873

Service Manual

EQUIPPED WITH
BOBCAT INTERLOCK
CONTROL SYSTEM (BICS™)

MELROE COMPANY
A BUSINESS UNIT OF CLARK EQUIPMENT COMPANY
6724280 (8–95)

Printed in U.S.A.

bobcat

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MAINTENANCE SAFETY

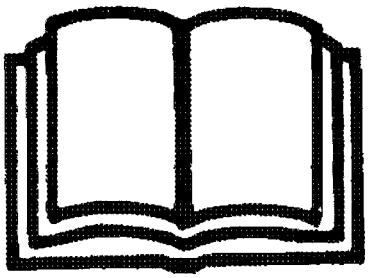
⚠ WARNING

Instructions are necessary before operating or servicing machine. Read 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. Failure to follow instructions can cause injury or death.

W–2003–1089

⚠ **Safety Alert Symbol: This symbol is used for important safety messages. When you see this symbol, follow the safety message to avoid personal injury or death.**

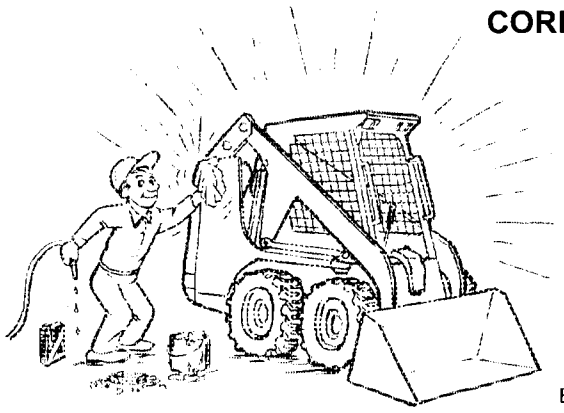
CORRECT



B–10731

⚠ **Never service the Bobcat loader without instructions.**

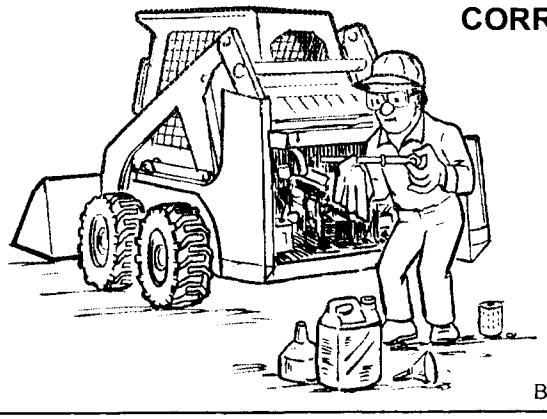
CORRECT



B–13561

⚠ **Cleaning and maintenance is required daily.**

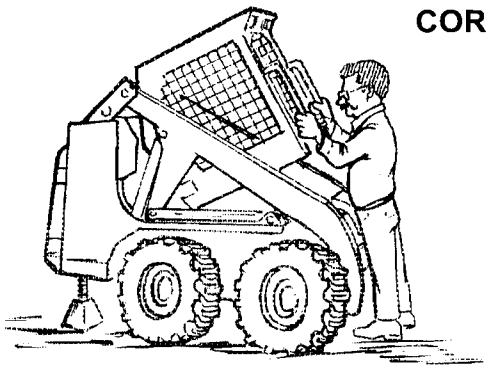
CORRECT



B–13562

⚠ **Keep rear door closed except for service. Close and latch door before operating loader.**

CORRECT

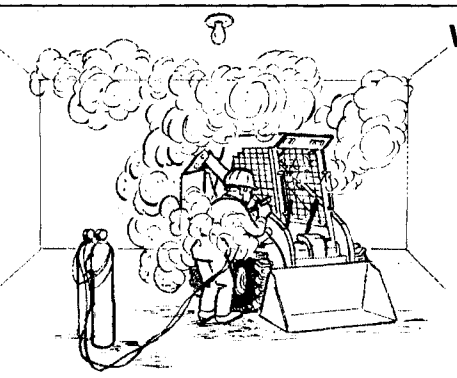


B–13573

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

⚠ **Follow the correct operator cab lifting and lowering procedure shown for this model.**

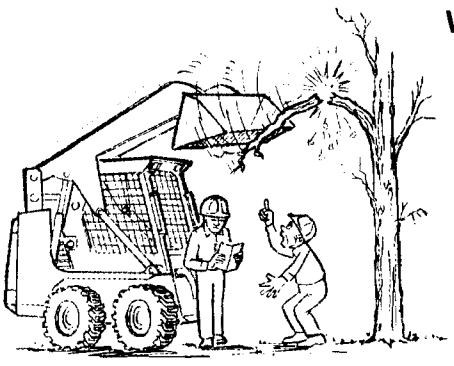
WRONG



B–13574

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

WRONG



B–13575

⚠ **Never work on loader with lift arms up unless lift arms are held by a lift arm support device.**

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

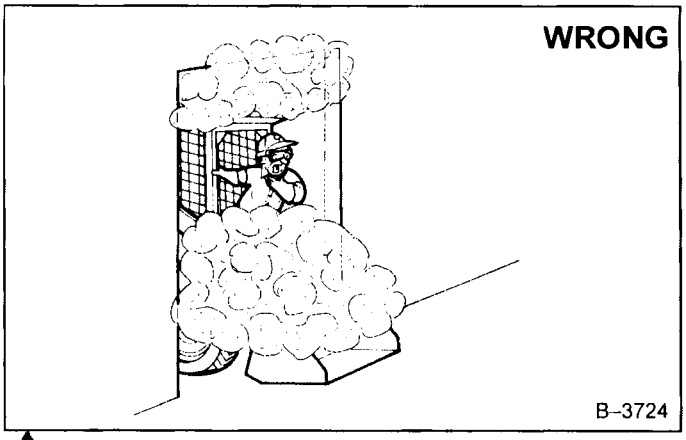
MAINTENANCE SAFETY (Cont'd)

⚠ WARNING

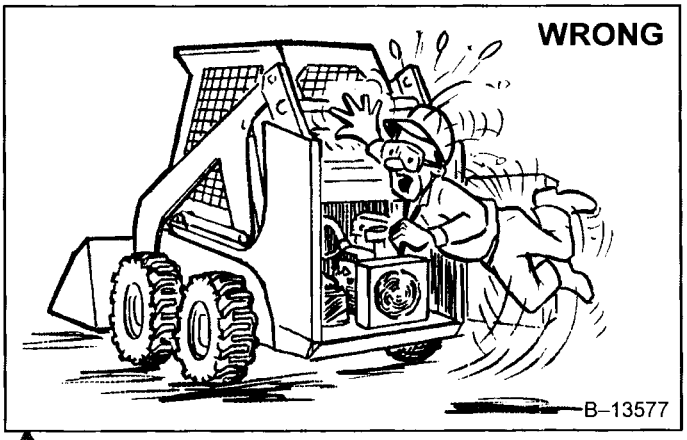
Instructions are necessary before operating or servicing machine. Read Operation & Maintenance Manual, Handbook and signs (decals) on machine. Follow warnings and instructions in the manuals when making repairs, adjustments or servicing. Check for correct function after adjustments, repairs or service.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

W–2003–1089

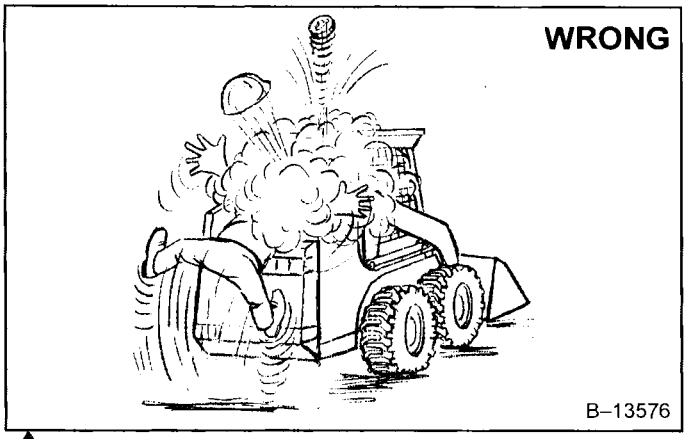
⚠ **Safety Alert Symbol: This symbol is used for important safety messages. When you see this symbol, follow the safety message to avoid personal injury or death.**



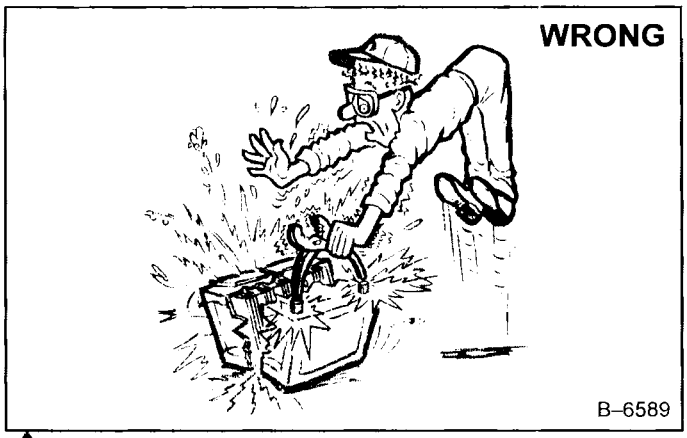
⚠ Vent exhaust to outside when engine must be run for service.
⚠ Avoid exhaust fume leaks which can kill without warning. Exhaust system must be tightly sealed.



⚠ Keep body, loose objects and clothing away from moving parts, electrical contacts, 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.



⚠ 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 fluids or diesel fuel which is under pressure. It can penetrate the skin or eyes.
⚠ Never fill fuel tank with engine running, while smoking or when near open flame.



⚠ 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.

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CALIFORNIA
PROPOSITION 65 WARNING

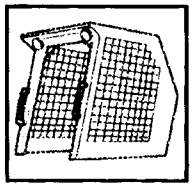
Diesel engine exhaust and some of its constituents are known to the State of California to cause cancer, birth defects and other reproductive harm.

FOREWORD

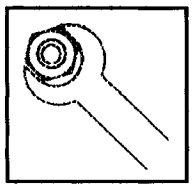
This manual is for the Bobcat loader mechanic. It provides necessary servicing and adjustment procedures for the Bobcat loader and its component parts and systems. Refer to the Operation & Maintenance Manual for operating instructions, starting procedure, daily checks, etc.

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

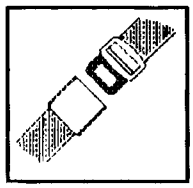
1. Check that the ROPS/FOPS (Including sidescreens) is in good condition and is not modified.



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



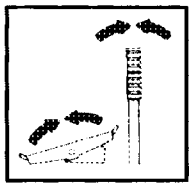
3. The seat belt must be correctly installed, functional and in good condition.



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

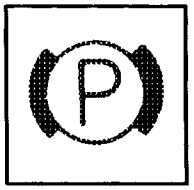
5. Machine signs must be legible and in the correct location.

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

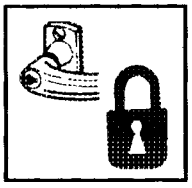


7. Check for correct funtion of the work lights.

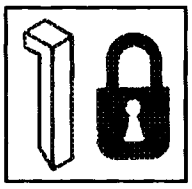
8. The parking brake must function correctly.



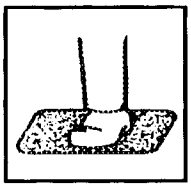
9. Enclosure door latches must open and close freely.



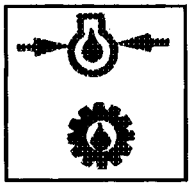
10. Bob–Tach wedges and linkages must function correctly and be in good condition.



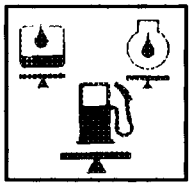
11. Safety treads must in good condition.



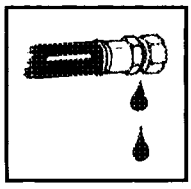
12. Check for correct function of indicator lamps (Optional on some models).



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

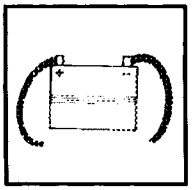


14. Inspect for fuel, oil or hydraulic fluid leaks.

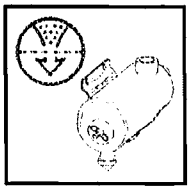


15. Lubricate the loader.

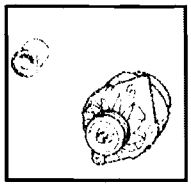
16. Check the condition of the battery and cables.



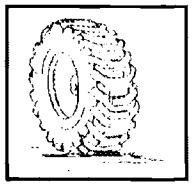
17. Inspect the air cleaner for damage or leaks. Check the condition of the element.



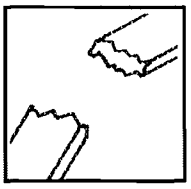
18. Check the electrical charging system.



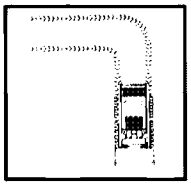
19. Check tires for wear and pressure.



20. Inspect for loose or broken parts or connections.



21. Operate the loader and check all functions.



22. Check for any field modification not completed.

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

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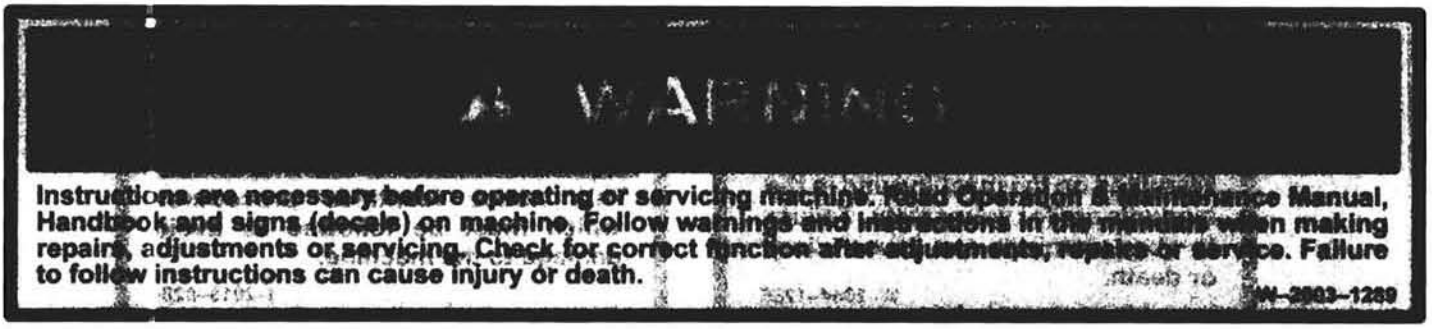
SAFETY INSTRUCTIONS



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

- The Delivery Report is used to assure that complete instructions have been given to the new owner and that the machine is in safe operating condition.
- The Operation & Maintenance Manual delivered with the loader gives operating information as well as routine maintenance and service procedures. It is a part of the loader and must stay with the machine when it is sold. Replacement Operation & Maintenance Manuals can be ordered from your Bobcat loader dealer.
- The loader has machine signs (decals) which instruct on the safe operation and care. The signs and their locations are shown in the Operation & Maintenance Manual. Replacement signs are available from your Bobcat loader dealer.
- The loader has a plastic Operator's Handbook fastened to the operator cab. Its brief instructions are convenient to the operator. The handbook is available from your dealer in English edition or French, German, Italian, Dutch & Spanish editions.
- The EMI Safety Manual (available in Spanish) delivered with the loader gives general safety information.
- The Service Manual and Parts Manual are available from your dealer for use by mechanics to do shop–type service and repair work.
- The Skid–Steer Loader Operator Training Course is available through your local dealer. This course is intended to provide rules and practices for correct operation of the Bobcat loader. The course is available in English and Spanish versions.

IMPORTANT

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

I–2019–0284

Safety Alert Symbol: This Safety Symbol is used for important safety messages. When you see this symbol follow the safety message to avoid personal injury or death.

- Wear tight fitting clothing. Always wear safety glasses when maintaining or servicing loader. Safety glasses, hearing protection or loader special applications kit are required for some work. See your dealer for Melroe Safety equipment.
- Know where fire extinguishers and first aid kits are located and how to use them.
- Do not use the Bobcat loader where exhaust, arcs, sparks or hot components can contact flammable material, explosive dust or gases.
- The engine compartment and engine cooling system must be inspected every day and cleaned if necessary to prevent fire hazard and overheating.
- Check all electrical wiring and connections for damage. Keep the battery terminals clean and tight. Repair or replace any damaged part.
- Check fuel and hydraulic tubes, hoses and fittings for damage and leakage. Never use open flame or bare skin to check for leaks. Tighten or replace any parts that show leakage. Always clean fluid spills. Do not use gasoline or diesel fuel for cleaning parts. Use commercial nonflammable solvents.
- Follow any environmental safety regulations when disposing of used fluids such as engine oil, grease or anti–freeze.
- Do not use ether or starting fluids on this engine. It has glow plugs. These starting aids can cause explosion and injure you or bystanders.
- Always clean the loader and disconnect the battery before doing any welding. Cover rubber hoses, battery and all other flammable parts. Keep a fire extinguisher near the loader when welding. Have good ventilation when grinding or welding painted parts. Wear dust mask when grinding painted parts. Toxic dust or gas can be produced.
- Stop the engine and let it cool before adding fuel. No smoking!
- Use the procedure in the Operation & Maintenance or Service Manuals for connecting the battery.

A fire extinguisher is available from your local dealer. The fire extinguisher can be installed in the location shown **[A]**.

SERIAL NUMBER LOCATIONS

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

LOADER SERIAL NUMBER

The loader serial number plate is located on the outside of the loader frame **[A]**.

Explanation of loader Serial Number:

XXXX XXXXX

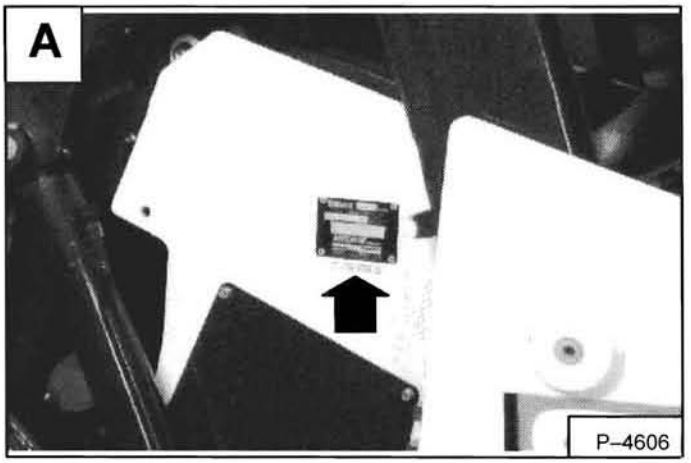
- XXXXX — Module 2. – Production Sequence (Series)
- XXXX — Module 1. – Model/Engine Combination

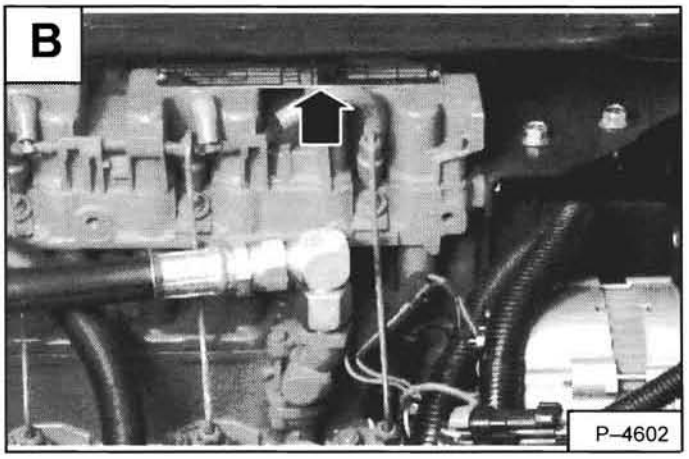
The four digit Model/Engine Combination module number identifies the model number and engine combination. This number (in parenthesis beside the model number) is used in the Service Manual to more easily identify the standard, optional and field accessory equipment included or available for each specific model.

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

ENGINE SERIAL NUMBER

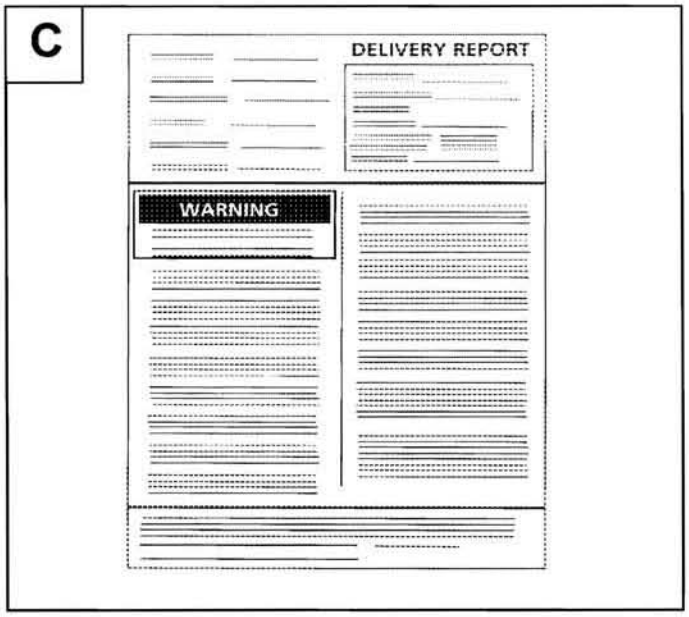
The serial number is located on the valve cover at the right side of the engine **[B]**.



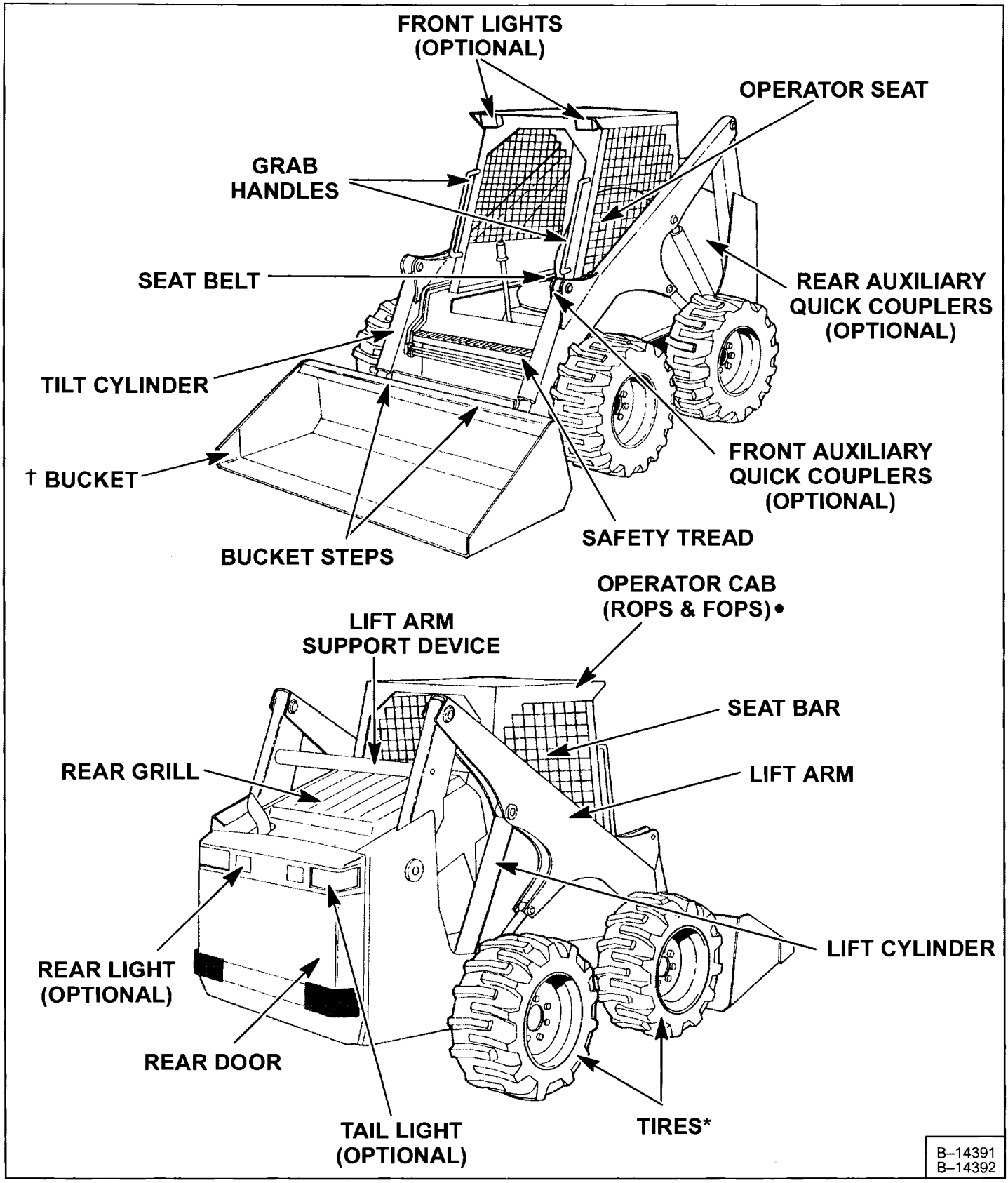


DELIVERY REPORT

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



BOBCAT LOADER IDENTIFICATION



* TIRES – Flotation tires are shown. Optional tires are available.

† BUCKET – Several different buckets and other attachments are available for the Bobcat loader.

• ROPS, FOPS – Roll Over Protective Structure, per SAE J1040 and ISO 3471 and Falling Object Protective Structure per SAE J1043 and ISO 3449 Level I. Level II FOPS is available for protection from heavy falling objects. The Bobcat loader is base–equipped with a standard operator cab as shown. Extra insulated cab is available as an option (Reduced noise level).

OPTIONS AND ACCESSORIES

All 873 Bobcat loaders are equipped with the following standard items:

Bob–Tach	Seat Belt
Servo Assist Steering	Seat Bar
Spark Arrestor Exhaust System	Parking Brake
Lift Arm Support Device	Gauges/Warning Lights
Operator Cab (W/ROPS & FOPS Approval	Bobcat Interlock Control System (BICS™)

Below is a listing of the optional equipment which is available through your Bobcat loader dealer.

	873
Tires	
12–16.5, 10 PR Bobcat Heavy Duty Flotation	Std.
8.25–15, 6 PR	Opt.
12.00–16.5, Segmented	Opt.
12.00–16.5, 6 PR Flotation	Opt.
8.00–16 Solid	Opt.
10.00–33 Solid	Opt.
31–15.5 x 18, 8 PR Terra Grip Flotation	Opt.
Operator Cab	
Sound Cab (85 dBa)	Opt. (Std. in Europe)
Deluxe Cab	Opt.
Suspension Seat	Opt. & FA (Std. in Europe)
Operating Lights (Front & Rear)	Opt. & FA (Std. in Europe)
Horn	FA
Backup Alarm	Opt. & FA
Heated Enclosed Cab	Opt. & FA
Top Window	Opt. & FA (Std. in Europe)
Rear Window	Opt. & FA (Std. in Europe)
Cab Enclosure Panels	FA
Vinyl Cab Enclosure	FA
Cover Kit (Pedals Area)	FA
Cover Kit (Hydraulic Reservoir Area)	FA (Std. in Europe)
Fire Extinguisher	FA
Flasher Lights	FA
Strobe or Rotating Beacon Light	FA
3" Seat Belt	FA
Special Applications Kit (Includes Front Door, Top & Rear Windows)	FA
Hydraulics	
Front Auxiliary Hydraulics	Opt. & FA
Rear Auxiliary Hydraulics	Opt. & FA
Hydraulic Bucket Positioning (Includes On/Off Switch)	Opt. & FA
Other	
Counterweight Kit (2400 ROC)	Opt. & FA
Single Point Lift	FA
Locking Fuel Cap	FA
Rear Door Bumpers	FA
Tailgate Lock	FA
Tool Box	FA
Instrumentation	
Gauges and Warning Lights	Std.
Bobcat Operating Sensing System (BOSS®)	Opt.

Std. = Standard Equipment
Opt. = Factory Installed Option
FA = Field Accessory

Specifications subject to change without notice

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bobcat

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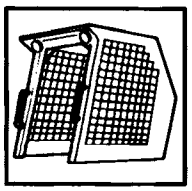
CALIFORNIA
PROPOSITION 65 WARNING
Diesel engine exhaust and some of its constituents are known to the State of California to cause cancer, birth defects and other reproductive harm.

FOREWORD

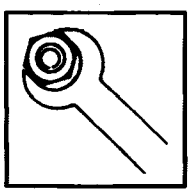
This manual is for the Bobcat loader mechanic. It provides necessary servicing and adjustment procedures for the Bobcat loader and its component parts and systems. Refer to the Operation & Maintenance Manual for operating instructions, starting procedure, daily checks, etc.

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

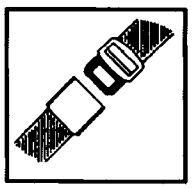
1. Check that the ROPS/FOPS (Including sidescreens) is in good condition and is not modified.



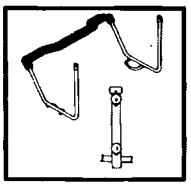
2. Check that ROPS mounting hardware is tightened and is Melroe approved.



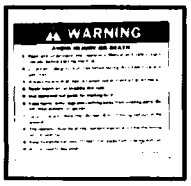
3. The seat belt must be correctly installed, functional and in good condition.



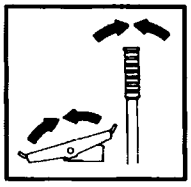
4. The seat bar and pedal interlocks must be correctly adjusted, clean and lubricated.



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



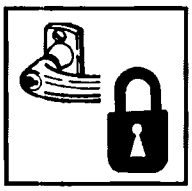
6. Steering levers and foot pedals must return to neutral.



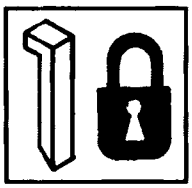
7. Check for correct funtion of the work lights.

8. The parking brake must function correctly.

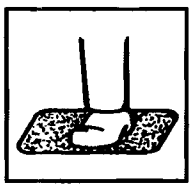
9. Enclosure door latches must open and close freely.



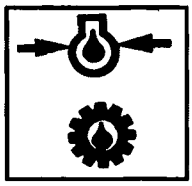
10. Bob–Tach wedges and linkages must function correctly and be in good condition.



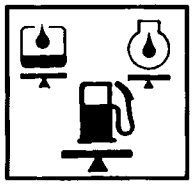
11. Safety treads must in good condition.



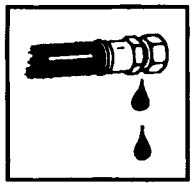
12. Check for correct function of indicator lamps (Optional on some models).



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

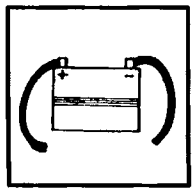


14. Inspect for fuel, oil or hydraulic fluid leaks.



15. Lubricate the loader.

16. Check the condition of the battery and cables.



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SERVICE SCHEDULE

Maintenance work must be done at regular intervals. Failure to do so will result in excessive wear and early failures. The service schedule is a guide for correct maintenance of the Bobcat loader.

⚠ WARNING

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

W–2003–1289

SERVICE SCHEDULE		HOURS					
ITEM	**SERVICE REQUIRED**	**8–10**	**50**	**250**	**500**	**■ 1000**	**◊ 3000**
Engine Oil	Check the oil level and add oil as needed.						
Engine Air Cleaner	Check condition indicator or display panel. Service only when required.						
Engine Cooling System	Clean debris from oil cooler and grill.						
Lift Arms, Cyl., Bob–Tach Pivot Pins and Wedges	Lubricate with multi–purpose lithium based grease (12 places).						
Engine Air System	Check for leaks and damaged components.						
Tires	Check for damaged tires and correct air pressure.						
Seat Belt, Seat Bar and Pedal Interlocks	Check the condition of seat belt. Check the seat bar and foot pedal interlocks for correct operation. Clean dirt and debris from moving parts.						
Bobcat Interlock Control System (BICS™)	Check BICS™ functions. Clean dirt, debris or objects from under or behind seat and around brake pedal as required.						
Safety Signs and Safety Treads	Check for damaged signs (decals) and safety treads. Replace any signs or safety treads that are damaged or worn.						
Operator Cab	Check the fastening bolts, washers and nuts. Check the condition of cab.						
Fuel Filter	Remove the trapped water.						
Traction Lock Control Sys.	Check operation and correct as needed.						
Hyd. Fluid, Hoses and Tubelines	Check fluid level and add as needed. Check for damage and leaks. Repair or replace as needed.						
Final Drive Trans.(Chaincase)	Check oil level.						
Battery	Check battery for damage, hold downs, cables, connections and electrolyte level. Add distilled water as needed.						
Foot Pedals and Steering	Check for correct operation. Repair or adjust as needed.						
Wheel Nuts	□ Check for loose wheel nuts and tighten to 105–115 ft.–lbs. (142–156 Nm) torque.						
Parking Brake	Check operation of the brake.						
Alternator Belt	Check tension and adjust as needed.						
Engine/Hydro. Drive Belt	* Check for wear or damage. Check idler arm stop.						
Fuel Filter	Replace filter element.						
Steering Shaft	Grease three fittings.						
Hydraulic Reservoir Breather Cap	Replace the reservoir breather cap.						
Hyd./Hydro. Filters	● Replace the filter elements.						
Engine Oil and Filter	† Replace oil and filter. Use CD or better grade oil and Melroe filter.						
Final Drive Trans.	Replace the oil in the chaincase.						
Hydraulic Reservoir	Clean or replace the fluid.						
Hydraulic Motors	Clean or replace the case drain filters.						
Bobcat Interlock Control System (BICS™)	Check lift arm by–pass control.						
Fan Drive Gearbox	Check gear lube level.						
Engine Valves	∞ Adjust the engine valves.						
Engine Timing Belt	◊ Replace the timing belt and belt tensioner assy.						

□ **Check wheel nut torque every 8 hours for the first 24 hours.**
● **Also replace hydraulic/hydrostatic filter element when the transmission warning light comes ON.**
■ **Or every 12 months.**
* **Inspect the new belt after first 50 hours.**
† **After the first 50 hours.**
∞ **After the frist 500 hours on new engine, adjust engine valves; 1000 hours thereafter.**
◊ **Or every 5 years.**

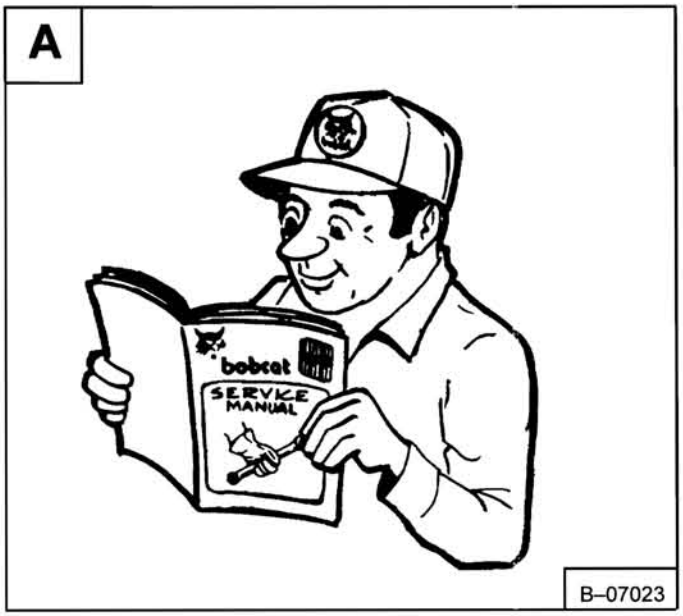
PREVENTIVE MAINTENANCE

⚠ WARNING

Instructions are necessary before operating or servicing machine. Read Operation & Maintenance Manuals, 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. Failure to follow instructions can cause injury or death.

W–2003–1289

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



LIFTING AND BLOCKING THE LOADER

Procedure

Always park the loader on a level surface.

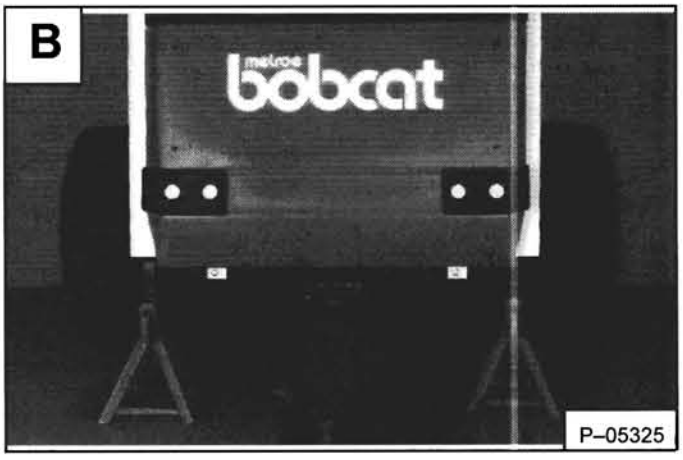
⚠ WARNING

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

Put floor jack under the rear of the loader **[B]**.

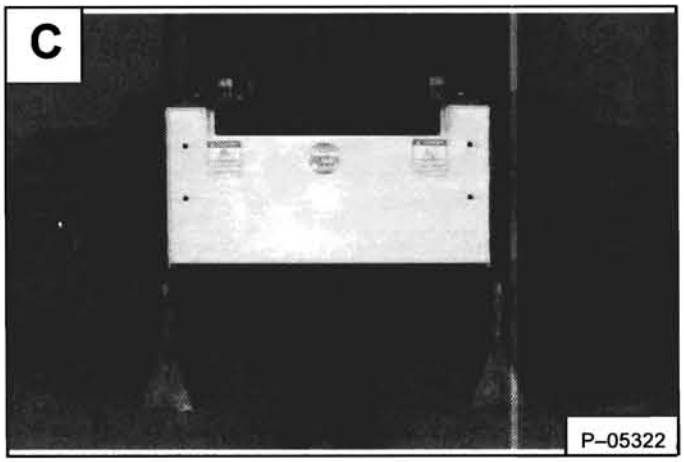
Lift the rear of the loader and install jackstands **[B]**.



Put the floor jack under the front of the loader **[C]**.

Lift the front of the loader and put jackstands under the axle tubes **[C]**.

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



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

Be sure the transport and towing vehicles are of adequate size and capacity.

Use the following procedure to fasten the Bobcat loader to the transport vehicle to prevent the loader from moving during sudden stops or when going up or down slopes **[B]**.

Lower the bucket or attachment to the floor. Stop the engine. Engage the parking brake. Install chains at the front and rear loader tie down positions (Inset) **[B]**. Fasten each end of the chain to the transport vehicle and tighten the chain with a chain tightener.

The Inset **[B]** shows the decal with attachment points for towing and tie down.

TOWING THE LOADER

Procedure

To prevent damage to the loaders hydrostatic system, the loader must be towed only a short distance at slow speed. (Example: Moving the loader onto a transport vehicle.)

The towing chain (or cable) must be rated at 1–1/2 times the weight of the loader (See *Specification*, Page 9–1).

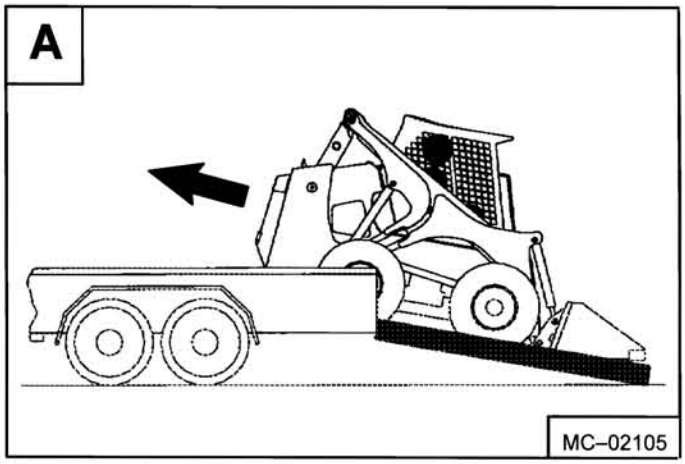
- Turn the key switch to ON and press the Traction Lock Override button.
- Tow the Bobcat at 2 MPH (3,2 km/hr.) or less for not more than 25 feet (7,6 meters).

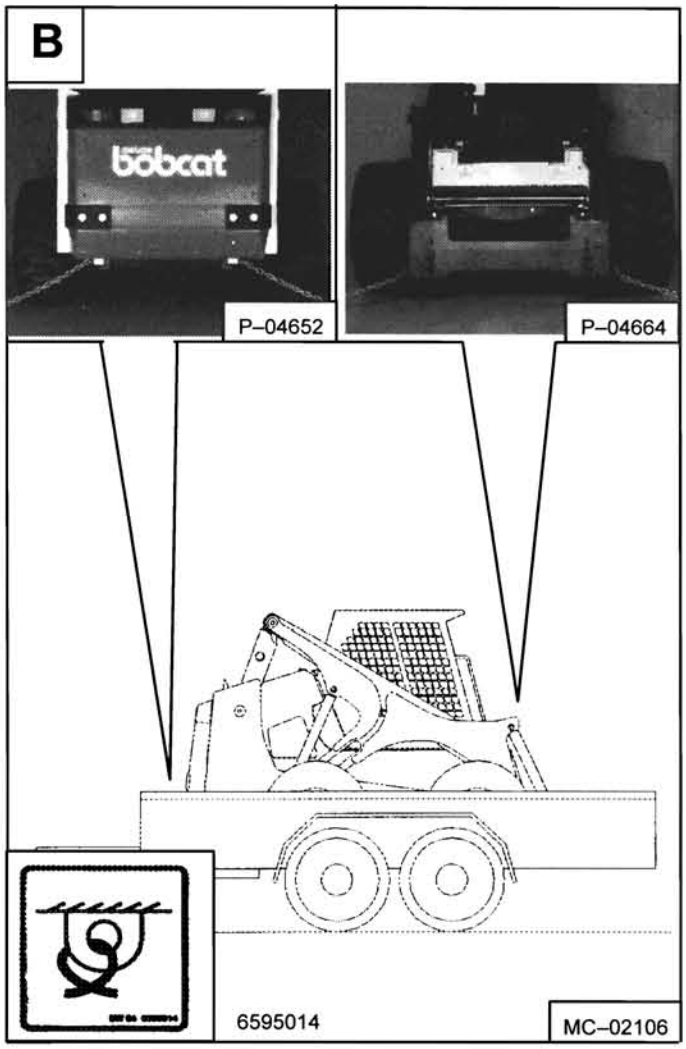
If the electrical system is not functioning part of the brake system must be disassembled to move the loader. See *Traction Lock* removal and installation procedure. (See Page 8–1.)

STOPPING THE BOBCAT LOADER

Procedure

When the steering levers are moved to the neutral position, the hydrostatic transmission will act as a *service brake* and stop the loader.





IMPORTANT

Do not push or pull the machine at more than 2 MPH (3,2 km/h) or for a distance of more than 25 feet (7,6 meters) with the towing tool in place.

I–2017–0389

LIFT ARM SUPPORT DEVICE

⚠ WARNING

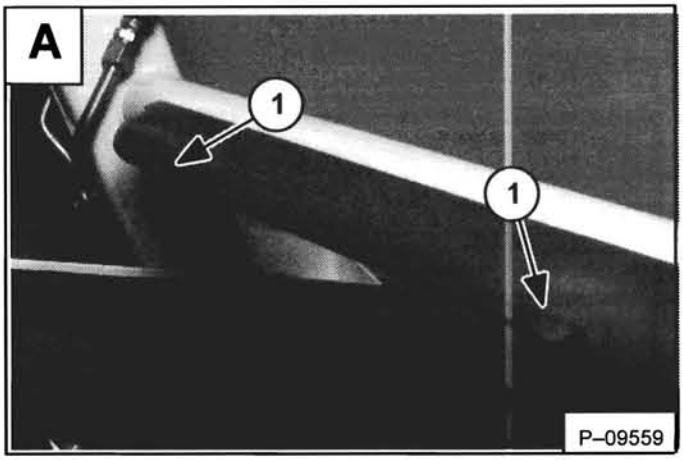
Never work on a machine with the lift arms up unless the lift arms are secured by a lift arm support device. Failure to use an approved lift arm support device can allow the lift arms or attachment to fall and cause injury or death.

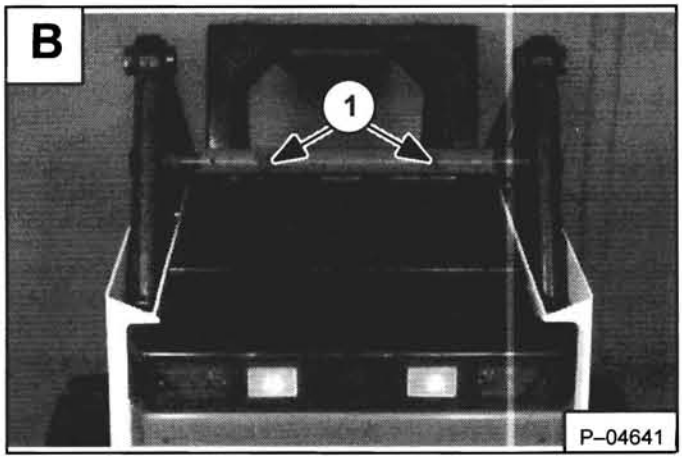
W–2059–0991

To Install the Lift Arm Support Device

Remove the retainer knobs (Item 1) **[A]** or **[B]**.

Remove the lift arm support device from the crossmember.





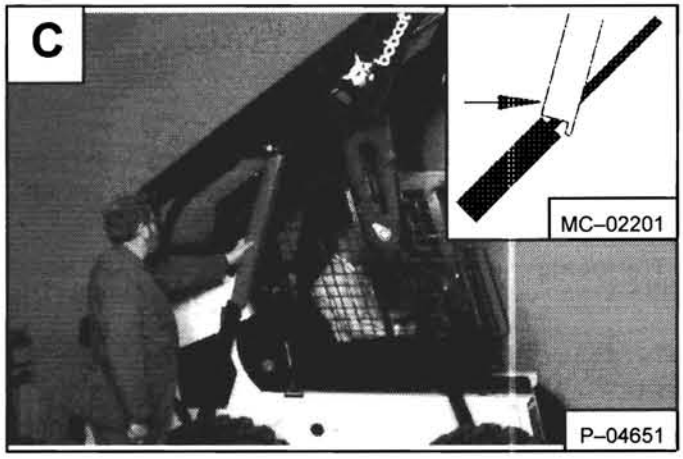
One person must stay in the operator seat **[C]** with the seat belt fastened and the seat bar lowered, while a second person installs the lift arm support device.

Start the engine and raise the lift arms.

Have a second person install the lift arm support device over the rod of one of the lift cylinders **[C]**.

The 90° notch should be installed against the outer case of the lift cylinder (Inset) **[C]**.

Lower the lift arms slowly until the support device is held between the lift arms and lift cylinder **[D]**.

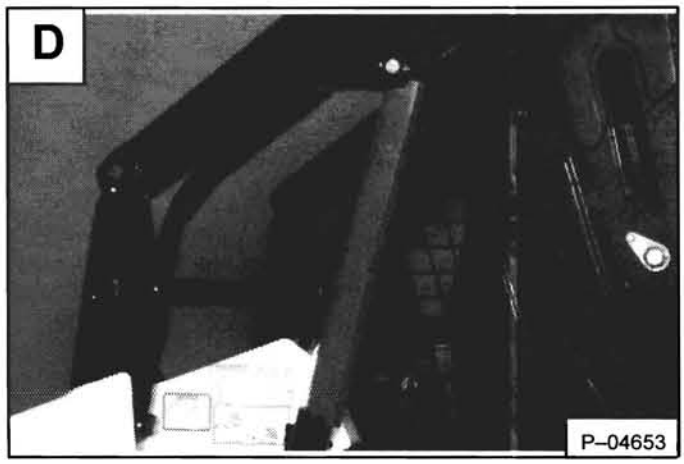


To Remove the Lift Arm Support Device

Raise the lift arms while a second person removes the lift arm support device **[C]**.

Stay in the seat until the lift arms are lowered all the way.

Return the lift arm support device to the storage position and secure with the retainer knobs **[A]** or **[B]**.



OPERATOR CAB

Description

The Bobcat loader has an operator cab (ROPS and FOPS) as standard equipment to protect the operator from rollover and falling objects. Check with your dealer if the operator cab has been damaged.

⚠ 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

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

Level I – Protection from falling bricks, small concrete blocks, and hand tools encountered in operations such as highway maintenance, landscaping, and other construction site services.

Level II – Protection from falling trees, rocks; for machines involved in site clearing, overhead demolition or forestry.

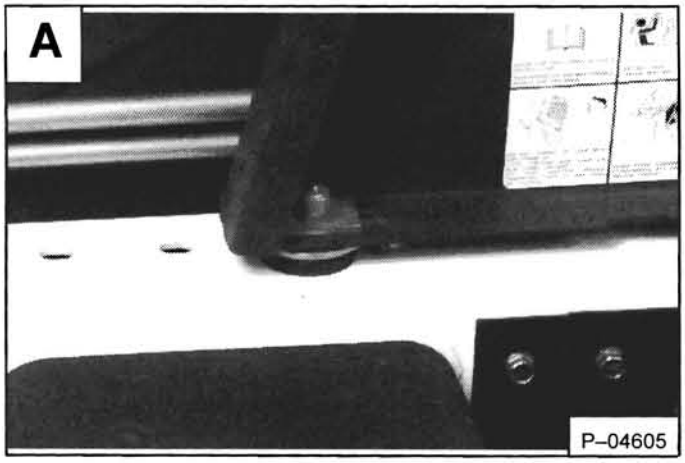
Raising the Operator Cab

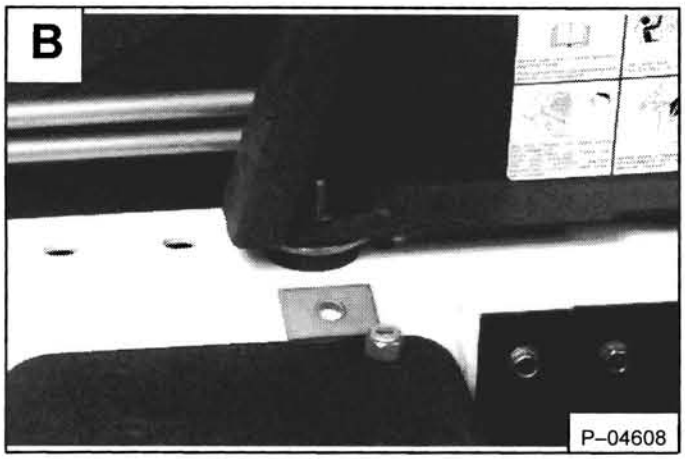
Stop the loader on a level surface. Lower the lift arms. If the lift arms must be up while raising the operator cab, install the lift arm support device. (See Page 1–6.)

Loosen the nut (both sides) at the front corner of the operator cab **[A]**.

Remove the nut and plate (both sides) **[B]**.

Lift on the grab handle and bottom of the operator cab. Raise slowly until the cab latching mechanism engages and the cab is all the way up **[C]**.



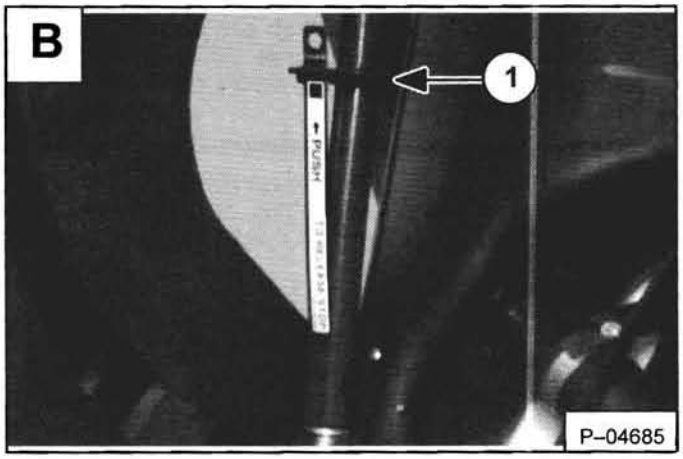


Lowering the Operator Cab

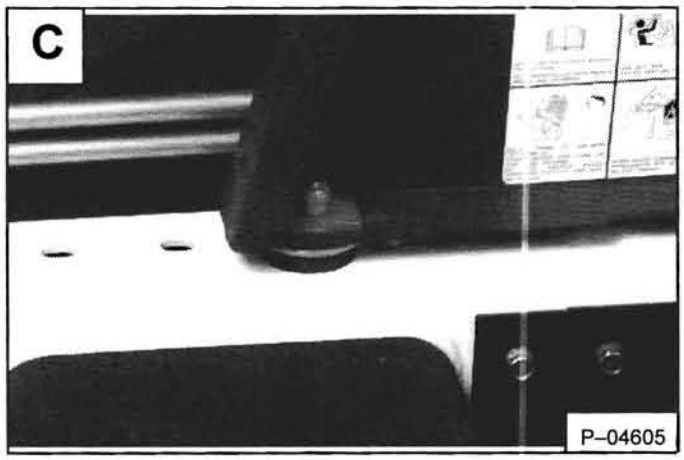
NOTE: Make sure the seat bar is fully raised or lowered when lowering the cab.

Pull down on the bottom of the operator cab until it stops at the latching mechanism **[A]**.

Release the latching mechanism (Item 1) **[B]** and pull the cab all the way down.



Install the plate and nut (both sides). Tighten the nuts to 40–50 ft.–lbs. (54–68 Nm) torque **[C]**.

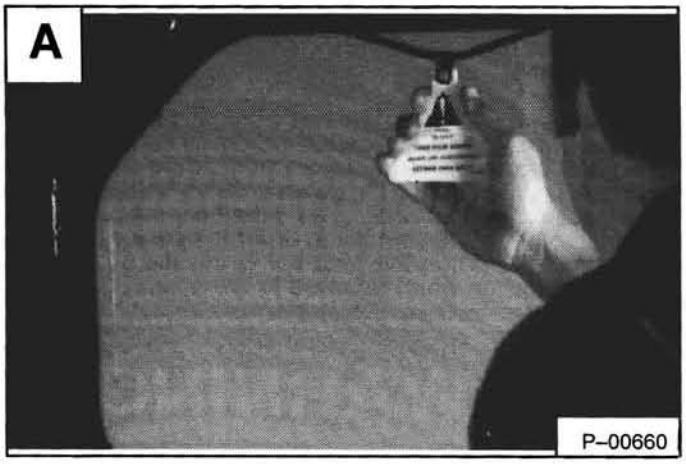


Emergency Exit

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

To exit through the rear window, use the following procedure:

Pull on the tag on the top of the rear window to remove the rubber cord **[A]**.

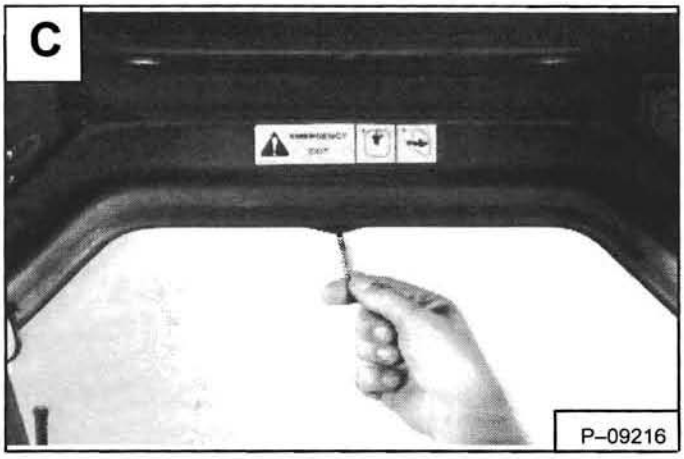


Push the rear window out of the rear of the operator cab.

Exit through the rear of the operator cab **[B]**.

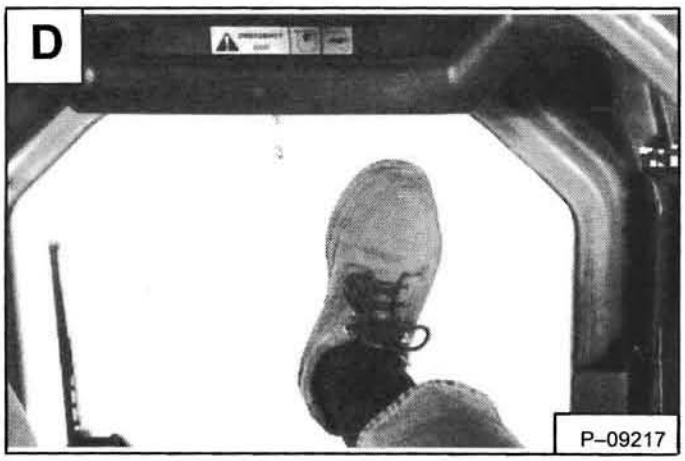
NOTE: When the Operator Cab Enclosure Kit is installed, the window of the front door can be used as an emergency exit.

Pull the plastic loop at the top of the window in the front door to remove the rubber cord **[C]**.



Push the window out with your foot **[D]**.

Exit through the front door.



SEAT BAR RESTRAINT SYSTEM

Description

The seat bar restraint system has a pivoting seat bar with arm rests and has spring loaded interlocks for the lift and tilt control pedals. The operator controls the use of the seat bar. The seat bar in the down position helps to keep the operator in the seat. The interlocks require the operator to lower the seat bar in order to operate the foot pedal controls. When the seat bar is up, the lift and tilt pedals are locked when returned to the neutral position.

⚠ 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

Seat Bar Inspection

Sit in the seat and fasten the seat belt. Engage the parking brake. Pull the seat bar all the way down. Start the engine. Operate each foot pedal to check both the lift and tilt functions. Raise the lift arms until the bucket is about 2 feet (600 mm) off the ground.

Raise the seat bar. Try to move each foot pedal. Pedals must be firmly locked in 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. Operate the lift pedals. While the lift arms are going up, raise the seat bar and the lift arms should stop.

Lower the seat bar, lower the lift arms and place the bucket flat on the ground. Stop the engine. Raise the seat bar and operate the foot pedals to be sure that the pedals are firmly locked in the neutral position. Unbuckle the seat belt.

⚠ WARNING

AVOID INJURY OR DEATH

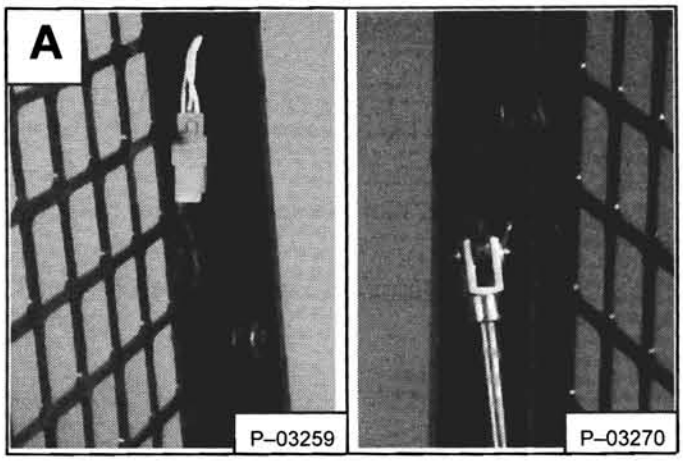
Never operate loader without pedal lock shield 6705474 on both interlocks. Shields prevent foot from unlocking interlocks when leaving loader seat.

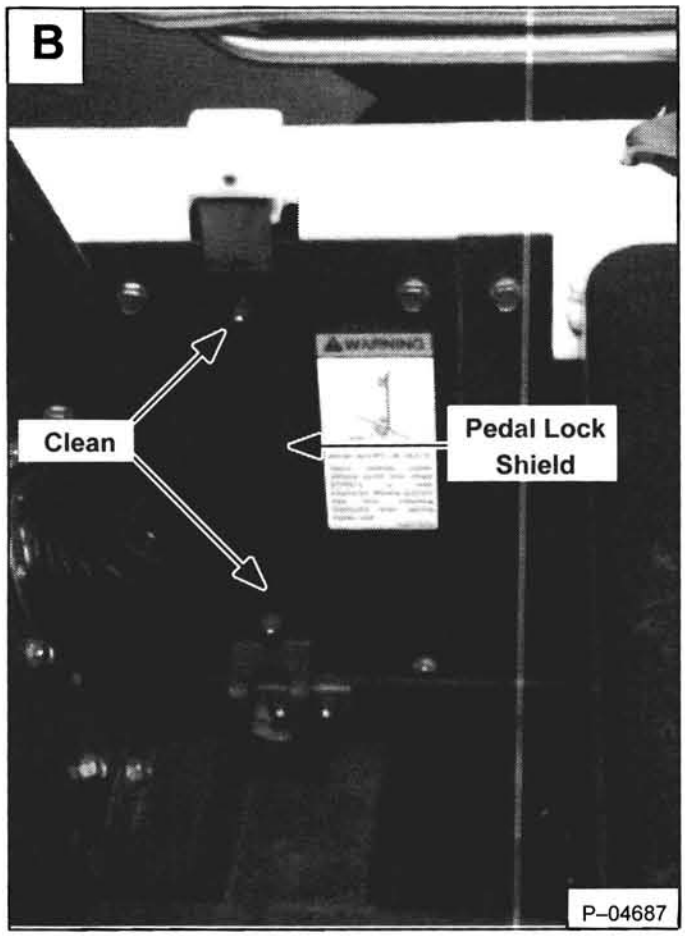
Seat Bar Maintenance

See the Service Schedule Page 1–3 or on the loader for correct service interval.

Clean any debris or dirt from the moving parts **[A]** & **[B]**. Inspect the linkage bolts and nuts for tightness. The correct torque is 25–28 ft.–lbs. (34–38 Nm).

If the seat bar system does not function correctly, check for free movement of each linkage part. Check for excessive wear. Adjust pedal control linkage. Replace parts that are worn or damaged. Use only genuine Melroe replacement parts.





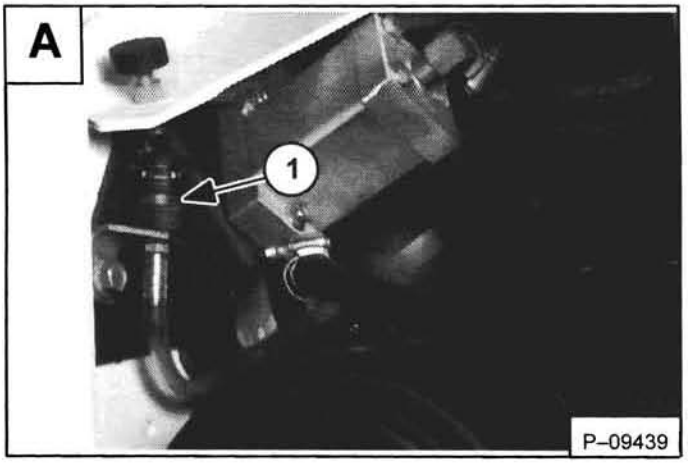
AIR CLEANER SERVICE

Replacing Filter Element

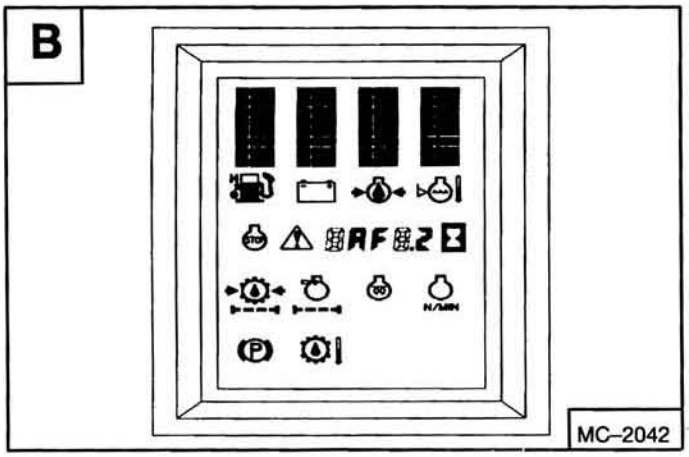
WITH CONDITION INDICATOR: Replace the large (outer) filter element only when the red ring shows in the window of the condition indicator (Item 1) **[A]**.

NOTE: Before replacing the filter element, push the button on the condition indicator. Start the engine. If the red ring does not show, do not replace the filter element.

Replace the inner filter every third time the outer filter is replaced or when the red ring still shows in the indicator window after the outer filter has been replaced.



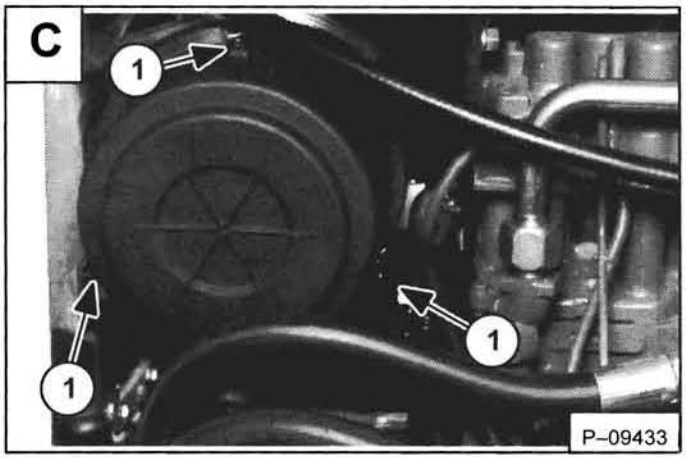
WITH BOSS® OPTION: It is important to change the air filter element only when the service codes (on the optional instrument panel) shows the symbols [*AF.2*] **[B]**.



Service the air cleaner as follows:

Remove the dust cover clips (Item 1) **[C]**.

Remove the dust cover.



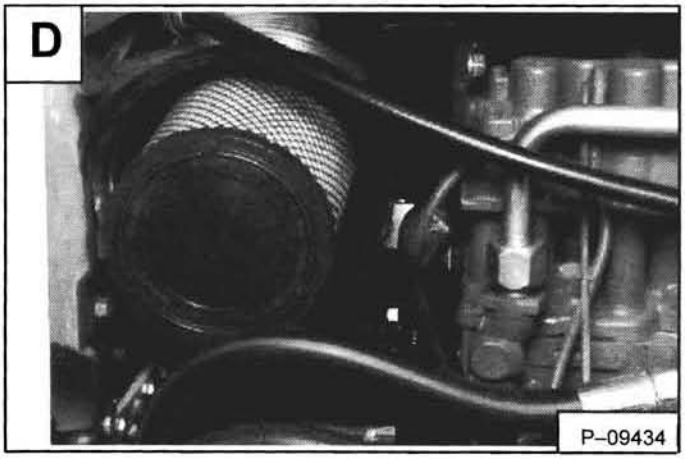
Remove the large filter element **[D]**.

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

Install the new filter element.

Install dust cover.

Check the air intake hose for damage. Check the air cleaner housing for damage. Check to make sure all connections are tight.

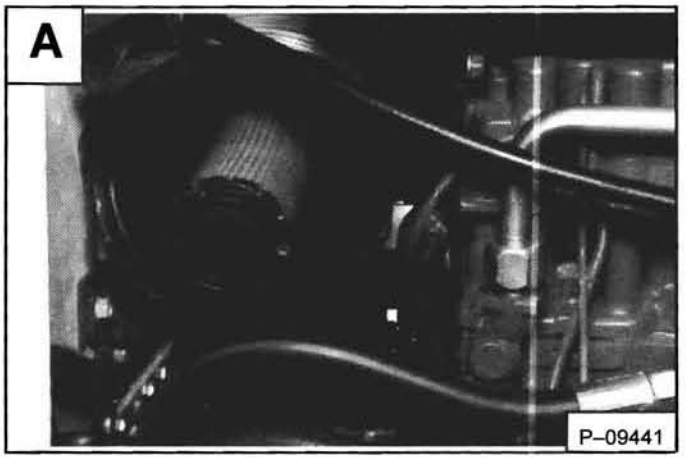


AIR CLEANER SERVICE (Cont'd)

Replacing Filter Element (Cont'd)

Only replace the inner filter element under the following conditions **[A]**:

1. Replace the inner filter element every third time the outer filter is replaced.
2. When the service codes show symbols (Page 1–11 **[B]**) during full engine speed, replace the inner filter element only after the outer filter element has been changed.



FUEL SYSTEM

Fuel Specifications

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

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

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

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

Filling the Fuel Tank

⚠ WARNING

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

W–2063–0887

Remove the fuel fill cap (Item 1) **[A]**.

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

Install and tighten the fuel fill cap **[A]**.

Fuel Filter

See the Service Schedule Page 1–3 for the recommended service interval when to remove the water from the fuel filter.

Loosen the drain (Item 1) **[C]** at the bottom of the filter element to drain any water from the filter.

See the Service Schedule Page 1–3 for the recommended service interval when to replace the fuel filter.

To replace the fuel filter element, use a filter wrench to remove the filter element **[C]**.

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

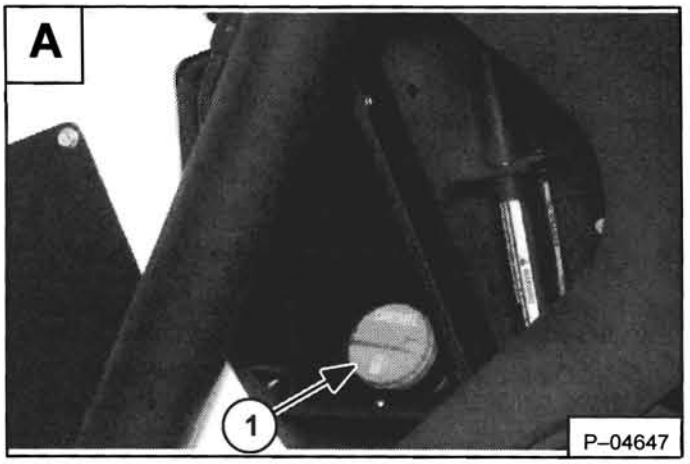
Removing Air From the Fuel System

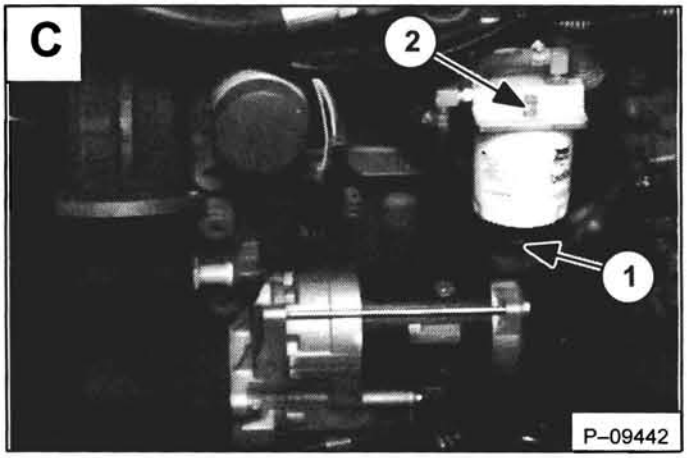
After replacing the fuel filter element or when the fuel tank has run out of fuel, the air must be removed from the fuel system prior to starting the engine.

Loosen the air vent plug (Item 2) **[C]** at the top of the fuel filter.

Crank the engine until fuel flows from the vent.

Tighten the air vent plug.





⚠ WARNING

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

W–2103–1285

ENGINE LUBRICATION SYSTEM

Checking Engine Oil

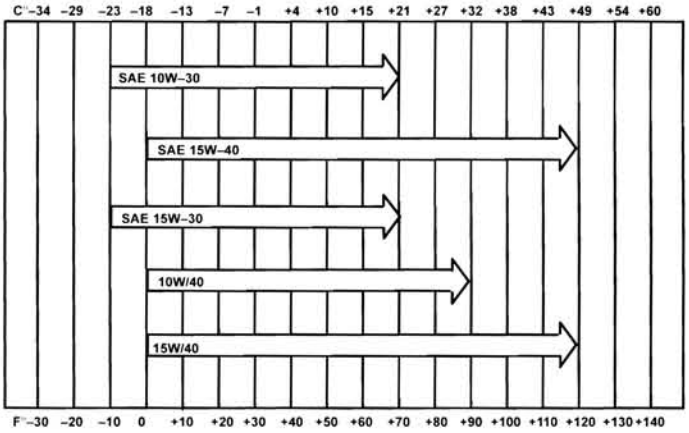
Check the engine oil level every day.

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

Keep the oil level between the marks on the dipstick.

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

RECOMMENDED SAE VISCOSITY NUMBER (LUBRICATION OILS FOR ENGINE CRANKCASE)



TEMPERATURE RANGE ANTICIPATED BEFORE NEXT OIL CHANGE

Replacing Oil and Filter

See the Service Schedule Page 1–3 for the service interval for replacing the engine oil and filter.

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

Open the rear door. Remove the drain plug (Item 1) **[B]**. Drain the oil into container.

Remove the oil filter (Item 1) **[C]**.

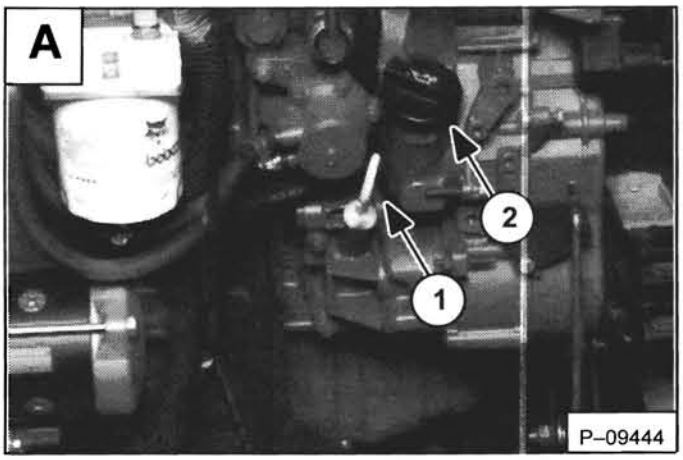
Clean the filter housing surface. Put clean oil on the new oil filter gasket. Install the filter and hand tighten only.

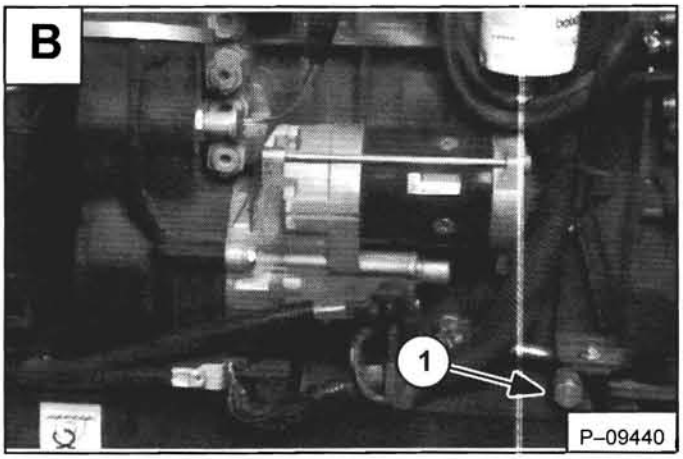
Install and tighten the drain plug.

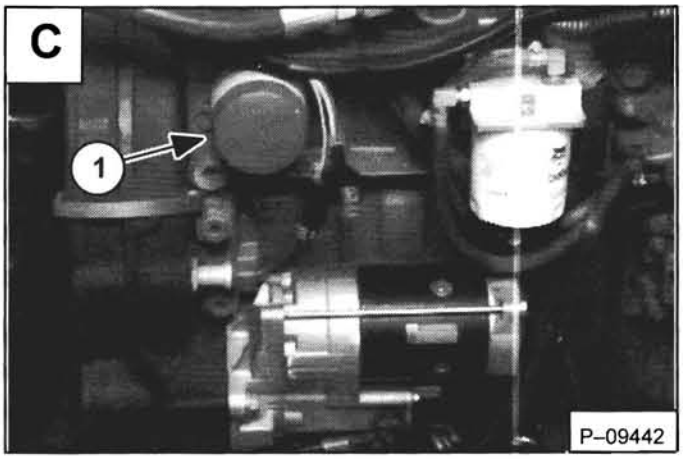
Remove the filler cap (Item 2) **[A]**.

Put 10 qts. (9,5 L) of oil in the engine.

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







⚠ WARNING

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

W–2103–1285

ENGINE COOLING SYSTEM

Cleaning Cooling System (S/N 11516 & Above)

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

⚠ WARNING

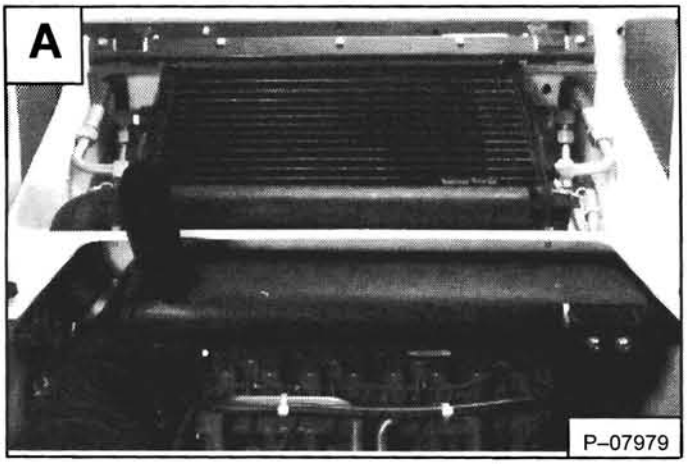
Wear safety glasses to prevent eye injury when any of the following conditions exist:

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

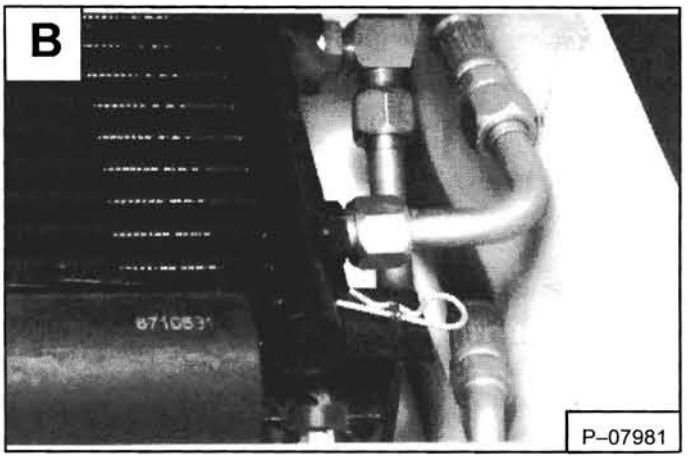
W–2019–1285

Remove the rear grill. (See Page 5–1.)

Use air pressure or water pressure to clean the top of the oil cooler **[A]**.

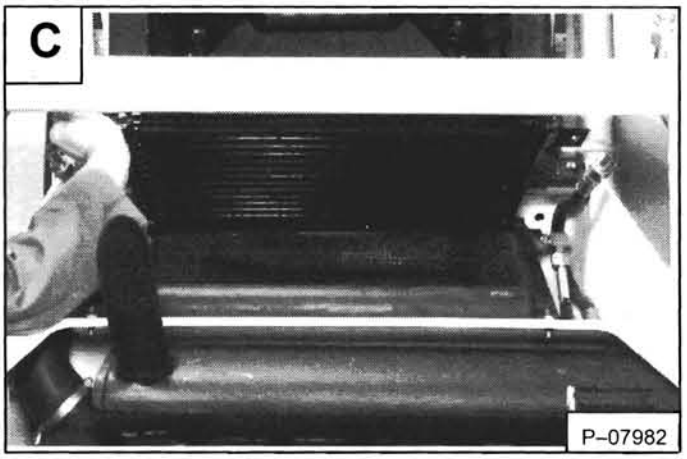


Remove the cotter pin (Item 1) **[B]** (both sides) from the oil cooler.

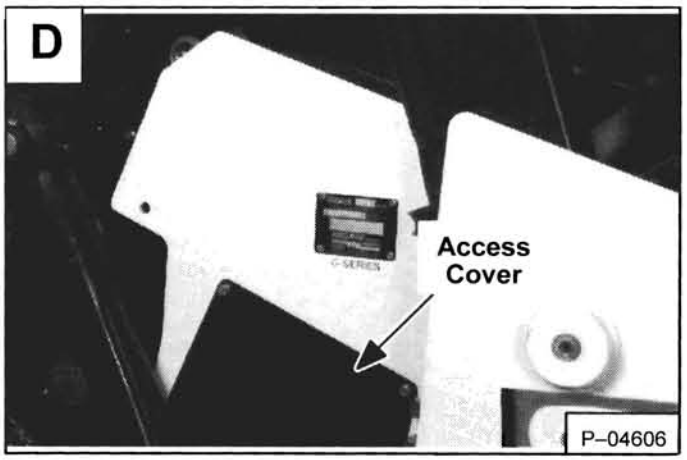


Raise the oil cooler **[C]**.

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



NOTE: The access cover (both sides) must be in place to ensure proper air flow thrugh the oil cooler which will ensure correct cooling for the engning/hydraulic system [D].



ENGINE COOLING SYSTEM

Cleaning the Cooling System (S/N 11515 & Below)

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

⚠ WARNING

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

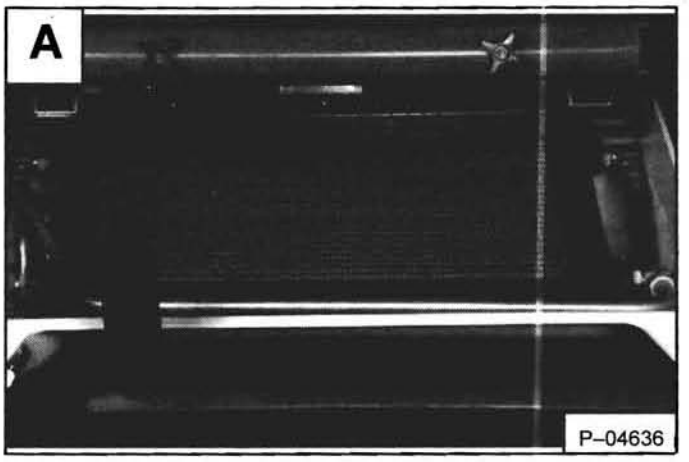
- **When fluids are under pressure.**
- **Flying debris or loose material is present.**
- **Engine is running.**
- **Tools are being used.**

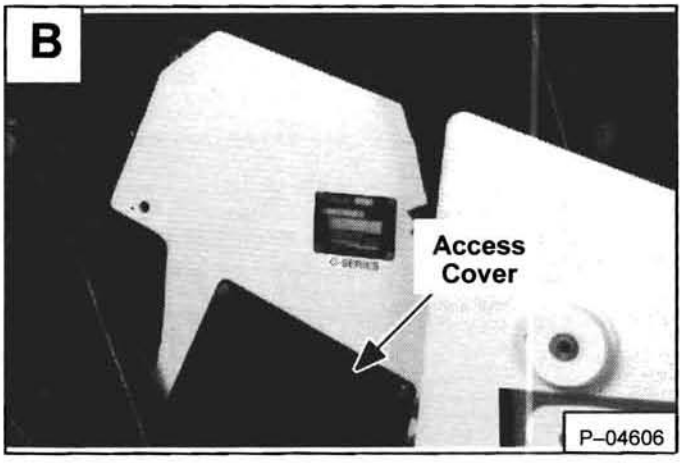
W–2019–1285

Remove the rear grill. (See Page 5–1.)

Use air pressure or water pressure to clean the top of the oil cooler **[A]**.

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





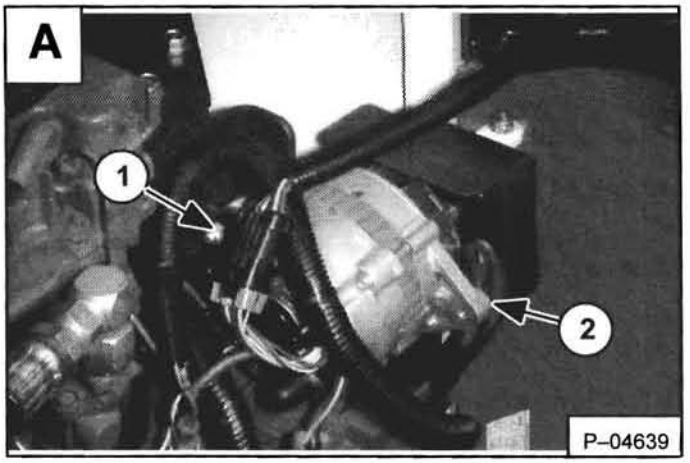
ALTERNATOR BELT

Adjusting the Alternator Belt

Stop the engine.

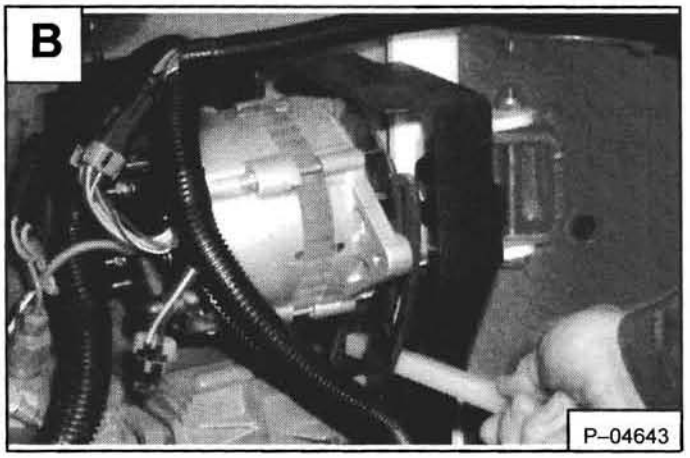
Loosen the alternator mounting bolt (Item 1) **[A]**.

Loosen the adjustment bolt (Item 2) **[A]**.



Move the alternator until the belt has 5/16 inch (8,0 mm) movement at the middle of the belt span with 15 lbs. (66 N) of force **[B]**.

Tighten the adjustment and mounting bolts.



HYDRAULIC/HYDROSTATIC SYSTEM

Checking and Adding Fluid

Use only recommended fluid in the hydraulic system. (See Specifications Page 9–1.)

To check the reservoir, use the following procedure:

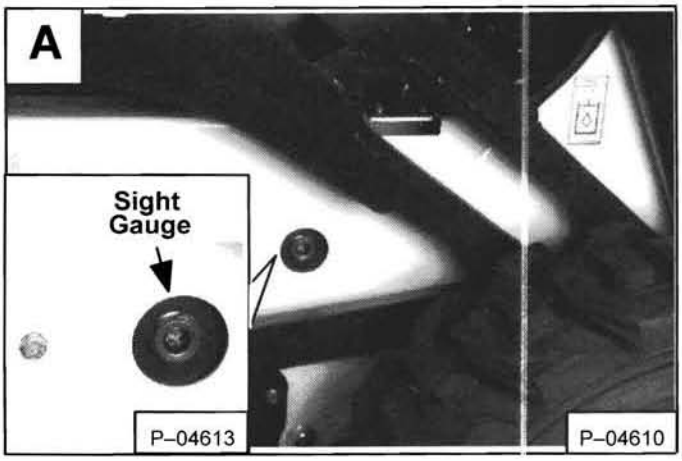
Put the Bobcat loader on a level surface. Lower the lift arms and tilt the Bob–Tach fully back.

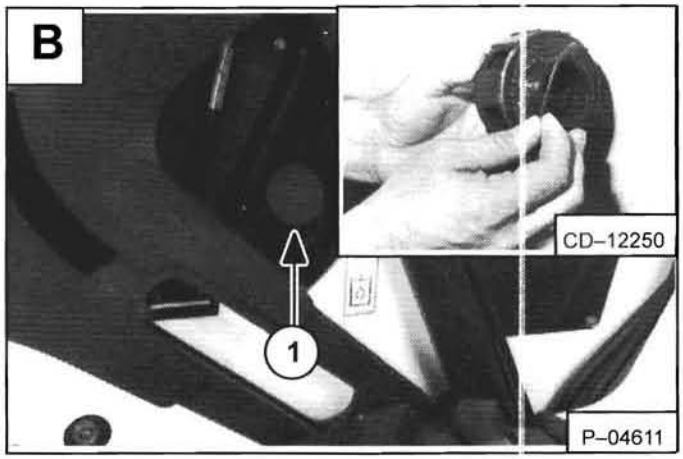
Check the fluid level at the sight gauge **[A]**. The fluid level must show in the sight gauge.

If fluid is needed, remove the fill cap (Item 1) **[B]**.

NOTE: Before installing the fill cap, make sure the rubber gasket is installed on the fill cap (Inset) [B].

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





Hydraulic/Hydrostatic Filter Replacement

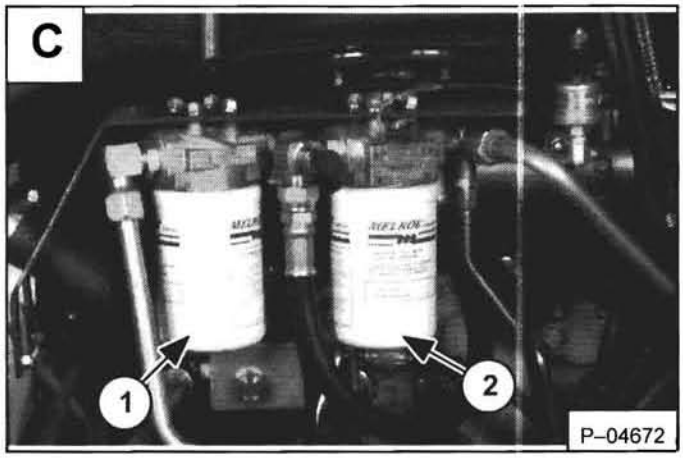
See the Service Schedule Page 1–3 for the correct service interval.

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

Use a filter wrench to remove the filter elements (Items 1 & 2) **[C]**.

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

Install and hand tighten the filter elements.



HYDRAULIC/HYDROSTATIC SYSTEM

Checking and Adding Fluid

Use only recommended fluid in the hydraulic system (See Specifications Section for the correct fluid, Page 9–1).

To check the reservoir, use the following procedure:

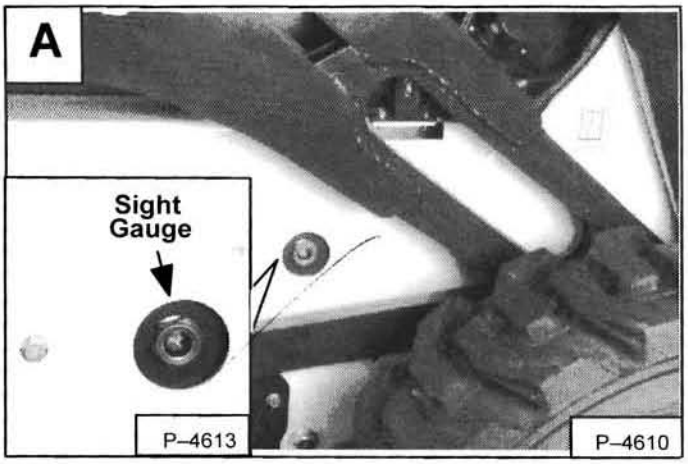
Put the Bobcat loader on a level surface. Lower the lift arms and tilt the Bob–Tach fully back.

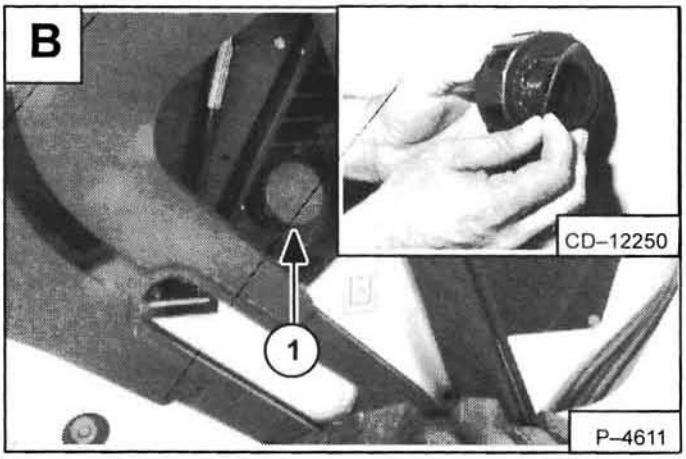
Check the fluid level at the sight gauge **[A]**. The fluid level must show in the sight gauge.

If fluid is needed, remove the fill cap (Item 1) **[B]**.

NOTE: Before installing the fill cap, make sure the rubber gasket is installed on the fill cap (Inset) [B].

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





Hydraulic/Hydrostatic Filter Replacement

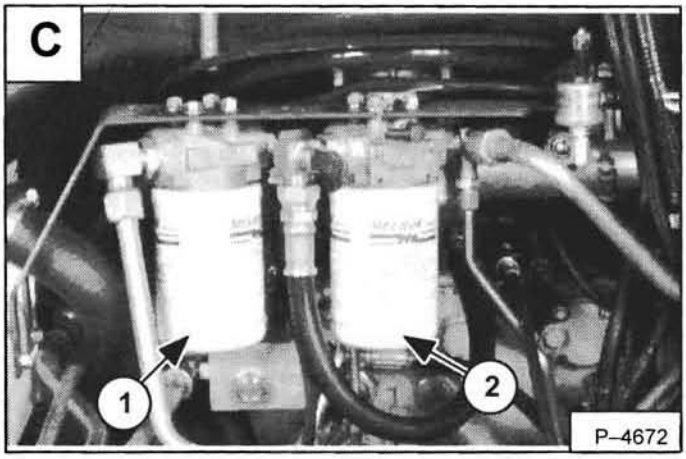
See the Service Schedule (Page 1–3) for the correct service interval.

Raise the operator cab (Page 1–7).

Use a filter wrench to remove the filter elements (Item 1 & 2) **[C]**.

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

Install and hand tighten the filter elements.



See Insert Sheet Revised 11/2/97

HYDRAULIC/HYDROSTATIC SYSTEM (Cont'd)

Hydraulic Fluid Replacement

See the Service Schedule (Page 1–3) for the service interval.

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

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

Remove the fill cap. Remove the screen from the reservoir **[A]**. Wash the screen in clean solvent and air dry.

Raise the operator cab (Page 1–7).

Replace the two filter elements (Page 1–17).

Disconnect the hoses from the hydrostatic motor case drain filter (Item 1) **[B]** & **[C]**.

Remove the case drain filters (Item 1) **[B]** & **[C]** and clean thoroughly with clean solvent.

Install the case drain filters and tighten the hoses.

Remove the left side hydrostatic motor cover. Pull the reservoir hose (Item 1) **[D]** out the motor cover hole. Remove the plug and drain the reservoir fluid into a container.

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

Add the correct fluid to the reservoir until the fluid level is at the sight gauge (Page 1–17).

⚠ WARNING

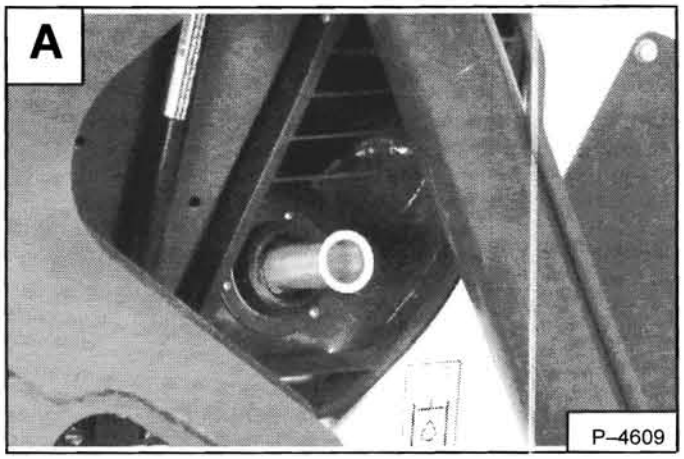
Diesel fuel or hydraulic fluid under pressure can penetrate skin or eyes causing serious injury. Fluid leaks under pressure may not be visible. Use a piece of cardboard or wood to find leaks. Do not use your bare hand. Wear safety goggles. If fluid enters skin or eyes, get immediate medical attention.

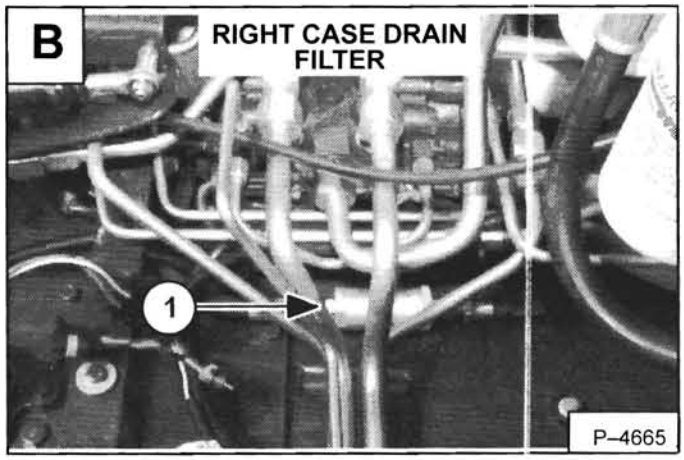
W–2074–1285

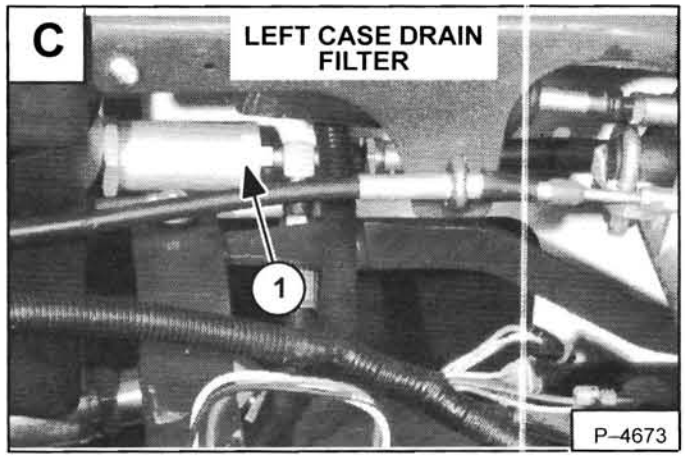
Always clean up spilled fuel or oil. Keep heat, flames, sparks or lighted tobacco away from fuel and oil. Failure to use care around combustibles can cause explosion or fire which can result in injury or death.

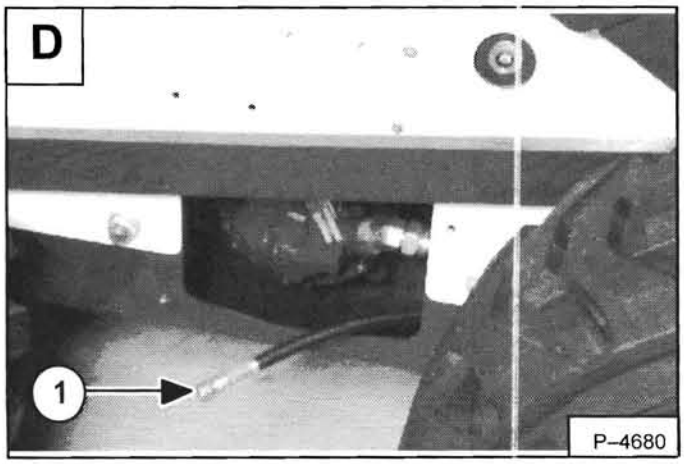
W–2103–1285

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









TIRE MAINTENANCE

Wheel Nuts

See the Service Schedule (Page 1–3) for the service interval to check the wheel nuts. The correct torque is 105–115 ft.–lbs. (142–156 Nm) torque **[A]**.

Tire Rotation

Check the tires regularly for wear, damage and pressure (See Specifications, Page 9–1 for the correct tire pressure).

Rear tires usually wear faster than front tires. To keep tire wear even, move the front tires to the rear and rear tires to the front **[B]**.

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

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

Tire Mounting

Tires are to be repaired only by an authorized person using the proper procedures and safety equipment. Tires and rims must always be checked for correct size before mounting. Check rim and tire bead for damage.

The rim flange must be cleaned and free of rust. The tire bead and rim flange must be lubricated with a rubber lubricant before mounting the tire, avoid excessive pressure which can rupture the tire and cause serious injury or death. During inflation of the tire, check the tire pressure frequently to avoid over inflation.

⚠ WARNING

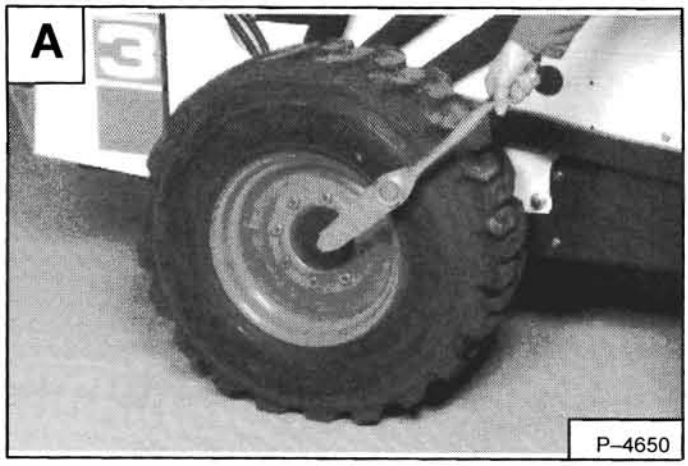
Do not inflate tires above specified pressure. Failure to use correct tire mounting procedure can cause an explosion which can result in injury or death.

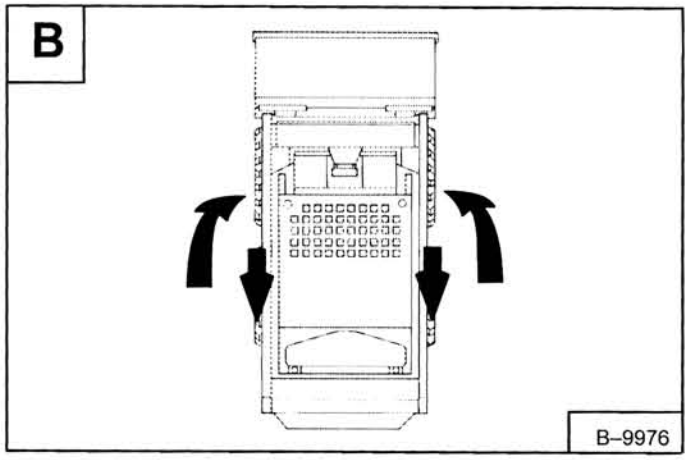
W–2078–1285

IMPORTANT

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

I–2057–0794





FINAL DRIVE TRANSMISSION (CHAINCASE)

Checking and Adding Oil

The chaincase contains the final drive sprockets and chains and uses the same type of oil as the hydraulic/hydrostatic system (See Specifications Section, Page 9–1).

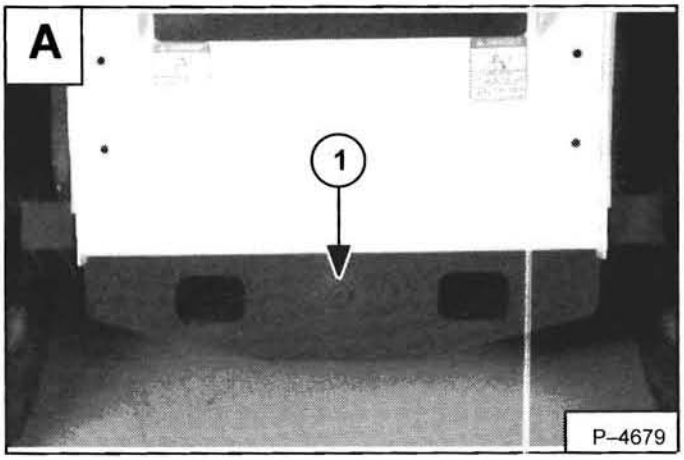
To check the chaincase oil level, use the following procedure:

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

Remove the plug (Item 1) **[A]** from the front of the chaincase housing.

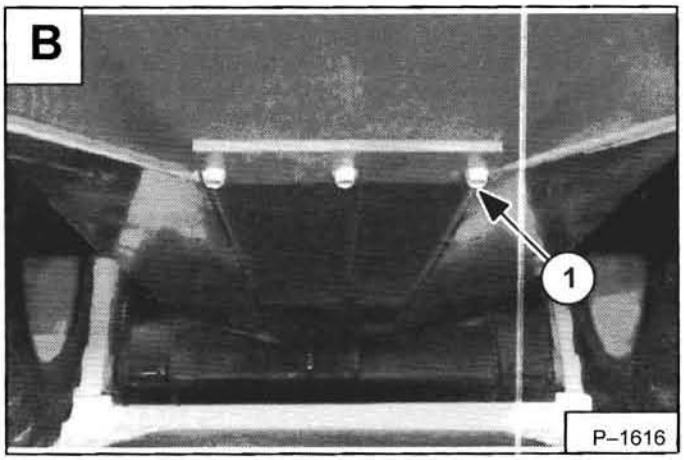
If oil can be reached with the tip of the your finger through the hole the oil level is correct.

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



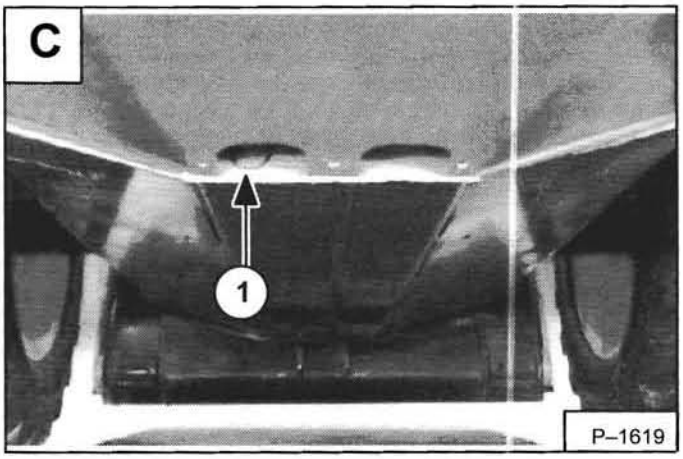
Removing Oil From the Chaincase

To drain the oil from the chaincase, remove the cover (Item 1) **[B]** over the drain plug at the rear of the chaincase.



Remove the drain plug (Item 1) **[C]** and drain the oil into a container.

NOTE: When installing the drain plug into the chaincase, always use a NEW drain plug.



FAN GEARBOX

Checking and Maintaining

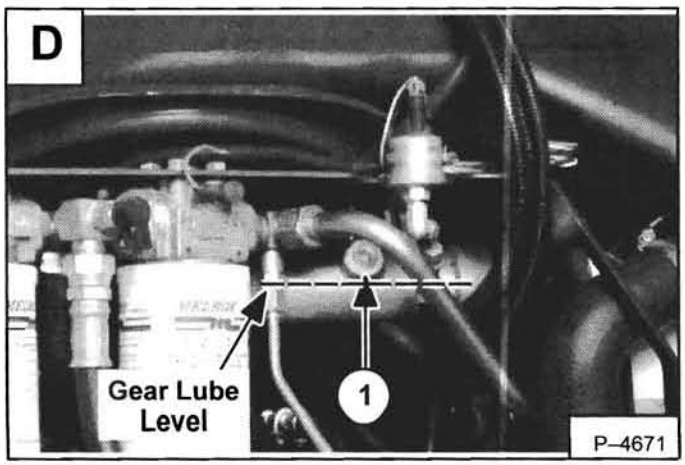
See the Service Schedule (Page 1–3) for the correct service interval.

Raise the operator cab (Page 1–7).

Remove the plug (Item 1) **[D]** to check the lubricant level.

If the level is low, add SAE 90W gear lube through the check plug hole until the lubricant flows from the hole. Install and tighten the plug.

When checking the gearbox lube level, make sure the level does not go above the top of the shaft in the gearbox **[D]**. Use SAE 90W gear lube if the level is low.



LUBRICATING THE LOADER

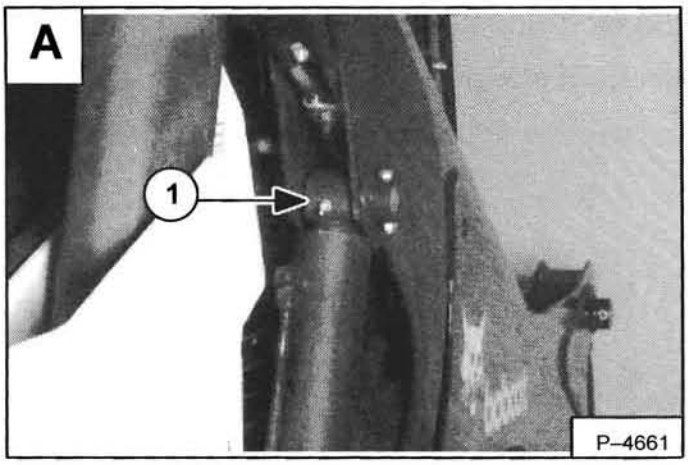
Procedure

Lubricate the loader as specified in the Service Schedule (Page 1–3) for the best performance of the loader.

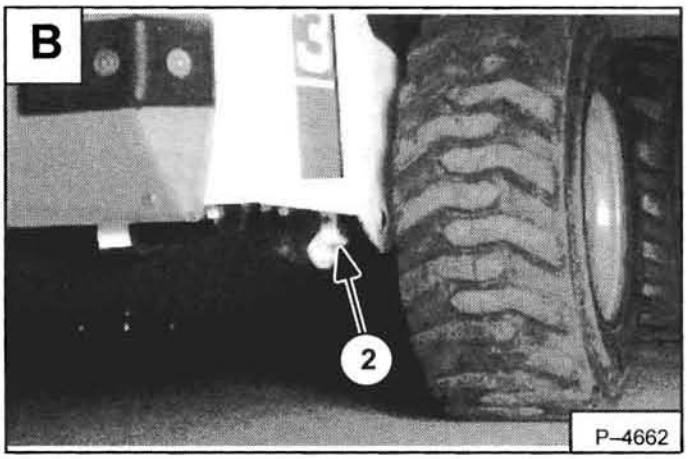
Always use a good quality lithium based multi–purpose grease when you lubricate the loader. Apply the lubricant until extra grease shows.

Lubricate the following locations on the loader:

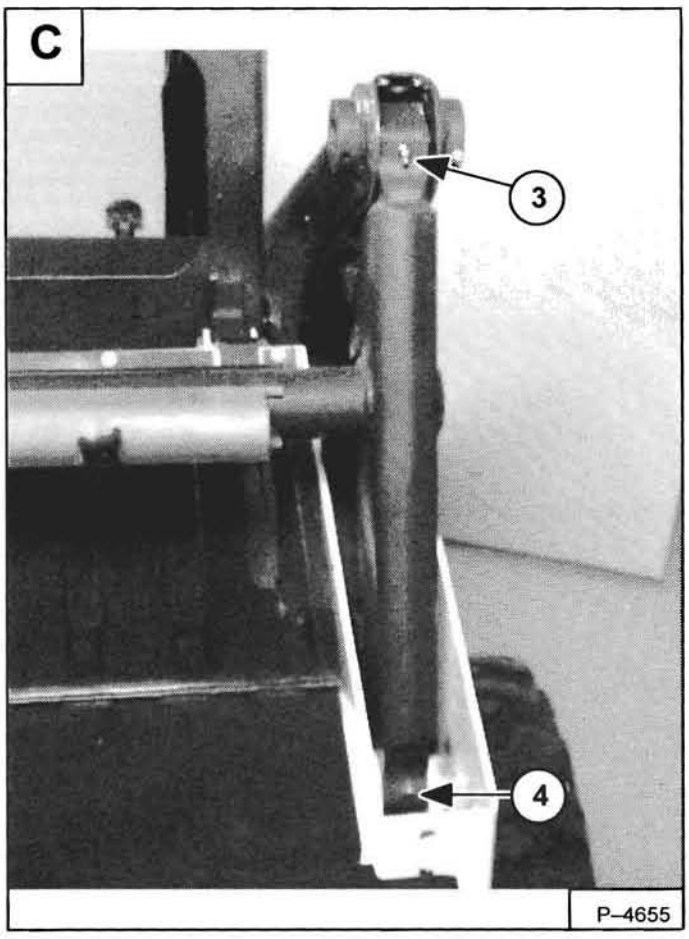
1. Rod End Lift Cylinder (Both Sides) **[A]**.



2. Base End Lift Cylinder (Both Sides) **[B]**.



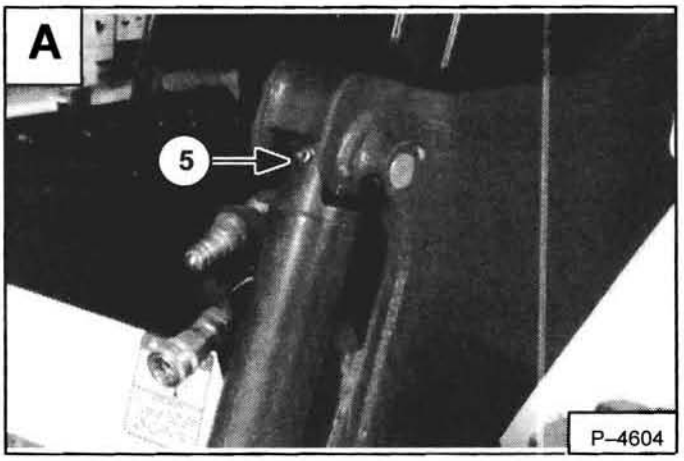
3. Lift Arm Pivot Pin (Both Sides) **[C]**.
4. Lift Arm Link Pivot (Both Sides) **[C]**.



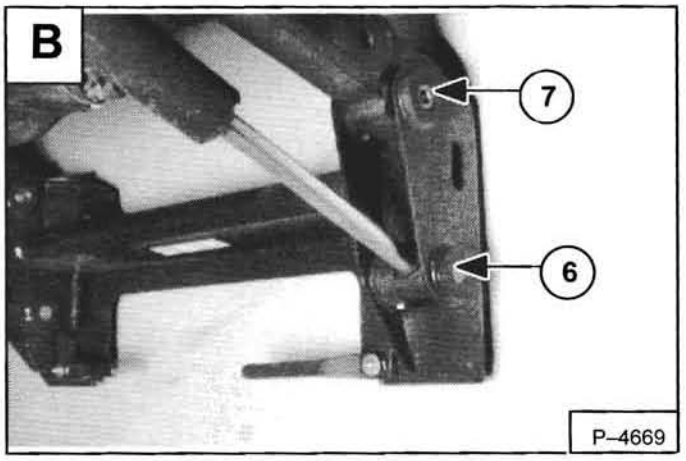
LUBRICATING THE LOADER (Cont'd)

Procedure (Cont'd)

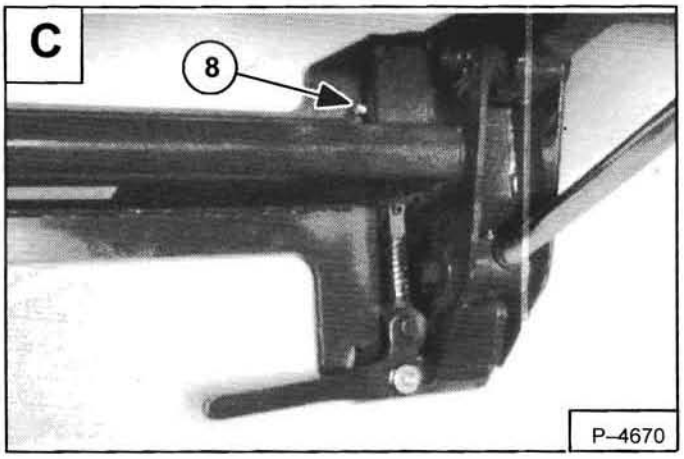
5. Base End Tilt Cylinder (Both Sides) **[A]**.



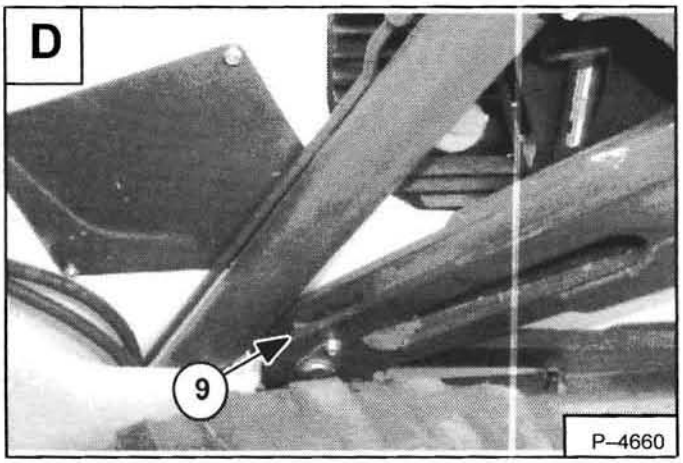
6. Rod End Tilt Cylinder (Both Sides) **[B]**.
7. Bob–Tach Pivot Pin (Both Sides) **[B]**.



8. Bob–Tach Wedge (Both Sides) **[C]**.

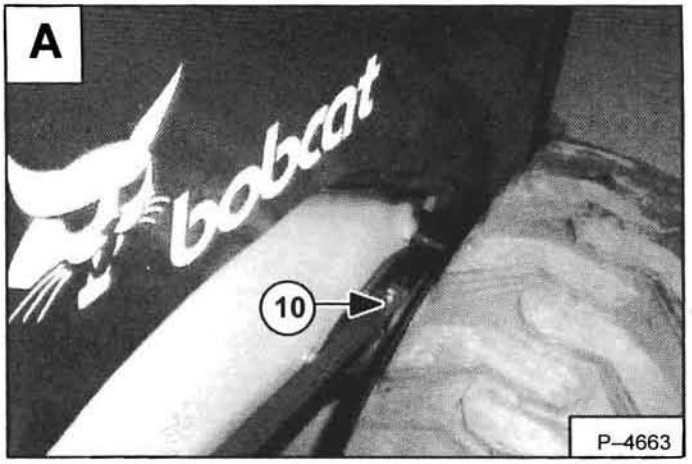


9. Stabilizer Bar (Both Sides) **[D]**.

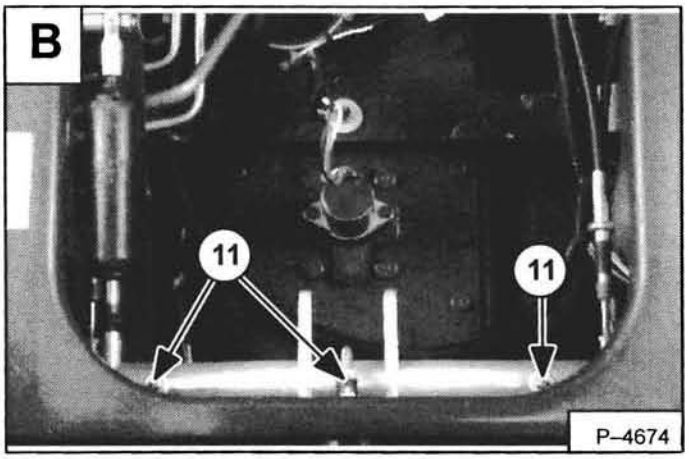


Procedure (Cont'd)

10. Stabilizer Bar (Both Sides) **[A]**.



11. **250 Hours:** Steering Lever Shaft (3) **[B]**.



REMOTE START SWITCH

Procedure

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

MEL1429 – Remote Start Switch

The Remote Start Switch is required when the service technician is adjusting the steering linkage, checking the hydraulic/hydrostatic system.

Lift and block the loader (Page 1–4).

Raise the lift arms and install an approved lift arm support device (Page 1–6).

Raise the operator cab (Page 1–7).

Disconnect the operator cab wire harness (Item 1) **[A]** from the engine wire harness.

Connect the remote start switch to the engine harness connectors (Item 1) **[B]**.

⚠ WARNING

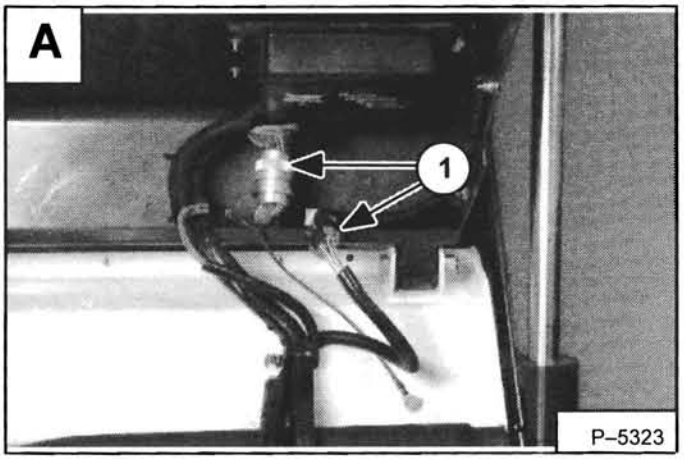
Put jackstands under the front axles and rear corners of the frame before running the engine for service. Failure to use jackstands can allow the machine to fall or move and cause injury or death.

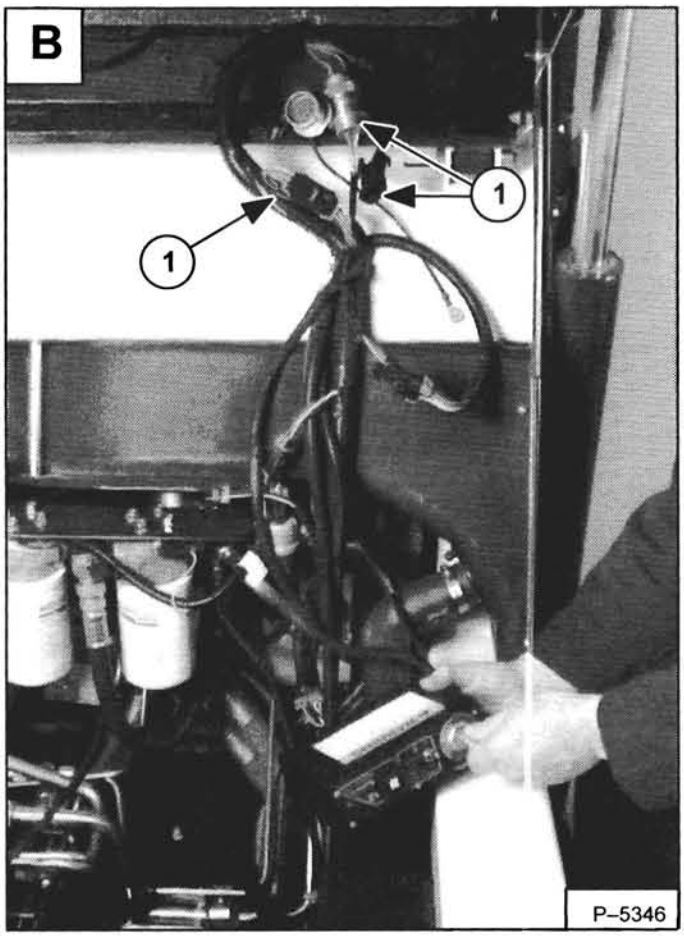
W–2017–0286

⚠ WARNING

Never work on a machine with the lift arms up unless the lift arms are secured by a 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–2059–0991



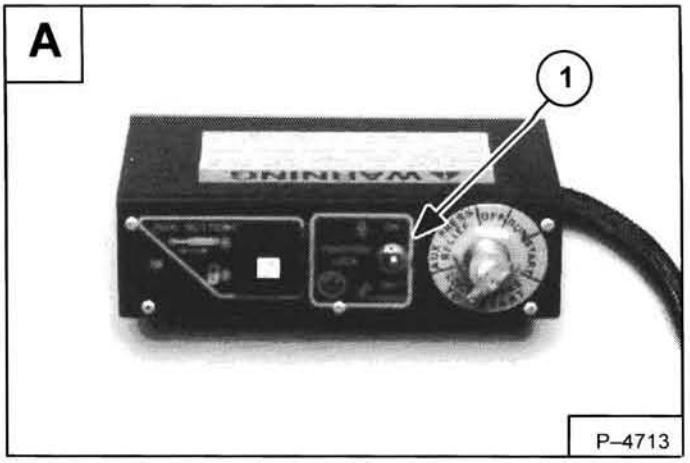


REMOTE START SWITCH (Cont'd)

Procedure (Cont'd)

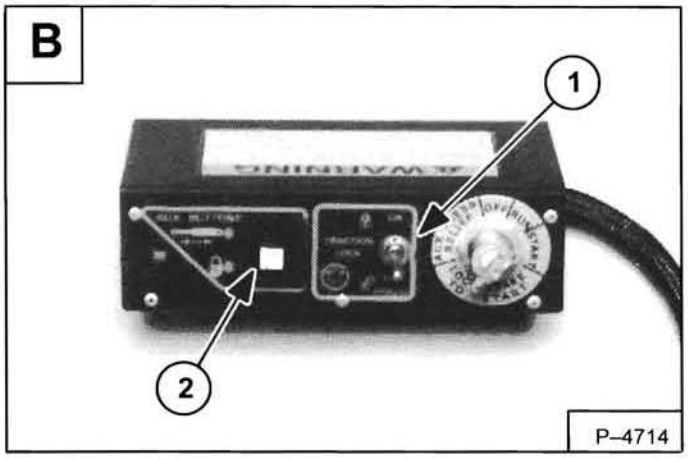
Put the traction lock override switch (Item 1) **[A]** in the "ON" position so the traction function is locked. The wheels are not able to turn.

Turn the key to the right and start the engine.



Move the traction lock override switch (Item 1) **[B]** to the "OFF" position so the traction function is unlocked. The wheels are now able to turn.

The auxiliary mode switch (Item 2) **[B]** is used to turn the front auxiliary quick couplers "ON" and "OFF" during relief pressure and flow tests.



bobcat

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TROUBLESHOOTING
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TIGHTEN ALL HARDWARE PER SIZE TO GRADE 5 TORQUE (SEE STANDARD TORQUE SPECIFICATIONS FOR BOLTS, SECTION 9) UNLESS OTHERWISE SPECIFIED.

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MC 2162TI

45-55 PSI (311-379 kPa)

(5) DIFFERENTIAL PRESSURE SWITCH:
36-44 PSI (248-303 kPa)
Standard Loader (Normally Open)
B.O.S.S. Loader (Normally Closed)

(6) CHECK VALVE . . LIFT CYLINDER

(7) FLOW ADJUSTMENT VALVE

(8) CHECK VALVE . . TILT CYLINDER

(9) FLOW CONTROL SPOOL

(10) UNLOADING SPOOL

(11) MANUAL BYPASS CONTROL

(12) CHECK VALVES

(13) LIFT LOCK BYPASS VALVE CONTROL SPOOL

(14) CONTROL SPOOL

(15) TILT LOCK VALVE SOLENOID

(16) MAIN RELIEF VALVE:
@ Quick Couplers
2950-3050 PSI (20340-21030 kPa)

(17) LOAD CHECK VALVES (TWO)

(18) ANTI-CAVITATION VALVE

(19) PORT RELIEF VALVE:
3500 PSI (24132 kPa)

(20) ONE WAY RESTRICTOR VALVE

(21) ANTI-CAVITATION/PORT RELIEF VALVE
3500 PSI (24132 kPa)

(22) ORIFICED LOAD CHECK VALVE

(23) AUXILIARY CONTROL SOLENOIDS

(24) PORT RELIEF VALVE . . (Optional)
2500 PSI (17238 kPa)

(25) DRIVE MOTOR SHUTTLE VALVES

(26) SHUTTLE RELIEF VALVES
70 PSI (483 kPa)

(31) CHARGE PUMP . . . 11.0 GPM
(41,6 L./Min.) @ 2750 RPM

(32) CHARGE RELIEF VALVE
100° F. (38°C.) Fluid @ Full RPM
Neutral . . . . 350-370 PSI
(2413-2551 kPa)
Stroked . . . . 340-360 PSI
(2344-2482 kPa)

(33) HYDROSTATIC FILTER
#3 Synthetic Media

(34) DIVERTER CONTROL SPOOL - ELECTRICALLY ACTIVATED

(35) CASE DRAIN CONTROL SPOOL
For D2 Control Spool -
Neutral Position

(36) "D2" CONTROL SPOOL

(37) "D1" CONTROL SPOOL

(38) "P2" & "F2" CONTROL SPOOL

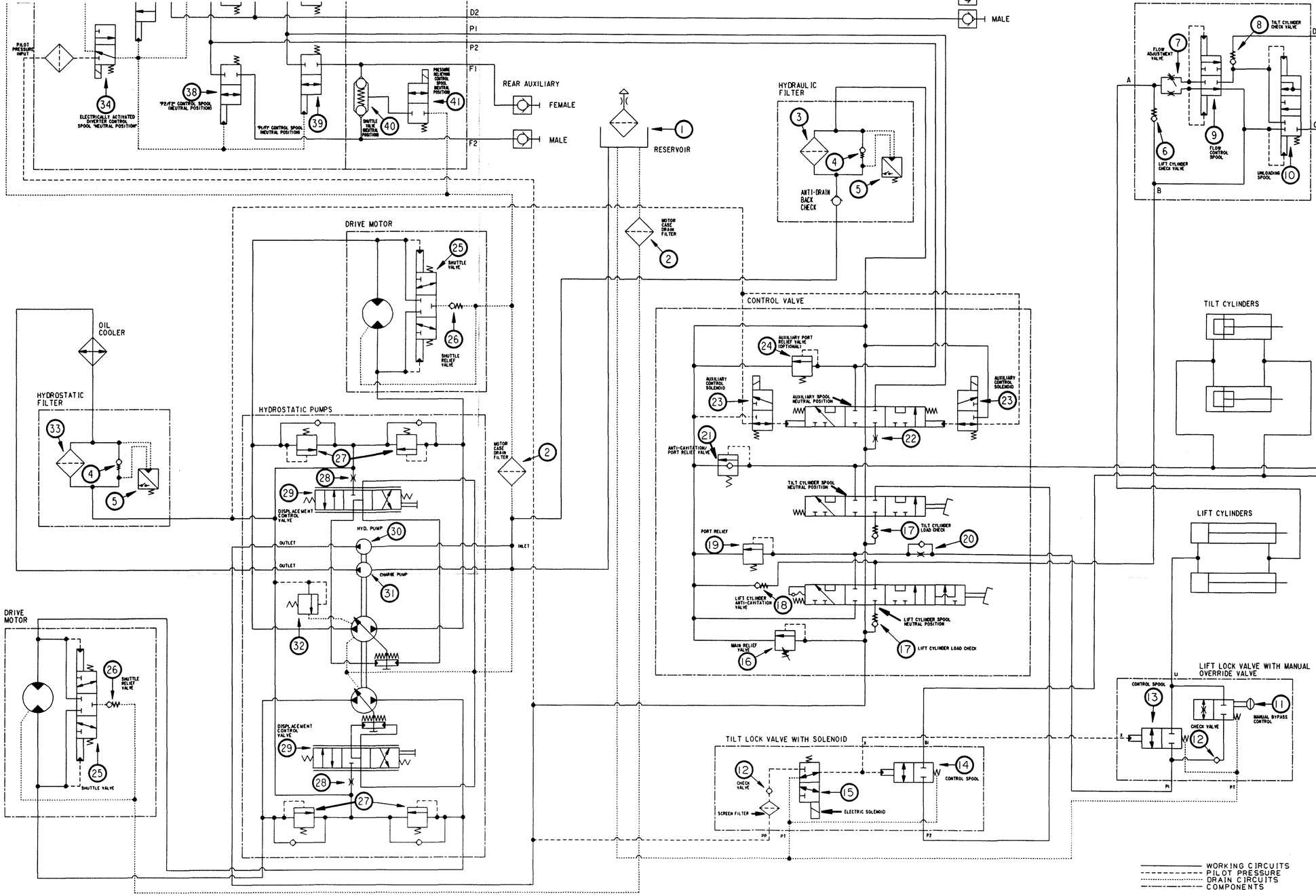
(39) "P1" & "F1" CONTROL SPOOL

*(40) SHUTTLE VALVE - Neutral Position

*(41) "SV2" ELECTRICALLY ACTIVATED PRESSURE RELIEVING (BLEED) CONTROL SPOOL - Neutral Position

*** NOTE: Items 40 and 41 will NOT be on the early Optional Diverter Valve.**

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



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MC 2162 (12-3-96)

HYDRAULIC SYSTEM

TROUBLESHOOTING

Chart

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

⚠ WARNING

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

W–2004–1285

PROBLEM	CAUSE
The hydraulic system will not operate.	1, 2, 3, 5, 8
The transmission warning light comes "ON" when hydraulics are operating.	1, 3
Slow hydraulic system action.	1, 3, 4, 6, 8
Hydraulic action is not smooth.	1, 4, 5, 6, 7
Lift arms go up slowly at full engine RPM.	1, 3, 4, 5, 6, 7, 8, 9
The lift arms or Bob–Tach will move when the pedal is in neutral position.	4
The lift arms come down with the pedal in the neutral position.	4, 9, 10, 11

KEY TO CORRECT THE CAUSE	
1.	The fluid level is not correct.
2.	The pedal linkage is disconnected.
3.	The hydraulic pump has damage.
4.	The pedal linkage is not adjusted correctly.
5.	Relief valve is not at the correct pressure.
6.	Suction leak on the inlet side of the hydraulic pump.
7.	Fluid is cold. Wrong viscosity fluid (See Section 9).
8.	Using the loader for more than its rated capacity.
9.	Internal leak in the lift cylinder(s).
10.	External leak from the lift cylinder(s).
11.	Damaged lift spool.

LIFT CYLINDER(S)

Checking the Lift Cylinder(s)

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

⚠ WARNING

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

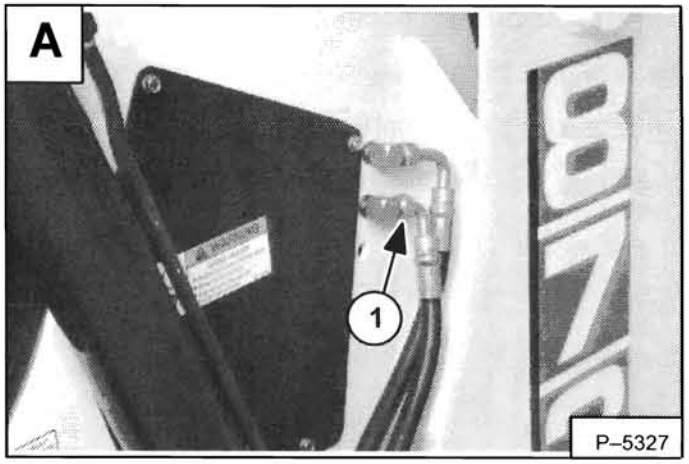
W–2145–0290

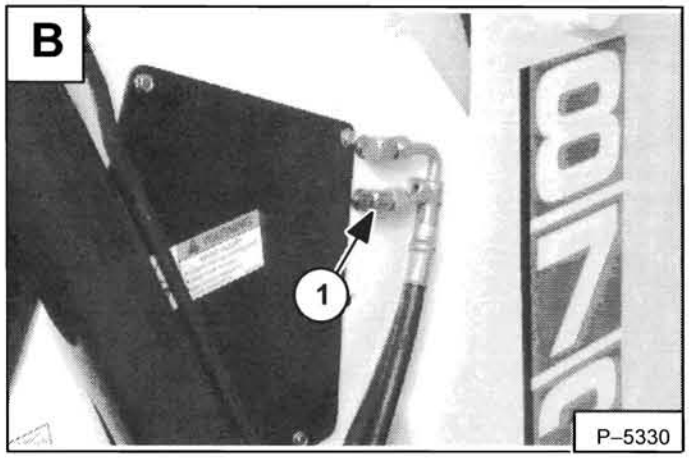
Check only one cylinder at a time. Disconnect the hose (Item 1) **[A]** which goes to the base end of the lift cylinder.

Install a cap (Item1) **[B]** on the fitting and tighten.

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

If there is any leakage from the hose end, remove the lift cylinder for repair. Repeat the procedure to check the other lift cylinder.



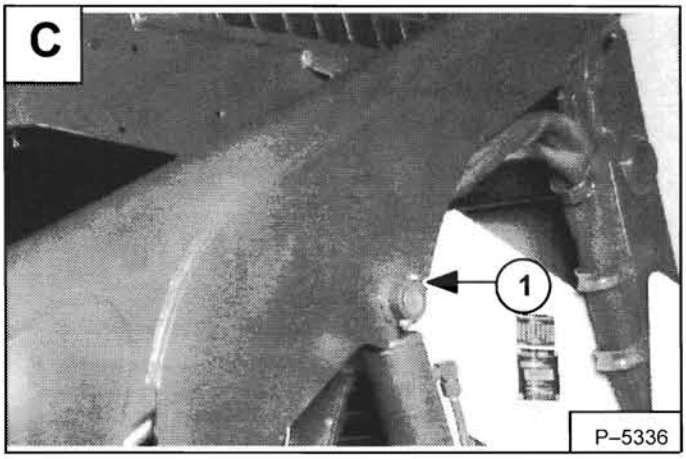


Removal and Installation

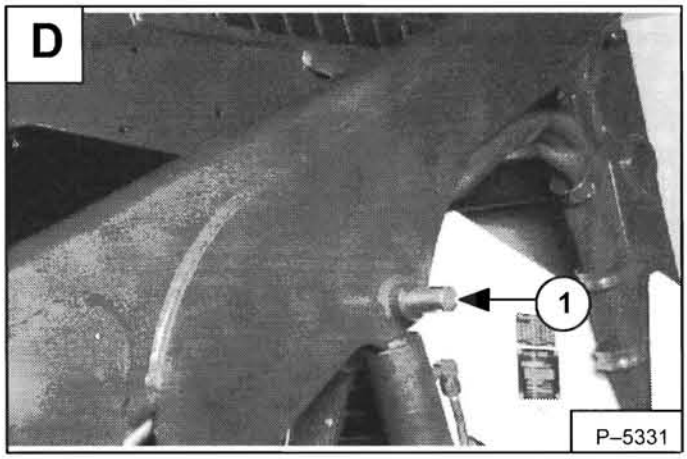
Raise the operator cab (Page 1–1).

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

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



Remove the retaining pin (Item 1) **[D]** from the rod end of the cylinder.



TILT CYLINDER(S)

Checking the Tilt Cylinder(s)

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

⚠ WARNING

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

W–2145–0290

Disconnect the hose (Item 1) **[A]** which goes to the base end of the tilt cylinder.

Put a plug (Item 1) **[B]** in the hose and tighten.

Engage the parking brake. Lower the seat bar. Start the engine and push the bottom (heel) of the tilt pedal. If there is leakage from the open port, remove the tilt cylinder for repair.

Repeat procedure to check the other tilt cylinder.

Removal and Installation

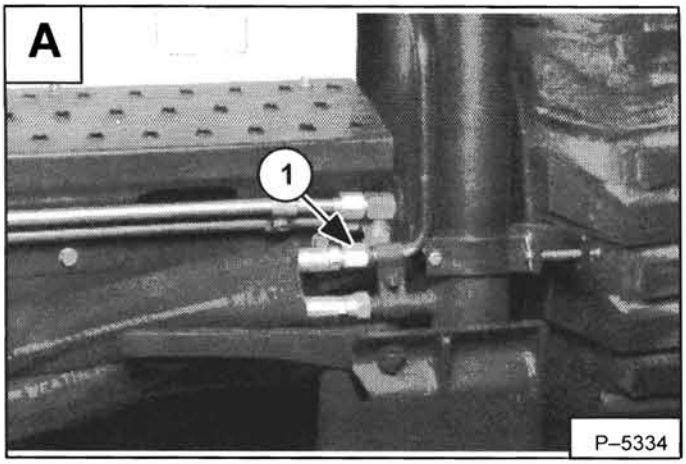
Remove the attachment. Roll the Bob–Tach fully forward **[C]**.

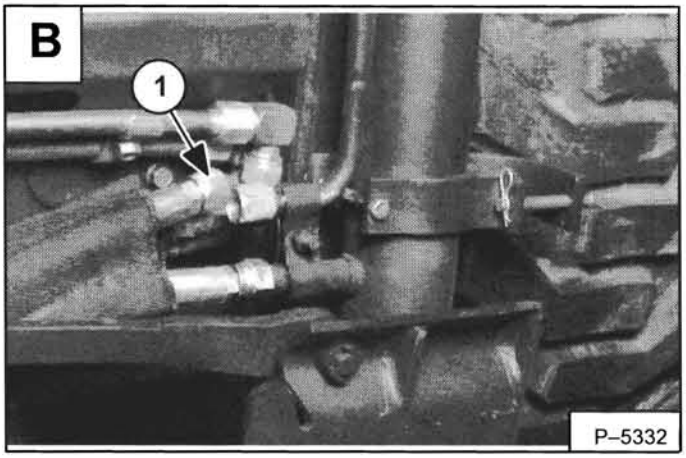
Stop the engine. Raise the seat bar.

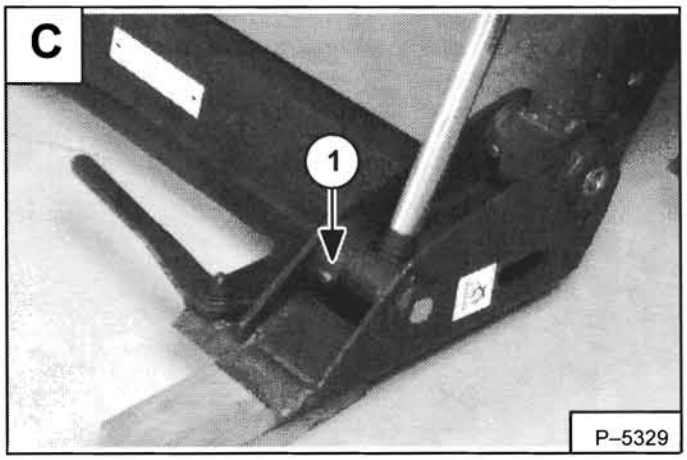
Remove the retainer bolt and nut (Item 1) **[C]** from the rod end pivot pin.

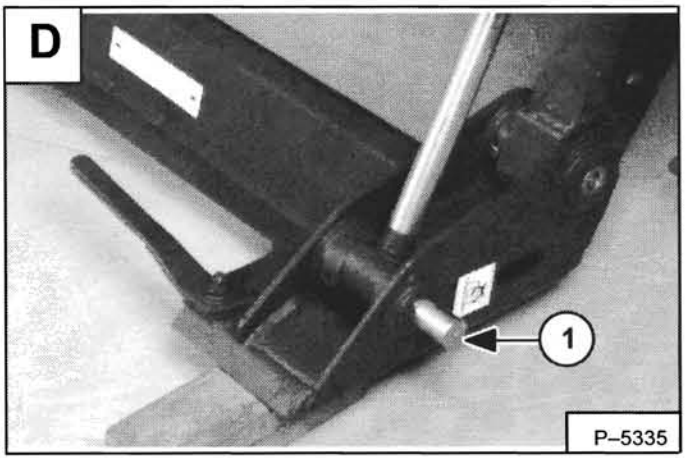
Installation: Tighten the retainer nut to 18–20 ft.–lbs. (24–27 Nm) torque.

Remove the rod end pivot pin (Item 1) **[D]**.









HYDRAULIC SYSTEM

TROUBLESHOOTING

Chart

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

⚠ WARNING

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

W–2004–1285

PROBLEM	CAUSE
The hydraulic system will not operate.	1, 2, 3, 5, 8
The transmission warning light comes "ON" when hydraulics are operating.	1, 3
Slow hydraulic system action.	1, 3, 4, 6, 8
Hydraulic action is not smooth.	1, 4, 5, 6, 7
Lift arms go up slowly at full engine RPM.	1, 3, 4, 5, 6, 7, 8, 9
The lift arms or Bob–Tach will move when the pedal is in neutral position.	4
The lift arms come down with the pedal in the neutral position.	4, 9, 10, 11

KEY TO CORRECT THE CAUSE	
1.	The fluid level is not correct.
2.	The pedal linkage is disconnected.
3.	The hydraulic pump has damage.
4.	The pedal linkage is not adjusted correctly.
5.	Relief valve is not at the correct pressure.
6.	Suction leak on the inlet side of the hydraulic pump.
7.	Fluid is cold. Wrong viscosity fluid (See Section 9).
8.	Using the loader for more than its rated capacity.
9.	Internal leak in the lift cylinder(s).
10.	External leak from the lift cylinder(s).
11.	Damaged lift spool.

IMPORTANT

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

I–2003–0284

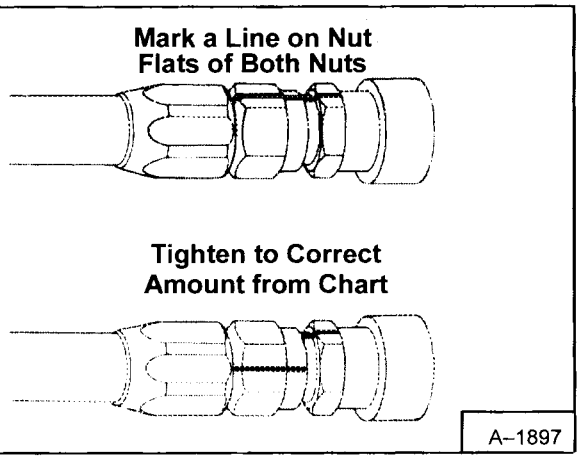
Flare Connections

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.

A



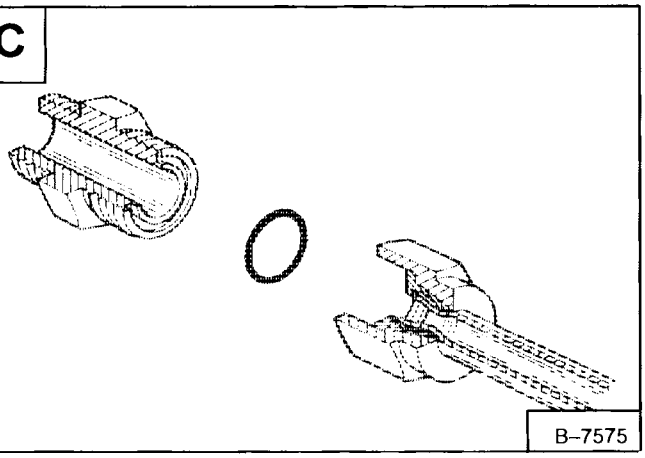
B

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

O–ring Face Seal Connection

When the fitting is tightened, you can "feel" when the fitting is tight to eliminate leakage caused by under or over torqued fittings. Use Vaseline petroleum jelly to hold the O–ring in position until the fittings are assembled **[C]**.

C



Straight Thread O–ring Fitting

Lubricate the O–ring before installing the fitting. Loosen the jam nut and install the fitting. Tighten the jam nut until the washer is tight against the surface **[D]**.

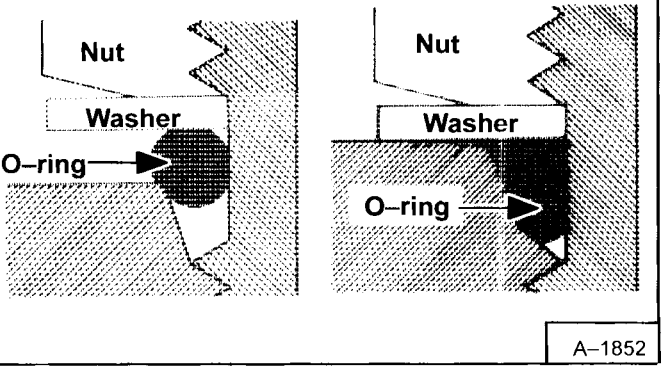
Tubelines and Hoses

Replace any tubelines that are bent or flattened. They will restrict flow, which will slow hydraulic action and cause heat.

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

Always use two wrenches when loosening and tightening hose or tubeline fittings.

D



LIFT CYLINDER(S)

Checking the Lift Cylinder(s)

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

⚠ WARNING

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

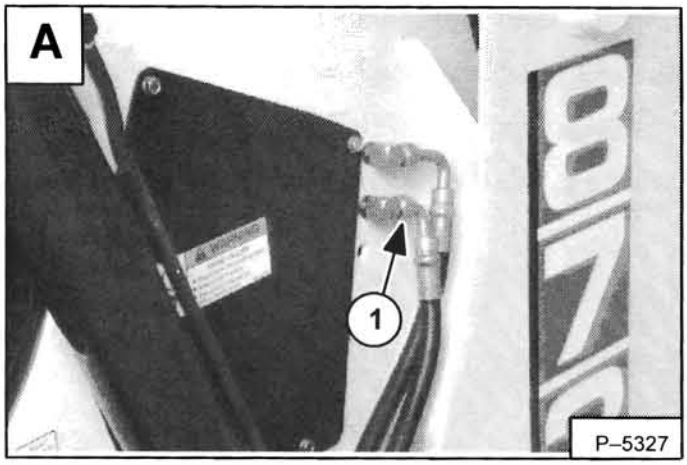
W–2145–0290

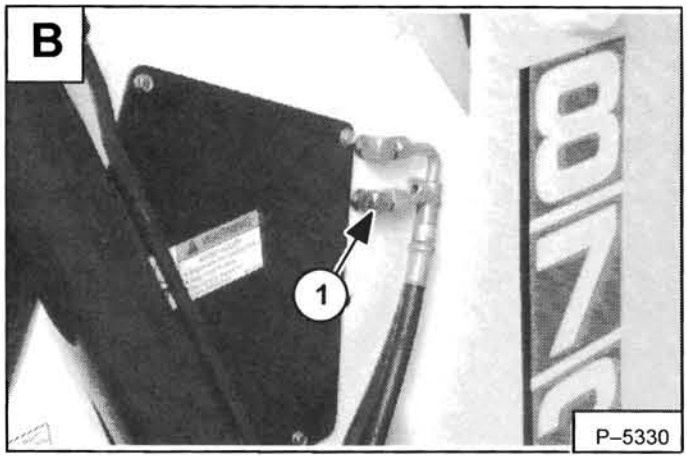
Check only one cylinder at a time. Disconnect the hose (Item 1) **[A]** which goes to the base end of the lift cylinder.

Install a cap (Item1) **[B]** on the fitting and tighten.

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

If there is any leakage from the hose end, remove the lift cylinder for repair. Repeat the procedure to check the other lift cylinder.



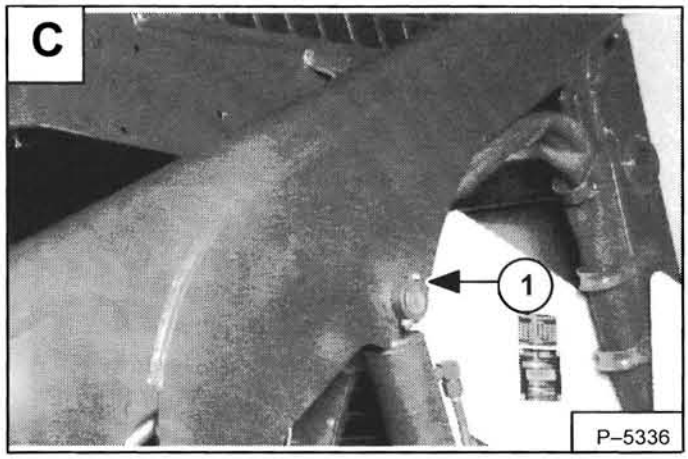


Removal and Installation

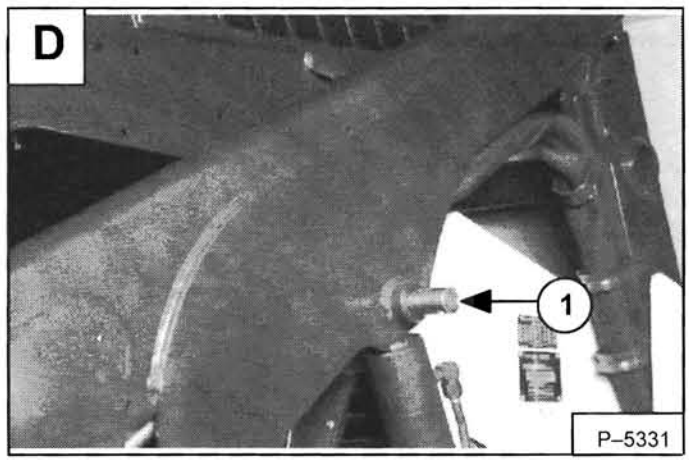
Raise the operator cab (Page 1–1).

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

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



Remove the retaining pin (Item 1) **[D]** from the rod end of the cylinder.

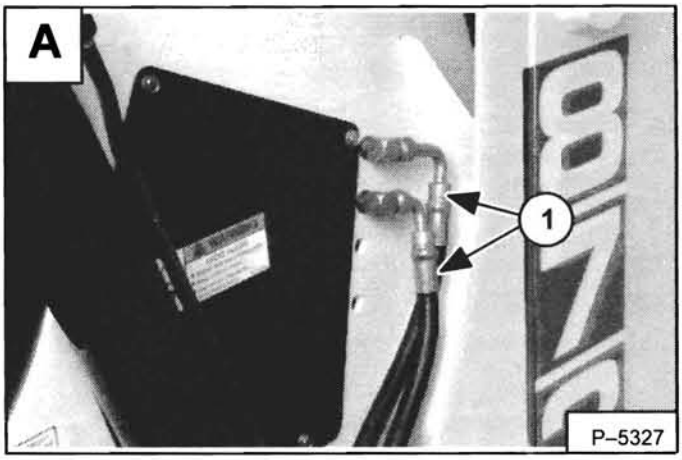


LIFT CYLINDER(S) (Cont'd)

Removal and Installation (Cont'd)

Mark the hoses for correct installation.

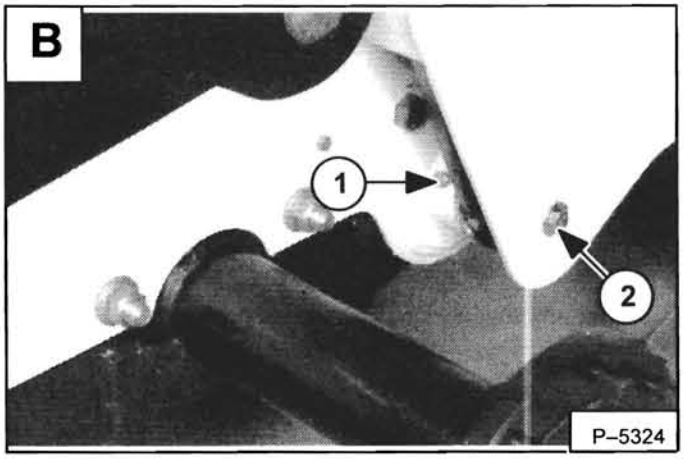
Disconnect the two hoses (Item 1) **[A]** from the lift cylinder.



Remove the retaining bolt and nut (Item 1) **[B]** from the pivot pin on the base end of the cylinder.

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

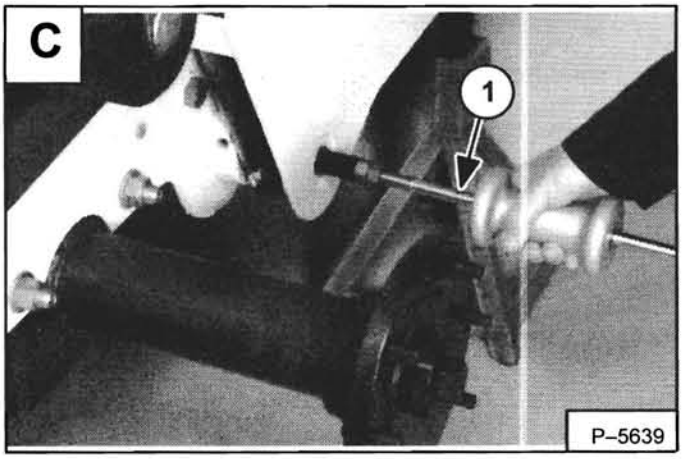
Remove the bolt (Item 2) **[B]** from the pivot pin.



Install a slide hammer puller (Item 1) **[C]**.

Remove the base end pivot pin.

Remove the lift cylinder.



⚠ WARNING

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

W–2103–1285

TILT CYLINDER(S)

Checking the Tilt Cylinder(s)

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

⚠ WARNING

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

W–2145–0290

Disconnect the hose (Item 1) **[A]** which goes to the base end of the tilt cylinder.

Put a plug (Item 1) **[B]** in the hose and tighten.

Engage the parking brake. Lower the seat bar. Start the engine and push the bottom (heel) of the tilt pedal. If there is leakage from the open port, remove the tilt cylinder for repair.

Repeat procedure to check the other tilt cylinder.

Removal and Installation

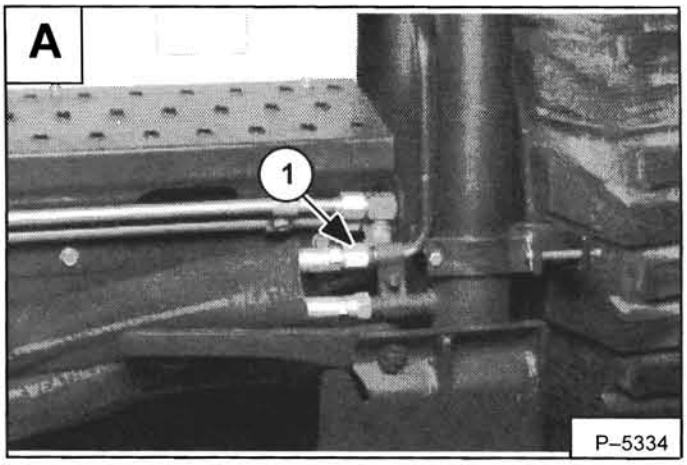
Remove the attachment. Roll the Bob–Tach fully forward **[C]**.

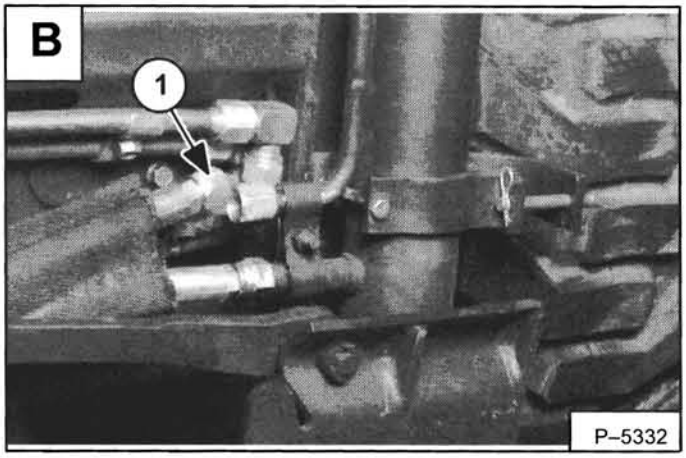
Stop the engine. Raise the seat bar.

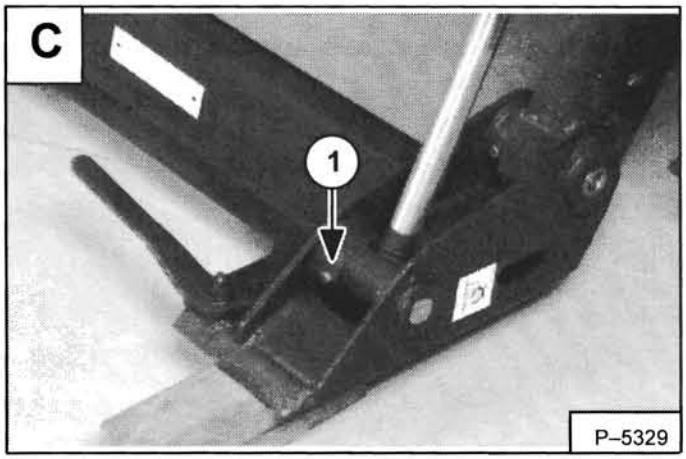
Remove the retainer bolt and nut (Item 1) **[C]** from the rod end pivot pin.

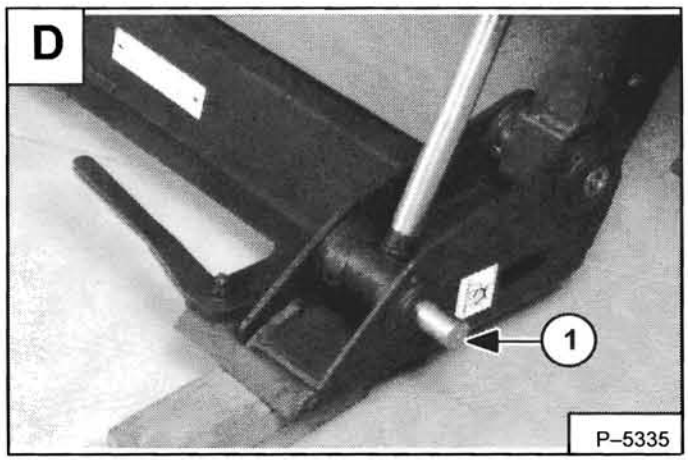
Installation: Tighten the retainer nut to 18–20 ft.–lbs. (24–27 Nm) torque.

Remove the rod end pivot pin (Item 1) **[D]**.





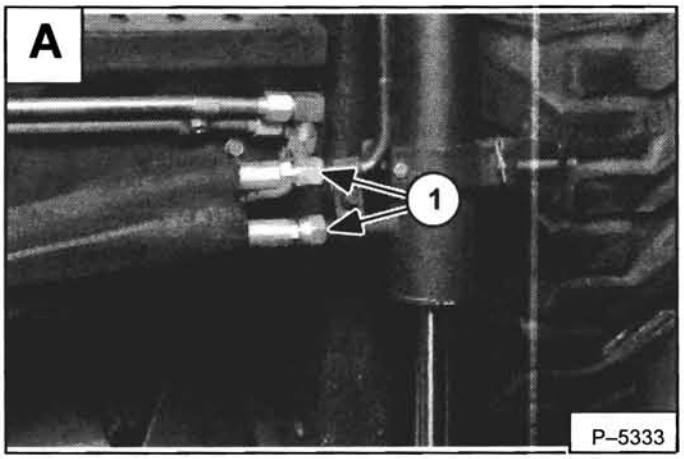




TILT CYLINDER(S) (Cont'd)

Removal and Installation (Cont'd)

Disconnect both hoses (Item 1) **[A]**.



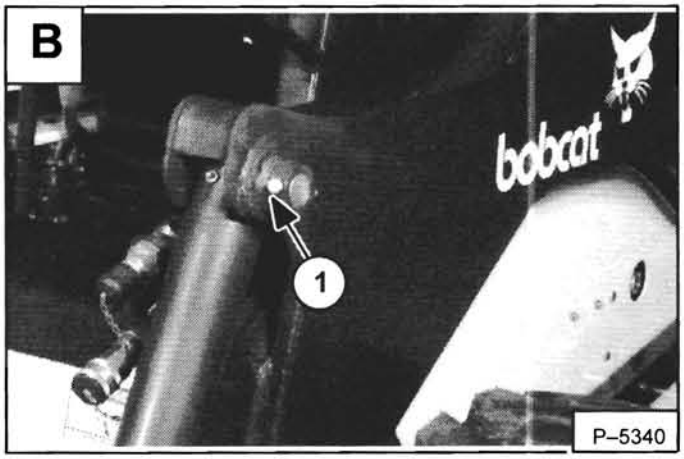
Remove the retainer bolt and nut (Item 1) **[B]** from the base end pivot pin.

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

⚠ WARNING

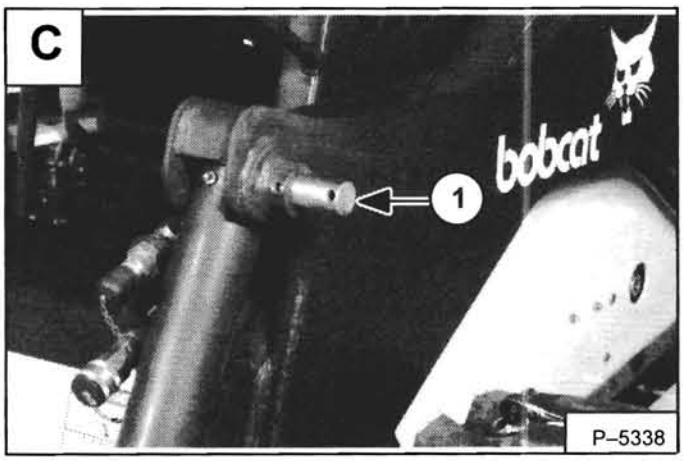
Always clean up spilled fuel or oil. Keep heat, flames, sparks or lighted tobacco away from fuel and oil. Failure to use care around combustibles can cause explosion or fire which can result in injury or death.

W–2103–1285



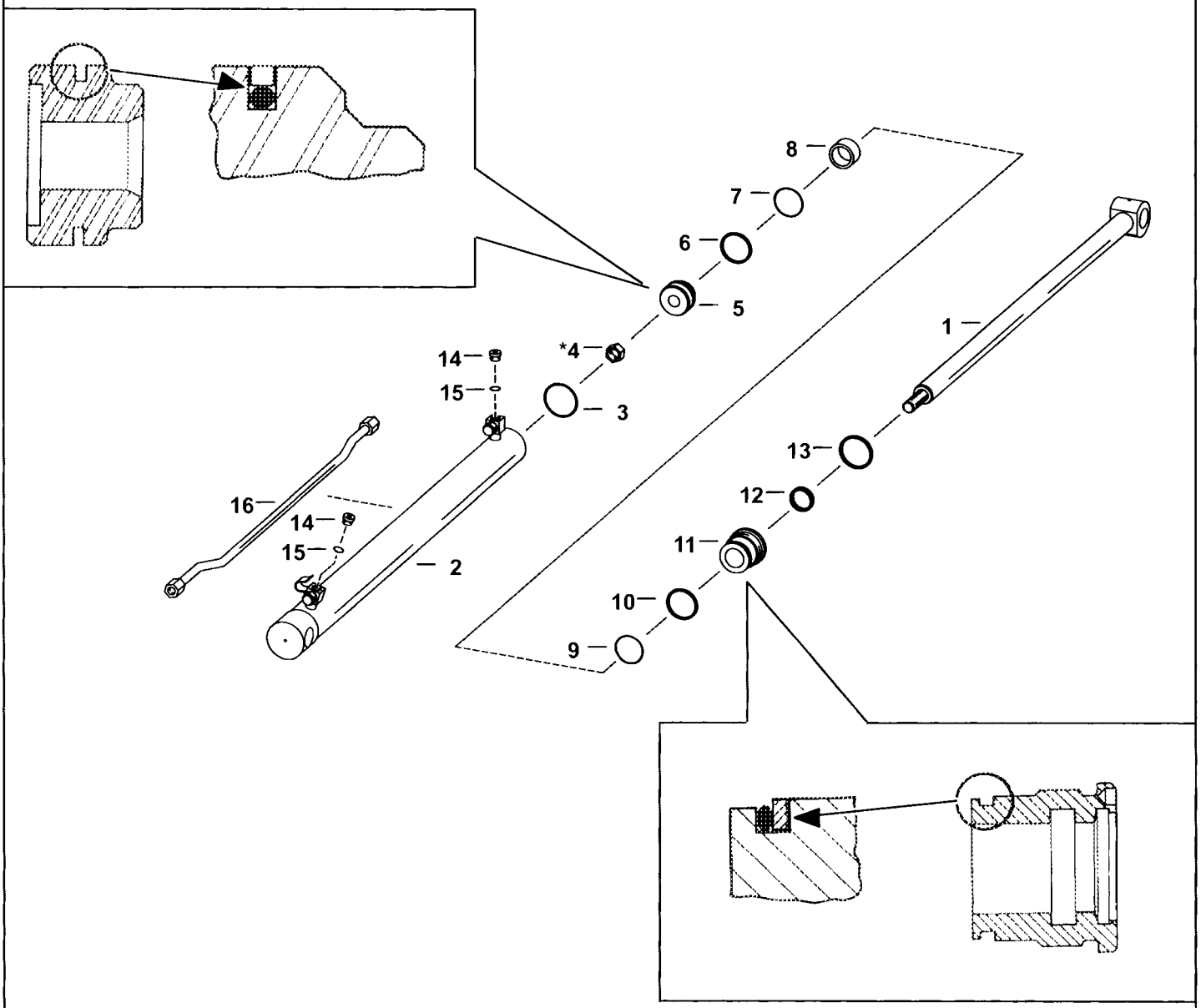
Remove the base end pivot pin (Item 1) **[C]**.

Remove the tilt cylinder from the loader.



Lift Cylinder Identification

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

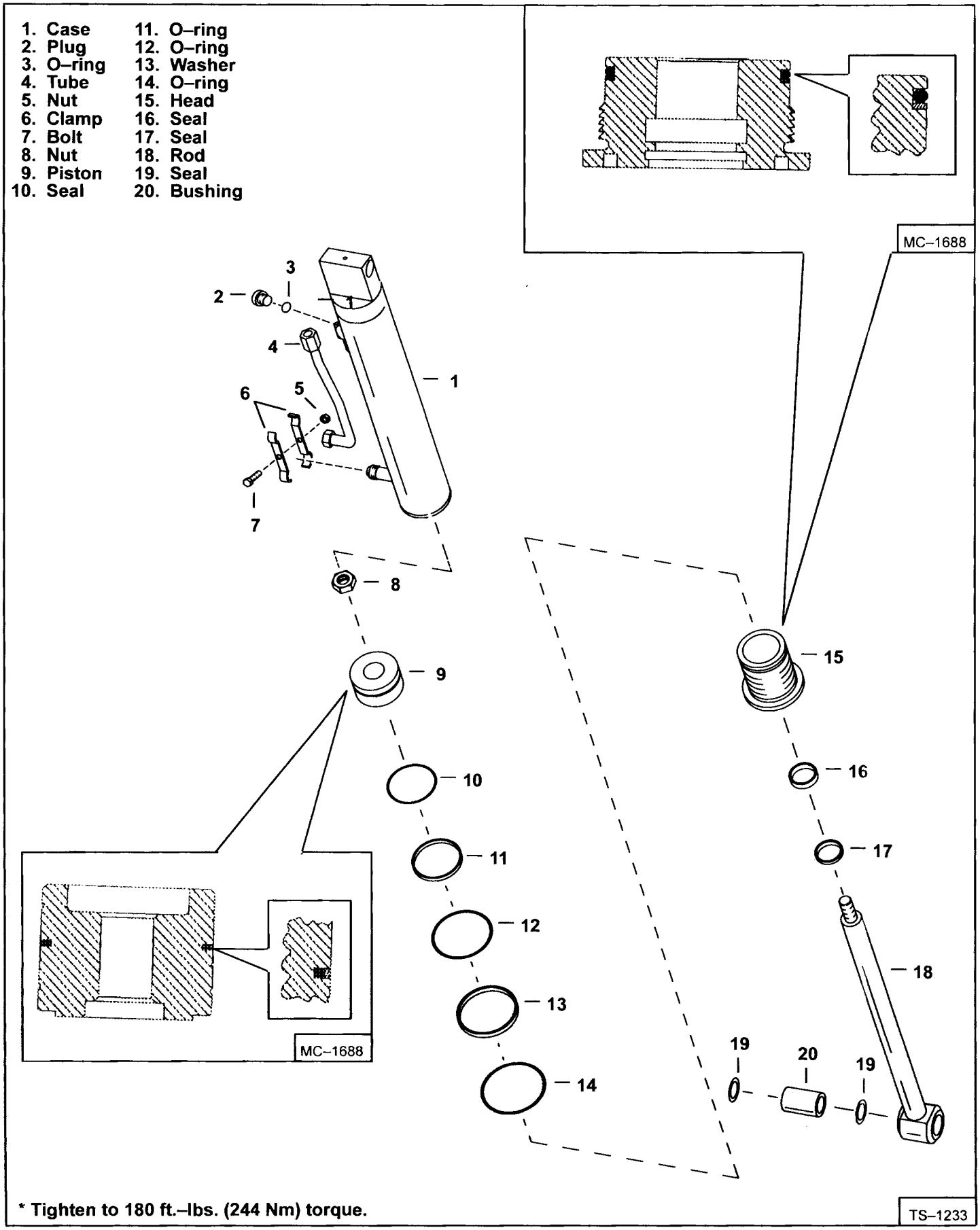


* Tighten to 180 ft.–lbs. (244 Nm) torque.

TS–1060

Tilt Cylinder Identification

1. Case
2. Plug
3. O–ring
4. Tube
5. Nut
6. Clamp
7. Bolt
8. Nut
9. Piston
10. Seal
11. O–ring
12. O–ring
13. Washer
14. O–ring
15. Head
16. Seal
17. Seal
18. Rod
19. Seal
20. Bushing



* Tighten to 180 ft.–lbs. (244 Nm) torque.

Disassembly

Tools necessary for the disassembly/assembly procedures:

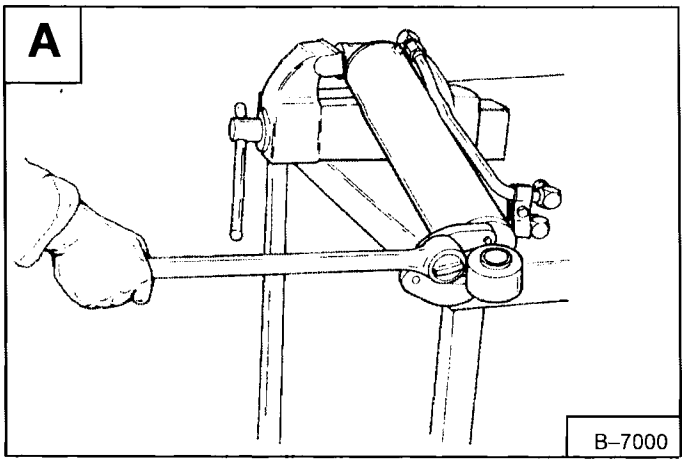
MEL1074 – O–ring Seal Hook
MEL1075 – Adjustable Gland Nut Wrench
MEL1396 – Seal Installation Tool
MEL1033 – Rod Seal Installation Tool
Piston Ring Compressor

NOTE: The drawings may not show the cylinder exactly as it appears, but the procedure is correct for all cylinders.

Put the base end of the hydraulic cylinder in a drain pan. Move the rod in and out to remove the fluid from the cylinder. Move the rod slowly so the fluid will go directly into the drain pan.

Put the base end of the cylinder in a vise.

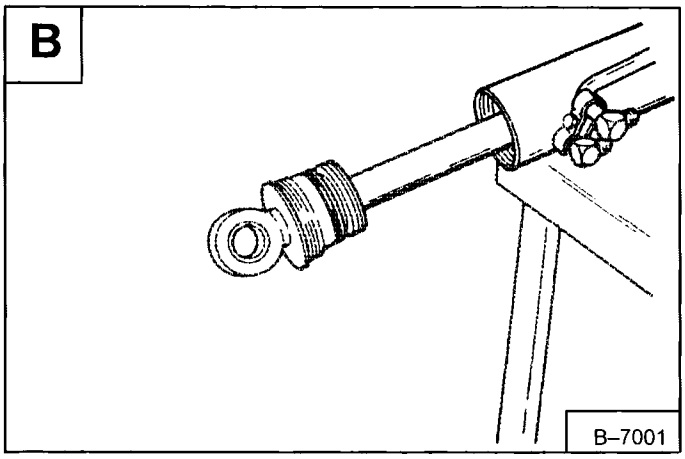
Use the adjustable gland nut wrench to loosen the head **[A]**.



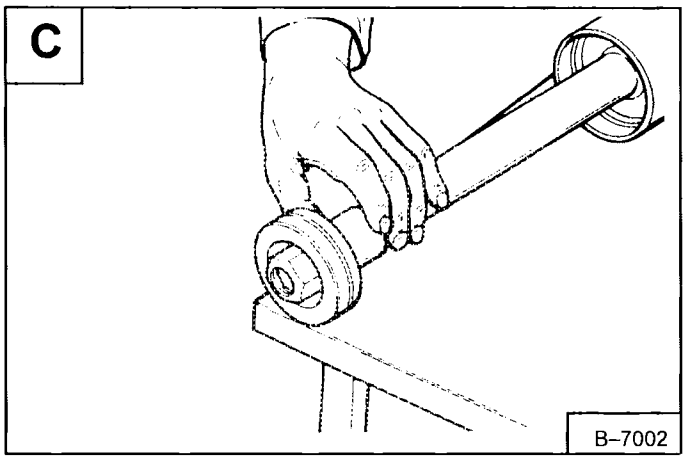
Remove the rod assembly from the cylinder case **[B]**.

Remove the cylinder case from the vise.

Put the rod end in the vise.

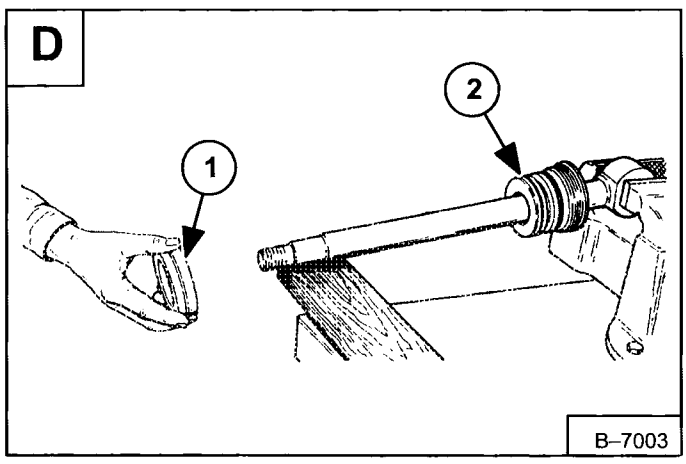


Remove the nut from the piston end of the rod **[C]**.



Pull the piston off the rod (Item 1) **[D]**.

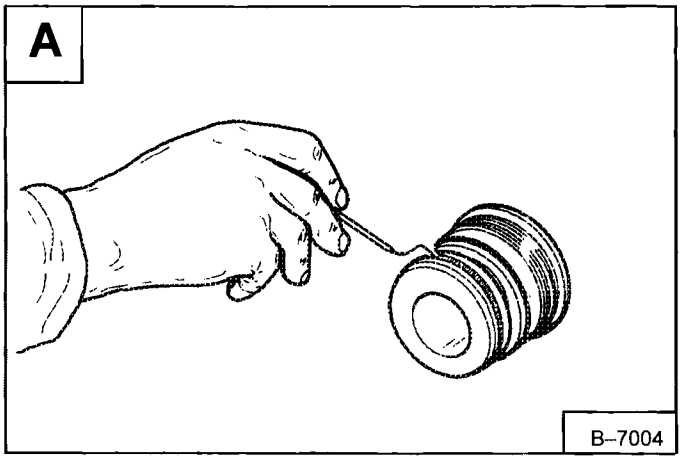
Pull the head (Item 2) **[D]** off the rod.



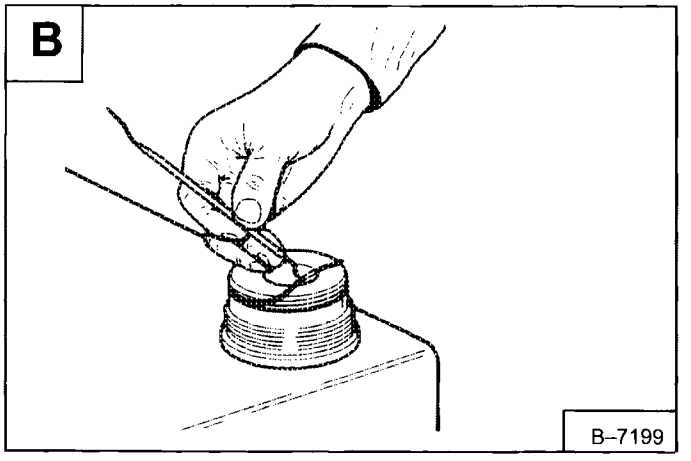
HYDRAULIC CYLINDER (Cont'd)

Disassembly (Cont'd)

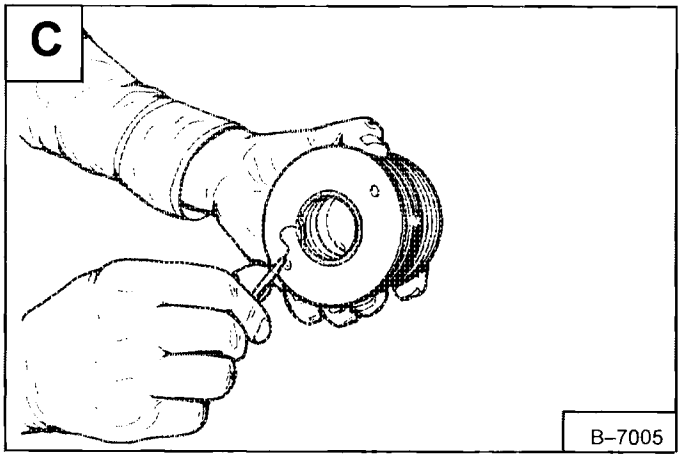
If the head has a seal, remove the seal from the head **[A]**.



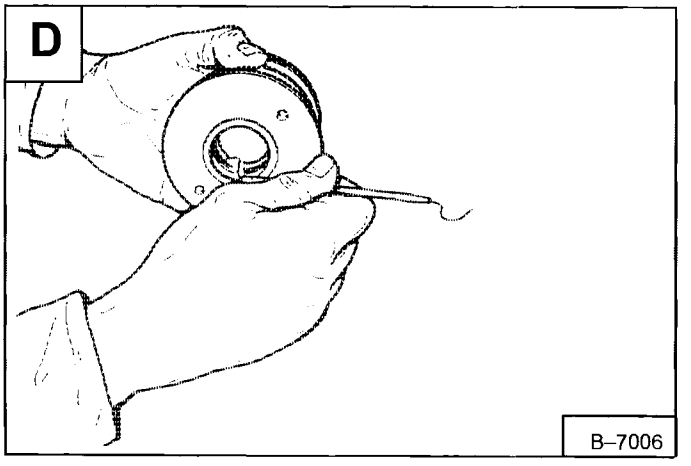
Remove the O–ring and backup washer from the head **[B]**.



Remove the wiper seal **[C]**.

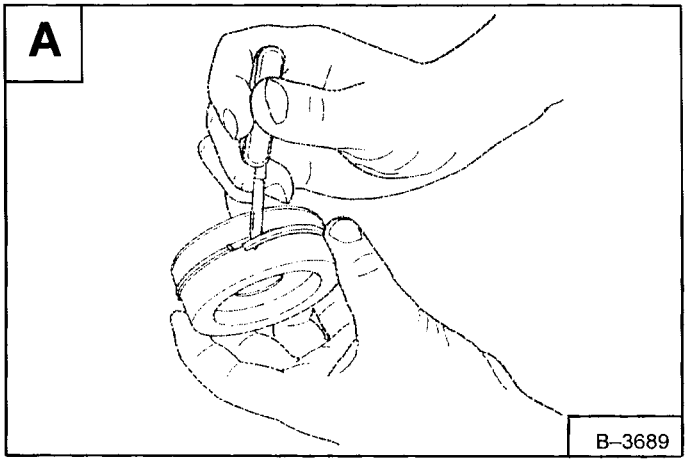


Remove the oil seal from the head **[D]**.



Disassembly (Cont'd)

Remove the piston seal from the piston **[A]**.

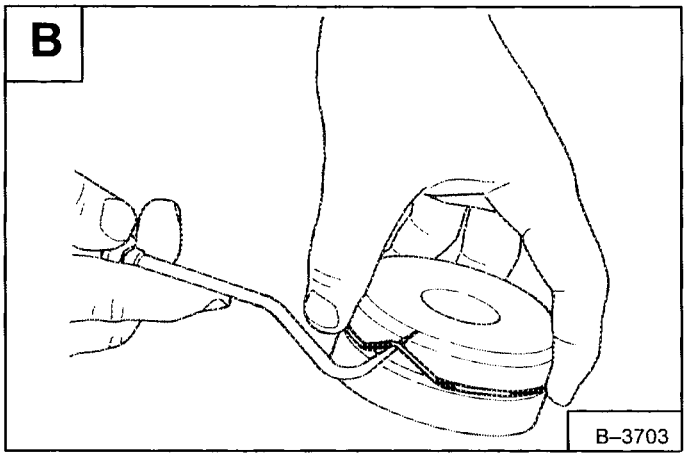


Remove the O–ring from the piston **[B]**.

Wash the cylinder parts in solvent and air dry them.

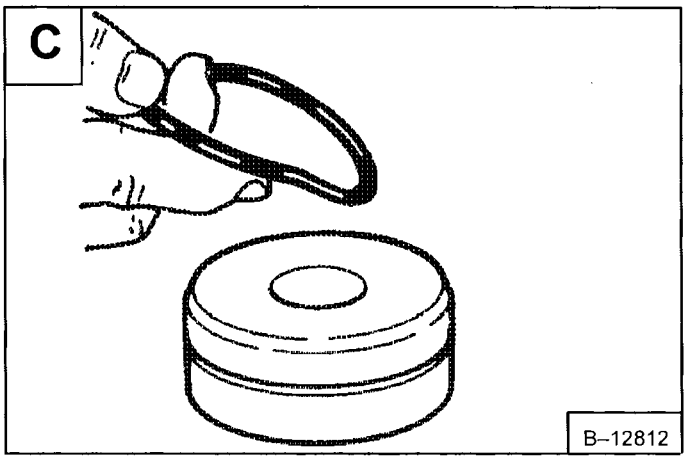
While servicing the cylinder do not damage the parts. Inspect for nicks, scratches or otherwise damaged or bent parts before assembling the cylinder. Replace parts that appear damaged in any way. The cylinder may not function correctly if there is damage to any of the parts.

Destroy all the O–rings and seals and replace them with NEW O–rings and seals.



Assembly

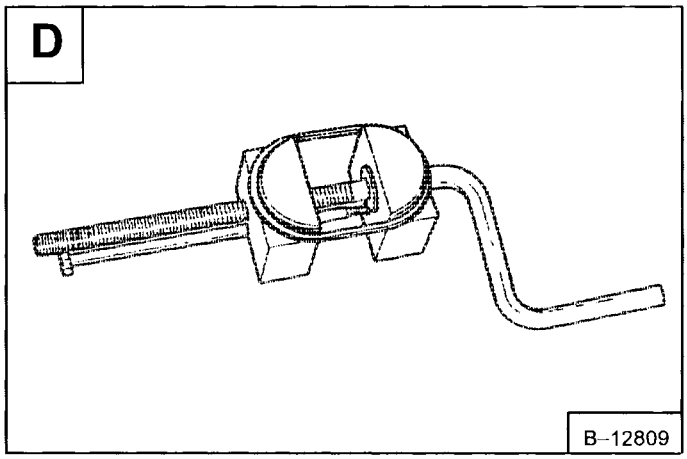
Install the O–ring on the piston **[C]**.



NOTE: Do not overstretch the seal.

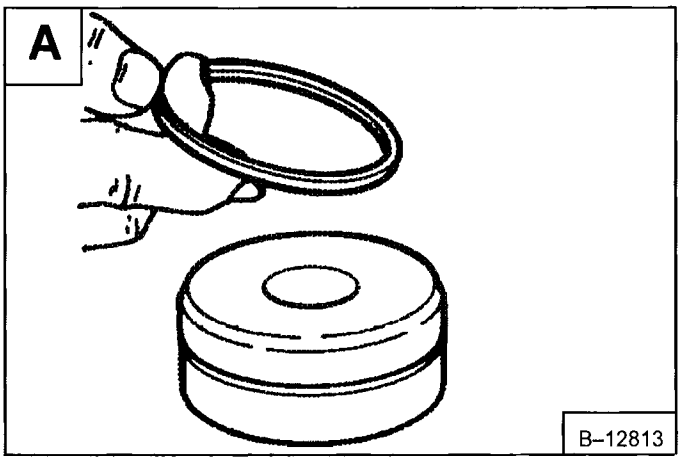
Install the seal on the tool and stretch it until it fits the piston **[D]**.

Allow the O–ring to stretch for 30 seconds before removing it from the tool.



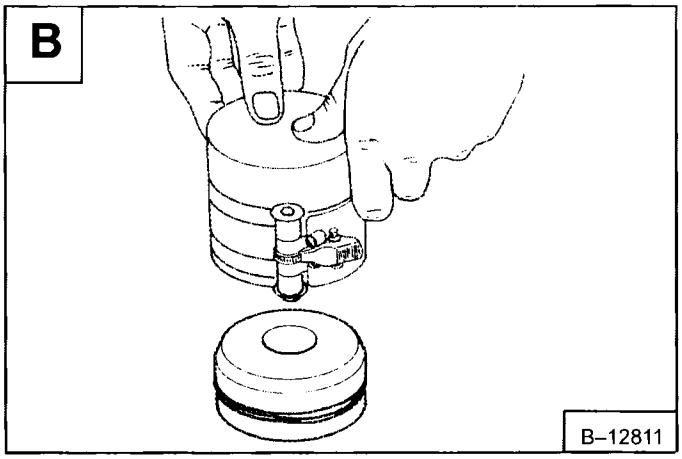
Assembly (Cont'd)

Install the seal on the piston **[A]**.



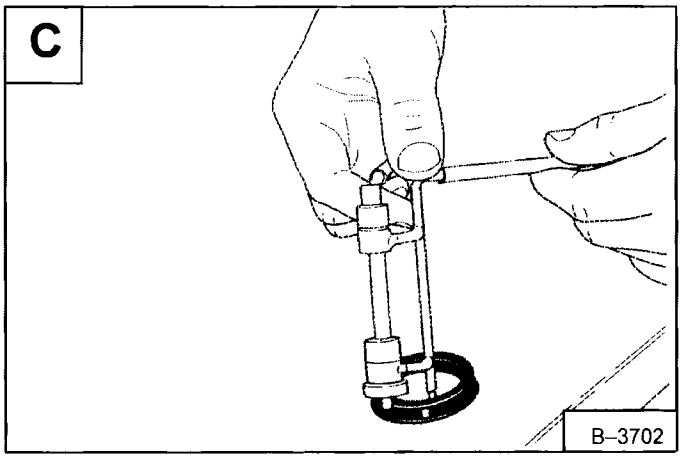
Use a ring compressor to compress the seal to the correct size **[B]**.

Leave the piston in the ring compressor for three minutes.

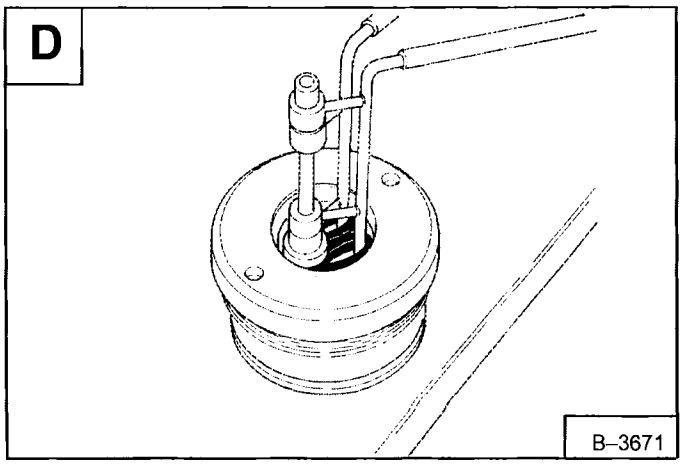


Install the oil seal on the rod seal tool **[C]**.

NOTE: The O–ring side of the oil seal goes toward the inside of the cylinder.

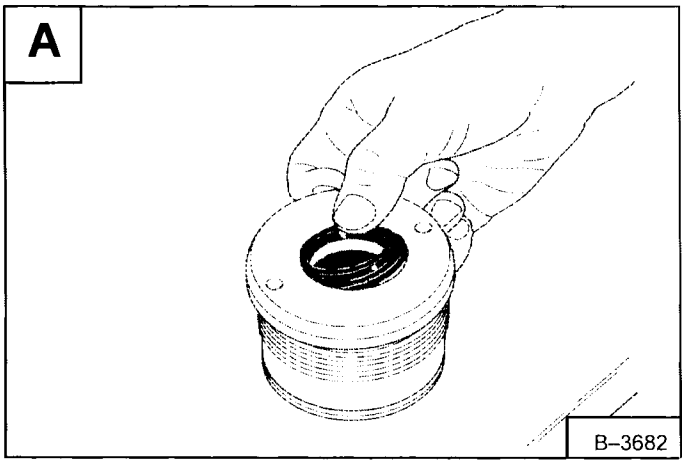


Install the oil seal in the head **[D]**.

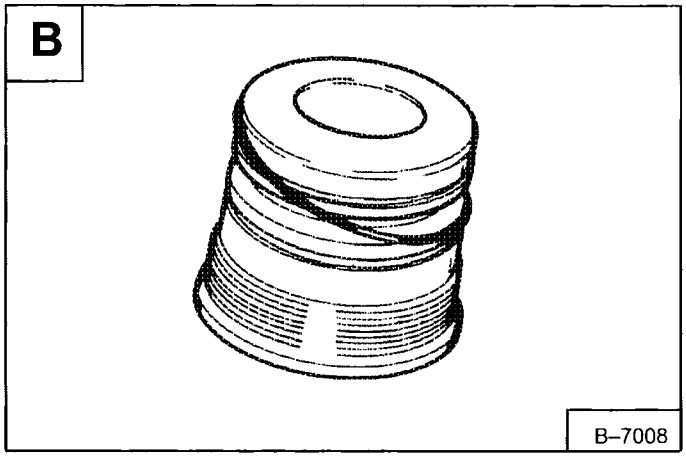


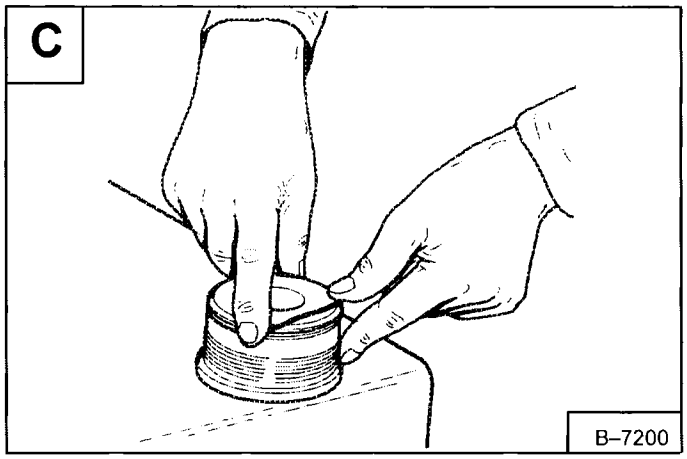
Assembly (Cont'd)

Install the wiper seal with the lip toward the outside of the head **[A]**.

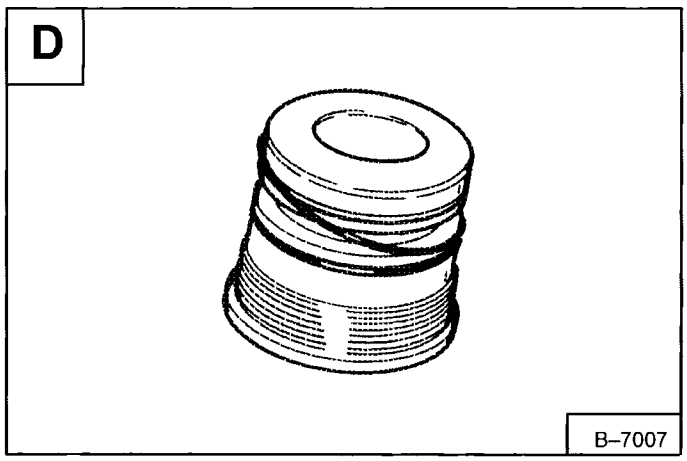


Install the backup washer on the head **[B]** & **[C]**.





Install the O–ring next to the backup ring **[D]**.



Assembly (Cont'd)

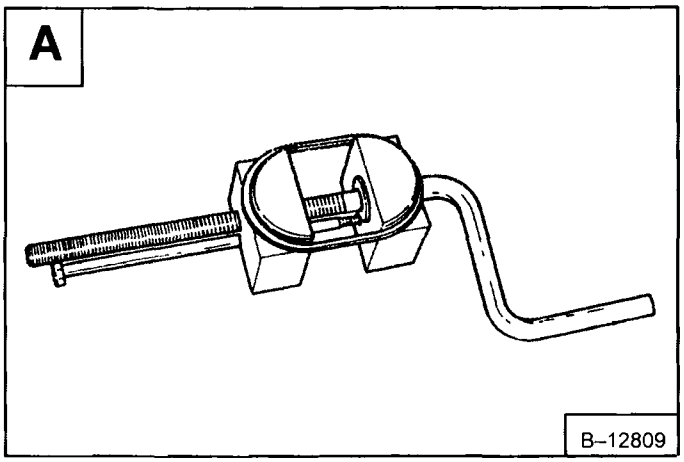
If a seal was removed from the head use the following procedure to install a new one.

NOTE: Do not overstretch the seal.

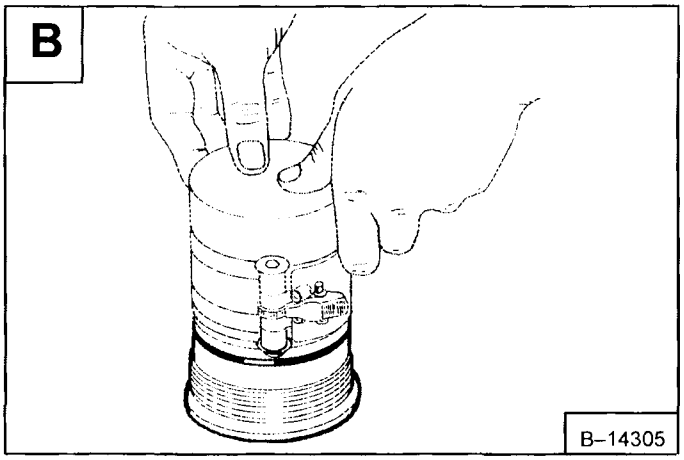
Install the seal on the tool and stretch it until it fits the piston **[A]**.

Allow the O–ring to stretch for 30 seconds before removing it from the tool.

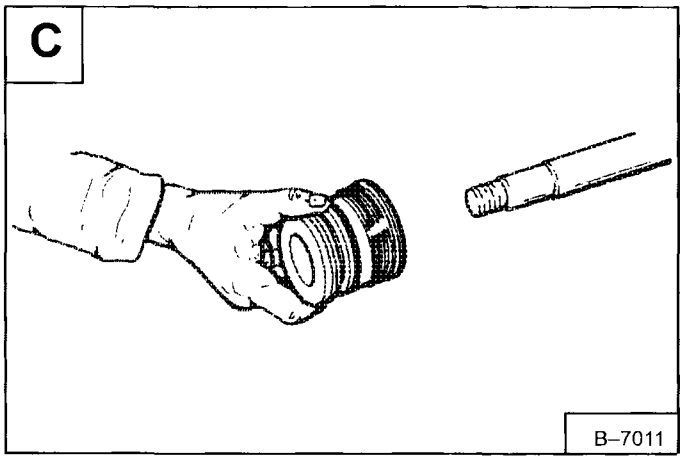
NOTE: Do not turn (roll) the seal as you install it. Damage to the seal may result.



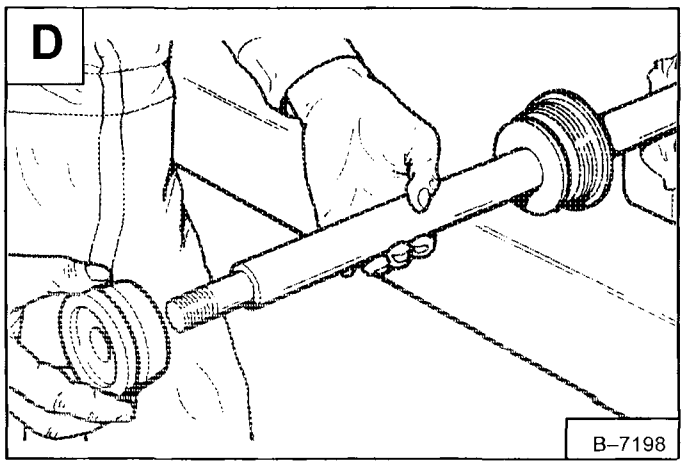
Use a ring compressor to compress the seal to the correct size **[B]**. Leave the tool over the seal for five minutes.



Install the head on the rod **[C]**.



Install the piston on the rod **[D]**.



HYDRAULIC CYLINDER (Cont'd)

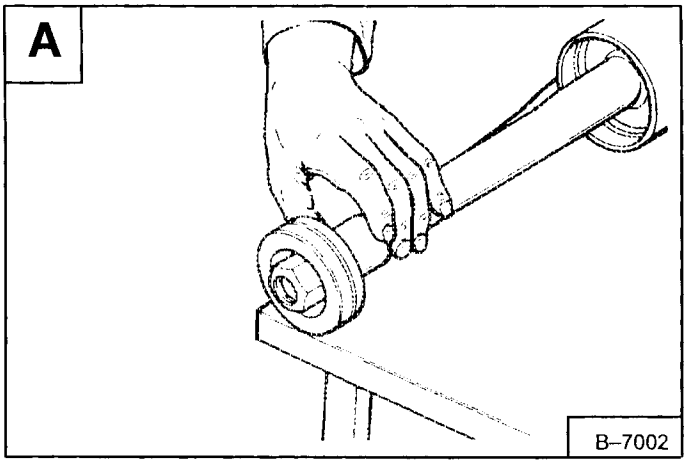
Assembly (Cont'd)

Lubricate the threads and install the nut **[A]**.

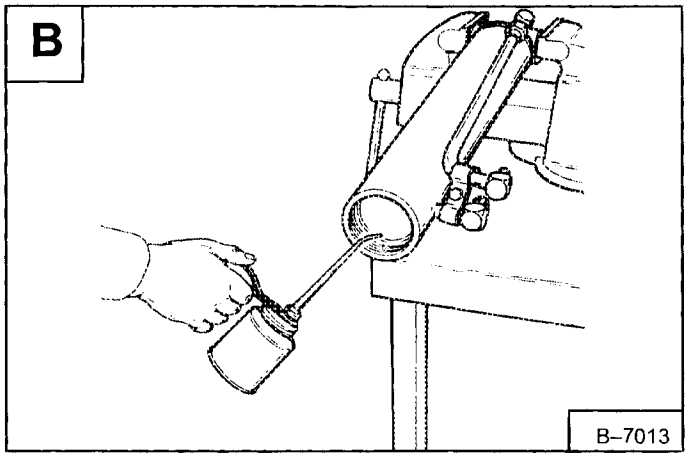
See Page 2–9 or 2–10 for the correct torque specifications.

Remove the rod from the vise.

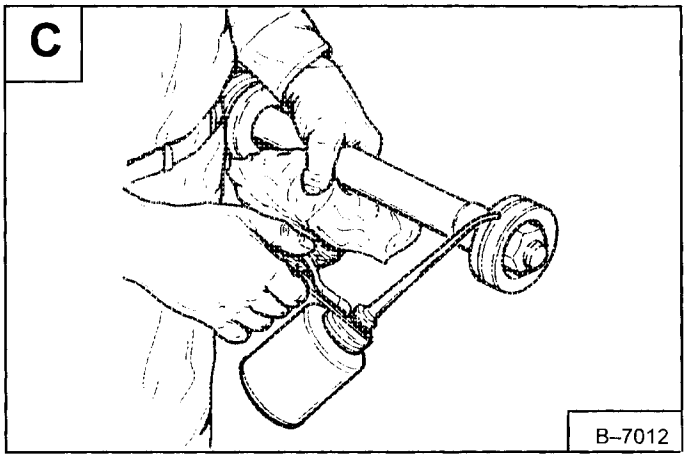
Install the cylinder case in the vise.



Put oil on the seal surface of the cylinder case **[B]**.

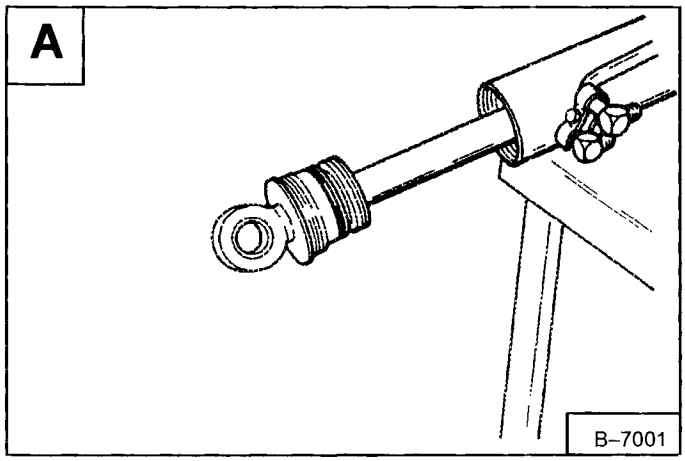


Put oil on the teflon seal on the piston **[C]**.



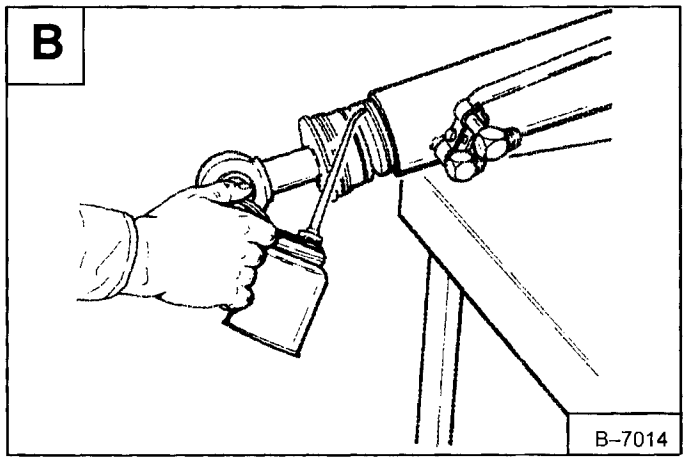
Assembly (Cont'd)

Install the rod assembly in the cylinder case **[A]**.

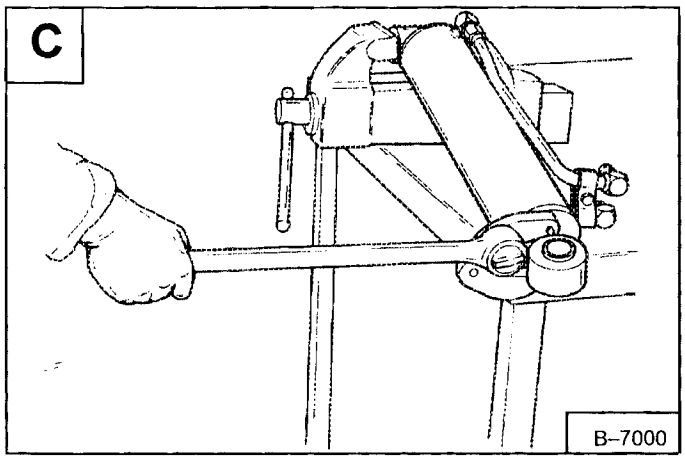


Put oil on the seals on the head **[B]**.

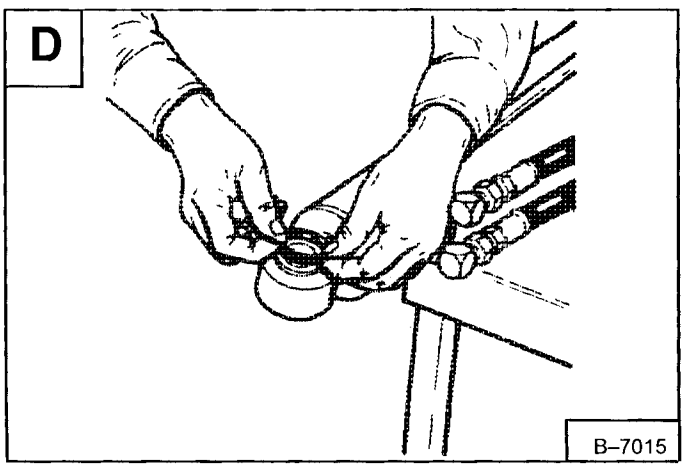
Put oil on the threads of the head.



Use the adjustable gland nut wrench to tighten the head **[C]**.



Replace the seal on the rod end (if so equipped) if it shows signs of wear or damage **[D]**.



MAIN RELIEF VALVE

Checking the Main Relief Valve

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

MEL10003 – Hydraulic Tester
MEL10006 – Hydraulic Test Kit

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

Lift and block the loader (Page 1–1).

Connect the "IN" port of the hydraulic tester to the female quick coupler on the loader **[A]**.

Connect the "OUT" port of the hydraulic tester to the male quick coupler on the loader **[A]**.

IMPORTANT

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

I–2024–0284

⚠ WARNING

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

W–2017–0286

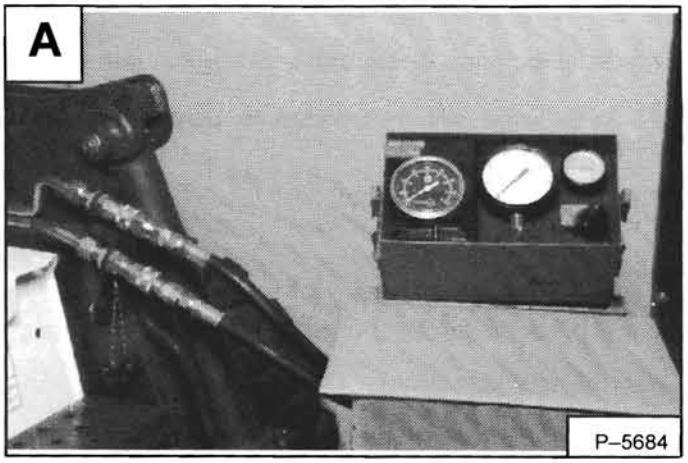
Start the engine and run at low engine idle RPM. Push the mode switch (Item 1) **[B]** (on the instrument panel) to engage the front auxiliary hydraulics, the light (Item 2) **[B]** will come "ON".

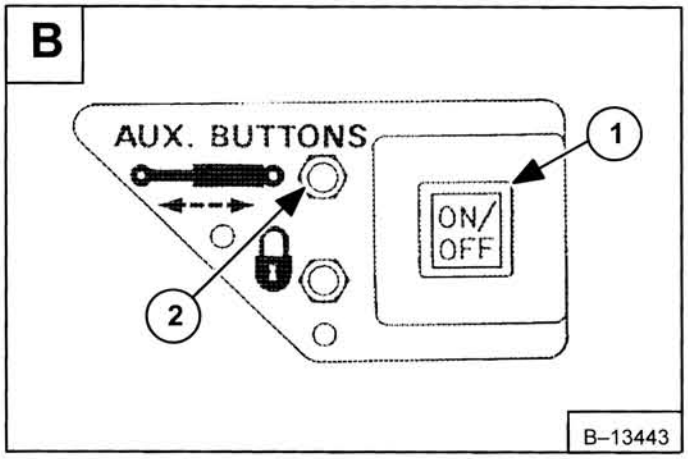
Push the button (Item 1) **[C]** for fluid flow to the quick couplers.

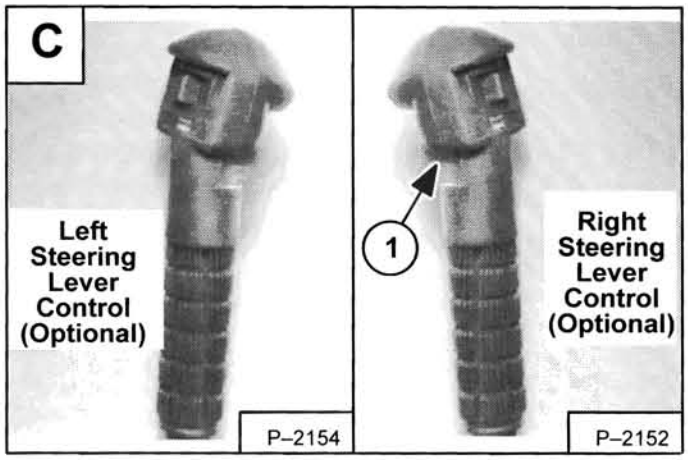
Watch the flow meter on the hydraulic tester to make sure the flow is correct. Increase the engine speed to full RPM.

There should be 18.0 GPM (68 L/min.) free flow. Turn the restrictor control, on the tester, until the main relief valve opens. The correct pressure for the main relief is 2950–3050 PSI (20340–21030 kPa).

If the relief pressure is not correct, stop the engine. Replace or adjust the main relief valve (Page 2–21).







MAIN RELIEF VALVE (Cont'd)

Checking the Main Relief Valve Without Auxiliaries

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

MEL10003 – Hydraulic Tester
MEL10006 – Hydraulic Test Kit

Stop the engine.

Lift and block the loader (Page 1–1).

Open the right side panel.

Disconnect the hose (Item 1) **[A]** from the pressure side of the hydraulic pump.

Connect the "IN" hose from the tester to the pump **[B]**.

Connect the "OUT" hose from the tester to the hose disconnected from the pump **[B]**.

Have a second person in the operator seat, with seat bar in down position.

IMPORTANT

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

I–2024–0284

Start the engine and run at idle RPM.

Check the flow at the hydraulic tester.

Make sure the flow is correct.

Increase the engine RPM to maximum.

There should be 18.0 GPM (68,1 L/min.) free flow.

Have the second person push the heel of the tilt pedal to roll the Bob–Tach back and the relief valve is opened.

The correct pressure is 2950–3050 PSI (20340–21030 kPa).

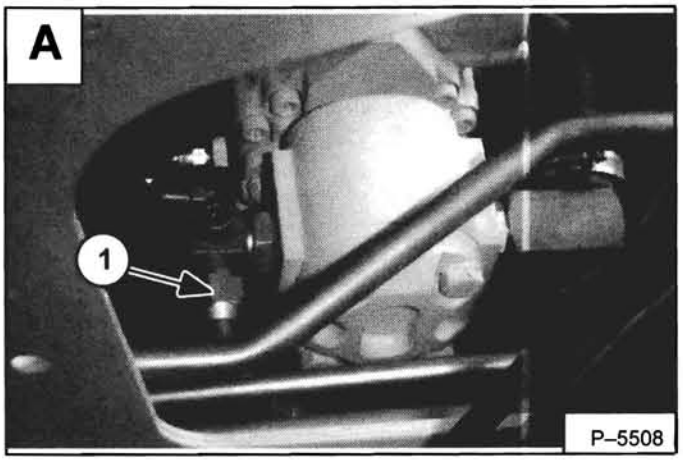
If not, stop the engine.

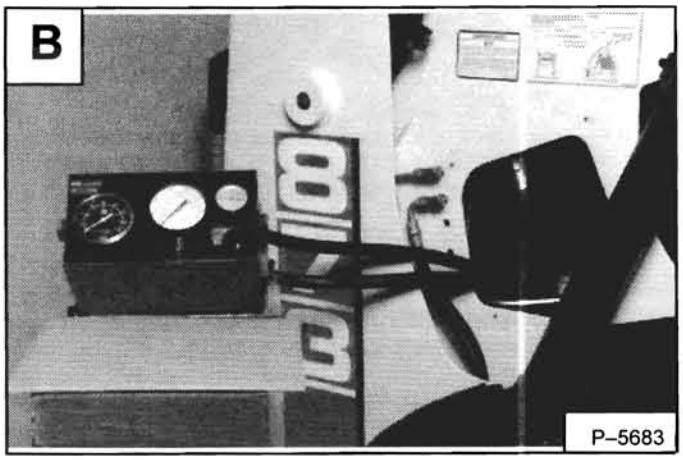
Replace or adjust the main relief valve (Page 2–21).

⚠ WARNING

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

W–2050–1285





MAIN RELIEF VALVE (Cont'd)

Removal and Installation

Raise the operator cab (Page 1–1).

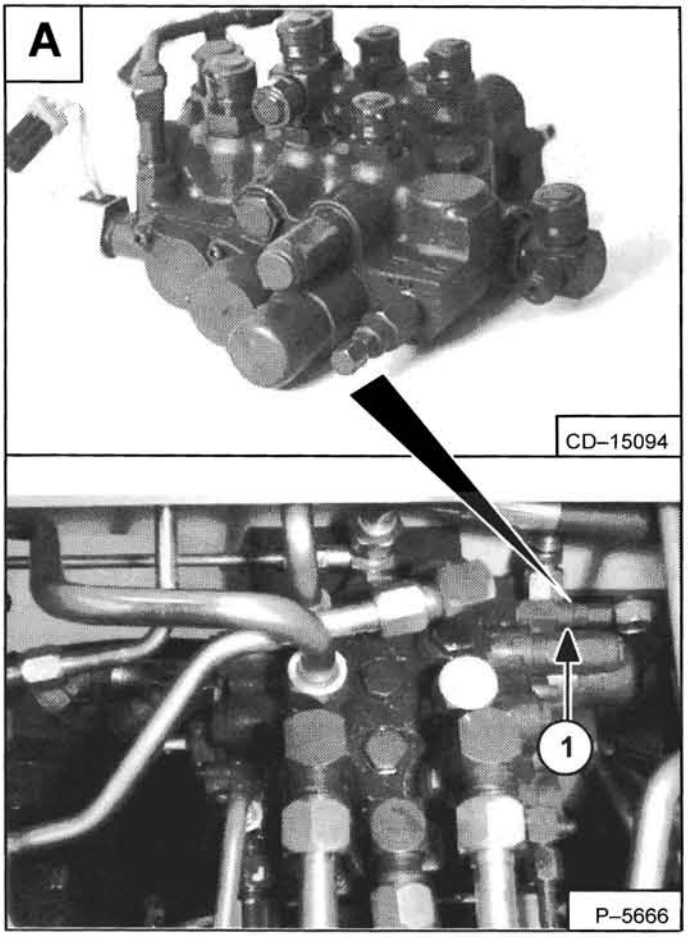
IMPORTANT

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

I–2003–0284

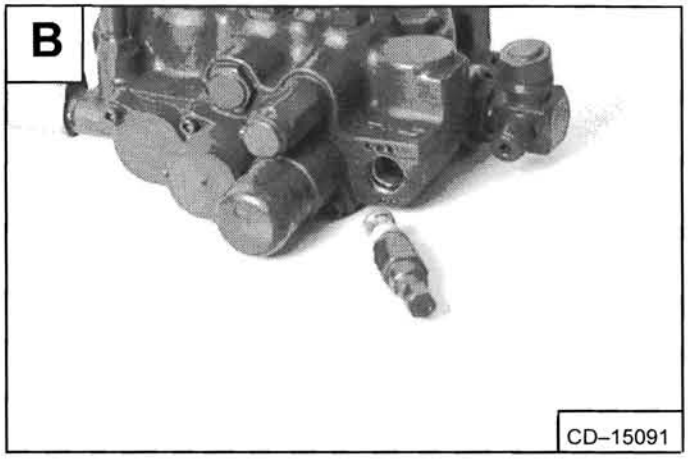
The main relief valve (Item 1) **[A]** is located at the right rear of the control valve.

Clean the area around the control valve.



Loosen and remove the main relief valve **[B]**.

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



Remove the O–rings and back–up washers.

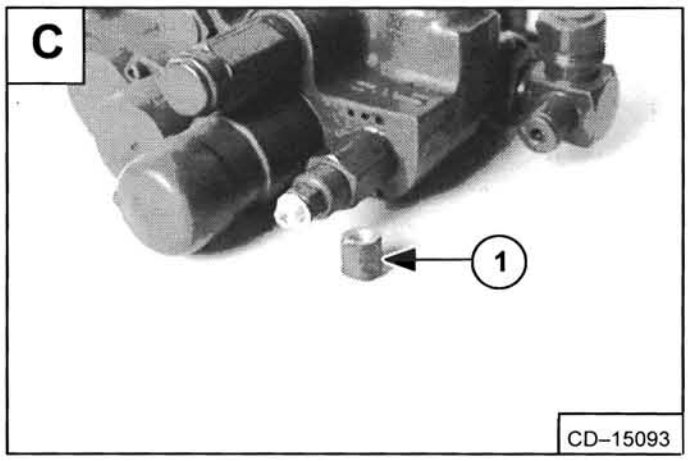
Clean the main relief valve in clean solvent. Use air pressure to dry the valve.

