SERVICE MANUAL

Crawler

650

8-11261

1. Trim along dashed line.
2. Slide into pocket on Binder Spine.

TYPE 1-4

SERVICE MANUAL

Crawler

650

8-11261

1. Trim along dashed line.
2. Slide into pocket on Binder Spine.

TYPE 1-4

SERVICE MANUAL

Crawler

650

8-11261

1. Trim along dashed line.
2. Slide into pocket on Binder Spine.

TYPE 1-4

SERVICE MANUAL

Crawler

650

8-11261

1. Trim along dashed line.
2. Slide into pocket on Binder Spine.

TYPE 1-4

PROCEDURE TO HEAT THE OIL

Torque Converter

1. Do the following steps to check the parking brake:

   a. Apply the parking brake.

   b. Put the range control lever in LO.

   c. Start and run the engine at low idle.

   d. Put the track speed control levers in HI.

   e. Put the direction control lever in F.

   f. Slowly increase the engine speed to full throttle. If the parking brake does not prevent the machine from moving, stop the engine.

   g. See Section 7001 and adjust the parking brake.

   h. Repeat steps 1a through 1g until the parking brake prevents the machine from moving with the engine running at full throttle.

2. Run the engine at low idle.

3. Put the range control lever in HI.

4. Put both track speed control levers in HI.

5. Put the direction control lever in F.

6. Run the engine at full throttle with the direction control lever in F for two minutes. Then reduce engine speed to low idle and put the direction control lever in NEUTRAL.

7. Run the engine at full throttle with the direction control lever in NEUTRAL for one minute. Then reduce engine speed to low idle and put the direction control lever in F.

8. Repeat steps 6 and 7 until the needle in the temperature gauge is in the green zone.

Hydraulic System

1. Apply the parking brake.

2. Put the transmission control levers in NEUTRAL.

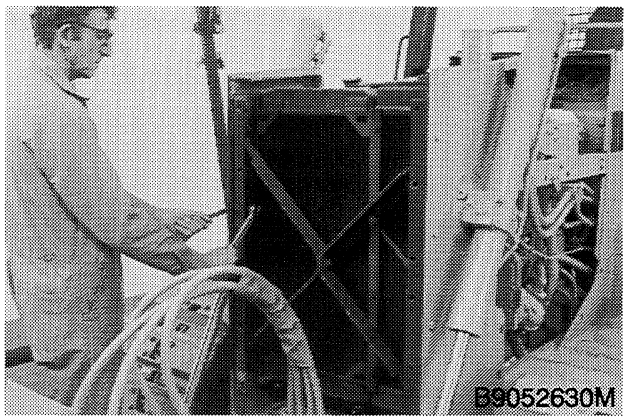
3. Start and run the engine at full throttle.

4. Put the blade control lever in TILT position.

5. Hold the blade control lever in the TILT position for 15 seconds. Then put the blade control lever in NEUTRAL for 30 seconds.

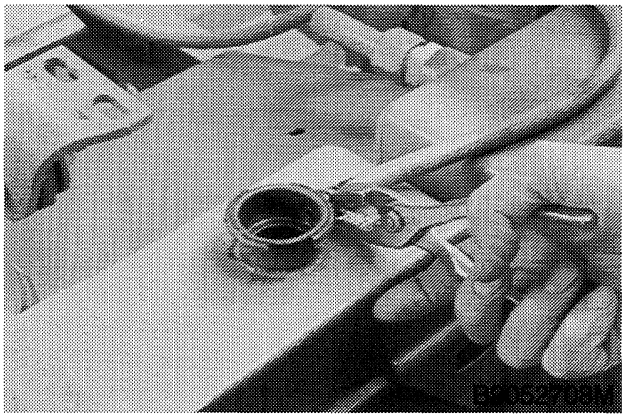
6. Repeat steps 4 and 5 until the temperature of the hydraulic oil is between 125 and 175°F (52 to 79°C). If a thermometer is not available, feel the tube connected to the inlet of the equipment control valve. The tube must be very warm.

STEP 24



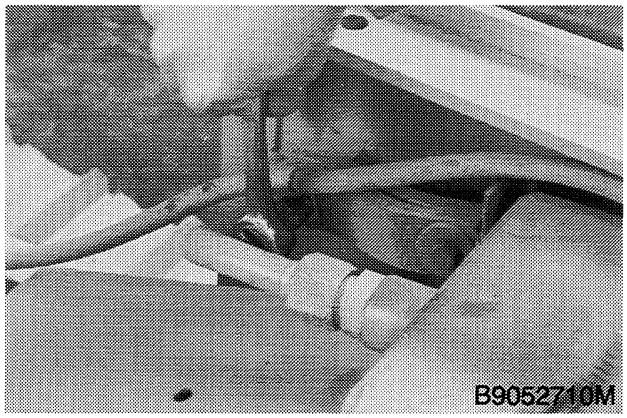
Loosen and remove the hardware that fastens both grille mounts and the cross brace to the radiator shroud. Remove the grille mounts and the cross brace.

STEP 25



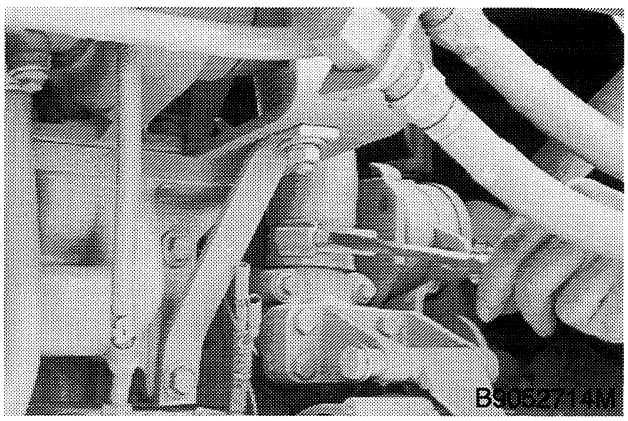
Disconnect the drain hose from the fill neck of the radiator.

STEP 26



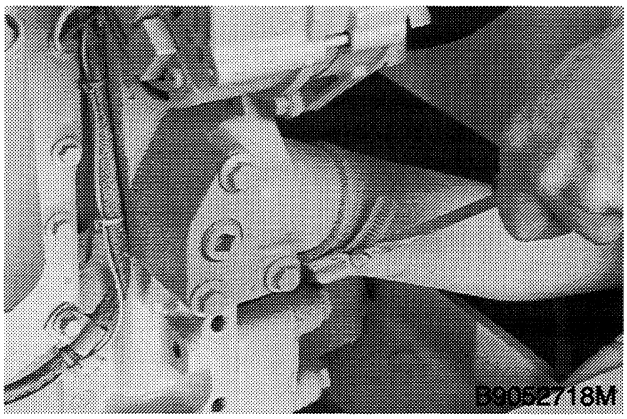
Loosen and remove the cap screws and flat washers that fasten the top radiator supports to the radiator shroud. A clamp for the drain hose is installed on the cap screw for the top radiator support on the left side of the radiator shroud.

STEP 27



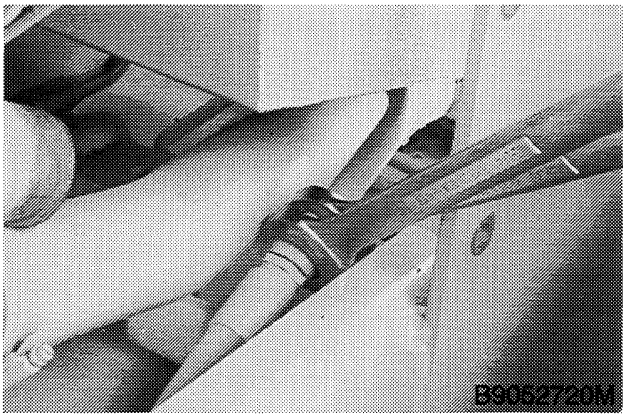
Loosen the clamp and disconnect the top radiator hose from the engine.

STEP 28



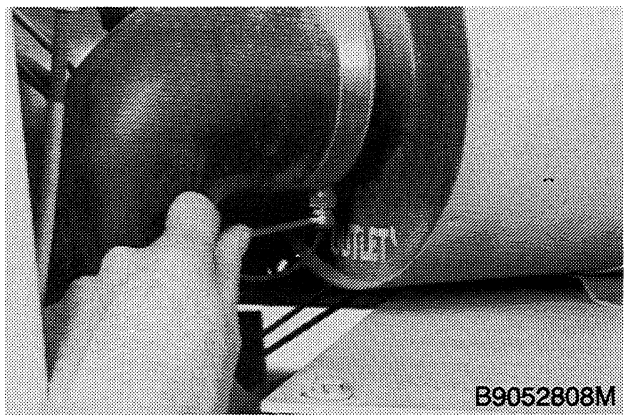
Loosen the clamp and disconnect the bottom radiator hose from the engine.

STEP 29



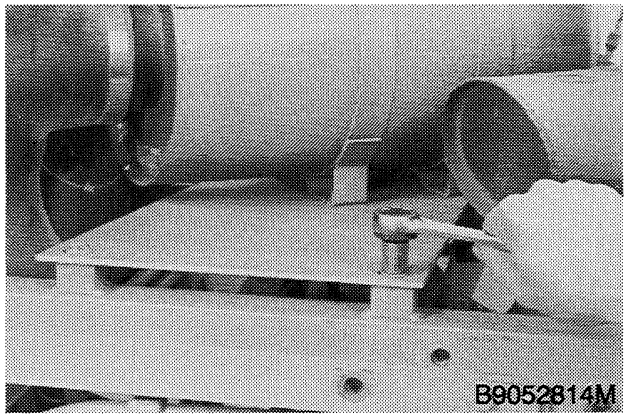
Disconnect the hose from the tube for the oil cooler.

STEP 72



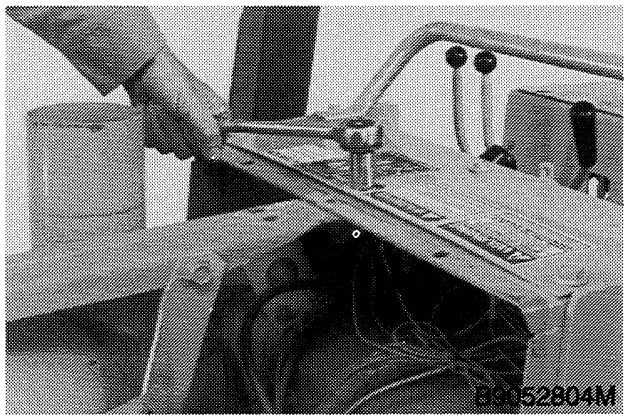
Disconnect the tube for the air restriction indicator from the air cleaner.

STEP 73



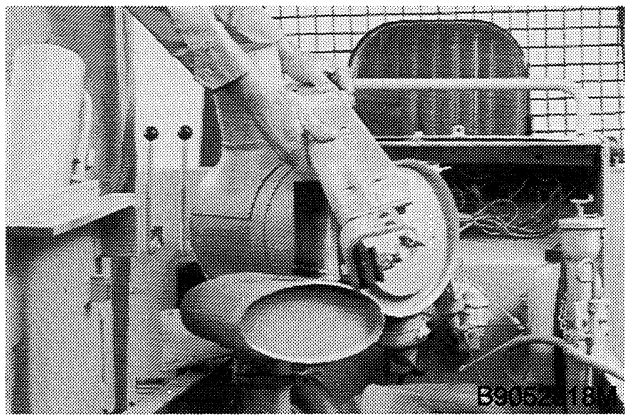
Loosen and remove the cap screws that hold the mounting bracket for the air cleaner.

STEP 74



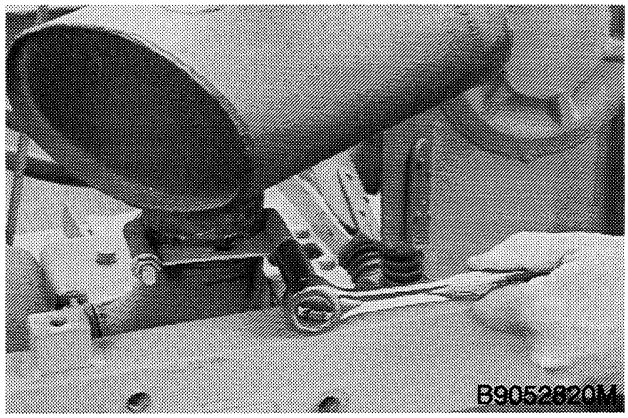
Loosen and remove the cap screw that holds the rear of the center hood brace.

STEP 75



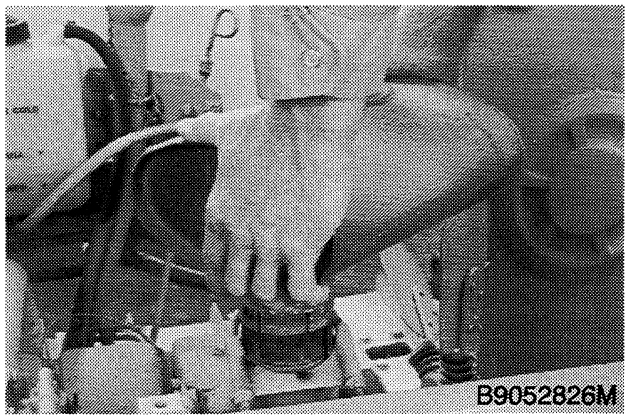
Remove the center hood brace, air cleaner, and ether injection assembly if equipped, from the machine.

STEP 76



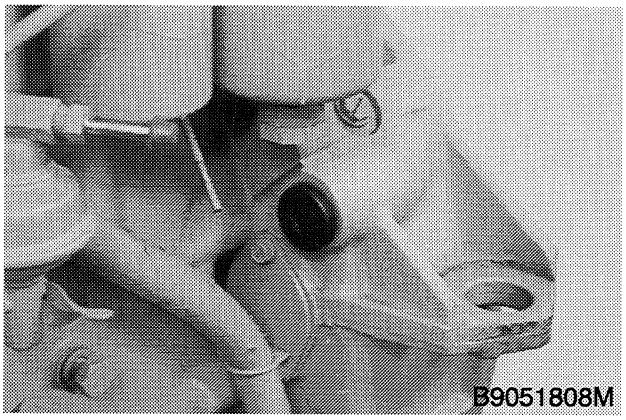
Loosen the nuts on the U-bolt for the muffler clamp.

STEP 77



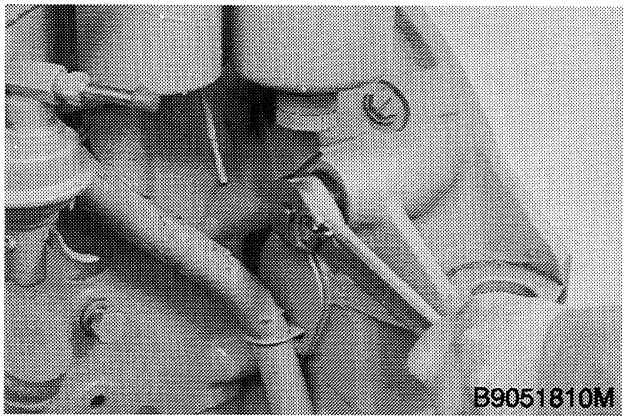
Remove the muffler. Cover or close the opening in the exhaust elbow.

STEP 131



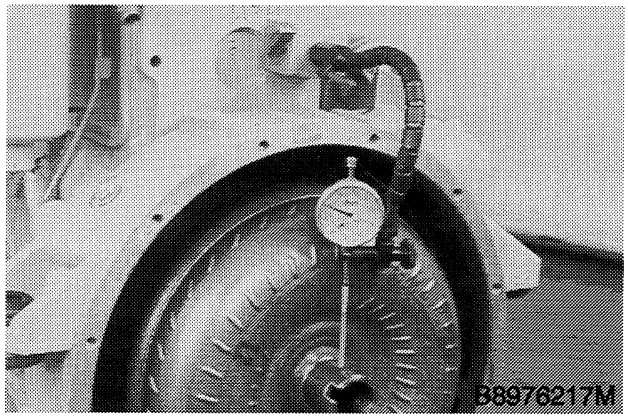
Install the CAS-1690 tool used to rotate the flywheel.

STEP 132



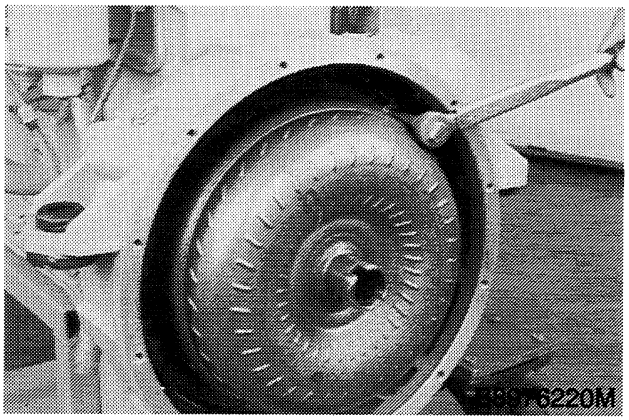
Rotate the flywheel and look at the dial indicator as the torque converter turns.

STEP 133



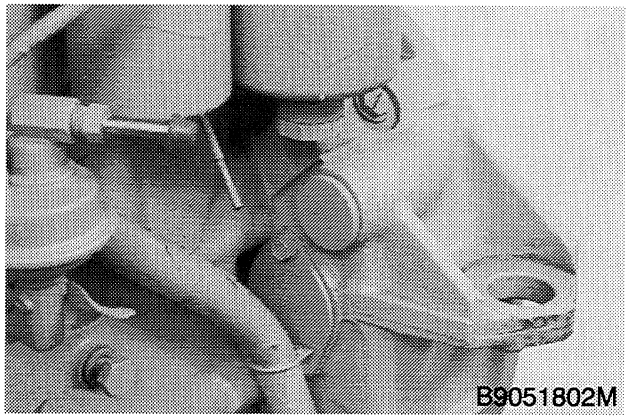
The torque converter must be centered on the flywheel to within 0.004 inch (0.1 mm) so that the full indicated movement on the dial indicator is 0.008 inch (0.2 mm) or less.

STEP 134



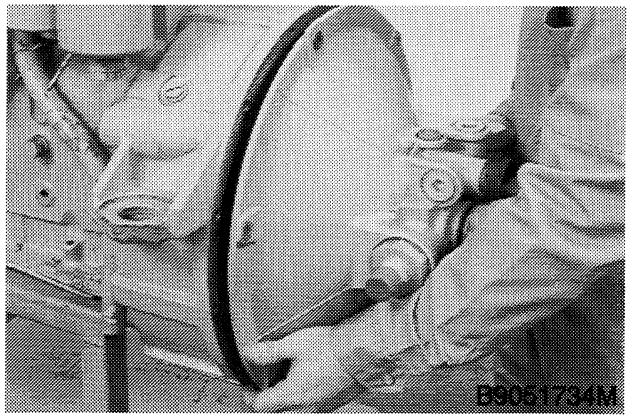
When the torque converter is centered on the flywheel, tighten the cap screws to 156 to 180 pound-inches (18 to 20 Nm).

STEP 135



Remove the CAS-1690 tool and install the plastic plug in the flywheel housing.

STEP 136



Install the torque converter housing.

IMPORTANT: *DO NOT use extra force to push the torque converter housing into place. If the torque converter housing does not easily slide into contact with the flywheel housing, the parts are not correctly aligned.*

Rocker Arm Assembly

OD of Shaft	18.963 to 18.975 mm
Minimum Service Limit	18.938 mm
ID of Arm Bore	19.000 to 19.026 mm
Maximum Service Limit	19.051 mm
Lubrication	Pressure From Oil Gallery
Shaft Oil Holes	Down

Intake Valve

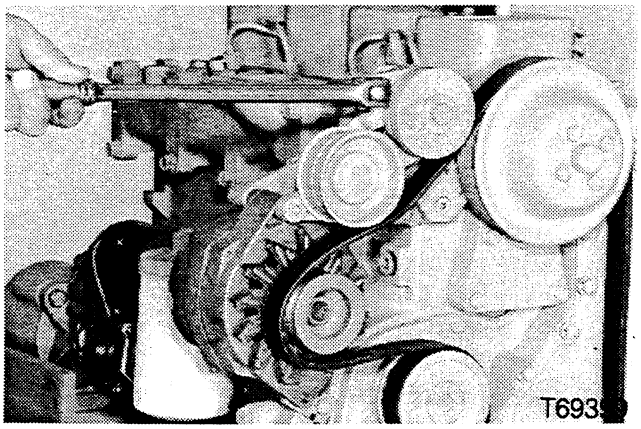
Tappet Clearance (Cold)	0.254 mm
Face Angle	29 Degrees
Face Run-Out	0.038 mm
Valve Head Edge Thickness, Minimum	1.50 mm
Length	128.84 to 129.46 mm
OD of Stem	7.960 to 7.980 mm
Minimum Service Limit	7.940 mm
OD of Head	44.870 to 45.130 mm
Seat Angle	30 Degrees
Seat Contact Width	1.32 to 1.92 mm
Seat Run-Out	0.10 mm
Insert Height	6.84 to 6.96 mm
OD of Insert	47.063 to 47.089 mm
ID of Insert	Tapered
Valve Recession Below Head Surface	0.99 to 1.52 mm
Maximum Service Limit	1.52 mm
ID of Valve Guide Bore	8.019 to 8.039 mm
Maximum Service Limit	8.089 mm

Exhaust Valve

Tappet Clearance (Cold)	0.508 mm
Face Angle	44 Degrees
Face Run-Out	0.038 mm
Valve Head Edge Thickness, Minimum	1.50 mm
OD of Head	41.870 to 42.130 mm
OD of Stem	7.960 to 7.980 mm
Minimum Service Limit	7.940 mm
Length	128.74 to 129.36 mm
Insert Seat Angle	45 Degrees
Seat Contact Width	1.47 to 2.07 mm
Seat Run-Out	0.10 mm
Insert Height	6.65 to 6.77 mm
OD of Insert	43.713 to 43.739 mm
ID of Insert	Tapered
Valve Recession Below Head Surface	0.99 to 1.52 mm
Maximum Service Limit	1.52 mm
ID of Valve Guide Bore	8.019 to 8.039 mm
Maximum Service Limit	8.089 mm

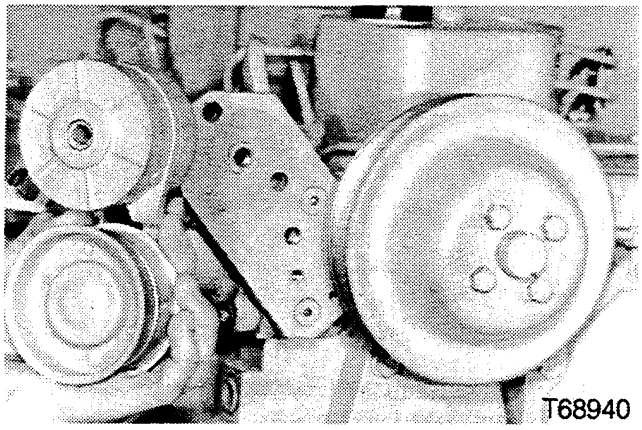
CYLINDER HEAD REMOVAL

STEP 1



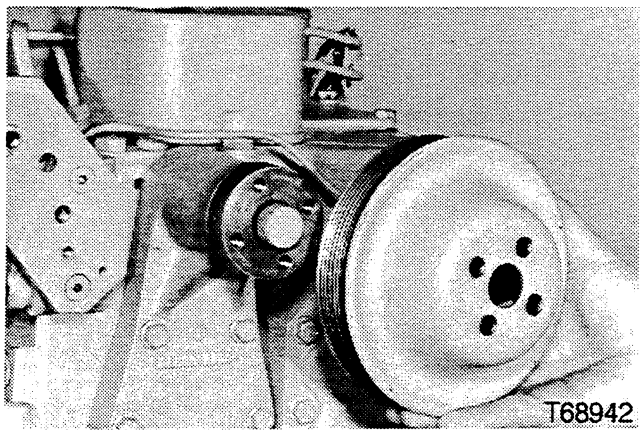
Lift the belt tensioner and remove the fan belt.

STEP 2



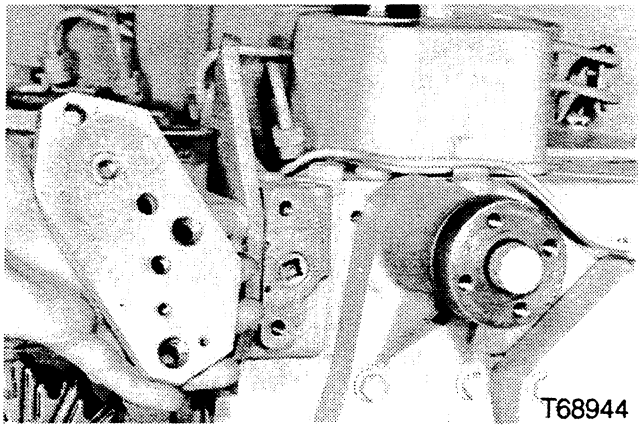
Remove the belt tensioner bolt and the belt tensioner.

STEP 3



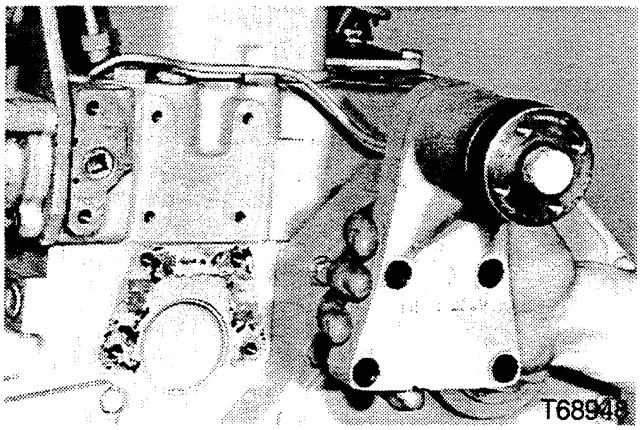
Remove the fan hub bolts and the fan hub.

STEP 4



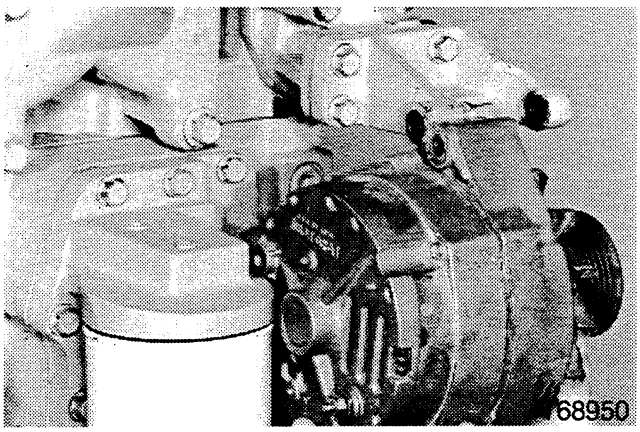
Remove the belt tensioner bolts and the bracket.

STEP 5



Remove the fan hub bracket bolts and the bracket.

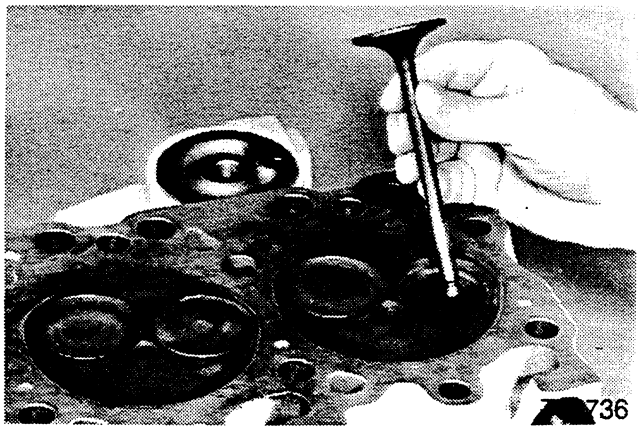
STEP 6



Remove the bolts that hold the alternator and remove the alternator.

INSPECTION OF THE VALVES AND VALVE SEATS

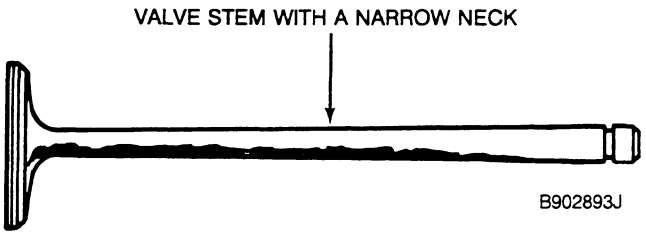
STEP 47



Clean the valves with a power driven wire brush. Do not scratch the valve stems.

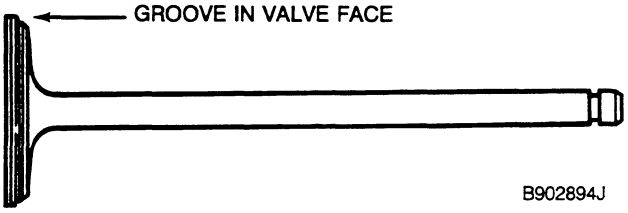
STEP 48

Check the valves for the following conditions.



NOTE: REPLACE THE VALVE IF THIS CONDITION OCCURS.

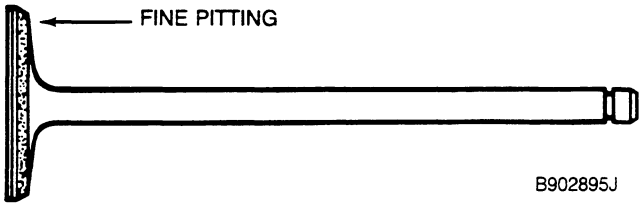
This Condition Can Be Caused By:
1. Valve does not have lubrication.
2. Restriction in the water passages.
3. Operating the engine under continued overload at too much engine RPM.



NOTE: GRIND OR REPLACE VALVE IF THIS CONDITION OCCURS.

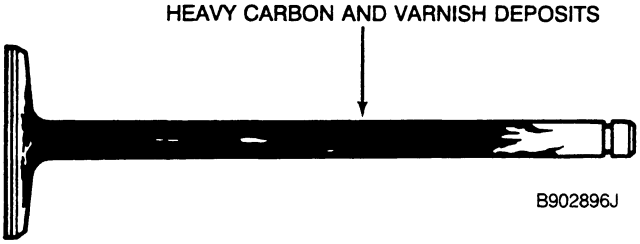
This condition can be caused by foreign material entering the engine through the intake system or not giving service to the air intake system.

STEP 48 (Cont'd)



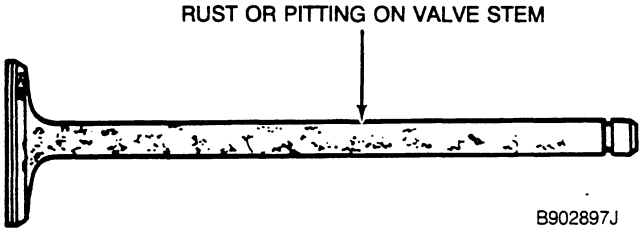
NOTE: THIS IS A NORMAL CONDITION.

Small amounts of very fine pitting can be found on the surfaces of the valve face or seat after the valves are cleaned. These are normal and will not change the engine performance. This fine pitting is caused by normal oxidation procedure and can occur on any engine during the run-in period. It is not necessary to grind valves or seats if this fine pitting is found, because pitting will generally occur after the engine has run for several hours.



NOTE: GRIND OR REPLACE THE VALVE IF THIS CONDITION OCCURS.

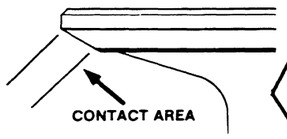
This condition is generally caused by worn valve guides or bad seals on the valves, permitting oil to go by the valves. Low operating temperature is a secondary cause. Worn piston rings and cylinder walls will also permit too much oil to reach the combustion chamber.



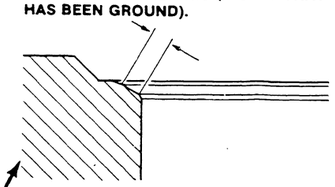
NOTE: REPLACE VALVE IF THIS CONDITION OCCURS.

This condition can be caused by using bad quality engine oil or fuel and by not correctly keeping the engine in storage.

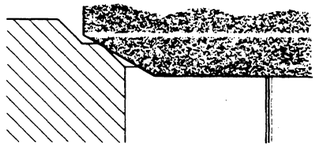
SEAT CONTACT AREA ON THE VALVE TO WIDE



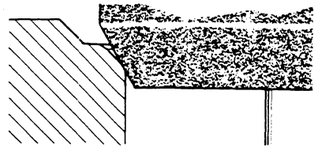
IF THE VALVE CONTACT AREA ON THE SEAT LOOKS LIKE THIS (A SEAT THAT HAS BEEN GROUND).



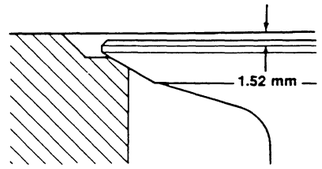
→ USE A 15 DEGREE STONE TO LOWER THE UPPER CONTACT AREA.



→ USE A 45 DEGREE OR 60 DEGREE STONE TO LIFT THE LOWER CONTACT AREA.

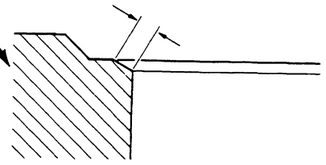


→ CHECK THAT THE VALVE HEAD IS NOT RECESSED MORE THAN 1.52 mm BELOW THE CYLINDER HEAD SURFACE.

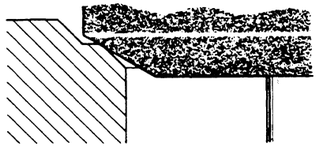


→ IF THE VALVE HEAD IS RECESSED MORE THAN 1.52 mm REPLACE THE VALVE AND INSTALL A VALVE SEAT.

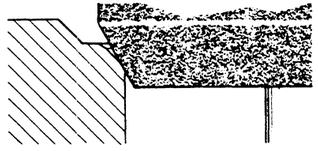
IF THE VALVE CONTACT AREA ON THE VALVE SEAT LOOKS LIKE THIS.



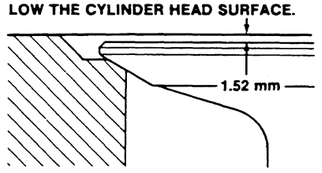
→ USE A 15 DEGREE STONE TO LOWER THE UPPER CONTACT AREA.



→ USE A 45 DEGREE OR 60 DEGREE STONE TO LIFT THE LOWER CONTACT AREA.

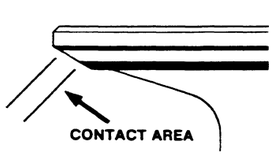


→ CHECK THAT THE VALVE HEAD IS NOT RECESSED MORE THAN 1.52 mm, BELOW THE CYLINDER HEAD SURFACE.

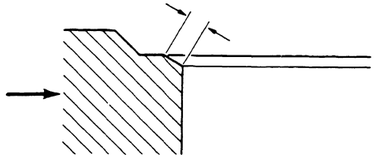


→ IF THE VALVE HEAD IS RECESSED MORE THAN 1.52 mm, REPLACE THE VALVE AND INSTALL A VALVE SEAT.

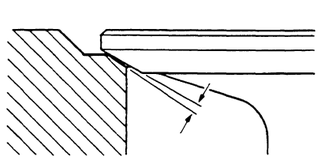
THIS IS THE CORRECT SEAT CONTACT AREA ON THE VALVE.



THE CORRECT VALVE CONTACT AREA ON THE SEAT WILL GIVE A SEAT WIDTH OF 1.32 TO 1.92 mm.



→ 1 DEGREE INTERFERENCE ANGLE



→ CORRECT REFACING OF THE INTAKE VALVE AND VALVE SEAT WILL GIVE A 1 DEGREE INTERFERENCE ANGLE. THIS ANGLE IS IMPORTANT BECAUSE IT GIVES ASSISTANCE IN CUTTING CARBON AND TO SEAT THE VALVES.

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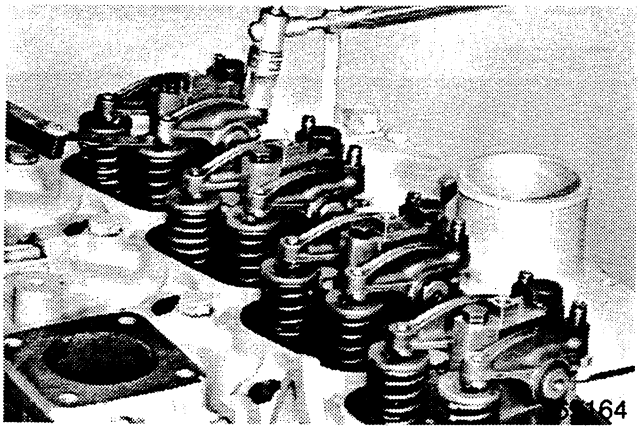
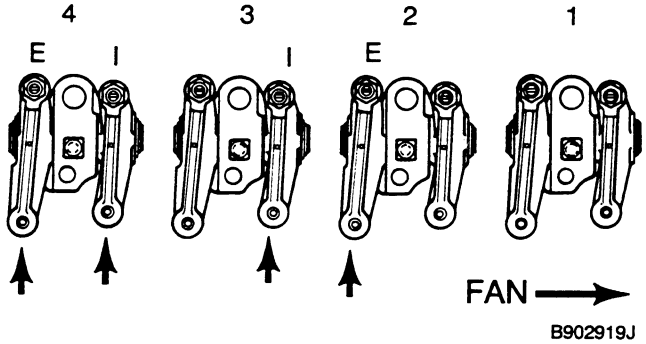
STEP 102



Turn the engine one complete revolution.

