880R EXCAVATOR
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C E Div 9-67074
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PRINTED IN U S A

CASE

Crankshaft with 3" (76.2 mm) Main Bearing Journals

	U.S. Value	Metric Value
Type	Forged, Heat Treated and Balanced	
End Play, Number Three Main Bearing Cap	0.003 to 0.015"	0.076 to 0.381 mm
Thrust Bearing, Standard Thickness	0.184 to 0.186"	4.674 to 4.724 mm
Thrust Bearing, Oversize Thickness for Service	0.190 to 0.192"	4.826 to 4.877 mm
Connecting Rod Journal Width	1.9975 to 2.0025"	50.7365 to 50.8635 mm
Connecting Rod Journal, Standard OD	2.748 to 2.749"	69.799 to 69.825 mm
0.010" (0.254 mm) OD Undersize, Grind to	2.738 to 2.739"	69.545 to 69.571 mm
0.020" (0.508 mm) OD Undersize, Grind to	2.728 to 2.729"	69.291 to 69.317 mm
0.030" (0.762 mm) OD Undersize, Grind to	2.718 to 2.719"	69.037 to 69.063 mm
Connecting Rod Journal Maximum Taper	0.0005"	0.0127"
Connecting Rod Journals Out of Round	0.0005"	0.0127 mm
Main Bearing Liners	Replaceable	
Main Bearing Liner Width, 1st, 3rd and 5th	2.1515 to 2.1615"	54.648 to 54.9021 mm
Main Bearing Liner Width, 2nd and 4th	1.151 to 1.161"	29.235 to 29.489 mm
Main Bearing Oil Clearance	0.0016 to 0.0046"	0.0406 to 0.1168 mm
Maximum Service Limit	0.005"	0.127 mm
Undersize Main Bearing Liners for Service	0.002, 0.010, 0.020, 0.030"	0.051, 0.254, 0.508, 0.762 mm
Main Bearing Journal, Standard OD	2.998 to 2.999"	76.149 to 76.175 mm
0.010" (0.254 mm) OD Undersize, Grind to	2.988 to 2.989"	75.895 to 75.921 mm
0.020" (0.508 mm) OD Undersize, Grind to	2.978 to 2.979"	75.641 to 75.667 mm
0.030" (0.762 mm) OD Undersize, Grind to	2.968 to 2.969"	75.387 to 75.413 mm
Main Bearing Journal Bore ID without Liners	3.191 to 3.192"	81.051 to 81.077 mm
Main Bearing Journal Width		
2nd and 4th	1.555 to 1.570	39.497 to 39.878 mm
3rd	2.623 to 2.627"	66.624 to 66.726 mm
5th	2.6175 to 2.6325"	66.4845 to 66.8655 mm

Crankshaft with 3.5" (88.9 mm) Main Bearing Journals

Type	0.003 to 0.015"	0.076 to 0.381 mm
Thrust Bearing, Standard Thickness	0.155 to 0.157"	3.937 to 3.988 mm
Thrust Bearing, Oversize Thickness for Service	0.161 to 0.163"	4.089 to 4.140 mm
Connecting Rod Journal Width	1.9775 to 2.0025"	50.2285 to 50.8635 mm
Connecting Rod Journal, Standard OD	2.998 to 2.999"	76.149 to 76.175 mm
0.010" (0.254 mm) OD Undersize, Grind to	2.988 to 2.989"	75.895 to 75.921 mm
0.020" (0.508 mm) OD Undersize, Grind to	2.978 to 2.979"	75.641 to 75.667 mm
0.030" (0.762 mm) OD Undersize, Grind to	2.968 to 2.969"	75.387 to 75.413 mm
Connecting Rod Journal Maximum Taper	0.0005"	0.0127 mm
Connecting Rod Journal Out of Round	0.0005"	0.0127 mm
Main Bearing Liners	Replaceable	
Main Bearing Liner Width, 1st, 3rd and 5th	2.1515 to 2.1615"	54.6481 to 54.9021 mm
Main Bearing Liner Width, 2nd and 4th	1.214 to 1.224"	30.836 to 31.089 mm
Main Bearing Oil Clearance	0.0016 to 0.0046"	0.0406 to 0.1168 mm
Maximum Service Limit	0.005"	0.127 mm
Undersize Main Bearing Liners for Service	0.002, 0.010, 0.020, 0.030"	0.051, 0.254, 0.508, 0.762 mm

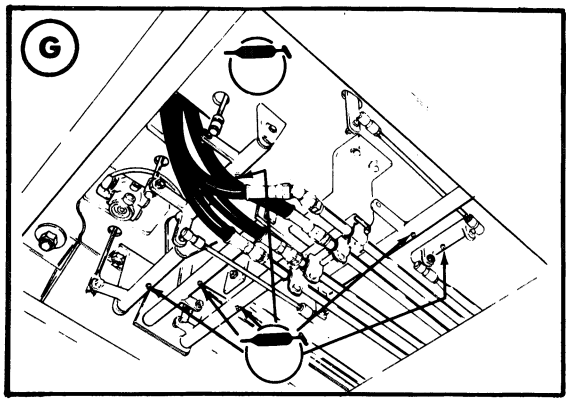
Fuel Injector (Cont'd)

	Decimal System	Metric System
Spray orifice size	.014″	.356mm
Sac hole size	.042 to .051″	1.067 to 1.295mm
No. of orifices	4	
Orifice length (through sacwall)	.095″	2.413mm
Orifice spray angle	150^0	150^0
Leakoff rate	3 to 10 drops in 30 seconds at 1500 PSI after first drop appears (serviced injector)	
Opening pressure control spring:		
Free length	.513″	13.030mm
No. coils	6-1/2	
Wire thickness	.064″	1.626mm
O.D.	.289″	7.341mm
Compressed	.444 to .459″ (11.3 to 11.7mm) 31 lbs.	14.1 kg

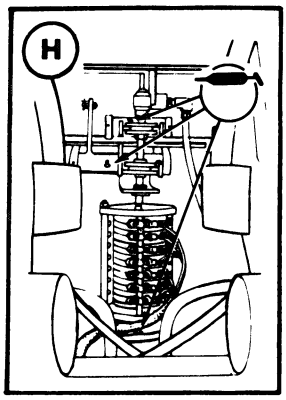
SPECIAL TORQUES

Fuel System

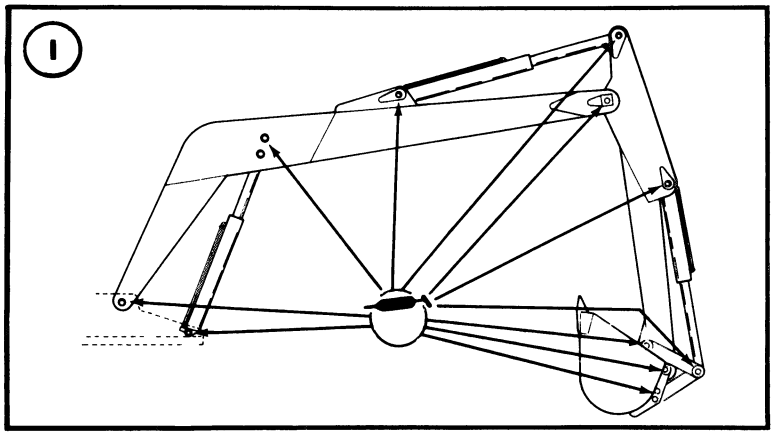
Fuel filters (2)	Install until gasket contacts filter head, then hand tighten 1/2 to 3/4 turn.	
Fuel filter bleeder screws	12 to 18 in. lbs.	138.26 to 207.69mm-kg.
Fuel injector clamp capscrews	18 to 22 ft. lbs.	2.5 to 3m-kg.
Fuel injector leakoff nuts	35 to 45 in. lbs.	403.2 to 518.5mm-kg.
Fuel injector pressure adjusting screw locknut	70 to 75 in. lbs.	806.5 to 864.1mm-kg.
Fuel injector tube nuts	18 to 22 ft. lbs.	2.5 to 3m-kg.
Fuel pump drive hub nut (14mm thread)	94 to 108.5 ft. lbs.	13 to 15m-kg.
Fuel pump timing pointer screws	60 to 72 in. lbs.	691.3 to 829.5mm-kg.



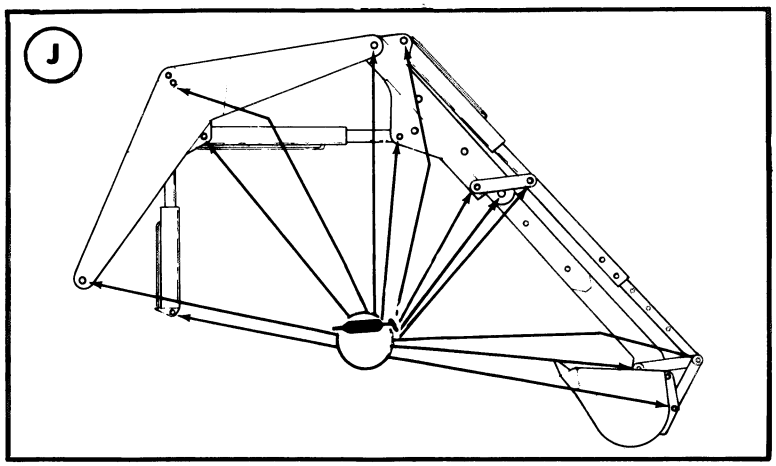
Grease Fittings on Control Bellcranks Below Operator's Cab



Grease Fittings on Upper Shift Linkage and Central Swivel Shaft



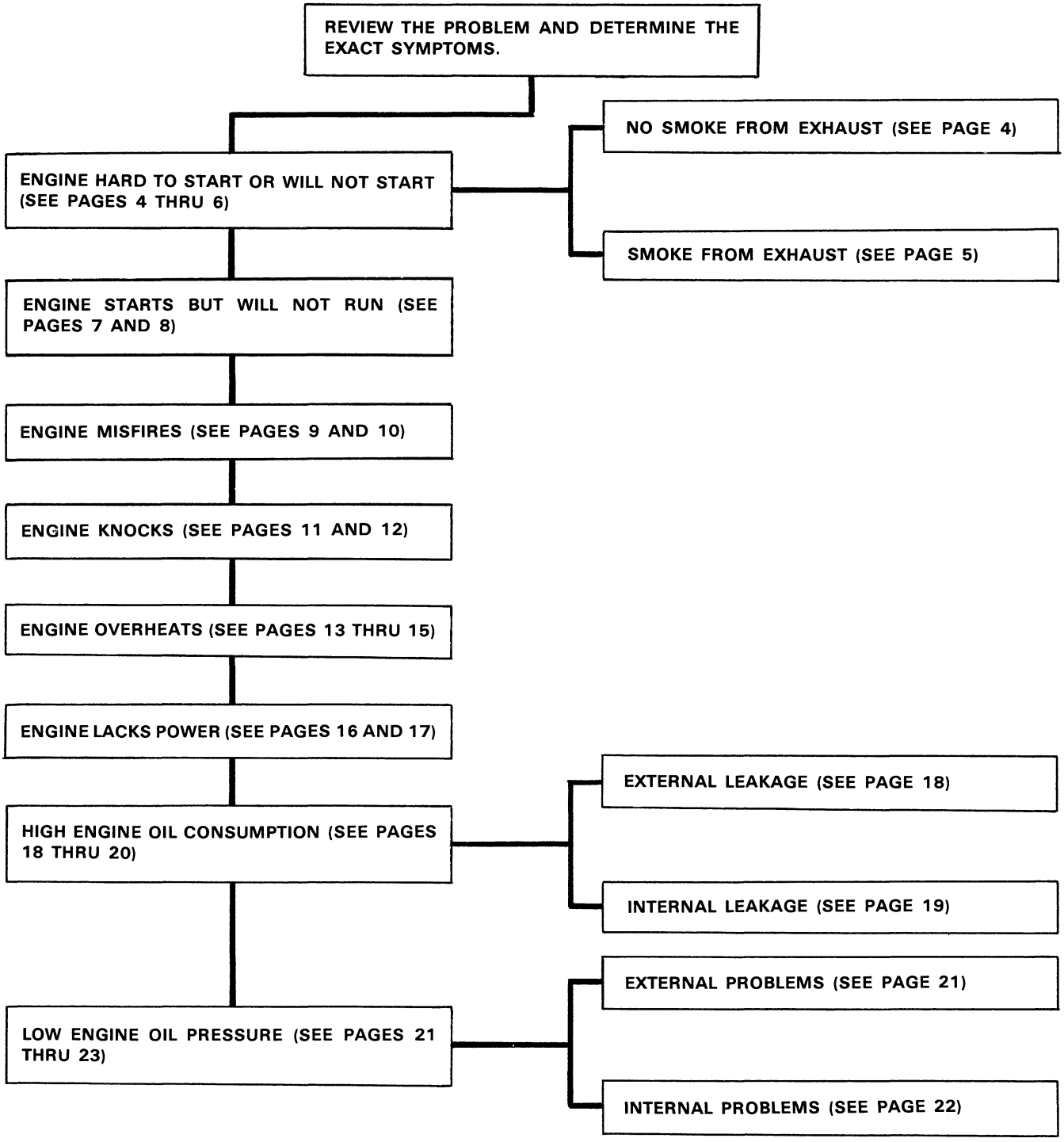
Grease Fittings on "E" Boom



Grease Fittings on "Y" Boom

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

ENGINE DIAGNOSIS CHART



ENGINE OVERHEATS

1. Fan Belt Loose

Check fan belt for proper tension. Check that the belt is not covered with oil or worn badly and riding very deep in pulley groove. Check for pulley groove wear.

2. Low Coolant Level

Check coolant level in radiator and refill if necessary.

3. Water Pump Malfunction

Remove the radiator cap and observe the coolant to see if there is movement which indicates the water pump is pumping. Move the fan back and forth to check for any defective bearings. Check around the water pump for any signs of coolant leakage indicating a bad water pump seal. Remove water pump and rebuild or replace.

4. Thermostat Inoperative

If there is high coolant temperature and boiling coolant, remove thermostats and test them.

5. Engine Timing Incorrect

Combustion will not occur in the cylinder at the correct moment (degrees BTDC) if the engine timing is incorrect. This can cause preignition or detonation and serious damage to the engine. Check for proper engine timing.

6. Tractor Mechanical Drag

A mechanical drag on a unit can cause low horsepower and engine overheating. Causes of some mechanical drags are defective brakes, bad bearings, or gears in transmission.

7. Radiator Cap Inoperative

Test radiator cap to see that it relieves at the correct pressure. Inspect cap gasket for proper sealing. An inoperative cap can cause water pump cavitation and lower coolant boiling points.

8. Radiator Fins Bent

Bent or damaged fins can cause a cooling system to overheat because of restricted air flow through the radiator core. All of the fin area is needed to dissipate the engine heat from the radiator.

9. Radiator Fins Plugged With Dirt

Radiator fins must be clean so air can flow through the radiator fins and help dissipate the heat of the coolant. Items that affect radiator cooling are: oil and grease on fins, leaves, and attachments covering radiator air inlet.

10. Cylinder Head Gasket Blown

A blown cylinder head gasket will cause one or two cylinders to loose power and cause an engine miss. It can also cause cooling system pressure to rise and blow engine coolant out the radiator overflow. Take a compression test to help determine a defective head gasket or, remove thermostats and fan belts, run engine, and check for gas bubbles rising in coolant in the water manifold.

11. Injection Pump Malfunction

A malfunctioning injection pump will usually under-fuel the engine. Adjust or replace the injection pump.

12. Radiator Baffling Missing

The removal of or non-reinstalling of radiator baffling, whether foam rubber or sheet metal, will cause cooling air flow to escape around the radiator instead of drawing in cool external air through the radiator.

13. Engine Low On Oil

An engine low on oil could loose lubrication to internal parts and start scoring pistons, sleeves and damage engine bearings. Proper oil level is required to help dissipate some of the engine heat. Check engine oil level every eight hours of operation. Low engine oil can also give low oil pressure readings.

14. Wrong Fuel or Contaminated Fuel

Wrong fuel or contaminated fuel can cause the unit not to run or to have preignition and detonation causing serious damage to the engine. Drain fuel tank and refill with correct fuel.

LOW ENGINE OIL PRESSURE

INTERNAL PROBLEMS (Cont'd)

11. Internal Oil Passage Leak

A crack, missing plug, or bad "O" ring could cause an internal oil gallery leak resulting in low oil pressure readings. Another possible leak is the "O" ring that seals between the engine oil pump and oil gallery. If such leakage is suspected, attach air pressure to the oil gallery and watch for leaks with oil pan removed.

12. Key In Oil Pump Gear Worn

The key in the oil pump drive gear could become worn and shear. Remove oil pan and oil pump, disassemble oil pump and inspect.

13. Camshaft Bearing Worn

A camshaft bearing knock is not a very sharp knock. The knock will be only at one-half of crankshaft speed and will not become worse at different engine speeds. By grounding out two or more cylinders at high RPM, the knock usually decreases. Low oil pressure could result from worn bearings and excessive oil clearance from lack of replacing cam bearing at engine overhaul.

14. Piston Ring Installation Faulty or Broken Rings

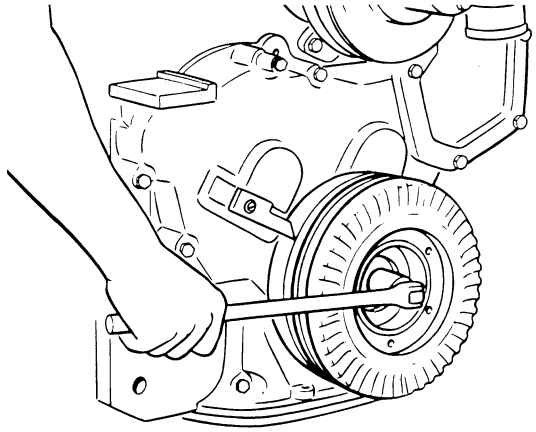
Many times piston rings are installed wrong, upside down, wrong size, or expanders are cut-off on three piece oil rings and overlapping the expander. Be sure to carefully read instructions before installing piston rings. Damaged rings can cause scoring of the piston and sleeves and cause the engine to use oil.

15. Turbo-Charger Seal Damaged

Seal leakage or failure in a turbo-charger will allow the lubricating oil to be drawn into the engine intake manifold and burned in the engine. Inspect turbo-charger compressor and turbine wheel for signs of lubricating oil.

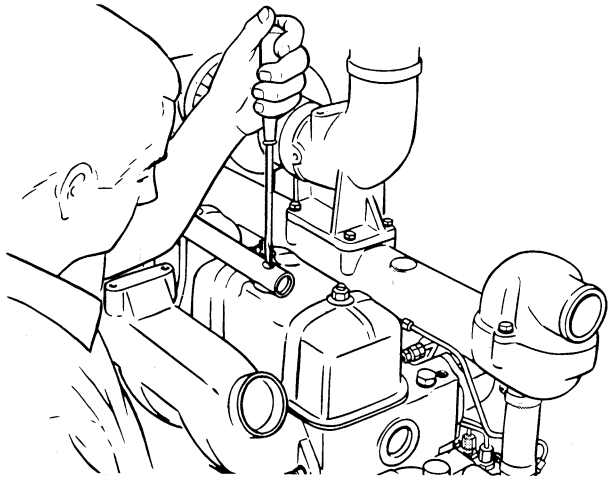
Checking Top Dead Center

STEP 2



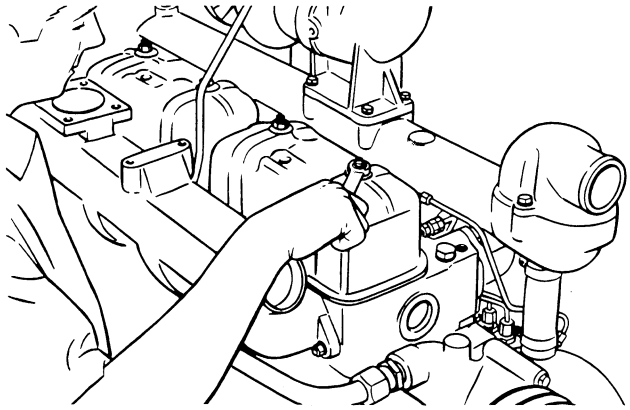
CRANK ENGINE UNTIL 10° BTDC MARK ON CRANKSHAFT PULLEY IS ALIGNED WITH TIMING POINTER.

STEP 3



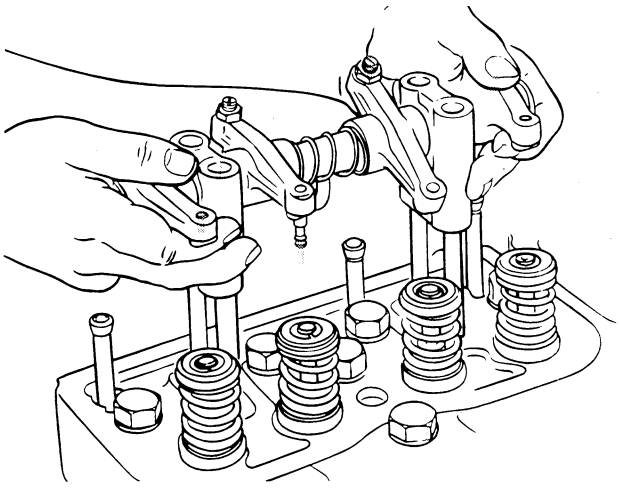
REMOVE BREATHER TUBE.

STEP 4



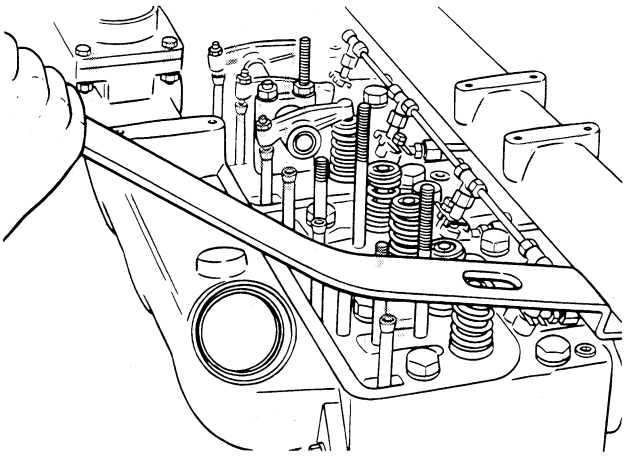
REMOVE VALVE COVER AND GASKET FROM NO. 1 AND NO. 2 CYLINDERS.

STEP 5



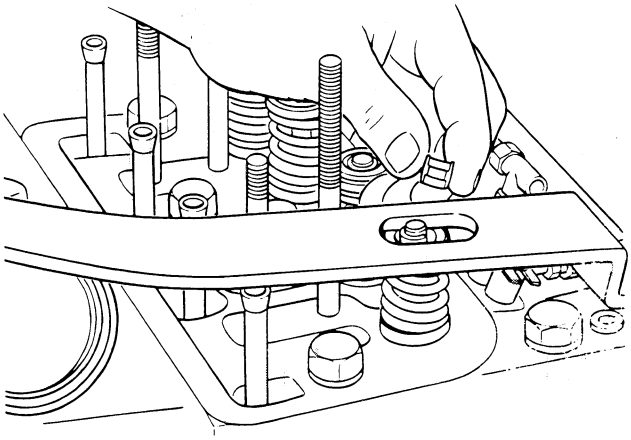
REMOVE ROCKER ARM ASSEMBLY.

STEP 6



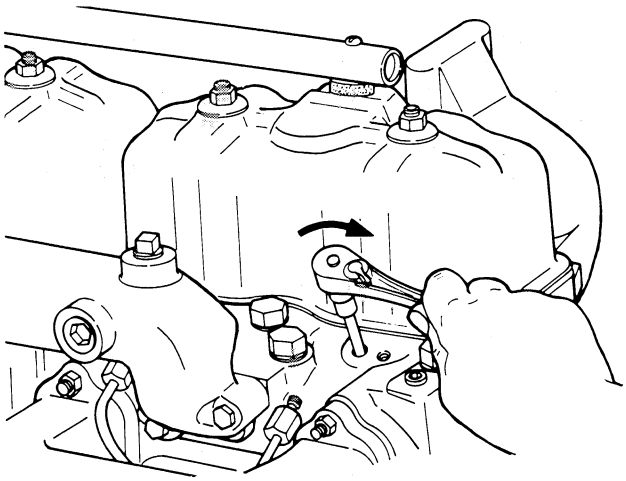
COMPRESS EXHAUST VALVE SPRING ON NO. 1 CYLINDER USING FABRICATED TOOL (SEE PAGE 3).

STEP 7



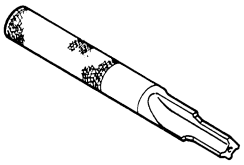
REMOVE VALVE KEEPERS

STEP 43 (CLAMP TYPE INJECTOR)

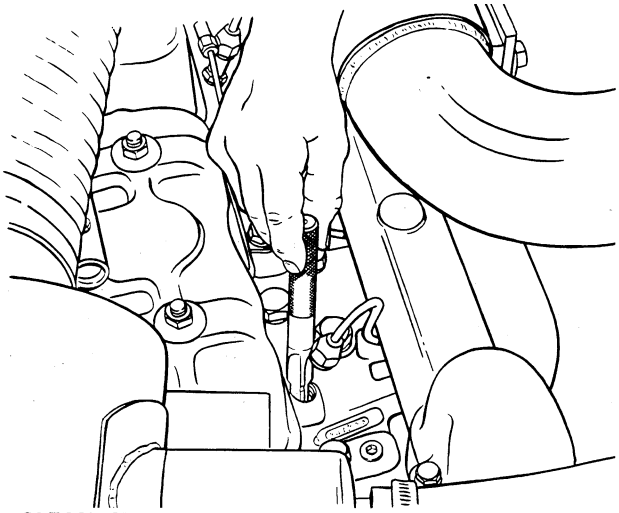


ALWAYS TURN TOOL CLOCKWISE. COUNTER-CLOCKWISE ROTATION DULLS TOOL. BLOW OUT WITH COMPRESSED AIR.

STEP 44 (SCREW-IN TYPE INJECTOR)

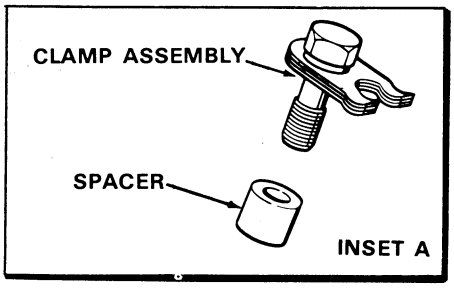


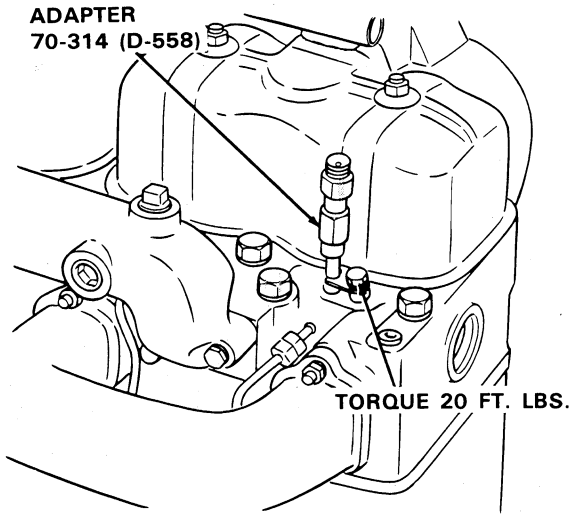
BORE CLEANING TOOL
NUDAY CO. P/N 6062
14615 WYOMING AVE.
DETROIT, MICHIGAN£ 48238
(PART OF KIT 2205)



CLEAN CYLINDER HEAD INJECTOR BORE USING BORE CLEANING TOOL 6062.

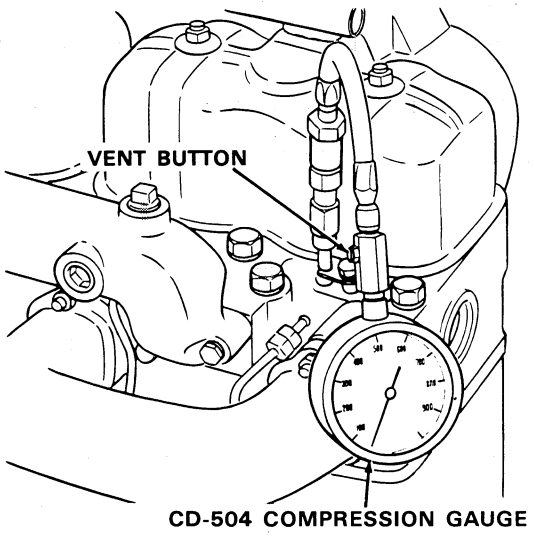
STEP 45 (CLAMP TYPE INJECTOR)





INSTALL BACHARACH 70-314 (D-558) COMPRESSION GAUGE ADAPTER. SECURE WITH AN ORIGINAL INJECTOR CLAMP ASSEMBLY AND SPACER.

