SERVICE MANUAL

LOADER

621B

721B

7-60064

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

TYPE 1-4

SERVICE MANUAL

LOADER

621B

721B

7-60064

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

TYPE 1-4

SERVICE MANUAL

LOADER

621B

721B

7-60064

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

TYPE 1-4

SERVICE MANUAL

LOADER

621B

721B

7-60064

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

TYPE 1-4

MAINTENANCE SCHEDULE
MODEL 721B LOADER
INSTRUCTIONS

AS REQUIRED

22	SERVICE THE AIR CLEANER IF THE AIR CLEANER WARNING LAMP ILLUMINATES	SEE OPERATORS MANUAL
7	REPLACE THE HYDRAULIC FILTERS IF THE HYDRAULIC FILTER WARNING LAMP ILLUMINATES	USE CASE FILTERS
21	CHECK THE FAN BELT CONDITION	REPLACE AS REQUIRED
	CHECK THE AIR CONDITIONING DRIVE TENSION (IF EQUIPPED) NOT SHOWN	ADJUST AS REQUIRED

EVERY 10 HOURS OF OPERATION OR EACH DAY - WHICHEVER OCCURS FIRST

17	CHECK THE ENGINE OIL LEVEL	SEE OPERATORS MANUAL

EVERY 50 HOURS OF OPERATION

1	CHECK THE COOLANT RESERVOIR FLUID LEVEL	ETHYLENE GLYCOL AND WATER
29	CHECK THE TRANSMISSION OIL LEVEL (ENGINE RUNNING AND OIL WARM)	CASE IH NO. 1 ENGINE OIL (SAE 10W-30)
15	CHECK THE FUEL SEDIMENT BOWL	CLEAN AS REQUIRED
6	CHECK THE HYDRAULIC RESERVOIR FLUID LEVEL	CASE TCH FLUID
8	LUBRICATE THE STEERING CYLINDER PIVOTS - ROD END (2 FITTINGS)	CASE MOLYDISULFIDE GREASE
16	LUBRICATE THE REAR AXLE TRUNNION PIVOTS (2 FITTINGS)	CASE MOLYDISULFIDE GREASE
10	LUBRICATE THE BUCKET AND BELLCRANK PIVOT POINTS (6 FITTINGS)	CASE MOLYDISULFIDE GREASE
27	LUBRICATE THE CENTER DRIVE SHAFT SLIP JOINT (1 FITTING)	CASE MOLYDISULFIDE GREASE
26	LUBRICATE THE FRONT DRIVE SHAFT SUPPORT BEARING (1 FITTING)	CASE MOLYDISULFIDE GREASE

EVERY 100 HOURS OF OPERATION

11	LUBRICATE THE STEERING CYLINDER PIVOTS - CLOSED END (2 FITTINGS)	CASE MOLYDISULFIDE GREASE
9	LUBRICATE THE LOADER LIFT ARM AND CYLINDER PIVOT POINTS (7 FITTINGS)	CASE MOLYDISULFIDE GREASE
35	LUBRICATE THE REAR DRIVE SHAFT SLIP JOINT (1 FITTING)	CASE MOLYDISULFIDE GREASE

EVERY 250 HOURS OF OPERATION

20	CHECK THE RADIATOR COOLANT LEVEL	ETHYLENE GLYCOL AND WATER
3	CHANGE THE ENGINE OIL AND REPLACE THE ENGINE OIL FILTER	SEE OPERATORS MANUAL
34	CHECK THE BATTERY FLUID LEVEL	SEE OPERATORS MANUAL
36	CHECK THE TIRE CONDITION AND AIR PRESSURE	SEE OPERATORS MANUAL
12	LUBRICATE THE FOOT THROTTLE PIVOT (1 FITTING)	CASE MOLYDISULFIDE GREASE
13	CLEAN THE CAB AIR FILTERS (IF EQUIPPED)	SEE OPERATORS MANUAL
2	REPLACE THE ENGINE COOLING SYSTEM FILTER	USE CASE FILTER A77544

EVERY 500 HOURS OF OPERATION

4	REPLACE THE FUEL FILTERS	USE CASE FILTERS
33	DRAIN WATER AND SEDIMENT FROM THE FUEL TANK	SEE OPERATORS MANUAL

EVERY 1000 HOURS OF OPERATION

37	CHECK THE ENGINE VALVE CLEARANCES	SEE SERVICE MANUAL
7	REPLACE THE HYDRAULIC FILTERS	USE CASE FILTERS
30	REPLACE THE TRANSMISSION OIL FILTER	USE CASE FILTERS
28	CHANGE THE TRANSMISSION OIL	CASE IH NO. 1 ENGINE OIL (SAE 10W-30)
23	CLEAN THE TRANSMISSION BREATHER	CLEAN WITH SOLVENT
24	LUBRICATE THE UPPER AND LOWER CHASSIS PIVOTS (2 FITTINGS)	CASE MOLYDISULFIDE GREASE
25	CHANGE THE FRONT AXLE DIFFERENTIAL AND PLANETARY OIL	SEE OPERATORS MANUAL
31	CHANGE THE REAR AXLE DIFFERENTIAL AND PLANETARY OIL	SEE OPERATORS MANUAL

EVERY 2000 HOURS OF OPERATION OR EACH YEAR - WHICHEVER OCCURS FIRST

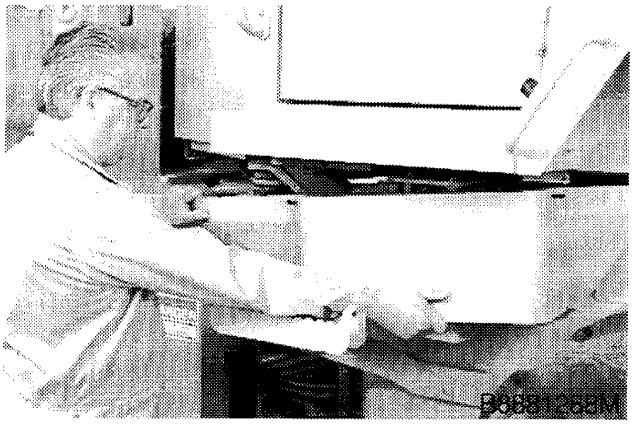
5	CHANGE THE HYDRAULIC OIL AND CLEAN THE SCREEN	CASE TCH FLUID
19	DRAIN, FLUSH AND REFILL THE ENGINE COOLING SYSTEM	ETHYLENE GLYCOL AND WATER
22	REPLACE THE AIR CLEANER ELEMENTS	USE CASE FILTERS

NOTE: WHEN YOU DRAIN, FLUSH AND REFILL THE ENGINE COOLING SYSTEM, REPLACE THE A77544 COOLANT FILTER AND ADD ONE CONTAINER (1 PINT) 331-509 COOLING SYSTEM TREATMENT.

STEP 74

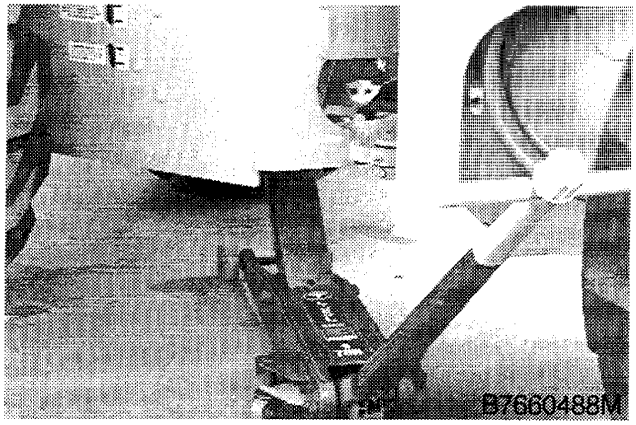
Loosen and remove the cap screws that fasten the panels under each side of the cab.

STEP 75



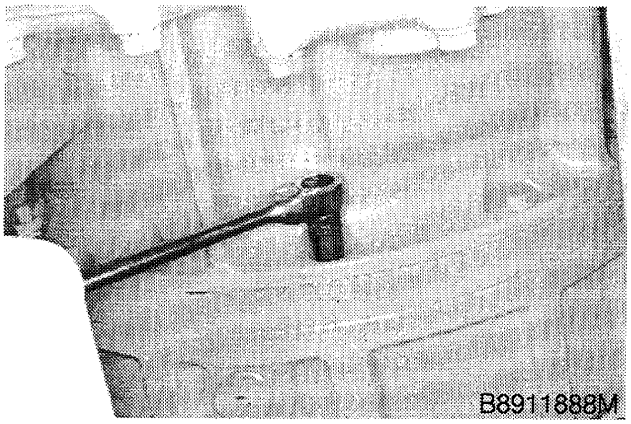
Remove the panels.

STEP 76



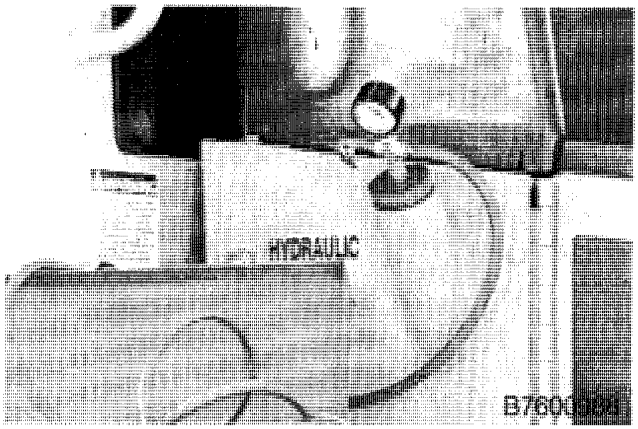
Put a floor jack under the transmission.

STEP 77



Loosen and remove the cap screws and lock washers that fasten the clamps for the wire harness, and the bracket for the heater hose to the flywheel housing. Loosen and remove the remaining cap screws and lock washers, and nuts and lock washers that fasten the transmission to the flywheel housing.

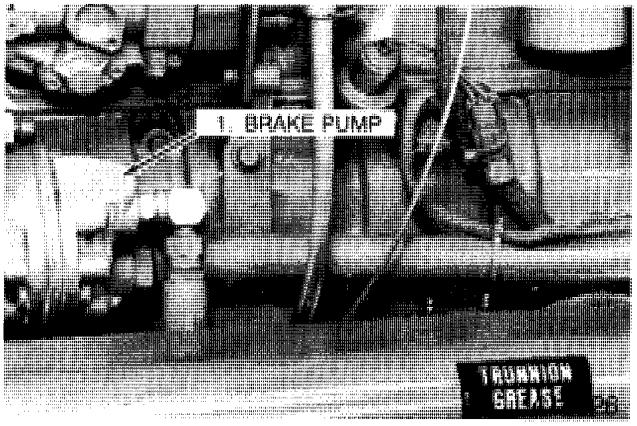
STEP 78



Remove the cap from the hydraulic reservoir and attach a vacuum pump to reservoir.

Start the vacuum pump.

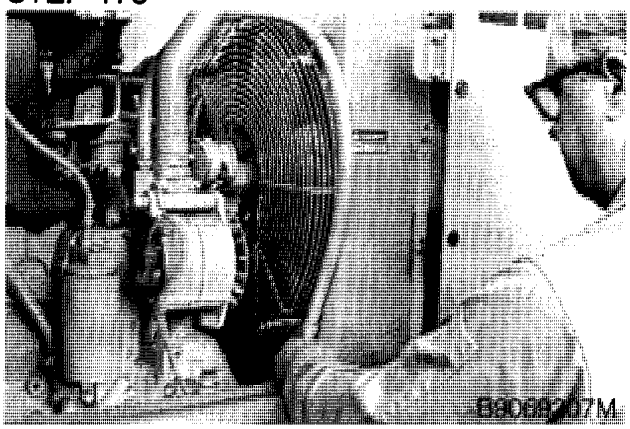
STEP 79



Disconnect the brake pump inlet and outlet lines at the brake pump. Cap and plug the hoses and fittings.

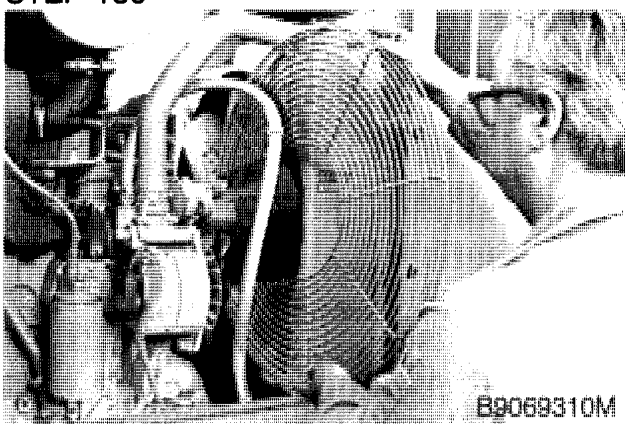
Stop the vacuum pump.

STEP 179



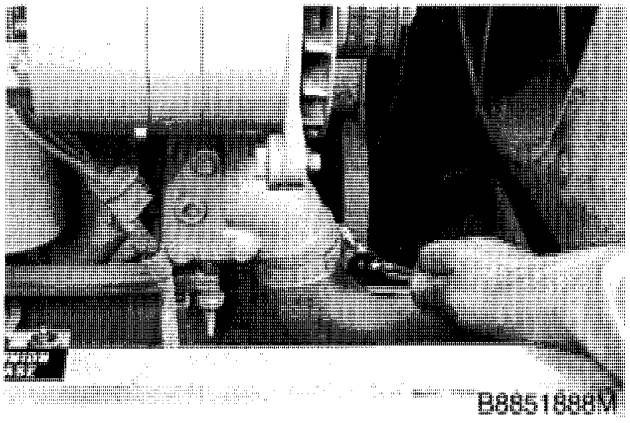
Loosen and remove the cap screws, lock washers, and flat washers that fasten the clamps for the hose and the guard to the fan shroud.

STEP 180



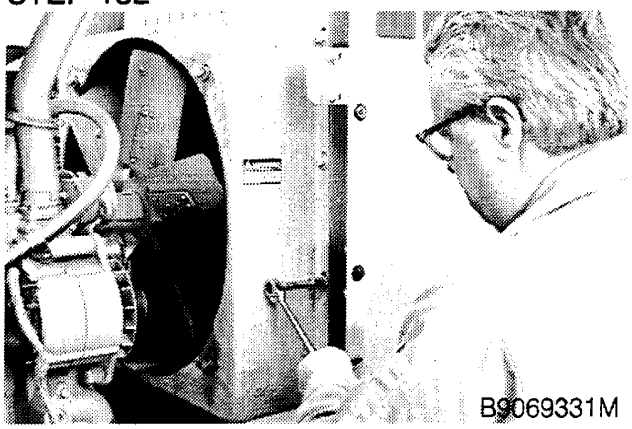
Remove the guard.

STEP 181



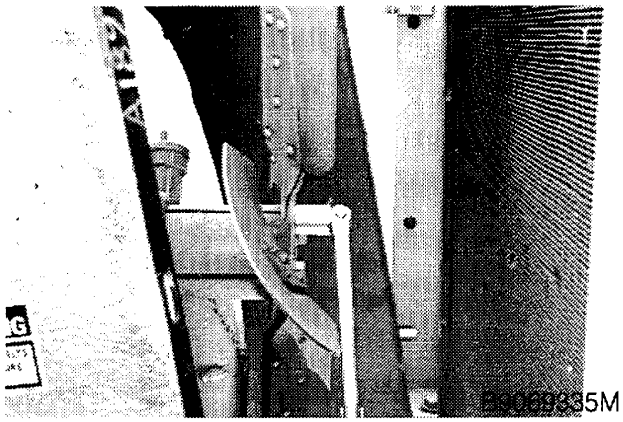
Disconnect the bottom radiator hose from the water pump.

STEP 182



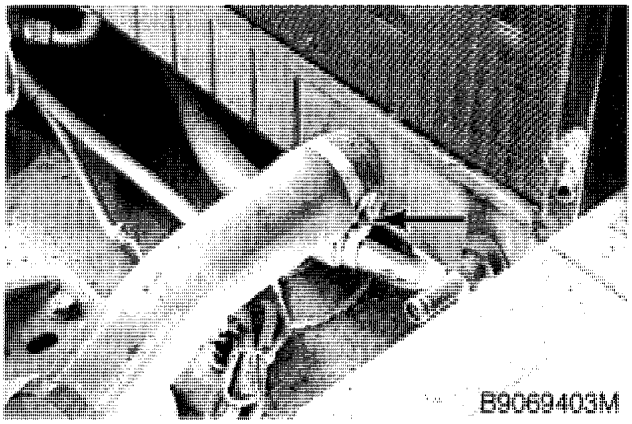
Loosen and remove the cap screws, lock washers, and flat washers that fasten the fan shroud to the radiator. Put the fan shroud over the fan.

STEP 183



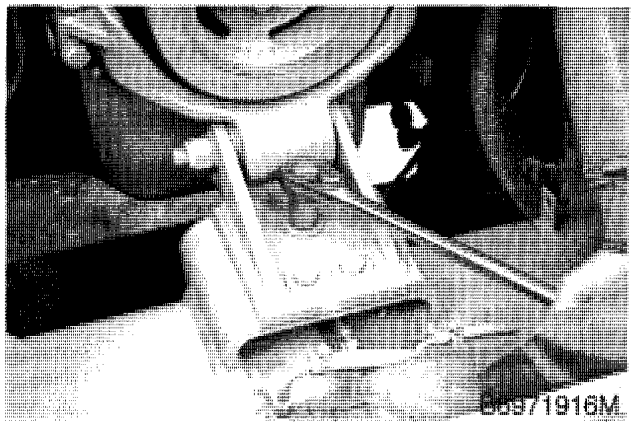
Loosen and remove the cap screws and lock washers that fasten the fan and spacer to the pulley. Remove the fan and spacer and remove the fan shroud.

STEP 184



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

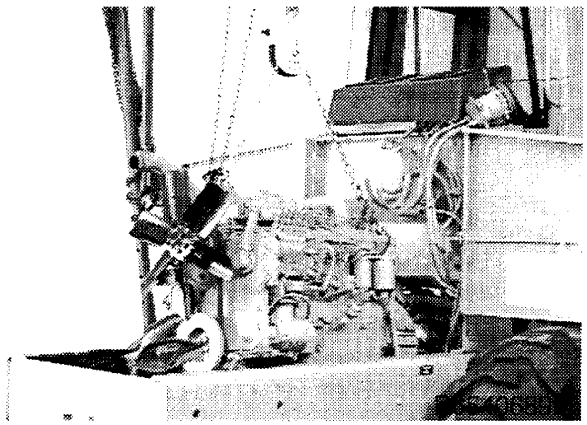
STEP 48



Loosen and remove the self-locking nuts, hardened washers, and bolts.

NOTE: *Put a container below the torque converter housing for the oil that will drain from the torque converter. The torque converter must stay with the transmission.*

STEP 49



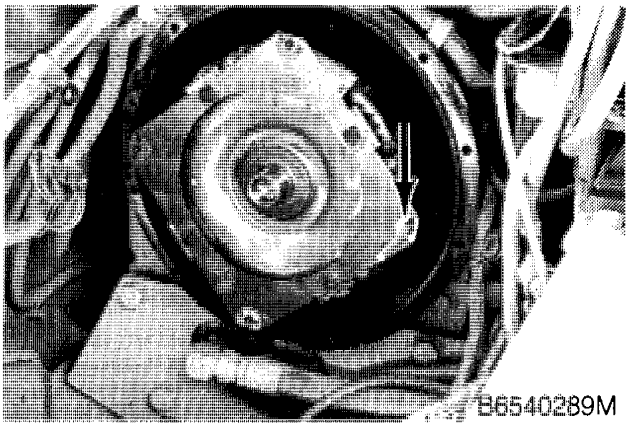
Move the engine straight rearward approximately 2 inches (50 mm). Check to make sure that the torque converter is free of the engine and pushed all the way onto the transmission shafts. Raise the engine and remove the engine from the machine.

ENGINE INSTALLATION

STEP 50

Make sure the torque converter is installed on the transmission. Three splined shafts must be engaged for the torque converter to be installed correctly.

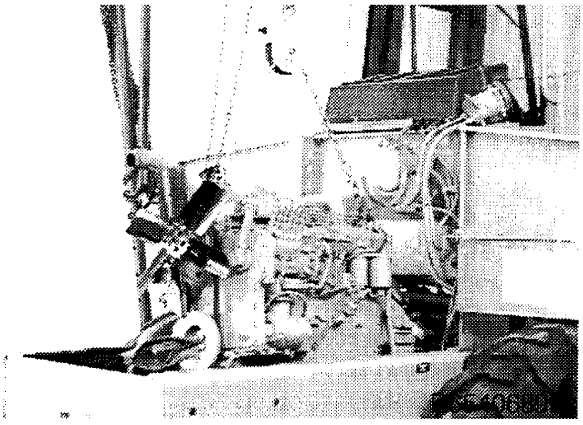
STEP 51



Install a stud 2-3/4 inches (70 mm) long with 10 mm threads in one of the holes in the flex plates so the stud is to the left side as shown. Make sure the flex plates are not bent or damaged.

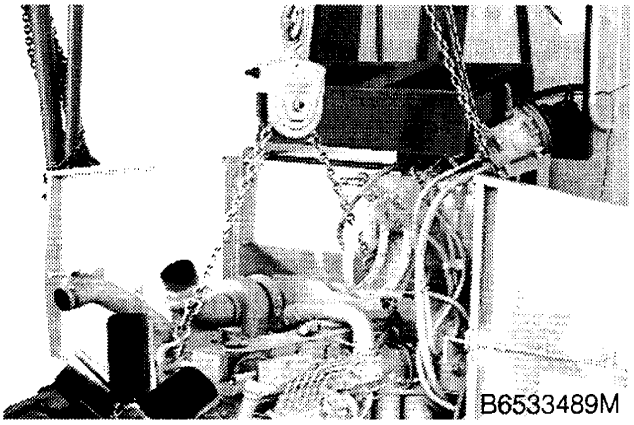
NOTE: *Some machines have a spacer installed on the pilot for the torque converter. This spacer maintains a 0 to 1 mm gap between the converter and the flywheel. If your machine had a spacer, install the spacer on the pilot of the torque converter.*

STEP 52



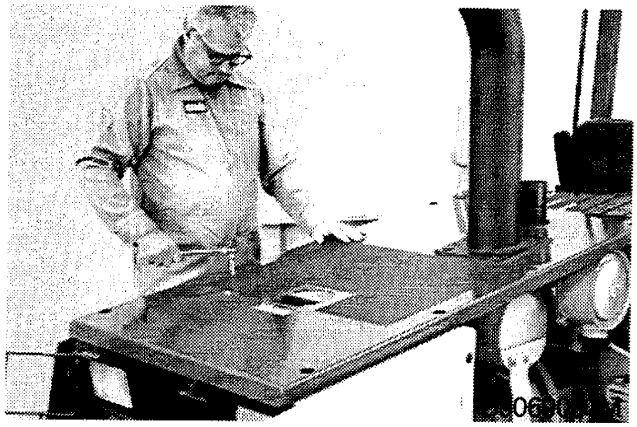
Carry the engine over the frame. Move the engine forward and lower the engine.

STEP 53



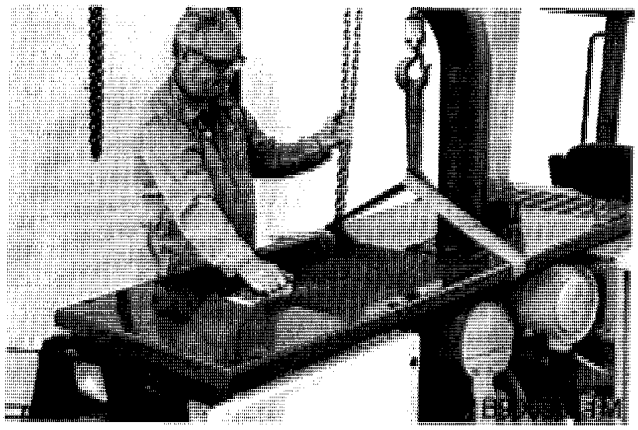
Push the engine toward the front. Have another person align the stud with the hole in the flywheel.

STEP 152



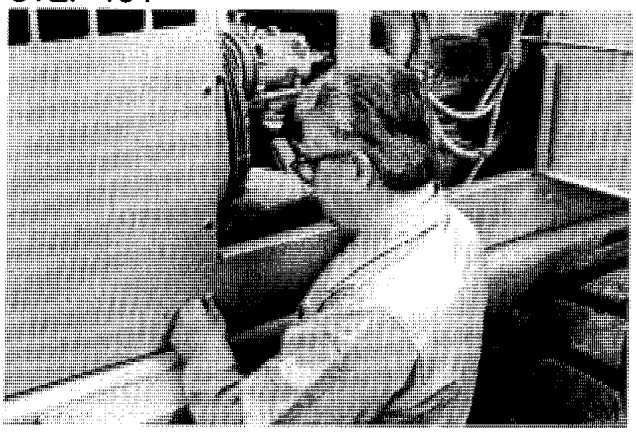
Remove the plugs and loosen and remove the cap screws, lock washers, and flat washers that fasten the hood.

STEP 153



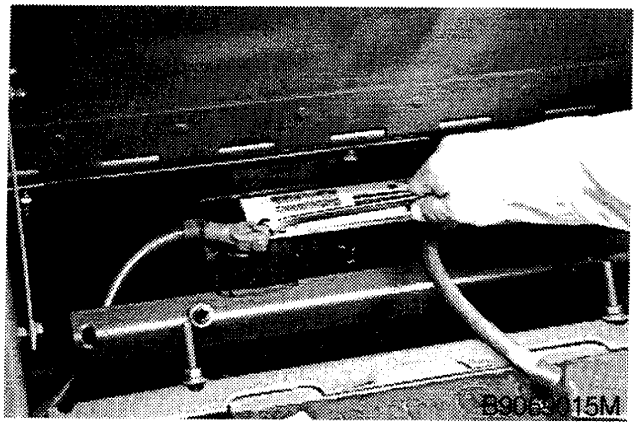
Connect suitable lifting equipment to the hood and remove the hood.

STEP 154



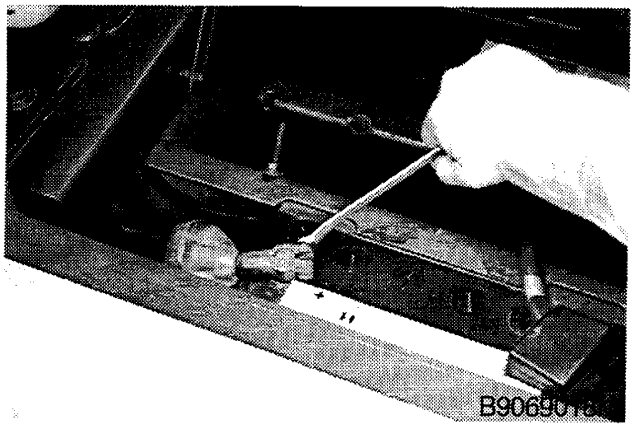
Loosen and remove the nuts, lock washers, flat washers, and carriage bolts that fasten the lower side panels. Remove both lower side panels.

STEP 155



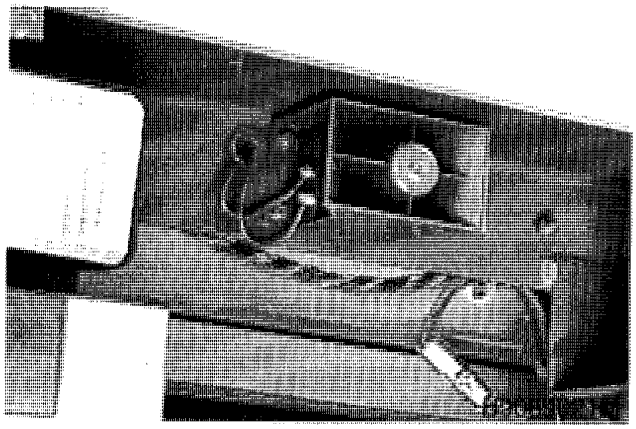
Disconnect the ground cable from the batteries.

STEP 156



Disconnect the positive cable from the batteries.

STEP 157

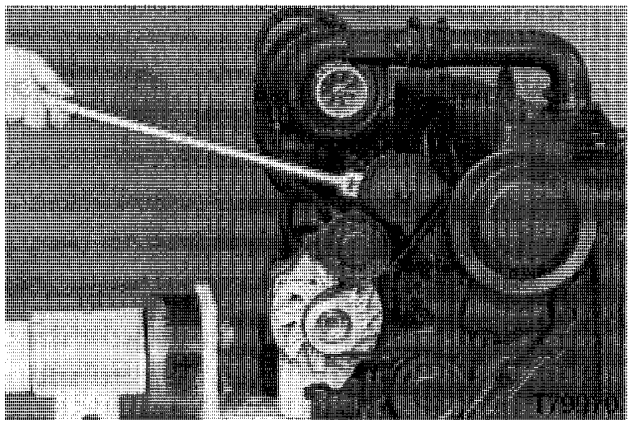


If equipped with a backup alarm, disconnect the wires from the backup alarm.

TABLE OF CONTENTS

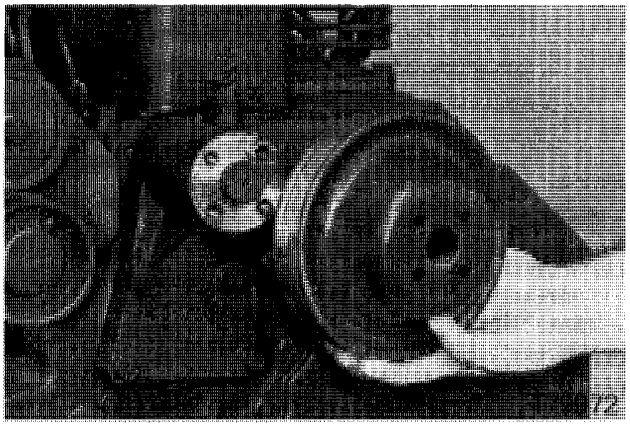
SERVICING THE CYLINDER HEAD AND VALVE TRAIN
Cylinder Head Removal

STEP 1



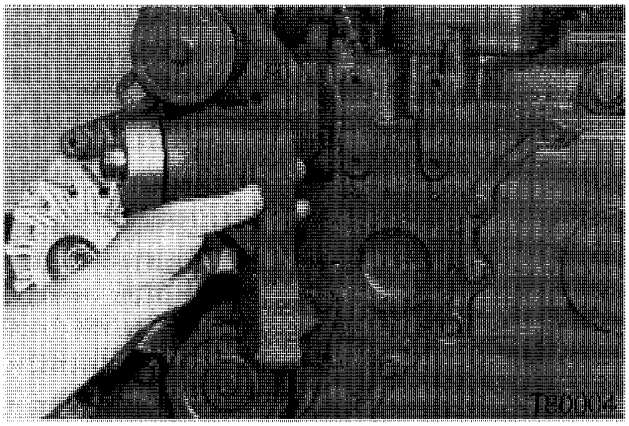
Lift the belt tensioner and remove the fan belt.

STEP 2



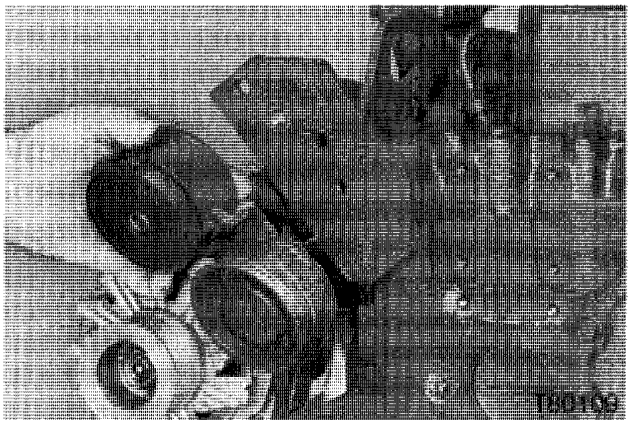
Remove the fan pulley bolts and the fan pulley.

STEP 3



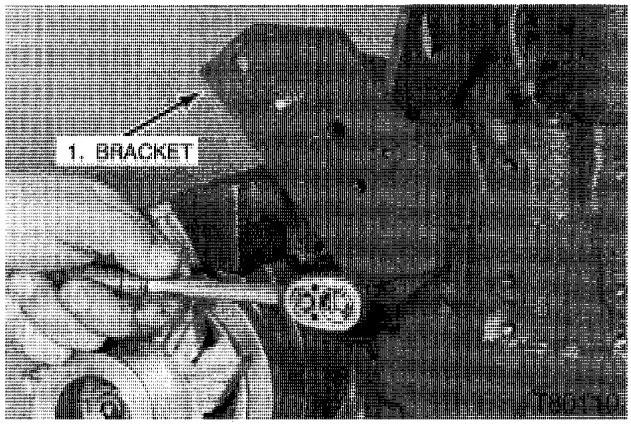
Remove the fan pulley bolts and the pulley bracket.

STEP 4



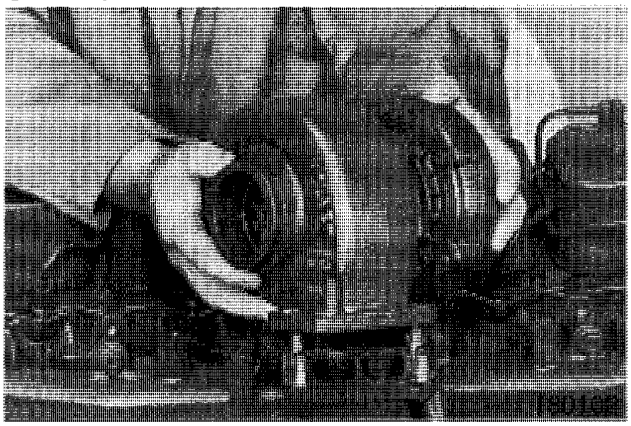
Remove the belt tensioner bolt and the belt tensioner.

STEP 5



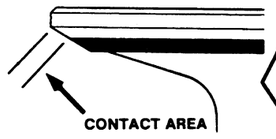
Remove the Allen head bolts and the belt tensioner bracket.

STEP 6

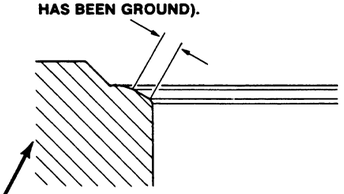


See section 2465 to remove the turbocharger.

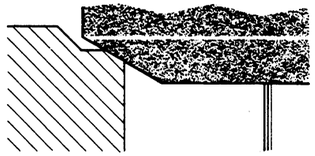
SEAT CONTACT AREA ON THE VALVE TO HIGH.



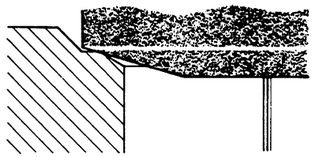
IF THE VALVE CONTACT AREA ON THE SEAT LOOKS LIKE THIS (A SEAT THAT HAS BEEN GROUND).



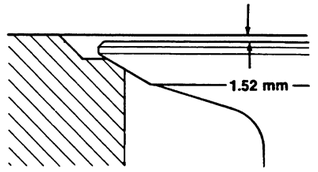
→ USE A 30 DEGREE STONE TO MAKE WIDER AND TO LOWER THE CONTACT AREA.



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

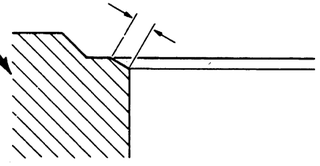


→ CHECK THAT THE VALVE HEAD IS NOT RECESSED MORE THAN 1.52 mm BELOW THE CYLINDER HEAD SURFACE.



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

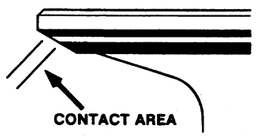
IF THE VALVE CONTACT AREA ON THE SEAT LOOKS LIKE THIS.



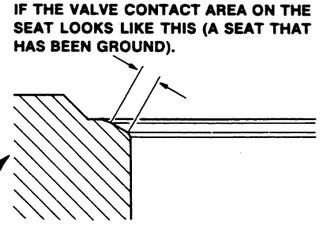
→ THE VALVE MUST BE REPLACED AND A VALVE SEAT INSTALLED BECAUSE MORE GRINDING WILL NOT CHANGE THE LOWER CONTACT POINT.

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

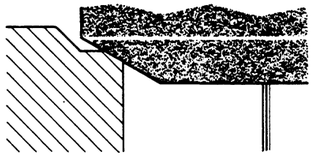
SEAT CONTACT AREA ON THE VALVE TO NARROW



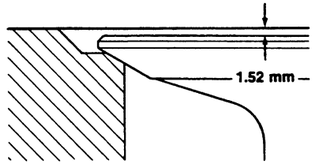
IF THE VALVE CONTACT AREA ON THE SEAT LOOKS LIKE THIS (A SEAT THAT HAS BEEN GROUND).



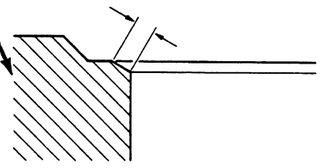
→ USE A 30 DEGREE STONE TO MAKE WIDER THE CONTACT AREA.



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



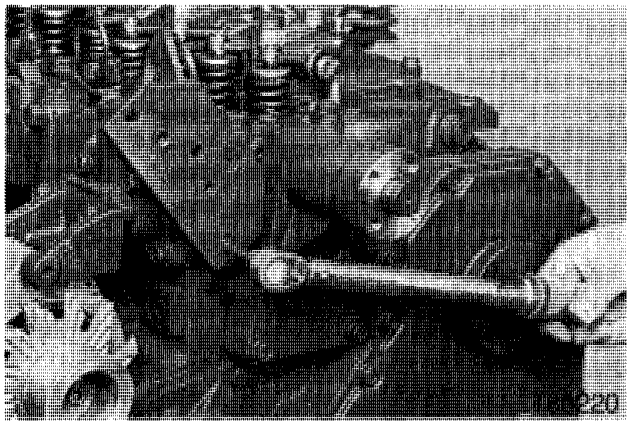
IF THE VALVE CONTACT AREA ON THE SEAT LOOKS LIKE THIS.



→ THE VALVE MUST BE REPLACED AND A VALVE SEAT INSTALLED BECAUSE MORE GRINDING WILL NOT CHANGE THE LOWER CONTACT POINT.

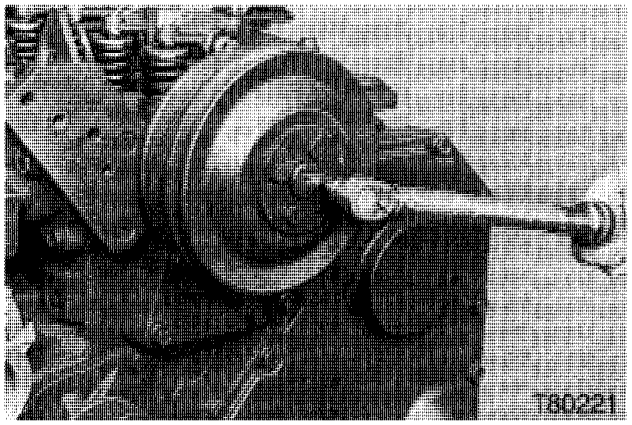
B902909J

STEP 118



Install the belt tensioner bracket and tighten the Allen head bolts to a torque of 21 to 27 Nm.

STEP 119



Install the fan belt pulley and torque the bolts the following:

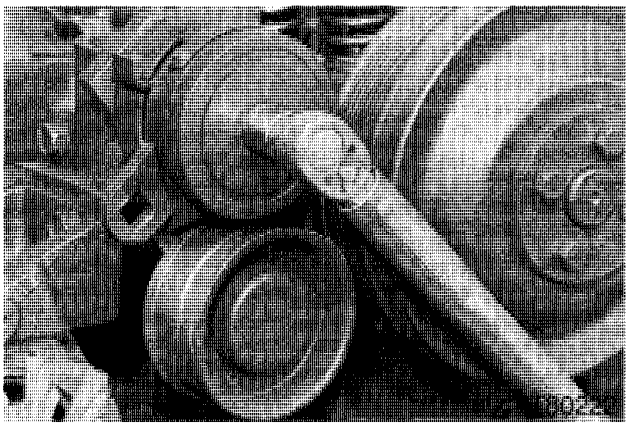
Grade 8.8 bolts Size M8 ..... 25 to 31 Nm

Grade 10.9 Size M8 ..... 37 to 43 Nm

Grade 8.8 ..... 51 to 52 Nm

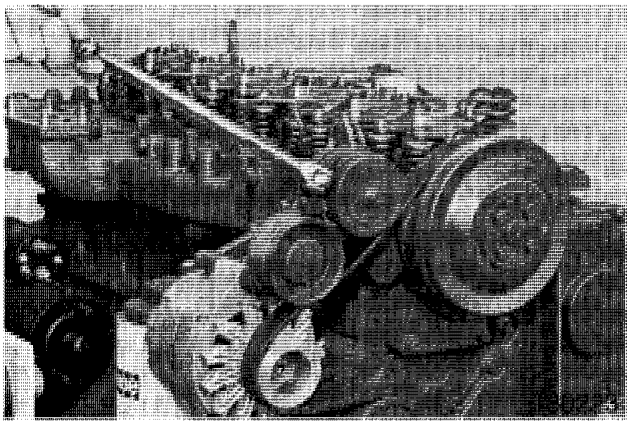
Grade 10.9 ..... 51 to 62 Nm

STEP 120



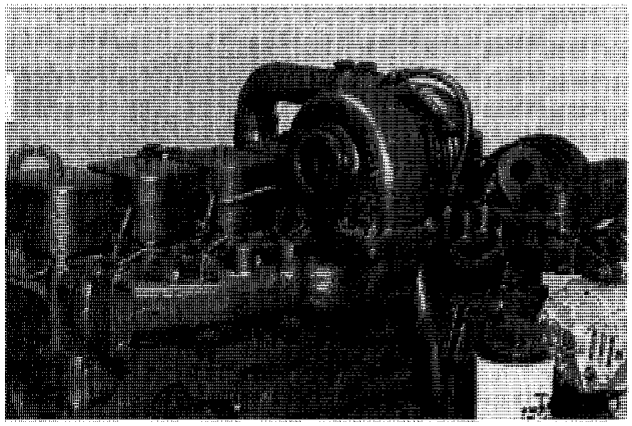
Install the belt tensioner and tighten the bolt to a torque of 39 to 47 Nm.

STEP 121



Lift the belt tensioner and install the fan belt.

STEP 122

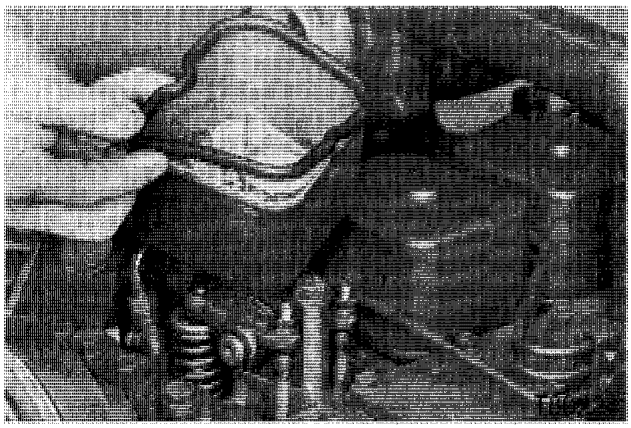


To install the turbocharger, see section 2465 in the service manual.

STEP 123

Start and operate the engine. Check the engine oil pressure indicator to make sure of correct engine oil pressure. Check the rocker arms to make sure that the arms are receiving oil.

STEP 124

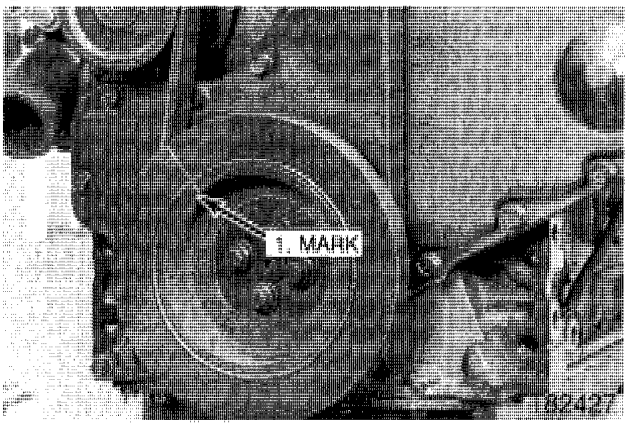


Install new gaskets on the valve covers.

Front Oil Seal, Seal and Wear Sleeve Installation

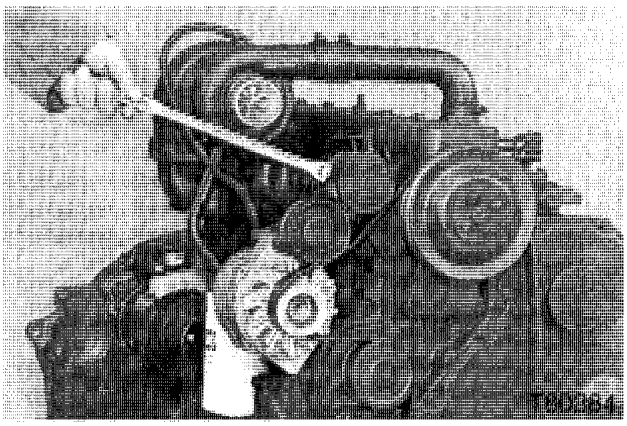
Used when crankshaft flange is worn and standard seal does not stop oil flow.

STEP 41



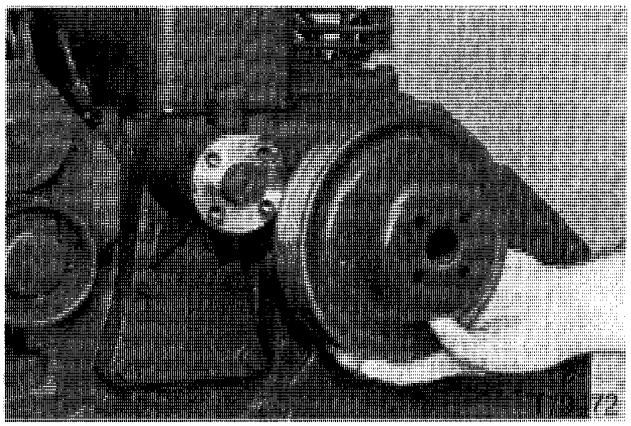
Make sure the upper and lower mark on the crankshaft pulley are in align. If the mark is not in align the crankshaft pulley must be replaced.

STEP 42



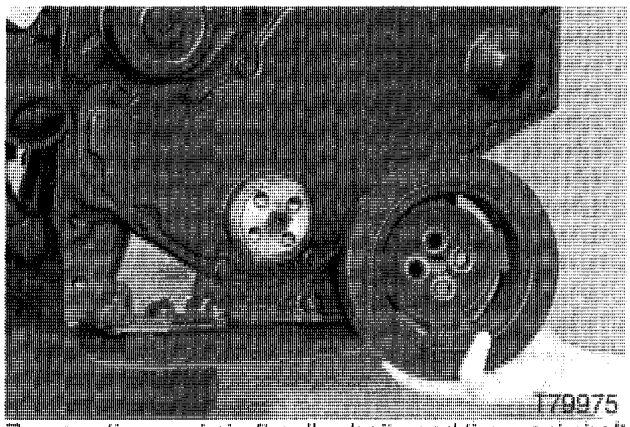
Lift the belt tensioner and remove the fan belt.

STEP 43



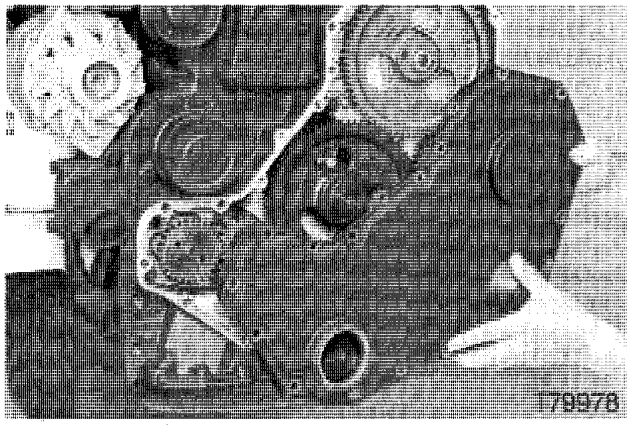
Remove the fan pulley bolts and the fan pulley.

STEP 44



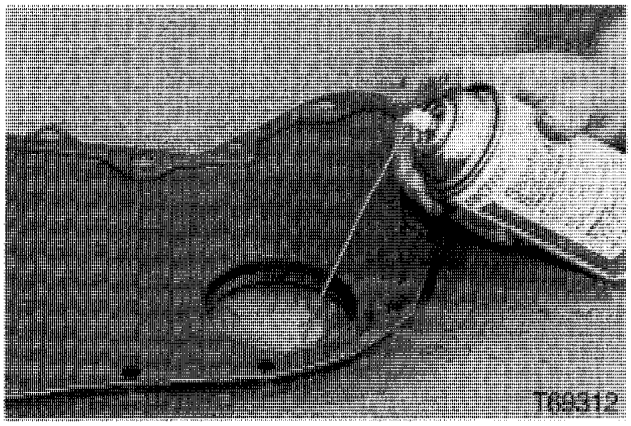
Remove the crankshaft pulley bolts and the crankshaft pulley.