Check and adjust the intake and exhaust valves as the arrows show below.

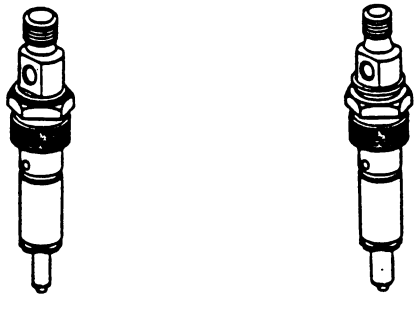


Number four cylinder top center compression stroke.

Valve Clearance, Cold: Intake Valves - 0.254 mm

Exhaust Valves - 0.508 mm

STEP 103

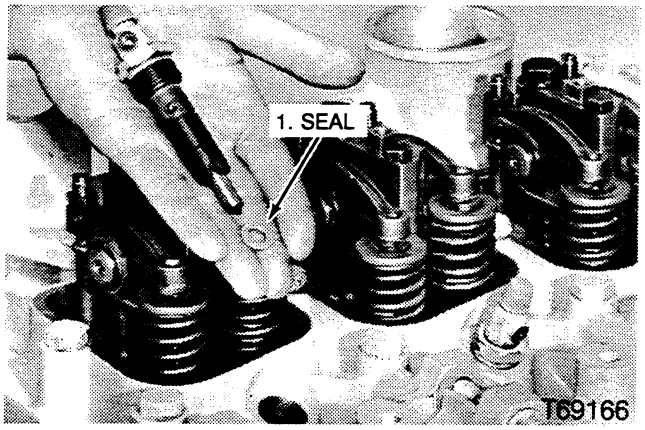


7 mm Diameter Tip

9 mm Diameter Tip

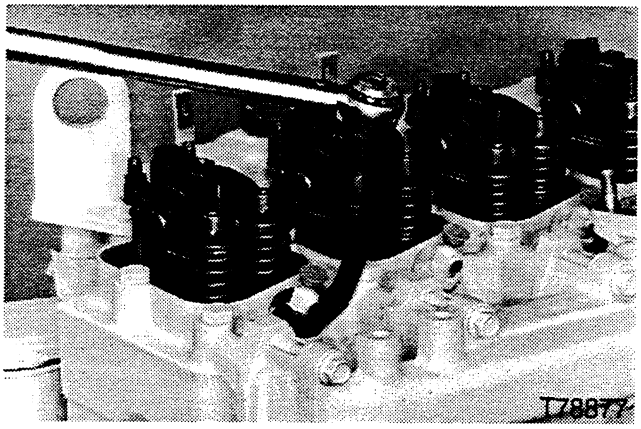
Before you order new injectors or seals, you must determine which injectors were installed in your engine.

STEP 104



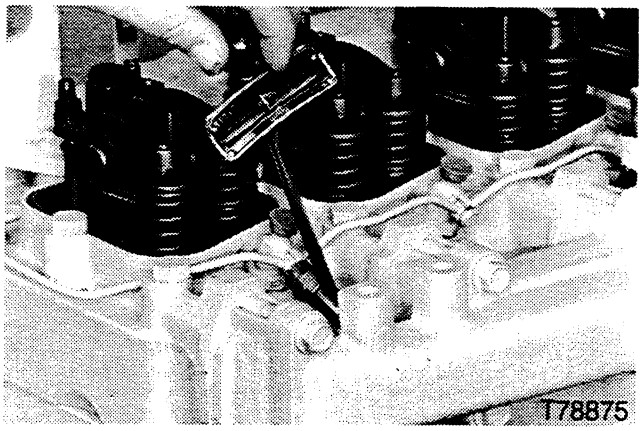
Put new seals on the injectors and install the injectors.

STEP 105



Tighten the injector nut to a torque of 55 to 60 Nm.

STEP 106



Install the leak off line, fittings and gaskets. Tighten the fittings to a torque of 5 to 7 Nm.

CAMSHAFT

ID of Bushing Installed	54.107 to 54.133 mm
Maximum Service Limit	54.146 mm
ID of Camshaft Bore	54.089 to 54.139 mm
Maximum Service Limit	54.164 mm
OD of Each Camshaft Bearing Surface	53.987 to 54.013 mm
Minimum Service Limit	53.962 mm
Camshaft Thrust Clearance	0.130 to 0.340 mm
Minimum Service Limit	0.470 mm
Cam Lobe Minimum Diameter At Peak	
Intake	47.265 mm
Exhaust	46.994 mm

GEAR TRAIN BACKLASH

Crankshaft Gear to Camshaft Gear	0.08 to 0.33 mm
Maximum Service Limit (All Gears)	0.45 mm

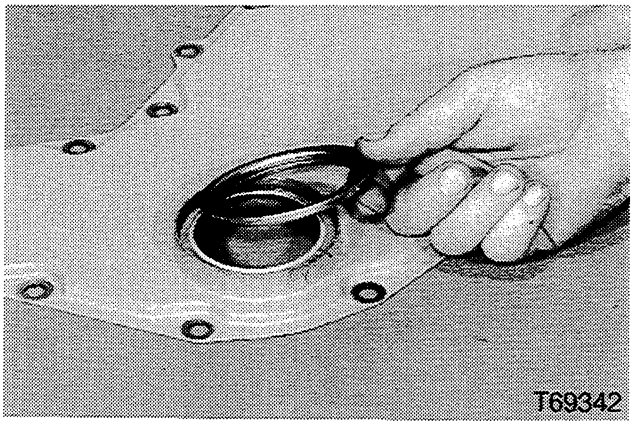
SPECIAL TORQUES

Belt tensioner bolt	39 to 47 Nm
Camshaft plate bolts	21 to 27 Nm
Connecting rod bolts	60 Nm Plus 60 Degrees
Crankshaft pulley bolts	120 to 130 Nm
Fan Pulley Bolts	
Grade 8.8 Size M8	26 to 31 Nm
Grade 10.9 Size M8	37 to 43 Nm
Grade 8.8 Size Size M10	51 to 62 Nm
Grade 10.9 Size M10	51 to 62 Nm
Flywheel bolts	130 to 144 Nm
Flywheel housing bolts	54 to 66 Nm
Front cover bolts	21 to 27 Nm
Front housing bolts	21 to 27 Nm
Fuel inlet bolts	29 to 35 Nm
Fuel inlet nut	29 to 35 Nm
Fuel outlet bolt	29 to 35 Nm
Injection pump nut	55 to 65 Nm
Injection pump lock bolt	6 to 8 Nm
Injection pump mounting nuts	21 to 27 Nm
Injection pump bracket bolts	21 to 27 Nm
Main bearing bolts	80 Nm Plus 50 Degrees
Oil suction tube bolts	18 to 30 Nm
Seal carrier bolts	8 to 10 Nm
Starter retaining bolts	39 to 47 Nm

STEP 44

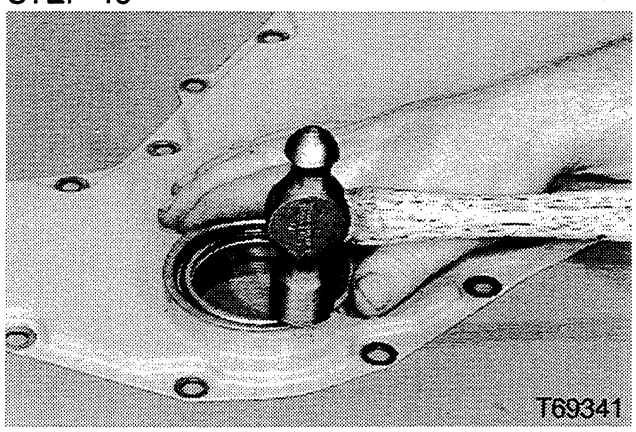
Put Loctite 277 on the outside diameter of the seal surface and install the seal in the front cover.

STEP 45



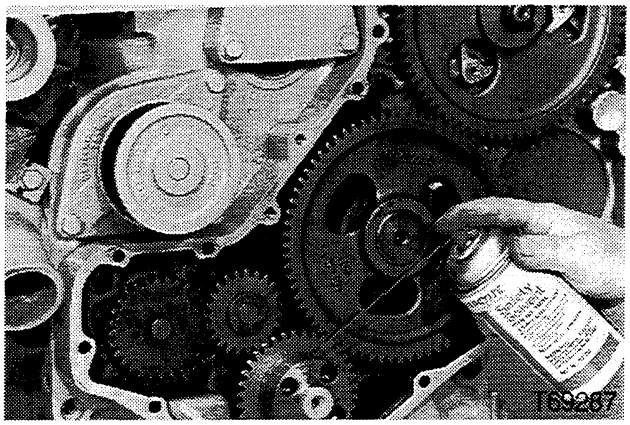
Put the seal installation tool on the oil seal. The small diameter of the seal installation tool must be toward the seal.

STEP 46



Push the seal into the cover until the outside diameter of the installation tool makes contact with the cover.

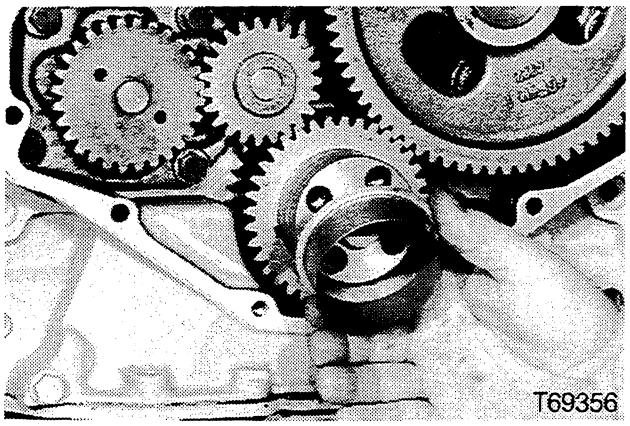
STEP 47



Clean the crankshaft with Loctite safety solvent.

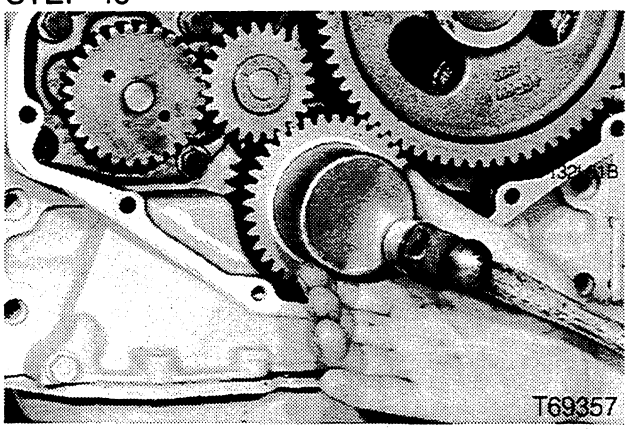
NOTE: *The seal surface must be free of all oil and grease to prevent damage to the oil seal.*

STEP 48



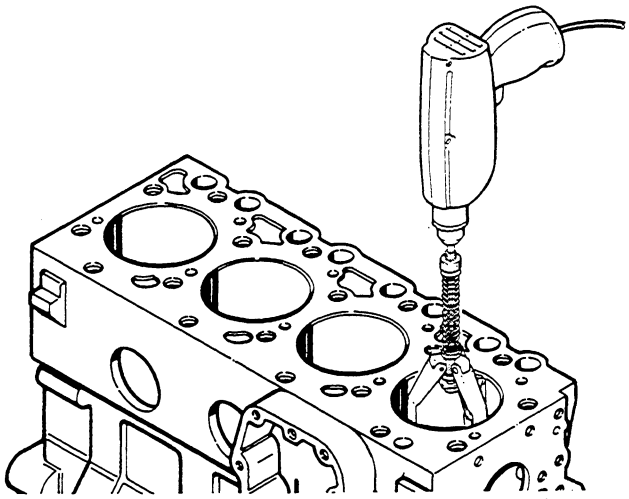
Install the wear sleeve on the crankshaft with the flange toward the engine.

STEP 49



Install the wear sleeve installation tool over the wear sleeve. Push the wear sleeve on the crankshaft until the flange makes contact with the face of the crankshaft gear. Remove the installation tool.

STEP 90

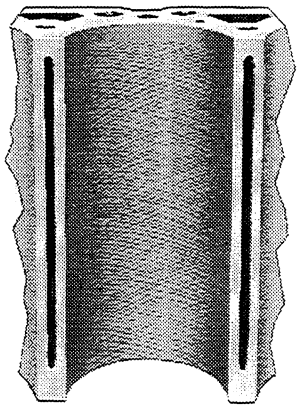

B902935J

Use a 3/8 inch or 1/2 inch drill to power the cylinder hone. Use a lubricant/coolant with the hone to keep the hone and the stones free of foreign material.

Start the hone at the top of the cylinder bore and actuate the hone up and down until the correct cross-hatch pattern is reached. The correct cross-hatch pattern is 45 to 60 degrees from horizontal.

Use a 250 to 300 grit stone to reach the correct cylinder bore finish of 0.4 to 0.8 micrometers.

STEP 91

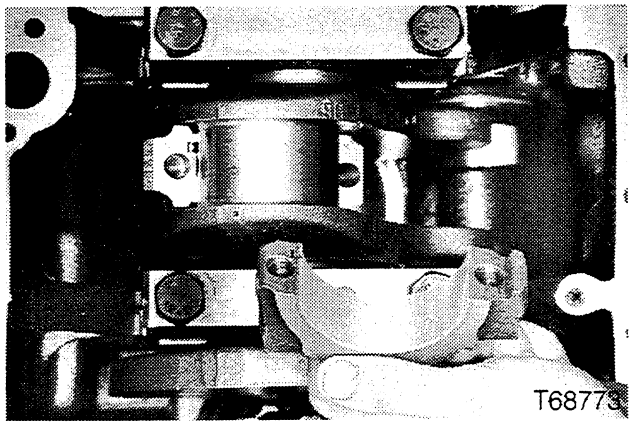

T10765

After removing the glaze, clean the cylinder walls with a clean cloth, warm water and a mild detergent soap. After cleaning the cylinder walls, clean the cylinder walls again with clean engine oil.

NOTE: *Clean the cylinder walls until a clean white cloth keeps completely clean, one cleaning operation is not enough.*

IMPORTANT: *Do not use gasoline, diesel fuel or kerosene to clean cylinders because these materials will not remove the abrasives from the sleeve surface.*

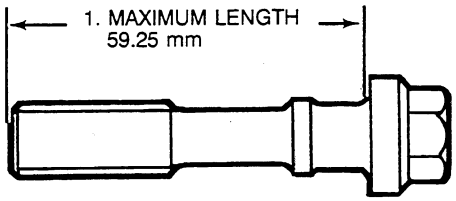
STEP 129



Install the bearing caps.

NOTE: *Make sure that the number on the bearing cap is the same as the number on the connecting rod.*

STEP 130

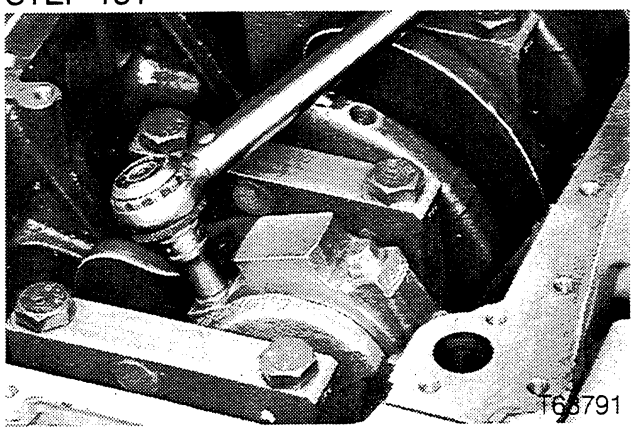


7L92

Measure the length of the connecting rod bolts. If the bolt length is more than 59.25 mm the bolt must be replaced.

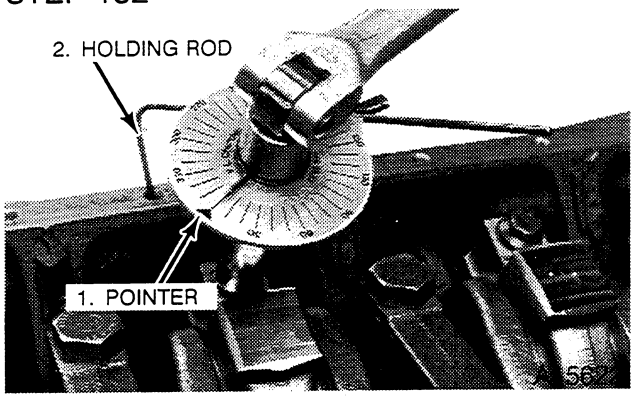
IMPORTANT: *Each bolt length must be checked before installation.*

STEP 131



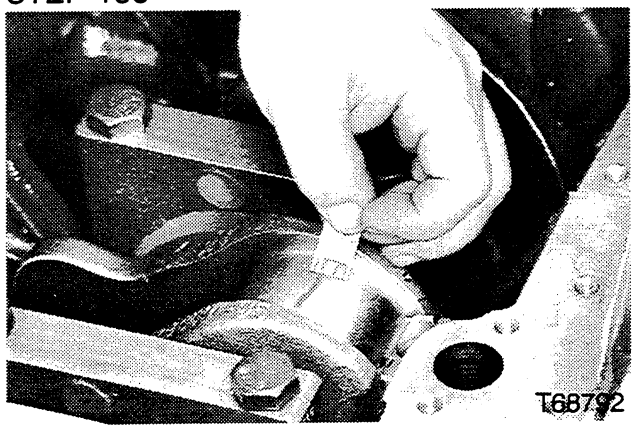
Lubricate the connecting rod bolts with clean engine oil and tighten the bolts to a torque of 60 Nm.

STEP 132



Install the torque angle gauge. Position and lock the holding rod. Move the pointer to 60 degrees. Tighten the bolt until the pointer is at 0 degrees.

STEP 133

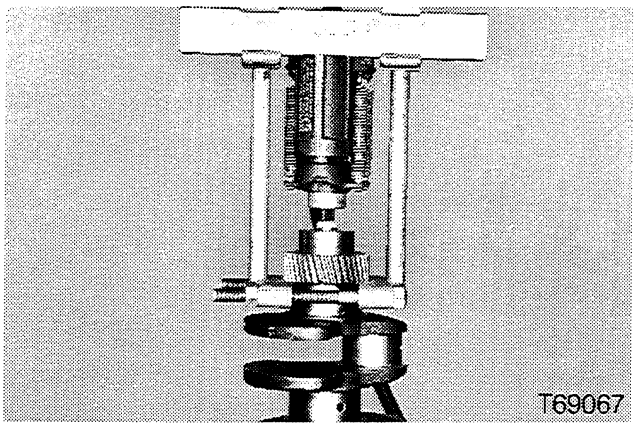


Remove the bearing caps and check the clearance. The clearance must be between 0.038 mm to 0.129 mm. If the clearance is more than 0.129 mm, undersize bearing liners must be installed and reconditioning of the bearing journals must be done by grinding.

NOTE: *A clearance of 0.038 mm to 0.116 mm is required when installing new bearing liners.*

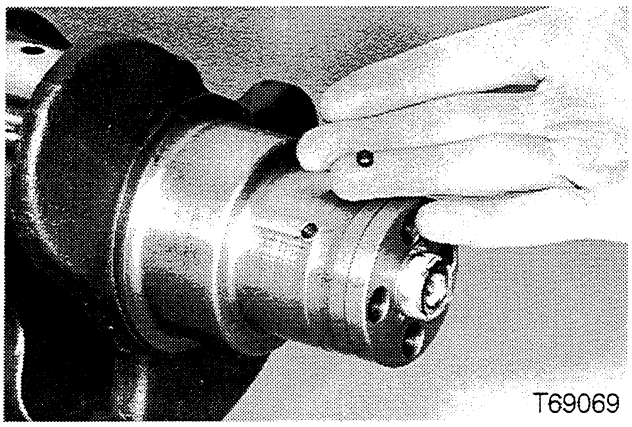
CRANKSHAFT GEAR REMOVAL

STEP 184



Pull the gear off the crankshaft.

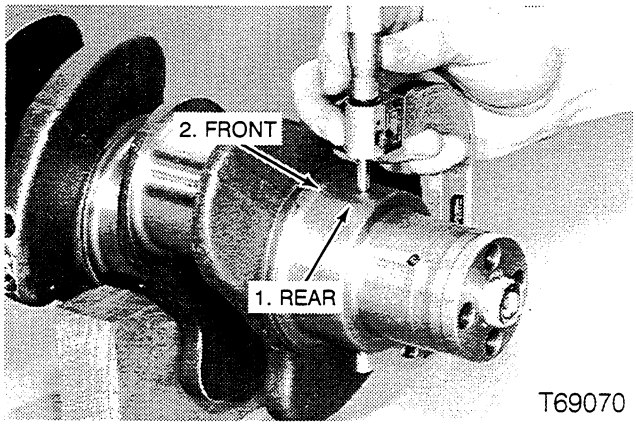
STEP 185



Remove the pin or woodruff key from the crankshaft.

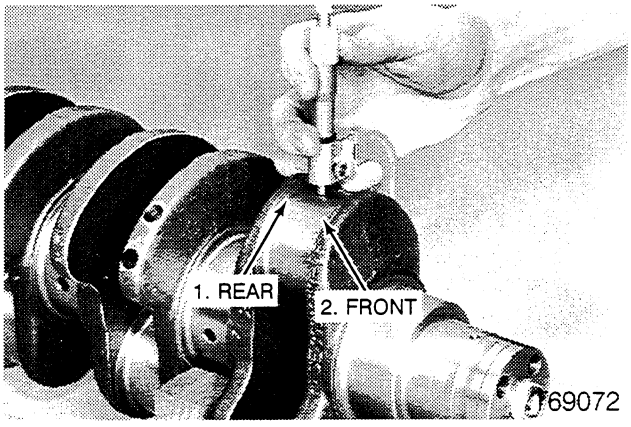
CRANKSHAFT INSPECTION

STEP 186



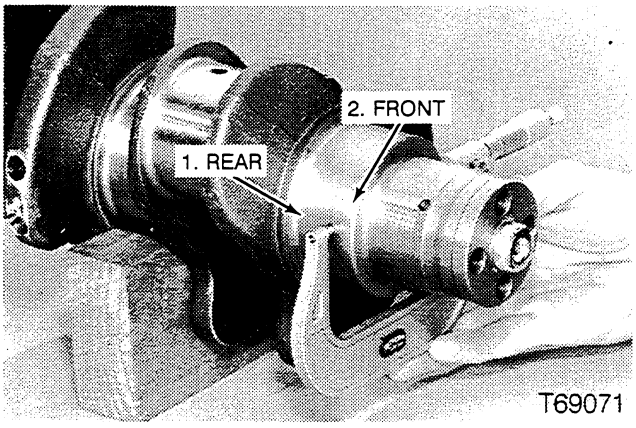
Measure the main bearing journals to see if the journals are worn. Measure the front and rear of each journal. If the diameter is less than 82.962 mm grind the crankshaft journals.

STEP 188



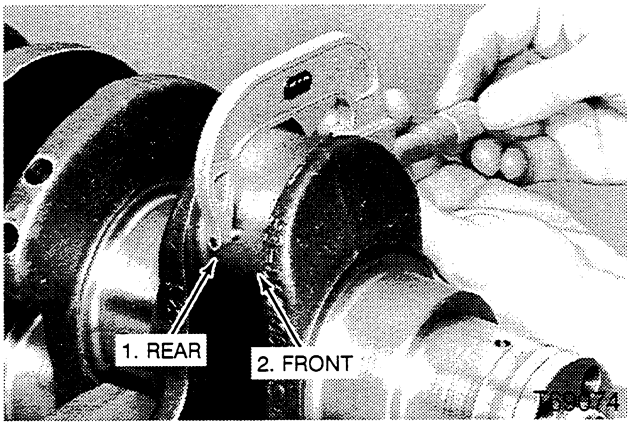
Measure the connecting rod journals. Measure the front and rear of each journal. Grind the journals if the taper is more than 0.013 mm or if the diameter is less than 68.962 mm.

STEP 187



Measure the main bearing journals, again, 90 degrees from the first measurements (Step 186) for out-of-round. If the out-of-round is more than 0.050 mm, grind the journals and use undersize liners.

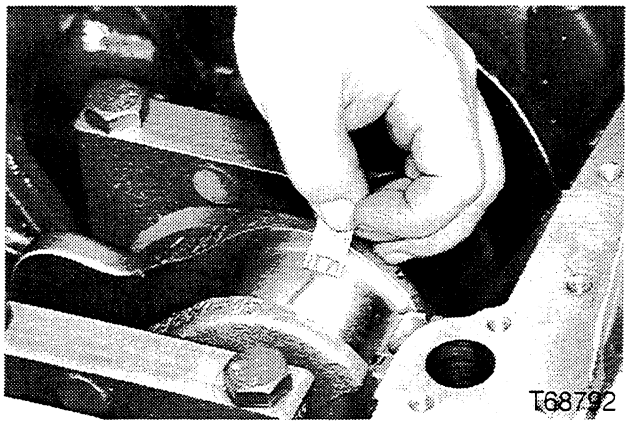
STEP 189



Check the connecting rod journals again, 90 degrees from the first measurements (Step 188) for out-of-round. Grind the journals if out-of-round is more than 0.050 mm.

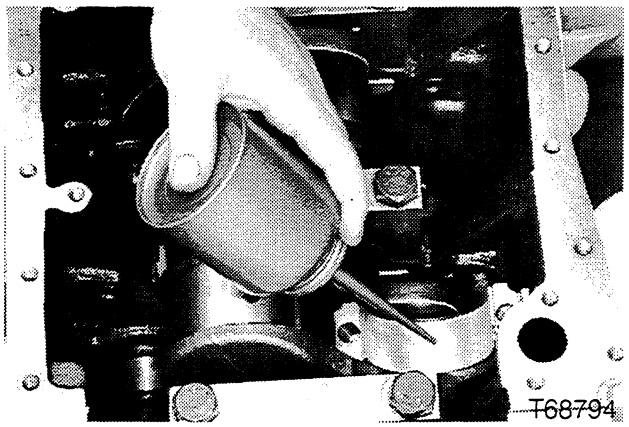
NOTE: *If the crankshaft is bent, replace the crankshaft.*

STEP 235



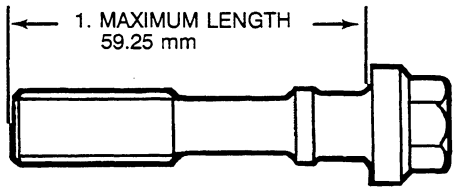
Remove the bearing caps and check the clearance. The clearance must be 0.038 to 0.129 mm. If the clearance is more than 0.129 mm, undersize bearing liners must be installed and reconditioning of the bearing journals must be done. Install new bearing liners which will give a clearance of 0.038 to 0.116 mm.

STEP 236



Add lubrication to the bearing liners. Use clean engine oil.

STEP 237

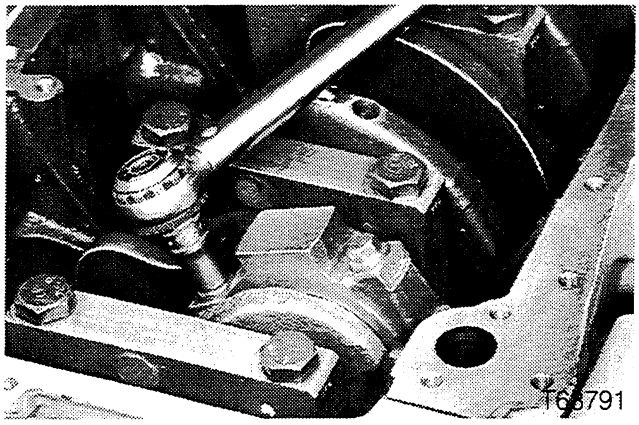


7L92

Measure the length of the connecting rod bolts. If the bolt length is more than 59.25 mm the bolt must be replaced.

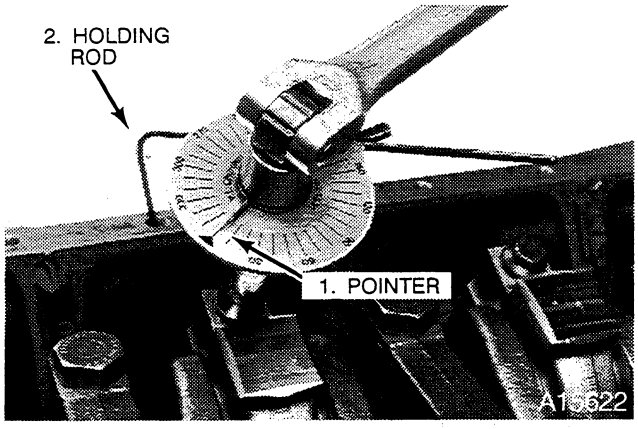
IMPORTANT: *Each bolt length must be checked before installation.*

STEP 238



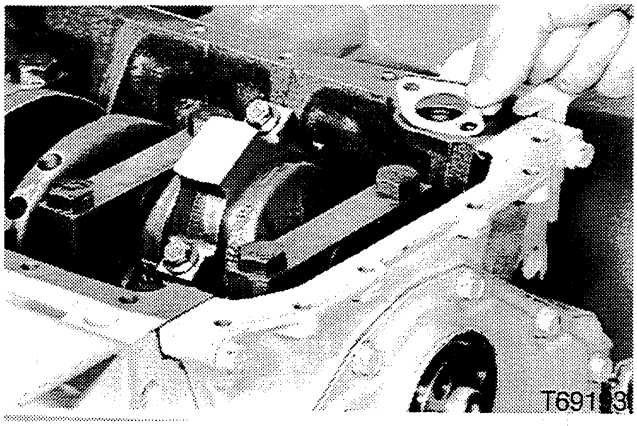
Add lubrication to the rod bolts. Install the rod bolts and tighten to a torque of 60 Nm.

STEP 239



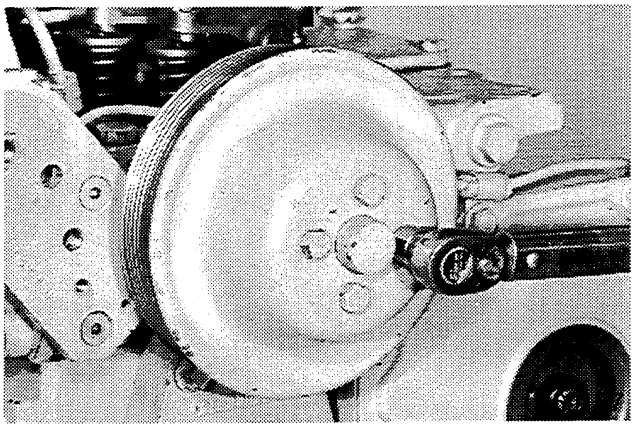
Install the torque angle gauge. Position and lock the holding rod. Turn the pointer to 60 degrees. Tighten the bolt until the pointer is at 0 degrees.

STEP 240



Install a new oil inlet tube gasket. See Section 2445 for oil inlet tube installation.

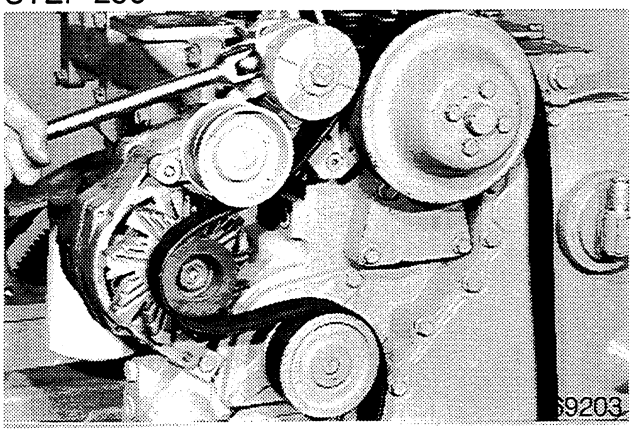
STEP 289



Install the fan pulley and bolts. Tighten the bolts to a torque of:

Grade 8.8 Size M8	26 to 31
Grade 10.9 SiZe M8	37 to 43
Grade 8.8 Size M10	51 to 62
Grade 10.9 Size M10	51 to 62

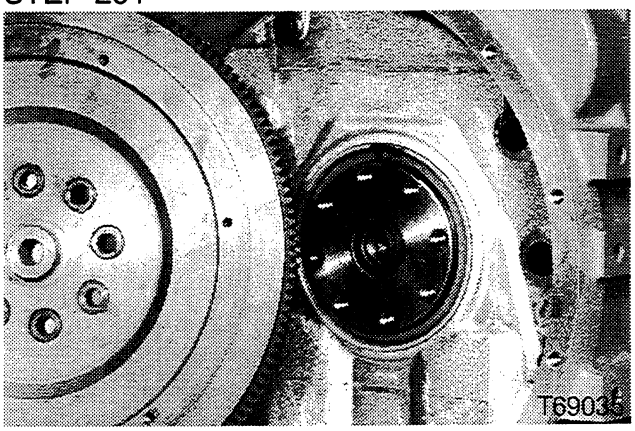
STEP 290



Lift the belt tensioner and install the fan belt.

FLYWHEEL
Removal

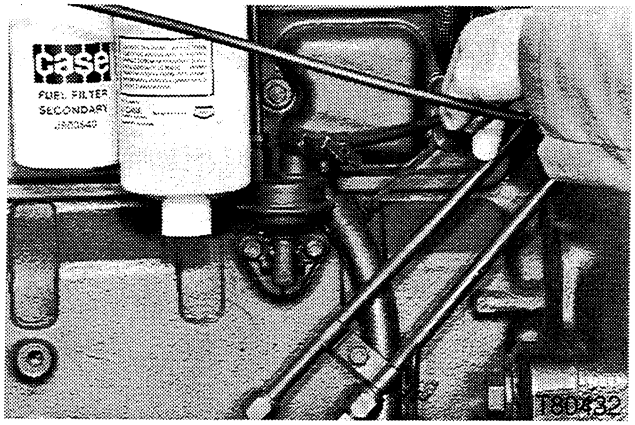
STEP 291



Remove the bolts and the flywheel from the engine.

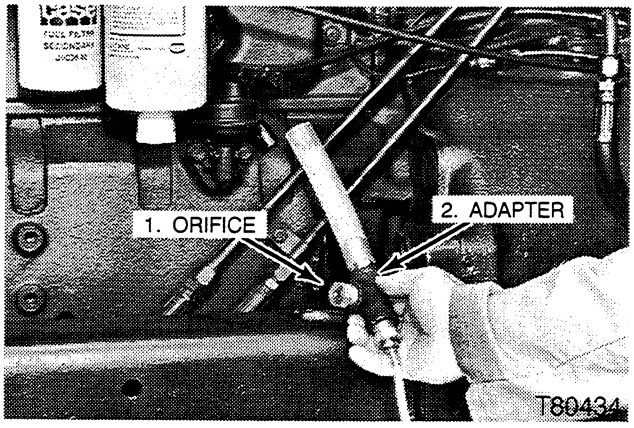
CRANKCASE PRESSURE CHECK (BLOW BY)
Manometer Installation

STEP 327



Remove the clamp and the breather hose.

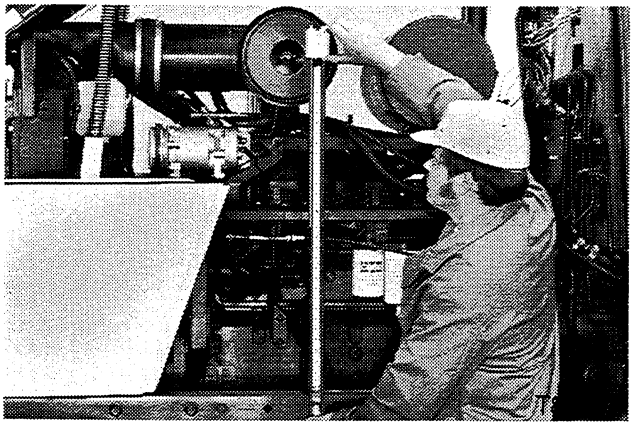
STEP 328



Install the breather adapter with the four cylinder orifice.

