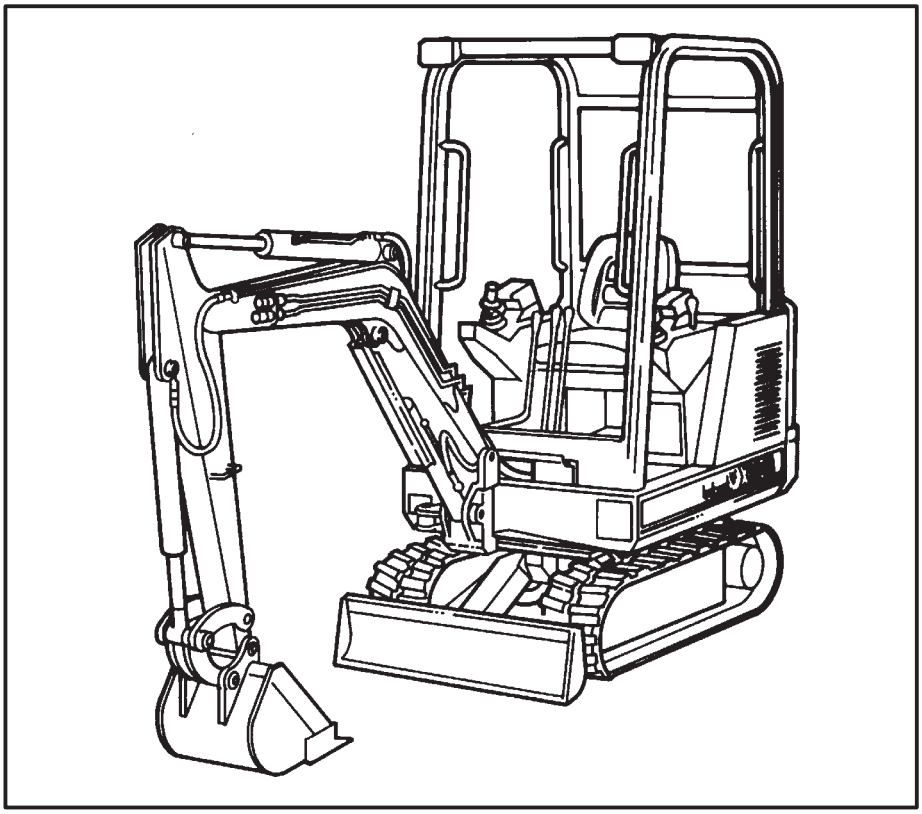
X 320

Excavator

Service Manual

(S/N 511720001 & Above)



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MELROE
INGERSOLL-RAND

6722642 (6-12)

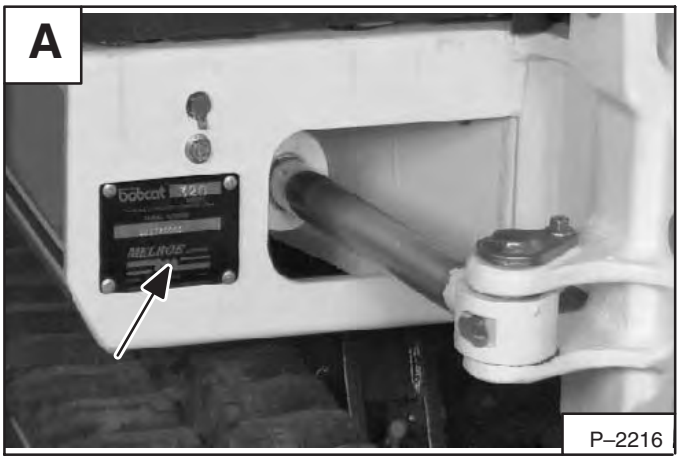
Printed in U.S.A.

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.

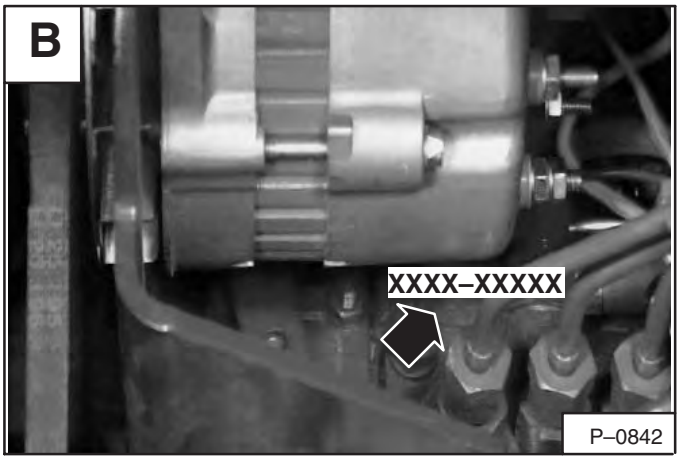
HYDRAULIC EXCAVATOR SERIAL NUMBER

The excavator serial number is on the front of the machine frame, to the left of the boom **[A]**.



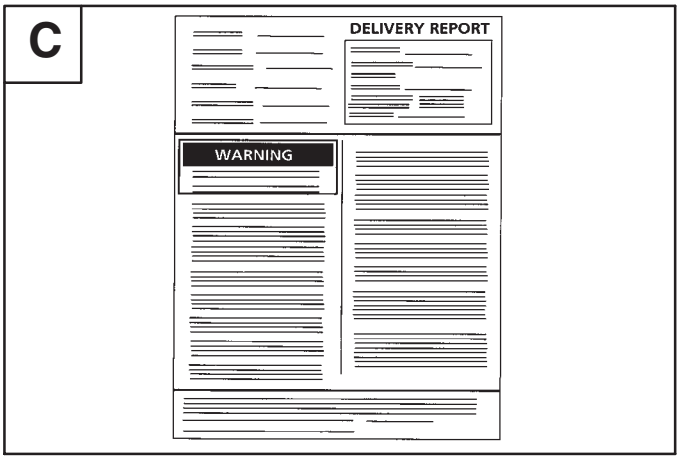
ENGINE SERIAL NUMBER

The engine serial number is located on the engine block, near the fuel injection pump **[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. The form contents must be explained to the owner. Make sure it is filled out completely **[C]**.



HYDRAULIC SYSTEM

Checking and Add Fluid

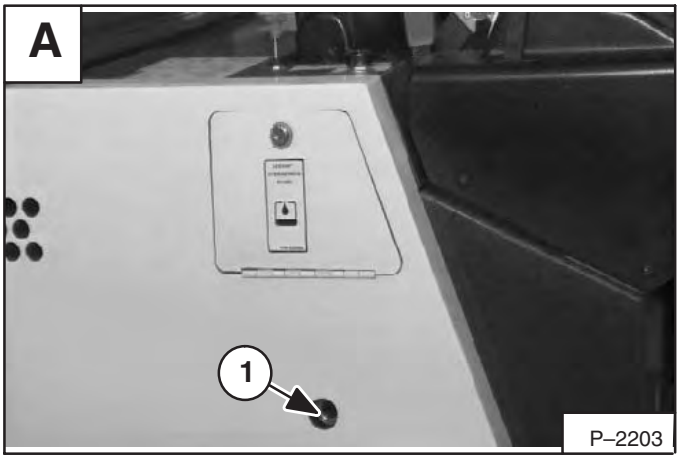
To check and add hydraulic fluid to the reservoir, use the following procedure:

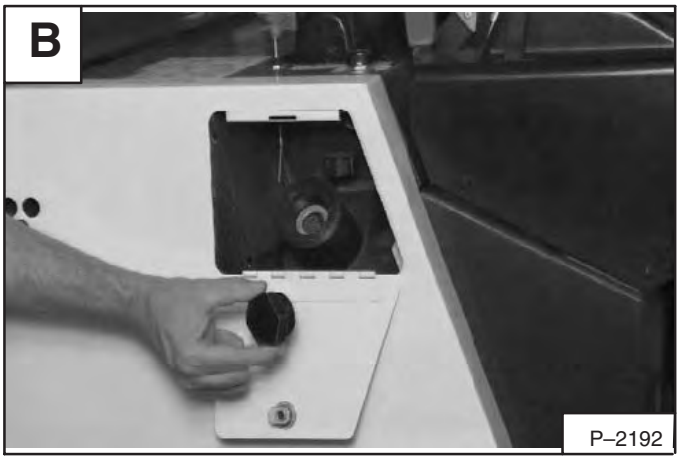
IMPORTANT

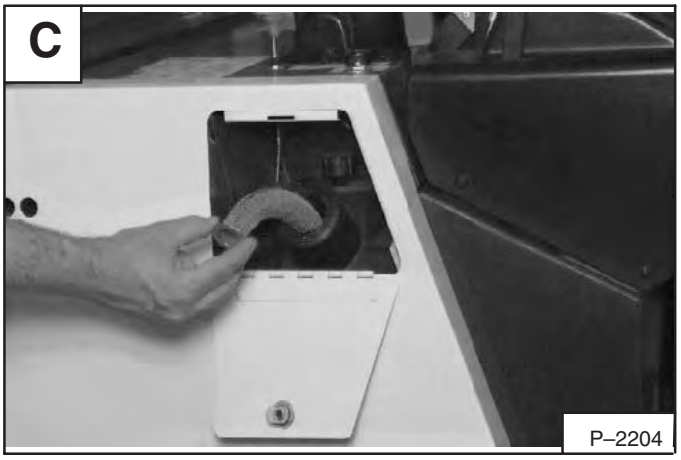
Prior to checking the hydraulic fluid level, retract the arm and bucket cylinder, put the bucket on the ground and raise the blade.

I–2076–0795

1. Put the machine on a flat level surface.
2. Retract the arm and bucket cylinders, put the bucket on the ground and raise the blade. Stop the engine.
3. The hydraulic fluid level must be visible in the sight gauge (Item 1) **[A]**.
4. If fluid level is not correct, open the hydraulic fill door and remove the hydraulic cap **[B]**.
5. Remove the screen from the fill neck and replace it if damaged **[C]**. Install the screen before adding fluid.
6. Add the correct fluid to the reservoir until it is visible in the center of the sight gauge **[A]**. (See Fuel, Coolant and Lubricants Chart, Page 8–1.)
7. Install the reservoir cap.





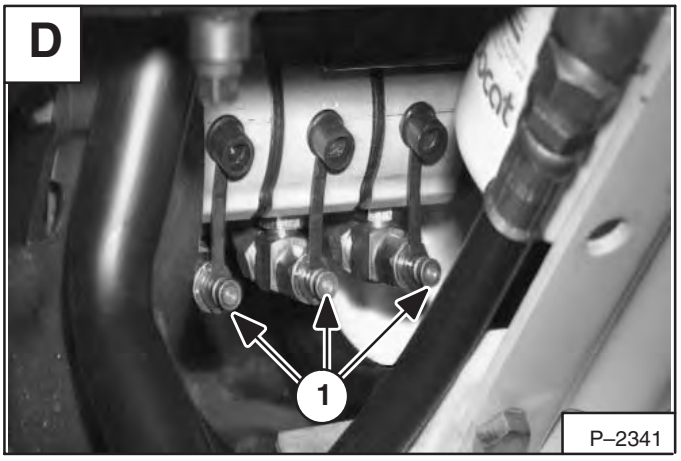


Diagnostic Couplers

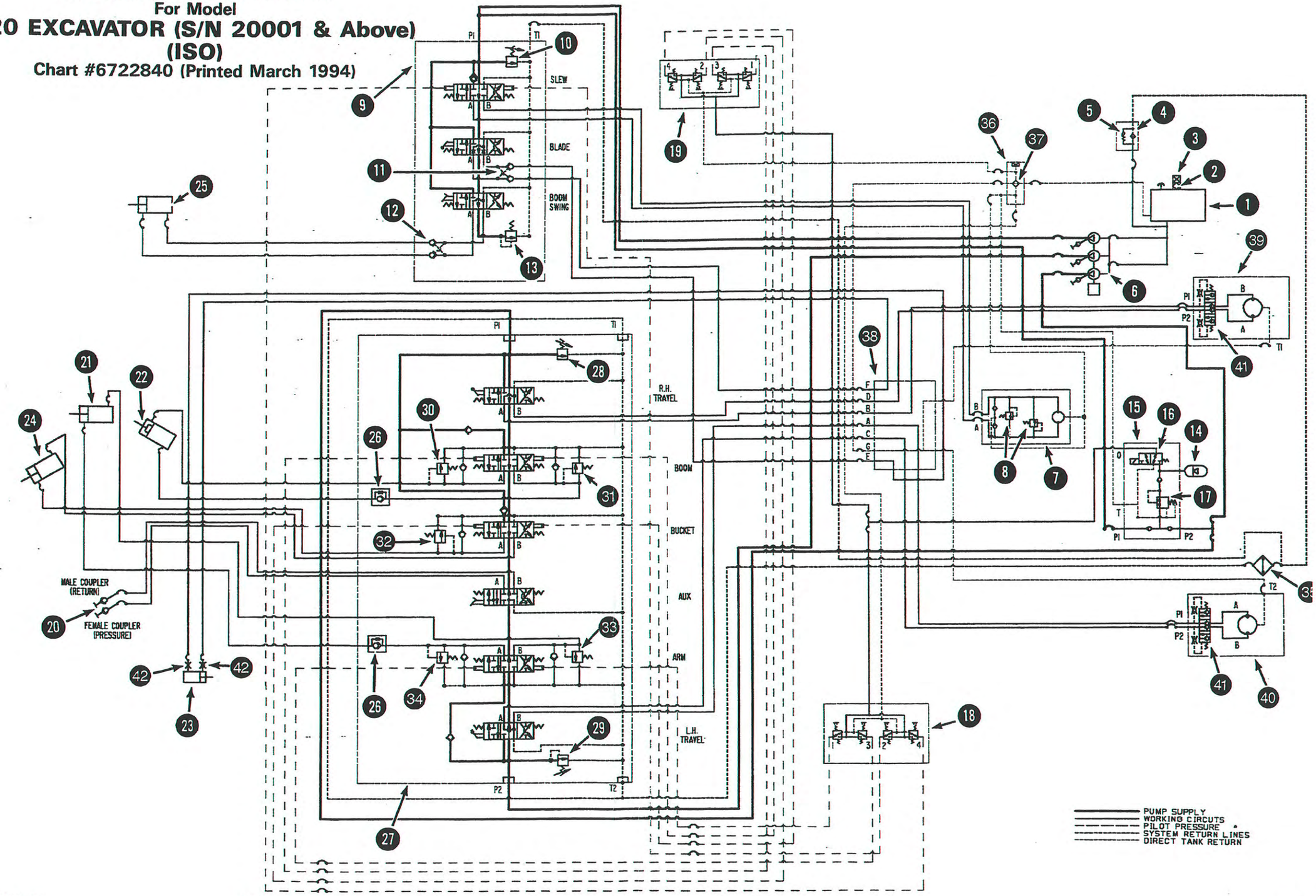
Diagnostic couplers are located at each hydraulic pump (Item 1) **[D]**.

The couplers can be used to check circuit pressures.

Refer to Page 2–1 for test procedure and tools needed for testing.



HYDRAULIC FLOW CHART
For Model
320 EXCAVATOR (S/N 20001 & Above)
(ISO)
Chart #6722840 (Printed March 1994)



Checking the Hydraulic Pump

The hydraulic pump flow should be 4 GPM (16 L/min.) on a new pump at 2500 RPM.

The following tools will be needed for hydraulic pump test:

MEL10003 – Hydraulic Tester

Stop the engine.

Raise the engine cover.

Remove the outlet hose from the hydraulic pumpsection being tested **[A]**.

Connect the hose removed from thepump to the outlet of the tester **[B]**.

Connect the inlet hose of the tester to the fitting on the pump **[B]**.

NOTE: The tester connection will be the same for each pump section.

NOTE: Open the flow control knob (Item 1) fully to prevent pump damage [B].

Start the engine and run at low RPM. Make sure that the tester is connected correctly. If no flow is indicated at the tester, the hoses are connected wrong.

Increase the engine speed to full RPM. W arm the hydraulic fluid to 140 °F (60°C) by turning the restrictor valve until the gauge reads approximately 1000 PSI (6895 kPa). Do not exceed system pressure.

After the temperature is correct, open the restrictor valve fully.

Record the pump free flow GPM (L/min.).

Close the flow control knob (Item 1) **[B]** slowly, to approximately 100 PSI below the relief valve setting which is (2350–2450 PSI/16207–16897 kPa).