STEP 45



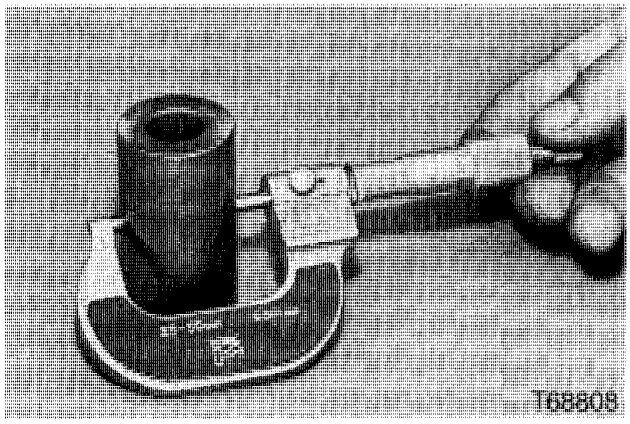
Remove the front cover bolts and the front cover.

STEP 46



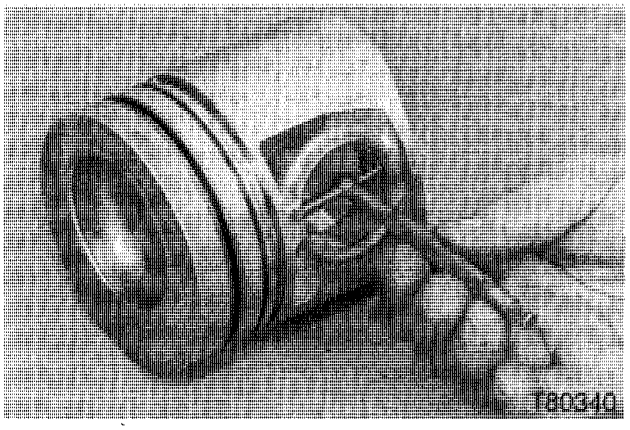
Remove the oil seal from the front cover and clean the seal surface with Loctite safety solvent.

STEP 119



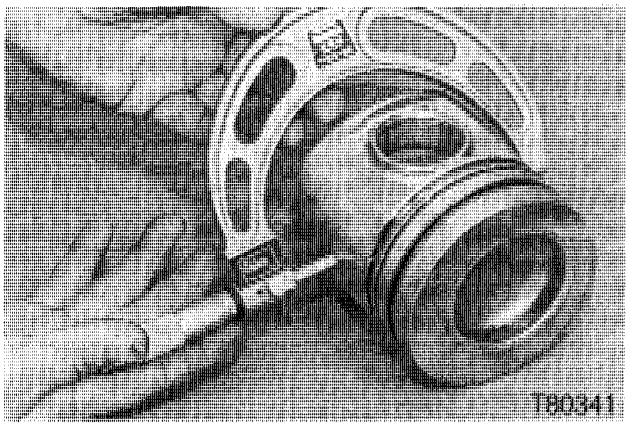
Measure the diameter of the piston pin. If the diameter is less than 39.990 mm the piston pin must be replaced.

STEP 120



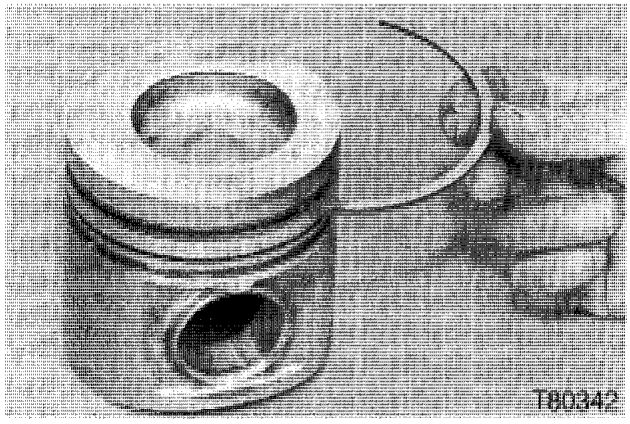
Measure the piston pin bore. If the piston pin bore is more than 40.025 mm the piston must be replaced.

STEP 121



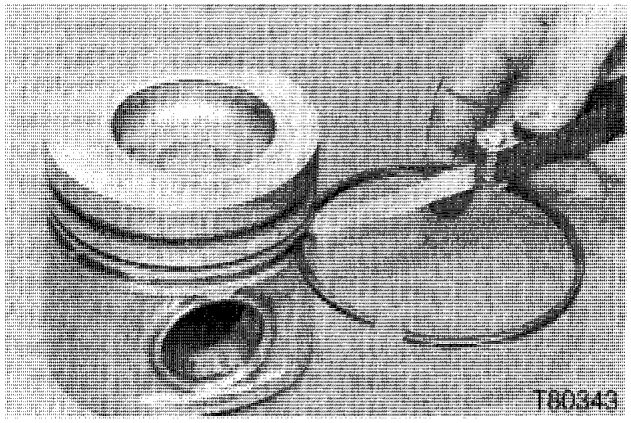
Measure the diameter of the piston across the thrust face 12 mm from the bottom of the piston, at right angles to the piston pin holes. Replace the piston if the diameter is less than 101.823 mm.

STEP 122



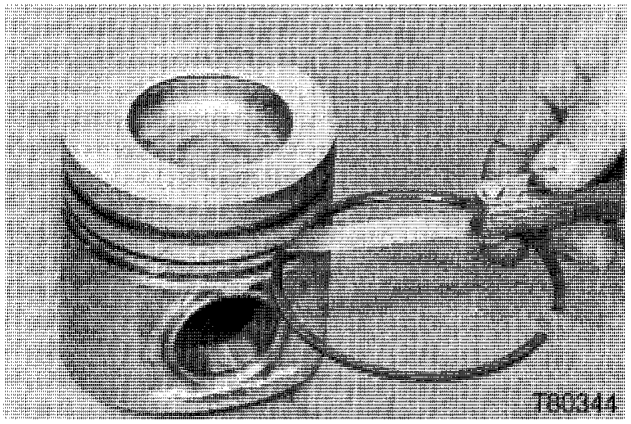
Break an old piston ring in half and use the broken ring half to clean the piston ring grooves. Too much deposit in the ring grooves can force the rings out and will cause scoring.

STEP 123



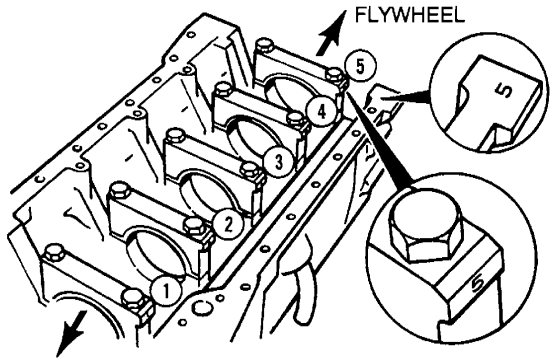
Check the side clearance of the oil ring in the piston. Insert a feeler gauge between the upper surface of a new ring and the piston lands to check the clearance. Replace the piston if side clearance is more than 0.13 mm.

STEP 124



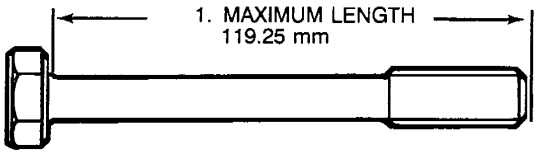
Check the side clearance of the second compression ring. Replace the piston if the side clearance is more than 0.15 mm.

STEP 211



Make sure the number on main bearing cap is in the correct number sequence.

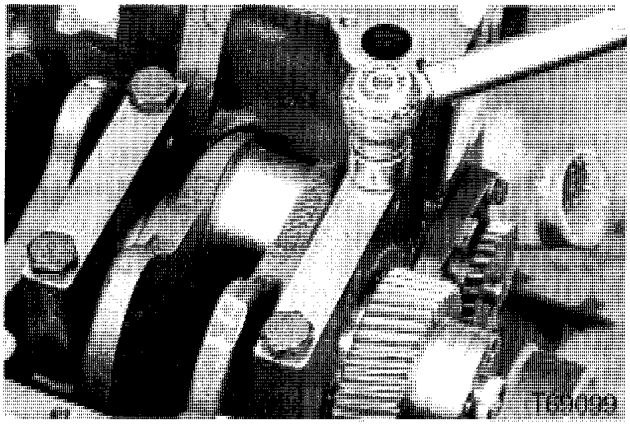
STEP 212



Measure the length of the main bearing bolt. If the bolt length is more than 119.25 mm the bolt must be replaced.

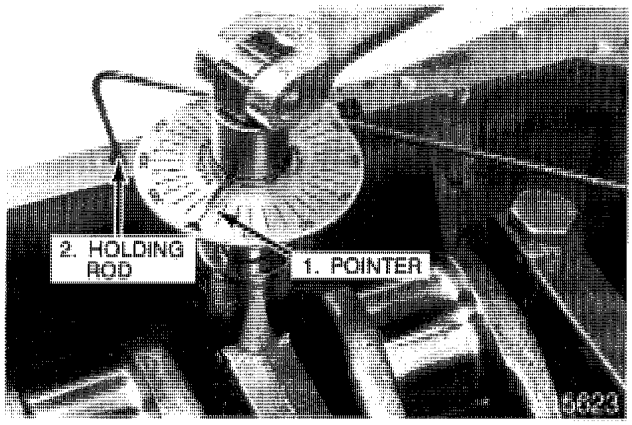
IMPORTANT: *Each bolt length must be checked before installation.*

STEP 213



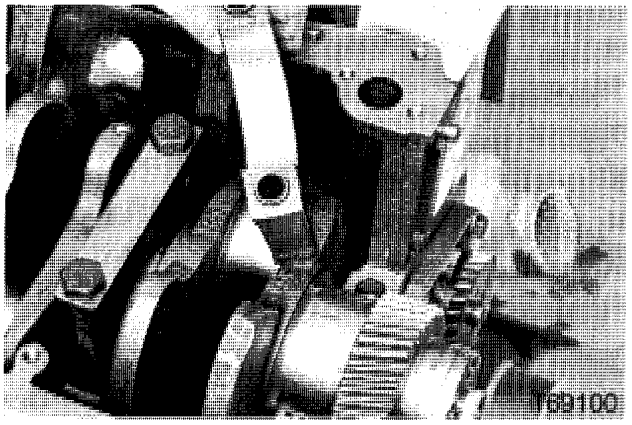
Add lubrication to the cap bolts and tighten to a torque of 80 Nm.

STEP 214



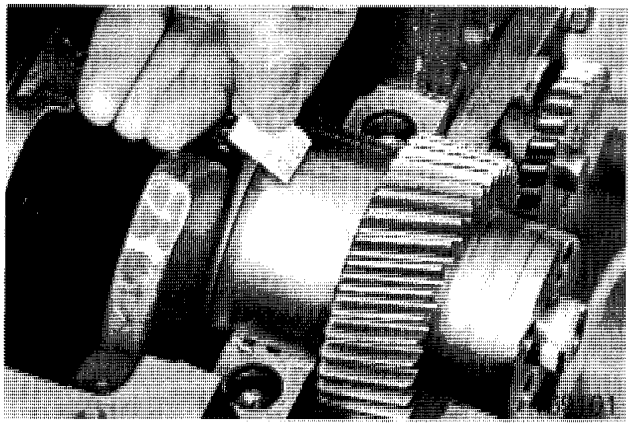
Install the torque angle gauge. Position and lock the holding rod. Turn the pointer to 60 degrees. Tighten the bolt until the pointer is at 0 degrees.

STEP 215



Remove the bolts and the main bearing caps.

STEP 216



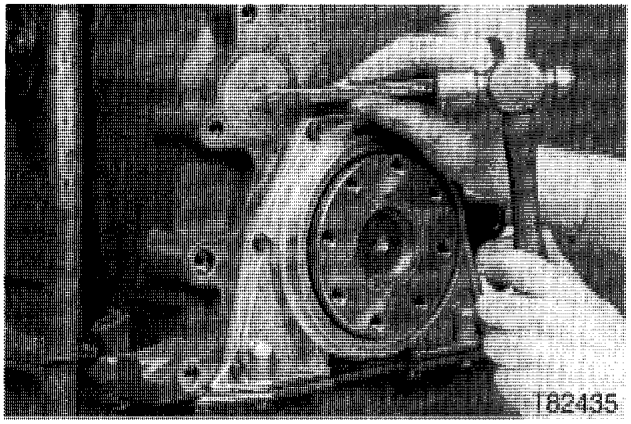
Check the main bearing oil clearance. Clearance must be 0.041 to 0.140 mm. If the clearance is more than 0.140 mm, undersize bearing liners must be installed. Install new undersize liners which will give a clearance of 0.041 to 0.119 mm.

NOTE: *If the clearance is more than 0.140 mm, the crankshaft must be machined.*

EXPANSION PLUG REMOVAL AND INSTALLATION
60 mm Expansion Plug, Camshaft

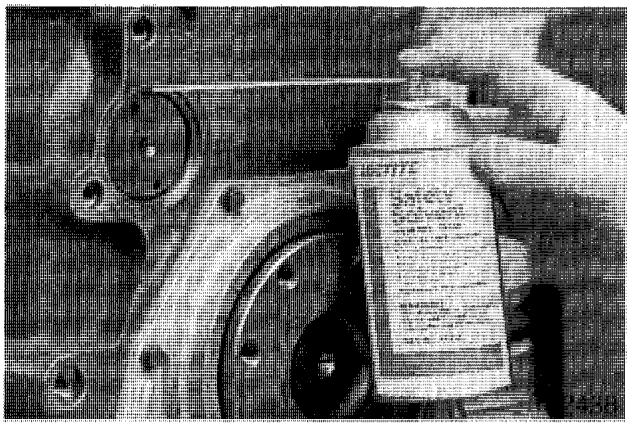
NOTE: *The flywheel and flywheel housing must be removed to replace the camshaft expansion plug.*

STEP 307



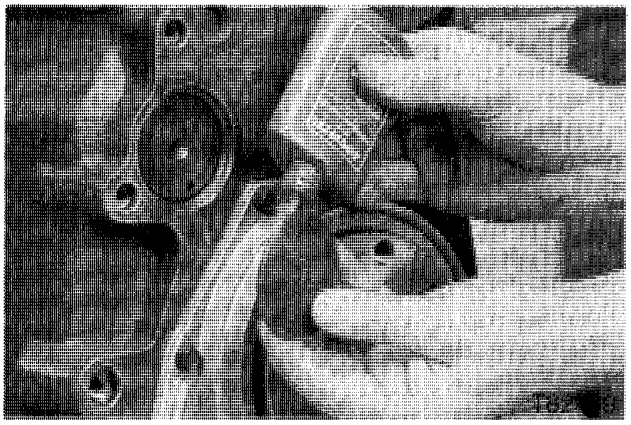
Remove the expansion plug from the cylinder block.

STEP 308



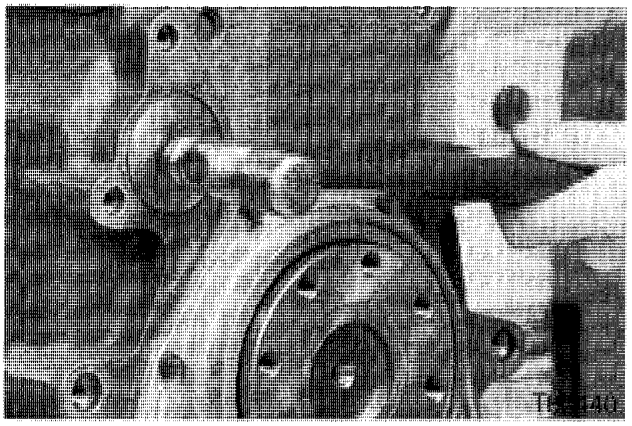
Use Loctite safety solvent to clean the sealing surface of all foreign material.

STEP 309



Apply Loctite 277 to the sealing surface of the expansion plug.

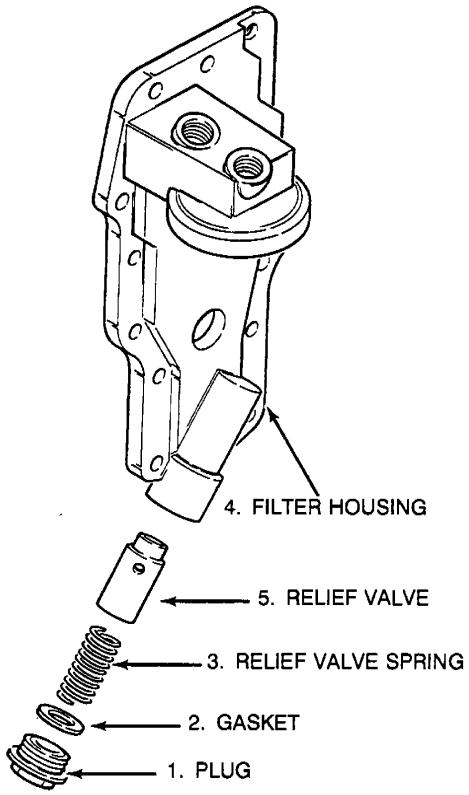
STEP 310



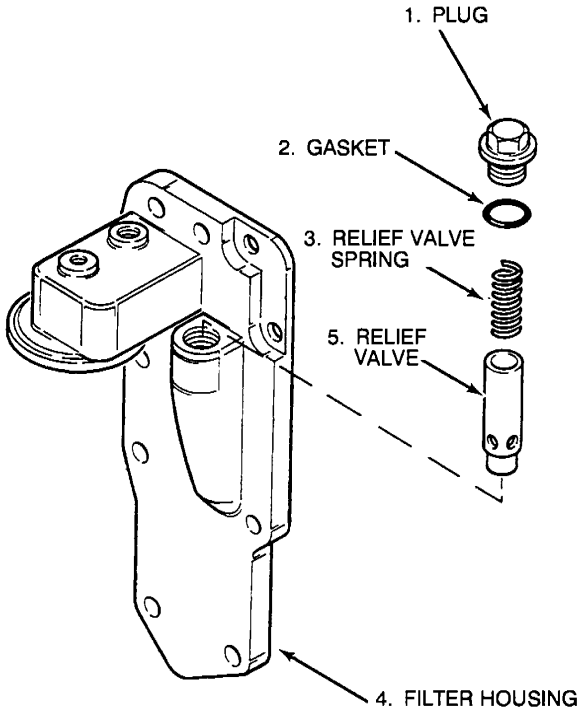
Install the expansion plug into the cylinder block. Hit the expansion plug in the center to lock the expansion plug in position.

OIL PRESSURE RELIEF VALVE
Disassembly and Inspection

Bottom Mounted Relief Valve



Top Mounted Relief Valve



401L91

STEP 17

Remove the plug, gasket, spring and relief valve from the filter housing.

STEP 18

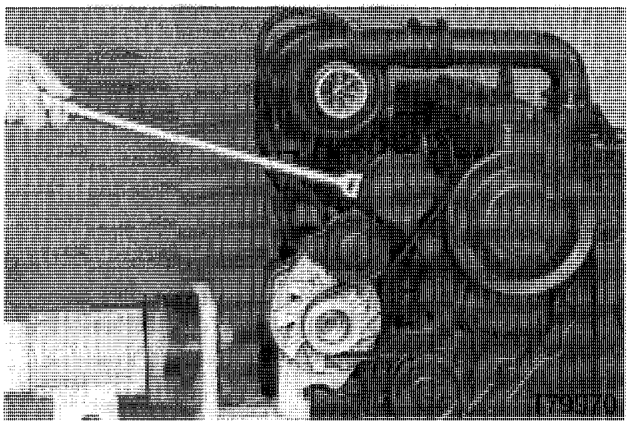
Check the relief valve spring for the following specifications:

Relief Valve Spring (2 Hole Relief Valve)
- Free Length ..... 55.83 mm
- Compress to 39.98 mm .....95 to 113 N

Relief Valve Spring (4 Hole Relief Valve)
- Free Length .....64.0 Nm
- Compress to 41.25 mm 104.74

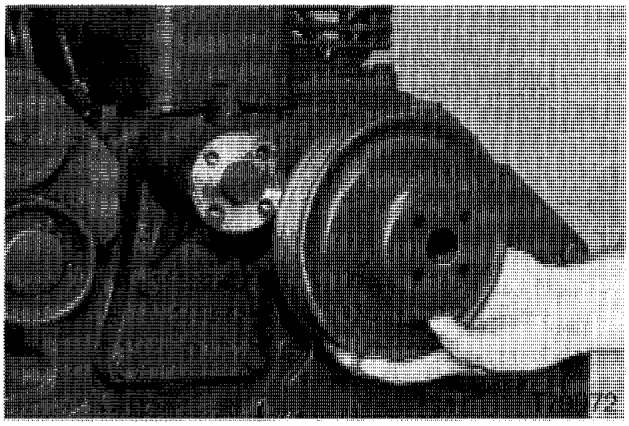
FAN PULLEY SERVICING
Fan Pulley Bracket Removal

STEP 28



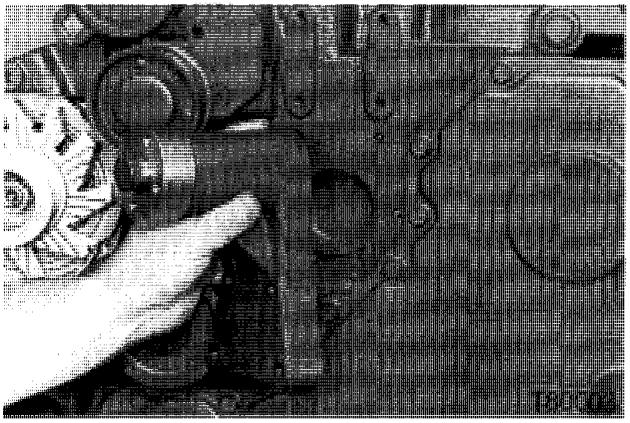
Lift the belt tensioner pulley and remove the fan belt.

STEP 29



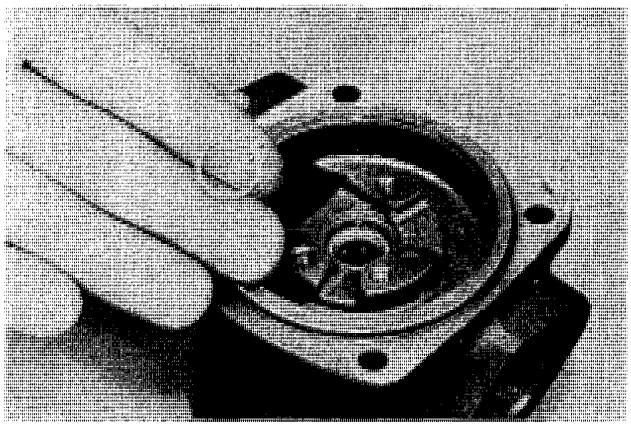
Remove the fan pulley bolts and the fan pulley.

STEP 30



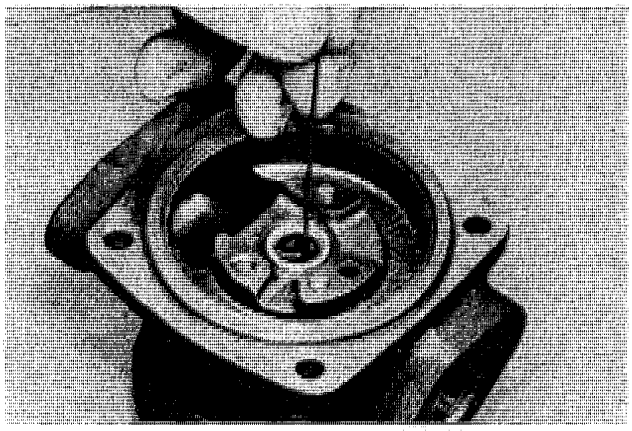
Remove the bracket bolts and the bracket.

STEP 43



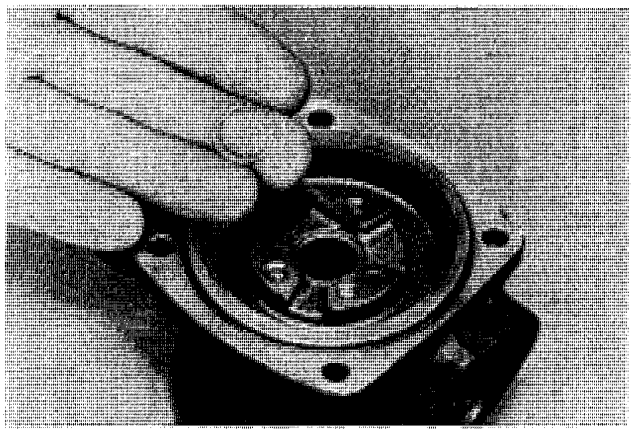
Remove the outer bearing retaining ring.

STEP 44



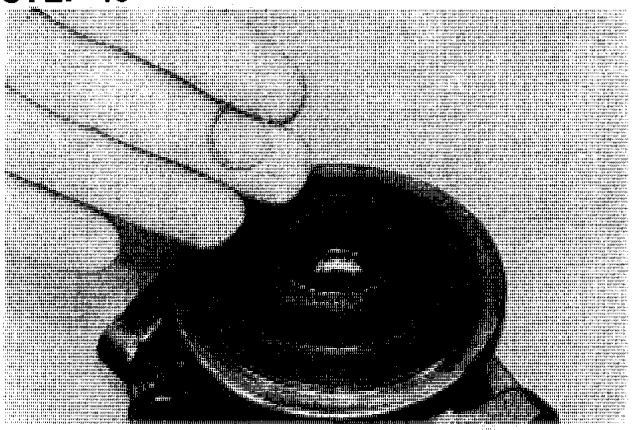
Use a wire hook and pull the bearing from the center housing.

STEP 45



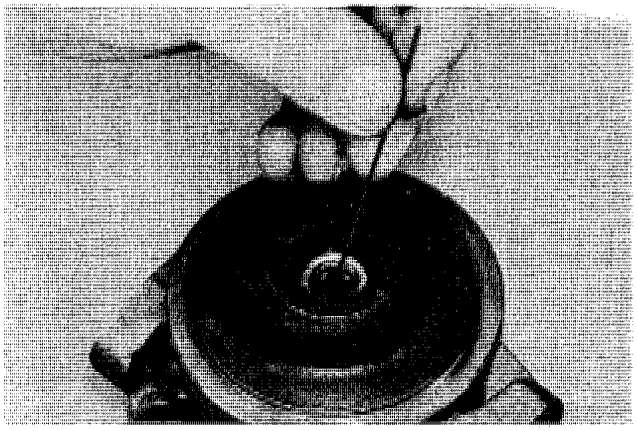
Remove inner bearing retaining ring.

STEP 46



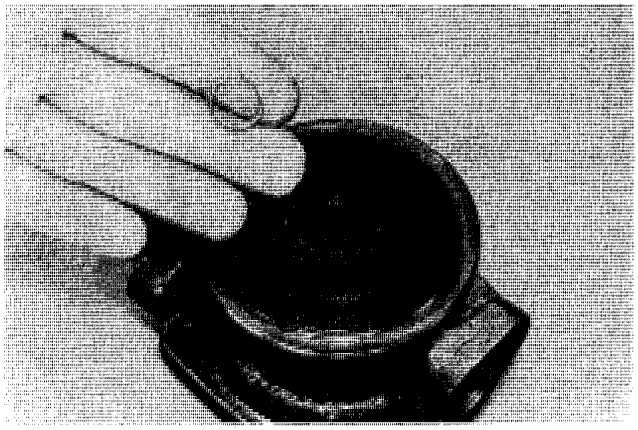
Turn the center housing over and remove the outer bearing retaining ring.

STEP 47



Use a wire hook and pull the bearing from the center housing.

STEP 48



Remove the inner bearing retaining ring.

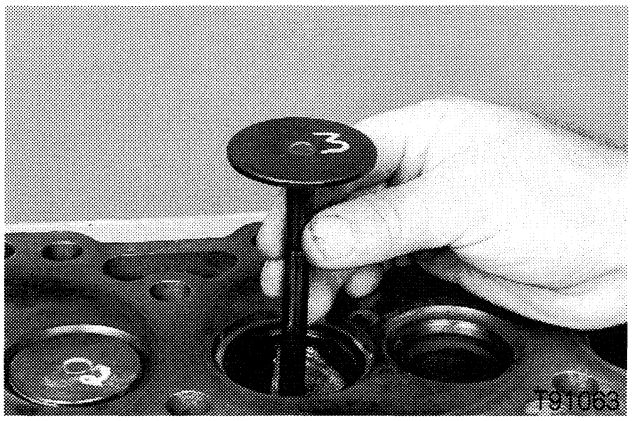
Crankshaft

Type	Hardened Steel, Balanced
Main Bearing Liners	Replaceable
Crankshaft End Clearance	0.157 to 0.334 mm
Maximum Service Limit	0.381 mm
Center Main Bearing Thrust Surface Thickness	3.447 to 3.530 mm
Connecting Rod Journal	
OD Standard	75.987 to 76.013 mm
Maximum Service Limit	75.962 mm (See Note)
0.25 mm OD Undersize, Grind to	75.737 to 75.763 mm
Maximum Service Limit	75.712 mm
0.50 mm OD Undersize, Grind to	75.487 to 75.513 mm
Maximum Service Limit	75.462 mm
0.75 mm OD Undersize, Guide to	75.237 to 75.263 mm
Maximum Service Limit	75.212 mm
1.00 mm OD Undersize, Grind to	74.987 to 75.013 mm
Maximum Service Limit	74.962 mm
Connecting Rod Journal Maximum Taper	0.013 mm
Journals Out of Round Maximum	0.050 mm
Undersize Main Bearing Liners For Service	0.25,0.50, 0.75 and 1.00 mm
Main Bearing Oil Clearance	0.66 to 0.134 mm
Main Bearing Journal	
OD, Standard	97.987 to 98.013 mm
Maximum Service Limit	97.962 mm
0.25 mm OD Undersize, Grind to	97.737 to 97.763 mm
Maximum Service Limit	97.712 mm
0.50 mm OD Undersize, Grind to	97.487 to 97.513 mm
Maximum Service Limit	97.462 mm
0.75 mm OD Undersize, Grind to	97.237 to 97.263 mm
Maximum Service Limit	97.212 mm
1.00 mm OD Undersize, Grind to	96.987 to 97.013 mm
Maximum Service Limit	96.972 mm
Main Bearing Journal Bore ID No Liners	104.987 to 105.013 mm
Main Journal Width:	
1st, 2nd, 3rd, 5th and 6th	42.924 to 43.076 mm
4th	42.975 to 43.025 mm
Connecting Rod Journals Width	45.950 to 46.050 mm

NOTE: *Only if installed rod bearing clearance is within limits.*

INSPECTION OF THE VALVES AND VALVE SEATS

STEP 45

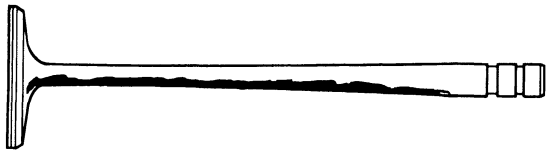


Clean the valves with a power driven wire brush. Do not scratch the valve stems.

STEP 46

Check the valves for the following conditions.

VALVE STEM WITH A NARROW NECK

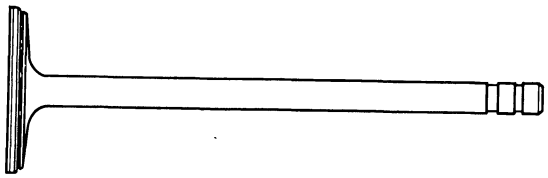


563L8

NOTE: REPLACE THE VALVE IF THE 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.

GROOVE IN VALVE FACE

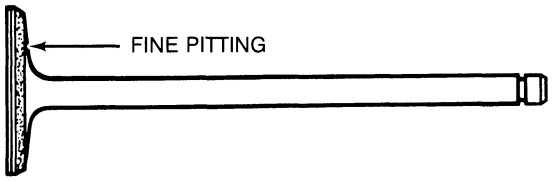


564L8

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 46 (Cont'd)

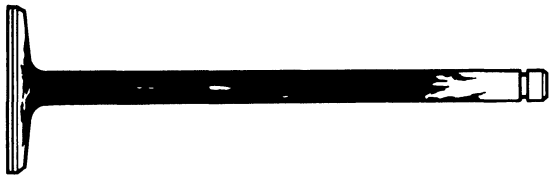


567L8

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.

HEAVY CARBON AND VARNISH DEPOSTS

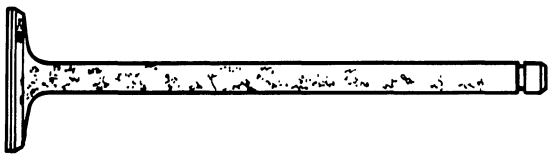


566L8

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.

RUST OR PITTING ON VALVE STEM



568L8

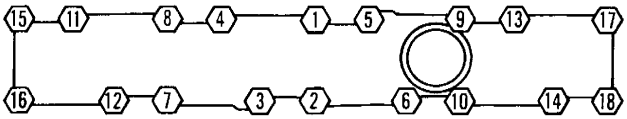
NOTE: REPLACE VALVE IF THIS CONDITION OCCURS.

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

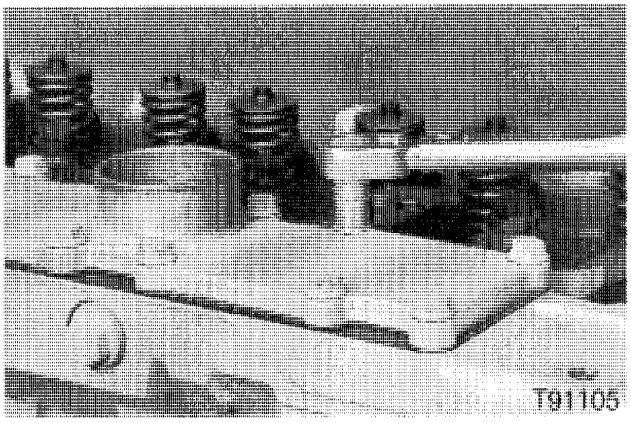
CYLINDER HEAD ASSEMBLY

STEP 80

BOLT TORQUE SEQUENCE

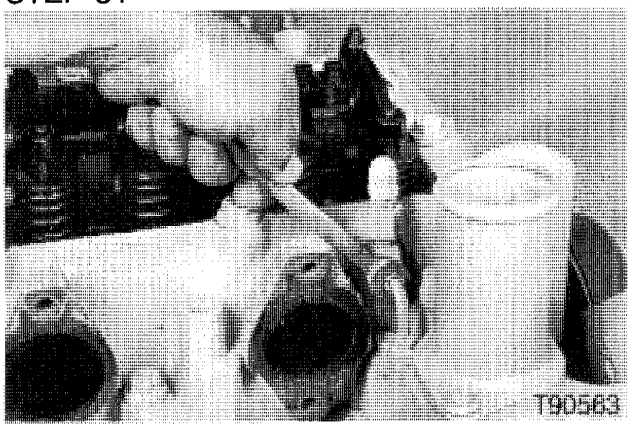


901L0



Install the gasket and the intake manifold. Tighten the bolts to a torque of 21 to 27 Nm, following the torque sequence shown above.

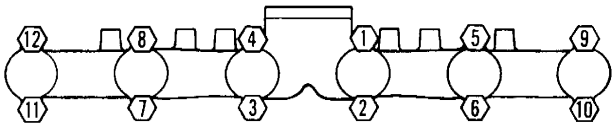
STEP 81



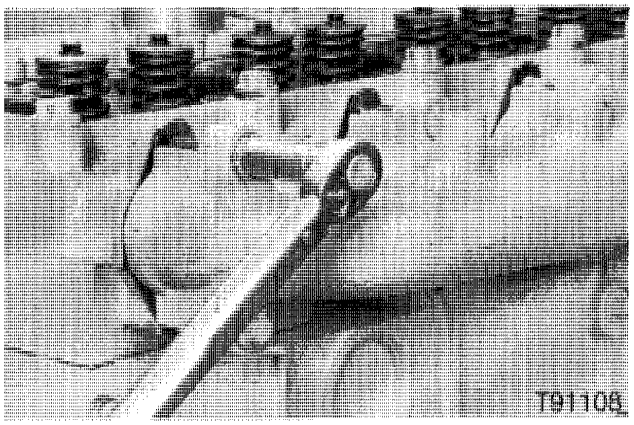
Connect and tighten the coolant bypass tube.

STEP 82

BOLT TORQUE SEQUENCE

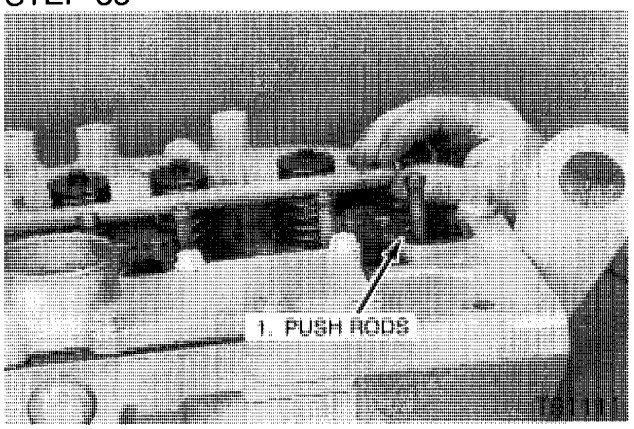


903L0



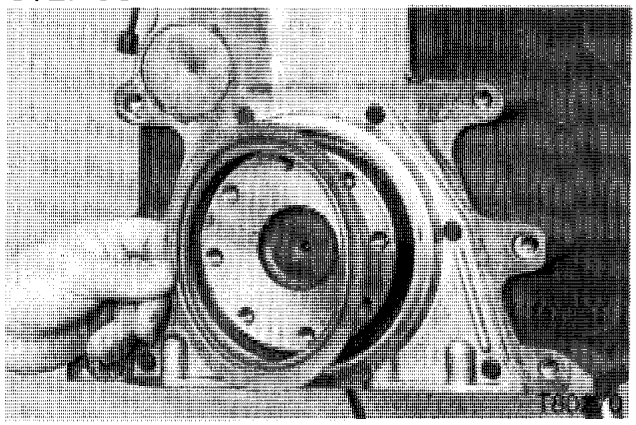
Install the manifold on the cylinder head. Tighten the bolts to a torque of 39 to 47 Nm, follow the torque sequence shown above.

STEP 83



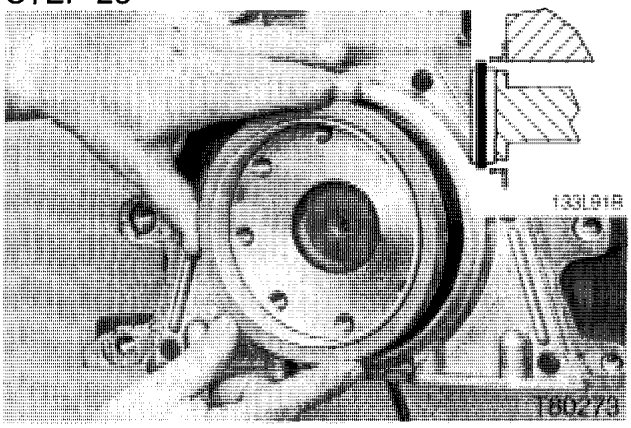
Install the push rods and the oil supply tube for the rocker arm assemblies.

STEP 25



Remove the seal installation tool.

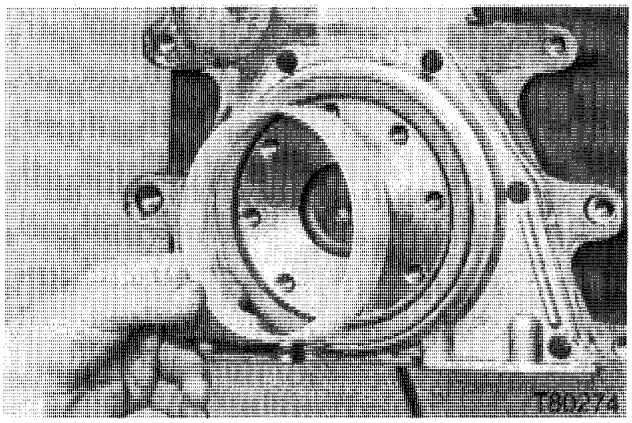
STEP 26



Install the oil seal and protective sleeve over the crankshaft until the outside diameter of the seal makes contact with the seal carrier.

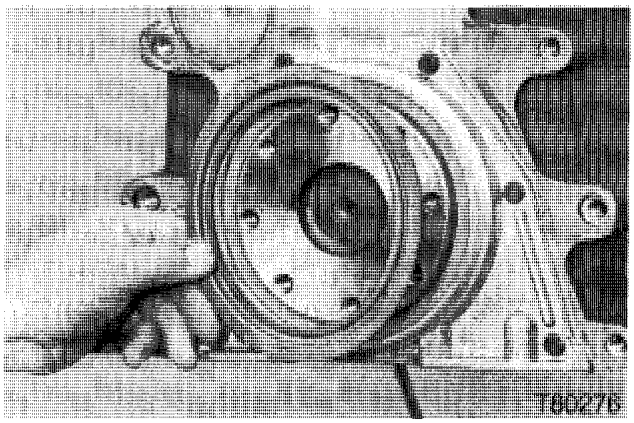
NOTE: *Put soap on the outside diameter of the seal.*

STEP 27



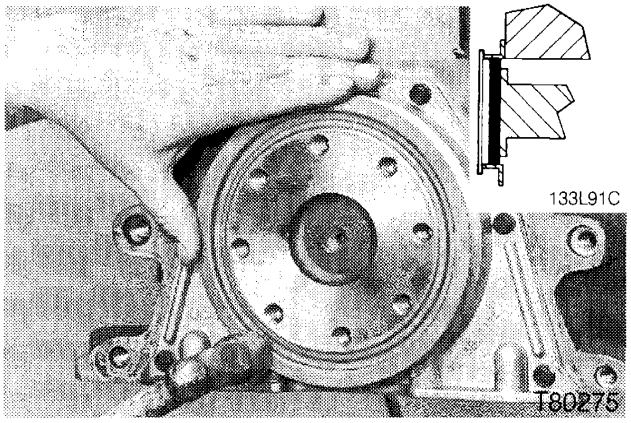
Remove the protective sleeve.

STEP 28



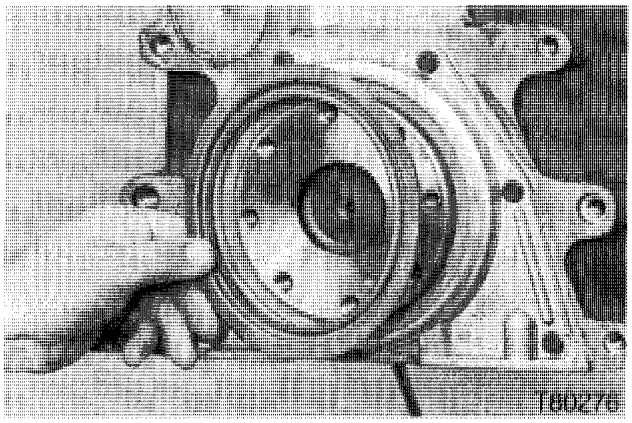
Install the seal installation tool with the small diameter toward the seal.

STEP 29



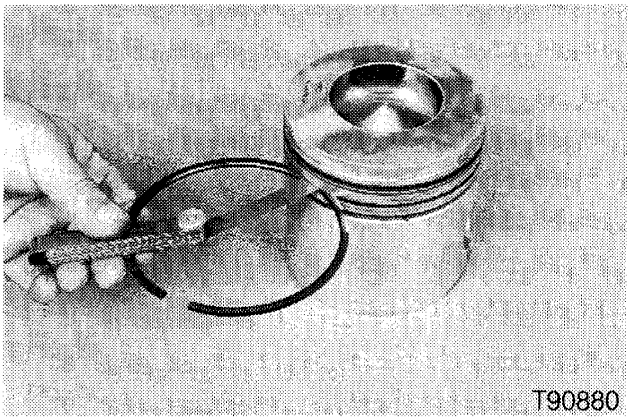
Push the oil seal into the seal carrier until the outside diameter of the seal installation tool makes contact with the seal carrier.

STEP 30



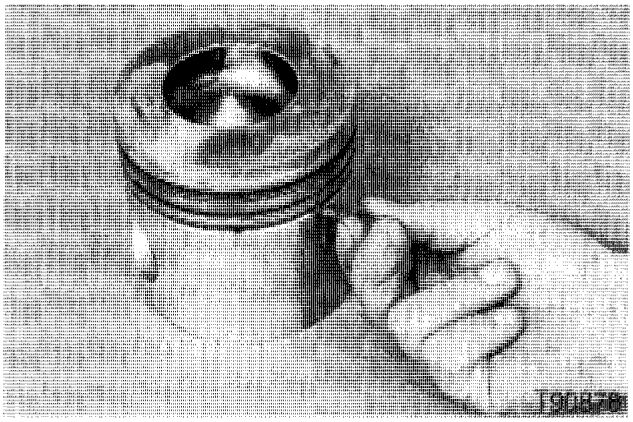
Remove the seal installation tool.

STEP 109



Check the side clearance of the second compression ring. Replace the piston if the side clearance is more than 0.125 mm.

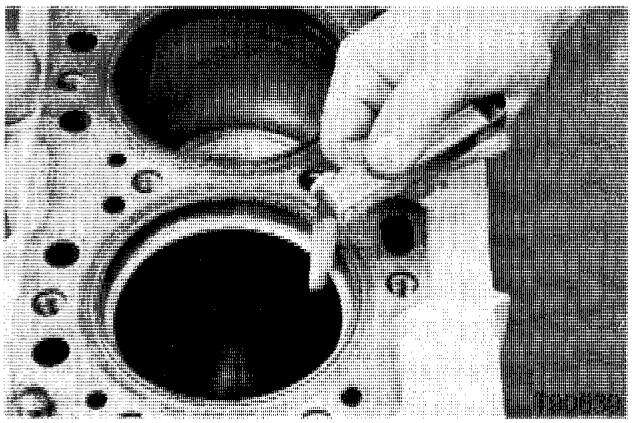
STEP 110



Clean the piston holes with a small drill or fine wire.

Piston Assembly

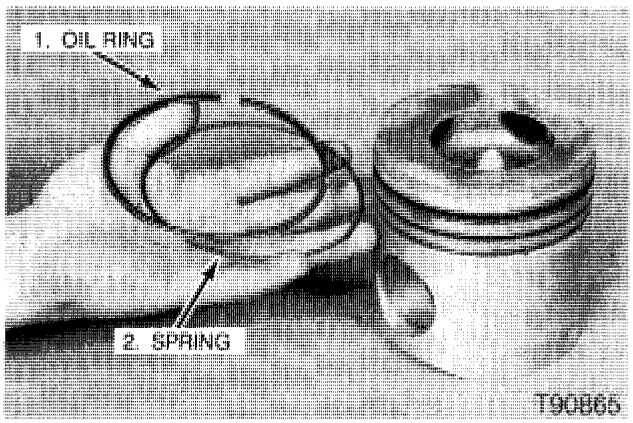
STEP 111



Put the piston rings in the cylinder sleeve and check the end gap. Replace the piston rings if the end gap is more than:

Number 1 Compression Ring 0.70
Number 2 Compressing Ring 0.70
Number 3 Oil Control Ring 0.60

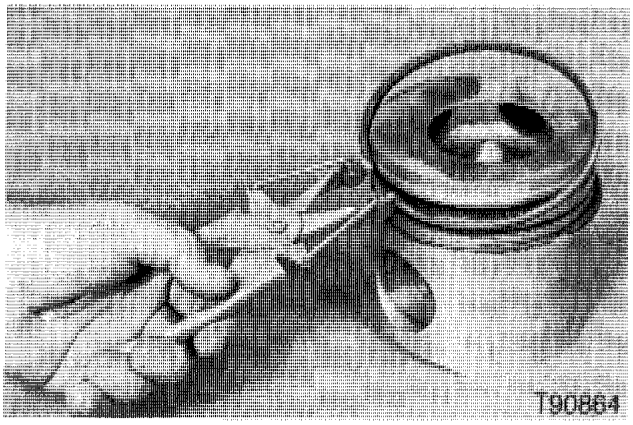
STEP 112



Install the oil ring. Install the spring first and the oil ring second.

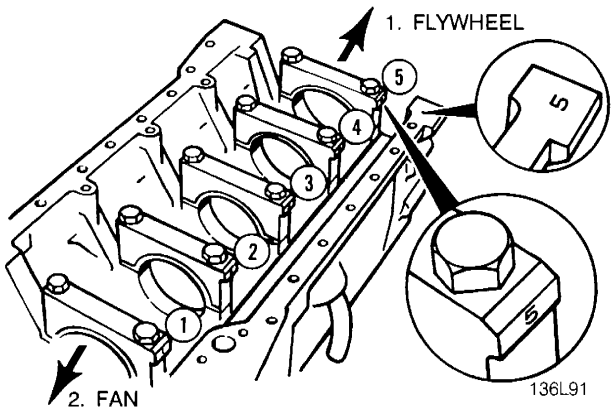
NOTE: *The spring must be between the oil ring and the piston.*

STEP 113



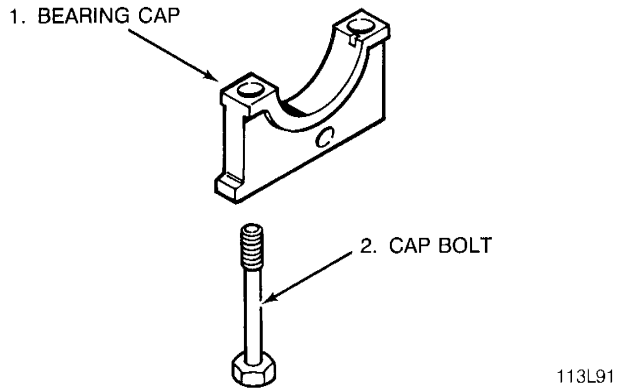
Install the second compression ring. The piston ring must be installed with the side marked TOP toward the top of the piston to give good oil control.