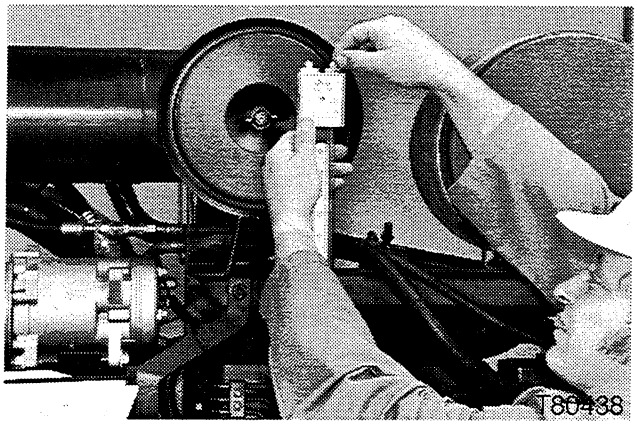
NOTE: *Use the 0.221 inch for four cylinder engines.*

STEP 329



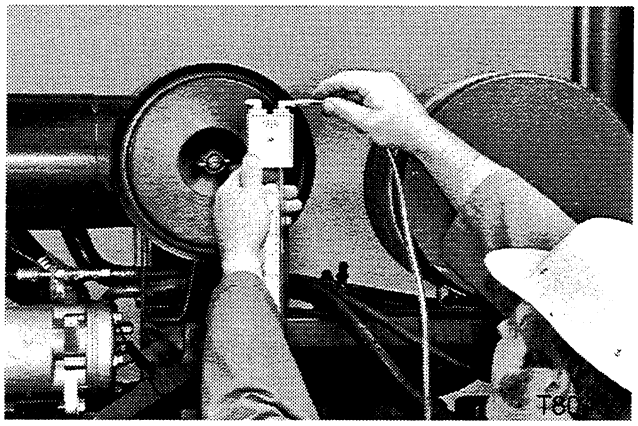
Install the manometer.

STEP 330



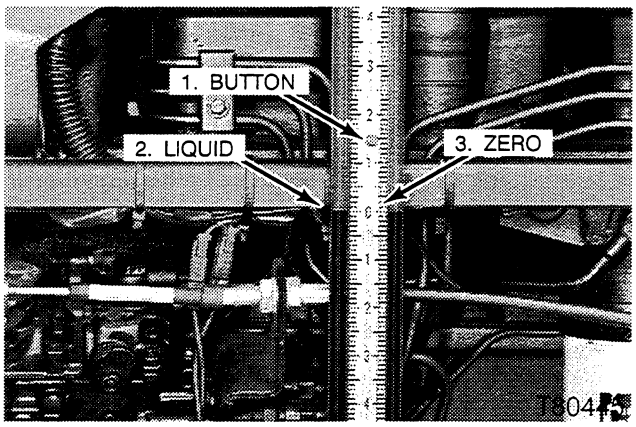
Turn each connector on the manometer one turn counterclockwise.

STEP 331



Connect the tube from the breather adapter to one of the connectors on the manometer.

STEP 332



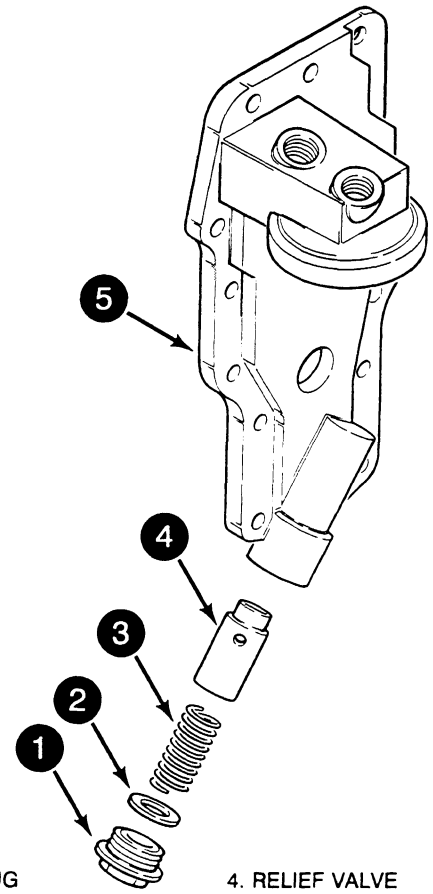
Push the button on the gauge and move the gauge up or down, until the zero on the gauge and the liquid in the tube are aligned.

OIL PRESSURE RELIEF VALVE SERVICE

STEP 19

Use a valve spring tester and check the valve spring for the following specifications:

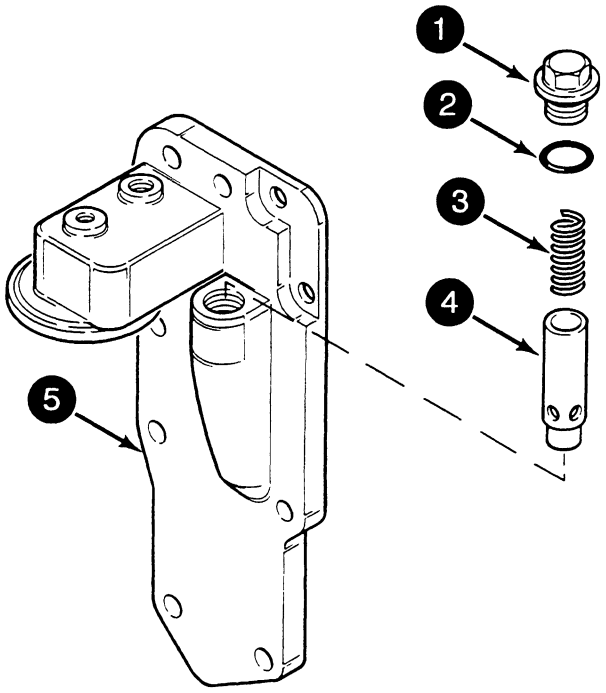
Bottom Mounted Relief Valve



1. PLUG
2. GASKET
3. RELIEF VALVE SPRING
4. RELIEF VALVE
5. OIL FILTER HOUSING

Relief Valve Springs (For 2 Hole Relief Valves)
Free Length ..... 55.83 mm
Outside Diameter ..... 14.02 mm
Assembled Height:
Compress to 44.98 mm ..... 63 to 79 N
Spring Load Height:
Compress to 39.98 mm ..... 95 to 113 N

Top Mounted Relief Valve



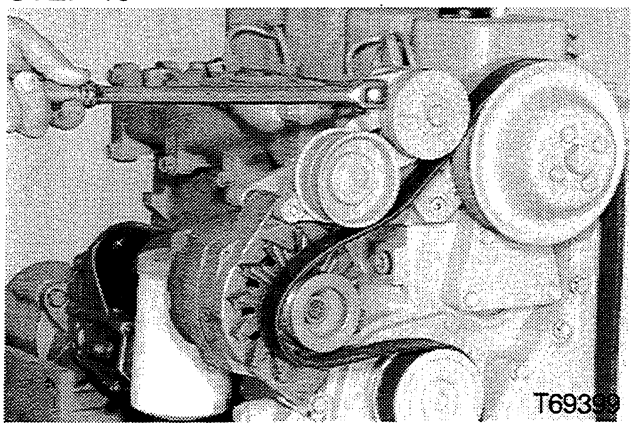
1. PLUG
2. GASKET
3. RELIEF VALVE SPRING
4. RELIEF VALVE
5. OIL FILTER HOUSING

Relief Valve Springs (For 4 Hole Relief Valves)
Free Length ..... 64.0 mm
Assembled Height:
Compress to 44.5 mm ..... 87 N
Spring Load Height:
Compress to 41.25 mm ..... 104.7 N

Replace the valve spring if specifications are not met.

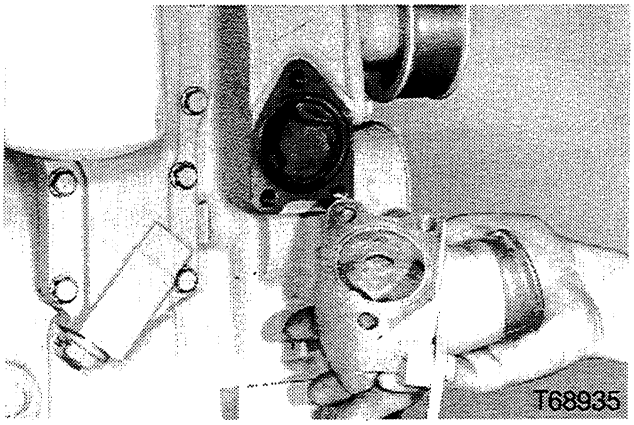
COOLANT INLET MANIFOLD
Removal

STEP 19



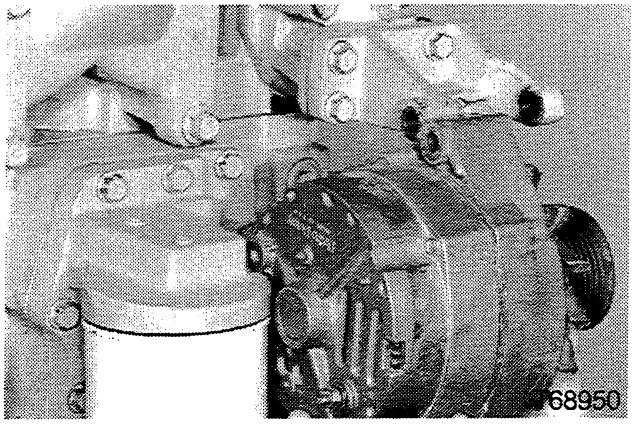
Lift the belt tensioner pulley and remove the fan belt.

STEP 21



Remove the coolant inlet manifold.

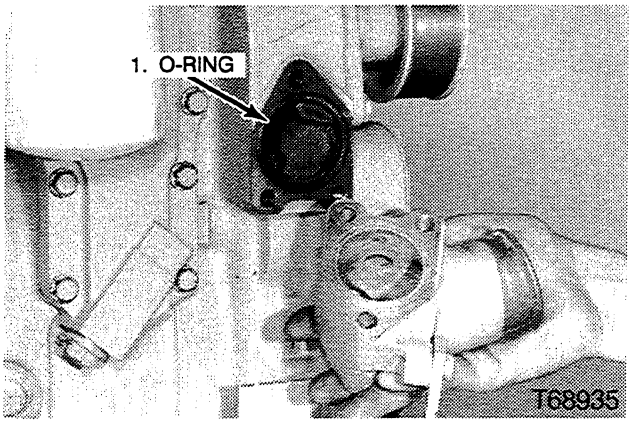
STEP 20



Remove the alternator retaining bolts and remove the alternator.

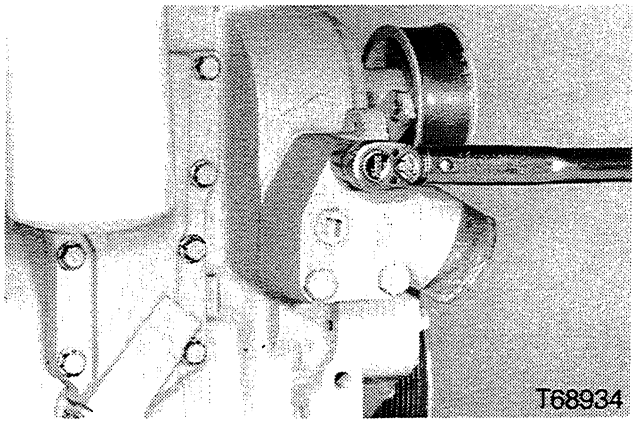
Installation

STEP 22



Install a new o-ring and the coolant inlet manifold.

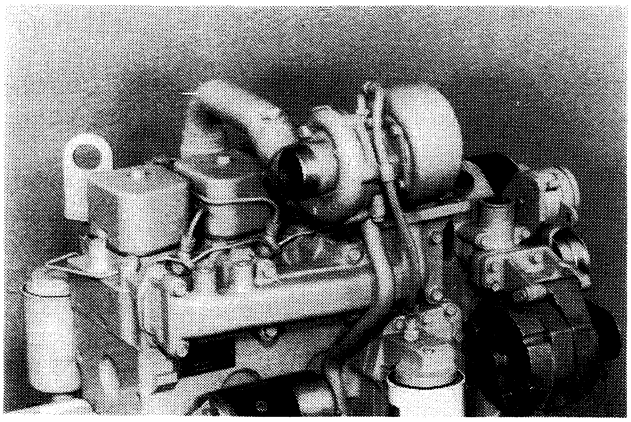
STEP 23



Install the coolant inlet manifold retaining bolts and tighten to a torque of 39 to 47 Nm.

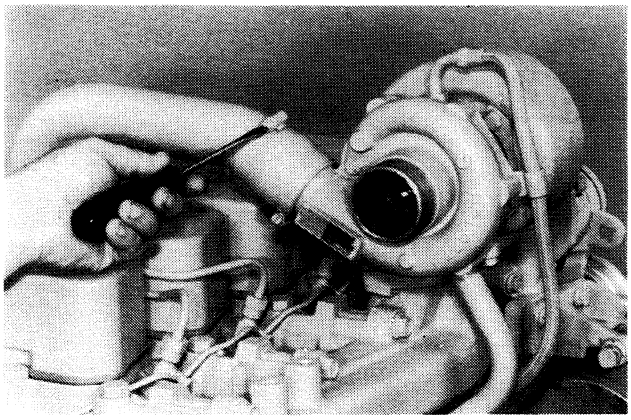
SERVICING THE TURBOCHARGER
Removal

STEP 1



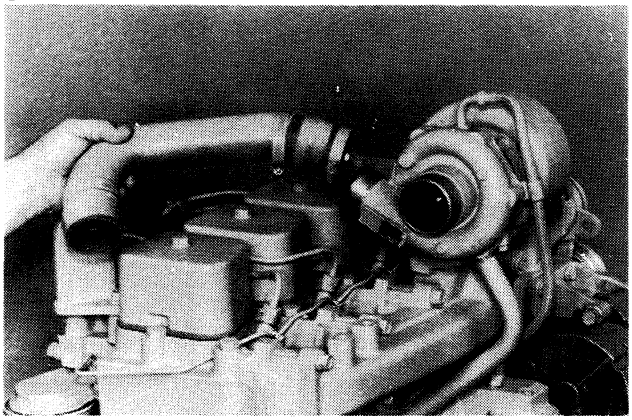
Turbocharger with the air cleaner and the exhaust pipe removed.

STEP 2



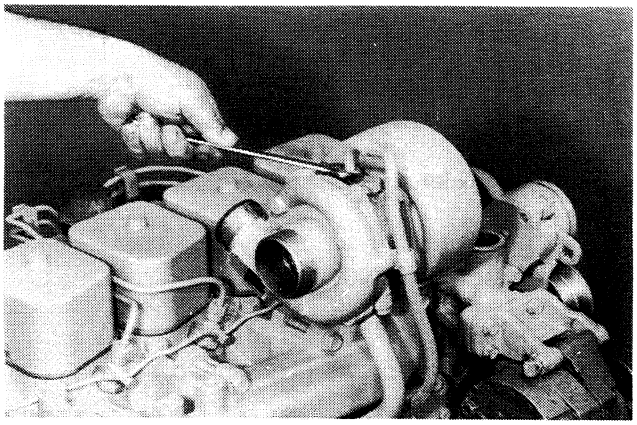
Loosen the air intake hose clamps.

STEP 3



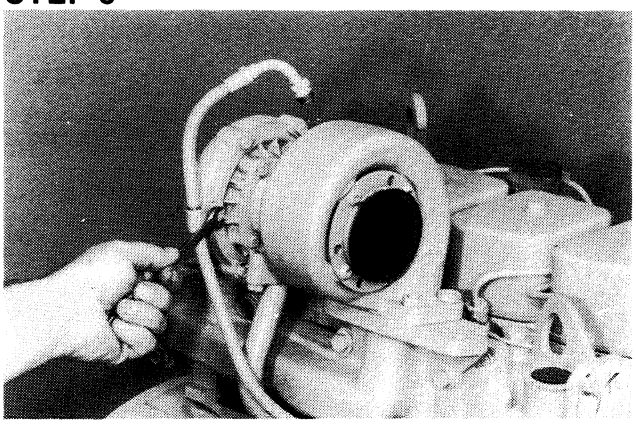
Remove the air intake hose.

STEP 4



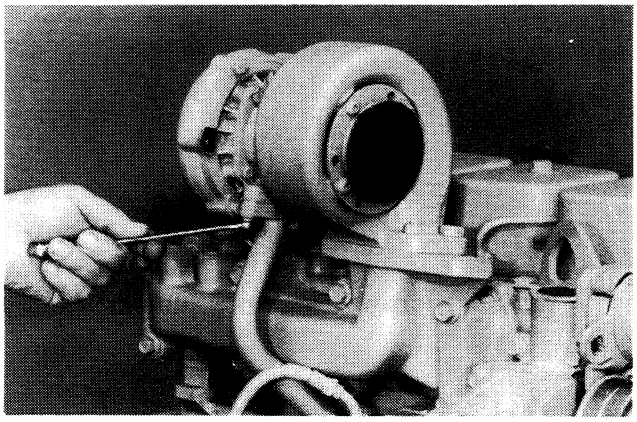
Disconnect the oil supply tube.

STEP 5



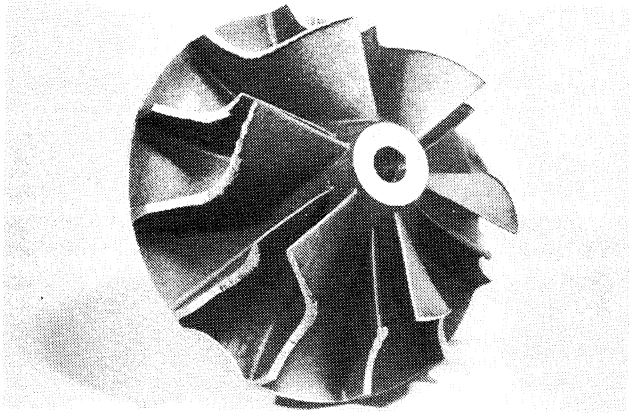
Disconnect the oil supply tube clamp from the turbocharger.

STEP 6



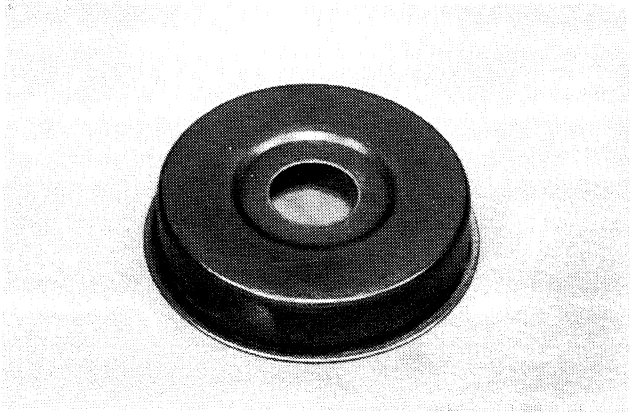
Disconnect the oil drain tube.

STEP 54



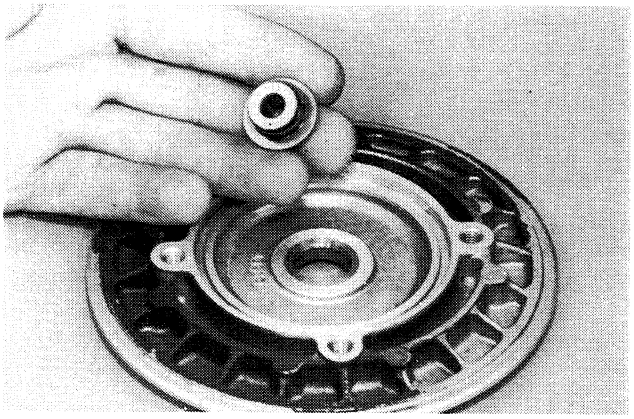
Inspect the compressor wheel for bent blades and scratches. Replace the turbocharger if the wheel shows damage.

STEP 55



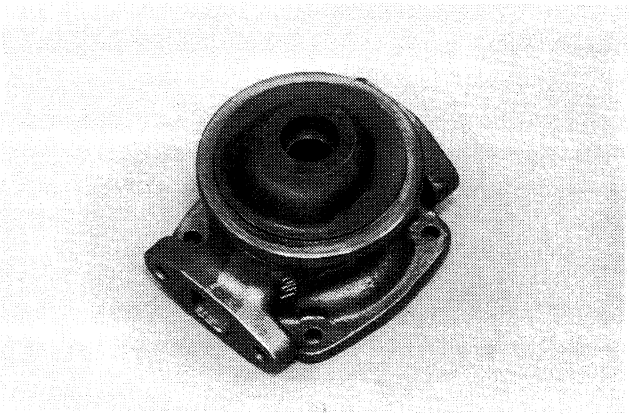
Replace the turbocharger if the heat shield shows damage.

STEP 56



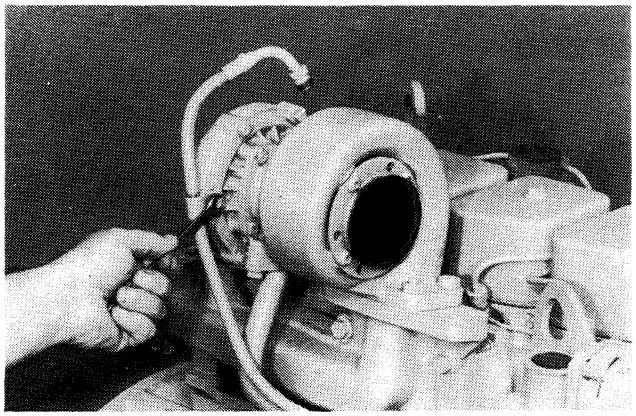
Replace the turbocharger if the oil slinger shows damage.

STEP 57



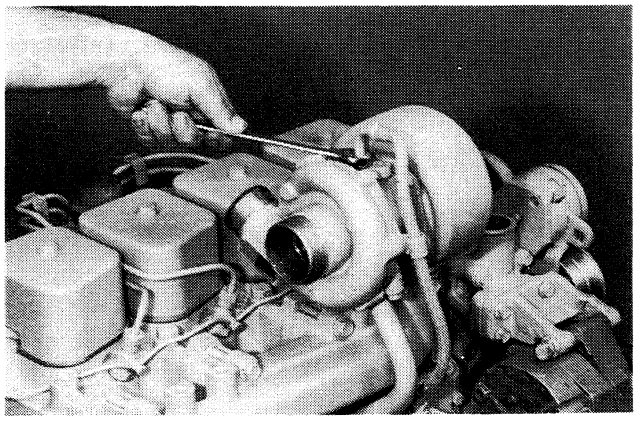
Inspect the center housing bearing surfaces for scoring or scratches. Replace the turbocharger if there is damage.

STEP 98



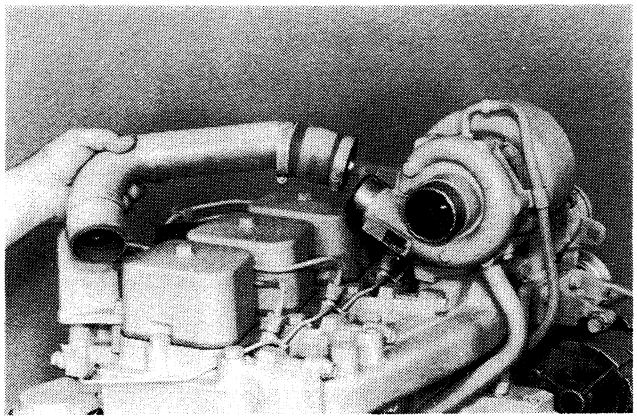
Install a tighten the bolt for the oil supply tube clamp.

STEP 99



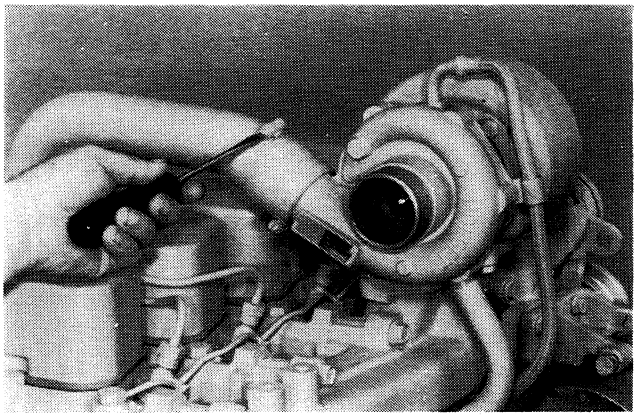
Connect and tighten the oil supply tube to the turbocharger.

STEP 100



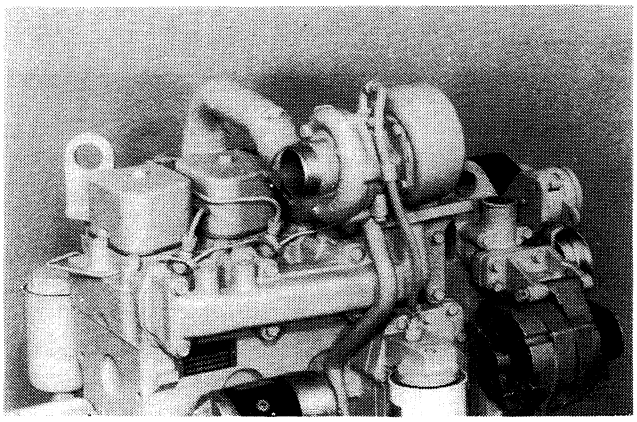
Install the air intake hose.

STEP 101



Install and tighten the air intake hose clamps.

STEP 102

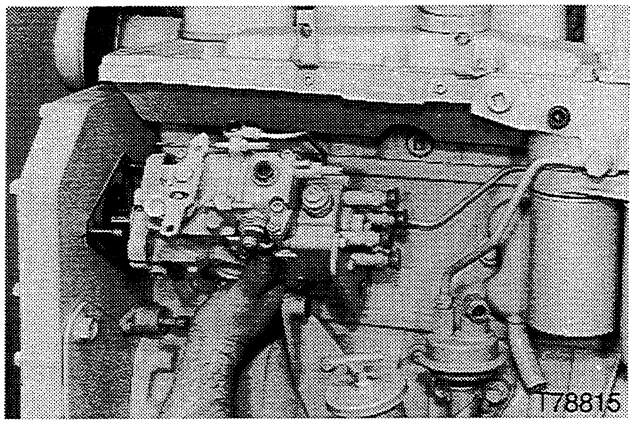


Turbocharger installed on engine.

NOTE CASE CORPORATION reserves the right to make improvements in design or changes in specifications at any time without incurring any obligation to install them on units previously sold.

Installation

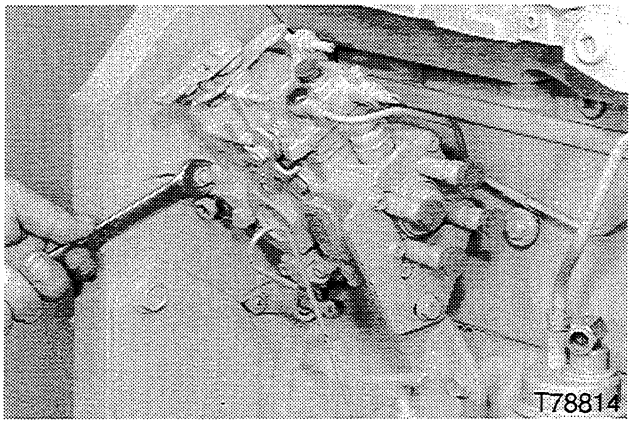
STEP 11



Install a new gasket. Install the injection pump. Install the injection pump washer and nut.

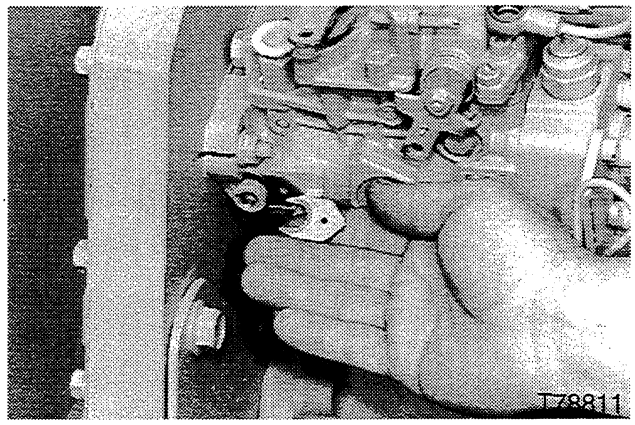
NOTE: *Make sure the key in the injection pump shaft and the slot in the drive gear are aligned.*

STEP 12



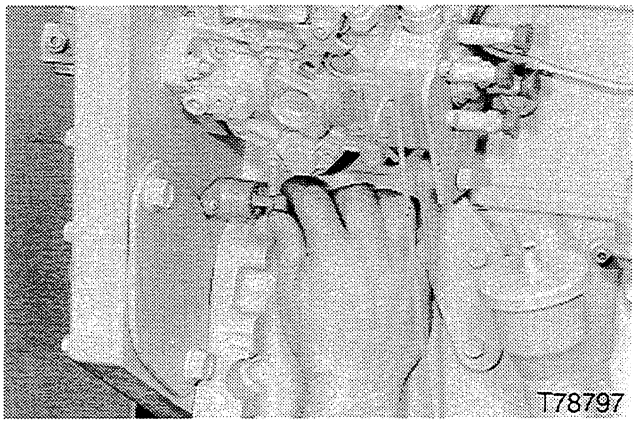
Align the marks on the injection pump flange and front housing. Install the pump retaining nuts and bolt. Install the bolt into pump mounting bracket. Tighten the nuts and bolts to a torque of 21 to 27 Nm.

STEP 13



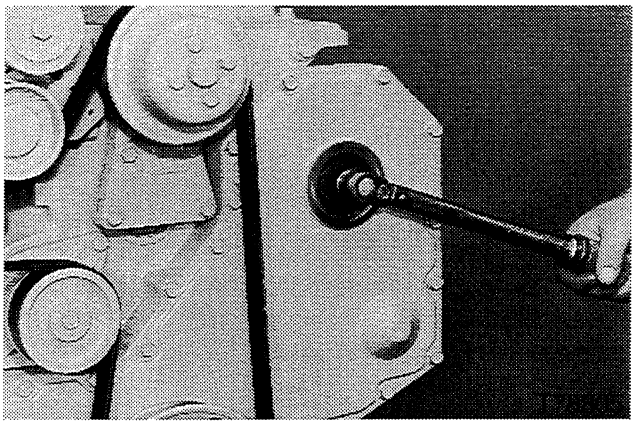
Install the slotted tab and tighten the lock bolt to a torque of 12 to 14 Nm.

STEP 14



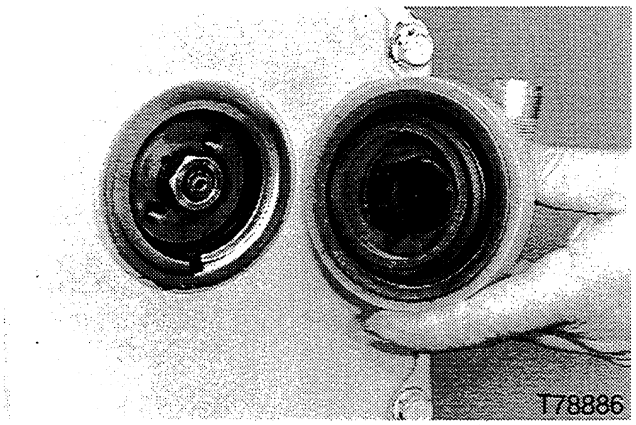
Pull out the locking pin from the camshaft gear.

STEP 15



Install the nut and washer on the injection pump shaft. Tighten the nut to a torque of 59 to 71 Nm.

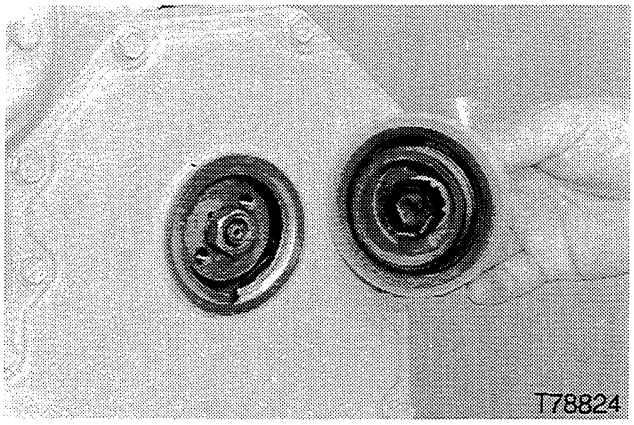
STEP 16



Install the tachometer drive assembly (if equipped).

NOTE: *The nut on the injection pump and the tachometer drive nut must be aligned.*

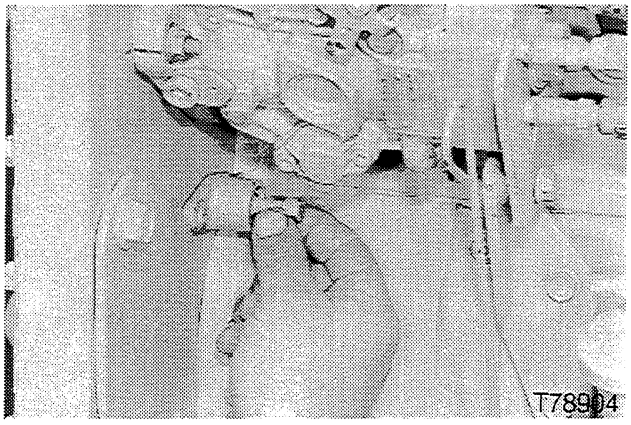
STEP 59



Install the tachometer drive assembly (if equipped).

NOTE: *The drive gear nut and the tachometer drive nut must be aligned.*

STEP 60

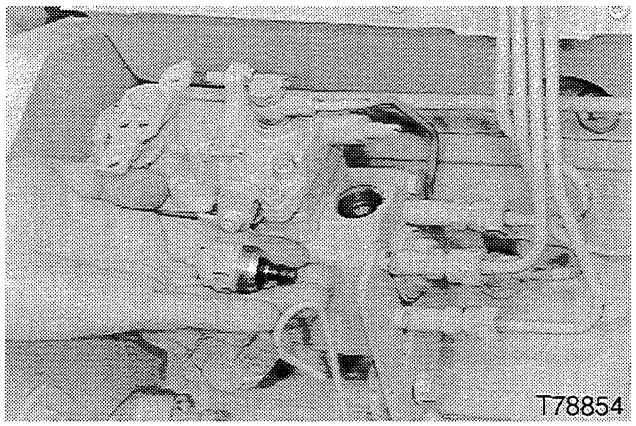


Pull the locking pin out of the camshaft gear.

FUEL SHUT-OFF SOLENOID

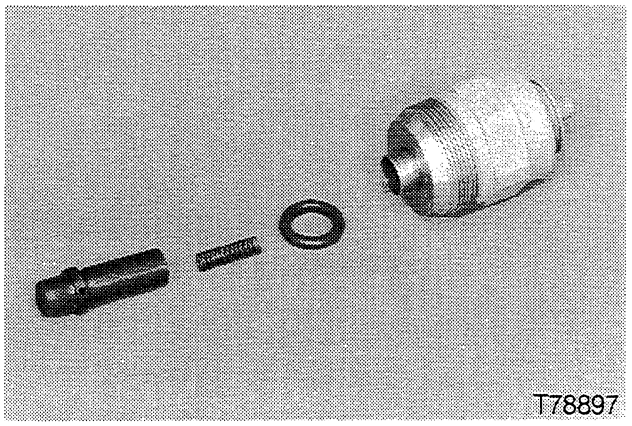
Removal and Disassembly

STEP 61



Remove the fuel shut-off solenoid from the injection pump.

STEP 62



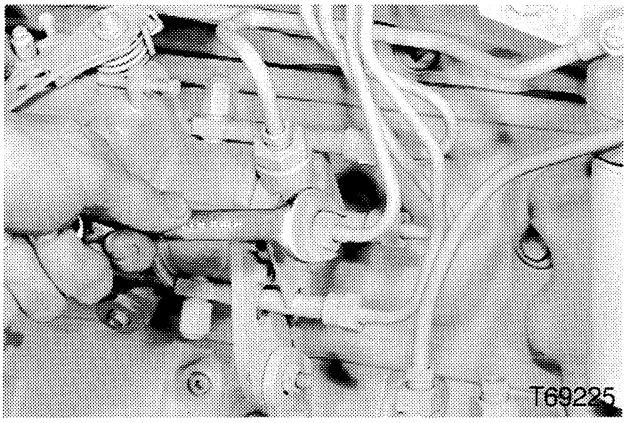
Disassemble the fuel shut-off. Check the plunger solenoid for scoring. Clean the orifice hole with a small piece of wire.