STEP 46 (CLAMP TYPE INJECTOR)



CONNECT CASE NO. CD-504 COMPRESSION GAUGE TO ADAPTER.

NOTE: TAKE SEVERAL COMPRESSION READINGS ON EACH CYLINDER USING VENT VALVE BUTTON TO RELIEVE GAUGE PRESSURE.

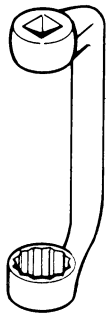
SEE CHART ON NEXT PAGE.

SPECIAL TOOLS

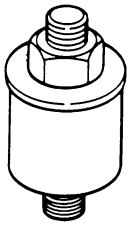
A43277 INJECTOR
REAMER

A43278 INJECTOR
REMOVAL TOOL

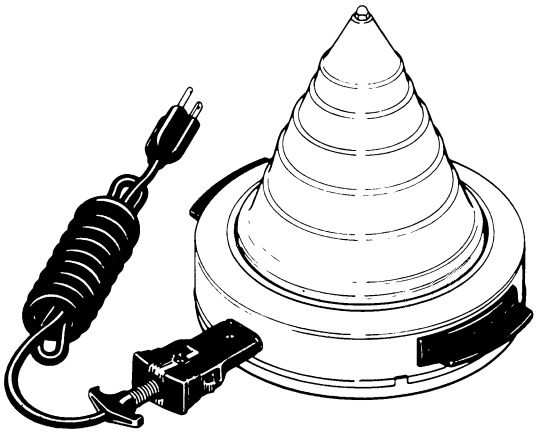
A43113 VALVE
GUIDE REAMER



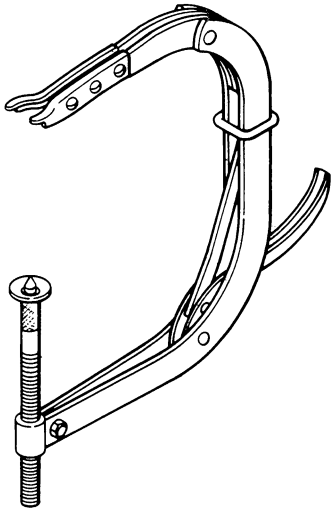
A42393 CYLINDER
HEAD WRENCH



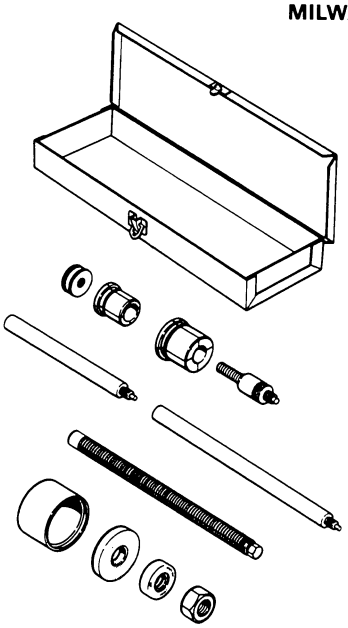
TACHOMETER DRIVE
REMOVAL TOOL



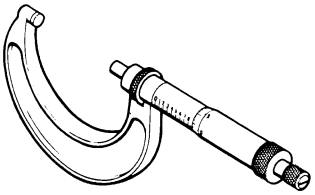
THERMO MOUNTER - MODEL "C"
ELECTRONIC DESIGNS, INC.
5164 N. 62ND STREET
MILWAUKEE, WIS. 53218



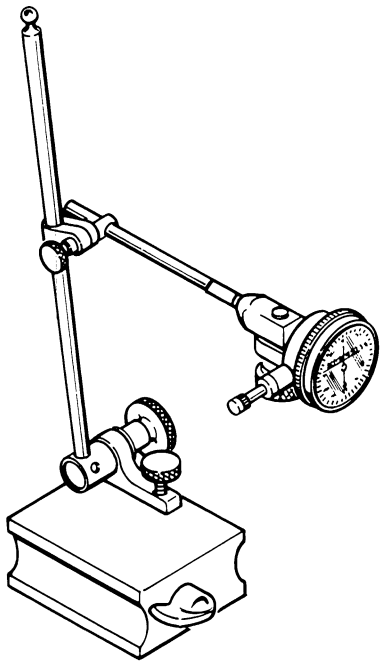
VALVE SPRING COMPRESSOR



A41103 CAMSHAFT
BUSHING TOOL KIT



0" TO 5" MICROMETER

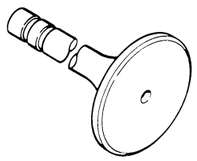


DIAL INDICATOR

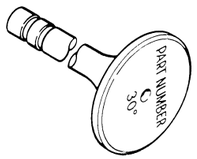
Refacing Intake and Exhaust Valves and Valve Seats

STEP 32

VALVE IDENTIFICATION



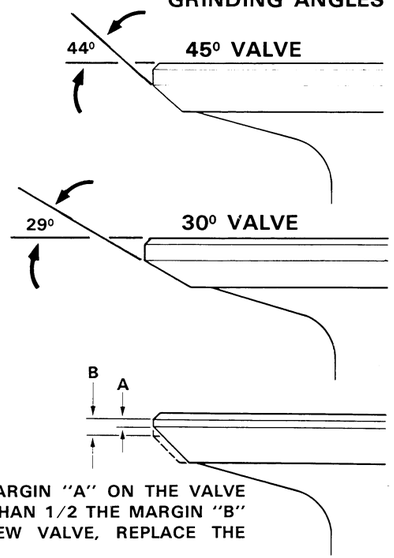
45° INTAKE AND EXHAUST VALVES HAVE NO IDENTIFICATION MARKS ON VALVE HEAD



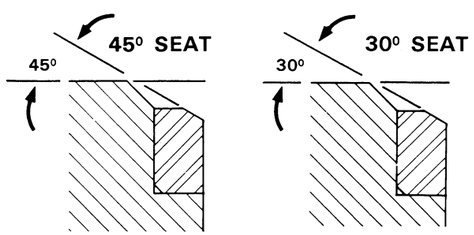
30° INTAKE VALVE ARE STAMPED WITH A PART NUMBER AND 30° ON THE VALVE HEAD

STEP 33

VALVE & SEAT GRINDING ANGLES

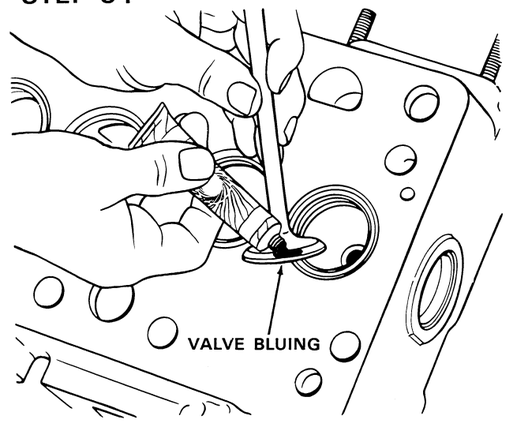


IF THE MARGIN "A" ON THE VALVE IS LESS THAN 1/2 THE MARGIN "B" ON A NEW VALVE, REPLACE THE VALVE.



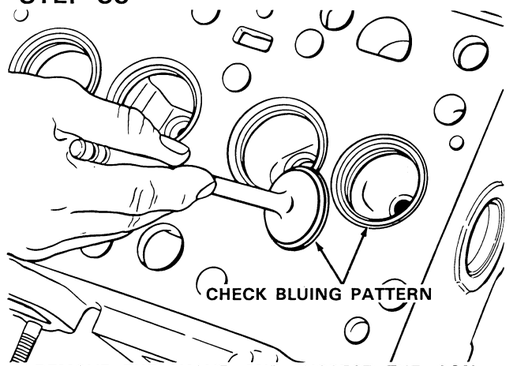
NOTE: USE A PRECISION SEAT GRINDER. TAKE VERY LIGHT CUTS WITH THE GRINDING STONES SO JUST ENOUGH METAL IS REMOVED TO END UP WITH A GOOD SMOOTH SEAT FINISH.

STEP 34



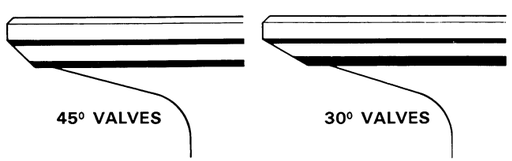
APPLY A SMALL AMOUNT OF VALVE BLUING (PRUSSIAN BLUE) ON THE VALVE FACE. INSTALL THE VALVE IN THE HEAD AND ROTATE THE VALVE ON ITS SEAT.

STEP 35



REMOVE THE VALVE AND INSPECT THE CONTACT AREA ON THE VALVE FACE AND SEAT. THE BLUING WILL HAVE BEEN REMOVED FROM THE VALVE FACE WHERE IT MADE CONTACT WITH THE SEAT.

STEP 36



CORRECT REFACING OF VALVES AND SEATS WILL PROVIDE A BLUING PATTERN AS SHOWN.

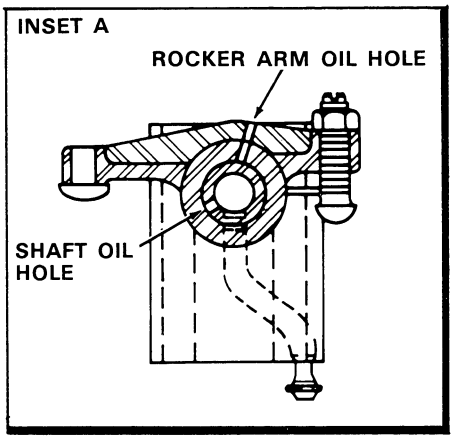
IF BLUING PATTERN IS OTHER THAN THE PATTERNS SHOWN, REFER TO DIAGNOSIS OF VARIOUS BLUING PATTERNS ON PAGES 14 THRU 18.

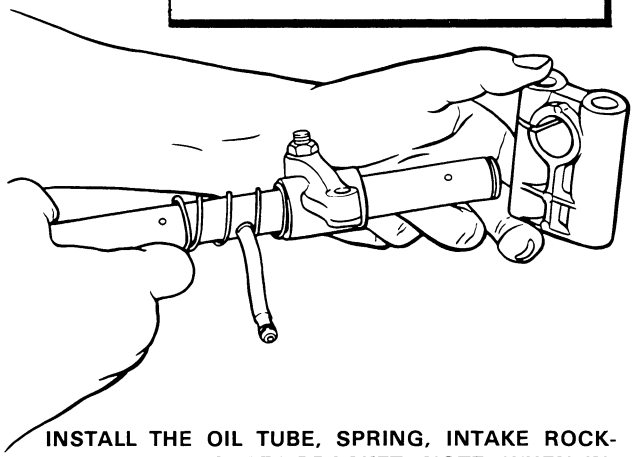
Rocker Arm Assembly

STEP 58

FLUSH THE ROCKER ARM SHAFTS TO REMOVE ANY RESIDUAL MATERIAL. INSPECT SHAFTS FOR WORN SPOTS ON THE BOTTOM SIDE OF SHAFT REPLACE THE SHAFTS IF A WORN CONDITION EXISTS. COAT ALL PARTS WITH CLEAN ENGINE OIL PRIOR TO ASSEMBLY

STEP 59

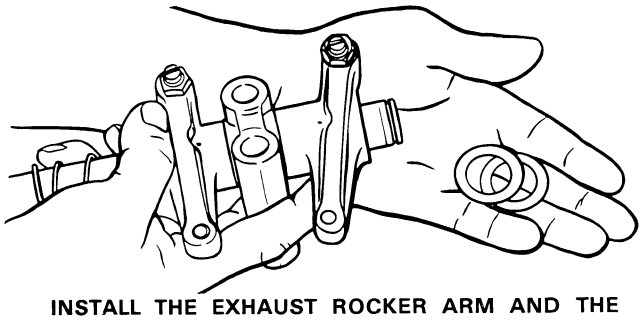




INSTALL THE OIL TUBE, SPRING, INTAKE ROCKER ARM AND SHAFT BRACKET NOTE: WHEN INSTALLING ROCKER ARMS ON THE SHAFT CHECK THAT THE ARMS ARE FREE TO ROTATE WITHOUT ANY SIDE WOBBLE IF ANY SIDE WOBBLE EXISTS, REPLACE THE ROCKER ARMS

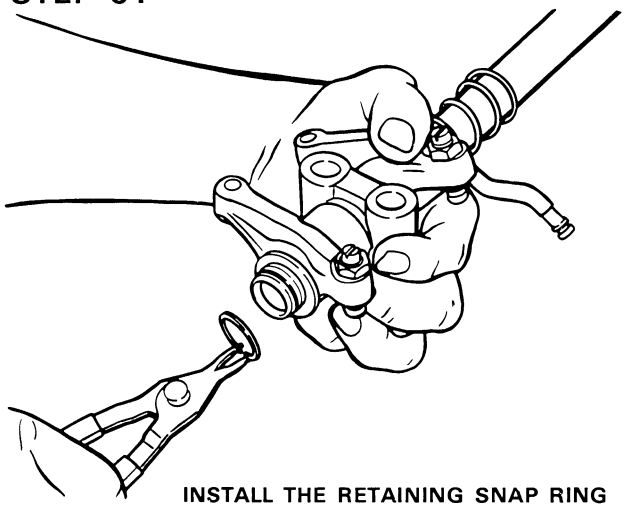
IMPORTANT: WHEN INSTALLING ROCKER ARMS, KEEP THE SHAFT OIL HOLES TOWARDS THE VALVES, INSET A.

STEP 60



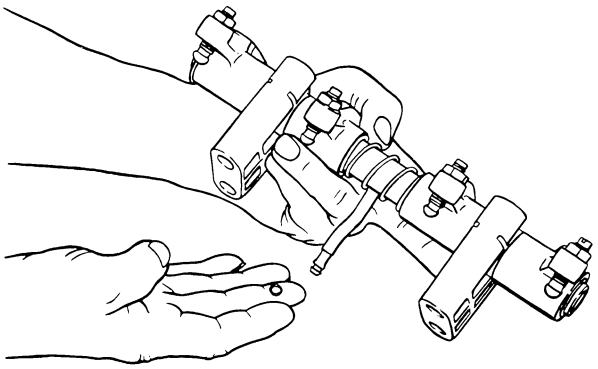
INSTALL THE EXHAUST ROCKER ARM AND THE SAME NUMBER OF SPACER WASHERS THAT WERE REMOVED, SEE STEP 65, PAGE 2015-24

STEP 61



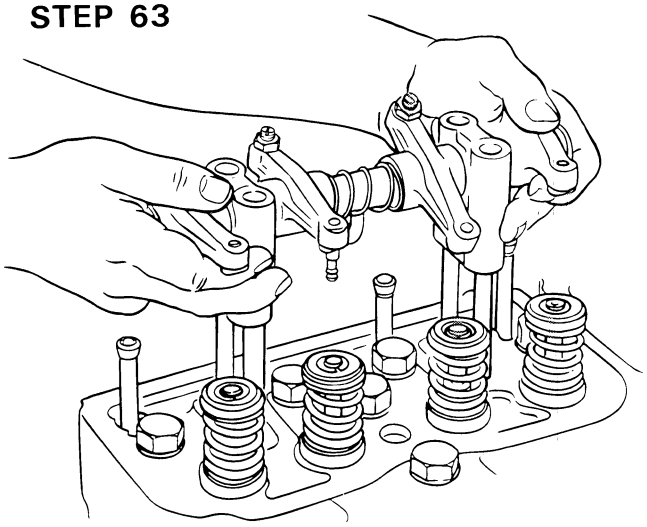
INSTALL THE RETAINING SNAP RING

STEP 62



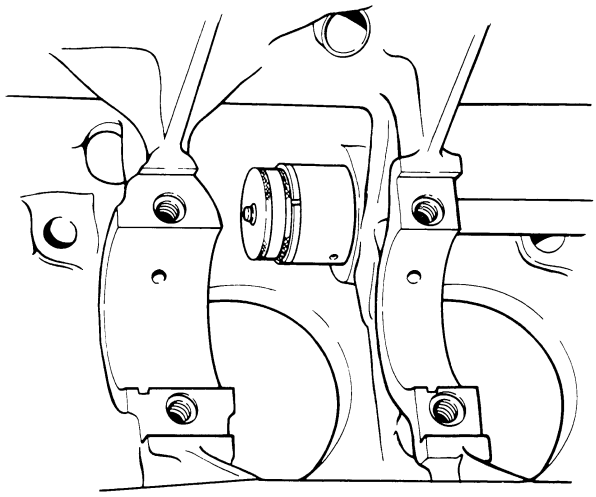
INSTALL A NEW "O" RING ON OIL TUBE

STEP 63



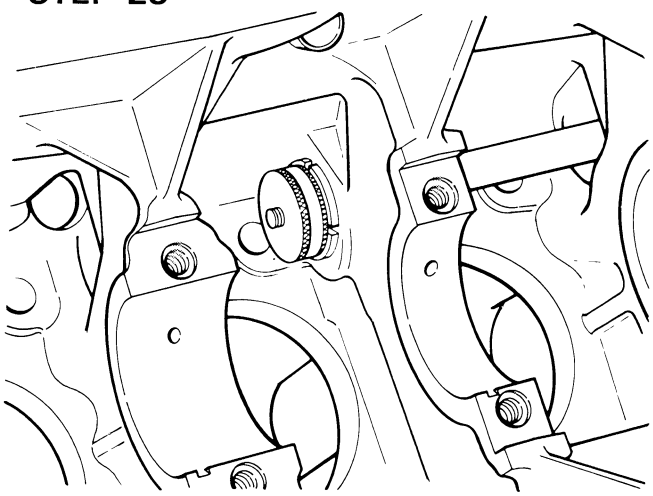
INSTALL THE ROCKER ARM ASSEMBLY ONTO THE CYLINDER HEAD

STEP 22



INSTALL THE BUSHING ON THE PULLER (WITH OIL HOLES ALIGNED) AND PULL BUSHING INTO PLACE.

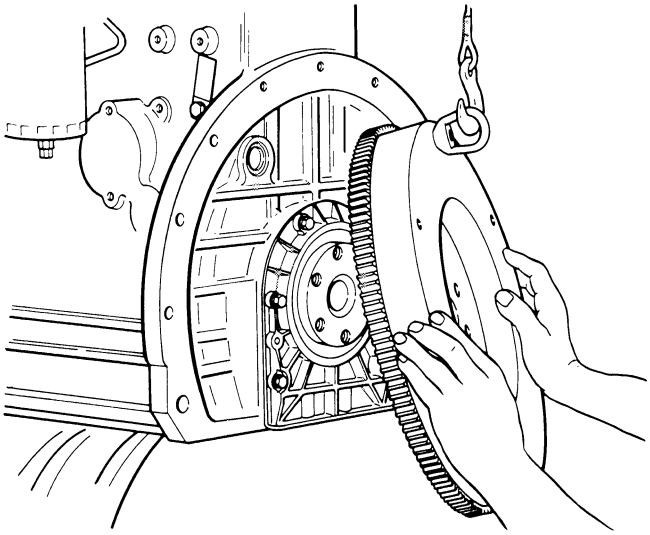
STEP 23



PULL THE BUSHING INTO BLOCK BORE UNTIL IT IS FLUSH WITH THE BORE, THEN REMOVE BUSHING TOOL.

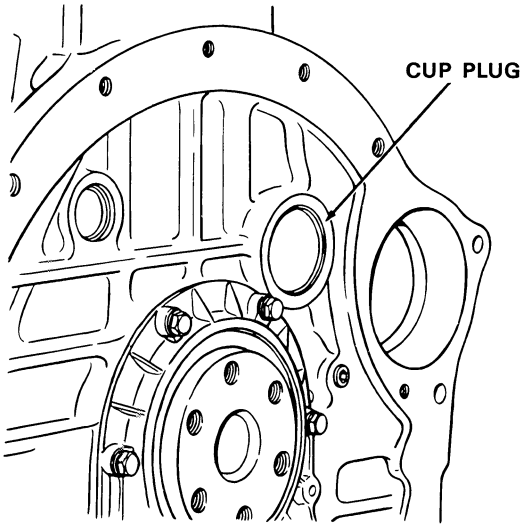
Rear Camshaft Bushing Replacement

STEP 24



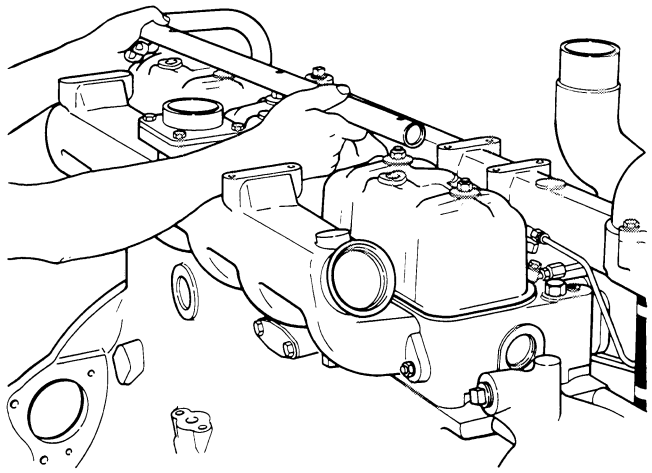
TO REPLACE THE REAR CAMSHAFT BUSHING THE ENGINE MUST BE REMOVED FROM THE MACHINE AND THE FLYWHEEL MUST BE REMOVED FROM THE ENGINE.

STEP 25



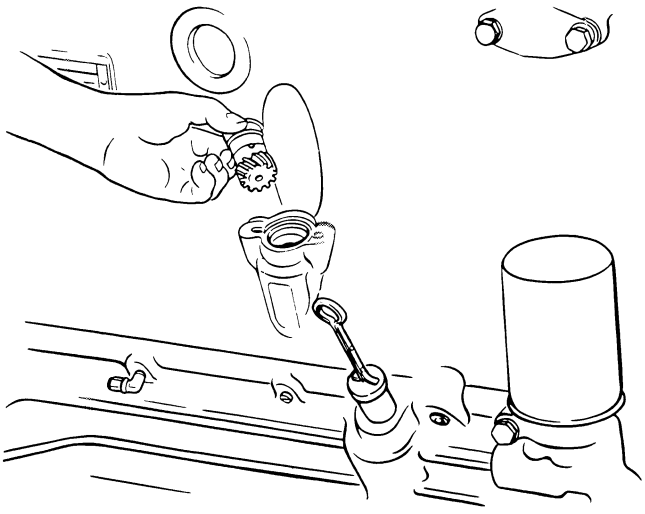
THE REAR ENGINE CUP PLUG MUST BE REMOVED BEFORE THE REAR CAMSHAFT BEARING CAN BE REMOVED FROM THE ENGINE BLOCK.

STEP 80



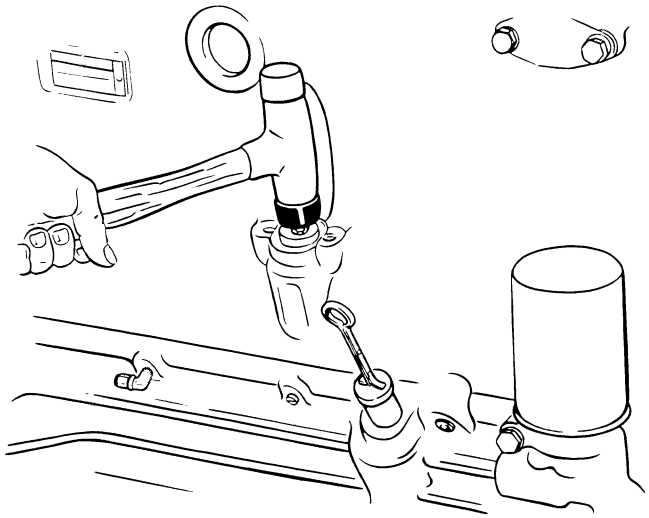
INSTALL BREATHER TUBE AND NEW GASKETS

STEP 81



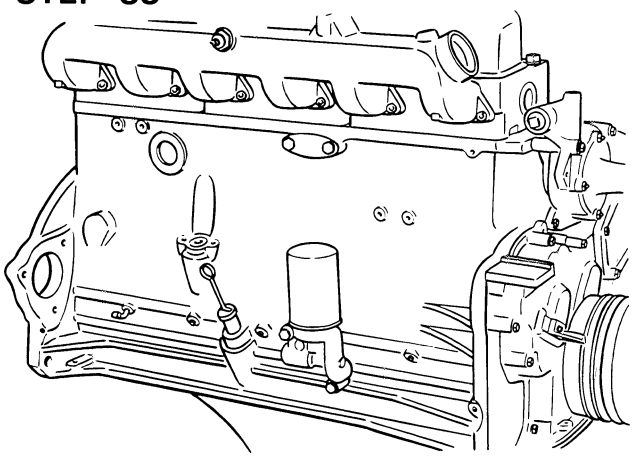
INSTALL TACHOMETER DRIVE.

STEP 82



CAREFULLY TAP DRIVE INTO ENGINE BLOCK UNTIL TOP OF DRIVE IS FLUSH WITH BLOCK.

STEP 83



TACHOMETER DRIVE INSTALLED.

STEP 18

AFTER DEGLAZING, SWAB CYLINDER SLEEVE WITH A CLEAN CLOTH DAMPENED IN WARM WATER AND A MILD DETERGENT SOAP. AFTER SWABBING THE CYLINDER SLEEVES, WIPE THEM OUT WITH CLEAN CASE HDM OIL OR SAE 10W ENGINE OIL.

NOTE: SWAB AND WIPE OUT THE CYLINDER SLEEVES UNTIL A CLEAN CLOTH REMAINS ABSOLUTELY CLEAN, ONE SWABBING - WIPING OPERATION IS NOT ENOUGH.

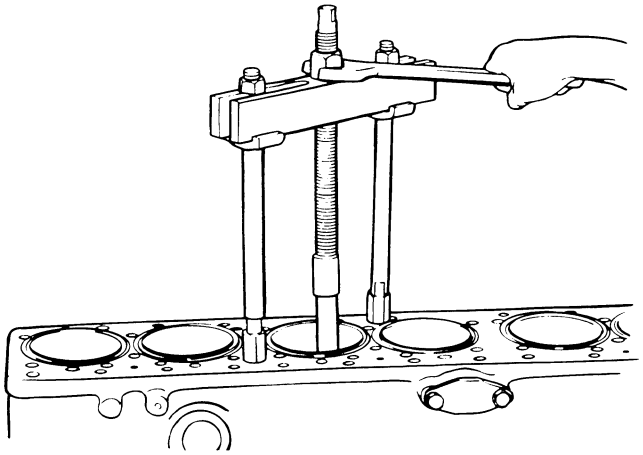
IMPORTANT: DO NOT USE GASOLINE, DIESEL FUEL OR KEROSENE TO CLEAN SLEEVES, SINCE THESE MATERIALS WILL NOT REMOVE THE ABRASIVES FROM SLEEVE SURFACE.

Cylinder Sleeve Removal and Installation

STEP 19

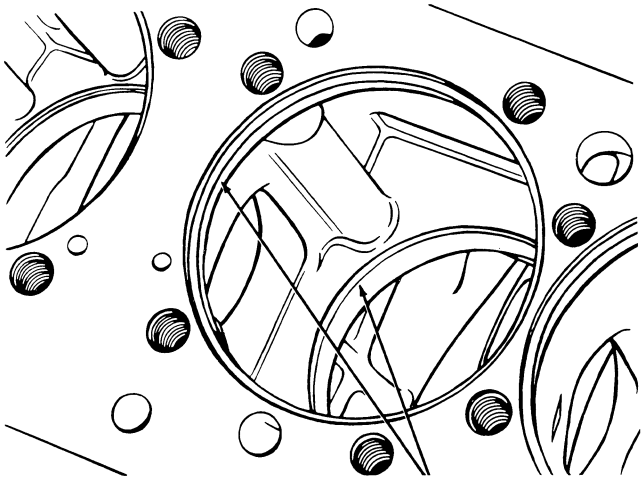
IMPORTANT: BEFORE REMOVING CYLINDER SLEEVES, COVER THE CRANKSHAFT AND MAIN BEARING TO PREVENT SEDIMENT FROM THE BLOCK DAMAGING THESE PARTS.