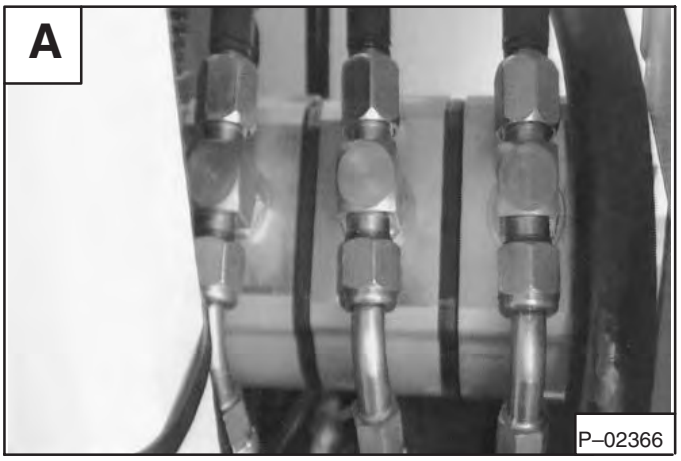
Record the pump high pressure flow GPM (L/min.).

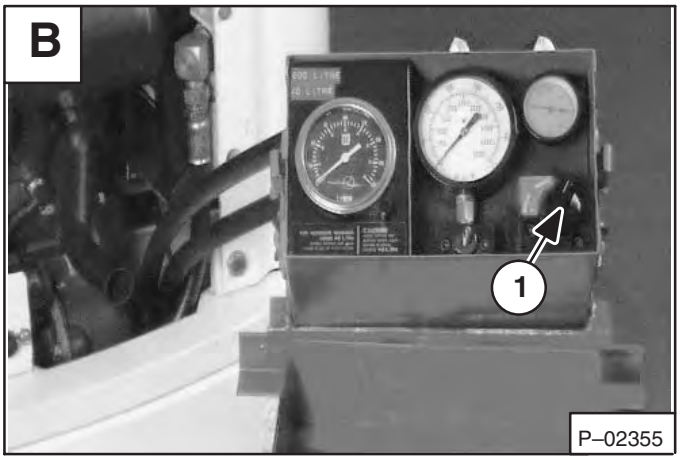
NOTE: The high pressure flow must be at least 80% of free flow.

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

If the high pressure flow is less than 80% of free flow, remove the hydraulic pump for repair or replacement.

Repeat the testing procedure and use the samereadings as shown above for each pump section.





HYDRAULIC CONTROL VALVE (6–Spool) DUKES VALVE (S/N 511720001–511721411) (Cont'd)

Inlet Section (R.H. and L.H. Travel)

Disassembly

Use a vise with protective jaws and clamp the valve section.

Remove the main relief valve from the valve section **[A]**.

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

NOTE: If the relief valve is disassembled, the relief pressure setting must be reset.

See Page 2–26 for relief valve repair.

Remove the two bolts from the end cap and remove the end cap from the valve section **[B]**.

Installation: Tighten the bolts to 5–6 ft.–lbs. (6–8 Nm) torque.

Insert a pin into the hole in the actuating end of the spool to retain the spool from turning. Loosen the spring retaining bolt from the end of the spool **[C]**. Do Not use any type of tool to grip the finished surface of the spool or the spool will be damaged.

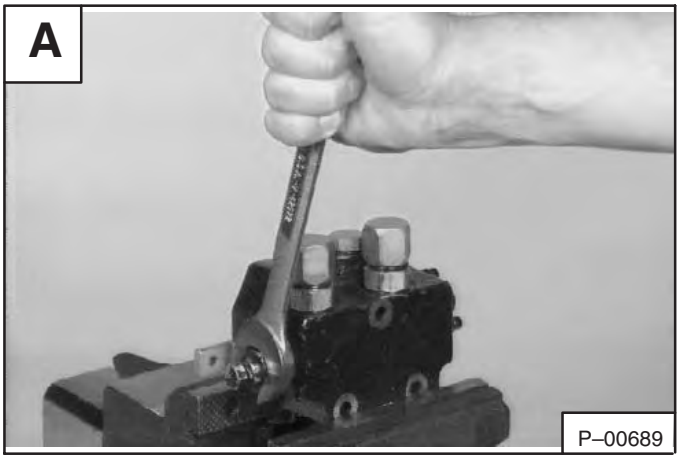
NOTE: The spring is under pressure, use care when removing the spring retaining bolt.

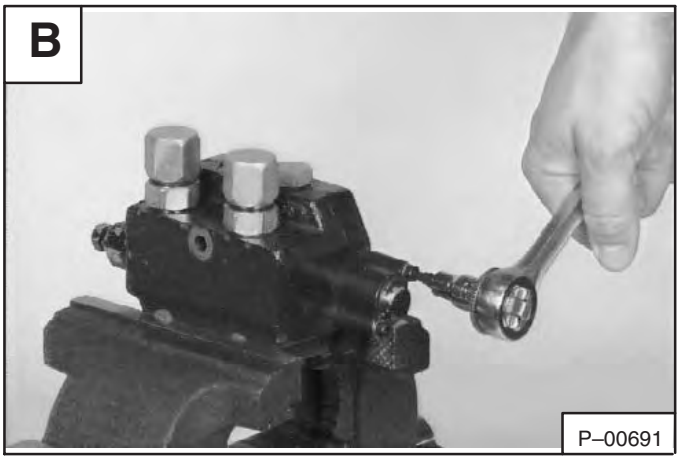
The spool and the housing are not serviceable separately The spool does not need tobe removed from the housing except to clean oil passages if contamination is found. If the spool is removed, use care not to scratch the spool surface and Do Not intermix the spools and the housing.

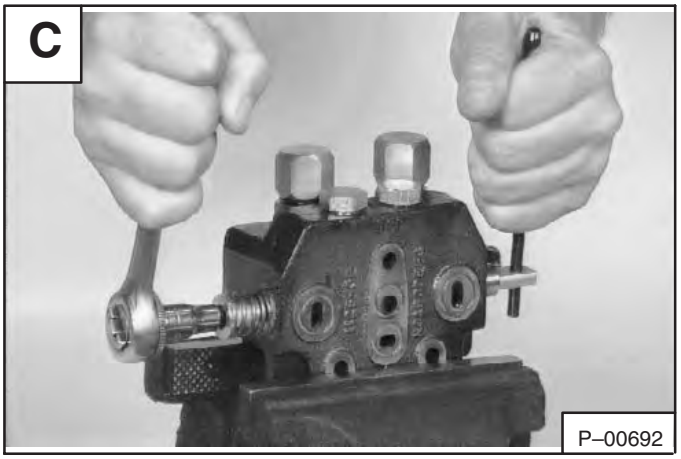
Pull the spool into the housing far enough to remove the spool O–ring from the bore in the valve section **[D]**.

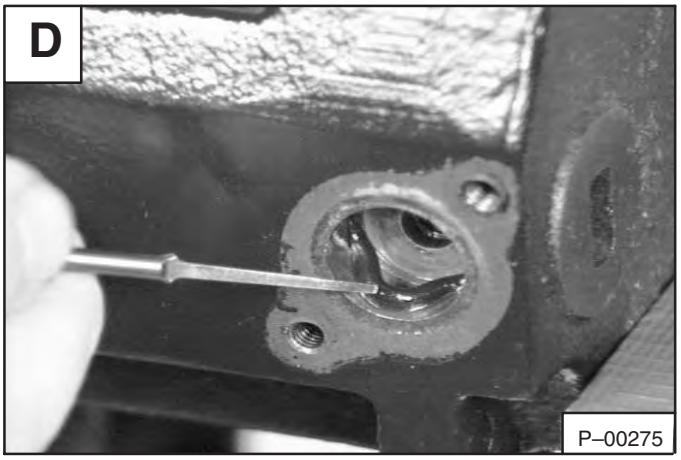
Use a brass tool to remove the O–ring. Do Not scratch the bore of the valve section while removing the O–ring or leakage may occur.

Check the O–ring gland for contamination and clean as necessary.









HYDRAULIC CONTROL VALVE (3–Spool) DUKES VALVE (S/N 511720001–511721411)

Removal And Installation

IMPORTANT

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

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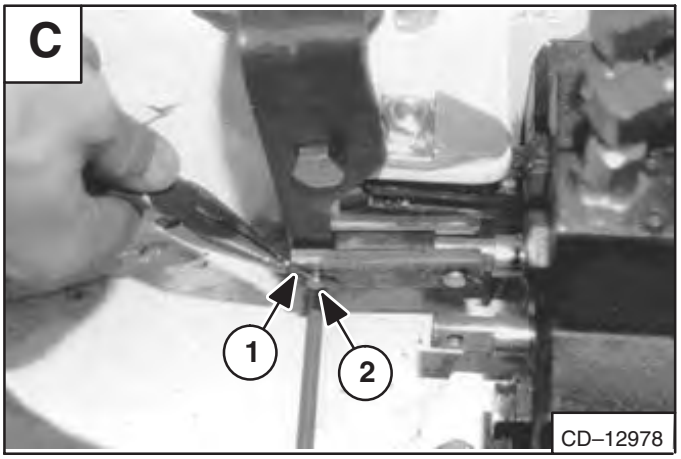
Remove the floor panels. (Page 3–1.)

Mark all the hose and tubelines for correct installation.

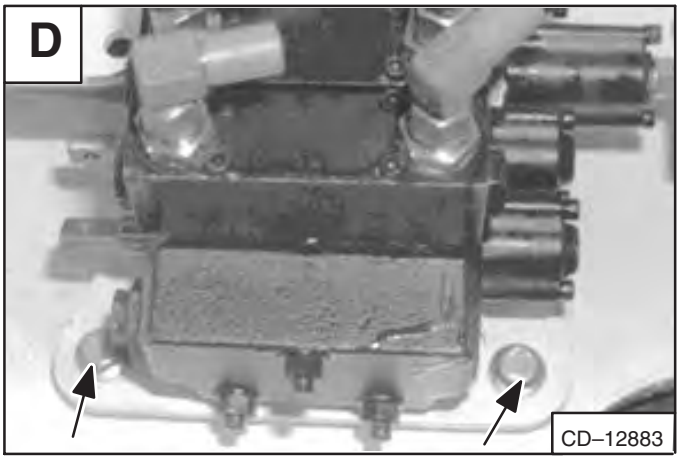
Disconnect all hoses and tubelines from the top of the control valve **[A]**.

Disconnect the two pilot tubelines from the control valve and the bulkhead elbows **[B]**.

Remove the two cotter pins (Item 1) **[C]** and the clevis pins (Item 2) **[C]** from the valve spools.



Remove the three bolts holding the valve mounting plate to the frame **[D]**.



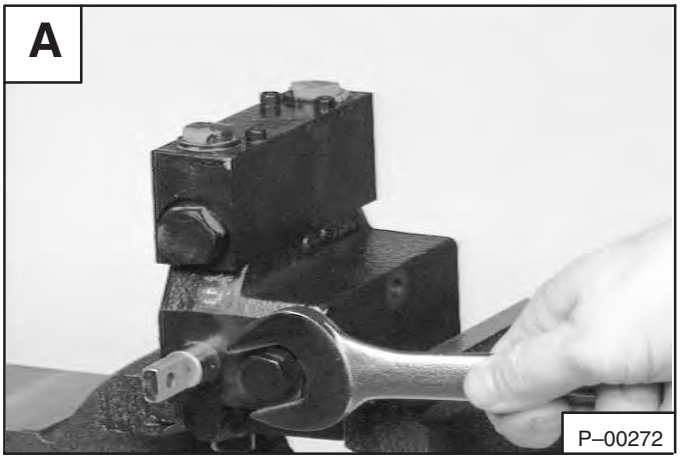
HYDRAULIC CONTROL VALVE (3–Spool) DUKES VALVE (S/N 511720001–511721411) (Cont'd)

Build–Up Valve

Remove the build–up valve from the valve **[A]**.

Installation: Tighten the build–up valve to 20–25ft.–lbs. (27–34 Nm) torque.

NOTE: If the control valve assembly is not being disassembled, plug the build–up port to avoid contamination.



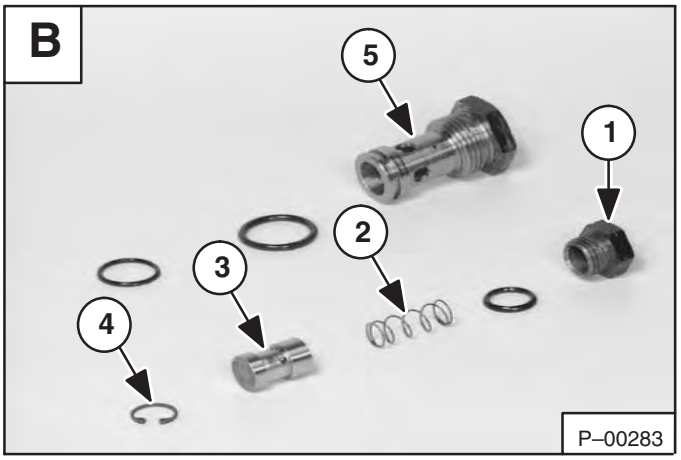
Remove the end plug (Item 1) **[B]**, spring (Item 2) **[B]**, piston (Item 3) **[B]** and the snap ring (Item 4)**[B]** from the build–up housing (Item 5) **[B]**.

Remove and discard the O–rings.

NOTE: The build–up piston (Item 3) [B] should not be disassembled as it is factory set and cannot be reset.

Clean all parts in solvent and dry.

Inspect all parts for wear or damage, if damage is found order a new build–up valve assembly from Melroe Parts.



Assembly

Reassemble parts in reverse order.

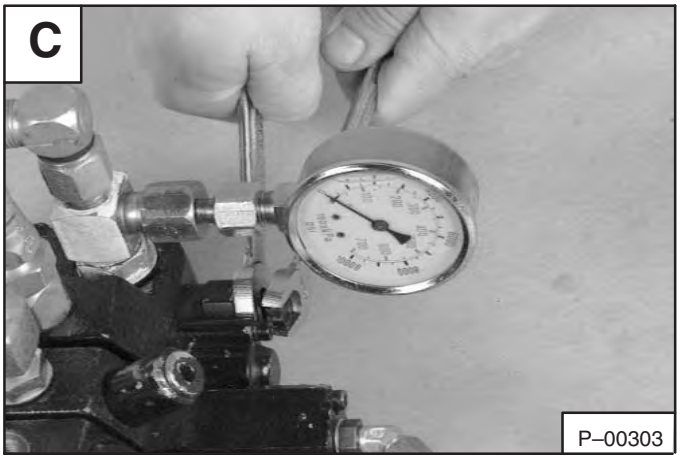
Apply oil to the new O–ring before installing.

Testing Procedure:

Install a gauge (5000 PSI minimum) into the pressure circuit at the valve **[C]**.

Start excavator and run engine at idle.

The build–up valve must develop 200 PSI (271 Nm)back pressure to charge the accumulator. The build–up valve is not field adjustable, if back pressure is wrong, order a new build–up valve from Melroe Parts.

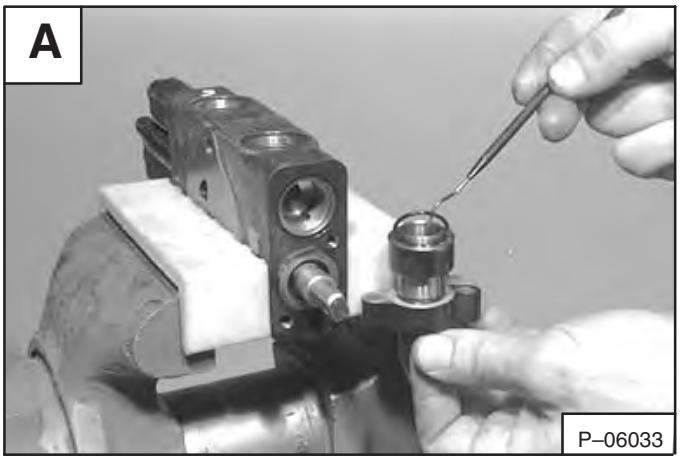


HYDRAULIC CONTROL V ALVE (6–Spool) HUSCO VALVE(S/N 511721412 & Above) (Cont'd)

Boom, Bucket & Arm Section (Cont'd)

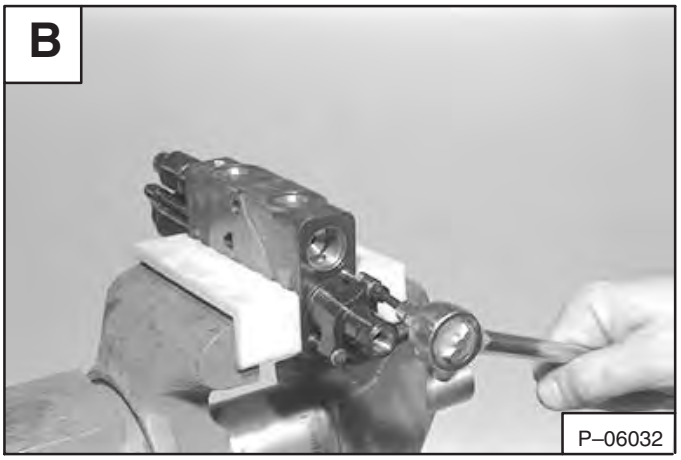
Assembly (Cont'd)

Apply oil to and install a new O–ring on the end cover for the actuating end of the valve section **[A]**.