LOCATING FAULTY INJECTORS

If there is a loss of power during engine operation, the injectors can be faulty. Refer to the following procedures to locate the faulty injectors:

Locating Faulty Injectors at the Fuel Pump

STEP 1

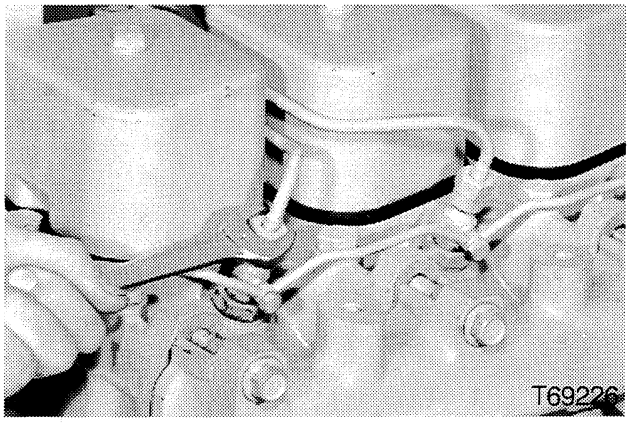


Loosen the tube nut on the fuel line. This will release the fuel and the injector will not work. If this injector is faulty, there will not be any difference in the engine performance. Connect and tighten the tube nut of the fuel line.

Repeat this procedure for the remaining injectors.

Locating Faulty Injectors at the Cylinder Head

STEP 2

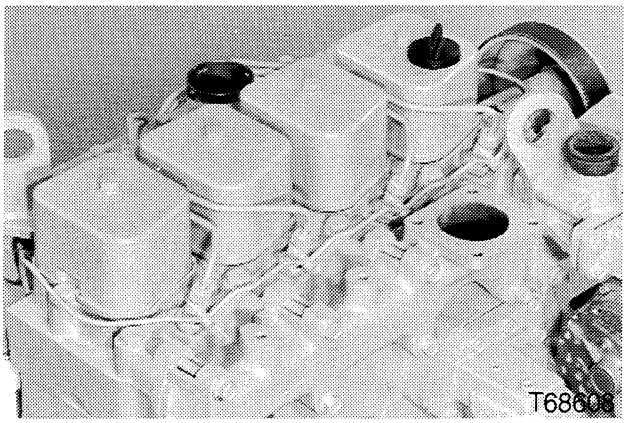


Loosen the tube nut on the fuel inlet line for the injector at the cylinder head. If the injector is faulty, there will not be any difference in the engine performance. Connect and tighten the tube on the fuel inlet line.

Repeat this procedure for the remaining injectors.

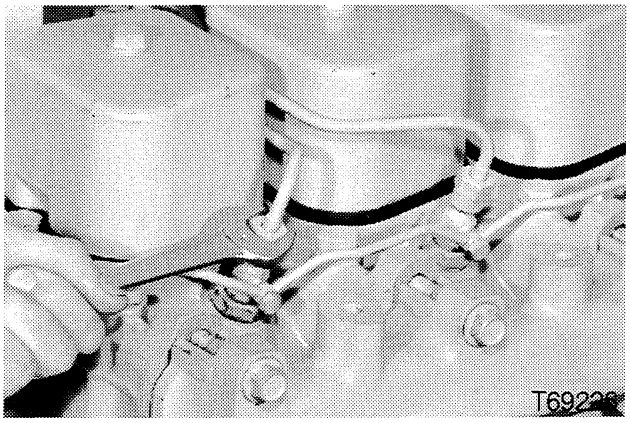
INJECTOR Removal

STEP 3



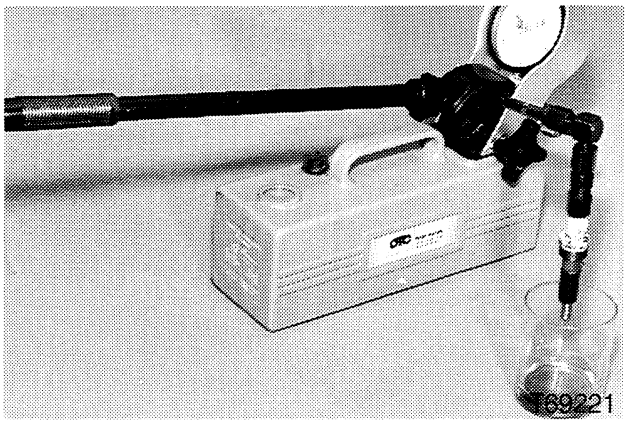
Clean the area around the fuel injectors.

STEP 4



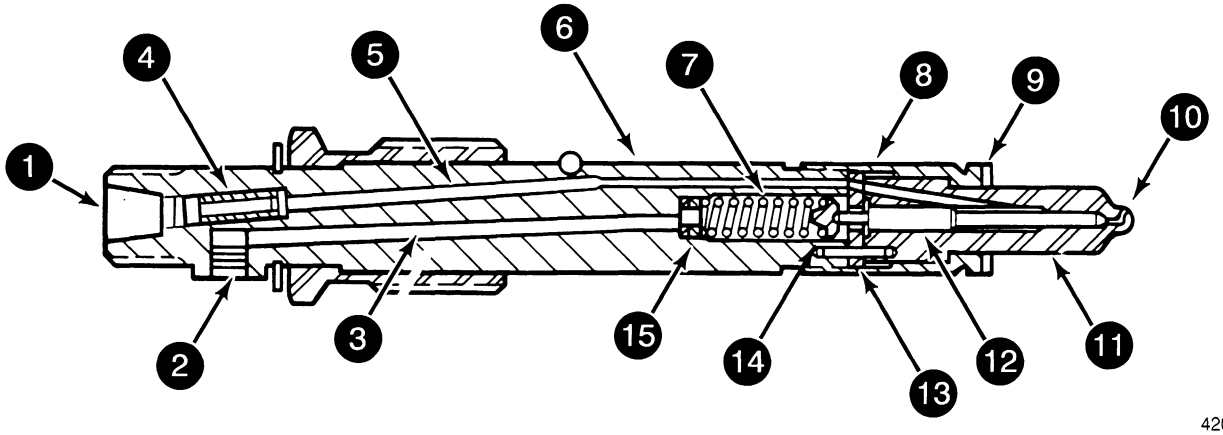
Disconnect the fuel line from the injector and install a dust cap or the injector.

STEP 25



Check the fuel injector on the test stand, refer to Pages 9 and 11.

1. INLET
2. LEAK OFF
3. LEAK OFF CHANNEL
4. EDGE FILTER (IF EQUIPPED)
5. HIGH PRESSURE CHANNEL
6. INJECTOR BODY
7. OPENING PRESSURE CONTROL SPRING
8. CAP NUT
9. NOZZLE SEALING WASHER
10. SPRAY ORIFICE
11. INJECTOR TIP
12. INJECTOR VALVE
13. VALVE STOP
14. SPRING SEAT
15. PRESSURE ADJUSTING SHIMS



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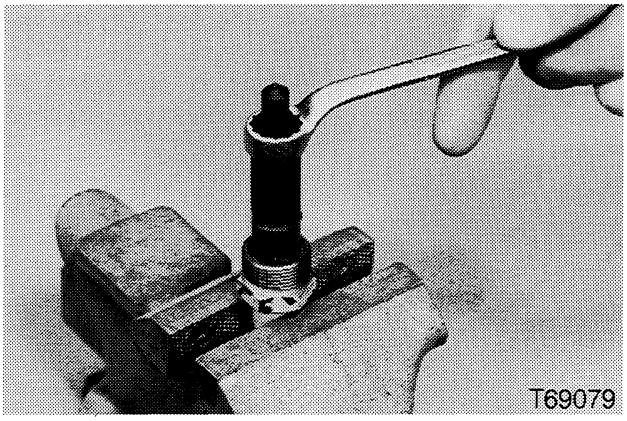
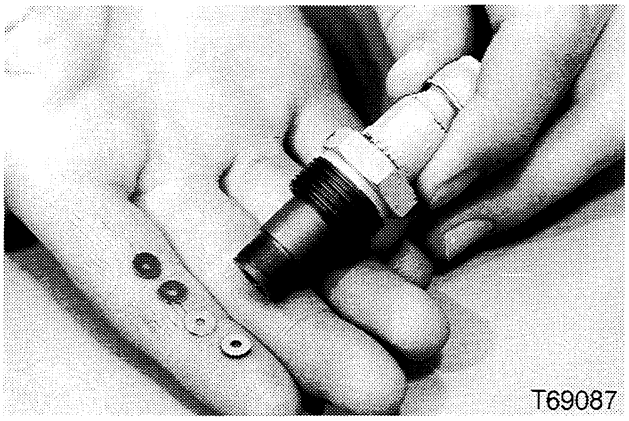
Adjustments

STEP 26



Remove the fuel injector from the nozzle tester. Put the injector in a soft faced vise. The flats of the injector holder must be toward the face of the vise. The injector tip must be facing up. Loosen the cap nut. To disassemble the injector, refer to Page 12.

STEP 27



Add pressure adjusting shims to increase the opening pressure. Remove pressure adjusting shims to decrease opening pressure. Do this until the correct pressure is reached.

IMPORTANT: *The opening pressure is changed by about 3.79 Bar (55 PSI) for each 0.0254 mm of shim thickness that is added or removed.*

STEP 39

Assemble the fuel injector. Refer to Pages 14 through 16.

(19) Ether Injection Solenoid

Check Points	Reading	Possible Cause of Bad Reading
Terminal for wire 0 to ground.	Continuity	Bad ground circuit.

NOTE: *Put the master disconnect switch in the ON position, put the engine run switch in the RUN position. Have another person push in and hold the start switch and the ether injection switch.*

Terminal for wire 28A to ground.	12 volt	Engine temperature too warm. Let the engine cool. Also check the engine temperature switch (14).

NOTE: *If the readings are good, replace the ether injection solenoid.*

(20) Right-Hand Instrument Panel Lamp

Check Points	Reading	Possible Cause of Bad Reading
Bulb	Good	Bad Bulb.
Check between the housing of the instrument panel lamp and the instrument panel.	Continuity	Bad ground connection between the instrument panel lamp and the instrument panel.

NOTE: *Put the master disconnect switch and the work light switch in the ON position.*

Terminal for wire 49A to ground.	12 volts	Check the wire between the instrument panel lamp and the work light switch (16). Also check the work light switch.

NOTE: *If the readings are good, replace the instrument panel lamp.*

(21) Left-Hand Instrument Panel Lamp

Check Points	Reading	Possible Cause of Bad Reading
Bulb	Good	Bad Bulb.
Check between the housing of the instrument panel lamp and the instrument panel.	Continuity	Bad ground connection between the instrument panel lamp and the instrument panel.

NOTE: *Put the master disconnect switch and the work light switch in the ON position.*

Terminal for wire 49B to ground.	12 volts	Check the wire between the instrument panel lamp and the work light switch (16). Also check the work light switch.

NOTE: *If the readings are good, replace the instrument panel lamp.*

SAFETY RULES

Never try to charge the battery if the electrolyte in the battery is frozen. 47-83A

Never cause sparks to occur or smoke near batteries that are charging or have been recently charged. 13-8A

Disconnect the ground cable first when the battery cables are disconnected from the battery.

Connect the ground cable last when the battery cables are connected to the battery. 47-55A

Some batteries have a ventilation tube. If there is battery acid in the ventilation tube, this battery acid can be released when the battery is turned upside down. If you turn the battery upside down, make sure that the end of the ventilation tube is away from you and away from any other people in the area. Battery acid can cause severe burns. 48-57B

Battery acid causes severe burns. Batteries contain sulfuric acid. Avoid contact with skin, eyes, or clothing. Antidote: EXTERNAL-Flush with water. INTERNAL-Drink large quantities of water or milk. Follow with milk of magnesia, beaten egg, or vegetable oil. Call physician immediately. Eyes: Flush with water for 15 minutes and get prompt medical attention.

Batteries produce explosive gases. Keep sparks, flame, and cigarettes away. Ventilate when charging or using in enclosed area. Always shield eyes when working near batteries.

Keep out of reach of children. D-47-53A

SPECIAL TOOLS

328M

The CAS-10147 tester is used to do the Capacity (Load) Test. This tool is first used on page 6.

7. Start and run the engine at full throttle.

8. Read the pressure gauge. The pressure gauge must indicate a pressure above 230 psi (1586 kPa). If the pressure gauge does not indicate the correct pressure, check the hose between the torque converter and the pressure gauge. If the problem is not found, the problem is in the torque converter charging pump or the pressure regulator.

10. Run the engine at full throttle.

11. Look at the pressure gauge. The pressure gauge must indicate 250 to 310 psi (1724 to 2137 kPa). If the pressure gauge does not indicate the correct pressure, check the hose between the torque converter and the pressure gauge. If the problem is not found, check the torque converter charging pump and the pressure regulator.

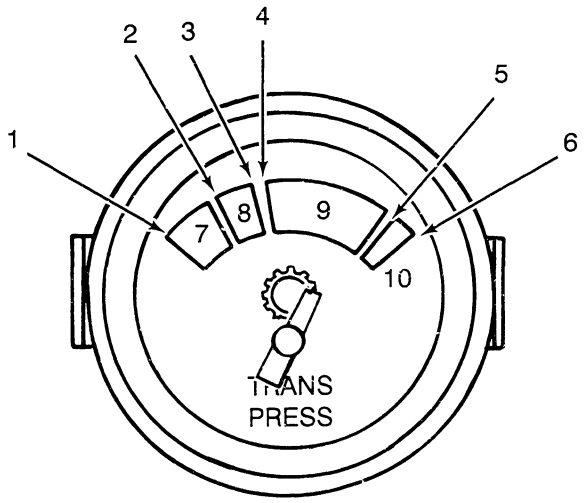
12. If the reading of the pressure gauge was 250 to 310 psi (1724 to 2137 kPa), make a record of the indication.

13. Stop the engine. Disconnect the pressure gauge from the hose. Connect the hose to the transmission oil pressure gauge in the instrument panel.

14. Start and run the engine at full throttle.

15. Make sure that the gauge for torque converter oil temperature is in the green area and read the transmission oil pressure gauge in the instrument panel. See the following illustration above and find the indication of the transmission oil pressure gauge.

16. Compare the indication of the pressure gauge in step 11 to the indication on the transmission oil pressure gauge in step 15. The two readings must be approximately the same.



B900108J

1. 160 psi (1103 kPa)
2. 210 psi (1448 kPa)
3. 240 psi (1655 kPa)
4. 250 psi (1724 kPa)
5. 350 psi (2413 kPa)
6. 380 psi (2620 kPa)
7. Red
8. Amber
9. Green
10. Amber

17. If the two readings were not approximately the same, replace the transmission oil pressure gauge.

Water Temperature Gauge

1. Park the machine on a level surface.

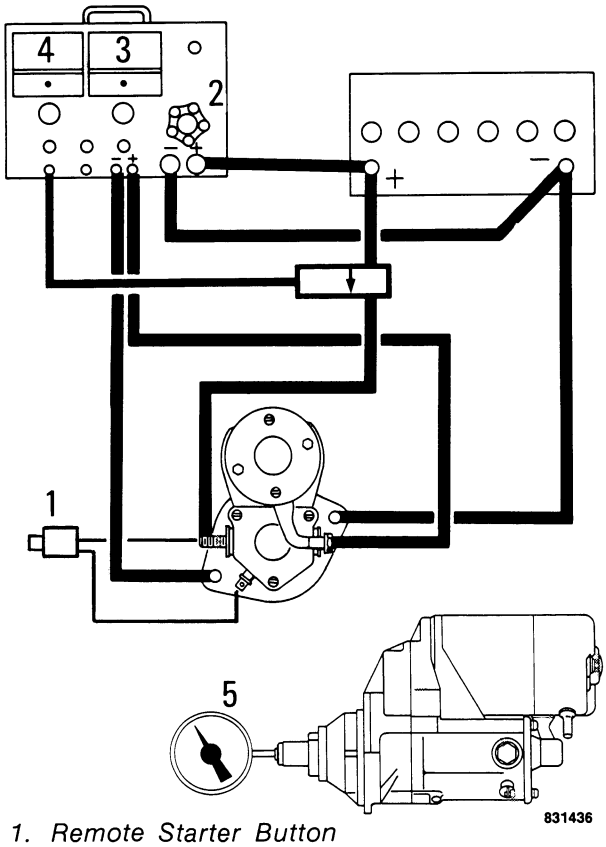
2. Lower the attachments to the floor.

3. Stop the engine and apply the parking brake.

4. When the engine has cooled, remove the radiator cap slowly.

IMPORTANT: *Steps 9, 10, and 11 must be done rapidly. Do not load the battery for more than 15 seconds at one time. After the battery has been loaded for 15 seconds, let the starter cool for 60 seconds.*

9. Actuate the remote starter button and turn the load control until the voltmeter indicates 11 volts.



1. *Remote Starter Button*
2. *Load Control*
3. *Voltmeter*
4. *Ammeter*
5. *Hand Held Tachometer*

10. Look at the ammeter and make a record of the ammeter indication.

11. Use the hand held tachometer and check the armature shaft speed. Make a record of armature shaft speed.

12. Release the remote starter button and turn the load control to the OFF position.

Understanding No Load Test Results

1. If the current draw and the armature shaft speed are within the ranges under Specifications, the starter is good.

2. Low armature shaft speed and high current draw are indications of too much friction. Possible causes of too much friction are:

   a. Tight, dirty, or worn bearings.

   b. A bent armature shaft.

   c. Loose pole shoes (pole shoes make contact with the armature).

   d. A short circuit in the armature coil. Disassemble the starter. Use an armature tester to test the armature. Use the instructions included with the armature tester.

   e. Damaged field coil. Do the test on page 4006-12.

3. If the armature does not rotate and the current draw is high, possible causes are:

   a. Field terminal making contact with the field frame. Inspect the insulators for the field terminal.

   b. Damaged field coil. Do the tests on page 4006-12.

   c. Damaged bearings.

4. If the armature does not rotate and the current draw is zero, possible causes are:

   a. An open field circuit. Disassemble the starter and inspect the field coil connections.

   b. An open armature coil. Disassemble the starter and check for burned commutator bars. Use an armature tester to test the armature. Use the instructions included with the armature tester.

   c. Brushes not making good contact with the commutator bars. Check for high insulation between the commutator bars, broken brush springs, or worn brushes.

5. Low armature shaft speed and low current draw are indications of:

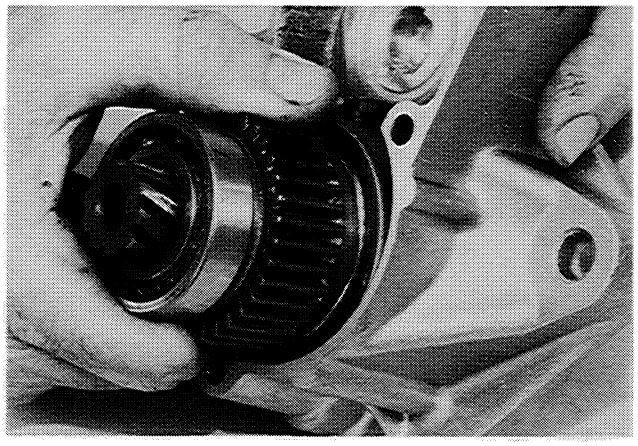
   a. Dirt or corrosion on connections.

   b. Damaged wiring.

   c. Dirty commutator bars.

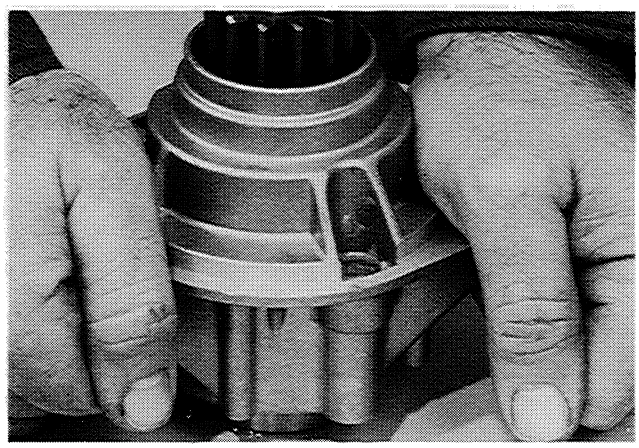
   d. All causes in step 4.

13. Start the starter drive into the starter drive housing.



330802

14. Push down the starter drive housing to push the starter drive all the way into the starter drive housing.



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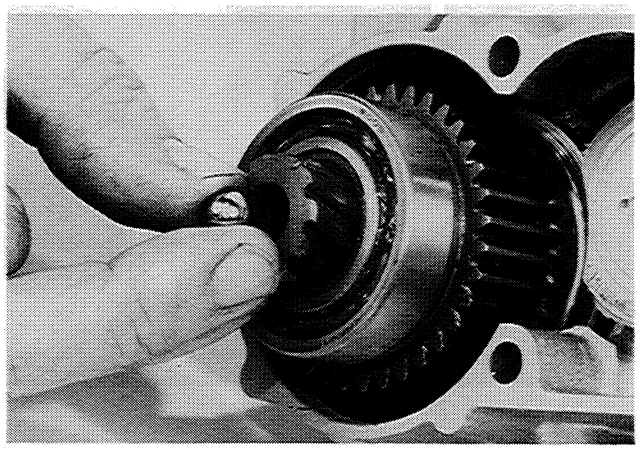
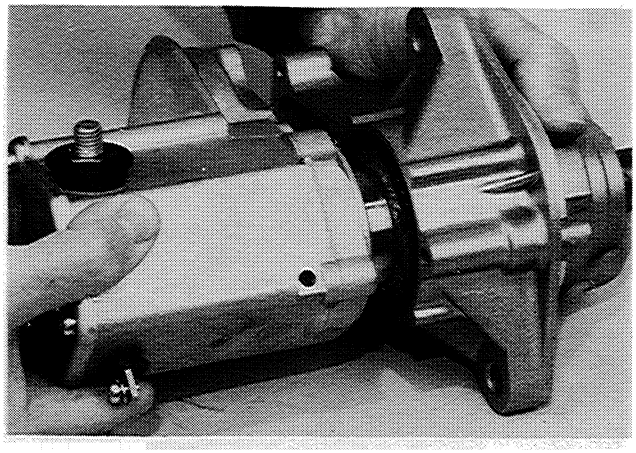
15. Put a small amount of grease in the hole in the starter drive and install the steel ball in the hole.



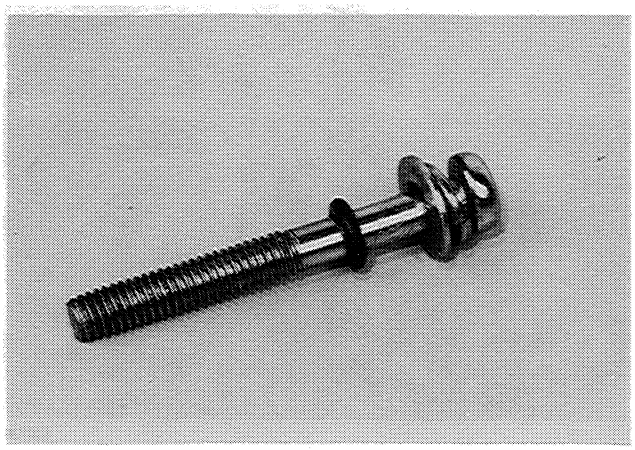
330804

16. Assemble the starter drive housing and starter solenoid.



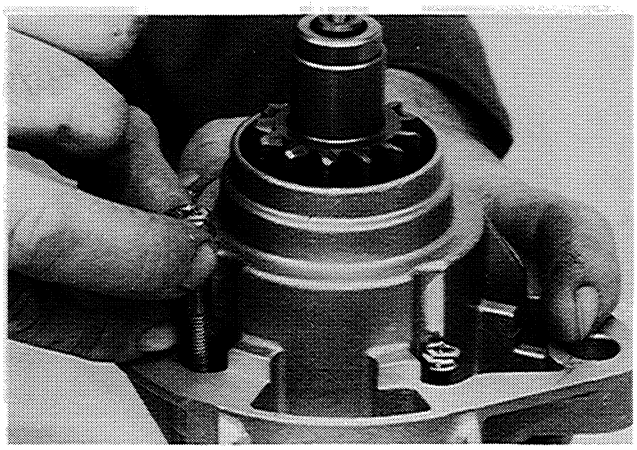
330741

17. Install a lock washer, flat washer, and O-ring on the screws that hold the starter drive housing. Lubricate the O-rings.



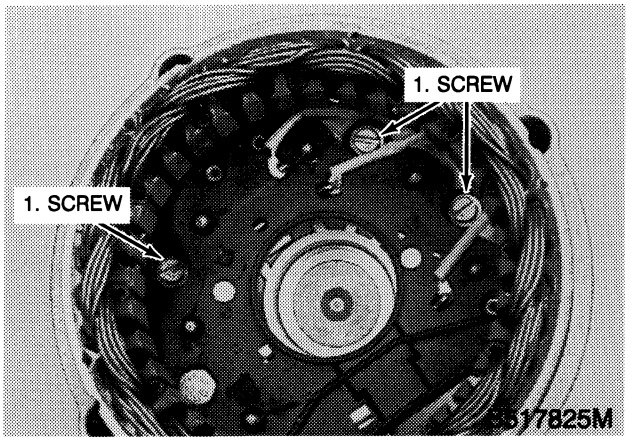
330805

18. Install the screws in the starter drive housing.



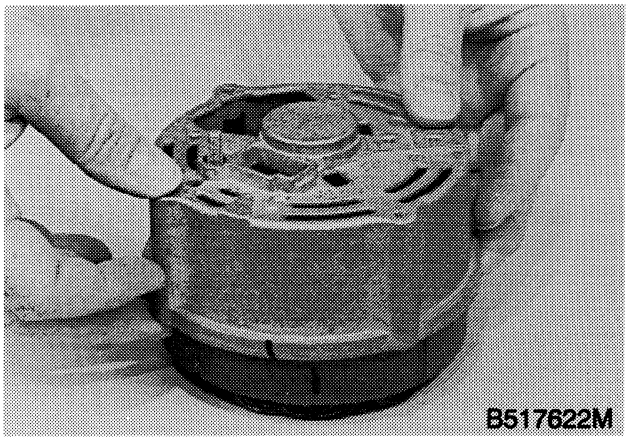
330807

STEP 12



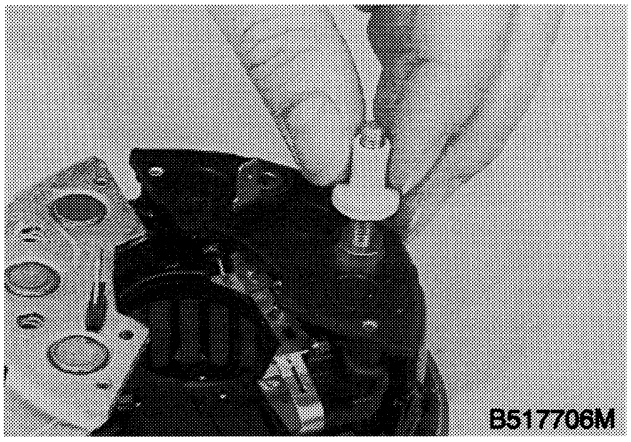
Remove the screws that fasten the rectifier bridge to the housing.

STEP 13



Remove the housing.

STEP 14



Remove the insulator from the terminal.

Section

5501

INSPECTION OF TRACK SYSTEM COMPONENTS

CASE CORPORATION

Bur 8-14950

Printed in U.S.A.
Issued April 1990

WEAR CHART FOR PIN AND BUSHING WEAR (PITCH EXTENSION) FOR SEALED TRACK

Inch	Percent Worn	(mm)
26.97	0	683.26
26.99	5	685.54
27.01	10	686.05
27.03	15	686.56
27.05	20	687.07
27.07	25	687.58
27.09	30	688.09
27.11	35	688.59
27.13	40	689.10
27.15	45	689.61
27.17	50	690.12
27.19	54	690.64
27.21	58	692.15
27.23	62	691.64
27.25	65	692.15
27.27	70	692.66
27.29	73	693.17
27.31	76	693.67
27.33	79	694.18
27.35	82	694.69
27.37	85	695.20
27.39	88	695.71
27.41	91	696.21
27.43	94	696.72
27.45	97	697.23
27.47	100	697.74
Turn pins and bushings at or before this point.		
It is recommended pins and bushings be replaced if wear is beyond this point.		
27.49	103	698.25
27.51	106	698.75
27.53	109	699.26
27.55	112	699.77
27.57	115	700.28
27.59	118	700.79
27.61	121	701.29
27.63	124	701.80

Section

5504

CASE LUBRICATED TRACK

CASE CORPORATION

Bur 8-14530

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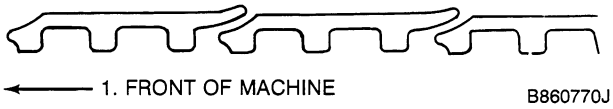
INSTALLING THE TRACK

NOTE: *The machine shown in this procedure is not a 650 but the procedure is the same.*

1. Put the track under the track rollers so that the track shoes are in the position shown.



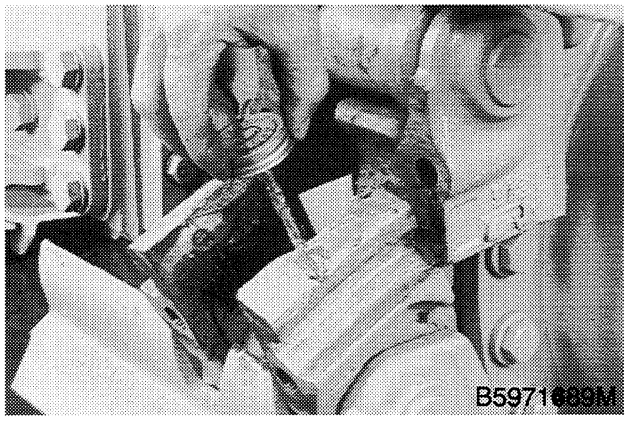
2. Make sure that the track chain mounting surface and the track shoe mounting surface are free of dirt and rust. Use 36 grit sand paper to clean the mounting surfaces.

3. Carefully lower the machine onto the track making sure that the teeth on the sprocket engage the track links.

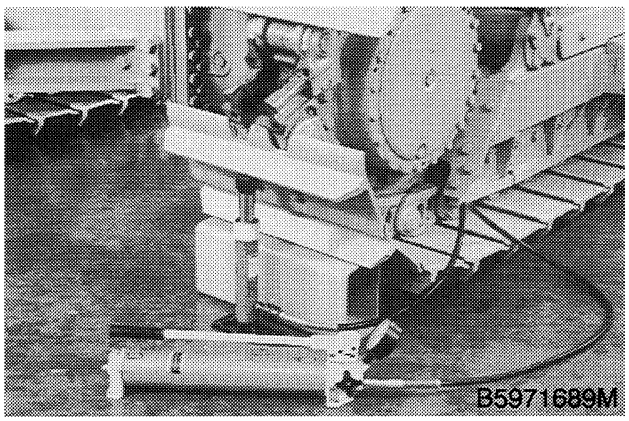
4. Use the lifting equipment to carry the track over the idler, carrier roller and onto the sprocket.

5. Use the lifting equipment to raise the bottom part of the track and use the blocks to hold the track in place as during removal.

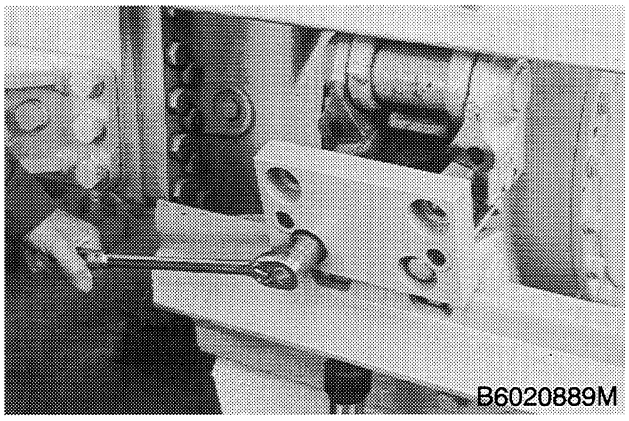
6. Apply antiseize compound to the locking surfaces of the halves of the master link.



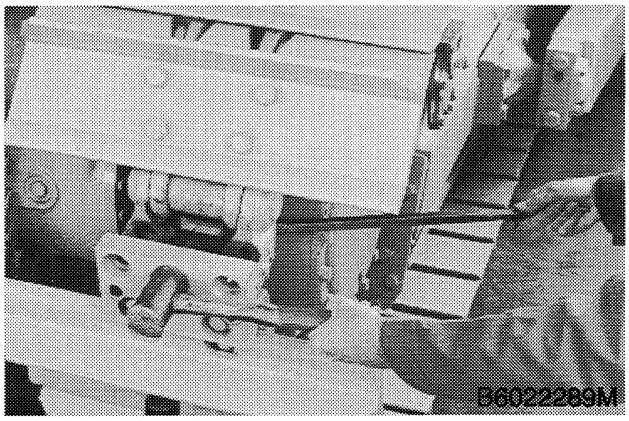
7. Use a hydraulic ram as shown to start the halves of the master link together.



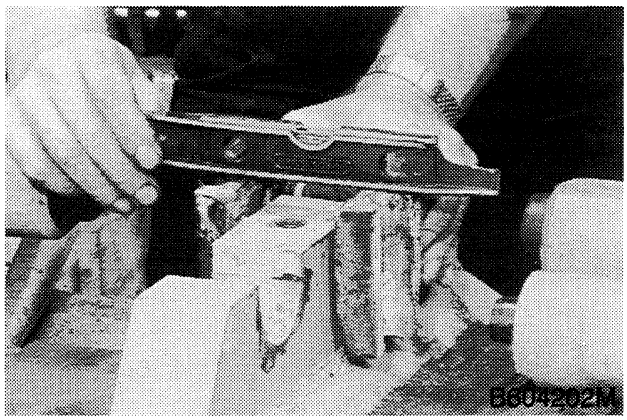
8. Fasten tool CAS-1848A to the bottom half of the master link.



9. Hit the tool with a brass hammer to drive the bottom half of the master link into the top half of the master link until the top cap screws can be installed.

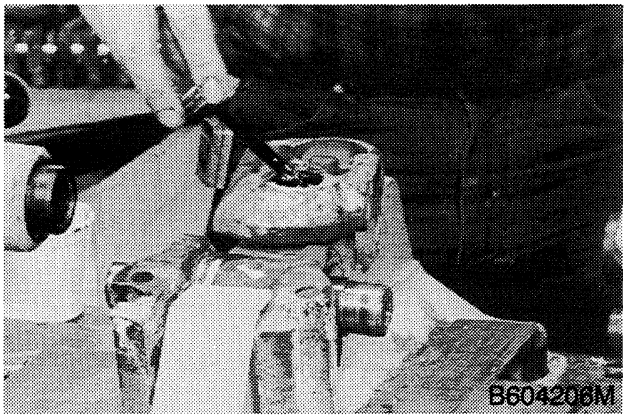


13. Check to make sure the link halves are level.



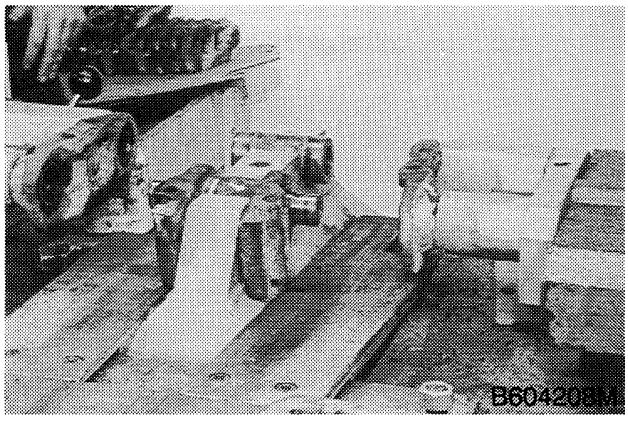
14. Install a pin in the bushing so that the mark is on top. The remainder of the pins must be installed so that the plugs are all on the same side. Apply Molykote Type G to both ends of two spacers according to the instructions on the container. Then install spacer on both ends of the pin.

15. Apply the sealant from the kit to the outer half of the bore for the pin in two links. The bore for the seal must be free of any foreign material.



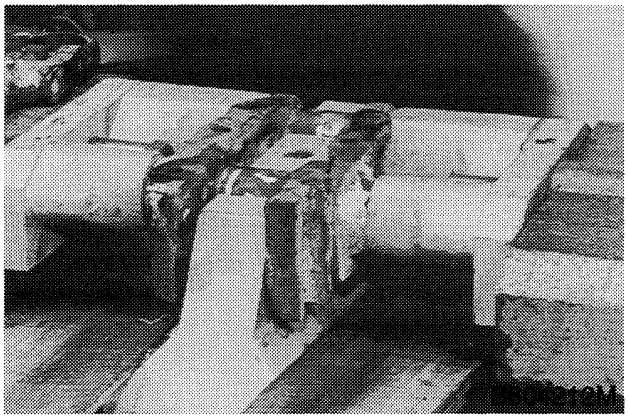
16. Make sure that the bores for the rubber ring and seal are free of oil and install a rubber ring and seal in both links.