STEP 200



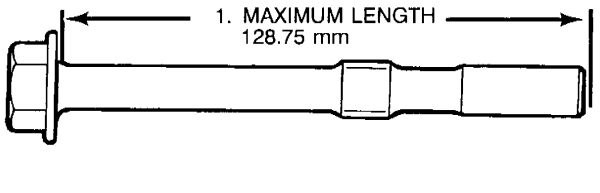
Make sure the number on main bearing cap is in the correct number sequence.

STEP 201



The cap bolt and bearing cap on engine serial number 4487830 and after use a larger diameter cap bolt.

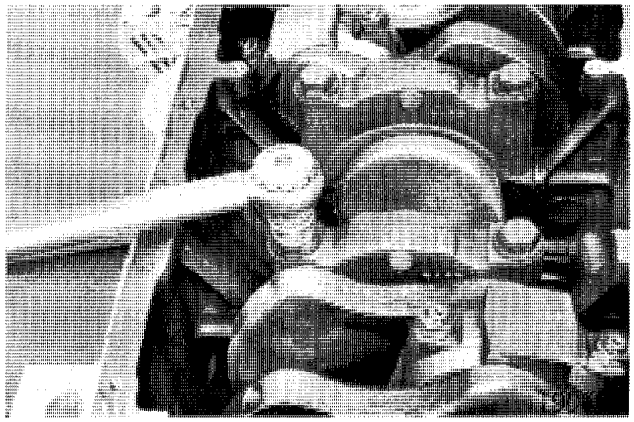
STEP 202



Measure the length of the main bearing bolts. If the bolt length is more than 128.75 mm the main bearing bolt must be replaced.

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

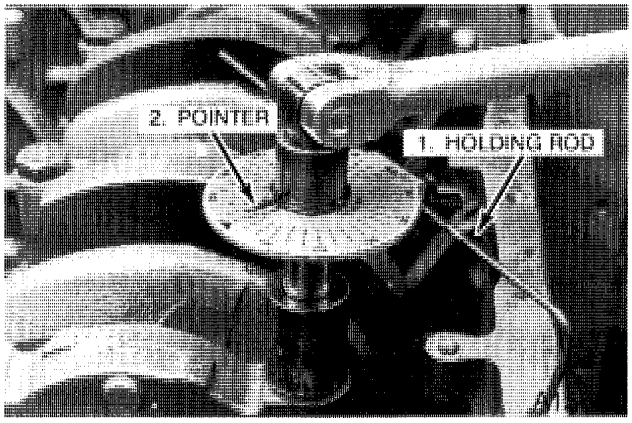
STEP 203



Install the main bearing cap bolts and torque. See below:

Torque Sequence:
Step 1 - Torque to 50 Nm
Step 2 - Torque to 95 Nm

STEP 204

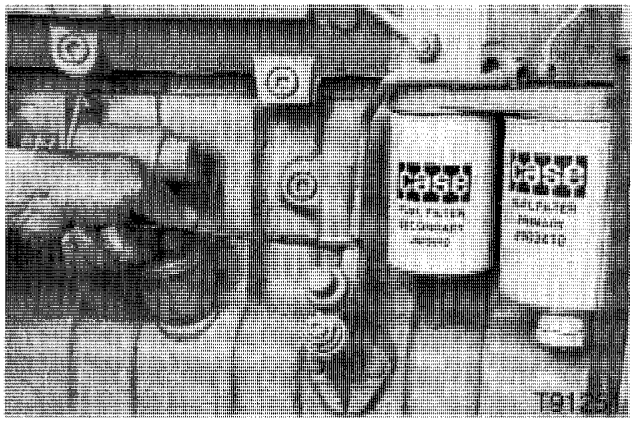


Install the torque angle gauge. Position and lock the holding rod. Turn the pointer to 60 degrees. Tighten the main bearing bolt until the pointer is at 0 degrees.

STEP 205

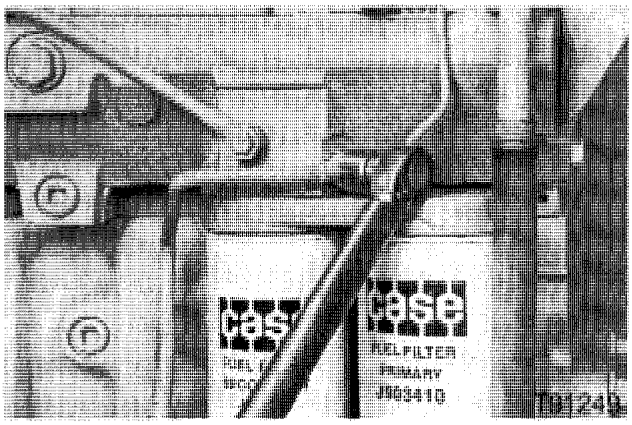
Remove the main bearing caps.

STEP 295



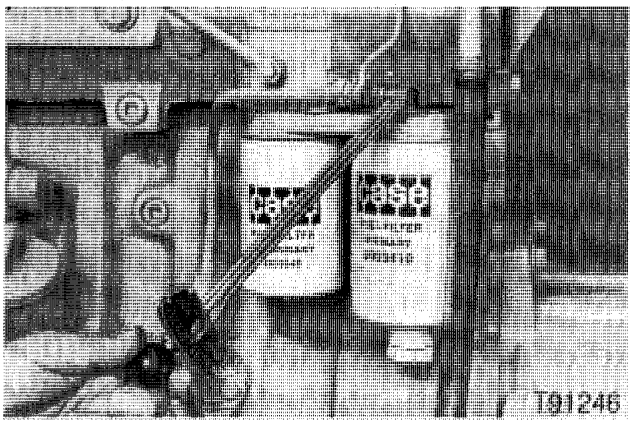
Connect and tighten the filter inlet line to the lift pump.

STEP 296



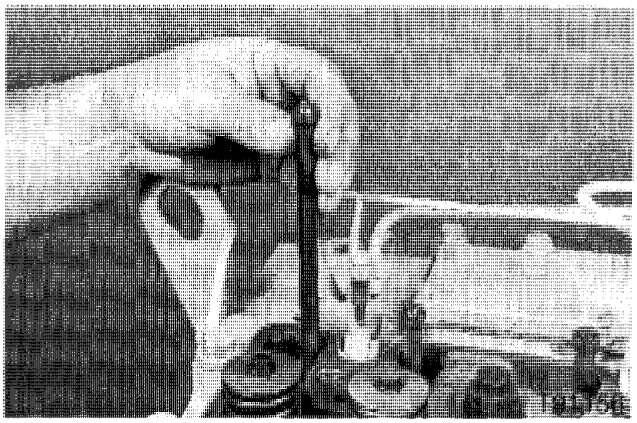
Install the gaskets one on each side of the inlet. Tighten the filter inlet fitting to a torque of 21 to 27 Nm.

STEP 297



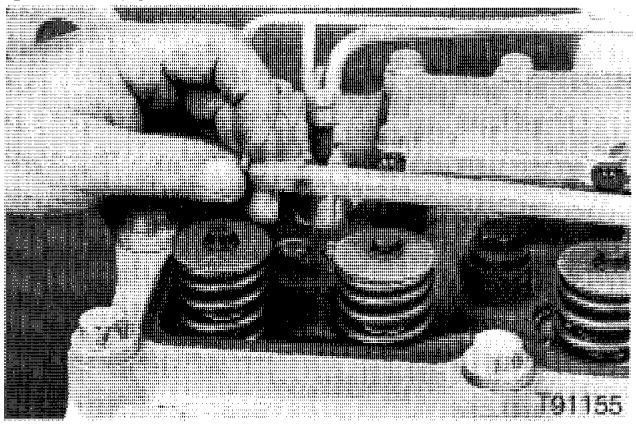
Install the gasket and leak off bolt. Tighten the leak off bolt to a torque of 7 to 9 Nm.

STEP 298



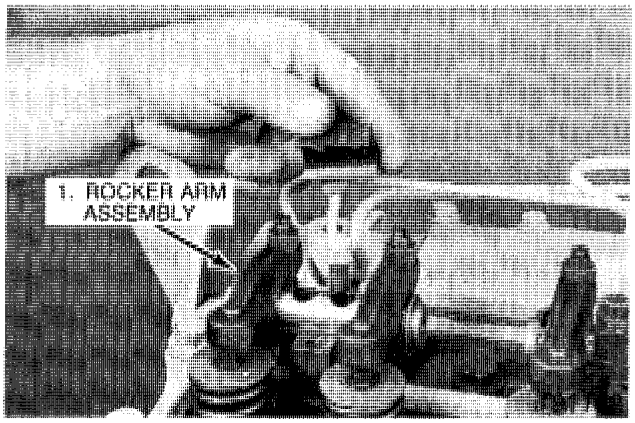
Install the push rods.

STEP 299



Install the oil supply tube for the rocker arms.

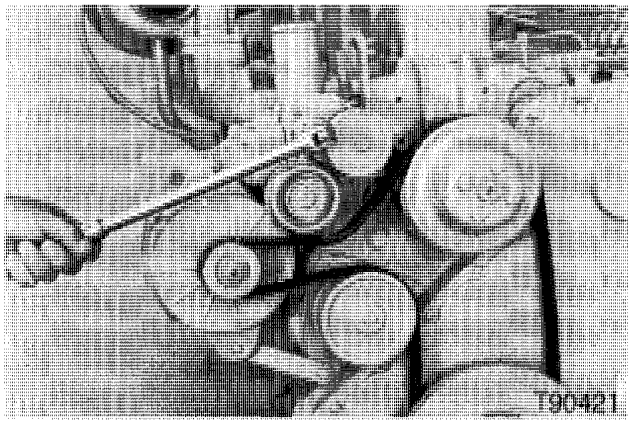
STEP 300



Install the rocker arm assembly and the rocker arm clamp.

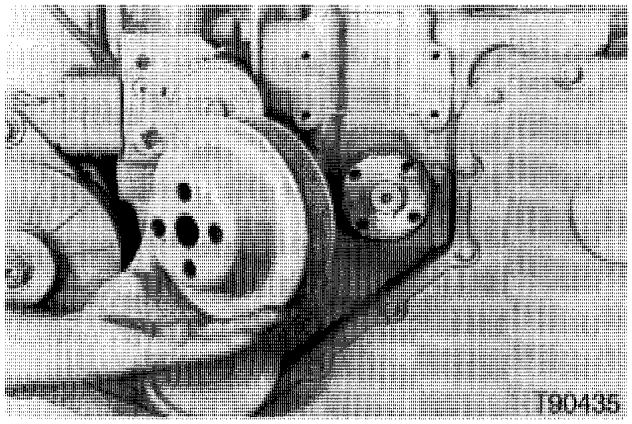
OIL PUMP SERVICE
Oil Pump Removal

STEP 1



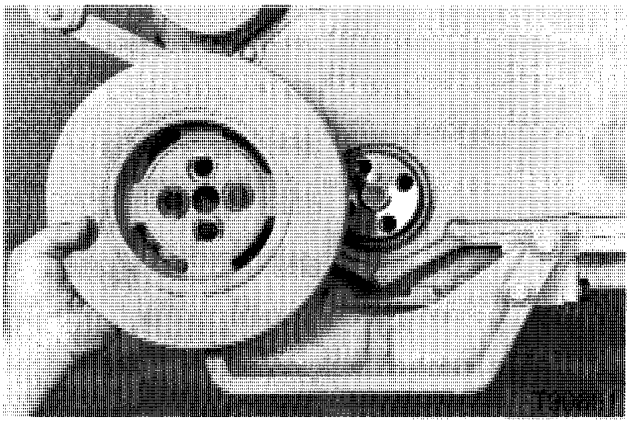
Lift the belt tensioner pulley and remove the fan belt.

STEP 2



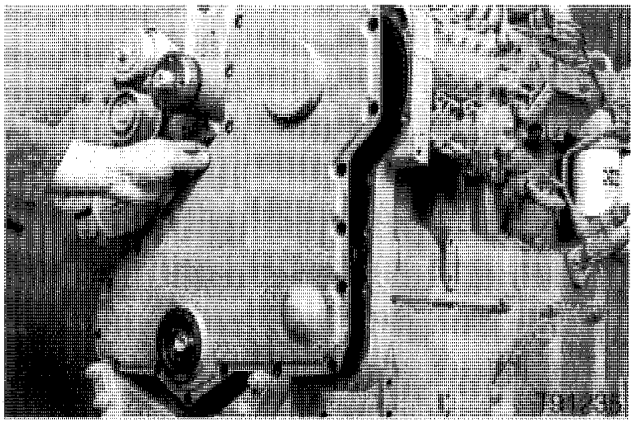
Remove the fan pulley bolts and the fan belt pulley.

STEP 3



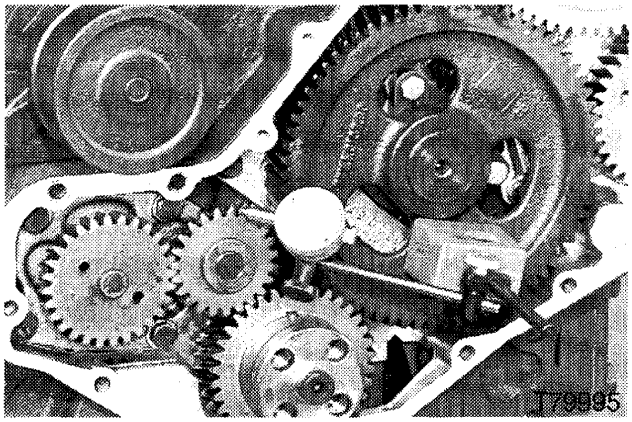
Remove the crankshaft pulley bolts and the crankshaft pulley.

STEP 4



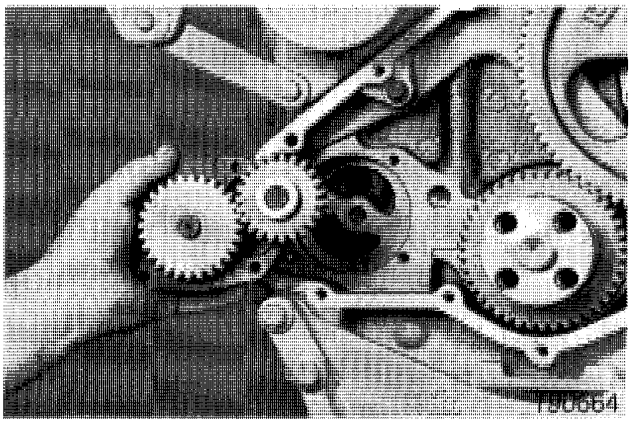
Remove the front cover bolts and the front cover.

STEP 5



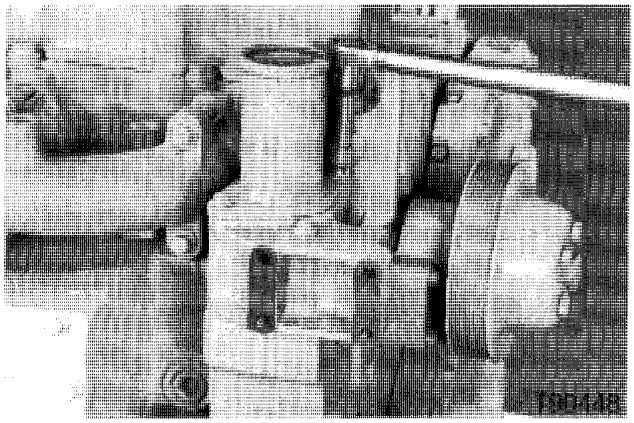
Check the backlash between the oil pump idler gear and the crankshaft. Put a dial indicator on the oil pump idler gear. If the backlash is more than 0.45 mm the oil pump must be replaced.

STEP 6



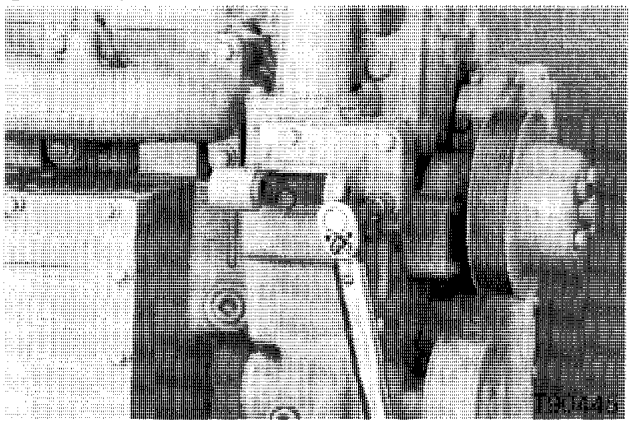
Remove the oil pump retaining bolts and the oil pump.

STEP 17



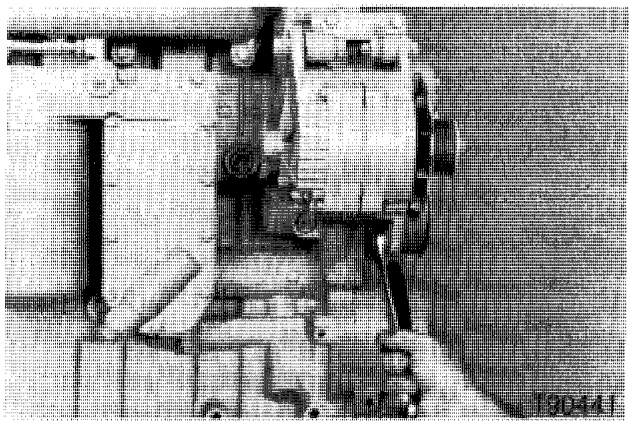
Install the gasket, coolant outlet pipe and bolts. Tighten the bolts to a torque of 21 to 27 Nm.

STEP 18



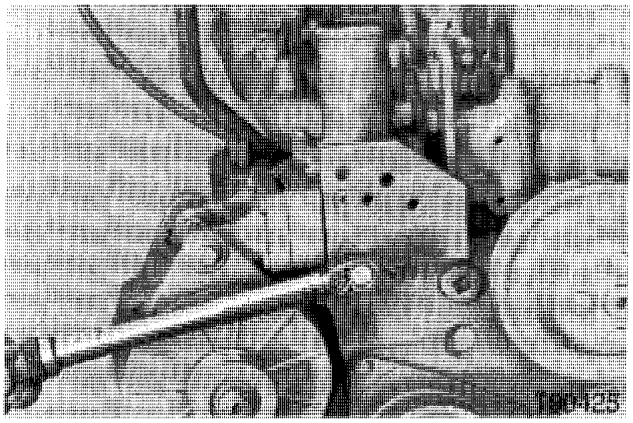
Install the alternator bracket and bolts. Tighten the bolts to a torque of 21 to 27 Nm.

STEP 19



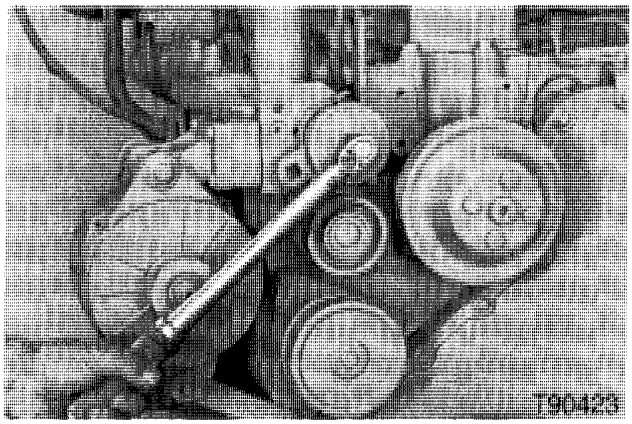
Install the alternator and tighten the bolts.

STEP 20



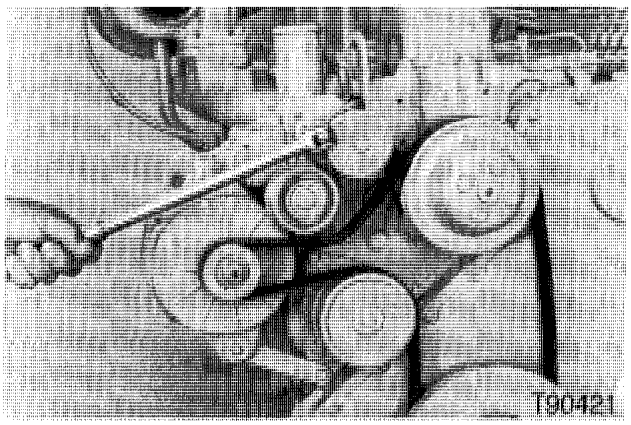
Install the tensioner bracket and bolts. Tighten the bolts to a torque of 21 to 27 Nm.

STEP 21



Install the belt tensioner and bolt. Tighten the bolt to a torque of torque of 39 to 47 Nm.

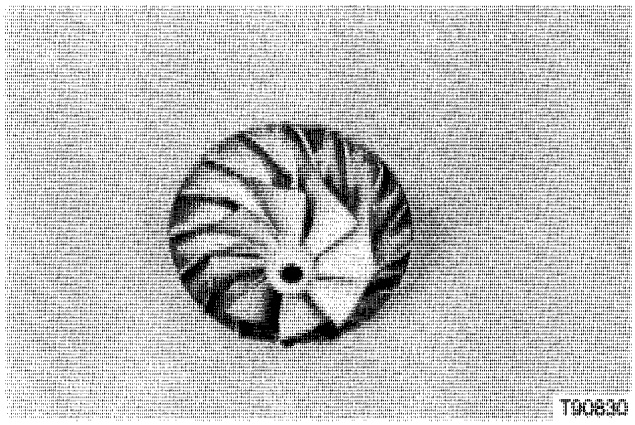
STEP 22



Lift the belt tensioner pulley and install the fan belt.

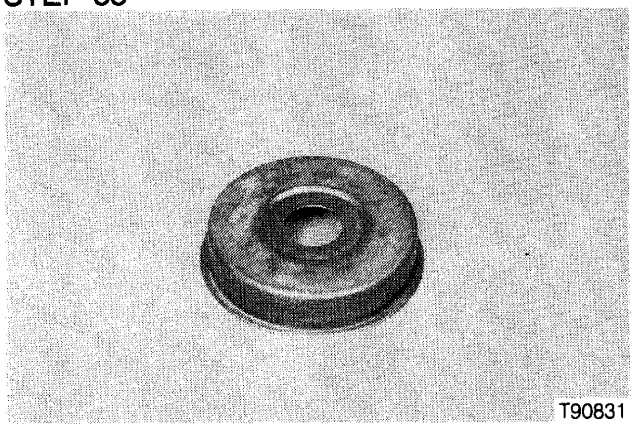
Inspection

STEP 54



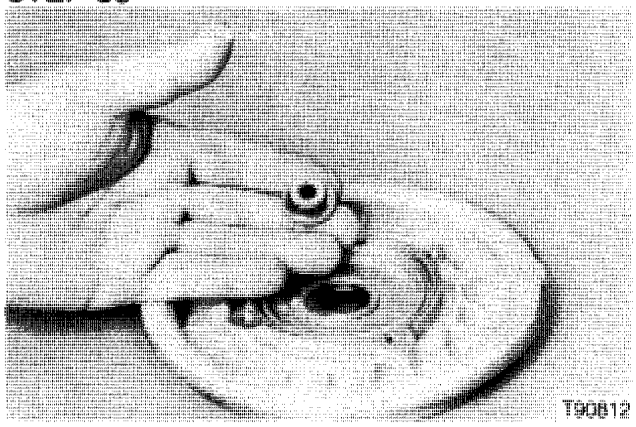
Inspect the compressor wheel for bent blades and scratches. Replace the turbocharger if the wheel shows damage.

STEP 55



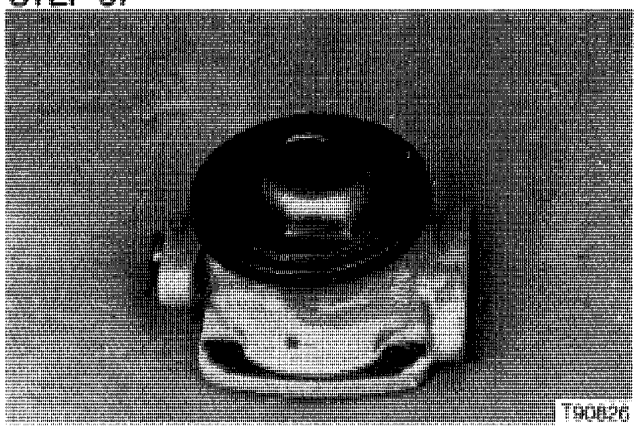
Replace the turbocharger if the heat shield shows damage.

STEP 56



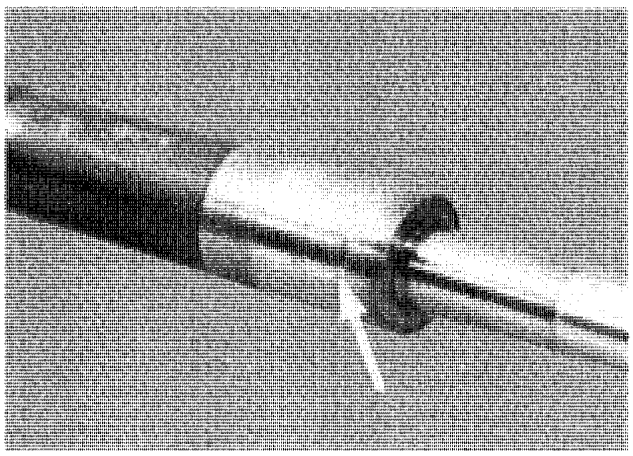
Replace the turbocharger if the oil slinger shows damage.

STEP 57



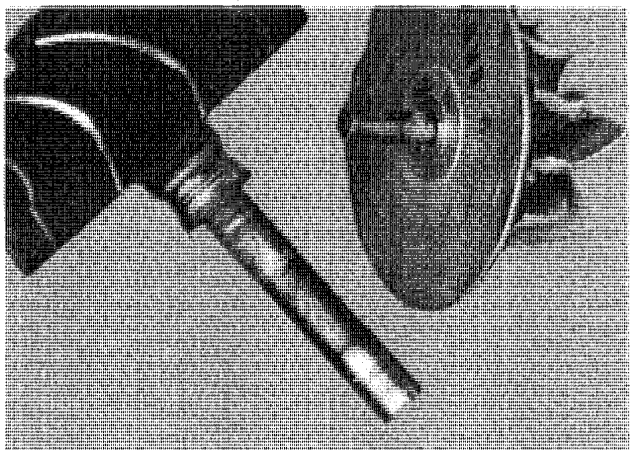
Inspect the center housing bearing surfaces for scoring or scratches. Replace the turbocharger if there is damage.

Fine Scratches on Shaft



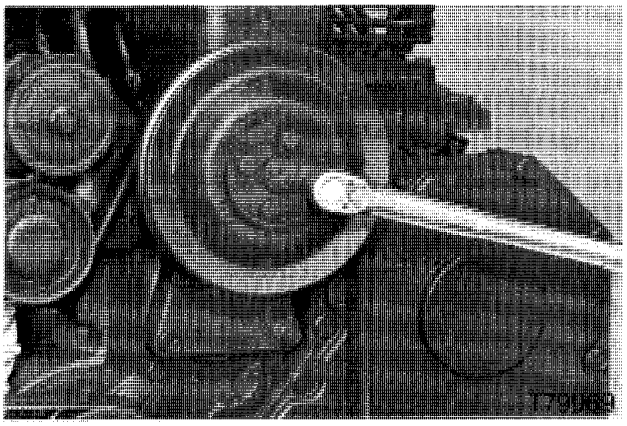
Fine scratches on both bearing journals are evidence that abrasive material has contaminated the lubricating oil.

Bent or Broken Shaft



Bearing damage and extreme shaft motion caused by lack of lubrication or abrasives in the oil may eventually cause the shaft to bend or even break. When this type of damage is evident, check the bearings.

STEP 52

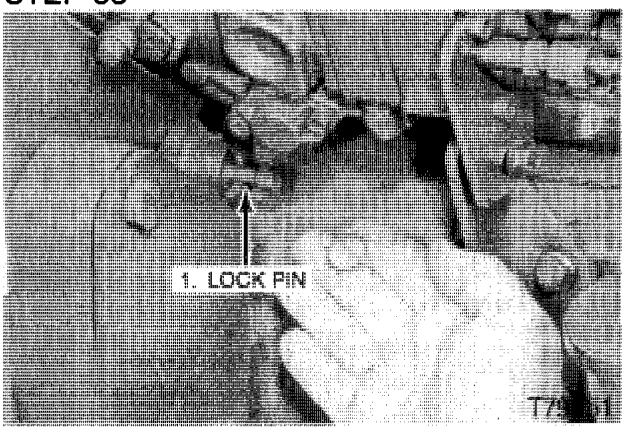


Torque the fan pulley bolts as follows:

Grade 8.8 (Size M8)	25 to 31 Nm
Grade 10.9 (Size M8)	37 to 43 Nm
Grade 8.8 (Size M10)	51 to 62 Nm
Grade 10.9 (Size M10)	51 to 62 Nm

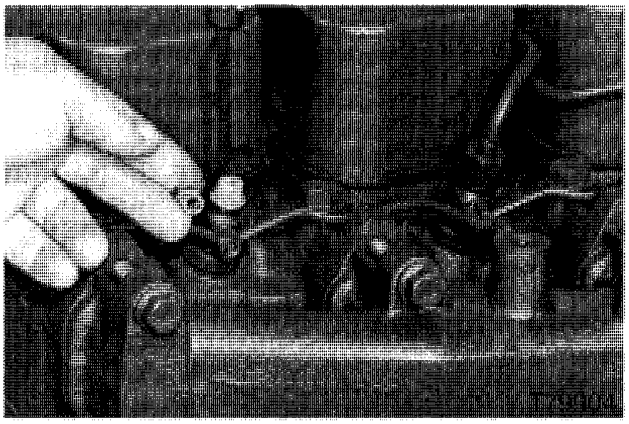
TIMING LOCK PIN
Removal

STEP 53



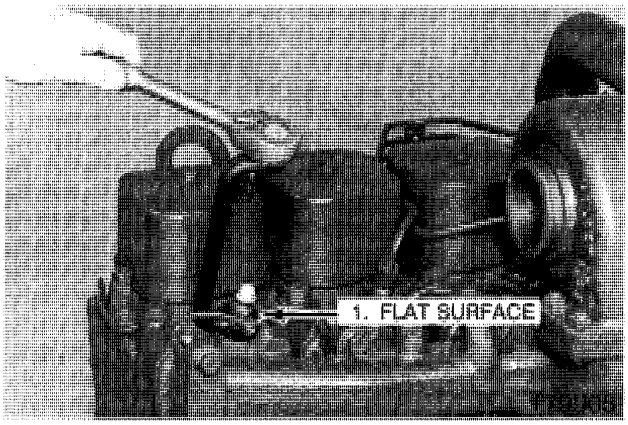
Remove the retaining ring and lock pin from the lock pin housing.

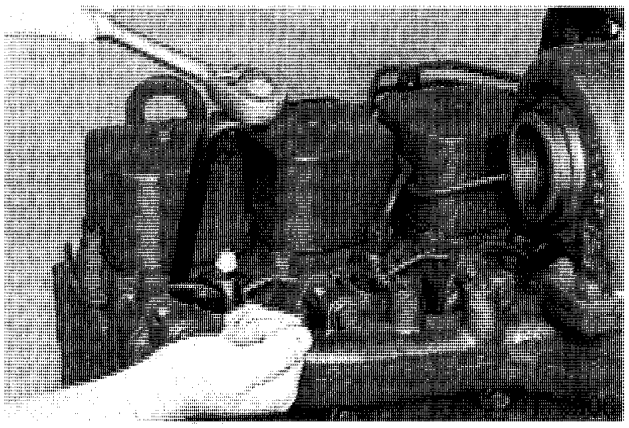
STEP 5



Remove the leak off bolt and the leak off line gasket.

STEP 6

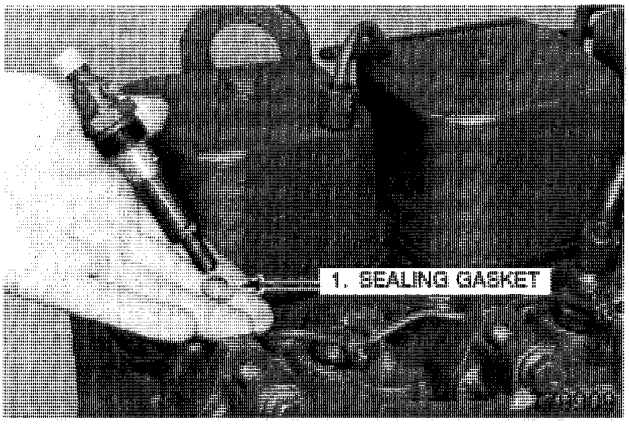




Install the special tool and a wrench on the flat surface of the injector. Loosen the injector.

IMPORTANT: *Do not let the injector body rotate when loosening. If the injector body does rotate it will damage the cylinder head bore.*

STEP 7

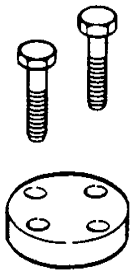


Remove the fuel injector from the engine. Always replace the injector sealing gasket when a fuel injector is removed. Remove the remainder of the injectors using the same procedure.

IMPORTANT: *Make sure that the injector sealing gasket comes out with the injector. Use an acceptable table tool or wire to remove the sealing gasket from the engine bore.*

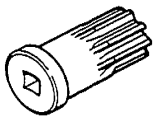
TABLE OF CONTENTS

SPECIAL TOOLS



CAS 1691A

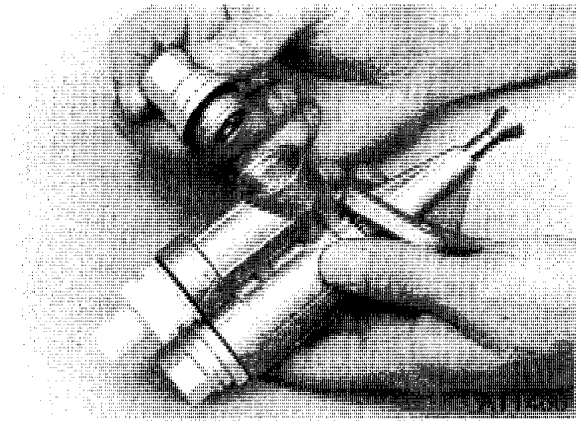
CAS-1691A GEAR PULLER
FIRST USED ON PAGE 7



CAS 1690

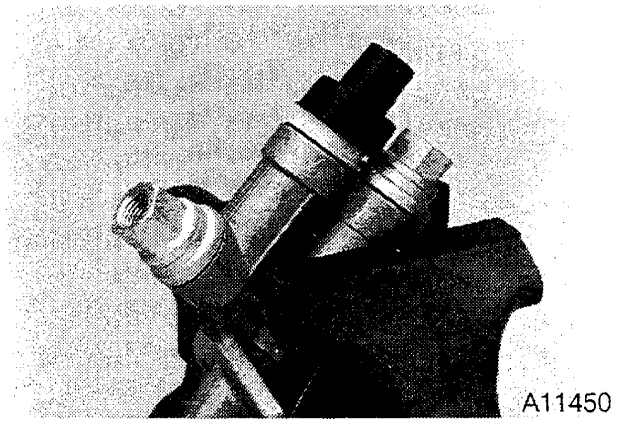
CAS-1690 ENGINE
TURN OVER TOOL
FIRST USED ON PAGE 6

STEP 73



Install the outlet fitting into the pump body and finger tighten.

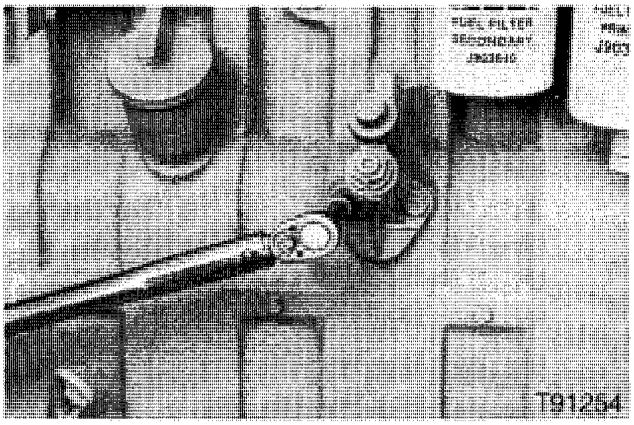
STEP 74



Put the primer pump in a soft jaw vise.Tighten the three fittings to a torque of 30 Nm.

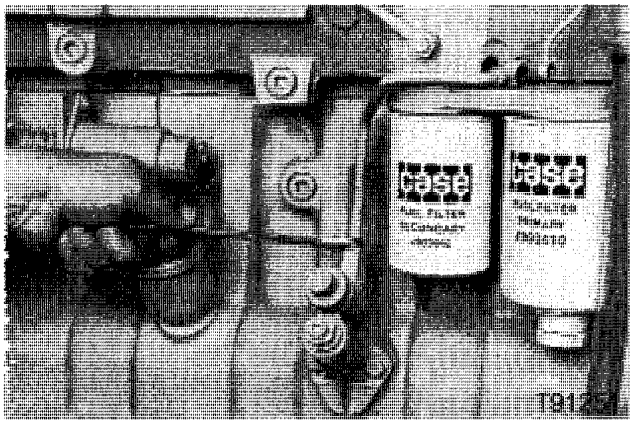
Install the rubber boot over the hand prime button.

STEP 75



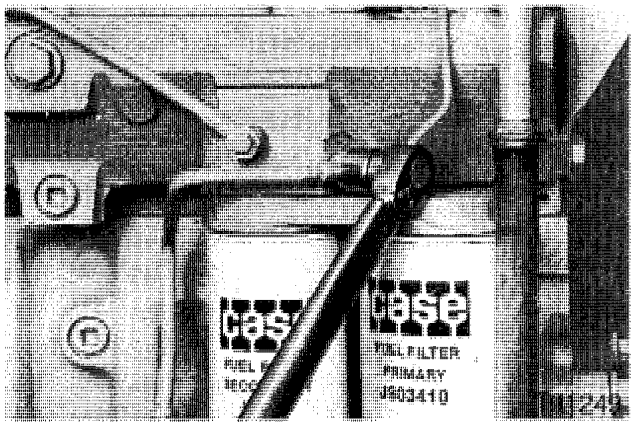
Install the primer pump in the engine block. Install the primer pump bolts and tighten to a torque of 21 to 27 Nm.

STEP 76



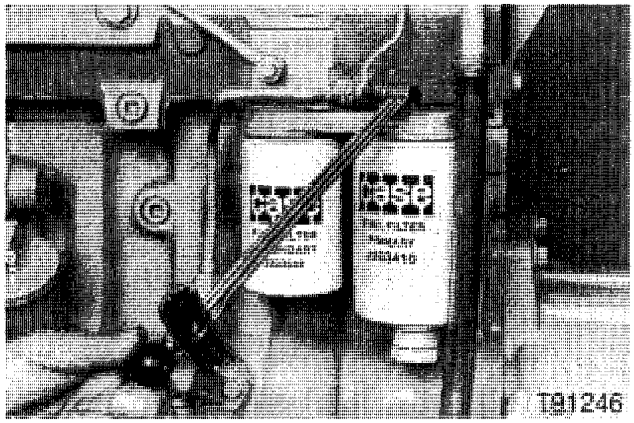
Connect and tighten the fuel inlet line to the primer pump.

STEP 77



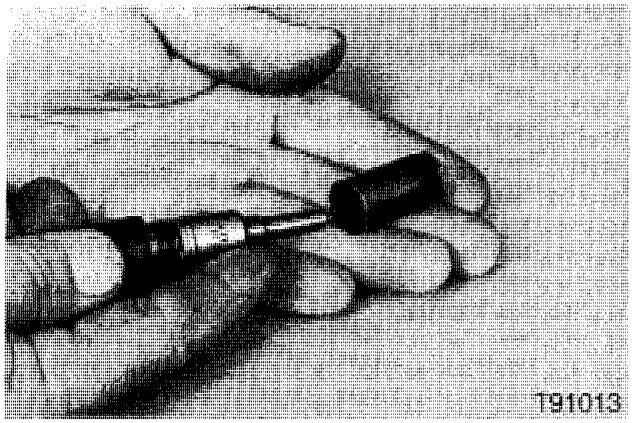
Install new gaskets and the inlet fitting. Tighten the inlet fitting to a torque of 14 to 27 Nm.

STEP 78



Install the leak off line gasket and bolt. Tighten the leak off bolt to a torque of 7 to 9 Nm.

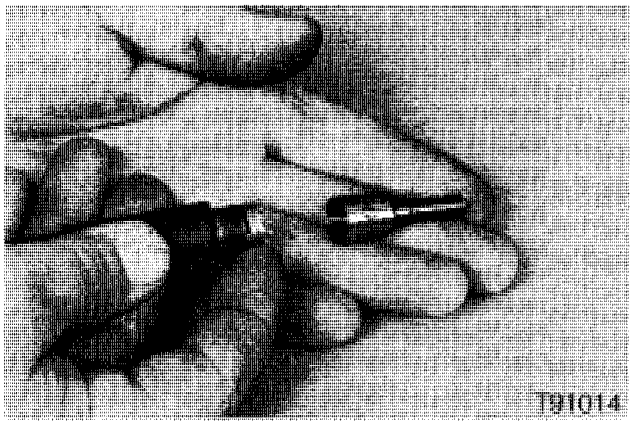
STEP 18



Loosen and remove the nozzle cap nut.

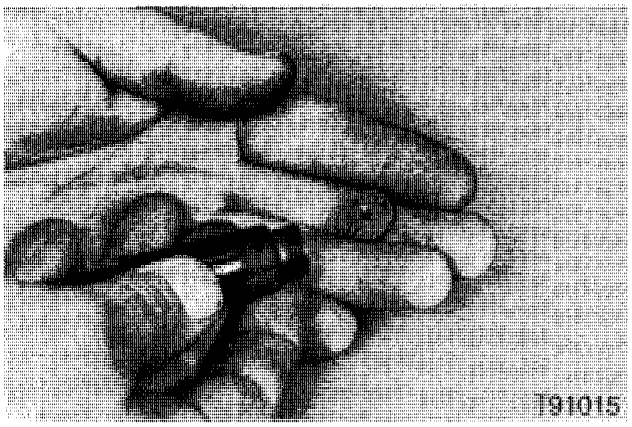
NOTE: *The injector parts have tight tolerances. Dirt will damage a smooth surface. Keep the work location and tools clean. Disassemble and assemble all parts carefully to prevent damage.*

STEP 19



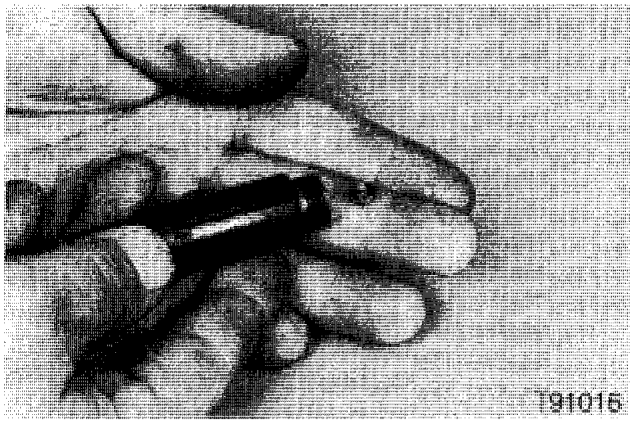
Remove the nozzle assembly.

STEP 20



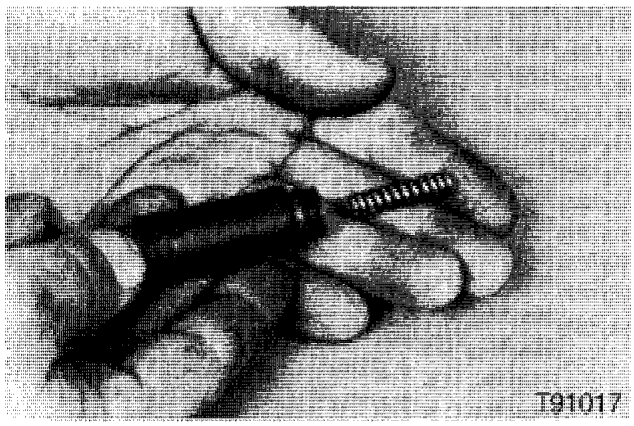
Remove the valve stop assembly.

STEP 21



Remove the pressure spring seat.

STEP 22



Remove the pressure spring.

SPECIFICATIONS

Electrical System ..... Two 12 Volt Batteries Connected in Series, Negative Ground

System Voltage ..... Approximately 24 Volts

Batteries (Standard)
- Group Size 31
- Reserve Capacity ..... 170 Minutes
- Cold Cranking Capacity
  - At 0°F (-17°C) ..... 700 Amperes
  - At -20°F (-29°C) ..... 520 Amperes
- Manifold Venting ..... Standard

Batteries (Optional)
- Group Size 4D
- Reserve Capacity ..... 290 Minutes
- Cold Cranking Capacity
  - At 0°F (-17°C) ..... 800 Amperes
  - At -20°F (-29°C) ..... 640 Amperes
- Nonspill Caps ..... Standard

Alternator ..... 24 volt, 65 Amperes

Voltage Regulator ..... Solid State, Temperature Compensated

Starter ..... 24 Volt, Solenoid Actuated

PROXIMITY SWITCH TESTS

1. Put the loader lift arm and loader bucket in position so that there are no targets in front of the proximity switch you are testing.

2. Put the hydraulic detent switch and the return to travel/float switch in the ON positions.

3. Disconnect the connector from the proximity switch you are testing. Connect jumper wires between the harness side of the connector and the switch side of the connector at A-A, B-B, and C-C.

4. Make sure there is 24 volts between B and C for each proximity switch. If there is no voltage, check the wiring.

5. The height control and return to travel proximity switches are normally closed. Make sure there is 24 volts between A and C of these switches. If there is no voltage, replace the switches.

6. The return-to-dig proximity switch is a normally open switch. Make sure there is 0 voltage between A and C of the switch. If there is voltage, replace the switch.

7. Place a steel or iron target in front of the proximity switch you are testing. The target must be larger than the head of the proximity switch.

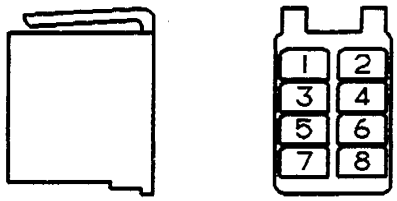
8. For the height control or return to travel proximity switches, make sure there is 0 volts between A and C. If there is voltage, replace the switch.

9. For the return-to-dig proximity switch, make sure there is 24 volts between A and C. If there is no voltage, replace the switch.

(19) Lamp Switch

Check Points	Good Reading	Possible Cause of Bad Reading
NOTE: *Put the master disconnect switch in the ON position.*		
Terminal B3 for wire 19G to ground	24 volts	Bad 10 ampere fuse (G).
Terminal B2 for wire 19H to ground	24 volts	Bad 15 ampere fuse (H).
Terminal B1 for wire 19T to ground	24 volts	Bad the 10 ampere circuit breaker (T).
NOTE: *Put the lamp switch in the ON position for all lamps.*		
Terminal IL for wire 49 to ground	24 volts	Bad lamp switch.
Terminal F1 for wire 42C to ground	24 volts	Bad lamp switch.
Terminal F3 for wire 42F to ground	24 volts	Bad lamp switch.
Terminal F2 for wire 42R to ground	24 volts	Bad lamp switch.
Terminal F4 for wire 41D to ground	24 volts	Bad lamp switch.
Terminal TL for wire 41T to ground	24 volts	Bad lamp switch.
Terminal HD for wire 41D to ground	24 volts	Bad lamp switch.

