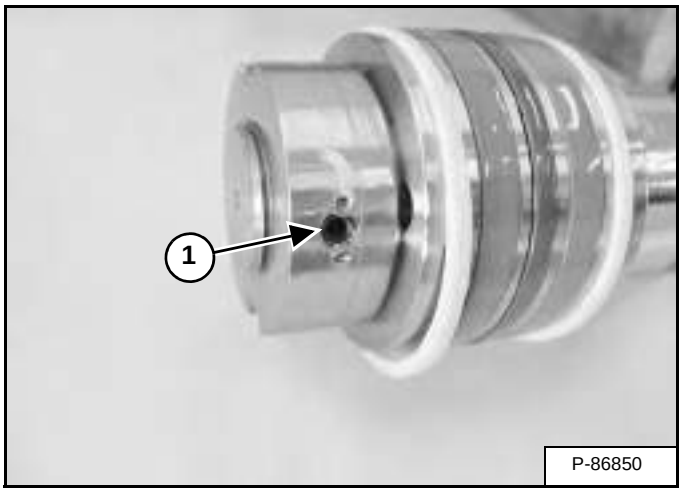
Figure 20-21-27



Clamp the rod end (Item 1) **[Figure 20-21-27]** in a vise.

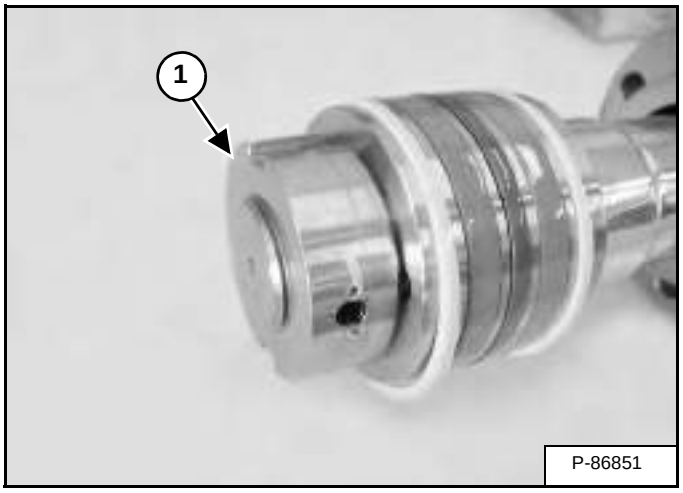
Support the end of the rod with a block.

Figure 20-21-28



Remove the set screw (Item 1) **[Figure 20-21-28]**.

Figure 20-21-29

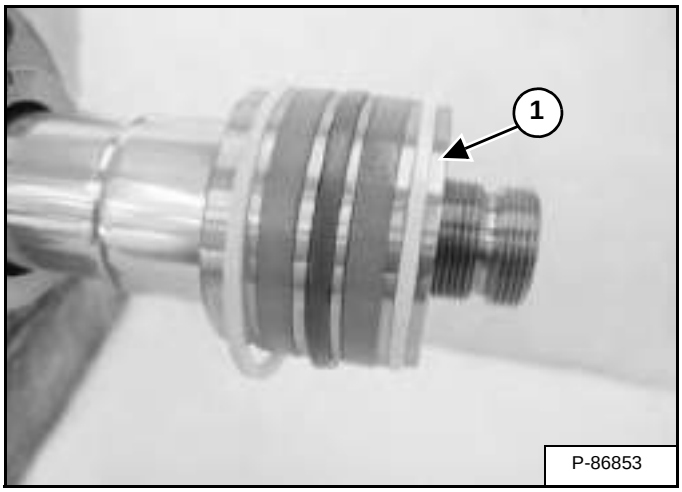


Apply moderate heat to the nut (Item 1) **[Figure 20-21-29]**.

Remove the nut.

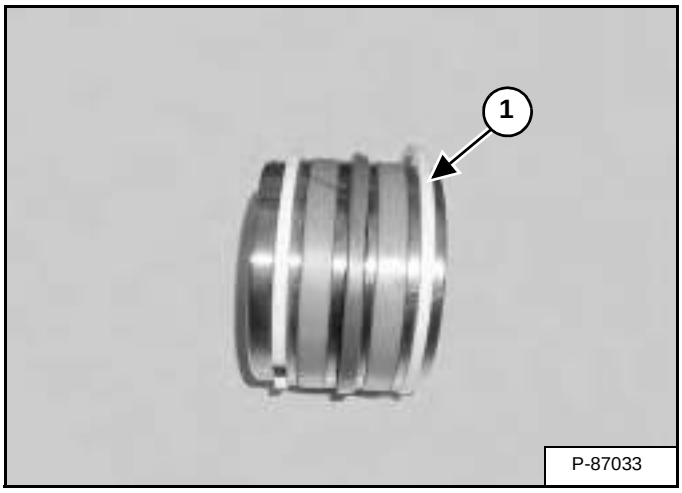
Disassembly (Cont'd)

Figure 20-21-30



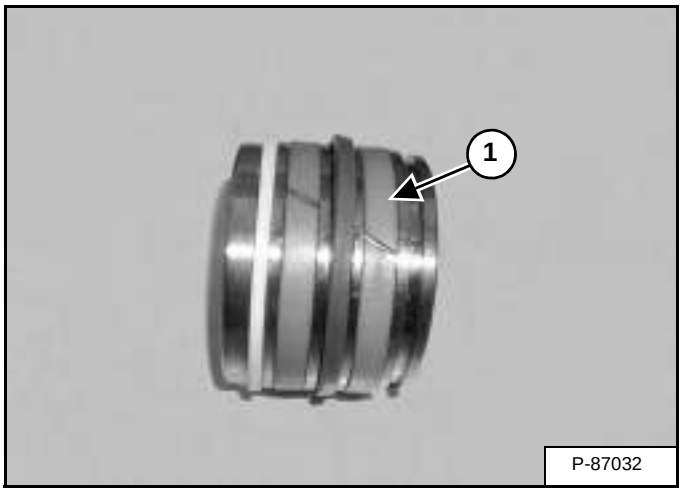
Remove the piston (Item 1) **[Figure 20-21-30]**.

Figure 20-21-31



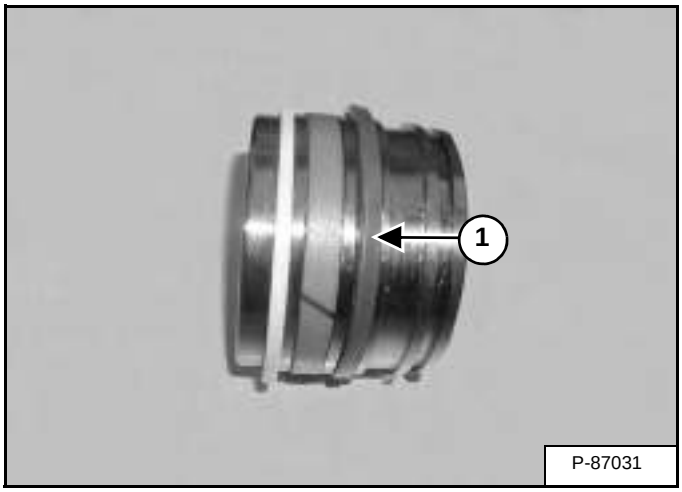
Remove the seal (Item 1) **[Figure 20-21-31]** from the piston.