Install new O–rings and backup washers. Install the main relief valve and tighten **[A]**. Check the pressure again (Page 2–19 or 2–20).

If the pressure is not correct, adjust the main relief valve. Remove the end cap (Item 1) **[C]**.

Turn the adjusting screw in or out until the pressure is correct.

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



HYDRAULIC CONTROL VALVE

Removal and Installation

IMPORTANT

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

I–2003–0284

Raise the lift arms and install an approved lift arm support device (Page 1–1).

Stop the engine. Raise the seat bar.

Raise the operator cab (Page 1–1).

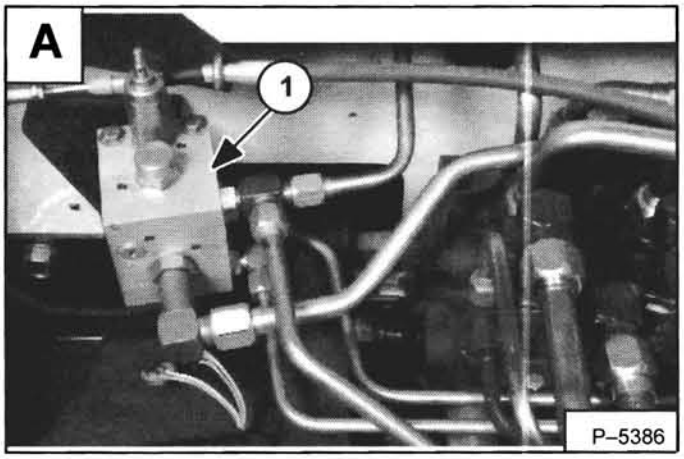
Clean the area around the control valve.

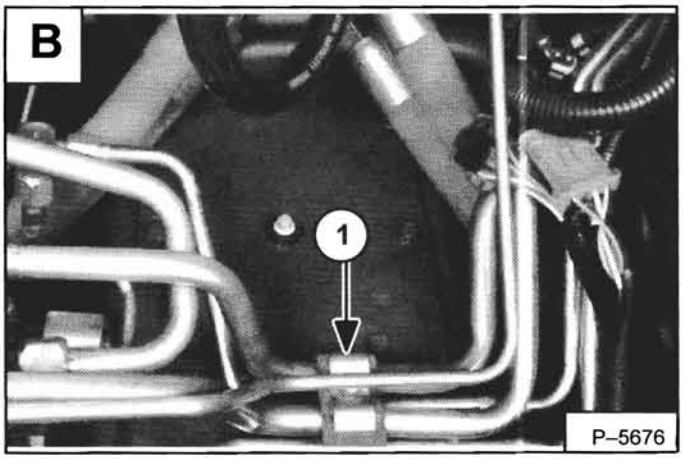
Remove the lift lock valve (Item 1) **[A]** (Page 8–1).

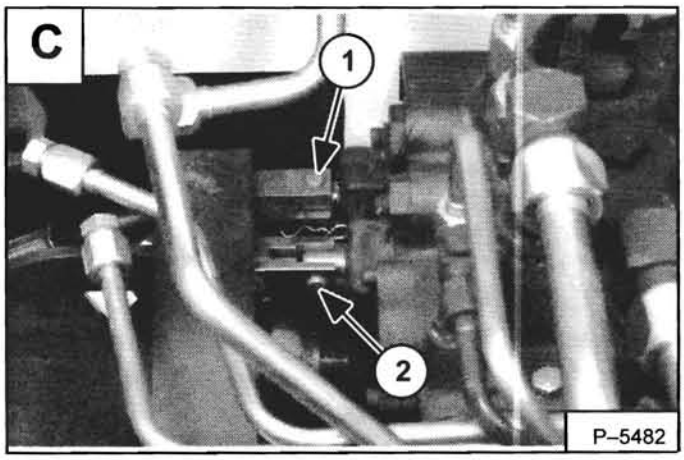
Remove the tubeline clamp (Item 1) **[B]**.

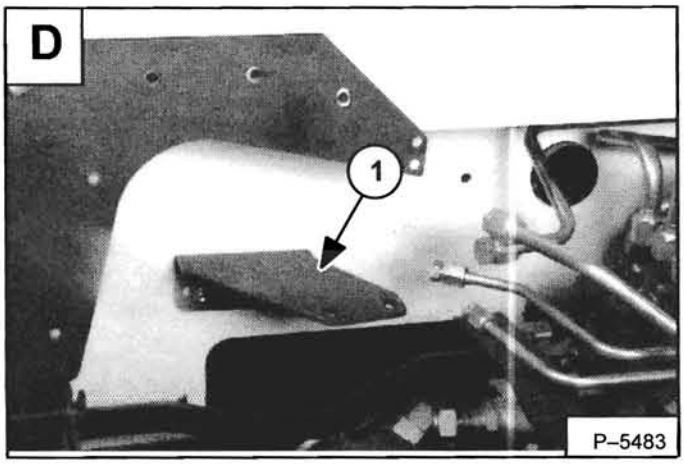
Disconnect the linkage (Items 1 & 2) **[C]** from the lift and tilt spools.

Remove the lift lock valve support bracket (Item 1) **[D]** from the loader frame.









HYDRAULIC CONTROL VALVE (Cont'd)

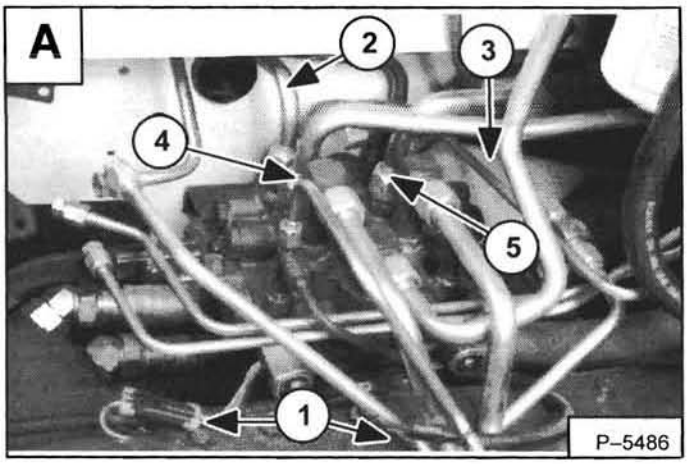
Removal and Installation (Cont'd)

Disconnect the wire harness connectors (Item 1) **[A]**.

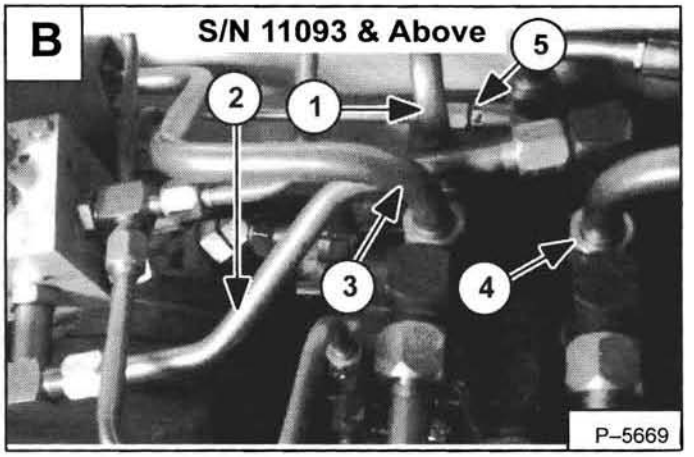
Disconnect the tubelines (Item 2) **[A]**; (Item 1) **[B]**.

Disconnect the tubelines (Item 3) **[A]**; (Item 2) **[B]**.

Disconnect the tubelines (Item 4 & 5) **[A]**; (Item 3 & 4) **[B]**.



Disconnect the tubeline (Item 5) **[B]**.



Disconnect the inlet hose (Item 1) **[C]**.

Disconnect the auxiliary tubelines (Item 2) **[C]**.

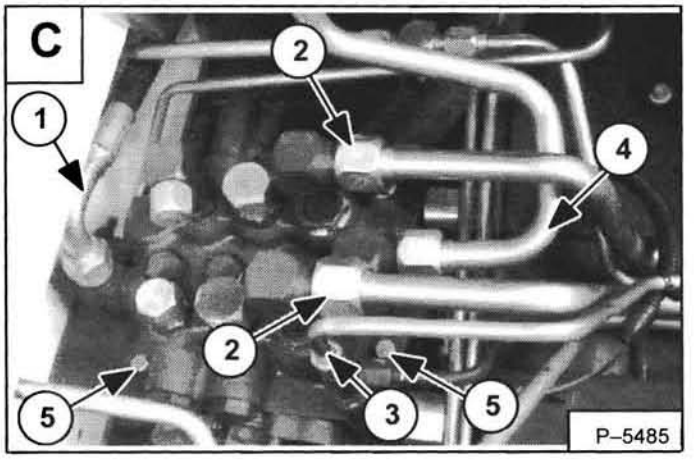
Disconnect the charge tubeline (Item 3) **[C]**.

Disconnect the outlet tubeline (Item 4) **[C]**.

Remove the control valve mounting bolts (Item 5) **[C]**.

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

Remove the control valve from the mounting bracket.



⚠ WARNING

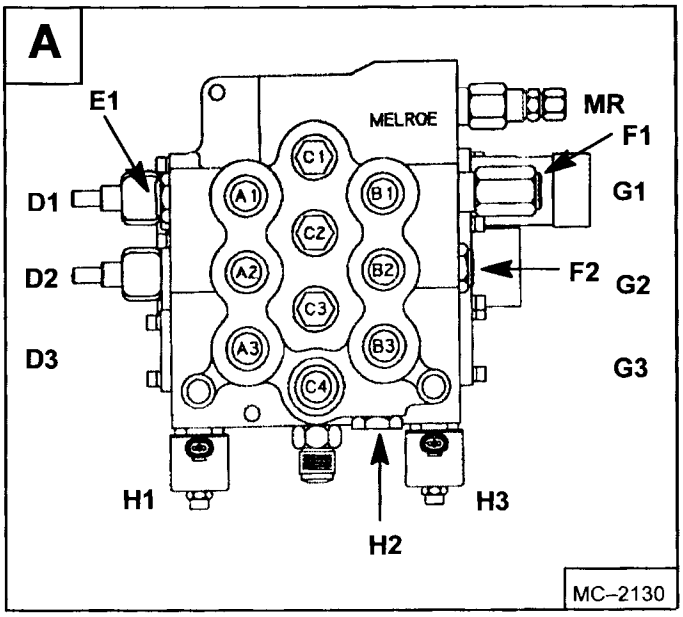
Always clean up spilled fuel or oil. Keep heat, flames, sparks or lighted tobacco away from fuel and oil. Failure to use care around combustibles can cause explosion or fire which can result in injury or death.

W–2103–1285

HYDRAULIC CONTROL VALVE (Cont'd)

Identification Chart

Item	873 Loader
A1	Lift Cylinder Rod End
A2	Tilt Cylinder Rod End
A3	Auxiliary Hydraulics
B1	Lift Cylinder Base End Restrictor
B2	Tilt Cylinder Base End
B3	Auxiliary Hydraulics
C1	Load Check Valve/Lift Function
C2	Load Check Valve/Tilt Function
C3	NO Load Check Valve Auxiliary Function
C4	Outlet Fluid Flow
D1	Lift Spool
D2	Tilt Spool
D3	Auxiliary Spool
E1	Anti–Cavitation Valve
E2	Plug
F1	Port Relief
F2	Anti–Cavitation Valve
G1	Lift Spool Detent
G2	Tilt Spool Centering Spring
G3	Auxiliary Spool
H1	Auxiliary Electric Solenoid
H2	Plug/Port Relief (Optional)
H3	Auxiliary Electric Solenoid
MR	Main Relief Valve



Disassembly and Assembly

The anti–cavitation valve, port relief valves and plugs are at different locations in the control valve. Refer to Page 2–24 (Control Valve Identification Chart) for the correct location of the parts.

IMPORTANT

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

I–2003–0284

Mark each valve section and spool so that the parts will be returned to its original bore during assembly.

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

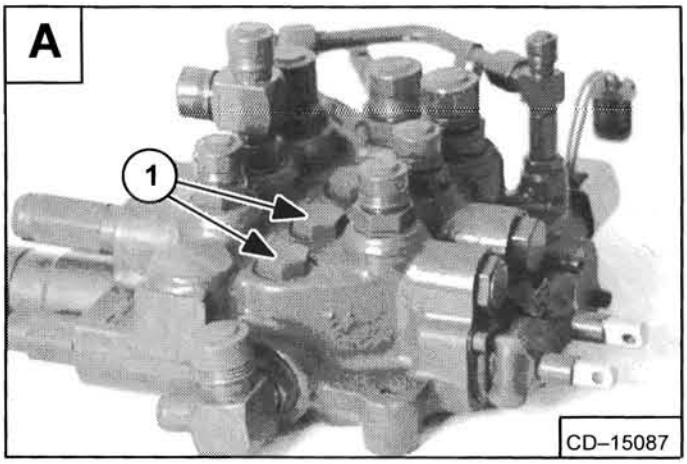
Load Check Valve

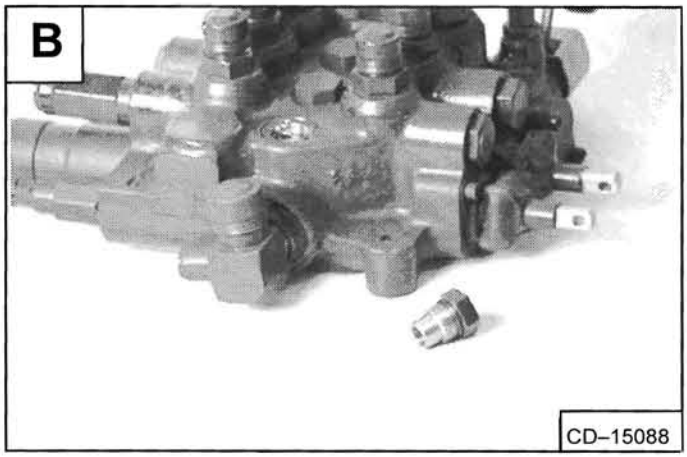
Loosen the load check plugs (Item 1) **[A]**.

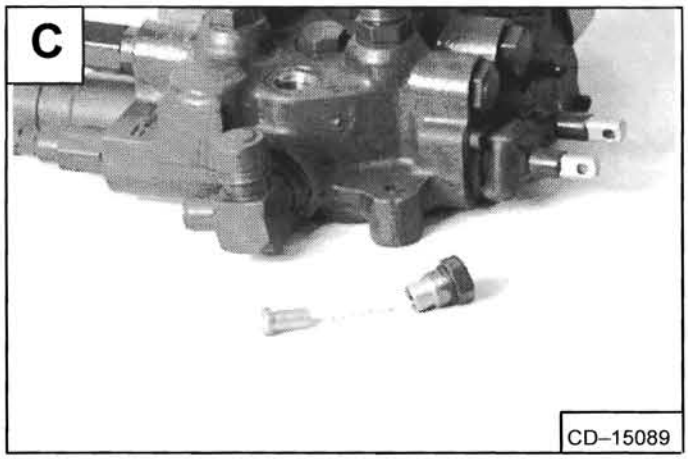
Assembly: Always use new O–ring. Tighten the plug to 35–40 ft.–lbs. (47–54 Nm) torque.

Remove the load check plug **[B]**.

Remove the spring and poppet **[C]**.





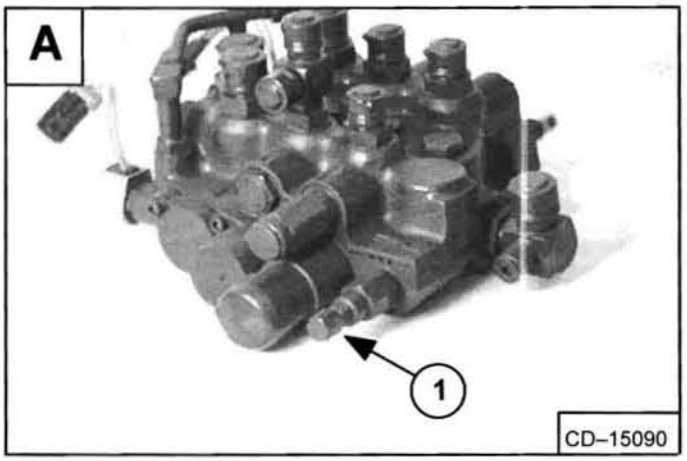


HYDRAULIC CONTROL VALVE (Cont'd)

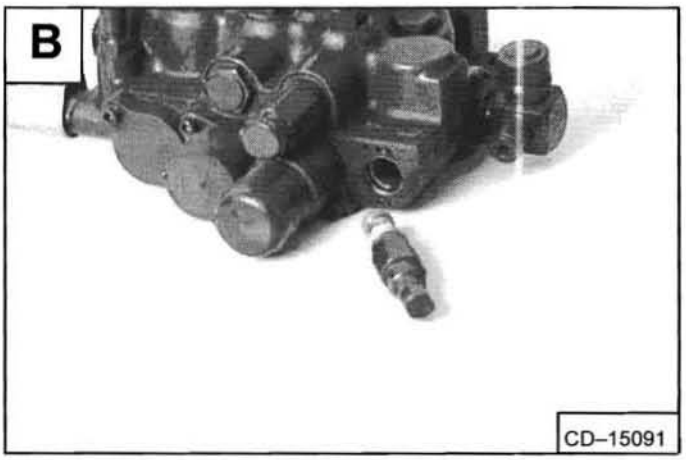
Main Relief Valve

Loosen the main relief valve (Item 1) **[A]**.

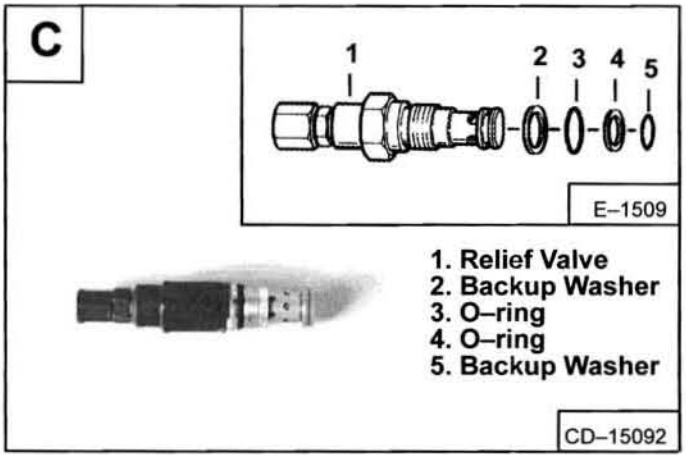
Assembly: Always use new O–rings and backup washers. Tighten to 35–40 ft.–lbs. (47–54 Nm) torque.



Remove the main relief valve **[B]**.



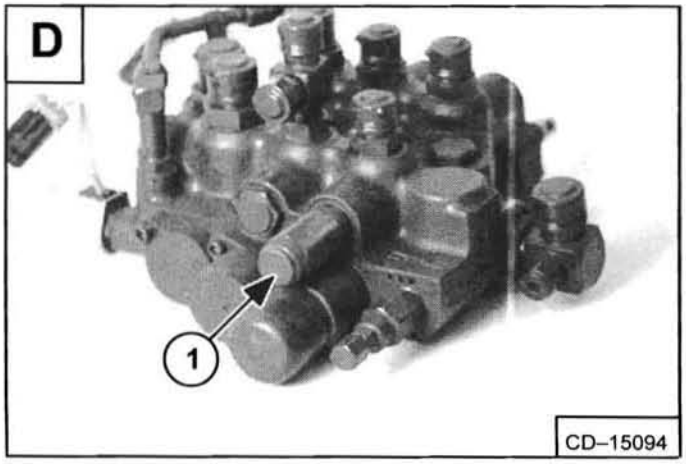
Remove the O–ring and backup washers from the main relief valve **[C]**.



Port Relief Valve

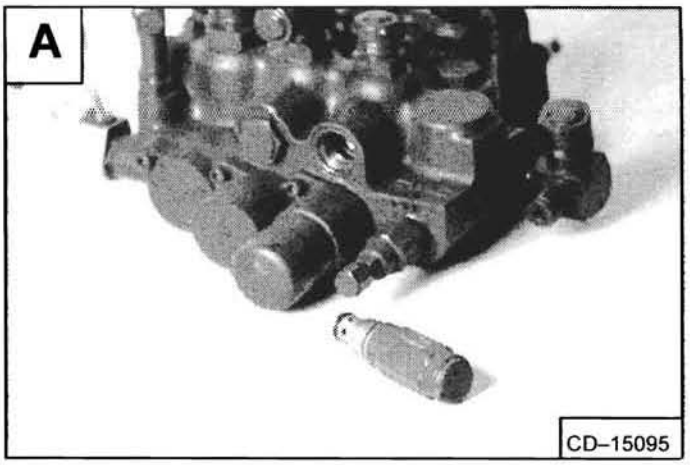
Loosen the port relief valve (Item 1) **[D]**.

Assembly: Always use new O–rings and backup washers. Tighten to 35–40 ft.–lbs. (47–54 Nm) torque.

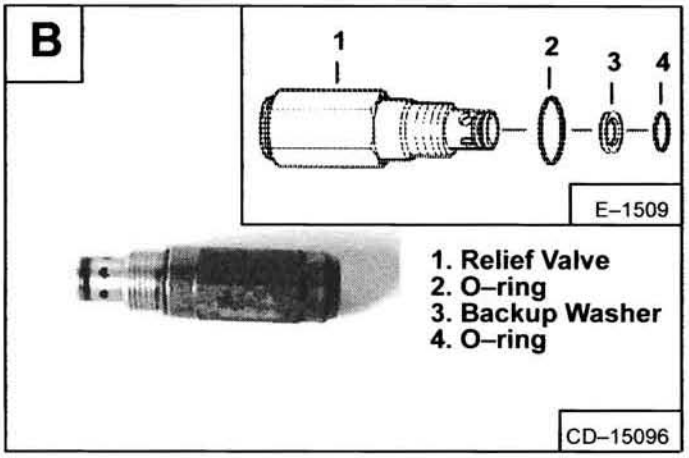


Port Relief Valve (Cont'd)

Remove the port relief valve **[A]**.



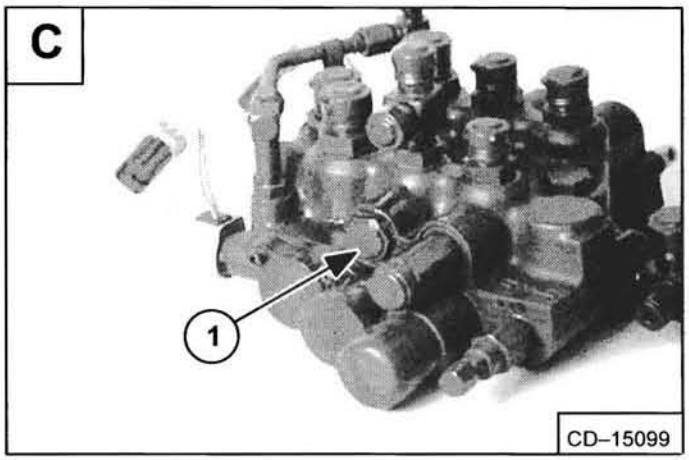
Remove the O–rings and backup washer from the port relief valve **[B]**.



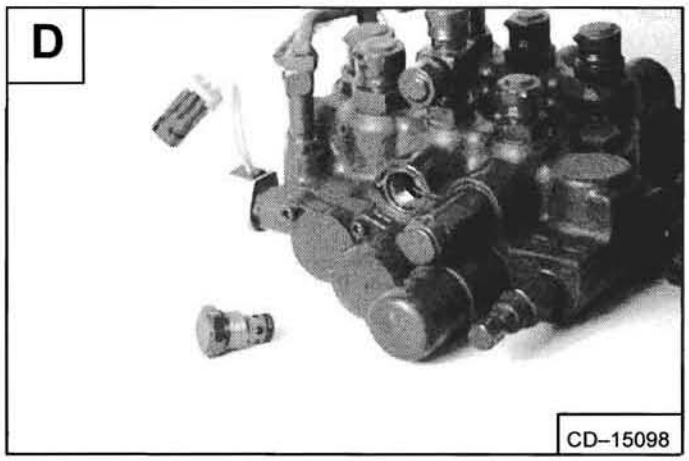
Anti–Cavitation Valve

Loosen the anti–cavitation valve (Item 1) **[C]**.

Assembly: Always use new O–rings and backup washers. Tighten to 35–40 ft.–lbs. (47–54 Nm) torque.



Remove the anti–cavitation valve from the control valve **[D]**.

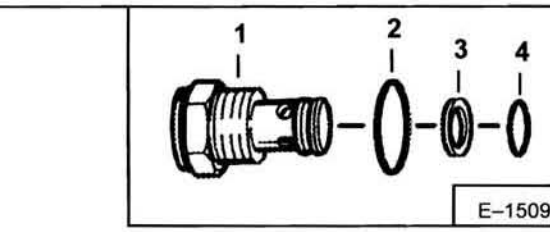


HYDRAULIC CONTROL VALVE (Cont'd)

Anti–Cavitation Valve (Cont'd)

Remove the O–rings and backup washer from the anti–cavitation valve **[A]**.

A



E–1509

1. Anti–Cavitation Valve
2. O–ring
3. Backup Washer
4. O–ring

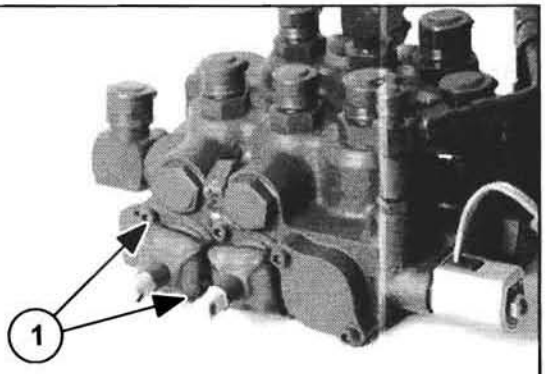
CD–15097

Rubber Boot

Loosen the two screws (Item 1) **[B]** on the rubber boot retainer.

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

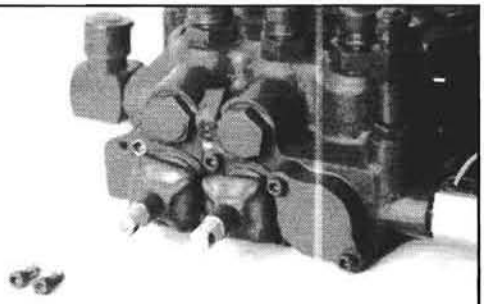
B



CD–15100

Remove the screws **[C]**.

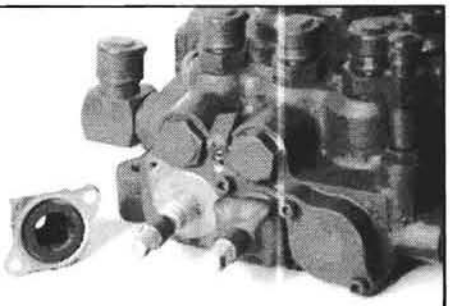
C



CD–15101

Remove the rubber boot and retainer **[D]**.

D



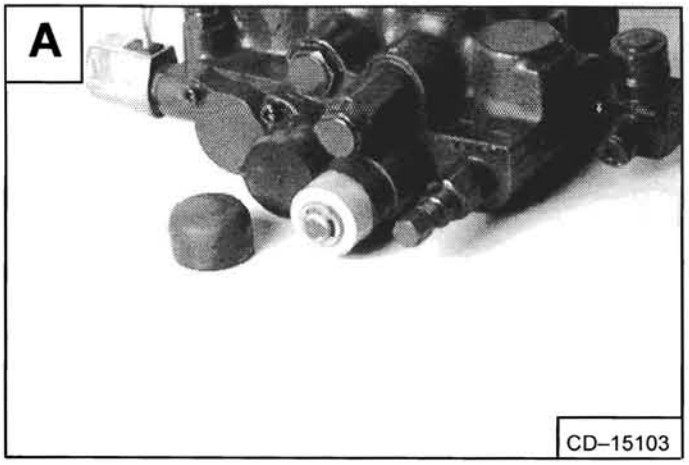
CD–15102

Lift Spool and Detent

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

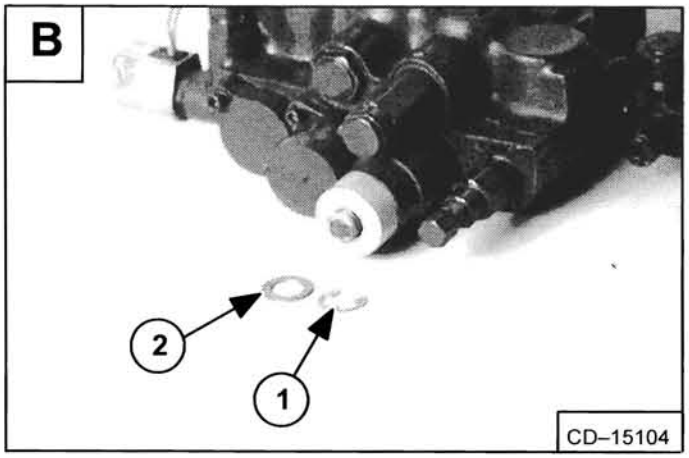
MEL1278 – Detent Tool

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



Use a screwdriver to remove the snap ring (Item 1) **[B]**.

Remove the washer (Item 2) **[B]**.



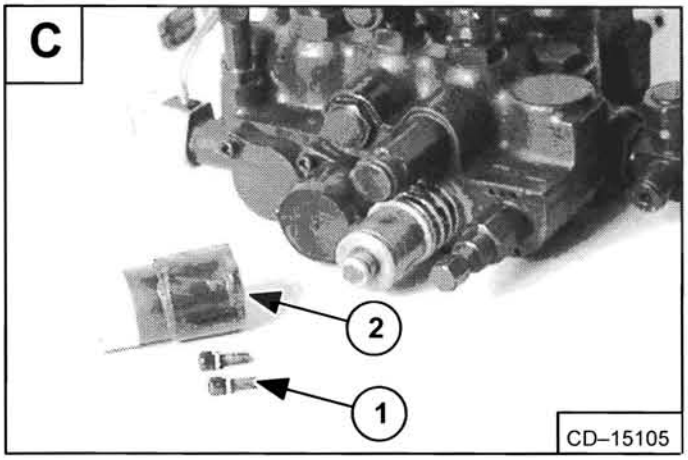
Remove the screws (Item 1) **[C]** from the detent sleeve.

Remove the detent sleeve (Item 2) **[C]**.

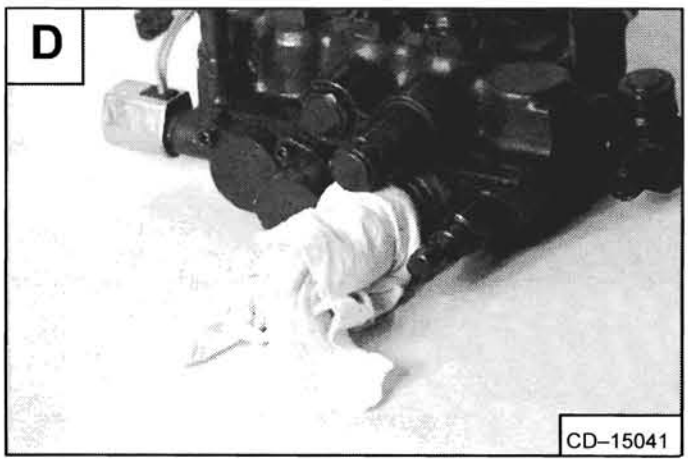
IMPORTANT

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

I–2012–0284



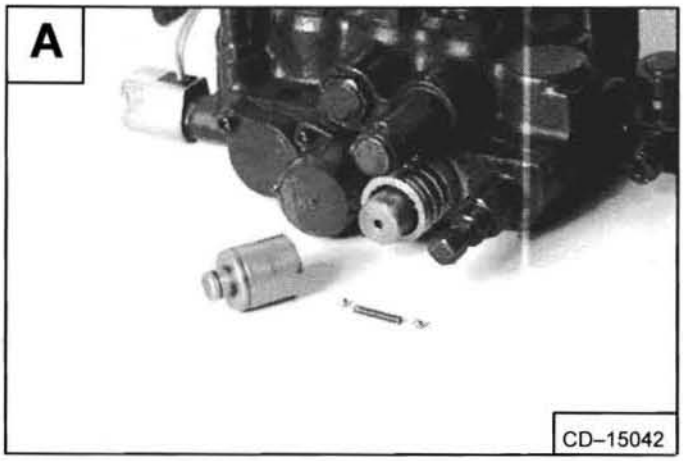
Put a rag around the detent assembly **[D]**. This will prevent the detent balls and spring from being lost when the detent sleeve is removed.



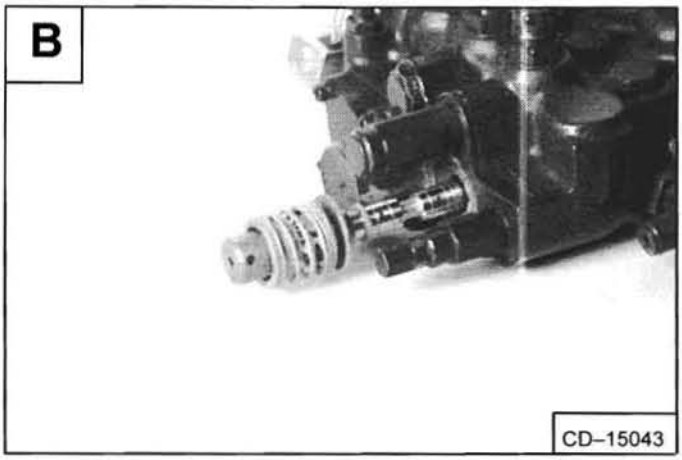
HYDRAULIC CONTROL VALVE (Cont'd)

Lift Spool Detent (Cont'd)

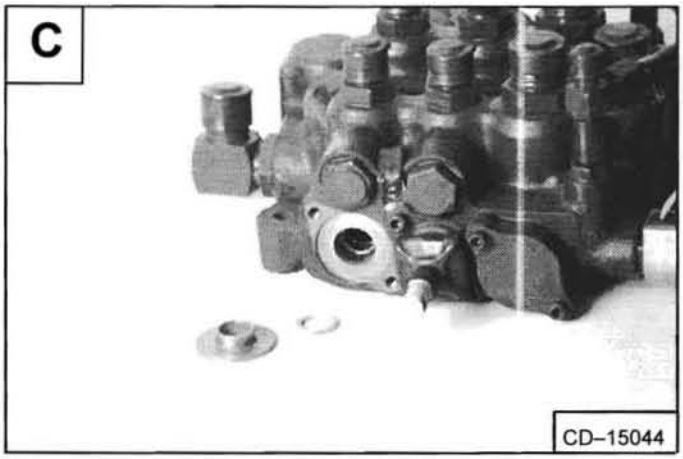
Remove the detent sleeve, detent balls and spring **[A]**.



Remove the spool, centering spring, backup washer, seal and spool assembly from the control valve **[B]**.



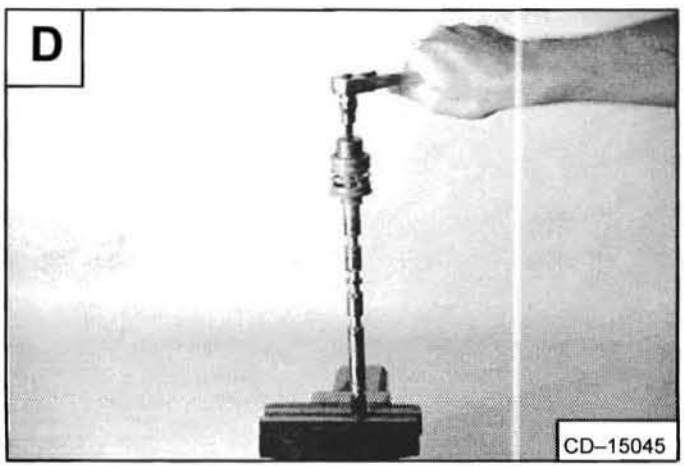
At the other end of the spool bore, remove the backup washer and seal **[C]**.



Put the linkage end of the spool in the vise **[D]**.

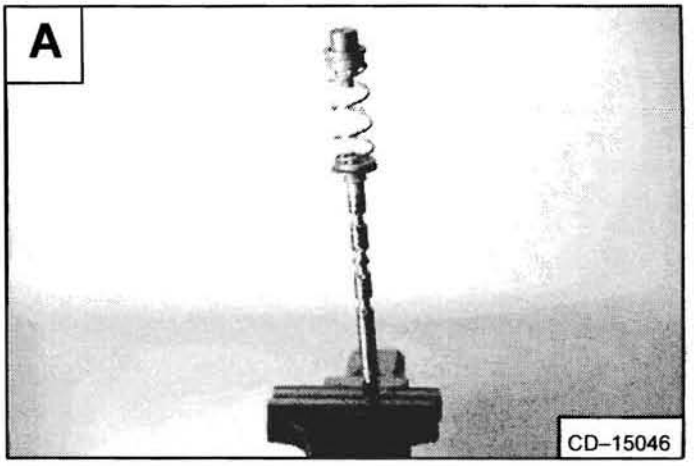
NOTE: Be careful when removing the detent adapter, because there is spring pressure.

Loosen the detent adapter **[D]**.

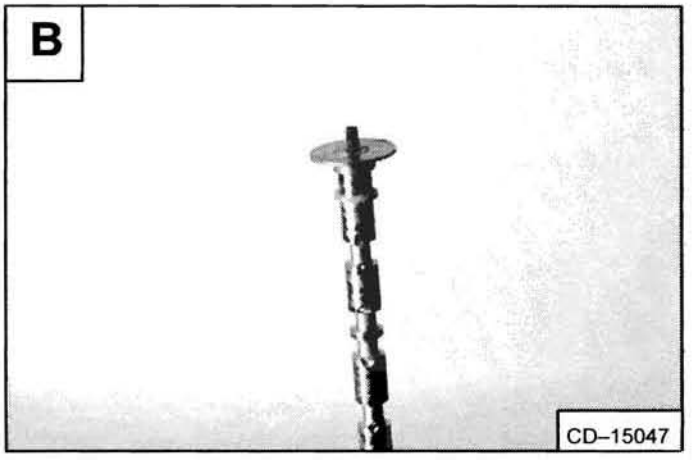


Lift Spool Detent (Cont'd)

Remove the detent adapter, and cap and centering spring **[A]**



Remove the backup washer and spool seal **[B]**.



Remove the stud from the end of the spool **[C]**.

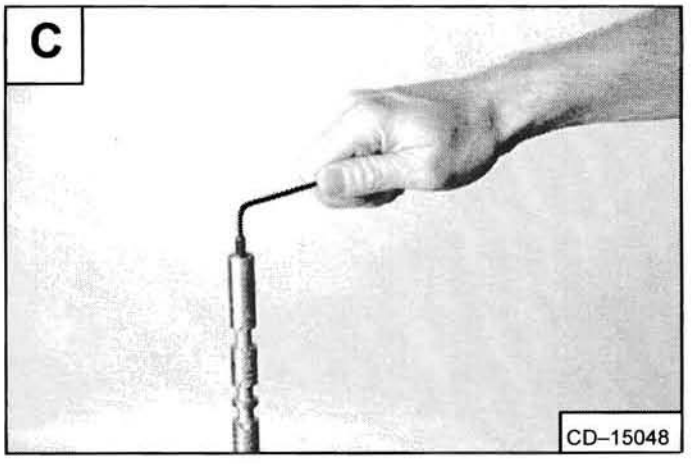
Removal of the plastic plug:

a. Make a center point in the plug using a 1/16 inch drill.

b. Drill a hole all the way through the plug using a 7/64 inch tap drill.

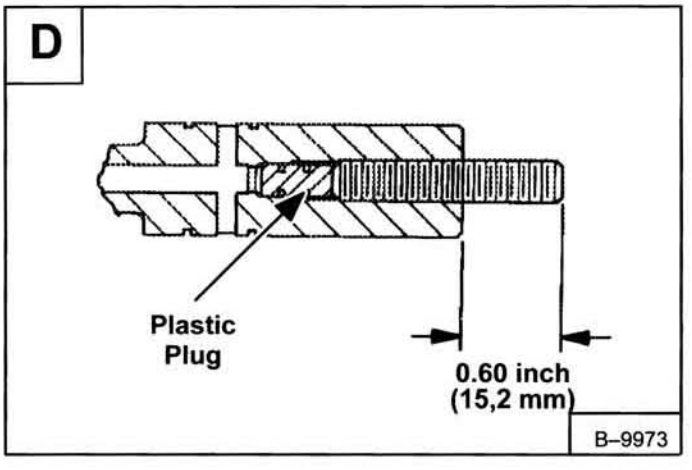
c. Turn a 6–32 tap into the plug. Pull the tap and plug out of the spool. Be careful, do not break the tap.

d. Clean all the debris from inside the spool bore.



NOTE: DO NOT USE LOCTITE ON THE STUD THREADS.

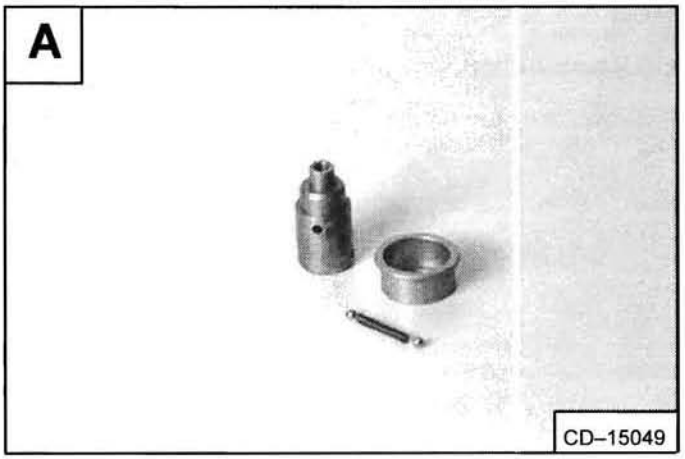
Assembly: Install the new plastic plug. Install the stud so that the end is about 0.60 inch (15,2 mm) from the spool.



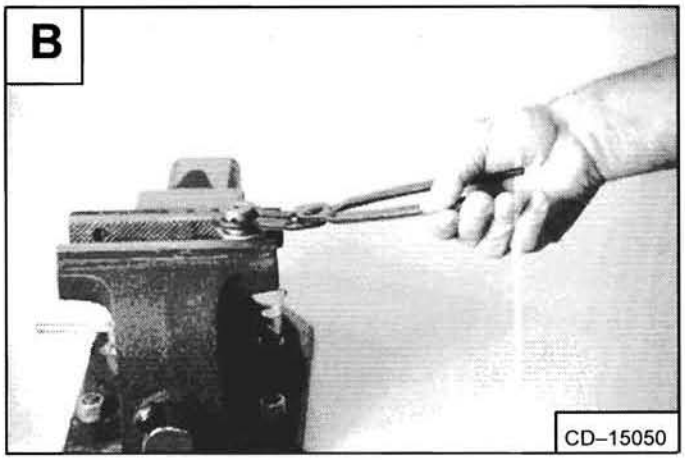
HYDRAULIC CONTROL VALVE (Cont'd)

Lift Spool and Detent (Cont'd)

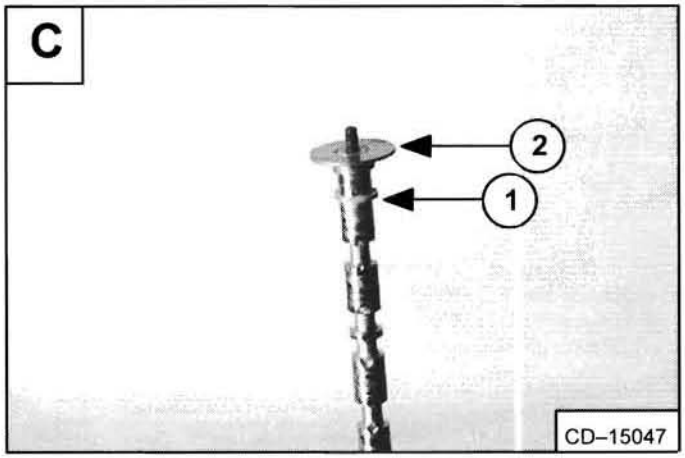
Put grease on all the detent component surfaces before assembly **[A]**.



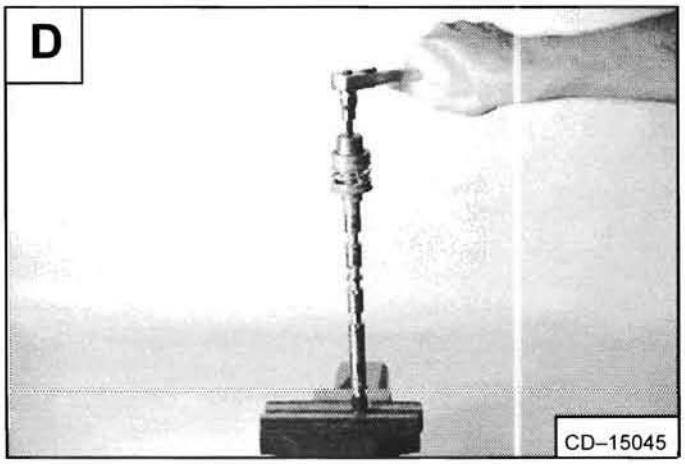
Install the detent balls and spring into the detent adapter. Hold the detent balls in position with the tool (MEL1278) and install the detent adapter into the end cap **[B]**.



Install the new spool seal (Item 1) **[C]** and backup washer (Item 2) **[C]**.

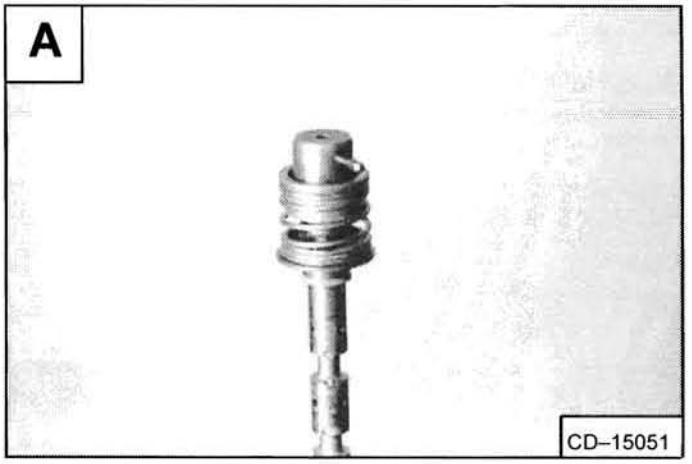


Install the centering spring, end cap/detent adapter on the valve spool. Tighten the detent adapter to 90–100 in.–lbs. (10,2–11,3 Nm) torque **[D]**.

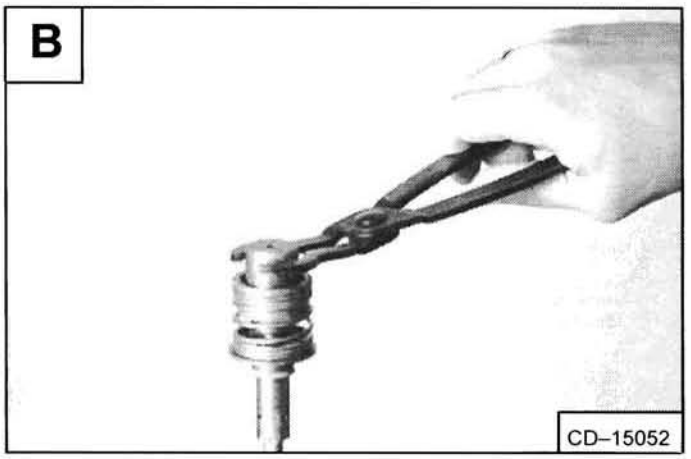


Lift Spool and Detent (Cont'd)

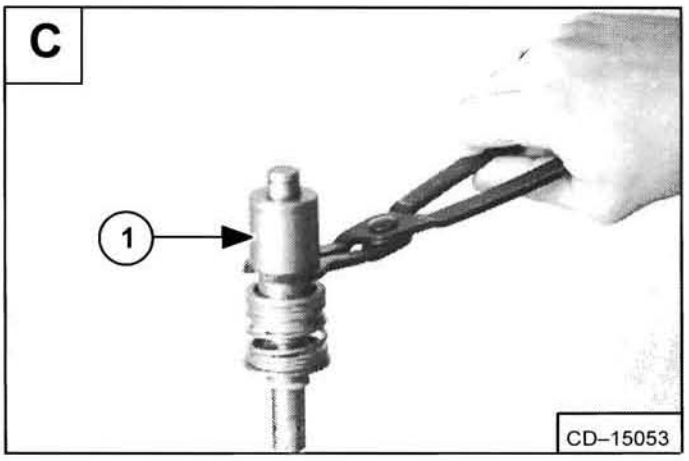
Install the detent balls and spring **[A]**.



Hold the detent balls and spring in position with the tool (MEL1278) **[B]**.



Install the detent sleeve (Item 1) **[C]** over the balls and into position.

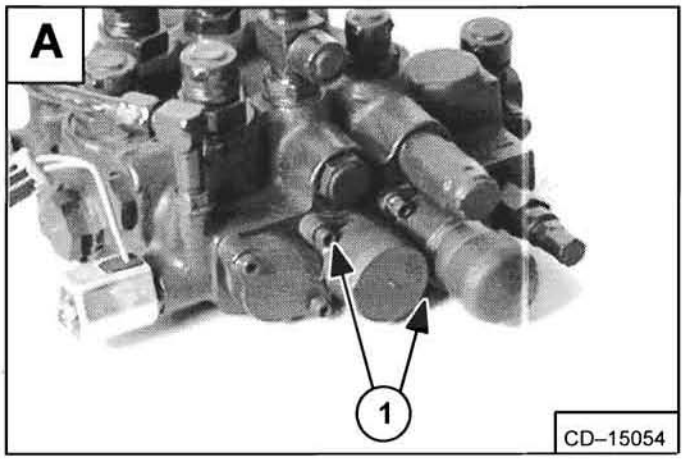


HYDRAULIC CONTROL VALVE (Cont'd)

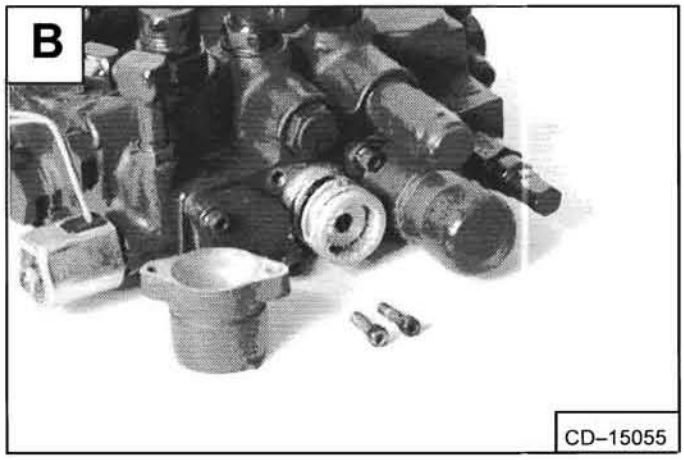
Tilt Spool and Centering Spring

Remove the end cap screws (Item 1) **[A]**.

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

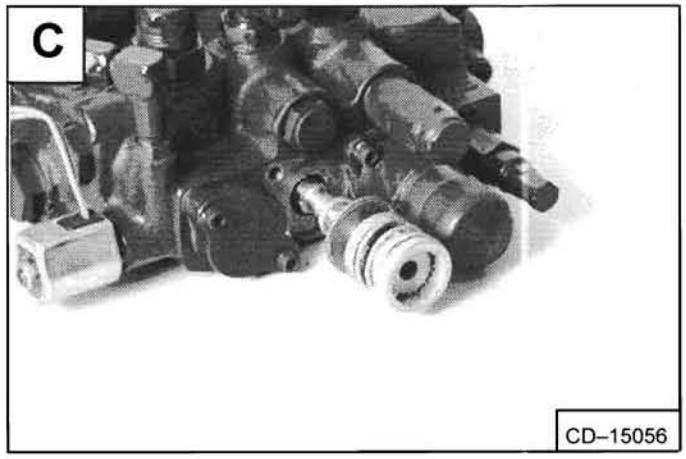


Remove the end cap **[B]**.



Remove the spool, centering spring, backup washer and spool seal **[C]**.

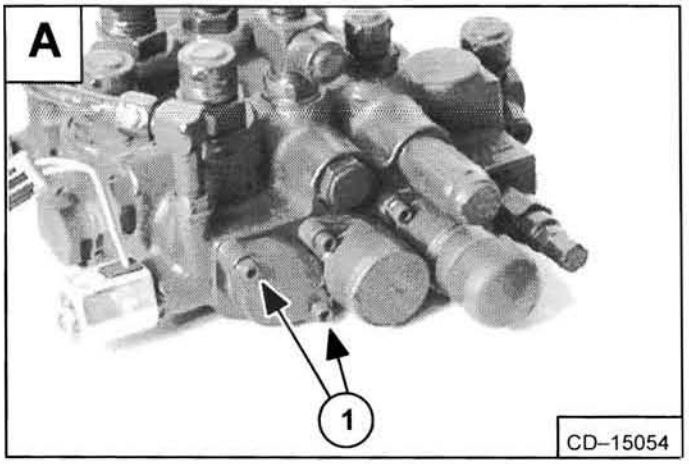
Assembly: If the centering spring bolt is removed, tighten to 90–100 in.–lbs. (10,2–11,3 Nm) torque. Put grease on all the centering spring component parts. Always use new spool seal.



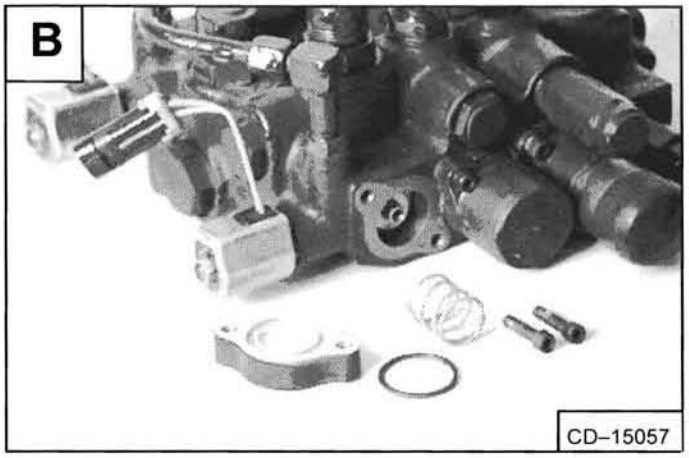
Auxiliary Spool

Remove the end plate screws (Item 1) **[A]**.

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

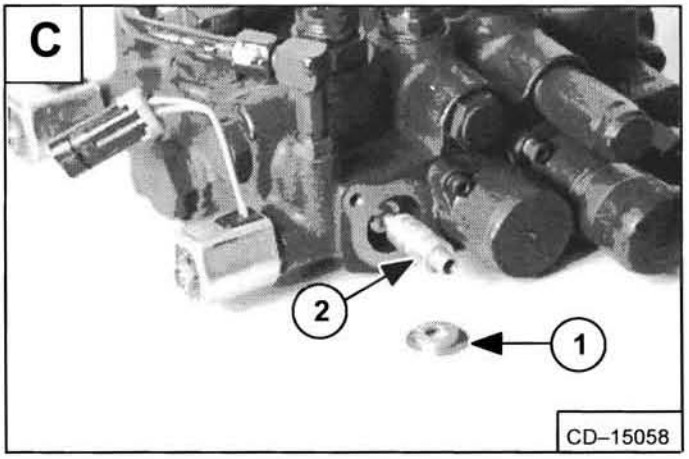


Remove the end plate, O–ring and spring (both sides) **[B]**.



Remove the washer (Item 1) **[C]** (both sides).

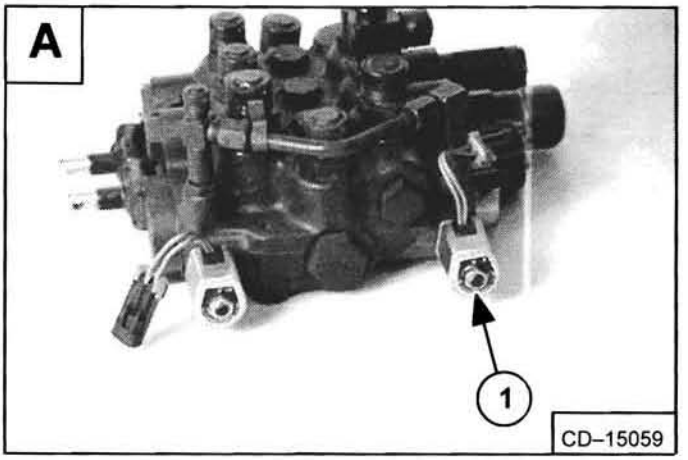
Remove the auxiliary spool (Item 2) **[C]**.



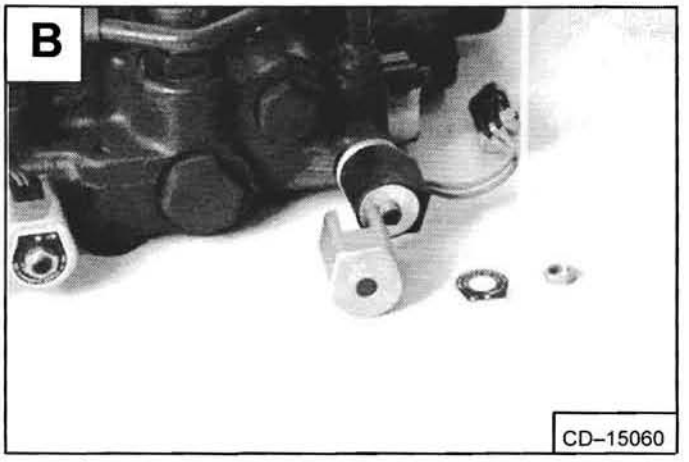
Auxiliary Electric Solenoid

Remove the nut (Item 1) **[A]** from the end of the solenoid.

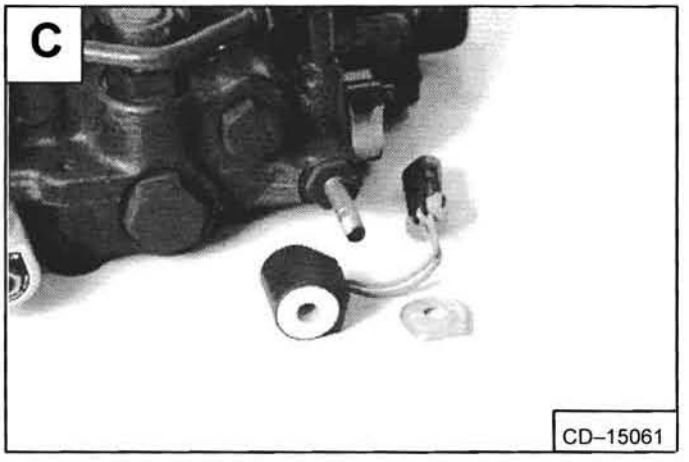
Assembly: Tighten the nut to 9–12 in.–lbs. (1,02–1,36 Nm) torque.



Remove the solenoid metal housing **[B]**.

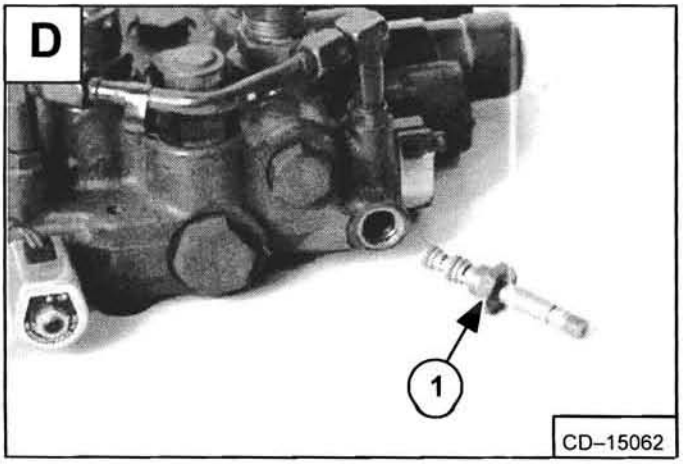


Remove the solenoid coil and end plate **[C]**.



Remove the electric solenoid valve (Item 1) **[D]**.

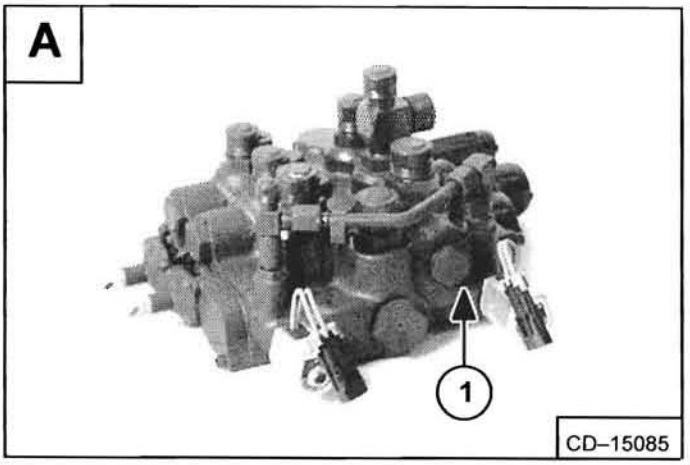
Assembly: Tighten the electric solenoid valve to 96–144 in.–lbs. (10,8–16 Nm) torque. Always install new O–rings and backup washers.



"H" Port – Auxiliary Section

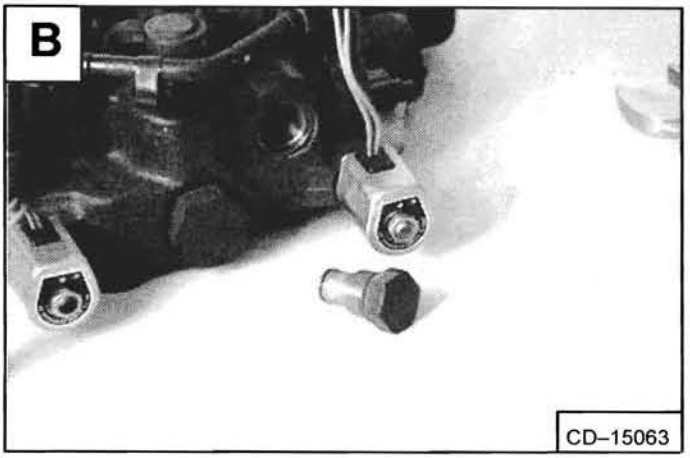
Loosen the plug (Item 1) **[A]**.

Assembly: Tighten the plug to 35–40 ft.–lbs. (47–54 Nm) torque.



Remove the plug from the control valve **[B]**.

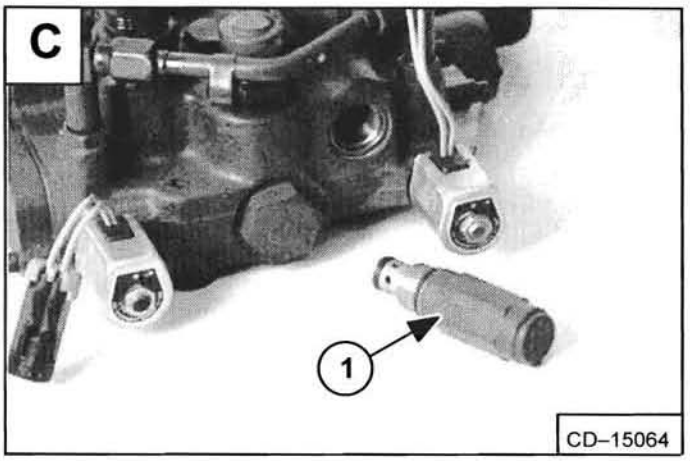
Replace the O–ring.



Depending on the application of the auxiliaries, the control valve may be equipped with a port relief valve ("H" port).

Remove the port relief valve (Item 1) **[C]**.

Assembly: Replace the O–rings and backup washers. Tighten the port relief valve to 35–40 ft.–lbs. (47–54 Nm) torque.



Base End Restrictor

Remove the adapter fitting (Item 1) **[D]** and remove the restrictor (Item 2) **[D]**.

Inspection

Check the spools for wear or scratches.

Check that the spools are not loose in their bore.

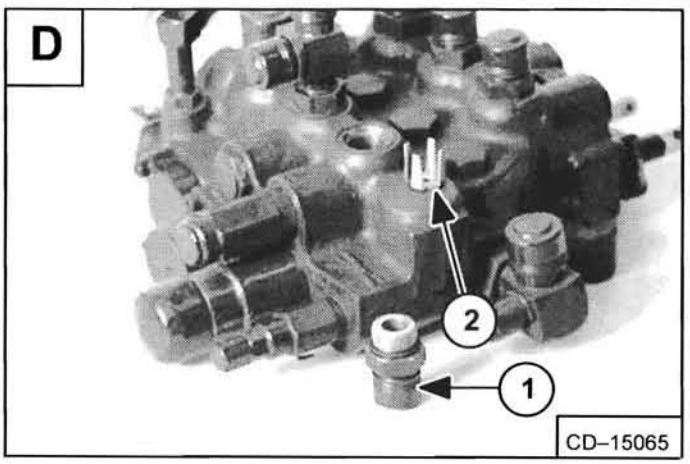
Check that the centering springs are not broken.

Check that the load check valve seats are not worn.

Check the load check poppets for damage.

Check the rubber boots and retainers that they are not worn or damaged.

Replace the parts as needed.



HYDRAULIC CONTROL VALVE (Cont'd)

Spool Seal Installation

To install new spool seals when the centering spring (tilt spool) or the detent assembly (lift spool) are not removed from the spool, use the following procedure:

Check the seal surface area (in the control valve) for rust, corrosion, scratches, etc. Correct any irregularities before continuing.

Put plastic material (Example: saran–wrap) on the valve spool **[A]**.

Put clean oil on the spool seal. Install the spool seal (Item 1) **[A]** on the spool being careful not to damage the seal on the sharp edges.

Remove the plastic material.

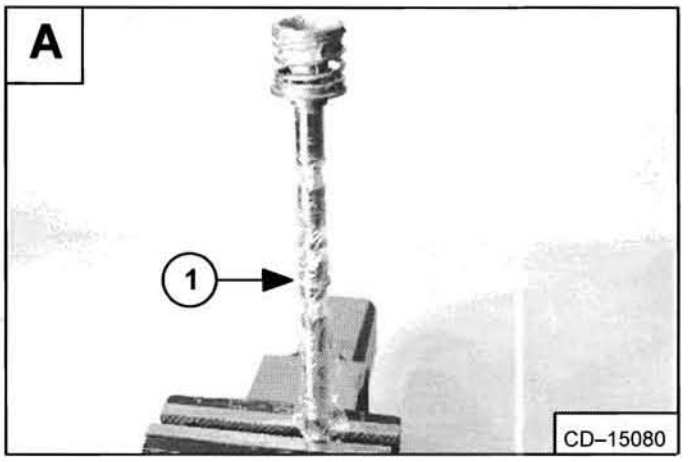
Install the spool into the control valve.

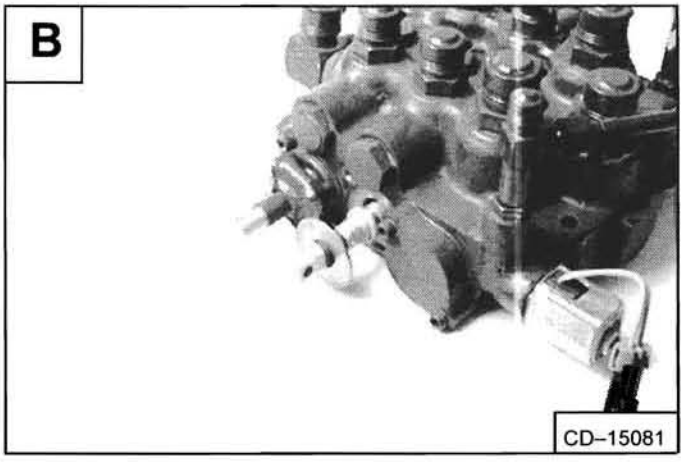
Slide the linkage end spool seal over the rubber boot groove **[B]**.

Be careful not to damage the spool seal.

Install the backup washer **[B]**.

Continue assembling the control valve.





HYDRAULIC PUMP

Checking the Output of the Pump

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

MEL10003 – Hydraulic Tester
MEL10006 – Hydraulic Test Kit

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

***Relief pressure must be per specification before the test is done.**

Lift and block the loader (Page 1–1).

Raise the lift arms and install an approved lift arm support device (Page 1–1).

Raise the operator cab (Page 1–1).

Connect the remote start switch (Page 1–1).

Disconnect the OUTLET hose (Item 1) **[A]** from the pump.

Connect the INLET hose from the tester to the OUTLET of the pump. Connect the OUTLET hose from the tester to the hose which was disconnected from the pump **[B]**.

⚠ WARNING

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

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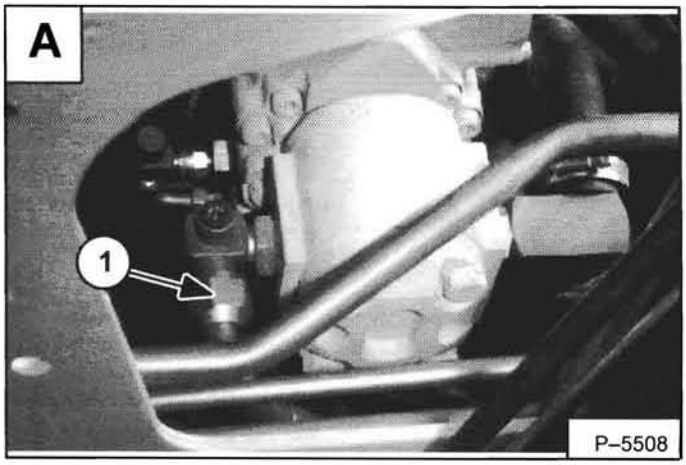
Start the engine and run at low idle RPM. Make sure the tester is connected correctly. If no flow is indicated on the tester, the hoses are connected wrong. With the hoses connected correctly, increase the engine speed to full RPM.

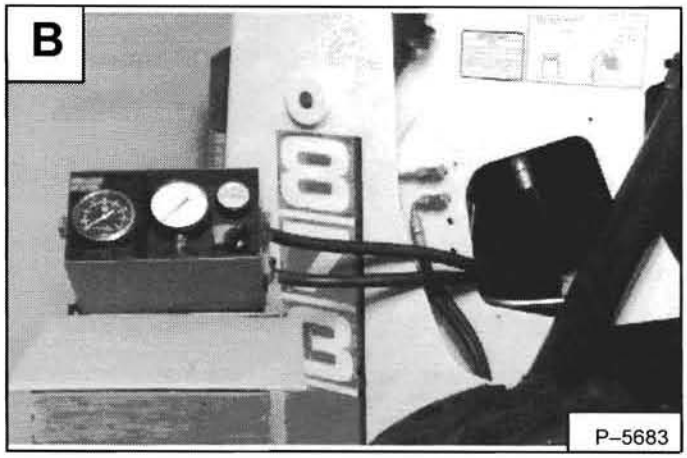
Warm the fluid to 140°F. (60°C.) by turning the restrictor control on the tester to about 1000 PSI (6895 kPa). DO NOT exceed system relief pressure. Open the restrictor control and record the free flow (GPM) at full RPM.

Turn the restrictor down to system operating pressure. DO NOT EXCEED SYSTEM RELIEF PRESSURE. The highest 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 pump problem.





Removal and Installation

IMPORTANT

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

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Raise the lift arms and install an approved lift arm support device (Page 1–1).

Raise the operator cab (Page 1–1).

Drain the hydraulic reservoir (Page 2–47).

Disconnect the hose (Item 1) **[A]** from the pump outlet. Install a cap on the fitting.

Disconnect the hose (Item 1) **[B]** from the pump inlet.

Disconnect the second hose (Item 2) **[B]** from the pump inlet.

Remove the pump mounting bolts (Item 1) **[C]** (Both Sides).

Installation: Tighten the mounting bolts to 25–27 ft.–lbs. (34–37 Nm) torque.

Remove the hydraulic pump.

⚠ WARNING

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

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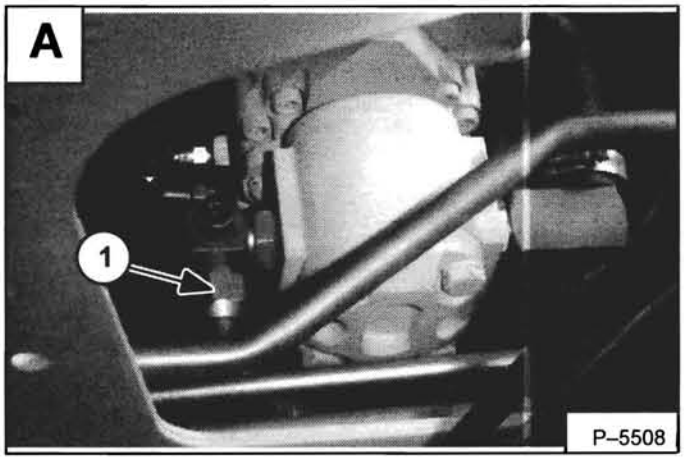
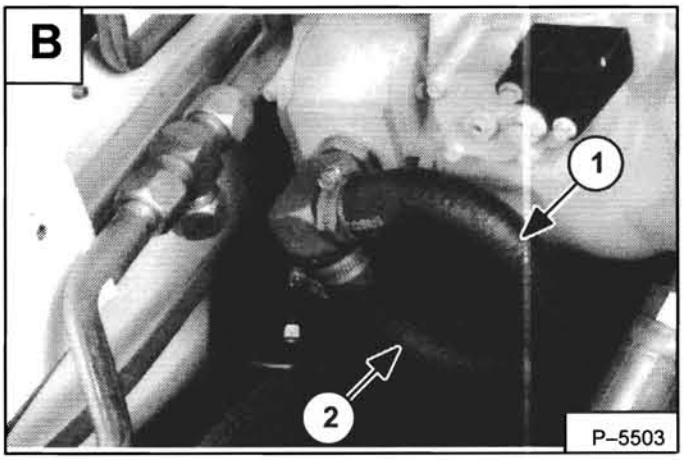
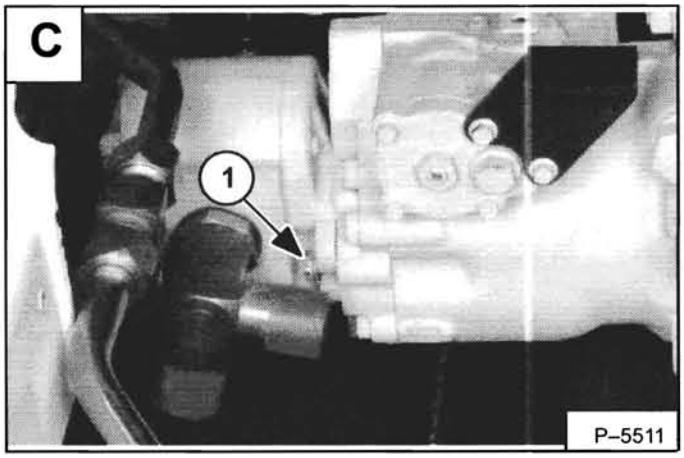
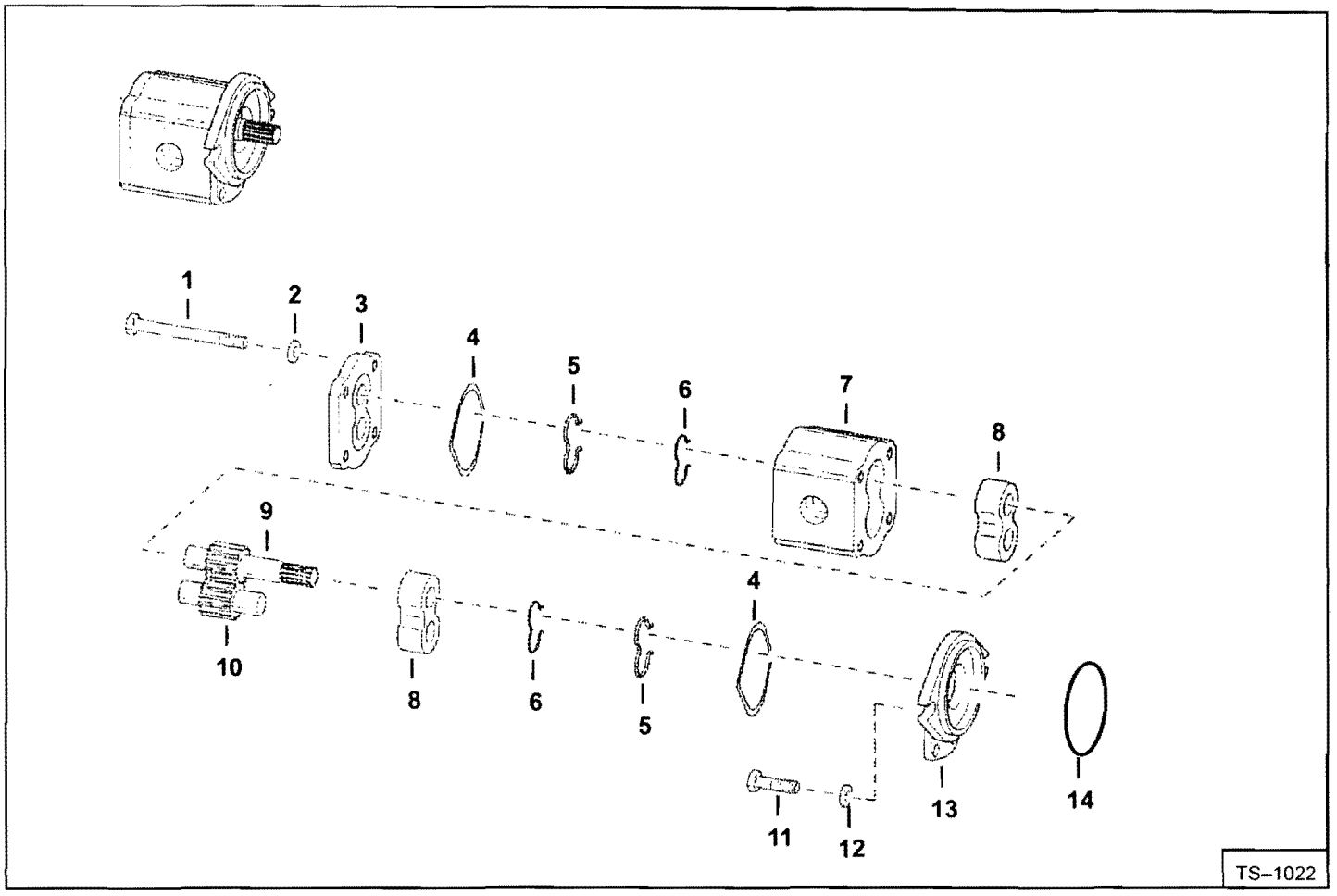






Parts Identification



Ref.	Description
1.	BOLT
2.	WASHER
3.	END HOUSING
4.	O–RING SEAL
5.	SEAL
6.	RING
7.	BODY
8.	BEARING HOUSING
9.	DRIVE GEAR
10.	IDLER GEAR
11.	BOLT
12.	WASHER
13.	COVER
14.	SEAL

Disassembly

IMPORTANT

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

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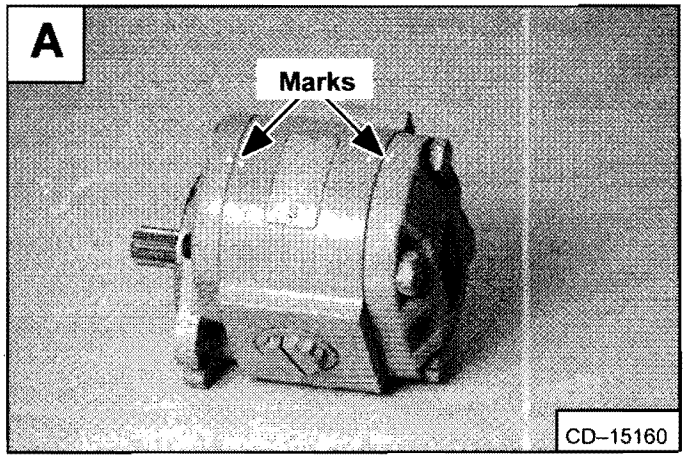
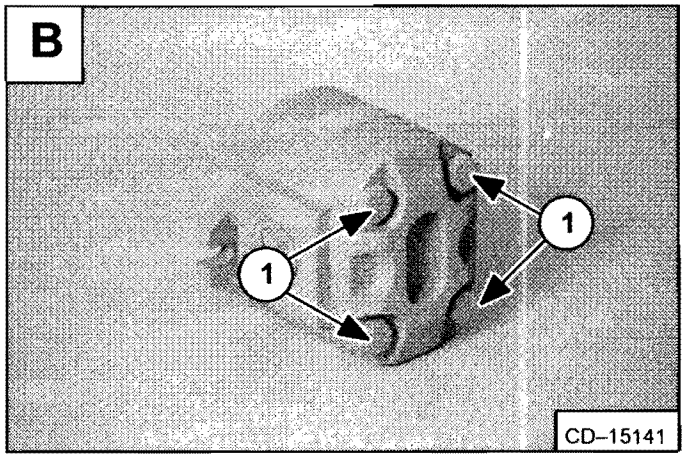
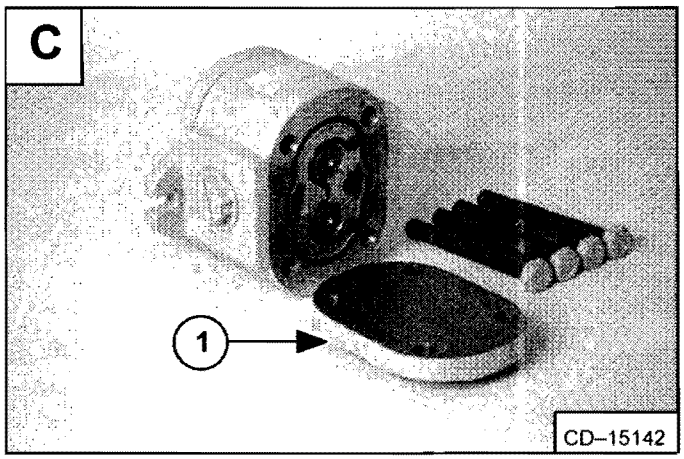
Mark the pump sections for correct assembly **[A]**.



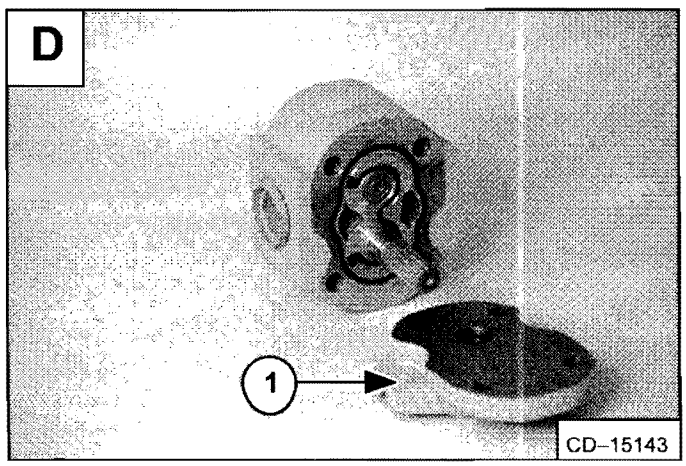
Remove the pump housing bolts (Item 1) **[B]**.



Remove the end housing (Item 1) **[C]**.



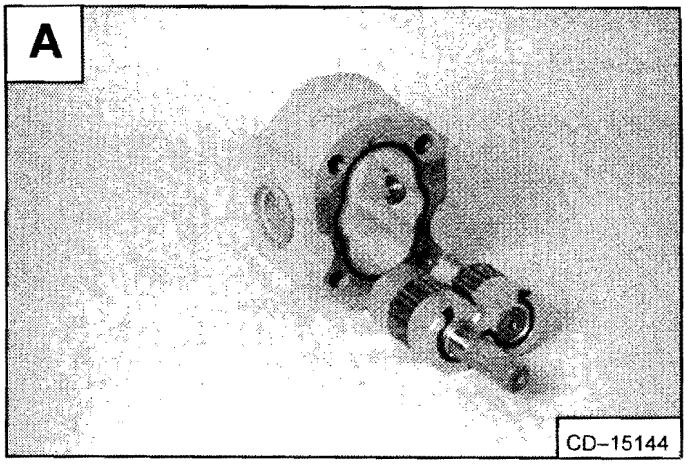
Remove the mounting flange end housing (Item 1) **[D]**.



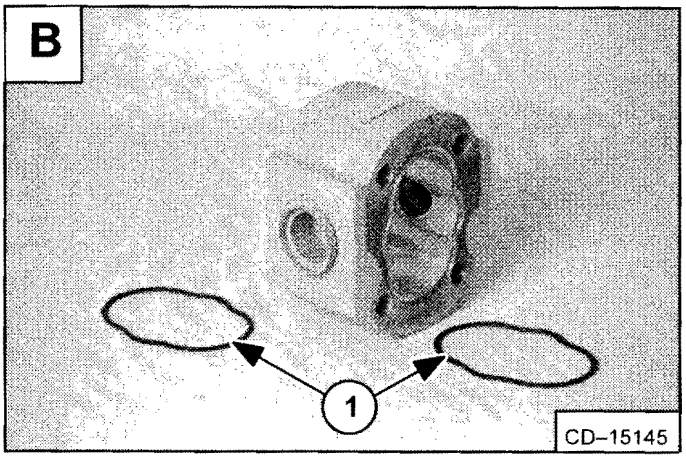
HYDRAULIC PUMP (Cont'd)

Disassembly (Cont'd)

Remove the gears/bearings assembly **[A]**.

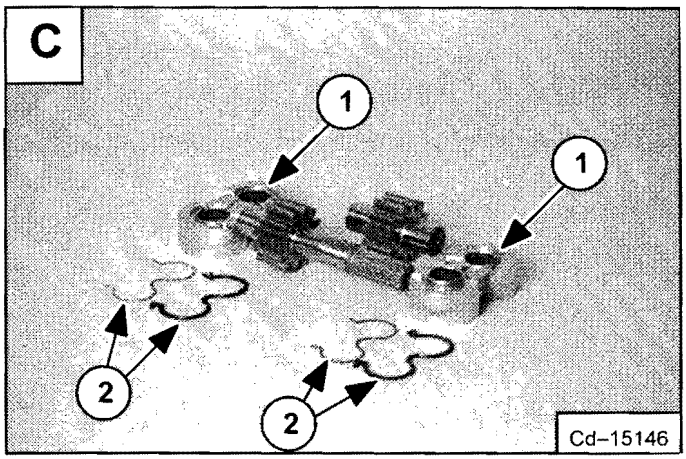


Remove the O–rings (Item 1) **[B]** from the pump housing.

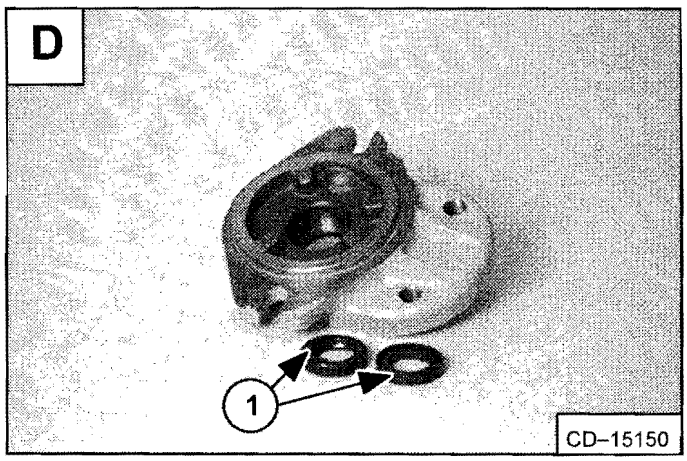


Remove the bearing housing (Item 1) **[C]** from the gears.

Remove the backup seals/O–ring seals (Item 2) **[C]** from the bearing housing.



Remove the drive gear shaft seals (Item 1) **[D]**.



HYDRAULIC PUMP (Cont'd)

Inspection

Wash all parts in clean solvent.

Use air pressure to dry them.

Make a visual inspection of all the parts.

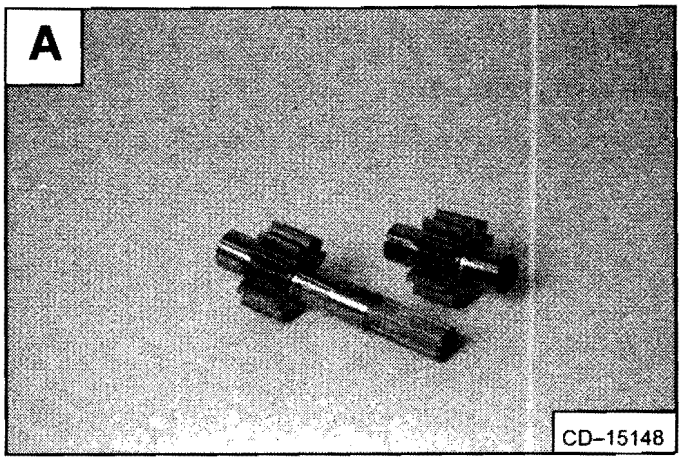
After visual inspection, those parts which are of questionable condition must be repaired.

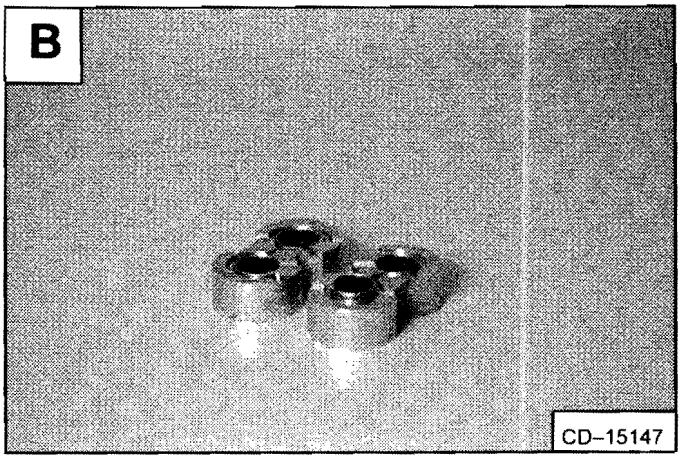
Check the drive and idler gears **[A]**.

If excessive wear is visible on the journals, side or face of the gears they must be replaced. If the splines are worn, replace the drive gear.

Check the bushings in the housing **[B]**.

If the bushings are worn, scratched, and etc., replace them as needed.

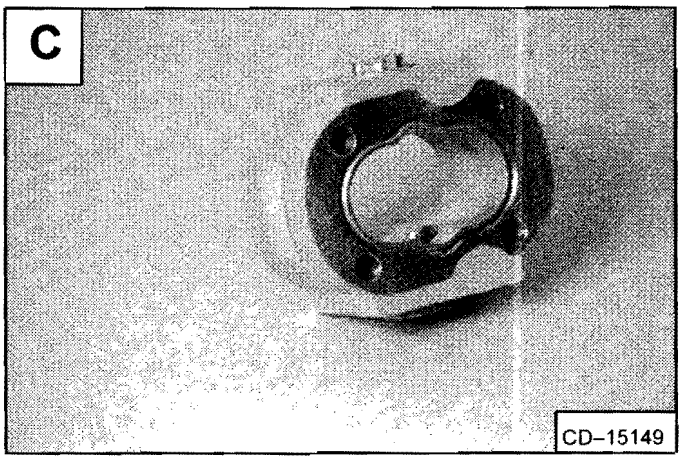




Check the pump housing **[C]**.

Check the surface in the gear area for scratches, wear and etc.

NOTE: See Parts Microfiche for available parts.



Assembly

Always use new O–rings and seals when assembling the hydraulic pump.

IMPORTANT

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

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Install the two seals (Item 1) **[A]** into the mounting flange housing using the correct size driver tool.

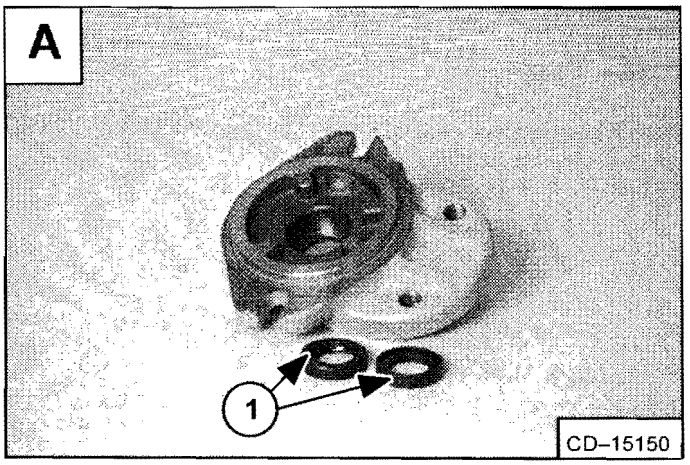
Install the inside seal with the lip facing the drive gear and the outside seal with the lip facing outward.

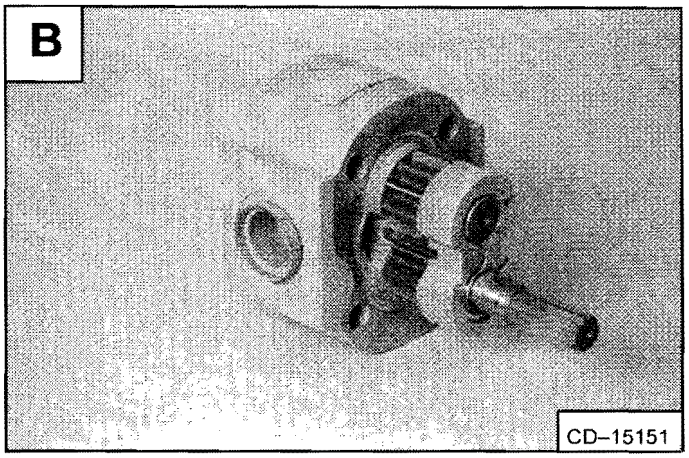
Install the bearing housing/gears assembly into the pump housing **[B]**.

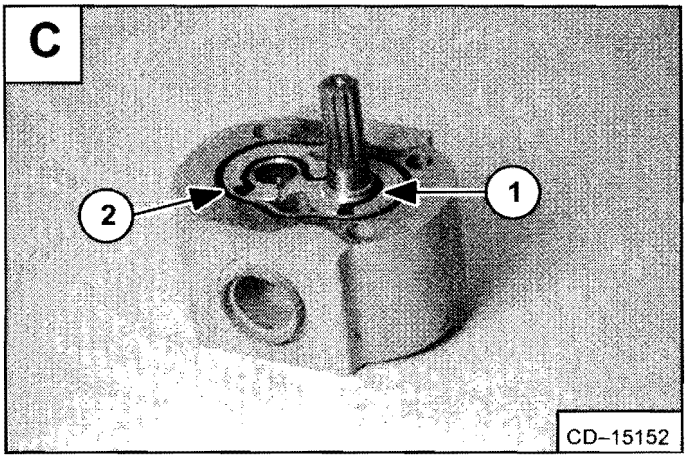
Install the backup seals/O–ring seals (Item 1) **[C]**.

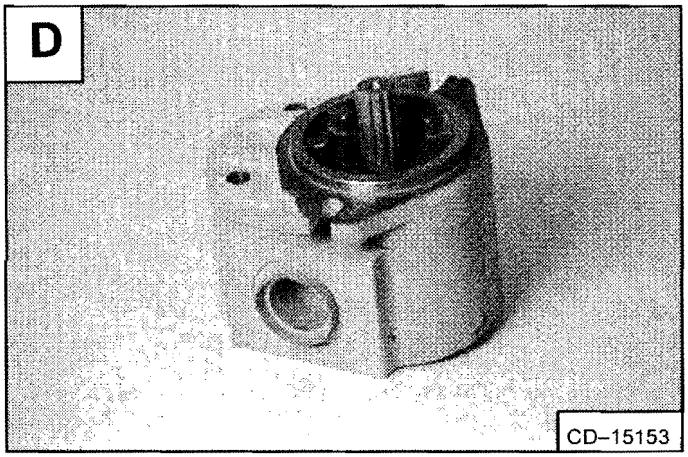
Install the large O–ring (Item 2) **[C]**.

Install the mounting flange housing on the pump housing **[D]**.







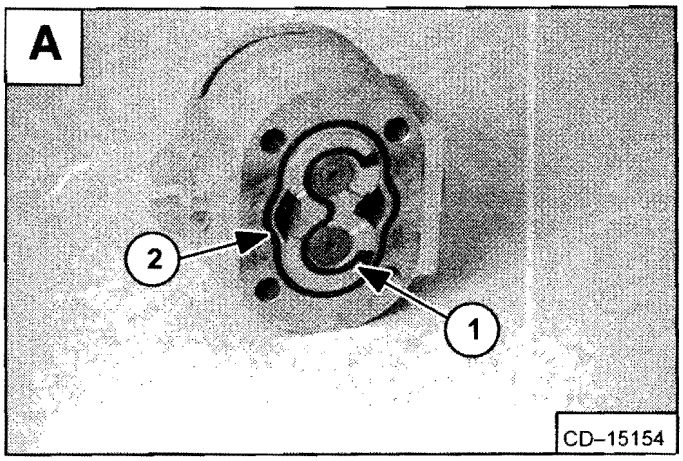


HYDRAULIC PUMP (Cont'd)

Assembly (Cont'd)

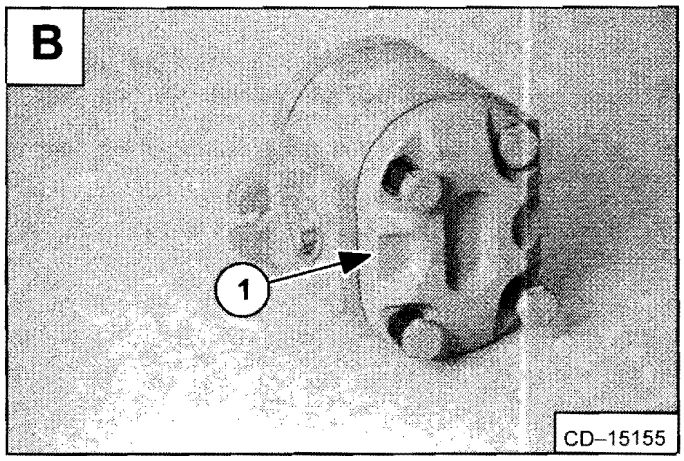
Install the backup seals/O–ring seals (Item 1) **[A]**.

Install the large O–ring (Item 2) **[A]**.

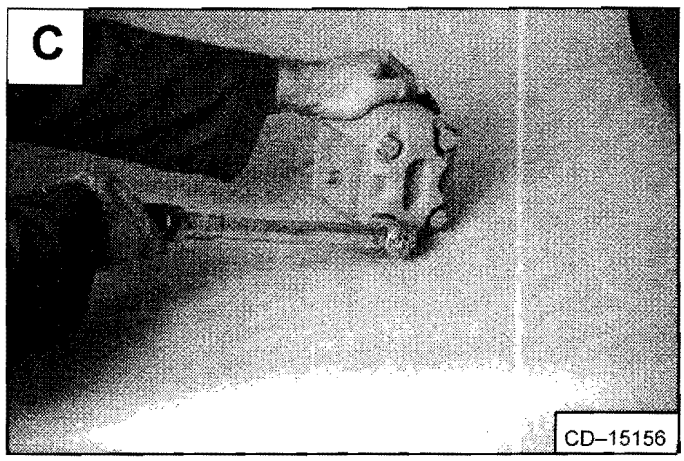


Install the end housing (Item 1) **[B]**.

Install the four pump housing bolts **[B]**.



Tighten the bolts to 45–50 ft.–lbs. (61–68 Nm) torque **[C]**.



HYDRAULIC FLUID RESERVOIR

Draining the Fluid Reservoir

Remove the side cover from the loader frame.

Pull the reservoir drain hose (Item 1) **[A]** out of the side of the loader frame.

Remove the hose end cap and drain fluid into a container **[A]**.

IMPORTANT

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

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⚠ WARNING

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

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Removal and Installation

Raise the lift arms and install an approved lift arm support device (Page 1–1).

Raise the operator cab (Page 1–1).

Drain the fluid from the reservoir **[A]**.

Remove the front panel/steering lever assembly (Page 3–1).

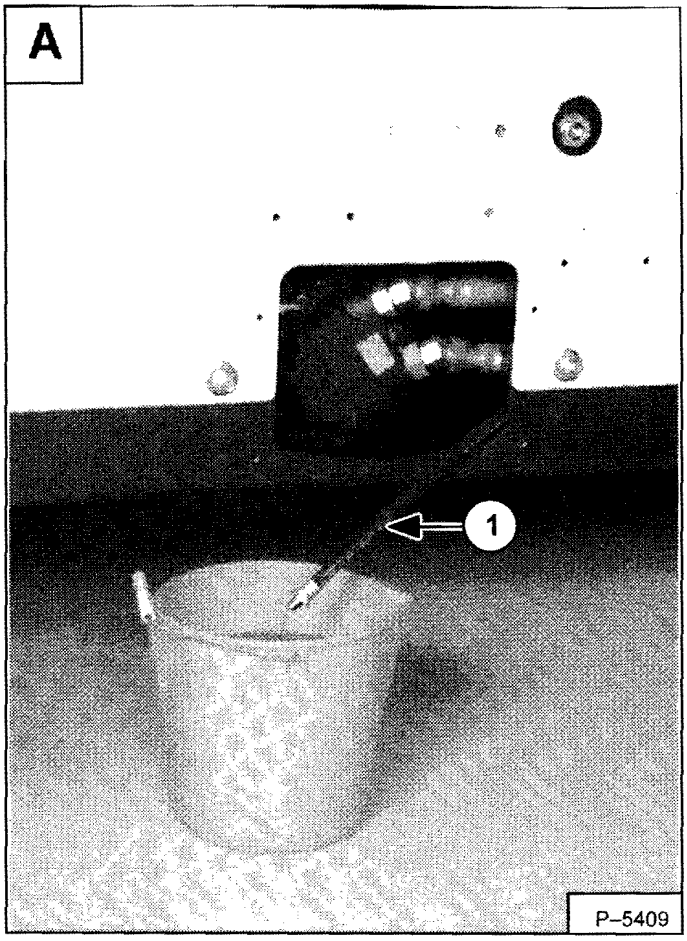
Remove the lift lock linkage (Item 1) **[B]**.

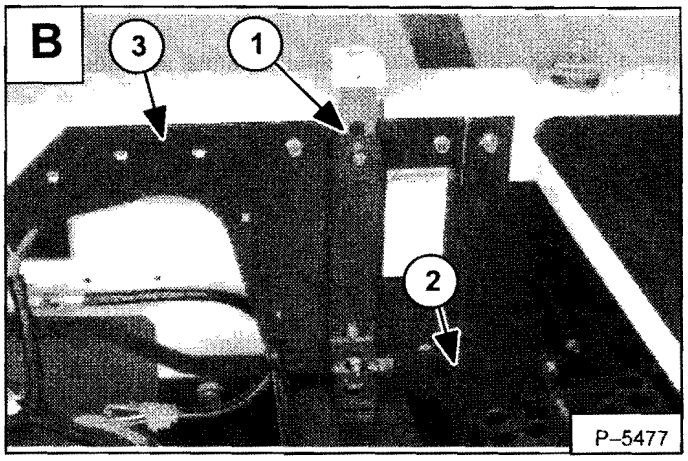
Disconnect the lift linkage (Item 2) **[B]** from the crossmember and pedal. Remove the lift linkage.

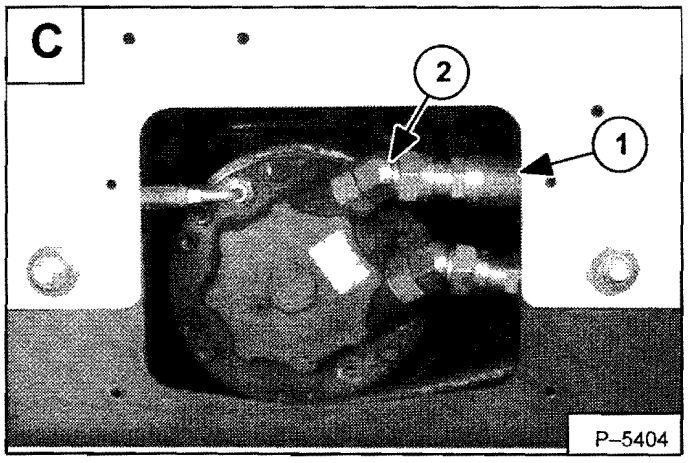
Remove the side panel (Item 3) **[B]**.

Disconnect the hydrostatic high pressure hose (Item 1) **[C]**.

Remove the hose fitting (Item 2) **[C]**.



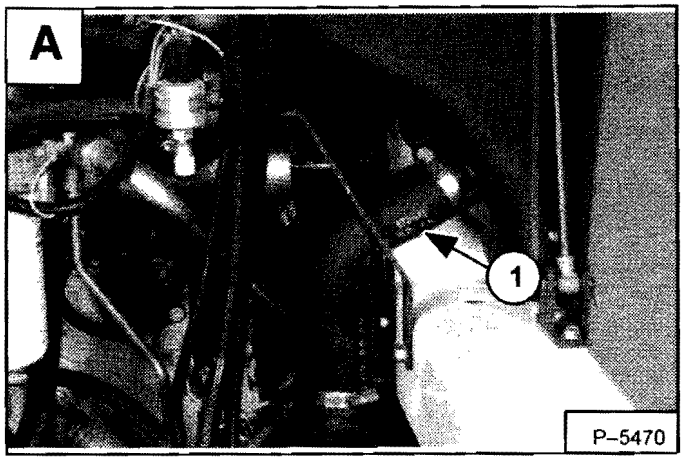




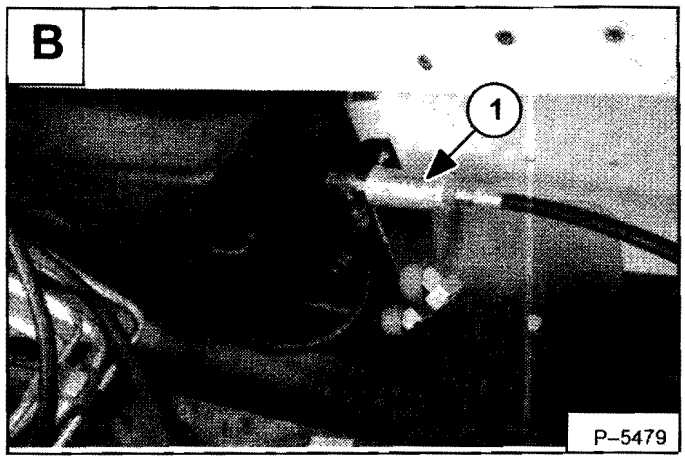
Removal and Installation (Cont'd)

Loosen the two hose clamps and remove the reservoir fill hose (Item 1) **[A]**.

Disconnect the hose at the bottom of the hydraulic reservoir (goes to the hydraulic pump).



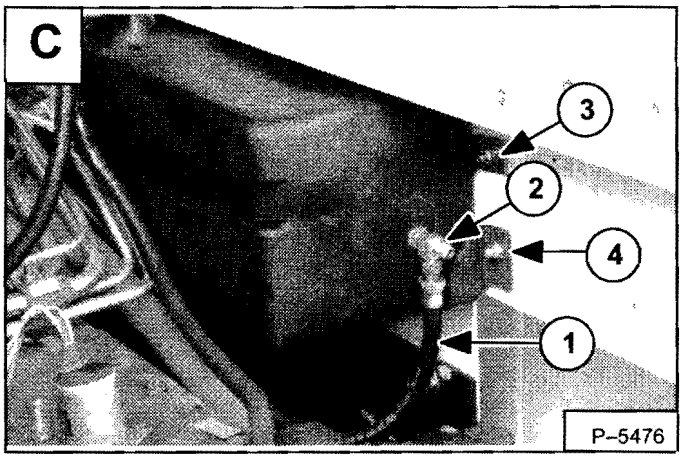
Disconnect the case drain filter (Item 1) **[B]**.



Disconnect the hose (Item 1) **[C]** and remove the tee fitting (Item 2) **[C]**.

Remove the mounting strap (Item 3) **[C]**, nut, plate end bolt (both sides).

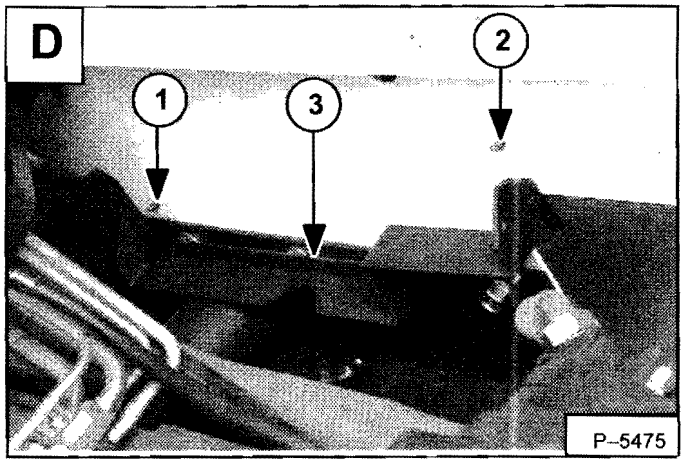
Installation: Tighten the bolt and nut to 16–20 ft.–lbs. (21–27 Nm) torque.



NOTE: Figure [D] shows reservoir mounting bracket for reference purpose.

Remove the reservoir mounting bracket bolts and nuts (Item 4) **[C]**; (Item 1 & 2) **[D]**.

Move the reservoir mounting bracket (Item 3) **[D]** down and away from the reservoir.

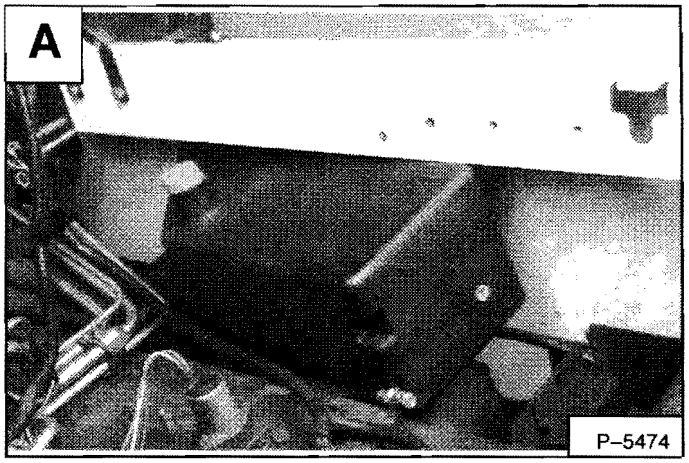


HYDRAULIC FLUID RESERVOIR (Cont'd)

Removal and Installation (Cont'd)

Slide the hydraulic reservoir forward and out from under the loader frame **[A]**.

Remove the hydraulic reservoir from the loader.



HYDROSTATIC FILTER HOUSING

Removal and Installation

IMPORTANT

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

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Raise the lift arms and install an approved lift arm support device (Page 1–1).

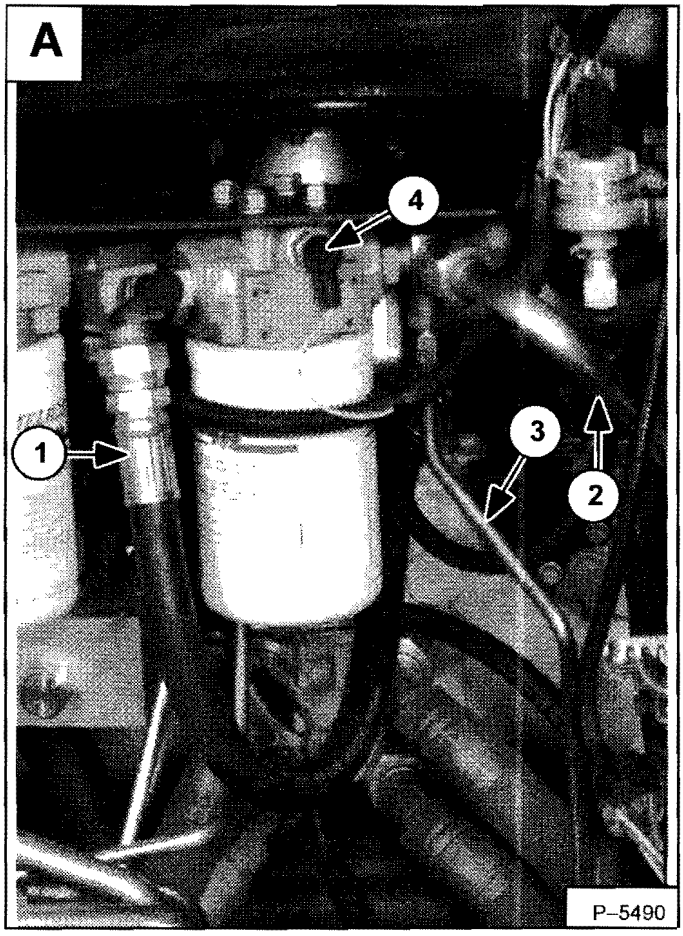
Raise the operator cab (Page 1–1).

Disconnect the hose (Item 1) **[A]**.

Disconnect the large tubeline (Item 2) **[A]**.

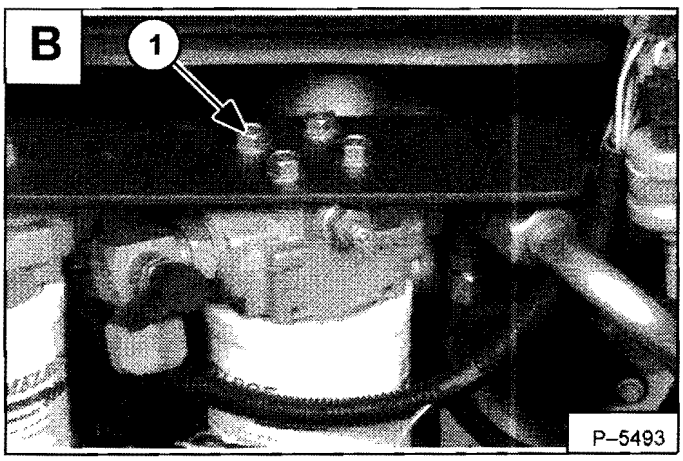
Disconnect the small tubeline (Item 3) **[A]**.

Disconnect the wire (Item 4) **[A]**.



Remove the four mounting bolts (Item 1) **[B]**.

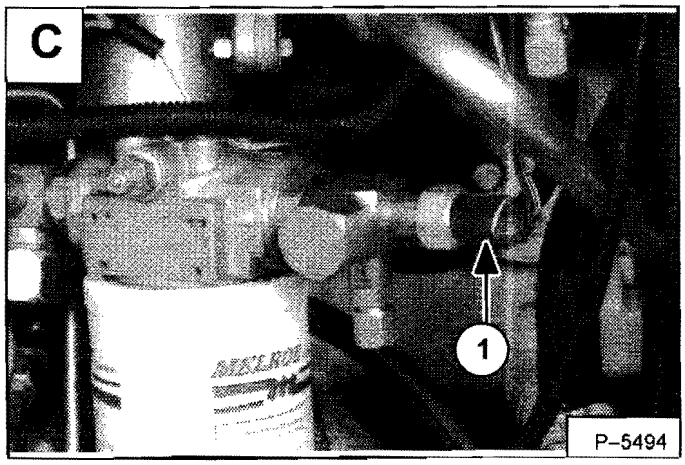
Installation: Tighten the mounting bolts to 25 ft.–lbs. (34 Nm) torque.



Pull the filter housing down and turn it.

Disconnect the electrical connector (Item 1) **[C]**.

Remove the filter housing/filter assembly.



HYDRAULIC FILTER HOUSING

Removal and Installation

IMPORTANT

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

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Raise the lift arms and install an approved lift arm support device (Page 1–1).

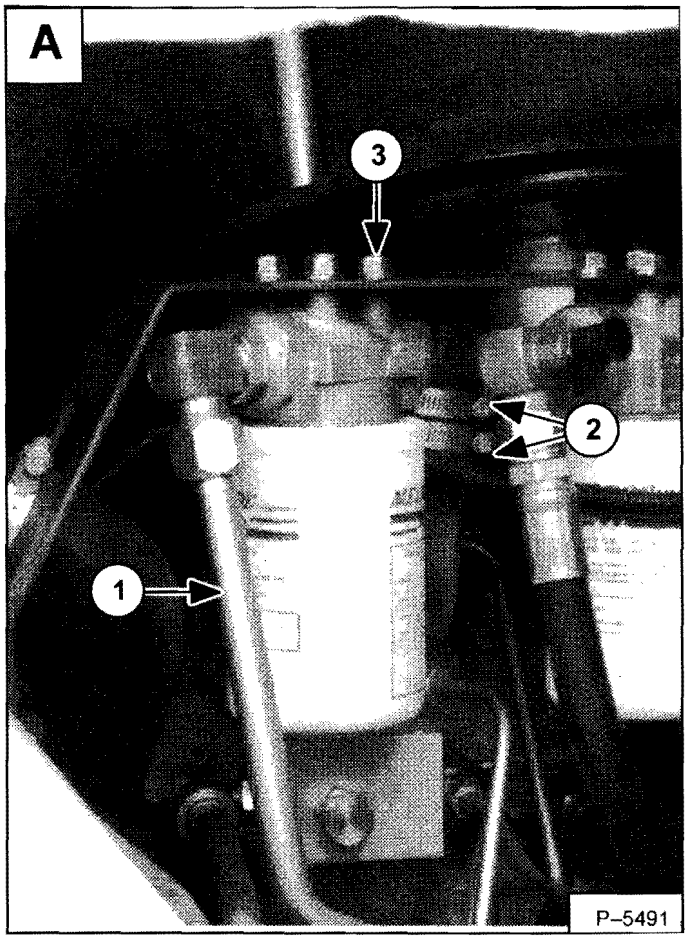
Raise the operator cab (Page 1–1).

Disconnect the tubeline (Item 1) **[A]**.

Loosen the two hose clamps (Item 2) **[A]** and disconnect the hose.

Remove the four mounting bolts (Item 3) **[A]**.

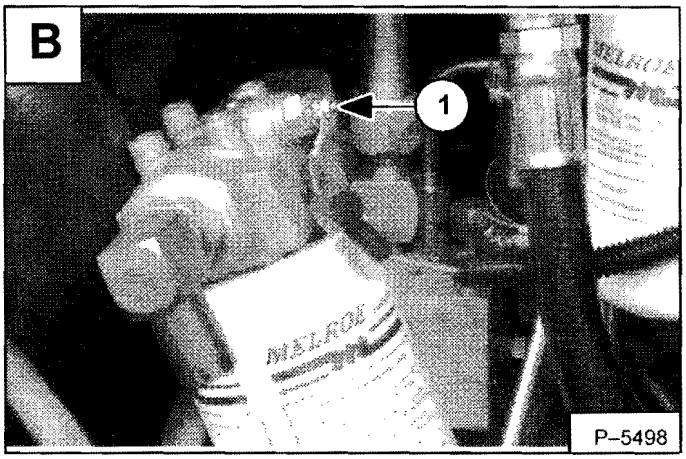
Installation: Tighten the mounting bolts to 25 ft.–lbs. (34 Nm) torque.



Pull the filter housing down and turn it.

Disconnect the wire (Item 1) **[B]**.

Remove the filter housing/filter assembly.



HYDRAULIC/HYDROSTATIC FILTER HOUSING BRACKET

Removal and Installation

IMPORTANT

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

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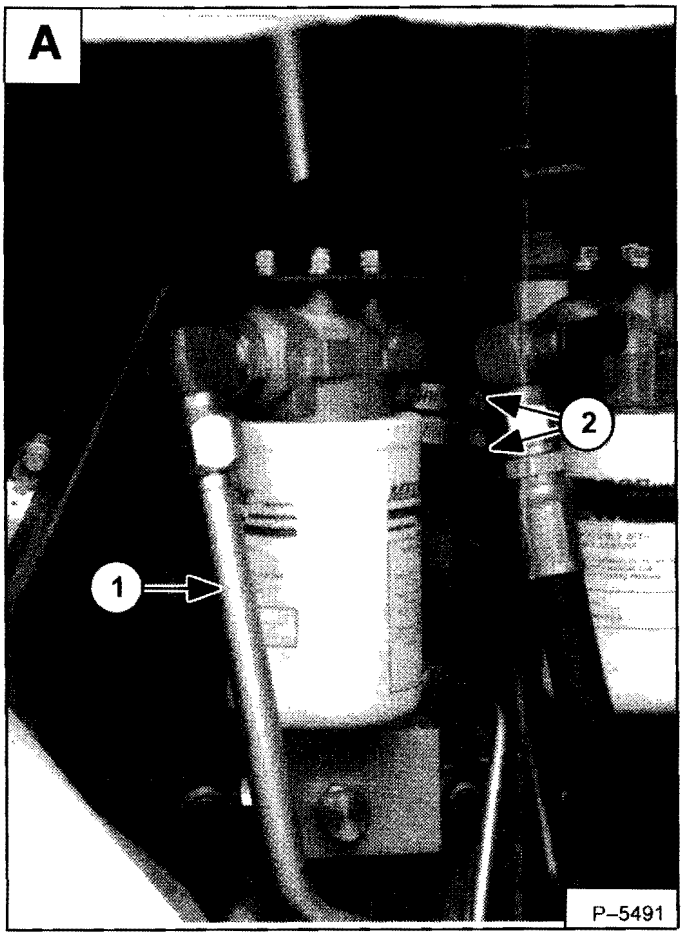
Raise the lift arms and install an approved lift arm support device (Page 1–1).

Raise the operator cab (Page 1–1).

Disconnect the tubeline (Item 1) **[A]**.

Loosen the two hose clamps (Item 2) **[A]** and disconnect the hose.



Disconnect the hose (Item 1) **[B]**.

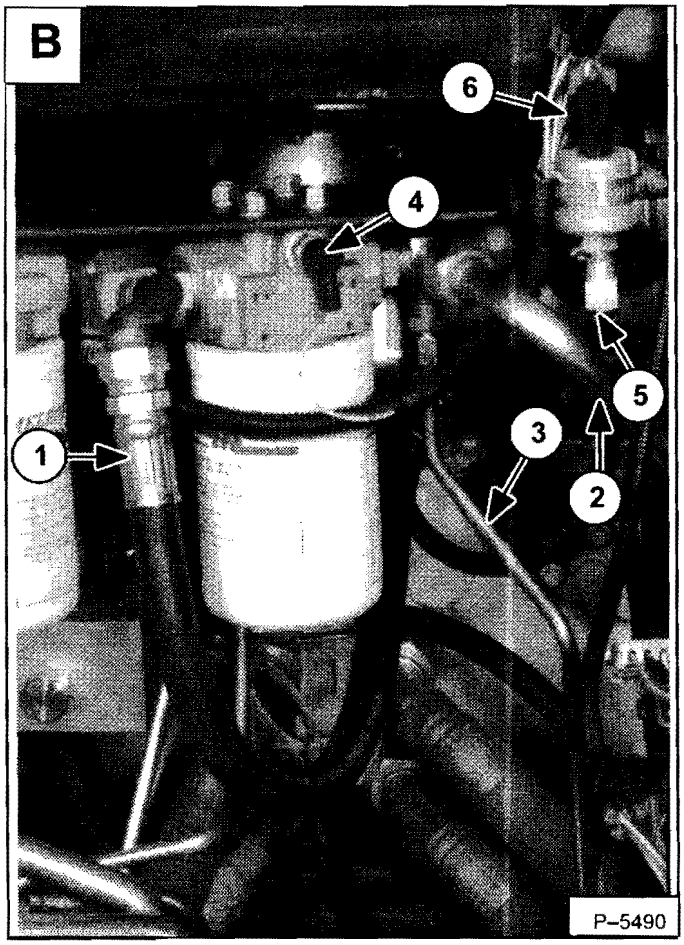
Disconnect the large tubeline (Item 2) **[B]**.

Disconnect the small tubeline (Item 3) **[B]**.

Disconnect the wire (Item 4) **[B]**.

Disconnect the hose (Item 5) **[B]** from the charge pressure switch.

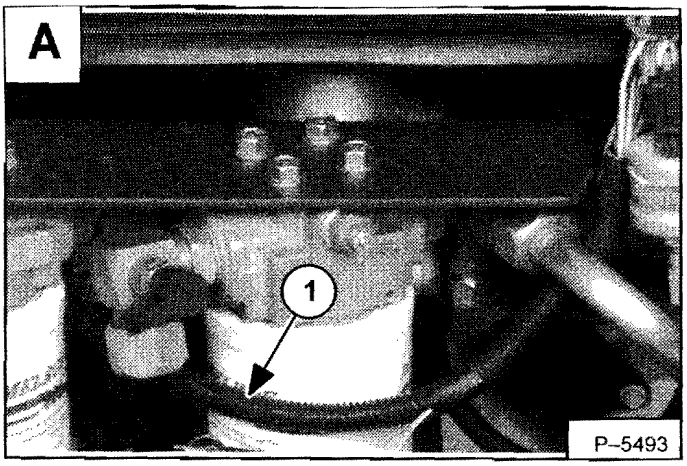
Disconnect the electrical connector (Item 6) **[B]** from the charge pressure switch.



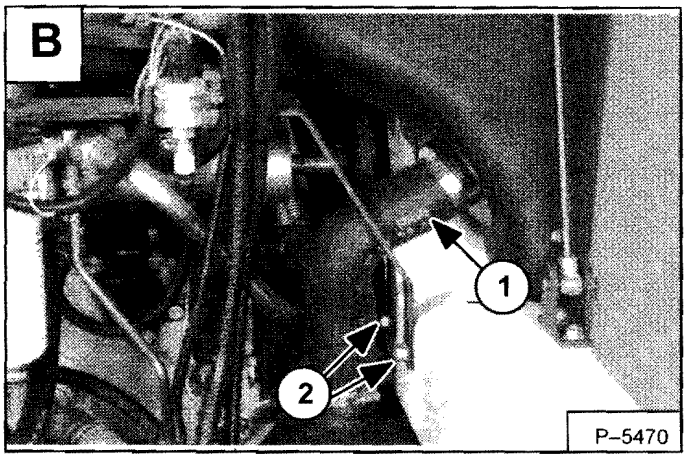
HYDRAULIC/HYDROSTATIC FILTER HOUSING BRACKET (Cont'd)

Removal and Installation (Cont'd)

Disconnect the wire (Item 1) **[A]** at the hydrostatic sender.



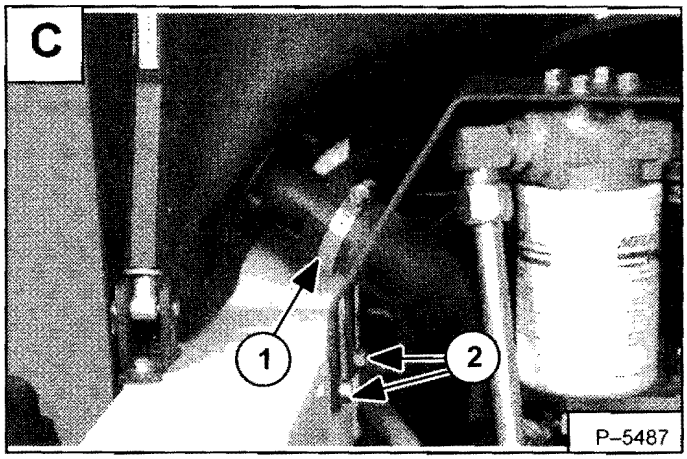
Loosen the hose clamp and remove the hydraulic reservoir fill hose (Item 1) **[B]**.



Loosen the hose clamp and disconnect the fuel fill hose (Item 1) **[C]** from the fill neck.

Remove the four mounting bolts (Item 2) **[B]** & **[C]**.

Remove the hydraulic/hydrostatic filter housing bracket assembly from the loader.



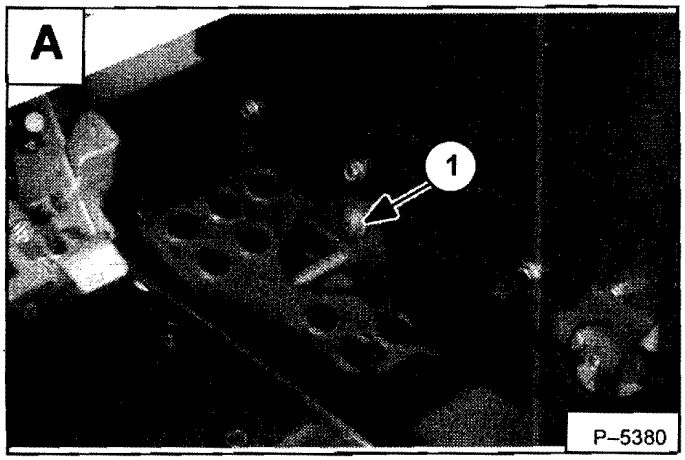
CONTROL PEDALS

Removal and Installation

Remove the bolt and nut (Item 1) **[A]** from the pedal linkage.

Installation: Tighten the bolt and nut to 21–25 ft.–lbs. (28–34 Nm) torque.

Check the rubber bushing in the pedal for wear and replace as needed.



Remove the two mounting bolts (Item 1) **[B]**.

Remove the pedal assembly from the loader.

Pedal Adjustment

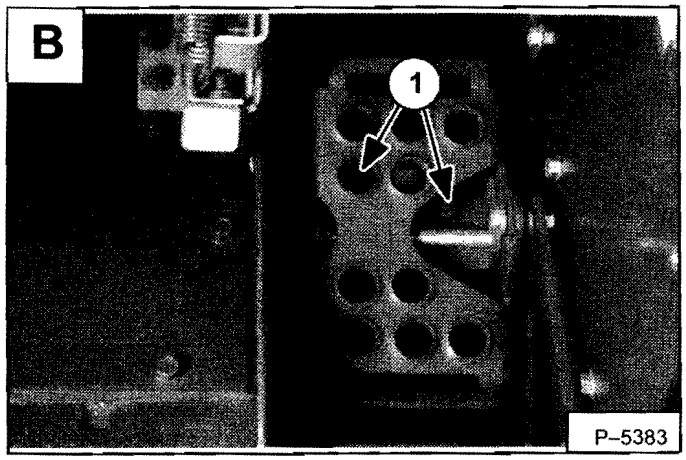
After installing the pedal, adjust the pedal so that there is clearance under the rear of the pedal and the valve spool must travel full stroke without hitting the floor panel.

⚠ WARNING

AVOID INJURY OR DEATH

Adjust locking tabs on pedal control linkage so that lift and tilt control pedals are locked in neutral when the seat bar is up.

W–2104–1285



NOTE: See Page 2–55 for correct procedure to adjust the pedal interlock linkage.

PEDAL INTERLOCK LINKAGE

Removal and Installation

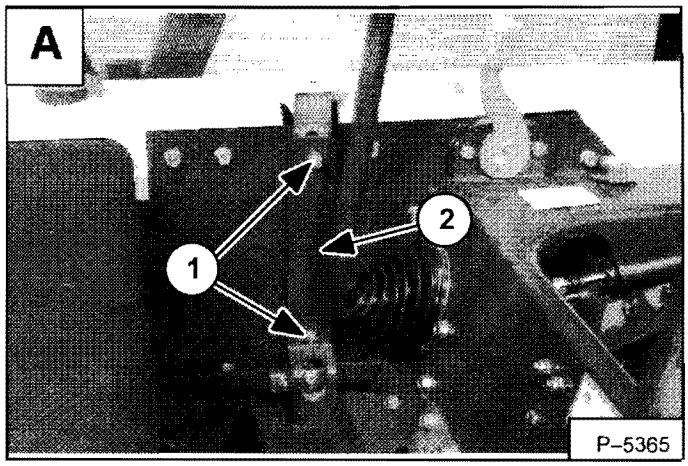
Raise the lift arms and install an approved lift arm support device (Page 1–1).

Raise the operator cab (Page 1–1).

Remove the interlock shield mounting nuts (Item 1) **[A]**.

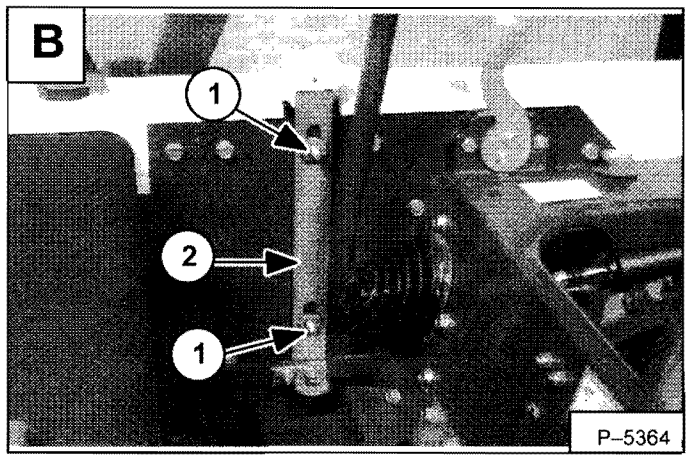
Installation: Tighten the shield mounting nuts to 25–28 ft.–lbs. (34–38 Nm) torque.

Remove the interlock shield (Item 2) **[A]**.



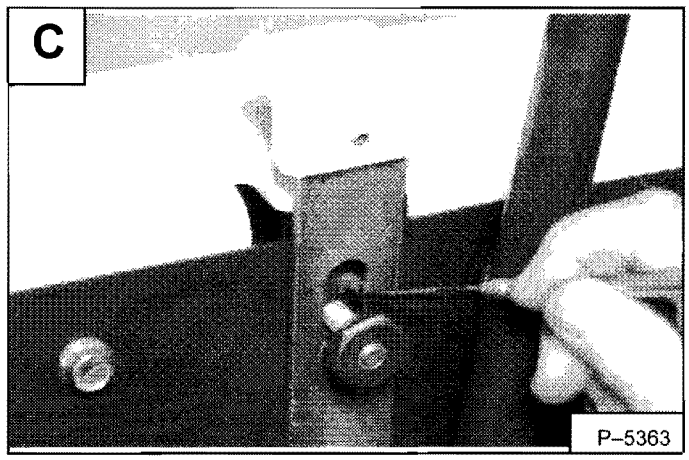
Remove the interlock mounting nuts (Item 1) **[B]** and plastic washers from behind the nuts.

Remove the interlock (Item 2) **[B]** and plastic washers from behind the interlock.



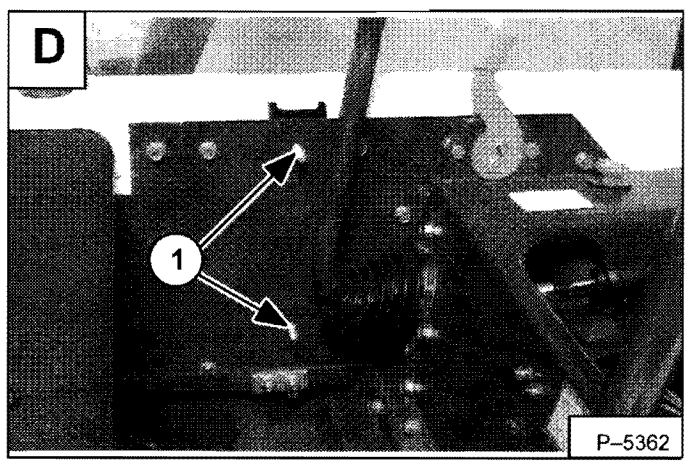
Installation: Hold the inside plastic washer up with an O–ring pick or a small screwdriver so the plastic washer does not become wedged between the side panel and the interlock nut **[C]**.

Installation: Tighten the interlock mounting nuts to 84–95 in.–lbs. (9,5–10,8 Nm) torque.



If the linkage lock mounting bolts (Item 1) **[D]** need replacement, remove the front side panel (Page 2–56).

Install the new mounting bolts through the back of the side panel.



PEDAL INTERLOCK LINKAGE (Cont'd)

Pedal Interlock Linkage Adjustment

Check the pedal interlock linkage so it is free and locks both pedals.

Check that the tab (Item 1) **[A]** on the linkage, slides into the slot on the interlock and holds the pedal in locked position.

If not, loosen the bolts and nuts (Item 2) **[A]** and adjust the tab for correct engagement.

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

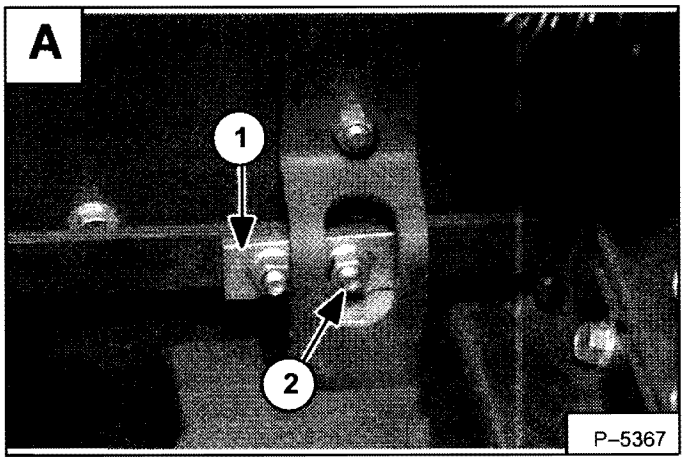
⚠ WARNING

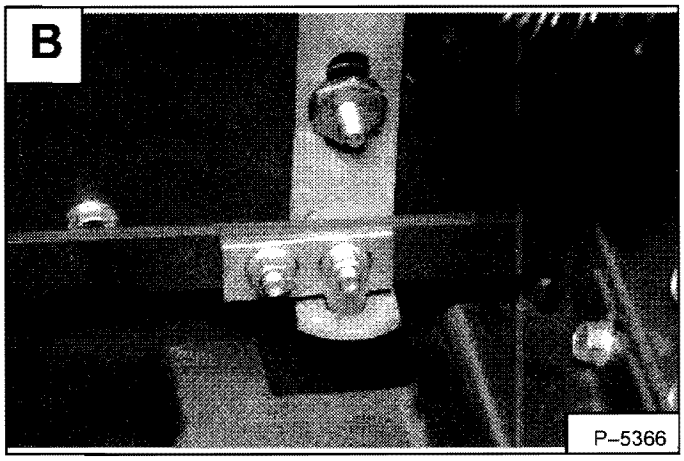
AVOID INJURY OR DEATH

Adjust locking tabs on pedal control linkage so that lift and tilt control pedals are locked in neutral when the seat bar is up.

W–2104–1285

The locking tab should fit into the slot of the interlock as shown in figure **[B]**, when adjusted correctly.

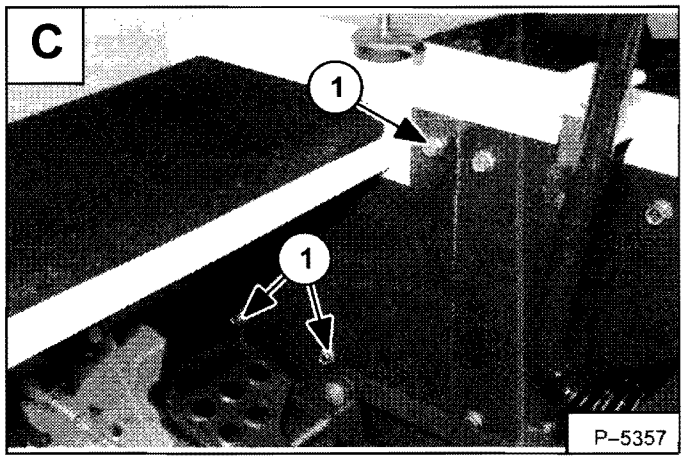




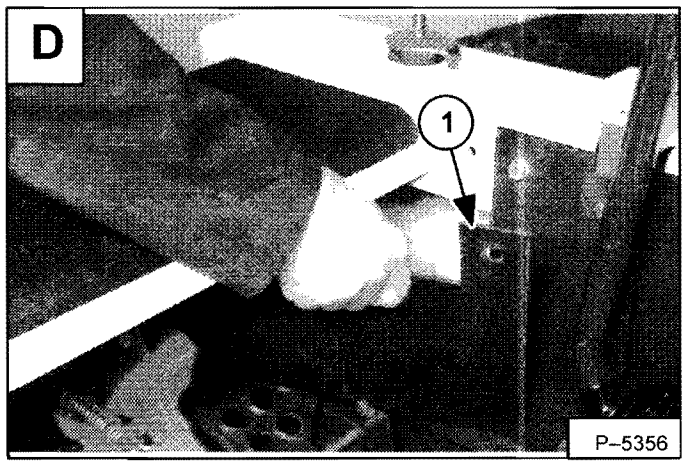
FRONT SIDE PANEL

Removal and Installation

Remove the three mounting bolts (Item 1) **[C]**.



Remove the front side panel (Item 1) **[D]** from the loader.



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bobcat

DRIVE BELT SHIELD

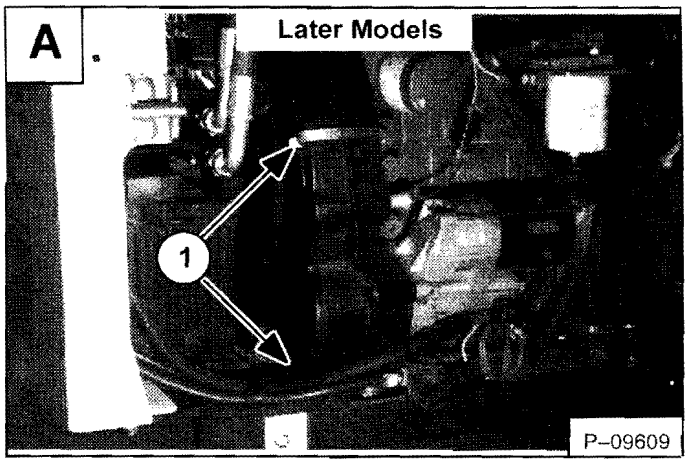
Removal and Installation

Stop the engine.

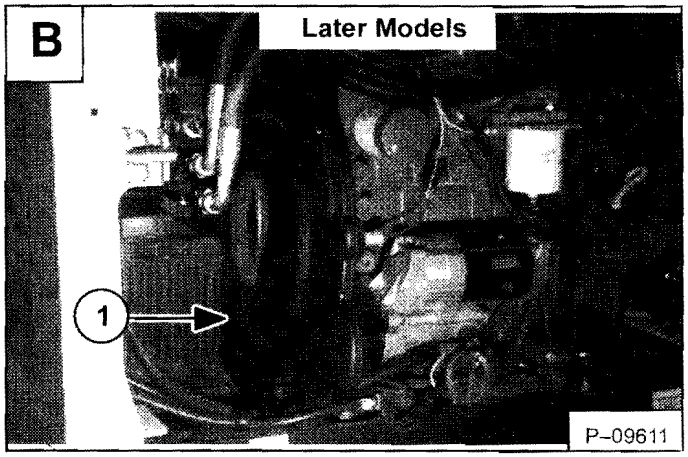
Open the rear door.

There are three belt shield holddown clips.

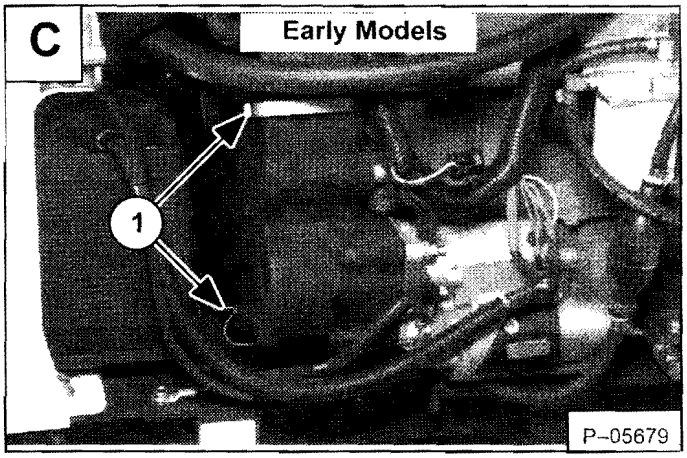
Remove the belt shield holddown clips (Item 1) **[A]** or **[C]**.

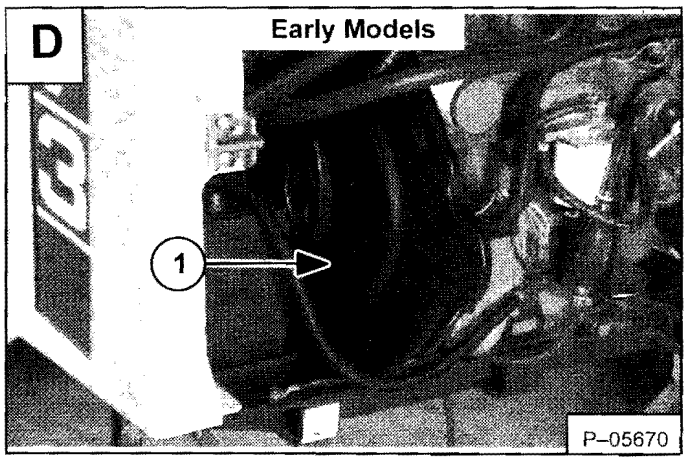


Remove the belt shield (Item 1) **[B]** or **[D]** from the drive belt housing.



Revised Issue. 11. 2. 97





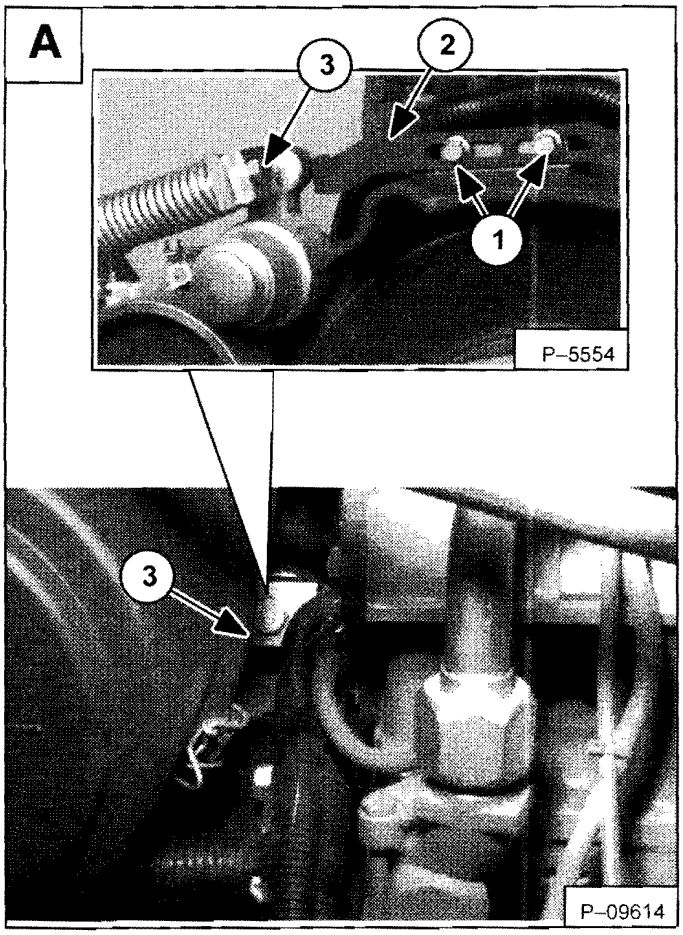
DRIVE BELT

Adjusting the Drive Belt

The drive belt idler arm stop is located on the left side of the engine block **[A]**.

Loosen the two bolts (Item 1) **[A]** and slide the stop (Item 2) **[A]** against the idler arm. Tighten the bolts.

There is no adjustment for the spring, just make sure the spring bolt (Item 3) **[A]** is tight.



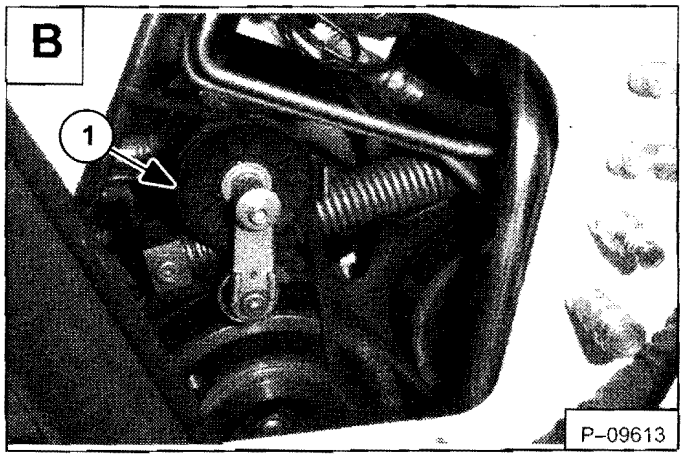
Replacing the Drive Belt

Remove the belt shield. (See Page 3–63.)

Loosen the two stop mounting bolts (Item 1) **[A]**.

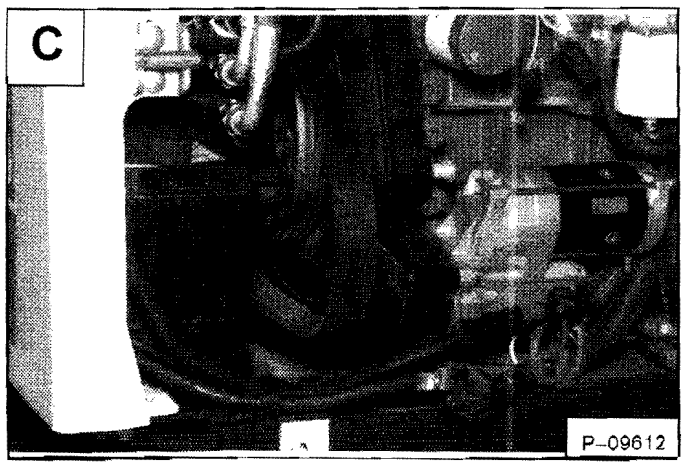
Loosen the spring tension bolt (Item 3) **[A]**.

Remove the fan drive belt from the tension pulley (Item 1) **[B]**.



Remove the drive belt from the hydrostatic pump pulley and flywheel pulley **[C]**.

Remove the drive belt **[C]**.



OIL COOLER (Cont'd)

Removal and Installation (S/N 11515 & Below)

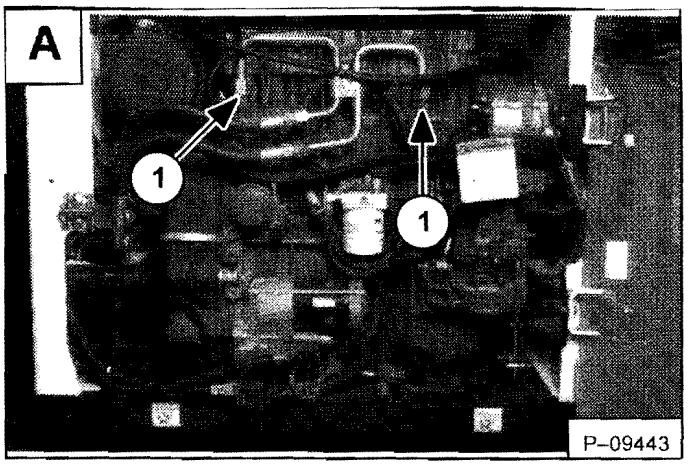
Raise the lift arms and install an approved lift arm support device. (See Page 1–1.)

Raise the operator cab. (See Page 1–1.)

Remove the rear grill. (See Page 5–1.)

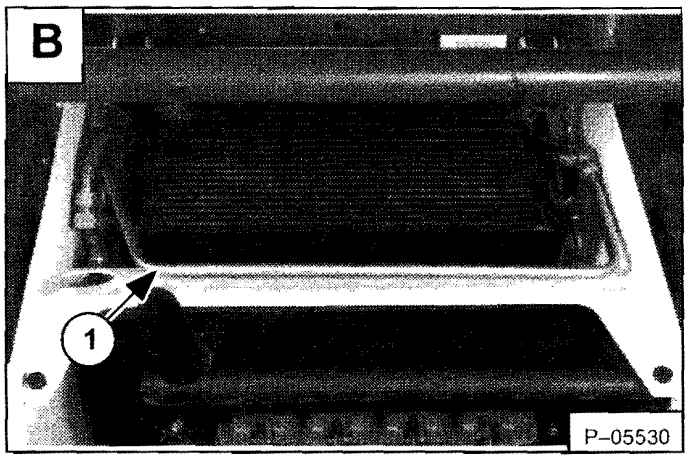
Remove the blower fan and housing. (See Page 7–1.)

Disconnect the hoses (Item 1) **[A]** from the engine and drain the engine oil from the oil cooler into a container.

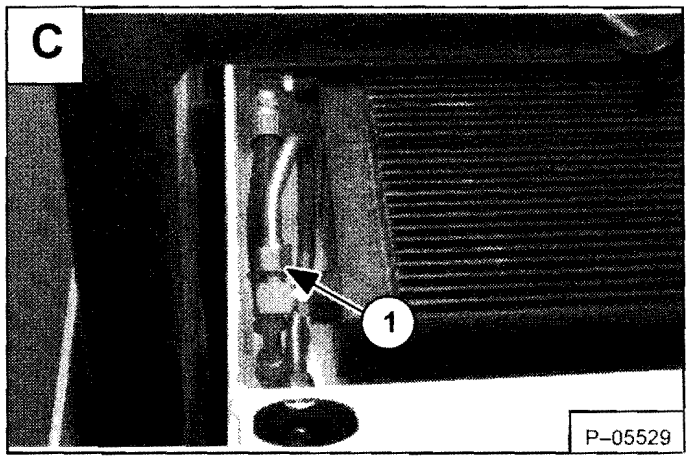


NOTE: Measure the amount of oil removed from the oil cooler and/or engine. Add the same amount of oil to the engine crankcase when adding engine oil.

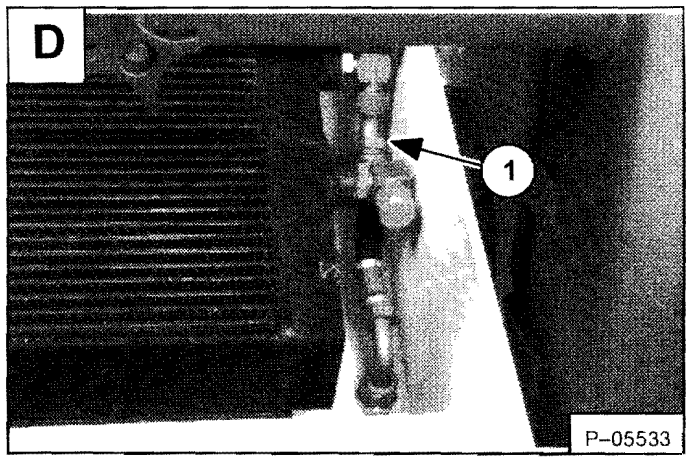
Remove the tubeline (Item 1) **[B]**.



Disconnect and remove the tubeline (Item 1) **[C]**.



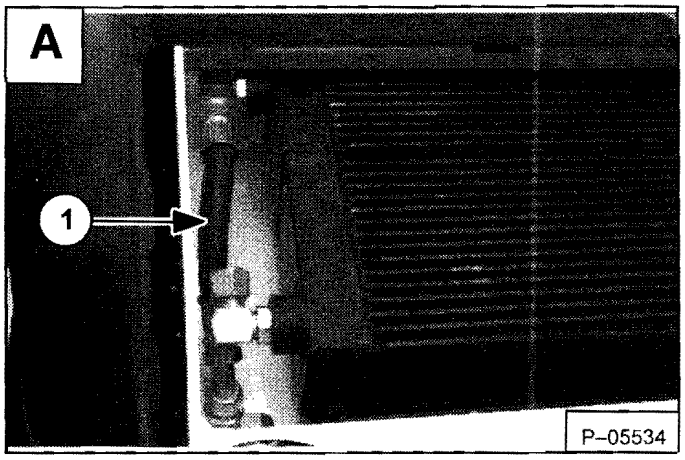
Disconnect the hose (Item 1) **[D]**.



OIL COOLER (Cont'd)

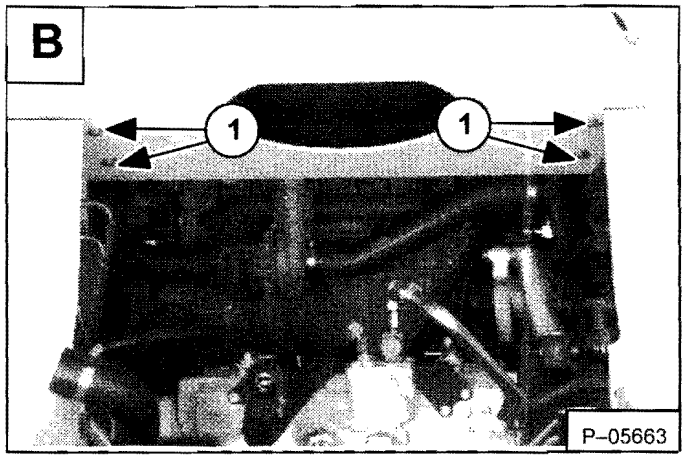
Removal and Installation (S/N 11513 & Below) (Cont'd)

Disconnect the hose (Item 1) **[A]**.



Remove the four mounting bolts (Item 1) **[B]** from the oil cooler.

Remove the oil cooler from the loader.



HYDROSTATIC SYSTEM

TROUBLESHOOTING

Chart

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

⚠ WARNING

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

W–2004–1285

PROBLEM	CAUSE
No drive on one side, in one direction.	1, 2
No drive on one side in both directions.	2, 3, 4, 5
The loader does not move in a straight line.	2, 3, 5, 6, 7
The hydrostatic system is overheating.	8, 9, 10, 11
Service code "HP 2" appears (Warnings, low charge pressure) or the warning light comes "ON" (873 Standard).	8, 11, 12, 13, 14

KEY TO CORRECT THE CAUSE

1. The hydrostatic pump replenishing valves not seating.
2. The steering linkage needs adjustment.
3. The hydrostatic pump has damage.
4. The final drive chains are broken.
5. The hydrostatic motor has damage.
6. The tires do not have the correct tire pressure.
7. The tires are not the same size.
8. The hydrostatic fluid is not at the correct level.
9. The oil cooler has a restriction.
10. The temperature sending switch is not operating correctly.
11. The loader is not being operated at the correct RPM.
12. The sender is defective.
13. Pump is defective or worn hydrostatics.
14. Hydraulic filter is plugged.

IMPORTANT

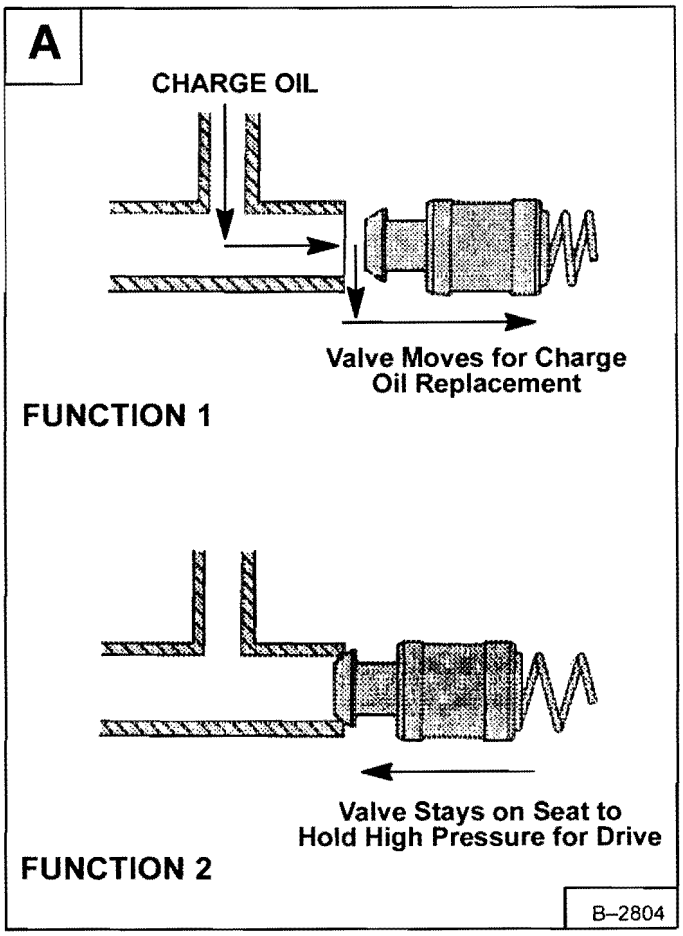
When making repairs on hydrostatic and hydraulic systems, clean the work area before disassembly and keep all parts clean. Always use caps and plugs on hoses, tubelines and ports to keep dirt out. Dirt can quickly damage the system.

I–2003–0284

Replenishing Valve Function

The functions of the replenishing valves are:

1. To give replacement fluid to the low pressure side of the hydrostatic circuit. Replacement fluid is needed because of normal internal leakage and the controlled flow to the oil cooler for cooling; Function 1 **[A]**.
2. To keep high pressure fluid out of the low pressure side of the hydrostatic circuitry; Function 2 **[A]**.



FRONT PANEL

Removal and Installation

⚠ WARNING

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

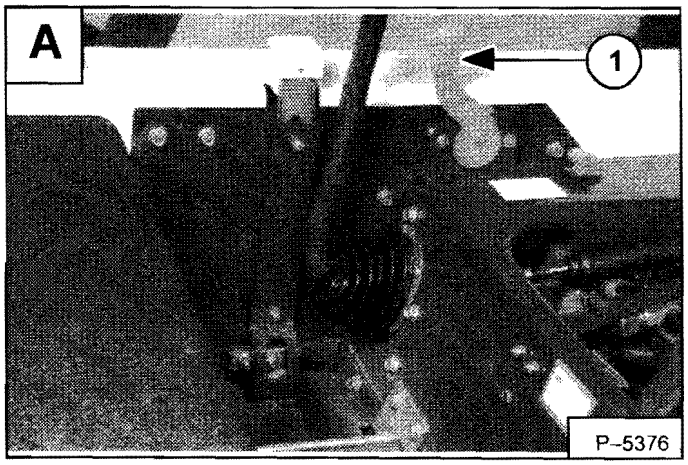
W–2017–0286

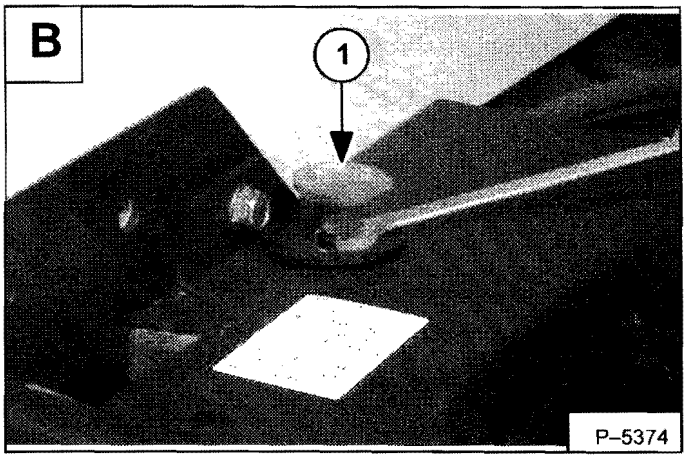
Raise the lift arms and install an approved lift arm support device (Page 1–1).

Raise the operator cab (Page 1–1).

Remove the engine speed control (Item 1) **[A]** (Page 7–1).

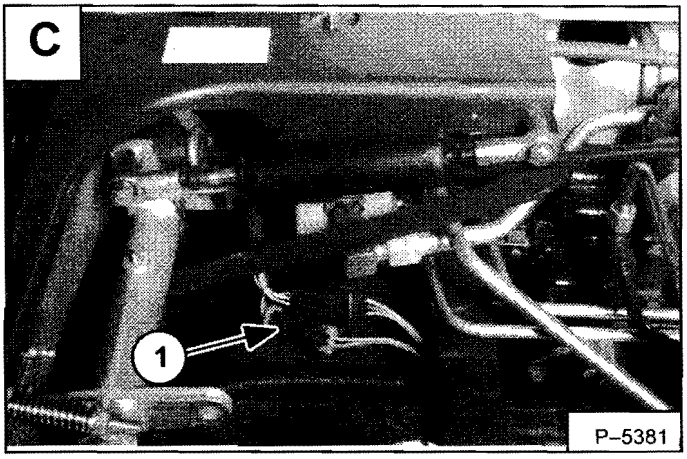
Hold the lock nut and remove the knob (Item 1) **[B]** from the lift lock valve.





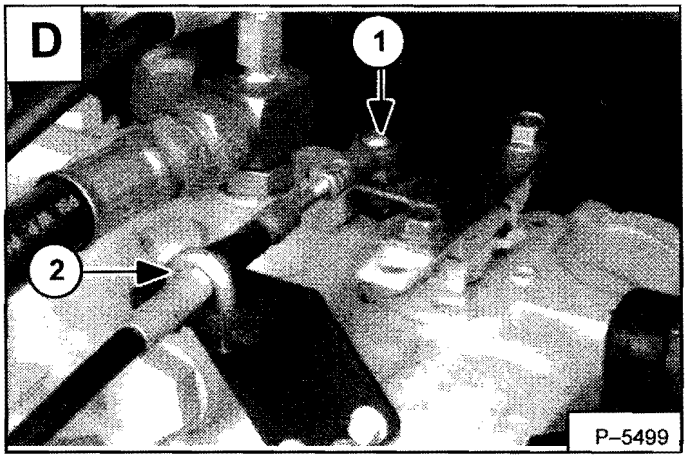
Disconnect the wire harness connectors (Item 1) **[C]** from the steering lever wire harness.

NOTE: The 873 without front auxiliary hydraulics does not have electric control handle.



Disconnect the steering cable (Item 1) **[D]** (both sides) from the hydrostatic pump lever.

Remove the u–bolt (Item 2) **[D]** from the steering cable mounting bracket (both sides).



FRONT PANEL (Cont'd)

Removal and Installation (Cont'd)

Remove the front panel top mounting bolt (Item 1) **[A]** & **[B]**.

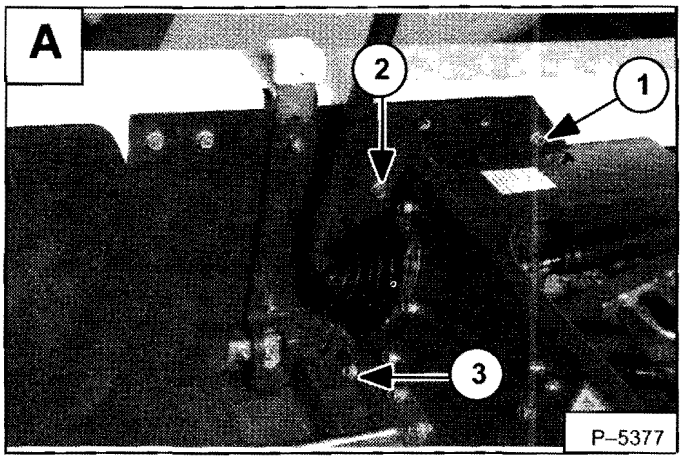
NOTE: Bolts (Item 2) [B] will have to be removed so the front panel will have clearance when being removed.

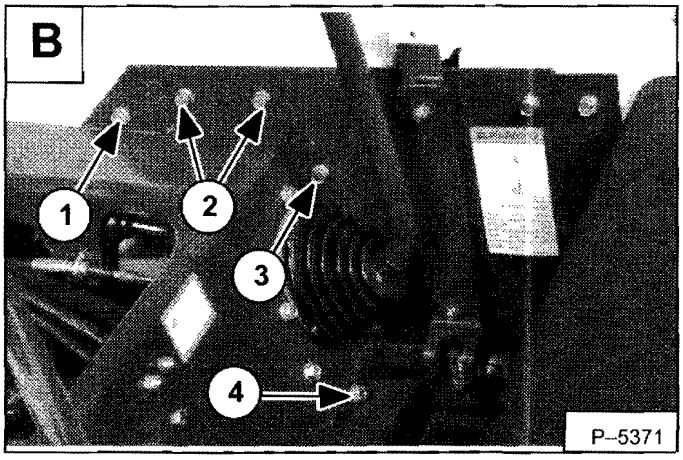
Remove the two mounting bolts (Item 2) **[A]**; (Item 3) **[B]** at the side of the front panel.

Remove the mounting bolts (Item 3) **[A]**; (Item 4) **[B]** from the foot rest.

NOTE: There is a nut on the foot rest mounting bolt.

Remove the front panel with the steering lever assembly.





STEERING LEVERS

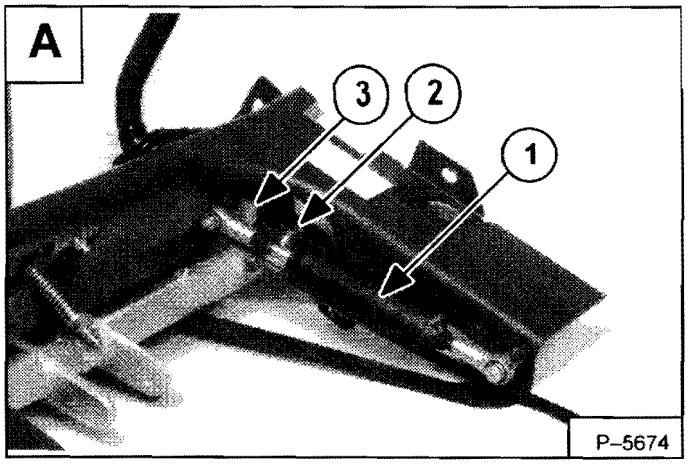
Disassembly and Assembly

Remove the front panel/steering lever assembly (Page 3–5).

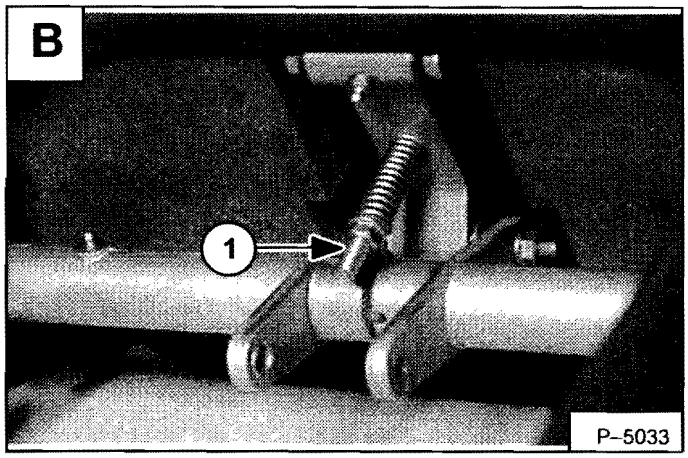
Remove the steering shock (Item 1) **[A]**.

Remove the u–bolt (Item 2) **[A]**.

Disconnect the steering cable (Item 3) **[A]** from the steering shaft (both sides).



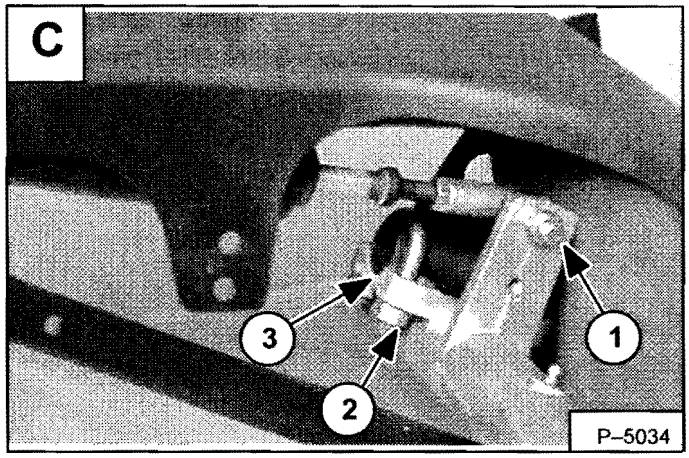
Remove the steering shaft centering mechanism bolt and nut (Item 1) **[B]** and spring.



Disconnect the steering shock (Item 1) **[C]**.

Loosen both U–bolts (Item 2) **[C]** at the steering lever.

Remove the steering lever.



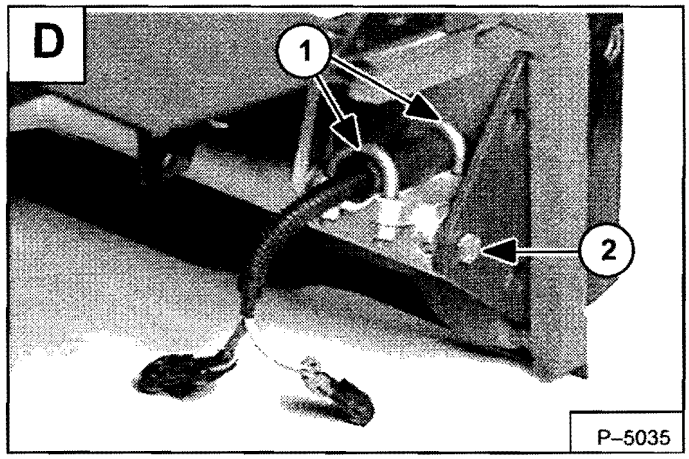
Loosen both U–bolts (Item 1) **[D]** at the steering lever.

Remove the steering lever.

Assembly: The steering levers must be mounted flush with the back of the mounting plate (Item 3) **[C]**.

Remove the steering shaft assembly bolts (Item 2) **[D]** (both sides).

Remove the steering shaft.

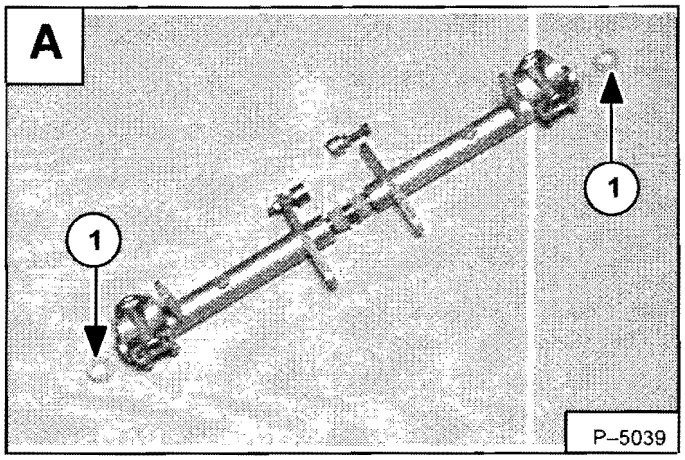


STEERING LEVERS (Cont'd)

Disassembly and Assembly (Cont'd)

Disassemble the right and left steering shaft from the cross shaft **[A]**.

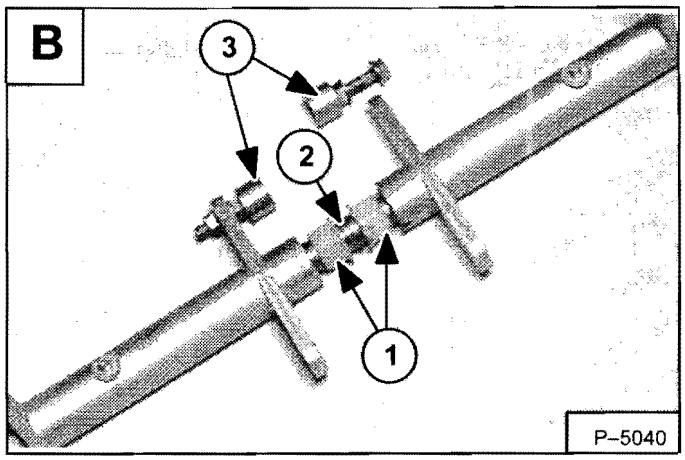
Install new nylon bushings (Item 1) **[A]** as needed at the ends of the steering shaft.



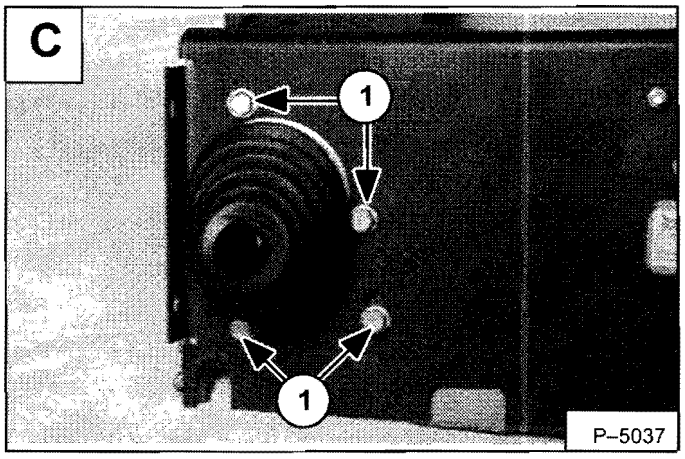
Check the nylon bushing (Item 1) **[B]** and replace as needed.

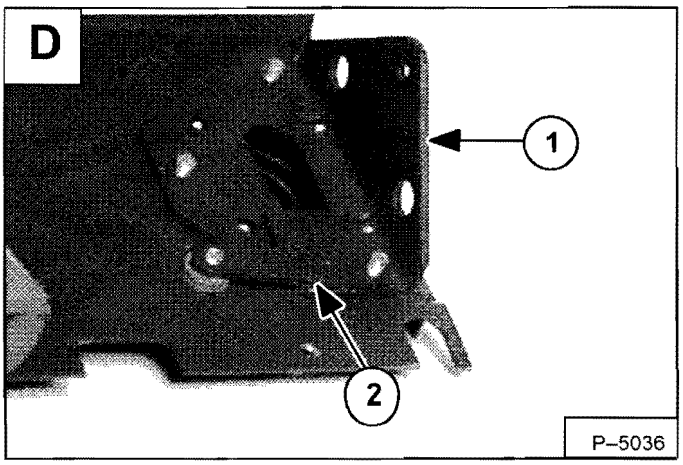
Assembly: Make sure the wave washer (Item 2) **[B]** is between the nylon bushings.

Check and replace the rollers (Item 3) **[B]** if worn or damaged.



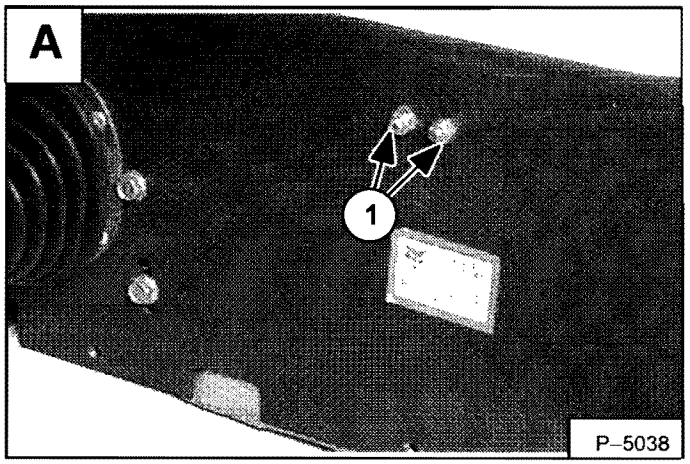
Remove the bolts (Item 1) **[C]** to remove the steering shaft mounting bracket (Item 1) **[D]** and the steering lever stop plate (Item 2) **[D]**.





Disassembly and Assembly (Cont'd)

To remove the centering mechanism bracket from the front panel, remove the two nuts and bolts (Item 1) **[A]**.



Adjustment

The loader should not creep when the steering levers are at rest in the neutral position.

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

MEL1429 – Remote Start Switch

Lift and block the loader (Page 1–1).

Raise the operator cab (Page 1–1).

Connect the remote start switch (Page 1–1).

⚠ WARNING

When working on the left side of the hydrostatic pump, BE CAREFUL to keep your fingers and tools clear of the cooling fan belt.

W–2184–0395

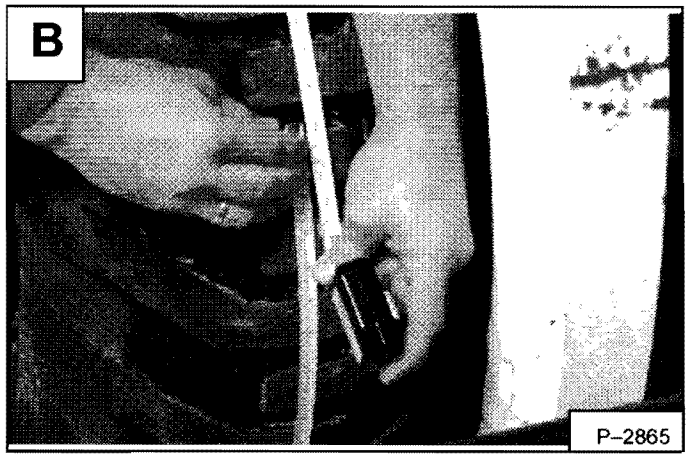
Check the following items (Steps a, b & c) before making any adjustments on the steering linkage:

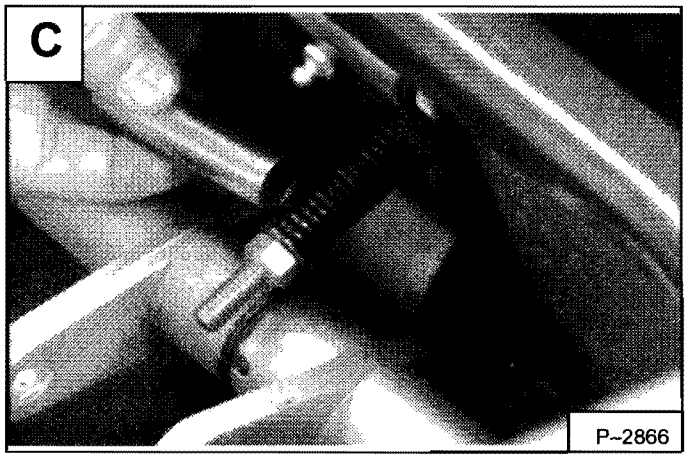
a. Always check tire pressure and tire size before making any adjustments to be sure the tires do not vary more than 1/4 inch (6,3 mm) in circumference which could cause different travel distance and the loader drifting to one side when driving straight forward **[B]**.

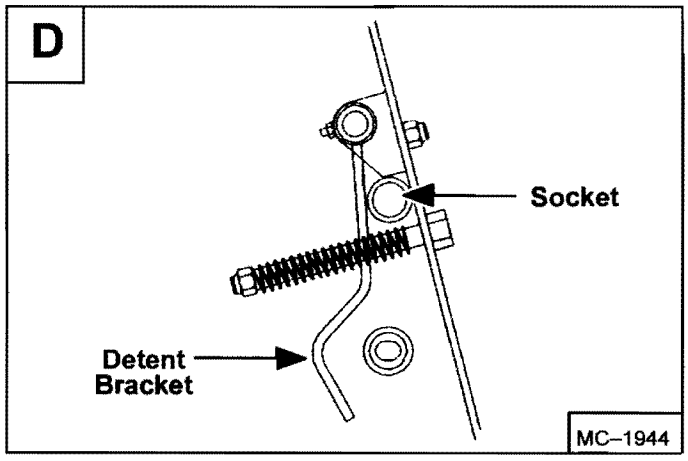
b. To be sure the hydrostatic pump is in neutral, block the neutral spring bracket out with a large socket (approximately 1–1/8 inch) so you can no longer feel the linkage neutral setting **[C]** & **[D]**.

c. Start the engine. Move the levers while observing the neutral position on the pump servo spool valve. You can feel and see the spring of the pump neutral adjustment. If the wheels do not move when the pump is in the neutral position then the pump is properly adjusted. Only linkage adjustment will be necessary for neutral position. See Page 3–59 for the pump neutral spring adjustment.

d. Stop the engine. Remove the socket.





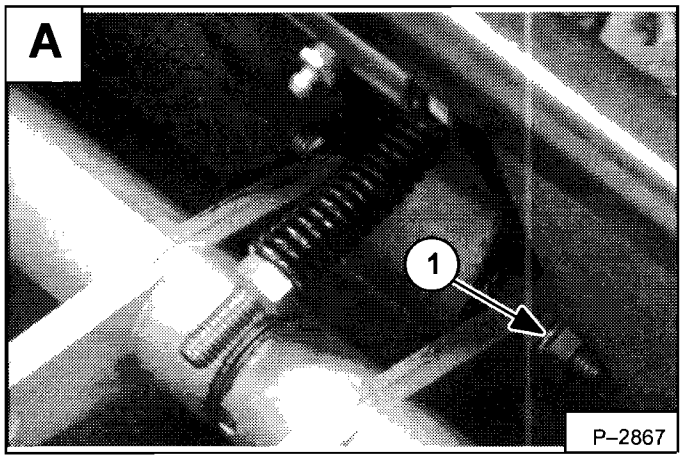


STEERING LEVERS (Cont'd)

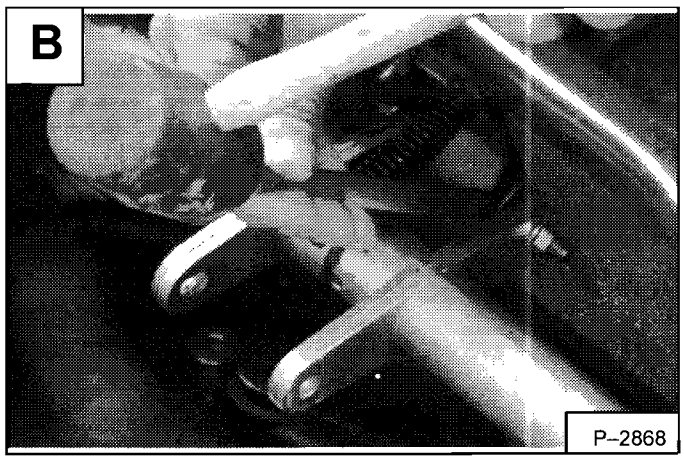
Adjustment (Cont'd)

Use the following procedure to adjust the steering linkage so both steering levers have no **free play** against the cam:

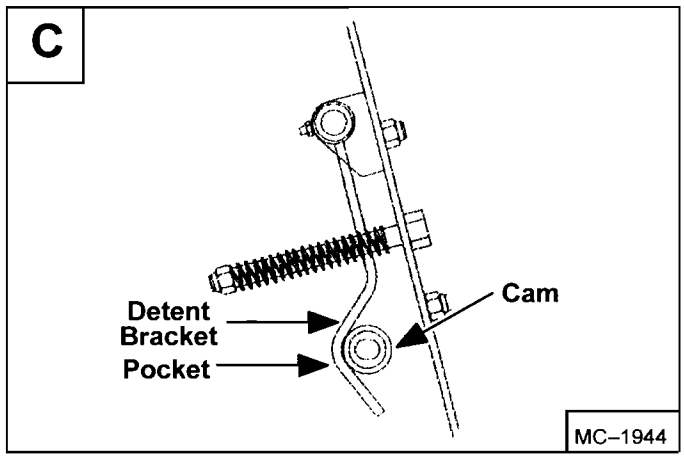
1. Only the right side cam is adjustable, the left side cam is fixed and will not require adjustment. The cam should not rotate on the mounting bolt. Tighten the cam jam nut (Item 1) **[A]** to be sure the cam does not rotate on the cam mounting bolt.
2. Loose the cam bolt and move the cam to the rear to get free play in the left hand lever.



3. Tighten the cam bolt. Use a punch and hammer, hit the cam nut (cam mounting bolt is still tight) until the **free play** is removed from the left hand lever **[B]**. The cam must be centered in the "detent" bracket pocket **[C]**.

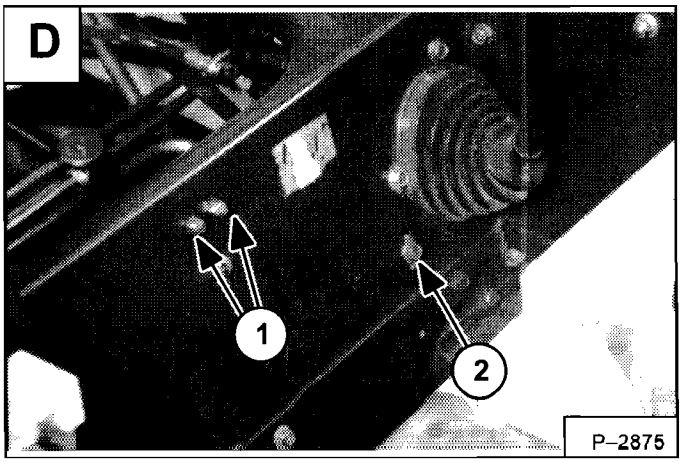


4. Recheck the torque at the cam bolt to be sure it is still tight. Check again to be sure there is no free play in the cams. **If there is any free play the neutral setting can not be obtained**.



Two mounting bolts (Item 1) **[D]** in the front of the steering lever panel allow the neutral spring bracket to be adjusted. To provide equal travel forward and reverse, use the following procedure:

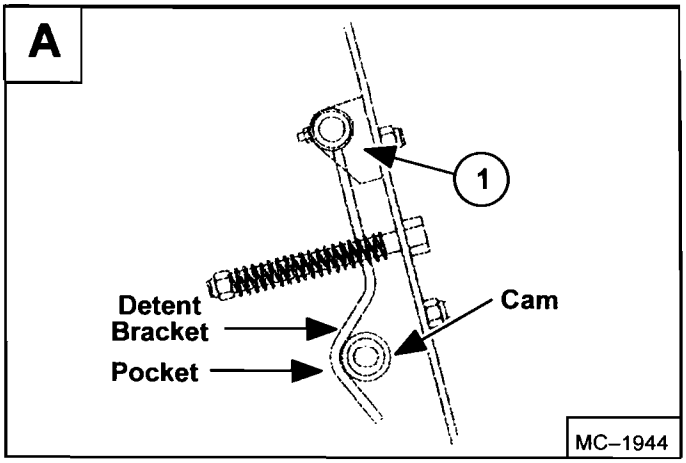
1. Loosen the bolts at the stop (Item 2) **[D]** and lower the stops (both sides).



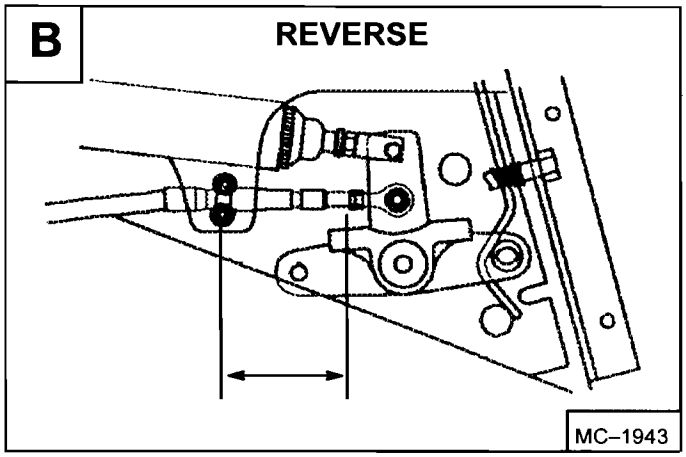
STEERING LEVERS (Cont'd)

Adjustment (Cont'd)

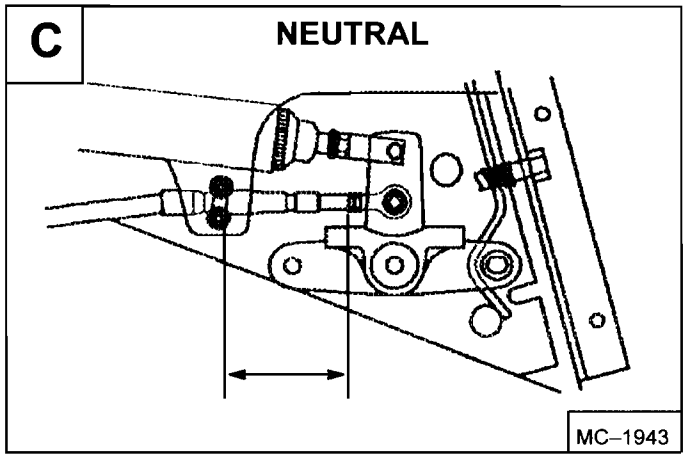
NOTE: Before taking the neutral measurement, move the steering lever a small amount to be sure the cam is in the detent pocket with no free play [A].



2. Move the lever to full reverse, use calipers to measure the distance from the U–bolt to the lock nut. Record this measurement **[B]**.



3. Move the lever to the neutral position, measure the distance from the U–bolt to the lock nut. Make a record of this measurement **[C]**.



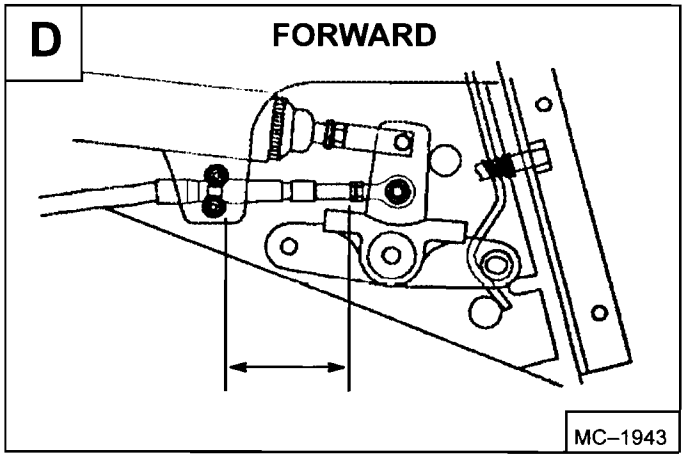
4. Move the lever to full forward, measure the distance from the U–bolt to the lock nut **[D]**.

5. Subtract the two numbers (forward/neutral & neutral/reverse) and it should equal the neutral distance (Step 2), if not, adjust the bracket (Item 1) **[A]** for equal travel in both directions. The difference between reverse and forward must be within 0.005–0.010 inch (0,13–0,25 mm).

   EXAMPLE:

   Neutral – 3.316 inch (84,2 mm)
   Reverse – 2.960 inch (75,2 mm)
   0.356 inch (9,0 mm)

   Forward – 3.662 inch (93,0 mm)
   Neutral – 3.316 inch (84,2 mm)
   0.346 inch (8,8 mm)



STEERING LEVERS (Cont'd)

Adjustment (Cont'd)

Use the following procedure to adjust neutral for the hydrostatic pumps:

NOTE: The following adjustments (Steps a, b, c & d) are not necessary if the thread engagement in the ball joint is equal on both ends of the cable.

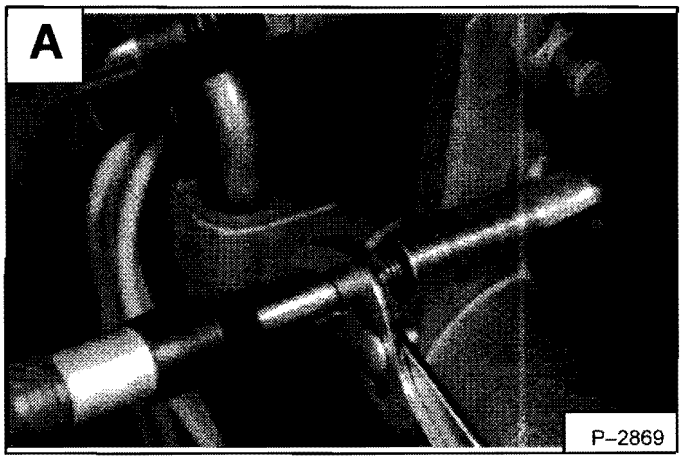
a. Disconnect the cable ball joint from the steering lever shaft.

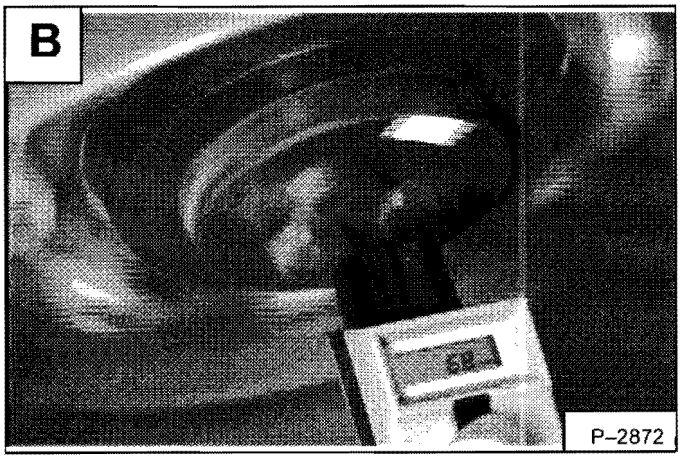
b. Loosen the jam nut and turn the ball joint all the way to the end of the threads (toward cable housing).

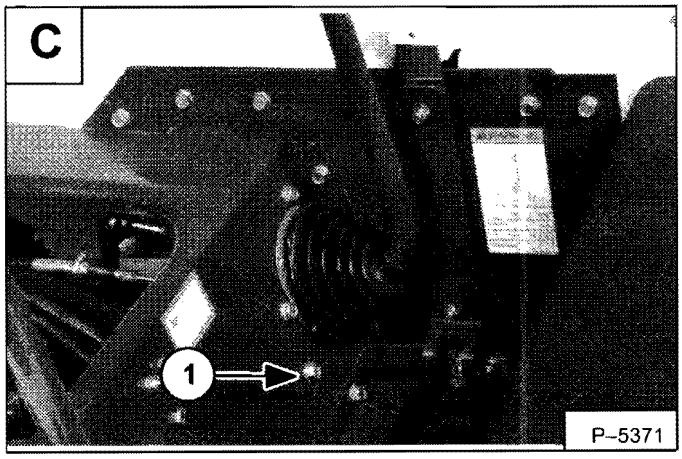
c. At the pumps, loosen the jam nut and turn the inner cable until the ball joint is all the way to the end of the threads (toward the cable housing).

d. Connect the steering cable ball joint.

1. Start the engine. WHEN THE ENGINE IS RUNNING, THE WHEELS WILL BE TURNING.
2. The steering cable ends have right and left hand threads. By turning the inner cable, it will shorten or lengthen the cable. Turn the inner cable until the wheels stop turning **[A]**.
3. Check the wheel RPM for forward and reverse travel; they should be the same **[B]**. If not, repeat the above steps again.
4. The stop (Item 1) **[C]** can be used for MINOR adjustment in the loader straight forward travel (right to left/left to right) when the steering levers are fully engaged.
5. Repeat the procedure for the other side of the loader.







HYDROSTATIC MOTOR

Removal and Installation

IMPORTANT

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

I–2003–0284

Lift and block the loader (See Page 1–1).

Raise the lift arms and install an approved lift arm support device (See Page 1–1).

Raise the operator cab (See Page 1–1).

Remove the tire/wheel assembly.

Remove the motor cover.

Mark the hoses for correct installation.

Disconnect the case drain hose (Item 1) **[A]**.

Disconnect the high pressure hoses (Item 2) **[A]**.

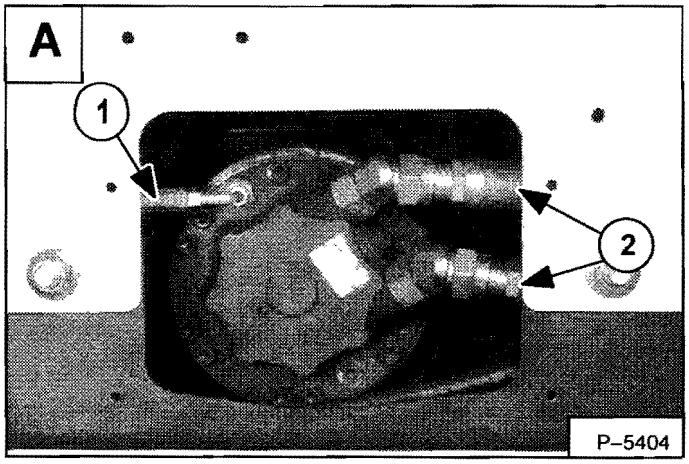
Remove the mounting bolts (Item 1) **[B]**.

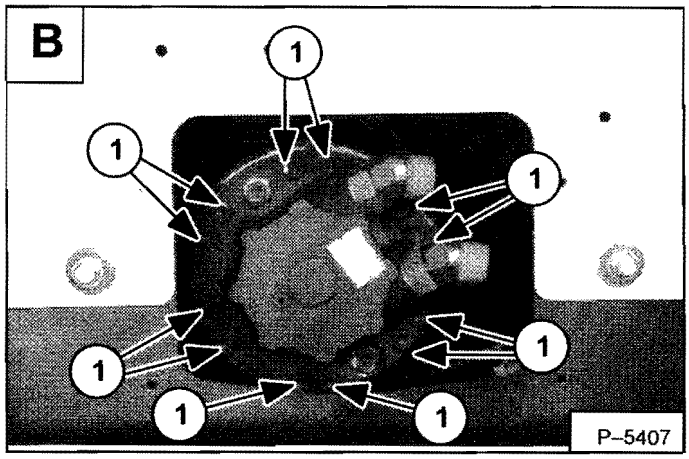
Installation: Tighten the bolts to 85–96 ft.–lbs. (115–130 Nm) torque.

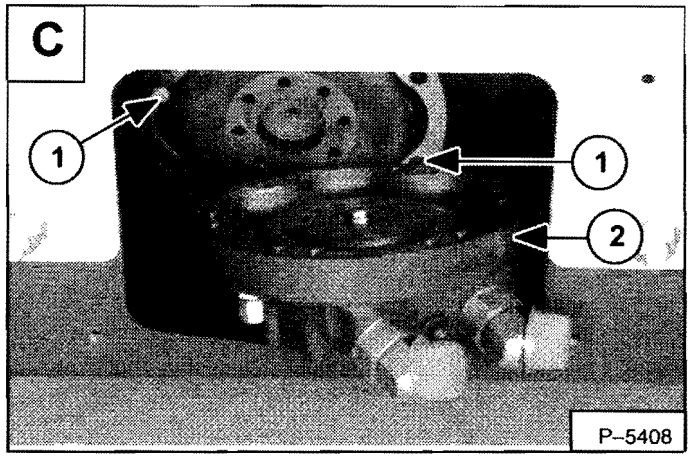
NOTE: Install two slotted studs (Item 1) [C] for easier remove and installation of the moter sections.

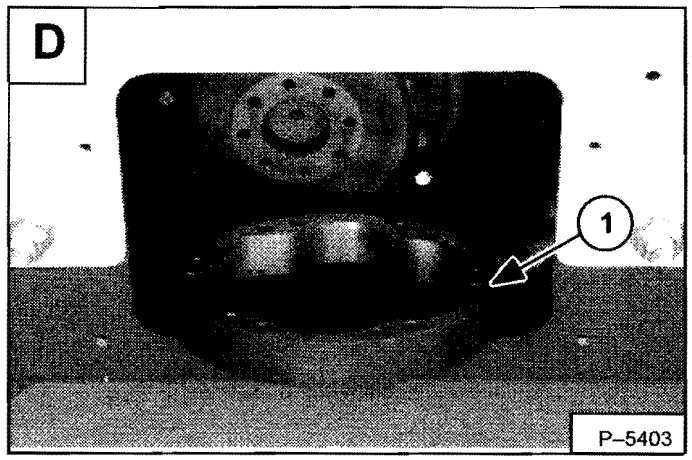
Remove the first motor section (Item 2) **[C]**.

Remove the outer ring section (Item 1) **[D]**.









Removal and Installation (Cont'd)

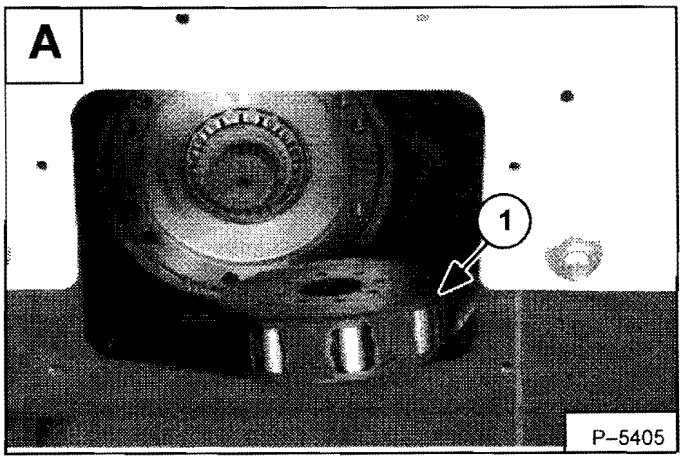
Remove the piston/roller section (Item 1) **[A]**.

To remove the motor carrier (see Page 3–20).

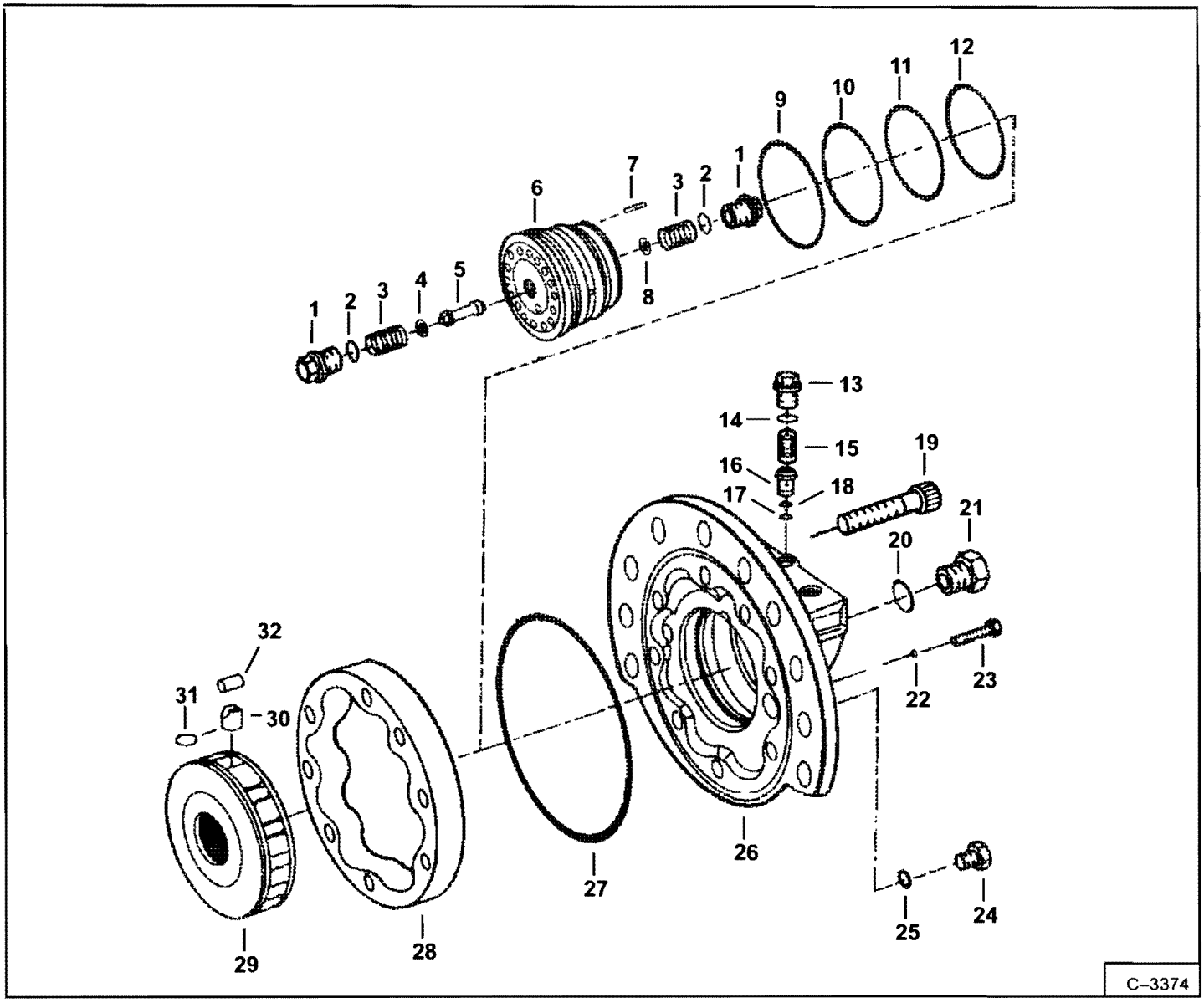
⚠ WARNING

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

W–2103–1285



Parts Identification



Ref.	Description	Ref.	Description
1.	PLUG	17.	SNAP RING
2.	O–RING	18.	ORIFICE
3.	SPRING	19.	BOLT
4.	WASHER	20.	O–RING
5.	PISTON	21.	PLUG
6.	DISTRIBUTOR	22.	O–RING
7.	SPRING	23.	PLUG
8.	WASHER	24.	PLUG
9.	O–RING	25.	O–RING
10.	O–RING	26.	REAR HOUSING
11.	O–RING	27.	O–RING
12.	O–RING	28.	CAM
13.	PLUG	29.	BLOCK
14.	O–RING	30.	PISTON
15.	SPRING	31.	RING
16.	POPPET	32.	ROLLER

Disassembly

IMPORTANT

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

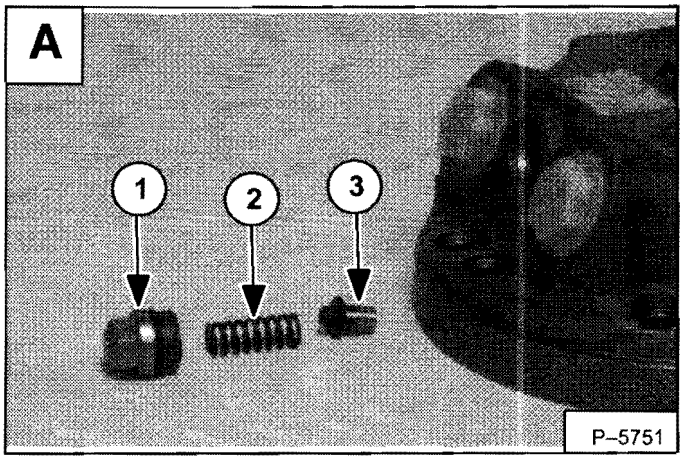
I–2003–0284

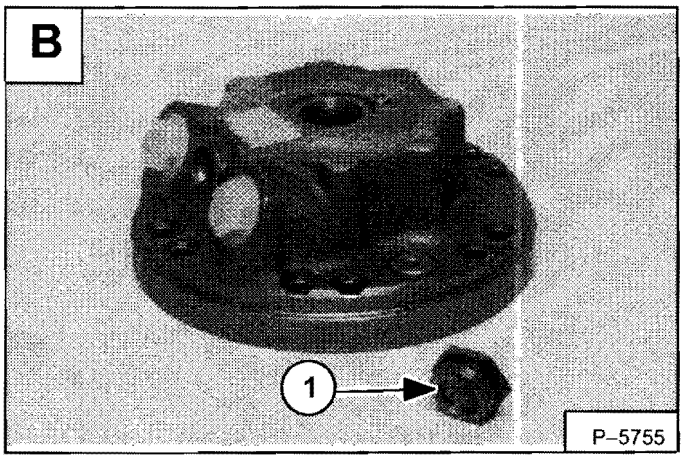
Remove the plug (Item 1) **[A]**, spring (Item 2) **[A]** and poppet (Item 3) **[A]**.

Remove the O–ring from the plug.

Remove the end plug (Item 1) **[B]** from the housing.

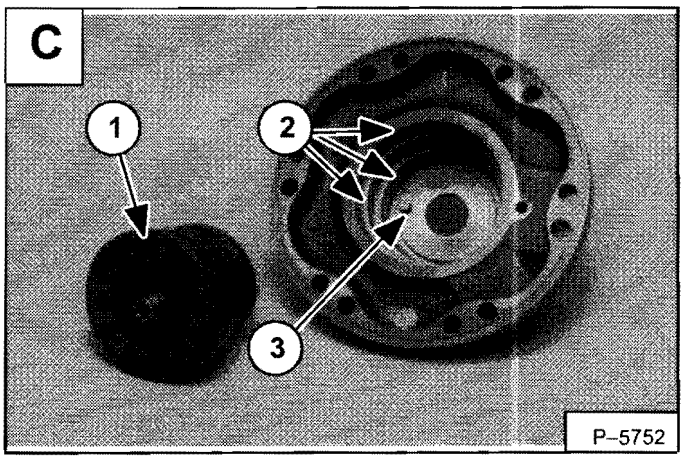
Remove the O–ring from the plug.





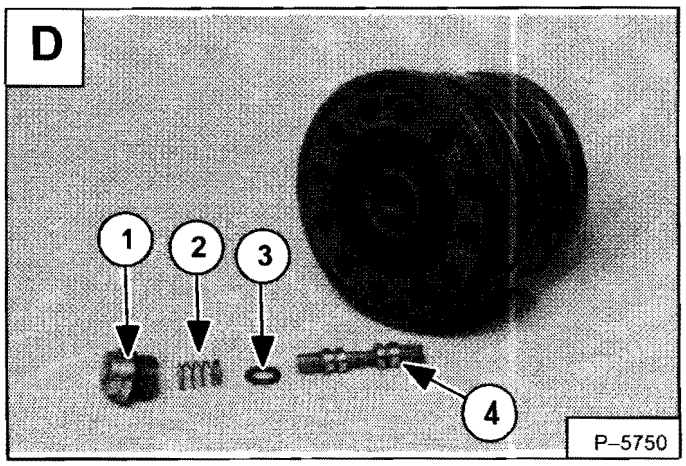
Use a brass drift and remove the distributor (Item 1) **[C]** from the housing.

Remove the three seals (Item 2) **[C]** and O–ring (Item 3) **[C]** from the housing.



Remove the plug (Item 1) **[D]**, spring (Item 2) **[D]**, washer (Item 3) **[D]** and piston (Item 4) **[D]** from the distributor.

Remove the O–ring from the plug.

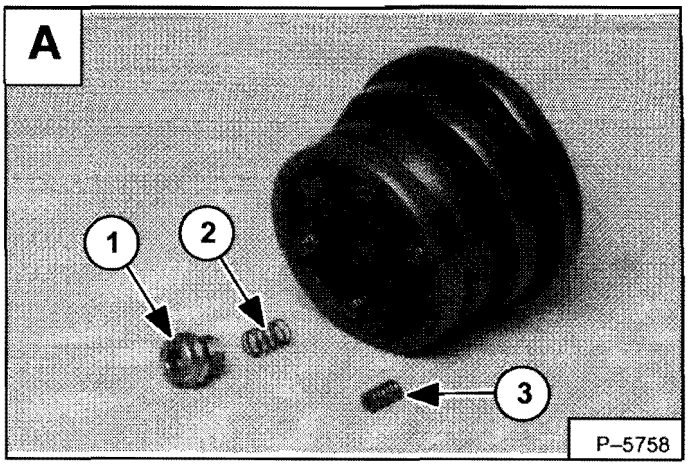


Disassembly (Cont'd)

Remove the plug (Item 1) **[A]** and spring (Item 2) **[A]** from the other end of the distributor.

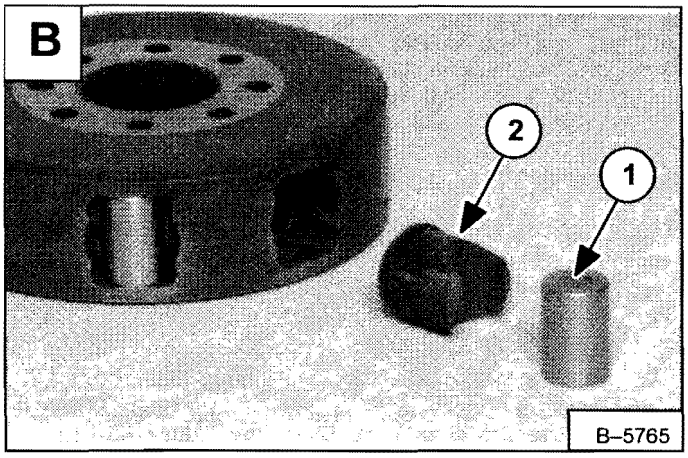
Remove the seven springs (Item 3) **[A]**

Remove the O–ring from the plug.



Apply low air pressure to each port in the cylinder block to remove the roller (Item 1) **[B]** and piston/ring assembly (Item 2) **[B]**.

NOTE: Put all the roller/piston assembly back in their original position.

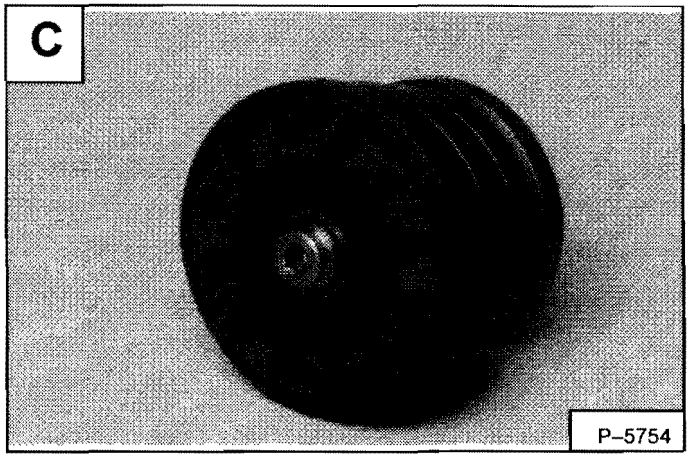


Inspection

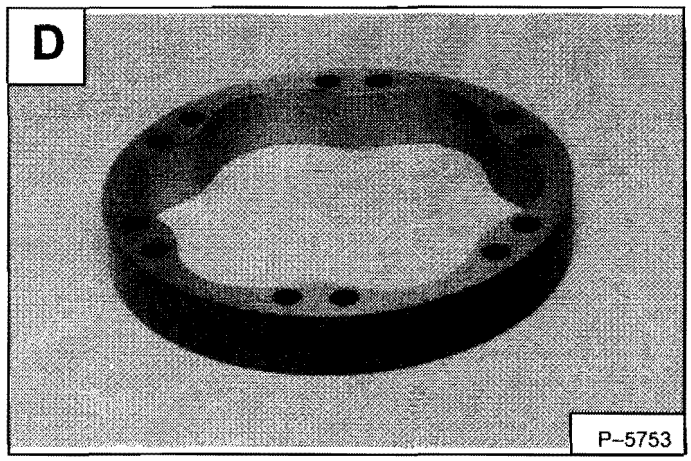
Clean all parts in clean solvent and use air pressure to dry them. DO NOT use cloth or paper because small pieces of material can get into the system and cause damage.

Before the motor is assembled, check the following items:

Check the distributor surface for scratches **[C]**.



Check the cam ring inside surface for wear and scratches **[D]**.



HYDROSTATIC MOTOR (Cont'd)

Inspection (Cont'd)

Check the cylinder block surface for scratches **[A]**.

Check all the roller/piston assembly for scratches and wear **[A]**.

Replace the parts as needed.

Assembly

IMPORTANT

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

I–2003–0284

NOTE: Always use new O–rings and seals when assembling the hydrostatic motor.

Install the roller (Item 1) **[B]** in the piston (Item 2) **[B]**.

Dip the roller/piston assembly into oil and install into the bore in the cylinder.

Repeat for each roller/piston assembly.

Put grease on the springs (Item 1) **[C]** to hold them in place.

