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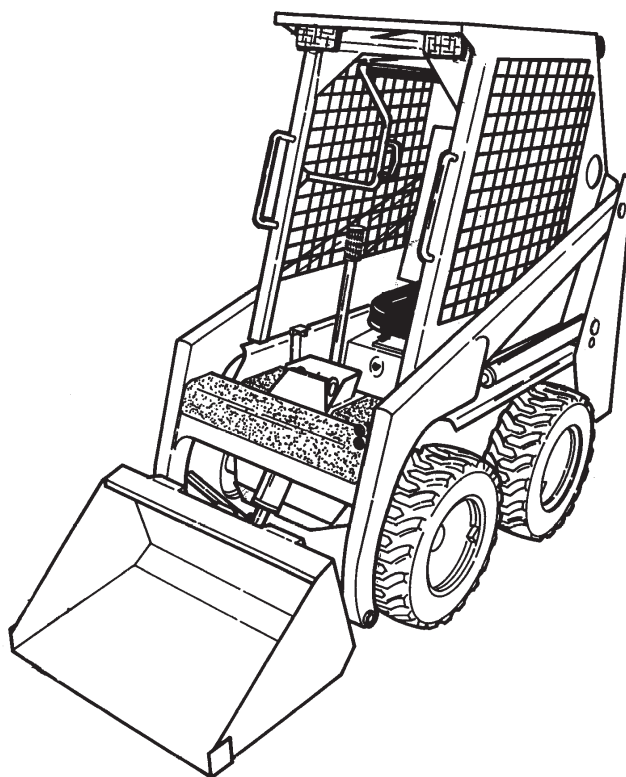
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O

B



# Service Manual



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**MELROE  
INGERSOLL-RAND**

6570160 (6-12)

Printed in U.S.A.



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# MAINTENANCE SAFETY



## WARNING

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

W-2003-0903



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

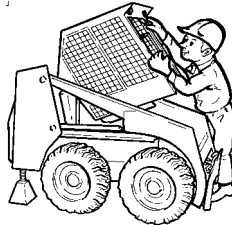
### CORRECT



B-10731a

Never service the Bobcat Skid-Steer Loader without instructions.

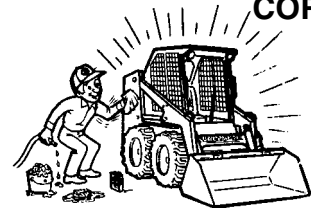
### CORRECT



B-12365

Use the correct procedure to lift or lower operator cab.

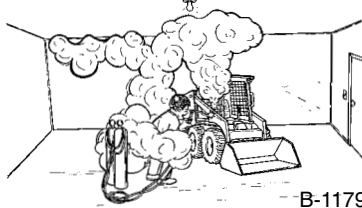
### CORRECT



B-7469

Cleaning and maintenance are required daily.

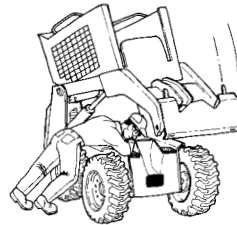
### WRONG



B-11799

- Have good ventilation when welding or grinding painted parts.
- Wear dust mask when grinding painted parts. Toxic dust and gas can be produced.
- Avoid exhaust fume leaks which can kill without warning. Exhaust system must be tightly sealed.

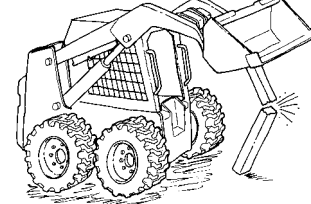
### WRONG



B-15231

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

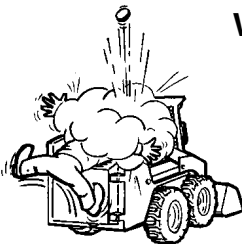
### WRONG



B-15280

- Never work on loader with lift arms up unless lift arms are held by an approved lift arm support device. Replace if damaged.
- Never modify equipment or add attachments not approved by Bobcat Company.

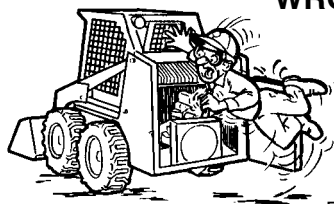
### WRONG



B-6590

- Stop, cool and clean engine of flammable materials before checking fluids.
- Never service or adjust loader with the engine running unless instructed to do so in the manual.
- Avoid contact with leaking hydraulic fluid or diesel fuel under pressure. It can penetrate the skin or eyes.
- Never fill fuel tank with engine running, while smoking or when near open flame.

### WRONG



B-6580

- Keep body, jewelry and clothing away from moving parts, electrical contact, hot parts and exhaust.
- Wear eye protection to guard from battery acid, compressed springs, fluids under pressure and flying debris when engines are running or tools are used. Use eye protection approved for type of welding.
- Keep rear door closed except for service. Close and latch door before operating the loader.

### WRONG



B-6589

- Lead-acid batteries produce flammable and explosive gases.
- Keep arcs, sparks, flames and lighted tobacco away from batteries.
- Batteries contain acid which burns eyes or skin on contact. Wear protective clothing. If acid contacts body, flush well with water. For eye contact flush well and get immediate medical attention.

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



**Bobcat®**

# FOREWORD

This manual gives the owner/operator necessary operating, servicing and adjustment of the Bobcat loader and overhaul instructions of the drive system, loader hydraulic/hydrostatic system and general main frame parts.

Refer to the Operator's Manual for operating instructions (Starting Procedure, Daily Checks, Bucket Operation, etc.)

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

1. Check hydraulic fluid level, engine oil level and fuel supply.
2. Inspect for any sign of fuel, oil or hydraulic fluid leaks.
3. Lubricate the loader.
4. Check the condition of the battery and cables.
5. Inspect air cleaner for damage or leaks. Check element and replace as needed.
6. Check electrical charging system.
7. Check tires for wear and pressure.
8. Inspect Operator Cab, Seat Belt, Seat Bar , Safety Treads, Lights, Horn, Safety Signs (Decals), Brake etc.
9. Inspect for loose or broken parts or connections.
10. Operate the loader and check all functions.
11. Inform the Owner/Operator of any items that need service.

**PREVENTIVE  
MAINTENANCE**

**HYDRAULIC  
SYSTEM**

**HYDROSTATIC  
SYSTEM**

**DRIVE  
SYSTEM**

**MAIN  
FRAME**

**ELECTRICAL  
SYSTEM**

**ENGINE  
SERVICE**

**TECHNICAL  
DATA**

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# I. SAFETY INSTRUCTIONS

## A. SAFETY IS YOUR RESPONSIBILITY

The Skid Steer loader is a highly maneuverable and compact machine. In operation, it is rugged and useful under a wide variety of conditions. This presents an operator with hazards which are common for off highway, rough terrain applications but are not unique for use of Bobcat loaders. The loader has an internal combustion engine with resultant heat and exhaust. All exhaust gases can kill so the loader must be used with adequate ventilation. The loader must not be used in an area with explosive dusts or gases or so that the engine can contact flammable material. The loader has a spark arrestor muffler which is required for operation in certain areas.

For loader applications, the dealer recommends the capabilities and restrictions of the loader and attachments for each application. The dealer demonstrates the safe operation of the loader according to the manufacturer's instructional materials; which are also available to all operators. The dealer can also identify unsafe modifications or use of unapproved attachments. The attachments and buckets are designed for rated capacity and secure fastening to the loader. For each model loader, the user must check with the dealer or manufacturer's literature, to identify each bucket or attachment for safe loads of materials of specified densities.

The following publications provide information on the safe use of the loader and attachments:

1. The Delivery Report is used to check whether complete instructions have been given to the new owner.
2. The Operator's Manual delivered with each loader gives operating information as well as routine maintenance and service.
3. Every loader has machine signs (decals) which instruct on the safe care and operation of the loader. The complete signs and their locations are shown in the Operator's Manual. All signs are available from your Bobcat dealer.
4. The loader has a plastic Operator Handbook fastened to the operator cab. It has brief instructions always available to the operator. The handbook is available from your Bobcat dealer.
5. The Service Manual and Parts Book are optional manuals from your Bobcat dealer for use by mechanics to do shop-type service and repair work.

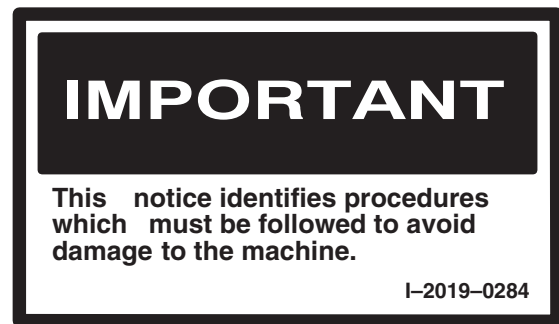
The dealer and owner/operator review the recommended uses of the loader and attachments at the time of delivery of the loader. If change of the use of the loader occurs in the future, the owner/operator must remember to ask the dealer for recommendations on the new use of the loader.

## B. BEFORE YOU OPERATE THE BOBCAT LOADER



B-10731

This Service Manual was written to give the service personnel instructions on the safe service of the Bobcat loader. **READ AND UNDERSTAND THIS SERVICE MANUAL BEFORE SERVICING YOUR BOBCAT.**



## C. SAFE OPERATION NEEDS A QUALIFIED OPERATOR

A QUALIFIED OPERATOR\* MUST DO THE FOLLOWING:

### 1. UNDERSTAND THE WRITTEN INSTRUCTIONS, RULES AND REGULATIONS

- a. The written instructions from the Melroe Co. include the delivery report, loader operator's handbook and manual, attachment manual and machine signs (decals).
- b. Check the rules and regulations at your location. The rules may include an employer's work safety requirements. Regulations may identify a hazard such as utility supply line.

### 2. HAVE TRAINING WITH ACTUAL OPERATION

- a. Operator training must consist of a demonstration and verbal instruction. This training is given by the Bobcat dealer before the loader is delivered.
- b. The new operator should start in an area without bystanders and use all the controls until he can control the loader at full use under the conditions for his work area.

### 3. KNOW THE WORK CONDITIONS

- a. For each material to be handled, the operator must know how to avoid exceeding the rated operating capacity of the loader. For example in handling a certain loose material with a given bucket, he must know whether he can safely take a full or part of a bucket load.
- b. The operator must know any prohibited uses or work areas for the loader. For example he needs to know about excessive slopes.

\* For an operator to be qualified, he must not use drugs or alcoholic drinks which change his alertness or coordination while working. An operator who is taking prescription drugs must get medical advice on whether or not he can safely operate a machine.

## II. FIRE PREVENTION

The loader has several components which are at high temperature under normal operating conditions. The primary source of high temperatures in the engine and exhaust system. The electrical system, if damaged or incorrectly maintained, can be a source of arcs or sparks. These conditions make it important to avoid applications where explosive dust or gases can be ignited by arcs, sparks or heat.

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

The spark arrestor muffler is designed to control the emission of hot particles from the engine and exhaust system, but the muffler and the exhaust gases are still hot. This spark arrestor muffler does not change the need to avoid use of the loader in an atmosphere with explosive dust or gases or where the exhaust can contact flammable material.

1. Do not use the Bobcat loader in applications where explosive dust or gases can be ignited by arcs, sparks, hot components or exhaust gases.
2. The operator cab, engine compartment and engine cooling system must be inspected every day and cleaned if necessary to prevent overheating. Remove all flammable material.
3. Check all electrical wiring and connections for damage. Keep the battery terminals clean and tight. Repair or replace any damaged part.
4. Check for damage and leakage at all the fuel, oil and hydraulic tubes, hoses and fittings. Tighten or replace any that show leakage. Always clean fluid spills.
5. Use ether or starting fluids only when approved by the engine manufacturer. Do not use ether or starting fluids on any engine which has glow plugs. These starting aids can explode and injure bystanders.
6. Always clean the loader before doing any welding. Cover rubber hoses, battery and all other flammable parts. Keep a fire extinguisher near the loader when welding.
7. Stop the engine and let it cool before adding fuel. No smoking.
8. Use the procedure in Operator's Manual for connecting and charging batteries.
9. Use the procedure in Operator's Manual for servicing the spark arrestor muffler every 100 hours of operation.



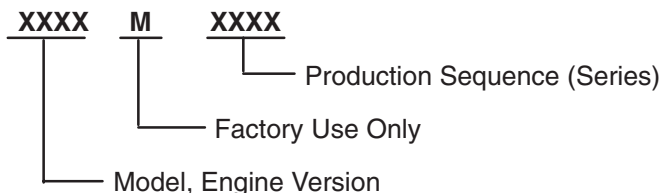
### III. SERIAL NUMBER LOCATIONS

It is important to make the correct reference to the Serial Number of the Bobcat loader and/or engine when repairs are done or when ordering parts. It is possible that the present loaders do not use the same parts as the earlier loaders.

#### LOADER SERIAL NUMBER

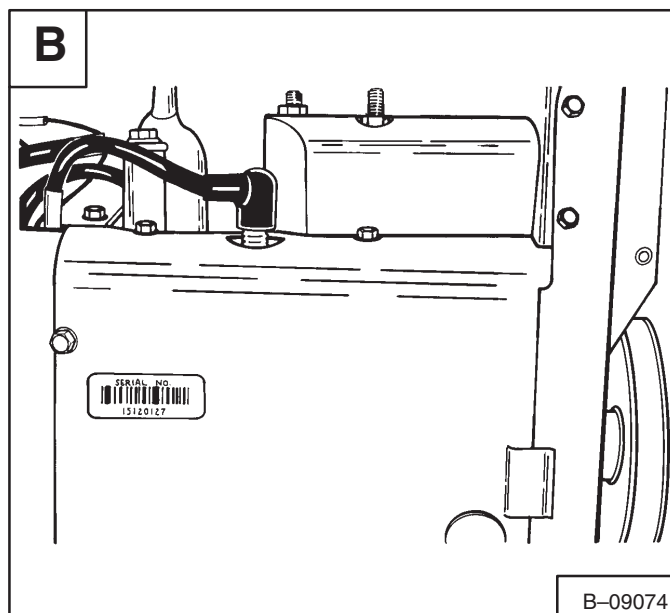
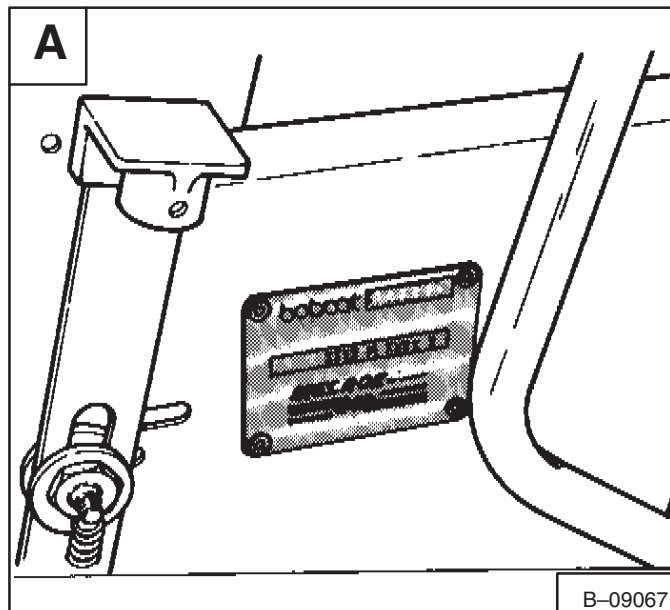
The Bobcat loader serial number plate location is on the inside of the operator cab on the right fender and in the front of the seat [A].

Explanation of loader Serial Number:



#### ENGINE SERIAL NUMBER LOCATION

The engine serial number is located on the engine shrouding on the rear of the engine [B].



### IV. DELIVERY REPORT

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

C

Bobcat DELIVERY REPORT

Dealer Name \_\_\_\_\_ Address \_\_\_\_\_ City \_\_\_\_\_ State \_\_\_\_\_ Zip \_\_\_\_\_

Customer Name \_\_\_\_\_ Address \_\_\_\_\_ City \_\_\_\_\_ State \_\_\_\_\_ Zip \_\_\_\_\_

Bobcat Model No. \_\_\_\_\_ Serial No. \_\_\_\_\_ Engine Serial No. \_\_\_\_\_ Bucket Size \_\_\_\_\_ Application \_\_\_\_\_ Date Delivered \_\_\_\_\_

**WARNING**

The following items are to be checked ☐ to step are explained in shown to the Owner/Operator by the Dealer at time of delivery:

- Explain delivery packet (Operator's Manual, Safety Manual and Warranty Brochure) when given to Owner/Operator.
- Advise owner that dealer is the source for operator training for operating, adjustments, adjustments and removal of job requirements and maintenance of loader and attachments.
- Explain capabilities and restrictions of loader and attachments for job usage, as identified by Owner/Operator.
- Review machine Safety Signs (Labels), Operator's Manual and Safety Manual.
- Explain plastic Operator Handbook attached with a label in the operator's cab, on Models 400 through 900 Series, 1080-5, 1600 & 2000.
- Show how to enter and exit loader safely, with lift arms down.
- Demonstrate use of seat belt and seat (or lift) as provided for this model. Seat belts are available for all Models 400 through 900 Series, 1600 and 2000.
- Demonstrate how to start, stop, turn and park the loader (also show how to lift, carry and dump the bucket or use other attachments).
- Explain use of operator cab which is a Roll-Over and Falling Object/Protective Structure Cab and available for all loaders and lift trucks. DO NOT modify or remove operator cab.
- Explain Enclosures and Spacing Application Kit available to keep material from entering cab windows.
- Explain the use of the rear window opening of the cab rear window in an emergency exit. DO NOT modify this opening or remove enclosures which block this exit.
- Explain correct operating capacity for safety and stability of the loader and attachments.
- Explain about rated & availability of bucket types and sizes for use with different materials.
- Explain recommended loading and unloading procedures.
- Advise owner to use the loader in an environment with explosive dusts or gases or with flammable materials near exhaust. Explain availability of loader with CE rating for fire insurance.
- Advise Owner/Operator of all available attachments and accessories, such as: Lift Arm Stops, Single Point Lift, Warning Alarm and Lights and others.
- Review maintenance procedure with Operator and/or maintenance man as listed in Operator's Manual.
- Explain "Warranty Policy" and limitations to Owner/Operator. Copy of Warranty Statement found in Operator's Manual and Warranty Brochure included in delivery packet.

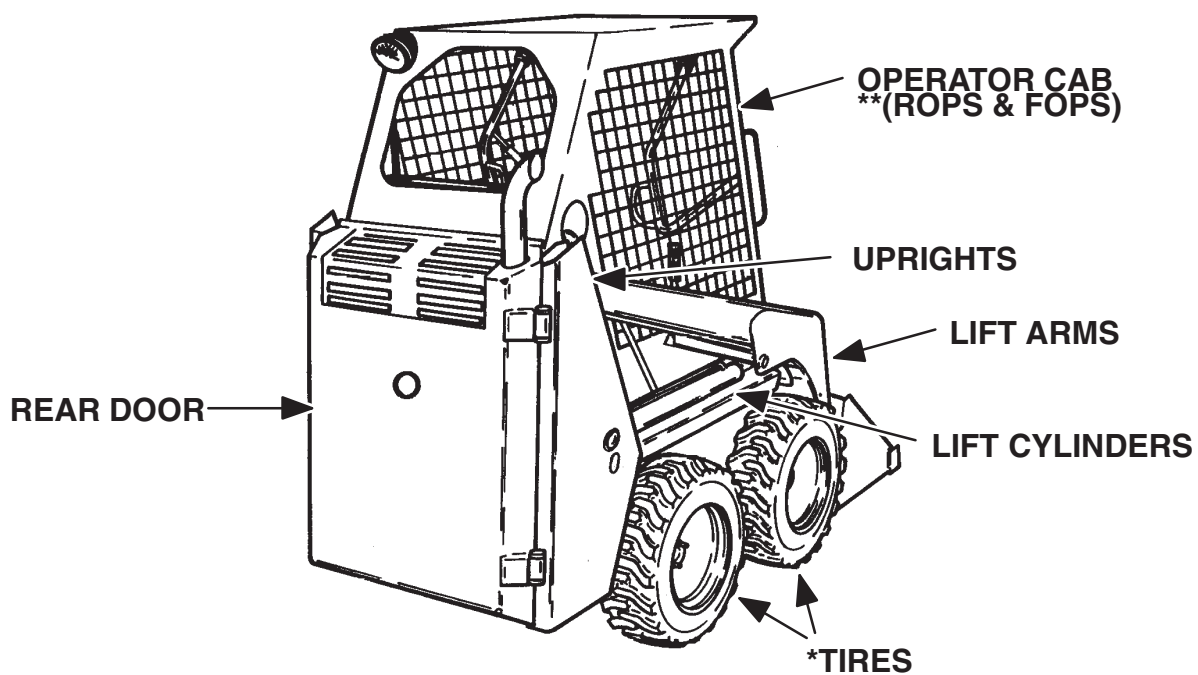
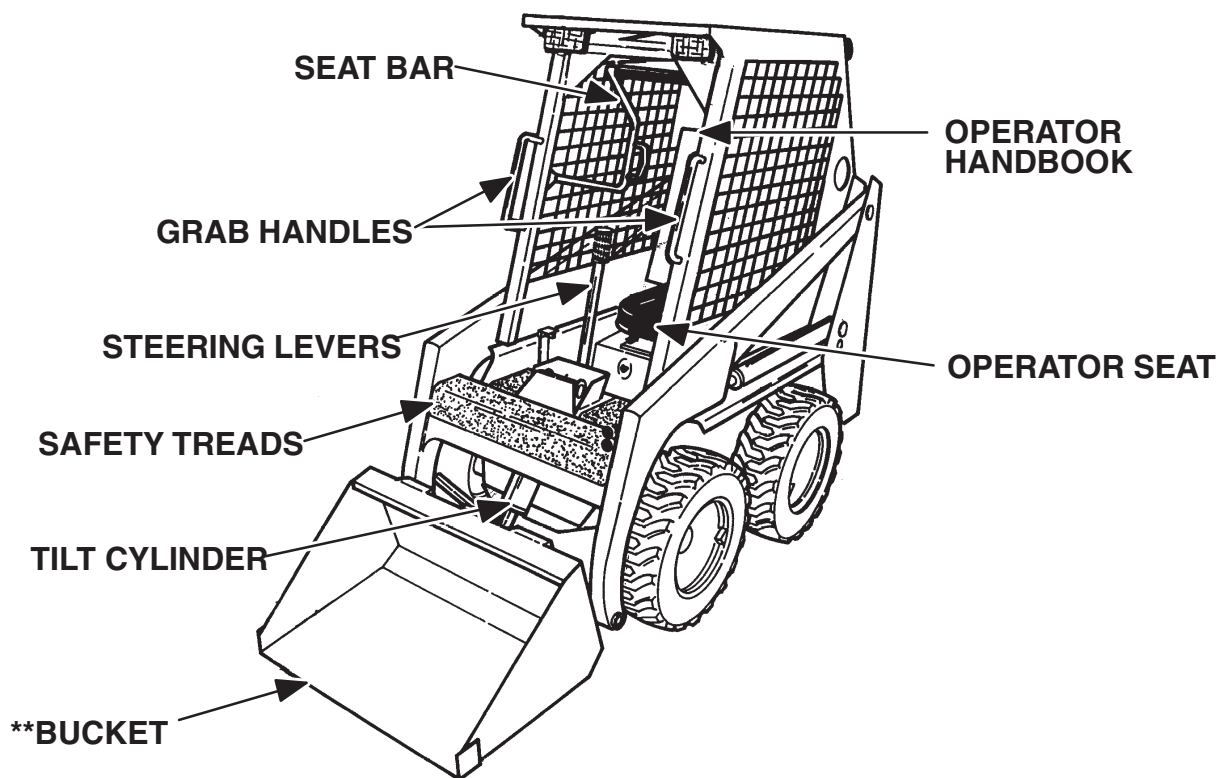
The above delivery information has been explained to me. I understand the operation and maintenance of this machine. I also acknowledge the warranty conditions and limitations as outlined in my copy of the warranty statement.

Owner/Operator Signature \_\_\_\_\_ Date \_\_\_\_\_

Dealer Representative Signature \_\_\_\_\_ Date \_\_\_\_\_

1st Copy: Dealer, Service Department 2nd Copy: Dealer, Sales Department 3rd Copy: Dealer, Sales Dept. 4th Copy: Customer 5th Copy: Bobcat, Inc. (U.S.A.)

## V. BOBCAT LOADER IDENTIFICATION



B-09039  
B-09040

- \* TIRES – Flotation (Optional) tires are shown. Bobcats are base-equipped with standard tires.  
\*\* BUCKET – Several different buckets and other attachments are available for the Bobcat loader .  
\*\*\* ROPS, FOPS – Roll-Over Protective Structure, Falling Object Protective Structure.

## PREVENTIVE MAINTENANCE

## PREVENTIVE MAINTENANCE

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## SERVICE SCHEDULE

Maintenance work must be done at regular intervals. Failure to do so will result in damage to the Bobcat loader or the engine. The service is a guide for correct maintenance of the Bobcat loader.

## HOURS CONVERSION CHART

An average work day is approximately 8 hours. If you use the loader for the following hours a day, do the service as recommended in the Service Schedule.

Use Loader Hours Per Day	CHECK OR SERVICE AS INDICATED BELOW						
	Service Schedule Hours						
	10 Hrs.	25 Hrs.	50 Hrs.	100 Hrs.	250 Hrs.	500 Hrs.	1000 Hrs.
2-3	4 days	10 days	3 wks.	6 wks.	6 mnths.	10 mnths.	20 mnths.
4-5	3 days	5 days	11 days	4 wks.	3 mnths.	5 mnths.	10 mnths.
6-7	2 days	4 days	8 days	2 wks.	5 wks.	4 mnths.	7 mnths.
8	each day	3 days	6 days	10 days	4 wks.	2 mnths.	5 mnths.

SERVICE SCHEDULE		HOURS							
ITEM	SERVICE REQUIRED	5	8-10	25	50	100	250	500	1000
Engine Oil	Change engine oil (New Engine Only).								
Engine Oil	Check level and add oil as needed.								
Engine Cooling System	Check and clean as needed.								
Tires	Check air pressure and for damage to the tires.								
Seat Belt & Seat Bar	Check the condition of seat belt. Check the seat bar for correct operation to lock both foot pedals.								
Safety Signs (Decals) & Safety Treads	Check for damaged signs (decals) & safety treads. Replace any signs (decals) & safety treads that are damaged.								
All Loader Pivot Points	Add grease to the fittings until the extra grease shows.								
Hydraulic Fluid	Check the fluid level in the reservoir & add fluid as needed.								
Engine Oil	Replace oil.								
Engine Air Cleaner	Clean or replace filter element as needed.								
Battery	Check water level and add as needed. Clean the cables.								
Control Pedals & Steering	Check operation. Make repairs & adjustments as needed.								
Wheel Nuts	Check for loose wheel nuts and tighten to 40-50 ft.-lbs. (54-61 Nm) torque.								
Parking Brake	Check operation. Make adjustments as needed.								
Hydraulic Filter Element	Replace filter element.								
Spark Arrestor Muffler	Clean the spark chamber.								
Steering Levers	Lubricate the grease fittings and the oil hole in the steering shaft.								
Engine Ignition System	Replace the spark plugs.								
Engine Air Shrouding	Remove and clean shrouding and cooling fins.								
Engine Fuel Filter	Replace the filter element.								
Hydraulic Reservoir Fill Cap (Breather)	Replace the breather cap.								
Final Drive Transmission (Chaincase)	Replace the fluid.								
Hydraulic/Hydrostatic (Reservoir)	Replace the fluid.								

## 1 PREVENTIVE MAINTENANCE



### WARNING

Instructions are necessary before operating or servicing machine. Read and understand the Operation & Maintenance Manual, 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-2003-0199

## LIFTING AND BLOCKING THE FELLER BUNCHER

### Procedure

Always park the loader on a level surface.



### WARNING

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

W-2017-0286

Lower the lift arms, stop the engine.

Put the floor jack under the rear of the loader.

Lift the loader and install jackstands [B].

Put the floor jack under the front of the loader.

Lift the front of the loader and install jackstands [C].

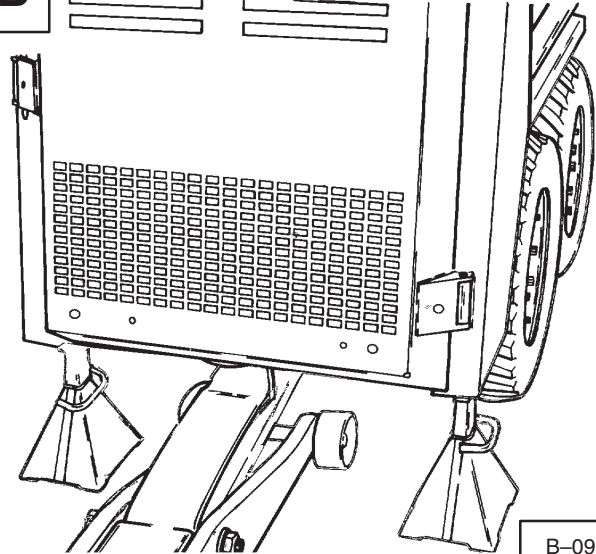
**NOTE:** Make sure the jackstands do not touch the tires.

A



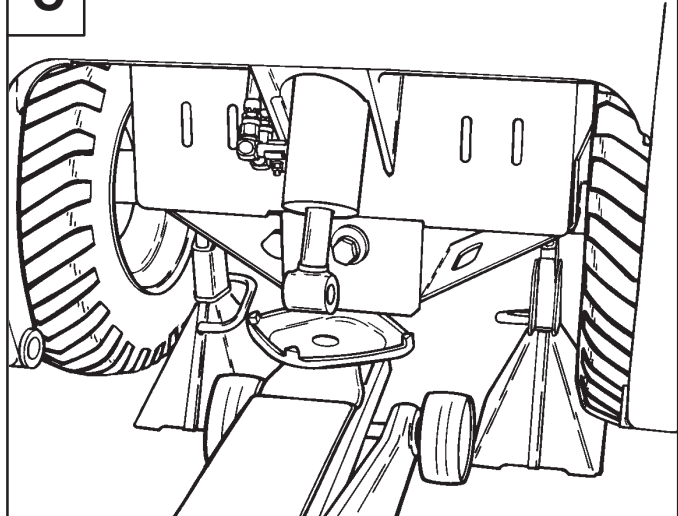
B-07023

B



B-09135

C



B-09134

## TRANSPORTING THE LOADER

### Procedure

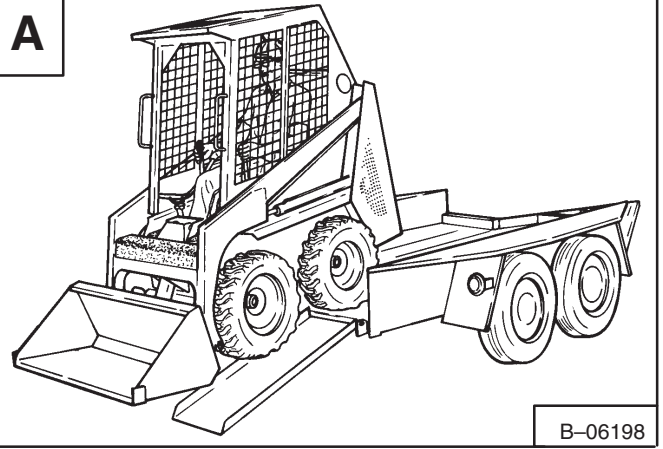


## WARNING

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

W-2058-0494

A



B-06198

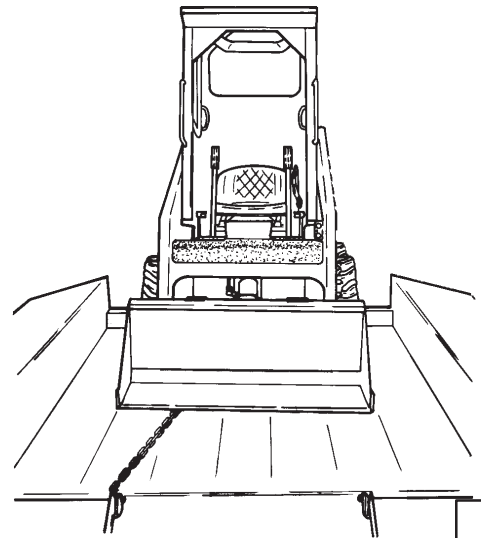
A loader with empty bucket or no attachment must be loaded backwards onto the transport vehicle [A].

After the loader is loaded onto the transport vehicle, lower the lift arms and stop the engine.

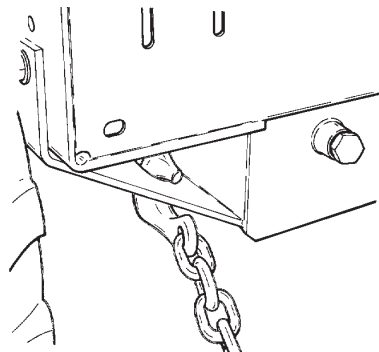
Engage the parking brake. Lift the seat bar and move the foot pedals until both pedals are locked.

Install chains (at the front and rear of the loader) to hold the loader in position to prevent it from moving during sudden stops or going up and down slopes [B].

B



B-06199



B-06200

## LIFT ARM STOP

### Procedure



## WARNING

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

W-2059-0598

**NOTE:** Lift arm stops are available from your local dealer.

One person must stay in the operator's seat, with the seat belt fastened and the seat bar lowered, while the second person installs the lift arm stop [A].



## WARNING

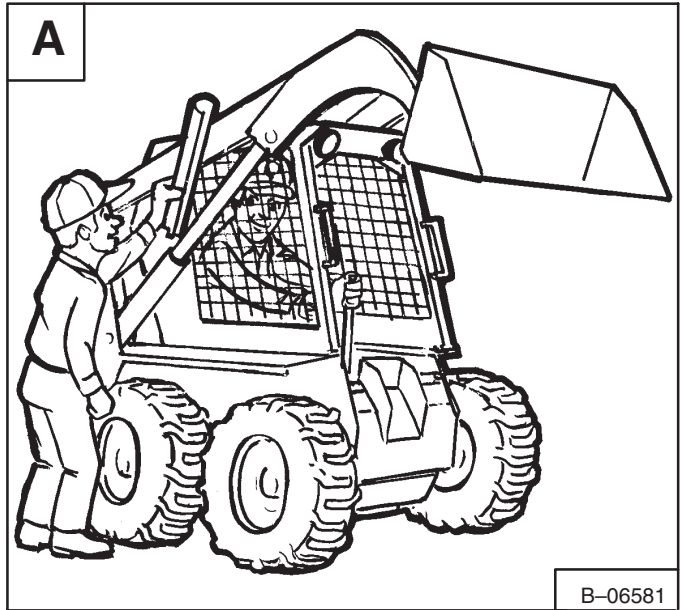
Put jackstands under the front axles and rear corners of the frame before running the engine for service. Failure to use jackstands can allow the machine to fall or move and cause injury or death.

W-2017-0286

Start the engine and raise the lift arms all the way up. Have the second person install the lift arm stop over the rod of one lift cylinder.

The lift arm stop must be tight against the cylinder rod. Lower the lift arms until the stop is held between and the lift arm and lift cylinder.

A



B-06581



## OPERATOR CAB

The loader has an operator cab (ROPS and FOPS) as standard equipment. The ROPS and FOPS protect the operator from rollover and falling objects.

### **WARNING**

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

W-2069-1285

Check with your dealer if the operator cab has been damaged.

The operator cab fastening bolts and nuts must be tight [A].

Tighten to 40–59 ft.-lbs. (54–68 Nm torque).

### **WARNING**

**Both sets of fasteners at the front of the operator cab (ROPS) must be assembled as shown in this manual. Failure to secure ROPS correctly can cause injury or death.**

W-2005-1189

**Before the cab or the lift arms are raised for service, jackstands must be put under the rear corners of the frame. Failure to use jackstands can allow the machine to tip backward causing injury or death.**

W-2014-0895

## Seat Bar System

The seat bar system has a pivoting seat bar with arm rests and has spring loaded latches for the lift and tilt control pedals. The operator controls the use of the seat bar. The seat bar in the down position keeps the operator in the seat and unlocks the foot pedals. When the seat bar is up, the lift and tilt pedals are locked in neutral position.

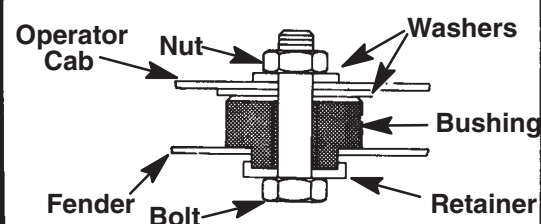
## Seat Bar Inspection

Sit in the seat and fasten the seat belt snugly [B]. Engage the brake.

Put the seat bar all the way down [B] and start the engine.

Operate each foot pedal to check both the lift arm and tilt functions. Raise the lift arms until the bucket is about two feet (600 mm) off the ground.

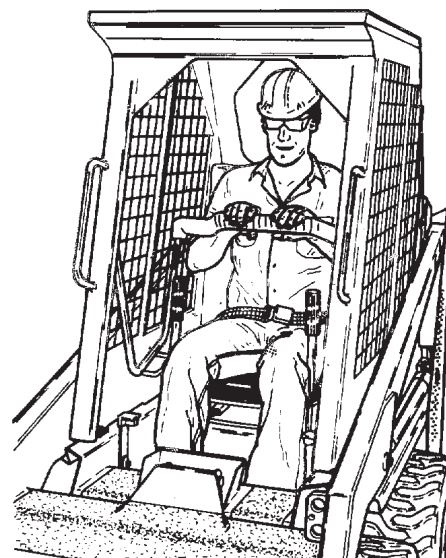
**A**



6565933

C-02599

**B**



B-09038

## OPERATOR CAB (Cont'd)

Raise the seat bar. Try to move each foot pedal [A]. Pedals must be firmly locked in the neutral position. There must be no motion of the lift arms or tilt (bucket) when the pedals are pushed.

Pull the seat bar down, lower the lift arms fully and place the bucket flat on the ground.

Stop the engine. Engage the brake. Raise the seat bar and operate the foot pedals to ensure that the pedals are firmly locked in the neutral position. Release the seat belt.

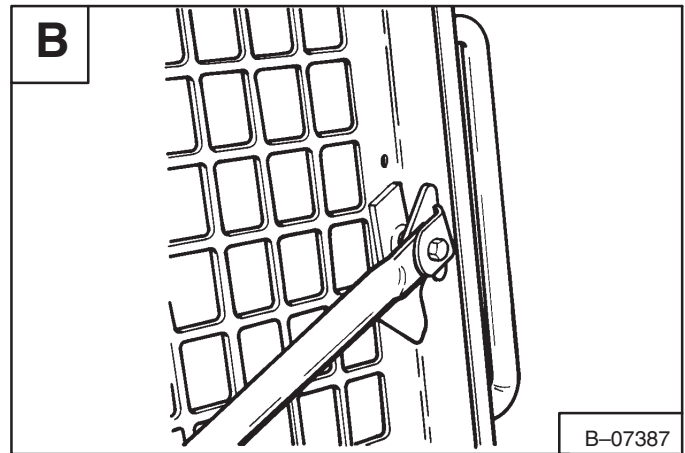
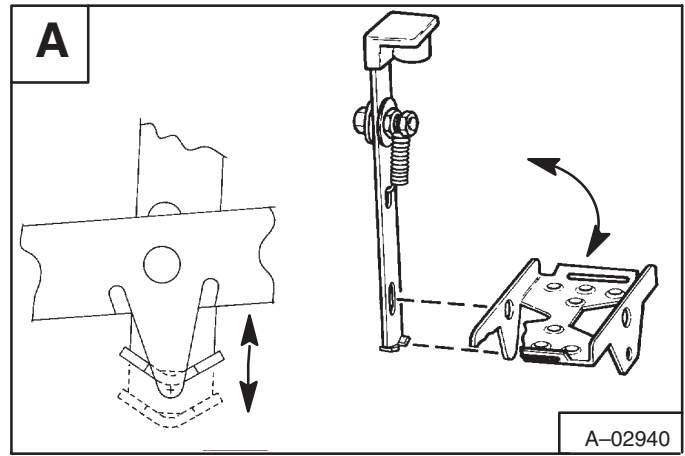
### Seat Bar Maintenance

Clean the debris or dirt from moving parts [A] and [B].

Inspect the linkage bolts and nuts for tightness 25–28 ft.-lbs. (34–38 Nm) torque.

Use general purpose grease to lubricate the seat bar pivot points at each side of the cab [B].

If seat bar system does not function correctly, check for free movement of each linkage part. Check for excessive wear. Adjust pedal control linkages. Replace parts that are worn, bent or broken.



## WARNING

### AVOID INJURY OR DEATH

The seat bar system must lock the lift and tilt control pedals in neutral when the seat bar is up. Service the system if pedals do not lock correctly.

W-2105-1285

## OPERATOR CAB (Cont'd)

### Raising the Operator Cab

Stop the loader on a level surface. Put the lift arms all the way down.

If the lift arms must be up while raising the cab, install a lift arm stop (See Page 1-4).



## WARNING

**Before the cab or the lift arms are raised for service, jackstands must be put under the rear corners of the frame. Failure to use jackstands can allow the machine to tip backward causing injury or death.**

W-2014-0895

Remove the two (2) fasteners (including the washers or plates) at the front corners of the operator cab **[A]**.

Two (2) persons are needed to raise the operator cab. Stand on the ground (one person on each side) and lift slowly until the operator cab is all the way up **[B]**.

The operator cab will lock in this position.

### Lowering the Operator Cab

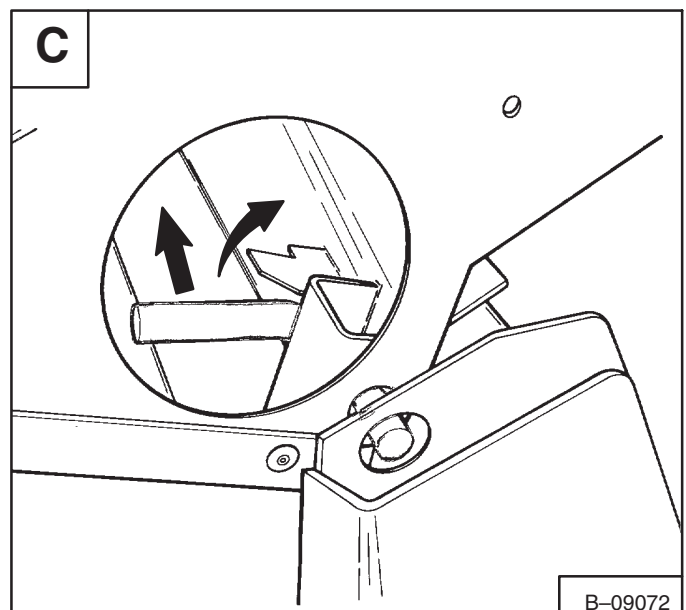
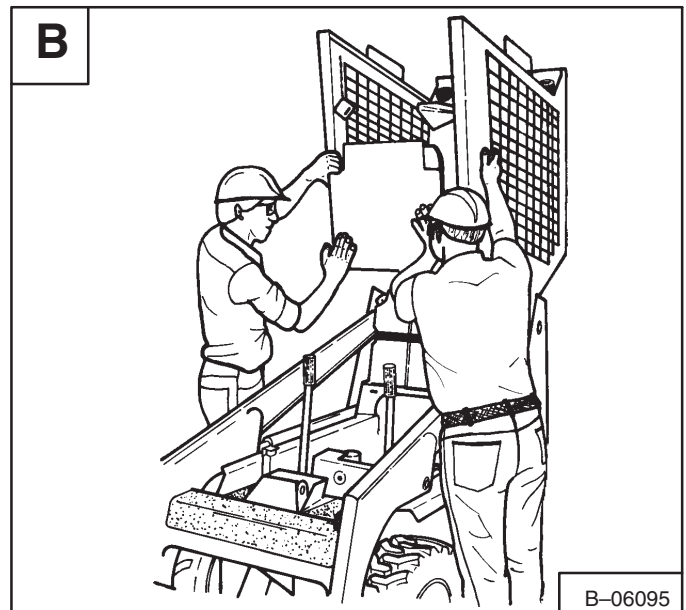
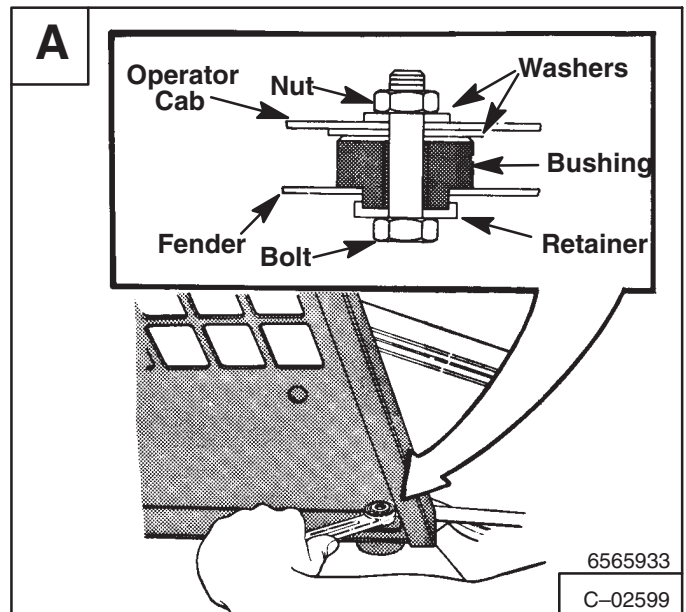
Two (2) persons are needed to lower the operator cab. Avoid slippery surfaces when lowering the cab.

Release the lock mechanism by pushing and turning the locking lever until it stays disengaged **[C]**. **REMOVE YOUR HAND BEFORE LOWERING THE OPERATOR CAB.**

Stand on the ground (one person on each side) and pull down on the operator cab **[B]**.

Both persons must slowly lower the operator cab by holding the bottom of the cab and grab handles **[B]**.

Install the two (2) fasteners (including the washers or plates) and tighten the nuts **[A]**.



## USING AND EXTRA BATTERY (JUMP START)

### Procedure

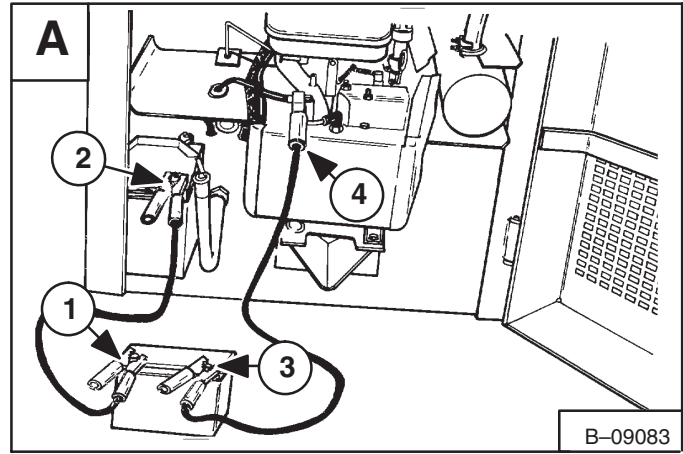
If it is necessary to use an extra battery to start the engine. **BE CAREFUL!** There must be one person in the operator's seat and one person to connect and disconnect the battery cables.

The extra battery must be the same voltage as the loader battery.

1. Turn the start switch "OFF".
2. Connect the first jumper cable to the positive (+) terminal of the extra battery (Item 1) and to the positive (+) terminal of the battery (Item 2) [A].

**NOTE: Never connect the negative (-) cable to the negative (-) terminal of the battery.**

3. Connect the second jumper cable to the negative (-) terminal of the extra battery (Item 3) and the engine (Item 4) [A].
4. Keep jumper cables away from moving parts.
5. Start the engine.
6. Immediately remove the negative (-) cable (Item 4) from the engine [A].
7. Remove the positive (+) cable from the battery terminal.
8. Remove the cables from the extra battery.



## IMPORTANT

Damage to the alternator can occur if:

- Engine is operated with battery cables disconnected.
- Battery cables are connected when using a fast charger or when welding on the loader. (Remove both cables from the battery.)
- Extra battery cables (booster cables) are connected wrong.

I-2023-1285

## ! WARNING

Keep arcs, sparks, flames and lighted tobacco away from batteries. When *jumping* from booster battery make final connection (negative) at engine frame.

Do not jump start or charge a frozen or damaged battery. Warm battery to 60 °F. (16°C.) before connecting to a charger. Unplug charger before connecting or disconnecting cables to battery. Never lean over battery while boosting, testing or charging.

Battery gas can explode and cause serious injury.

W-2066-1296

Batteries contain acid which burns eyes and skin on contact. Wear goggles, protective clothing and rubber gloves to keep acid off body.

In case of acid contact, wash immediately with water. In case of eye contact get prompt medical attention and wash eye with clean, cool water for at least 15 minutes.

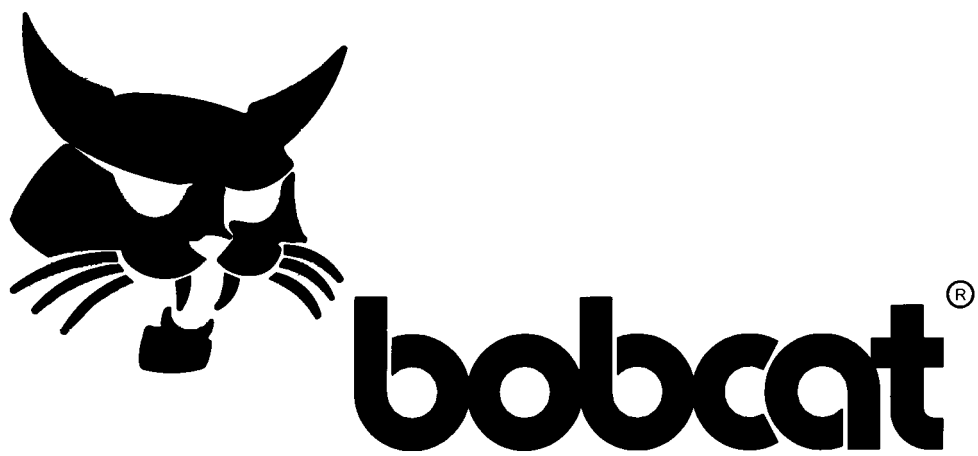
If electrolyte is taken internally drink large quantities of water or milk! DO NOT induce vomiting. Get prompt medical attention.

W-2065-1296

## HYDRAULIC SYSTEM

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## HYDRAULIC SYSTEM







# HYDRAULIC / HYDROSTATIC FLOW CHART

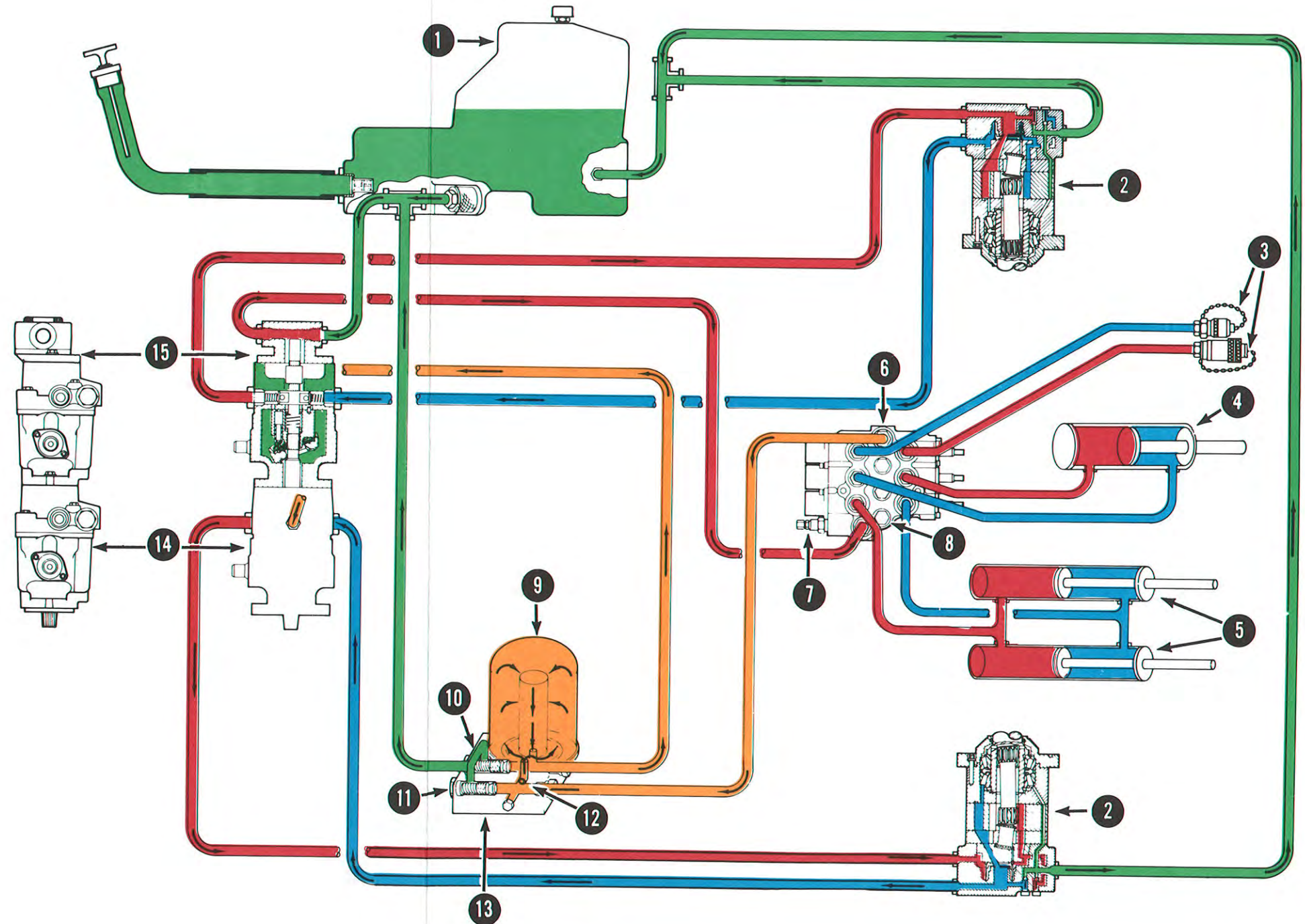
For Model

**440B and Farmboy**

Chart # 6570190 (Printed January 1987)

RED - - - - - High Pressure  
BLUE - - - - - Low Pressure  
GREEN - - - - - Case Drain & Reservoir  
ORANGE - - - - - Charge Pressure

**NOTE**  
Chart shows oil flow in Forward Drive Position and with Hydraulic Cylinders Partially Extended. For Hydraulic/Hydrostatic System Operation, refer to Sheet 2 of this publication.



E-1715







# HYDRAULIC / HYDROSTATIC SYSTEM OPERATION

## To Be Used With HYDRAULIC / HYDROSTATIC FLOW CHART

For Model  
**440B and Farmboy**

Chart # 6570190 (Printed January 1987)

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### CHART LEGEND

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- ① **FLUID RESERVOIR,**  
Cap: . . . . . 2.4 Gals. (9,0 L)  
Working Cap: 4.5-5.5 Gals. (4,3-5,2 L)
- ② **HYDROSTATIC MOTOR**
- ③ **AUXILIARY QUICK COUPLERS**  
(OPTIONAL)
- ④ **TILT CYLINDER**
- ⑤ **LIFT CYLINDERS**
- ⑥ **HYDRAULIC CONTROL VALVE**
- ⑦ **MAIN RELIEF VALVE, 1300-1350 PSI**  
(8964-9370 kPa)
- ⑧ **LOAD CHECK VALVES**
- ⑨ **10 MICRON FILTER**
- ⑩ **BY-PASS VALVE, 84 PSI (579 kPa)**
- ⑪ **BY-PASS VALVE, 120 PSI (827 kPa)**
- ⑫ **ORIFICE . . . . . 0.244" (6,198 mm) Dia.**
- ⑬ **PORT BLOCK**
- ⑭ **HYDROSTATIC PUMPS**
- ⑮ **HYDRAULIC PUMP . . . . . 6.8 GPM**  
(25,7 Lmin.) @ 3200 Engine RPM  
(2240 RPM @ Hydraulic Pump)

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## OIL FLOW EXPLANATION

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The fluid flows from the reservoir ① to the hydraulic pump ⑮. "Case drain" fluid from the hydrostatic pumps ⑭ also supplies fluid to the hydraulic pump ⑮.

The hydraulic pump ⑮ is a "gear type" pump and is driven by a shaft through the hydrostatic pumps ⑭. The fluid from the hydraulic pump ⑮ goes to the control valve ⑥. The control valve ⑥ has a pilot-operated main relief valve ⑦. When all three spools are in the neutral position, the fluid goes to the port block ⑬. If one of the spools is activated, the fluid goes out the respective port and to either the base end or rod end of the hydraulic cylinder(s) ④ ⑤. As the fluid goes into one end of the cylinder(s), return fluid comes back from the opposite end of the cylinder(s) and back to the control valve ⑥. When the cylinder(s) reaches the end of the stroke, the fluid flow stops and causes hydraulic pressure to increase. When the pressure reaches the setting of the main relief valve ⑦ it opens and lets the fluid bypass the hydraulic circuit (internally). When this happens, there is no fluid to the down stream sections of the control ⑥. If the spool goes back to the neutral position, then there is fluid available for the other sections. Two sections of the control valve ⑥ can be used at the same time if the main relief ⑦ is not open.

The fluid goes through an orifice ⑫ and through the 10 micron filter ⑨ and to the hydrostatic pumps ⑭ for charge supply fluid. The by-pass valve ⑪ will open during any of the following conditions: (a) during cold weather operation (when the fluid is cold), (b) if there is excessive flow from the cylinder(s) ④ ⑤. and (c) will allow fluid flow when it cannot go through the filter element ⑨ (plugged).

The normal flow of the fluid called "charge pressure" goes to the front and rear hydrostatic pumps ⑭ from the 10 micron filter ⑨. The charge relief valve ⑩ regulates charge pressure. Excessive fluid will go back to the fluid reservoir ①.

When the fluid gets to the pumps ⑭, it activates the replenishing valves. As the pressure increases the replenishing valves will open and let fluid into the pumps ⑭ and the motors ② for replenishing of fluid.

When the replenishing valves open and charge fluid goes into the pumps ⑭, the flow becomes "drive loop fluid". When the steering levers are in the neutral position, the pumps ⑭ and motors ② are not working but do have charge pressure. When the steering levers are moved, the swashplates in the pumps ⑭ are angled and the fluid is pumped out of the pressure side of the pumps ⑭ to the motors ②. This fluid is called "drive pressure fluid". Drive pressure fluid is much higher than charge pressure fluid causing the replenishing valves to close to allow the flow of the fluid to go to the motors ②.



One hydrostatic pump ⑭ and hydrostatic motor ② work together as a pair to drive one side of the loader. The other pump and motor work as a pair to drive the opposite side of the loader.

The hydrostatic motors ② are a “geroller type” and have a built in balls and springs. The balls are held on their seats by the drive loops pressure. The balls will remain on their seats as long as the case drain line is not plugged. The case drain fluid in the motors ② is used for lubrication and cooling and flows back to the fluid reservoir ① .



## 2 HYDRAULIC SYSTEM

### TROUBLESHOOTING

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

PROBLEM	CAUSE
The hydraulic system will not operate.	1, 2, 3, 4
Slow hydraulic system action.	1, 3, 5, 6,
Hydraulic action is not smooth.	1, 5, 6, 7
Lift arms go up slowly at full engine RPM.	1, 3, 5, 6, 8, 10
The lift arms or bucket will move the pedal in neutral position.	9
The lift arms come down slowly with the pedals in the neutral position.	9, 10, 11

KEY TO CORRECT THE CAUSE
<ol style="list-style-type: none"><li>1. The fluid level is not correct.</li><li>2. The pedal linkage is disconnected.</li><li>3. The hydraulic pump is not working correctly.</li><li>4. The relief valve is not working correctly.</li><li>5. Relief valve is not at the correct pressure.</li><li>6. Suction leak on the inlet side of the hydraulic pump.</li><li>7. Fluid is cold.</li><li>8. Using the loader for more than its rated capacity.</li><li>9. Spool in the valve section is not centering or the centering spring is broken.</li><li>10. Internal leak at the lift cylinder(s).</li><li>11. External leak at the lift cylinder(s).</li></ol>

# 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

Flare Connections

Use the following procedure to tighten the flare fitting:

Tighten the nut until it makes contact with the seat.

Make a mark across the “flats” of both the male and female parts of the connection [A].

Use the chart to find the correct tightness needed [B].

If the fitting leaks after tightening, disconnect it and inspect the seat area for damage.

Straight Thread O-ring Fitting

When installing this fitting, the O-ring must be first lubricated. Loosen the jam nut, install the fitting into place, then tighten the jam nut. Tighten the jam nut until it and the washer are tight against the surface [C].

Tubelines and Hoses

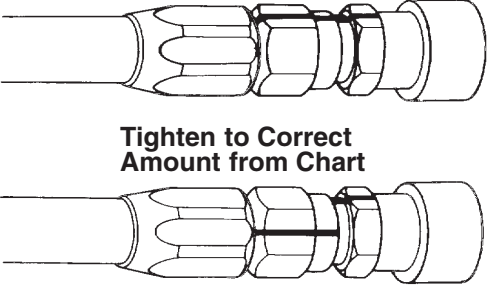
Make replacement of tubelines which are bent or have become flat. There will be a restriction of fluid flow which will give a slow hydraulic action and cause heat.

Make replacement of hoses which show signs of wear, damage or weather cracked rubber.

When installing tubelines or hoses, make sure you use two wrenches when loosening and tighten them.

## A

Mark a Line on Nut Flats of Both Nuts



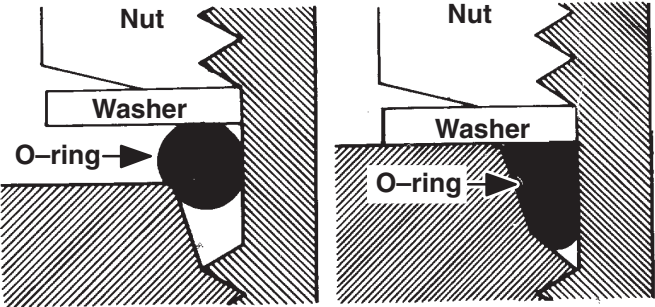
Tighten to Correct Amount from Chart

A-01897

## B

Wrench Size	Tube Size Outside Dia.	Thread Size	Rotate No. of Hex Flats
5/8"	5/16"	1/2" – 20	2–1/2
11/16"	3/8"	9/16" – 18	2
7/8"	1/2"	3/4" – 16	2
1"	5/8"	7/8" – 14	1–1/2 – 2
1–1/4"	3/4"	1–1/16" – 12	1
1–3/8"	1"	1–5/16" – 12	3/4 – 1
2"	1–1/4"	1–5/8" – 12	3/4 – 1
2–1/4"	1–1/2"	1–7/8" – 12	1/2 – 3/4

## C



Nut

Washer

O-ring

A-01852

## LIFT CYLINDER

### Checking the Lift Cylinder(s)

Lower the lift arms. Stop the engine. Activate the lift pedal to release the hydraulic pressure.

# ! WARNING

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

W-2072-0496

Open the rear door. Remove the retainer plate at the lift cylinder pivot pin.

Installation: Tighten bolt at retainer plate to 18–20 ft.-lbs. (24–27 Nm) torque.

Use a slide hammer and pull the pivot pin from the base end of the cylinder [A].

Pull the lift cylinder forward until the hydraulic hose can be disconnected.