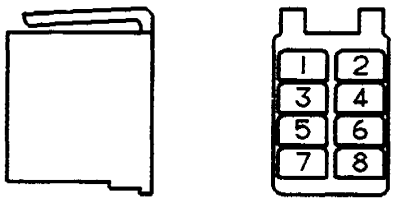
62



CAV.	WIRE COLOR
1	O/W(63H)
2	OPEN
3	O(19D)
4	OPEN
5	O/W(63L)
6	OPEN
7	O/W(63C)
8	OPEN

CAB ROOF HARNESS TO FRONT WINDSHIELD WIPER SWITCH

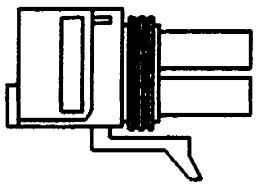
64



CAV.	WIRE COLOR
1	O(19D)
2	OPEN
3	OPEN
4	OPEN
5	O/W(67)
6	OPEN
7	OPEN
8	OPEN

CAB ROOF HARNESS TO FRONT WINDSHIELD WASHER SWITCH

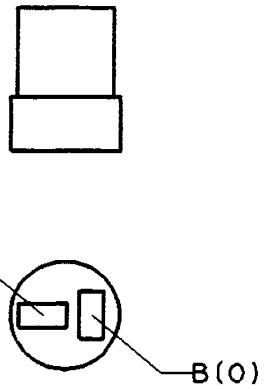
63



CAV.	WIRE COLOR
A	O/W(63H)
B	O/W(63L)
C	O(19D)
D	O/W(63C)

MAIN CAB HARNESS TO FRONT WINDSHIELD WIPER MOTOR

65



MAIN CAB HARNESS TO FRONT WINDSHIELD WASHER PUMP

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11 Neutral Start Relay

Check Points	Reading	Possible Cause of Bad Readings
Terminal 85 for wire 0 to ground.	Continuity	Bad ground circuit.

NOTE: *Put the master disconnect switch and the key switch in the ON positions. Make sure the transmission is in NEUTRAL.*

Terminal 30 for wire 21N to ground.	24 volts	Bad circuit 21N.

NOTE: *Have another person hold the key switch in the START position.*

Terminal 86 for wire 21K to ground.	24 volts	Bad circuit 21K.
Terminal 87 for wire 21C to ground.	24 volts	Bad neutral start relay.

12 Key Switch

Check Points	Reading	Possible Cause of Bad Readings

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

Terminal BAT for wire 1 to ground.	24 volts	Bad circuit to batteries.

NOTE: *Disconnect the connector from the key switch. Turn the switch to ON.*

Between Bat and Ign.	Continuity	Bad key switch.
Between Bat and Acc.	Continuity	Bad key switch.

NOTE: *Hold the key switch in the START position.*

Between Bat and St.	Continuity	Bad key switch.

13 Cab Power Relay

Check Points	Reading	Possible Cause of Bad Readings
Terminal 85 for wire 0 to ground.	Continuity	Bad ground circuit

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

Battery terminal 30 to ground.	24 volts	Bad circuit to batteries.

NOTE: *Put the key switch in the ON position.*

Terminal 86 for wire 13C to ground.	24 volts	Bad key switch (12). Also bad circuit 13C.
Terminal 87 for switched power.	24 volts	Bad cab power relay.

7 Air Filter Restriction Switch

Check Points	Reading	Possible Cause of Bad Readings
Check between the housing of the air filter restriction switch and ground.	Continuity	Bad ground connection between the air filter restriction switch and ground.

NOTE: *Put the master disconnect switch in the ON position. Put the key switch in the ON position.*

Terminal for wire 31A to ground.	Approximately 9 volts	Test instrument cluster (1).

NOTE: *If the readings are good, replace the air filter restriction switch.*

8 Engine Oil Pressure Switch

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

NOTE: *Put the master disconnect switch in the ON position. Put the key switch in the ON position.*

Terminal for wire 31P to ground.	Approximately 5 volts	Test instrument cluster (1).

NOTE: *If the readings are good, replace the engine oil pressure switch.*

9 Low Brake Pressure Switch

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

NOTE: *Put the master disconnect switch in the ON position. Put the key switch in the ON position.*

Terminal for wire 31L to ground.	Approximately 9 volts	Test instrument cluster (1).

NOTE: *If the readings are good, replace the low brake pressure switch.*

10 Master Warning Lamp

Check Points	Reading	Possible Cause of Bad Readings
Bulb	Good	Bad bulb.

NOTE: *Put the master disconnect switch in the ON position. Put the key switch in the ON position.*

Terminal for wire 19C to ground.	24 volts	Bad 5 ampere fuse (C).
Between terminal for wire 31W and terminal 4 in the instrument cluster connector.	Continuity	Bad circuit between the master warning lamp and the instrument cluster (1). Test the instrument cluster (1).

4 Thermostat Switch

Check Points	Reading	Possible Cause of Bad Readings
NOTE: *Put the master disconnect switch and the key switch to the ON positions. Put the blower switch to HIGH.*		
Terminal 3 for wire 61T to ground.	24 volts	Bad blower switch.
NOTE: *Turn the thermostat switch all the way to COLD.*		
Terminal 1 for wire 61A to ground.	24 volts	Bad thermostat switch.
Terminal 2 for wire 61M to ground.	24 volts	Bad thermostat switch.

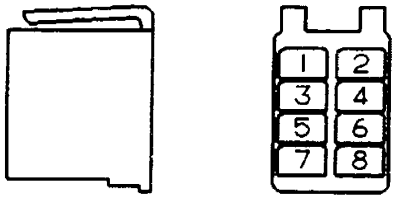
5 Compressor Clutch Lock Out Relay

Check Points	Reading	Possible Cause of Bad Readings
Terminal 85 for wire 0 to ground.	Continuity	Bad ground circuit.
NOTE: *Put the master disconnect switch and the key switch in the ON positions. Put the blower switch to HIGH and the thermostat switch to COLD.*		
Terminal 30 for wire 61A to ground.	24 volts	Check thermostat switch (4). Bad circuit 61A.
Terminal 87 for wire 61R to ground.	0 volts	Bad low pressure switch (7). Bad high pressure switch (6).
Terminal 87A for wire 61C to ground.	24 volts	Bad compressor clutch lockout relay.

6 High Pressure Switch

Check Points	Reading	Possible Cause of Bad Readings
NOTE: *Put the master disconnect switch and the key switch to the ON positions. Put the blower switch to HIGH and the thermostat switch to COLD.*		
Terminal A for wire 61A to ground.	24 volts	Bad thermostat switch (4). Bad circuit 61A.
NOTE: *Disconnect the wires from the high pressure switch.*		
Between the terminals of the high pressure switch.	Open	Bad high pressure switch.

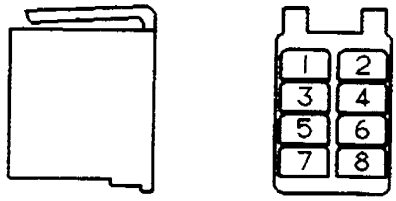
62



CAV.	WIRE COLOR
1	O/W(63H)
2	OPEN
3	O(19D)
4	OPEN
5	O/W(63L)
6	OPEN
7	O/W(63C)
8	OPEN

CAB ROOF HARNESS TO FRONT WINDSHIELD WIPER SWITCH

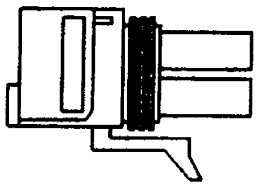
64



CAV.	WIRE COLOR
1	O(19D)
2	OPEN
3	OPEN
4	OPEN
5	O/W(67)
6	OPEN
7	OPEN
8	OPEN

CAB ROOF HARNESS TO FRONT WINDSHIELD WASHER SWITCH

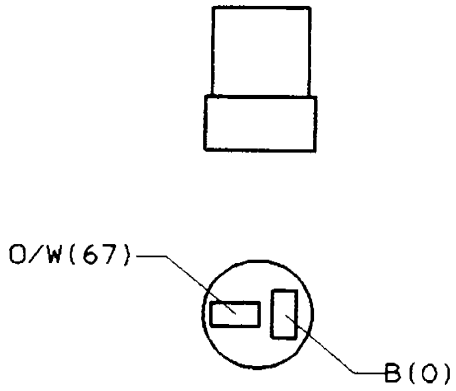
63



CAV.	WIRE COLOR
A	O/W(63H)
B	O/W(63L)
C	O(19D)
D	O/W(63C)

MAIN CAB HARNESS TO FRONT WINDSHIELD WIPER MOTOR

65



MAIN CAB HARNESS TO FRONT WINDSHIELD WASHER PUMP

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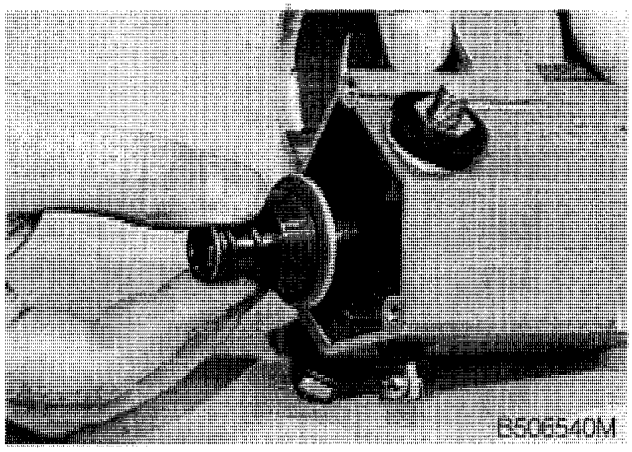
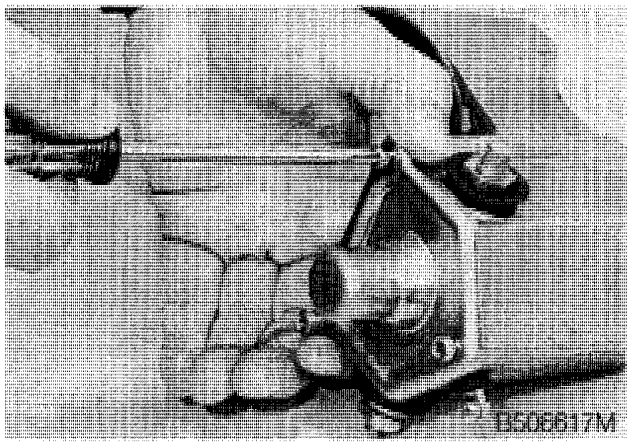
ASSEMBLY

STEP 22



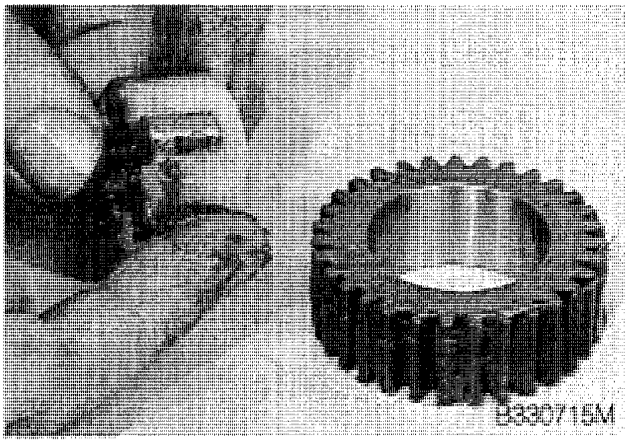
Install the plunger.

STEP 23



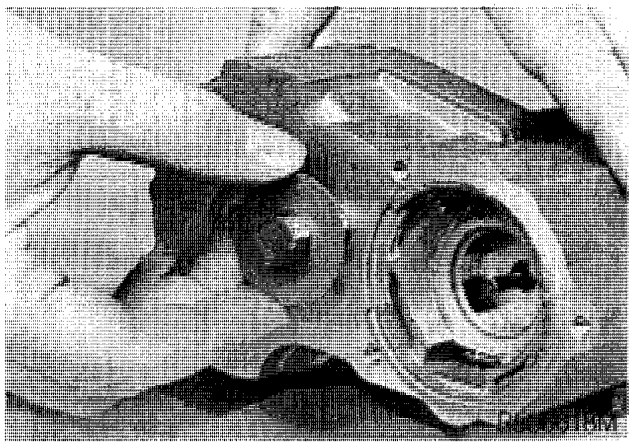
Hold the solenoid cover in position and install the screws and lock washers that fasten the solenoid cover to the solenoid housing.

STEP 24



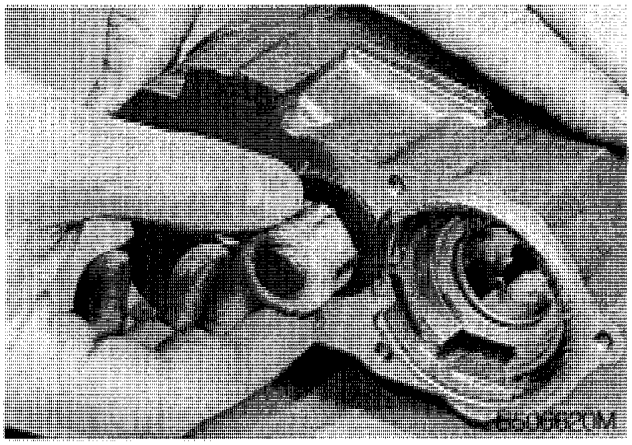
Lubricate the bearing cage and the idler gear with the lubricant specified on page 4006-2.

STEP 25



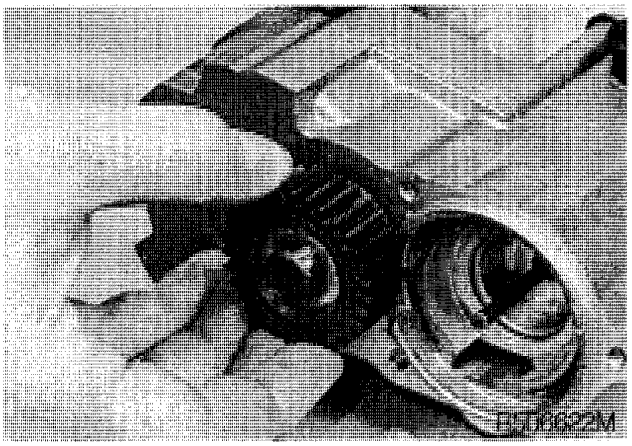
Install the thrust washer.

STEP 26

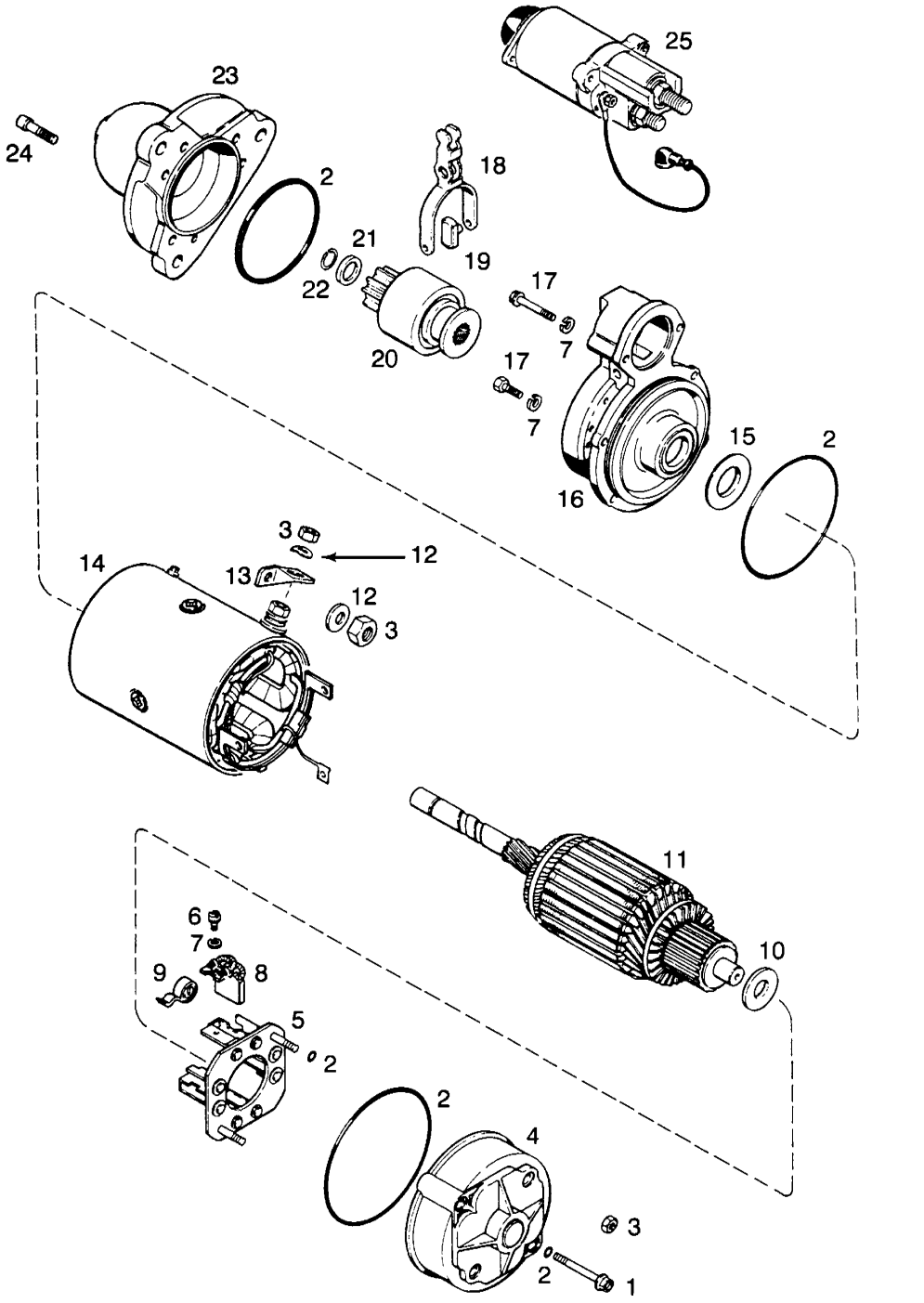


Install the bearing cage as shown.

STEP 27



Install the idler gear.



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1. *Cap Screw*
2. *O-Ring*
3. *Nut*
4. *End Cap*
5. *Brush Holder*
6. *Screw*
7. *Lock Washer*
8. *Brush*
9. *Spring*
10. *Thrust Washer*
11. *Armature*
12. *Wave Washer*
13. *Connector*
14. *Field Frame Assembly*
15. *Washer*
16. *Shift Lever Housing*
17. *Cap Screw*
18. *Shift Lever*
19. *Wear Pad*
20. *Drive Clutch*
21. *Stop Collar*
22. *Retaining Ring*
23. *Drive Housing*
24. *Allen Screw*
25. *Starter Solenoid*

CHARGING GUIDE FOR BATTERIES OTHER THAN MAINTENANCE FREE BATTERIES

Recommended Rate* and Time for Fully Discharged Battery

Battery Capacity - See Reserve Capacity under Specifications	Slow Charge	Fast Charge
80 Minutes or Less	10 Hours at 5 Amperes 5 Hours at 10 Amperes	2.5 Hours at 20 Amperes 1.5 Hours at 30 Amperes
Above 80 to 125 Minutes	15 Hours at 5 Amperes 7.5 Hours at 10 Amperes	3.75 Hours at 20 Amperes 1.5 Hours at 50 Amperes
Above 125 to 170 Minutes	20 Hours at 5 Amperes 10 Hours at 10 Amperes	5 Hours at 20 Amperes 2 Hours at 50 Amperes
Above 170 to 250 Minutes	30 Hours at 5 Amperes 15 Hours at 10 Amperes	7.5 Hours at 20 Amperes 3 Hours at 50 Amperes
Above 250 Minutes	24 Hours at 10 Amperes	6 Hours at 40 Amperes 4 Hours at 60 Amperes

*Initial rate for standard taper charger.

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PREPARING A DRY CHARGED BATTERY FOR USE

1. Remove the caps from the battery.

2. Fill each cell to the top of the separators with electrolyte. This will permit the volume of electrolyte to increase when heated by charging the battery.

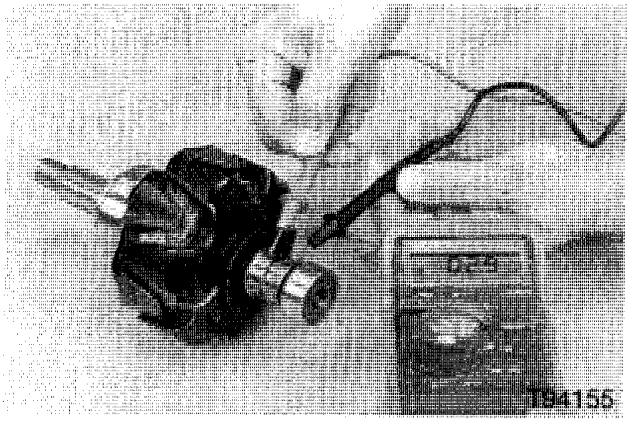
3. Install the caps on the battery. If the battery in your machine must have nonspill caps, install the nonspill caps. See Specifications in Section 4001 to find if the battery in your machine must have nonspill caps.

4. Connect a battery charger to the battery.

5. Charge the battery at 30 amperes until the specific gravity is 1.250 or more and the temperature of the electrolyte is at least 60°F (15.5°C).

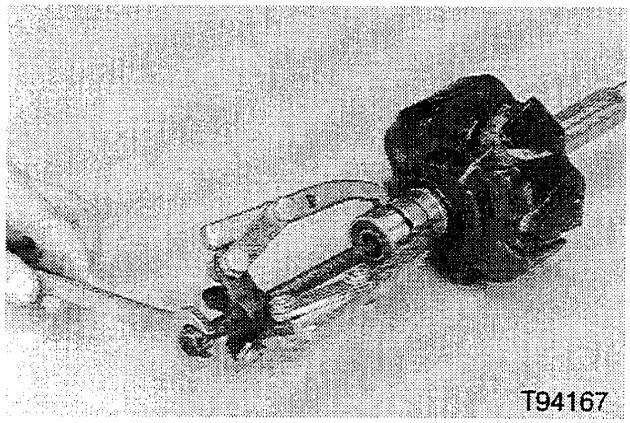
6. If necessary, fill each cell with electrolyte until the electrolyte is just below split ring at the bottom of the cell opening.

STEP 17



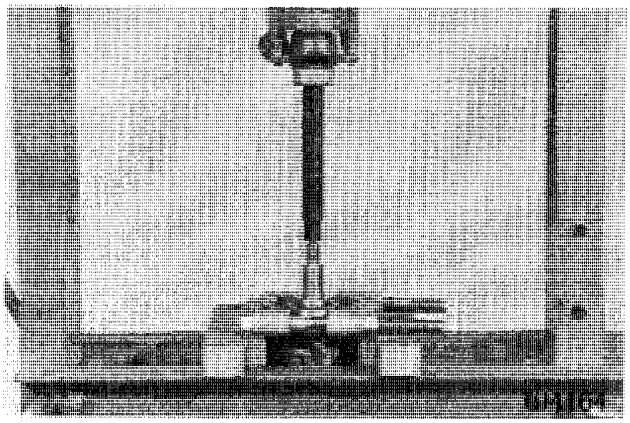
Connect an ohmmeter between the two slip rings. The reading on the ohmmeter must be 8 to 9 ohms. If the reading on the ohmmeter is high, there is a break in the rotor coil and the rotor assembly will have to be replaced.

STEP 18



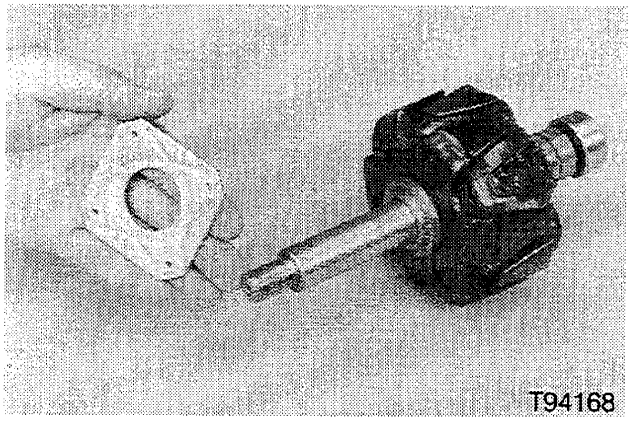
Remove the rear bearing from the rotor using a bearing puller.

STEP 19



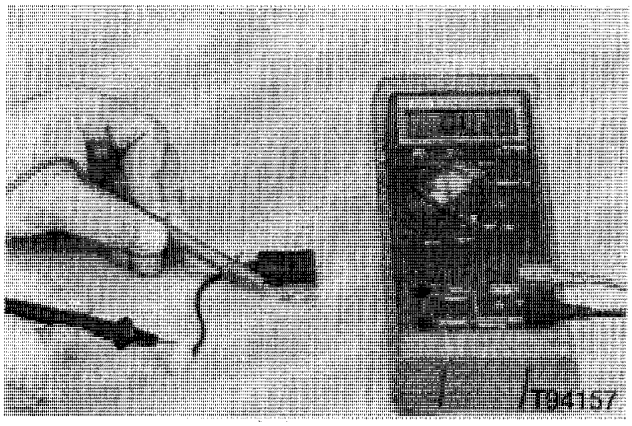
Remove the front rotor bearing and spacer ring by using a bearing puller and a hydraulic press.

STEP 20



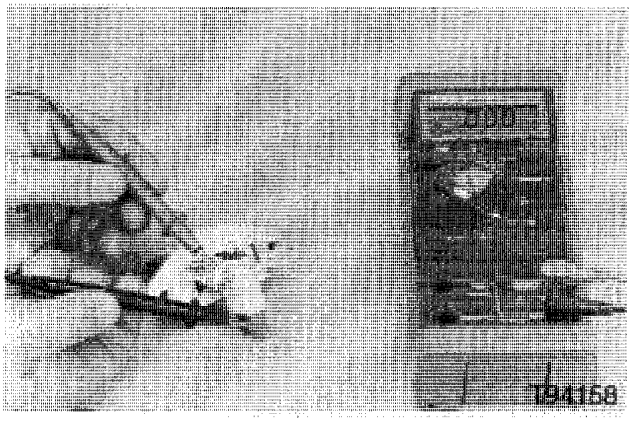
Remove bearing retaining plate.

STEP 21



Check the capacitor for continuity between the mounting tab and the lead. If there is continuity the capacitor is bad. Check the capacitor by connecting an ohmmeter between the mounting tab and the lead. The ohmmeter will initially show movement and then return to indicating no continuity as the capacitor is charged. Discharge the capacitor by grounding the lead to the tab before installation.

STEP 22



Check for continuity between each brush and the brush terminal. If there is no continuity replace the brushes.

AUXILIARY STEERING PUMP

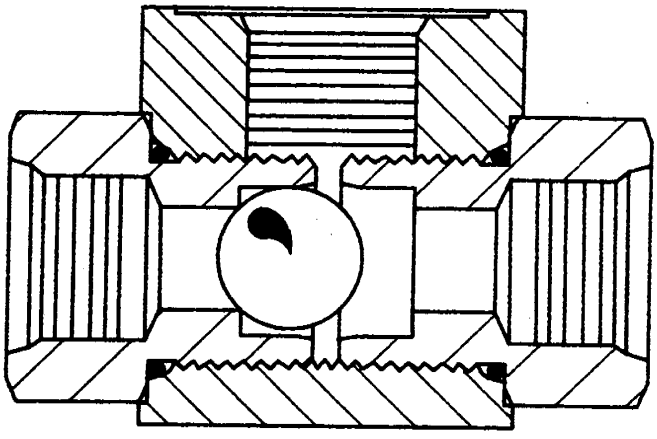
Removal

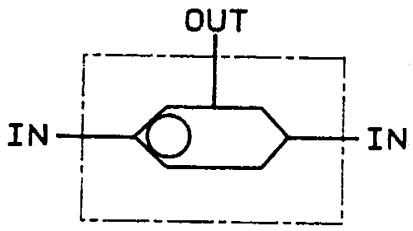
1. Remove the fill cap for the hydraulic reservoir.
2. Connect a vacuum pump to the hydraulic reservoir. Start the vacuum pump.
3. Disconnect the hose (1) from the auxiliary steering pump and install a plug in the hose. Thread size is 1-1/16-12.
4. Disconnect the hose (2) from the auxiliary steering pump and install a plug in the tube. Thread size is 3/4-16.
5. Stop the vacuum pump.
6. Remove the cap screws and flat washers that hold the auxiliary steering pump.
7. Remove the auxiliary steering pump. Be careful not to lose the drive coupling.

Installation

1. Make sure that the drive coupling is installed on the shaft of the auxiliary steering motor.
2. Install the auxiliary steering pump so that the large elbow is toward the top side of pump.
3. Install the cap screws and flat washers. Tighten the cap screws with force equal to 100 to 150 pound-inches (11 to 17 Nm).
4. Start the vacuum pump.
5. Connect the hose (1) and hose (2) to the auxiliary steering pump.
6. Stop the vacuum pump and install the fill cap in the hydraulic reservoir.
7. Start and run the engine at low idle and loosen hose at the pressure switch to bleed out air in line.
8. Stop engine.
9. Disconnect the wire from the fuel shutoff solenoid on the fuel injection pump.
10. Actuate the starter for three to five seconds to actuate the auxiliary steering motor.
11. Turn the steering wheel all the way to the left and to the right to make sure that the auxiliary steering pump works correctly. Then turn the key switch to OFF.
12. Connect the wire to the fuel shutoff solenoid.

AUXILIARY STEERING SHUTTLE VALVE





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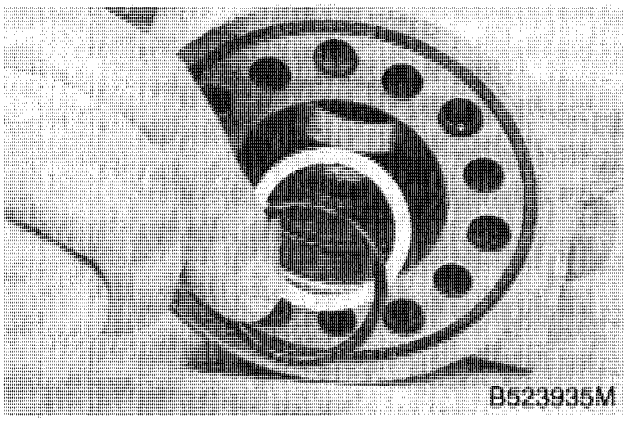
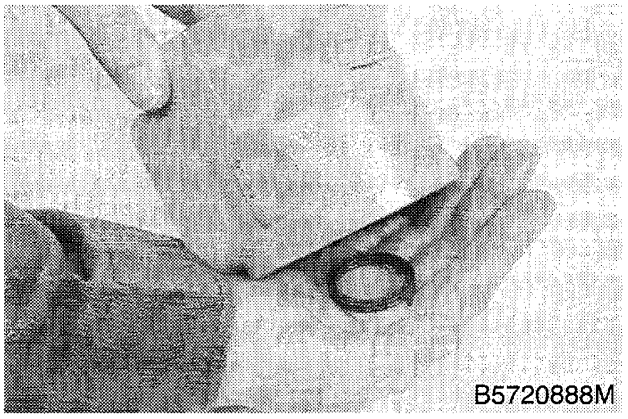
STEP 16



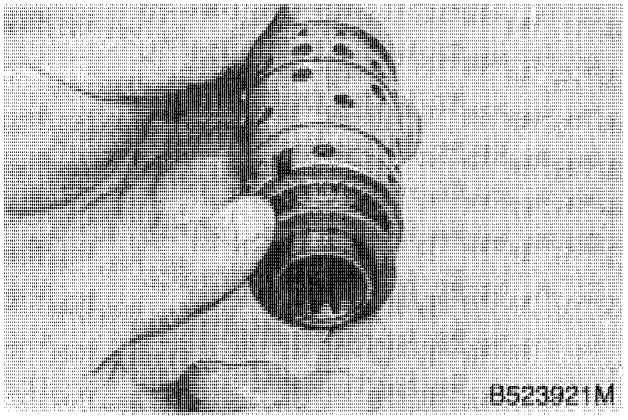
If there is a spacer on the spool, but the O-ring and the backup ring stayed in the gland, remove the O-ring and the backup ring from the bottom of the gland. Discard the O-ring and the backup ring. If there is no spacer, go to step 17.

STEP 17



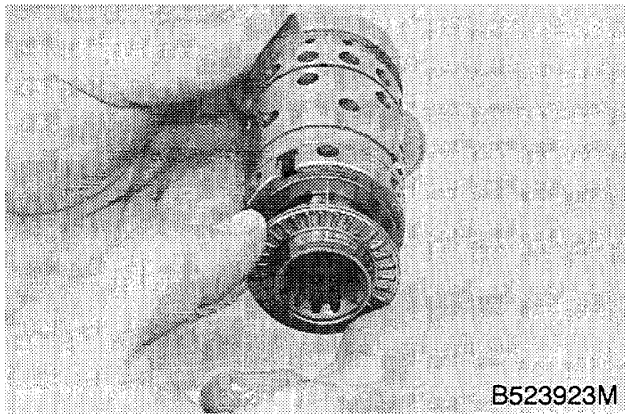
If there is no spacer on the spool, then there will be a quad ring in the gland instead of an O-ring and a backup ring. Push the quad ring out of the bottom of the gland with your finger.

STEP 18



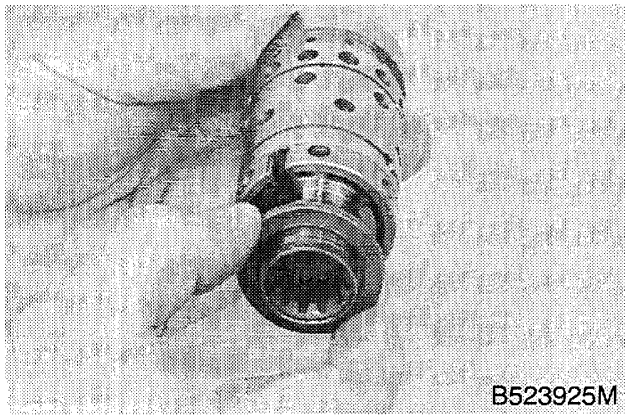
Remove the washer.

STEP 19



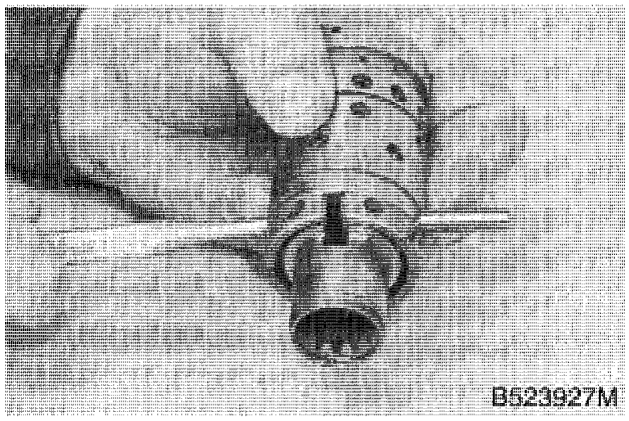
Remove the bearing.

STEP 20



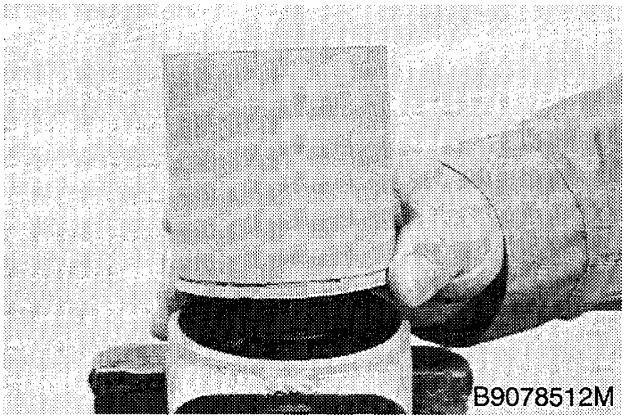
Remove the other washer.

STEP 21



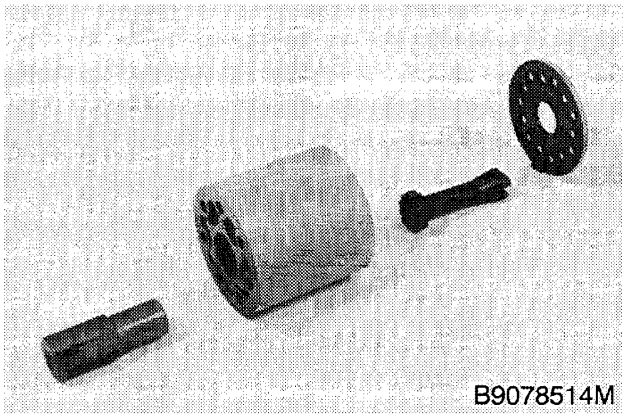
Use a punch to push the pin out of the sleeve and spool.

STEP 6



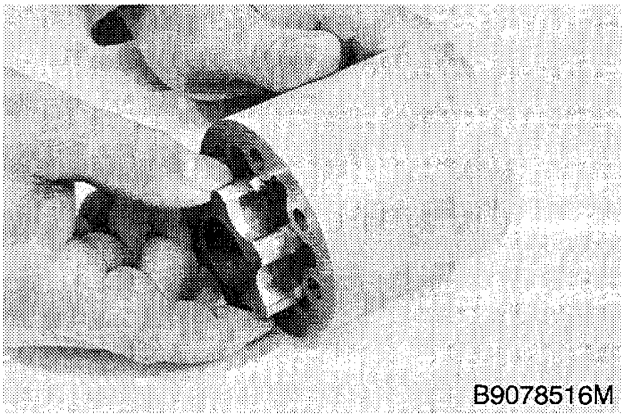
Lift the gerotor set, the drive shaft spacer, the drive shaft, and the spacer plate as an assembly from the body.

STEP 7



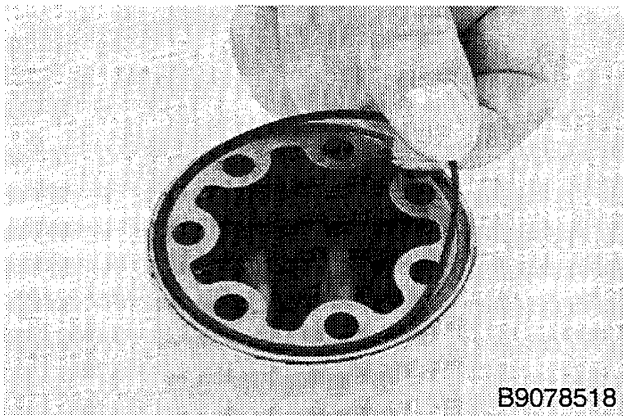
Separate the drive shaft spacer, the drive shaft, the gerotor set, and the spacer plate.

STEP 8



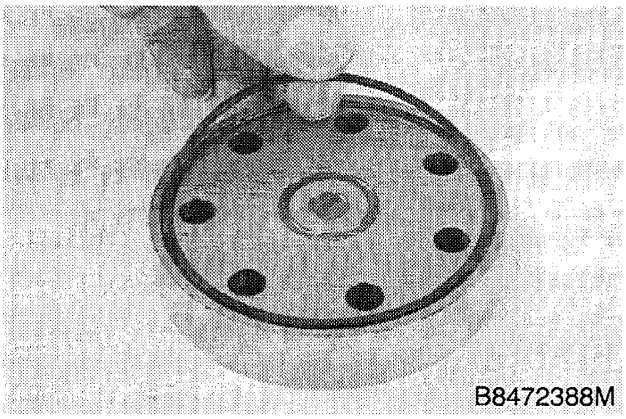
Remove the rotor from the stator.

STEP 9



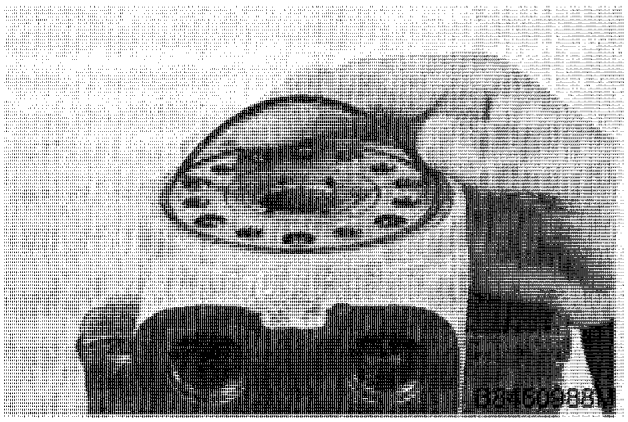
Remove and discard the O-ring from the stator.

STEP 10



Remove and discard the O-ring from the end plate.

STEP 11



Remove and discard the O-ring from the body.

GENERAL INFORMATION

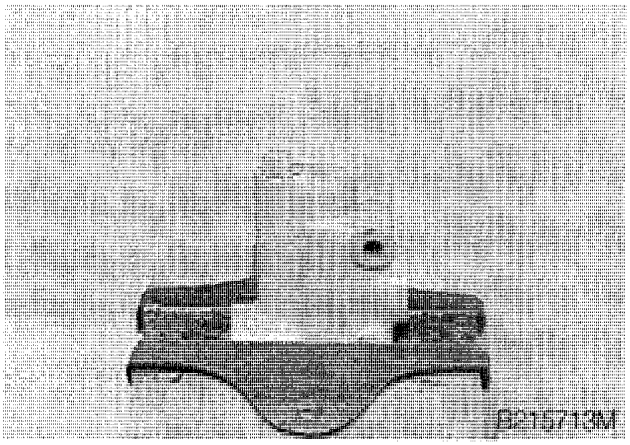
The flow control valve is installed between the pump and the steering control valve.

The flow control valve keeps the correct amount of oil from the pump flowing to the steering control valve at all engine speeds. Approximately 16 U.S. gpm (61 L/min) of oil will flow through the flow control valve to the steering control valve. The remainder of the oil will push the spool in the flow control valve to open the passage to the hydraulic reservoir.

The relief valve for the steering system is in the spool of the flow control valve. The pressure setting of the relief valve is 2400 to 2600 psi (16 548 to 17 929 kPa, 165 to 179 bar). This relief valve is not adjustable. See Section 5002 for the procedure to check the pressure setting. If the pressure setting is not correct, replace the spool in the flow control valve.

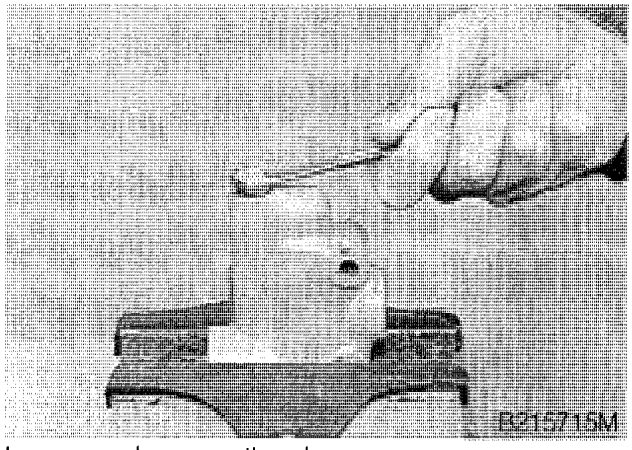
DISASSEMBLY

STEP 1



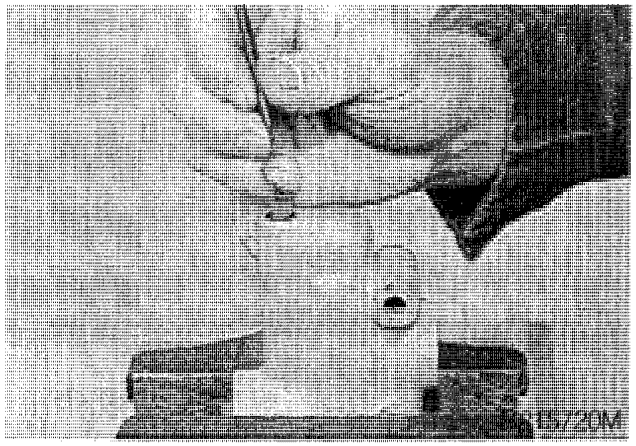
Put the flow control valve in a vise with soft jaws.

STEP 2



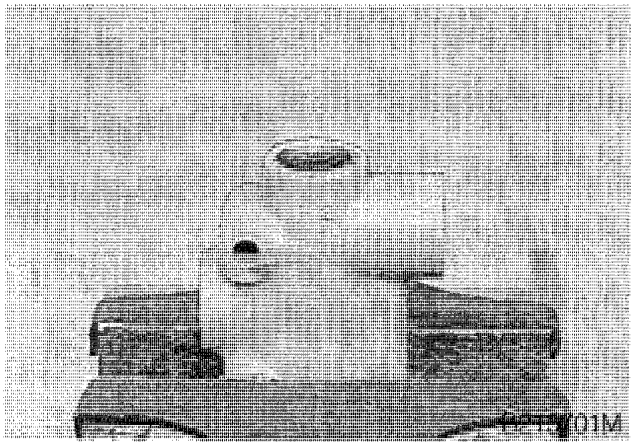
Loosen and remove the plug.

STEP 3



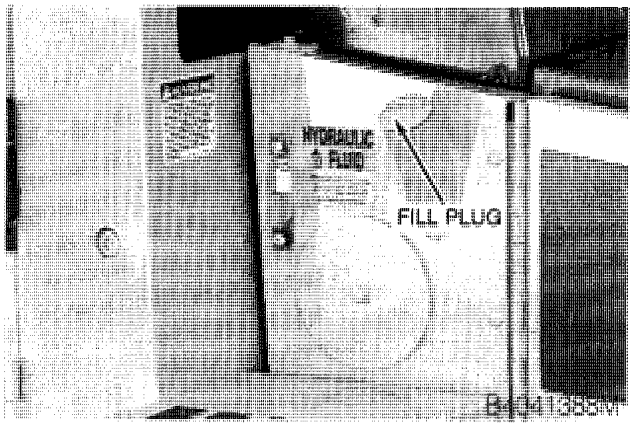
Remove the screen.

STEP 4



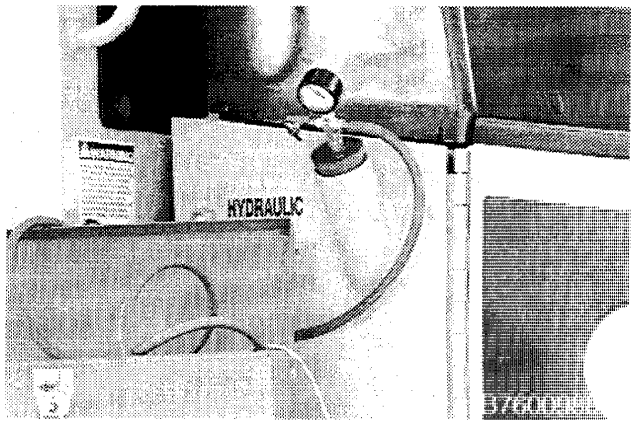
Put the flow control valve in the vise so that the other end is up.

STEP 6



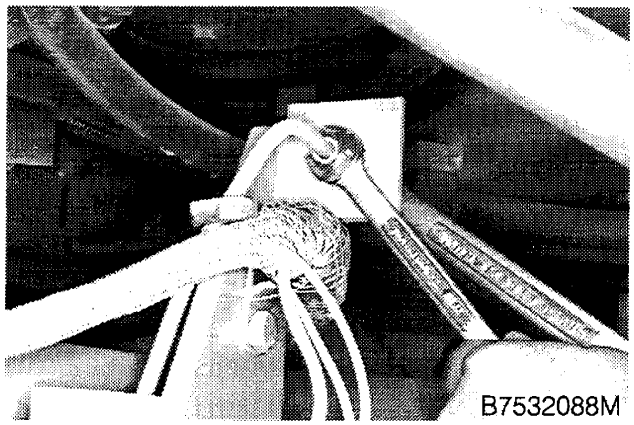
Loosen and remove the fill plug for the hydraulic reservoir.

STEP 7



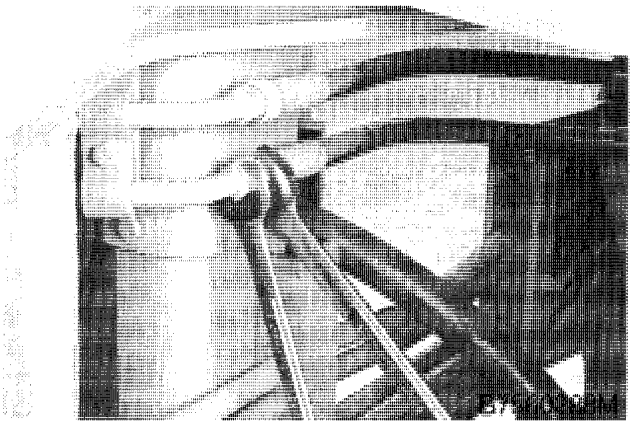
Connect a vacuum pump to the hydraulic reservoir. Start the vacuum pump.

STEP 8



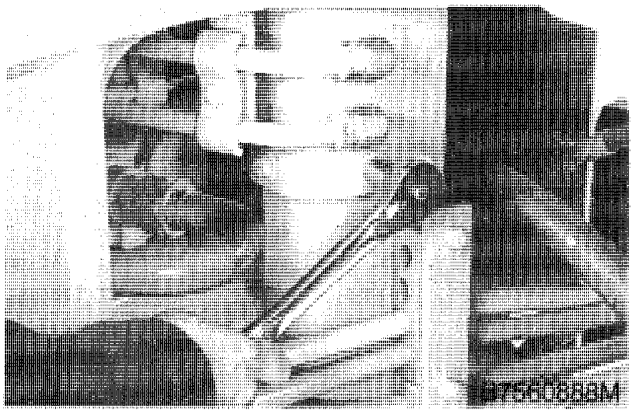
Disconnect the brake hose from the backside of front brake line bracket. Install a plug in the tube and a cap on the fitting.