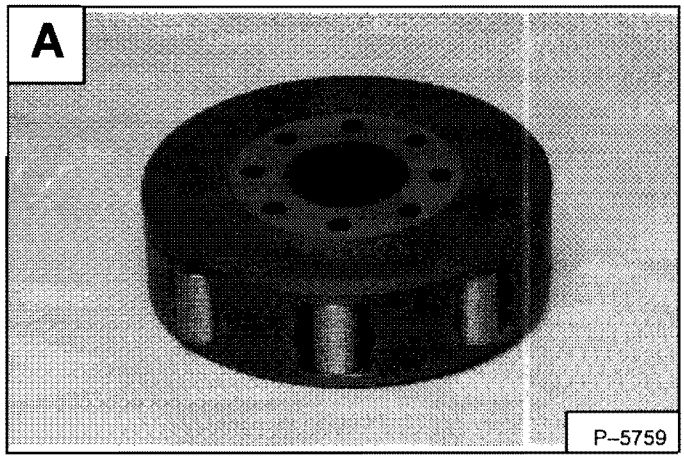
Install the springs (Item 1) **[C]** into the distributor (Item 2) **[C]**.

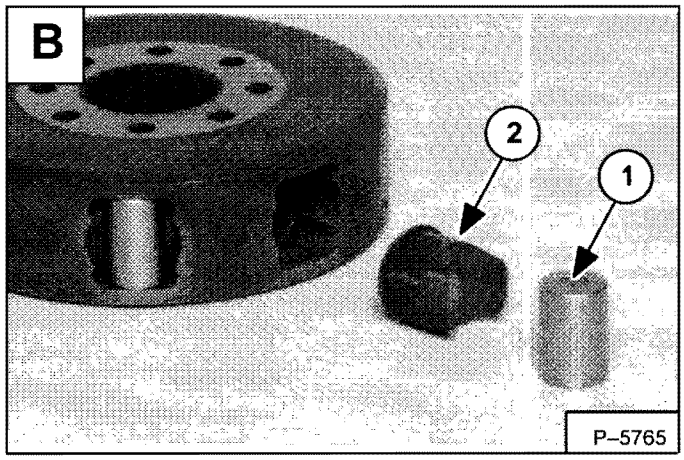
Install the spring (Item 3) **[C]** and plug (Item 4) **[C]**.

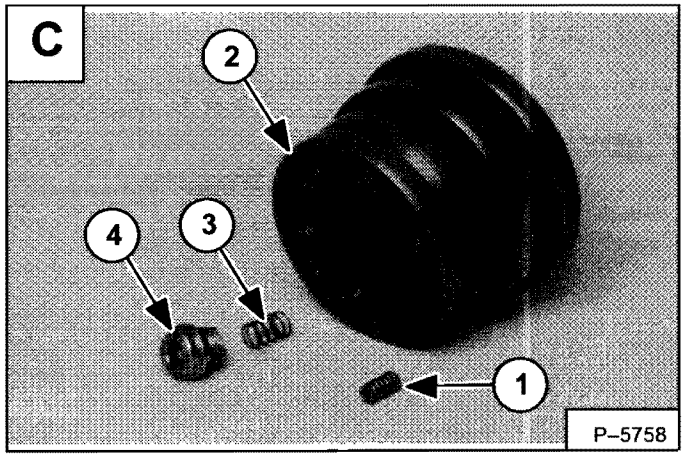
Tighten the plug to 60–65 ft.–lbs. (80–90 Nm) torque.

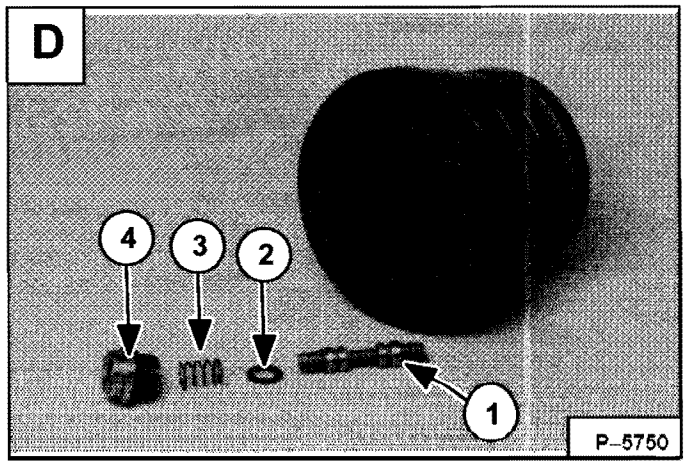
Install the piston (Item 1) **[D]**, washer (Item 2) **[D]**, spring (Item 3) **[D]** and plug (Item 4) **[D]**.

Tighten the plug to 60–65 ft.–lbs. (80–90 Nm) torque.









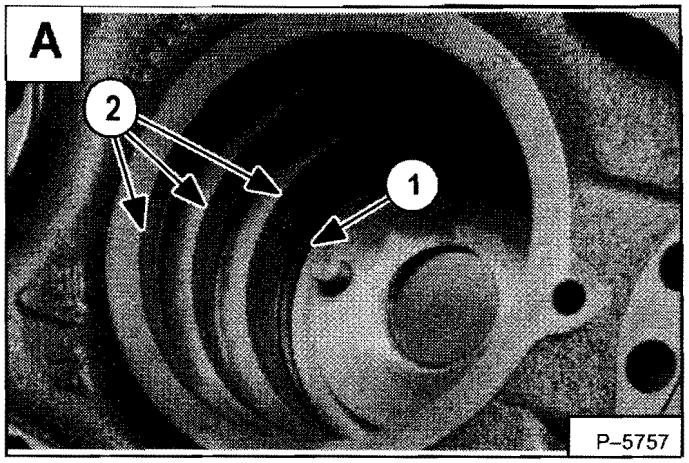
HYDROSTATIC MOTOR (Cont'd)

Assembly (Cont'd)

Install the O–ring (Item 1) **[A]** into the housing.

Install the three seals (Item 2) **[A]** into the housing with minimum distortion.

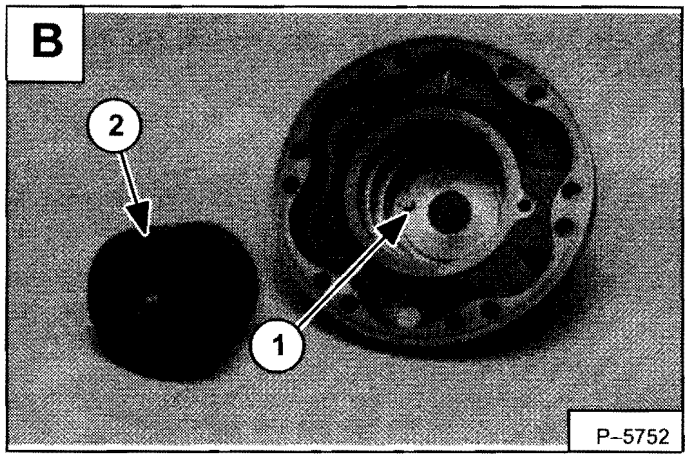
Lightly smear grease over the seals and O–ring.



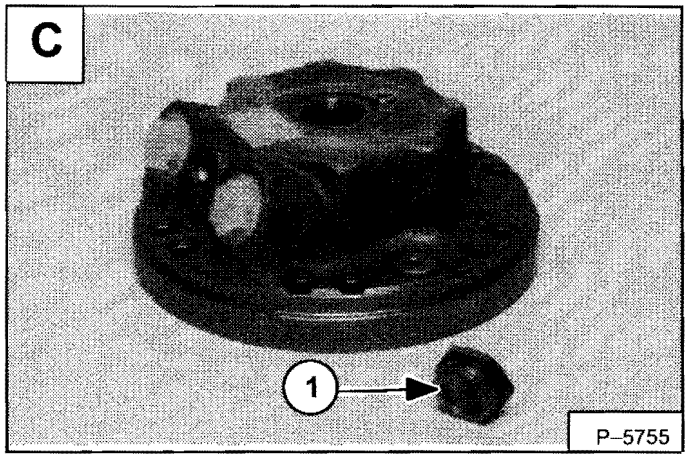
Install the stop pin (Item 1) **[B]** (if it was removed) and tighten to 7–9 ft.–lbs. (10–12 Nm) torque.

Install the distributor (Item 2) **[B]** into the housing.

Align the distributor hole with the stop pin. When aligned correctly, the distributor can be depressed slightly.



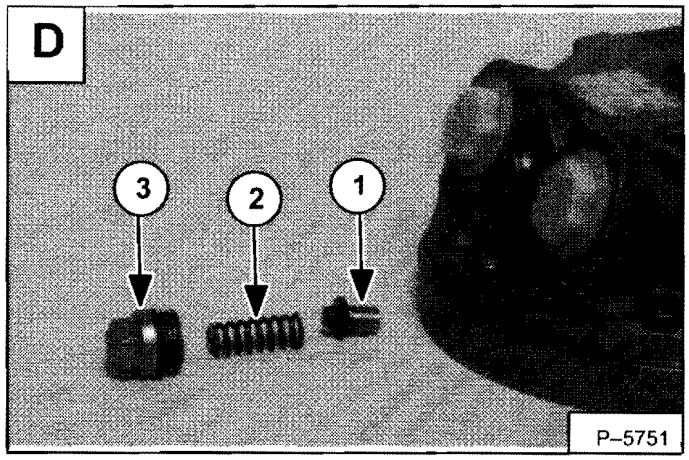
Install the plug (Item 1) **[C]** and tighten to 60–65 ft.–lbs. (80–90 Nm) torque.



Install the poppet (Item 1) **[D]** and spring (Item 2) **[D]**.

Install the plug (Item 3) **[D]** and tighten to 37–44 ft.–lbs. (50–60 Nm) torque.

See Page 3–13 to install the hydrostatic motor into the motor carrier.



MOTOR CARRIER

Removal and Installation

Lift and block the loader (Page 1–1).

Raise the lift arm and install an approved lift arm support device (Page 1–1).

Raise the operator cab (Page 1–1).

Remove the fluid from the chaincase (Page 4–1).

Remove the front axle (Page 4–1).

If the motor carrier is removed from the right side, remove the lift lock valve (Page 8–1) and the hydraulic control valve (Page 2–1).

Remove the six mounting bolts (Item 1) **[A]** from the carrier.

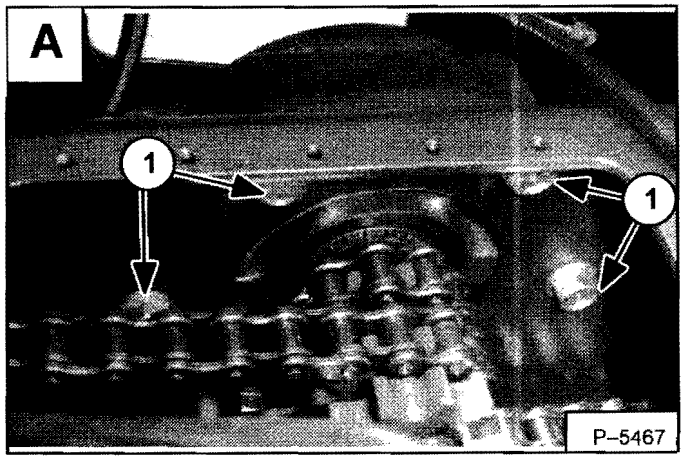
Installation: Tighten the mounting bolts to 213–240 ft.–lbs. (288–325 Nm) torque.

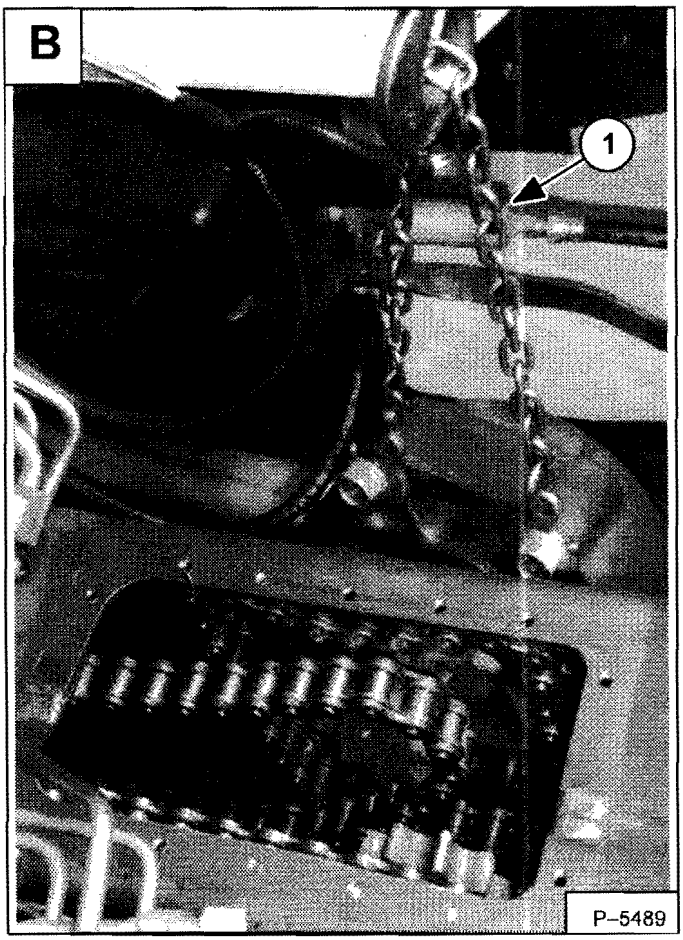
Slide the motor carrier toward the rear and remove the rear drive chain.

NOTE: For easier access for the motor carrier coming out and going into the chaincase, tie the front drive chain to the chaincase with a wire [B].

Slide the motor carrier out of the chaincase far enough to install a chain and chain hoist to the carrier **[B]**.

Remove the case drain filter (Item 1) **[B]** from the hydraulic reservoir.



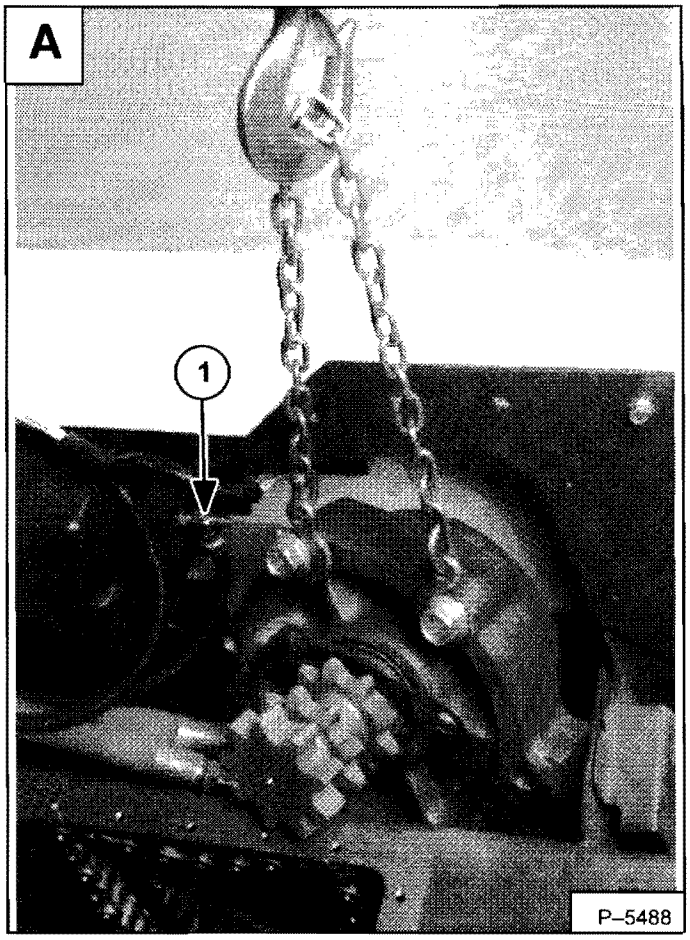


Removal and Installation (Cont'd)

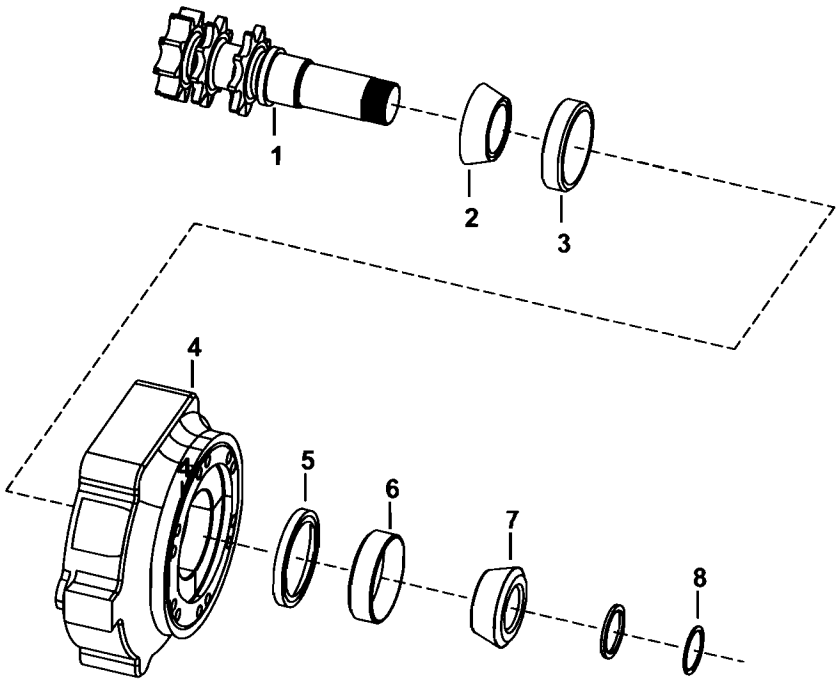
NOTE: Be careful not to damage the tee fitting (Item 1) [A] at the hydraulic reservoir. If may be necessary to remove the tee fitting for easier removal and installation of the motor carrier from the loader.

Pull the motor carrier out of the chaincase **[A]**.

Lift the motor carrier out of the loader **[A]**.



Parts Identification

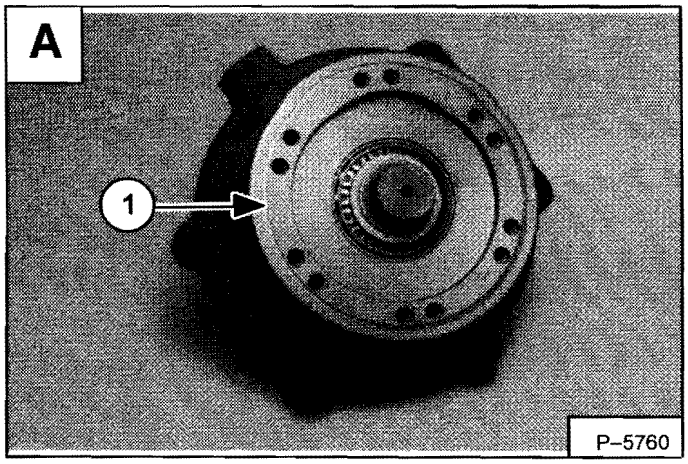


TS–1227

Ref.	Description
1.	SHAFT
2.	BEARING
3.	RACE
4.	HOUSING
5.	SEAL (2)
6.	RACE
7.	BEARING
8.	SNAP RING

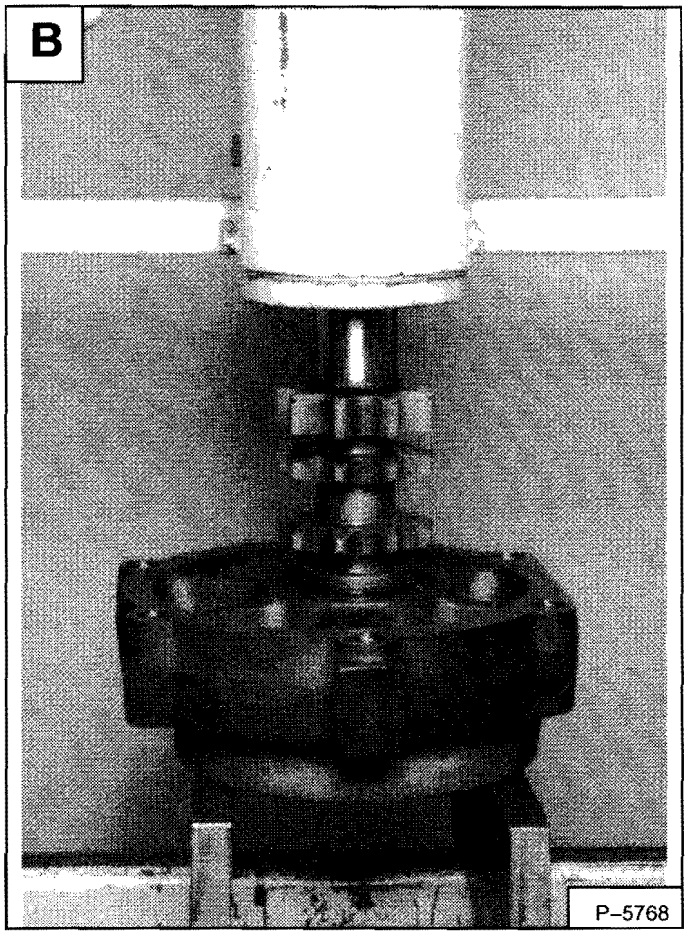
Disassembly

Remove the large O–ring from the groove (Item 1) **[A]** in the housing.

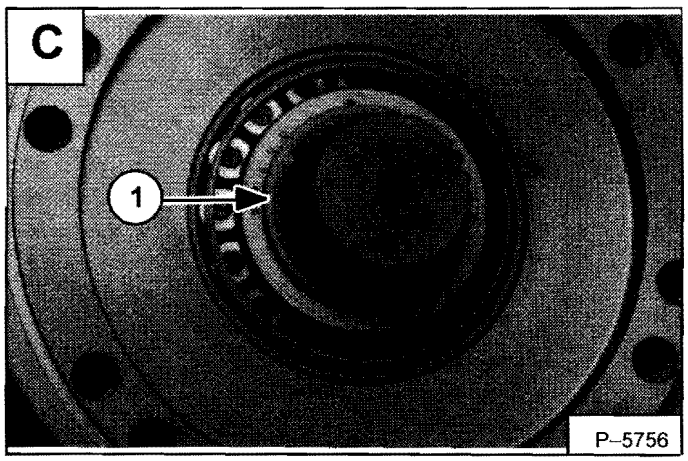


Put the motor carrier in a hydraulic press **[B]**.

Put a small amount of pressure on the shaft to release the pre–load on the snap ring.



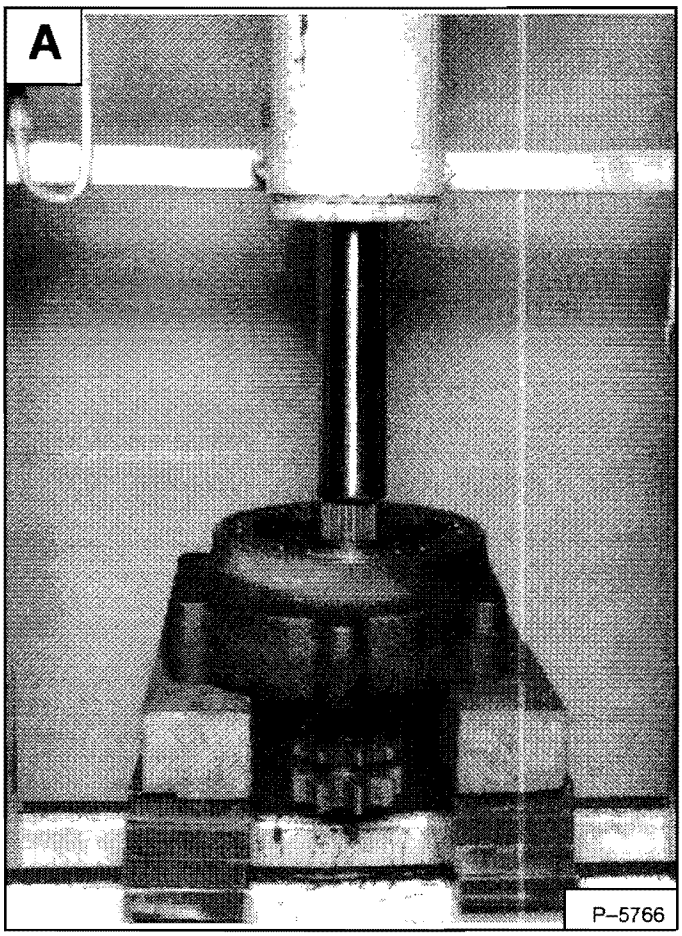
Remove the snap ring (Item 1) **[C]** and washer from the shaft.



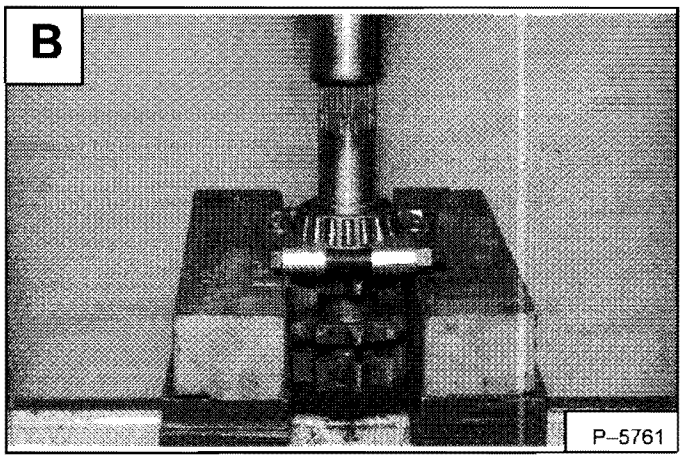
MOTOR CARRIER (Cont'd)

Disassembly (Cont'd)

Use a hydraulic press, remove the shaft from the housing **[A]**.

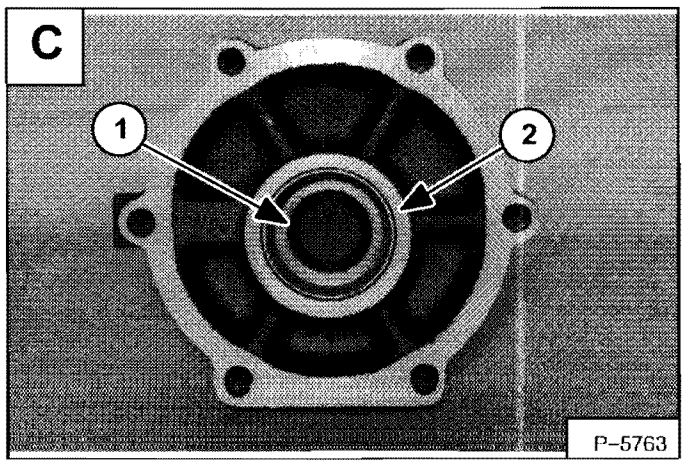


Install the bearing puller tool under the bearing flange, use the hydraulic press to remove the bearing from the shaft **[B]**.



Remove the two seals (Item 1) **[C]** from the housing.

Check the bearing cup (Item 2) **[C]** (both sides) and replace as needed.



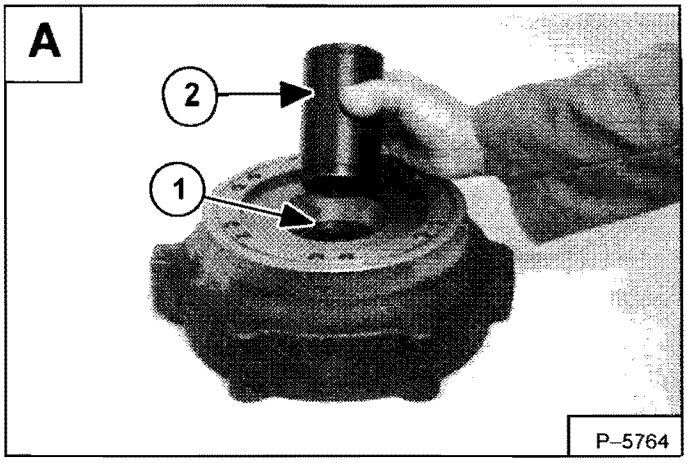
Assembly

The tool listed will be needed to the following procedure:

MEL1431 – Seal Driver Tool

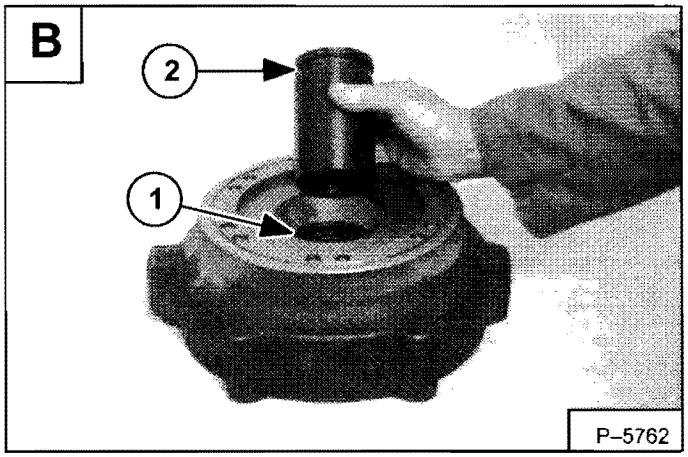
Install the first seal (Item 1) **[A]** into the housing with the seal lip facing away from you.

Use the tool (Item 2) **[A]** as shown in the figure.



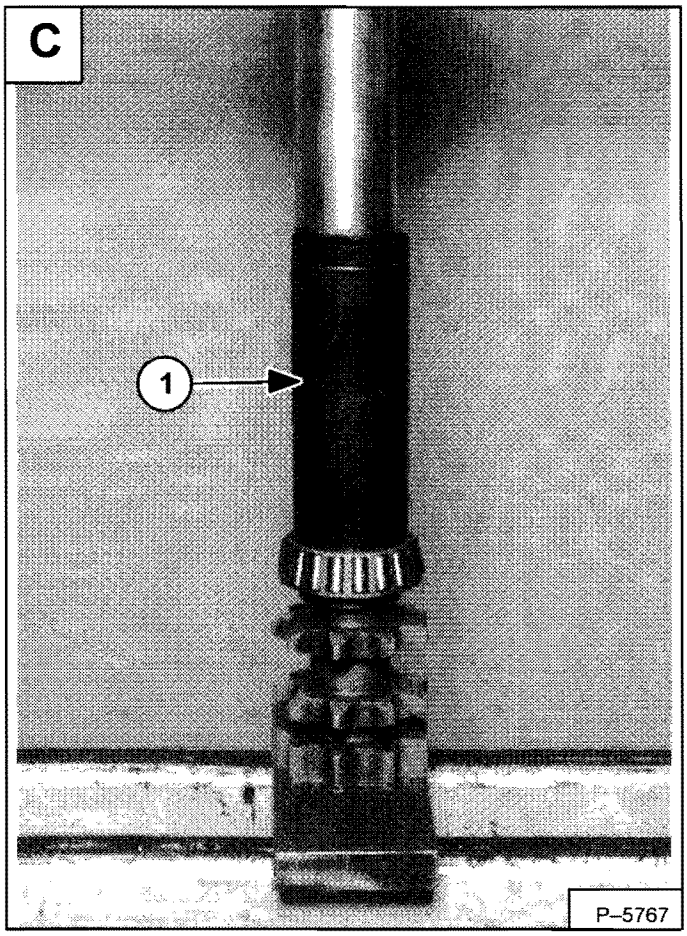
Install the second seal (Item 1) **[B]** into the housing with the seal lip facing toward you.

Use the tool (Item 2) **[B]** as shown in the figure.



Install the bearing on the shaft **[C]**.

Use a pipe (Item 1) **[C]** with O.D. that seats on the I.D. of the bearing.



MOTOR CARRIER (Cont'd)

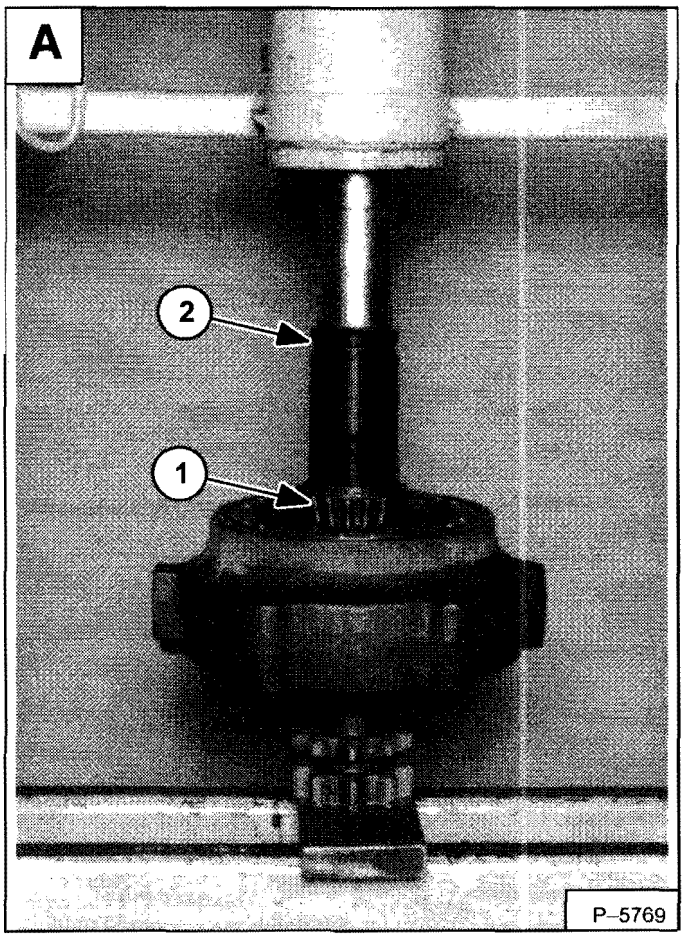
Assembly (Cont'd)

Install the shaft/bearing assembly into the housing.

Install the bearing (Item 1) **[A]** using the tool (Item 2) **[A]** (MEL1431).

After the bearing is seated. Install the washer and snap ring on the shaft.

It may be necessary to use the tool to push the washer and snap ring down into position because of the pre–load on the bearings.

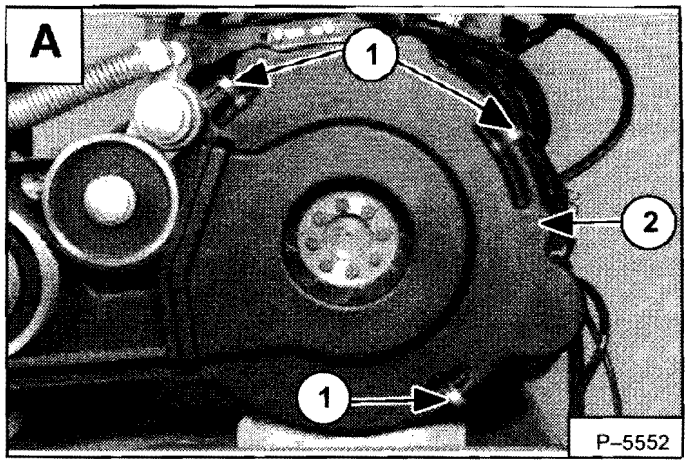


HYDROSTATIC PUMP

Removal and Installation

Remove the hydrostatic pump/engine assembly from the loader (Page 7–1).

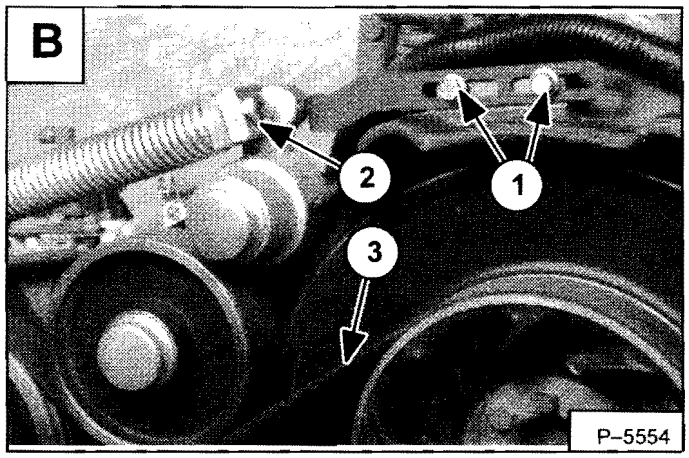
Remove the belt shield clips (Item 1) **[A]** and belt shield (Item 2) **[A]**.



Loosen the stop mounting bolts (Item 1) **[B]**.

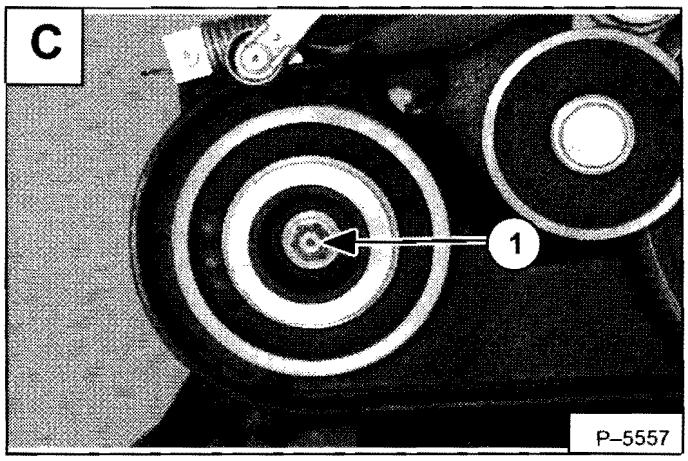
Loosen the spring tension bolt (Item 2) **[B]**.

Remove the drive belt (Item 3) **[B]**.



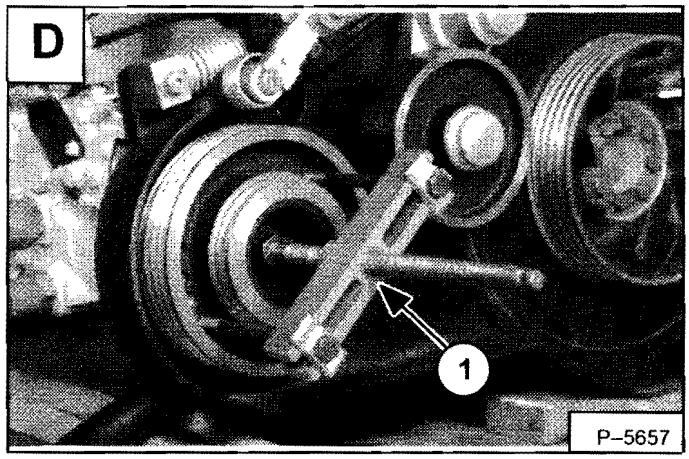
Remove the washer and nut (Item 1) **[C]** from the hydrostatic pump drive shaft.

Installation: Tighten the nut to 175–200 ft.–lbs. (237–271 Nm) torque.



Install the nut on the end of the pump drive shaft (without washer).

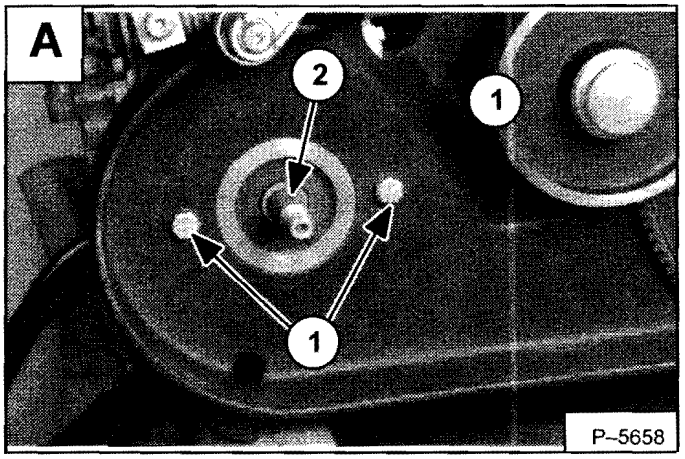
Use a puller (Item 1) **[D]** to remove the pulley from the pump drive shaft.

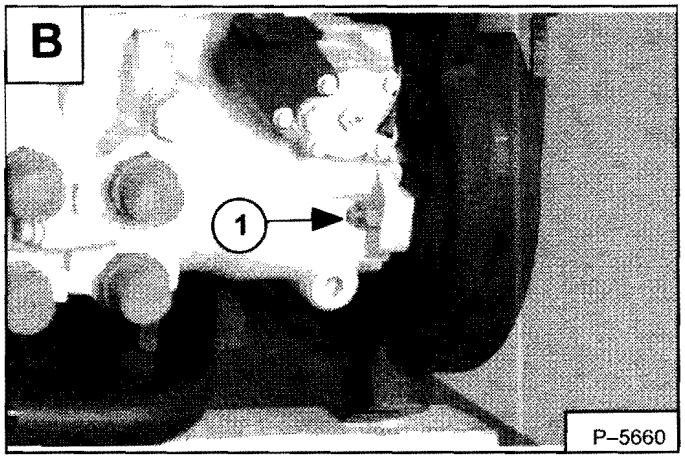


Removal and Installation (Cont'd)

Remove the two mounting bolts (Item 1) **[A]** and nuts (Item 1) **[B]**.

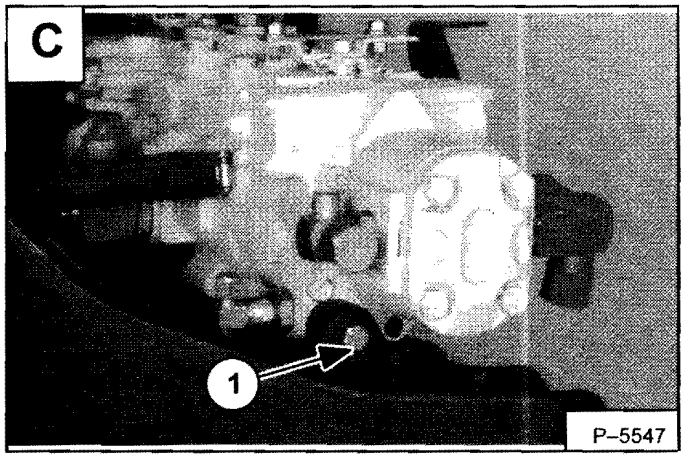
Installation: Tighten the mounting bolts and nuts to 65–70 ft.–lbs. (88–95 Nm) torque. Make sure the key (Item 2) **[A]** is installed.





Remove the mounting bolt (Item 1) **[C]** at the hydraulic pump end of the pump.

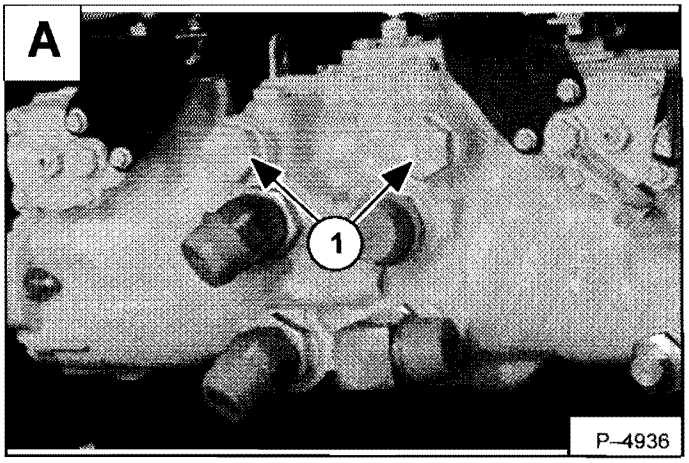
Remove the hydrostatic pump from the mounting bracket and drive belt housing.



Replenishing/High Pressure Relief Valve

There are four replenishing/high pressure relief valves (Item 1) **[A]** in the hydrostatic pump assembly. Two are located at the front of the pumps and two at the rear of the pumps.

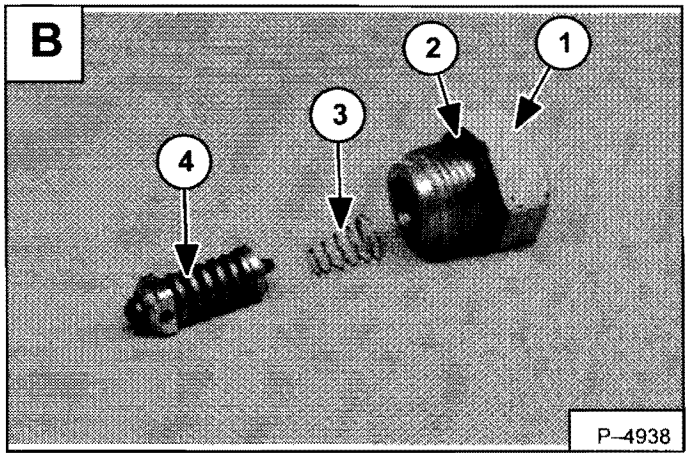
See Page 3–4 for valve function.



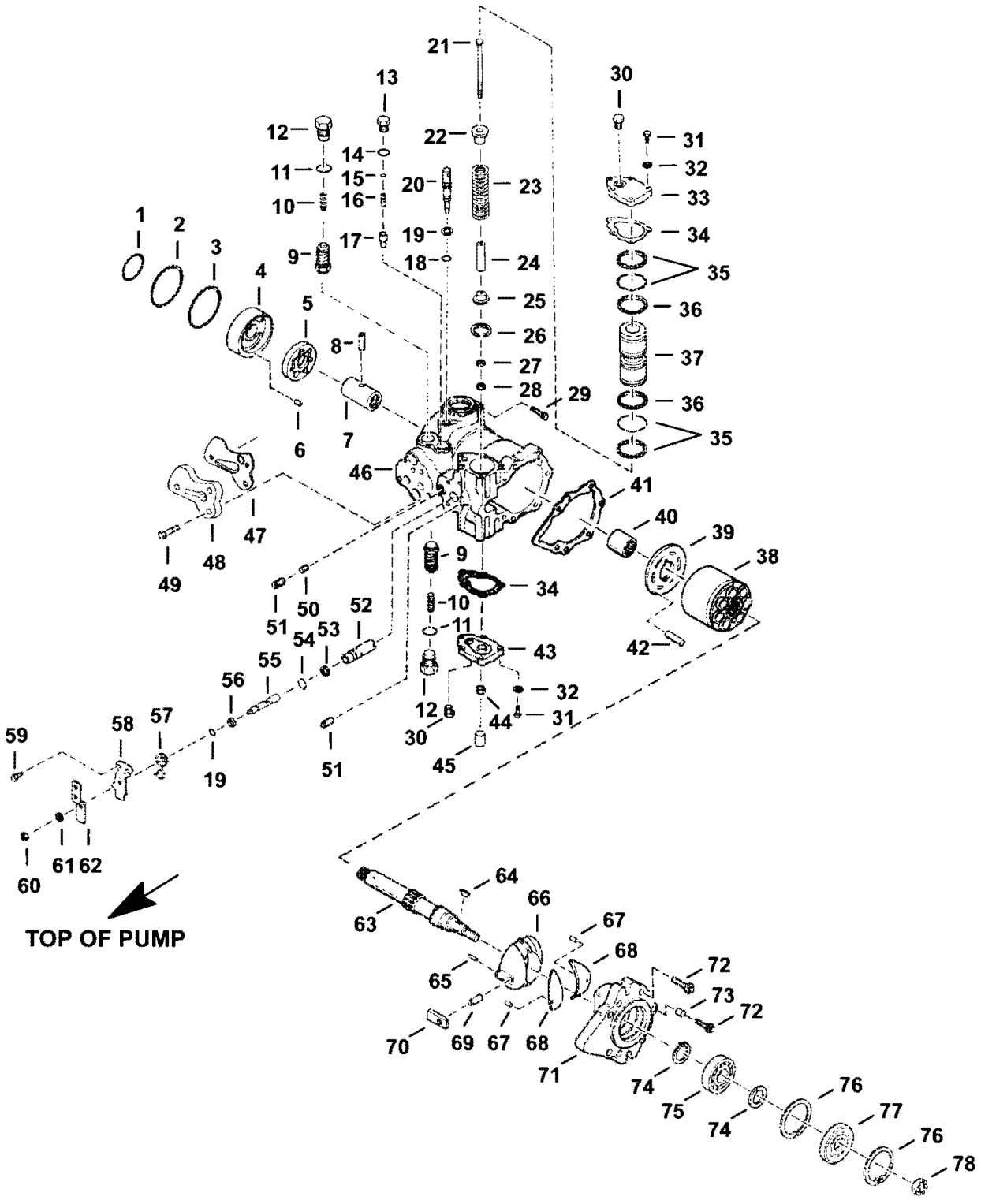
Remove the plug, spring and high pressure relief valve from the pump **[B]**.

Check for damage and replace as needed.

Ref.	Description
1.	PLUG
2.	O–RING
3.	SPRING
4.	HIGH PRESSURE RELIEF



Parts Identification



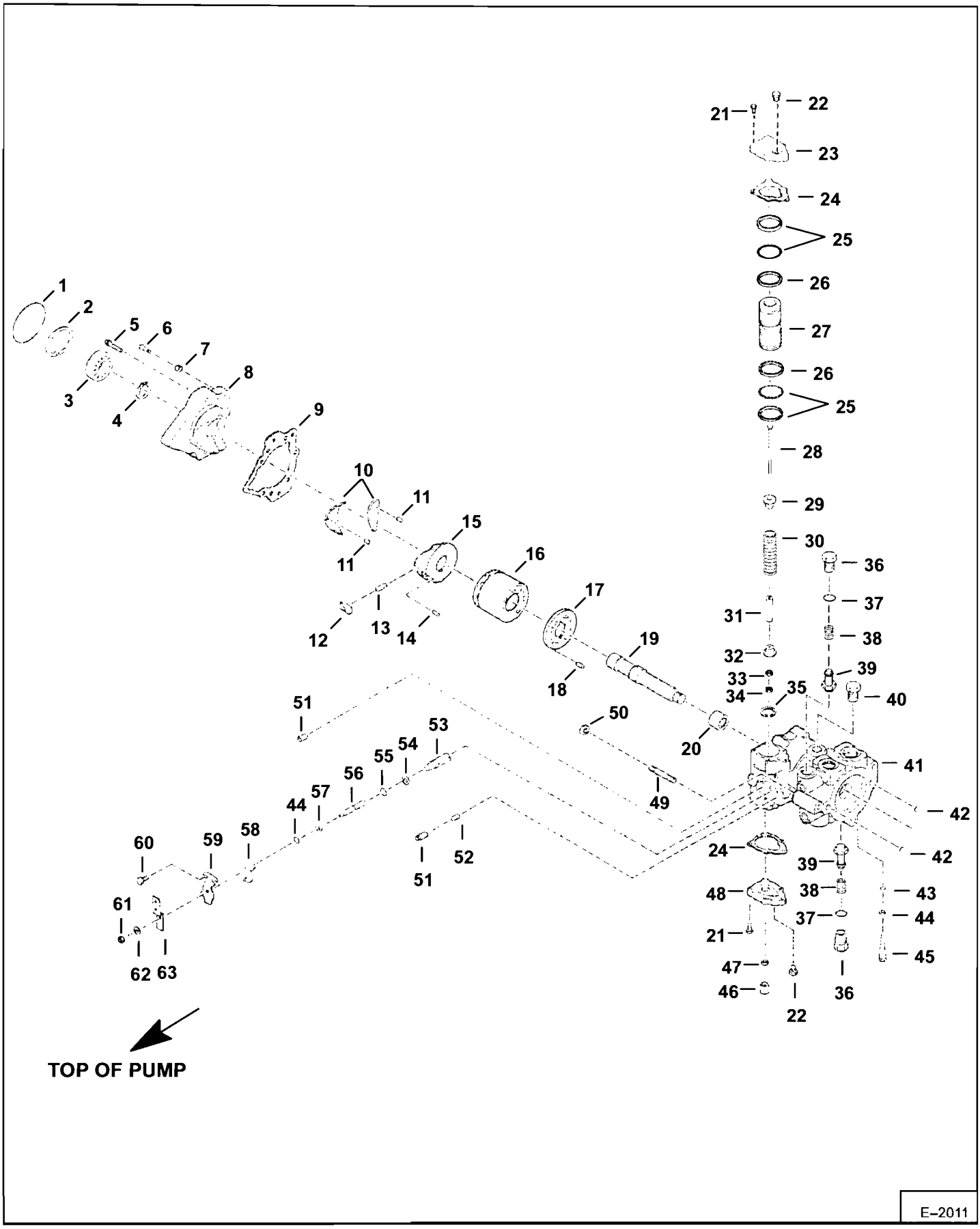
E–2012

Parts Identification (Cont'd)

Ref.	Description
1.	O–RING
2.	O–RING
3.	O–RING
4.	COVER
5.	ROTOR ASSY.
6.	PIN
7.	COUPLER
8.	PIN
9.	RELIEF VALVE
10.	SPRING
11.	O–RING
12.	PLUG
13.	PLUG
14.	O–RING
15.	SHIM
16.	SPRING
17.	CHARGE RELIEF VALVE
18.	O–RING
19.	RING
20.	BYPASS VALVE
21.	BOLT
22.	GUIDE
23.	SPRING
24.	STOP
25.	GUIDE
26.	SNAP RING
27.	NUT
28.	LOCKING NUT
29.	BOLT
30.	PLUG
31.	BOLT
32.	WASHER
33.	SERVO COVER
34.	GASKET
35.	SEAL
36.	RING
37.	SERVO PISTON
38.	ROTATING GROUP ASSY.
39.	VALVE PLATE

Ref.	Description
40.	BEARING
41.	GASKET
42.	PIN
43.	SERVO COVER
44.	NUT
45.	COVER
46.	HOUSING
47.	O–RING PLATE
48.	ADAPTER
49.	BOLT
50.	ORIFICE
51.	PLUG
52.	SLEEVE
53.	O–RING
54.	O–RING
55.	SPOOL
56.	O–RING
57.	SPRING
58.	BRACKET
59.	BOLT
60.	NUT
61.	WASHER
62.	HANDLE
63.	SHAFT
64.	KEY
65.	PIN
66.	SWASH PLATE
67.	PIN
68.	JOURNAL BEARING
69.	PIN
70.	SLEEVE
71.	FRONT COVER
72.	BOLT
73.	PIN
74.	SNAP RING
75.	BEARING
76.	SNAP RING
77.	SEAL
78.	NUT

Parts Identification (Cont'd)



Parts Identification (Cont'd)

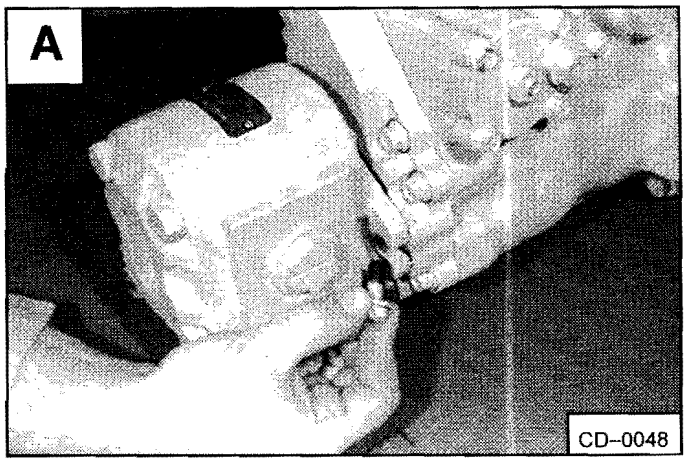
Ref.	Description
1.	O–RING
2.	SNAP RING
3.	BEARING
4.	SNAP RING
5.	BOLT
6.	BOLT
7.	PIN
8.	COVER
9.	GASKET
10.	JOURNAL BEARING
11.	PIN
12.	SLEEVE
13.	PIN
14.	PIN
15.	SWASH PLATE
16.	ROTATING GROUP ASSY.
17.	VALVE PLATE
18.	PIN
19.	SHAFT
20.	BEARING
21.	BOLT
22.	PLUG
23.	SERVO COVER
24.	GASKET
25.	SEAL
26.	RING
27.	SERVO PISTON
28.	BOLT
29.	GUIDE
30.	SPRING
31.	STOP
32.	GUIDE
33.	LOCKING NUT
34.	NUT
35.	RING
36.	PLUG
37.	O–RING
38.	SPRING
39.	RELIEF VALVE
40.	PLUG
41.	HOUSING
42.	O–RING
43.	O–RING
44.	RING
45.	BYPASS VALVE
46.	COVER
47.	NUT
48.	COVER
49.	STUD
50.	NUT
51.	PLUG
52.	ORIFICE
53.	SLEEVE
54.	O–RING
55.	O–RING
56.	SPOOL
57.	O–RING
58.	SPRING
59.	BRACKET
60.	BOLT
61.	NUT
62.	WASHER
63.	HANDLE

Hydraulic Pump Removal

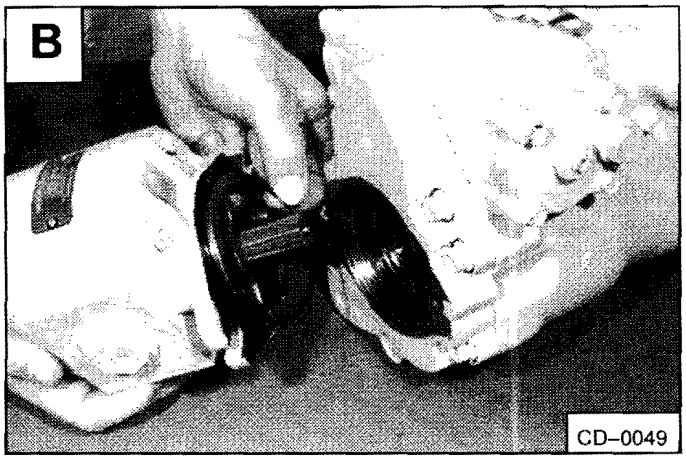
IMPORTANT

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

I–2003–0284



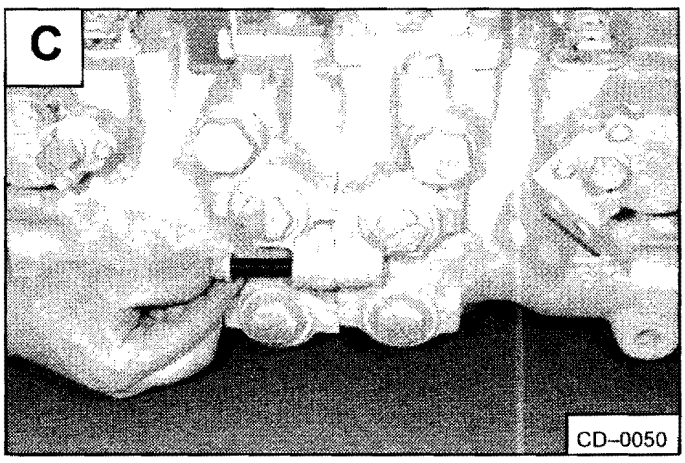
Remove the two hydraulic pump mounting bolts **[A]**.



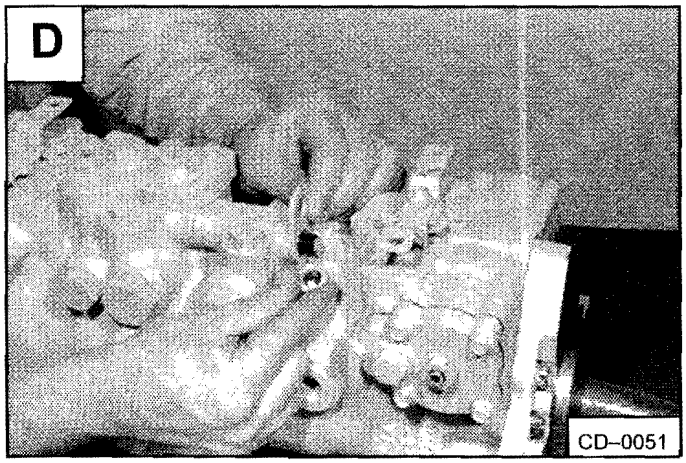
Remove the hydraulic pump and O–ring **[B]**.

Hydrostatic Pump Separation

Remove the bolt from both sides of the pump assembly **[C]**.



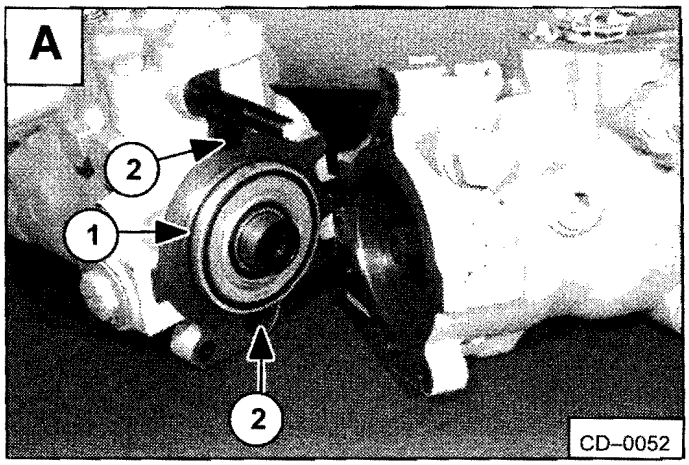
Remove the nut and lift bracket **[D]**.



Hydrostatic Pump Separation (Cont'd)

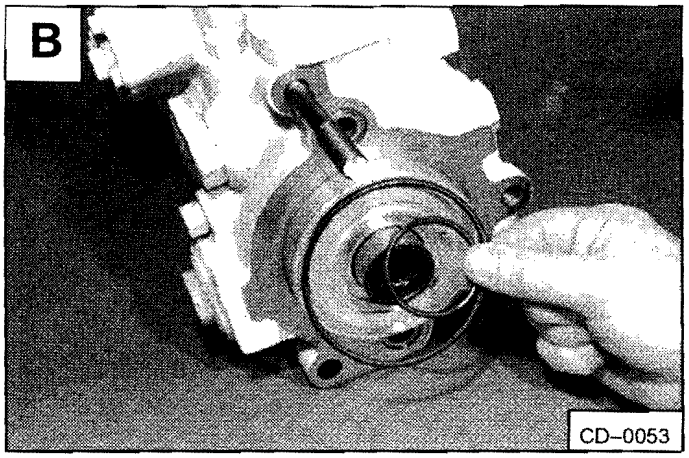
Separate the two pumps **[A]**.

Remove the large O–ring (Item 1) **[A]** and two small O–rings (Item 2) **[A]** from the rear pump.

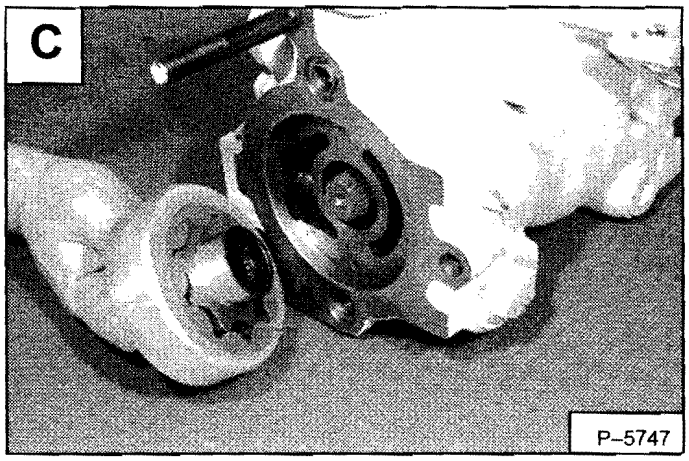


Charge Pump Disassembly

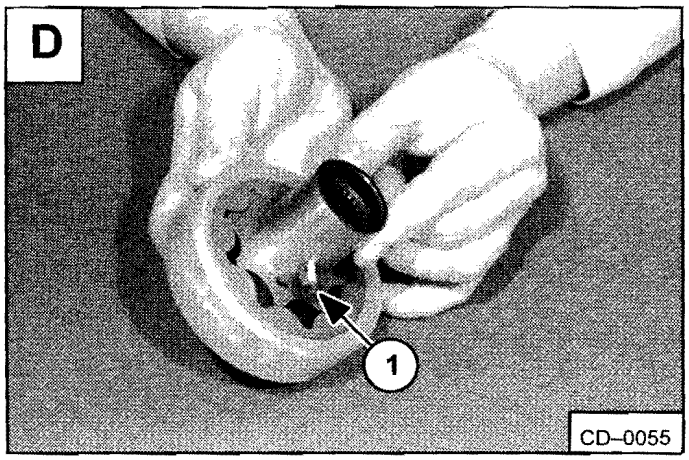
Remove the two O–rings from the gerotor cover **[B]**.



Remove the gerotor pump assembly and splined coupler from the rear pump **[C]**.



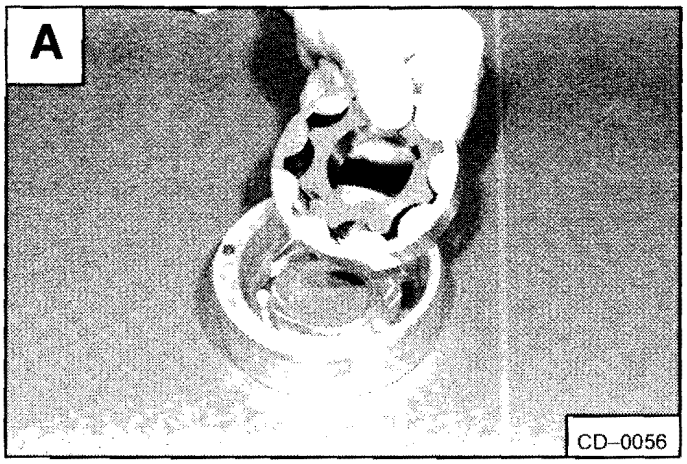
Remove the splined coupler and drive pin (Item 1) **[D]**.



Charge Pump Disassembly (Cont'd)

Remove the gerotor assembly from the gerotor cover **[A]**.

Check all charge pump components for wear or damage. Replace parts as necessary.

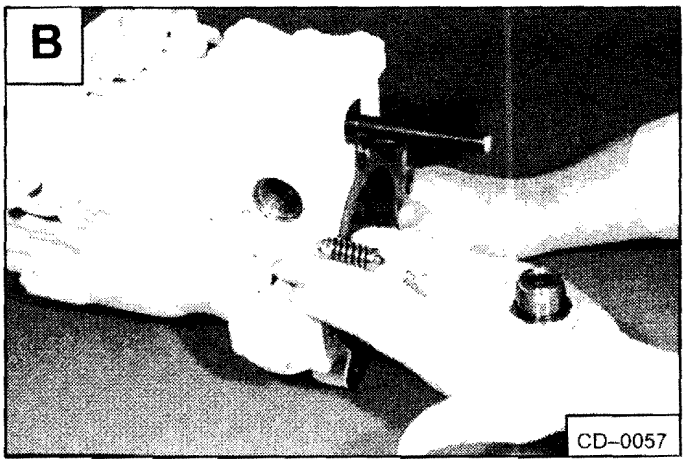


Disassembly

IMPORTANT

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

I–2003–0284

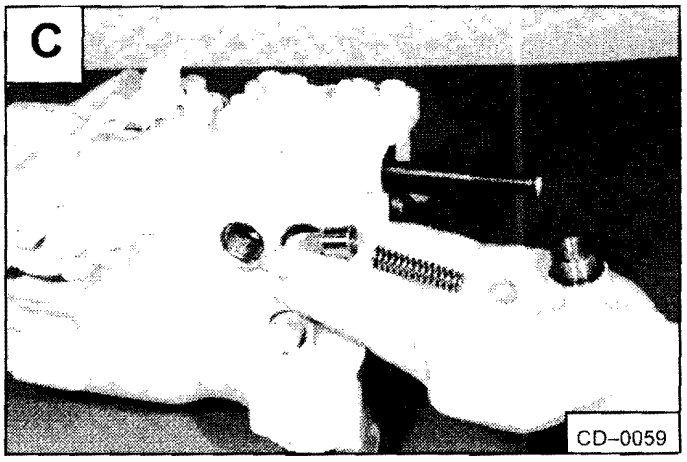


Use the following procedure to disassemble both front and rear hydrostatic pumps. Procedures to be performed on the front or rear pump only are marked.

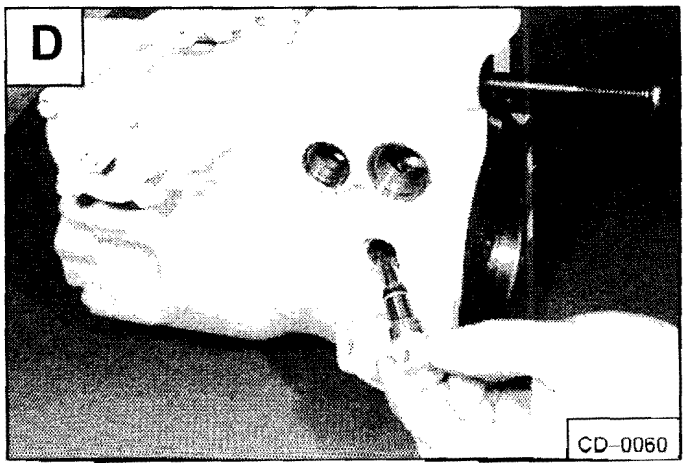
NOTE: Keep front and rear pump parts separate during disassembly and assembly.

Remove the plug, shims (if equipped), spring and high pressure relief valve cartridge from each side of the pump **[B]**.

♦ Remove the plug, shims (if equipped), spring and charge pressure relief valve **[C]**.



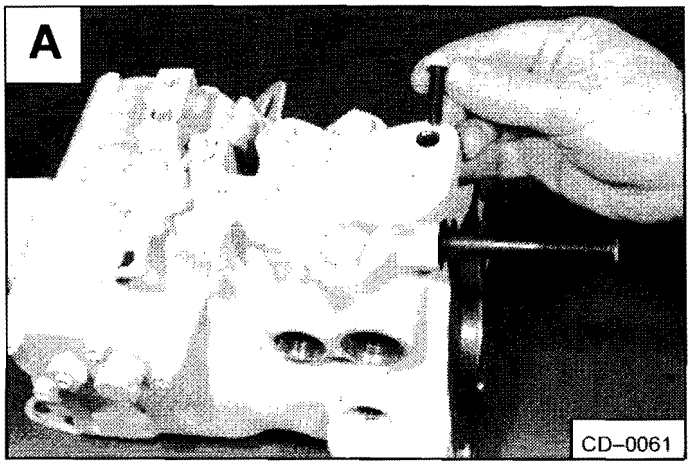
◊ Remove the bypass valve **[D]**.



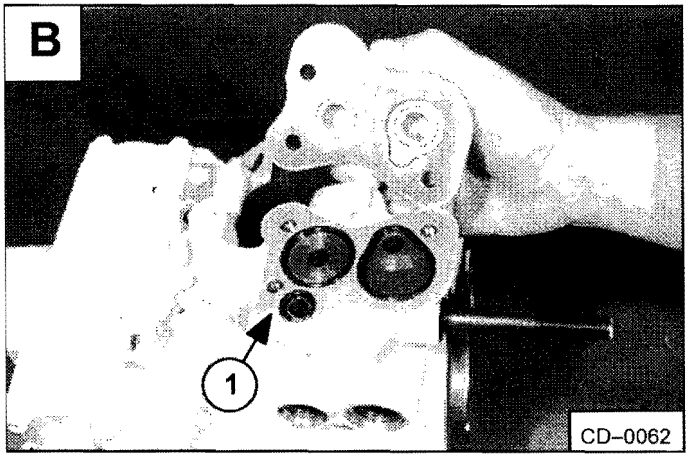
◊ Front Pump
♦ Rear Pump

Disassembly (Cont'd)

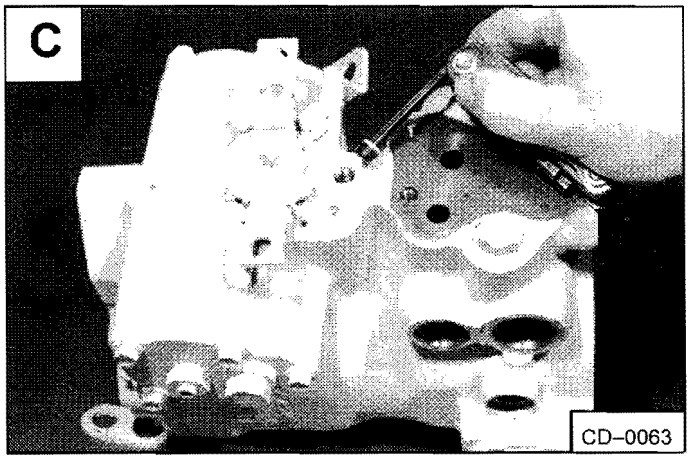
◊ Remove the three bolts at the adapter housing **[A]**.



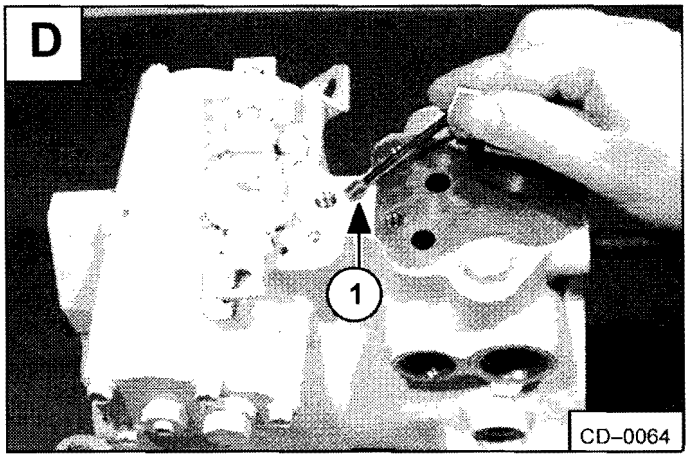
♦ Remove the adapter housing and plate (Item 1) **[B]**.



Remove the plug at the control inlet orifice port **[C]**.



Remove the screened orifice plug (Item 1) **[D]**.



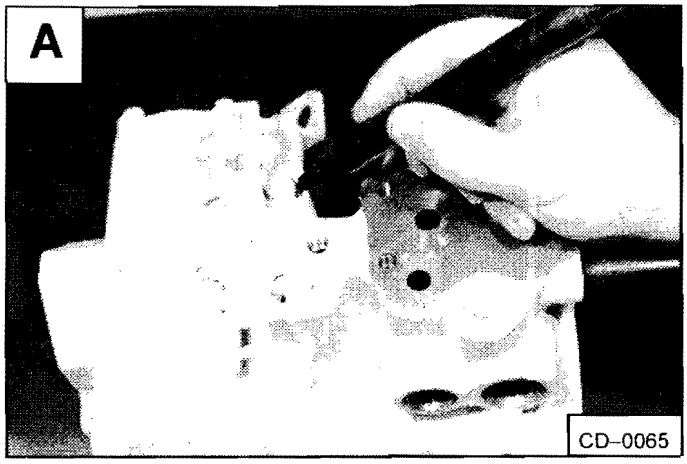
◊ Front Pump
♦ Rear Pump

HYDROSTATIC PUMP (Cont'd)

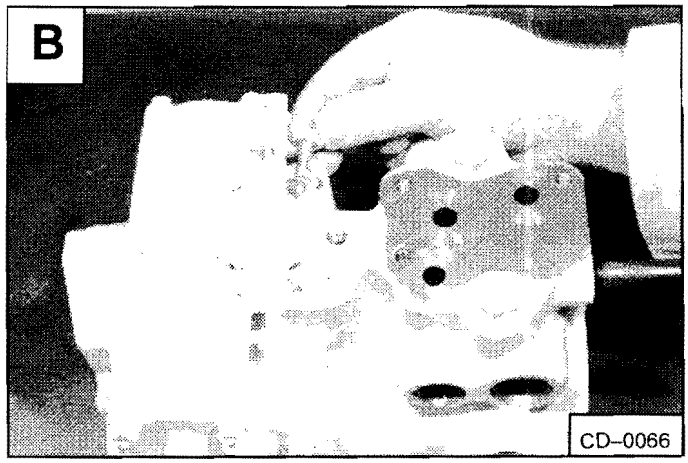
Disassembly (Cont'd)

Mark the position of the neutral bracket for reference during assembly **[A]**.

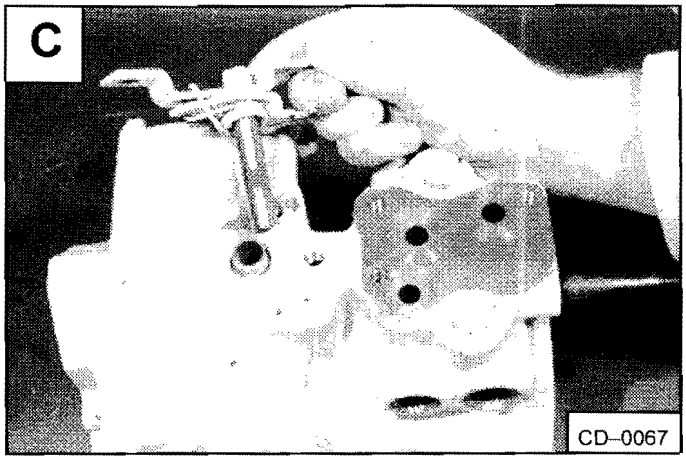
NOTE: Removal of any part of the mechanical control will result in the loss of the neutral setting and will require neutral adjustment. Refer to Page 3–9 for the correct neutral adjustment procedure. The neutral adjustment procedure must be performed with the pump installed and engine running.



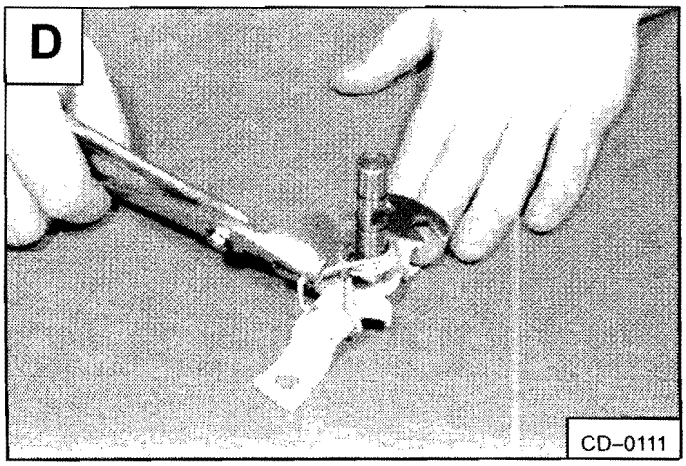
Remove the flange head screw **[B]**.



Remove the control lever and spool assembly **[C]**.

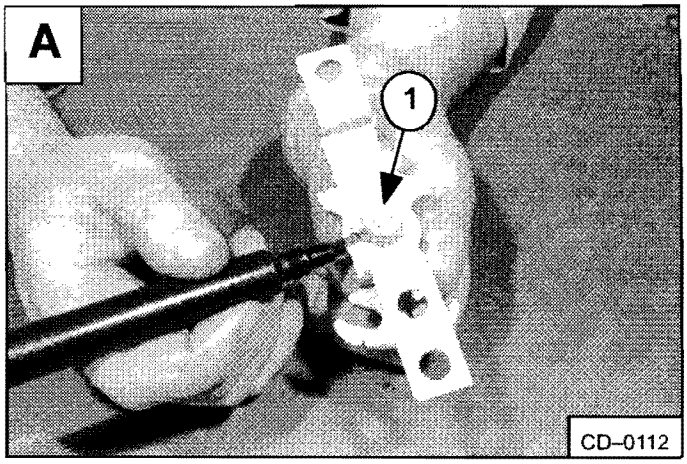


If necessary, remove the spring from the control lever and spool assembly **[D]**.



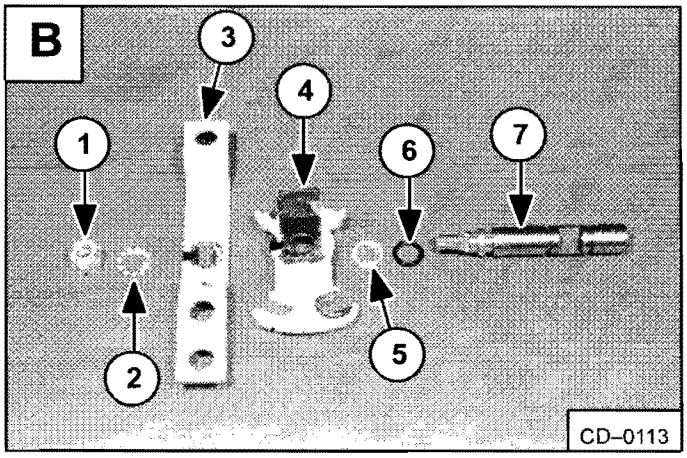
Disassembly (Cont'd)

If disassembly of the control lever and spool assembly is necessary, locate the notch (Item 1) **[A]** in the end of the spool. Mark the control lever and neutral bracket on the same side as the spool notch.



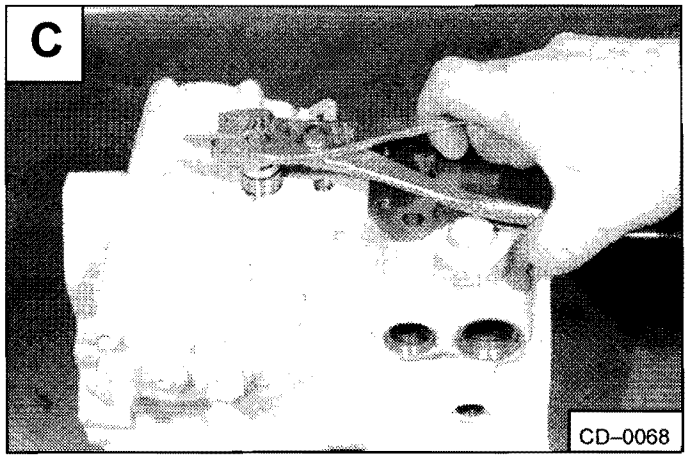
Disassembly as shown in Figure **[B]**:

Remove the nut (Item 1), lock washer (Item 2), control lever (Item 3), neutral bracket (Item 4), backup washer (Item 5) and O–ring (Item 6) from the spool (Item 7).

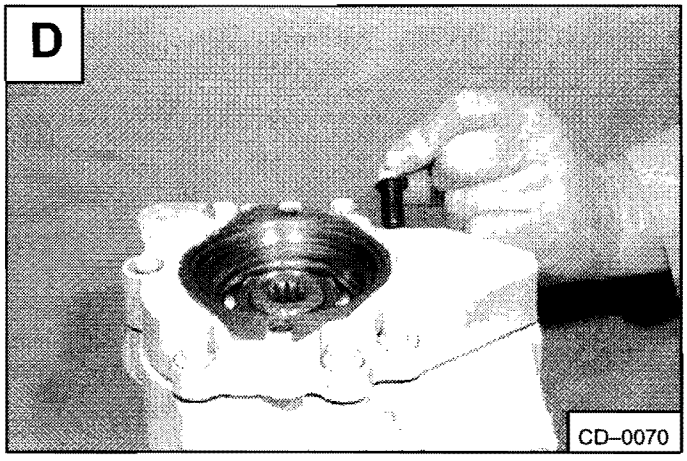


Gripping the outside of the control sleeve with a pliers, remove the control sleeve **[C]**.

NOTE: Do not grip the inside diameter of the control sleeve.



Remove the seven end housing bolts **[D]**.

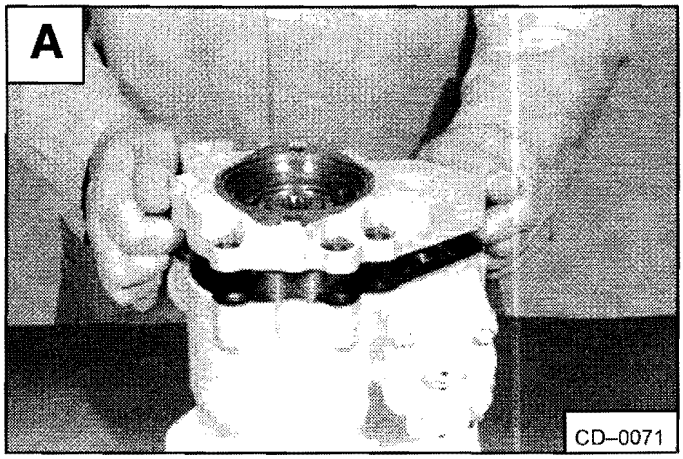


HYDROSTATIC PUMP (Cont'd)

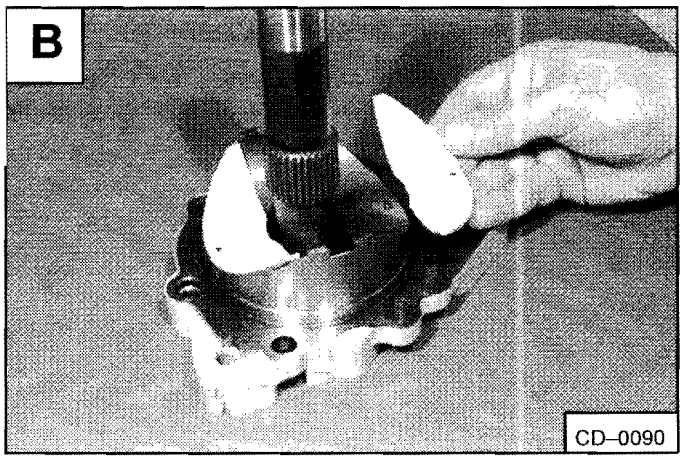
Disassembly (Cont'd)

Remove the end housing with the shaft assembly **[A]**.

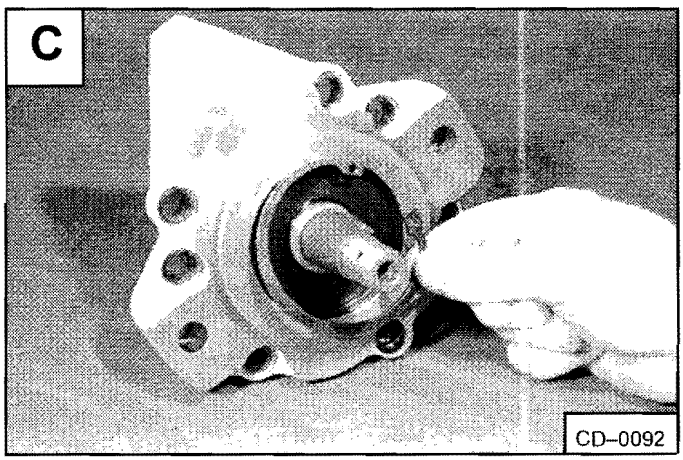
Remove the gasket **[A]**.



Remove the swashplate journal bearings from the end housing **[B]**.

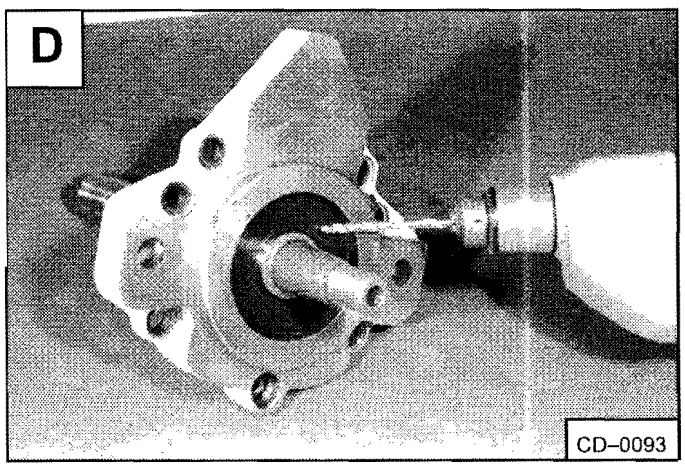


◊ Remove the snap ring at the seal **[C]**.



◊ Use an electric drill with a magnetized or greased bit to make a small hole in the seal **[D]**.

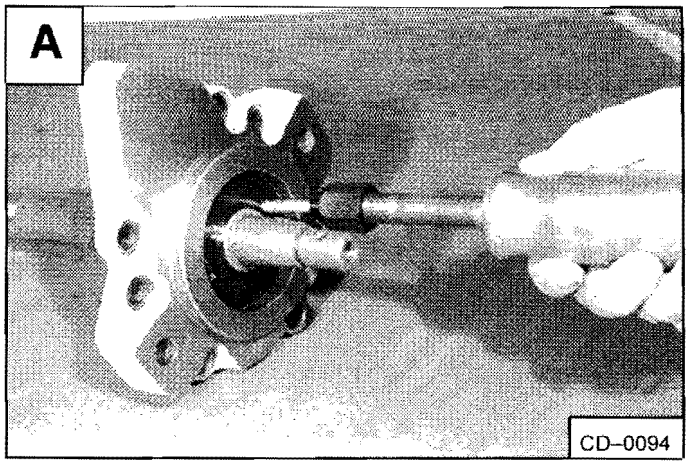
NOTE: Be careful not to damage the bearing behind the seal.



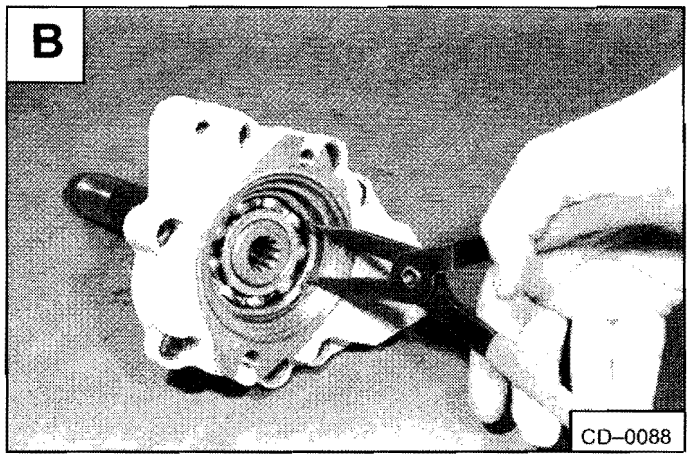
◊ Front Pump
♦ Rear Pump

Disassembly (Cont'd)

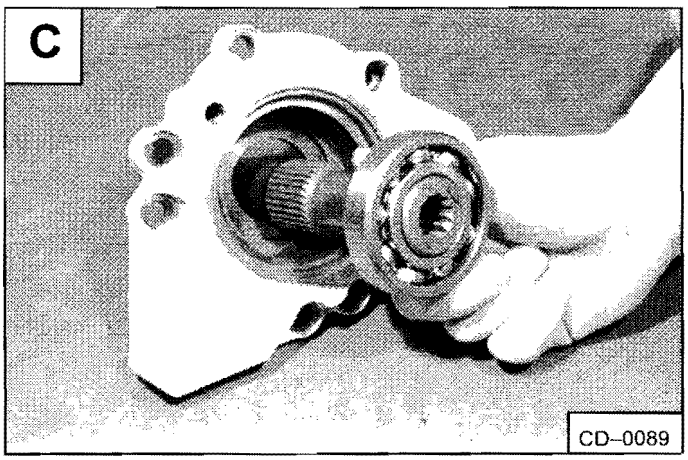
◊ Install a seal puller and remove the seal **[A]**.



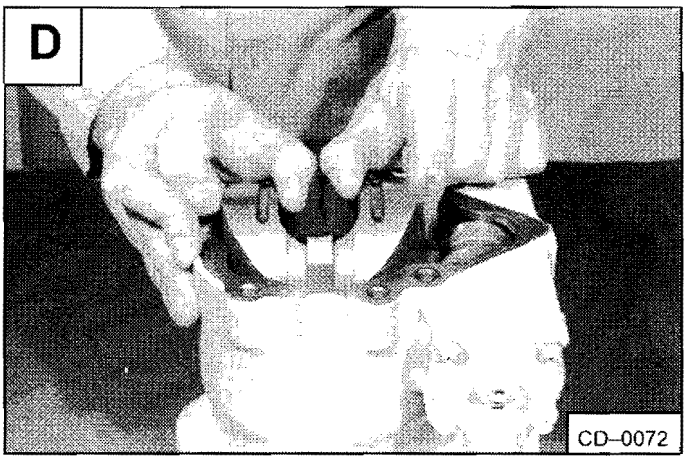
Remove the large snap ring at the bearing **[B]**.



Remove the shaft and bearing assembly **[C]**.



Remove the swashplate from the housing **[D]**.

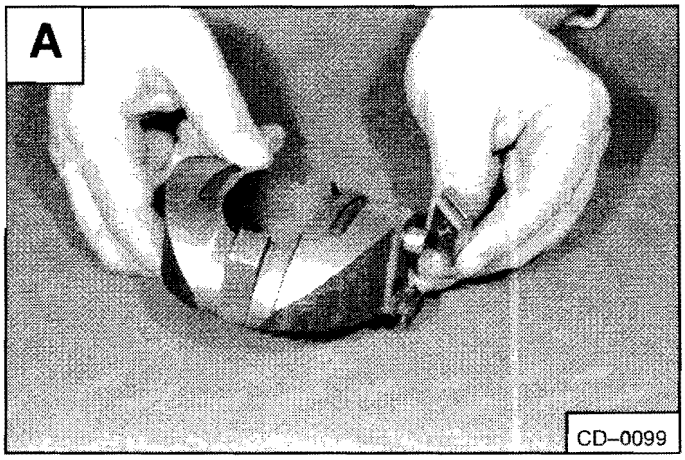


◊ Front Pump
♦ Rear Pump

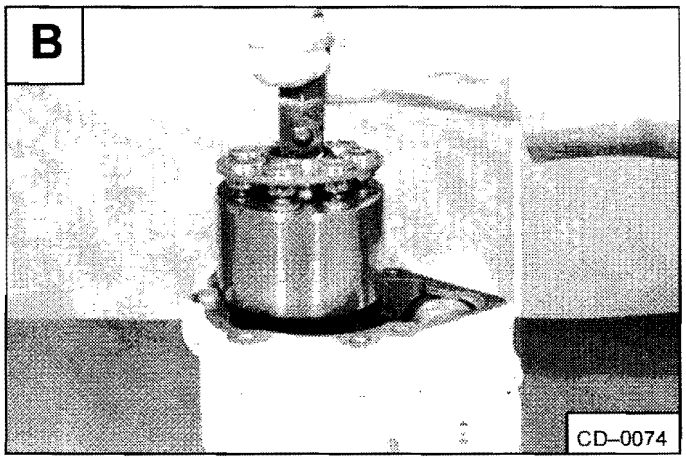
HYDROSTATIC PUMP (Cont'd)

Disassembly (Cont'd)

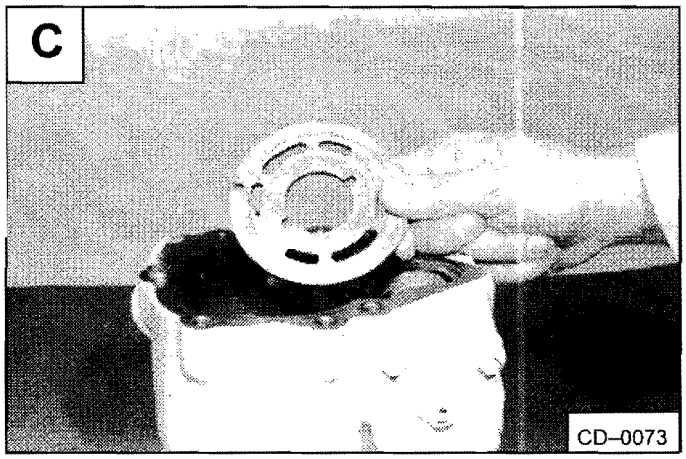
Remove the guide from the swashplate **[A]**.



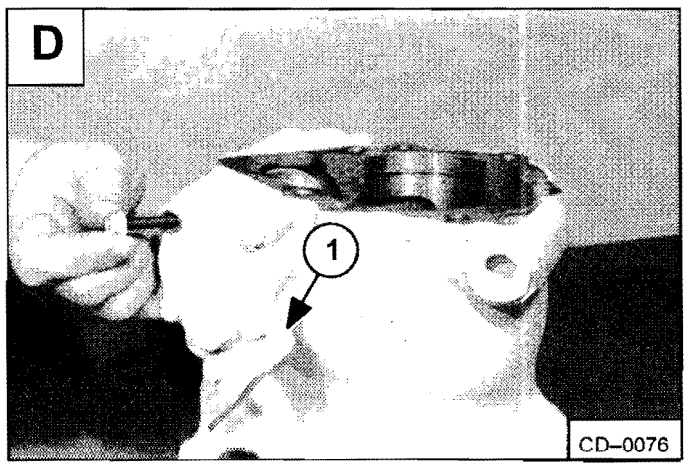
Using a snap ring pliers, remove the rotating group assembly **[B]**.



To remove the valve plate, use an O–ring pick tool to lift the valve plate up. Remove the valve plate from the housing **[C]**.



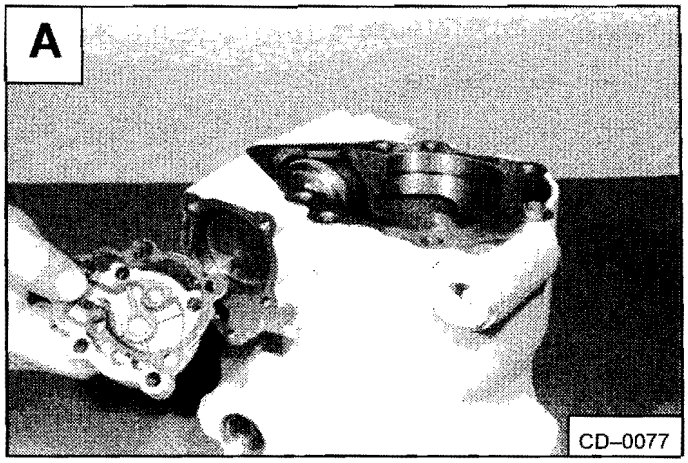
- Remove the five bolts and bracket (Item 1) **[D]** from the end cap.



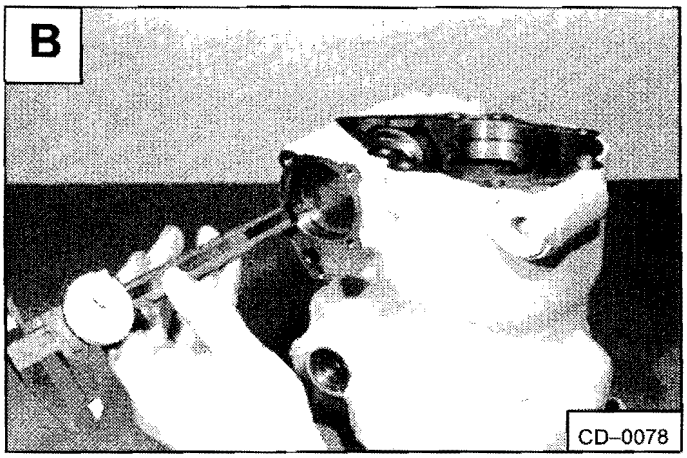
◊ Front Pump
♦ Rear Pump

Disassembly (Cont'd)

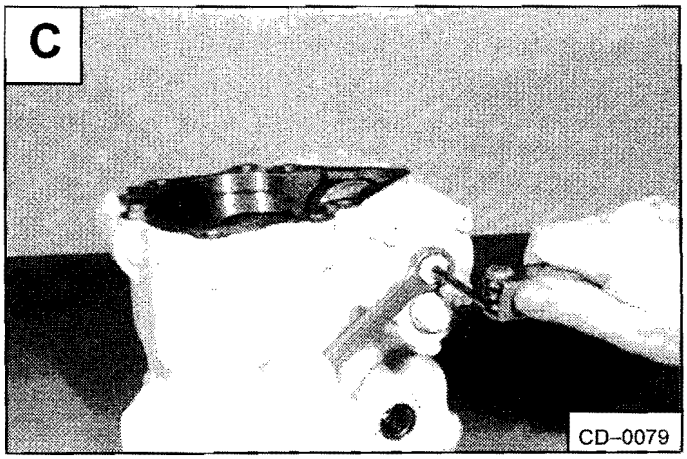
Remove the end cap and gasket **[A]**.



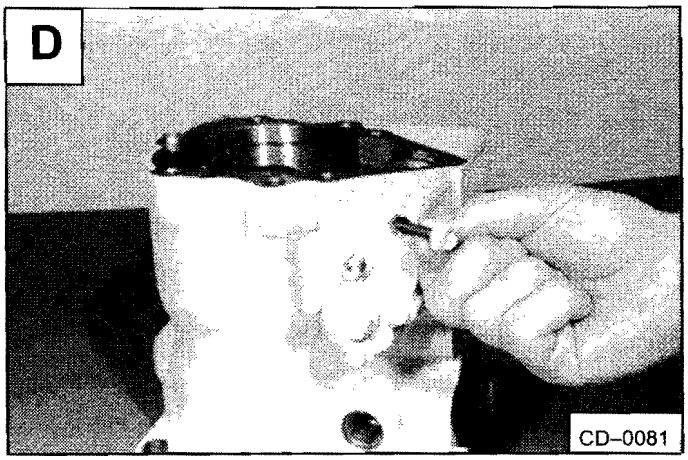
Measure and record the distance between the piston and housing **[B]**.



While holding the centering screw stationary, remove the neutral adjustment lock nut **[C]**.

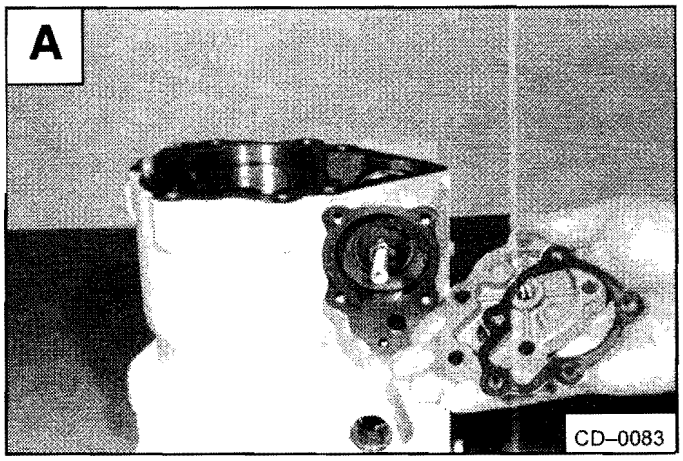


Remove the five bolts from the end cap **[D]**.



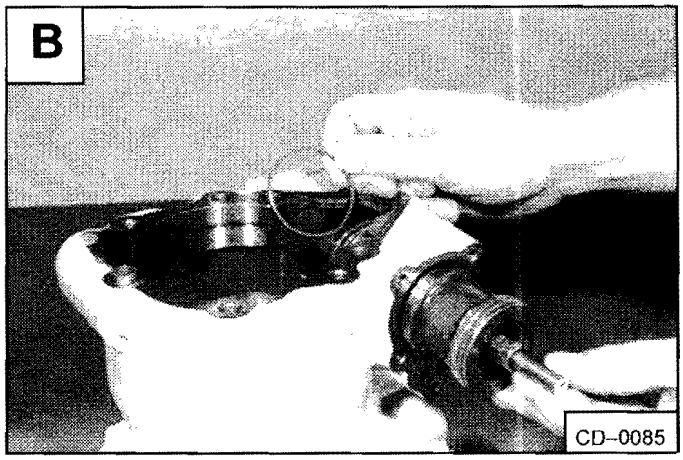
Disassembly (Cont'd)

Turn the end cap off the centering screw. Remove the gasket **[A]**.



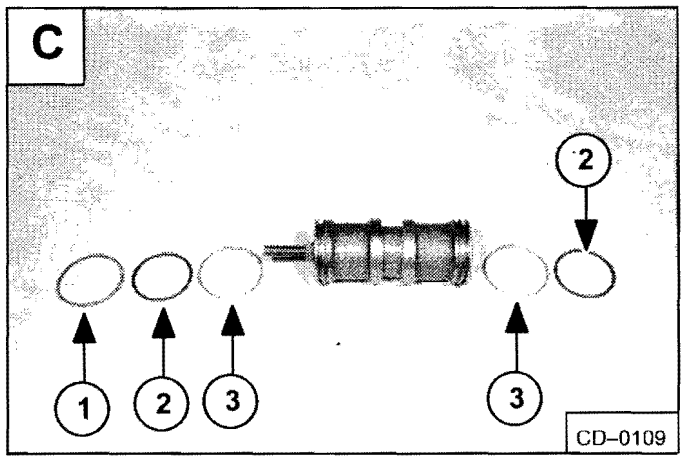
Push the end of the piston into the housing and remove the seal **[B]**.

Remove the piston from the housing by pulling on the centering screw **[B]**.



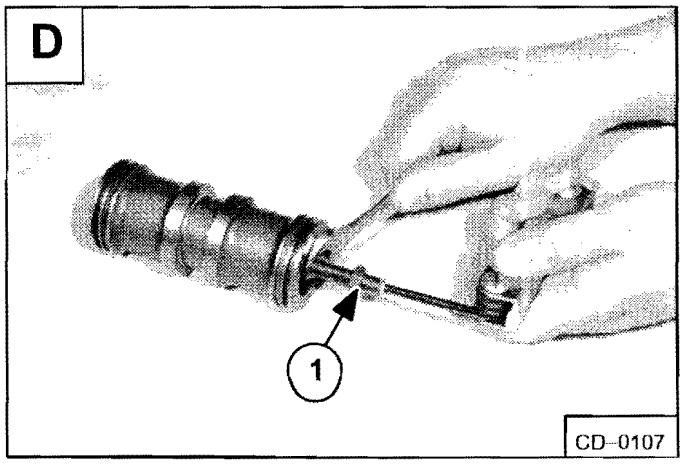
Disassembly of the piston as shown in Fig. **[C]**:

Remove the seal (Item 1) from the centering screw end of the piston. Remove the O–ring (Item 2) and bearing ring (Item 3) from both ends of the spool.



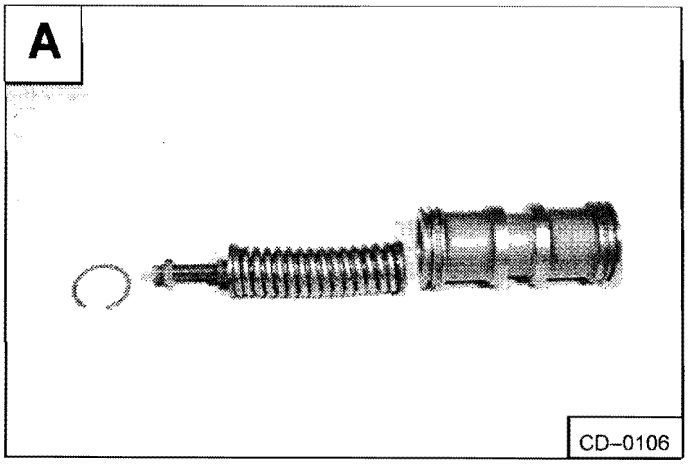
If it is necessary to disassemble the piston, use the following procedure:

Loosen the jam nut (Item 1) **[D]**. Tighten the nut at the piston to release spring tension on the snap ring.



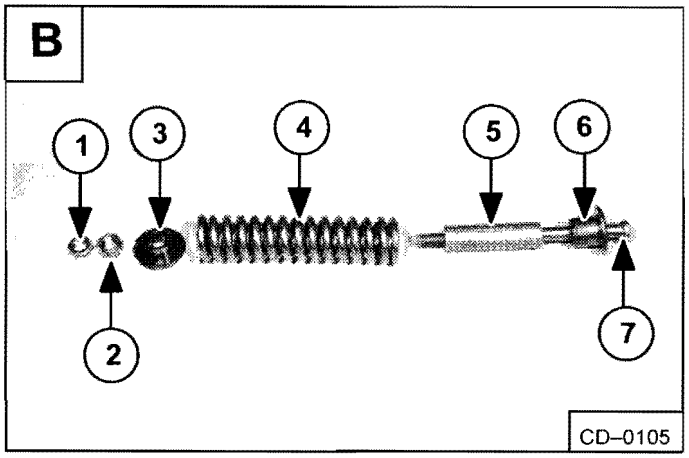
Disassembly (Cont'd)

Remove the snap ring and centering spring assembly from the piston **[A]**.



Disassemble the centering spring assembly as shown in Figure **[B]**:

Remove the lock nut (Item 1), nut (Item 2), short spring guide (Item 3), spring (Item 4), stop (Item 5) and long spring guide (Item 6) from the centering screw (Item 7).

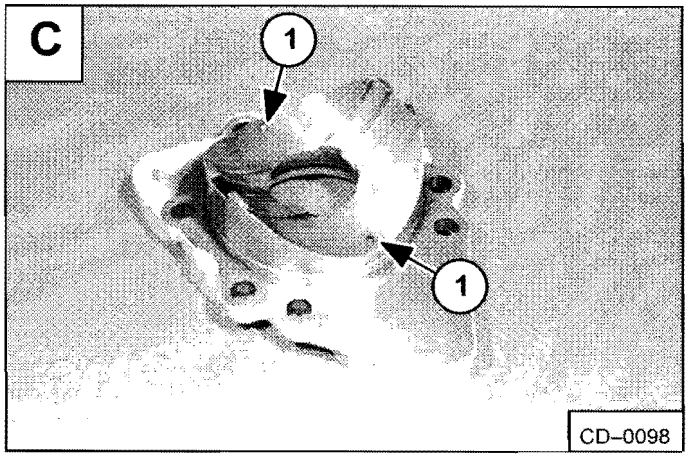


Inspection

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.

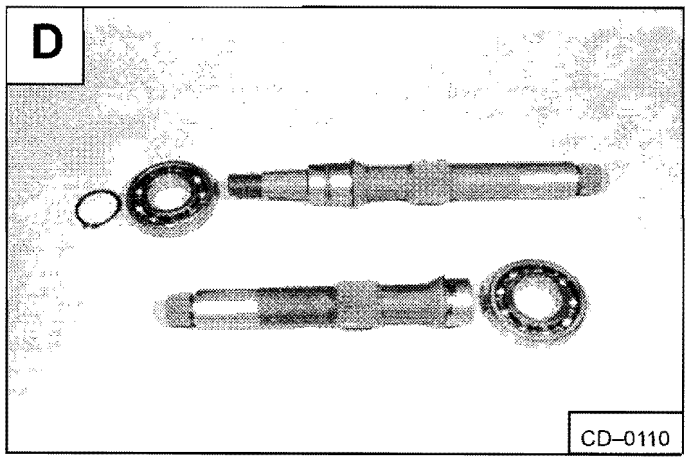
Lubricate all internal pump parts with clean hydraulic oil before assembly.

Check the two bearing locater pins (Item 1) **[C]** in the end housing. The pins must measure 0.0625–0.080 inch (1,65–2,03 mm) from the end housing surface to the end of the pins.



Check the shaft for wear or damage in the splined and bearing areas **[D]**.

Check the bearing for proper operation. Remove from the shaft only if necessary to replace **[D]**.



HYDROSTATIC PUMP (Cont'd)

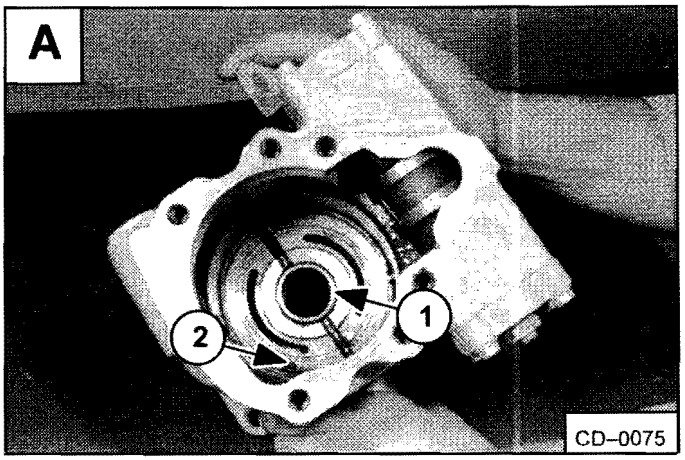
Inspection (Cont'd)

Check the needle bearing (Item 1) **[A]** in the housing for proper operation.

If the bearing must be replaced, use the correct driver to remove and install the bearing. The numbered end of the bearing must be installed toward the inside of the pump housing. When installed correctly, the end of the bearing must measure 0.08–0.10 inch (2,0–2,5 mm) above the machined housing surface.

Check the locating spring pin (Item 2) **[A]**.

The pin must measure 0.165–0.185 inch (4,19–4,70 mm) from the housing to the end of the pin.



Check the swashplate (Item 1) **[B]** and valve plate (Item 2) **[B]**.

The surface finish must be smooth and free of scratches. If scratches can be felt with a fingernail, replace the parts.

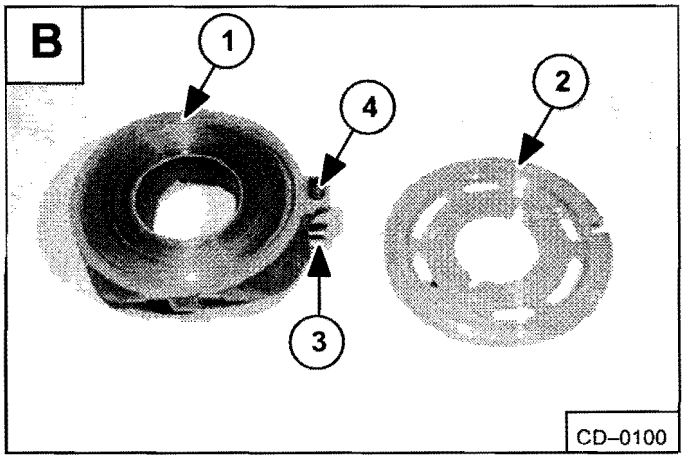
Check the four small holes in the swashplate surface to make sure they are open.

Check the guide pin (Item 3) **[B]**.

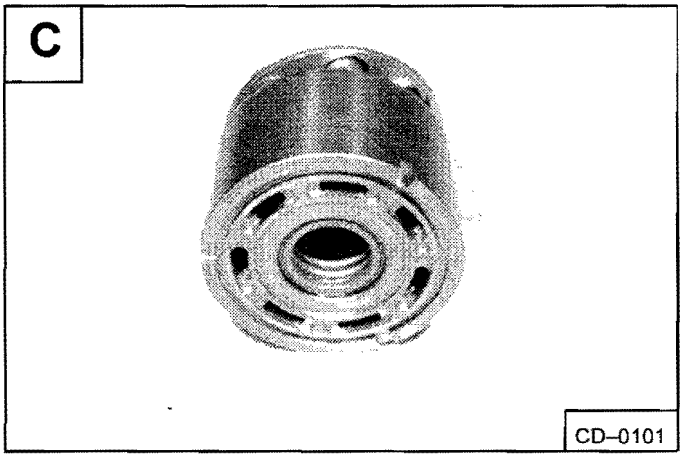
The guide pin must measure 0.29–0.31 inch (7,4–7,9 mm) from the swashplate surface to the end of the pin.

Check the spring pin (Item 4) **[B]**.

The spring pin must be installed with the split toward the center of the swashplate. The spring pin must measure 0.33–0.5 inch (8,4–8,9 mm) from the swashplate to the end of the pin.



Check the end of the piston block. The surface must be smooth and free of scratches **[C]**.

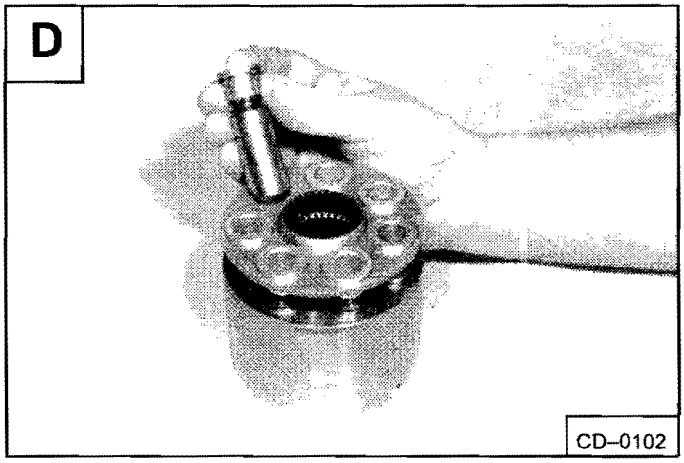


Check that each piston moves freely in its bore **[D]**.

Check each piston and piston shoe for wear or scratches.

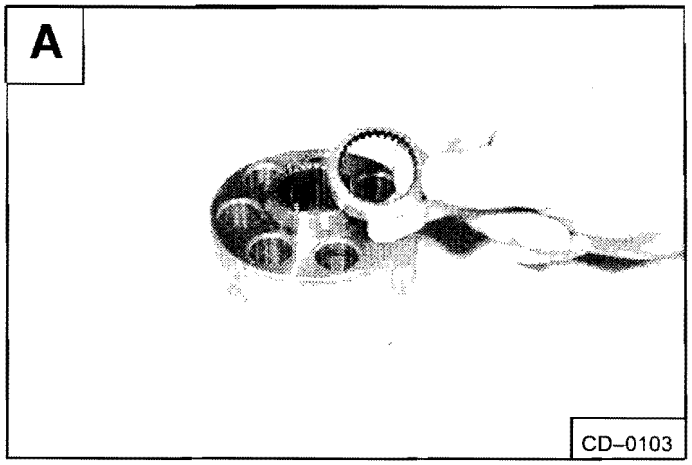
Check the cylinder bores in the piston block for wear or scratches.

Check the shoe plate. The shoe plate must be flat with no sign of cracks or wear.



Inspection (Cont'd)

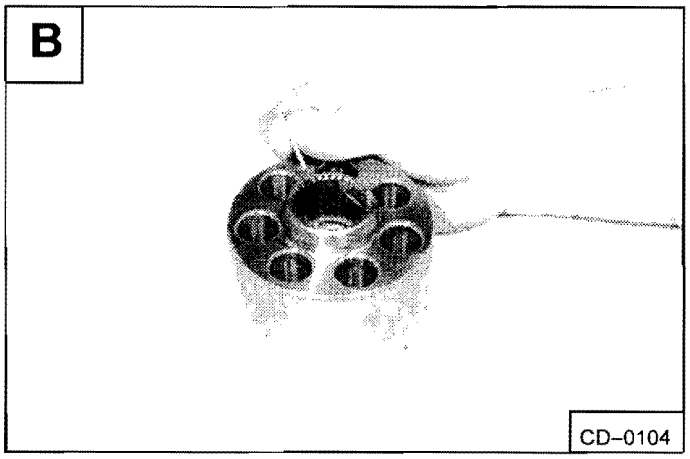
Check the spherical washer for wear or damage **[A]**.



Check the three pins **[B]**.

The pins must not be bent. All pins must be the same length.

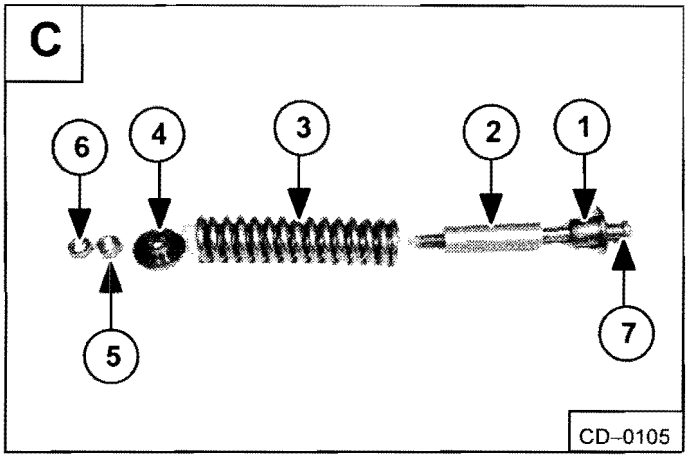
NOTE: If there is any defect in the rotating group, the complete rotating group must be replaced.



Assembly

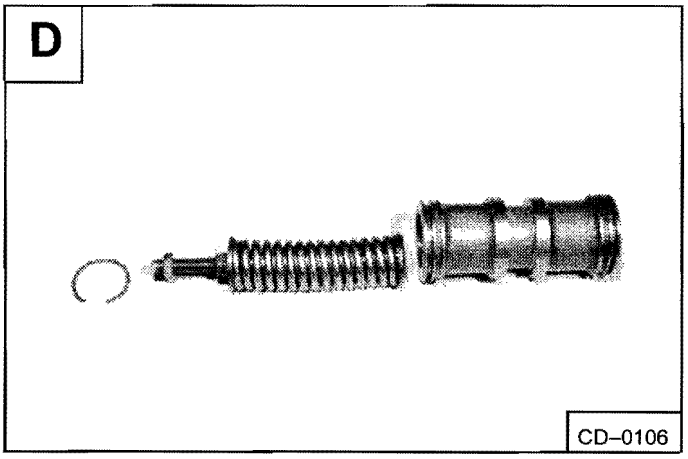
If disassembly, assembly as shown in Fig. **[C]**:

Apply oil to and install the long spring guide (Item 1), stop (Item 2), spring (Item 3), short spring guide (Item 4), nut (Item 5) and lock nut (Item 6) onto the centering screw (Item 7).



Hold the centering screw from turning and tighten the nut to compress the spring.

Install the centering spring assembly and snap ring into the piston **[D]**.



HYDROSTATIC PUMP (Cont'd)

Assembly (Cont'd)

To seat the snap ring, loosen the nut until the centering screw is loose **[A]**.

Tighten the nut until all axial looseness is removed between the centering screw and spring guides but stop tightening the nut before the spring assembly becomes loose in the piston **[A]**.

NOTE: It will be impossible to set the pump neutral position if there is any free play between the piston and spring assembly or between the spring assembly and centering screw.

While holding the nut, tighten the jam nut to 18–27 ft.–lbs. (24–37 Nm) torque.

Install the rings, O–rings and seals as shown in Figure **[B]**:

Apply oil to two new bearing rings (Item 1), two new O–rings (Item 2) and two new seals (Item 3).

Install a bearing ring (Item 1) **[B]** and O–ring (Item 2) **[B]** onto each end of the piston.

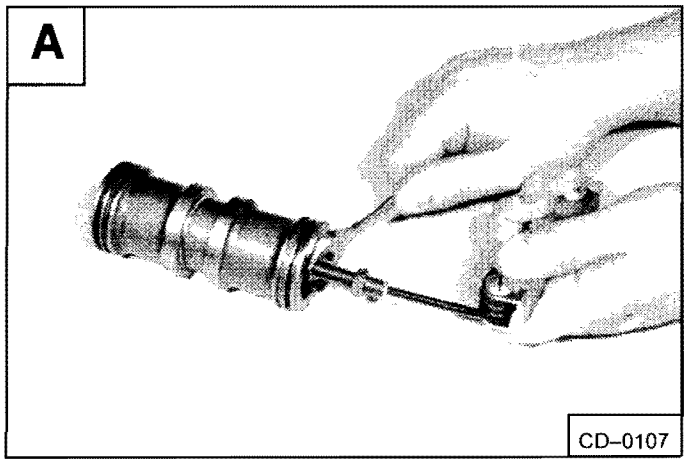
Install a seal (Item 3) **[B]** over the O–ring on the end opposite the centering screw.

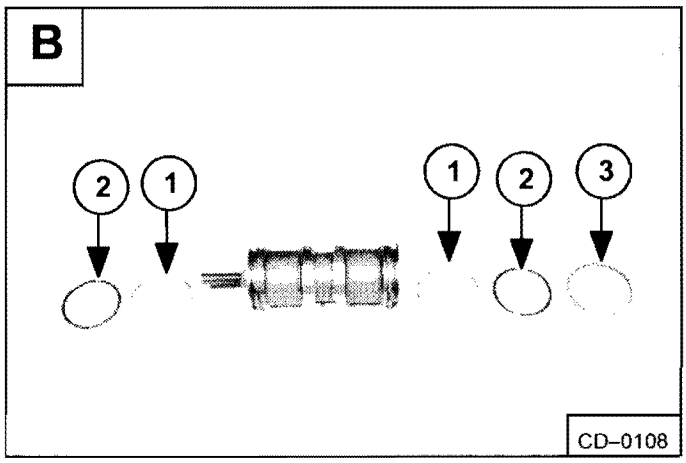
Apply oil to the spool. Carefully install the spool, centering screw first, into the housing toward the outlet port side of the housing **[C]**.

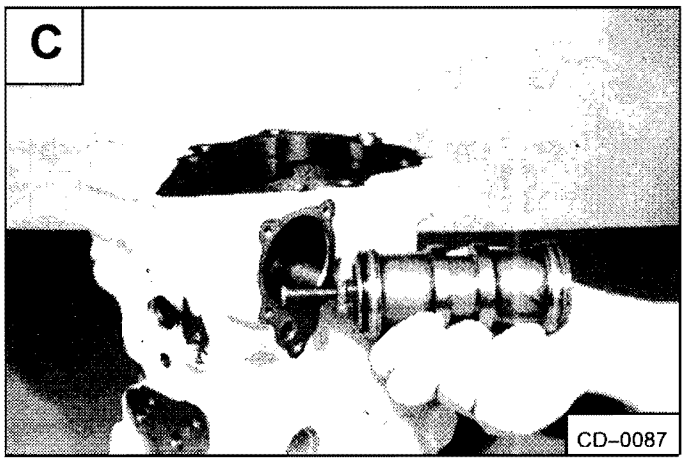
With the centering screw toward the front it makes neutral adjustment easier.

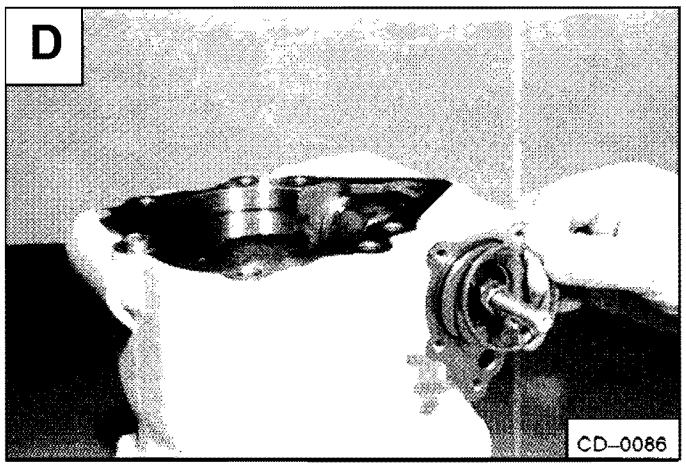
Push the piston through the housing just far enough to install the new seal over the O–ring **[D]**.

Carefully push the piston back into the housing.



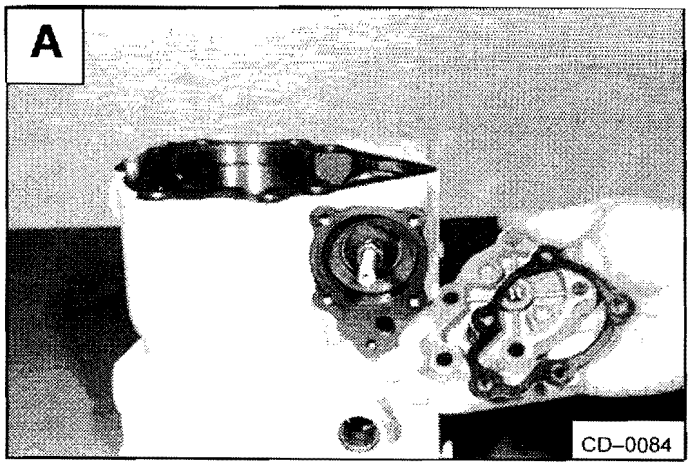






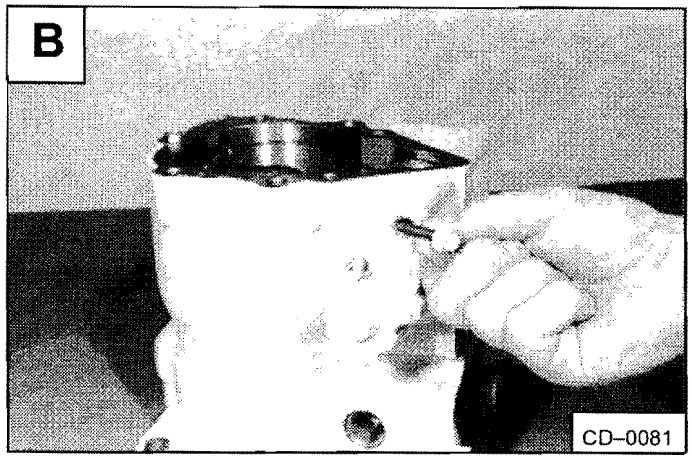
Assembly (Cont'd)

Install a new gasket. Install the end cap over the centering screw. Turn the end cap up to the housing **[A]**.



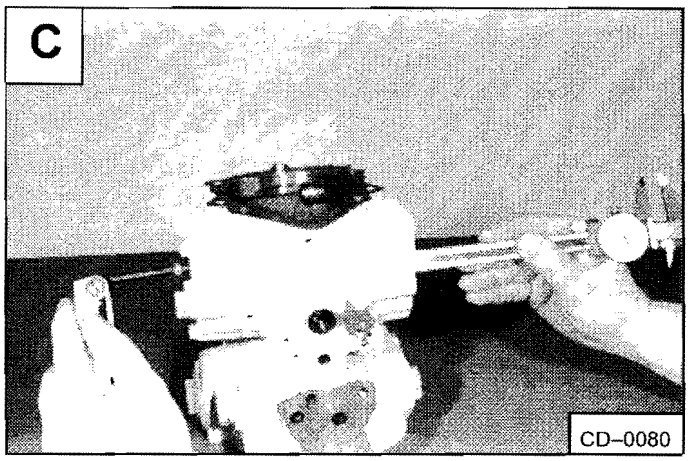
Install the five bolts into the end cap **[B]**.

Tighten the bolts to 10–13 ft.–lbs. (14–18 Nm) torque.

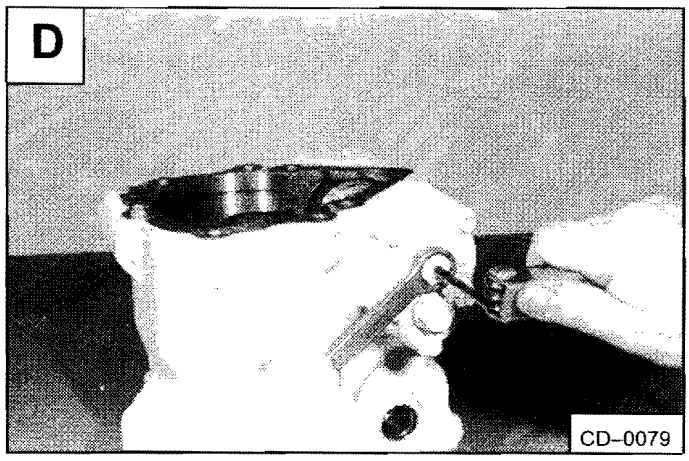


Center the piston using the measurement recorded during disassembly **[C]**.

NOTE: The approximate distance between the piston and housing edge is 0.5 inch (12,7 mm). Any measured adjustment is approximate. The final neutral adjustment must be performed with the pump installed and engine running.

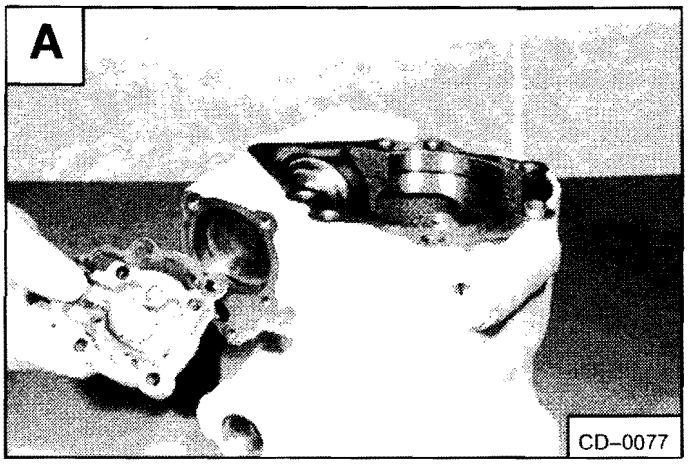


While holding the centering screw stationary, install the neutral adjustment lock nut **[D]**.



Assembly (Cont'd)

Install a new gasket and the end cap **[A]**.



Install the five bolts into the end cap **[B]**.

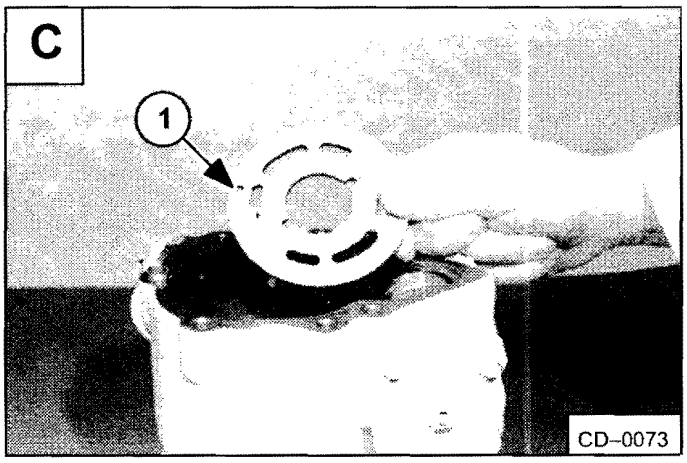
Tighten the bolts to 10–13 ft.–lbs. (14–18 Nm) torque.

Apply oil to the valve plate.

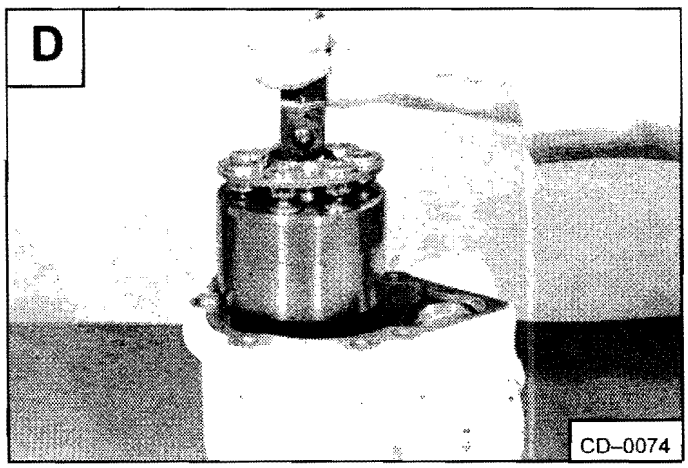
Install the valve plate, bronze side up, into the housing **[C]**.

The notch (Item 1) **[C]** in the valve plate must engage the locating spring pin in the housing.

Apply oil to the needle bearing at the base of the housing.

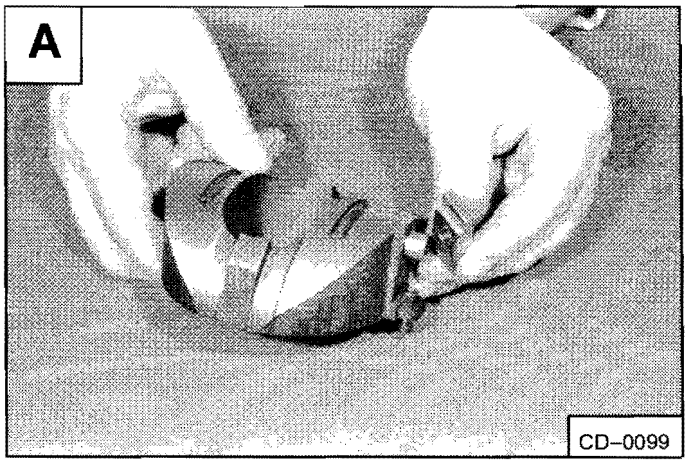


Apply oil to all parts and surfaces in the rotating group. Using a snap ring pliers, lower the rotating group into the housing **[D]**.



Assembly (Cont'd)

Apply oil to the guide and swashplate. Install the guide onto the swashplate with the guide offset positioned to provide clearance for the journal bearing **[A]**.

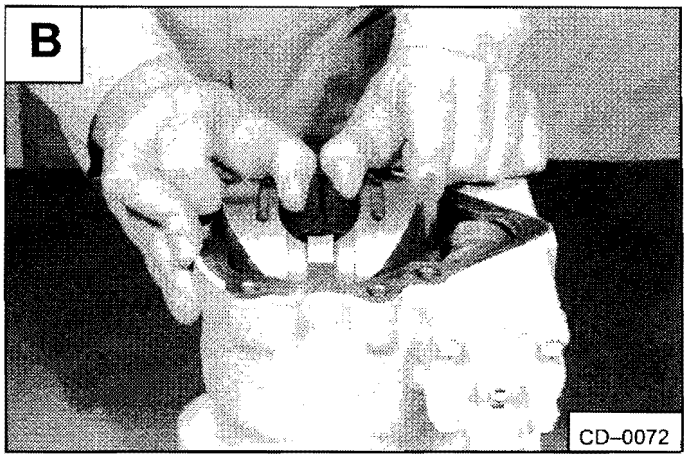


Install the swashplate into the housing **[B]**.

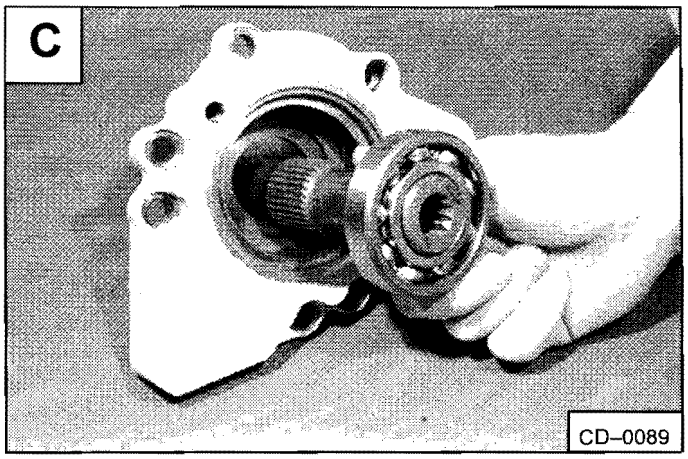
Adjust the swashplate so that the guide engages the piston.

Center the rotating group and swashplate over the needle bearing.

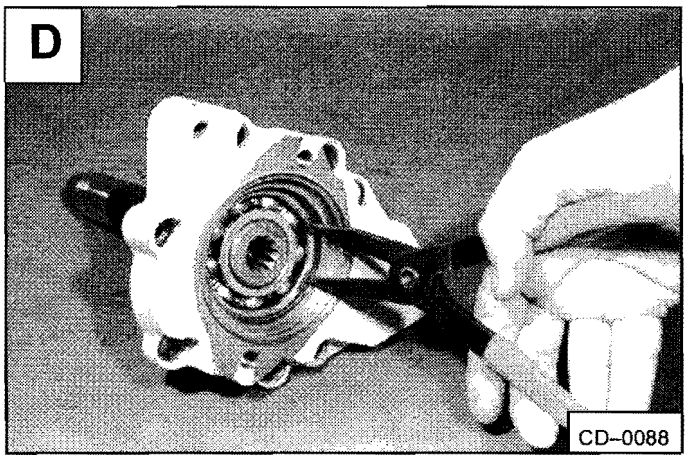
Check that the spherical washer is on top of the three pins.



Apply oil to the bearing and shaft. Install the shaft and bearing assembly into the end housing **[C]**.



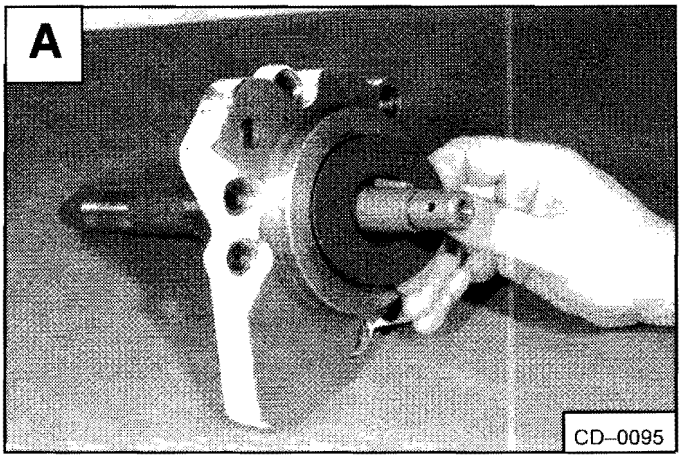
Install the snap ring **[D]**.



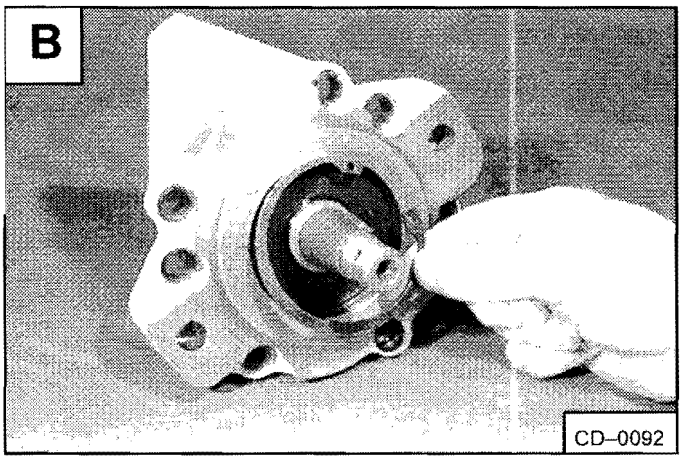
HYDROSTATIC PUMP (Cont'd)

Assembly (Cont'd)

◊ Apply a light coating of grease to the lips of a new seal. Using a correct size driver tool, install the new seal **[A]**.



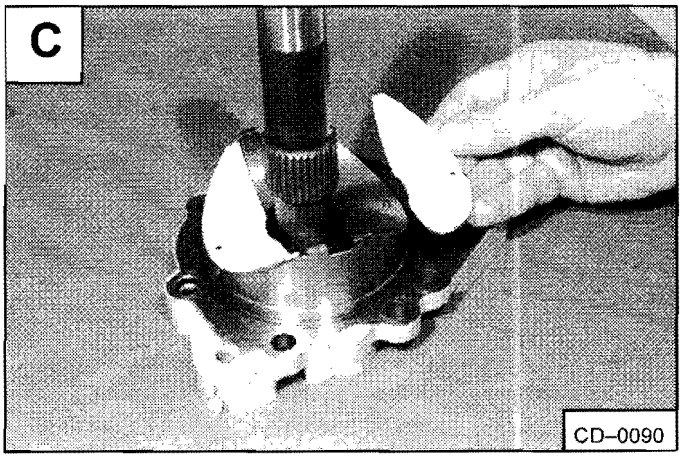
◊ Install the snap ring **[B]**.



Apply oil to both journal bearings. Install the journal bearings on the end housing **[C]**.

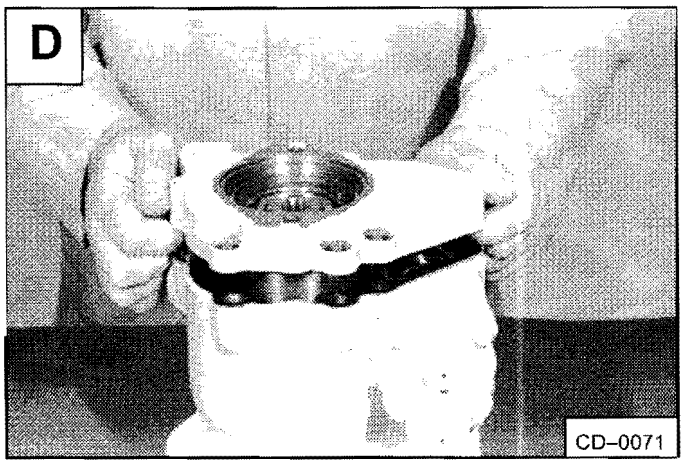
Check that the journal bearings are seated on the bearing locater pins.

NOTE: Petroleum jelly can be applied between the journal bearings and end housing to retain the journal bearings during installation on the pump.



Install a new gasket. Carefully install the end housing and shaft assembly **[D]**.

When the shaft and end housing are properly installed the rotating group spring will hold the end housing. A maximum distance of 0.125 inch (3,2 mm) away from the housing.



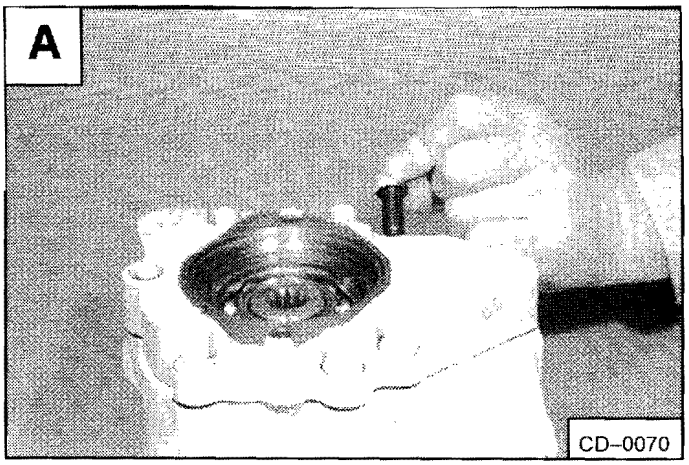
◊ Front Pump
♦ Rear Pump

Assembly (Cont'd)

Install the seven end housing bolts **[A]**.

Evenly tighten the six 7/16 inch bolts to 60–74 ft.–lbs. (81–100 Nm) torque and 3/8 inch bolt to 39–47 ft.–lbs. (53–64 Nm) torque.

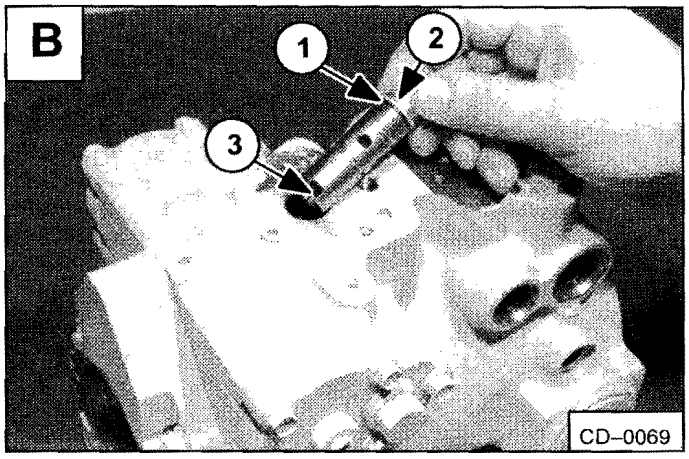
Rotate the shaft periodically while tightening the bolts to assure the correct pump assembly. When fully assembled a torque of 4–8 ft.–lbs. (5,4–10,8 Nm) will be required to turn the shaft.



Apply petroleum jelly to a new O–ring and backup washer. Install the O–ring (Item 1) **[B]** and backup washer (Item 2) **[B]** on the control sleeve.

Apply oil to the control sleeve. Install the sleeve into the housing **[B]**.

The notch (Item 3) **[B]** in the control sleeve must be installed toward the end housing and engage the spring pin in the swashplate.

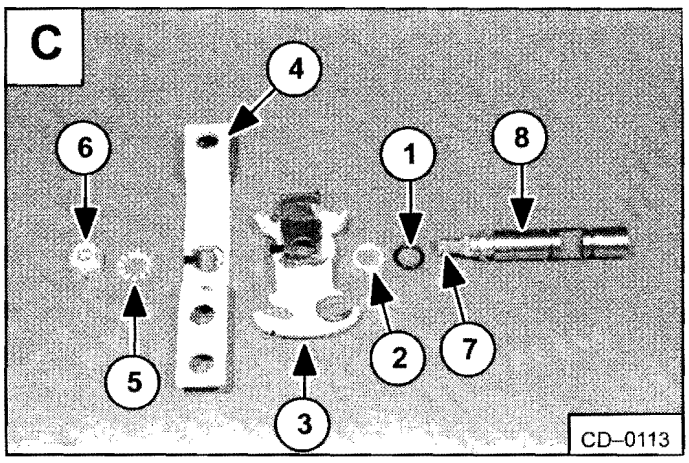


Apply petroleum jelly to a new O–ring and backup washer. Install the O–ring (Item 1) **[C]** and backup washer (Item 2) **[C]** onto the spool.

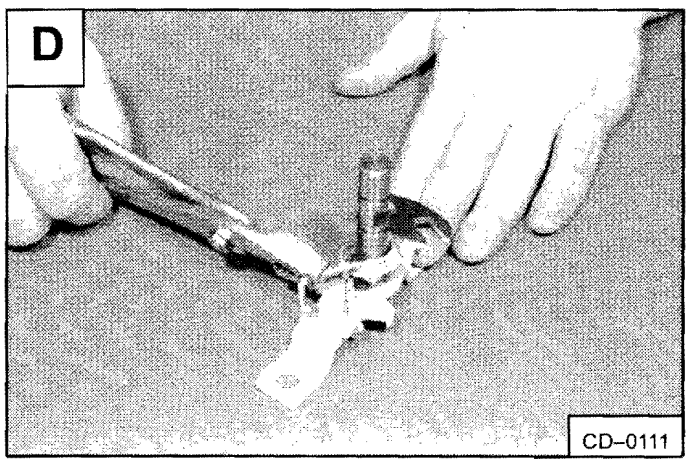
Install the neutral bracket (Item 3) **[C]** and control lever (Item 4) **[C]** on the spool aligning the marks made during disassembly with the notch (Item 4) **[C]** in the end of the spool (Item 8) **[C]**.

Install the lock washer (Item 5) **[C]** and nut (Item 6) **[C]** onto the spool.

Tighten the nut to 10–12 ft.–lbs. (13,6–16,3 Nm) torque.

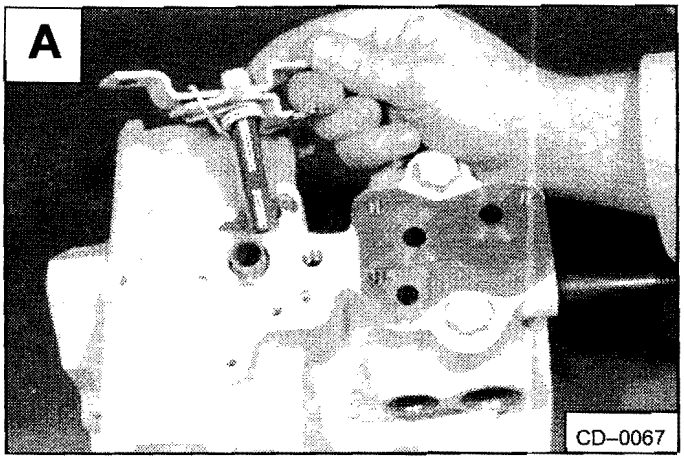


Install the spring on the control lever and spool assembly **[D]**.



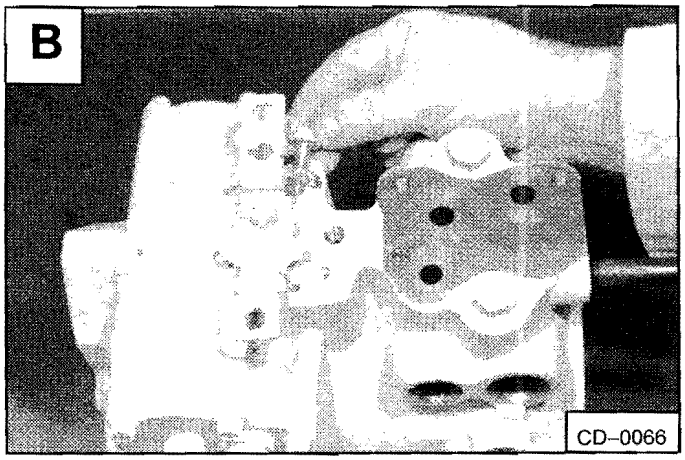
Assembly (Cont'd)

Apply oil to the spool. Install the control lever and spool assembly into the housing **[A]**.



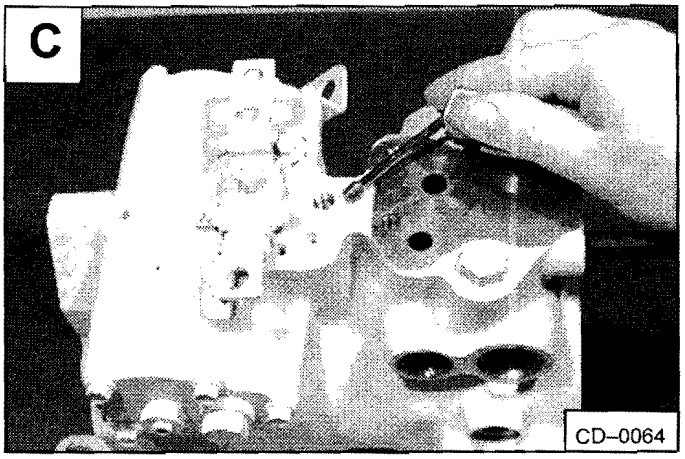
Align the neutral bracket with the reference mark made during disassembly. Install the flange head screw **[B]**.

NOTE: Removal of any part of the mechanical control will result in the loss of the neutral setting and will require neutral adjustment. Refer to Page 3–59 for the correct neutral adjustment procedure. The neutral adjustment procedure must be performed with the pump installed and engine running.

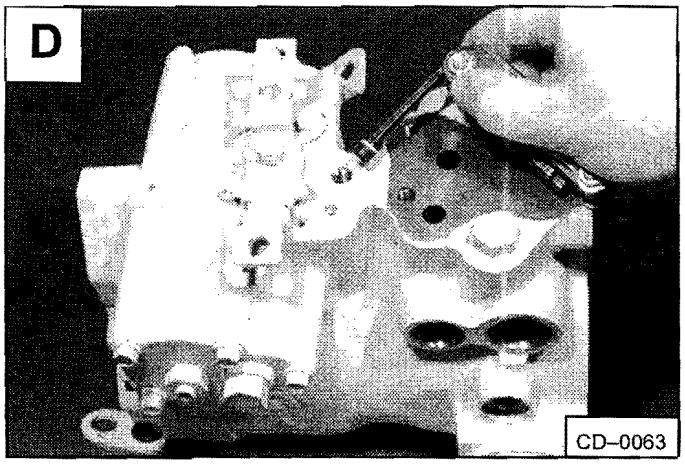


Install the screened orifice plug **[C]**.

Tighten the plug to 8–12 ft.–lbs. (10,8–16,3 Nm) torque.



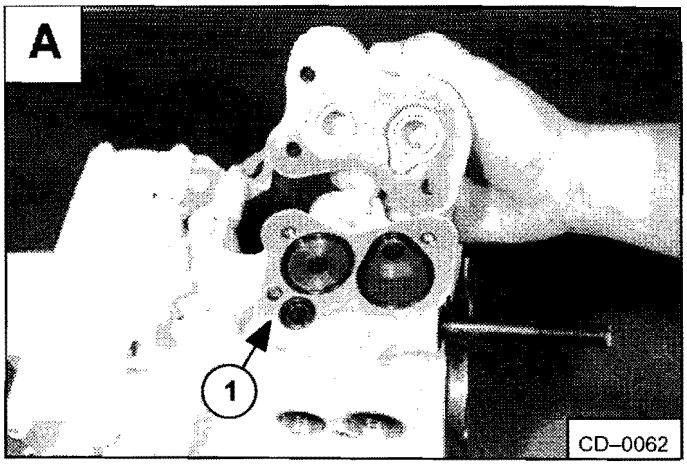
Apply thread sealant to the plug threads. Install the plug into the housing **[D]**.



Assembly (Cont'd)

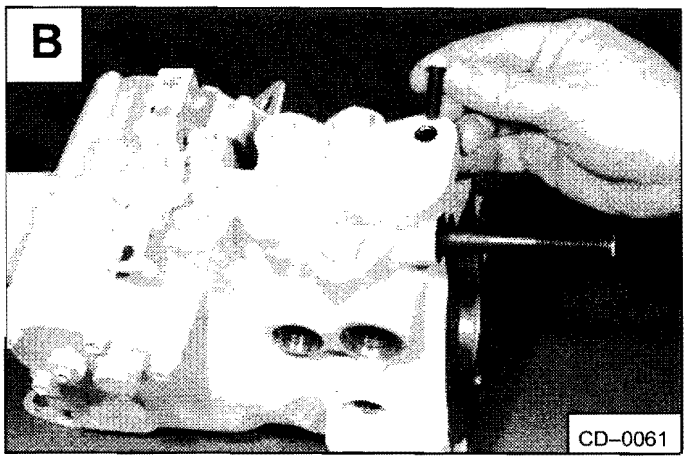
◊ Apply oil to the three molded O–rings on the plate (Item 1) **[A]**. Install the plate onto the housing.

Install the adapter housing **[A]**.



♦ Install the three bolts into the adapter housing **[B]**.

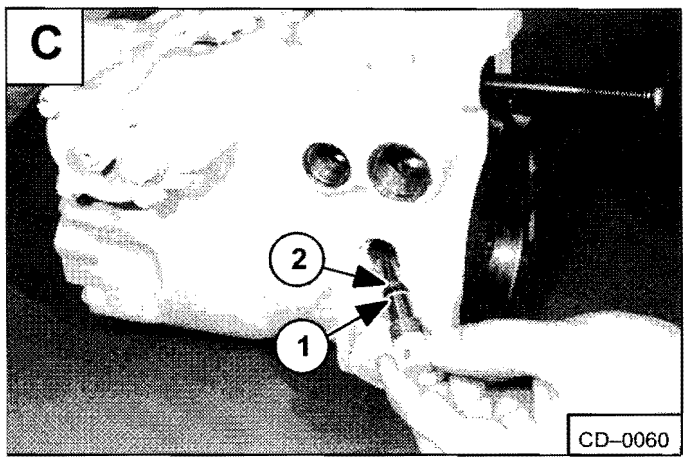
Evenly tighten the bolts to 16–21 ft.–lbs. (22–28 Nm) torque.



♦ Apply petroleum jelly to a new O–ring and backup washer. Install the backup washer (Item 1) **[C]** and O–ring (Item 2) **[C]** onto the bypass valve.

Install the bypass valve **[C]**.

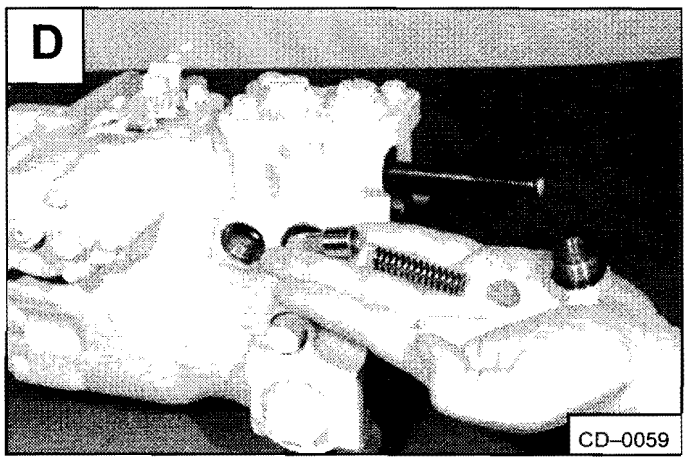
Tighten the valve to 7–10 ft.–lbs. (9,5–13,6 Nm) torque.



♦ Apply petroleum jelly to a new O–ring. Install the O–ring on the plug **[D]**.

Apply oil to the charge pressure relief valve. Install the charge pressure relief valve, spring, shims (if equipped) and plug **[D]**.

Tighten the plug to 30–70 ft.–lbs. (41–95 Nm) torque.



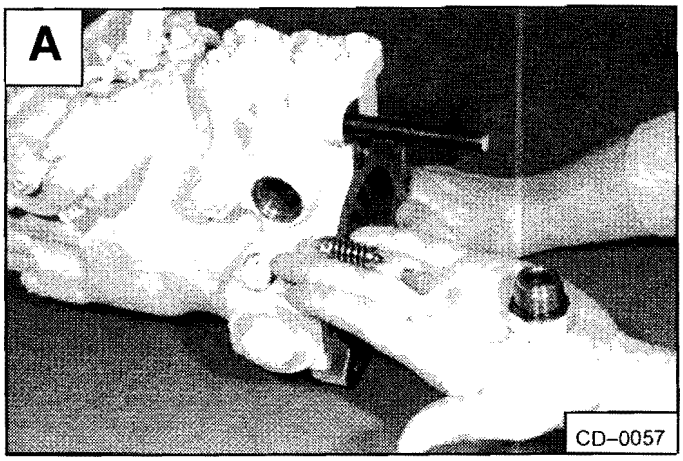
◊ Front Pump
♦ Rear Pump

Assembly (Cont'd)

Apply petroleum jelly to a new O–ring. Install the O–ring on the plug **[A]**.

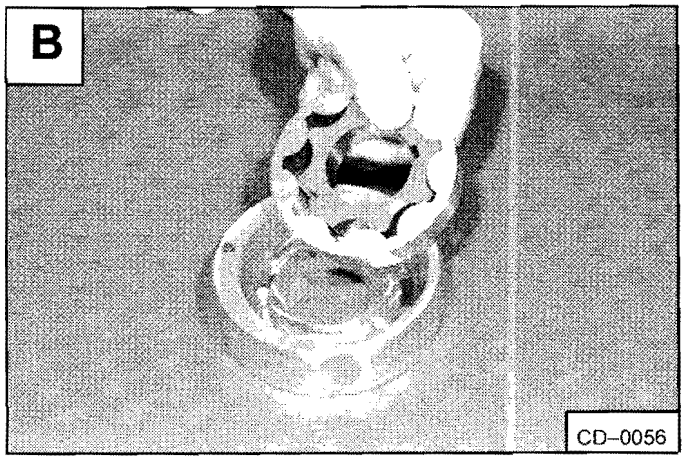
Apply oil to the high pressure relief valve cartridge. Install the high pressure relief valve cartridge, spring, shims (if equipped) and plug **[A]**.

Tighten the plug to 70 ft.–lbs. (95 Nm) torque.



Charge Pump Assembly

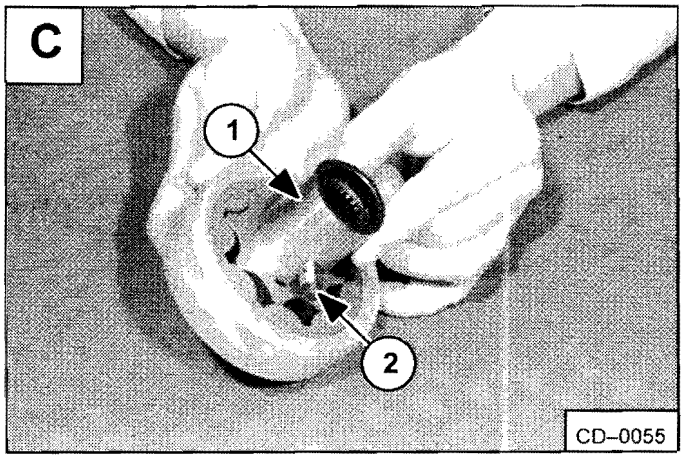
Apply oil to the gerotor assembly and gerotor cover. Install the gerotor assembly into the gerotor cover **[B]**.



Apply oil to the splined coupler (Item 1) **[C]** and drive pin (Item 2) **[C]**.

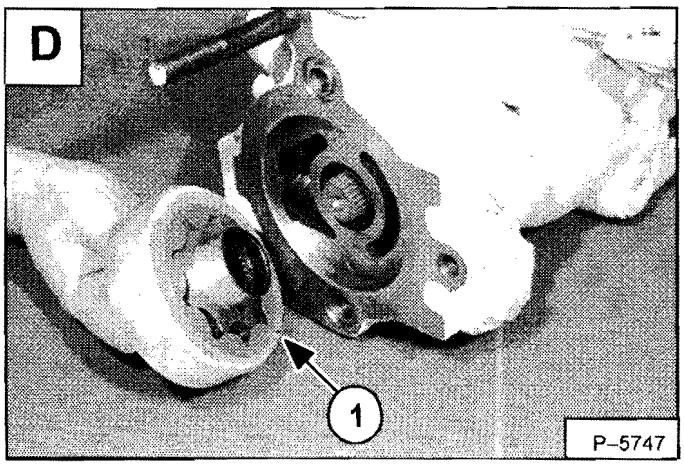
Install the splined coupler and drive pin into the gerotor assembly **[C]**.

The drive pin must be engaged in the gerotor slot.



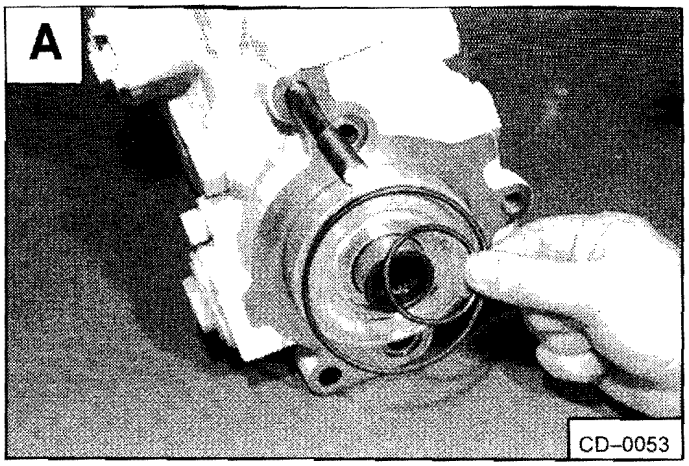
Install the gerotor assembly into the rear pump **[D]**.

Make sure to install the gerotor assembly for the correct rotation. The pin (Item 1) **[D]** must be installed closest to the control with the four pressure ports on one side (top hole).



Charge Pump Assembly (Cont'd)

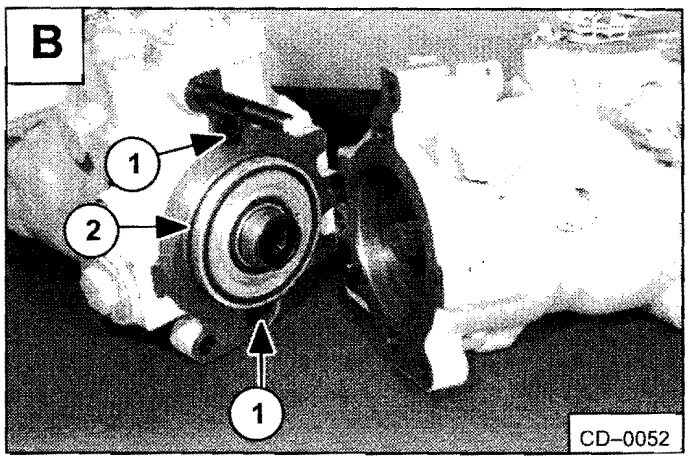
Apply petroleum jelly to two new O–rings. Install the O–rings on the gerotor cover **[A]**.



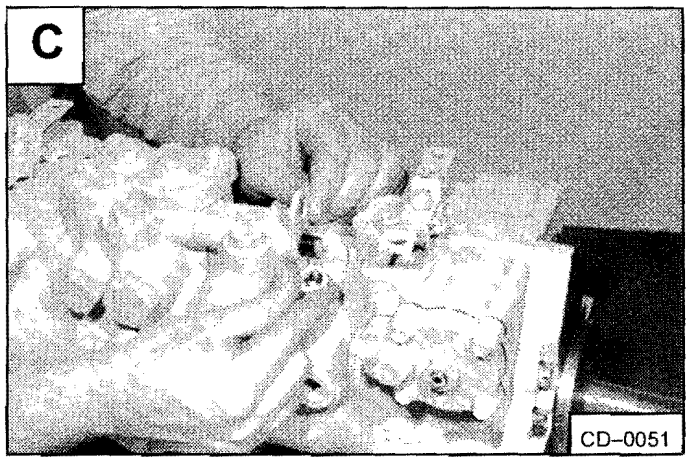
Hydrostatic Pump Connection

Apply petroleum jelly to two new small O–rings (Item 1) **[B]** and a large O–ring (Item 2) **[B]**. Install the O–rings on the rear pump.

Connect the two hydrostatic pumps **[B]**.



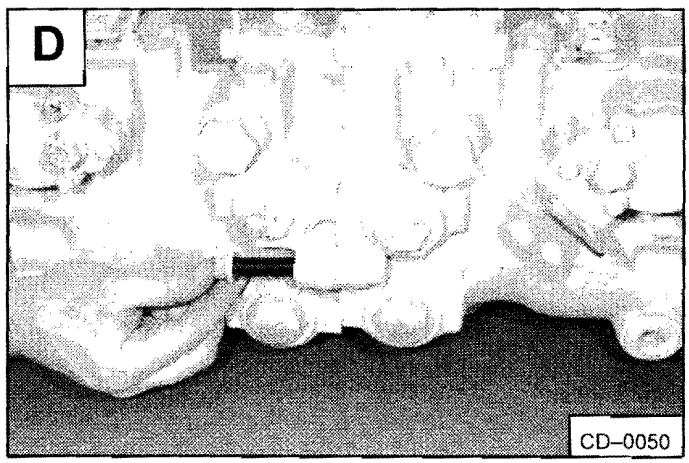
Install the lift bracket and nut **[C]**.



Install a bolt on both sides of the pump assembly **[D]**.

Evenly tighten the two bolts and nuts to 67–82 ft.–lbs. (91–111 Nm) torque.

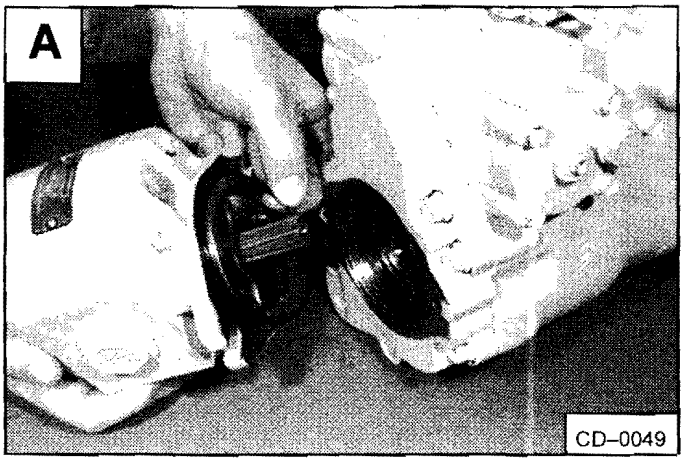
Rotate the tandem pump input shaft to check for proper assembly.



Hydraulic Pump Installation

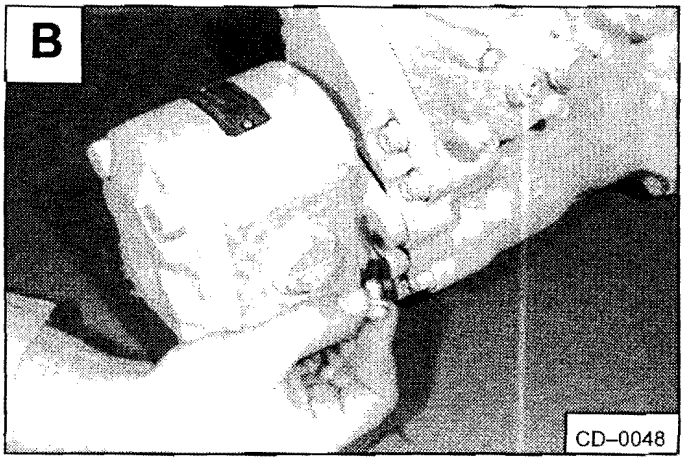
Apply petroleum jelly to a new O–ring. Install the O–ring on the hydraulic pump **[A]**.

Install the hydraulic pump on the tandem pump assembly **[A]**.



Install the two bolts **[B]**.

Tighten the bolts evenly to 25–27 ft.–lbs. (34–37 Nm) torque.



Hydrostatic Pump Neutral Adjustment

⚠ WARNING

When working on the left side of the hydrostatic pump, Be Careful to keep your fingers and tools clear of the cooling fan belt.

W–2185–0395

After the hydrostatic pump has been rebuilt, the neutral for the servo valve spool will have to be adjusted. Use the following procedure:

NOTE: The hydrostatic pump must be installed in the loader for this procedure.

1. Block the neutral spring bracket out with a large socket (1–1/8") so you can feel and see the linkage neutral setting **[A]** & **[B]**.

2. Loosen the bolt for the neutral adjustment bracket on the servo spool.

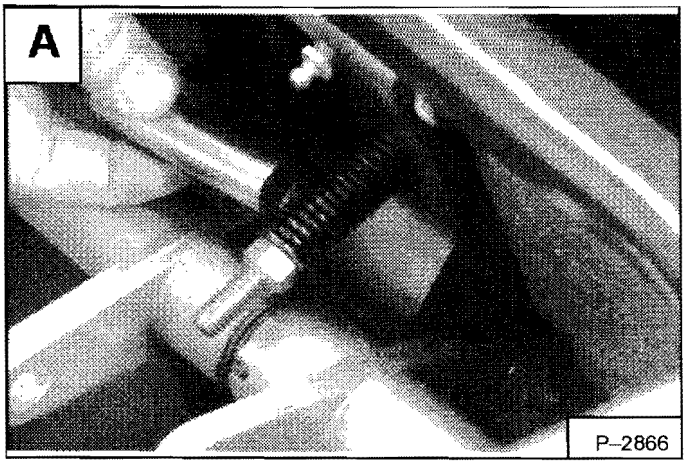
3. Clamp the control lever to the neutral adjustment bracket with a small vice grip **[C]**.

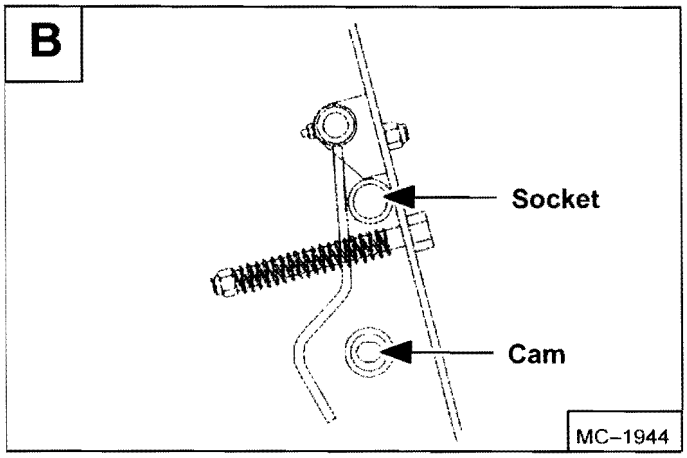
4. Start the engine. With the engine running at full RPM, move the control lever forward until the wheels just begin to move. Mark the position on the bracket (felt tip pen) **[D]**.

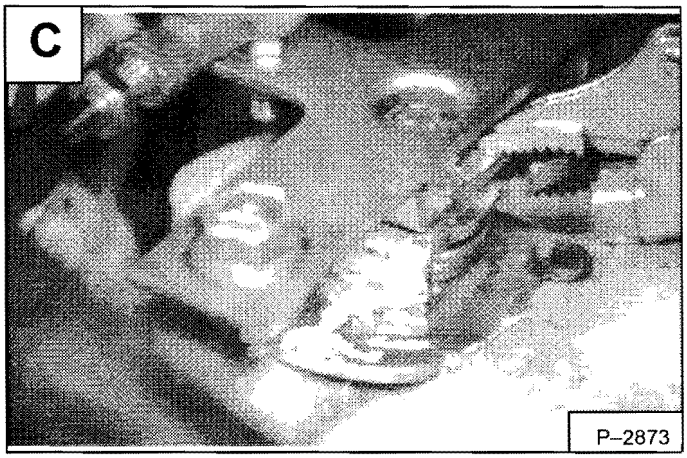
5. Move the control lever in reverse until the wheels just begin to move. Mark this position **[D]**.

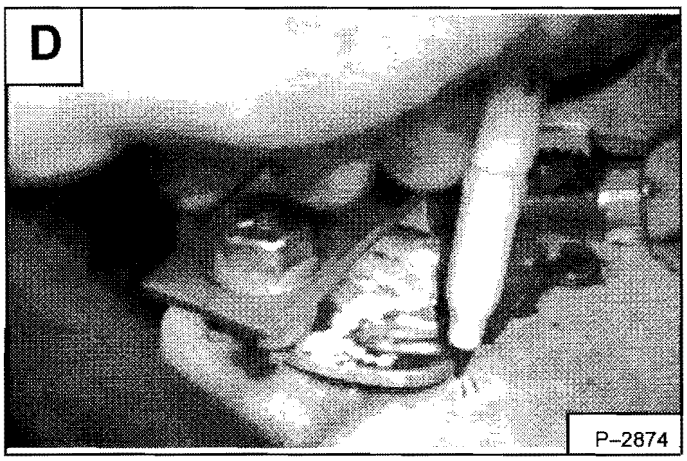
6. Stop the engine.

7. Position the neutral adjustment bracket between the two marks and tighten the holddown bolt. Remove the vise grip. Start the engine and check in both directions to be sure the pump will return to neutral.









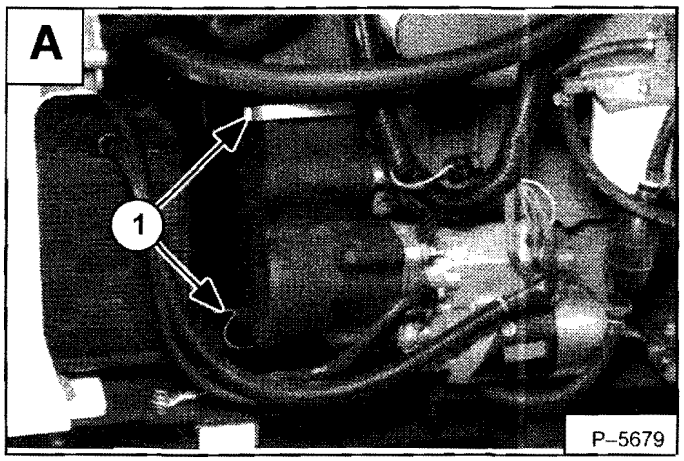
DRIVE BELT SHIELD

Removal and Installation

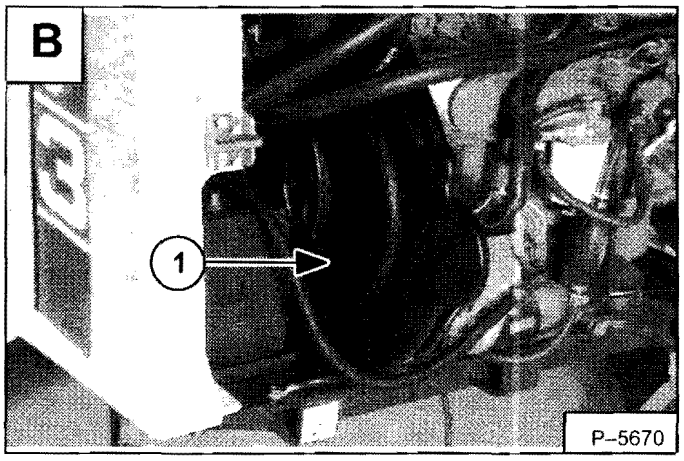
Stop the engine.

Open the rear door.

Remove the three belt shield holddown clips (Item 1) **[A]**.



Remove the belt shield (Item 1) **[B]** from the drive belt housing.



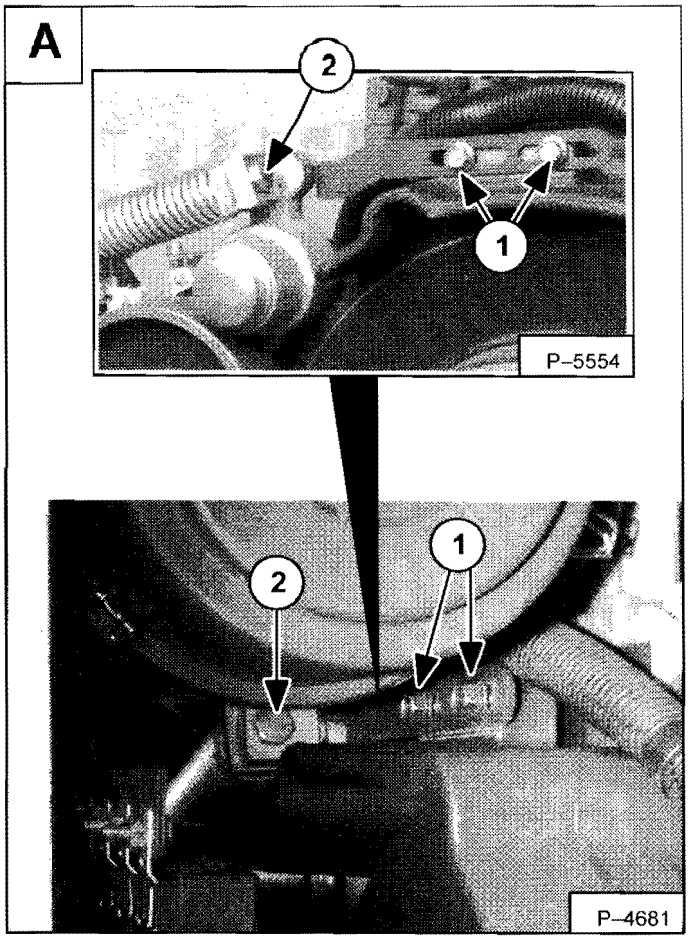
DRIVE BELT

Adjusting the Drive Belt

The drive belt idler arm stop is located on the left side of the engine below the air cleaner **[A]**.

Loosen the two bolts (Item 1) **[A]** and slide the stop against the idler arm. Tighten the bolts.

There is no adjustment for the spring, just make sure the spring bolt (Item 2) **[A]** is tight.



Replacing the Drive Belt

Remove the belt shield (Page 3–60).

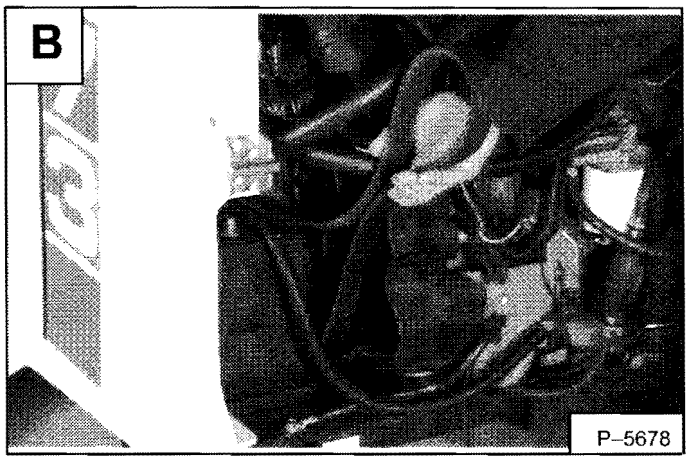
Loosen the two stop mounting bolts (Item 1) **[A]**.

Loosen the spring tension bolt (Item 2) **[A]**.

Remove the fan drive belt from the tension pulley.

Remove the drive belt from the hydrostatic pump pulley and flywheel pulley.

Remove the drive belt **[B]**.

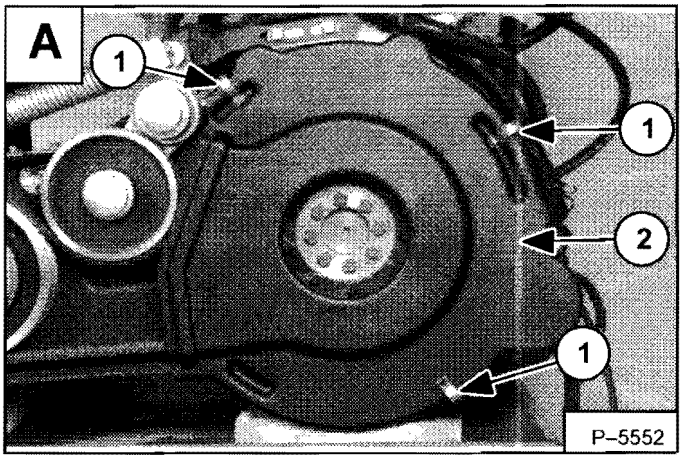


DRIVE BELT TENSIONER PULLEY

Removal and Installation

Remove the belt shield clips (Item 1) **[A]**.

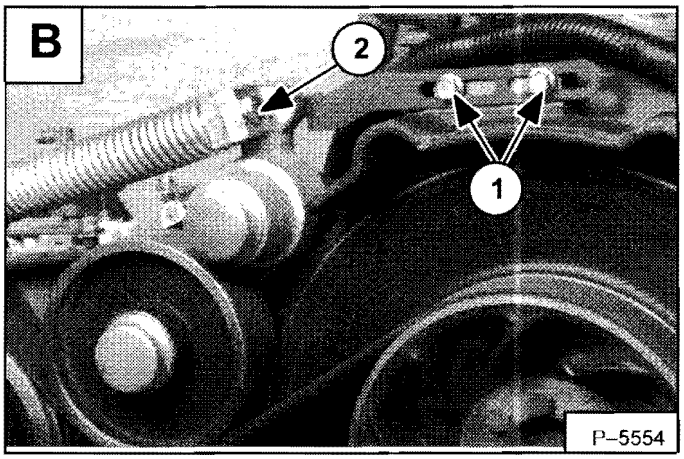
Remove the belt shield (Item 2) **[A]**.



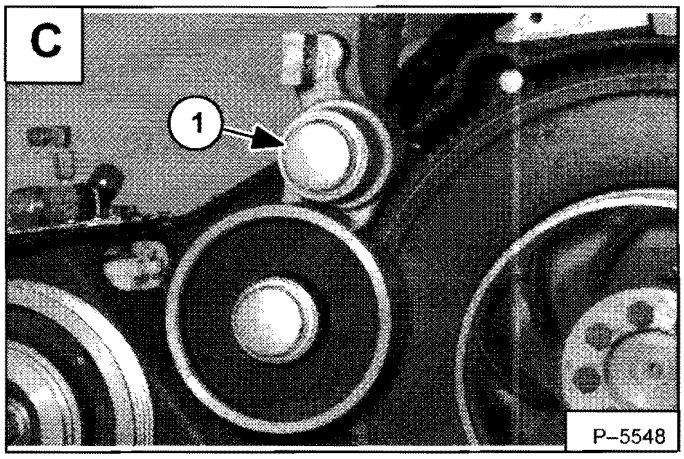
Remove the two stop mounting bolts (Item 1) **[B]**.

Remove the stop.

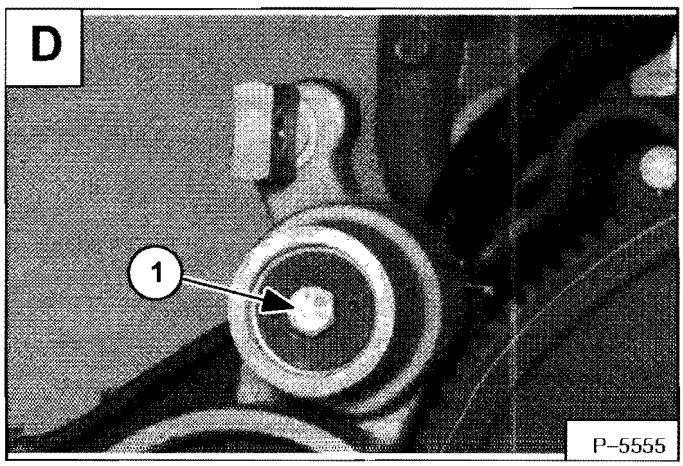
Remove the spring tension bolt (Item 2) **[B]**.



Remove the end cap (Item 1) **[C]** from the tension pulley arm.



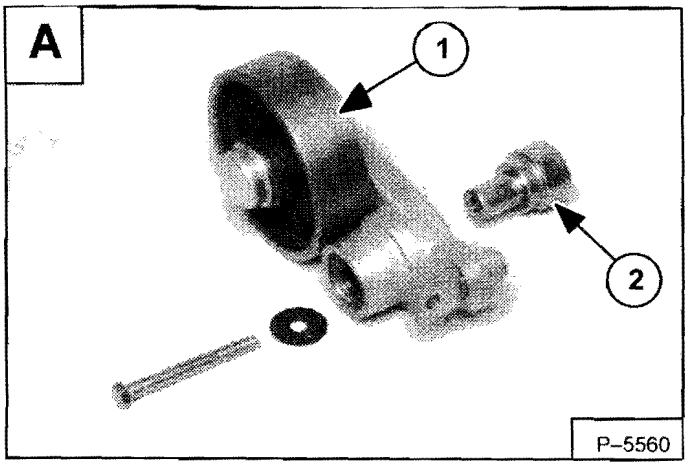
Remove the mounting bolt (Item 1) **[D]** from the tension pulley arm.



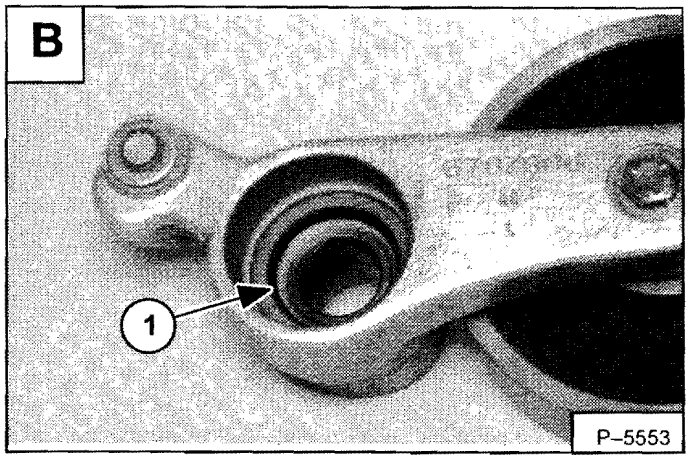
Removal and Installation (Cont'd)

Remove the pulley/arm assembly (Item 1) **[A]** from the engine housing.

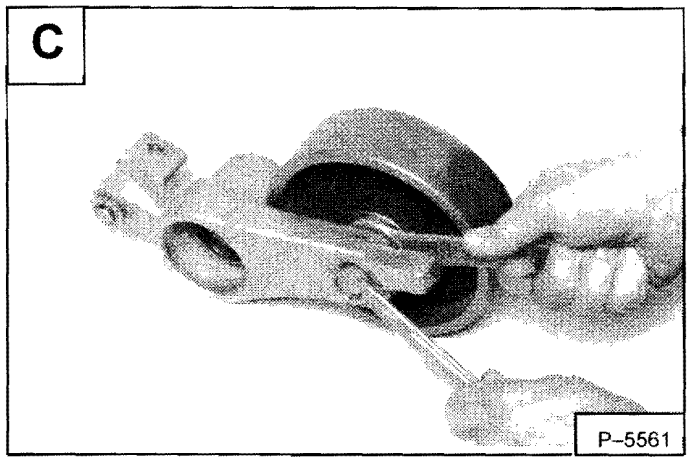
Remove the arm bushing (Item 2) **[A]**. Check for wear and replace as needed.



Check the arm seal (Item 1) **[B]**. Replace the seal as needed.

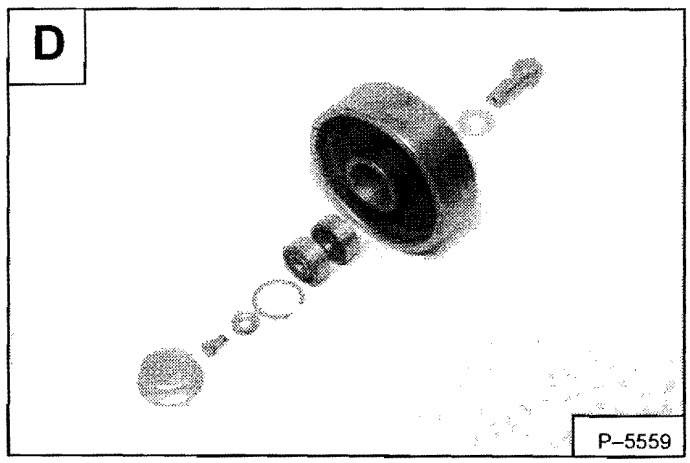


Remove the pulley mounting bolt **[C]**.



Disassembly the pulley and bearings as shown in figure **[D]**.

Check the parts for wear and replace as needed.

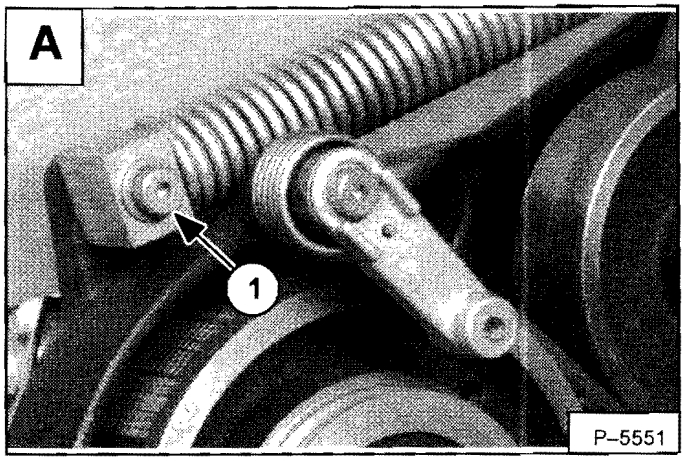


DRIVE BELT TENSIONER PULLEY (Cont'd)

Tension Spring

Remove the base end bolt (Item 1) **[A]** from the spring block.

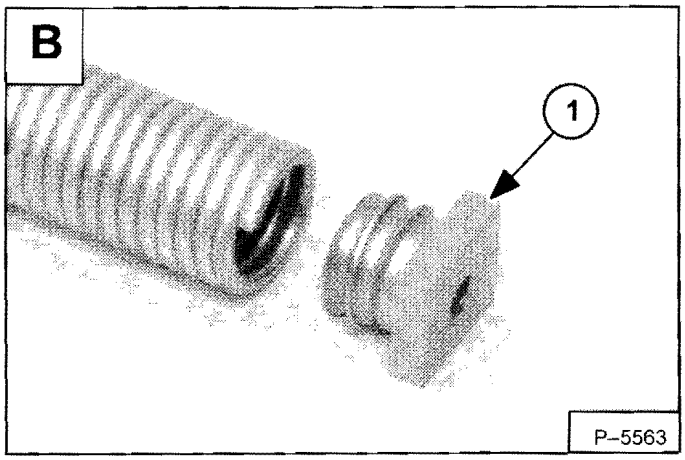
Remove the tension spring from the engine housing.



Remove the end block (Item 1) **[B]** (both ends) from the spring.

Check the spring for wear and etc. Replace the spring as needed.

Check the spring end blocks for wear and replace as needed.



OIL COOLER

Removal and Installation

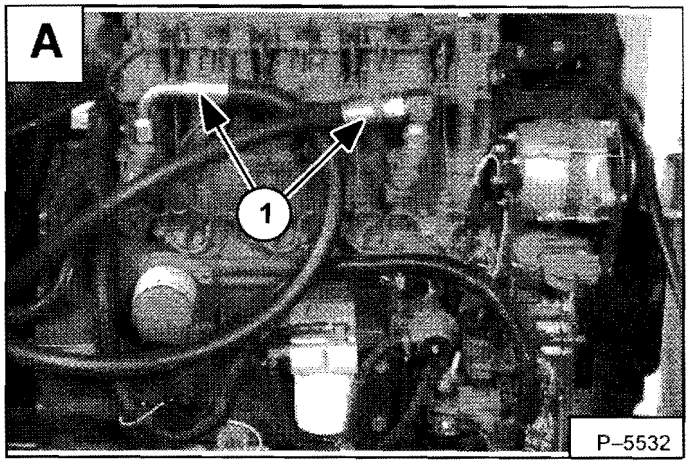
Raise the lift arms and install an approved lift arm support device (Page 1–1).

Raise the operator cab (Page 1–1).

Remove the rear grill (Page 5–1).

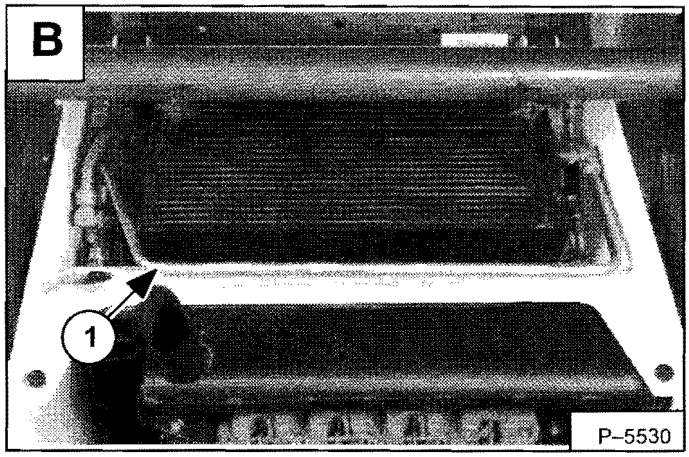
Remove the blower fan and housing (Page 7–1).

Disconnect the hoses (Item 1) **[A]** from the engine and drain the engine oil from the oil cooler into a container.

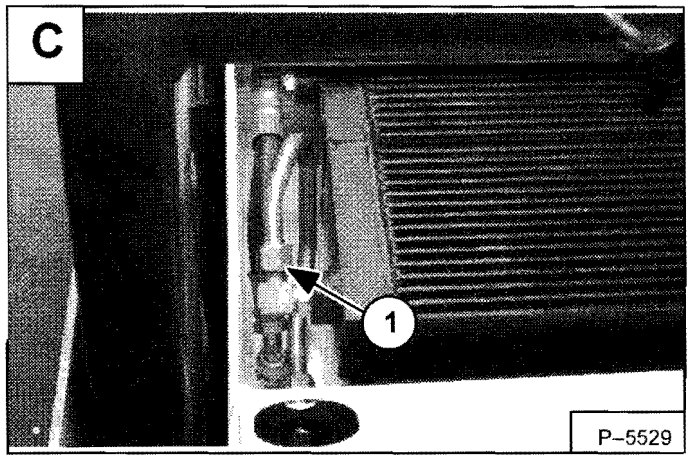


NOTE: Measure the amount of oil removed from the oil cooler and/or engine. Add the same amount of oil to the engine crankcase when adding engine oil.

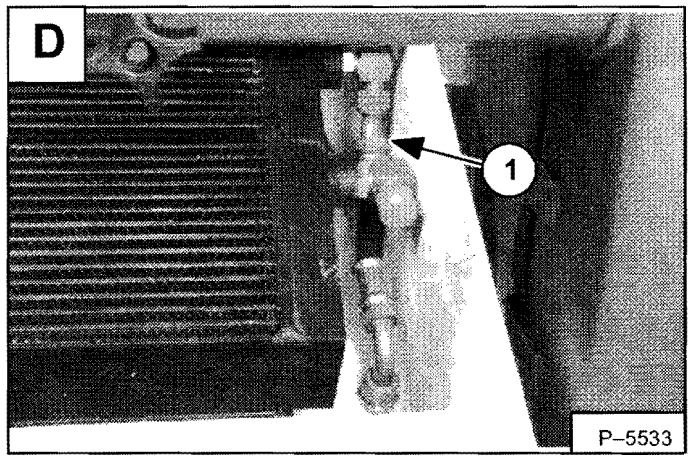
Remove the tubeline (Item 1) **[B]**.



Disconnect and remove the tubeline (Item 1) **[C]**.

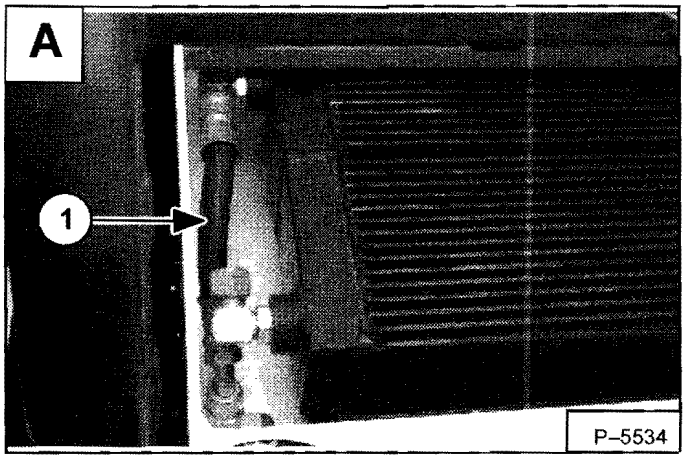


Disconnect the hose (Item 1) **[D]**.



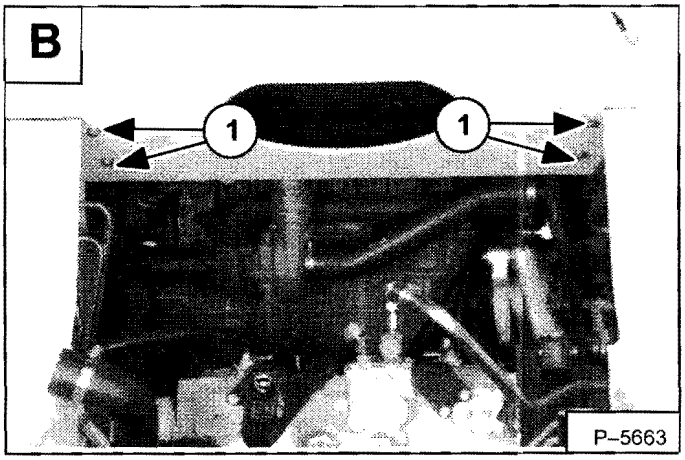
Removal and Installation (Cont'd)

Disconnect the hose (Item 1) **[A]**.



Remove the four mounting bolts (Item 1) **[B]** from the oil cooler.

Remove the oil cooler from the loader.



DRIVE SYSTEM

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BRAKE DISC	
Removal and Installation	4–5
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FRONT CHAINCASE COVER	
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PARKING BRAKE PEDAL	
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REAR CHAINCASE COVER	
Removal and Installation	4–7

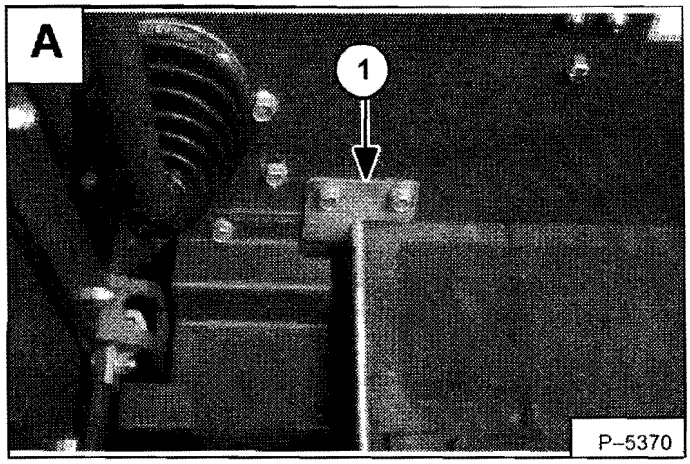
bobcat

PARKING BRAKE PEDAL

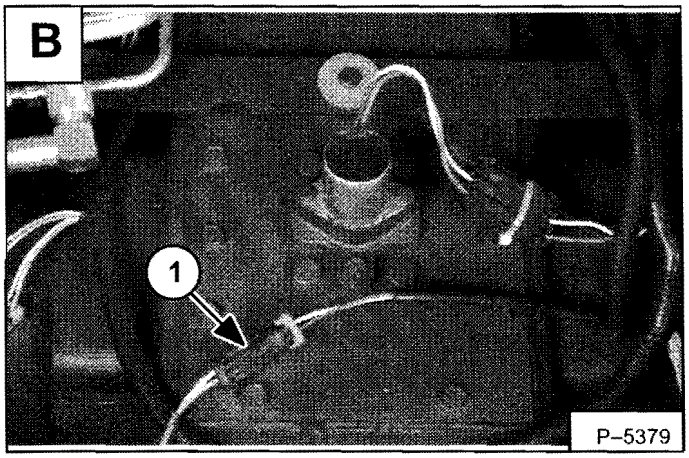
Removal and Installation

Raise the operator cab (Page 1–1).

Remove the access cover (Item 1) **[A]** at the front panel.

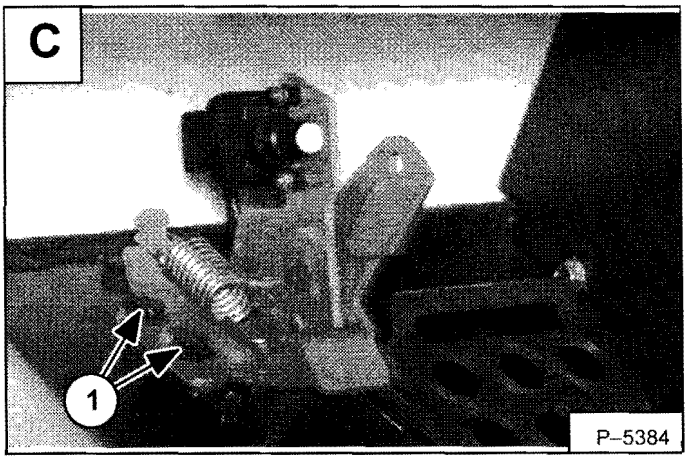


Disconnect the wire connectors (Item 1) **[B]** from the brake pedal.



Remove the mounting bolts (Item 1) **[C]** from the brake pedal.

Remove the brake pedal assembly.



PARKING BRAKE PEDAL (Cont'd)

Disassembly and Assembly

Loosen and remove the mounting bolt (Item 1) **[A]** and nut from the spring mounting bracket (Item 2) **[A]**.

Remove the brake pedal spring (Item 3) **[A]** from the tension spring mounting bracket (Item 2) **[A]** and from the brake pedal mounting bracket (Item 4) **[A]**.

Remove the mounting bolts, washers and nuts (Item 5) **[A]** from the brake pedal sensor.

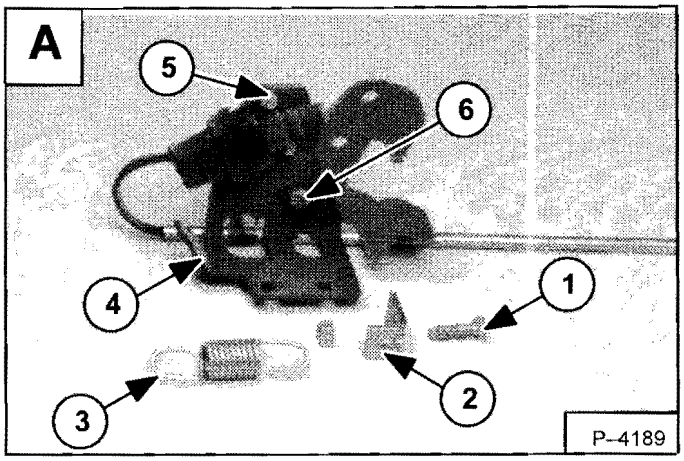
Remove the harness mounting clamp (Item 1) **[B]** from the pedal mounting bracket (Item 4) **[A]**.

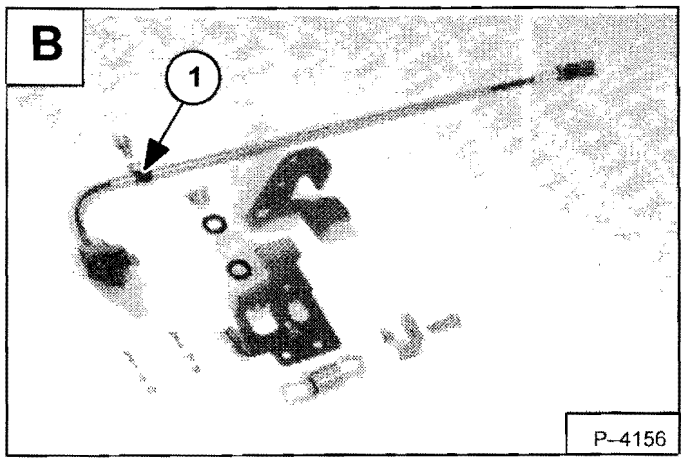
Remove the sensor harness from the pedal mounting bracket.

Remove the pedal mounting bolt (Item 6) **[A]**, plastic spacers and bushing nut from the brake pedal.

Remove the pedal from the pedal mounting bracket.

Photo **[B]** shows the parking brake disassembled to identify the existing parts in the brake assembly.





BRAKE DISC

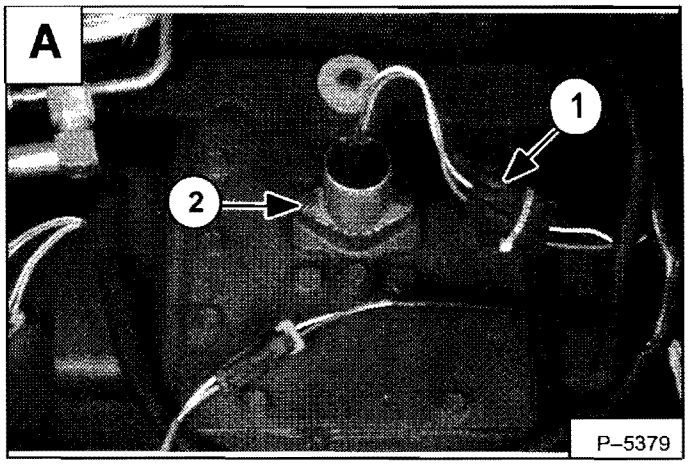
Removal and Installation

Raise the lift arms and install an approved lift arm support device (Page 1–1).

Raise the operator cab (Page 1–1).

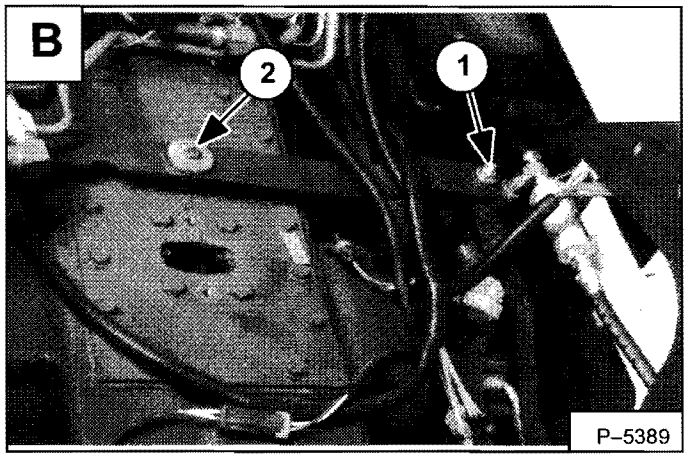
Disconnect the wiring connector (Item 1) **[A]** at the traction lock solenoid.

Remove the traction lock solenoid (Item 2) **[A]** (Page 8–1).

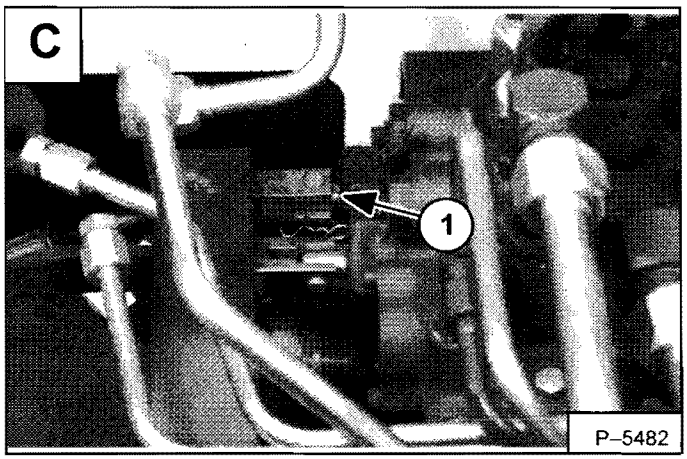


Remove the bolt and nut (Item 1) **[B]** to disconnect the lift linkage from crossmember.

Remove the crossmember bolt (Item 2) **[B]**.

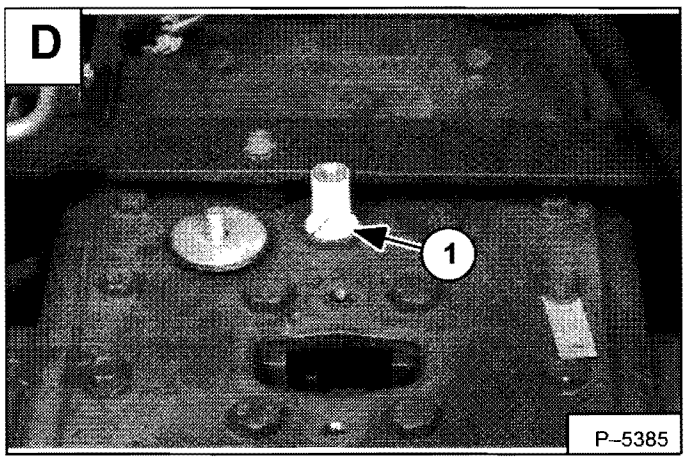


Disconnect the crossmember from the control valve lift spool (Item 1) **[C]**.



Remove the crossmember from the pivot **[D]**.

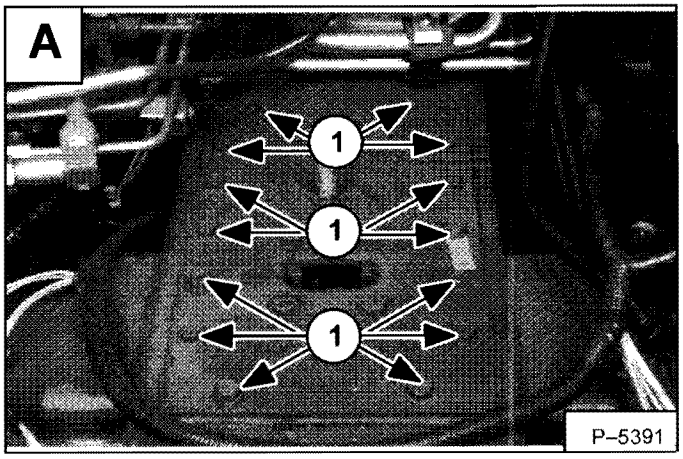
Installation: Check the nylon bushing (Item 1) **[D]** for wear and replace as needed.



BRAKE DISC (Cont'd)

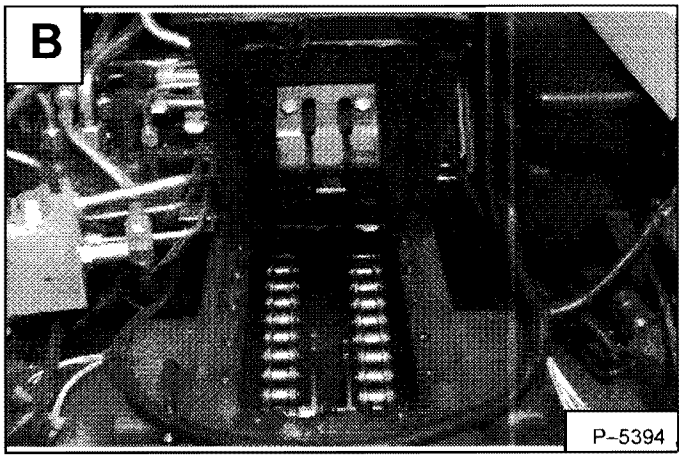
Removal and Installation (Cont'd)

Remove the bolts (Item 1) **[A]** from the center cover.



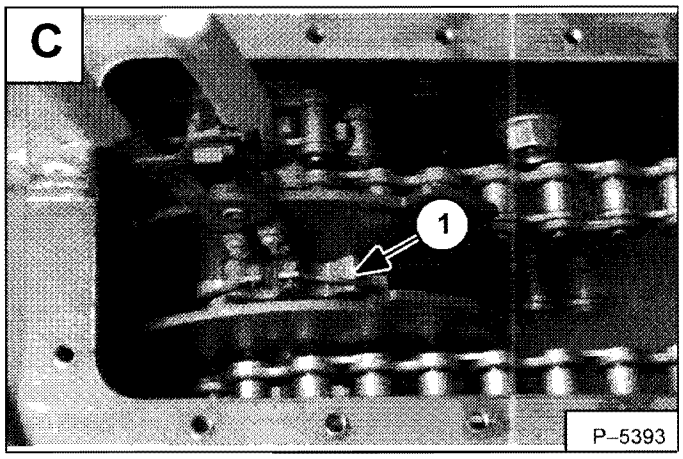
Remove the center chaincase cover/disc guides assembly **[B]**.

Installation: Make sure the brake discs go between the disc guide slots.



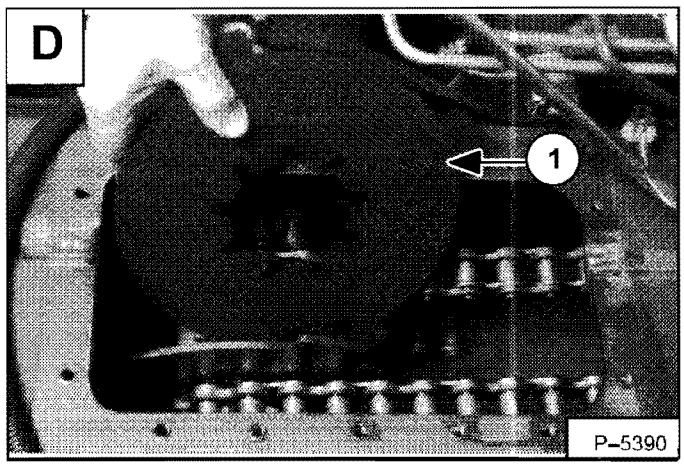
A snap ring pliers with 90° tips is needed for removing the brake disc snap ring.

Remove the snap ring from the end of the disc hub (Item 1) **[C]**.



Slide the brake disc (Item 1) **[D]** off the disc hub and remove from chaincase.

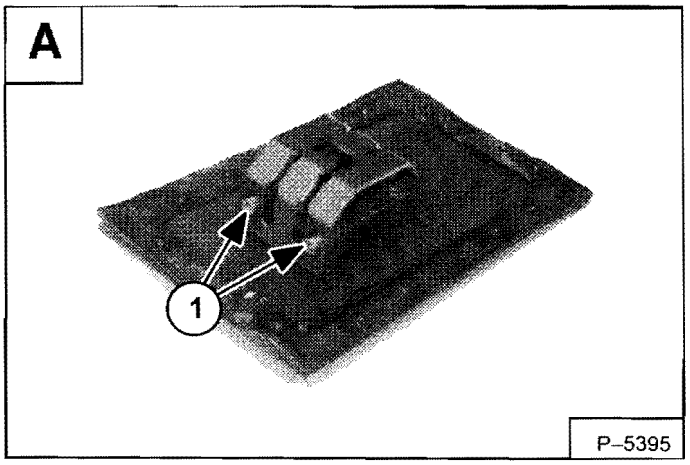
Inspect the brake disc for wear or damage and replace as needed.



BRAKE DISC (Cont'd)

Removal and Installation (Cont'd)

The brake disc guide can be replaced by removing the guide mounting bolts (Item 1) **[A]**.



FRONT CHAINCASE COVER

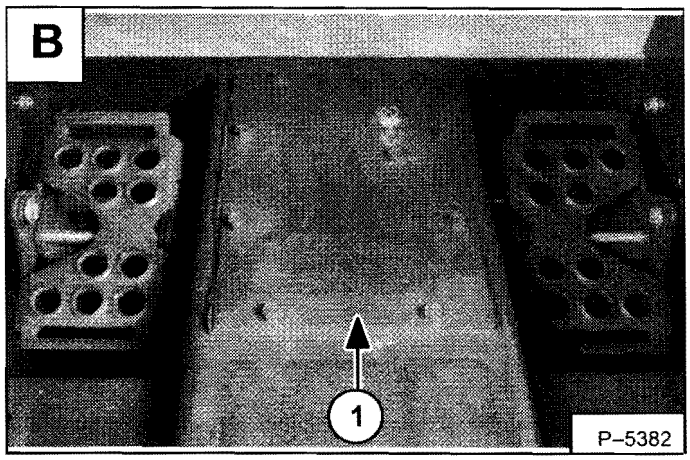
Removal and Installation

Remove the front panel (Page 3–1).

Remove the parking brake pedal (Page 4–3).

Remove the mounting bolts from the front chaincase cover (Item 1) **[B]**.

Remove the cover.