STEP 20



MARK THE CYLINDER SLEEVES WITH PAINT IN RELATION TO THE BLOCK, IF THE SAME SLEEVES ARE GOING TO BE REINSTALLED. USE A SLEEVE PULLER TO REMOVE CYLINDER SLEEVES.

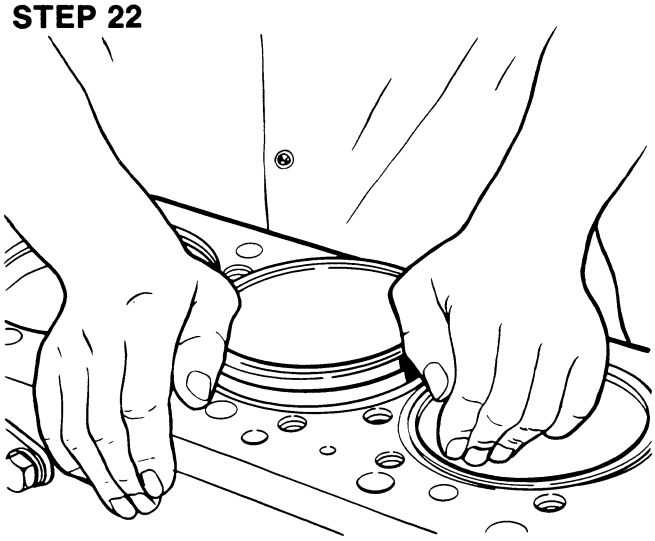
STEP 21



CLEAN ALL DEPOSITS FROM UNDER THE FLANGE OF THE SLEEVE AND IN THE BORE IN THE BLOCK. THE SLEEVE MUST REST FLAT TO PREVENT DISTORTION. CLEAN THE LOWER SEALING SURFACES IN THE BLOCK AND ON THE SLEEVE TO PREVENT COOLANT LEAKS WHEN THE SLEEVE IS INSTALLED.

NOTE: CHECK THE LOWER BORE CHAMFER IN THE BLOCK. THE CHAMFER MUST BE SMOOTH. SEE SETION 2290 IF THE CHAMFER IS NOT SMOOTH.

STEP 22



PUSH SLEEVES IN THE BLOCK.

IMPORTANT: INSTALL THE SLEEVE WITHOUT THE O-RINGS.

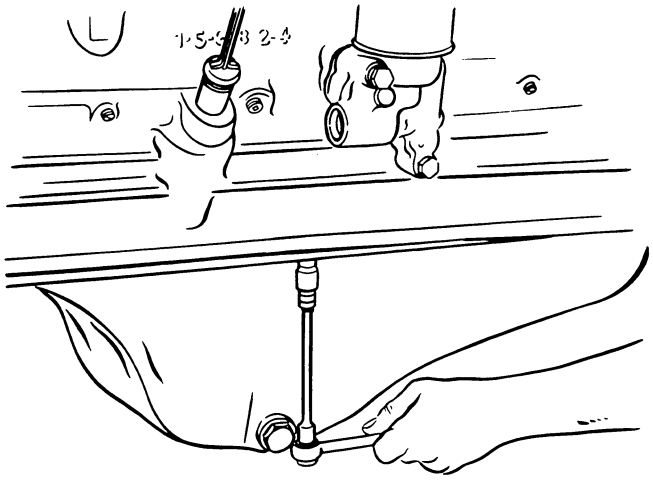
Section
2035

CRANKSHAFT, MAIN BEARINGS, FLYWHEEL
AND
OIL SEAL REPLACEMENT

REPLACEMENT OF MAIN BEARINGS WITHOUT REMOVING CRANKSHAFT

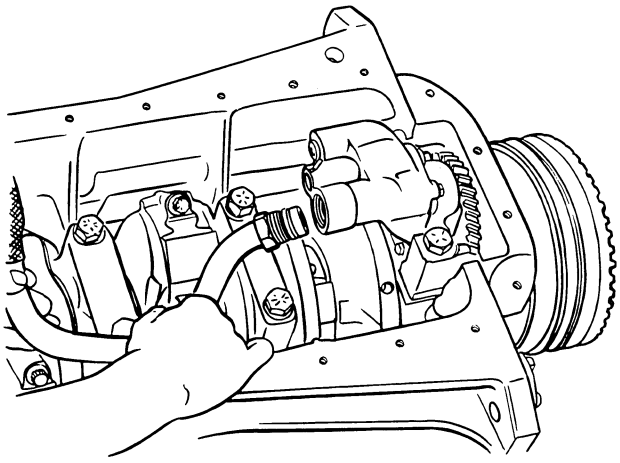
Removal

STEP 1



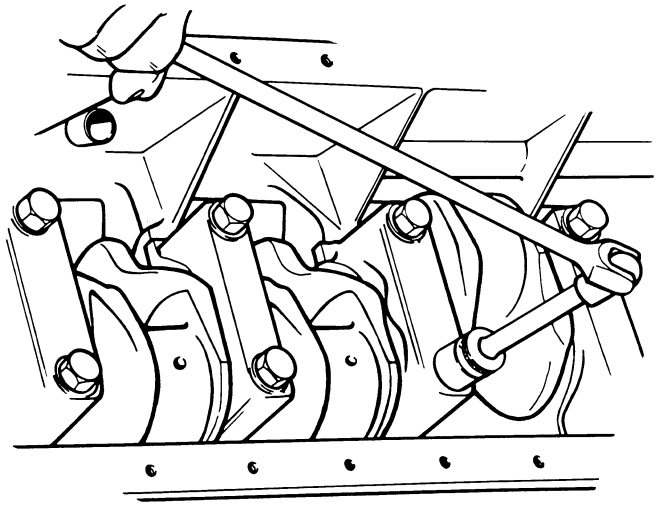
REMOVE THE ENGINE OIL PAN.

STEP 2



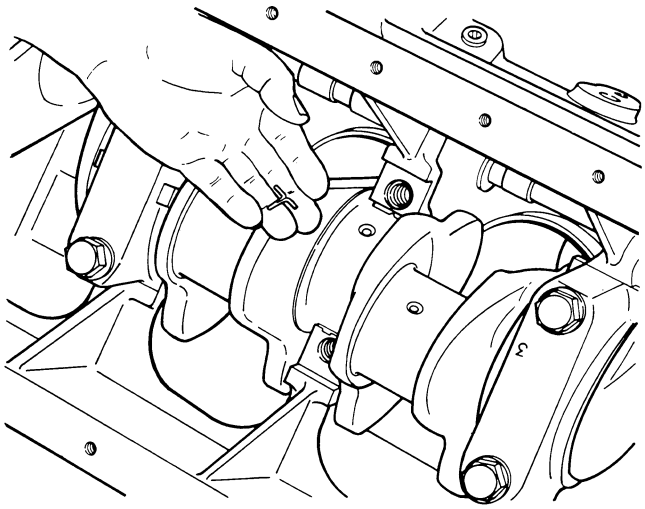
REMOVE THE OIL PUMP SUCTION TUBE.

STEP 3



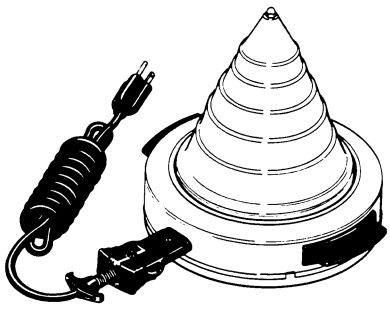
REMOVE THE MAIN BEARING CAP. NOTE: REMOVE ONLY ONE CAP AT A TIME.

STEP 4

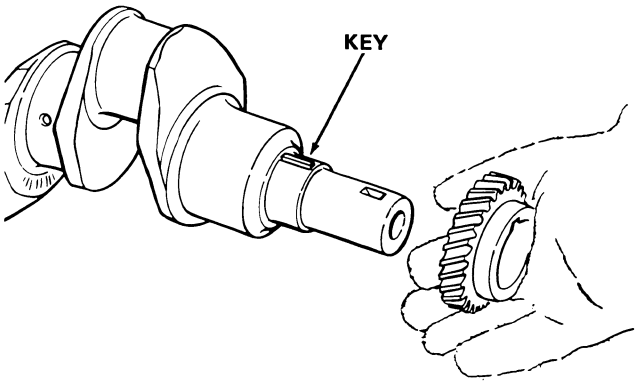


FABRICATE A SMALL "T" BAR OUT OF WIRE.

STEP 28



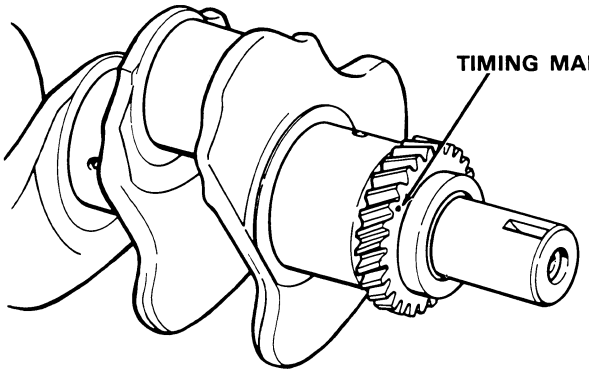
HEAT CRANKSHAFT GEAR, USING A GEAR & BEARING HEATER, TO FACILITATE ASSEMBLING GEAR ON CRANKSHAFT.



INSTALL KEY AND HEATED CRANKSHAFT GEAR ON CRANKSHAFT.

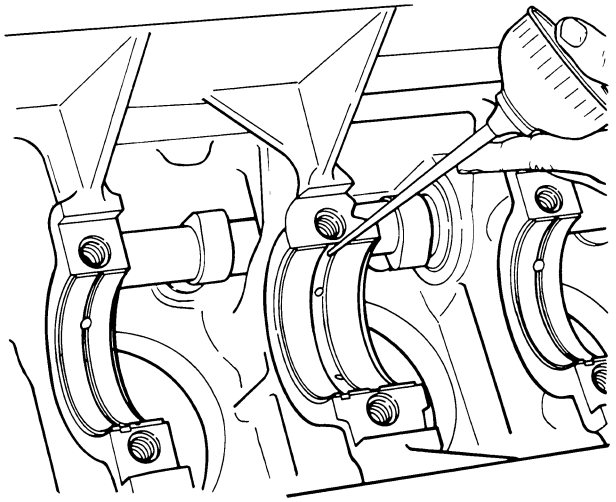
CAUTION: ALWAYS WEAR ASBESTOS GLOVES TO PREVENT BURNING YOUR HANDS WHEN HANDLING HEATED PARTS.

STEP 29



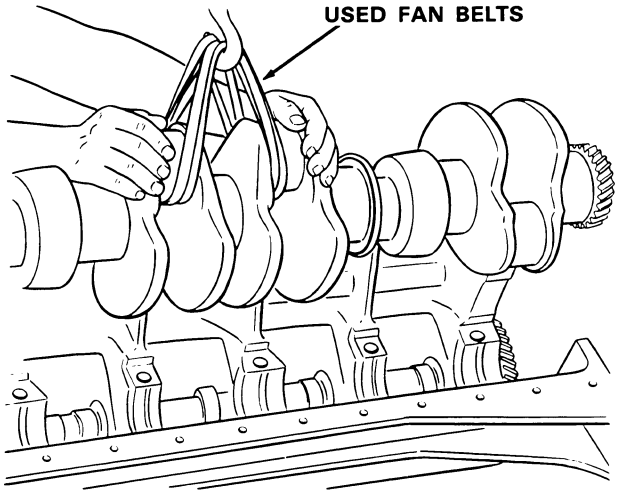
MAKE SURE THE TIMING MARK ON GEAR IS OUTWARD.

STEP 30



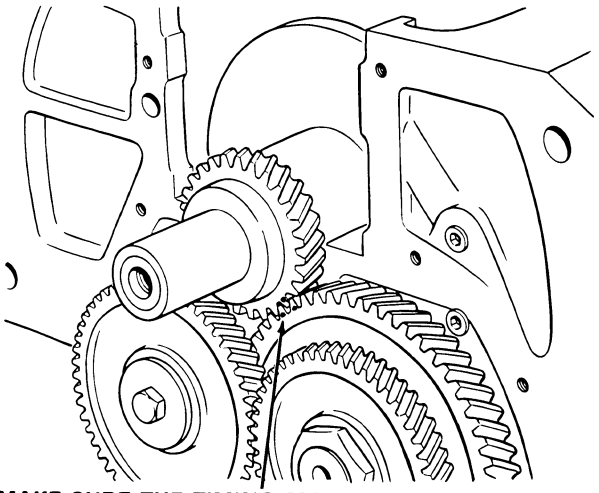
INSTALL BEARING LINERS AND LUBRICATE WITH CLEAN ENGINE OIL.

STEP 31



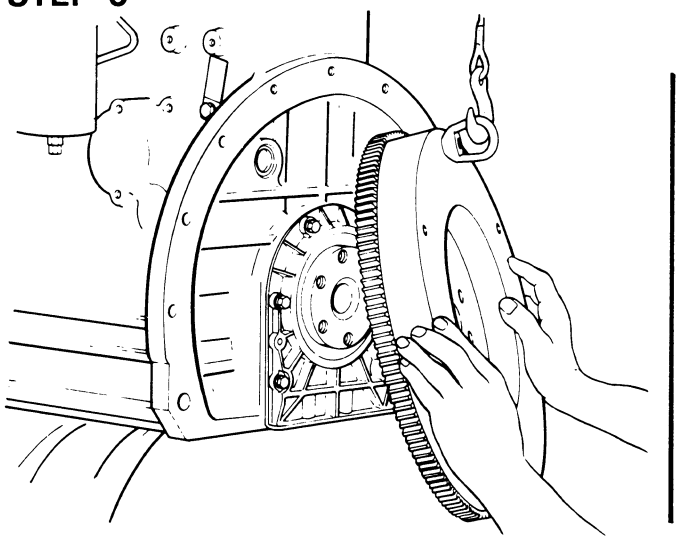
INSTALL CRANKSHAFT INTO THE ENGINE BLOCK.

STEP 32



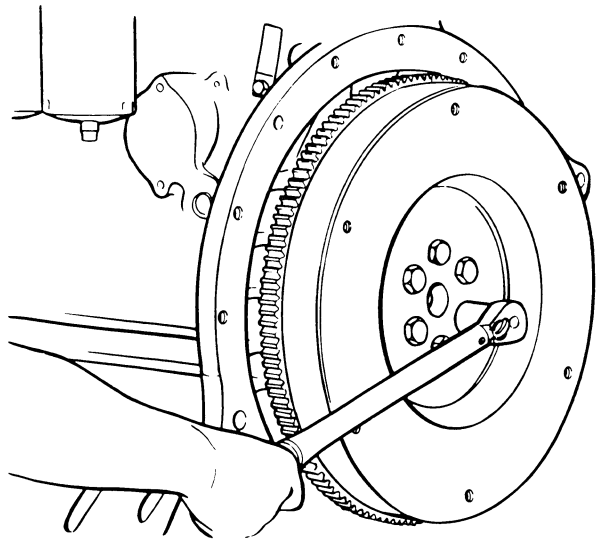
MAKE SURE THE TIMING MARKS ON THE CRANKSHAFT GEAR AND CAMSHAFT GEAR ARE ALIGNED.

STEP 6



Install flywheel to crankshaft.

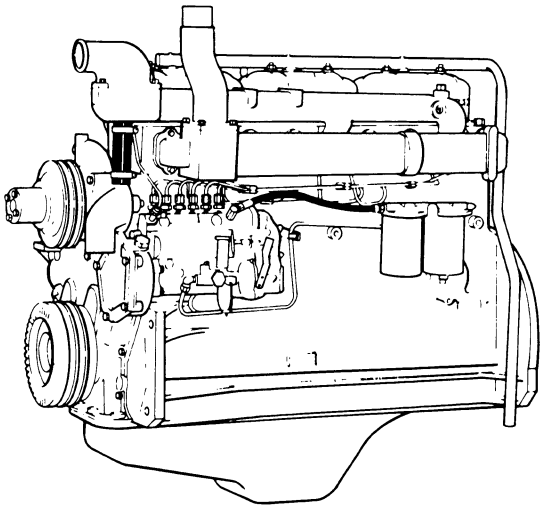
STEP 7

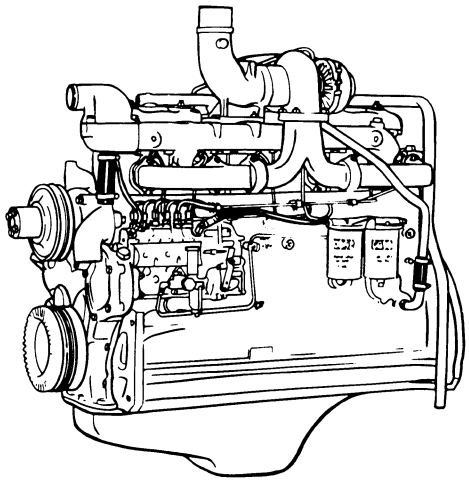


Tighten the flywheel retaining bolts to the following torques:

Without hardened washers - 180 to 190 ft. lbs. (244 to 258 Nm) (24.4 to 25.8 kgm).

With hardened washers - 230 to 250 ft. lbs. (312 to 339 Nm) (31.2 to 33.9 kgm).





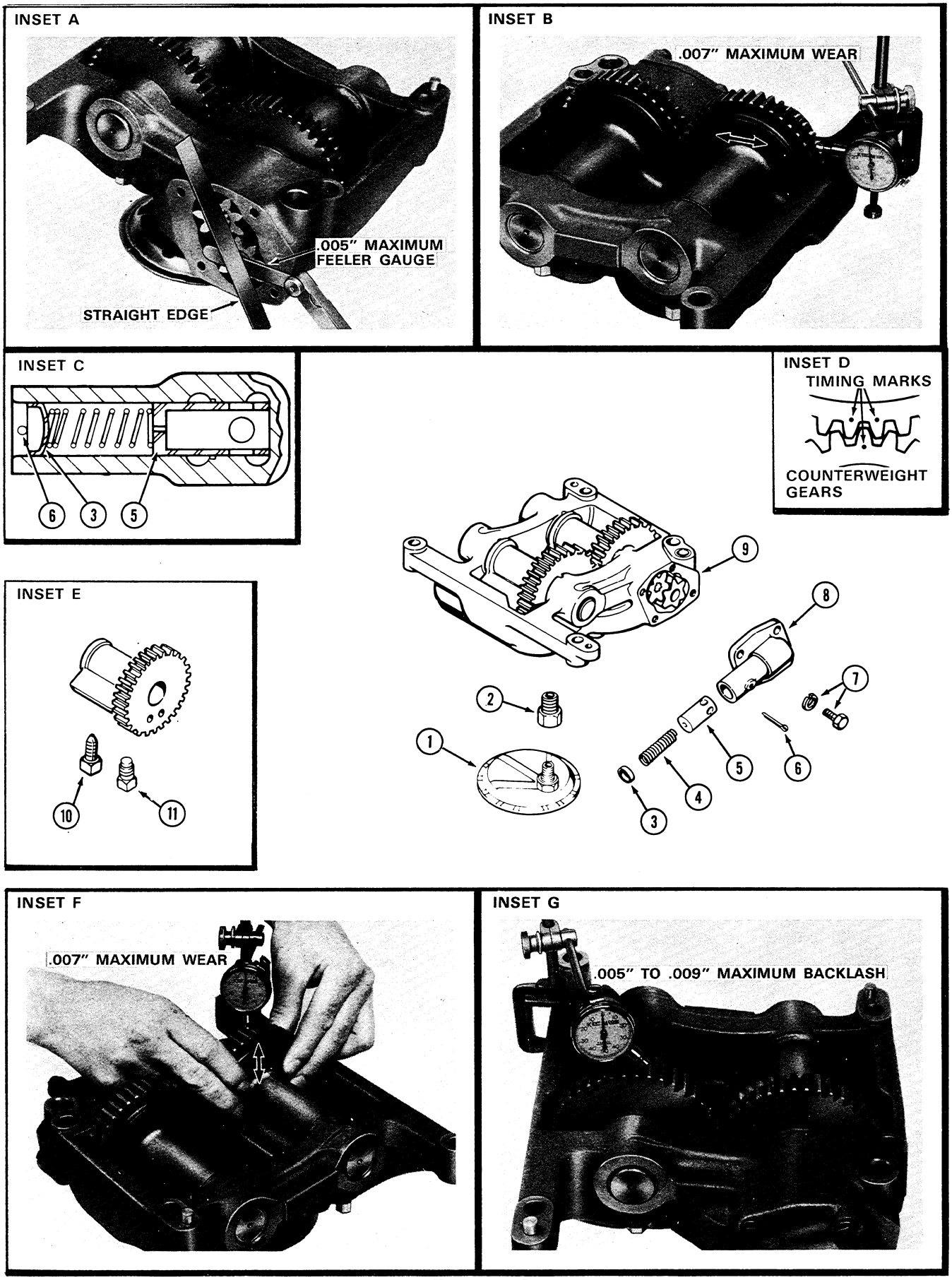

INSET A
.005" MAXIMUM FEELER GAUGE
STRAIGHT EDGE
INSET B
.007" MAXIMUM WEAR
INSET C
6
3
5
INSET D
TIMING MARKS
COUNTERWEIGHT GEARS
9
8
7
2
1
5
6
4
3
INSET E
10
11
INSET F
.007" MAXIMUM WEAR
INSET G
.005" TO .009" MAXIMUM BACKLASH

Figure 3

Test Summary

If engine speed is as specified, proceed to Test 3.

If engine speed is below the specified rpm, a worn engine or faulty transmission/Converter could be the source of trouble. Perform Test 3. If this test is also unsatisfactory, it can be concluded that the engine is at fault.

If Test 3 is satisfactory it indicates transmission/converter problems.

If engine speed is above the specified rpm, the converter hydraulic system is at fault. Causes may be internal oil leakage, wear in charging pump or a faulty regulator valve.

Test 3 - Hydraulic Stall

1. Start engine and run at half throttle.
2. Roll the bucket back and hold control lever in the power position. Accelerate to wide open throttle and record engine rpm.

Test Summary

If engine speed is below the specified rpm, it indicates engine wear or excessive pressure or restriction in the hydraulic system. Check main relief valve pressure setting (should have been done prior to testing) and adjust as required. If engine speed is still low, the engine is likely at fault.

If engine speed is above the specified rpm, the hydraulic system is inefficient. Causes may be internal oil leakage, pump wear, or low main relief valve setting.

Further tests of the hydraulic system can be made with a flowmeter as instructed in Section 4202.

ENGINE REMOVAL

1. Drain cooling system. Disconnect battery ground cable and remove batteries. Open drain cock on air reservoir.
2. Remove the air cleaner rain cap.
3. From inside the engine shrouding disconnect all wires, hoses, etc. that attach to engine or frame. Label them for correct installation.
4. Remove engine shroud and grill assembly.
5. Remove exhaust system from engine.
6. Disconnect torque converter cooling lines from radiator and converter. Remove upper and lower radiator hoses at the engine.
7. Remove the hydraulic lines from the oil cooler. Cap or plug the lines.
8. Attach a hoist to the radiator and oil cooler and remove radiator mounting bracket nuts and washers to loosen brackets from the frame.
9. With the hoist remove the radiator, oil cooler and air shroud.
10. Disconnect or remove from the left side of the engine:
    a. Fuel supply and return lines at transfer pump and fuel return line at rear of engine.
    b. Wire from engine temperature sending unit.
    c. Throttle linkage air line and fuel shut-off wire at the solenoid.
11. Disconnect or remove from the right side of the engine:
    a. Battery cables from starter and static solenoid.
    b. Hoses from air compressor and governor at air reservoir.
    c. Wiring from oil pressure sending unit and oil pressure switch.
    d. Wiring from alternator. Remove wiring clamp below alternator. Also remove any remaining harness or hose clamps that are attached to the engine block.

One method of checking overbore is to insert a new piston in honed cylinder and measure the clearance, using a wire gauge I.D. of honed cylinder must not exceed piston diameter by more than .007" (.178 mm).

After honing the cylinder, check for burrs or sharp edges at the compensating port. If a burr is present, remove it with a deburring tool.

Crocus cloth or jeweler's rouge may be used to polish cylinder or housing if it is not damaged enough to require honing.

Assembly

Reassembly is essentially the same as disassembly only in reverse. Coat parts with clean brake fluid to aid in assembly and provide initial lubrication.

Attention should be given to the lock wire (circlip or retaining ring) to make sure it is expanded securely into its groove.

Post overhaul Fill and Bleed: Bench bleed the cylinder. Fill the reservoir with fluid and force the piston through one full stroke. Repeat stroking until fluid is forced past residual check valve and through the outlet port.

Installation

1. Attach master cylinder to its proper place with mounting capscrews, yoke and clevis.

2. Bleed accelerator lines as instructed on page 2052-3.

ACCELERATOR SLAVE CYLINDER

Removal

To remove the slave cylinder disconnect the inlet line and the linkage to the governor lever, then remove retaining U-bolt. Transfer cylinder to a clean work area for disassembly and repair.

Disassembly

1. Remove push rod and rubber dust cover to expose circlip.

2. Remove circlip. Remove piston, seal and spring.

Inspection and Repair

After cleaning, hold the cylinder body against a strong light and sight through the cylinder bore. If pitting, scratches or visible wear patterns are evident, the housing must be replaced. Check bleed valve and spring.

Replace piston and seal and any parts found defective. Repair kits are available. See Parts Manual.

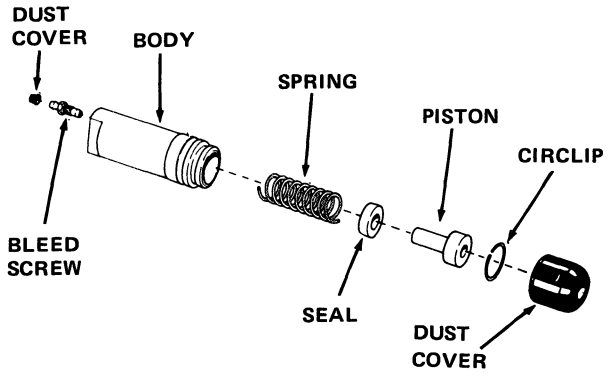


Figure 5. Accelerator Slave Cylinder, Exploded View

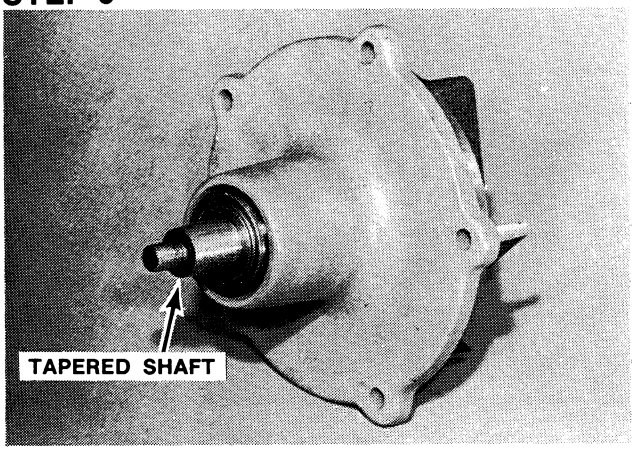
Reassembly and Installation

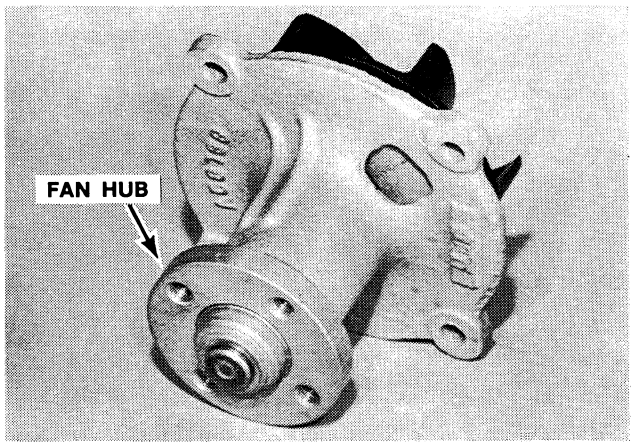
1. Reassembly is the reverse of disassembly. Refer to Figure 5. When installing cylinder, do not overtighten U-bolt. Cylinder damage may result.