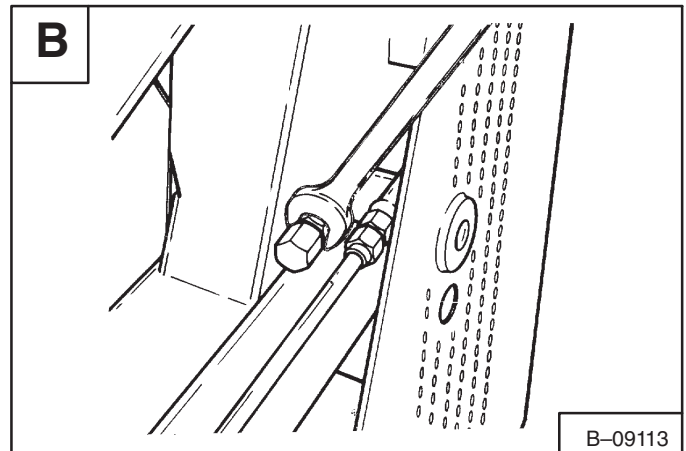
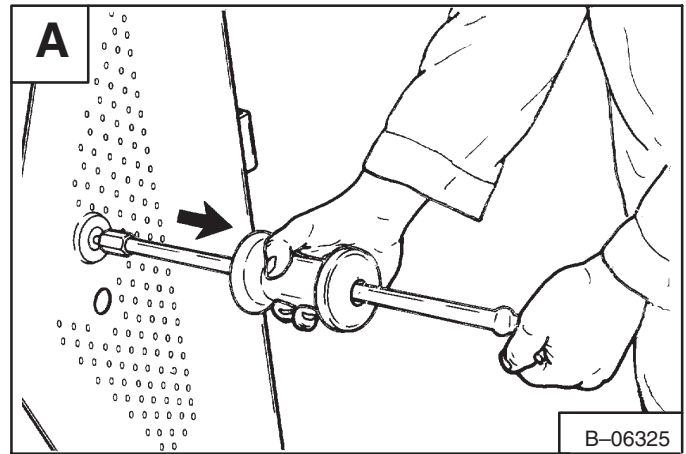
Disconnect the hose which goes to the base end of the lift cylinder [B].

Install a plug in the hose.

Start the engine. Push the top (toe) of the lift pedal.

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

Repeat this procedure to check the other lift cylinder.



**LIFT CYLINDERS (Cont'd)**

**Removal and Installation**

Lower the lift arm. Stop the engine. Activate the pedals to release the hydraulic pressure.

Open the rear door.

Remove the retainer plate at the base end of pivot pin of the lift cylinder.

Installation: Tighten the bolt at the retainer plate to 18–20 ft.-lbs. (24–27 Nm) torque.

Use a slide hammer to remove the base end pivot pin [A].

Move the lift cylinder forward, disconnect the hydraulic hoses.

Remove the retainer plate from the rod end of the lift cylinder [B].

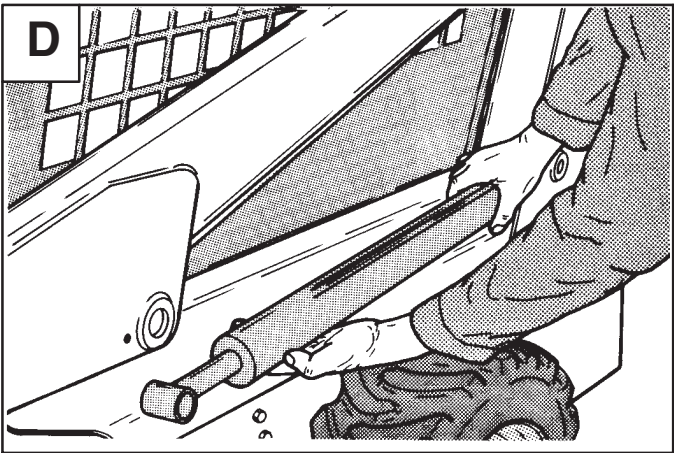
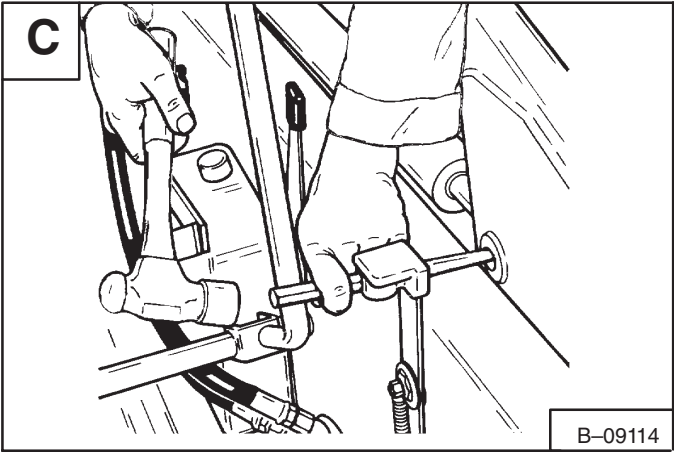
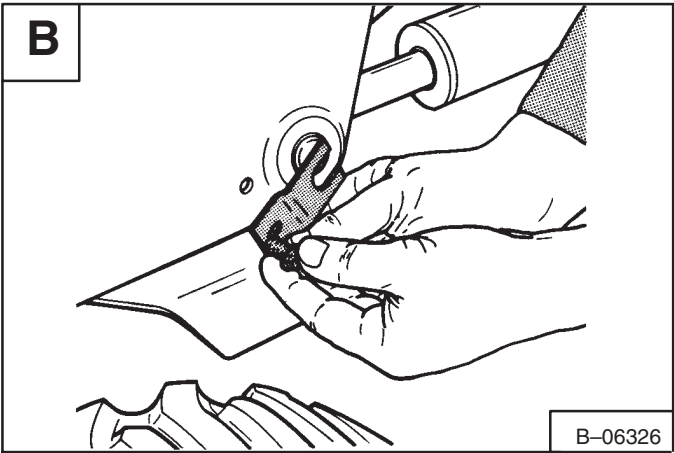
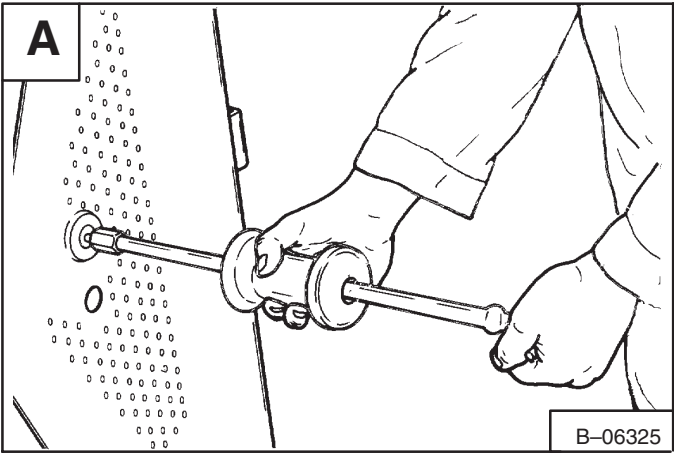
Installation: Tighten the bolt at the retainer plate to 18–20 ft.-lbs. (24–27 Nm) torque.

Put floor jack under the front of the lift arms and lift until there is clearance to remove the pivot pin at the rod end of the lift cylinder.

Using a punch and hammer, remove the rod end pivot pin [C].

Remove the lift cylinder from the loader [D].

See Page 2–6 for Hydraulic Cylinder Repair.





## TILT CYLINDER

### Checking the Tilt Cylinder

Remove the bucket or attachment (See Page 5–5 for the correct procedure).

Stop the engine. Activate the tilt pedal to release the hydraulic pressure.

## WARNING

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

W-2072-0496

Disconnect the hose which goes to the rod end of the tilt cylinder [A].

Pull a plug in the hose.

Start the engine. Push the top (toe) of the tilt pedal. If there is fluid leakage from the operator, remove the tilt cylinder for repair.

### Removal and Installation

Remove the bucket or attachment (See Page 5–5 for the correct procedure).

Stop the engine. Activate the tilt pedal to release the hydraulic pressure.

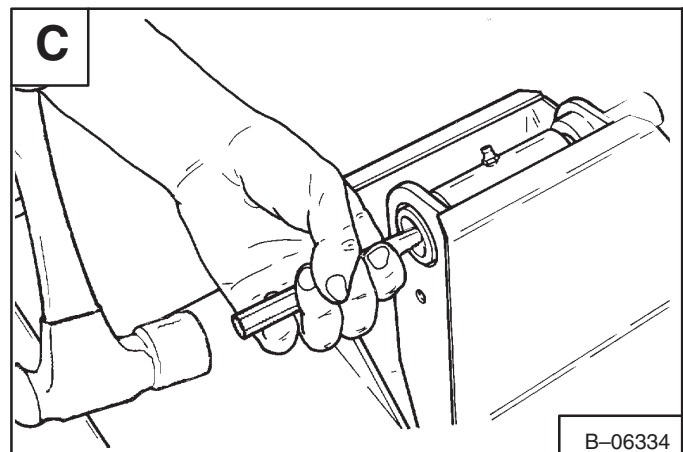
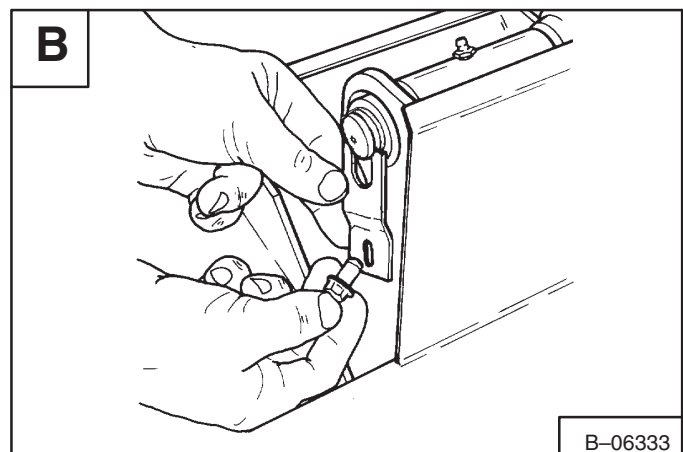
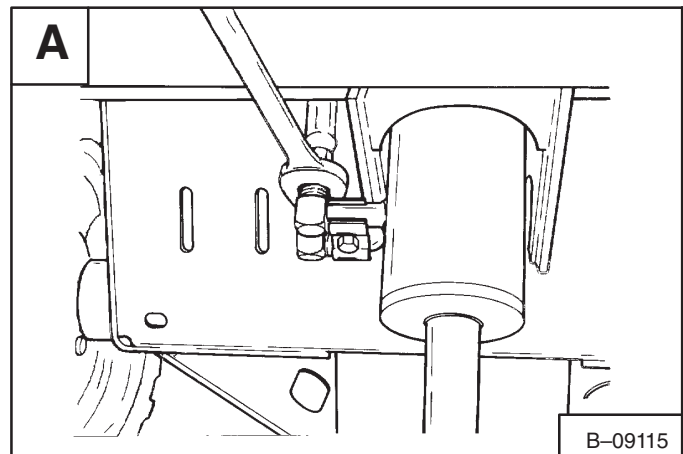
Remove the retainer plate at the base end pivot pin [B].

Installation: Tighten the bolt at the retainer plate 18–20 ft.-lbs. (24–27 Nm) torque.

Using a punch and hammer, remove the base end pivot pin [C].

**NOTE: Make sure to support the tilt cylinder when removing the pivot pin so the cylinder will not fall on the floor.**

See Page 2–6 for Hydraulic Cylinder Repair.



## HYDRAULIC CYLINDER REPAIR

**NOTE:** The following procedure can be used for either the lift or tilt cylinders. The tools listed will be identified as to which hydraulic cylinder they will be used on.

### Disassembly

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

MEL-1074—O-ring Seal Hook  
MEL-1075—Gland Nut Wrench  
MEL-1076—Cylinder Wrench  
MEL-1032—Rod Seal Tool (1" Dia.)  
MEL-1033—Rod Seal Tool (1.25" & Up Dia.)  
MEL-1008—Seal Installation Tool (2")  
MEL-1009—Seal Installation Tool (3")

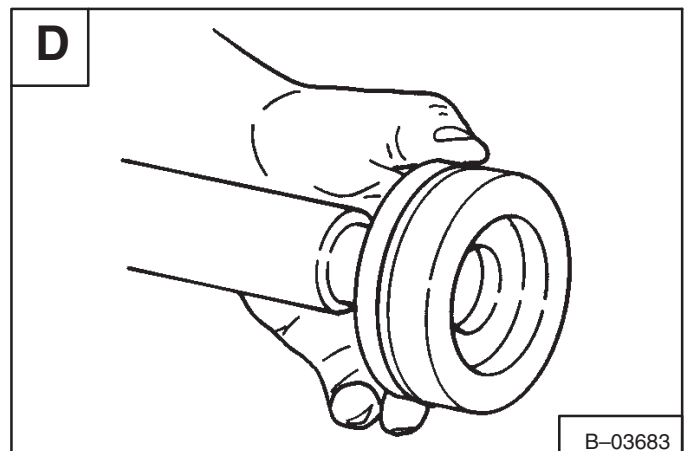
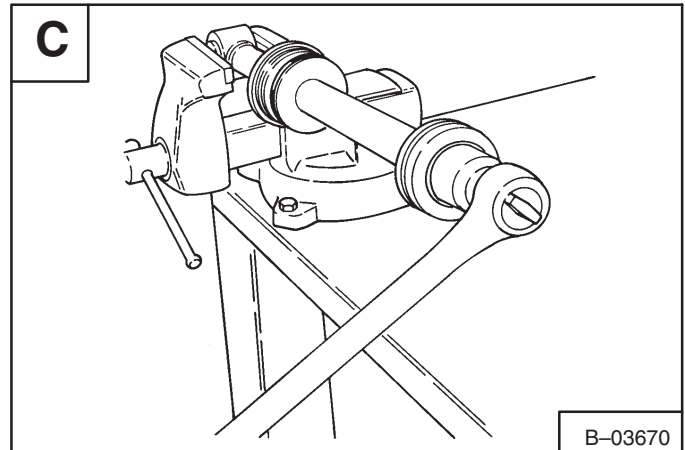
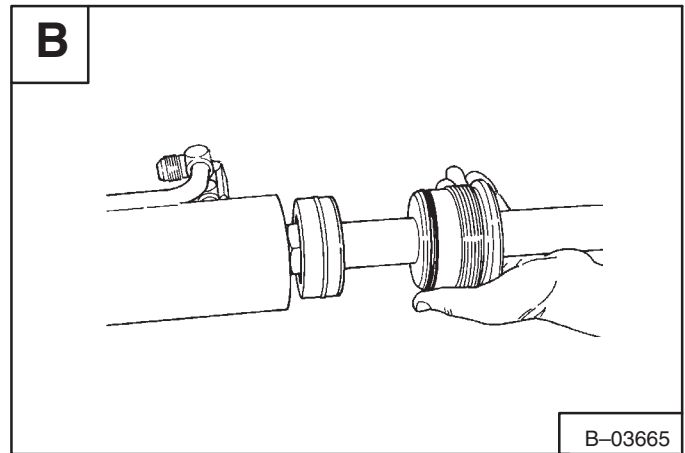
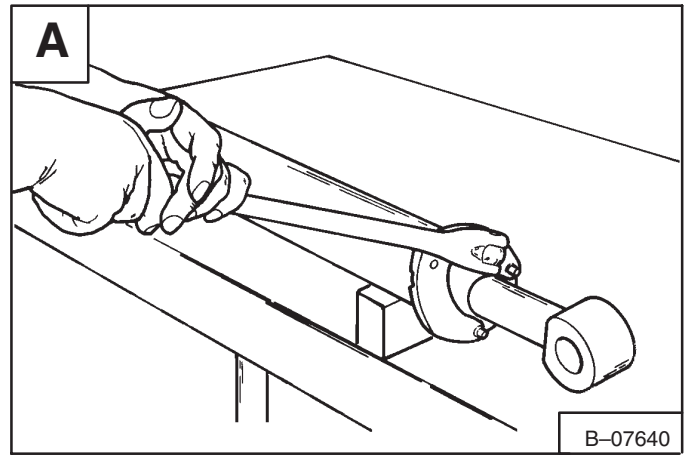
Put the base end of the cylinder in a drain pan. Move the rod in and out to remove the fluid from the cylinder barrel.

Put the base end of the cylinder in a vise. Remove the end cap from the cylinder using the special tool [A].

Remove the rod with the end cap and piston from the cylinder barrel [B].

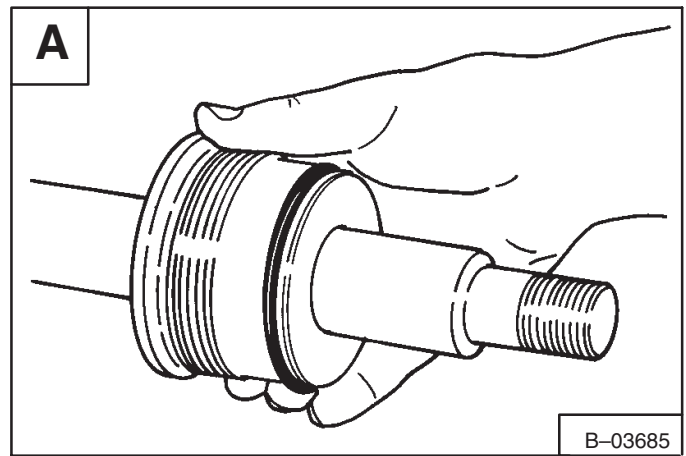
Put the rod end of the shaft in the vise and remove the nut [C].

Remove the piston from the rod [D].

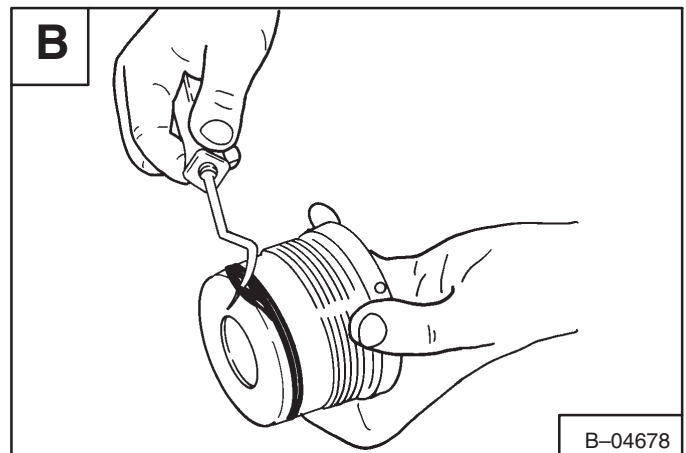


## HYDRAULIC CYLINDER REPAIR (Cont'd)

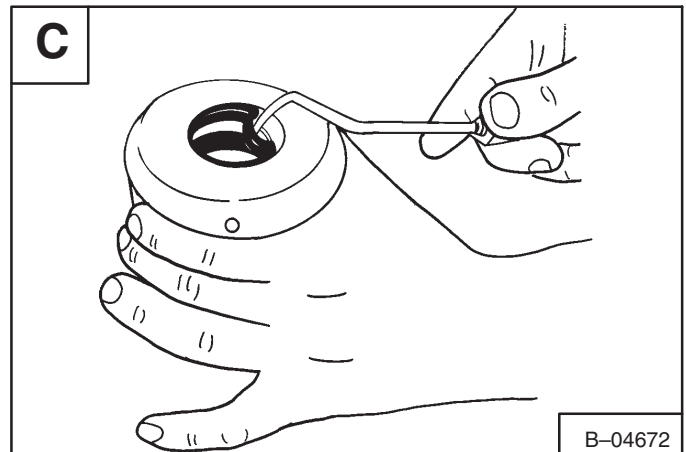
Remove the end cap from the rod **[A]**.



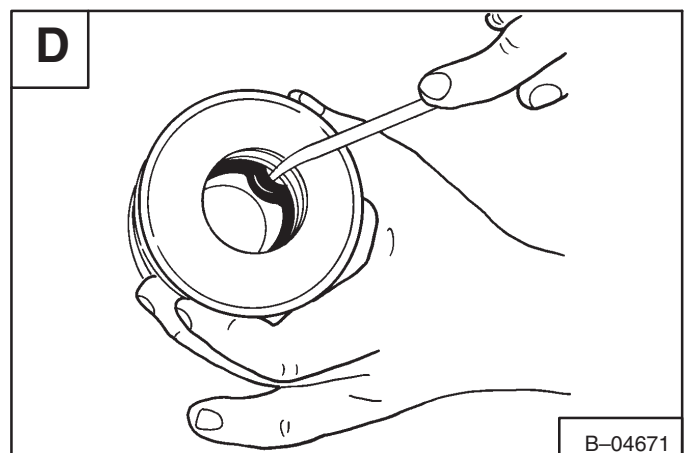
Remove the O-ring and back-up washer from the end cap **[B]**.



Remove the wiper seal from the end cap **[C]**.



Remove the oil seal from the end cap **[D]**.



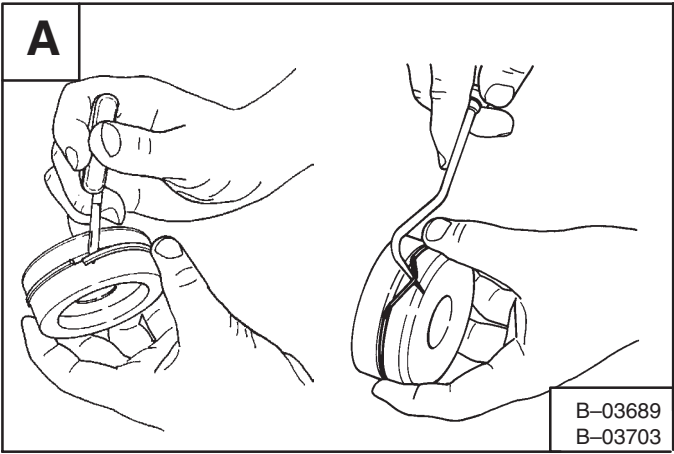
HYDRAULIC CYLINDER REPAIR (Cont'd)

Assembly

Remove the teflon seal and the O-ring from the piston [A].

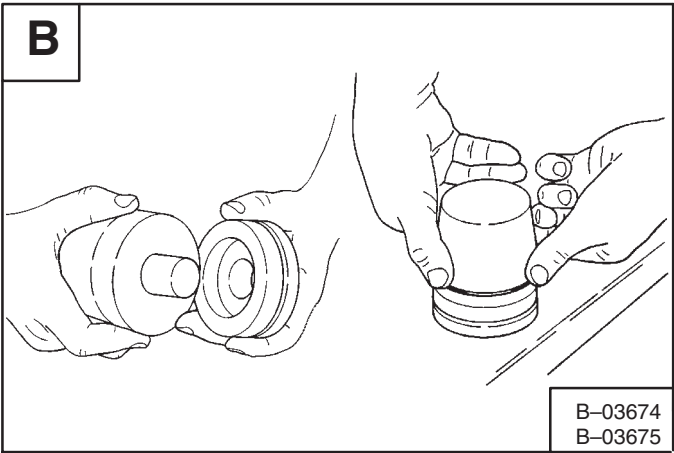
Wash all the parts in clean solvent. Dry with air only .  
Destroy old seals and O-rings.

Inspect the parts for scratches, nicks, bent, etc. Replace the parts as needed.



Install the piston on the tool [B].

Install the O-ring on the piston using the tool [B].

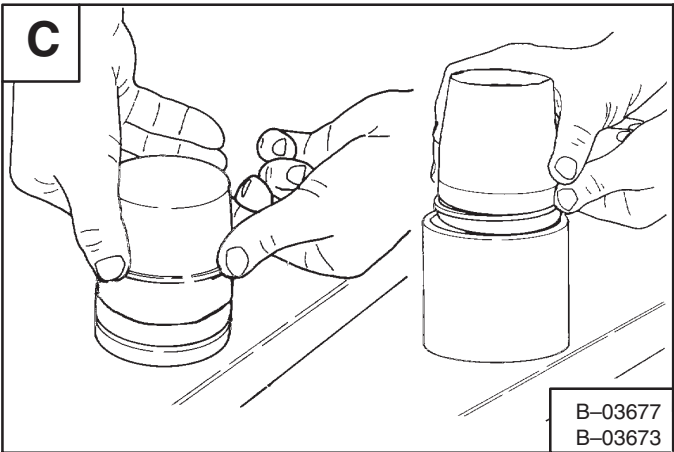


Install the teflon seal over the tool and on the piston [C].

**NOTE: To prevent damage to the teflon seal, do not turn it into the piston groove.**

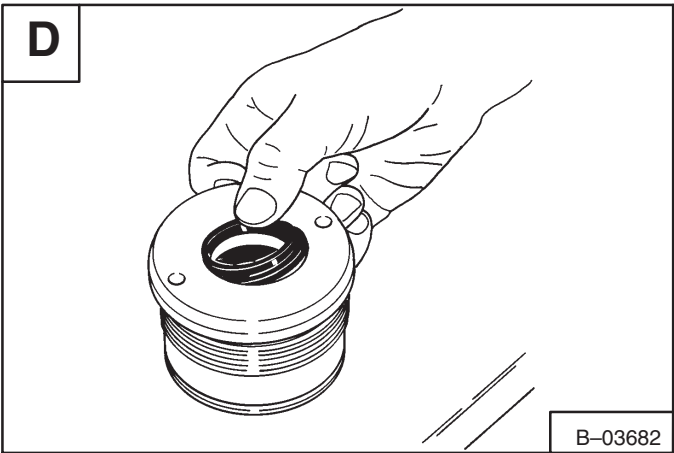
Install the piston into the tapered end of the tool to get the teflon seal to return to the cylinder diameter.

Wait 5 minutes so that the teflon seal will become the same size as the piston.



Install the wiper seal with the lip toward the outside of the end cap [D].

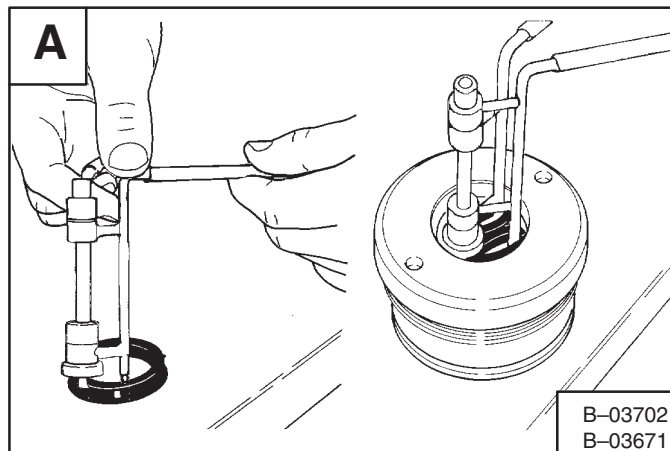
**NOTE: The O-ring side of the seal goes toward the inside of the cylinder.**



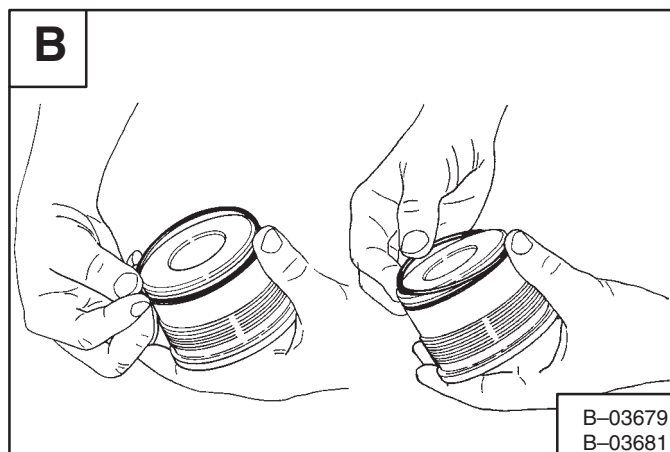
## HYDRAULIC CYLINDER REPAIR (Cont'd)

Install the seal on the rod seal tool [A].

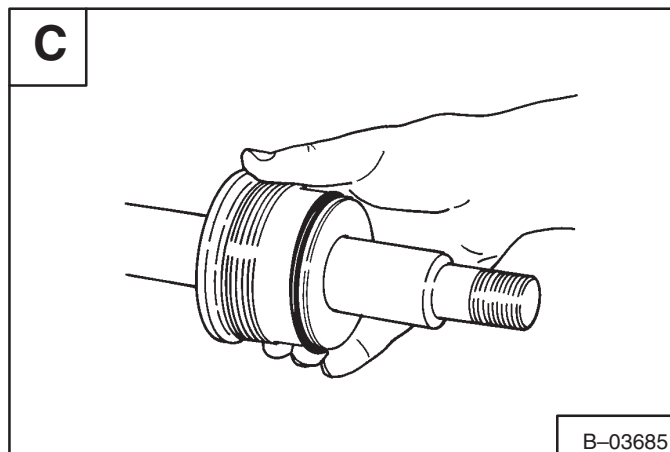
Install the seal in the end cap [A].



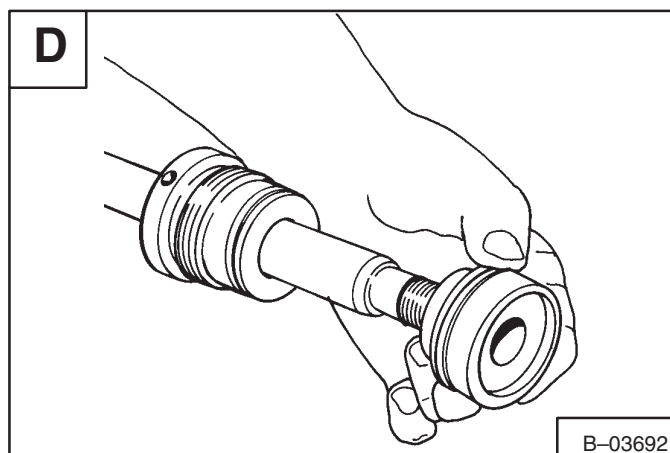
Install the back-up washer and O-ring on the end cap [B].



Put oil on the wiper seal and install the end cap on the shaft [C].



Remove the piston from the tool and install the piston on the shaft [D].

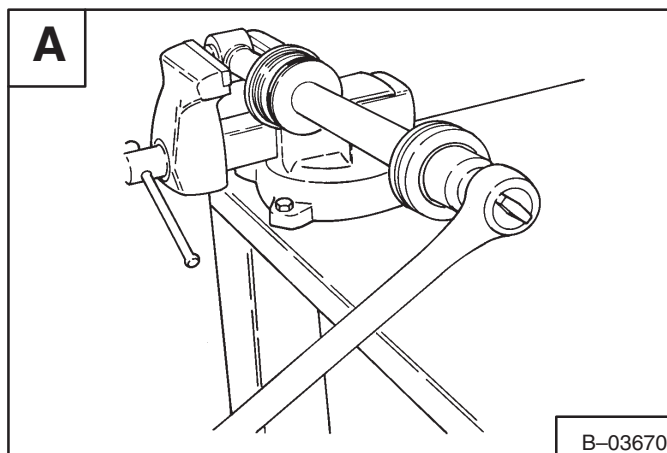


## HYDRAULIC CYLINDER REPAIR (Cont'd)

Install the nut and tighten to the following torque **[A]**.

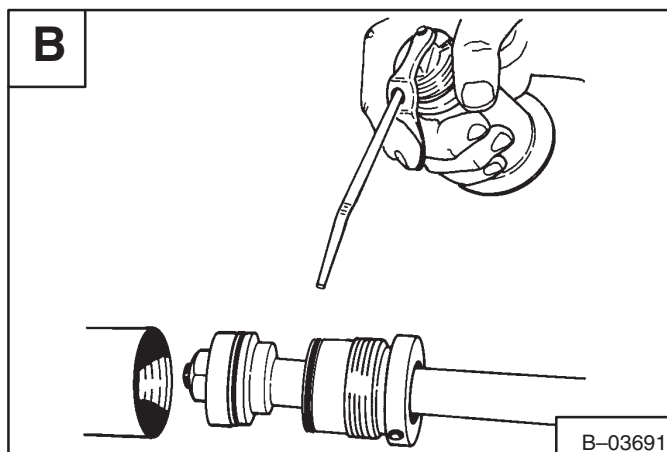
Lift Cylinder—150–160 ft.-lbs. (203–217 Nm)

Tilt Cylinder—330–360 ft.-lbs. (447–488 Nm)



Inspect the cylinder barrel bore for scratches.

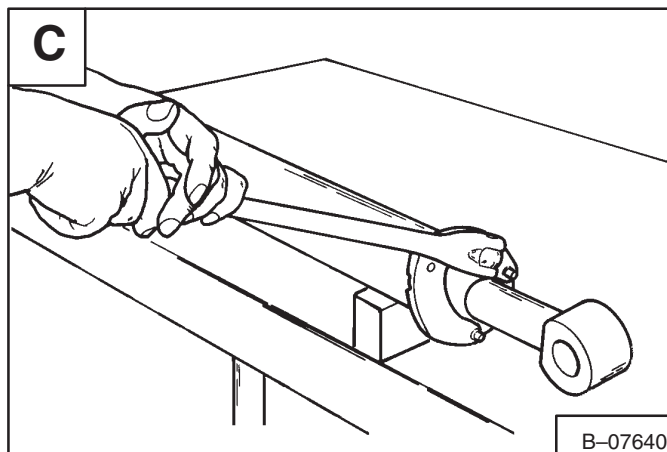
Put oil on the seals, O-rings and end cap threads **[B]**.



Install the assembly in the cylinder barrel.

Tighten the end cap with the special tool **[C]**.

Push the cylinder rod in and out the full length of the cylinder barrel. It must travel freely through the full stroke of the cylinder with no binding.



## HYDRAULIC CONTROL VALVE

### 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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### Checking the Main Relief Valve

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

OEM-1238-Hydraulic Tester  
MEL-10006-Hydraulic Test Kit

Operate the loader until the fluid is at operating temperature. Stop the engine.

Lift and block the loader (See Page 1-2 for the correct procedure).

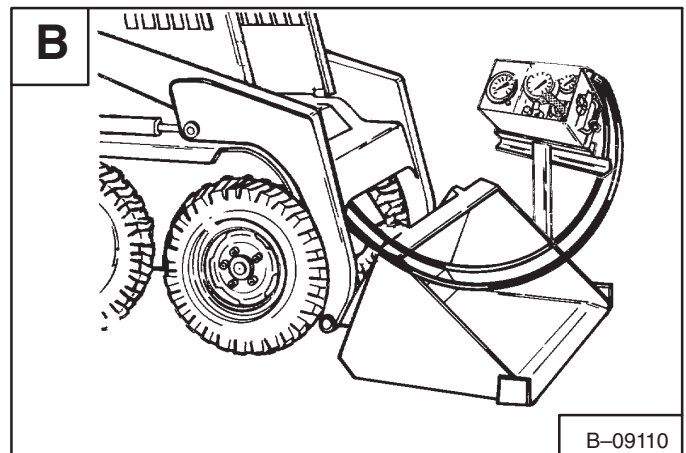
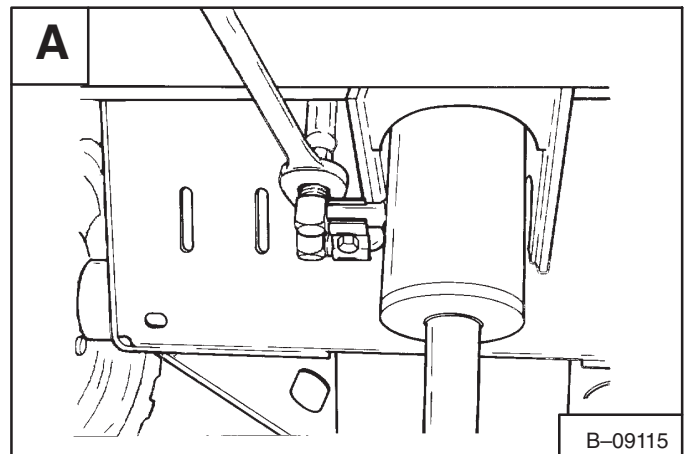
**NOTE: If the loader is equipped with the optional auxiliary hydraulics, the main relief valve can be checked at the quick couplers.**

Disconnect the hoses at the tilt cylinder [A].

Connect the hydraulic tester to the tilt cylinder hoses[B].

Have a second person in the operator seat, with the seat bar in the down position, start the engine and run at idle RPM.

Push the tilt pedal at the top (toe) and bottom (heel) until the flow to the hydraulic tester is correct. Increase the engine RPM to maximum.



## HYDRAULIC CONTROL VALVE (Cont'd)

Turn the restrictor control on the tester to increase the pressure. The main relief valve must open between 1435–1495 PSI (9894–10308 kPa).

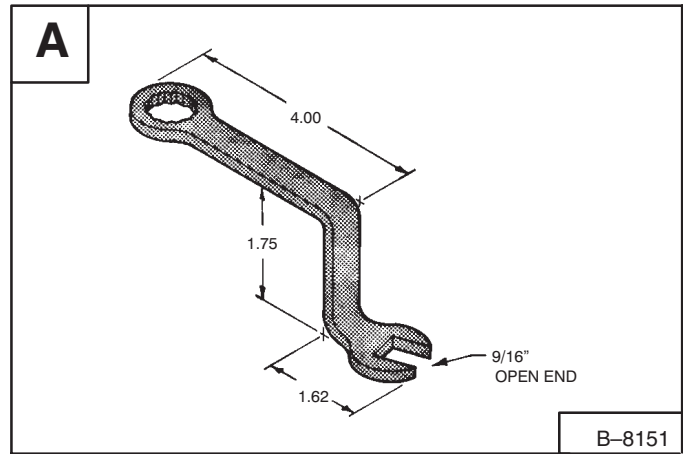
If the pressure is not correct, stop the engine.

Raise the operator cab (See Page 1–7 for the correct procedure).

Clean the area around the control valve.

Remove the cap at the main relief valve.

**NOTE:** To make the relief valve adjustment easier , bend a wrench as shown [A].

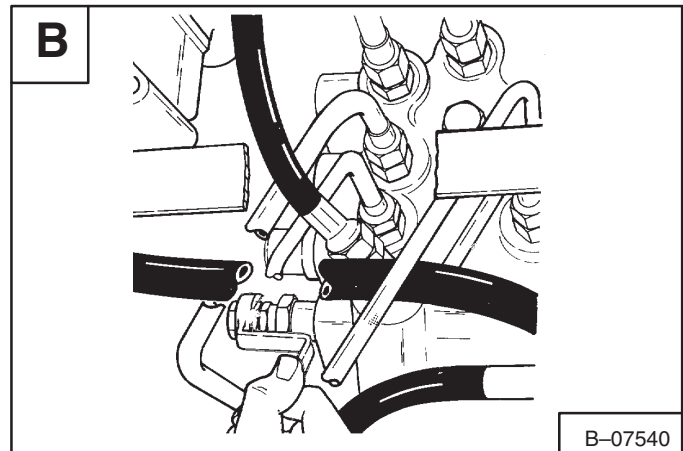


Adjust the relief valve, turn clockwise to increase the pressure, turn counterclockwise to decrease the pressure [B].

Install the cap at the relief valve.

Lower the operator cab.

Check the main relief pressure again, using the above procedure.



## Removal and Installation

Stop the engine. Lift and block the loader (See Page 1–2 for the correct procedure).

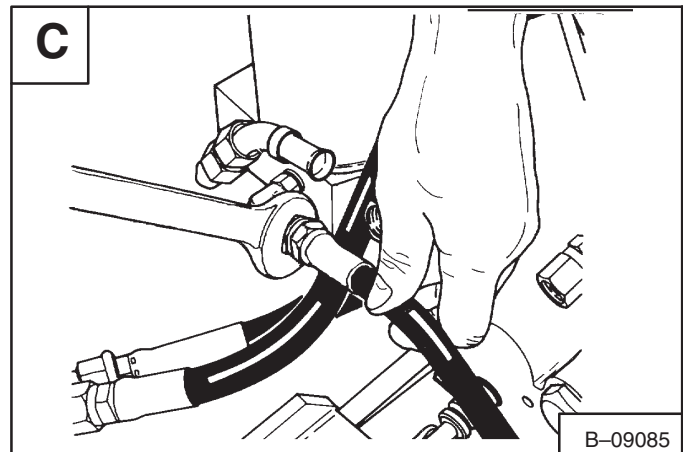
Raise the operator cab (See Page 1–7 for the correct procedure).

Clean the area around the control valve.

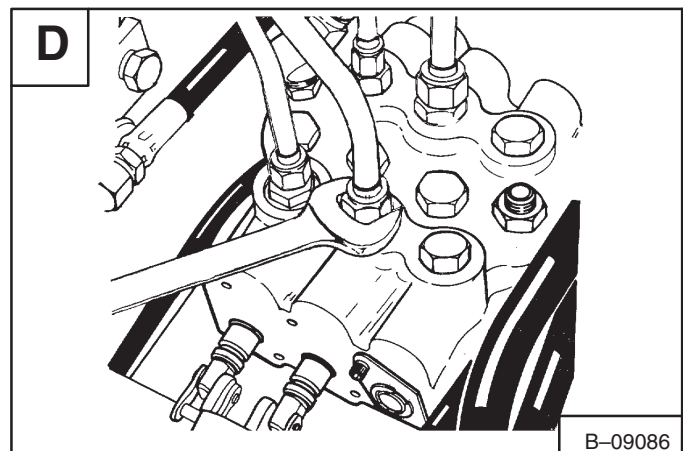
Remove the front panel (See Page 3–3 for the correct procedure).

Remove the steering levers and linkage (See Page 3–4 for the correct procedure).

Remove the charge pressure hose at the port block [C].



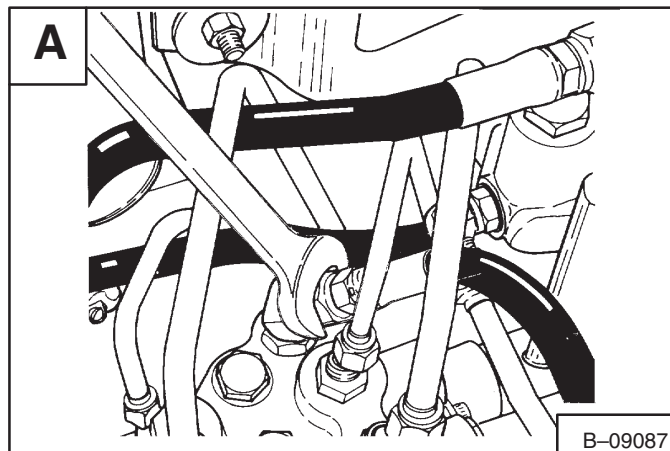
Remove all the tubelines from the control valve [D].





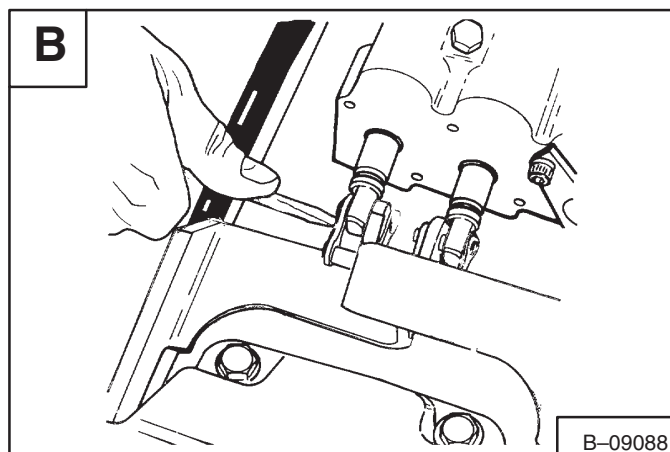
## HYDRAULIC CONTROL VALVE (Cont'd)

Remove the inlet hose from the control valve [A].



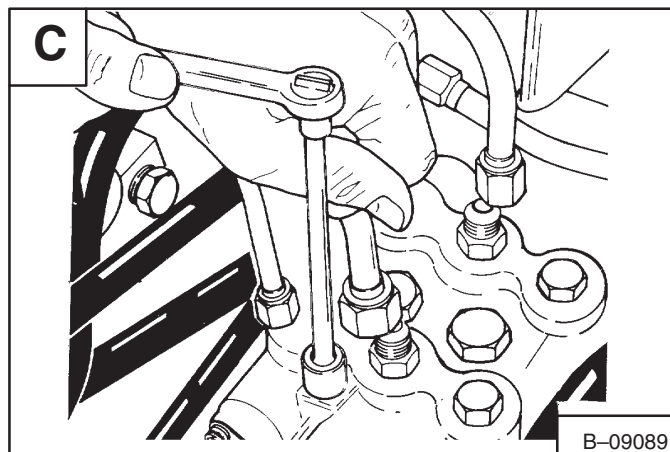
Disconnect the lift and tilt linkage from the control valve [B].

**NOTE:** If equipped with auxiliary hydraulics, disconnect the auxiliary linkage from the control valve.

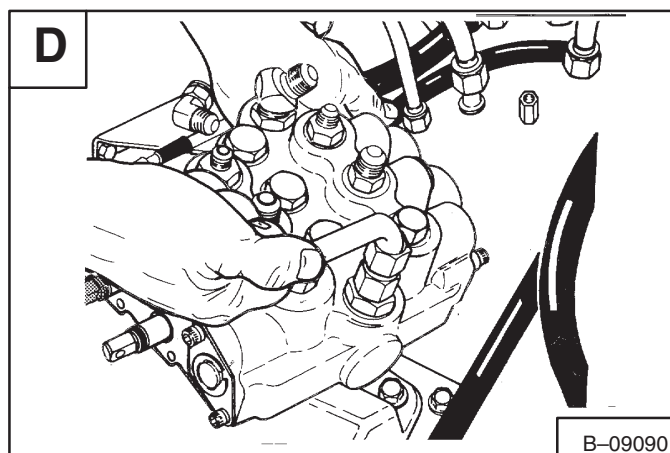


Remove the two mounting bolts [C].

Installation: Tighten the bolts to 180–200 in.-lbs. (21–23 Nm) torque.



Slide the control valve forward and remove it from the loader [D].



HYDRAULIC CONTROL VALVE (Cont'd)

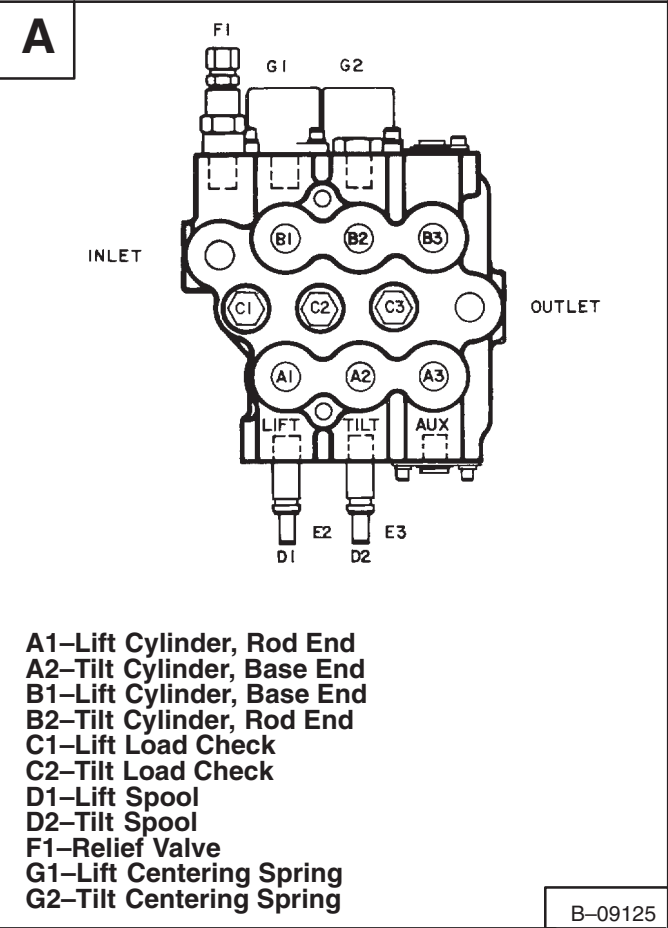
Disassembly and Assembly

IMPORTANT

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

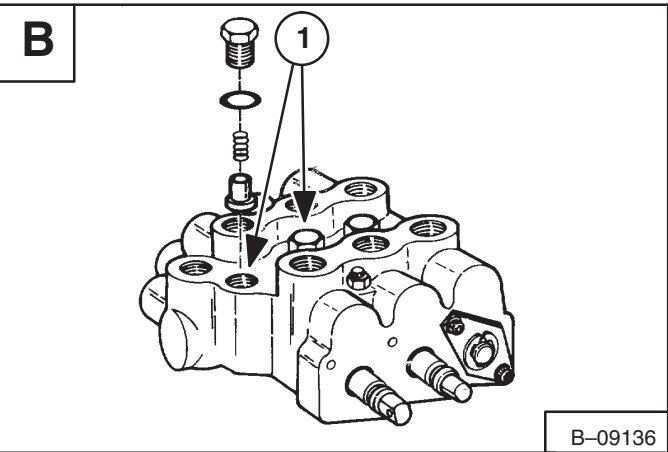
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Before disassembly of the control valve, see the control valve layout for the location of all the parts [A].



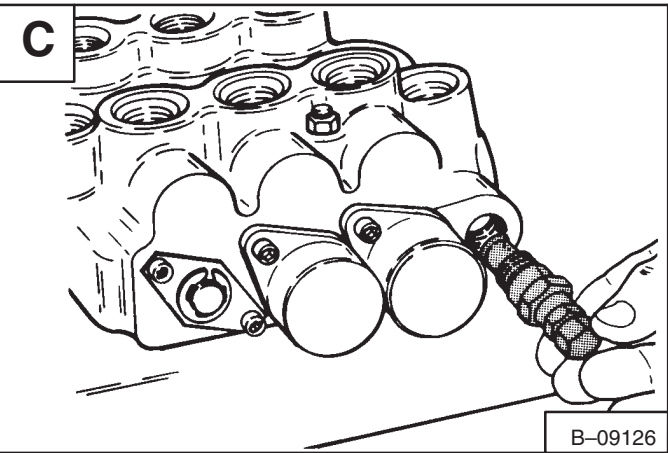
Remove the load check valves [B].

Installation: Tighten the load check valves to 50-60 ft.-lbs. (68-81 Nm) torque.



Remove the main relief valve [C].

Installation: Remove the O-rings and back-up washers and install new ones. Tighten the main relief valve to 50-60 ft.-lbs. (68-81 Nm) torque.

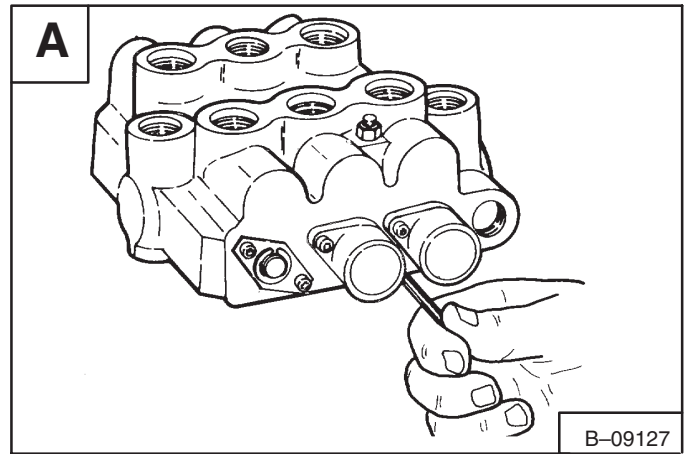


## HYDRAULIC CONTROL VALVE (Cont'd)

Remove the screws at the lift and tilt end caps [A].

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

Remove the end cap.

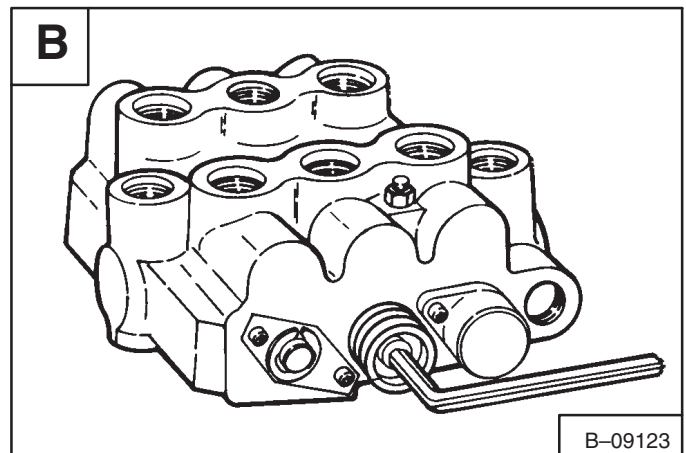


Using an Allen wrench, remove the bolt which holds the centering spring at the lift and tilt spool [B].

### **WARNING**

Carefully remove the bolt from the spool because there is spring tension.

Installation: Put Loctite on the bolt, tighten to 90–100 in.-lbs. (10–11 Nm) torque.



At the lift and tilt spool, remove the spring, back-up washer and O-ring [C].

Mark the lift and tilt spool so they will be returned to original bore on assembly. Carefully remove the spools to prevent damage to the surface.

### Inspection

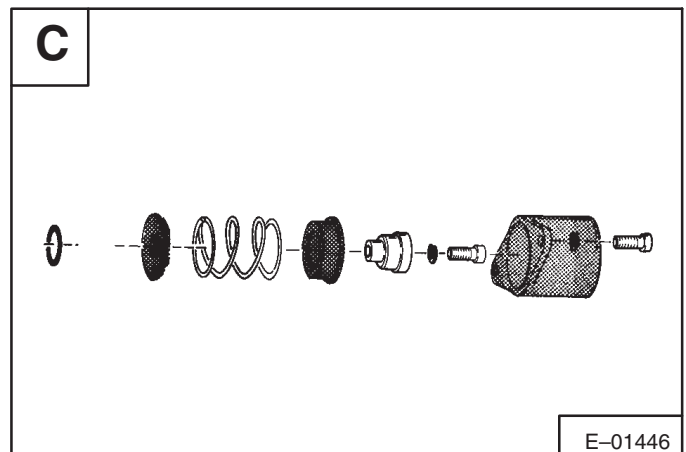
Check the spools for scratches or wear.

Check that the spools are not loose in their bores.

Check that centering springs are not broken.

Check that the load check poppets and seats are not worn.

Replace any parts that are worn or broken as needed.



## HYDRAULIC PUMP

# 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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### Checking Output of Hydraulic Pump

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

MEL-1238-Hydraulic Tester  
MEL-10006-Hydraulic Test Kit

**NOTE:** Be sure that all the air is removed from the system before beginning the test. Air in the system can give an inaccurate test.

Lift and block the loader (See Page 1-2 for the correct procedure).

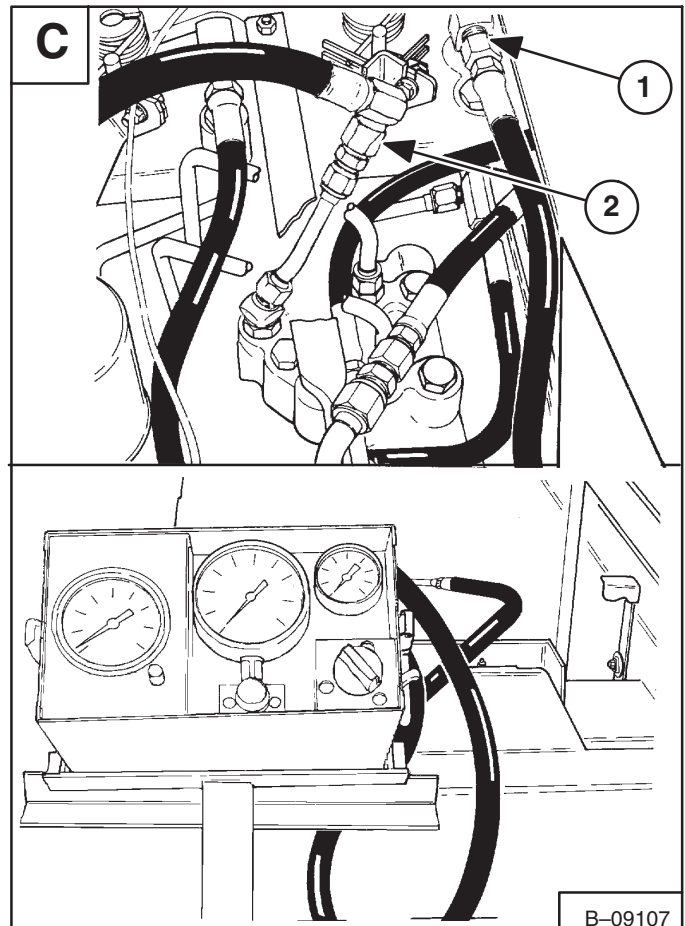
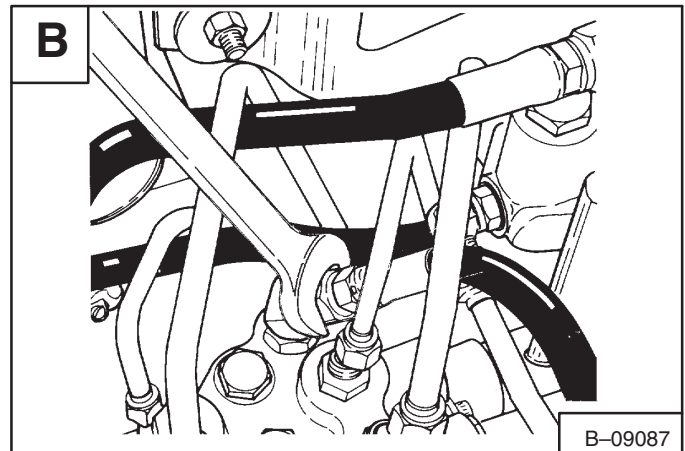
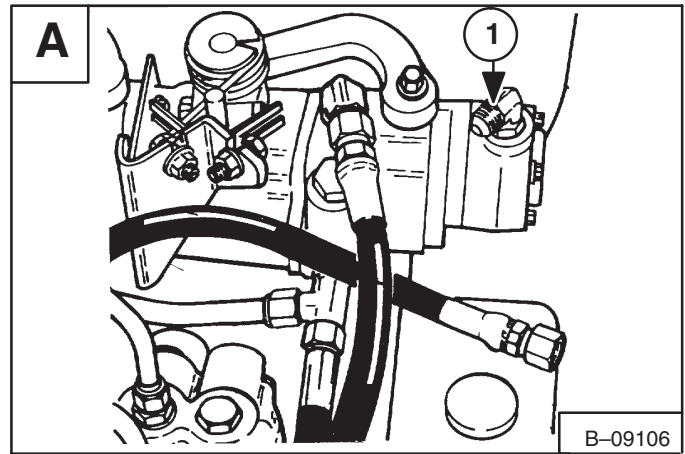
Raise the operator cab (See Page 1-7 for the correct procedure).

Disconnect the hose at the outlet of the hydraulic pump [A].

Disconnect the hose at the inlet of the hydraulic control valve [B].

Connect the inlet hose from the hydraulic tester to the outlet of the hydraulic pump (Item 1) [C].

Connect the outlet hose from the tester to the inlet of the control valve (Item 2) [C].



## HYDRAULIC PUMP (Cont'd)

### IMPORTANT

**Do not turn the flow control valve (on tester) all the way off. If you do, there will not be a relief valve in the system.**

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Disconnect both hoses at the tilt cylinder and install plugs in the hoses [A].

Start the engine and run at idle RPM. Make sure the tester is connected correctly.

Increase the engine RPM to full throttle.

Warm the fluid to 140° F (60° C) by turning the restrictor knob on the tester to about 1000 PSI (6895 kPa). DO NOT exceed the system relief pressure.

Open the restrictor on the tester . Record the free flow (GPM) at full throttle. \*

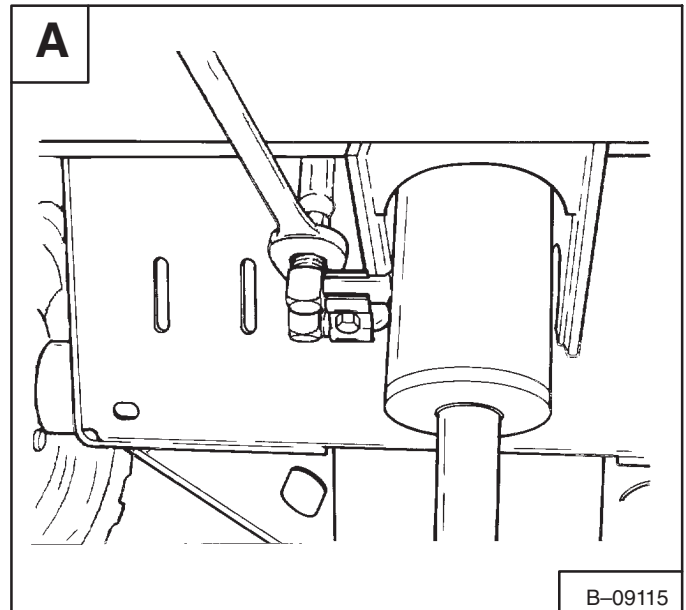
Operate the tilt pedal. Record the high pressure (PSI) and the flow (GPM) at full throttle. \*

The high pressure flow must be at least 80% of free flow.

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

A low percentage may indicate a failed hydraulic pump, or it may be caused by air in the hydraulic system. Be sure that all the air is removed from the system.

\*Refer to the Specifications Section for system relief pressure and full throttle RPM specifications. The system relief pressure must be per specifications before test is run.



## HYDRAULIC PUMP (Cont'd)

### Removal and Installation

# IMPORTANT

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

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Lift and block the loader (See Page 1-2 for the correct procedure).

Raise the operator cab (See Page 1-7 for the correct procedure).

Remove the hydraulic/hydrostatic fluid from the reservoir (See Page 2-22).

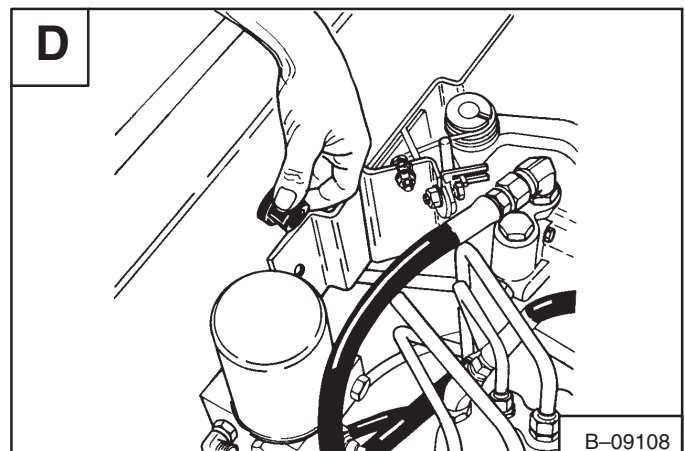
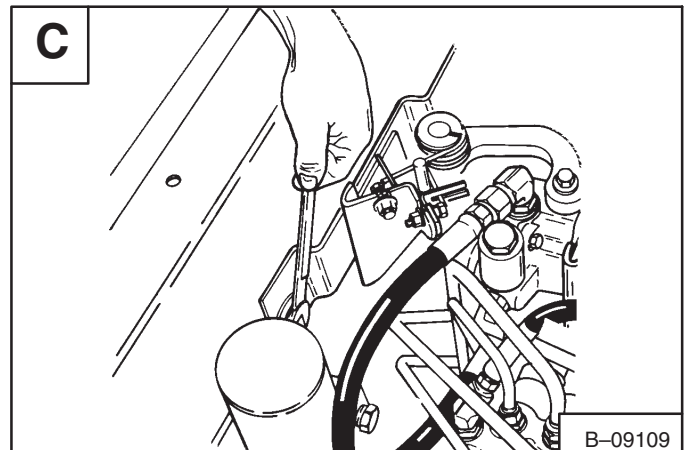
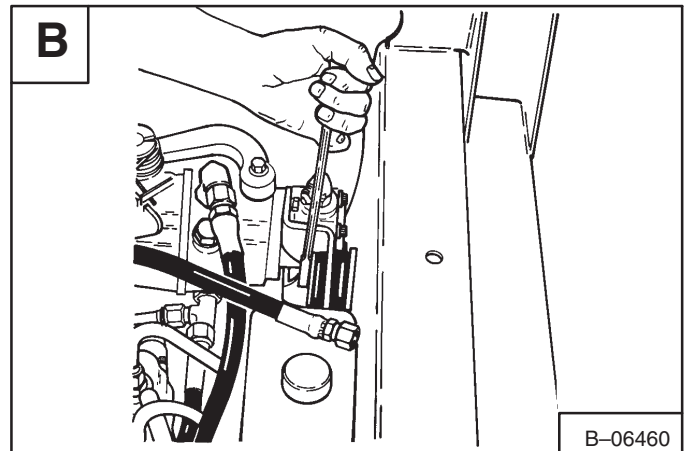
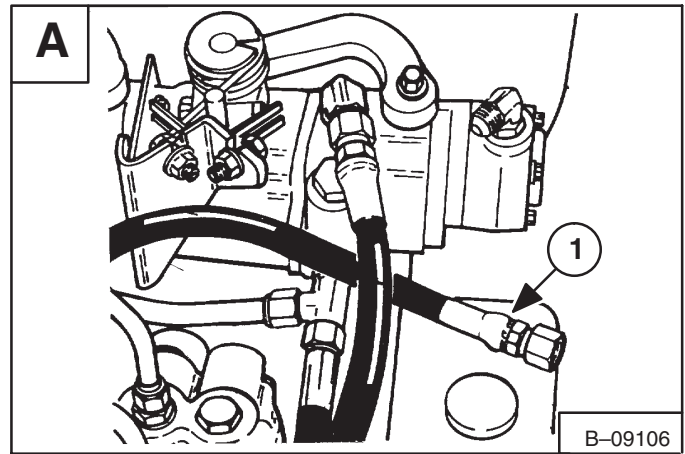
Remove the battery from the loader (See Page 6-2 for the correct procedure).