17. Put the links on the drivers and a bushing in the carrier so that the mark is on top.

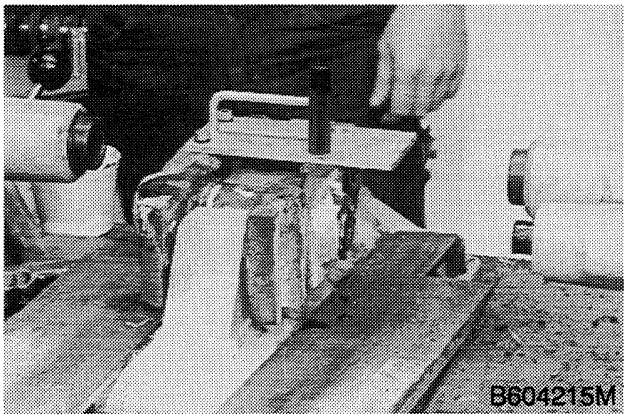


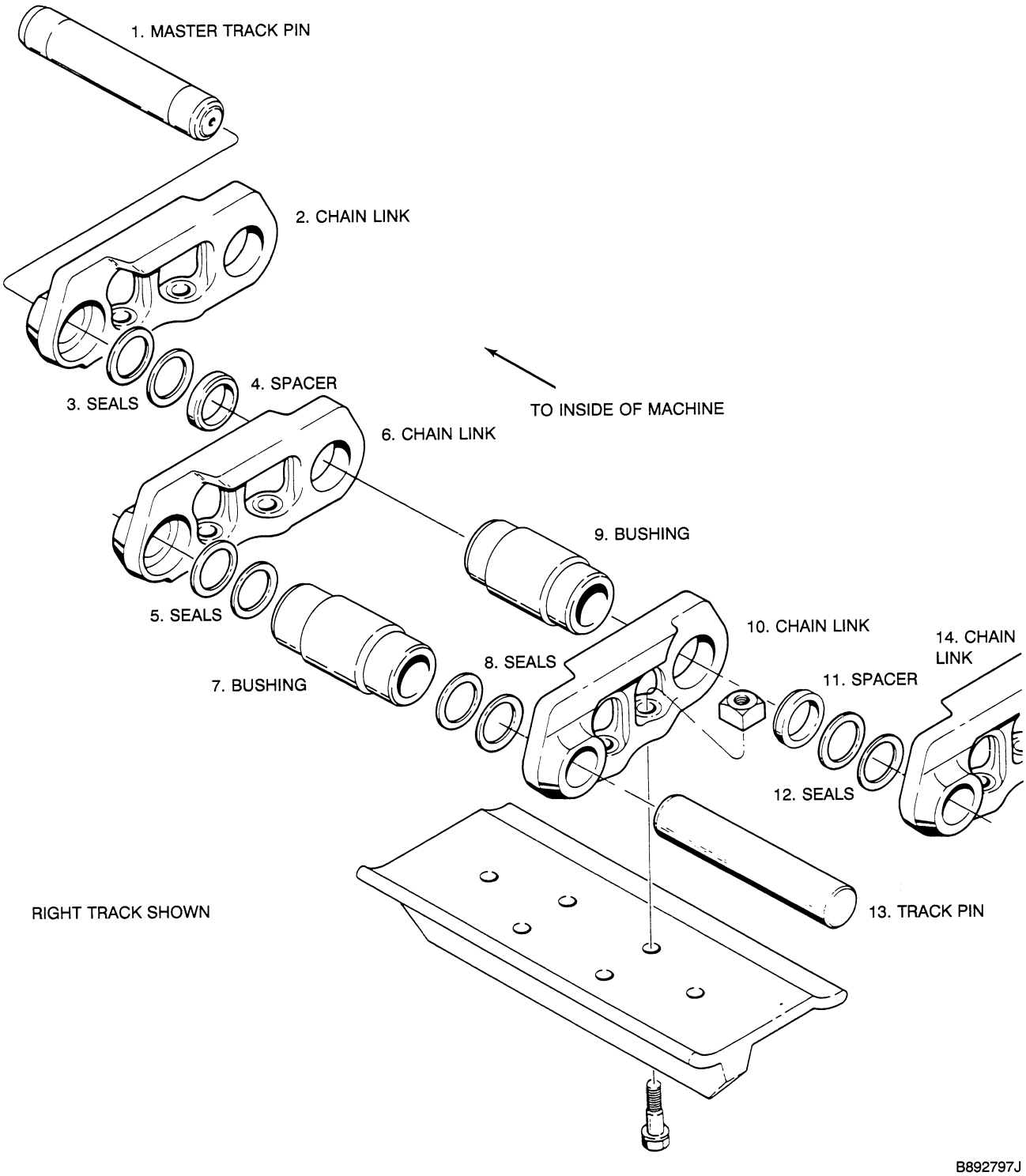
18. Hold the master link level and actuate the rams until the drivers touch the links.

19. Press the links onto the pin and bushing.



20. Use the gauge and pin to check the spacing between the links.




1. MASTER TRACK PIN
2. CHAIN LINK
3. SEALS
4. SPACER
TO INSIDE OF MACHINE
6. CHAIN LINK
9. BUSHING
5. SEALS
10. CHAIN LINK
14. CHAIN LINK
8. SEALS
7. BUSHING
11. SPACER
12. SEALS
RIGHT TRACK SHOWN
13. TRACK PIN
B892797J

Section

5508

IDLER, TRACK ADJUSTER AND RECOIL HOUSING

CASE CORPORATION

Bur 8-14550

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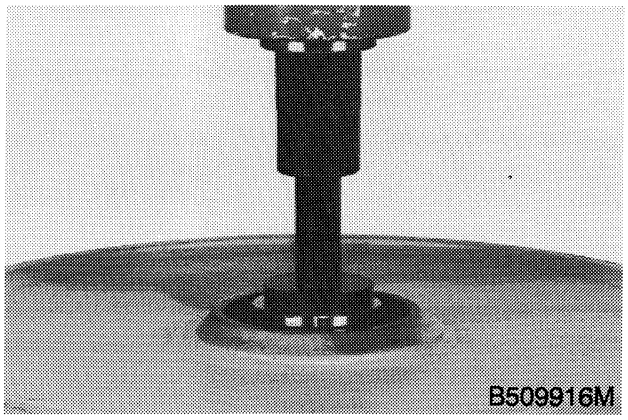
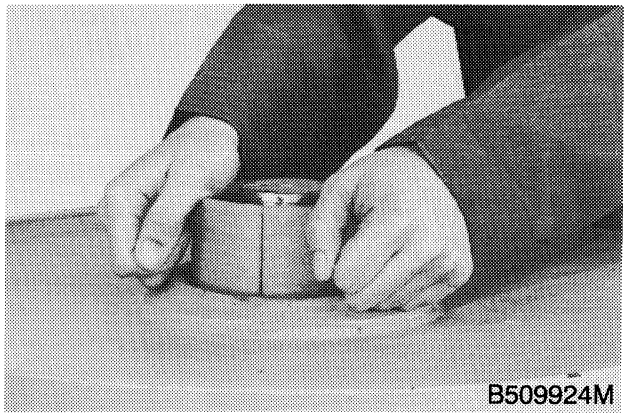
Issued February 1990

Assembly

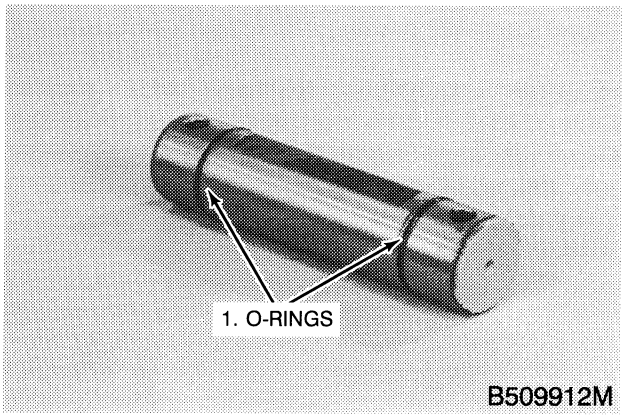
STEP 23
If the bushings were removed from the idler wheel, do step 24.

STEP 24


Put the idler wheel in a press and start a new bushing into the hub. Use an acceptable driver to press the bushing into the hub until the bushing stops moving. Repeat for the other bushing.

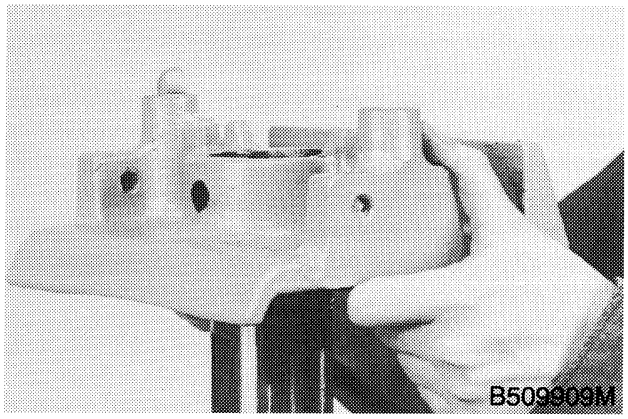
STEP 25


Make sure that the seal area of the idler wheel is clean and dry. Use soap and water or a fast drying oil free compound on the rubber seal. Do not twist the seal during installation. Use the tool CAS-1755 to install a metal ring and rubber ring in each side of the idler wheel.

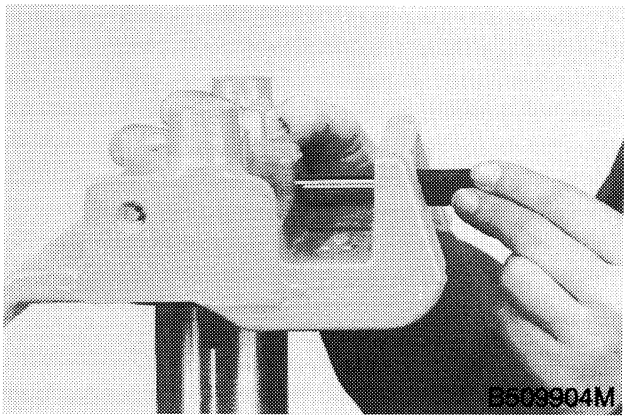
STEP 26


Install the O-rings on the shaft. Lubricate the O-rings with petroleum jelly.

STEP 27
Fasten the shaft in a vise with soft jaws. Be careful not to damage the O-rings.

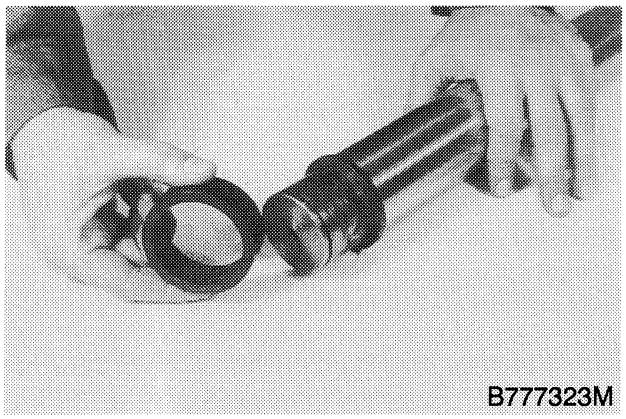
STEP 28


Put the bracket on the shaft. Align the hole in the shaft with the hole in the bracket.

STEP 29


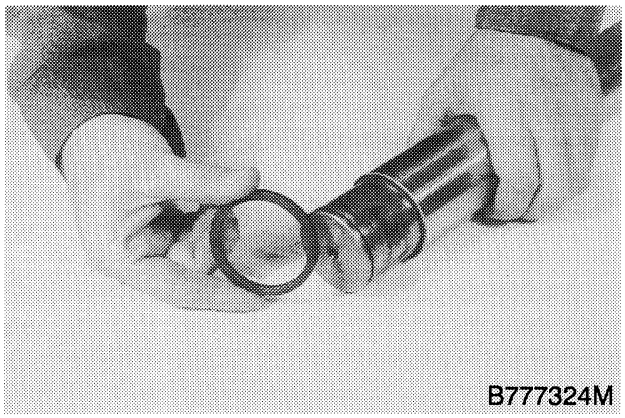
Use a punch to hold the bracket in position on the shaft.

STEP 49



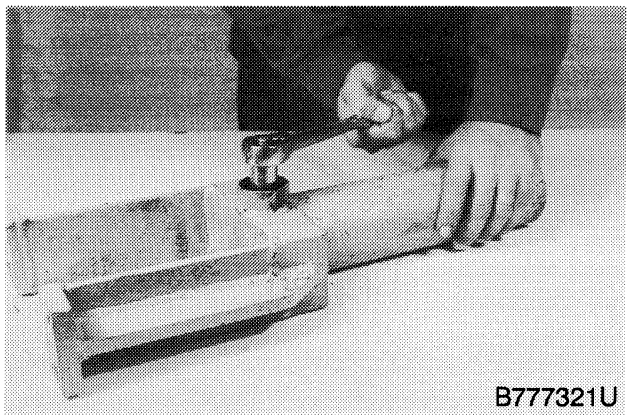
Remove the bearing from the piston.

STEP 50



Remove the spacer from the piston.

STEP 51



Remove the valve.

STEP 52

Remove the grease from the bore of the cylinder.

Inspection

1. Discard the seal.
2. Clean all parts in cleaning solvent.
3. Check the bearings, spacer, and wiper for damage.
4. Check the cylinder bore for scratches and rust.
5. Check the piston for scratches and rust.
6. Clean the valve and check for damage.

REMOVING A SPROCKET

NOTE: *See Section 5501 for checking wear on the sprocket.*

1. Separate the track according to the instructions in Section 5504. It is not necessary to completely remove the track.

2. Remove the track from the sprocket (1).

3. If the machine has track guards, loosen and remove the cap screws that hold the outer cover in place at the rear of the track frame.

4. Remove the outer cover.

5. Loosen and remove the cap screws that hold the inner cover in place at the rear of the track frame.

6. Remove the inner cover.

7. Raise the rear of the machine until the sprocket (1) is free of the track links.

8. Put an acceptable support under the rear of the machine to hold the machine in place.

9. Loosen and remove the self-locking nuts (2) from the bolts (3) that hold the sprocket (1) in place.

10. Remove the bolts (3) and washers (4).

11. The weight of the sprocket (1) is approximately 100 pounds (45 kg). Carefully remove the sprocket (1) to prevent personal injury.

12. Shims (5) are used between the sprocket (1) and final drive shaft (6). Keep all of the shims (5) together for use during installation of the sprocket (1).

INSTALLING A SPROCKET

1. Put the same amount of shims (5) removed on the final drive shaft (6). Use a small amount of grease to hold the shims (5) in place and keep the shims (5) aligned.

2. Install the sprocket (1).

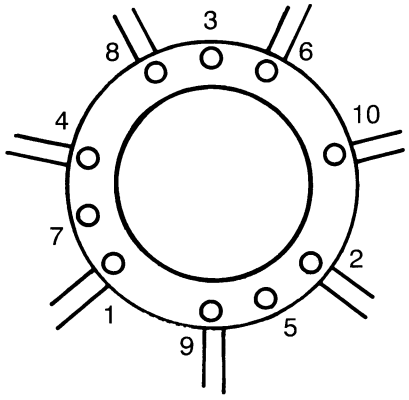
3. Align the sprocket (1) with the shims (5) and final drive (6).

4. Lubricate the bolts (3), self-locking nuts (2) and washers (4) with engine oil.

5. Install the bolts (3) and washers (4).

6. Install the self-locking nuts (2) on the bolt (3). It is recommended that new self-locking nuts (2) be used.

7. Hold the self-locking nuts (2) and tighten bolts 1, 2, 3 and 4 to 100 pound-feet (135 Nm).



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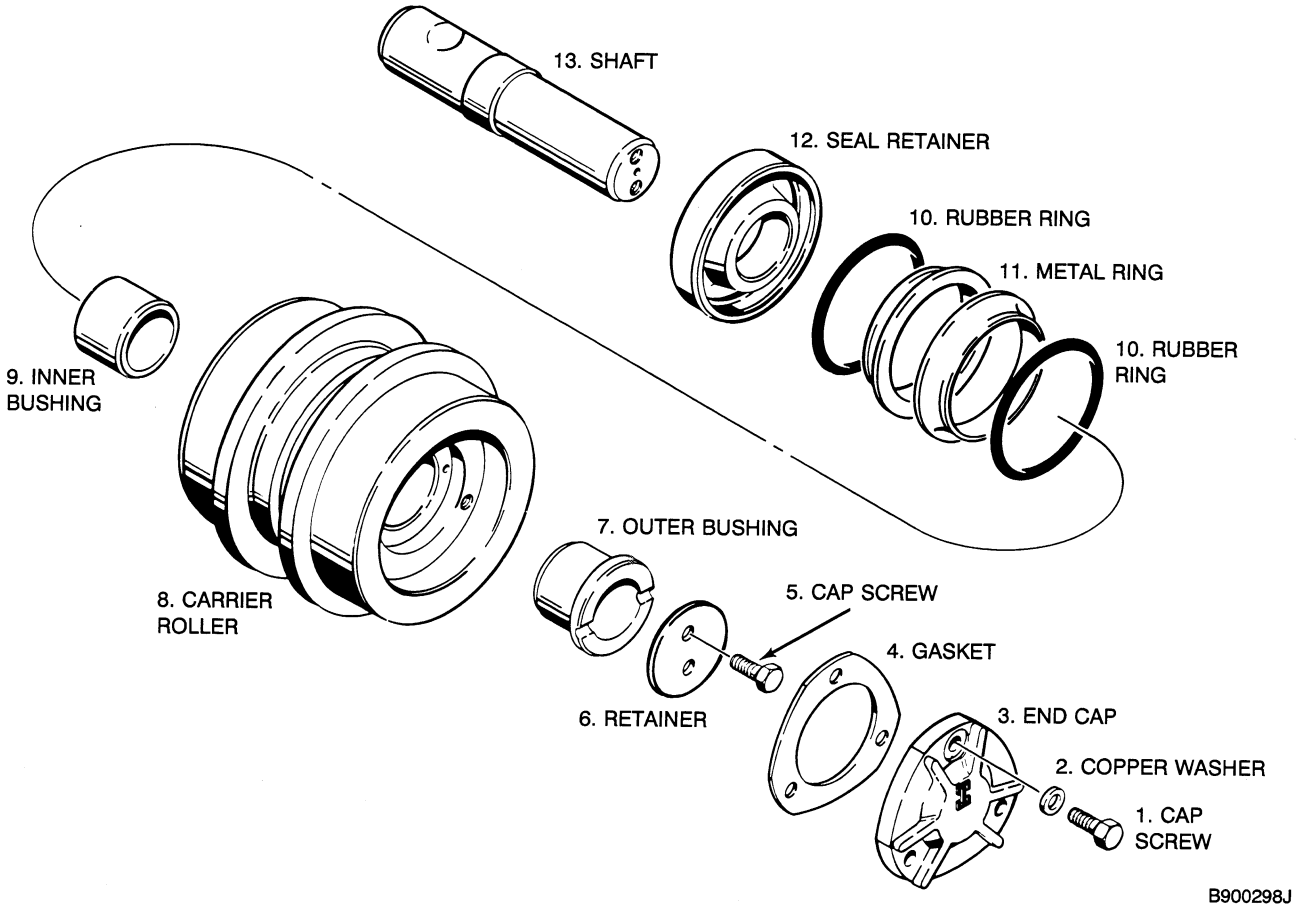
Bolt Tightening Sequence


13. SHAFT
12. SEAL RETAINER
10. RUBBER RING
11. METAL RING
10. RUBBER RING
9. INNER BUSHING
8. CARRIER ROLLER
7. OUTER BUSHING
5. CAP SCREW
4. GASKET
6. RETAINER
3. END CAP
2. COPPER WASHER
1. CAP SCREW
B900298J

Section

5511

TRACK ROLLER

CASE CORPORATION

Bur 8-14580

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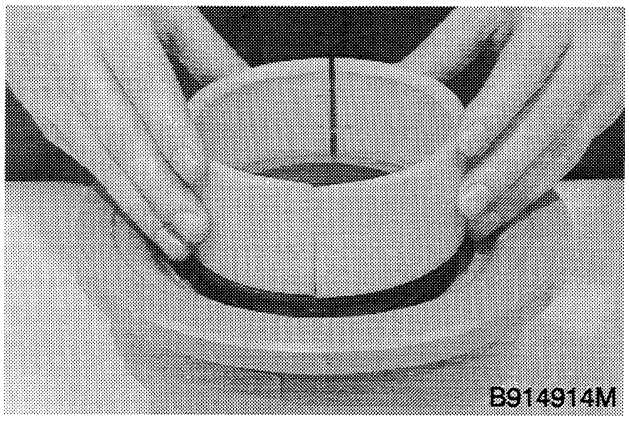
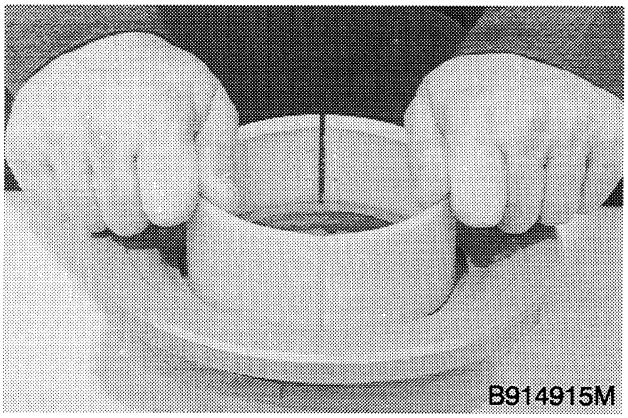
STEP 25



Apply soap and water or a fast drying oil free lubricant on the rubber ring. Start the rubber ring into one end of the track roller.

STEP 26

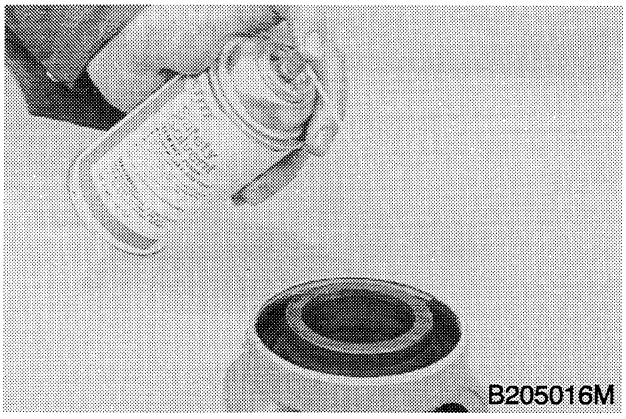


Push down on the tool CAS-1283 to push the rubber ring into the track roller.

STEP 27

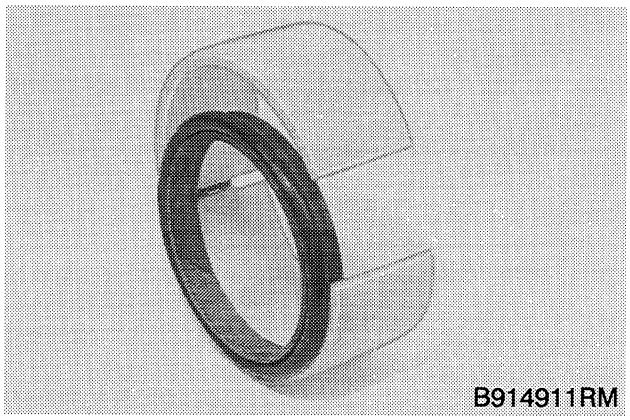
Repeat steps 24 through 26 for the other rubber ring and metal ring.

STEP 28



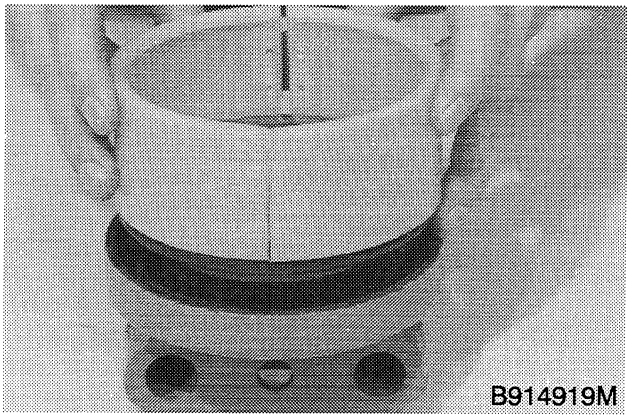
Make sure all oil is removed from the bore for the rubber ring in each end cap.

STEP 29



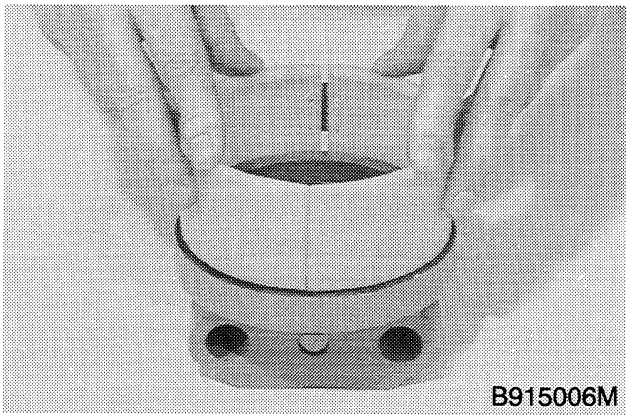
Install a metal ring in the tool CAS-1283 as shown.

STEP 30



Apply soap and water or a fast drying oil free lubricant on the rubber ring. Start the rubber ring into an end cap.

STEP 31



Push down on the tool CAS-1283 until the rubber ring is seated in the end cap.

STEP 32

Repeat steps 29 through 31 for the other end cap.

SECTION INDEX - POWER TRAIN

CASE CORPORATION

Bur 8-14590

Printed in U.S.A.
Issued February 1990

CHECKING SYSTEM PRESSURE

Equipment Required

400 psi (2758 kPa, 27 bar) gauge

Adapter, item 25 (0717) from pressure fitting kit

Test Procedure

Adapter and gauge connected to test port in elbow at outlet of filter.

All transmission controls in NEUTRAL.

Oil at operating temperature.

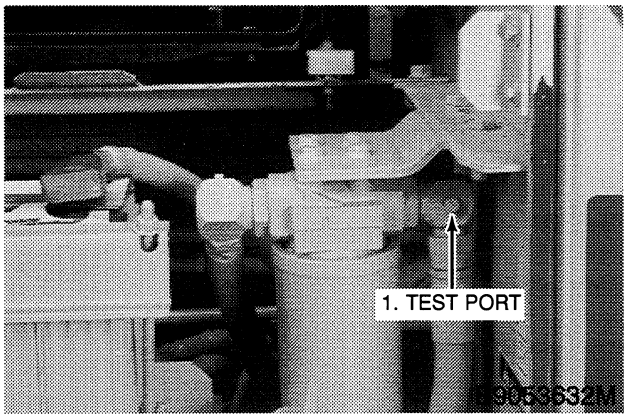
Engine running at 2200 prm (r/min).

Read gauge and record the reading.

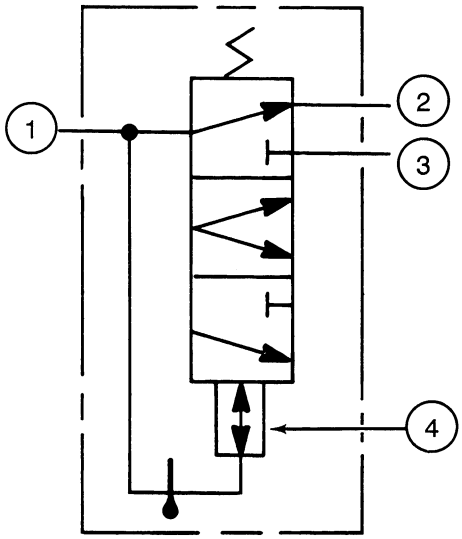
See specification on page 3.

If the pressure is not as specified, adjust the setting of the pressure regulator valve according to instructions in this section.

If you cannot get the specified pressure, check the ouput of the charging pump.

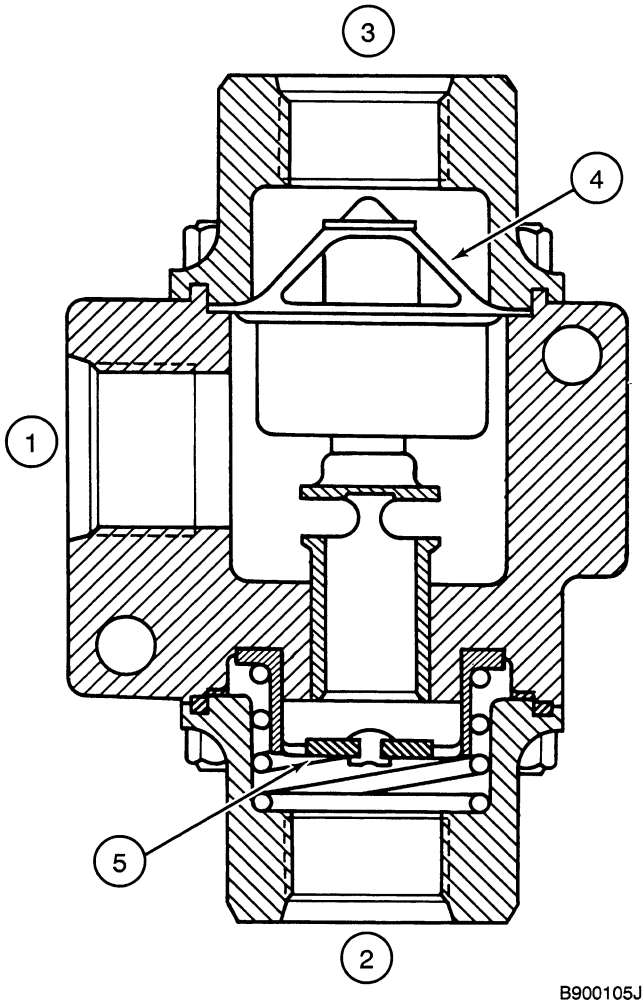


7 BYPASS VALVE



Controls flow of oil to the oil cooler. When thermostat is closed the oil is sent to the transmission. As the thermostat begins to open the oil is sent to the oil cooler and transmission. When the thermostat is all the way open, all oil is sent to the oil cooler.

1. *Inlet*
2. *To Transmission*
3. *To Oil Cooler*
4. *Thermostat*
5. *Seal*



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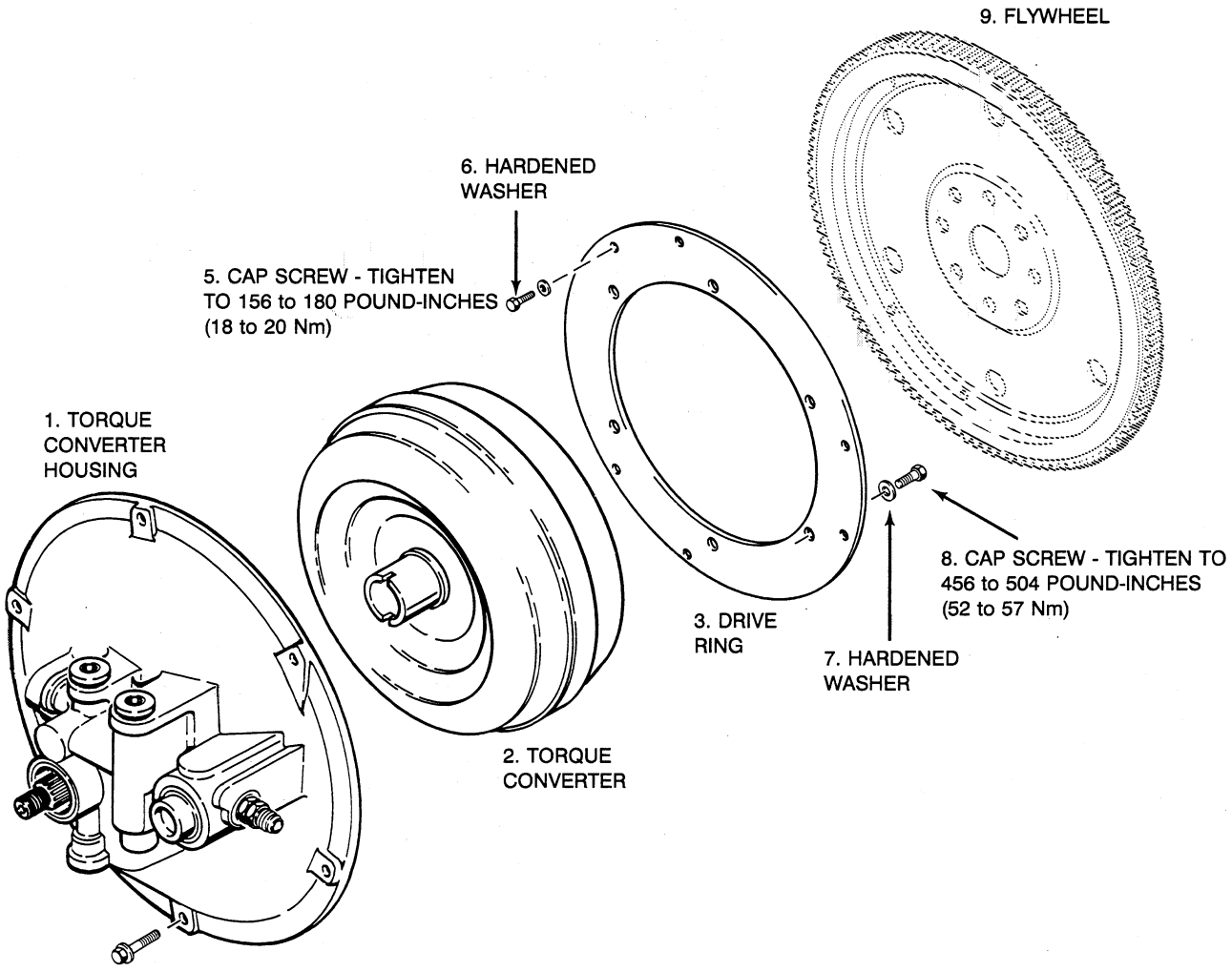
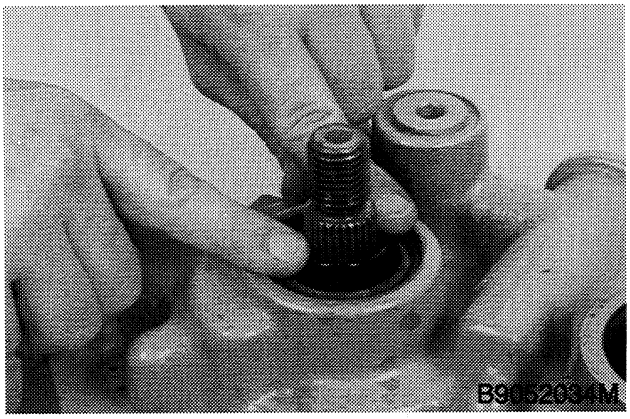
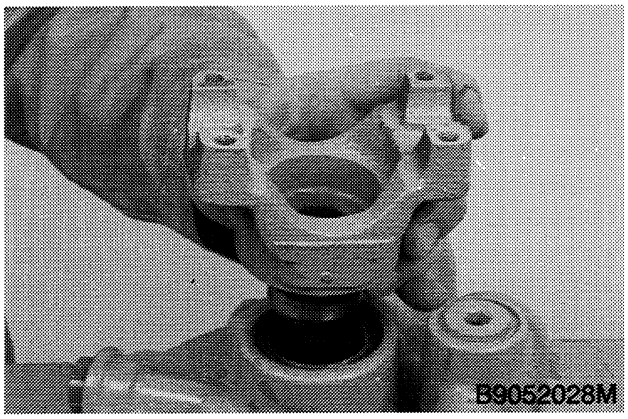

9. FLYWHEEL
6. HARDENED WASHER
5. CAP SCREW - TIGHTEN TO 156 to 180 POUND-INCHES (18 to 20 Nm)
1. TORQUE CONVERTER HOUSING
2. TORQUE CONVERTER
3. DRIVE RING
7. HARDENED WASHER
8. CAP SCREW - TIGHTEN TO 456 to 504 POUND-INCHES (52 to 57 Nm)
4. CAP SCREW - TIGHTEN TO 456 to 540 POUND-INCHES (52 to 61 Nm)
B900197J

STEP 55



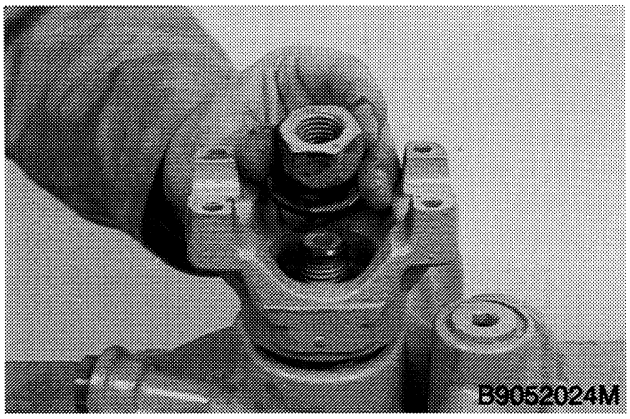
Lubricate a new O-ring with petroleum jelly and install the O-ring on the output shaft.