2. Bleed accelerator lines, as instructed on page 2052-3.

Water Pump Repair

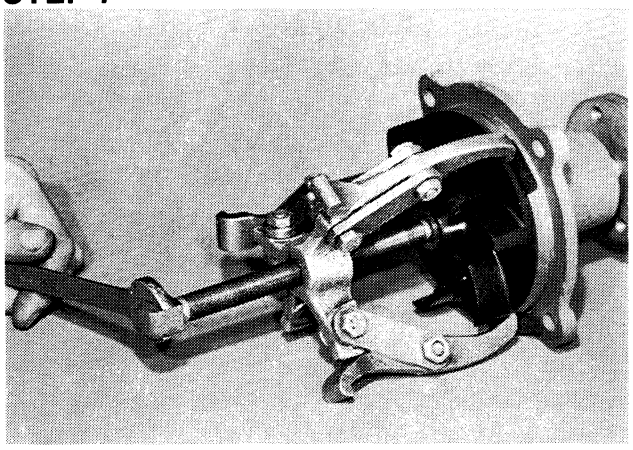
STEP 6

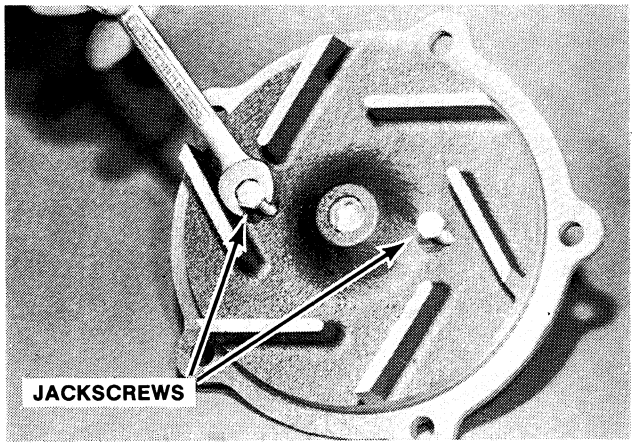




The two basic types of water pumps are the tapered shaft style for fan mounting or the straight shaft with hub for fan mounting. Disassembly and repair is similar for the two units.

STEP 7





Remove impeller from pump shaft using a suitable puller. If impeller is provided with jackscrew holes, use two 1/4" x 1-1/4" full thread screws turned in evenly so impeller is forced straight off the shaft. Do not pry against the housing when removing impeller. This could cause damage to sealing face of housing.

NOTE: *If equipped with a plastic impeller, it will be destroyed during removal and must be replaced with a new cast iron impeller.*

Section

2565

TURBOCHARGER FAILURE ANALYSIS

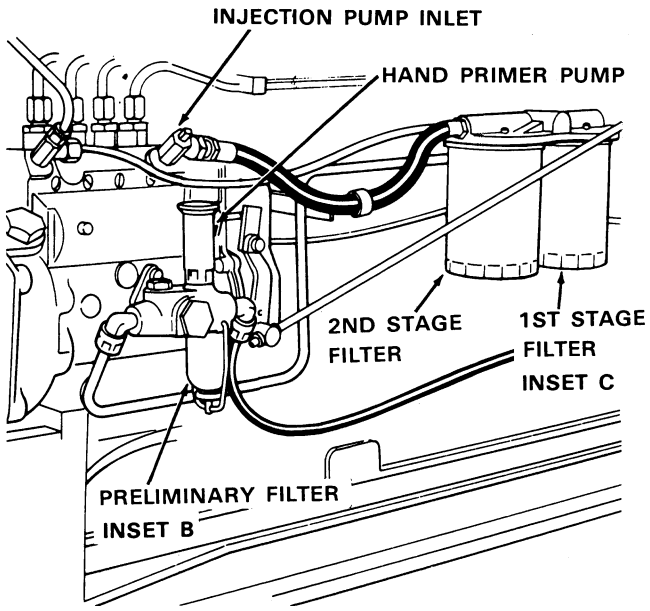
2565

CASE CORPORATION
700 State Street
Racine, WI 53404 U.S.A.

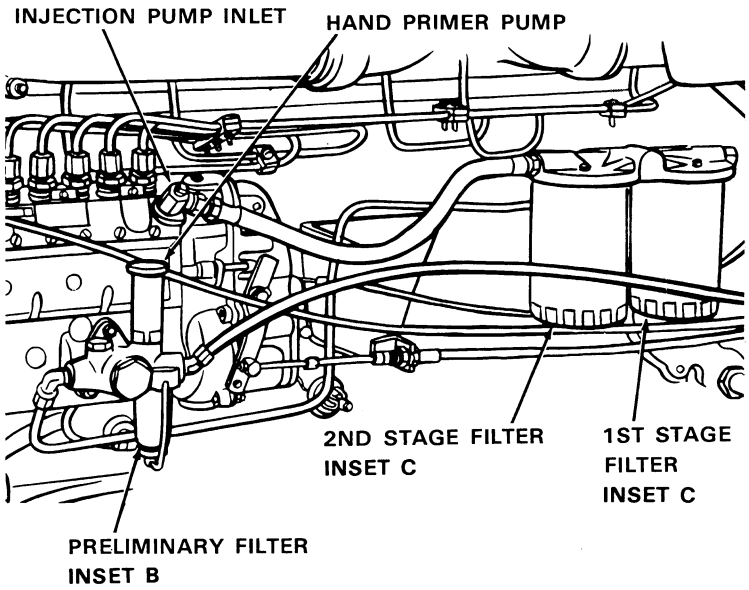
CASE CANADA CORPORATION
3350 South Service Road
Burlington, ON L7N 3M6 CANADA

Rac 9-78235

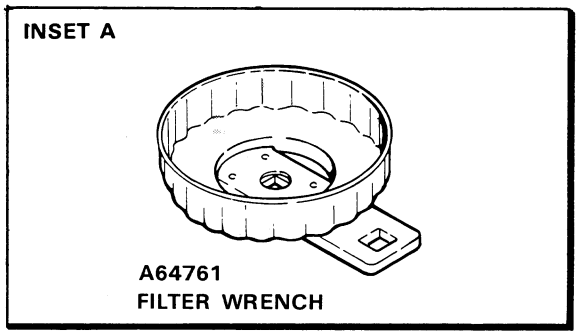
Printed in U.S.A.
February, 1996

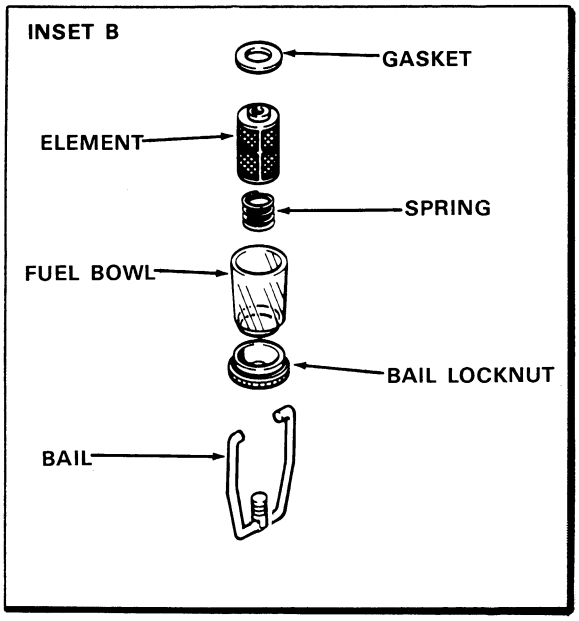


FOUR CYLINDER ENGINES



SIX CYLINDER ENGINES





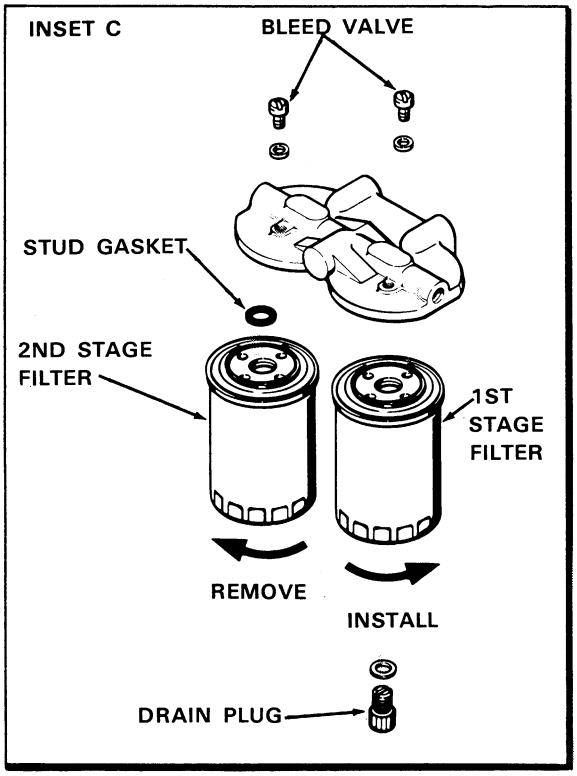
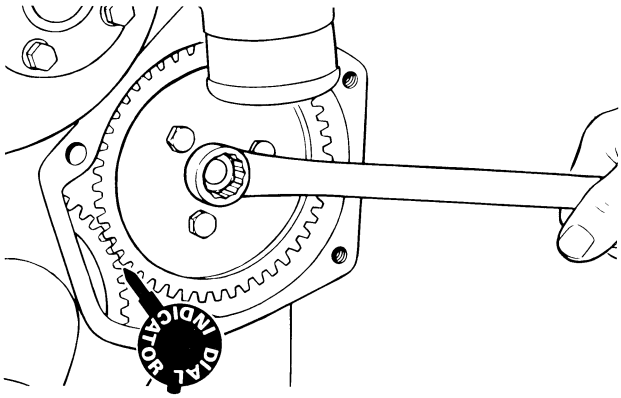


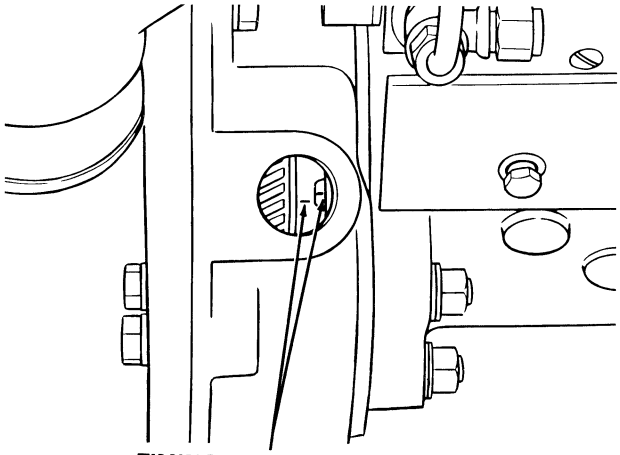
Figure 1

STEP 28



CHECK PUMP GEAR TO IDLER GEAR BACKLASH USING DIAL INDICATOR. MAXIMUM BACKLASH .012 INCH

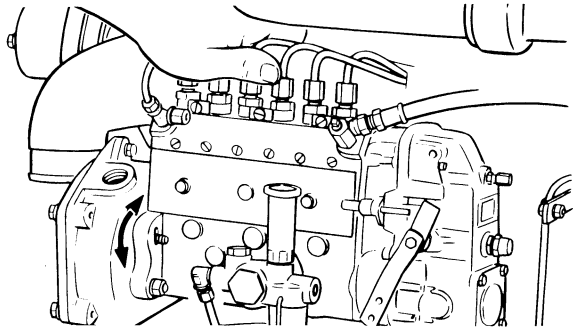
STEP 29



TIMING MARKS NOT ALIGNED

NOTE: IF TIMING MARKS ARE NOT ALIGNED , PROCEED TO NEXT STEP. IF MARKS ARE ALIGNED PROCEED TO STEP 31.

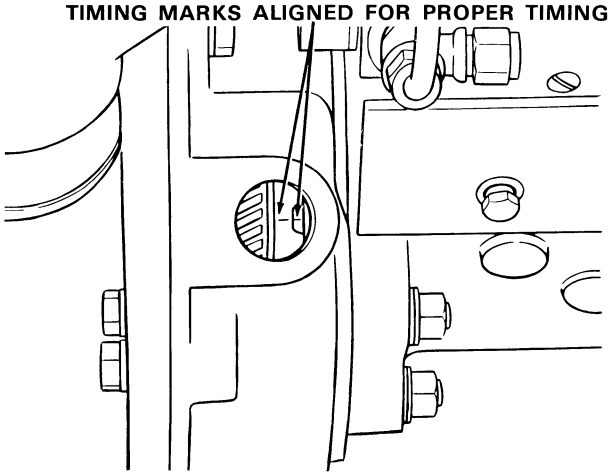
STEP 30



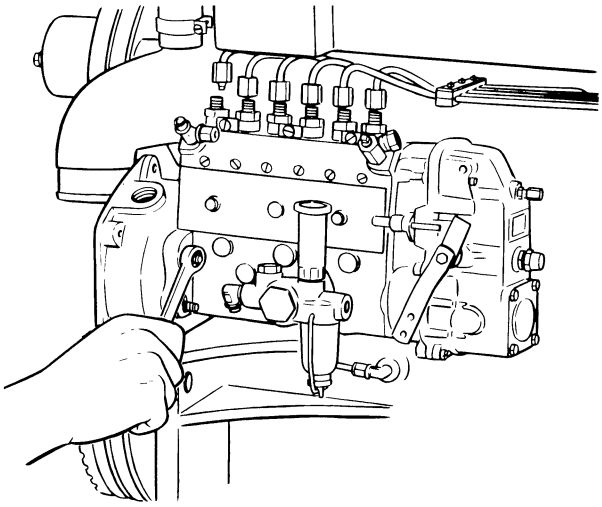
LOOSEN PUMP MOUNTING NUTS. MOVE PUMP TOWARD OR AWAY FROM ENGINE UNTIL TIMING MARKS ARE ALIGNED.

STEP 31

TIMING MARKS ALIGNED FOR PROPER TIMING.

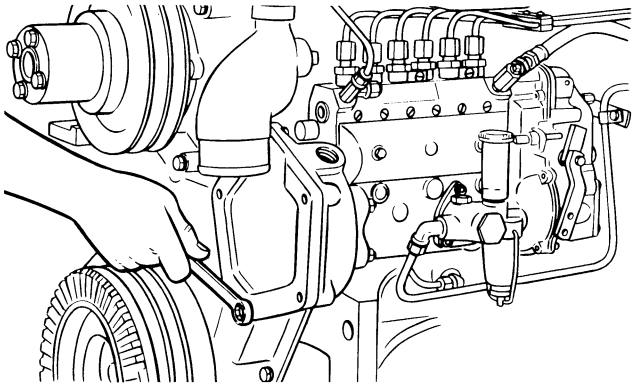


STEP 32



TORQUE PUMP MOUNTING NUTS 35 TO 42 FT. LBS.

STEP 33



INSTALL GEAR COVER AND NEW GASKET. TORQUE 3/8 IN. BOLTS 35 TO 42 FT. LBS. TORQUE 5/16 IN. BOLTS 17 TO 20 FT. LBS.

THIS SAFETY ALERT SYMBOL INDICATES IMPORTANT SAFETY MESSAGES IN THIS MANUAL. WHEN YOU SEE THIS SYMBOL, CAREFULLY READ THE MESSAGE THAT FOLLOWS AND BE ALERT TO THE POSSIBILITY OF PERSONAL INJURY OR DEATH.

WARNING ***When testing or adjusting fuel injectors, do not place your hands or arms in front of the injector nozzle.***

The fuel spray from an injector has sufficient penetrating power to puncture the flesh and destroy tissue. Should the fuel enter the blood stream, it may cause blood poisoning.

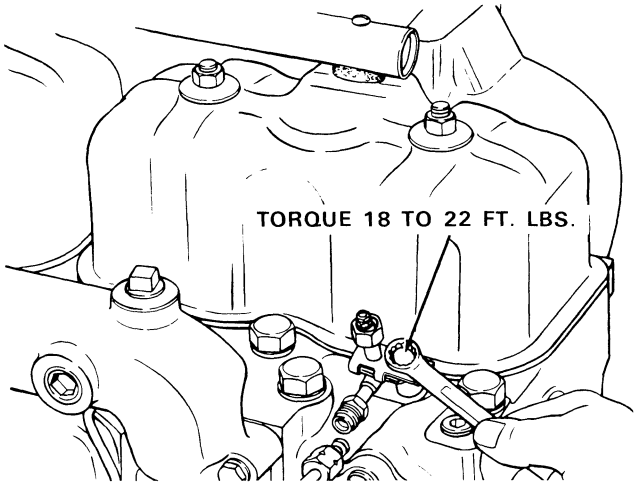
In the event the skin is punctured from the discharge of an injector, apply the following first aid immediately and then have the injury examined by a physician as quickly as possible.

Wash the injured part with boric acid solution. Support the injured finger or hand with a splint and sling so the injured part will remain absolutely at rest until a physician can examine it.

TABLE OF CONTENTS

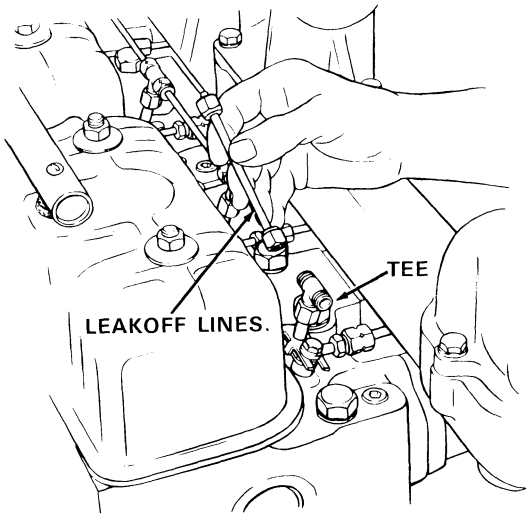
INSTALLING INJECTORS

STEP 13



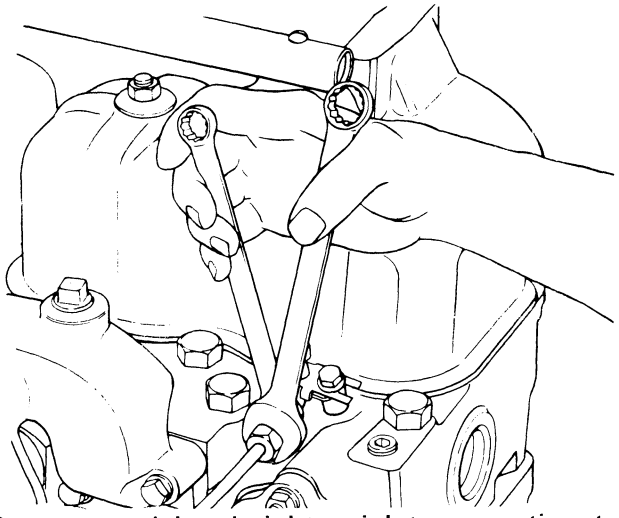
Install spacer and clamp assembly engaging locating plate. Torque clamp bolt 18 to 22 ft. lbs.

STEP 14



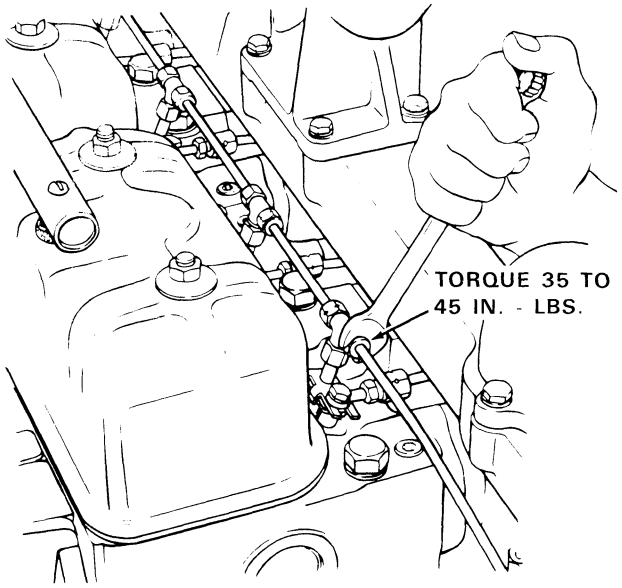
Install tee and leakoff lines.

STEP 15



Connect and hand tighten inlet connection to tube. Crank engine over until fuel flows from inlet fitting. Tighten inlet fitting using one-hand two-wrench method. Torque 18 to 22 ft. lbs. *NOTE:* Start engine and check for leaks.

STEP 16

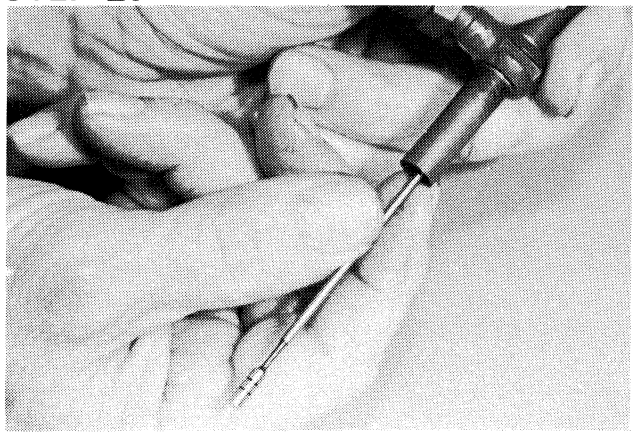


Torque leakoff line nuts 35 to 45 in. lbs.

SERVICING INJECTORS

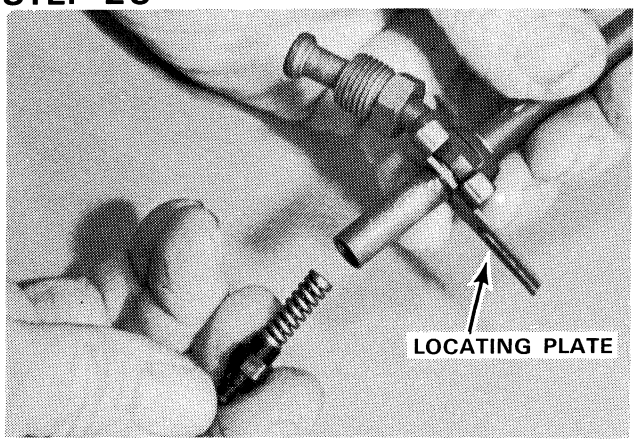
Wash and flush all parts thoroughly before assembly. Wet all injector parts and hands with clean fuel during assembly.

STEP 27



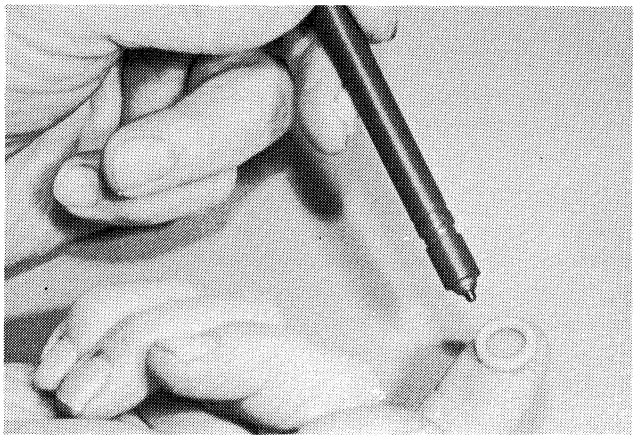
Handle the valve by the shank and slide it partially into the body. Install the locating plate on the body before assembling the pressure adjusting screw and locknut.

STEP 28



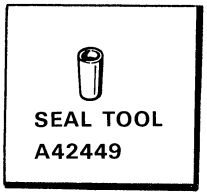
Assemble the shim (if equipped), spring and seat (with small diameter end toward lift adjusting screw) on the lift and pressure adjusting screw assembly. *NOTE: On injectors A58694 and A59092 (which have a single locknut on adjusting screw end) also assemble ball washer and upper spring seat.* Tilt the injector body and with the spring seat contacting the valve top, push the valve and spring components into the body. Exercise care not to dislodge the spring during this assembly. Thread the pressure adjusting screw into the body by hand until the spring is compressed sufficiently to hold all parts in place.

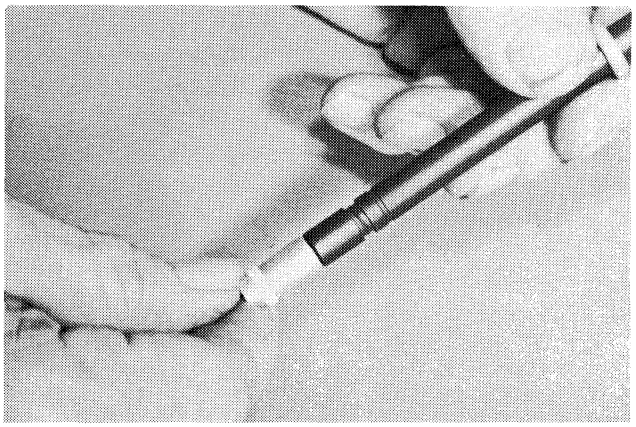
STEP 29



Install a new compression seal.

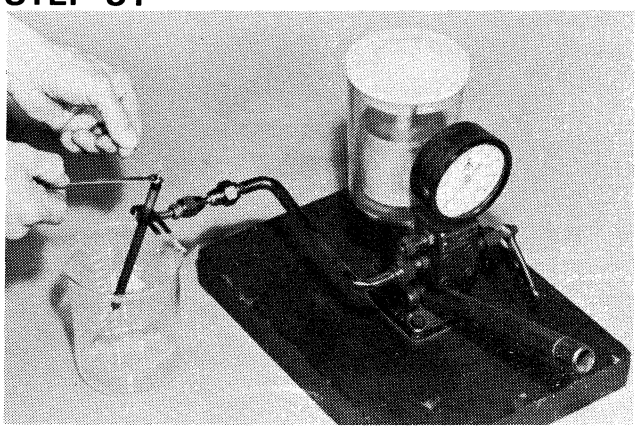
STEP 30





Install a new carbon dam seal using the carbon seal tool, Case Part No. A42449.

STEP 31



Install injector assembly on the test stand. Test and adjust opening pressure, valve lift and leakoff. See Page 24 for injector adjustments.

SPECIFICATIONS

Reservoir Capacity	18.7 gallons (71 liters)
Hydraulic System Capacity (approx.)	63 gallons (236 liters)
Hydraulic Oil	Case TCH Fluid
Alternate Oil	(1) Tenneco Hytrans Fluid
	(2) Engine oil meeting API designation SD or CA.
	Above 32° F (0° C) use SAE 10W; below 32° F (0° C) use SAE 5W

SAFETY RULES

This Safety Alert Symbol Indicates Important Safety Messages In This Manual. When You See This Symbol, Carefully Read The Message That Follows And Be Alert To The Possibility Of Personal Injury Or Death.

CAUTION: Hydraulic systems are highly pressurized. Escaping hydraulic oil, even an invisible pinhole leak, can penetrate body tissues causing serious injury. Use a piece of wood or cardboard when looking for leaks - never use the hands or other parts of the body.

Relieve hydraulic pressure before disconnecting circuits. When reassembling, make absolutely certain that all connections are tight.

If injured by hydraulic oil escaping under pressure, see a doctor immediately. Serious complications may arise if medical attention is not given at once.

WARNING: To prevent injury from burns always use a non-flammable solvent for cleaning component parts. DO NOT USE gasoline or other flammable substances.

CAUTION: Think out the circuit before making or breaking a connection. A wrong connection can be painful and expensive.

CAUTION: Always lower all attachments to the ground or block them securely before performing any service or adjustment.