Disconnect the suction hose at the bottom of the hydraulic pump.

Disconnect the pressure hose at the top of the hydraulic pump (Item 1) [A].

Remove the mounting bolts from the hydrostatic pump brackets (both sides) [B] [C].

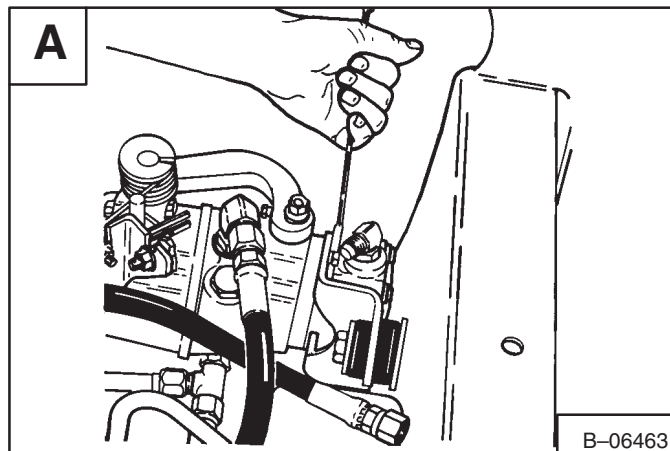
Remove the right side rubber mounting bushing [D].



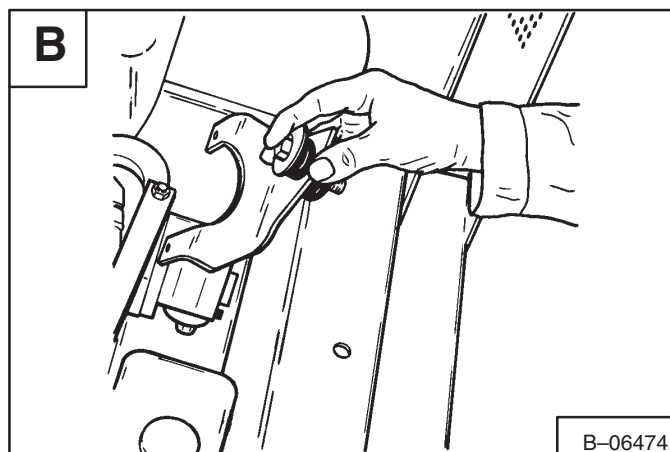
## HYDRAULIC PUMP (Cont'd)

Remove the mounting bolts from the hydraulic pump **[A]**.

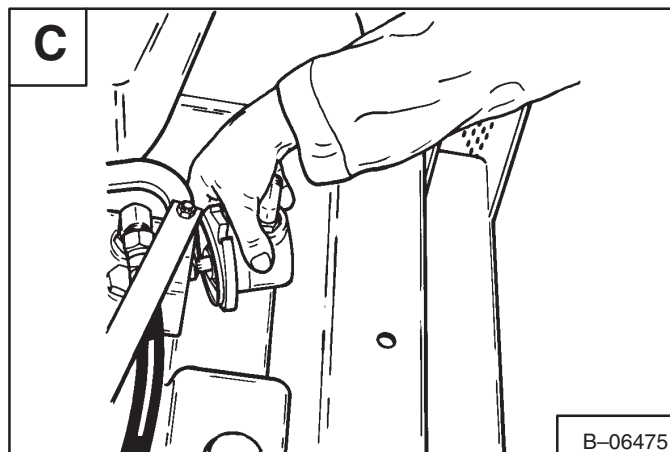
Installation: Tighten the bolts to 27–31 ft.-lbs. (36–42 Nm) torque.



Remove the hydraulic/hydrostatic mounting bracket **[B]**.



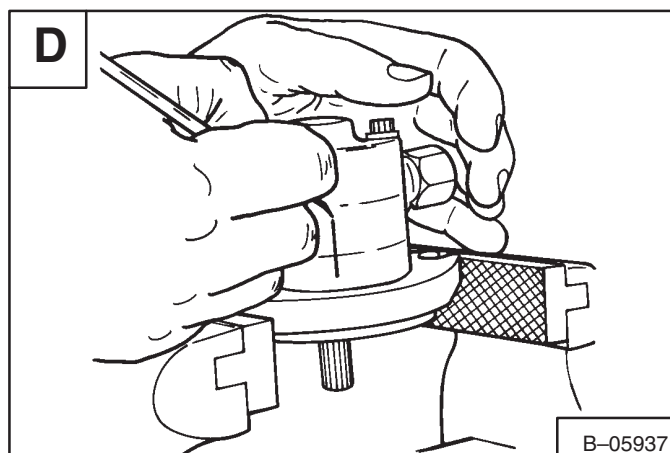
Remove the hydraulic pump and coupler from the hydrostatic pump **[C]**.



## Disassembly and Assembly

Put the hydraulic pump in the vise.

Put a mark across the housing of the pump for correct assembly.

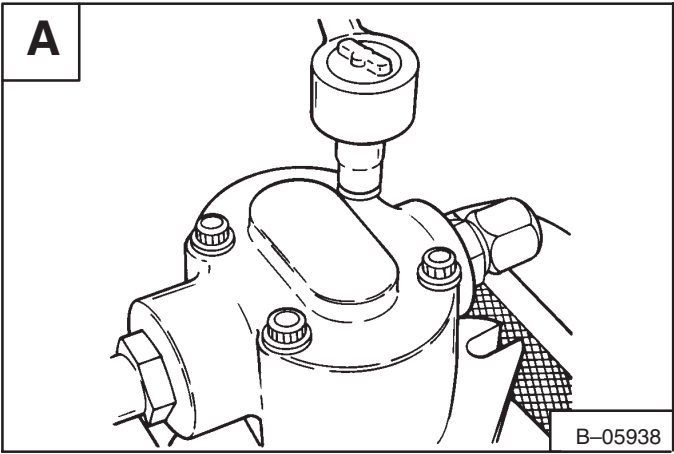




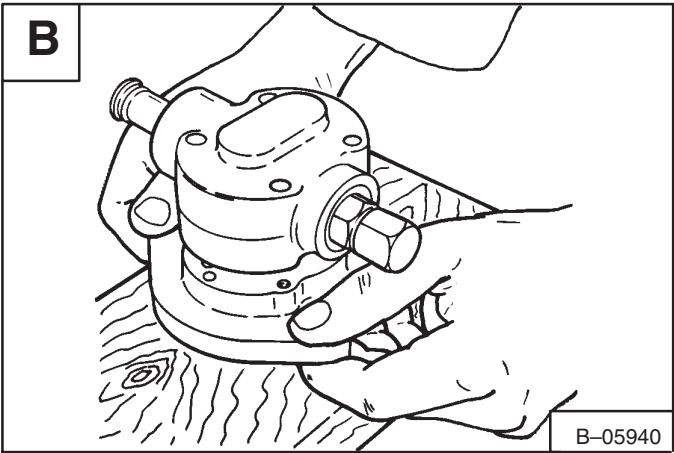
**HYDRAULIC PUMP (Cont'd)**

Remove the four bolts from the pump [A].

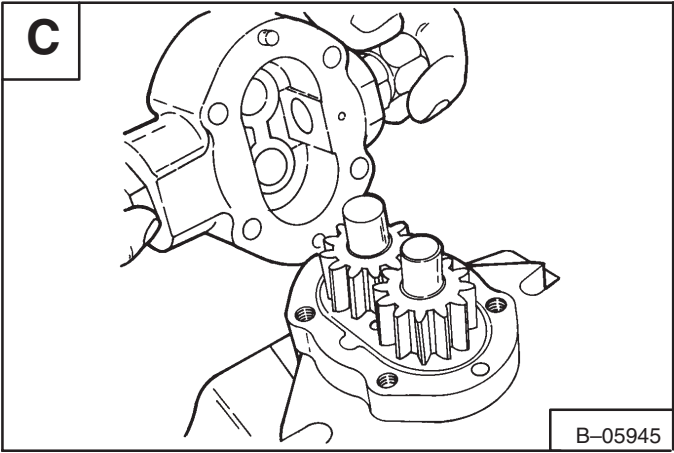
Installation: Tighten the bolts to 25–28 ft.-lbs. (34–38 Nm) torque.



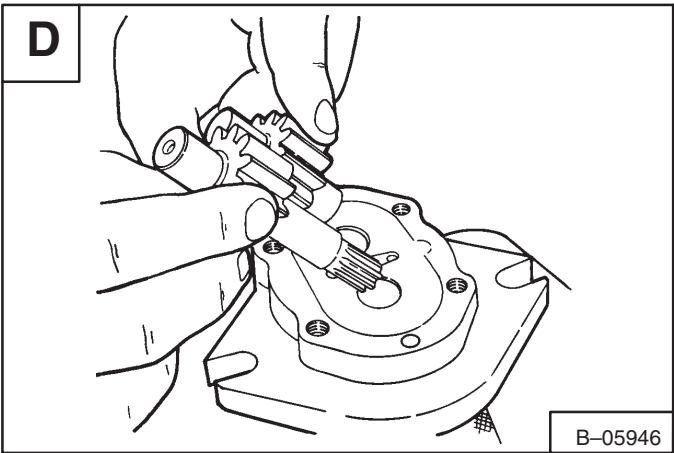
Remove the pump from the vise. Hold the pump in both hands and hit the shaft against a block of wood to separate the pump housing [B].



Remove the housing from the end of the pump [C].



Remove the pump gears [D].

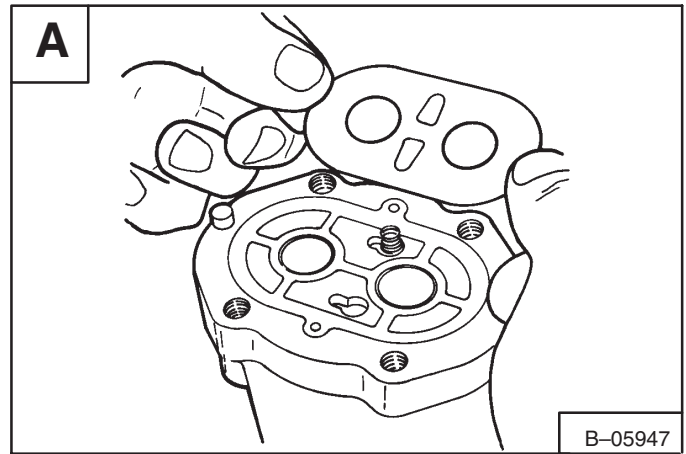




## HYDRAULIC PUMP (Cont'd)

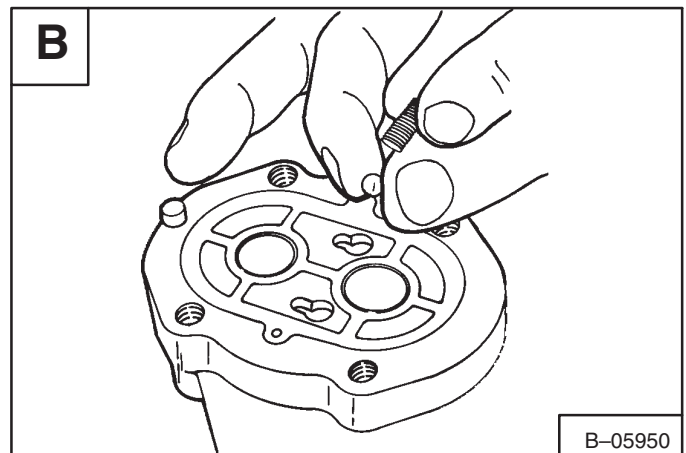
Remove the wear plate (Item 1) [A].

Remove the gasket and diaphragm seal from the pump housing (Item 2) [A].



Remove the spring and steel ball from the pump housing [B].

**NOTE:** Make sure to mark the port where the spring and ball are removed from the correct installation when assembling the pump.



## Inspection

Clean and dry all the parts.

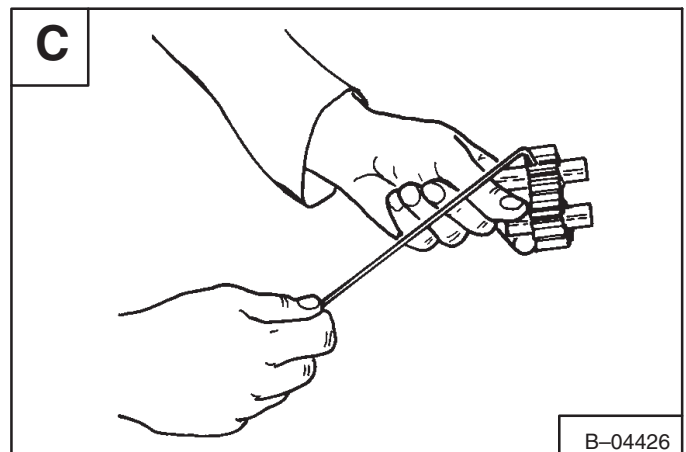
Inspect the gears as follows [C].

1. Inspect both the drive and idler gear shafts at the bearing points and seal area for rough surface and wear.
2. Check the face of the gears for wear.

Check for wear on the face of the wear plate. If the wear is more than 0.0015" (0,038 mm) from one side to the other, the plate must be replaced.

Check the housing in the gear area for wear.

Replace the parts as needed.



## HYDRAULIC/HYDROSTATIC FLUID RESERVOIR

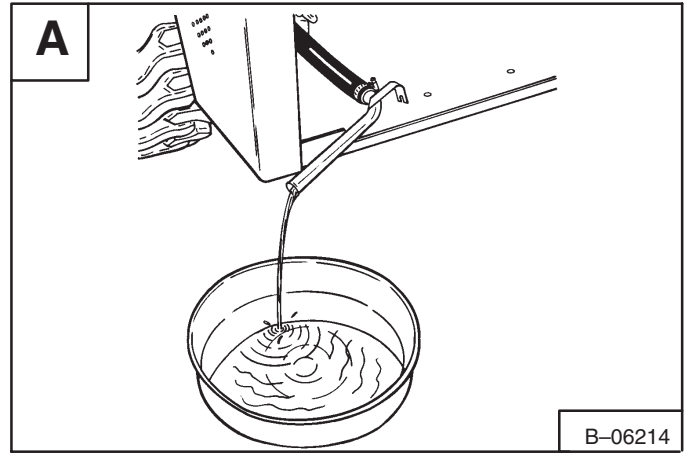
### Removing Fluid from Reservoir

Open the rear door.

Remove the nut at the reservoir fill tube.

Loosen the clamp at the hose.

Turn the dipstick tube down and drain the fluid into a container [A].



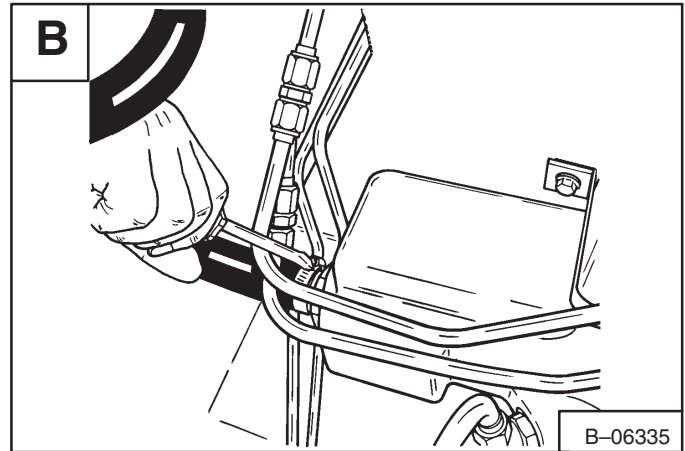
### Removal and Installation

**NOTE:** The engine and hydrostatic pump must be removed before the reservoir can be removed. See Page 7-7 for the correct procedure.

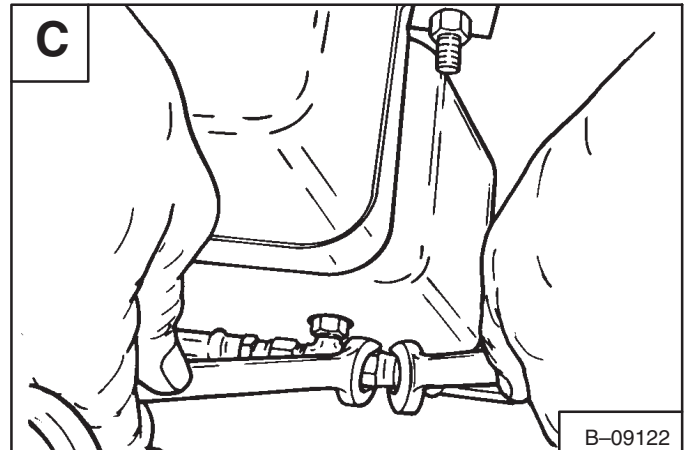
Remove the fluid from the reservoir.

Remove the fill hose and dipstick tube from the reservoir [B].

Remove the hose at the bottom of the reservoir.

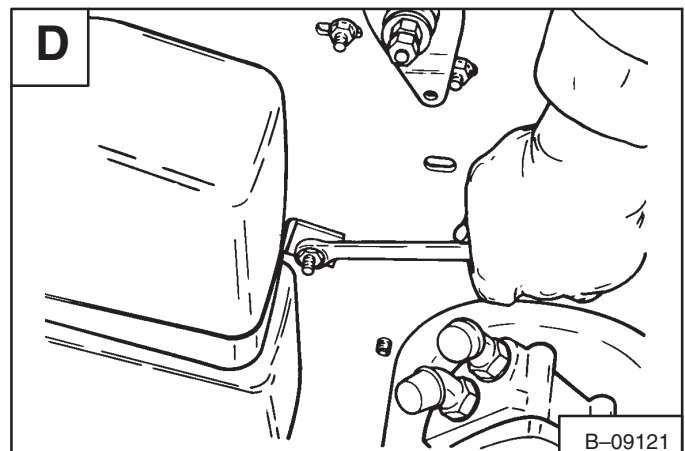


Disconnect the case drain hoses from the “tee” fitting at the reservoir [C].



Remove the two bolts and nuts from the reservoir mounting strap [D].

Remove the reservoir from the loader.



## CONTROL PEDALS

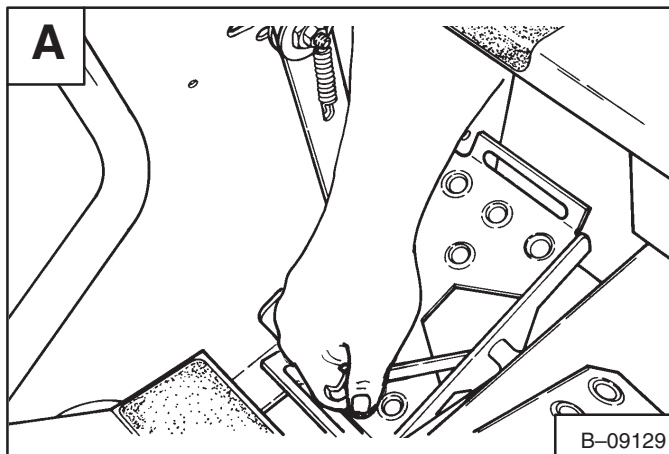
### Removal and Installation

Lift and block the loader (See Page 1–2 for the correct procedure).

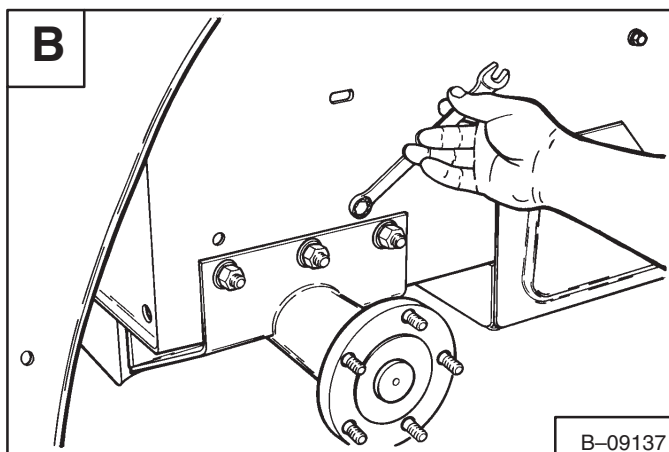
Raise the operator cab (See Page 1–7 for the correct procedure).

Remove the front wheel and tire at the side where the pedal will be removed.

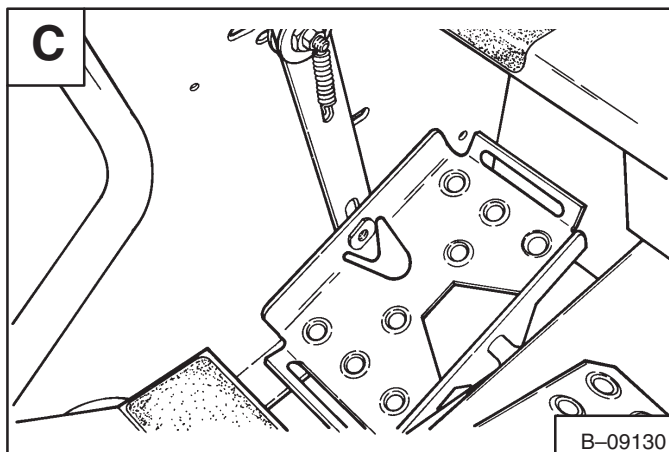
Remove the nut and bolt at the pedal linkage **[A]**.



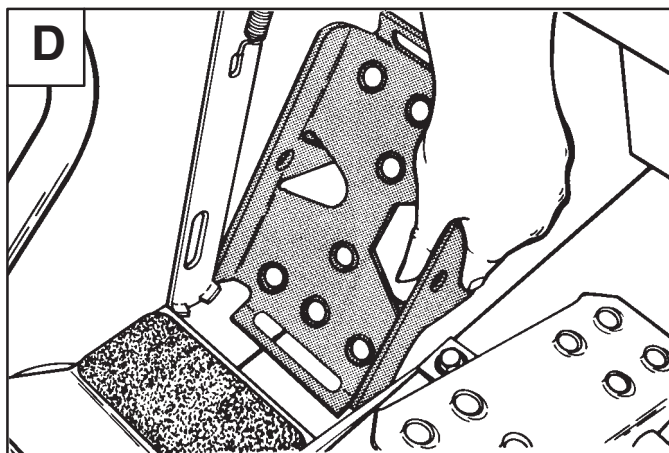
Hold the bolt at the outside of the fender **[B]**.



Remove the nut (Item 1) at the pedal **[C]**.



Remove the pedal from the loader **[D]**.



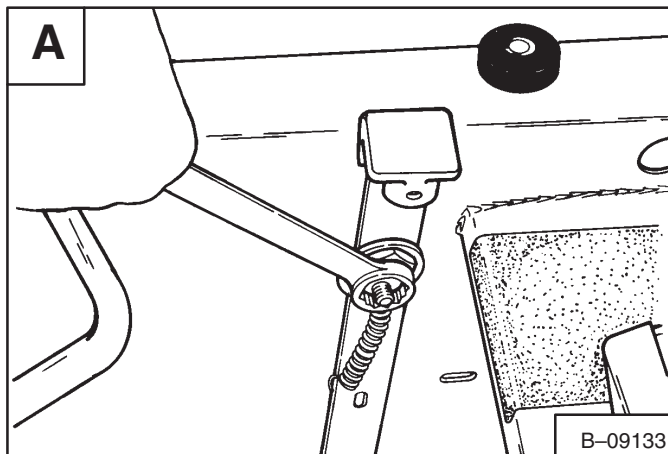
## PEDAL LOCK LINKAGE

### Removal and Installation

Remove the hydraulic foot pedal (See Page 2-24).

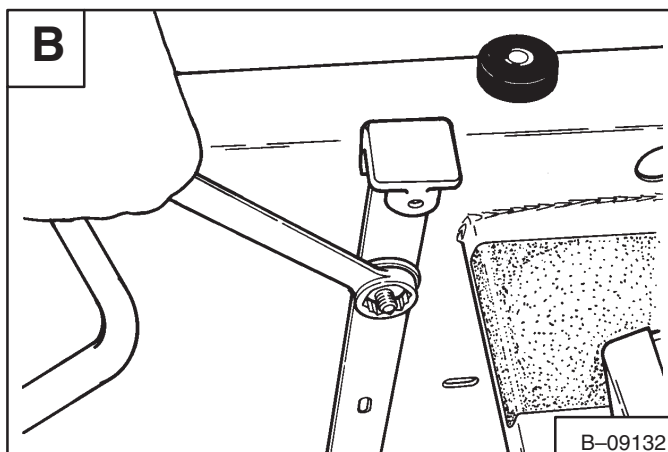
Remove the nut at the spring **[A]**.

Disconnect the spring from the bolt.



Remove the large nut **[B]**.

Remove the washer, plastic washers and pedal lock bar.



## HYDROSTATIC SYSTEM

### Page Number

#### DRIVE BELT & TENSION PULLEY

Drive Belt Replacement in the Loader

Removal and Installation ..... 3-27

Tension Pulley

Removal and Installation ..... 3-26

#### FRONT PANEL

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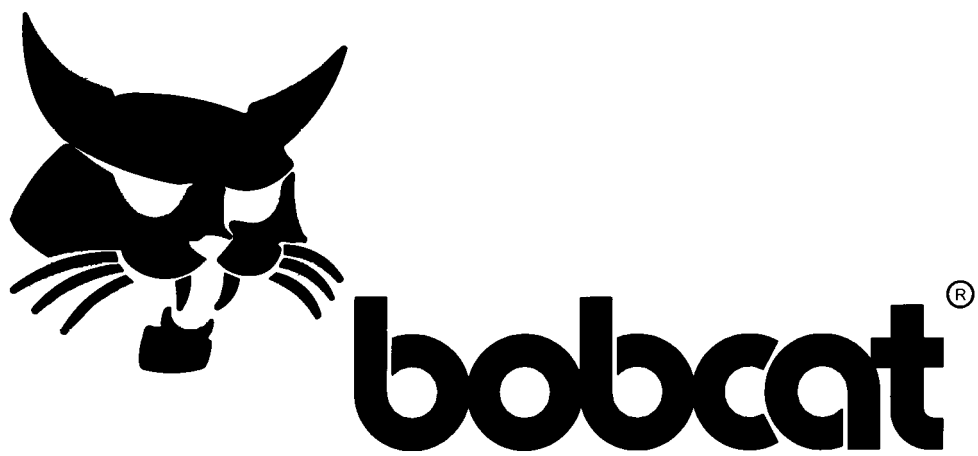
#### TOWING THE BOBCAT LOADER

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#### TROUBLESHOOTING

Chart ..... 3-1. . .

## HYDROSTATIC SYSTEM



### 3 HYDROSTATIC SYSTEM

#### TROUBLESHOOTING

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

PROBLEM	CAUSE
No drive on one side, in one direction.	1, 2, 3, 4
No drive on one side in both directions.	2, 4, 5, 6, 7
The loader does not move in a straight line.	2, 3, 5, 7, 8, 9
The hydrostatic system is overheating.	3, 10, 11, 12

KEY TO CORRECT THE CAUSE
<ol style="list-style-type: none"><li>1. The hydrostatic system has a fluid leak.</li><li>2. The steering linkage needs adjustment.</li><li>3. The check valve in the hydrostatic motor has a defect.</li><li>4. The balance plate in the hydrostatic motor seal is defective.</li><li>5. The hydrostatic pumps have a defect.</li><li>6. The final drive chain(s) is broken.</li><li>7. The hydrostatic motor has a defect.</li><li>8. The tires do not have the correct tire pressure.</li><li>9. The tires are not the same size.</li><li>10. The hydrostatic fluid is not operating correctly.</li><li>11. The control valve is not operating correctly.</li><li>12. The loader is not being operated at the correct RPM.</li></ol>



# 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.

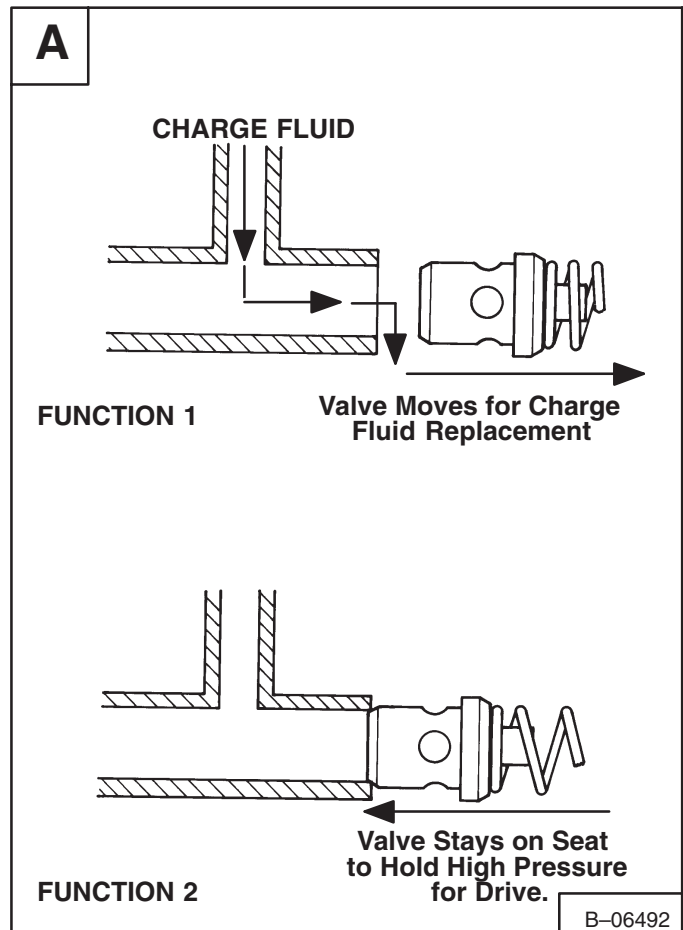
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## High Pressure Relief Replenishing Valves Function

The high pressure relief replenishing valves are used both in forward and reverse travel.

The functions of the high pressure relief replenishing valves are as follows:

1. Give replacement fluid to the low pressure side of the closed hydrostatic circuit (Function 1) [A].
2. To keep the high pressure flow of fluid out of the low pressure side of the closed hydrostatic circuit (Function 2) [A].



## FRONT PANEL

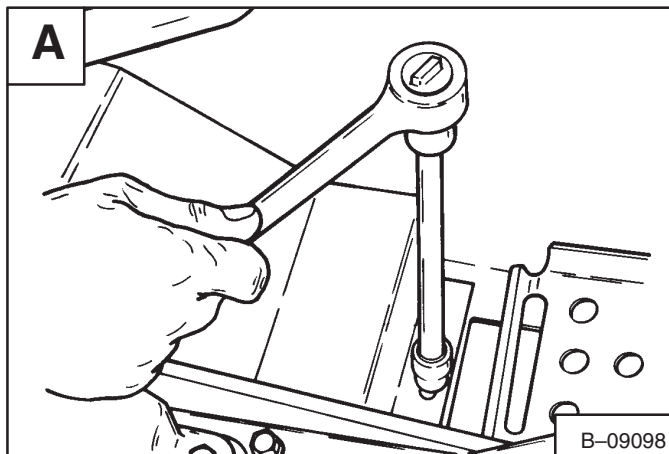
### Removal and Installation

Raise the operator cab (See Page 1–7 for the correct procedure).

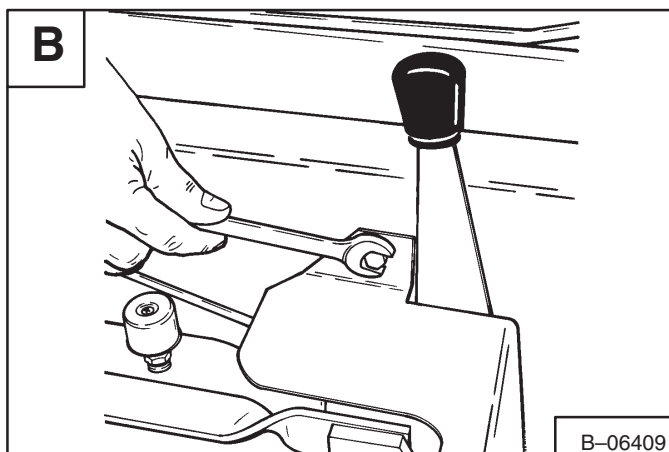
Disconnect the choke control at the carburetor.

Disconnect the wire harness at the key switch and fuse.

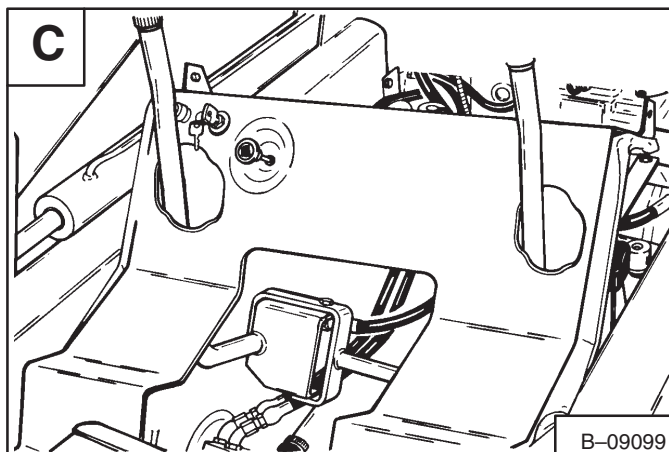
Remove the bolts (both sides) at the bottom of the front panel **[A]**.



Remove the bolts (both sides) at the sides of the front panel **[B]**.



Remove the front panel from the loader **[C]**.

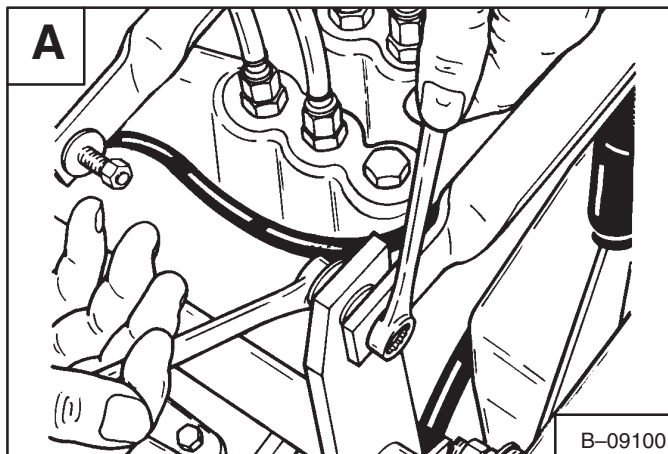


## STEERING LEVERS

### Removal and Installation

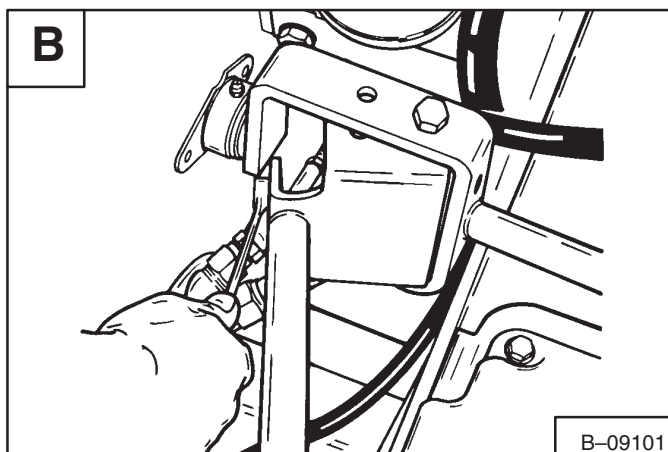
Remove the front panel from the loader (See Page 3–3).

Disconnect the steering linkage at the steering levers (both sides) [A].

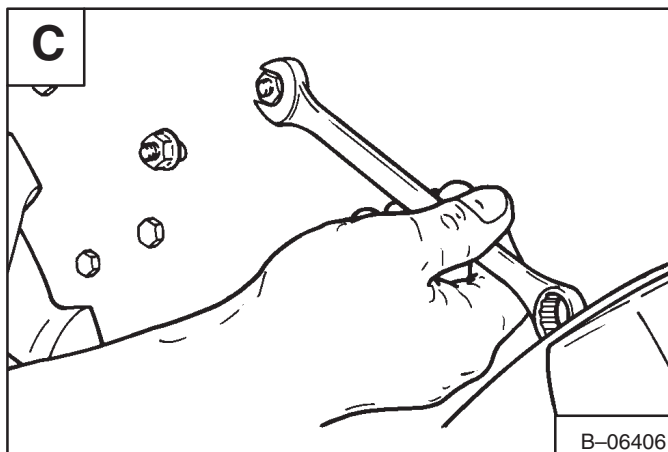


If equipped with auxiliary option, disconnect the auxiliary linkage at the steering levers [B].

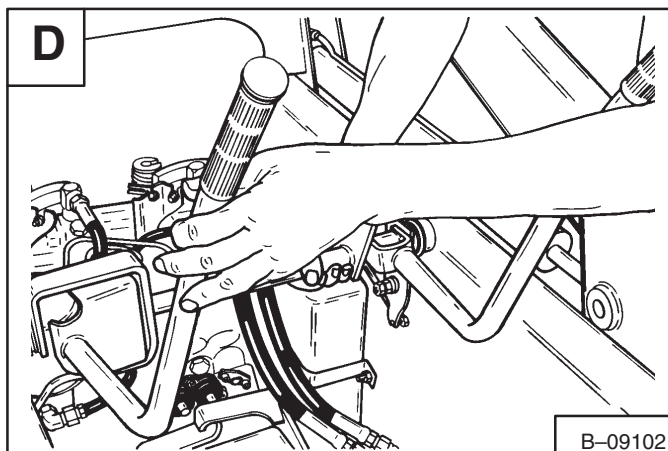
Installation: Tighten the bolts and nuts to 25–28 ft.-lbs. (34–38 Nm) torque.



Remove the bolts and nuts at the pivot bearings (both sides) [C].



Remove the steering lever assembly from the loader [D].



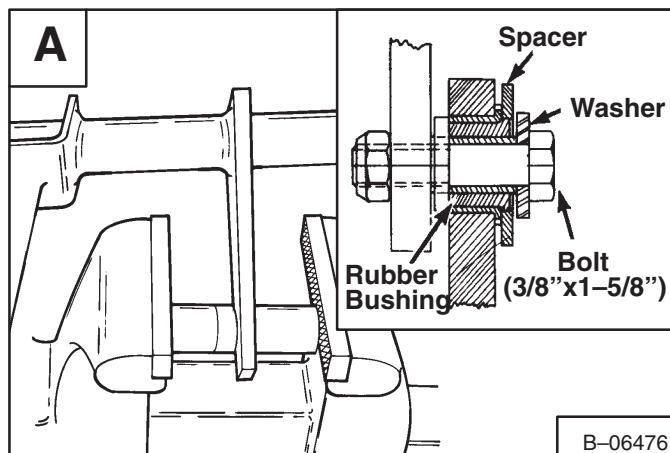
## STEERING LEVERS (Cont'd)

### Disassembly and Assembly

Disassemble the right and left steering lever. Remove the plastic bushings.

Remove the bushings at the steering linkage ends.

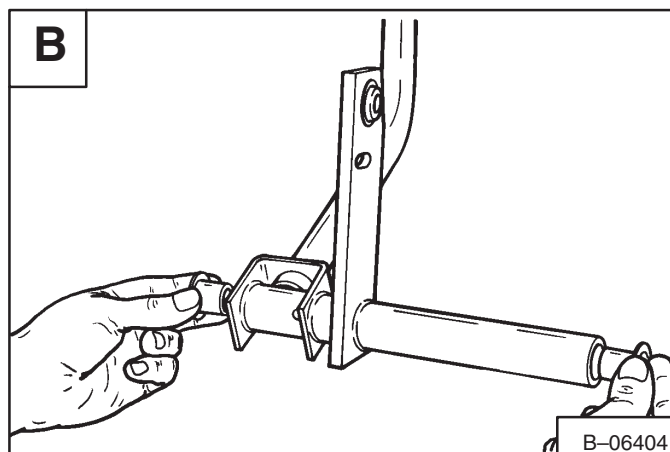
Using two sockets and a vise, install the new bushings in the steering linkage ends [A].



Install new plastic bushings on the steering levers shaft [B].

Assemble the two steering lever assemblies together.

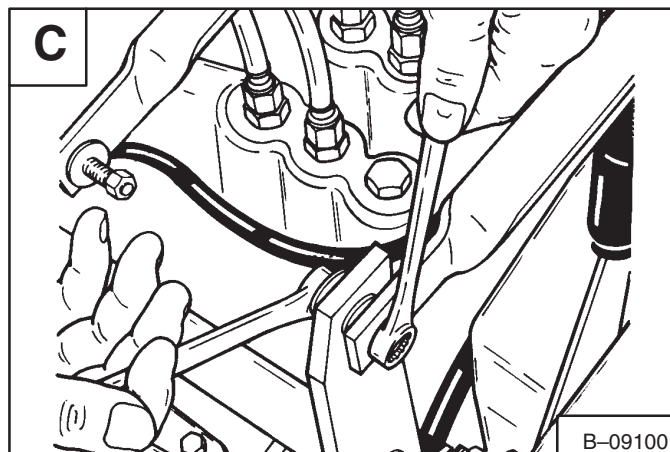
Check the pivot bearings, replace as needed.



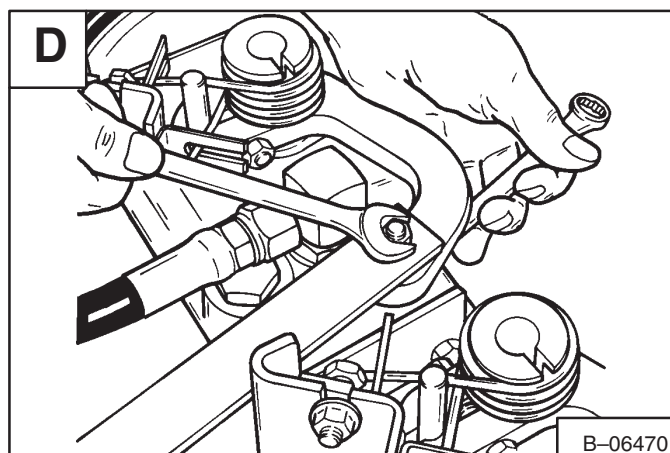
### Neutral Adjustment

Lift and block the loader (See Page 1-2 for the correct procedure).

Loosen the nuts at the steering levers [C].



Loosen the nuts at the pintle arms [D].



## STEERING LEVERS (Cont'd)

Start the engine and run at a slow RPM.

Adjust the bolts at the centering springs so that the springs just touch the pin and the adjusting bolts heads **[A]** or **[B]**.

If the wheels are turning (creeping), move the steering lever and find the correct side of the centering spring in order to make the adjustment.

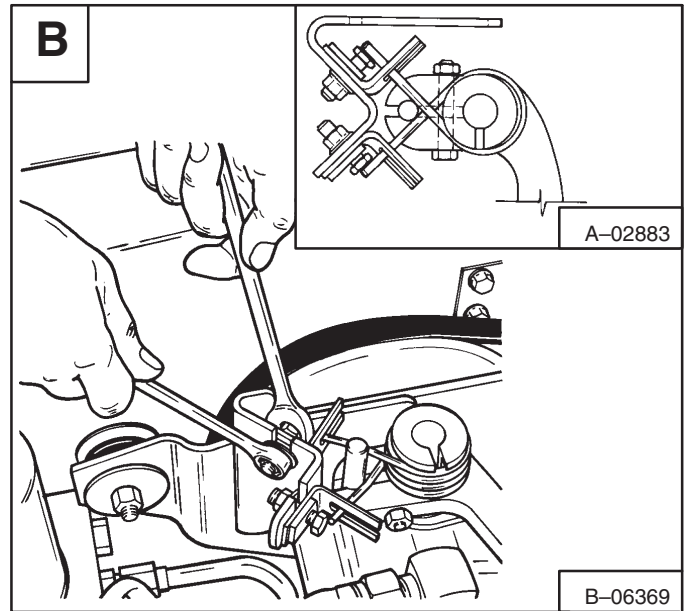
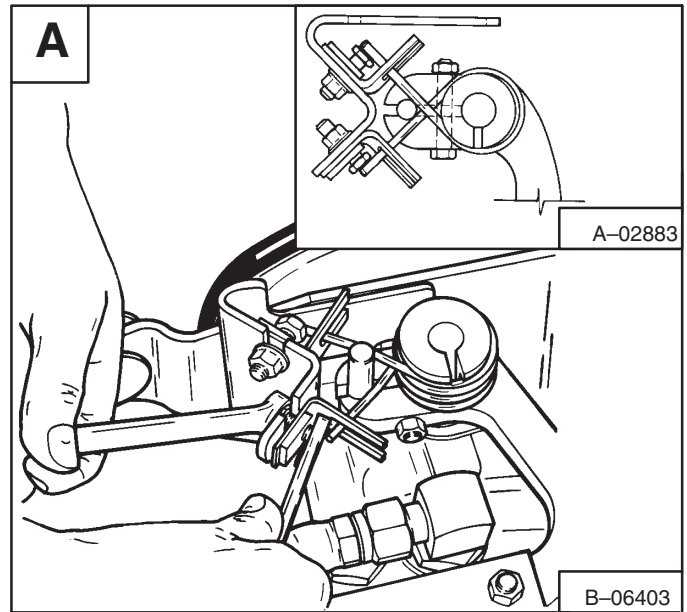
Turn the bolt out a small amount until the wheel stops turning.

Move the steering lever forward and backward and let the transmission return to neutral position.

If the transmission does not return to the neutral position, repeat the adjustment again.

Repeat the procedure to adjust the other side.

After the adjustment is correct, tighten the steering linkage bolts and nuts (both ends) to 11–13 ft.-lbs. (15–18 Nm) torque.



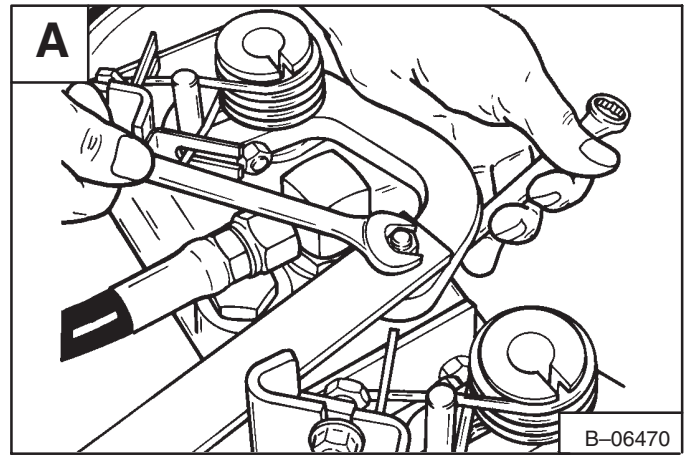
## PINTLE ARMS

### Removal and Installation

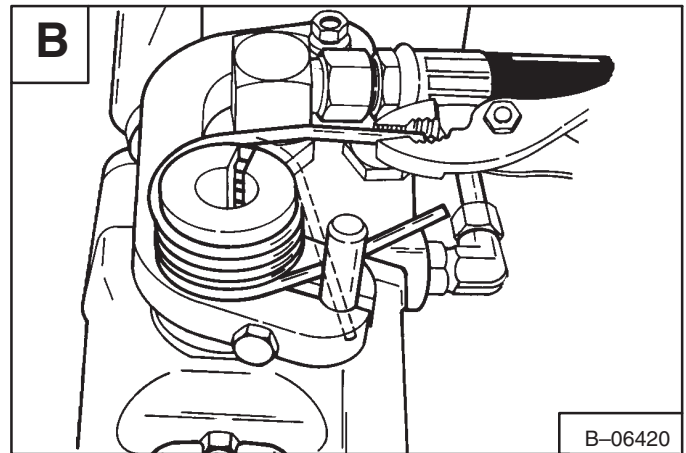
Raise the operator cab (See Page 1–7 for the correct procedure).

Remove the bolt and nut at the steering linkage **[A]**.

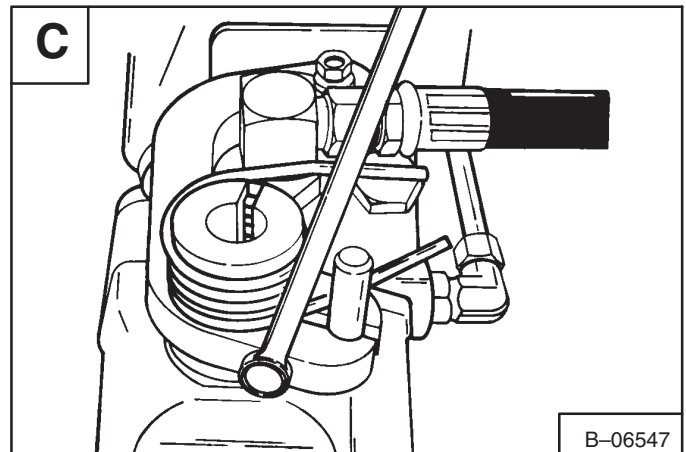
Installation: Tighten the bolt and nut to 11–13 ft.-lbs. (16–18 Nm) torque.



Using a plier, remove the centering spring from the bracket **[B]**.



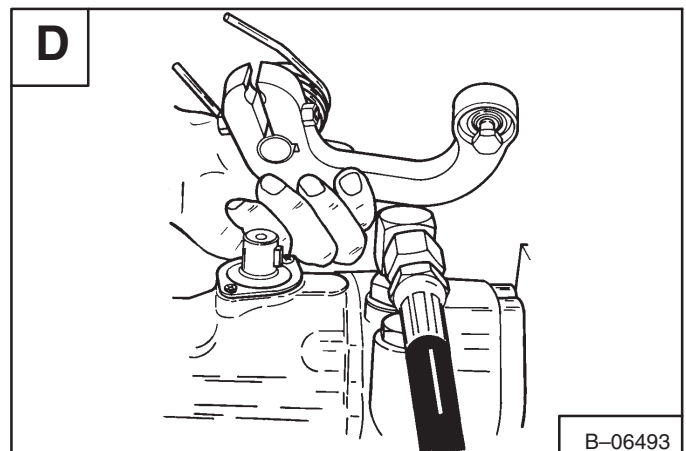
Loosen the pintle arm bolt and nut **[C]**.



Use a small gear puller and remove the pintle arm assembly from the shaft of the hydrostatic pump **[D]**.

**NOTE:** Do not use a screwdriver to pry the pintle arm off, it will cause damage to the seal retainer (Item 1) **[D]**.

Adjust neutral position after pintle arms are installed (See Page 3–6).



## PINTLE ARMS (Cont'd)

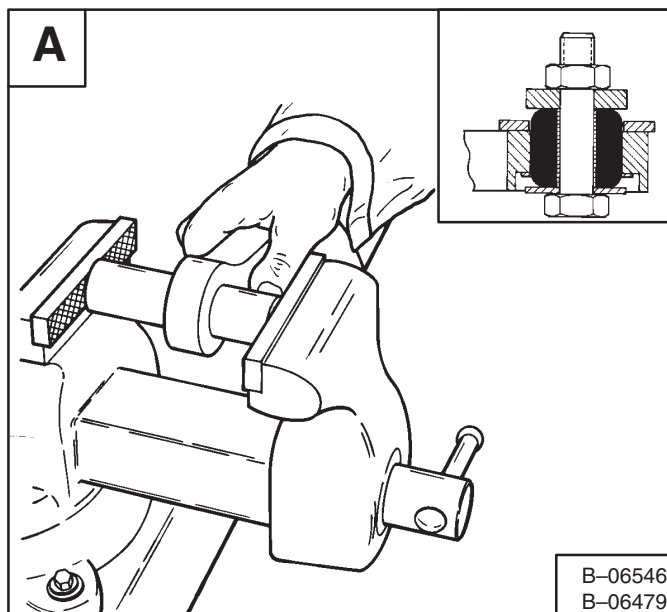
### Disassembly and Assembly

Remove the bushing from the pintle arm.

Check the keyway in the pintle arm for wear.

Check the centering spring ends and the spring sleeve for wear. Replace the parts as needed.

Using two sockets and a vise, install the new bushings in the pintle arm **[A]**.





## HYDROSTATIC MOTOR

### Removal and Installation

# IMPORTANT

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

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Lift and block the loader (See Page 1-2 for the correct procedure).

Remove the wheel from the side of the loader where the motor is going to be removed.

Remove the motor cover [A].

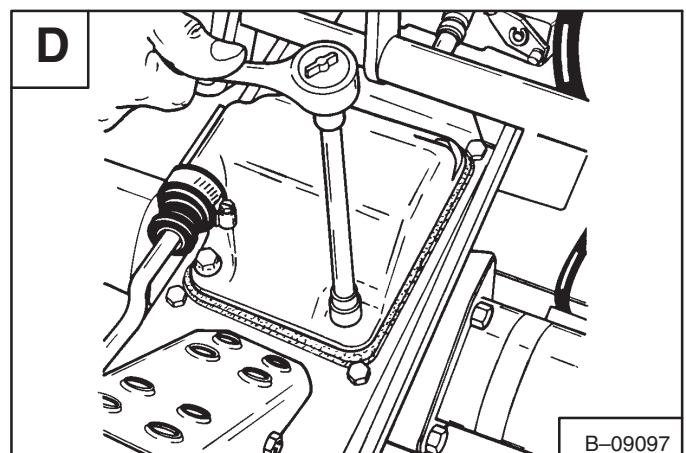
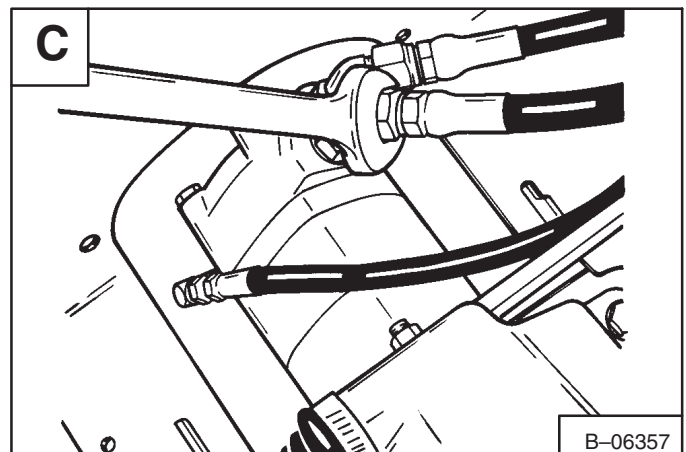
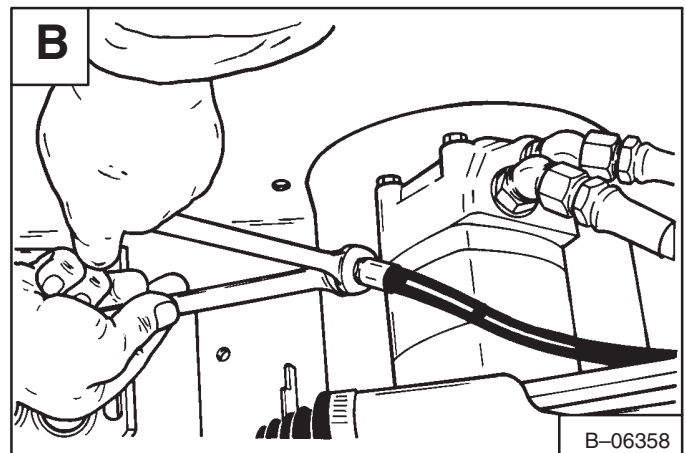
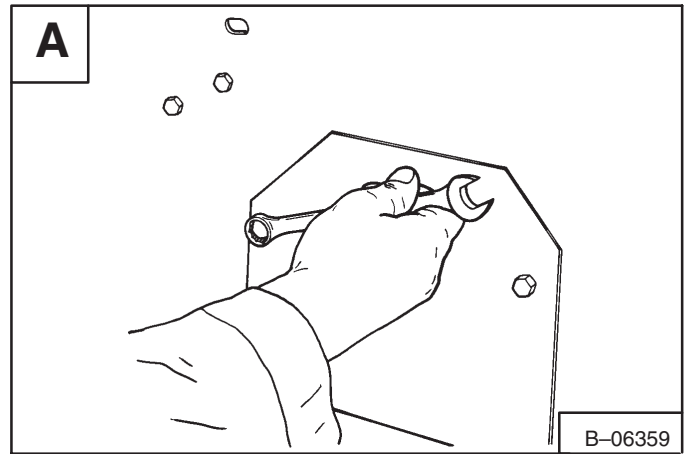
Disconnect the case drain hose [B].

**NOTE:** Mark the high pressure hoses for correct installation.

Disconnect the high pressure hoses [C].

Remove the front panel (See Page 3-3).

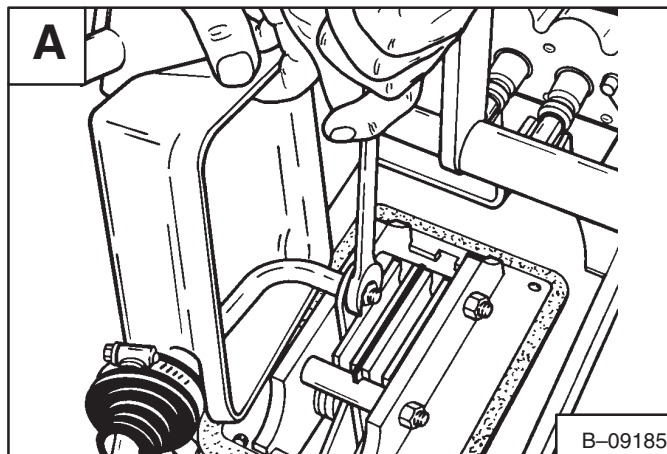
Remove the brake cover [D].



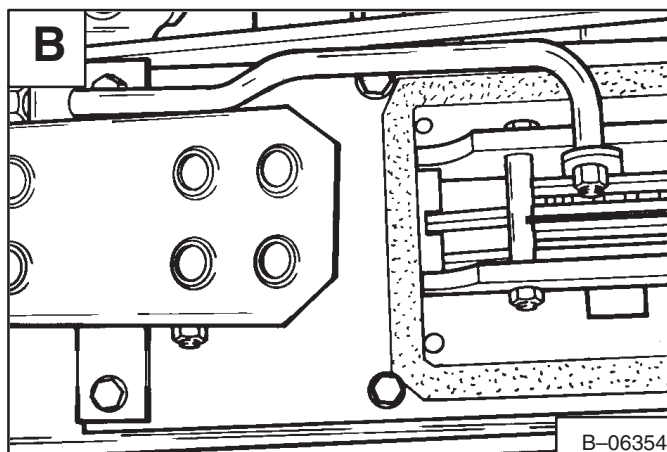
## HYDROSTATIC MOTOR (Cont'd)

Remove the nut at the end of the brake linkage **[A]**.

Remove the brake cover from the brake linkage.

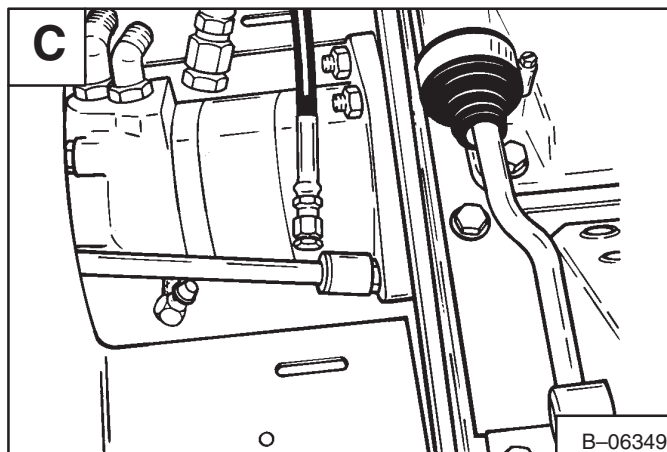


Install the brake linkage rod and nut **[B]**. Put the parking brake in the locked position to hold the brake disc in position.

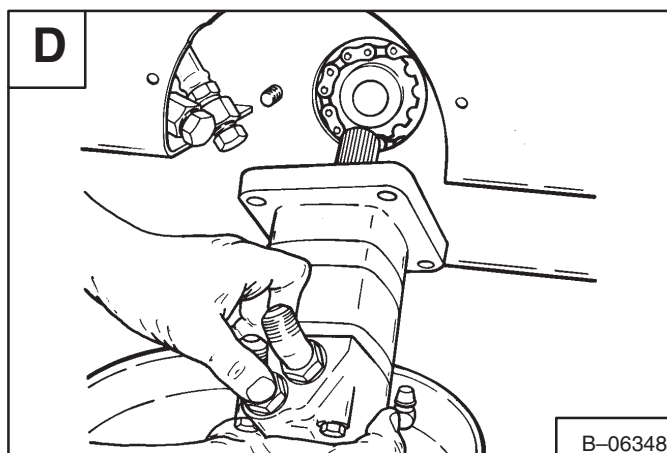


Remove the nuts from the motor flange **[C]**.

Installation: Tighten the nuts to 90–100 ft.-lbs. (123–135 Nm) torque.



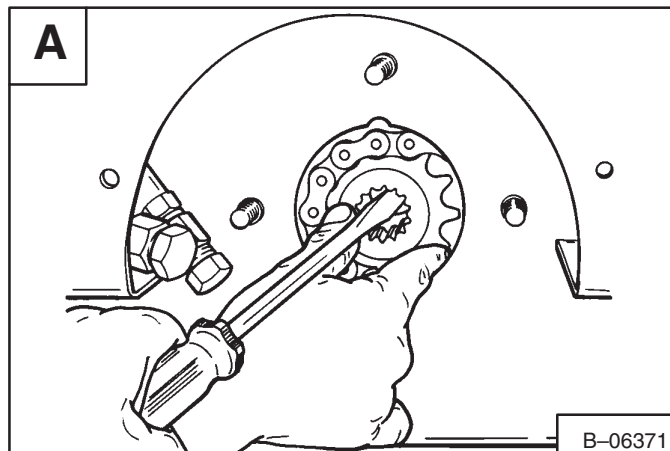
Remove the hydrostatic motor from the chaincase **[D]**.



## HYDROSTATIC MOTOR (Cont'd)

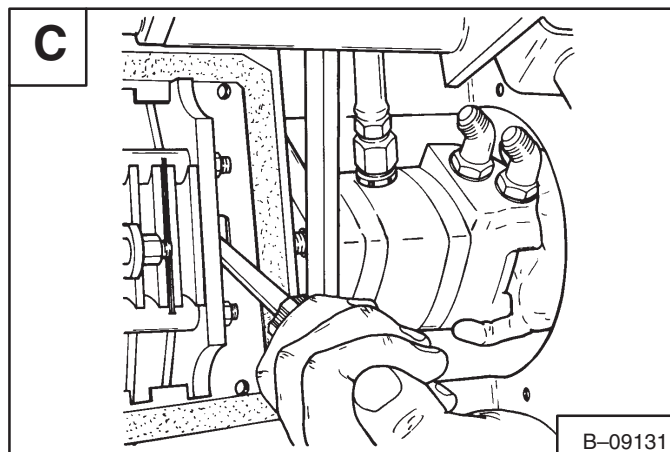
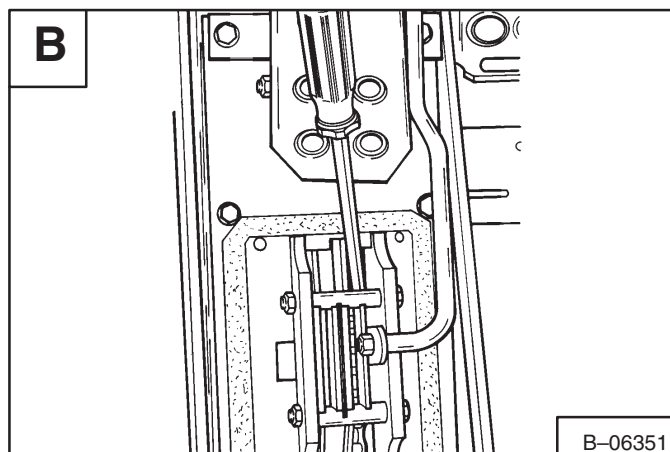
**NOTE:** When the motor is removed from the chaincase, the chain sprocket may pull out of the brake disc and fall into the chaincase. When installing the motor in the chaincase, the chain sprocket will have to be aligned in the brake disc.