REAR CHAINCASE COVER

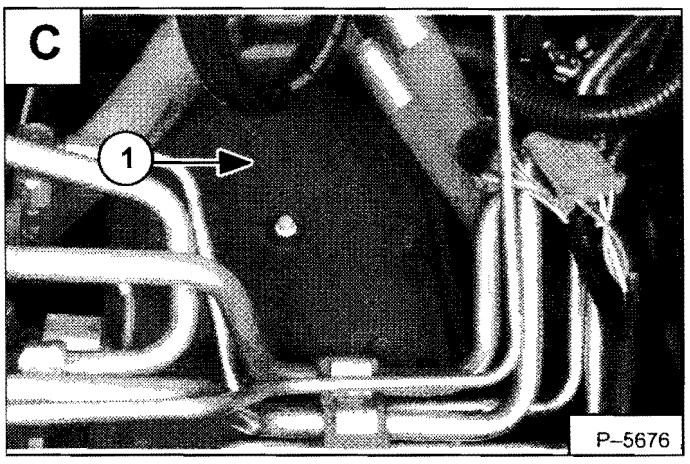
Removal and Installation

Raise the lift arms and install an approved lift arm support device (Page 1–1).

Raise the operator cab (Page 1–1).

Remove the mounting bolts from the rear chaincase cover (Item 1) **[C]**.

Remove the cover.



AXLE SEAL

Removal and Installation

Lift and block the loader (Page 1–1).

Remove the tire/wheel assembly.

Installation: Tighten the wheel nuts to 105–115 ft.–lbs. (142–155 Nm) torque.

Remove the bolts (Item 1) **[A]** and plate.

Installation: Tighten the bolt to 685–785 ft.–lbs. (928–1064 Nm) torque.

Remove the two wheel studs (Item 2) **[A]** across from each other.

Install puller (Item 1) **[B]** on the wheel hub.

⚠ WARNING

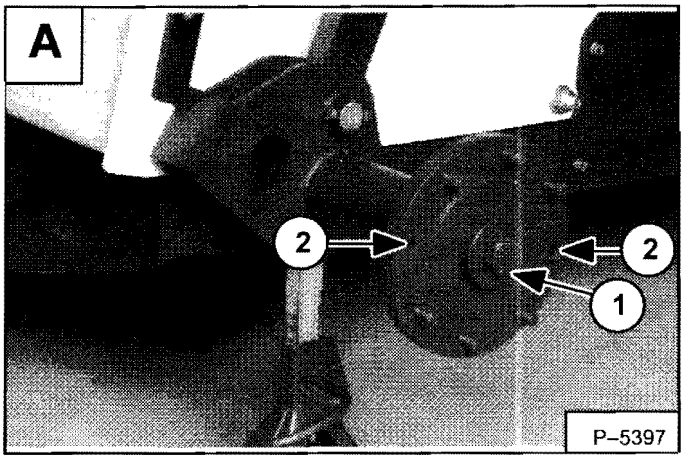
NEVER STAND IN–LINE OF THE HUB WHEN REMOVING A HUB FROM AN AXLE. The hub has a tapered fit on the axle end and can come off the axle with great force and cause serious injury.

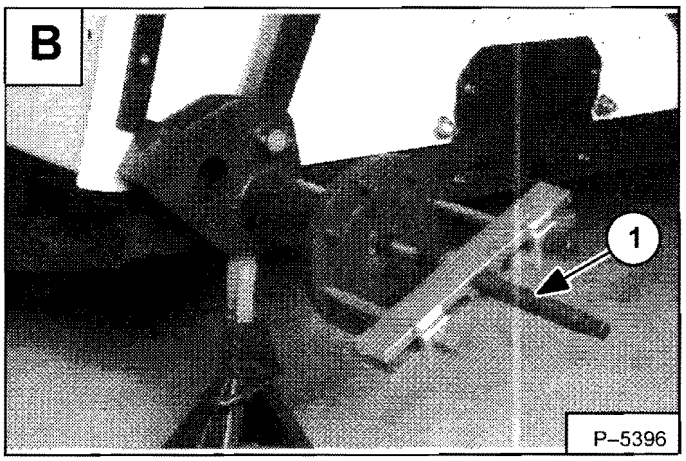
W–2186–0395

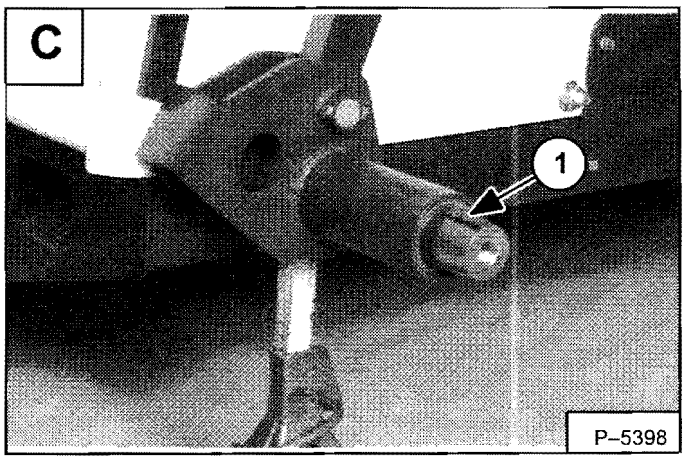
Remove the hub from the axle.

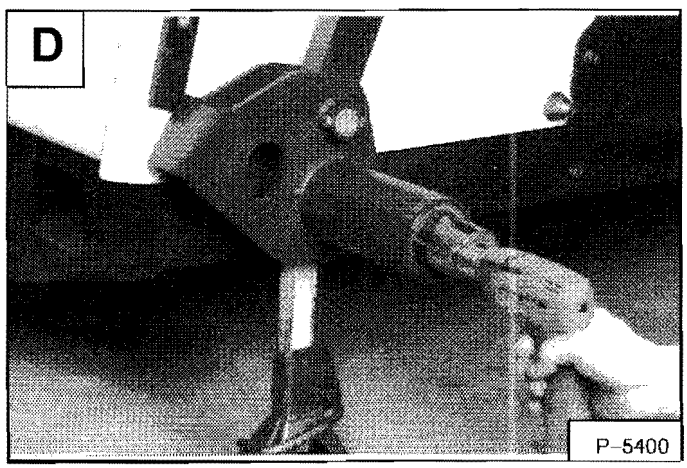
Remove the key (Item 1) **[C]** from the axle.

Drill a hole into the axle seal **[D]**.









AXLE SEAL (Cont'd)

Removal and Installation (Cont'd)

Install a slide hammer (Item 1) **[A]** with a screw tip end into the axle seal.

Remove the axle seal.

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

MEL1407 – Seal Installation Tool

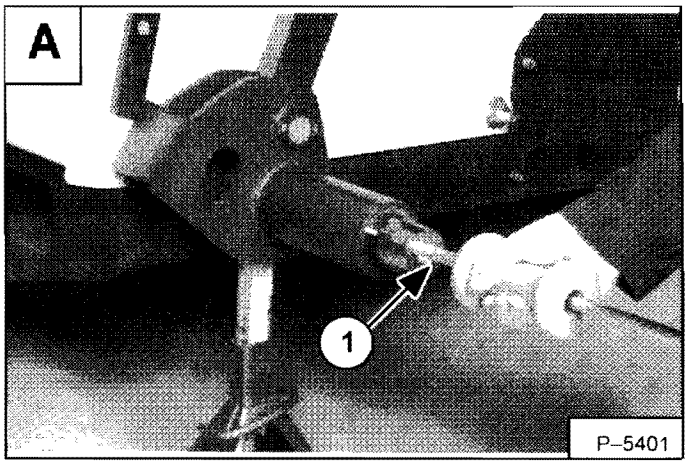
If the axle is damaged or worn, an axle repair sleeve kit is available from Melroe Parts Sales in Chicago.

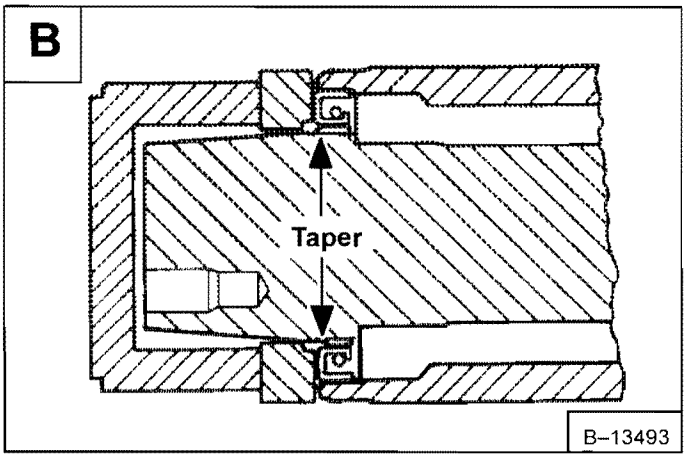
NOTE: If a new wear ring is being installed with new seal, put LOCTITE sealant on the inside diameter of the wear ring.

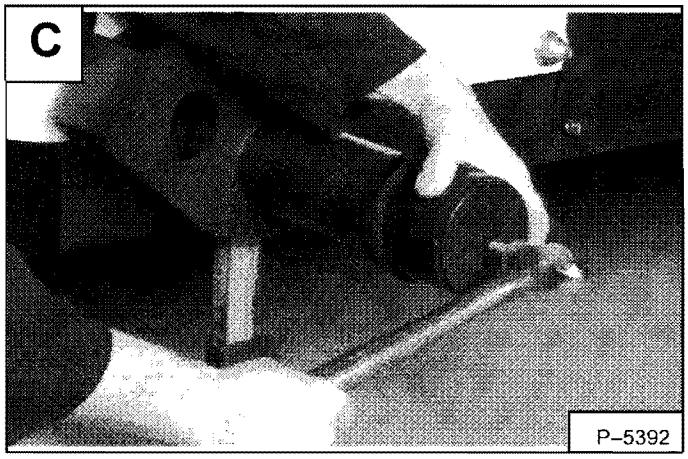
Put the taper on the wear ring so it faces the outside **[B]**.

Put the seal with the lip facing in **[B]**.

Use a hammer to install the new axle seal until the tool is flush with the edge of the axle tube **[C]**.







AXLE, BEARINGS AND SPROCKET

Removal and Installation

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

MEL1242 – Port–a–Power
MEL1202B – Axle Bearing Service Set

NOTE: The procedure shown for removal and installation of the axle, sprocket and bearings is for a front axle. This procedure will also be the same for the rear axle (See Page 4–7 for rear chaincase cover removal).

Raise the lift arms and install an approved lift arm support device (Page 1–1).

Lift and block the loader (Page 1–1).

Remove the front panel/steering lever assembly (Page 3–1).

Remove the front cover (Page 4–7).

Remove the fluid from the chaincase (Page 4–15).

Loosen the axle sprocket bolt (Item 1) **[A]**.

Installation: Tighten the axle sprocket bolt to 284–325 ft.–lbs. (385–440 Nm) torque.

Remove the bolts (Item 1) **[B]** and plate.

Installation: Tighten the bolts to 685–785 ft.–lbs. (928–1064 Nm) torque.

Remove the two wheel studs (Item 2) **[B]** across from each other.

Install a puller (Item 1) **[C]** on the wheel hub.

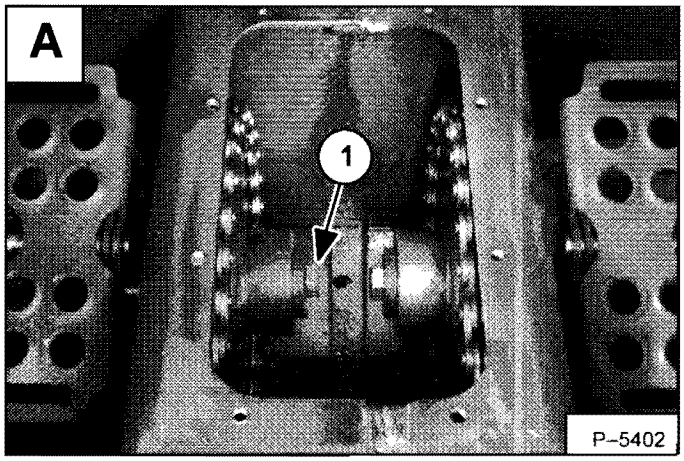
⚠ WARNING

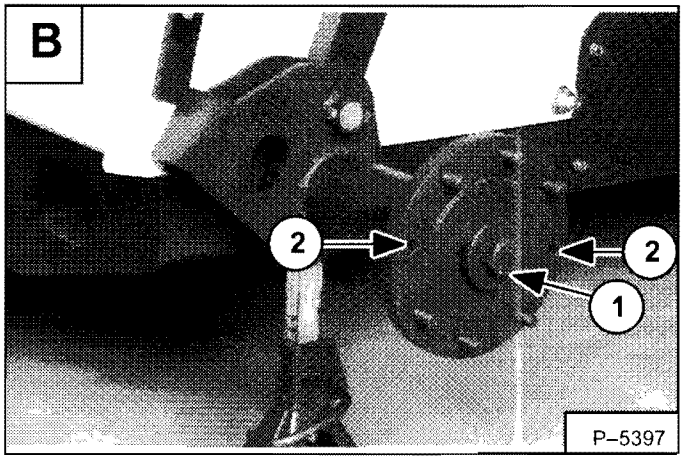
NEVER STAND IN–LINE OF THE HUB WHEN REMOVING A HUB FROM AN AXLE. The hub has a tapered fit on the axle end and can come off the axle with great force and cause serious injury.

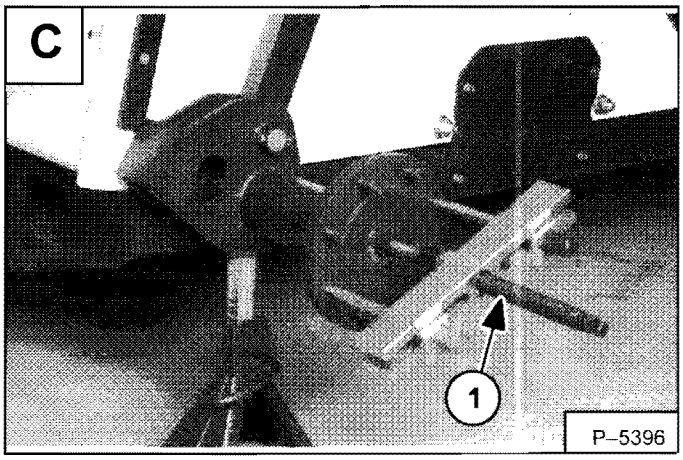
W–2186–0395

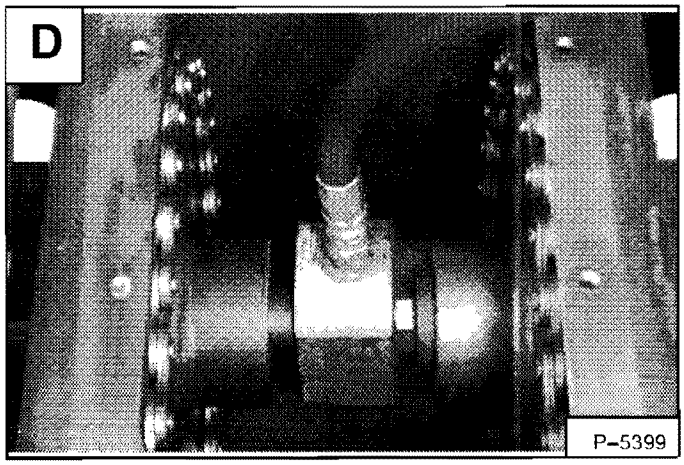
Remove the hub from the axle.

Install a Port–a–Power ram between the two sprockets **[D]**.









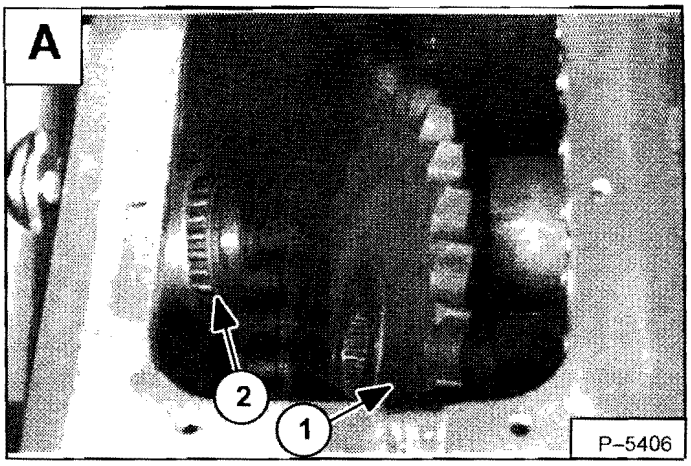
Removal and Installation (Cont'd)

Push the axle out until the ram is at the end of the stroke. Add a spacer and push the axle out again. Repeat this procedure until the axle is out of the sprocket.

Remove the drive chain from the sprocket.

Remove the sprocket (Item 1) **[A]** and inner bearing (Item 2) **[A]**.

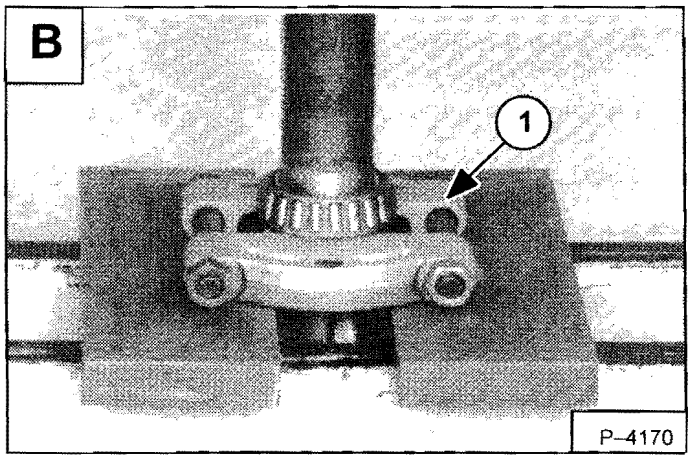
Installation: Pack the inner and outer bearing with grease before installing them.



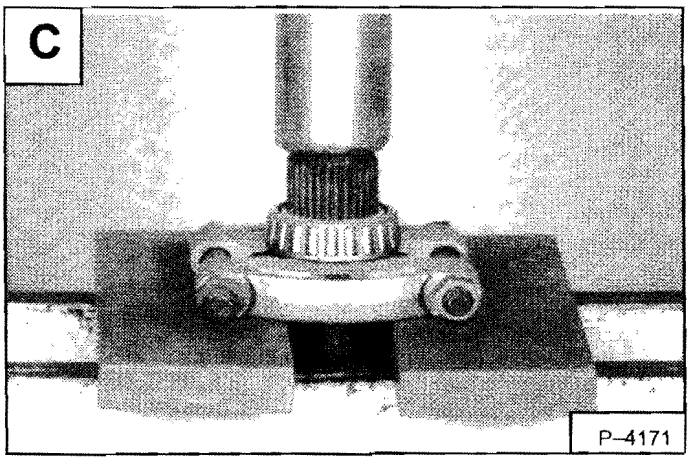
A bearing puller (Item 1) **[B]** is needed to do the following procedure:

Be sure the bearing puller makes good contact with the inner race and press the bearing off the mounting surface of the axle **[B]**.

NOTE: Hold the axle during removal because it will slide freely after the bearing is removed from the mounting surface.



Press the splined end of the axle free from the bearing **[C]**.

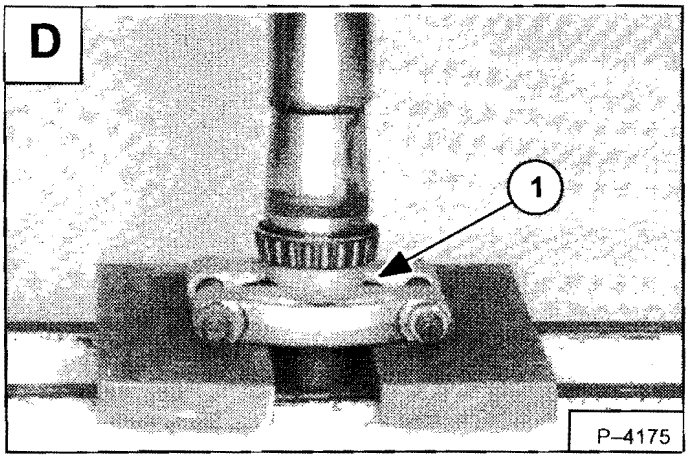


Installation: Put the spline end of the axle shaft into the bearing and press the bearing onto the axle.

NOTE: Hold the axle during installation because it will slide freely after the bearing is pressed over the splined end of the shaft.

Put a piece of tubing over the axle (Item 1) **[D]** that contacts inner race of the bearing only.

Press the bearing onto the mounting surface until the bearing is fully seated **[D]**.

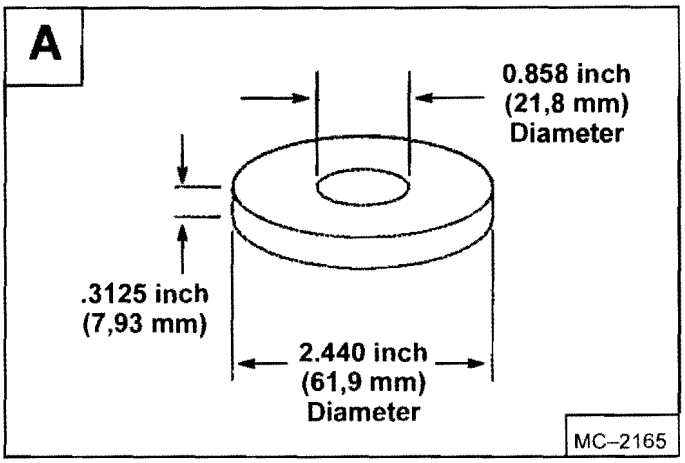


AXLE, BEARINGS AND SPROCKET (Cont'd)

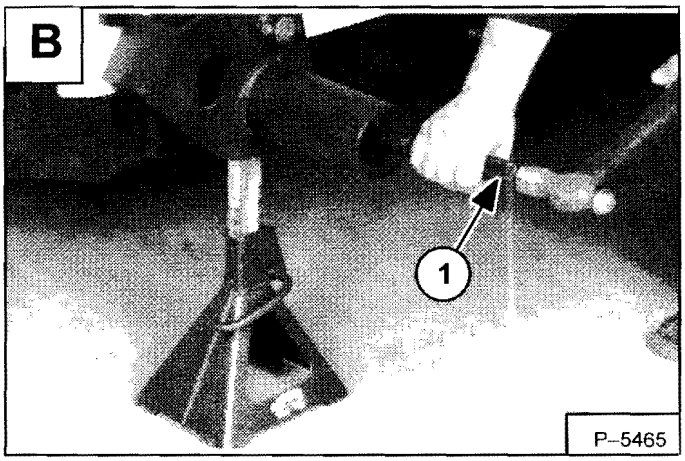
Removal and Installation (Cont'd)

Use the tools provided in the MEL1202B Axle Bearing Service Set. A slide hammer is also needed.

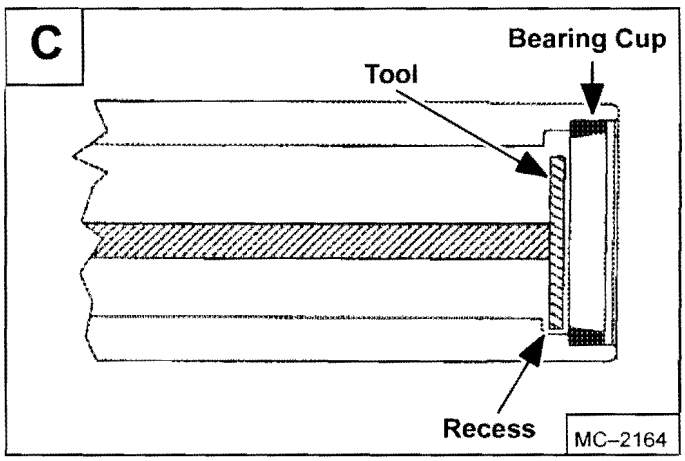
Use the dimensions shown in figure **[A]** to make a bearing cup removal tool.



Use the long driver handle (Item 1) **[B]** and the bearing cup removal tool (shown in figure **[A]**) to remove the inner bearing cup.

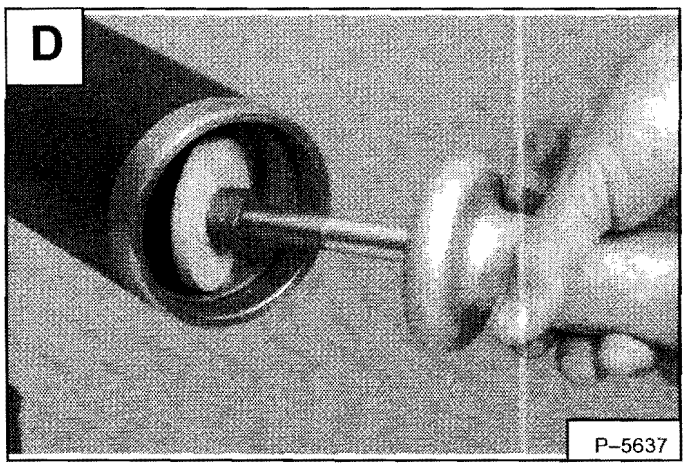


The bearing cup removal tool must fall into the recess behind the bearing cup, drive the cup out of the axle tube **[C]**.



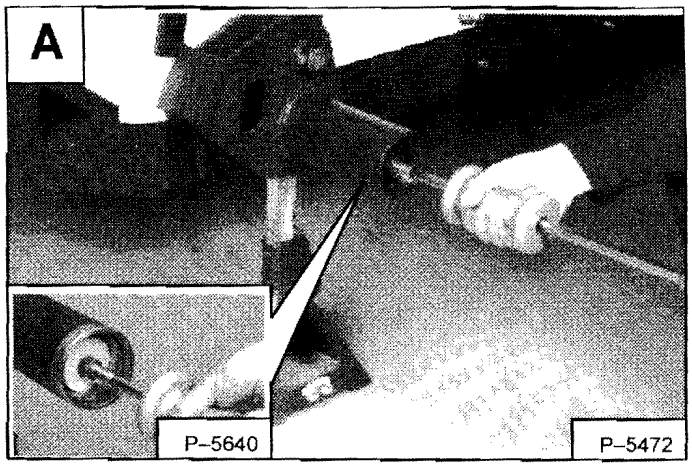
To remove the outer bearing, install a bearing cup removal tool (shown in figure **[A]**) on the slide hammer.

Install the slide hammer/tool assembly behind the bearing cup **[D]**.



Removal and Installation (Cont'd)

Use the slide hammer to remove the bearing cup from the axle tube **[A]**.

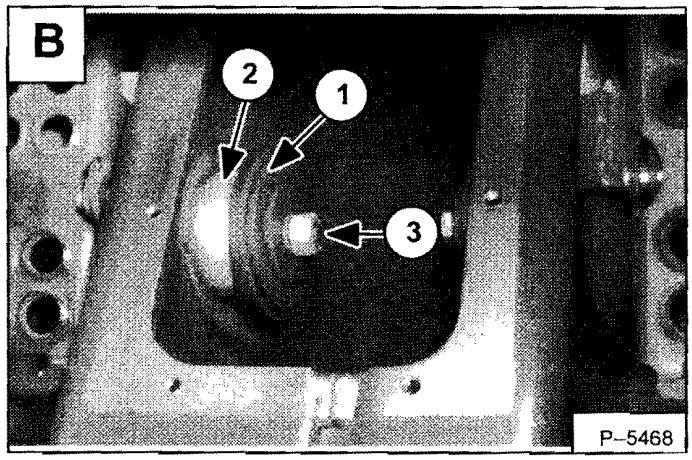


Use the bearing cup installation tool (Item 1) **[B]** and (Item 1) **[C]**.

Put the inner cup (Item 2) **[B]** in the axle tube.

Install the long treaded rod (Item 2) **[C]** into the axle tube and through the installation tool (Item 1) **[B]**.

Install the nut (Item 3) **[B]**.

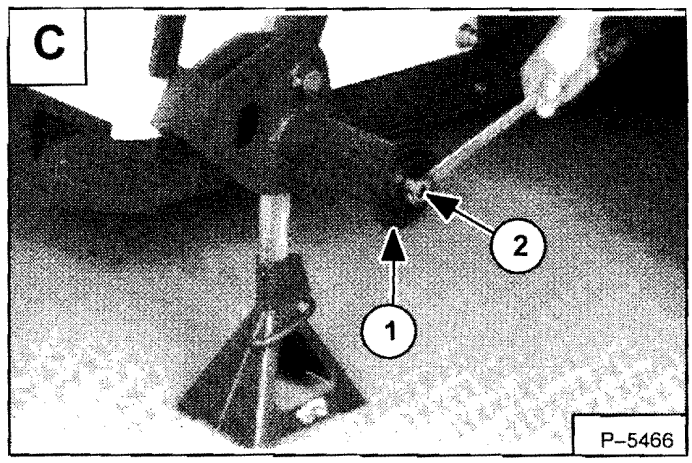


Install the installation tool (Item 1) **[C]** on the threaded rod. Install the nut.

Hold the inside nut (Item 3) **[B]** with a wrench and tighten the outside nut **[C]**.

Tighten the nut until the bearing cup is seated.

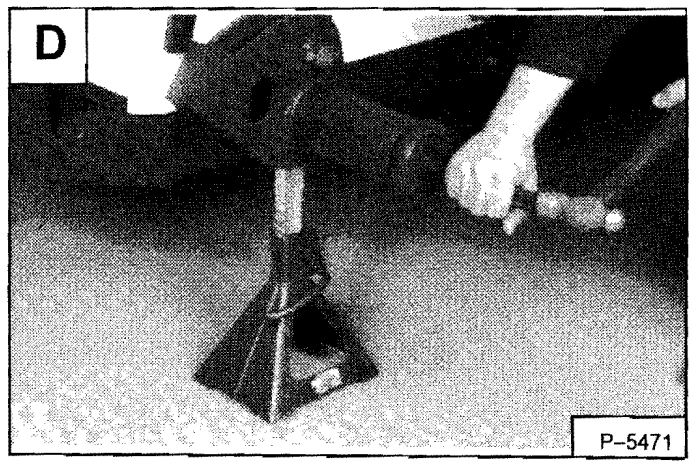
Remove the installation tool and threaded rod.



To install the outer bearing cup, install the bearing cup installation tool on the driver handle.

Install the bearing cup into the axle tube, and put the tool into the bearing cup.

Hit the driver handle with a hammer until the bearing cup is seated inside the axle tube **[D]**.



DRIVE CHAIN

Removal and Installation

Raise the lift arms and install an approved lift arm support device (Page 1–1).

Lift and block the loader (Page 1–1).

Raise the operator cab (Page 1–1).

Remove the front panel/steering lever assembly (Page 3–1).

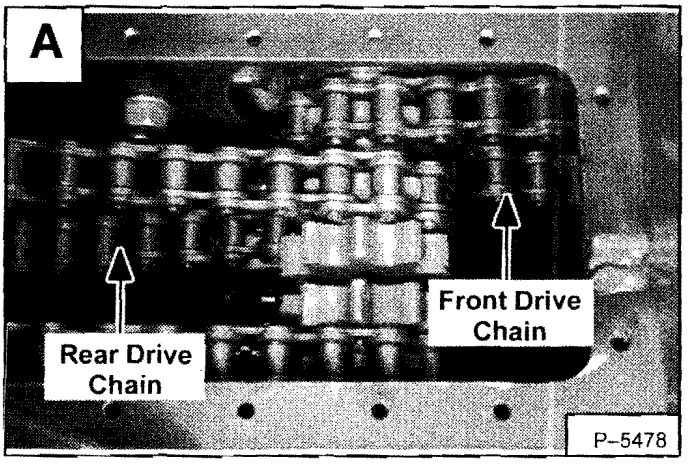
Remove the center chaincase cover (Page 4–5).

Remove the front and rear chaincase cover (Page 4–7).

Remove the fluid from the chaincase (Page 4–15).

Remove the rear axle (Page 4–10).

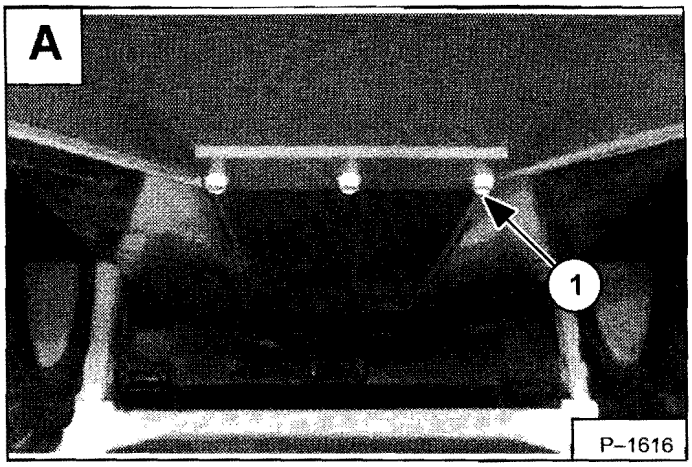
NOTE: It is necessary to remove the rear axle and drive chain [A] if the front chain has to be removed.



CHAINCASE FLUID

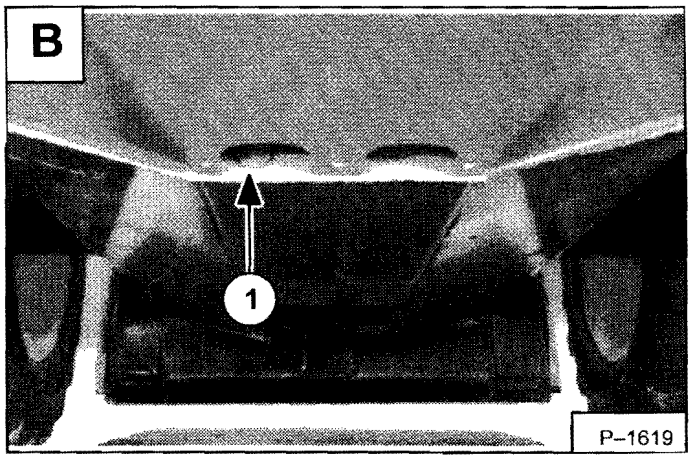
Removing the Fluid From the Chaincase

To drain the oil from the chaincase, remove the cover (Item 1) **[A]** which is installed over the drain plug at the rear of the chaincase.



Remove the drain plug (Item 1) **[B]** and drain the oil into a container.

Check the drain plug and replace if necessary.



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MAIN FRAME

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SEAT BAR (W/GAS SPRING)

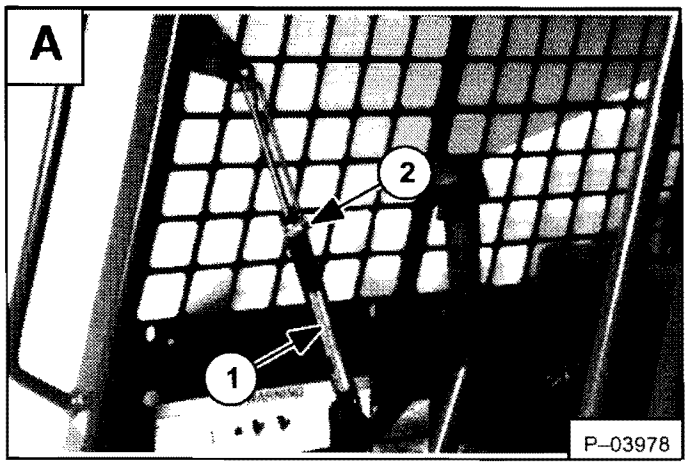
Removal and Installation

The tool listed is needed for the following procedure:

MEL1426 – Gas Spring Retainer Tool

Lower the operator seat bar.

Install the gas spring retainer tool on the gas cylinder (Item 1) **[A]**.

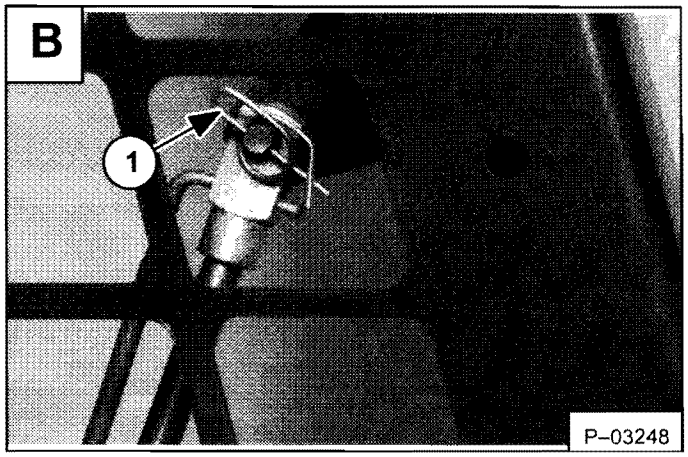


Install the end of the tool that is bent at a 90° angle in the clevis of the cylinder as shown **[B]**.

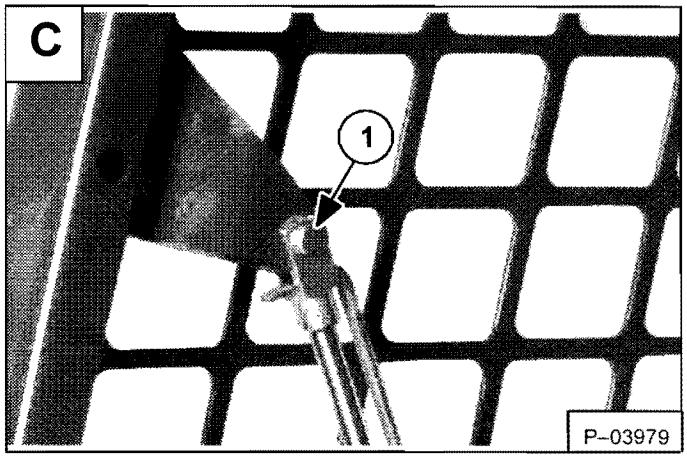
Install the curved end of the tool on the base end of the gas cylinder.

Secure the tool to the gas cylinder with a hose clamp (Item 2) **[A]**.

Remove the retainer pin (Item 1) **[B]** from the clevis pin.



Remove the clevis pin (Item 1) **[C]** from the gas cylinder.

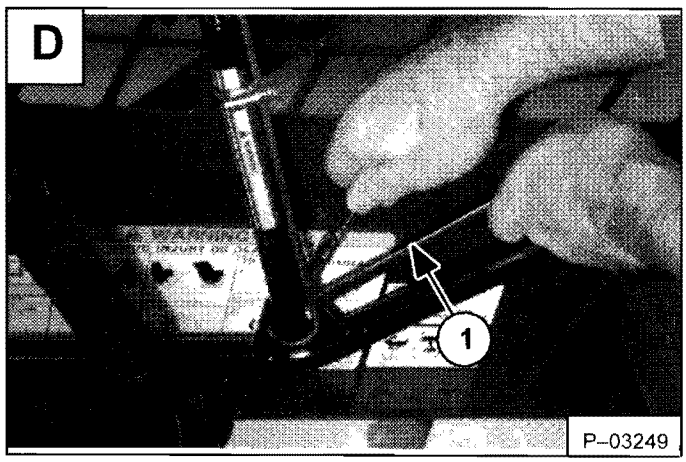


Use a 17/32 inch tappet wrench (thin wrench) (Item 1) **[D]** to hold the ball joint on the gas cylinder.

Remove the mounting nut from the ball joint **[D]**.

Installation: Be careful not to overtighten the mounting nut on the ball joint.

Remove the gas cylinder from the seat bar.



⚠ WARNING

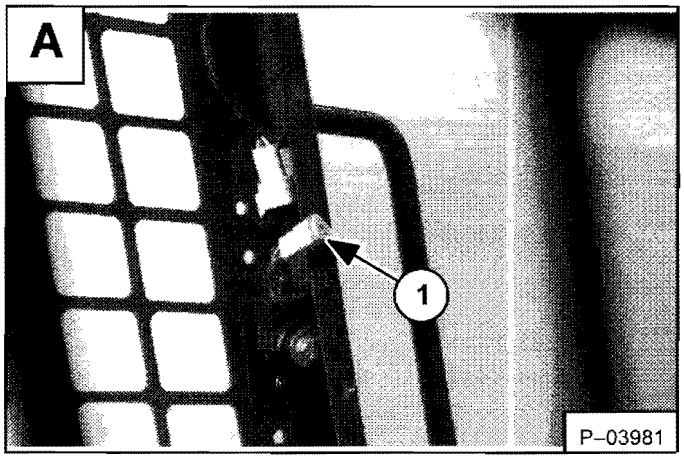
Cylinder contains high pressure gas. Do not open. Opening cylinder can release rod and cause injury or death.

W–2113–0288

Replace the gas cylinder if it malfunctions.

Removal and Installation (Cont'd)

Disconnect the seat bar sensor connector (Item 1) **[A]**.



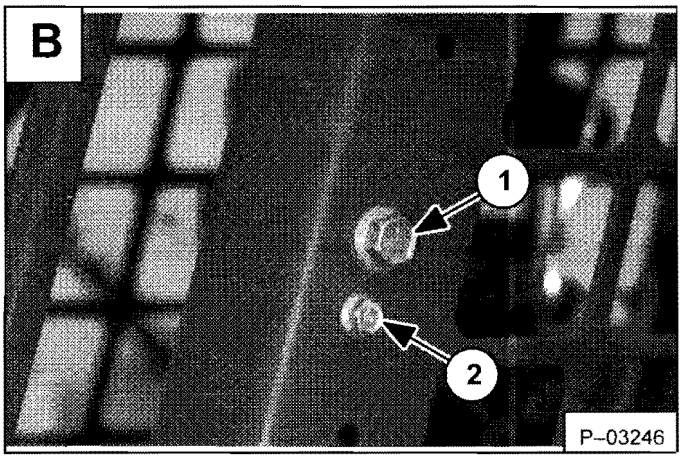
Remove the seat bar mounting bolt (Item 1) **[B]** (both sides).

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

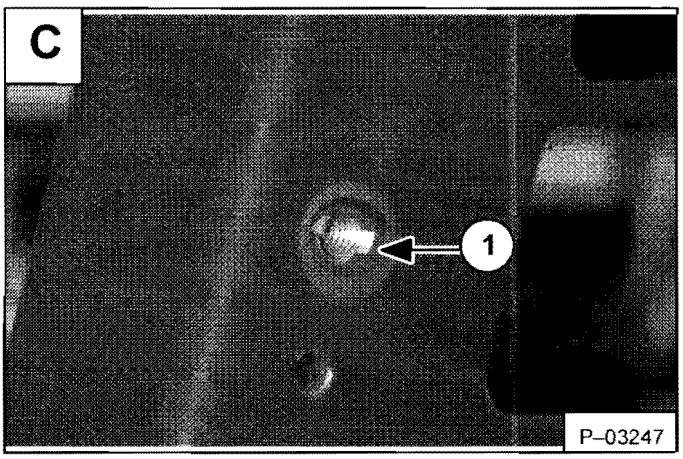
Remove the seat bar sensor mounting bolt (Item 2) **[B]** and nut.

Installation: Tighten the sensor mounting bolt to 80–90 in.–lbs. (9–10 Nm) torque.

Remove the sensor assembly from the magnetic bushing on the seat bar.



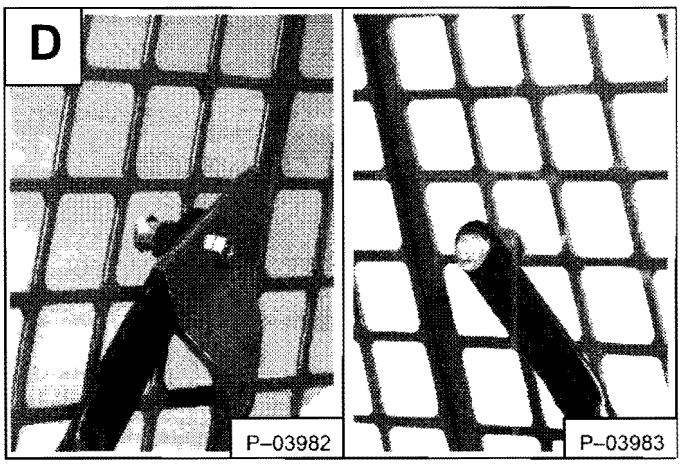
Installation: Be sure the two tabs on the pivot bushing are located in the slot on the cab as shown **[C]**.



Pull both ends of the seat bar which are mounted to the operator cab, back from the mounting positions on the operator cab **[D]**.

Remove the magnetic bushing mounting bolt, washer, magnetic bushing, plastic bushing and pivot bushing from the seat bar **[D]**. Refer to Page 8–1 for correct assembly procedure of the seat bar sensor assembly.

Remove the mounting bolt, gas cylinder mounting bracket, plastic bushing and pivot bushing from the seat bar **[D]**. Refer to Page 5–3 for correct assembly procedure of the gas cylinder mounting assembly.



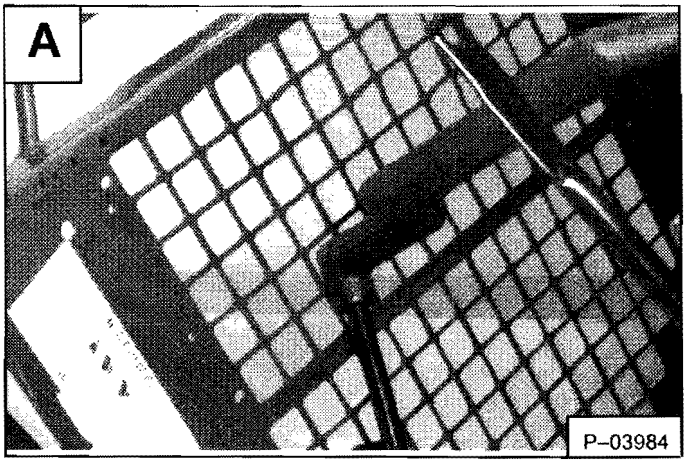
SEAT BAR (W/GAS SPRING) (Cont'd)

Removal and Installation (Cont'd)

To remove the seat bar from the operator cab, the seat bar needs to be put in the correct location.

Use the squares in the right side of the operator cab side screen to locate the seat bar correctly **[A]**.

Put the padded corner of the seat bar five squares back from the front of the operator cab side screen and four squares up from the bottom of the screen **[A]**.



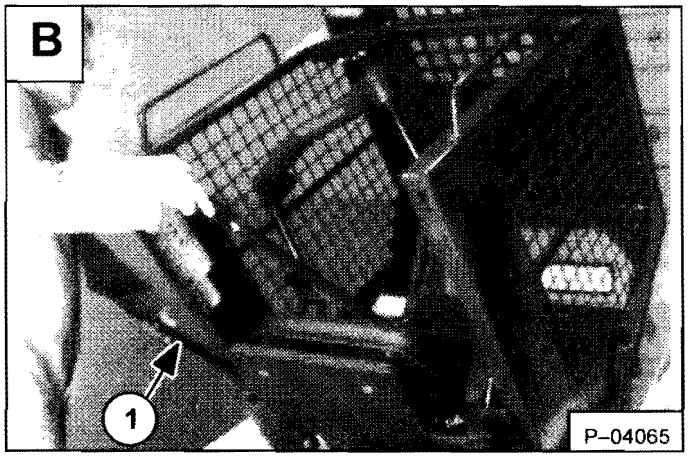
The arm of the seat bar (Item 1) **[B]** should also be located outside of the operator cab, just below the bottom edge of the cab.

Grab both ends of the seat bar as shown and pull the left side of the seat bar out of the operator cab until the seat bar is free **[B]**.

Remove the seat bar from the operator cab.

Reverse removal procedure to install the seat bar.

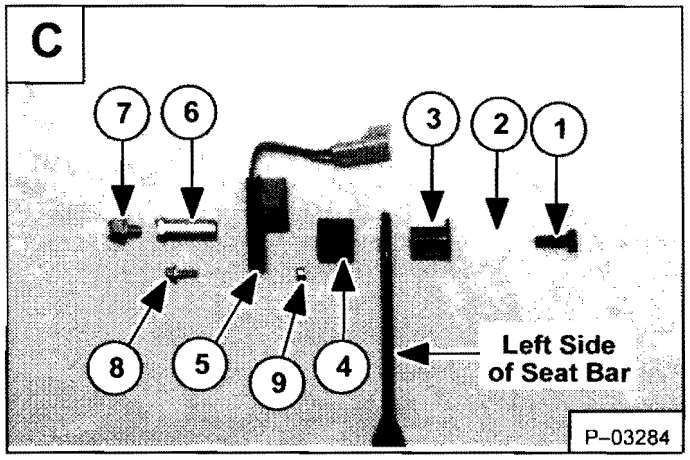
See the following assembly procedure when installing the seat bar.



Assembly

Assemble the parts as shown for the left side of the seat bar pivot assembly **[C]**:

Mounting Bolt (Item 1)
Washer (Item 2)
Keyed Plastic Bushing (Item 3)
Magnetic Bushing Assembly (Item 4)
Sensor Bracket (Item 5)
Pivot Bushing (Item 6)
Mounting Bolt (Item 7)
Sensor Mounting Bolt (Item 8)
Sensor Mounting Nut (Item 9)



SEAT BAR (W/GAS SPRING) (Cont'd)

Assembly (Cont'd)

Assemble the parts as shown for the right side of the seat bar pivot assembly **[A]**:

Mounting Bolt (Item 1)
Pivot Bushing (Item 2)
Keyed Plastic Bushing (Item 3)
Gas Spring Mounting Bracket (Item 4)
Mounting Bolt (Item 5)

Install the right side pivot assembly as shown. Tighten the mounting bolt (Item 1) **[B]** to 180–200 in.-lbs. (21–23 Nm) torque.

NOTE: Be sure the bend in the gas spring bracket faces in toward the operator when installing the gas spring bracket. Slide the bracket all the way forward so the front edge of the bracket fits tightly against the operator cab.

Compressing the Gas Cylinder

To compress the seat bar gas spring, it is necessary to use the gas spring retainer tool MEL1426.

Use the following procedure to compress the gas spring:

⚠ WARNING

Cylinder contains high pressure gas. Do not open. Opening cylinder can release rod and cause injury or death.

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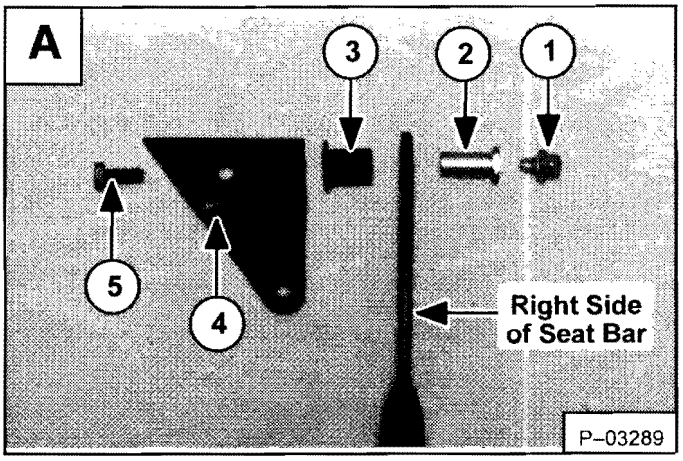
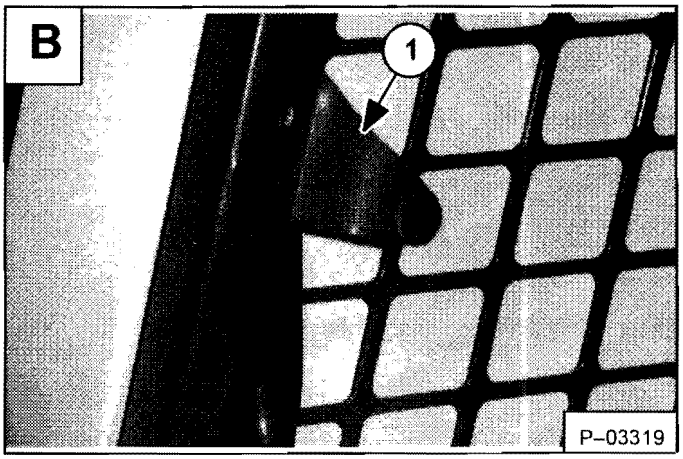
Install the gas spring on the seat bar. Install the clevis pin and cotter pin in the gas spring.

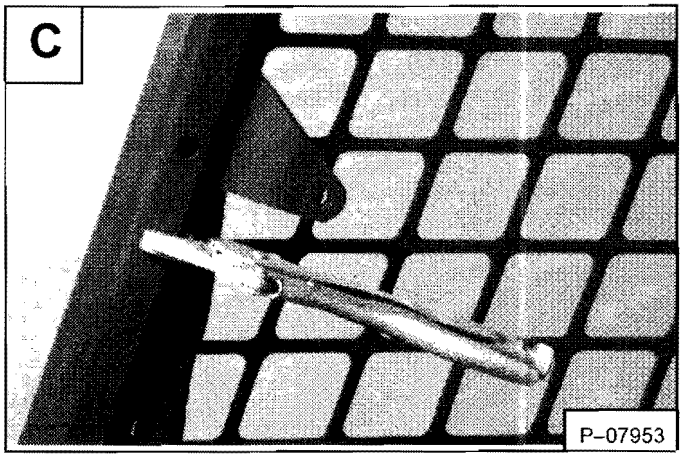
Securely clamp a locking pliers to the cab one inch (25,4 mm) below the gas spring mounting bracket **[C]**.

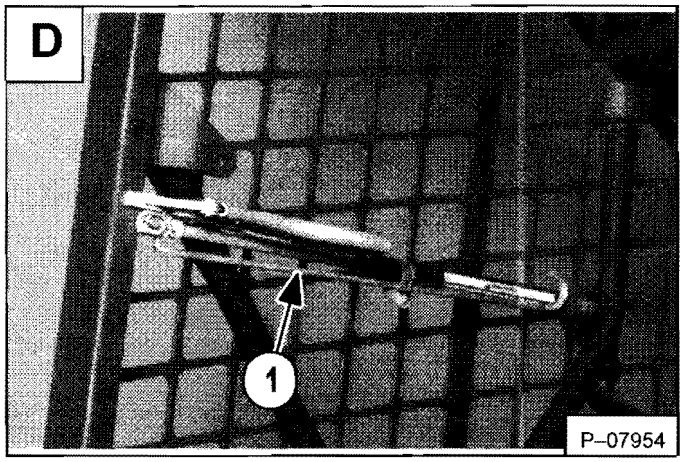
Put the clevis under the locking pliers against the cab **[D]**.

Install the gas spring retainer tool (Item 1) **[D]** with the 90° bend in the clevis of the rod end of the gas cylinder. Install the hose clamp to hold the tool. Do not tighten the hose clamp.





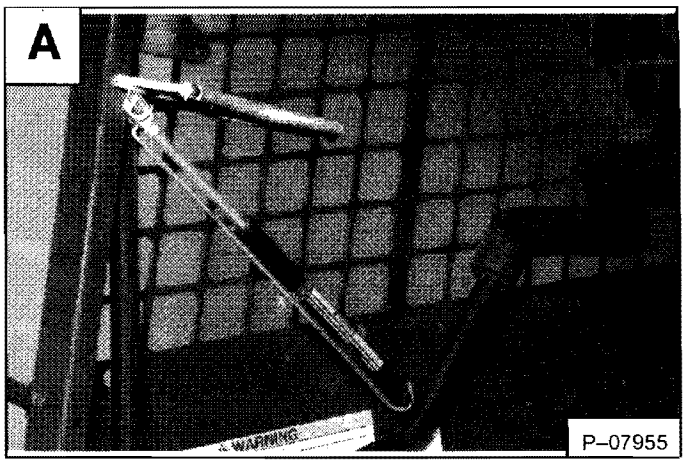




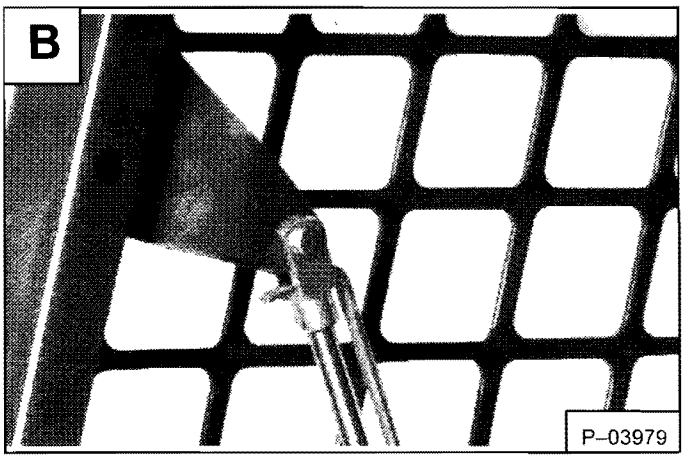
SEAT BAR (W/GAS SPRING) (Cont'd)

Compressing the Gas Cylinder (Cont'd)

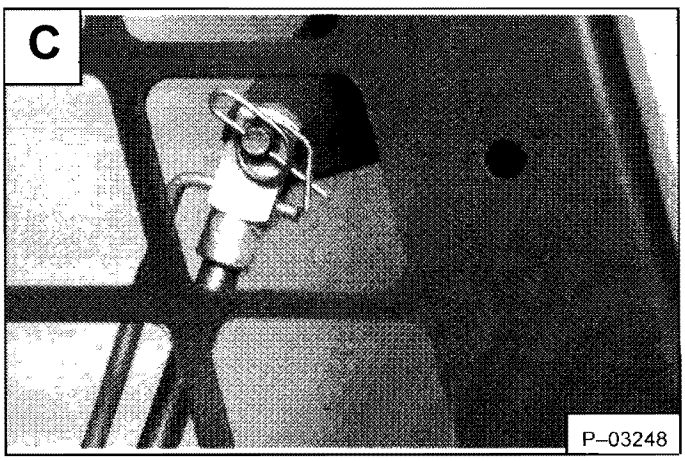
Pull the seat bar down and compress the gas cylinder. Install the curved end of the tool around the base end of the gas spring. Tighten the hose clamp **[A]**.



Remove locking pliers. Remove clevis pin and cotter pin. Install gas spring to mounting bracket with clevis pin **[B]**.

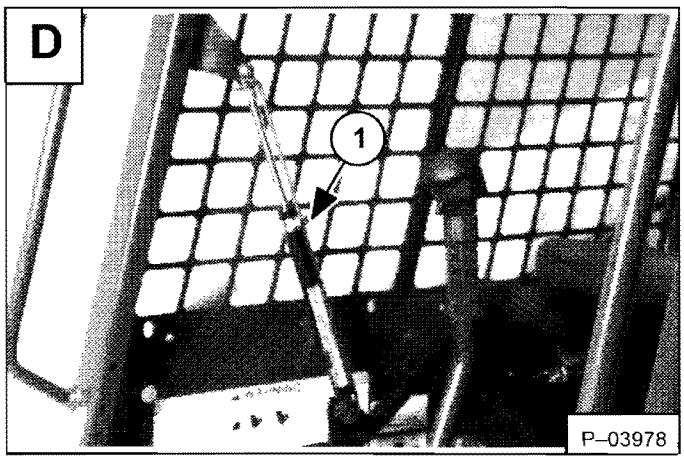


Install cotter pin in the clevis pin **[C]**.



Remove the hose clamp and tool (Item 1) **[D]**.

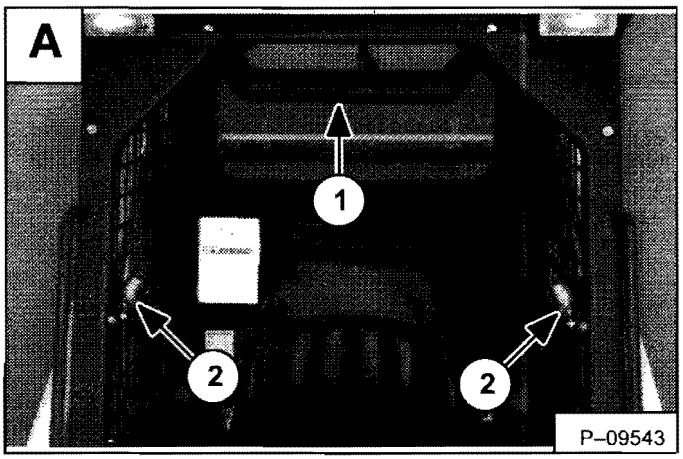
Rotate seat bar so that tool can be easily removed.



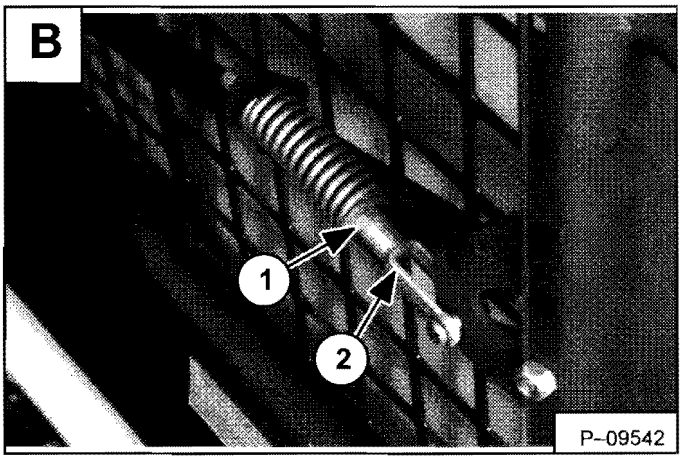
SEAT BAR (W/COMPRESSION SPRING)

Removal and Installation

Lower the seat bar (Item 1) **[A]** so the compression springs (Item 2) **[A]** will be in a down position.

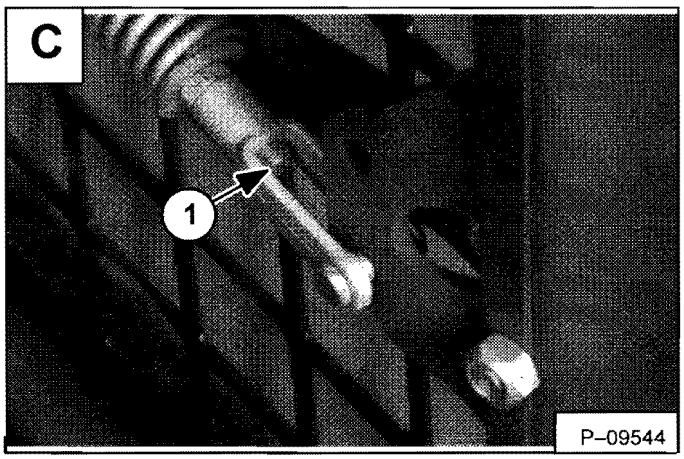


Loosen the adjustment lock nut (Item 1) **[B]** (both sides).

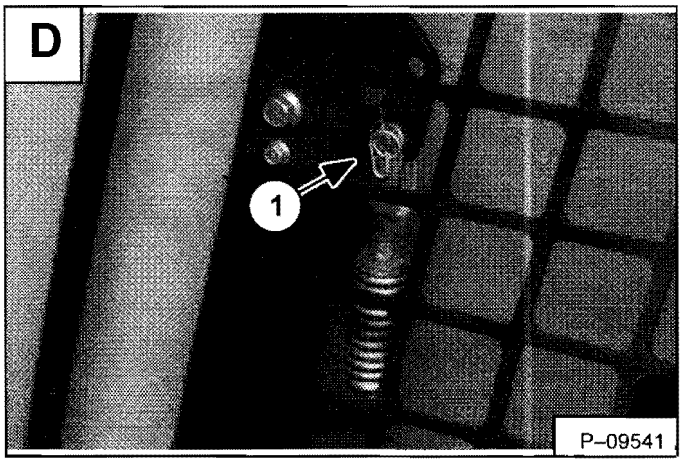


Turn the bolt (Item 1) **[C]** into the clevis five turns (both sides).

Installation: The compression spring is adjusted correctly when the bolt is flush with the clevis (Item 2) **[B]**.



Remove the retaining pin (Item 1) **[D]** and clevis pin (both sides).



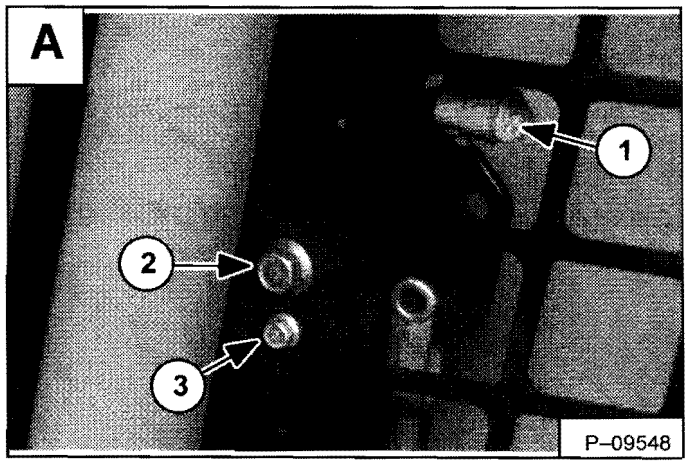
SEAT BAR (W/COMPRESSION SPRING) (Cont'd)

Removal and Installation (Cont'd)

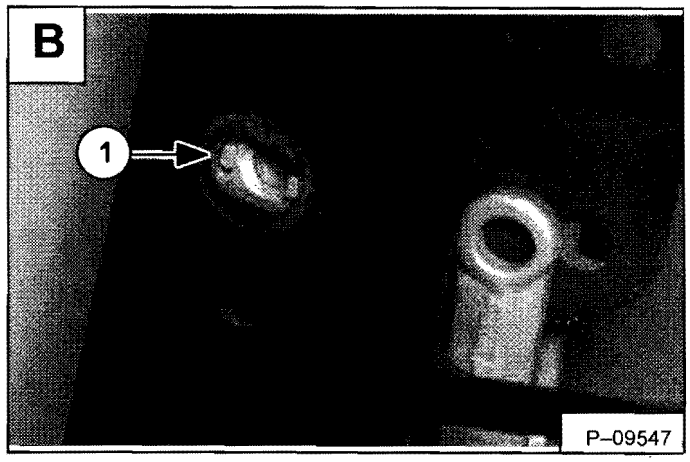
Disconnect the wiring harness connector (Item 1) **[A]** (left side).

Remove the seat bar mounting bolt (Item 2) **[A]** (both sides).

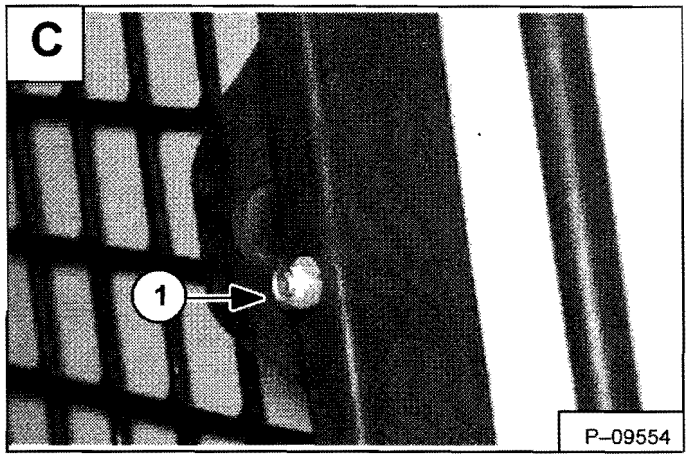
Remove the sensor mounting bolt (Item 3) **[A]** (left side).



Installation: Make sure the two tabs (Item 1) **[B]** are located in the slot on the operator cab.



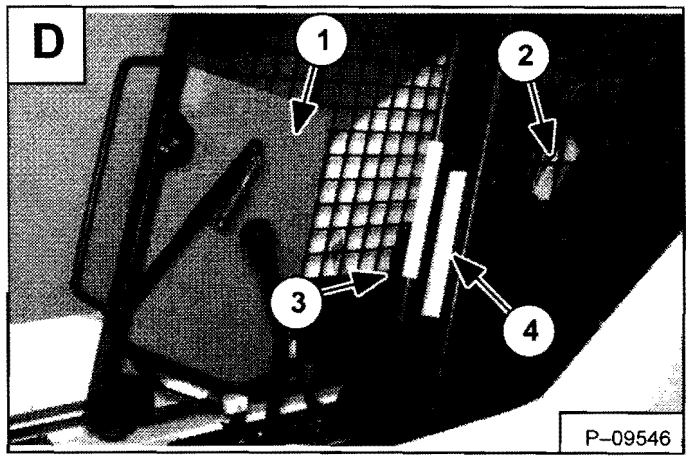
Installation: Tighten the mounting bolt and nut (Item 1) **[C]** to 180 – 200 in.–lbs. (21 – 23 Nm) torque.



To protect the paint on the operator cab from getting scratched, install cardboard (Item 1) **[D]** on the right side.

Wrap tape around the left pivot end (Item 2) **[D]** of the seat bar.

Wrap tape around the cab grab handle (Item 3) **[D]** and the front edge of the cab (Item 4) **[D]**.

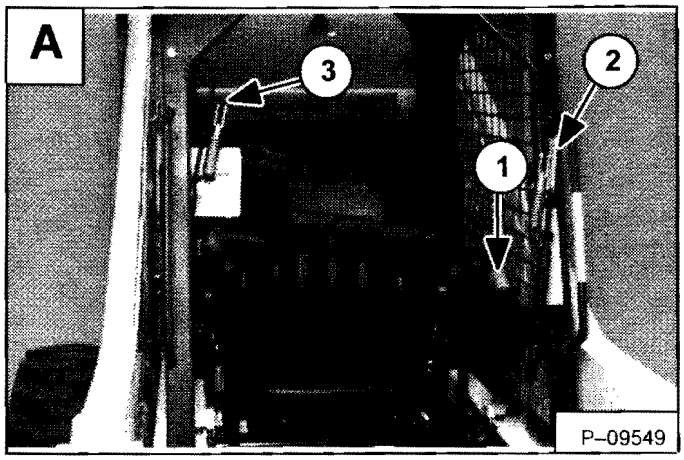


SEAT BAR (W/COMPRESSION SPRING) (Cont'd)

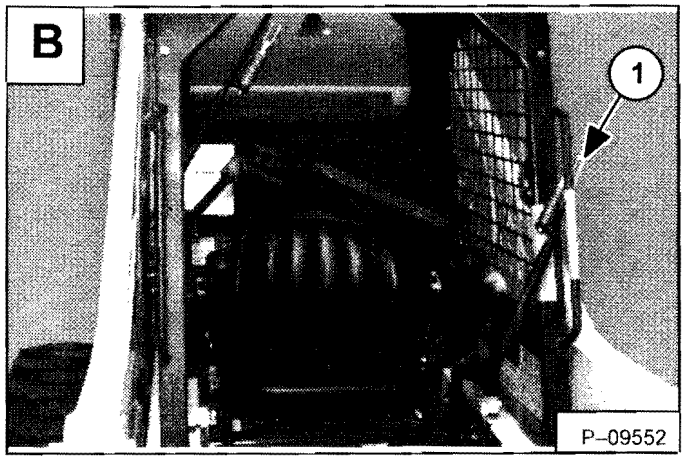
Removal and Installation (Cont'd)

Position the seat bar in the recess on the left side of the cab (Item 1) **[D]**. Position the left side pivot end of the seat bar between the cab and the grab handle (Item 2) **[A]**.

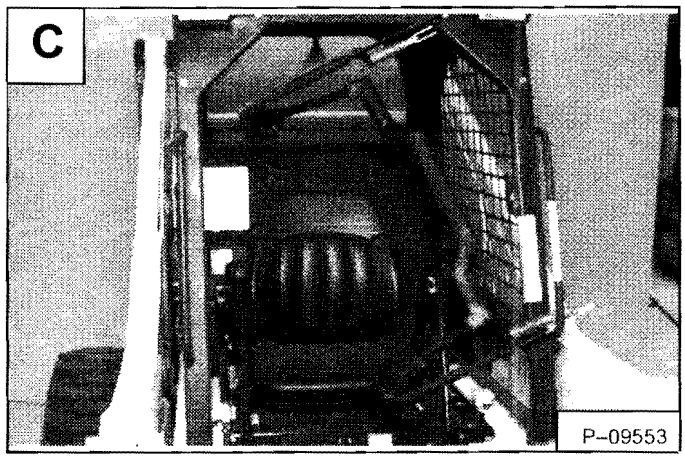
Lift straight up on the right side (Item 3) **[A]** of the seat bar.



Continue to lift on the right side of the seat bar and allow the left side of the seat bar to rotate between the cab and the grab handle (Item 1) **[B]**.

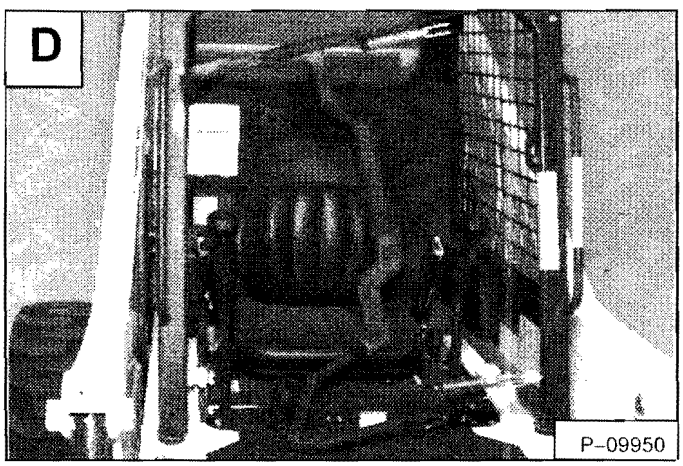


Lift the right side of the seat bar until it clears the right side screen of the cab **[C]**.



Remove the left side of the seat bar pivot from between the cab and grab handle and remove the seat bar from the cab **[D]**.

Reverse the above procedure to install the seat bar into the operator cab.

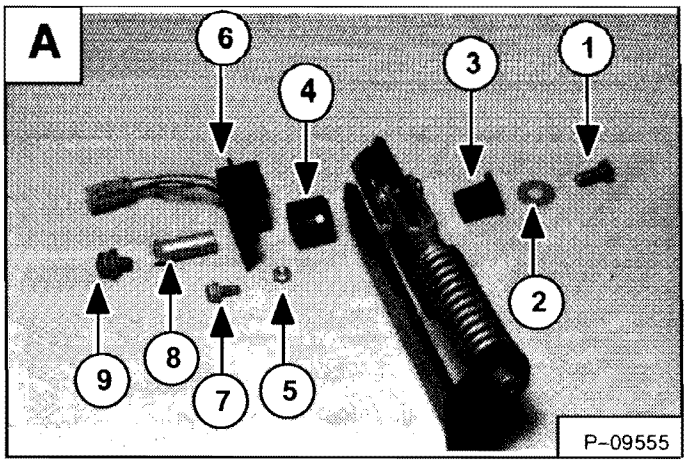


SEAT BAR (W/COMPRESSION SPRING) (Cont'd)

Assembling Components

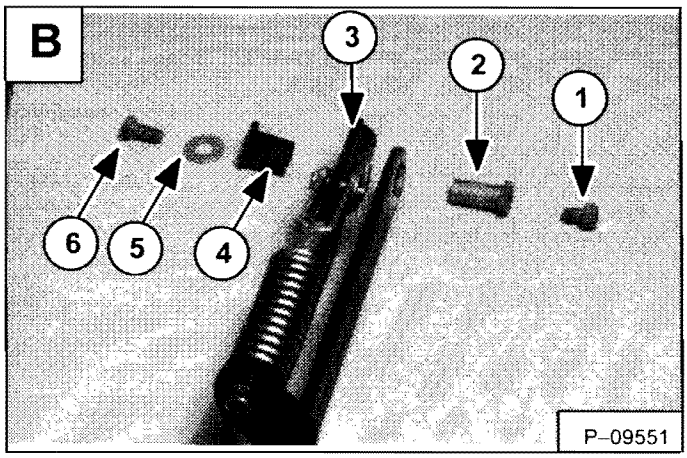
Assemble the parts as shown for the left side of the seat bar pivot assembly **[A]**:

Mounting Bolt (Item 1)
Washer (Item 2)
Keyed Plastic Bushing (Item 3)
Magnetic Bushing Assembly (Item 4)
Sensor Mounting Nut (Item 5)
Sensor Bracket (Item 6)
Sensor Mounting Bolt (Item 7)
Pivot Bushing (Item 8)
Mounting Bolt (Item 9)



Assemble the parts as shown for the right side of the seat bar pivot assembly **[B]**:

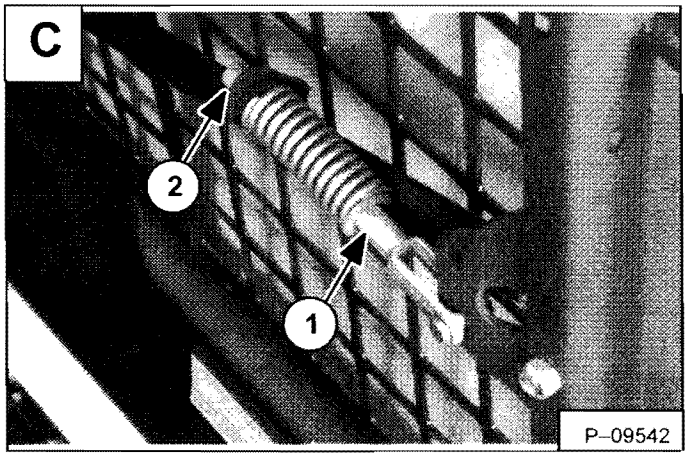
Mounting Bolt (Item 1)
Pivot Bushing (Item 2)
Mounting Bracket (Item 3)
Keyed Plastic Bushing (Item 4)
Washer (Item 5)
Mounting Bolt (Item 6)



Compression Spring Disassembly and Assembly

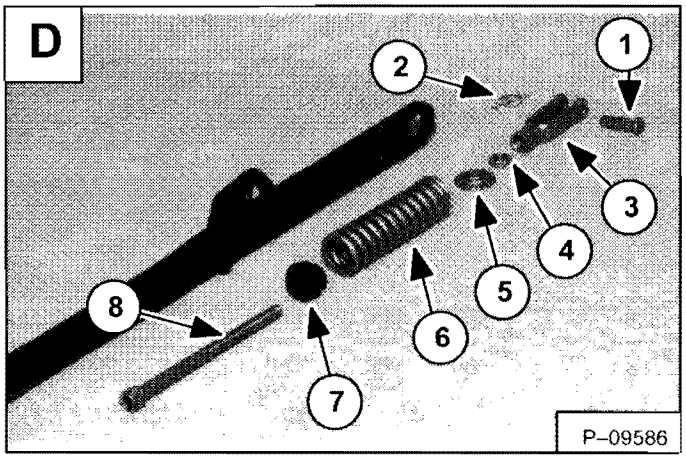
Loosen the lock nut (Item 1) **[C]** and turn the bolt (Item 2) **[C]** out of the clevis.

Assembly: Adjust the compressin spring as shown on Page 5–8; Fig. **[B]**.



Disassemble and assemble the seat bar compression spring and parts as shown in Fig. **[D]**:

Pin (Item 1)
Retaining Pin (Item 2)
Clevis (Item 3)
Lock Nut (Item 4)
Washer (Item 5)
Spring (Item 6)
Bushing (Item 7)
Bolt (Item 8)



OPERATOR CAB GAS CYLINDER

Removal and Installation

⚠ WARNING

Cylinder contains high pressure gas. Do not open. Opening cylinder can release rod and cause injury or death.

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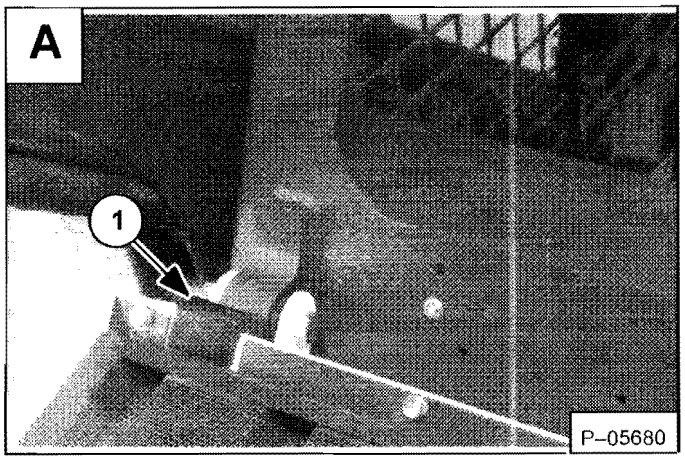
Remove the operator cab stop (Item 1) **[A]**.

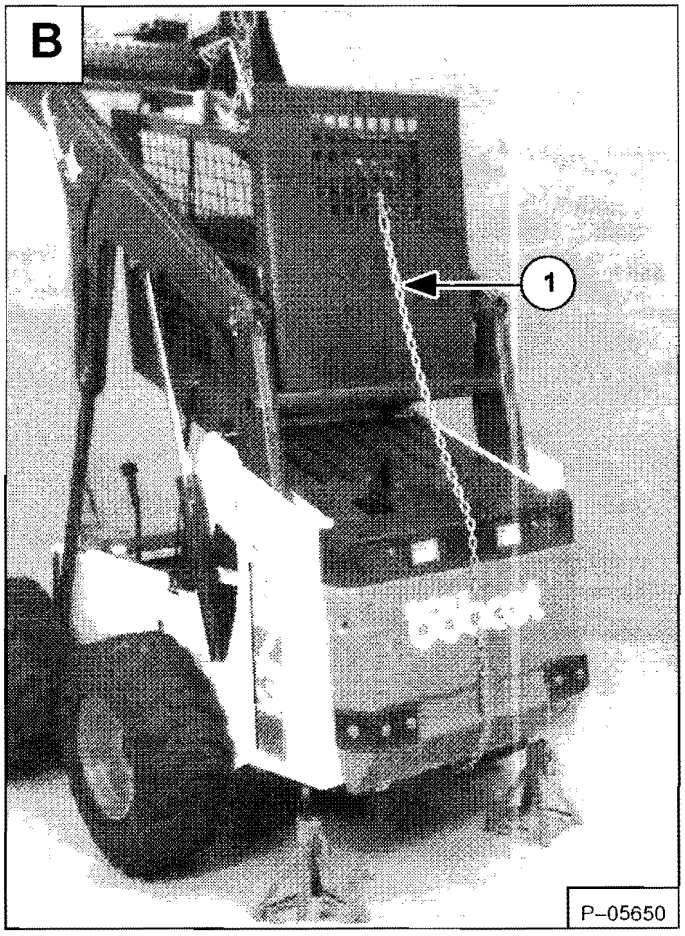
NOTE: Be careful not to break the rear window (if so equipped) when the cab is raised after the cab stops are removed.

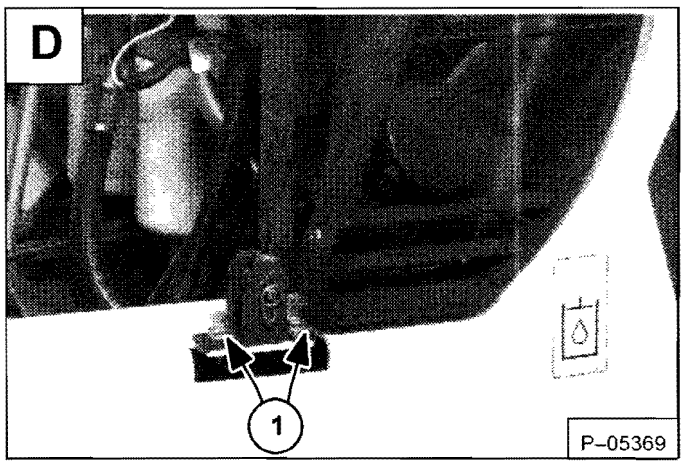
Raise the operator cab. (See Page 1–1.)

Install a chain (Item 1) **[B]** from the operator cab to the loader main frame to prevent the cab from tipping forward when the gas cylinder(s) are removed.

Remove the bolts (Item 1) **[C]** from the gas cylinder mounting bracket.



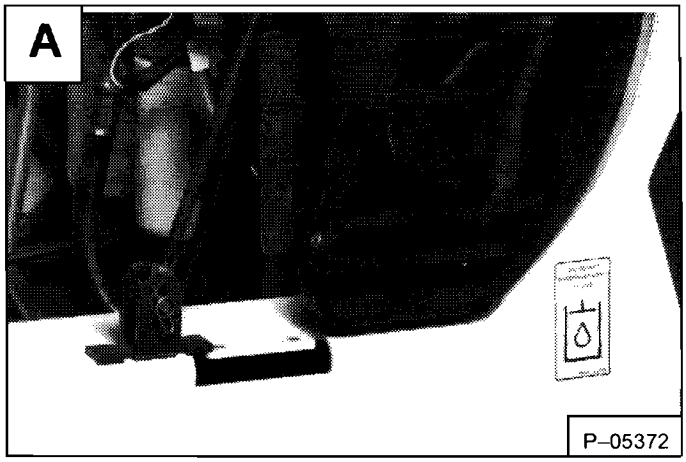




OPERATOR CAB GAS CYLINDER (Cont'd)

Removal and Installation (Cont'd)

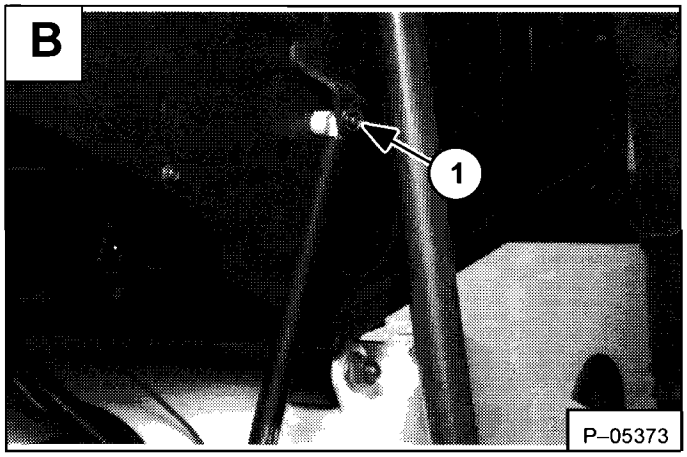
Move the mounting bracket forward to relieve any remaining tension on the gas cylinder **[A]**.



Remove the retainer pin (Item 1) **[B]** from the top pivot pin.

Remove the pivot pin and bushing from the gas cylinder.

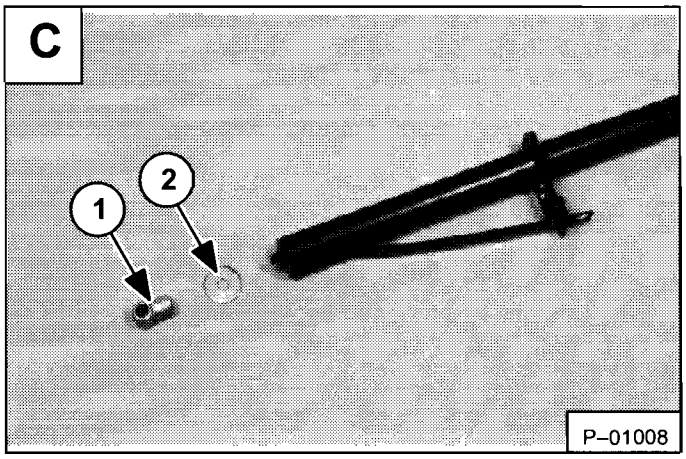
Remove the gas cylinder.



Disassembly and Assembly

Remove the clevis (Item 1) **[C]** and washer (Item 2) **[C]** from the end of the gas cylinder.

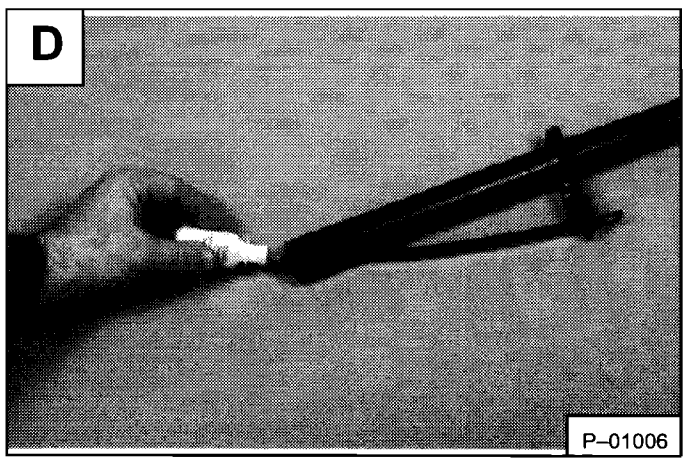
Remove the gas cylinder from the outer housing.



Assembly: Install a replacement cylinder inside the cylinder housing.

Apply a small amount of LOCTITE on the threads of the cylinder rod **[D]**.

Reinstall the washer and clevis on the cylinder rod.



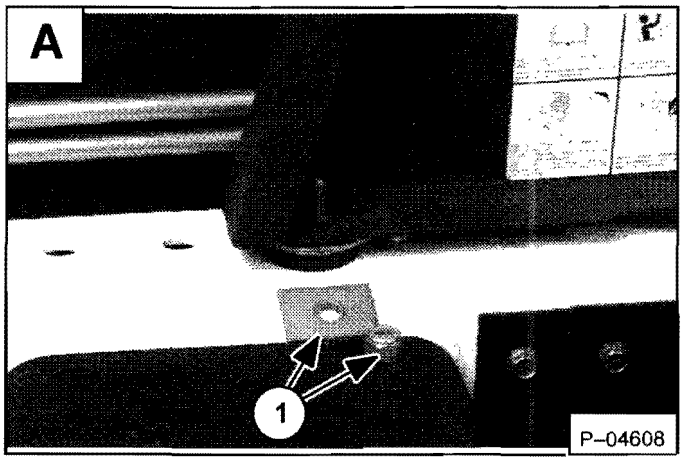
OPERATOR CAB

Removal and Installation

Remove the cab nut and holddown plate (Item 1) **[A]** (both sides).

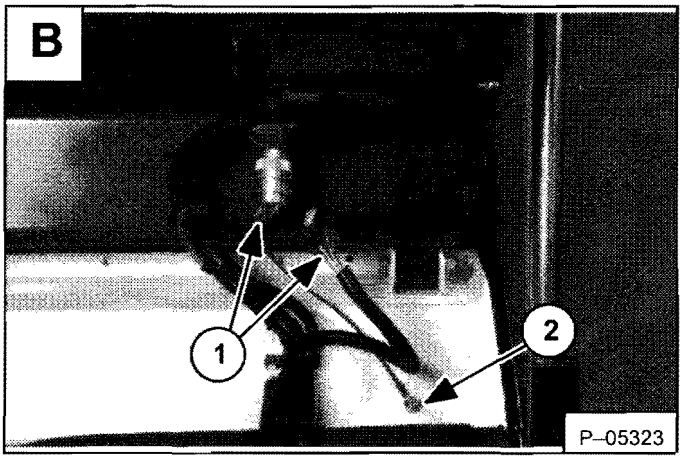
Installation: Tighten the nut to 40–50 ft.–lbs. (54–68 Nm) torque.

Raise the operator cab. (See Page 1–1.)



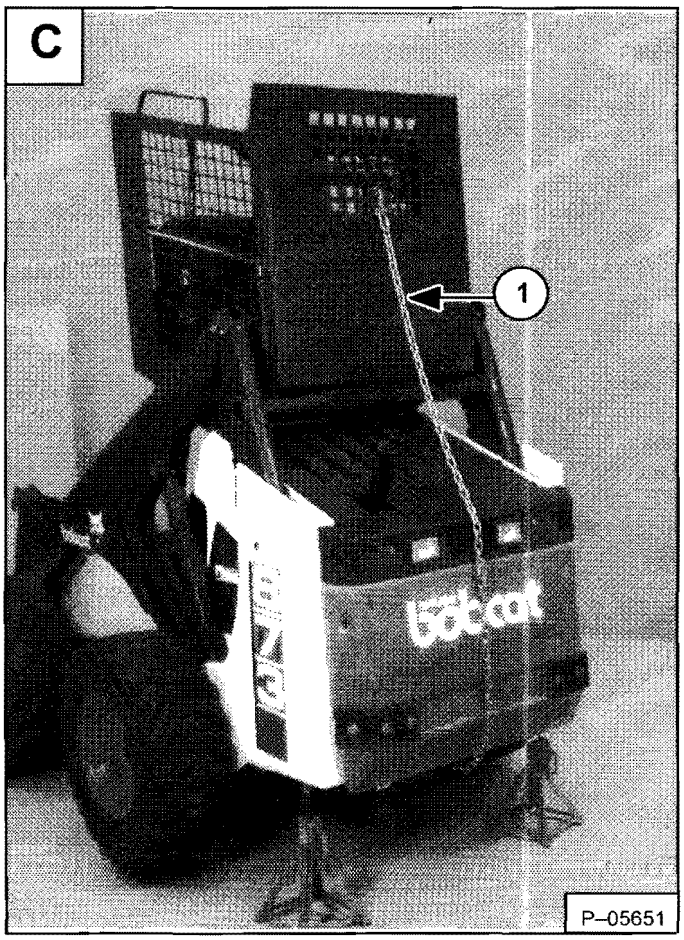
Disconnect the wiring harness connectors (Item 1) **[B]**.

Disconnect the ground strap (Item 2) **[B]**.



Install a chain (Item 1) **[C]** from the operator cab to the loader main frame to prevent the cab from tipping forward when the gas cylinders are removed.

Remove both gas cylinders. (See Page 5–13.)



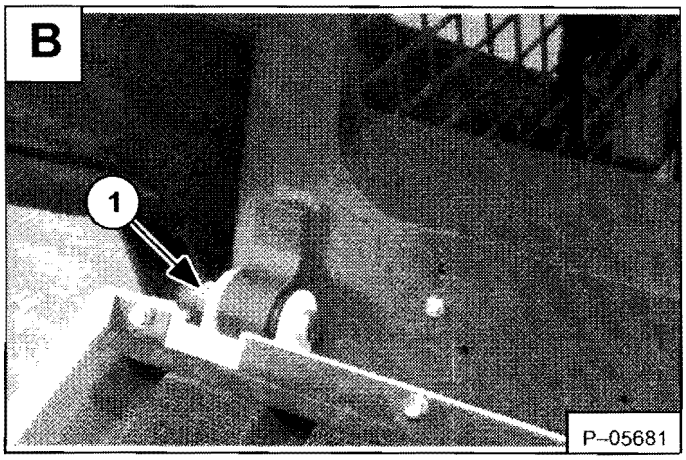
Removal and Installation (Cont'd)

Connect a sling and chain hoist to the operator cab grab handles and lower (or raise) the operator cab when the gas cylinders are disconnected **[A]**.

Remove the nut (Item 1) **[B]** from the pivot bolt (both sides).

Installation: Tighten the pivot bolt and nut to 25–35 ft.–lbs. (34–47 Nm) torque.

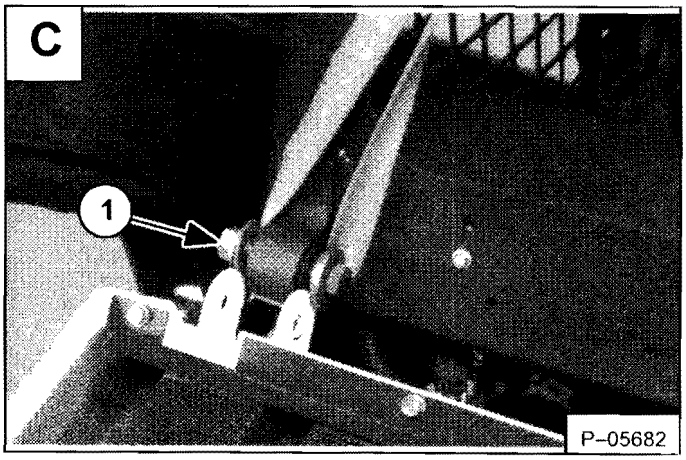
Remove the pivot bolt (both sides).



Move the operator cab forward a small amount for clearance at the pivot mounting brackets **[C]**.

Install the pivot bolt, washer (one on each side) and nut (Item 1) **[C]** (both sides).

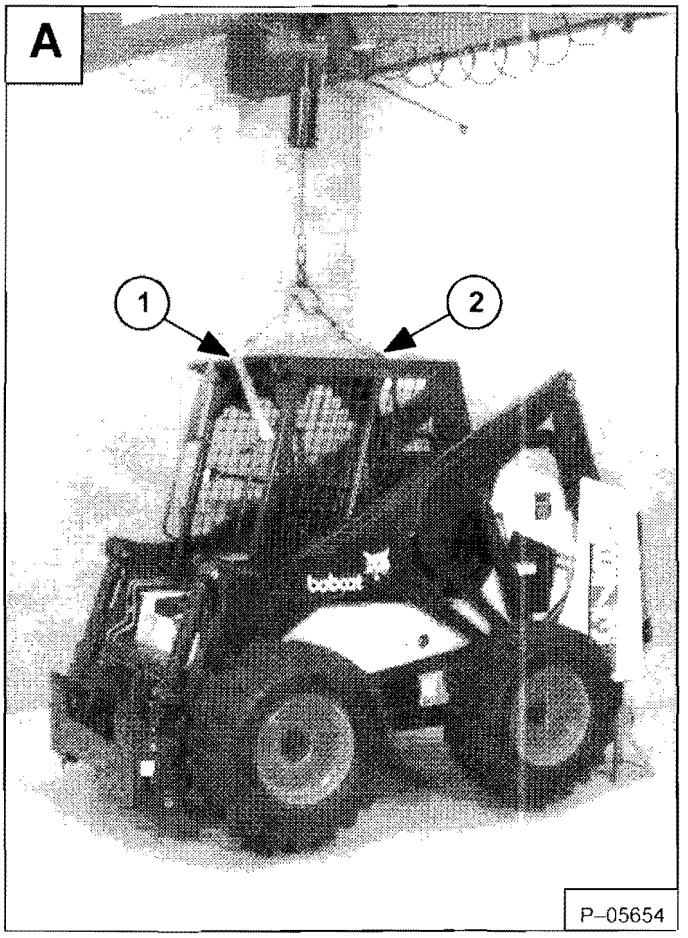
Install the sling under the pivot bolt and pivot of the operator cab **[C]**.



Removal and Installation (Cont'd)

Connect the slings (Items 1 & 2) **[A]** to a chain hoist.

Remove the operator cab from the loader **[A]**.



OPERATOR SEAT

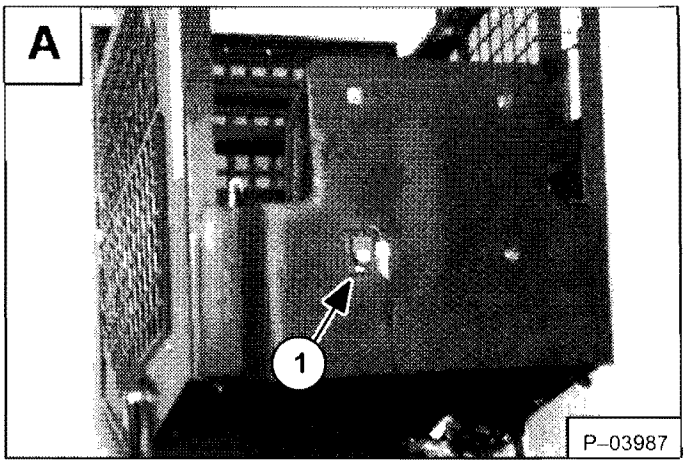
Removal and Installation

Use the following procedure to remove the operator seat from the operator cab:

Raise the operator cab. (See Page 1–1.)

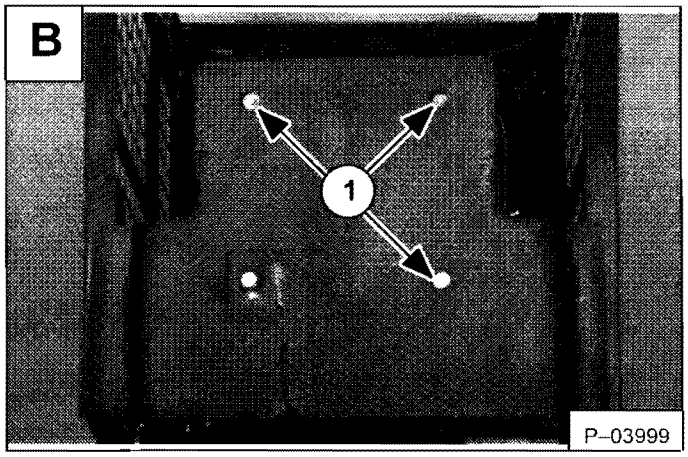
Locate the operator seat sensor (Item 1) **[A]** on the bottom of the seat pan.

Disconnect the seat sensor connector and remove the seat sensor assembly. (See Page 8–1.)



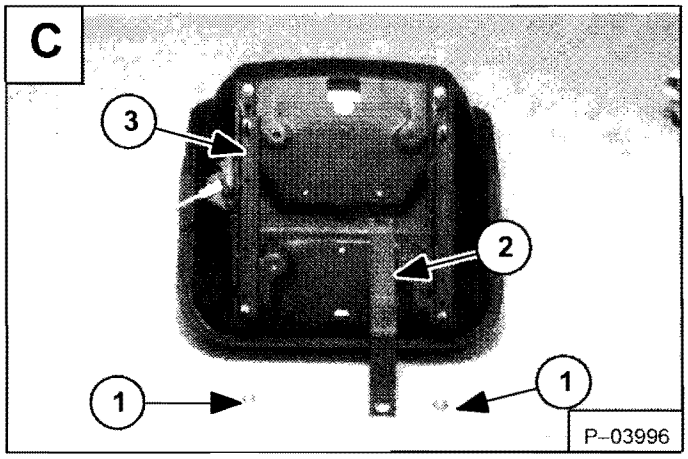
Remove the three seat mounting nuts (Item 1) **[B]** and washers from the operator seat mounting studs.

Lower the operator cab and remove the operator seat from the cab.



NOTE: There are two spacers (Item 1) [C] located between seat track and the seat pan on each front mounting stud. Be sure not to lose the spacers when removing the seat.

Remove the seat spring (Item 2) **[C]** from under the right seat track when removing the operator seat.

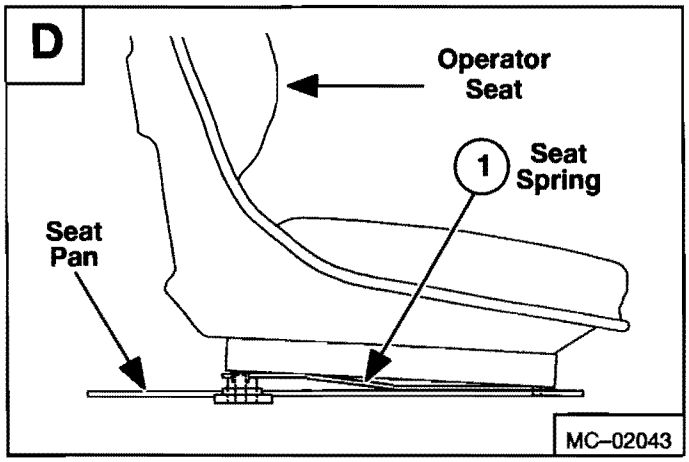


Installation: Install the seat spring (Item 1) **[D]** with the bend of the seat spring in the position shown.

Inspect the seat adjustment track (Item 3) **[C]**.

Remove the mounting bolt from each end of the track and replace the adjustment track if necessary.

Reverse the removal procedure to install the operator seat.



BOB–TACH

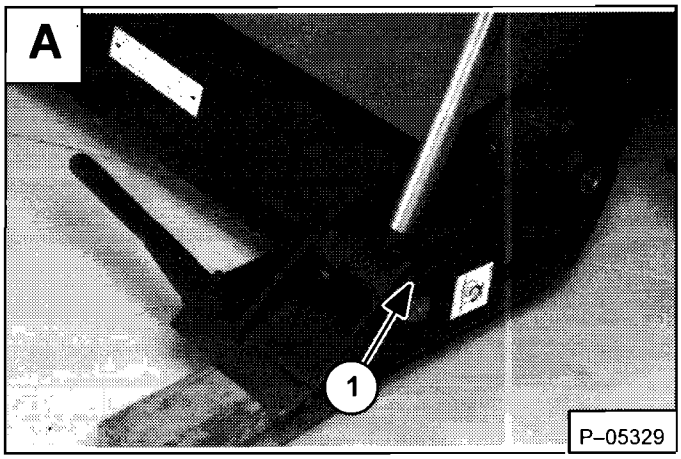
Removal and Installation

Tilt the Bob–Tach forward, so it is parallel to the floor. Put blocks (approximately 3 inches) under each side of the Bob–Tach **[A]**.

Lower the Bob–Tach onto the blocks.

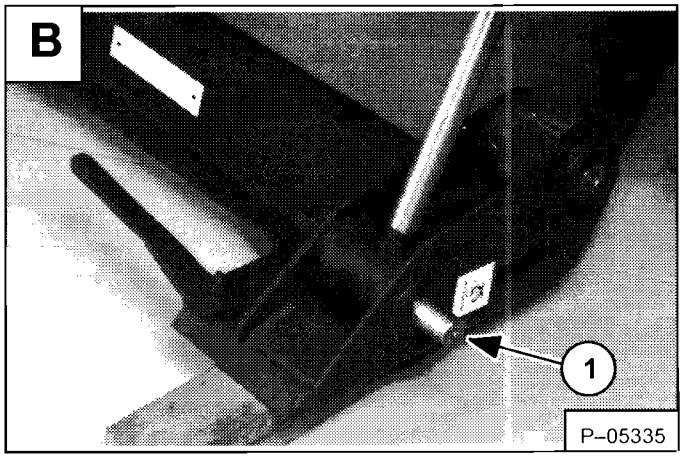
Remove the retainer bolt (Item 1) **[A]** and nut from the tilt cylinder rod end pin (both sides).

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



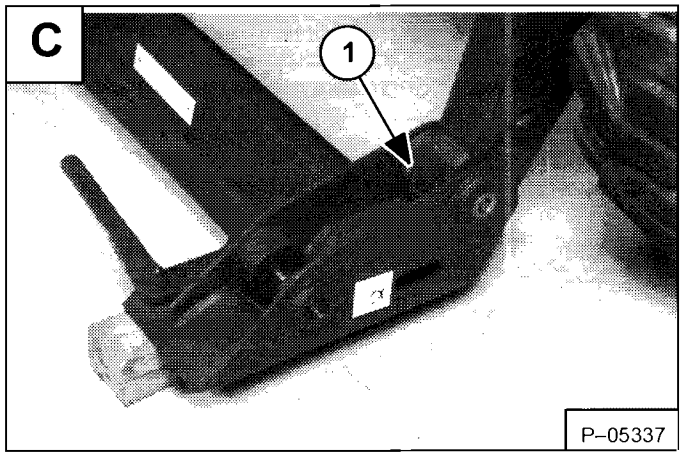
Remove the pivot pin (Item 1) **[B]** from the tilt cylinder rod end (both sides).

Remove the tilt cylinder rod end from the Bob–Tach (both sides).



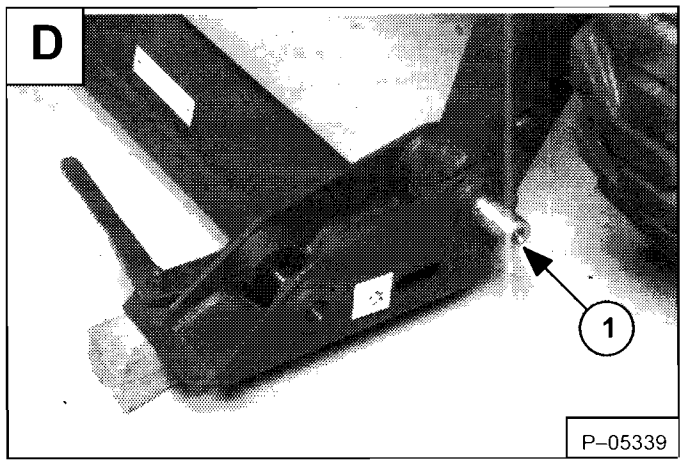
Remove the retainer bolt (Item 1) **[C]** and nut from the Bob–Tach pivot pin (both sides).

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



Remove the Bob–Tach pivot pin (Item 1) **[D]** (both sides).

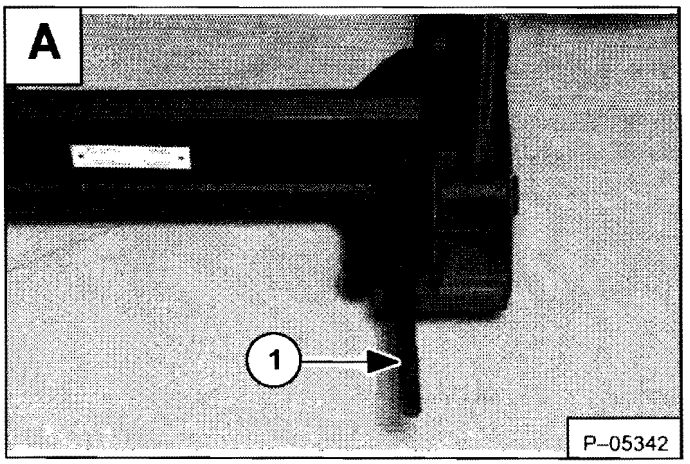
Remove the Bob–Tach from the lift arms.



Bob–Tach Lever and Wedge

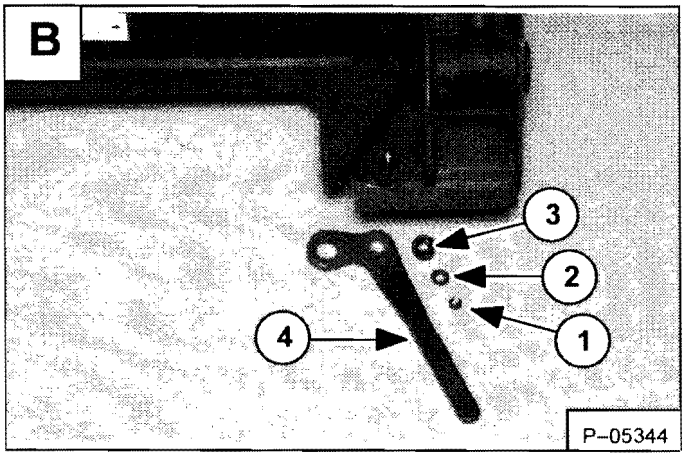
Use the following procedure to remove and install the Bob–Tach lever (Item 1) **[A]**, spring and wedge.

NOTE: Removal procedure is shown for the right side. Left side procedure is the same.



Remove the lever mounting nut (Item 1) **[B]**, washer (Item 2) **[B]**, spring (Item 3) **[B]** and lever (Item 4) **[B]**.

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

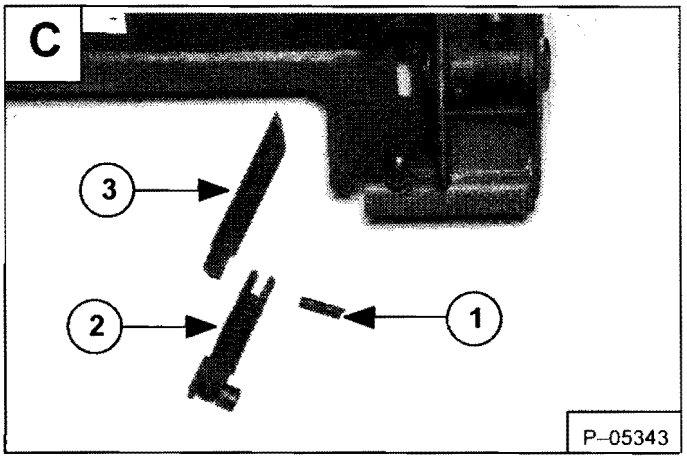


Use a punch and hammer, remove the roll pin (Item 1) **[C]** from the Bob–Tach wedge and spring clevis.

Remove the spring/clevis (Item 2) **[C]** assembly.

Remove the wedge (Item 3) **[C]**.

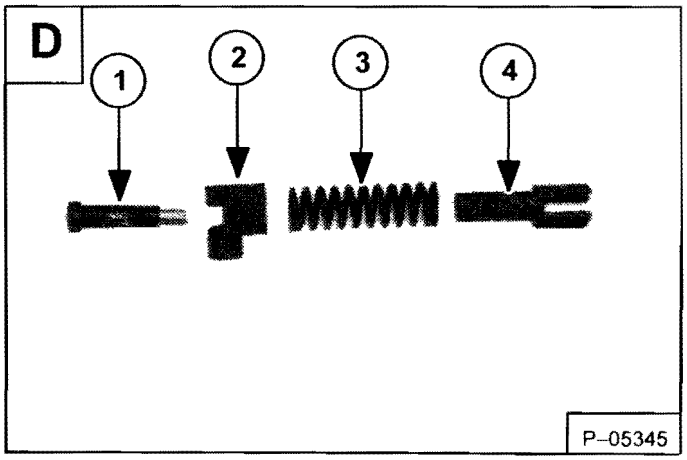
Always replace bent or broken wedges.



If the bolt (Item 1) **[D]**, handle pivot (Item 2) **[D]**, spring (Item 3) **[D]** or clevis (Item 4) **[D]** are damaged, put the assembly in a vise.

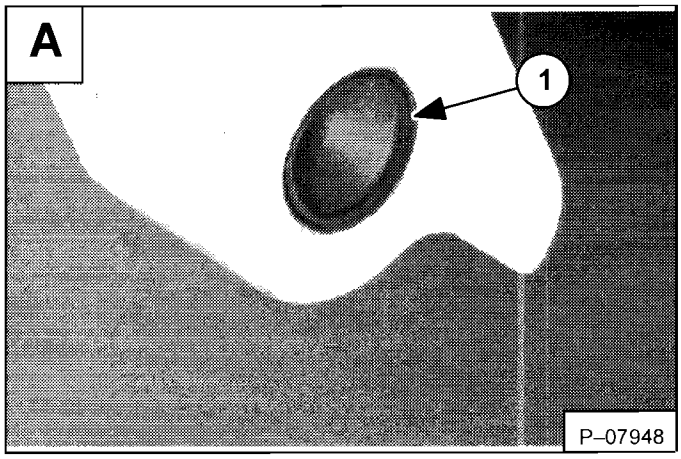
Remove the bolt and replace the damaged parts as needed,

Reverse the removal procedure to install the Bob–Tach lever and wedge.

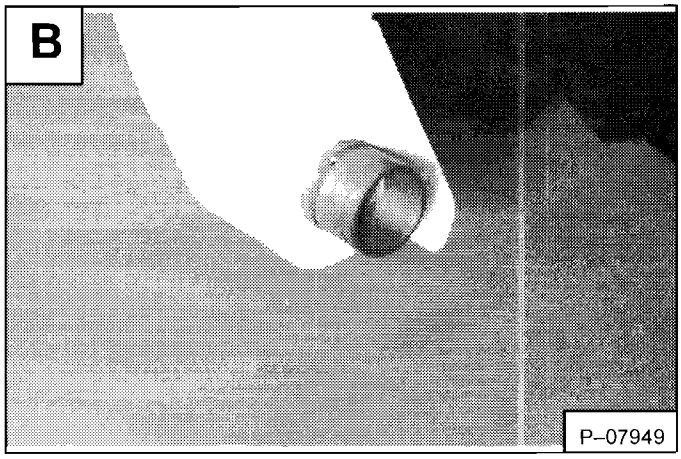


Pivot Pin Bushing and Seal Replacement

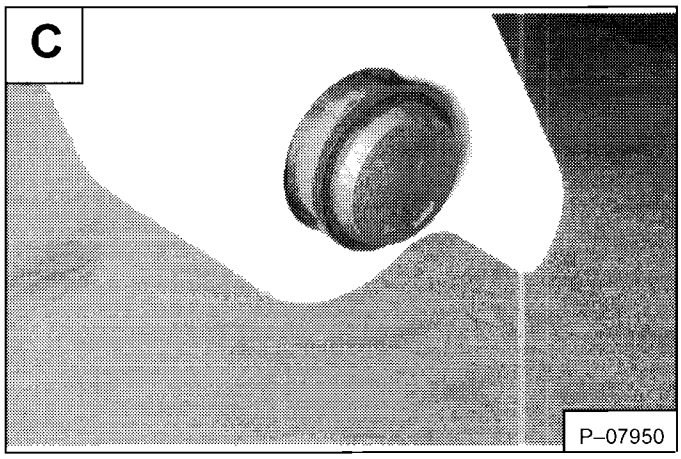
Use a seal pick to remove seals (Item 1) **[A]** on both sides of pivot bushing.



Remove and replace bushing with a driver tool and hammer **[B]**.



Use a driver to install new seals. The pivot pin can be used to locate seal **[C]**.



LIFT ARM STABILIZER BAR

Removal and Installation

Lift and block the loader. (See Page 1–1.)

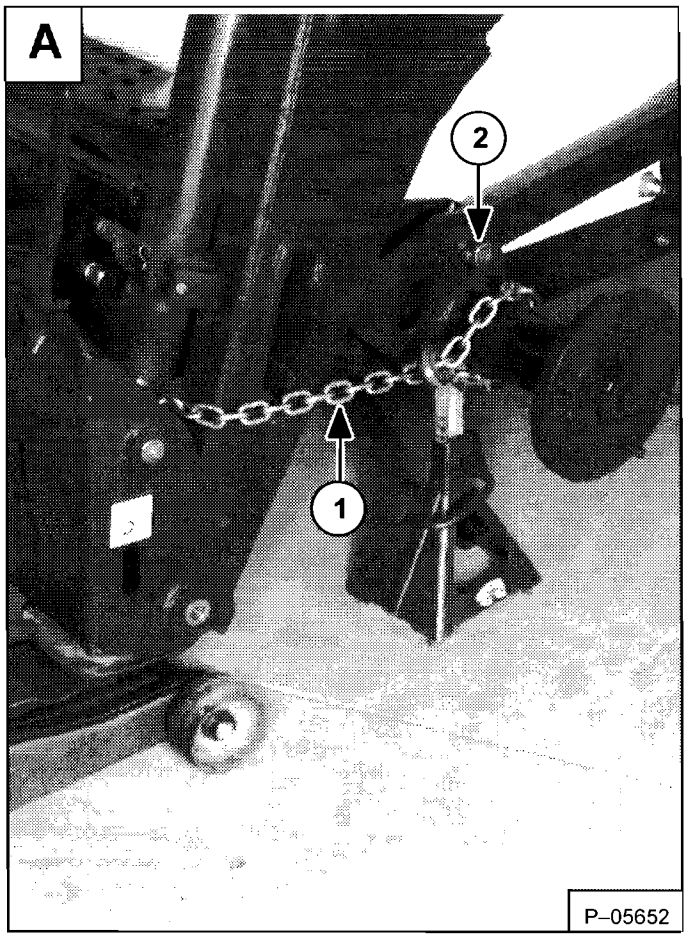
Remove the wheel/tire assembly from the side of the loader where the stabilizer bar is removed from.

Install a chain (Item 1) **[A]** around the axle tube and connect it to the lift arms.

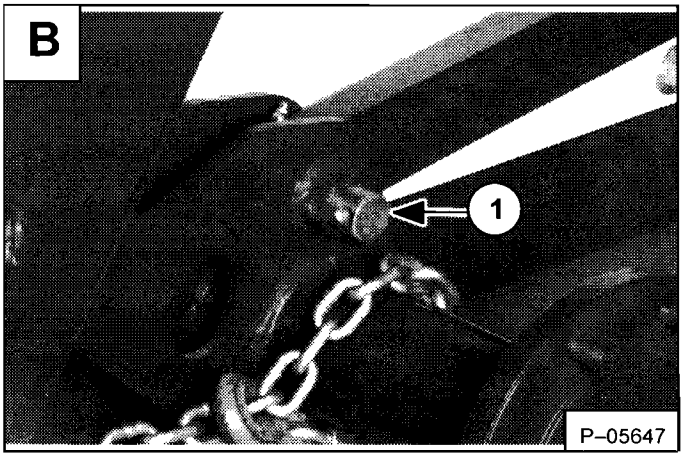
Put a floor jack under the Bob–Tach frame **[A]**.

Remove the retainer bolt (Item 2) **[A]** and nut from the stabilizer bar pivot pin.

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



Remove the stabilizer bar pivot pin (Item 1) **[B]**.

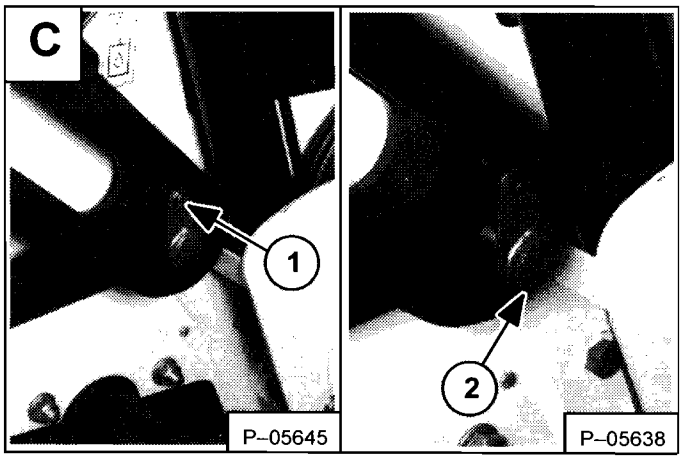


Remove the retainer bolt (Item 1) **[C]** from the rear stabilizer bar pivot pin.

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

Remove the stabilizer bar pivot pin (Item 2) **[C]**.

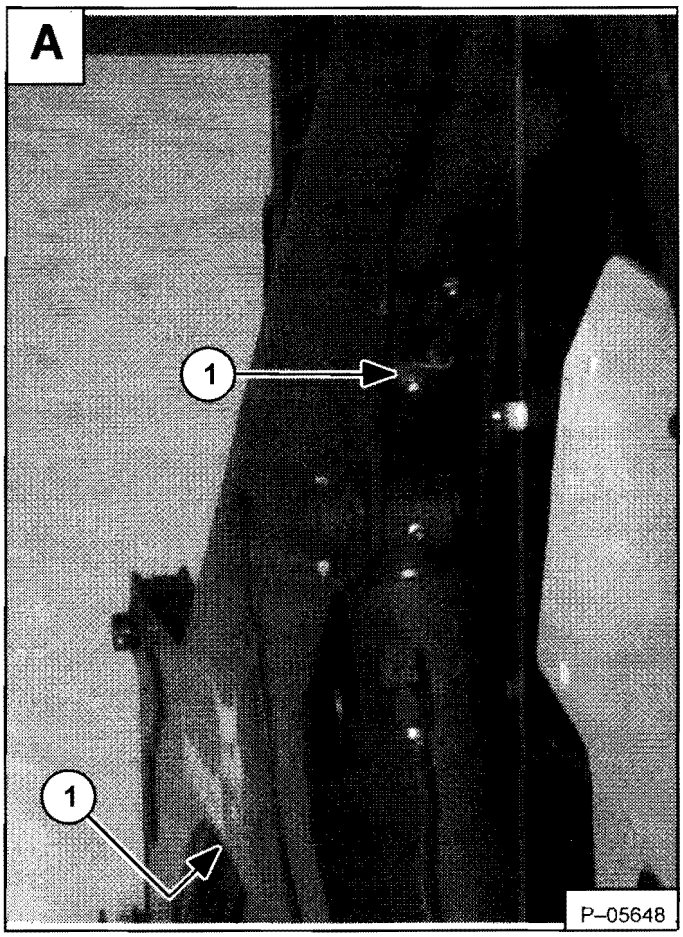
Remove the stabilizer bar.



LIFT ARM LINK

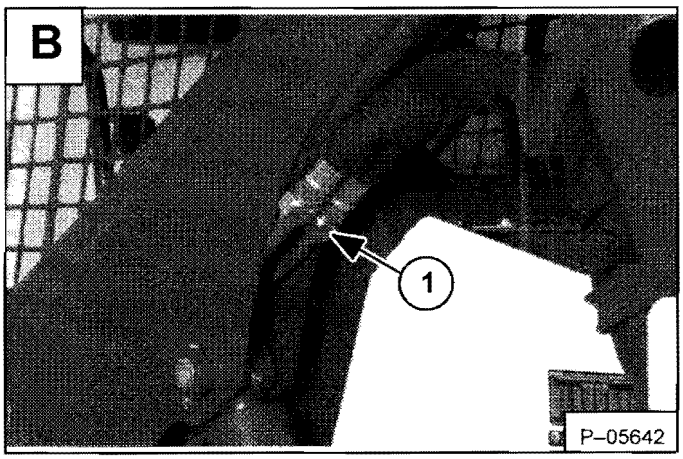
Removal and Installation

Remove the tubeline clamps (Item 1) **[A]**.



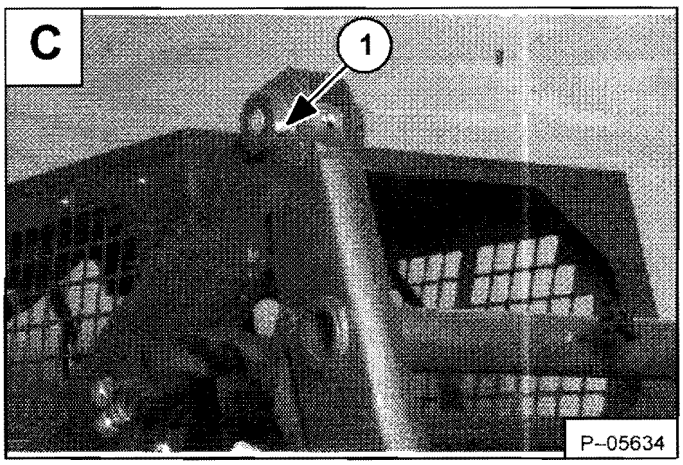
Pull the tubelines down, disconnect the hydraulic hoses (Item 1) **[B]**.

Repeat the above procedure for the other side of the lift arms.



Remove the retainer bolt (Item 1) **[C]** and nut from the lift arm pivot pin (both sides).

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

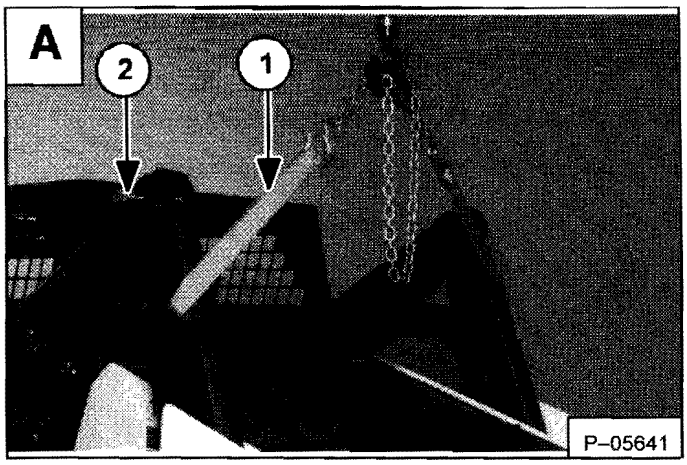


LIFT ARM LINK (Cont'd)

Removal and Installation (Cont'd)

Install a sling (Item 1) **[A]** and chain hoist on the lift arm link.

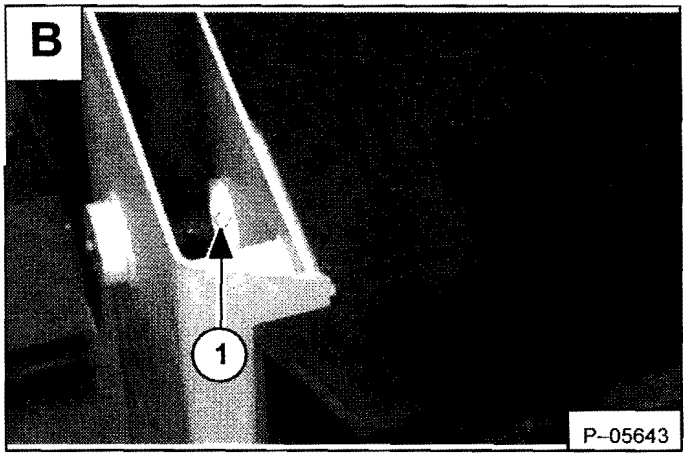
Remove the lift arm pivot pin (Item 2) **[A]** (both sides).



Remove the retainer bolt (Item 1) **[B]** and nut from the lift arm link pivot pin (both sides).

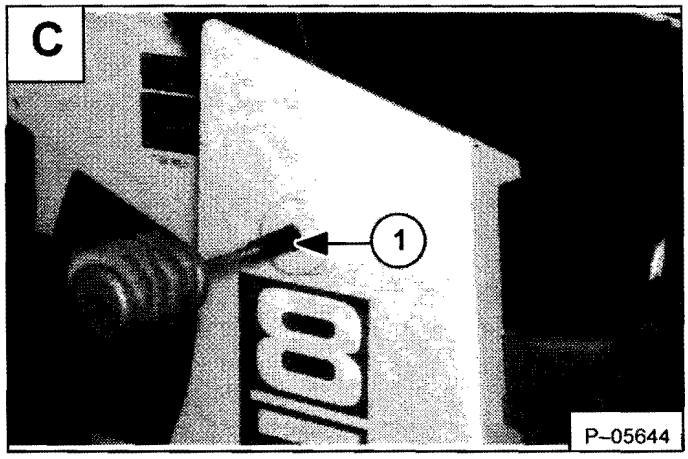
Installation: Tighten the retainer bolt and nut to 18–20 ft.–lbs. (24–27 Nm) torque.

Remove the bolt (Item 2) **[B]** from the end of the pivot pin (both sides)



Install a slide hammer, remove the lift arm link pivot pin (Item 1) **[C]** (both sides).

Remove lift arm link from the loader frame.



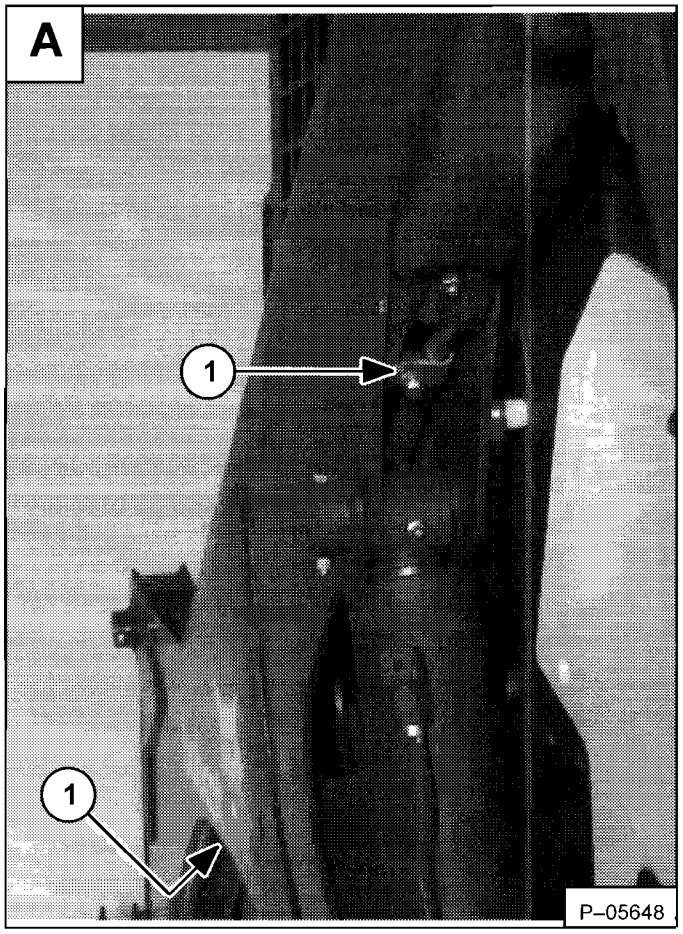
LIFT ARMS

Removal and Installation

Lift and block the loader. (See Page 1–1.)

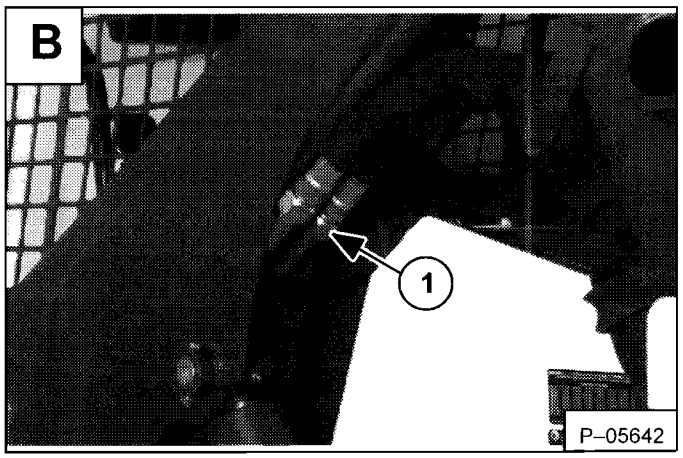
Remove the rear wheel/tire assembly (both sides).

Remove the tubeline clamps (Item 1) **[A]**.



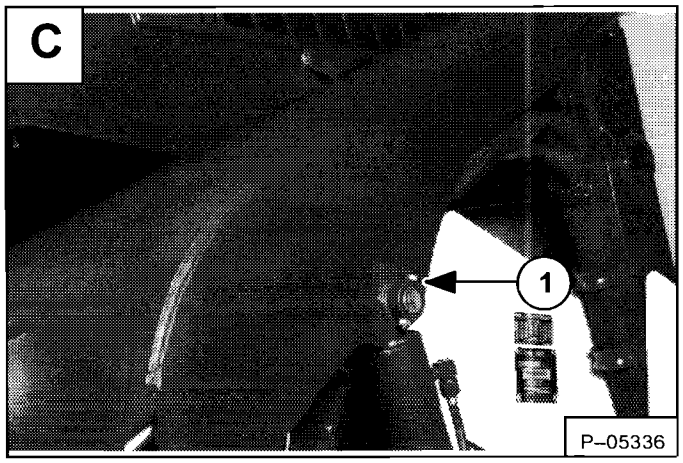
Pull the tubelines down, disconnect the hydraulic hoses (Item 1) **[B]**.

Repeat the above procedure for the other side of the lift arms.



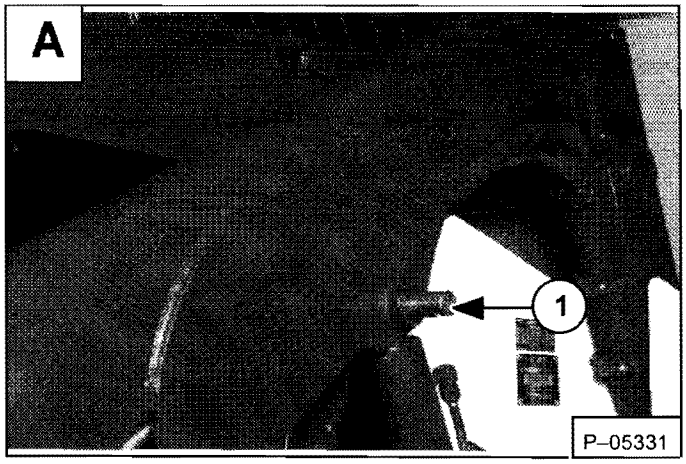
Remove the retainer bolt (Item 1) **[C]** and nut from the lift cylinder rod end pivot pin (both sides).

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



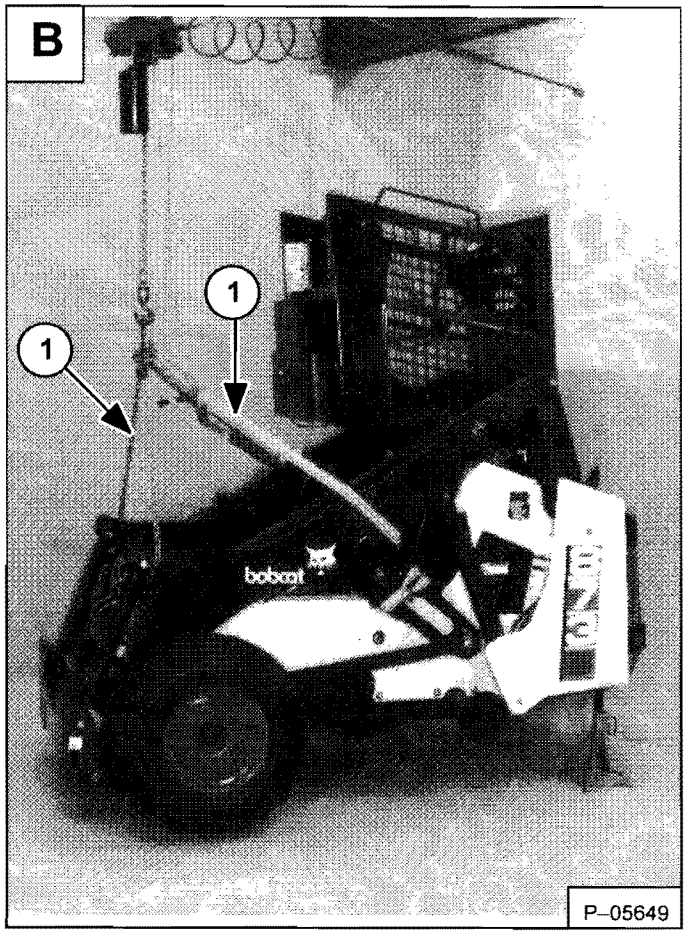
Removal and Installation (Cont'd)

Remove the lift cylinder rod end pivot pin (Item 1) **[A]** (both sides).



Raise the operator cab. (See Page 1–1.)

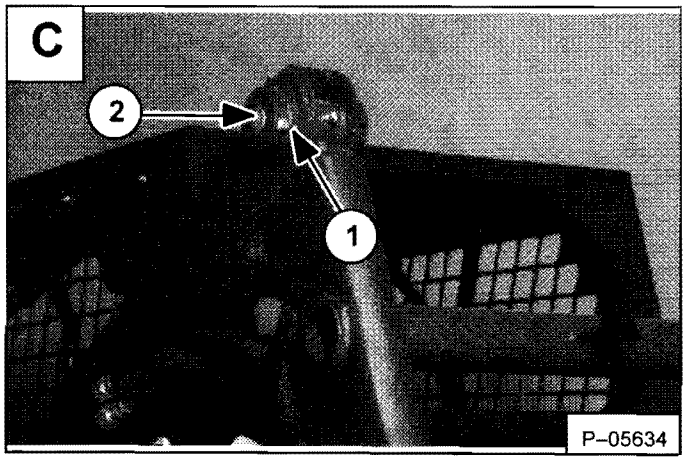
Install a sling and chain (Item 1) **[B]** on the lift arms and connect to a chain hoist.



Remove the retainer bolt (Item 1) **[C]** and nut from the lift arm pivot pin (both sides).

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

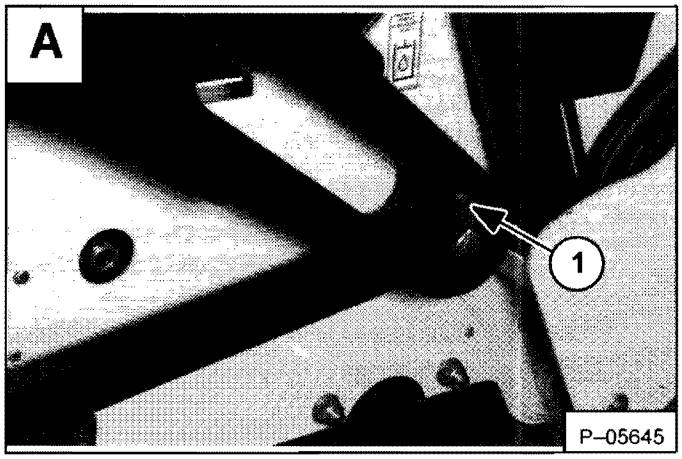
Remove the lift arm pivot pin (Item 2) **[C]** (both sides).



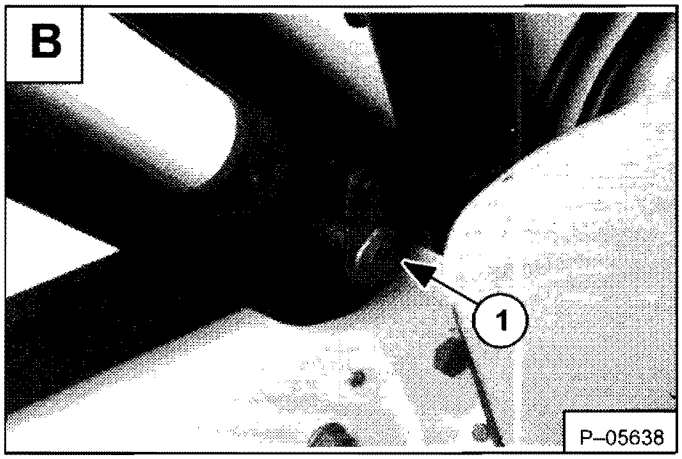
Removal and Installation (Cont'd)

Remove the retainer bolt (Item 1) **[A]** at the stabilizer bar pivot pin (both sides).

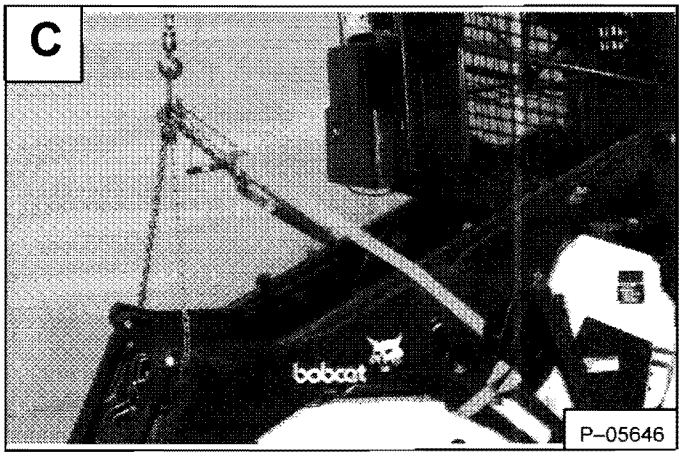
Installation: Tighten the retainer bolt to 18–20 ft.–lbs. (24–27 Nm) torque.



Remove the stabilizer bar pivot pin (Item 1) **[B]** (both sides).



Lift the lift arms and remove them from the loader frame **[C]**.



REAR GRILL

Removal and Installation

Open the rear door.

Lift the panel, over the top of the muffler, and lay it on top of the rear grill **[A]**.

Lift and pull the rear grill and remove it from the loader **[B]**.

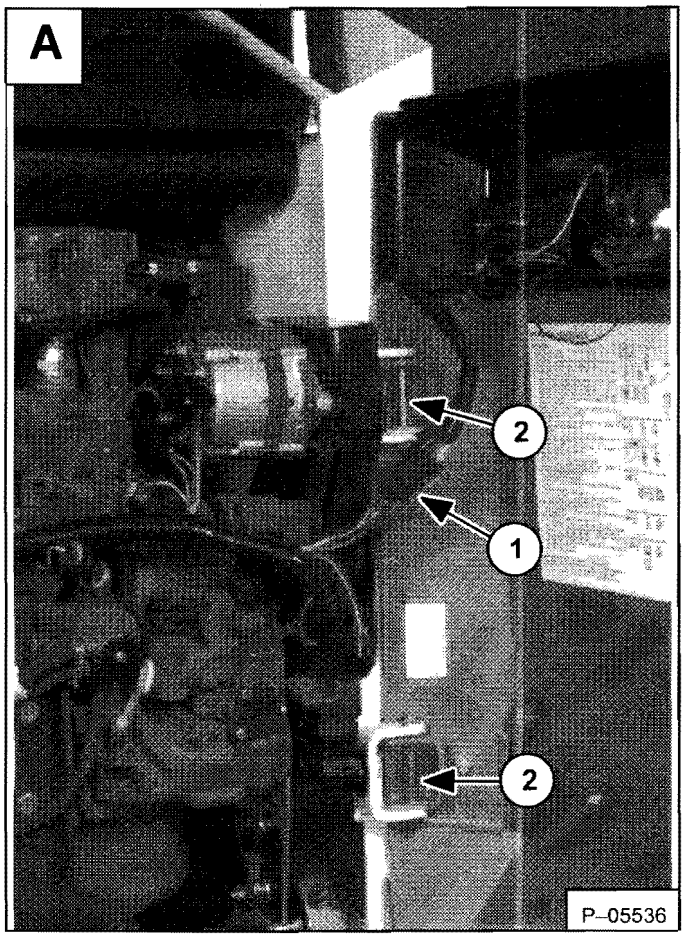
REAR DOOR

Removal and Installation

Open the rear door, disconnect the wiring harness connector (Item 1) **[A]**.

Remove the nuts (Item 2) **[A]** from the pivot bolts.

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



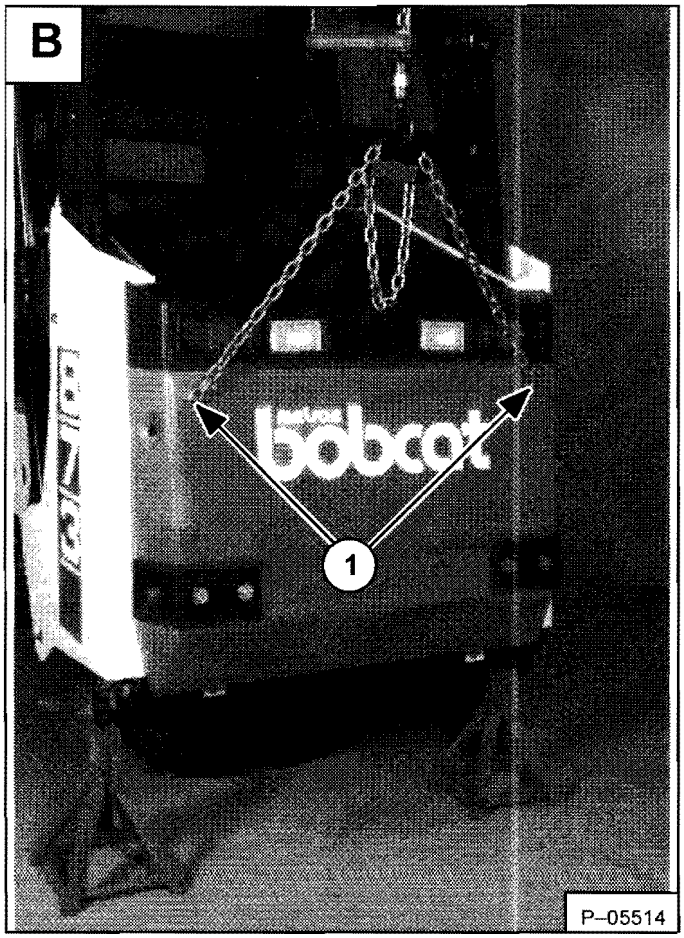
Connect a chain to the rear door using two bolts (Item 1) **[B]**.

Inside the rear door, secure the chain with washers and nuts.

Connect a chain hoist to the chain **[B]**.

Remove the rear door pivot bolts (Item 2) **[A]**.

Lift the rear door away from the loader frame and put the door flat on the floor.



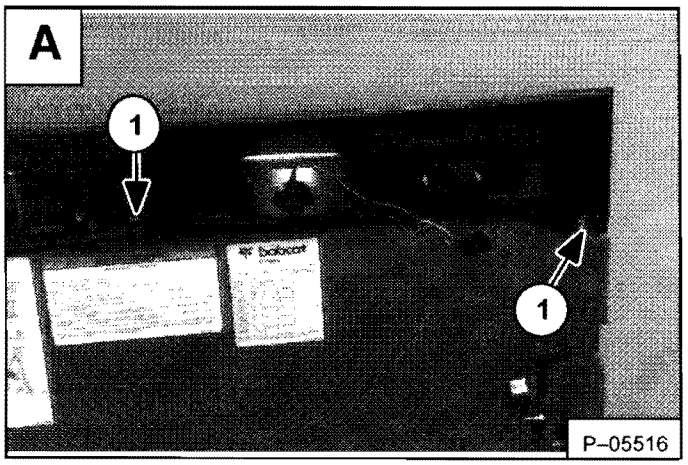
Hood Removal and Installation

Remove the rear lights harness from the rear door hood if so equipped.

Remove the mounting bolts from the rear door hood (Item 1) **[A]**.

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

Remove the hood from the rear door.

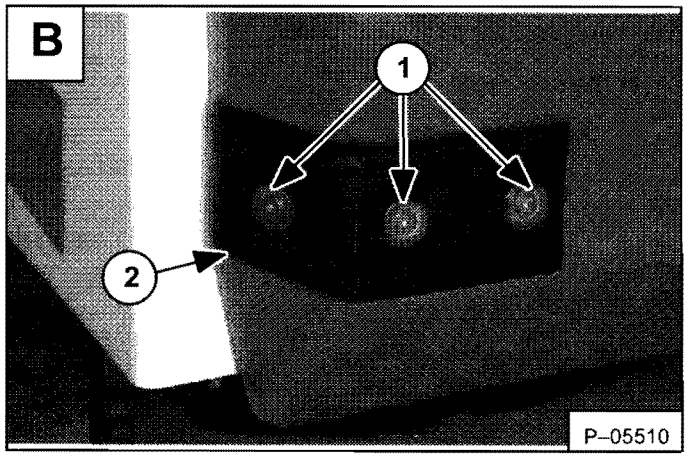


Bumper Removal and Installation

Remove the rear bumper mounting bolts (Item 1) **[B]** with a 7/32 inch allen wrench.

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

Remove the bumper (Item 2) **[B]** from the rear door.



Door Latch Removal and Installation

Remove the door latch mounting bolts (Item 1) **[C]** from the door latch mechanism.

Installation: Tighten the mounting bolts to 80–90 in.–lbs. (9–10 Nm) torque.

Remove the latch and handle mechanisms from the rear door.

Door Latch and Catch Adjustment

⚠ WARNING

AVOID INJURY

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

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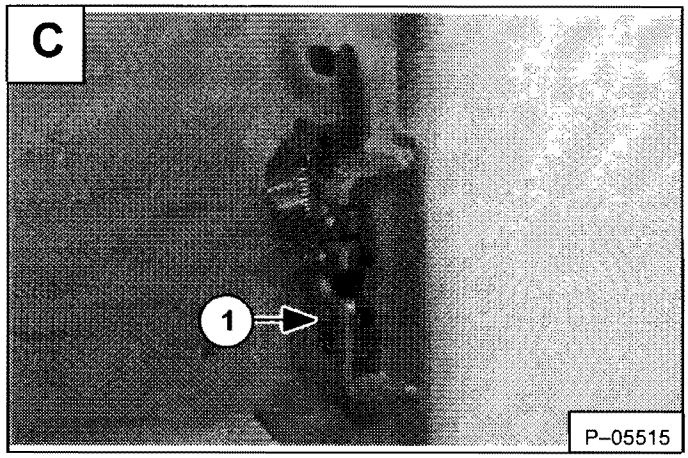
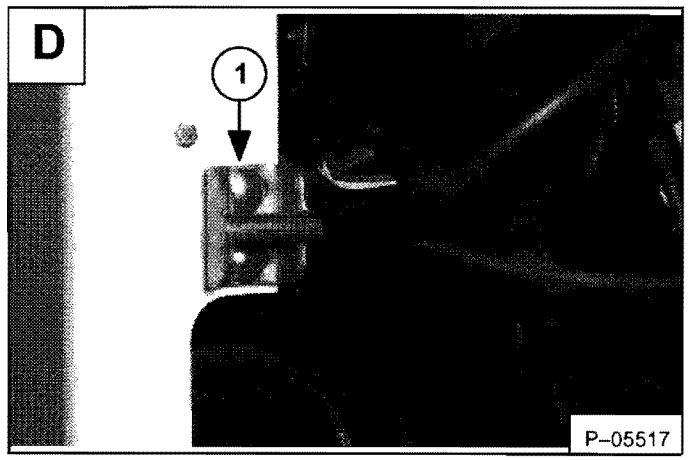
The door catch (Item 1) **[D]** can be adjusted side to side for alignment with the door latch.

The door latch mechanism (Item 1) **[C]** can be adjusted forward or backward for alignment with the door catch.

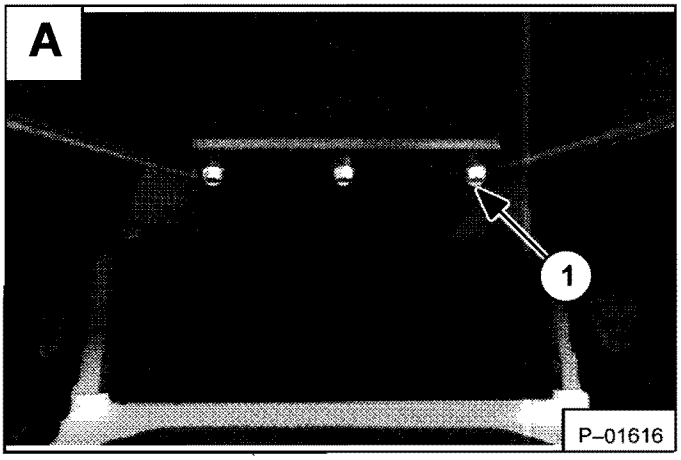




FUEL TANK

Removal and Installation

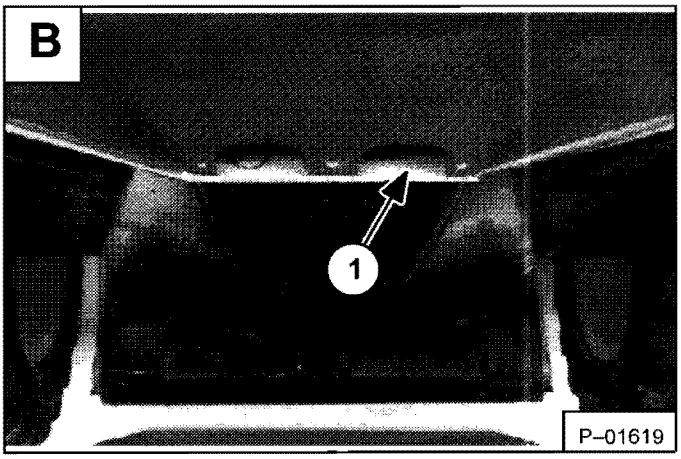
Remove the cover (Item 1) **[A]** which is installed over the drain plug.



Remove the drain plug (Item 1) **[B]**.

Drain the fuel into a container.

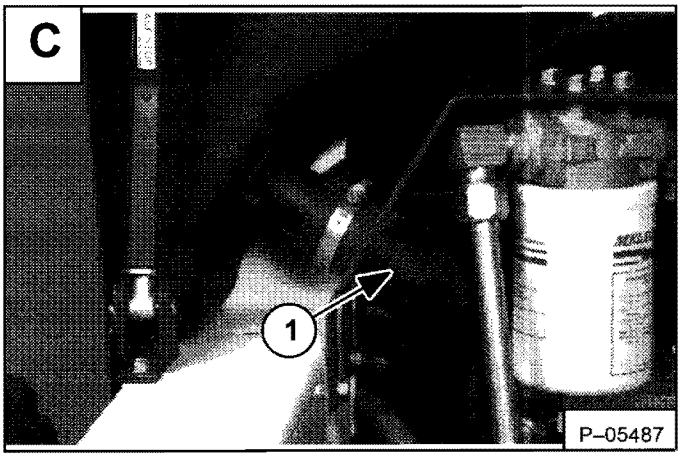
Check the drain plug and replace if necessary.



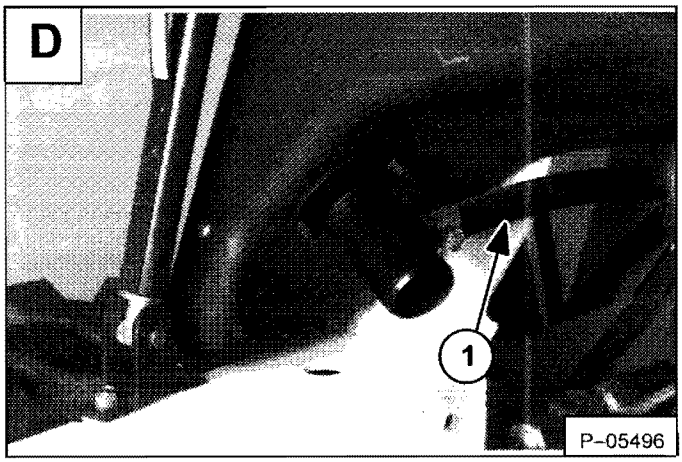
Disconnect the fuel fill hose (Item 1) **[C]**.

Remove the hydraulic/hydrostatic filter housing assembly. (See Page 2–1.)

Remove the engine/hydrostatic pump assembly from the loader. (See Page 7–1.)



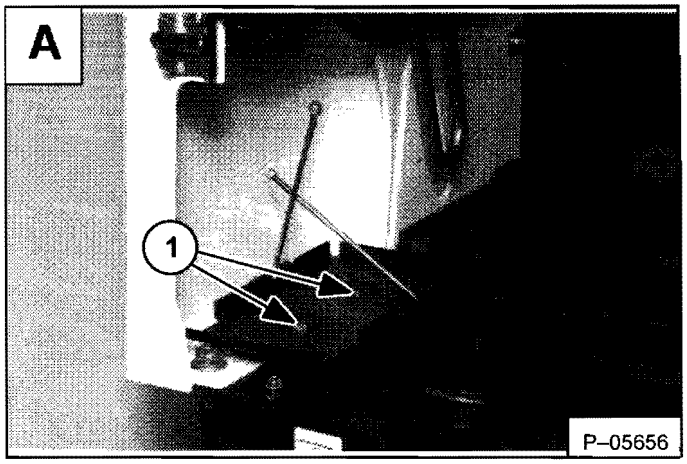
Disconnect the tank vent hose (Item 1) **[D]**.



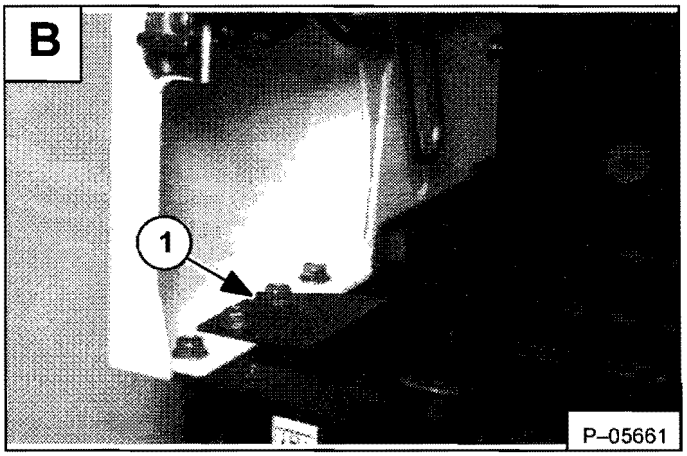
Removal and Installation (Cont'd)

Remove the bolts (Item 1) **[A]** from the battery holddown plate.

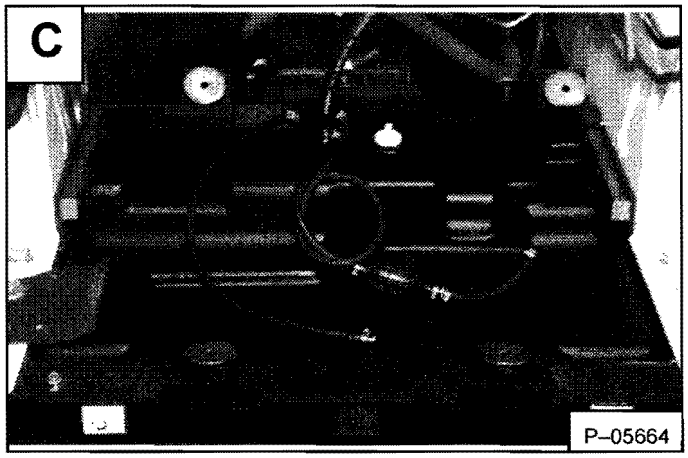
Remove the holddown plate from the loader.



Remove the mounting plate (Item 1) **[B]** for the battery holddown plate.



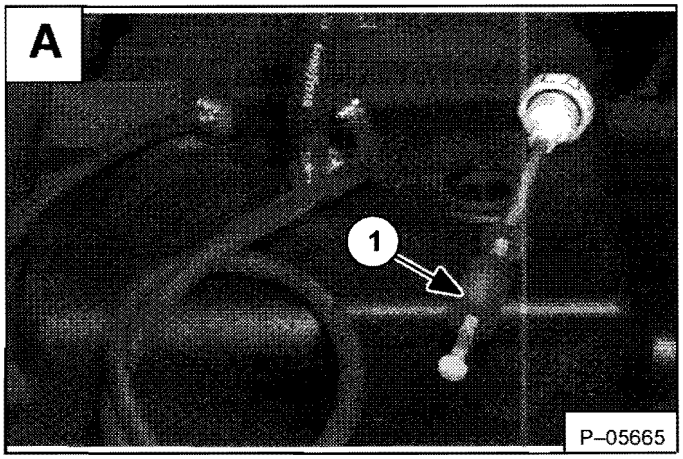
Lift the fuel tank and remove it from the loader frame **[C]**.



Fuel Level Sender

Loosen the fuel level sender in fuel tank.

Remove the fuel level sender (Item 1) **[A]**.



Inlet Screen

The inlet screen (Item 1) **[B]** is located at the fuel fill neck.

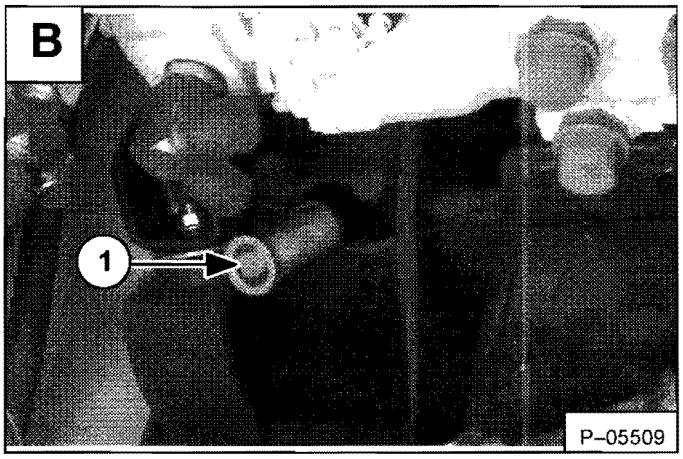
Disconnect the fuel fill hose.

Remove the inlet screen (Item 1) **[B]**.

Wash the screen in clean solvent.

Dry the screen and check for damage.

Replace as needed.



873 BICS
OPERATOR CAB WIRING DIAGRAM
INDEX

USE YOUR LOADER SERIAL NUMBER TO FIND THE CORRECT DIAGRAM SHEET.

LOADER S/N	OPTION	SHEET #	COMMENTS
514111001 – 12611	W/O BOSS	**Sht 1**	
514112612 & Abv.	W/O BOSS	**Sht 2**	added side console
514111001–12611 **514211001–11273**	W/BOSS	**Sht 3**	
514112612 & Abv.	W/BOSS	**Sht 4**	added side console
514211274 & Abv.	Euro W/BOSS	**Sht 5**	added side console

873 BICS
ENGINE WIRING DIAGRAM
INDEX

USE YOUR LOADER SERIAL NUMBER TO FIND THE CORRECT DIAGRAM SHEET.

LOADER S/N	OPTION	SHEET #	COMMENTS
514111001 – 11423	W/O BOSS	**Sht 1**	
514111424 – 12611	W/O BOSS	**Sht 2**	added rear auxiliary bleed down
514112612 & Abv.	W/O BOSS	**Sht 3**	added side console
514111001 – 11423 **514211001 – 11094**	W/BOSS	**Sht 4**	
514111424 – 12611 **514211095 – 11273**	W/BOSS	**Sht 5**	added rear auxiliary bleed down
514112612 & Abv. **514211274 & Abv.**	W/BOSS	**Sht 6**	added side console

873 BICS
OPERATOR CONTROLS WIRING DIAGRAM
INDEX

USE YOUR LOADER SERIAL NUMBER TO FIND THE CORRECT DIAGRAM SHEET.

LOADER S/N	OPTION	SHEET #	COMMENTS
514111001–11442 **514211001–11004**	ALL	**Sht 1**	
514111443 – 12488 **514211105 – 11269**	ALL	**Sht 2**	added auxiliary deactivation
514112489 & Abv. **514211270 & Abv.**	ALL	**Sht 3**	added auxiliary deactivation

873 BICS
BICS WIRING DIAGRAM
INDEX

USE YOUR LOADER SERIAL NUMBER TO FIND THE CORRECT DIAGRAM SHEET.

LOADER S/N	OPTION	SHEET #	COMMENTS
514111001 – 12611 **514211001 – 11273**	All	**Sht 1**	
514112612 & Abv.	All	**Sht 2**	added auxiliary deactivation
514211274 & Abv.	European	**Sht 3**	added auxiliary deactivation & travel control

873 BICS
OPTIONAL WIRING DIAGRAM
INDEX

USE YOUR LOADER SERIAL NUMBER TO FIND THE CORRECT DIAGRAM SHEET.

CAB ACCESSORY

LOADER S/N	OPTION	SHEET #	COMMENTS
514112612 & Abv. 514211274 & Abv.		Sht 1	

ATTACHMENT

LOADER S/N	OPTION	SHEET #	COMMENTS
514111001 – 11501 514211001 – 11107		Sht 1	
514111502 & Abv. 514211108 & Abv.		Sht 2	

ELECTRICAL SYSTEM

	Page Number
ALTERNATOR	
Alternator Output Test	6–7
Alternator Regulator Test	6–8
Assembly	6–12
Disassembly	6–10
Rectifier Continuity (Diode) Test	6–11
Rectifier (Diode) Test	6–7
Removal and Installation	6–9
Rotor Continuity Test	6–11
Rotor Ground Test	6–11
Stator Continuity Test	6–10
Stator Ground Test	6–10
BATTERY	
Removal and Installation	6–5
ELECTRICAL SYSTEM INFORMATION	
Description	6–4
Fuse Location	6–4
FRONT LIGHTS	
Removal and Installation	6–19
RELAY SWITCHES	
Location	6–20
STANDARD INSTRUMENT PANEL	
Removal and Installation	6–18
STARTER	
Checking the Starter	6–13
Cleaning and Inspection	6–17
Disassembly and Assembly	6–15
Parts Identification	6–14
Removal and Installation	6–13
TROUBLESHOOTING	
Chart	6–3

bobcat

WIRING DIAGRAM (P/N 6724417) Sheet 1
Operator Cab - Without BOSS (BASE)
(Harness 6707665 Rev. C)
873 BICS™ (S/N 514111001-12611)

(Printed November 1996)

Printed in U.S.A.

MC 2173TI

WIRE LEGEND

NO.'s	COLOR	GAUGE
10	Black	10
10A	Black	12
10P	Black	16
12F	Orange	*18
12FA	Orange	*18
12FB	Orange	16
12H	Orange	16
12HW	Orange	*18
12T	Orange	16
12V	Orange	16
19D	Red/White	16
19G	Red/White	16
19L	Red/White	14
19LA	Red/White	16
19LB	Red/White	16
19S	Red/White	14
19W	Red/White	16
19WA	Red/White	16
19WP	Red/White	14
21G	White	*18
21R	White	*18
21RM	White	*18
23BL	White/Black	*18
23F	White/Black	16
23HF	White/Black	*18
26A	Lt. Blue/Green	16
28	Lt. Blue/Black	*18
28A	Lt. Blue/Black	*18
30	Black	16
30G	Black	16
30T	Black	16
31	Yellow/Green	*18
31P	Yellow/Green	*18
32	Yellow/Dk. Blue	*18
32F	Yellow/Dk. Blue	*18
35H	Yellow/Brown	*18
36	Purple	*18
36T	Purple/White	*18
40	Black	16
40A	Black	16
40B	Black	16
40D	Black	16
40F	Black	16
40FA	Black	16
40FB	Black	16
40FD	Black	16
40FL	Black	16
40FR	Black	16
40H	Black	16
40L	Black	*18
40R	Black	*18
41	Pink	16
41A	Pink	16
41B	Pink	16

WIRE LEGEND (Cont'd)

NO.'s	COLOR	GAUGE
42F	Dk. Blue	16
42FL	Dk. Blue	16
42FR	Dk. Blue	16
42R	Dk. Blue/White	16
42RF	Dk. Blue/White	16
46B	Brown/Red	16
46H	Brown	16
46L	Brown/Yellow	16
46LA	Brown/Yellow	*18
46LF	Brown/Yellow	16
46LF	Yellow (Flasher Harness)	16
46LR	Brown/Yellow	16
46R	Brown/Green	16
46RA	Brown/Green	*18
46RF	Brown/Green	16
46RF	Green (Flasher Harness)	16
46RR	Brown/Green	16
46T	Brown	16
49F	Gray	16
49T	Gray	16
49V	Gray	16
50E	Black	16
56A	Dk. Green/Yellow	*18
56L	Lt. Green/Blue	*18
56P	Lt. Green/Red	*18
57F	Lt. Blue/Red	*18
57L	Lt. Green/Pink	*18
58B	Dk. Green/Red	*18
59E	Orange	*18
60H	Black	16
60W	Black	16
60WA	Black	16
60WB	Black	16
63A	Blue/Black	16
63B	Orange/Black	16
64	Orange/Blue	16

*** Some Machines Have 16 Gauge Wires.**

Printed in U.S.A.

PARTS LEGEND

1. Cab Harness (BASE) 6707665 Rev. C
2. PWM Control Harness Connector
3. Mainframe Ground
4. Operator Cab Ground
5. Dome Light With Switch (Euro. Opt.)
6. Headlight Harness (Opt.) 6578528 Rev. B
7. Left Headlight (Opt.)
8. Left Front Turn Indicator (Opt.)
9. Light Connector
10. Flasher (Opt.)
11. Shutdown Module (Opt.)
12. Horn (Euro. Opt.)
13. Right Headlight (Opt.)
14. Right Front Turn Indicator (Opt.)
15. Front Wiper Connector
16. Front Wiper Harness (Opt.) 6708269 Rev. A
17. Front Wiper Switch (Opt.)
18. Front Wiper Motor (Opt.)
19. Front Windshield Washer Pump and Water Tank Reservoir (Opt.)
20. Glow Plug Switch
21. Jumper
22. Bucket Level Switch (Opt.)
23. Beacon/Strobe Switch (Opt.)
24. Hazard Switch (Opt.)
25. Accessory Power Plug
26. Ignition Switch
27. Keyless Ignition Module (Opt.)
28. Light Switch (Opt.)
29. Engine & Transmission Warning Indicator Lights
30. Light Connectors

PARTS LEGEND (Cont'd)

31. Hourmeter
32. Fuel Gauge
33. Engine Temperature Gauge
34. Voltmeter
35. Auxiliary Enable Switch/ Momentary Enable Light/ Detent Enable Light
36. Diode
37. Rotating Beacon/Strobe Harness (Opt.) 6708318
38. Strobe Light or Rotating Beacon (Opt.)
39. 4-Way Flasher Harness (Opt.) 6709530
40. Beacon or Strobe Connector
41. For Future Use
42. Left Front Turn Light (Opt.)
43. Left Clearance Lamp (Euro. Opt.)
44. Right Front Turn Light (Opt.)
45. Right Clearance Lamp (Euro. Opt.)

CONNECTOR IS VIEWED FROM THE MATING SIDE

19S — G — H — 46T
64 — X — J — 28
57F — W — B — 19WP
59E — V — K — 35H
L — 23F
3IP — F — C — 12F
M — 21R
46RR — U — A — 32F
46LR — T — N — 36
19L — E — P — 36T
42R — S — D — 10A
41 — R

OPTION

Denotes Ground

Connect Here for European Option

Connect Here For Domestic Option

Wire 26A is connected to wire 23F when Shutdown Module is NOT used.

A Connects To A Engine Wiring Diagram - Sheet 1 or 2

B Connects To B Controls Wiring Diagram - Sheet 1 or 2

Shown in "OFF" position (20)

Shown in "OFF" position (22)

Shown in "OFF" position (23)

Shown in "OFF" position (24)

Ignition Switch (26)

Keyless Ignition Module (27)

Shown in "OFF" position (28)

Fuel Gauge (32)

Temp. Gauge (33)

Voltmeter (34)

Shown in "OFF" position (17)

Dk. Blue (To Detent Light)
Lt. Blue (To Momentary Light)
Red (To Lights and Switch)
Green (To Switch)
Bottom LED
Top LED
Aux. Enable Switch (35)

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MC 2173 (10-16-96)

WIRING DIAGRAM (P/N 6724417) Sheet 2
Operator Cab - Without BOSS (BASE)
(Harness 6711767 Rev. A)
873 BICS™ (S/N 514112612 and Above)

(Printed November 1996)

Printed in U.S.A.

MC 2256T7

WIRE LEGEND

NO.'s	COLOR	GAUGE
10	Black	10
10A	Black	12
12F	Orange	18
12FA	Orange	18
12FB	Orange	16
12FC	Orange	18
12H	Orange	16
12HW	Orange	18
12T	Orange	16
12V	Orange	16
19G	Red/White	16
19L	Red/White	14
19S	Red/White	14
19W	Red/White	16
19WA	Red/White	16
19WP	Red/White	14
21R	White	18
23BL	White/Black	18
23F	White/Black	16
23HF	White/Black	16
26A	Lt. Blue/Green	16
28	Lt. Blue/Black	18
30	Black	16
30G	Black	16
30T	Black	16
31P	Yellow/Green	18
32F	Yellow/Dk. Blue	18
35H	Yellow/Brown	18
36	Purple	18
36T	Purple/White	18
40	Black	16
40FL	Black	16
40FR	Black	16
41	Pink	16
42F	Dk. Blue	16
42FR	Dk. Blue	16
42R	Dk. Blue/White	16
42RF	Dk. Blue/White	16
49F	Gray	16
49T	Gray	16
49V	Gray	16
50E	Black	16
56A	Dk. Green/Yellow	18
56L	Lt. Green/Blue	18
56P	Lt. Green/Red	18
57F	Lt. Blue/Red	18
57L	Lt. Green/Pink	18
58B	Dk. Green/Red	18
*58J	Dk. Green/Red	18
59E	Orange	18
60H	Black	16
60W	Black	16
60WA	Black	16
60WB	Black	16
63A	Blue/Black	16
63B	Orange/Black	16
64	Orange/Blue	16

PARTS LEGEND

1. Cab Harness (BASE) 6711767 Rev. A
2. PWM Control Harness Connector
3. Mainframe Ground
4. Operator Cab Ground
5. Headlight Harness (Opt.) 6578528 Rev. B
6. Left Headlight (Opt.)
7. Horn (Euro. Opt.)
8. Right Headlight (Opt.)
9. Front Wiper Connector
10. Front Wiper Harness (Opt.) 6712259 Rev. A
11. Front Wiper Switch (Opt.)
12. Diode
13. Front Wiper Motor (Opt.)
14. Front Windshield Washer Pump and Water Tank Reservoir (Opt.)
15. Bucket Level Switch (Opt.)
16. Jumper
17. Glow Plug Switch
18. Ignition Switch
19. Keyless Ignition Module (Opt.)
20. Light Switch (Opt.)
21. Engine & Transmission Warning Indicator Lights
22. Hourmeter
23. Fuel Gauge
24. Engine Temperature Gauge
25. Voltmeter
26. Auxiliary Enable Switch/ Momentary Enable Light/ Detent Enable Light
27. Shutdown Connector

* This Wire May Not Be Found on All Harnesses.

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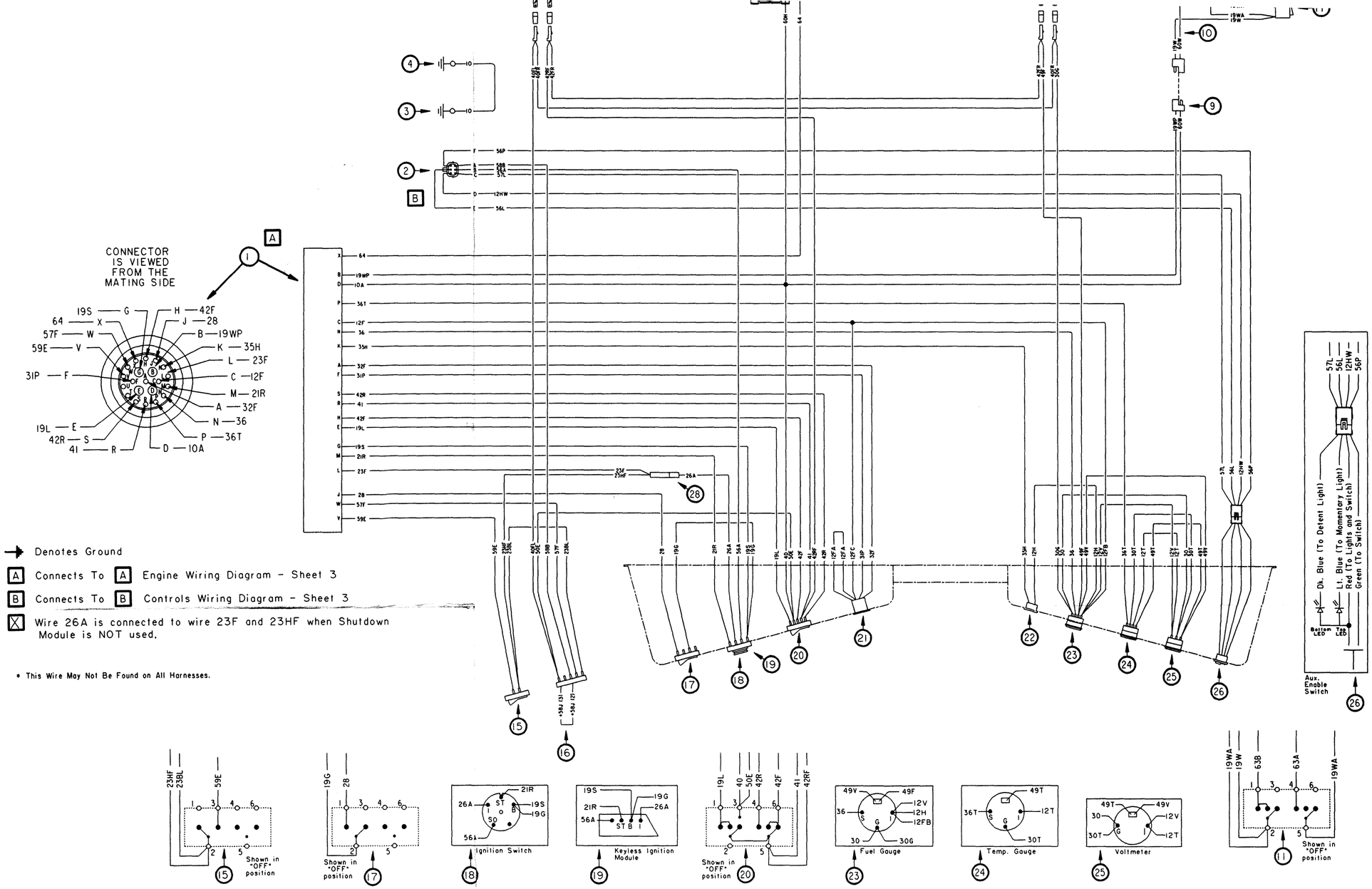
MC 2256L7 (10-16-96)



Denotes Ground

[A] Connects To [A] Engine Wiring Diagram - Sheet 3

[B] Connects To [B] Controls Wiring Diagram - Sheet 3

[X] Wire 26A is connected to wire 23F and 23HF when Shutdown Module is NOT used.

* This Wire May Not Be Found on All Harnesses.

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MC 225687 (10-16-96)

WIRING DIAGRAM (P/N 6724417) Sheet 3
Operator Cab - With BOSS
(Harness 6707671 Rev. C)
873 BICS™ (S/N 514111001-12611)
(S/N 514211001-11273)

(Printed November 1996)

WIRE LEGEND

NO.'s	COLOR	GAUGE
1M	Red	*18
10	Black	10
10A	Black	12
10E	Black	16
10EA	Black	16
10M	Black	18
10P	Black	16
12DB	Orange	18
12DL	Orange	16
12DR	Orange	18
12HW	Orange	18
19D	Red/White	16
19L	Red/White	14
19LA	Red/White	16
19LB	Red/White	16
19S	Red/White	14
19W	Red/White	16
19WA	Red/White	16
19WP	Red/White	14
21R	White	*18
23BL	White/Black	*18
23F	White/Black	16
23HF	White/Black	*18
38A	Purple/Red	18
38AA	Purple/Red	18
38AM	Purple/Red	16
38B	Purple/White	18
38BA	Purple/White	18
38BM	Purple/White	16
40	Black	16
40A	Black	16
40B	Black	16
40D	Black	16
40F	Black	16
40FA	Black	16
40FB	Black	16
40FD	Black	16
40FL	Black	16
40FR	Black	16
40H	Black	16
40L	Black	*18
40R	Black	*18
41	Pink	16
41A	Pink	16
41B	Pink	16
42F	Dk. Blue	16
42FL	Dk. Blue	16
42FR	Dk. Blue	16
42R	Dk. Blue/White	16
42RF	Dk. Blue/White	16
46B	Brown/Red	16
46H	Brown	16
46L	Brown/Yellow	16
46LA	Brown/Yellow	*18

WIRE LEGEND (Cont'd)

NO.'s	COLOR	GAUGE
46LF	Brown/Yellow	16
46LF	Yellow (Flasher Harness)	16
46LR	Brown/Yellow	16
46R	Brown/Green	16
46RA	Brown/Green	*18
46RF	Brown/Green	16
46RF	Green (Flasher Harness)	16
46RR	Brown/Green	16
46T	Brown	16
50E	Black	16
56A	Dk. Green/Yellow	*18
56L	Lt. Green/Blue	*18
56P	Lt. Green/Red	*18
57F	Lt. Blue/Red	*18
57L	Lt. Green/Pink	*18
58B	Dk. Green/Red	*18
59E	Orange	*18
60H	Black	16
60W	Black	16
60WA	Black	16
60WB	Black	16
63A	Blue/Black	16
63B	Orange/Black	16
64	Orange/Blue	16

*** Some Machines Have 16 Gauge Wires.**

Printed in U.S.A.

PARTS LEGEND

1. Cab Harness (BOSS) 6707671 Rev. C
2. PWM Control Harness Connector
3. Mainframe Ground
4. Operator Cab Ground
5. Dome Light With Switch (Euro. Opt.)
6. Left Front Turn Indicator (Opt.)
7. Headlight Harness 6578528 Rev. B
8. Left Headlight
9. Flasher (Opt.)
10. Horn (Euro. Opt.)
11. Right Headlight
12. Right Front Turn Indicator (Opt.)
13. Front Wiper Harness (Opt.) 6708269 Rev. A
14. Front Wiper Switch (Opt.)
15. Front Wiper Motor (Opt.)
16. Front Windshield Washer Pump and Water Tank Reservoir (Opt.)
17. Jumper
18. Bucket Level Switch (Opt.)
19. Beacon/Strobe Switch (Opt.)
20. Hazard Switch (Opt.)
21. Accessory Power Plug
22. Ignition Switch
23. Keyless Ignition Module (Opt.)
24. Light Switch
25. Diagnostic Monitor
26. Light Connectors
27. Auxiliary Enable Switch/ Momentary Enable Light/ Detent Enable Light

PARTS LEGEND (Cont'd)

28. Instrument Lamp
29. LCD Display Connector
30. LCD Panel Display
31. Diode
32. Rotating Beacon/Strobe Harness (Opt.) 6708318
33. Strobe Light or Rotating Beacon (Opt.)
34. 4-Way Flasher Harness (Opt.) 6709530
35. Beacon or Strobe Connector
36. For Future Use
37. Left Front Turn Light (Opt.)
38. Left Clearance Lamp (Euro. Opt.)
39. Right Front Turn Light (Opt.)
40. Right Clearance Lamp (Euro. Opt.)

OPTION

OPTION

CONNECTOR IS VIEWED FROM THE MATING SIDE

Denotes Ground

A Connects To A Engine Wiring Diagram - Sheet 4 or 5

B Connects To B Controls Wiring Diagram - Sheet 1 or 2

Connect Here For Domestic Option

Connect Here For European Option

Shown in "OFF" position (18)

Shown in "OFF" position (19)

Shown in "OFF" position (20)

Ignition Switch (22)

Keyless Ignition Module (23)

Shown in "OFF" position (24)

Diagnostic Monitor (25)

Shown in "OFF" position (14)

Aux. Enable Switch (27)

WIRING DIAGRAM (P/N 6724417) Sheet 4
Operator Cab - With BOSS
(Harness 6711774 Rev. A)
873 BICS™ (S/N 514112612 and Above)

(Printed November 1996)

Printed in U.S.A.

MC 2274T7

WIRE LEGEND

NO.'s	COLOR	GAUGE
1M	Red	18
10	Black	10
10A	Black	12
10E	Black	16
10EA	Black	16
10M	Black	18
12DB	Orange	18
12DL	Orange	16
12DR	Orange	18
12HW	Orange	18
19L	Red/White	14
19S	Red/White	14
19W	Red/White	16
19WA	Red/White	16
19WP	Red/White	14
21R	White	18
23BL	White/Black	16
23F	White/Black	16
23HF	White/Black	16
38A	Purple/Red	18
38AA	Purple/Red	18
38AM	Purple/Red	16
38B	Purple/White	18
38BA	Purple/White	18
38BM	Purple/White	16
40	Black	16
40FL	Black	16
40FR	Black	16
41	Pink	16
42F	Dk. Blue	16
42FR	Dk. Blue	16
42R	Dk. Blue/White	16
42RF	Dk. Blue/White	16
50E	Black	16
56A	Dk. Green/Yellow	18
56L	Lt. Green/Blue	18
56P	Lt. Green/Red	18
57F	Lt. Blue/Red	18
57L	Lt. Green/Pink	18
58B	Dk. Green/Red	18
*58J	Dk. Green/Red	18
59E	Orange	18
60H	Black	16
60W	Black	16
60WA	Black	16
60WB	Black	16
63A	Blue/Black	16
63B	Orange/Black	16
64	Orange/Blue	16

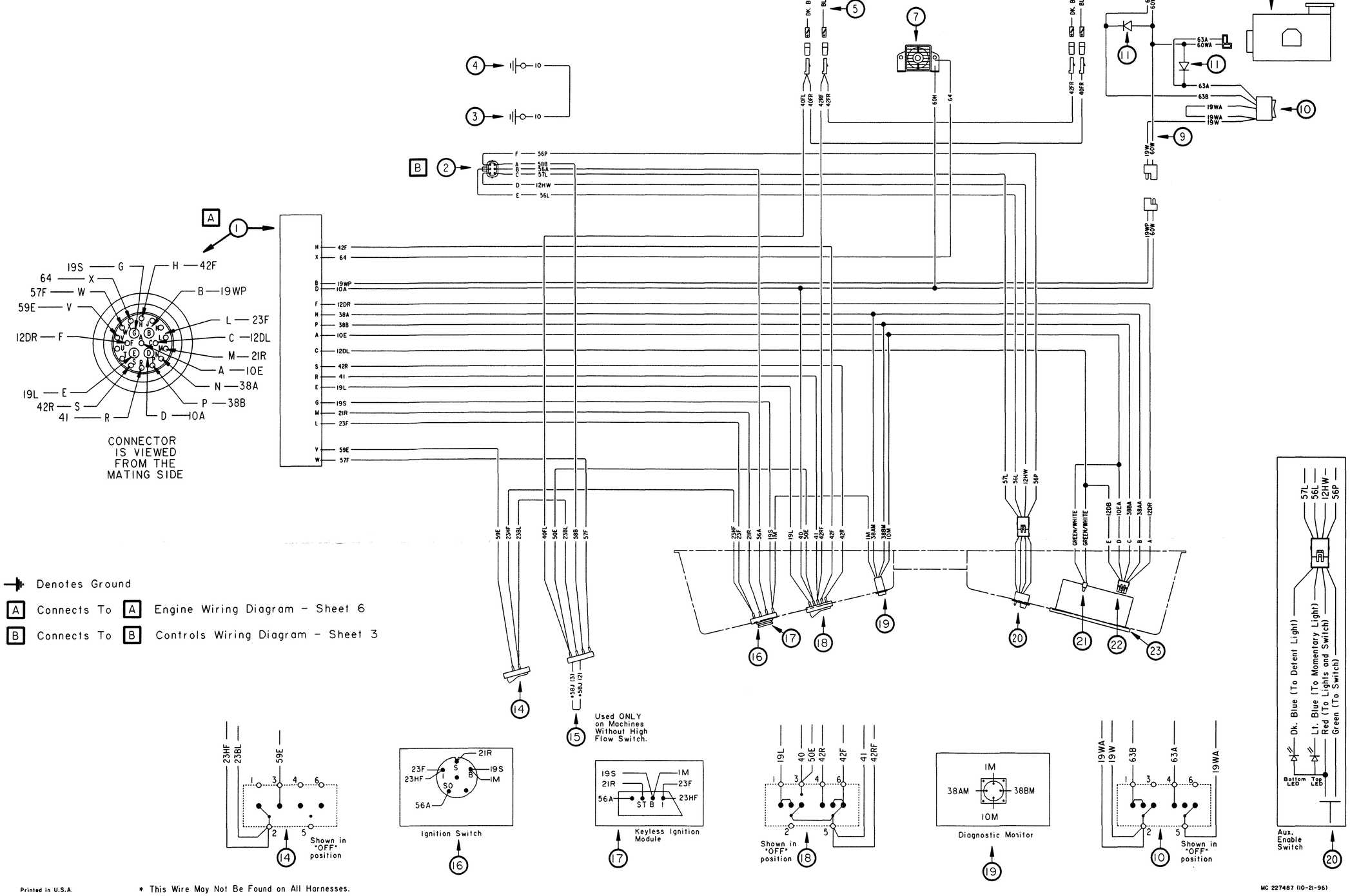
* This Wire May Not Be Found on All Harnesses.

PARTS LEGEND

1. Cab Harness (BOSS) 6711774 Rev. A
2. PWM Control Harness Connector
3. Mainframe Ground
4. Operator Cab Ground
5. Headlight Harness 6578528 Rev. B
6. Left Headlight
7. Horn (Euro. Opt.)
8. Right Headlight
9. Front Wiper Harness (Opt.) 6712259 Rev. A
10. Front Wiper Switch (Opt.)
11. Diode
12. Front Wiper Motor (Opt.)
13. Front Windshield Washer Pump and Water Tank Reservoir (Opt.)
14. Bucket Level Switch (Opt.)
15. Jumper
16. Ignition Switch
17. Keyless Ignition Module (Opt.)
18. Light Switch
19. Diagnostic Monitor
20. Auxiliary Enable Switch/ Momentary Enable Light/ Detent Enable Light
21. Instrument Lamp
22. LCD Display Connector
23. LCD Panel Display

Printed in U.S.A.

MC 2274L7 (10-21-96)



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* This Wire May Not Be Found on All Harnesses.

MC 227487 (10-21-96)

WIRING DIAGRAM (P/N 6724417) Sheet 5
European Operator Cab - With BOSS
(Harness 6710483 Rev. A)
873 BICS™ (S/N 514211274 and Above)

(Printed November 1996)

Printed in U.S.A.

WIRE LEGEND

NO. 's	COLOR	GAUGE
1M	Red	18
10	Black	10
10A	Black	12
10E	Black	16
10EA	Black	16
10M	Black	18
10P	Black	16
12A	Orange	16
12DB	Orange	18
12DL	Orange	16
12DR	Orange	18
12HW	Orange	18
19D	Red/White	16
19F	Red/White	16
19L	Red/White	14
19LA	Red/White	16 or 14
19S	Red/White	14
19W	Red/White	16
19WA	Red/White	16
19WP	Red/White	14
21R	White	18
23BL	White/Black	16
23F	White/Black	16
23HF	White/Black	16
38A	Purple/Red	18
38AA	Purple/Red	18
38AM	Purple/Red	16
38B	Purple/White	18
38BA	Purple/White	18
38BM	Purple/White	16
40	Black	16
40C	Black	16
40D	Black	16
40FL	Black	16
40FR	Black	16
41	Pink	16
42F	Dk. Blue	16
42FR	Dk. Blue	16
42R	Dk. Blue/White	16
42RF	Dk. Blue/White	16
50E	Black	16
56A	Dk. Green/Yellow	18
56L	Lt. Green/Blue	18
56P	Lt. Green/Red	18
57F	Lt. Blue/Red	18
57L	Lt. Green/Pink	18
58B	Dk. Green/Red	18
*58J	Dk. Green/Red	18
59E	Orange	18
60H	Black	16
60W	Black	16
60WA	Black	16
60WB	Black	16
63A	Blue/Black	16
63B	Orange/Black	16
64	Orange/Blue	16

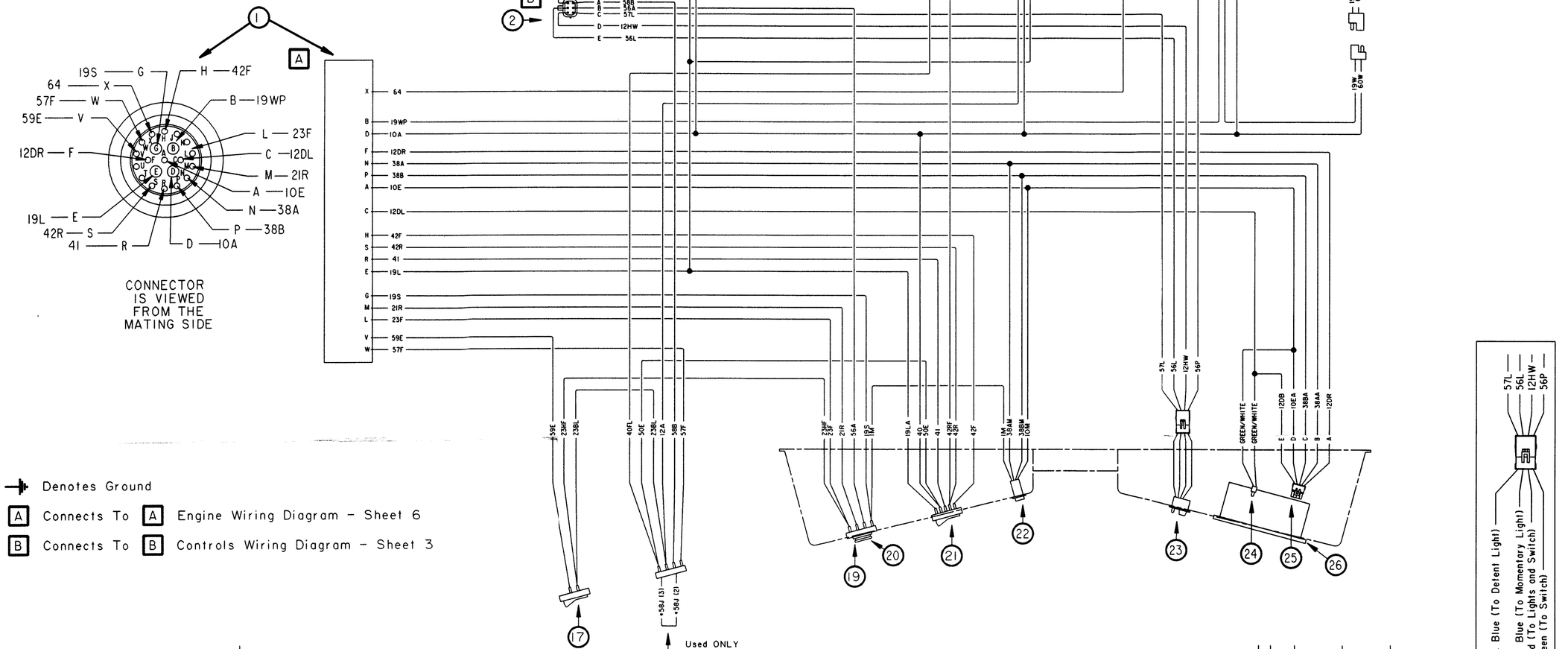
PARTS LEGEND

1. Cab Harness (BOSS) 6710483 Rev. A
2. PWM Control Harness Connector
3. Mainframe Ground
4. Operator Cab Ground
5. Dome Light With Switch (Euro. Opt.)
6. Headlight Harness 6578528 Rev. B
7. Left Headlight
8. Blinker/Warning Light Module (Opt.)
9. Horn (Euro. Opt.)
10. Power Plug
11. Right Headlight
12. Front Wiper Harness (Opt.) 6712259 Rev. A
13. Front Wiper Switch (Opt.)
14. Diode
15. Front Wiper Motor (Opt.)
16. Front Windshield Washer Pump and Water Tank Reservoir (Opt.)
17. Bucket Level Switch
18. Jumper
19. Ignition Switch
20. Keyless Ignition Module (Opt.)
21. Light Switch
22. Diagnostic Monitor
23. Auxiliary Enable Switch/ Momentary Enable Light/ Detent Enable Light
24. Instrument Lamp
25. LCD Display Connector
26. LCD Panel Display

* This Wire May Not Be Found on All Harnesses.

Printed in U.S.A.

MC 2276L7 (10-21-96)



* This Wire May Not Be Found on All Harnesses.

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MC 227687 (10-21-96)

WIRING DIAGRAM (P/N 6724861) Sheet 1

Engine
Without BOSS (Base)
(Harness 6707890 Rev. B)
873 BICS™ (S/N 514111001-11423)

(Printed November 1996)

Printed in U.S.A.

MC 2166TI

WIRE LEGEND

NO. 's	COLOR	GAUGE
0	Black	Cable
1	Red	Cable
1A	Red	12
1AA	Red	14
1AB	Red	12
1B	Red	10
1D	Red	16
1E	Red	14
1H	Red	14
1L	Red	12
1S	Red	12
1SA	Red	12
1SB	Red	16
1SC	Red	16
1SD	Red	12
1SP	Red	16
1W	Red	14
10	Black	14
10A	Black	12
10A	Black (Heater Harness)	14
10K	Black	14
10L	Black	14
10S	Black	16
12	Orange	16
12B	Orange	16
12C	Orange	14
12CA	Orange	14
12CB	Orange	12
12CC	Orange	16
12CD	Orange	14
12F	Orange	16
12H	Orange	16
12H	Orange (Heater Harness)	14
12S	Orange	16
14F	Lt. Green	16
14R	Lt. Green/White	16
19A	White	14
19E	Red/White	14
19H	Red/White	14
19L	Red/White	12
19S	Red/White	14
19W	Red/White	14
19WA	Red/White	14
19WR	Red/White	16
19WRA	Red/White	16
20	Black	14
20	Red (Heater Harness)	14
20B	Black	16
20S	Black	16
21	Yellow	14
21R	White	16
21S	White/Lt. Green	14
22	Orange	14
23F	White/Black	16
23FA	Red/Blue	16
28A	Lt. Blue/Orange	16
28B	Lt. Blue/Orange	12
30F	Black	16
30H	Black	16
30T	Black	16
31P	Yellow/Green	16
32F	Yellow/Dk. Blue	16
32FR	Dk. Blue/Yellow	16
32P	Yellow/Dk. Blue	16
32P	Yellow/Lt. Blue (Filter Harness)	16
32T	Yellow/Black	16
35H	Yellow/Brown	16
36F	Purple	16

WIRE LEGEND (Cont'd)

NO. 's	COLOR	GAUGE
36T	Purple/White	16
40	Black	16
40L	Black	16
40LA	Black	16
40R	Black	16
40RA	Black	16
41	Pink	16
41C	Pink	16
41L	Pink	16
41R	Pink	16
42R	Dk. Blue/White	16
42RR	Dk. Blue/White	16
44B	Dk. Green/Yellow	16
44BA	Dk. Green/Yellow	16
44BB	Dk. Green/Yellow	16
46L	Yellow	16
46LA	Yellow	16
46LR	Brown/Yellow	16
46R	Dk. Green	16
46RA	Green	16
46RR	Brown/Green	16
46T	Brown	16
50A	Black	16
50V	Black	16
57DA	Yellow	16
57F	Lt. Blue/Red	16
59E	Orange	16
60B	Black	16
60BA	Black	16
60W	Black	16
63W	Orange/Black	16
63WR	Blue/Black	16
64	Orange/Blue	16
66	Orange/Green	16
70	Black	14
70C	Black	16
72B	Pink/White	16
78	White	14

Printed in U.S.A.

PARTS LEGEND

① Engine Harness (BASE) 6707890 Rev. B
② Auxiliary Hydraulic Connector
③ Back-Up Alarm Harness (Opt.) 6704815 Rev. A
④ BICS Connector
⑤ Accessory Fused and Switched Power Connectors
⑥ Fused 10 Amp - BICS
⑦ Fused 15 Amp - Engine
⑧ Fused 15 Amp - PWM (Attachment)
⑨ Fused 25 Amp - Brake
⑩ Fused 25 Amp - Accessories
⑪ Fused 25 Amp - Accessories
⑫ Fused 25 Amp - Lights
⑬ Fused 10 Amp - BOSS
⑭ Brake Relay
⑮ Glow Plug Relay
⑯ Starter Relay
⑰ Switched Power Relay
⑱ Battery
⑲ Starter
⑳ Fuel Sensor
㉑ Engine Oil Pressure Switch
㉒ Fuel Shut-Off Solenoid
㉓ Glow Plugs
㉔ Alternator
㉕ Traction Control Harness Connector
㉖ Rear Auxiliary (Diverter) Valve (Opt.)
㉗ Engine Oil Coolant Temperature Sender
㉘ Base Filter Connector
㉙ Base Filter Harness 6707883
㉚ Hydraulic Charge Pressure Switch
㉛ Hydraulic Oil Temperature Switch
㉜ Hydraulic Oil Filter Differential Pressure Sensor
㉝ Charge Oil Filter Differential Pressure Sensor
㉞ Rear Wiper Connector
㉟ Rear Wiper Harness (Opt.) 6708285
㊱ Rear Wiper Motor (Opt.)

PARTS LEGEND (Cont'd)

㊲ Rear Wiper Switch (Opt.)
㊳ Rear Wiper/Washer Tank Harness (Opt.) 6709164
㊴ Rear Wiper/Washer Pump and Tank (Opt.)
㊵ Rear Light Harness (Opt.) 6708278
㊶ Left Rear Taillight (Opt.)
㊷ Left Rear Work Light (Opt.)
㊸ Back-Up Alarm (Opt.)
㊹ Registration Lamp-License Plate (Euro. Opt.)
㊺ Right Rear Work Light (Opt.)
㊻ Right Rear Taillight (Opt.)
㊼ Back-Up Alarm Switch (Opt.)
㊽ Heater Harness (Heater Section) (Opt.) 6660892
㊾ Heater Relay Switch (Opt.)
㊿ Heater and Heater Motor (Opt.)
(51) Heater Fan Switch (Opt.)
(52) Heater Harness (Eng. Section) (Opt.) 6660894
(53) Fuse and Fuse Cap (Opt.)

CONNECTOR IS VIEWED FROM THE MATING SIDE

Denotes Ground

- A Connects To A Cab Wiring Diagram - Sheet 1
- C Connects To C Controls Wiring Diagram - Sheet 1
- D Connects To D BICS Wiring Diagram - Sheet 1
- E Connects To E Attachment Wiring Diagram - Sheet 1
- P Connects To P Attachment Wiring Diagram - Sheet 1
- R Connects To R BICS Wiring Diagram - Sheet 1
- U Connects To U BICS Wiring Diagram - Sheet 1

Printed in U.S.A.

MC 2166 (10-22-96)

WIRING DIAGRAM (P/N 6724861) Sheet 2

Engine
Without BOSS (Base)
(Harness 6709896 or 6711562 Rev. B)
873 BICS™ (S/N 514111424-12611)

(Printed November 1996)

Printed in U.S.A.

MC 2238T8

WIRE LEGEND

NO.'s	COLOR	GAUGE
0	Black	Cable
1	Red	Cable
1A	Red	12
1AA	Red	12
1AB	Red	12
1B	Red	10
1D	Red	16
1E	Red	14
1H	Red	14
1L	Red	12
1S	Red	12
1SA	Red	12
1SB	Red	16
1SC	Red	16
1SD	Red	12
1SP	Red	16
1W	Red	14
10	Black	14
10A	Black	12
10A	Black (Heater Harness)	14
10K	Black	14
10L	Black	14
10S	Black	16
12	Orange	16
12B	Orange	16
12C	Orange	14
12CA	Orange	14
12CB	Orange	12
12CC	Orange	16
12CD	Orange	14
12F	Orange	16
12H	Orange	16
12H	Orange (Heater Harness)	14
12S	Orange	16
14F	Lt. Green	16
14R	Lt. Green/White	16
19A	White	14
19E	Red/White	14
19H	Red/White	14
19L	Red/White	12
19S	Red/White	14
19W	Red/White	14
19WA	Red/White	14
19WR	Red/White	16
19WRA	Red/White	16
20	Black	14
20	Red (Heater Harness)	14
20B	Black	16
20S	Black	16
21	Yellow	14
21R	White	16
21S	White/Lt. Green	12
22	Orange	14
23F	White/Black	16
23FA	Red/Blue	16
28A	Lt. Blue/Orange	16
28B	Lt. Blue/Orange	12
30F	Black	16
30H	Black	16
30P	Black	16

WIRE LEGEND (Cont'd)

NO.'s	COLOR	GAUGE
30T	Black	16
31P	Yellow/Green	16
32F	Yellow/Dk. Blue	16
32FR	Yellow/Dk. Blue	16
32P	Yellow/Dk. Blue	16
32P	Yellow/Lt. Blue (Filter Harness)	16
32T	Yellow/Black	16
35H	Yellow/Brown	16
36F	Purple	16
36T	Purple/White	16
40	Black	16
40L	Black	16
40LA	Black	16
40R	Black	16
40RA	Black	16
41	Pink	16
41C	Pink	16
41L	Pink	16
41R	Pink	16
42R	Dk. Blue/White	16
42RR	Dk. Blue/White	16
44B	Dk. Green/Yellow	16
44BA	Dk. Green/Yellow	16
44BB	Dk. Green/Yellow	16
*46L	Yellow	16
46LA	Yellow	16
46LR	Brown/Yellow	16
46LRA	Brown/Yellow (6711562)	16
*46R	Dk. Green	16
46RA	Green	16
46RR	Brown/Green	16
46RRA	Brown/Green (6711562)	16
46T	Brown	16
50A	Black	16
50B	Black	16
50V	Black	16
56RB	Dk. Green/Yellow	16
57DA	Yellow	16
57F	Lt. Blue/Red	16
59E	Orange	16
60B	Black	16
60BA	Black	16
60W	Black	16
63W	Orange/Black	16
63WR	Blue/Black	16
64	Orange/Blue	16
66	Orange/Green	16
70	Black	14
70C	Black	16
72B	Pink/White	16
78	White	14

*** This Wire Found ONLY on Machines With Harness 6711562.**

+ 6709896 for S/N's 514111424-11706

*** 6711562 for S/N's 514111707-12611**

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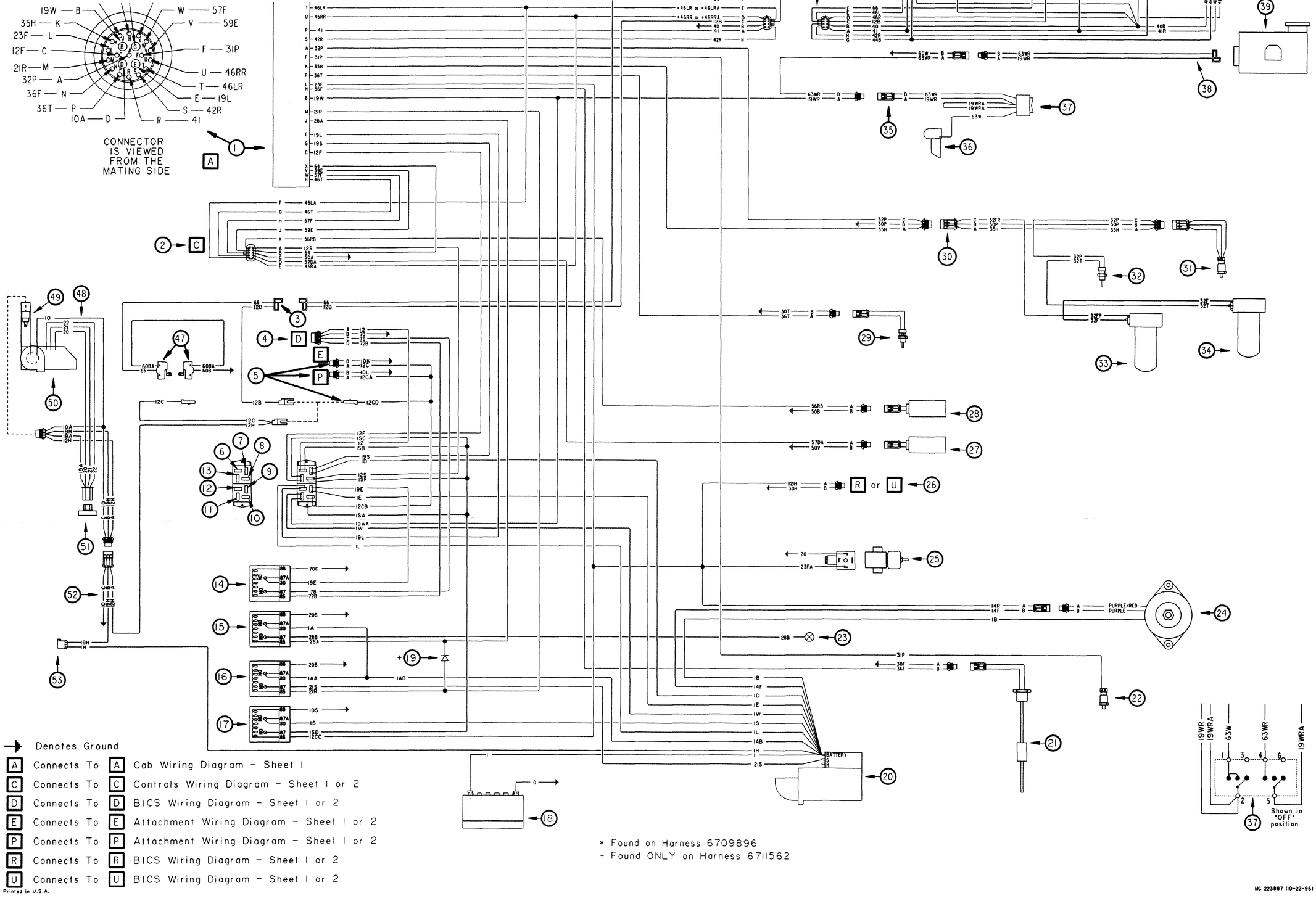
PARTS LEGEND

1. Engine Harness (BASE) +6709896 or *6711562 Rev. B
2. Auxiliary Hydraulics Connector
3. Back-Up Alarm Harness (Opt.) 6704815 Rev. A
4. BICS Connector
5. Accessory Fused and Switched Power Connectors
6. Fused 10 Amp - BICS
7. Fused 15 Amp - Engine
8. Fused 15 Amp - PWM
9. Fused 25 Amp - Brake
10. Fused 25 Amp - Accessories
11. Fused 25 Amp - Accessories
12. Fused 25 Amp - Lights
13. Fused 10 Amp - BOSS
14. Brake Relay
15. Glow Plug Relay
16. Starter Relay
17. Switched Power Relay
18. Battery
19. Diode
20. Starter
21. Fuel Sensor
22. Engine Oil Pressure Switch
23. Glow Plugs
24. Alternator
25. Fuel Shut-Off Solenoid
26. Traction Control Harness Connector
27. Rear Auxiliary (Diverter) Valve (Opt.)
28. Rear Auxiliary Bleed Down (Opt.)
29. Engine Oil Coolant Temperature Sender
30. Base Filter Harness 6710364 Rev. A
31. Hydraulic Charge Pressure Switch
32. Hydraulic Oil Temperature Switch
33. Hydraulic Oil Filter Differential Pressure Sensor
34. Charge Oil Filter Differential Pressure Sensor

PARTS LEGEND (Cont'd)

35. Rear Wiper Harness (Opt.) 6708285
36. Rear Wiper Motor (Opt.)
37. Rear Wiper Switch (Opt.)
38. Rear Wiper/Washer Tank Harness (Opt.) 6709164
39. Rear Wiper/Washer Pump and Tank (Opt.)
40. Rear Light Harness (Opt.) 6708278
41. Left Rear Taillight (Opt.)
42. Left Rear Work Light (Opt.)
43. Back-Up Alarm (Opt.)
44. Registration Lamp-License Plate (Euro. Opt.)
45. Right Rear Work Light (Opt.)
46. Right Rear Taillight (Opt.)
47. Back-Up Alarm Switch (Opt.)
48. Heater Harness (Heater Section) (Opt.) 6660892
49. Heater Relay Switch (Opt.)
50. Heater and Heater Motor (Opt.)
51. Heater Fan Switch (Opt.)
52. Heater Harness (Eng. Section) (Opt.) 6660894
53. Fuse and Fuse Cap (Opt.)



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MC 223887 (10-22-96)

WIRING DIAGRAM (P/N 6724861) Sheet 3

Engine
Without BOSS (Base)
(Harness 6710492)

873 BICS™ (S/N 514112612 and Above)

(Printed November 1996)

Printed in U.S.A.

MC 2291T8

WIRE LEGEND

NO.'s	COLOR	GAUGE
0	Black	Cable
1	Red	Cable
1A	Red	12
1AA	Red	12
1AB	Red	12
1B	Red	10
1D	Red	16
1E	Red	14
1H	Red	14
1L	Red	12
1S	Red	12
1SA	Red	12
1SB	Red	16
1SC	Red	16
1SD	Red	12
1SP	Red	16
1W	Red	14
10	Black	14
10A	Black	12
10A	Black (Heater Harness)	14
10K	Black	14
10L	Black	14
10S	Black	16
12	Orange	16
12B	Orange	16
12C	Orange	14
12CA	Orange	14
12CB	Orange	12
12CC	Orange	16
12CD	Orange	14
12F	Orange	16
12H	Orange	16
12H	Orange (Heater Harness)	14
12S	Orange	16
12W	Orange	16
14F	Lt. Green	16
14R	Lt. Green/White	16
19A	White	14
19E	Red/White	14
19H	Red/White	14
19L	Red/White	12
19L	Red/White (Strobe Harness)	16
19LA	Red/White	12
19LB	Red/White	16
19S	Red/White	14
19W	Red/White	14
19WR	Red/White	16
19WRA	Red/White	16
20	Black	14
20	Red (Heater Harness)	14
20B	Black	16
20S	Black	16
21	Yellow	14
21R	White	16
21S	White/Lt. Green	12
22	Orange	14
23F	White/Black	16
23FA	Red/Blue	16
28A	Lt. Blue/Orange	16
28B	Lt. Blue/Orange	12
30F	Black	16
30H	Black	16
30P	Black	16
30T	Black	16
31P	Yellow/Green	16
32F	Yellow/Dk. Blue	16
32FR	Yellow/Dk. Blue	16
32P	Yellow/Dk. Blue	16

WIRE LEGEND (Cont'd)

NO.'s	COLOR	GAUGE
32P	Yellow (Filter Harness)	16
32P	Yellow/Lt. Blue (Filter Harness)	16
32T	Yellow/Black	16
34FR	Dk. Blue/Yellow	16
35H	Yellow/Brown	16
36F	Purple	16
36T	Purple/White	16
40	Black	16
40A	Black	16
40B	Black	16
40L	Black	16
40LA	Black	16
40R	Black	16
40RA	Black	16
41	Pink	16
41A	Pink	16
41B	Pink	16
41C	Pink	16
41L	Pink	16
41R	Pink	16
42F	Dk. Blue	16
42R	Dk. Blue/White	16
42RR	Dk. Blue/White	16
44B	Dk. Green/Yellow	16
44BA	Dk. Green/Yellow	16
44BB	Dk. Green/Yellow	16
46B	Brown/Red	16
46L	Yellow	16
46LA	Yellow	16
46LR	Brown/Yellow	16
46LRA	Brown/Yellow	16
46R	Dk. Green	16
46RA	Green	16
46RR	Brown/Green	16
46RRA	Brown/Green	16
46T	Brown	16
50A	Black	16
50B	Black	16
50V	Black	16
56RB	Dk. Green/Yellow	16
57DA	Yellow	16
57F	Lt. Blue/Red	16
59E	Orange	16
60B	Black	16
60BA	Black	16
60W	Black	16
60WA	Black	16
60WB	Black	16
63W	Orange/Black	16
63WR	Blue/Black	16
64	Orange/Blue	16
66	Orange/Green	16
70	Black	14
70C	Black	16
72B	Pink/White	16
78	White	14

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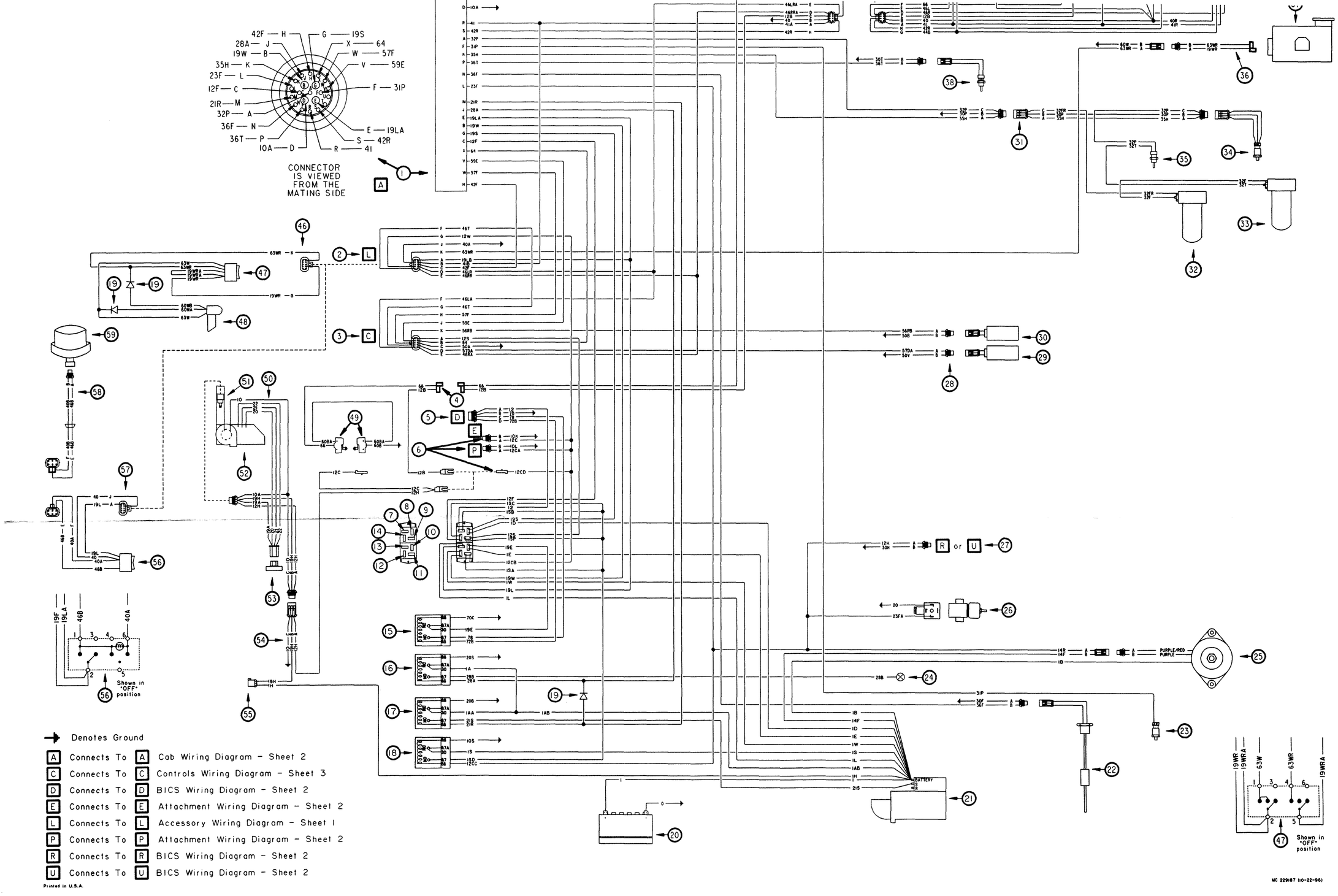
PARTS LEGEND

1. Engine Harness (BASE) 6710492
2. Cab Accessory Connector
3. Auxiliary Hydraulics Connector
4. Back-Up Alarm Harness (Opt.) 6704815 Rev. A
5. BICS Connector
6. Accessory Fused and Switched Power Connectors
7. Fused 10 Amp - BICS
8. Fused 15 Amp - Engine
9. Fused 15 Amp - PWM
10. Fused 25 Amp - Brake
11. Fused 25 Amp - Accessories
12. Fused 25 Amp - Accessories
13. Fused 25 Amp - Lights
14. Fused 10 Amp - BOSS
15. Brake Relay
16. Glow Plug Relay
17. Starter Relay
18. Switched Power Relay
19. Diode
20. Battery
21. Starter
22. Fuel Sensor
23. Engine Oil Pressure Switch
24. Glow Plugs
25. Alternator
26. Fuel Shut-Off Solenoid
27. Traction Control Harness Connector
28. Rear Auxiliary (Diverter) Valve Connector
29. Rear Auxiliary (Diverter) Valve (Opt.)
30. Rear Auxiliary Bleed Down (Opt.)
31. Base Filter Harness 6710364 Rev. A
32. Hydraulic Oil Filter Differential Pressure Sensor
33. Charge Oil Filter Differential Pressure Sensor
34. Hydraulic Charge Pressure Switch

PARTS LEGEND (Cont'd)

35. Hydraulic Oil Temperature Switch
36. Rear Wiper/Washer Tank Harness (Opt.) 6709164
37. Rear Wiper/Washer Pump and Tank (Opt.)
38. Engine Oil Coolant Temperature Sender
39. Rear Light Harness (Opt.) 6708278
40. Left Rear Taillight (Opt.)
41. Left Rear Work Light (Opt.)
42. Back-Up Alarm (Opt.)
43. Registration Lamp-License Plate (Euro. Opt.)
44. Right Rear Work Light (Opt.)
45. Right Rear Taillight (Opt.)
46. Rear Wiper Harness (Opt.) 6712260
47. Rear Wiper Motor (Opt.)
48. Rear Wiper Switch (Opt.)
49. Back-Up Alarm Switch (Opt.)
50. Heater Harness (Heater Section) (Opt.) 6660892
51. Heater Relay Switch (Opt.)
52. Heater and Heater Motor (Opt.)
53. Heater Fan Switch (Opt.)
54. Heater Harness (Eng. Section) (Opt.) 6660894
55. Fuse and Fuse Cap (Opt.)
56. Beacon/Strobe Switch (Opt.)
57. Strobe Harness (Opt.) 6712258
58. Rotating Beacon Harness (Opt.) 6708318
59. Strobe Light or Rotating Beacon (Opt.)