Figure 20-21-32



Remove the wear ring (Item 1) **[Figure 20-21-32]** from the piston.

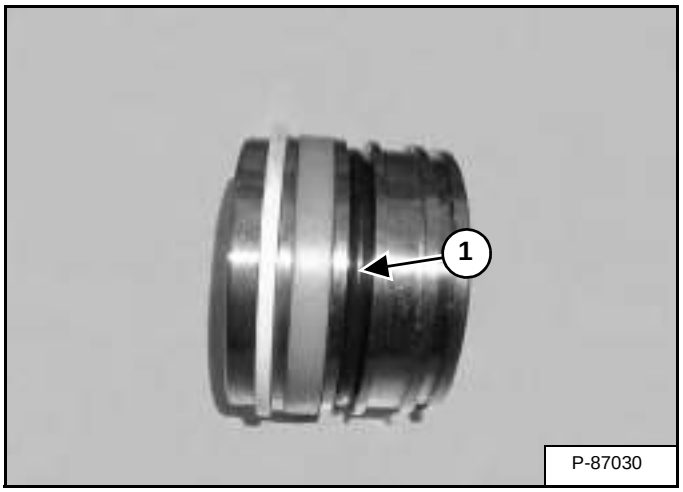
Figure 20-21-33



Remove the seal (Item 1) **[Figure 20-21-33]**.

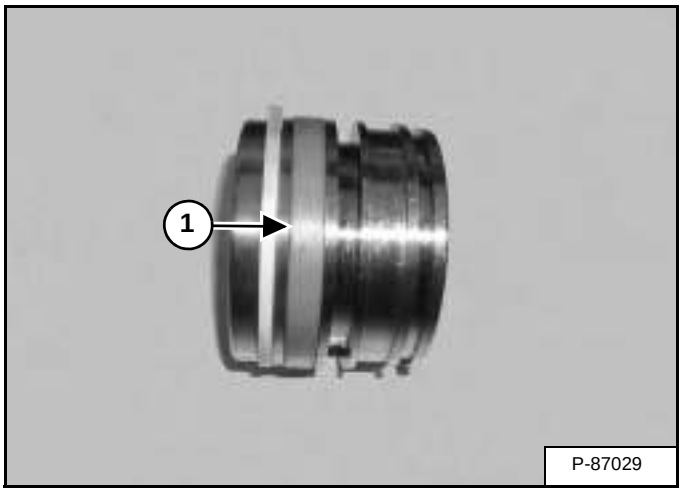
Disassembly (Cont'd)

Figure 20-21-34



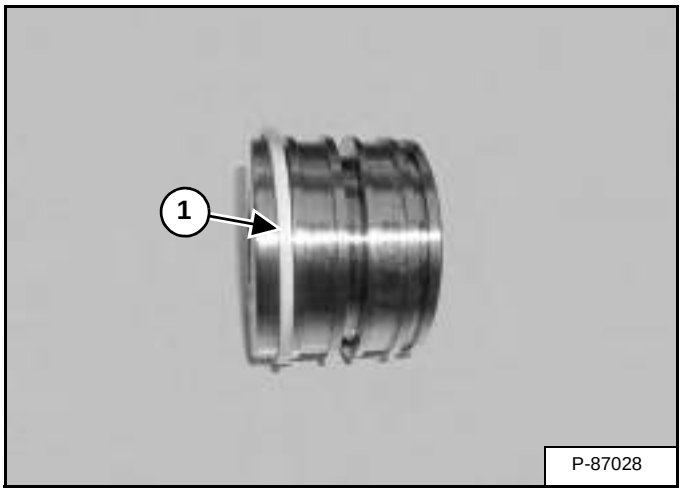
Remove the O-ring (Item 1) **[Figure 20-21-34]** from the piston.

Figure 20-21-35



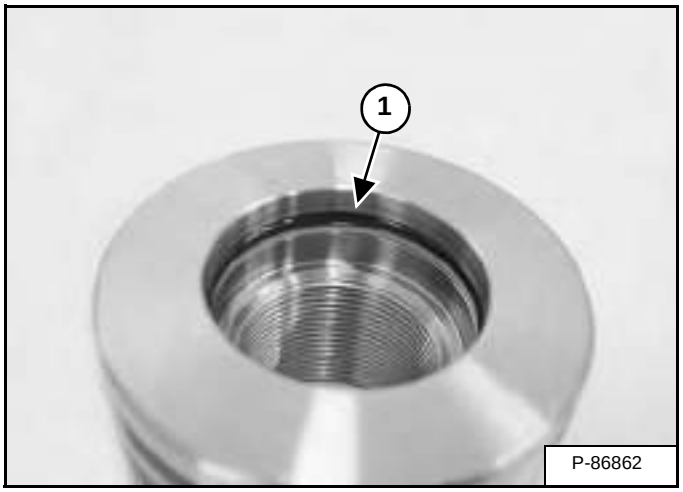
Remove the wear ring (Item 1) **[Figure 20-21-35]** from the piston.

Figure 20-21-36



Remove the seal (Item 1) **[Figure 20-21-36]** from the piston.

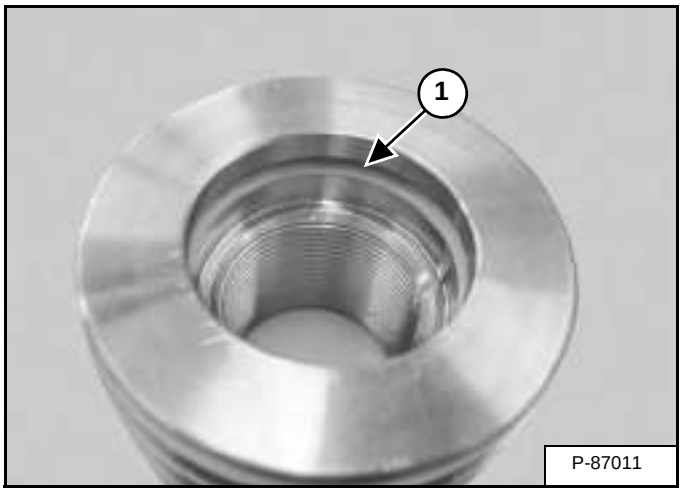
Figure 20-21-37



Remove the O-ring (Item 1) **[Figure 20-21-37]** from the piston.