STEP 56



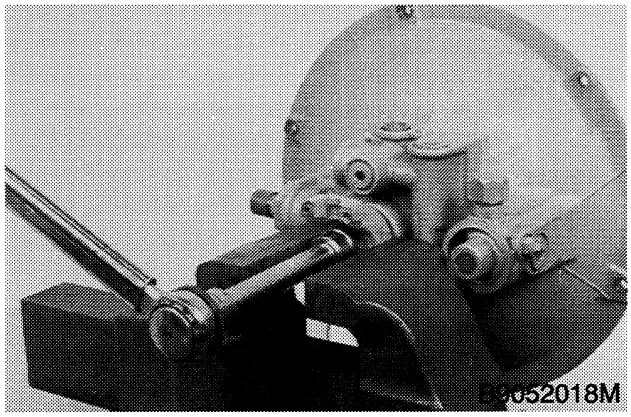
Install the yoke.

STEP 57



Install the washer and lock nut.

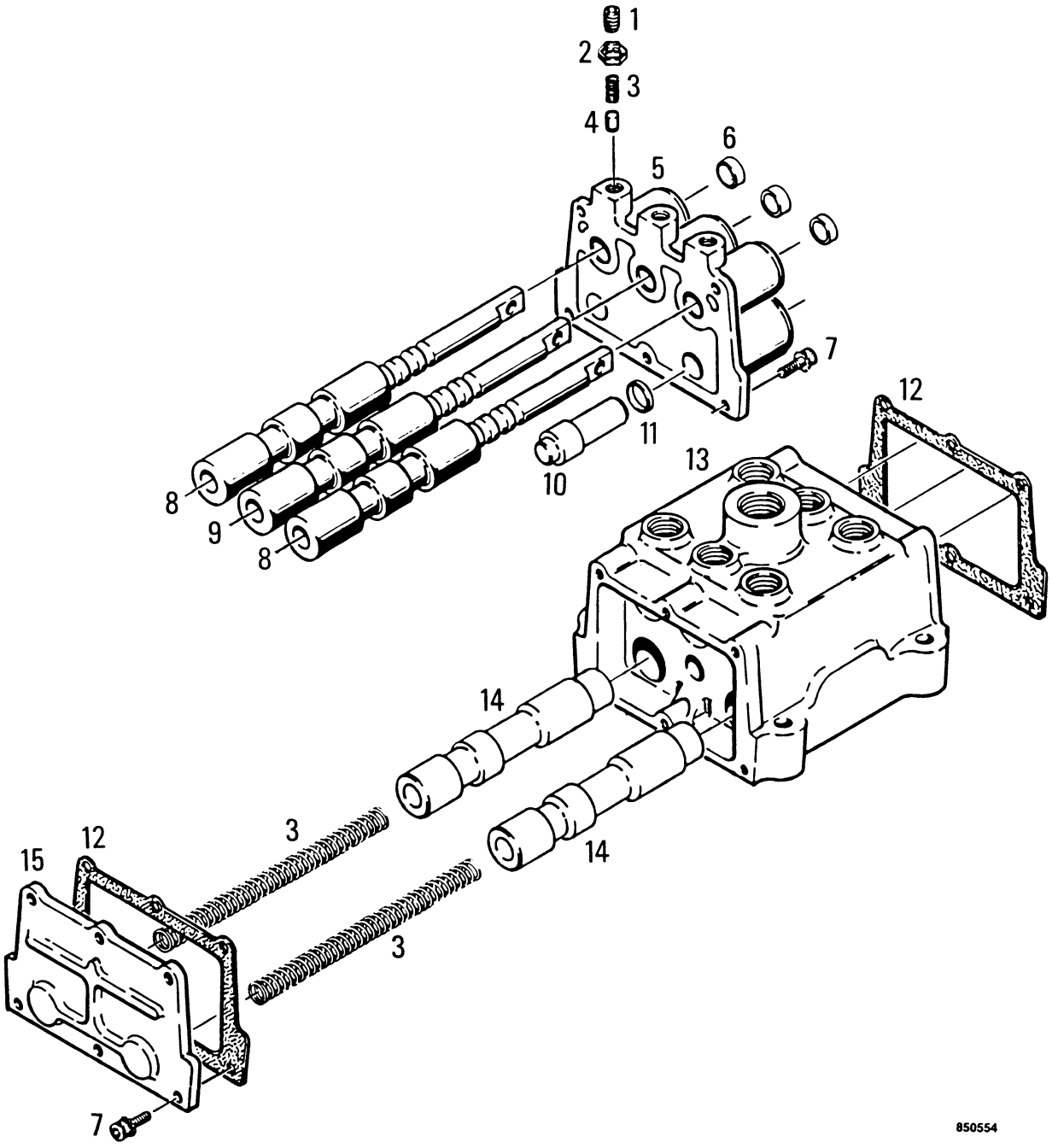
STEP 58



Prevent the yoke from turning and tighten the lock nut to 170 to 185 pound-feet (230 to 251 Nm).

STEP 59

Install the charging pump and torque converter housing according to the instructions in this section.



1. *Allen Screw*
2. *Lock Nut*
3. *Spring*
4. *Detent Pin*
5. *Front Cover*
6. *Seal*
7. *Allen Head Screw*
8. *Track Speed Spool*
9. *Direction Spool*
10. *Piston*
11. *Quad Ring*
12. *Gasket*
13. *Body*
14. *Clutch Cutout Spool*
15. *Rear Cover*

INSPECTION

1. Clean all parts in cleaning solvent.

2. Inspect the bores in the body for scoring or other indications of wear that will result in leakage between track, direction and modulator spools and the bore. If a bore is damaged, a new modulator valve must be installed.

3. Check each spring to see if each spring is equal to the specification on page 3.

4. Inspect the direction spool, track spool, poppet, modulator spool and piston for scoring and other indications of wear that will result in leakage between these parts and the bores.

5. Inspect the O-rings for wear or damage. Replace the O-rings as required.

6. If a new direction spool is needed, a new orifice plug must be pressed into the direction spool.

ASSEMBLING THE MODULATOR VALVE

1. Lubricate the bores in the valve body with clean oil.

2. Lubricate the spools (4, 7, and 11), poppet (5) and piston (14) with clean oil.

3. Lubricate the O-rings (17) with clean oil.

4. Assemble the piston (14), pin (15) and spring (16). Install these parts in the bottom port spring (16) first.

5. Install the plug (13).

6. Install the spring (18), and poppet (5), pin end down, in the bore nearest the inlet port.

7. Install the track spool (4) and spring (3) in the bore with the poppet.

8. Install the plug (2).

9. Assemble the spring (9) and spring guide (8) and install these parts in the center bore.

10. Install the modulator spool (7) in the center bore.

11. Install the plug (6).

12. Install the direction spool (11) and filter (19) in the last bore.

13. Install the plug (10).

14. Fasten the modulator valve in a vise and tighten all the plugs.

33. Use a chain hoist and lifting sling(s) to support the rear of the seat and tank frame. The four cap screws on each side of the transmission also support the seat and tank frame.

34. Loosen and remove the cap screws and hardened washers that fasten each final drive to the pivot shaft.

35. Loosen and remove the cap screws and hardened washers from each side of the transmission.

36. Carefully remove the transmission from the machine.

INSTALLING THE TRANSMISSION

1. Fasten the transmission to the lifting equipment.

2. Move the transmission into alignment with brackets on the pivot shaft and the engine frame.

3. Install the four cap screws and hardened washers that fasten the transmission and seat and tank frame to the engine frame. Do not tighten the cap screws now.

4. Install the four cap screws and hardened washers that fasten the bracket to each final drive.

5. Tighten the cap screws that hold the transmission and the cap screws that hold each final drive.

6. Remove the lifting equipment that held the transmission.

7. Remove the lifting equipment that held the seat and tank frame.

8. Clean all mounting surfaces of the filler tube and apply form-in-place gasket material to the mounting surface.

9. Install the filler tube and cap screws and tighten the cap screws.

10. Connect the breather hose to the transmission.

11. Connect the tee to the elbow in the modulator valve.

12. Push the hose onto the fitting in the range housing and tighten the clamp.

13. Start the fitting into the bottom of the transmission and tighten the fitting.

14. Tighten the clamp.

15. Push the hose onto the suction tube in the transmission and tighten both clamps.

16. Install the clevis pin and cotter pin that fastens the control linkage to the shift rod in the range housing.

17. Engage the drive shaft with the yoke on the transmission and torque converter.

18. Install and tighten the cap screws to 300 to 360 pound-inches (34 to 40 Nm).

19. Install the clevis pins and cotter pins that fasten the control linkage to the spools in the transmission control valve.

20. Connect the tubes from the master cylinder to the transmission control valve.

21. Install the clevis pins and cotter pins that fasten the brake cables to each brake arm.

22. Fill the transmission with 8 U.S. gallons (30 litres) of Case TCH Fluid.

23. See Section 5509 and install the sprockets.

24. Apply the parking brake and start the engine. Run the engine at 1000 rpm (r/min) for two minutes.

25. Stop the engine and check for oil leaks.

26. Use the jack and install the guards and cap screws that hold the guards.

27. Tighten the cap screws that hold the guards.

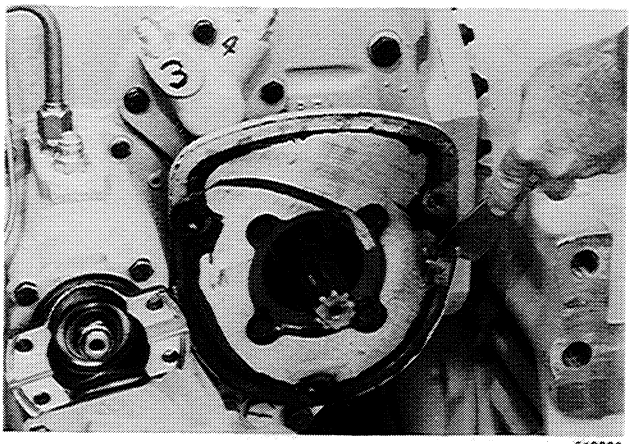
28. Install the right floor plate.

29. Install the clevis pin and cotter pin that fastens the accelerator rod to the cross shaft.

30. Install the right side panel for the engine compartment.

31. Install the top cap screws for the engine compartment and tighten all cap screws that hold the side panel.

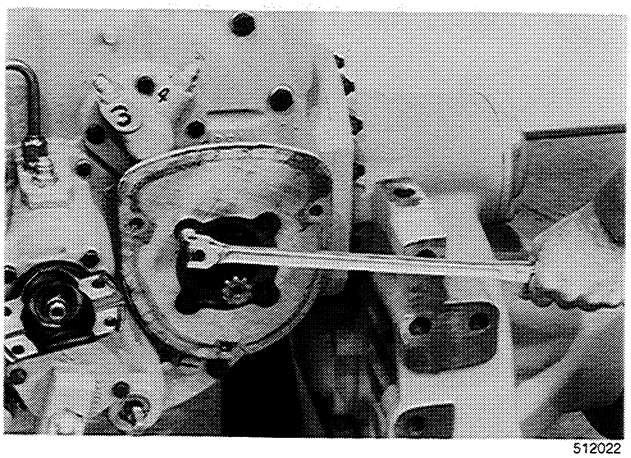
j. Remove the gasket from the brake mount.



512020

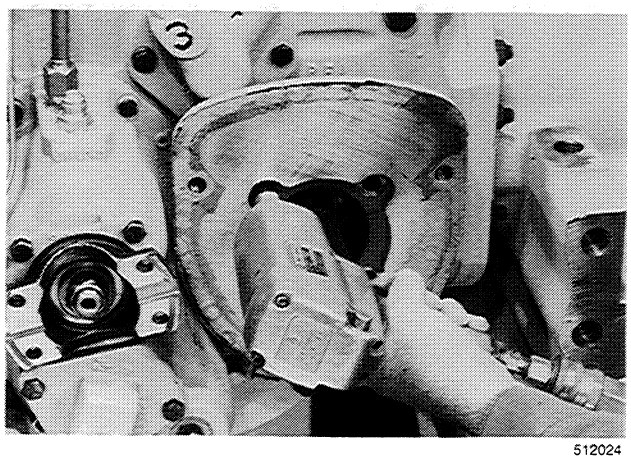
11. Remove the brake mounts.

a. Loosen the Ferry head screws that hold the brake mount.



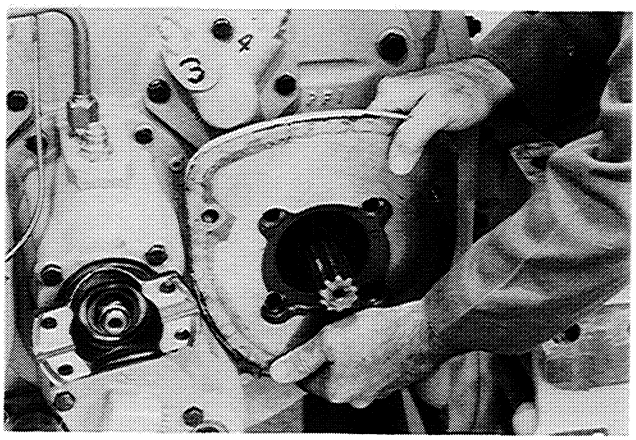
512022

b. Remove the Ferry head screws.



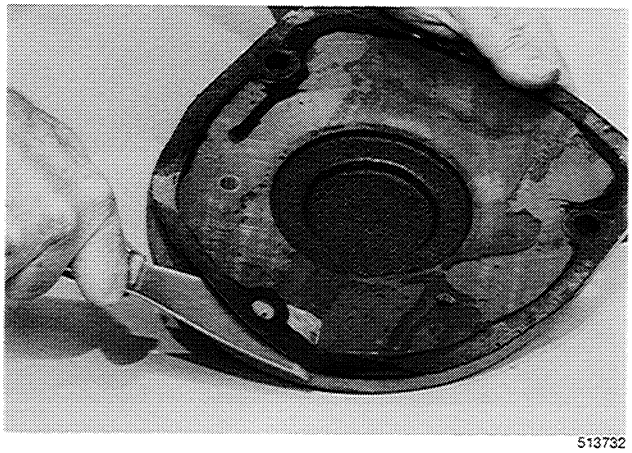
512024

c. Remove the brake mount. The fit of the O-ring holds the brake mount.



512026

12. Remove any gasket material from the covers and brake housings.

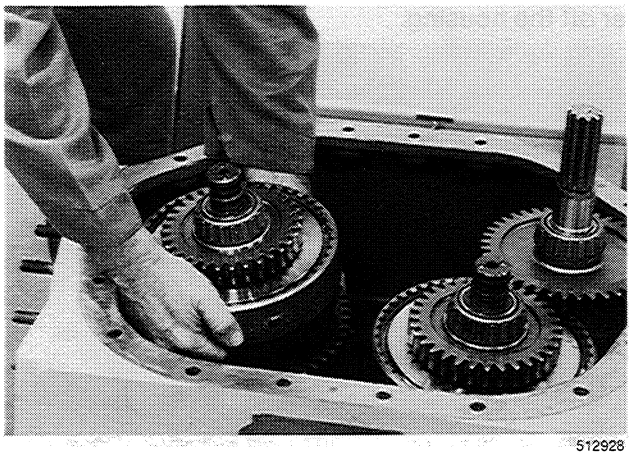


513732

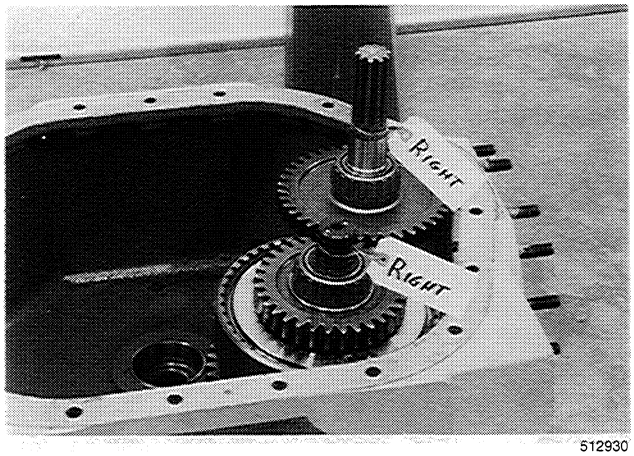
13. Remove the O-ring from the brake mounts.

513736

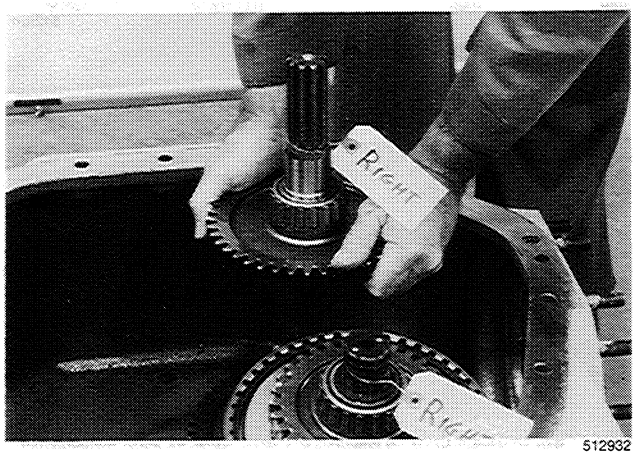
62. Remove the left track speed shaft.



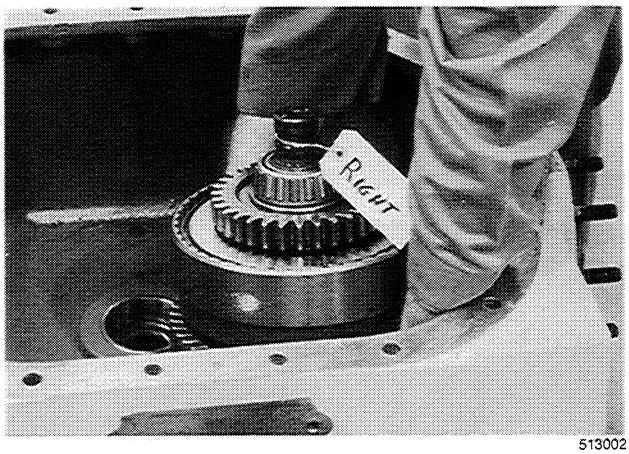
63. Fasten an identification tag to the right track speed and pinion shafts.



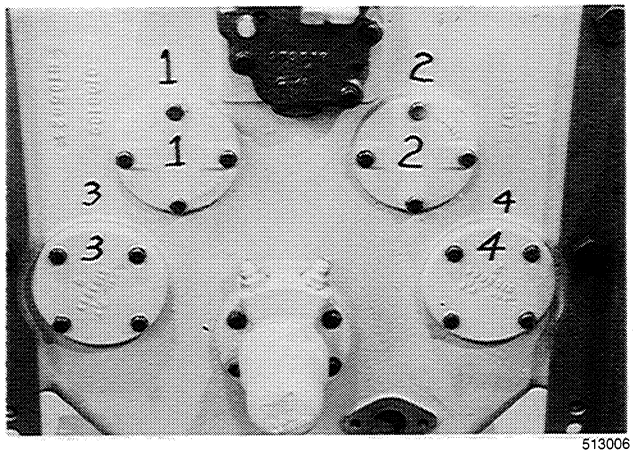
64. Remove the right pinion shaft.



65. Remove the right track speed shaft.

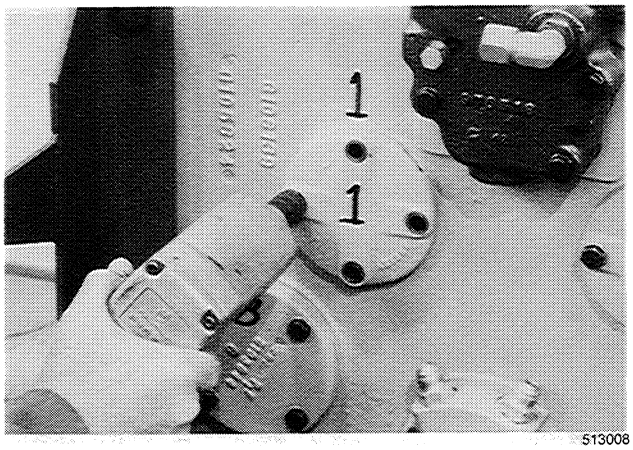


66. Write a number on each retainer and the housing.

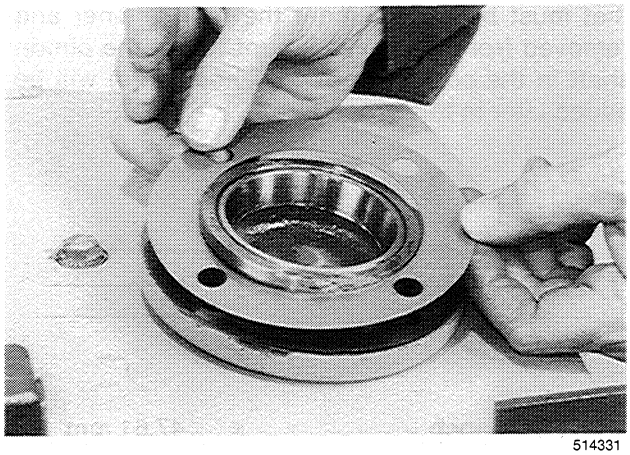


67. Remove retainers one and two.

a. Loosen and remove the cap screws.



26. As required according to step 23 or 24, add or remove shims from each retainer.

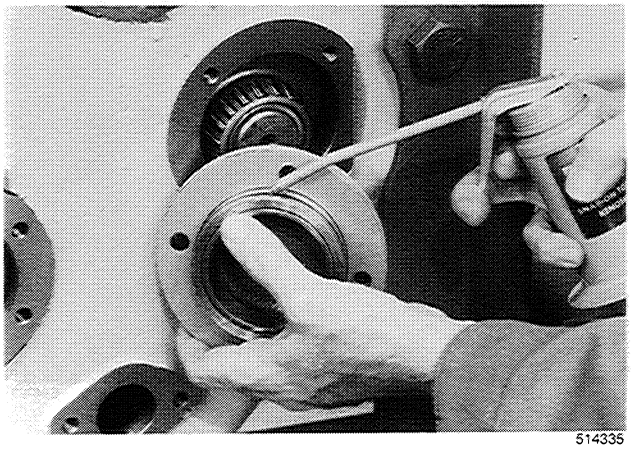

514331

27. Install the retainers.

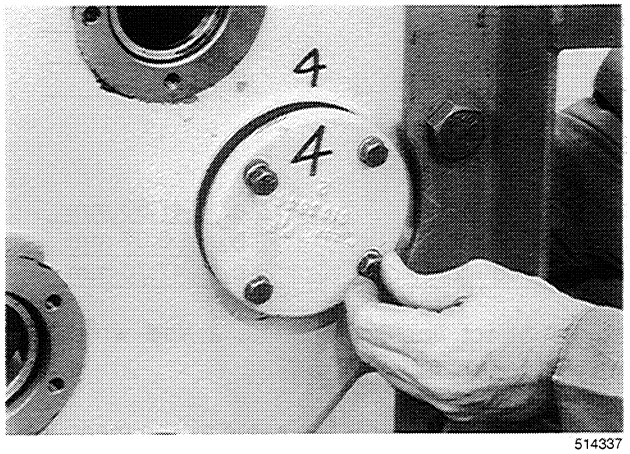
a. Install a new O-ring in the groove in each retainer.


514333

b. Lubricate the O-ring and the bore for the retainer with clean oil.

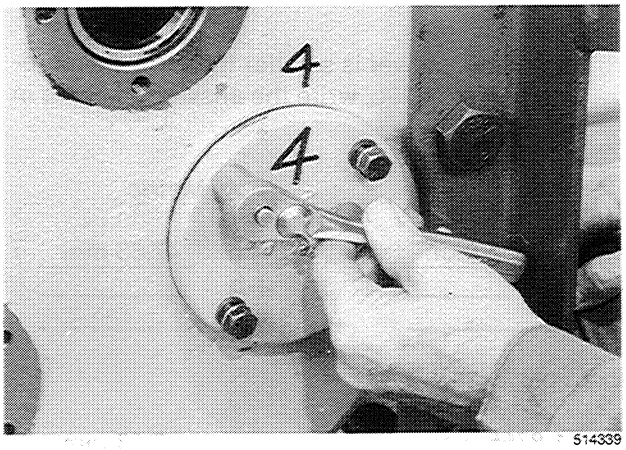

514335

c. Install the retainer and cap screws and new copper washers.



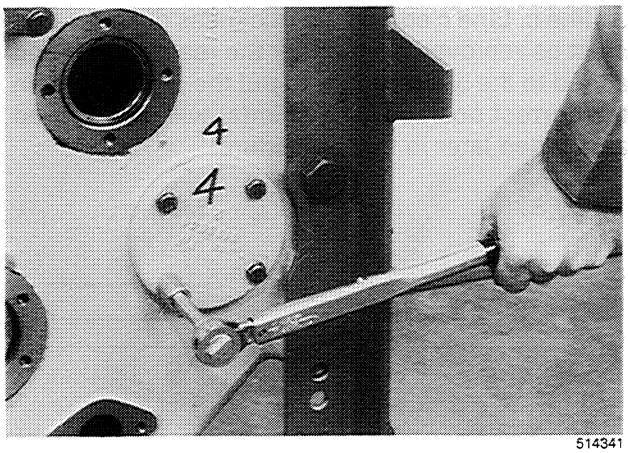
514337

d. Tighten two cap screws to pull the retainer into the housing.



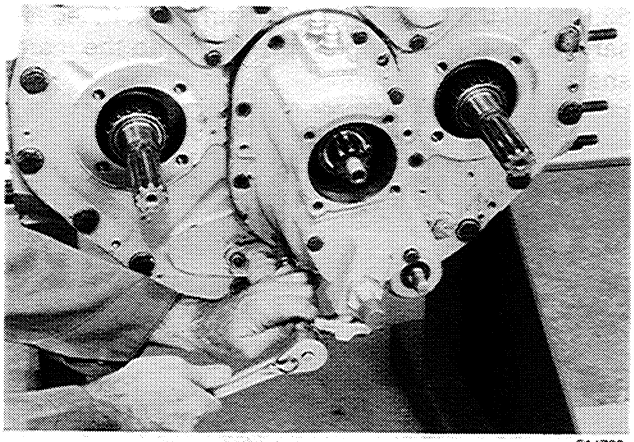
514339

e. Tighten the cap screws to 360 to 420 pound-inches (41 to 47 Nm).



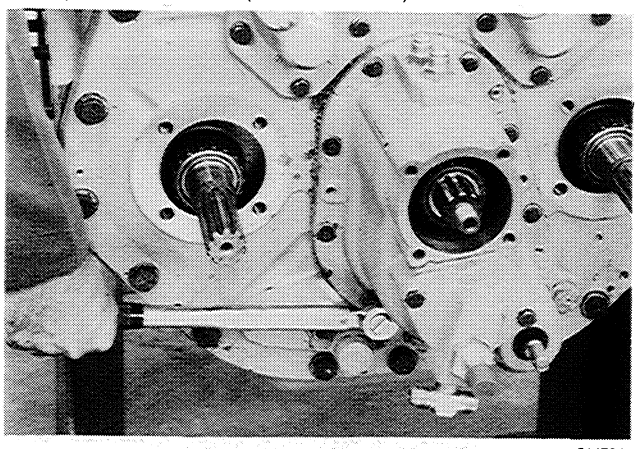
514341

68. Install a Ferry head screw and new copper washers on each side of the dowel pins and tighten the Ferry head screws evenly to pull the range housing against the cover.



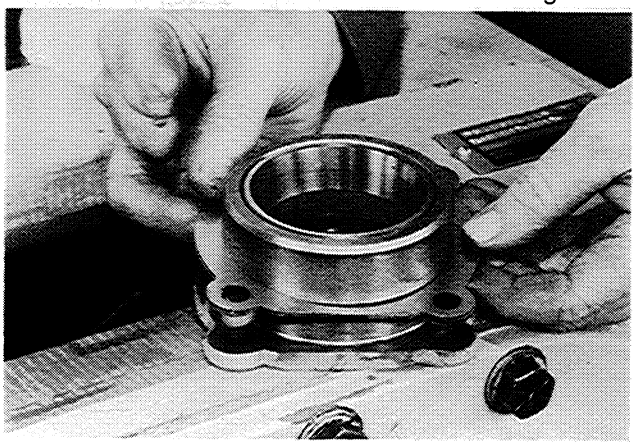
514730

69. Install new copper washers on the remainder of the Ferry head screws and install the Ferry head screws. Tighten the Ferry head screws to 420 to 540 pound-inches (47 to 61 Nm).



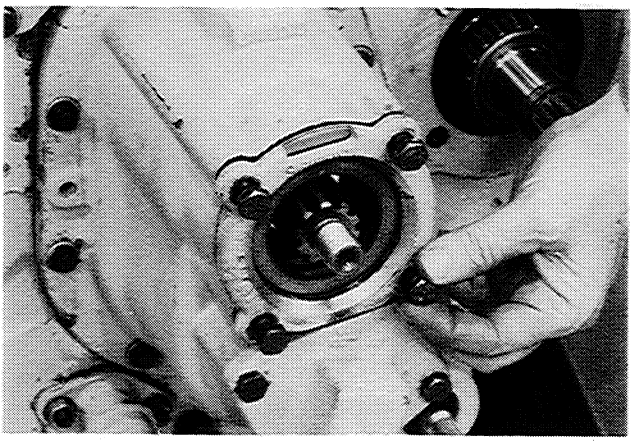
514734

70. Install the same amount of shims on the retainer that were removed during disassembly. The flat side of the shims must be aligned with the flat side of the retainer. Do not install the O-ring now.



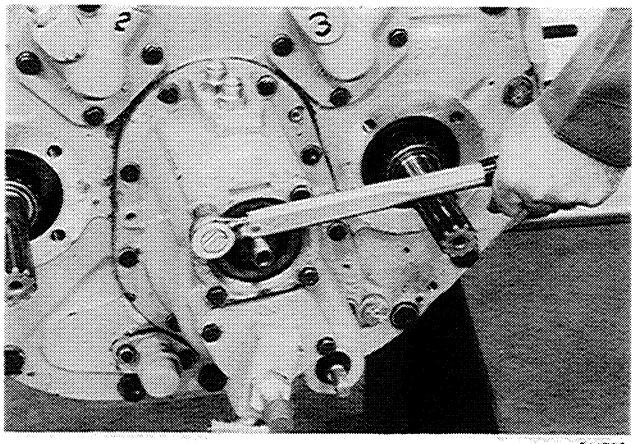
514740

71. Install the retainer so that the flat side is down and install the cap screws.



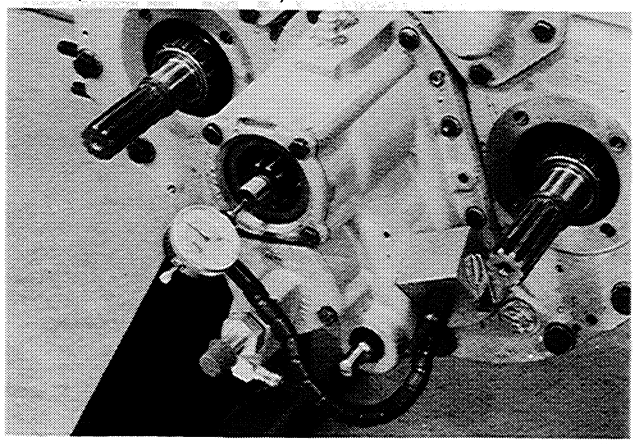
514744

72. Tighten the cap screws to 360 to 420 pound-inches (41 to 47 Nm).



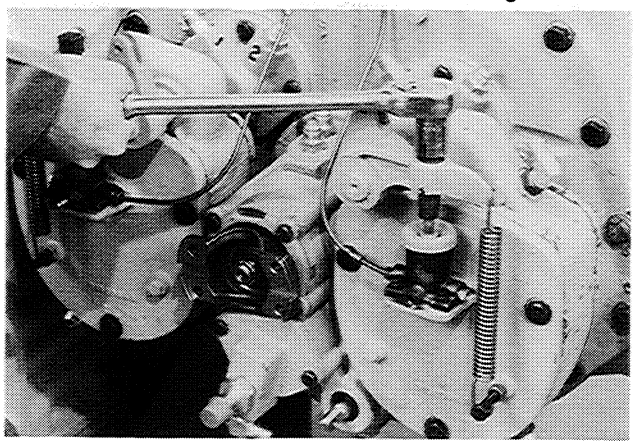
514702

73. Use a dial indicator and check the end play of the input shaft. The end play must be .002 to .004 inch (0.05 to 0.10 mm).



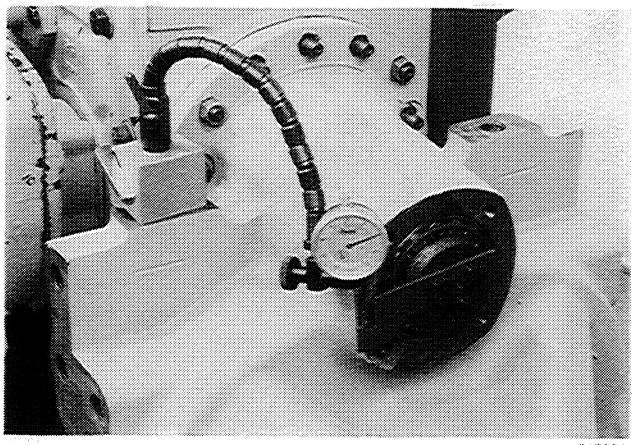
514704

i. Tighten the adjusting screw for the brake to prevent the pinion shaft from turning.



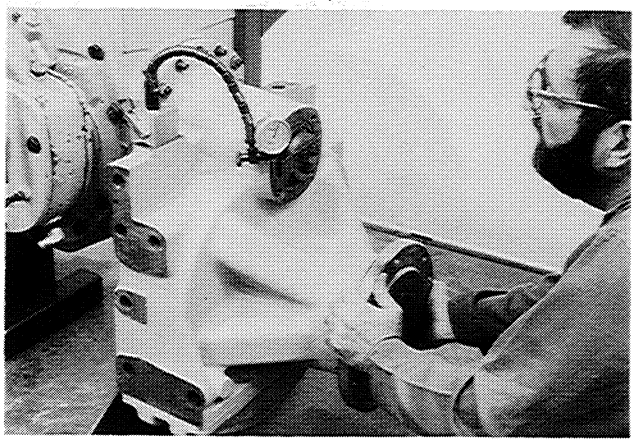
515222

j. Install the dial indicator as shown.



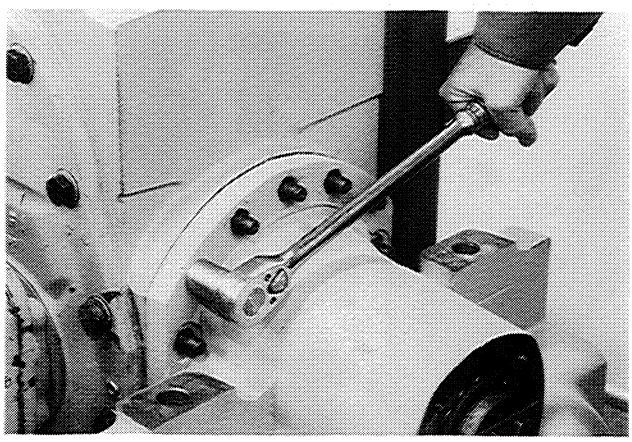
515224

k. Turn the sprocket shaft with enough force so that the teeth on the gears touch in both directions. The backlash must be .006 to .015 inch (0.15 to 0.38 mm).



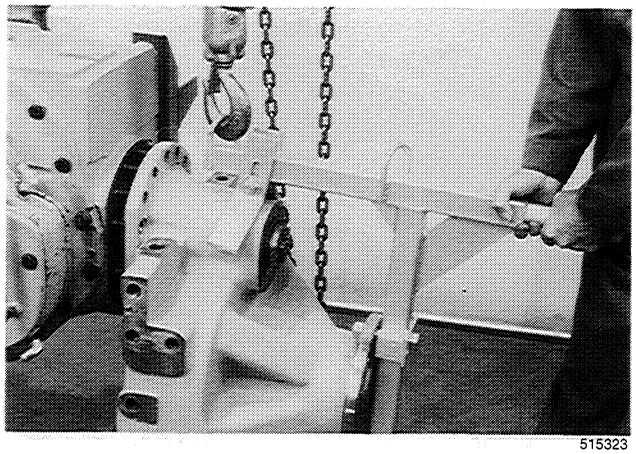
515228

l. Loosen and remove the nuts.