Printed in U.S.A.
MC 229187 (10-22-96)

WIRING DIAGRAM (P/N 6724861) Sheet 4

Engine
With BOSS
(Harness 6707891 Rev. B)
873 BICS™ (S/N 514111001-11423)
(S/N 514211001-11094)

(Printed November 1996)

WIRE LEGEND

NO.'s	COLOR	GAUGE
0	Black	Cable
1	Red	Cable
1A	Red	12
1AA	Red	14
1AB	Red	12
1B	Red	10
1CB	Red	16
1D	Red	16
1E	Red	14
1H	Red	14
1L	Red	12
1S	Red	12
1SA	Red	12
1SB	Red	16
1SC	Red	16
1SD	Red	12
1SP	Red	16
1W	Red	14
10	Black (Heater Harness)	14
10A	Black	12
10A	Black (Heater Harness)	14
10E	Black	16
10H	Black	16
10HA	Black	16
10K	Black	12
10L	Black	12
10S	Black	16
12	Orange	16
12B	Orange	16
12C	Orange	14
12CA	Orange	14
12CB	Orange	12
12CC	Orange	16
12CD	Orange	14
12DL	Orange	16
12DR	Orange	16
12G	Orange	16
12GA	Orange	16
12H	Orange	16
12H	Orange (Heater Harness)	14
12S	Orange	16
14F	Lt. Green	16
14R	Lt. Green/White	16
19A	White	14
19E	Red/White	14
19H	Red/White	14
19L	Red/White	12
19S	Red/White	14
19SA	Red/White	16
19W	Red/White	14
19WA	Red/White	14
19WR	Red/White	16
19WRA	Red/White	16
20	Black	14
20	Black (Hourmeter Harness)	16
20B	Black	16
20M	Black	16
20S	Black	16
21	Yellow	14
21R	White	16
21RA	White	16
21S	White/Lt. Green	14
22	Orange	14
23F	White/Black	16
23FA	Red/Blue	14
28A	Lt. Blue/Orange	16
28B	Lt. Blue/Orange	12
30AF	Black	16
30F	Black	16

WIRE LEGEND (Cont'd)

NO.'s	COLOR	GAUGE
30H	Black	16
30P	Black	16
30PE	Black	16
30S	Black	16
30T	Black	16
30TE	Black	16
31S	Yellow/Lt. Blue	16
33P	Yellow/Green	16
33T	Yellow/Red	16
34F	Yellow/Dk. Blue	16
34FR	Dk. Blue/Yellow	16
34P	Yellow/Lt. Blue	16
34T	Yellow/Brown	16
36A	Purple/Red	16
36F	Purple	16
38A	Purple/Red	18
38B	Purple/White	18
40	Black	16
40L	Black	16
40LA	Black	16
40R	Black	16
40RA	Black	16
41	Pink	16
41C	Pink	16
41L	Pink	16
41R	Pink	16
42R	Dk. Blue/White	16
42RR	Dk. Blue/White	16
44B	Dk. Green/Yellow	16
44BA	Dk. Green/Yellow	16
44BB	Dk. Green/Yellow	16
46L	Yellow	16
46LA	Brown/Yellow	16
46LR	Brown/Yellow	16
46R	Dk. Green	16
46RA	Green	16
46RR	Brown/Green	16
46T	Brown	16
50A	Black	16
50B	Black	16
50V	Black	16
51	Lt. Blue/White	16
51A	Lt. Blue/White	16
51B	Orange/Blue	16
51S	Orange/White	16
51SA	Orange/White	16
51SB	Orange/White	16
51SS	White/Orange	16
56RB	Dk. Green/Yellow	16
57DA	Yellow	16
57F	Lt. Blue/Red	16
59E	Orange	16
60B	Black	16
60BA	Black	16
60W	Black	16
63W	Orange/Black	16
63WR	Blue/Black	16
64	Orange/Blue	16
66	Orange/Green	16
70	Black	14
70C	Black	16
72B	Pink/White	16
78	White	14

Printed in U.S.A.

PARTS LEGEND

① Engine Harness (BOSS) 6707891 Rev. B
② Auxiliary Hydraulic Connector
③ Back-Up Alarm Harness (Opt.) 6704815
④ BICS Connector
⑤ Accessory Fused and Switched Power Connectors
⑥ Fused 10 Amp - BICS
⑦ Fused 15 Amp - Engine
⑧ Fused 15 Amp - PWM
⑨ Fused 25 Amp - Brake
⑩ Fused 25 Amp - Accessories
⑪ Fused 25 Amp - Accessories
⑫ Fused 25 Amp - Lights
⑬ Fused 10 Amp - BOSS
⑭ Brake Relay
⑮ Glow Plug Relay
⑯ Starter Relay
⑰ Switched Power Relay
⑱ Battery
⑲ Starter
⑳ Traction Control Harness Connector
㉑ Glow Plugs
㉒ Alternator
㉓ Rear Auxiliary (Diverter) Valve (Opt.)
㉔ Fuel Shut-Off Solenoid
㉕ Diode
㉖ Magnetic Pick-up to Traction Control Harness
㉗ Fuel Sensor
㉘ Engine Oil Pressure Switch
㉙ Engine Oil Coolant Temperature Sensor
㉚ Air Filter Cleaner (Vacuum) Switch
㉛ BOSS Filter Harness 6707059
㉜ Hydraulic Oil Filter Return Pressure Sensor
㉝ Hydraulic Charge Pressure Switch

PARTS LEGEND (Cont'd)

㉞ Hydraulic Oil Temperature Sensor
㉟ Hydraulic Oil Filter Differential Pressure Sensor
㊱ BOSS Computer
㊲ Shutdown Relay
㊳ Rear Wiper Harness (Opt.) 6708285
㊴ Rear Wiper Motor (Opt.)
㊵ Rear Wiper Switch (Opt.)
㊶ Rear Wiper/Washer Tank Harness (Opt.) 6709164
㊷ Rear Wiper/Washer Tank and Pump (Opt.)
㊸ Rear Light Harness 6708278
㊹ Left Rear Taillight
㊺ Left Rear Work Light
㊻ Back-Up Alarm (Opt.)
㊼ Registration Lamp-License Plate (Euro. Opt.)
㊽ Right Rear Work Light
㊾ Right Rear Taillight
㊿ Back-Up Alarm Switch (Opt.)
(51) Heater Harness (Heater Section) (Opt.) 6660892
(52) Heater Relay Switch (Opt.)
(53) Heater and Heater Motor (Opt.)
(54) Heater Fan Switch (Opt.)
(55) Heater Harness (Eng. Section) (Opt.) 6660894
(56) Fuse and Fuse Cap (Opt.)

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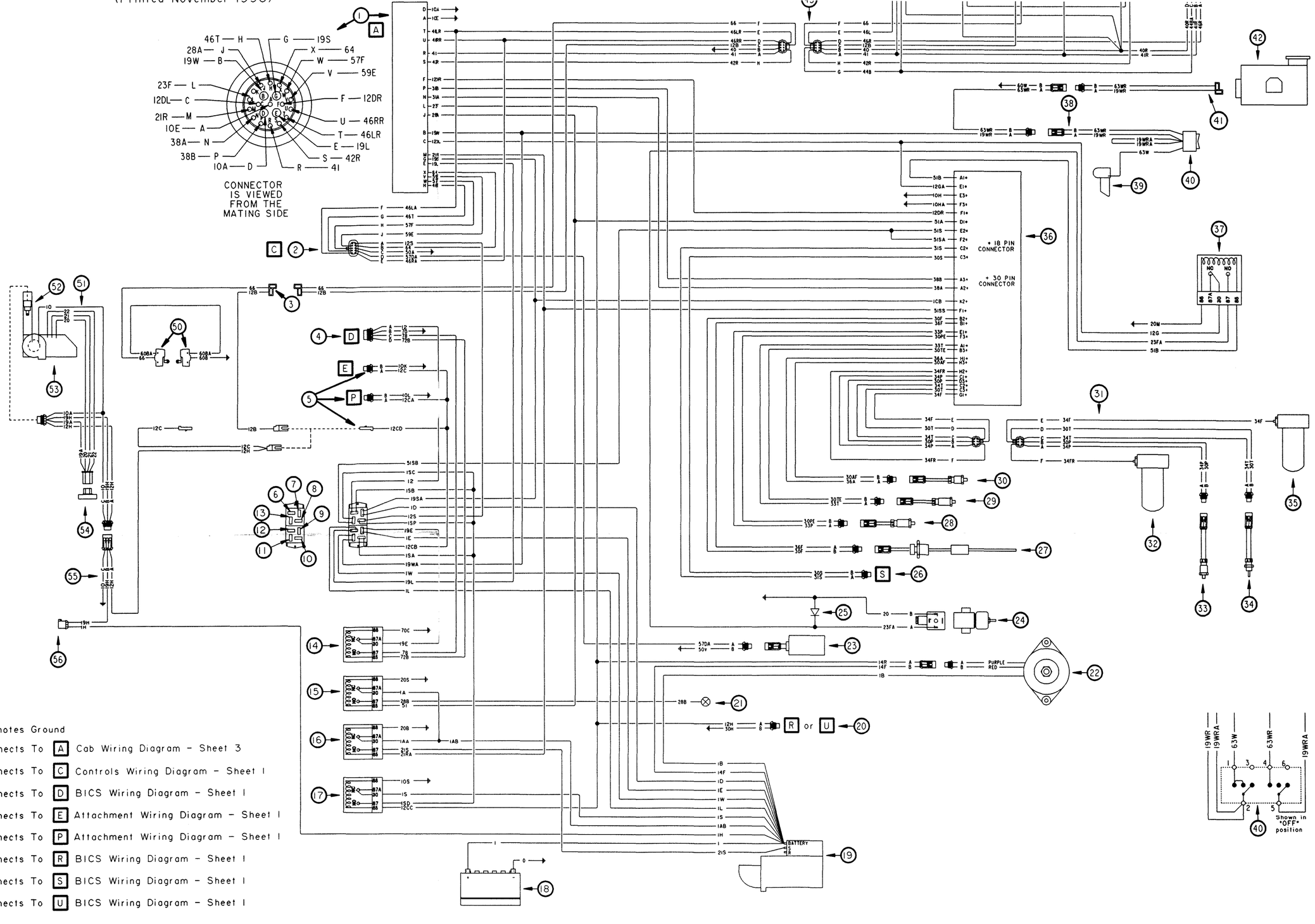

Denotes Ground

- A Connects To A Cab Wiring Diagram - Sheet 3
- C Connects To C Controls Wiring Diagram - Sheet 1
- D Connects To D BICS Wiring Diagram - Sheet 1
- E Connects To E Attachment Wiring Diagram - Sheet 1
- P Connects To P Attachment Wiring Diagram - Sheet 1
- R Connects To R BICS Wiring Diagram - Sheet 1
- S Connects To S BICS Wiring Diagram - Sheet 1
- U Connects To U BICS Wiring Diagram - Sheet 1

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WIRING DIAGRAM (P/N 6724861) Sheet 5
Engine
With BOSS
(Harness 6709897 Rev. A or 6711603 Rev. B)
873 BICS™ (S/N 514111424-12611)
(S/N 514211095-11273)

(Printed November 1996)

Printed in U.S.A.

MC 2240T8

WIRE LEGEND

NO.'s	COLOR	GAUGE
0	Black	Cable
1	Red	Cable
1A	Red	12
1AA	Red	12
1AB	Red	12
1B	Red	10
1CB	Red	16
1D	Red	16
1E	Red	14
1H	Red	14
1L	Red	12
1S	Red	12
1SA	Red	12
1SB	Red	16
1SC	Red	16
1SD	Red	12
1SP	Red	16
1W	Red	14
10	Black (Heater Harness)	14
10A	Black	12
10A	Black (Heater Harness)	14
10E	Black	16
10H	Black	16
10HA	Black	16
10K	Black	12
10L	Black	12
10S	Black	16
12	Orange	16
12B	Orange	16
12C	Orange	14
12CA	Orange	14
12CB	Orange	12
12CC	Orange	16
12CD	Orange	14
12DL	Orange	16
12DR	Orange	16
12G	Orange	16
12GA	Orange	16
12H	Orange	16
12H	Orange (Heater Harness)	14
12S	Orange	16
14F	Lt. Green	16
14R	Lt. Green/White	16
19A	White	14
19E	Red/White	14
19H	Red/White	14
19L	Red/White	12
19S	Red/White	14
19SA	Red/White	16
19W	Red/White	14
19WA	Red/White	14
19WR	Red/White	16
19WRA	Red/White	16
20	Black	14
20	Black (Hourmeter Harness)	16
20B	Black	16

WIRE LEGEND (Cont'd)

NO.'s	COLOR	GAUGE
30H	Black	16
30P	Black	16
30PE	Black	16
30S	Black	16
30T	Black	16
30TE	Black	16
31S	Yellow/Lt. Blue	16
33P	Yellow/Green	16
33T	Yellow/Red	16
34F	Yellow/Dk. Blue	16
34FR	Dk. Blue/Yellow	16
34P	Yellow/Lt. Blue	16
34T	Yellow/Brown	16
36A	Purple/Red	16
36F	Purple	16
38A	Purple/Red	18
38B	Purple/White	18
40	Black	16
40L	Black	16
40LA	Black	16
40R	Black	16
40RA	Black	16
41	Pink	16
41C	Pink	16
41L	Pink	16
41R	Pink	16
42R	Dk. Blue/White	16
42RR	Dk. Blue/White	16
44B	Dk. Green/Yellow	16
44BA	Dk. Green/Yellow	16
44BB	Dk. Green/Yellow	16
46L	Yellow	16
46LA	Yellow	16
46LR	Brown/Yellow	16
*46LRA	Brown/Yellow	16
46R	Dk. Green	16
46RA	Green	16
46RR	Brown/Green	16
*46RRA	Brown/Green	16
46T	Brown	16
50A	Black	16
50B	Black	16
50V	Black	16
51	Lt. Blue/White	16
51A	Lt. Blue/White	16
51B	Orange/Blue	16
51S	Orange/White	16
51SA	Orange/White	16
51SB	Orange/White	16
51SS	White/Orange	16
56RB	Dk. Green/Yellow	16
57DA	Yellow	16
57F	Lt. Blue/Red	16
59E	Orange	16
60B	Black	16
60BA	Black	16

PARTS LEGEND

1. Engine Harness (BOSS)
   +6709897 Rev. A or *6711603 Rev. B
2. Auxiliary Hydraulics Connector
3. Back-Up Alarm Harness (Opt.)
   6704815
4. BICS Connector
5. Fused and Switched Power Connectors
6. Fused 10 Amp - BICS
7. Fused 15 Amp - Engine
8. Fused 15 Amp - PWM
9. Fused 25 Amp - Brake
10. Fused 25 Amp - Accessories
11. Fused 25 Amp - Accessories
12. Fused 25 Amp - Lights
13. Fused 10 Amp - BOSS
14. Brake Relay
15. Glow Plug Relay
16. Starter Relay
17. Switched Power Relay
18. Battery
19. Diode
20. Starter
21. Magnetic Pick-up to Traction Control Harness
22. Fuel Sensor
23. Engine Oil Pressure Switch
24. Glow Plug
25. Fuel Shut-Off Solenoid
26. Alternator
27. Traction Control Harness Connector
28. Rear Auxiliary (Diverter) Valve (Opt.)
29. Rear Auxiliary Bleed Down (Opt.)
30. Air Filter Cleaner (Vacuum) Switch
31. Engine Oil Coolant Temperature Sensor

PARTS LEGEND (Cont'd)

33. Hydraulic Charge Pressure Switch
34. Hydraulic Oil Temperature Sensor
35. Hydraulic Oil Filter Differential Pressure Sensor
36. Hydraulic Oil Filter Return Pressure Sensor
37. BOSS Computer
38. Shutdown Relay
39. Rear Wiper/Washer Tank Harness (Opt.) 6709164
40. Rear Wiper/Washer Tank and Pump (Opt.)
41. Rear Wiper Harness (Opt.)
    6708285
42. Rear Wiper Motor (Opt.)
43. Rear Wiper Switch (Opt.)
44. Rear Light Harness
    6708278
45. Right Rear Taillight
46. Right Rear Work Light
47. Registration Lamp-License Plate (Euro. Opt.)
48. Back-Up Alarm (Opt.)
49. Left Rear Work Light
50. Left Rear Taillight
51. Back-Up Alarm Switch (Opt.)
52. Heater Harness (Heater Section) (Opt.) 6660892
53. Heater Relay Switch (Opt.)
54. Heater and Heater Motor (Opt.)
55. Heater Fan Switch (Opt.)
56. Heater Harness (Eng. Section) (Opt.)
    6660894
57. Fuse and Fuse Cap (Opt.)

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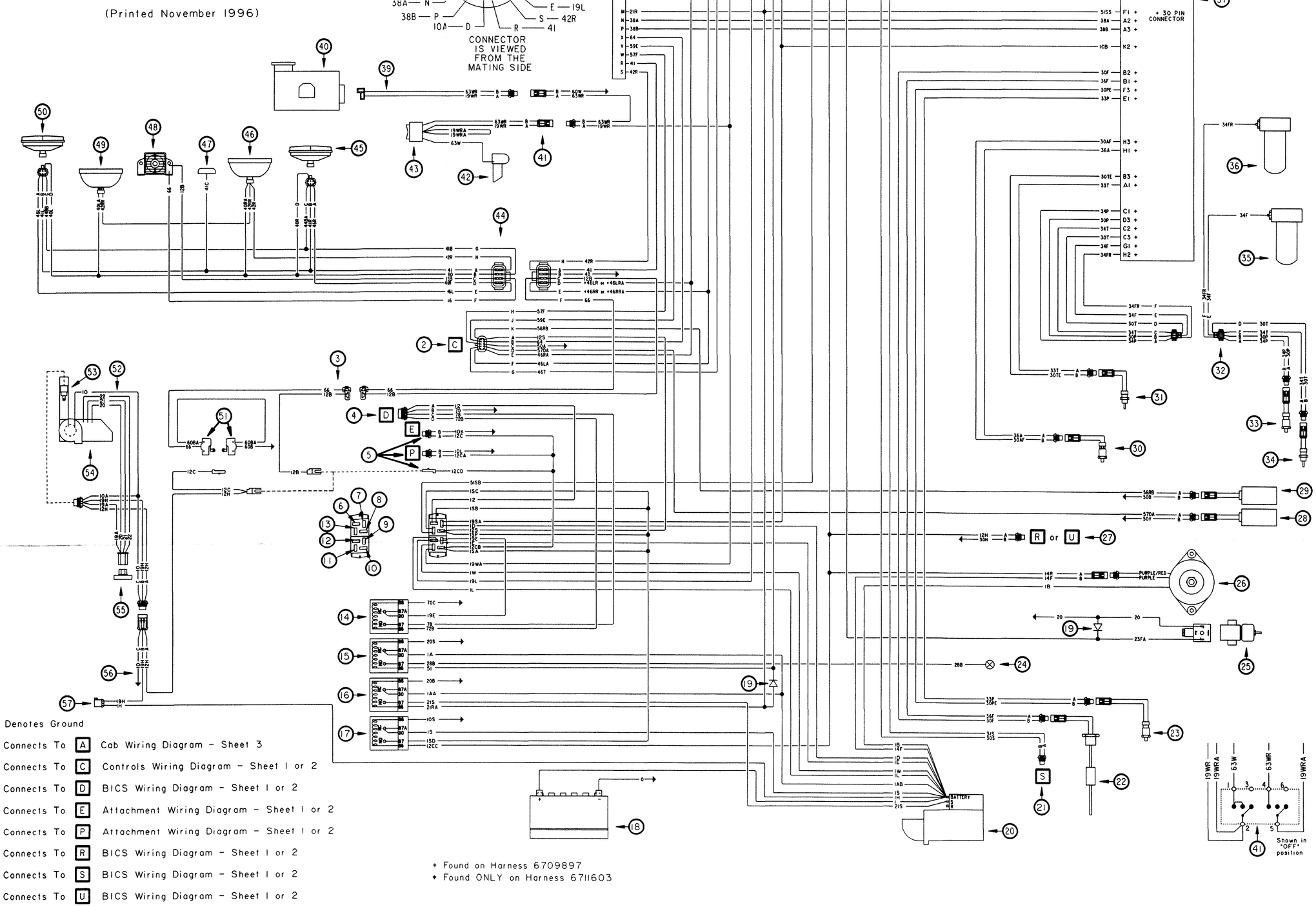

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MC 224087 (10-22-96)

WIRING DIAGRAM (P/N 6724861) Sheet 6
Engine
With BOSS
(Harness 6710493)
873 BICS™ (S/N 514112612 and Above)
(S/N 514211274 and Above)

(Printed November 1996)

Printed in U.S.A.

MC 2293T8

WIRE LEGEND

NO. 's	COLOR	GAUGE
0	Black	Cable
1	Red	Cable
1A	Red	12
1AA	Red	12
1AB	Red	12
1B	Red	10
1CB	Red	16
1D	Red	16
1E	Red	14
1H	Red	14
1L	Red	12
1S	Red	12
1SA	Red	12
1SB	Red	16
1SC	Red	16
1SD	Red	12
1SP	Red	16
1W	Red	14
10	Black (Heater Harness)	14
10A	Black	12
10A	Black (Heater Harness)	14
10E	Black	16
10H	Black	16
10HA	Black	16
10K	Black	12
10L	Black	12
10S	Black	16
12	Orange	16
12B	Orange	16
12C	Orange	14
12CA	Orange	14
12CB	Orange	12
12CC	Orange	16
12CD	Orange	14
12DL	Orange	16
12DR	Orange	16
12G	Orange	16
12GA	Orange	16
12H	Orange	16
12H	Orange (Heater Harness)	14
12S	Orange	16
12W	Orange	16
14F	Lt. Green	16
14R	Lt. Green/White	16
19A	White	14
19E	Red/White	14
19H	Red/White	14
19L	Red/White	12
19L	Red/White (Strobe Harness)	16
19LA	Red/White	12
19LB	Red/White	16
19S	Red/White	14
19SA	Red/White	16
19W	Red/White	14
19WA	Red/White	14
19WR	Red/White	16
19WRA	Red/White	16
20	Black	14
20	Red (Heater Harness)	14
20B	Black	16
20C	Black	16
20M	Black	16
20S	Black	16
21	Yellow	14
21R	White	16
21RA	White	16
21S	White/Lt. Green	12
22	Orange	14
23F	White/Black	16
23FA	Red/Blue	14
28A	Lt. Blue/Orange	16
28B	Lt. Blue/Orange	12
30AF	Black	16
30F	Black	16

WIRE LEGEND (Cont'd)

NO. 's	COLOR	GAUGE
30H	Black	16
30P	Black	16
30PE	Black	16
30S	Black	16
30T	Black	16
30TE	Black	16
31S	Yellow/Lt. Blue	16
33P	Yellow/Green	16
33T	Yellow/Red	16
34F	Yellow/Dk. Blue	16
34FR	Dk. Blue/Yellow	16
34P	Yellow/Lt. Blue	16
34T	Yellow/Brown	16
36A	Purple/Red	16
36F	Purple	16
38A	Purple/Red	18
38B	Purple/White	18
40	Black	16
40A	Black	16
40B	Black	16
40L	Black	16
40LA	Black	16
40R	Black	16
40RA	Black	16
41	Pink	16
41A	Pink	16
41B	Pink	16
41C	Pink	16
41L	Pink	16
41R	Pink	16
42F	Dk. Blue	16
42R	Dk. Blue/White	16
42RR	Dk. Blue/White	16
44B	Dk. Green/Yellow	16
44BA	Dk. Green/Yellow	16
44BB	Dk. Green/Yellow	16
46B	Brown/Red	16
46L	Yellow	16
46LA	Yellow	16
46LR	Brown/Yellow	16
46LRA	Brown/Yellow	16
46R	Dk. Green	16
46RA	Green	16
46RR	Brown/Green	16
46RRA	Brown/Green	16
46T	Brown	16
50A	Black	16
50B	Black	16
50V	Black	16
51	Lt. Blue/White	16
51A	Lt. Blue/White	16
51B	Orange/Blue	16
51S	Orange/White	16
51SA	Orange/White	16
51SB	Orange/White	16
51SS	White/Orange	16
56RB	Dk. Green/Yellow	16
57DA	Yellow	16
57F	Lt. Blue/Red	16
59E	Orange	16
60B	Black	16
60BA	Black	16
60W	Black	16
60WA	Black	16
60WB	Black	16
63W	Orange/Black	16
63WR	Blue/Black	16
64	Orange/Blue	16
66	Orange/Green	16
70	Black	14
70C	Black	16
72B	Pink/White	16
78	White	14

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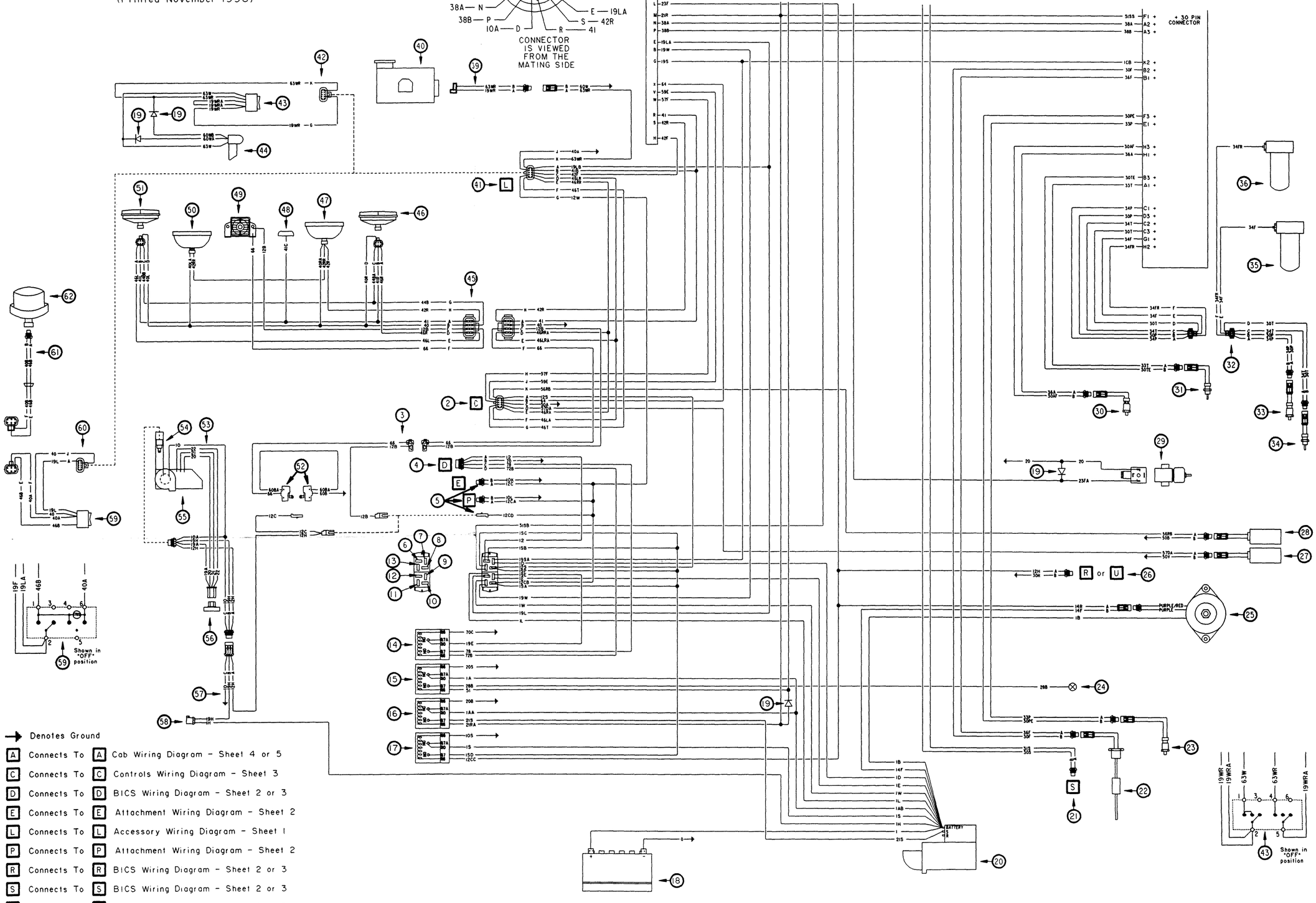
PARTS LEGEND

1. Engine Harness (BOSS) 6710493
2. Auxiliary Hydraulics Connector
3. Back-Up Alarm Harness (Opt.) 6704815
4. BICS Connector
5. Fused and Switched Power Connectors
6. Fused 10 Amp - BICS
7. Fused 15 Amp - Engine
8. Fused 15 Amp - PWM
9. Fused 25 Amp - Brake
10. Fused 25 Amp - Accessories
11. Fused 25 Amp - Accessories
12. Fused 25 Amp - Lights
13. Fused 10 Amp - BOSS
14. Brake Relay
15. Glow Plug Relay
16. Starter Relay
17. Switched Power Relay
18. Battery
19. Diode
20. Starter
21. Magnetic Pick-up to Traction Control Harness
22. Fuel Sensor
23. Engine Oil Pressure Switch
24. Glow Plugs
25. Alternator
26. Traction Control Harness Connector
27. Rear Auxiliary (Diverter) Valve (Opt.)
28. Rear Auxiliary Bleed Down (Opt.)
29. Fuel Shut-Off Solenoid
30. Air Filter Cleaner (Vacuum) Switch
31. Engine Oil Coolant Temperature Sensor
32. Boss Filter Harness 6707059
33. Hydraulic Charge Pressure Switch
34. Hydraulic Oil Temperature Sensor
35. Hydraulic Oil Filter Differential Pressure Sensor
36. Hydraulic Oil Filter Return Pressure Sensor

PARTS LEGEND (Cont'd)

37. BOSS Computer
38. Shutdown Relay
39. Rear Wiper/Washer Tank Harness (Opt.)
40. Rear Wiper/Washer Tank and Pump (Opt.)
41. Cab Accessory Connector
42. Rear Wiper Harness (Opt.) 6712260
43. Rear Wiper Motor (Opt.)
44. Rear Wiper Switch (Opt.)
45. Rear Light Harness 6708278
46. Right Rear Taillight
47. Right Rear Work Light
48. Registration Lamp-License Plate (Euro. Opt.)
49. Back-Up Alarm (Opt.)
50. Left Rear Work Light
51. Left Rear Taillight
52. Back-Up Alarm Switch (Opt.)
53. Heater Harness (Heater Section) (Opt.) 6660892
54. Heater Relay Switch (Opt.)
55. Heater and Heater Motor (Opt.)
56. Heater Fan Switch (Opt.)
57. Heater Harness (Eng. Section) (Opt.) 6660894
58. Fuse and Fuse Cap (Opt.)
59. Beacon/Strobe Switch (Opt.)
60. Strobe Harness (Opt.) 6712258
61. Rotating Beacon Harness (Opt.) 6708318
62. Strobe Light or Rotating Beacon (Opt.)

(Printed November 1986)



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MC 229387 (10-22-96)

WIRING DIAGRAM (P/N 6724862) Sheet 1

Operator Controls

(Harness 6708055)

873 BICS™ (S/N 514111001-11442)

(S/N 514211001-11104)

(Printed November 1996)

Printed in U.S.A.

MC 2305TI

WIRE LEGEND

NO. 's	COLOR	GAUGE
12	Orange	16
12B	Orange	16
12H	Orange/White	16
12HW	Orange	16
12K	Orange	16
12L	Orange/White	16
12M	Orange	16
12S	Orange	16
46LA	Yellow	16
46RA	Green	16
46T	Brown	16
50A	Black	16
50B	Black	16
50C	Black	16
50D	Black	16
50E	Black	16
56A	Dk. Green/Yellow	16
56AL	Dk. Green	16
56B	Dk. Green/Red	16
56BA	Dk. Green/Red	16
56BB	Dk. Green/Red	16
56L	Lt. Green/Blue	16
56P	Lt. Green/Red	16
56R	Dk. Green/Lt. Green	16
56RA	Dk. Green/Lt. Green	16
56RC	Dk. Green/Lt. Green	16
57DA	Yellow	16
57L	Lt. Green/Pink	16
57RB	Yellow/Red	16
57RR	Yellow/Lt. Green	16
59E	Orange	16
64	Orange/Blue	16

PARTS LEGEND

(1) Left Two-Switch Control Handle (Opt.)

(1a) Left Multi-Switch Control Handle (Opt.)

(2) Right Two-Switch Control Handle (Opt.)

(2a) Right Multi-Switch Control Handle (Opt.)

(3) Auxiliary Control Module (Opt.)

(4) Hydraulic Control Valve

(5) Front Auxiliary Solenoid (Base End/Female Coupler)

(6) Front Auxiliary Solenoid (Rod End/Male Coupler)

(7) Bucket Positioning Valve (Opt.)

(8) Bucket Level Off Solenoid (Opt.)

(9) Control Harness (Opt.)
6708055

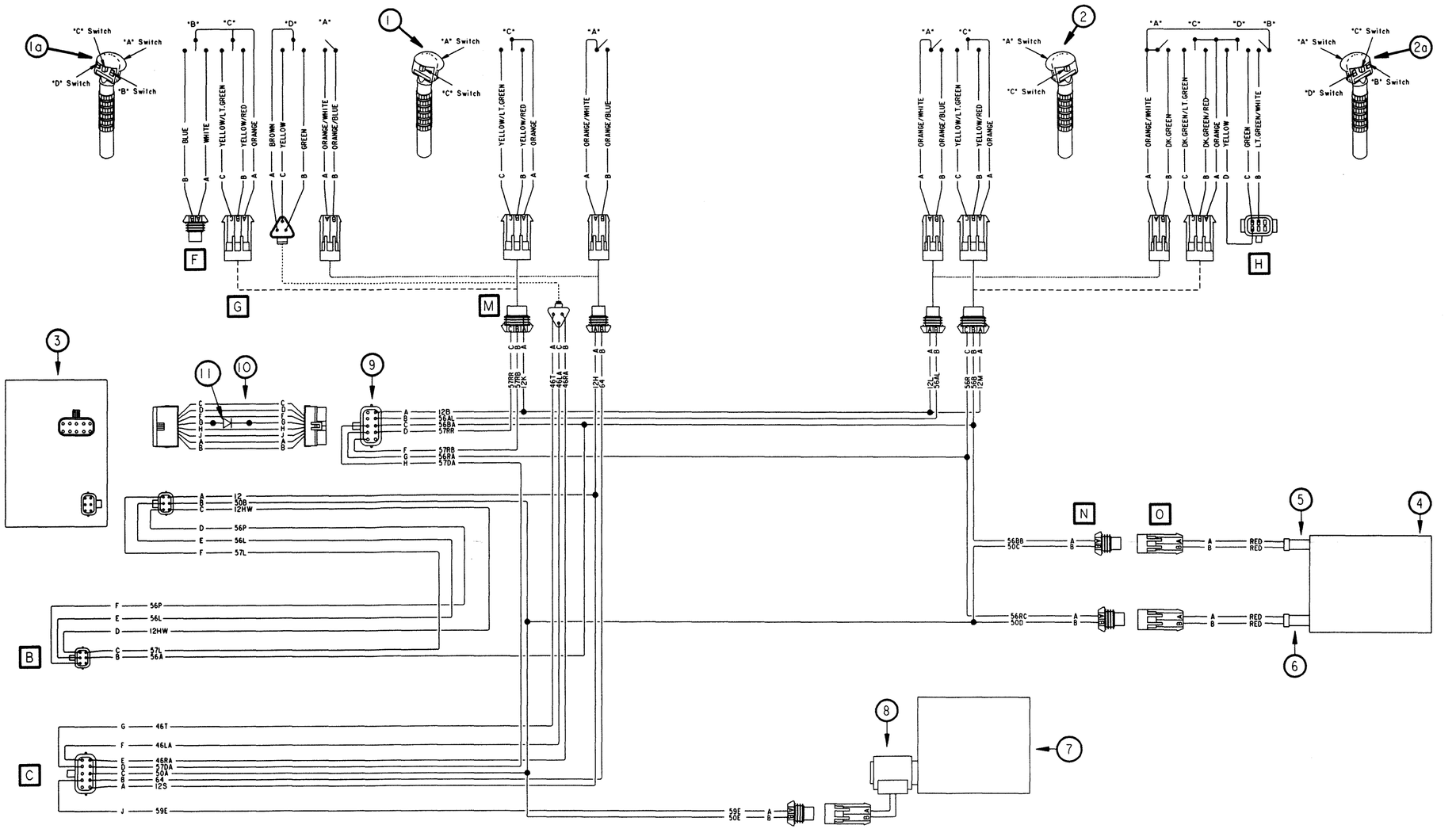
(10) Electrical Connector Assembly Harness (Opt.) for Rear Auxiliary ONLY
6704114 Rev. A

(11) Diode

M Connects To M Attachment Wiring Diagram - Sheet 1

N Connects To N Attachment Wiring Diagram - Sheet 1

O Connects To O Attachment Wiring Diagram - Sheet 1



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MC 2305 (10-22-96)

WIRING DIAGRAM (P/N 6724862) Sheet 2
Operator Controls
(PWM Control Harness 6708284)
873 BICS™ (S/N 514111443-12488)
(S/N 514211105-11269)

(Printed November 1996)

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MC 2306T1

WIRE LEGEND

NO.'s	COLOR	GAUGE
12	Orange/White	16
12H	Orange	16
12HW	Orange	16
12K	Orange/White	16
12L	Orange	16
12S	Orange	16
46LA	Yellow	16
46RA	Green	16
46T	Brown	16
50	Black	16
50A	Black	16
50B	Black	16
50C	Black	16
50H	Black	16
53P	Dk. Blue	16
53PB	Dk. Green/Yellow	16
53PR	Dk. Blue/White	16
53PW	Dk. Blue/Yellow	16
56A	Dk. Green/Yellow	16
56AA	Dk. Green/Yellow	16
56AB	Dk. Green/Yellow	16
56AL	Dk. Green	16
56B	Dk. Green/Red	16
56L	Lt. Green/Blue	16
56P	Lt. Green/Red	16
56R	Dk. Green/Lt. Green	16
56RB	Dk. Green/Yellow	16
57DA	Yellow	16
57L	Lt. Green/Pink	16
57RB	Yellow/Lt. Green	16
57RR	Yellow/Brown	16
58A	Orange/Green	16
*58B	Lt. Blue/Red	16
59E	Orange	16
64	Orange/Blue	16

* This Wire May Not Be Found on All Harnesses.

PARTS LEGEND

1. Left Deluxe (Multi-Switch) Control Handle (Opt.)
2. Left Two-Switch Control Handle (Opt.)
3. Right PWM Deluxe 4-Switch Control Handle (Opt.)
4. Right PWM 2-Switch Control Handle (Opt.)
5. PWM Auxiliary Controller Module (Opt.)
   (S/N 514111443-12336)
   (S/N 514211105-11260)

5A. PWM Auxiliary Controller Module (Opt.)
   (S/N 514112337-12488)
   (S/N 514211261-11269)

6. PWM Control Harness (Opt.) 6708284
7. Front Auxiliary Solenoid (Base End/Female Coupler)
8. Front Auxiliary Solenoid (Rod End/Male Coupler)
9. PWM Control Valve
10. Bucket Level Off Solenoid (Opt.)
11. Bucket Positioning Valve (Opt.)
12. Rear Auxiliary Bleed Connector
13. PWM Bleed Adapter Harness used with Rear Auxiliary (Opt.)
    6710435 Rev. A

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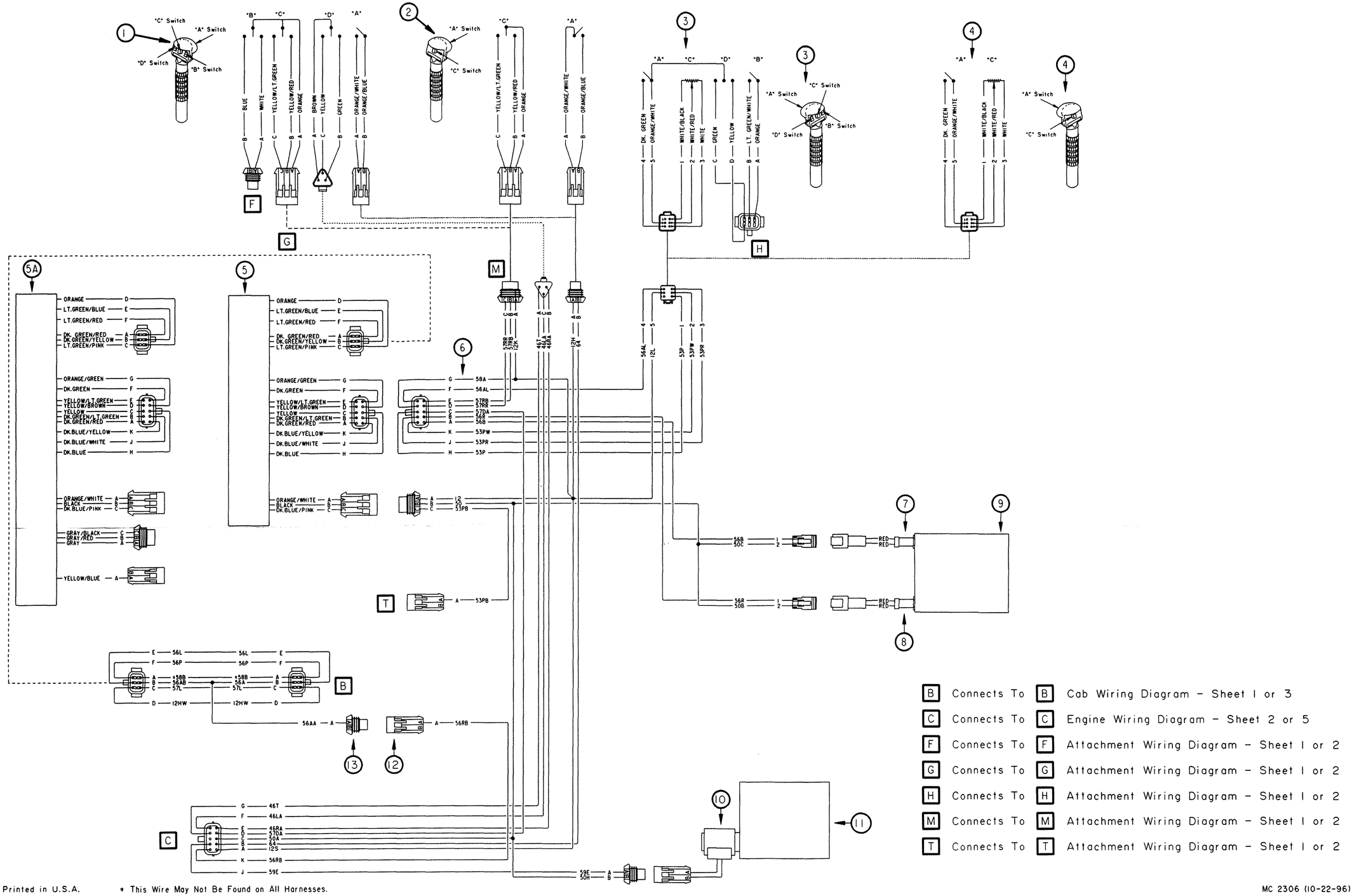
MC 2306LE (10-22-96)



B Connects To B Cab Wiring Diagram - Sheet 1 or 3

C Connects To C Engine Wiring Diagram - Sheet 2 or 5

F Connects To F Attachment Wiring Diagram - Sheet 1 or 2

G Connects To G Attachment Wiring Diagram - Sheet 1 or 2

H Connects To H Attachment Wiring Diagram - Sheet 1 or 2

M Connects To M Attachment Wiring Diagram - Sheet 1 or 2

T Connects To T Attachment Wiring Diagram - Sheet 1 or 2

Printed in U.S.A.

* This Wire May Not Be Found on All Harnesses.

WIRING DIAGRAM (P/N 6724862) Sheet 3
Operator Controls
(PWM Control Harness 6712522 Rev. A)
873 BICS™ (S/N 514112489 and Above)
(S/N 514211270 and Above)

(Printed November 1996)

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MC 2307T1

WIRE LEGEND

NO.'s	COLOR	GAUGE
12	Orange/White	16
12H	Orange	16
12HW	Orange	16
12K	Orange/White	16
12L	Orange	16
12S	Orange	16
46LA	Yellow	16
46RA	Green	16
46T	Brown	16
50	Black	16
50A	Black	16
50B	Black	16
50C	Black	16
50H	Black	16
53P	Dk. Blue	16
53PB	Dk. Green/Yellow	16
53PR	Dk. Blue/White	16
53PW	Dk. Blue/Yellow	16
56A	Dk. Green/Yellow	16
56AA	Dk. Green/Yellow	16
56AB	Dk. Green/Yellow	16
56AL	Dk. Green	16
56B	Dk. Green/Red	16
56L	Lt. Green/Blue	16
56P	Lt. Green/Red	16
56R	Dk. Green/Lt. Green	16
56RB	Dk. Green/Yellow	16
57DA	Yellow	16
57L	Lt. Green/Pink	16
57RB	Yellow/Lt. Green	16
57RR	Yellow/Brown	16
58A	Orange/Green	16
* 58B	Dk. Green/Red	16
* 58B	Lt. Blue/Red (PWM Bleed Adapter Harness)	16
59E	Orange	16
64	Orange/Blue	16
77B	Yellow/Blue	16

* This Wire May Not Be Found on All Harnesses.

PARTS LEGEND

(1) Left Deluxe (Multi-Switch) Control Handle (Opt.)

(2) Left Two-Switch Control Handle (Opt.)

(3) Right PWM Deluxe 4-Switch Control Handle (Opt.)

(4) Right PWM 2-Switch Control Handle (Opt.)

(5) PWM Auxiliary Controller Module (Opt.)

(6) PWM Control Harness (Opt.) 6712522 Rev. A

(7) Front Auxiliary Solenoid (Base End/Female Coupler)

(8) Front Auxiliary Solenoid (Rod End/Male Coupler)

(9) PWM Control Valve

(10) Bucket Level Off Solenoid (Opt.)

(11) Bucket Positioning Valve (Opt.)

(12) Rear Auxiliary Bleed Connector

(13) PWM Bleed Adapter Harness used with Rear Auxiliary (Opt.) 6710435 Rev. A

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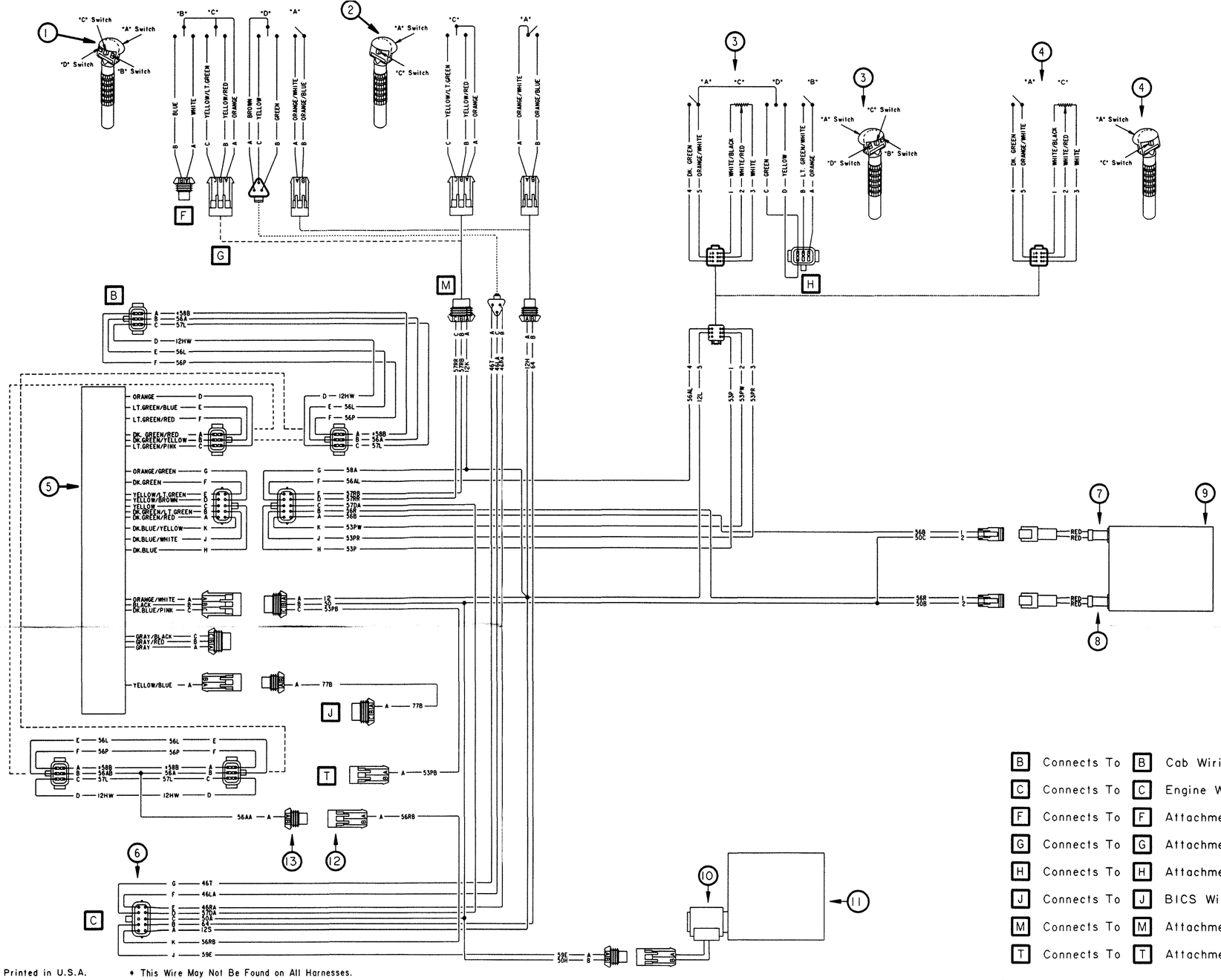
MC 2307LE (10-4-96)



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* This Wire May Not Be Found on All Harnesses.

B	Connects To	B	Cab Wiring Diagram - Sheet 2, 4 or 5
C	Connects To	C	Engine Wiring Diagram - Sheet 3 or 6
F	Connects To	F	Attachment Wiring Diagram - Sheet 3
G	Connects To	G	Attachment Wiring Diagram - Sheet 3
H	Connects To	H	Attachment Wiring Diagram - Sheet 3
J	Connects To	J	BICS Wiring Diagram - Sheet 2 or 3
M	Connects To	M	Attachment Wiring Diagram - Sheet 3
T	Connects To	T	Attachment Wiring Diagram - Sheet 3

MC 2307 (10-22-96)

WIRING DIAGRAM (P/N 6724863) Sheet 1
BICS™
(BICS™ Controller Harness 6706828 Rev. E or 6710312 Rev. A)
873 BICS™ (S/N 514111001-12611)
(S/N 514211001-11273)

(Printed November 1996)

Printed in U.S.A.

MC 2172T8

WIRE LEGEND

NO.'s	COLOR	GAUGE
12	Orange	16
12H	Orange	16
12HA	Orange	16
12HB	Orange	16
30	Black	16
30H	Black	16
30HA	Black	16
30HB	Black	16
30S	Green	16
30SA	Green/Lt. Blue	16
31S	Yellow/Lt. Blue	16
31SA	Yellow	16
70	Black (BICS Controller Harness)	16
70	Black (Mainframe Harness)	14
70A	Black	14
70B	Black	16
70D	Black	16
71A	Dk. Green	16
72A	Red (Color Was Pink/Red on some machines)	16
72B	Pink/White	16
73A	Blue (Color Was Dk. Blue on some machines)	16
73B	White (Color Was Brown on some machines)	16
73BA	White/Lt. Blue	16
73BB	White	16
74A	Lt. Blue/Red	16
74B	Lt. Blue/Black	16
74C	Lt. Blue/Green	16
75A	Dk. Blue/White	16
75B	Gray	16
76A	Yellow/Red	16
76B	Yellow/Black	16
76C	Yellow/Green	16
78	White (Color Was Red on some Mainframe Harnesses)	14

PARTS LEGEND

(1) BICS Controller Harness Connector (All S/N Machines) 6706828 (Rev. E) and 6710312 (Rev. A)

(1A) BICS Controller Harness Connector * 6706828 (Rev. E)

(1B) BICS Controller Harness Connector + 6710312 (Rev. A)

(2) BICS Controller

(3) Traction Lock (Brake) Override Switch

(4) Seatbar Sensor

(5) Seat Sensor

(6) Traction Lock (Manual Brake) Assembly Switch

(7) Traction Lock (Brake) Solenoid

(8) Hydraulic Tilt Lock Valve Solenoid

(9) Mainframe Controller Harness Connector (All S/N Machines) 6706876 (Rev. E) and 6710313

(9A) Mainframe Controller Harness Connector * 6706876 (Rev. E)

(9B) Mainframe Controller Harness Connector + 6710313

(10) Traction Controller

(11) Traction Control Harness 6713455

(12) Magnetic Pickup Connector (873 BOSS ONLY)

(13) Magnetic Pickup

(14) Auxiliary Power Connector

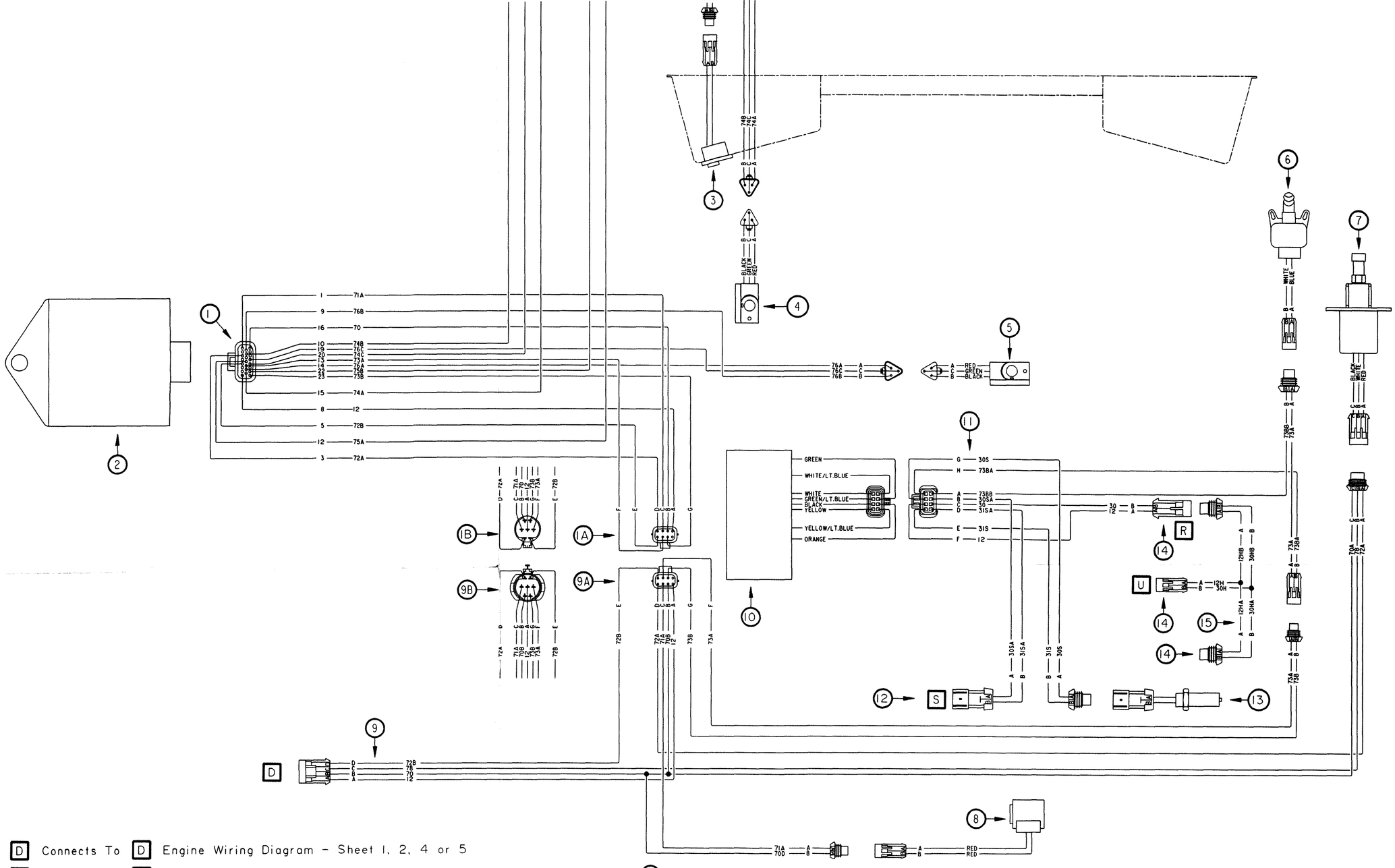
(15) Auxiliary Power Harness (Opt.) 6713596

***S/N for BICS Controller Harness 6706828 Rev. E and Mainframe Controller Harness 6706876 Rev. E**

873 BICS™ (S/N 514111001-11221)
(S/N 514211001-11036)

+S/N for BICS Controller Harness 6710312 (Rev. A) and Mainframe Controller Harness 6710313

873 BICS™ (S/N 514111222-12488)
(S/N 514211037-11269)



D Connects To D Engine Wiring Diagram - Sheet 1, 2, 4 or 5

R Connects To R Engine Wiring Diagram - Sheet 1, 2, 4 or 5 (Do NOT use when item (15) is present)

S Connects To S Engine Wiring Diagram - Sheet 4 or 5 (873 BOSS ONLY)

U Connects To U Engine Wiring Diagram - Sheet 1, 2, 4 or 5 (Use only when item (15) is present)

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WIRING DIAGRAM (P/N 6724863) Sheet 2

BICS™

(BICS™ Controller Harness 6712134)

873 BICS™ (S/N 514112612 and Above)

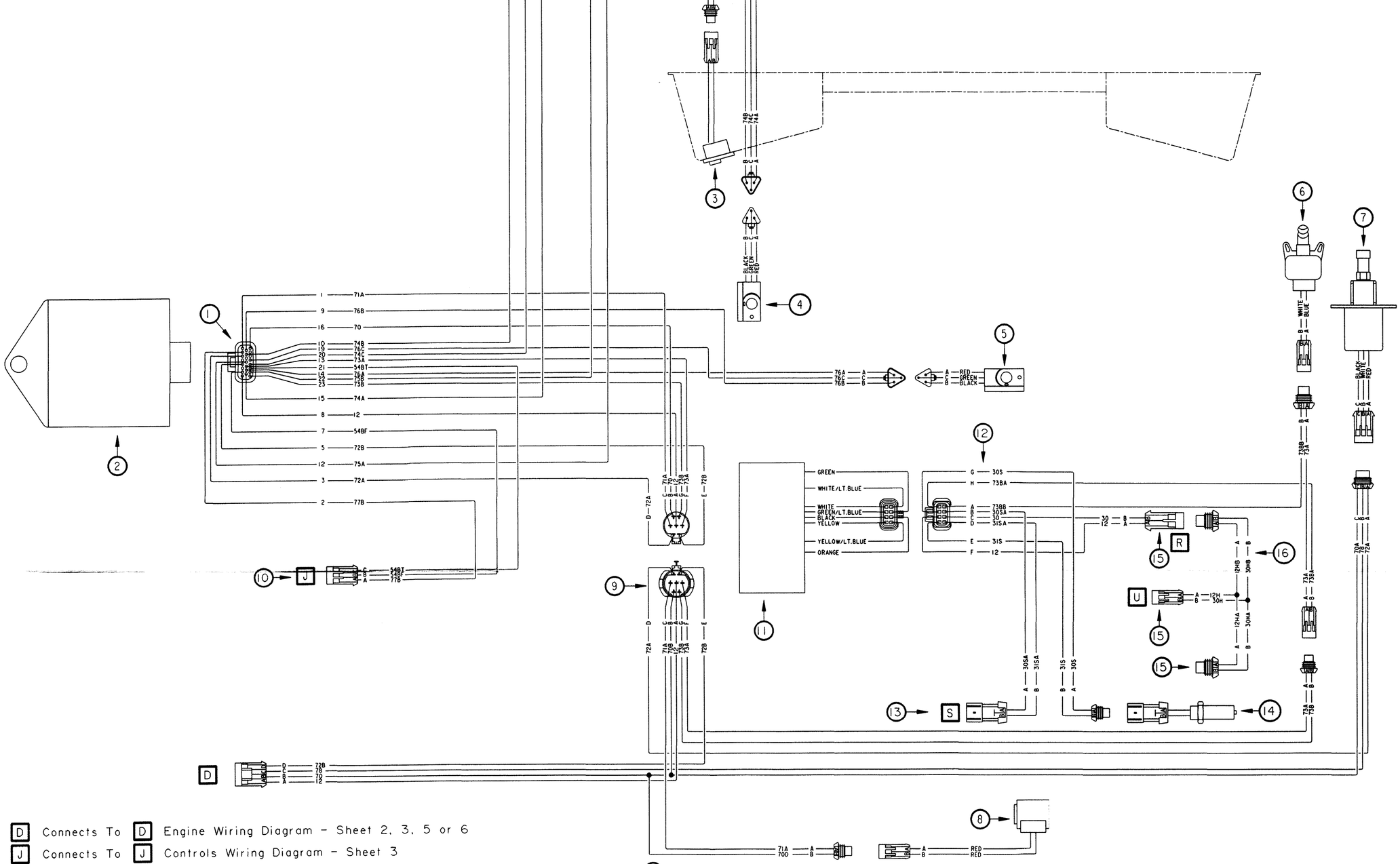
(Printed November 1996)

WIRE LEGEND

NO.'s	COLOR	GAUGE
12	Orange	16
12H	Orange	16
12HA	Orange	16
12HB	Orange	16
30	Black	16
30H	Black	16
30HA	Black	16
30HB	Black	16
30S	Green	16
30SA	Green/Lt. Blue	16
31S	Yellow/Lt. Blue	16
31SA	Yellow	16
54BF	Purple/White	16
54BT	Purple/Red	16
70	Black (BICS Controller Harness)	16
70	Black (Mainframe Harness)	14
70A	Black	14
70B	Black	16
70D	Black	16
71A	Dk. Green	16
72A	Red	16
72B	Pink/White	16
73A	Blue	16
73B	White	16
73BA	White/Lt. Blue	16
73BB	White	16
74A	Lt. Blue/Red	16
74B	Lt. Blue/Black	16
74C	Lt. Blue/Green	16
75A	Dk. Blue/White	16
75B	Gray	16
76A	Yellow/Red	16
76B	Yellow/Black	16
76C	Yellow/Green	16
77B	Yellow/Blue	16
78	White	14

PARTS LEGEND

1. BICS Controller Harness
   6712134
2. BICS Controller
3. Traction Lock (Brake) Override Switch
4. Seatbar Sensor
5. Seat Sensor
6. Traction Lock (Manual Brake) Assembly Switch
7. Traction Lock (Brake) Solenoid
8. Hydraulic Tilt Lock Valve Solenoid
9. Mainframe Controller Harness
   6712523
10. Controls Connector
11. Traction Controller
12. Traction Control Harness
    6713455
13. Magnetic Pickup Connector (873 BOSS ONLY)
14. Magnetic Pickup
15. Auxiliary Power Connector
16. Auxiliary Power Harness (Opt.)
    6713596



D Connects To D Engine Wiring Diagram - Sheet 2, 3, 5 or 6

J Connects To J Controls Wiring Diagram - Sheet 3

R Connects To R Engine Wiring Diagram - Sheet 2, 3, 5 or 6 (Do NOT use when item (16) is present)

S Connects To S Engine Wiring Diagram - Sheet 5 or 6 (873 BOSS ONLY)

U Connects To U Engine Wiring Diagram - Sheet 2, 3, 5 or 6 (Use only when item (16) is present)

Printed in U.S.A.

MC 225987 (11-1-96)

WIRING DIAGRAM (P/N 6724863) Sheet 3
BICS™
(BICS™ European Controller Harness 6712135 Rev. B)
873 BICS™ (S/N 514211274 and Above)

(Printed November 1996)

WIRE LEGEND

NO.'s	COLOR	GAUGE
12	Orange	16
12A	Orange	16
12B	Orange	16
12H	Orange	16
12HA	Orange	16
12HB	Orange	16
30	Black	16
30H	Black	16
30HA	Black	16
30HB	Black	16
30S	Green	16
30SA	Green/Lt. Blue	16
31S	Yellow/Lt. Blue	16
31SA	Yellow	16
54BF	Purple/White	16
54BT	Purple/Red	16
70	Black (BICS Controller Harness)	16
70	Black (Mainframe Harness)	14
70A	Black (BICS Controller Harness)	16
70A	Black (Mainframe Harness)	14
70B	Black	16
70D	Black	16
71A	Dk. Green	16
72A	Red	16
72B	Pink/White	16
73A	Blue	16
73B	White	16
73BA	White/Lt. Blue	16
73BB	White	16
74A	Lt. Blue/Red	16
74B	Lt. Blue/Black	16
74C	Lt. Blue/Green	16
75A	Dk. Blue/White	16
75B	Gray	16
76A	Yellow/Red	16
76B	Yellow/Black	16
76C	Yellow/Green	16
77A	Yellow	16
77B	Yellow/Blue	16
78	White	14

PARTS LEGEND

(1) BICS European Controller Harness
6712135 Rev. B

(2) BICS Controller

(3) Traction Lock (Brake) Override Switch

(4) Seatbar Sensor

(5) Seat Sensor

(6) Traction Lock (Manual Brake) Assembly Switch

(7) Traction Lock (Brake) Solenoid

(8) Hydraulic Tilt Lock Valve Solenoid

(9) Mainframe Controller Harness
6712523

(10) Controls Connector

(11) Travel Control Switch

(12) Traction Controller

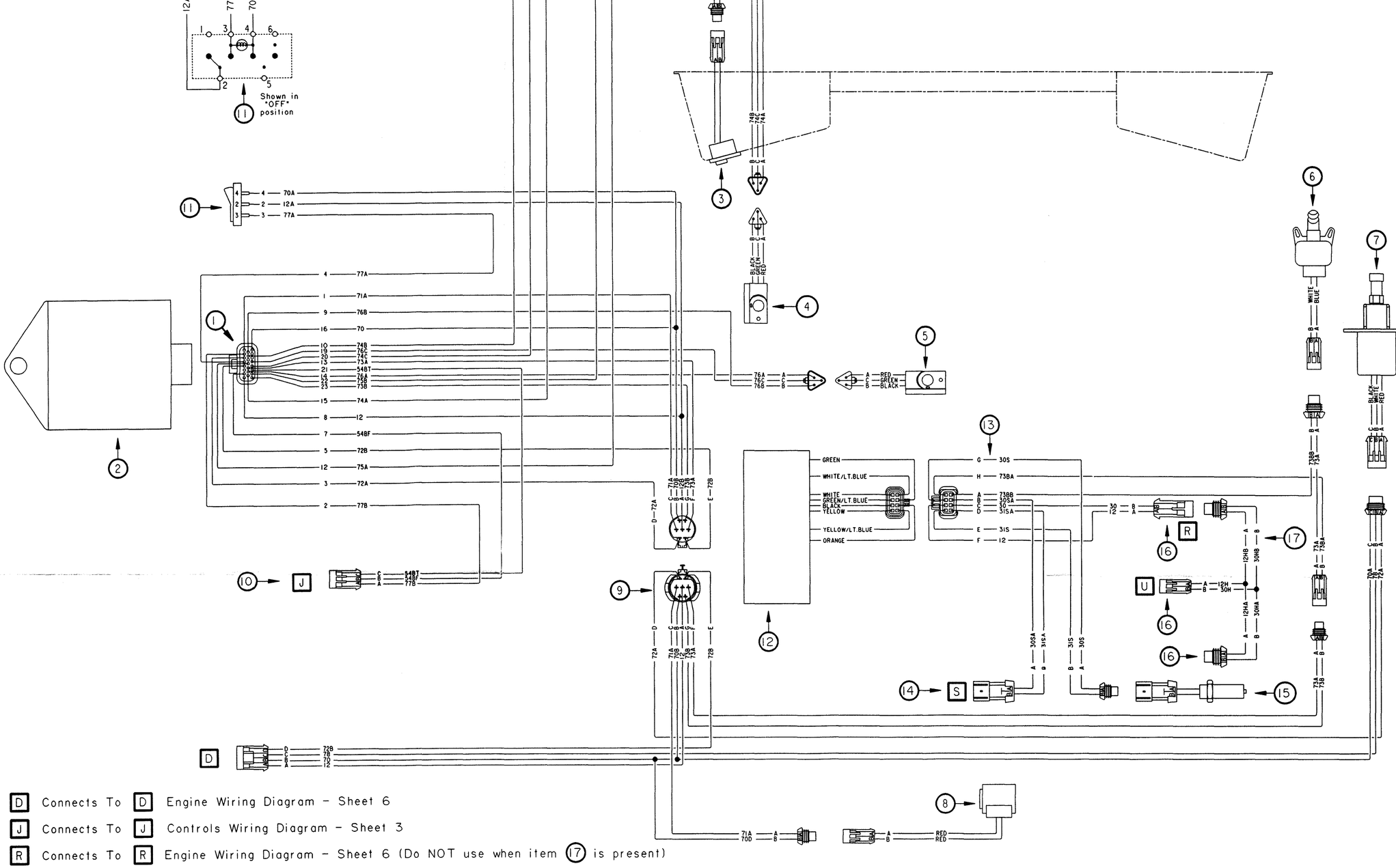
(13) Traction Control Harness
6713455

(14) Magnetic Pickup Connector (873 BOSS ONLY)

(15) Magnetic Pickup

(16) Auxiliary Power Connector

(17) Auxiliary Power Harness (Opt.)
6713596



D Connects To D Engine Wiring Diagram - Sheet 6

J Connects To J Controls Wiring Diagram - Sheet 3

R Connects To R Engine Wiring Diagram - Sheet 6 (Do NOT use when item (17) is present)

S Connects To S Engine Wiring Diagram - Sheet 6 (873 BOSS ONLY)

U Connects To U Engine Wiring Diagram - Sheet 6 (Use only when item (17) is present)

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WIRING DIAGRAM (P/N 6724864) Sheet 1

Optional Attachment
(Lift Arm Harness 6705901 Rev. D)
873 BICS™ (S/N 514111001-11501)
(S/N 514211001-11107)

(Printed November 1996)

WIRE LEGEND

NO. 's	COLOR	GAUGE
12	Orange	16
12A	Orange	16
12B	Orange	14
12B	Orange(40 Power Harness)	16
12C	Orange	16
12D	Orange	16
12E	Orange	16
19	Red/White	14
50	Black	14
50A	Black	16
50B	Black	16
50C	Black	16
50D	Black	16
50E	Black	14
50W	Black	16
56A	Dk. Green/Yellow	16
56B	Yellow	16
56BA	Yellow	16
56BAA	Yellow	16
56BB	Dk. Blue	16
56BBA	Dk. Blue	16
56BBB	Dk. Blue	16
56R	Dk. Green	16
56RA	Dk. Green	16
56RAA	Dk. Green	16
56RB	White (*Orange/White)	16
56RBA	Orange/White	16
56RBB	Orange/White	16
56S	Dk. Green	16
56SA	Dk. Green	16
56SG	Dk. Green	16
56W	Lt. Green/White	16
57B	Yellow/Red (*Lt. Blue)	16
57BA	Lt. Blue	16
57BB	Lt. Blue	16
57BBA	Lt. Green	16
57BBB	Lt. Green	16
57BBC	Lt. Green	16
57BC	Yellow/White	16
57C	Orange/Dk. Blue	16
57CA	Orange/Dk. Blue	16
57CB	Orange/Dk. Blue	16
57RB	Yellow/Red (*Red)	16
57RR	Yellow/Lt. Green (*Brown/White)	16
57RRA	Yellow/Lt. Green (*Brown)	16
57RRB	Brown	16
57RRC	Brown	16
57RRD	Red	14
57RRE	White	16
57RRF	Brown/Yellow	16
64	Orange/Blue	16

* Alternate Color Used On Some Harnesses.

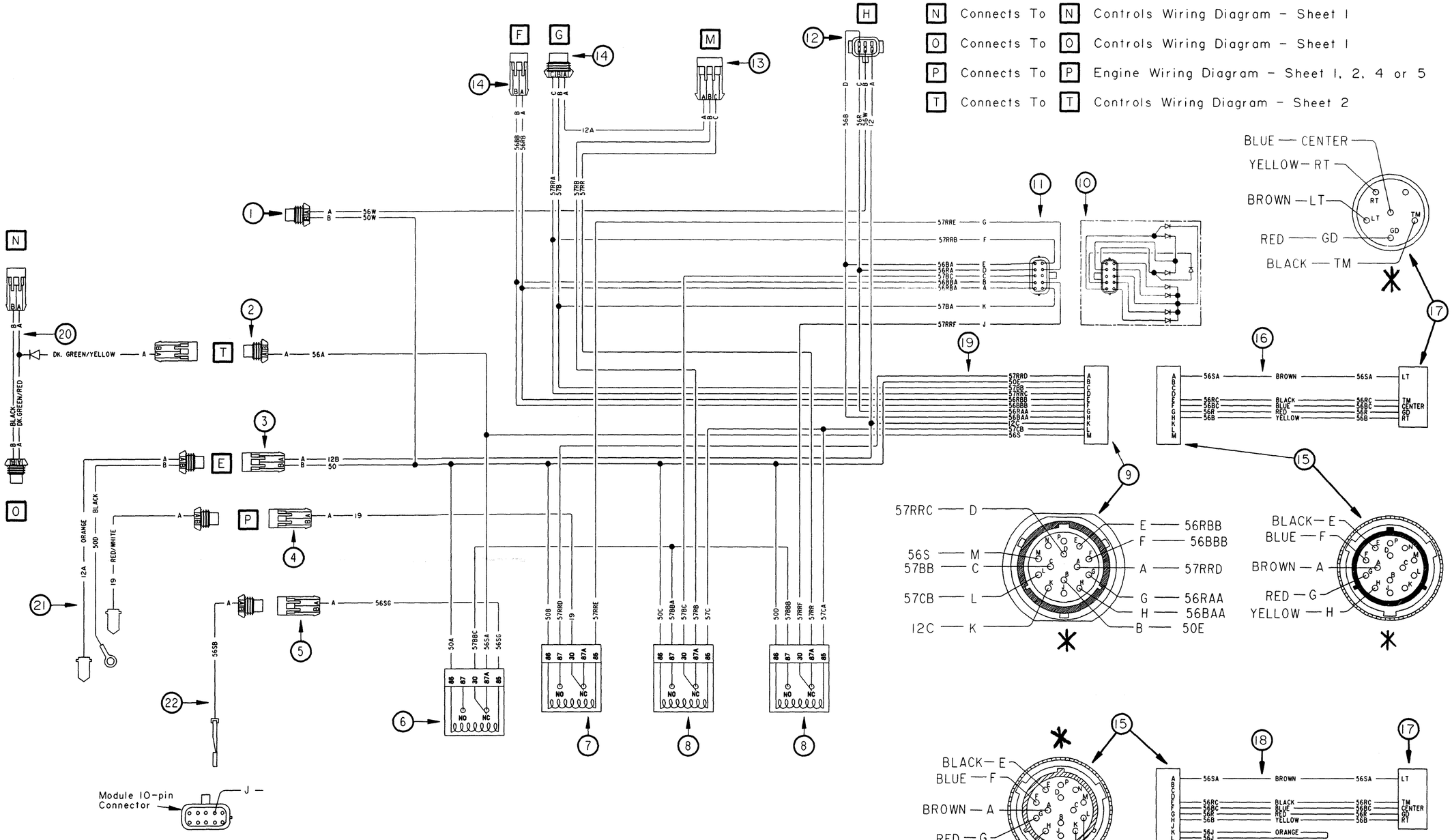
PARTS LEGEND

1. Connector-Water Kit
2. Connector - Auxiliary/Hydraulic BASE
3. Connector - Fused and Switched
4. Connector - Power and Fused (Angle Broom)
5. Connector-Stump Grinder (High Flow Valve)
6. Power Relay - Stump Grinder
7. Power Relay - Angle Broom
8. Power Relay - Front/Rear Auxiliary
9. Plug-In Connector - Lift Arm Harness - Boom Electrical Attachment Connector
10. Diode Module
11. Connector - Diode Module
12. Connector - Right Control Handle
13. Connector - Loader Control Harness
14. Connector - Left Control Handle
15. Adapter Connector - Optional Attachment Harness
16. New to Old Adapter Harness 6706391
17. Adapter Connector - Older Model Attachments
18. Grader Harness 6707303
19. Lift Arm (PWM) Attachment Harness 6705901 Rev. D
20. Attachment Power Harness 6706552 Rev. A
21. Power Wiring Harness 6706446 Rev. A
22. Jumper Wire - Stump Grinder 50 ONLY

Printed in U.S.A.

MC 2063L8 (11-6-96)

M	Connects To	M	Controls Wiring Diagram - Sheet 1 or 2
N	Connects To	N	Controls Wiring Diagram - Sheet 1
O	Connects To	O	Controls Wiring Diagram - Sheet 1
P	Connects To	P	Engine Wiring Diagram - Sheet 1, 2, 4 or 5
T	Connects To	T	Controls Wiring Diagram - Sheet 2



*LOADER CONNECTOR IS VIEWED FROM THE MATING SIDE

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MC 206387 (10-23-96)

WIRING DIAGRAM (P/N 6724864) Sheet 2

Optional Attachment
(Harness 6710299 and 6710300 Rev. A)
873 BICS™ (S/N 514111502 and Above)
(S/N 514211108 and Above)

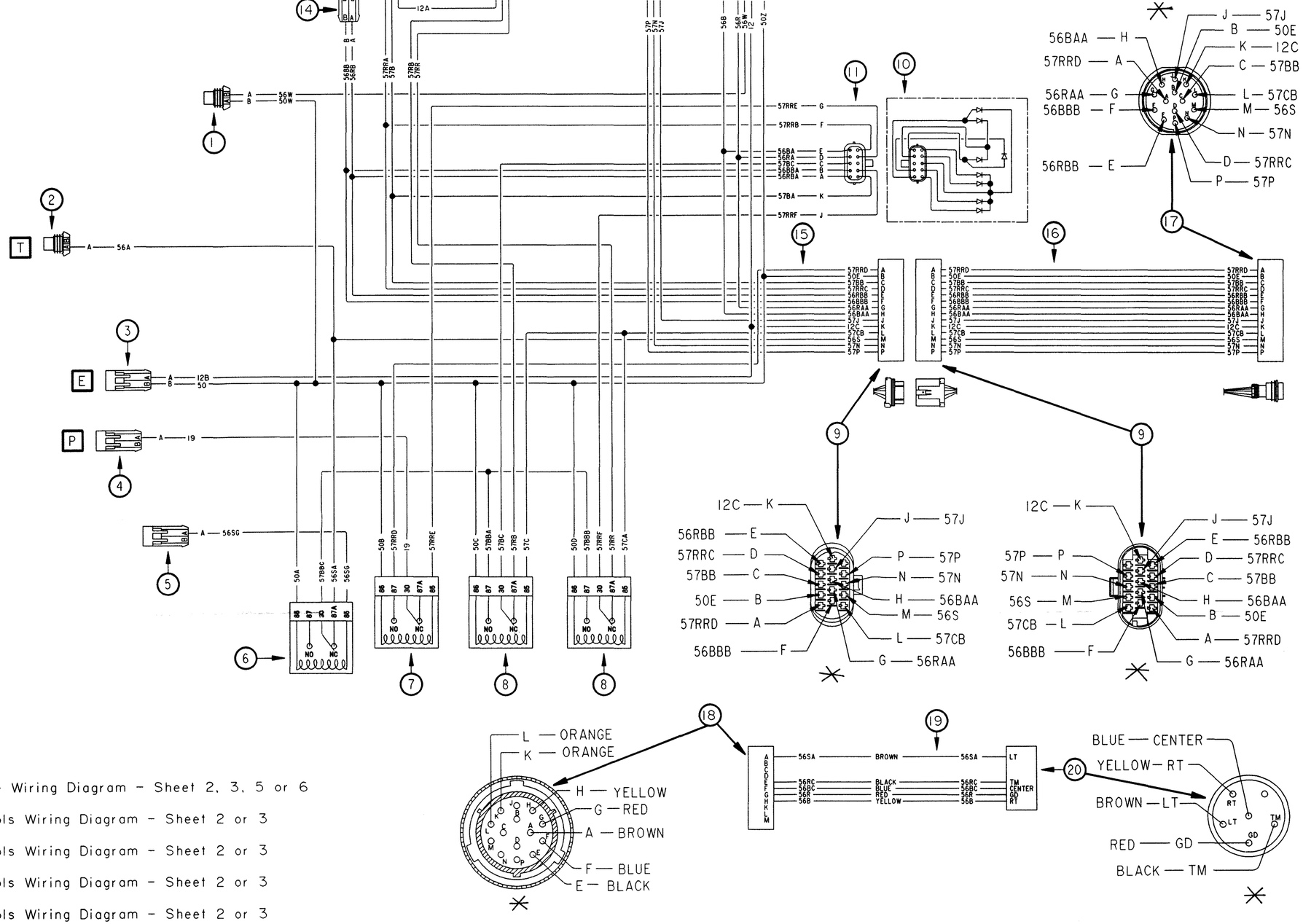
(Printed November 1996)

WIRE LEGEND

NO. 's	COLOR	GAUGE
12	Orange	16
12A	Orange	16
12B	Orange	14
12C	Orange	16
19	Red/White	14
50	Black	14
50A	Black	16
50B	Black	16
50C	Black	16
50D	Black	16
50E	Black	14
50W	Black	16
50Z	Black	16
56A	Dk. Green/Yellow	16
56B	Yellow	16
56BA	Yellow	16
56BAA	Yellow	16
56BB	Dk. Blue	16
56BBA	Dk. Blue	16
56BBB	Dk. Blue	16
56R	Dk. Green	16
56RA	Dk. Green	16
56RAA	Dk. Green	16
56RB	White	16
56RBA	Orange/White	16
56RBB	Orange/White	16
56S	Dk. Green	16
56SA	Dk. Green	16
56SG	Dk. Green	16
56W	Lt. Green/White	16
57B	Yellow/Red	16
57BA	Lt. Blue	16
57BB	Lt. Blue	16
57BBA	Lt. Green	16
57BBB	Lt. Green	16
57BBC	Lt. Green	16
57BC	Yellow/White	16
57C	Orange/Dk. Blue	16
57CA	Orange/Dk. Blue	16
57CB	Orange/Dk. Blue	16
57J	Lt. Green	16
57N	Pink	16
57P	White	16
57RB	Yellow/Red	16
57RR	Yellow/Lt. Green	16
57RRA	Yellow/Lt. Green	16
57RRB	Brown	16
57RRC	Brown	16
57RRD	Red	14
57RRE	White	16
57RRF	Brown/Yellow	16

PARTS LEGEND

1. Connector-Water Kit
2. Connector - Auxiliary/Hydraulic BASE
3. Connector - Fused and Switched
4. Connector - Power and Fused (Angle Broom)
5. Connector-Stump Grinder (High Flow Valve)
6. Power Relay - Stump Grinder
7. Power Relay - Angle Broom
8. Power Relay - Front/Rear Auxiliary
9. Boom Connector
10. Diode Module
11. Connector - Diode Module
12. Connector - Right Control Handle
13. Connector - Loader Control Harness
14. Connector - Left Control Handle
15. PWM Attachment Harness - 6710300 Rev. A
16. PWM Attachment Harness 6710299
17. Attachment Connector
18. Adapter Connector - Optional Attachment Harness
19. New to Old Adapter Harness 6706391
20. Adapter Connector - Older Model Attachments
21. For Future Use



E Connects To E Engine Wiring Diagram - Sheet 2, 3, 5 or 6

F Connects To F Controls Wiring Diagram - Sheet 2 or 3

G Connects To G Controls Wiring Diagram - Sheet 2 or 3

H Connects To H Controls Wiring Diagram - Sheet 2 or 3

M Connects To M Controls Wiring Diagram - Sheet 2 or 3

P Connects To P Engine Wiring Diagram - Sheet 2, 3, 5 or 6

T Connects To T Controls Wiring Diagram - Sheet 2 or 3

*LOADER CONNECTOR IS VIEWED FROM THE MATING SIDE

Printed in U.S.A.

MC221187 (11-6-96)

WIRING DIAGRAM (P/N 6724865) Sheet 1

Accessory

(Cab Accessory Harness 6710481 Rev. A)

873 BICS™ (S/N 514112612 and Above)

(S/N 514211274 and Above)

(Printed November 1996)

WIRE LEGEND

NO.'s	COLOR	GAUGE
12A	Orange	16
12W	Orange	16
19F	Red/White	16
19L	Red/White	16
19LA	Red/White	16
19WPA	Red/White	16
40	Black	16
40A	Black	16
40B	Black	16
40C	Black	16
40F	Black	16
40FA	Black	16
40FB	Black	16
40FC	Black	16
40FD	Black	16
41	Pink	16
41A	Pink	16
41B	Pink	16
42F	Dk. Blue	16
42FA	Dk. Blue	16
46B	Brown/Red	16
46H	Brown	16
46L	Brown/Yellow	16
46LA	Brown/Yellow	16
46LF	Brown/Yellow	16
46LR	Brown/Yellow	16
46LR	Yellow (Light Harness)	16
46R	Brown/Green	16
46RA	Brown/Green	16
46RF	Brown/Green	16
46RF	Green (Light Harness)	16
46RR	Brown/Green	16
46T	Brown	16
63WP	Orange/Black	16
63WR	Dk. Blue/Black	16

PARTS LEGEND

1. Cab Accessory Harness (Opt.) 6710481 Rev. A
2. Flasher Connector
3. Rear Wiper Rocker Switch (Opt.)
4. Hazard Light Rocker Switch (Euro. Opt.)
5. Beacon Rocker Switch (Opt.)
6. Blinker/Warning Light Module (Euro. Opt.)
7. Light Connector
8. Diode
9. Wiper Motor Connector
10. Beacon/Strobe Harness (Opt.) 6708318
11. Rotating Beacon or Strobe Light (Opt.)
12. Euro. Headlight Harness (Euro. Opt.) 6707672
13. Rotating Beacon or Strobe Connector
14. Left Euro. Headlight (Euro. Opt.)
15. Left Turn Lamp (Euro. Opt.)
16. Left Clearance Lamp (Euro. Opt.)
17. Right Turn Lamp (Euro. Opt.)
18. Right Clearance Lamp (Euro. Opt.)
19. Right Euro. Headlight (Euro. Opt.)

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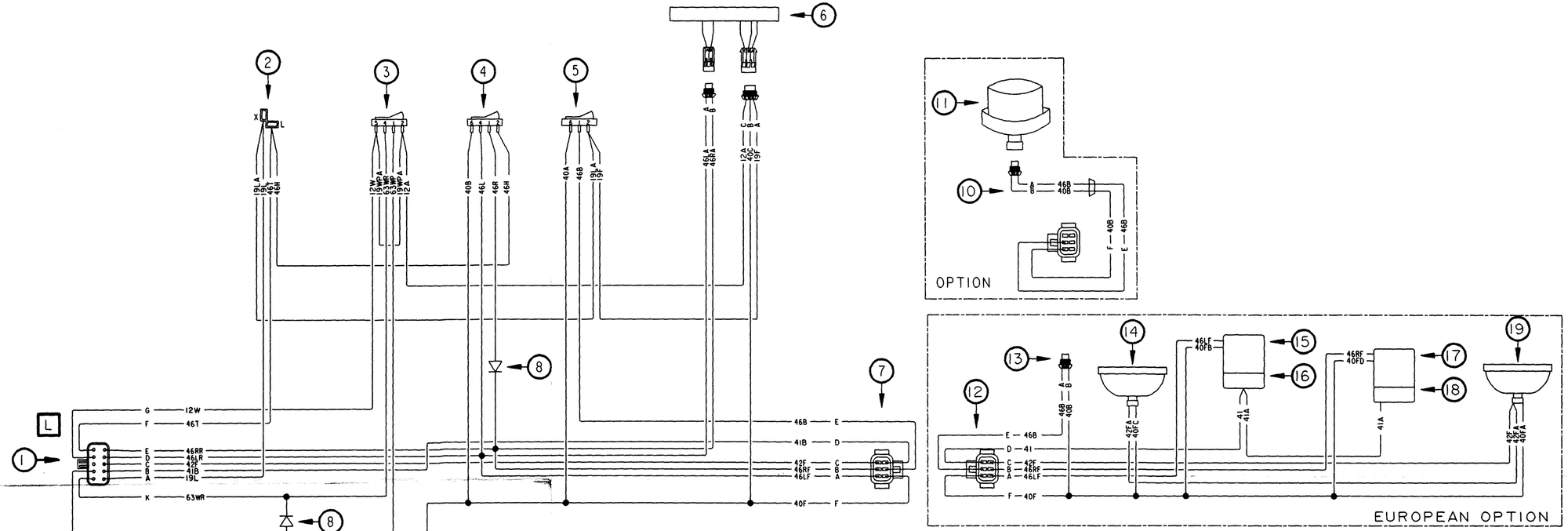
MC 2278L7 (10-22-96)

(Printed November 1996)



L Connects To L Engine Wiring Diagram – Sheet 3 or 6

ELECTRICAL SYSTEM

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ALTERNATOR	
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TROUBLESHOOTING	
Chart	6–3

bobcat

TROUBLESHOOTING

Chart

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

⚠ WARNING

Instructions are necessary before operating or servicing machine. Read Operation & Maintenance Manuals, 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. Failure to follow instructions can cause injury or death.

W–2003–1289

PROBLEM	CAUSE
Battery will not take a charge.	2, 3, 4
Alternator will not charge.	1, 4
Starter will not turn the engine.	2, 3, 4, 6, 7, 8, 9

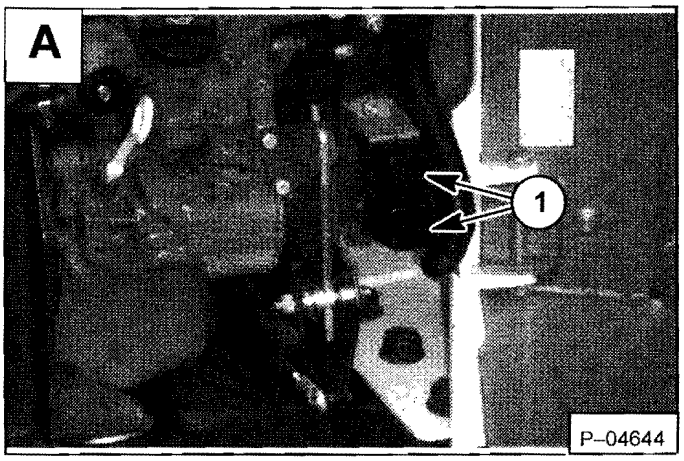
KEY TO CORRECT THE CAUSE

1. Alternator belt is loose or damaged.
2. Battery connections are dirty or loose.
3. Battery is damaged.
4. The cable & wire connection are not making a good contact.
5. The alternator is damaged.
6. The engine is locked.
7. The starter is damaged.
8. The wiring or the solenoid is damaged.
9. Check the fuses.

ELECTRICAL SYSTEM INFORMATION

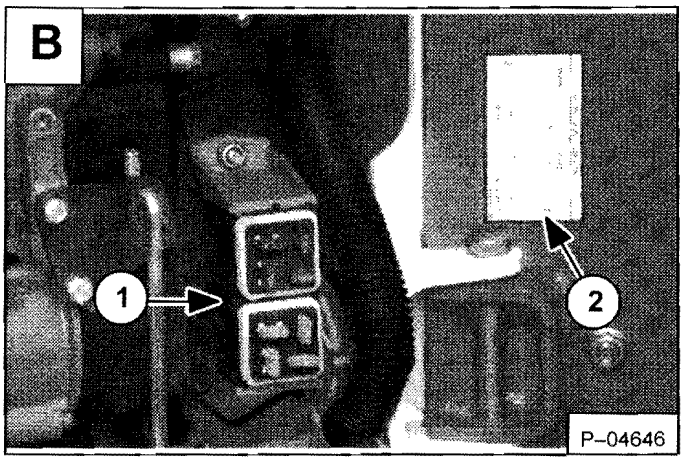
Description

The loader has a 12 volt, negative ground alternator charging system. The electrical system is protected by fuses (Item 1) **[A]** located in the engine compartment. The fuses will protect the electrical system when there is an electrical overload. The reason for the overload must be found before starting the engine again.

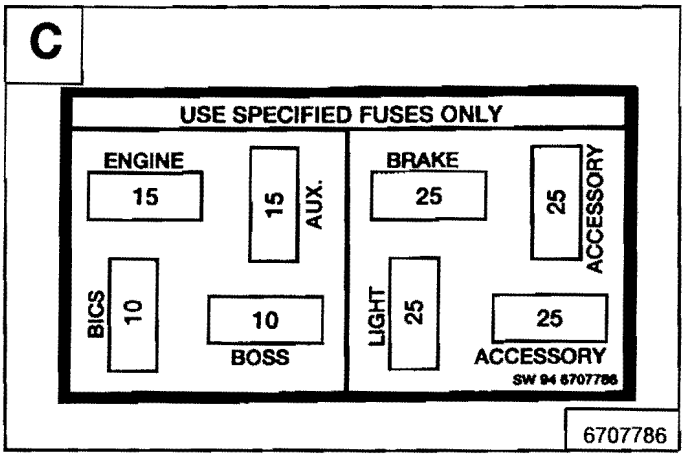


Fuse Location

The electrical system for loaders is protected by eight fuses located in the fuse block (Item 1) **[B]**. Remove the fuse block cover to access the fuses.



The decal (Item 2) **[B]** inside the rear door specifies the fuse sizes used in various loader circuits **[C]**.



BATTERY

Removal and Installation

⚠ WARNING

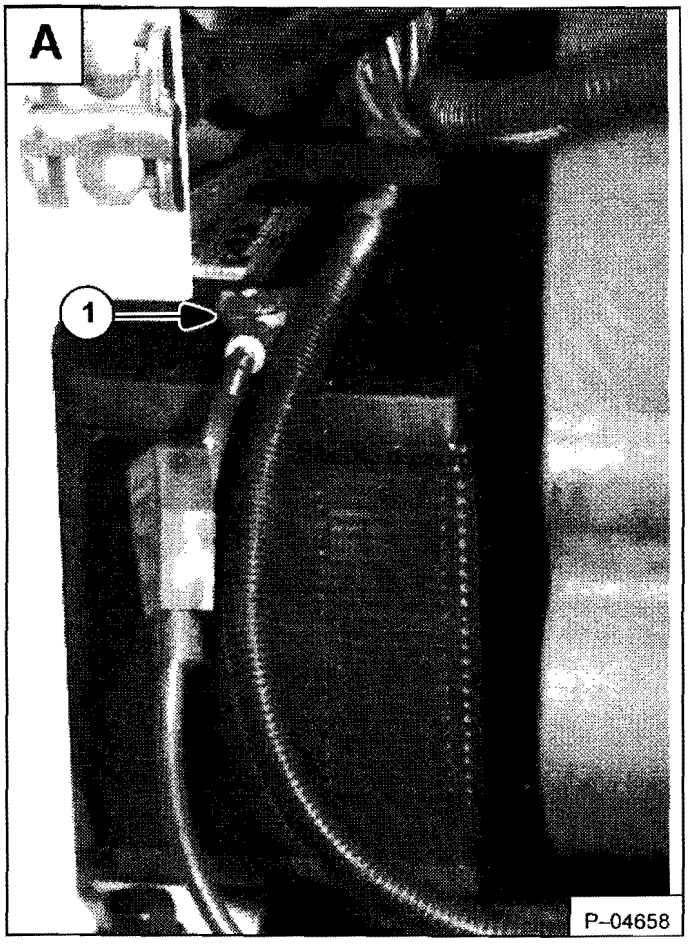
Batteries contain acid which burns eyes and skin on contact. Wear goggles, protective clothing and rubber gloves to keep acid off body.

In case of acid contact, wash immediately with water for several minutes and get medical attention in case of eye contact.

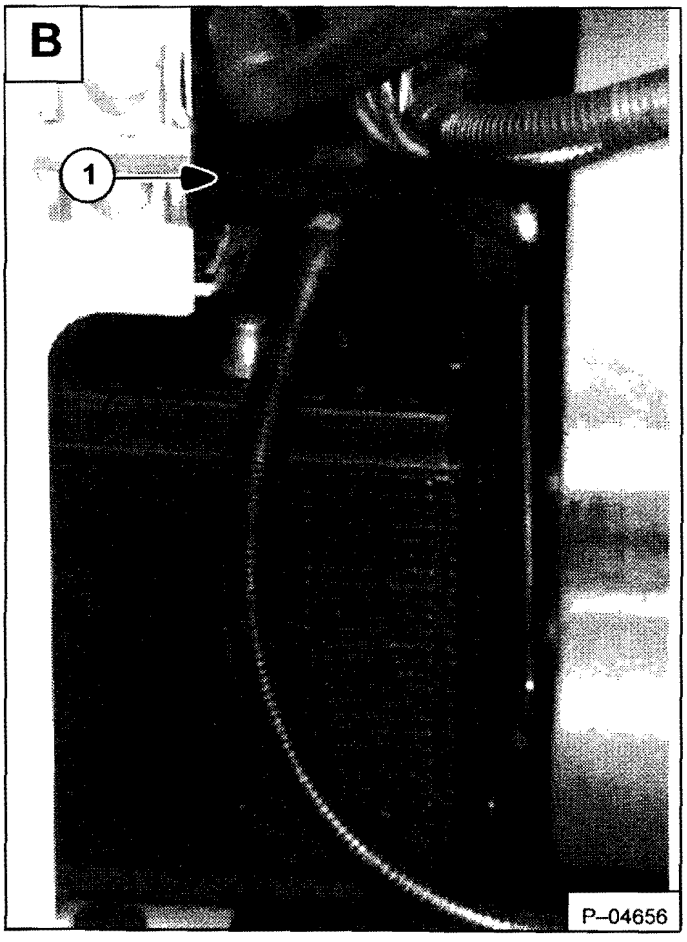
W–2065–1286

Open the rear door.

Disconnect the negative (–) cable (Item 1) **[A]** from the battery.

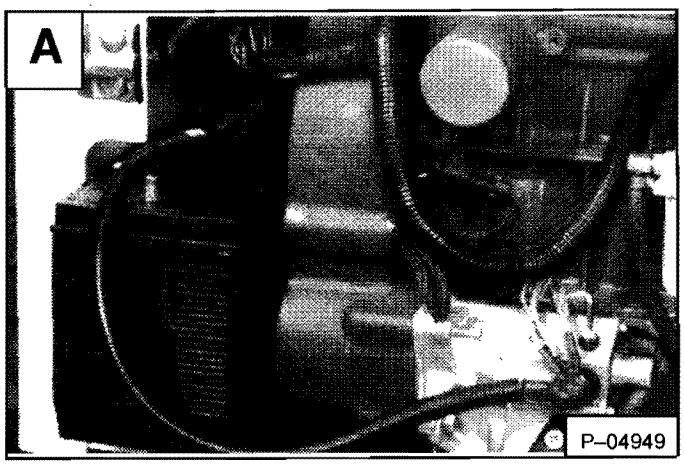


Remove the battery holddown clamp (Item 1) **[B]**.

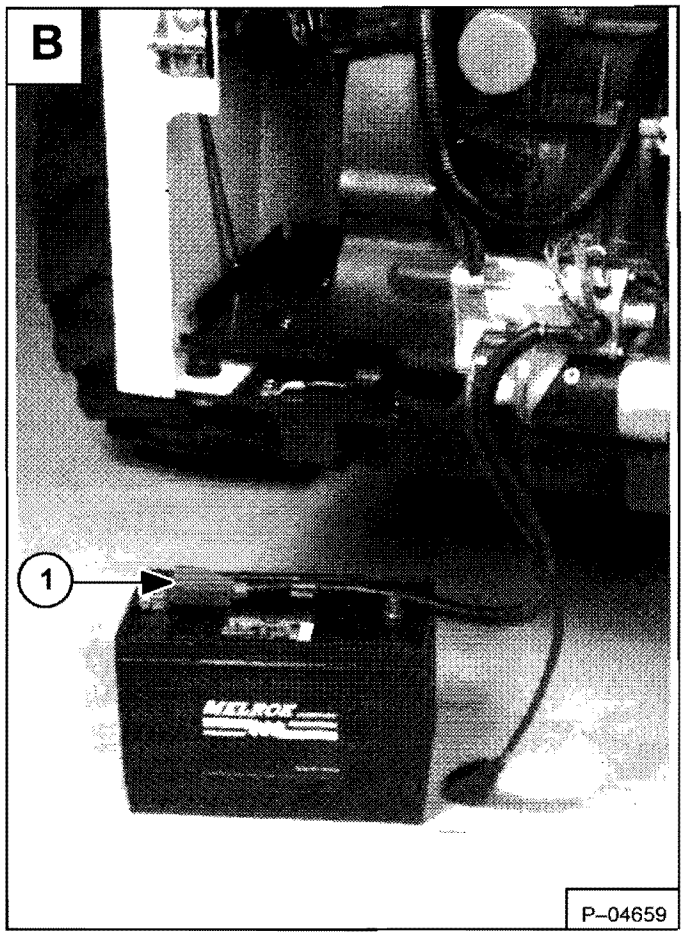


Removal and Installation (Cont'd)

Remove the battery from the loader **[A]**.



Disconnect the positive (+) cable (Item 1) **[B]** from the battery.



⚠ 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 battery. Warm battery to 60°F. (16°C.) before connecting to a charger. Unplug charger before connecting or disconnecting cables to battery.

Battery gas can explode and cause serious injury.

W–2066–0490

Removal and Installation (Cont'd)

Always clean the terminals and cable ends when installing a new battery **[A]** and **[B]**.

When installing the battery in the loader, do not touch any metal parts with the battery terminal posts.

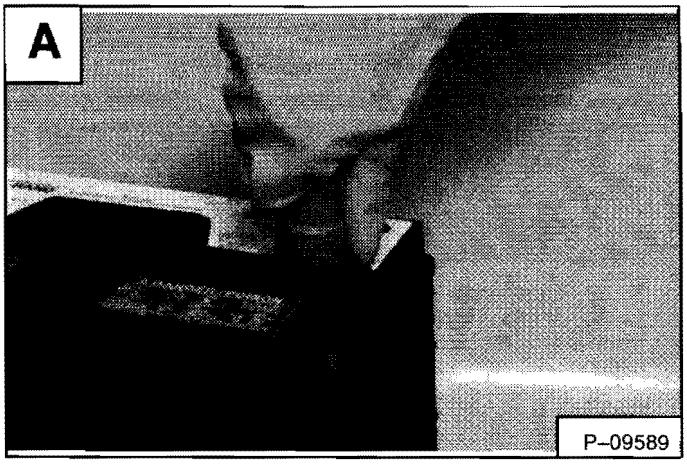
Connect and tighten the battery cables. Connect the negative (–) cable last to prevent sparks.

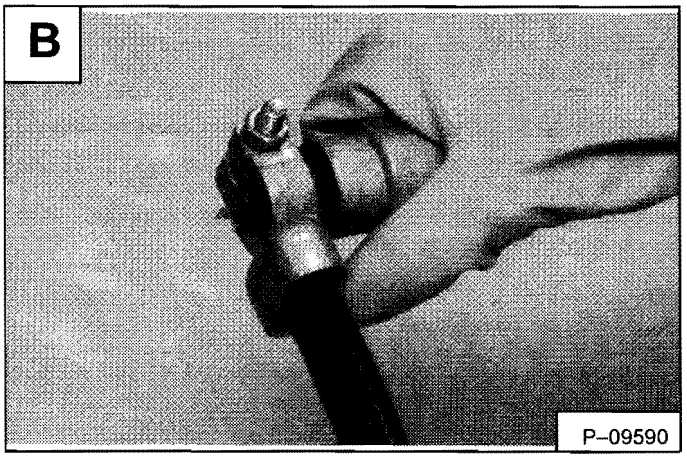
⚠ WARNING

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 for several minutes and get medical attention in case of eye contact.

W–2065–1286





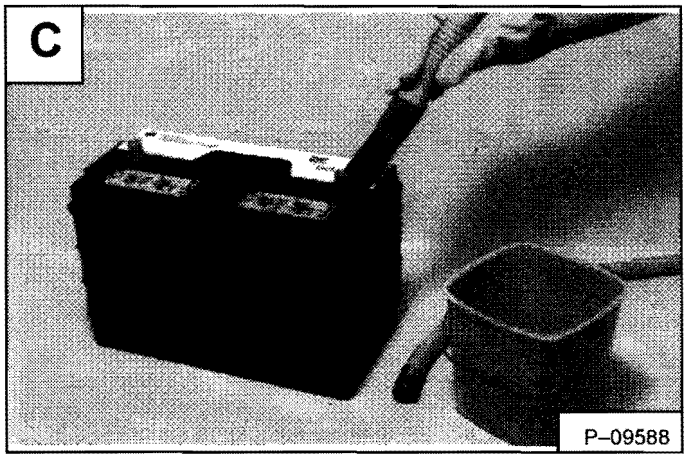
Servicing the Electrical System

The battery cables must be clean and the connections tight. Remove acid or corrosion from the battery and cables with a sodium bicarbonate (baking soda) and water solution **[C]**.

Clean the terminals and cable ends as shown in Fig. **[A]** and **[B]**.

Check the electrolyte level in the battery. Add distilled water as needed.

Put Battery Saver (P/N 6664458) or grease on the battery terminals and cable ends to prevent corrosion.



Using A Booster Battery (Jump Starting)

⚠ 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 battery. Warm battery to 60°F. (16°C.) before connecting to a charger. Unplug charger before connecting or disconnecting cables to battery.

Battery gas can explode and cause serious injury.

W–2066–0490

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

The ignition must be in the OFF position. The booster battery to be used must be 12 volt.

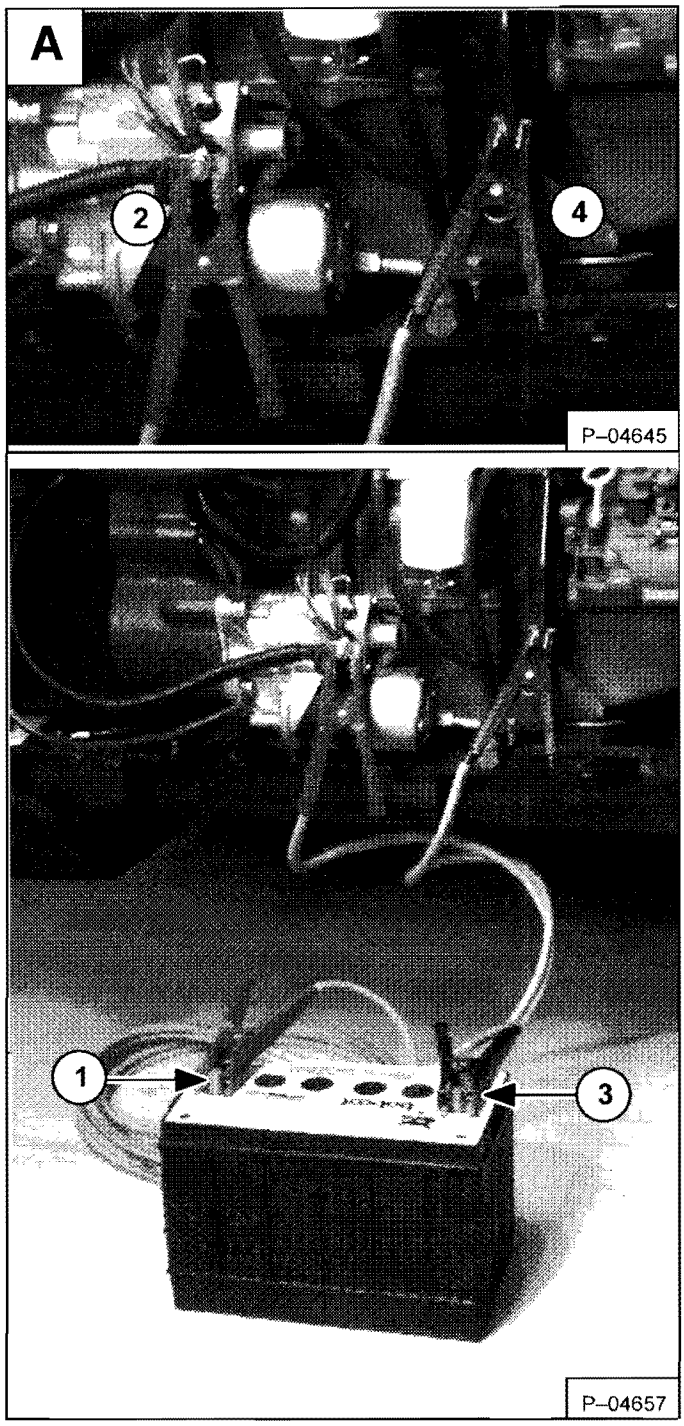
Connect the end of the first cable (Item 1) **[A]** to the positive (+) terminal of the booster battery. Connect the other end of the same cable (Item 2) **[A]** to the positive terminal on the starter.

Connect the end of the second cable (Item 3) **[A]** to the negative (–) terminal of the booster battery. Connect the other end of the same cable (Item 4) **[A]** to the engine.

Keep cables away from moving parts. Start the engine (See *Cold Temperature Starting Condition*, Operation & Maintenance Manual.

After the engine has started, remove the ground (–) cable (Item 4) **[A]** first.

Remove the cable from the starter.



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

ALTERNATOR

Alternator Output Test

⚠ WARNING

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

W-2017-0286

Lift and block the loader (See Page 1–1).

Disconnect the negative (–) cable from the battery.

Disconnect the red wire (Item 1) **[A]** from the alternator. Connect the wire to the negative (–) side of the ammeter.

Connect the positive (+) side of the ammeter to the output terminal on the alternator (Item 1) **[A]**.

Disconnect the fuel stop solenoid connector.

Connect the negative (–) cable to the battery.

Turn on the lights and crank the engine for 30 seconds to discharge the battery.

Connect the fuel stop solenoid, start the engine and run at 2600 RPM.

If ammeter reading is between 45–55 amps. @ 2600 RPM the alternator is good and no further testing is needed.

If the reading is low, remove the screws and pull the regulator cover away from the alternator and continue testing (below).

Rectifier (Diode) Test

NOTE: The alternator is removed from the loader for clarity purposes.

Disconnect the negative (–) cable from the battery.

Install the wire in their original location on the back of the alternator.

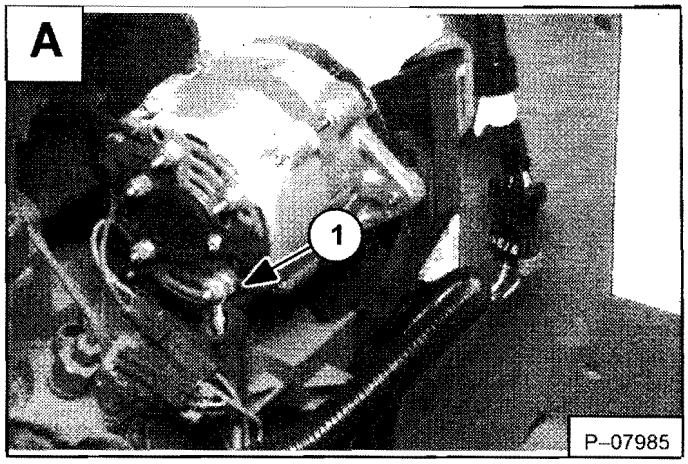
Connect a jumper wire (Item 1) **[B]** to the alternator output terminal and the regulator terminal.

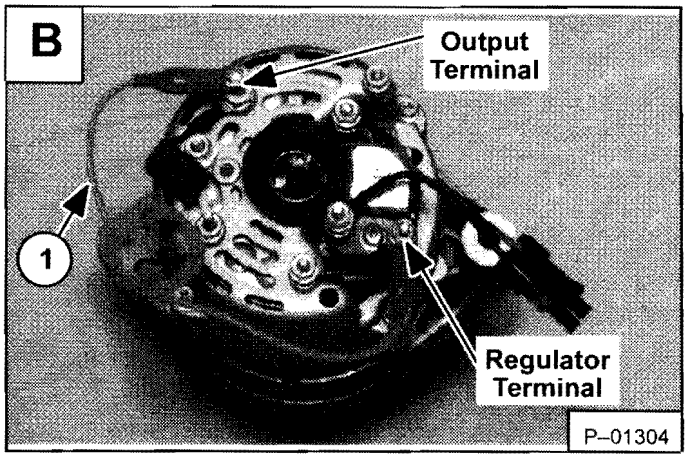
Connect the battery negative (–) cable.

Start the engine and run at 2600 RPM.

If the reading is within 45–55 amps. @ 2600 RPM replace the rectifier (diode) assembly or replace the alternator.

If the reading is low, do the Alternator Regulator Test.





Alternator Regulator Test

⚠ WARNING

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

W–2050–1285

Connect the positive (+) voltmeter lead to the positive (+) battery terminal **[A]**.

Connect the negative (–) voltmeter lead to the negative (–) battery terminal **[A]**.

Start the engine and run at 1500–2000 RPM.

The voltmeter should read between 13.9–14.7 volts.

If the reading is low, stop the engine and disconnect the battery negative (–) cable.

NOTE: The alternator is removed from the loader for clarity purposes.

Remove the wires from the back of the alternator.

Remove the regulator cover from the back of the alternator.

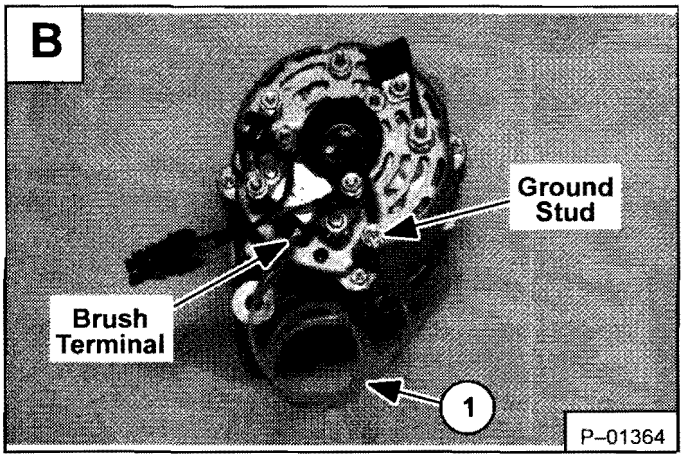
Install the wires on the back of the alternator.

Connect a jumper wire (Item 1) **[B]** from the brush terminal to the ground stud.

Connect the negative (–) battery cable and start the engine. Run at 1500 RPM.

If the voltmeter reading is 14.5 or above, replace the regulator.

If the voltmeter reading is below 14.5, repair or replace the alternator.



Removal and Installation

IMPORTANT

Damage to the alternator can occur if:

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

I–2023–1285

Open the rear door.

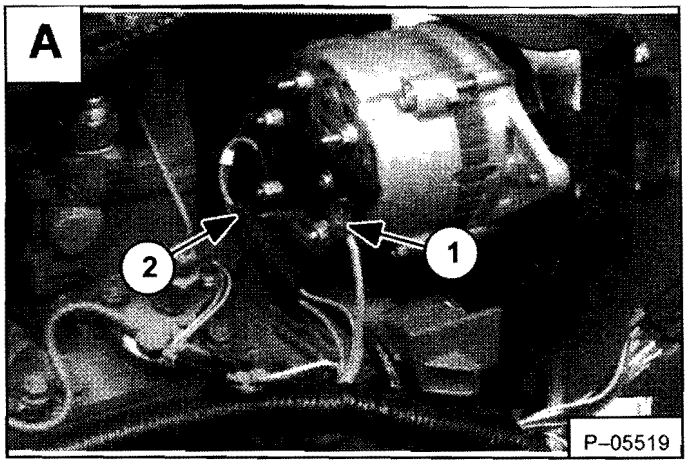
Disconnect the negative (–) cable at the battery.

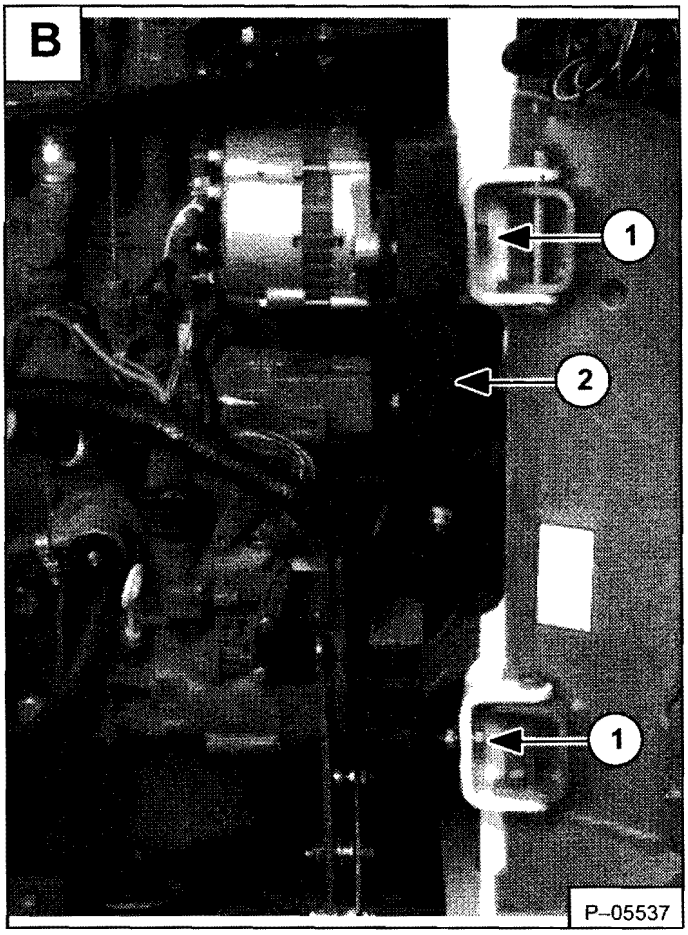
Disconnect the orange wire (Item 1) **[A]** at the alternator.

Disconnect the wiring harness connector (Item 2) **[A]**.

Remove the bolts (Item 1) **[B]** and nuts from the alternator belt shield (Item 2) **[B]**.

Remove the belt shield.





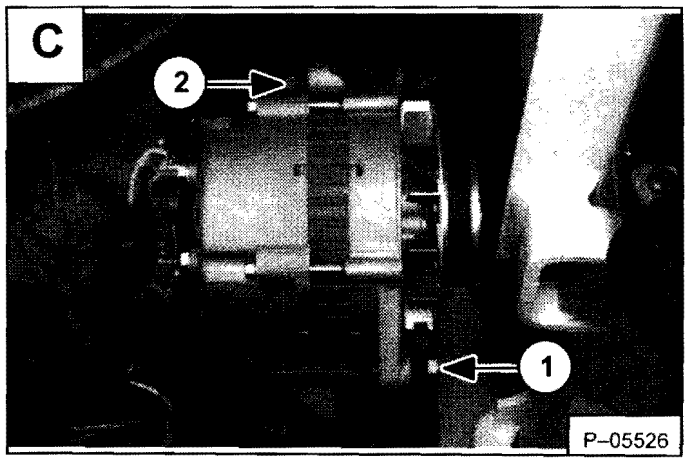
Loosen the adjustment bolt (Item 1) **[C]**.

Remove the alternator belt.

Remove the adjustment bolt (Item 1) **[C]**.

Remove the mounting bolt (Item 2) **[C]** and nut.

Remove the alternator.



ALTERNATOR (Cont'd)

Disassembly

Disassemble the alternator (See Parts Identification) **[A]**.

Remove the regulator cover and regulator.

Remove the four bolts holding halves together.

Pry the halves apart.

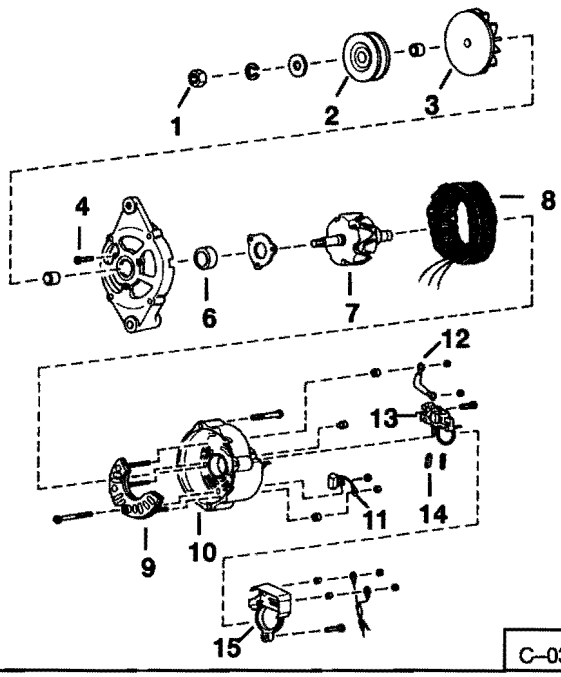
Use a soft jaw vise to hold rotor while removing pulley nut.

Remove front case half from the rotor using a plastic hammer.

Unsolder the stator leads from the rectifier. Remove the stator.

A

1. Nut
2. Pulley
3. Fan
4. Bolt
5. Case Half (Front)
6. Bearing
7. Rotor
8. Stator
9. Rectifier (Diode)
10. Case Half (Rear)
11. Condenser Assy.
12. Strap
13. Regulator
14. Brush
15. Cover



C–03312

Stator Continuity Test

Use an ohmmeter to test the stator.

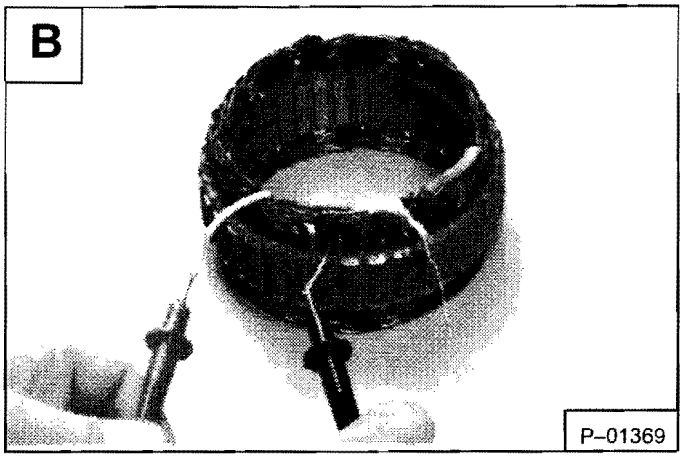
Touch the probes to two of the bare stator wires **[B]**.

Move one of the probes to the third wire.

The readings should be the same.

If there is no continuity, replace the stator.

B



P–01369

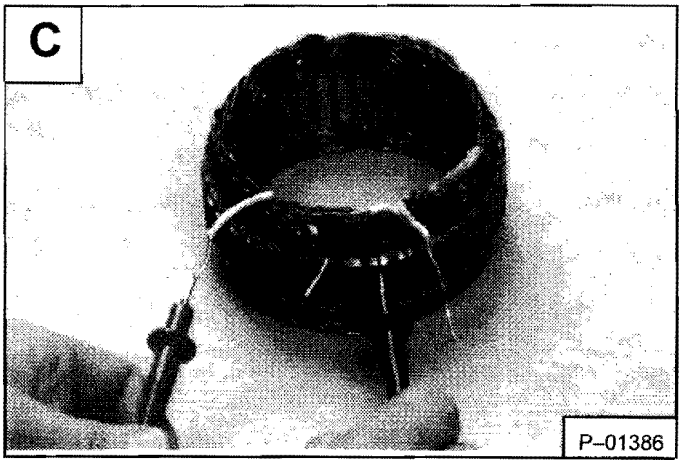
Stator Ground Test

Touch one probe to a bare stator lead and the other probe to the bare metal surface of the stator **[C]**.

There should be no continuity.

Replace the stator if there is continuity.

C



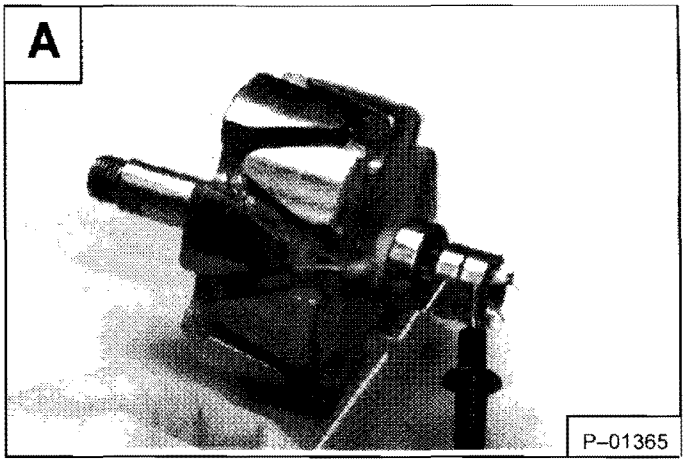
P–01386

Rotor Continuity Test

Touch the probes to the slip rings **[A]**.

The ohmmeter should read between 3.0–33.0 ohms.

If there is no continuity replace the rotor.

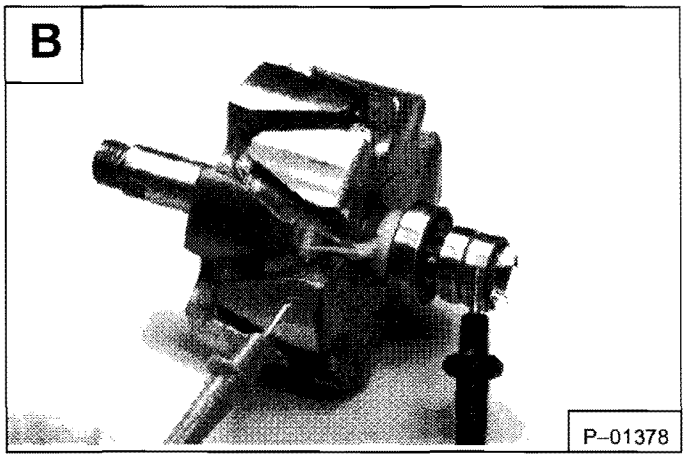


Rotor Ground Test

Touch one probe to one of the slip rings and the other probe to the rotor shaft **[B]**.

There should be no continuity.

Replace the rotor if there is continuity.



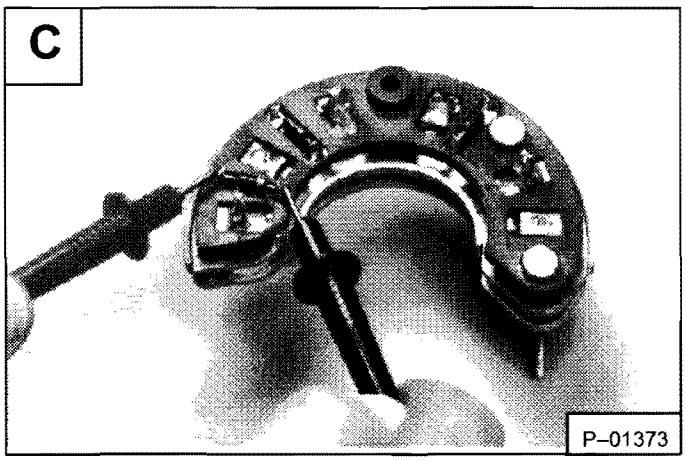
Rectifier Continuity (Diode) Test

NOTE: In the diode tests there should be continuity in one direction only. If the diode being tested shows no continuity or continuity in both directions, replace the rectifier assembly.

Touch the probes to the terminals of each diode and read the meter **[C]**.

Reverse the probes to check the diode in the other direction.

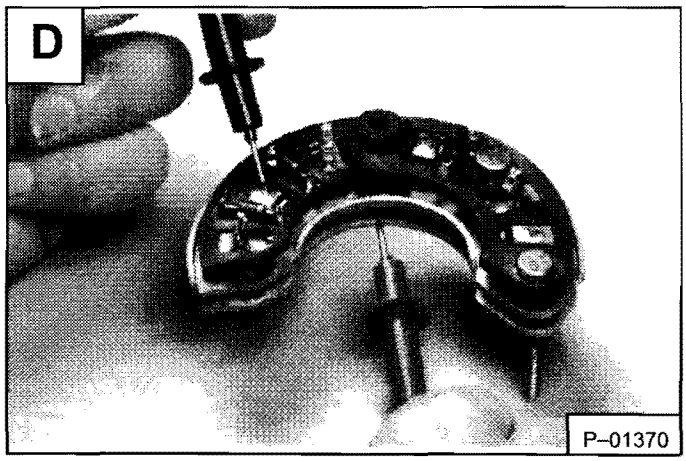
There should be continuity in one direction only.



Touch one probe to the diode and the other probe to the connected heat sink and read the meter **[D]**.

Reverse the probes to check the diode in the other direction.

There should be continuity in one direction only.



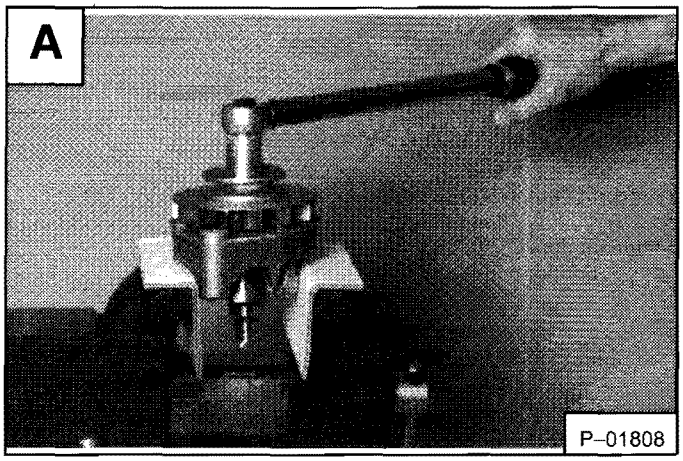
ALTERNATOR (Cont'd)

Assembly

Reverse the order of disassembly.

Place the rotor in soft jaws when tightening the shaft nut. Tighten to 50 ft.–lbs. (68 Nm) torque **[A]**.

Install the rear case half and the remaining parts.



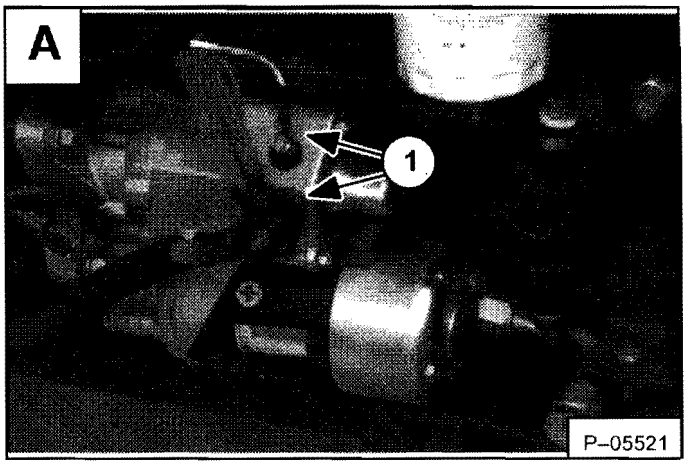
STARTER

Removal and Installation

Open the rear door.

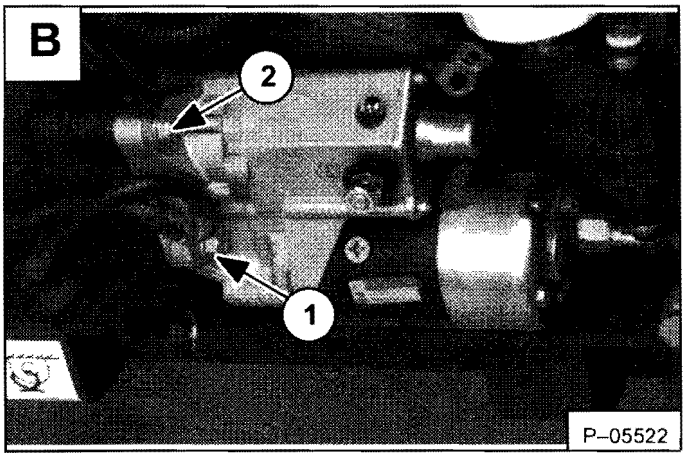
Disconnect the negative (–) cable from the battery.

Disconnect the wires and positive (+) cable (Item 1) **[A]** from the starter solenoid.

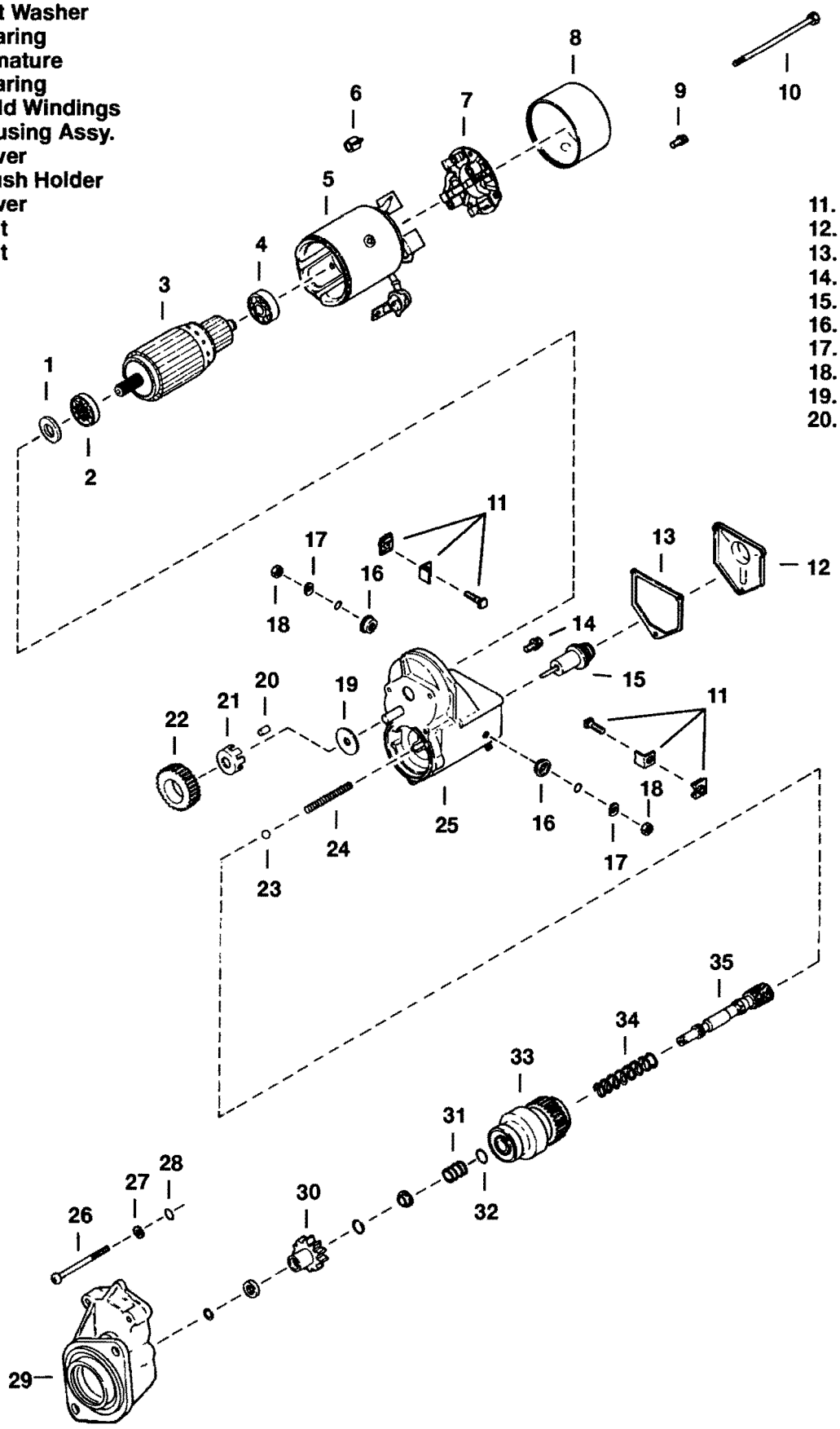


Remove the starter mounting bolt (Items 1 & 2 **[B]**. Disconnect the ground wires.

Remove the starter.



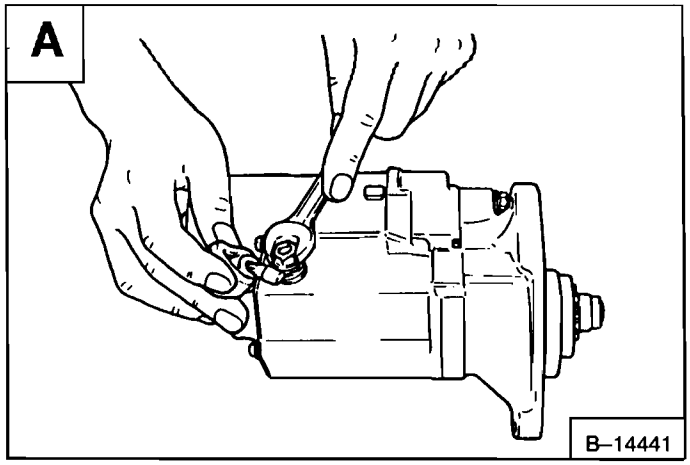
Parts Identification



Disassembly and Assembly

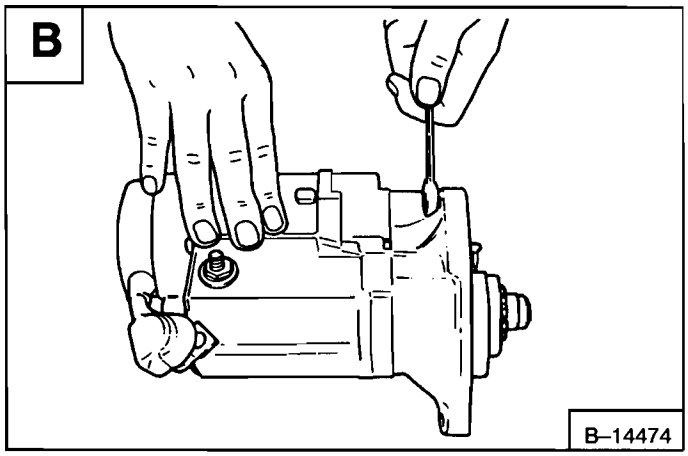
Disconnect the wire from the magnetic switch **[A]**.

Assembly: Tighten the nut to 52–86 in.–lbs. (5,9–9,7 Nm) torque. Securely put the rubber boot over the terminal.

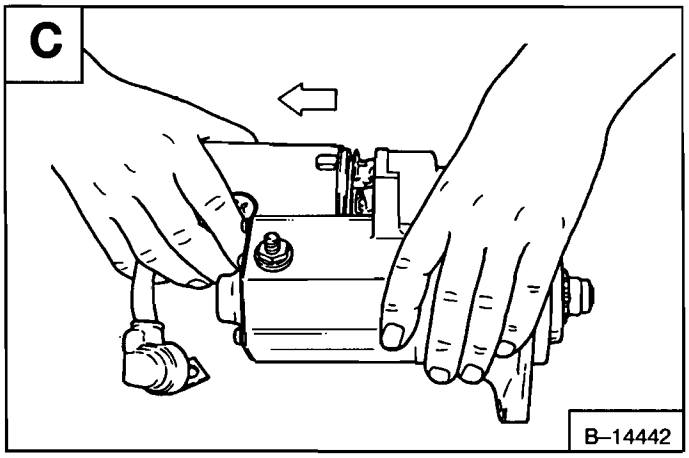


Remove the through bolts from the drive end frame **[B]**.

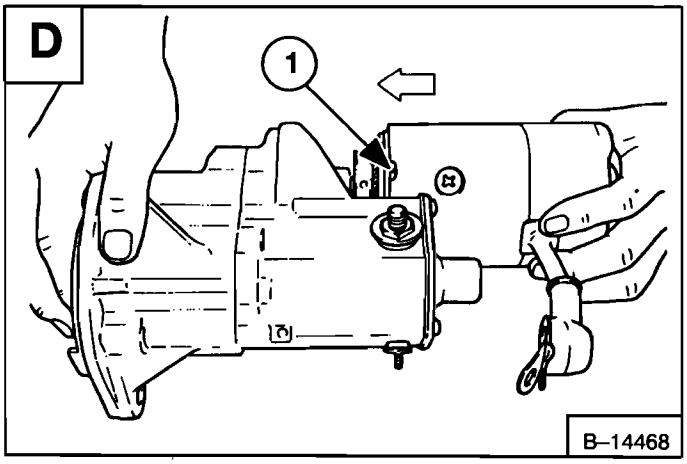
Assembly: Tighten the through bolts to 60–104 in.–lbs. (6,8–11,8 Nm) torque.



Remove the field windings housing from the magnetic switch **[C]**.



Assembly: When installing the field windings housing to the magnetic switch, engage the tab (Item 1) **[D]** on the field windings housing with the notch in the magnetic switch.



STARTER (Cont'd)

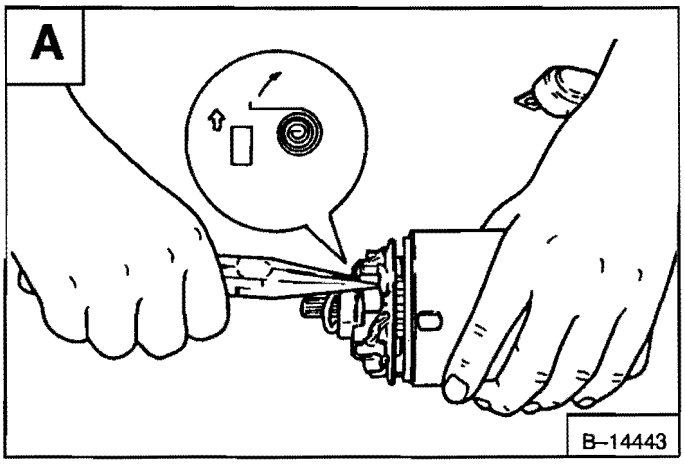
Disassembly and Assembly (Cont'd)

Remove the screws from the cover over the brushes.

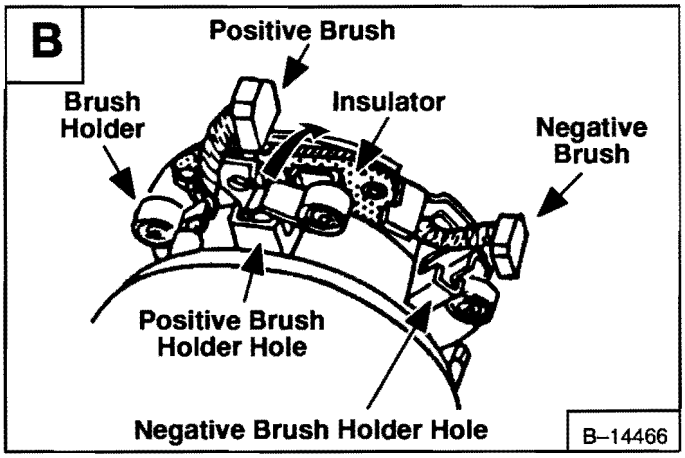
Remove the cover over the brushes.

Use a long nose pliers, to remove the brushes from the brush holder **[A]**.

Remove the brush holder.

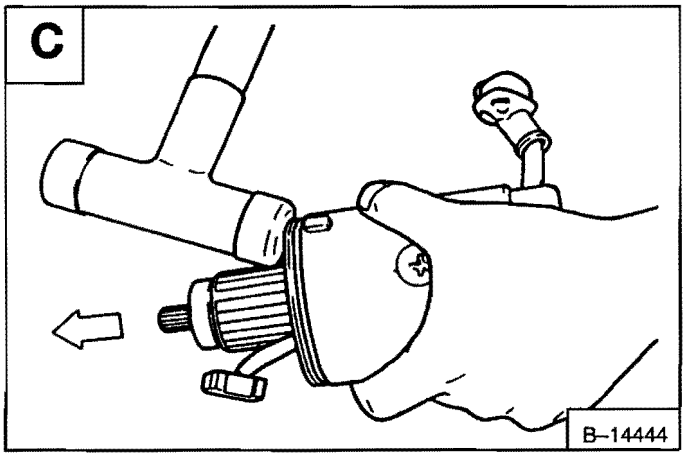


Assembly: Install the negative brushes (brush holder side) to the brush holders (not insulated), and the positive brushes to the brush holders (separated from plate with insulator). Make sure that the positive brush wires are not grounded when assembling the brush holder to the field windings, take care not to damage and get oil on the brushes **[B]**.



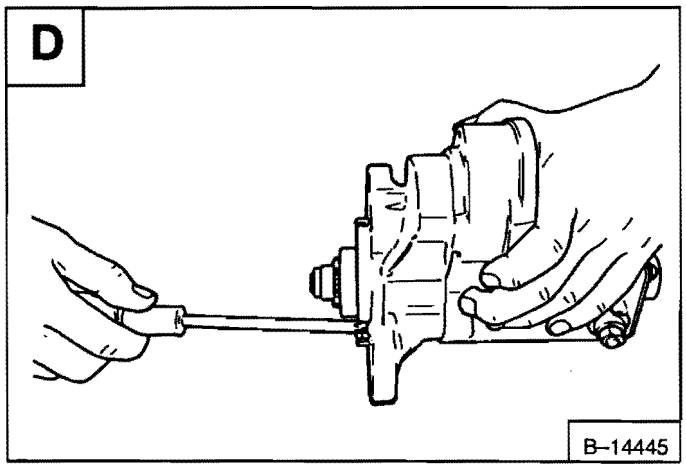
Remove the armature from the field windings **[C]**.

NOTE: Use a plastic hammer to tap the field windings housing, when necessary to remove the armature.



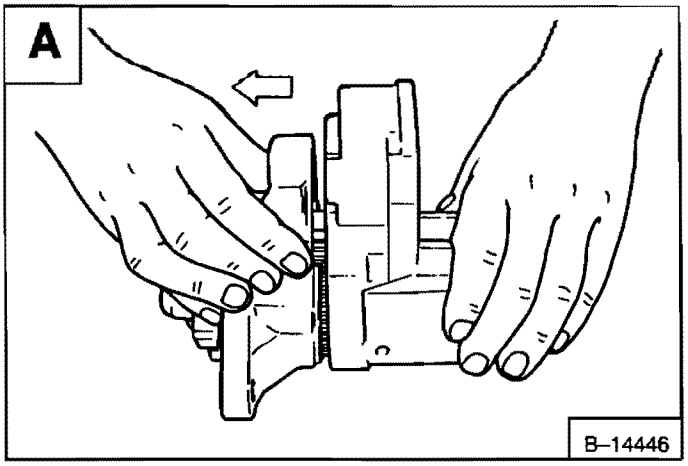
Remove the screws from the drive end frame **[D]**.

Assembly: Tighten the screws to 60–104 in.-lbs. (6,8–11,8 Nm) torque.



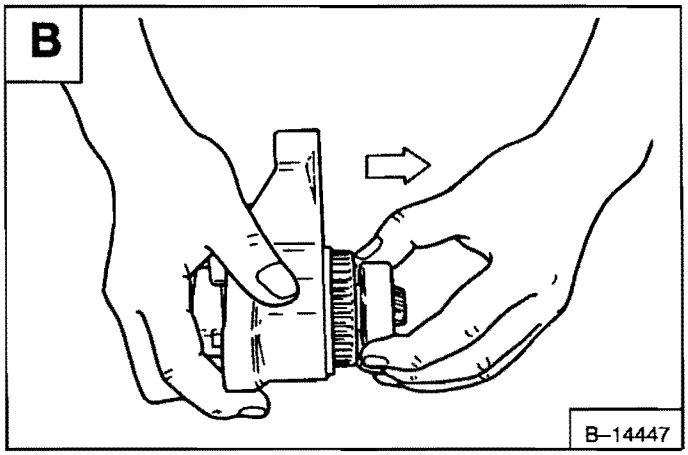
Disassembly and Assembly (Cont'd)

Remove the drive end frame from the magnetic switch **[A]**.

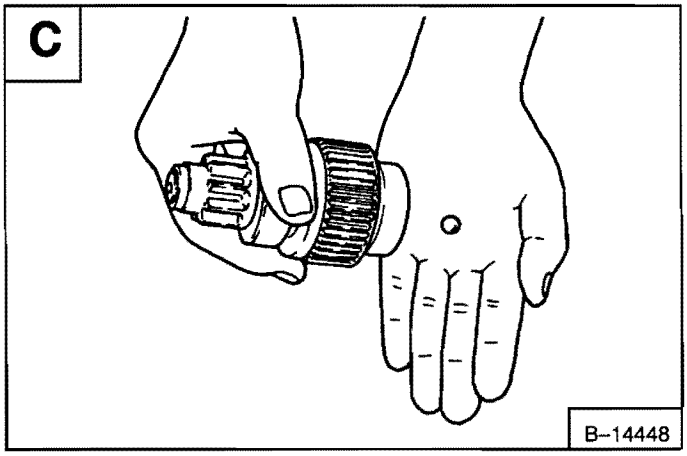


Remove the overrunning clutch from the drive end frame **[B]**.

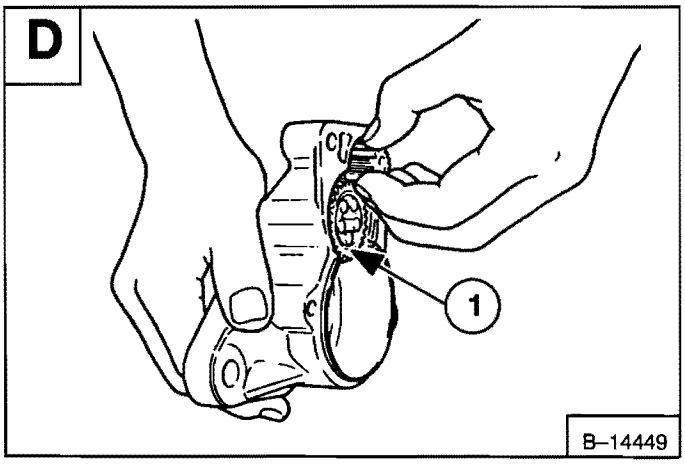
NOTE: If the pinion is installed on the drive end frame (externally attached to the overrunning clutch shaft), it will be necessary to remove the pinion prior to removing the overrunning clutch. (See Page 6–21.)



Remove the steel ball from the overrunning clutch **[C]**.



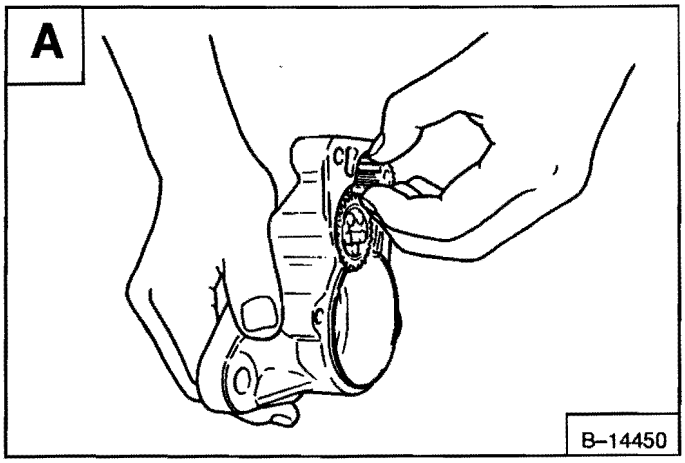
Remove the pinion (Item 1) **[D]** from the drive end frame.



STARTER (Cont'd)

Disassembly and Assembly (Cont'd)

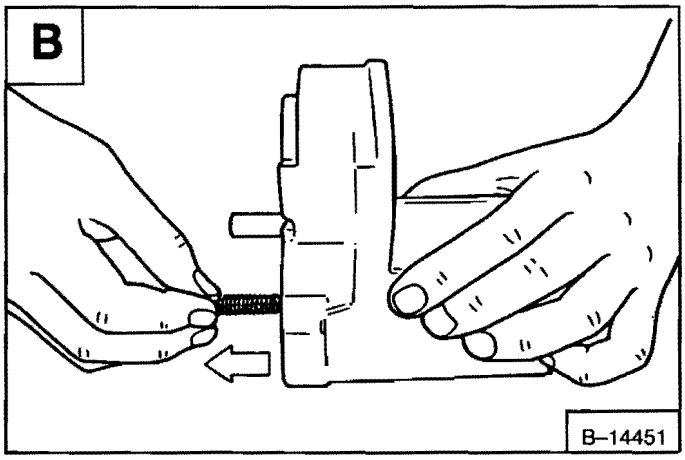
Remove the retainer and rollers from the drive end frame **[A]**.



Remove the return spring from the magnetic switch **[B]**.

Assembly: Reverse the order of disassembly. Before reassembling, put grease on the following parts:

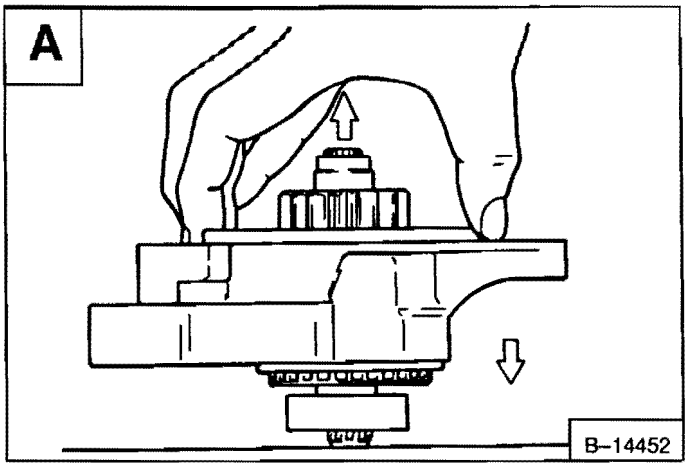
Overrunning Clutch
Retainer and Rollers
Steel Ball
Return Spring
Armature Bearing
Felt Washer



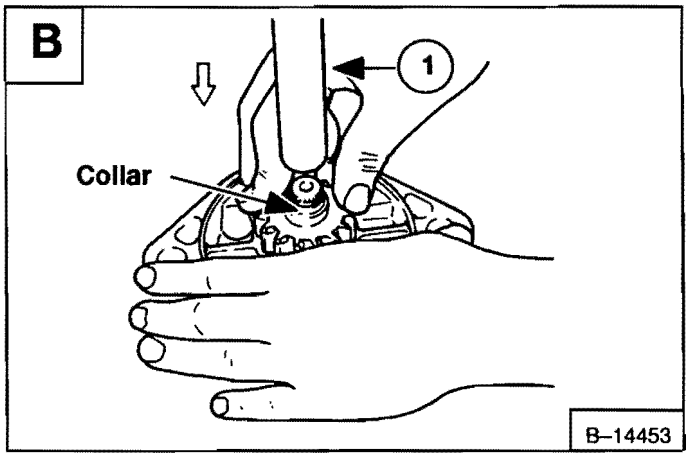
External Pinion

If the pinion is installed on the drive end frame (externally attached to overrunning clutch shaft), it will be necessary to remove the pinion prior to removing the overrunning clutch.

Push down on the drive end frame **[A]**.

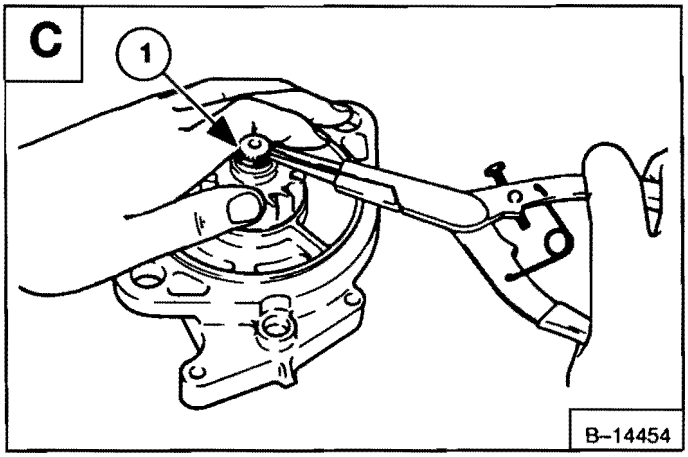


While pressing down on the starter pinion, tap the collar using a pipe (Item 1) **[B]**.



Remove the snap ring (Item 1) **[C]**.

After the snap ring is removed, the pinion, overrunning clutch, shaft, washer, and spring can be removed.

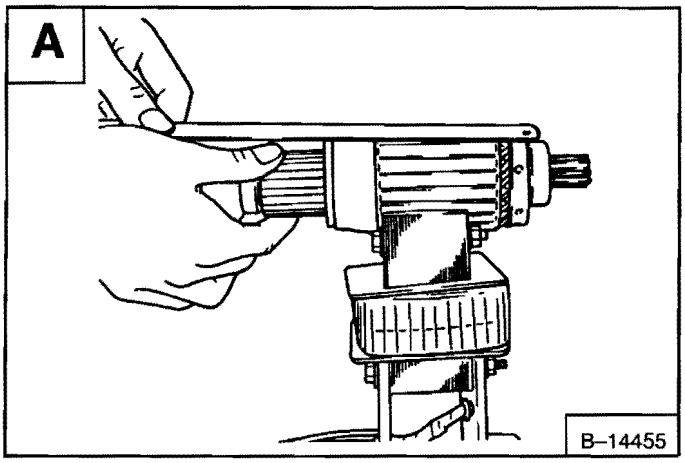


STARTER (Cont'd)

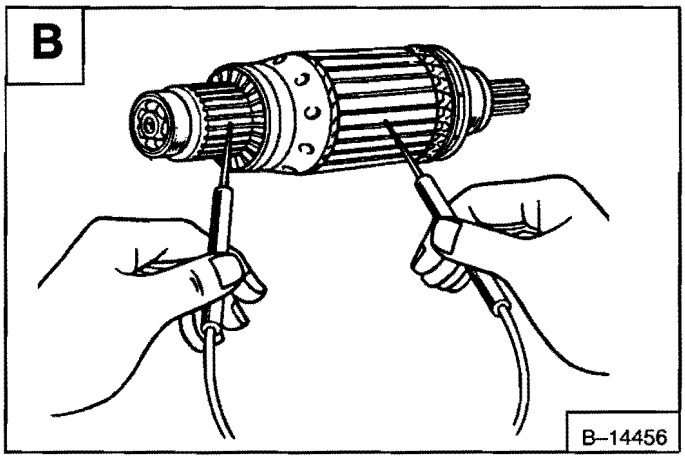
Inspection and Repair

ARMATURE:

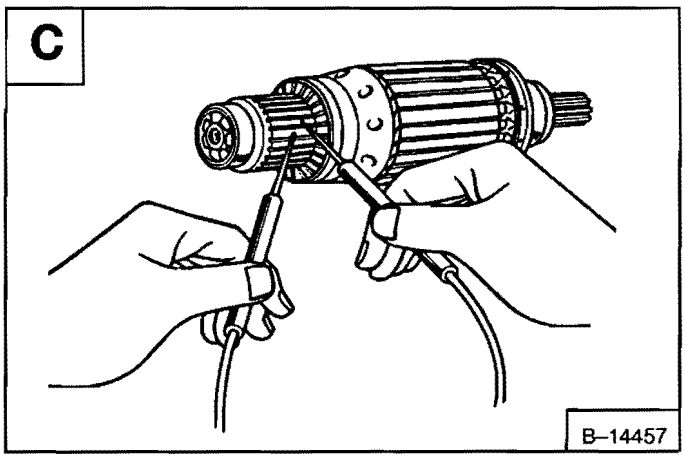
Armature Short–Circuit Test: Use a growler tester, put the armature on the growler and hold a hack saw blade against the armature core while slowly rotating the armature **[A]**. A short circuited armature causes the blade to vibrate and be attracted to the core. An armature which is short–circuited must be replaced.



Armature Winding Ground Test: Use a circuit tester, touch one probe to a commutator segment and the other probe to the armature core **[B]**. There should be no continuity. If there is continuity, the armature is grounded and must be replaced.



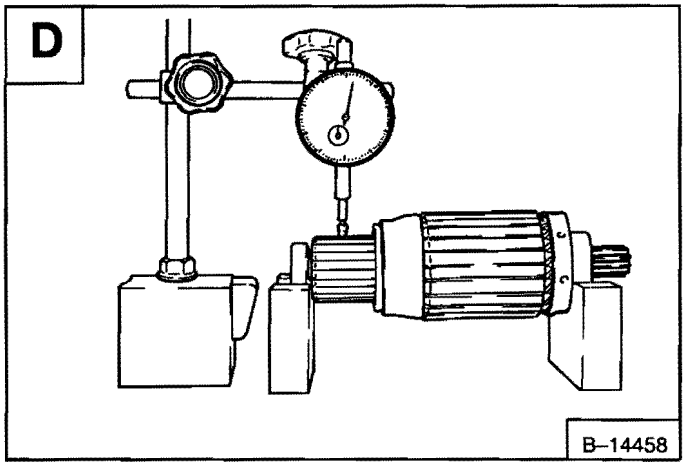
Armature Winding Continuity Test: Use a circuit tester, touch the probes to two commutator segments **[C]**. There should be continuity at any point. If there is no continuity, the winding is open–circuited, replace the armature.



Commutator Run–Out Test: Check the commutator run–out as shown in **[D]**.

Service Limit – 0.02 inches (0,5 mm)

If the commutator exceeds the service limit, repair as needed.



STARTER (Cont'd)

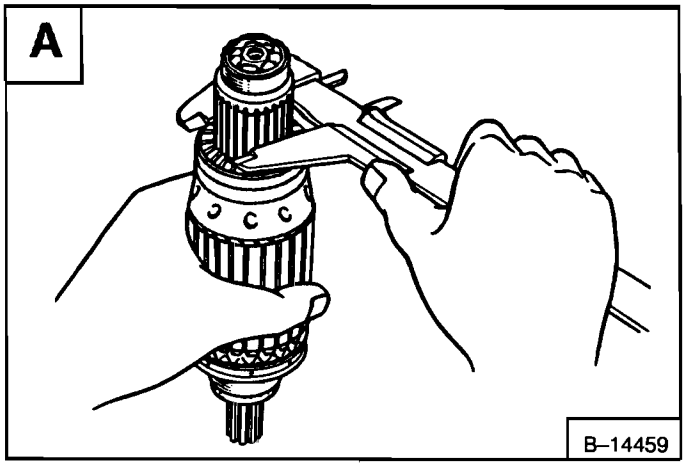
Inspection and Repair (Cont'd)

ARMATURE (Cont'd)

Measure the commutator outer diameter **[A]**.

Service Limit – 1.38 inches (35 mm)

If it is worn, replace the armature.

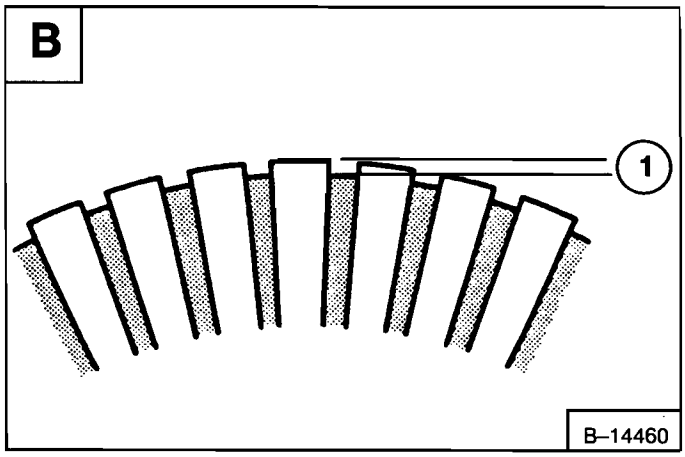


Measure the segment mica depth (Item 1) **[B]**.

Service Limit – 0.008 inches (0,2 mm)

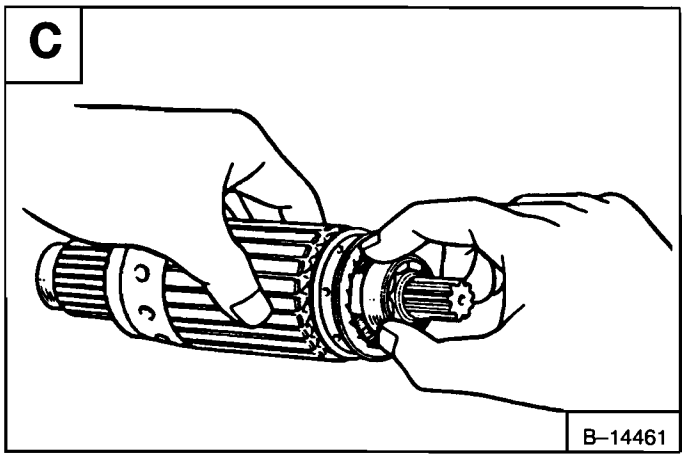
If it is worn, undercut the segment mica.

Check the commutator surface for burned spots which usually indicates an open–circuit, and correct it using #400 sand paper.

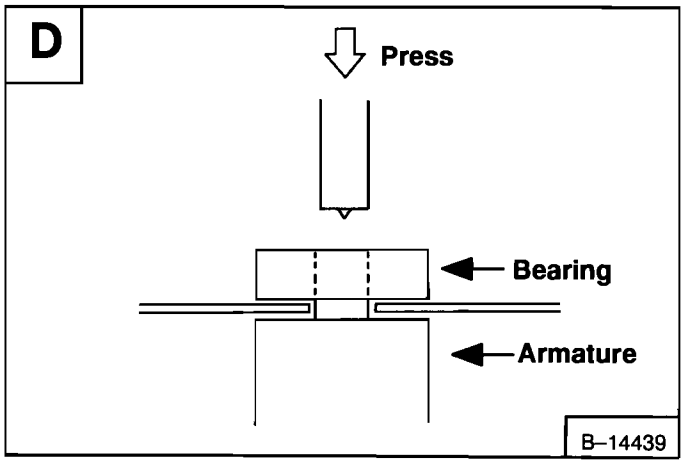


Check the bearings for wear and damage **[C]**.

If the bearings are worn or damaged, they should be replaced.



Use a press as shown in **[D]**, replace the worn or damaged bearing(s).



STARTER (Cont'd)

Inspection and Repair (Cont'd)

FIELD WINDINGS:

Check the field windings for wear and damage.

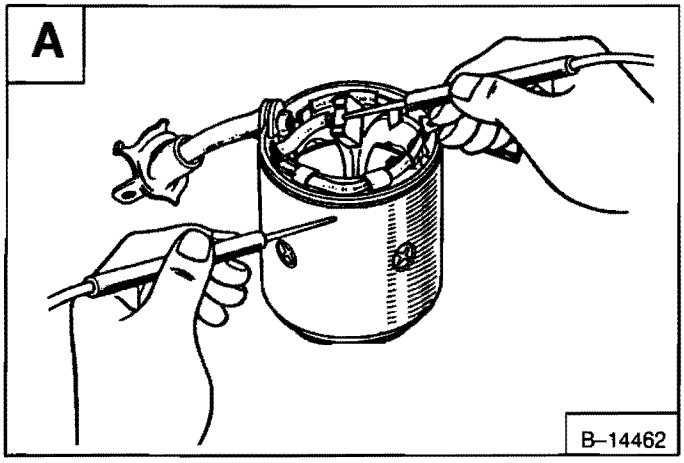
Check all the connections for clean and tight solder joints.

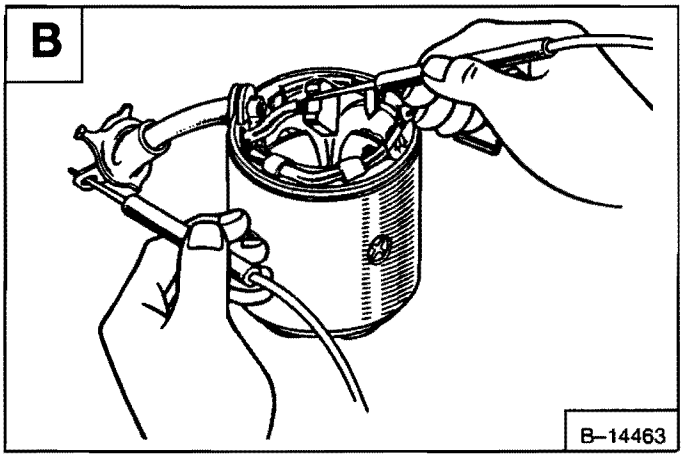
Field Winding Ground Test: Use a circuit tester, touch one probe to the field winding end of the brush and the other probe to the surface of the field windings housing **[A]**. There should be no continuity. If there is continuity, the field windings are grounded.

Replace the field windings.

Field Windings Continuity Test: Use a circuit tester, touch one probe to the wire and the other probe to the brush **[B]**. There should be continuity. If there is no continuity, the field windings are open–circuited.

Replace the field windings.





BRUSH AND BRUSH HOLDER:

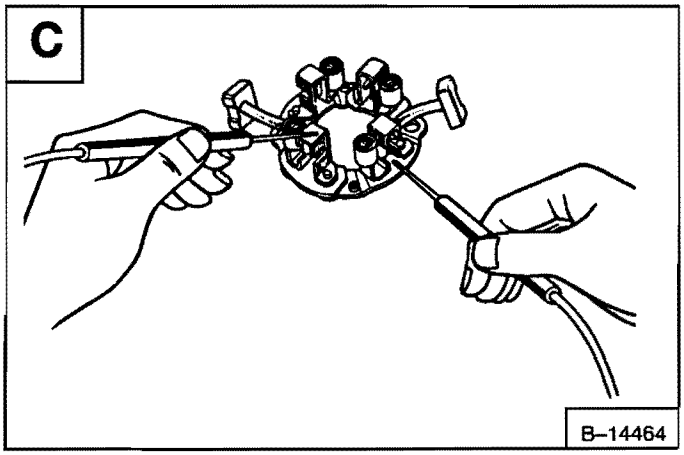
Measure the brush length.

Service Limit – 0.512 inches (13 mm)

If it exceeds the limit, replace the brush holder or field windings assembly.

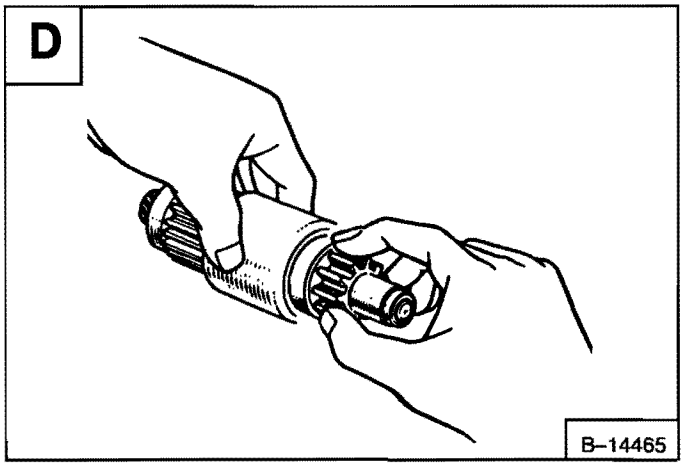
Check brush springs, for damage or rust. Replace as needed.

Brush Holder Insulation Test: Use a circuit tester, touch one probe to the positive brush holder plate and the other probe to the holder plate **[C]**. There should be no continuity. If there is continuity, replace or repair.



OVERRUNNING CLUTCH:

Inspect the pinion, it must rotate freely in the direction of the starter rotation and locked in the opposite rotation **[D]**.



Magnetic Switch Test

The following tests should be done without the armature assembly.

NOTE: Each test should be performed a short time (3 to 5 seconds) to prevent the magnetic switch winding from burning. Each test should be performed with 12 volts.

Pull–In Test: Connect the wires as shown in **[A]**. When connecting Terminal C and M.T. are closed, the pinion should engage.

Hold–In Test: With the same conditions as in the pull–in test, open the connecting Terminal C **[B]**. The pinion should remain in the engaged position.

Return Test: With the same conditions as in the hold–in test, open the connecting Terminal 50 **[C]**. The pinion should return immediately.

M.T. . . . Main Terminal to which the main cable from the battery is connected.

C . . . . . C–Terminal to which the wire from the field windings is connected.

50 . . . . . 50–Terminal to which the wire from the starting switch or stator relay is connected.

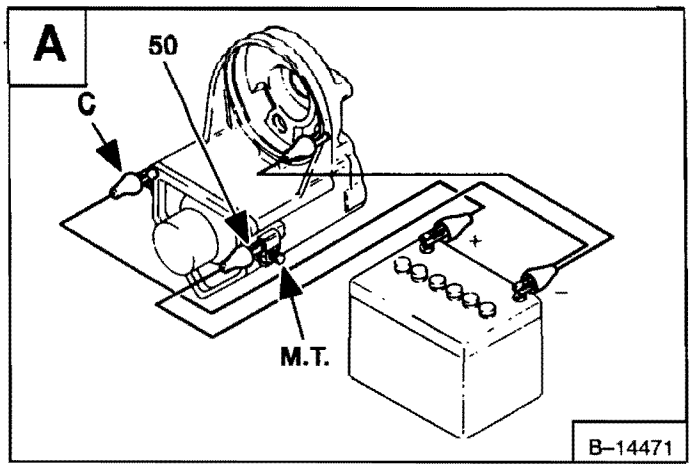
No Load Test

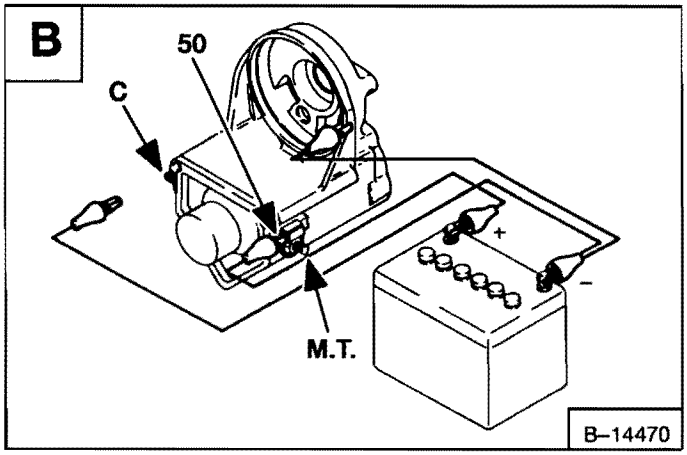
The following test should be done after reassembling the starter:

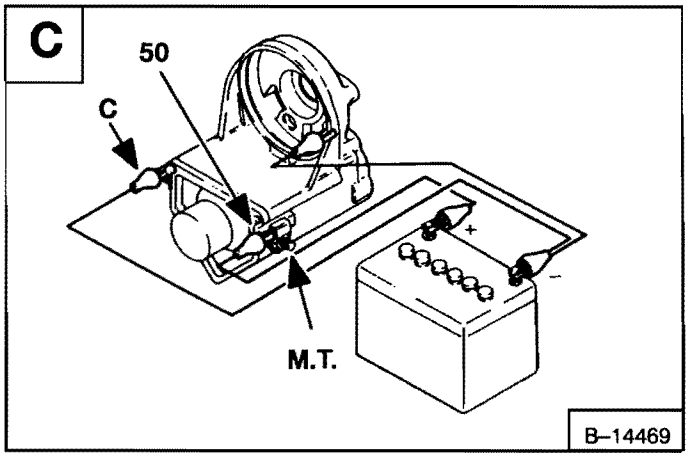
Clamp the starter in a vise. Use a 12 volt battery and ammeter, connect the positive wire of the battery, and the ammeter to the 50 Terminal **[D]**. Connect the negative wire to the starter body.

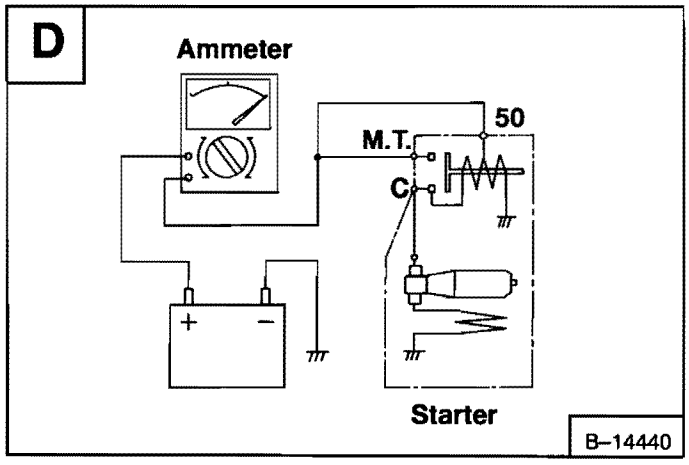
The starter should show smooth and steady rotation immediately after the pinion is engaged, it should draw less than the specified current.

Service Limit – 220 Amp. Maximum Draw





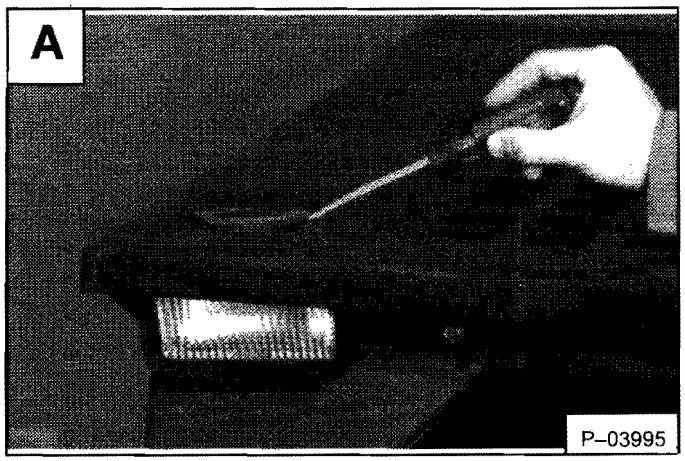




STANDARD INSTRUMENT PANEL

Removal and Installation

Pry the rubber light mount loose from the operator cab (both sides) **[A]**.

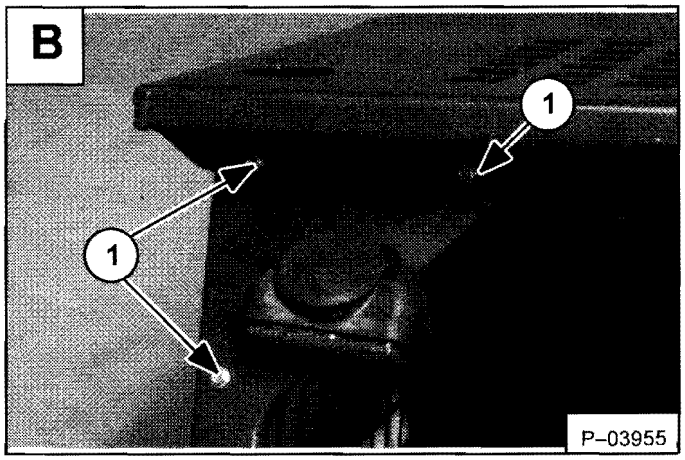


Lower the light from the operator cab and locate the three instrument panel mounting bolts (Item 1) **[B]** (both sides).

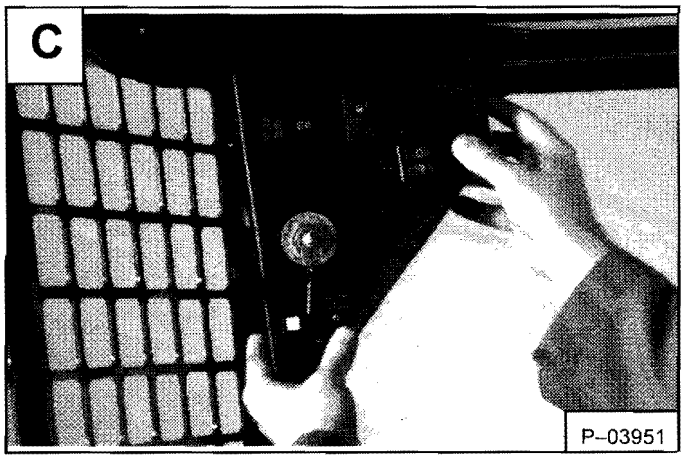
Remove the three mounting bolts (Item 1) **[B]**.

Installation: Be careful not to overtighten the instrument panel mounting bolts to prevent stripping the threaded holes in the panels.

NOTE: Before any wires are disconnected, make sure you have the correct wiring schematic for the loader.

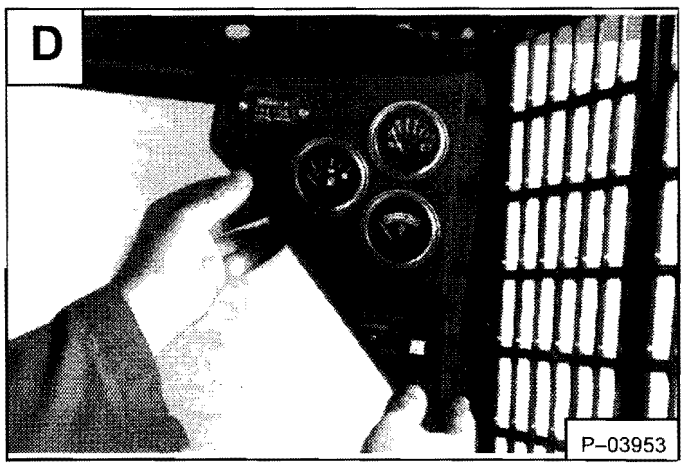


Pull the left instrument panel down and disconnect the wire harness connectors from the panel. Remove the panel **[C]**.



Repeat steps **[A]** and **[B]**. Pull the right instrument panel down and disconnect the wire harness connectors from the panel. Remove the panel **[D]**.

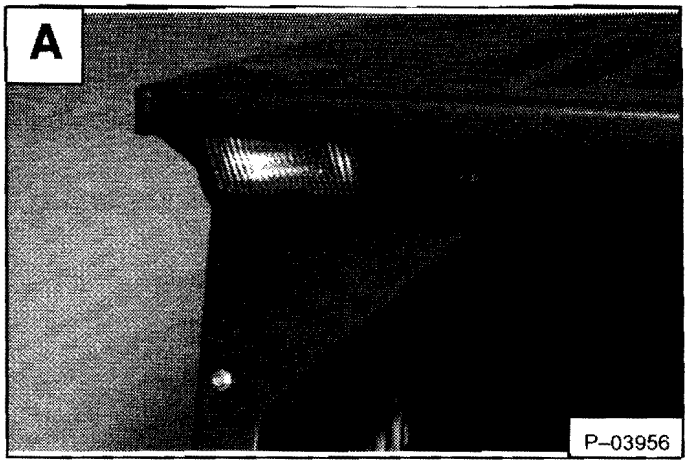
Reverse the removal procedure to install the instrument panel.



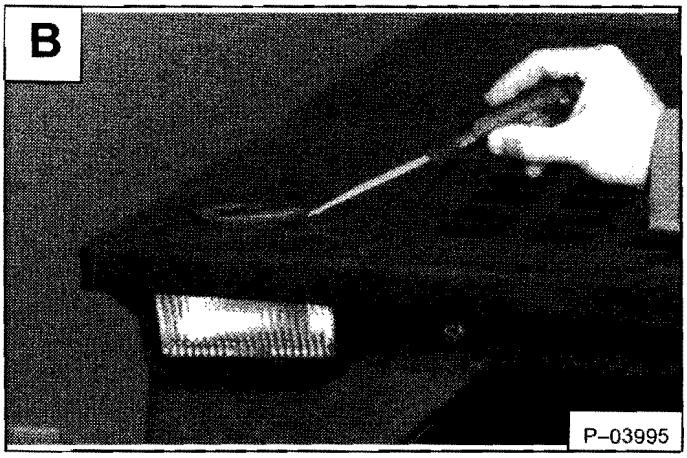
FRONT LIGHTS

Removal and Installation

The front lights are mounted in the upper corners of the operator cab **[A]**.



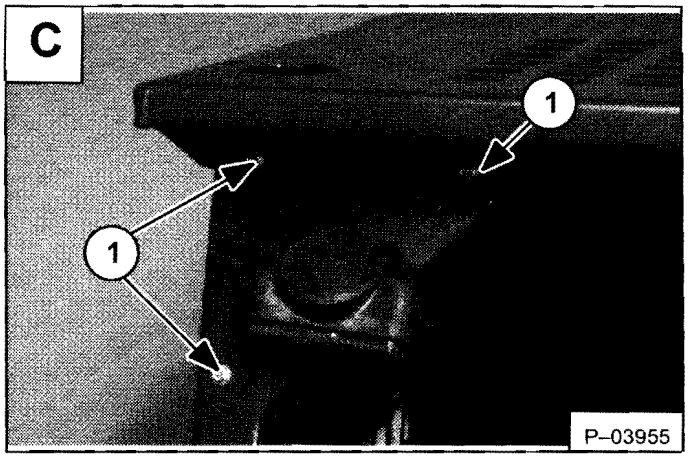
Pry the rubber light mount free from the operator cab **[B]**.



Pull the light down and remove the three mounting bolts (Item 1) **[C]** from the instrument panel.

Disconnect the front light connector from the instrument panel. Remove the front light from the operator cab.

Reverse the removal procedure to install the front light.



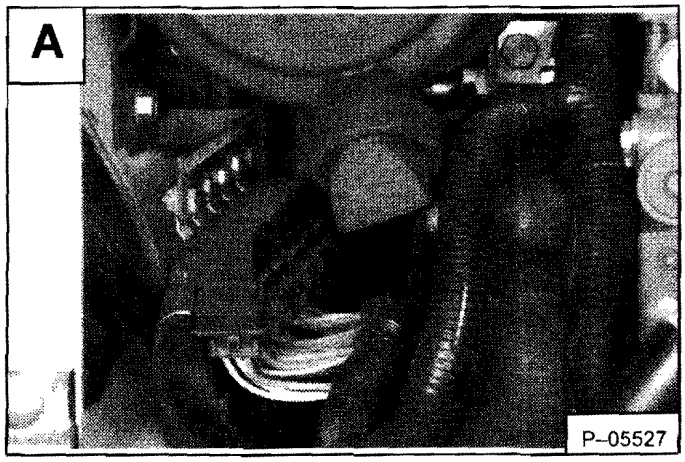
RELAY SWITCHES

Location

The engine harness has relay switches located below the air cleaner **[A]**.

The switches are for the starter, switch power, glow plug, brake and engine shutdown.

Remove the screw from the mounting tab on the switch and replace if the switch malfunctions.



Revised Jan. 97

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bobcat

ENGINE SERVICE

TROUBLESHOOTING

Chart

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

PROBLEM	CAUSE
Slow cranking speed.	1, 2, 3, 4
Engine will not start.	2, 5, 6, 7, 8, 9, 11, 12, 13, 14, 15, 16, 17, 19, 27, 28, 29
Difficult to start.	5, 7, 8, 9, 10, 11, 12, 13, 15, 16, 17, 18, 19, 20, 25, 27, 28, 29
No power for engine.	8, 9, 10, 11, 12, 13, 15, 16, 17, 18, 20, 21, 22, 23, 27, 28, 29
Engine is mis–firing.	8, 9, 11, 12, 13, 15, 16, 17, 21, 22, 24, 25, 26, 28
Too much fuel consumption.	10, 12, 13, 15, 16, 17, 19, 20, 21, 23, 24, 25, 27, 28, 29
Black exhaust.	10, 12, 13, 15, 16, 17, 19, 20, 21, 23, 24, 25, 27, 28, 29
Blue/white exhaust.	4, 10, 15, 16, 17, 21, 23, 27, 29, 30, 47
Low oil pressure.	4, 31, 32, 33, 34, 35, 37, 39, 48
Engine knocking.	13, 15, 16, 19, 22, 24, 25, 27, 29, 31, 40, 41, 49
Engine running rough.	7, 8, 9, 10, 11, 12, 13, 17, 18, 22, 24, 25, 26, 29, 40, 49
Vibration.	12, 13, 17, 21, 22, 25, 26, 29, 40, 42, 43
High oil pressure warning.	4, 33, 36
Overheating.	10, 12, 13, 15, 16, 20, 21, 32, 40, 44, 47
Too much crankcase pressure.	22, 27, 29, 30, 40, 46
Poor compression.	10, 16, 21, 24, 25, 27, 28, 29, 30, 41, 49
Start and stop.	9, 10, 11

KEY TO CORRECT THE CAUSE

1. Battery capacity low.
2. Bad electrical connections.
3. Faulty starter motor.
4. Incorrect grade of oil.
5. Low cranking speed.
6. Fuel tank empty.
7. Faulty stop control operation.
8. Plugged fuel line.
9. Plugged fuel filter.
10. Restriction in the air cleaner.
11. Air in the fuel system.
12. Faulty fuel injection pump.
13. Faulty fuel injectors.
14. Broken injection pump drive.
15. Incorrect injection pump timing.
16. Incorrect valve timing.
17. Poor compression.
18. Plugged fuel tank vent.
19. Incorrect grade of fuel.
20. Exhaust pipe restriction.
21. Cylinder head gasket leaking.
22. Overheating.
23. Cold running.
24. Incorrect tappet adjustment.
25. Sticking valves.
26. Incorrect high pressure fuel pipes.
27. Worn cylinder bores.
28. Worn valve and seats.
29. Broken, worn or sticking piston rings.
30. Worn valve stems or guides.
31. Worn or damaged bearings.
32. Not enough oil in the oil pan.
33. Switch/sensor is defective.
34. Oil pump worn.
35. Pressure relief valve is sticking open.
36. Pressure relief valve is sticking closed.
37. Broken relief valve spring.
38. Faulty suction pipe.
39. Plugged oil filter.
40. Piston seizure.
41. Incorrect piston height.
42. Faulty engine mounting.
43. Incorrect alignment of flywheel.
44. Faulty thermostat.
45. Plugged oil cooler
46. Plugged breather pipe.
47. Damaged valve stem oil deflectors.
48. Plugged oil pump pipe strainer.
49. Broken valve spring.

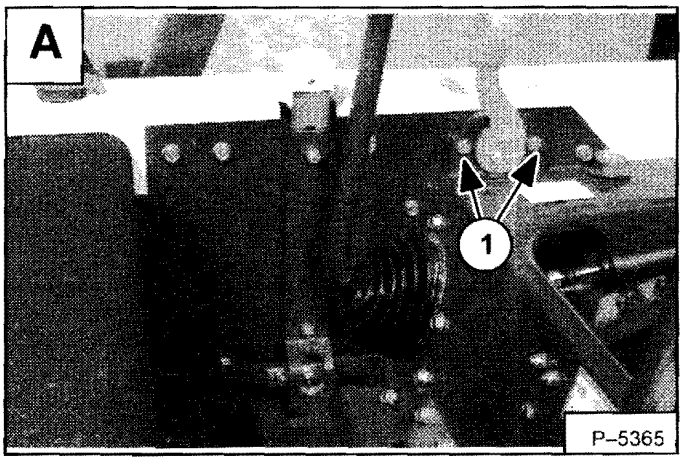
ENGINE SPEED CONTROL

Removal and Installation

Raise the lift arms and install an approved lift arm support device (Page 1–1).

Raise the operator cab (Page 1–1).

Remove the two mounting bolts (Item 1) **[A]**.

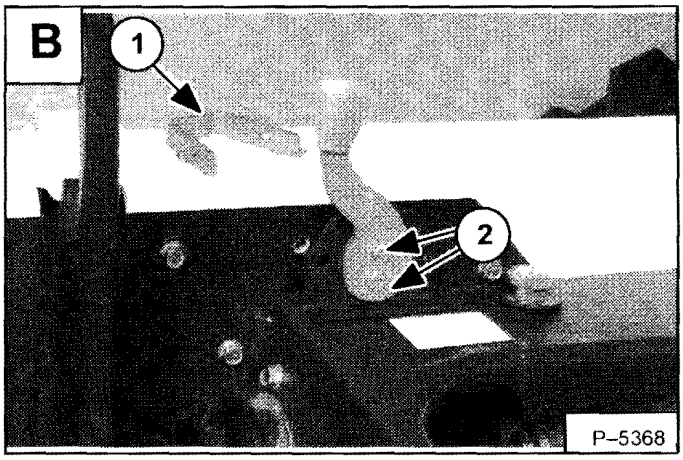


Mark the front of the stop bracket (Item 1) **[B]** and remove the stop bracket

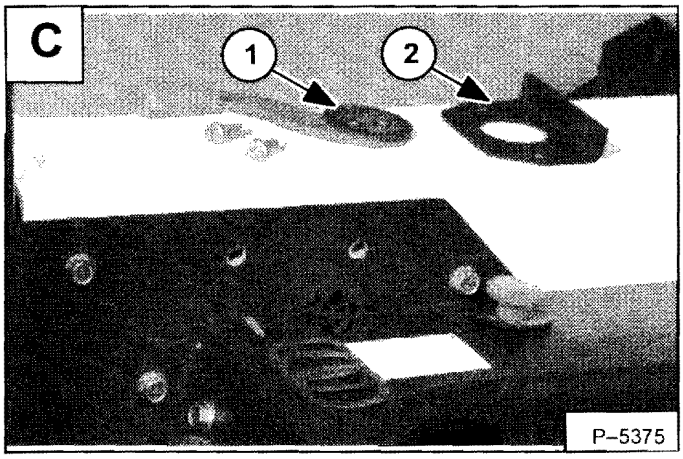
Installation: It is important for the front and rear stop on the bracket to be located correctly.

Remove the bolts (Item 2) **[B]**.

Installation: Tighten the bolts evenly until the speed control lever moves backward and forward at a comfortable tension.

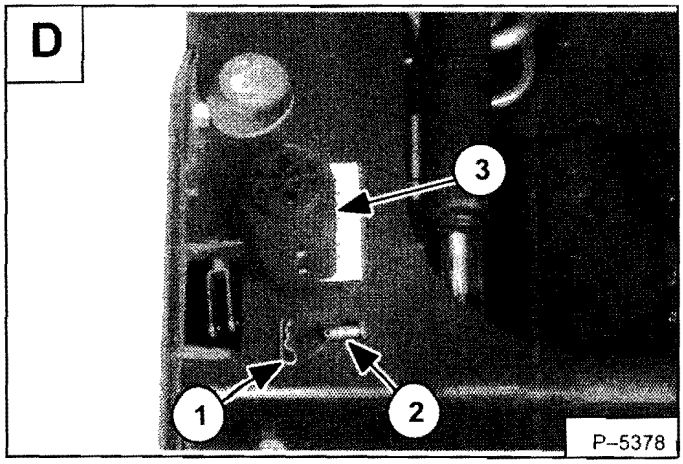


Remove the speed control lever (Item 1) **[C]** and mounting bracket (Item 2) **[C]**.



Remove the retainer pin (Item 1) **[D]** and pivot pin (Item 2) **[D]** from the speed control arm (Item 3) **[D]** to disconnect the speed control cable clevis.

NOTE: Do not lubricate the speed control parts when assembling.



Speed Control Cable

Raise the lift arm and install an approved lift arm support device (Page 1–1).

Raise the operator cab (Page 1–1).

Remove the speed control lever assembly (Page 7–4).

NOTE: The front panel/steering levers are shown removed for photo clarity.

Remove the u–bolt (Item 1) **[A]** from the cable.

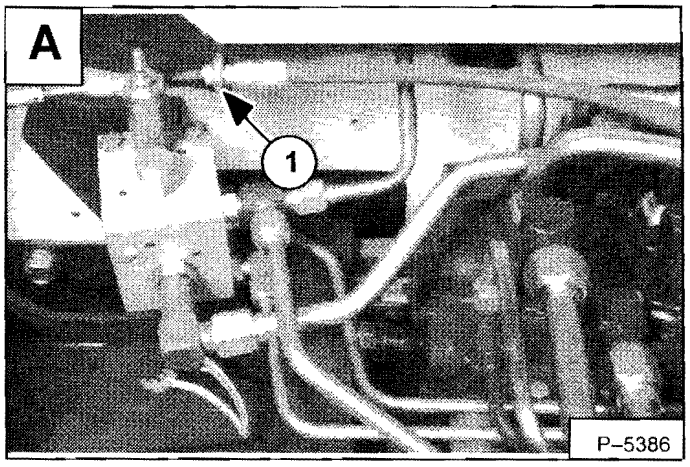
Open the rear door.

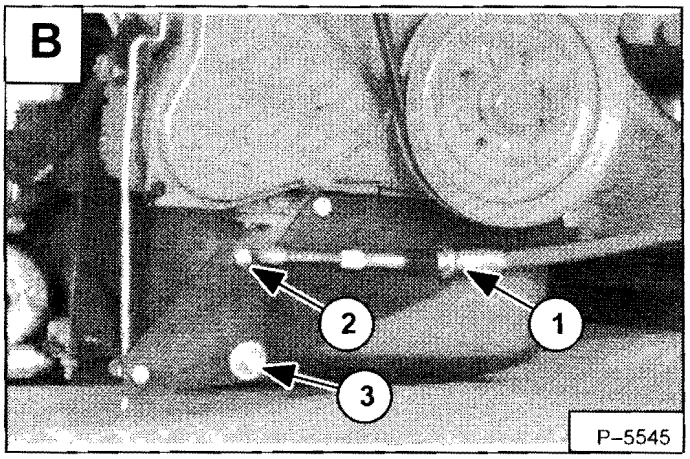
NOTE: Engine is shown removed from loader for photo clarity.

Remove the u–bolt (Item 1) **[B]** from the cable.

Remove the nut (Item 2) **[B]** to disconnect the cable from the linkage.

Remove the speed control cable.





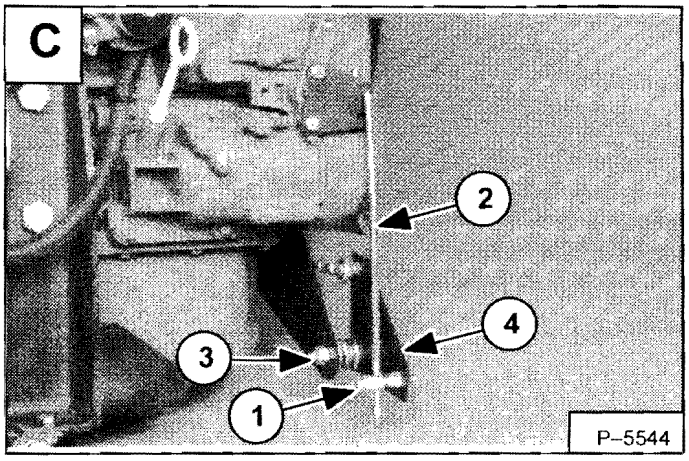
Speed Control Linkage

Loosen the bolt (Item 1) **[C]** to remove the linkage rod (Item 2) **[C]**.

Disconnect the cable nut (Item 2) **[C]**.

Remove the nut (Item 3) **[C]** from the pivot bolt (Item 3) **[B]**.

Remove the linkage (Item 4) **[C]** and spring.



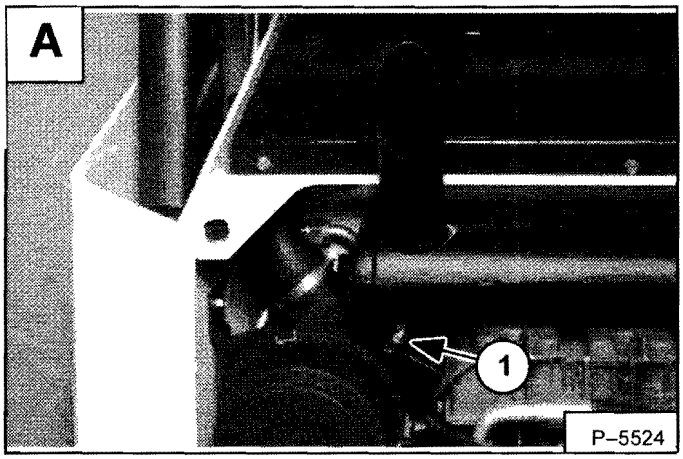
ENGINE MUFFLER

Removal and Installation

Open the rear door.

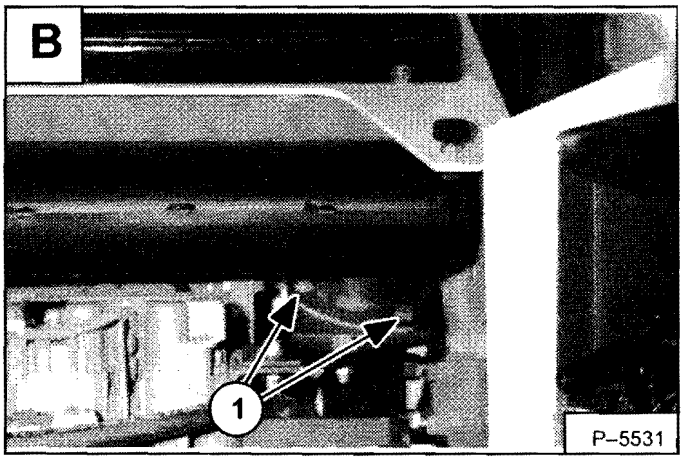
Remove the rear grill (Page 5–1).

Remove the two bolts and nuts (Item 1) **[A]** from the engine muffler mounting bracket.



Remove the three bolts and nuts (Item 1) **[B]** from the muffler exhaust flange.

Remove the muffler.



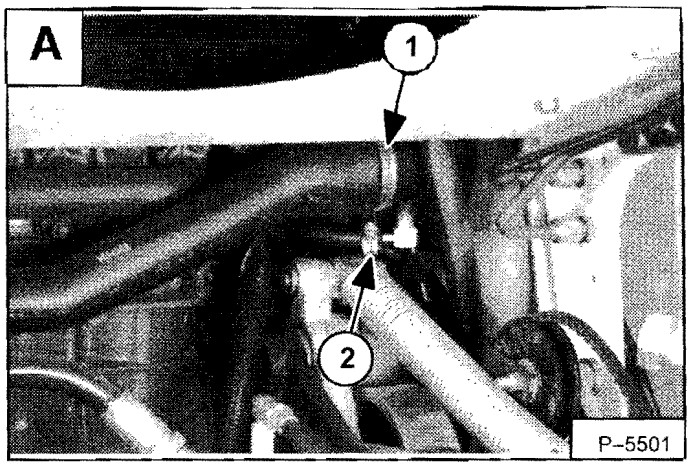
AIR CLEANER HOUSING

Removal and Installation

NOTE: Fan/Blower Housing assembly shown removed in figure [A] for photo clarity.

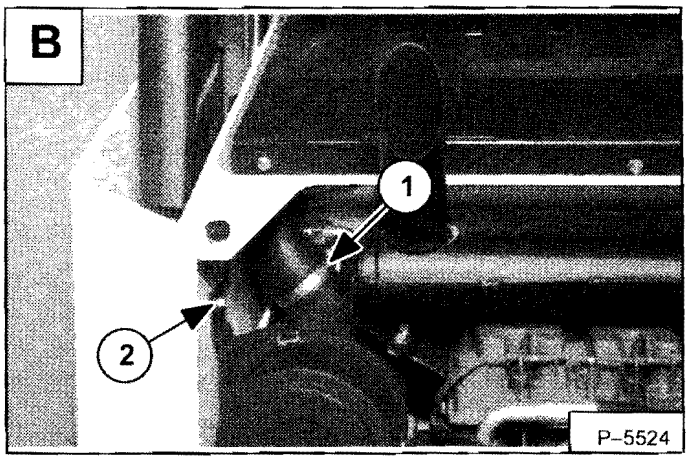
Disconnect the air cleaner outlet hose (Item 1) **[A]** from the air cleaner.

Loosen the hose clamp (Item 2) **[A]** and disconnect the breather hose.

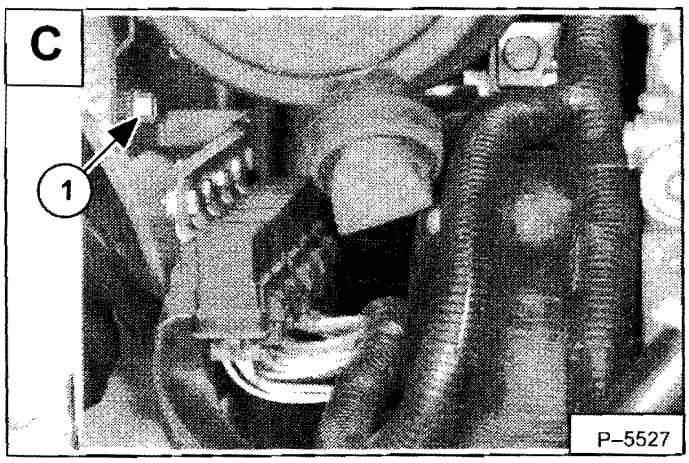


Loosen the hose clamp (Item 1) **[B]** and disconnect the inlet hose to the air cleaner.

Remove the top mounting bolt (Item 2) **[B]** from the air cleaner housing mounting bracket.

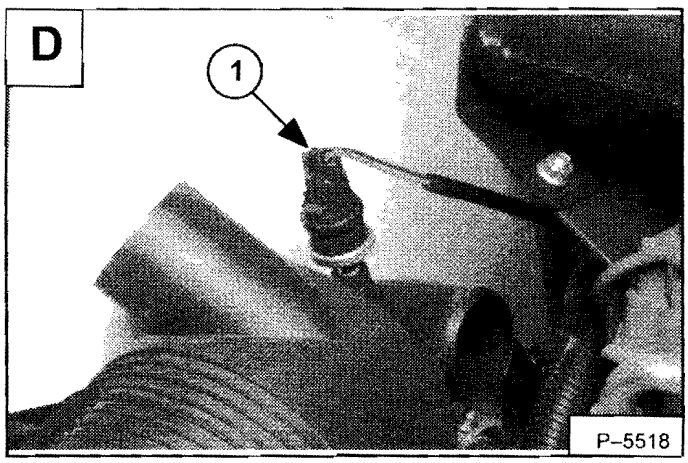


Remove the bottom mounting bolt (Item 1) **[C]**.



BOSS® Option Loader Only:

Slide the air cleaner housing forward and disconnect wires (Item 1) **[D]** at the sensor.



BLOWER HOUSING/FAN GEARBOX

Removal and Installation

Raise the lift arms and install an approved lift arm support device (Page 1–1).

Raise the operator cab (Page 1–1).

Remove the operator cab gas cylinder on the left side of the loader (Page 5–1).

Disconnect the operator cab wiring harness from the engine wiring harness (Item 1) **[A]**.

Remove the harness clamp bolt (Item 2) **[A]**.

Lay the electrical harness down for clearance at the blower housing.

Remove the hydraulic/hydrostatic filter mounting bracket assembly (Page 2–1).

Remove the fan drive belt.

Remove the four mounting bolts (Item 1) **[B]** and spacer tubes (two spacer tubes are outside the housing and two inside the housing).

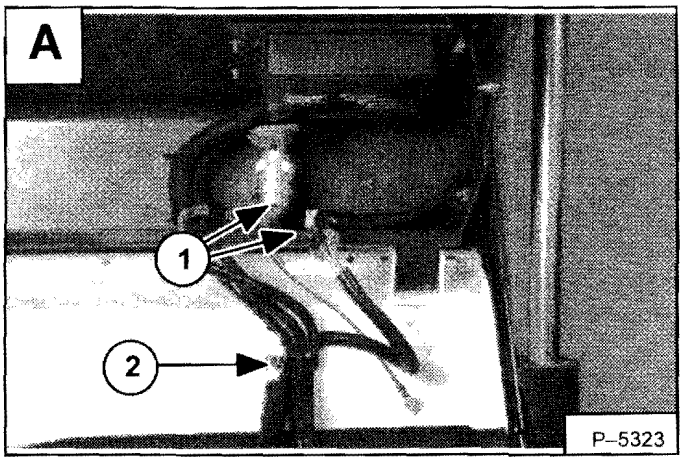
NOTE: Remove the two rear mounting bolts first.

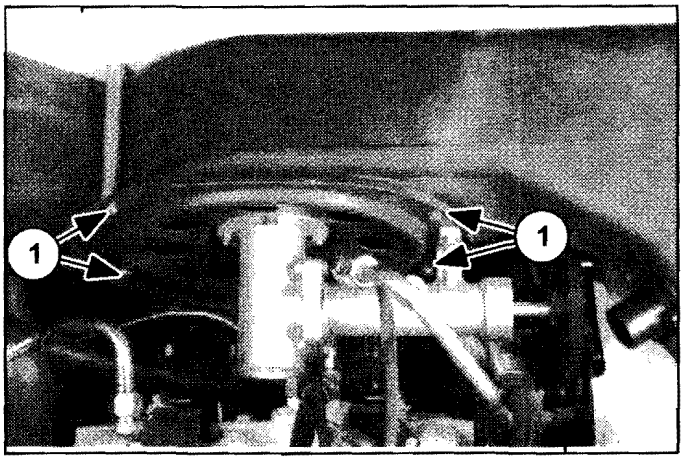
Installation: Tighten the mounting bolts to 25–28 ft.–lbs. (34–38 Nm) torque.

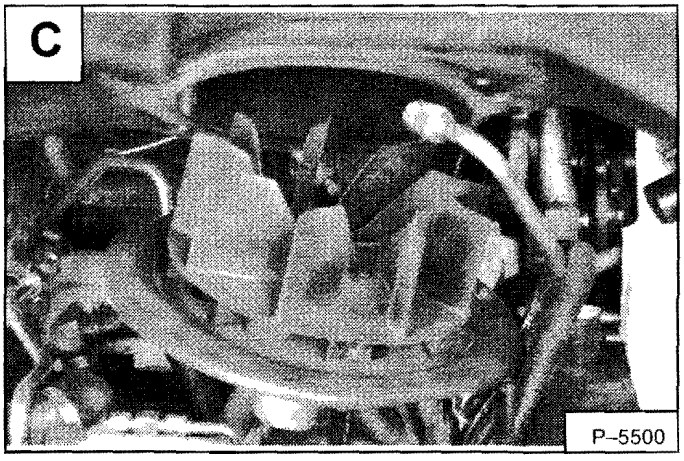
Slide the blower housing forward and remove the fan/fan gearbox assembly **[C]**.

Remove the blower housing.

See Page 7–12 for Disassembly of the Fan Gearbox





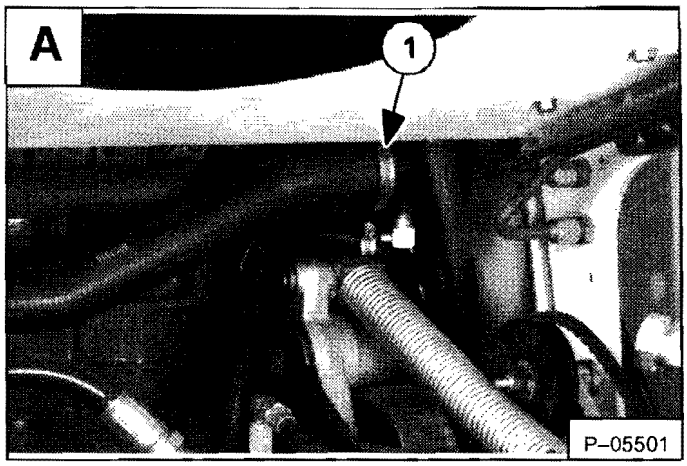


AIR CLEANER HOUSING

Removal and Installation

NOTE: Fan/Blower Housing assembly shown removed in figure [A] for photo clarity.

Disconnect the air cleaner outlet hose (Item 1) **[A]** from the air cleaner.

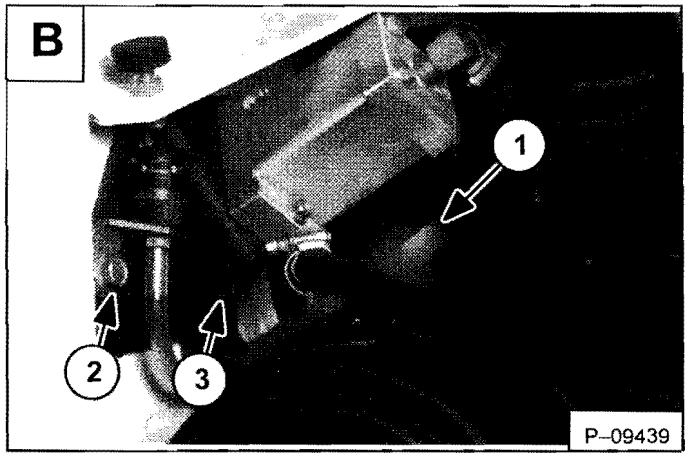


Loosen the hose clamp (Item 1) **[B]** and disconnect the inlet hose to the air cleaner.

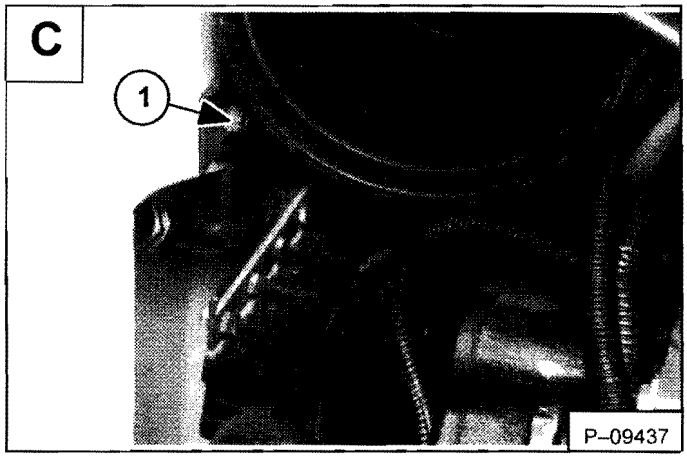
Remove the bolt (Item 2) **[B]** from the air cleaner housing mounting bracket and PCV module bracket.

Remove the PCV module. (See Page 7–117.)

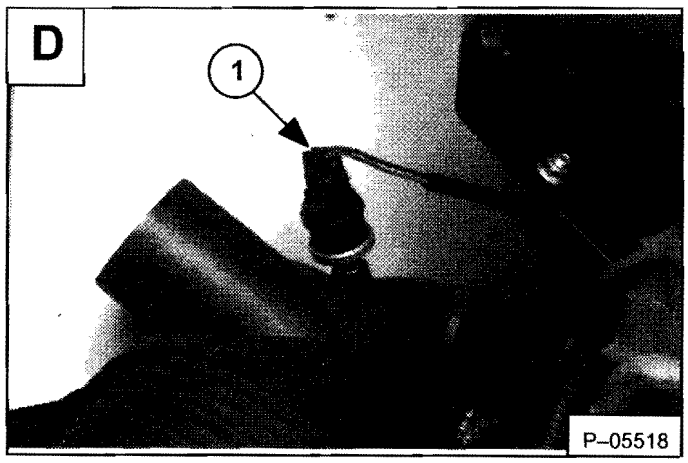
Remove the bolt (Item 3) **[B]** from the air cleaner housing mounting bracket.



Remove the bottom mounting bolt (Item 1) **[C]**.



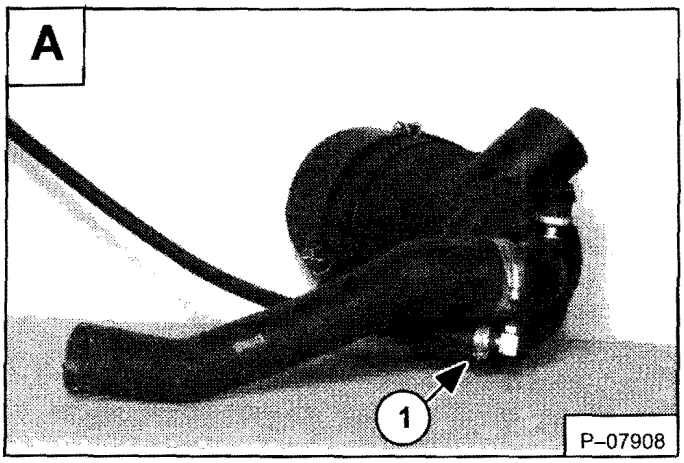
BOSS® Option Loader Only: Slide the air cleaner housing forward and disconnect wires (Item 1) **[D]** at the sensor.



Removal and Installation (Cont'd)

Slide the air cleaner housing forward and disconnect the vent hose (Item 1) **[A]**.

Remove the air cleaner housing from the loader.