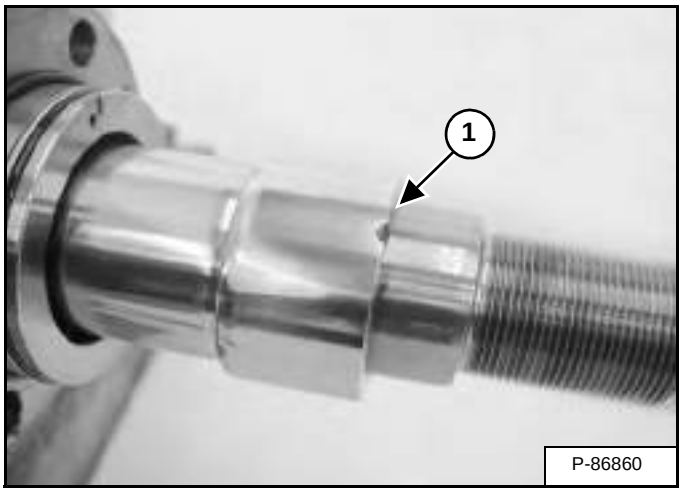
Disassembly (Cont'd)

Figure 20-21-38



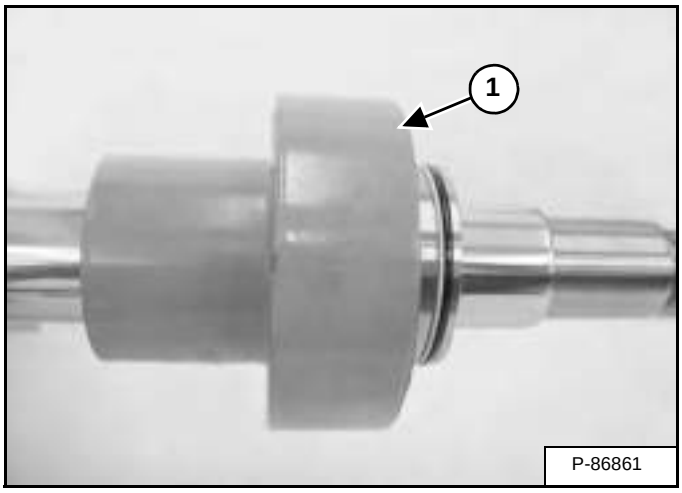
Remove the back-up ring (Item 1) **[Figure 20-21-38]**.

Figure 20-21-39



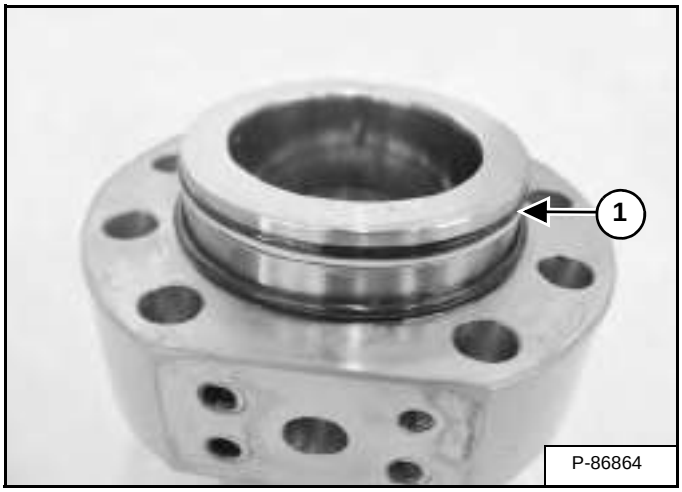
Remove the cushion ring (Item 1) **[Figure 20-21-39]** from the rod.

Figure 20-21-40



Remove the head (Item 1) **[Figure 20-21-40]** from the rod.

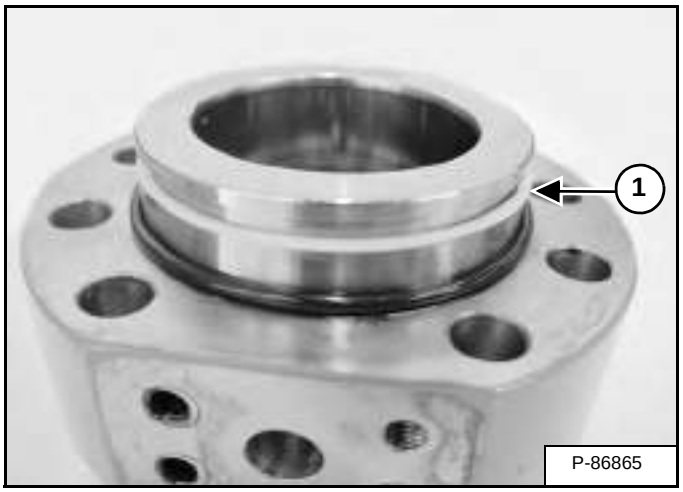
Figure 20-21-41



Remove the O-ring (Item 1) **[Figure 20-21-41]**.

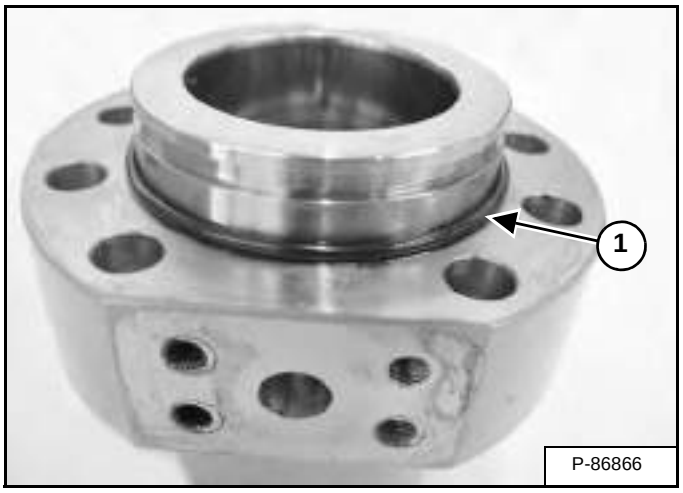
Disassembly (Cont'd)

Figure 20-21-42



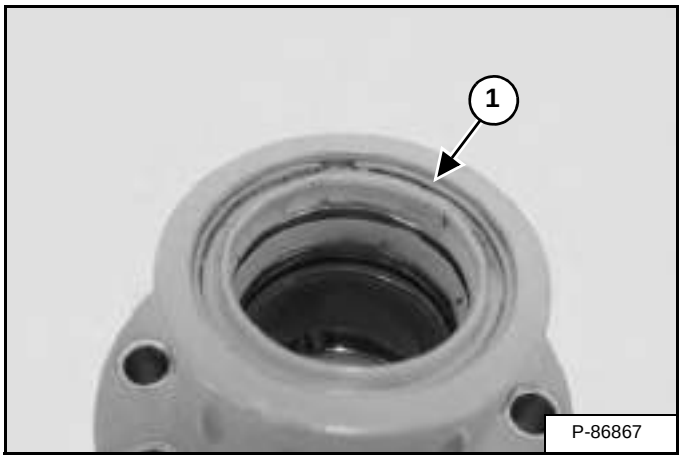
Remove the back-up ring (Item 1) **[Figure 20-21-42]**.

Figure 20-21-43



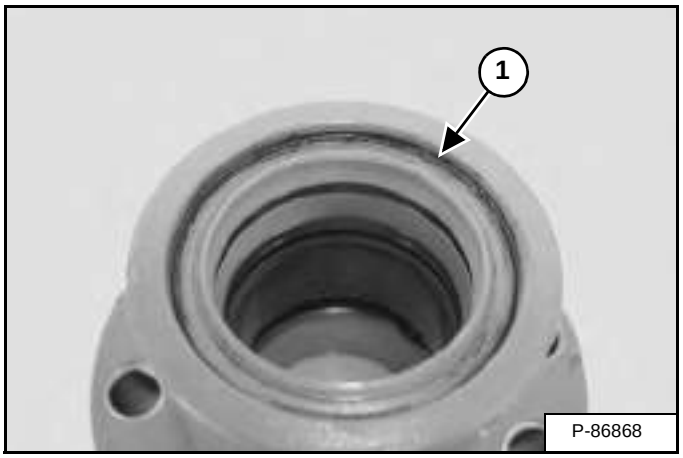
Remove the O-ring (Item 1) **[Figure 20-21-43]**.