STEP 9



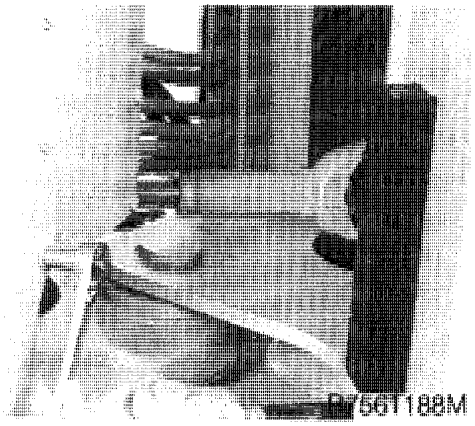
Disconnect the hoses for the steering cylinders. Install caps on the fittings and plugs in the hoses.

STEP 10



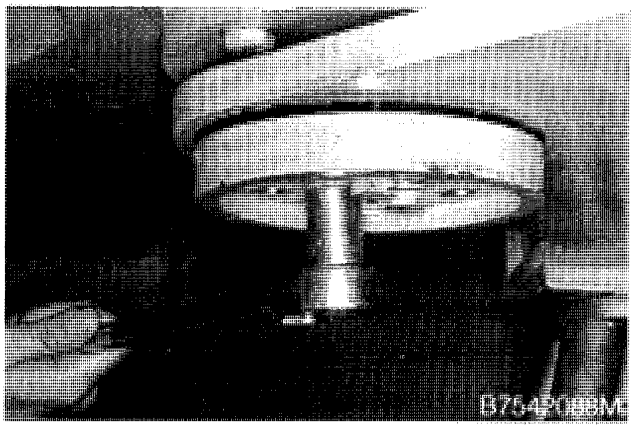
Loosen and remove the bolts, lock washers, and self-locking nuts that fasten the mounting bracket for the hoses to the bracket on the front frame.

STEP 11



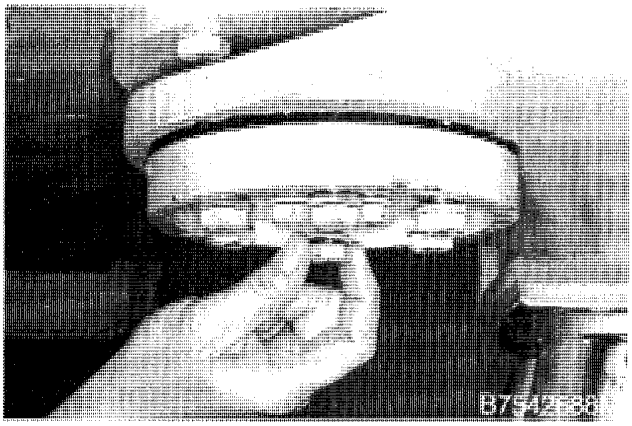
Loosen and remove the bolts, flat washers, and self-locking nuts that fasten the bracket for the hoses to the rear frame.

STEP 83



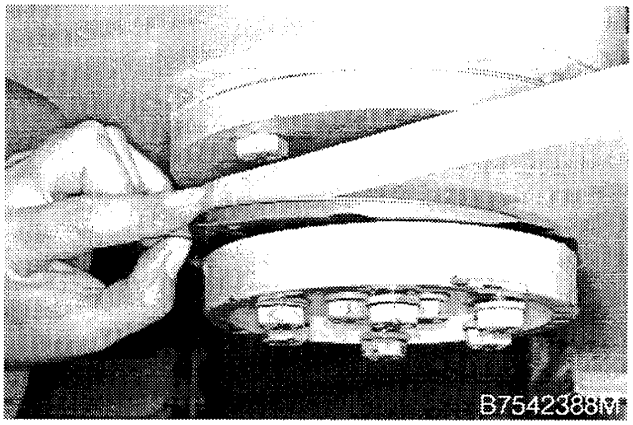
Loosen the cap screws that fasten the pivot pin retainer to the pivot pin.

STEP 84



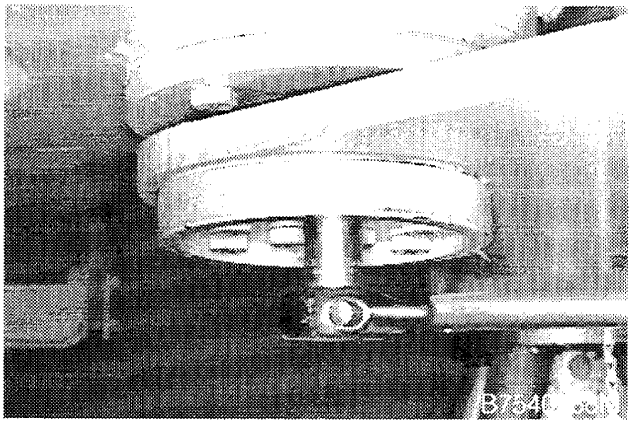
Start the six (6) outer cap screws into the pivot pin retainer and the front pivot.

STEP 85



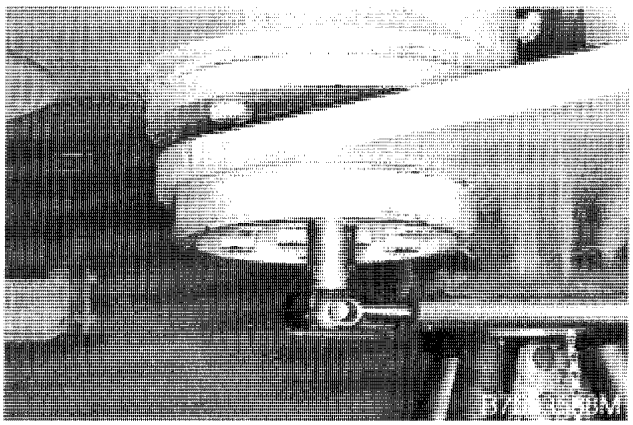
Install the shims from Step 82.

STEP 86



Tighten the six (6) outer cap screws to 125 pound-feet (170 Nm).

STEP 87



Tighten the three inner cap screws to 125 pound-feet (170 Nm).

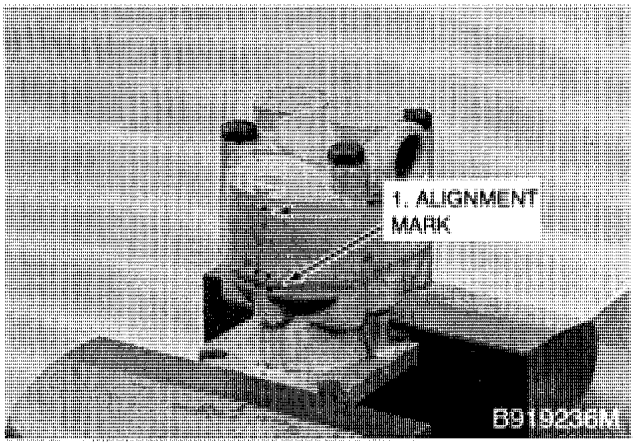
STEP 88

Remove the jacks from the rear frame. Remove the blocks from the rear axle. Remove the stands from the front frame.

AUXILIARY STEERING PUMP

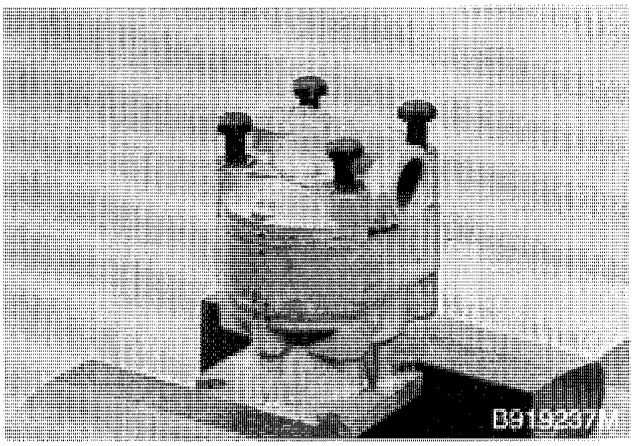
Disassembly

STEP 49



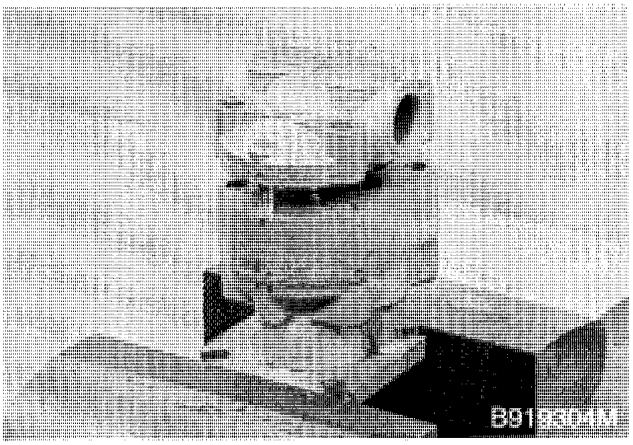
Make alignment marks on the port end cover, gear housing and drive end cover.

STEP 50



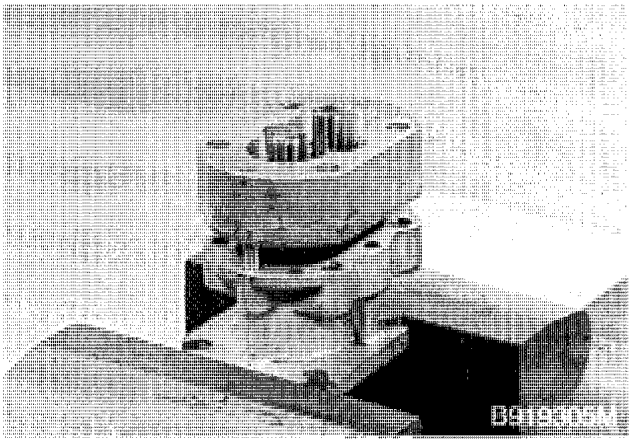
Loosen and remove the cap screws.

STEP 51



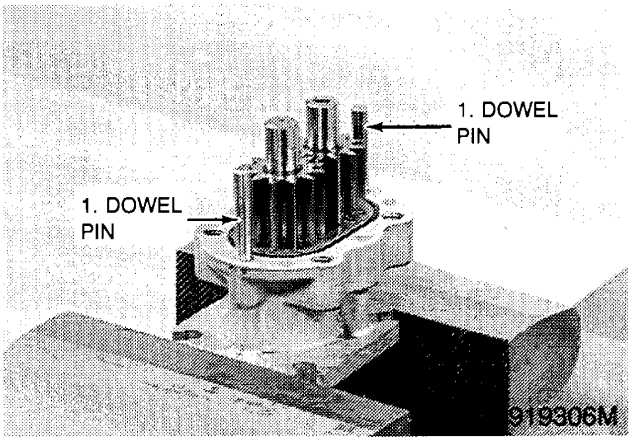
Remove the port end cover.

STEP 52



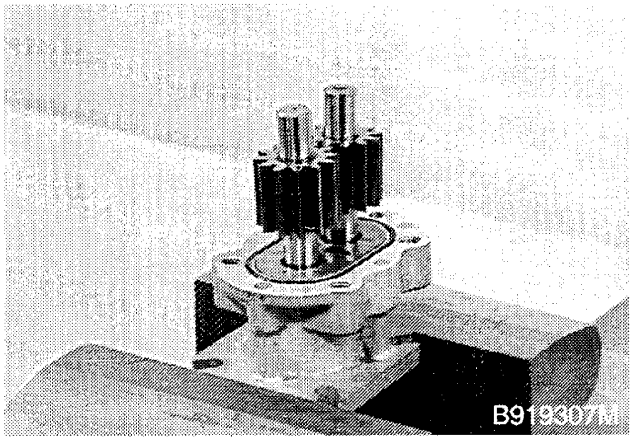
Remove the gear housing.

STEP 53



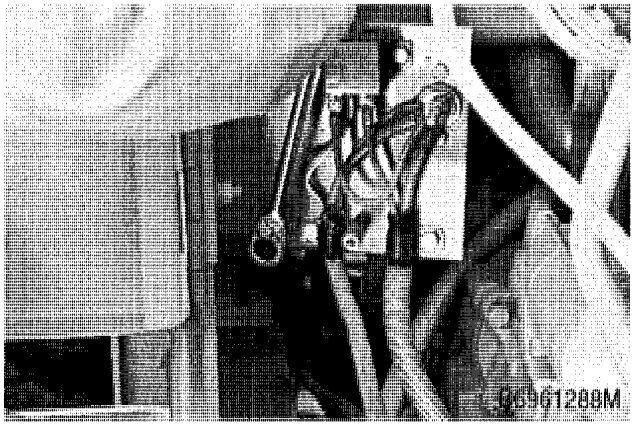
Remove the dowel pins.

STEP 54



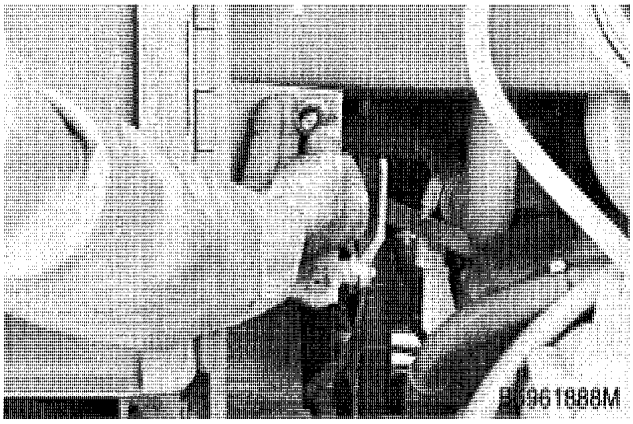
Remove the drive gear and driven gear.

STEP 41



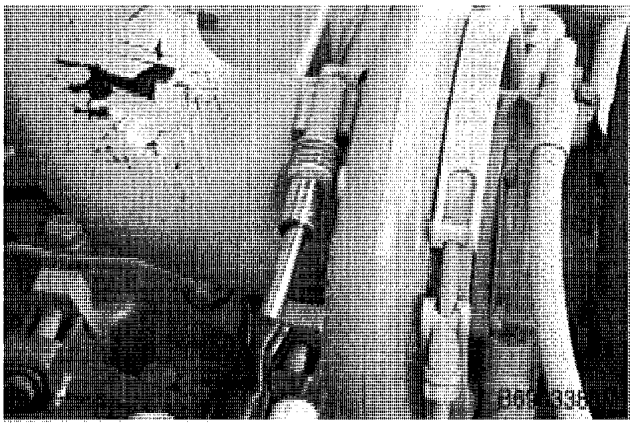
Remove the mounting plate for the relay.

STEP 42



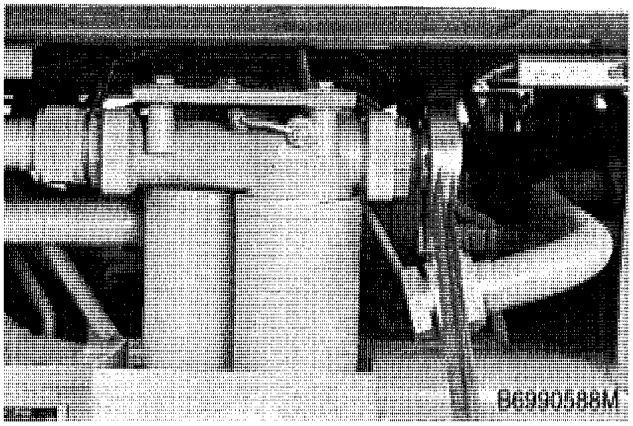
Remove the spacer.

STEP 43



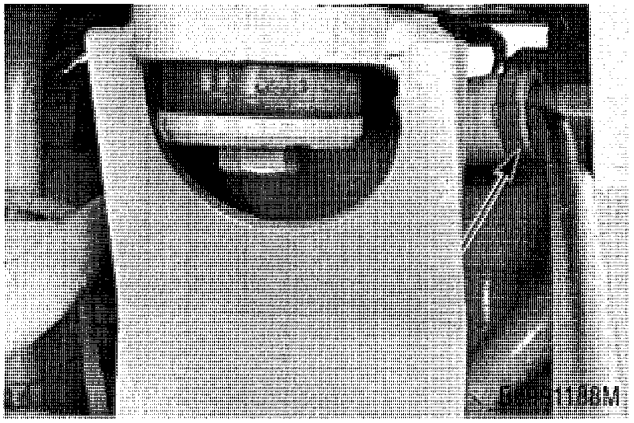
Remove the hose from the turbocharger.

STEP 44



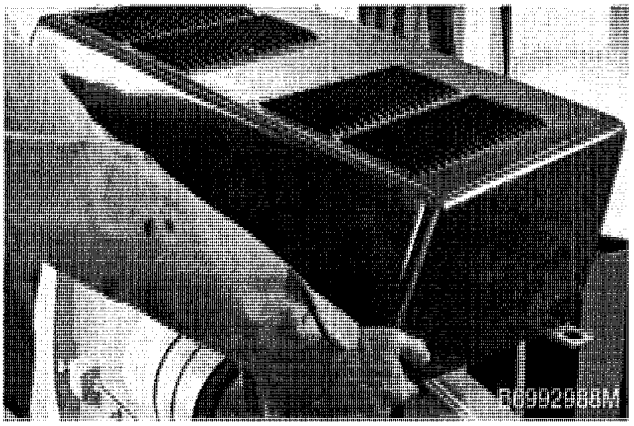
Disconnect the tube from the outlet for the filters. Install a plug in the tube and a cap on the fitting.

STEP 45



Use a prybar and remove the hose. Install a cap plug in the hose and on the tube.

STEP 46



Remove the condenser and put out of the way.

TABLE OF CONTENTS

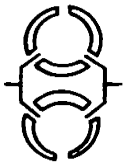
CROSSOVER OF LINES

CONNECTING LINES

RETURN TO SUMP

CLUTCH PACK

OIL SUMP



TORQUE CONVERTER

PRESSURE OPERATED CHECK VALVE

ALLOWS FLOW IN ONE DIRECTION

ORIFICE

RESTRICTS AMOUNT OF FLUID FLOW

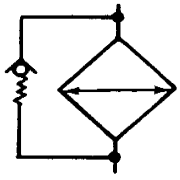
OIL PUMP

SUPPLIES OIL UNDER PRESSURE TO SYSTEM

INDICATOR

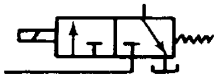
WARNING LAMP OR GAUGE ON OPERATORS PANEL

OIL COOLER



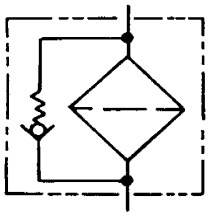
COOLS OIL IN HYDRAULIC SYSTEM

SOLENOID



ELECTRICALLY OPERATED, SPRING RETURN

FILTER ASSEMBLY



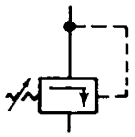
CLEANS FLUID AS IT COMES OUT OF THE PUMP

SPOOL

DIRECTS FLUID TO OPERATING SYSTEM

TEST CONNECTION

PRESSURE REGULATOR VALVE



ALLOWS FLOW AFTER PRESET PRESSURE IS OBTAINED

554L93

OPERATION OF THE M6 SOLENOID AND THE M6 TEMPERATURE SWITCH

M6 Solenoid

The M6 solenoid is controlled by the electronic control module. The electronic control module energizes the M6 solenoid for programmed periods of time depending on what shifting action is required. The M6 solenoid has two major functions in the shifting procedure. The M6 solenoid allows the clutch cylinder to be filled with oil very rapidly when a shift occurs. This causes a faster shift. The M6 solenoid also allows lower modulation pressure at the beginning of a shift. This causes a smoother shift. An additional use of the M6 solenoid occurs when a shift happens before the modulation valve has been reset from the previous shift, for example, a quick forward--reverse--forward shift. In transmissions without the M6 solenoid, this would cause a harsh shift. With this transmission, brief activation of the M6 solenoid by the electronic control module will cause the modulation valve to be reset before the shift occurs. This will provide a smooth shift.

M6 Temperature Switch

The M6 temperature switch works with the M6 solenoid to protect the clutch components during operations when the transmission oil is cold. Without preventative action, the higher viscosity of cold transmission oil can cause a long modulation time during the shift. This can cause an extended period of clutch slippage with possible damage to the clutch linings. Below a certain minimum temperature, the M6 temperature switch will activate the M6 solenoid. The action of the M6 solenoid will cause rapid filling of the clutch cylinder, reducing the period of clutch slippage and preventing damage to the clutch linings.

OUTPUT SPEED SENSOR AND TURBINE SPEED SENSOR

The output speed sensor senses the speed of one of the gears in the transmission. The turbine speed sensor senses the speed of another gear in the transmission. Information from both is sent to the electronic control module. The electronic control module receives this input and uses the information from the turbine speed sensor to verify the information from the output speed sensor. Then the electronic control module uses this speed information to determine proper shift points and to provide overspeed protecton.

CHECKS TO DO BEFORE TROUBLESHOOTING

NOTE: *The electronic control module controls the inputs from the shifter and other components and the outputs to the transmission solenoids. The electronic control module can sense incorrect inputs (for example, open circuits, short circuits, component failure, etc.) and determine if there is a problem in the control circuits. If there is such a problem, the electronic control module can shift to a neutral condition and prevent all outputs to the transmission solenoids or prevent the transmission from shifting higher than second gear. You can remove this output lockup by shifting the transmission though the neutral position and by turning the key switch off and on. After you do this, the electronic control module will return to normal operation for a period of time. Another shift change can cause the output lockup to return. If output lockup continues to occur, it is necessary to find and correct the problem.*

1. Check the level, the type, and the grade of oil in the transmission. See Section 1002 for the correct oil.

2. Do the stall tests according to the instructions in Section 2002 to make sure that the problem is in the transmission or the torque converter.

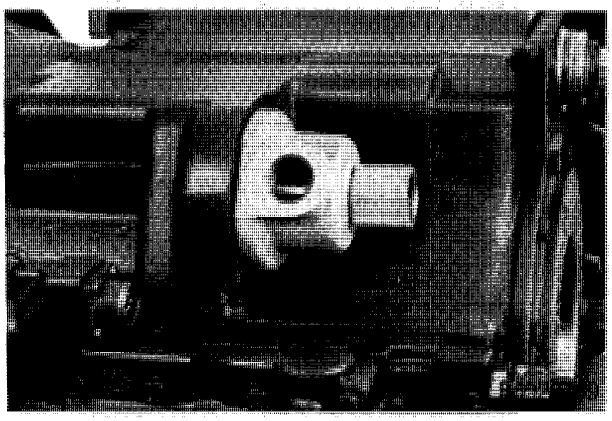
3. If an electrical problem is indicated, see Electrical Troubleshooting in this section to check the electrical system for the transmission.

4. If a hydraulic problem is indicated, see Hydraulic Troubleshooting in this section to check the hydraulic system for the transmission.

FLOWMETER TEST

Test Equipment Required

CAS-1808 Flowmeter Kit; CAS-2011 Flowmeter Adapter



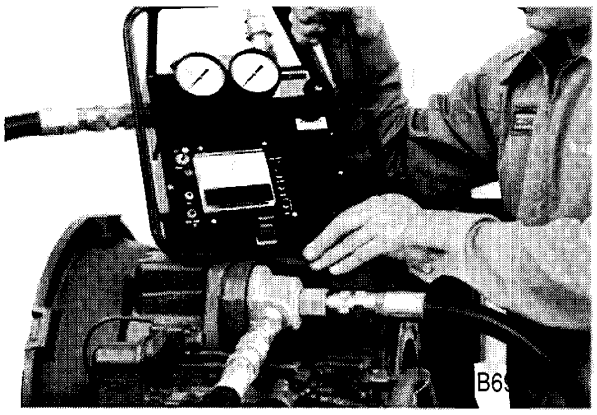
Flowmeter Test Procedure

1. Block the machine tires.
2. Apply the parking brake.
3. Heat the oil to an operating temperature of 176° to 212°F (80° to 100°C).
4. Remove the filter and install the CAS-2011 adapter.
5. Install the flowmeter between the adapter and the filter.
6. While in the cab, put the transmission in NEUTRAL. Run the engine at full throttle. Read and record the flow measurement. The flow must be as follows:

   621/621B - 52 L/min (14 U.S. gpm) @ 2000 rpm

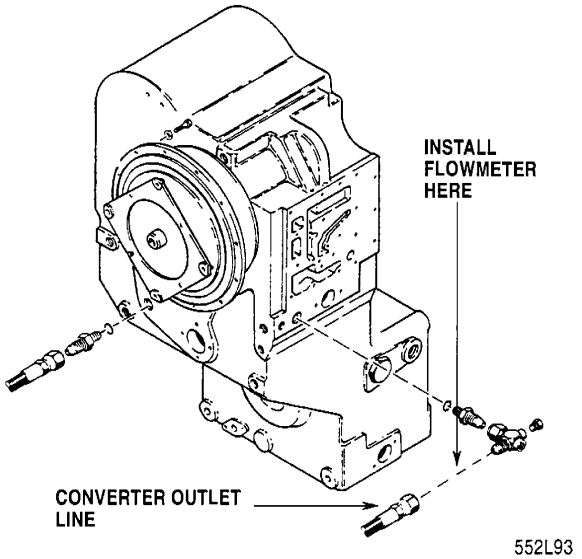
   721/721B - 80 L/min (21 U.S. gpm) @ 2000 rpm

   821/821B - 80 L/min (21 U.S. gpm) @ 2000 rpm

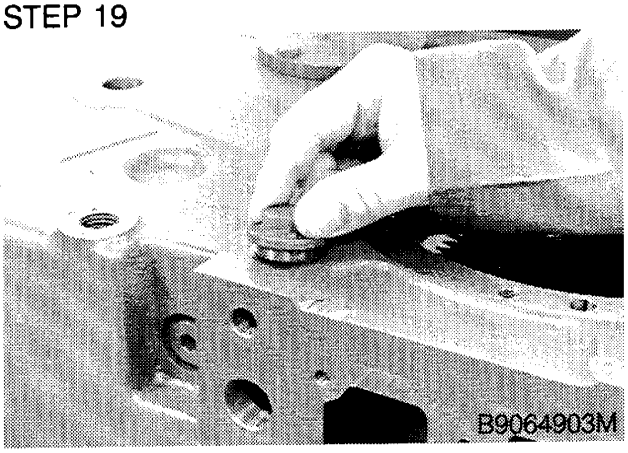


Consumption Test Procedure

1. Block the machine tires.
2. Apply the parking brake.
3. Heat the oil to an operating temperature of 176° to 212°F (80° to 100°C).
4. Install flowmeter to converter outlet line (line to cooler) in series.
5. While in cab, put the transmission in NEUTRAL. Run the engine at full throttle. Read and record the flow. The flow must be within 9.1 L/min (2 U.S. gpm) of the readings from the flowmeter test procedure above.
6. Repeat the procedure with the transmission in FORWARD in third gear. Record the flow measurement. Results must be within 9.1 L/min (2 U.S. gpm) of the readings from the flowmeter test procedure above.
7. Repeat the procedure with the transmission in REVERSE in third gear. Record the flow measurement. Results must be within 9.1 L/min (2 U.S. gpm) of the readings from the flowmeter test procedure above.

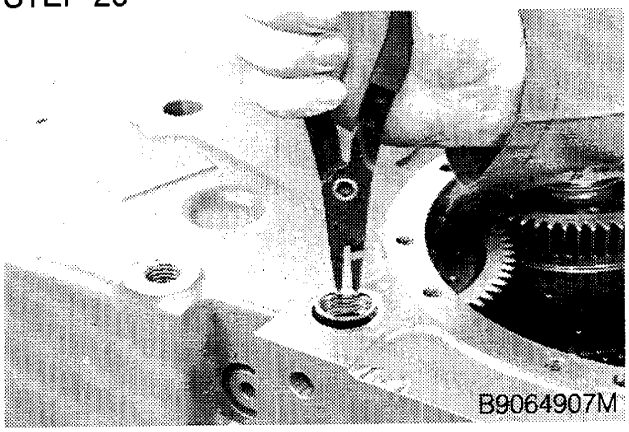


STEP 19



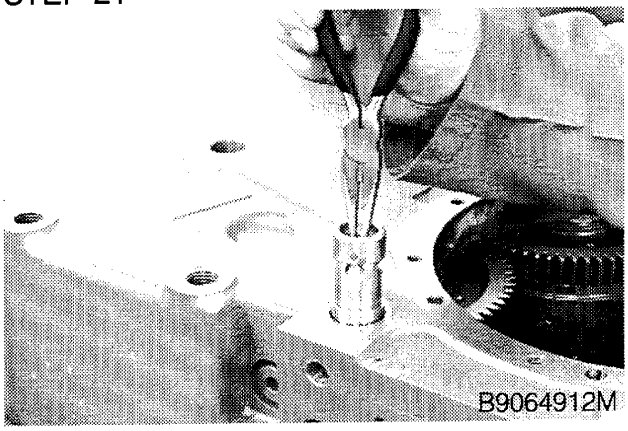
Remove the plug from the transmission housing.

STEP 20



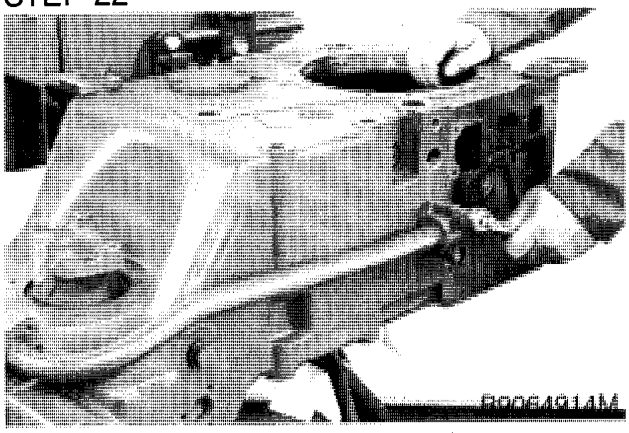
Remove the snap ring that fastens the converter control valve in the transmission housing.

STEP 21



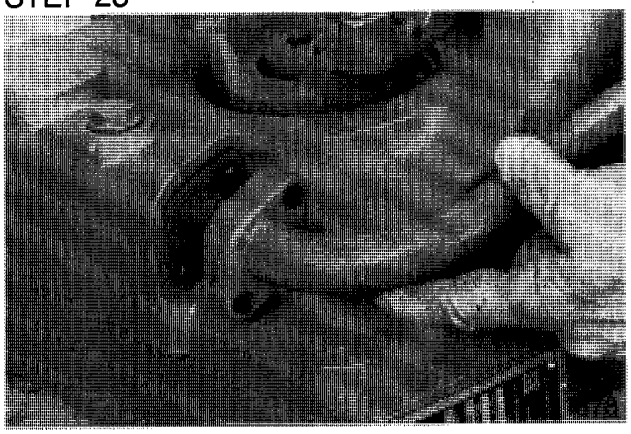
Remove the converter control valve.

STEP 22



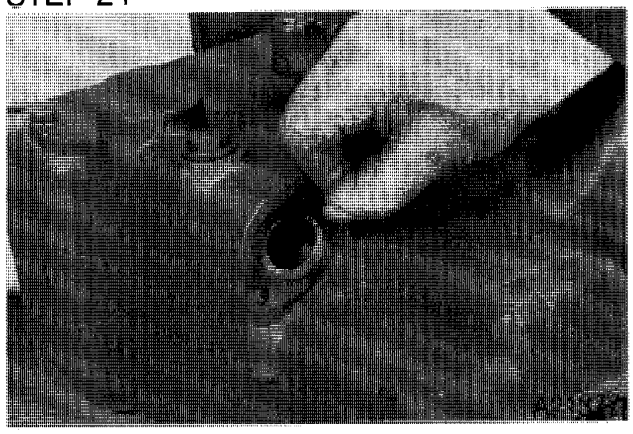
Remove the four cap screws that fasten the suction tube to the transmission housing.

STEP 23



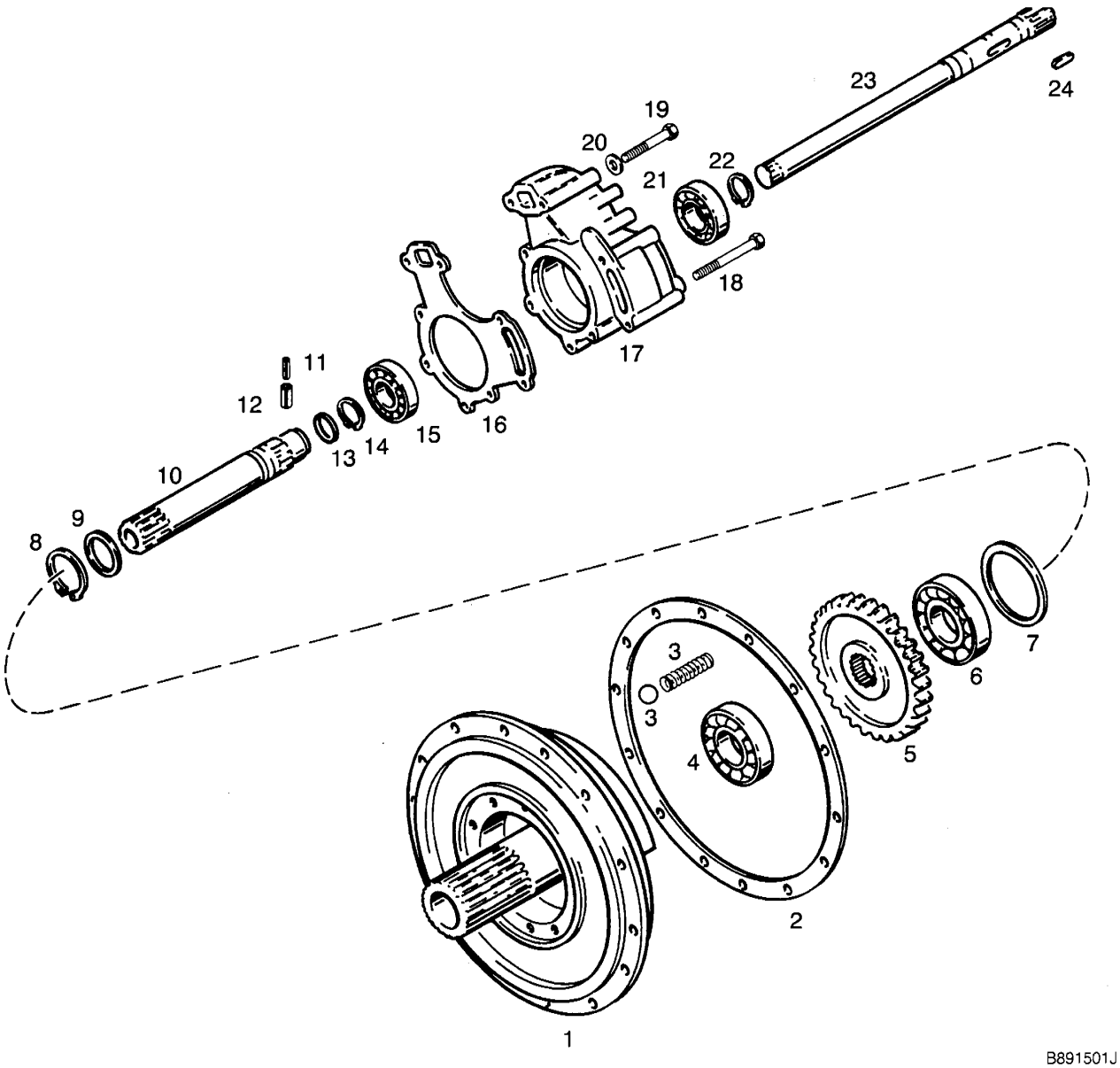
Pull the suction tube out of the transmission housing.

STEP 24



Remove the gasket from housing.

EXPLODED VIEW OF OIL PUMP AND SUPPLY FLANGE

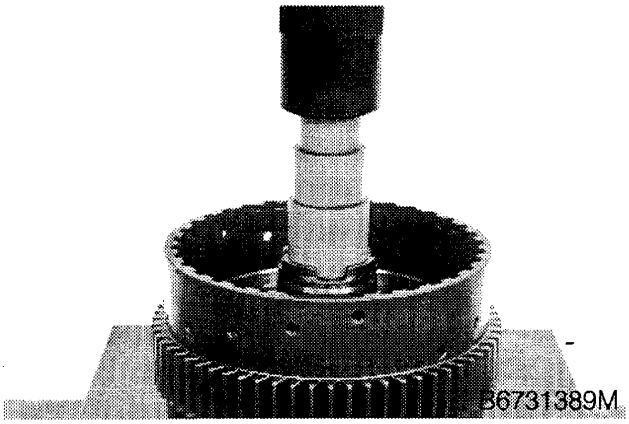


B891501J

1. Supply Flange
2. Gasket
3. Converter Relief Valve
4. Roller Bearing
5. Input Gear
6. Ball Bearing
7. Shim(s)
8. Snap Ring
9. Piston Ring
10. Input Shaft
11. Roll Pin, 1.5 mm OD
12. Roll Pin, 2.5 mm OD
13. Sealing Ring
14. Snap Ring
15. Ball Bearing
16. Gasket
17. Oil Pump
18. Cap Screw, 110 mm Long
19. Cap Screw, 85 mm Long
20. Lock Washer
21. Ball Bearing
22. Snap Ring
23. Pump Shaft
24. Woodruff Key

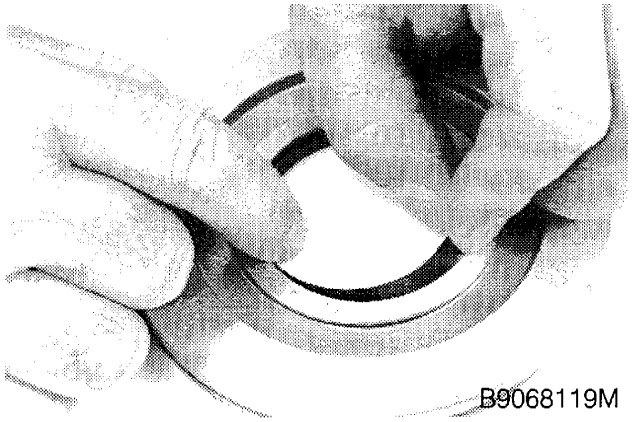
ASSEMBLY OF THE FORWARD AND LOW CLUTCHES

STEP 190



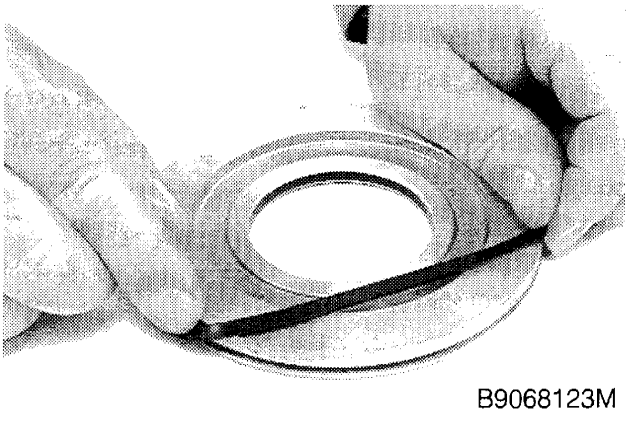
Put the clutch housing in a press. Use CAS-1937A needle bearing replacer to press the needle bearing into the clutch housing until the needle bearing is seated in the bore. Then turn the clutch housing over and repeat this step for the needle bearing in the opposite side.

STEP 191



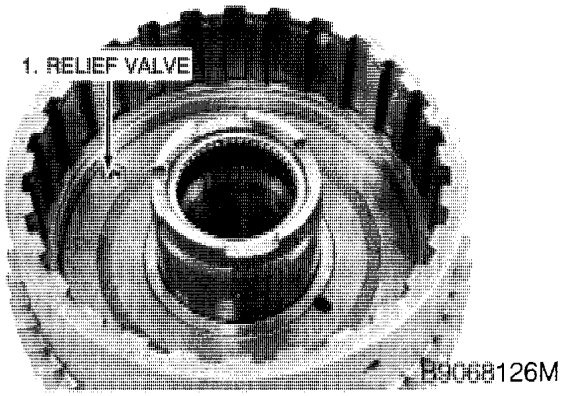
Install a new inner seal on the piston for the forward gear.

STEP 192



Install a new outer seal on the piston for the forward gear.

STEP 193

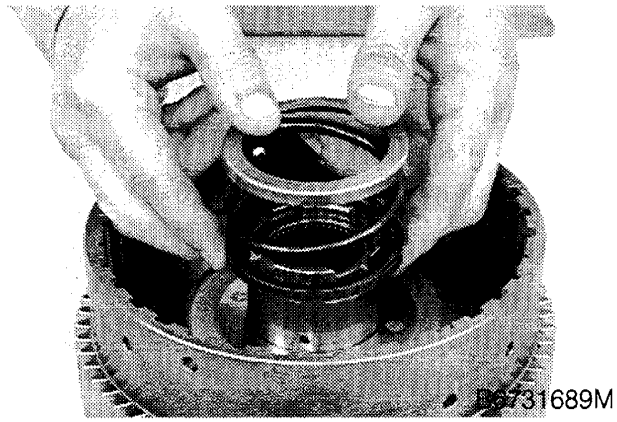


Check to make sure that the relief valve is free of obstruction.

STEP 194

Use the CAS-1933A to install the piston in the clutch housing.

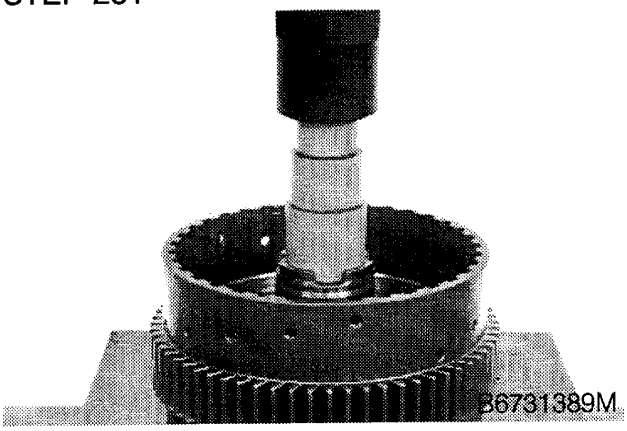
STEP 195



Install the lower spring guide, the spring, and the upper spring guide.

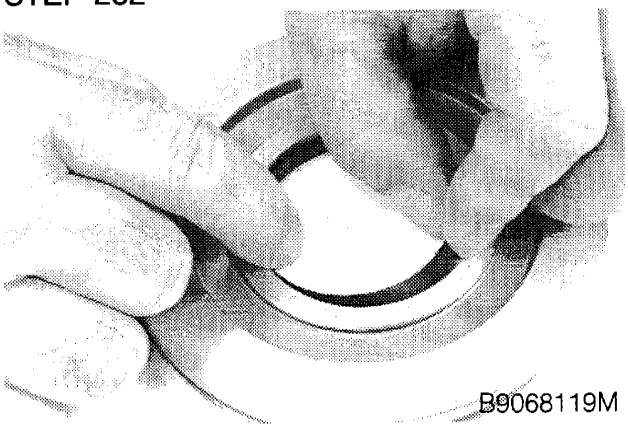
ASSEMBLY OF THE REVERSE AND SECOND CLUTCHES

STEP 281



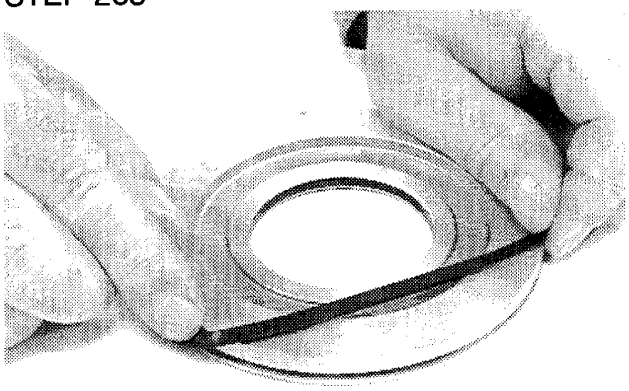
Put the clutch assembly in a press. Use CAS-1937A needle bearing replacer to press the needle bearing into the clutch assembly until the needle bearing is seated in the bore. Then turn the clutch assembly over and repeat this step for the needle bearing in the opposite side.

STEP 282



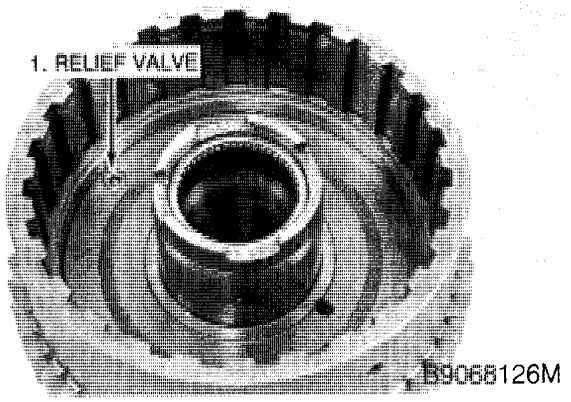
Install a new inner seal on the piston for the reverse gear.

STEP 283



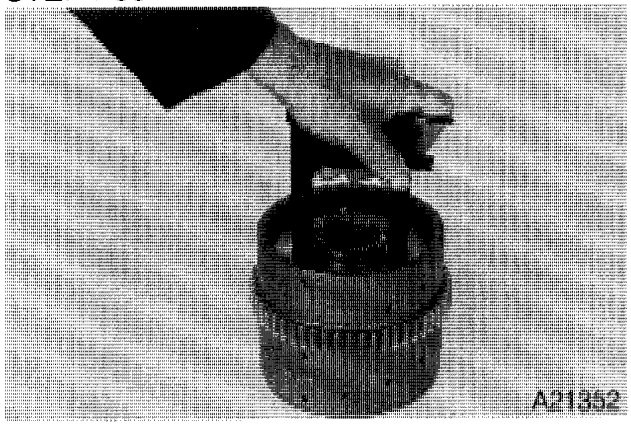
Install a new outer seal on the piston for the reverse gear.

STEP 284



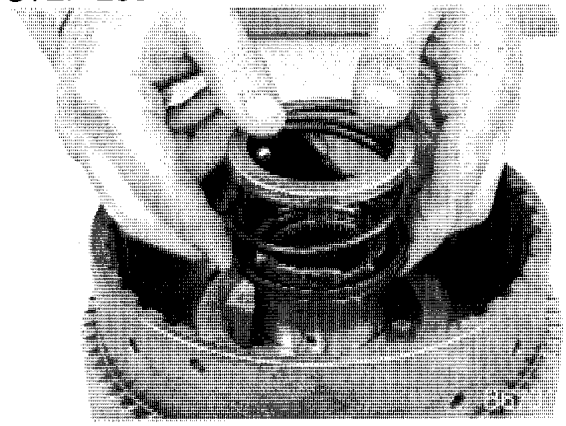
Check to make sure that the relief valve is free of obstruction.

STEP 285



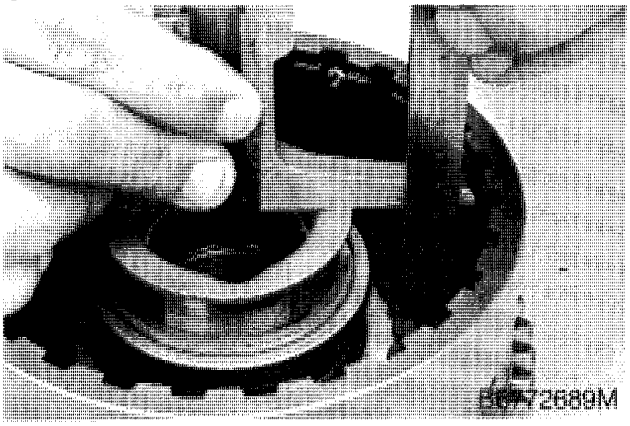
Use the CAS-1933A to install the piston in the clutch housing.

STEP 286



Install the lower spring guide, the spring, and the upper spring guide.

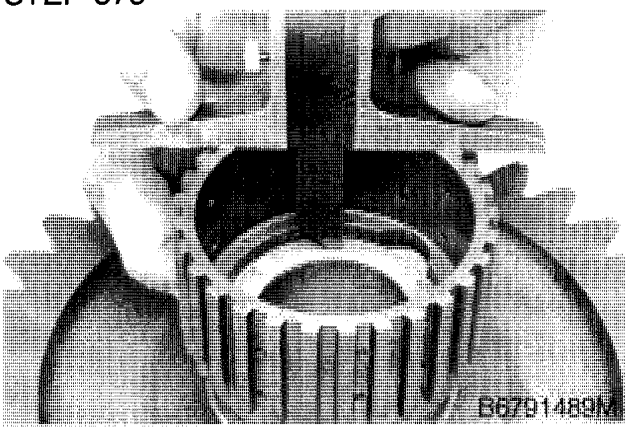
STEP 378



Use the CAS-1938 depth gauge to measure the distance from the thrust plate to the metal disc. Then remove the thrust plate.

Example: Dimension A = 1.74 inches (44.3 mm)

STEP 379



Apply grease to the plastic thrust washer to hold the plastic thrust washer in position. Install the plastic thrust washer in the third gear. Use the CAS-1938 depth gauge to measure the distance from the face of the third gear to the plastic thrust washer.