Lift and make alignment of the chain sprocket in the brake disc [A].



Using a screwdriver, hold the sprocket in the brake disc through the top of the chaincase [B] or [C].

Install a new O-ring on the mounting flange and install the motor.

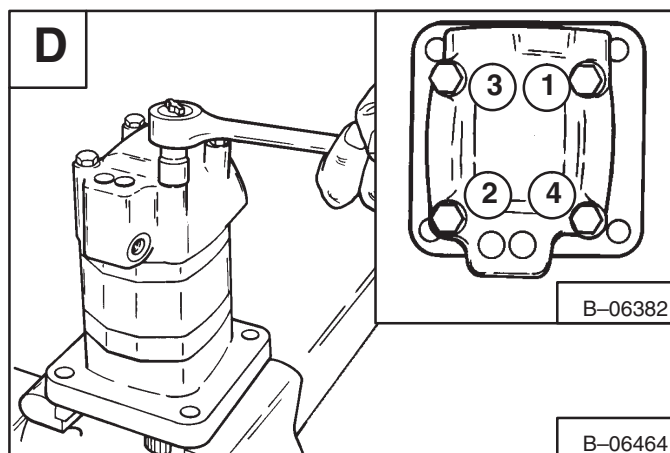


## Disassembly and Assembly

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

Remove the four bolts from the motor [D].

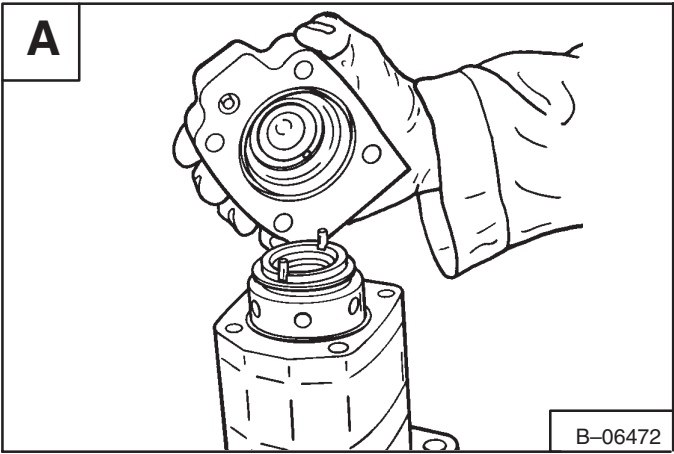
Installation: Tighten the bolts to 37 ft.-lbs. (50 Nm) torque.



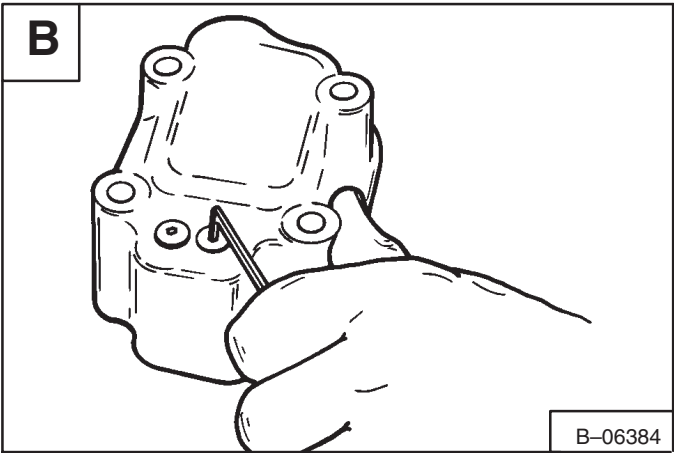
**HYDROSTATIC MOTOR (Cont'd)**

Lift the valve housing straight up. If done carefully , the springs and balance plate will stay on the valve **[A]**.

Remove the O-rings.

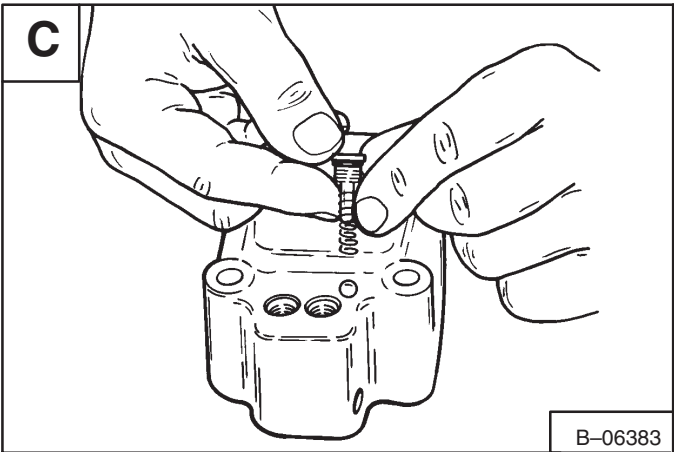


Remove the two check plugs **[B]**.

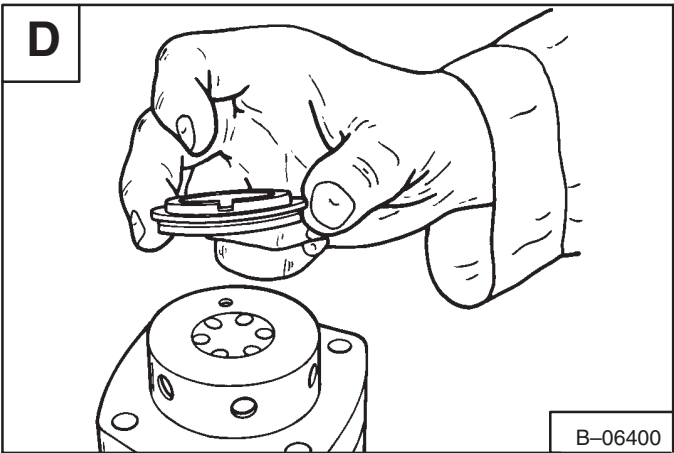


Remove the two springs and balls from the housing **[C]**.

Installation: Check the balls and springs. Replace as needed.



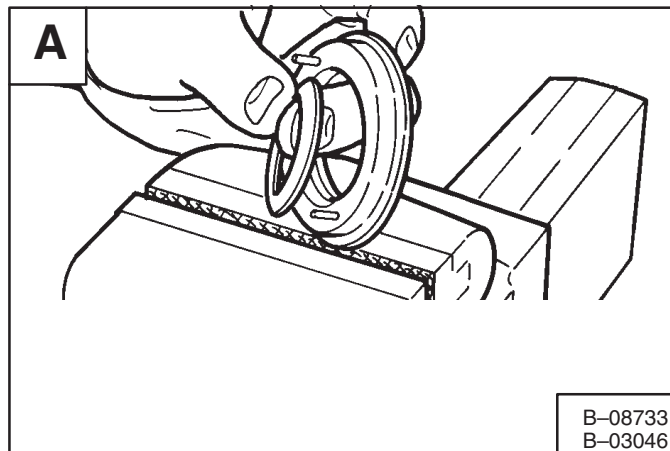
Remove the balance plate **[D]**.



## HYDROSTATIC MOTOR (Cont'd)

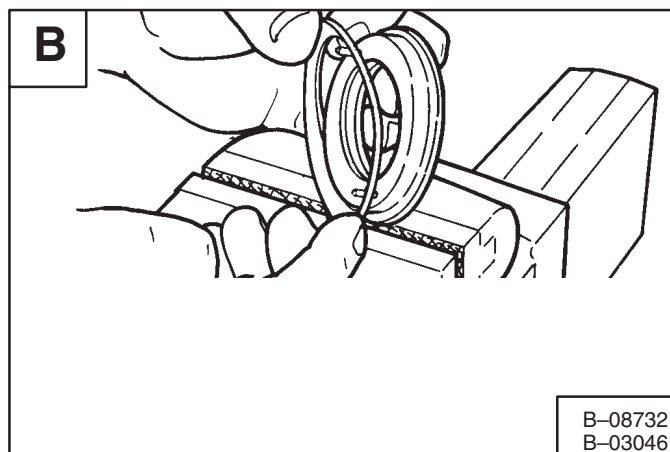
Remove the inner seal from the balance plate [A].

Assembly: Put grease on the inner seal and install as shown [A].

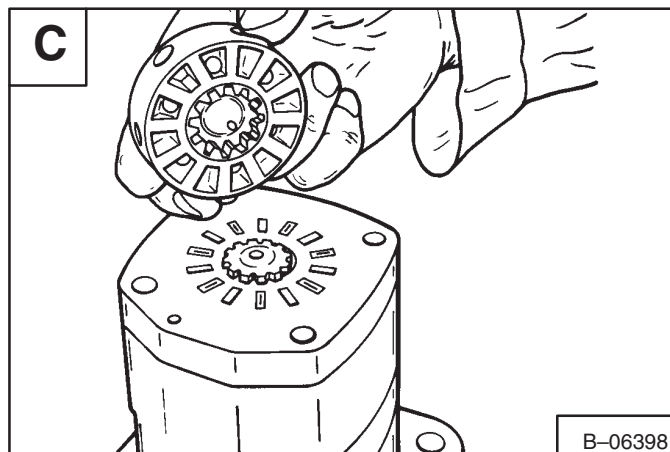


Remove the outer seal from the balance plate [B].

Assembly: Put grease on the outer seal and install as shown [B].

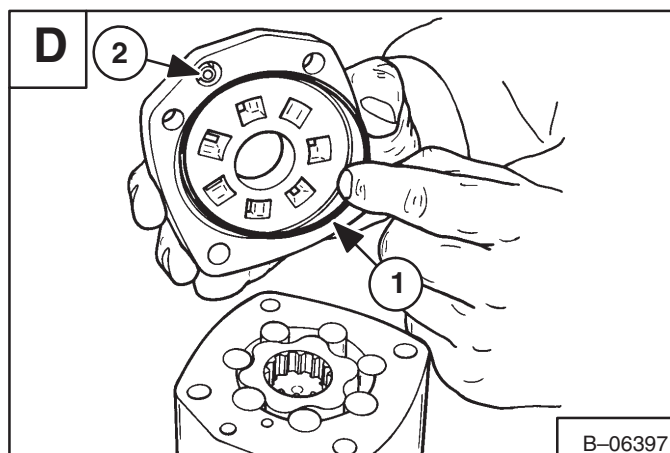


Remove the valve [C].



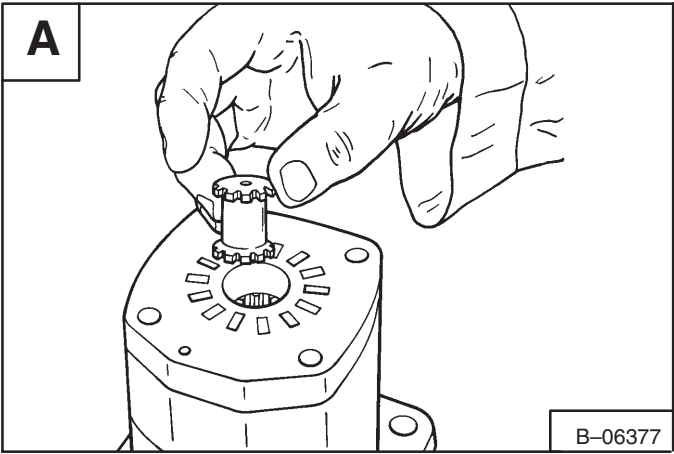
**NOTE:** See Page 3-17 for timing the motor when installing the valve, valve drive and geroler.

Remove the valve plate [D].

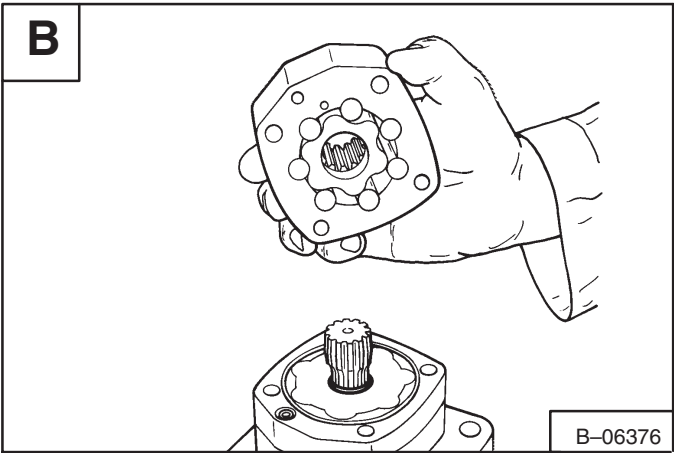


**HYDROSTATIC MOTOR (Cont'd)**

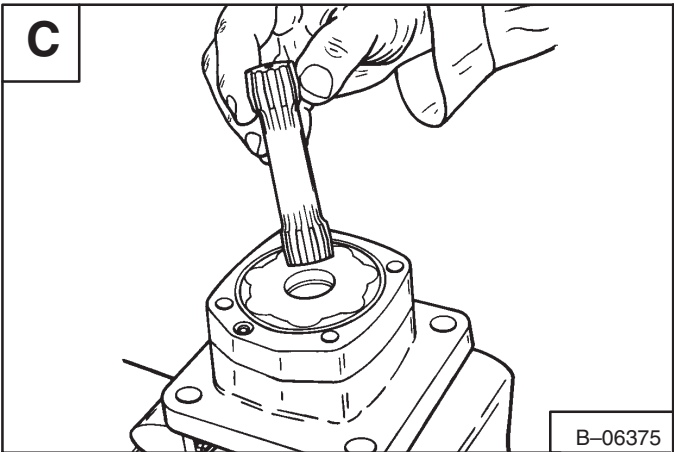
Remove the valve drive [A].



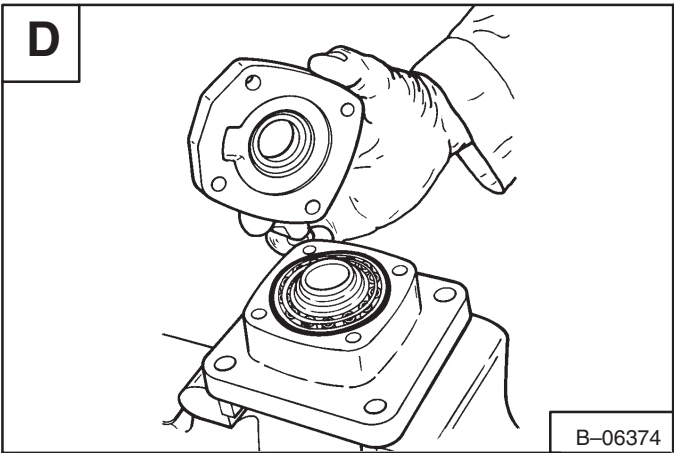
Remove the geroler [B].



Remove the drive shaft [C].

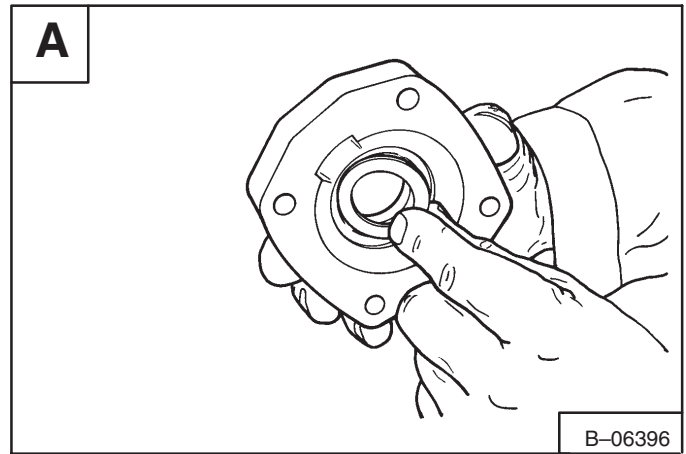


Remove the wear plate [D].



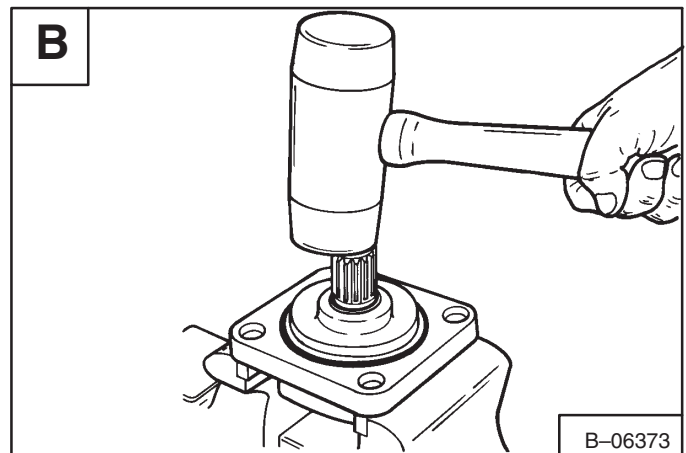
## HYDROSTATIC MOTOR (Cont'd)

Remove the shaft face seal from the wear plate [A].



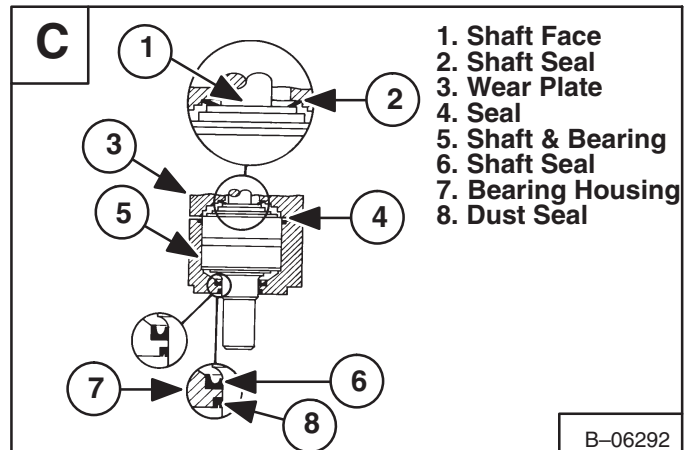
Remove the shaft and bearing assembly from the housing [B].

**NOTE: The shaft and bearing assembly are not sold as individual parts. Replace as a complete unit.**

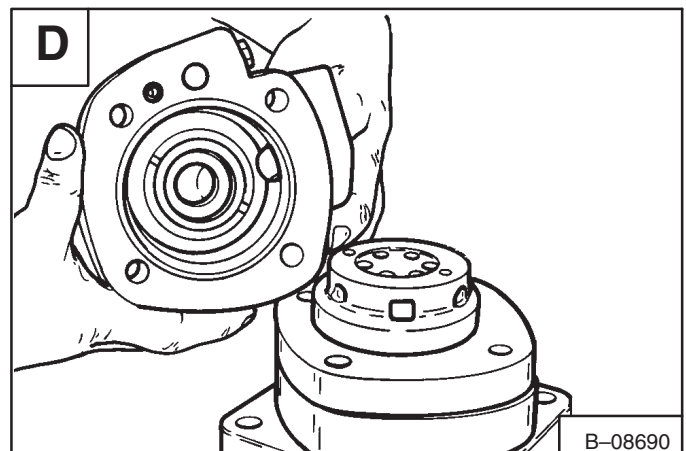


Remove the dust seal and shaft seal from the housing [C].

Assembly: Install a new shaft seal and dust seal as shown [C]. Use a press to install the bearing and shaft assembly



When installing the balance plate in the end housing, put your finger through the hole and hold it in position until the housing is in position [D].





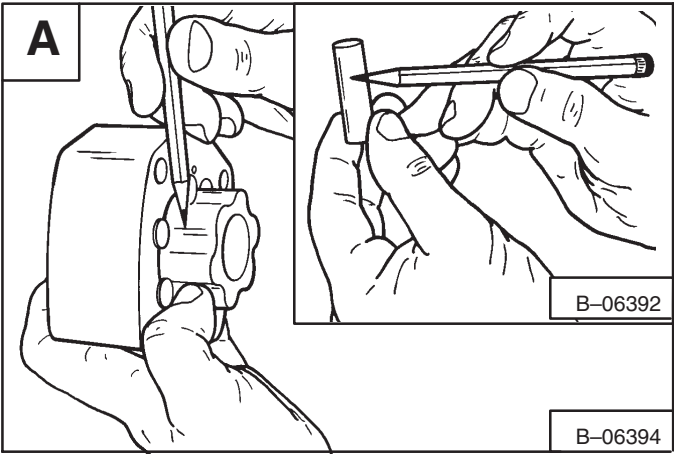
HYDROSTATIC MOTOR (Cont'd)

Inspection

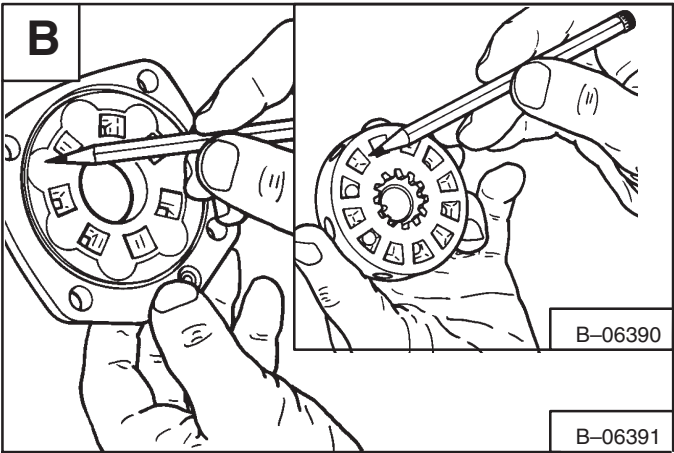
Before the motor is assembled, check the following items:

- 1. Check the geroler roller and rotor for wear and scratches [A].

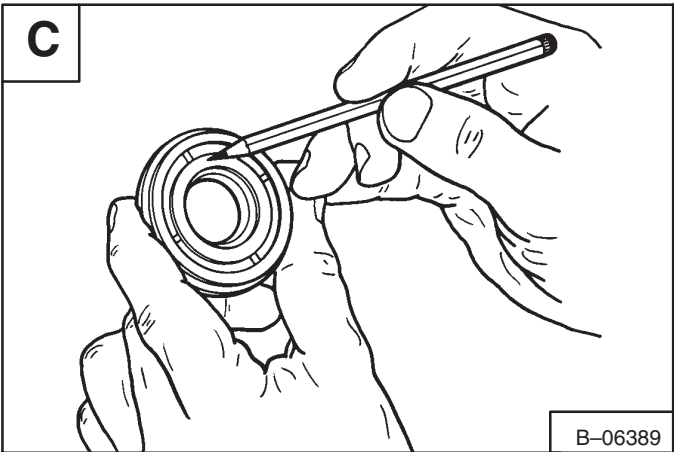
**NOTE: Put all rollers back in their original position.**



- 2. Check valve plate for scratches [B].



- 3. Check balance plate for scratches [C].
- 4. Check the valve drive and main drive for wear.

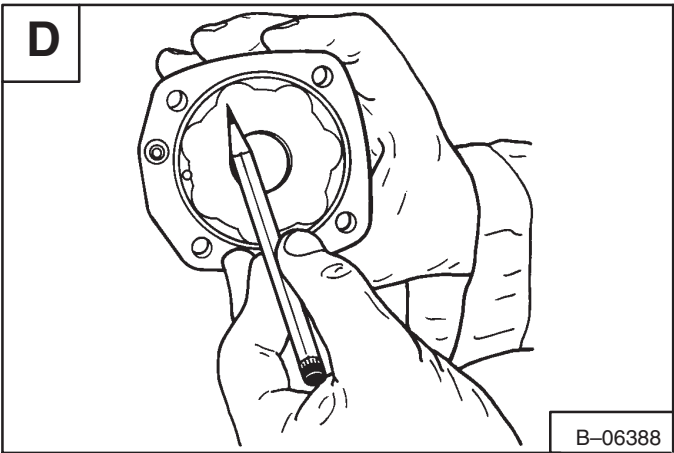


- 5. Check the end plate surface for scratches [D].

Start Up Procedure

Because of the close tolerance in the hydrostatic motor, it is important that the motor is NOT OPERATED AT LOW LOAD/HIGH SPEED (road condition) when the motor is new or first used after being repaired.

If the hydrostatic motor and hydrostatic pump have both been replaced or repaired, it is important to remove all the air from the system and then put the motor under a load condition.



## HYDROSTATIC MOTOR (Cont'd)

### Timing the Hydrostatic Motor

The timing of the motor controls the direction of rotation of the drive shaft of the motor. The timing parts are as follows:

1. Geroler (Item 1) [A].
2. Valve Drive (Item 2) [A].
3. Valve Plate (Item 3) [A].
4. Valve (Item 4) [A].

Find the largest opening between the geroler star and the geroler ring. Mark the outside of the geroler ring at the point [A].

Align the two drain holes and the three pressure holes in the geroler ring with the same holes in the mounting flange. Then install the geroler assembly.

Install all the new O-rings.

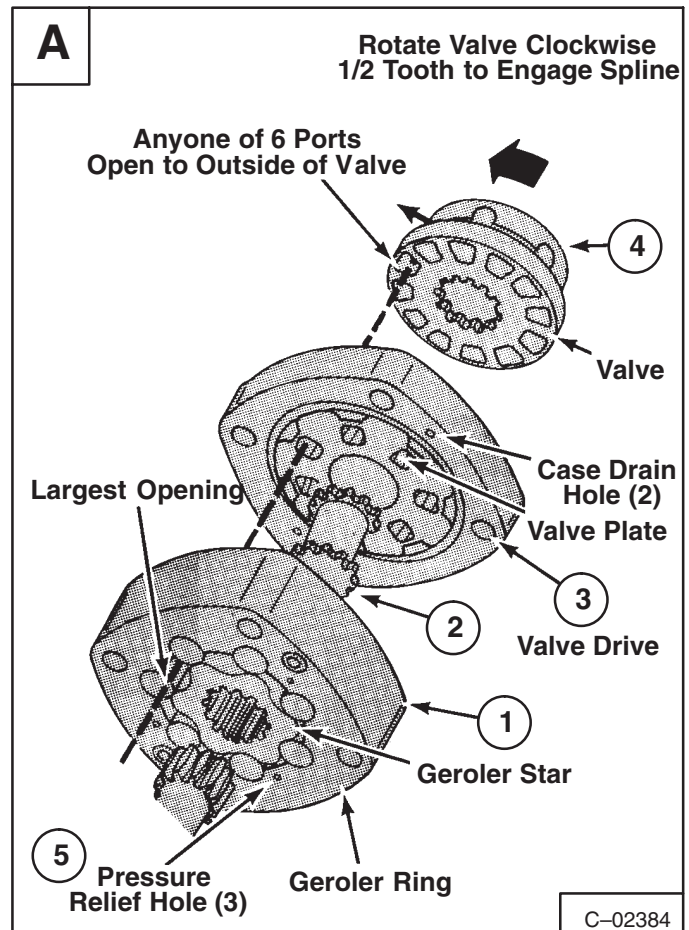
Install the valve drive [A].

Align the drain hole in the valve plate with the drain hole in the geroler. Install the valve plate with the O-ring toward the geroler. Make sure the slot opening of the valve plate is in alignment with the largest opening of the geroler.

Install the valve plate.

Install the valve on the valve plate. Make alignment with one of the side openings with the mark on the geroler. Turn the valve clockwise a small amount until the teeth on the valve drive engage.

Continue with the rest of the assembly procedure.



## HYDROSTATIC PUMP

### 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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### Checking Charge Pressure

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

MEL-1173-Test Kit

Lift and block the loader (See Page 1-2 for the correct procedure).

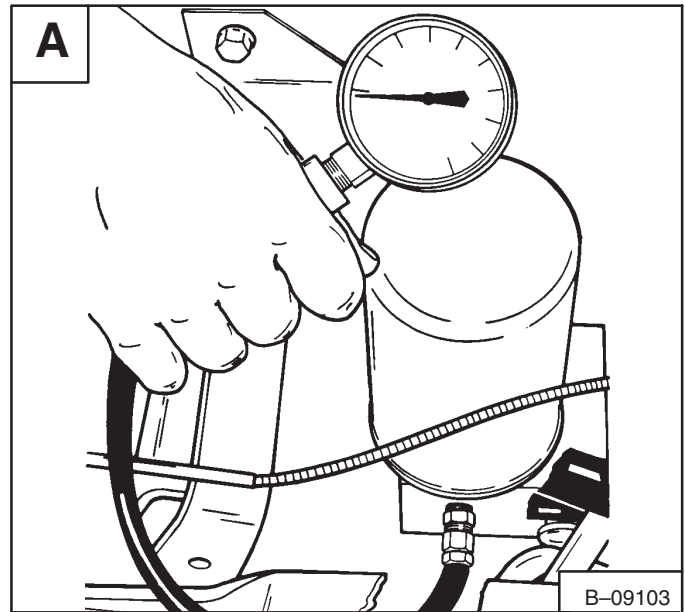
Raise the operator cab (See Page 1-7 for the correct procedure).

Remove the plug at the port block and install a pressure gauge [1].

Start the engine.

Run the engine at full RPM. The pressure must be 35-85 PSI (241-586 kPa) minimum with no hydraulic action.

If the pressure is not correct, remove the charge spring and poppet and replace parts as needed.



## HYDROSTATIC PUMP (Cont'd)

### Removal and Installation

**NOTE:** The engine and hydrostatic pump are removed from the loader as an assembly. See Page 7-7. When the engine and hydrostatic pump have been removed from the loader, follow the procedure below to remove the pump from the mounting brackets.



## WARNING

The pulley for the drive belt tension has a strong spring. Use a firm grip and release it at a slow rate after the drive belt is removed.

Remove the drive belt from the pulleys [A].

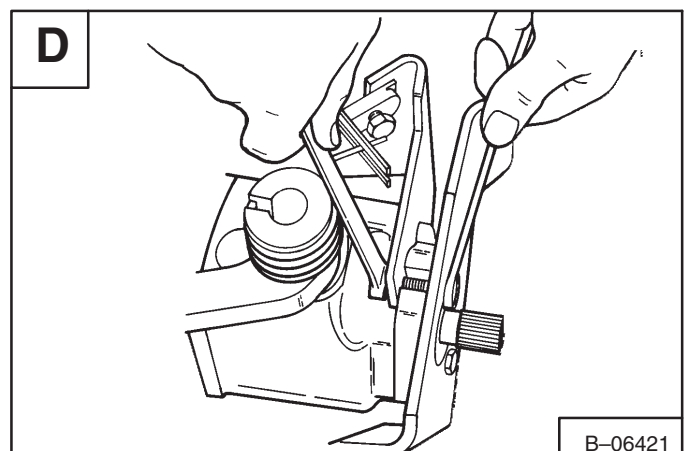
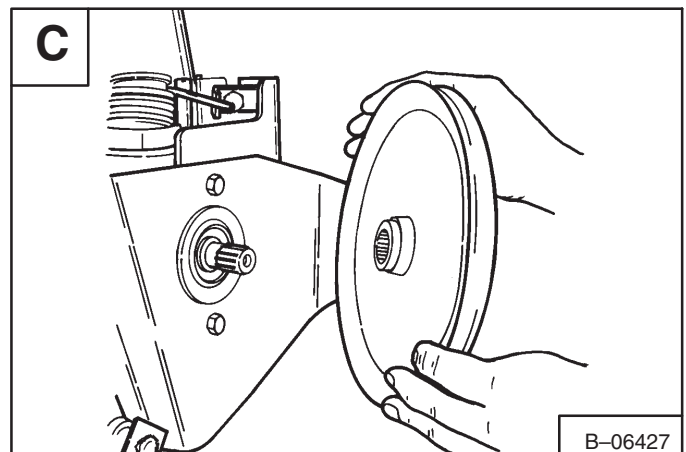
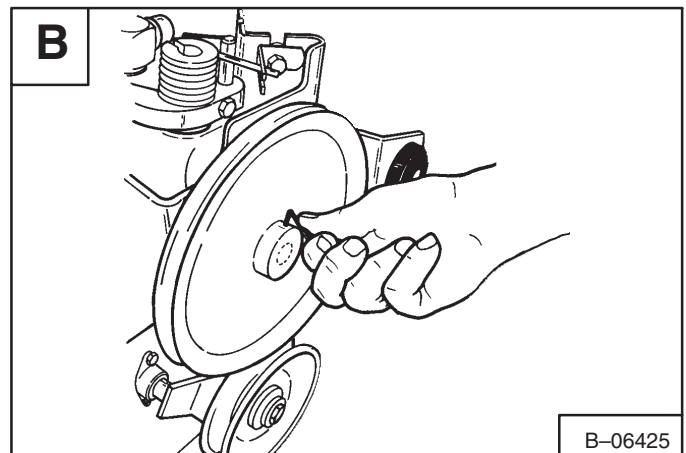
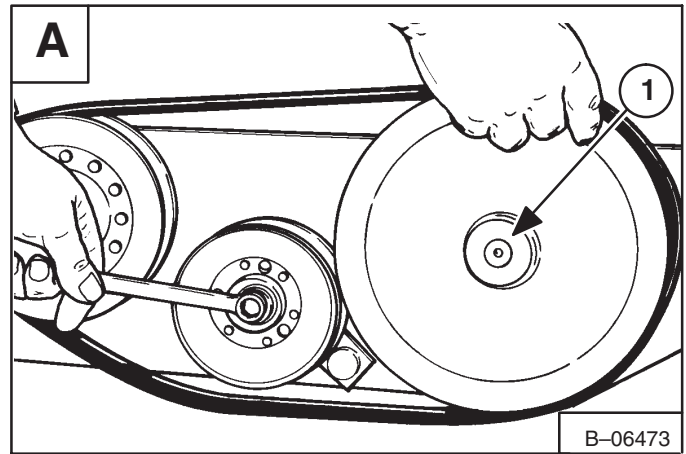
Loosen the two set screws in the pulley on the pump [B].

Installation: Tighten the set screws to 90 in.-lbs. (10 Nm) torque.

Remove the pulley from the pump shaft [C].

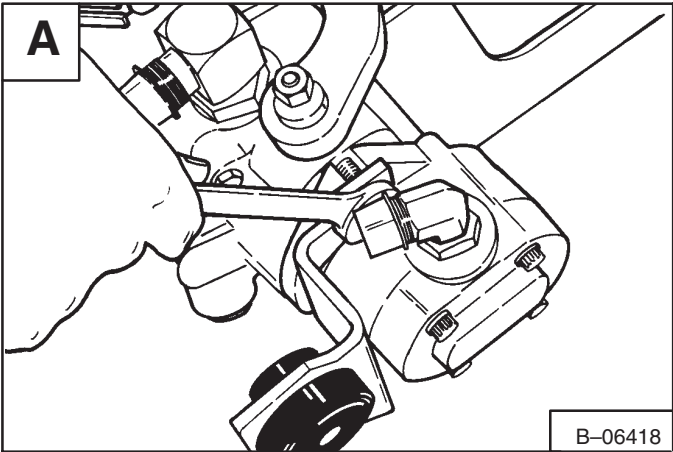
**NOTE:** Later production loaders have a tapered shaft (Item 1) at the hydrostatic pump [A]. Remove the bolt to remove the pulley. When installing the bolt tighten to 35-40 ft.-lbs. (48-54 Nm) torque.

Remove the centering bracket and mount at the pulley side of the pump [D].



**HYDROSTATIC PUMP (Cont'd)**

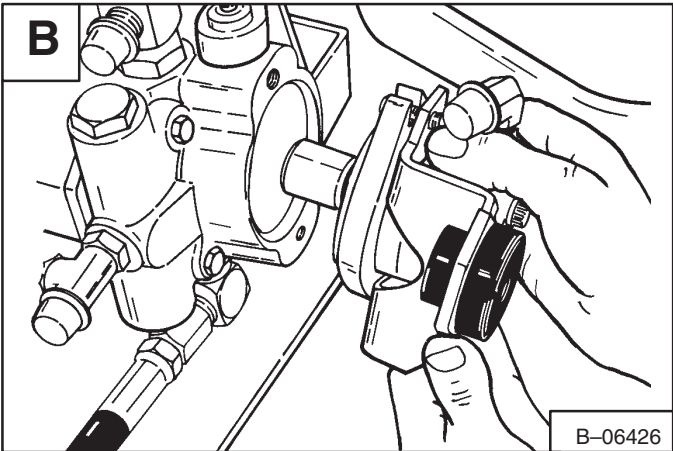
Remove the bolts at the mounting bracket and hydraulic pump [A].



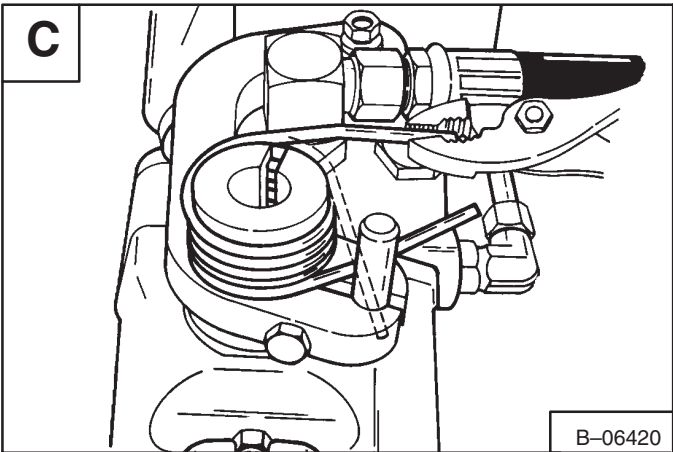
Remove the mounting bracket and hydraulic pump [B].

**NOTE: If the hydraulic pump needs repair, See Page 2-20 for the correct procedure.**

Remove the hydrostatic pump from the engine mounting bracket and put it on a work bench.

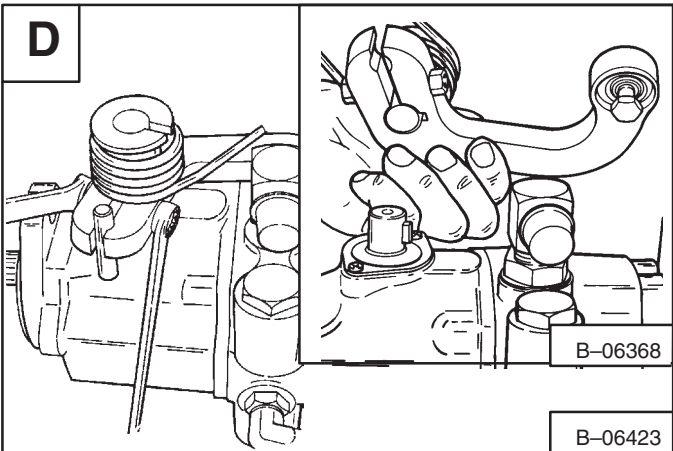


Remove the centering spring from the dowel [C].



Loosen the bolt and nut at the pintle arm [D].

Use a small gear puller and remove the pintle arm from the pump shaft (both pumps) [D].



## HYDROSTATIC PUMP (Cont'd)

Remove the high pressure hoses.

Remove the charge tubelines [A].

### Disassembly and Assembly

# IMPORTANT

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

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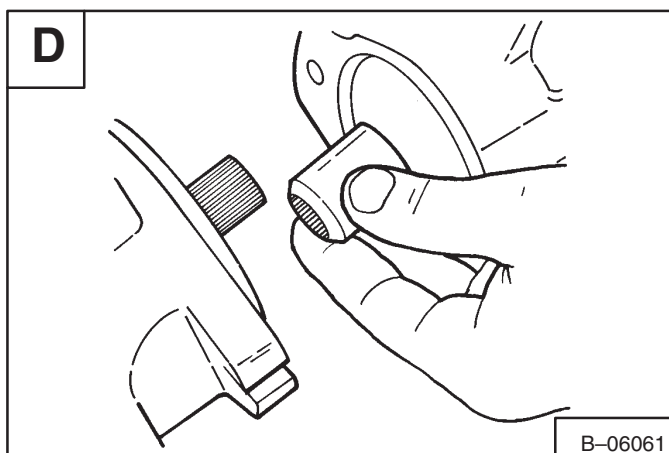
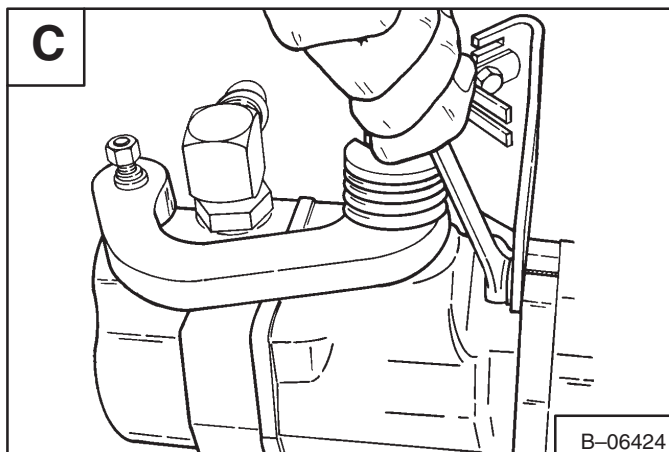
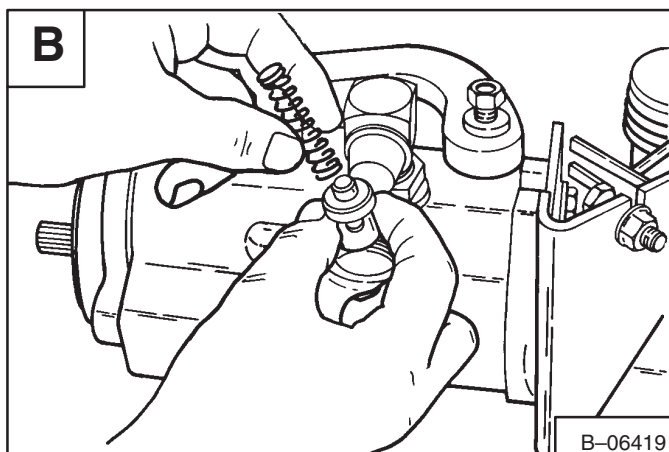
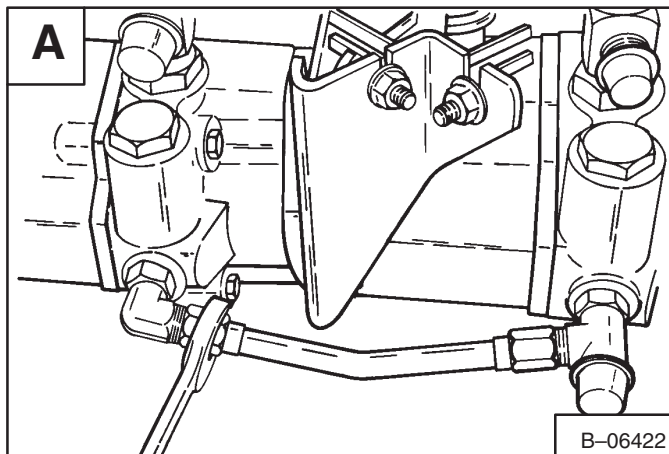
Remove the four replenishing valves from the pump [B].

Remove the bolts and center bracket from the pump[C].

Installation: Tighten the bolts to 27–31 ft.-lbs. (37–42 Nm) torque.

Separate the pump housing from the center section.

Remove the coupler from the center section [D].

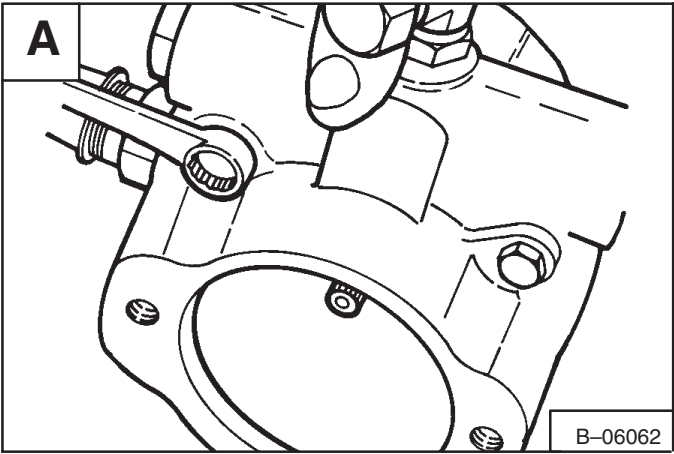


**HYDROSTATIC PUMP (Cont'd)**

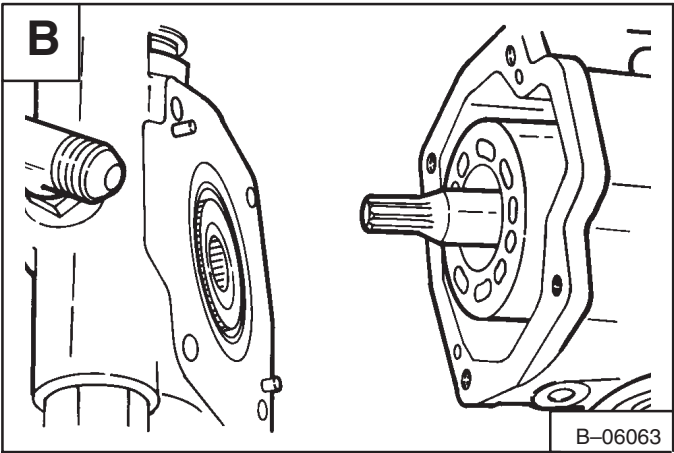
**NOTE:** The hydrostatic pump front and rear pump internal parts are the same. Some of the external parts are different and the copy will list the different procedures.

Remove the four bolts from the center section **[A]**.

Installation: Tighten the bolts to 17–21 ft.-lbs. (23–27 Nm) torque.

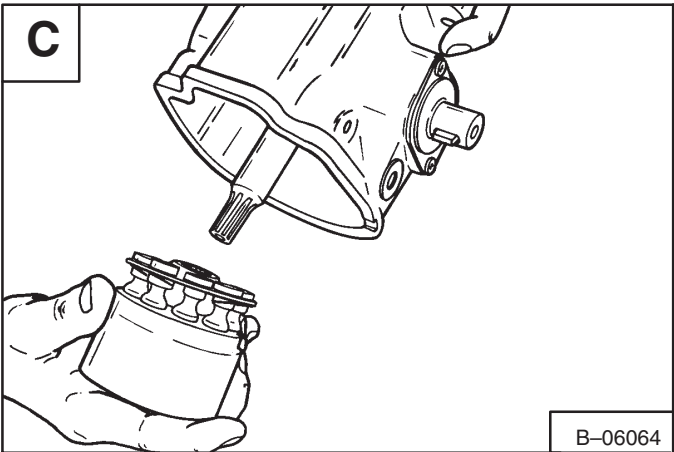


Remove the center section **[B]**.



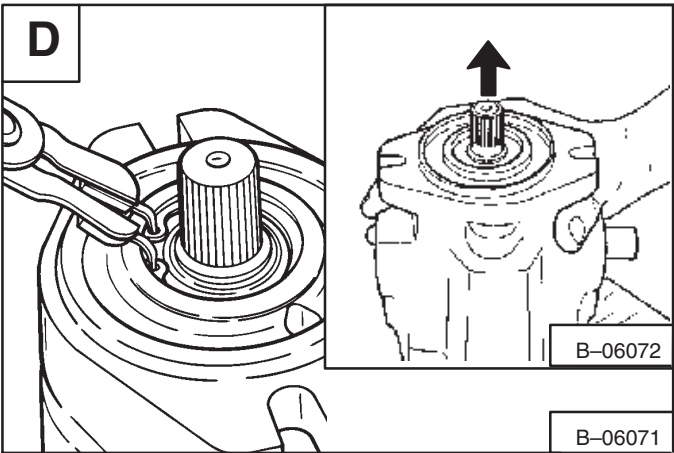
Remove the rotating group **[C]**.

Put your hand under the rotating group and turn the pump housing around so the rotating group will slide into your hand.



Remove the snap ring from the rear housing **[D]**.

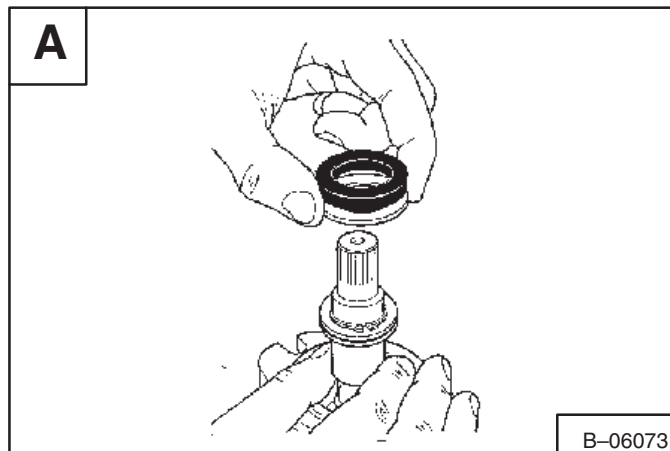
Hit the shaft on a block of wood to remove the bearing and the shaft **[D]**.





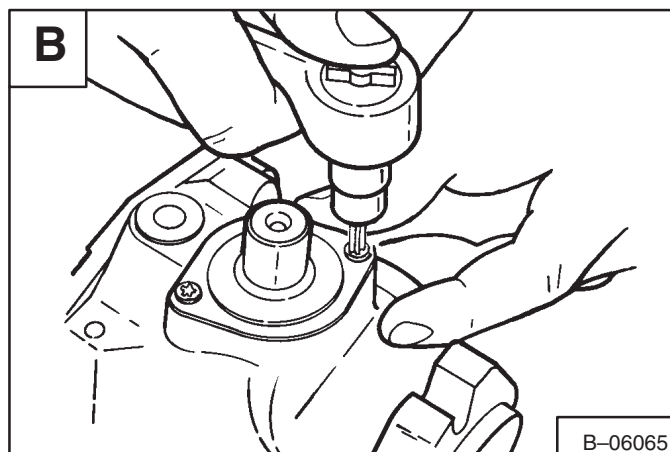
## HYDROSTATIC PUMP (Cont'd)

Remove the seal and back-up washer from the shaft **[A]**.

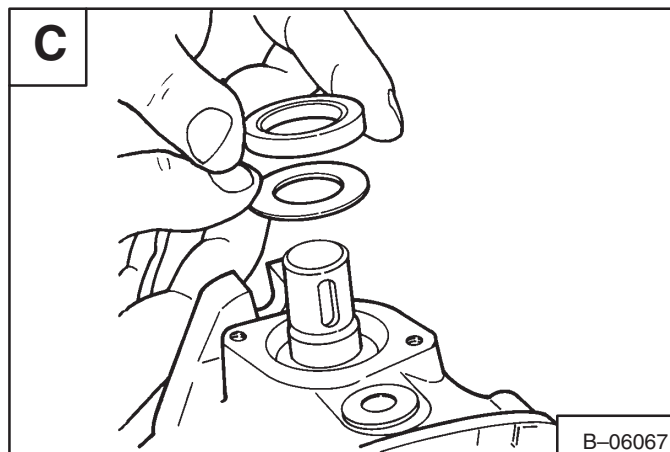


Remove the bolts at the cover of the long pintle shaft **[B]**.

Remove the pintle cover.

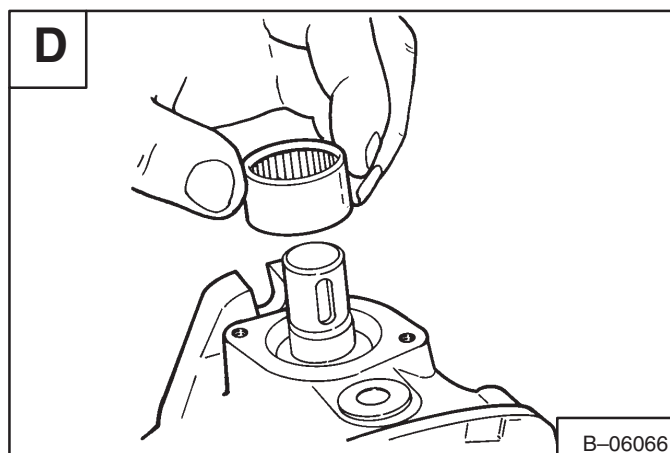


Remove the seal and washer **[C]**.



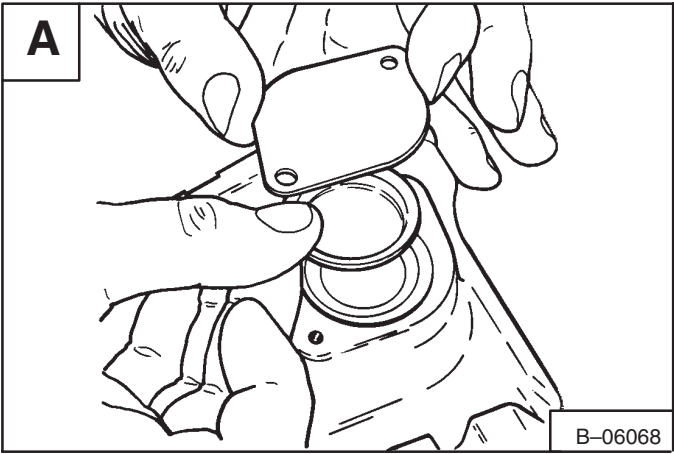
Remove the pintle shaft bearing **[D]**.

Installation: When installing the bearing make sure the numbered side of the bearing is toward the outside.

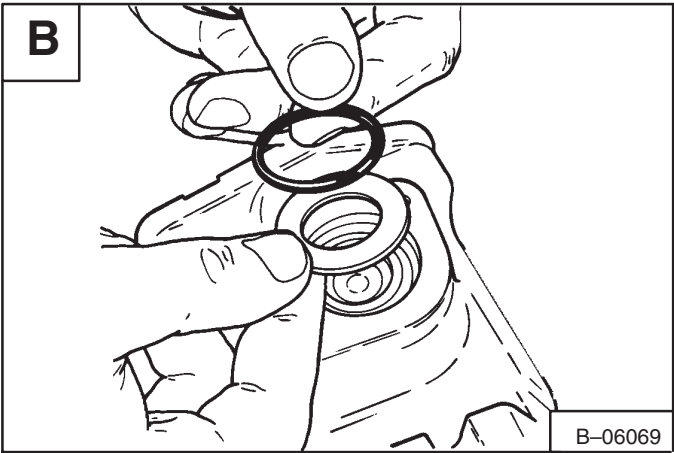


**HYDROSTATIC PUMP (Cont'd)**

Remove the screws and cover from the short pintleshaft [A].

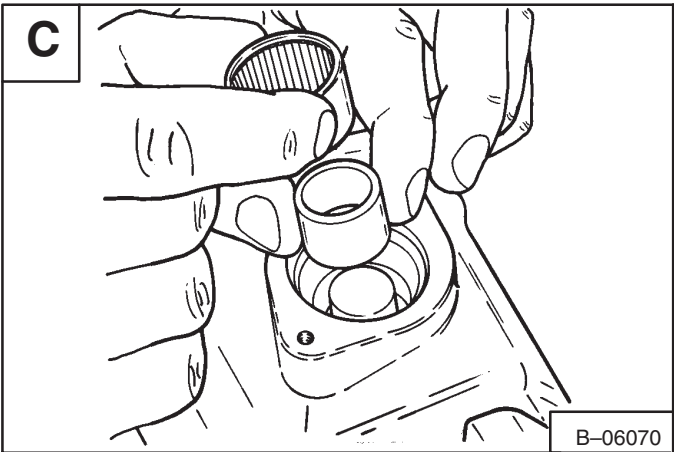


Remove the washer and O-ring from the shaft [B].

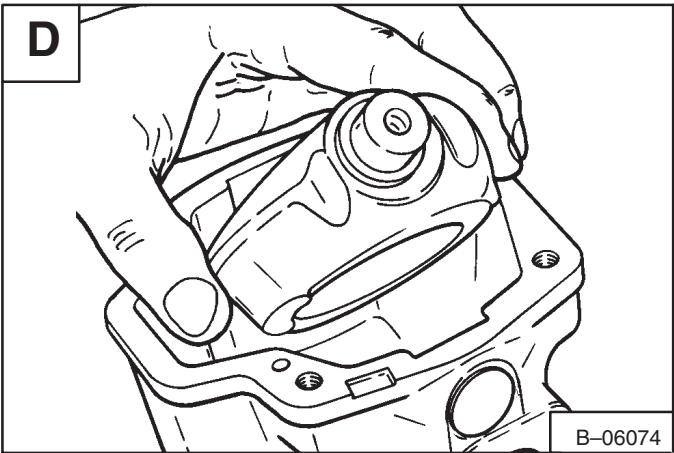


Remove the bearing and bearing race from the shaft [C].

Installation: When installing the race make sure the chamfer side is toward the camplate.



Remove the camplate from the housing [D].



## HYDROSTATIC PUMP (Cont'd)

### Inspection

**NOTE: Keep all the parts for one pump separated from the parts for the other pump.**

Inspect the input drive shafts, bearings and races for wear and damage to the shaft splines **[A]**.

The bearings in the center section and housing, only have to be removed if they are loose and show wear. Use a press to remove and replace the bearings.

Inspect the flat surface of the sections. The finish must be smooth and free of grooves. If grooves can be felt on the finished surface with a fingernail, replace the parts **[B]**.

Inspect the camplate for wear. The finish must be smooth and free of grooves. If grooves can be felt with a fingernail, replace the camplate.

Inspect the rotating group for the following:

Check each piston in its bore. The piston must move freely.

Check the pins for wear or damage **[C]**. All the pins must be the same length and must not be bent.

Check the spherical washer for sharp edges, wear or scratches **[C]**.

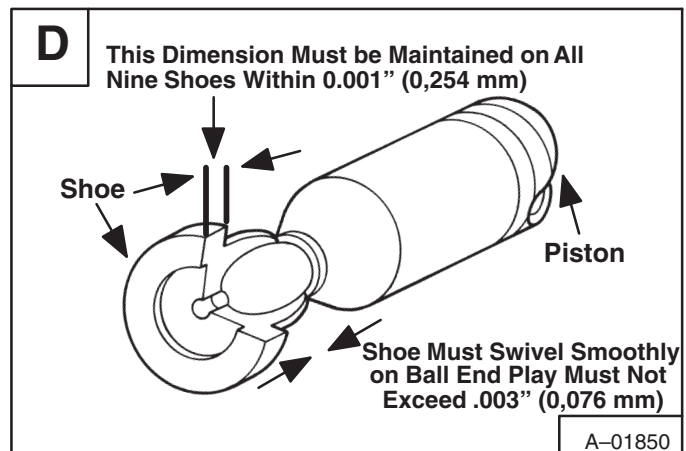
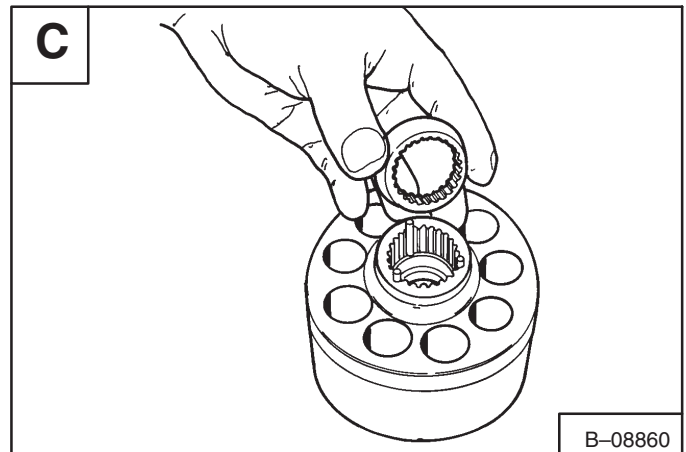
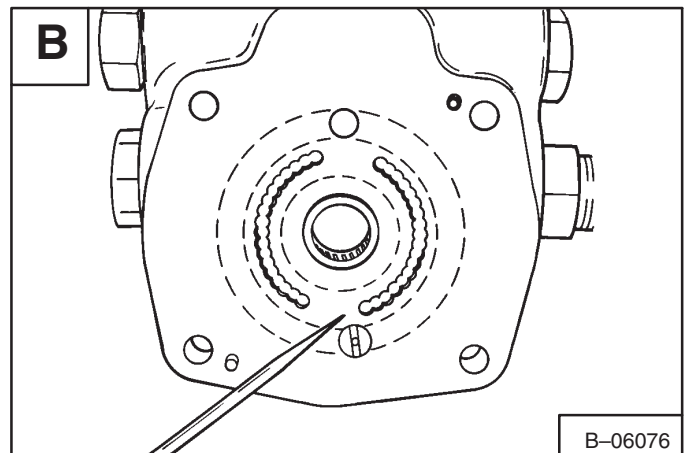
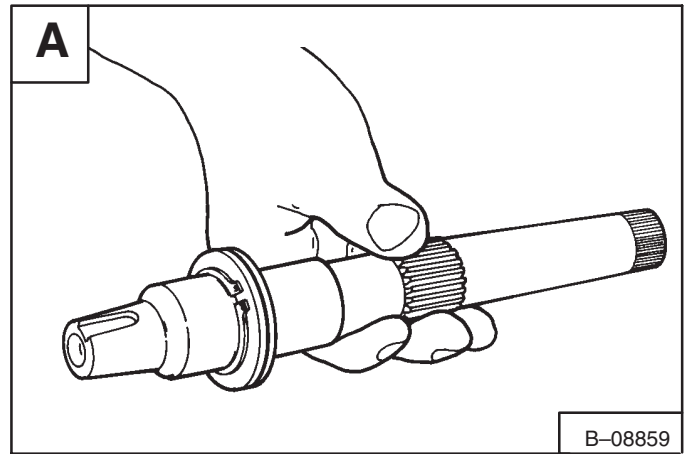
Check the piston shoe for scratches.

Check the end play of each piston assembly **[D]**. Measure the thickness of each shoe. All shoes must be within 0.001" (0,025 mm) of each other **[D]**.

Inspect the shoe plate for wear or cracks. If there is any defect in the rotating group, the complete unit must be replaced.

Clean all parts in solvent and use air pressure to dry them. DO NOT use cloth or paper because small pieces of material can get into the system and cause damage.

DO NOT use sandpaper or a file to remove scratches.



## HYDROSTATIC PUMP (Cont'd)

### Start Up Procedure

Lift and block the loader (See Page 1–2 for the correct procedure).

Make sure all the hoses and tubelines are tight.

Check the hydraulic/hydrostatic reservoir, make sure the fluid is at the correct level.

Put the steering levers in neutral position.

Start the engine and run at low idle RPM. The hydraulic pump must immediately pick up fluid and fill the system. If there is no sign of a fill, stop the engine and find the cause.

**NOTE: Make sure that all the air has been removed from the hydrostatic pumps before the steering levers are stroked.**

After the system is full and has no air, at a slow rate move the steering levers. Operate the system at a slow speed with no load until at normal operating temperature.

Stop the engine. Check the reservoir and fluid as needed.

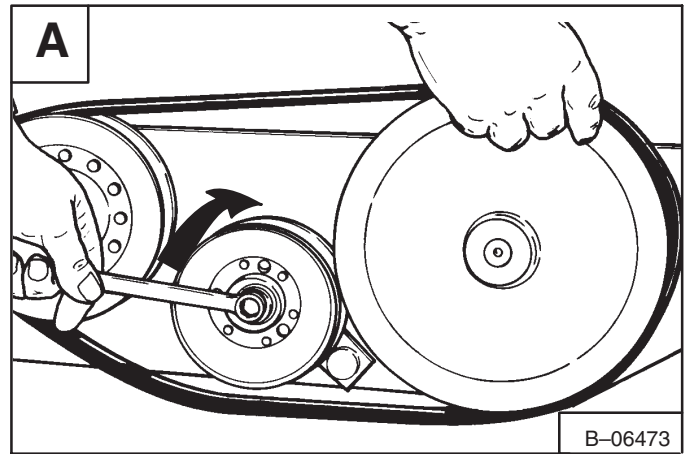
Check for leaks.

Adjust neutral position (See Page 3–5).

## DRIVE BELT & TENSION PULLEY

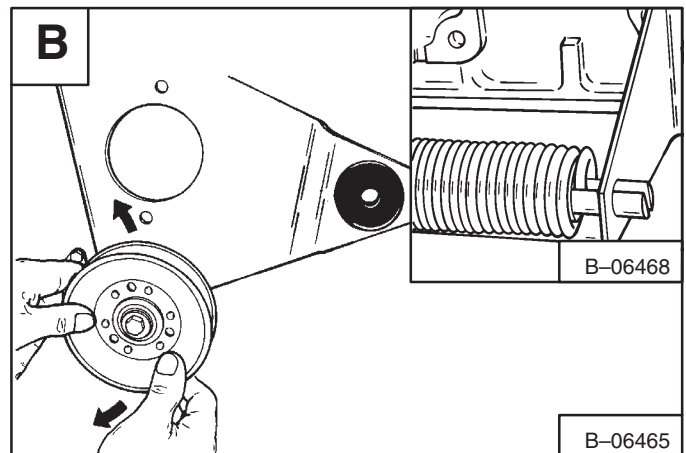
### Tension Pulley Removal and Installation

Remove the drive belt from the engine pulley and the pump pulley **[A]**.