KEY

- PUMP SUCTION LINE
- RETURN TO RESERVOIR
- RETURN TO OIL COOLER AND PUMP SECTION NO. 2
- "A" PORT PRESSURE LINES
- PUMP PRESSURE
- "B" PORT PRESSURE LINES
- RIGHT TURN
- LEFT TURN

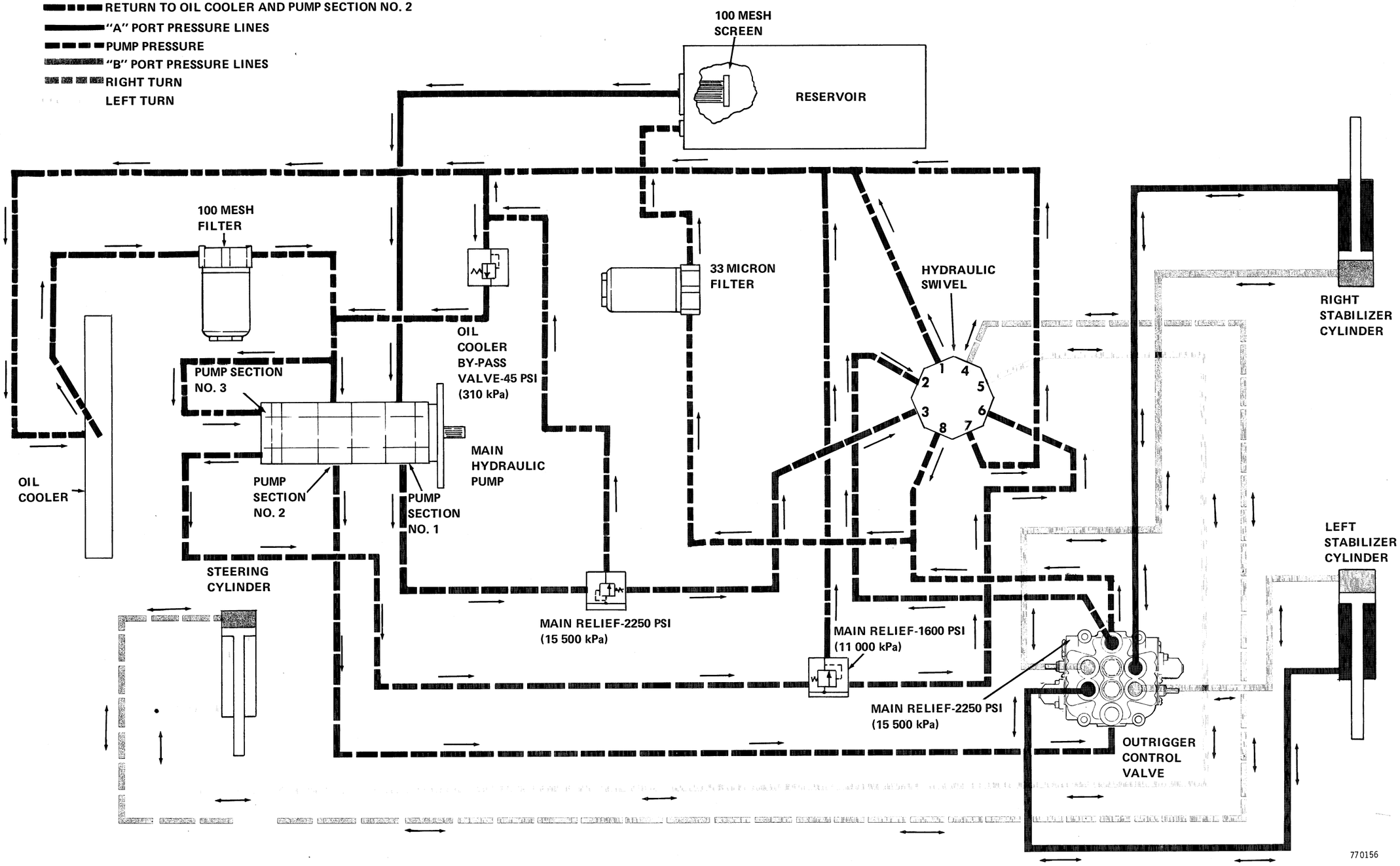


Figure 1. Hydraulic System Diagram, Reservoir to Hydraulic Swivel

Cylinders

PROBLEM	POSSIBLE CAUSE	REMEDY
Sluggish or no movement	Worn piston packing	Check cylinder packing. Replace if defective
	Loose piston bolt	Remove cylinder and repair as required. Torque bolt to specifications
	Hoses not properly connected	Refer to Figures 16, 18, 19, 22, 23, and 25. Check connections against figures. Reconnect hose as required.
Excessive cylinder bushing wear	Failure to lubricate fittings as specified	Lubricate fittings daily or more often if operating in severe conditions
Excessive cylinder packing wear	Contaminated oil	Flush the complete hydraulic system as instructed in Section 4201
	Dent in cylinder tube	Replace tube
	Excessive relief valve pressure settings	Check and adjust main relief valve and secondary relief valves as instructed in this section.
Bent piston rod	Failure to lubricate pivot pins as specified	Lubricate fittings daily or more often if operating in severe conditions
	Excessive relief valve pressure settings	Check and adjust main relief valve, and secondary relief valves if in circuit as instructed in this section
Cylinder starts to retract after beginning to extend	Defective load hold valve	Check and repair or replace load hold valve

Test No. 1 - Pump Output

1. Connect the flowmeter as described under Flowmeter Installation.

2. Set the flowmeter volume control to handle up to 50 gpm (190 l/min) Open the load valve. Be sure cap is installed on the tee.

   IMPORTANT: In this hookup there is no relief valve. Therefore, the load valve must be at least partially open at all times. When testing close the load valve slowly and gradually.

3. If oil temperature is below operating temperature, start the engine and run about three quarter speed. Partially close the load valve on the flowmeter until the pressure reaches 1000 psi (6 900 kPa). Hold until the temperature reaches the desired level.

4. Open the load valve completely (0 psi). Run engine at 2000 rpm and take the gpm reading and record on the check sheet.

   NOTE: The check sheet is on page 4202-40. This check sheet is available in pads from Case.

5. With engine running at 2000 rpm, gradually close the flowmeter load valve. As load is increased, the engine speed must be corrected as it will drop under load. Take a gpm reading when pressure reaches 1000 psi (6 900 kPa) and record. Increase pressure to 2000 psi (13 800 kPa) and record gpm reading.

   NOTE: When hydraulic pressures increase, the additional load on the engine will cause a loss in rpm's. To insure accurate test results, maintaining 2000 rpm for all psi settings is very important.

6. Open the load valve and shut off engine.

Interpreting Test Results

1. Loss of output with the load valve open (free flow) is an indication of a possible restriction in the pump intake line. If output meets specifications it does NOT prove that the pump is good; it only proves there is no restriction between the reservoir and the inlet side of the pump.

   NOTE: With the load valve wide open, it is possible for pump output to exceed the gpm rating.

2. Loss of output under 2000 psi load indicates pump wear or damage. The point at which a pump should be repaired or replaced is a matter of judgement, however, if pump efficiency is less than 70% (as determined by calculations on the checksheet), servicing the pump is recommended.

   NOTE: If the pump is rebuilt rather than replaced, rebuilding of No. 1, No. 2 and No. 3 sections is recommended.

3. If the pump and suction lines are in good condition but the malfunction persists it will be necessary to test each of the circuits individually with a flowmeter "T" test. Connect the flowmeter as shown in Figure 16 to complete Tests 2 thru 5. Enter the gpm readings on form on page 4202-40.

Test No. 2 - Valve No. 1 Main Relief Valve

1. Refer to Figure 16. With shut-off remove the cap and plug from both the pump outlet and main relief return lines. Reconnect the lines

   NOTE: Main relief return line must be reconnected to valve before completing tests 2 thru 5.

2. Open the flowmeter load valve and start the engine.

3. With the engine running at full throttle, move the tool control lever to load the bucket and hold the lever in this position. Gradually close the flowmeter load valve, allow the bucket to roll back completely. Continue to hold the lever in power position and close the load valve. Watch the flow gauge; when the volume starts to drop rapidly, the "crack point" for the relief valve has been reached. Record this reading.

4. Continue to close the load valve. When the volume drops to zero, read the pressure gauge and record this reading. This is the setting of the main relief valve.

5. Open the load valve and bring engine to idle speed.

Interpreting Test Results

The setting should be specified on page 4202-3. Adjust if required. The "crack point" of a relief valve in satisfactory condition will be within 10% of its setting at full flow.

Test No. 5 - Swing Circuit "T" Test

1. It will be necessary to reduce the swing circuit loading from 2000 psi (13 800 kPa) to 1000 psi (6 900 kPa) because of the cushion valve relief setting of 1350 (9 300 kPa).

2. Set the house brake, activate the swing control right, then left. Record the gpm reading with 1000 psi (6 900 kPa) and engine rpm at 2000.

Interpreting Test Results

1. All hydraulic motors will have an amount of internal leakage at high pressures. This loss occurs between the gear teeth and gear housing. The maximum leakage allowable is 6 gpm (23 l/min), any greater loss will reduce the operating efficiency of the hydraulic motor.

2. Compare the gpm reading obtained during the "T" test with the gpm reading taken during the No. 2 pump output test at 1000 psi (6 900 kPa) and 2000 rpm.

3. If there is a difference of more than 6 gpm (23 l/min) an excessive amount of leakage is occuring. Isolate the source by capping both hydraulic lines before the swing motor. See A on Figure 24.

4. Repeat the "T" test and compare the readings with the readings of the first "T" test. If the leak disappears the source of the leak is in the swing motor.

5. If the leak still remains, the source of leak is either in the cross-over relief valve or any component up stream from the motor. Disconnect the lines between the No. 2 valve bank and cross-over relief valve. See B on Figure 24. Cap and plug the lines.

6. Repeat the "T" test and compare the readings with the first "T" test. If the leak disappears, the cross-over relief valve is the leak source. If it does disappear the leak source is in either the No. 2 valve bank, the hydraulic swivel or the outrigger valve.

7. Disconnect the line between the hydraulic swivel and the control valve. See C on Figure 24.

8. Repeat the "T" test. Compare the gpm Readings with the first "T" test. Should the leak disappear the problem is in the No. 2 main control valve. Should the leak still persist reconnect the lines and disconnect the lines between the outrigger control valve and the No. 2 port of the hydraulic swivel. See D on Figure 24. Cap and plug the lines.

9. Repeat the "T" test. Compare the readings. Should leak disappear, repair the hydraulic swivel and if it should remain repair or replace the outrigger valve. Reconnect the lines.

Test No. 6 - Crowd Circuit "T" Test

1. Crowd out and record the gpm reading when the cylinder bottoms out with the pressure at 2000 psi (13 800 kPa) and engine rpm at 2000

2. Crowd in and record the gpm reading when the cylinder is bottomed out with the pressure at 2000 psi (13 800 kPa) and the engine rpm at 2000.

Interpreting Test Results

1. Compare the gpm readings obtained during the "T" test with gpm taken on the No. 2 pump output test at 2000 psi (13 800 kPa) and 2000 rpm.

2. If there is a difference of 2 gallons (8 liters) or more a loss of oil is occuring. This loss is occuring at either the hydraulic cylinder or any component up stream.

3. This source of the leak can be determined by capping the hydraulic lines between the crowd cylinder and the control valve. See A on Figure 25.

4. If the leak disappears check out the crowd cylinder for it is leaking. Should the leak still remain a component up stream is leaking (main control valve, etc.).

5. Disconnect the line between the hydraulic swivel and the control valve. See B on Figure 25.

6. Repeat the "T" test. Compare the gpm readings

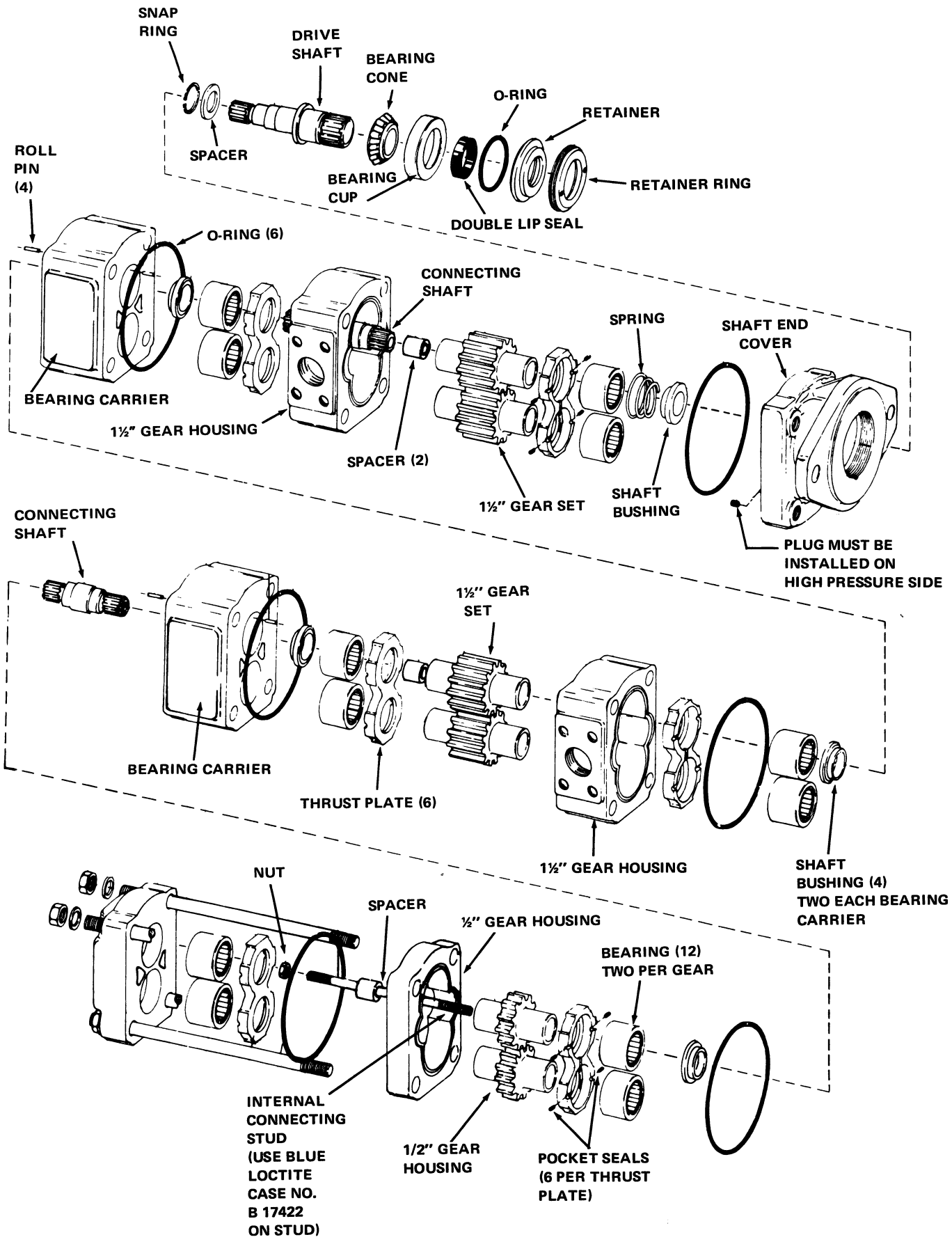


Figure 2. Hydraulic Pump

Section 4207

CONTROL VALVES

CASE CORPORATION

C.E. Div. 9-67071 March 1977

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Operation as a Regeneration Valve

The function of the regeneration feature of the secondary relief valve is to prevent cavitation, (hydraulic voids) in the working circuits. This feature is not adjustable but is designed to operate whenever the working circuit pressure is lower than the reservoir pressure.

1. Figure 12. To illustrate this function, assume that the bucket is loaded, at a maximum height and the engine is running at low idle. When the hoist control lever is positioned to lower the boom and dipper, oil may leave the piston side of the hoist cylinder faster than the pump can supply oil to the rod side of the cylinder. When this occurs, a loss of pressure is created on the working circuit side of the relief valve, illustrated in yellow, and the pressure on the return passage side of the relief valve is greater.

2. Figure 13. The force on surface "A" then is greater than the force on surface "B", which unseats the poppet sleeve and poppet allowing oil from the reservoir to flow into the working circuit to augment the pump and prevent cavitation.

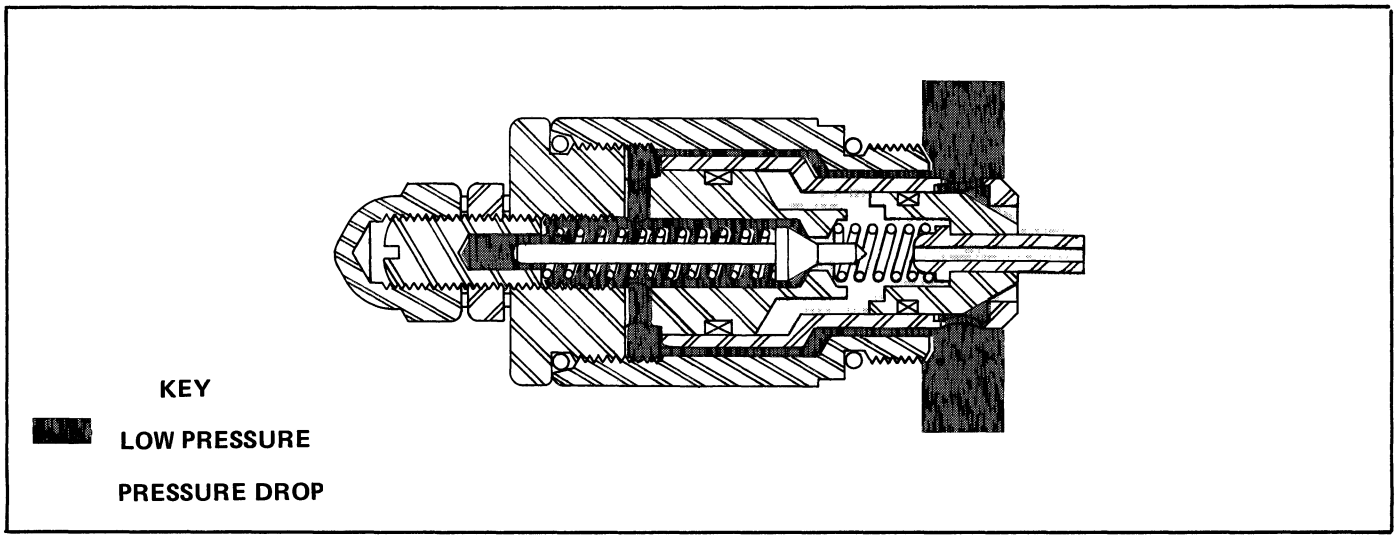

Figure 12.

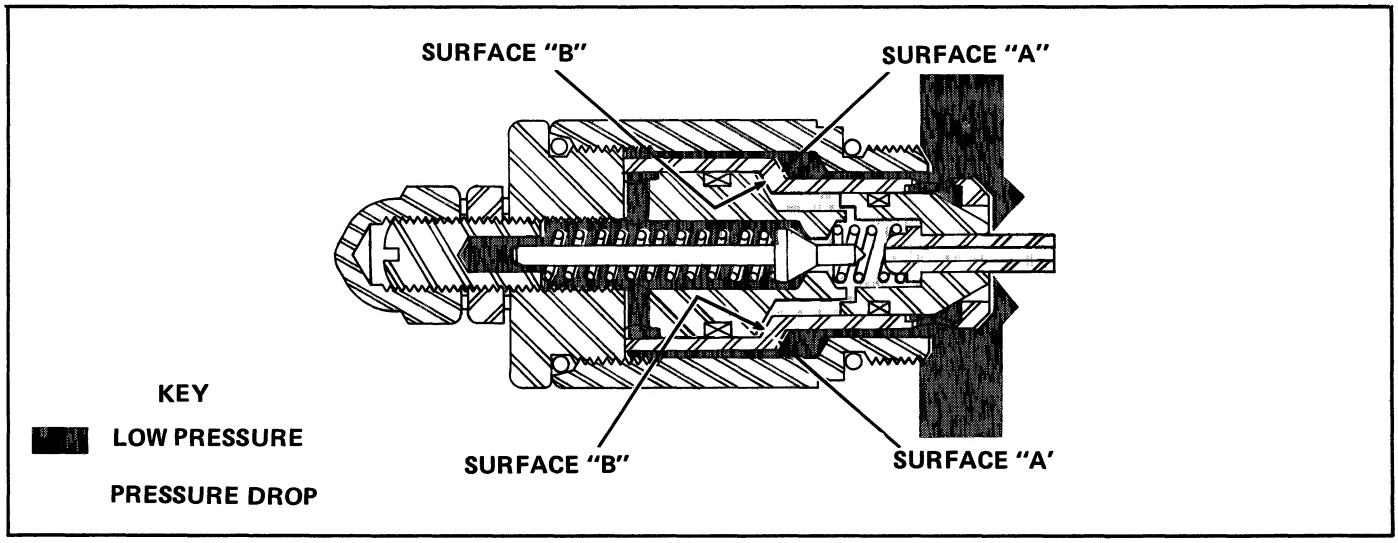

Figure 13.

Section 4209

OUTRIGGER CIRCUIT

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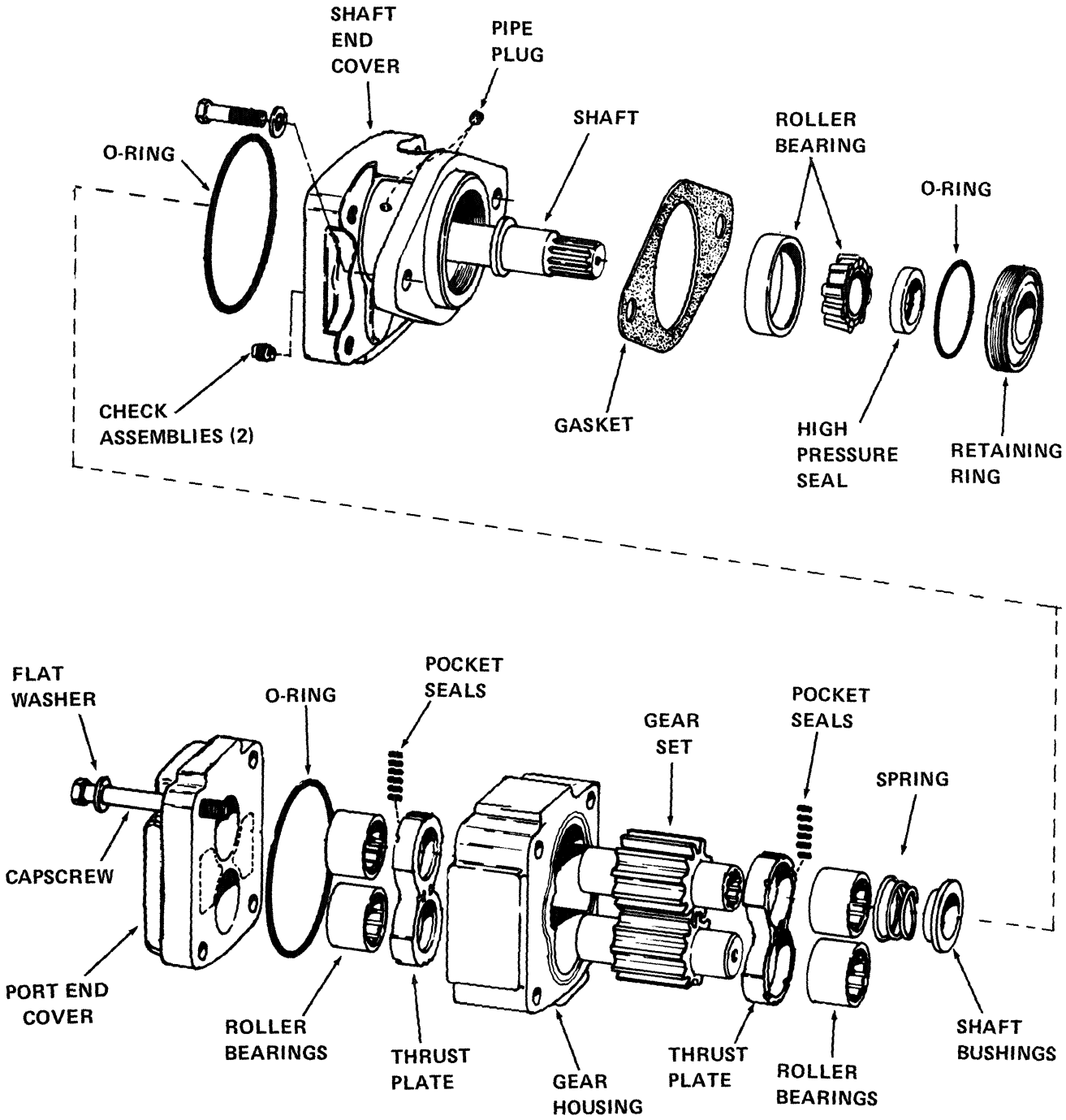

Figure 2. Swing Motor, Exploded View

PROBLEM	POSSIBLE CAUSE	REMEDY
Boom raises slowly	Control linkage improperly adjusted	Check adjustment as instructed in Section 4202.
	Leakage in hydraulic circuit.	Check with flowmeter as instructed in Section 4202.
	Malfunction in hoist cylinder	See troubleshooting chart for cylinders in Section 4202.
Boom will not lower	Inoperative hoist cylinder	See troubleshooting chart for cylinders in Section 4202
	Control linkage improperly adjusted	Check adjustment as instructed in Section 4202
Boom lowers too fast (with fast hoist activated)	Check valve allowing flow past its ball	Check and replace check valve
	Regulator valve allowing too much flow to pass through it.	Check and replace regulator valve.
Boom raises and then starts to drop	Load hold check valve spring broken or valve stuck off of its seat	Check and repair load hold check valve

Section 4218

HYDRAULIC SWIVEL

CASE CORPORATION

C.E. Div. 9-67071 March 1977

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SPECIFICATIONS

Torque Specifications

Piston Retaining Bolts and Nuts*

Crowd Cylinder	1800-2000 lb-ft (2440-2700 Nm)
Hoist Cylinder	1800-2000 lb-ft (2440-2700 Nm)
Tool Cylinder	1500-1800 lb-ft (2030-2440 Nm)
Outrigger Cylinder	1500-1800 lb-ft (2030-2440)
Steering Cylinder	.475-525 lb-ft (645-710 Nm)
Wrist-O-Twist Cylinders	1700 lb-ft (2300 Nm)

*Note: Torques are wet threads

Glands

All Glands	.100-200 lb-ft (136-271 Nm)

(see assembly instructions)

Hydraulic Fittings (Steel)

Dash Size	Tube O.D. Hose I.D.	Thread Size	37° Flare Torque		Straight Thread O-ring Torque	
			Ft-lbs	N m	Ft-lbs	N m
4	1/4"	7/16"-20	6-12	8-16	12-19	16-25
5	5/16"	1/2"-20	8-16	11-21	16-25	22-33
6	3/8"	9/16"-18	10-25	14-33	25-40	34-54
8	1/2"	3/4"-16	15-42	20-56	42-67	57-90
10	5/8"	7/8"-14	25-58	34-78	58-92	79-124
12	3/4"	1-1/16"-12	40-80	54-108	80-128	108-174
14	7/8"	1-3/16"-12	60-100	81-135	100-160	136-216
16	1"	1-5/16"-12	75-117	102-158	117-187	159-253
20	1-1/4"	1-5/8"-12	125-165	169-223	165-264	224-357
24	1-1/2"	1-7/8"-12	210-250	258-338	250-400	339-542

GROUP 2 - STEERING AND OUTRIGGER CYLINDERS

Removal

See page 4290-5.

Disassembly

1. Secure cylinder in a vise using care not to distort the tube. Remove the self-tapping screw from the gland. Use a spanner wrench and unscrew gland, Figure 13.

2. Carefully pull the piston rod from cylinder. Pull the rod straight out to prevent damage to the cylinder wall.

3. Secure piston rod in a vise as shown in Figure 14 and remove the piston bolt. See Specifications for torque values.

4. Remove piston assembly from piston rod. Then remove piston wear rings, o-rings and packings.

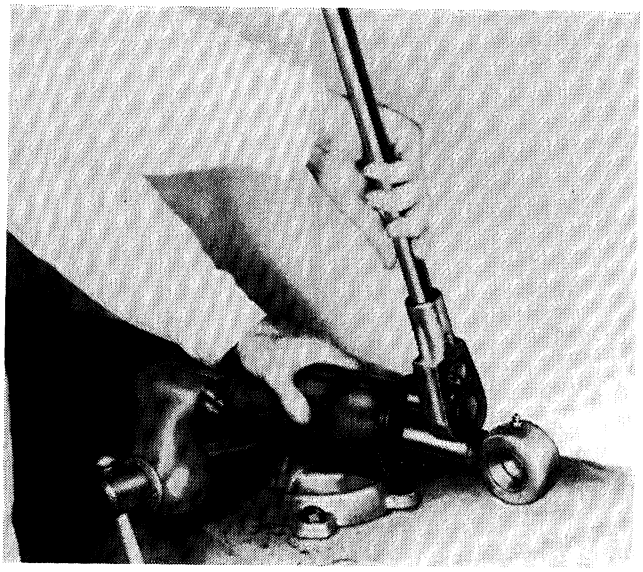

Figure 13. Removing Gland

5. Remove gland from piston rod. If necessary, the gland may be driven off the rod with a soft hammer. Refer to Figures 15 and 16 and disassemble gland.