Install the end cover, the end cover retaining plate and the screws **[B]**.

Tighten the screws to 6–9 ft.–lbs. (8–10 Nm) torque.



MAIN RELIEF VALVES HUSCO VALVE (Cont'd)

Adjusting The Main Relief Valves

Install the control valve into the excavator.

Install all hoses and tubelines.

Install all the control linkages.

Test the relief valve pressure setting per information on Page 2–6.

If the relief valves need to be adjusted do the following:

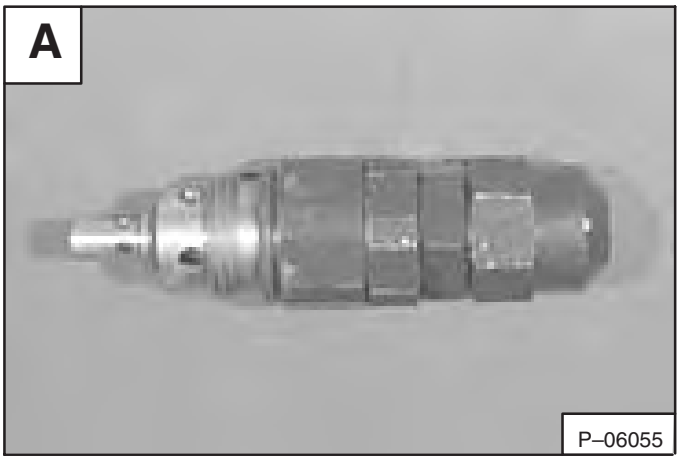
Remove the end cap.

Loosen the lock nut on the relief valve adjusting screw . Turn the adjusting screw clockwise to increase the pressure, counterclockwise to decrease the pressure.

When the correct pressure setting is obtained, tighten the lock nut while holding the adjusting screw from turning.

Recheck the gauge reading after tightening the lock nut to assure that the correct setting has been maintained. Tighten the lock nut to 16–20 ft.–lbs. (21–26 Nm) of torque.

Install and tighten end cap to 16–20 ft.–lbs. (21–26 Nm) of torque.



HYDRAULIC CONTROL V ALVE (3–Spool) HUSCO VALVE (S/N 511721412 & Above) (Cont'd)

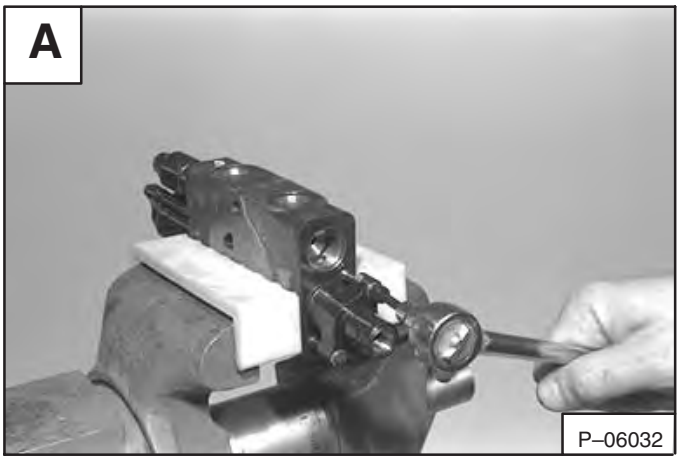
Swing Motor Valve Section (Cont'd)

Assembly (Cont'd)

Install the end cover and plate.

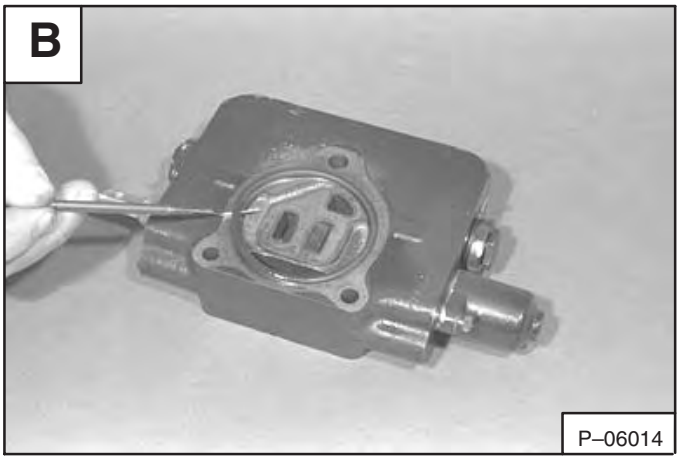
Install the two screws **[A]**.

Tighten screws to 6–8 ft.–lbs. (8–11 Nm) of torque.



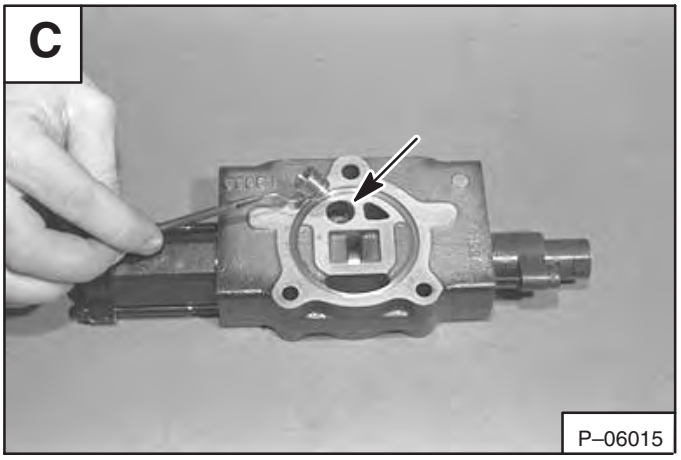
Assembly

Put oil on the new O–rings and install the O–rings on to the face of each valve section **[B]**.

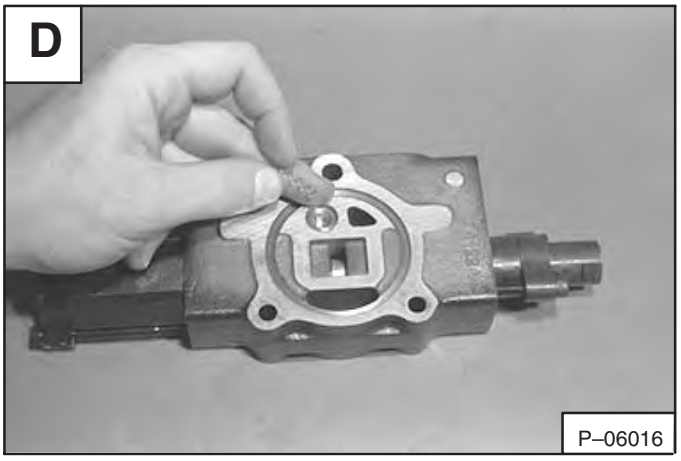


Install the load check valve into the swing motor valve section **[C]**.

NOTE: The open end of the poppet faces up.



Install the spring into the poppet **[D]**.

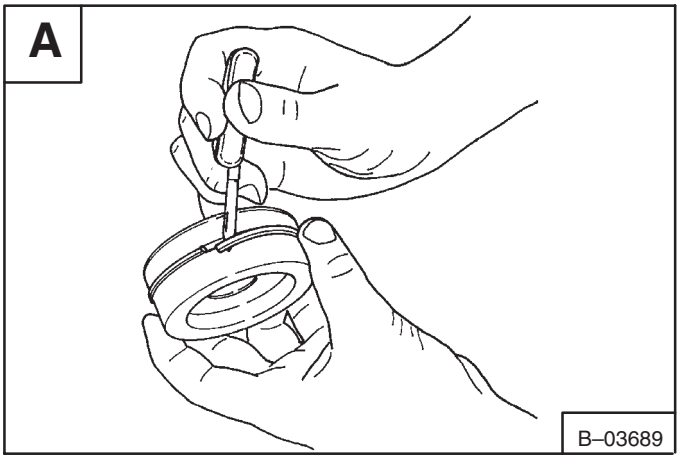


HYDRAULIC CYLINDER (Cont'd)

Disassembly (Cont'd)

For Piston With Single Ring Groove

Cut the old teflon seal and remove the seal from the piston **[A]**.

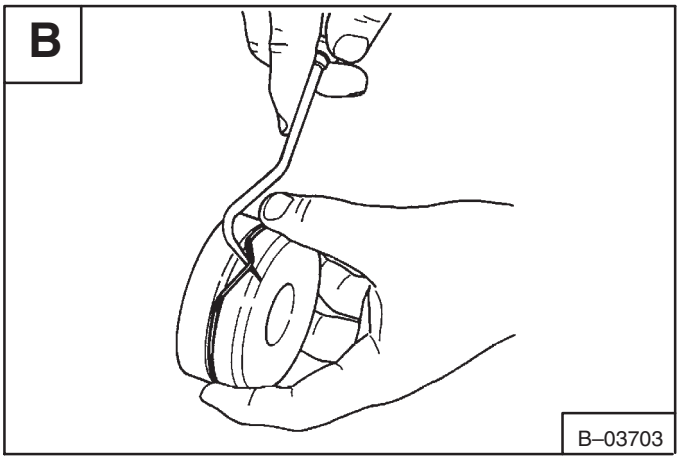


Remove the O–ring from the piston **[B]**.

Wash the cylinder parts in solvent and air dry them.

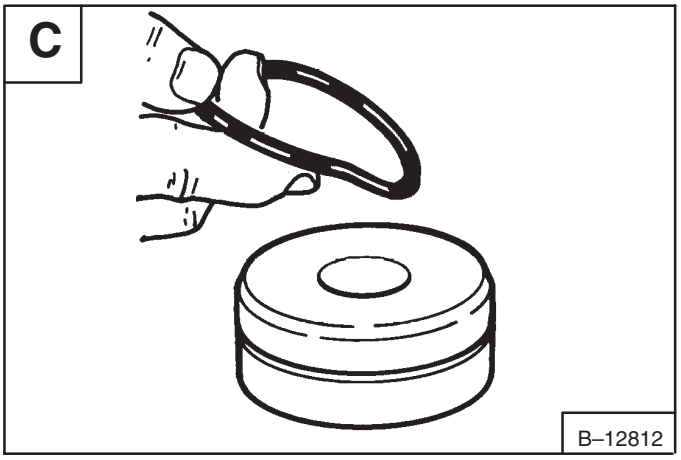
While servicing the cylinder do not damage the parts. Inspect for nicks, scratches or otherwise damaged or bent parts before assembling the cylinder. Replace parts that appear damaged in any way. The cylinder may not function correctly if there is damage to any of the parts.

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



Assembly

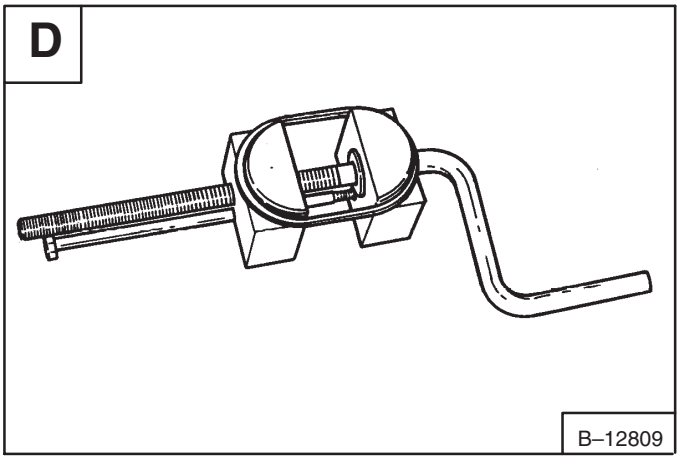
Install the O–ring on the piston **[C]**.



NOTE: Do not overstretch the seal.

Install the seal on the tool (MEL1396) and stretch it until it fits the piston **[D]**.

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



JOYSTICK MANIFOLD WITH ACCUMULA TOR (Cont'd)

Disassembly And Assembly

Remove the solenoid coil nut (Item 1) **[A]**.

Remove the solenoid coil (Item 2) **[A]**.

Remove the solenoid (Item 3) **[A]**.

Installation: Tighten solenoid to 10–12.ft.–lbs. (13–16 Nm) torque.

Remove the pressure reducing valve (Item 4) **[A]**.

Installation: Tighten pressure reducing valve to 10–12 ft.–lbs. (13–16 Nm) torque.

Remove the accumulator (Item 5) **[A]**.

Remove the adapter (Item 6) **[A]**.

Remove the check valve plugs (Item 7) **[A]**.

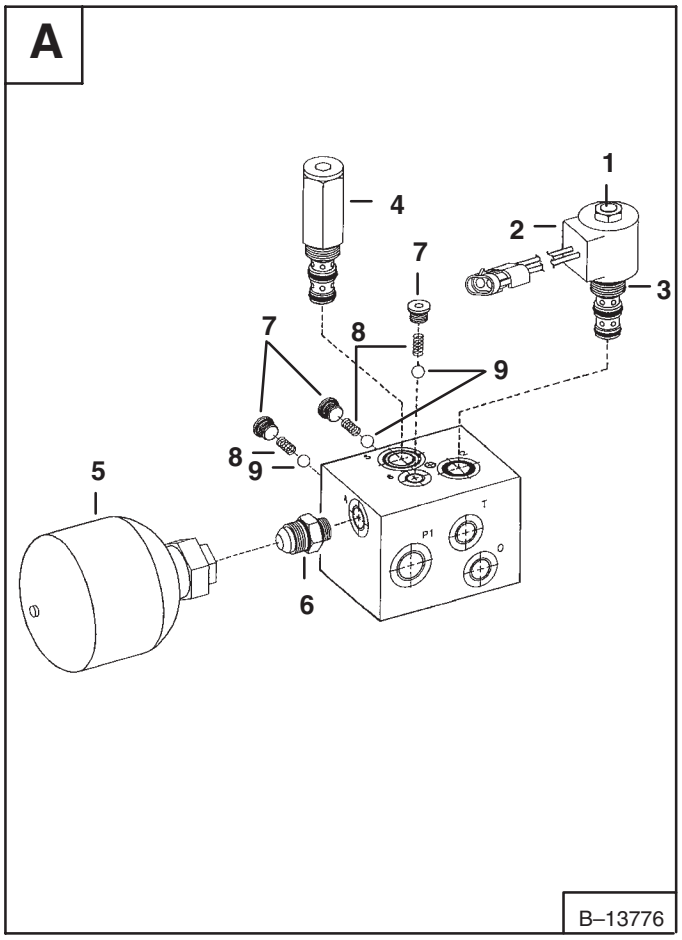
Remove the check valve springs (Item 8) **[A]**.

Remove the check balls (Item 9) **[A]**.

Clean all parts in solvent and dry.

Inspect the check balls for wear and replace as necessary.

Remove O–rings and back–up ring and replace with new



LEFT CONTROL CONSOLE (Cont'd)

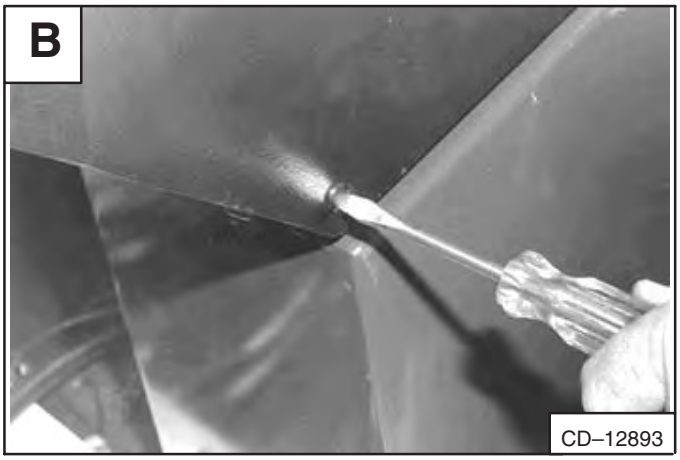
Console Cover Removal and Installation

Lower the blade and the boom to the ground.

Disconnect the battery negative (–) cable. (See Page 6–3.)

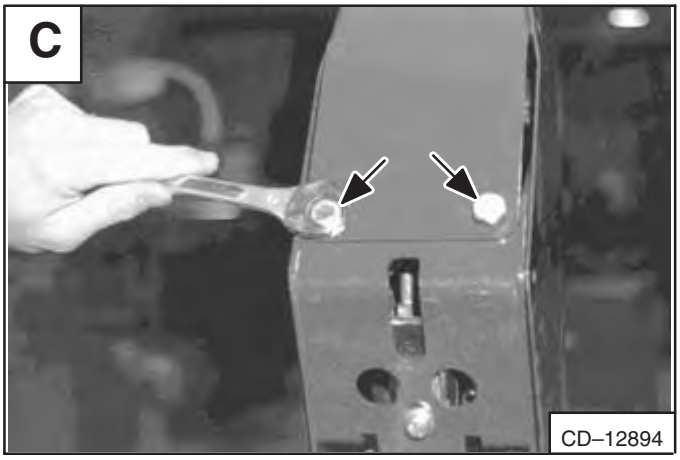
Remove the latch knob **[A]**.