Example: Dimension B = 1.85 inches (47.0 mm)

STEP 380

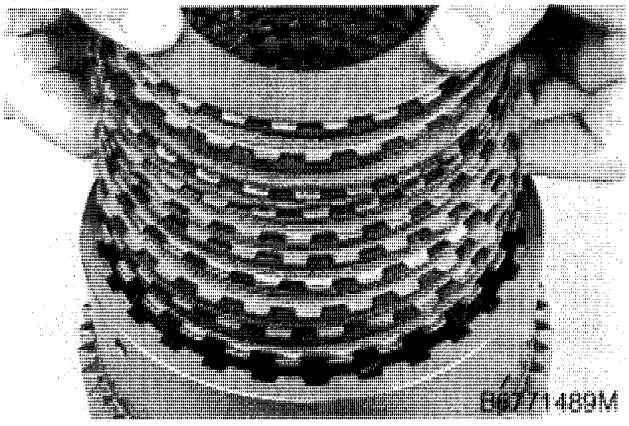
Subtract the figure determined in Step 378 from the figure determined in Step 379.

Example: Dimension B 1.85 inches (47.0 mm)
Dimension A -1.74 inches (44.3 mm)
Dimension C 0.11 inch (2.7 mm)

If the clearance of the vented clutch (Dimension C) is smaller than 0.098 inch (2.5 mm), a second friction disc (external tooth) can be inserted on the piston side. The additional thickness must be corrected by using thinner metal discs away from the piston.

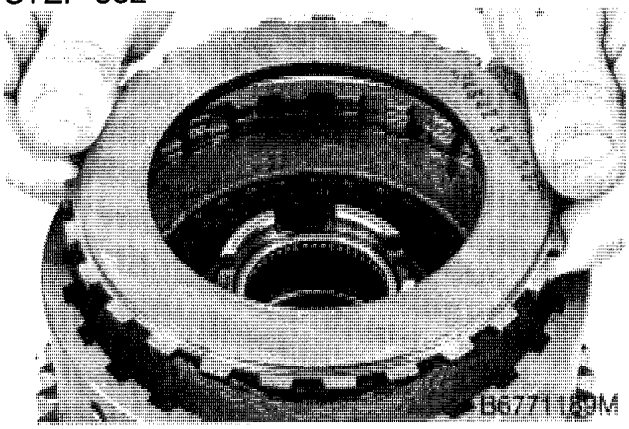
NOTE: *The discs must be soaked in transmission fluid prior to assembly.*

STEP 381



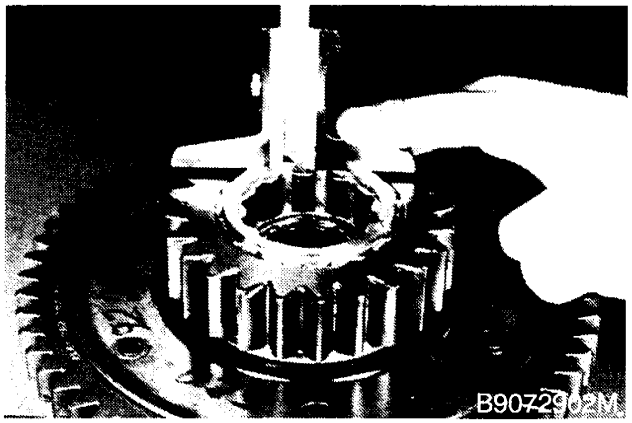
Install the remaining friction discs and metal discs in alternating sequence. Refer to Table 1 on page 59 for the correct number of plates required in each clutch assembly. Make sure that the last disc is a friction disc.

STEP 382



Install the pressure plate.

STEP 481



Use the CAS-1938 depth gauge to measure the distance from the face of the bearing cage in the second gear to the face of the rollers in the bearing cage.

Example: Dimension D = 0.10 inch (2.6 mm).

STEP 482

Subtract the figure determined in Step 479 from the figure determined in Step 478 and subtract the figure determined in Step 481 from the figure determined in step 480. Then subtract the result of dimension C - dimension D from the result of dimension A - dimension B.

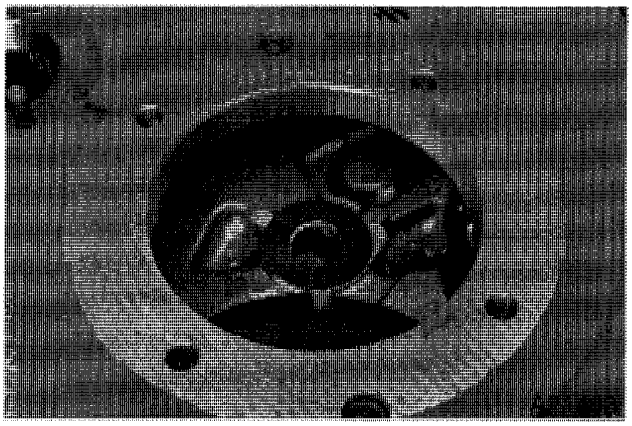
Example: Dimension A 9.37 inches (237.9 mm)
Dimension B -1.06 inches (26.8 mm)
8.31 inches (211.1 mm)

Dimension C 8.34 inches (211.9 mm)
Dimension D -0.10 inch (2.6 mm)
8.24 inches (209.3 mm)

Dimension A-B 8.31 inches (211.1 mm)
Dimension C-D -8.24 inches (209.3 mm)
Measured End Play 0.07 inch (1.8 mm)

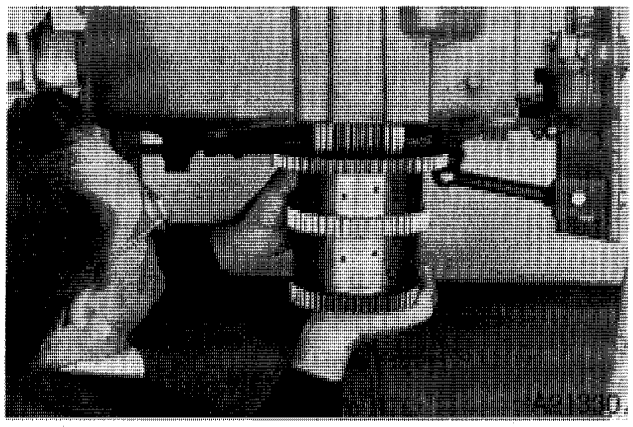
The required end play is 0.004 to 0.012 inch (0.1 to 0.3 mm). If the measured end play is not correct, use a shim(s) of the necessary thickness to correct the end play. In this example, a shim of 0.06 inch (1.6 mm) will give the correct end play.

STEP 483



Remove the slotted thrust washer and the plastic thrust washer from the transmission housing.

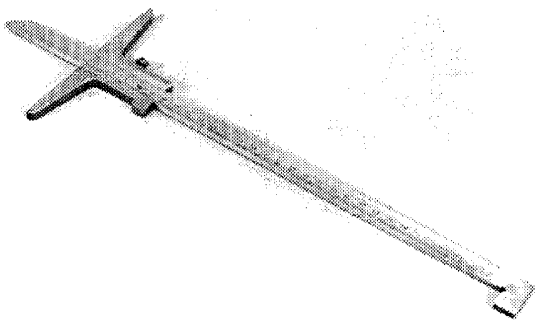
STEP 484



Install the tab washer in the reverse gear and lift the reverse and second gear clutch assembly into the transmission housing.

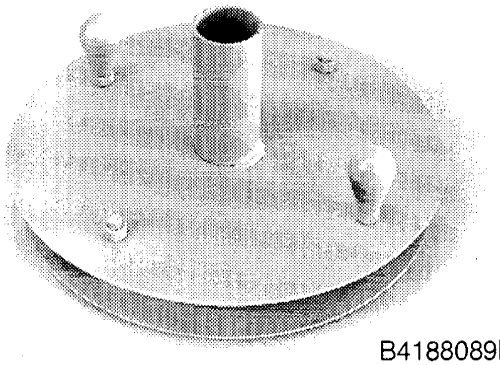
STEP 485

Move the clutch assembly into position and insert the CAS-1939 clutch pack alignment tool to align the parts of the clutch assembly.



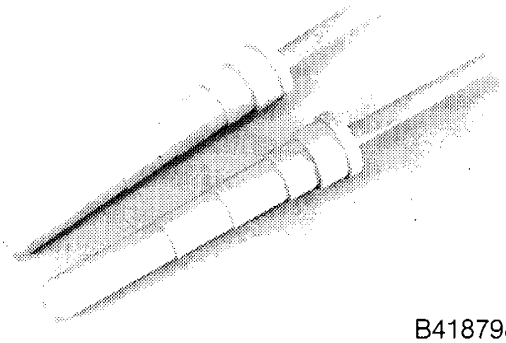
B4188589M

CAS-1938 Caliper



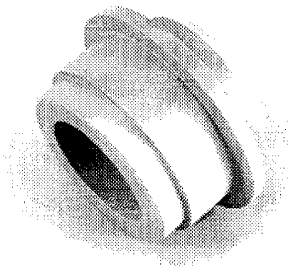
B4188089M

CAS-1941 Preheat Sleeve



B4187989M

CAS-1939 Clutch Pack Alignment Tool

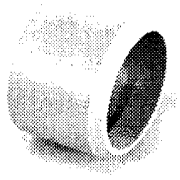


B4187789M

CAS-1942 Bearing and Seal Replacer

B4187689M

CAS-1940 Cup Plug Replacer

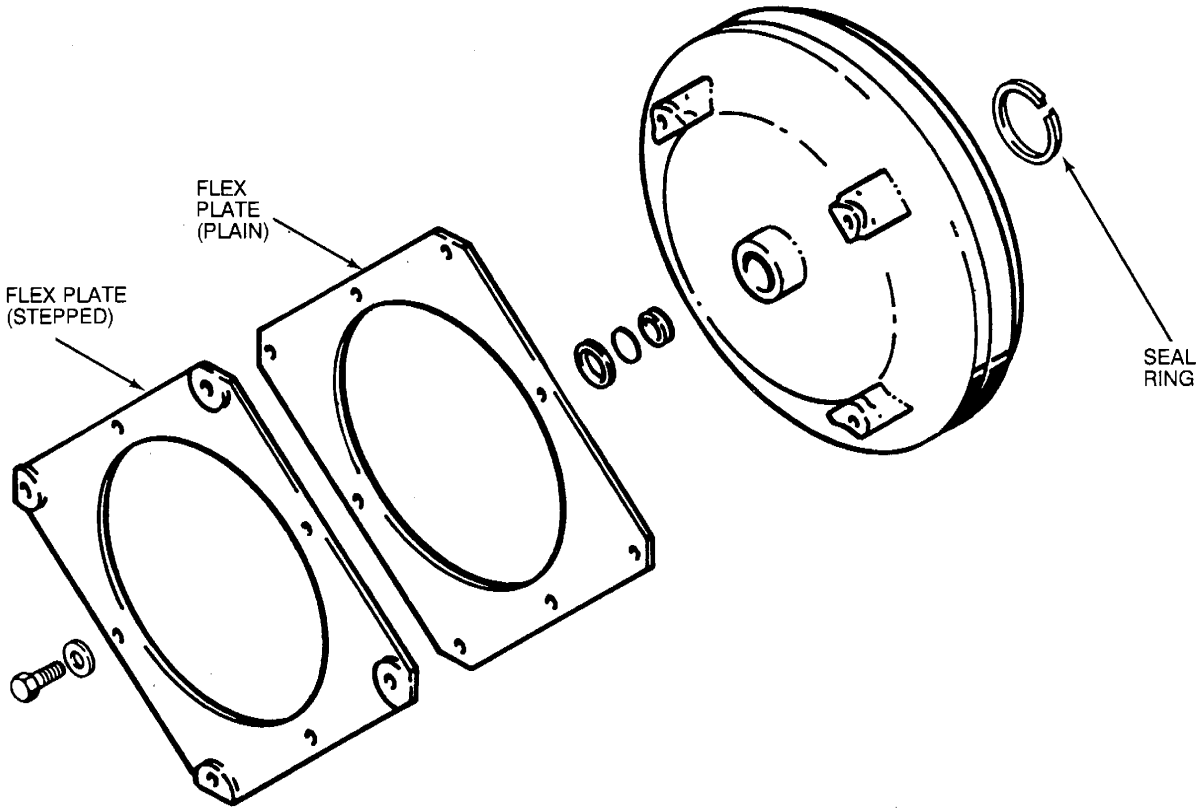


B4187889M

CAS-1943 Seal Replacer

INSPECTION OF THE TORQUE CONVERTER

The torque converter is a sealed unit. Except for the flex plates, ring and O-ring on the plug, there is no inspection to be done of the torque converter. If the torque converter is not operating correctly, it must be replaced.



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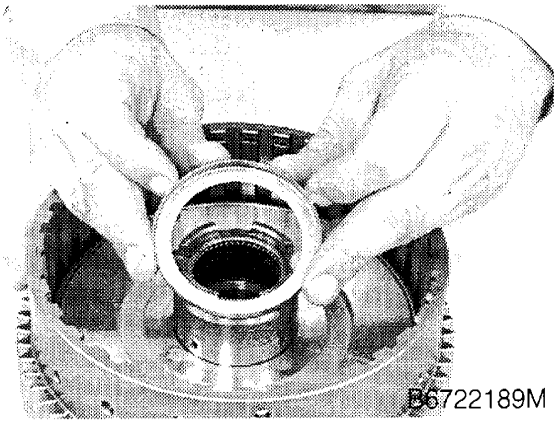
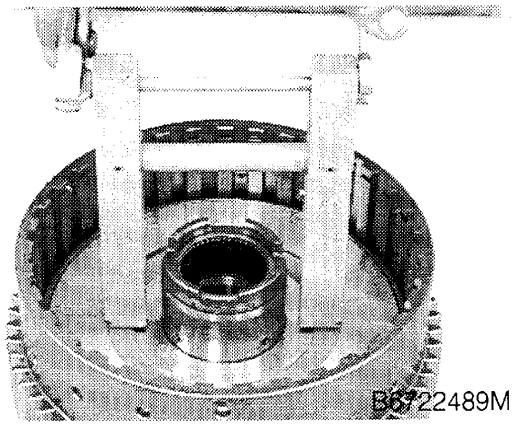
STEP 155



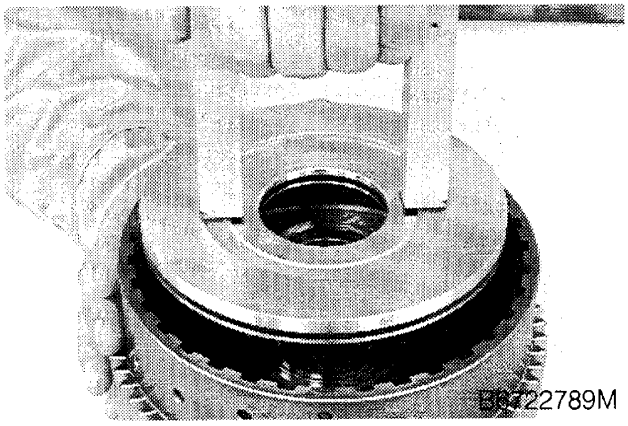
Remove the lower spring guide.

STEP 156



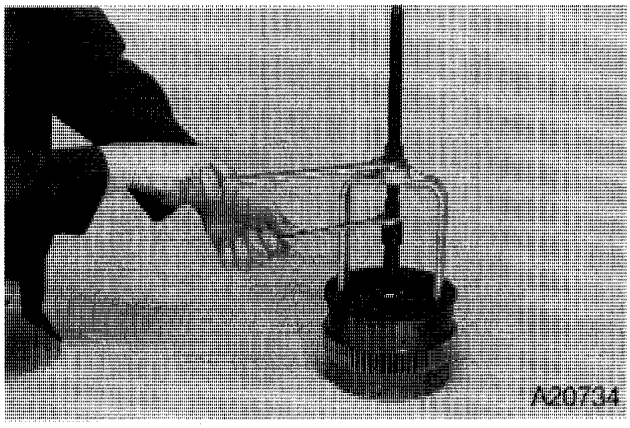
Install the piston puller CAS-1933A as shown.

STEP 157



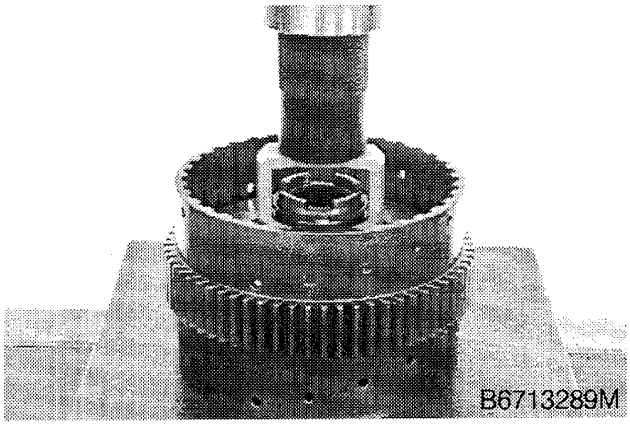
Use the piston puller CAS-1933A and remove the piston.

STEP 158



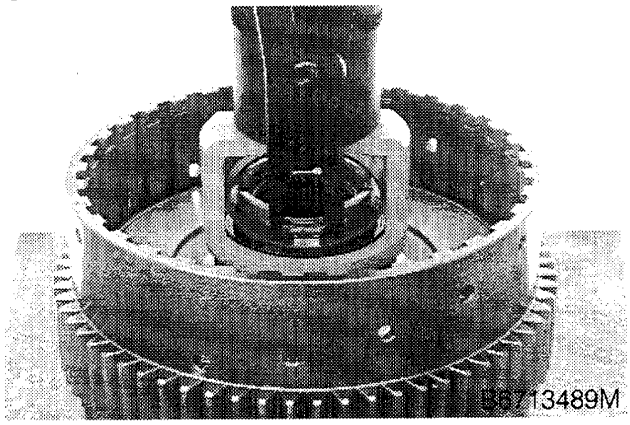
Use the puller set CAS-1934A and remove the needle bearing from the clutch housing.

STEP 159



Turn the clutch housing over. Place the clutch housing in a press with preload compressor CAS-1932.

STEP 160

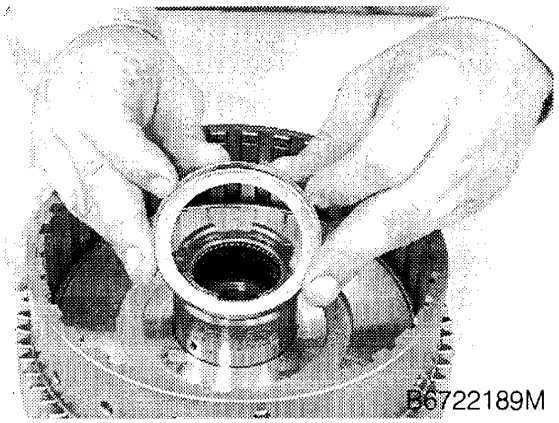


Slowly apply pressure until the snap ring can be removed.

STEP 250

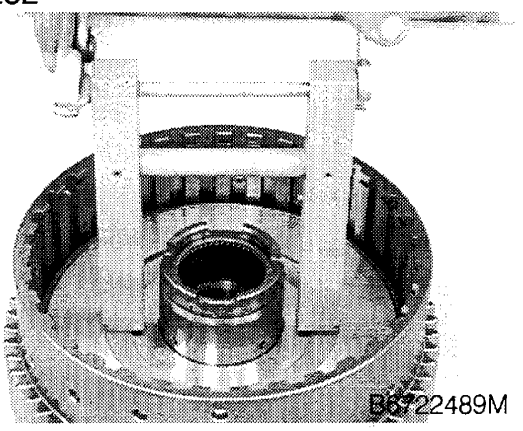
Remove the spring.

STEP 251



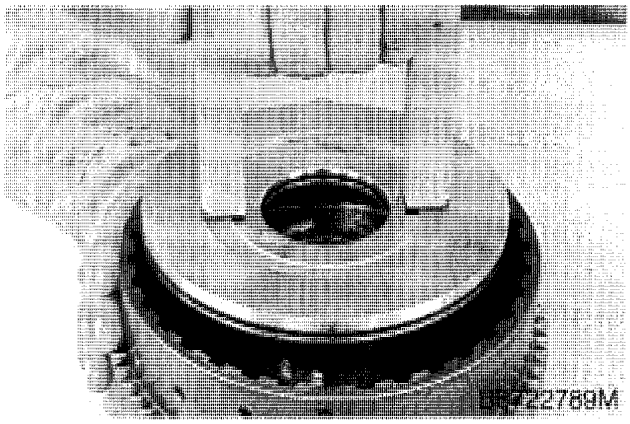
Remove the lower spring guide.

STEP 252



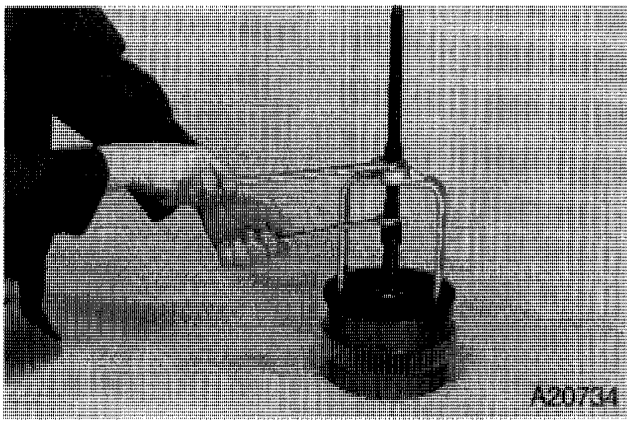
Install the piston puller CAS-1933A as shown.

STEP 253



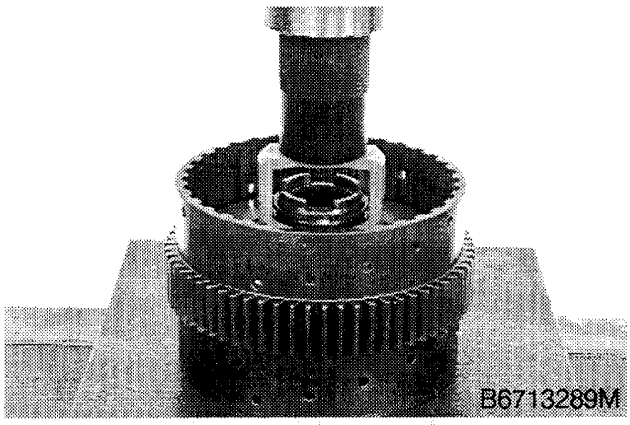
Use the piston puller CAS-1933 and remove the piston.

STEP 254



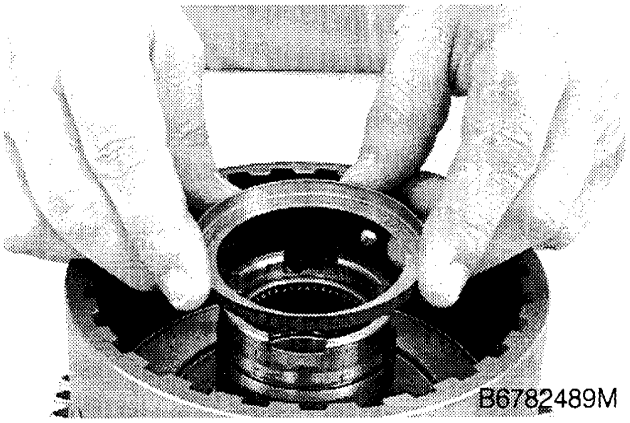
Use the puller set CAS-1934A and remove the needle bearing from the clutch housing.

STEP 255



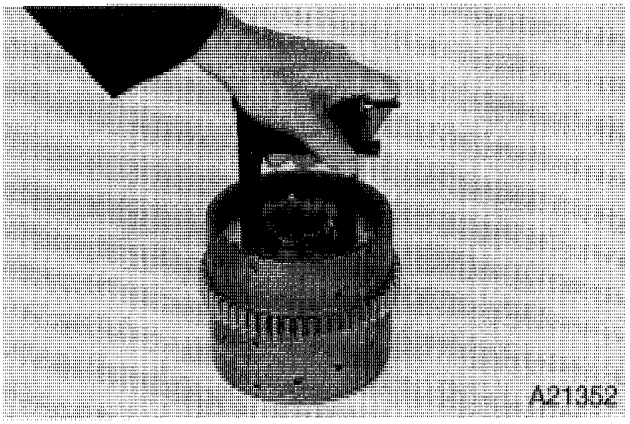
Turn the clutch assembly over. Place the clutch assembly in a press with preload compressor CAS-1932.

STEP 344



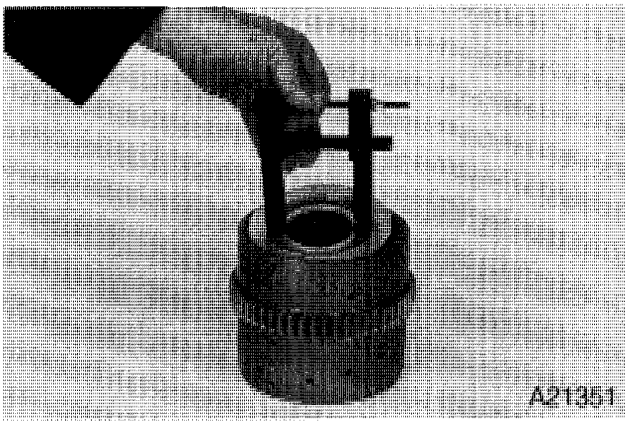
Remove the lower spring guide.

STEP 345



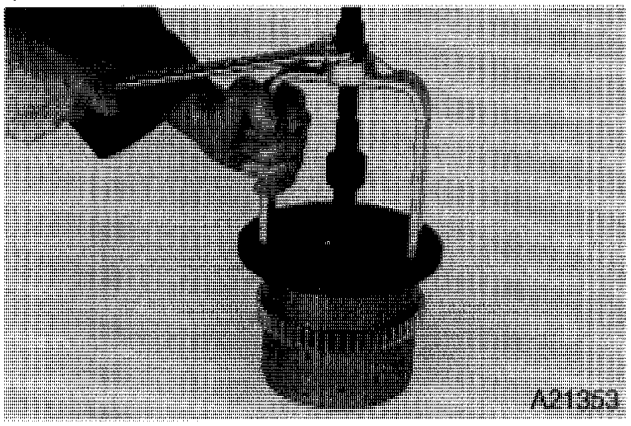
Install the piston puller CAS-1933A as shown.

STEP 346



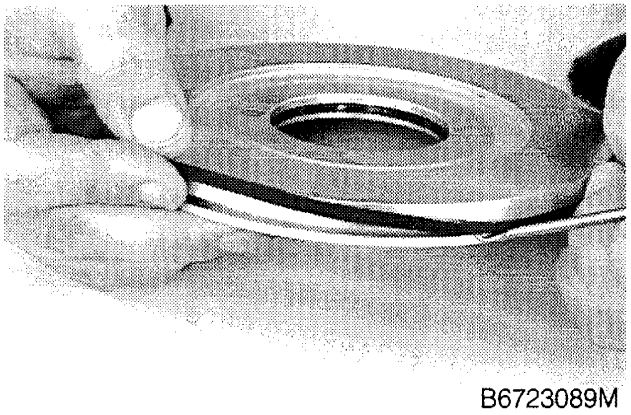
Use the piston puller CAS-1933A and remove the piston.

STEP 347



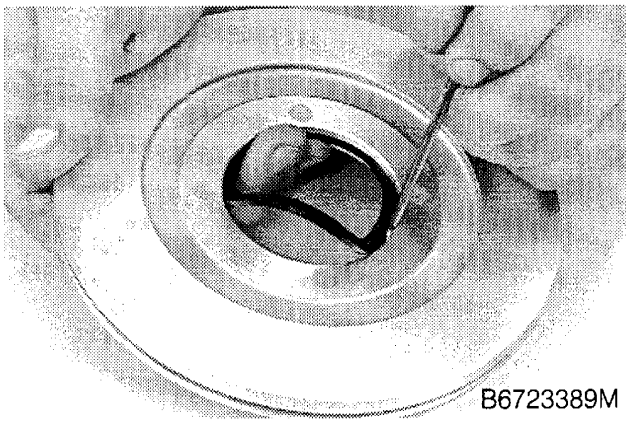
Use the puller set CAS-1934A and remove the needle bearing from the clutch housing.

STEP 348



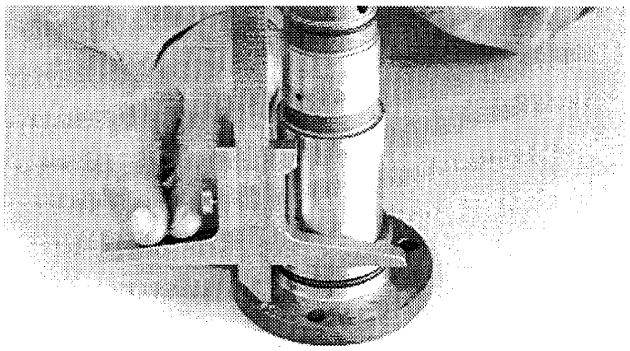
Remove the outer seal from both the pistons.

STEP 349



Remove the inner seal from both the pistons.

STEP 441

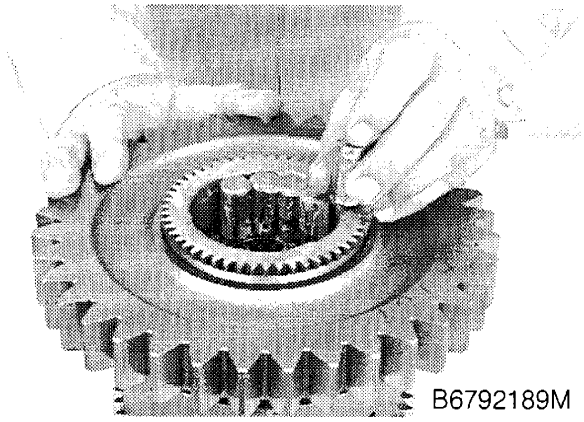


B6843489M

Use caliper CAS-1938 and measure the distance from the contact surface of the rollers to the flange face.

Example: Dimension B = 0.82 inch (20.8 mm).

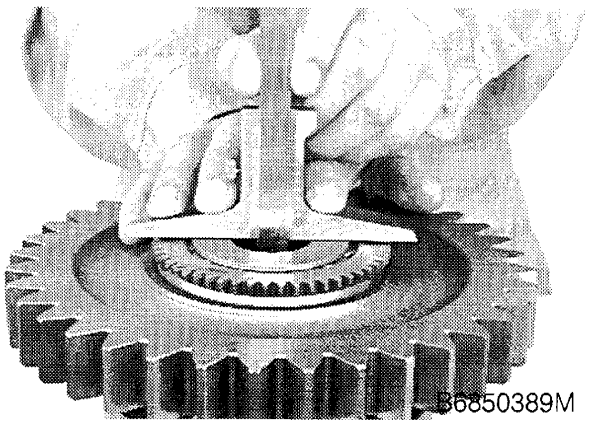
STEP 442



B6792189M

Apply grease to the rollers and install the rollers in the third gear.

STEP 443



B6850389M

Install a spacer over the rollers. Use caliper CAS-1938 and measure the distance from the face of the spacer to the contact surface of the fourth gear. Subtract the thickness of the spacer for dimension C.

Example:	Measurement	8.90 inches	226.1 mm
	Spacer	– 0.05 inches	1.3 mm
	Dimension C	8.85 inches	224.8 mm

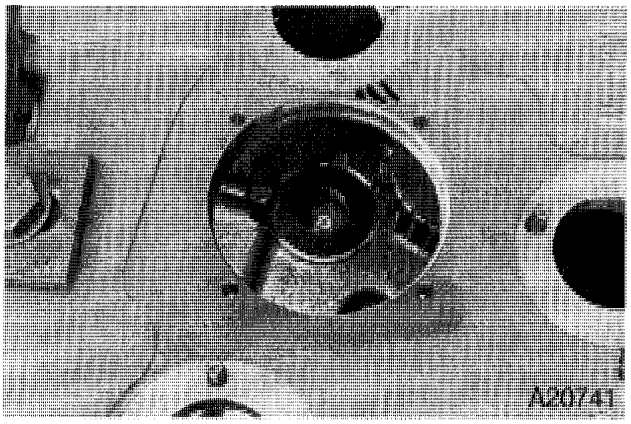
STEP 444

Determine shim size by subtracting the figure determined in step 441 from the figure determined in step 440 and then subtracting the figure determined in step 443 from the result.

Example:	Dimension A	9.78 inches	248.4 mm
	Dimension B	– 0.82 inches	20.8 mm
		8.96 inches	227.6 mm
	Dimension C	– 8.85 inches	224.8 mm
		0.11 inches	2.8 mm

In order to get the required end play of 0.004 to 0.012 inch (0.1 to 0.3 mm), a shim of 0.11 inch (2.8 mm) must be used.

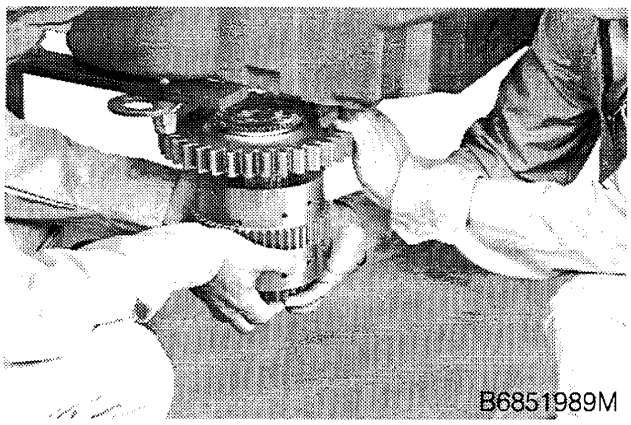
STEP 445



A20741

Remove the slotted and plastic thrust washers.

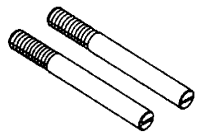
STEP 446



B6851989M

Lift the fourth and third gear clutch assembly into the housing and move it into position.

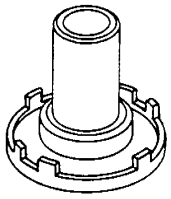
SPECIAL TOOLS



CAS-2285
CAS-2286

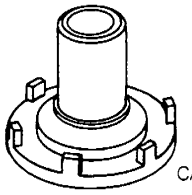
PLANETARY GUIDE STUDS CAS-2285 (411 AXLE) FIRST USED IN STEP 1

PLANETARY GUIDE STUDS CAS-2286 (407 AND 409 AXLE) FIRST USED IN STEP 1



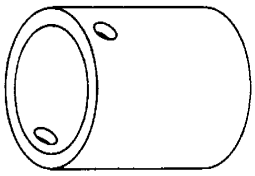
CAS-2283

PLANETARY HUB NUT WRENCH CAS-2283 (411 AXLE) FIRST USED IN STEP 9



CAS-2279

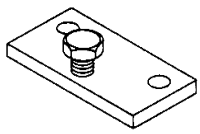
PLANETARY HUB NUT WRENCH CAS-2279 (407 AND 409 AXLE) FIRST USED IN STEP 9



CAS-2280
CAS-2295

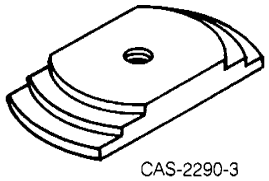
AXLE HOUSING THREAD PROTECTOR CAS-2280, (407 and 409 AXLE) FIRST USED IN STEP 10

AXLE HOUSING THREAD PROTECTOR CAS-2295 (411 AXLE) FIRST USED IN STEP 10



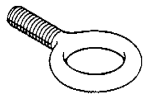
CAS-2203

8LANETARY CARRIER RETAINING PLATE CAS-2203, FIRST USED IN STEP 11



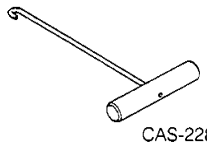
CAS-2290-3

PLANETARY CARRIER LIFTING PLATE CAS-2290-3, FIRST USED IN STEP 15



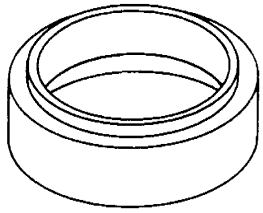
CAS-2290-5

EYEBOLT CAS-2290-5, FIRST USED IN STEP 15



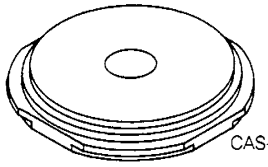
CAS-2281

BRAKE SPRING HOOK CAS-2281, FIRST USED IN STEP 20



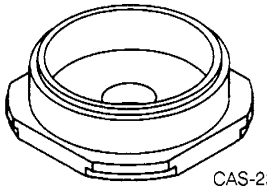
CAS-2296

PLANETARY CARRIER BEARING CONE INSTALLER CAS-2296, FIRST USED IN STEP 24



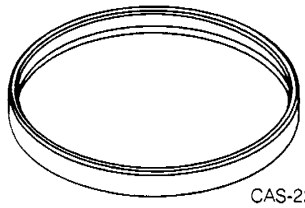
CAS-2300-1

PLANETARY HUB BEARING CUP INSTALLER CAS-2300-1, FIRST USED IN STEP 25



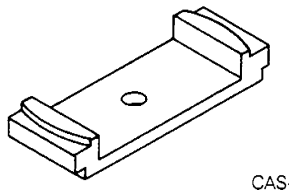
CAS-2300-2

PLANETARY HUB BEARING INSTALLER CAS-2300-2, FIRST USED IN STEP 25



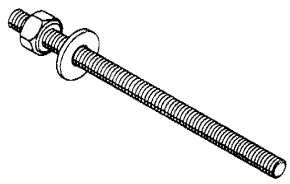
CAS-2290-1

BRAKE PISTON COMPRESSOR RING CAS-2290-1, FIRST USED IN STEP 27



CAS-2290-2

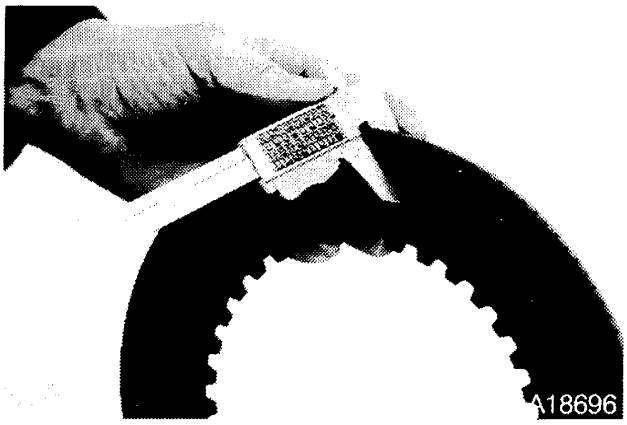
BRAKE PISTON PRESS PLATE CAS-2290-2, FIRST USED IN STEP 27



CAS-2290-4

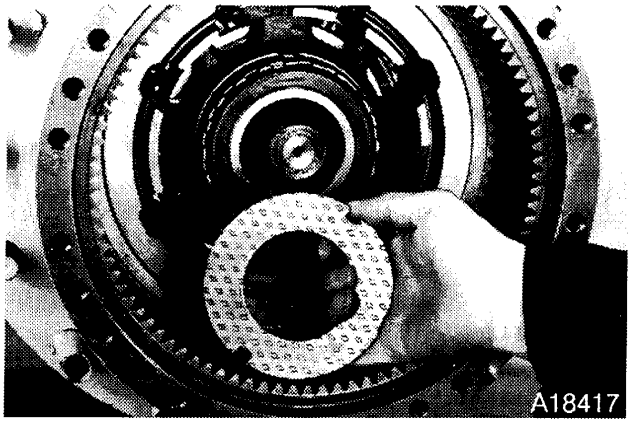
BRAKE FORCING ROD CAS-2290-4, FIRST USED IN STEP 27

STEP 75



Measure the friction discs. Replace the disc/discs if the thickness is 3.5 mm or smaller.

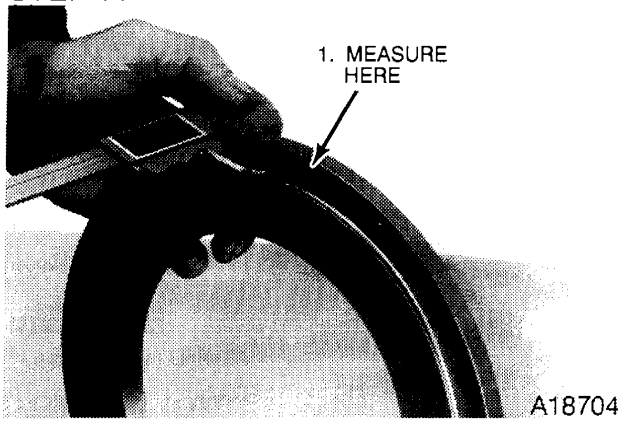
STEP 76



Install the thrust washer. 407 and 409 axle shown.

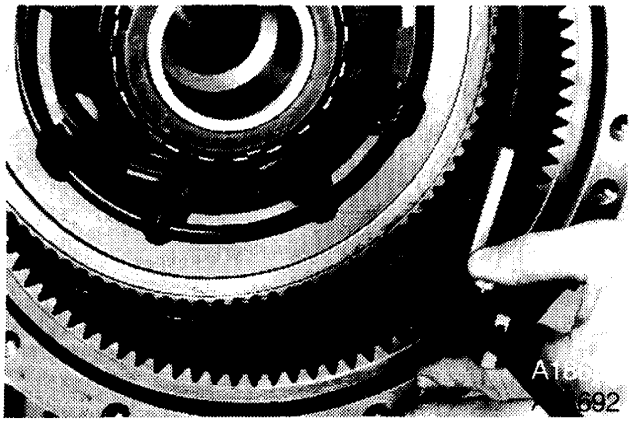
Brake Disc Clearance Procedure

STEP 77



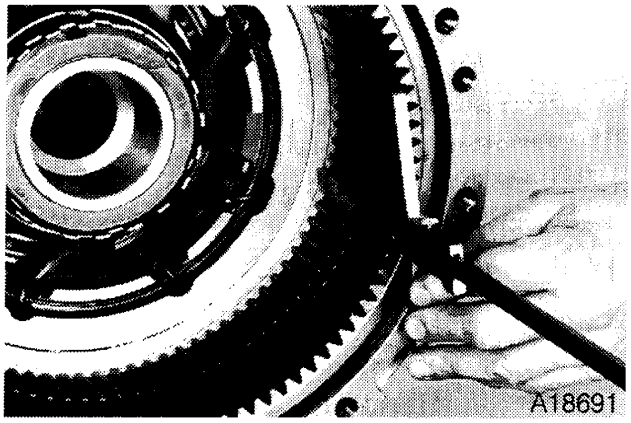
Measure the thickness of all brake discs and backing plate. Add all the dimensions together. Example: 43.5 mm. Measure the recessed portion of the backing plate.

STEP 78



Measure from the hub end to the inner surface of the brake disc snap ring installed in the carrier. Example: 75.2 mm.

STEP 79



Measure from the hub end to the face of the brake piston. Example: 121.5 mm.

Subtract the two dimensions, 75.2 mm and 43.5 mm from 121.5 mm.

Example:
121.5 mm
-75.2 mm
-43.5 mm
2.8 mm Disc Clearance

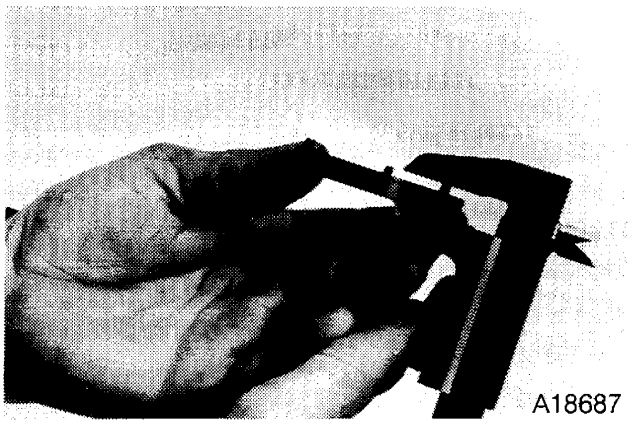
Piston stroke/disc clearance must be 2.4 to 2.8 mm. Adjust stroke/clearance with steel discs. Sizes available are 4.0 or 4.5 mm. Install the thinner discs at the piston and backing plate first. If necessary, then add to inner positions.

PINION SHAFT BEARING PRELOAD PROCEDURE

STEP 156

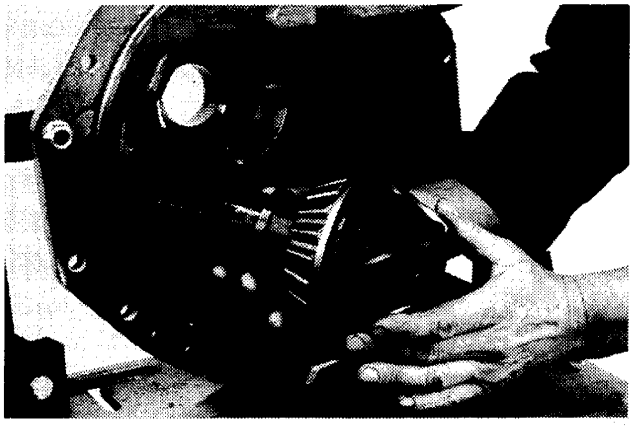
Bearing cups with shim under inner cut must be installed in carrier.

STEP 157



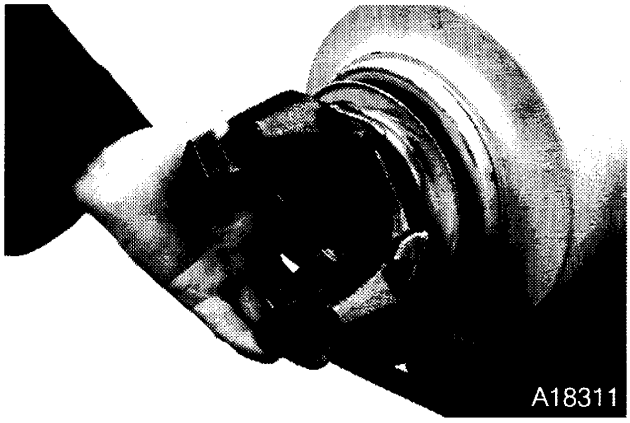
Adjust spring pins in Adjusting Ring CAS-2301 for the 407 and 409 axles or CAS-2302 for the 411 axle so the overall width is 10 mm.

STEP 158



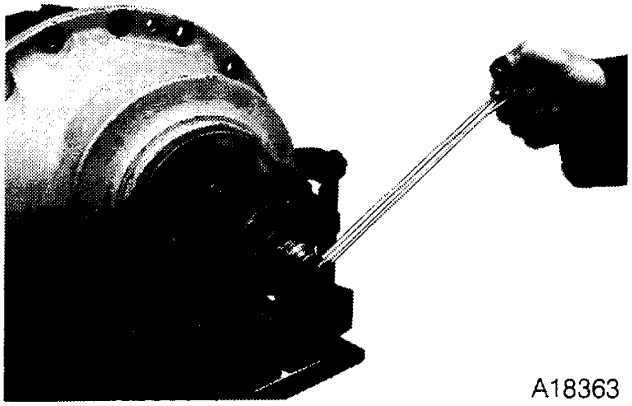
Install the adjusting ring on the pinion shaft. Install the pinion shaft into the carrier.

STEP 159



Install the outer bearing and yoke.

STEP 160



Tighten the retaining nut until the rolling resistance is 1.1 to 2.3 Nm for the 407 and 409 axles. The 411 front axle rolling torque must be 1.5 to 3.0 Nm.

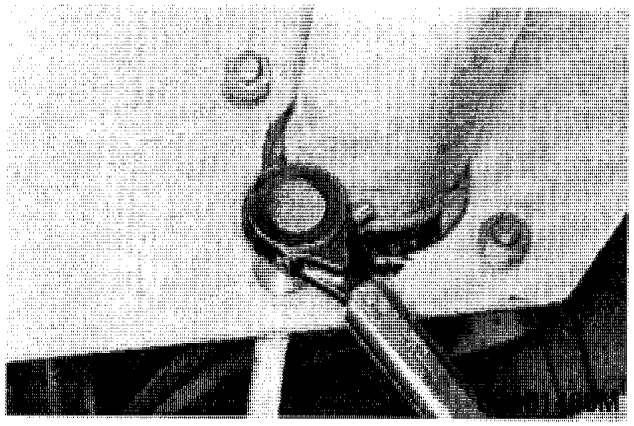
STEP 161

Remove the yoke and outer bearing. Remove the adjusting ring and measure the width over the ring and spring ring. This dimension is the size spacer ring needed.