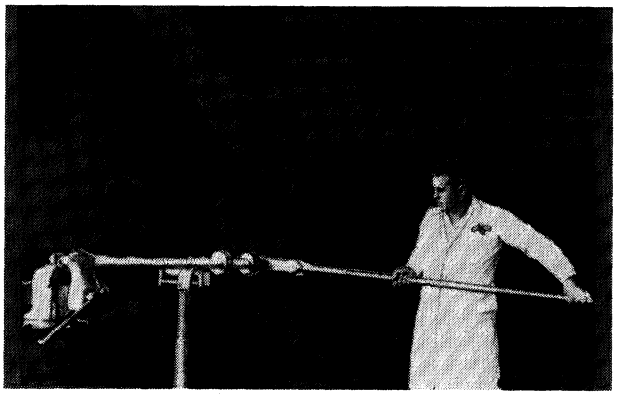

Figure 14. Removing Piston Bolt

Inspection

1. Wash parts in cleaning solvent and dry with compressed air.

2. Discard piston packing, o-rings, seals, rod wipers and other parts found to be defective. A kit is available for rebuilding the cylinder. Refer to the Case Parts Catalog.

3. Shine a light in the cylinder tube. If it has deep grooves or score marks, or has been severely damaged in any way, it should be replaced.

4. Inspect the piston rod for alignment. Replace if bent; do not attempt to straighten.

5. Inspect bushings and replace as required.

6. Before reassembling, remove any minor nicks, scratches, etc. on the rotor or in the cylinder tube with medium grit emery cloth. Polish with a rotary motion rather than lengthwise.

7. Scoring, pitting, etc. are signs of possible oil contamination. Check the hydraulic oil for contamination (See Section 4201).

SPECIFICATIONS

Hydraulic System
- Rated Pump Output
  - Section No. 1 (tool) (2000 psi at 2000 rpm) . . . . . 32 gpm (121 l/min)
  - Section No. 2 (swing) (2000 psi at 2000 rpm) . . . . . 32 gpm (121 l/min)
  - Section No. 3 (steering) (1000 psi at 2000 rpm) . . . . . 11gpm (42 l/min)
- Main Relief Valves
  - Valve No. 1 - (inline) . . . . . 2250 psi (15 500 kPa)
  - Valve No. 2 - (outrigger) . . . . . 2250 psi (15 500 kPa)
  - Valve No. 3 - (steering) . . . . . 1600 psi (11 000 kPa)

SAFETY RULES

This Safety Alert Symbol Indicates Important Safety Messages In This Manual. When You See This Symbol, Carefully Read The Message That Follows And Be Alert To The Possibility Of Personal Injury Or Death.

CAUTION: Hydraulic systems are highly pressurized. Escaping hydraulic oil, even an invisible pinhole leak, can penetrate body tissues causing serious injury. Use a piece of wood or cardboard when looking for leaks - never use the hands or other parts of the body.

Relieve hydraulic pressure before disconnecting circuits. When reassembling, make absolutely certain that all connections are tight.

If injured by hydraulic oil escaping under pressure, see a doctor immediately. Serious complications may arise if medical attention is not given at once.

CAUTION: Think out the circuit before making or breaking a connection. A wrong connection can be painful and expensive.

CAUTION: Always lower all attachments to the ground or block them securely before performing any service or adjustment.

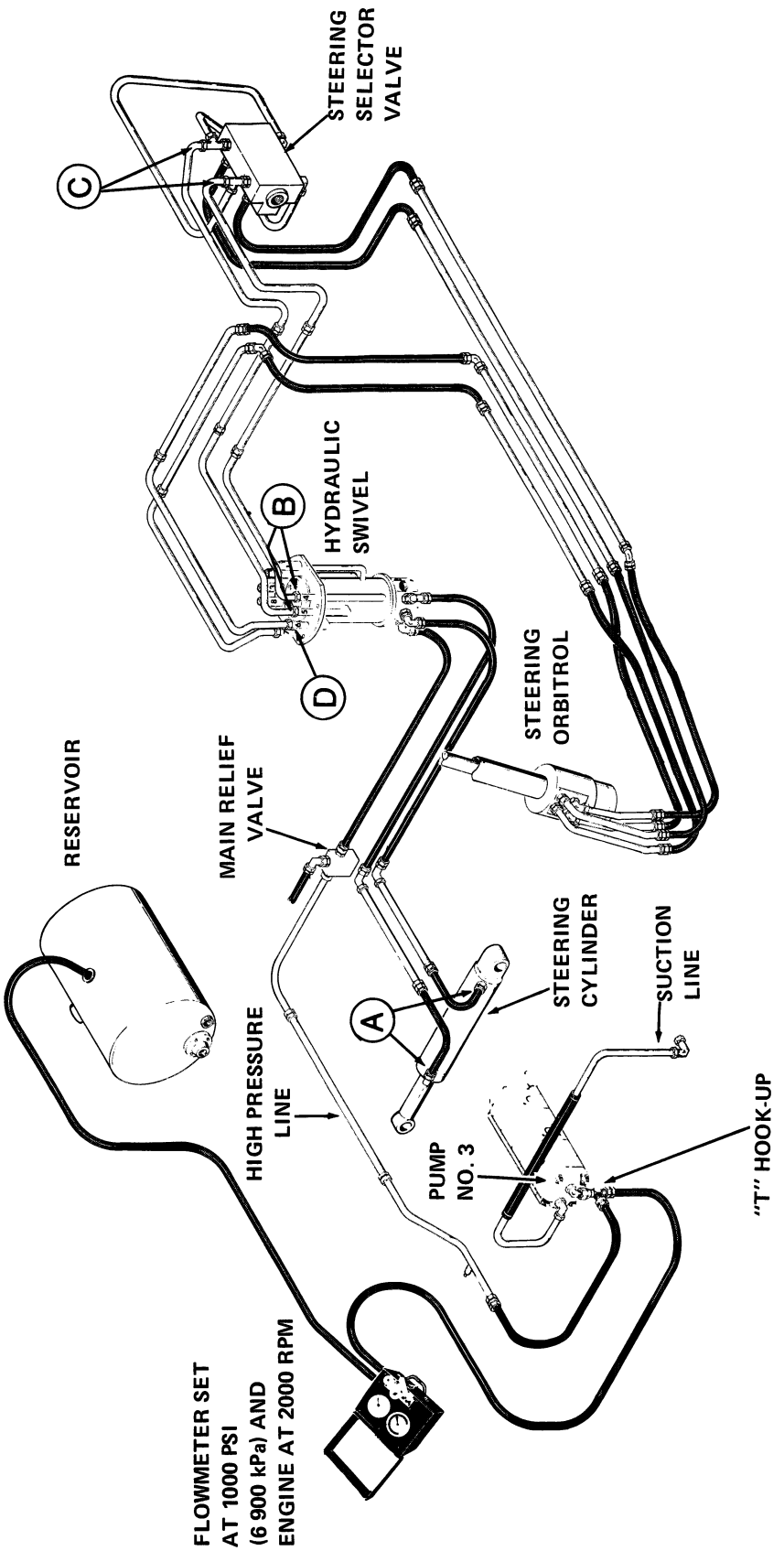

Figure 9. Flowmeter "T" Test

sleeve and install the centering springs.

a. The tool shown in Figure 8 is used to install the springs. It can be shop made or ordered from the Char Lynn Co., 15151 Highway 5, Eden Prairie, Minnesota 55345, part number 600057.

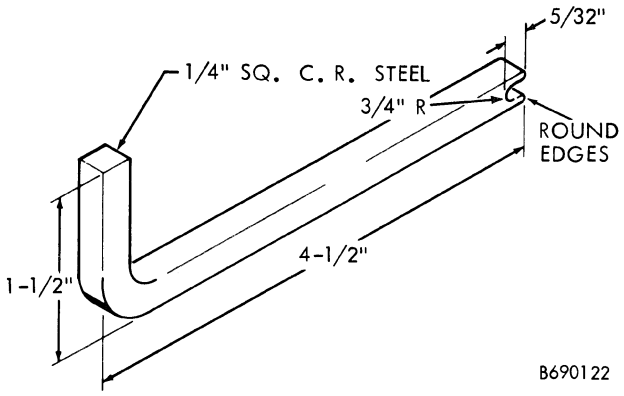

Figure 8. Spring Installation Tool

b. Insert the tool through the spring slots in both parts.

c. Position the springs in sets of 3 with the arched centers together. Enter one end of the complete spring set into the notch in the tool with the notched corners of the springs toward the gear end of the spool.

d. Compress the extended end of the spring set and push into the spool-sleeve assembly, using the tool to guide the springs into the opposite slot. Center the spring set in the sleeve and make sure the springs are flush with the top of the sleeve.

4. Install the cross pin in the spool-sleeve assembly with a disc at each end. A dab of grease under the discs will hold them in place.

5. Install the spool-sleeve assembly, splined end first, through the gear end of the housing. Push the sleeve into the housing with a twisting motion (to prevent binding and damage) until flush with the gear end of the housing.

6. Place a thrust washer, thrust bearing and the remaining thrust washer on the spool. Align the bearing and washers and install bearing retainer.

7. Install new seal, lip toward steering column, in cover. Then install the quad ring and O-ring in cover.

8. Place the valve housing on a clean, smooth surface, gear end down. Lubricate the cover seal, quad ring and O-ring with hydraulic oil and install over spool. Align marks made during disassembly and install capscrews in the proper holes. Torque the capscrews to 250 inch-pounds.

9. Secure the valve housing in the vise with the gear end up. Clean the gear end surface of the housing with the palm or thumb of a clean hand. Clean the gear rings and the plate in the same manner prior to placement on the housing.

10. Install the untagged gear on the driveshaft. The pin slot in the driveshaft must be in alignment with the valleys on the gear as illustrated in Figure . Then install the driveshaft in the spool. Rotate the gear as required until the driveshaft engages the cross pin.

IMPORTANT: Alignment of the slot and cross pin with the gear valleys determine proper valve timing of the unit. If the parts slip out of position during step 10, repeat until you are certain that correct alignment is obtained.

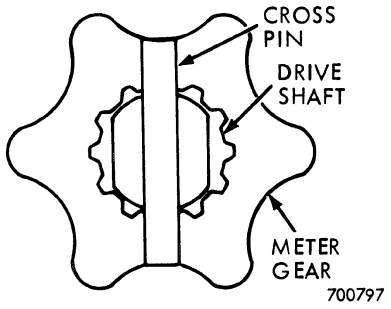

Figure 9. Gear and Cross Pin Alignment

Drop Box Transmission

The drop box transmission serves two purposes:

1. Transmits drive from level of engine to level of drive wheels, eliminating the need for sharp bends in the drive lines.

2. Provides four separate engine/drive ratios to add to the versatility of the 880R.

This transmission has four speeds: a Low range first and second, a High range first and second. First and second gears are synchronized and may be shifted while the machine is in motion. There is no synchronization between High and Low range; therefore the machine must be brought to a complete stop before shifting ranges.

The upper bellcrank on the transmission controls the synchronizer assembly on the 2nd stage shaft (1st and 2nd gear). The lower bellcrank controls the shift collar on the 3rd stage gear (High and Low range). The cross-section view in Figure 5 shows the gear arrangement within the transmission.

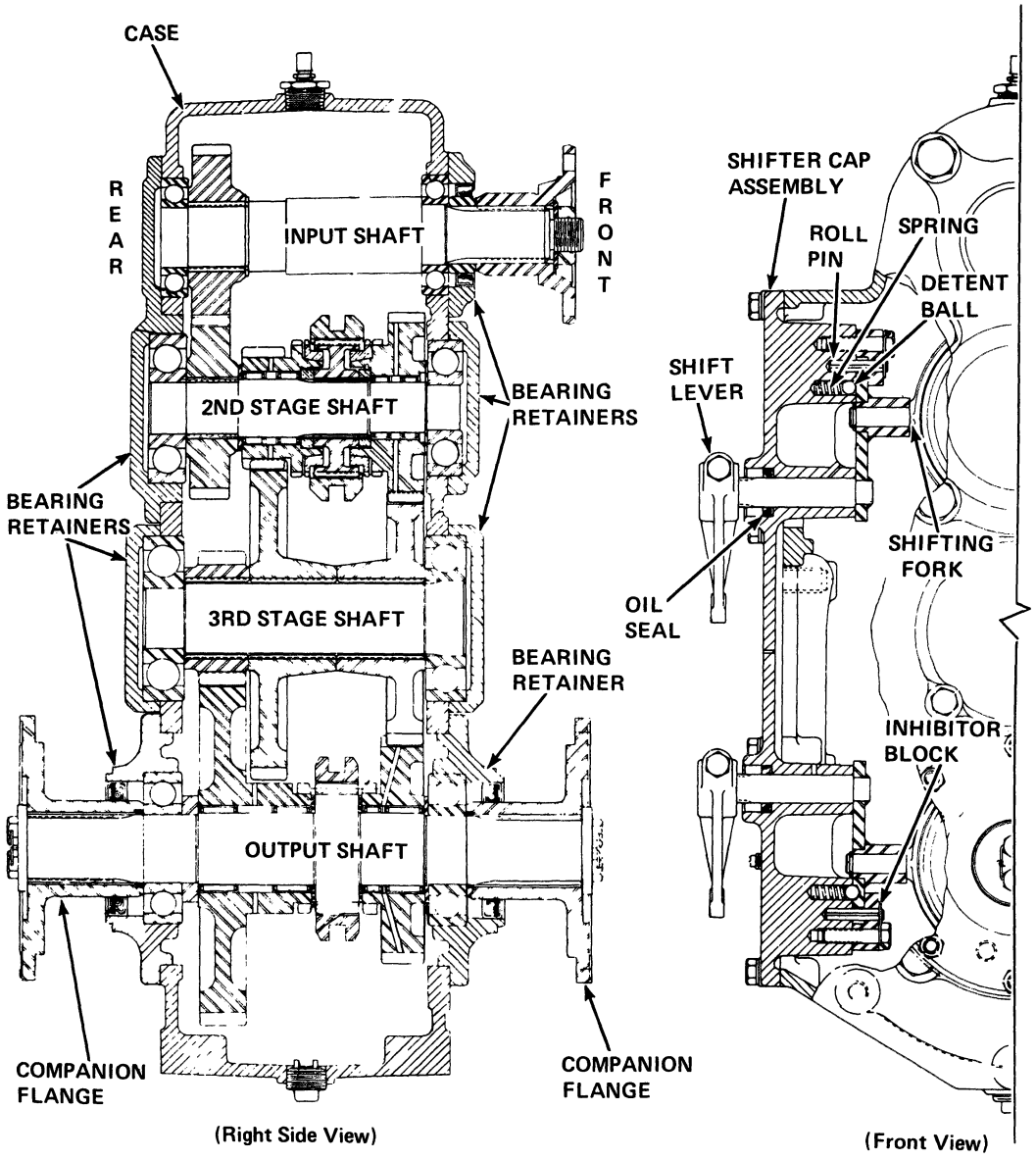

Figure 5. Transmission, Cross Section View

Drop Box Transmission

Troubleshooting Guide

PROBLEM	POSSIBLE CAUSE	REMEDY
Noisy operation	Improper oil level	Add oil if required; refer to Section 6101
	Loose mounting bolts	Tighten bolts to proper torque.
	Damaged gear teeth	Replace as necessary; refer to Section 6116
	Flaws in gear shaft	Replace as necessary; refer to Section 6116
Excessive vibration	Loose mounting bolts	Tighten bolts to proper torque
	Damaged gear teeth	Replace as necessary; refer to Section 6116
	Faulty gear box bearings	Inspect and replace as necessary. Refer to Section 6116
Difficult to shift gears	Improper lubricant	Replace if necessary; refer to Section 6101 for recommended type
	Linkage bent or out of adjustments	Check and repair or adjust as instructed in Section 6118
	Incorrect or insufficient lubricant on shifting tubes	Lubricate with dry lubricant. See Section 6101
	Forward/reverse disconnect switch malfunctioning	See Section 8002
	Clutch drag or failed clutch in forward/reverse unit	See "Troubleshooting Guide - Forward/Reverse Unit", page 6102-11.
Transmission will not stay in proper ratio	Transmission linkage for bent, worn, or broken parts	Replace faulty parts and readjust linkage; refer to Section 6118
	Excessive endplay due to wear in shift forks, sliding gear, fork grooves, thrust washers, output shaft bearings	Replace faulty parts and readjust for faulty endplay. Refer to Section 6116

Section 6107

CONTROL VALVE

CASE CORPORATION C.E. Div. 9-67071 March 1977 PRINTED IN U.S.A.

Disassembly

NOTE: Because of its near symmetry, check the transmission case carefully to determine input and output sides. The input (front) side has two companion flanges, the output side has one.

IMPORTANT: All bearings in this unit are press fit on the shafts. Pressure must be applied only to the inner race of these bearings when removing.

Shifter Assemblies

1. Position assembly on work bench with shifter assembies up.

2. To remove shifter assemblies, remove the eight capscrews and starwashers from the shift caps. Tap edge of shifter caps with hammer to loosen gasket seal, then lift assemblies out.

3. To disassemble shifter assemblies, remove the snap ring from shifting fork, then remove fork and shifter lever. Remove retaining bolt, then pry the inhibitor block off roll pin. Remove roll pin. Remove shifting bracket from shifter cap. Remove detent ball, spring and oil seal.

Output Shaft

1. Remove companion flanges on both the input and output sides by first cutting and removing safety wires. Remove two 7/16" capscrews from each flange. Remove washers and shims from both flanges. Wire shims together and tag for output or input end. Companion flanges will now slip off of shaft. Remove and discard o-rings. Refer to Figure 1.

2. Remove four capscrews from output shaft bearing retainer on the input side of the transmission.

3. Drive the output shaft toward the input side of case. The larger output gear may ride against the larger third stage gear as shaft is driven out of bearing. The following items with drive off with shaft: (Refer to Figure 2).
   a. Bearing retainer and oil seal
   b. Bearing
   c. Thrust washers
   d. Small output gear and bearings
   e. Shifting collar

4. When shaft is driven loose of the output side bearing retainer, the shaft assembly can be removed from input side of case. Be careful not to let larger output gear drop inside case when shaft is pulled through it. The larger gear can not be removed at this time.

5. Disassemble shaft assembly by tapping off the bearing retainer. Remove the bearing (input side) from shaft by pulling the smaller output gear with a gear puller. Remove thrust washer and small output gear. Shifting collar will slip off shaft. Thrust washers will slip off shaft.

   IMPORTANT: If bearing is removed from shaft by pulling on outer race, bearing must be discarded

6. Remove spacer which has dropped to bottom of case when output shaft was pulled.

7. Remove remaining output shaft bearing retainer from case and carefully drive out bearing.

8. From both bearing retainers drive out the shaft seals.

Third Stage Shaft

1. Remove four capscrews and washers from bearing retainers on both sides and pry off bearing retainers.

2. Drive or press the third stage shaft toward input side. When shaft is driven free of bearing on output side, shaft is removed from inside of case as the three gears respectively are removed (out of shifter cap opening) as shaft is pulled through them.

   NOTE: It is permissable for the gear on the output side to drive against case as shaft is driven out.

Section 6121

DRIVE SHAFTS

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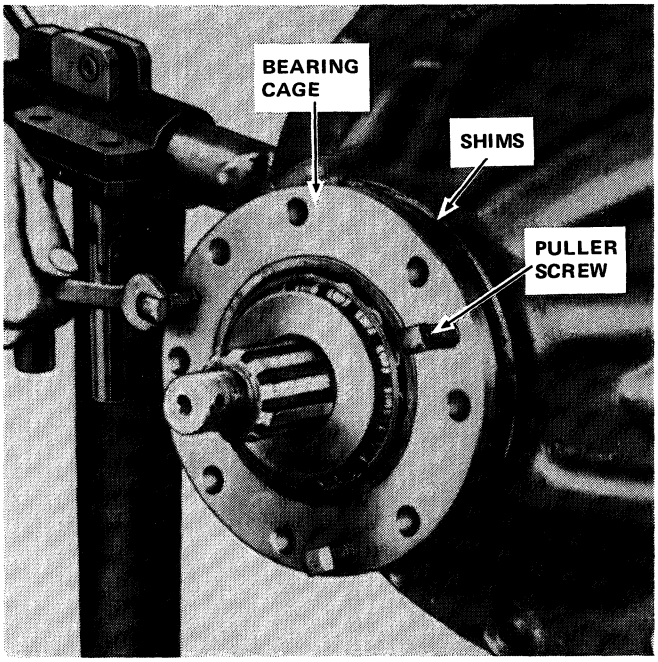

Figure 7. Removing Pinion Bearing Cage

10. Hold a piece of bar stock (brass) against inner end of pinion and drive pinion out of carrier. If pinion is not easily removed, use a driver that contacts the outer race of the rear bearing and press pinion out of carrier.

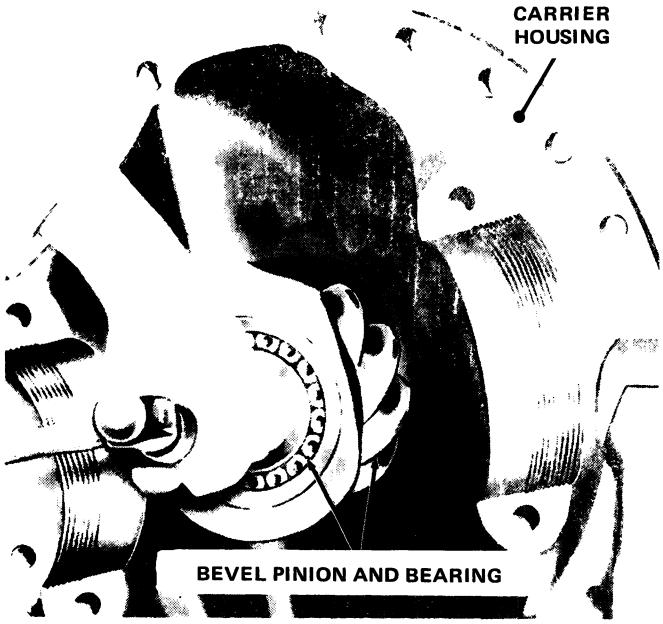

Figure 8. Removing Pinion Shaft

Pinion and Bearing Cage

1. Press the inner pinion bearing off the pinion shaft, Figure 9.

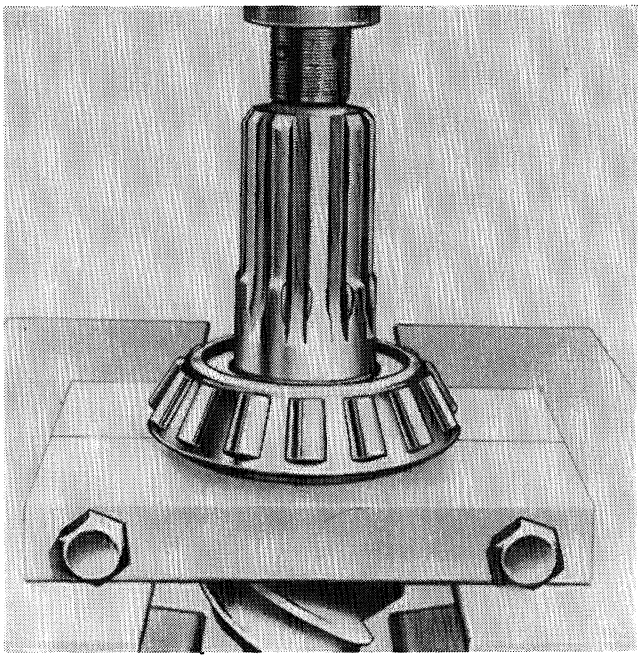

Figure 9. Removing Inner Bearing

2. If it is necessary to replace the radial bearing, first remove the snap ring, Figure 10.

Figure 10. Removing Bearing Snap Ring

b. Improperly tightened case halves or bearing cap bolts.

c. Damaged bearing or cup.

d. Improperly installed ring gear.

4. After all end play has been removed and runout is at a minimum, the bearings may be preloaded. Tighten the adjusting nuts one notch each from .00" end play. This will put the proper preload on the bearings.

Adjusting Pinion - Ring Gear Backlash

After the end play has been adjusted, the backlash between the pinion and ring gear must now be properly adjusted.

1. The backlash must be checked with a dial indicator. Position the dial indicator as shown in Figure 35.

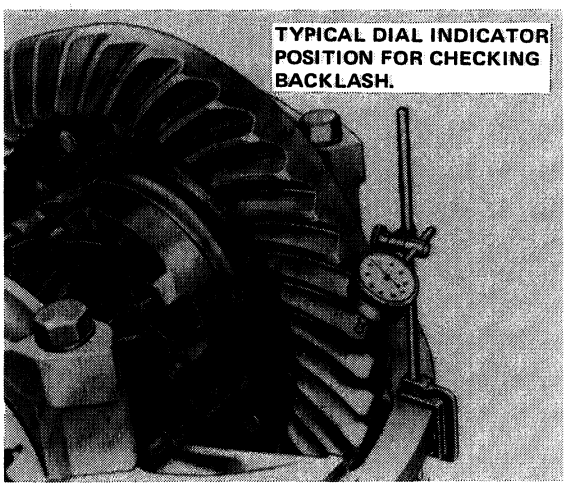

Figure 35. Checking Backlash

2. The backlash for new ring gear and pinion is .010". If using original gears, use backlash reading obtained prior to disassembly.

3. With the dial indicator positioned as shown in Figure 35, prevent the pinion from turning and move the ring gear, noting reading on dial indicator.

4. If the reading is not as recorded (old gears) or specified (new gears), move the ring gear away from the pinion to increase backlash or move ring gear toward pinion to decrease backlash. When loosening and tightening the adjusting nuts, move each nut the same distance to maintain zero end play.

5. Secure adjustment by installing adjusting nut locks between lugs on adjusting nuts.

Checking Tooth Contact

1. Apply a light coat of oiled red lead to about twelve teeth on the ring gear.

2. Rotate the pinion. The read lead will be squeezed away by the contact of the teeth, leaving bare areas the exact size, shape and location of the contacts. Sharper impressions may be made by applying a small amount of resistance to the ring gear with a flat steel bar and using a wrench to rotate the pinion.

Tooth Contact Patterns

1. Satisfactory tooth contact, gears unloaded, is illustrated in Figure 36. With adjustments properly made (pinion at correct depth and backlash set properly) the contacts shown will be procured. The area of contact favors the toe and is centered between the top and bottom of the tooth.

2. Satisfactory tooth contact, gears loaded, is shown in Figure 37. This illustration shows the pattern is almost the full length of the gear tooth and the top of the pattern approaches the top of the gear tooth. The pattern on the coast side (not shown) is the same width, but the overall length is centered between the toe and heel of the gear tooth.

   Set used ring gear to have the tooth contacts to match wear patterns. Hand rolled patterns of used gears will be smaller in area and should be at the toe end of the wear pattern.

3. Incorrect tooth contact is illustrated in Figures 38 and 39.

   a. Figure 39 shows a high contact which indicates the pinion is too far out. Set the pinion to the correct depth by removing

11. After bevel pinion and bearing cage are removed tie together the shims.

12. Remove the input flange and nut.

Bevel Pinion and Bearing Cage

1. Press the bearing cage off the pinion shaft. Recover the shims and the spacer. See Figure 8.

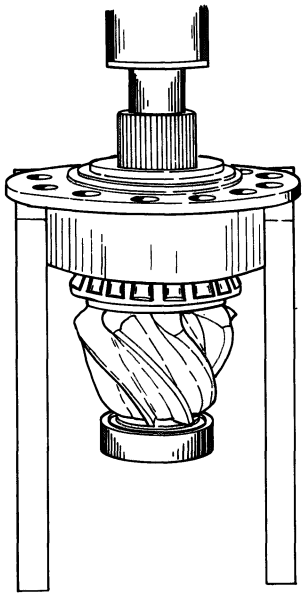

Figure 8. Removing Bearing Cage

2. Press the center bearing off the pinion shaft. See Figure 9.

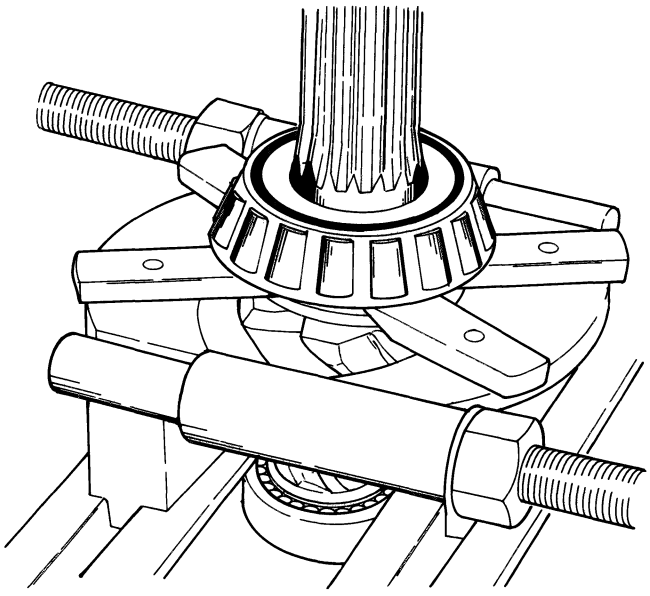

Figure 9. Removing the Center Bearing

3. If it is necessary to replace the inner bearing, bend the crimping to the inner side. See Figure 9.

Figure 10. Bending the Crimping to the Inner Side

4. Pull the inner bearing off the bevel pinion as shown in Figure 11.

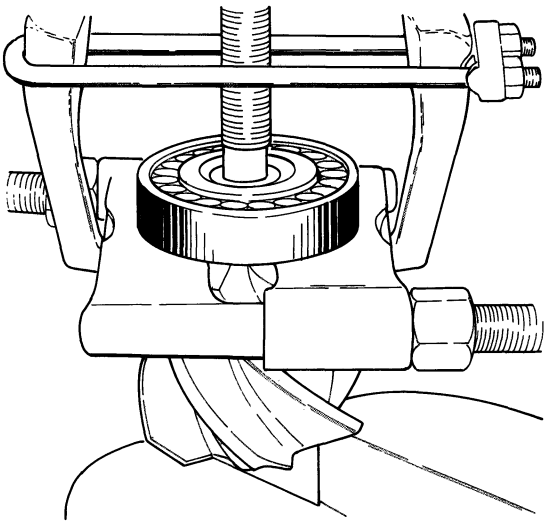

Figure 11. Removing the Inner Bearing

5. Remove the outer bearing from the bearing cage. Remove the outer and center bearing cups only if cup or bearing is replaced.