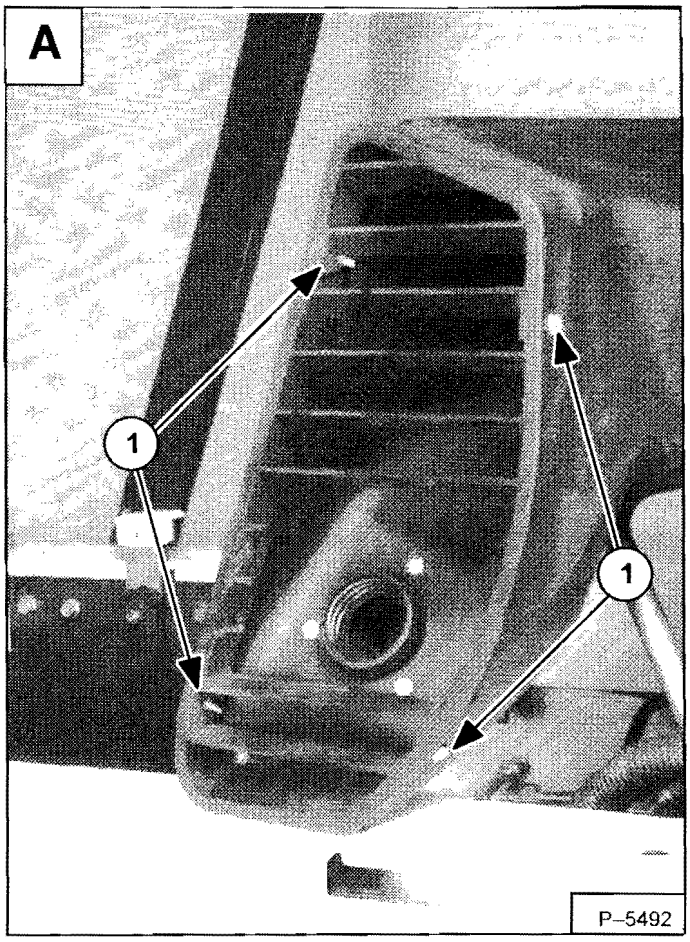


Removal and Installation (Cont'd)

The blower housing must be moved away from the loader frame if the side grills have to be replaced.

To replace the side grill, remove the four mounting screws (Item 1) **[A]** from the blower housing.

Install the new grill and replace the screws.

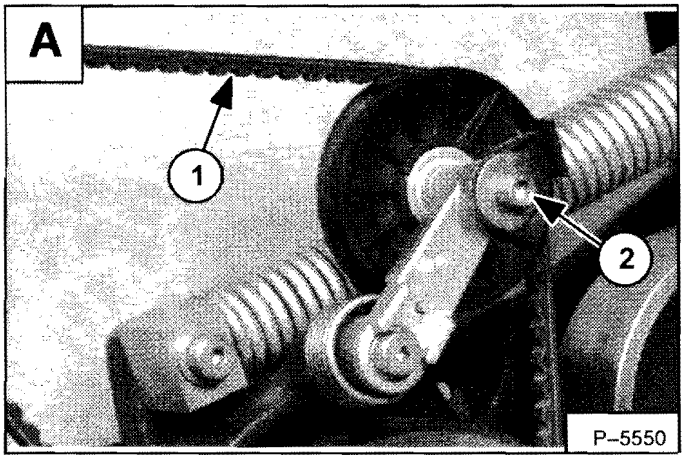


FAN DRIVE TENSION PULLEY

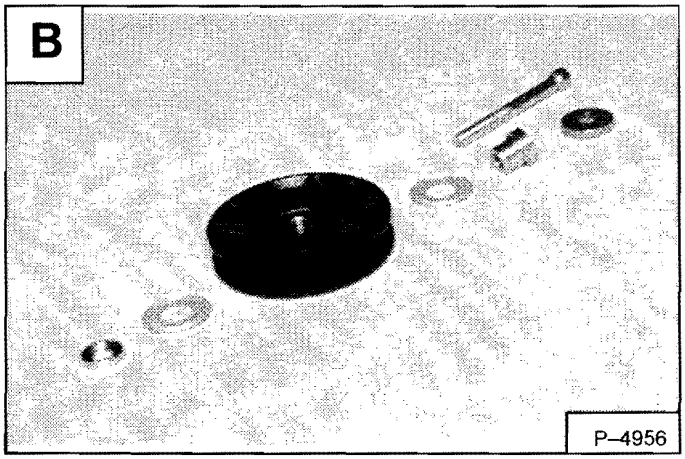
Removal and Installation

Remove the fan drive belt (Item 1) **[A]**.

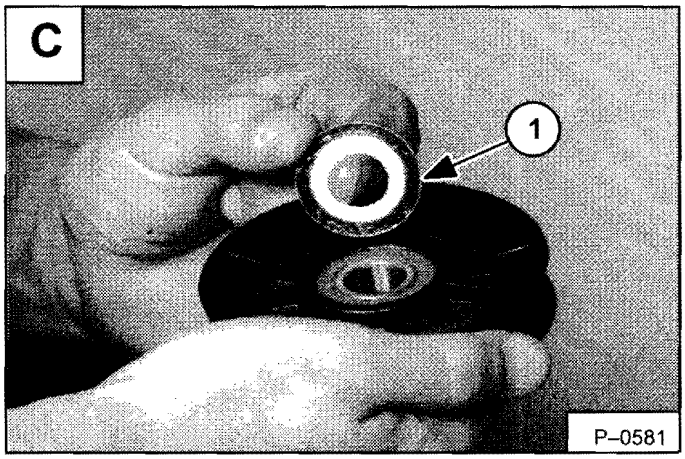
Remove the idler pulley bolt (Item 2) **[A]**.



Remove the spacers, bolt and washers from the arm **[B]**.

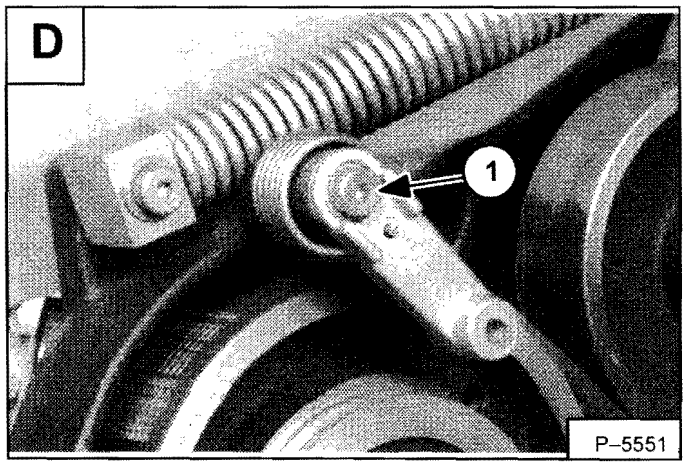


Installation: Put a small amount of grease around the outside edge (Item 1) **[C]** on the grease rings (both sides).



Remove the bolt (Item 1) **[D]**, spring and arm.

Check all parts for damage or wear. Replace the parts as needed.

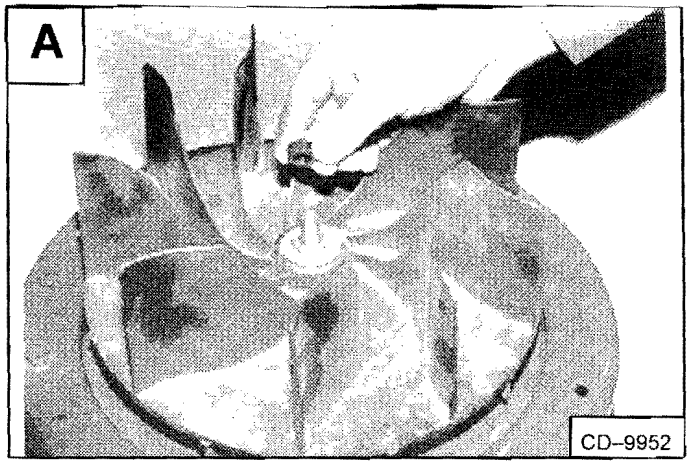


BLOWER FAN

Removal and Installation

Remove the lock nut and spacer **[A]**.

Installation: Tighten the nut to 45–55 ft.–lbs. (61–75 Nm) torque.



Use the following procedure to remove the fan from the shaft:

⚠ WARNING

AVOID INJURY OR DEATH

Wear safety goggles to prevent eye injury when drilling or grinding.

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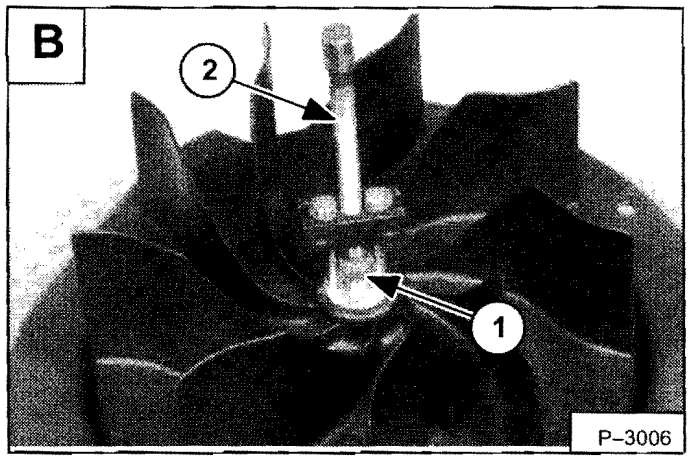
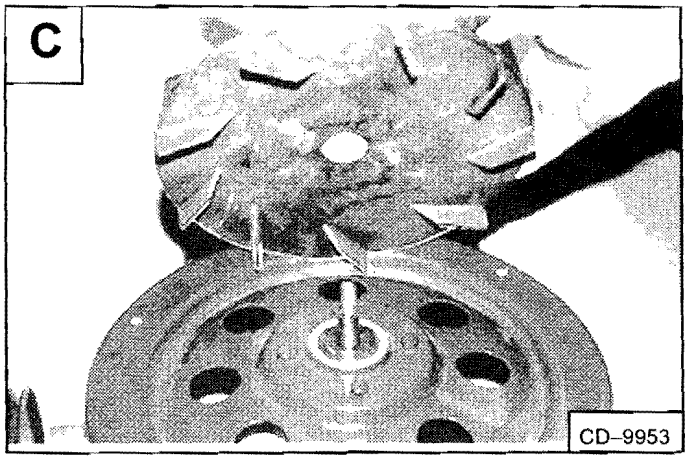
Install the nut (Item 1) **[B]** on the tapered shaft to protect the shaft and threads.

Install the puller on the fan as shown **[B]**.

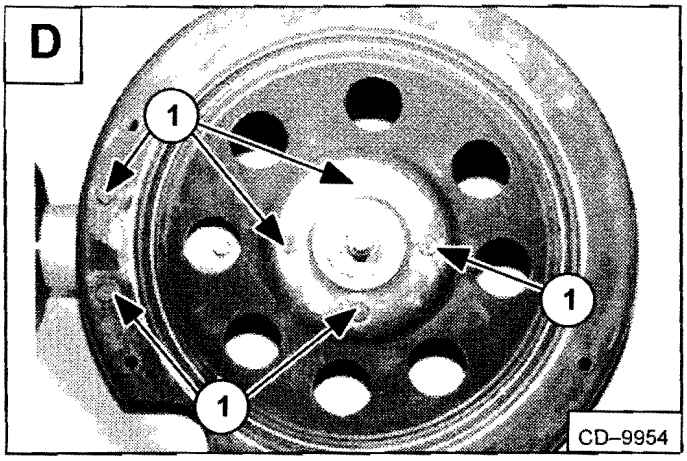
As the center bolt (Item 2) **[B]** is tightened, periodically strike the bolt head to loosen the fan from the shaft .

Remove the fan from the tapered shaft **[C]**.



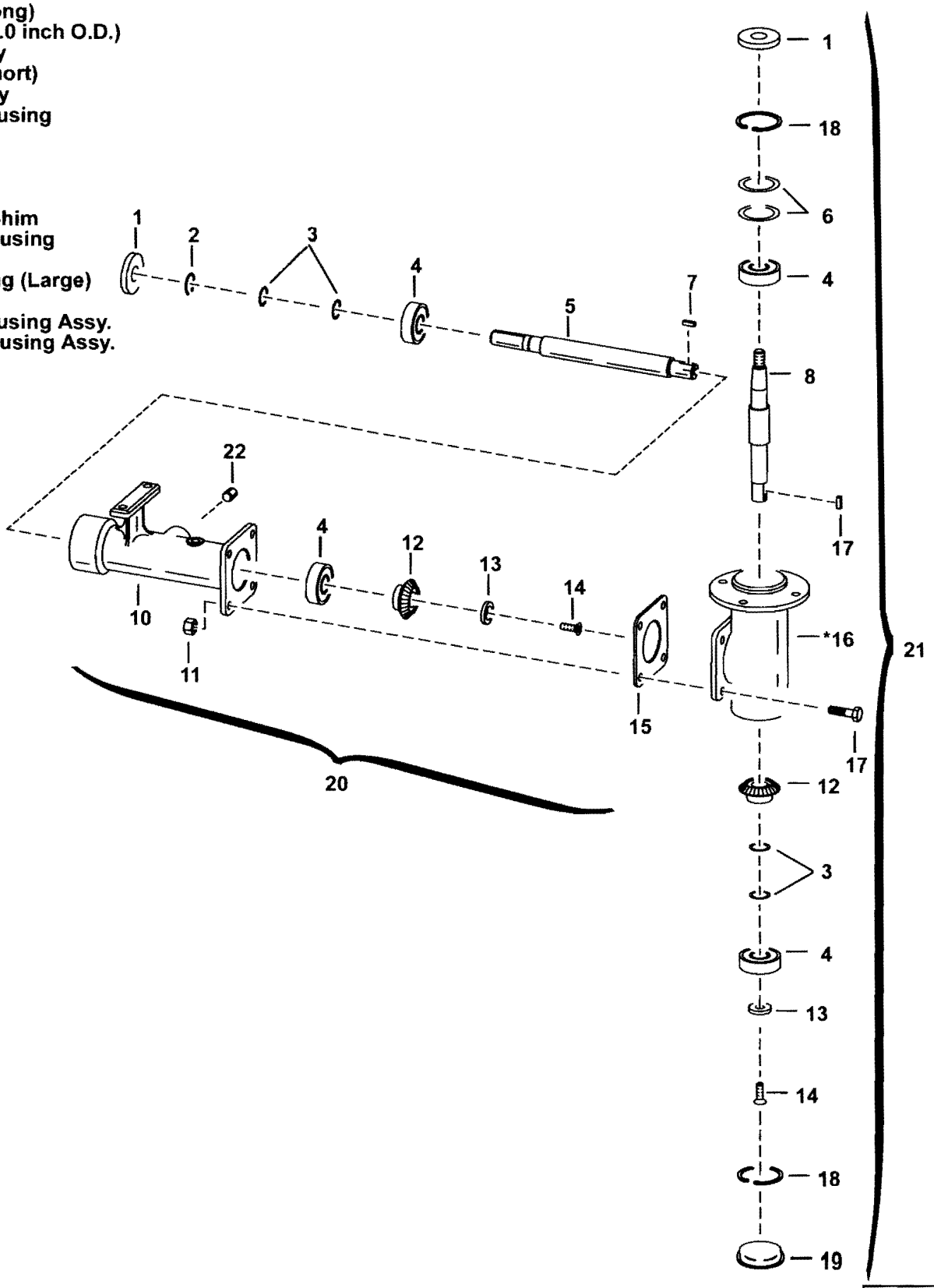


To remove the blower housing mounting plate, remove the six bolts (Item 1) **[D]**.



Parts Identification

1. Seal
2. Snap Ring (Small)
3. Shims (1.0 inch O.D.)
4. Bearing
5. Shaft (Long)
6. Shims (2.0 inch O.D.)
7. Long Key
8. Shaft (Short)
9. Short Key
10. Long Housing
11. Nut
12. Gear
13. Washer
14. Screw
15. Square Shim
*16. Short Housing
17. Bolt
18. Snap Ring (Large)
19. Cap
20. Long Housing Assy.
21. Short Housing Assy.
22. Fill Plug



* Individual Part not available

TS-1002

Disassembly

NOTE: When repairing the gearbox order the following as needed:

1. **Complete Assembly**
2. **Long Housing Assembly**
3. **Long Housing**
4. **Short Housing Assembly (See Note Below)**
5. **Internal Parts**

NOTE: The short housing is only available as an assembly. See the parts identification page (Page 7–12) for reference (Order parts from Melroe Parts Sales).

NOTE: Be sure to count the number and thickness of shims during disassembly. Install the shims in the original location during assembly.

Remove the fan and blower housing mounting plate (Page 7–11).

Long Housing

Loosen the set screws (Item 1) **[A]** and remove the pulley (Item 2) **[A]**.

Remove the long key (Item 3) **[A]**.

Remove the four mounting bolts and the part number tag **[B]**.

Remove the oil from the gearbox.

⚠ WARNING

AVOID INJURY OR DEATH

Wear safety goggles to prevent eye injury when drilling or grinding.

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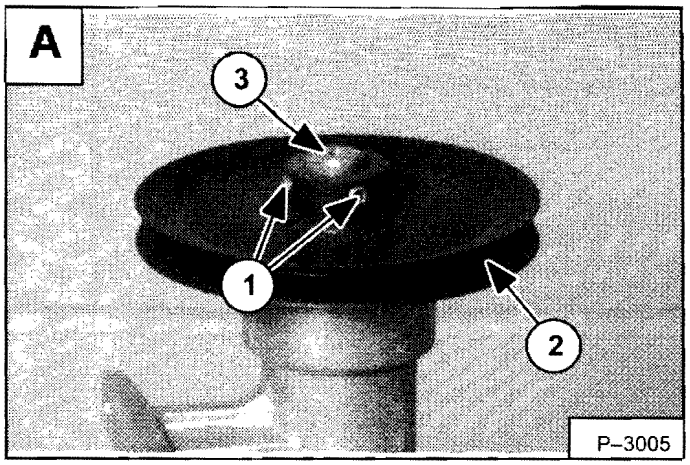
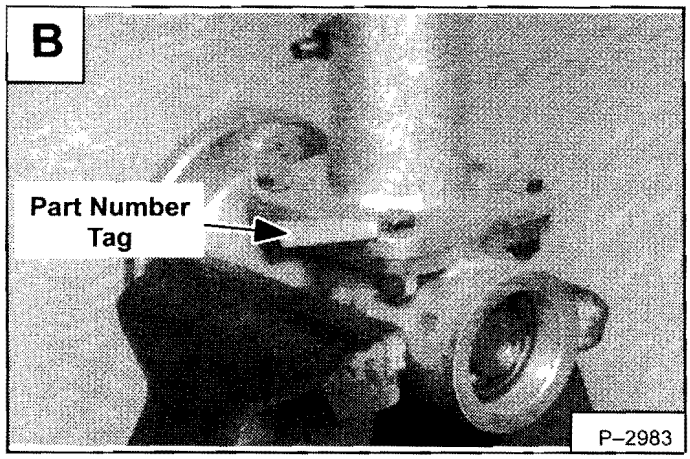
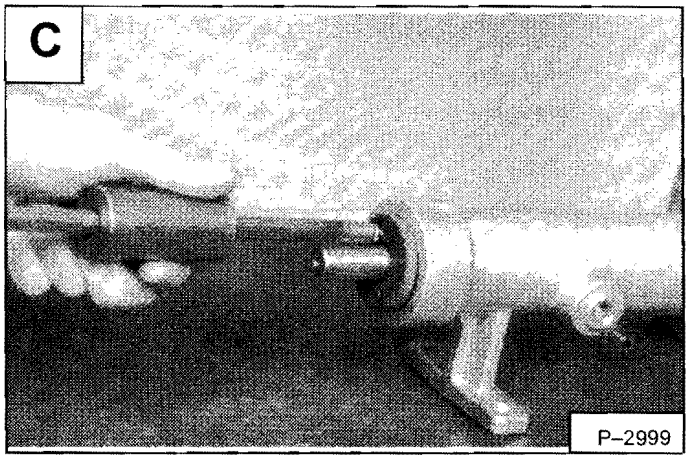
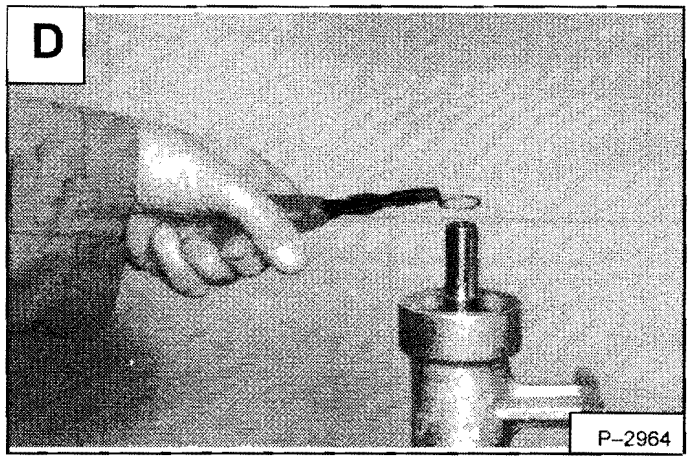
Drill an 1/8 inch (13 mm) hole in the seal. Use a slide hammer tool to remove the seal **[C]**.

Remove the small snap ring **[D]**.





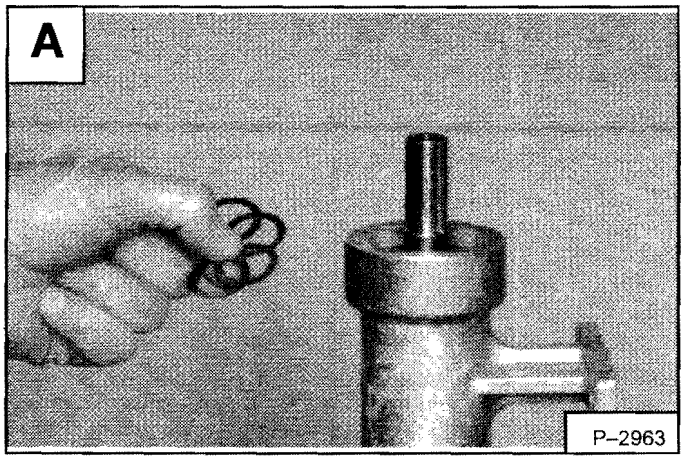




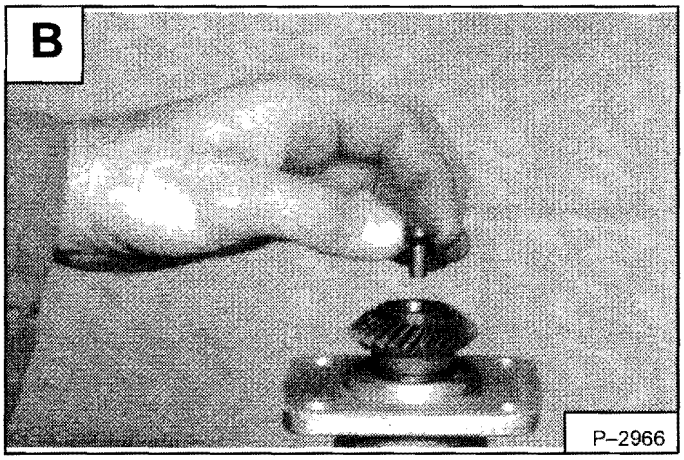
FAN GEARBOX (Cont'd)

Disassembly (Cont'd)

Remove the small shims **[A]**.

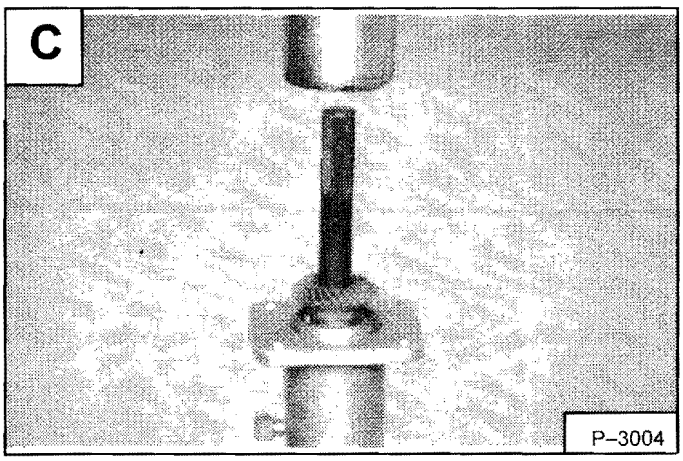


Remove the screw and washer from the shaft **[B]**.

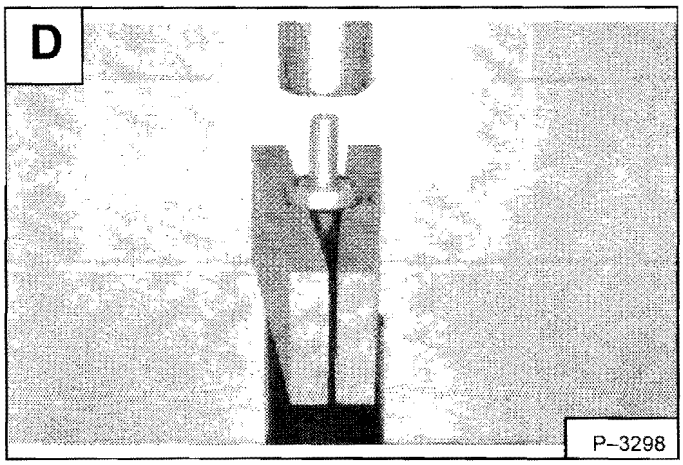


Support the lower flange and press the shaft from the bearing **[C]**.

NOTE: The gear and the other bearing (pulley end) will be removed with the shaft.



Support the bearing and press the shaft from the bearing **[D]**.



FAN GEARBOX (Cont'd)

Disassembly (Cont'd)

Short Housing

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

Use care not to damage the housing.

⚠ WARNING

AVOID INJURY OR DEATH

Wear safety goggles to prevent eye injury when drilling or grinding.

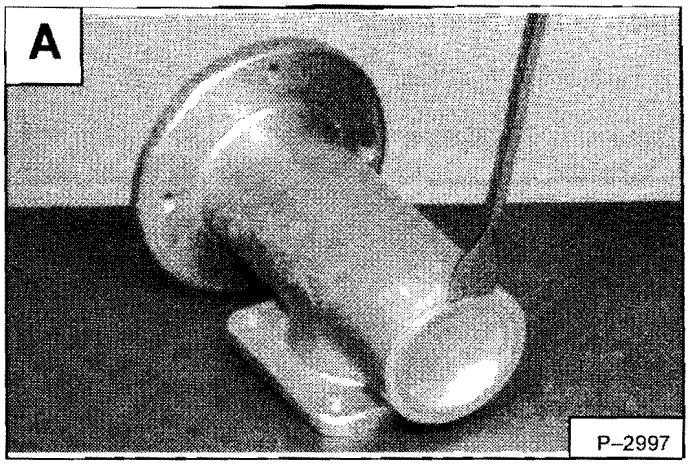
W-2108-1186

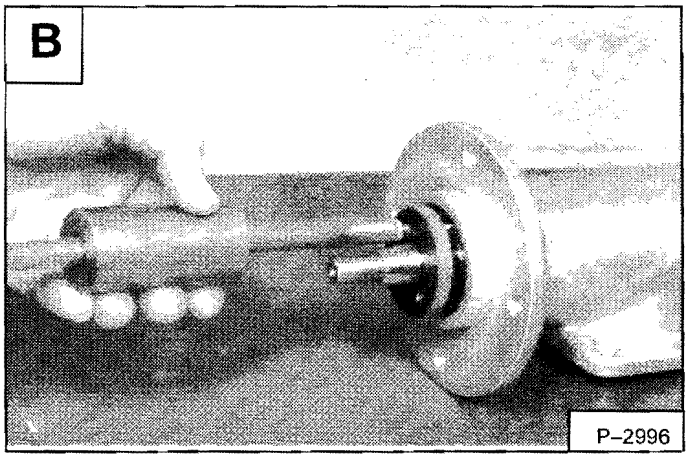
Drill an 1/8 inch (3 mm) hole in the seal. Use a slide hammer tool to remove the seal **[B]**.

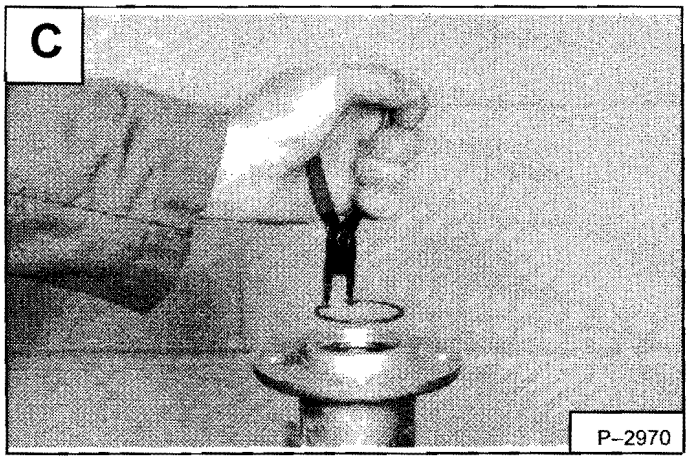
Remove the large snap ring from the flange end of the housing **[C]**.

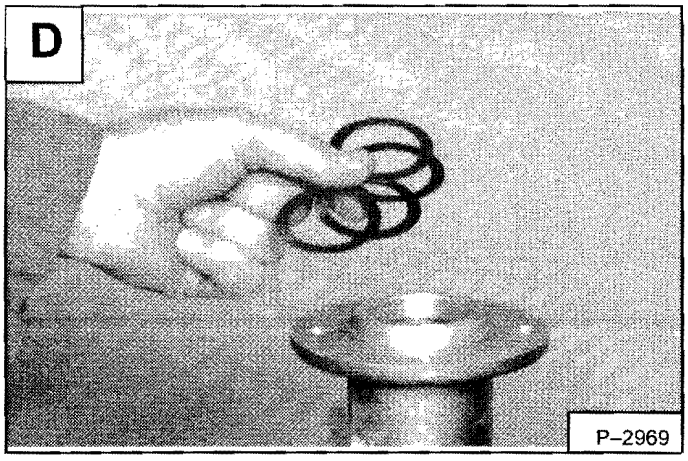
Remove the large shims from the housing **[D]**.

NOTE: Use the same size and thickness of shims during assembly.





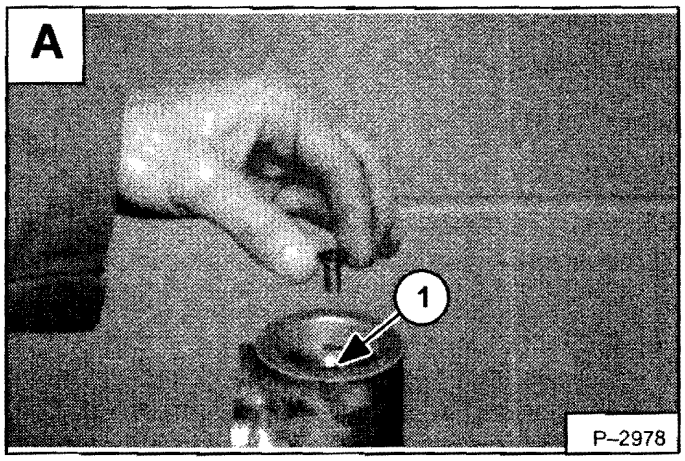




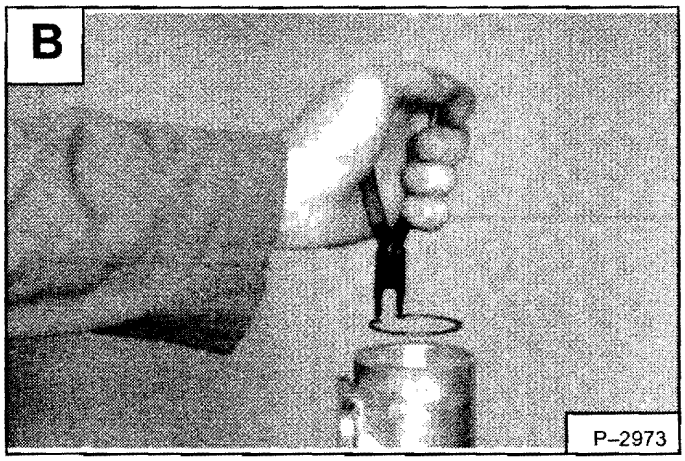
FAN GEARBOX (Cont'd)

Disassembly (Cont'd)

Remove the screw and washer (Item 1) **[A]** from the shaft.

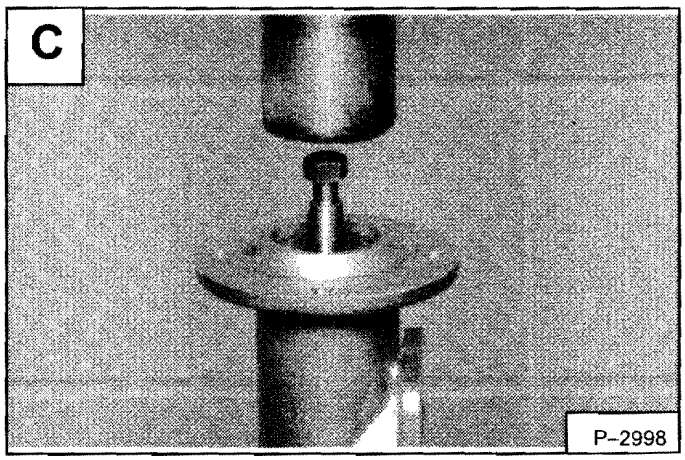


Remove the snap ring from the cap end of the housing **[B]**.

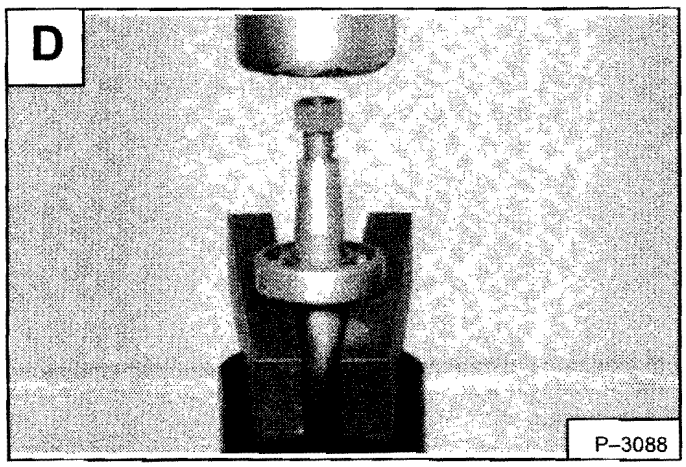


Press the shaft from the housing **[C]**.

NOTE: Both bearings may come out of the housing with the shaft. If one bearing remains in the housing, use a non metal object to tap the bearing from the housing.



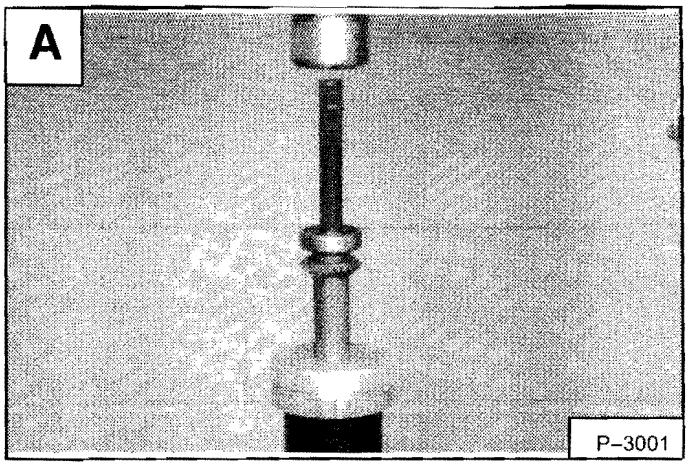
Press the bearing from the tapered end of the shaft **[D]**.



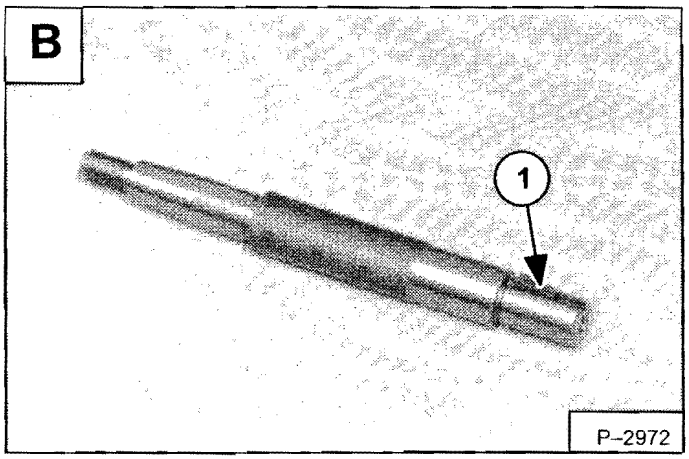
FAN GEARBOX (Cont'd)

Disassembly (Cont'd)

Press the bearing, shims and gear from the shaft **[A]**.



Remove the key (Item 1) **[B]** from the shaft.



FAN GEARBOX (Cont'd)

Assembly

NOTE: See Note Page 7–13 when ordering parts for the Fan Gearbox. Always replace seals during assembly. Replace the parts in the gearbox as needed.

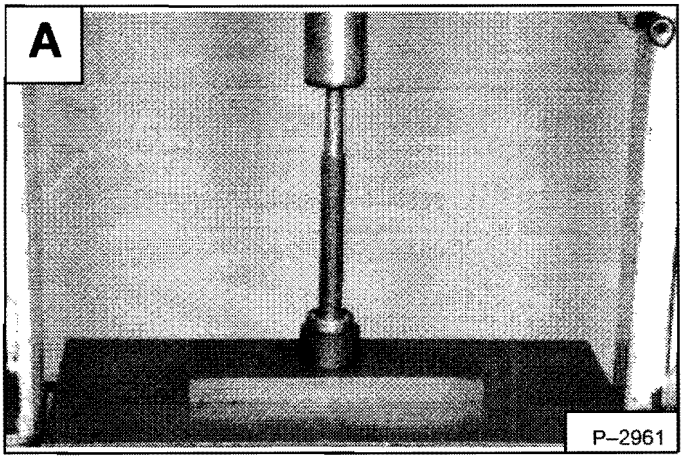
NOTE: Do not install the seals and cap in the housing until after the backlash has been checked.

NOTE: Use care when pressing the bearings into the aluminum housing. The housing can be damaged if too much pressure is used.

NOTE: For procedures requiring the use of LOCTITE adhesive, thoroughly clean and dry affected parts before the application of LOCTITE.

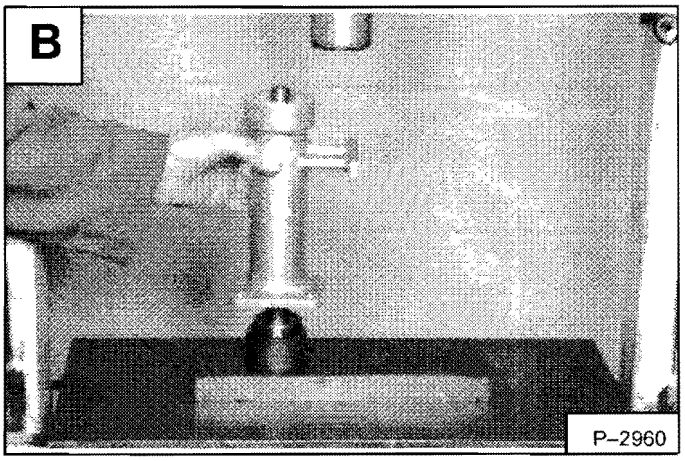
Long Housing

Press a bearing on the short keyed end of the long shaft **[A]**.



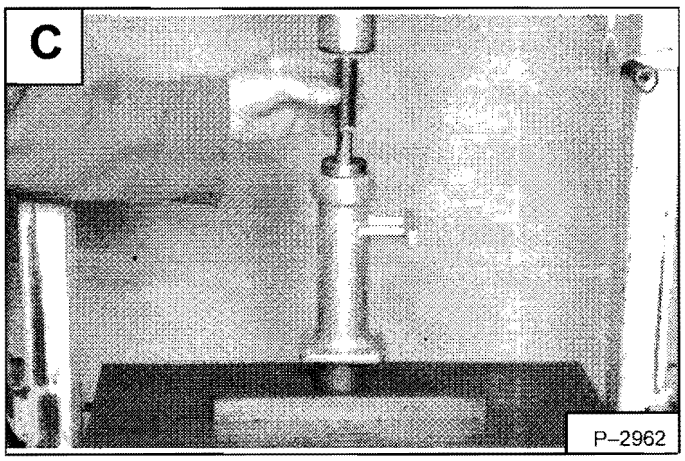
Install the long housing on the shaft **[B]**.

Be sure the bearing is seated in the bore at the lower end of the housing.

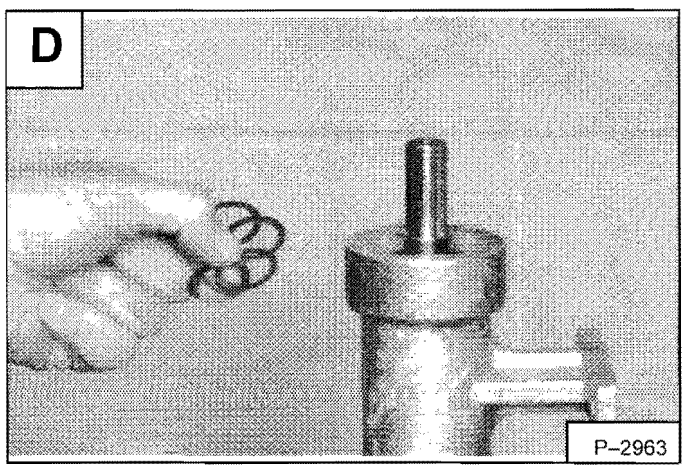


Install a bearing on the long keyed end of the shaft **[C]**.

Support the lower bearing and press the other bearing in the housing until the bearings seat in the housing **[C]**.



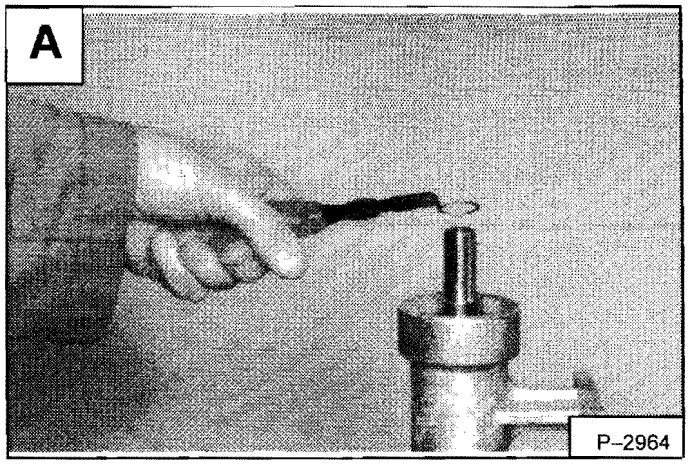
Install on the bearing, the same number and size shims that were removed during disassembly **[D]**.



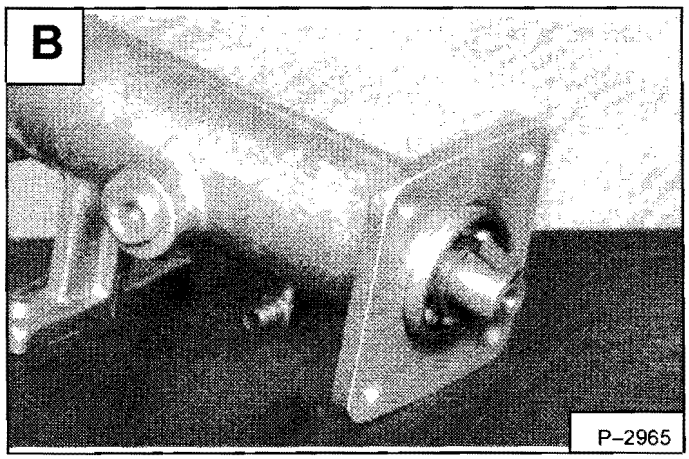
FAN GEARBOX (Cont'd)

Assembly (Cont'd)

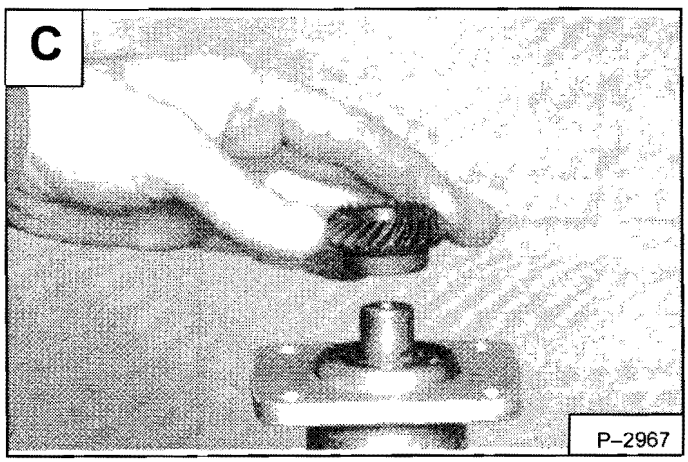
Install the small snap ring in the groove above the shims **[A]**.



Install the gear key in the flange end of the shaft **[B]**.

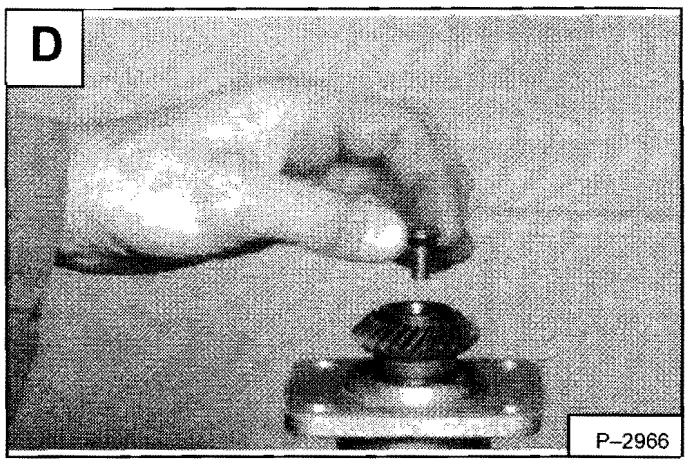


Align the key and gear. While supporting the bearing on the other end, press the gear on the shaft until it seats against the bearing **[C]**.



Install the washer **[D]**.

Put liquid adhesive (LOCTITE 242) on the screw threads. Install and tighten the screw **[D]**.

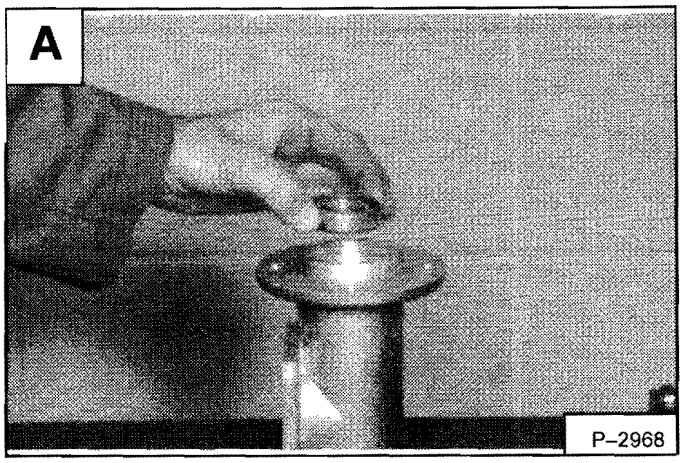


FAN GEARBOX (Cont'd)

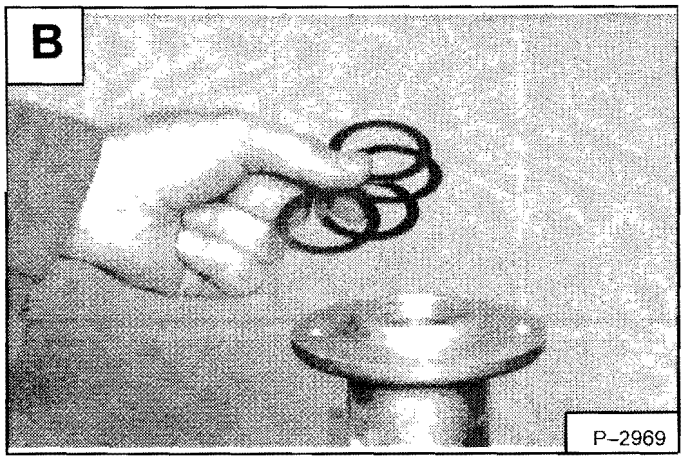
Assembly (Cont'd)

Short Housing

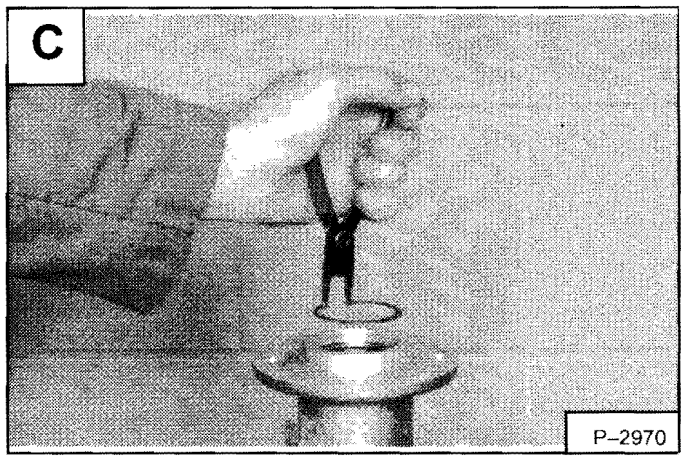
Install a bearing in the flanged end of the housing **[A]**.



Install the large shims on the bearing (flanged end) **[B]**.

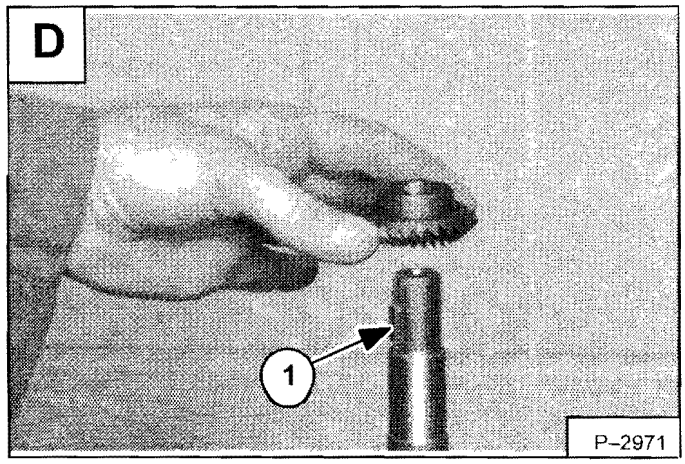


Install the large snap ring in the groove above the shims **[C]**.



Install the short key (Item 1) **[D]**.

Align and press the gear on the shaft (teeth toward the tapered end of the shaft) **[D]**.

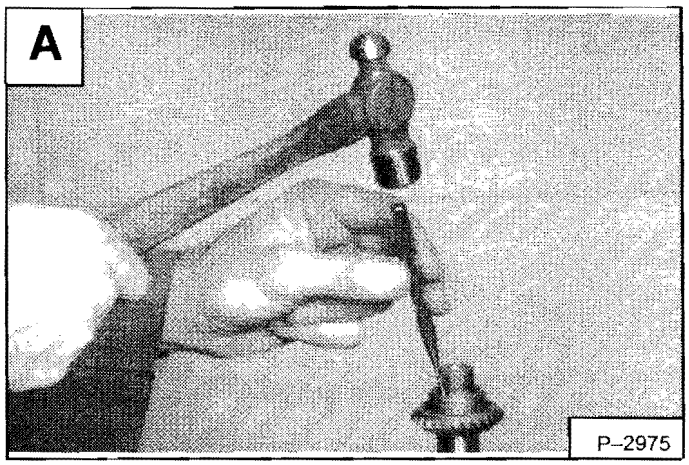


FAN GEARBOX (Cont'd)

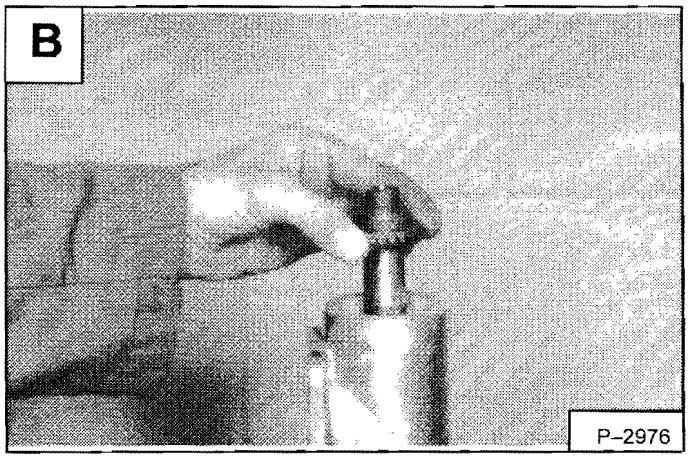
Assembly (Cont'd)

After the gear is seated, drive the key down inside the gear key way **[A]**.

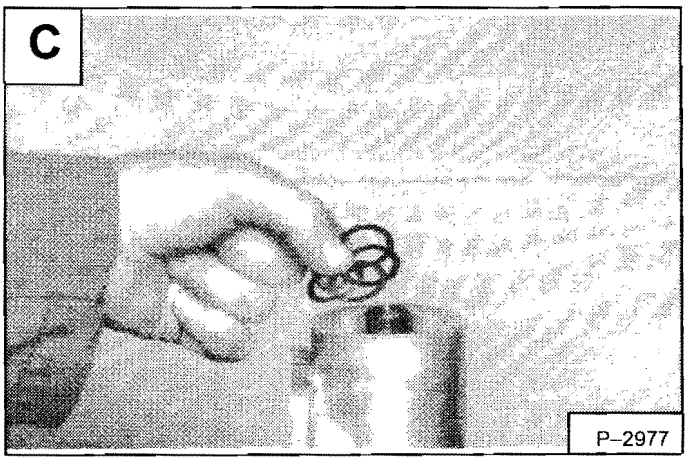
NOTE: This will prevent damage to the shims when the bearing is installed later.



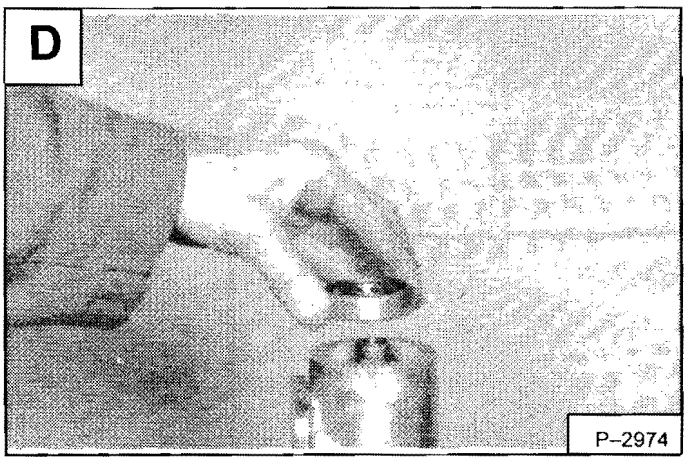
Install the shaft in the housing, tapered end in the bearing at the round flange end of the housing **[B]**.



Install on the shaft, the same number and size shims that were removed during disassembly **[C]**.



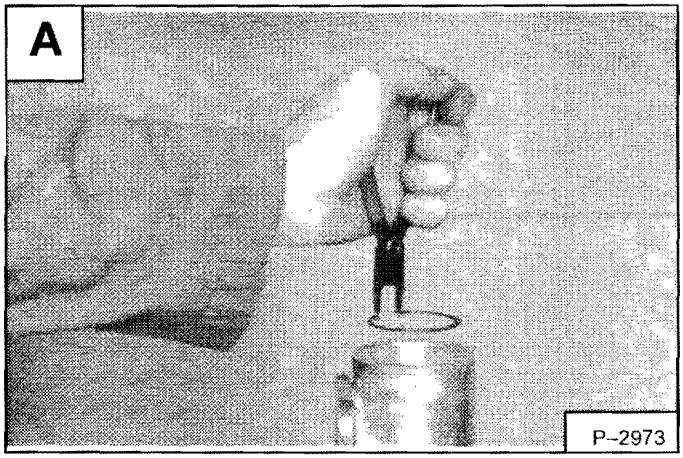
Install a bearing on the gear end of the shaft **[D]**.



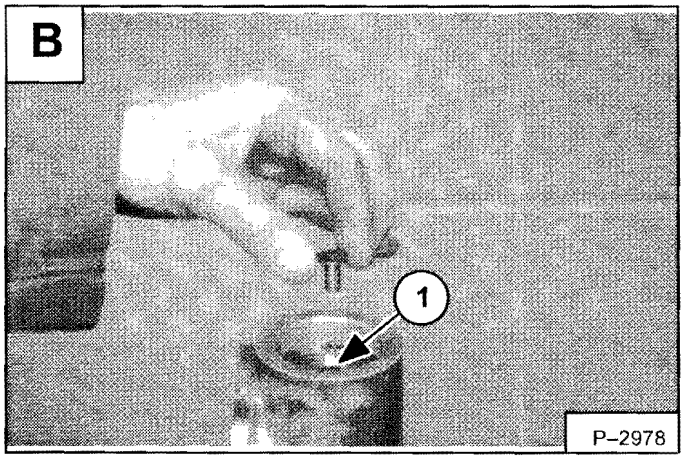
FAN GEARBOX (Cont'd)

Assembly (Cont'd)

Install the snap ring in the groove above the bearing **[A]**.



Install the washer (Item 1) **[B]** on the shaft. Put liquid adhesive (LOCTITE 242) on the screw threads and install the screw **[B]**.



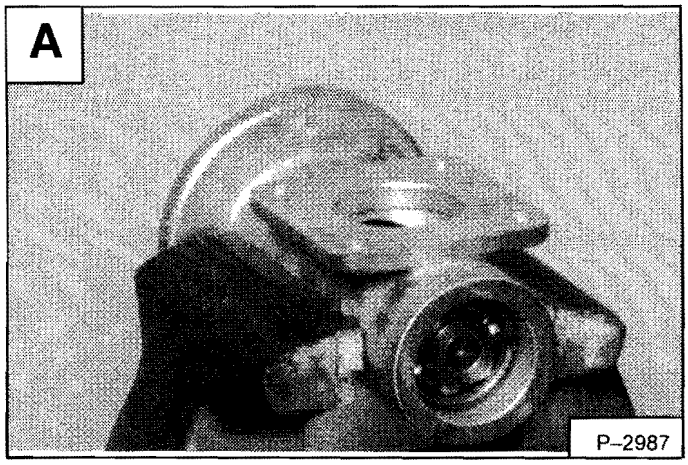
Checking Backlash

NOTE: For procedures requiring the use of LOCTITE adhesive, thoroughly clean and dry affected parts before the application of LOCTITE.

The backlash tolerance between the gears should be 0.005–0.008 inch (0,127–0,203 mm).

To check the gear backlash use the following procedure:

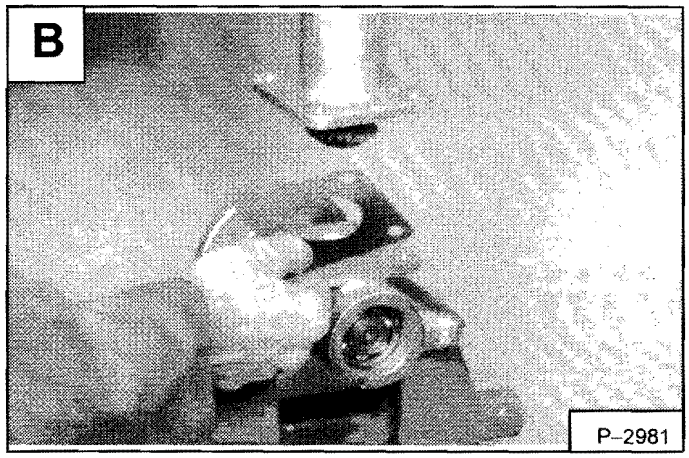
Put the short housing in a vise, square flange facing up as shown **[A]**.



Install the same size and number of square shims (if present during disassembly) between the two housings **[B]**.

Set the long housing on the short housing with a small amount of liquid adhesive (LOCTITE 242) between the mounting surfaces.

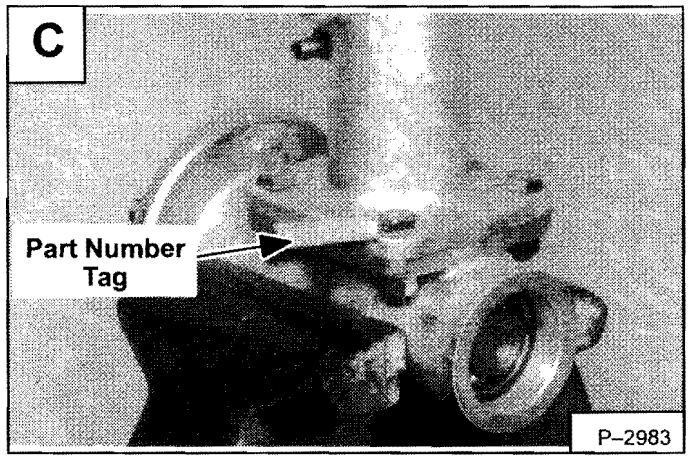
NOTE: If square shims are used, put a small amount of the liquid adhesive on both sides of all shims.



Install the four mounting bolts through the flange holes **[C]**.

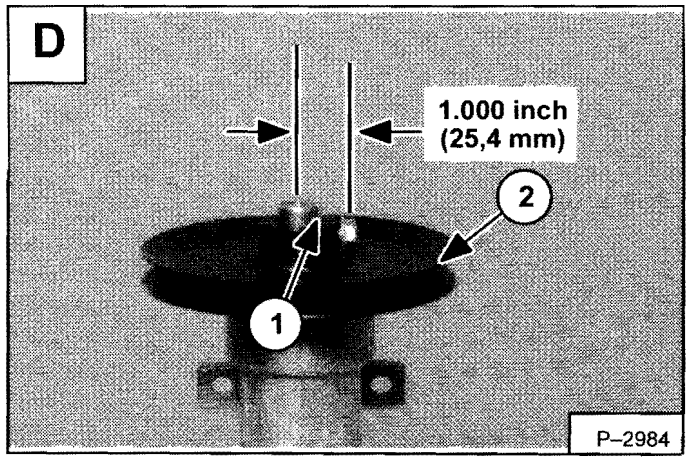
Install the part number tag **[C]**.

Install and tighten the nut to 25–28 ft.–lbs. (34–38 Nm) torque.



Install the long key (Item 1) **[D]** and the pulley (Item 2) **[D]**.

Install a bolt in the set screw hole to maintain a 1.000 inch (25,4 mm) distance from the shaft center to the bolt head (to be used with a dial indicator) **[D]**.

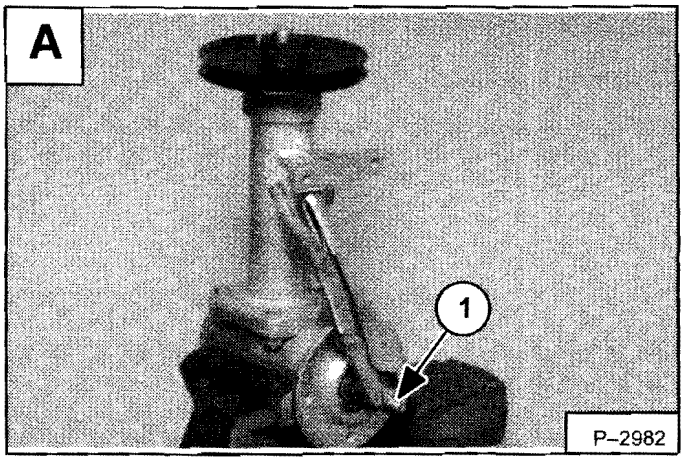


FAN GEARBOX (Cont'd)

Checking Backlash (Cont'd)

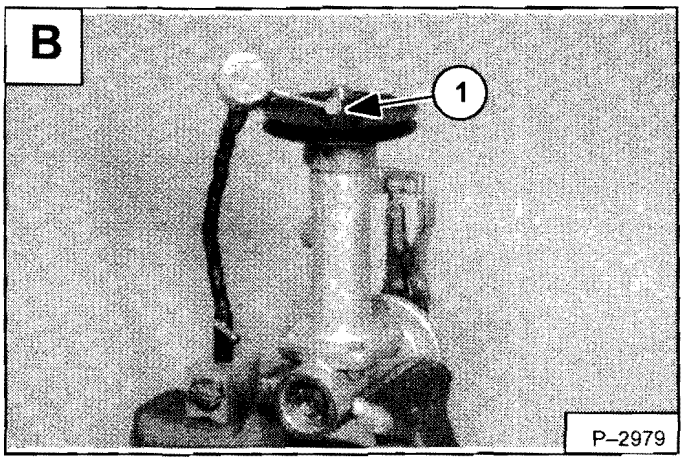
Put the fan nut (Item 1) **[A]** on the shaft and tighten snugly.

Install a locking pliers on the fan nut and support the handle against the long housing **[A]**.



Using a magnetic based dial indicator mounted on a bench vise, touch the dial stem on the bolt (Item 1) **[B]**.

Hold the locking pliers against the long housing and rotate the pulley back and forth to read the dial gauge **[B]**.



If the backlash is GREATER than 0.008 inch (0,203 mm), do the following:

1. Remove a square shim(s) (if present) between the two housings.
2. Remove a large shim(s) from the tapered end of the short shaft and add a small shim(s) of the same thickness between the bearing and the gear on the screw end of the shaft.

If the backlash is LESS than 0.005 inch (0,127 mm) do the following:

1. Add a square shim(s) between the two housings.
2. Remove a small shim(s) between the bearing and the gear on the screw end of the short shaft and add a large shim(s) of the same thickness between the snap ring and the bearing on the tapered end of the shaft.

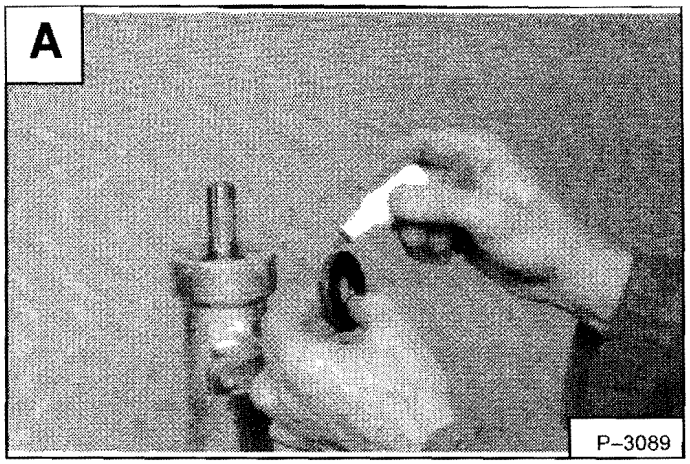
FAN GEARBOX (Cont'd)

Checking Backlash (Cont'd)

When the backlash is correct, install the seals, cap and gear oil as follows:

Remove the bolts from the flanges and separate the two housings.

Put liquid adhesive (LOCTITE 242) on the outside diameter of the seal(s) **[A]**.



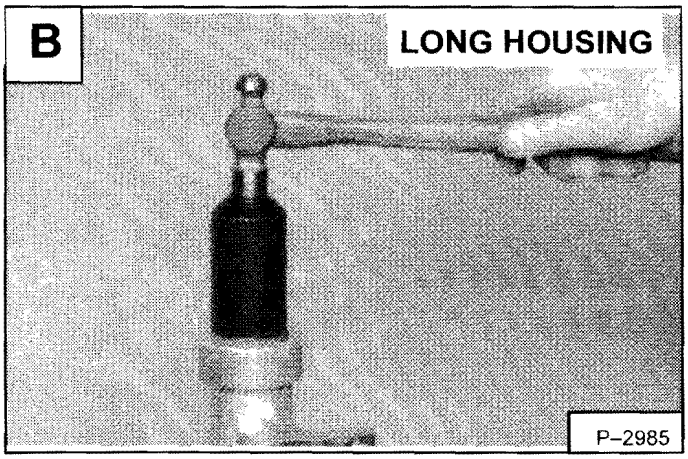
Install the seal(s) flush with the housing surface **[B]** & **[C]**.

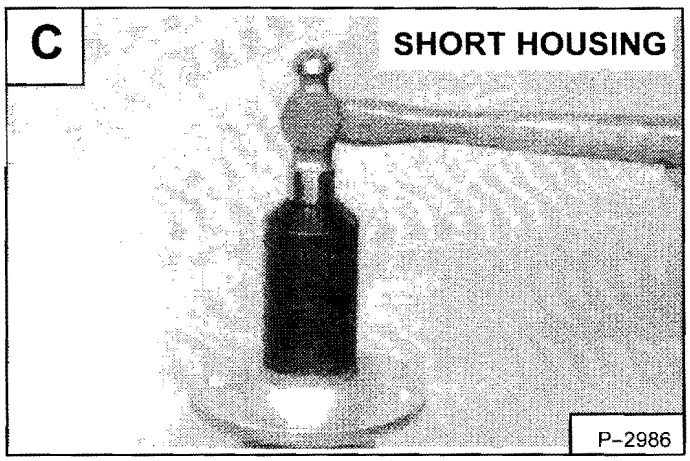
Clean any oil from the flange surface.

Install the long housing on the short housing flange.

Install the four bolts and part number tag.

Install and tighten the nuts to 25–28 ft.–lbs. (34–38 Nm) torque.





ENGINE

Removal and Installation

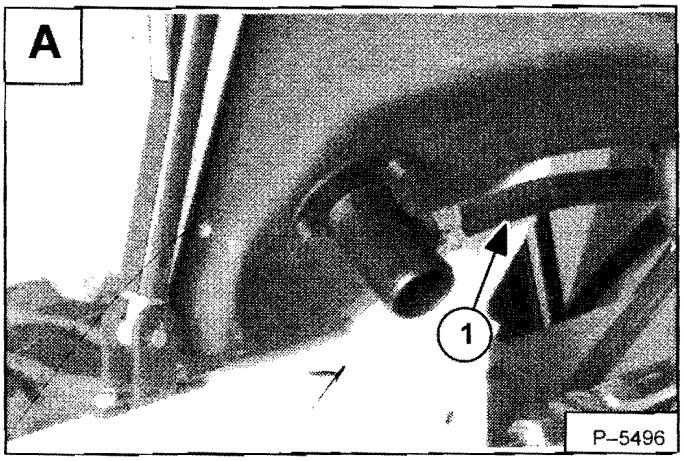
Raise the lift arms and install an approved lift arm support device (Page 1–1).

Raise the operator cab (Page 1–1).

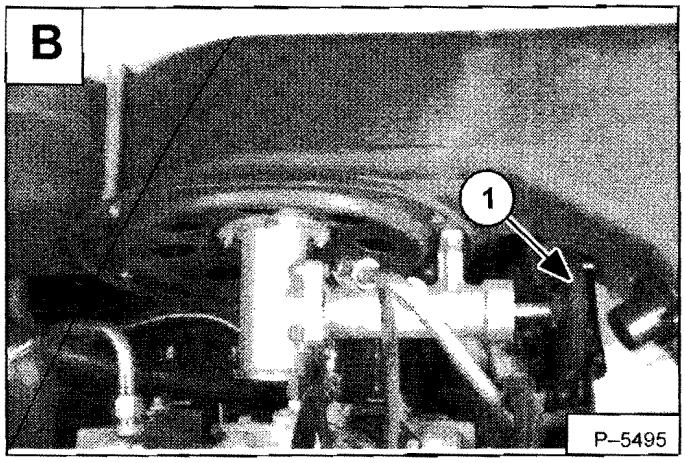
Drain the fluid from the hydraulic reservoir (Page 2–1).

Remove the hydraulic/hydrostatic filters mounting bracket assembly (Page 2–1).

Disconnect the air vent hose (Item 1) **[A]** from the fuel fill neck.



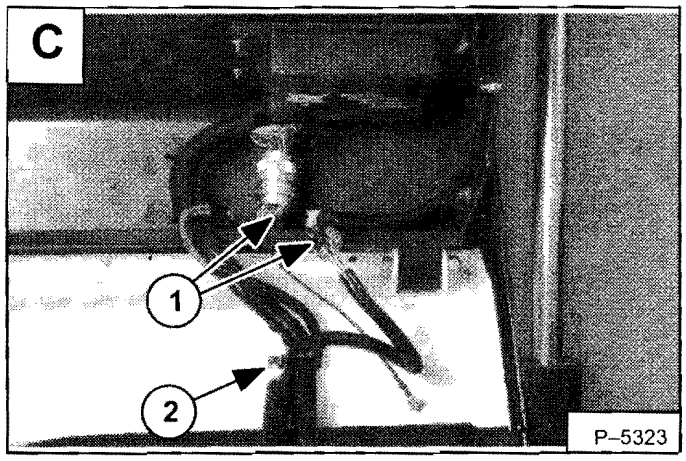
Remove the fan drive belt (Item 1) **[B]**.



Disconnect the engine wiring harness (Item 1) **[C]** from the operator cab wiring harness.

Remove the bolt (Item 2) **[C]** from the harness mounting clamp.

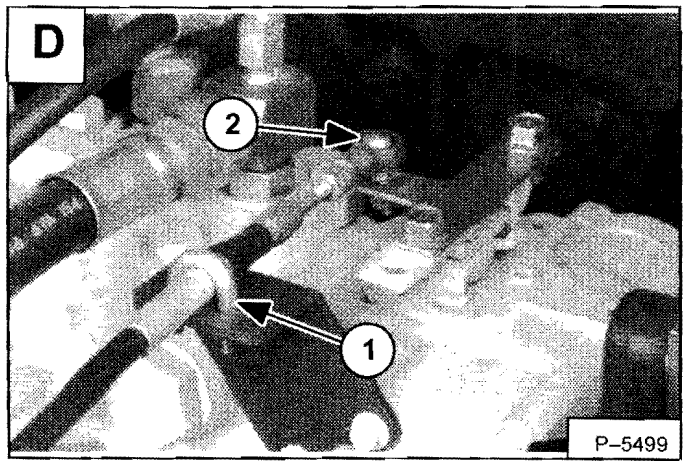
NOTE: The electrical harness will be removed with the engine.



Remove the u–bolt (Item 1) **[D]** at the steering cable (both sides).

Disconnect the steering cable end (Item 2) **[D]** from the hydrostatic pump lever (both sides).

Installation: See Page 3–1 for transmission neutral adjustment.



Revised Version 11.2.97

ENGINE/HYDROSTATIC PUMP ASSEMBLY

Removal and Installation

The engine and hydrostatic pumps will be removed as an assembly

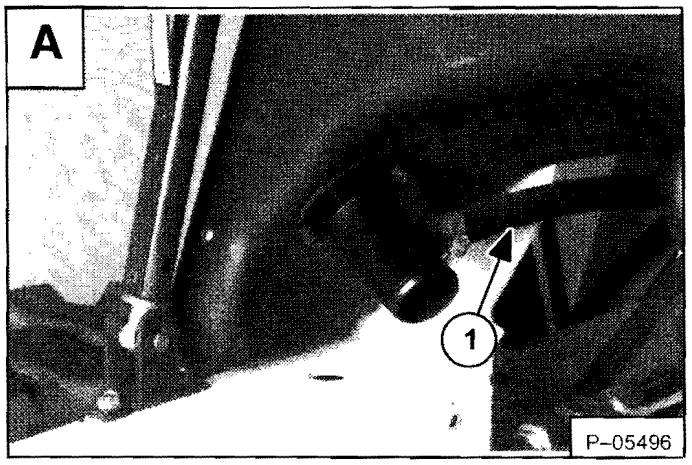
Raise the lift arms and install an approved lift arm support device. (See Page 1–1.)

Raise the operator cab. (See Page 1–1.)

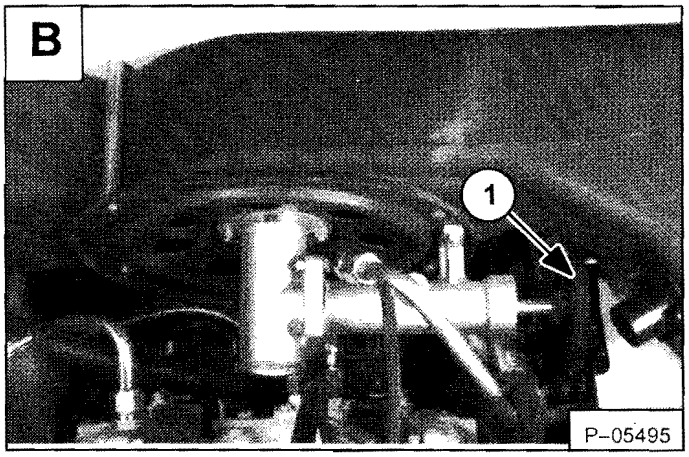
Drain the fluid from the hydraulic reservoir. (See Page 2–1.)

Remove the hydraulic/hydrostatic filters mounting bracket assembly. (See Page 2–1.)

Disconnect the air vent hose (Item 1) **[A]** from the fuel fill neck.



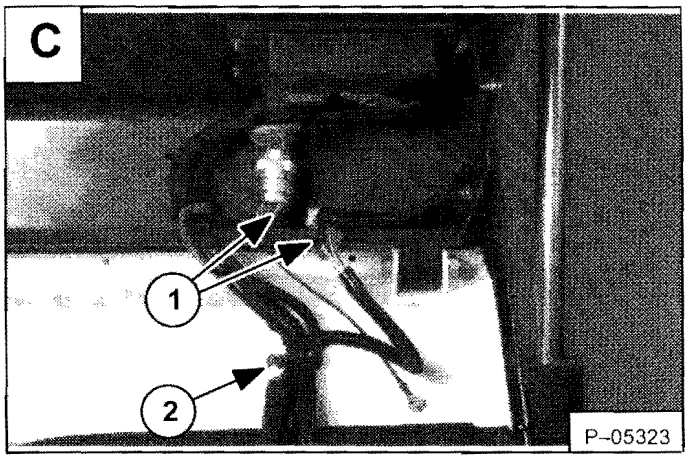
Remove the fan drive belt (Item 1) **[B]**.



Disconnect the engine wiring harness (Item 1) **[C]** from the operator cab wiring harness.

Remove the bolt (Item 2) **[C]** from the harness mounting clamp.

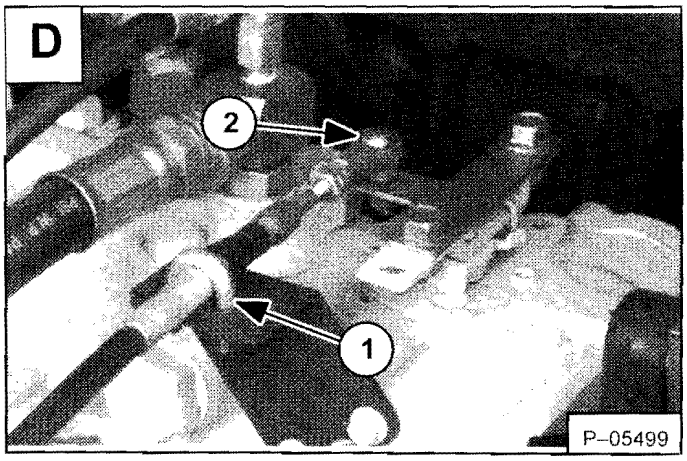
NOTE: The electrical harness will be removed with the engine.



Remove the u–bolt (Item 1) **[D]** from the steering cable (both sides).

Disconnect the steering cable end (Item 2) **[D]** from the hydrostatic pump lever (both sides).

Installation: See Page 3–1 for transmission neutral adjustment.



Removal and Installation (Cont'd)

IMPORTANT

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

I–2003–0284

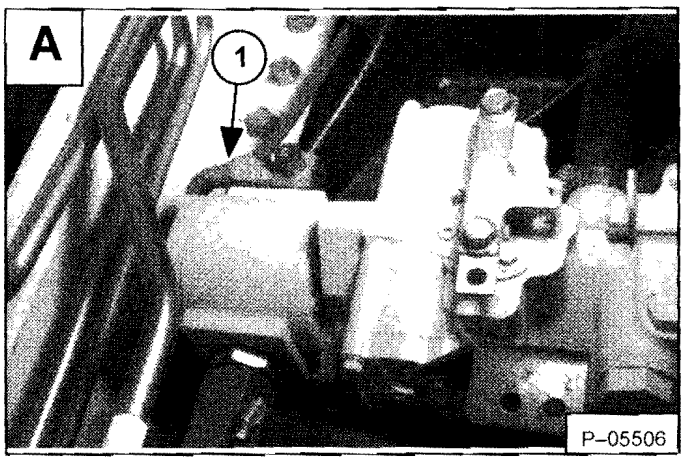
Disconnect the outlet hose (Item 1) **[A]** from the hydraulic pump.

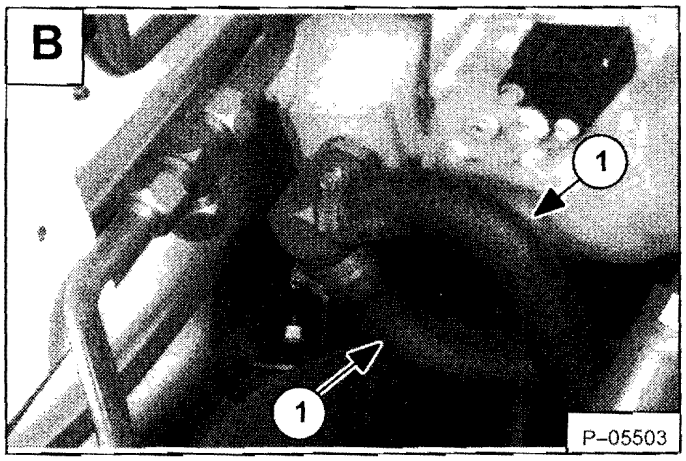
Disconnect both inlet hoses (Item 1) **[B]** from the hydraulic pump.

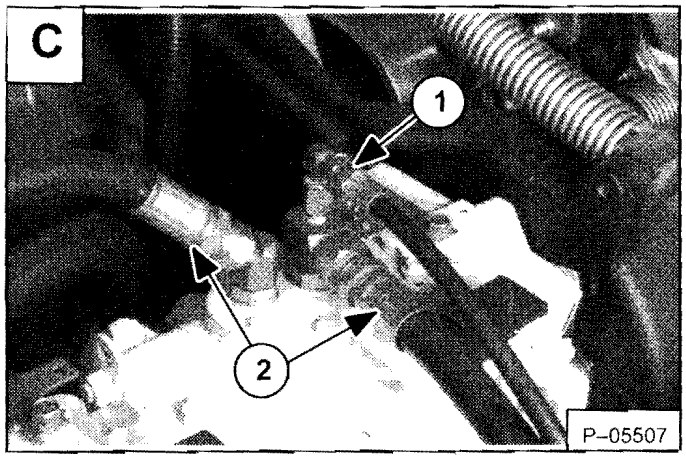
Disconnect the small hose (Item 1) **[C]** from the hydrostatic pump.

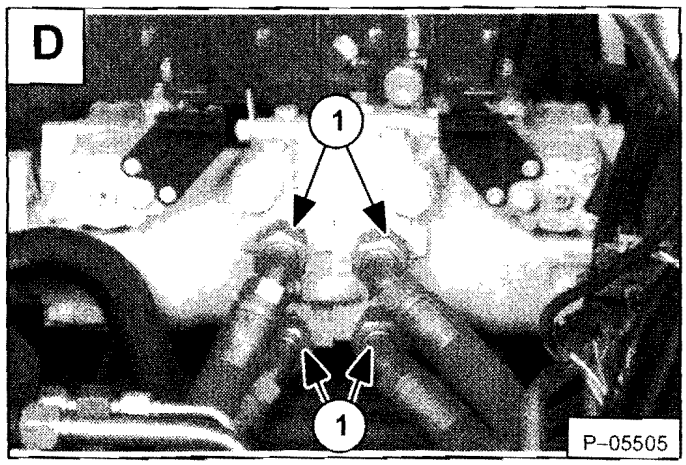
Disconnect the two larger hoses (Item 2) **[C]** from the hydrostatic pump.

Disconnect the four high pressure hoses (Item 1) **[D]** from the hydrostatic pumps.



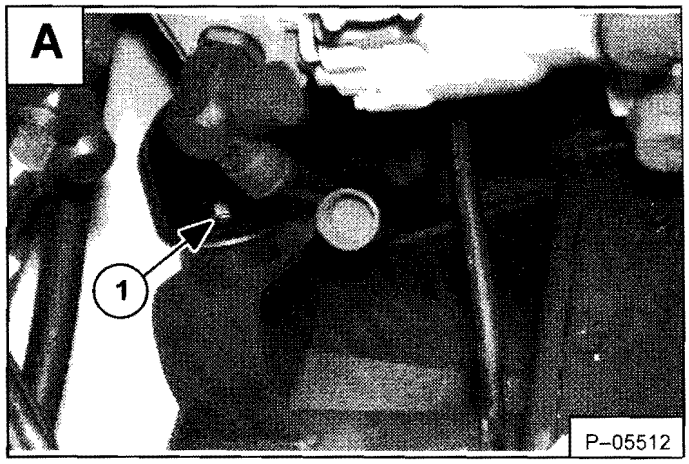






Removal and Installation (Cont'd)

Remove the bolt and nut (Item 1) **[A]** at the right front engine mount.



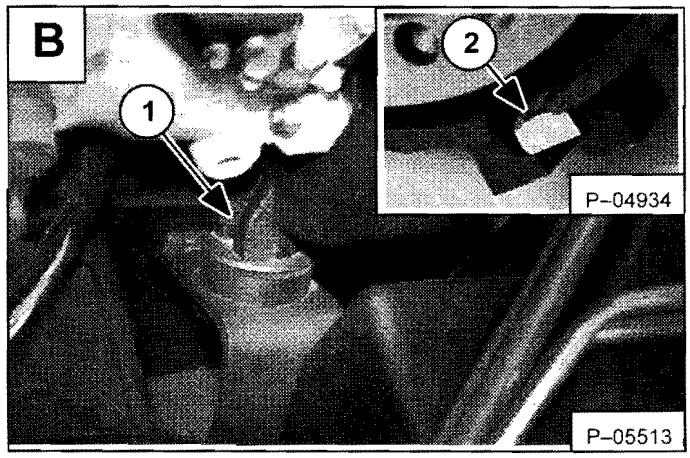
Remove the bolt (Item 1) **[B]** at the left front engine mount.

NOTE: The nut (Item 2) [B] is held in the housing and will not turn.

Installation: Tighten the mounting bolts and nuts to 61–69 ft.–lbs. (83–94 Nm) torque.

Disconnect fuel level sender wire connector at the fuel tank.

Disconnect the fuel return hose at the fuel tank.



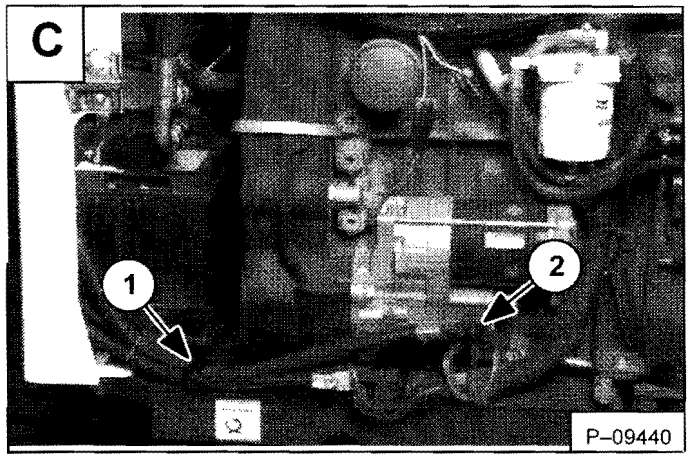
Disconnect the engine ground cable (Item 1) **[C]**.

Disconnect the positive (+) cable (Item 2) **[C]** at the starter.

Remove the battery. (See Page 6–1.)

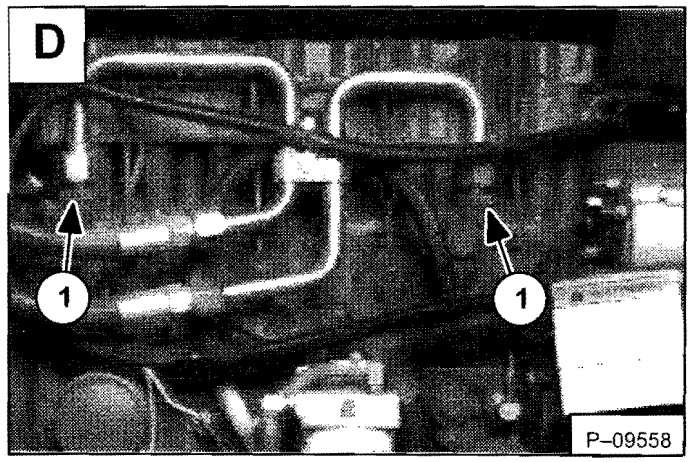
Remove the engine muffler. (See Page 7–6.)

Remove the air cleaner housing. (See Page 7–7.)



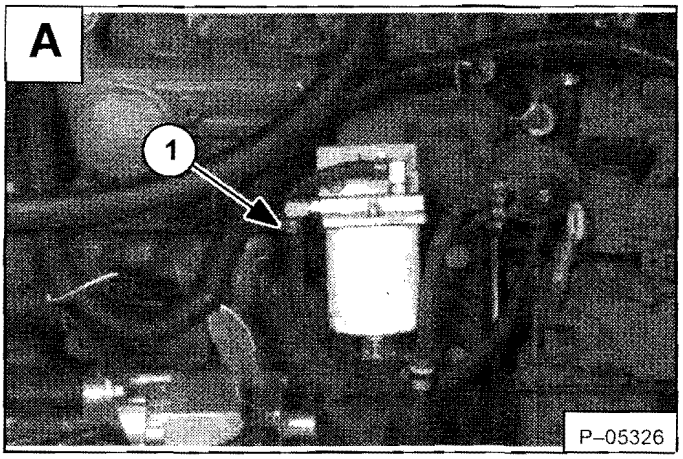
Disconnect the hoses (Item 1) **[D]** at the engine and drain the oil from the oil cooler into a container.

NOTE: Measure the amount of oil removed from the oil cooler and/or engine. Add the same amount of oil to the engine crankcase when adding engine oil.



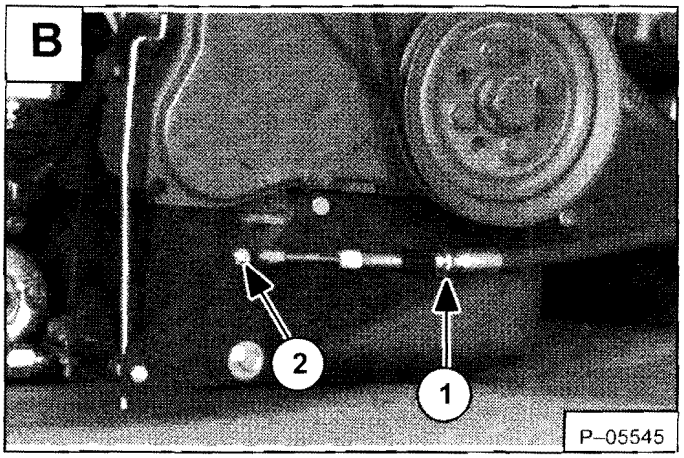
Removal and Installation (Cont'd)

Disconnect the fuel hose (Item 1) **[A]** from the fuel filter.



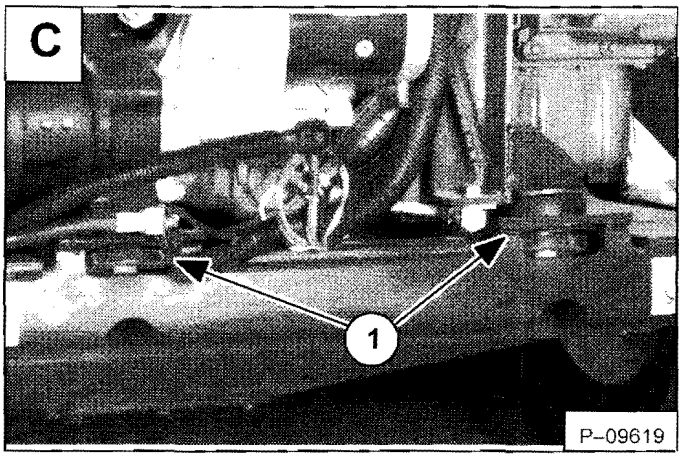
At the right side of the engine, remove the u–bolt (Item 1) **[B]** from the throttle cable.

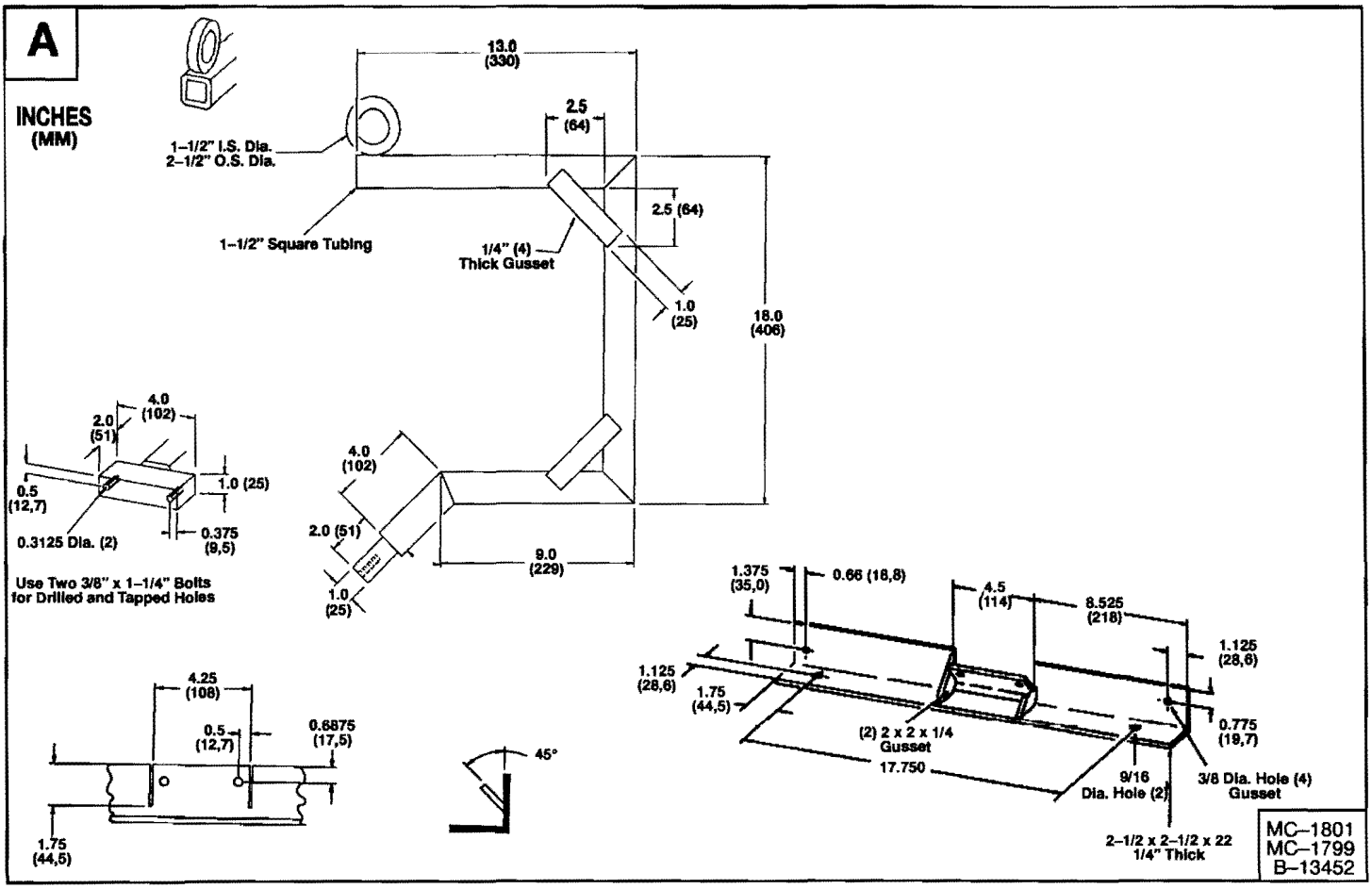
Disconnect the cable end (Item 2) **[B]** at the linkage.



Remove the left and right rear engine mounting bolts (Item 1) **[C]** and nuts.

Installation: Tighten the bolts and nuts to 61–69 ft.–lbs. (83–94 Nm) torque.





ENGINE (Cont'd)

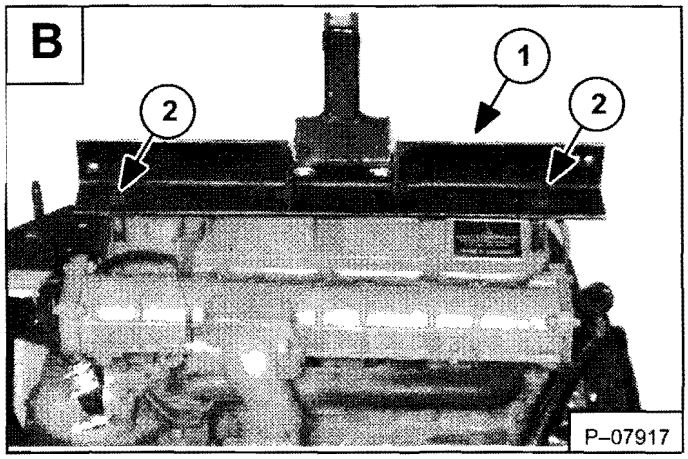
Removal and Installation (Cont'd)

Use the dimensions from figure **[A]** to make engine removal and installation brackets.

Install the lift bracket (Item 1) **[B]** on the engine.

Tighten the bolts (Item 2) **[B]** until the lift bracket is held firmly against the valve cover.

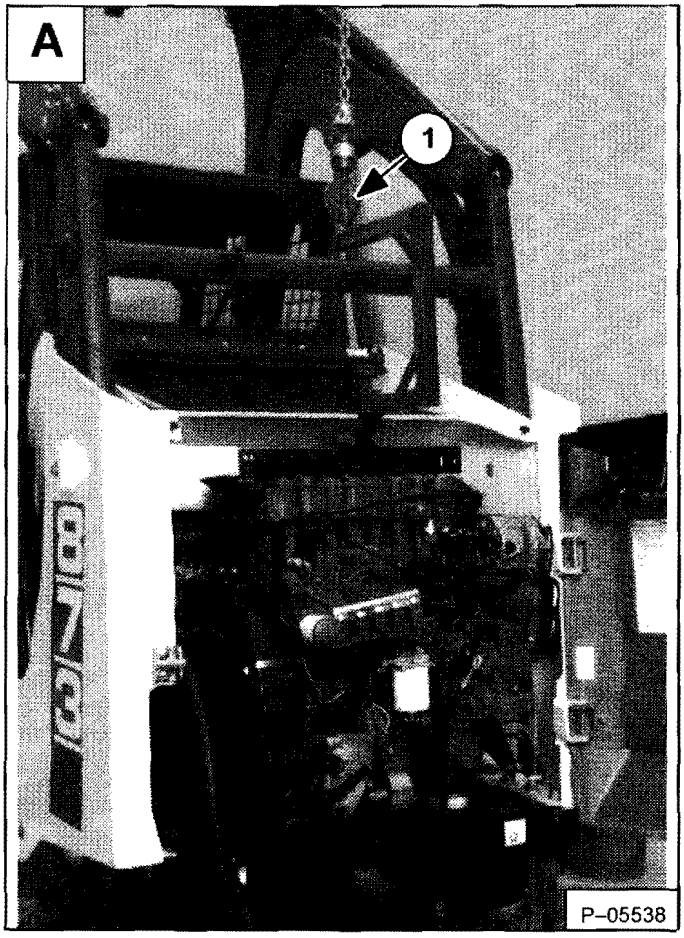
NOTE: Bolts required are two 12 x 80 mm x 1.75 threads.



Removal and Installation (Cont'd)

Connect a chain hoist to the ring (Item 1) **[A]** on the lift bracket.

Remove the engine/hydrostatic pump assembly from the loader **[A]**.



ENGINE MOUNTS

Replacement

Use the following procedure to install new engine mounts:

Remove the existing mount from the engine. Refer to engine removal and installation for engine mount locations.

Replace all four engine mounts (two front and two rear).

Use the parts shown to install the new engine mounts **[A]**.

Item 1 – Square Nut – Used on left side engine mounts

Item 2 – Hex Nut – Used on right side engine mounts

Item 3 – Mount Washer

Item 4 – Engine Mount

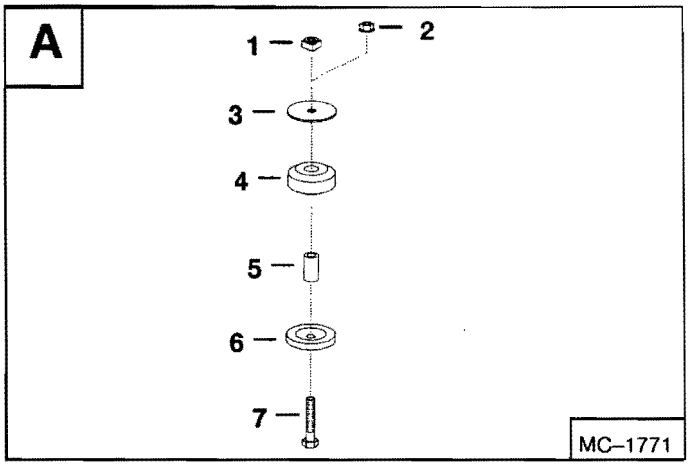
Item 5 – Tube Spacer

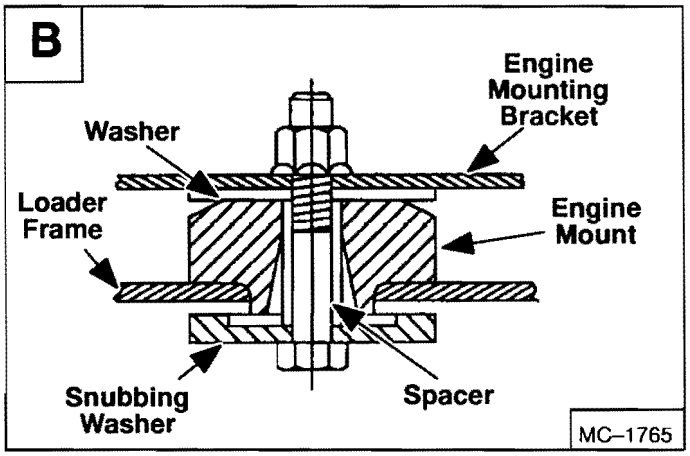
Item 6 – Snubbing Washer

Item 7 – Mounting Bolt

Install the new engine mount as shown in the cut away side view **[B]**.

Tighten the mounting bolts to 61–69 ft.–lbs. (83–94 Nm) torque.





ENGINE

Removal and Installation

The following procedure for engine removal and installation the hydrostatic pump assembly and front mounts will be left in place.

Remove the side access covers.

Remove the battery. (See Page 6–1.)

Remove the air cleaner housing. (See Page 7–7.)

Remove the relay bracket/relay assembly and leave connected to the engine wiring harness.

Remove the drive belt cover. (See Page 3–1.)

Remove the drive belt. (See Page 3–1.)

Remove the starter. (See Page 6–1.)

Remove the flywheel. (See Page 7–36.)

NOTE: The rear door is removed for photo clarity only.

Remove the alternator belt cover (Item 1) **[A]**.

Remove the fuses/bracket assembly (Item 2) **[A]**.

Disconnect the glow plug(s), alternator, senders and route the engine wiring harness to the left side of the engine.

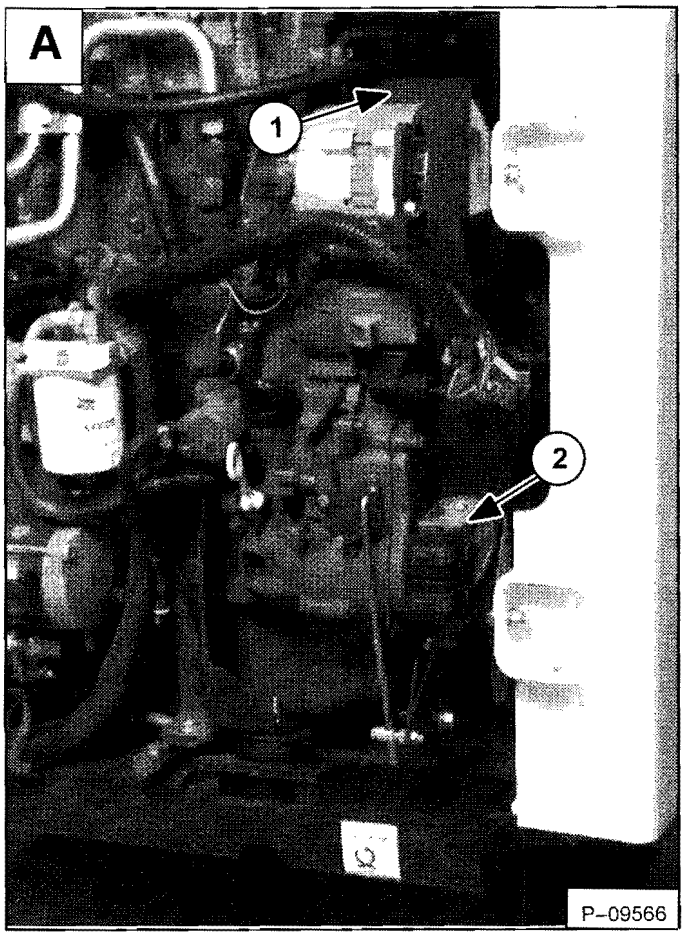
Remove the alternator. (See Page 6–1.)

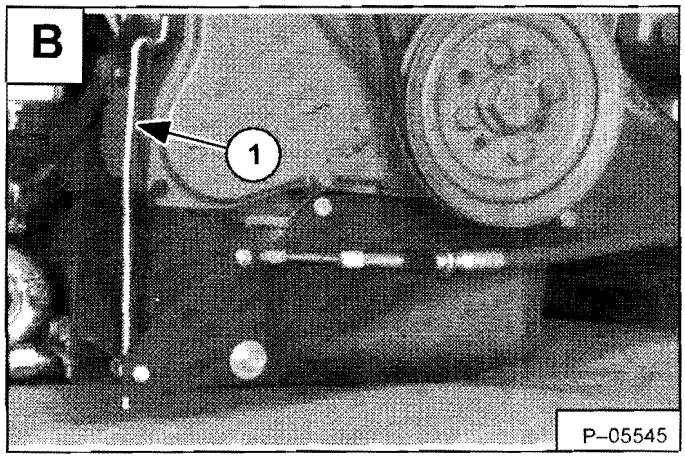
Remove the muffler. (See Page 7–6.)

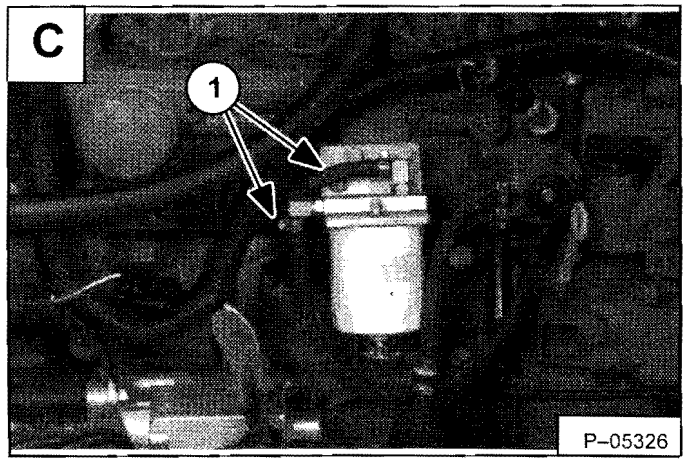
Disconnect the throttle rod (Item 1) **[B]**.

Remove the throttle cable bracket complete with the bellcrank **[B]**.

Disconnect the the fuel hoses (Item 1) **[C]**.







GLOW PLUG

Checking the Glow Plug

Early S/N Loaders:

Early S/N loaders use a intake manifold heater (Glow Plug). Figure **[A]** shows the two mounting locations possible. Locate the glow plug on your loader.

Location one: On the front side of engine facing the right side of loader. Raise the operator cab. (See page 1–1).

Location two: On the top of engine facing the rear of loader. Remove the engine muffler. (See page 7–1).

Disconnect the wire to the glow plug.

Use a testmeter to measure the resistance of the glow plug.

Connect the testmeter lead to the terminal of the glow plug **[B]**.

Touch the other lead from the testmeter to the intake manifold **[B]**.

The reading must be approximately 0.4 ohms.

If the resistance is zero ohms the glow plug has a short circuit.

If the resistance is infinite, the coil of the glow plug is broken.

Replace the glow plug if needed. Tighten the glow plug to 15–18 ft.–lbs. (20–24 Nm) torque.

Late S/N Loaders:

Late S/N loaders use four glow plugs, one for each cylinder. The glow plugs are located on the rear side of engine in the cylinder head as shown if figure **[C].**

Unplug the wire from the glow plug (Item 1) **[C].**

Use a testmeter to measure the resistance of the glow plug.

Connect the testmeter lead to the terminal of the glow plug **[D]**.

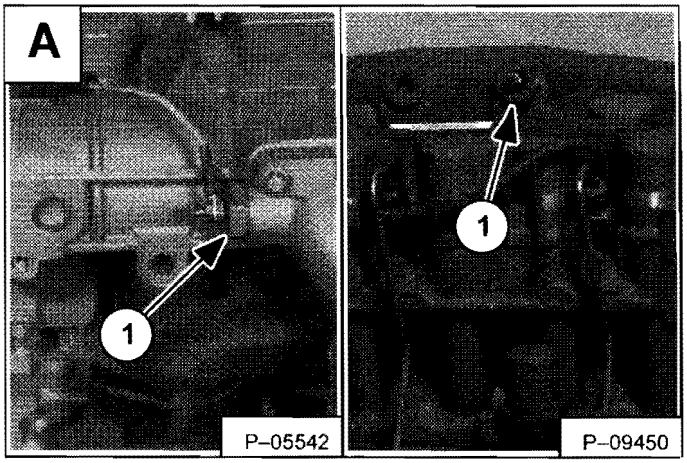
Touch the other lead from the testmeter to the base of the glow plug **[B]**.

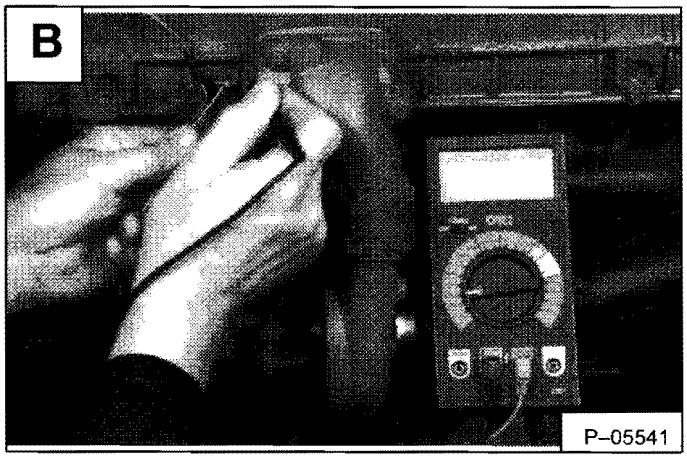
The reading must be approximately 0.2 ohms.

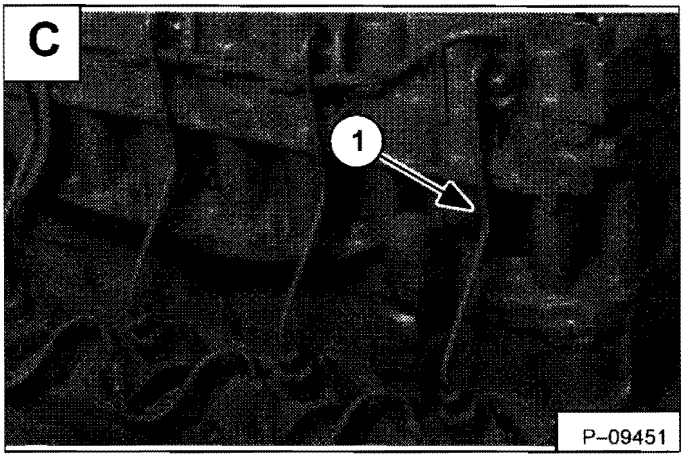
If the resistance is zero ohms the glow plug has a short circuit.

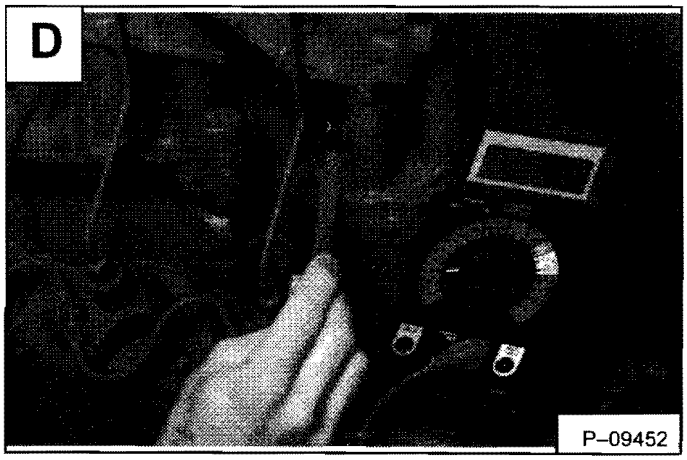
If the resistance is infinite, the coil of the glow plug is broken.

Replace the glow plug if needed.









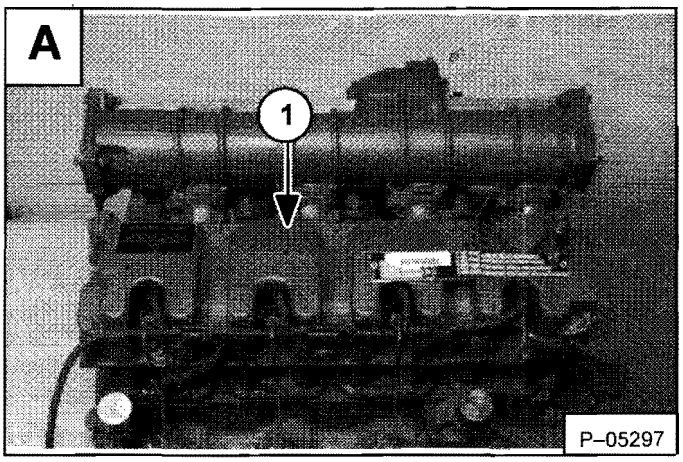
VALVE CLEARANCE

Adjustment

Make the valve clearance adjustment with engine stopped and cold.

Remove the valve cover (Item 1) **[A]**.

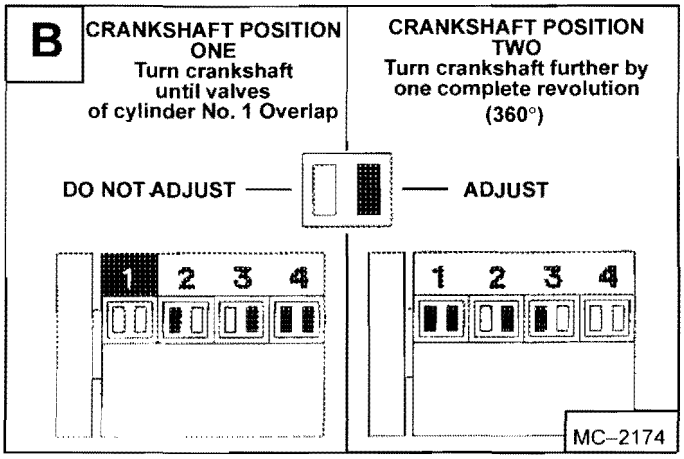
When installing the valve cover bolts, tighten the bolts to 75 in.–lbs. (8,5 Nm) torque.



Use the following sequence as shown in figure **[B]** to set the valve clearance.

Turn the crankshaft until the valves of cylinder No. 1 over–lap **[B]**.

Turn the crankshaft by one complete revolution (360°) and set the other valves.



Loosen the locknut and turn the set screw until the clearance is correct.

Intake – 0.012 inch (0,3 mm)
Exhaust – 0.020 inch (0,5 mm)

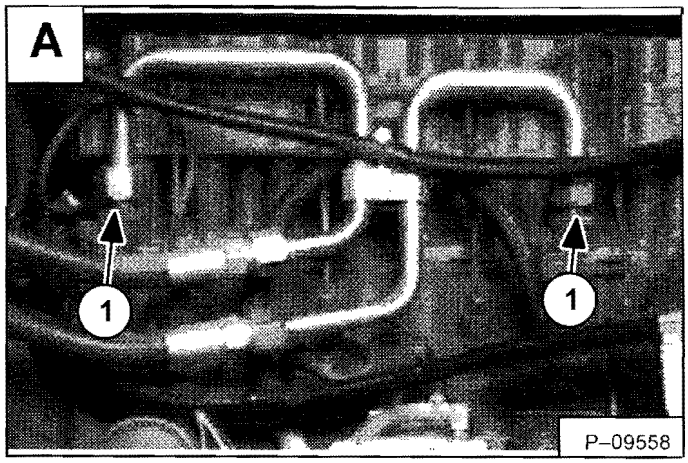
Tighten the locknut to 49–59 in.–lbs. (5,5–6,7 Nm) torque.

Removal and Installation (Cont'd)

Disconnect the heater hoses (if so equipped).

Disconnect the hoses (Item 1) **[A]** at the engine and drain the oil from the oil cooler into a container.

NOTE: Measure the amount of oil removed from the oil cooler and/or engine. Add the same amount of oil to the engine oil pan when adding engine oil.

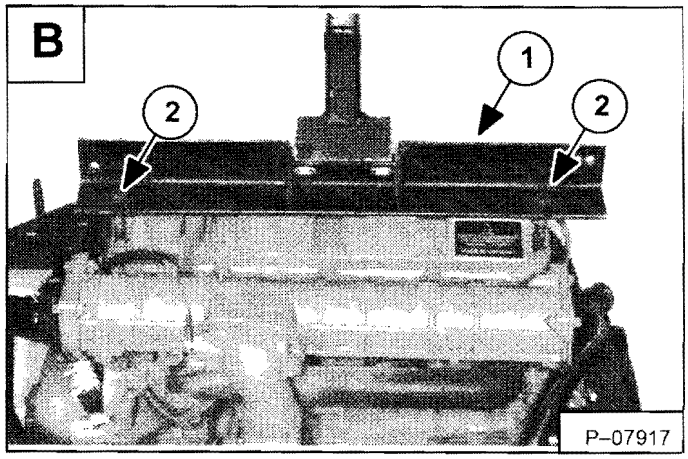


Install the engine lift bracket (Item 1) **[B]** on the engine. (See Page 7–31 for lift bracket dimensions.)

Tighten the bolts (Item 2) **[B]** until the lift bracket is held firmly against the valve cover.

NOTE: Bolts required are two 12 x 80 mm x 1.75 threads.

Using a chain hoist, lift the engine a small amount to support the engine weight.



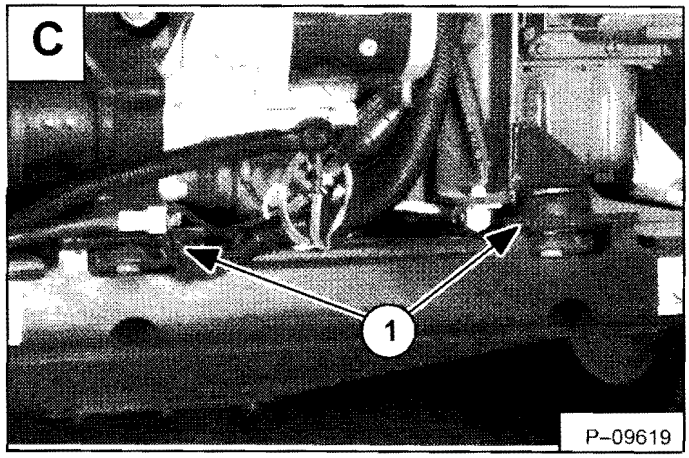
Remove the rear engine mounts (Item 1) **[C]** completely.

Remove the flywheel housing bolts. (See Page 7–36.)

Remove the bolts holding the mount between the crankcase and the hydrostatic pump. Leave the mount attached to the pump per one bolt.

Lift slowly and remove the engine from the engine compartment.

Lower the engine to the floor or work bench. Block the engine to prevent it from tipping.



⚠ WARNING

Engine can tip over. Always block and support components when setting in a work area.

W–2259–0197

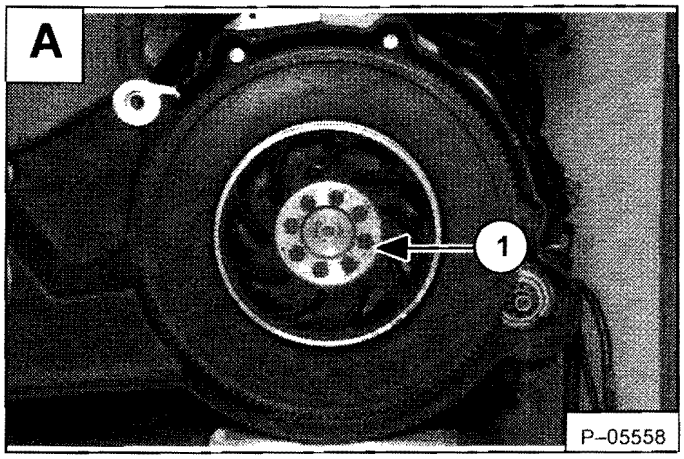
FLYWHEEL

Removal and Installation

Remove the drive belt. (See Page 3–1.)

Remove the bolts (Item 1) **[A]** from the flywheel.

Installation: Tighten the flywheel bolts as follows:
Initial Torque ..... 22 ft.–lbs. (30 Nm)
1st Step Angle ..... 60°
2nd Step Angle ..... 30°



Remove the flywheel from the engine crankshaft **[B]**.

Flywheel Ring Gear

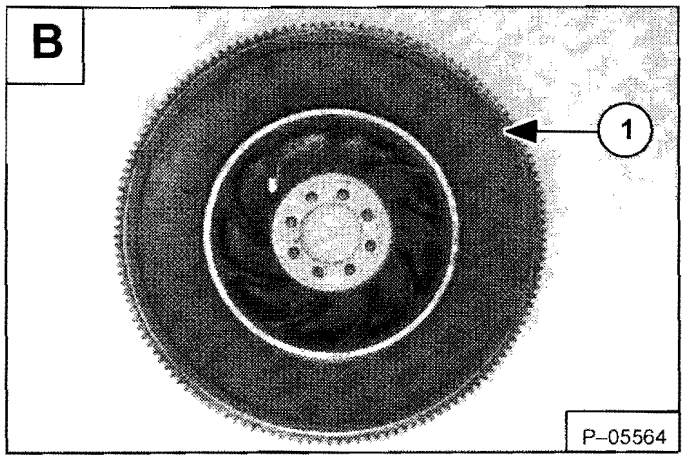
NOTE: The lead chamfer on ring gear tooth must face the starter.

The ring gear (Item 1) **[B]** on the flywheel is an interference fit. Heat the ring gear enough to expand it and hit it with a hammer to remove it evenly.

Clean the outer surface of the flywheel to give it a smooth fit.

Clean the new ring gear and heat it to a maximum temperature of 428°F (220°C).

Fit the ring gear over the flywheel. Make sure the gear is on the seat correctly.



FLYWHEEL HOUSING

Removal and Installation

Remove the drive belt. (See Page 3–1.)

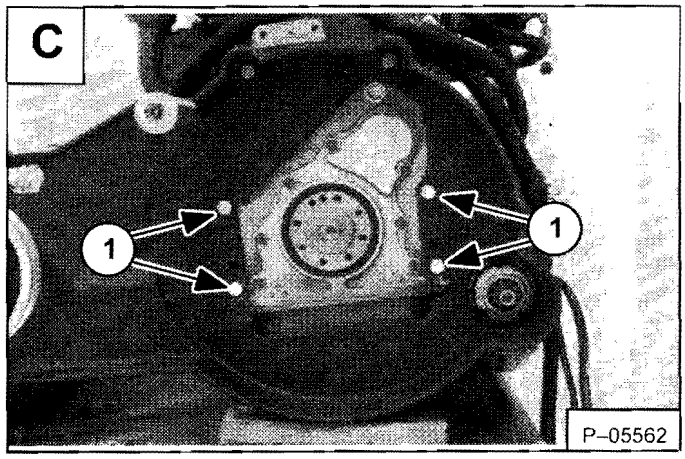
Remove the hydrostatic pump. (See Page 3–1.)

Remove the belt tension pulley assembly. (See Page 3–1.)

Remove the starter. (See Page 6–1.)

Remove the flywheel housing mounting bolts (Item 1) **[C]**.

Remove the flywheel housing from the engine.



GLOW PLUG

Checking the Glow Plug

Early S/N Loaders:

Early S/N loaders use a intake manifold heater (Glow Plug). Figure **[A]** shows the two mounting locations possible. Locate the glow plug on your loader.

Location one: On the front side of engine facing the right side of loader. Raise the operator cab. (See page 1–1).

Location two: On the top of engine facing the rear of loader. Remove the engine muffler. (See page 7–6.)

Disconnect the wire to the glow plug.

Use a testmeter to measure the resistance of the glow plug.

Connect the testmeter lead to the terminal of the glow plug **[B]**.

Touch the other lead from the testmeter to the intake manifold **[B]**.

The reading must be approximately 0.4 ohms.

If the resistance is zero ohms the glow plug has a short circuit.

If the resistance is infinite, the coil of the glow plug is broken.

Replace the glow plug if needed. Tighten the glow plug to 15–18 ft.–lbs. (20–24 Nm) torque.

Late S/N Loaders:

Late S/N loaders use four glow plugs, one for each cylinder. The glow plugs are located on the rear side of engine in the cylinder head as shown if figure **[C].**

Unplug the wire from the glow plug (Item 1) **[C].**

Use a testmeter to measure the resistance of the glow plug.

Connect the testmeter lead to the terminal of the glow plug **[D]**.

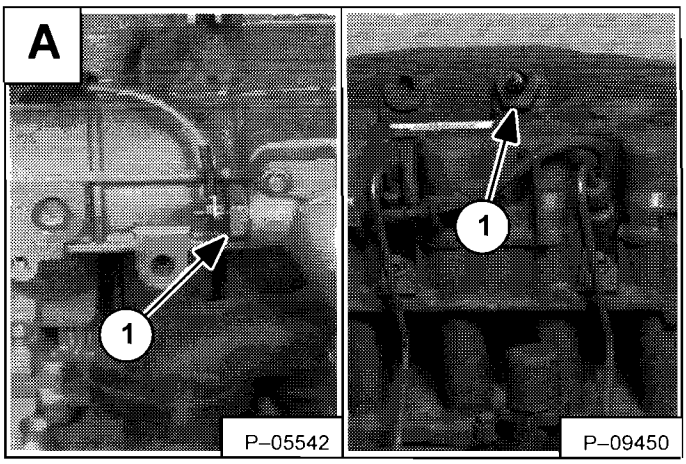
Touch the other lead from the testmeter to the base of the glow plug **[B]**.

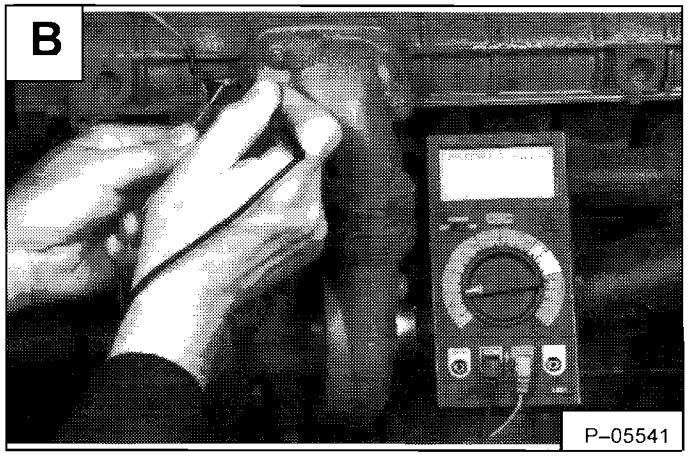
The reading must be approximately 0.2 ohms.

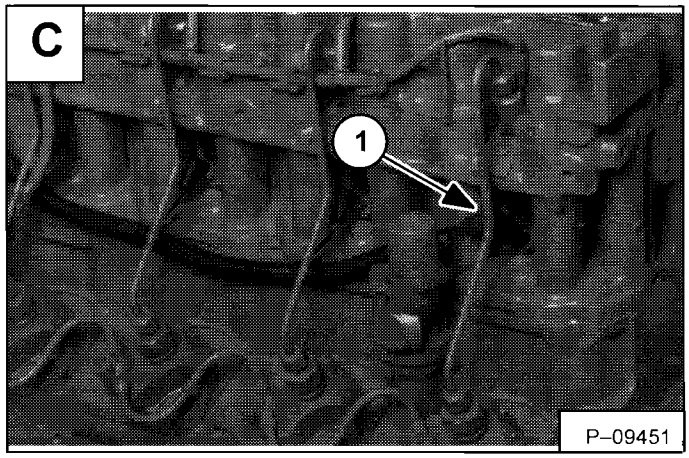
If the resistance is zero ohms the glow plug has a short circuit.

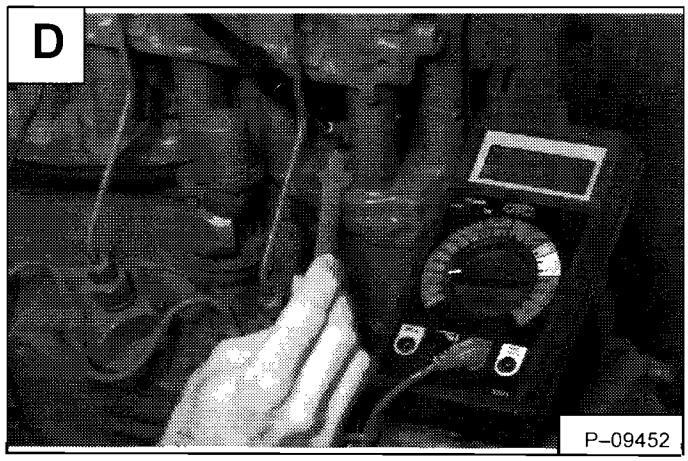
If the resistance is infinite, the coil of the glow plug is broken.

Replace the glow plug if needed.









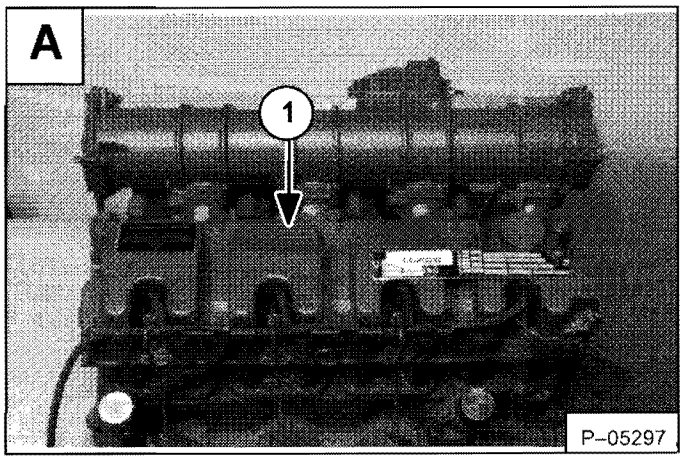
VALVE CLEARANCE

Adjustment

Make the valve clearance adjustment with engine stopped and cold.

Remove the valve cover (Item 1) **[A]**.

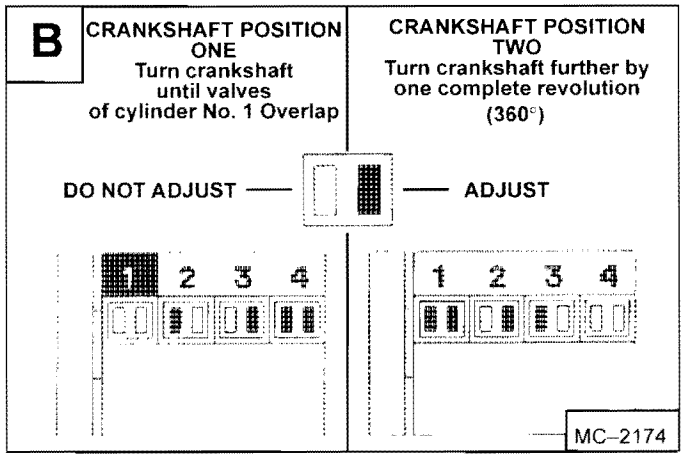
When installing the valve cover bolts, tighten the bolts to 75 in.–lbs. (8,5 Nm) torque.



Use the following sequence as shown in figure **[B]** to set the valve clearance.

Turn the crankshaft until the valves of cylinder No. 1 over–lap **[B]**.

Turn the crankshaft by one complete revolution (360°) and set the other valves.



Loosen the locknut and turn the set screw until the clearance is correct.

Intake – 0.012 inch (0,3 mm)
Exhaust – 0.020 inch (0,5 mm)

Tighten the locknut to 49–59 in.–lbs. (5,5–6,7 Nm) torque.

FUEL INJECTION PUMP

Description

The injection pump(s) contain parts which have a very close tolerance and its operation has a direct effect on the performance of the engine.

IMPORTANT

Do not attempt to maintain or adjust unless you are trained and have the correct equipment.

I–2028–0289

Removal

Remove the fuel tubeline (Item 1) **[A]** to the fuel injection pumps (Item 2) **[A]**.

Disconnect the respective high pressure fuel line (Item 3) **[A]** from the injection pump to be removed and fuel injector.

Use a flare nut wrench (Item 1) **[B]** to loosen the high pressure fuel line nut.

IMPORTANT

Do not bend the high pressure fuel injection tubes when removing or installing them.

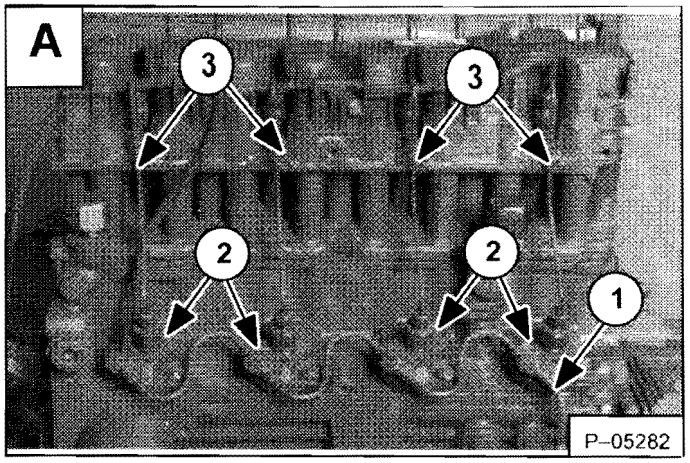
I–2029–0289

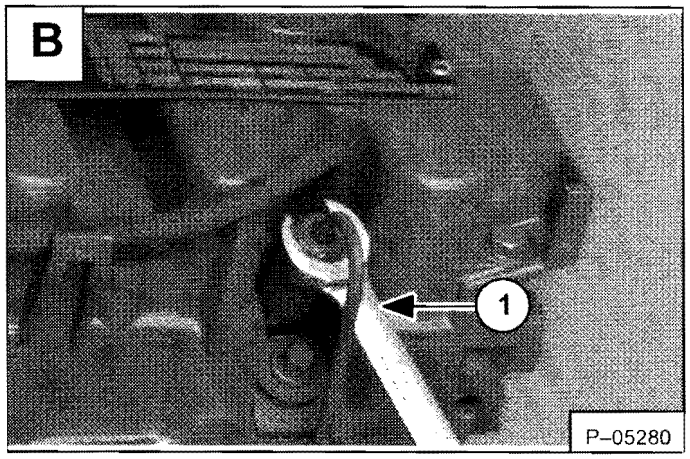
Remove the two mounting nuts (Item 1) **[C]** from the injection pump.

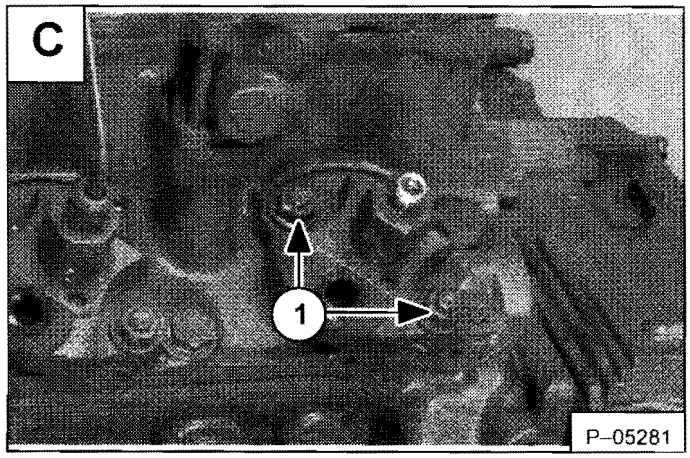
Remove the fuel injection pump (Item 1) **[D]**.

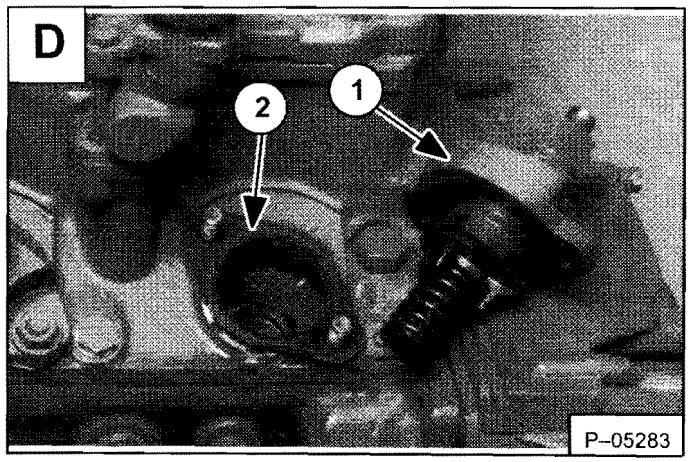
Remove the shim (Item 2) **[D]**.

NOTE: The shim(s) are used to time the injection pump, keep the same thickness for each injection pump.







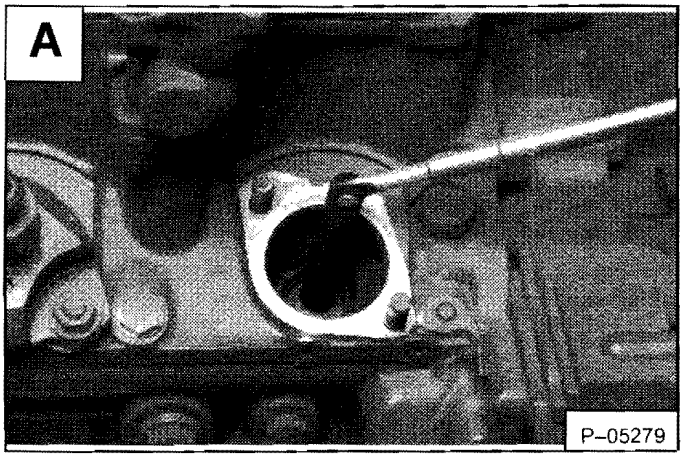


FUEL INJECTION PUMP (Cont'd)

Removal (Cont'd)

Use a magnet to remove the injection pump tappet **[A]**.

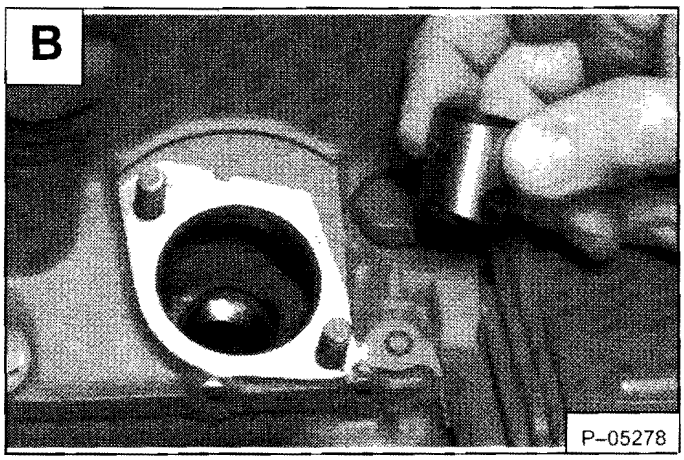
Inspect the tappet for wear or damage, replace as needed.



Install the tappet into its respective bore **[B]**.

Injection Pump Timing

The fuel injection pump does not need to be timed if the tappet, shim(s) and the camshaft are not changed.



Install a depth micrometer (Item 1) **[C]**.

Measure the distance between the engine block surface (without shim) and surface of the tappet **[D]**.

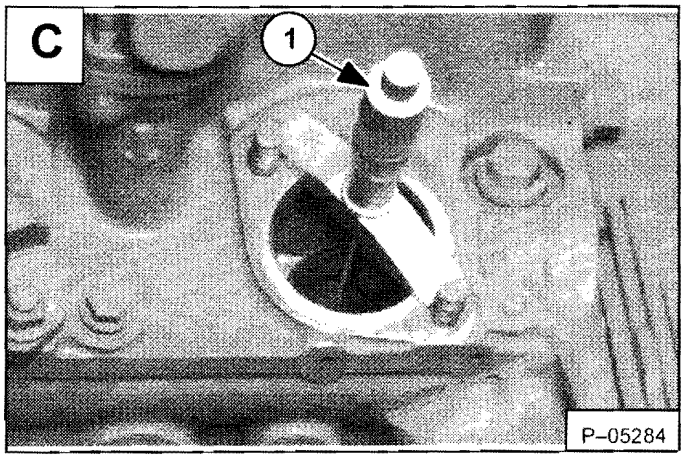
Installation dimension of the injection pump is 2.28 inch (58 mm).

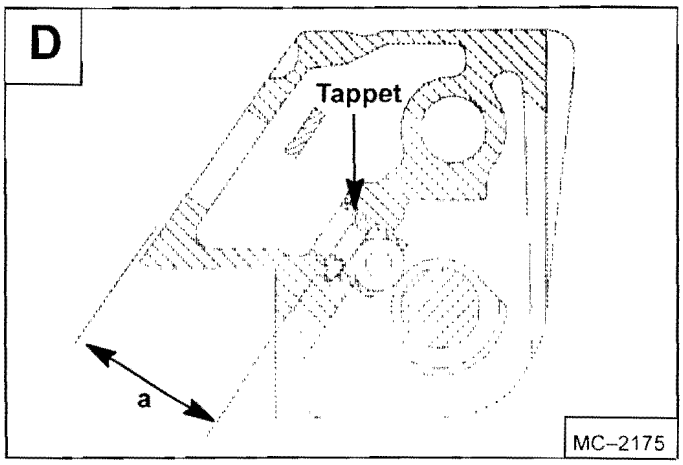
EXAMPLE:

Installation Depth	2.28 inch (58 mm)
Measured Depth **a**	2.25 inch (57,55 mm)
Difference	0.030 inch (0,65 mm)

Determine the number of shim(s) needed to get the correct installation height.

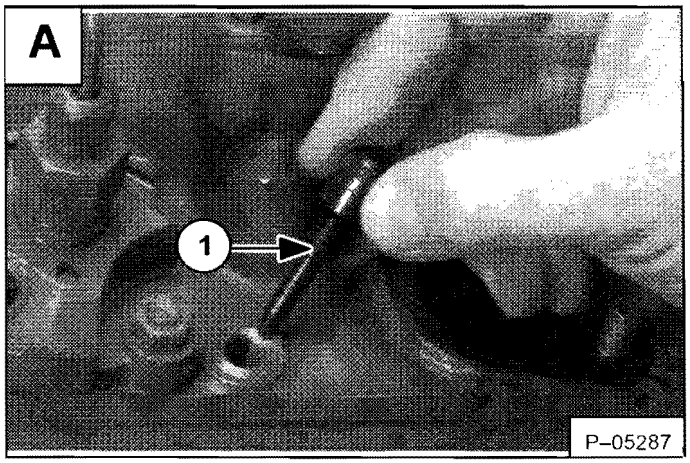
Install the appropriate number of shim(s) on the engine block surface.





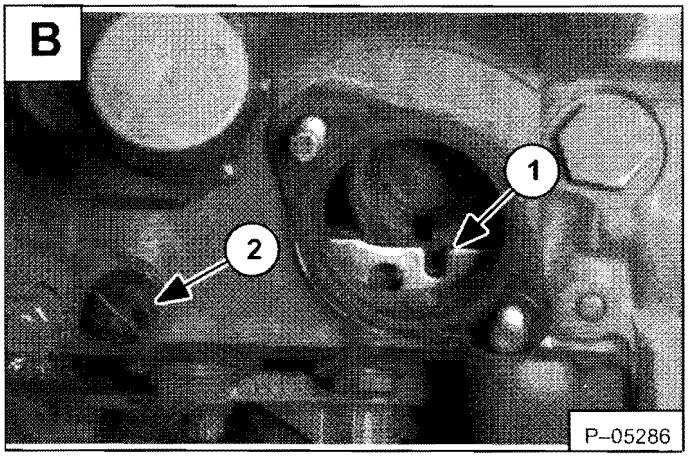
Installation

Remove the plug from the engine block. Install control rack locating pin (Item 1) **[A]**. (See Page 7–58, for correct tool.)

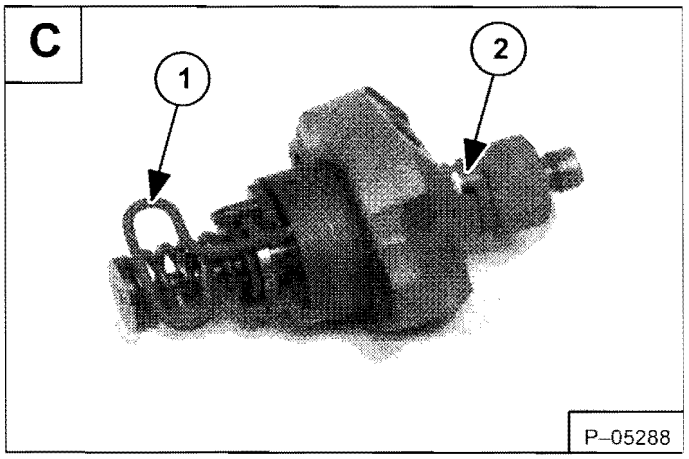


Move the control rack until the slot (Item 1) **[B]** is in the center of the injection pump bore.

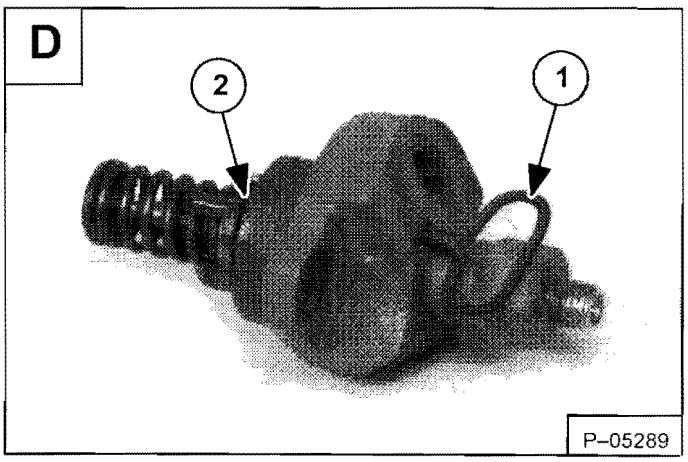
Tighten the locating pin (Item 2) **[B]**.



Use the centering pin (Item 1) **[C]** to remove the press–in plug (Item 2) **[C]** from the injection pump. (See Page 7–58, for correct tool.)



Install the centering pin (Item 1) **[D]** into the injection pump and into the control lever (Item 2) **[D]**. Make sure the control lever is in the center position.

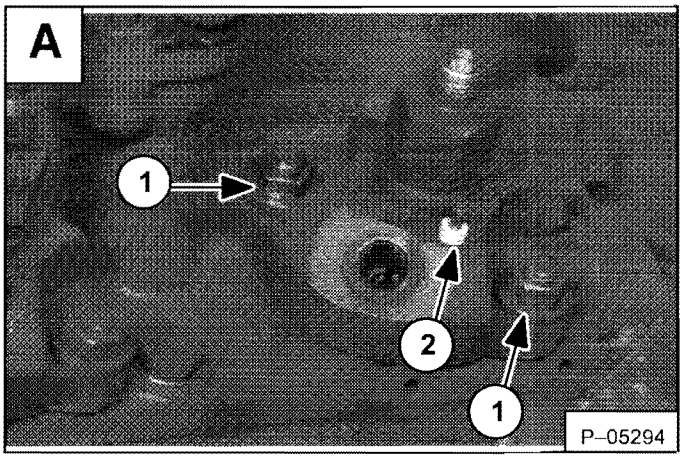


FUEL INJECTION PUMP (Cont'd)

Installation (Cont'd)

Install the injection pump into the engine block. Make sure the control lever goes into the slot on the fuel control rack.

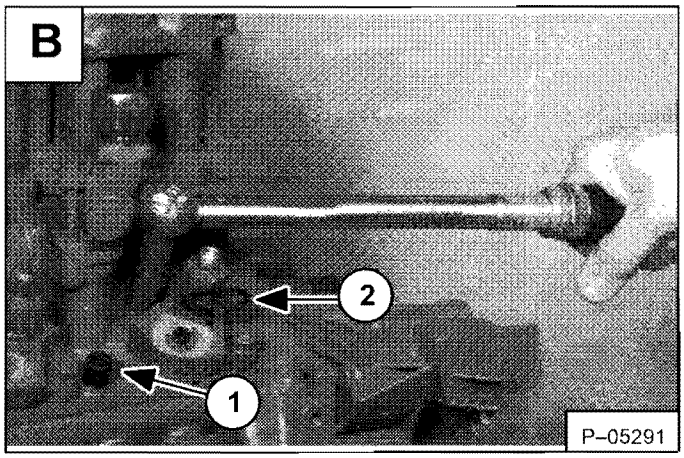
Install the two nuts (Item 1) **[A]**.



Remove the fuel control rack locating pin (Item 1) **[B]** and install the plug.

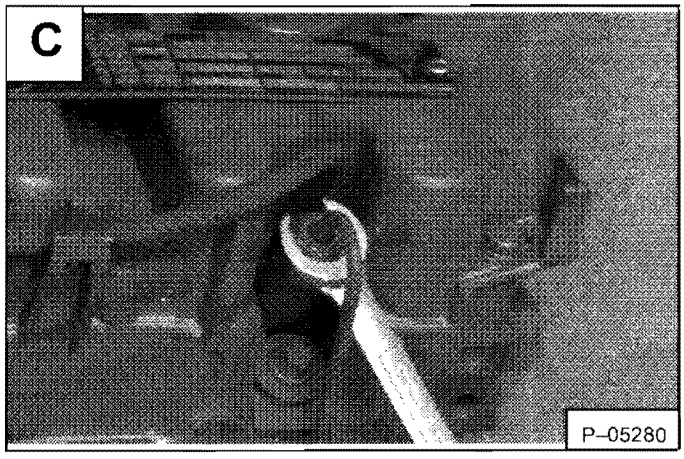
Remove the centering pin (Item 2) **[B]** and install the press–in plug (Item 2) **[A]**.

Tighten the mounting nuts to 54–65 in.–lbs. (6,1–7,3 Nm) torque **[B]**.



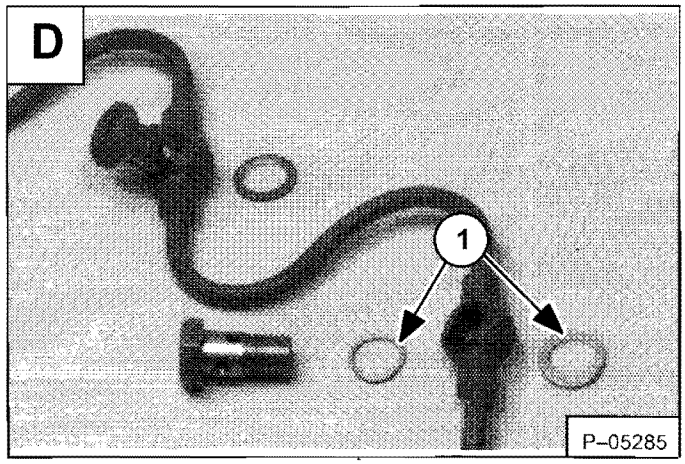
Install the high pressure fuel line.

Tighten the fuel line nut to 36–45 in.–lbs. (4,1–5,1 Nm) torque **[C]**.



Install new washers (Item 1) **[D]** on the fuel line fastening bolt.

Install the fuel line on the injection pumps and tighten to 36–45 in.–lbs. (4,1–5,1 Nm) torque.



FUEL INJECTOR

Removal and Installation

Disconnect the respective high pressure fuel line from fuel injector to be removed and fuel injection pump.

Use a flare nut wrench (Item 1) **[A]** to loosen the high pressure fuel line nut.

IMPORTANT

Do not bend the high pressure fuel injection tubes when removing or installing them.

I–2029–0289

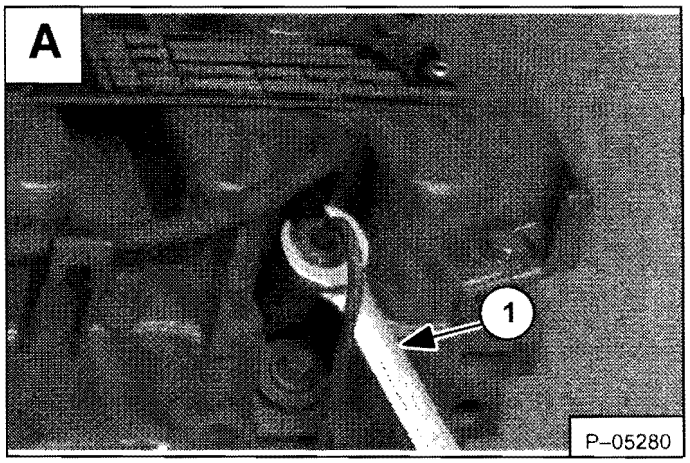
Remove the high pressure fuel line.

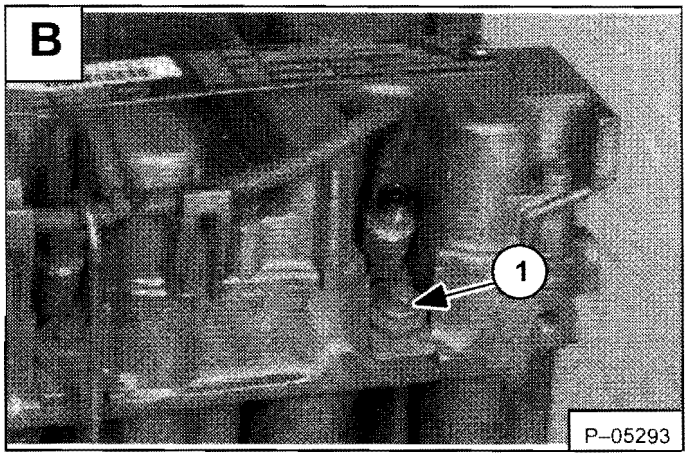
Installation: Tighten the fuel line nut to 36–45 in.–lbs. (4,1–5,1 Nm) torque.

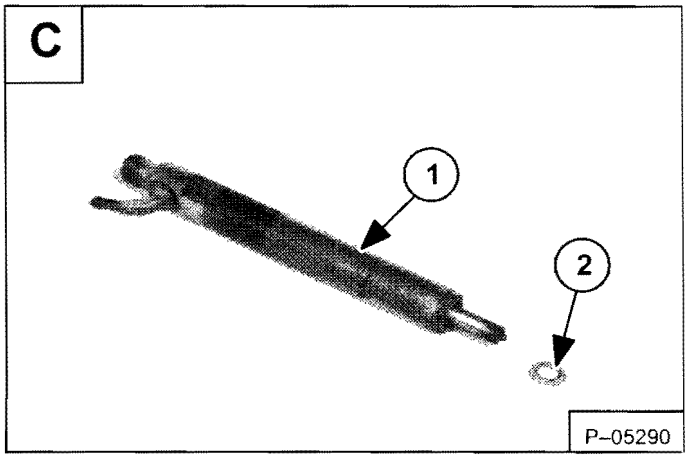
Remove the bolt (Item 1) **[B]** and holddown clamp from the fuel injector.

Installation: Tighten the bolt to 49–59 in.–lbs. (5,5–6,7 Nm) torque.

Remove the fuel injector (Item 1) **[C]** and washer (Item 2) **[C]** from the cylinder head.







FUEL INJECTOR (Cont'd)

Checking

IMPORTANT

Do not disassemble or test the fuel injector nozzles unless you have the correct service and testing tools.

I–2027–0284

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

OEM1064 – Injection Nozzle Tester
OEM1065 – Accessory Set

Connect the nozzle to the test pump, in a down position **[A]**.

Operate the test pump until the nozzle valve opens:

Injection Pressure:
Used ..... 3553 lbs. (245 bar)
New ..... 3625 lbs. (250 bar)

⚠ WARNING

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

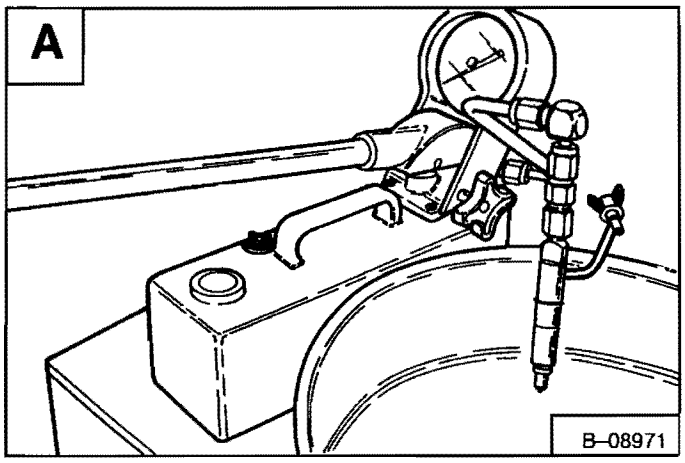
W–2072–0496

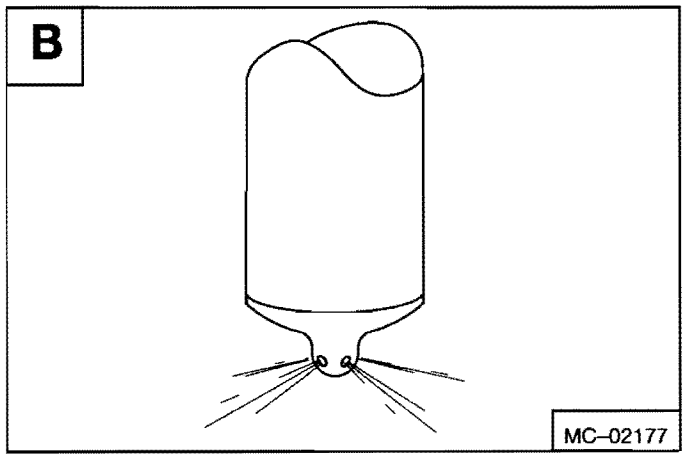
Check nozzles spray pattern **[B]**:

The spray pattern must be uniform from all four holes of the nozzle.

The nozzles are dirty or defective:

- If the spray pattern is not uniform.
- If fuel drips from the end of the nozzle.
- If the spray is a solid stream instead of a mist.

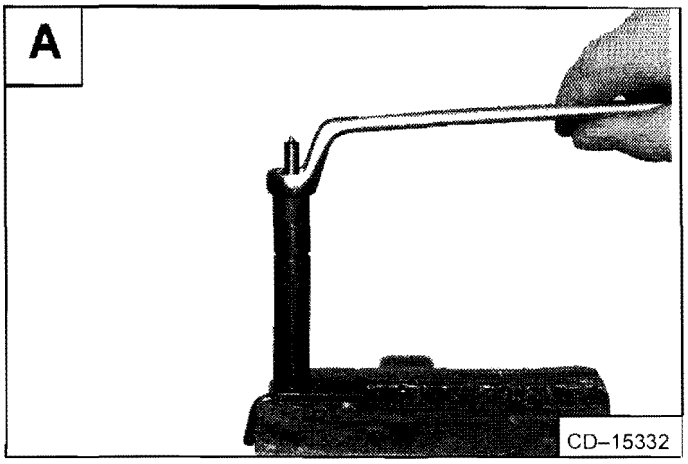




FUEL INJECTOR (Cont'd)

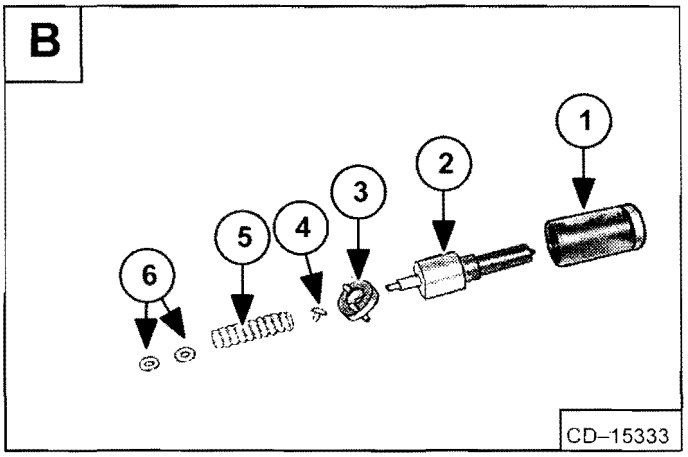
Disassembly

Remove the nozzle cap nut **[A]**.



Disassembly the parts as shown in Fig. **[B]**.

1. Nozzle Cap Nut
2. Injector Nozzle
3. Adapter
4. Thrust Pin
5. Spring
6. Shim(s)



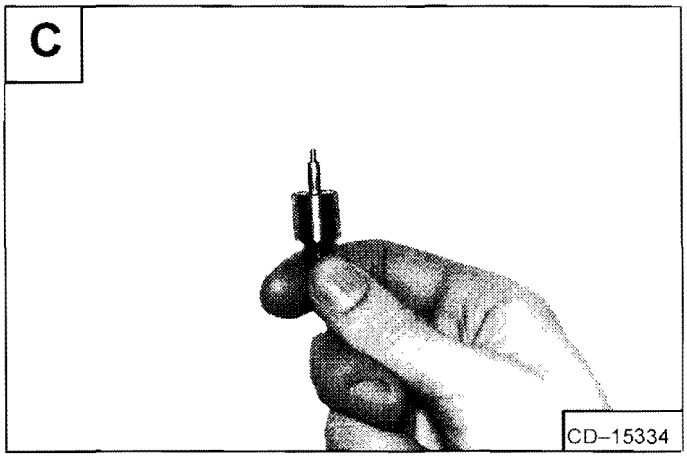
Wash all the parts in clean diesel fuel and blow dry using compressed air.

The nozzle needle and body are lapped together and can not be exchanged with other nozzle parts.

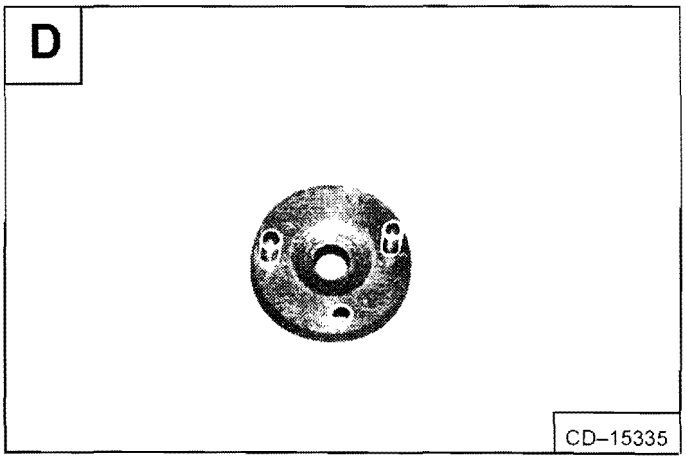
DO NOT touch the nozzle needle with your fingers.

When the nozzle body is held in the upright position, the needle should by its own weight slide slowly and smoothly on its seat **[C]**.

NOTE: If the nozzle needle does not slide smoothly, wash the injector nozzle parts again in clean diesel fuel. Blow dry with compressed air. Re–do the procedure again. Replace the injectors as needed. Wash all new injectors in clean diesel fuel before installation.



Check the seat surface of the adapter for wear. Make sure the centering pins are in place **[D]**.

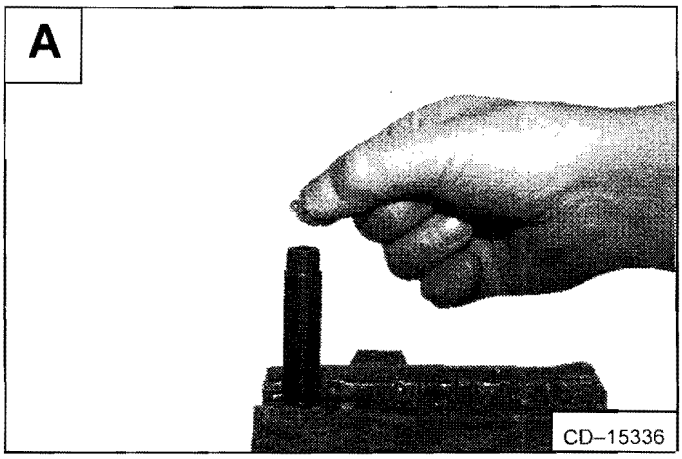


FUEL INJECTOR (Cont'd)

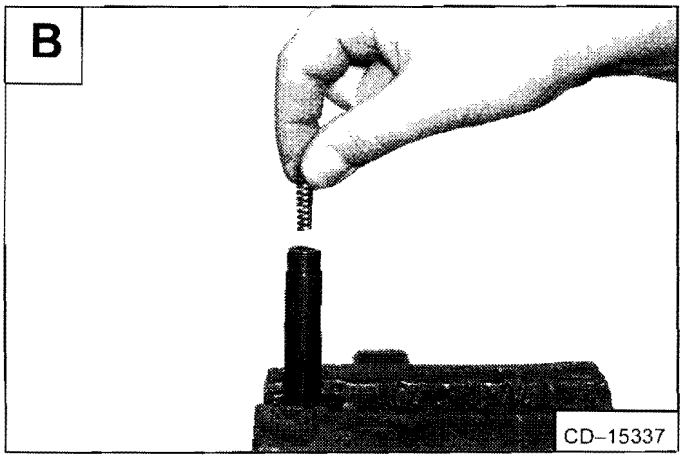
Assembly

Install the shim(s) **[A]**.

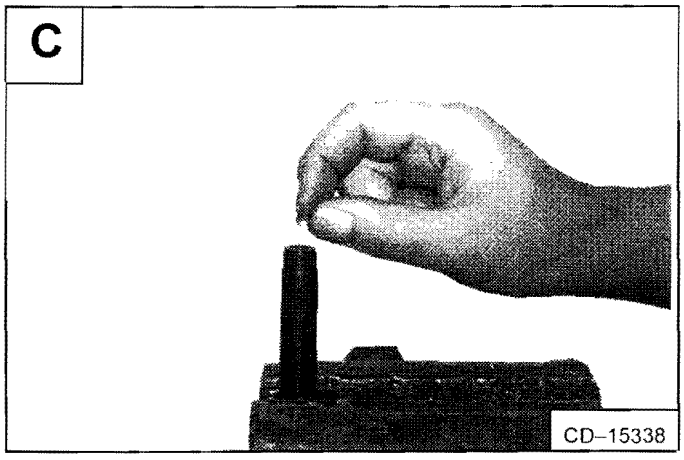
The injector opening pressure is adjusted by selecting the correct amount of shim(s). A thicker shim will increase the opening pressure at the injector nozzle.



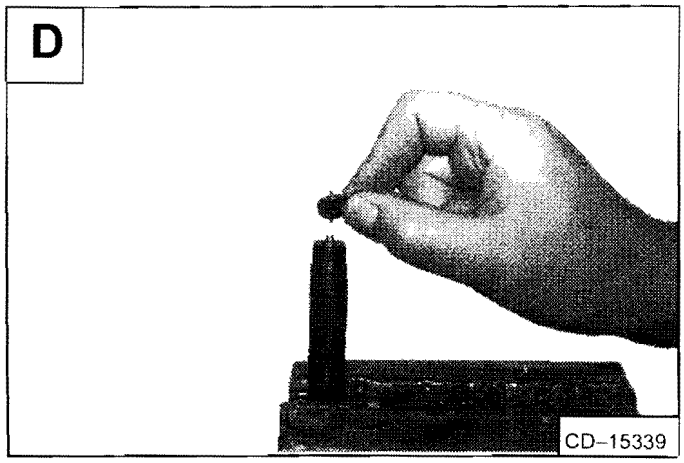
Install the compression spring **[B]**.



Install the thrust pin with the centering collar facing toward the compression spring **[C]**.



Install the adapter with the centering pins toward the thrust pin **[D]**.

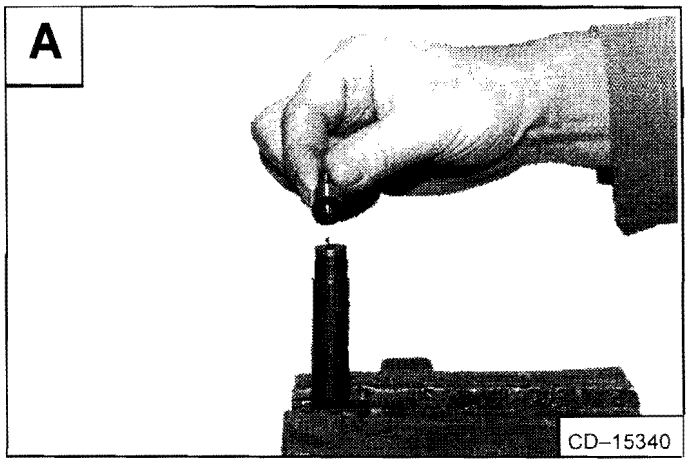


FUEL INJECTOR (Cont'd)

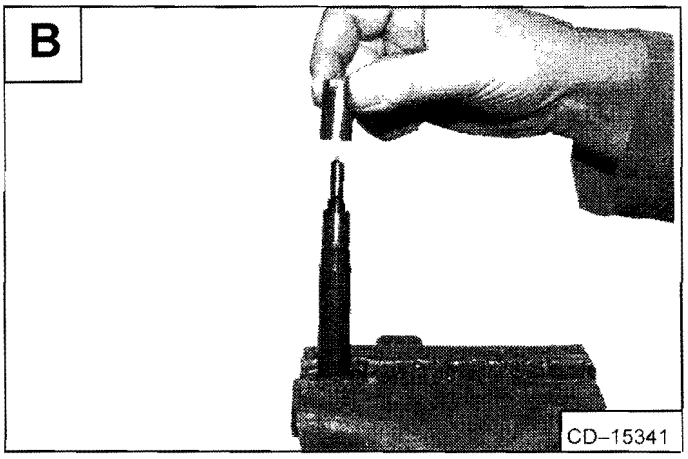
Assembly (Cont'd)

Install the injector nozzle, make sure the center bore fits over the centering pins of the adapter **[A]**.

NOTE: Be careful that the nozzle needle does not fall out of the nozzle body.

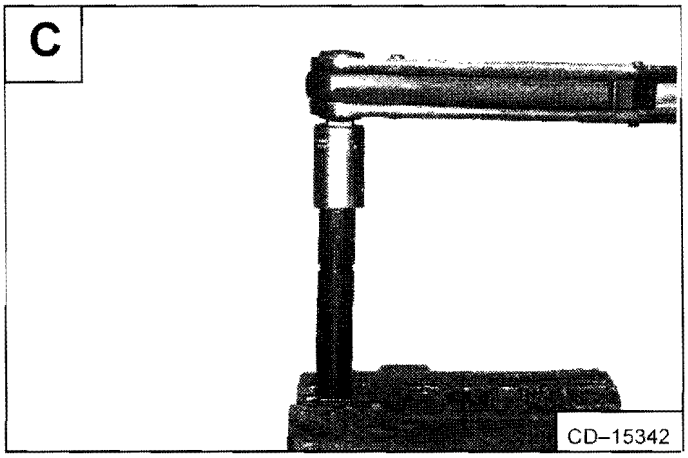


Install the nozzle cap nut **[B]**.



Tighten the cap nut to 35 ft.–lbs. (47 Nm) torque **[C]**.

Check the injector nozzle on the nozzle tester before installation. (See Page 7–44.)



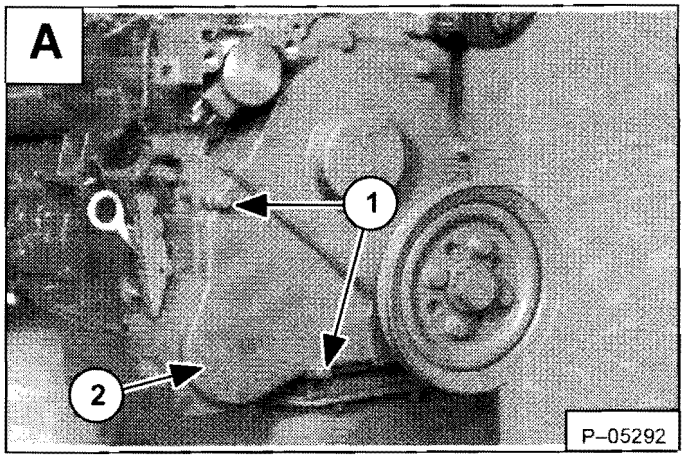
TIMING BELT

Inspection

NOTE: The timing belt is maintenance free. Timing belts that have been in operation do not need to be re–tensioned. The timing belt, belt tensioner, and mounting bolt must be replaced every 3000 operating hours or every 5 years. A repair kit is available.

Remove the bolts (Item 1) **[A]** from the timing belt inspection cover.

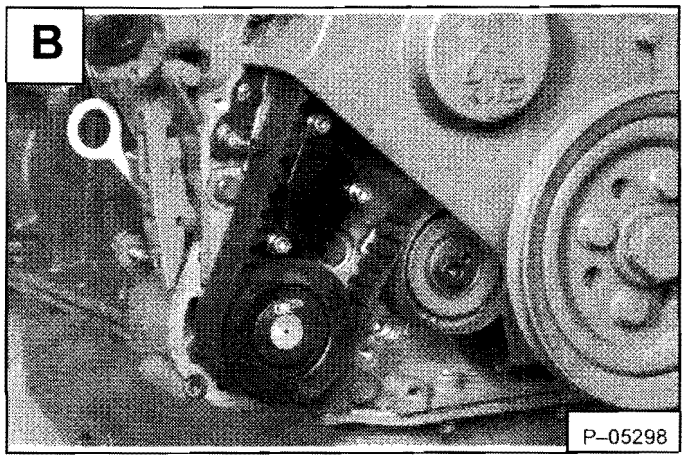
Remove the cover (Item 2) **[A]**.



Check the timing belt, sprockets and tensioner for wear, cracks or damage **[B]**.

Check the timing belt in detail for the following conditions, replace as needed.

1. Oil deposits
2. Hardened back rubber surfaces
3. Cracked
4. Badly worn teeth
5. Missing tooth
6. Side of belt badly worn
7. Side of belt cracked



Removal

Remove the bolts (Item 1) **[A]** from the timing belt inspection cover.

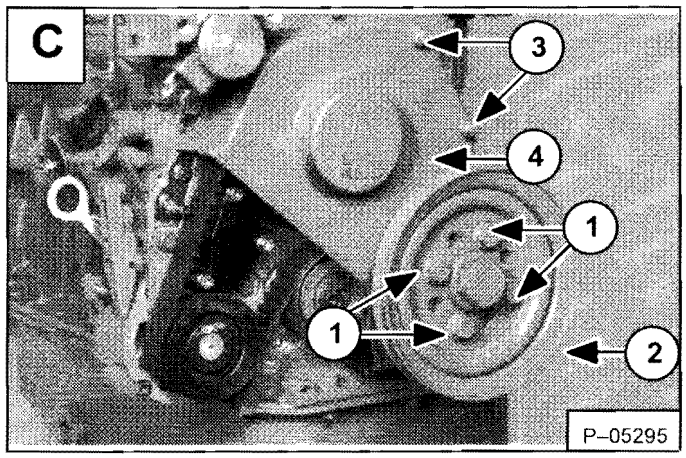
Remove the cover (Item 2) **[A]**.

Remove the bolts (Item 1) **[C]** from the v–belt pulley (Item 2) **[C]**.

Remove the v–belt pulley.

Remove the bolts (Item 3) **[C]** from the timing belt cover.

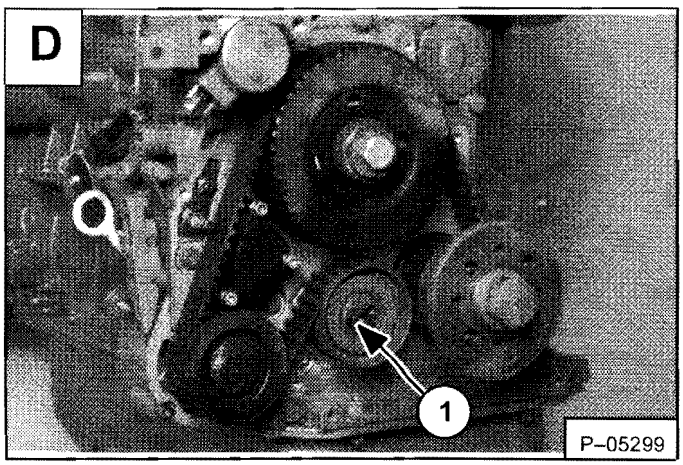
Remove the cover (Item 4) **[C]**.



Loosen the belt tensioner mounting bolt (Item 1) **[D]**.

Loosen the belt tensioner.

Remove the timing belt.



TIMING BELT (Cont'd)

Installation

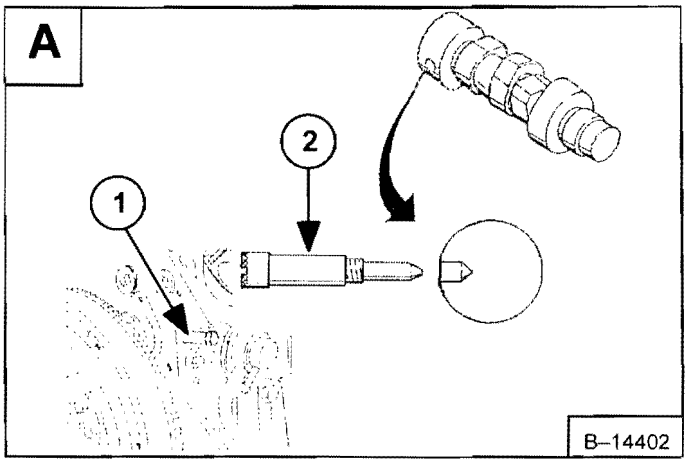
NOTE: Remove the fuel injectors (Page 7–43) and rocker brackets from the cylinder head. This will let the crankshaft turn easier for timing belt installation.

The camshaft plug is located at the rear of the engine block (Item 1) **[A]** on the fuel injection pump side. (See Page 7–58, for the correct tool.)

Remove the plug.

Rotate the camshaft until the notch in the camshaft can be seen through the plug hole.

Install the timing tool (Item 2) **[A]** and tighten.

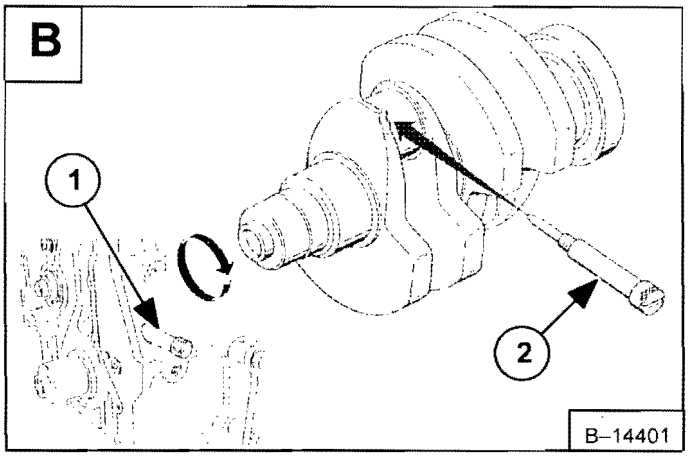


The crankshaft plug is located at the front of the engine block (Item 1) **[B]** on the exhaust manifold side.

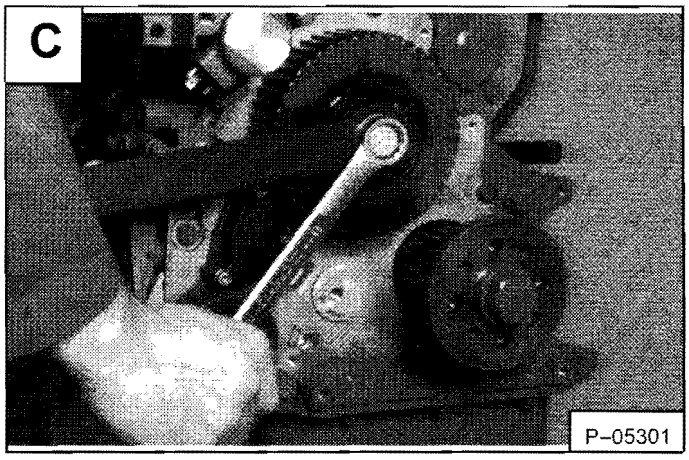
Remove the plug.

Rotate the crankshaft until the flat spot on the crankshaft throw can be seen through the plug hole. Turn the crankshaft back a small amount. Install the timing tool (Item 2) **[B]** and tighten.

Rotate the crankshaft until it hits the timing tool and stops.

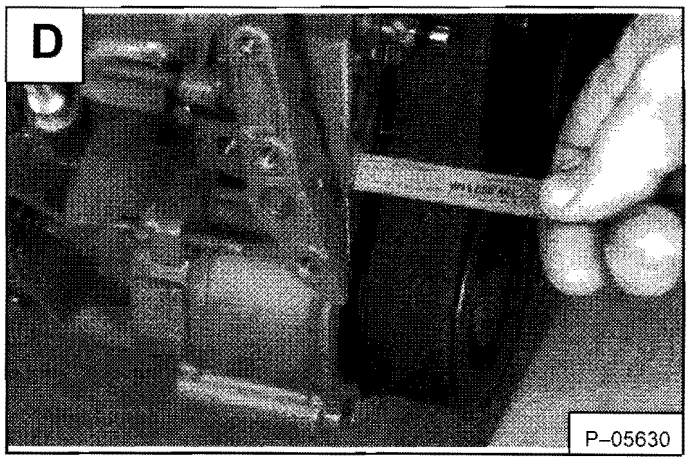


Loosen the nut at the camshaft gear **[C]**. (See Page 7–58, for correct tool.)



Install the new timing belt.

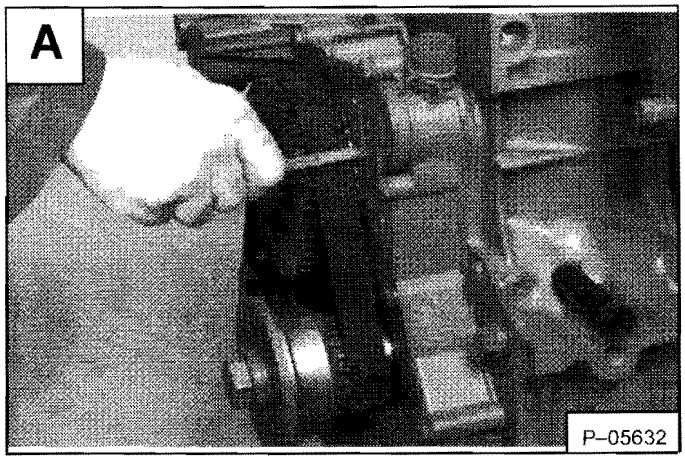
Measure the distance from the edge of the belt to the front cover surface **[D]**.



TIMING BELT (Cont'd)

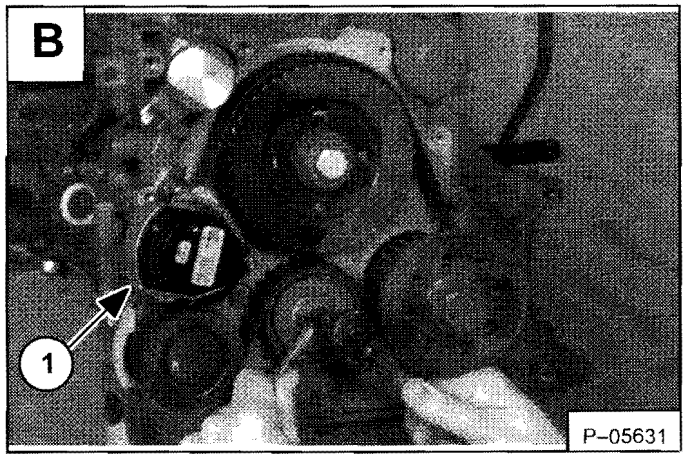
Installation (Cont'd)

Using the dimensions from Figure **[D]**; Page 7–49. Align the timing belt to make sure it is an equal distance from the mounting surface for the front cover **[A]**.



Install the belt tension tool (Item 1) **[B]**. (See Page 7–58, for correct tool.)

Turn the idler tensioner pulley in counterclockwise direction to obtain a scale reading of 3.0–3.5. Tighten the idler tensioner pulley nut to 33 ft.–lbs. (45 Nm) torque **[B]**.

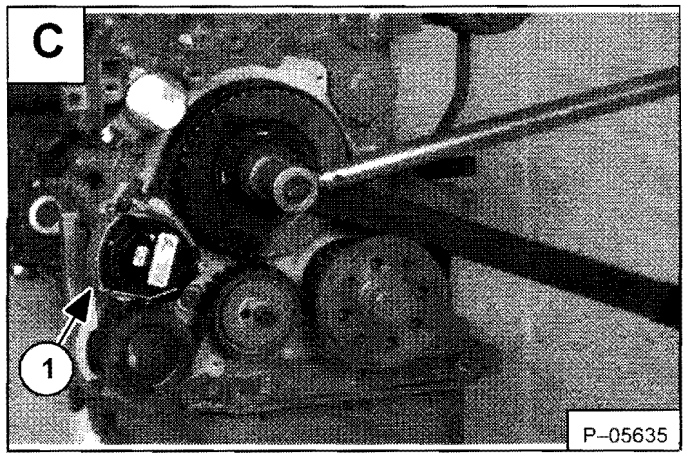


Initially tighten camshaft bolt to 22 ft.–lbs. (30 Nm) **[A]**.

Mark camshaft bolt and tighten an additional 210° **[A]**.

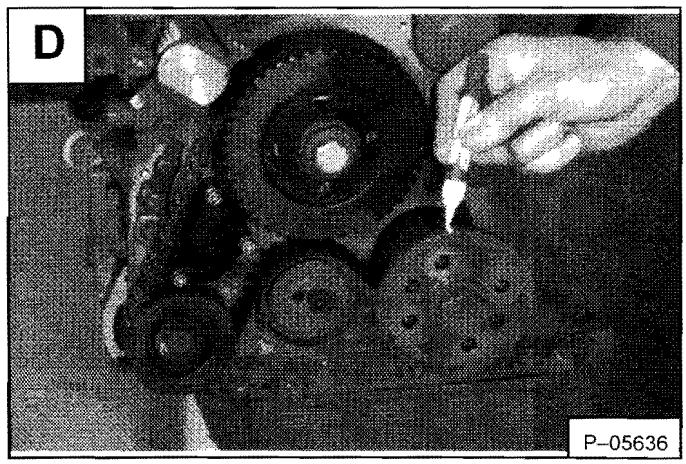
Remove the belt tension tool (Item 1) **[C]**.

Remove the camshaft and crankshaft locating pins (Fig. **[A]** & **[B]**; Page 7–49).



Mark the crankshaft pulley **[D]**.

Make four complete crankshaft revolutions in the direction of engine rotation. Bring the mark on the crankshaft pulley back to the same position.



TIMING BELT (Cont'd)

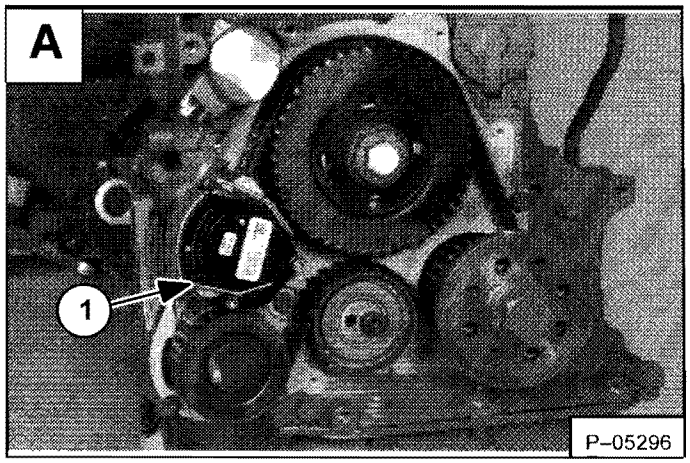
Installation (Cont'd)

Install the belt tension tool (Item 1) **[A]**.

Measure belt tension and the reading should be 6.5–9.5.

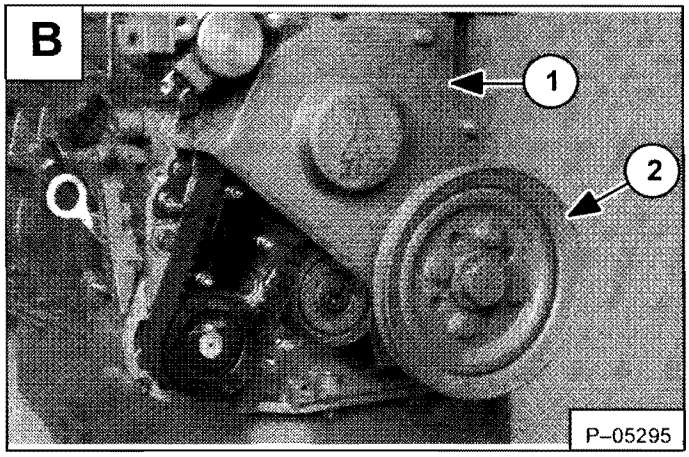
NOTE: If the specified scale reading is not obtained, repeat the installation procedure starting with Figure [A]; Page 7–49.

Remove the belt tension tool.

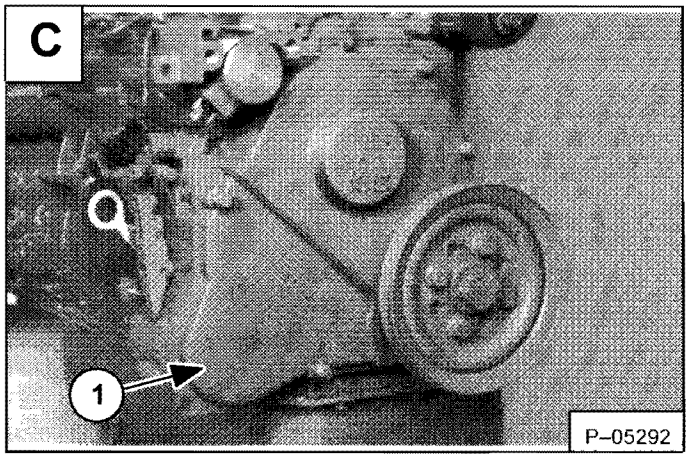


Install the belt cover (Item 1) **[B]** and tighten the bolts.

Install the v–belt pulley (Item 2) **[B]** and tighten the bolts to 30–36 ft.–lbs. (41–49 Nm) torque.



Install the timing belt inspection cover (Item 1) **[C]** and tighten the bolts.



Belt Replacement In Loader

Use the following procedure to replace the timing belt, tensioner and tensioner bolt. If the belt is broken, additional procedures are required and noted.

- ***For Broken Belt Replacement Only***
- Remove the engine muffler. (See Page 7–6)
- Remove the valve cover. Remove and inspect the rocker arms/brackets and push rods. (See Page 7–38)

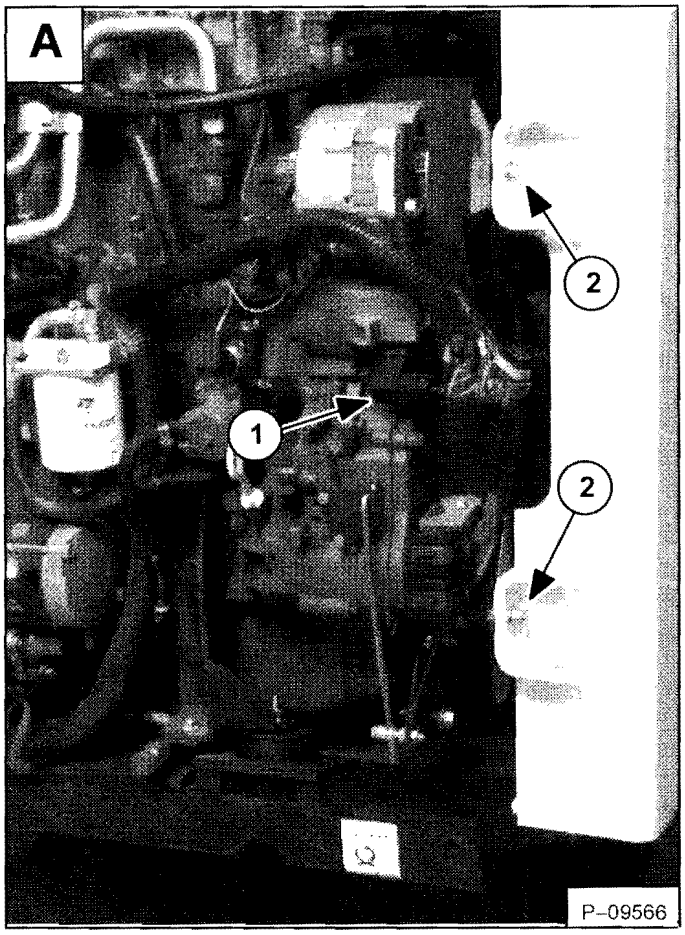
NOTE: The rear door is removed for photo clarity only.

Disconnect the negative (–) battery cable.

Loosen the screw and unplug the fuel solenoid connector (Item 1) **[A]**.

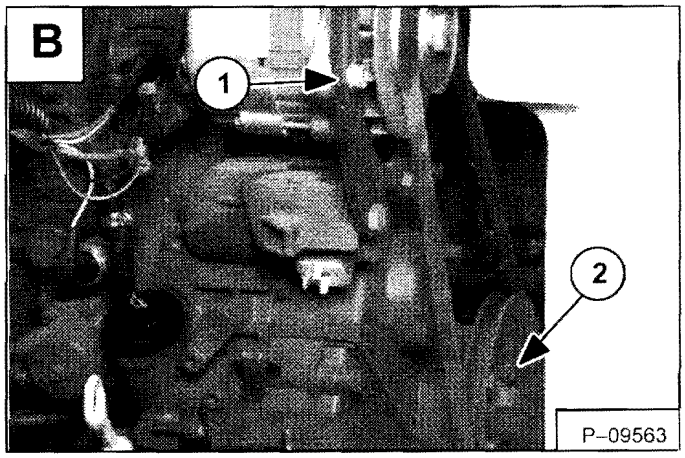
NOTE: Do not lose the rubber seal gasket on the solenoid connector.

Remove the bolts (Item 2) **[A]** holding the belt shield. Move the shield away from the work area.



Loosen the alternator adjustment bolt (Item 1) **[B]** and remove the alternator belt.

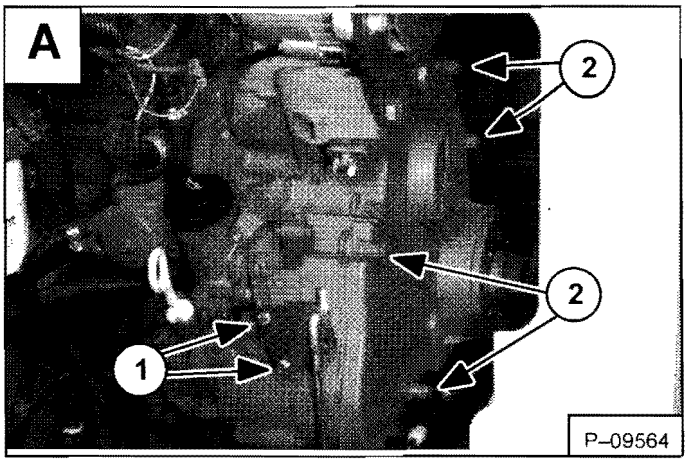
Remove the crankshaft pulley bolts (Item 2) **[B]**. Remove the pulley.



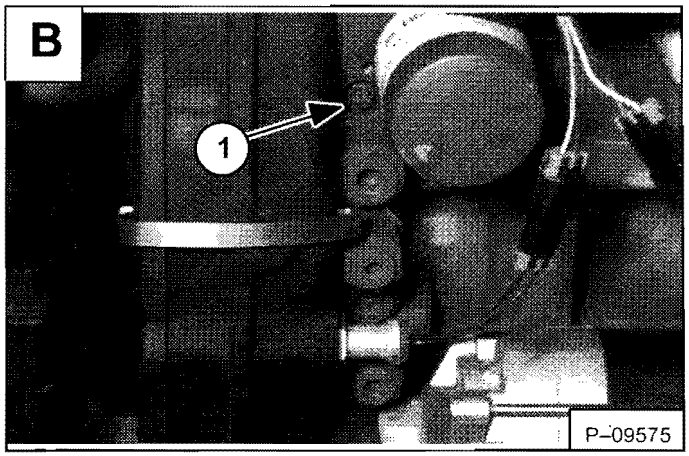
Belt Replacement In Loader (Cont'd)

Remove the throttle linkage bolts (Item 1) **[A]**. Lower the throttle linkage.

Remove the four belt cover bolts (Item 2) **[A]**. Remove the front and rear belt covers.

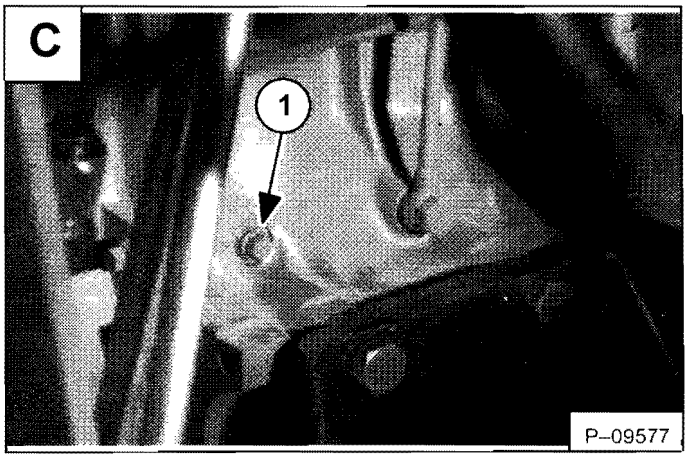


Remove the camshaft access plug (Item 1) **[B]**.



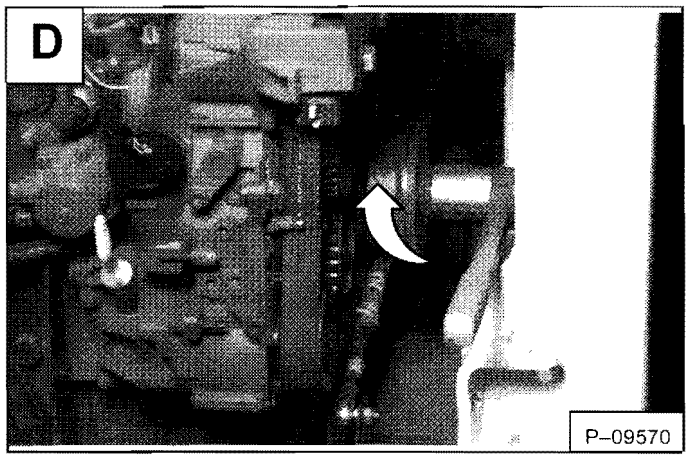
Remove the crankshaft access plug (Item 1) **[C]**.

NOTE: The plug is located on the front of crankcase, below the turbocharger and just above the right side front engine mount.



Rotate the crankshaft in correct rotation as shown in figure **[D]** until the notch in the camshaft can be seen through the access hole.

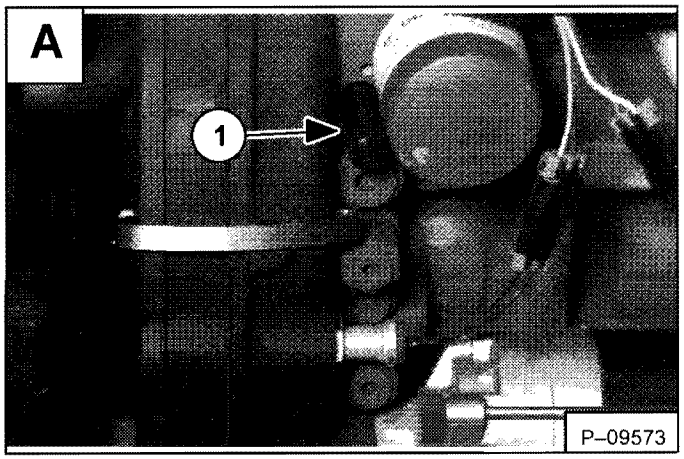
NOTE: The crankshaft must be turned in correct rotation. Turn clockwise as viewed from the timing belt end of engine as shown.



TIMING BELT (Cont'd)

Belt Replacement In Loader (Cont'd)

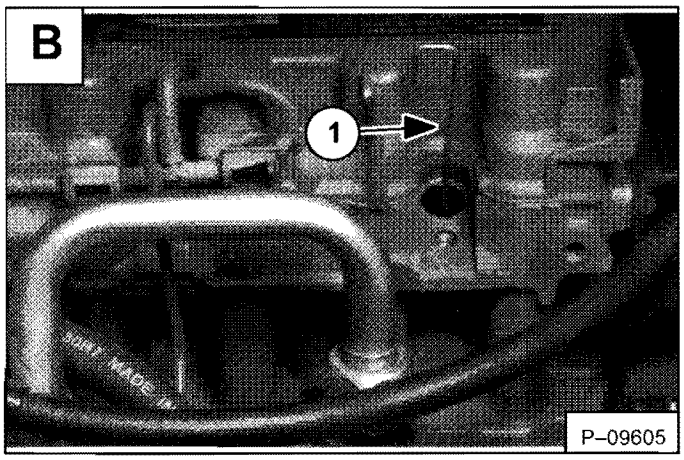
Install the camshaft timing tool (Item 1) **[A]** and tighten. (See Page 7–58 for correct tool.)



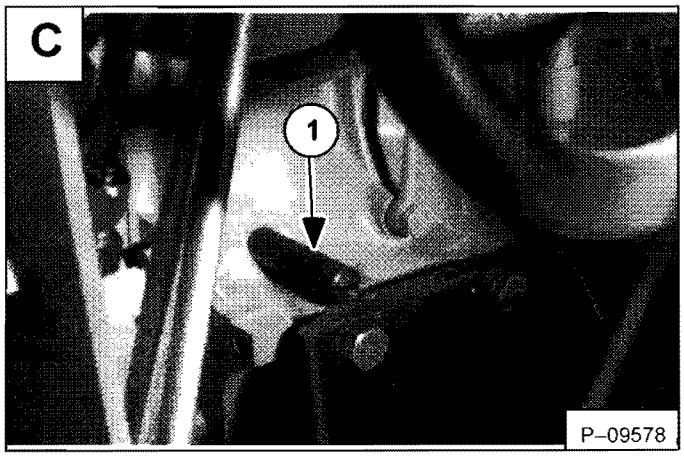
- ***For Broken Belt Replacement Only***
- Remove the number four cylinder fuel injector. (See Page 7–40)
- Rotate the crankshaft and use a wire (Item 1) **[B]** in the fuel injector hole to indicate piston is moving upward, to top dead center (T.D.C.).

NOTE: The crankshaft must be turned in correct rotation. Turn clockwise as viewed from the timing belt end of engine.

- Install the crankshaft timing tool (Item 1) **[C]** and tighten. (See Page 7–58 for correct tool.)
- Rotate crankshaft against timing tool.



Install the crankshaft timing tool (Item 1) **[C]** and tighten. (See Page 58 for the correct tool.)

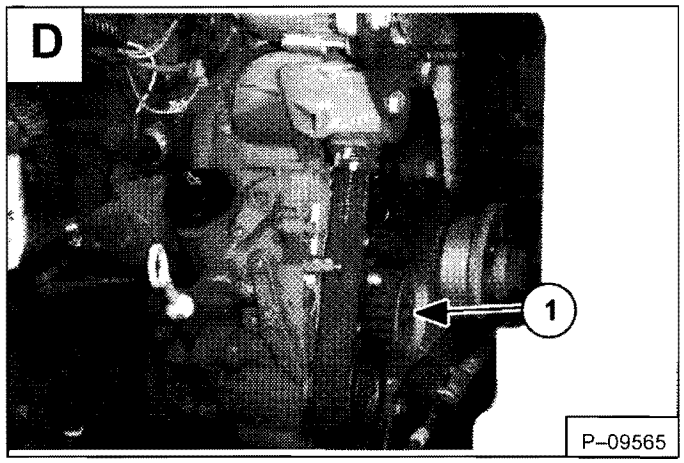


Remove the tensioner bolt (Item 1) **[D]** and the tensioner. Remove the timing belt.

NOTE: The timing belt, belt tensioner and mount bolt must be replaced as a set. A repair kit is available.

Install the new timing belt, belt tensioner and mount bolt. Do not tighten the mount bolt.

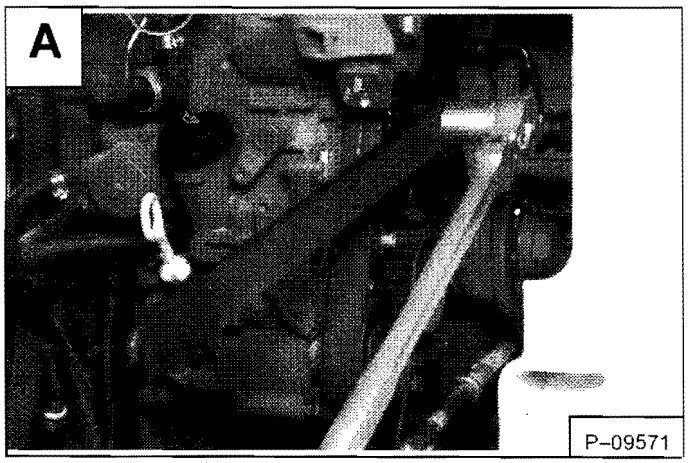
NOTE: Align the timing belt on gears to obtain equal distance between the belt and front cover to insure belt runs straight on gears.



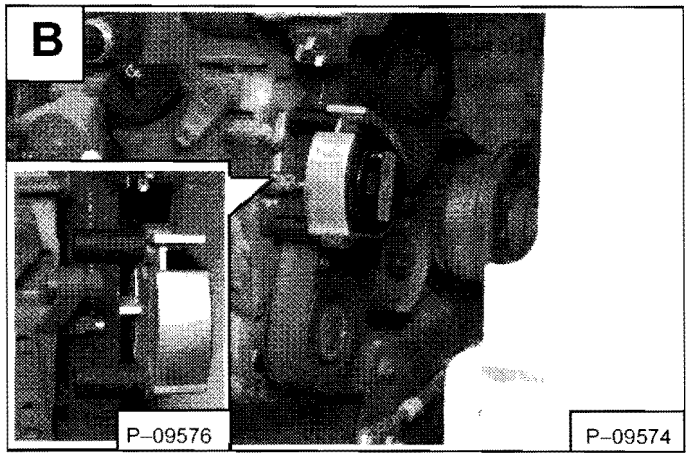
Belt Replacement In Loader (Cont'd)

Install the camshaft gear tool (Item 1) **[A]**. (See Page 7–58 for correct tool.)

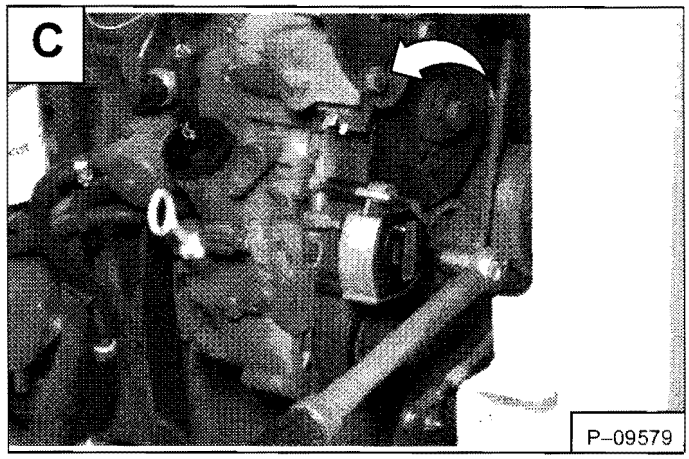
Loosen the camshaft gear **[A]**.



Install the belt tension tool as shown in Figure **[B]**. (See Page 7–58 for the correct tool.)



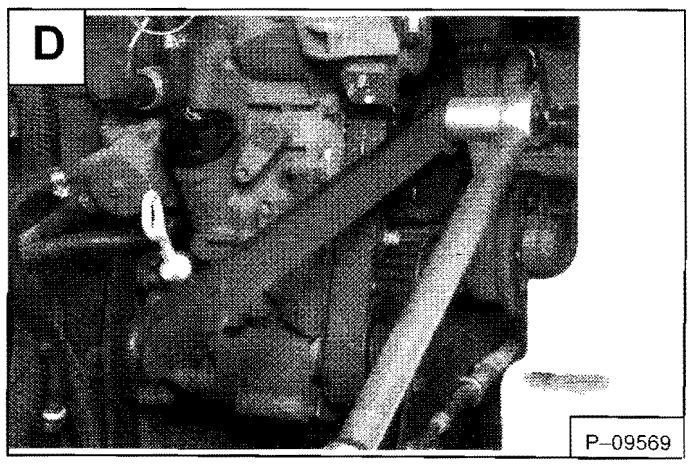
Use a hex wrench to turn the idler tension pulley in counterclockwise direction as shown in figure **[C]**. Obtain a scale reading of 3.0–3.5. Tighten the idler tension pulley mount bolt to 33 ft.–lbs. (45 Nm) torque.



Remove the belt tension tool, hex wrench and torque wrench.

Install the camshaft gear tool.

Tighten camshaft bolt to 22 ft.–lbs. (30 Nm) torque as shown in figure **[D]**. Mark the camshaft bolt and tighten an additional 210°.

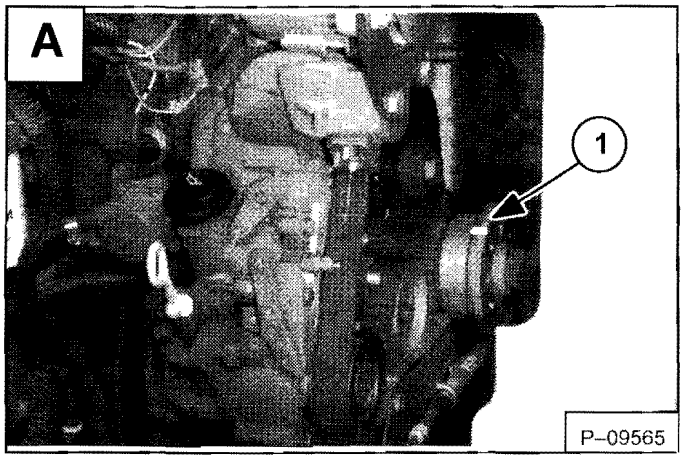


TIMING BELT (Cont'd)

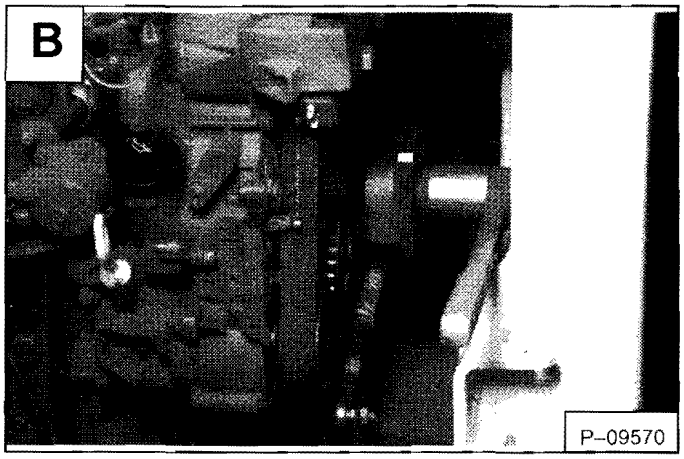
Belt Replacement In Loader (Cont'd)

Remove the camshaft and crankshaft timing tools (Item 1) **[A]** & **[C]**; Page 7–54.)

Mark the crankshaft pulley hub (Item 1) **[A]**.



Make four complete crankshaft revolutions in the direction of engine rotation. Bring the mark on the crankshaft pulley back to the same position as before **[B]**.



Install the belt tension tool. Check the belt tension reading. It should be 6.5–9.5.

NOTE: If the specified scale reading is not obtained, repeat the procedure.

Remove the belt tension tool.

- ***For Broken Belt Replacement Only***
- Install the push rods and rocker arms/brackets. Replace all damaged parts. (See Page 7–66.)
- Set the valve clearance. (See Page 7–38.)
- Install the valve cover and gasket. Tighten the bolts to 75 in.–lbs. (8,5 Nm) torque.

Install the crankshaft and camshaft access plugs.

Install the belt covers and four mounting bolts.

Install the throttle linkage and bolts.

Install the crankshaft pulley and bolts. Tighten the bolts to 30–36 ft.–lbs. (41–49 Nm) torque.

Install the alternator belt. Adjust the belt tension.

Install the belt shield and bolts.

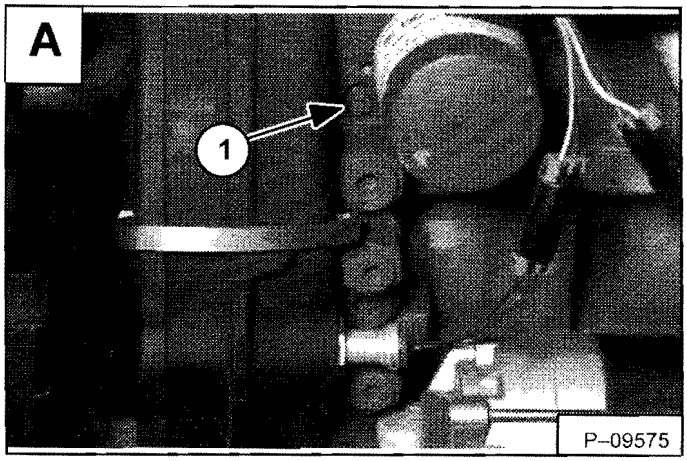
Plug in the fuel solenoid connector and tighten the screw.

Reconnect the negative (–) battery cable.

VALVE TIMING

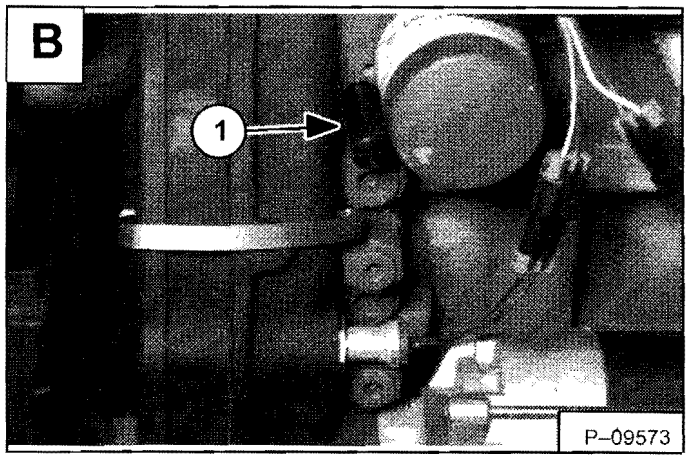
Checking

Remove the camshaft access plug (Item 1) **[A]**.



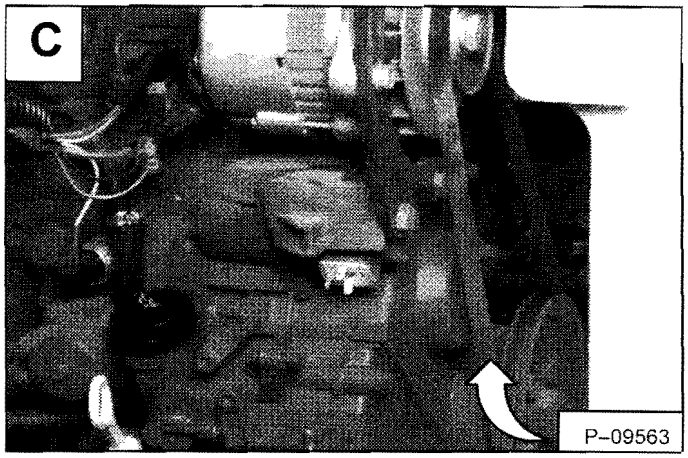
Rotate the crankshaft/camshaft until the notch in the camshaft can be seen through the plug hole.

Install the timing tool (Item 1) **[B]**.



At the crankshaft pulley bolt, install a torque wrench and turn the engine in the direction of rotation to 30 ft.–lbs. (40 Nm) torque **[C]**.

Remove the torque wrench, DO NOT change the crankshaft position.



Remove the crankshaft access plug (Item 1) **[D]**.

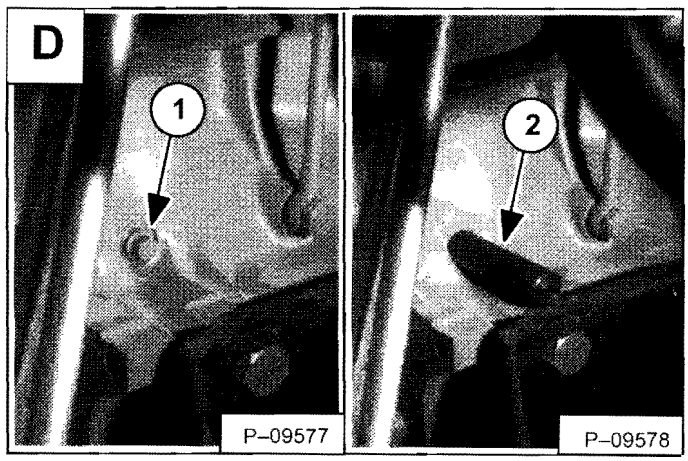
NOTE: The access plug is located on the front of the crankcase, below the turbocharger and just above the right side front engine mount.

Turn the crankshaft timing tool (Item 2) **[D]** into the crankcase until it makes slight contact with the crankshaft.

Mark the position of the timing tool.

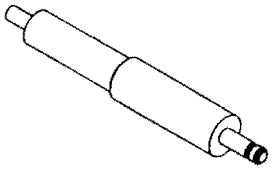
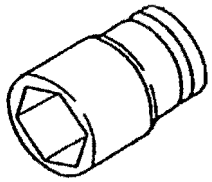
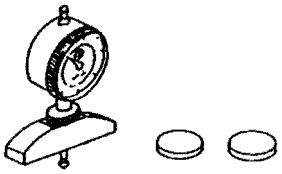
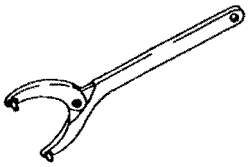
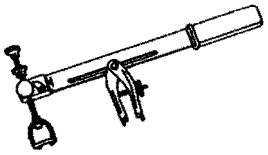
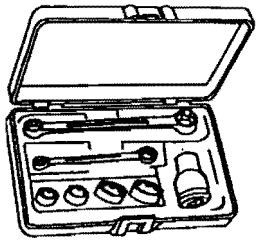
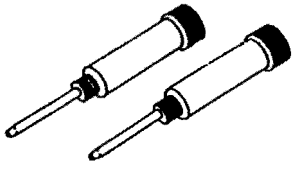
The valve timing is correct if the timing tool can be turned into the crankcase another 3/4 to 2–1/4 turns until it stops.