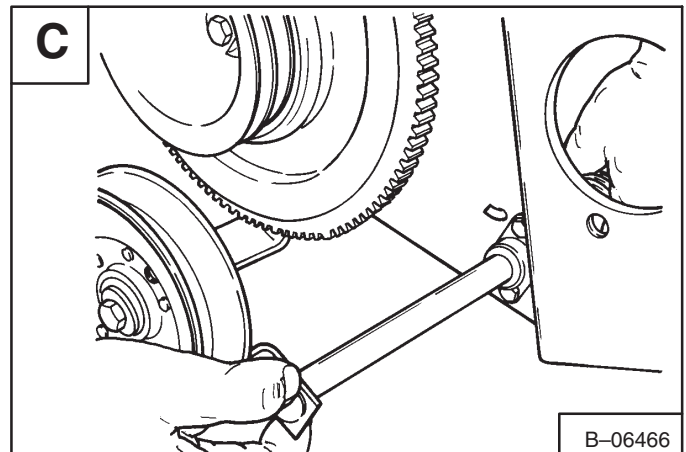


Turn the tension pulley counterclockwise **[B]**.

Installation: Make sure the slot in the end of the shaft is engaged in the end of the spring (Inset) **[B]**. Turn the tension pulley one full turn clockwise to put the correct tension on the spring. Use a rope and fasten the pulley to mounting bracket, until the belt is installed.

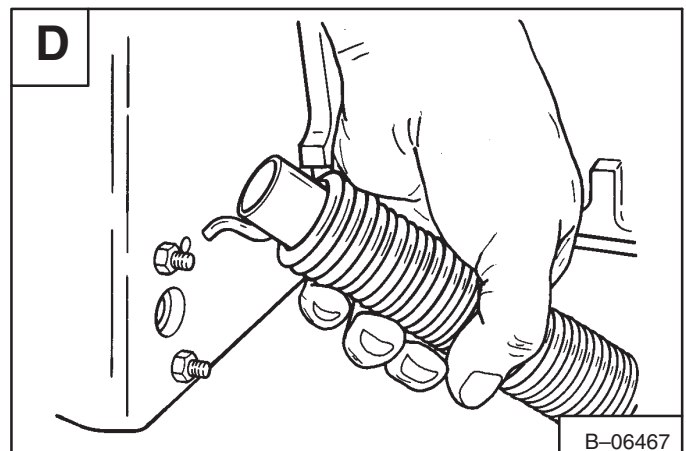


Remove the pulley and shaft assembly from the mounting bracket and bearing **[C]**.



Remove the spring from the mounting bracket **[D]**.

Check the bearings and spring ends, replace the parts as needed.



## DRIVE BELT & TENSION PULLEY

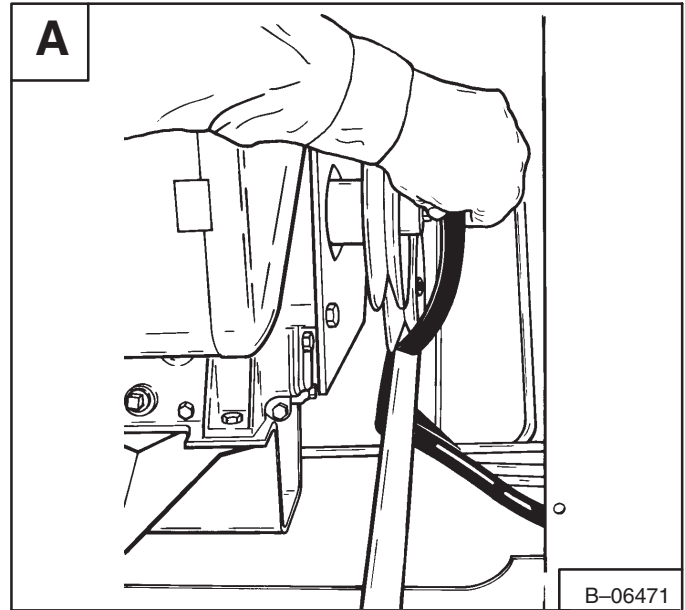
### Drive Belt Replacement In Loader Removal and Installation

Raise the operator cab (See Page 1–7 for the correct procedure).

At the right side of the loader, loosen the bolt at the engine and hydrostatic mounting bracket.

Using the long pry bar, lift up on the tension pulley and remove the drive belt from the engine pulley **[A]**.

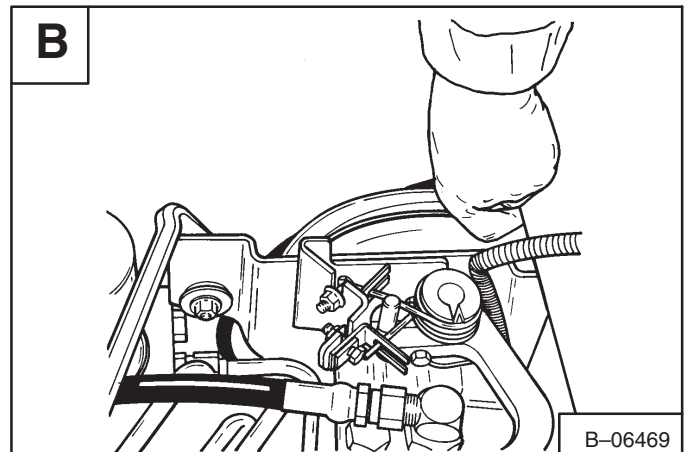
**NOTE:** The tension pulley may have to be removed from its mounting arm so there will be clearance to remove the drive belt.



Using a pry bar, move the engine and hydrostatic pump to the left. Remove the drive belt from the pulley at the hydrostatic pump **[B]**.

Remove the drive belt from the loader.

Reverse the above procedure to install the drive belt.

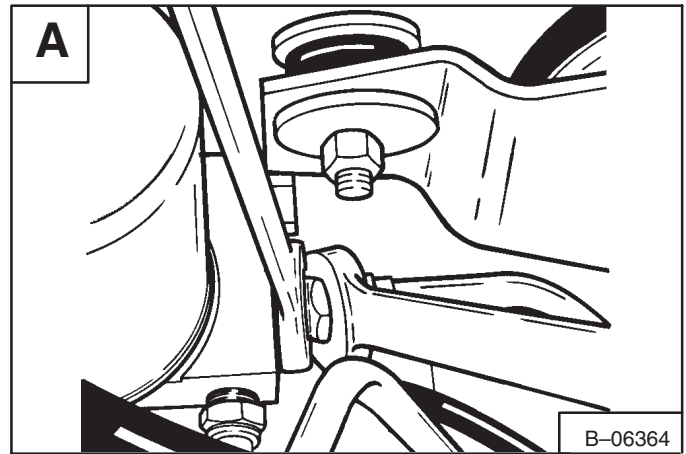


## PORT BLOCK

### Charge Pressure Relief Valve Removal and Installation

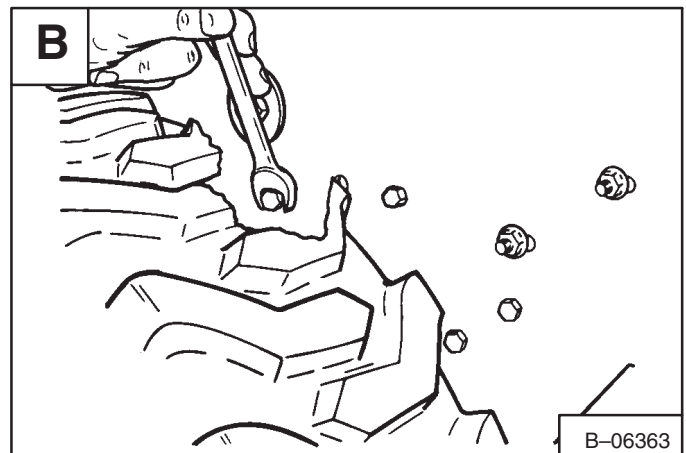
Raise the operator cab (See Page 1–7 for the correct procedure).

Remove the charge by-pass tubeline from the port block [A].



Remove the mounting bolt on the outside of the loader fender [B].

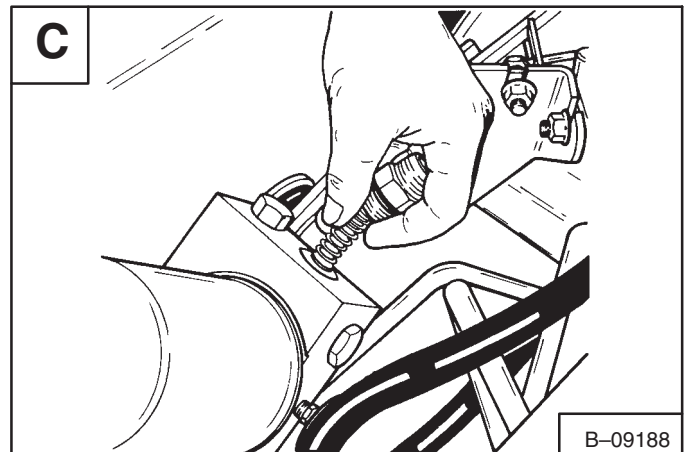
Tip the port block forward.



Remove the fitting from the port block. Remove the spring and poppet [C].

Clean and inspect the parts. Replace as needed.

Install a new O-ring when installing the fitting.



### Cold Weather By-Pass Valve Removal and Installation

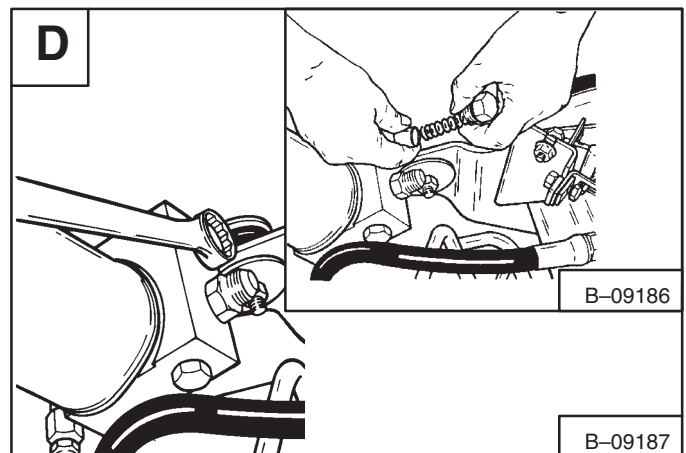
Follow the procedure in Charge Pressure Relief Valve to tip the port block forward.

Remove the plug from the port block [D].

Remove the spring and poppet [D].

Clean and inspect the parts, replace as needed.

Install a new O-ring when installing the plug.





## TOWING THE BOBCAT LOADER

### Procedure

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

MEL-1220-Valve Release Tool Set

To move a disabled loader, use the following procedure:

Raise the operator cab (See Page 1-7 for the correct procedure).

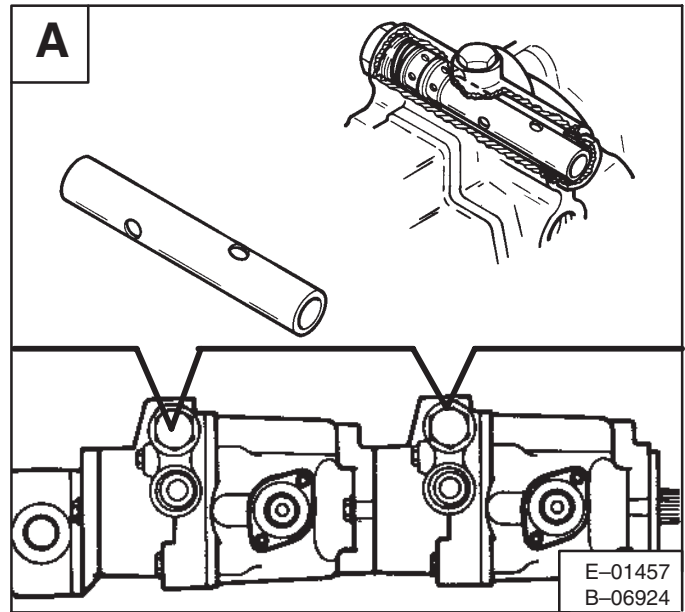
Clean the area around the hydrostatic pumps.

Remove the high pressure relief valves from one side of the hydrostatic pumps **[A]**.

Install the relief valve tubes **[A]**. Install the plugs and tighten.

Move the loader only for a short distance and at a slow rate (Example: Loading onto a transport vehicle).

After the loader is moved, replace the high pressure relief valves. Install new O-rings on the plugs. Install the plugs and tighten to 55-60 ft.-lbs. (75-81 Nm) torque.



## DRIVE SYSTEM

	Page Number
AXLE, AXLE SEAL AND BEARINGS	
Installation .....	4-6..
Removal .....	4-4..
CHAINCASE FLUID	
Removal and Installation .....	4-11
DRIVE CHAINS	
Installation .....	4-9..
Removal .....	4-9..
PARKING BRAKE	
Adjustment .....	4-1..
Calipers and Bushings .....	4-2..
Removal and Installation .....	4-1..

## DRIVE SYSTEM



## 4 DRIVE SYSTEM

### PARKING BRAKE

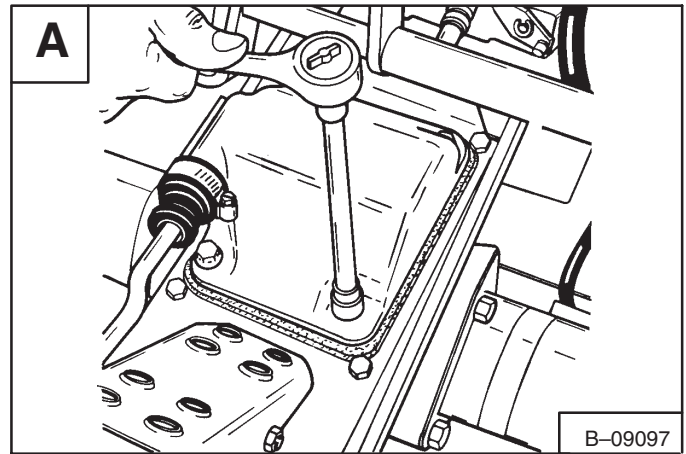
#### Adjustment

When the brake is in good condition and adjusted correctly, it will keep the loader from moving in the parked position.

Raise the operator cab (See Page 1-7 for the correct procedure).

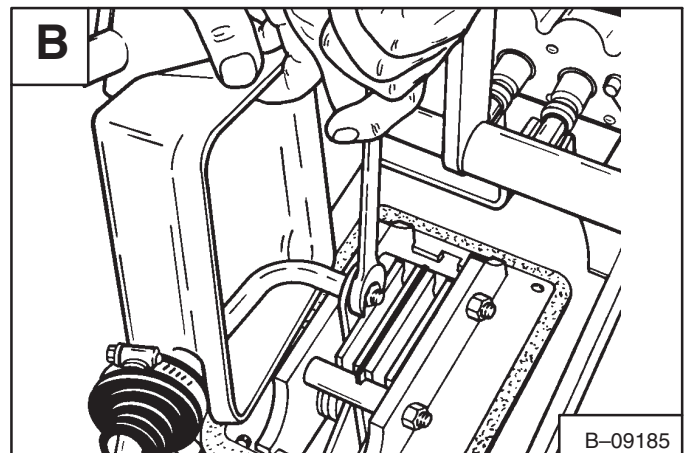
Remove the front panel from the steering levers (See Page 3-3 for the correct procedure).

Remove the brake cover [A].



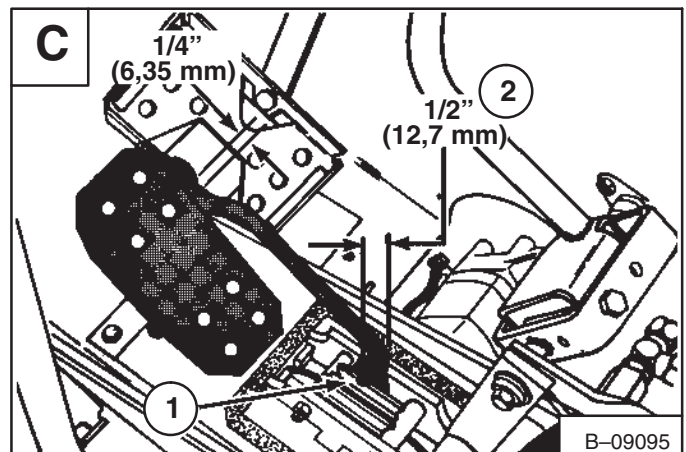
Remove the nut from the end of the brake linkage [B].  
Remove the brake cover from the linkage rod.

Install the brake linkage rod and nut.



Remove or add shims (Item 1) between the brake calipers so there is 1/2" (12.7 mm) of movement at the brake lever (Item 2) [C].

Loosen the locknut at the pedal linkage and adjust so there is 1/4" (6,35 mm) at the nut (Item 3) and pivot mounting of the pedal [C].



#### Removal and Installation

Raise the operator cab (See Page 1-7 for the correct procedure).

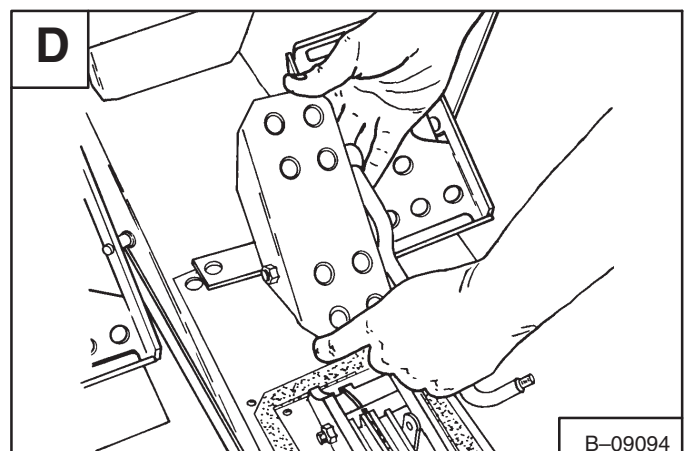
Remove the front panel from the steering levers (See Page 3-3 for the correct procedure).

Remove the brake cover [A].

Remove the brake linkage [B].

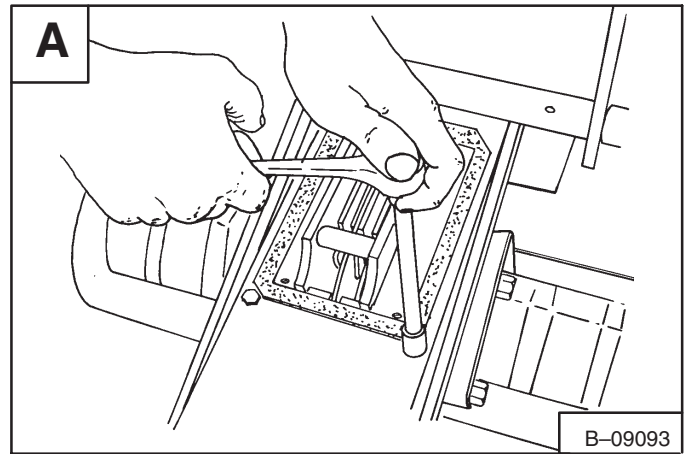
Remove the brake cover from the linkage.

Remove the parking brake pedal [D].

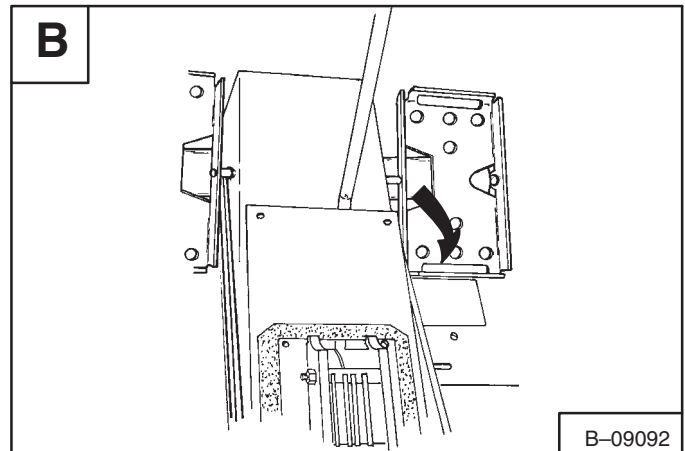


## PARKING BRAKE (Cont'd)

Remove the bolts from the chaincase cover [A].



Lift the chaincase cover [B]. Remove the cover from the loader.

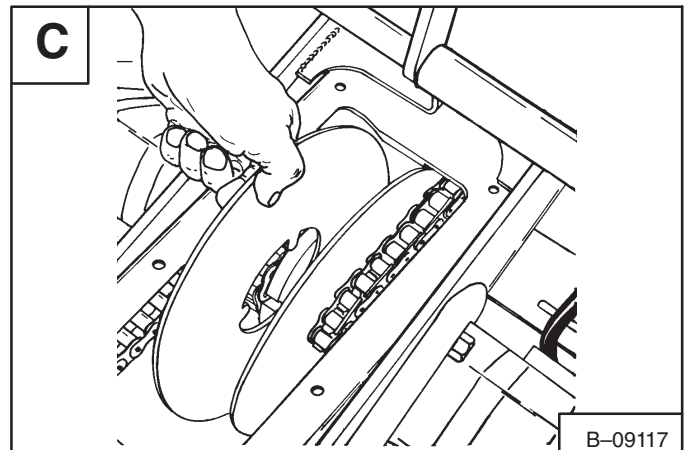


Remove the brake disc from the sprocket [C].

**NOTE:** It may be necessary to loosen (do not remove) the nuts on the hydrostatic motor and move the motor so there is clearance for the brake disc.

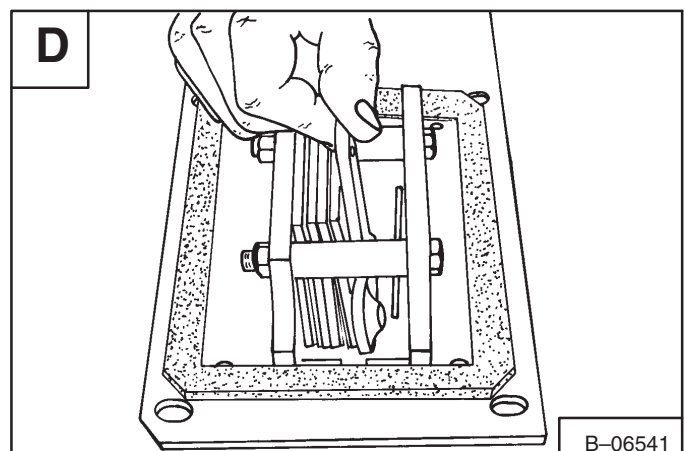
Check the brake for damage. Replace the disc as needed. DO NOT grind the discs.

Installation: If the hydrostatic motor nuts were loose, tighten them to 95 ft.-lbs. (129 Nm) torque. Make alignment of the brake discs before the cover and brake assembly are installed.



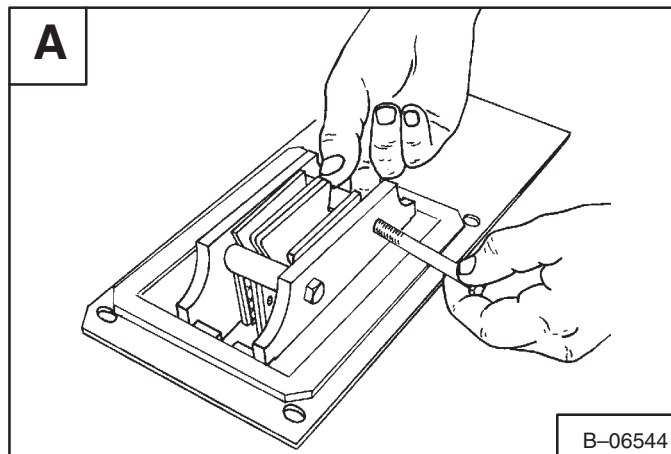
## Calipers and Bushings

Move all the disc calipers to one side and remove the disc caliper lever [D].

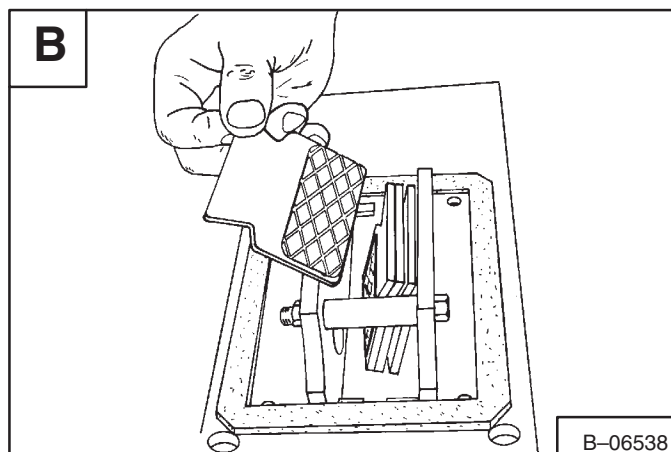


## PARKING BRAKE (Cont'd)

Remove the bolts and spacer from the mounting bracket **[A]**.



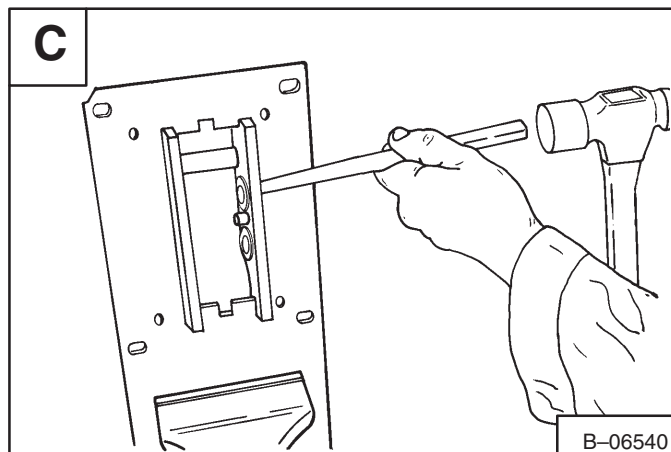
Remove the calipers from the mounting bracket **[B]**.



Using a punch and hammer, remove the pivot bushings for the disc caliper lever **[C]**.

Check the calipers for wear. Replace as needed.

Check the pivot bushings for wear. Replace as needed.



## AXLE, AXLE SEAL AND BEARINGS

### Removal

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

MEL-10540-Slide Hammer  
MEL-1221-Axle Puller  
MEL-1202-A-Axle Bearing Service Set  
MEL-1205-Seal Tool

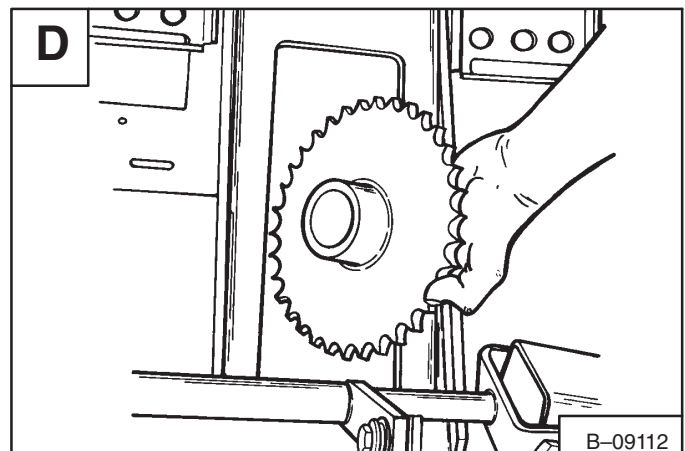
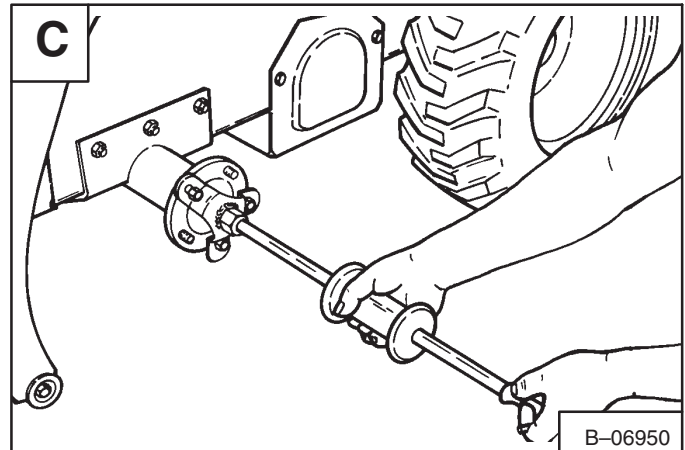
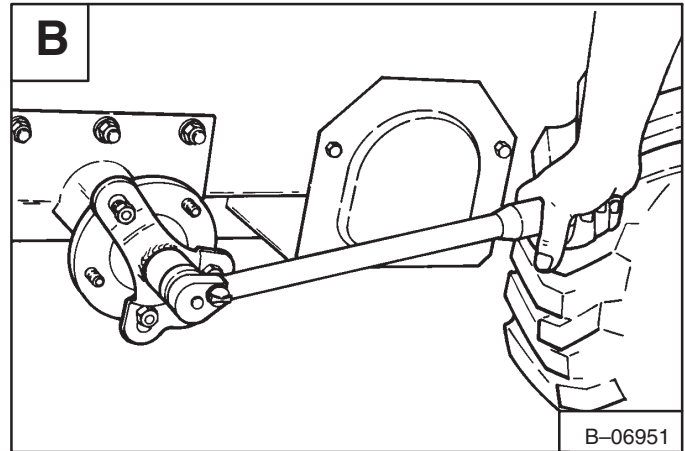
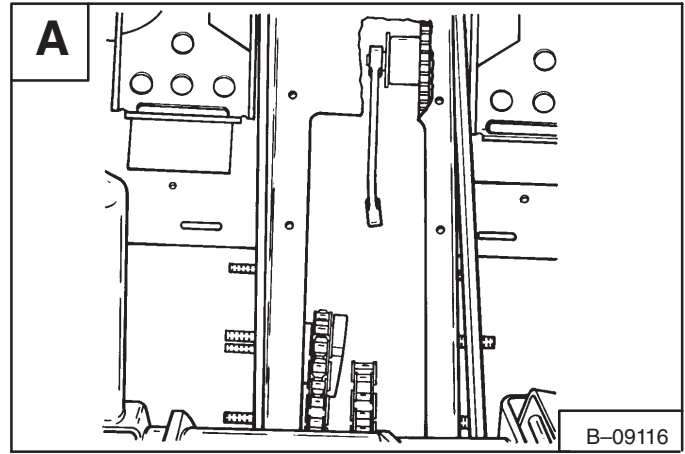
Lift and block the loader (See Page 1-2 for the correct procedure).

Remove the chains from the chaincase (See Page 4-9).

Remove the bolt and washer from the end of the axle at the sprocket, using the following procedure:

1. Put a wrench on the bolt **[A]**.
2. Turn the axle at the hub using the flange adapter **[B]**.
3. Turn the bolt out until it touches the other axle. Install a slide hammer and pull the axle out until it stops **[C]**.
4. Repeat steps 2 and 3 until the bolt is removed.

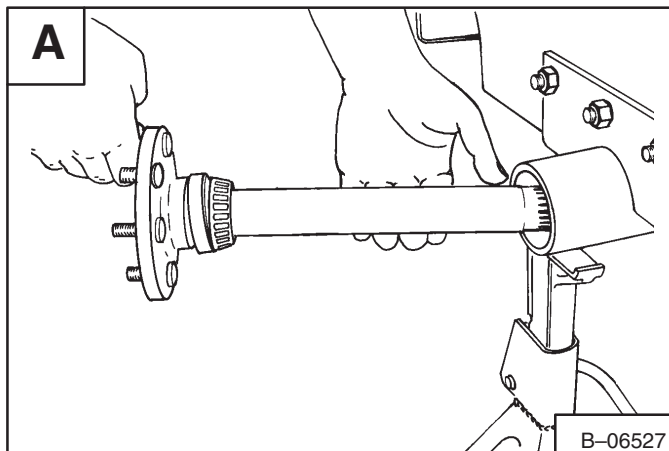
Remove the sprocket from the chaincase **[D]**.



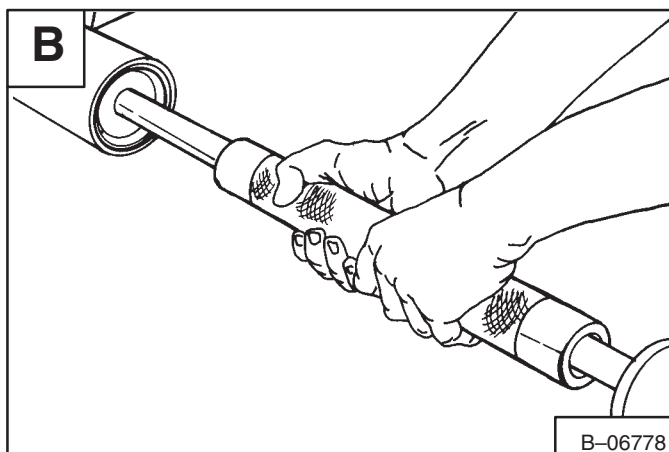


## AXLE, AXLE SEAL AND BEARINGS (Cont'd)

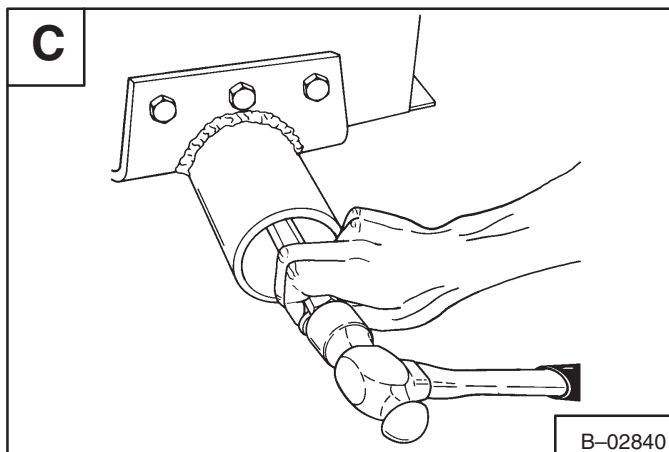
Remove the axle from the chaincase tube [A].



Using a bearing puller tool and slidehammer, remove the outer bearing cup [B].



Using a long punch and hammer, remove the inner bearing cup [C].

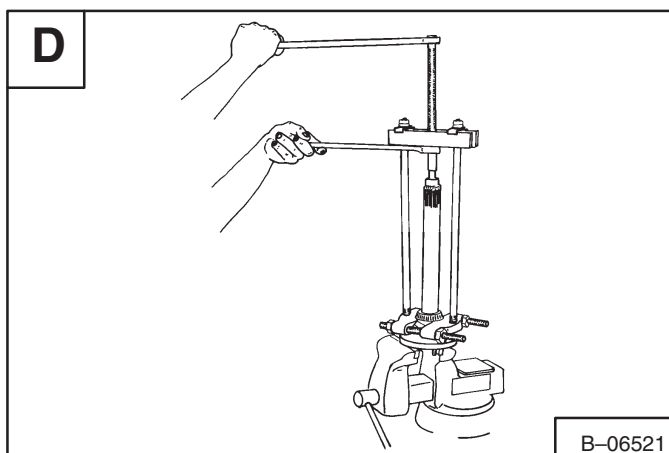


Use a puller to remove the bearing from the axle [D].

Remove the axle seal.

**NOTE:** If the axle has grooves worn into the seal area, install the Axle Seal Sleeve Repair Kit (See Parts Fiche).

Clean and check all the parts for wear or damage. Replace as needed.

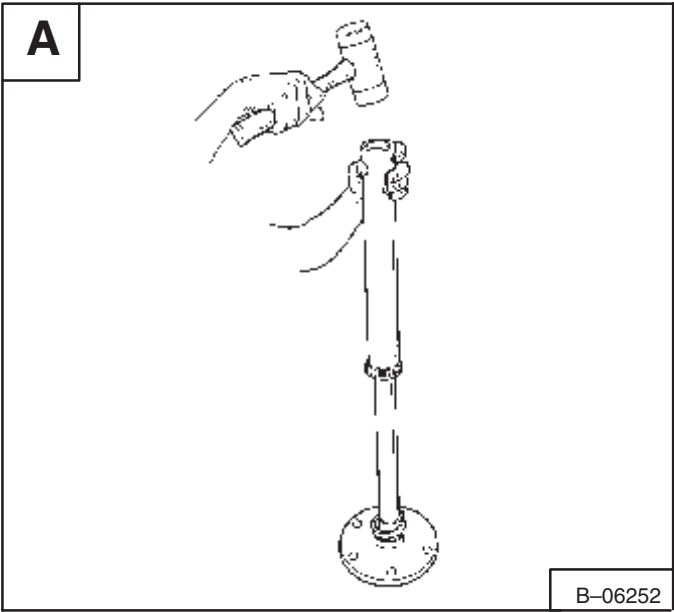


**AXLE, AXLE SEAL AND BEARINGS (Cont'd)**

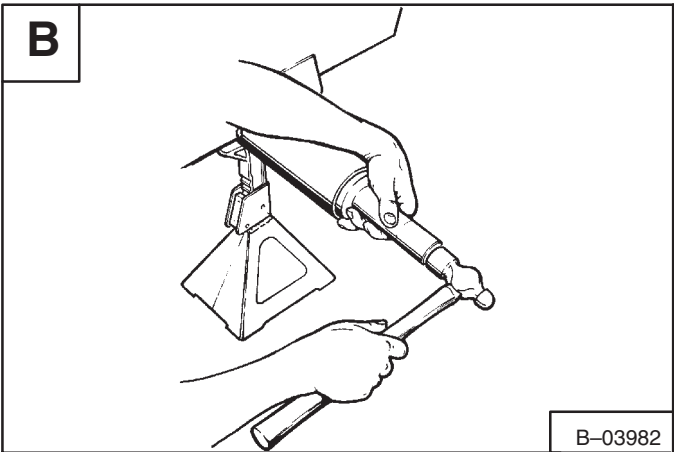
**Installation**

Lubricate the seal and install on the axle. Make sure the open side of the seal is toward the chaincase.

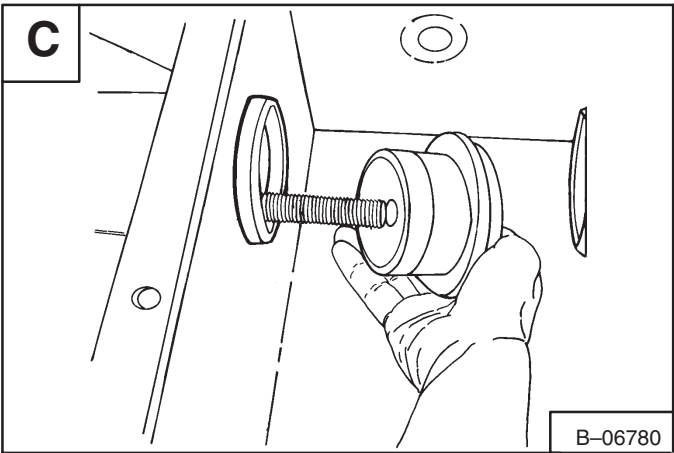
Pack the bearing with grease. Install the bearing, using an arbor. Press on the inner race of the bearing only **[A]**.



Using a bushing driver, install the outer bearing cup **[B]**.



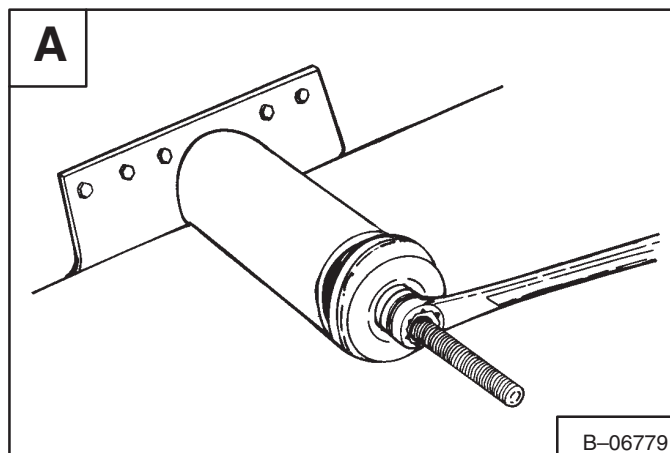
Position the inner bearing cup inside the chaincase in the axle tube. Install the race tool in the bearing cup **[C]**.



## AXLE, AXLE SEAL AND BEARINGS (Cont'd)

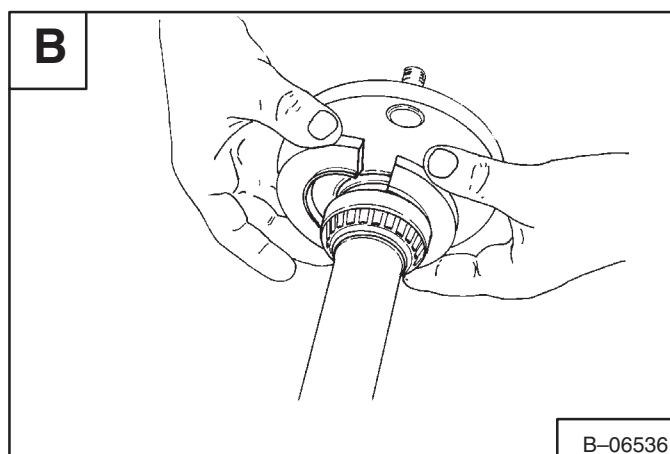
Install the outer bearing cup race tool [A].

Put a wrench on the inside and outside nuts, turn the nuts to install the inner bearing cup [A].

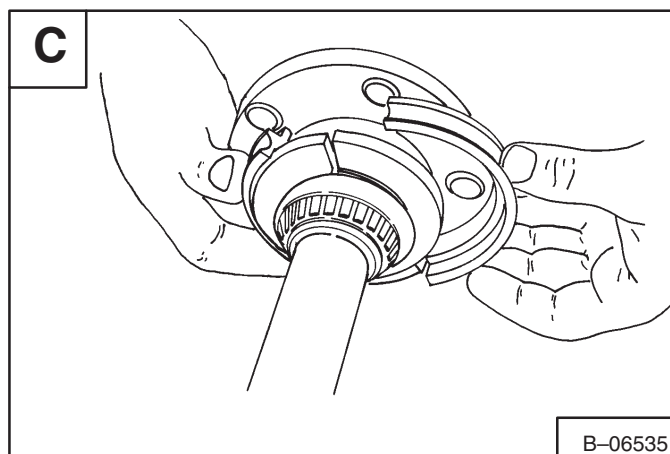


Install the axle, seal and bearing assembly in the axle tube.

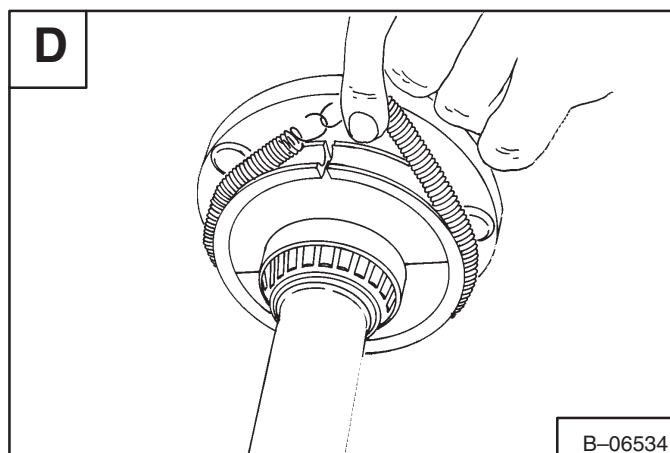
Install the inner halves of the installation tool behind the outer seal of the axle [B].



Install the outer halves of the installation tool on the inner halves of the tool [C].



Install the spring on the tool [D].



## AXLE, AXLE SEAL AND BEARINGS (Cont'd)

Start the seal into the axle tube [A].

Pack the inside bearing with grease. Install the bearing inside the chaincase in the bearing cup on the axle.

Put the sprocket in the chaincase.

**NOTE:** The wide part of the sprocket hub goes toward the outside on the front axle and toward the inside on the rear axle.

Make alignment of the splines on the axle and the sprocket. Install the bolt and washer into the end of the axle.

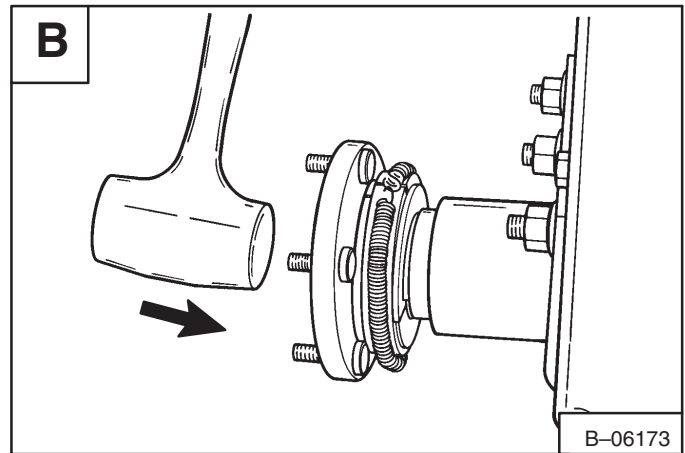
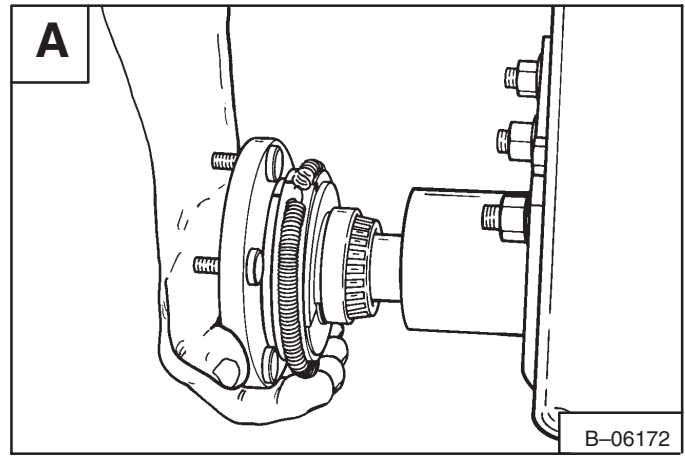
Using a large soft faced hammer hit the axle hub until the bolt touches the other axle [B].

Tighten the axle bolt.

Repeat this procedure until the axle assembly is installed.

Tighten the axle bolt to 175–190 ft.-lbs. (238–257 Nm) torque.

Check the end play, it must be between 0.00–0.10" (0, 254 mm). If not replace the washer at the axle bolt to get the correct end play.



## DRIVE CHAINS

### Removal

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

MEL-1045-Chain Breaker

MEL-1037-Chain Link Press Tool

Lift and block the loader (See Page 1-2 for the correct procedure).

Raise the operator cab (See Page 1-7 for the correct procedure).

Remove the front panel from the steering levers (See Page 3-3 for the correct procedure).

Remove the chaincase cover and parking brake assembly (See Page 4-1).

Remove the chaincase fluid (See Page 4-11).

Remove the hydrostatic motor on the side the chain(s) are going to be removed (See Page 3-9 for the correct procedure).

Using the chain breaker tool, break the front chain **[A]**.

Remove the motor sprocket.

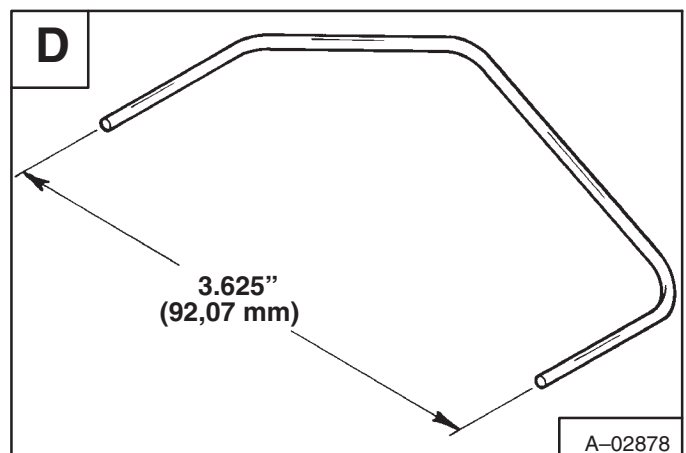
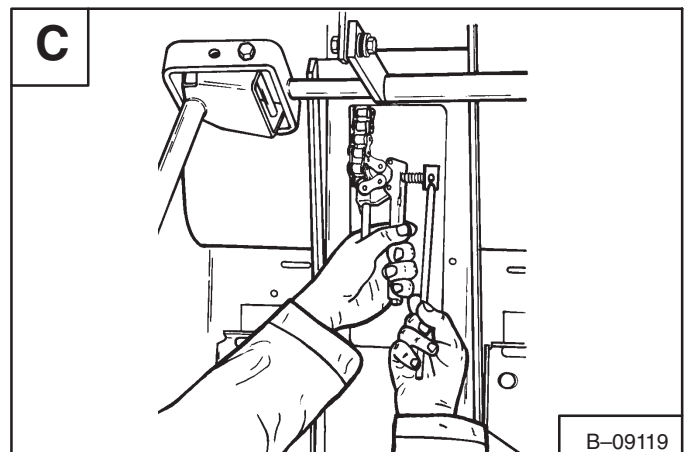
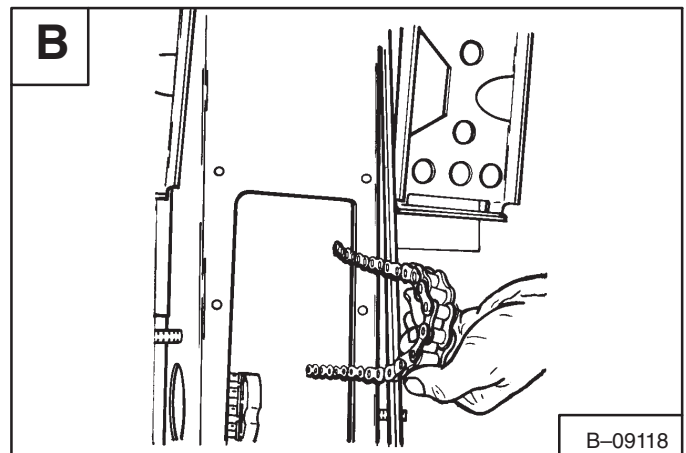
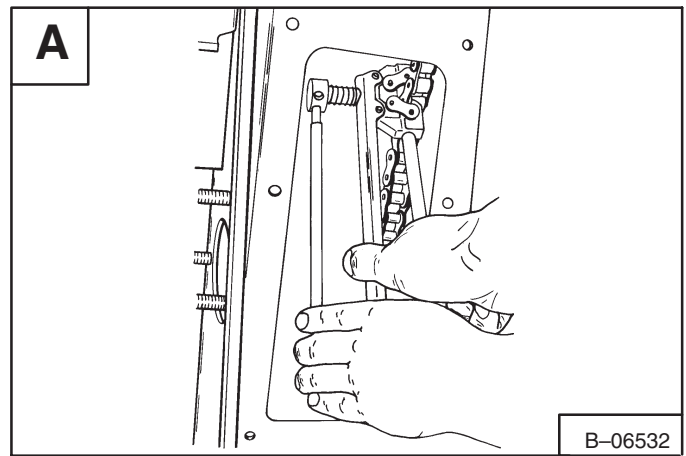
Remove the chain from the chaincase **[B]**.

Lift the rear chain and install the chain breaker tool. Break the rear chain **[C]**.

Remove the rear chain from the chaincase.

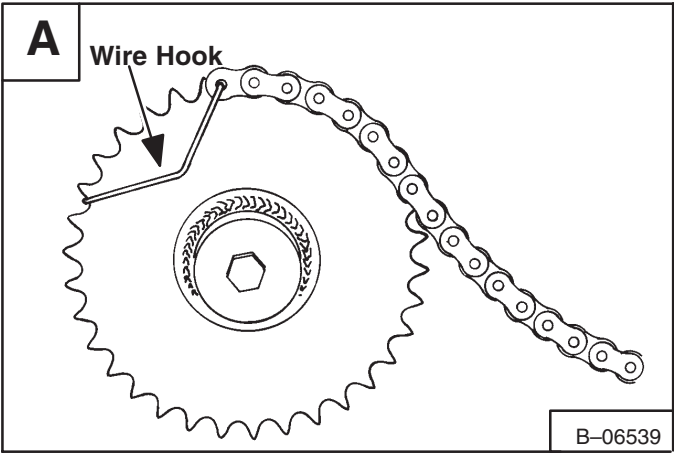
### Installation

Bend a piece of wire so the chain can be threaded over the axle sprocket **[D]**.



**DRIVE CHAINS (Cont'd)**

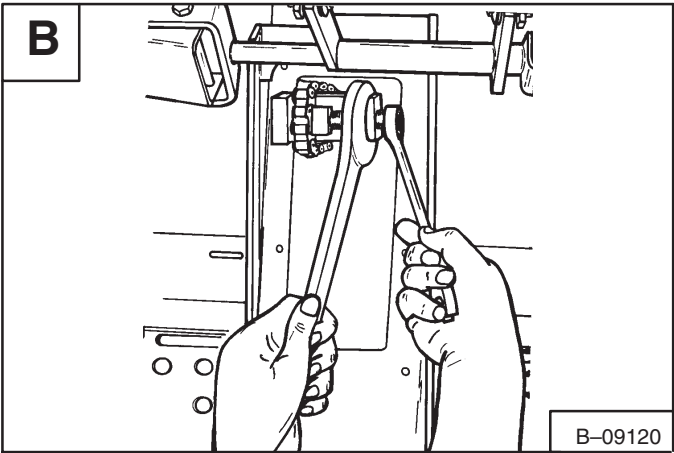
Install the chain into the chaincase and thread the chain over the rear axle sprocket **[A]**.



Using the chain link press tool, connect the chain ends together **[B]**.

Install the hydrostatic motor sprocket into the chain.

Install the front chain in the chaincase. Thread the chain over the front axle sprocket **[A]**.

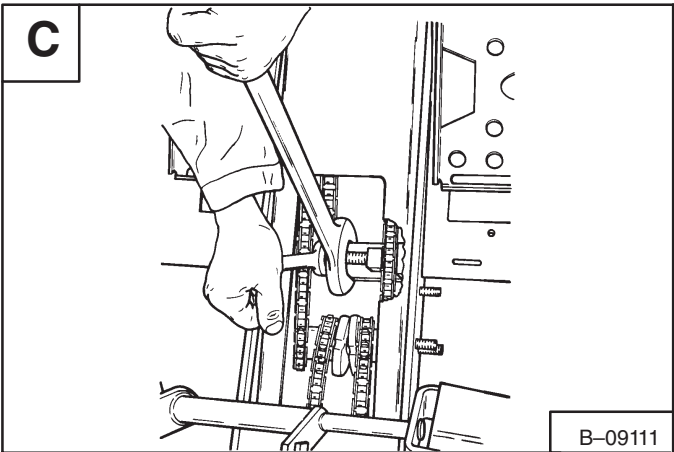


Using the chain link press tool, connect the chain ends together **[C]**.

Install the hydrostatic motor into the sprocket and chaincase.

Install the chaincase cover and parking brake assembly.

Add fluid to the chaincase.



## DRIVE CHAINS (Cont'd)

### Removal and Installation

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

MEL-10627-Hydraulic Transfer Pump

Raise the operator cab (See Page 1-7 for the correct procedure).

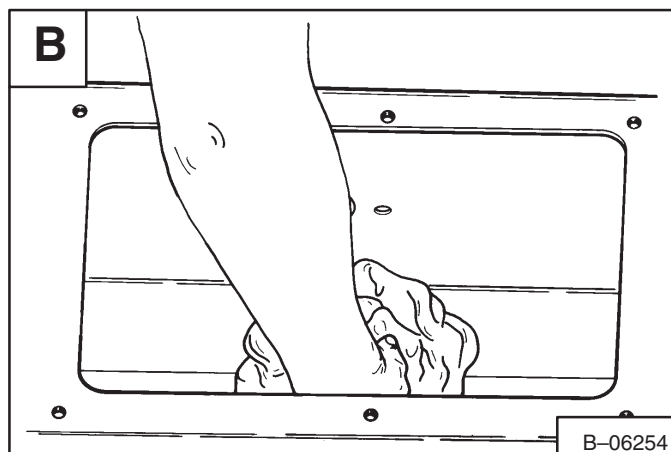
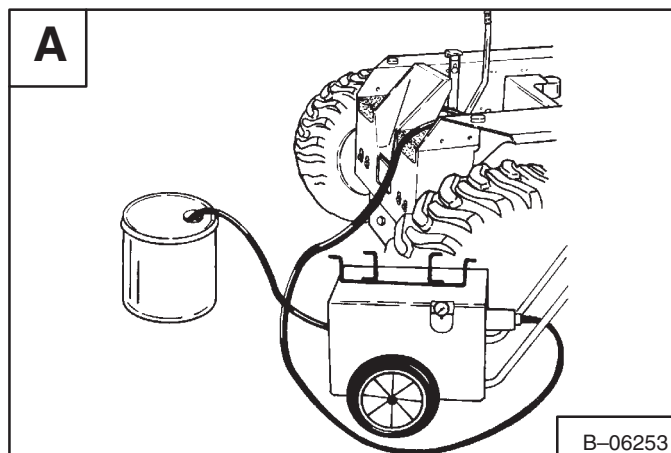
Remove the chaincase cover and parking brake assembly (See Page 4-1).

Use a hydraulic transfer pump and remove the fluid from the chaincase **[A]**.

Use clan rags to clean the chaincase **[B]**.

Use only recommended replacement fluid (See Specifications, Section 8).

Fill the chaincase with 12 qts. (11,3 L) of fluid.







**MAIN FRAME**

	<b>Page Number</b>
<b>BUCKETS AND ATTACHMENTS</b>	
Installation .....	5-5..
Removal .....	5-5..
<b>FUEL TANK</b>	
Removal and Installation .....	5-6.
<b>LIFT ARMS</b>	
Removal and Installation .....	5-4.
<b>OPERATOR CAB</b>	
Removal and Installation .....	5-1.
<b>REAR DOOR</b>	
Removal and Installation .....	5-3.
<b>SEAT BAR</b>	
Removal and Installation .....	5-2.

**MAIN  
FRAME**



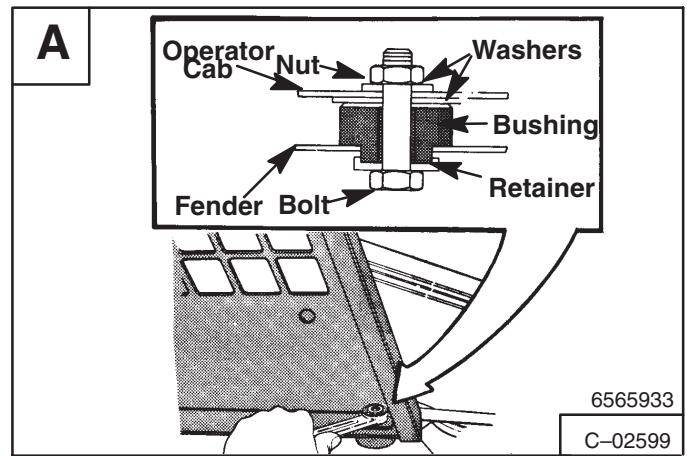
## 5 MAIN FRAME

### OPERATOR CAB

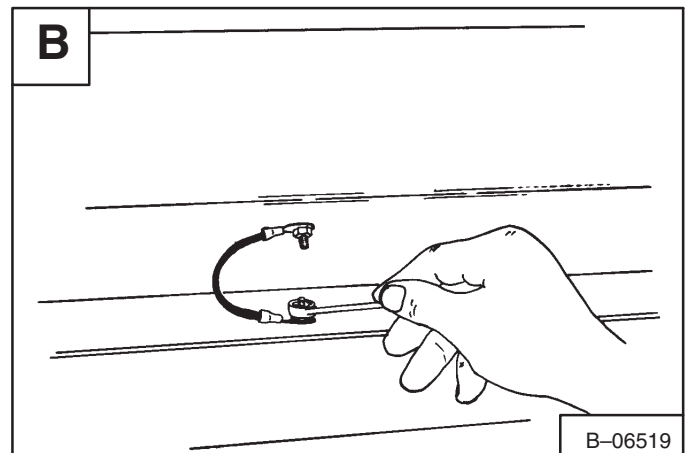
#### Removal and Installation

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

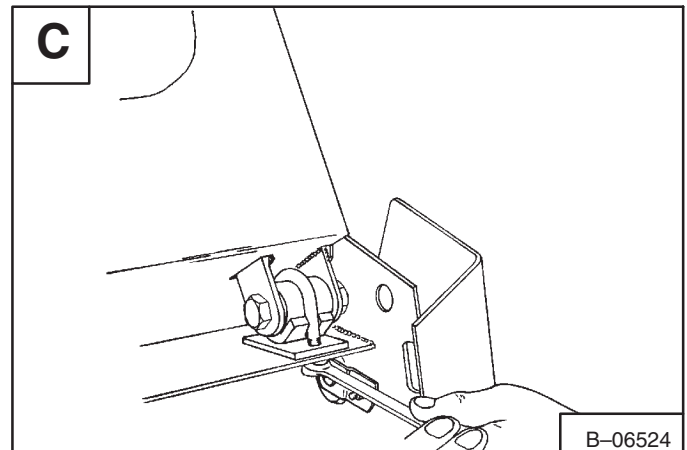
Remove the nuts at the fasteners at the front of the operator cab **[A]**.



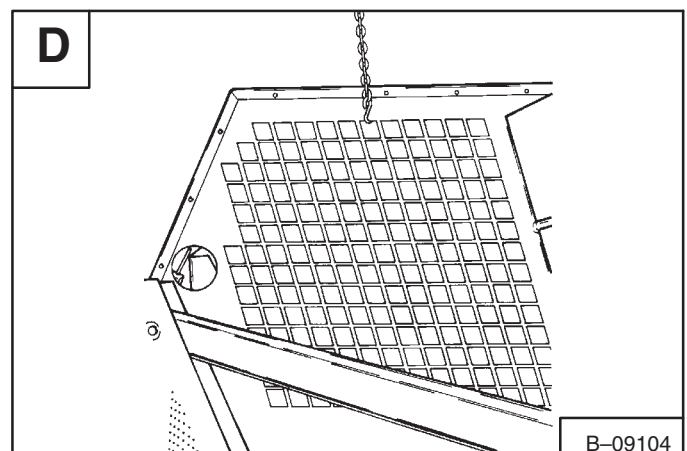
Disconnect the ground wire at the rear of the operator cab **[B]**.



Remove the U-bolts at the operator cab **[C]**.



Install a chain hoist and remove the operator cab from the loader frame **[D]**.



## SEAT BAR

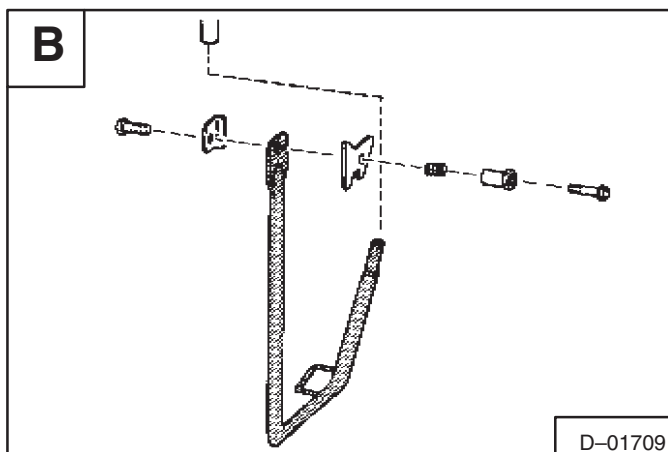
### Removal and Installation

Remove the seat bar pivot bolt (both sided) [A].



Remove the bolt, spacer, washer, spring and plate (both sides) [B].

**NOTE:** To remove the seat bar it may be necessary to pull the seat bar together to get the clearance at the operator cab.