6. Remove the oil seal from the bearing cage cover and discard.

Differential Case

1. If the original identification marks are not clear on the case halves, mark both halves with a punch for correct assembly.

SPECIFICATIONS

Service Specifications

Wheel bearing adjustment . . . . . page 6127-00

Special Torques

Wheels

Wheel nuts . . . . . .450-500 lb-ft (610-678 Nm)

Planetaries

At all locations other than tie rod components, use the following torque valves for the size and grade gastener employed.

Exceptions are wheel mounting nuts and wheel bearing adjusting nuts.

Size	Grade 5				Grade 6				Grade 8			
	Min.		Max.		Min.		Max.		Min.		Max.	
	lb-ft	Nm	lb-ft	Nm	lb-ft	Nm	lb-ft	Nm	lb-ft	Nm	lb-ft	Nm
5/16 - 24	17	23	22	30	21	29	27	37	23	31	29	39
3/8 - 16	25	34	35	47	30	41	40	54	35	47	50	68
7/16 - 14	40	54	55	75	50	68	65	88	60	81	75	102
1/2 - 13	65	88	85	115	80	108	105	142	90	122	120	163
1/2 - 20	75	102	95	129	90	122	120	163	105	142	135	183
9/16 - 12	95	129	120	163	115	156	150	203	130	176	170	231
5/8 - 11	130	176	170	231	160	217	205	278	185	251	235	319
5/8 - 18	150	203	190	258	185	251	235	319	210	285	270	366
3/4 - 10	230	312	300	407	290	393	370	502	325	441	420	570
3/4 - 16	260	353	335	454	320	434	415	563	365	495	470	637
7/8 - 9	345	468	440	597	470	637	595	807	530	719	680	922
7/8 - 14	380	515	485	658	510	692	655	888	585	793	750	1017
1 - 14	580	786	750	1017	780	1058	1000	1356	890	1207	1150	1560
1-1/8-12	780	1058	1000	1356	1120	1519	1420	1926	1260	1709	1620	2197
1-1/4-12	1080	1464	1390	1885	1540	2088	1980	2685	1750	2373	2260	3065

Torques given apply to parts lightly covered with rust preventing oil, unplated and uncoated. For dry parts, increase torques 10%. For parts coated with multi-purpose gear oil, decrease torques 10%. Nuts on studs to use same torque as for driving the stud (coarse thread torque value).

Section
6127A

AXLE PLANETARIES

(USED ON UNITS WITH SERIAL NUMBERS 6202227 AND AFTER)

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8. Install the spindle onto the knuckle by locating the roll pins in their proper holes.

9. Install the eleven spindle bolts. Assemble and install the brake. See Section 7121A.

10. Lubricate the spindle bolt threads and install the nuts. Tighten nuts to a torque of 89 lb-ft (120 Nm). Then loosen nuts and again tighten to a torque of 130 lb-ft (175 Nm). Use Figure 13 as reference for sequence of tightening nuts.

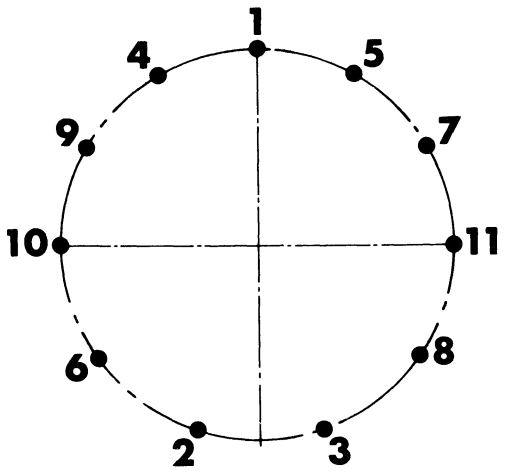

Figure 13. Torquing Sequence

12. From the rear of the knuckle, drive the three smaller roll pins into the three larger roll pins as shown in Figure 14. Lock them by a welding point.

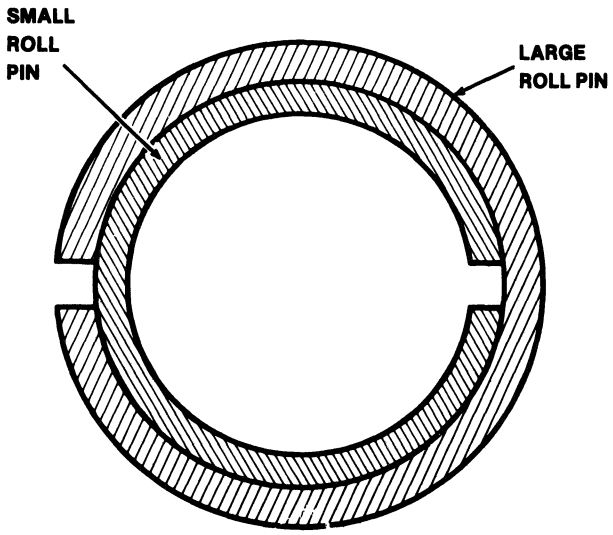

Figure 14. Roll Pins Installed

13. Install bronze bushings, if removed, from the bearings with a suitable driver and ream if necessary.

14. Position the steering knuckle over the trunnion socket and install upper and lower felt rings on the king pins. Immerse seals in hot oil a few minutes before installing.

15. Install the lipped seal into both bearings using a suitable driver.

16. Install the upper and lower bearings.

17. Install the fuction washer, rubber washer and shims on the top bearing. If shim thickness has to be changed as previously calculated, install new shims.

18. Attach the top cover with six screws. Tighten the screws to a torque of 9 lb-ft (120 Nm) using sequence shown in Figure 15.

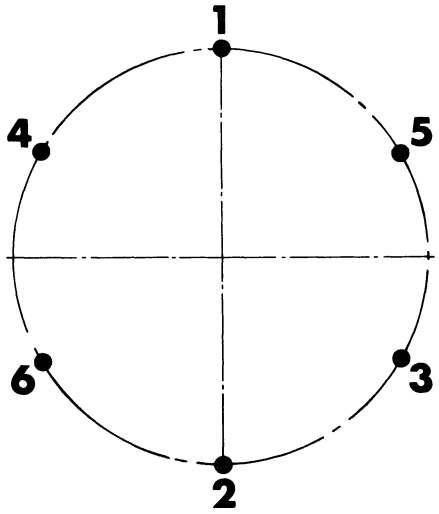

Figure 15. Torquing Sequence

19. In the bottom bearing, install the friction washer and large shim. Next install the shims. If shim thickness has changed per previous calculation use new shims.

20. Attach the bottom cover with six screws. Tighten to a torque of 89 lb-ft (120 Nm).

21. It should take a torque of between 148 and 222 lb-ft (200 and 300 Nm) to turn steering knuckle.

TIE ROD REMOVAL/INSTALLATION

Units with Serial Number 6202128 thru 6202226

Removal

1. Disconnect tie rod from steering knuckle by removing cotter pin, nut and bolt.

2. To remove yoke, loosen lock nut and yoke clamp bolts, then remove the yoke from end of tie rod.

Installation

Install in reverse order of removal.

Units with Serial Number 6202227 and AFTER

Removal

1. Remove cotter pin, nut and dust shield from king pin.

2. Pull the ball joint assembly upwards to remove the tie rod from the steering arm.

Disassembly of Ball Joint

1. Remove snap ring.

2. Unscrew the slotted head plug. Remove springs, upper cup, king pin, spacer and lower cup.

Inspection and Repair

Inspect the king pin and the upper and lower cups for scale, rust scoring or wear. Replace any parts which are not serviceable. Replace grease fitting if it is plugged or damaged.

Assembly and Installation

Assemble the ball joint in reverse order. Refer to Figure 2. Tighten the slotted head plug just enough to allow for installation of the snap ring, then back it out until it touches the snap ring.

Lubricate the ball joint thoroughly with No. 2 Molydisulfide grease after installation.

SPECIFICATIONS

Manufacturer and model	Bendix-Westinghouse Tu-Flo 500
Number of cylinders	2
Bore and stroke	2-1/2" x 1-1/16" (62.15 mm x 42.9 mm)
Test rack specifications	
Minimum Cooling water required (at max. speed)	2.5 apm (9.3 l/min)
Horsepower required at 1250 rpm at 100 psi	2.3
Oil pressure required	15 psi (103 kPa)
Maximum time to reach 100 psi (689 kPa) at 1250 rpm	.30 sec.
Pressure regulation by governor	
Governor cut-in	105 psi (724 kPa)
Governor cut-out	125 psi (862 kPa)
Service specifications and wear allowances	
Discharge valve travel	.056" - .070"
Top of cylinder block to inlet valve seat	.101" - .145"
Crankshaft journals, maximum out of round	.001"
Crankshaft clearance in end cover main bearing	.0003" - .0021"
Crankshaft clearance in connecting rod inserts	.003" - .0021"
Piston clearance in piston bore	.002" - .004"
Piston ring groove clearance	See Figure 8
Wrist pin clearance in wrist pin bushings (new)	.0001" - .0006"
Maximum allowable	.0015"

OPERATING AND AIR LEAKAGE TESTS

1. If the compressor cannot maintain pressure in the air system, and the problem is not due to a faulty governor or leakage elsewhere in the system (such as the reservoir safety valve, etc.), perform the following checks:

   a. Leakage past the discharge valves can be detected by removing the discharge line, applying shop air back through the discharge port and listening for escaping air. Also the discharge valves and unloader pistons can be checked for leakage by building up the air system until the governor cuts out, then stopping the engine. With the engine stopped, carefully listen for escaping air at the intake.

   b. To pinpoint leakage, if noted, squirt soapy water around the unloader pistons. If there is not noticeable leakage at the unloader pistons, the discharge valves may be leaking.

   c. If a test rack is available, the compressor can be removed from the machine and tested as described under Checking Compressor Output on page 7103-14.

15. Insert the connecting rod and piston assembly through the top of the cylinder whose journal is down.

16. Position and attach the cap to the connecting rod making sure the locks are properly positioned on the cap so that new lock prongs will be bent.

17. Tighten the connecting rod bolts evenly and bend the two new lock prongs against the head of the bolts.

18. Install the other connecting rod and piston in the same manner.

19. For installation of inlet valve and cylinder head, refer to steps 3 to 6 under Assembly, page 7103-9.

20. Install the bottom over with new gasket and mount with capscrews and lockwashers.

21. Install the governor and gasket on the cylinder block with capscrews and lockwasher.

Servicing Unloader Without Removing Cylinder Head

Disassembly

1. Remove air strainer assembly from air compressor.

2. Insert screwdriver blade under the unloader spring and raise spring to remove it. See Figure 9.

3. Raise spring saddle and remove it from the unloader plunger. See Figure 10.

4. Using a pair of cutters, cut the unloader plunger stems and remove the same. See Figure 11.

5. Raise the pistons with air pressure, Figure 12, and grasp with long nosed pliers to remove.

6. Remove o-ring and backup ring from pistons. See Figure 9.

7. Remove guides from remainder of plunger.

8. Remove spring seat.

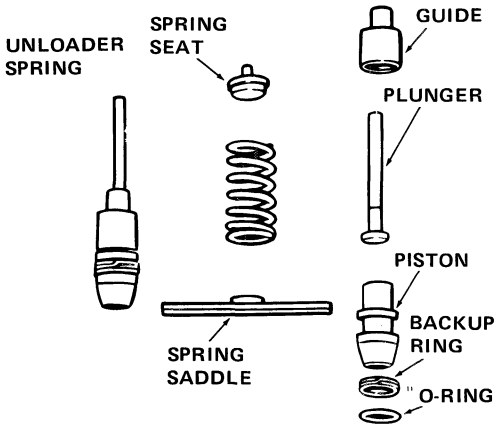

Figure 8. Unloader Parts

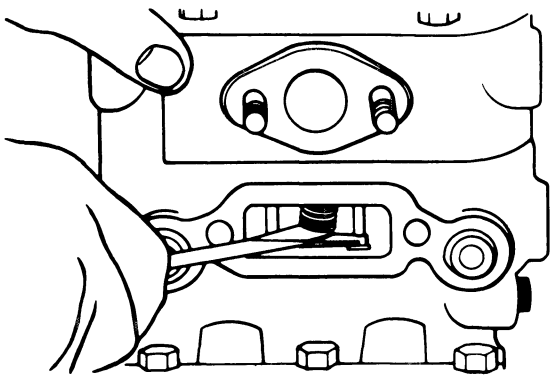

Figure 9. Removing Spring

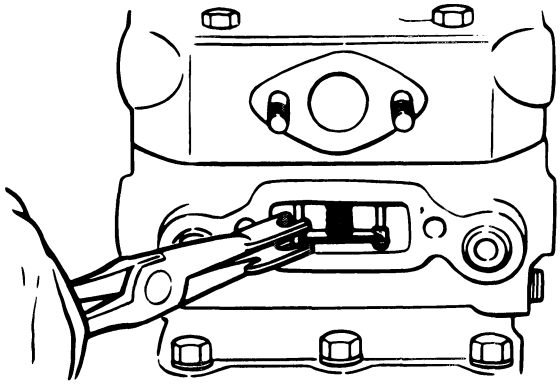

Figure 10. Removing Spring Saddle

Section 7105

BRAKE VALVE

CASE CORPORATION C.E. Div. 9-67071 March 1977 PRINTED IN U.S.A.

DIGGING BRAKE CONTROL VALVE

Removal

1. Partially push in the control valve button and hold to depressurize the air system or open the drain cock on the air reservoir.
2. Note location of air lines at valve, then disconnect the air line.
3. Drive out pin, Figure 2, and remove button.
4. Remove the valve retaining nut and remove valve.

Disassembly

1. Remove the machine screws that retain the cover to the valve body.
2. Remove the self locking nut from the plunger, then remove the plated washer and the inlet/exhaust valve from the plunger.
3. Remove the remaining parts. Clean all parts in non-flammable solvent.

Inspection

1. Inspect components for wear, distortion, scoring, or other damage. Replace all defective parts. Make sure all rust and corrosion is cleaned away. Inspect the inlet/exhaust valve for excessive wear or damage and replace if conditions warrant. It is best to replace rubber seals when the valve is being disassembled.

Assembly and Installation

1. Lubricate body bore, plunger and o-ring with silicone paste lubricant.
2. Reassemble the parts shown in Figure 2. Torque the locknut to 30 to 40 inch-pounds (3.4 to 4.5 Nm).
3. Position the valve in the instrument panel. Install the hex retaining nut. Install button on plunger and secure with the pin.
4. Connect the air lines.
5. Start the engine and pressurize the air system. Make sure the digging brake can be released (button pushed in and held) when air pressure reaches approximately 70 psi (483 kPa). Check for leakage at the exhaust port by applying soap suds. No leakage is permissible. Make leakage check with button in both positions.

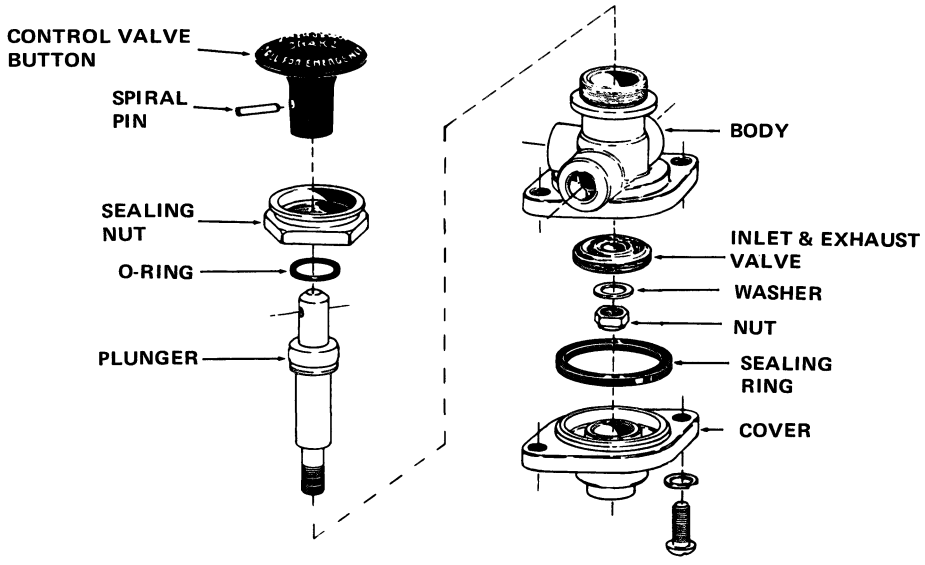

Figure 3. Digging Brake Control Valve, Exploded View

Section 7111

ALCOHOL EVAPORATOR

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BRAKE SHOES

Removal

Front Brake

1. Disassemble the planetary end as instructed in Section 6127.
2. Rotate the eccentric cams until fully released.
3. Use brake spring pliers and remove the return spring.
4. Remove brake shoe pivot pin C-washers and link.
5. Remove wheel cylinder yoke pins and remove brake shoe and lingings.

Rear Brake

1. Disassemble the planetary end as instructed in Section 6127.
2. Rotate the eccentric cams until fully released.
3. Use brake spring pliers and remove the return spring.
4. Remove the anchor pin C-washers, link and guide pin locks and washers, and remove brake shoes.

Inspection

1. If brake shoes are to be used again, inspect for glazing, and grease or brake fluid contamination. Deglaze the brake linings if necessary. The brake shoes must be replaced if contaminated with grease or brake fluid.
2. Check brake shoes for signs of cracking, and wear in guide pin slots.
3. Check for loose guide pins on rear axle only. If guide pins cannot be tightened, the backing plate must be replaced.
4. Inspect brake drum for scoring, cracks and other defects that may result in brake drum failure. If the drum is heavily scored it should be rebored. A drum with light scoring may be used without reboring.
5. Inspect the return spring for signs of cracking and distortion. If either condition is present, replace the spring.
6. Inspect the anchor pins and eccentric cams for wear.
7. Discard the anchor pin C-washers and guide pin locks and replace with new parts.

Reboring The Brake Drum

Whenever the brake drum is heavily scored it must be rebored to insure proper contact between the drum and brake lining. If a badly scored drum is not rebored it will result in a brake grabbing condition because of unequal surface contact between the two brake drums.

When reboring a brake drum, only the minimum boring to remove the soring should be done.

Installation

1. Position the brake shoes over the guide pins (rear brake only) and anchor pins, Figure 2.
2. Install the new anchor pin C-washers and guide pin washers and locks. Squeeze the ends of anchor pin C-washers to gether.
3. Turn the eccentric cams to the fully released position and install the return spring.
4. Position the anchor pins so the flats on the pins are horizontal and the punch marks on the pins face each other. (Front brake only).
5. Reassemble planetary end as instructed in Section 6127.
6. Bleed and adjust brakes as instructed on page 7121-9.

SERVICING THE FOOT BRAKES

General

The hydraulic brake used on this machine is a two shoe type. The brake is self-adjusting.

Any time it is necessary to service the brake shoes or wheel cylinders the planetary end must be disassembled first. Refer to Section 6127A.

Whenever new shoes are installed, the wheel cylinder must be rebuilt or replaced. If the shoes are removed to deglaze the lining, the wheel cylinder need not be replaced. Always rebuild or replace a wheel cylinder that shows signs of leaking.

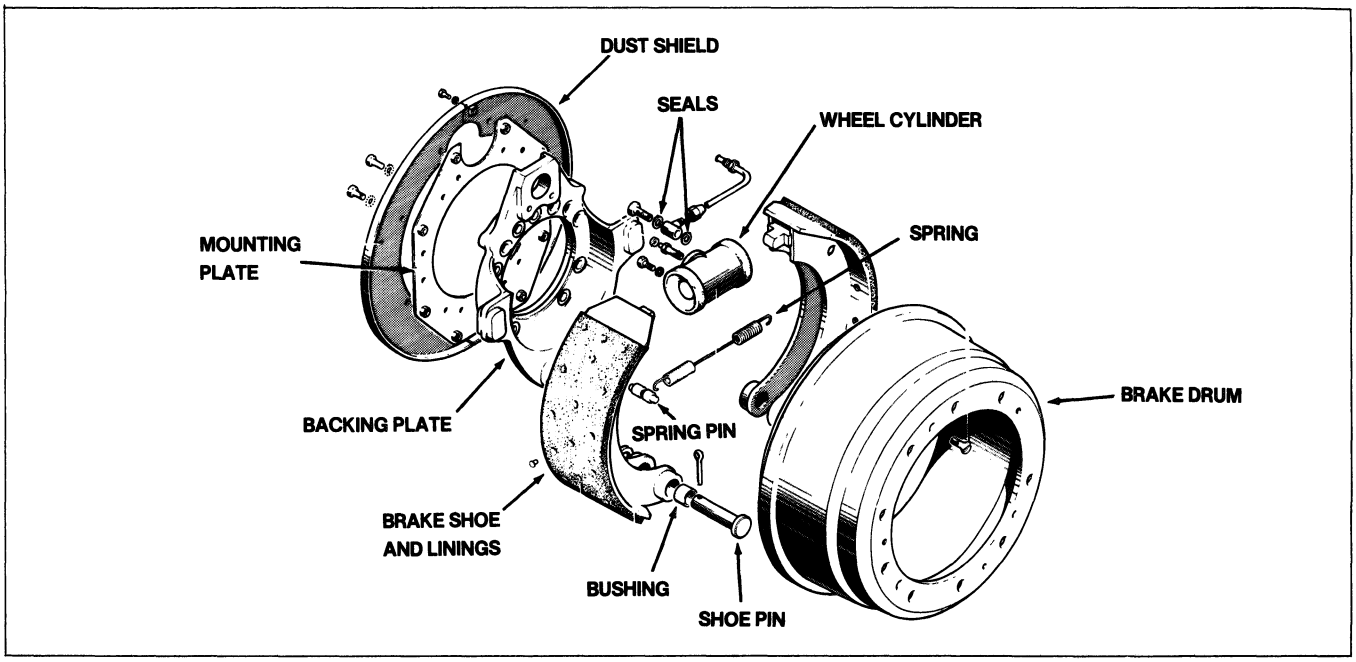

Figure 1. Front Brake Assembly

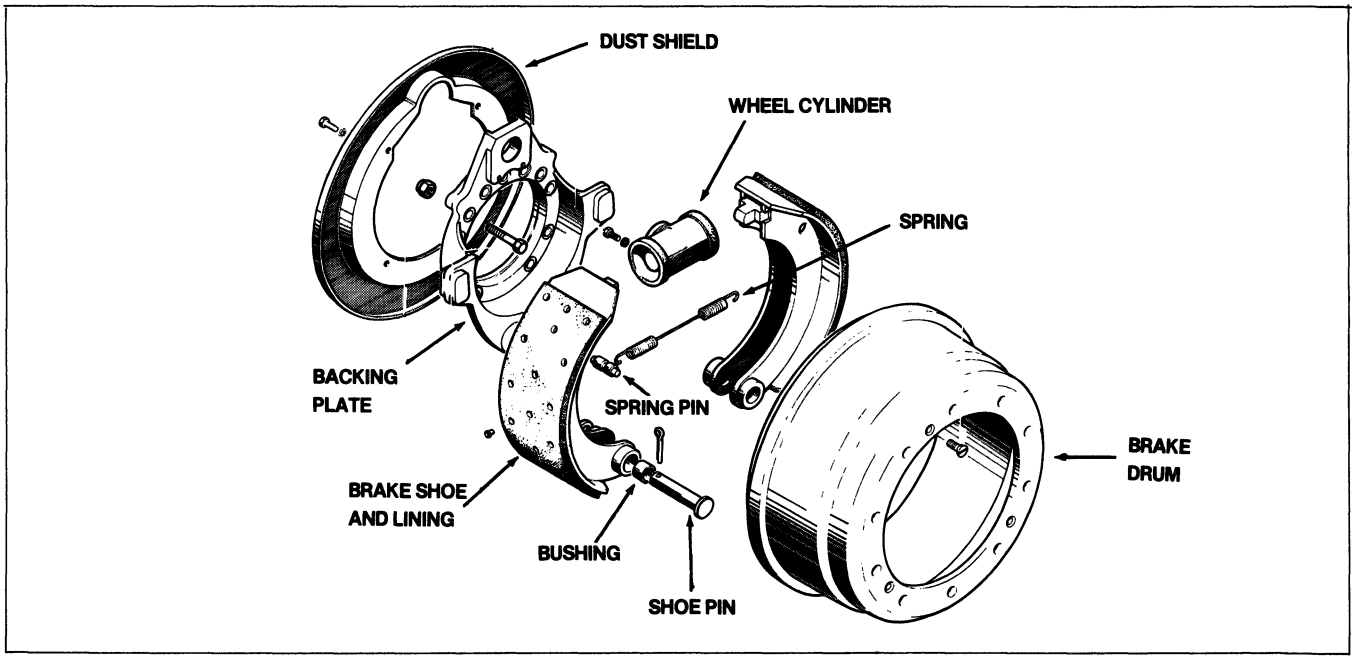

Figure 2. Rear Brake Assembly

A collector ring, located at the center of turntable rotation, provides a means of maintaining circuit continuity between the upper and lower structures through 360° turntable rotation.

Electrical circuit protection is provided by three circuit breakers and several fuses. Location and identification of the circuits protected are shown in Figures 3 thru 7.