Remove the eight screws from the console cover **[B]**.



Tilt the console up.

Remove the two bolts holding the access plate **[C]**.



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

LOCK LEVER (Cont'd)

Left Hand Removal and Installation (Cont'd)

Push down on the console to remove the gas spring pressure on the latch.

Pull the actuating rod forward to release the console latch and tilt the console up.

Remove the two bolts holding the console lock latch **[A]**.

Installation: Tighten the bolts to 15–18 ft.–lbs. (20–25 Nm) torque.

Remove the actuating rod and the lock latch with the microswitch **[B]**.

NOTE: See Page 3–3 for microswitch removal and testing.

Adjustment Procedure

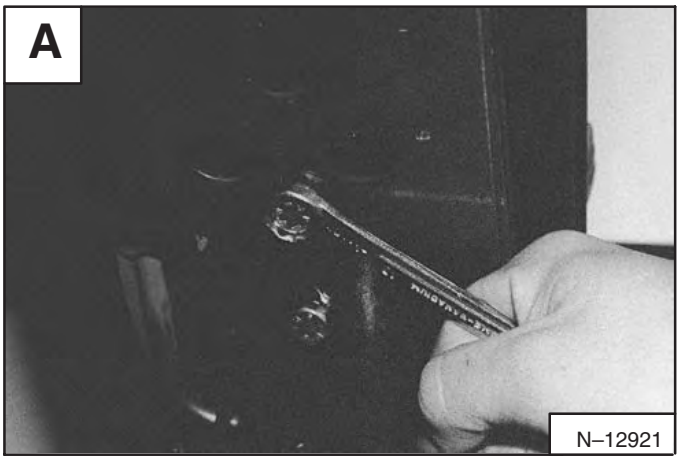
NOTE: Before the lock lever adjustments can be made, the microswitch must be moved to the top of the adjustment slots. Switch damage may occur if this is not done prior to lock lever adjustment.

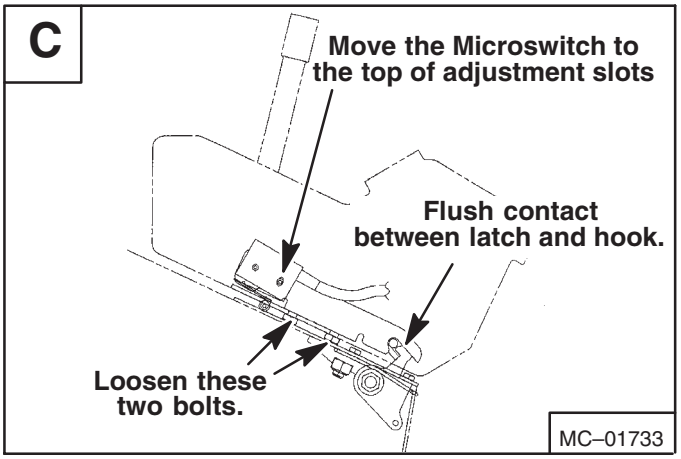
Loosen the two bolts that hold the lock latch to the console **[A]**. (These bolts should be loosened so that the lock latch will not move when the control console is closed but loose enough so that the bolt heads can be tapped with a punch to move the latch fore and aft for proper adjustment.)

Close the control console to latched position.

Push down on the console to remove the gas spring pressure.

Adjust the latch until the spring loaded hook will just make contact with the lock latch when the console is closed **[C]**.



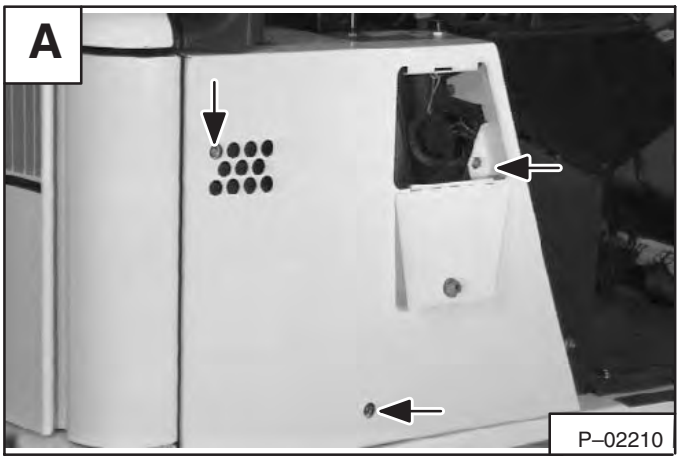


Control Console Removal and Installation (Cont'd)

Remove the right hand side cover by opening the hydraulic fill door and removing the four bolts **[A]**.

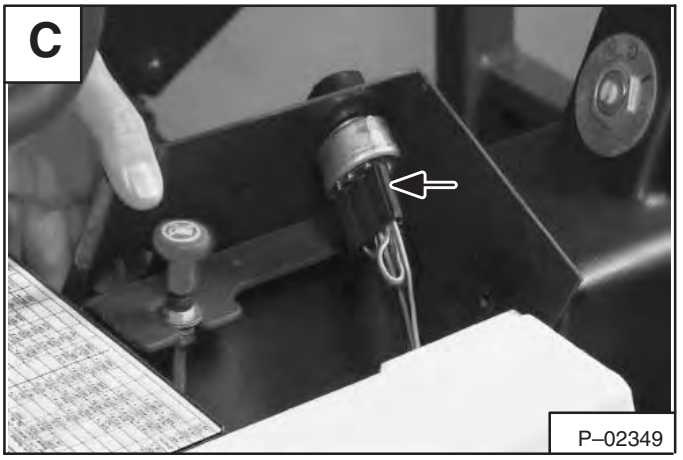
Slide the cover out from the frame and remove.

Installation: Tighten the bolts to 14–18 ft.–lbs. (20–25 Nm) torque.



Remove the screw from the right hand cover **[B]**.

Lift the right hand cover and remove the light switch harness **[C]**.

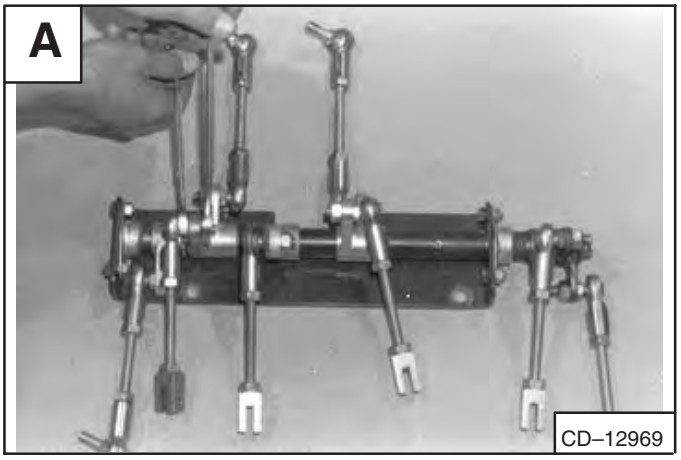


ROCKERSHAFT (Cont'd)

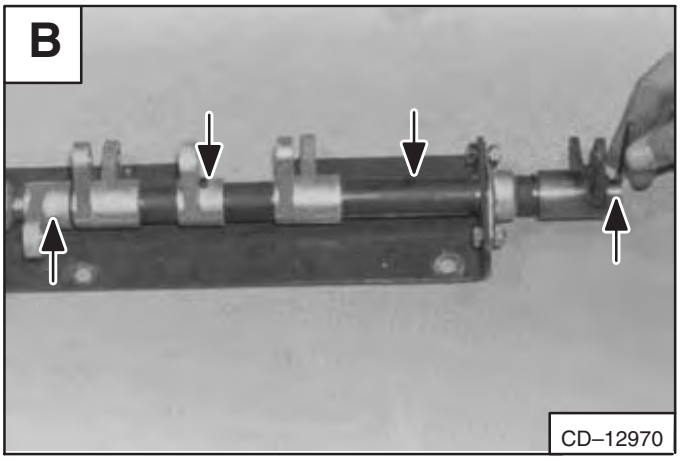
Removal and Installation (Cont'd)

Mark the linkage rods and their orientation in the bellcranks for ease of assembly.

Remove the nuts from the linkage ball joints and remove the linkages **[A]**.

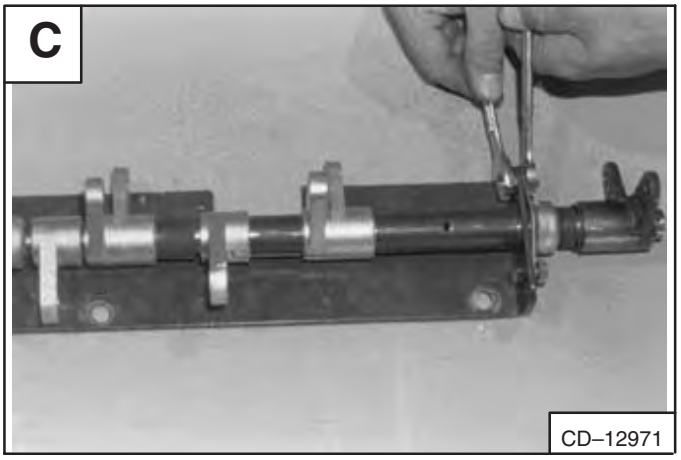


Remove the four roll pins from the rockershaft **[B]**.



Remove the four bolts and nuts from the bearings **[C]**.

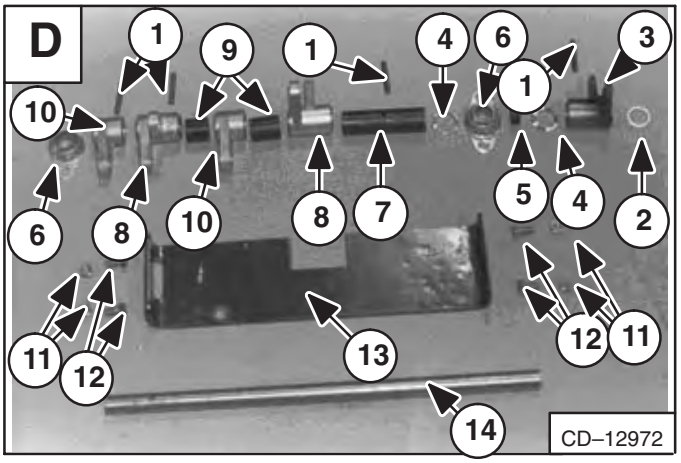
Installation: Tighten the bolts to 15–18 ft.–lbs. (20–25 Nm) torque.



Disassemble the rockershaft **[D].** Roll pin (Item 1), washers (Item 2), bellcrank (Item 3), wave washer (Item 4), spacer (Item 5), bearing (Item 6), spacer (Item 7), bellcrank (Item 8), spacer (Item 9), bellcrank (Item 10), nut (Item 11), bolt (Item 12), mounting plate (Item 13) and rockershaft (Item 14).

NOTE: The wave washers (Item 4) [D] are used in quantities as required. Replace the wave washers in the same locations as originally removed. Test the rockershaft after assembling to make sure the shaft rotates smoothly and without excessive side play.

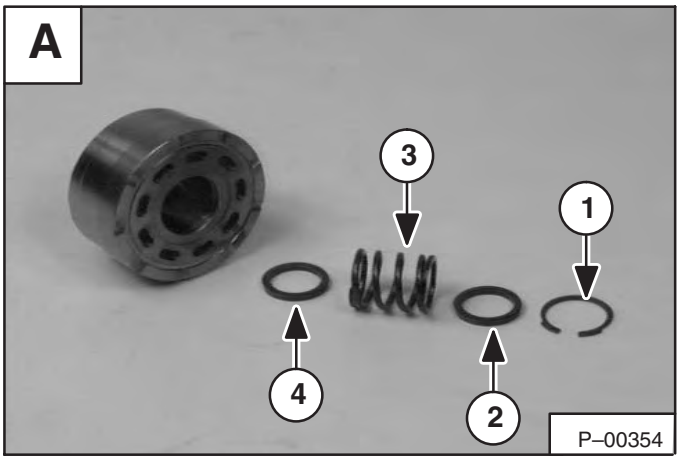
NOTE: Bellcranks (Item 8) [D] have replaceable bushings pressed into each end.



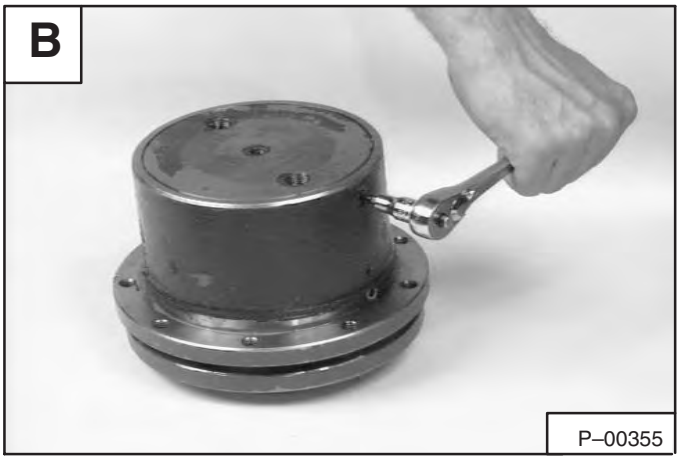
DRIVE MOTOR (Kayaba) (S/N 51 1720001 – 23974) (Cont'd)

Disassembly (Cont'd)

Remove the snap ring (Item 1) **[A]**, collar (Item 2) **[A]**, spring (Item 3) **[A]** and the collar (Item 4) **[A]** from the piston housing.

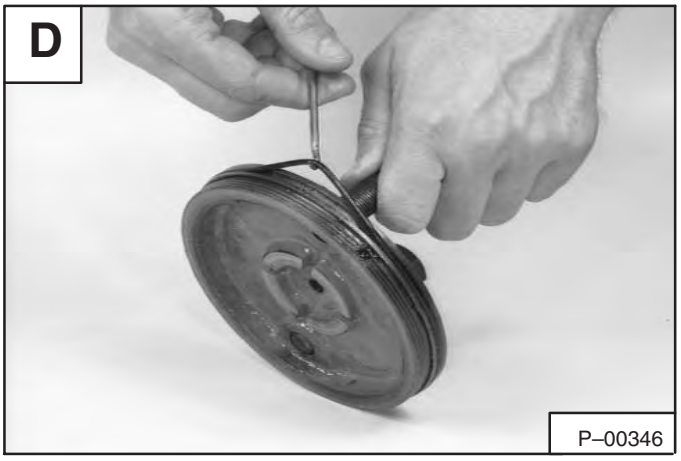


Turn the motor over and remove the end cap retaining plug from the side of the housing **[B]**.



Install two 3/8 PT metric bolts (or eye bolts) into the drain plug holes. Use a bar between the bolts (or through the eyebolts) and turn the cover counterclockwise and remove the cover **[C]**.

Remove the O–ring from the end cover **[D]**.

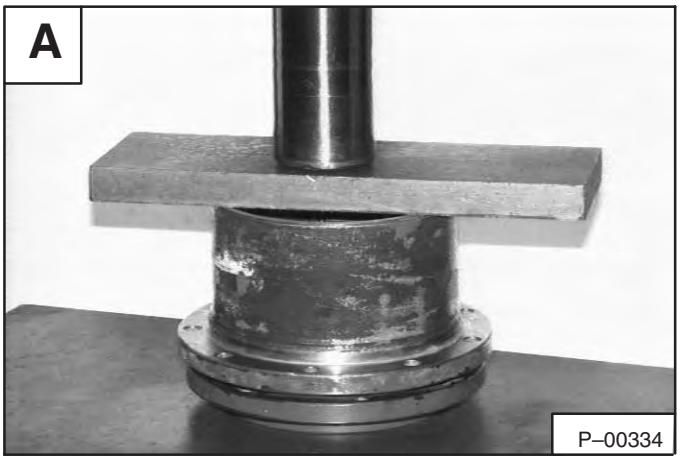


DRIVE MOTOR (Kayaba) (S/N 51 1720001 – 23974) (Cont'd)

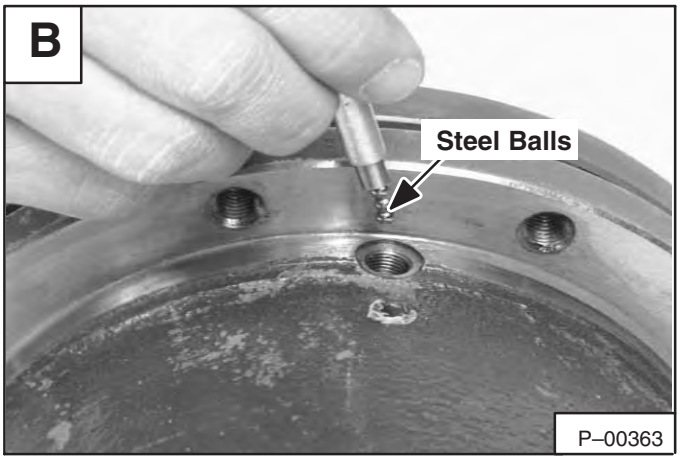
Assembly (Cont'd)

Install the housing onto the hub and press into position **[A]**. The housing must be pressed onto the hub until the groove in the bearing is centered in the hub plug hole.