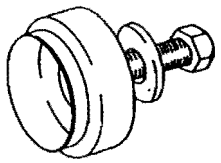
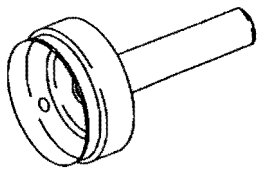
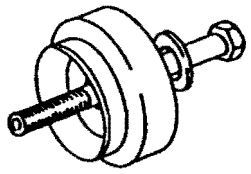
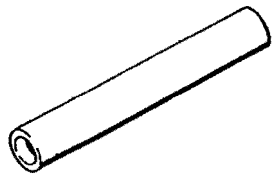
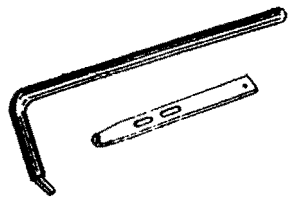
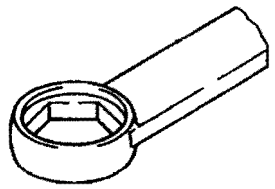
If the timing tool can not be turned into the crankcase the required turns, the camshaft (valve timing) setting will have to be redone.



DEUTZ ENGINE TOOLS

Identification Chart

Part No.	Description	Illustration
MEL1433	Compression Test Adapter	
MEL1453	Socket 60 JMP	
MEL1454	Depth Gauge w/Spacers	
MEL1455	Spanner	
MEL1456	Valve Spring Assembly Lever	
MEL1457	Torx Tool Kit	
MEL1458	Timing Pin for Crankshaft and Camshaft	
MEL1459	Adjusting Pin for Injection Pump Control	

Part No.	Description	Illustration
MEL1460	Belt Tension Tool for Toothed Belt	
MEL1461	Crankshaft Seal Tool (Front)	
MEL1462	Crankshaft Seal Tool (Rear)	
MEL1463	Camshaft Seal Tool	
MEL1464	Valve Stem Seal Tool	
MEL1465	Crankshaft Gasket Removing Tool	
MEL1466	Camshaft Gear Wrench	
MEL1467	Centering Pin Injection Pump Control Lever	

RECONDITIONING THE ENGINE

Disassembly

Remove the starter. (See Page 6–1.)

Remove the alternator. (See Page 6–1.)

Drain the oil from the engine oil pan.

Remove the turbocharger. (See Page 7–113.)

Remove the exhaust manifold.

Remove the intake manifold.

Remove the fuel injection pumps. (See Page 7–39.)

Remove the fuel injectors. (See Page 7–43.)

Remove the oil filter.

Remove the fuel filter & fuel lift pump **[A]**.

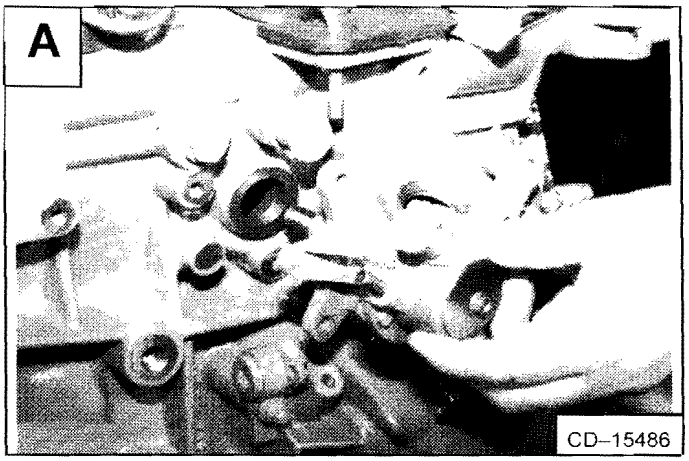
Remove the valve cover.

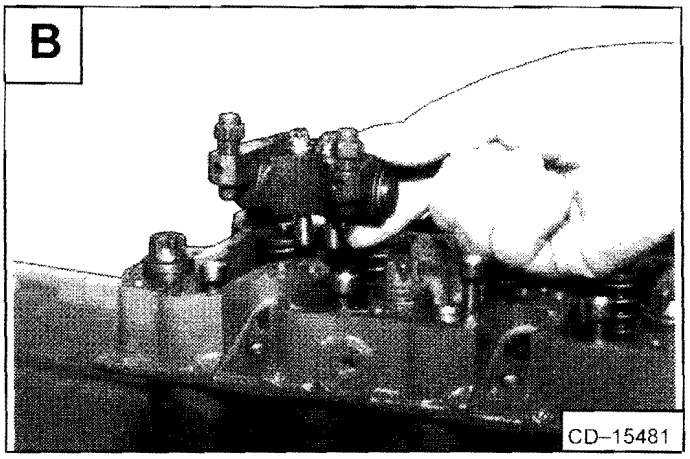
Remove the rocker arms and brackets **[B]**.

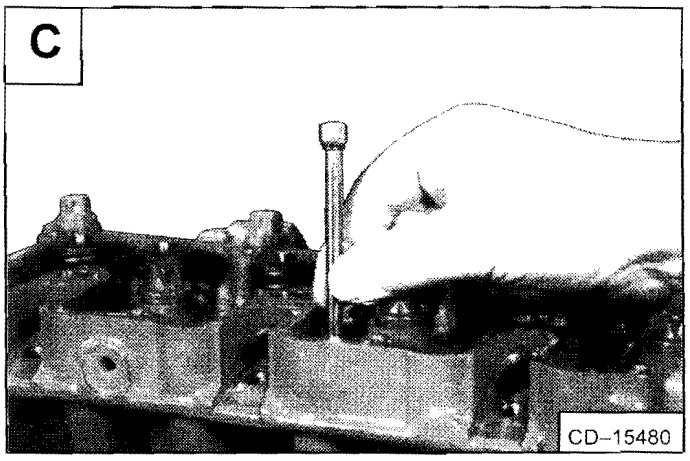
Remove the push rods **[C]**.

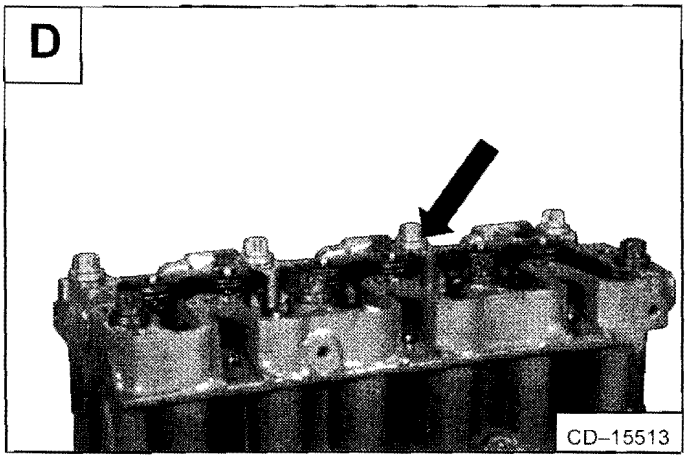
Remove the cylinder head bolts **[D]**.

Remove the cylinder head.





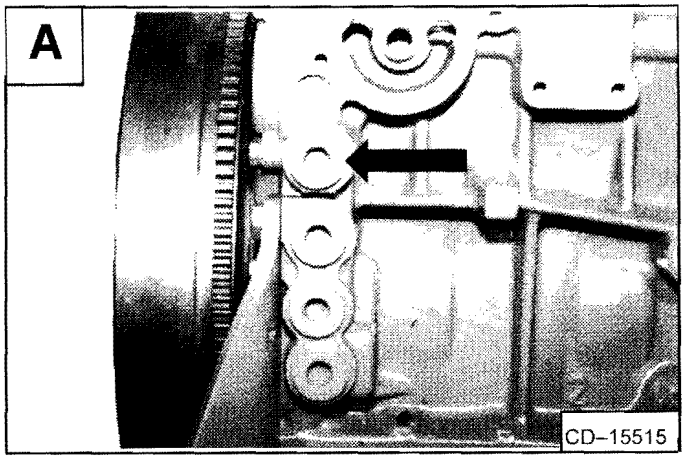




Disassembly (Cont'd)

Remove the oil pressure control valve **[A]**.

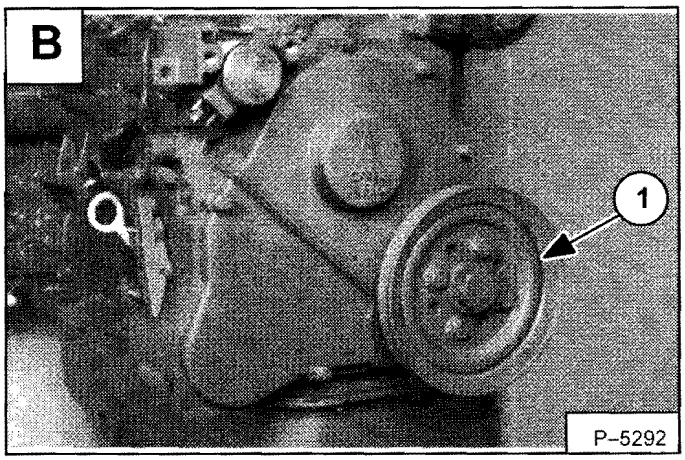
Remove the plugs or fittings from the engine block.



Remove the belt pulley (Item 1) **[B]**.

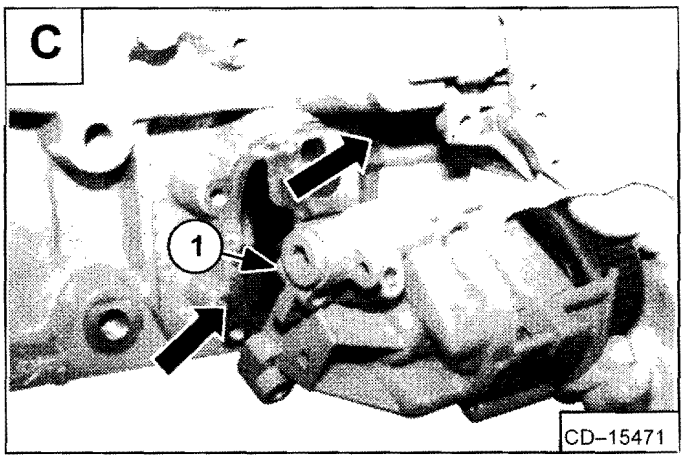
Remove the front cover and timing belt. (See Page 7–48.)

Remove the crankshaft gear.

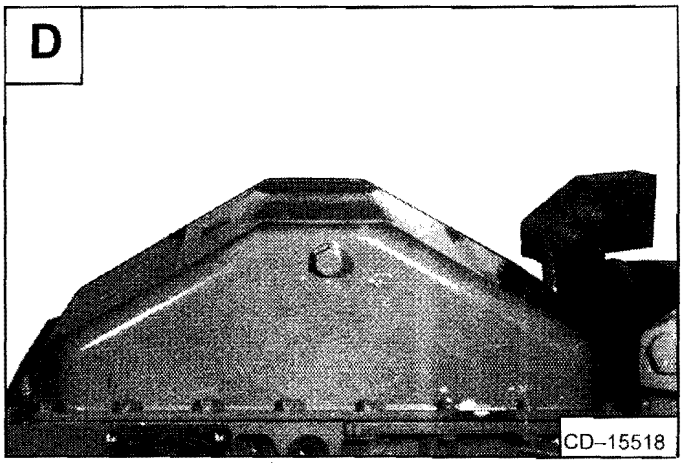


Remove the oil pump **[C]**.

Remove the oil pump relief valve (Item 1) **[C]**.

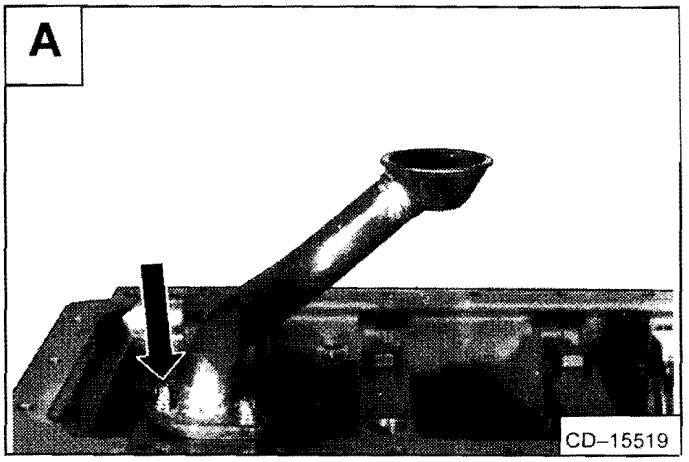


Remove the oil pan **[D]**.



Disassembly (Cont'd)

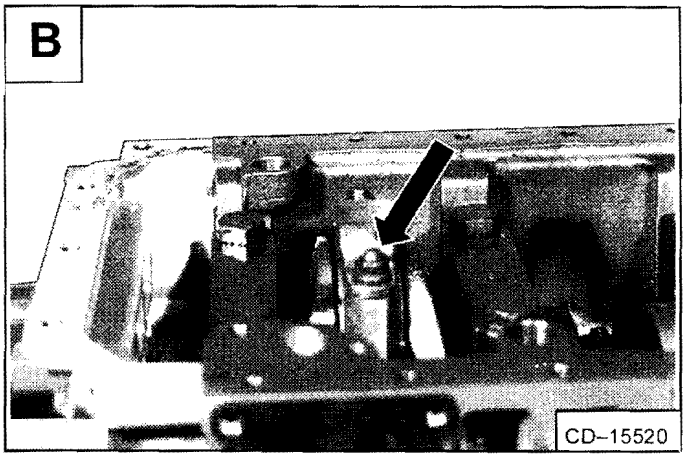
Remove the oil suction pipe **[A]**.



Remove the connecting rod bolts **[B]**.

Remove all the piston/connecting rod assembly from the engine block.

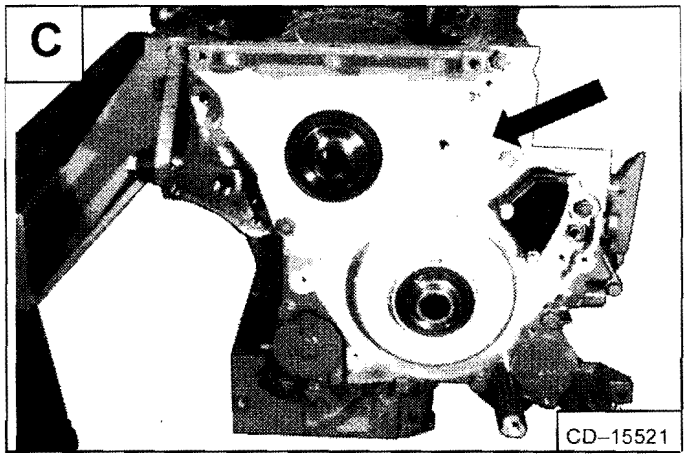
To check the piston/connecting rod assembly. (See Page 7– 92.)



Remove the front cover **[C]**.

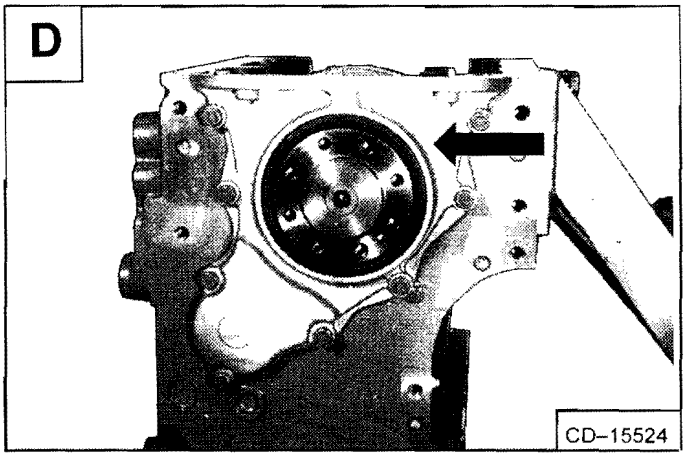
To disassemble, repair and assemble the front cover. (See Page 7– 98.)

Remove the flywheel. (See Page 7–36.)



Remove the rear cover **[D]**.

To install a new rear seal and inspect the cover. (See Page 7–87.)

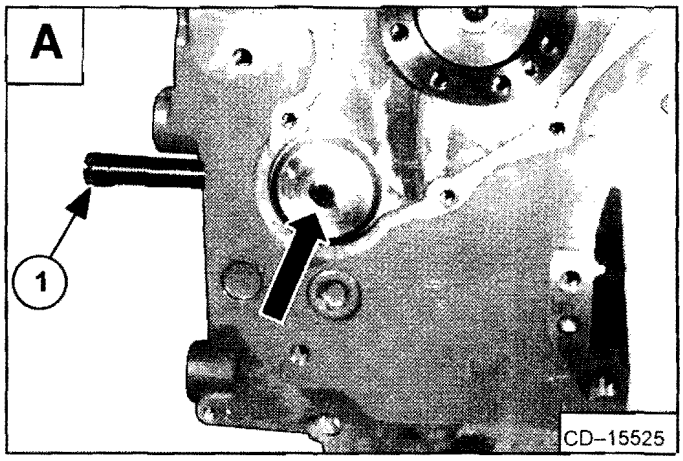


Disassembly (Cont'd)

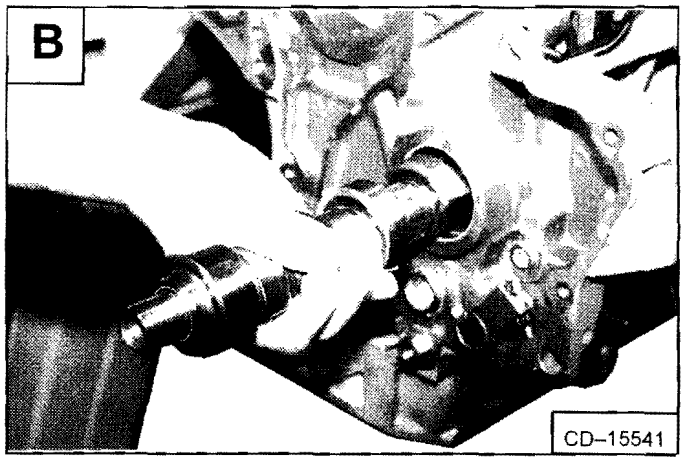
Install the timing tool (Item 1) **[A]** for the camshaft.

Remove the thrust washer from the camshaft **[A]**.

Remove the timing tool.



Remove the camshaft **[B]**.



Mark the location of each main bearing cap so it will be returned to original position.

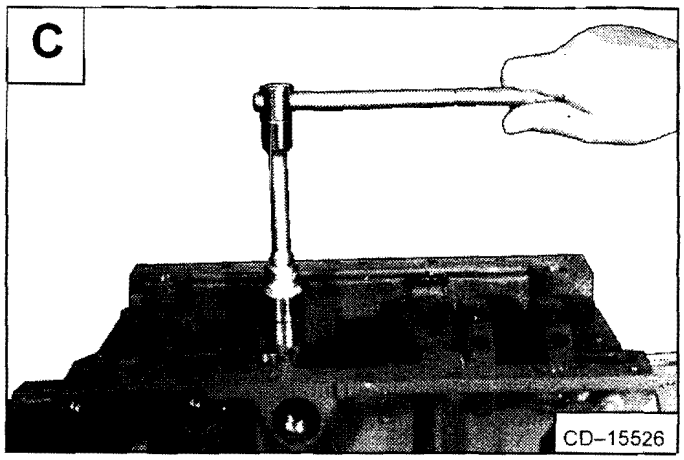
Remove the main bearing caps bolts **[C]**.

Remove the main bearing caps.

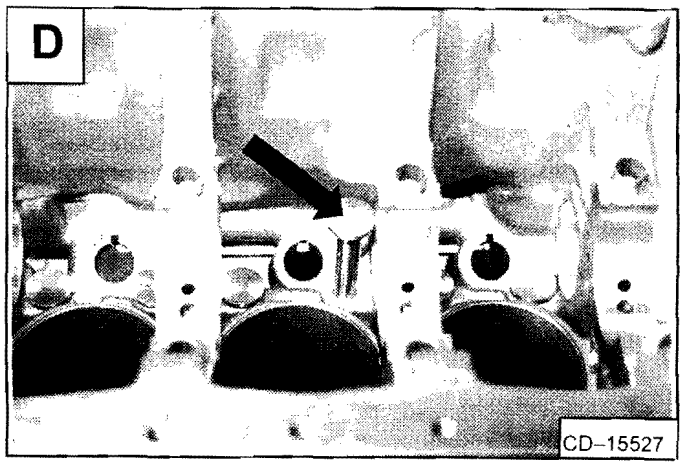
Remove the crankshaft.

To check the crankshaft specifications. (See Page 7–88.)

Remove the upper half of the main bearings.



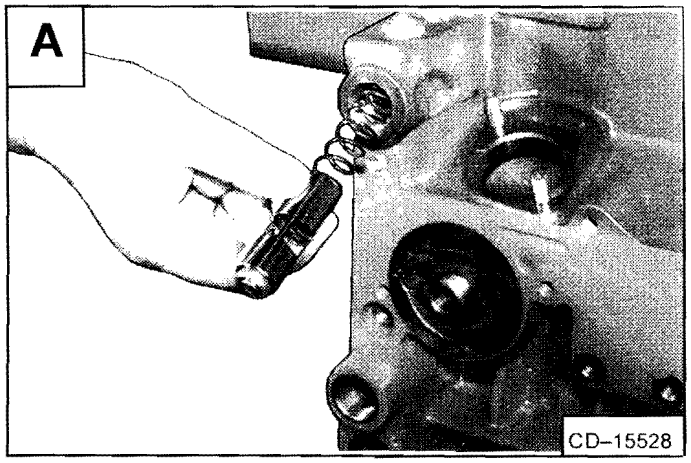
Remove the tappets from the engine block **[D]**.



Assembly

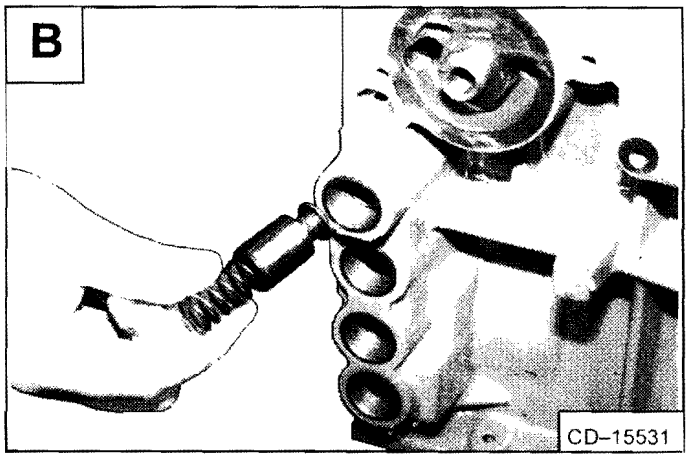
Install the thermostat and compression spring **[A]**.

Install the plug and tighten to 82 ft.–lbs. (111 Nm) torque.



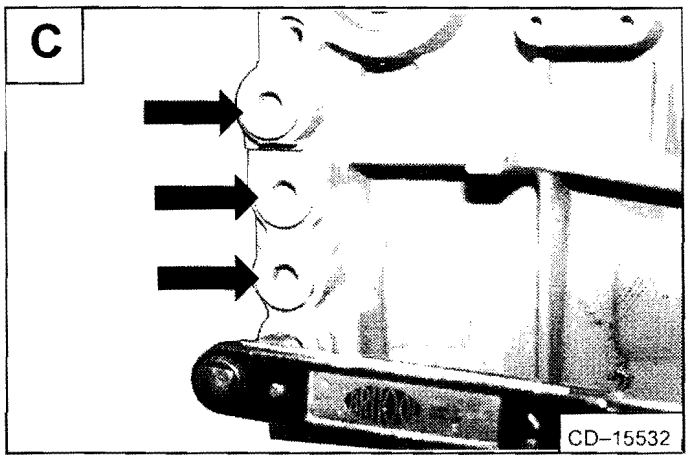
Install the oil pressure control valve and compression spring **[B]**.

Install the plug.

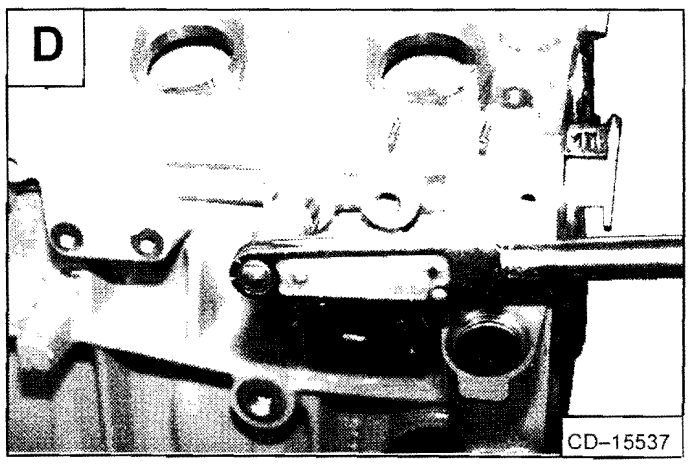


Install new seals on the fittings and/or plugs.

Install all the fittings and/or plugs and tighten to 82 ft.–lbs. (111 Nm) torque **[C]**.

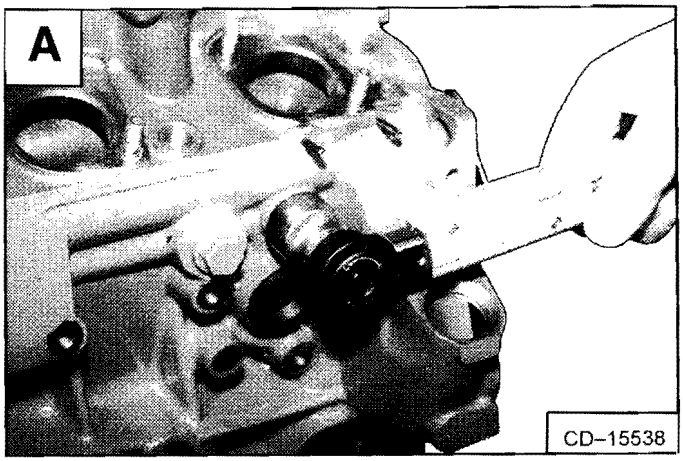


Install the plug and tighten to 37 ft.–lbs. (50 Nm) torque **[D]**.

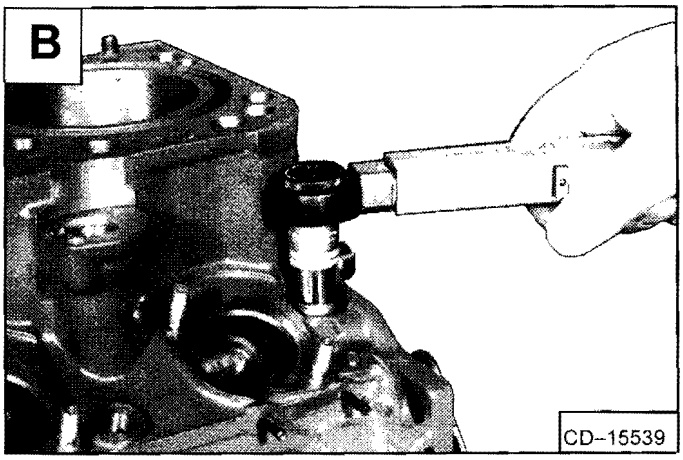


Assembly (Cont'd)

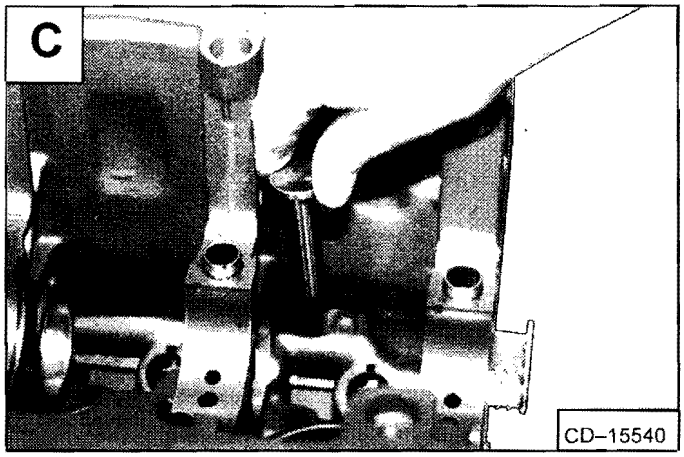
Install the oil pressure switch and tighten to 115 in.–lbs. (13 Nm) torque **[A]**.



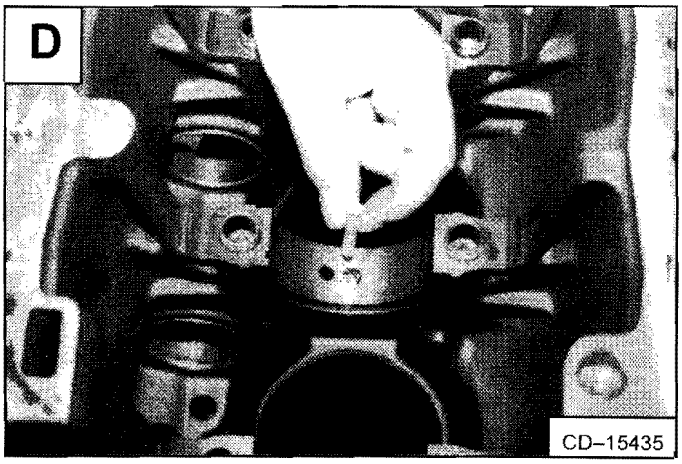
Install a new seal on the plug and install in the block. Tighten the plug to 21 ft.–lbs. (28 Nm) torque **[B]**.



Install the tappets **[C]**.

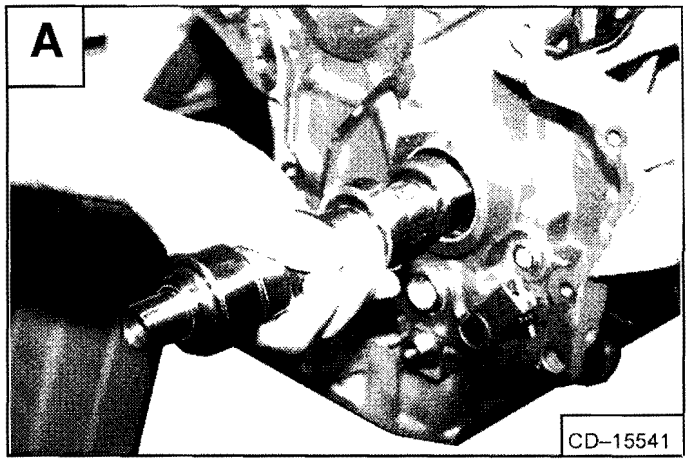


Before installing the new piston cooling oil nozzle, check that the bores in the block are clean and free of oil. Press in the piston cooling nozzle as far as it will go **[D]**.

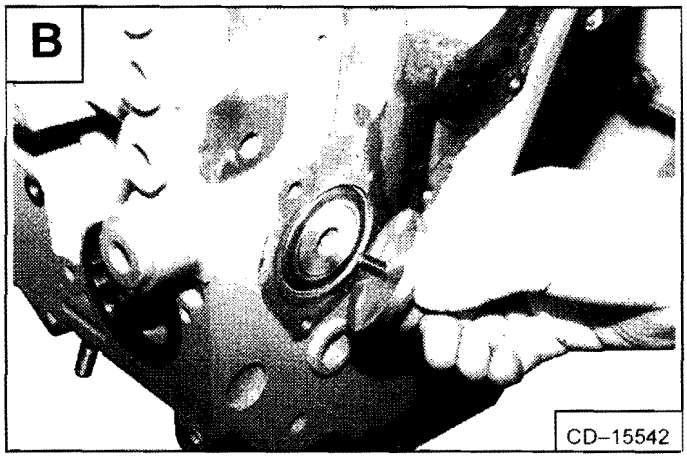


Assembly (Cont'd)

Install the camshaft **[A]**.



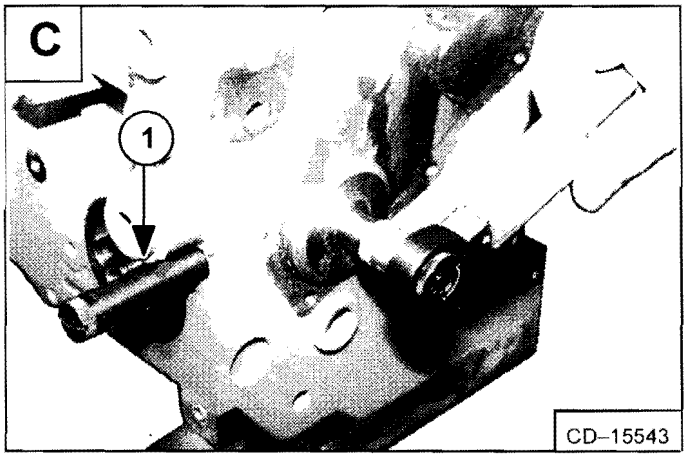
Install the thrust washer with the lubricating groove toward the crankcase **[B]**.



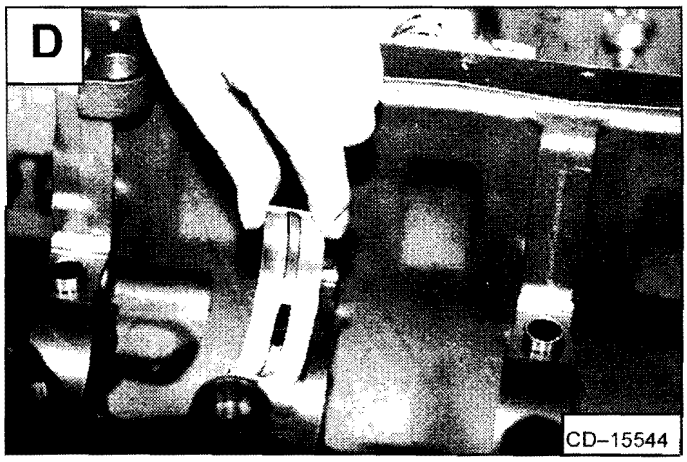
Install the camshaft timing tool (Item 1) **[C]**.

Tighten the camshaft thrust washer bolt to 15 ft.–lbs. (21 Nm) torque **[C]**.

Remove the timing tool.



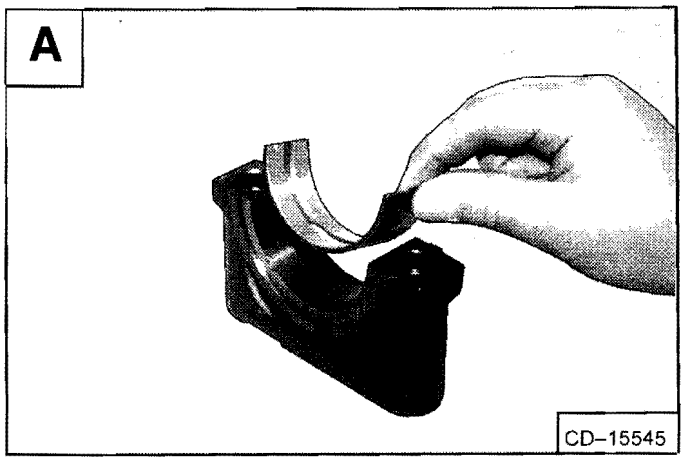
Install the upper main bearing halves **[D]**.



RECONDITIONING THE ENGINE (Cont'd)

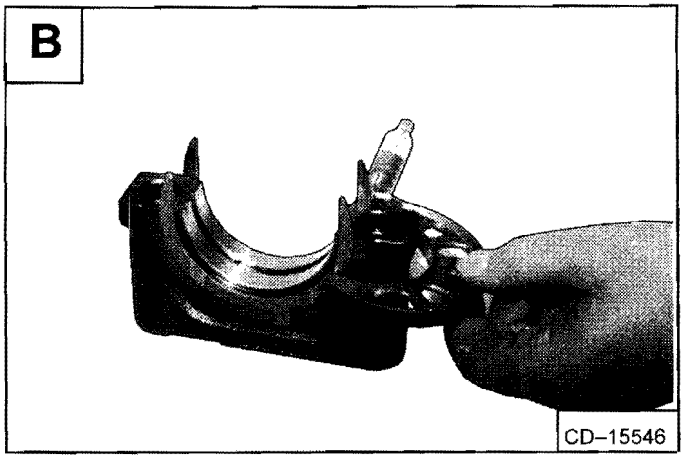
Assembly (Cont'd)

Install the other main bearing half into the main bearing caps **[A]**.



Install the thrust bearings halves on the main bearing cap **[B]**.

Measure the width of the thrust washers/main bearing cap **[B]**.



Measure the bearing journal width at the crankshaft (inset) **[C]**

Specifications:

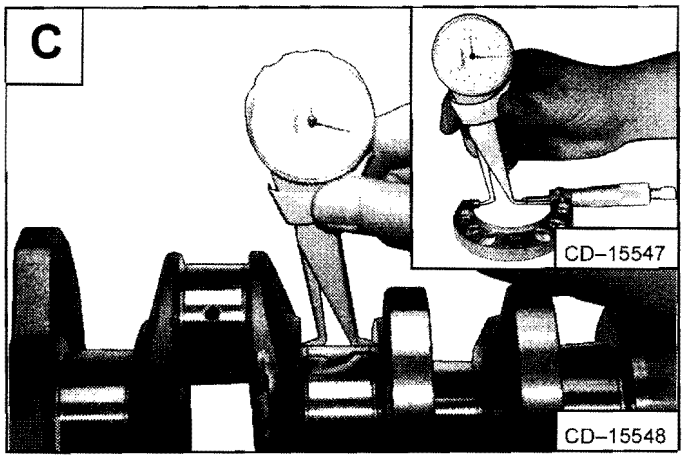
Std. Journal Width ..... 1.378–1.379 inch (35,0–35,04 mm)
O/S Limit ..... 1.395 inch (35,44 mm)

Determine the end play for the crankshaft **[C]**.

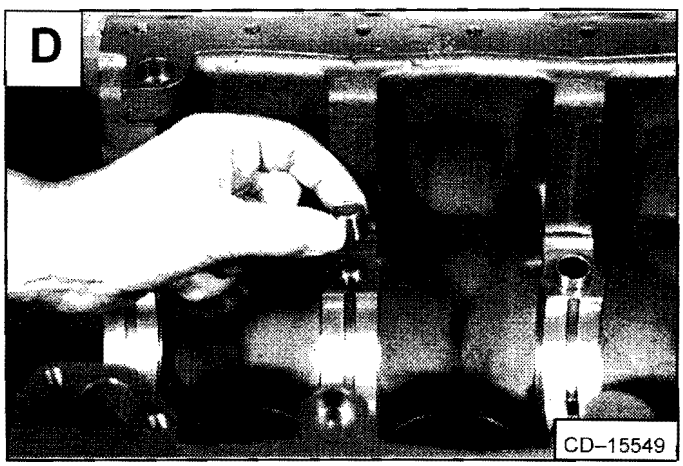
Specifications:

Std. End Play ..... 0.004–0.010 inch (0,1–0,273 mm)
Wear Limit ..... 0.016 inch (0,4 mm)

Use new thrust washer as needed to get the correct end play.

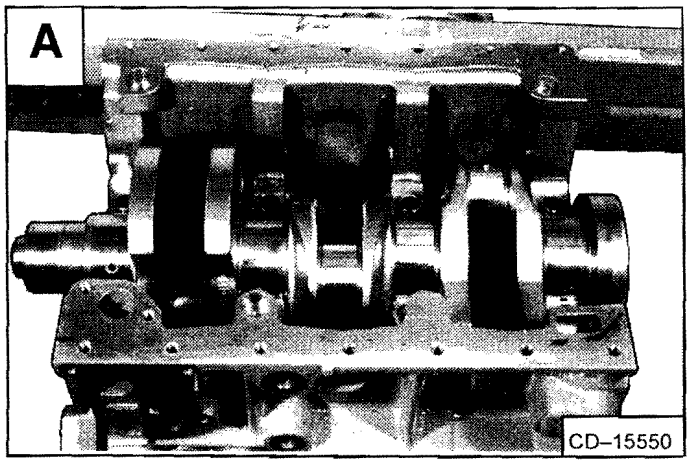


Install the main bearing locating sleeves **[D]**.

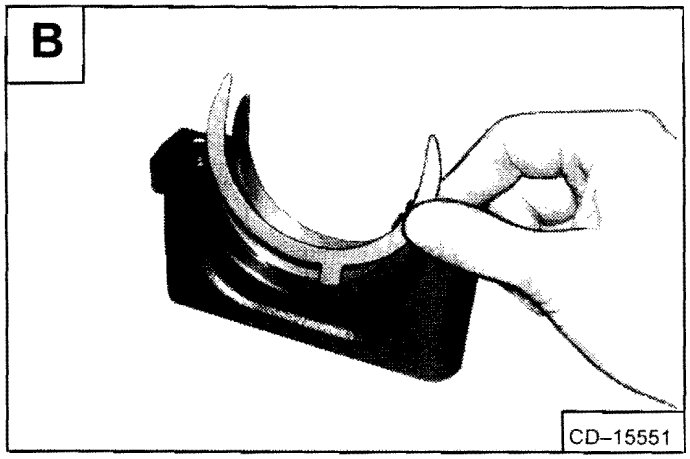


Assembly (Cont'd)

Install the crankshaft into the engine block **[A]**.

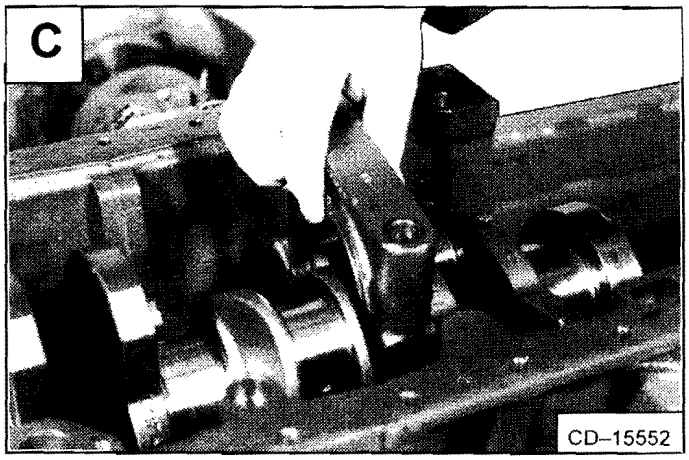


Lubricate the thrust washer with grease and install them on the main bearing cap **[B]**.



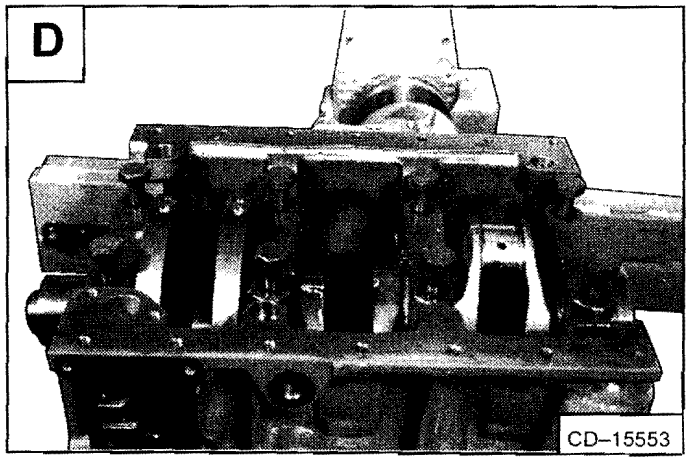
Install the main bearing/thrust washer assembly **[C]**.

NOTE: The main bearing cap No. 1, at the flywheel end, the chamfer must be towards the flywheel end.



Install the main bearing caps/main bearing assembly **[D]**.

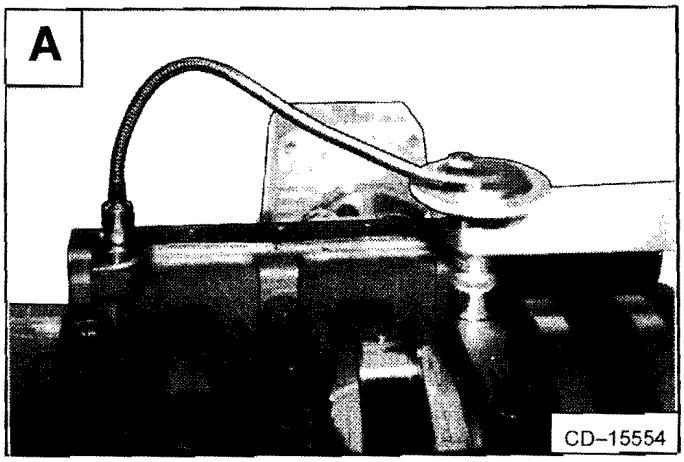
Make sure they are returned to their original location.



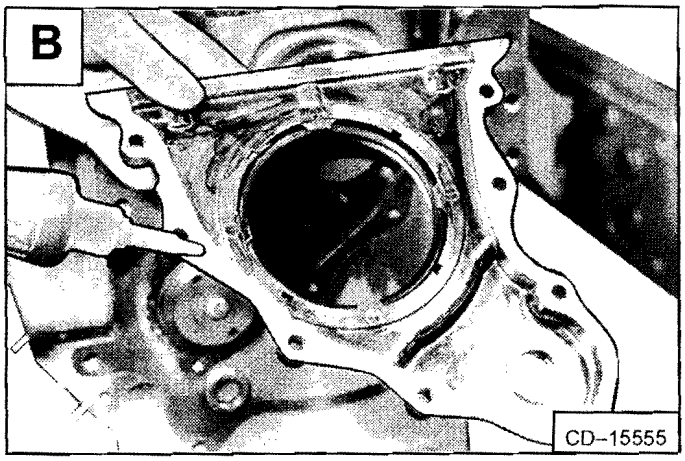
Assembly (Cont'd)

Tighten the main bearing cup bolts as follows **[A]**:

Initial Torque ..... 37 ft.–lbs. (50 Nm)
1st Step Angle ..... 60°
2nd Step Angle ..... 45°



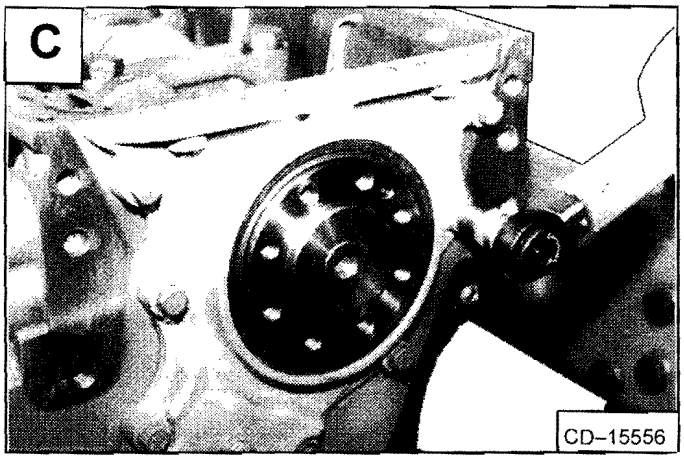
Put sealing compound on the rear cover **[B]**.



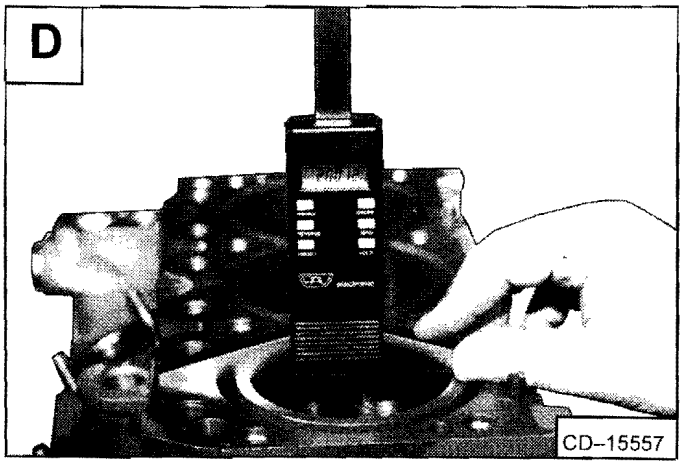
Install the rear cover complete with a new rear seal **[C]**.

NOTE: Make sure the rear cover oil pan surface aligns with the engine block surface.

Tighten the bolts to 15 ft.–lbs. (12 Nm) torque **[C]**.



Measure the distance between the top edge of the crankpin (TDC) and cylinder head sealing surface at every cylinder **[D]**.



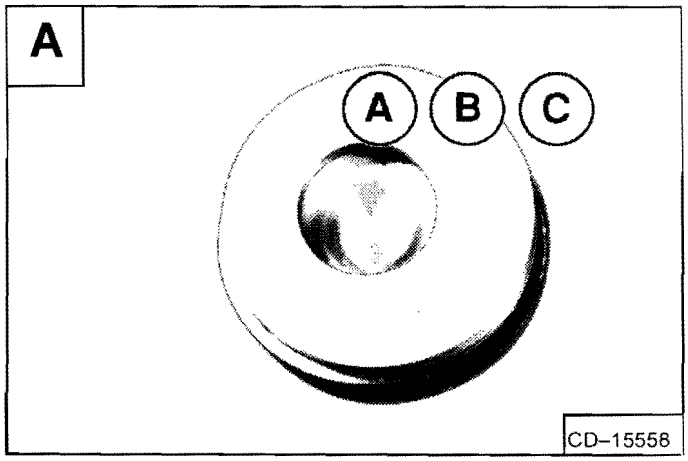
Assembly (Cont'd)

Compare actual dimension with the dimension listed **[A]**:

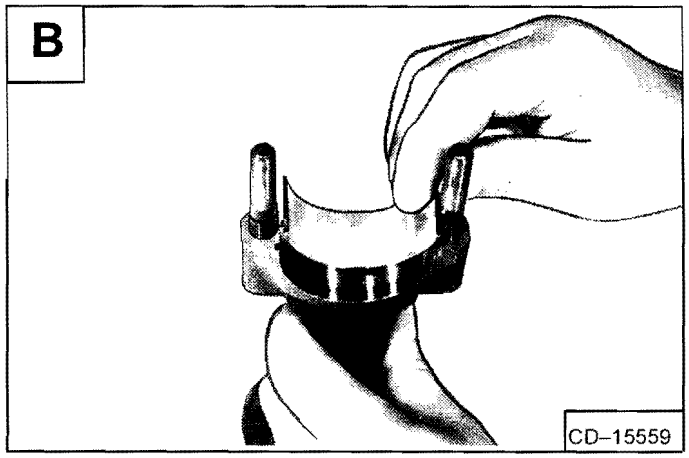
Specifications:

Piston Class A ..... 7.732–7.736 inch (196,39–196,49 mm)

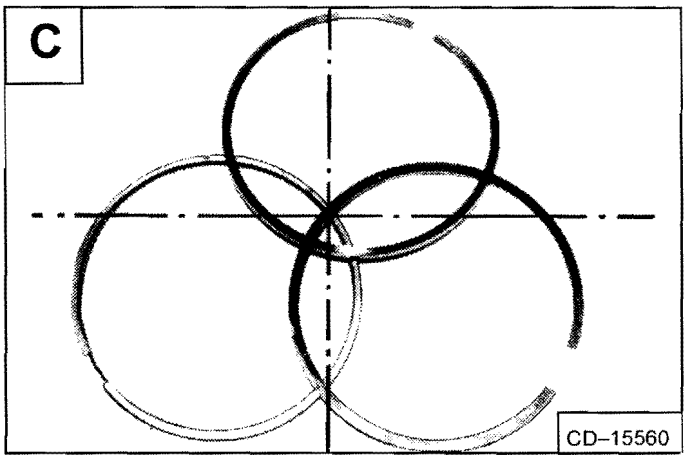
NOTE: If the crankshaft is undersize, 0.005 inch (0,125 mm) must be added to the dimension listed.



Install the connecting rod bearing halves into the connecting rod **[B]**.



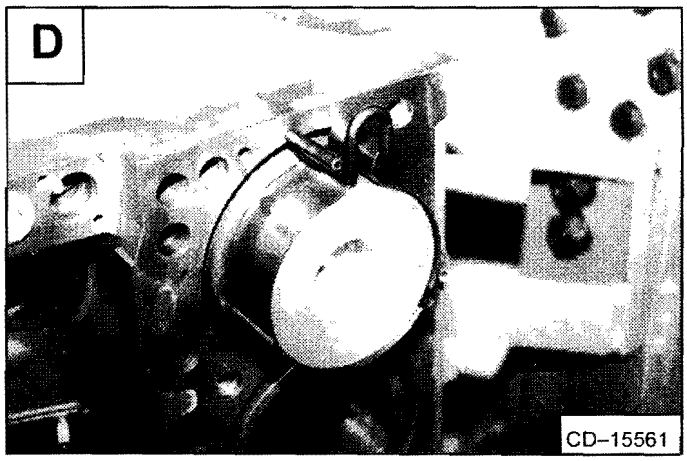
Before installing piston/connecting rod assembly, make sure the piston ring gaps are staggered as shown in Fig. **[C]**.



Install a piston ring compressor on the piston rings.

Install the piston/connecting rod assembly into the engine block **[D]**.

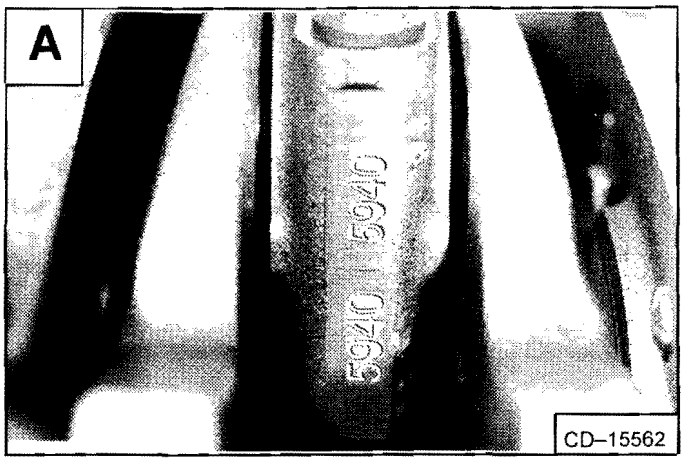
NOTE: The flywheel symbol on the piston must be toward the flywheel.



RECONDITIONING THE ENGINE (Cont'd)

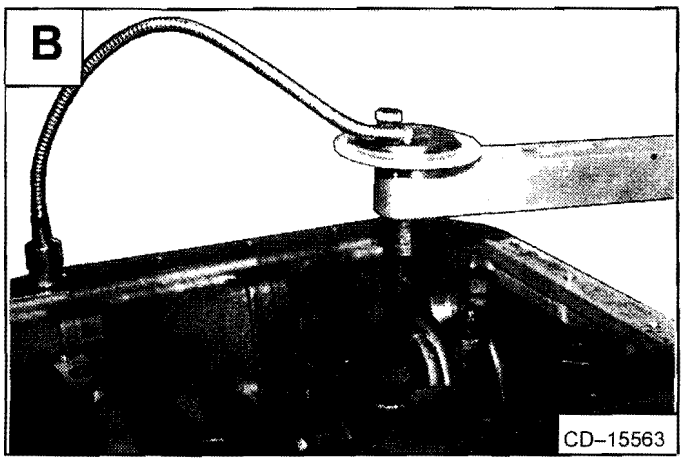
Assembly (Cont'd)

Install the connecting rod cap on the connecting rod, make sure the numbers are aligned **[A]**.

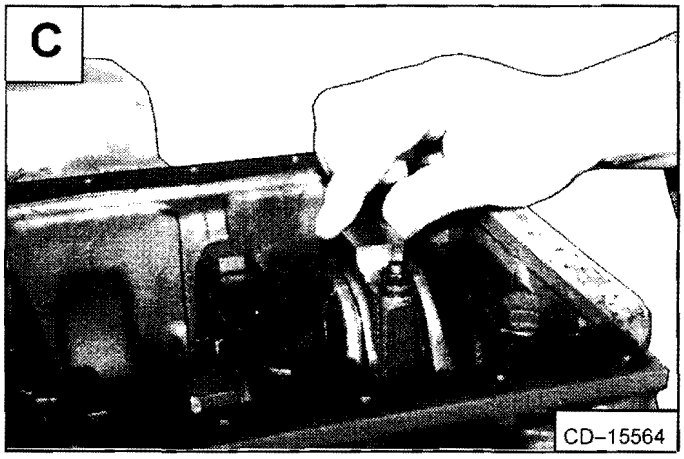


Tighten the connecting rod bolts as follows **[B]**:

Initial Torque ..... 22 ft.–lbs. (30 Nm)
1st Step Angle ..... 60°
2nd Step Angle ..... 60°

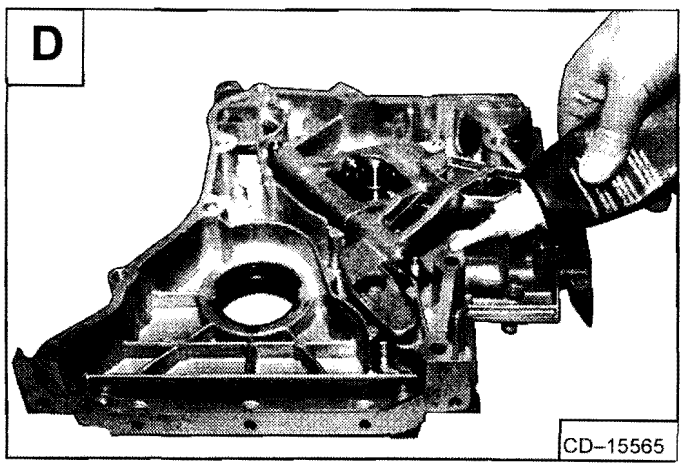


Check that the connecting rods can be easily moved back and forth on the crankpin **[C]**.



Put sealing compound on the front cover sealing surface **[D]**.

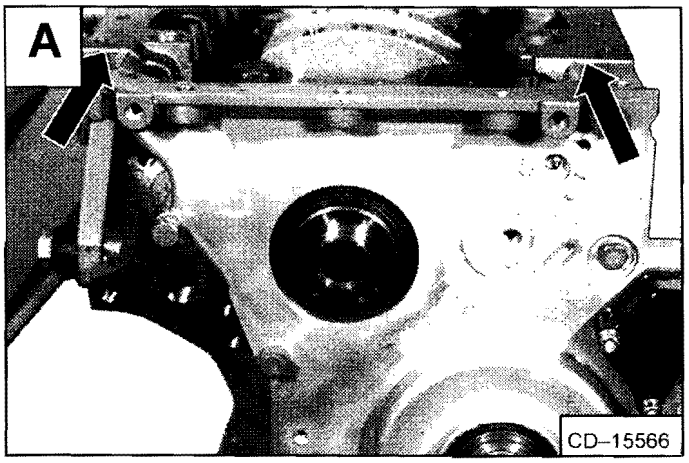
NOTE: Make sure the camshaft/centrifugal governor connecting is clean and free of oil.



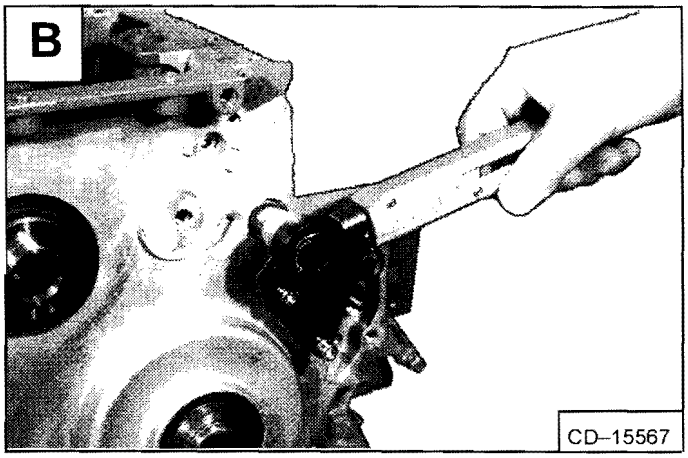
Assembly (Cont'd)

Install the front cover with the new shaft seals on the engine block **[A]**.

NOTE: Make sure the oil pan sealing surface on the front cover aligns with the sealing surface on the block [A].



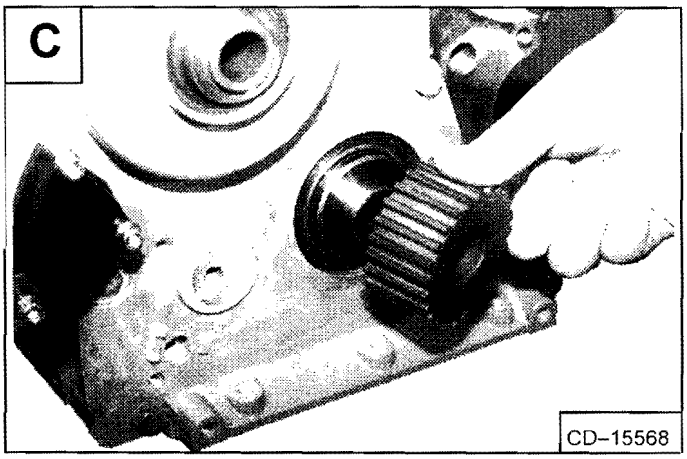
Tighten the front cover bolts to 15 ft.–lbs. (21 Nm) torque **[B]**.



Install the crankshaft gear on the crankshaft **[C]**. Make sure the mating surfaces are clean and free of oil.

Install the bolt and tighten as follows:

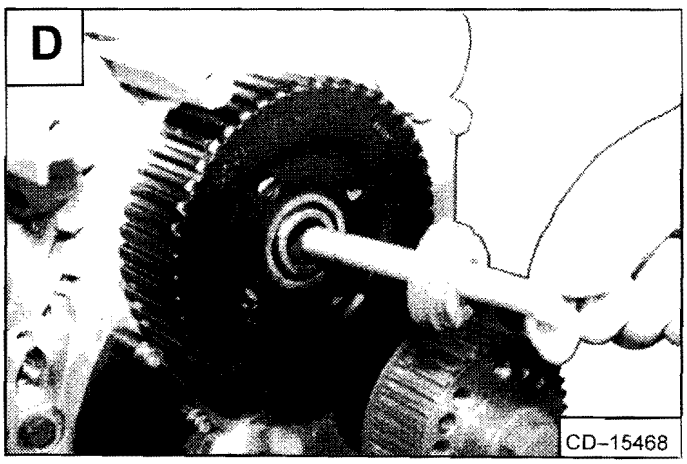
Initial Torque ..... 95 ft.–lbs. (130 Nm)
1st Stage Angle ..... 210°
2nd Stage Angle ..... 10°



Install the camshaft gear **[D]**.

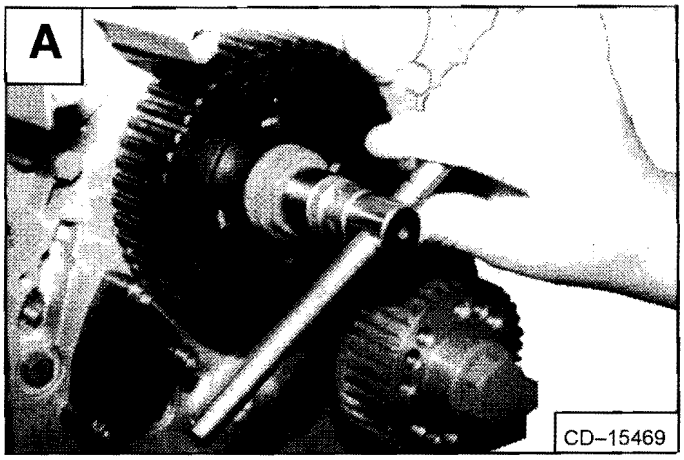
Make sure all mating surfaces are clean and free of oil.

Install the camshaft bolt **[D]**.

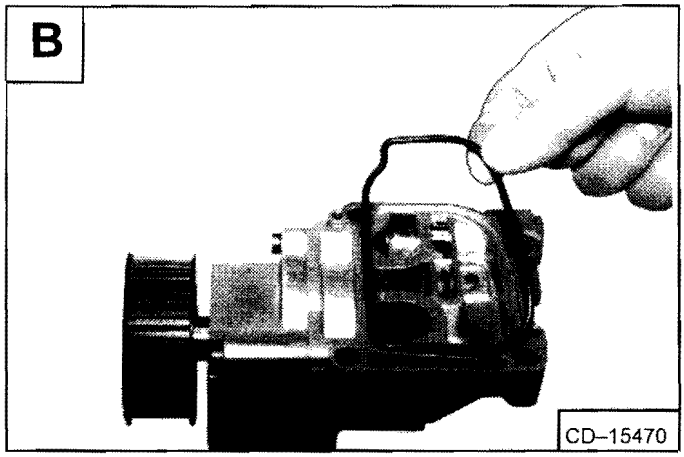


Assembly (Cont'd)

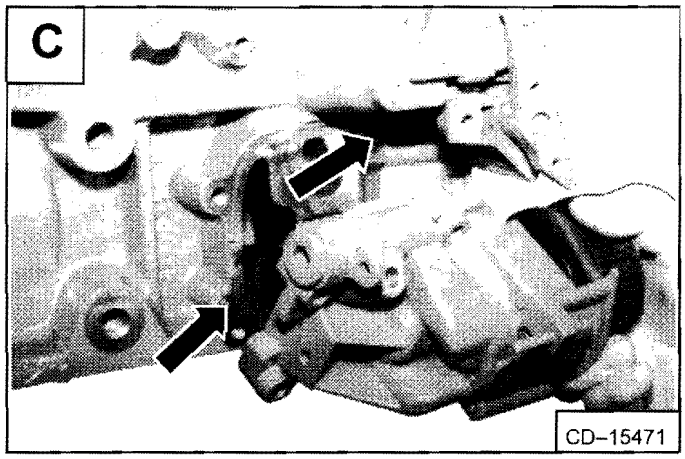
Tighten the camshaft bolt finger tight only **[A]**. Camshaft gear must still turn freely.



Install a new gasket on the oil pump **[B]**.

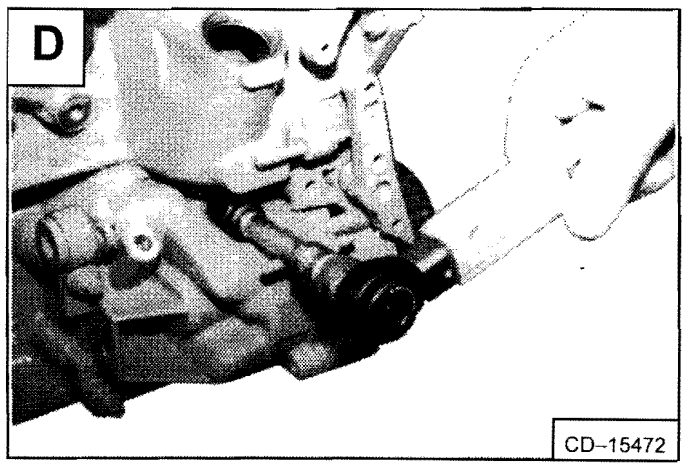


Install the oil pump on the engine block **[C]**.



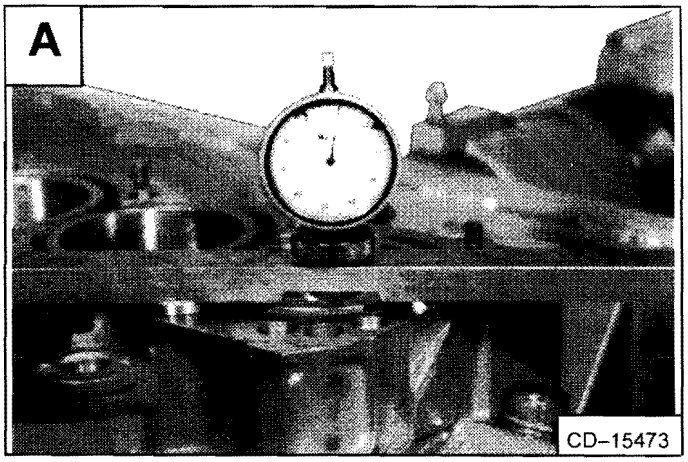
Tighten the oil pump bolts to 16 ft.–lbs. (22 Nm) torque **[D]**.

Install the engine timing belt. (See Page 7–49.)

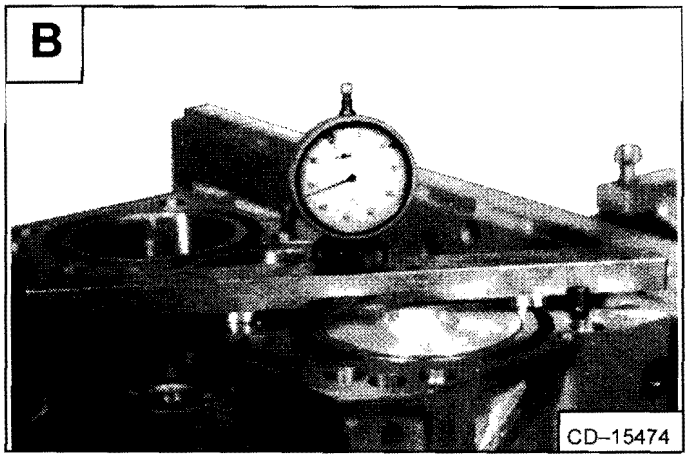


Assembly (Cont'd)

Put spacers on sealing surface of the engine block and set dial indicator gauge to 0 **[A]**. (See Page 7–58, for correct tool.)

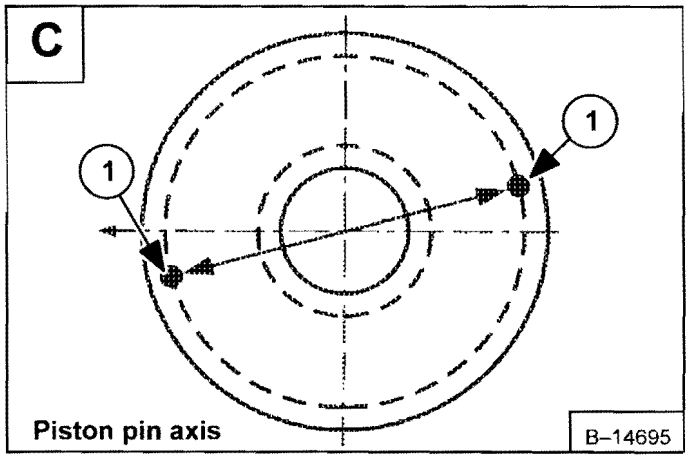


Position the dial gauge on the piston **[B]**.



Measure at the gauge points (Item 1) **[C]**.

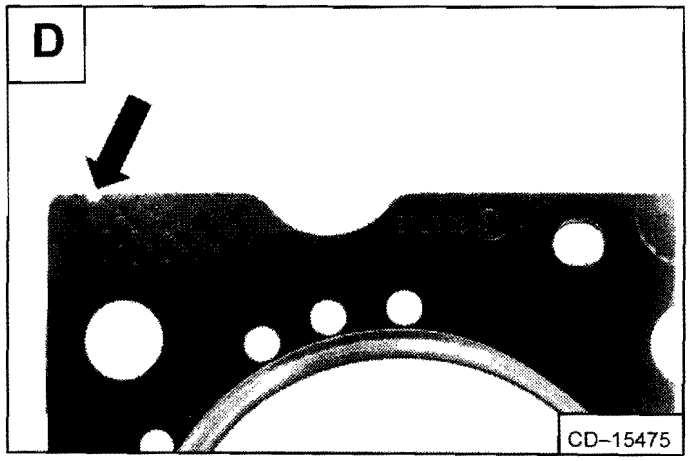
To determine maximum piston projection measure all the pistons.



Compare the measurements with the specifications to determine the correct cylinder head gasket.

Specifications:

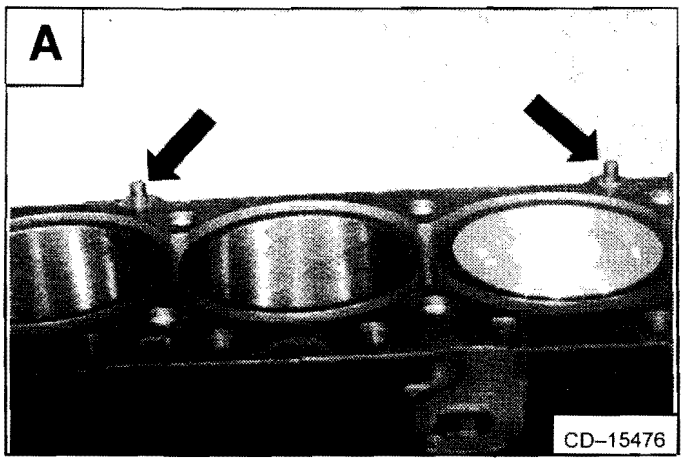
Piston Projection	Marking of Cylinder Head Gasket [D]
0.021–0.027 inch (0,53–0,69 mm)	1 Notch
0.027–0.030 inch (0,69–0,76 mm)	2 Notches
0.030–0.033 inch (0,76–0,83 mm)	3 Notches



RECONDITIONING THE ENGINE (Cont'd)

Assembly (Cont'd)

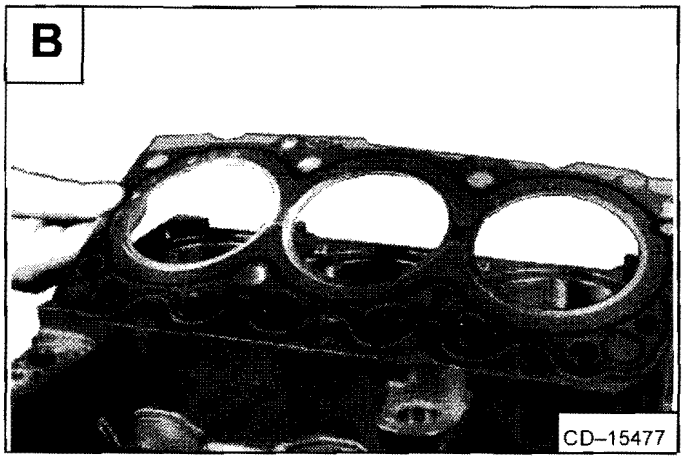
Make sure the dowel pins are installed in the engine block **[A]**.



Install the cylinder head gasket **[B]**. Gasket is marked TOP.

Make sure the sealing surfaces of the cylinder head gasket is free of oil.

Install the cylinder head.



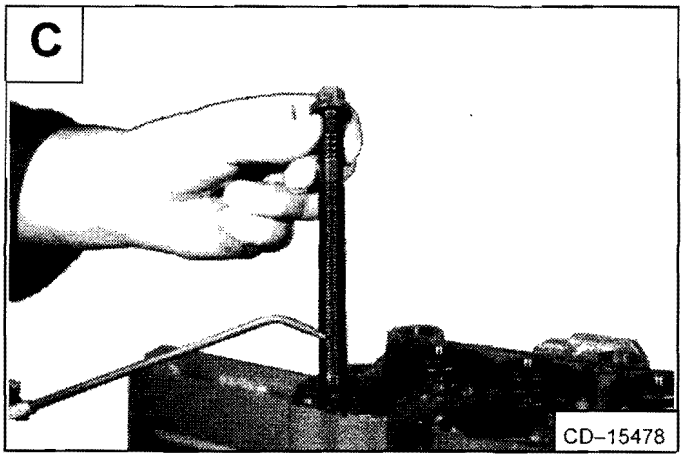
Measure the cylinder head bolts.

Specifications:

Std. Length ..... 5.90 ± 0.03 inch (150±0,8 mm)

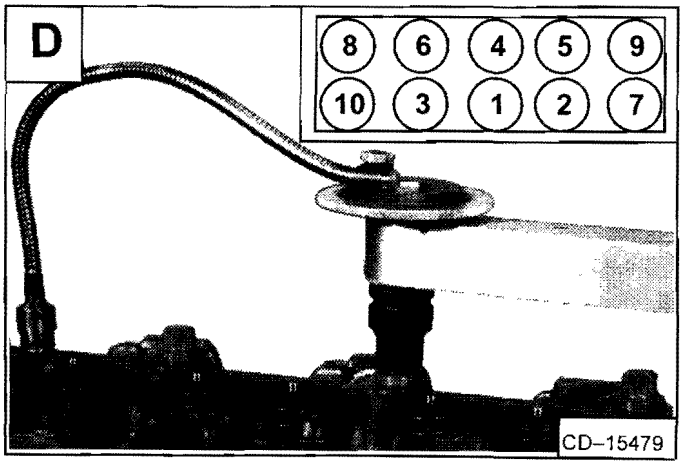
Put a light coat of oil on the head bolts **[C]**.

Install the head bolts.



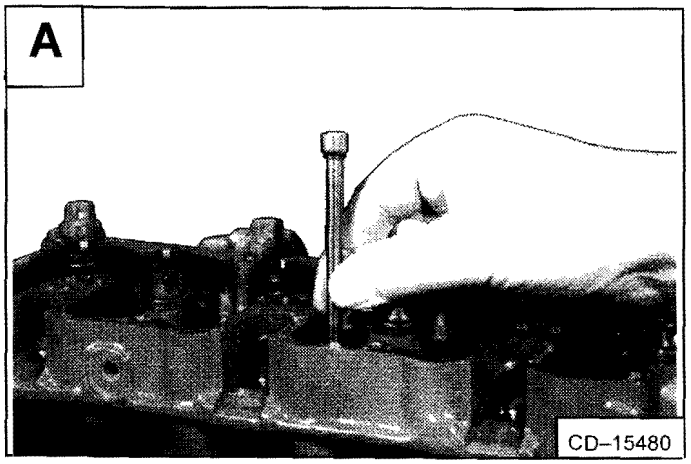
Tighten the cylinder head bolts to the correct torque in the correct sequence **[D]**.

Initial Torque	22 ft.–lbs. (30 Nm)
1st Stage Torque	59 ft.–lbs. (80 Nm)
2nd Stage Torque	118 ft.–lbs. (160 Nm)
3rd Stage Torque	90°

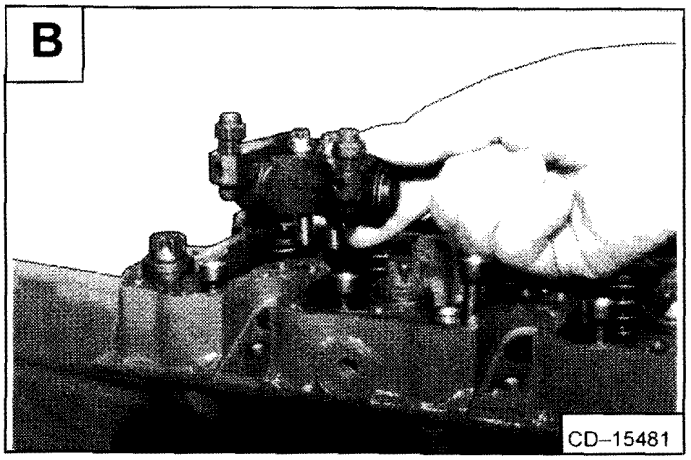


Assembly (Cont'd)

Install the push rods **[A]**.

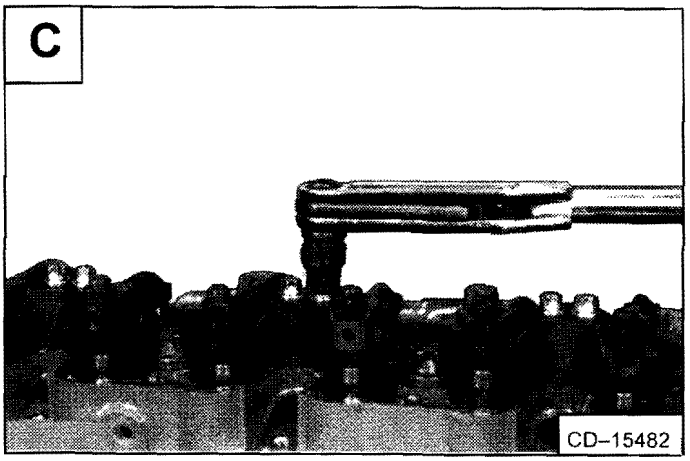


Install the rocker arms/bracket assembly **[B]**.



Tighten the rocker arm bracket bolts to 15 ft.–lbs. (21 Nm) torque **[C]**.

Set the valve clearance. (See Page 7–38.)



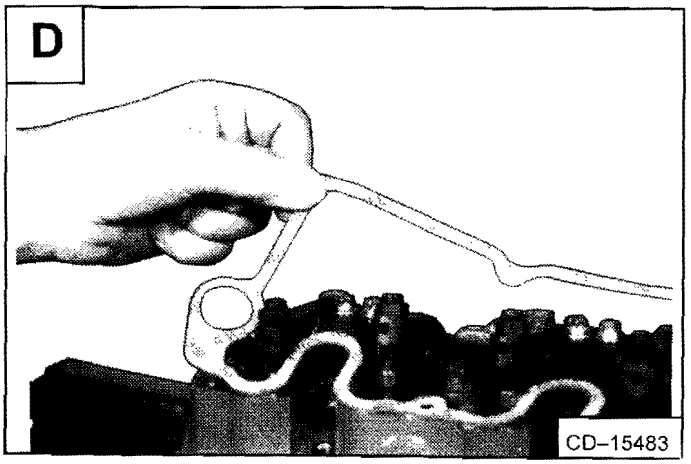
Install the valve cover gasket **[D]**. Install the valve cover. Tighten the bolts to 75 in.–lbs. (8,5 Nm) torque.

Install new intake manifold gasket.

Install the intake manifold and tighten the bolts to 15 ft.–lbs. (20 Nm) torque.

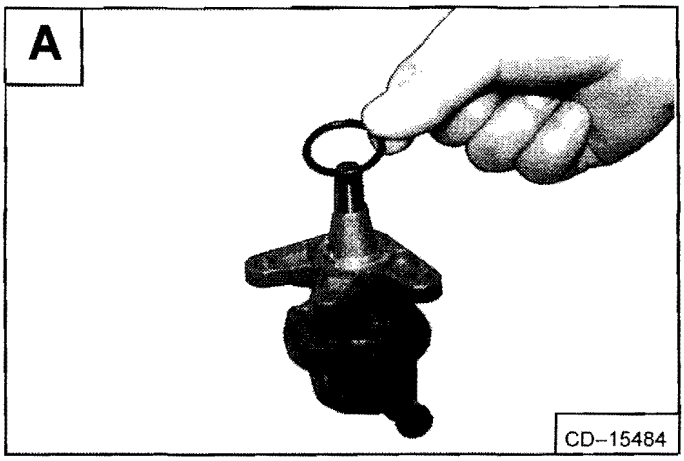
Install new exhaust manifold gaskets.

Install the exhaust manifold and tighten the bolts to 30 ft.–lbs. (40 Nm) torque.

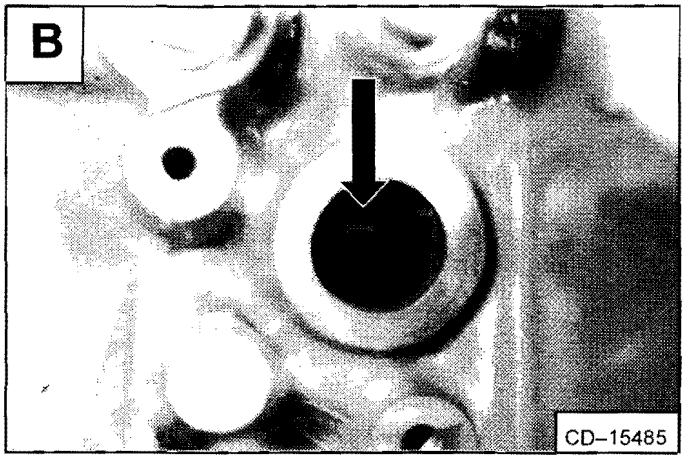


Assembly (Cont'd)

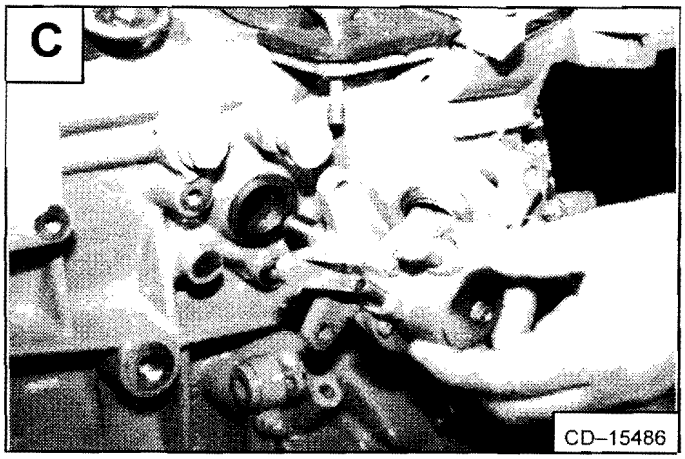
Install a new seal on the fuel lift pump **[A]**.



Turn the camshaft so the fuel lift pump lobe is at B.D.C. (bottom dead center) **[B]**.



Install the fuel lift pump **[C]**.

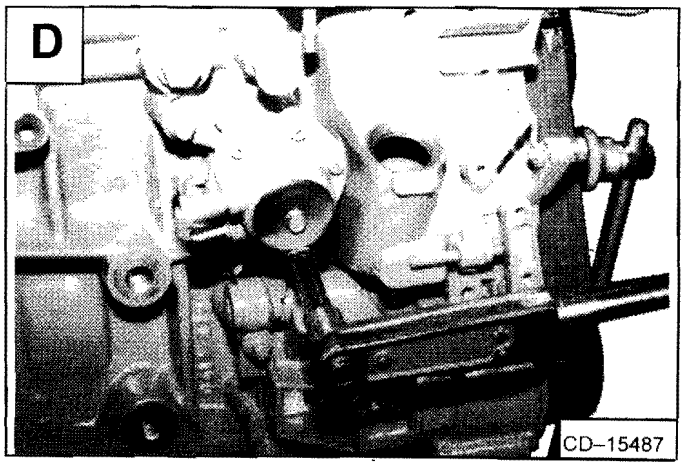


Tighten the lift pump bolts to 15 ft.–lbs. (21 Nm) torque **[D]**.

Install a new oil filter.

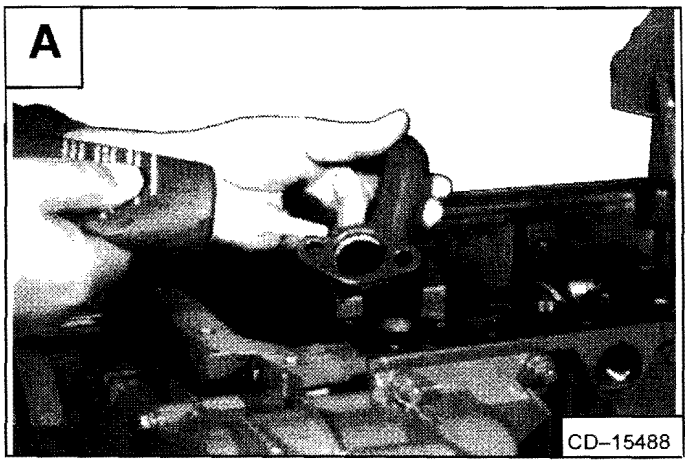
Install the fuel injectors. (See Page 7–43.)

Install the fuel injector pumps. (See Page 7–41.)

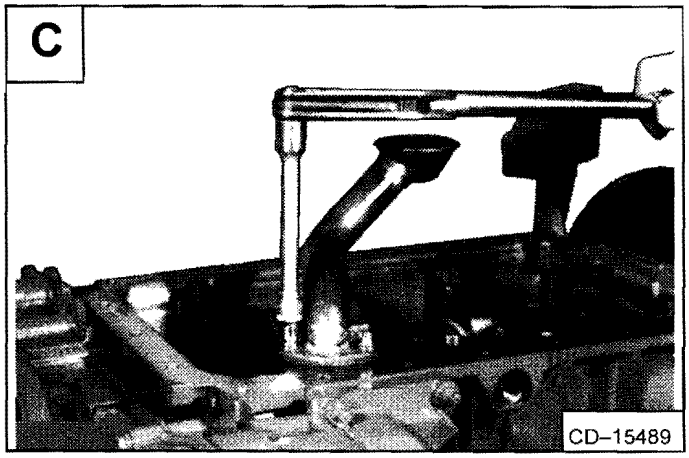


Assembly (Cont'd)

Put sealing compound on the sealing surface of the oil suction pipe **[A]**.

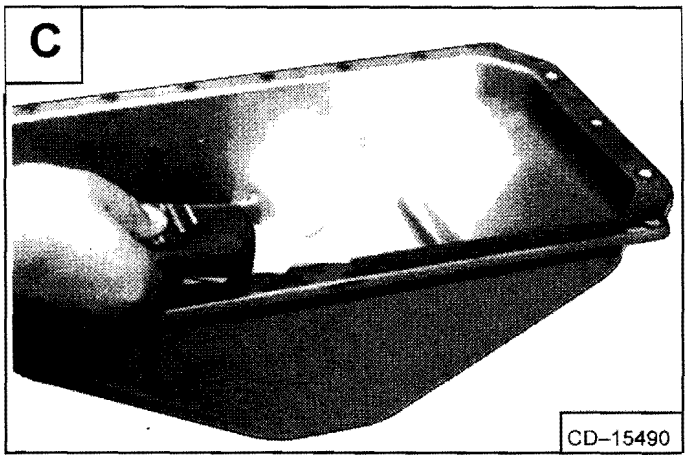


Install the oil suction pipe and tighten the bolts to 16 ft.–lbs. (22 Nm) torque **[B]**.



Put sealing compound on the sealing surface of the oil pan **[C]**.

Install the oil pan



Initially install the corner bolts first and tighten to 5 in.–lbs. (0,5 Nm) torque.

Install the oil pan bolts and tighten to 15 ft.–lbs. (21 Nm) torque as shown in the Figure **[D]**.

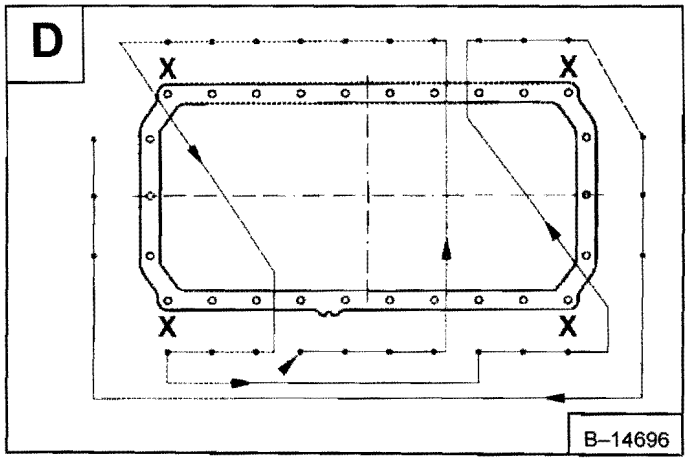
Install the oil pan plug and tighten to 40 ft.–lbs. (55 Nm) torque.

Install the flywheel. (See Page 7–36.)

Install the turbocharger. (See Page 7–113.)

Install the starter. (See Page 6–1.)

Install the alternator. (See Page 6–1.)



CYLINDER LINERS

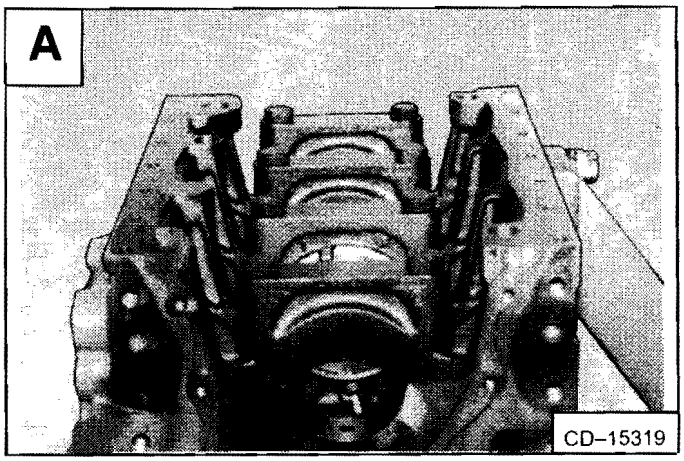
Checking the Cylinder Liners

Clean the engine block and inspect for damage.

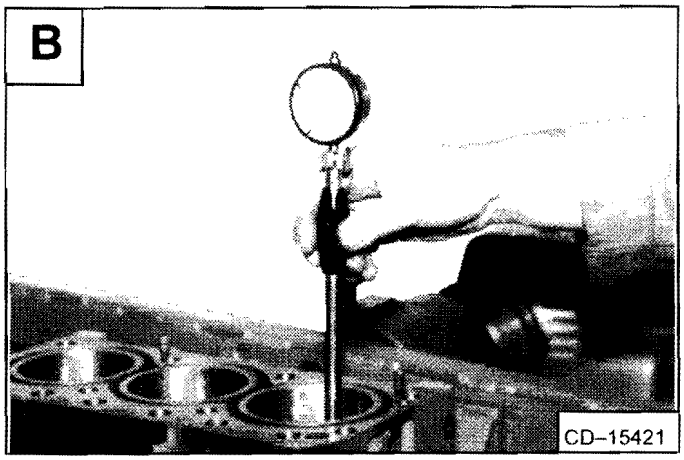
Install the main bearing caps **[A]**.

Tighten the main bearing cap bolts as follows:

Initial Torque ..... 37 ft.–lbs. (50 Nm)
1st Stage Angle ..... 60°
2nd Stage Angle ..... 45°



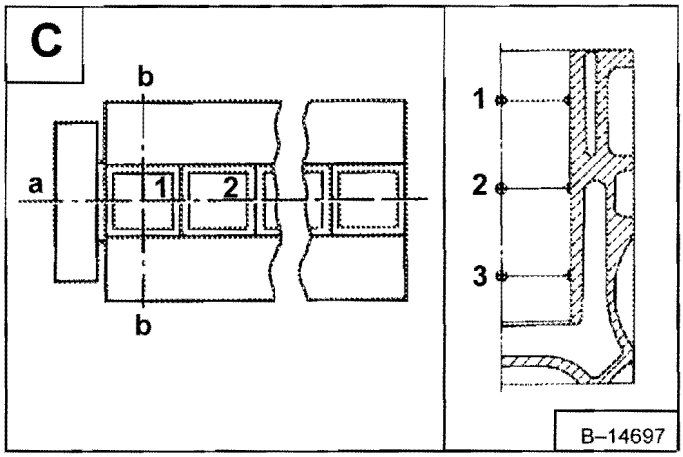
Using a dial indicator gauge check the cylinders **[B]**.



Check the cylinders with engine block longitudinal **(a)** and transverse **(b)** axis and in three planes **[C]**.

Specifications:

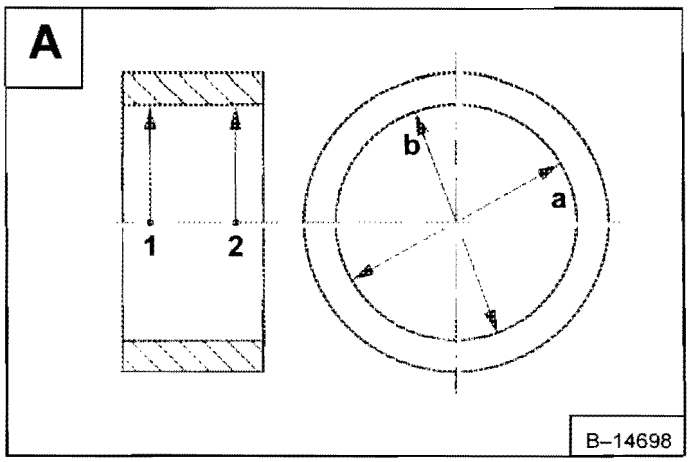
Cylinder Bore ..... 3.58 + 0.0008 inch (91 + 0,02 mm)
Wear Limit ..... 3.59 inch (91,1 mm)



CAMSHAFT BEARINGS

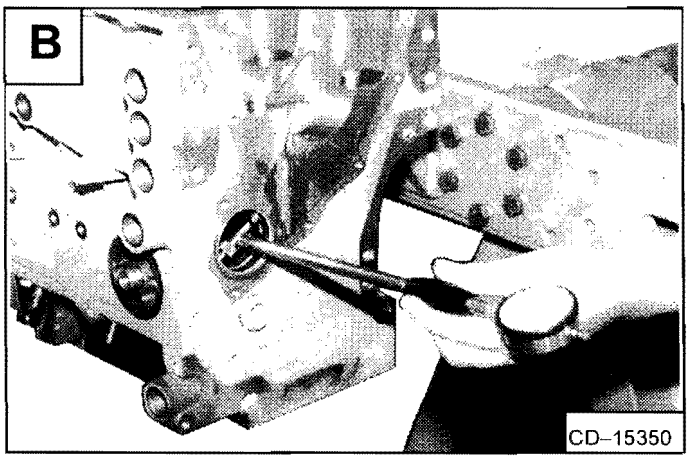
Checking

Check the camshaft bearing bushings at points **(1)** and **(2)** in the planes of **(a)** and **(b) [A]**.



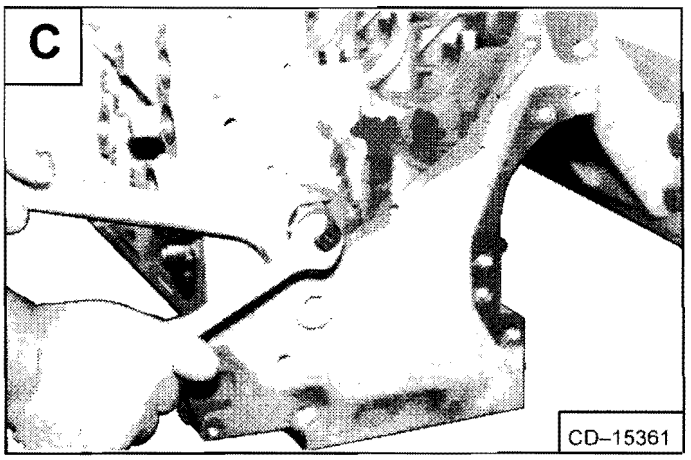
Check the camshaft bushings using a gauge **[B]**.

Inner Diameter . . . . . 2.126 + 0.002 inch (54 + 0,054 mm)
Wear Limit . . . . . 2.129 inch (54,08 mm)

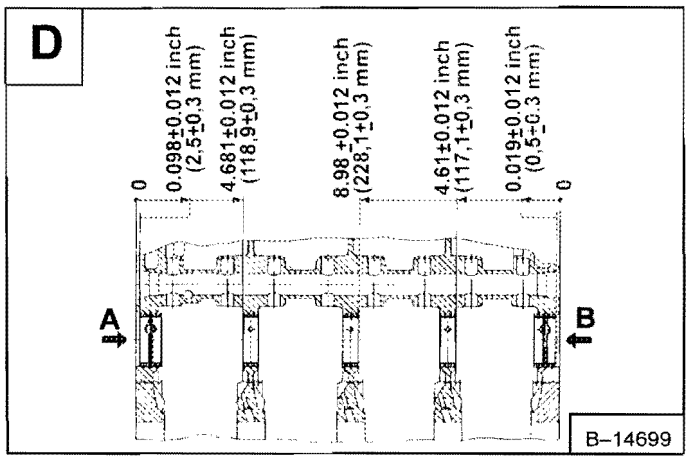


Removal and Installation

Remove all the camshaft bearing bushings using a camshaft bushing removal tool as needed **[C]**.



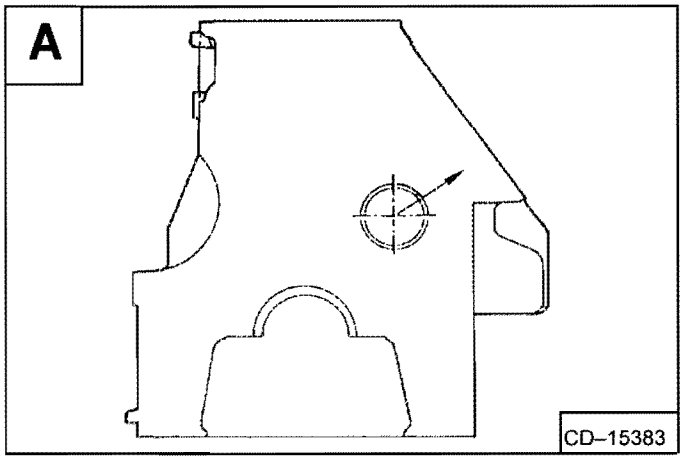
Use the dimensions in figure **[D]** to install the camshaft bushings.



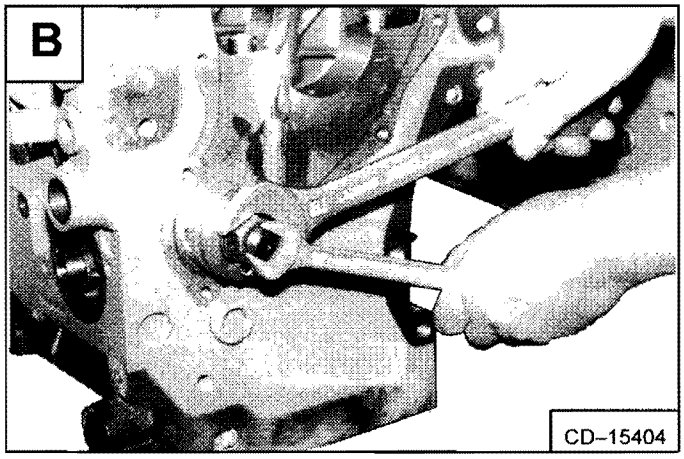
CAMSHAFT BEARINGS (Cont'd)

Removal and Installation (Cont'd)

When installing the new camshaft bushings make sure the oil lube hole aligns with the oil hole in the engine block **[A]**.



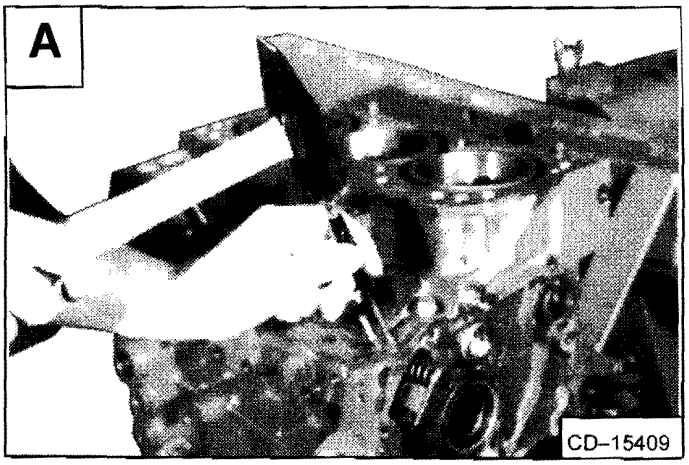
Install the new camshaft bushings using a camshaft bushing installation tool **[B]**.



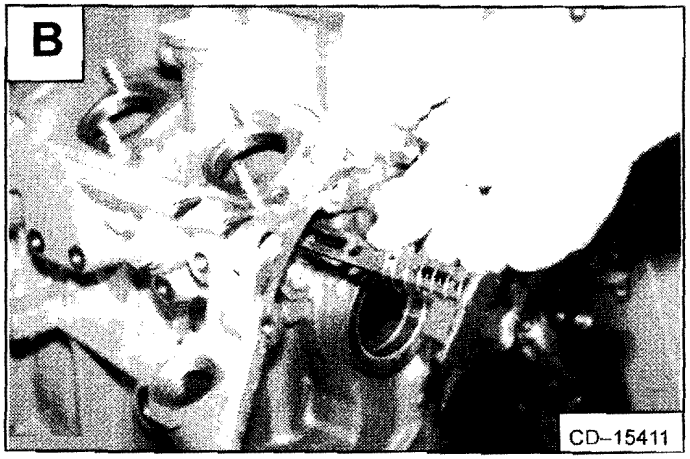
CONTROL ROD GUIDE BUSHING

Removal

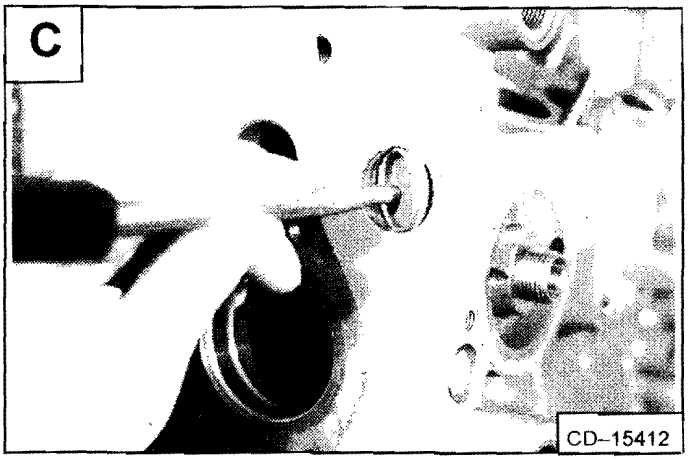
Remove the parallel pin **[A]**.



Remove the control rod and spring **[B]**.

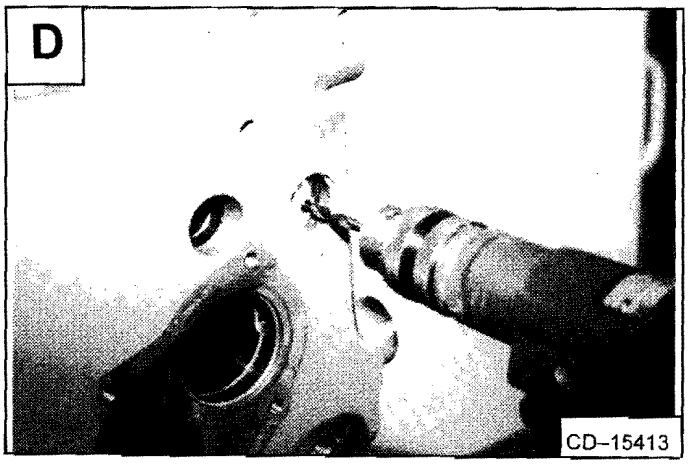


Remove the cover **[C]**.



Drill a 7/32 inch (5,5 mm) hole on one side of the pipe **[D]**.

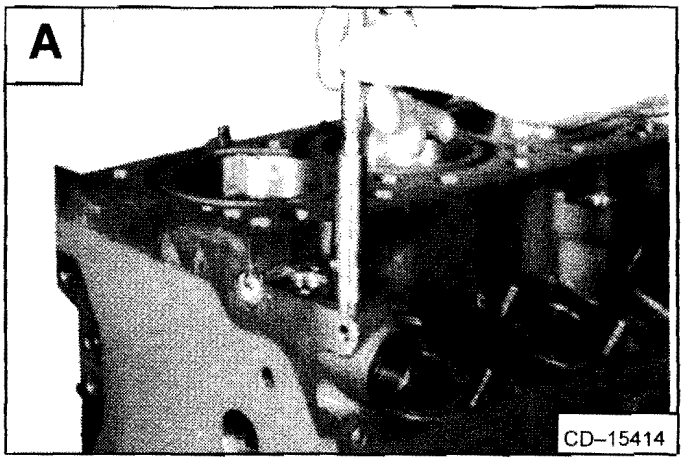
NOTE: Carefully clean the engine block after drilling.



CONTROL ROD AND GUIDE BUSING (Cont'd)

Removal (Cont'd)

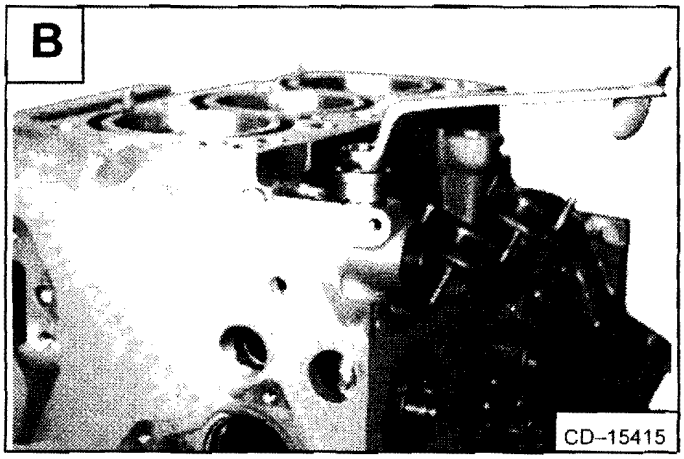
Install the puller into the bore until the pin engages **[A]**.



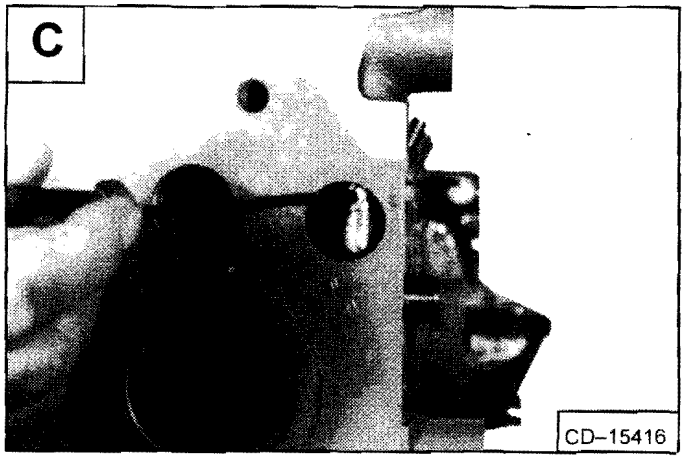
Install the spacer tool in position. Pull the pipe from the lower press fit **[B]**.

NOTE: Do Not pull pipe completely out.

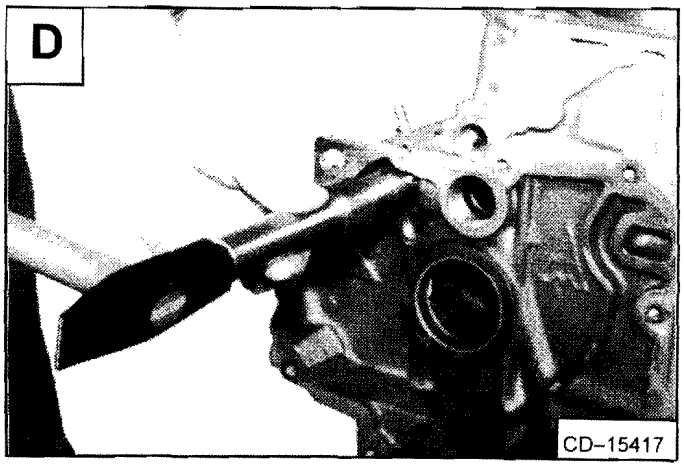
Remove the spacer tool.



Press pin in until it does not project beyond the pipe **[C]**. Pull the pipe out completely.

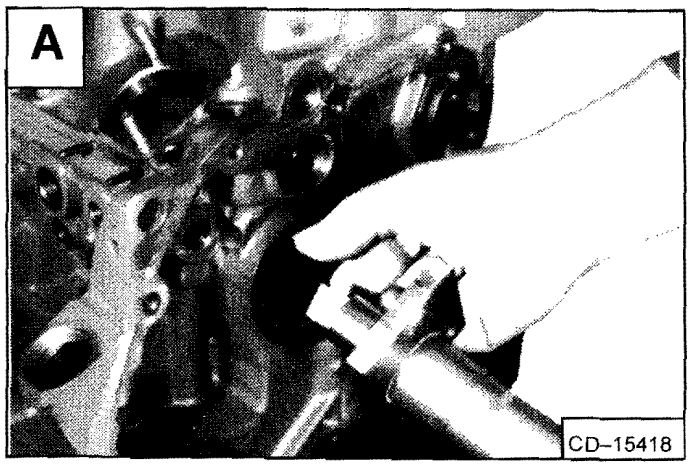


Using the tool, drive the guide bushing out **[D]**.

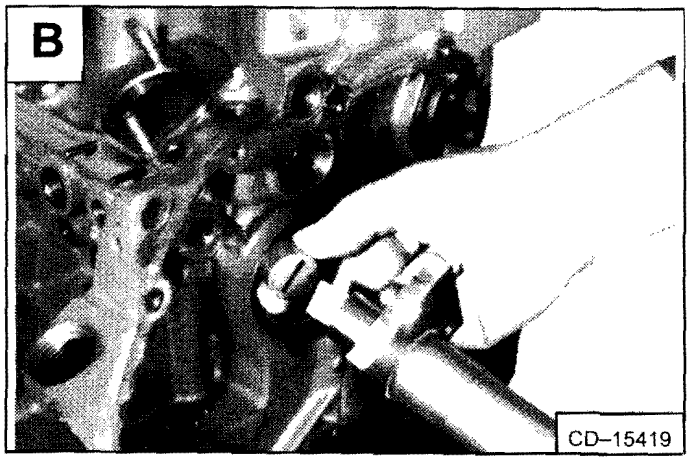


Installation

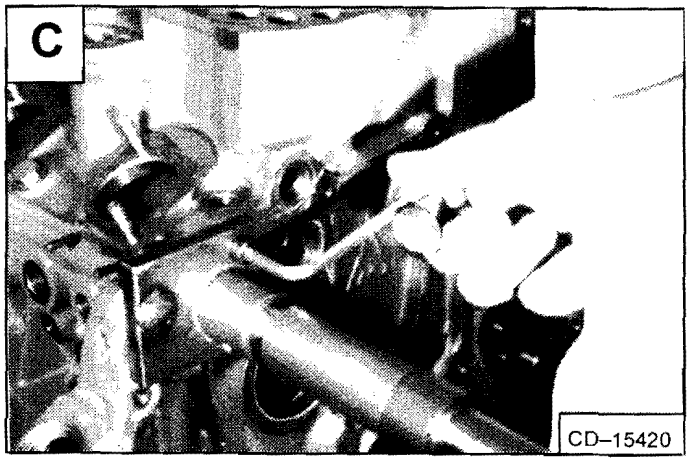
Install the new bushing into the center of the arbor assembly **[A]**.



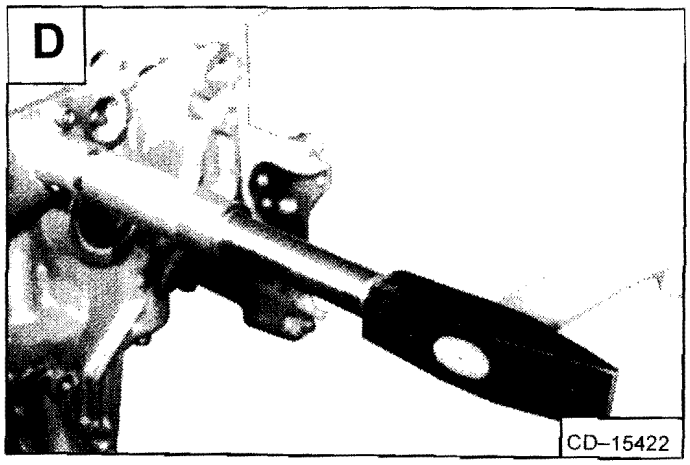
Install the guide on the arbor assembly with the chamfer pointing toward the crankcase **[B]**.



Fasten the arbor assembly and bushing on the engine block **[C]**.

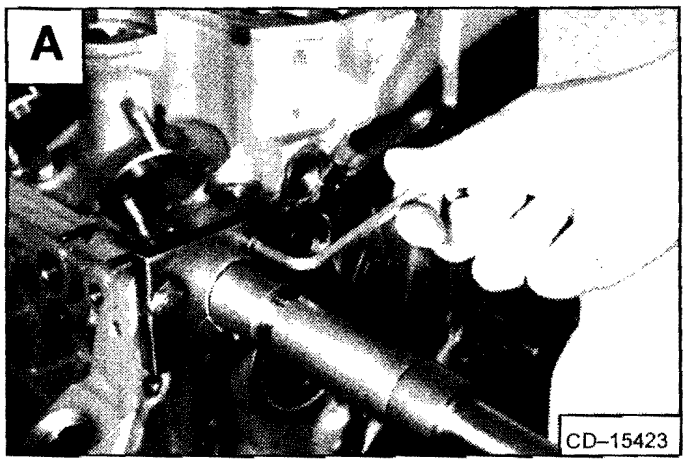


Drive the bushing into the engine block as far as it will go **[D]**.

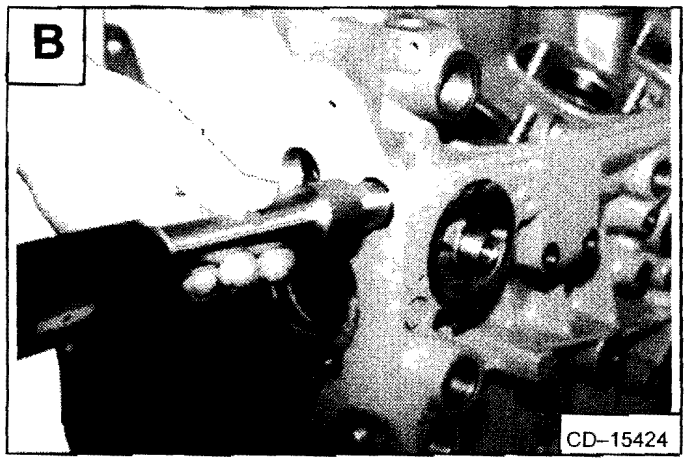


Installation (Cont'd)

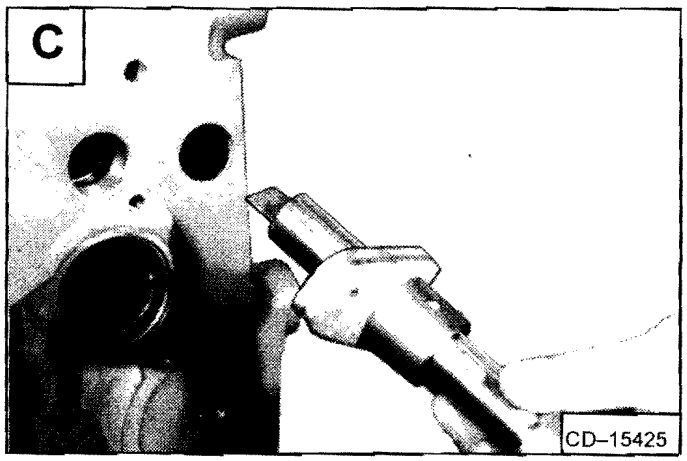
Remove the arbor assembly **[A]**.



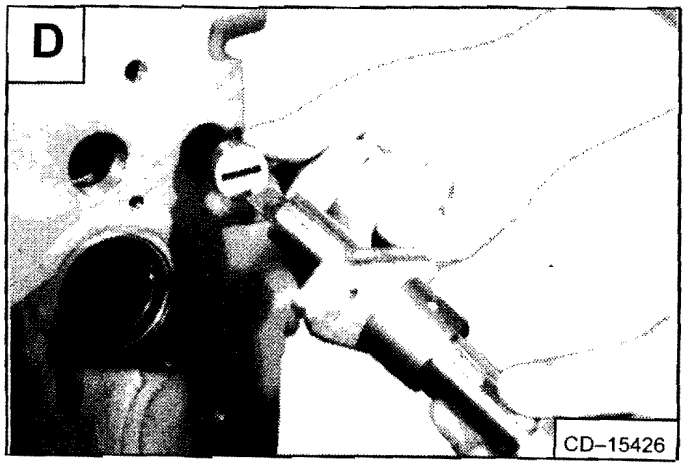
Remove the guide bushing at the flywheel end of the engine block **[B]**.



Assemble the arbor without the spacer **[C]**.



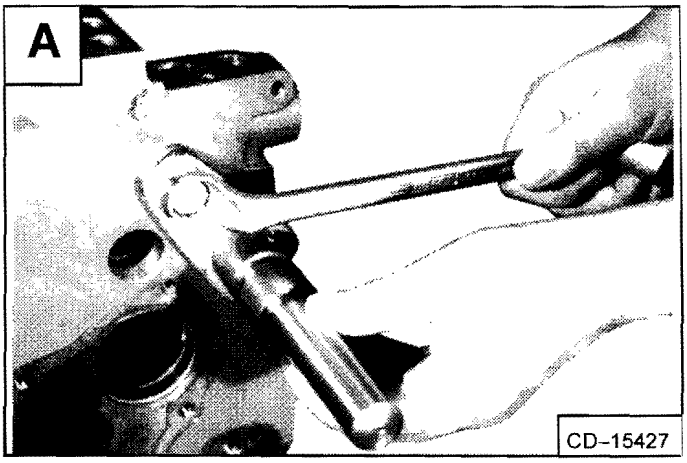
Install the guide bushing on the arbor assembly with the chamfer pointing toward the crankcase **[D]**.



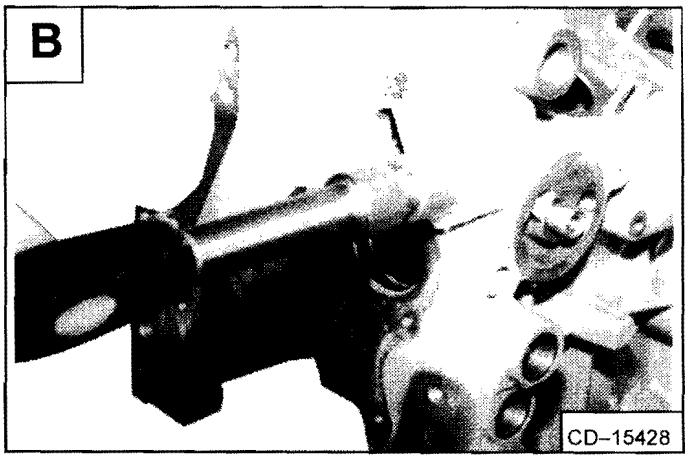
CONTROL ROD AND GUIDE BUSHING (Cont'd)

Installation (Cont'd)

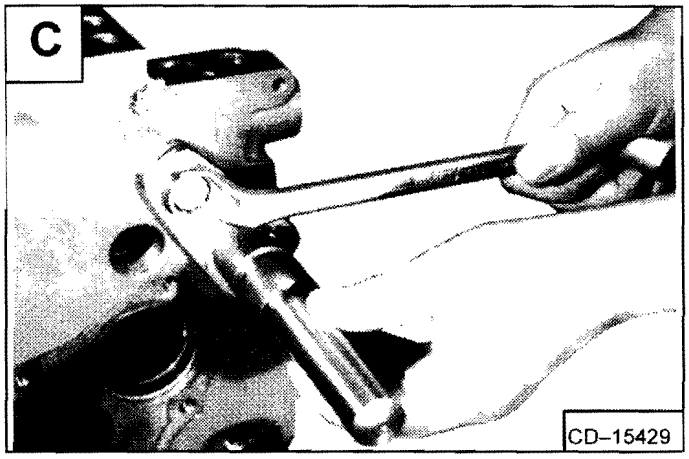
Fasten the arbor assembly and guide bushing to the engine block **[A]**.



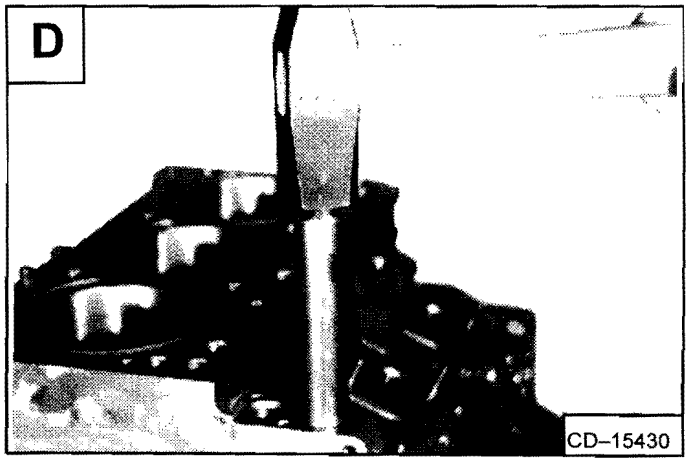
Drive in the guide bushing as far as it will go, at the flywheel end **[B]**.



Remove the arbor assembly **[C]**.

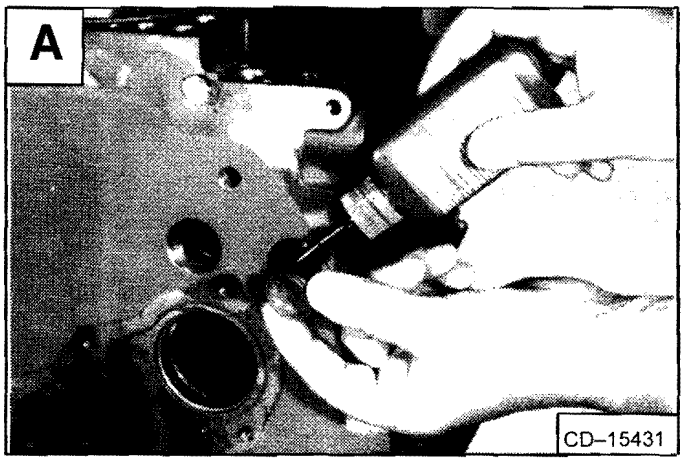


Install the new pipe in the block as far as it will go with the arbor assembly **[D]**.

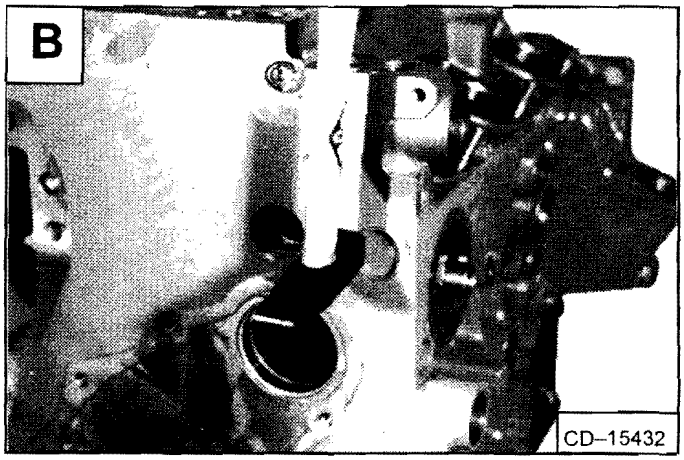


Installation (Cont'd)

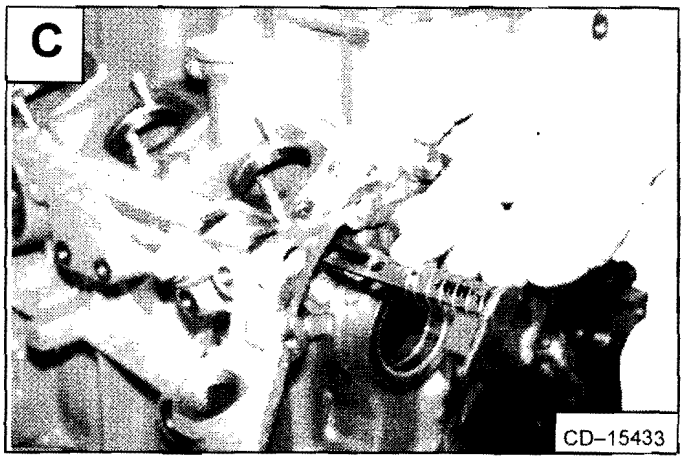
Put sealing compound on the new cover **[A]**.



Install the new cover flush with the engine block **[B]**.

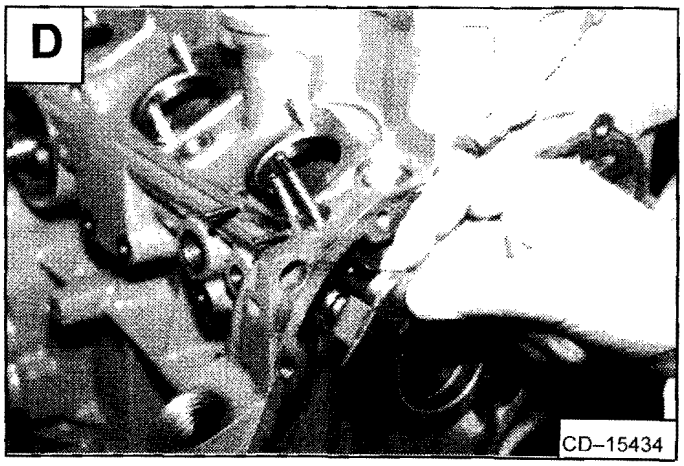


Install the control rod with starter spring into the guide bushings **[C]**.



Compress the starter spring. Install the parallel pin into the recess for the control rod travel limitation **[D]**.

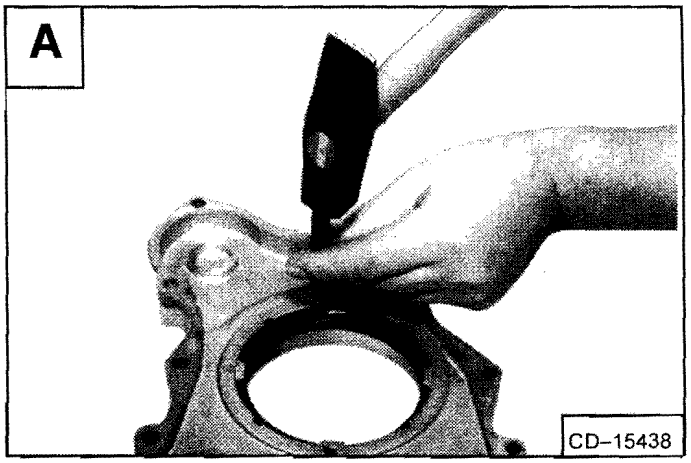
Check to make sure it is flush with the surface.



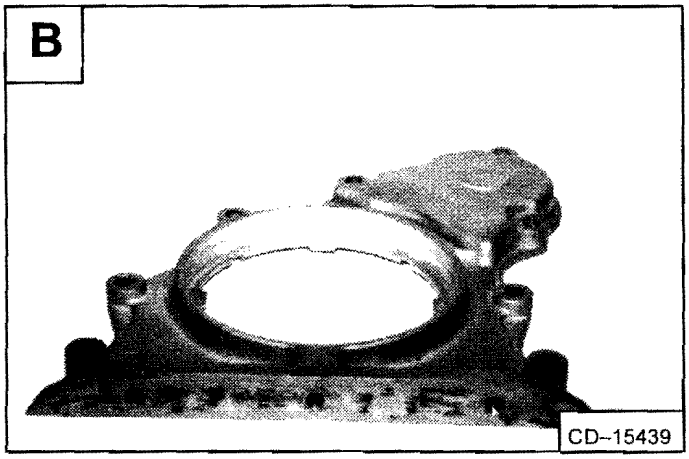
REAR COVER SEAL

Removal and Installation

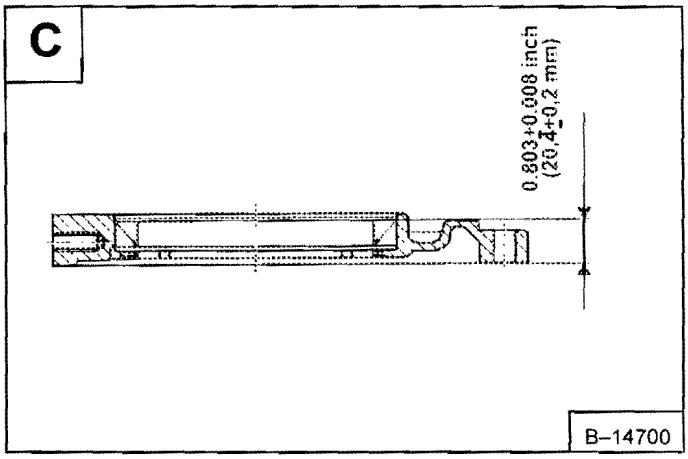
Remove the rear cover shaft seal **[A]**.



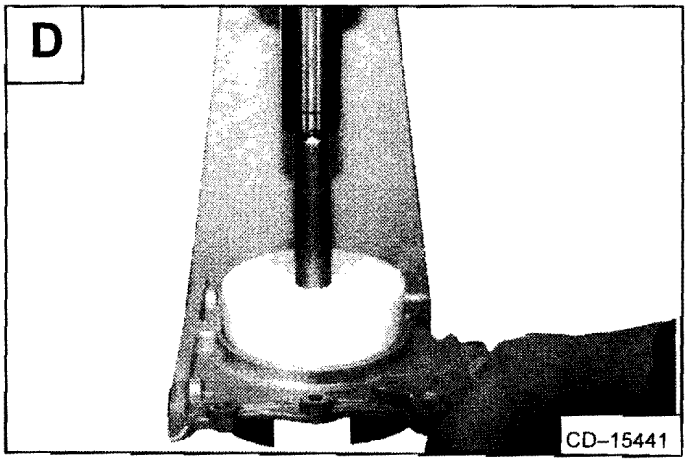
Clean the seal seating surface **[B]**. Inspect the cover for damage, replace as needed.



When installing the new shaft seal, use the dimension shown in Figure **[C]**.



Use the seal driver tool and install to the correct depth **[D]**. (See Page 7–58, for correct tool.)



CRANKSHAFT

Checking the Crankshaft

Put the crankshaft on v–blocks.

Check the main bearing journals:

Specifications:

Journal Dia. ..... $2.755^{-0.0004}_{-0.0012}$ inch
($70^{-0.0001}_{-0.03}$ mm)

Each Undersize ..... 0,010 inch (0,25 mm)

Undersize Limit ..... $2.736^{-0.0004}_{-0.0012}$ inch
$69{,}51^{-0.0001}_{-0.03}$ mm)

Wear Limit
Journal Oval ..... 0.0003 inch (0,008 mm)

Check the thrust bearing width **[A]**.

Specifications:

Journal Width ..... 1.378 + 0.0016 inch
(35 + 0.04 mm)

Each Oversize ..... 0.016 inch (0,4 mm)

Oversize Limit ..... 1.395 inch (35,44 mm)

Check the connecting rod journals **[B]**.

Pin Dia. ..... $2.16^{-0.0004}_{-0.0012}$ inch
($55^{-0.0001}_{-0.03}$ mm)

Undersize Limit ..... $2.146^{-0.0004}_{-0.0012}$ inch
($54{,}5^{-0.0001}_{-0.03}$ mm)

Wear Limit
Pin Oval ..... 0.0004 inch (0,01 mm)

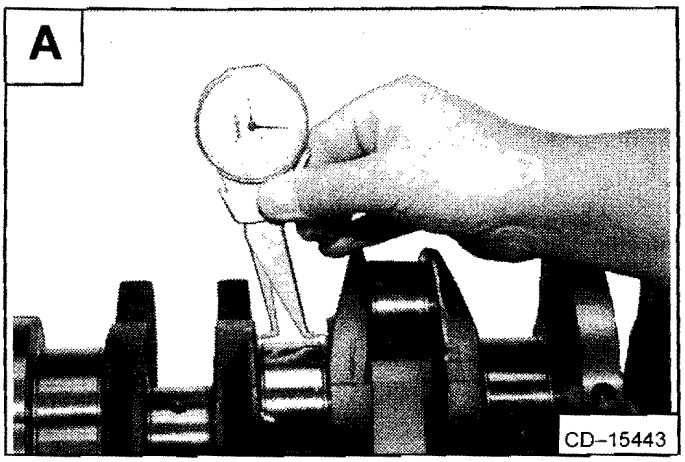
Use a dial indicator and check crankshaft for out of roundness **[C]**.

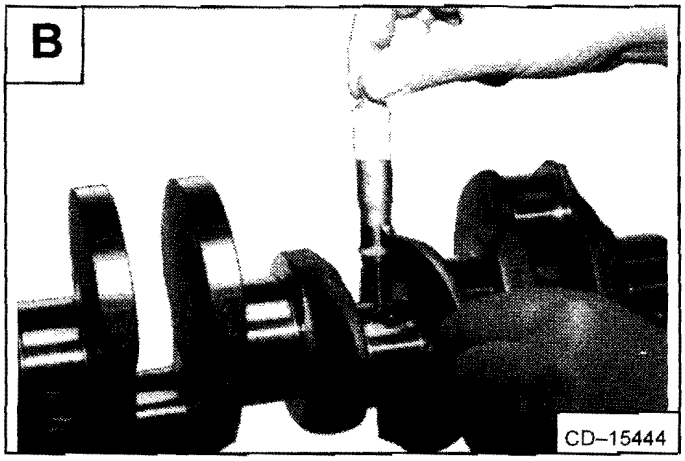
Specification:

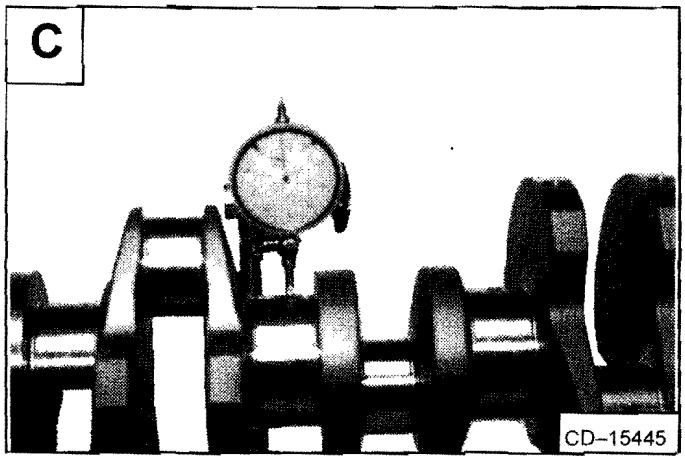
Out of Roundness Max. ..... 0.002 inch (0,05 mm)

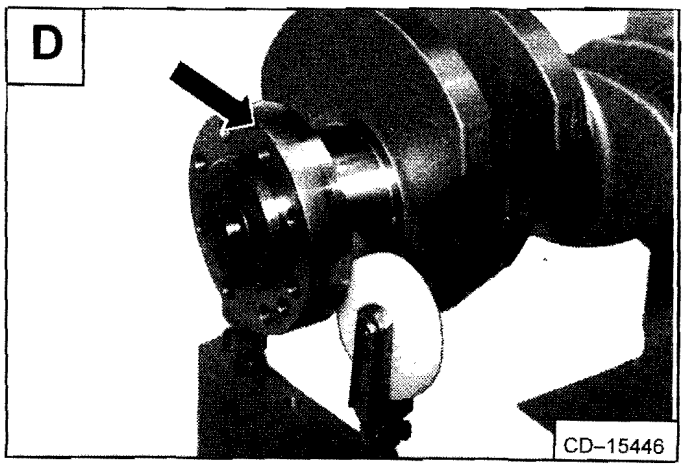
Check the surface of the crankshaft seal area **[D]**.

Recondition the crankshaft as needed.





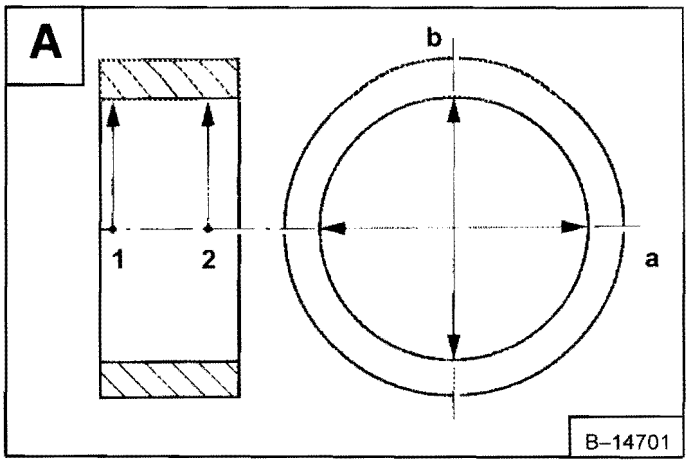




CONNECTING ROD

Checking the Connecting Rod

When checking the connecting rod large and small end, measure at the points **(1)** and **(2)** and in planes **(a)** and **(b)** **[A]**.

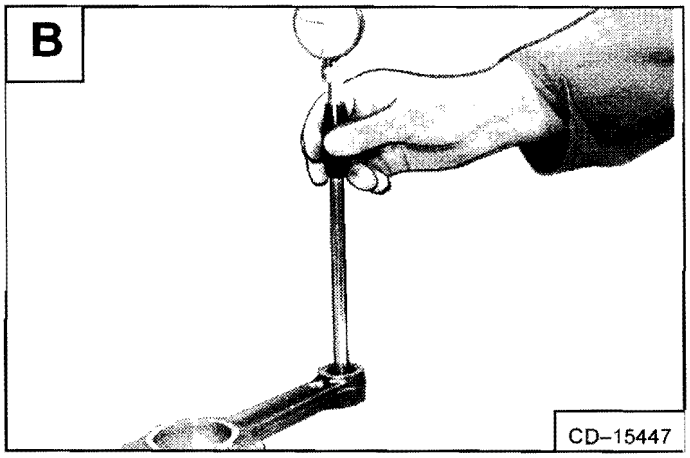


Check the small end bushing **[B]**.

Specifications:

I.D. of Small End Bushing ..... $1.181^{+0.00014}_{+0.00009}$ inch
$(30^{+0,0035}_{+0,0025}$ mm)

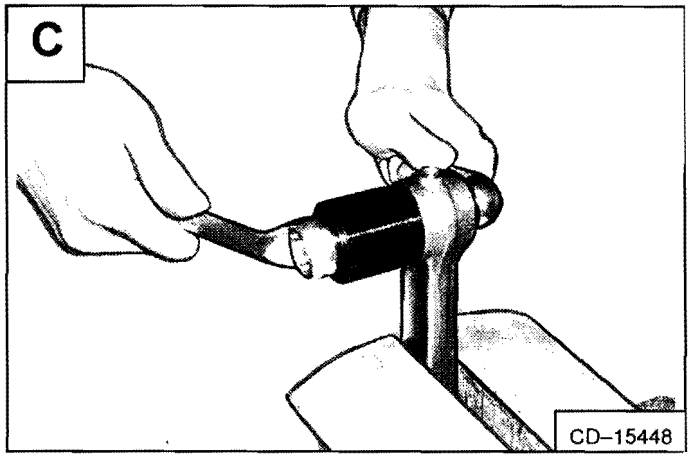
Wear Limit Bushing
Clearance ..... 0.003 inch (0,08 mm)



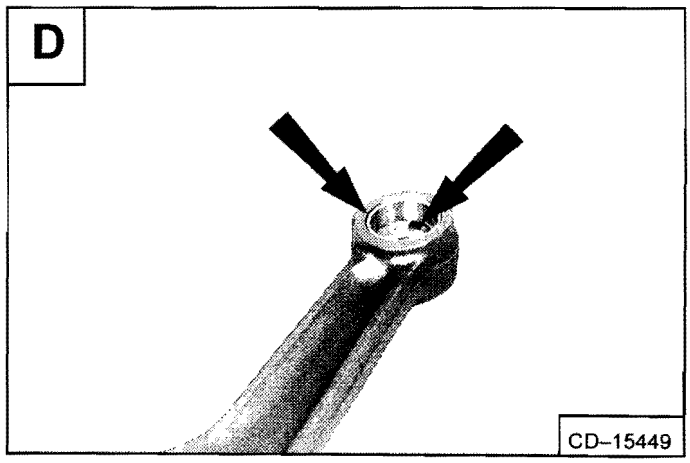
Replace small end bushing as needed **[C]**.

Bore for Small End Bushing ..... 1.299 + 0.0008 inch
(33 + 0,02 mm)

O.D. of Small End Bushing ..... $1.299^{+0.004}_{+0.0027}$ inch
$(33^{+0,110}_{+0,070}$ mm)



Press in the small end bushing, make sure the lubrication holes are in alignment **[D]**.



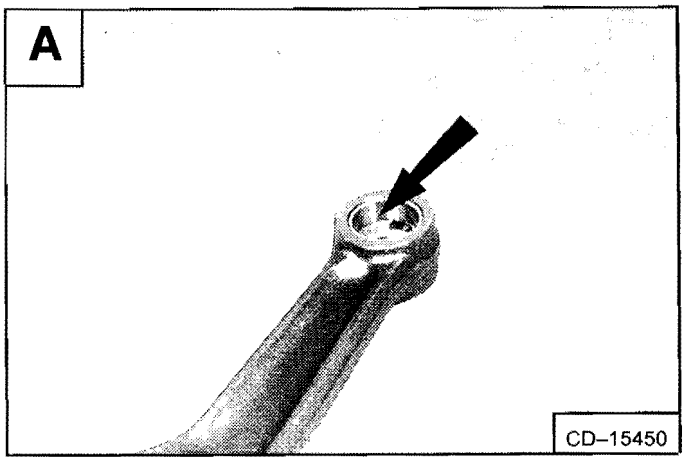
CONNECTING ROD (Cont'd)

Checking the Connecting Rod (Cont'd)

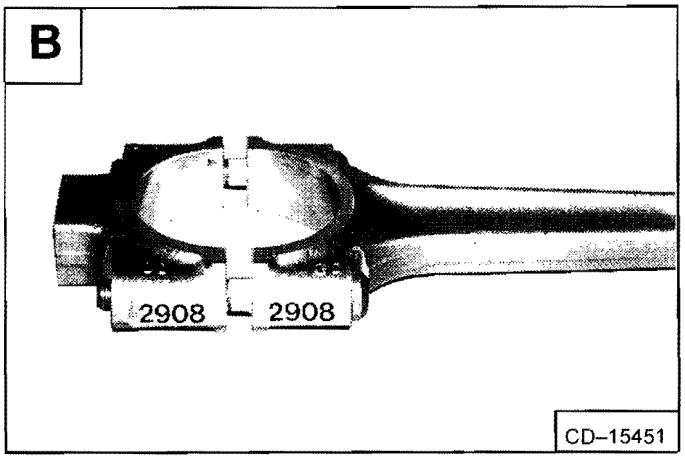
After pressing in the small end bushing, bore the bushing to the following dimensions **[A]**.

Specifications:

I.D. of Small End Bushing ..... 1.181 $^{+0.00014}_{+0.00009}$ inch
($30\ ^{+0,0035}_{+0,0025}$ mm)

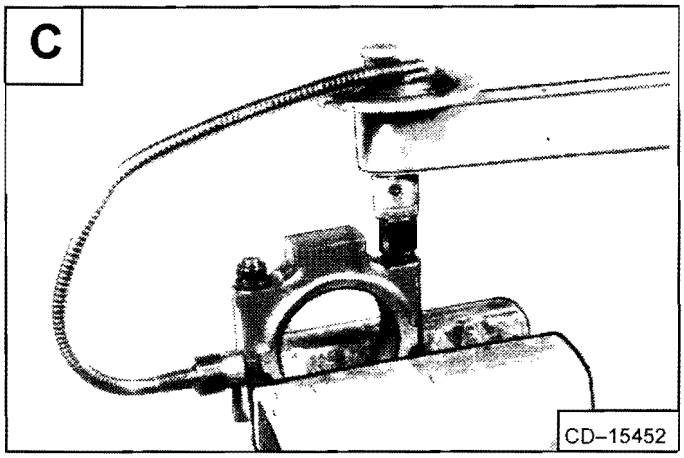


Install the correct cap on the correct rod **[B]**.



Tighten the connecting rod cap nuts as follows **[C]**.

Initial Torque ..... 22 ft.–lbs. (30 Nm)
Ist Step Angle ..... 60°
2nd Step Angle ..... 60°



Measure the big end bore **[D]**. If the measurement is the same as the specific valve, the necessary preload on the bearing halves will be obtained.

Specifications:

I.D. of Big End ..... 2.303 + 0.0008 inch
(58,5 + 0,02 mm)

Remove connecting rod cap. Install new bearing halves. Tighten the connecting rod cap nuts and tighten as listed above.

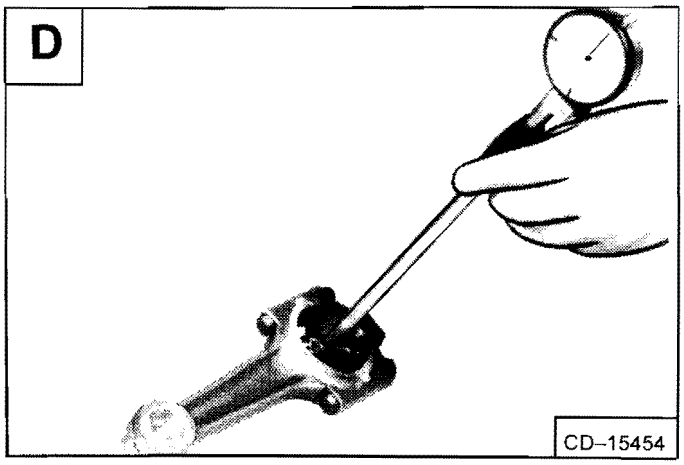
Measure the bearing halves:

I.D. of Big End Bearing ..... 2.1655–2.167 inch
(55,004–55,04 mm)

Each Undersize ..... 0.010 inch (0,25 mm)

Undersize Limit ..... 2.148–2.1472 inch
(54,504–54,54 mm)

Radial Clearance
Wear Limit ..... 0.005 inch (0,12 mm)



Checking the Connecting Rod (Cont'd)

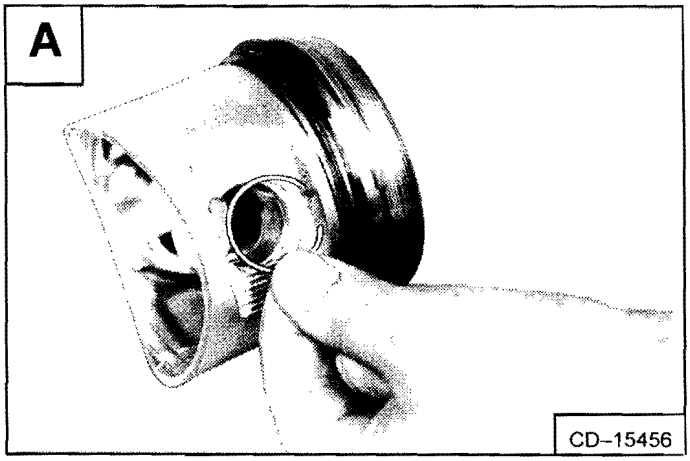
Check the connecting rod, without bearing halves, on a connecting rod tester.

Specifications:

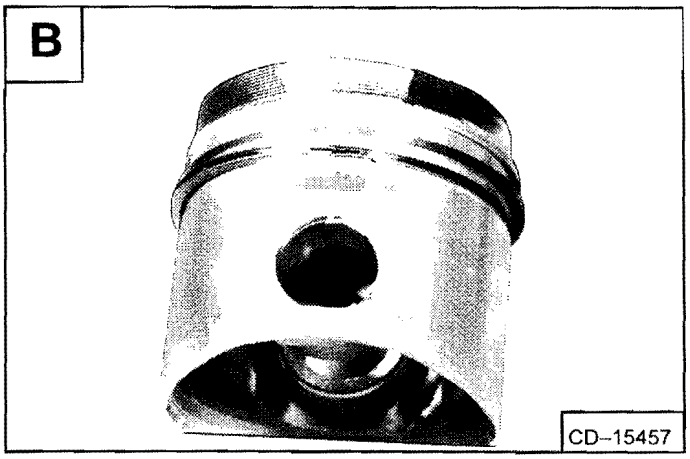
Parallel Check–Tolerance ..... 0.004 inch (0,10 mm)
Over a Distance of ..... 3.94 inch (100 mm)
Squareness Check–Tolerance .. 0.002 inch (0,05 mm)

See Page 7–84 to check the piston specifications.

Install the snap ring into the piston **[A]**.

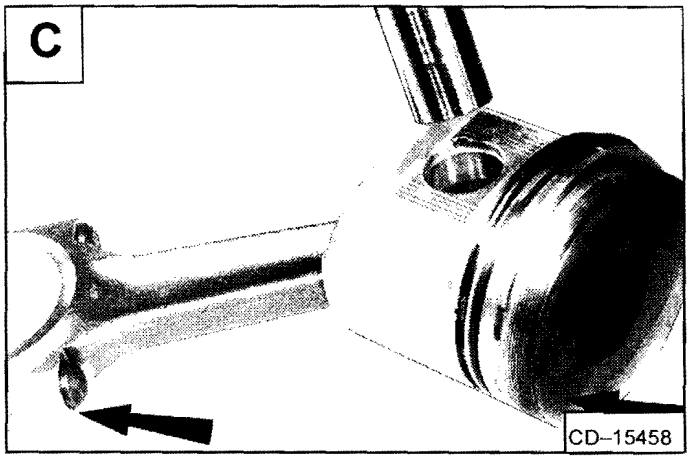


NOTE: The snap ring gap must be towards the piston crown [B].

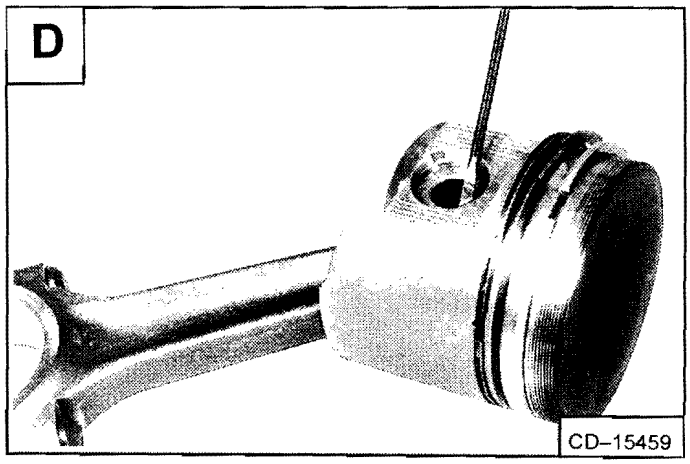


Install the piston on the connecting rod **[C]**.

The flywheel symbol on the piston must be toward the identification number on the connecting rod **[C]**.



Install the other side snap ring **[D]**.



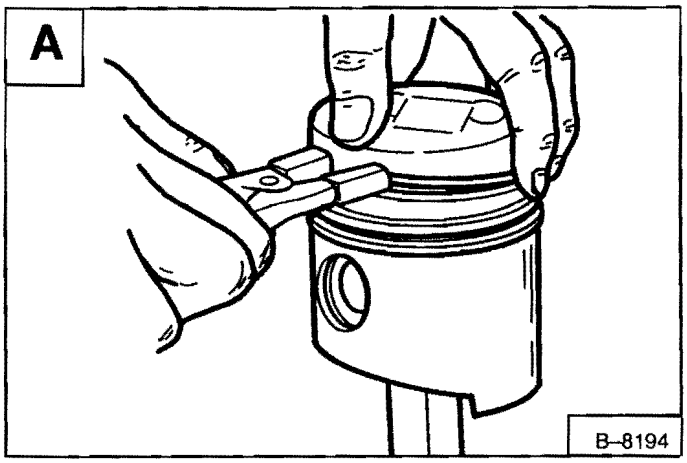
PISTON AND PISTON PIN

Checking the Piston

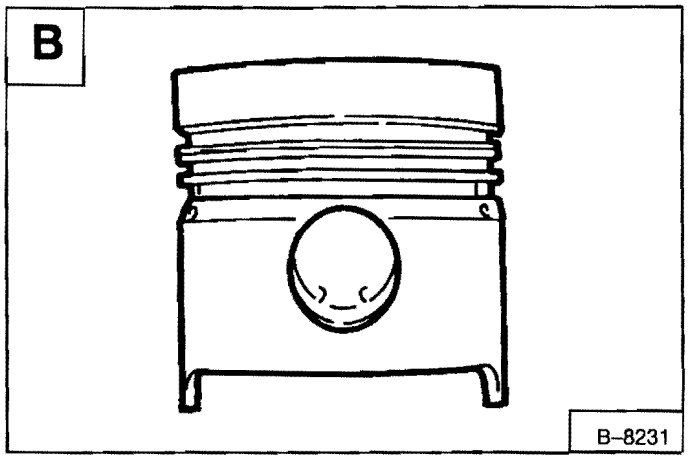
Remove the piston rings from the piston **[A]**.

Remove the piston from the connecting rod.

Check connecting rod specifications. (See Page 7–89.)



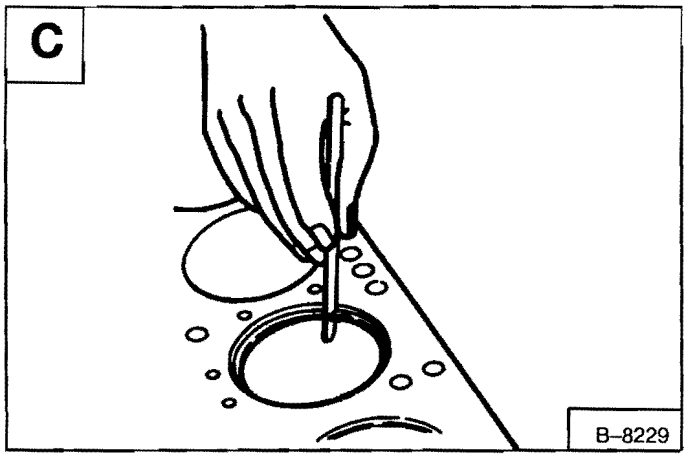
Clean and inspect piston and piston ring grooves **[B]**.



Measure the ring gap with a feeler gauge in the cylinder **[C]**.

Specifications:

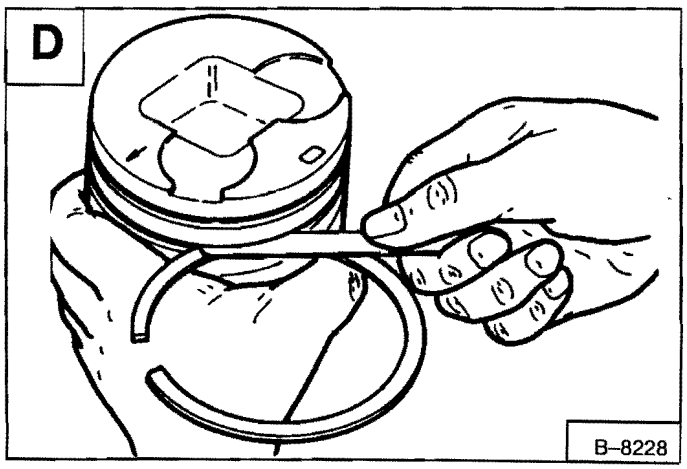
Wear Limit	1st Ring Gap	0.031 inch (0,8 mm)
	2nd Ring Gap	0.07 inch (1,8 mm)
	3rd Ring Gap	0.05 inch (1,2 mm)



Using new rings, measure the ring grooves using a feeler gauge **[D]**.

Specifications:

Wear Limit	1st Ring	0.008 inch (0,2 mm)
	2nd Ring	0.006 inch (0,16 mm)
	3rd Ring	0.005 inch (0,12 mm)



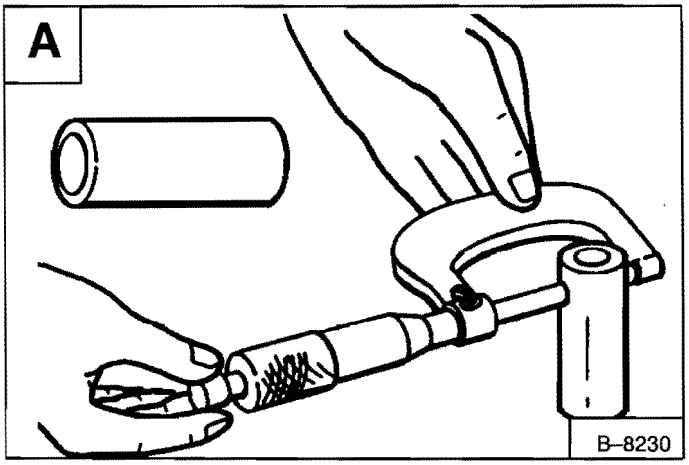
PISTON AND PISTON PIN (Cont'd)

Checking Piston Pin

Check piston pin for wear **[A]**.

Specifications:

O.D. of Piston Pin ..... 1.181 –0.0002 inch (30 –0,005 mm)

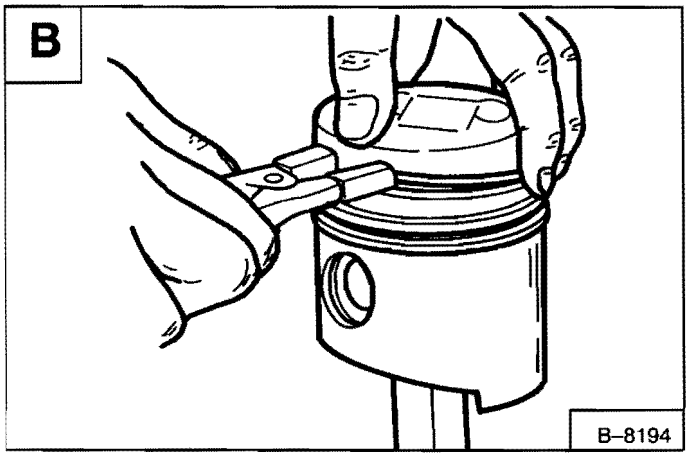


Installing Piston Rings

When installing the piston rings position them as listed below **[B]**:

Ist Ring–Key stone Ring, top facing combustion chamber.
2nd Ring–Tapered compression ring, top facing combustion chamber.
3rd Ring–Bevelled edge slotted oil control ring.

The gap of each ring must be offset by 180° to the other ring.



CYLINDER HEAD

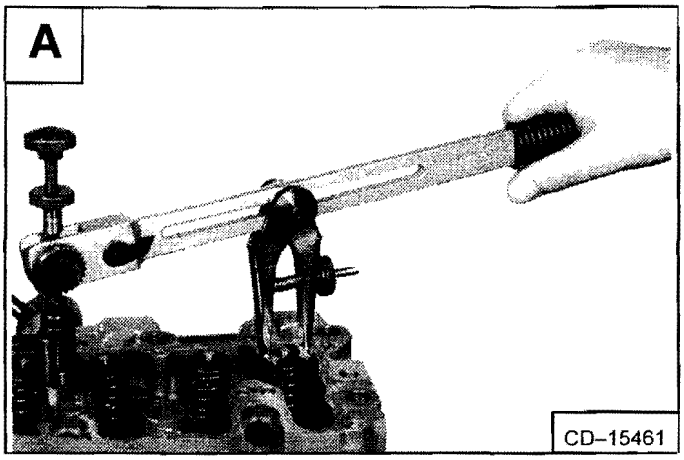
Disassembly

Using a valve spring tool, remove the spring locks, valve spring cap, valve spring and valve **[A]**. (See Page 7–58, for correct tool.)

Repeat the procedure for all the valves.

Remove the valve seals.

Clean the cylinder head and inspect for damage.

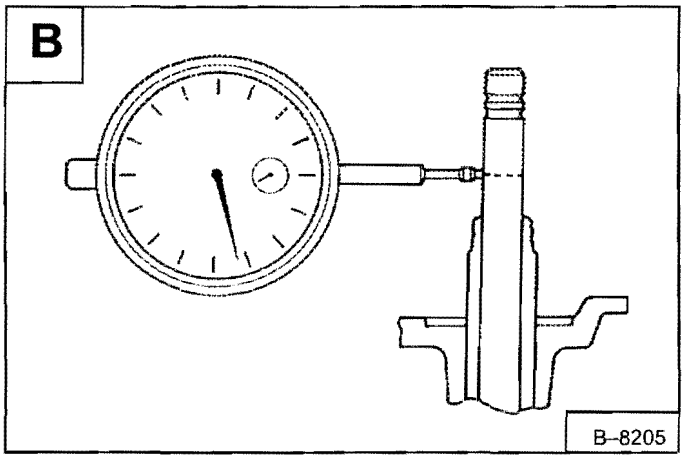


Checking the Valves

Measure the valve stem clearance **[B]**.

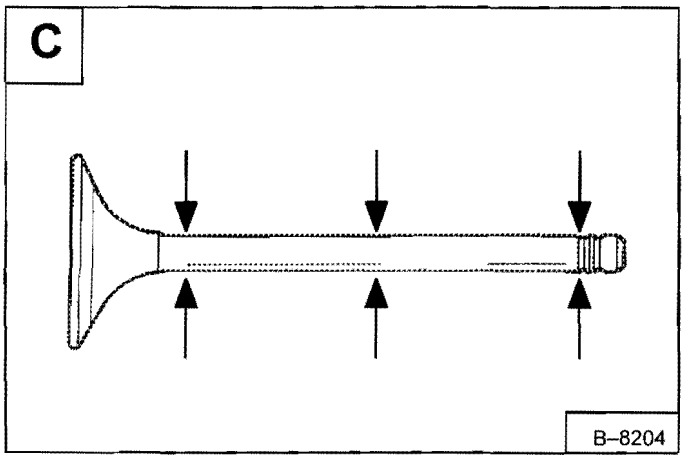
Specifications:

Wear Limits:
- Intake Valve ..... 0.005 inch (0,12 mm)
- Exhaust Valve ..... 0.006 inch (0,15 mm)



Measure the valve stem diameter **[C]**.

- Std. Intake Valve ..... 0.314 –0.0006 inch (7,98 –0,015 mm)
- Std. Exhaust Valve ..... 0.313 – 0.0006 inch (7,96 –0,15 mm)



Measure the valve rim thickness **[D]**.

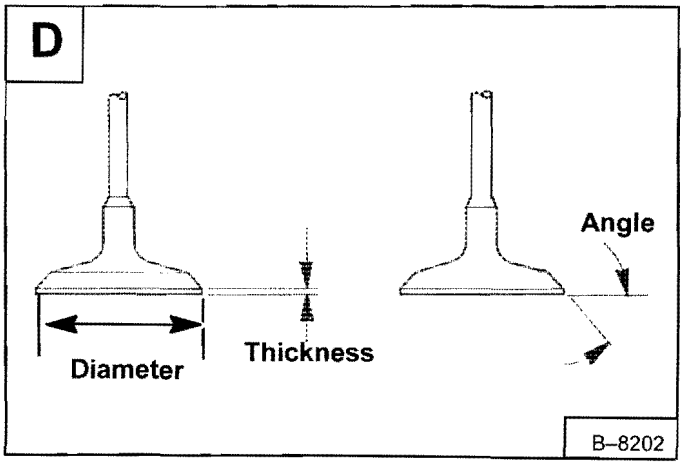
Specifications:
- Intake Valve ..... 0.03 inch (0,8 mm)
- Exhaust Valve ..... 0.05 inch (1,2 mm)

Measure the valve head diameter **[D]**.

Specifications:
- Intake Valve ..... 1.578 ± 0.004 inch (40,1 ± 0,1 mm)
- Exhaust Valve ..... 1.374 ± 0.004 inch (34,9 ± 0,1 mm)

Valve seat angle **[D]**.

- Intake Valve ..... 30°
- Exhaust Valve ..... 45°



Checking Valve Seats

Measure the valve seat width **[A]**.

Specifications:

Intake Valve	0.06 ± 0.016 inch (1,58 ± 0,4 mm)
Exhaust Valve	0.07 ± 0.016 inch (1,7 ± 0,4 mm)

Valve Seat Angle:

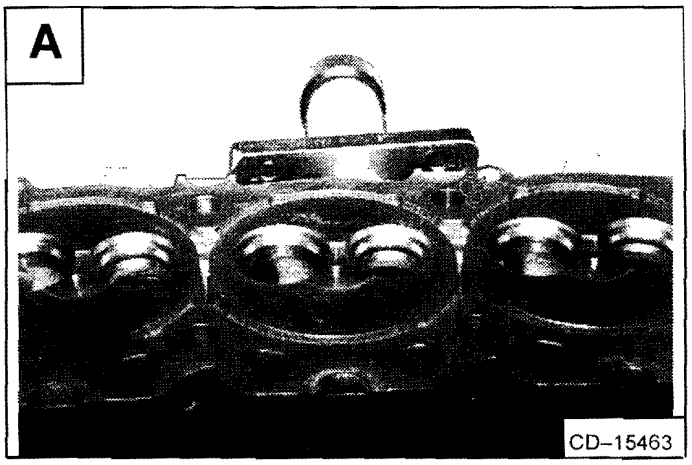
Intake Valve	30°
Exhaust Valve	45°

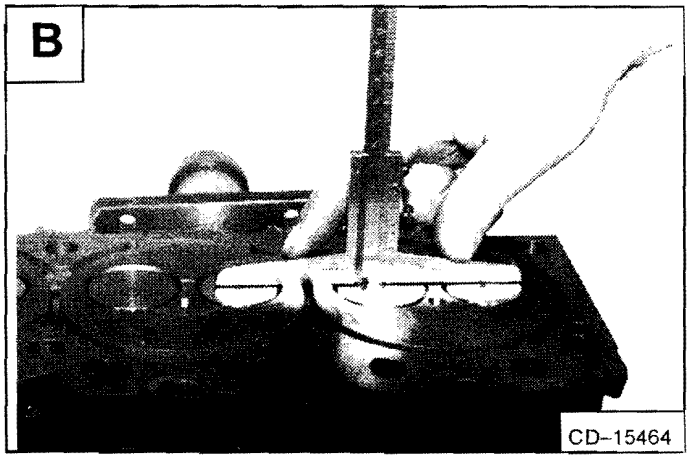
Measure the valve clearance between the valve head and cylinder head sealing surface **[B]**.

Valve penetration into cylinder head:

Wear Limit	0.051 inch (1,3 mm)

If the valve seats, valve guides are worn or cylinder head sealing surface is damaged the cylinder head can be reconditioned.



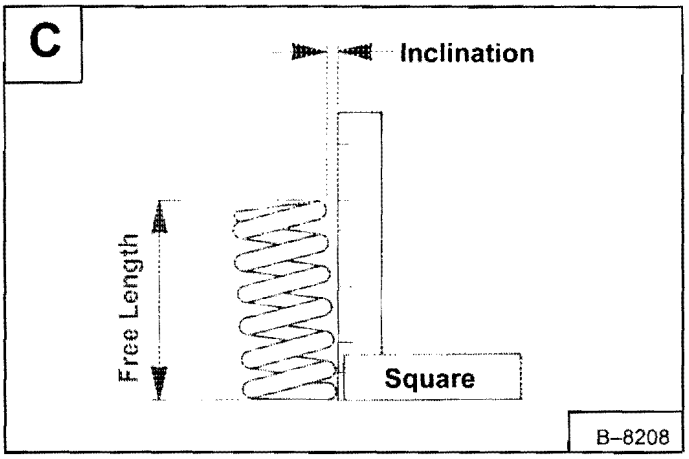


Valve Spring

Measure valve spring free length **[C]**.

Specifications:

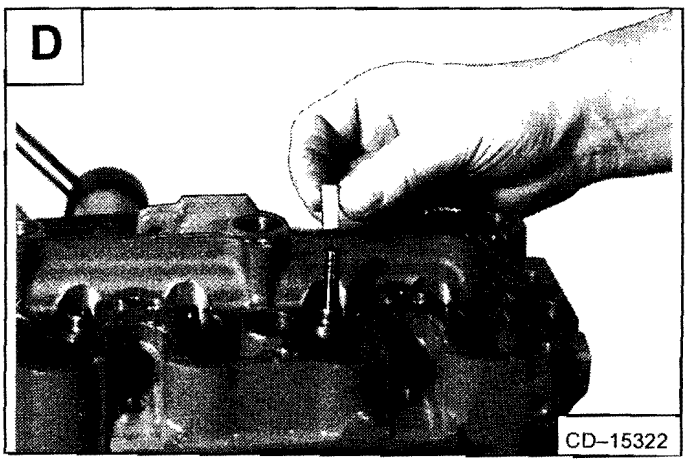
Valve Spring Dia.	0.132 inch (3,35 mm)
Free Length	1.531 inch (38,9 mm)
Valve Spring Dia.	0.134 inch (3,40 mm)
Free Length	1.547 inch (39,3 mm)
Inclination	0.126 inch (3,2 mm)



Assembly

Install the valve into the cylinder head **[D]**.

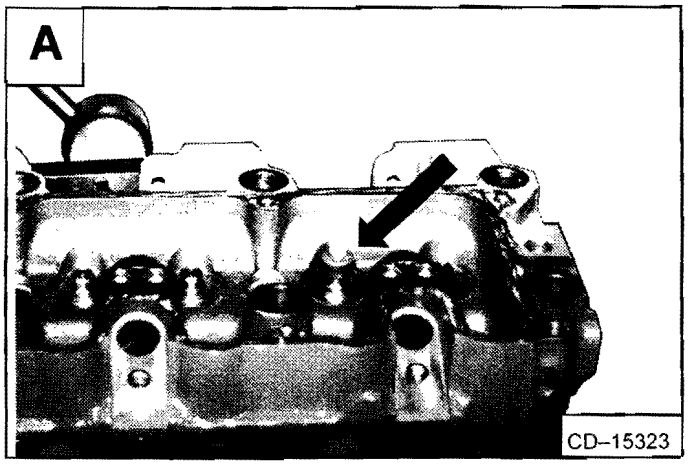
Install the protective sleeve or masking tape on the valve stem grooves **[D]**.



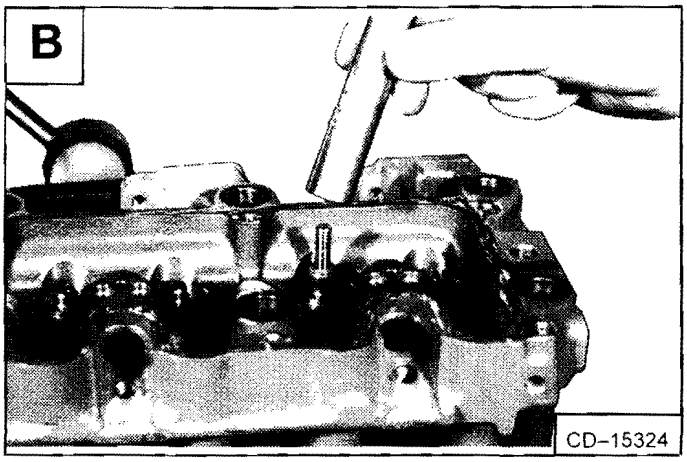
Assembly (Cont'd)

Install the valve seal on the protective sleeve and push the seal down **[A]**.

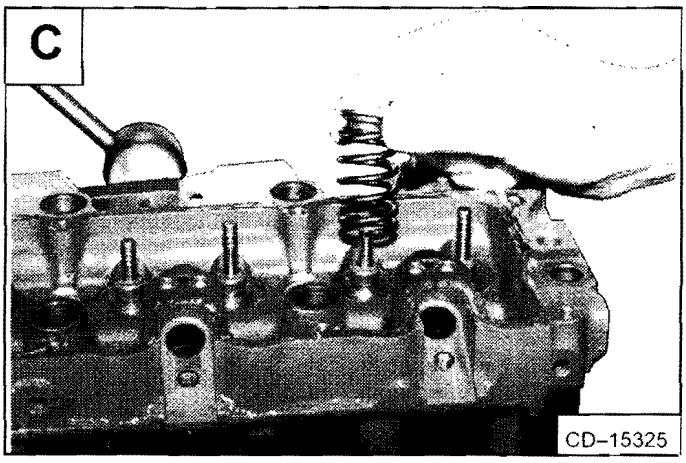
Remove the protective sleeve.



Use the tool and press the valve stem as far as it will go **[B]**. (See Page 7–58, for correct tool.)

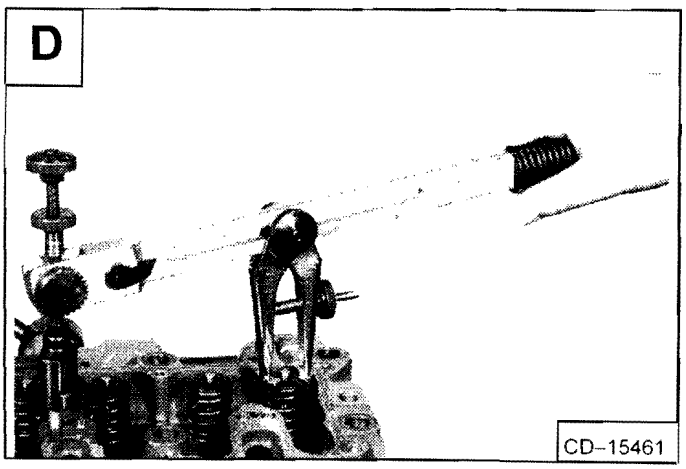


Install the valve spring and cap **[C]**.



Use the valve spring tool, install the valve spring lock **[D]**.

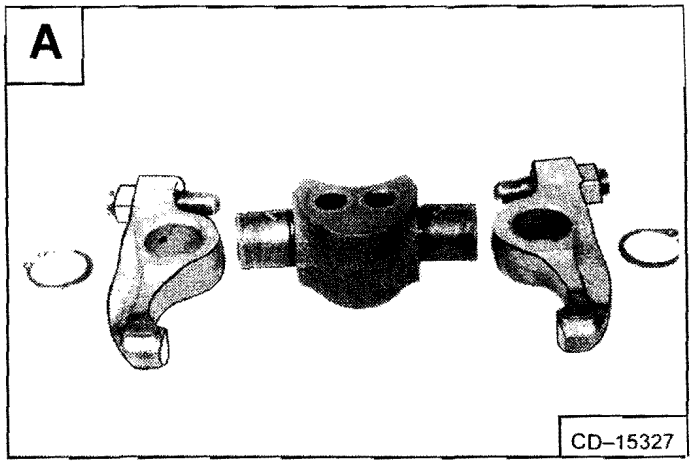
Repeat the above procedure to install all the valves.



ROCKER ARM AND BRACKET

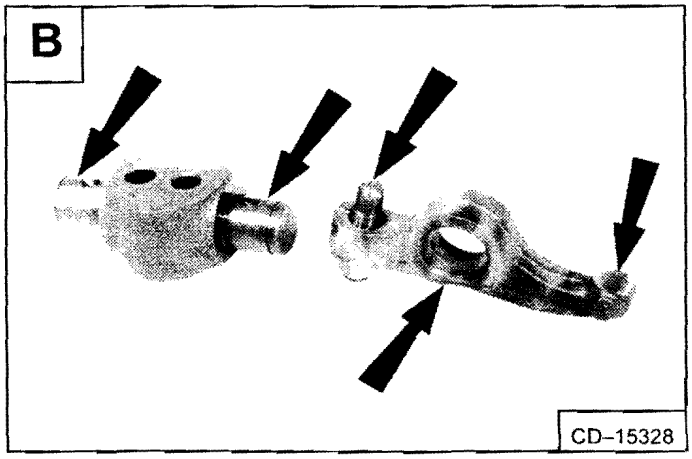
Checking

Disassembly the rocker arms from the bracket **[A]**.

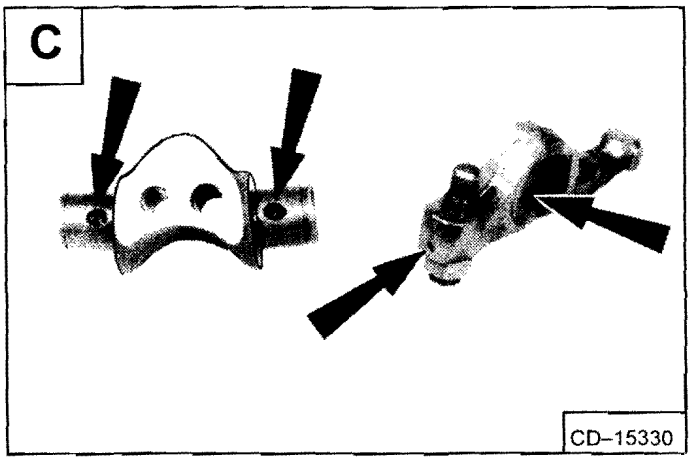


Check for wear at the following locations and replace as needed **[B]**:

Journals
Adjusting Bolt
Rocker Arm Contact Face
Bore

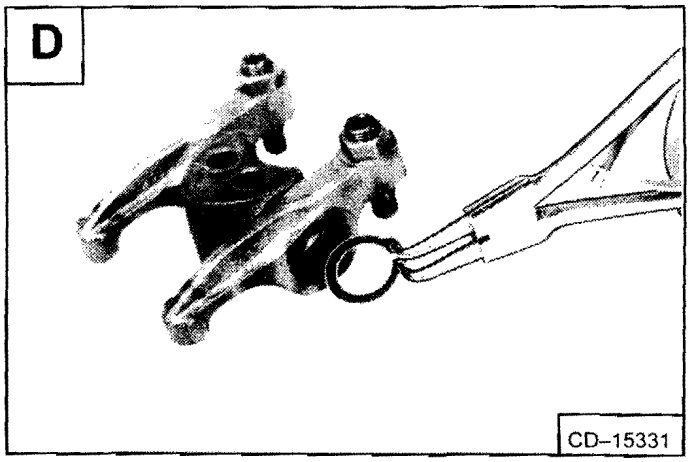


Check the oil passages that they are open and clean **[C]**.



Install the rocker arms on the bracket.

Install the snap ring **[D]**.

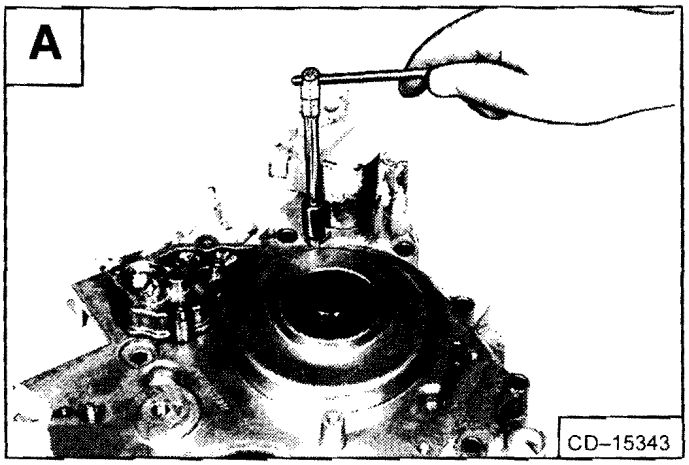


FRONT COVER

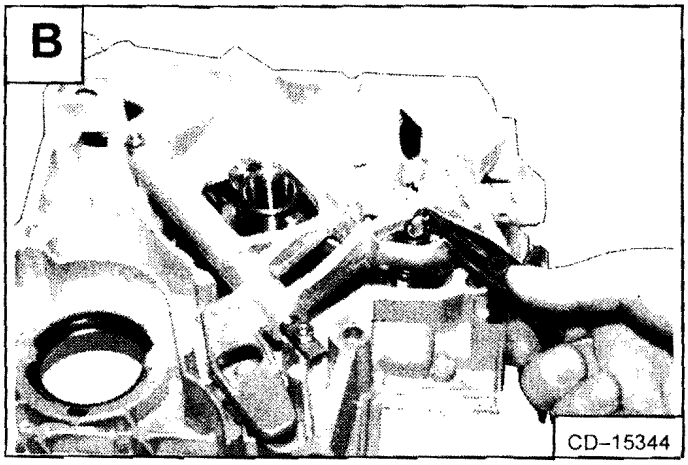
Disassembly

NOTE: Dynamometer testing is recommended if the governor assembly is re–built.

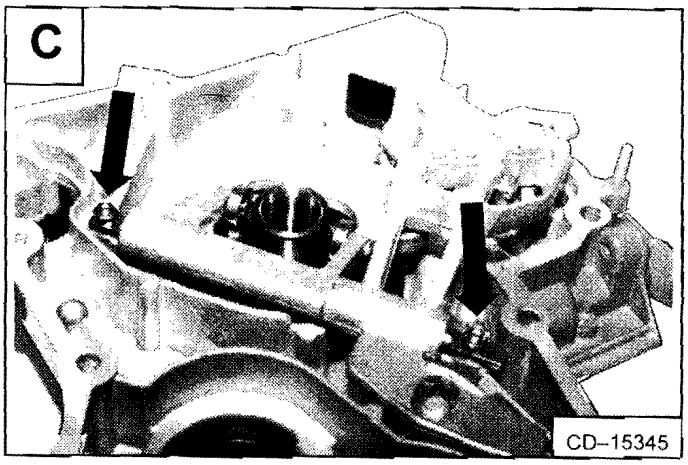
Remove the engine shut–down solenoid **[A]**.



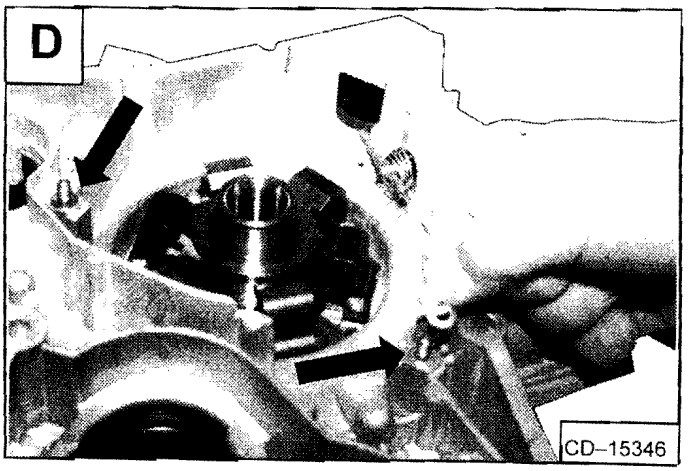
Disconnect the governor spring **[B]**.



Remove the governor lever shaft **[C]**.



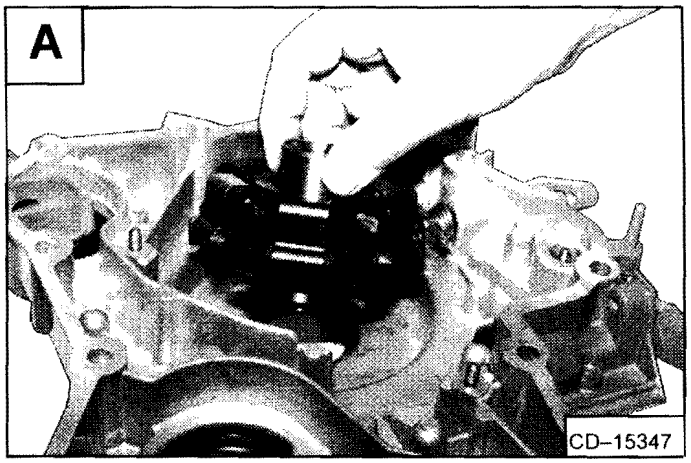
Remove the shims below the governor lever shaft **[D]**.



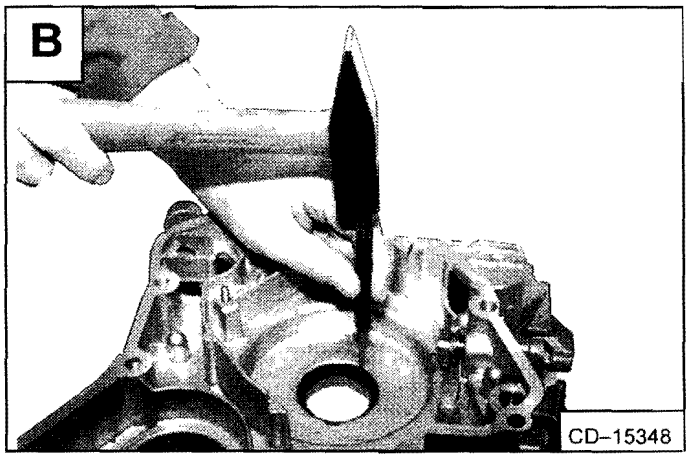
FRONT COVER (Cont'd)

Disassembly (Cont'd)

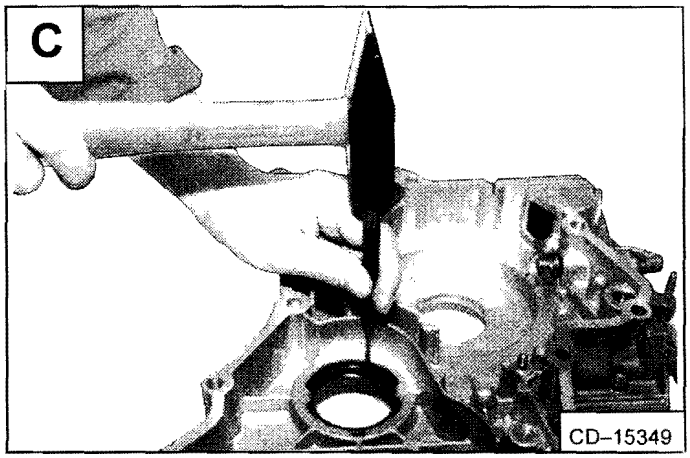
Remove the centrifugal governor **[A]**.



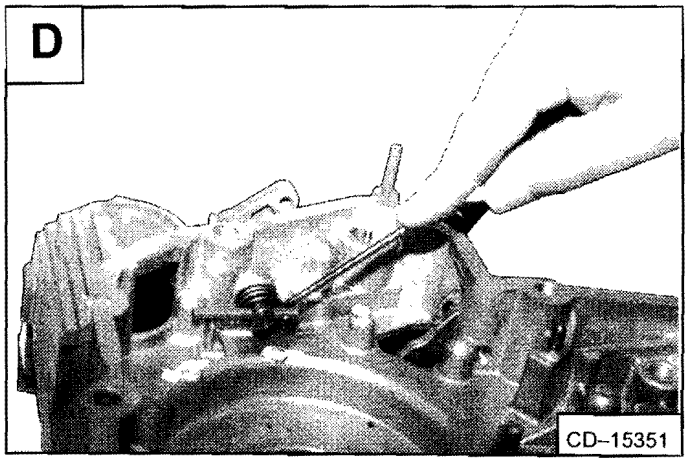
Remove the camshaft seal **[B]**.



Remove the crankshaft seal **[C]**.

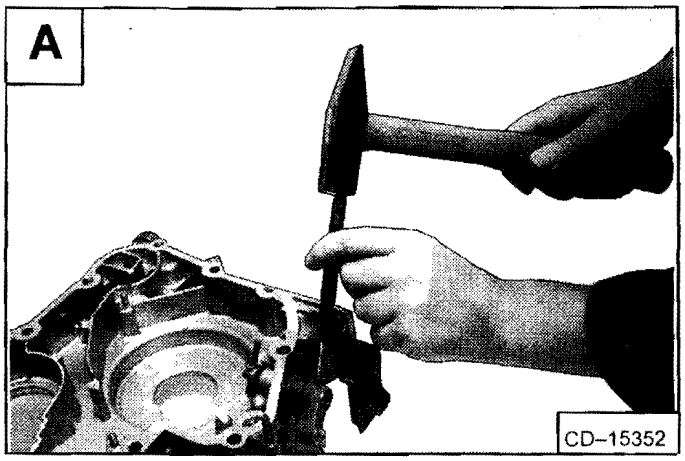


Disconnect the spring **[D]**.

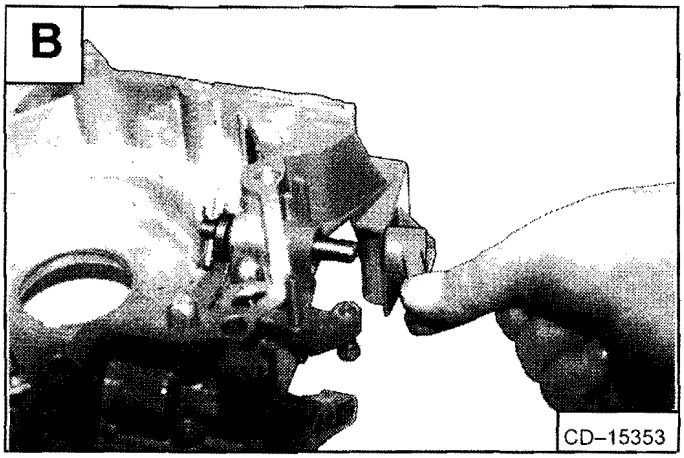


Disassembly (Cont'd)

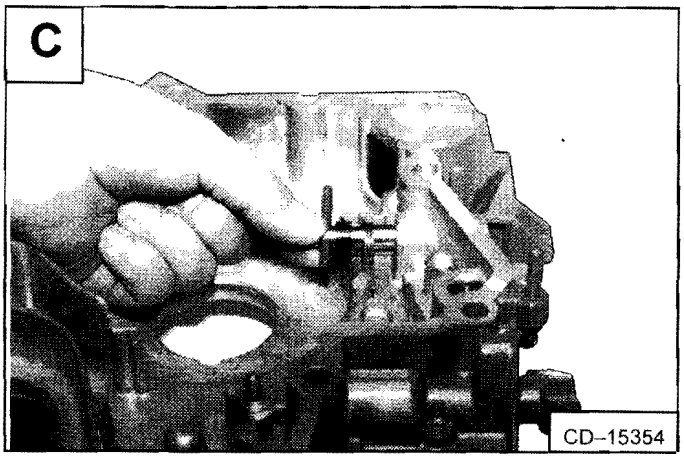
Remove the dowel pin **[A]**.



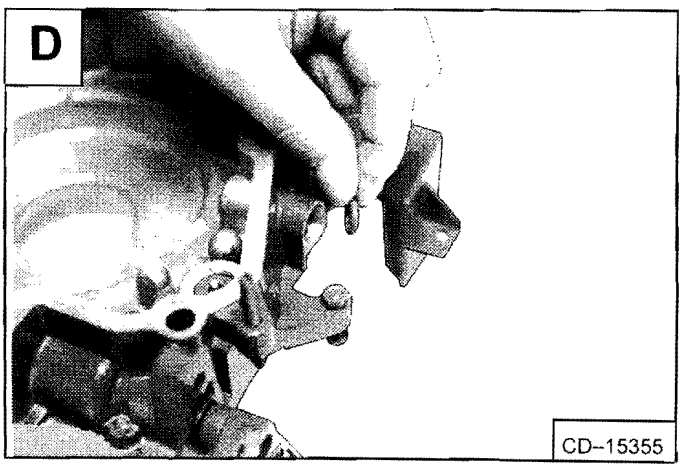
Remove the shut–down lever with spacer bushings **[B]**.



Remove the shaft, spacer bushing and spring **[C]**.

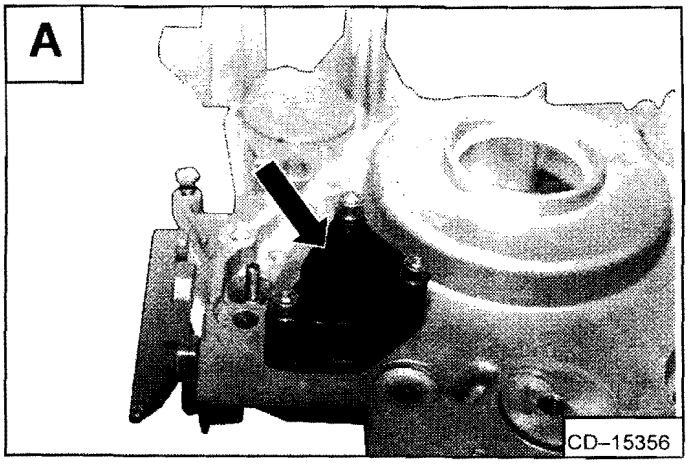


Remove the O–ring **[D]**.

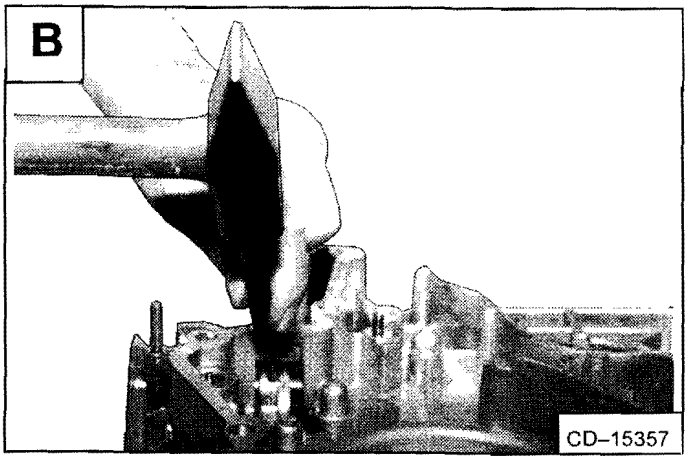


Disassembly (Cont'd)

Remove the cover **[A]**.

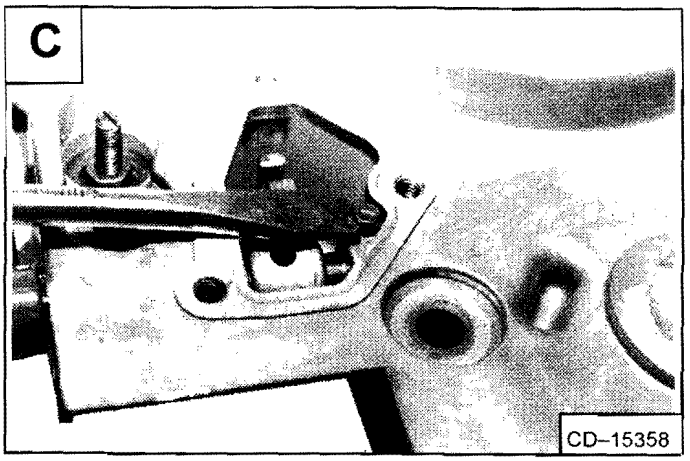


Remove the dowel pin **[B]**.

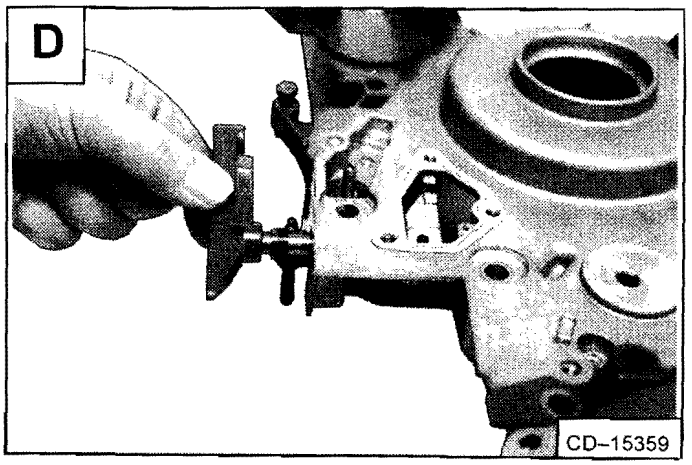


Remove the pin from the lever **[C]**.

Do not damage the cover sealing surface.

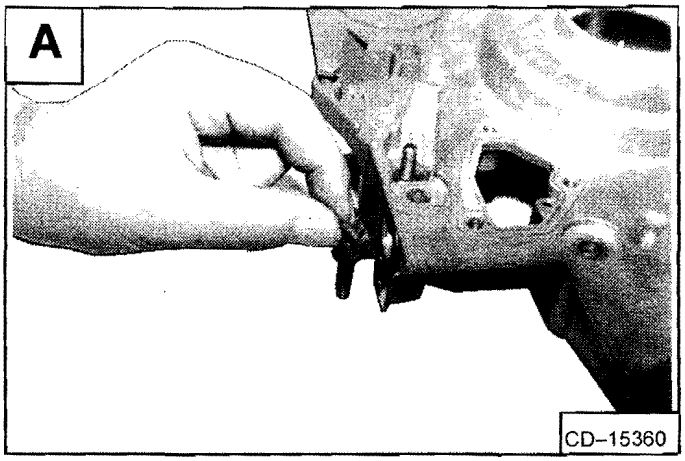


Remove the speed control lever and spacer bushing **[D]**.

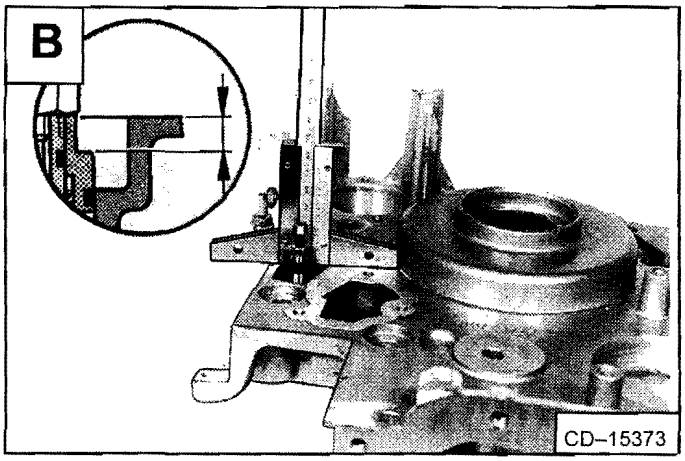


Disassembly (Cont'd)

Remove the O–ring **[A]**.

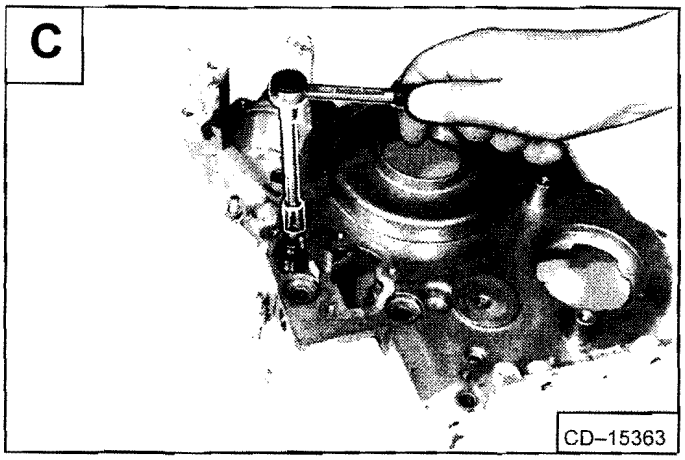


Before removing the torque control assembly, measure the height from the cover **[B]** and make a record of this for assembly.

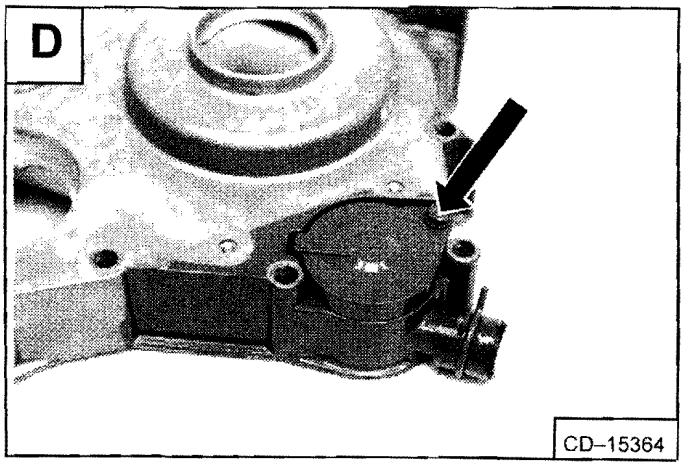


Remove the nut and clamp **[C]**.

Remove the torque control assembly.



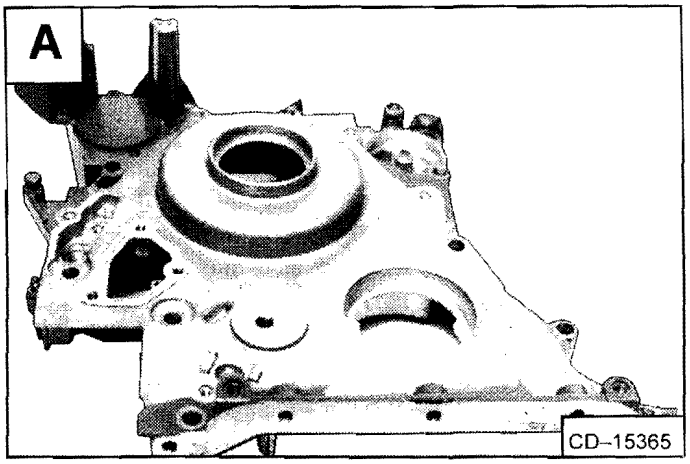
Remove the breather vent **[D]**.



Assembly

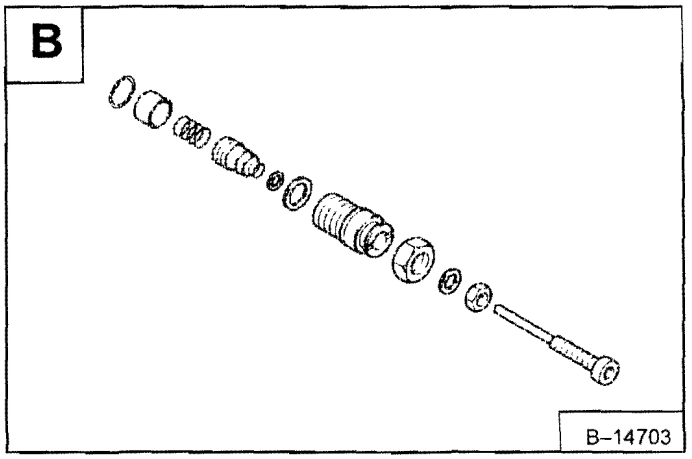
Inspect the front cover for damage **[A]**.

Replace the front cover as needed.



Inspect the individual parts of the torque control assembly **[B]**.

Replace the parts as needed.



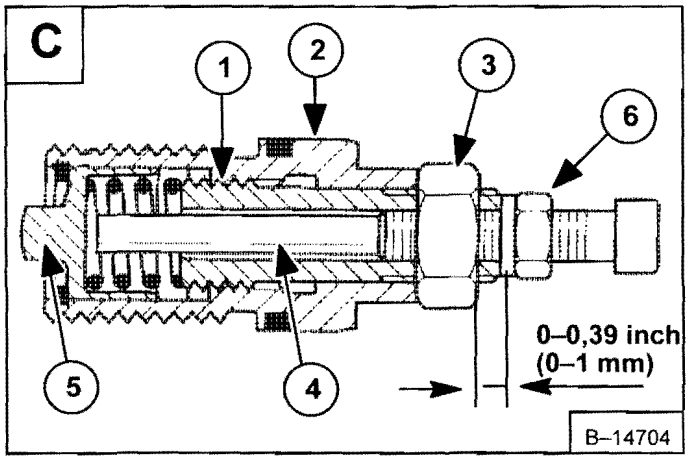
If the torque control was disassemble, do the following procedure to assemble:

Turn (Item 1) **[C]** into (Item 2) **[C]** to leave a protrusion of 0–0.039 inch (0–1 mm).

Tighten the lock nut (Item 3) **[C]** to 12 ft.–lbs. (16 Nm) torque.

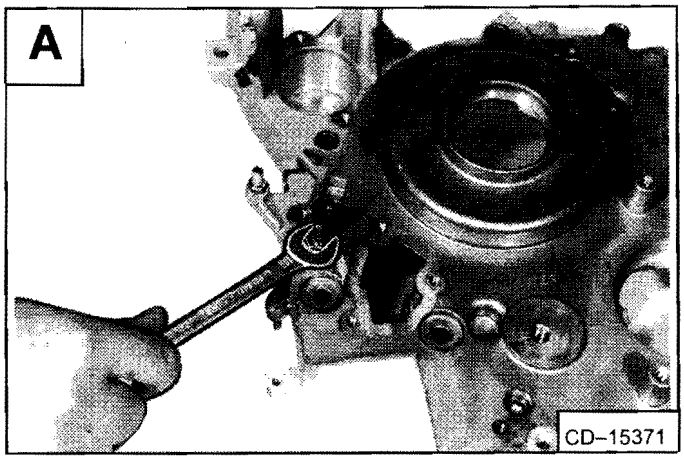
Turn (Item 4) **[C]** as far as it will go into (Item 5) **[C]**. Turn back one full turn.

Tighten the lock nut (Item 6) **[C]** to 53 in.–lbs. (6 Nm) torque.



Assembly (Cont'd)

Install the torque control into the front cover **[A]**.

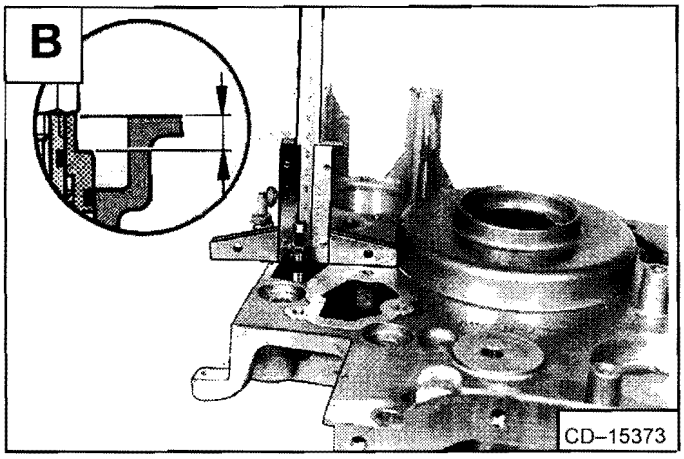


Install the torque control assembly to the dimensions taken (Page 102; Fig. **[B]**) or use the procedure below:

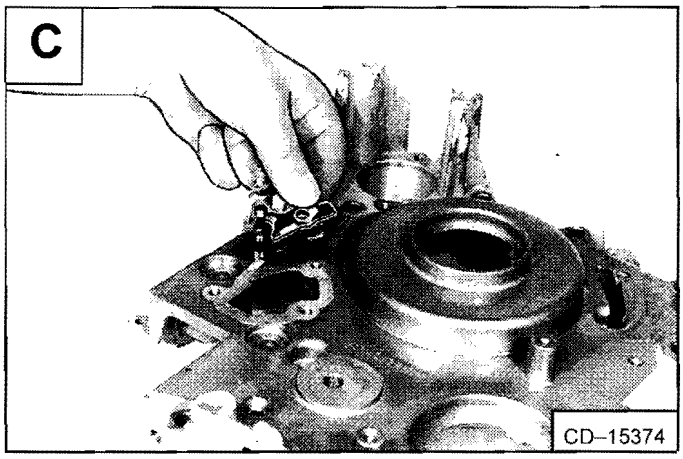
Specification:

Thread Reach ..... 0.252 ± 0.019 inch (6,4 ± 0,5 mm)

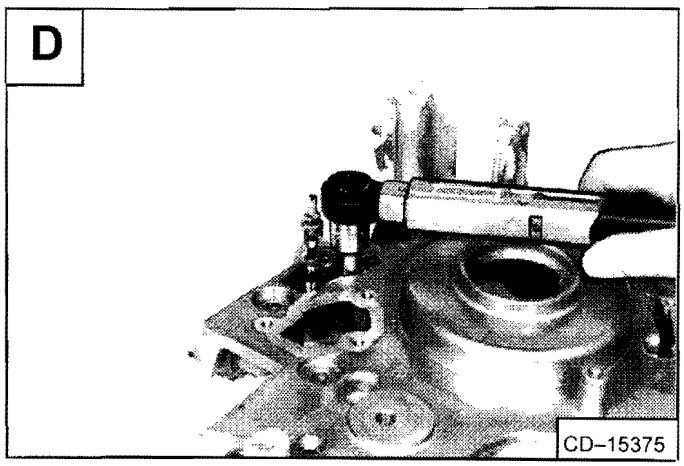
NOTE: Dynamometer testing may be necessary depending on engine performance.



Install the clamp and nut **[C]**.



Tighten the clamp nut to 88 in.–lbs. (10 Nm) torque **[D]**.

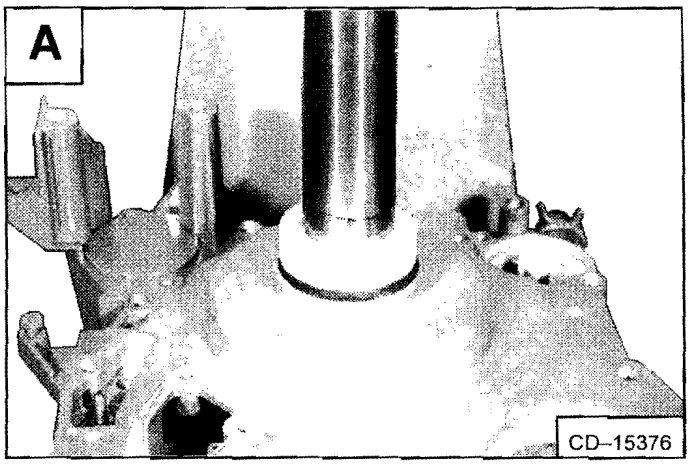


FRONT COVER (Cont'd)

Assembly (Cont'd)

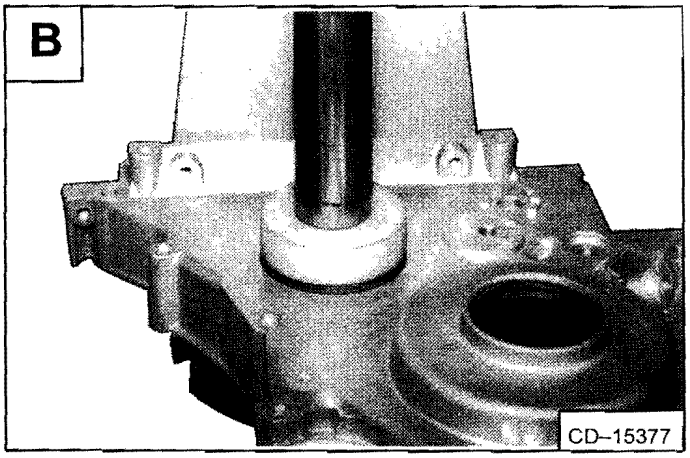
Put a light coat of oil on the camshaft seal.

Press the camshaft seal into the front cover **[A]**. (See Page 7–58, for correct tool.)



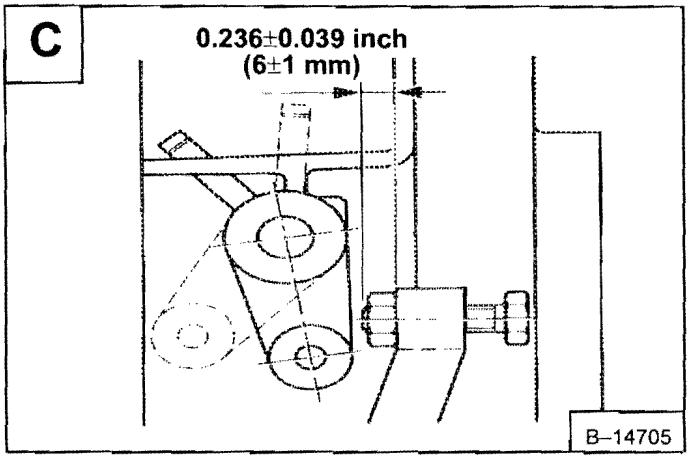
Do Not put oil on the crankshaft seal.

Press the crankshaft seal into the front cover **[B]**.



Adjust the distance of the shut–down stop screw to 0.236 ± 0.039 inch (6 ± 1 mm) **[C]**.

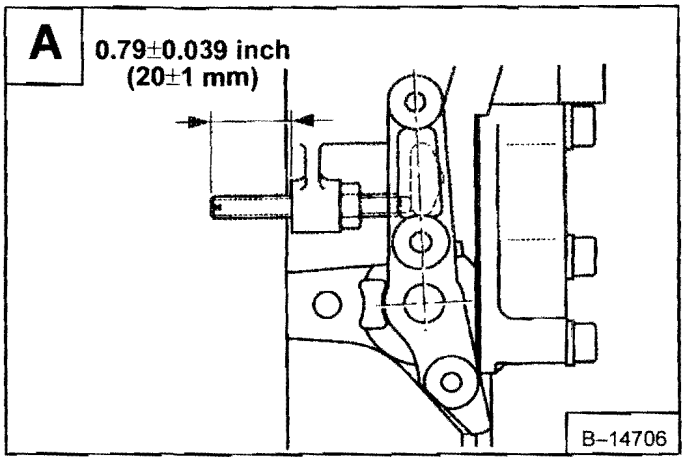
Tighten the lock nut to 40 in.–lbs. (4,5 Nm) torque.



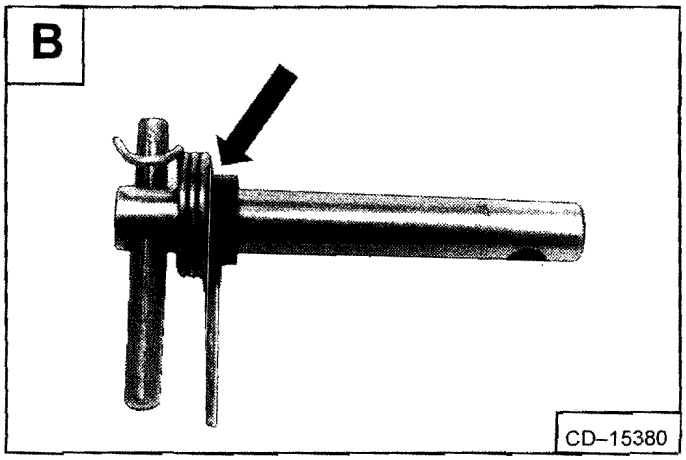
Assembly (Cont'd)

Adjust the minimum speed screw to 0.79 ± 0.039 inch (20 ± 1,0 mm) **[A]**.

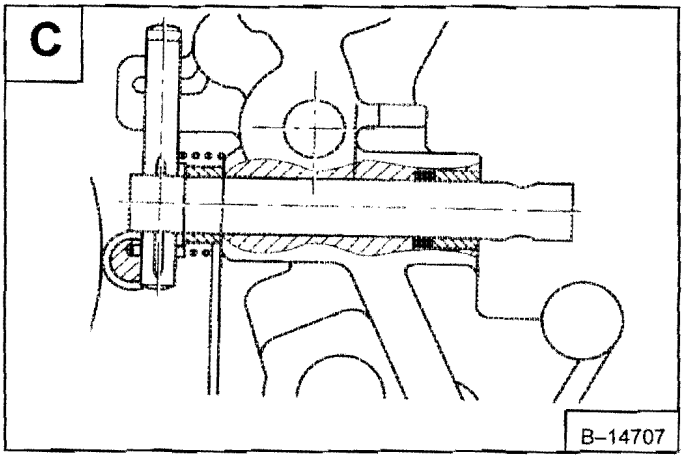
Tighten the lock nut to 40 in.–lbs. (4,5 Nm) torque.



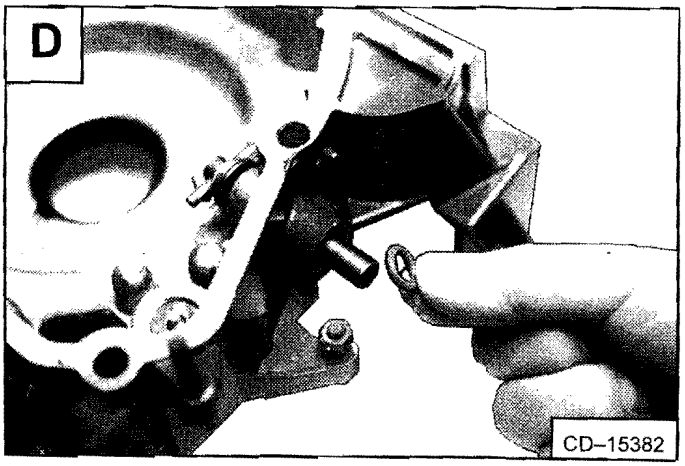
Install the spacer bushing and spring on the shut–down shaft **[B]**.



Install the shut–down shaft **[C]**.

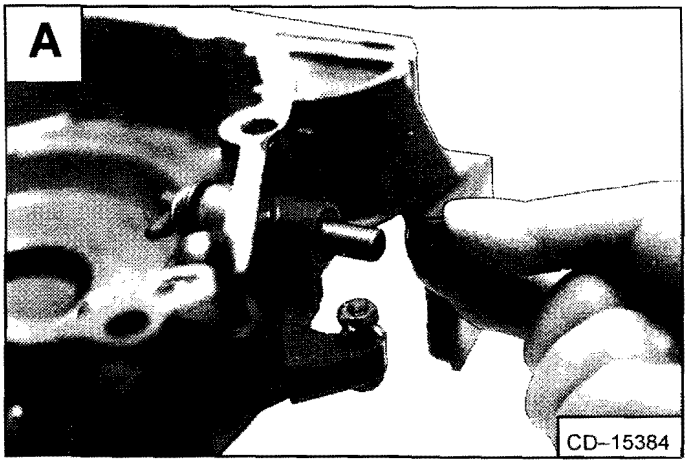


Put grease on the O–ring and install on the shaft **[D]**.