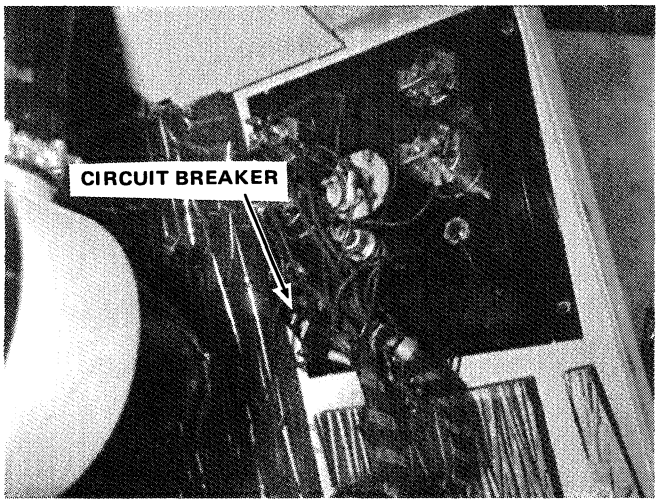

Figure 3. Main Circuit Breaker Location

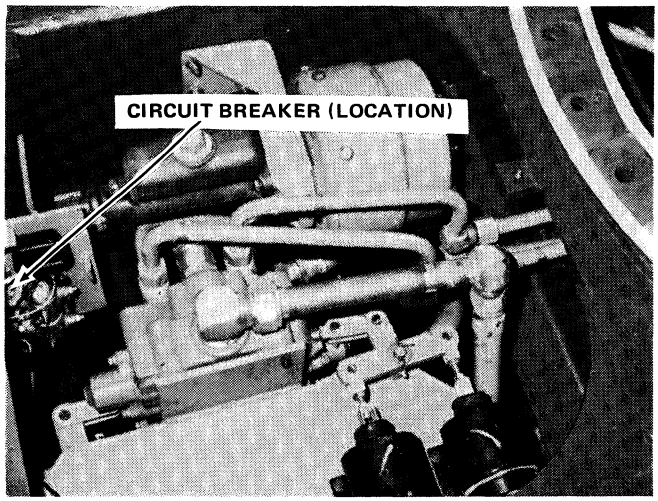

Figure 4. Circuit Breaker in Outrigger Control System

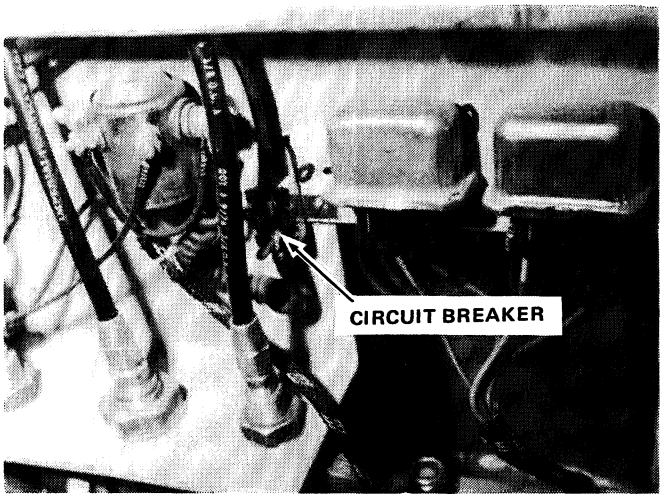

Figure 5. Circuit Breaker in Fast Hoist Circuit

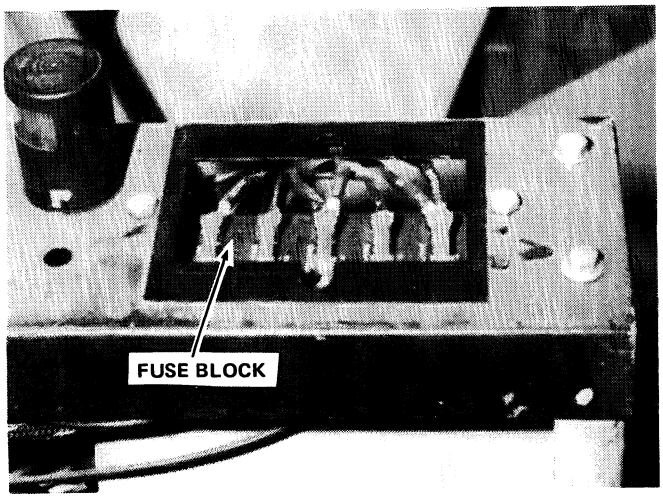

Figure 6. Fuse Block in Cab Instrument Panel

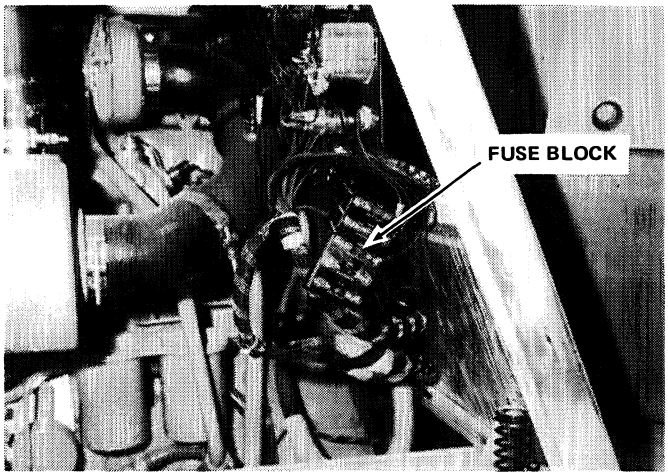

Figure 7. Fuse Block in Engine Hood.

Troubleshooting Chart - Charging System

PROBLEM	POSSIBLE CAUSE	REMEDY
Alternator fails to charge	Alternator belt loose or broken.	Tighten to specifications in Section 8016 or replace.
	Open or high resistance in charging or ground circuits.	Refer to Alternator and Voltage Regulator Testing, this section.
	Excessively worn, open, or defective brushes.	Repair or replace brush assembly.
	Open, ground or short in stator winding.	Refer to Stator Testing, Section 8016. Replace stator.
	Faulty regulator.	Refer to test in this section. Replace regulator.
	Defective Dual Voltage Charge Control.	Refer to Testing the Dual Voltage Charge Control, this section. Replace DUVAC if faulty.
	Open, ground, or short in rotor (field) winding.	Refer to Rotor Testing, Section 8016. Replace rotor assembly.
	Wire improperly connected after repairs.	Refer to wiring diagram in this section.
	Dirty slip rings or poor slip ring conditions.	Inspect slip rings. Clean or repair as required.
Low or unsteady or charging rate	All reasons under Alternator Fails to Charge.	
Excessive charging rate. Lights burning out.	Improper or loose connections on alternator and regulator.	Check for proper connections and tighten if necessary.
	Faulty regulator.	Replace regulator. Refer to testing the regulator, in this section.
Batteries requiring too frequent refilling.	Faulty regulator permitting excessive charging rate.	Refer to Testing the Regulator, in this section.Replace if necessary. Regulator cannot be repaired or adjusted.

contact. A strong impact against the machine can cause a brush to jump out of its channel. Make sure all brushes are properly seated.

Replacing Brushes

NOTE: Before brushes can be removed for replacement, the spring tension acting on them must be removed. Spring tension is released by holding the spring tension screw with a screw driver at a slot "A" and loosening the spring tension screw nut on the opposite side. DO NOT REMOVE THE NUT COMPLETELY, JUST LOOSE!

After tension is released, pull the spring "B" up and out of the way and unscrew the binder screw "C". Take off the brush shung connector "D" and remove the brush "E" to be replaced.

To place a new brush into the assembly, reverse the above procedure.

Replacement of the spring tension screw can be accomplished by removing the nut and pulling the screw and spring out of the holes in the brush holder "F". Insert the spring into the new screw, then place screw and spring back into holder. Install and tighten nut.

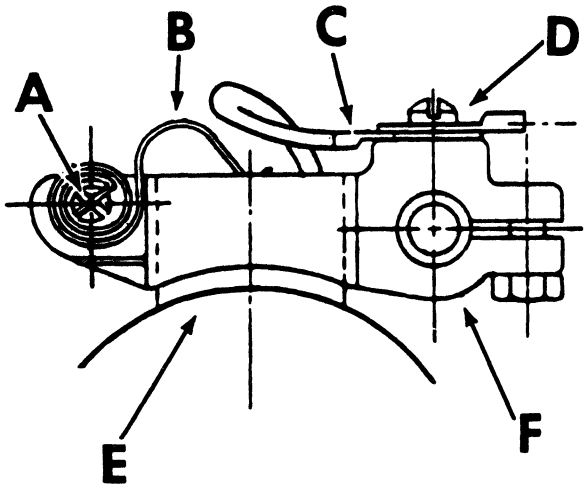

Figure 23. Brush and Spring on Collector Ring

NOTE: Tension is applied on the brush spring by holding the nut with a wrench and turning the screw clockwise until the inner coils of the spring are tight. Back off 1/4 turn, then tighten the nut. The spring should have a minimum of one (1) pound pull at the brush.

Removal

1. Disconnect battery leads to prevent arcing when removing or installing connectors. Remove protective cover from collector ring.

2. Remove top swivel bracket by removing two 3/8" x 1-1/4" capscrews, flat washers and self-locking nuts.

3. Disconnect accelerator hydraulic line at accelerator swivel.

4. Disconnect and cap the accelerator hydraulic line at bottom of swivel. Remove (4) retainer rings from the two shifting tube guides and loosen the inner swivel tube clamp to allow shifting tubes to be pulled out through top center swivel assembly.

5. Label and disconnect wiring harness connectors at collector ring.

6. Remove (3) 3/8" x 1-3/4" capscrews and flat washers from the inner swivel tube support plate at top of swivel. Loosen the shifting linkage and pivot the bellcranks off to the side to allow for removal of the inner swivel tubes.

7. Carefully pull inner swivel assembly straight up and out of the center swivel assembly.

8. Loosen setscrew at base of collector ring. Lift collector ring off the mounting bracket and collector ring tube.

Disassembly

1. Remove the nuts that retain the outboard bearing to the studs, then lift off the outboard bearing.

2. Tag individual brushes to identify the slip rings on which they ride - from 1 to 14, top to bottom, then pivot the brushes so they can be slid off the stud and insulator on which they pivot.

3. Loosen the setscrew that retains the collar to the collector ring tube and remove the brass rings and insulators.

Section 8004

BATTERIES

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Section 8015

STARTER AND STARTER SOLENOID

CASE CORPORATION

C.E. Div. 9-73495 March 1977

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Section
8016

ALTERNATOR

WILL BE FURNISHED AT A LATER DATE

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INTERCHANGING SWING AND CROWD CONTROL LINKAGE

When shipped from factory, swing is controlled by a foot pedal and crowd is controlled by a lever.

These control functions may be interchanged under the turntable where the balljoints connect to the bellcranks. Each bellcrank has an unused balljoint located on the opposite end for the purpose of interchaning linkage.

WARNING: Never operate this machine unless you are fully aware of all the controls. Any changes made to the controls must be clearly noted and posted in the operator's cab.

Disconnect balljoint for crowd control linkage and reconnect on unused balljoint of swing pedal bellcrank. Likewise reconnect the swing control linkage to the crowd lever bellcrank.

NOTE: When swing function is controlled by the foot pedal and crowd function is controlled by the lever, a DECAL (CASE Part Number S 511622) MUST be posted in the operator's cab. When swing function is controlled by the lever and crowd function is controlled by the foot pedal a DECAL (CASE Part Number S 511623) MUST be posted in the operator's cab.

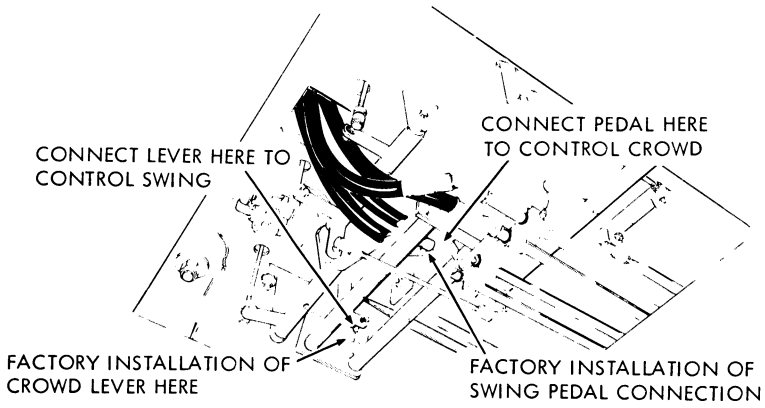

Figure 7.

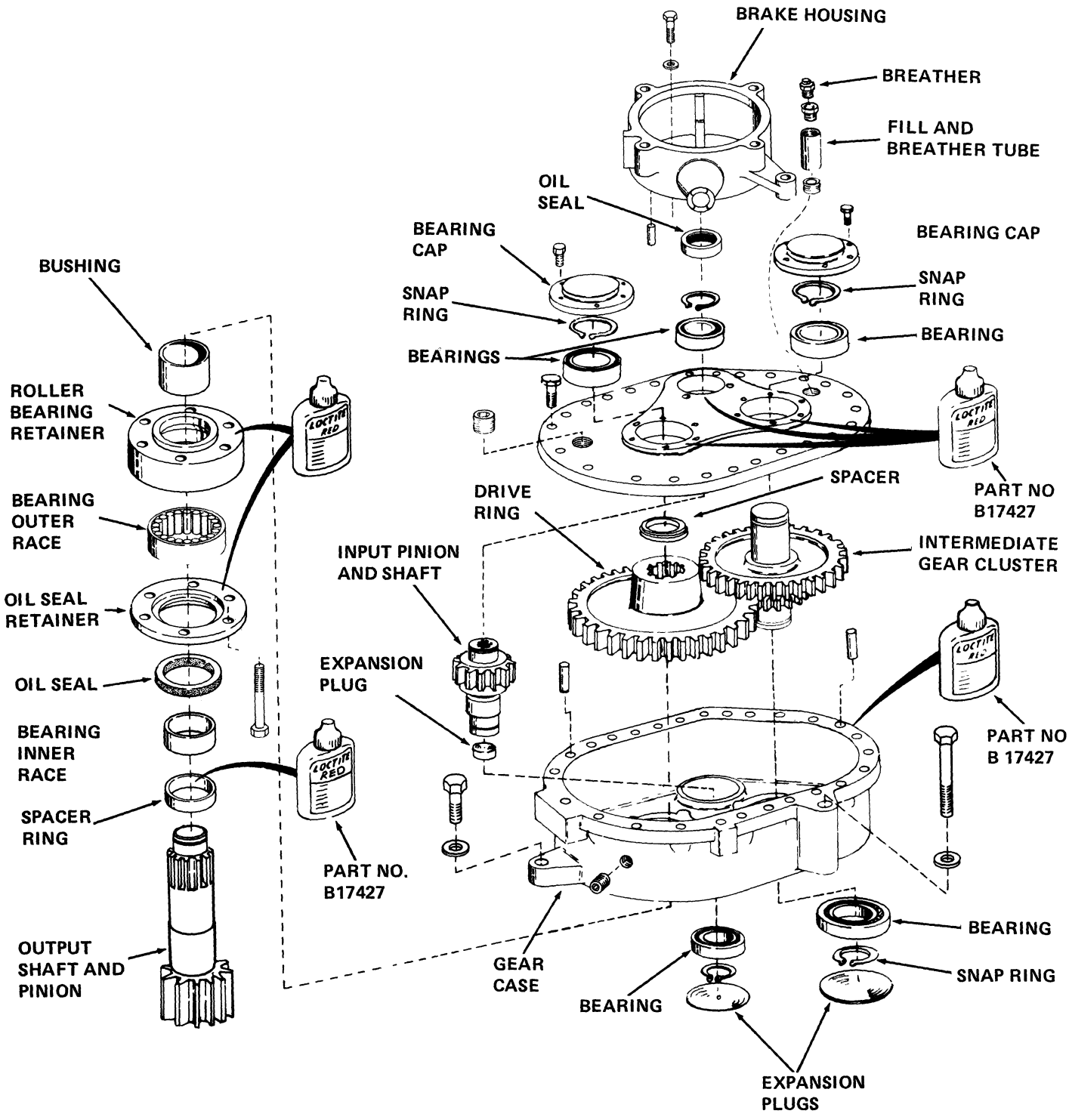

Figure 3. Swing Gearbox, Exploded View

GENERAL

The boom is constructed of cast and welded steel and is reinforced in all areas where load stresses concentrate. The structural has been carefully designed and tested to ensure that it will withstand even the severest shock loads extended upon it during excavation in hard rock. A periodic check should be made, however, to detect cracks or other damage. A steam cleaning is often necessary for close inspection. Repair any cracks immediately.

Periodically check all pins and retaining hardware to ensure that they are securely installed. Keep hose clamps tightly fastened to prevent hoses from getting damaged or pinched during operation. Sound reduction tube clamps are used to reduce hydraulic noise levels. These clamps may possibly loosen during operation and slide out of the clamp mounting bracket. Check clamps at regular intervals. Tighten as required.

Lube fittings are installed at all pivot points in the boom, cylinders and bucket. Grease these areas DAILY or every 10 hours with No. 2 Moly-disulfide bearing grease or functional equivalent. Always apply enough grease to force the old contaminated grease out of the bearing or bushing. If the grease fitting will not accept grease, remove it, clean out the obstruction, then re-install the fitting. Any damaged or defective fittings should be replaced. See Section 1050 for grease fitting locations

This Safety Alert Symbol Indicates Important Safety Messages In This Manual. When You See This Symbol, Carefully Read The Message That Follows And Be Alert To The Possibility Of Personal Injury Or Death.

DISASSEMBLING THE BOOMS

This topic describes removal of the attachment, dipperstick and boom.

Attachment Removal

Remove attachment using instructions for that particular attachment in Section 9213.

Dipperstick Removal

CAUTION: Dipperstick weighs approximately 800 lbs. (360 kg), and tool cylinder weighs approximately 175 lbs. (80 kg). Use a hoist capable of lifting these items as personal injury could result.

1. Remove the attachment as instructed under attachment removal.
2. Lower the dipperstick to the ground.
3. Stop the engine. Move the tool control lever in both directions to relieve circuit pressure. Attach a hoist to the tool cylinder. Remove hydraulic lines and close all openings with caplugs. Tag all lines for reassembly.
4. Remove cylinder rod end pin retaining hardware. Drive out the pin.
5. Remove cylinder base end pin retaining hardware. Drive out the pin and remove the cylinder.
6. Attach a hoist to dipperstick. Move the crowd control lever in both directions to relieve the circuit pressure.
7. Place a block of wood under the crowd cylinder to provide support. Remove pin retaining hardware from the cylinder rod pivot pin and remove the pivot pin.
8. Remove cotter pin, nut and flat washer from dipperstick pivot pin and remove pin.
9. Lift the dipperstick away from main boom and lower to the ground.

ASSEMBLING THE BOOMS

Main Boom Installation

1. If crowd and hoist cylinders were removed from boom, install onto main boom and tie both to underside of main boom.

2. Attach a chain hoist to the boom and lift boom into position to attach it to the turntable.

3. Install the main boom pivot pin and retaining hardware.

4. Untie main boom cylinder and attach it to turntable. Be careful when untying the main boom cylinder. Prevent it from swinging back to fast.

5. Connect hoses to hoist cylinder. Connect hoses to crowd auxiliary and tool circuit tube lines at the base of the boom. The boom can now be raised hydraulically.

Tool Boom Installation

1. Attach a chain hoist to the tool boom and position the tool boom so the pivot pin can be installed.

2. Install pivot pin and attach flat washer, castle nut and cotter pin. Rest boom on ground.

3. Attach a chain hoist to the crowd cylinder. Untie the cylinder and lower rod end to fit in tool boom. Drive in pin and attach retaining hardware.

4. Attach tool cylinder to tool boom.

Tool Boom Extension Installation

1. Connect the tool cylinder to the outer adjustable tool link and side links with pin and retaining hardware.

2. If tool boom extension is resting on support, position tool boom so it will slide over the tool boom extension and inner adjustable link will slide into outer adjustable link.

3. If boom extension is laying on ground, attach a hoist and move the extension into position so tool boom will slide over it and adjustable links will slide together.

4. Start engine and slowly work the crowd and hoist controls to work tool boom over the extension.

5. When proper position is obtained install the pins in the adjustable tool link and the tool boom extension.

6. Remove plugs and reconnect the auxiliary lines.

Attachment Installation

Attach the attachment using instructions for that particular attachment in Section 9213.

SERVICING THE BUSHINGS

Bushings For Cylinder, Buckets, Booms

Service Information

Bushings are extensively used in the boom assembly at pivot points subject to extensive wear. These steel bushings are heat treated to the hardness required by the load placed on them. When worn, they are easily replaced.

Bushings should be regularly checked - by the customer in the field and whenever the machine is brought for servicing. Any bushing which is severely worn should be replaced. A bushing should bever be allowed to wear clear through.

Many bushings are located at lubrication points - in these cases, bushing life can be extended by faithfully following the recommended lubrication

HOUSE BRAKE

The brake assembly basically consists of two brake discs assemblies and an actuator. As pressure is exerted on the actuator by the brake lever, the actuator expands and exerts pressure on the upper and lower friction disc assemblies to apply the brake.

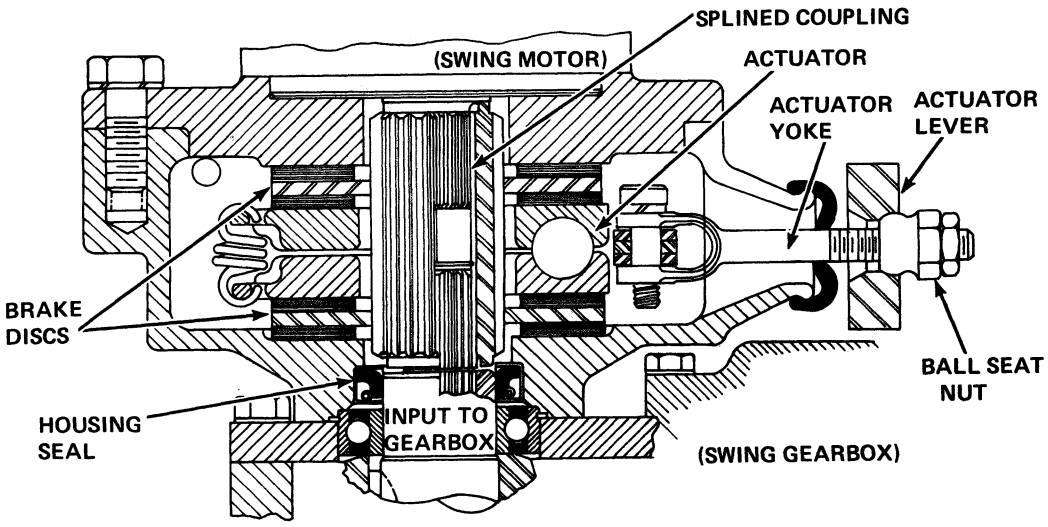

Figure 4. House Brake, Cross Section View

House Brake Adjustment

If the house brake fails to hold the turntable, and the knurled knob on end of house brake, handle has been turned down as far as it will go, adjust the brake as follows:

1. Place brake control handle in RELEASED position.
2. Loosen jam nut (A). See Figure 4. Turn ball nut (B) clockwise until it is snug in its seal. Back off

Test the adjustment. If brake still fails to hold the turntable, disassemble and inspect the brake discs and actuator. (See Section 9210).

If in cold weather, excessive condensation in the brake housing causes the brake discs to freeze, the problem can be eliminated by disassembling brake and applying graphite to bottom brake surface.

CENTER SWIVEL

The center swivel consists of two hydraulic swivels. Located at the center of turntable rotation, the swivel assembly maintains hydraulic circuit continuity through 360 degrees turntable rotation.

For detailed description of the individual components of the center swivel, refer to section 4218.

TURNTABLE BEARING

The turntable bearing is mounted between the upperstructure and leveler or carbody. It permits the upperstructure to revolve a full 360°. The turntable should be greased at least once a week. Apply grease to the bearing through the central lube fitting (located next to the house brake in the operator's cab) while slowly rotating the turntable through several revolutions.

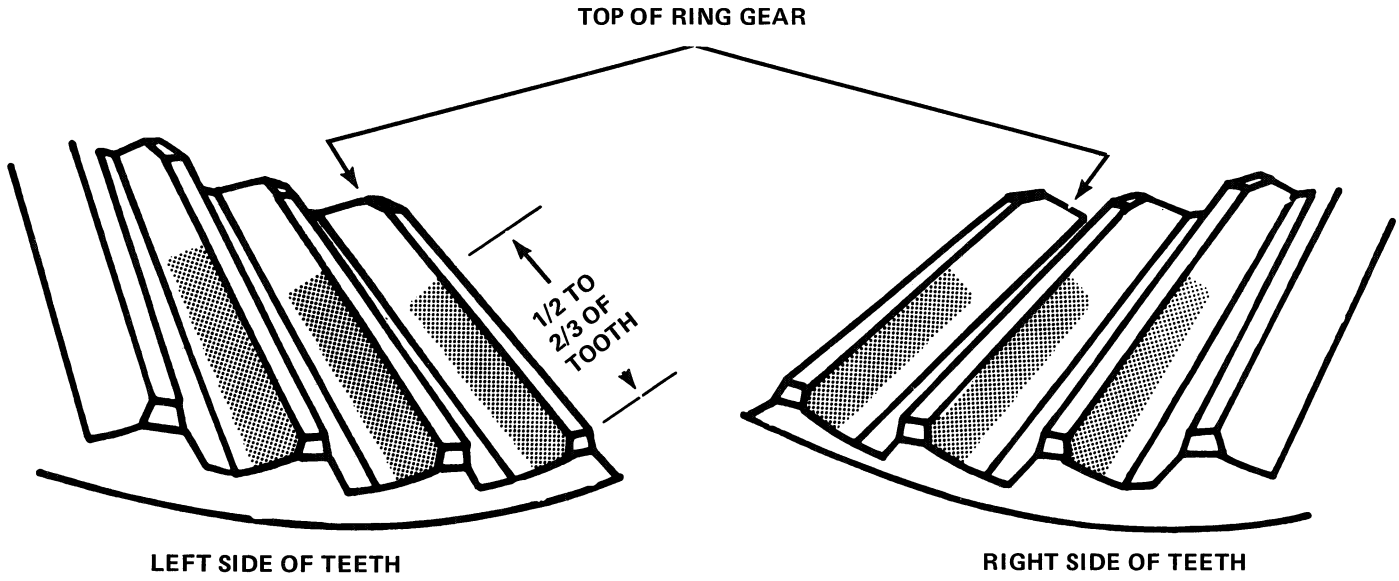

Figure 15. Correct Open Ring Gear Tooth Pattern

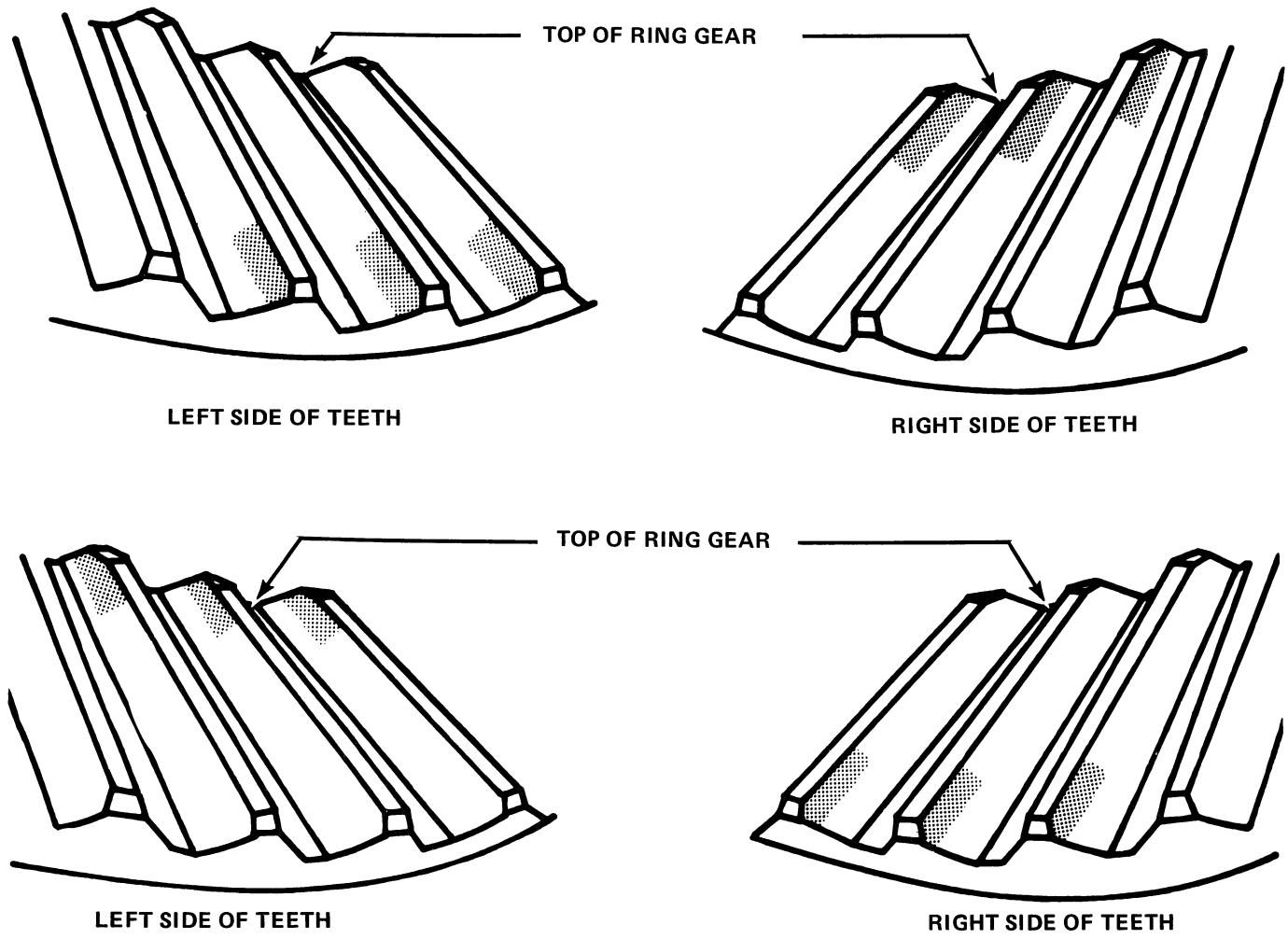

Figure 16. Incorrect Open Ring Gear Tooth Pattern