Figure 20-21-44



Remove the snap ring (Item 1) **[Figure 20-21-44]**.

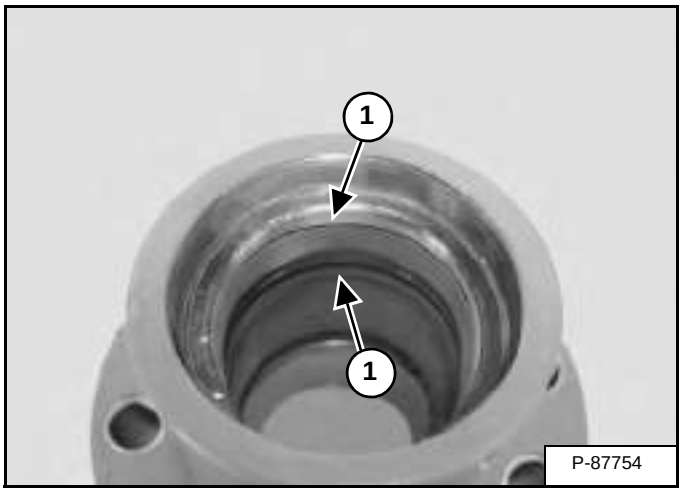
Figure 20-21-45



Remove the wiper seal (Item 1) **[Figure 20-21-45]**.

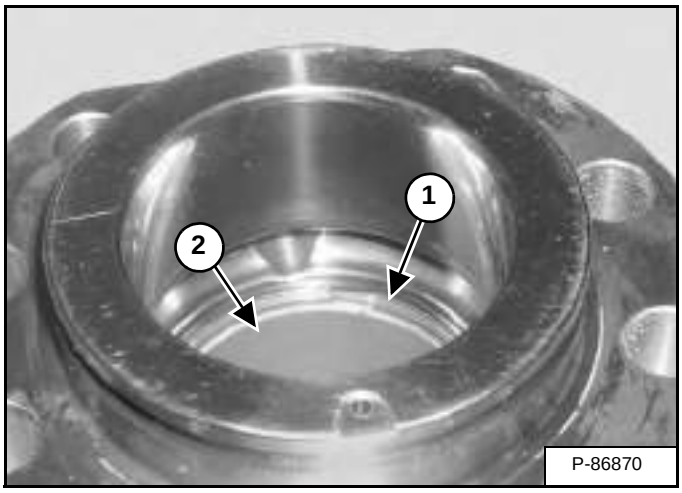
Disassembly (Cont'd)

Figure 20-21-46



Remove the two seals (Item 1) **[Figure 20-21-46]**.

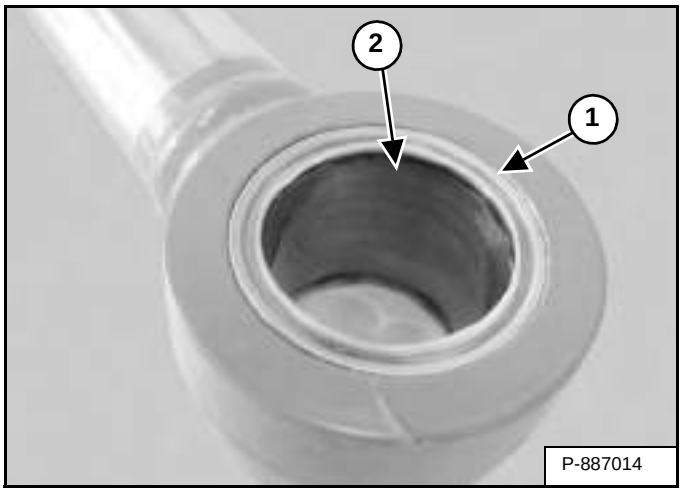
Figure 20-21-47



Remove the snap ring (Item 1) and bushing (Item 2) **[Figure 20-21-47]**.

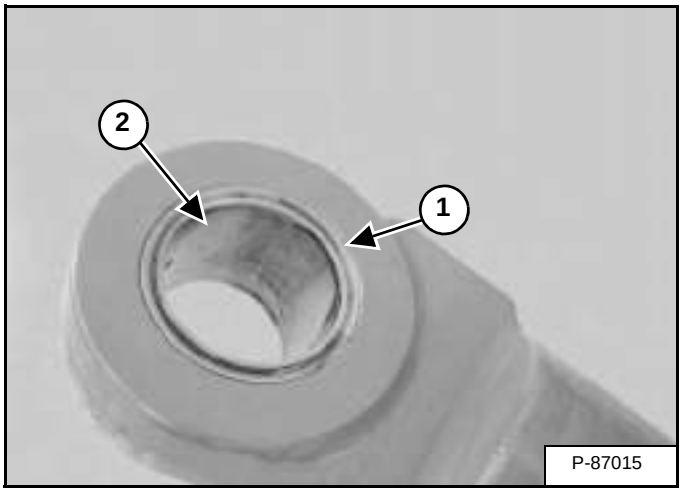
Remove the rod from the vise.

Figure 20-21-48



Remove the seal (Item 1) (both sides) and bushing (Item 2) **[Figure 20-21-48]** from the rod end.

Figure 20-21-49



Remove the seal (Item 1) (both sides) and bushing (Item 2) **[Figure 20-21-49]** from the base end.

Assembly

Use the following tools to assemble the cylinder:

MEL1396 - Universal Seal Expander
MEL1033 - Rod Seal Installation Tool
MEL1396-2 - Piston Ring Compressor

Wash the cylinder parts in clean solvent and dry with compressed air.

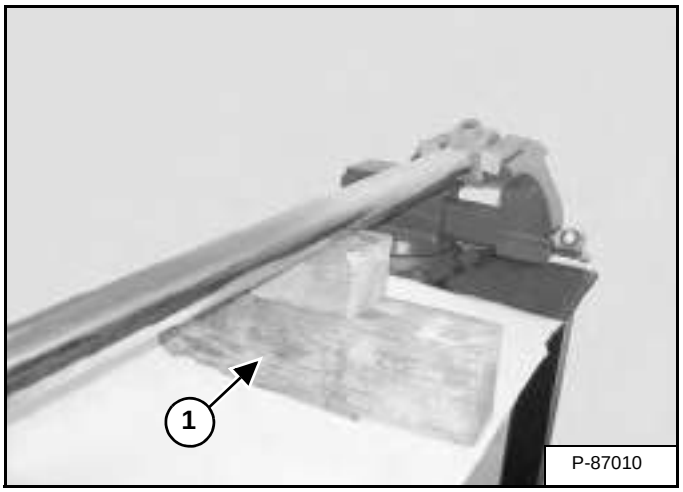
Inspect the cylinder parts for nicks, scratches and other damage. Replace any damaged parts.

Always install new O-rings and seals during assembly.