Adjusting ring sizes available are:

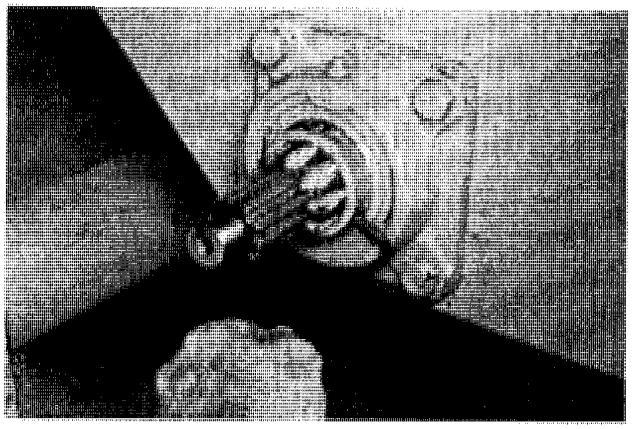
mm	mm
8.3	8.9
8.4	9.1
8.5	9.2
8.6	9.3
8.7	9.4
8.8	

STEP 41



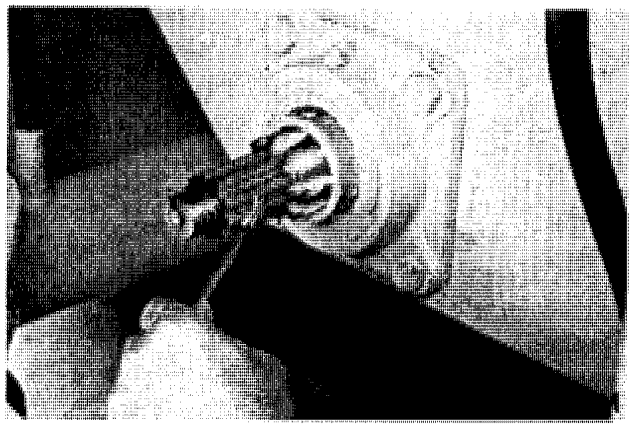
Tighten the nuts or bolts to 110 to 132 pound-feet (149 to 179 Nm).

STEP 42



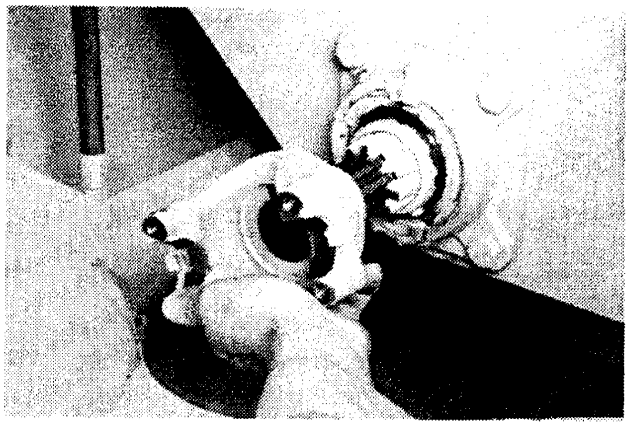
Tighten the Allen screws in the inner race. If a replacement center bearing has been installed, tighten the Allen screw in the locking collar.

STEP 43



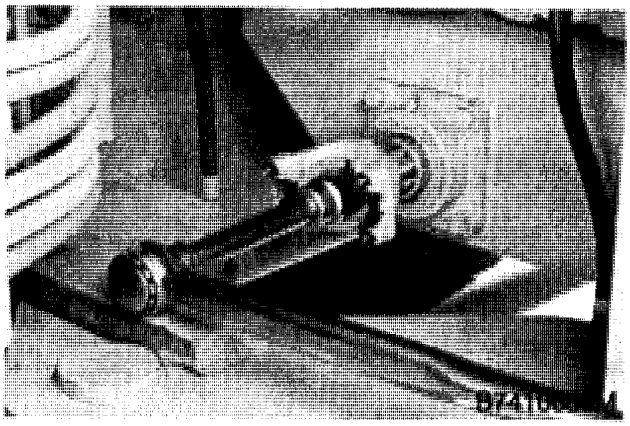
Apply antiseize compound to the splines.

STEP 44



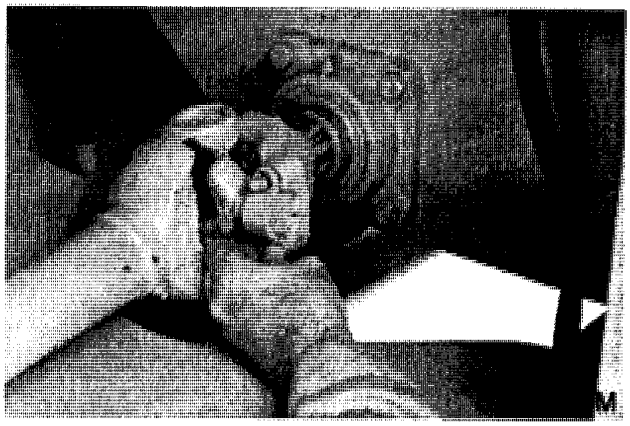
Install the yoke so that the alignment marks are aligned. Make sure this yoke is parallel to the yoke at the other end of the front drive shaft.

STEP 45



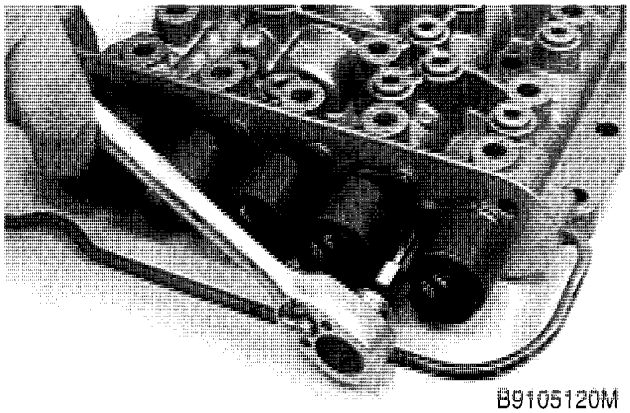
Install and tighten the self-locking nut to 400 to 450 pound-feet (543 to 610 Nm).

STEP 46



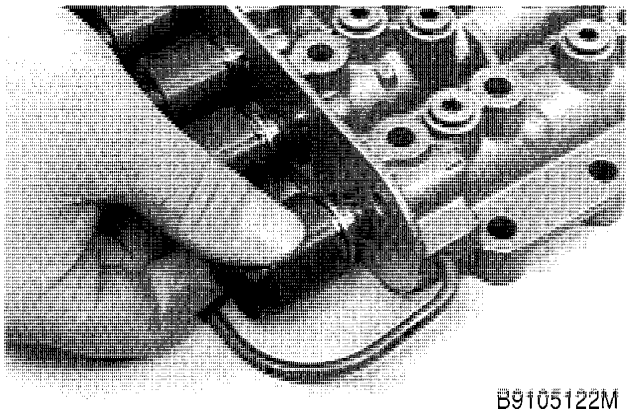
Engage the universal joint with the yoke and install the clamps and Ferry head screws.

STEP 7



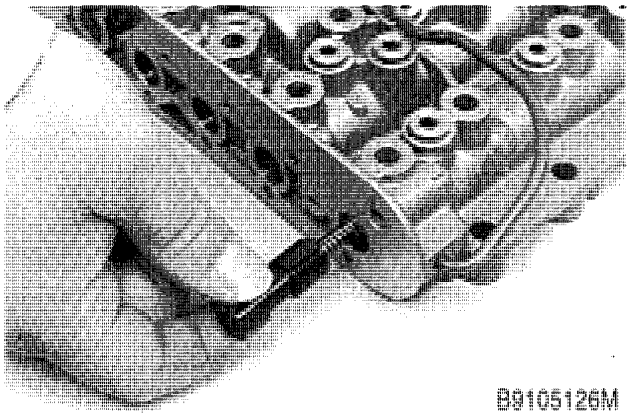
Remove the Allen head screws, the support plates, and the flat washers which fasten the solenoid valves to the body.

STEP 8



Remove the solenoid valves.

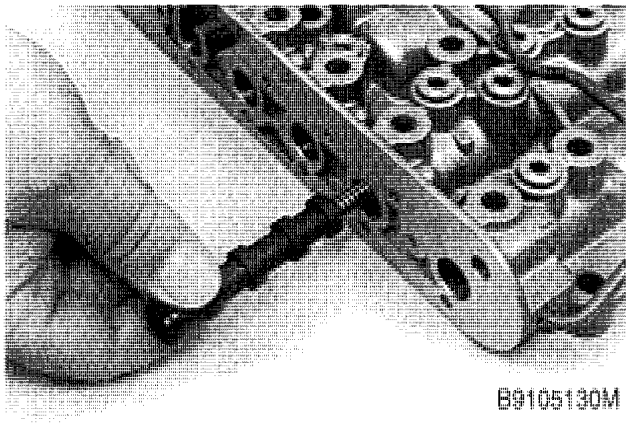
STEP 9



Remove the spool and spring from the number one bore.

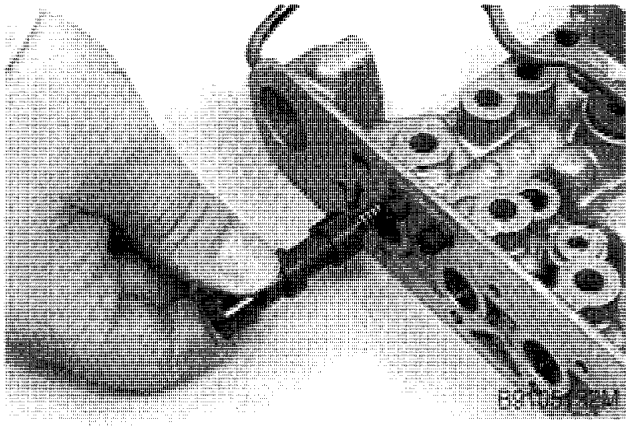
NOTE: *Use identification tags or marks as necessary on each spool, spring, and bore so that the parts can be assembled correctly later.*

STEP 10



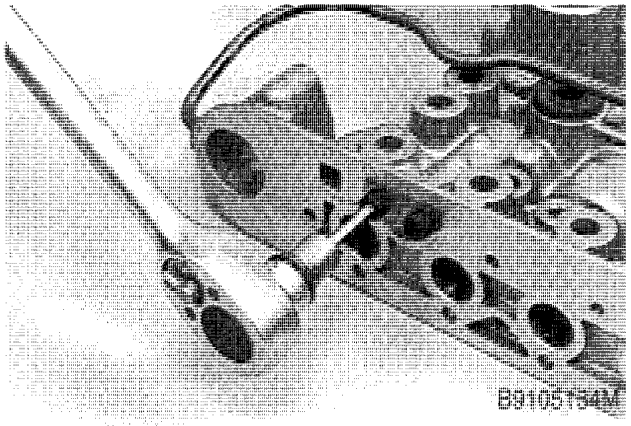
Remove the spool and spring from the number two bore.

STEP 11



Remove the spool and spring from the number five bore.

STEP 12

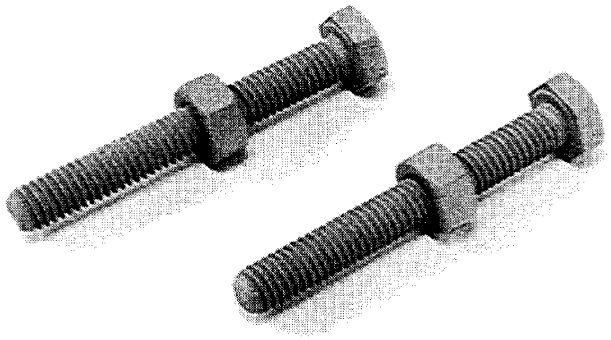


Remove the Allen head screws which fasten the keeper.

TABLE OF CONTENTS

SPECIAL TOOLS

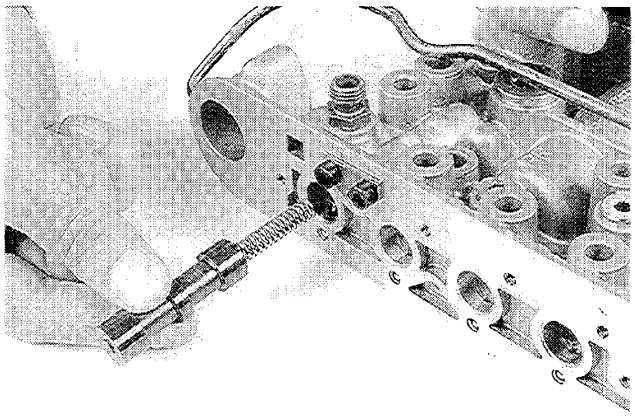
The special tools shown below are used to remove and install the cover on the transmission control valve.



B4028691M

Use two M6 (metric) bolts and two M6 nuts. The M6 bolts must be at least 88.9 mm (3.5 inches) long. These special tools are first shown on page 5.

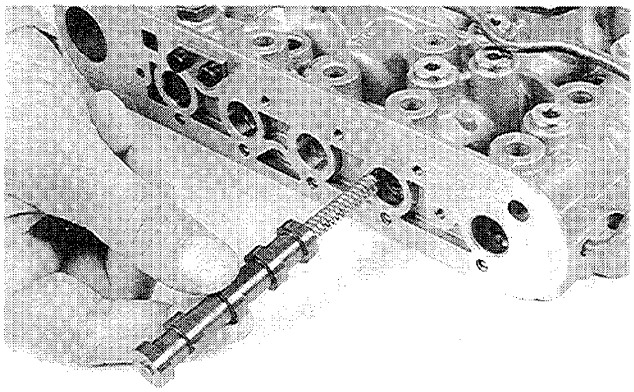
STEP 86



BP96J034

Install the valve spool and the spool spring in the number five transmission control valve bore.

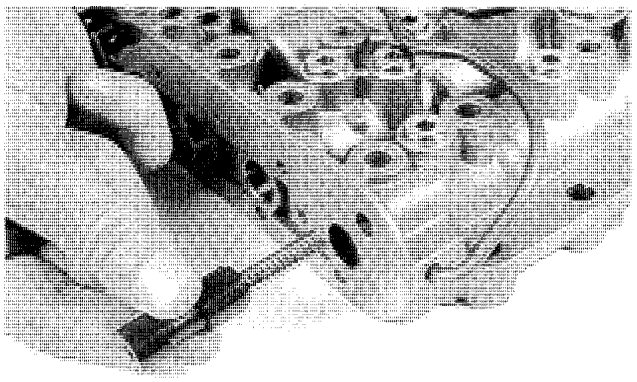
STEP 87



BP96J033

Install the valve spool and the spool spring in the number two transmission control valve bore.

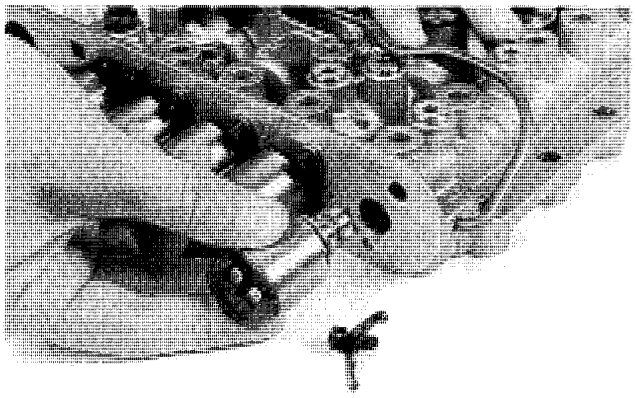
STEP 88



BP96J032

Install the valve spool and the spool spring in the number one transmission control valve bore.

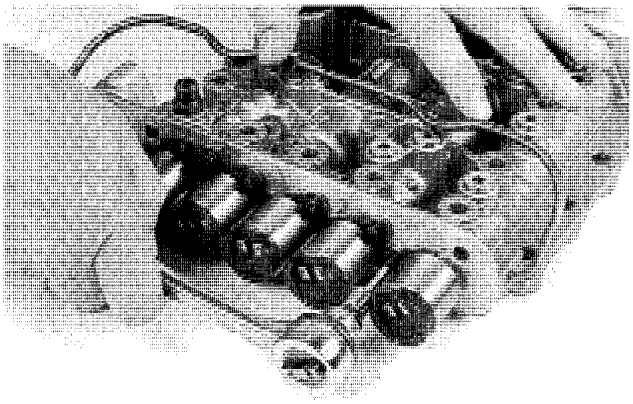
STEP 89



BP96J031

Install the transmission solenoid valves.

STEP 90

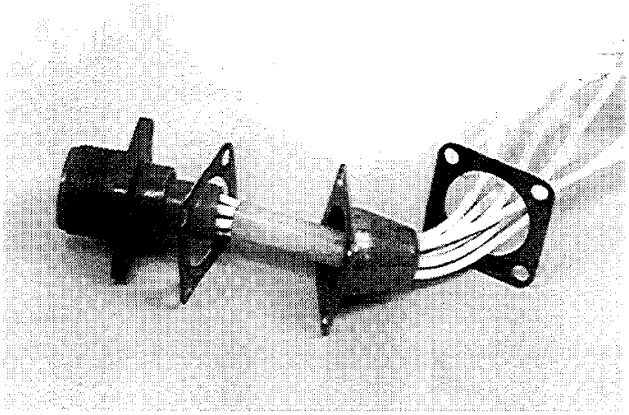


BP96J030

Position the solenoid valve support plates and flat washers. Install the Allen head cap screws and tighten to a torque of 6.5 to 8 Nm (5 to 6 pound-feet).

NOTE: *Make sure that the flat washers are installed between the transmission control valve body and the support plate.*

STEP 91



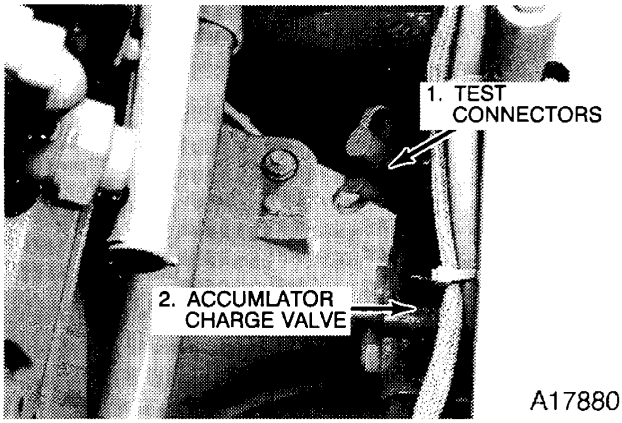
B9105118M

Make sure that the gaskets and the grommet are installed correctly on the wiring harness.

ACCUMULATOR CHARGE VALVE HYDRAULIC PRESSURE TEST

Test the accumulator charge valve according to instructions in this section.

1. Stop the engine. Push down and release the brake pedal many times to release pressure in the brake circuits.



A17880

2. Connect two (2) 3000 psi (20 685 kPa, 207 bar) pressure gauges to the test connectors on the accumulator charge valve.

3. Start and run the engine at idle. Continue to run the engine for one minute. Read the pressure gauges. The pressure must be 2515 to 2615 psi (17 340 to 18 030 kPa, 173 to 180 bar) on each gauge.

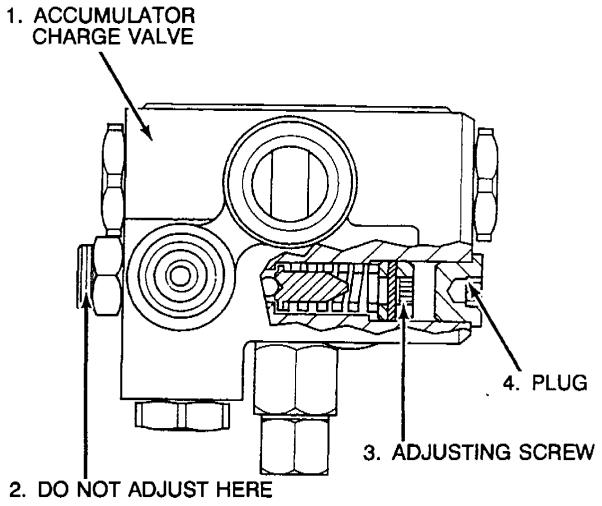
If the pressures are not correct, do the following steps:

4. Push down and release the brake pedal several times and watch the pressure gauges. The pressures will decrease to 1415 to 1515 psi (9 756 to 10 446 kPa, 98 to 104 bar) and then increase. If the pressures do not decrease and then increase, stop the engine and repair the accumulator charge valve.

5. After the accumulator charge valve works correctly, do the following to adjust the accumulator charge valve.

ADJUSTING THE ACCUMULATOR CHARGE VALVE

1. Keep the pressure gauges connected to the accumulator charge valve as in step 2 above.



83L93

2. Remove the plug from the accumulator valve.

   NOTE: *DO NOT turn the external lock nut or adjusting screw (for brake relief valve).*

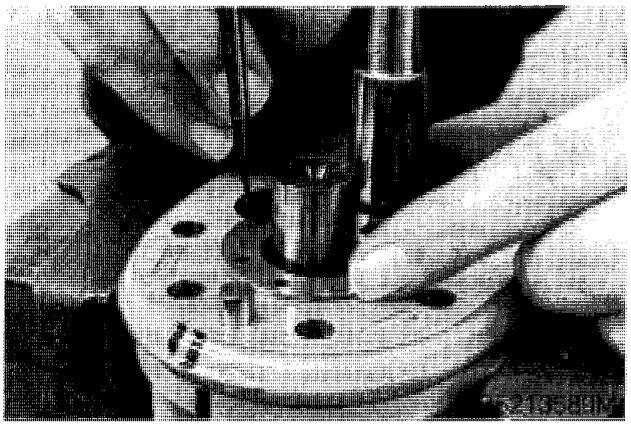
3. Start and run the engine at idle for one minute. Push down and release the brake pedal several times and watch the pressure gauges. The pressures must decrease to approximately 1415 to 1515 psi (9 756 to 10 446 kPa, 98 to 104 bar) and then increase to 2515 to 2615 psi (17 340 to 18 030 kPa, 173 to 180 bar).

4. If the pressures are not correct, turn the internal adjusting screw a small amount at a time. Turn the adjusting screw clockwise to increase the pressures and counterclockwise to decrease the pressures.

5. Repeat steps 3 and 4 until the high pressures are 2515 to 2615 psi (17 340 to 18 030 kPa, 173 to 180 bar) and the low pressures are 1415 to 1515 psi (9 756 to 10 446 kPa, 98 to 104 bar).

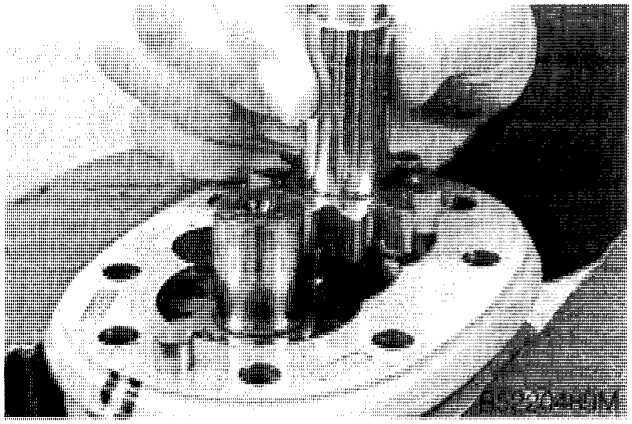
6. Install the plug after completing the adjustment.

STEP 7



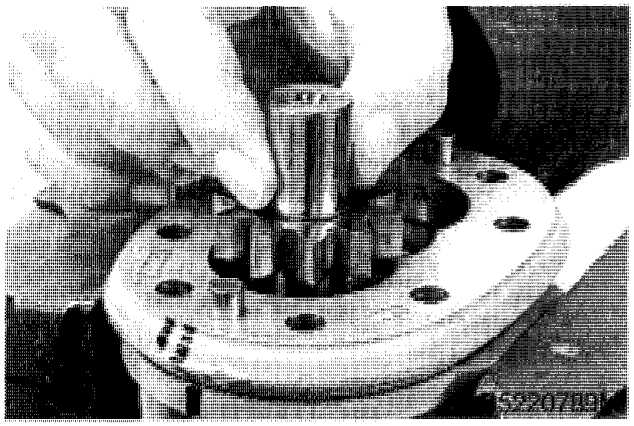
Remove the wear plate.

STEP 8



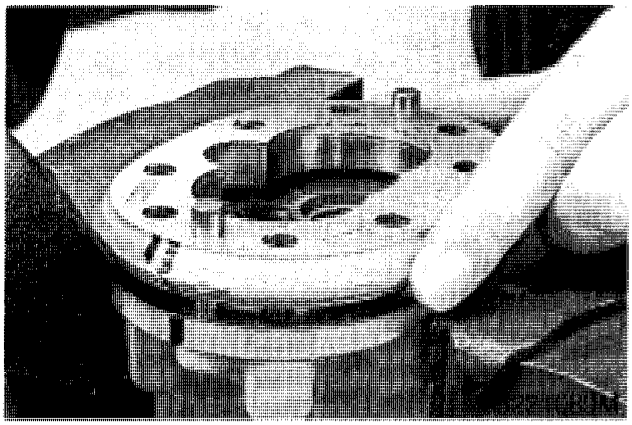
Remove the drive gear.

STEP 9



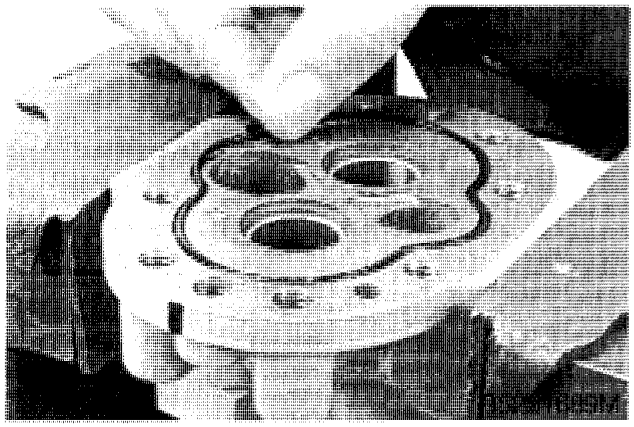
Remove the driven gear.

STEP 10



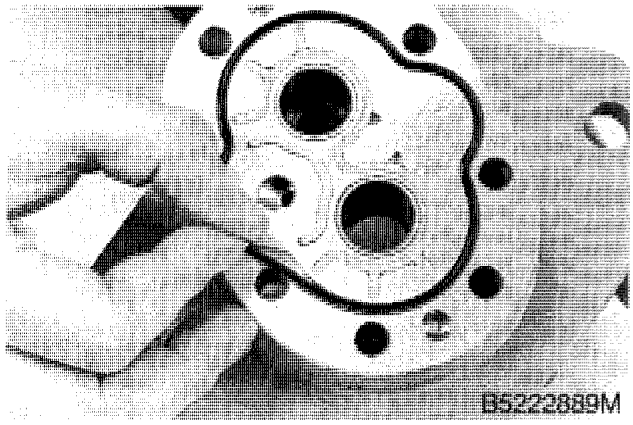
Remove the gear housing.

STEP 11



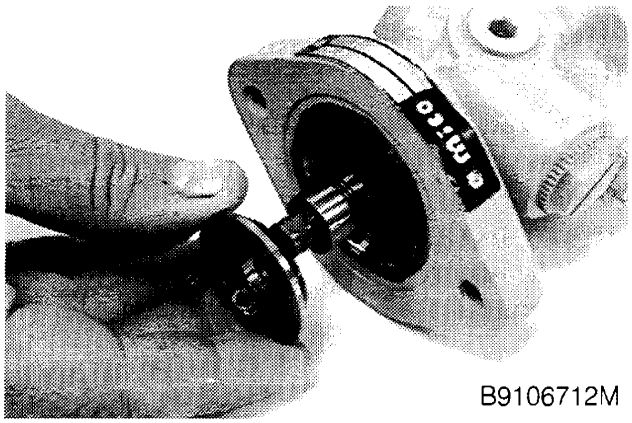
Remove the o-ring from the rear cover.

STEP 12



Remove the o-ring from the front cover.

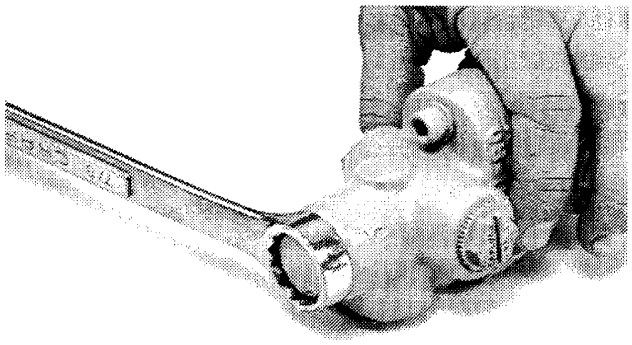
STEP 7



B9106712M

Remove the cupped washer and upper spool.

STEP 8

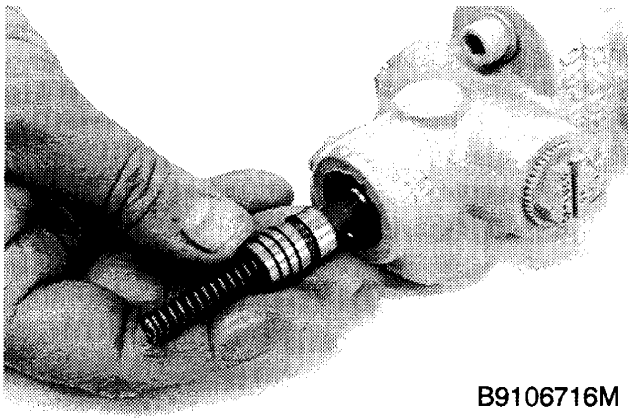


B9106714M

Remove the plug from the opposite end.

NOTE: *During assembly tighten the plug to 40 to 50 lb ft (54 to 67 Nm).*

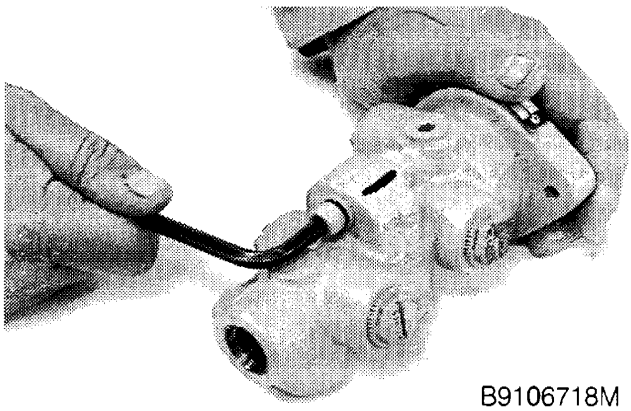
STEP 9



B9106716M

Remove the spring and lower spool.

STEP 10

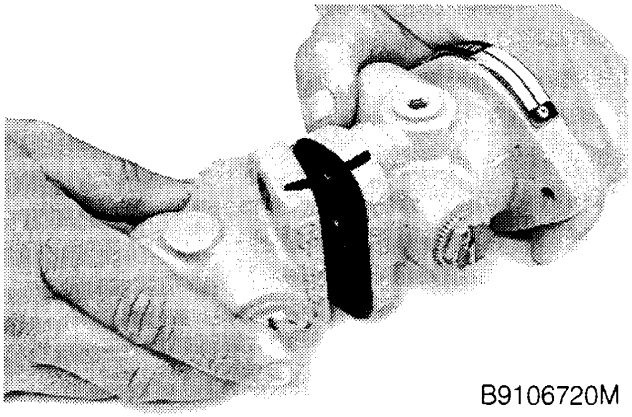


B9106718M

Put an alignment mark on the bodies. Remove the Allen head screws and washers.

NOTE: *During assembly, tighten the Allen head screws to 20 to 25 lb ft (27 to 33 Nm).*

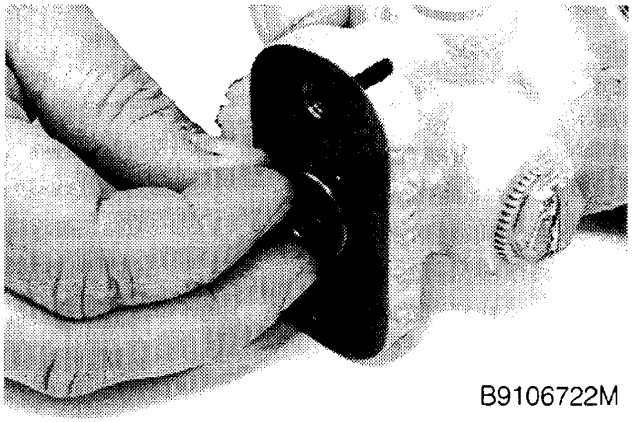
STEP 11



B9106720M

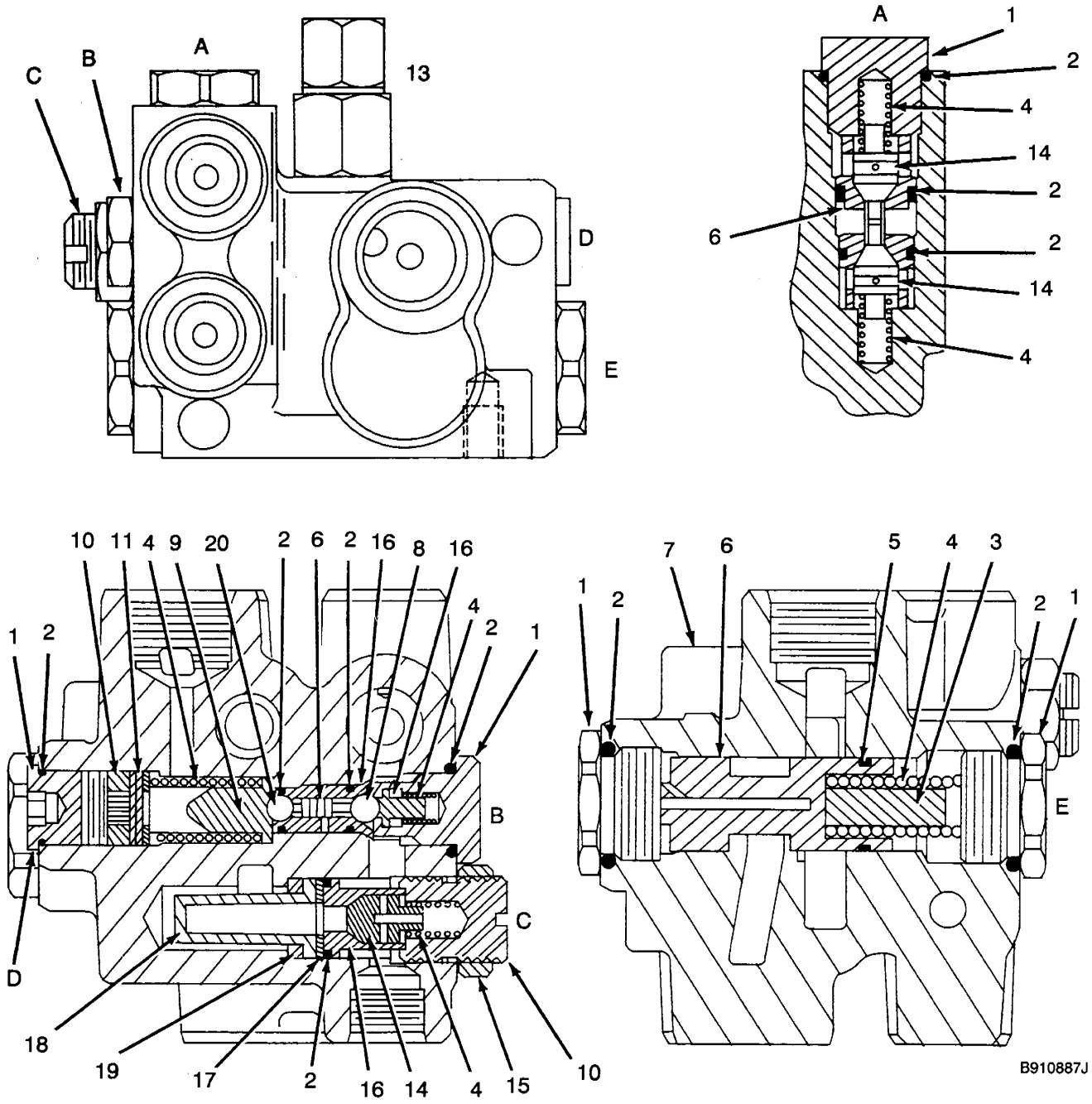
Separate the bodies.

STEP 12



B9106722M

Remove the O-ring.

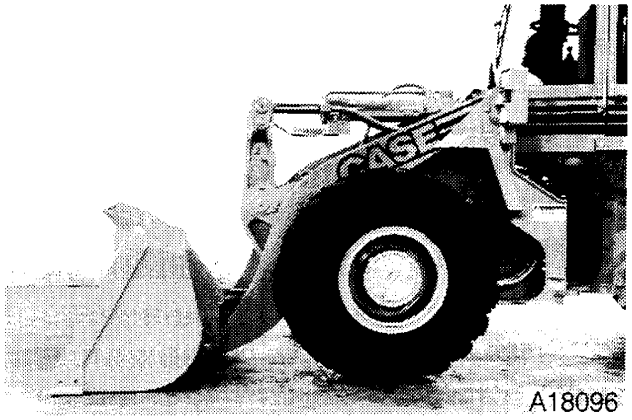


1. Plug
2. O-ring
3. Pin
4. Spring
5. Quad Ring
6. Spool
7. Body
8. Steel Ball (Large)
9. Spring Seat
10. Adjusting Screw
11. Nylon Pin
12. Backup Ring (Not Shown)
13. Relief Valve
14. Poppet
15. Lock Nut
16. Seat
17. Flat Washer
18. Filter
19. Spacer
20. Steel Ball (Small)

REMOVAL OF REMOTE CONTROL VALVE

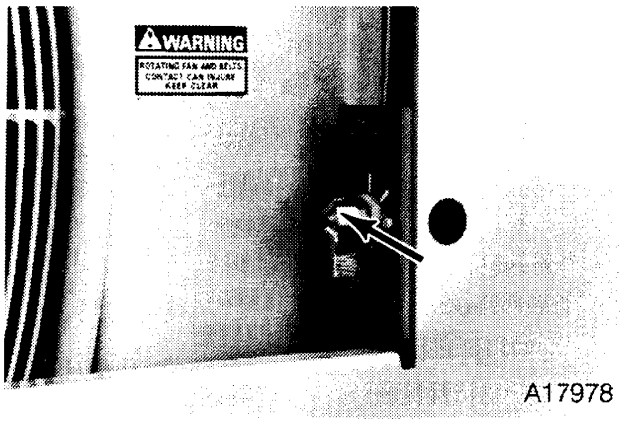
1. Park the machine on a level surface and lower the bucket to the floor. Stop the engine and apply the parking brake.

IMPORTANT: *Pump the brakes repeatedly to be sure the brake accumulators have no hydraulic pressure, then move a loader control valve lever back and forth several times to release any hydraulic pressure in the pilot control circuit.*



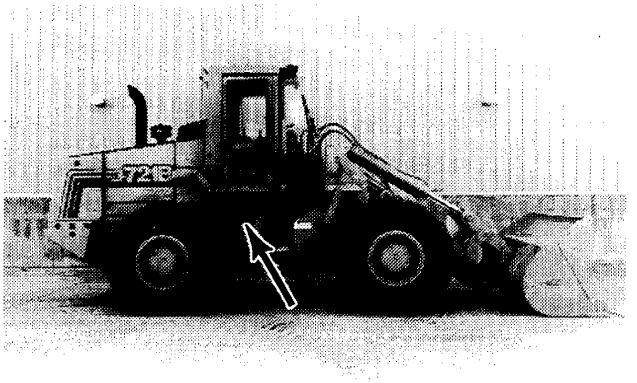
A18096

2. Open the access door on the left side of the engine compartment and turn the battery disconnect switch to the OFF position.

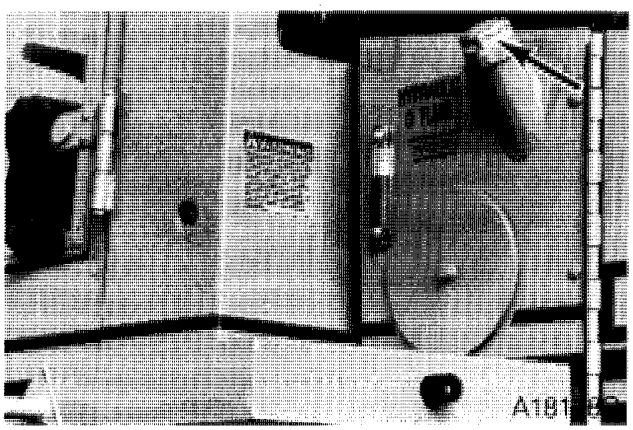


A17978

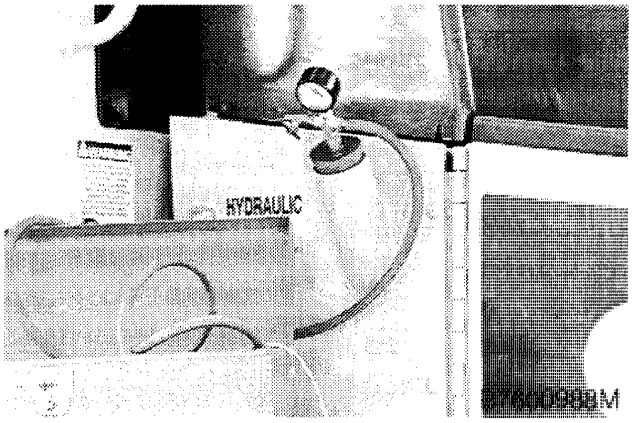
3. Loosen and remove the cap screws that fasten the panel under the right side of the ROPS cab or ROPS canopy. Remove the panel.


A18141

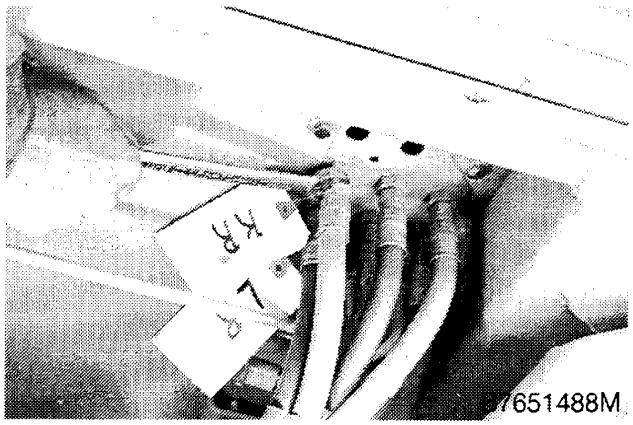
4. Loosen the filler cap in the reservoir to release air in the reservoir.


A181

5. Connect a vacuum pump to the reservoir.

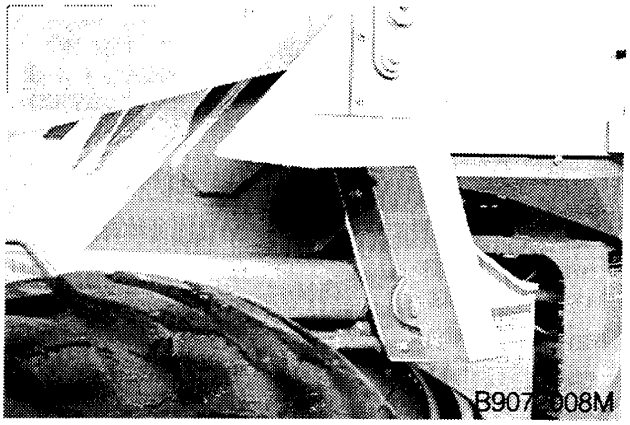


6. See the illustration on Page 18. Put identification tags on the hoses connected to the fittings in the separator. The separator is located under the right side of the ROPS cab or ROPS canopy. Start the vacuum pump. Disconnect the hoses from the fittings. Install plugs in the hoses and caps on the fittings. Thread size is 9/16-18.



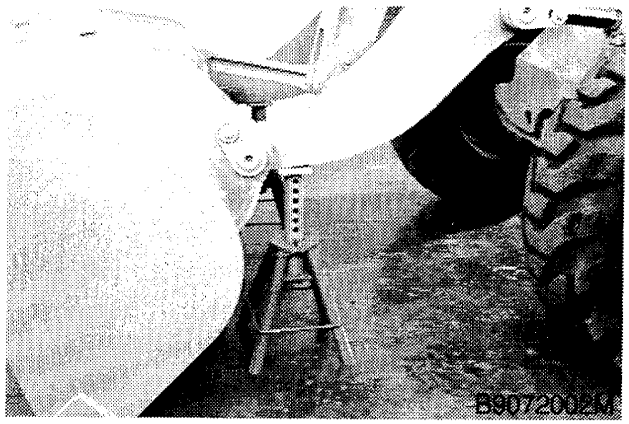
REMOVAL OF LIFT CYLINDER

1. If equipped with fenders, loosen and remove the nuts, lock washers and flat washers. Do not remove the bolts.



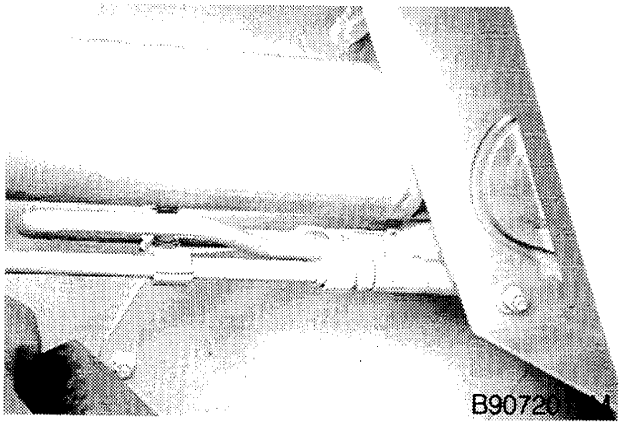
2. Remove the fender. The bolts can stay in the front frame.

3. Raise the loader frame so that the yoke on the piston rod is above the tire.

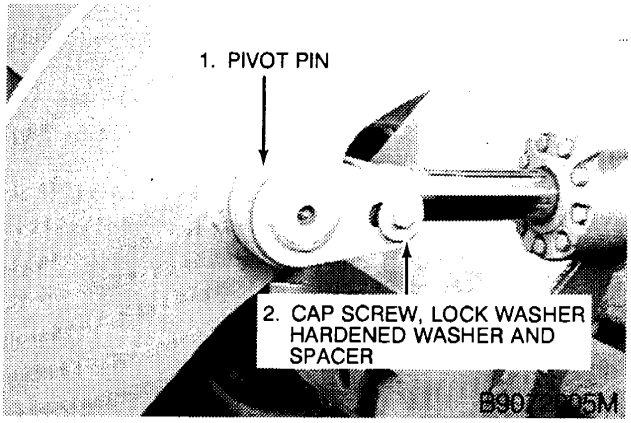


4. Use acceptable supports to hold the loader frame in place.

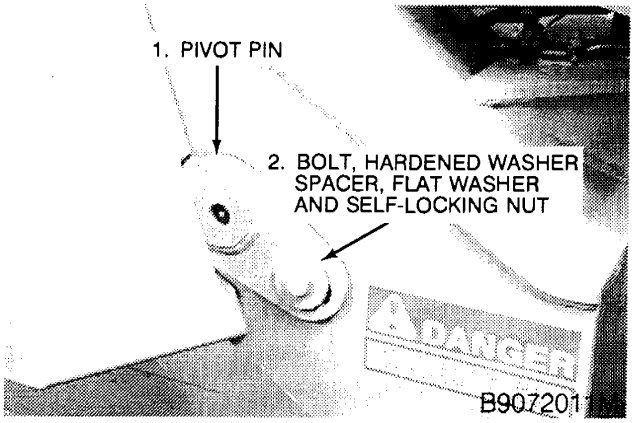
5. Disconnect the hoses at the lift cylinder. Install a cap on each hose. Thread size is 1-1/16-12.



6. Loosen and remove the cap screw, lock washer, hardened washer and spacer that hold the pivot pin for the yoke.

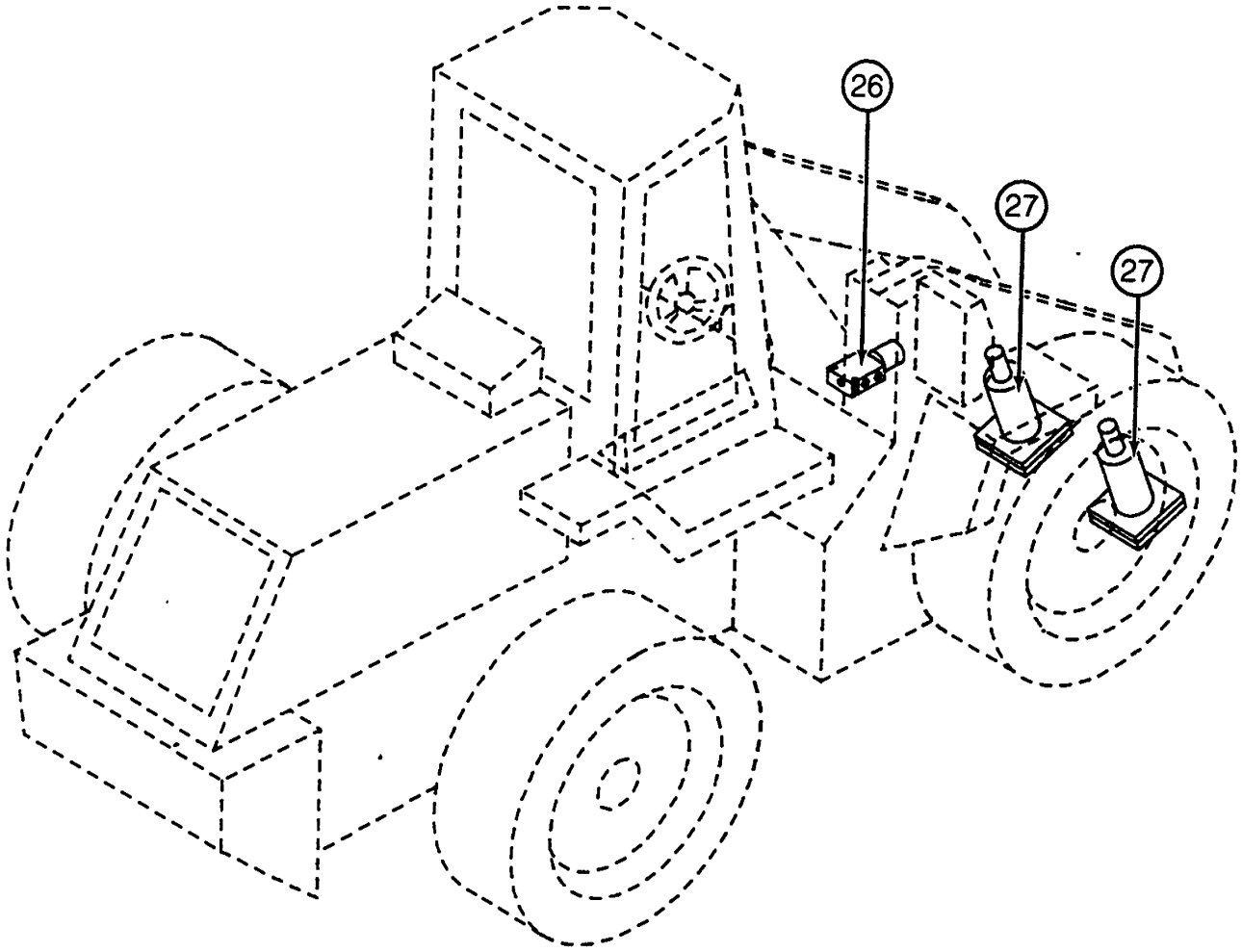


7. Loosen and remove the self-locking nut, flat washer and bolt, hardened washer and spacer that holds the pivot pin at the closed end of the lift cylinder.