NOTE: Make sure that the housing is pressed squarely onto the hub so that the planetary gears do not shave metal off of the housing splines. If this happens the housing and the planetary gears will be damaged.

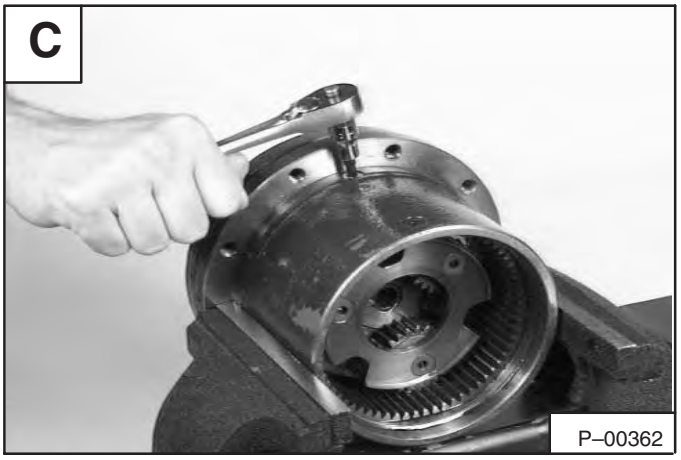


Clamp the hub and housing in a vise with the hole plug facing up. Tighten the vise until the ball groove is in the center of the plug hole and insert the 109 steel balls into the hole in the side of the hub **[B]**.



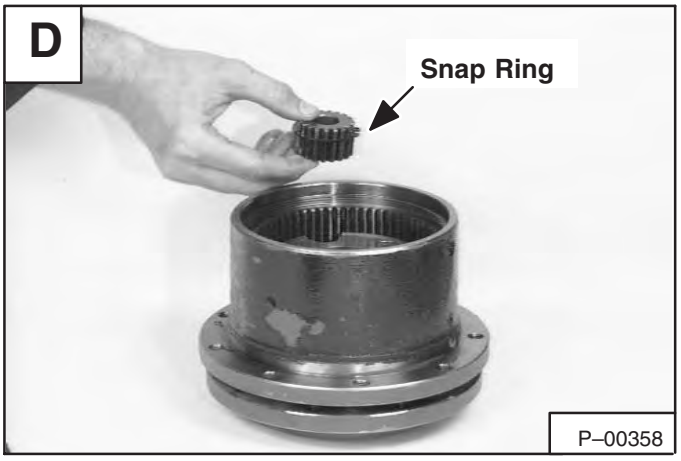
Install the plug into the hub **[C]**.

Tighten the plug to 5–6 ft.–lbs. (7–9 Nm) torque.



Install the snap ring onto the gear hub (if previously removed) and install the gear hub intothe planetary gear assembly **[D]**.

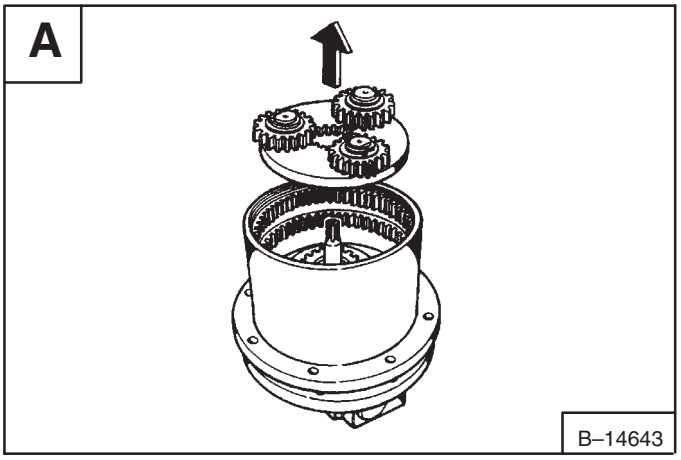
NOTE: The gear hub must be installed with the narrow section of the gear upwards (when viewed using the snap ring as the dividing line).



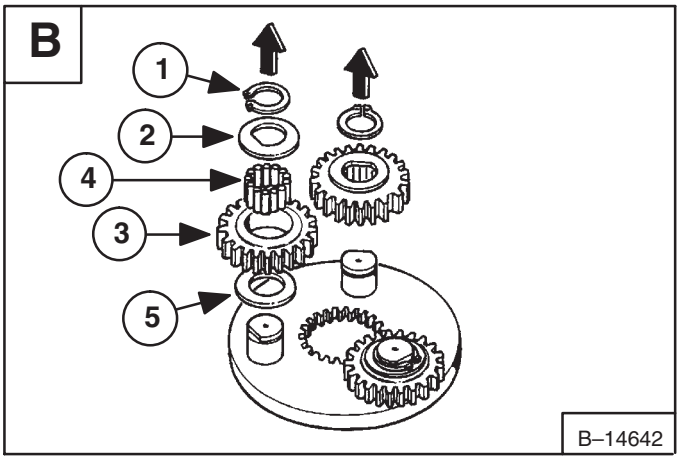
DRIVE MOTOR (SOM) (S/N 23975 & Above) (Cont'd)

Disassembly (Cont'd)

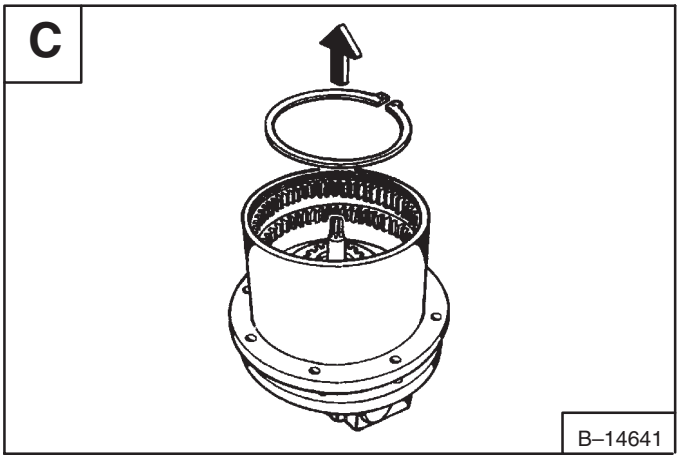
Remove the planetary carrier **[A]**.



Remove the snap rings (Item 1) **[B]**, anti–rotation washers (Item 2) **[B]**, gears (Item 3) **[B]**, bearings (Item 4) **[B]** and bottom thrust washers (Item 5) **[B]** from the planetary carrier assembly.

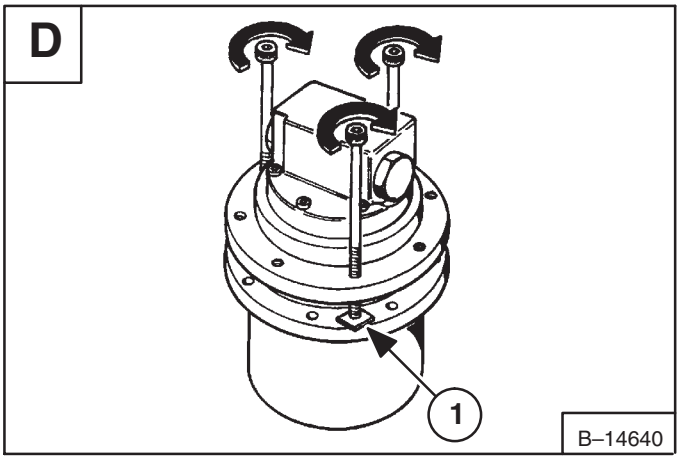


Remove the external snap ring from the hub to free the two bearings, ring gear and motor **[C]**.



Install three 10 mm bolts thru the hub mounts, and tighten to separate the hub and ring gear assembly.

NOTE: Place a piece of scrap metal (Item 1) [D] in between the bolt and ring gear flange to prevent damage to the flange when tightening the bolts.



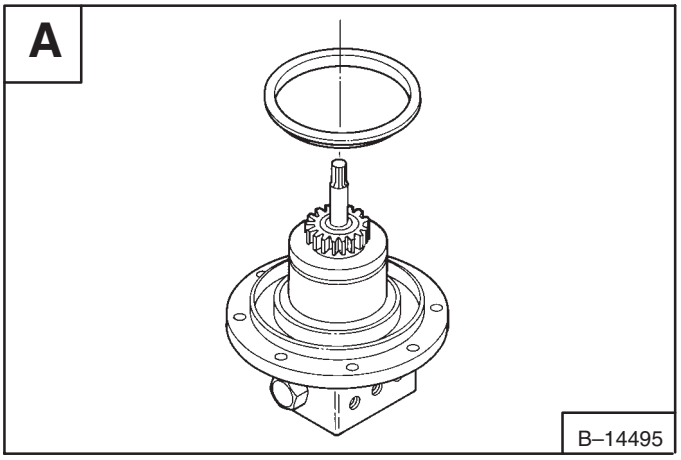
DRIVE MOTOR (SOM) (S/N 23975 & Above) (Cont'd)

Assembly (Cont'd)

The seal ring assembly must be lubricated with alcohol, so the O–ring will slip past the housing retaining ring and seal uniform in the motor housing radius **[A]**.

The O–ring on the seal ring assembly must belubricated with alcohol.

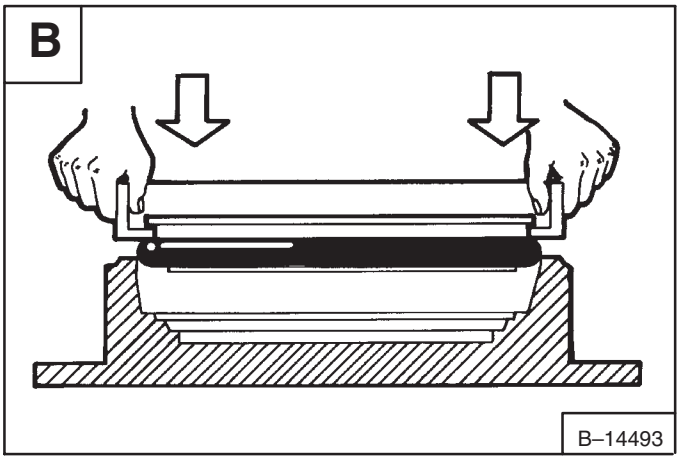
This will allow the O–ring to slide on the motor housing sealing surface without twisting **[A]**.



Dip the O–ring and seal ring assembly in a pan of alcohol.

Shake off the excess alcohol and install the seal ring assembly on the motor **[B]**.

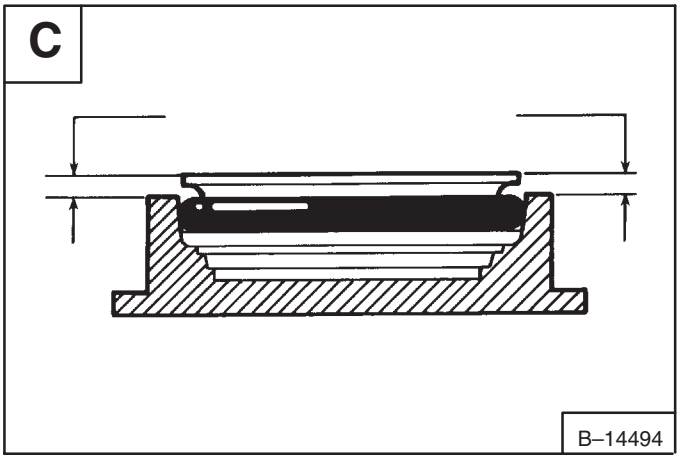
Use firm even pressure on the installation tool (MEL1468) to *pop* the O–ring into the motor housing.



After the seal ring is installed, check the stand out height **[C]** in four places, 90° apart.

The stand out height is .30 ± .02" (7.7 ± 6 mm).

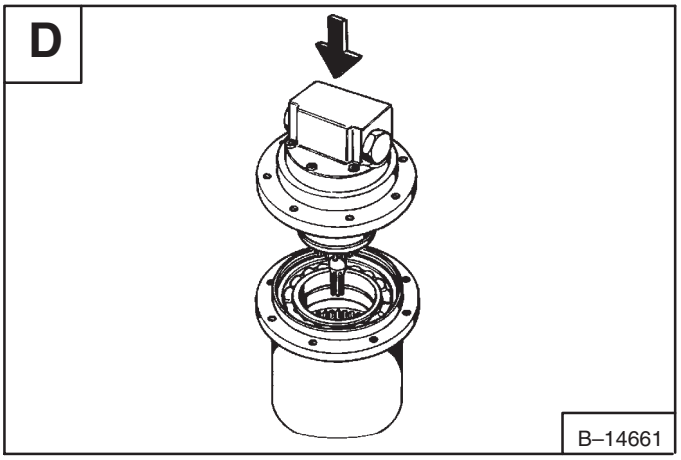
NOTE: If the seal ring does not meet the height specifications inspect the torque ring for twists or obvious bulges.



Apply a light film of oil to the seal ring and lapped face of the bearing.

NOTE: Do not get any oil on the O–ring.

Press the reduction unit and motor assembly into the seat of the bearings **[D]**. The inner bearing may move deeper into the housing as the motor assembly is pressed into the housing. If this happens, press the inner bearing down to its original position.



UPPER WORKS AND SWING SECTION

UPPERSTRUCTURE (Cont'd)

Installation

Attach a lifting hoist to the upperstructure per the information on the previous page.

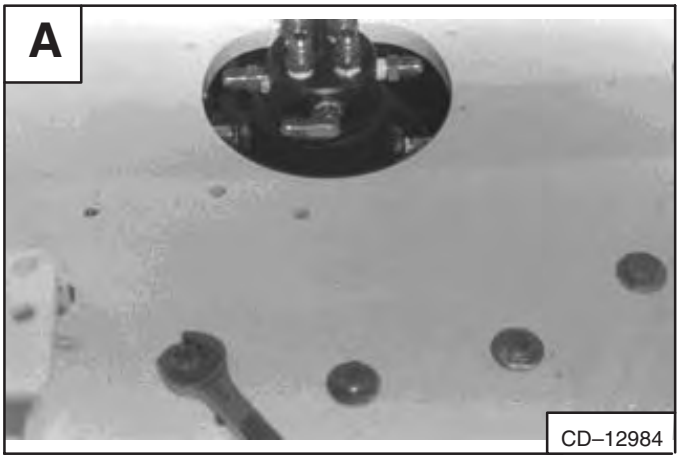
Lower the frame onto the swing bearing. Maintain a slight amount of frame weight on the hoist.

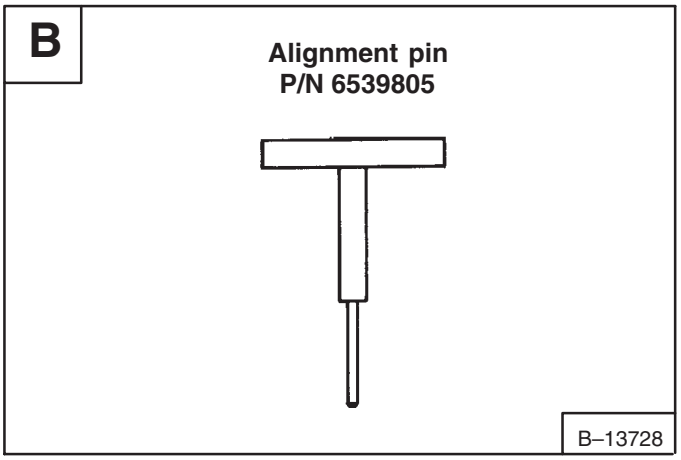
Remove any paint from the three alignment pin holes in the frame.

Apply LOCTITE 242 to the threads of the mounting bolts.

Install the sixteen bolts and washers through the frame and into the swing bearing **[A]**.

DO NOT tighten the bolts at this time.





Insert the three alignment pins (P/N 639805) into the alignment holes **[C]**.

Reposition the frame as necessary until the alignment pins will slide through the frame and into the teeth of the swing bearing.

With the pins installed, lower the frame onto the swing bearing and remove the hoist.

Tighten the bolts to 44–47 ft.–lbs. (60–65 Nm) torque.

Remove the alignment pins.

Do the following procedure to check for proper swing motor gear to swing bearing gear back lash.

Install the swing motor (Item 1) **[D]** into the frame.