## REAR DOOR

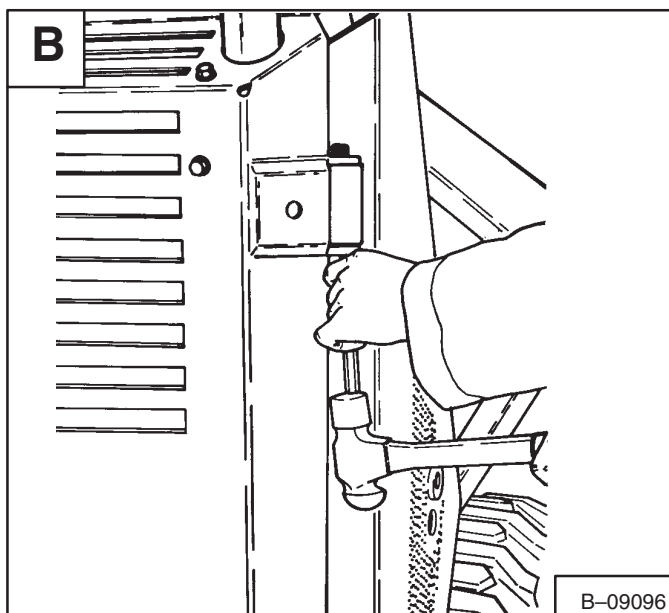
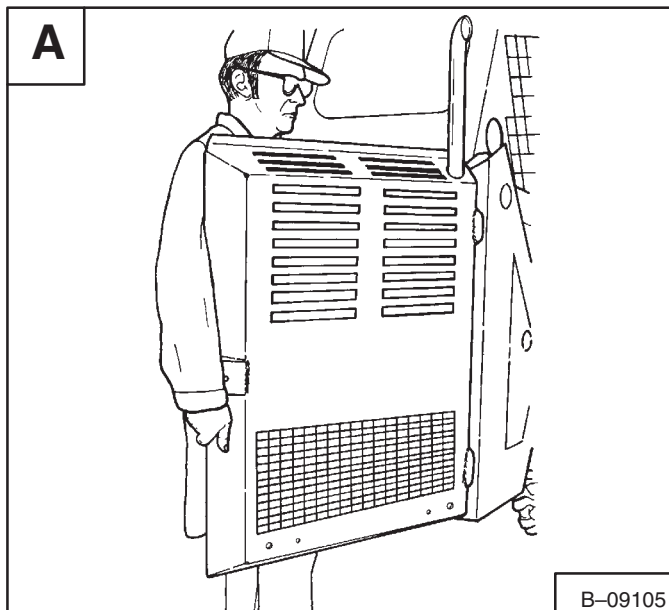
### Removal and Installation

Open the rear door.

Have a second person hold the rear door **[A]**.

Remove both hinge pins **[B]**.

Remove the rear door from the loader.



## LIFT ARMS

### Removal and Installation

Stop the engine. Activate the hydraulic controls to release all the hydraulic pressure.

Remove the bucket from the lift arms (See Page 5-5).

Disconnect the hoses from the tubelines for the tilt cylinder and auxiliary tubelines if so equipped.

Fasten a chain hoist to the lift arms **[A]**.

Put a floor jack under the lift arms. Raise the lift arms, until the pivot pins at the rod end of the lift cylinder can be removed.

Remove the bolt and retainer plate at the rod end of the lift cylinder **[B]**.

Raise the operator cab.

Using a hammer and punch, remove the rod end pivot pin (both sides).

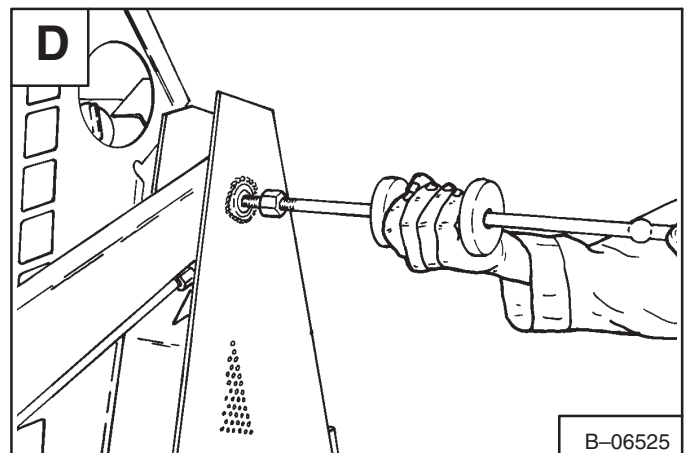
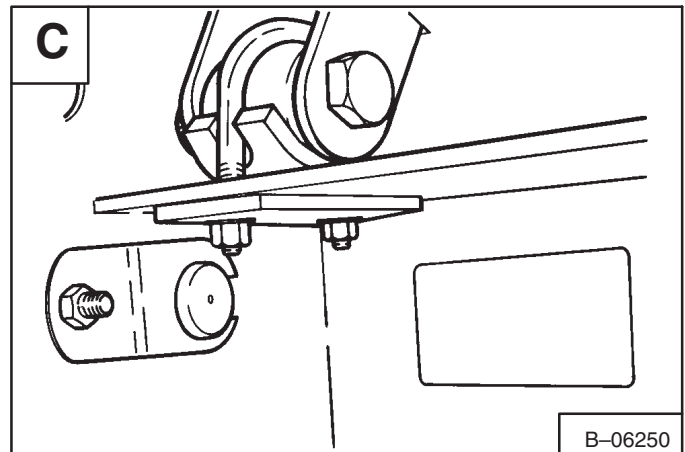
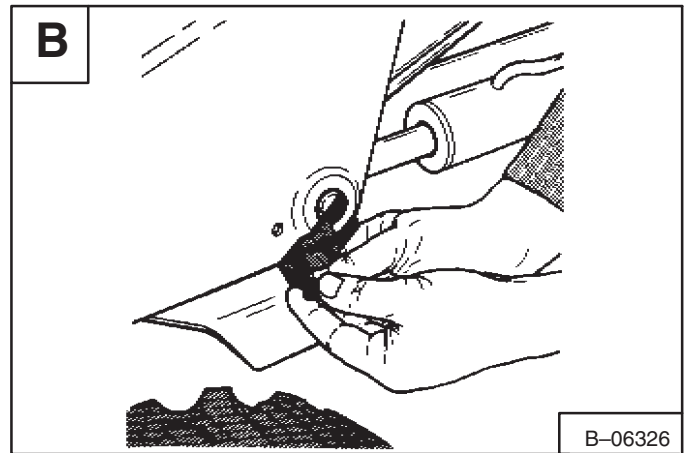
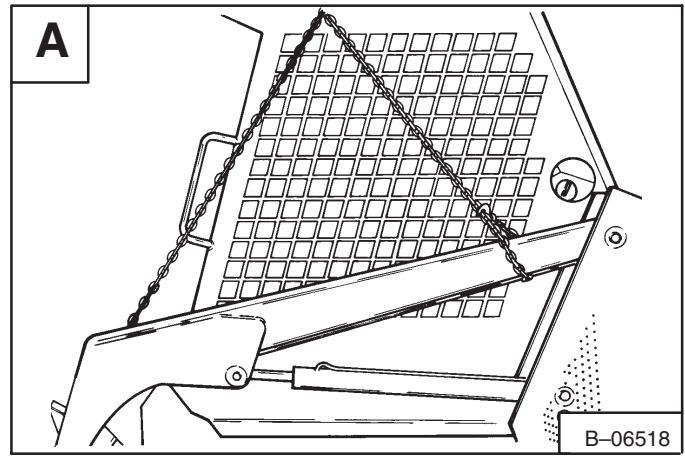
Installation: Tighten the bolt at the retainer plate to 18–20 ft.-lbs. (24–27 Nm) torque.

Remove the bolt and retainer plate (in the engine area) for the lift arm pivot pins (both sides) **[C]**.

Installation: Tighten the bolt at the retainer plate to 18–20 ft.-lbs. (24–27 Nm) torque.

Using a slide hammer, remove the pivot pins **[D]**.

Raise the lift arms with the chain hoist and remove from the loader frame.





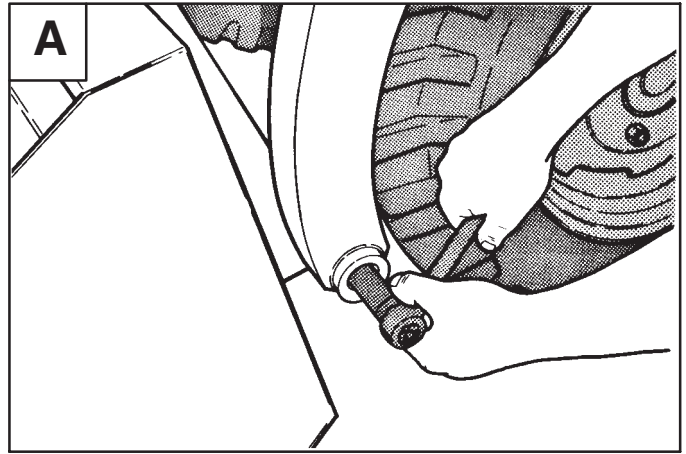
## BUCKETS AND ATTACHMENTS

### Removal

Put the bucket on the ground. Stop the engine.

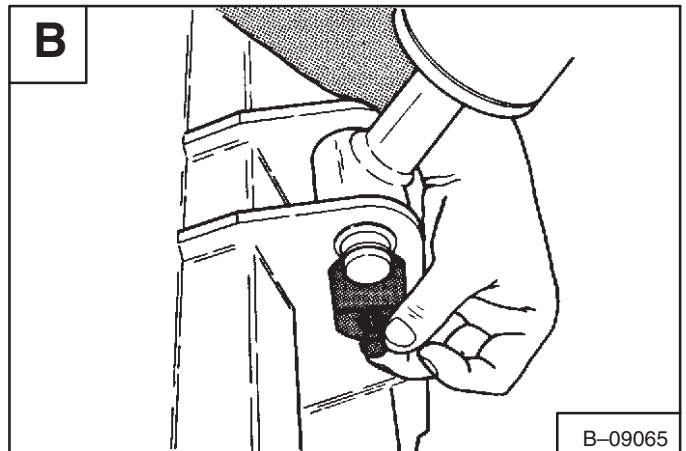
Remove the grease fittings at the pivot pin housing on the bucket. Put a rag over the grease fitting holes.

Loosen the pivot pin bolt **[A]**. Do not remove the bolt. Hit the bolt to remove the pivot pin off its tapered seat.



Remove the bolt, retainer plate and pivot pin at the rod end of the tilt cylinder **[B]**.

Remove the pivot pin at the rod end of the tilt cylinder.

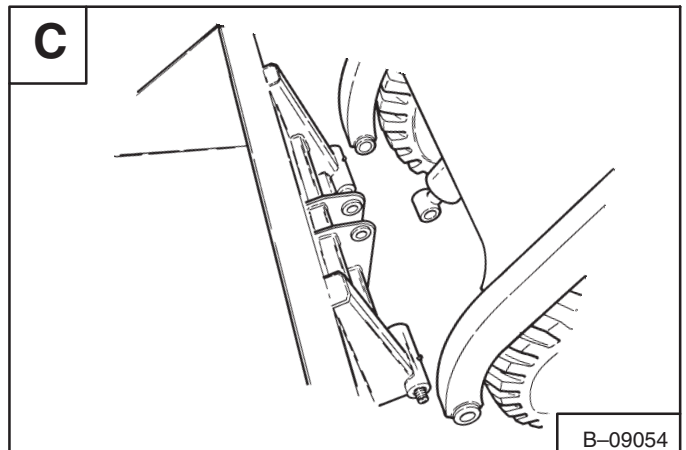


### Installation

Drive the loader forward to the bucket until the lift arms pivot pin holes make alignment with the holes in the bucket **[C]**. Stop the engine.

To install the pivot pin, turn a longer bolt into the pivot pin. Pull the tapered pin into the lift arm holes.

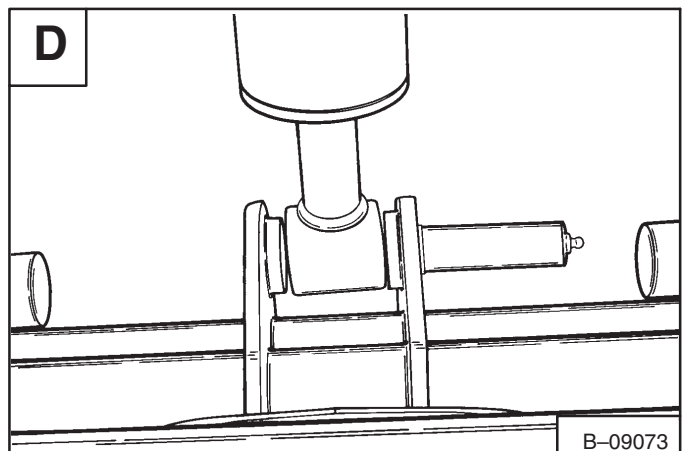
Remove the longer bolt, install the bolt in the pivot pin and tighten to 65–70 ft.-lbs. (88–94 Nm) torque **[A]**.



Install the rod end of the tilt cylinder into the bucket **[D]**.

**NOTE: Be careful not to damage the seal at the rod end of the cylinder.**

Install the pivot pin. Install the retainer plate and bolt. Tighten the bolt to 8–10 ft.-lbs. (10–13 Nm) torque **[B]**.

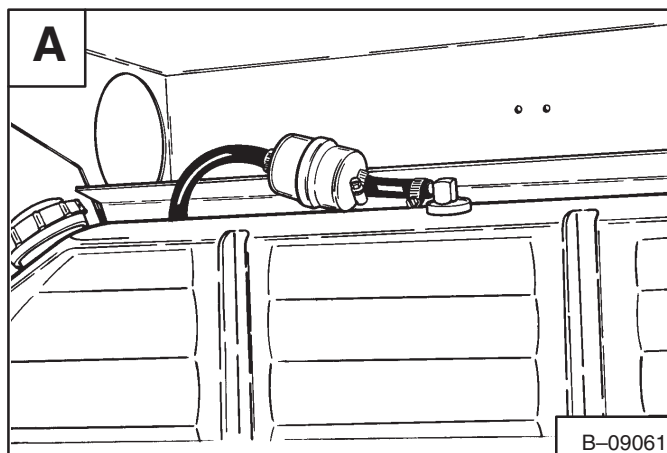


## FUEL TANK

### Removal and Installation

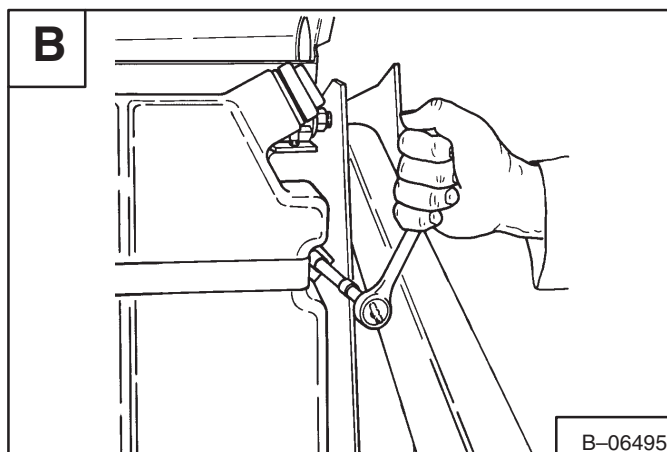
Raise the operator cab (See Page 1–7 for the correct procedure).

Remove the fuel line at the fuel filter **[A]**.



Remove the bolt at the fuel tank mounting strap **[B]**.

Remove the fuel tank from the loader.



## ELECTRICAL SYSTEM

	Page Number
ALTERNATOR	
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Description .....	6-3
Replacement of Stator .....	6-4
BATTERY	
Checking the Battery .....	6-2
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STARTER	
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TROUBLESHOOTING	
Chart .....	6-1

## ELECTRICAL SYSTEM







## WIRE LEGEND

NO.'s	COLOR	GAUGE
1D	Red	12
10C	Black	16
19F	Red/White	16
19L	Red/White	16
19S	Red/White	16
20	Black	10
21R	White	16
23F	White/Black	16
23M	White/Black	16
26	Lt. Blue	16
40FL	Black	16
40FR	Black	16
41	Pink	16
42FL	Dk. Blue	16
42FR	Dk. Blue	16
42R	Dk. Blue/White	16

## PARTS LEGEND

- ① Harness Connectors
- ② Ignition Switch
- ③ Fuse
- ④ Battery
- ⑤ Start Relay
- ⑥ Diode
- ⑦ Starter
- ⑧ Fuel Shut-Off Solenoid
- ⑨ Spark Plugs
- ⑩ Regulator/Rectifier
- ⑪ Flywheel Alternator
- ⑫ Ignition Module
- ⑬ Light Switch (Opt.)
- ⑭ Right Front Light (Opt.)
- ⑮ Left Front Light (Opt.)
- ⑯ Tail Light (Opt.)
- ⑰ Rear Light (Opt.)







## 6 ELECTRICAL SYSTEM

### ELECTRICAL SYSTEM INFORMATION

#### Description

The loader has a 12 volt, negative ground electrical system. There are two main circuits.

1. The charging circuit has an internal alternator , rectifier/regulator and battery.
2. The starting circuit has a starter and solenoid.

The electrical is protected by one fuse in the front panel, the fuse protects the electrical from overload.

#### TROUBLESHOOTING

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

PROBLEM	CAUSE
Battery does not hold it's charge.	1, 2, 3, 4
Internal alternator will not charge.	1, 2, 4
Starter will not turn the engine.	2, 3, 5, 6, 7, 8

KEY TO CORRECT THE CAUSE
<ol style="list-style-type: none"><li>1. Battery connections are dirty or loose.</li><li>2. Battery is damaged.</li><li>3. The ground connection is not making a good contact.</li><li>4. The internal alternator is damaged.</li><li>5. The engine is locked.</li><li>6. The starter is damaged.</li><li>7. The wiring or the solenoid is damaged.</li><li>8. Check the fuse.</li></ol>



## WARNING

Instructions are necessary before operating or servicing machine. Read and understand the Operation & Maintenance Manual, 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-2003-0199

## BATTERY

### Checking the Battery

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

MEL-10004-Battery Tester

To make a safe and complete check of the battery see the Clark Battery Manual (P/N 6566047).

The battery Manual has all the information and specifications needed for checking and servicing the battery. Replace the battery as needed.

## WARNING

Batteries contain acid which burns eyes and skin on contact. Wear goggles, protective clothing and rubber gloves to keep acid off body.

In case of acid contact, wash immediately with water. In case of eye contact get prompt medical attention and wash eye with clean, cool water for at least 15 minutes.

If electrolyte is taken internally drink large quantities of water or milk! DO NOT induce vomiting. Get prompt medical attention.

W-2065-1296

DO NOT remove the vent caps from the battery while charging the battery. The battery has vent caps which will decrease the possibility of the battery being exploded by an external spark.

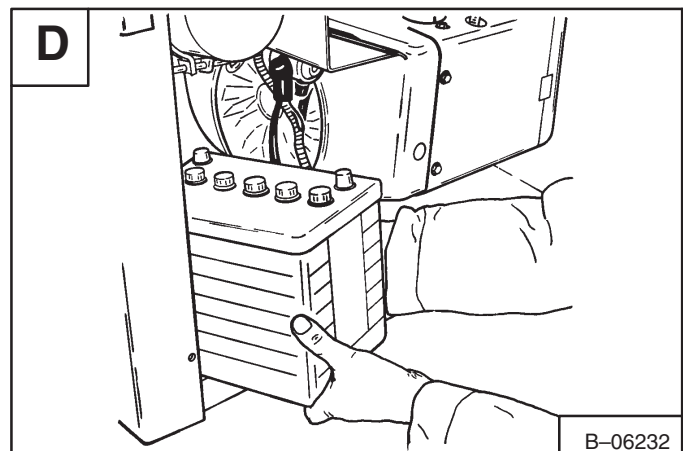
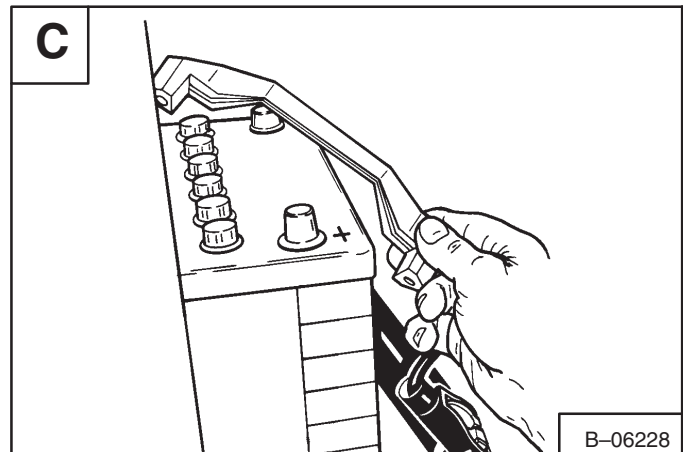
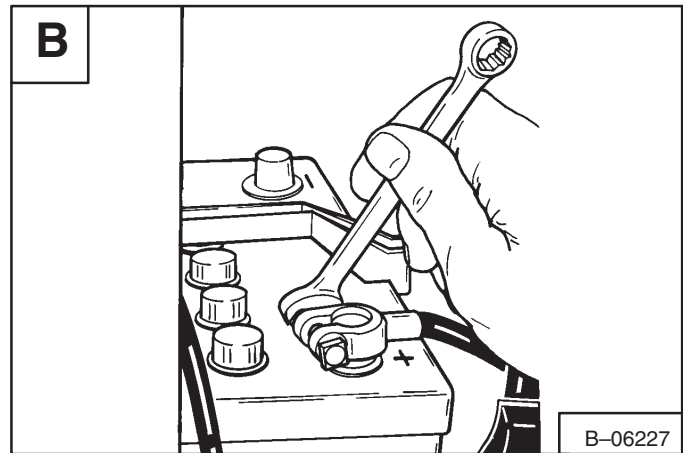
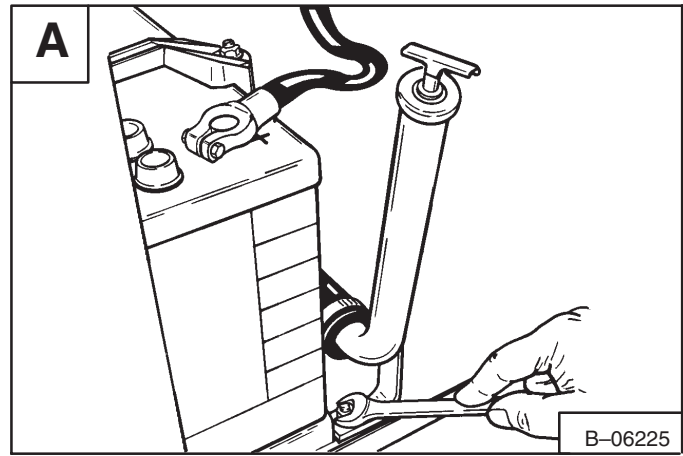
### Removal and Installation

Remove the nut at the hydraulic/hydrostatic fill tube [A]. Move the fill tube to one side for clearance.

Disconnect the battery cables [B]. Always remove the negative cable first to prevent sparks.

Remove the nuts and bolts from the holddown clamp. Remove the holddown clamp [C].

Remove the battery from the loader [D].



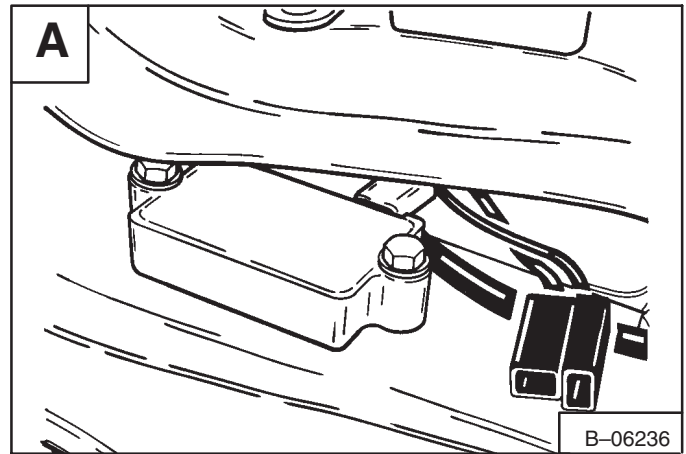
## ALTERNATOR

### Description

This is a 15 amp. system (13 amps. @ 3200 RPM) and has a rectifier/regulator mounted on the number one side of the blower housing [A]. There are no adjustments in this alternator system and field service is not recommended. All faulty parts must be replaced.

The 15 amp. alternator circuit has three major components which are:

1. Ceramic magnet permanently mounted in the inner ring of the flywheel.
2. Alternator stator mounted on the crankcase.
3. Rectifier/Regulator.



## IMPORTANT

1. Make sure the battery polarity is correct. Negative ground is used.
2. Prevent alternator leads from touching or shorting. This can cause damage to the stator.
3. Always disconnect the leads from the rectifier/regulator before welding on the loader.

**NOTE:** Always zero the ohmmeter scale to be used before testing or you will not get a correct reading.

## ALTERNATOR (Cont'd)

### Checking Alternator Circuit

Test w/engine running at 3600 RPM—no load  
Battery should be fully charged

Make reference to loader Electrical Diagram for location of the AC & B+ terminals.

TYPE OF FAILURE	TEST	TEST RESULT	CONCLUSION
No charge to battery.  Battery continuously charges at high rate.	Test A—Insert ammeter in rectifier—regulator B+ lead.	A-1 Charge rate increases.	A-1 Charging system good, battery fully charged.
	With B+ lead connected, check B+ (at terminal on rectifier—regulator) to ground with DC voltmeter. If 13.8 volts or higher, place minimum load of 5 amps * on battery to reduce voltage.	A-2 Charge rate does not increase	A-2 Follow Test B.
	Test B—Disconnect plug at rectifier—regulator. Connect AC voltmeter across AC leads, check AC voltage.	B-1 Less than 28 volts.	B-1 Defective stator, replace with new assembly.
		B-2 More than 28 volts.	B-2 Defective rectifier—regulator, replace with new unit.
	Test C1—With engine stopped, test resistance between AC leads.	C-1 More than .1 ohms.	C-1,2 Stator indings are shorted, replace with new unit.
	Test C2—Test resistance from each AC lead to ground.	C-2 Less than infinity ohms.	
	Test D—Check B+ to ground with DC voltmeter.	D-1 Over 14.7 volts.	D-1 Rectifier—regulator not functioning properly. Replace with new unit.
		D-2 Under 14.7 volts.	D-2 Alternator system OK. Battery unable to hold charge. Check specific gravity of battery. Replace if necessary.

**NOTE:** Faulty ignition switch or poor connections can cause increased resistance and the rectifier/regulator will not operate correctly.

### Replacement of the Stator

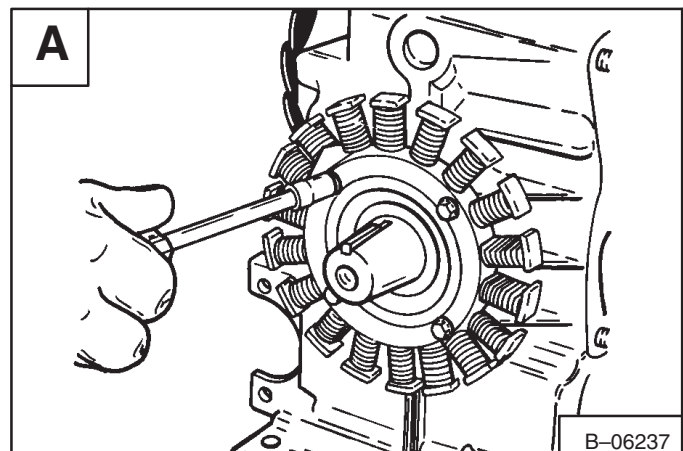
Remove the engine air shrouding from the flywheel (See Section 7 for the correct procedure).

Remove the flywheel (See Section 7 for the correct procedure).

Remove the bolts which fasten the stator to the engine block [A].

Install a new stator, rotate the stator on the crankcase until the clip that holds the leads together is between the eight and ten o'clock position.

Install the bolts and tighten.



Revised Feb. 86

## STARTER

### Checking the Starter

The following chart are problems which can most often occur during normal use. If the corrections do not solve the problem, repair or replace the starter.

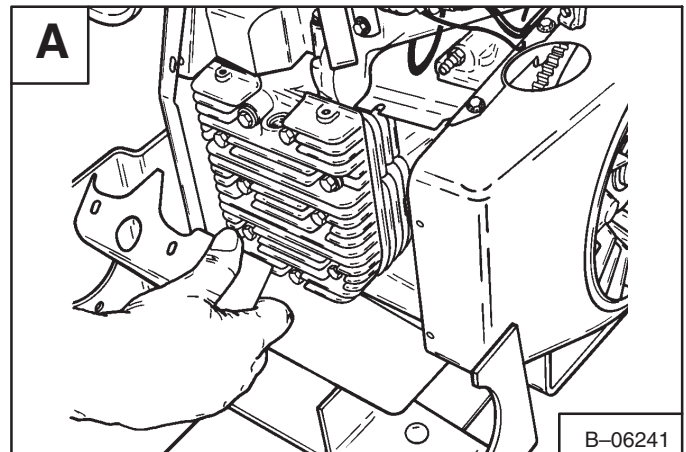
PROBLEM	POSSIBLE FAULT	CORRECTION
STARTER DOES NOT TURN	Wiring	1. Clean corroded connections—tighten loose connections. 2. Replace wires in poor condition—frayed or broken insulation.
	Starter Switch or Solenoid	Bypass the switch or solenoid with a jumper wire—if starter cranks normally replace either part.
	Battery	Check specific gravity of battery—if low, recharge or replace as needed.
STARTER TURNS SLOWLY	Battery	Check specific gravity of battery—if low, recharge or replace as needed.
	Brushes	Check for excessively dirty or worn brushes and commutator. Clean or replace brushes if worn.

### Removal and Installation

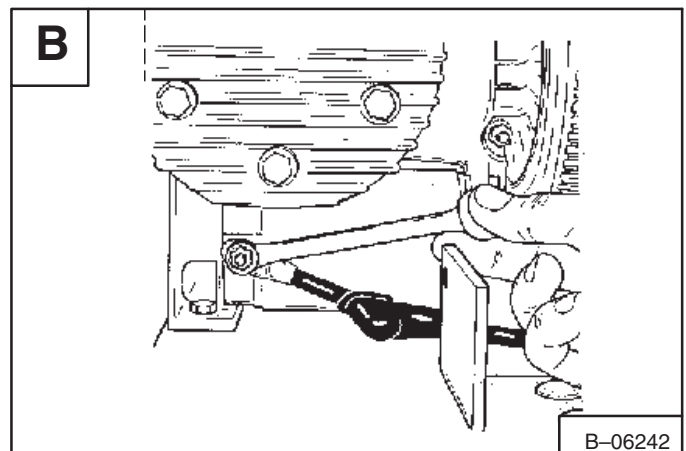
Remove the engine and hydrostatic pump assembly from the loader (See Section 7 for the correct procedure).

Remove the hydrostatic pumps from the mounting brackets (See Page 3-19 for the correct procedure).

Remove the air shrouding from the 2 cylinder [A].

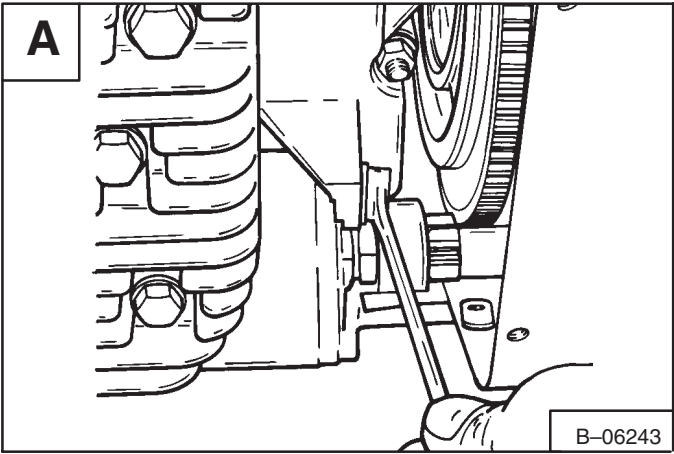


Remove the cable from the starter [B].

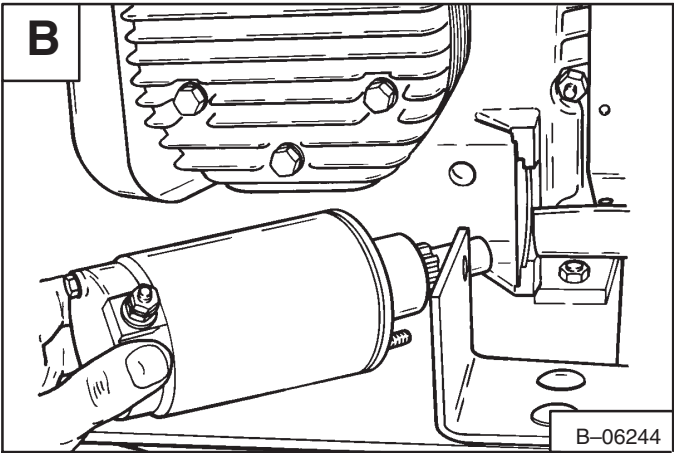


**STARTER (Cont'd)**

Remove the starter bolts [A].



Remove the starter [B].



**Disassembly and Assembly**

Mark the end caps (Items 1 & 6) for the correct assembly [C].

Hold the drive pinion in vise. Remove the dust shield (Item 11) [C].

**NOTE: DO NOT over-tighten the vise on the drive pinion.**

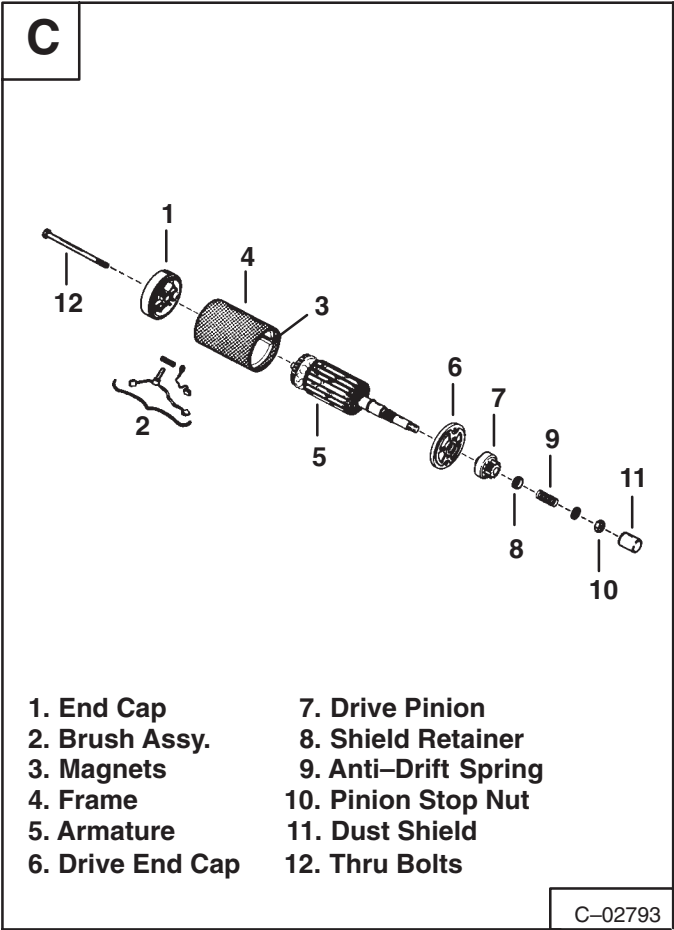
Remove the nut (Item 10) [C].

Remove the drive pinion assembly as shown [C].

Remove the thru bolts (Item 12) [C].

Remove the end cap (Item 1) from the armature (Item 5) [C]. The brush springs will falbut when removed from the commutator.

Clean the commutator. Clean or cut with a lathe.



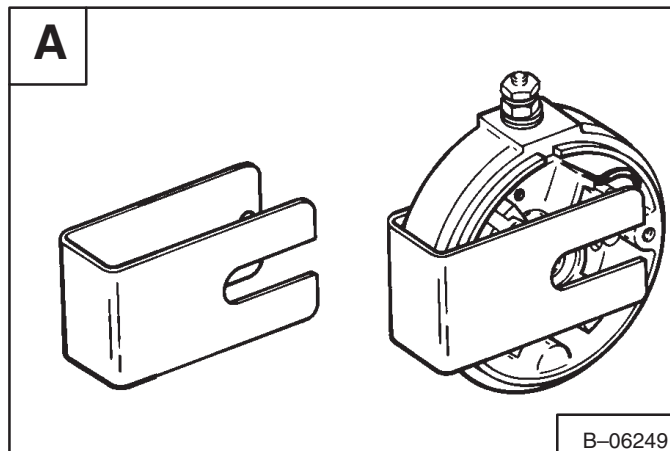
## STARTER (Cont'd)

Replace the brushes as follows:

1. Remove the nut from the positive stud terminal.
2. Remove the stud and brush through the inside of the end cap.
3. Install a new stud terminal and brush assembly.
4. Remove the nut for insulated brush. Remove the brush.
5. Install the new insulated brush and tighten the nut.

To keep the brushes in position so they will fit over the commutator as the end cap is installed, use a brushholder as shown **[A]**.

Clean the drive pinion with clean solvent. Dry with air. Use starter drive lubricant and lubricate the drive.







## ENGINE SERVICE

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### ENGINE SERVICE



## 7 ENGINE SERVICE

### TROUBLESHOOTING

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

PROBLEM	CAUSE
Slow cranking speed.	1, 2, 3, 4, 45, 46
Engine will not start.	5, 6, 7, 8, 9, 10, 11, 12, 13, 15, 16, 17, 19, 27, 28, 29, 30, 45, 46
Difficult to stop.	5, 7, 8, 9, 10, 11, 12, 13, 15, 16, 17, 18, 19, 21, 26, 27, 28, 29, 30
No power from the engine.	7, 8, 9, 10, 11, 14, 16, 17, 18, 19, 20, 21, 22, 23, 24, 27, 28, 29, 45, 46
Engine is mis-firing.	7, 8, 9, 10, 14, 16, 17, 22, 23, 25, 26, 27, 28, 29, 30
Too much fuel consumption.	7, 11, 14, 17, 20, 21, 22, 24, 25, 26, 27, 28, 29, 30
Black exhaust.	7, 11, 14, 16, 17, 19, 21, 24, 25, 26, 28, 30
Low oil pressure.	4, 32, 33, 34, 35, 37, 43
Engine knocking.	9, 16, 23, 25, 26, 28, 30, 32, 38, 44
Engine running rough.	7, 8, 9, 10, 11, 14, 15, 17, 18, 20, 23, 25, 26, 27, 30, 38, 44
Vibration.	14, 15, 17, 20, 22, 23, 26, 27, 30, 38, 40
High oil pressure.	4, 36
Overheating.	11, 16, 21, 38, 39
Too much crankcase pressure.	22, 28, 30, 41
Poor compression.	16, 22, 25, 26, 28, 29, 30, 31
Start and stop.	10, 11, 14

DESCRIPTION OF THE CAUSE	
<ol style="list-style-type: none"> <li>1. Battery capacity low.</li> <li>2. Bad electrical connections.</li> <li>3. Faulty starter motor.</li> <li>4. Incorrect grade of oil.</li> <li>5. Low cranking speed.</li> <li>6. Fuel tank empty.</li> <li>7. Ignition system has damage.</li> <li>8. Plugged fuel lift pump.</li> <li>9. Faulty fuel lift pump.</li> <li>10. Plugged fuel filter.</li> <li>11. Restriction in the air cleaner.</li> <li>12. Wrong starting procedure.</li> <li>13. Choke not completely closed.</li> <li>14. Choke not completely open.</li> <li>15. Carburetor is dirty or has a defect.</li> <li>16. Incorrect valve timing.</li> <li>17. Poor compression.</li> <li>18. Plugged fuel tank vent.</li> <li>19. Dirt or water in the fuel.</li> <li>20. Sticking or restricted throttle.</li> <li>21. Exhaust pipe restriction.</li> <li>22. Cylinder head gasket leaking.</li> <li>23. Overheating.</li> </ol>	<ol style="list-style-type: none"> <li>24. Governor adjustment not correct.</li> <li>25. Incorrect valve tappet adjustment.</li> <li>26. Sticking valves.</li> <li>27. Spark plug gap not correct.</li> <li>28. Worn cylinder bores.</li> <li>29. Worn valves and seats.</li> <li>30. Broken, worn or sticking piston rings.</li> <li>31. Worn valve stems or guides.</li> <li>32. Worn or damaged bearings.</li> <li>33. Not enough oil in pan.</li> <li>34. Oil pump worn.</li> <li>35. Pressure relief valve is open.</li> <li>36. Pressure relief valve is closed.</li> <li>37. Broken relief valve spring.</li> <li>38. Piston seizure.</li> <li>39. Damaged fan.</li> <li>40. Faulty engine mounting.</li> <li>41. Plugged breather pipe.</li> <li>42. Valve stem seals damaged.</li> <li>43. Plugged oil pump strainer.</li> <li>44. Broken valve spring.</li> <li>45. Auxiliary hydraulics engaged (Optional).</li> <li>46. Hydrostatic drive not in neutral.</li> </ol>

ENGINE COMPRESSION

Checking

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

DEM-1074-Engine Compression Kit

The engine must be at operating temperature.

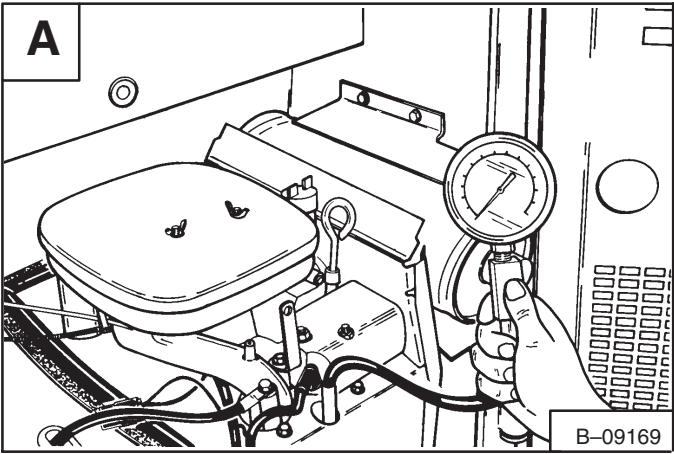
Remove both spark plugs.

Install the compression gauge in the cylinder to be tested [A].

Turn the engine several times with the starter.

The difference in pressure readings between the cylinders must not be in excess of 15% or below 90 PSI (621 kPa).

See chart below for the problem if the compression is low.



CAUSE	CORRECTION
1. Cylinder head gasket leaking.	Remove the head, check for straight surface, replace gasket, install the head and check the compression again.
2. Cylinder head not straight or loose	Remove the head, check for straight surface.
3. Piston rings worn below by occurring.	Recondition the engine.
4. Valves leaking.	Recondition the valves and the seats.
5. Excessive combustion deposits.	Remove the head, clean the combustion deposits from the combustion chamber.

## CARBURETOR AND GOVERNOR

### Carburetor Adjustment

# IMPORTANT

The adjusting screws have tapered ends which are needle valves. They will be damaged if the screws are turned in forcefully.

**NOTE:** Make the carburetor adjustments after the engine is at operating temperature.

Lift and block the loader (See Page 1-2 for the correct procedure).

Stop the engine. Turn the main fuel adjustment screw in until it bottoms [A].

Turn the screw counterclockwise 2-1/2" turns [A].

Start the engine. Run at full RPM with no load.

Turn the screw clockwise from the preliminary setting until the engine RPM decreases. Make note of the position.

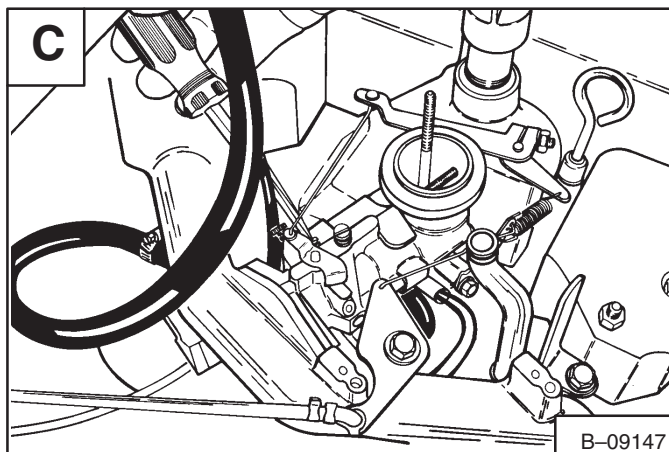
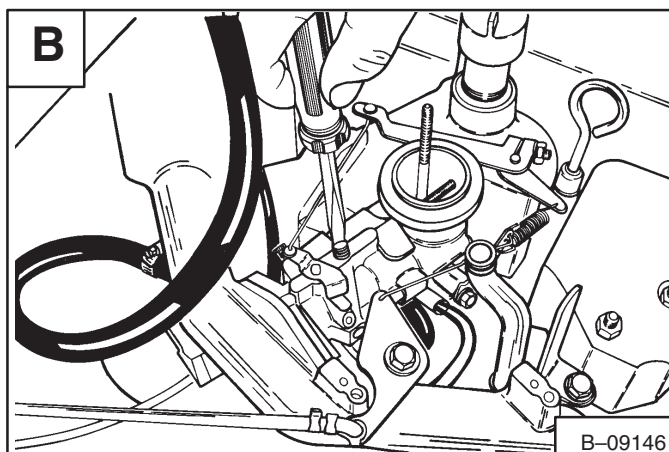
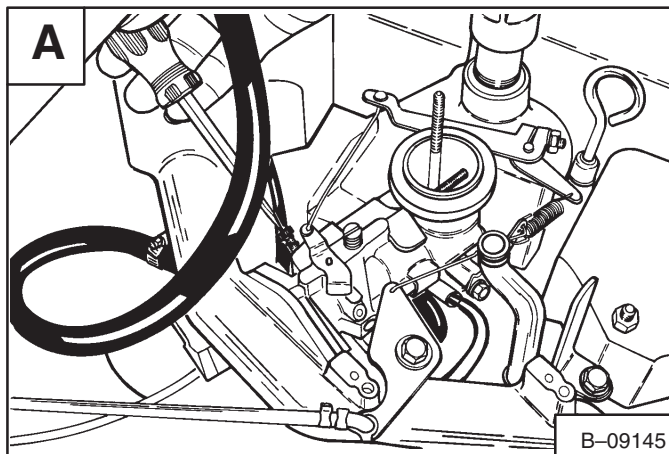
Now turn the screw counterclockwise until the engine RPM decreases. Make note of this position. Adjust the main fuel screw between the two positions.

Decrease the engine RPM to idle speed.

Turn the idle fuel adjustment screw in until engine RPM decreases [B]. Make note of this position.

Turn the idle fuel adjustment screw out until engine RPM decreases. Adjust the idle fuel screw between the two positions.

Turn the idle screw until the engine speed is at 1200 RPM [C].



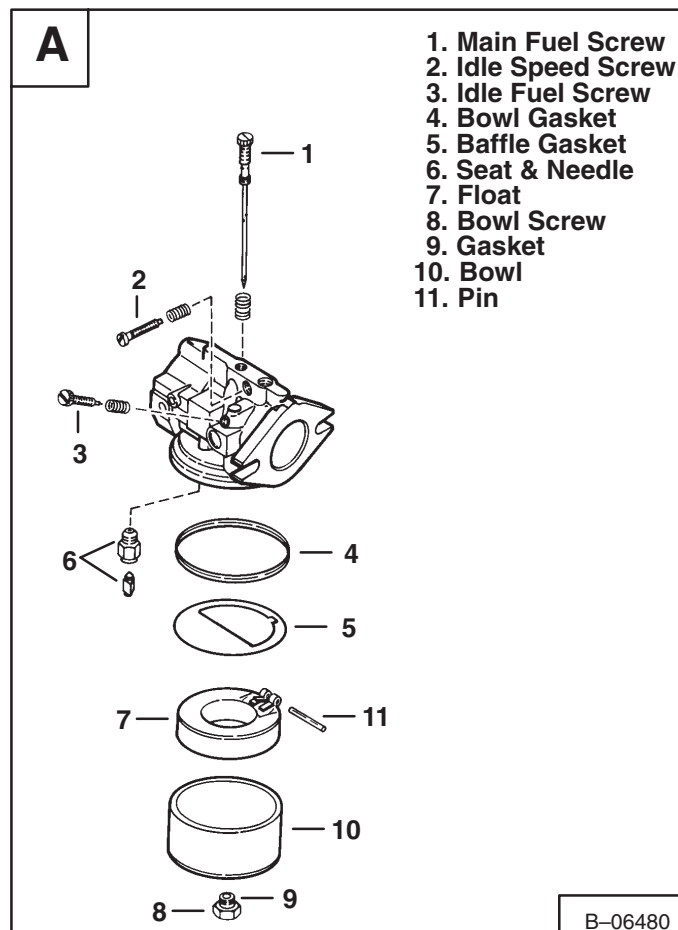
## Carburetor Removal and Installation

Disconnect the fuel line.

Remove the nuts at the carburetor mounting flange and remove the carburetor from the intake manifold.

Remove the bowl retaining screw and bowl **[A]**.

Remove the float pin, float, fuel inlet needle and seat. Check the float for dents and leaks and for wear on the float pin lip and hinge.

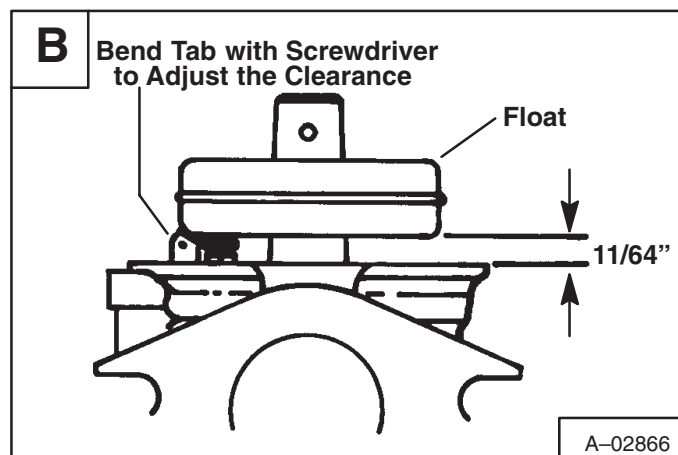


Remove the baffle gasket and bowl gasket.

Remove the idle fuel screw and main fuel screw **[A]**.

Do not remove the choke or throttle plates. If these parts are worn, replace the carburetor assembly.

**NOTE:** Always use new gaskets when assembling the carburetor.



## CARBURETOR AND GOVERNOR (Cont'd)

### Governor Adjustment

# ! WARNING

Never change the governor setting to exceed engine RPM given in the manual. Excess speed can cause explosive failure of engine parts which can cause injury

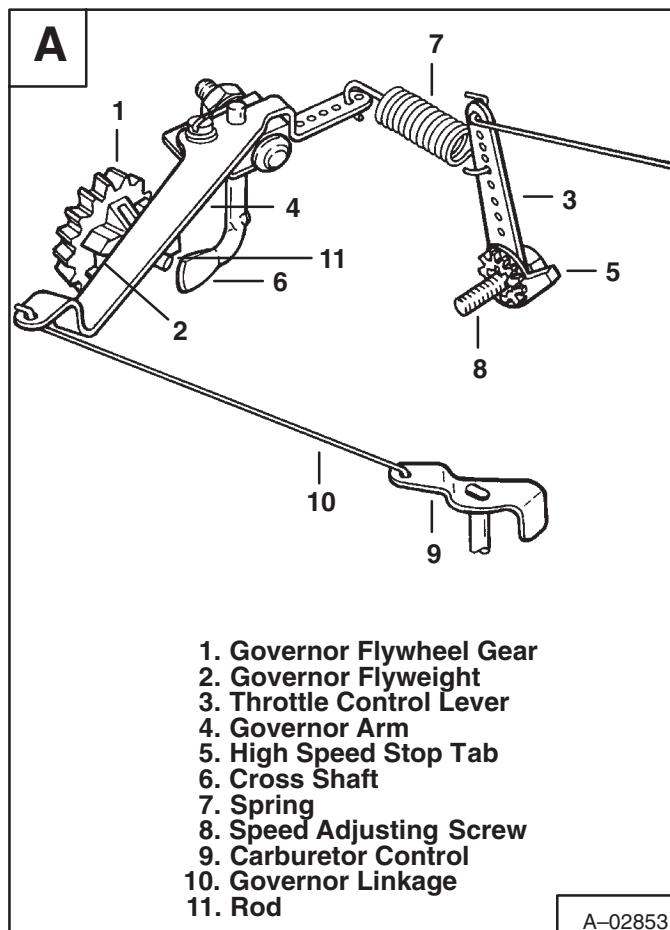
W-2080-1285

The governor is adjusted at the factory and further adjustment is not necessary.

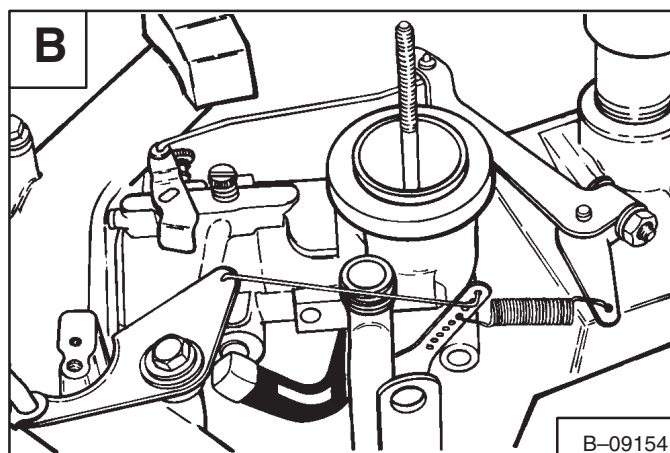
The governor sensitivity can be adjusted by putting the spring end in different holes in the governor arm [A].

To make the governor more sensitive, increase the spring tension by moving the spring end closer to the center of the governor arm. To allow the governor to be less sensitive and more governor control, move the spring end closer to the end of the governor arm.

The speed adjustment is set at the stop tab (Item 5) [A]. Check the operating speed with a hand tachometer. The maximum allowable speed is 3200 RPM with no load. DO NOT EXCEED THIS RPM. If adjustment is necessary, loosen the speed adjusting screw (Item 8) and turn the speed stop tab until the correct speed is set [A]. Tighten the screw.



Always mark the position of the spring ends and governor linkage before any disassembly is done, so the governor linkage can be assembled correctly [B].





**CARBURETOR (Fixed Main Jet)**

**Description**

Some features and benefits of the fixed main jet carburetor:

Fixed main jet eliminates main fuel needle adjustment providing a consistent air/fuel mixture. This results in longer valve (engine) life.

A special “high altitude” main fuel jet is available.

Improved cold and warm weather starting.

Improved acceleration.

Improved access to mounting bolts.

**Adjusting the Carburetor**

With the engine stopped, turn the idle fuel adjusting needle in (clockwise) until it bottoms lightly [A].

**NOTE: Damage to the needle and the seat in the carburetor body will result if the needle is forced.**

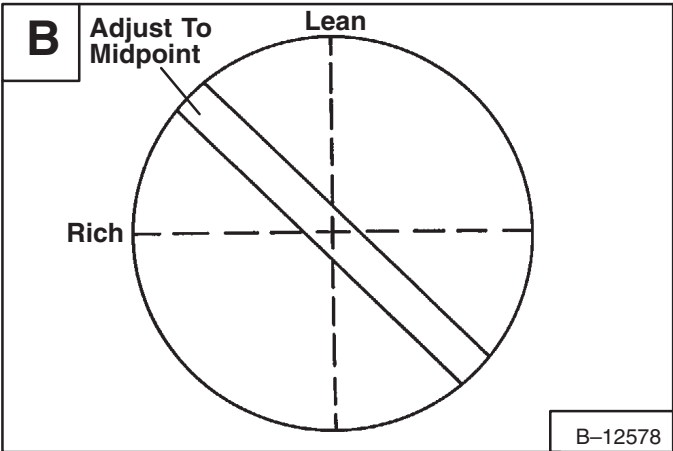
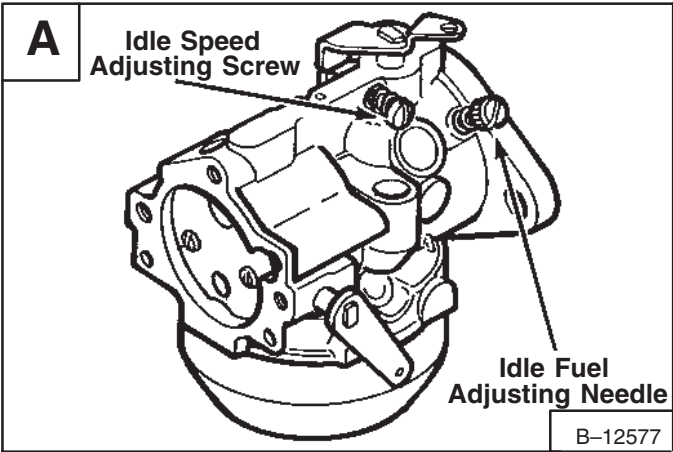
Turn the idle fuel needle out (counterclockwise) about 1–1/4 turn.

Start the engine, run until at operating temperature.

Put the throttle into the idle position. Set the idle speed (See Specifications, Section 8 for the correct RPM). Use a tachometer to set the idle speed.

Turn the idle fuel needle out until engine speed decreases (rich). Note the position of the needle.

Now turn the fuel needle in. The engine speed will increase, then it will decrease as the needle is turned in (lean). Set the adjusting needle midway between the rich and lean setting [B].



## CARBURETOR (Fixed Main Jet) (Cont'd)

### Disassembly and Assembly

Remove the bowl retaining screw, gasket and fuel bowl [A].

Assembly: Tighten the bowl retaining screw to 45–55 in.-lbs. (5,1–6,2 Nm) torque.

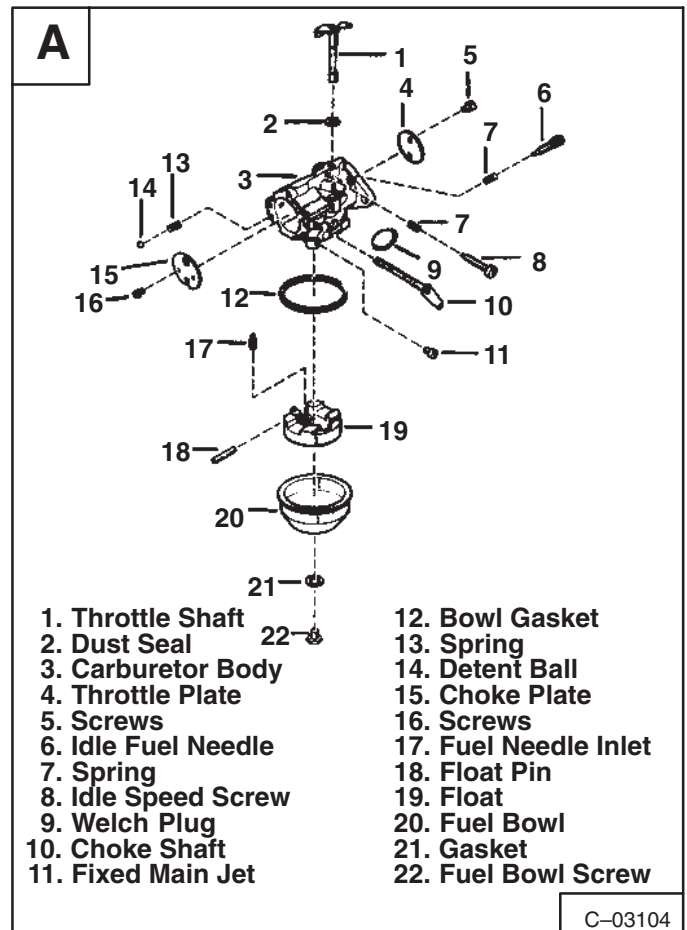
Remove the bowl gasket, float pin, float and fuel inlet needle [A].

**NOTE: Do not attempt to remove the fuel inlet seat. Replace the carburetor if the inlet seat is damaged.**

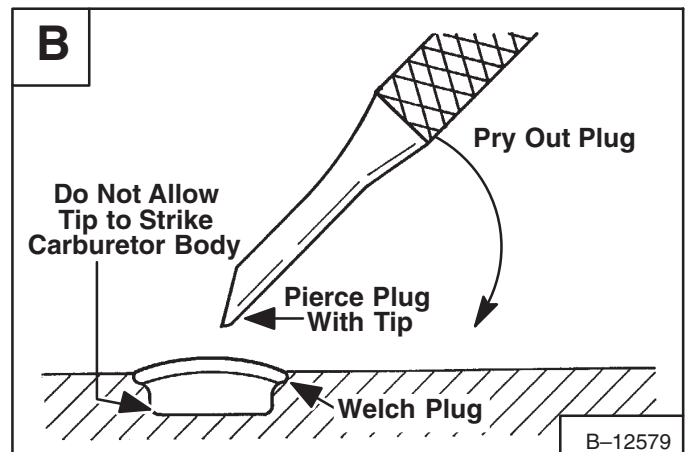
Remove the idle fuel adjusting needle and spring.  
Remove the idle speed screw.

Remove the main fuel jet [A].

Assembly: Tighten the main fuel jet to 12–16 in.-lbs. (1,4–1,8 Nm) torque.

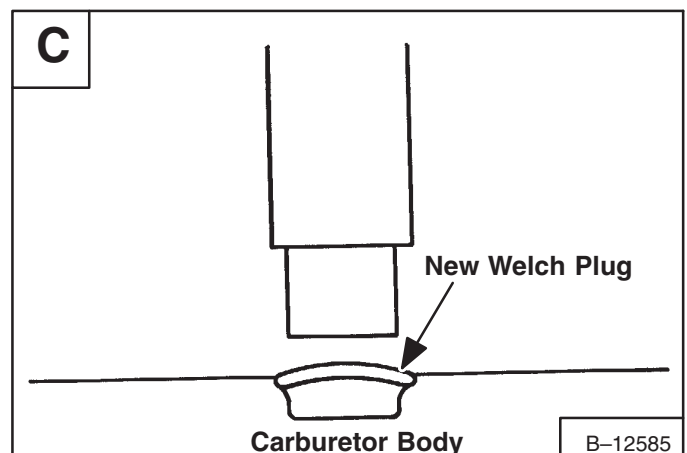


To clean the “off-idle” ports and bowl vent channel, the welch plugs must be removed using a pointed tool [B].



Installation: Place the new welch plug into the hole with the raised portion up. Use the end of the tool that is about the same size as the plug and flatten the plug [C].

Do not force the plug below the top surface.

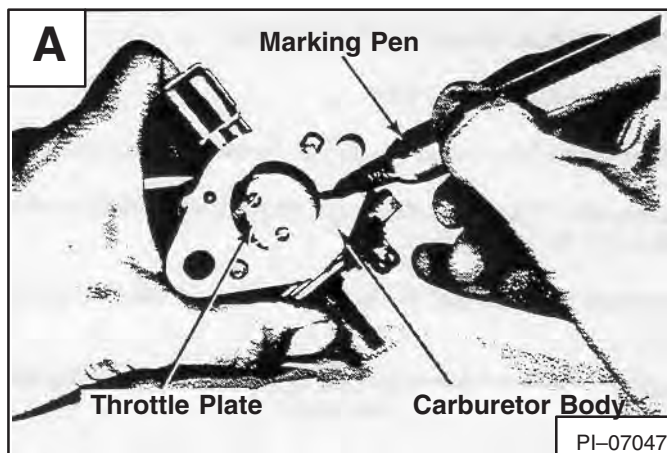


## CARBURETOR (Fixed Main Jet) (Cont'd)

Further disassembly to remove the throttle and choke shaft is recommended if these parts are to be replaced.

### Throttle Shaft

The throttle plate edges are beveled, mark the throttle plate and carburetor body to ensure correct assembly [A].



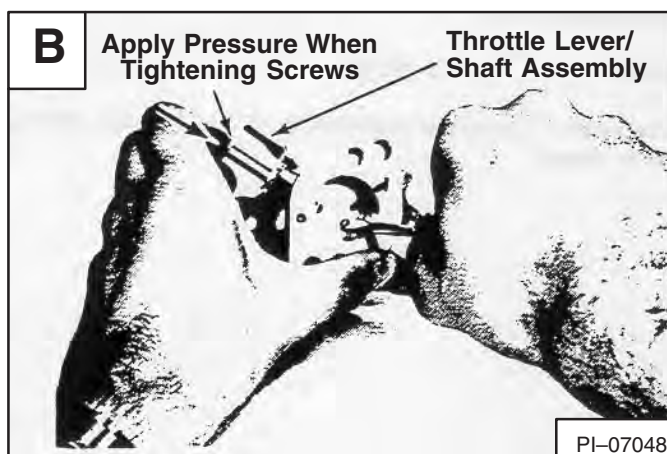
Remove the screws [B].