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

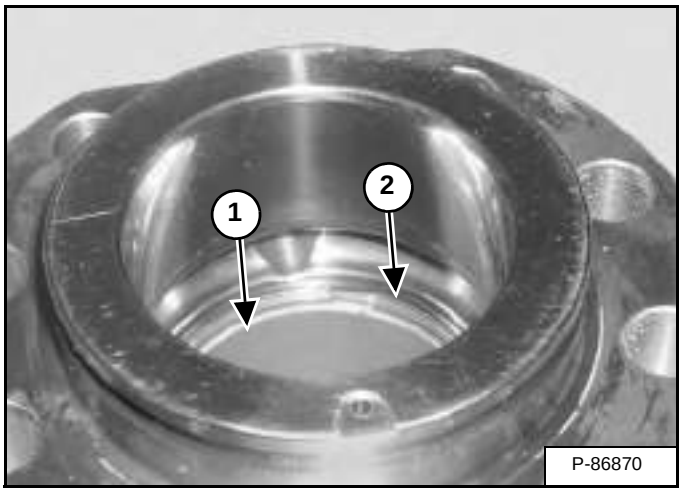
Clamp the rod end in a vise.

Figure 20-21-50



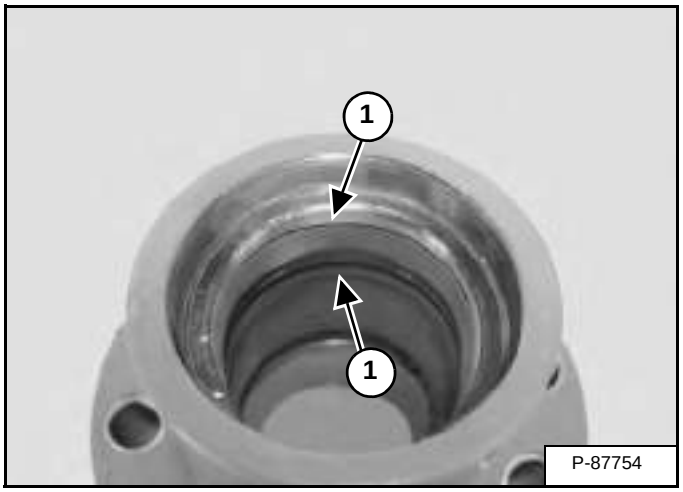
Support the end of the rod with a block (Item 1) **[Figure 20-21-50]**.

Figure 20-21-51



Install the bushing (Item 1) and snap ring (Item 2) **[Figure 20-21-51]** into the head.

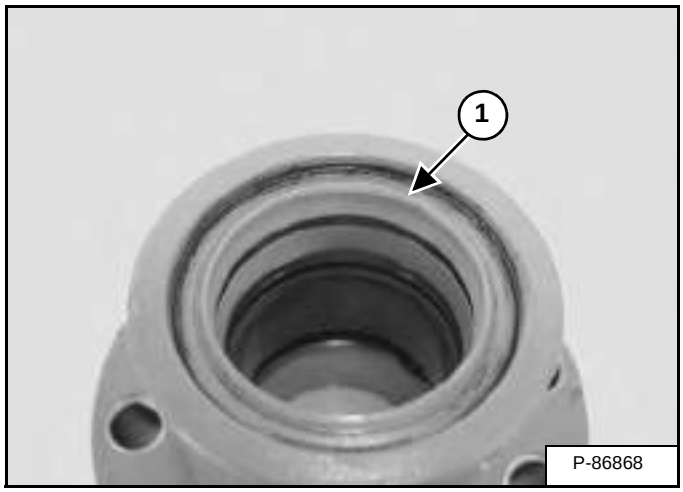
Figure 20-21-52



Install the two seals (Item 1) **[Figure 20-21-52]** into the head.

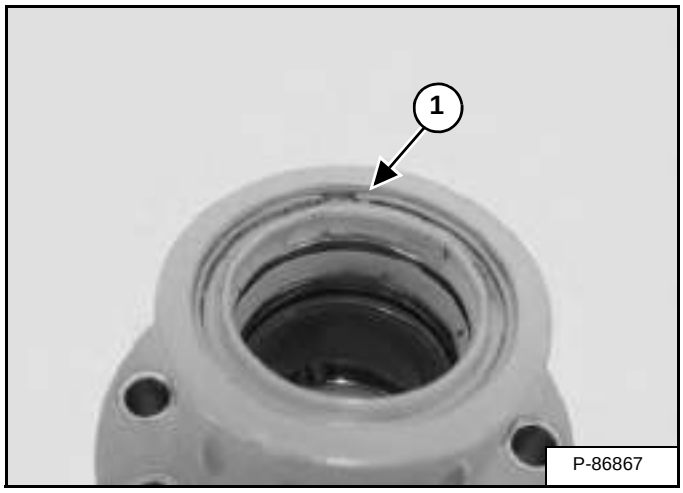
Assembly (Cont'd)

Figure 20-21-53



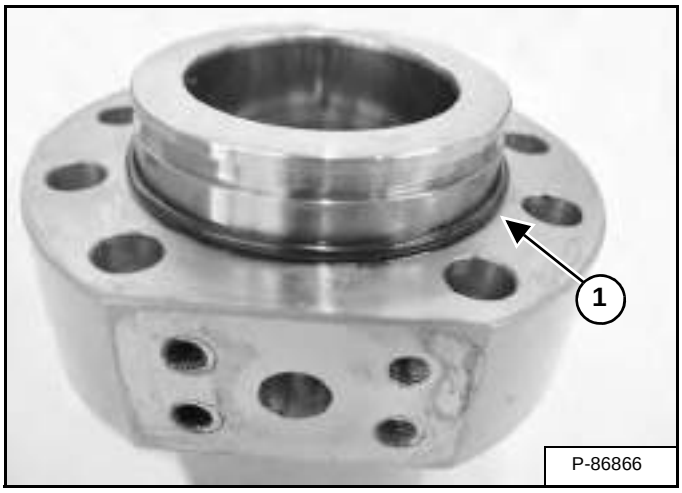
Install the wiper seal (Item 1) **[Figure 20-21-53]** into the head.

Figure 20-21-54



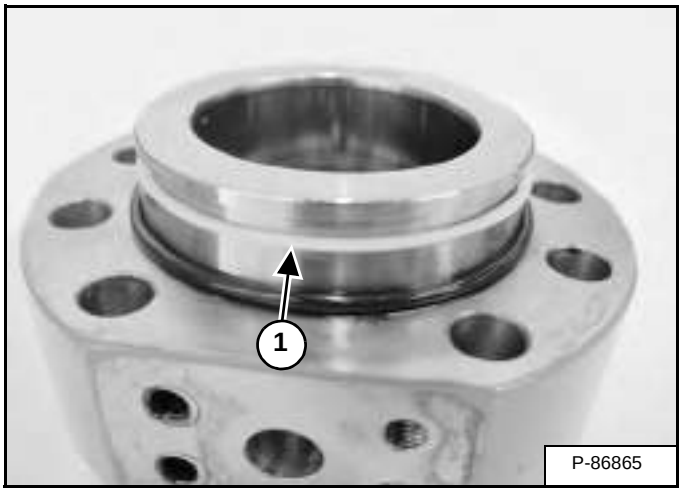
Install the snap ring (Item 1) **[Figure 20-21-54]** into the head.