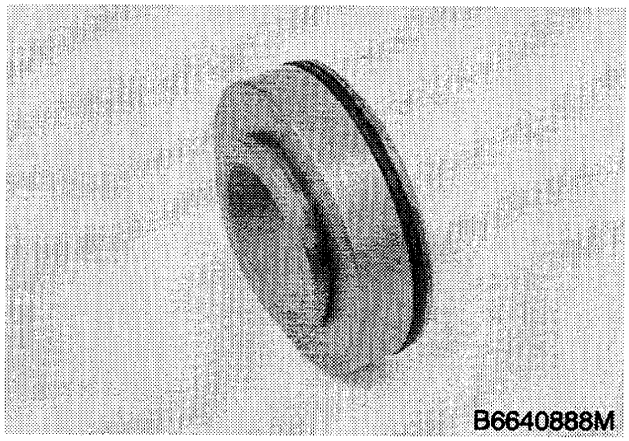
IMPORTANT: *The approximate weight of the lift cylinder is 140 pounds (63 kg). Fasten acceptable lifting equipment to hold and remove the lift cylinder.*

9. Remove the pivot pins and remove the lift cylinder from the machine.



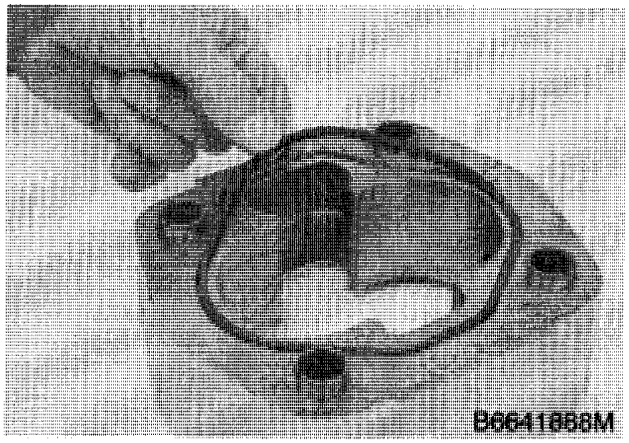
153L93

STEP 25



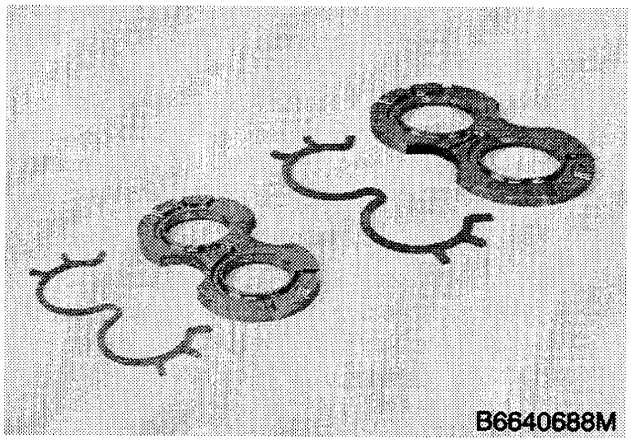
Remove the O-ring from the seal retainer.

STEP 26



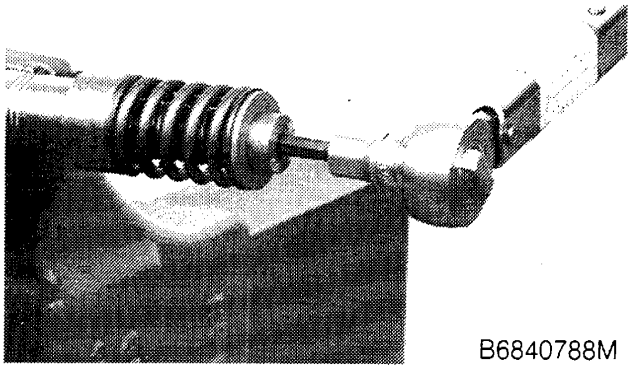
Remove the quad rings from the sections of the hydraulic pumps.

STEP 27



Remove the seals from the thrust plates.

STEP 27

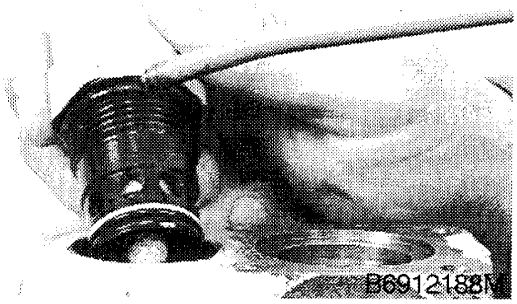


B6840788M

Install the special screw, outer spring seat, outer spring, inner spring, and inner spring seat.

Tighten the special screw to 216 to 240 pound-inches (24.4 to 27.1 Nm).

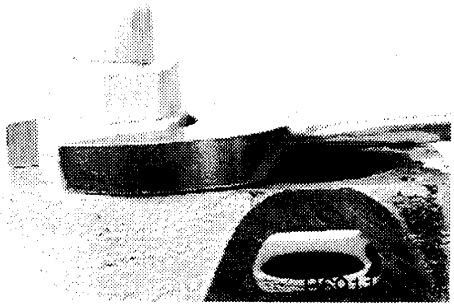
STEP 28



B6912188M

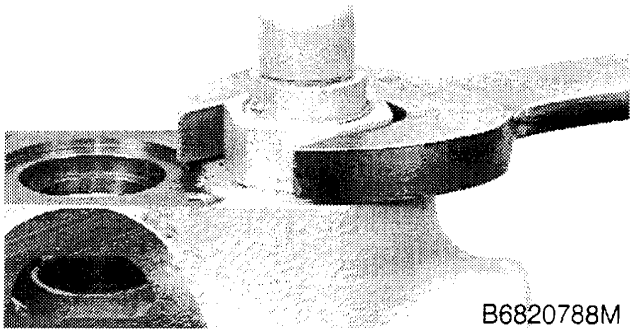
Fasten the body in a vise with soft jaws. Lubricate the o-rings on the circuit relief and anticavitation valve(s), or the circuit relief valve.

STEP 29



Install and tighten the circuit relief and anticavitation valve(s).

STEP 30

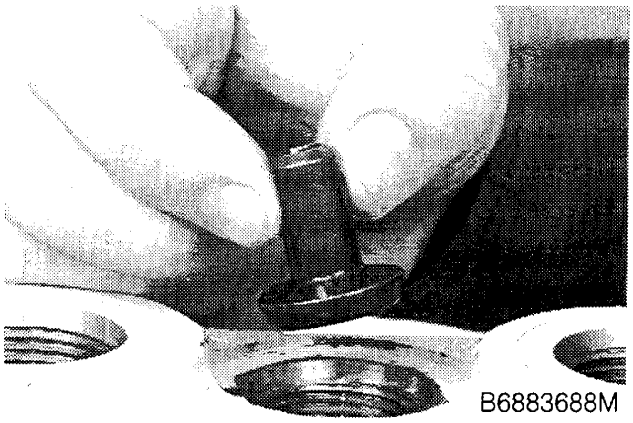


B6820788M

Install and tighten the circuit relief valve.

NOTE: *For Z-Bar models only, install the circuit relief valve into B port of bucket section.*

STEP 31



B6883688M

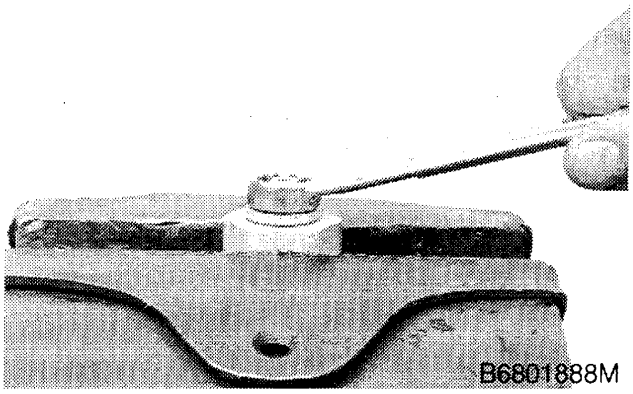
Install the poppet.

STEP 32

B6883488M

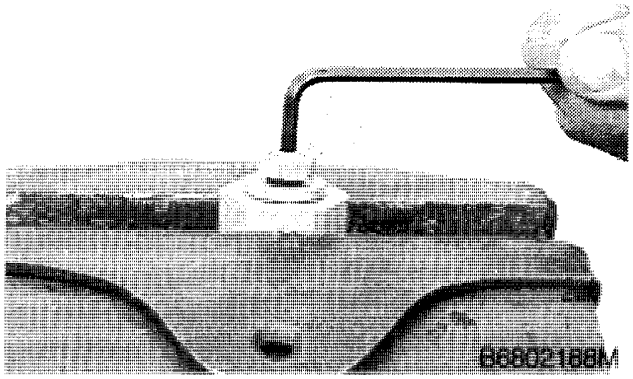
Install the spring.

STEP 95



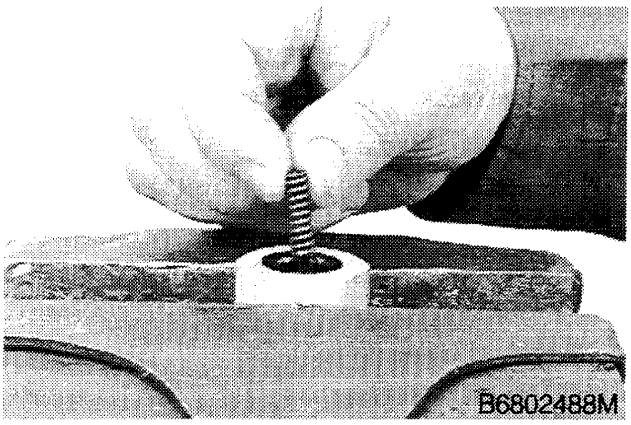
Loosen the lock nut.

STEP 96



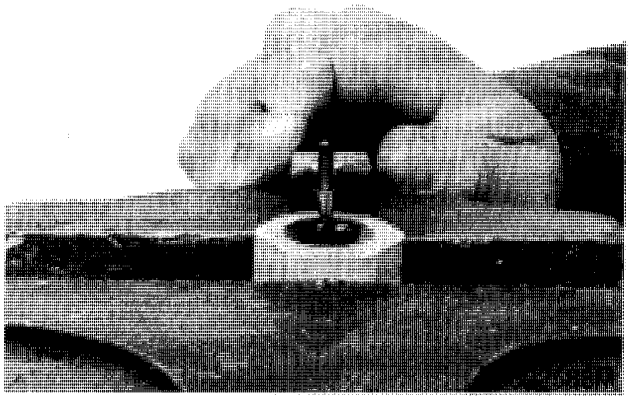
Remove the adjusting screw.

STEP 97



Remove the spring.

STEP 98

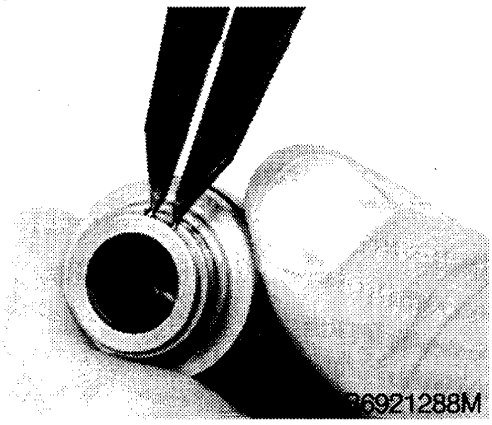


Remove the plunger.

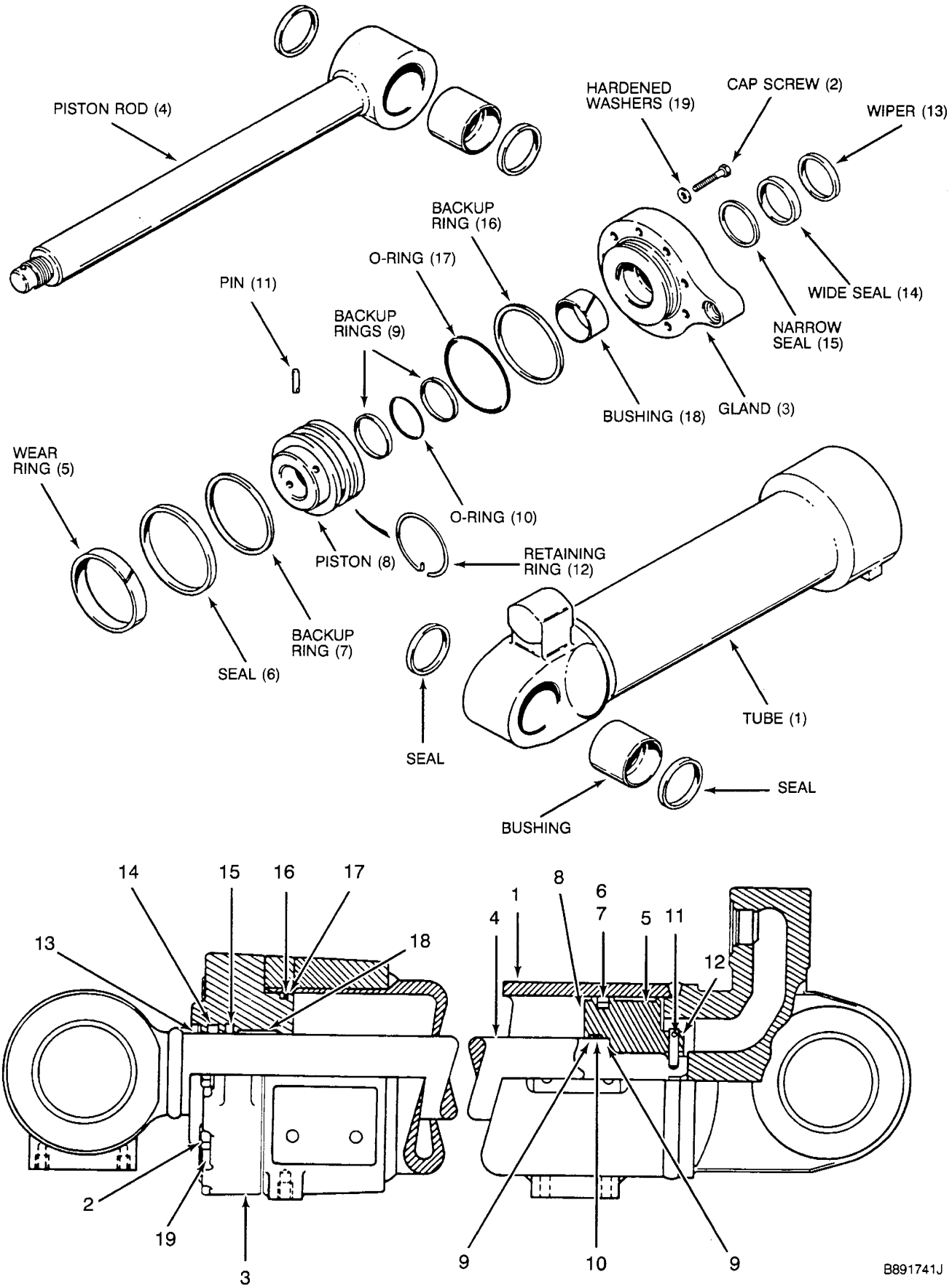
STEP 99

Carefully push the poppet and sleeve out of the body.

STEP 100



Remove the retaining ring from the poppet.



LOADER BUCKET CYLINDER Z-BAR MODEL

Section

8010

REMOTE PILOT CONTROL VALVES

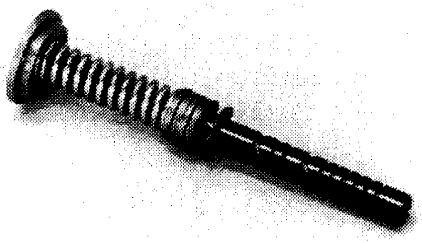
CASE CORPORATION

Rac 7-59610

Printed in U.S.A.
August, 1993

Inspection

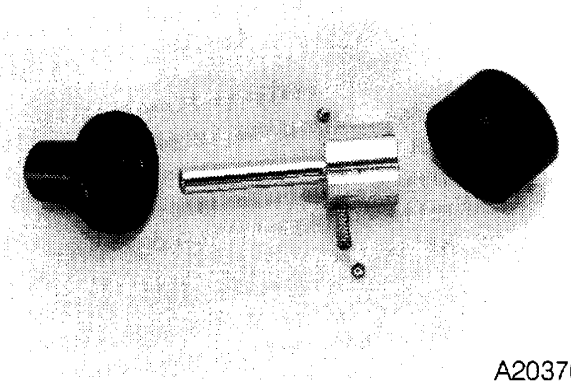
STEP 75



A20385

Inspect the spool assembly for wear and damage. Use a new spool assembly as required.

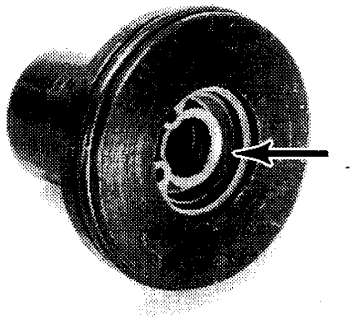
STEP 76



A20376

Separate the parts of the plunger assembly with Feel and inspect for wear. Use new parts as necessary.

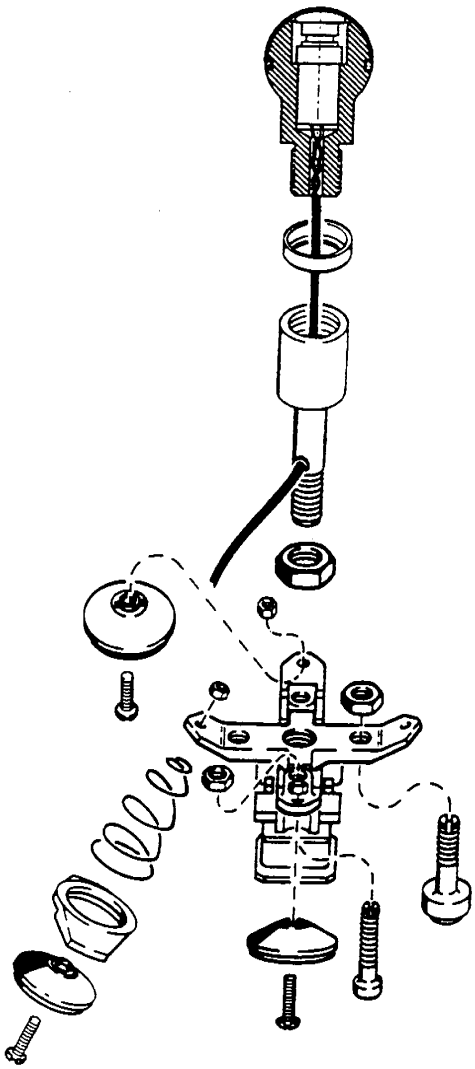
STEP 77



A20386

Separate the parts of all the plunger assemblies. Remove the snap ring and replace the seal and O-ring. Install the snap ring.

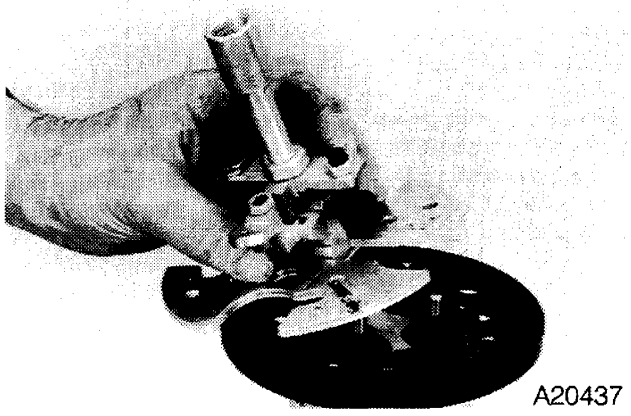
STEP 78



286L93

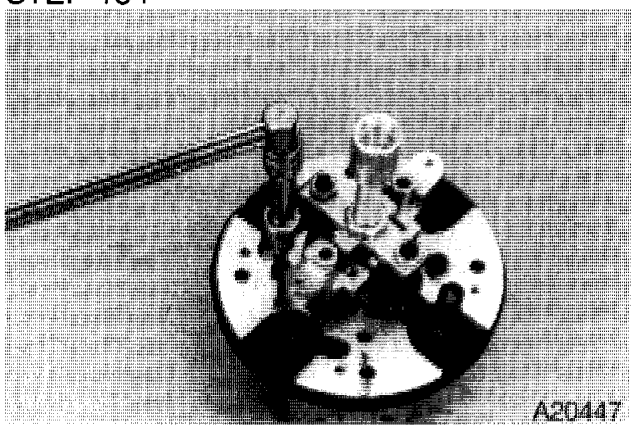
Inspect the parts of the lever assembly. Use new parts as necessary.

STEP 153



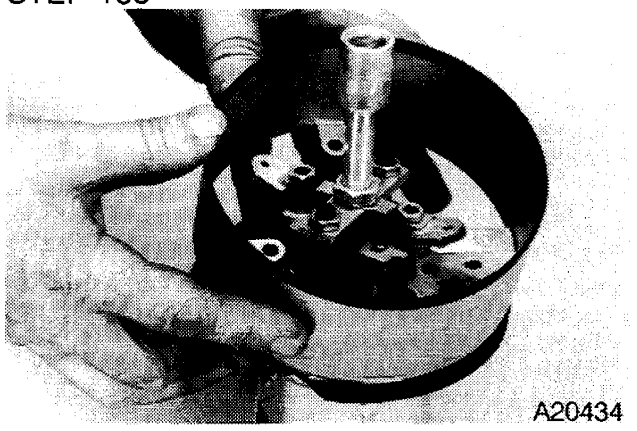
Install the metal plate and lever assembly on plastic plate and valve body.

STEP 154



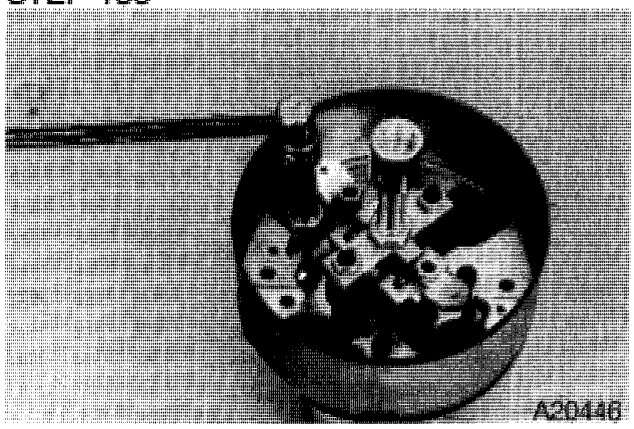
Apply Loctite 242 on the Allen screws. Install two Allen screws to fasten the plates to the body. Tighten the Allen screws to 40 to 45 lb in (4.5 to 5 Nm).

STEP 155



Install the collar.

STEP 156



Apply Loctite 242 to the Allen screws. Install and tighten the Allen screws to 40 to 45 lb in (4.5 to 5 Nm).

STEP 157

Install the boot.

STEP 158

Install the knob.

PRESSURE TESTING

Manifold Gauge Set

The manifold gauge set is the most important tool used to service the air conditioning system. The manifold gauge set is used to learn the high and low pressures of the system, the correct refrigerant charge, system diagnosis, and operating efficiency. The manifold gauge set can read both the high (discharge) and low (suction) sides at the same time, since pressures must be compared in order to make a diagnosis of system operation.

LOW PRESSURE GAUGE -The low pressure gauge is a compound gauge. All air conditioning systems can under some conditions, change from a pressure into a vacuum on the low side. For this reason, it is necessary that a gauge be used that will indicate both pressure and vacuum.

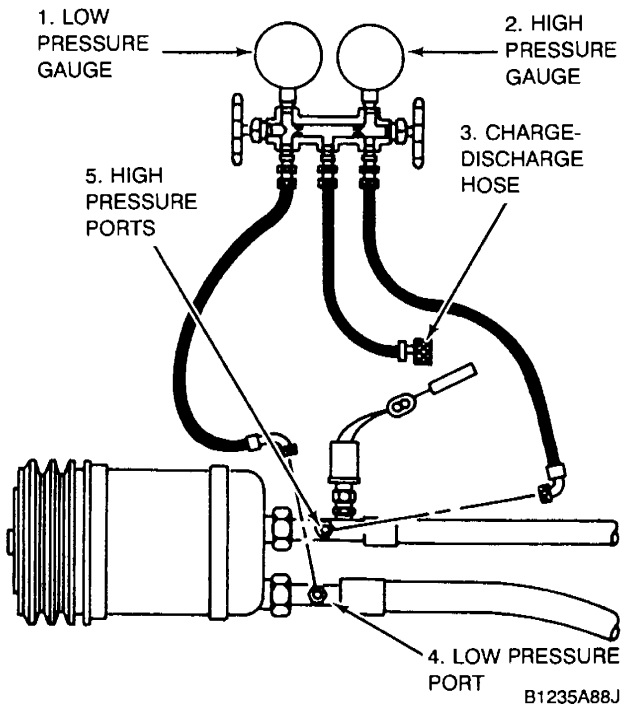
During normal operation the low pressure gauge must always indicate from 10 to 35 psi (69 to 242 kPa, 0.7 to 2.4 bar) after the system has run 10 to 15 minutes.

HIGH PRESSURE GAUGE - The high pressure gauge is used to indicate pressures in the high side of the system. The gauge must indicate from 0 to 400 psi (0 to 2758 kPa, 0 to 27.2 bar) minimum.

During normal operation, the high pressure gauge will normally indicate from 120 to 270 psi (827 to 1861 kPa, 8.1 to 18.4 bar). See pressure - temperature chart.

Pressure Test Connection

Connect the manifold gauge set into the air conditioning system as shown. Make sure that both valves in the manifold gauge set are closed.



Pressure - Temperature Chart

Ambient Temperature*	High Pressure Indication
80°F (27°C)	150 to 170 psi (1034 to 1172 kPa, 10.2 to 11.6 bar)
90°F (32°C)	175 to 185 psi (1206 to 1275 kPa, 11.9 to 12.6 bar)
95°F (35°C)	195 to 205 psi (1344 to 1413 kPa, 13.3 to 13.9 bar)
100°F (38°C)	210 to 230 psi (1447 to 1585 kPa, 14.3 to 15.6 bar)
105°F (41°C)	230 to 250 psi (1585 to 1723 kPa, 15.6 to 17.0 bar)
110°F (43°C)	250 to 270 psi (1723 to 1861 kPa, 17.0 to 18.4 bar)
*The temperature of the air around the machine.	

OPERATION

The refrigerant circuit of the air conditioning system contains five major components: compressor, condenser, receiver-drier, expansion valve and evaporator. These components are connected by tubes and hoses and operate as a closed system. The air conditioner system is charged with HFC-134a refrigerant.

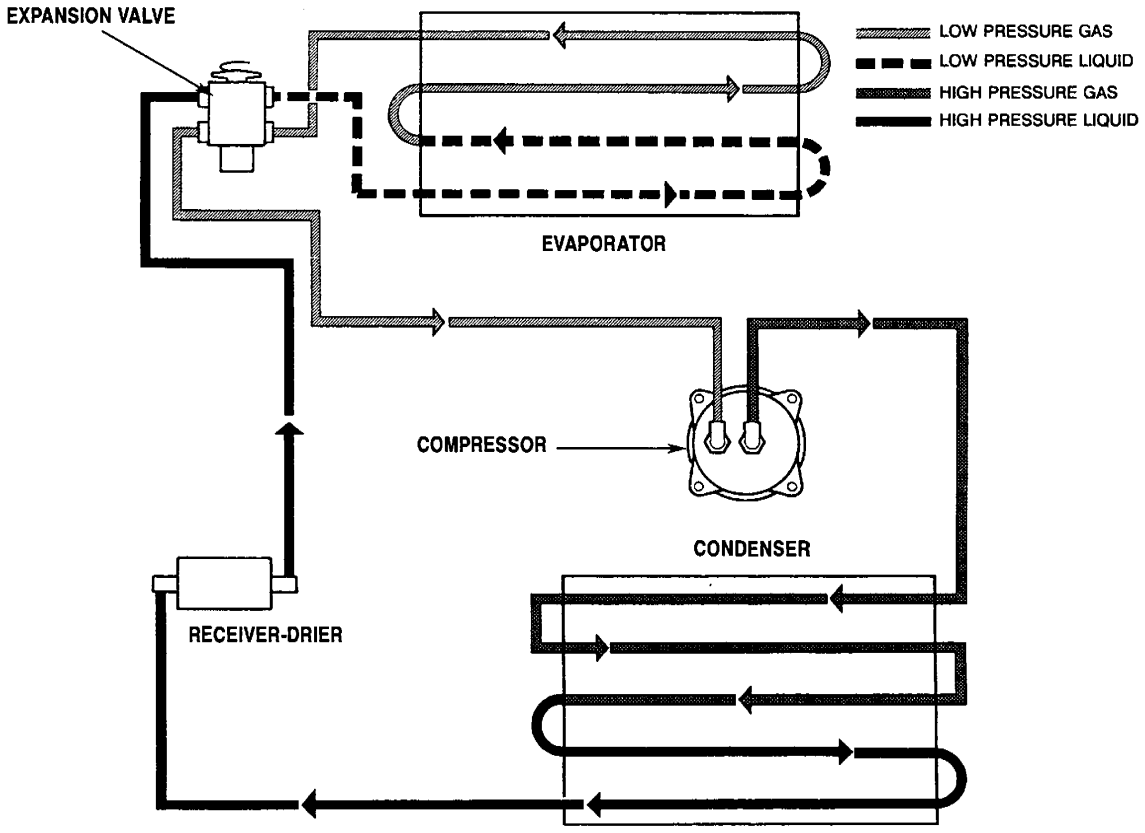
The compressor receives the refrigerant as a low pressure gas. The compressor then compresses the refrigerant and sends it in the form of a high pressure gas to the condenser. The air flow through the condenser then removes the heat from the refrigerant. As the heat is removed the refrigerant changes to a high pressure liquid.

The high pressure refrigerant liquid then flows from the condenser to the receiver-drier. The receiver-drier is a container filled with moisture removing material, which removes any moisture that may have entered the air conditioner system in order to prevent corrosion of the internal components of the air conditioner system.

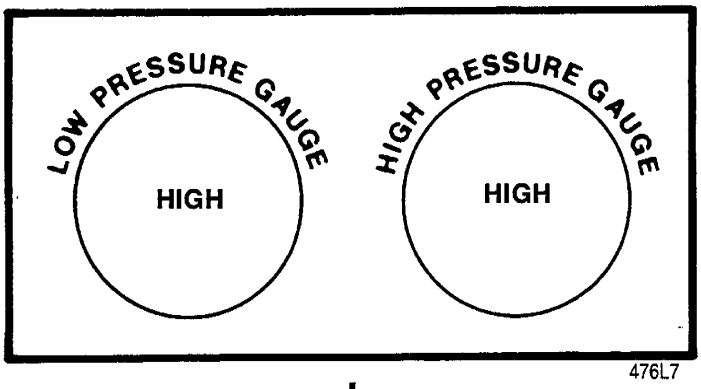
The refrigerant, still in a high pressure liquid form, then flows from the receiver-drier to the expansion valve. The expansion valve then causes a restriction in flow of refrigerant to the evaporator core. The evaporator meters refrigerant flow based on evaporator heat load.

As the refrigerant flows through the evaporator core the refrigerant is heated by the air around and flowing through the evaporator fins. The combination of increased heat and decreased pressure causes the air flow through the evaporator fins to become very cool and the liquid refrigerant to become a low pressure gas. The cooled air then passes from the evaporator to the cab for the operator's comfort.

The electrical circuit of the air conditioning system consists of a fan speed control, temperature control, three (3) relays, two (2) 10 amp circuit breakers, two (2) 24V condenser fan motors, a blower motor, blower resistor, A.C. compressor clutch, A.C. low pressure switch, A.C. high pressure switch, and A.C. warning light.



208L95



See pressure - temperature chart on Page 13.

Condenser Not Operating - Indications:

A. Liquid line very hot.

B. Discharge air from evaporator warm.

1. Check for loose or worn compressor belt and proper condenser fan operation.
2. Check to see that condenser is clean and that the fins are straight.
3. Check system for too much refrigerant.
   A. Remove refrigerant from system until gauge pressure is below normal. See Section 9002.
   B. Add refrigerant until gauge pressures are normal. See Section 9002.
   C. If there is still a problem, do step 4.
4. Remove and inspect condenser for restrictions caused by oil or reduced heat transfer.
   A. Discharge refrigerant from system. See Section 9002.
   B. Use compressed air to remove oil from condenser.
   C. Replace receiver-drier. See Section 9003.

Air in the System - Indications:

A. Warm discharge air from evaporator.

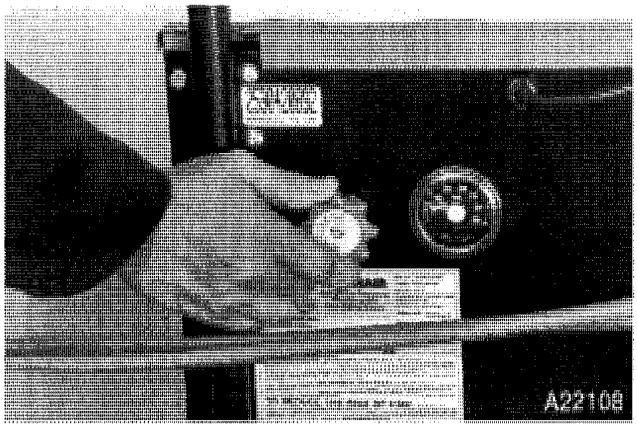
1. Discharge refrigerant from system. See Section 9002.
2. Replace receiver-drier.
3. Remove air and moisture from the system. See Section 9002.
4. Charge system with new refrigerant. See Section 9002.

STEP 5

Connect the main power plug to a 115 volt AC outlet. Move the main power switch to the ON position and depress the recovery start switch.

The compressor will shut OFF automatically when recovery is complete. Wait for 5 minutes and observe the manifold pressure gauges for a pressure rise. If pressure rises above 0 psi (0 bar), depress the hold/cont switch. Then wait for the compressor to automatically shut OFF.

STEP 6



Drain the oil separator of the A/C system oil. Open the air purge valve long enough to let some of the compressor discharge pressure back into the separator.

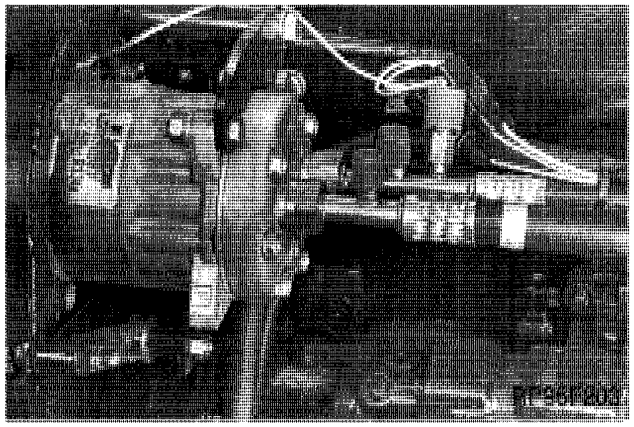
STEP 7

Slowly open the oil drain valve and drain the oil into the reservoir. When the oil stops draining, close the oil drain valve completely.

STEP 8

Fill the A/C compressor with fresh SP-20 PAG oil equal to the amount in the reservoir.

STEP 9



Remove the hoses from the service ports and install the caps.

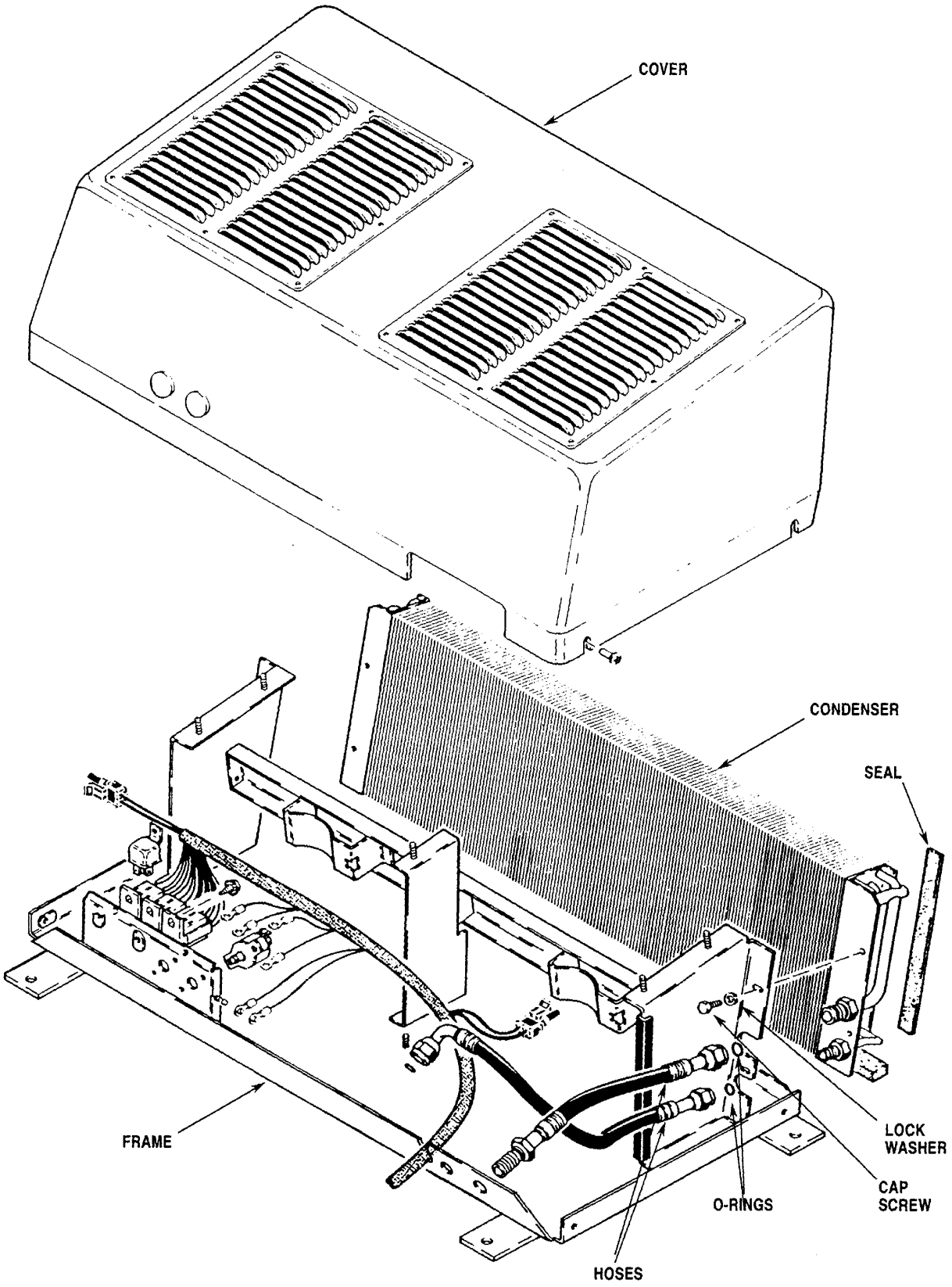
Section

9003

REMOVAL AND INSTALLATION OF AIR CONDITIONING COMPONENTS FOR SYSTEMS WITH HFC-134a REFRIGERANT

Printed in U.S.A.
Rac 7-64380
September, 1995

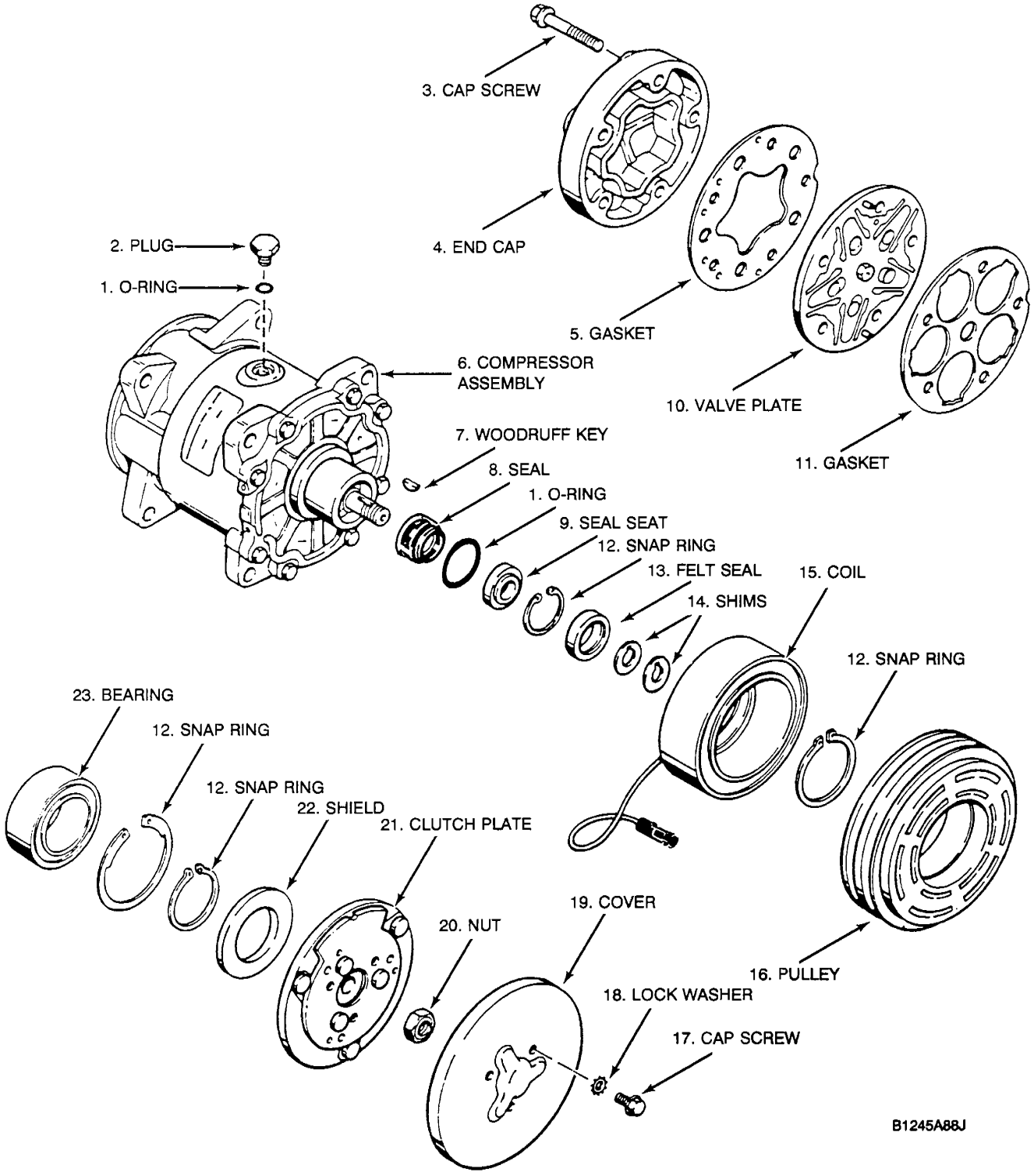
Illustration of Condenser



STEP 70
Loosen and remove the filler plug and drain the oil into a measuring container.

STEP 71
Fill the compressor with the same amount of NEW refrigeration oil.

STEP 72
Install a new O-ring on the filler plug. Install and tighten the filler plug to 70 to 105 pound-inches (8 to 12 Nm).



STANDARD BUCKETS
Replacing the Cutting Edge

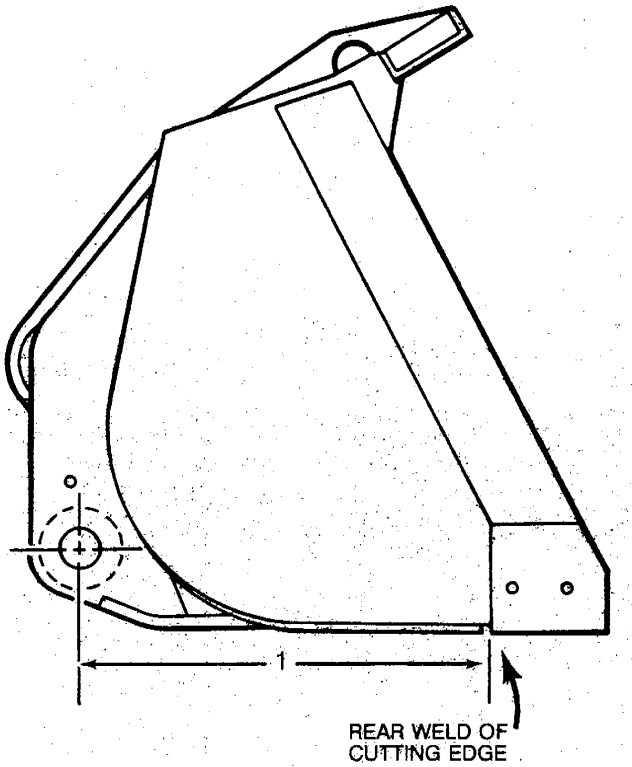
1. If the bucket is not removed from the loader frame, disconnect the wiring from the alternator after doing Step 2.

2. Raise the bucket to an acceptable height and put supports below the bucket to hold the bucket in place.

3. If there are bucket teeth on the cutting edge, loosen and remove the nuts, hardened washers, and bolts that hold the bucket teeth in place and remove the bucket teeth.

4. Use carbon arc rod or an acetylene cutting torch to remove the cutting edge.

5. When removing the weld at the rear of the cutting edge, cut off the cutting edge according to the dimension shown in the following illustration for the bucket you are repairing.



B891014J

1. 2-1/4 yd³ (1.7 m³) ..... 30.2 INCH (768 mm)
   2-1/2 yd³ (1.9 m³) ..... 31.1 INCH (790 mm)
   2-3/4 yd³ (2.1 m³) ..... 33.2 INCH (843 mm)
   3-1/4 yd³ (2.5 m³) ..... 38.9 INCH (988 mm)

6. Use a grinder to remove any welds or extra metal on the bucket that will prevent the new cutting edge from fitting correctly.

7. Put the new cutting edge in place and use C-clamps to hold the cutting edge in place. See the illustration on this page for the correct distance to the rear of the weld on cutting edge.

8. See the photographs on the next two pages for weld specifications. Use E-7018 welding rod.

9. When welding the top of the cutting edge for a 2 1/4 yd³ (1.7 m³) bucket:

   a. Start at 1/3 the bucket width away from either side of the bucket. Weld from this point towards the closest edge.

   b. Begin the second weld 1/3 the bucket width from the opposite side. Weld in the direction of the first weld.

   c. Start at the end of the bucket and weld toward the second weld.

   d. Continue to weld the cutting edge to the bucket using this method until the hollow area is filled.

10. When welding the top of the cutting edge for the 2 1/2 yd³, 2 3/4 yd³, or 3 1/4 yd³ (1.9 m³, 2.1 m³, or 2.5 m³) bucket:

    a. Start at one end of the bucket and weld toward the center until one welding rod is used.

    b. Start at the center of the bucket and weld in both directions from center until one welding rod is used.

    c. Start at the other end of the bucket and weld toward the center until one welding rod is used.

    d. Continue to weld the cutting edge to the bucket using this method until the cutting edge is completely welded.

11. If bucket teeth were removed from the old cutting edge, install the bucket teeth and tighten the nuts to 380 to 456 pound-feet (515 to 618 Nm).

12. Connect the wiring to the alternator.