Remove the throttle plate and shaft.

Installation: Install the foam dust seal on the throttle shaft. Install the shaft with the cut-out toward the mounting flange. Install the throttle plate.

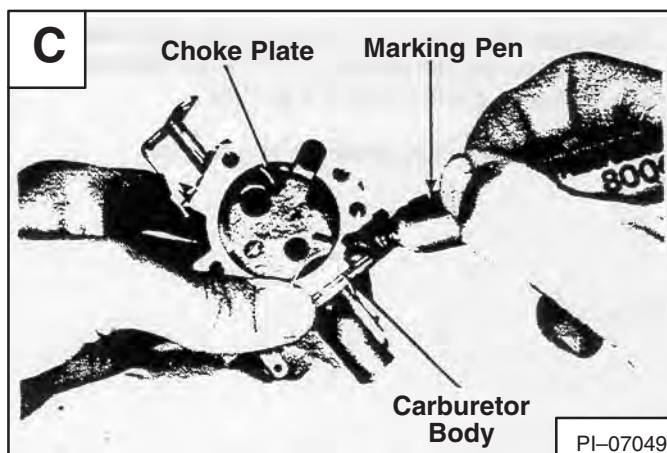
Apply loctite to the two retaining screws. Apply finger pressure to the throttle shaft to keep it seated against the pivot in the body [B].

Rotate the shaft until the plate is fully closed. Tighten the screws to 8–10 in.-lbs. (0,9–1,4 Nm) torque. Check for free operation of the throttle plate.



### Choke Shaft

The choke plate edges are beveled, mark the choke plate and carburetor body to ensure correct assembly [C].



## CARBURETOR (Fixed Main Jet) (Cont'd)

Remove the retaining screws. Remove the choke plate.

File off any burrs which may have been left when the screws were removed. Do not remove the choke shaft before removing the burrs.

Rotate the shaft until the cut-out portion of the shaft is facing the mounting flange [A].

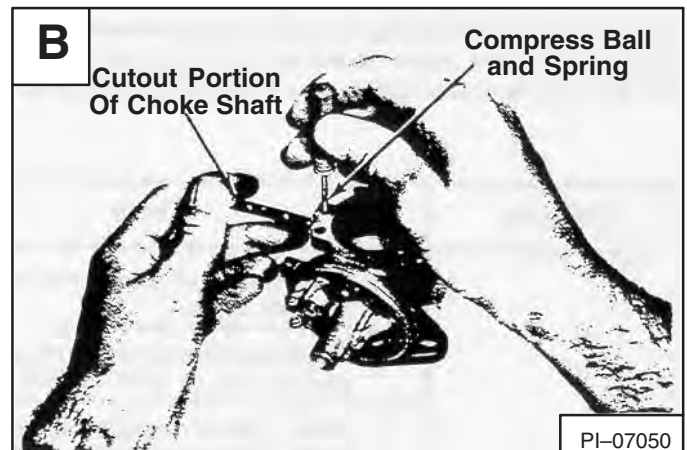
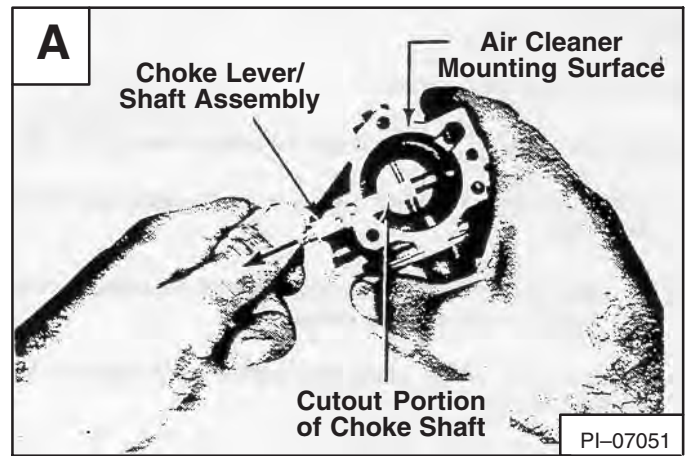
Put the carburetor on the work bench with choke side down. Remove the choke shaft, the detent ball and spring will drop out.

Installation: Install the detent ball and spring. Compress the ball and spring. Install the choke shaft into the carburetor body [B].

Position the cut-out portion toward the mounting flange. Install the choke plate.

Apply loctite to the retaining screws. Rotate the shaft until the choke plate is fully closed. Tighten the screws to 8–12 in.-lbs. (0,9–1,4 Nm) torque.

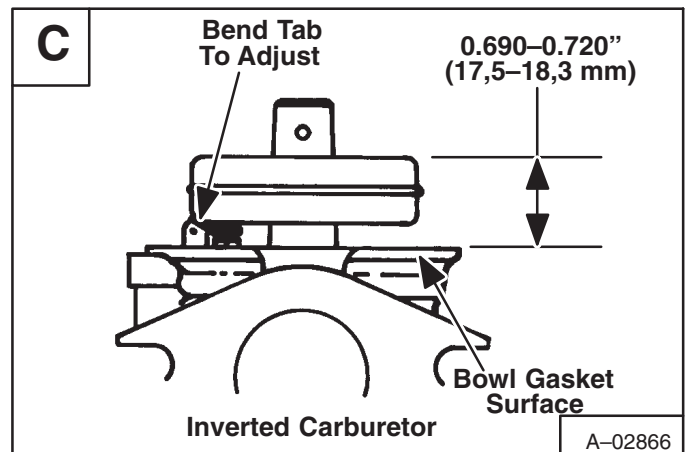
Check for free operation of the choke plate.



## Float Level

Invert the carburetor so the float tab rests on the fuellet needle. The float should be parallel with the bowl gasket surface.

The free end of the float should be 0.690–0.720" (17,5–18,3 mm) from the bowl gasket surface [C].



## FUEL PUMP

### Removal & Installation

Disconnect the fuel lines from the fuel pump.

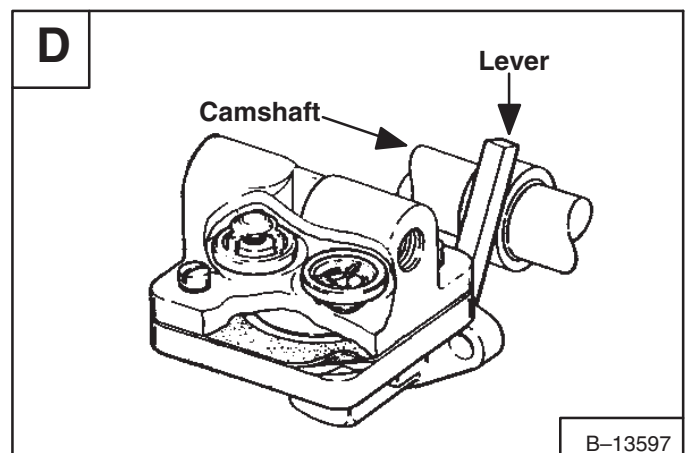
Remove the bolts.

Installation: Tighten the bolts to 80 in.-lbs. (9,0 Nm) torque.

Remove the fuel pump.

Installation: Make sure the fuel pump lever is positioned to the right of the camshaft (when looking at fuel pump mounting flange). Engine damage could result if the lever is positioned to the left of the camshaft [D].

**NOTE: The fuel pump is not serviceable and must be replaced when faulty.**



IGNITION SYSTEM

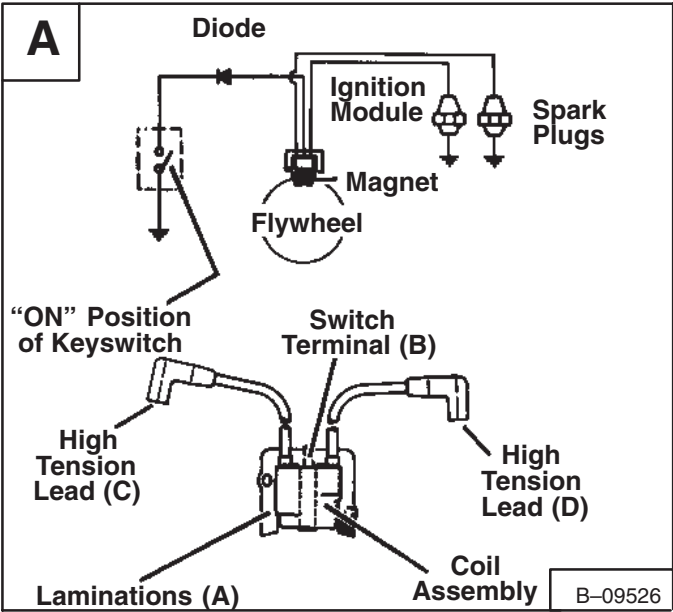
Igintion System Information

The ignition system consists of the following components [A].

- 1. A magnet assembly, which is permanently attached to the flywheel.
- 2. An electronic magneto module, which is mounted to the No. 1 side of the cylinder barrel.
- 3. A key switch which stops the engine by grounding the ignition module.

Troubleshooting

The following chart is provided as an assistance in locating and correcting problems. Many of the recommended procedures must be done by authorized Bobcat Service Personnel only.



PROBLEM	TEST	CONCLUSION
	1. Make sure spark plug leads are connected to spark plugs.	
	2. Check condition of spark plugs. Make sure gaps are set to .035" (0,889 mm)	If plugs are in good condition, check/adjust gaps and reinstall.
	3. Check ignition module using test plugs. Make reference to Ignition System Tester (Page 7-6a).	If visible and audible sparks ARE produced, the ignition module is OK.
		If visible and audible sparks ARE NOT produced: <ul style="list-style-type: none"><li>a. Make sure engine ignition switch is in the "run" position.</li><li>b. Check wires and terminals of ignition module and other components for accidental grounding and/or damaged insulation.</li><li>c. If wires and terminals are OK, the ignition module is probably faulty and should be replaced. Test module further using an ohmmeter (Test 4).</li></ul>
	4a. Measure the primary resistance of module using an ohmmeter [A].  <b>NOTE: Connect negative (-) lead of ohmmeter to switch terminal B.</b>  <b>Primary Leads/Terminals</b> A-B  <b>Primary D.C. Resistance</b> 1.0/1.5 ohms	If resistance is low or 0 ohms, module primary is shorted. Replace module.  If resistance is high or infinite ohms, module primary is open. Check keyswitch/wiring for shorts or connections which could apply 12V to switch terminal B. Correct those conditions, then replace module.  If resistance is within range, module primary is OK. Test Secondary (Test 4b).
	4b. Measure the secondary resistance of module using an ohmmeter [A].  <b>Secondary Leads/Terminals</b> C-D  <b>Secondary D.C. Resistance</b> 22,000/42,000 ohms	If resistance is within range, module secondary is OK.  If resistance is low or 0 ohms, module secondary is shorted. Replace module.  If resistance is high or infinite ohms, module secondary is open. Replace module.



## IGNITION SYSTEM (Cont'd)

### Ignition System Tester

Use two new spark plugs. Remove the ground electrode from one of the spark plugs. This gives a spark gap of 0.13" (3,3 mm). Set the gap of the other plug to 0.035" (0,889 mm). This gap arrangement simulates the spark required under actual engine conditions.

Cut two 1-1/4" x 1/2" (31,6 x 12,7 mm) I.D. fuel line. Put them over the firing tips to make the spark more visible [A].

Remove the high-tension wires from the engine spark plugs. Connect them to the test plugs. Ground the test plugs [A].

**NOTE: Do not remove the spark plugs from the engine to maintain normal cranking speed.**

Make sure the key switch is in the "ON" position. Crank the engine and observe the test plugs. Make reference to the Troubleshooting Chart (Page 7-6).

### Spark Plugs

Every 100 hours of loader operation, remove the spark plugs. Check the condition and set the gap.

Clean the area around the spark plugs.

Remove the spark plugs [B].

Examine the spark plugs for deposits which could indicate the condition of the rings, valves, carburetor or ignition system.

Clean the spark plugs and set the gap to 0.035" (0,889 mm).

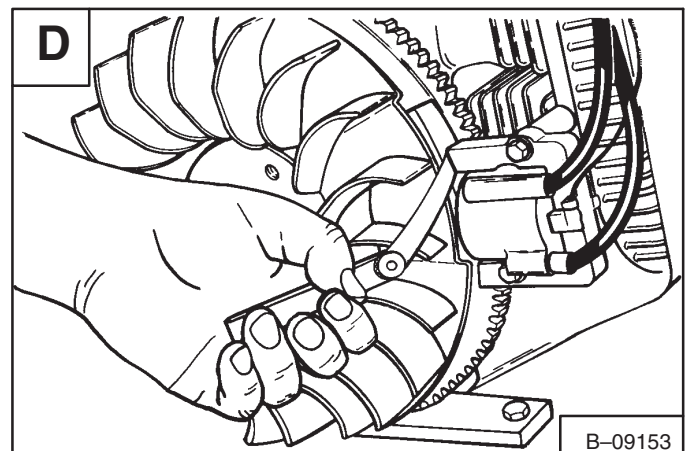
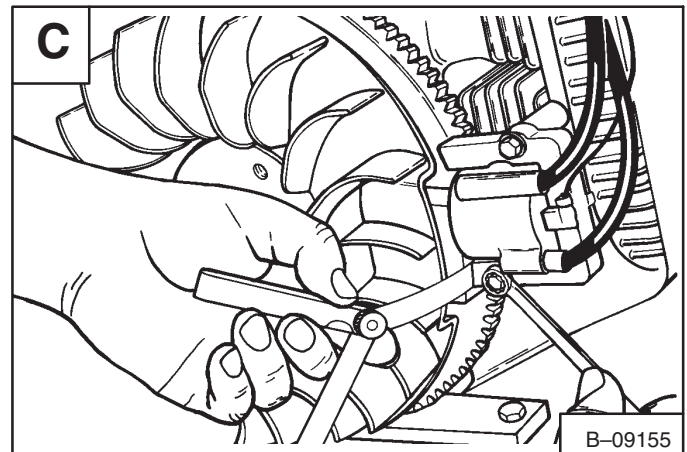
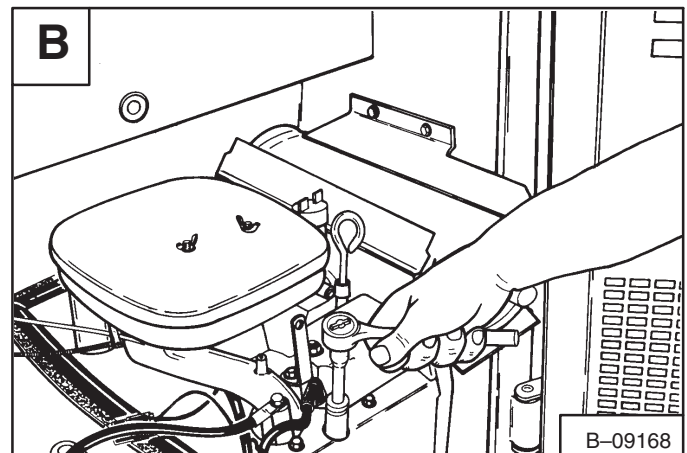
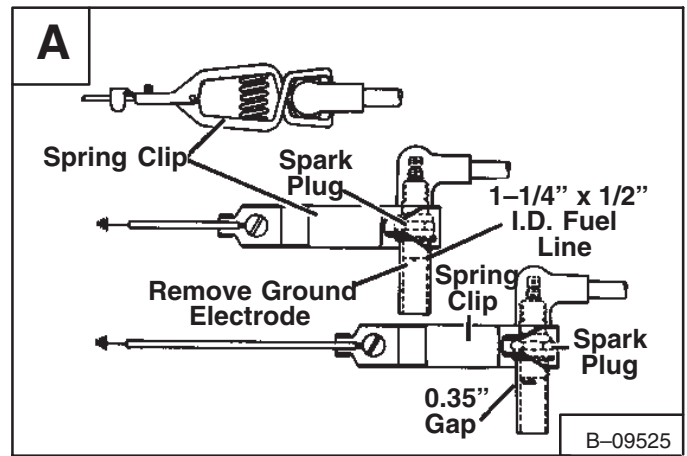
Install the plugs and tighten to 10-15 ft.-lbs. (14-20 Nm) torque.

Every 250 hours of operation, replace the spark plugs.

### Ignition Module

After replacement of the ignition module, set the air gap at both magnetic shoes to 0.009-0.012" (0,21-0,30 mm) [C] & [D].

**NOTE: Do not connect 12 volts to the low voltage wire or damage will result to the ignition module.**



## CRANKCASE VACUUM

### Manometer Tube

Use the following procedure to make a manometer to check the crankcase vacuum [A].

1. Cut a piece of wood so it measures 10 x 30".
2. Fasten a 6 foot length of 1/2" O.D. clear tube to the board. Make a gradual, rather than a sharp, bend in the tube.
3. Inside the "U" formed tubing, measure off a 24" portion of the board between the straight sides of the "U". Divide this section into one inch increments and mark them on the board. Start the middle increment with zero.
4. Add a shut-off valve or clamp to the tube to prevent the engine from sucking water under cranking condition. Drill a 1/2" hole in a rubber stopper and install on the tube.
5. Pour colored water into the tube until the level reaches the halfway mark (zero) on the scale.

### Vacuum Test

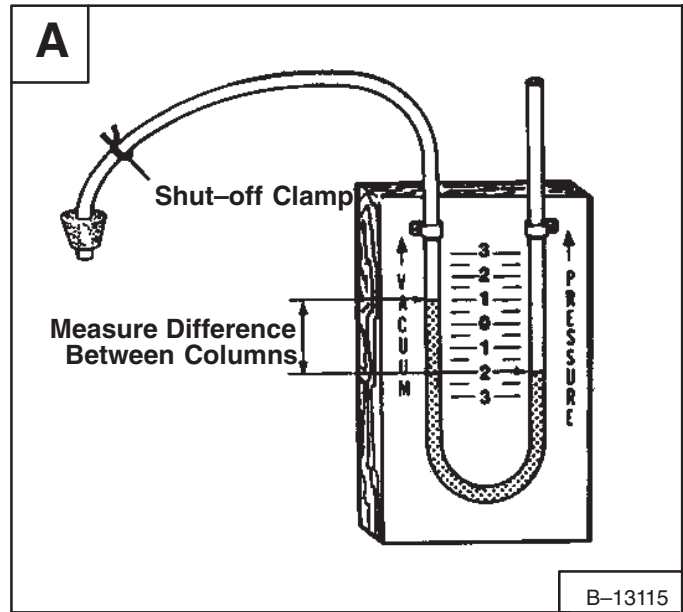
Use either commercial vacuum gauge, mercury or water manometer or construct a simple "U" tube manometer as shown in figure [A].

Install the rubber stopper in oil fill hole. Make sure the shut-off clamp is closed.

Start the engine and run at full RPM.

Release shut-off clamp and the water level in the engine side of the tube should be 15–20" above the level in the open side. If there is not vacuum or positive pressure, check for the following conditions.

- a. Crankcase breather clogged or not working.
- b. Seals and/or gaskets leaking.
- c. Blow-by leaky valves.
- d. Exhaust restriction.



## ENGINE

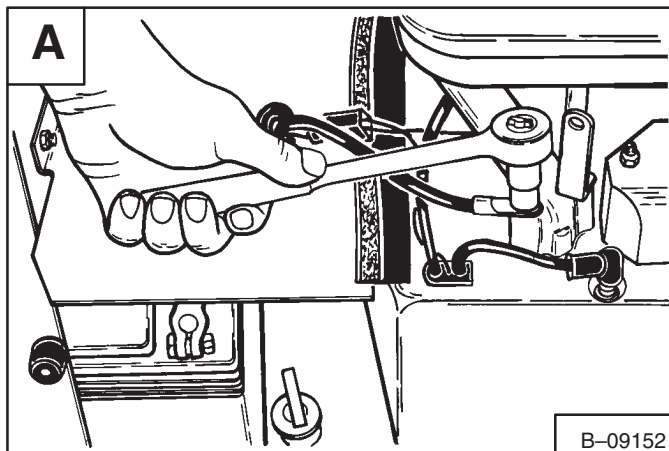
### Removal and Installation

**NOTE:** The engine and hydrostatic pumps are removed from the loader as an assembly.

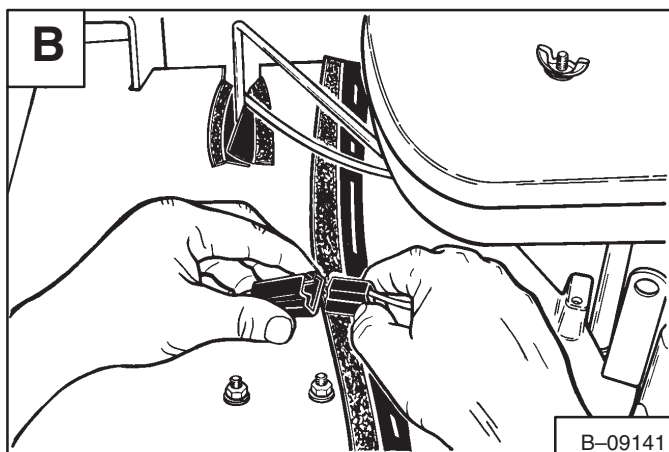
Lift and block the loader (See Page 1–2 for the correct procedure).

Open the rear door and clean the area around the engine.

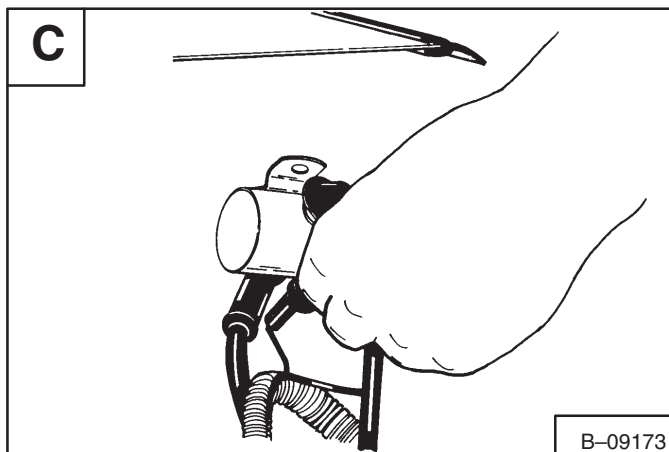
Disconnect the ground battery cable at the engine [A].



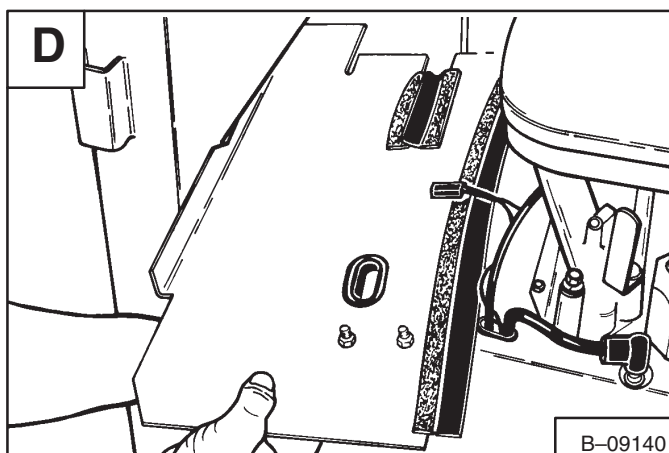
Disconnect the wire connector at the rectifier/regulator [B].



Remove the solenoid from the engine side shield [C].



Remove the bolts and nuts at the engine side shield.  
Remove the side shield from the loader [D].

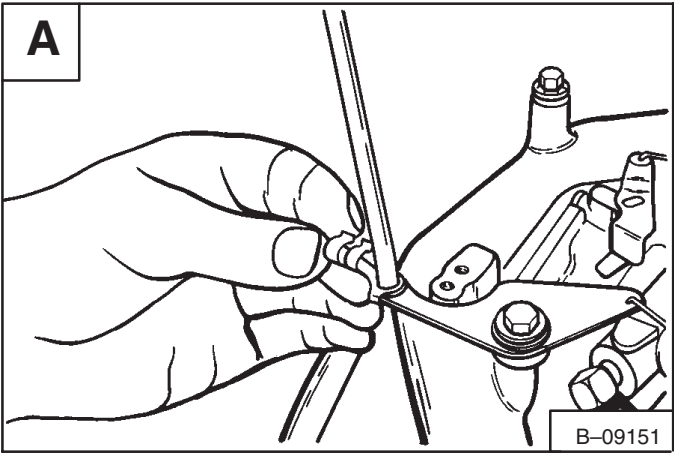




**ENGINE (Cont'd)**

Disconnect the throttle linkage [A].

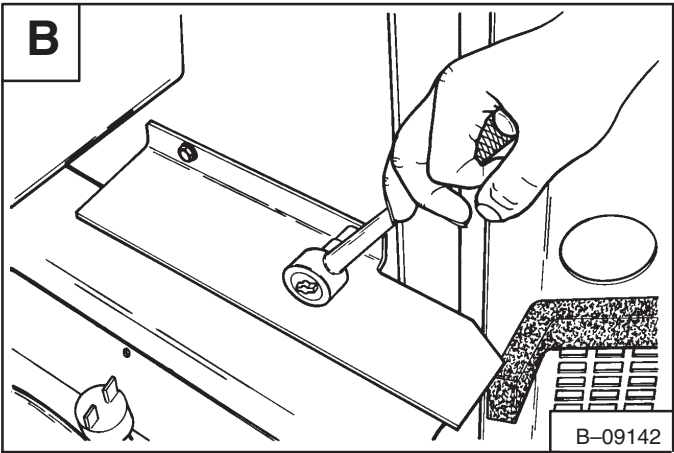
Disconnect the choke cable from the intake manifold and carburetor.



Remove the bolts and nuts at the engine side shield.  
Remove the top and bottom side shield at the muffler [B].

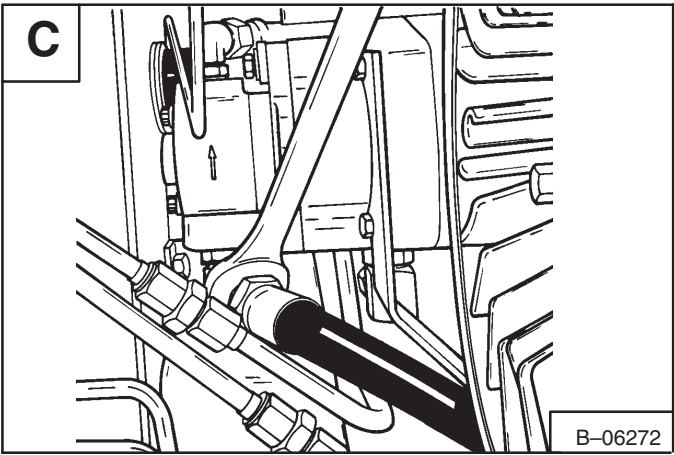
Remove the fluid from the hydraulic/hydrostatic reservoir  
(See Page 2-23 for the correct procedure).

Remove the battery from the loader (See Page 6-2 for the correct procedure).

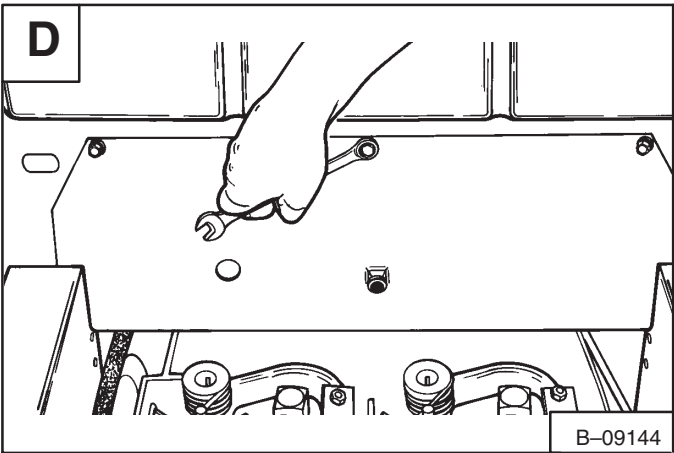


Disconnect the inlet hose at the hydraulic pump [C].

Raise the operator cab (See Page 1-7 for the correct procedure).



Remove the shield at the front of the engine [D].



## ENGINE (Cont'd)

Disconnect the high pressure hoses (two) at the hydrostatic pumps [A].

### IMPORTANT

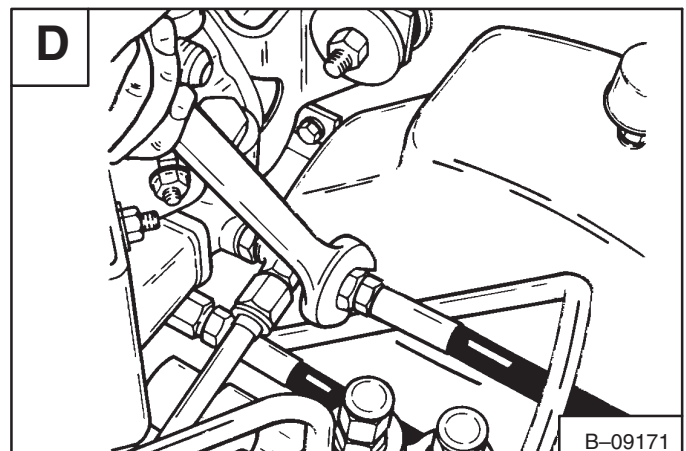
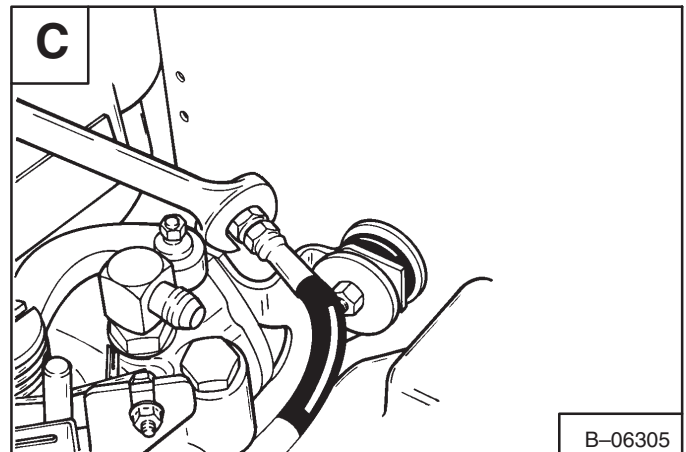
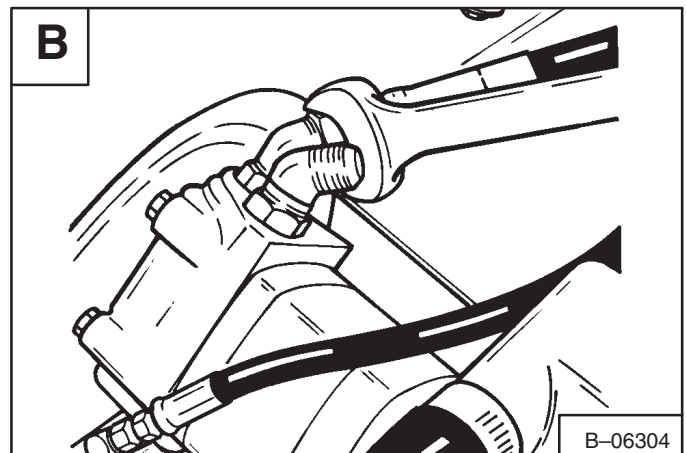
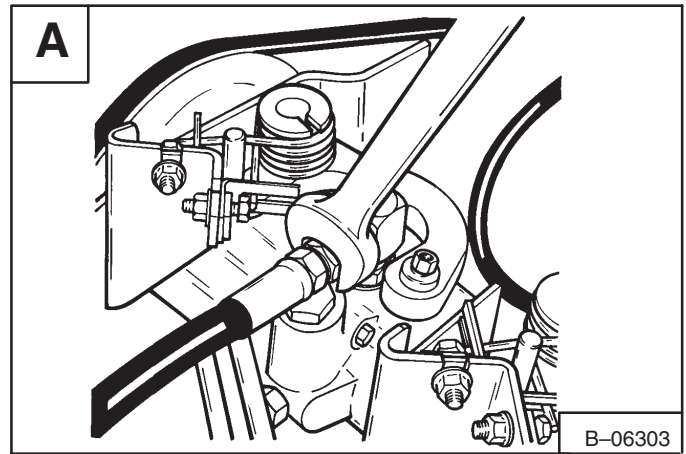
When repairing hydrostatic and hydraulic systems, clean the work area before disassembly and keep all parts clean. Always use caps and plugs on hoses, tubelines and ports to keep dirt out. Dirt can quickly damage the system.

I-2003-0888

Disconnect the high pressure hoses, which come from the bottom of the hydrostatic pumps, at the hydrostatic motors (both sides) [B].

Disconnect the outlet hose at the hydraulic pump [C].

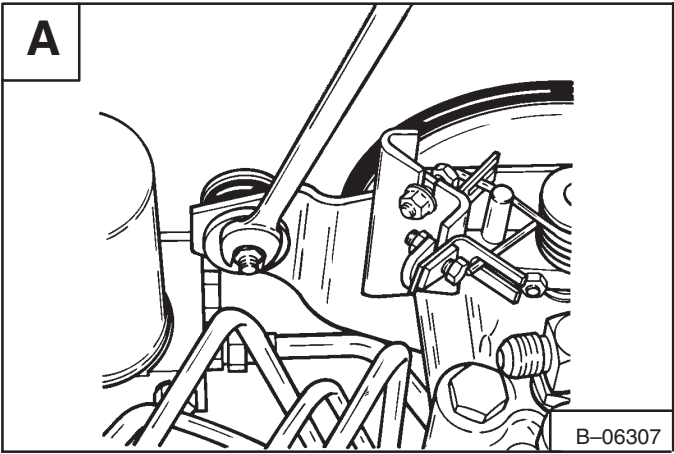
Disconnect the charge pressure hose at the hydrostatic pump [D].



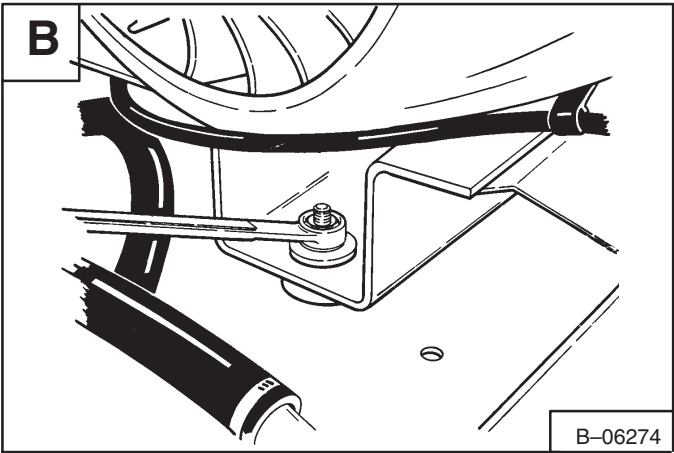
**ENGINE (Cont'd)**

Remove the bolt, washers and nut from the mounting brackets for the hydrostatic pumps (both sides) [A].

**NOTE:** The large washers are used for equally spacing of the mounting brackets, make a note for correct installation.



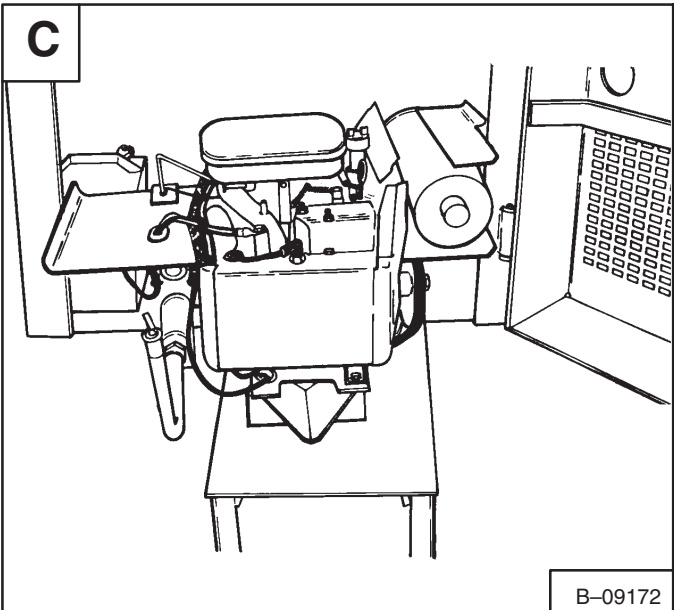
Remove the rear mounting bolts and nuts at the engine [B].



Install an engine removal table (made locally) at the loader frame [C].

Lift the engine onto the table and remove from the loader

**NOTE:** To remove the hydrostatic and hydraulic pump assembly from the engine, see page 3-19 for the correct procedure.



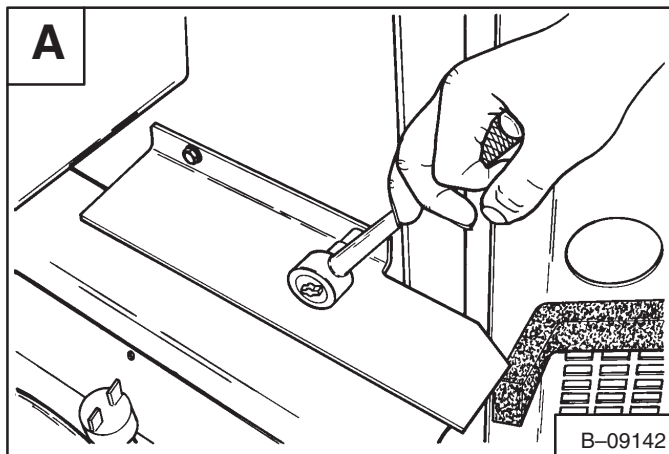
## ENGINE MUFFLER

### Removal and Installation

Open the rear door.

**NOTE:** Make sure the muffler is cool before removing it.

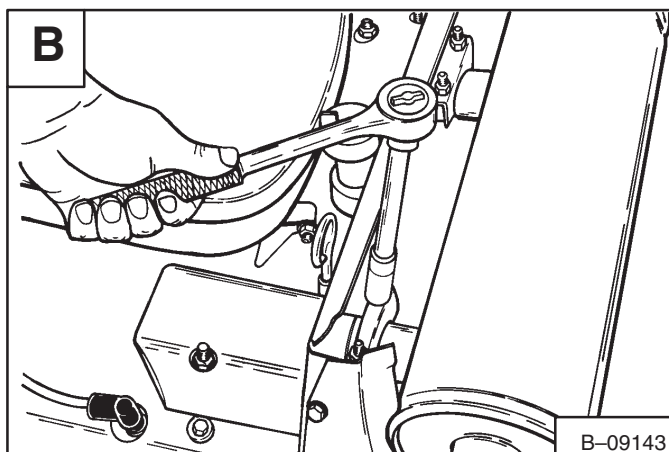
Remove the bolts and nuts at the side shield. Remove the side shield [A].



Remove the muffler clamps [B].

Remove the muffler from the exhaust manifolds.

**NOTE:** If there is not enough clearance to remove the muffler with this method, remove the exhaust manifolds from the engine.



## RECONDITIONING THE ENGINE

### Disassembly

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

MEL-1206-Strap Wrench  
MEL-1207-Barrel Wrench

Remove the engine from the loader (See Page 7-7).

Remove the intake manifold and exhaust manifolds.

Remove all the air shrouding from the engine.

## WARNING

Use the procedure in the manual for removing the flywheel to avoid cracked flywheel or broken crankshaft. Do not use a puller which holds only the outside of the flywheel. Damaged parts can break explosively during use and cause injury or death.

W-2079-1285

Use a strap wrench to hold the flywheel and remove the flywheel bolt [A].

Remove the flywheel with a puller.

Remove the stator [B].

Mark the crankcase halves [C]. Side one is the closest to the flywheel. It contains the governor, oil pump gear and dipstick.

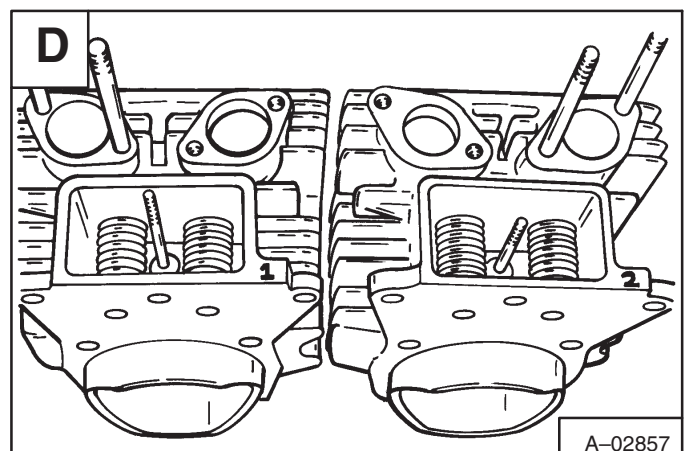
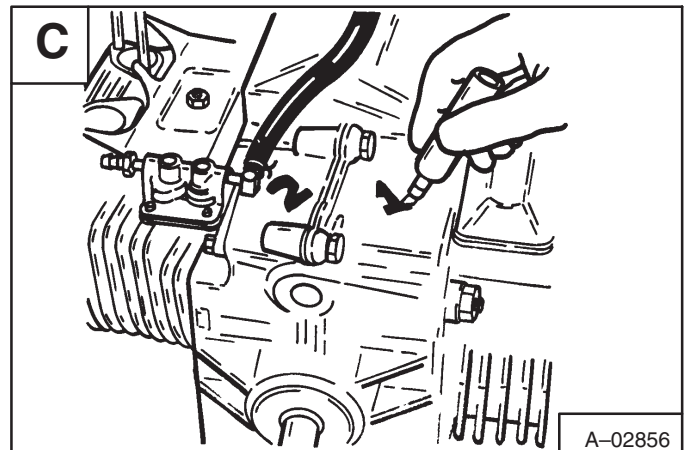
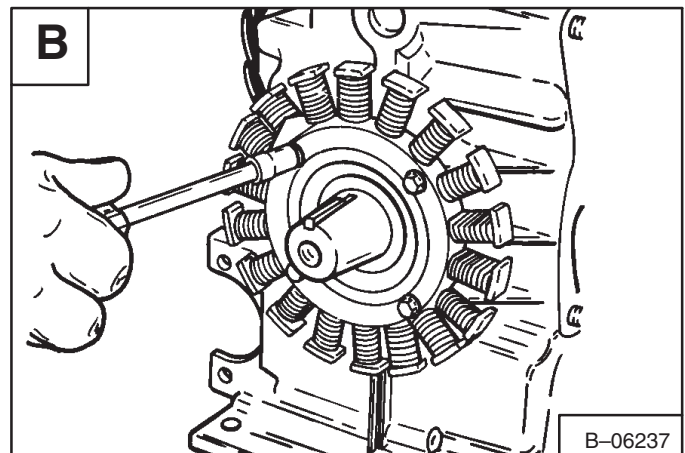
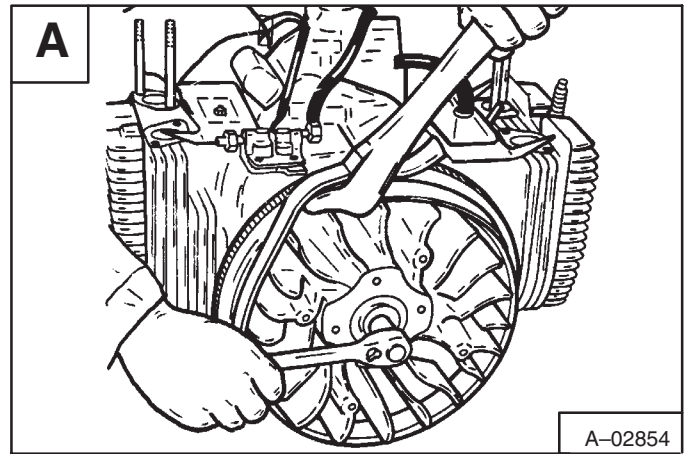
Remove the fuel pump.

Remove the starter.

Remove the cylinder heads (both sides).

Remove the cylinder barrels. Make sure the cylinder barrels are stamped #1 and #2 for correct installation [D].

**NOTE:** Make sure to mark all the parts (Tappets, valve springs, retainers, pistons and rods) for the #1 and #2 sides.



## RECONDITIONING THE ENGINE (Cont'd)

Using a valve spring compressor, remove the valve spring locks, valves and springs. The springs must be kept with the correct valves and valve locks.

Remove the piston pin retainers. Use a brass punch, support the piston and remove the piston pin. Remove the piston rings.

Remove the closure plate.

Remove the oil pressure relief valve ball spring from the crankcase [A].

Remove the crankcase bolt and nuts. Put the crankcase on the work bench with the #2 side in the up position.

Using a large screwdriver, pry the crankcase halves apart [B].

Remove the camshaft from the #1 side.

Remove the crankshaft and rods.

Remove the oil seal, then remove the sleeve bearings and spacers from the crankshaft.

Mark the connecting rods and caps.

Loosen the connecting rod nuts until the ends of the studs no longer extend for the nuts.

Using a plastic hammer, tap the nuts until the rod and rod cap separate.

Remove the nuts and disassemble the connecting rod and cap from the crankshaft.

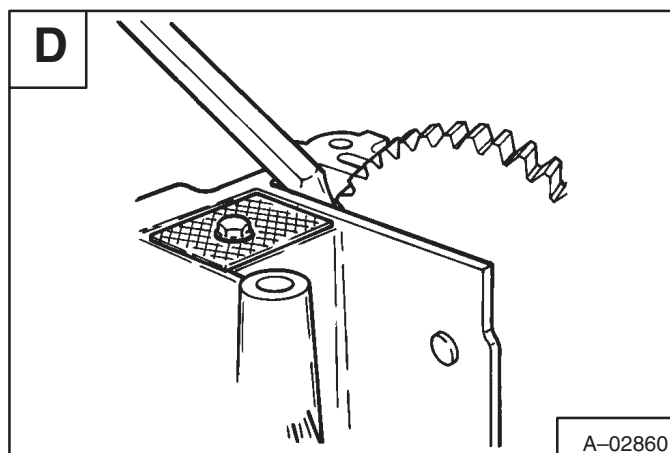
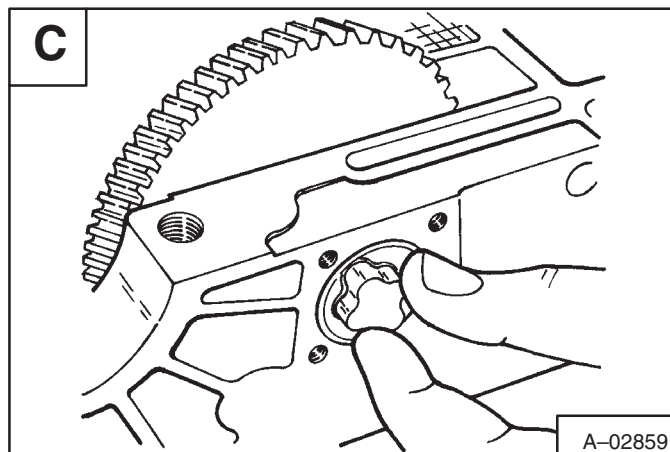
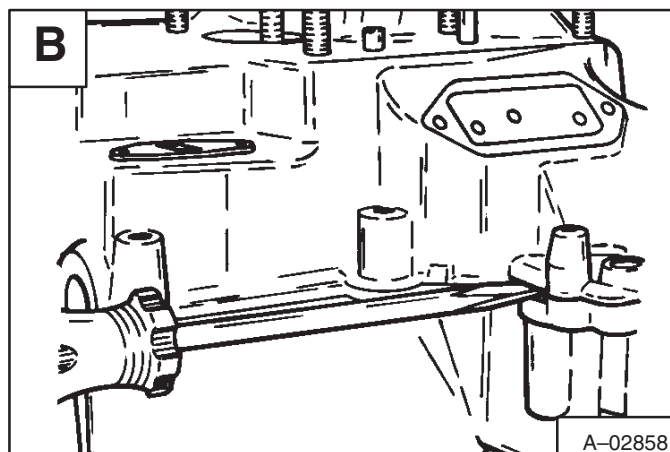
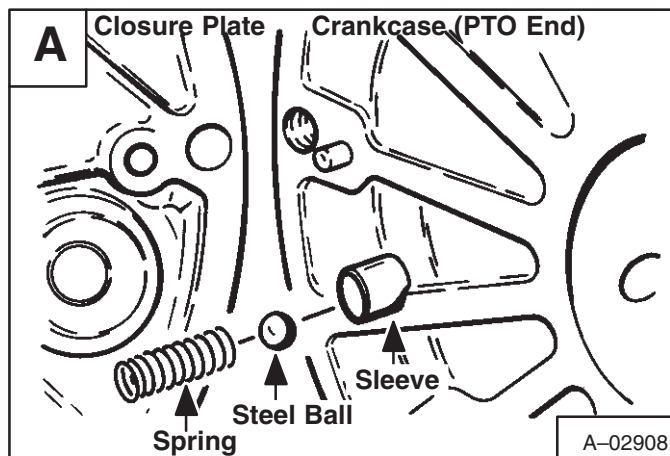
Remove the oil pump cover. Remove the inner and outer rotor [C].

Use a punch and remove the small roll pin at the oil pump gear [D]. Remove the gear and shaft.

Remove the governor stop pin from the crankcase. Remove the governor from the stub shaft. Remove the clamp at the governor cross shaft.

Remove the retaining ring and washer from the cross shaft and remove the shaft.

Remove the tappets.





## RECONDITIONING THE ENGINE (Cont'd)

### Assembly

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

MEL-1208—Seal Driver Handle  
MEL-1209—Adapter, Enclosure Seal  
MEL-1210—Adapter, Flywheel Seal  
Purchased Locally— $11/16"$  (17,5 mm) Reamer

Before assembling the engine crankcase, the camshaft bore at the flywheel end of the engine must be reconditioned. Reconditioning is necessary since the camshaft plug is "staked" in position. To recondition the camshaft bore use the following procedure:

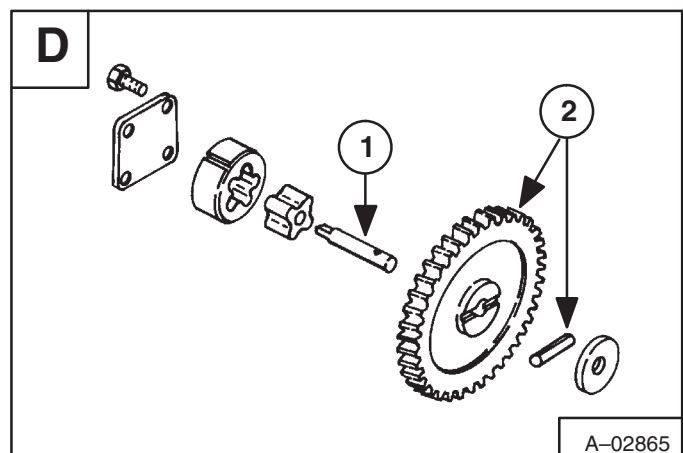
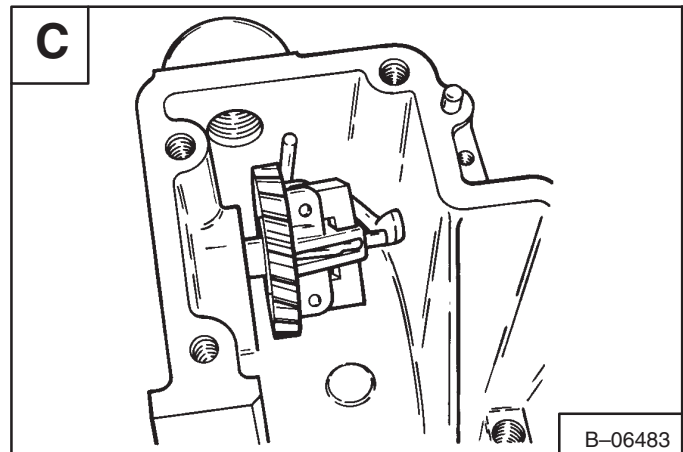
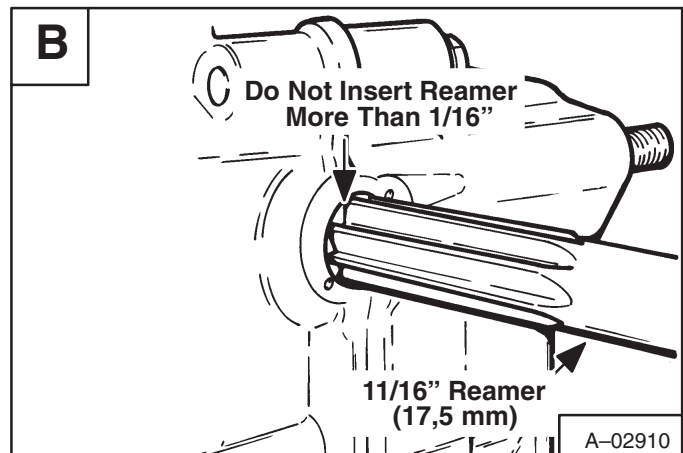
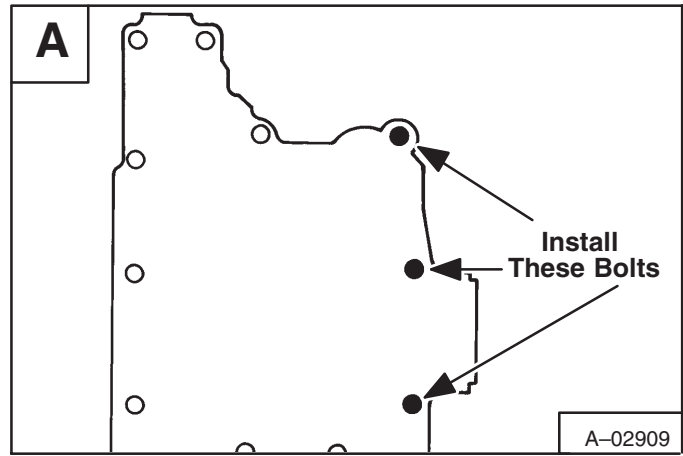
1. Assemble the crankcase halves and install the three bolts as shown [A].
2. Install the reamer into the camshaft bore [B]. Rotate the reamer several times to remove the deformed crankcase material.
3. Remove the three bolts from the crankcase and separate. Clean the crankcase halves thoroughly to remove any chips and debris.

Install the governor gear on the stub shaft inside the crankcase [C].

Install the governor stop pin and washer into the crankcase. Tighten the pin to 70 in.-lbs. (8 Nm) torque.

Install the governor cross shaft, with the washer at each end, through the hole in the crankcase. Fasten with the retainer ring.

Install the drive gear shaft (Item 1) from the inside of the crankcase [D]. Install the gear and spacer in the correct position (Item 2). Slotted end of gear hub toward support rib and spacer between rib and the gear.



## RECONDITIONING THE ENGINE (Cont'd)

Push the drive shaft until the hole in the shaft make alignment with the slot in the gear hub. Install the new roll pin until it is even with the gear hub **[A]**.

Measure the drive gear end play. The correct end play is no more than 0.029" (0,737 mm), replace the spacer to get the correct end play. Minimum drive gear end play is 0.010" (0,254 mm).

Lubricate the pump cavity with oil. Install the inner (Item 1) and outer rotors (Item 2) **[B]**.

Install the cover (Item 3) and tighten the bolts.

Lubricate the connecting rod journals and bearings.

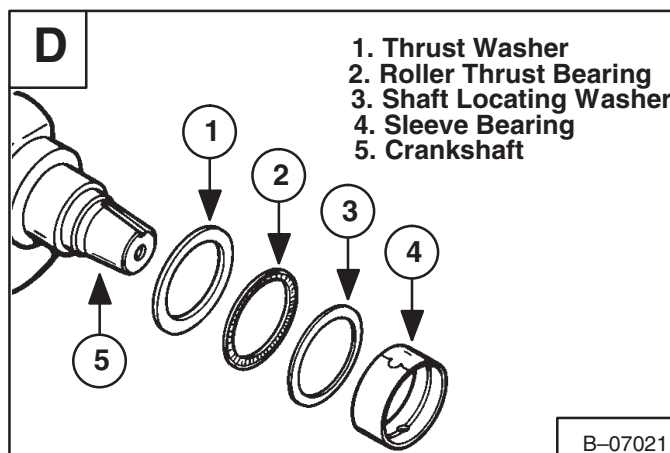
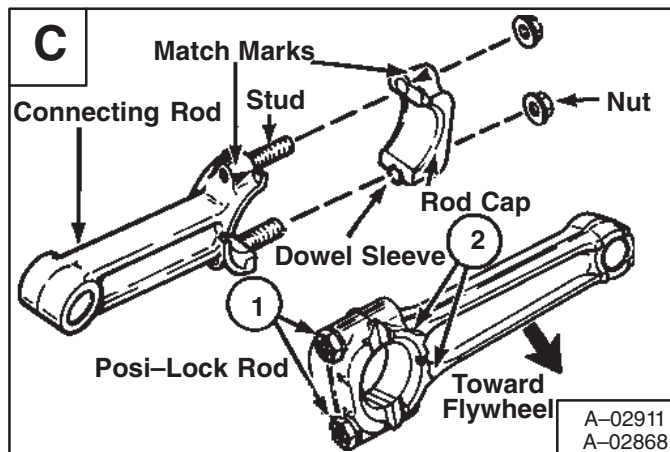
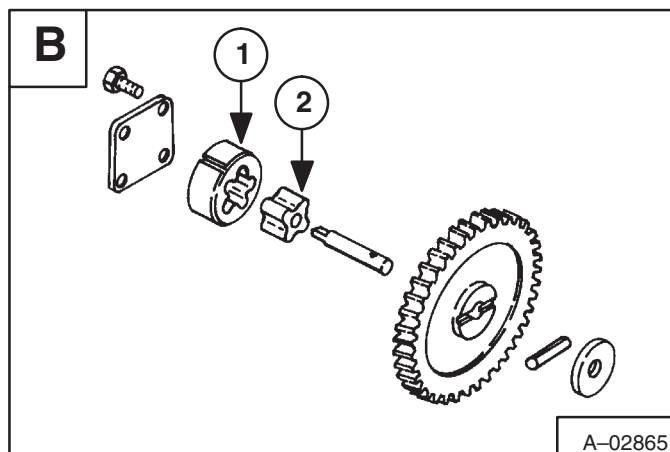
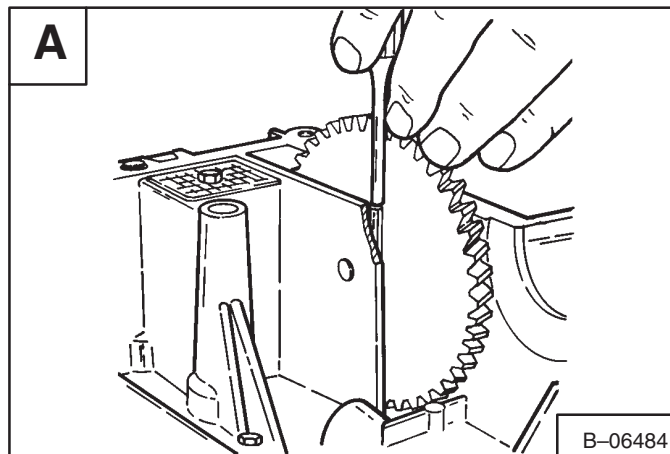
Install the connecting rods on the crankshaft so the two raised markings (bosses) (Item 1) between the rod bolts are toward the flywheel **[C]**.

Lubricate the rod bolts and tighten the nuts as listed:

NEW—140 in.-lbs. (16 Nm) torque.  
USED—100 in.-lbs. (11 Nm) torque.

Install the roller thrust bearing and flat thrust washer on the flywheel end as follows **[D]**.

Install the 0.039" (0,99 mm) thrust washer, roller thrust bearing and 0.156" (4,0 mm) locating washer on the flywheel end. Lubricate the sleeve bearing (without flange) and install it on the crankshaft.





## RECONDITIONING THE ENGINE (Cont'd)

Install the thrust washer on the PTO end of the crankshaft [A].

Lubricate the sleeve bearing (with flange) and install it on the crankshaft.

Install the crankshaft and rod assembly into the #1 crankcase. Locate the tabs on the sleeve bearings to the notches in the crankcase.

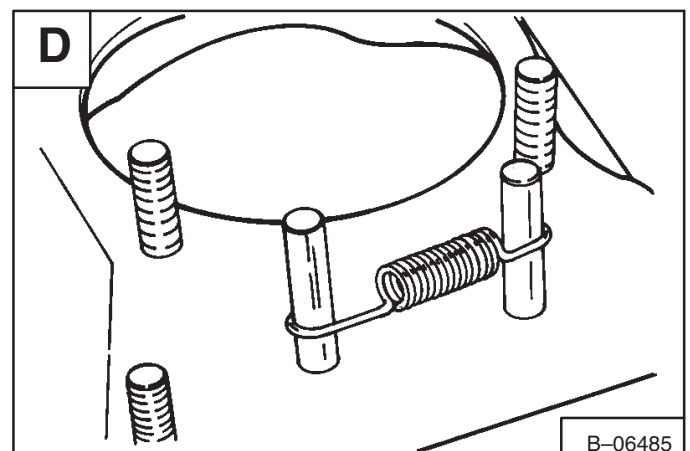
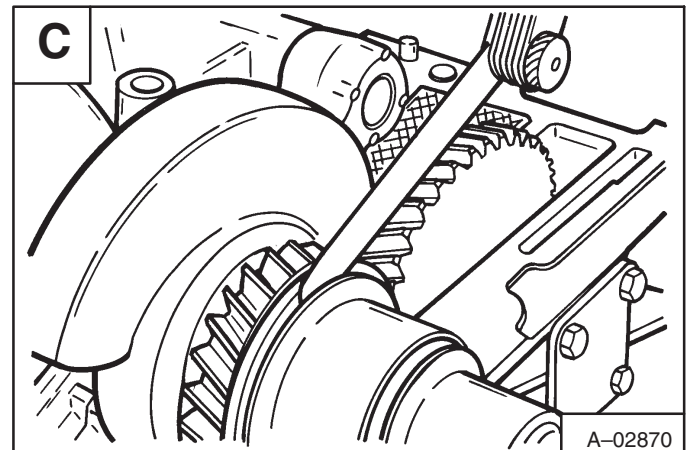
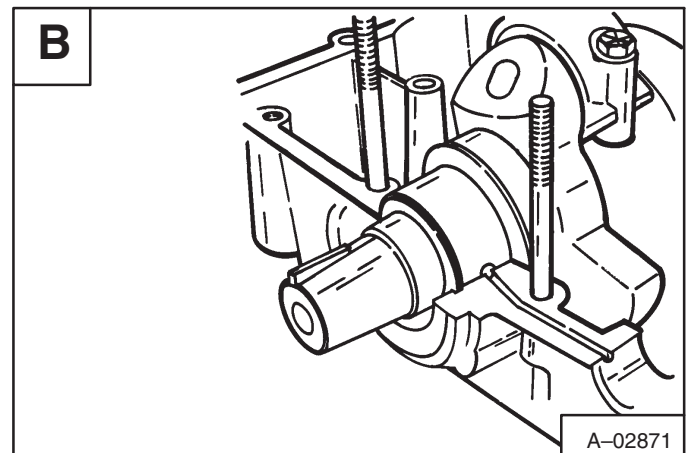
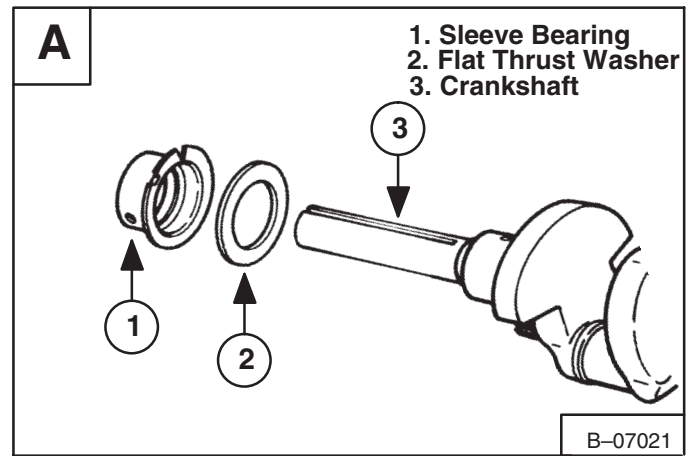
If the bearings are install correctly, the oil holes will make alignment with the channel in the crankcase [B].