Figure 20-21-55



Install the O-ring (Item 1) **[Figure 20-21-55]** onto the head.

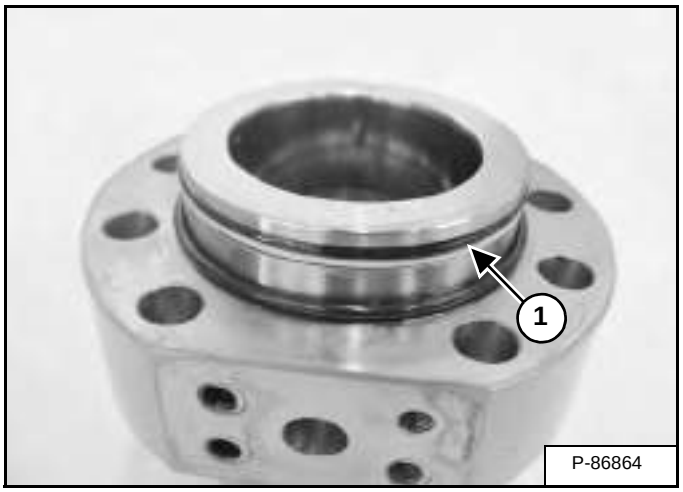
Figure 20-21-56



Install the back-up ring (Item 1) **[Figure 20-21-56]** onto the head.

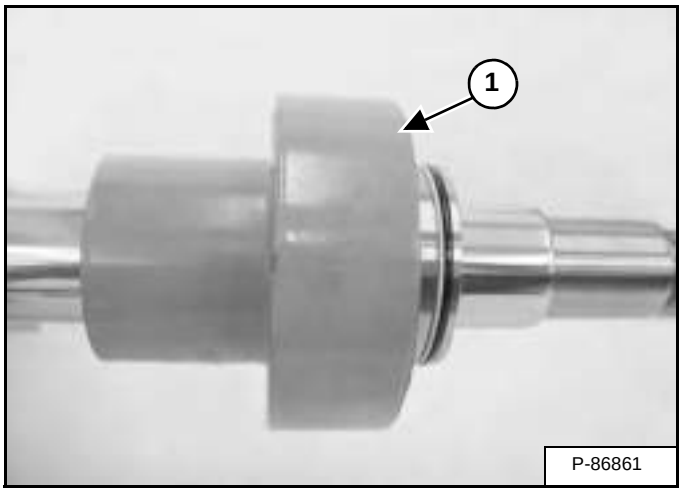
Assembly (Cont'd)

Figure 20-21-57



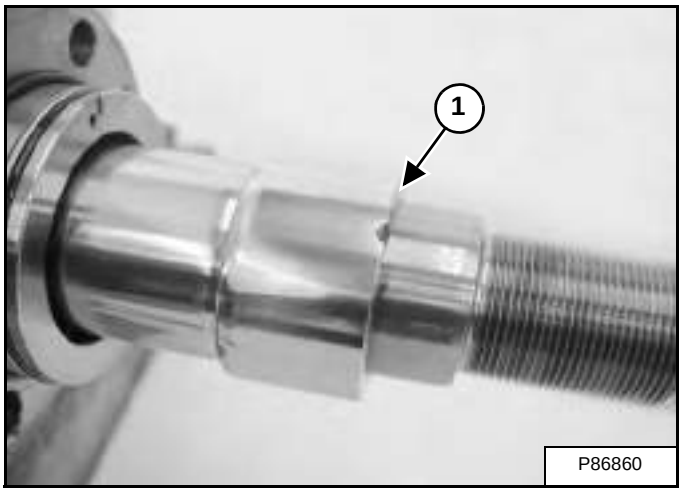
Install the O-ring (Item 1) **[Figure 20-21-57]**.

Figure 20-21-58



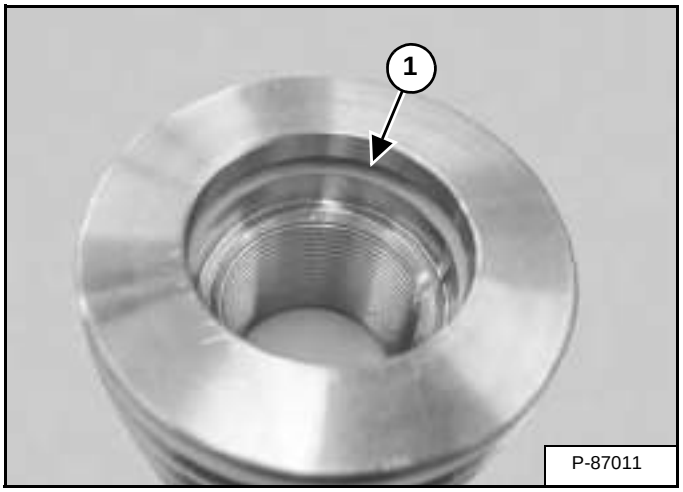
Install the head (Item 1) **[Figure 20-21-58]** onto the rod.

Figure 20-21-59



Install the cushion ring (Item 1) **[Figure 20-21-59]** on the rod.

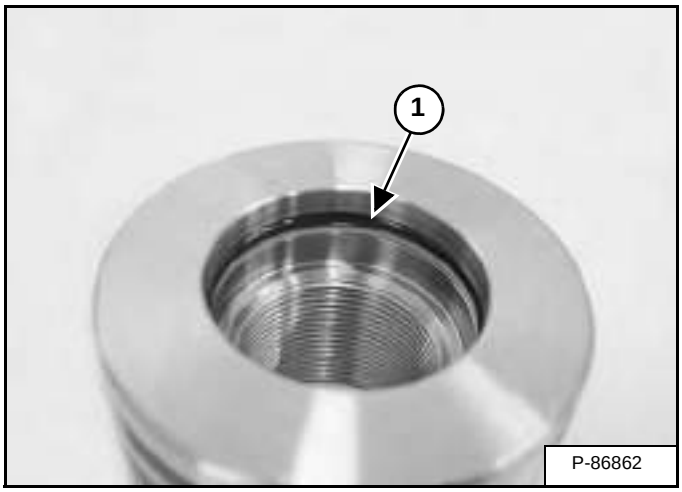
Figure 20-21-60



Install the back-up ring (Item 1) **[Figure 20-21-60]** into the piston.