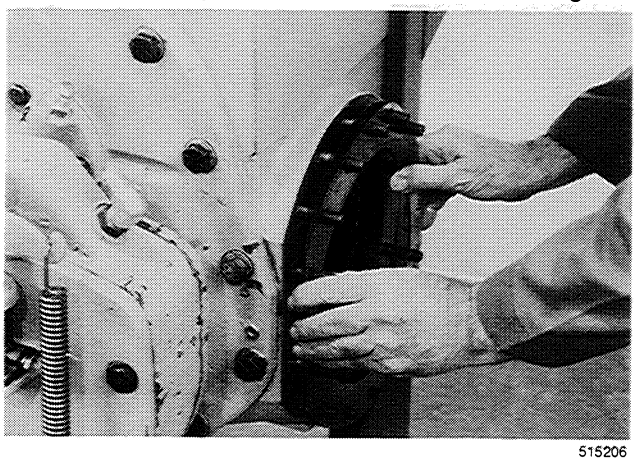
515318

m. Install the lifting tool and remove the final drive.



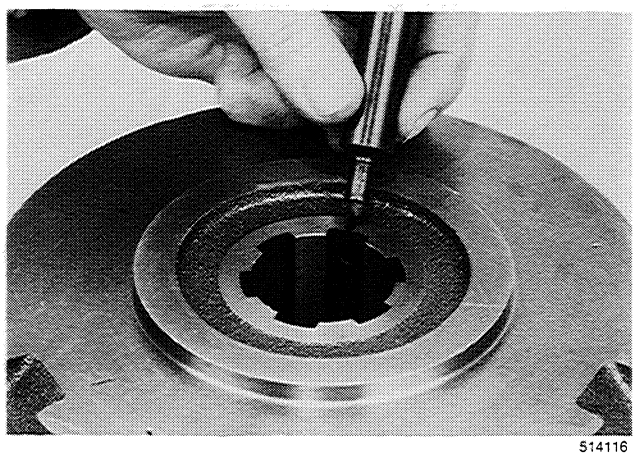
515323

n. If the backlash is not as specified, add shims to increase the backlash or remove shims to decrease the backlash. After adding or removing shims, check the backlash again.



515206

17. Make a mark on the housing for the forward clutch to show the location of a spline that has a hole.

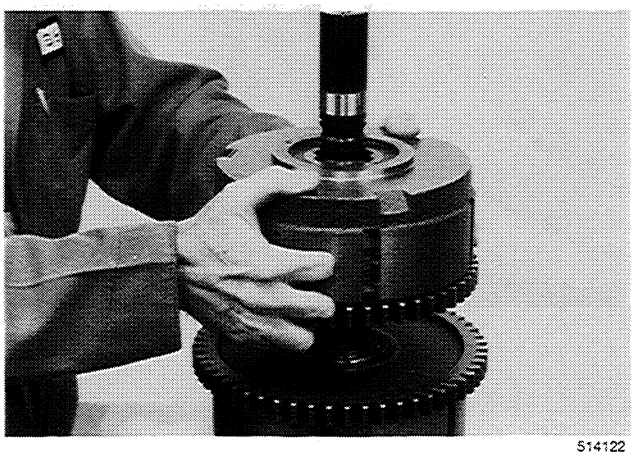


514116

18. Make a mark on the end of the main shaft to show the location of a spline that has a hole.

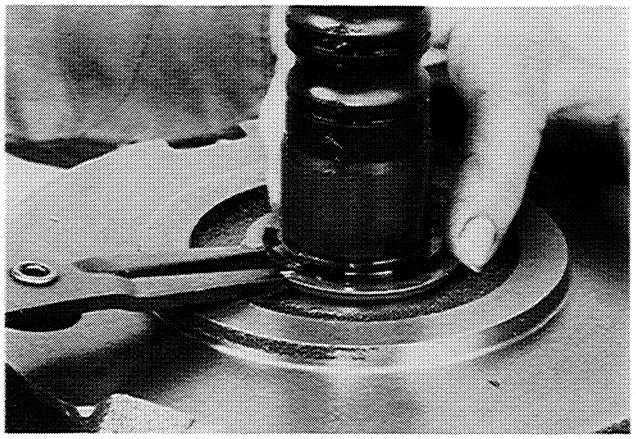
514120

19. Install the forward clutch. Do not let the forward gear come out of the metal discs.



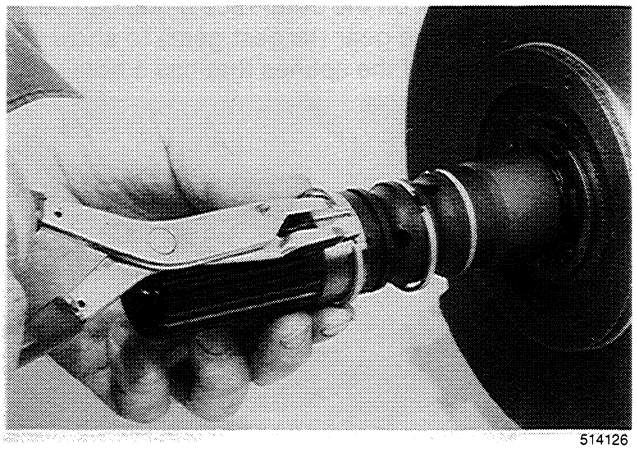
514122

20. Install the snap ring.



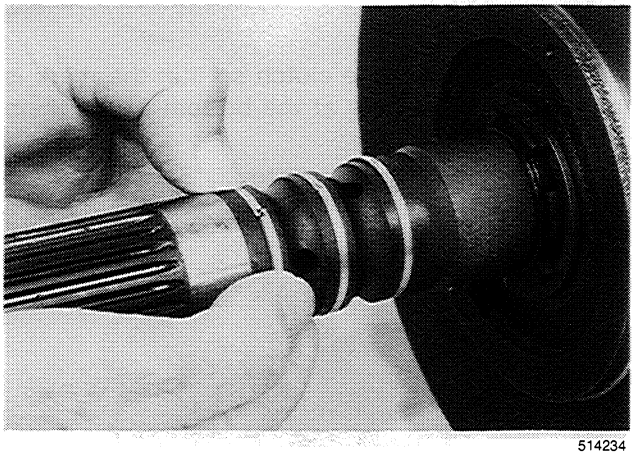
514124

21. Install new sealing rings.



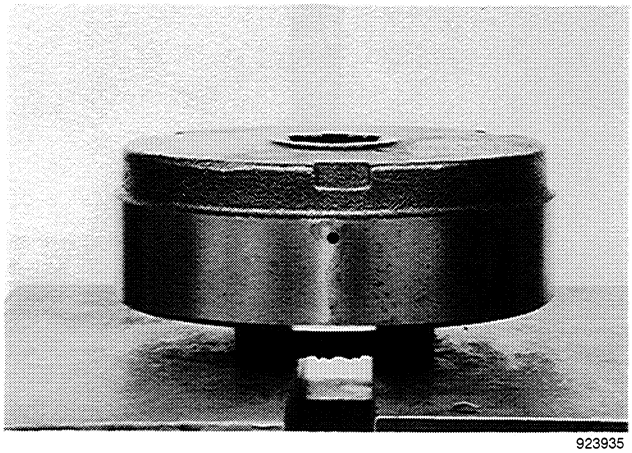
514126

22. Engage the ends of the sealing rings.



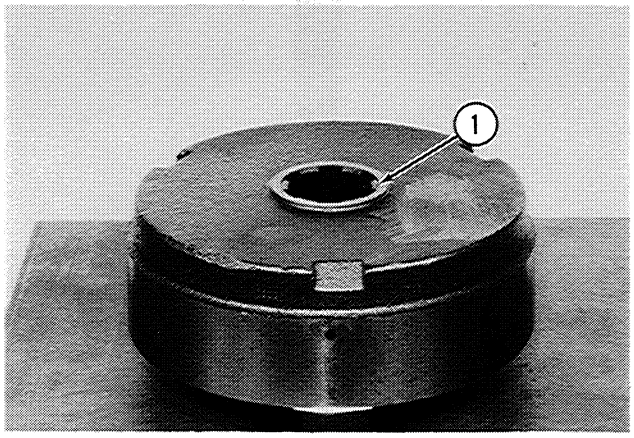
514234

13. Two holes in the OD of the housing for the low clutch are aligned with the holes in the bore of the housing. Put the low clutch in the press so that the low gear is down. Put the housing in the press so that one of the holes on the OD aligned with a hole in the bore is in front of you.



923935

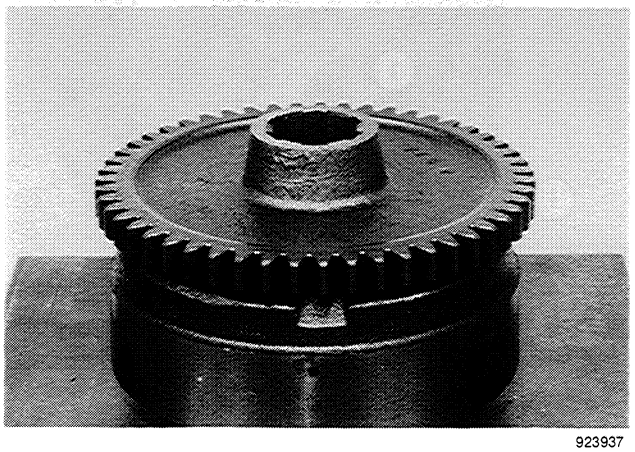
14. Put the spacer on the housing.



1. Spacer

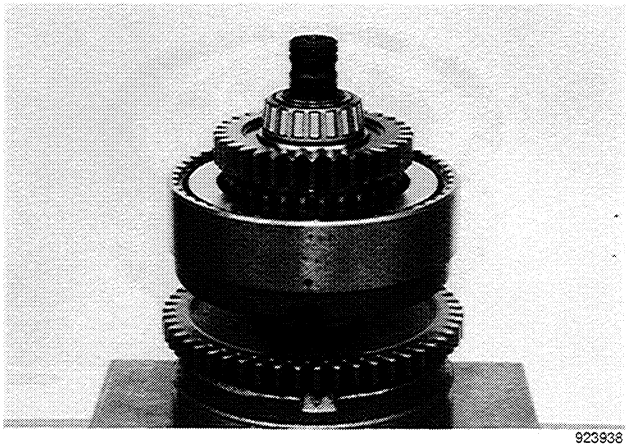
923936

15. Put the drive gear on the spacer and housing so that the long hub is up.



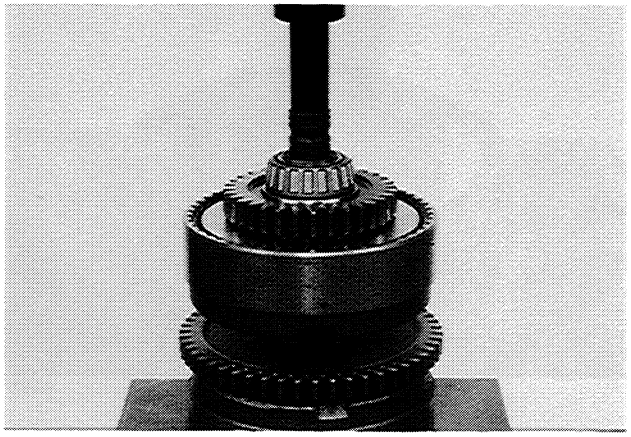
923937

16. Install the track speed shaft in the drive gear and low clutch. Be sure the hole in the large spline is aligned with the hole in the bore of the housing.



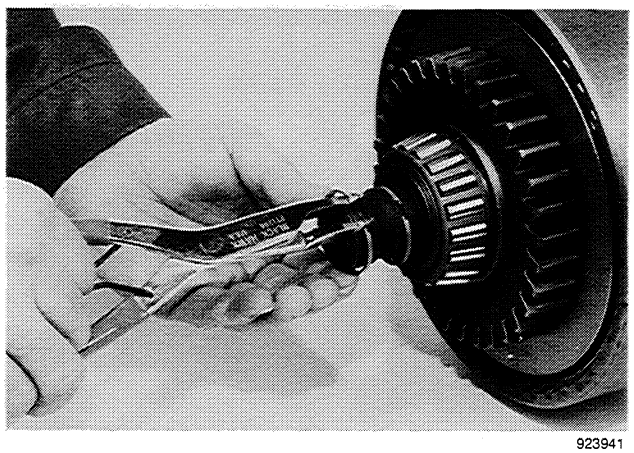
923938

17. Press the track speed shaft into the ball bearing in the low gear.



923940

18. Install the sealing rings in the grooves in the track speed shaft.



923941

SPECIAL TOOLS

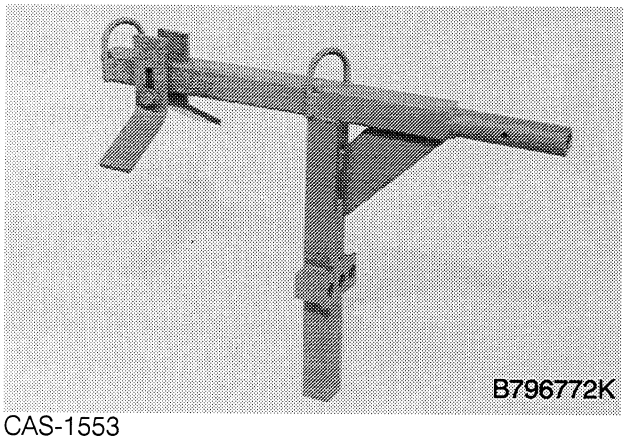
Order special tools from one of the following addresses:

In the U.S. A. and Canada

Service Tools
P.O. Box 314
Owatonna, Minnesota 55060

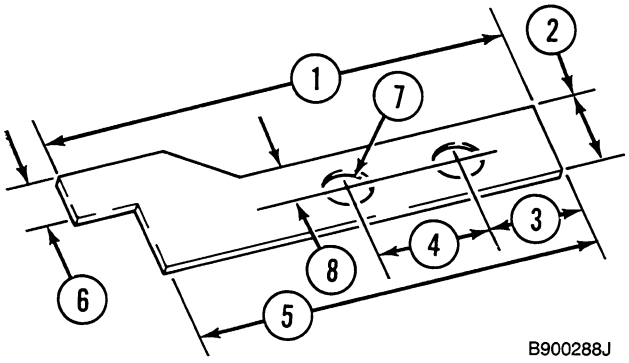
In Europe

VL Churchill Ltd
P.O. Box 3, Daventry
Northants, NN11 4NF
England



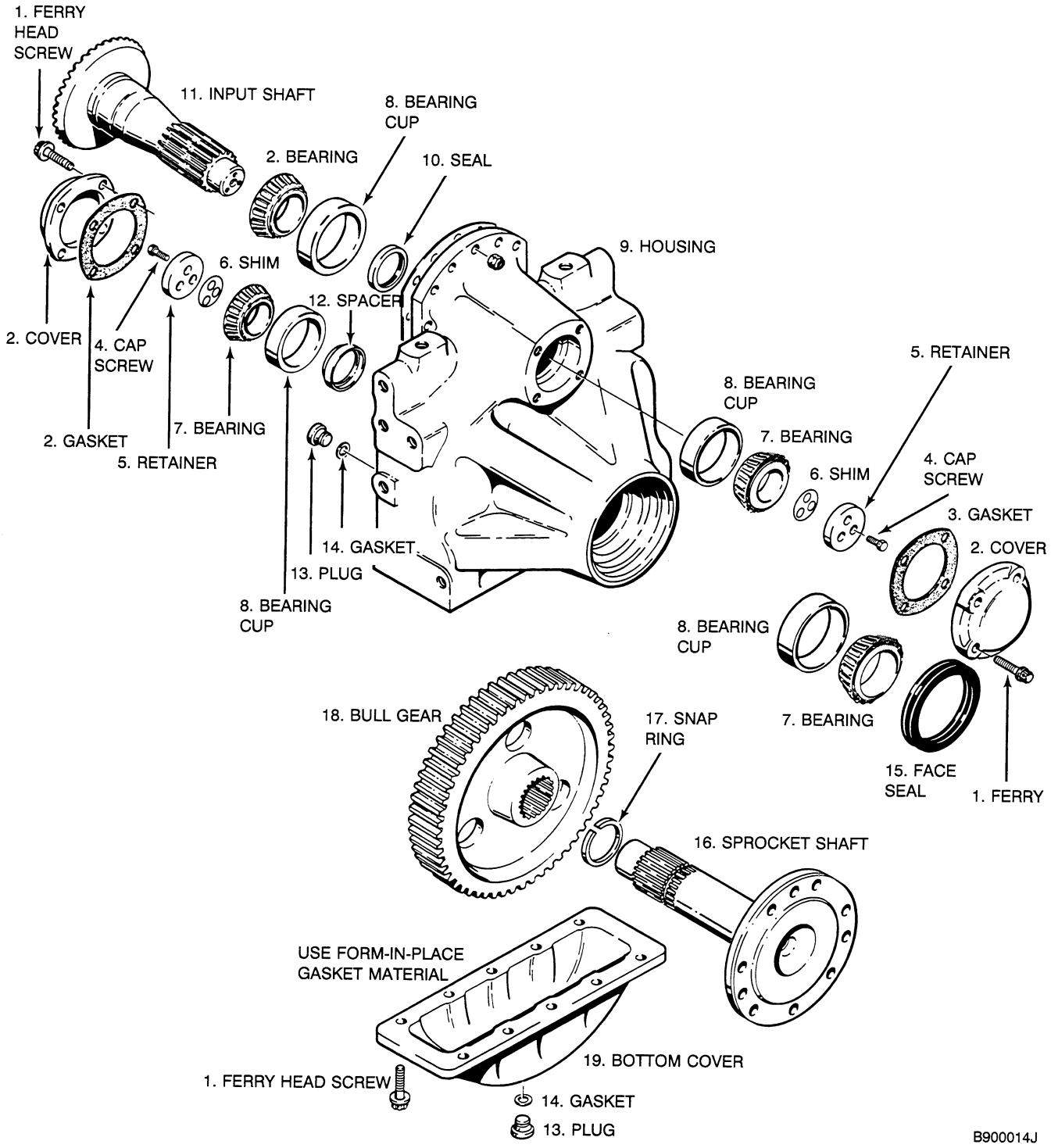
CAS-1553

The special tool shown above is used to remove and install a final drive. Tool first used on page 5.



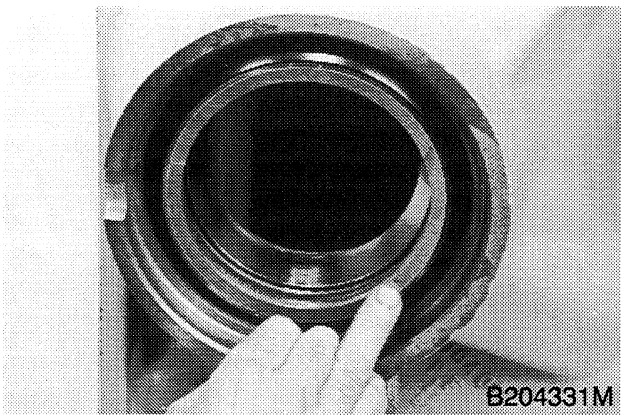
1. *5-1/8 Inches (130 mm)*
2. *1 Inch (25 mm)*
3. *1 Inch (25 mm)*
4. *1-1/4 Inch (31.7 mm)*
5. *4-7/16 Inches (112.7 mm)*
6. *5/8 Inch (16 mm)*
7. *17/32 Inch (13.5 mm) Diameter*
8. *1/2 Inch (12.7 mm)*

The special tool shown above is used to measure the backlash of the level gear. Make the tool from 1/8 inch (3 mm) thick material. Tool first used on page 6.


1. FERRY HEAD SCREW
11. INPUT SHAFT
8. BEARING CUP
2. BEARING
10. SEAL
9. HOUSING
6. SHIM
12. SPACER
2. COVER
4. CAP SCREW
2. GASKET
7. BEARING
5. RETAINER
8. BEARING CUP
13. PLUG
14. GASKET
5. RETAINER
8. BEARING CUP
7. BEARING
6. SHIM
4. CAP SCREW
3. GASKET
2. COVER
8. BEARING CUP
7. BEARING
15. FACE SEAL
1. FERRY
18. BULL GEAR
17. SNAP RING
16. SPROCKET SHAFT
USE FORM-IN-PLACE GASKET MATERIAL
19. BOTTOM COVER
1. FERRY HEAD SCREW
14. GASKET
13. PLUG
B900014J

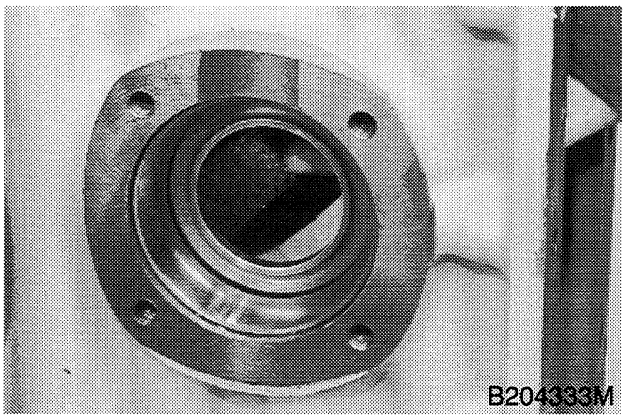
Final Drive

STEP 82



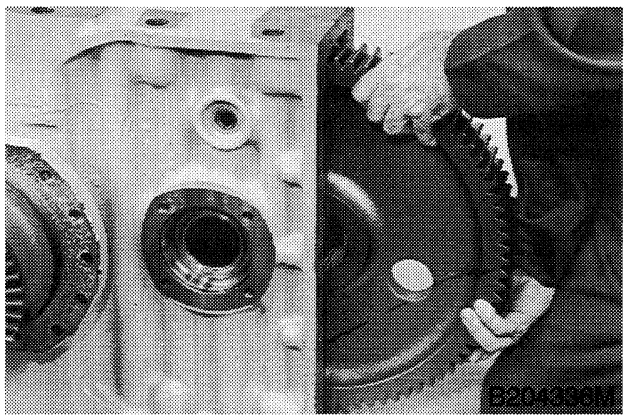
Lubricate the sealing face of the metal ring with a small amount of clean oil.

STEP 83



Put the spacer in the inner bore for the sprocket shaft so that the chamfer on the ID is toward the bull gear.

STEP 84

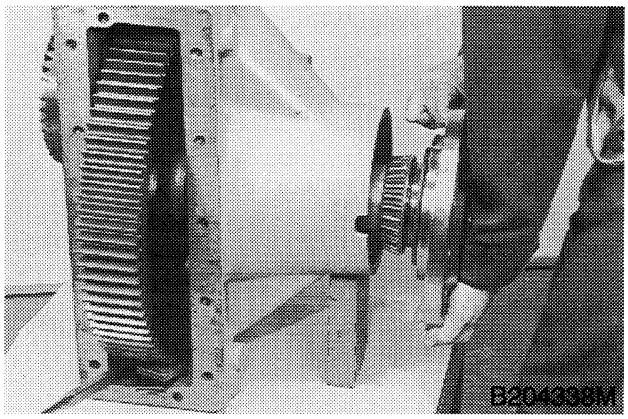


Install the bull gear.

STEP 85

Make sure the snap ring is installed in the groove in the sprocket shaft.

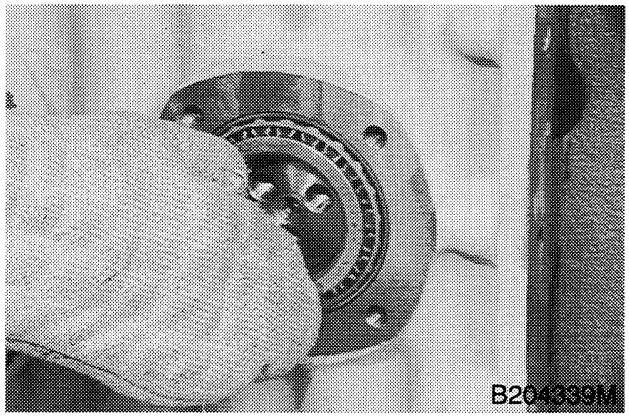
STEP 86



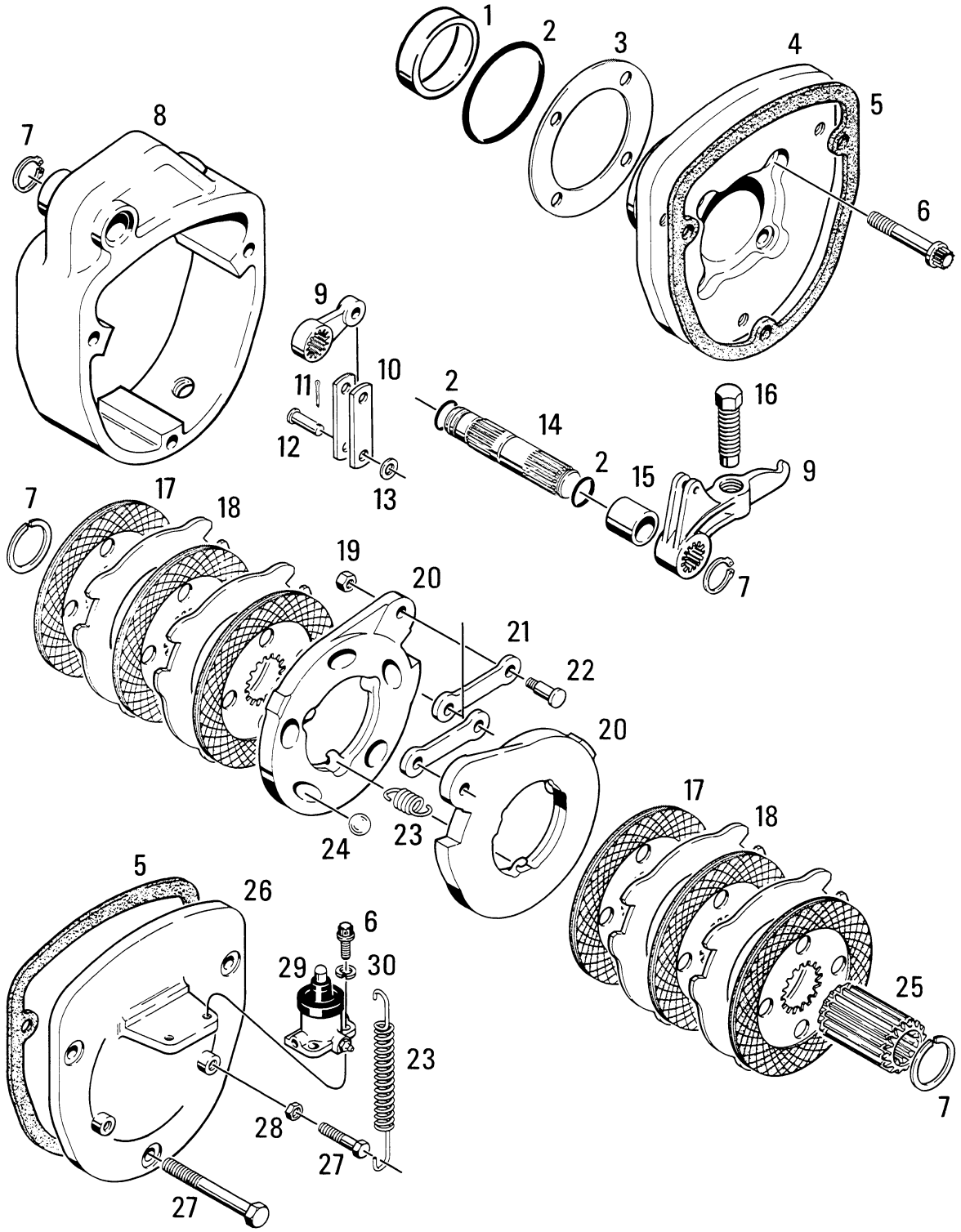
Install the sprocket shaft.

Use insulated gloves or mittens when working with hot parts.

STEP 87



Have another person hold the sprocket shaft in place. Remove the bearing from the oven and install the bearing on the sprocket shaft.



1. *Bearing Cup*
2. *O-ring*
3. *Shim*
4. *Brake Mount*
5. *Gasket*
6. *Ferry Head Screw*
7. *Snap Ring*
8. *Brake Housing*
9. *Lever*
10. *Connector Link*
11. *Cotter Pin*
12. *Clevis Pin*
13. *Flat Washer*
14. *Shaft*
15. *Spacer*
16. *Adjusting Screw*
17. *Friction Disc*
18. *Metal Disc*
19. *Nut*
20. *Actuator Plate*
21. *Actuator Link*
22. *Shoulder Bolt*
23. *Spring*
24. *Steel Ball (5)*
25. *Hub*
26. *Cover*
27. *Cap Screw*
28. *Lock Nut*
29. *Brake Cylinder*
30. *Lock Washer*

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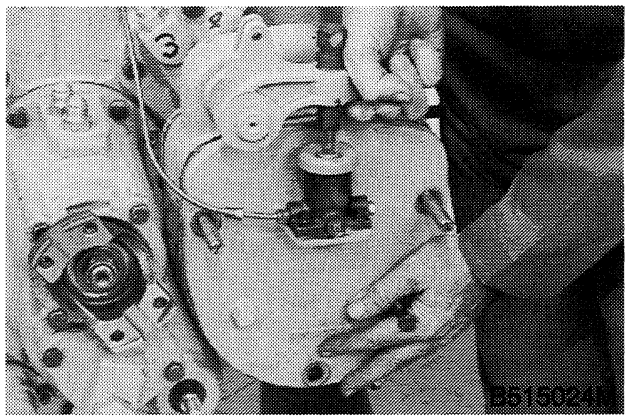
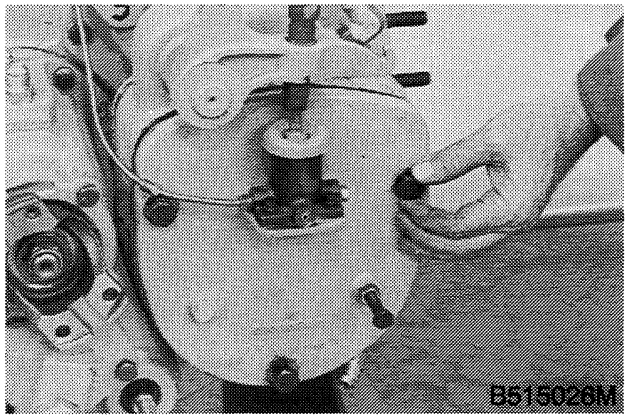
STEP 95



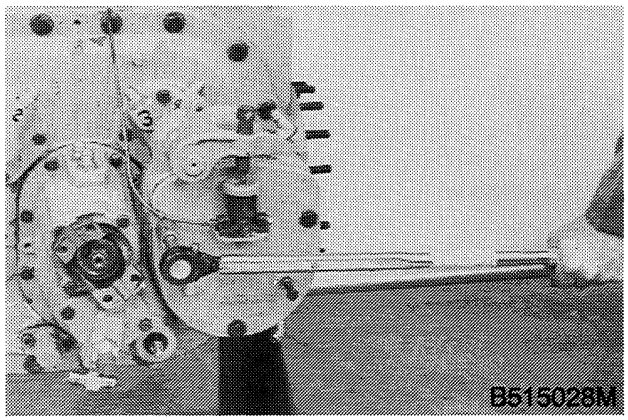
Install the cover.

STEP 96



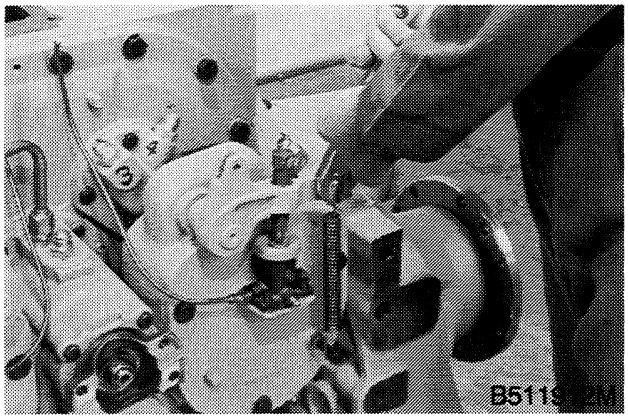
Remove the studs and install the cap screws that hold the cover.

STEP 97



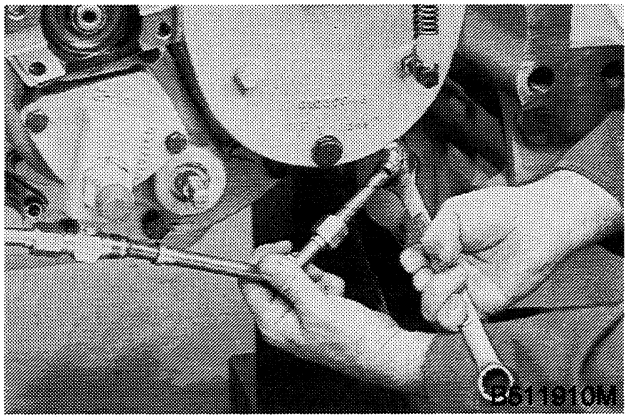
Tighten the cap screws to 80 to 90 pound-feet (102 to 122 Nm).

STEP 98



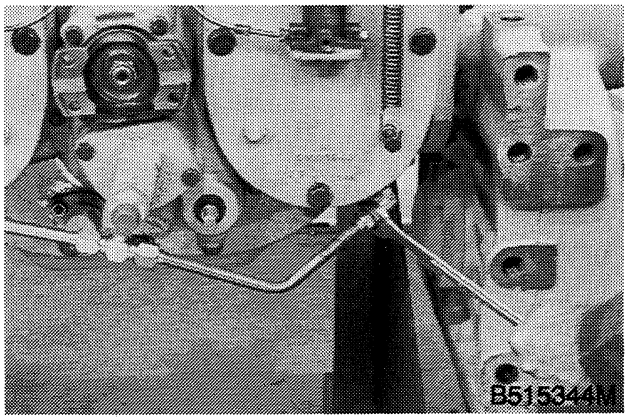
Install the spring.

STEP 99



Install the bottom tube and turn the elbow into alignment with the tube.

STEP 100



Tighten the nut at each end of the tube and tighten the lock nut on the elbow.

EQUIPMENT CONTROL VALVE

Removal

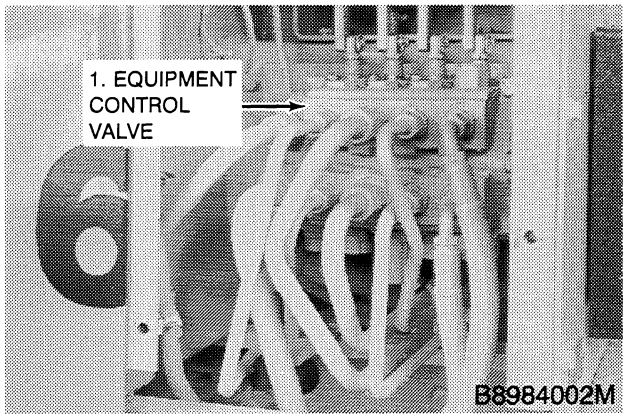
1. Park the machine on a level surface and lower all attachments to the floor. Stop the engine and apply the parking brake.

2. Move the equipment control levers in both directions to release any pressure in the hydraulic circuits.

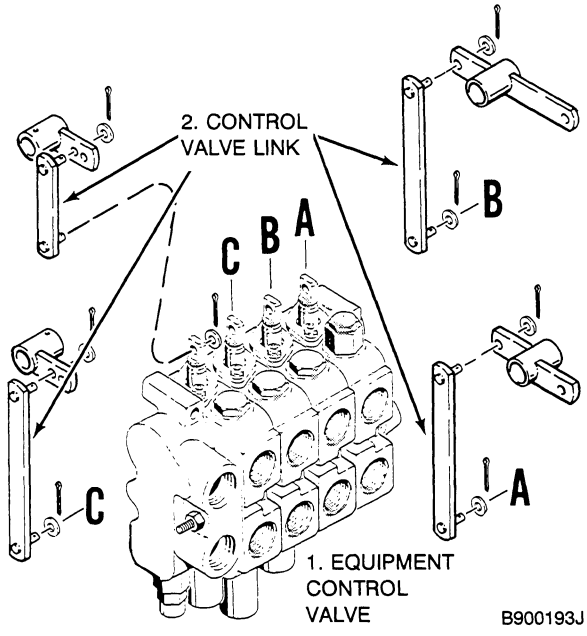
3. The equipment control valve is in front of the hydraulic reservoir. Remove the side cover for the equipment control valve.

4. Remove the upper cover for the equipment control valve.

5. Clean all dirt and grease from around the equipment control valve.



6. Remove the cotter pins and washers from the top and bottom of each control valve link. Remove the control valve links from the machine.



7. Connect a vacuum pump to the hydraulic reservoir.

8. Remove the breather from the front of the hydraulic reservoir and install a plug in the hole.

9. Put identification tags on the hoses and tubes that are connected to the equipment control valve (1).

10. Start the vacuum pump.

11. Disconnect the supply tube (12) from the equipment control valve (1). Disconnect the opposite end of the supply tube (12) from the tube below and to the rear of the equipment control valve (1). Remove the supply tube (12) from the machine. Use caps and plugs to close all openings.

12. Disconnect the return tube (13) from the equipment control valve (1). Install a plug in the return tube (13) and a cap on the fitting.