Check the crankshaft and play using a feeler gauge [C].

The correct end play is as listed:  
0.002–0.014" (0,051–0,355 mm)

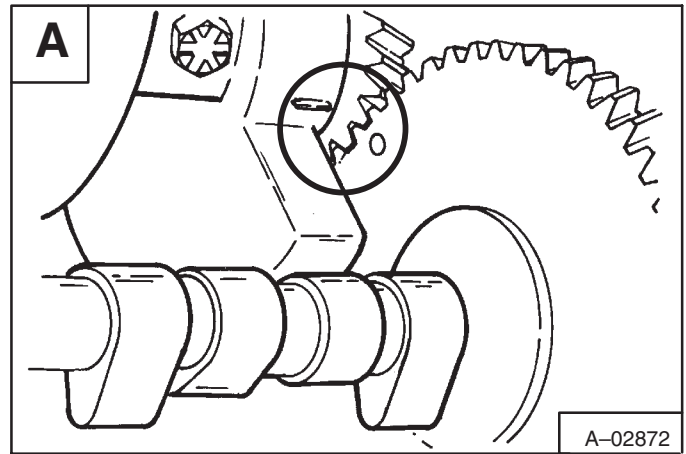
Replace the thrust washer to get the correct end play.

Lubricate the tappets and install them in their original bore. To keep the #2 side tappets from falling out, hook a spring between the tappets [D].



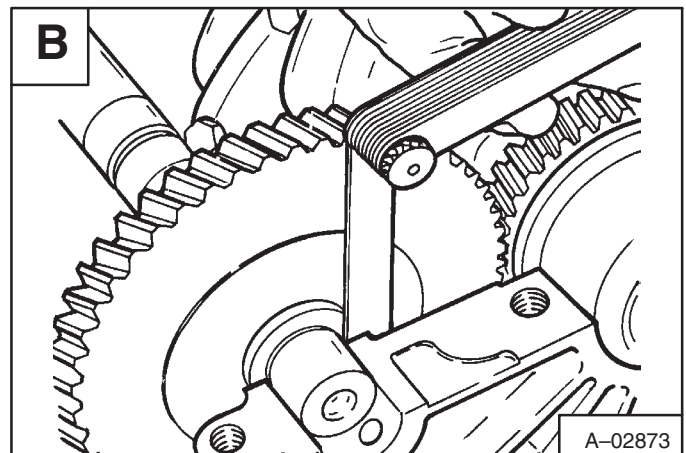
## RECONDITIONING THE ENGINE (Cont'd)

Install the camshaft. Make alignment of the timingmarks [A].



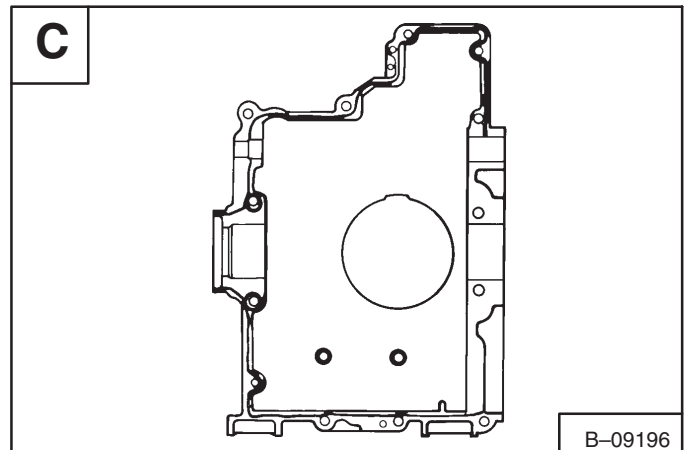
The correct camshaft end play is 0.003–0.013" (0,07–0,33 mm) [B].

**NOTE:** Starting with engine S/N 1917809296 & Above a new camshaft went into production. The new camshaft is marked with a 3/8" circle of orange dye. The camshaft kit (P/N 6654041) includes four tappets. The tappets with the kit require a setting of 0.003–0.006" (0,07–0,15 mm) Intake; 0.013–0.016" (0,33–0,41 mm) Exhaust. When replacing the new camshaft in engines prior to S/N 1917809295, a 30° exhaust valve and new valve seat insert must be installed (See Page 7–23a).



Make sure the crankcase sealing surfaces are clean. Put a bead (about 1/16" dia.) of sealant in the #2 half of the crankcase [C].

Be careful around the oil passages. Any sealant left in the oil passage will cause lack of lubrication.

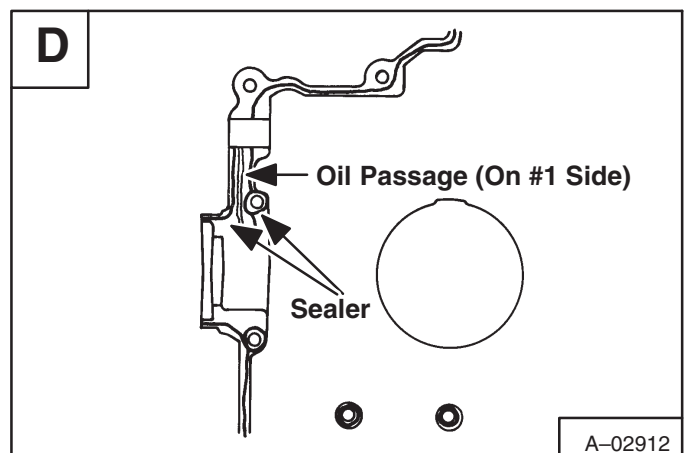


Put two beads (1/16" dia.) of sealant in the area between the camshaft bore and flywheel end main bearings [D].

**NOTE:** The fuel pump must be removed before installing the crankcase halves.

Hold the #2 connecting rod up. Install the #2 crankcase half.

Remove the #2 crankcase half and check for sealant in the oil passage. Then install the #2 half again.



## RECONDITIONING THE ENGINE (Cont'd)

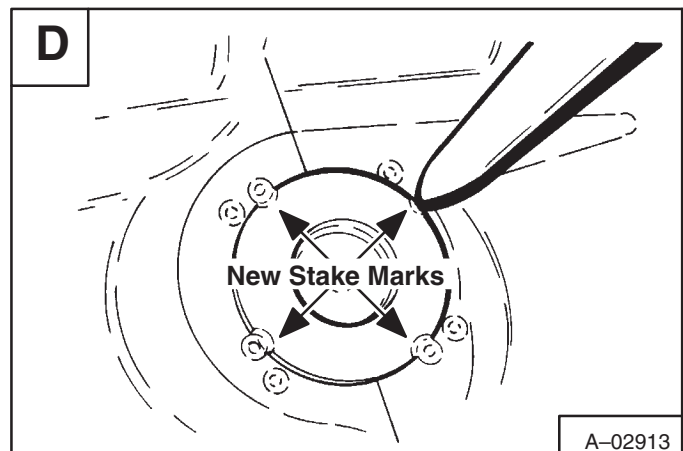
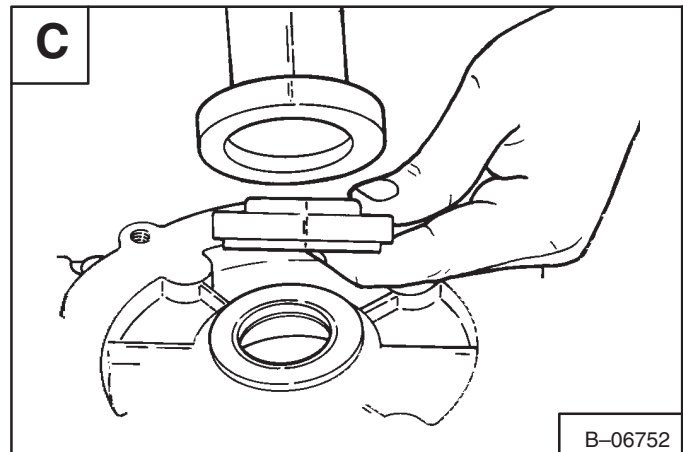
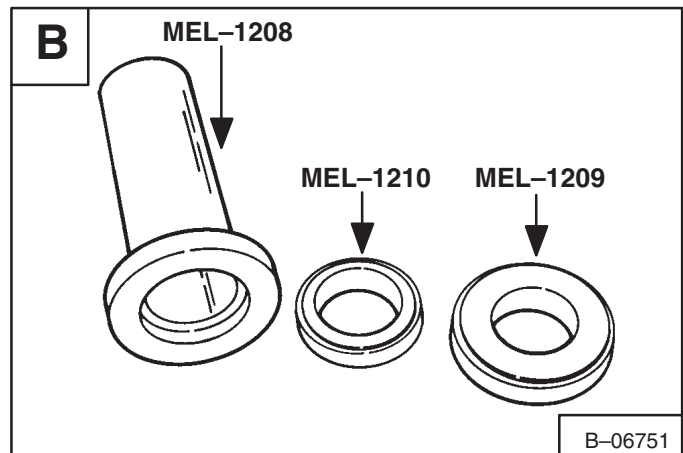
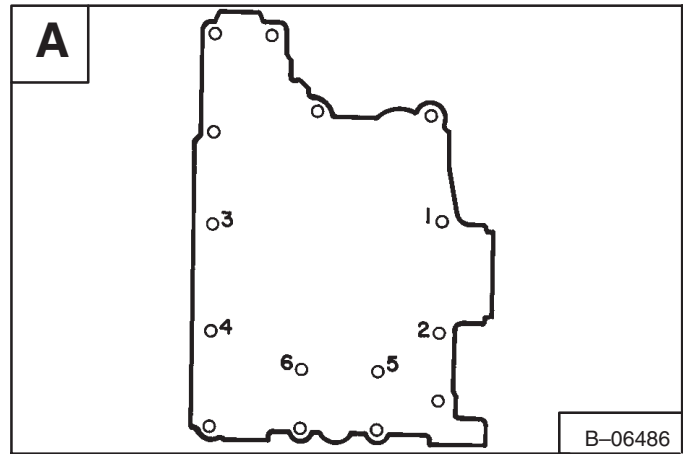
Install the bolts and nuts. Torque in the correct sequence [A].

Clean the excess sealant from the crankcase halves.

Using the seal driver (MEL-1208) and adapter (MEL-1209) [B]. Install the seal in therear closure plate to a depth of 0.1562" (3,97 mm) [C].

A machined plug is used with an O-ring to seal the camshaft bore. Make sure the camshaft bore has been reconditioned (See Page 7-14). Install the camshaft plug.

1. Inspect the plug and O-ring. Replace the plug if it is bent, cracked or damaged. Replace the O-ring.
2. Lubricate the O-ring. Start the plug into the bore, with your hand, until the plug shoulder "bottoms" against the crankcase surface.
3. Using a center punch, "stake" the plug in four locations 90° apart and away from previous deformed areas.

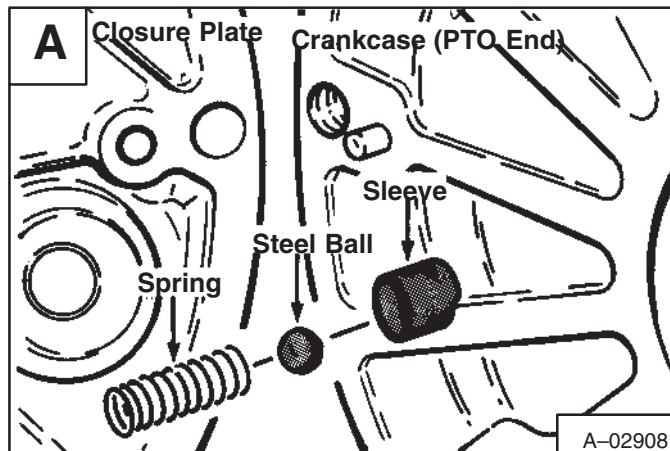


## RECONDITIONING THE ENGINE (Cont'd)

Check the free length of the spring for the oil pump relief valve.

The length must be  $0.94" \pm 0.010"$  ( $23,9 \text{ mm} \pm 0,254 \text{ mm}$ ). Replace the spring if the free length is not within specifications.

Install the steel sleeve, ball and spring into the machined hole in the PTO side of the crankcase [A].

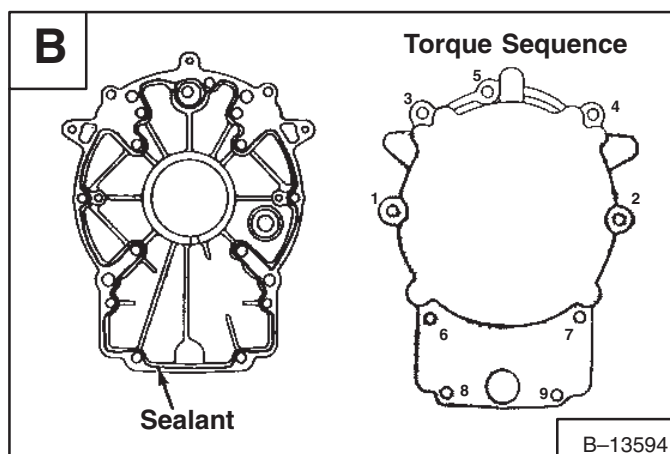


**NOTE:** Later production models use silicone sealant as a gasket between the closure plate and crankcase. Therefore, closure plates designed for use with gaskets cannot be installed using sealant; closure plates designed for use with sealant cannot be installed using a gasket.

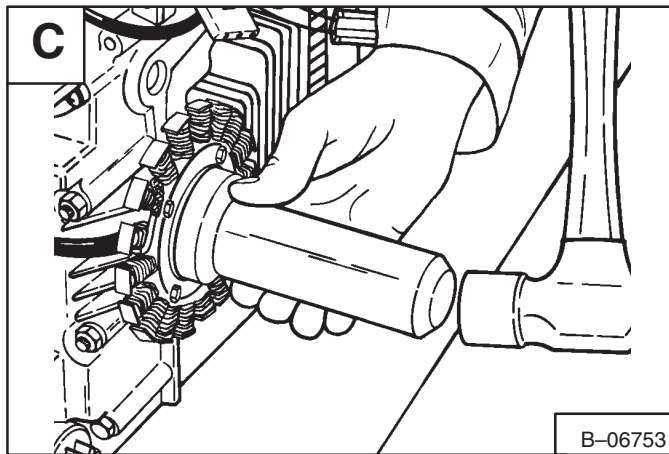
When installing a closure plate with gasket, always use a new gasket.

When installing a closure plate using sealant apply  $1/16"$  ( $1,6 \text{ mm}$ ) bead of sealant as shown in figure [B].

Install the closure plate and tighten the bolts in the correct sequence to 150 in.-lbs. (17 Nm) torque [B].



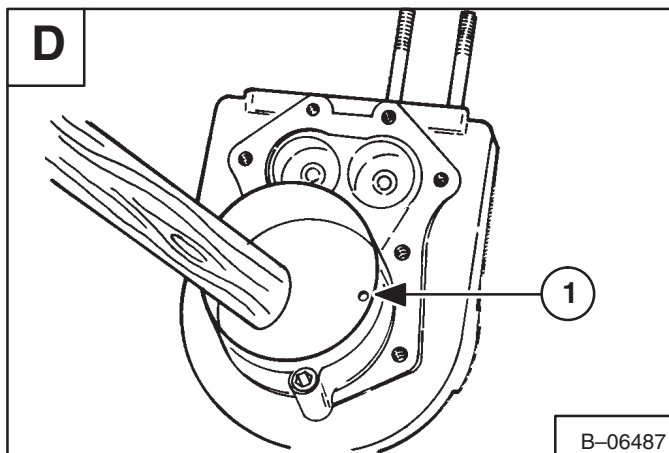
Use the seal driver (MEL-1208) and adapter (MEL-1210) and install the seal in the flywheel end of the engine to a depth of  $5/32"$  ( $3,97 \text{ mm}$ ) [C].



Install the rings on the piston. Move the rings on the pistons so the end gaps are not in alignment with each other.

Using a ring compressor, install the pistons into the cylinder bore [D].

The mark (Item 1) on the top of the piston must be toward the drive end of the crankcase [D].

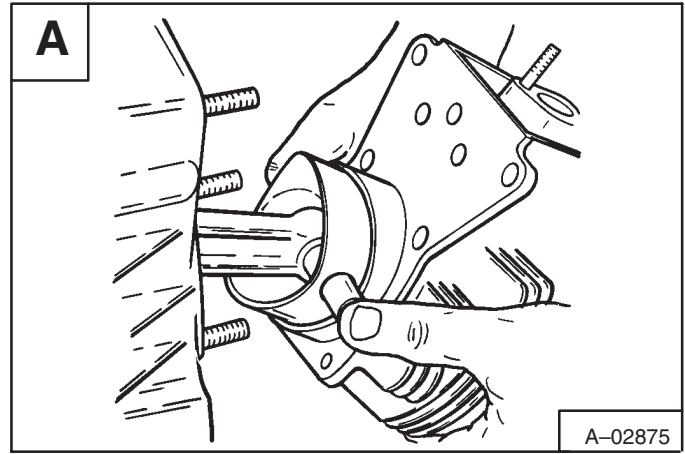


## RECONDITIONING THE ENGINE (Cont'd)

Install the gaskets on the cylinder barrel on the crankcase.

Install the piston and cylinder barrel assembly on the connecting rod using the piston pin and retainers [A].

**NOTE:** The oil drain back holes are not the same in the #1 and #2 cylinder barrels, so they are not interchangeable.



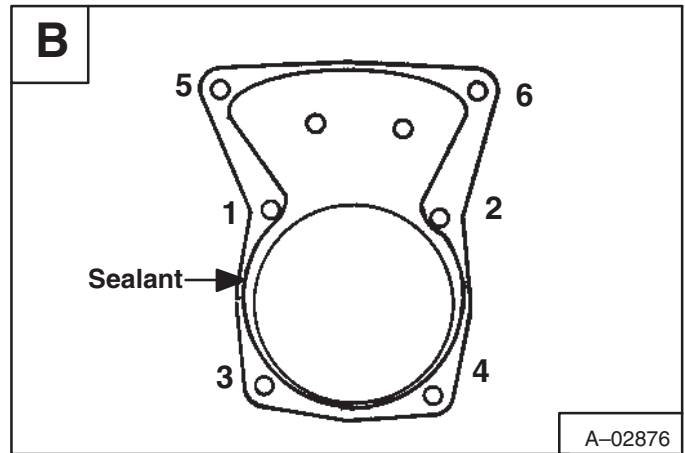
**NOTE:** Put a 1/16" bead of sealant on the crankcase as shown in figure [B].

Torque the nuts at the cylinder barrel in the correct sequence [B].

You must use an extension wrench. The correction factor is as follows with a 12" (305 mm) torque wrench:

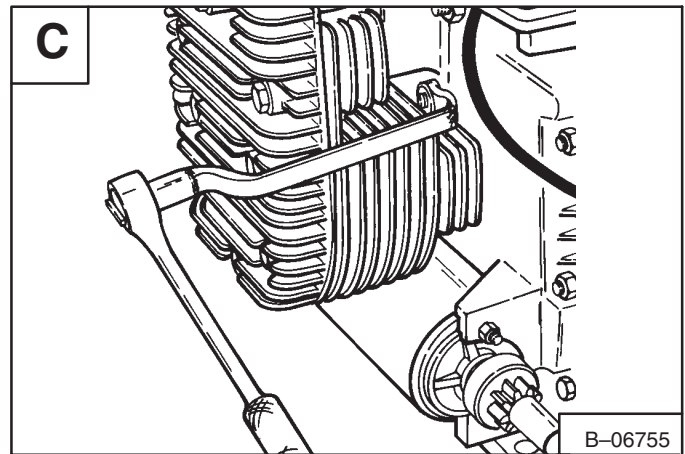
3" (76 mm) extension tighten to 210 in.-lbs. (24 Nm) torque.

2" (51 mm) extension tighten to 225 in.-lbs. (25 Nm) torque.



Lubricate the valve stems with oil. Install the valves into the guides.

Rotate the camshaft so the tappet does not touch the cam lobe. Hold the valve firmly on the seat and check the clearance at the valve stem and tappet [D].



### Intake Valves (Cold)

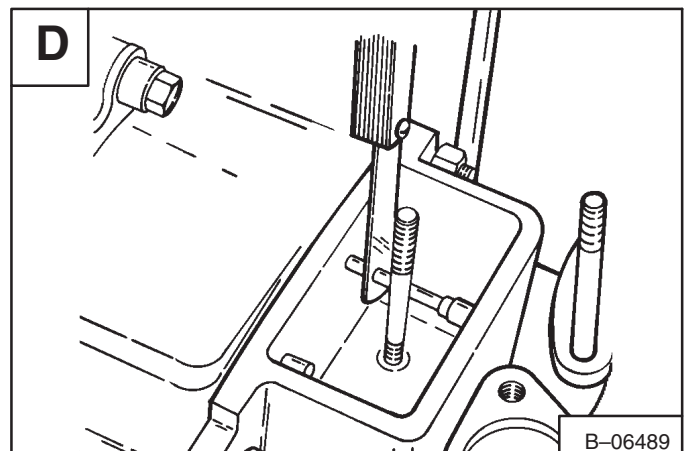
0.003–0.006" (0,076–0,15 mm)

### Exhaust Valves (Cold)

0.011–0.014" (0,279–0,355 mm)

If the clearance is not correct, remove the valve and grind the stem until the clearance is correct.

Install the valve seals. Using a spring compressor, install the valve springs (close coils toward cylinder head) and locks.

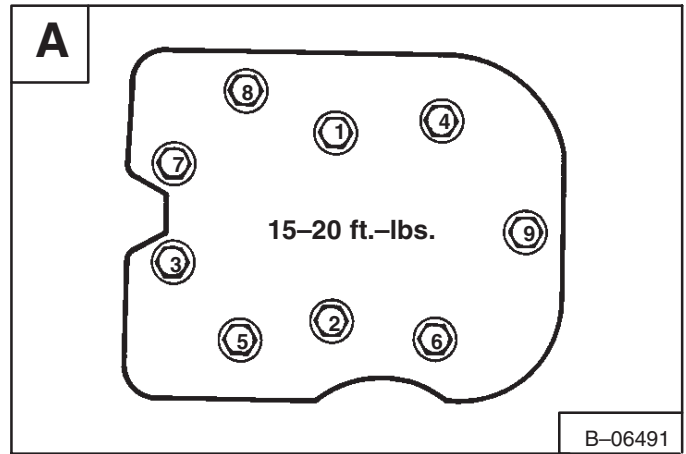


## RECONDITIONING THE ENGINE (Cont'd)

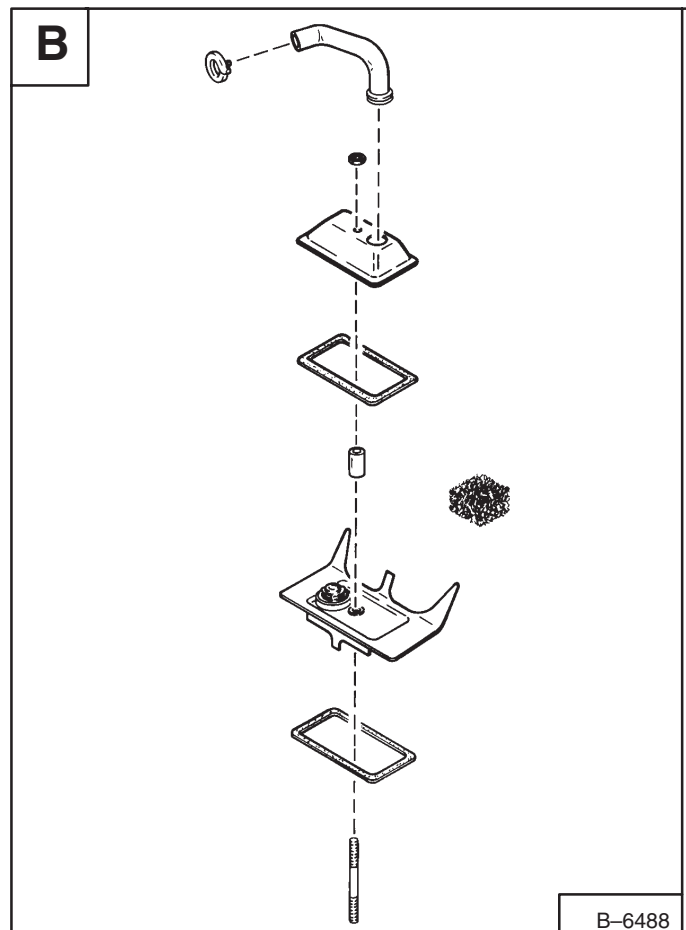
Install the bolts in the cylinder heads. Position the head gasket over the bolts.

Install the cylinder head and bolt assembly on the cylinder barrel.

Tighten the bolts in the correct sequence to 15–20 ft.-lbs. (20–27 Nm) torque **[A]**.



Install the breather assembly into the #1 side of the engine **[B]**.



Install the flywheel and tighten the bolt to 40 ft.-lbs. (54 Nm) torque **[C]**.

Install the air shrouding on the engine.

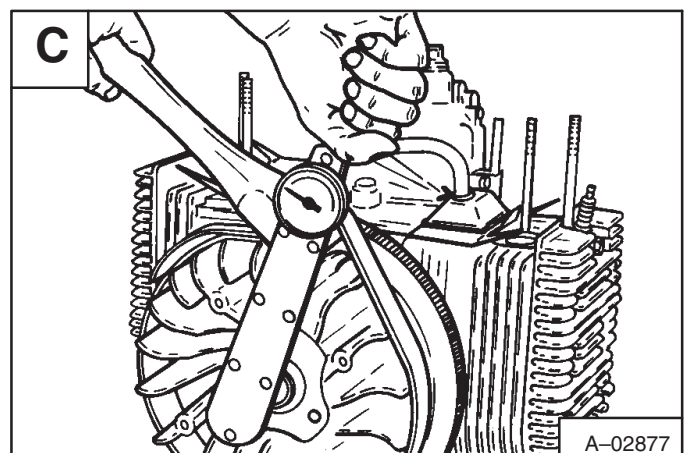
Install the starter and fuel pump.

Install the intake and exhaust manifold and tighten the bolts to 150 in.-lbs. (17 Nm) torque.

Connect the governor linkage.

See Page 3–19 and install the hydrostatic pumps on the mounting brackets.

Install the engine and hydrostatic assembly into the loader.



## CYLINDER HEAD

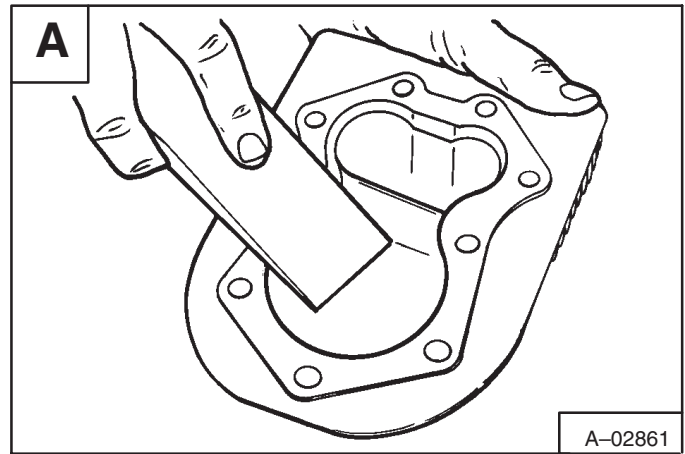
### Checking

Plugged cylinder head cooling fins can cause “hot spots” which can blow the head gasket. Clean the cylinder fins.

If the cylinder head is in good condition, use a block of wood to clean the carbon deposits [A].

Be careful not to scratch the aluminum head in the gasket seat area.

Check the cylinder head for being straight [B]. Use a surface plate and feeler gauge. If the head is more than 0.003” (0,08 mm) from being straight, replace the head.



## CYLINDER BARRELS

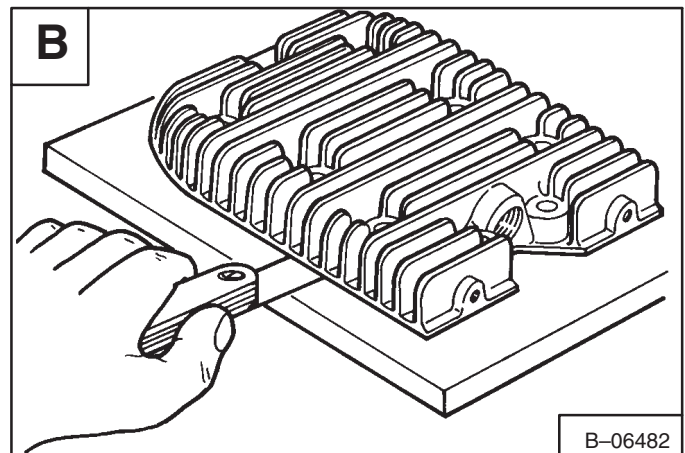
### Checking

Check all the gasket surfaces to make sure they are free of deep scratches. Check the cylinder bore for wear, tapered or out-of-round as listed in the below:

**New Bore Diameter 3.125” (79,375 mm)**  
**Max. Wear Dia.: 3.128” (79,45 mm)**  
**Max. Out-of-round: 0.002” (0,05 mm)**  
**Max. Taper: 0.0015” (0,03 mm)**

The cylinder bore can be bored oversize to 0.010” (0,254 mm), 0.020” (0,508 mm) and 0.030” (0,762 mm). Make sure to fit the correct oversize piston to the bore.

After boring or honing, clean the bore with warm water and soap. Dry the cylinder bore and lubricate with SAE 10 oil to prevent rust.











## VALVES (Engine S/N 1917809296 & Above)

### Checking

Carefully inspect valve parts. Check valves and valve seat area (or inserts) for deep pitting, cracks or distortion.

Check the clearance of the valve guides [A].

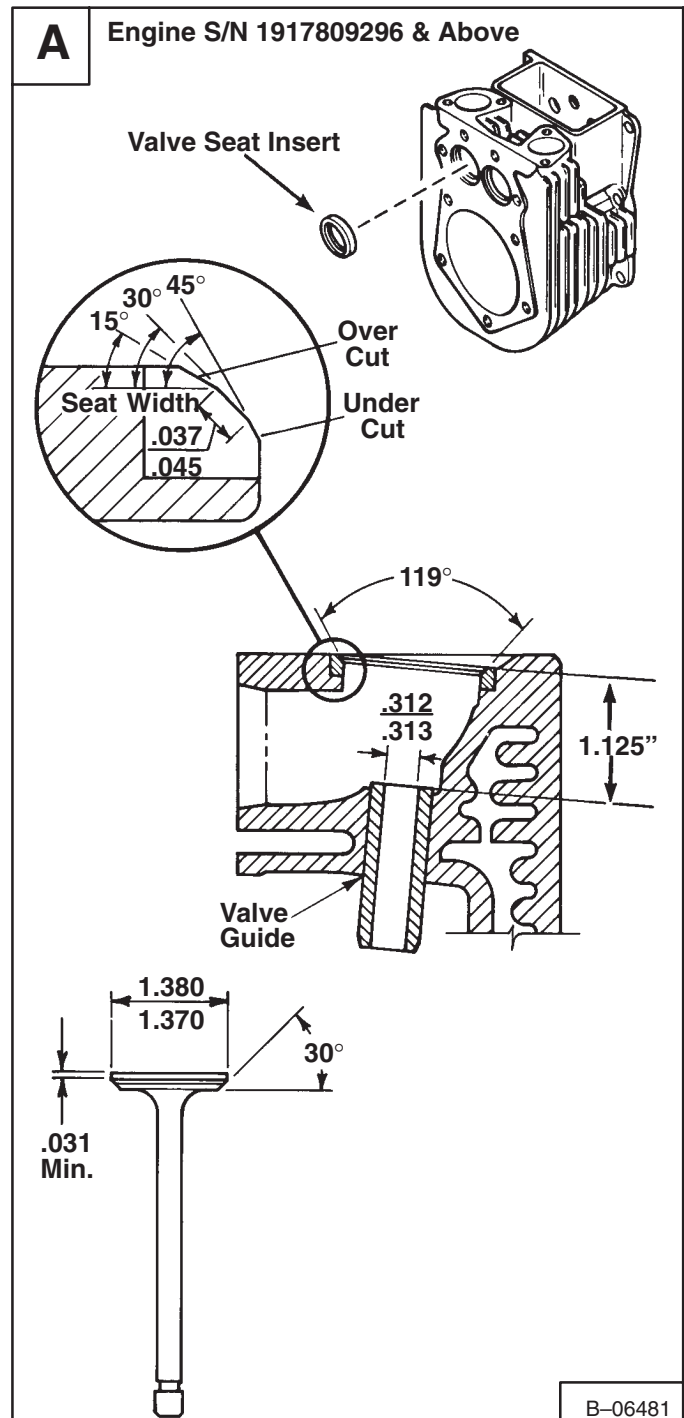
### VALVE SEAT INSERTS (Engine S/N 1917809296 & Above)

#### Removal and Installation

If the exhaust valve seat is pitted, cracked or distorted the insert must be replaced. Before removing the insert, measure the width of the insert so you can order the correct size.

Remove the insert with a seat removal tool. Make sure the new inserts are correctly seated in the bore so it is pressed in straight.

Grind the exhaust valve seat to the correct angle (See Engine Serial Number) [A].



## PISTON AND PISTON RINGS

### Checking

The ring replacement sets and pistons are available in standard size, 0.010" 0.020" and 0.030" oversize sets.

If the cylinder bore is within the wear limits and the piston is free of score or scuff marks, use it again.

The ring ridge must be removed and cylinder walls deglazed by honing.

Clean the ring grooves.

Check the ring end gap in the cylinder bore **[A]**.

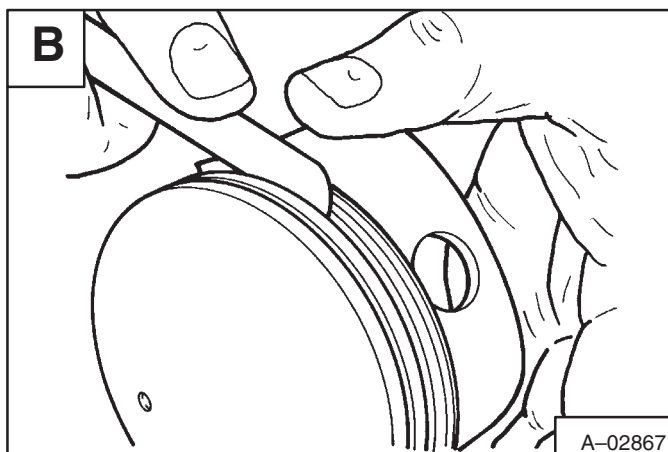
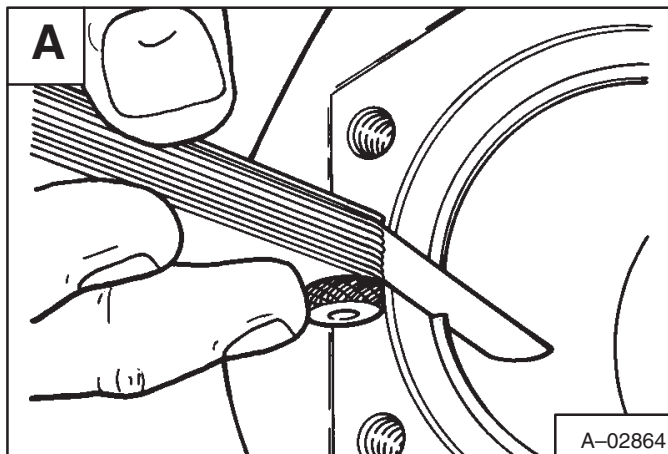
The gap must not exceed 0.030" (0,762 mm) used cylinder bore and 0.020" (0,508 mm) for a new cylinder bore.

Check side clearance on the rings in the piston groove **[B]**.

**Top Ring:** 0.002–0.004 (0,05–0,10 mm)

**Second Ring:** 0.001–0.003" (0,025–0,077 mm)

**Oil Ring:** 0.001–0.003" (0,025–0,077 mm)



## CRANKSHAFT AND CONNECTING RODS

### Checking

Inspect the gear teeth on both the crankshaft and camshaft. If they are worn, chipped or missing, replace the damaged component.

Inspect the crankshaft bearings. Do not replace the bearings unless they show damage or the clearances are not within limits:

#### Crankshaft Main Journals:

Minimum Dia. . . . . 1.7407" (44,22 mm)  
Running Clearance (Sleeve Bearing) . . 0.0013–0.0033"  
(0,034–0,083 mm)

#### Crankshaft Crankpin:

Max. Out-of-round . . . . . 0.005" (0,013 mm)  
Max. Taper . . . . . 0.001" (0,025 mm)  
New Dia. . . . . 1.3733–1.3738" (34,89–34,90 mm)

#### Connecting Rod:

Piston Pin Running 0.0006–0.0011" (0,016–0,027 mm)  
Side Play on Crankpin . 0.005–0.016" (0,13–0,41 mm)  
Crankpin Running . 0.0012–0.0022" (0,030–0,056 mm)  
Large End Bore Dia. (New) . . . . . 1.375–1.3755"  
(34,93–34,94 mm)  
Large End Bore Dia. (Max.) . . . . . 1.376" (34,950 mm)  
Small End Box (New) . . . . . 0.62565" (15,891 mm)

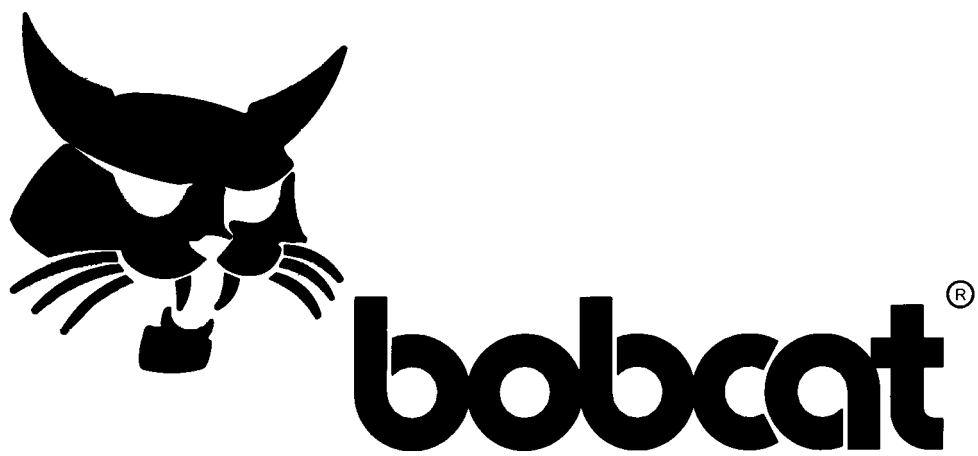
## GOVERNOR AND OIL PUMP

### Governor Inspection

Inspect the governor gear teeth. Check for worn, chipped or cracked teeth. If any of these problems are found, replace the governor.

### Oil Pump Inspection

Check the oil pump gear for cracks, chipped or worn teeth. Replace the gear if any of these problems are found. The oil pump rotors and shaft are trouble free and will require little service.



## TECHNICAL DATA

### Page Number

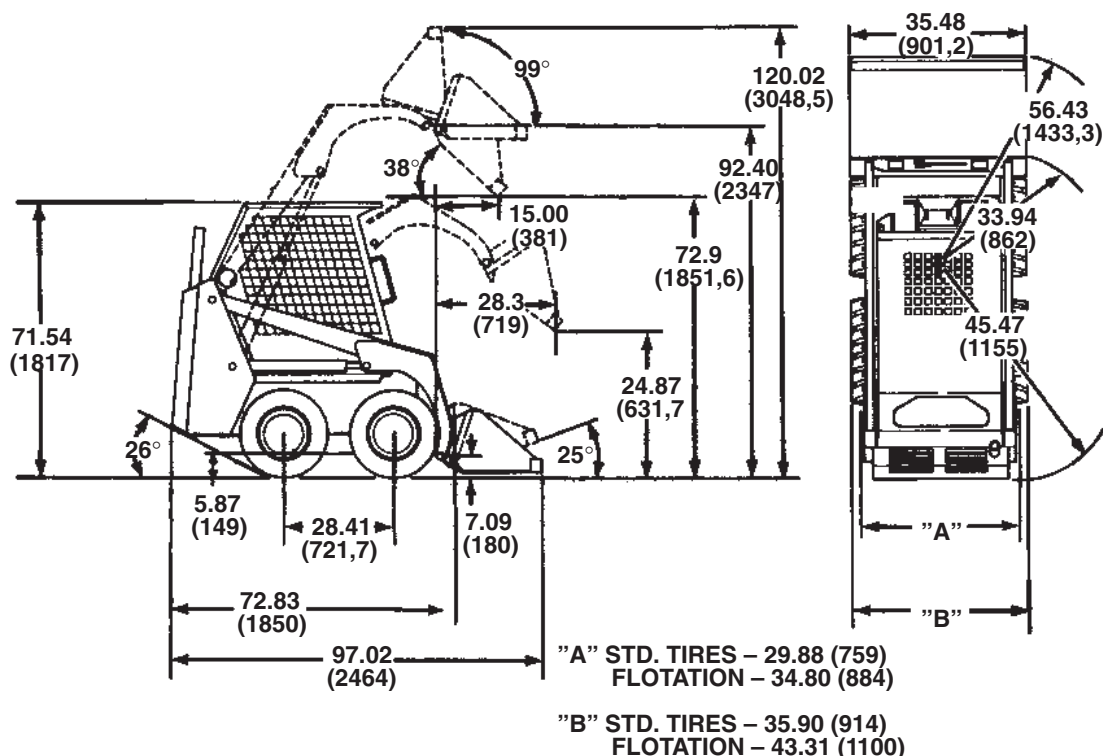
DECIMAL AND MILLIMETER EQUIVALENTS	8-6
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**TECHNICAL  
DATA**



## LOADER SPECIFICATIONS

- Dimensions are given for loader equipped with standard tires and dirt bucket. Dimensions may vary with other types. All dimensions are shown in inches. Respective metric dimensions are given in millimeters enclosed by parentheses.
- Where applicable, specifications conform to SAE standards and are subject to change without notice.



PI-02617

## OPERATIONS & PERFORMANCE

## Weights

Operating Weight	.....
Rated Operating Capacity (Melroe)	....
Tipping Load (SAE Rating)	.....

## 440B and FARMBOY

2195 lbs. (996 kg)  
600 lbs. (272 kg)  
1217 lbs. (552 kg)

## Travel Speed

Infinitely variable 0–5.2 MPH (8.4 km/hr)

## Controls

Vehicle .....  
 Loader .....  
 Engine .....  
 Main Drive .....  
 Parking Brake .....

Direction & speed controlled by two hand levers.  
Lift, tilt function controlled by separate foot pedals  
Hand lever throttle; key-type starter switch; pull cable choke.  
Hydrostatic  
Mechanical disc, foot operated pedal

## ENGINE

Make	.....
Model	.....
Fuel	.....
Horsepower	.....
Maximum Governed RPM	.....
Torque	.....
Number of Cylinders	.....
Bore/Stroke	.....
Displacement	.....
Cooling System	.....
Lubrication	.....
Crankcase Ventilation	.....
Air Cleaner	.....
Ignition	.....
High Idle	.....
Low Idle	.....

Kohler  
M18—QS  
Gasoline  
16.5 HP (12,3 kW) @ 3000 RPM  
3000 RPM  
30.5 ft.-lbs. (41,4 Nm) @ 2250 RPM  
Two  
3.125(79,4)/2.75(69,8)  
42.19 cu.in. (691,4 cm<sup>3</sup>)  
Air  
Pressure System  
External  
Dry replaceable cartridge, with foam Pre—Cleaner  
12 Volt, Electronic Magneto System  
3200 RPM  
1200 RPM



**LOADER SPECIFICATIONS (Cont'd)****LOADER HYDRAULICS**

Pump .....  
Pump Capacity .....  
System Relief Setting .....  
Filter .....

Engine driven, gear type  
6.8 GPM (25,7 L/min.) @ 3200 Engine RPM  
1350 PSI (9308 kPa)  
Full flow 10 micron replaceable cartridge in the charge line

**Hydraulic Cylinders**

Bore Diameter:  
Lift Cylinder (2) .....  
Tilt Cylinder (1) .....  
Rod Diameter:  
Lift Cylinder (2) .....  
Tilt Cylinder (1) .....  
Stroke:  
Lift Cylinder (2) .....  
Tilt Cylinder (1) .....

Doubleacting

2.0 (50,8)

3.0 (76,2)

1.0 (28,4)

1.25 (31,8)

21.88 (555,8)

10.94 (277,9)

Control Valve .....  
Fluid Lines .....

3–spool, open center, series type  
SAE standard tubes, hoses & fittings

**Hydraulic Function Time:**

Raise Lift Arms to Maximum Height ....  
Lower Lift Arms from Maximum Height .  
Move Bucket to Dump Position .....  
Move Bucket to Retracted Position .....

5.0 Seconds

4.0 Seconds

3.0 Seconds

2.5 Seconds

**ELECTRICAL**

Alternator .....  
Battery .....  
Starter .....

15 amp flywheel  
12 volt, 425 cold crank amps. @ 0°F (–17.8°C) 106 min. reserve capacity  
12 volt, gear drive

**DRIVE SYSTEM**

Transmission .....  
Final Drive .....  
Fluid Type .....

Tandem hydro. pumps driving 2 fully reversing hydro. motors  
#60 HS roller chains & sprockets in sealed chaincase with oil lub.  
Clark Bobcat Fluid (P/N 6563328) If fluid is not available, use  
10W–30 or 10W–40 Class SE Motor Oil for temperatures above 0° F (–18° C),  
use 5W–30 Motor Oil for temperatures below 0 F (–18° C).

**CAPACITIES**

Fuel .....  
Engine Lubrication .....  
Cooling System .....  
Hydraulic/Hydrostatic System .....  
Chaincase Reservoir .....

6.5 gals. (24,5 L)  
2.25 qts. (1,06 L)  
Air Cooled  
4.0 gal. (15,1 L) (includes 5.3 qts. (5,0) in the reservoir)  
4.0 gals. (15,1 L)

**TIRES**

Standard .....  
Pressure .....

5.70 x 12,4 Ply Rating  
40 PSI (276 kPa)

## ENGINE SPECIFICATIONS

*All dimensions are given in inches. Respective metric dimensions are given in millimeters enclosed by parentheses.*

### Engine (General)

Ignition Module Air Gap	0.008–0.012 (0,20–0,30)
Spark Plug Gap	0.035 (0,89)
Compression at Cranking Speed	90.PSI (621 kPa)
High Idle No Load	3200 RPM
Low Idle No Load	1200 RPM
Oil Pressure (Idle RPM)	25–50 PSI (172–345 kPa)

### Cylinder Bore

New Diameter	3.125 (79,38)
Wear Diameter (Maximum)	3.128 (79,45)
Taper (Maximum)	0.0015 (0,038)
Out-of-Round (Maximum)	0.002 (0,05)

### Crankshaft

End Play	0.002–0.014 (0,05–0,36)
Crankpin–New Diameter	1.3733–1.3738 (34,88–34,89)
Crankpin–Out-of-Round (Maximum)	0.0005 (0,013)
Crankpin–Taper (Maximum)	0.001 (0,025)
Sleeve Bearing–Running Clearance	0.0013–0.0033 (0,033–0,084)
Bearing Diameter (Minimum)	1.7407 (44,21)

### Camshaft

End Play	0.003–0.013 (0,076–0,33)
Shaft to Bearing Clearance	0.0010–0.0025 (0,025–0,064)

### Connecting Rod

Big End–New Diameter	1.375–1.3755 (34,93–34,94)
Big End–Wear Diameter (Maximum)	1.376 (34,95)
Small End–New Diameter	0.626 (15,89)
Rod to Piston Pin–Clearance	0.0006–0.0011 (0,015–0,028)
Side Play on Crankpin	0.005–0.016 (0,13–0,41)
Crankpin Running Clearance	0.0012–0.0022 (0,030–0,056)

### Piston, Pin & Rings

*Thrust Face–Wear Diameter (Maximum)	3.1165 (79,16)
*Thrust Face to Bore Running (@ Gauge Dia.)	0.006–0.008 (0,15–0,20)
Ring Side Clearance–Top	0.002–0.004 (0,51–0,10)
Second & Oil	0.001–0.003 (0,025–0,076)
Ring–End Gap	0.010–0.020 (0,25–0,51)
Wrist Pin to Boss (Maximum)	0.0003 (0,008)
Wrist Pin to Rod	0.0006–0.0011 (0,015–0,028)

### Valves, Guides & Tappets

Intake Valve to Tappet Clearance (Cold)	0.003–0.006 (0,076–0,15)
Exhaust Valve to Tappet Clearance (Cold) (45°)	0.011–0.014 (0,28–0,36)
(30°)	0.013–0.016 (0,33–0,41)
Valve Lift – Zero Clearance	0.280 (7,11)
Intake Valve Stem to Guide (Maximum)	0.0045 (0,114)
Exhaust Valve Stem to Guide (Maximum)	0.0065 (0,17)
Tappet Clearance in Guide (Maximum)	0.005–0.0024 (0,013–0,060)
Valve Guide Interference Fit	0.002–0.005 (0,05–0,13)
Valve Guide Ream Diameter	0.312–0.313 (7,925–7,950)

\*Measured just below oil ring at right angles to the pin.

ENGINE SPECIFICATIONS (Cont'd)

All dimensions are given in inches. Respective metric dimensions are given in millimeters enclosed by parentheses.

Oil Pump

Pump Shaft to Crankcase Running	0.0010–0.0025 (0,025–0,064)
Pump Drive Gear End Play	0.010–0.029 (0,254–0,737)
Relief Spring Length	0.94.0.010 (23,9–0,25)

Engine Torque

Spark Plug	10–15 ft.–lbs. (14–20 Nm)
Governor Stop Pin	70 in.–lbs. (8 Nm)
Connecting Rod Nut	
New	140 in.–lbs. (16 Nm)
Used	100 in.–lbs. (11 Nm)
Crankcase Halves Bolts	260 in.–lbs. (29 Nm)
	200 in.–lbs. (23 Nm)
Rear Closure Plate Bolts	150 in.–lbs. (17 Nm)
Cylinder Barrel Nuts	
3" (76 mm) Extension	210 in.–lbs. (24 Nm)
2" (51 mm) Extension	225 in.–lbs. (25 Nm)
Cylinder Head Bolt	15–20 ft.–lbs. (20–27 Nm)
Flywheel Bolts	40 ft.–lbs. (54 Nm)
Intake & Exhaust Manifold Bolt	150 in.–lbs. (17 Nm)

## HYDRAULIC/HYDROSTATIC FLUID SPECIFICATIONS

### Hydraulic/Hydrostatic Fluid

Use Melroe hydraulic/hydrostatic transmission fluid (P/N 6563328). If this fluid is not available, use 10W-30 or 10W-40 SAE Motor Oil.

DO NOT use automatic transmission fluids in this loader or permanent damage to the transmission will result.

Where temperatures below zero are common, the loader must be kept in a warm building. Extra warm-up time must be used each time the loader is started during cold temperature conditions. Cold fluid will not flow easily and it makes action of the hydraulic function slower. Loss of fluid flow to the hydrostatic transmission pump will cause transmission damage in less than 60 seconds time.

## DECIMAL AND MILLIMETER EQUIVALENTS

FRACTIONS	DECIMALS	MM
	1/64 —	0.015625 —
1/32 —	0.03125 —	0.794
	3/64 —	0.046875 —
1/16 —	0.0625 —	1.588
	5/64 —	0.078125 —
3/32 —	0.09375 —	2.381
	7/64 —	0.109375 —
1/8 —	0.1250 —	3.175
	9/64 —	0.140625 —
5/32 —	0.15625 —	3.969
	11/64 —	0.171875 —
3/16 —	0.1875 —	4.762
	13/64 —	0.203125 —
7/32 —	0.21875 —	5.556
	15/64 —	0.234375 —
1/4 —	0.2500 —	6.350
	17/64 —	0.265625 —
9/32 —	0.28125 —	7.144
	19/64 —	0.296875 —
5/16 —	0.3125 —	7.938
	21/64 —	0.328125 —
11/32 —	0.34375 —	8.731
	23/64 —	0.359375 —
3/8 —	0.3750 —	9.525
	25/64 —	0.390625 —
13/32 —	0.40625 —	10.319
	27/64 —	0.421875 —
7/16 —	0.4375 —	11.112
	29/64 —	0.453125 —
15/32 —	0.46875 —	11.906
	31/64 —	0.484375 —
1/2 —	0.5000 —	12.700

1 mm = 0.03937"

FRACTIONS	DECIMALS	MM
	33/64 —	0.515625 —
17/32 —	0.53125 —	13.097
	35/64 —	0.546875 —
9/16 —	0.5625 —	13.494
	37/64 —	0.578125 —
19/32 —	0.59375 —	13.891
	39/64 —	0.609375 —
5/8 —	0.6250 —	14.288
	41/64 —	0.640625 —
21/32 —	0.65625 —	14.684
	43/64 —	0.671875 —
11/16 —	0.6875 —	15.081
	45/64 —	0.703125 —
23/32 —	0.71875 —	15.478
	47/64 —	0.734375 —
3/4 —	0.7500 —	15.875
	49/64 —	0.765625 —
25/32 —	0.78125 —	16.272
	51/64 —	0.796875 —
13/16 —	0.8125 —	16.669
	53/64 —	0.828125 —
27/32 —	0.84375 —	17.066
	55/64 —	0.859375 —
7/8 —	0.8750 —	17.462
	57/64 —	0.890625 —
29/32 —	0.90625 —	17.859
	59/64 —	0.921875 —
15/16 —	0.9375 —	18.256
	61/64 —	0.953125 —
31/32 —	0.96875 —	18.653
	63/64 —	0.984375 —
1 —	1.000 —	19.050
		19.447
		19.844
		20.241
		20.638
		21.034
		21.431
		21.828
		22.225
		22.622
		23.019
		23.416
		23.812
		24.209
		24.606
		25.003
		25.400

0.001" = 0.0254 mm

## U.S. TO METRIC CONVERSION

	TO CONVERT	INTO	MULTIPLY BY
<b>LINEAR MEASUREMENT</b>	Miles	Kilometers	1.609
	Yards	Meters	0.9144
	Feet	Meters	0.3048
	Feet	Centimeters	30.48
	Inches	Meters	0.0254
	Inches	Centimeters	2.54
	Inches	Millimeters	25.4
<b>AREA</b>	Square Miles	Square Kilometers	2.59
	Square Feet	Square Meters	0.0929
	Square Inches	Square Centimeters	6.452
	Acre	Hectare	0.4047
<b>VOLUME</b>	Cubic Yards	Cubic Meters	0.7646
	Cubic Feet	Cubic Meters	0.02832
	Cubic Inches	Cubic Centimeters	16.39
<b>WEIGHT</b>	Tons (Short)	Metric Tons	0.9078
	Pounds	Kilograms	0.4536
	Ounces (Avdp.)	Grams	28.3495
<b>PRESSURE</b>	Pounds/Sq. In.	Kilopascal	6.895
<b>WORK</b>	Foot-Pounds	Newton-Meter	1.356
<b>LIQUID VOLUME</b>	Quarts	Liters	0.9463
	Gallons	Liters	3.785
<b>LIQUID FLOW</b>	Gallons/Minute	Liters/Minute	3.785
<b>TEMPERATURE</b>	Fahrenheit	Celsius	1. Subtract 32°
			2. Multiply by 5/9

## STANDARD TORQUE SPECIFICATIONS FOR BOLTS

The following table shows standard torque specifications for bolts with zinc phosphate coating. Bolts purchased from Melroe that have zinc phosphate coating are specified by the letter "H" following the part number.

THREAD SIZE		SAE GRADE 5	SAE GRADE 8
INCH. LBS. (Nm)	.250	80–90 (9–10)	110–120 (13–14)
	.3125	180–200 (21–23)	215–240 (24–27)
FOOT LBS. (Nm)	.375	25–28 (34–38)	35–40 (48–54)
	.4375	40–45 (54–61)	60–65 (82–88)
	.500	65–70 (88–95)	90–100 (125–135)
	.5625	90–100 (125–135)	125–140 (170–190)
	.625	125–140 (170–190)	175–190 (240–260)
	.750	220–245 (300–330)	300–330 (410–450)
	.875	330–360 (450–490)	475–525 (645–710)
	1.000	475–525 (645–710)	725–800 (985–1085)
	1.125	650–720 (880–975)	1050–1175 (1425–1600)
	1.250	900–1000 (1200–1360)	1475–1625 (2000–2200)
	1.375	1200–1350 (1630–1830)	2000–2200 (2720–2980)
	1.500	1500–1650 (2040–2240)	2600–2850 (3530–3870)
	1.625	2000–2800 (2720–2980)	3450–3800 (4680–5150)
	1.750	2500–2750 (3390–3730)	4300–4800 (5830–6500)
	1.875	3150–3500 (4270–4750)	5500–6100 (7450–8300)
	2.000	3800–4200 (5150–5700)	6500–7200 (8800–9800)



**MELROE  
INGERSOLL-RAND**



# SERVICE MANUAL REVISION

<b>FB-1</b>
Revision Number
<b>10 February 1986</b>
Date

## ROUTE TO ATTENTION

PARTS MANAGER	<input type="checkbox"/>
SERVICE MANAGER	<input checked="" type="checkbox"/>
SALES MANAGER	<input type="checkbox"/>

### AFFECTING:

Product BOBCAT LOADER

Model Farmboy

Manual No. 6570160

## NOTICE

Insert This Sheet With The Above Listed Manual For Future Reference.

The following pages are a revision to the above Service Manual.

Take out existing pages and put in the new pages as listed below:

### TAKE OUT

iii, iv  
1-7, 1-8  
2-19, 2-20  
5-3, 5-4  
6-3, 6-4  
Engine Service Tab Page  
7-5, 7-6  
7-15, 7-16  
7-25

### PUT IN

iii, iv (Revised Feb. 86)  
1-7 (Revised Feb. 86), 1-8 (Revised Feb. 86)  
2-19, 2-20 (Revised Feb. 86)  
5-3 (Revised Feb. 86), 5-4 (Revised Feb. 86)  
6-3, 6-4 (Revised Feb. 86)  
Engine Service Tab Page (Revised Feb. 86)  
7-5 (Revised Feb. 86), 7-6 (Revised Feb. 86)  
7-6a (Added Feb. 86)  
7-15 (Revised Feb. 86), 7-16  
7-25 (Revised Feb. 86)

Add complete Section 8 to the back of the Service Manual





**MELROE  
INGERSOLL-RAND**



# SERVICE MANUAL REVISION

**AFFECTING:**

Product BOBCAT LOADER

Model Farmboy

Manual No. 6570160

**FB-2**

Revision Number

**17 September 86**

Date

## ROUTE TO ATTENTION

PARTS MANAGER ☐

SERVICE MANAGER ☒

SALES MANAGER ☐

## NOTICE

Insert This Sheet With The Above Listed Manual For Future Reference.

The following pages are a revision to the above Service Manual.

Take out existing pages and put in the new pages as listed below:

### TAKE OUT

2-19, 2-20 (Revised Feb. 86)

### PUT IN

2-19, 2-20 (Revised Sept. 86)



**MELROE  
INGERSOLL-RAND**



# SERVICE MANUAL REVISION

440B/FB-3

Revision Number

13 January 1987

Date

## ROUTE TO ATTENTION

PARTS MANAGER ☐

SERVICE MANAGER ☒

SALES MANAGER ☐

### AFFECTING:

Product BOBCAT LOADER

Model Farmboy

Manual No. 6570160 (8-85)

## NOTICE

Insert This Sheet With The Above Listed Manual For Future Reference.

The following pages are a revision to the above Service Manual.

Take out existing pages and put in the new pages as listed below:

### TAKE OUT

Cover-6570160 (8-85)

iii, iv (Revised Feb. 86)

1-5, 1-6

HYDRAULIC/HYDROSTATIC FLOW CHART  
(Printed Aug. 85)

LOADER WIRING DIAGRAM (Printed Aug. 85)

8-1 (Added Feb. 86), 8-2 (Added Feb 86)

### PUT IN

Cover-6570160 (1-87)

iii (Revised Jan. 87), iv (Revised Jan. 87)

1-5 (Revised Jan. 87), 1-6 (Revised Jan. 87)

HYDRAULIC/HYDROSTATIC FLOW CHART  
(Printed Jan. 87)

LOADER WIRING DIAGRAM (Printed Jan. 87)

8-1 (Revised Jan. 87), 8-2 (Revised Jan. 87)



**MELROE  
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# SERVICE MANUAL REVISION

**440B/FB-4**

Revision Number

**26 September 1988**

Date

## ROUTE TO ATTENTION

PARTS MANAGER ☐

SERVICE MANAGER ☒

SALES MANAGER ☐

### AFFECTING:

Product BOBCAT LOADER

Model 440B, Farmboy

Manual No. 6570160 (1-87)

## NOTICE

Insert This Sheet With The Above Listed Manual For Future Reference.

The following pages are a revision to the above Service Manual.

Take out existing pages and put in the new pages as listed below:

### TAKE OUT

3-19, 3-20

Loader Wiring Diagram (Printed Jan. 1987)

Engine Service-Tab Page (Revised Feb. 86)

7-5 (Revised Feb. 86), 7-6 (Revised Feb. 86)

### PUT IN

3-19 (Revised Sept. 88), 3-20

Wiring Diagram (P/N 6570924) (Printed Sept. 1988)

Engine Service-Tab Page (Revised Sept. 88)

7-5 (Revised Feb. 86), 7-5a (Added Sept. 88)

7-5b (Added Sept. 88), 7-5c (Added Sept. 88)

7-5d (Added Sept. 88), 7-6 (Revised Feb. 86)



**MELROE  
INGERSOLL-RAND**



# SERVICE MANUAL REVISION

**440B/FB-5**

Revision Number

**13 December 1989**

Date

## ROUTE TO ATTENTION

PARTS MANAGER

☐

SERVICE MANAGER

☒

SALES MANAGER

☐

### AFFECTING:

Product **BOBCAT LOADER**

Model **440B, Farmboy**

Manual No. **6570160 (1-87)**

## NOTICE

Insert This Sheet With The Above Listed Manual For Future Reference.

The following pages are a revision to the above Service Manual.

Take out existing pages and put in the new pages as listed below:

### TAKE OUT

Engine Service Tab Page (Revised Sept. 88)

7-6a (Added Feb. 86)

7-17, 7-18

7-23, 7-24

8-3 (Revised Feb. 86), 8-4 (Revised Feb. 86)

### PUT IN

Engine Service Tab Page (Revised Dec. 89)

7-6a (Added Feb. 86), 7-6b (Added Dec. 89)

7-17 (Revised Dec. 89), 7-18 (Revised Dec. 89)

7-23 (Revised Dec. 89), 7-23a (Added Dec. 89),  
7-24 (Revised Dec. 89)

8-3 (Revised Dec. 89), 8-4 (Revised Dec. 89)





**MELROE  
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# SERVICE MANUAL REVISION

**440B/FB-6**

Revision Number

**7 June 1991**

Date

## ROUTE TO ATTENTION

PARTS MANAGER ☐

SERVICE MANAGER ☒

SALES MANAGER ☐

### AFFECTING:

Product BOBCAT LOADER

Model 440B, Farmboy

Manual No. 6570160 (1-87)

## NOTICE

Insert This Sheet With The Above Listed Manual For Future Reference.

The following pages are a revision to the above Service Manual.

Take out existing pages and put in the new pages as listed below:

### TAKE OUT

ENGINE SERVICE-TAB PAGE (Revised Dec. 89)  
7-5d (Added Sept. 88), 7-6 (Revised Feb. 86)  
7-19, 7-20

8-1 (Revised Jan. 87), 8-2 (Revised Jan 87)

### PUT IN

ENGINE SERVICE-TAB PAGE (Revised June 91)  
7-5d (Revised June 91), 7-6 (Revised June 91)  
7-19 (Revised June 91), 7-20 (Revised June 91)

8-1 (Revised Jan. 87), 8-2 (Revised June 91)





# SERVICE MANUAL REVISION

## ROUTE TO ATTENTION

PARTS MANAGER	<input type="checkbox"/>
SERVICE MANAGER	<input checked="" type="checkbox"/>
SALES MANAGER	<input type="checkbox"/>

## NOTICE

Insert This Sheet With The Below Listed Manual For Future Reference.

Revision No: 440B/FB-7  
Date: 15 June 2012  
Product: Bobcat Loader  
Model: 440B/Farmboy  
Manual No: 6570160 (1-87)

The following Sections are a revision to the above Service Manual.

COVER



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