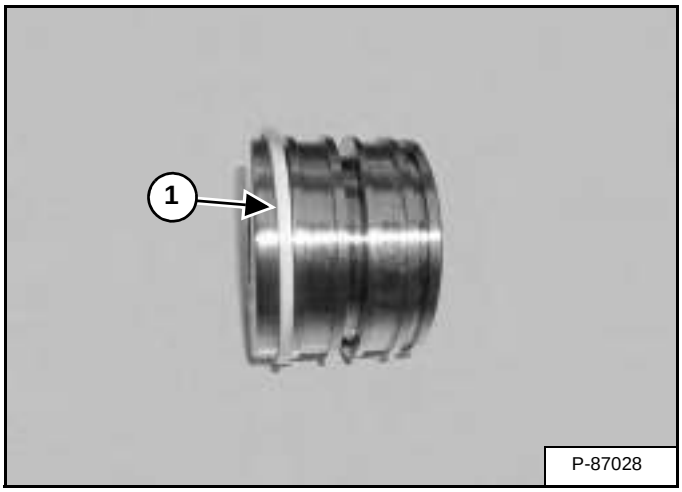
Assembly (Cont'd)

Figure 20-21-61



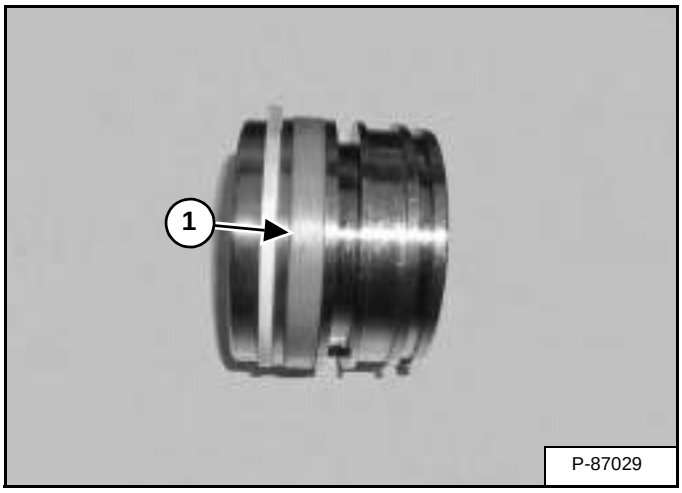
Install the O-ring (Item 1) **[Figure 20-21-61]** into the piston.

Figure 20-21-62



Install the seal (Item 1) **[Figure 20-21-62]** onto the piston.

Figure 20-21-63



Install the wear ring (Item 1) **[Figure 20-21-63]** onto the piston.

Figure 20-21-64

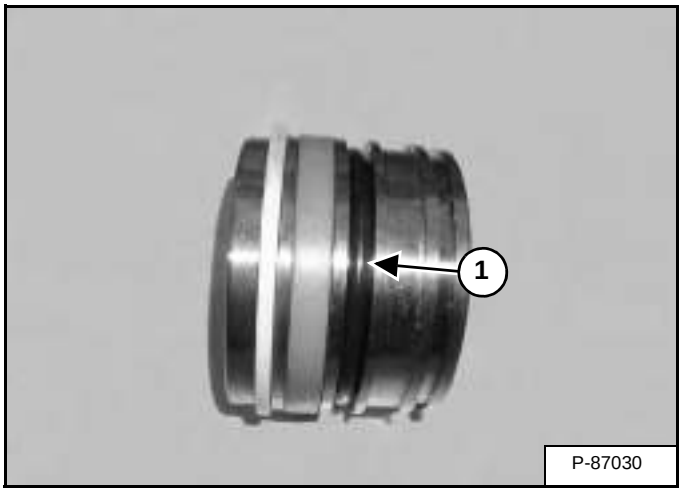
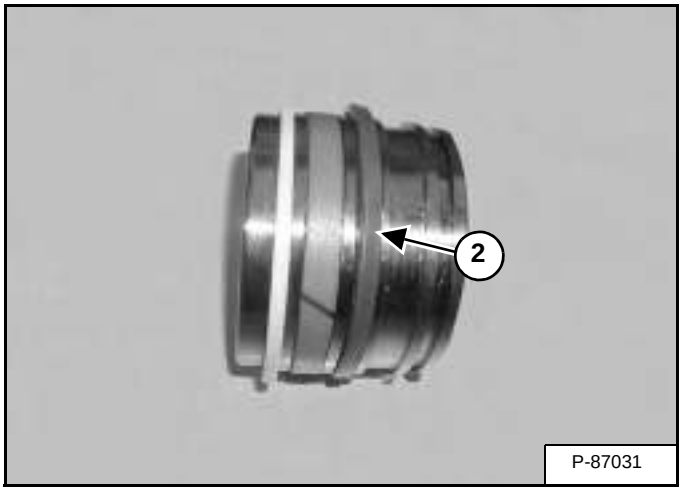


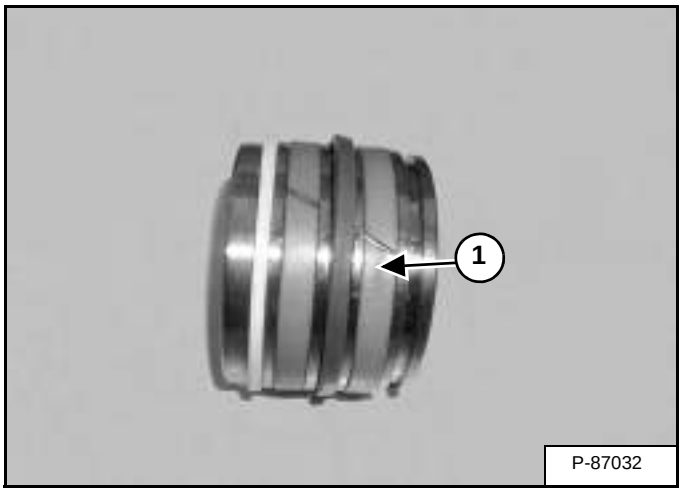
Figure 20-21-65



Install the O-ring (Item 1) **[Figure 20-21-64]** and seal (Item 2) **[Figure 20-21-65]** onto the piston.

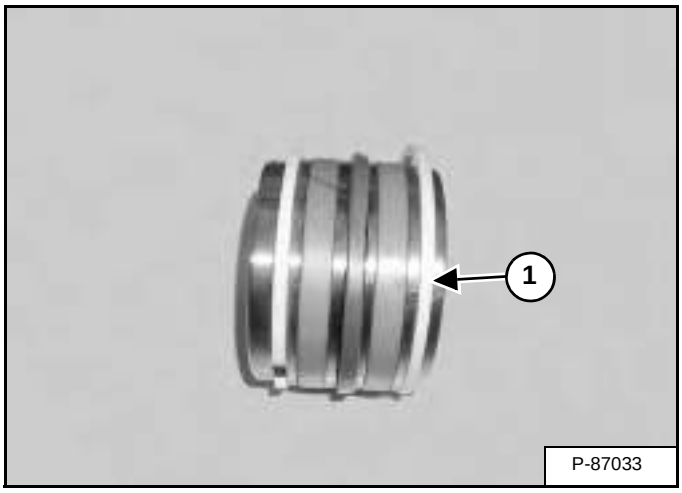
Assembly (Cont'd)

Figure 20-21-66



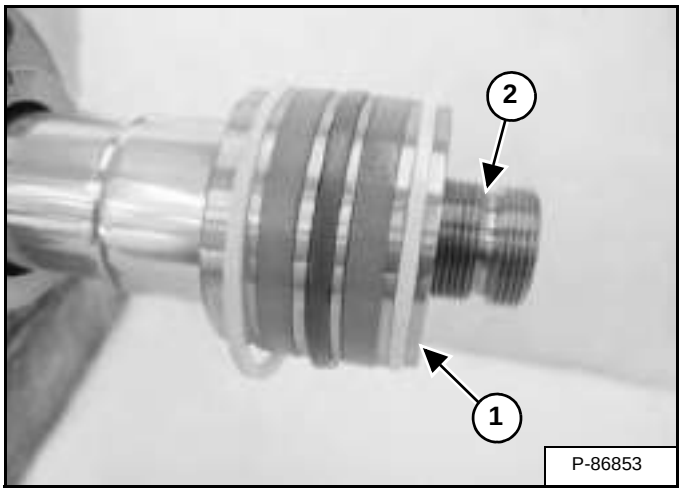
Install the wear ring (Item 1) **[Figure 20-21-66]** onto the piston.