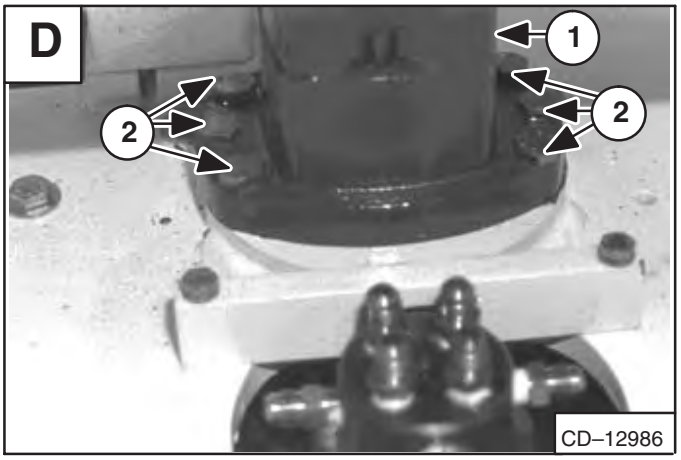
Apply LOCTITE 242 to the threads of the six bolts (Item 2) **[D]** and install.

Tighten these bolts to 29–37 ft.–lbs. (40–50 Nm) torque.

Remove the caps and/or plugs from the swing motor but do not install any hoses.

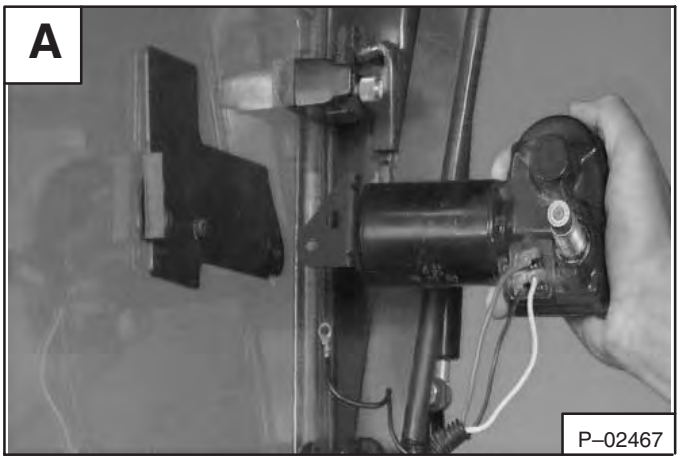
The swing motor gear to the swing bearing gear engagement must be checked to insure that there is back lash between the gears through 360° of frame rotation.

Check for back lash by moving the frame back and forth at several points throughout the frames rotation. There must be some backlash present.



Front Window (Removal And Installation) (Cont'd)

Remove the wiper motor from the window. Mark the wires for ease of assembly and remove the wires from the wiper motor **[A]**.

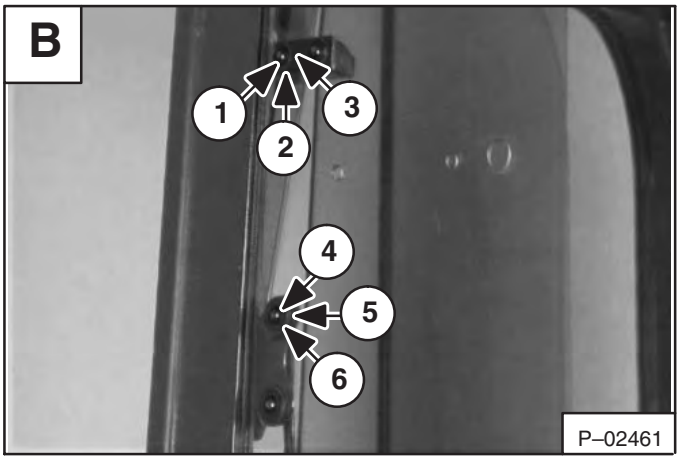


Remove the mounting screws (Item 1) **[B]**, washers (Item 2) **[B]** and the grommet (Item 3) **[B]** from the four (4) latches.

Installation: Tighten the mounting screws to 10 in–lbs. (1,1 Nm) torque.

With the help of a second person, use the window handles to hold the window in position and remove the mounting screws (Item 4) **[B]**, washers (Item 5) **[B]**, grommets (Item 6) **[B]** and the nuts form the window pivot mounts.

Installation: Tighten the mounting screws to 30 in–lbs. (3,4 Nm) torque.

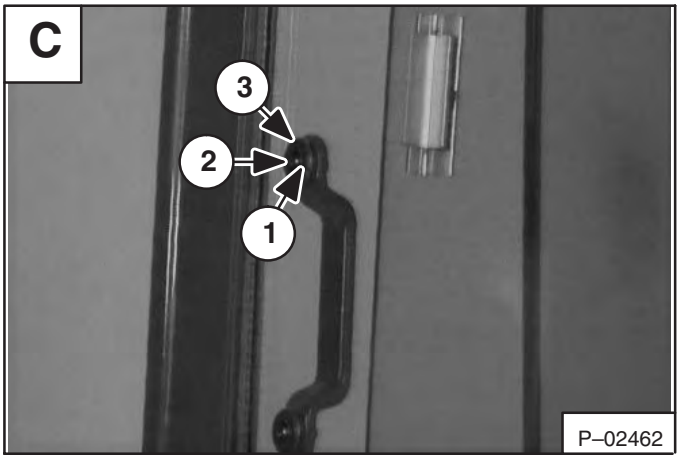


Remove the glass.

Remove the window seal from the outer edge of the glass.

Remove the mounting screws (Item 1) **[C]**, washers (Item 2) **[C]**, grommets (Item 3) **[C]** and the nuts from the two (2) window handles.

Installation: Tighten the mounting screws to 30 in.–lbs. (3,4 Nm) torque.



SPEED CONTROL LEVER/SWING LOCK LEVERAND MOUNTING

Removal and Installation

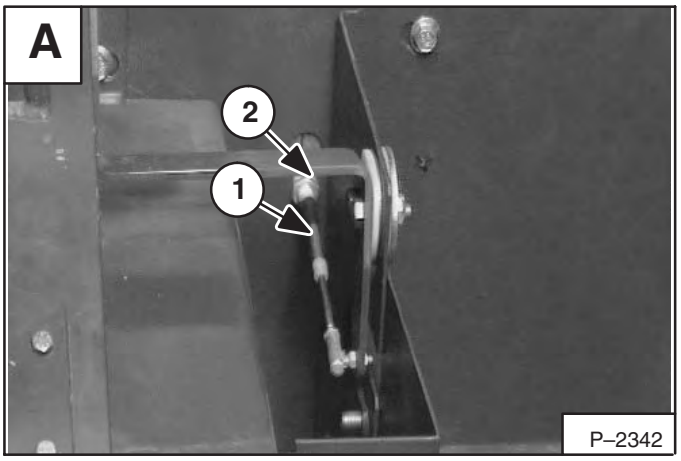
Remove the seat. (See Page 5–2.)

Remove the seat mount. (See Page 5–2.)

Disconnect the speed control cable (Item 1) **[A]** from the ball joint.

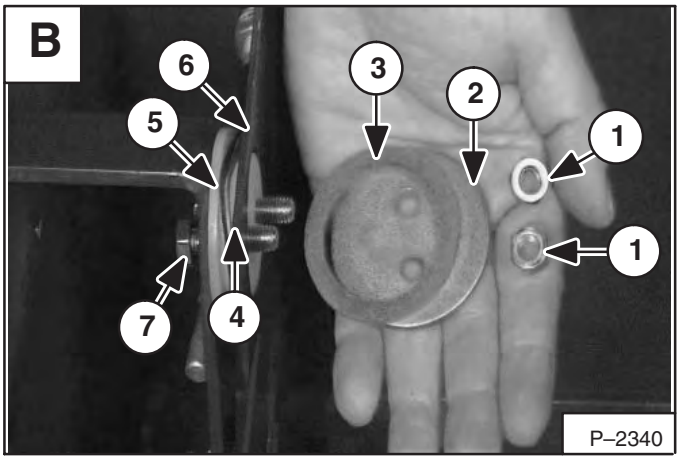
Loosen the jam nut (Item 2) **[A]** on the speed cable at the engine cover.

Push the cable through the engine cover hole and out of the way.



Remove the two (2) nuts (Item 1) **[B]**, the washer (Item 2) **[B]**, the friction washer (Item 3) **[B]**, the two wave washers (Item 4) **[B]**, the nylon spacer (Item 5) **[B]**, the lever (Item 6) **[B]** and the two (2) bolts (Item 7) **[B]**.

Installation: Tighten the locknuts (Item 1) **[B]** until approximately 15 lbs. (66 N) of force is needed to move the speed control lever.

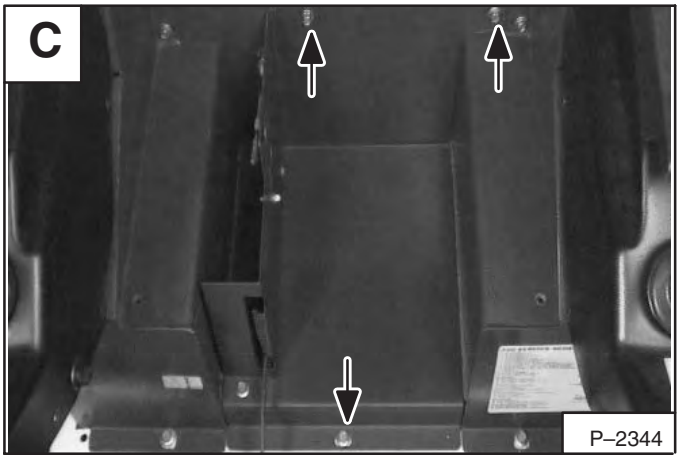


Remove the three (3) bolts from the seat mount **[C]**.

Installation: Tighten the bolts to 28–37 ft.–lbs. (40–50 Nm) torque.

Remove the mounting plate.

NOTE: The speed control lever does not need to be removed to remove the mounting plate.



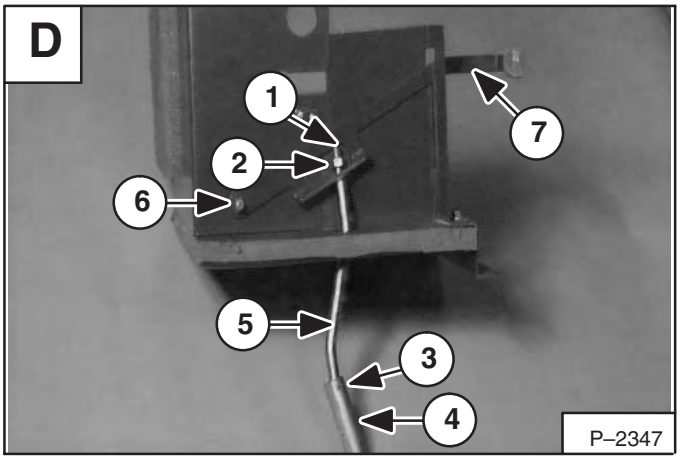
Remove the nut (Item 1) **[D]** and washer (Item 2) **[D]**.

Installation: Tighten the locknut until it contacts the end of threads.

Remove the roll pin (Item 3) **[D]**, lock pin (Item 4) **[D]** and the rod (Item 5) **[D]**.

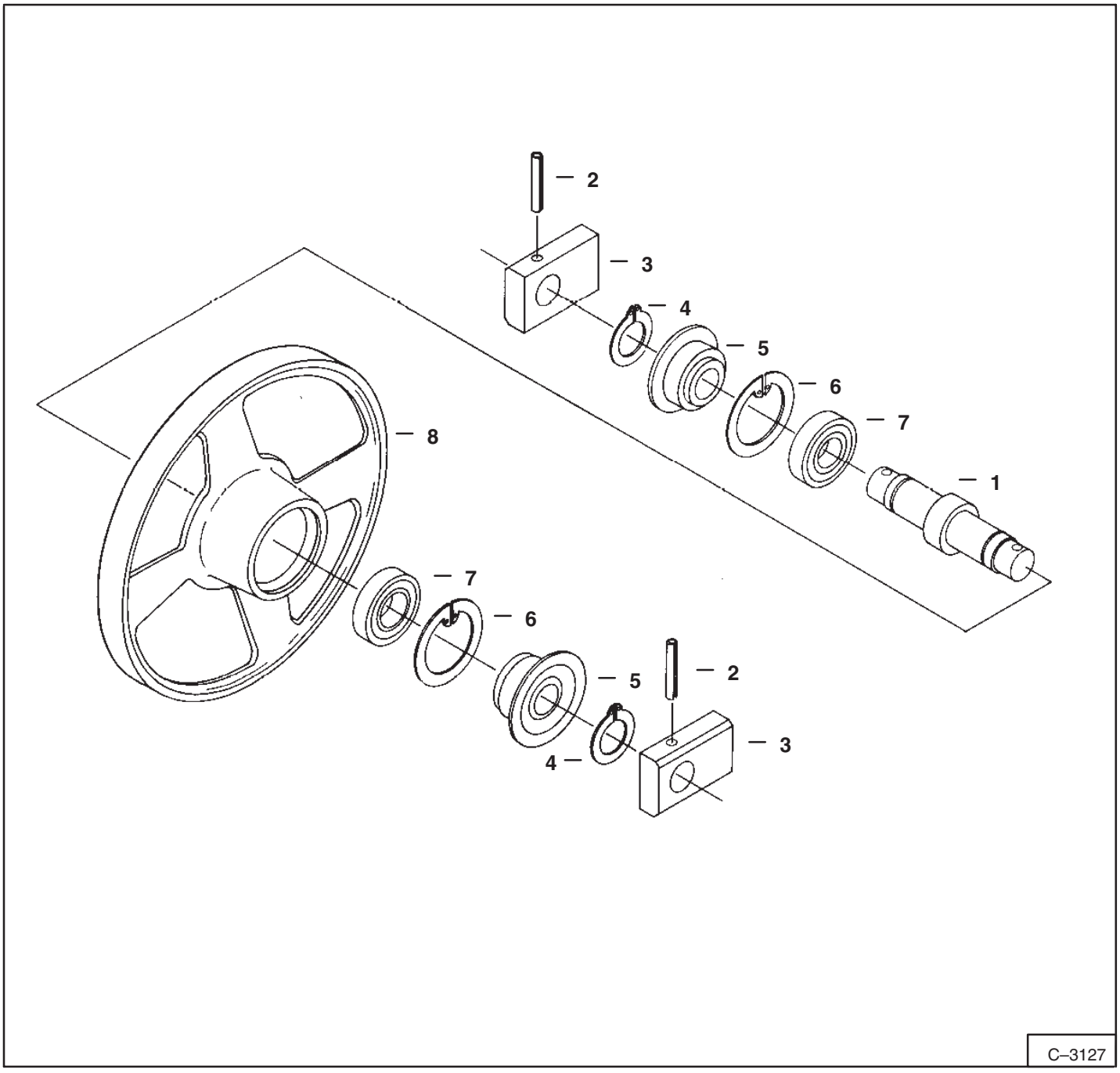
Remove the bolt (Item 6) **[D]** and nut from the lever (Item 7) **[D]**.

Installation: Tighten the bolt and nut until there is very little free play but the lever must not bind against the mounting plate.



TRACK IDLER

Parts Identification



FRONT IDLER

Ref.	Description	Ref.	Description
1.	Shaft	5.	Seal
2.	Pin	6.	Snap Ring
3.	Block	7.	Bearing
4.	Snap Ring	8.	Idler

TRACK ROLLER (Cont'd)

Disassembly (Cont'd)

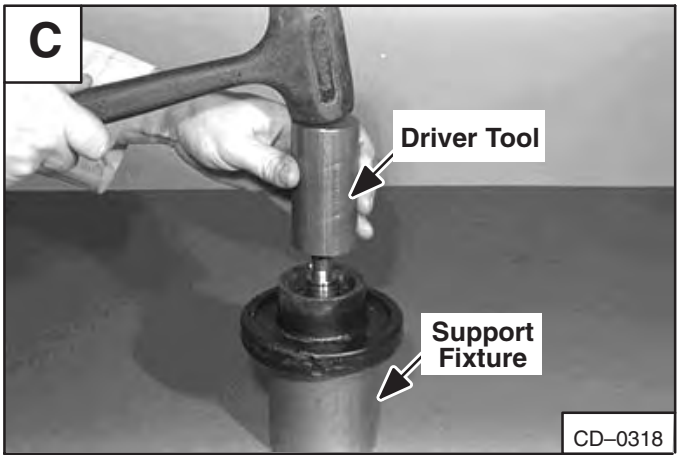
Remove the outer part of the seal from the roller using two screwdrivers **[A]**.

Pour the oil out of the roller. Discard the oil in an appropriate manner.