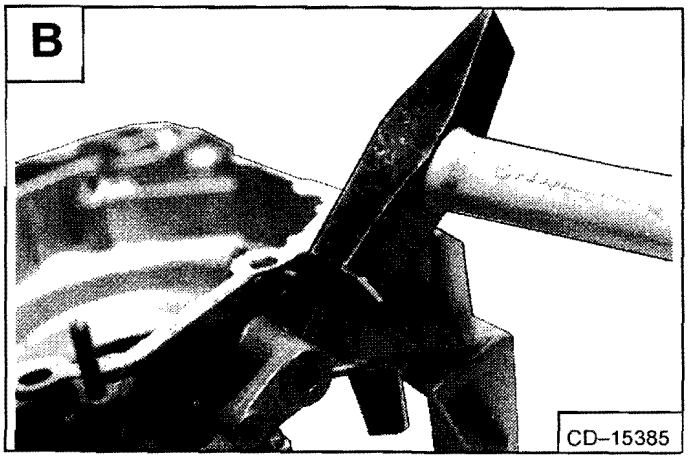


Assembly (Cont'd)

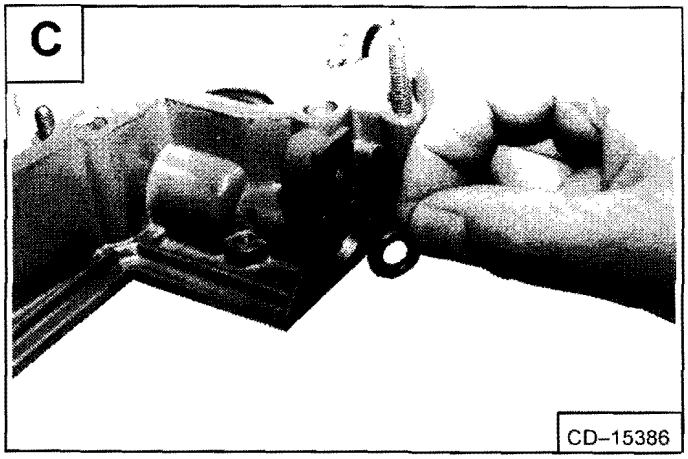
Install the spacer bushing **[A]**.



Install the shut–down lever and dowel pin **[B]**.

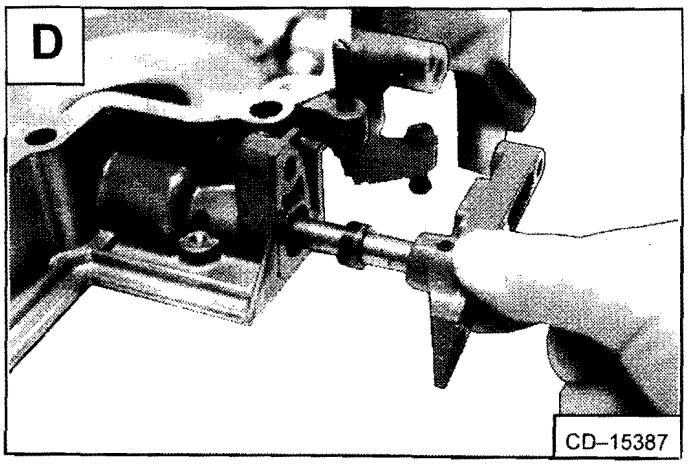


Put grease on the O–ring and install in the front cover **[C]**.



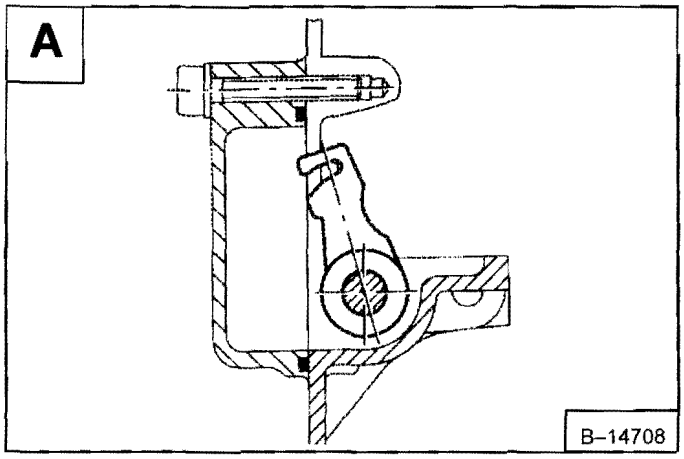
Install the spacer bushing on the speed control lever **[D]**.

Install the speed control lever into the front cover **[D]**.

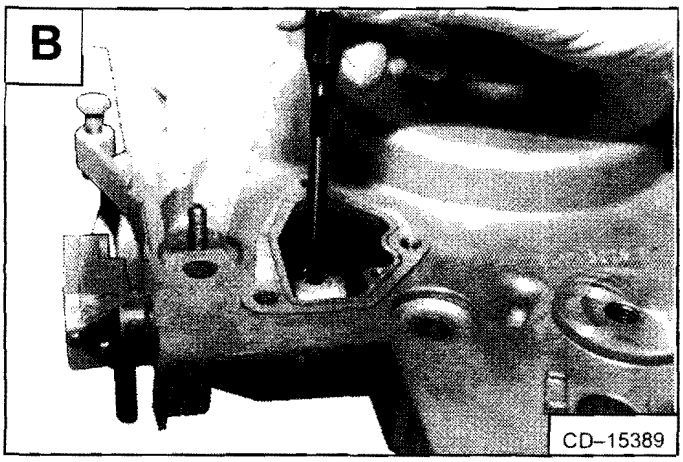


Assembly (Cont'd)

When installing the speed control lever, make sure it is installed in the correct direction **[A]**.

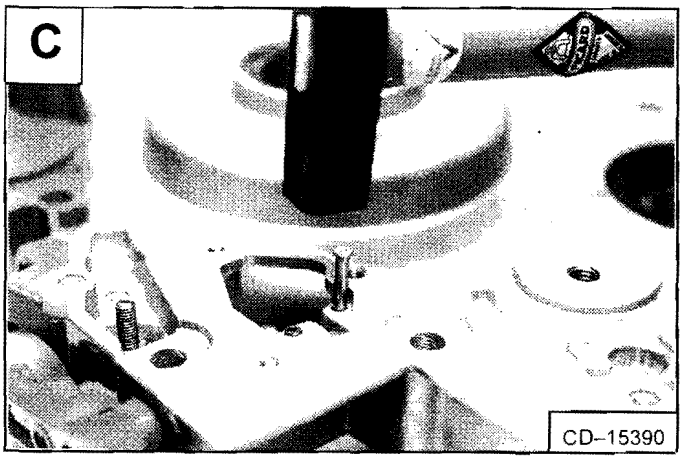


Install the dowel pin into the speed control lever **[B]**.

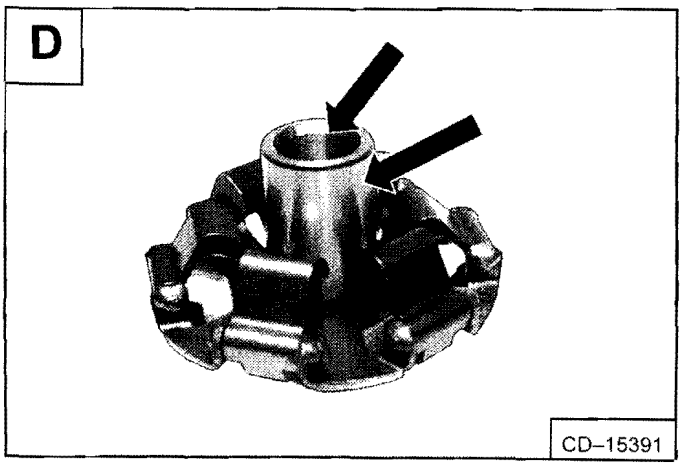


Drive the pin into the lever **[C]**.

The groove in the speed control shaft must be in line with the dowel pin bore.



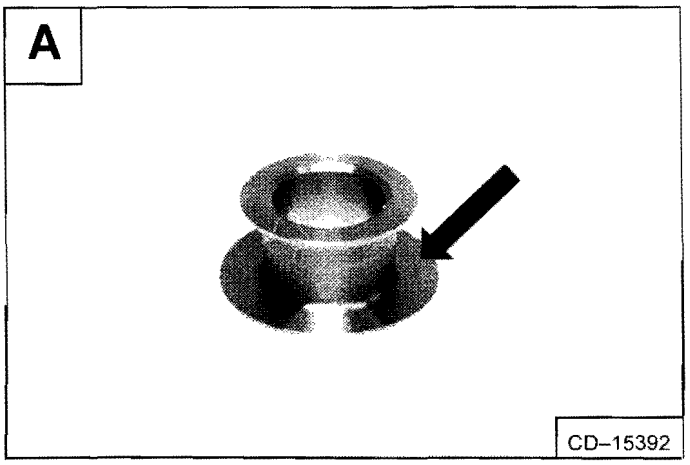
Inspect the centrifugal governor for wear **[D]**. Replace as needed.



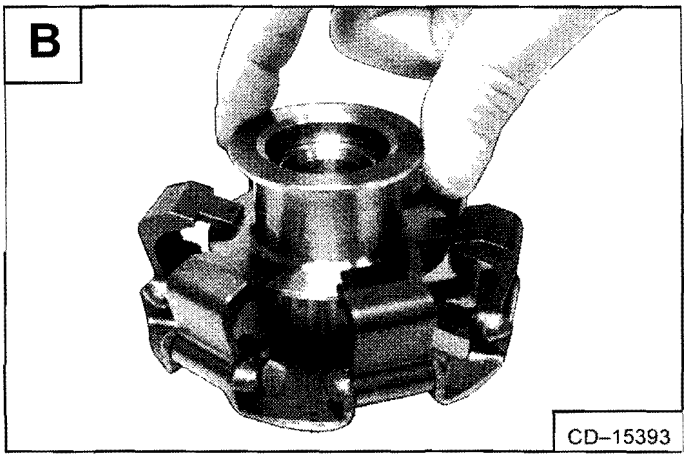
Assembly (Cont'd)

Inspect the governor plate for wear **[A]**.

Replace as needed.

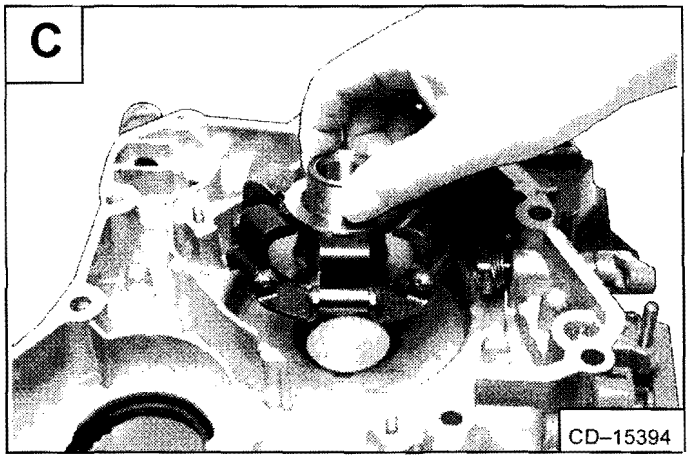


Assemble the governor plate with the centrifugal governor **[B]**.



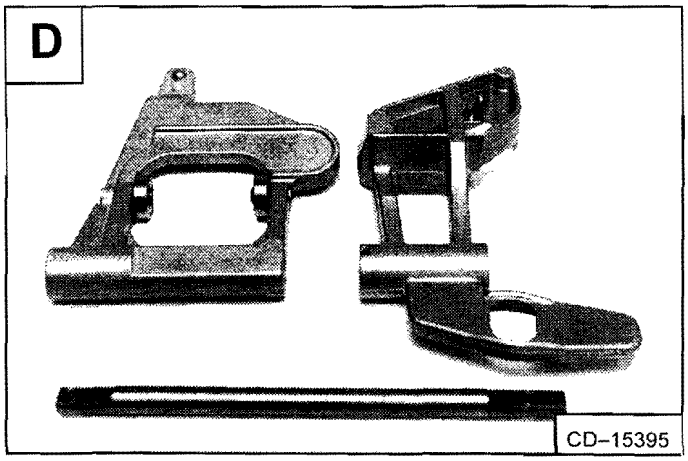
Install centrifugal governor assembly into the front cover **[C]**.

Be careful not to damage the shaft seal.



Inspect roller lever, shaft and idling lever wear **[D]**.

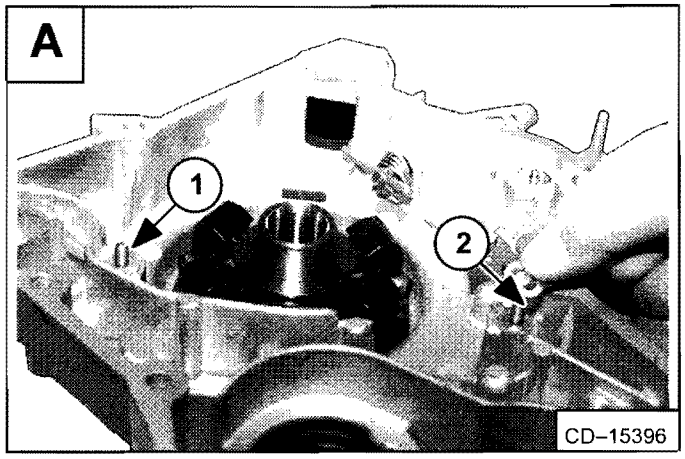
Replace the parts as needed.



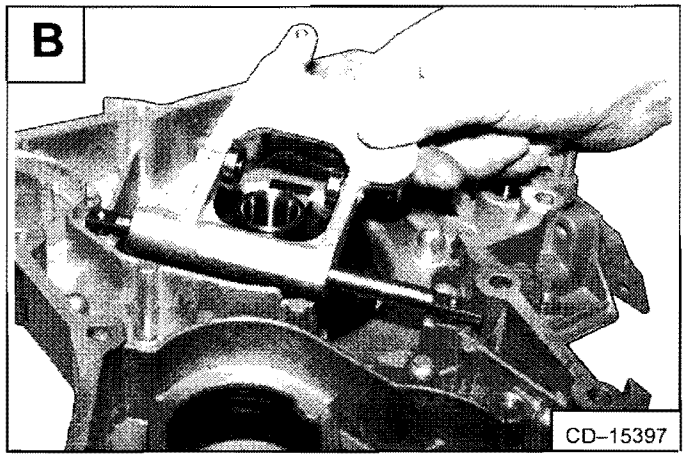
FRONT COVER (Cont'd)

Assembly (Cont'd)

Install shims of at least 0.011 inch (0,3 mm) thickness at points (Items 1 & 2) **[A]**.

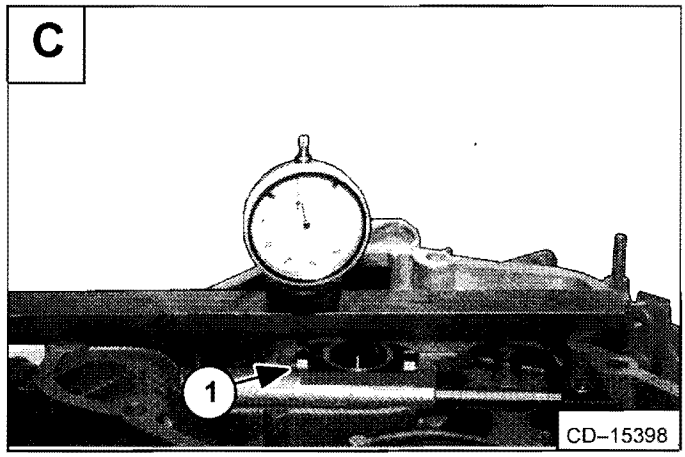


Install the governor lever shaft without the idling lever **[B]**. Tighten the bolts to 81 in.–lbs. (9,2 Nm) torque.



Measure the ball bearing (Item 1) **[C]**, by lightly pressing the roller lever.

Set the dial gauge to zero.

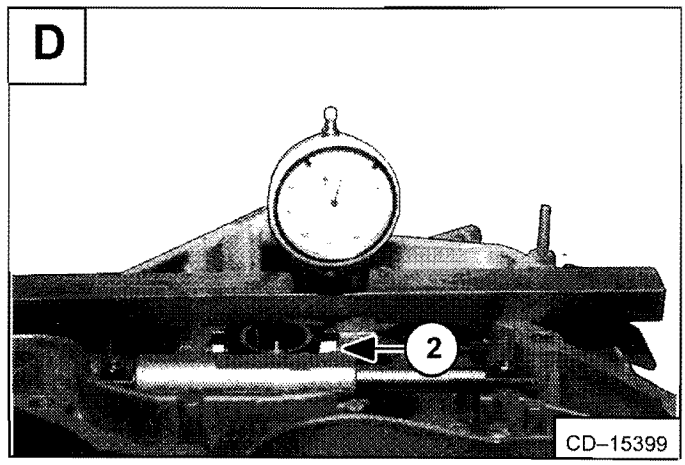


Place dial indicator on ball bearing (Item 2) **[D]**.

Make record of the two readings.

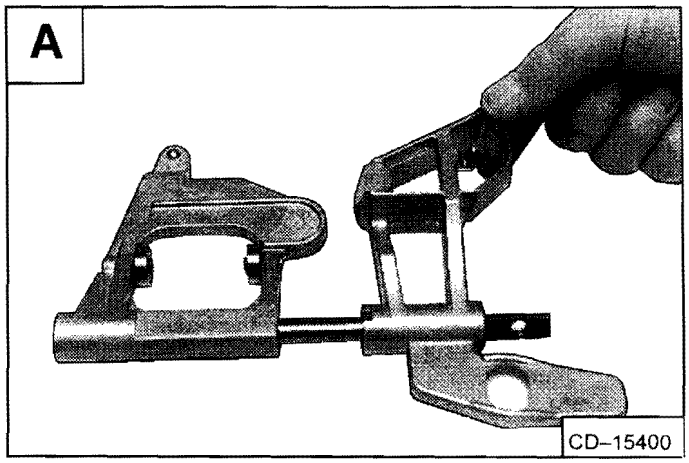
The required tolerance is 0.0019 inch (0,05 mm).

It is possible to install extra shims at (Items 1 & 2) **[A]** to get the required measurement.



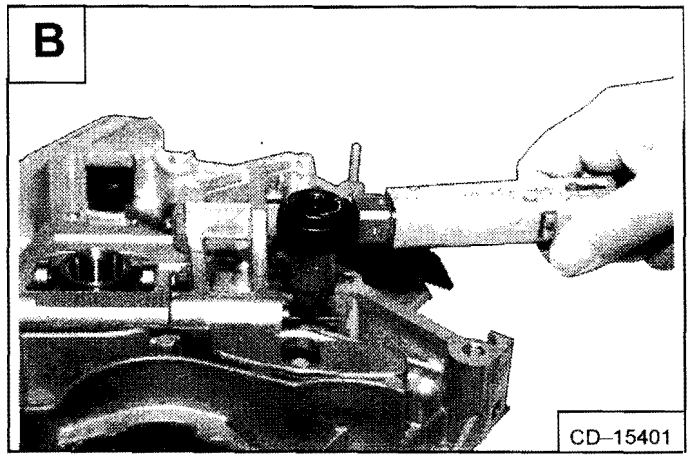
Assembly (Cont'd)

Assemble the roller lever with the idling lever and shaft **[A]**

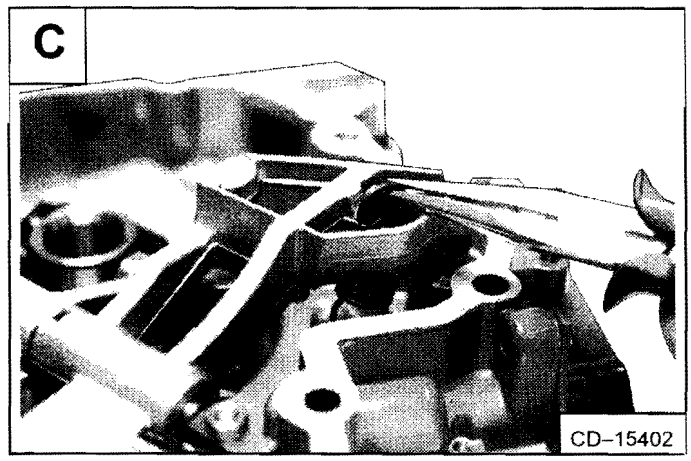


Install the complete governor lever shaft assembly into the front cover.

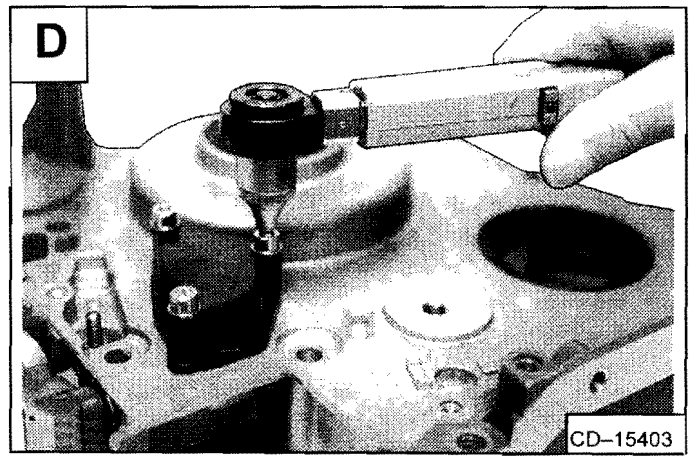
Tighten the bolts to 81 in.–lbs. (9,2 Nm) torque **[B]**.



Connect the governor spring **[C]**.

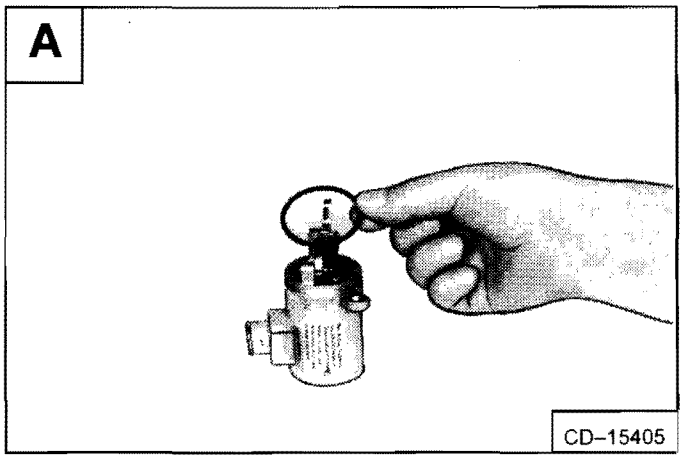


Install the cover with new gasket. Tighten the bolts to 40 in–lbs. (4,5 Nm) torque **[D]**.



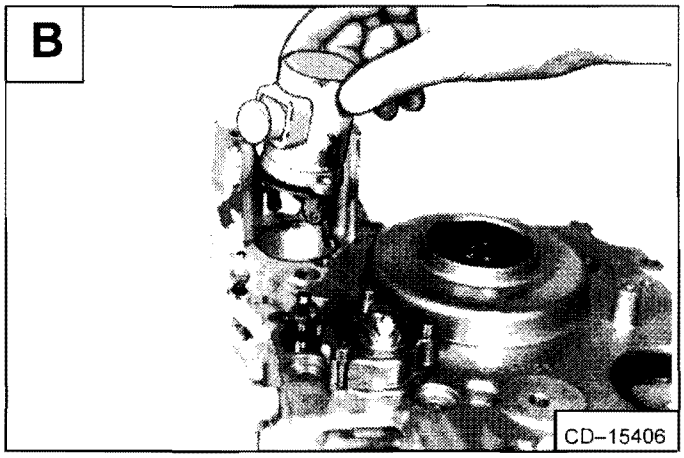
Assembly (Cont'd)

Install a greased O–ring on the shut–down solenoid **[A]**.

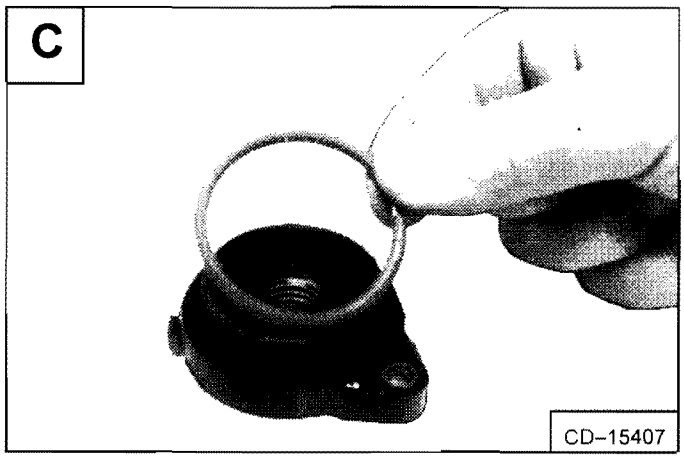


Install the shut–down solenoid into the front cover **[B]**.

Tighten the bolts to 79 in.–lbs. (9 Nm) torque.

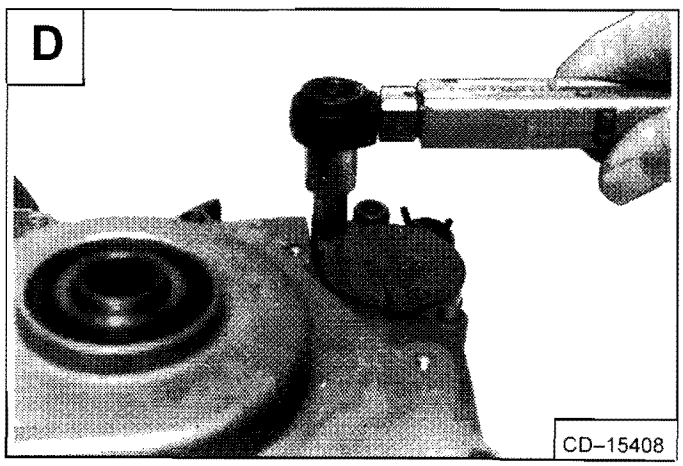


Install new O–ring on the breather vent **[C]**.



Install the breather vent into the front cover. Tighten the bolts to 75 in.–lbs. (8,5 Nm) torque **[D]**.

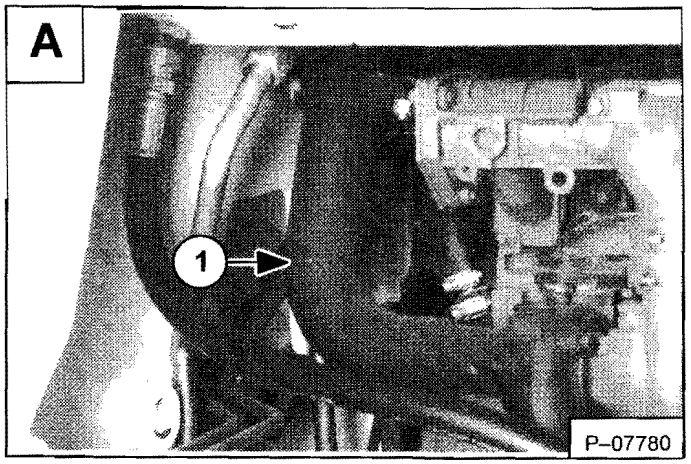
NOTE: Dynamometer testing is recommended after the governor assembly is re–built.



TURBOCHARGER

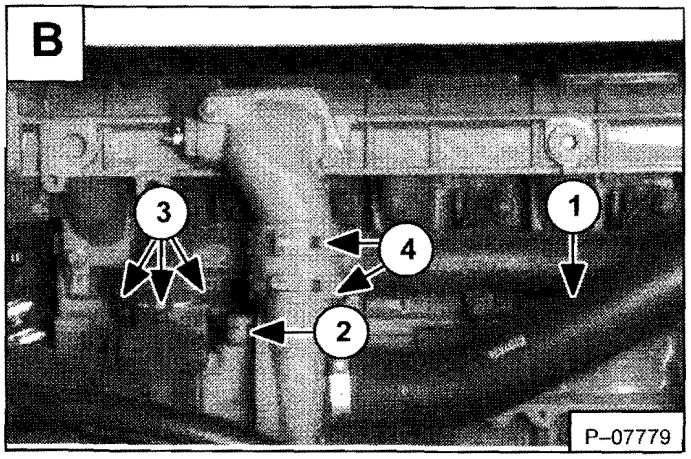
Removal and Installation

Remove the exhaust pipe (Item 1) **[A]**.



Disconnect the air cleaner hose (Item 1) **[B]**.

Disconnect the oil tubeline (Item 2) **[B]**.



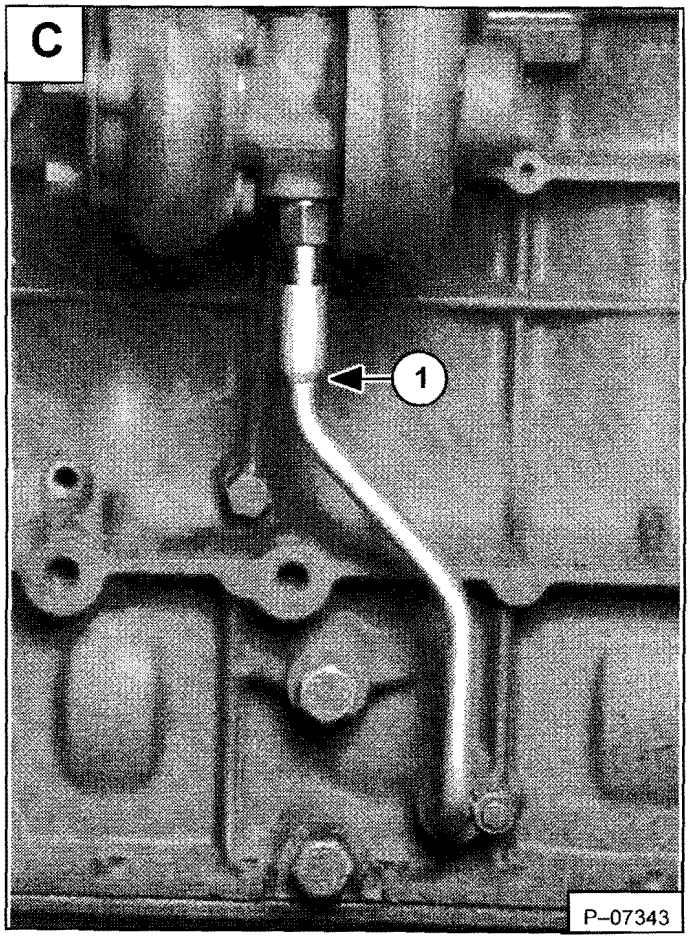
Disconnect the oil tubeline (Item 1) **[C]**.

Remove the exhaust manifold nuts (Item 3) **[B]**.

Installation: Tighten the nuts to 22 ft.–lbs. (30 Nm) torque.

Remove the hose clamps (Item 4) **[B]**.

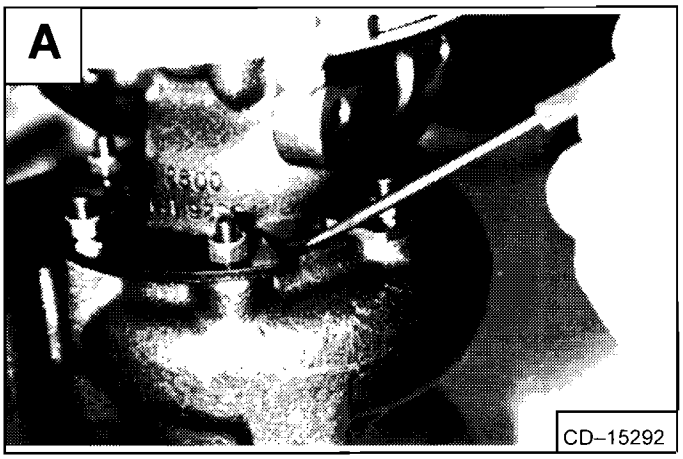
Remove the turbocharger from the intake manifold hose.



TURBOCHARGER (Cont'd)

Disassembly

Mark the turbine housing, bearing housing and back plate so they will be assembled correctly **[A]**.

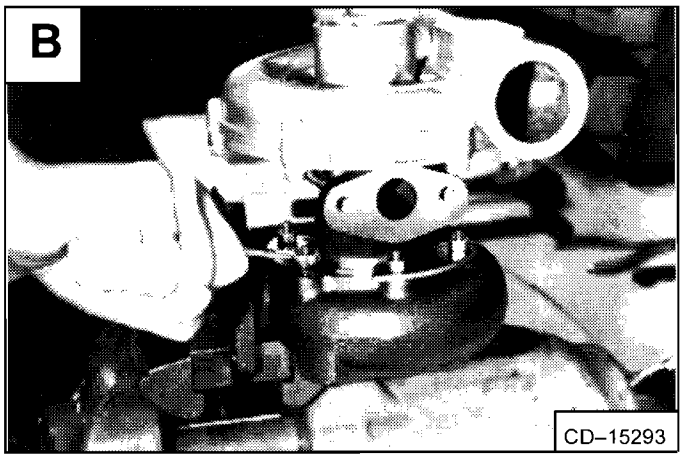


Clamp the turbine housing in a vise **[B]**.

Remove the nuts from the compressor and turbine housing **[B]**.

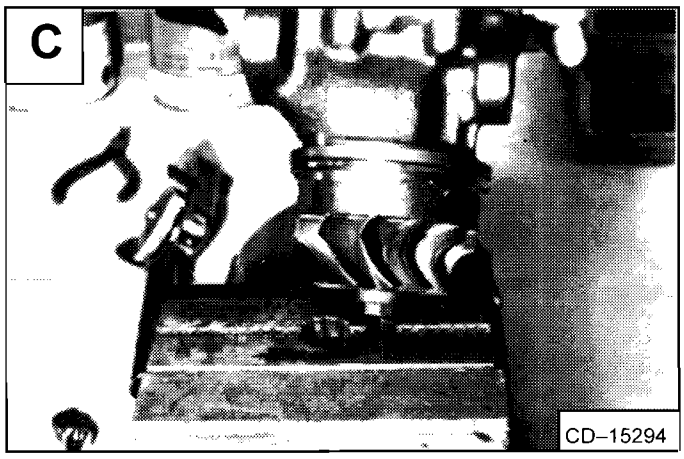
Remove the turbine housing.

Remove the compressor housing.



Clamp the hub of the shaft and turbine wheel assembly in the vice **[C]**.

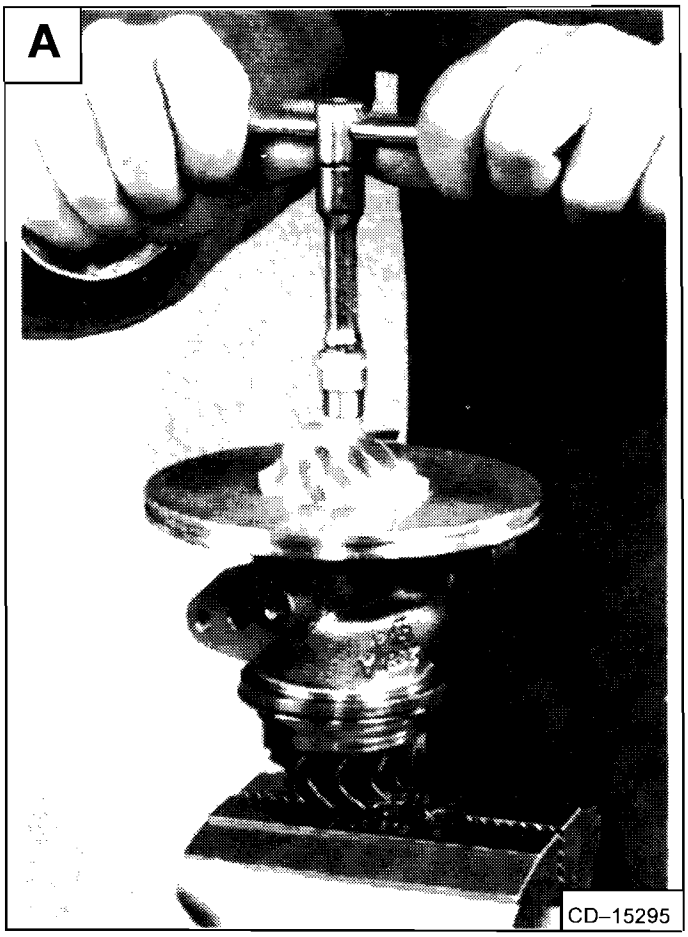
NOTE: Use vice jaw guards.



Disassembly (Cont'd)

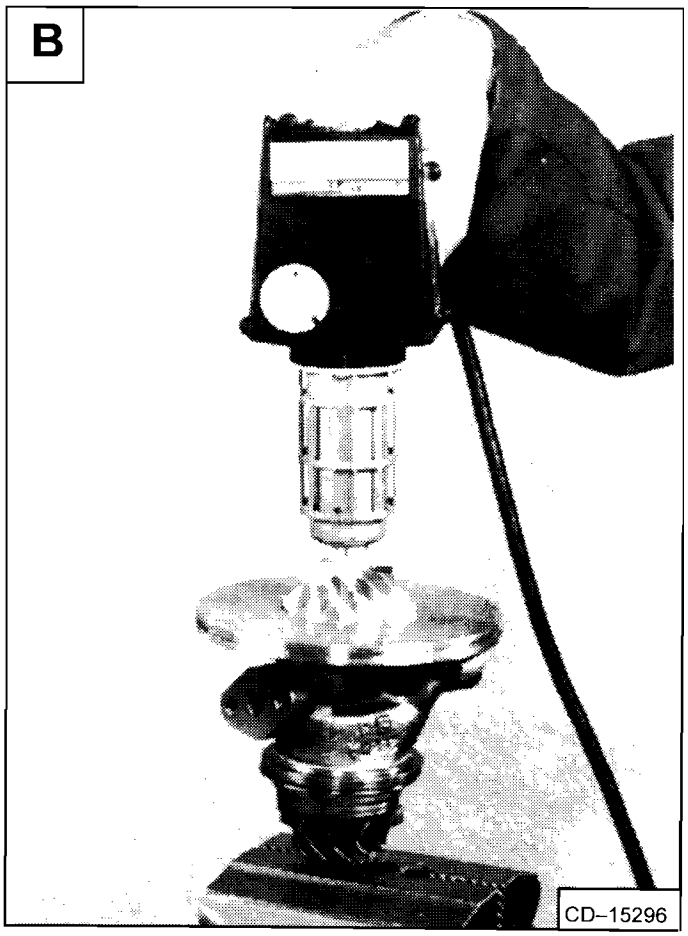
Remove the shaft nut **[A]**.

NOTE: Use a hot air blower to heat the nut. When the nut was installed, LOCTITE #640 was used on the threads, do not bend the shaft when removing the nut.



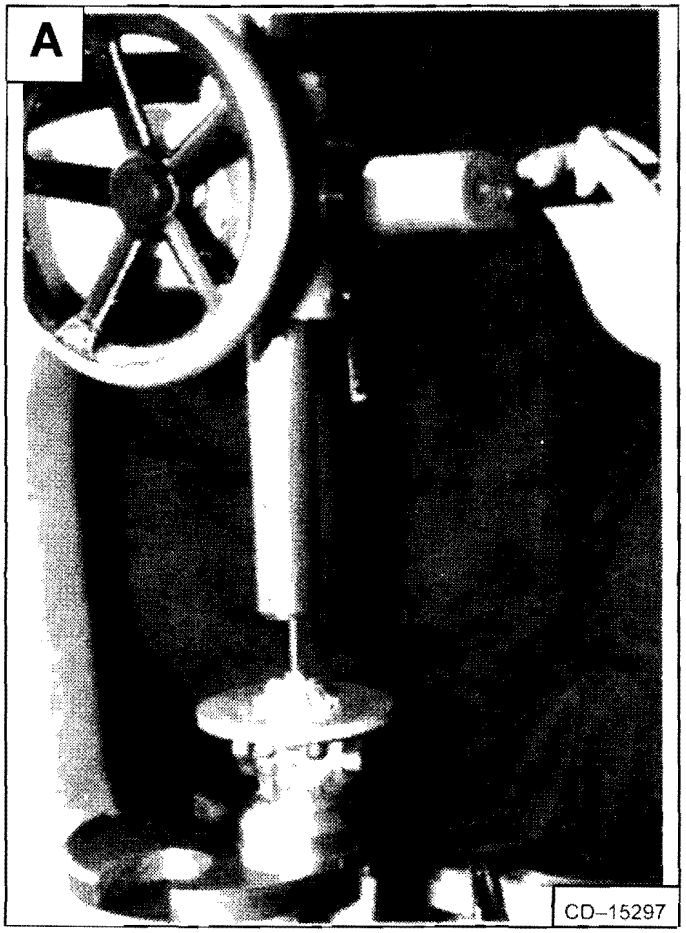
Heat the compressor wheel to a maximum temperature of 130°F. (55°C.) using a hot air blower **[B]**.

Protect the rotor threads from overheating.



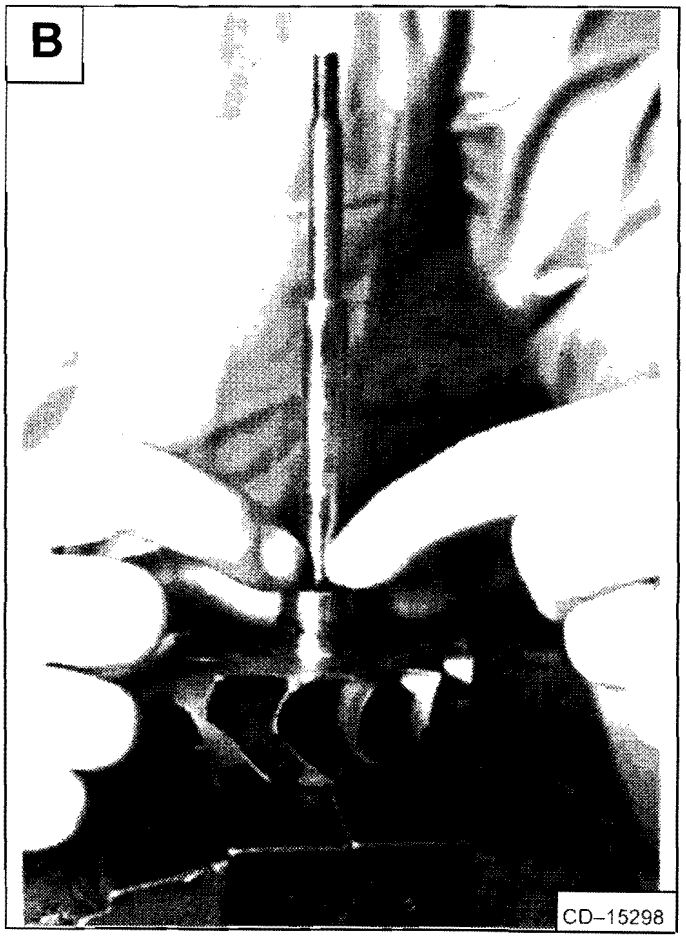
Disassembly (Cont'd)

Carefully push out the shaft and turbine wheel assembly **[A]**.



Remove the piston rings from the shaft and turbine wheel assembly **[B]**.

Remove the heat shield.

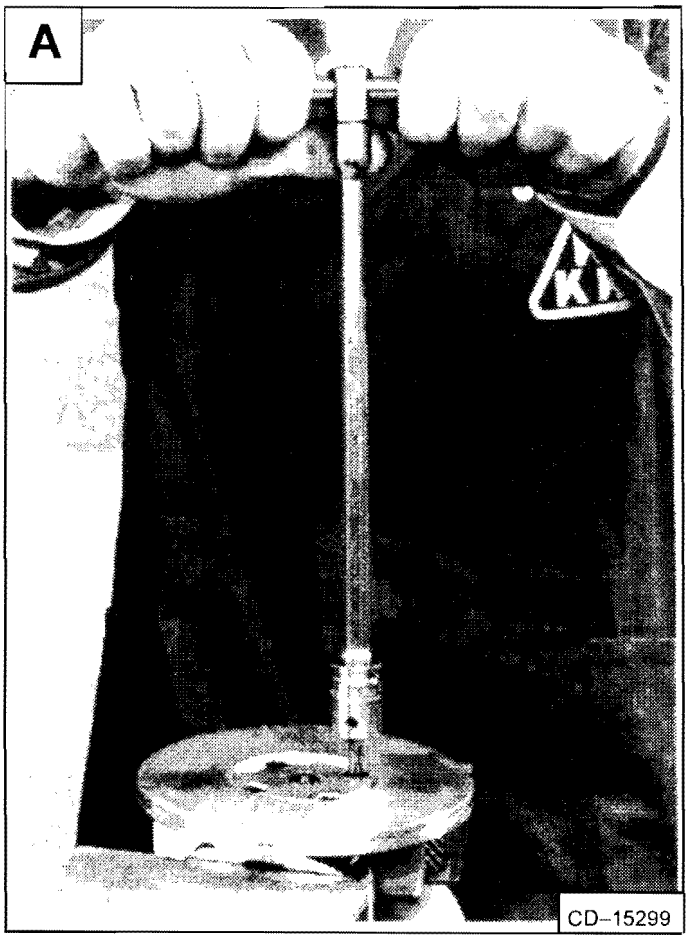


Disassembly (Cont'd)

Clamp the bearing housing in a vise, use jaw guards **[A]**.

Remove the screws **[A]**.

NOTE: The screws are secured with LOCTITE #640.

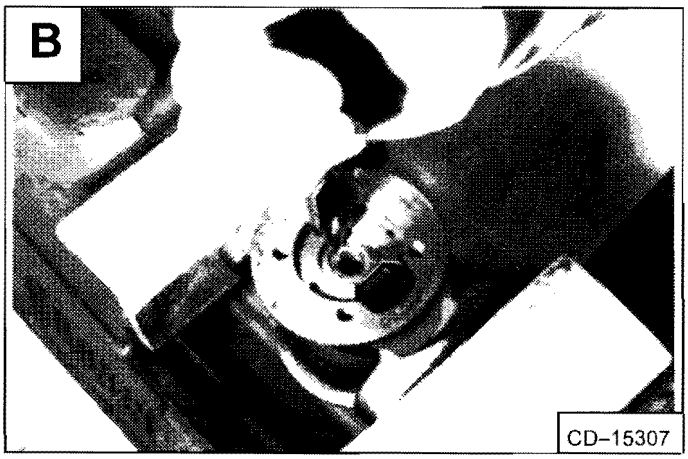


Remove the back plate from the bearing housing.

Remove the sleeve from the back plate.

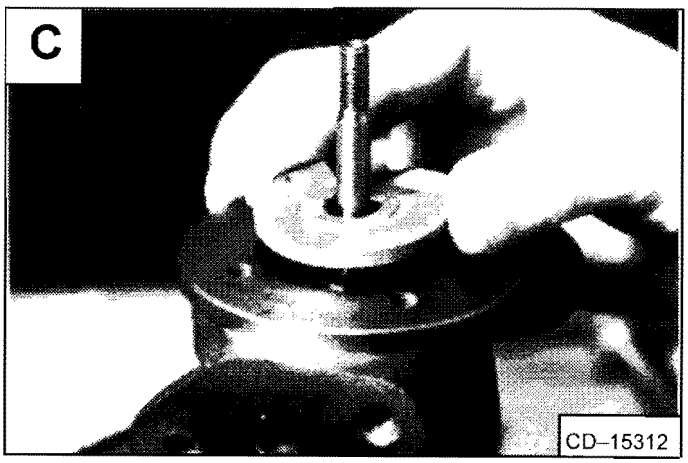
Remove the O–rings from the back plate.

Remove the piston rings from the back plate **[B]**.



Remove the oil deflector ring, oil deflector and thrust bearing from the bearing housing.

Remove the spacer sleeve and thrust ring from the bearing housing **[C]**.



TURBOCHARGER (Cont'd)

Inspection

Carefully clean the following parts:

Housings
Shaft and turbine wheel assembly
Compressor wheel
Back plate
Heat shield

Remove LOCTITE from threads.

Visual check the housings, heat shield, turbine and compressor wheels for cracks, any foreign material and scratches. Inspect oil feed holes in the bearing housing. Inspect piston ring sealing surfaces and bearing areas for damage.

Examine the turbine housing for scaling.

Examine the gas inlet and outlet flanges of the turbine housing for distortion.

Examine the turbine and compressor wheels, for bent or broken, and the shaft for scoring at bearing seats.

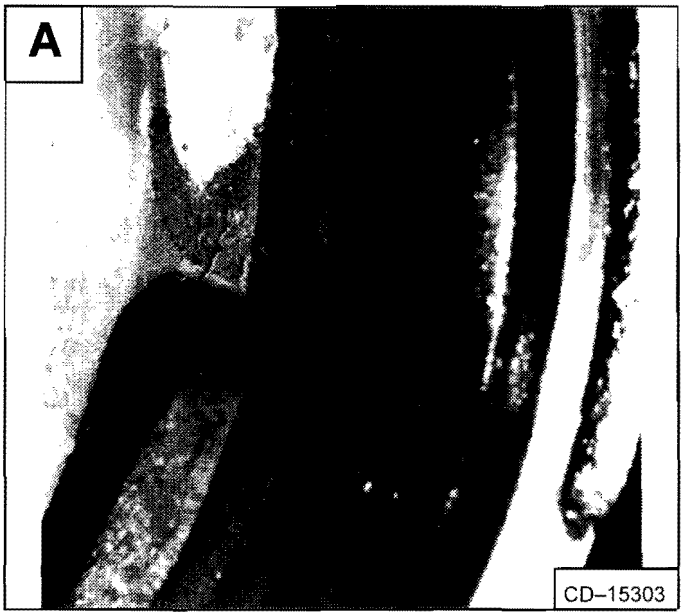
NOTE: Wear parts which have excessive wear, as well as rotating parts with cracks must be replace [A].

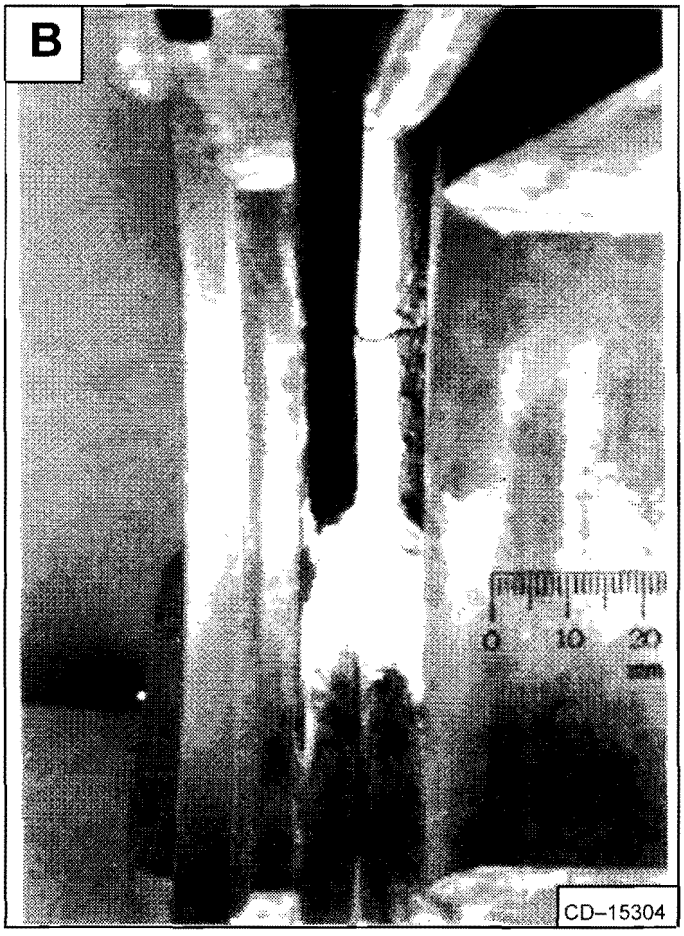
Radial cracks up to 0.39 inch (10 mm) long are permissible in the areas of the torque and partitioning wall **[B]**.

Replace the shaft and turbine wheel assembly with scratches, cracks or any bent blades.

Place the shaft and turbine wheel assembly in twin v–blocks. Use a dial indicator 0.20 inch (5 mm) from the compressor wheel end of the shaft.

Measure the out–of–round. When it is more than 0.0003 inch (0,008 mm) out–of–round, replace the assembly.





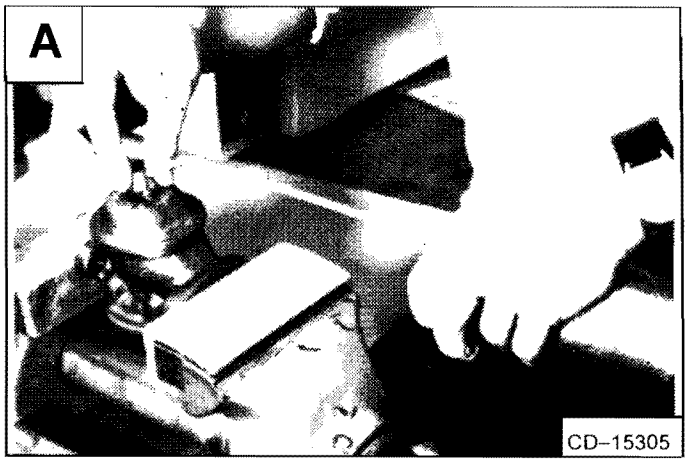
TURBOCHARGER (Cont'd)

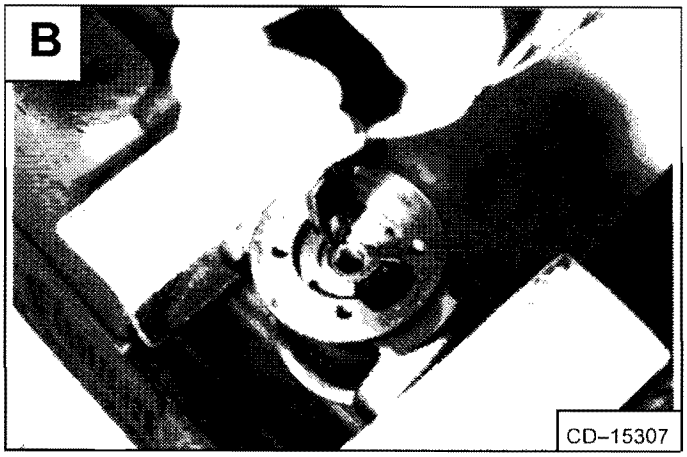
Assembly

Make sure all the parts are clean. Put oil on the following parts before assembling:

Bearing seat of the shaft
Bearings
Thrust bearing
Finger sleeve
Oil deflector ring
Thrust ring
Piston rings
Spacer sleeve

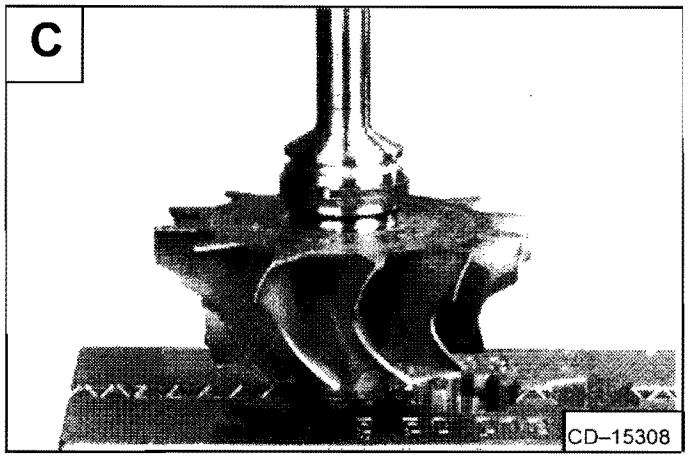
Install the bearings and snap rings in the bearing housing **[A]** & **[B]**.





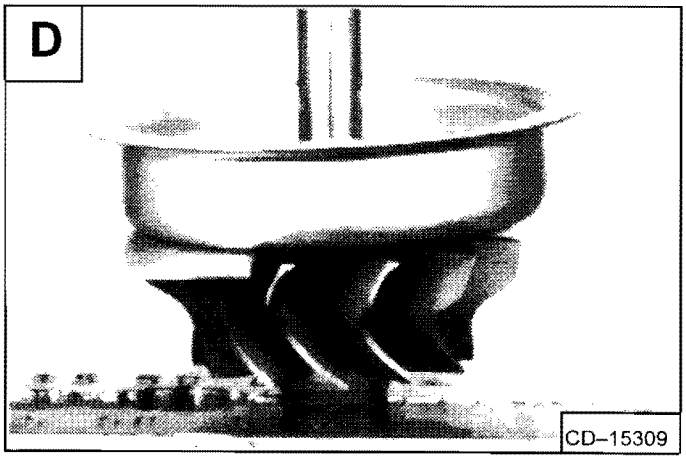
Clamp the shaft and turbine wheel assembly in a vice using jaw plates. Install the two piston rings on the shaft.

Position the ring gaps at 180° to each other **[C]**.



Install the heat shield on the shaft and turbine wheel assembly **[D]**.

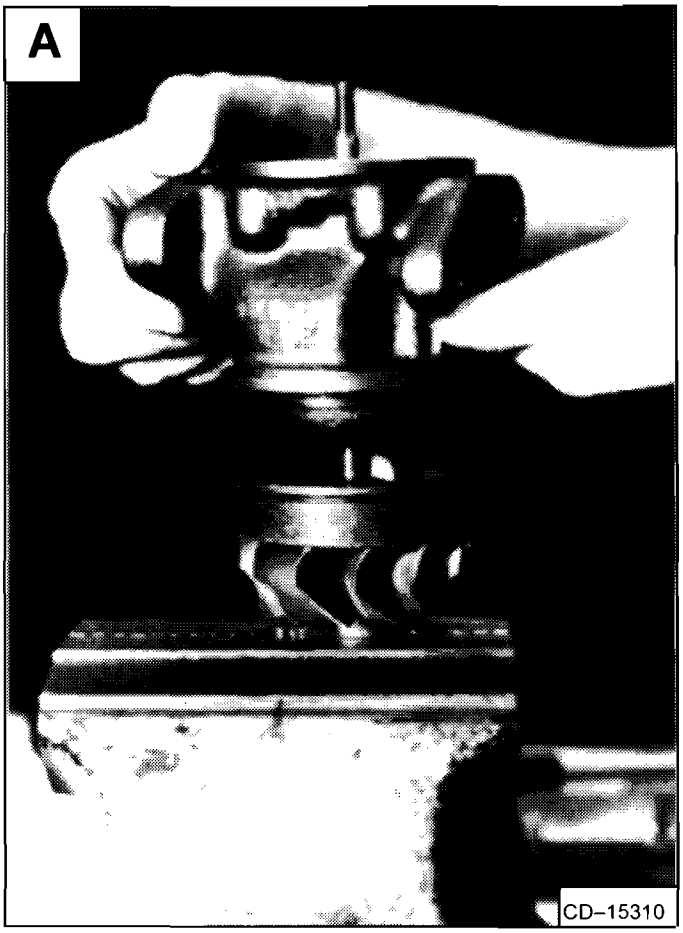
NOTE: Install a piece of shim, 0.039 inch (1,0 mm) thick between the heat shield end turbine wheel to make sure that the piston rings are guided inside the bearing housing bore.



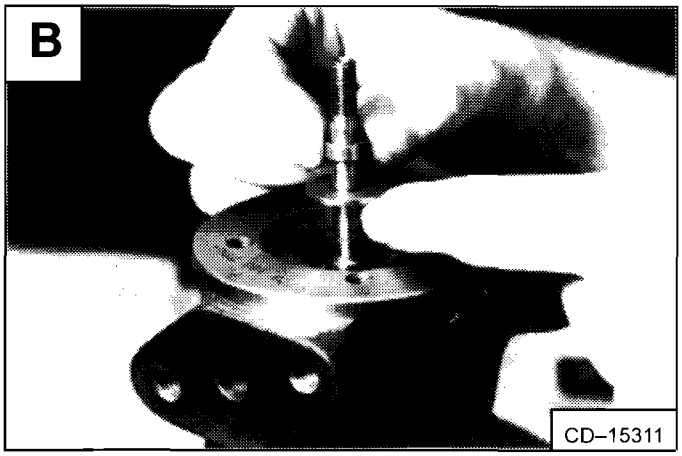
Assembly (Cont'd)

Install the bearing housing carefully onto the rotor shaft **[A]**.

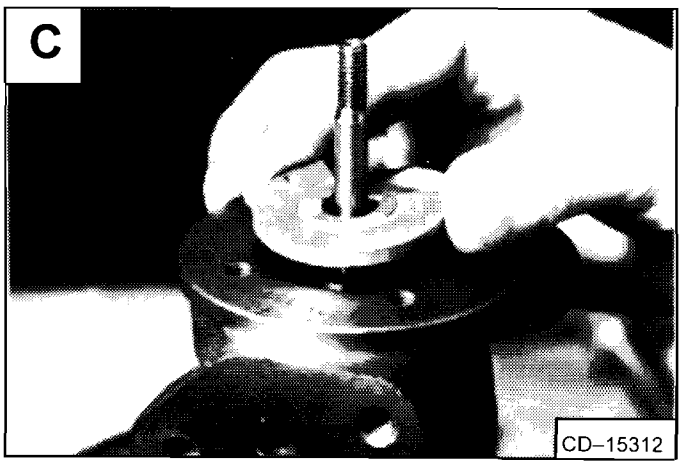
NOTE: Make sure the piston rings are seated, and the heat shield and bearing housing turn freely.



Install the thrust ring and spacer onto the rotor shaft **[B]**.



Install the thrust bearing in bearing housing **[C]**.

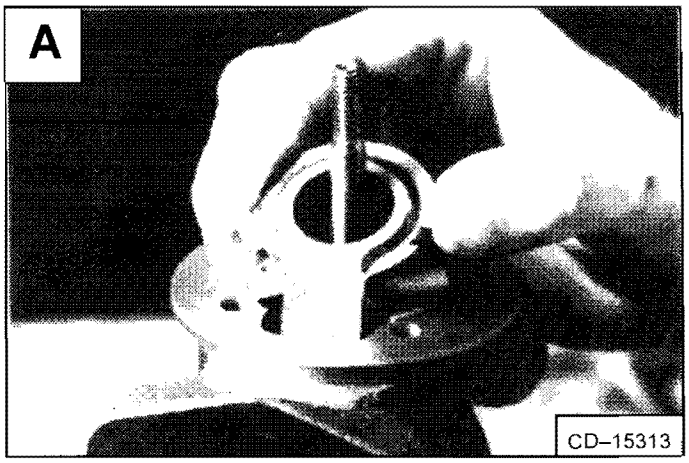


Assembly (Cont'd)

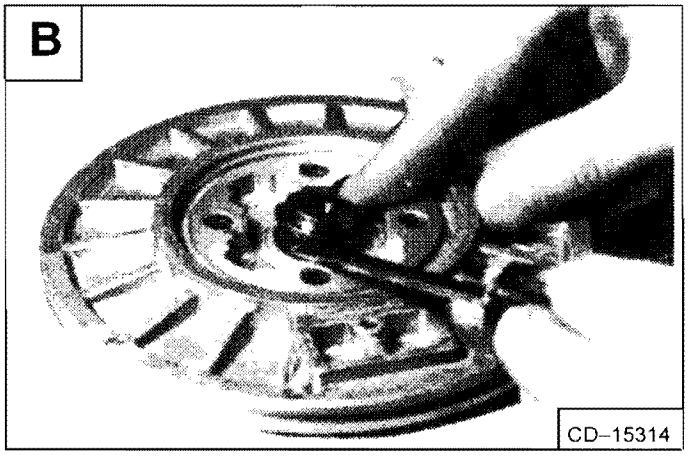
Install a new oil deflector plate on the thrust bearing **[A]**.

Install the oil deflector ring onto the rotor shaft with the large collar at the top.

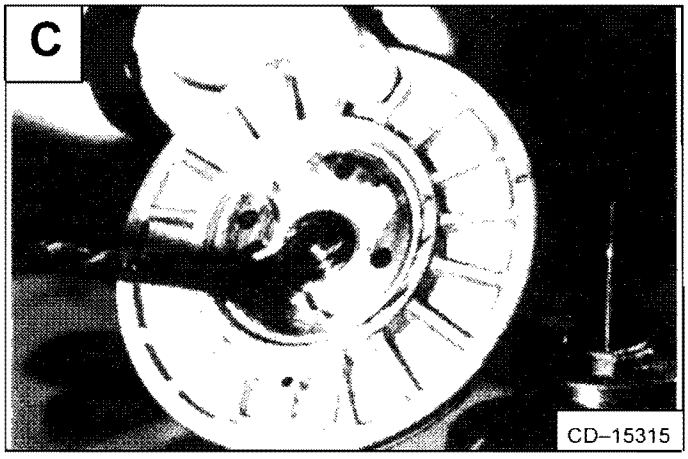
Install the piston rings onto the finger sleeve. Position the piston ring gaps at 180° to each other.



Install finger sleeve, complete with piston rings into back plate **[B]**. When necessary press piston rings together using a screwdriver.



Put seal compound on backplate **[C]**.



TURBOCHARGER (Cont'd)

Assembly (Cont'd)

Install back plate on bearing housing.

Put LOCTITE #640 on the screws.

Tighten the screws to 88 in.–lbs. (10 Nm) torque.

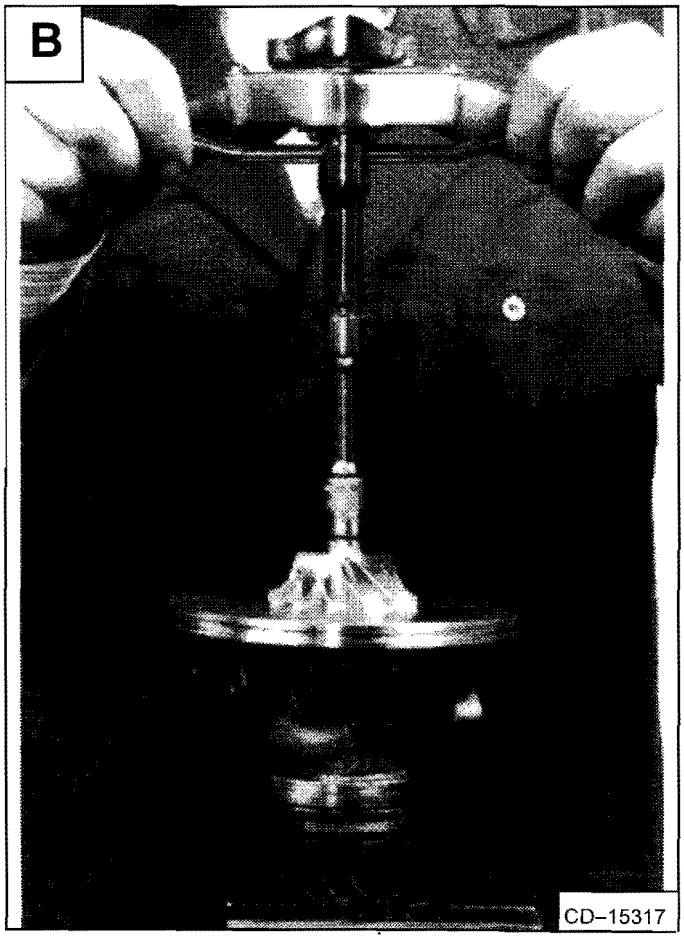
Heat compressor wheel to maximum 130°F (55° C.) using a hot air blower.

Put oil on the compressor wheel seat on the shaft.

Push the warm compressor wheel onto the shaft and turbine wheel assembly.

Pre–heat the shaft nut. Install and tighten to 44 in.–lbs. (5 Nm) torque **[D]**.

Cool the assembly for 10 minutes. Loosen the shaft nut 1–2 turns. Put LOCTITE #640 on the shaft nut. Tighten to 44 in.–lbs. (5 Nm) + 60°.



Assembly (Cont'd)

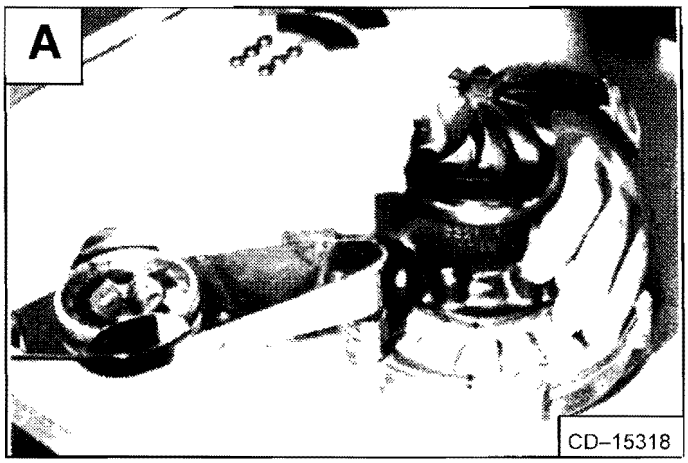
Put sealing compound on compressor housing back plate O–ring groove.

Install the O–ring

Install the compressor housing on the back plate.

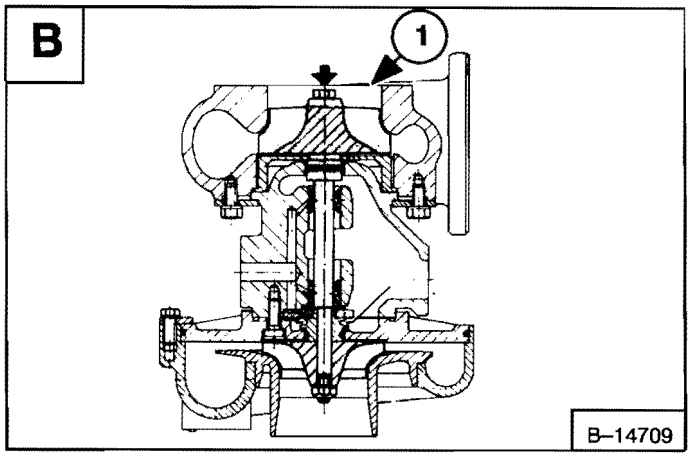
Coat the bolts with heat resistant lubricating paste.

Tighten the bolts to 62 in.–lbs. (7 Nm) torque **[A]**.



Install dial indicator at the shaft end (Item 1) **[B]**. Press shaft and turbine wheel assembly against the dial indicator. Set to Zero. Release the shaft.

Axial End Play – Max. . . . . 0.006 inch (0,16 mm)

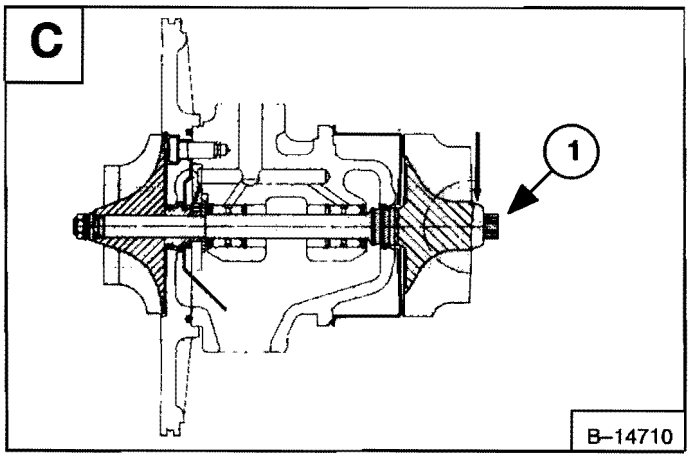


Check radial play at turbine side (Item 1) **[C]** only.

Install the dial indicator touching the cone on the turbine wheel.

Pull turbine wheel down using about 11 lbs. (50 N) of force. Set to zero. Release the shaft.

Radial Play – Max. . . . . 0.018 inch (0,4 6 mm)



POSITIVE CRANKCASE VENTILATION SYSTEM

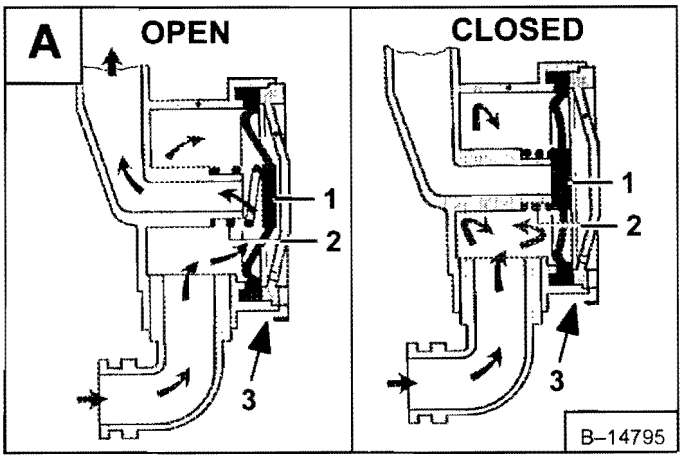
Description

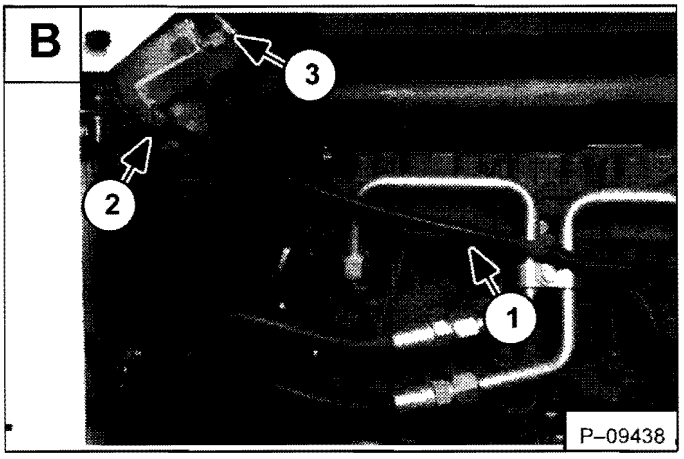
The positive crankcase ventilation system performs two important functions for the engine.

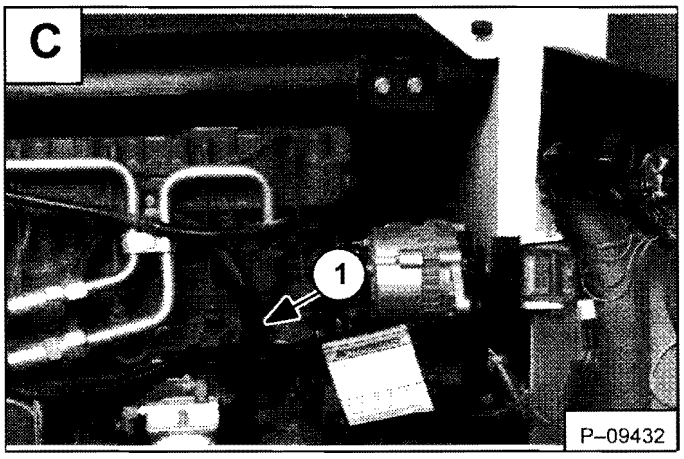
1. To regulate crankcase negative pressure to 0.06 PSI (0,41 kPa) in the engine crankcase.
2. To provide an oil air mixture from the crankcase area for lubrication of the engine valves and seats.

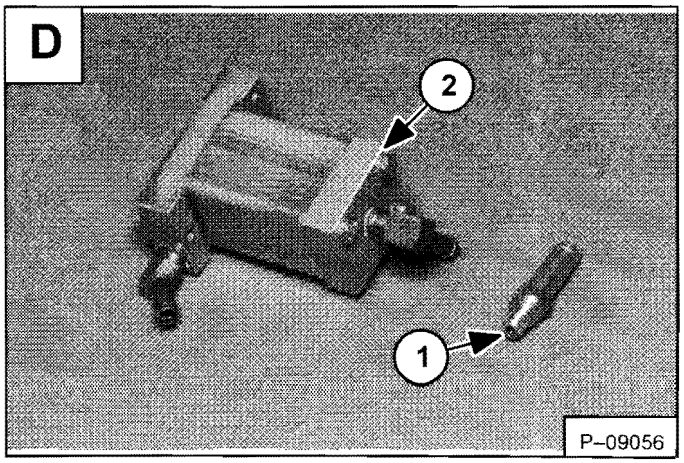
The crankcase breather valve **[A]** located in the front engine cover controls the combustion blow–by gasses in the crankcase. The gasses flow through the air cleaner housing and into the intake manifold. The vacuum (suction) created in the manifold is working on the diaphragm (Item 1) **[A]** and against the spring (Item 2) **[A].** If the air filter becomes restricted the vacuum increases and the diaphragm closes the connection to the intake manifold preventing oil to be drawn into the air cleaner housing.

During normal operation the breather valve **[A]** opens and closes rapidly. The gasses flow from the breather valve through the hose (Item 1) **[B]** into the PCV module (Item 2) **[B]** and **[D]**. Air continues out the module through the hose (Item 3) **[B]** to the air cleaner housing. If the loader is operated at a 30 angle or greater to the right side, a ball inside the PCV module will close the outlet of the module. This prevents oil from the engine crankcase from entering the air cleaner housing. When the PCV outlet is closed the check valve (Item 1) **[C]** and **[D]** opens allowing temporary ventilation to the engine compartment.









Inspection

The breather valve vent hole (Item 3) **[A]** must be open to allow correct valve operation.

The PCV module (Item 2) **[B]** and **[D]** can be rotated to verify the ball is free to close the outlet passage. When rotating the module you can feel and hear the ball movement. Replace the module if the ball is not free. Module disassembly and cleaning is not recommended.

The check valve (Item 1) **[D]** has a ball and spring to allow air to flow out the hose end of fitting only. A small punch may be used in the threaded end of the check valve to make sure the ball and spring open and close. The spring pressure is very light. The check valve can be cleaned with solvent or air pressure. The check valve hose outlet must be routed to the bottom of the engine compartment.

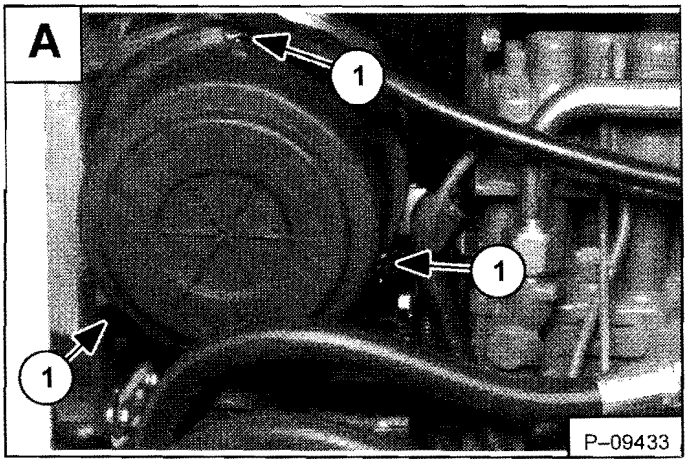
Routing of the hose is important for correct function. The module inlet hose (Item 1) **[B]** must be installed as shown. If the hose is replaced the correct length must be used to prevent any loop or sag in the hose. Check all connections and hoses for leaks or damage.

Module Removal and Installation

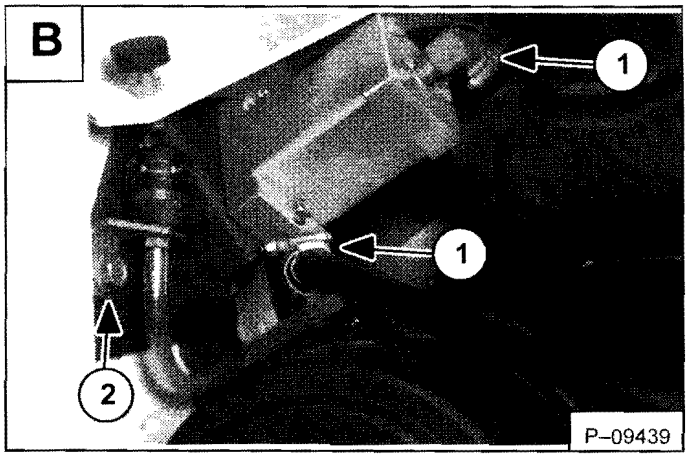
Release the three dust cover clips (Item 1) **[A]**.

Remove the dust cover.

Remove both filter elements.



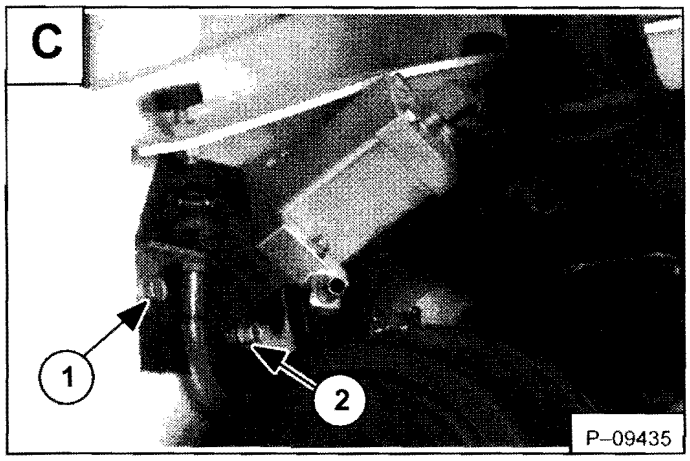
Loosen the hose clamps (Item 1) **[B]** and disconnect the hoses from module.



Loaders without BOSS: Remove the indicator bracket bolt (Item 1) **[C]**.

Loosen the bolt (Item 2) **[C]**. Slide the module rearward and remove from the loader.

NOTE: The module mounting bracket is slotted to allow removal or installation of module without removing air cleaner housing mount bolts.



bobcat®

BOBCAT INTERLOCK CONTROL SYSTEM (BICS™)

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BOBCAT INTERLOCK CONTROL SYSTEM (BICS™)

Inspecting the BICS System Controller (Engine STOPPED – Key ON)

1. Sit in the operator's seat. Turn key "ON", lower the seat bar and disengage the parking brake. All five (5) BICS Controller lights should be "ON" (Items 1, 2, 3, 4 & 5) **[A]**.

2. Engage the parking brake, raise the seat bar fully. Seat bar light (Item 2) **[A]**, valve light (Item 3) **[A]** and traction light (Item 4) **[A]** should be "OFF".

3. Raise up slightly off the seat. Seat light (Item 1) **[A]** should be "OFF".

NOTE: Record what lights are blinking (if any) and number of blinks. Refer to BICS Troubleshooting Chart, Page 8–4.

4. Exit the loader and press traction lock override button. Traction light (Item 4) **[A]** should be "ON". Press override button again and traction light (Item 4) **[A]** should be "OFF".

Inspecting the Seat and Seat Bar Sensors (Engine RUNNING)

5. Sit in the operator's seat, lower the seat bar and engage the parking brake. Fasten the seat belt.

6. Start the engine and operate at low idle. While raising the lift arms, raise the seat bar fully. The lift arms should stop. Repeat using the tilt function.

NOTE: The auxiliary hydraulic functions are not affected by the Bobcat Interlock Control System (BICS).

Inspecting the Traction Lock (Engine RUNNING)

7. Fasten the seat belt, disengage the parking brake, and raise the seat bar fully. Move the steering levers slowly forward and backward. The traction lock should be engaged. Lower the seat bar.

8. Engage the parking brake pedal and move the steering levers slowly forward and backward. The traction lock should be engaged.

Inspecting the Lift Arm By–Pass Control

9. Raise the lift arms six feet (2 m) off the ground. Stop the engine, pull and hold the by–pass control knob. Push the "toe" of the left foot pedal or move the left hand control in toward the operator (hand controls) and the lift arms should lower slowly.

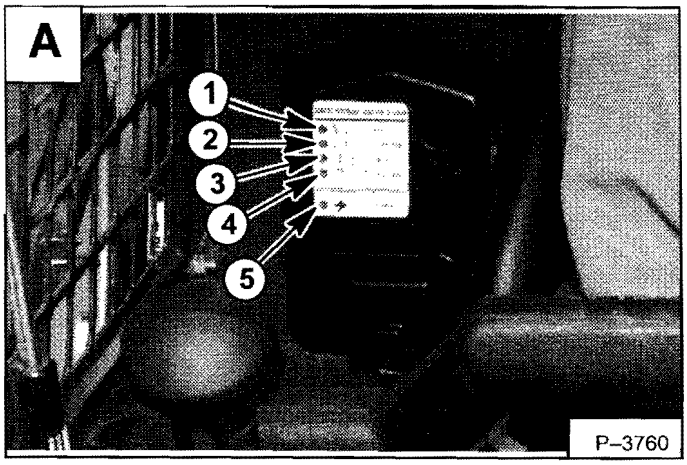
Maintenance

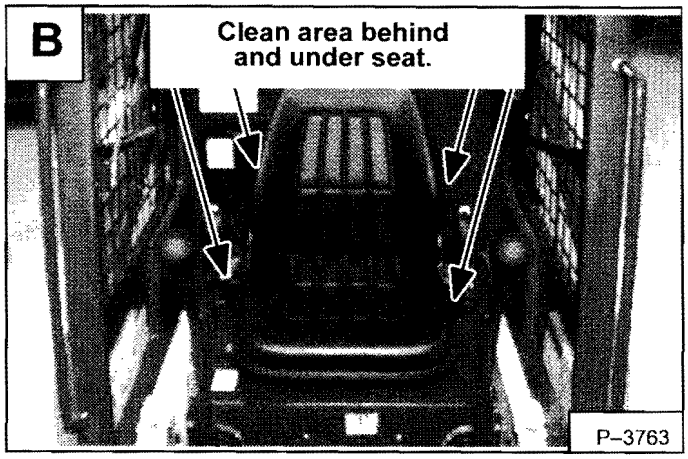
Clean any debris, dirt or objects from under or behind the operator seat **[B]** & **[C]**. The rear of the seat must move up and down.

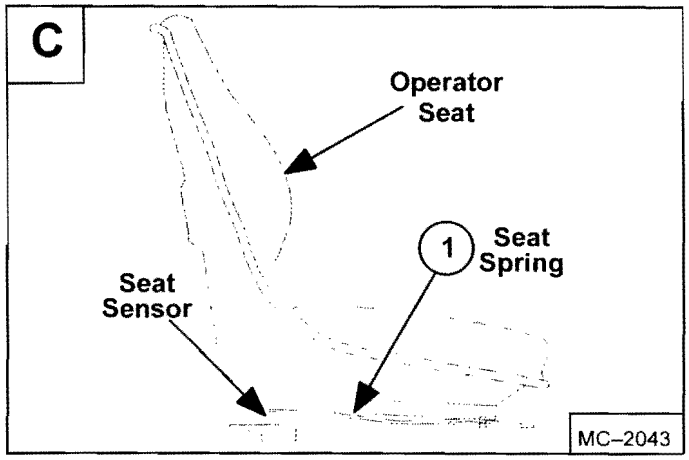
Clearance is necessary under the seat spring (Item 1) **[C]** and the seat, to allow the seat to move up and down freely. With adequate clearance, the seat sensor will be allowed to function properly.

Inspect seat bar pivot area for tightness of linkage bolts.

Replace parts that are damaged. Use only genuine Melroe replacement parts.







⚠ WARNING

AVOID INJURY OR DEATH

The Bobcat Interlock Control System (BICS™) must deactivate the lift, tilt and traction drive functions. If it does not, contact your dealer for service. DO NOT modify the system.

W–2151–0394

Troubleshooting Chart

The following list shows the effects which can happen to the loader, and the probable causes when the BICS Controller lights are off or flashing. Have the service procedure performed ONLY BY QUALIFIED BOBCAT SERVICE PERSONNEL.

Indicator Light	Light ON	Light OFF	Effect on Operation of Loader When Light Is OFF	Flashing Indicator Means System Problem (See Your Bobcat Dealer for Service)	
				Number of Flashes	Cause
Seat	Operator in Seat	No Operator in Seat	Lift and tilt functions will not operate.	2	Seat sensor circuit shorted to battery.
				3	Seat sensor circuit shorted to ground.
Seat Bar	Seat Bar Down	Seat Bar Up	Lift, tilt and traction functions will not operate.	2	Seat bar sensor circuit shorted to battery.
				3	Seat bar sensor circuit shorted to ground.
Valve	Control Valve Can Be Used	Control Valve Cannot Be Used	Lift and tilt functions will not operate.	1	Valve output circuit is open.
				2	Valve output circuit shorted to battery.
				3	Valve output circuit shorted to ground.
Traction	Loader can be moved forward & backward.	Loader cannot be moved forward and backward.	Loader cannot be moved forward and backward.	1	Traction lock hold coil circuit is open.
				2	Traction lock hold coil circuit shorted to battery.
				3	Traction lock hold coil circuit shorted to ground or no ground.
				4	Traction lock pull coil circuit is open.
				5	Traction lock pull coil circuit is shorted to battery.
				6	Traction lock pull coil circuit is shorted to ground.
Power	BICS Controller is is operating correctly.	BICS Controller is not operating correctly.	Lift, tilt and traction functions will not operate.		

NOTES:

(1) If the seat and/or seat bar sensor circuits are open, the corresponding lights will be "OFF". If one of the lights stay "OFF", check the circuit for continuity. See Inspection & Maintenance Instructions in Preventive Maintenance section.

(2) If all five lights flash repeatedly, the voltage supply is greater than 16 volts or less than 9 volts.

(3) Flashing patterns will repeat every 3.25 seconds.

(4) If seat indicator light does not go "ON", check for debris, dirt or objects under or behind the seat.

Troubleshooting Guide

The following troubleshooting guide is provided for assistance in locating and correcting BICS system problems. It is recommended that these procedures be done by authorized Bobcat Service Personnel only.

⚠ WARNING

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

W–2004–1285

BICS SYSTEM CONTROLLER

PROBLEM	SOLUTION #
Power indicator light does not come "ON".	1, 2, 3, 6
All indicator lights flashing.	4
One of the indicator lights flashing.	5
Intermittent indicator lights.	6, 7, 8, 9

SOLUTION SUGGESTIONS

1. Check that ignition switch is "ON".
2. Check BICS 10 amp. fuse.
3. Check wiring and connections. Make sure the connector is securely connected to the controller. Remove controller and pull on connector to check.
4. Look at indicator light windows, if they are milky white in appearance, it is most likely caused by moisture in the controller. Allow to dry or replace the controller.
5. Refer to BICS controller troubleshooting chart (See Page 8–4).
6. Check wire connections to make sure connectors are locked into place.
7. Check pins in connectors for pins pushed back or bent.
8. Move the system wiring back & forth to try to find area that may be causing the intermittent connection.
9. Use sensor tester MEL1428 to isolate problem between sensor and controller and wiring.

Troubleshooting Guide (Cont'd)

The following troubleshooting guide is provided for assistance in locating and correcting BICS system problems. It is recommended that these procedures be done by authorized Bobcat Service Personnel only.

⚠ WARNING

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

W–2004–1285

TRACTION LOCK

PROBLEM	SOLUTION #
Traction lock stays engaged.	1, 2, 3, 4, 5, 6, 7, 8
Intermittent activation of traction lock.	9, 10, 11

SOLUTION SUGGESTIONS

1. Check that controller power indicator light is "ON".
2. Make sure brake pedal is not engaged.
3. Maneuver loader to allow brake discs to move and remove pressure on the brake wedge so it can retract.
4. If all lights indicate the brake should be released, but it doesn't, check the brake 25 amp. fuse.
5. When checking fuse, also check other fuses. Check the fuse block for correct orientation and location of fuses (See Electrical System, Page 6–1).
6. To test the solenoid, the pull coil should be .4 to .5 ohms and the hold coil 10.5 to 11.0 ohms.
7. Check brake solenoid and cover mounting hardware for the correct torque.
8. Remove brake cover and check wedges for binding in the wedge guides.
9. Check wire connections for loose connector body.
10. Check for loose or bent pins in connectors.
11. Check for loose spade connectors in fuse holder.

Troubleshooting Guide (Cont'd)

The following troubleshooting guide is provided for assistance in locating and correcting BICS system problems It is recommended that these procedures be done by authorized Bobcat Service Personnel only.

⚠ WARNING

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

W-2004-1285

SEAT SENSOR

PROBLEM	SOLUTION #
Seat indicator light does not come "ON" with operator in seat.	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11
Seat indicator light stays "ON" when operator is out of seat.	2, 3, 6, 10, 11, 12, 13, 14
Intermittent indicator light during operation.	11, 15, 16, 17, 18

SOLUTION SUGGESTIONS

1. Check to make sure power indicator light is "ON".
2. Check for debris under and around seat.
3. Look for any obstruction around seat.
4. Check to make sure seat rail lowers when weight is in seat.
5. Raise cab and check for magnet collar movement when weight is added to seat. (Magnet collar should extend approximately 3/8" beyond the sensor assembly with weight in the seat).
6. Use sensor tester to check operation of sensor and controller. Follow instructions on tester.
7. Check to make sure the magnet guide pin is in place.
8. Check for contamination on magnets such as metal particles or for shipping plate over magnets.
9. Check to make sure both magnets are in collar.
10. Check for binding of magnet collar or bushing with hex head on other side for binding.
11. Check for correct mounting. One spring for standard seat. Two springs for suspension seats. Thick washers should be under front seat mounting rails on both sides.
12. Check for loose hardware mounting magnet collar. Check to make sure the magnet collar bushing is threaded on all the way so it is contacting seat rail.
13. Check to make sure seat rail raises when weight is removed from the seat.
14. Raise cab and check for magnet collar movement when weight is removed from seat. (Magnet collar should extend approximately 1/8" beyond the sensor assembly without weight in seat).
15. With smaller operators that operate with the seat forward some mounting alterations may be required. (See solution suggestions 16, 17 and 18).
16. Adjust suspension seat to lightest weight setting.
17. Check to make sure the seat rails move up and down freely when weight is added.
18. Add washer between the bushing and the magnet collar assembly which slides on and the seat rail. This will reduce the amount of seat travel required to activate the system. **Must check**, with seat moved all the way back, that indicator light does not stay on with operator out of seat. If light does not go out with operator out of the seat, the washer must be removed.

Troubleshooting Guide (Cont'd)

The following troubleshooting guide is provided for assistance in locating and correcting BICS system problems. It is recommended that these procedures be done by authorized Bobcat Service Personnel only.

⚠ WARNING

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

W–2004–1285

SEAT BAR SENSOR

PROBLEM	SOLUTION #
Indicator light does not come "ON" when seat bar is lowered.	1, 2, 3, 4, 5, 6

SOLUTION SUGGESTIONS
1. Check controller power indicator light. It must be "ON".
2. Check sensor wire connection.
3. Use the BICS sensor tester MEL1428 to check sensor and controller.
4. Check for loose hardware.
5. Check keyed bushing to make sure magnet collar rotates with seat bar.
6. Check magnet collar magnets for contamination such as metal particles.

Troubleshooting Guide (Cont'd)

The following troubleshooting guide is provided for assistance in locating and correcting BICS system problems. It is recommended that these procedures be done by authorized Bobcat Service Personnel only.

⚠ WARNING

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

W–2004–1285

LIFT LOCK BY–PASS VALVE

PROBLEM	SOLUTION #
By–pass valve stuck.	1
By–pass valve stem bent or broke.	2

SOLUTION SUGGESTIONS
1. Rotate shaft.
2. Replace manual spool cartridge.

BICS™ SYSTEM CONTROLLER

Removal and Installation

Raise the operator cab (Page 1–1).

The controller mounting bolts are located on the back of the operator cab **[A]**.

Remove the top mounting bolt (Item 1) **[A]** from the controller.

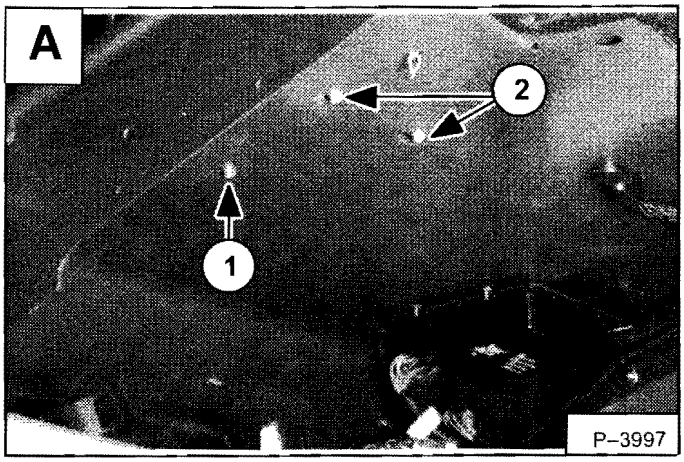
Loosen the two lower mounting bolts (Item 2) **[A]**.

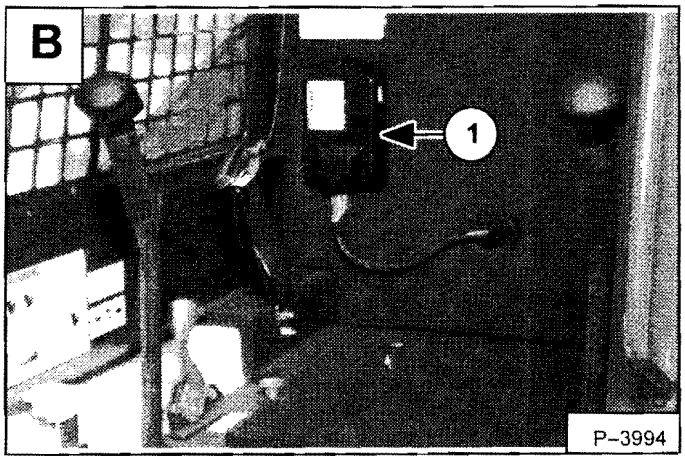
Lower the operator cab.

NOTE: The operator seat is removed in photo [B] for clarity purpose only. The seat does not need to be removed to remove the controller.

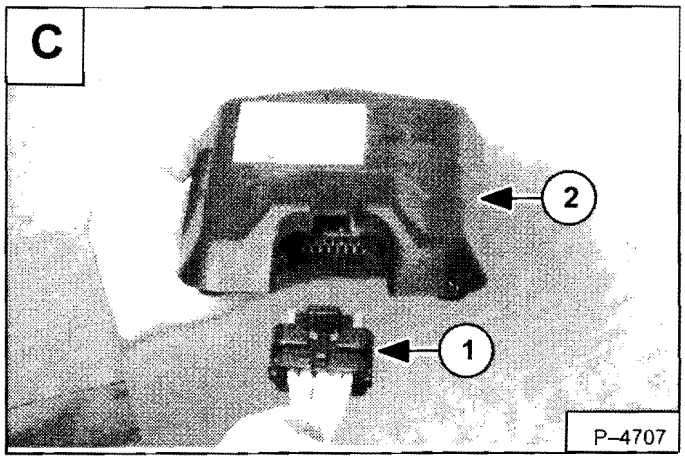
Slide the controller (Item 1) **[B]** up and remove it from the back of the operator cab.

Disconnect the electrical harness from the controller and remove the controller from the loader.





NOTE: Install the harness connector (Item 1) [C] into the controller (Item 2) [C] before installing the controller.



IMPORTANT

Be sure the connector to the BICS controller is correctly engaged in the controller when installing the controller. An audible snap can be heard when the connector is correctly installed. Try to pull the connector out of the controller, if it cannot be removed it has been correctly installed [C].

Installation: Tighten the controller mounting bolts to 80–90 in.–lbs. (9–10 Nm) torque.

Reverse the removal procedure to install the controller.

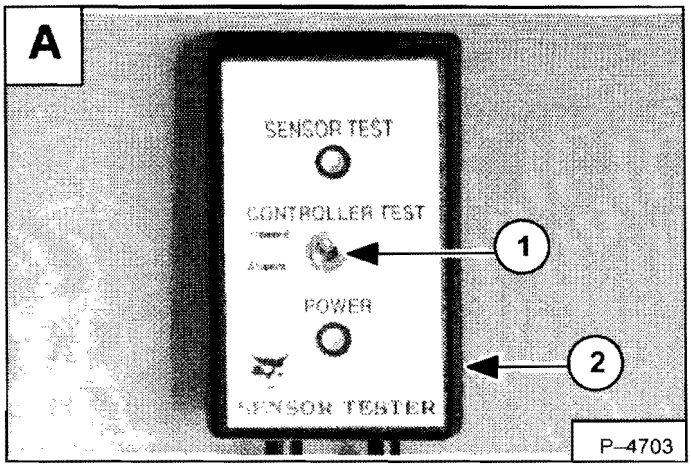
Controller Test

MEL1428 Sensor Tester is necessary for the following procedure:

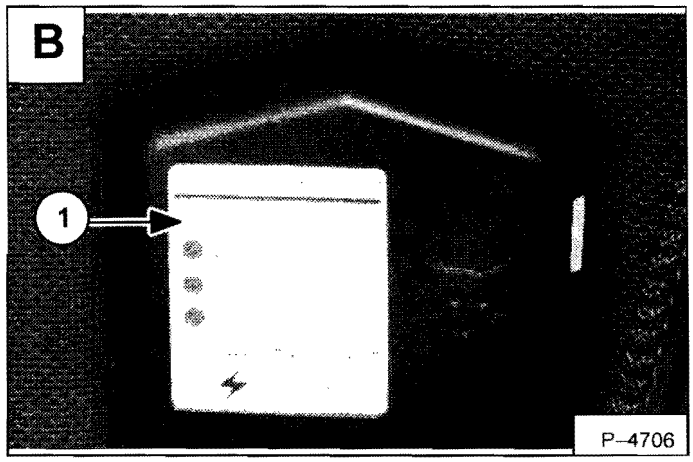
Turn the key to the "ON" position. **DO NOT START THE ENGINE.**

After completing the procedure for the Seat sensor test or the Seat Bar sensor test, do the Controller test. Refer to Page 8–3 for correct procedures to do the Seat Bar sensor test or the Seat sensor test.

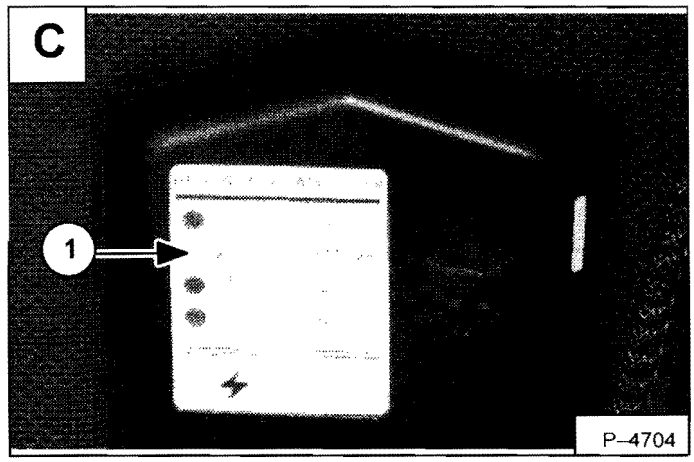
Move the toggle switch (Item 1) **[A]** on the sensor tester (Item 2) **[A]** to the **Present** position.



If the controller is working correctly, the Seat light (Item 1) **[B]** on the controller will illuminate when the tester is connected to the Seat sensor.



When the tester is connected to Seat Bar sensor, the Seat Bar light (Item 1) **[C]** will illuminate if the controller is working correctly.

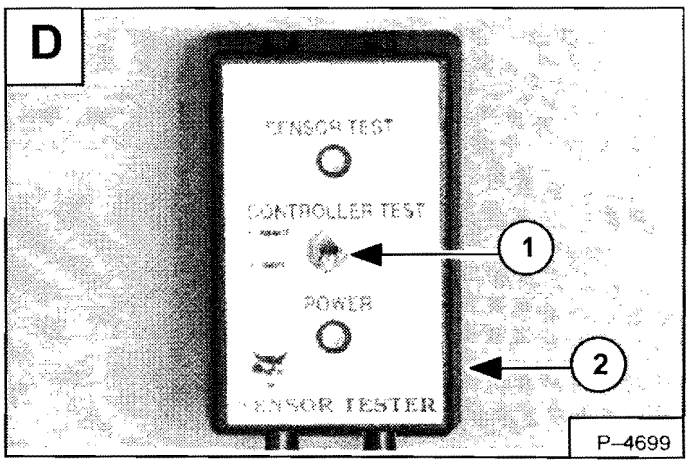


Move the toggle switch (Item 1) **[D]** on the sensor tester (Item 2) **[D]** to the **Absent** position.

The Seat light (Item 1) **[B]** or the Seat Bar light (Item 1) **[C]** should go off.

If the tests above fail, there is a problem with the BICS system controller or the wiring harness.

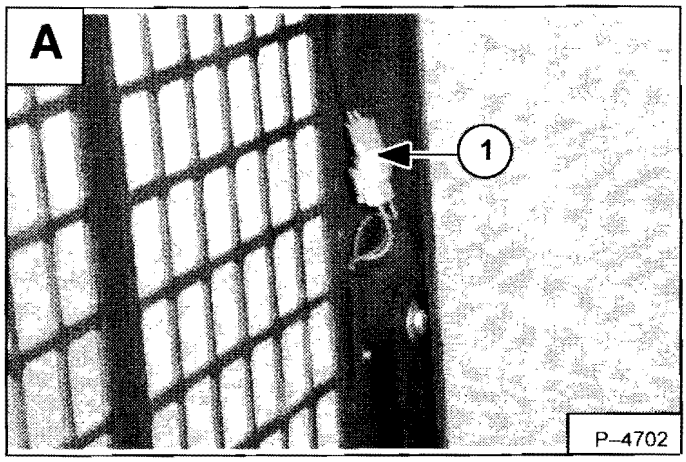
Refer to Page 8–3 for the correct procedure to inspect the BICS System Controller.



SEAT BAR SENSOR

Removal and Installation

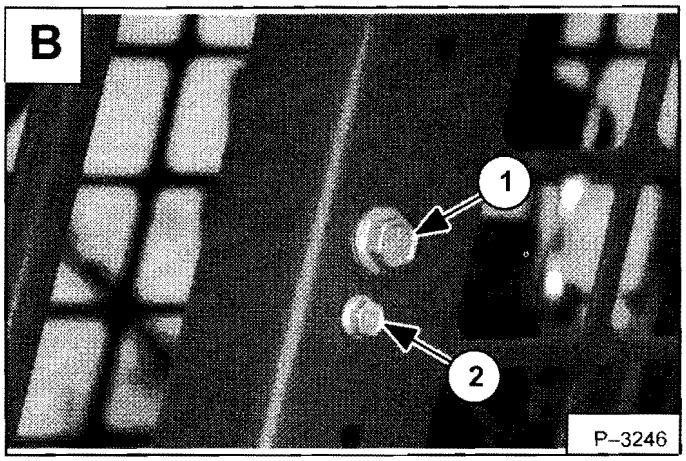
Disconnect the seat bar sensor connector (Item 1) **[A]**.



Remove the mounting bolt (Item 1) **[B]** from the pivot bushing.

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

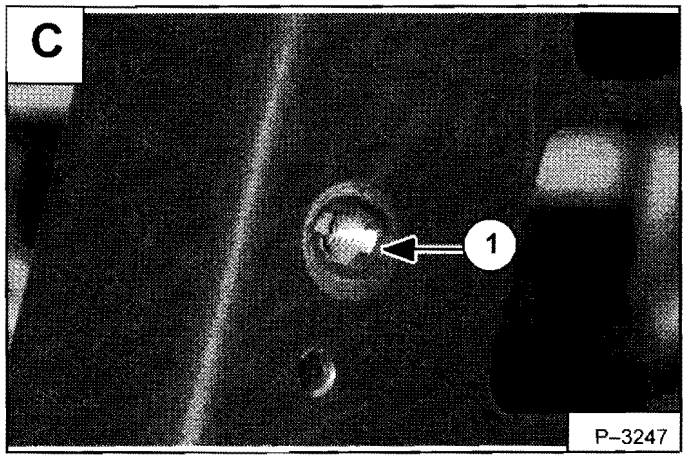
Remove the sensor mounting bolt (Item 2) **[B]** and nut.



IMPORTANT

Be careful to not overtighten the sensor mounting bolt and nut to prevent breakage of the sensor.

Installation: Be sure the tabs on the pivot bushing are positioned in the slotted hole (Item 1) **[C]** of the operator cab as shown.

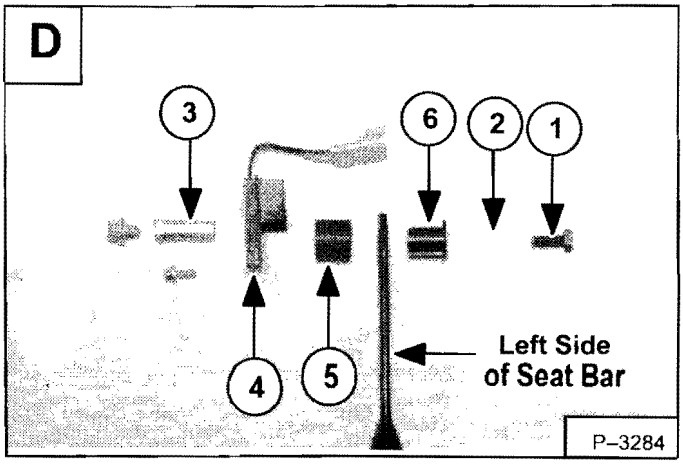


Pull the seat bar back and remove the assembly as follows:

NOTE: The sensor assembly [D] is shown removed from the operator cab for clarity purpose only. The sensor assembly can be removed without removing the seat bar from the operator cab.

Remove the pivot bushing mounting bolt (Item 1) **[D]** and washer (Item 2) **[D]** from the pivot bushing (Item 3) **[D]**.

Installation: Tighten the pivot bushing mounting bolt to 180–200 in.–lbs. (21–23 Nm) torque.



Remove the pivot bushing (Item 3) **[D]**, sensor (Item 4) **[D]**, magnet (Item 5) **[D]** and plastic bushing (Item 6) **[D]** from the seat bar.

Inspect all parts for damage and wear and replace if necessary.

Reverse the removal procedure to install the seat bar sensor.

Refer to Page 5–1 for seat bar removal and installation procedure.

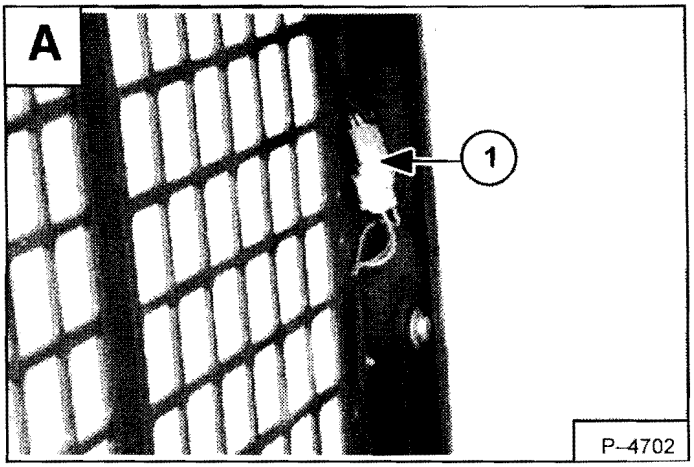
SEAT BAR SENSOR (Cont'd)

Seat Bar Sensor Test

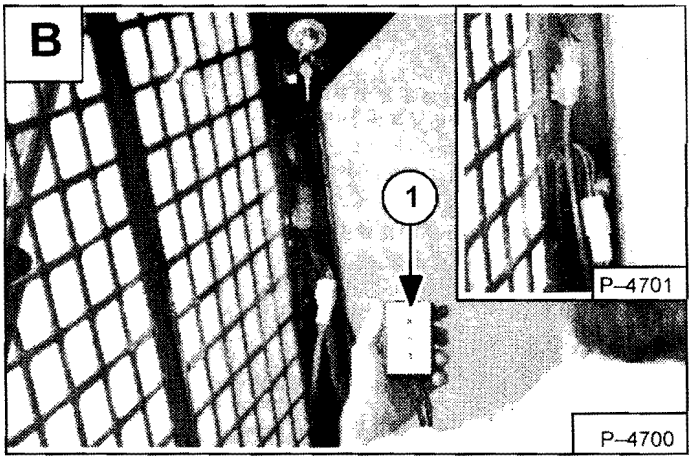
Use MEL1428 Sensor Tester for the following procedure:

Turn the key to the "ON" position. **DO NOT START THE ENGINE.**

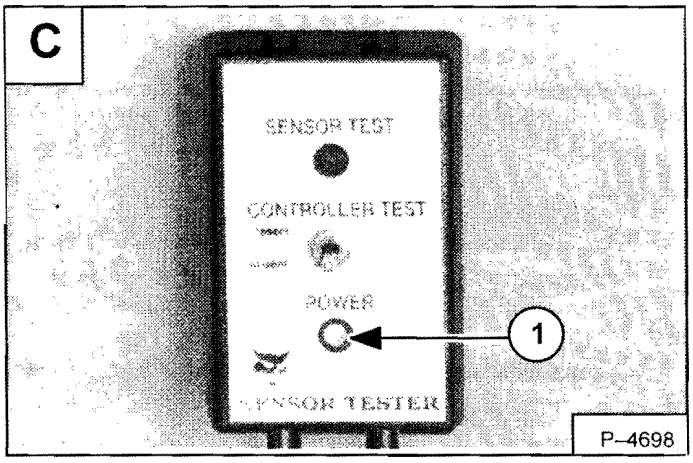
Disconnect the seat bar sensor connector (Item 1) **[A]**.



Connect MEL1428 Sensor Tester (Item 1) **[B]** inline as shown to the seat bar sensor connectors. Also see inset **[B]**.



The power light (Item 1) **[C]** on the sensor tester will illuminate.



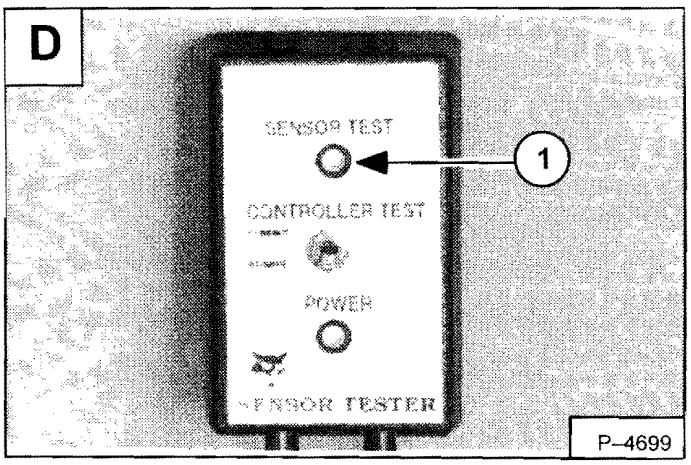
Lower the seat bar. The sensor test light (Item 1) **[D]** should illuminate.

Raise the seat bar. The sensor test light (Item 1) **[D]** should go off.

If the above tests fails, there is a problem with the seat bar sensor.

Refer to Page 8–3 for the correct procedure to inspect the Seat Bar Sensor.

Refer to Page 5–1 for seat bar removal and installation procedure.

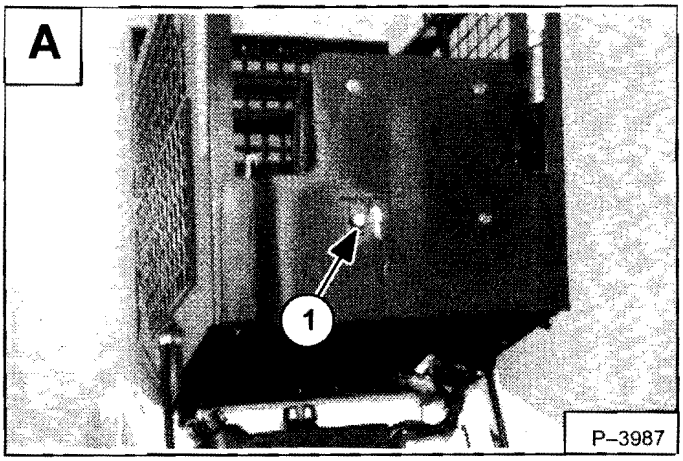


SEAT SENSOR

Removal and Installation

Raise the operator cab (Page 1–1).

Locate the seat sensor (Item 1) **[A]** beneath the operator cab.



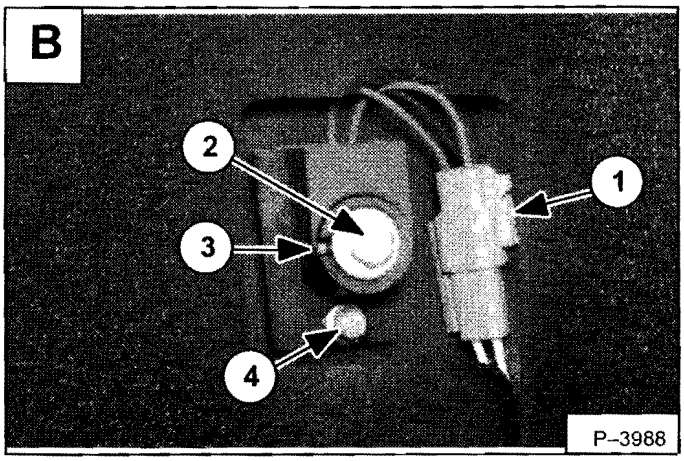
Remove the sensor connector (Item 1) **[B]** from the holder.

Disconnect the sensor connector (Item 1) **[B]**.

Remove the magnet collar mounting bolt (Item 2) **[B]**, washer (Item 1) **[C]** and magnet (Item 2) **[C]** from the sensor (Item 3) **[B]**.

IMPORTANT

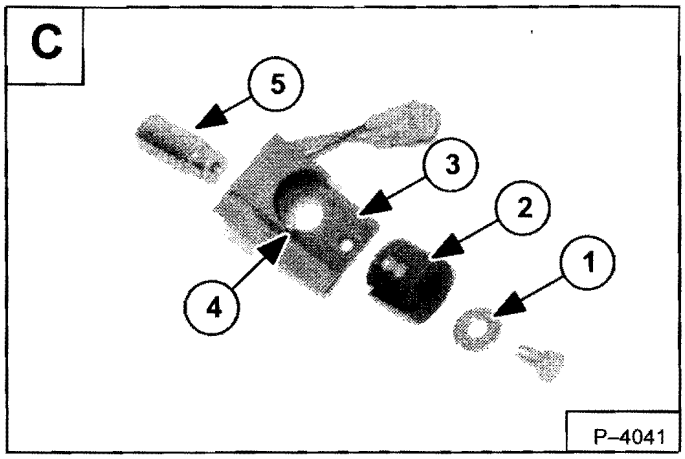
DO NOT overtighten the magnet mounting bolt to prevent damage to the magnet.



Remove the sensor mounting bolt (Item 4) **[B]** and nut.

IMPORTANT

Be careful to not overtighten the sensor mounting bolt and nut to prevent breakage of the sensor.



Remove the sensor (Item 3) **[C]**.

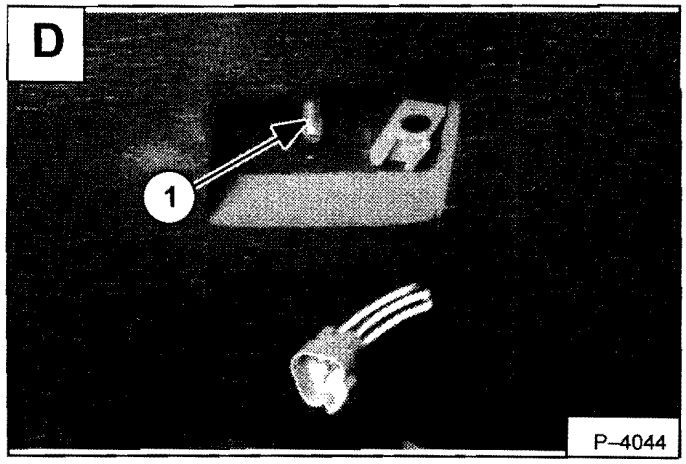
NOTE: Be sure not to lose the magnet collar alignment pin (Item 4) [C] which is located in the sensor (Item 3) [C] when removing the sensor.

Remove the threaded bushing (Item 5) **[C]** from the seat track mounting bolt (Item 1) **[D]**.

Inspect all parts for damage and wear and replace if necessary.

Reverse the removal procedure to install the seat sensor.

Refer to Page 5–1 for seat removal and installation procedure.



SEAT SENSOR (Cont'd)

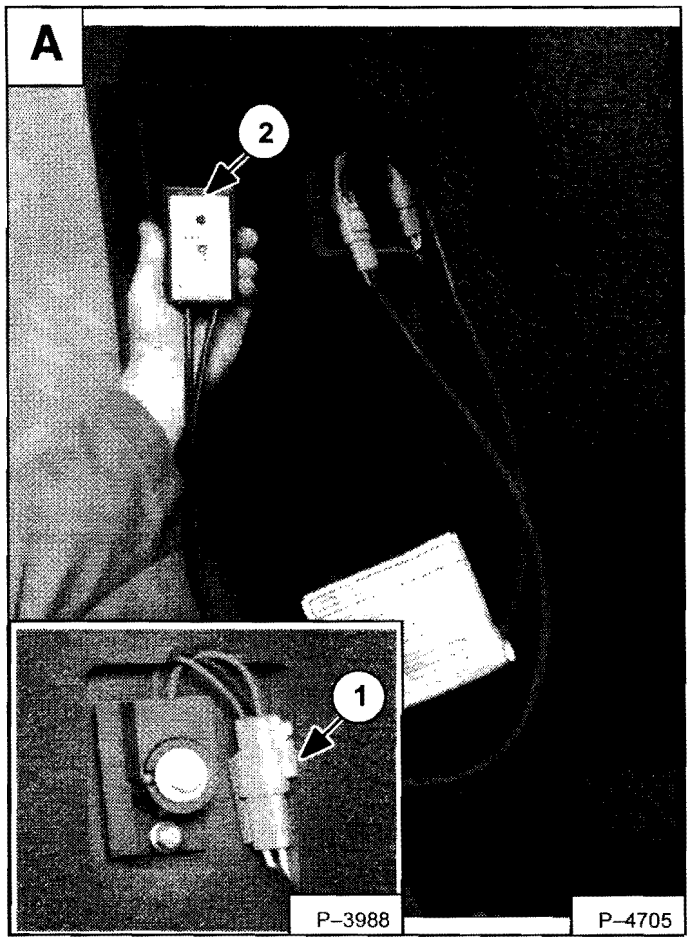
Seat Sensor Test

Use MEL1428 Sensor Tester for the following procedure:

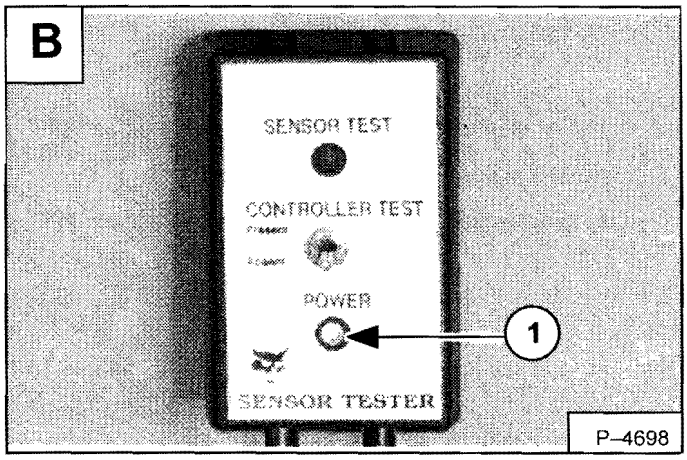
Turn the key to the "ON" position. **DO NOT START THE ENGINE**.

Disconnect the seat sensor connector (Item 1 – Inset) **[A]**.

Connect MEL1428 Sensor Tester (Item 2) **[A]** inline as shown to the seat sensor.



The power light (Item 1) **[B]** on the sensor tester will illuminate.



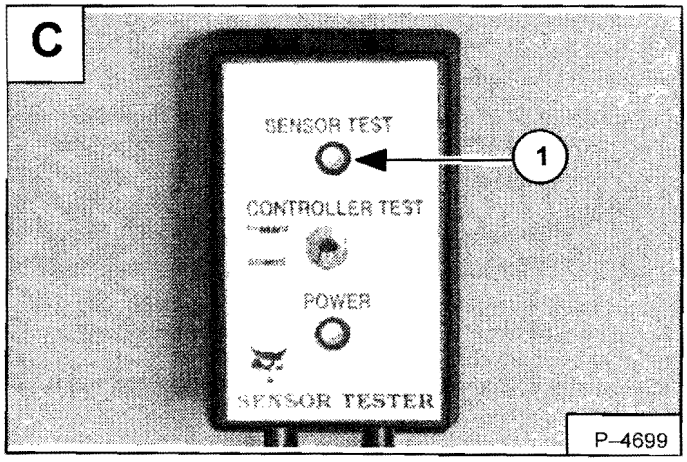
Sit on the operator seat. The sensor test light (Item 1) **[C]** should illuminate.

Get off the operator seat. The sensor test light (Item 1) **[C]** should go off.

If the above tests fail, there is a problem with the seat sensor.

Refer to Page 8–14 for the correct procedure to inspect the Seat Sensor.

Refer to Page 5–1 for seat removal and installation procedure.



TRACTION LOCK

Removal and Installation

⚠ WARNING

AVOID INJURY OR DEATH

Do not modify the electrical wiring connected to the traction lock solenoid or any part of the traction lock system. The traction lock provides the locking function of the parking brake. Service work on the traction lock system should only be performed by a qualified technician. Use only genuine Melroe parts if repair is necessary.

W–2165–0195

Raise the operator cab (Page 1–1).

Remove the "Do Not Modify" sta–strap from the electric solenoid connector (Item 1) **[A]**.

Installation: Install a new "Do Not Modify" sta–strap (P/N 6665527) on the electric solenoid connector.

Remove the two mounting bolts (Item 2) **[A]** from the electric solenoid mounting bracket.

Installation: Tighten the mounting bolts to 25–28 ft.–lbs. (34–38 Nm) torque. Be sure the solenoid mounting bracket is installed in the same position. The solenoid mounting surface has a slight angle which tips the top of the solenoid toward the rear of the loader when installed correctly.

Remove the electric solenoid and bracket assembly from the chaincase cover **[B]**.

Remove and inspect the compression spring (Item 1) **[B]** for wear or damage. Replace if necessary. The spring may also stay with the shaft when the electric solenoid and bracket are removed from the chaincase.

Installation: Install the compression spring (Item 1) **[B]** on the collar located on the electric solenoid.

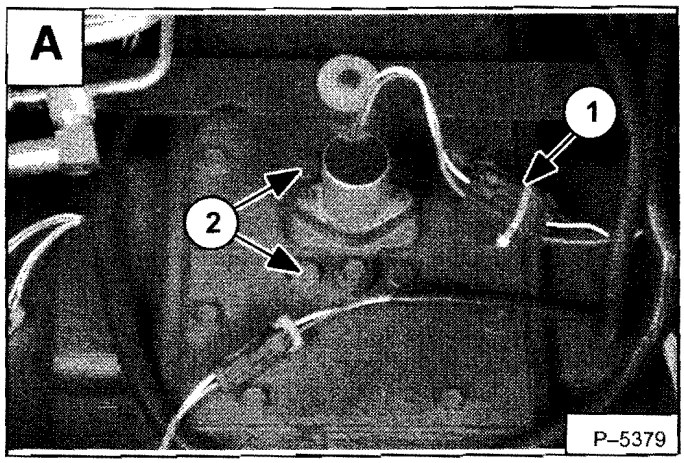
Remove the traction lock assembly (Item 1) **[C]** from the chaincase.

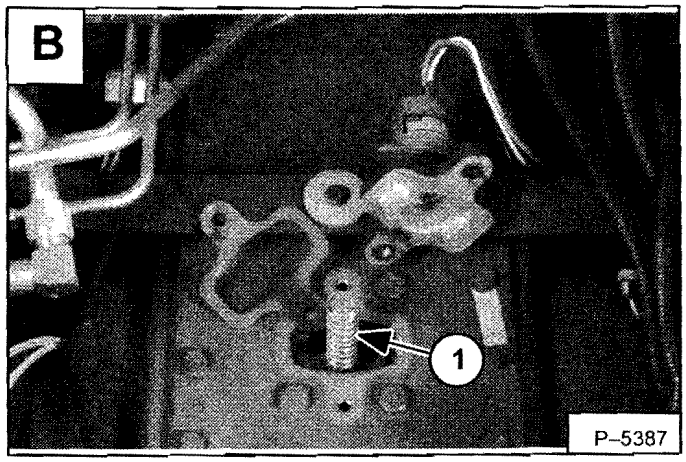
Remove the shaft mounting bolt (Item 1) **[D]**, washer and spring from the assembly shaft (Item 2) **[D]**. Remove the wedge (Item 3) **[D]** and inspect all parts for damage or wear. Replace if necessary.

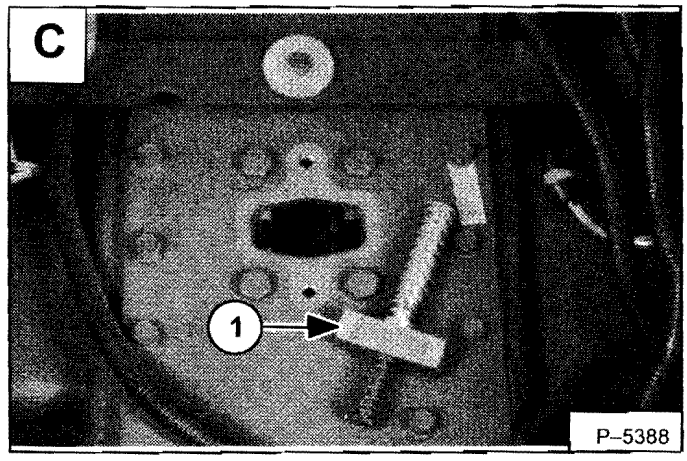
Installation: Thoroughly clean and dry the shaft mounting bolt (Item 1) **[D]**, the shaft (Item 2) **[D]** and wedge (Item 3) **[D]**. Use LOCTITE 242 when assembling these parts to the traction lock assembly.

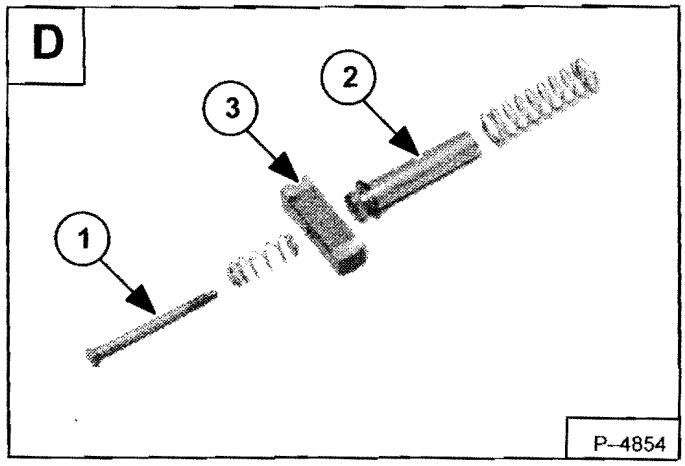
IMPORTANT

Failure to use LOCTITE may allow the traction lock assembly to loosen up which can cause damage to the traction lock system.









LIFT LOCK BY–PASS VALVE

Removal and Installation

⚠ WARNING

Never work on a machine with the lift arms up unless the lift arms are secured by a 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–2059–0991

IMPORTANT

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

I–2003–0284

Raise the lift arms and install an approved lift arm support device (Page 1–1).

Raise the operator cab (Page 1–1).

Remove the control panel/steering levers (Page 3–1).

Disconnect the tubelines (Items 1 & 2) **[A]**; (Item 1 & 2) **[C]**.

Disconnect the tubeline (Item 3) **[A]**; (Item 3) **[C]**.

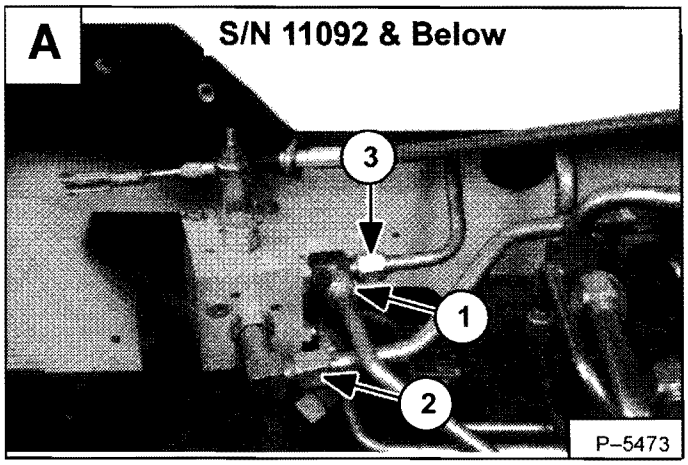
Remove the two mounting bolts (Item 1) **[B]**; (Item 4) **[C]**.

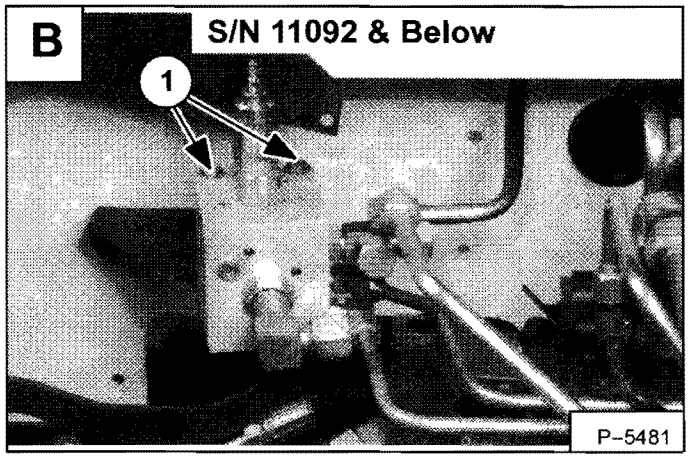
Installation: Tighten the mounting bolts to 180–200 in.–lbs. (21–23 Nm) torque.

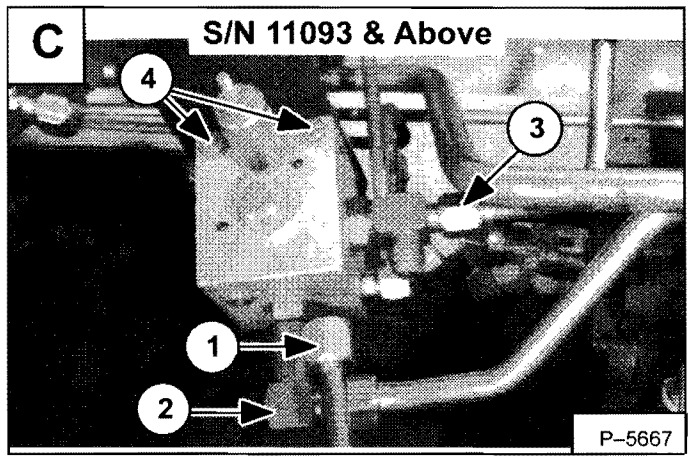
Remove the lift lock by–pass valve.

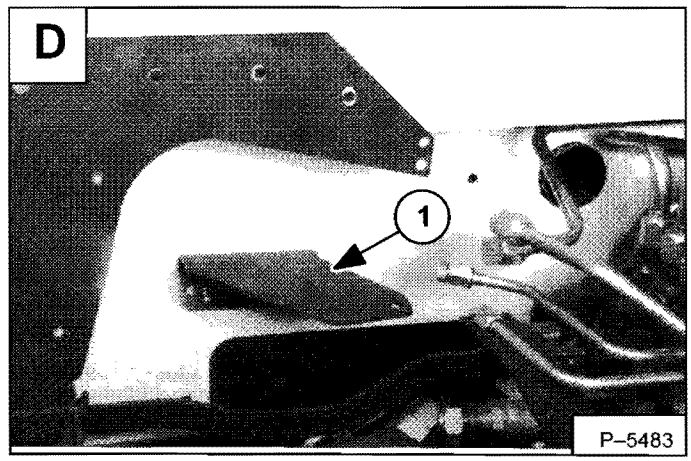
Remove the by–pass valve mounting bracket (Item 1) **[D]** as needed.

Reverse the removal procedure to install the lift lock by–pass valve.









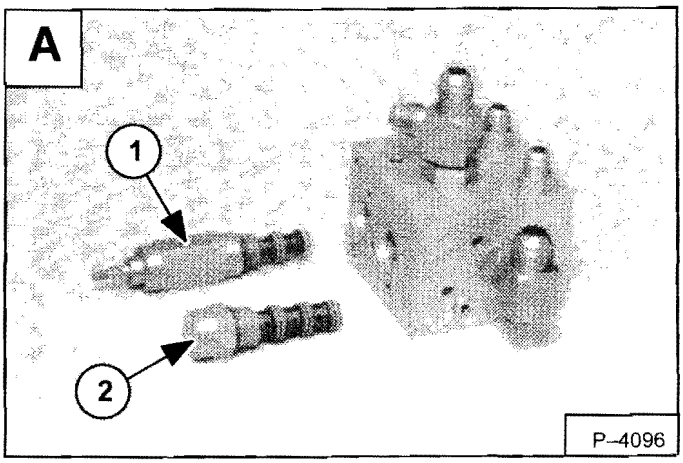
LIFT LOCK BY–PASS VALVE (Cont'd)

Disassembly and Assembly

Remove the by–pass valve (Item 1) **[A]** from the valve block. Inspect the by–pass valve for damage and replace if necessary.

Remove the check valve (Item 2) **[A]** from the valve block. Inspect the check valve for damage and replace if necessary.

Inspect the hydraulic fittings on the valve block for damage and replace if necessary.



⚠ WARNING

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

W–2103–1285

TILT LOCK VALVE

⚠ WARNING

Never work on a machine with the lift arms up unless the lift arms are secured by a 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–2059–0991

IMPORTANT

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

I–2003–0284

Raise the lift arms and install an approved lift arm support device. (See Page 1–1.)

Raise the operator cab. (See Page 1–1.)

Removal and Installation (S/N 11092 & Below)

Remove the hydraulic/hydrostatic filter mounting bracket assembly. (See Page 2–1.)

Disconnect the tubelines (Items 1, 2, 3 & 4) **[A]**.

Remove tilt lock valve.

Removal and Installation (S/N 11093 & Above)

Remove the front panel/steering levers assembly. (See Page 3–1.)

Remove the shield (Item 1) **[B]** from the lock linkage.

Remove the tilt linkage (Item 2) **[B]**.

Remove the lock linkage (Item 1) **[C]**.

Remove the side panel mounting bolts (Item 2) **[C]**.

Remove the side panel.

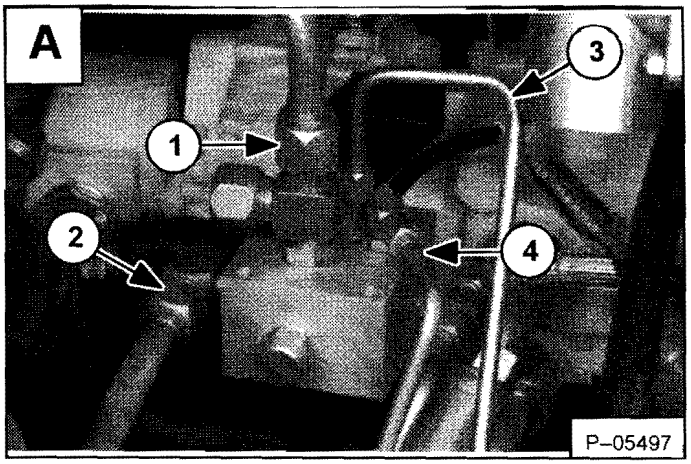
Disconnect the wiring harness connector (Item 1) **[D]**.

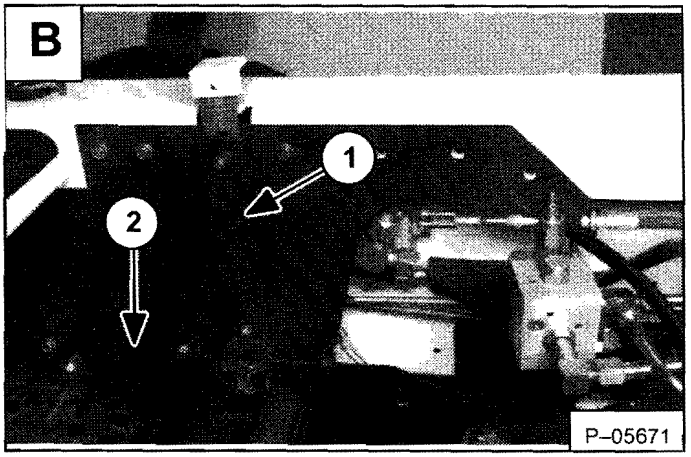
Installation: Install a new *Do Not Modify* sta–strap (P/N 6665527) on the harness connector.

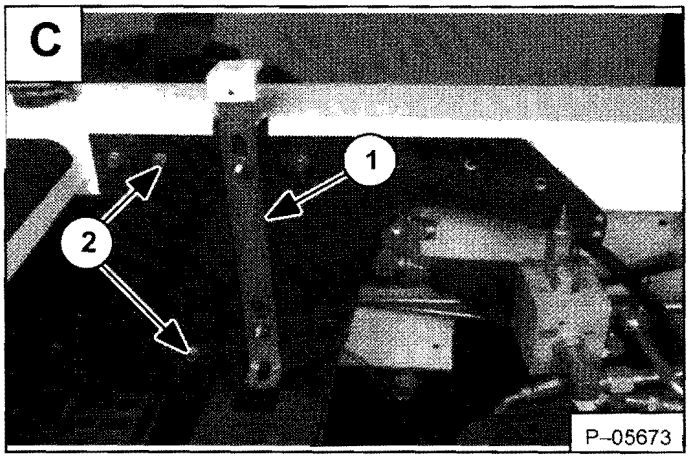
Disconnect the tubelines (Items 2 & 3) **[D]**.

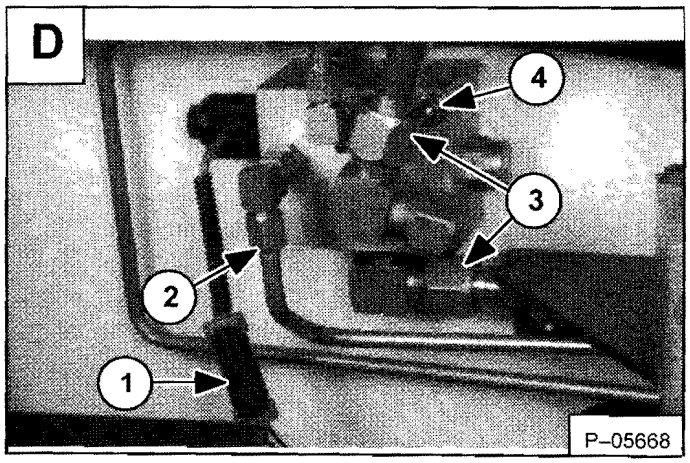
Remove the mounting bolts (Item 4) **[D]** and nuts.

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









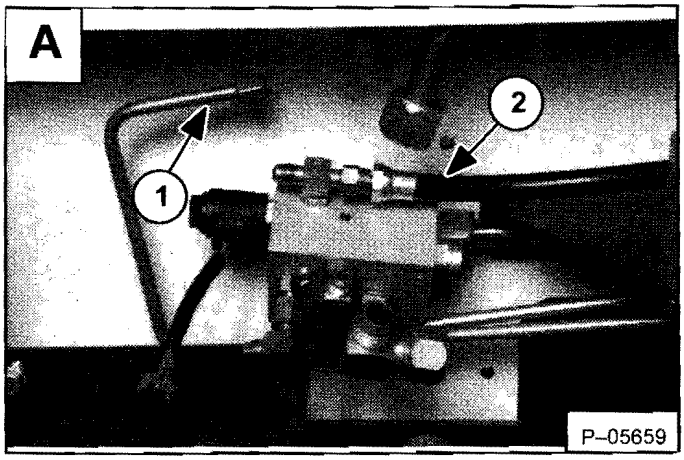
Removal and Installation (S/N 11093 & Above) (Cont'd)

Pull the tilt lock valve down a small amount.

Disconnect the tubeline (Item 1) **[A]**.

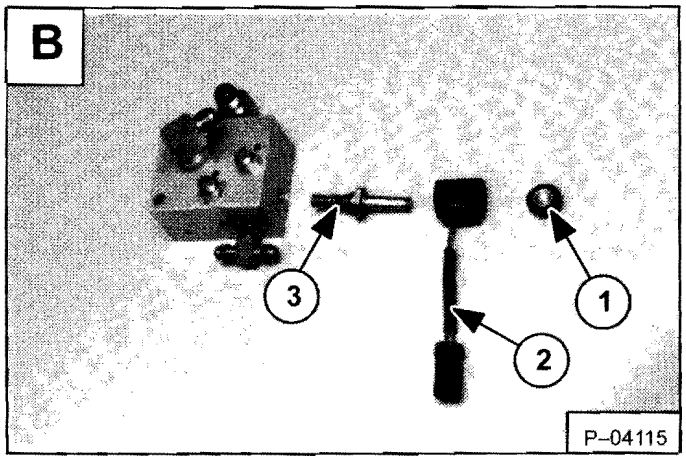
Disconnect the hose (Item 2) **[A]**.

Remove the tilt lock valve.



Disassembly and Assembly

Remove the solenoid mounting nut (Item 1) **[B]**, solenoid (Item 2) **[A]** and solenoid valve (Item 3) **[B]** from the tilt lock valve.

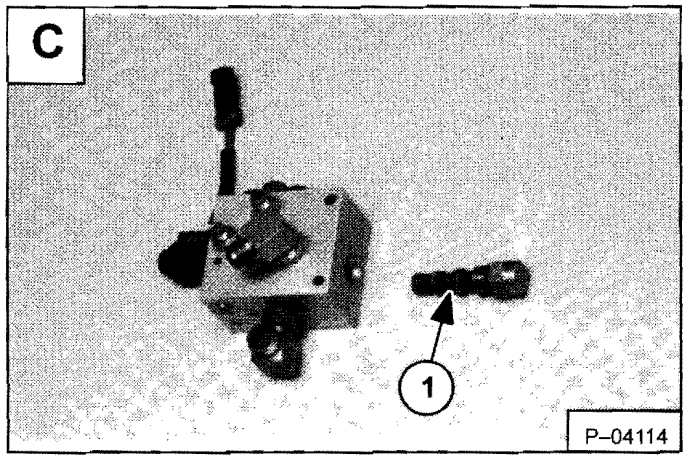


Remove the check valve (Item 1) **[C]** from the lift lock valve.

Assembly: Tighten the solenoid mounting nut to 80–90 in.–lbs. (9–10 Nm) torque.

Inspect the solenoid valve, check valve and hydraulic fittings for damage or wear. Replace if necessary.

Refer to Page 8–1 for lift arm by–pass control inspection procedure.



BOSS® DIAGNOSTIC TOOL

Procedure

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

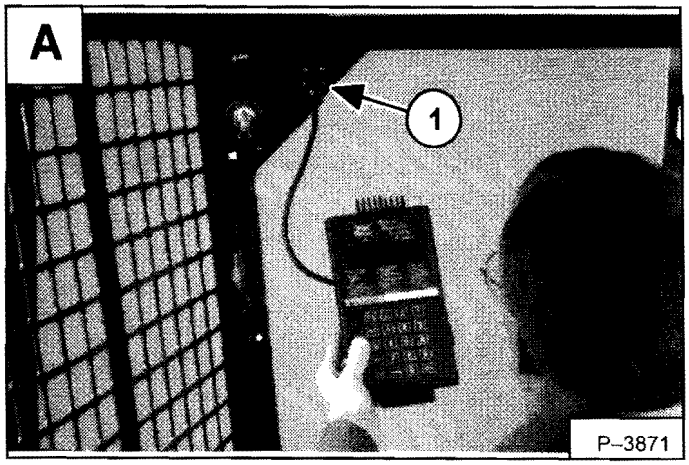
MEL1400 – Diagnostic Tool

Stop the engine.

Lift and block the loader (Page 1–1).

Remove the dust cap from the diagnostic connector plug. Connect the diagnostic tool plug (Item 1) **[A]** into the loader connector.

Use the instructions from the BOSS Operation & Maintenance Manual to make service checks of BOSS system operating unit and other components **[A]**.

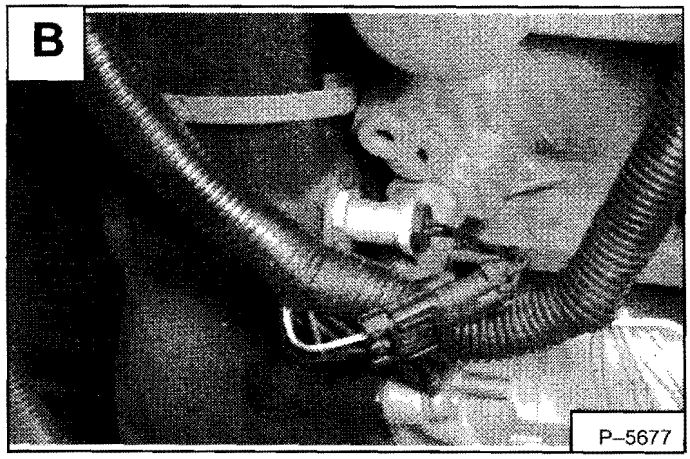


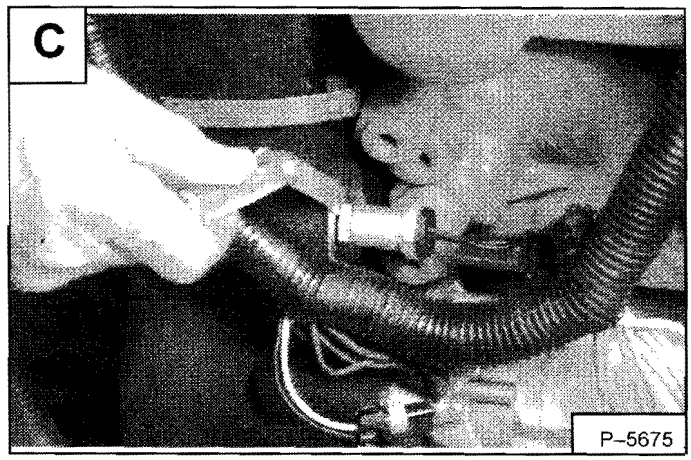
SENDER AND SENSOR

Service Checks

Use the following information when checking the senders and sensor with a volt/ohmmeter:

Components	Value
TEMPERATURE SENDER	
70 degree F. (21 degree C.)	970 ohms
80 degree F. (27 degree C.)	1013 ohms
ENGINE OIL PRESSURE SENDER	
0 PSI	3 ohms Max.
6 PSI (41 kPa)	7 ohms Min.
50 PSI (345 kPa)	49 ohms
70 PSI (483 kPa)	59 ohms
TRANSMISSION CHARGE PRESSURE SENDER	
0 PSI	0–5 ohms
100 PSI (690 kPa)	58 ohms
130 PSI (896 kPa)	75 ohms
150 PSI (1034 kPa)	87 ohms
FUEL SENDER	
Full	30 ohms
Empty	270 ohms





RPM SENSOR

Adjustment

Continuity Resistance of 3000–3500 ohms.

Disconnect the connector **[B]** from the engine harness.

Loosen the jam nut (Item 1) **[B]** on the RPM sensor.

Turn the RPM sensor (Item 1) **[C]** in until it makes contact with the engine flywheel.

Turn the jam nut until it contacts the flywheel housing. The jam nut should not be tightened, it needs to turn with the RPM sensor when the sensor is turned back out for adjustment.

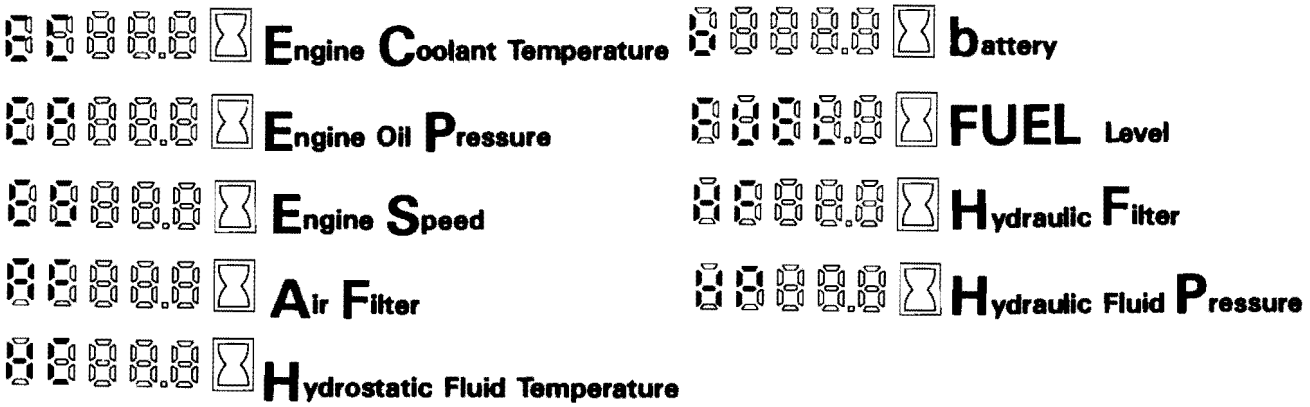
Turn the RPM sensor and the jam nut out from the flywheel. Set a clearance of 0.050" (1,27 mm) between the jam nut and the housing with a feeler gauge **[C]**.

Retighten the jam nut.

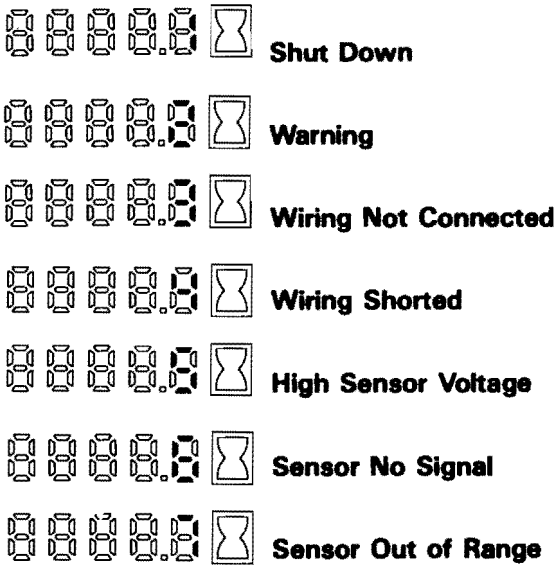
NOTE: The plastic tip is used as a gauge to set a new RPM SENSOR. The plastic tip is designed to come off after the engine is started.

MONITOR SERVICE CODES

One of the following Alphabetic Codes may appear on your monitor.



One of the following Numeric Codes will appear following one of the above Alphabetic Codes. Example:



(See Pages 8–23 & 8–24 for additional code information)

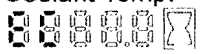
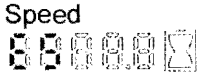
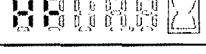
The following list references the defect codes that are transmitted to the instrument panel display which can occur. Some service procedures for correcting the problems can be found in this manual and other procedures must be performed ONLY BY QUALIFIED BOBCAT SERVICE PERSONNEL.

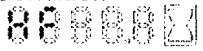
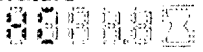
⚠ WARNING

Instructions are necessary before operating or servicing machine. Read 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. Failure to follow instructions can cause injury or death.

W–2003–1289

SERVICE CODES

SUBJECT	DISPLAY READS	CONDITION
Engine Coolant Temp. 	EC–1.1	SHUTDOWN, Engine Temperature
	EC–2.1	WARNING, Engine Temperature
	EC 3	Wiring Not Connected
	EC 4	Wiring Shorted
	EC 5	High Sensor Voltage
	EC 7	Sensor Out Of Range
Engine Oil Pressure	EP 1	SHUTDOWN, Pressure
	EP 2	WARNING, Pressure
	EP 3	Wiring Not Connected
	EP 4	Wiring Shorted
	EP 5	High Sensor Voltage
	EP 7	Sensor Out Of Range
Engine Speed 	ES 1	SHUTDOWN, Engine Speed Too High
	ES–2.1	WARNING, Engine Speed Slightly High
	ES–6	Sensor No Signal
	ES–7	Sensor Out Of Range
Air Filter 	AF 2	WARNING, Restriction Too High
	AF 6	Sensor No Signal
Battery	b–2.1	WARNING, Bad Battery
	b–2.2	WARNING, Battery Voltage
Fuel Level	FUEL2	WARNING, Low Level
	FUEL3	Wiring Not Connected
	FUEL4	Wiring Shorted
	FUEL5	High Sensor Voltage
	FUEL7	Sensor Out Of Range

SERVICE CODES		
SUBJECT	**DISPLAY READS**	**CONDITION**
Hydrostatic Charge Filter Condition 	HF1–2	WARNING, High Restriction
	HF1–6	Sensor No Signal
Hydrostatic Fluid	HP 1	SHUTDOWN, Pressure
	HP 2	WARNING, Pressure
	HP 3	Wiring Not Connected
	HP 4	Wiring Shorted
	HP 5	High Sensor Voltage
	HP 7	Sensor Out Of Range
Hydrostatic Fluid Temperature 	HC 1	SHUTDOWN, Temperature
	HC 2	WARNING, Temperature
	HC 3	Wiring Not Connected
	HC 4	Wiring Shorted
	HC 5	High Sensor Voltage
	HC 7	Sensor Out Of Range

TROUBLESHOOTING THE BOSS® & LCD DISPLAY

Chart

SUBJECT	SYMPTOM	INDICATES	TO CORRECT SYMPTOM
BOSS	Temperature related shutdown codes when no heating occurs. * **NOTE: You may have some or all of the codes listed. You will have high temps, high pressure, low voltage and low fuel.**	12 volt supply and BOSS failure.	1. Check stored defects with the BOSS tool. *2. If defect list has EC1, HC1, EC2.1, HC2. EP3, EP7, HP7, B2.2, low fuel, Fuel 7 and last occurrence hr. readings are within a hundredth, the BOSS is defective and must be replaced. 3. Using a voltmeter, check the alternator output.
LCD Display	Intermittent code of ES6 while engine running.	Sensor No Signal or No RPM's.	1. ES6 will occur if the loader is stalled or shutdown during run cycle. The code is generated due to the lack of RPM and the existence of residual pressure in the system.
	Display is dead – No Icons, Bar Graphs, Hourmeter. **LCD DISPLAY CONNECTOR** A B C D E Orange – 5.0 Volts Regulated Power Purple/White – Positive Com. 3.5 to 4 Volts Purple/Red – Negative Com. .5 to 1.5 Volts Black – Ground Orange – 12 Volt – Back Light Power Display Operation	Lack of 5.0 volts regulated power.	1. Check pin "A" for 5.0 volts. If 5.0 volts is present replace the display. 2. If no power exists at pin "A", install BOSS backup to confirm the BOSS system. 3. If the problem still exists, check the harness for continuity.
	During an active WARNING display, reset occurs and the hourmeter becomes all zero's.	Low voltage (5.0) triggered reset.	1. Turn the ignition switch "OFF". Re–starting will return hourmeter reading. 2. If re–starting will not return hourmeter reading, check pins "B" & "C" as stated in Step 5 below.
	Garbled message, missing segments, etc.	The display is not fault tolerant. Also can be an indication of poor internal connections.	1. Turn the ignition switch "OFF" and re–start. A fault is an invalid message that the display tries to display. Generally a fault occurs if communications of two messages are combined on the display.
	After glow sequence or after a WARNING goes away, the Icon remains "ON".		1. Turn the key "OFF" and re–start.
	No Bar Graphs, no Hours. * **NOTE: The display has caused the problem by locking the communication lines and stopping communications from the BOSS.**	Bad display or BOSS is not communicating.	1. Plug in the BOSS tool and start the engine. 2. If data is being received by the BOSS tool, the BOSS unit is not the cause of the problem. 3. If no data is received at the BOSS tool, disconnect the LCD display. *4. If messages are now received at the tool, the display is the problem. If problem still exists go to Step 5. 5. Check pins "B" & "C" for signal. 6. If there is no signal, install BOSS backup unit. 7. If the problem still exists, check the harness for continuity.

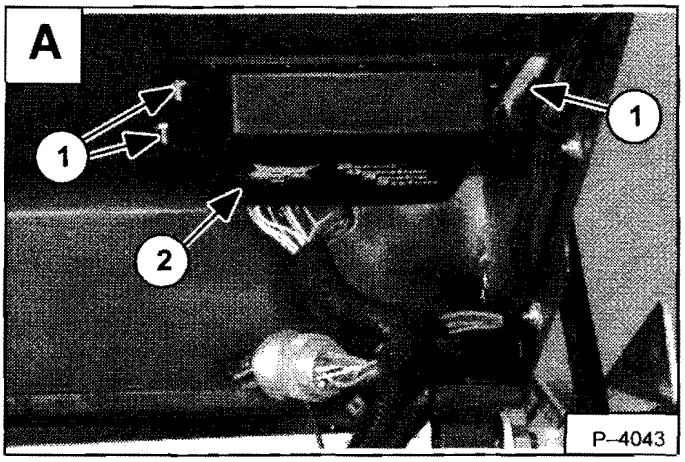
OPERATION SENSING SYSTEM UNIT

Removal and Installation

Raise the operator cab (Page 1–1).

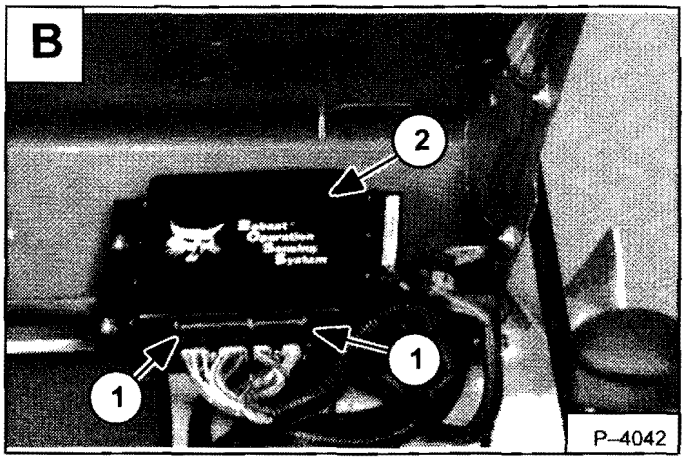
Loosen the nuts (Item 1) **[A]** from the sensing system unit (Item 2) **[A]**.

Slide the unit forward in the mounting slots and remove it from the operator cab.



Use a screwdriver and remove the two connectors (Item 1) **[B]** from the sensing system unit (Item 2) **[B]**.

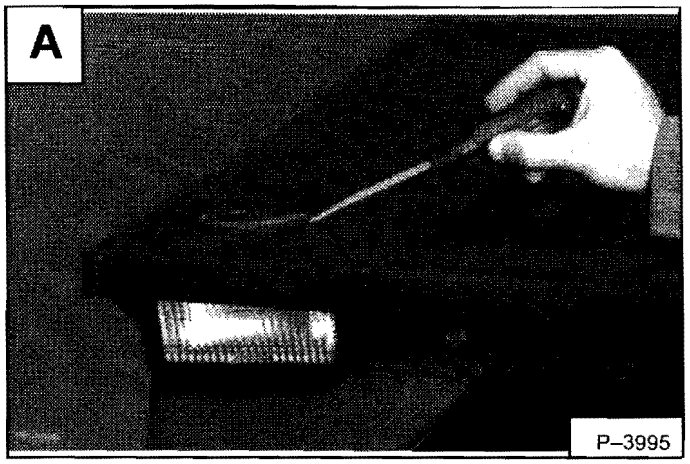
Installation: Put the heads of the mounting bolts into the slots of the operator cab and slide the unit back into place. Tighten the three mounting nuts to 80–90 in.–lbs. (9–10 Nm) torque.



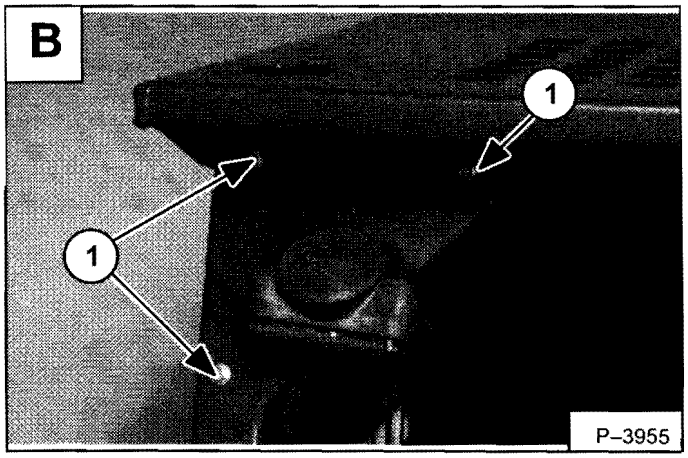
BOSS® INSTRUMENT PANEL

Removal and Installation

Pry the rubber light mount free from the operator cab (both sides) **[A]**.



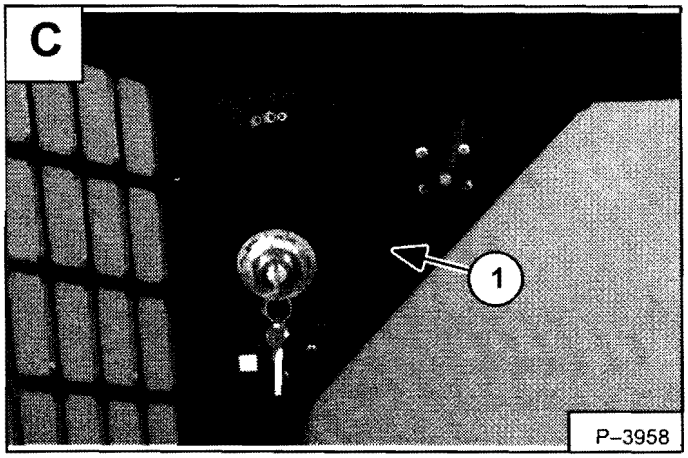
Lower the light from the operator cab to locate the three instrument panel mounting bolts (Item 1) **[B]** (both sides).



Remove the three mounting bolts and pull the left panel (Item 1) **[C]** down from the operator cab.

Installation: Be careful to not overtighten the panel mounting bolts to prevent stripping the threaded holes of the panels.

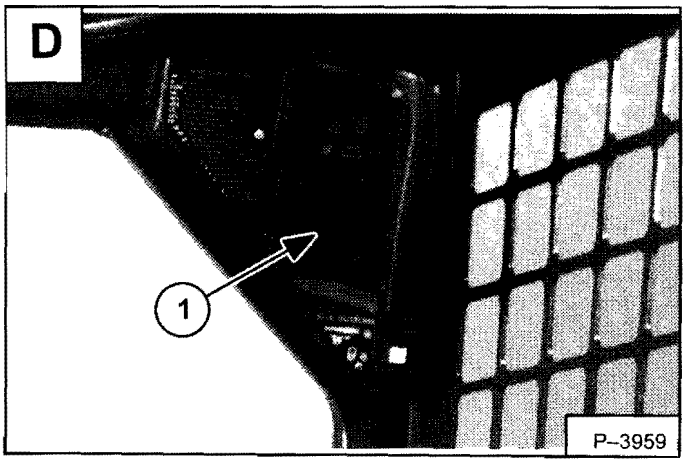
Disconnect the wire harness connectors from the panel and remove the panel.



Remove the three mounting bolts and pull the right panel (Item 1) **[D]** down from the operator cab.

Installation: Be careful to not overtighten the panel mounting bolts to prevent stripping the threaded holes of the panels.

Disconnect the wire harness connectors from the panel and remove the panel.



PWM MODULE(*S/N 514111443 & Above) (*Except S/N 11445)

Description

- Take voltage measurements by probing into wires near the PWM module shown in Figure **[A]**. All connectors must remain plugged into their respectful harness.
- Key is turned to the ON position with the engine OFF.
- Turn switches ON to get their appropriate readings. (Example: Input from Proportional flow switch – Push switch full left then full right to get the voltage readings listed below.)
- Press the auxiliary mode switch (Item 2) **[B]** twice. Both Green lights will be ON. Check Wire #9, 17, 18, or 19.

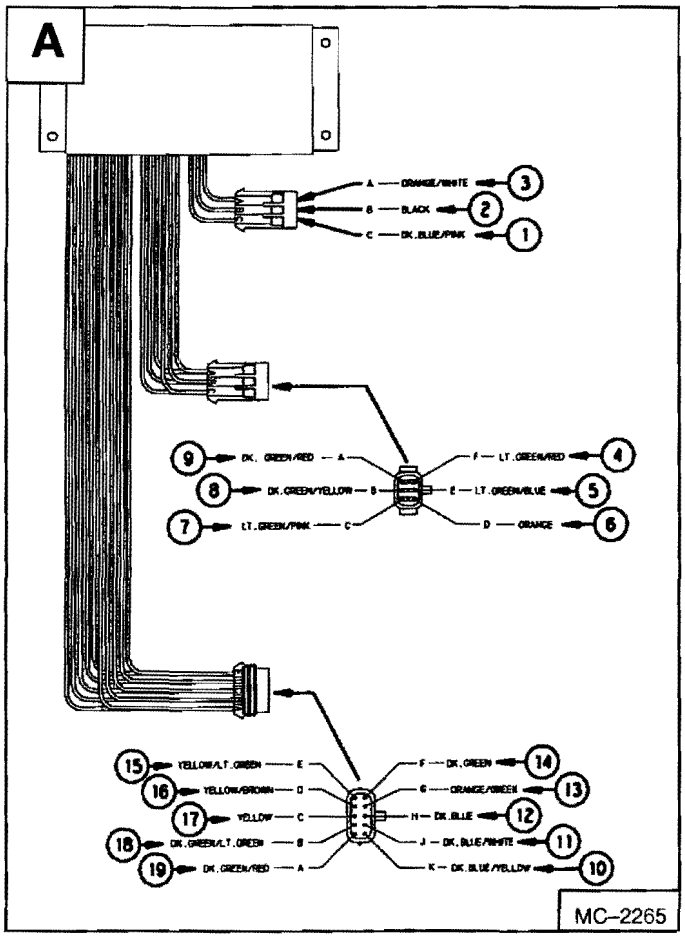
NOTE: Item descriptions are listed below as Input to or Output from the Module. Voltage readings are approximate. They are affected by battery condition (system voltage). Voltage readings for Items 10, 18, and 19 are variable and correspond to Proportional Flow Switch travel.

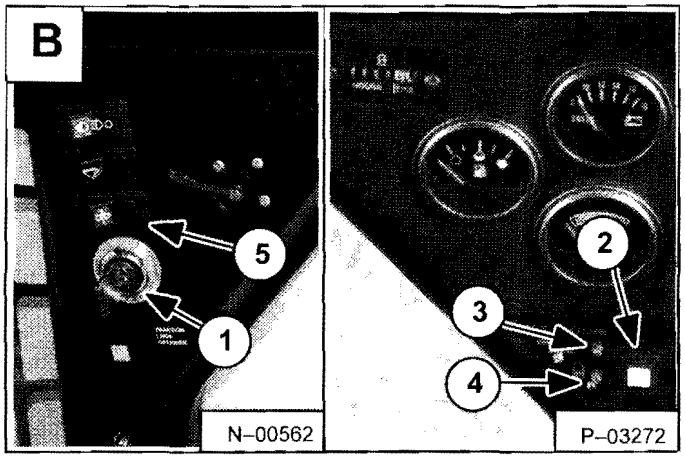
Fig. [A]:

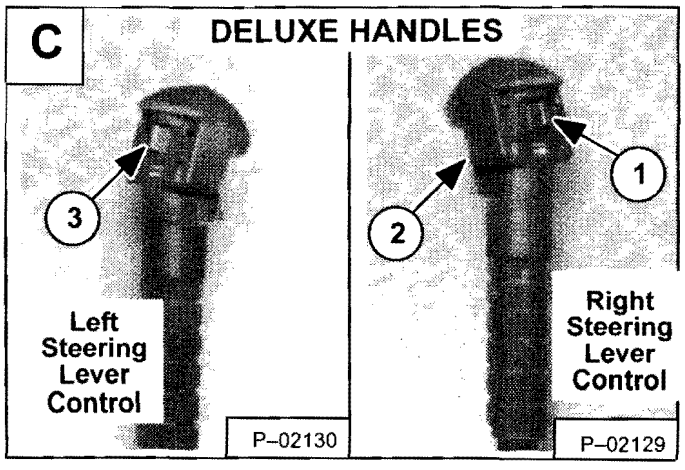
Item	Description	Volts
1	Input for Attachment I.D.	11.5
2	Ground	0
3	Input from Key	12.0
4	Input from *Mode Switch	9.5
5	Output to Momentary Light	7.5
6	Output to Mode Switch	11.0
7	Output to Detent Light	6.5
8	Input from Key Switch (Bleed Position)	12.5
9	Output To **High Flow Solenoid	11.5
10	Input from Proportional Flow Switch	.5–1.5
11	Ground to Proportional Flow Switch	0
12	Power to Proportional Flow Switch	2.0
13	Input for Loader Model I.D.	12.0
14	Input from Detent Switch	12.0
15	Input from Rear Aux. Rod Switch	11.0
16	Input from Rear Aux. Rod Switch	11.0
17	Output to Rear Aux. Diverter Solenoid	10.0
18	Output to Aux. Rod Solenoid	0–6.0
19	Output to Aux. Base Solenoid	0–6.0

* Input signal is present only as Mode Switch is pushed.
**Not used on this Model loader.

Key Switch	Item 1 **[B]**
Mode Switch	Item 2 **[B]**
Momentary Light	Item 3 **[B]**
Detent Light	Item 4 **[B]**
High Flow Switch	Item 5 **[B]**
Proportional Flow Switch	Item 1 **[C]**
Detent Switch	Item 2 **[C]**
Rear Aux. Switch (Base & Rod)	Item 3 **[C]**







PWM MODULE (*S/N 5141 11443 & Above) (Cont'd) (*Except S/N 11445)

Description (Cont'd)

Later S/N loaders have additional wires in the PWM module as shown in Fig. **[A]**. Loaders with the module mounted on the inside left fender are equipped with the auxiliary hydraulics deactivation feature and are listed below:

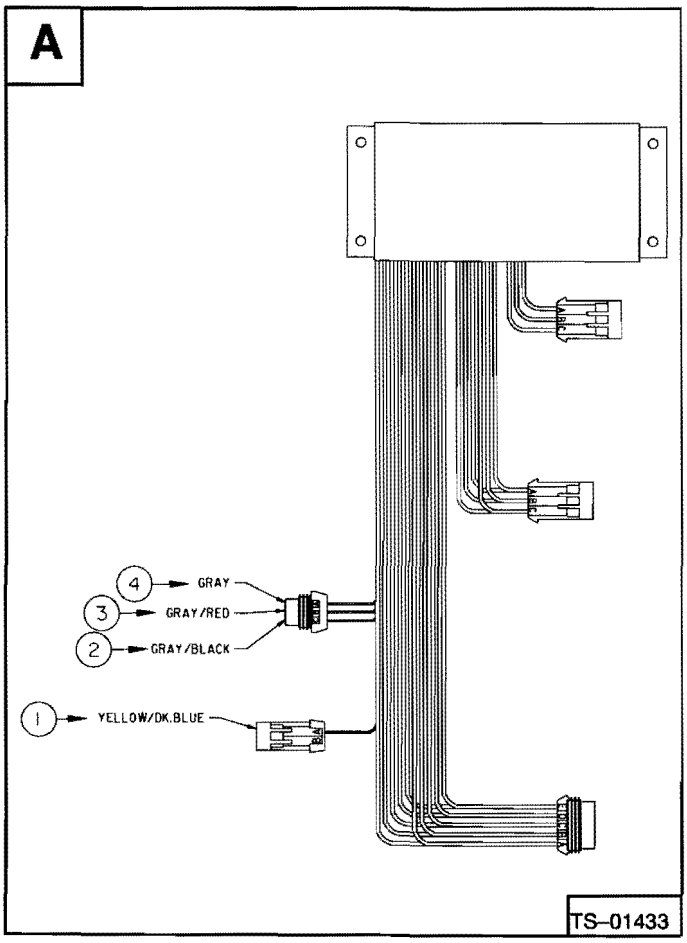
Loader S/N's 5141 12489 & Above
5142 11270 & Above

- Take voltage measurements by probing into wires near the PWM module. All connectors must remain plugged into their respectful harness
- Sit in the operator's seat. Turn key to ON position. Lower the seat bar. Check that the BICS™ controller lights are on. Check input voltage (Item 1) **[B]**. Press the auxiliary hydraulics mode switch. The mode switch light will come ON. Raise the seat bar. The light should be OFF. Input voltage will drop to less than 1.0 volts.

NOTE: Item descriptions are listed below as Input to or Output from the Module. Voltage readings are approximate. They are affected by battery condition (system voltage).

Fig. [A]:

Item	Description	Volts
1	Input from BICS™ Auxiliary Deactivation	12.0
2	For future use	
3	For future use	
4	For future use	



PWM TROUBLESHOOTING

Conditions

- Mode Switch lights will not come ON. Check the following:

  PWM fuse
  Wires disconnected, shorted, or cut.
  Mode switch failure.
  Module failure.

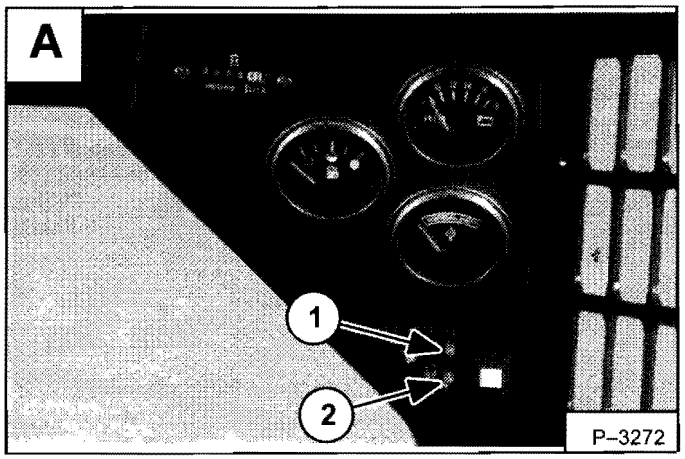
  Use the voltage tests in the wire identification section to determine the cause.

- Mode Switch lights are flashing. See the troubleshooting chart. (See Page 8–30.)

PWM TROUBLESHOOTING (*S/N 11443 & Above) (*Except S/N 11445)

Chart

- When the lights are flashing, the key needs to be turned OFF and then ON. If the problem still exists they will continue to flash.
- Proportional flow cannot be engaged if the lights are flashing.
- Continuous flow (detent) can be engaged if alternate flashing lightsare off after the key switch is turned OFF and then ON (during a porportional flow switch failure).



Momentary LED (Item 1) [A]	Detent LED (Item 2) [A]	CAUSE	CORRECTION
Light Flashing	Light OFF	Base End Solenoid or Wiring	• Wires Disconnected • Wires Shorted • Wires Cut • Solenoid failed. Perform solenoid coil test. • PWM module failed.
Light Off	Light Flashing	Rod End Solenoid or Wiring	• Wires Disconnected • Wires Shorted • Wires Cut • Solenoid failed. Perform solenoid coil test. • PWM module failed.
Light Flashing	Light Flashing	Diverter Solenoid or Wiring	• Wires Disconnected • Wires Shorted • Wires Cut • Solenoid failed. Perform solenoid coil test. • PWM module failed.
*Flashing/OFF	*OFF/Flashing	Proportional Flow Switch (Right Handle)	• Wires Disconnected • Wires Shorted • Wires Cut • Proportional flow switch failed. Check voltage to switch . Perform handle test. • PWM module failed.

*Alternate Flashing Lights

PWM CONTROL HANDLE

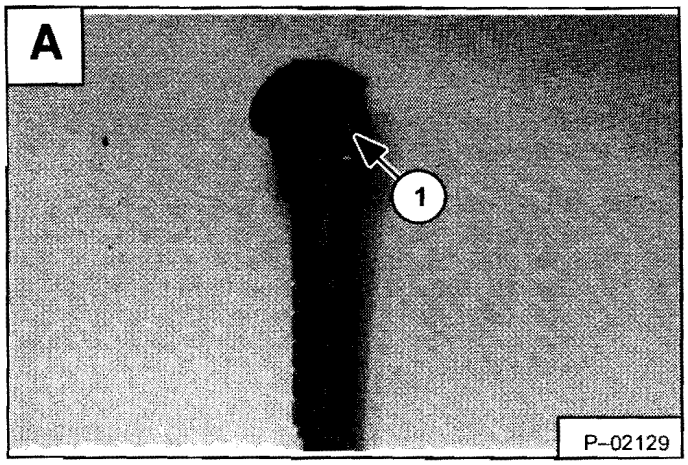
Handle Testing

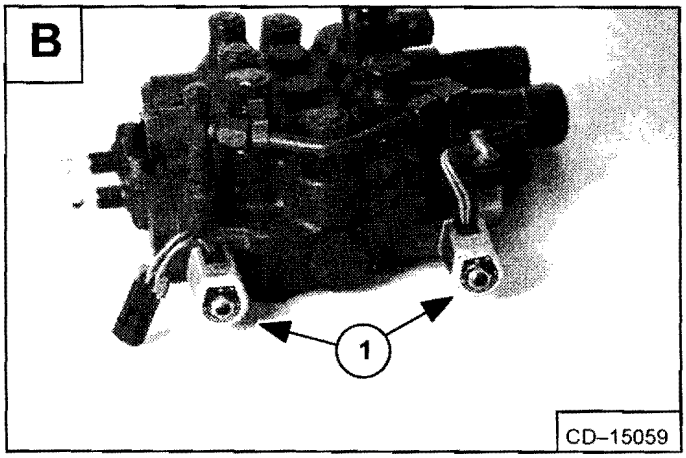
The right side steering lever handle switch (Item 1) **[A]** controls the proportional flow to front auxiliary. Test the switch with a Ohm test meter.

Disconnect the handle switch harness from the controls harness. Use the chart below to test the handle switch.

	Handle Switch Position		
Test between handle wires	Full Left	Center	Full Right
White/Black & White	No Test	4.8–5.2 Ohms	No Test
White/Red & White	1.3–1.5 Ohms	2.6–2.8 Ohms	3.8–4.0 Ohms
White/Red & White/Black	3.8–4.0 Ohms	2.6–2.8 Ohms	1.3–1.5 Ohms

NOTE: Push the switch gradually from center to either left or right. The Ohm reading must change gradually. Replace the handle switch assembly if required.





PWM ELECTRIC SOLENOID

Solenoid Coil Testing

The front auxiliary solenoid valves (Item 1) **[B]** are located in the hydraulic control valve. Test the solenoid coils with a Ohm test meter.

Disconnect the coil from the controls harness. The correct reading is 1–5 Ohms.

TRACTION LOCK CONTROL SYSTEM

Description

The Traction Lock Control System will lock the traction drive system when the engine stops.

NOTE: When the Traction Lock Override button is activated, the Traction Lock Control system will NOT engage the Traction Lock if the engine stops. The traction light on the BICS controller [A] will remain OFF until the engine is started and if the parking brake is disengaged.

The Traction Lock Control System and consists of:
Control Module (Item 1) **[B]** – Located on the inside of the left frame.
Wiring Harness (Item 2) **[B]**.
Speed Sensor (Item 1) **[C]** – Located on the engine flywheel housing.

Inspection

Sit in the operator's seat. Turn the key switch ON, lower the seat bar and disengage the parking brake. Four lights of the BICS Controller light should be ON (Items 1, 2, 3, & 5) **[A]**. The traction light should be OFF.

Fasten the seat belt, engage the parking brake and start the engine. Disengage the parking brake and operate at low idle. The traction light should be ON.

Maintenance

Check all six of the electrical connections on the Traction Lock Control System wire harness (Item 3, 4, & 5) **[B]** and (Items 2, 3, & 4) **[C]**. Be sure that all connectors are plugged in and secure.

Check the wire harness for loose or broken wires. Replace any parts that are damaged or broken. Use only genuine Bobcat replacement parts.

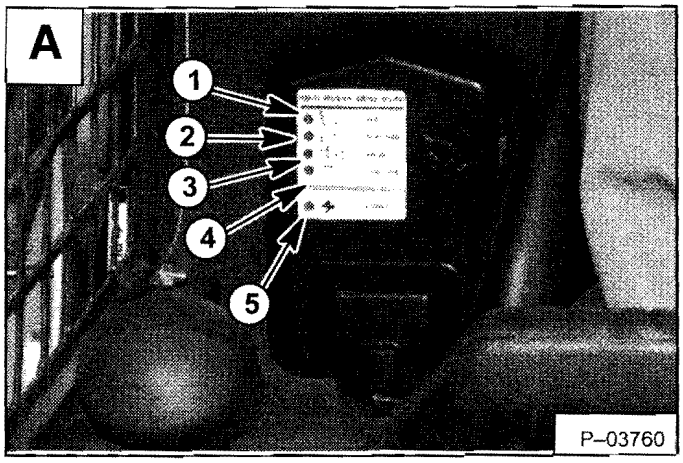
NOTE: One of the connections (Item 3) [C] is connected to the engine harness only when the BOSS option is installed. The connector is plugged when the BOSS option is not present.

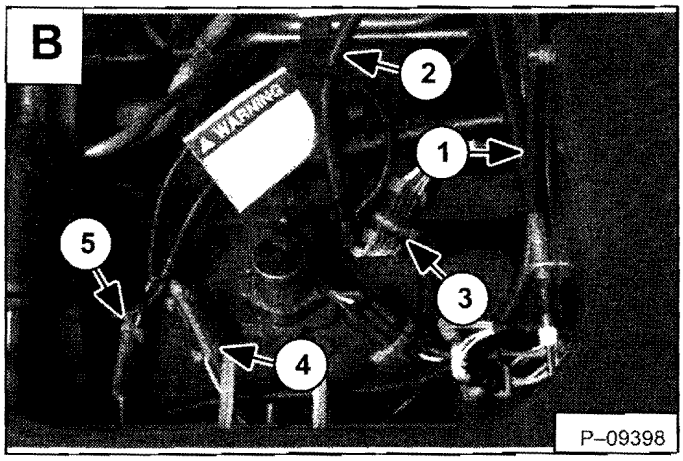
⚠ WARNING

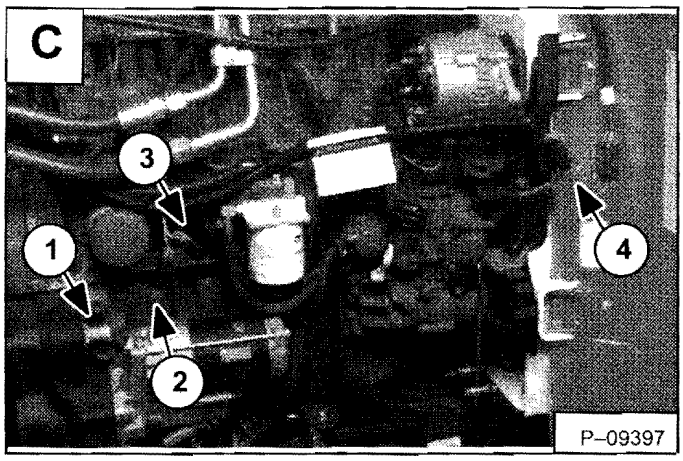
AVOID INJURY OR DEATH

All connectors at both ends must be plugged in for proper operation of Traction Lock.

W-2255-1096

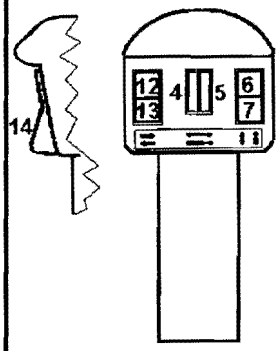


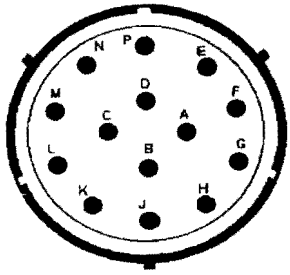




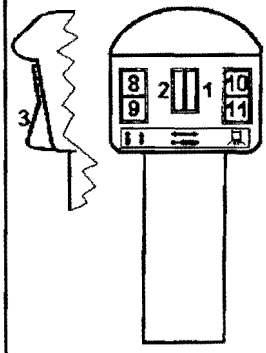
Controls Identification Chart

Left Side Control Handle Switches	Switch Number	Solenoid Number Activated		Attachment Harness Terminal Activated	Attachment Harness Connector	Right Side Control Handle Switches
			RH			
	1	1	1	K		
	2	2	2	K		
	* 3	1	1	K		
	4	2	2 & 3	K, A, D		
	5	1	1 & 3	K, A, C		
	6	1	1 & 3	K, E		
	7	1	1 & 3	K, F		
	8	1	1 & 3	K, G		
	9	1	1 & 3	K, H		
	10, 11, 12, 13, 14	–	—	K		



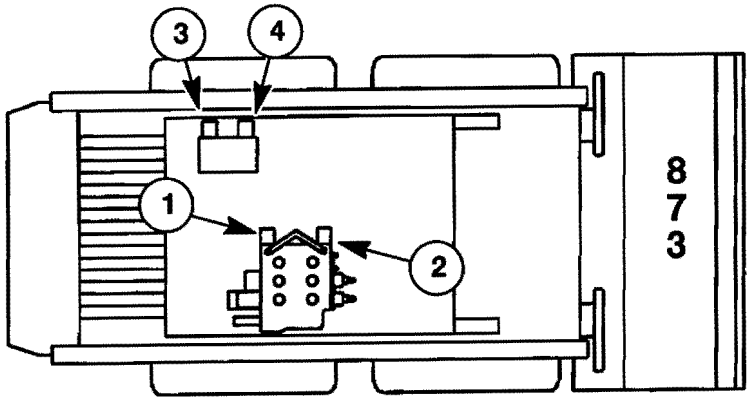


Viewed from front (pin side of connector) of loader.



RH – Loaders with Rear Hydraulics Option.

* If harness terminals K & L are jumped together, switches 4 thru 9 will function the same as switch 3.



Solenoid Number	Hydraulic Coupler	Wiring Color
1	Front Female	Dk. Green/ Red
2	Front Male	Dk. Green/ Lt. Green
3 (Rear)	Diverter	Yellow
4 (Front)	Bleed – Rear Male & Female	Dk. Green/ Yellow

MC–02315

NOTE: The Key Switch fully left position activates solenoids number 1 & 4.

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SPECIFICATIONS

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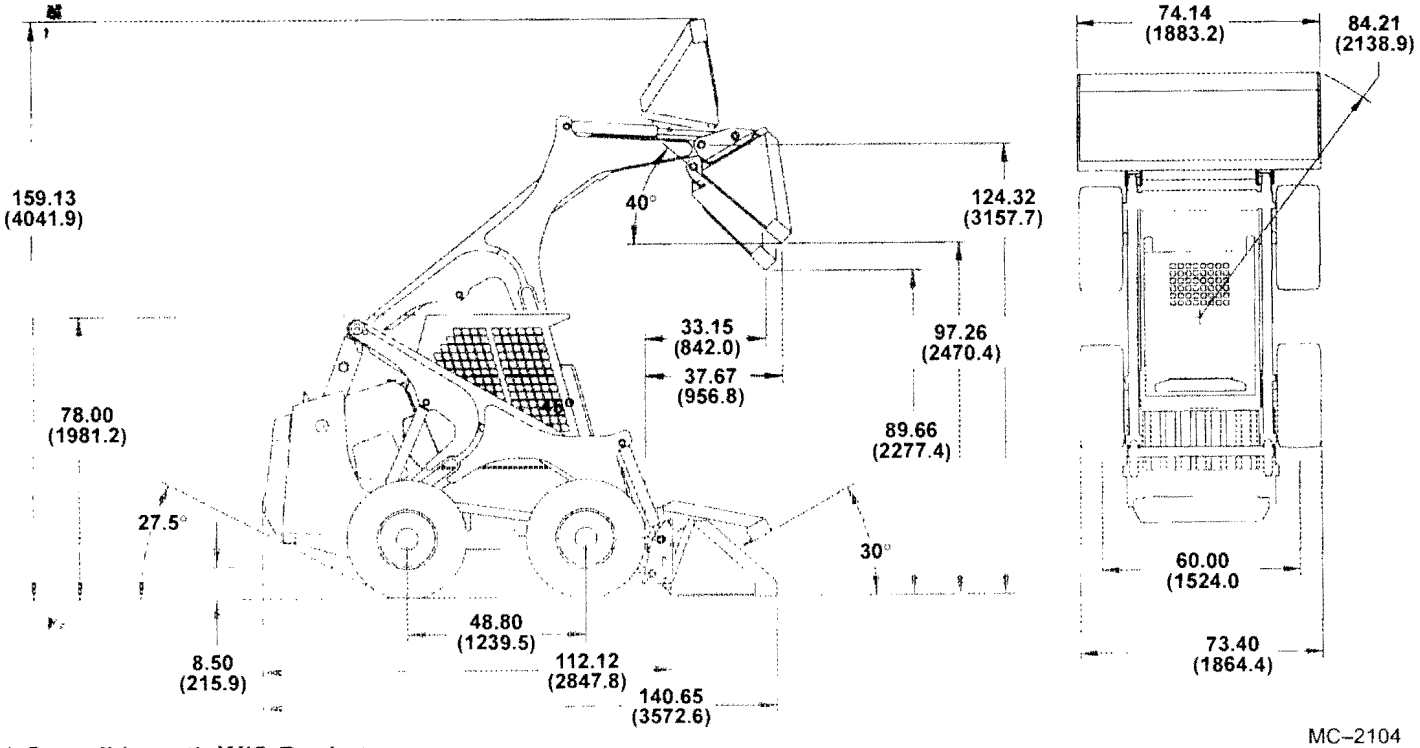
LOADER SPECIFICATIONS

LOADER DIMENSIONS

- 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/ISO standards and are subject to change without notice.



MC–2104

*** Overall Length W/O Bucket**

This loader was designed without counterweights or ballasts. Changes of structure or weight distribution of the loader can cause changes in control and steering response and can cause failure of the loader parts.

OPERATION & PERFORMANCE	873
Weights	
Operating Weight	6850 lbs. (3110 kg)
Rated Operating Capacity	2300lbs. (1044 kg)
Tipping Load	4600 lbs. (2088 kg)
Travel Speed	Infinitely variable 0–8.4 MPH (13,5 km/hr.)
Controls	
Vehicle	Direction & speed controlled by two hand levers.
Loader Function	Lift, tilt functions controlled by separate foot pedals. Auxiliary functions controlled by electrical push buttons on steering levers and toggle switch in operator area.
Engine	Hand lever throttle; key–type starter switch.
Main Drive	Hydrostatic
Service Brake	Two independent hydrostatic drive systems controlled by two hand operated steering levers.
Secondary Brake	One of the hydrostatic transmissions.
Parking Brake	Spring actuated mechanical traction lock applied when seat bar is up, key is turned OFF or when foot pedal is engaged.
ENGINE	
Make	Deutz
Model	BF4M 1011
Fuel	Diesel
Horsepower	73.5 HP (54,8 kW) @ 2600 RPM
Maximum Governed RPM	900–3000 RPM
Torque	164 ft.–lbs. (222 Nm) @ 1800 RPM
Number of Cylinders	Four
Bore/Stroke	3.58/4.13 (91/105)
Displacement	166.7 cu.in. (2732 cu. cm.)
Cooling System	Engine Crankcase Oil
Lubrication	Pressure System W/Filter
Crankcase Ventilation	Closed
Air Cleaner	Dry replaceable cartridge, dual safety element
Ignition	Diesel–Compression
Low Idle	1125–1175 RPM
High Idle	2770 RPM

LOADER SPECIFICATIONS (Cont'd)	873
HYDRAULIC SYSTEM	
Pump	Engine driven gear type
Pump Capacity	18.0 GPM (68 L/min.) @ 2750 RPM @ 1150 PSI (7929 kPa)
System Main Relief	2950–3050 PSI (20340–21030 kPa) @ Quick Couplers
Filter	Two full flow replaceable 3 media synthetic element Two 90 micron motor case drain filters
Hydraulic Cylinders	Doubleacting
Bore Diameter:	
Lift Cylinder (2)	2.75 (70)
Tilt Cylinder (1)	2.25 (57)
Rod Diameter:	
Lift Cylinder (2)	1.50 (38,1)
Tilt Cylinder (1)	1.25 (32)
Stroke:	
Lift Cylinder (2)	31.0 (787)
Tilt Cylinder (1)	18.03 (458)
Control Valve	3–spool, open center, series type W/float detent on lift, single spool electrical control front auxiliaries
Fluid Lines	SAE standard tubes, hoses & fittings
Hydraulic Function Time:	
Raise Lift Arms to Maximum Height	5.04 Seconds
Lower Lift Arms from Maximum Height	4.57 Seconds
Move Empty Bucket to Dump Position	2.33 Seconds
Move Bucket to Retracted Position	1.78 Seconds
Fluid Type	Bobcat Fluid (P/N 6563328); If fluid is not available, use 10W/30 or 10W/40 class SC Motor Oil – For temperatures above 0°F (–18°C) 5W/30 Motor Oil – For temperatures below 0°F (–18°C)
ELECTRICAL	
Alternator	Belt drive, 06 amps. Open with internal/regulator
Battery	12 volt, 1000 cold crank amps. @ 0°F (–18°C) 180 min. reserve capacity
Starter	12 volt, 3.62 HP (2,7 kW)
Instrumentation	Gauges: Hourmeter, Voltmeter, Fuel, Engine Temperature Warning Lights: Engine Temperature, Engine Oil Pressure, Hydraulic Fluid Temperature & Pressure, Hydrostatic Charge Pressure, Hydrostatic Fluid Temperature & Filters
DRIVE SYSTEM	
Transmission	Tandem hydro. pumps infinitely variable, driving 2 fully reversing hydrostatic motors
Final Drive	#100 HS roller chain & sprockets in sealed chaincase with oil lubrication
Total Engine to Wheel Reduction	30.35:1
CAPACITIES	
Fuel	25 gals. (95 L)
Engine Crankcase Oil W/Filter	10 qts. (9,5 L)
Engine Lubrication/Cooling System Capacity	17 qts. (16,1 L)
Hydraulic Reservoir	21 qts. (19.9 L)
Hydraulic/Hydrostatic System	13 gals. (49 L)
Chaincase Reservoir	10 gals. (38 L)
TIRES	
Recommended Pressure	Inflate tires to the MAXIMUM pressure shown on the side wall of the tire. DO NOT mix brands of tires used on the same loader.
VIBRATION DATA	
Hand Arm Vibration	Less Than 2,5 m/sec^2 RMS
Whole Body Vibration	Less Than 0,5 m/sec^2 RMS

ENGINE SPECIFICATIONS

All dimensions are given in inches. Respective metric dimensions are given in millimeters enclosed by parentheses.

General

Displacement	166.7 cu. in. (2732 cu. cm.)
Bore	3.58 (91)
Stroke	4.13 (105)
Crankshaft Rotation (Facing Flywheel)	Counterclockwise
Ignition	4 Stroke Diesel – Compression
Combustion System	Direct Injection
Compression Ratio	18.5–1
Compression	363–435 lbs. (25–35 bar)
Firing Order	1–3–4–2

Fuel System

Fuel Injection Pump Pressure	Min. 4350 lbs. (300 bar)
Injection Pump Testing Tightness	2175–2030 lbs. (150–140 bar) drop in a minute
Injection Nozzle Opening Pressure (Used)	3553 lbs. (245 bar)
Injection Nozzle Opening Pressure (New)	3625 lbs. (250 bar)

Valve and Valve Guide & Seat Insert

Valve Guide I.D.	0.315 ± 0.0009 (8 ± 0,025)
Valve Seat Insert O.D. (Intake)	1.68 ± 0.00019 (42,67 ± 0,005)
Valve Seat Insert O.D. (Exhaust)	1.46 ± 0.00019 (37,07 ± 0,005)
Valve Seat Insert Bore (Intake)	1.68 + 0.0011 (42,6 + 03)
Valve Seat Insert Bore (Exhaust)	1.465+ 0.0011 (37 + 0.03)
Valve Stem Diameter (Intake)	0.314 – 0.0006 (7,98 – 0,015)
Valve Stem Diameter (Exhaust)	0.313 – 0.0006 (7,96 – 0,015)
Valve Stem Clearance (Intake)	0.0008 → 0.0023 (0,02 → 0,06)
Wear Limit	0.005 (0,12)
Valve Stem Clearance (Exhaust)	0.002→ 0.003 (0,04 → 0,08)
Wear Limit	0.006 (0,15)
Valve Head O.D. (Intake)	1.58 ± 0.004 (40,1 ± 0,1)
Valve Head O.D. (Exhaust)	1.37 ± 0.004 (34,9 ± 0,1)
Valve Seat Width	0.067 ± 0.016 (1,7 ± 0,4)
Seat Angle	45 degrees
Marg Thickness (Intake)	0.049 (1,25)
Wear Limit	0.03 (0,8)
Marg Thickness (Exhaust)	0.073 (1,85)
Wear Limit	0.047 (1,2)
Valve Spring Length (Un–Loaded)	1.74 (44,3)
Valve Recess	0.039 ± 0.005 (1,0 ± 0,13)
Wear Limit	0.06 (1,53)

Piston, Rings and Connecting Rod

Piston Diameter	3.58 (90,93)
I.D. for Piston Pin	1.023 + 0.0004 → 0.00015 (26,0 + 0,01 → 0,004)
Piston Pin Diameter	1.023 – 0.00019 (26 – 0,005)
Piston Ring Groove – 1st	0.078 + 0.04 → 0.003 (2,0 + 0,10 → 0,08)
2nd	0.078 + 0.04 → 0.003 (2,0 + 0,10 → 0,08)
3rd	0.118 + 0.0016 → 0.0008 (3,0 + 0,04 → 0,02)
Piston Ring Clearance – 1st	0.0035 → 0.005 (0,09 → 0,12)
Wear Limit	0.008 (0,2)
2nd	0.003 → 0.004 (0,07 → 0,102)
Wear Limit	0.006 (0,16)
3rd	0.0015 → 0.003 (0,04 → 0,075)
Wear Limit	0.005 (0,12)
Piston Ring Gap – 1st	0.011 → 0.019 (0,3 → 0,5)
Wear Limit	0.031 (0,8)
2nd	0.031 → 0.041 (0,8 → 1,05)
Wear Limit	0.071 (1,8)
3rd	0.018 → 0.028 (0,45 → 0,7)
Wear Limit	0.047 (1,2)
Bore for Piston Pin Bushing	1.14 + 0.0008 (29,0 + 0,02)

All dimensions are given in inches. Respective metric dimensions are given in millimeters enclosed by parentheses.

Piston, Rings and Connecting Rod (Cont'd)

Piston Pin Bushing O.D.	1.14 + 0.04 → 0.002 (29,0 + 0,1 → 0,06)
Piston Pin Bushing I.D. (pressed in)	1.02 + 0.0014 → 0.00098 (26,0 + 0,035 → 0,025)
Piston Pin Clearance	0.00098 → 0.0015 (0,025 → 0,04)
Wear Limit	0.0031 (0,08)
Connecting Rod Width	1.062 – 0.0023 (27,0 – 0,06)
Connecting Rod Axial Clearance	0.0078 – 0.022 (0,2 – 0,56)
Wear Limit	0.0315 (0,8)

Cylinder Head

Cylinder Head Studs – Length	7.28 ± 0.031 (185 ± 0,8)
Cylinder Bore	3.58 + 0.0008 (91,0 + 0,02)
Wear Limit	0.004 (0,1)

Crankshaft and Main Bearings

Crankshaft Pin Width	1.22 (31,0)
Crankshaft Pin Diameter	2.17 – 0.0004 – 0.0011 (55 – 0,01 – 0,03)
Oval Wear Limit	0.0004 (0,01)
Crankshaft Journal Width	1.38 (35,0)
Crankshaft Journal Diameter	2.76 – 0.0004 – 0.0011 (70,0 – 0,01 – 0,03)
Oval Wear Limit	0.0003 (0,008)
Eccentricity Max. Permitted	0.002 (0,05)
Thrust Bearing Journal Width	1.38 + 0.002 (35,0 + 0,04)
Main Bearing Shell I.D.	2.757 → 2.758 (70,02 → 70,055)
Radial Clearance	0.0011 → 0.0033 (0,03 → 0,084)
Wear Limit	0.005 (0,12)
Bearing Bore in Crankcase	2.95 + 0.0007 (75,0 + 0,019)
Thrust Bearing Stop Rings O.D.	1.37 – 0.005 (34,9 – 0,133)
Oversize	0.016 (0,4)
Limit for Oversize	1.41 – 0.005 (35,7 – 0,133)
Crankshaft Axial Clearance	0.0039 – 0.012 (0,1 – 0,3)
Wear Limit	0.016 (0,4)
Center Distance From Small to Large Bore	6.81 ± 0.0011 (173,0 ± 0,03)
Bore for Large End Bearing	2.30 + 0.0008 (58,5 + 0,02)
Large End Bearing Shells I.D.	2.165 → 2.167 (55,004 → 55,04)
Limit for Undersize	2.145 → 2.147 (54,504 → 54,54)
Large End Bearing Radial Clearance	0.00094 → 0.0031 (0,024 → 0.078)
Wear Limit	0.005 (0,12)
Large End Bearing Width	1.008 – 0.012 (25,6 – 0,3)

Camshaft and Bearings

Camshaft Axial Clearance	0.011→ 0.024 (0,3 → 0,6)
Wear Limit	0.0315 (0,8)
Camshaft Bearing I.D.	2.008 + 0.002 (51,0 + 0,054)
Radial Clearance	0.002 → 0.005 (0,05 → 0,124)
Wear Limit	0.006 (0,15)
Cam Lift (Intake)	0.259 (6,6)
Cam Lift (Exhaust)	0.267 (6,8)

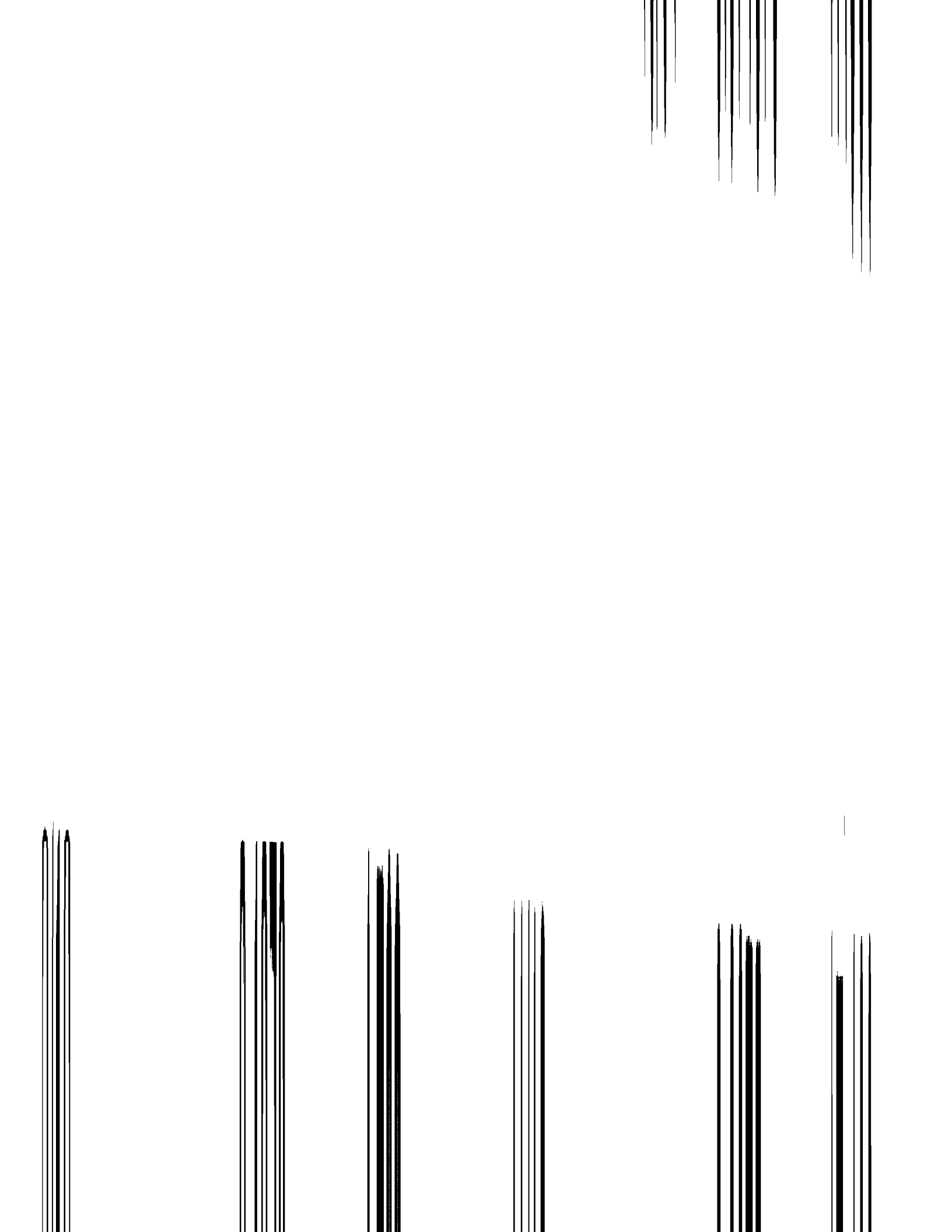
Oil Pump

Oil Pump Pressure Setting	87 lbs. (6 bar)

Engine Torque Specifications

Description	Ft.–Lbs.	Nm
Adapter Housing Bolts (M12 x 35, M12 x 75)	21–24	95–105
Flywheel; Mounting Bolts	7	30
Plus 60 degrees, 60 degrees = 120 degrees		
Camshaft Nut	22	30
Plus 210 degrees		
Crankshaft Bolt	30	130
Plus 210 degrees		
Crankcase Screw Plugs (M30 x 1,5)	12–15	54–66
Cylinder Head Studs Step 1	7	30
Step 2	18	80
Step 3	36	160
Plus 120 degrees		
Exhaust Manifold Bolts (M10 x 30 Torx)	26–32	36–44
Flywheel Bolts	7	30
Plus 60 degrees, 30 degrees = 90 degrees		
Front Mount Foot Bolts M14 x 55)	38	168
Injector Cap Nut	29–37	40–50
Main Bearing Bolts	11	50
Plus 60 degrees, 45 degrees = 105 degrees		
Oil Pan Drain	11–13	50–60
Oil Press. Control Valve Screw Plug	43	190
Oil Return Line Cap Nut	13–14	57–63
Rear Mounting Foot Bolts (M12 x 30)	23	106
Starter Carrier Bolts (M12 x 28)	15–18	68–82
Starter Fastening Bolts (M10 x 28)	28–33	38–46
Thermostat Housing Screw Plug M38 x 1,5)	11–13	50–60
V–Belt Pulley Bolts (M10 x 25)	30–36	41–49

Description	In.–Lbs.	Nm
Air Intake Manifold Bolts (M8 x 30 Torx)	54–65	20–24
Air Intake 3–Hole Flange Bolts (M8 x 35 Torx)	54–65	20–24
Camshaft Bolt (M14 x 1,5 x 110)	81	30
Plus 150 degrees		
Camshaft Thrust Bearing Bolt (M8 x 35)	54–65	20–24
Crankcase Screw Plugs (M20 x 1,5)	85–104	31,5–38,5
(M10 x 1)	28–36	10,5–13,5
(M6 x 12)	13–16	4–6
(M16 x 12)	62–78	23–29
Cylinder Head Cover	22–27	8–10
Exhaust Turbocharger Nuts (M8)	78	29
Fuel Filter Bracket Bolt (M8 x 20)	54	20
Fuel Pump Bolts (M8 x 20 Torx)	54–65	18–22
Injector Fastening Bolt (M8 x 35 Torx)	49–59	18–22
Injector Line	36–45	13,5–16,5
Injection Pump Nuts	54–65	18–22
Oil Filter Bracket Bolts (M6 x 25, M6 x 35)	24–30	9–11
Oil Intake Housing Bolts (M8 x 75 Torx)	54–65	18–22
Oil Pan Bolts (M8 x 28)	54–65	20–24
Oil Pump Bolts (M8 x 35 Torx)	54–65	20–24
Piston Cooling Oil Nozzles	11	4
Thermostat Housing Bolts (M6 x 35 Torx)	20–24	7,5–9,0
Thermostat Housing Bolts (M8 x 105 Torx)	24–32	19–22
Rocker Arm Bolts (M8 x 45 Torx)	54–65	20–24
Rocker Arm Set Screw Nut	49–59	18–22
Valve Plunger Housing Bolts (M8 x 30 Torx)	24–32	19–22



TORQUE SPECIFICATIONS FOR LOADER

Specifications

Item	Ft.–Lbs.	Nm
Air Cleaner Mounting Bolts	25–28	34–38
Alternator Pulley Nut	50	68
Axle Hub Mounting Bolt	685–785	928–1064
Axle Sprocket Bolt	284–325	385–440
Bob–Tach Lever Pivot Bolt	25–28	34–38
Control Pedal Linkage Bolts	21–25	28–34
Control Valve Mounting Bolts & Nuts	15–16	20–22
Engine Mounting Bolts	61–69	83–94
Exhaust Pipe to Exhaust Manifold	20–35	27–47
Filter Housing Mounting Bolts	25	34
Front Panel Bolts	16–20	22–27
Glow Plug	15–18	20–24
Hydraulic Pump Bolts	45–50	61–68
Hydraulic Pump Mounting Bolts	25–27	34–37
Hydraulic Reservoir Strap Bolts	16–20	22–27
Hydrostatic Motor Mounting Bolts	85–96	115–130
Hydrostatic Pump Mounting Bolts	65–70	88–95
Hydrostatic Pump Pulley Bolt	175–200	237–271
Main Frame to Chaincase Bolts	301–339	408–460
Main Relief Valve	35–40	47–54
Motor Carrier Bolts	213–240	288–325
Operator Cab Fastening Nuts	40–50	54–68
Operator Cab Pivot Bolts & Nuts	25–35	34–47
Pedal Lock Linkage to Main Frame Bolts	7–8	9,5–10,8
Pedal Lock Linkage Tab Bolt	25	34
Pivot Pins Lock Bolt & Nut	18–20	24–27
Seat Belt Fastening Bolts	40–45	54–61
Seat Mounting Bolts	9–11	12,2–15
Seat Bar Pivot Bolts	25–28	34–38
Wheel Nuts	105–115	142–156

HYDRAULIC/HYDROSTATIC FLUID SPECIFICATIONS

Specifications

Use Melroe hydraulic/hydrostatic transmission fluid (P/N 6563328). If this fluid is not available, use 10W–30 or 10W–40 SAE Motor Oil (5W–30 for 0°F [–18°C] and Below).

DO NOT use automatic transmission fluids in the loader or permanent damage to the transmission will result.

⚠ WARNING

Diesel fuel or hydraulic fluid under pressure can penetrate skin or eyes causing serious injury. 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.

W–2074–1285

When temperatures below zero degree F (–18°C) are common, the loader must be kept in a warm building. Extra warm–up time must be used each time the loader is started during cold temperature conditions. Cold fluid will not flow easily and it makes action of the hydraulic function slower. Loss of fluid flow to the hydrostatic transmission pump (indicated by "TRANS" light "ON") can cause transmission damage in less than 60 seconds.

⚠ WARNING

During cold weather 32°F (0°C) and below, do not operate machine until the engine has run for at least five (5) minutes at less than half throttle. This warm–up period is necessary for foot pedal operation and safe stopping. Do not operate controls during warm–up period. When temperatures are below –20°F (30°C), the hydrostatic oil must be heated or kept warm. The hydrostatic system will not get enough oil at low temperatures. Park the machine in an area where the temperature will be above 0°F (–18°C), if possible.

W–2027–1285

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 (9,0–10,2)	110–120 (12,4–13,6)
	.3125	180–200 (20,3–22,6)	215–240 (24,2–27,1)
FOOT LBS. (Nm)	.375	25–28 (34–38)	35–40 (47–54)
	.4375	40–45 (54–61)	60–65 (81–88)
	.500	65–70 (88–95)	90–100 (122–136)
	.5625	90–100 (122–136)	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)

DECIMAL AND MILLIMETER EQUIVALENTS

FRACTIONS	DECIMALS	MM
1/64	0.015625	0.397
1/32	0.03125	0.794
3/64	0.046875	1.191
1/16	0.0625	1.588
5/64	0.078125	1.984
3/32	0.09375	2.381
7/64	0.109375	2.778
1/8	0.1250	3.175
9/64	0.140625	3.572
5/32	0.15625	3.969
11/64	0.171875	4.366
3/16	0.1876	4.762
13/64	0.203125	5.159
7/32	0.21875	5.556
15/64	0.234375	5.953
1/4	0.2500	6.350
17/64	0.265625	6.747
9/32	0.28125	7.144
19/64	0.296875	7.541
5/16	0.3125	7.938
21/64	0.328125	8.334
11/32	0.34375	8.731
23/64	0.359375	9.128
3/8	0.3750	9.525
25/64	0.390625	9.922
13/32	0.40625	10.319
27/64	0.421875	10.716
7/16	0.4375	11.112
29/64	0.453125	11.509
15/32	0.46875	11.906
31/64	0.484375	12.303
1/2	0.5000	12.700

FRACTIONS	DECIMALS	MM
33/64	0.515625	13.097
17/32	0.53125	13.494
35/64	0.546875	13.891
9/16	0.5625	14.288
37/64	0.578125	14.684
19/32	0.59375	15.081
39/64	0.609375	15.478
5/8	0.6250	15.875
41/64	0.640625	16.272
21/32	0.65625	16.669
43/64	0.671875	17.066
11/16	0.6875	17.462
45/64	0.703125	17.859
23/32	0.71875	18.256
47/64	0.734375	18.653
3/4	0.7500	19.050
49/64	0.765625	19.447
25/32	0.78125	19.844
51/64	0.796875	20.241
13/16	0.8125	20.638
53/64	0.828125	21.034
27/32	0.84375	21.431
55/64	0.859375	21.828
7/8	0.8750	22.225
57/64	0.890625	22.622
29/32	0.90625	23.019
59/64	0.921875	23.416
15/16	0.9375	23.812
61/64	0.953125	24.209
31/32	0.96875	24.606
63/64	0.984375	25.003
1	1.000	25.400

1 mm = 0.03937"

0.001" = 0.0254 mm

U.S. TO METRIC CONVERSION

	TO CONVERT	INTO	MULTIPLY BY
LINEAR MEASUREMENT	Miles	Kilometers	1.609
	Yards	Meters	0.9144
	Feet	Meters	0.3048
	Feet	Centimeters	30.48
	Inches	Meters	0.0254
	Inches	Centimeters	2.54
	Inches	Millimeters	25.4
AREA	Square Miles	Square Kilometers	2.59
	Square Feet	Square Meters	0.0929
	Square Inches	Square Centimeters	6.452
	Acre	Hectare	0.4047
VOLUME	Cubic Yards	Cubic Meters	0.7646
	Cubic Feet	Cubic Meters	0.02832
	Cubic Inches	Cubic Centimeters	16.39
WEIGHT	Tons (Short)	Metric Tons	0.9078
	Pounds	Kilograms	0.4536
	Ounces (Avdp.)	Grams	28.3495
PRESSURE	Pounds/Sq. In.	Kilopascal	6.895
WORK	Foot–Pounds	Newton–Metre	1.356
LIQUID VOLUME	Quarts	Liters	0.9463
	Gallons	Liters	3.785
LIQUID FLOW	Gallons/Minute	Liters/Minute	3.785
TEMPERATURE	Fahrenheit	Celsius	1.Subtract 32° 2. Multiply by 5/9