Figure 20-21-67



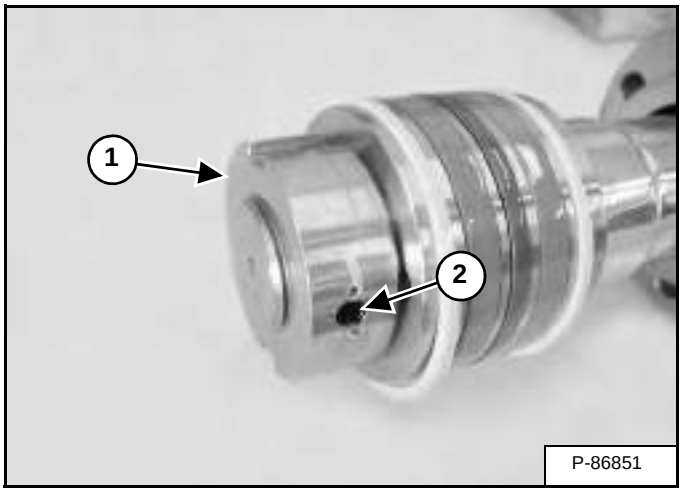
Install the seal (Item 1) **[Figure 20-21-67]** onto the piston.

Figure 20-21-68



Install the piston (Item 1) **[Figure 20-21-68]** onto the rod.

Figure 20-21-69

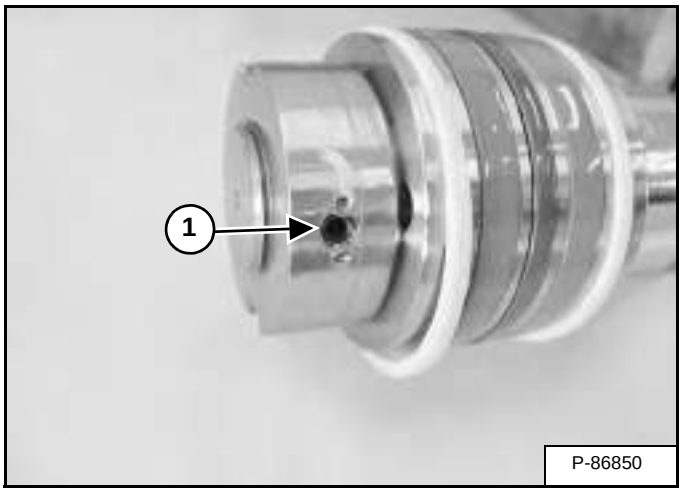


Install the nut (Item 1) **[Figure 20-21-69]**.

Tighten the nut until the bore (Item 2) **[Figure 20-21-69]** of the set screw is aligned with the groove (Item 2) **[Figure 20-21-68]** of the rod.

Assembly (Cont'd)

Figure 20-21-70

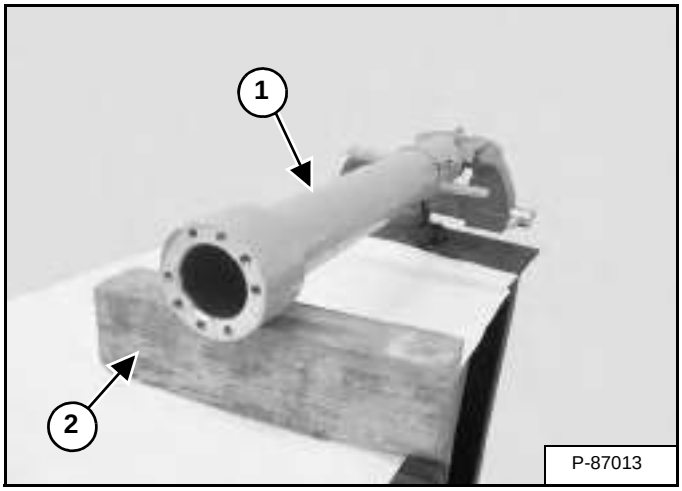


Install the set screw (Item 1) **[Figure 20-21-70]** into the nut.

Use a center punch to deform the threads of the set screw bore.

Remove the rod end from the vise.

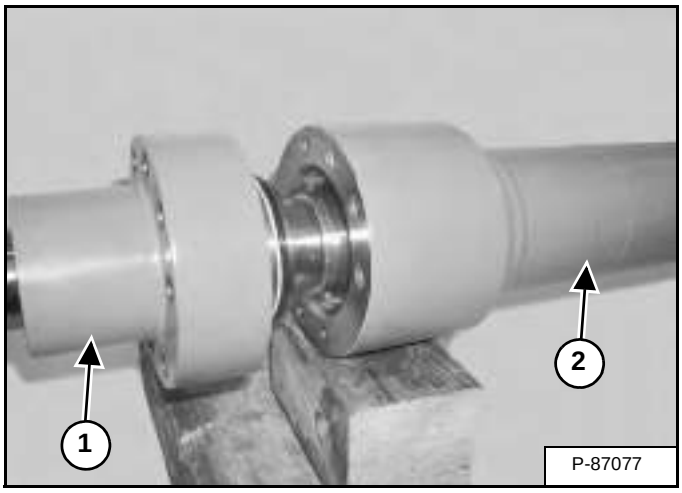
Figure 20-21-71



Install the base end of the cylinder housing (Item 1) **[Figure 20-21-71]** in a vise.

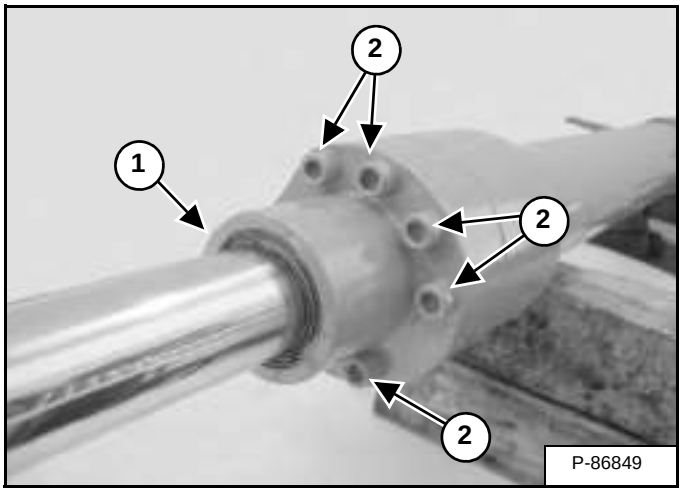
Support the housing with a block (Item 2) **[Figure 20-21-71]**.

Figure 20-21-72



Install the rod assembly (Item 1) into the cylinder housing (Item 2) **[Figure 20-21-72]**.

Figure 20-21-73



Install the head (Item 1) using the eight bolts (Item 2) **[Figure 20-21-73]**.

Tighten the bolts to 123 - 149 N•m (91 - 110 ft-lb) torque.