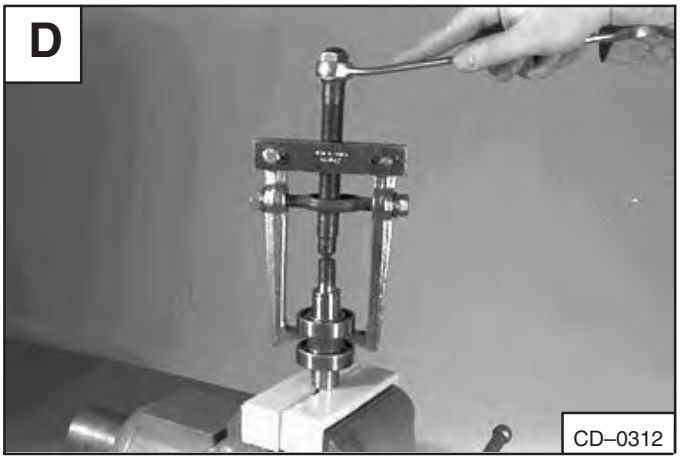
Turn the roller assembly over and removethe other seal.

Remove the snap ring from each side of the roller **[B]**.

Using the fabricated driver tool and support fixture, press or drive the shaft and bearing assembly out of the roller **[C]**.



Inspect the bearings for rust or for rough spots. The bearings must turn freely. If any damage is found, replace the bearings. If replacement of the bearings is necessary, use a two (2) or three (3) jaw puller , remove the two bearings from the shaft **[D]**.



TRACK (Cont'd)

Damage Identification and Causes (Cont'd)

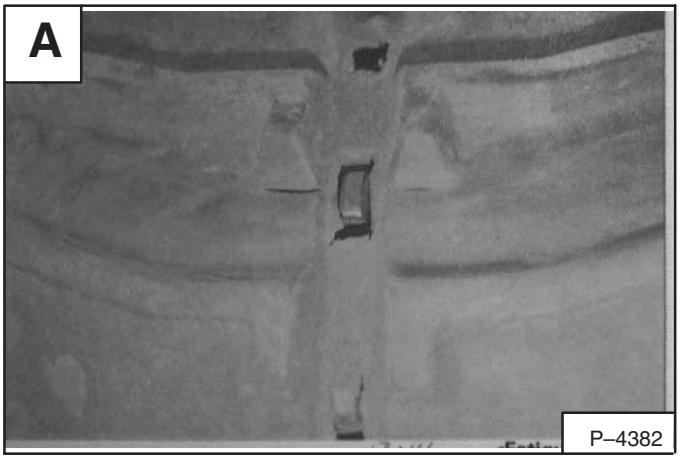
Cracks Of The Lug Side Rubber Due To Fatigue

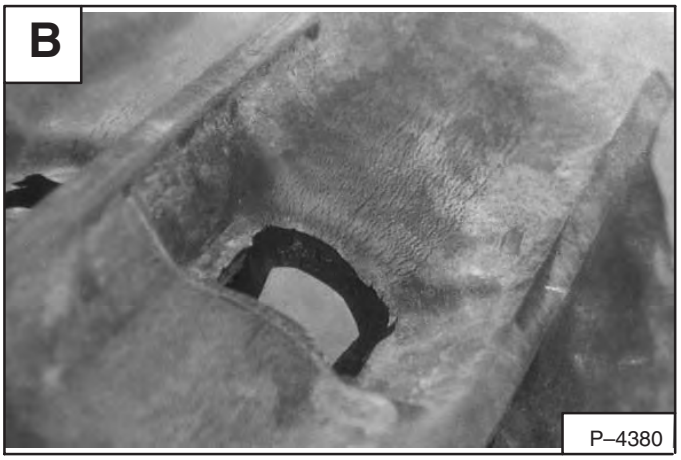
Damage:

Small racks around the root of the lug as a result from operation fatigue **[A]** & **[B]**.

Replacement;

When the cracks reach so deep that they expose the steel cords, track replacement is required.





Causes of the damage:

Because of wound stress applied to rubber tracks around the undercarriage parts during operation, the fatigue especially causes cracks on the lug side rubber surface. Once the cracks occur , they gradually deteriorate with even small external cracks.

Also when operating near seashores or under cold temperatures, rubber tracks are more likely to suffer from ozone cracks.

Prevention:

Rubber tracks are designed with special rubber compounds to prevent cracks due to fatigue. However, external injuries on the lug side rubber sometimes cause more chance of cracking. Machine operators should observe soil conditions when driving, so as not to cause external injuries to the lug side rubber . In order to minimize the occurrence of ozone cracks, attention should be paid to the following instructions for maintenance:

Avoid exposing stored tracks to direct sun light

Avoid exposing stored tracks to direct rain and snow fall

Store tracks in well ventilated warehouses

Use the tracks at least once a month

BATTERY

Checking the Battery

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

MEL10004A – Battery Tester

To make a safe and complete check of the battery, see the Melroe Battery Manual (P/N 6566047). The battery manual has all the information needed for checking and servicing the battery.

Removal and Installation

Open the engine cover.

Disconnect the negative (–) cable (Item 1) **[A]** first.

Disconnect the positive (+) cable (Item 2) **[A]**.

⚠ 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 hydraulic tank access door **[B]**.

Remove the four (4) bolts from the side cover **[B]**.

Remove the side cover.

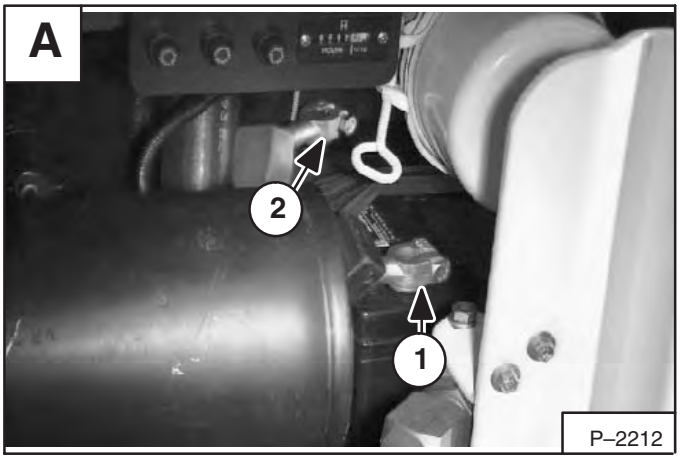
Remove the two (2) nuts (Item 1) **[C]** and remove the hold down clamp (Item 2) **[C]**.

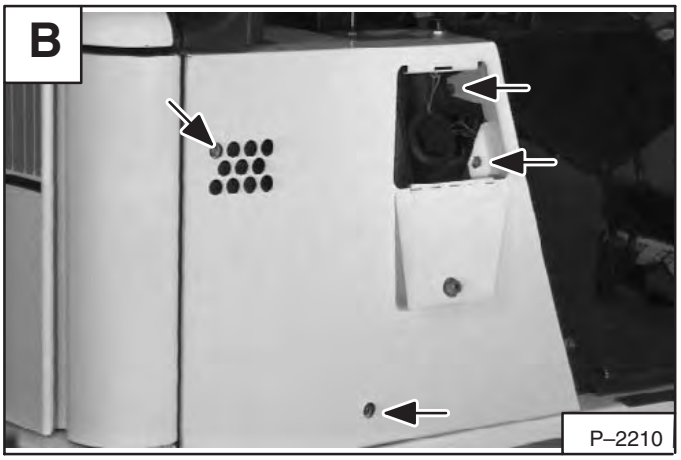
Remove the battery from the compartment **[D]**.

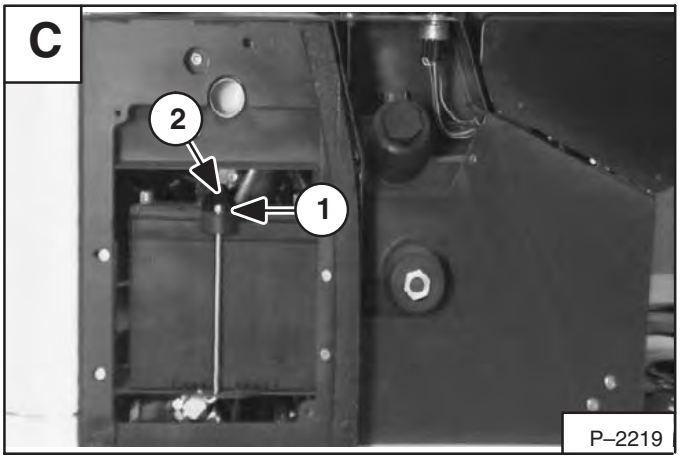
NOTE: Do Not touch any metal to the battery terminals.

NOTE: When installing the battery, always make the last connection the negative (–) cable to the battery.

NOTE: When installing a new battery, check the locations of the positive (+) and negative (–) post between the factory installed battery and the replacement battery. Make sure to install the cables to the correct battery posts.







STARTER (Cont'd)

Disassembly and Assembly

Disassemble the stator as shown **[A]**.

Cleaning and Inspection

⚠ 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

Use a brush and air pressure to clean the drive, field coils, armature and starter housing.

NOTE: Do not use solvent to clean the drive assembly. The solvent will remove the lubricant and the drive will slip.

Check the following items:

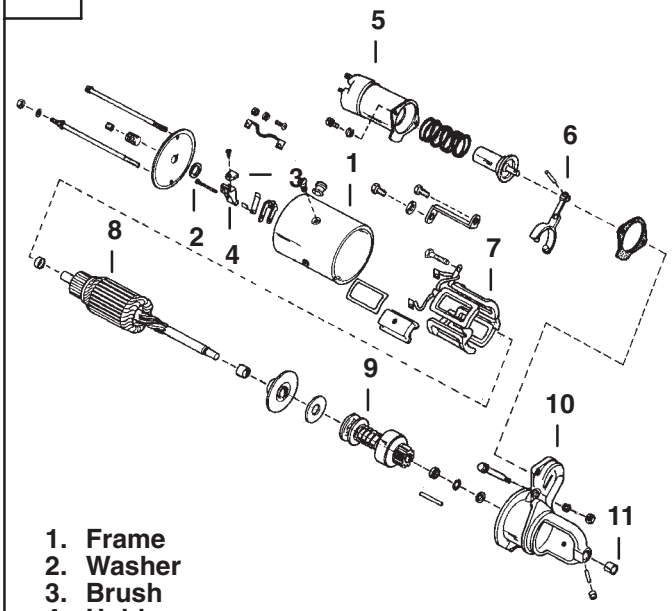
Armature
- Broken or burned insulation.
- Loose connections at commutator.
- Open or grounded circuits.
- Worn shaft or bearings.
- Rough commutator.

Field Coils
- Broken or burned insulation.
- Electrical continuity.
- Brush connections.

Drive Gear
- Worn teeth.
- Tooth engagement (drive gear must engage ring gear by 1/2 the depth of the ring gear tooth).

Brush Holders
- Broken springs.
- Broken insulation.
- Spring tension.

A



1. **Frame**
2. **Washer**
3. **Brush**
4. **Holder**
5. **Solenoid**
6. **Lever**
7. **Fields**
8. **Armature**
9. **Drive**
10. **Housing**
11. **Bushing**

B–1192

FUEL INJECTOR NOZZLES

⚠ 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. W ear safety goggles. If fluid enters skin or eyes, get immediate medical attention.

W–2074–1285

Some problems caused by faulty injector nozzles:

* The engine is hard to start or will not start.

* Rough engine operation at idle.

* The engine will not have full power.

* The engine exhaust smoke is black, white or blue.

Removal and Installation

IMPORTANT

Do not bend the high pressure fuel injection tubes when removing or installing them.

I–2029–0289

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

MEL1181 – Nozzle Socket

Disconnect the high pressure fuel lines from the fuel injectors **[A]**.

Disconnect the other end of the fuel lines from the injection pump. Remove the high pressure fuel lines.

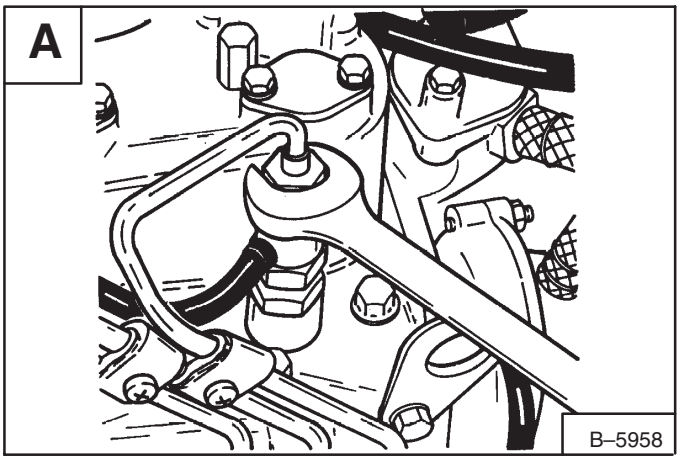
Disconnect the return fuel hoses (Item 1) **[B]**.

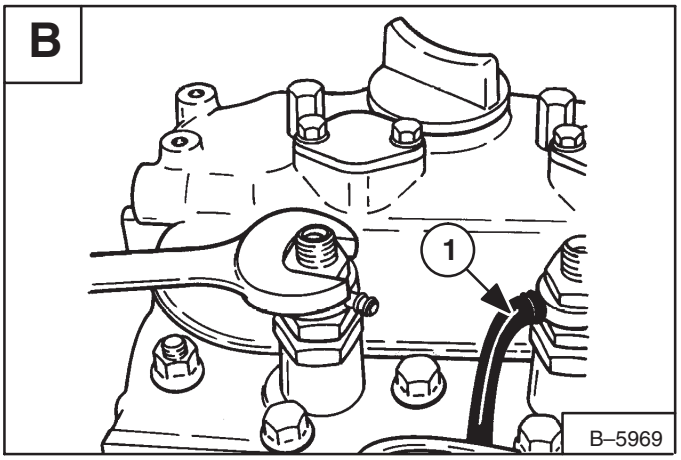
Remove the banjo fitting from the fuel injector **[B]**.

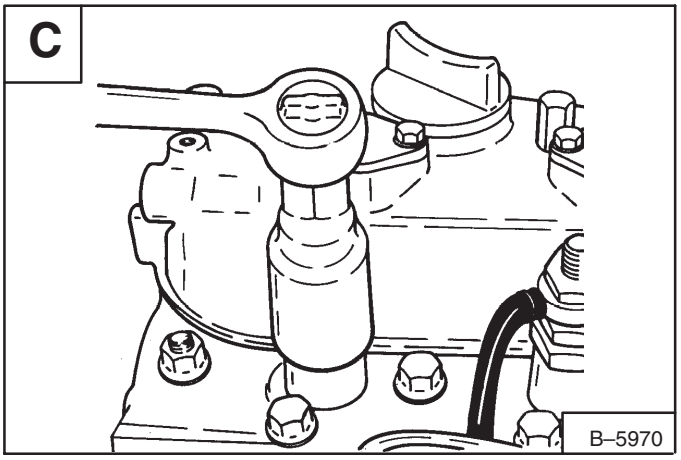
Use the special socket and loosen the injector nozzle **[C]**.

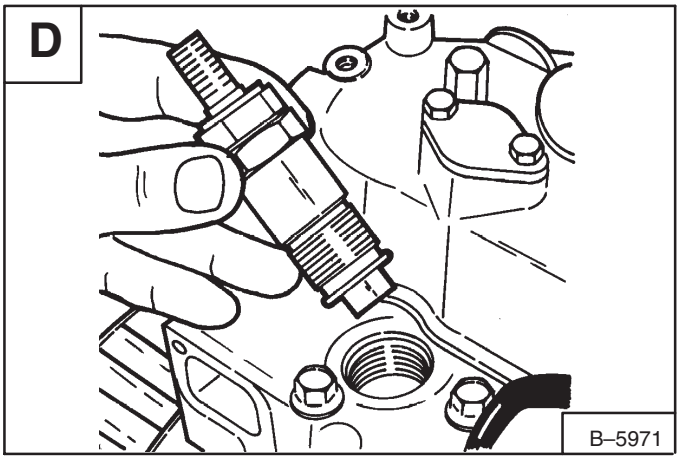
Installation: Tighten the injector nozzle to 22–36 ft.–lbs. (29–49 Nm) torque.

Remove the injector nozzle from the cylinder head **[D]**.









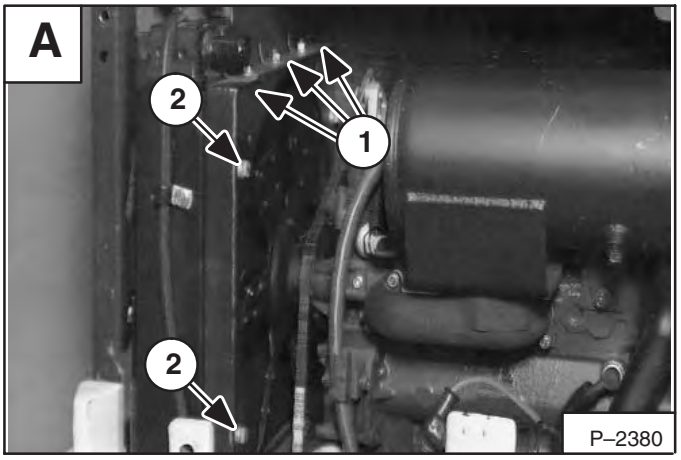
RADIATOR (Cont'd)

Removal and Installation (Cont'd)

Remove the three (3) nuts (Item 1) **[A]** from the top radiator support bracket.