13. Stop the vacuum pump.

14. Disconnect the hoses (6) from the auxiliary section of the equipment control valve (1).

15. Remove the clamps (8, 11, and 14) so that the tubes (7, 9, and 10) can be moved for clearance when disconnected.

16. Disconnect the tubes (7) from the angle section of the equipment control valve (1).

17. Disconnect the tubes (9) from the tilt section of the equipment control valve (1).

18. Disconnect the tubes (10) from the lift section of the equipment control valve (1).

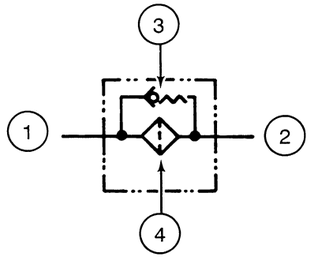
19. Use caps and plugs to close all openings.

20. Remove the three bolts (4), lock washers (3), and nuts (2) which fasten the equipment control valve (1) to the mounting plate (5).

21. Remove the equipment control valve (1) from the machine.

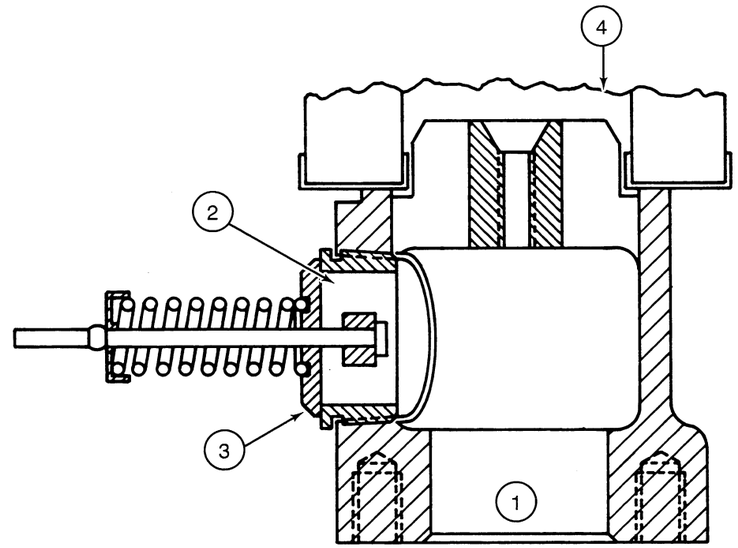
TABLE OF CONTENTS

3 FILTER



Filters the oil before the oil enters the reservoir.

1. *Inlet*
2. *Outlet*
3. *Bypass Valve*
4. *Filter*



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FLUSHING WATER FROM THE HYDRAULIC SYSTEM

1. Start and run the engine at 1500 rpm (r/min).

2. Completely retract the cylinders of all attachments on the machine.

3. Any attachment or part of an attachment that is raised must be supported to prevent the attachment or part from falling.

4. Loosen and remove the filler cap from the hydraulic reservoir.

5. Drain the oil from the hydraulic reservoir.

   a. The hydraulic reservoir holds approximately 12 U.S. gallons (45.4 litres) of oil.

   b. Have available acceptable equipment to drain the oil.

   c. Remove the drain plug from the bottom of the hydraulic reservoir.

6. Loosen and remove the cap screws that fasten the cover to the top of the hydraulic reservoir.

7. Remove the cover.

8. Loosen and remove the T-screw that holds the element in place. Remove the spring with the T-screw.

9. Remove the element from the hydraulic reservoir. Remove the flat washer from the element and discard the element.

10. Clean the inside of the hydraulic reservoir with clean lint free cloths.

11. Install the spring and flat washers on the T-screw.

12. Install and tighten the T-screw to hold the element in place.

13. Install the drain plug in the bottom of the hydraulic reservoir.

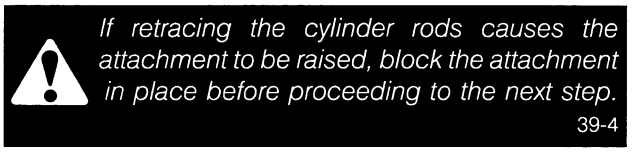
14. Fill the hydraulic reservoir. See the Operators manual for the correct oil.

15. Check the condition of the gasket for the cover. Install a new gasket if required.

16. Install the cover.

17. Install and tighten the cap screws that hold the cover in place.

18. Install the filler cap.



19. Move each control lever in both directions to release pressure in the circuits.

20. Disconnect the line from the rod end and closed end of each cylinder.

21. Be sure all control levers are in the neutral position.

22. Start the engine and run the engine at low idle.

IMPORTANT: *Check the oil level in the hydraulic reservoir frequently while doing step 23.*

23. Move each control lever in both directions until oil begins to flow from the open line. Hold the control lever in place until clean oil flows from the open line.

24. Stop the engine.

25. Connect the line to the CLOSED end of each cylinder.

26. Start the engine and run the engine at low idle.

27. If the machine has a backhoe, use a chain hoist or other acceptable lifting equipment to lower the dipper until the bucket touches the floor. Oil will be pushed out of the rod end of the dipper cylinder. As the dipper is being lowered, move the dipper control lever to the IN position a small amount to keep the closed end of the dipper cylinder full of oil.

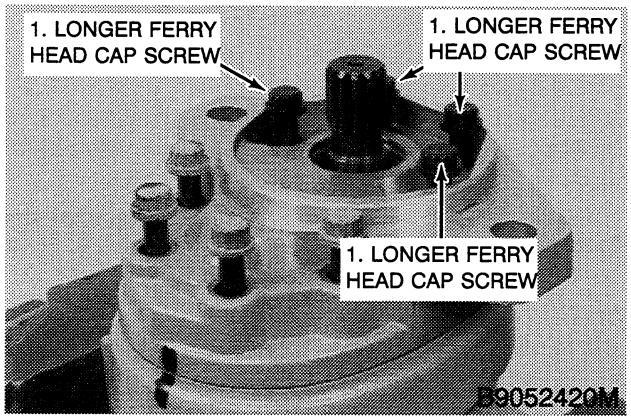
28. Completely extend all cylinders. As the piston rod comes out of the cylinder, oil will be pushed out of the rod end of the cylinder.

29. Support all attachments or parts of attachments that are raised.

30. Stop the engine.

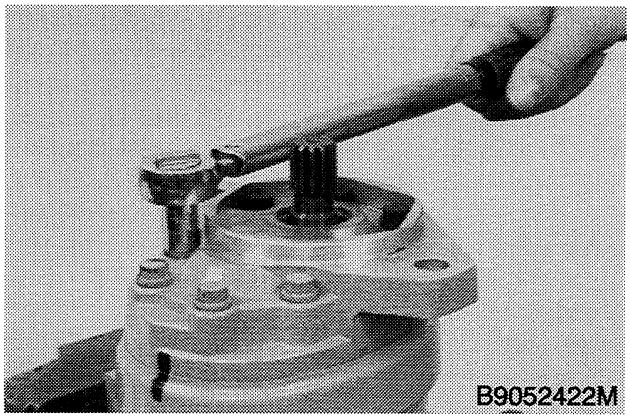
31. Connect the lines to the rod end of the cylinders.

STEP 28



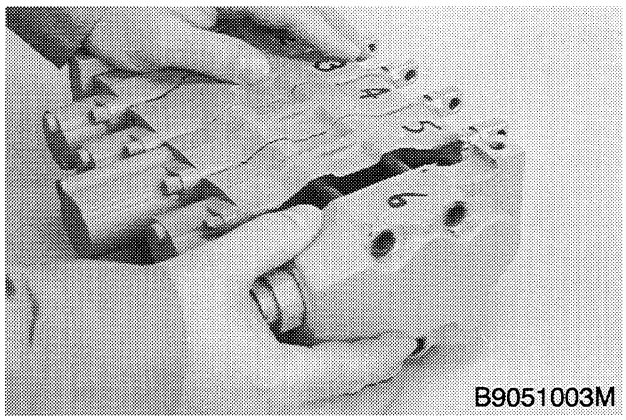
Install the Ferry head cap screws. The four longer Ferry head cap screws must be installed in the holes nearest the shaft of the pump.

STEP 29



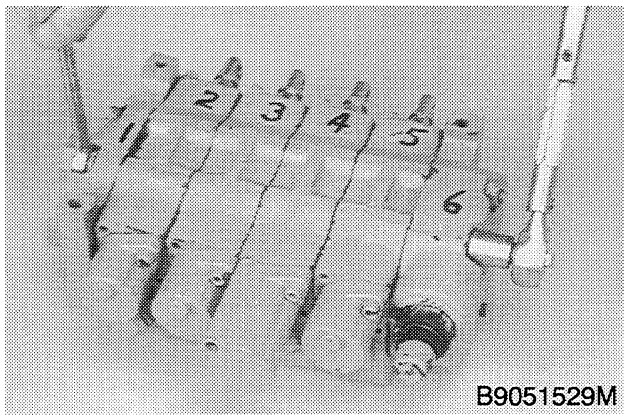
Tighten the Ferry head cap screws evenly to a torque of 480 to 600 pound-inches (54 to 68Nm).

STEP 17



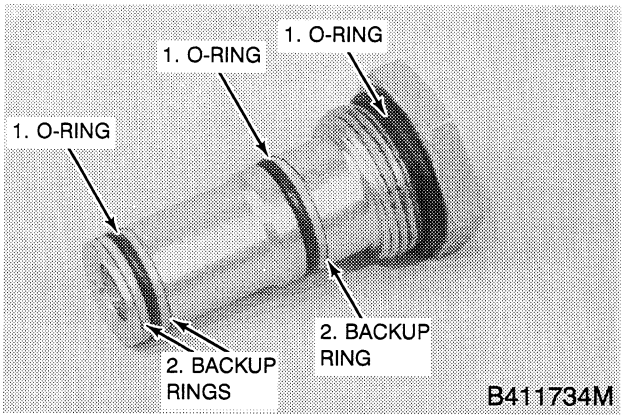
Install the inlet/outlet section.

STEP 18



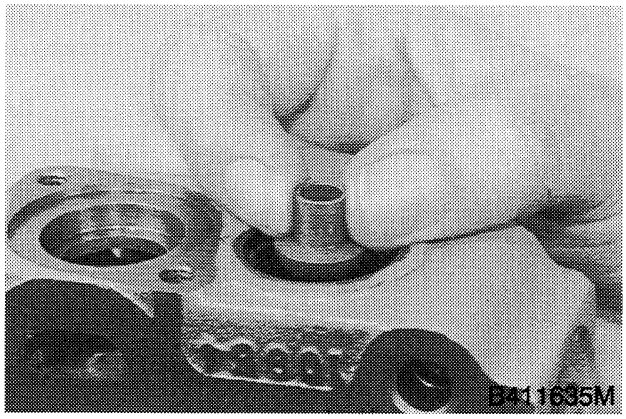
Install the nuts on the bolts to fasten the sections together. Tighten the nuts to a torque of 360 to 420 pound-inches (41 to 47 Nm).

STEP 60



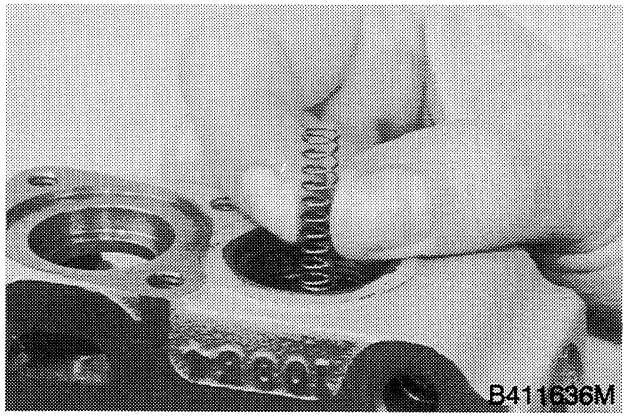
Install the O-rings and the backup rings on the load check valves.

STEP 61



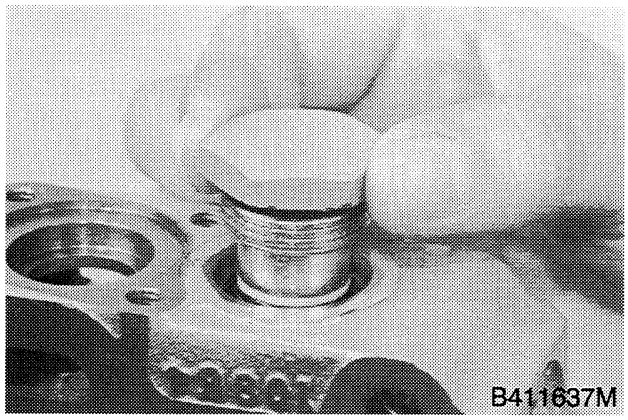
Fasten the body in a vise with soft jaws. Make sure that the A port end of the body is up. Install the poppet.

STEP 62



Install the spring.

STEP 63



Use clean oil to lubricate the O-rings and the backup rings on the load check valve. Install the load check valve.

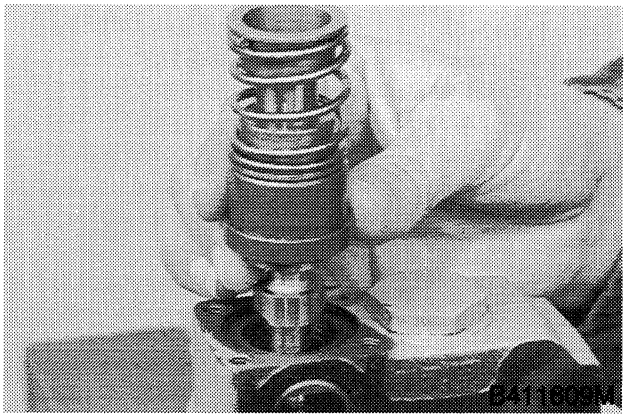
STEP 64

Tighten the load check valve to a torque of 216 to 264 pound-inches (24 to 30 Nm).

STEP 65

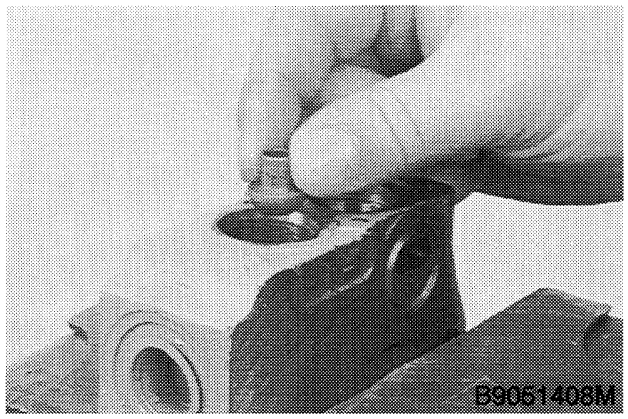
Repeat steps 61 through 64 to install the load check valve in the B port end of the body.

STEP 66



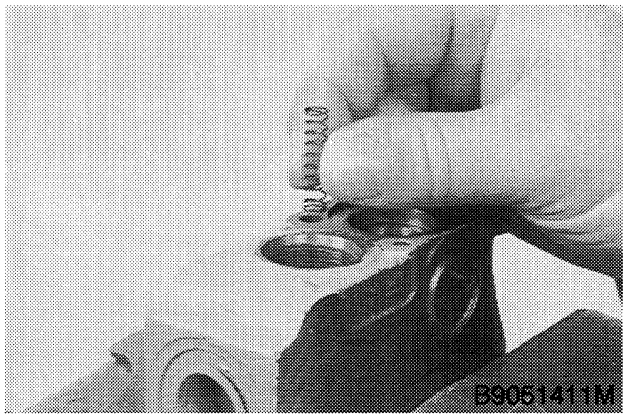
Use clean oil to lubricate the spool. Install the spool in the body.

STEP 111



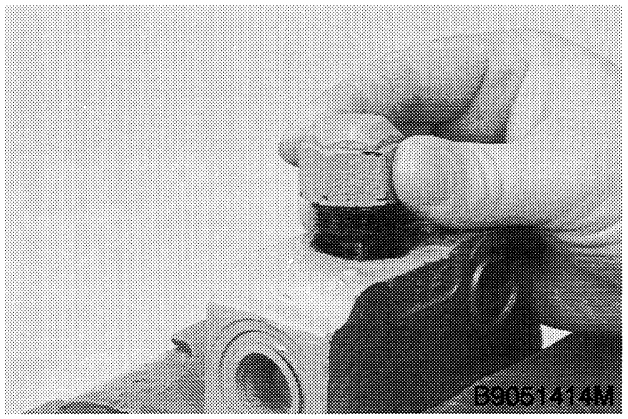
Install the poppet in the B port end of the body.

STEP 112



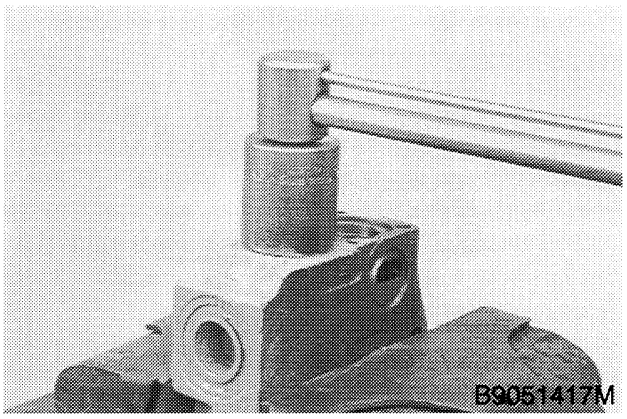
Install the spring.

STEP 113



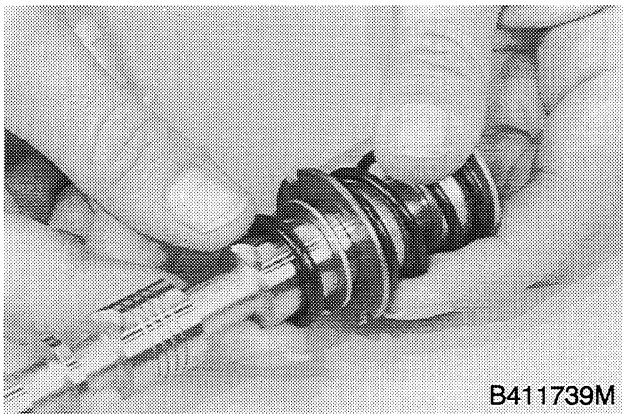
Use clean oil to lubricate the O-rings and backup rings on the circuit relief valve or the load check valve. Install the circuit relief valve or the load check valve in the body.

STEP 114



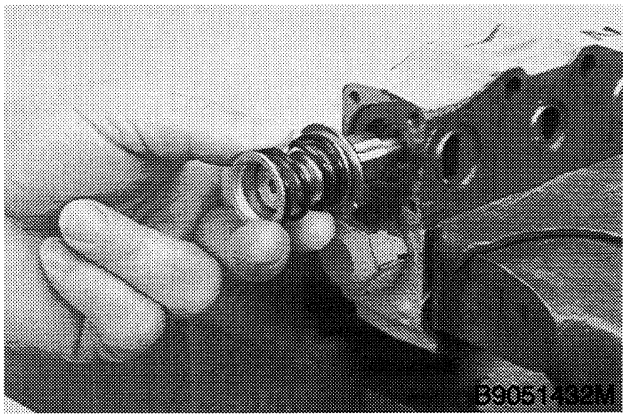
Tighten the circuit relief valve or the load check valve to a torque of 216 to 264 pound-inches (24 to 30 Nm).

STEP 115



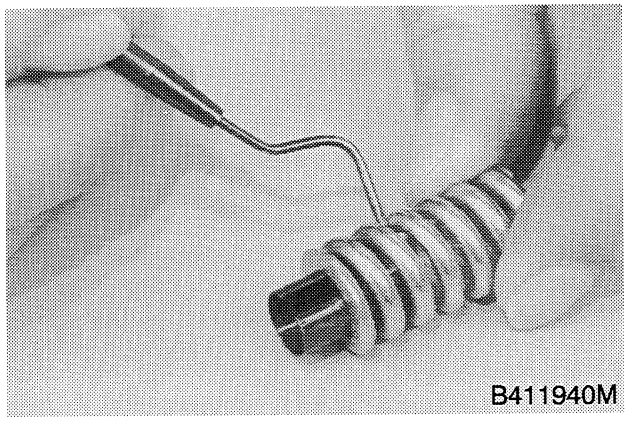
Install the retainer, the backup ring, and the O-ring on the spool.

STEP 116

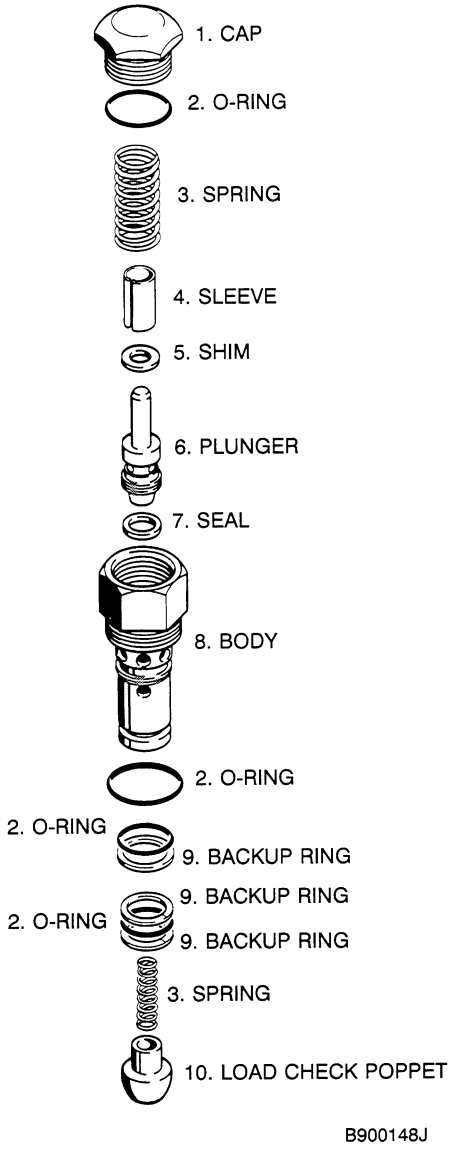


Put clean oil on the spool. Install the spool in the B port end of the body.

STEP 162



Remove the sleeve from the spring.



Circuit Relief Valve

Inspection

1. Discard the parts that were removed from the piston and the gland

2. Clean all parts in cleaning solvent.

3 Check to be sure that the piston rod is straight. If the piston rod is not straight, install a new piston rod.

4 Illuminate the inside of the tube. Inspect the inside of the tube for deep grooves and other damage. If there is any damage to the tube, a new tube must be used.

5. Remove small scratches on the piston rod or inside the tube with emery cloth of medium grit. Use the emery cloth with a rotary motion.

6. Inspect the bushings in the piston rod eye and the tube, and replace the bushings as required.

7. Inspect the gland for rust and clean and remove rust as necessary.

8. Inspect the gland end of the tube for sharp edges that will cut the gland O-ring and remove as necessary.

9. Inspect the piston for damage and wear. If the piston is damaged or worn, a new piston must be used.

Assembly

NOTE: *If a new gland is being used, put the part number of the cylinder on the new gland.*

1. Install the new bushing (12) into the gland (3).

2. Install the wide seal (16) in the gland (3). The wide seal (16) is to be installed so that the lips of the wide seal (16) are toward the small end of the gland (3). The wide seal (16) can be difficult to install.

3. Install the narrow seal (11) in the gland (3). The side of the narrow seal (11) with the groove must be toward the small end of the gland (3).

4. Press a new wiper (13) into the gland (3). The lips of the wiper (13) must be toward the outside end of the gland (3).

5. Install a new backup ring (15) in the groove on the outside of the gland (3). If both sides of the backup ring (15) are not flat, the side that is not flat must be toward the small end of the gland (3).

6 Install the O-ring (14) next to the backup ring (15) in the groove on the outside of the gland (3). The O-ring (14) must be toward the small end of the gland (3).

7. Fasten the piston rod eye in the vise.

8 Remove any marks and sharp edges on the chamfer at the end of the piston rod (4). Make sure that the piston rod (4) is clean.

9. Lubricate the bore of the gland (3) and the piston rod (4) with clean oil.

10. Push the gland (3) onto the piston rod (4). If necessary, use a soft hammer to drive the gland (3) onto the piston rod (4).

11. Put a support below and near the end of the piston rod (4). Use a shop cloth between the support and the piston rod (4) to prevent damage to the piston rod (4).

12. Put the piston (8) on the end of the piston rod (4).

13. Put the hardened washer (10) on the cap screw (9).

14. Clean the threads on the end of the piston rod and the threads of the cap screw using Loctite cleaning solvent. Allow to dry. Apply Loctite 242 to the piston rod threads 1/4 inch from the open end of the piston rod so that there is 1/2 inch of Loctite 242 on the piston rod threads. DO NOT apply Loctite to the first 1/4 inch of the piston rod threads.

15. Install the cap screw (9). See Specifications in this section and tighten the cap screw (9) to the torque value for the cylinder that is being repaired. A torque multiplier can be used to help tighten the cap screw.

16. Install a new wear ring (5) in each groove on the outside ends of the piston (8).

17. Install a new backup ring (6) in the center groove on the outside of the piston (8).

18. Install a new seal (7) on top of the backup ring (6) on the outside of the piston (8).

19. Fasten the tube (1) in a vise or other holding equipment. Be careful to prevent damage to the tube (1).

20. Lubricate the inside of the tube (1) and the piston (8) with clean oil.

21. Push the piston (8) straight into the tube (1).

22 Lubricate the O-ring (14) on the gland (3) with clean oil.

Continued on page 8

REPLACING BUSHINGS

1. Use a press and an acceptable driver and press the bushings out of the bore.

2 Clean the bore for the bushing.

3. Start the new bushing into the bore.

4. Use the press and an acceptable driver and press the bushing into the bore until the bushing is flush with the outside of the piston rod eye or tube.

NOTE: *When two bushings are used in the same bore, pressing a bushing in too far can close the passage to the grease fitting.*

BRAKE ADJUSTMENT

The brakes must be adjusted when the brake pedals are not at the same height when the brakes are applied. Both brakes must be adjusted at the same time.

1. Loosen and remove the cap screws that hold the left floor plate.

2. Remove the left floor plate.

3. Loosen the cap screws at the top of the right side panel for the engine compartment.

4. Loosen the bottom cap screws and remove the side panel.

5. Disconnect the rod from the accelerator pedal from the cross shaft in the engine compartment.

6. Loosen and remove the cap screws that hold the right floor plate.

7. Remove the right floor plate.

NOTE: *The remainder of this procedure will require two persons.*

8. One person is to push down and hold the left brake pedal (1) and the other person is to measure the amount of travel of the adjusting screw.

9. Subtract 1/8 inch (3 mm) from the measurement in step 8.

10. Turn the adjusting screw into the lever equal to the answer in step 9.

11. Apply the left brake pedal (1) and measure the amount of travel for the adjusting screw. The adjusting screw must move 1/8 to 3/16 inch (3 to 5 mm). Turn the adjust screw as required to get this amount of movement.

12. Do steps 8, 9, 10, and 11 for the right brake. The movement of the adjusting screw for both brakes must be as equal as possible.

13. Install the floor plates.

14. Connect the rod from the accelerator pedal to the cross shaft.

15. Install the side panel for the engine compartment.

REMOVING THE BLADE AND C-FRAME AS AN ASSEMBLY

1. Lower the blade to the floor.

2. Move the blade control lever in all directions to relieve any pressure in the hydraulic circuits.

3. Remove the cap screw (1) and hardened washer (2) that hold one of the pivot pins (3) in place at the rear of the C-frame (4).

4. Use a prybar to remove the pivot pin (3).

5. Repeat steps 3 and 4 for the other pivot pin.

6. Start the engine and run the engine at low idle.

7. Move the blade control lever to the LOWER position to lower the rear of the C-frame (4) to the floor.

8. Stop the engine.

9. Remove the snap ring (5) from the outer end of one of the pivot pins (3) for the piston rod eyes of the lift cylinders (6).

10. Drive the pivot pin (3) out of the C-frame (4).

11. Repeat steps 9 and 10 for the other lift cylinder.

12. Start the engine and run the engine at low idle.

13. Completely retract the piston rods of the lift cylinders (6).

14. Stop the engine.

15. Move the blade control lever in all directions and the angle control lever in both directions to relieve any pressure in the hydraulic circuits.

16. Loosen the cap screws that hold the guard for the hoses in place at the front of the machine.

17. Remove the cap screws and guard.

18. Fasten an identification tag to each hose for correct connections during installation.

19. Remove the dirt and grease from the connections at the front of the machine.

20. Disconnect the hoses at the front of the machine.

21. Install a plug in each hose and a cap on each tube.

22. Carefully move the machine out of the C-frame (4).

INSTALLING THE BLADE AND C-FRAME AS AN ASSEMBLY

1. Carefully move the machine into the C-frame (4).

2. Extend the piston rods of the lift cylinders (6) so that the piston rod eyes can be aligned with the C-frame (4).

3. Align a piston rod eye with the C-frame (4) and install the pivot pin (3).

4. Align the other piston rod eye with the C-frame (4) and install the pivot pin (3).

5. Install a snap ring (5) in the groove in each pivot pin (3).

6. With the engine running at low idle, slowly raise the C-frame (4) into alignment with the main frame.

7. Install the pivot pins (3) for the C-frame so that the groove in the pivot pin is toward the outside.

8. Stop the engine.

9. Install the hardened washer (2) and cap screw (1) to hold each pivot pin (3) in place. The hardened washer must engage the groove in the pivot pin (3).

10. Connect the hoses to the tubes at the front of the machine.

11. Install the guard and cap screws at the front of the machine. Tighten the cap screws.

12. Start the engine and run the engine at low idle.

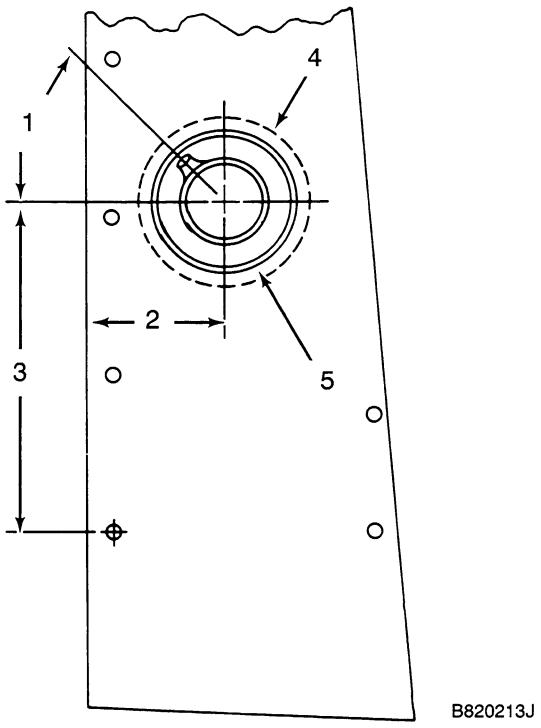
13. Slowly extend and retract the angle cylinders (7) and lift cylinders (6) four times to remove any air from the hydraulic circuits.

INSTALLING THE MOUNTING PLATE FOR THE TRUNNION HOLDER

1. Put the cover in the counterbore on the inside of the mounting plate.

2. Weld the cover to the mounting plate. Use E-7018 welding rod.

3. Put the mounting plate in the radiator shroud according to the dimensions in the illustration below. Use a C-clamp to hold the mounting plate in place.



Left Side Shown

1. *45 Degrees*
2. *8.25 Inches (209.5 mm)*
3. *20.4 Inches (518 mm)*
4. *3/16 Inch (5 mm) Fillet*
5. *1/4 Inch (6 mm) Groove*

Weld Specification for Trunnion Holder

4. Make the 3/16 inch (5 mm) fillet weld on the inside of the radiator shroud.

5. Cover the opening in the mounting plate to prevent damage to the inner surface.

6. Make the 1/4 inch (6 mm) groove weld on the outside of the radiator shroud.

7. Hold the trunnion holder in the mounting plate and install the 19 steel balls to hold the trunnion holder in place.

8. Install the plug in the mounting plate.

9. Install the radiator in the machine.

10. Fasten the top left radiator support to the radiator shroud. Make sure there is a flat washer on each side of the top radiator support.

11. Fasten the top right radiator support to the radiator shroud. Make sure there is a flat washer on each side of the top radiator support.

12. Install the cap screw with lock washer and flat washer to fasten the radiator to the left radiator mount.

13. Install the cap screw with lock washer and flat washer to fasten the radiator to the right radiator mount.

14. Tighten the cap screws to 50 to 60 pound-feet (68 to 81 Nm).

15. Connect the bottom radiator hose to the radiator.

16. Tighten the clamp that fastens the bottom radiator hose to the radiator.

17. Connect the top radiator hose to the radiator.

18. Tighten the clamp that fastens the top radiator hose to the radiator.

19. Remove the cap from the left fitting in the radiator and the plug from the hose.

20. Connect the hose to the fitting in the radiator.

21. Remove the cap from the other fitting and the plug from the other hose.

22. Connect the hose to the fitting in the radiator.

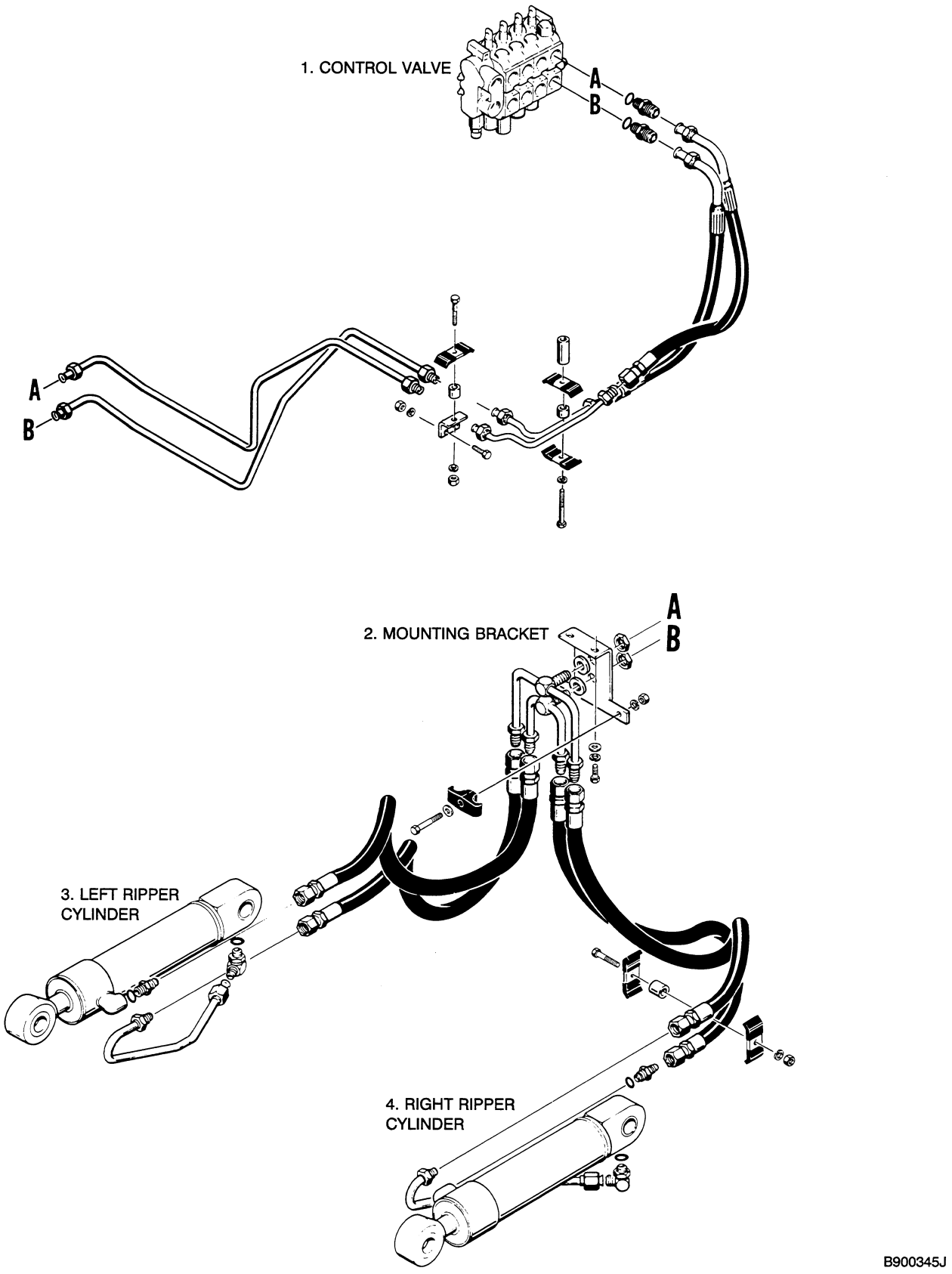
23. If the machine has front lamps:

    a. Hold the front lamp mount in place and install the cap screws that hold the front lamp mount in place.

    b. Tighten the cap screws.

    c. Use two tie straps to fasten the front lamp wiring harness to the top radiator hose.

    d. Connect the front lamp wiring harness to the front wiring harness.



Ripper Hydraulic Installation