Remove the four (4) bolts (Item 2) **[A]** from the sides of the radiator shroud.

Move the shroud over the fan blades and leave in this position.



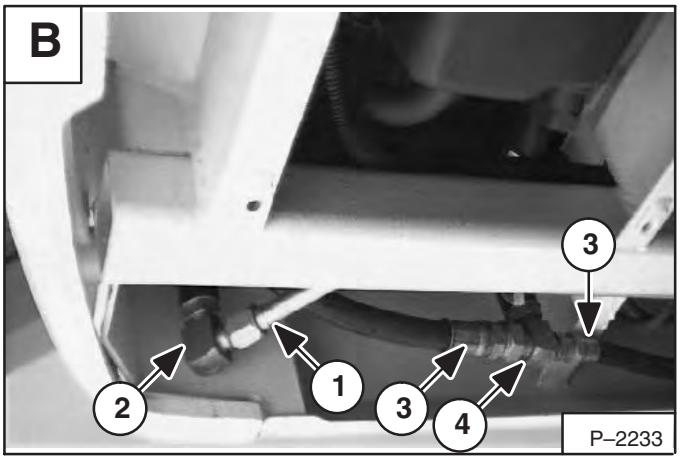
If the oil cooler has not been removed;

Remove the tubeline (Item 1) **[B]** from the elbow (Item 2) **[B]**.

Remove the two (2) hoses (Item 3)**[B]** from the tee (Item 4) **[B]**.

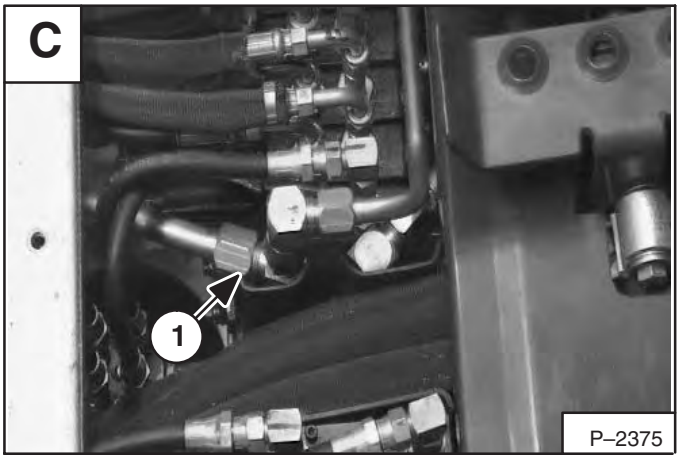
Remove the tee (Item 4) **[B]** from the bottom of the oil cooler.

NOTE: The elbow (Item 2) [B] can not be removed at this point.



Remove the tubeline (Item 1) **[C]** from the control valve.

The tubeline will need to be repositioned under the frame so clearance will be available for radiator removal.

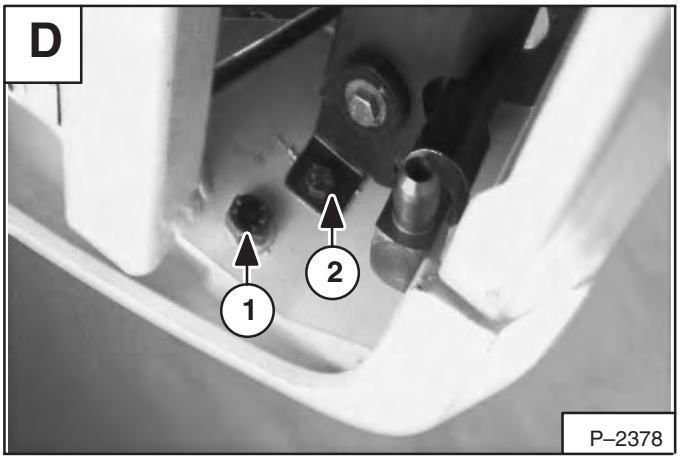


Remove the counterweight mounting bolt (Item 1) **[D]**.

Installation: Tighten the bolt to 125–140 ft.–lbs. (170–190 Nm) torque.

Remove the two (2) bolts (Item 2) **[D]** from the lower mount.

Installation: Tighten the bolts to 29–32 ft.–lbs. (40–50 Nm) torque.



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

TIMING GEAR COVER

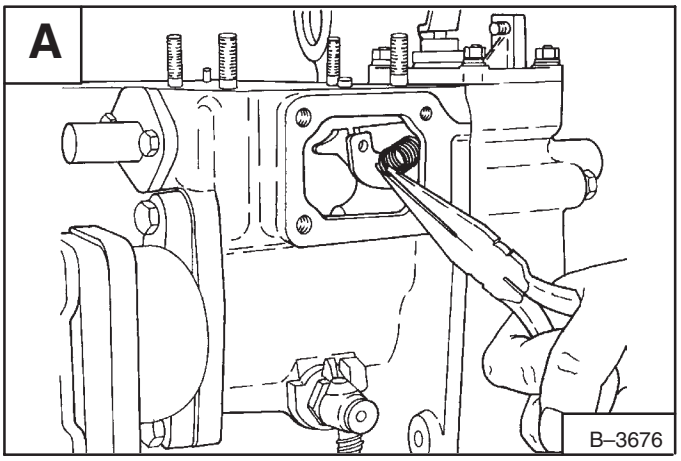
Removal and Installation

NOTE: It may be easier to remove and install the timing gear cover with the engine removed from the machine.

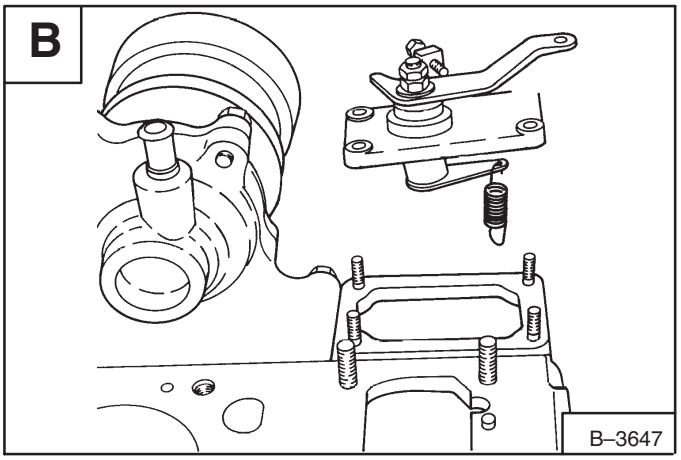
Remove the fuel injection pump. (See Page 7–5.)

Remove the side plate from the governor housing.

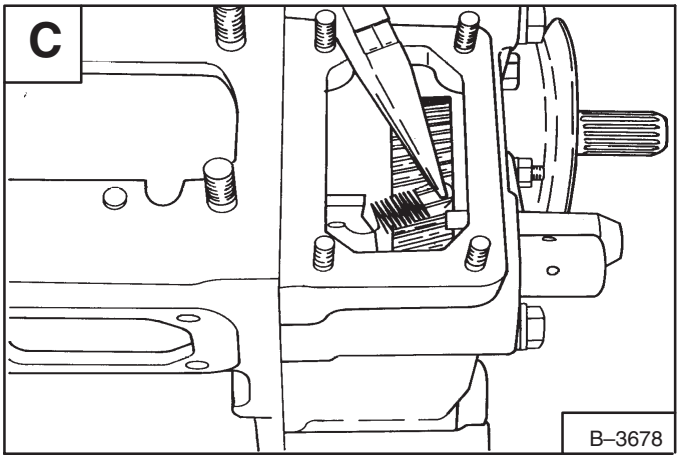
Disconnect the governor spring from the governor fork **[A]**.



Remove the plate for the speed control and governor spring **[B]**.



Remove the start spring from the gear case **[C]**.

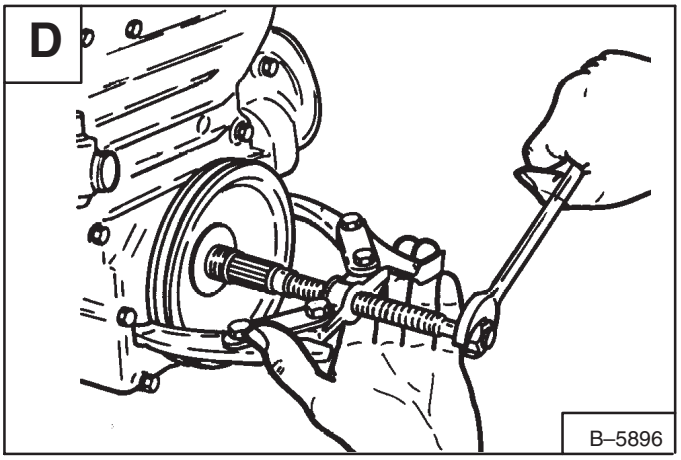


Straighten the washer on the crankshaft pulley. Remove the nut and washer.

Installation: Tighten the nut to 101–1 16 ft.–lbs. (137–157 Nm) torque.

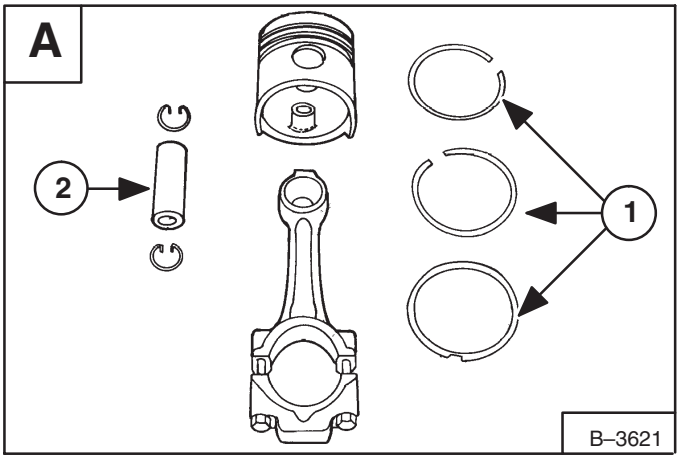
Use a puller and remove the pulley **[D]**.

Remove the crankshaft key.

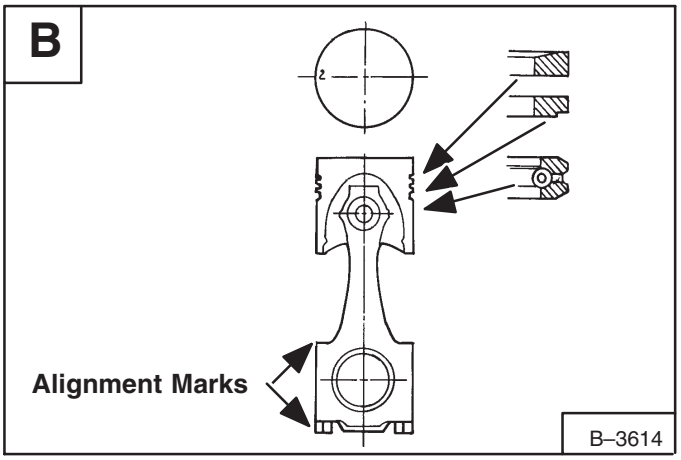


Servicing the Connecting Rods and Pistons

Remove the piston rings (Item 1) **[A]** and the piston pin (Item 2) **[A]**.

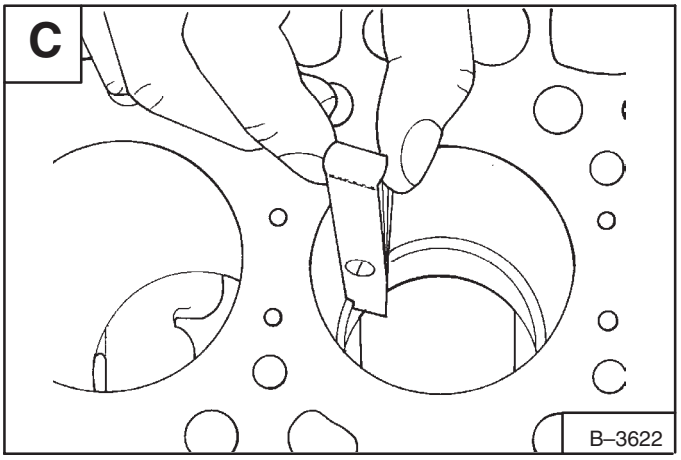


Installation: Position the top ring so the gap is not lined up with the piston pin. Position the other rings so there is a gap every 90° **[B]**. Use a ring compressor to install the pistons in the engine block with the marks away from the camshaft.



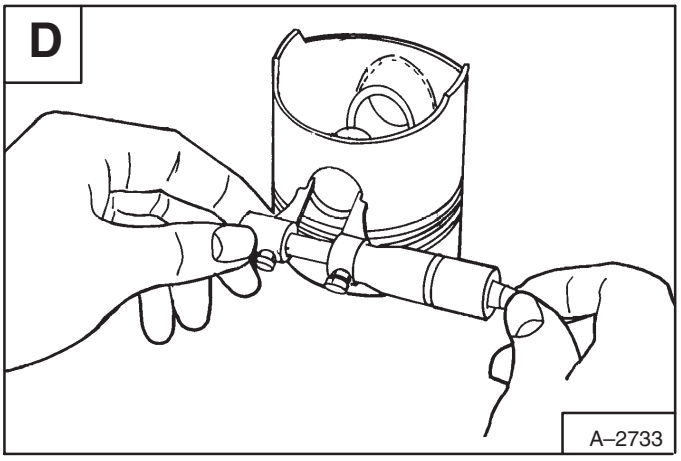
Put the piston ring on the bottom of the cylinder bore**[C]**. Check the clearance of the ring gap. The specifications are:

Top & 2nd Ring . . . . . 0.010–0.0158" (0,25–0,40 mm)
Oil Ring . . . . . .0.008–0.0158" (0,20–0,40 mm)
Wear Limit . . . . . .0.05" (1,27 mm)



Measure the piston pin hole **[D]**.

The specifications are 0.787–0.788" (19,98–20,02 mm). The wear limit is 0.0789'' (20,04 mm).



All dimensions are given in inches. Respective metric dimensions are given in millimeters enclosed by parentheses.

Camshaft

O.D. of Camshaft Bearing Journal	1.2966–1.2972 (32,93–32,95)
I.D. of Camshaft Bearing	1.2992–1.3002 (32,99–33,025)
Clearance between Camshaft Bearing & Journal	0.0017–0.0045 (0,042–0,115)
Limit Permitted	0.006 (0,15)
Alignment of the Camshaft	0.002 (0,05)
Cam Lobe Height	1.0583 (22,88)
Gear Backlash	0.002–0.003 (0,051–0,08)
Limit Permitted	0.008 (0,2)

Cylinders

I.D. of Cylinder Liner	2.677–2.678 (67,99–68,02)
Limit Permitted	+0.0059 (+0,15)

Piston Rings

Ring Gap (Top & 2nd Ring)	0.010–0.016 (0,25–0,41)
Ring Gap, Oil	0.0078–0.0158 (0,20–0,40)
Limit Permitted	0.049 (1,24)
Side Clearance of Ring Groove:	
Top Ring	0.00 (0,0)
Second Ring	0.003–0.004 (0,08–0,10)
Oil Ring	0.0008–0.002 (0,02–0,051)
Oversize of Piston & Ring	0.020 (0,51)

Pistons

I.D. of Piston Bosses	0.787–0.788 (19,98–20,02)
Limit Permitted	0.789 (20,04)
O.D. of Piston Pin	0.787–0.788 (19,98–20,04)
I.D. of Connecting Rod Bushing (Small End, Fitted)	0.788–0.790 (20,02–20,07)
Clearance between Piston Pin & Bushing (New)	0.0006–0.0015 (0,015–0,04)
(Service Replacement Parts)	0.006–.0026 (0,015–0,066)
Connecting Rod Alignment	0.0008 (0,02)
Limit Permitted	0.002 (0,05)

Crankshaft

Crankshaft Alignment	0.0008 (0,02)
Limit Permitted	0.003 (0,08)
O.D. of Crankshaft Journals	1.7297–1.7303 (43,93–43,95)
I.D. of Crankshaft Bearing No. 1	1.7317–1.7339 (43,984–44,040)
Clearance between Crankshaft Journals & Bearing No. 1	0.0013–0.0042 (0,03–0,106)
Limit Permitted	0.008 (0,2)
Clearance between Crankshaft Journals & Bearing No. 2	0.0013–0.0036 (0,034–0,092)
Limit Permitted	0.0079 (0,2)
O.D. of Connecting Rod Journals	1.4551–1.4557 (36,96–36,98)
I.D. of Connecting Rod Bearings	1.4568–1.4587 (37,003–37,051)
Clearance between Connecting Rod Journal & Bearing	0.0011–0.0036 (0,028–0,091)
Crankshaft End Play	0.006–0.012 (0,15–0,30)
Limit Permitted	0.020 (0,5)