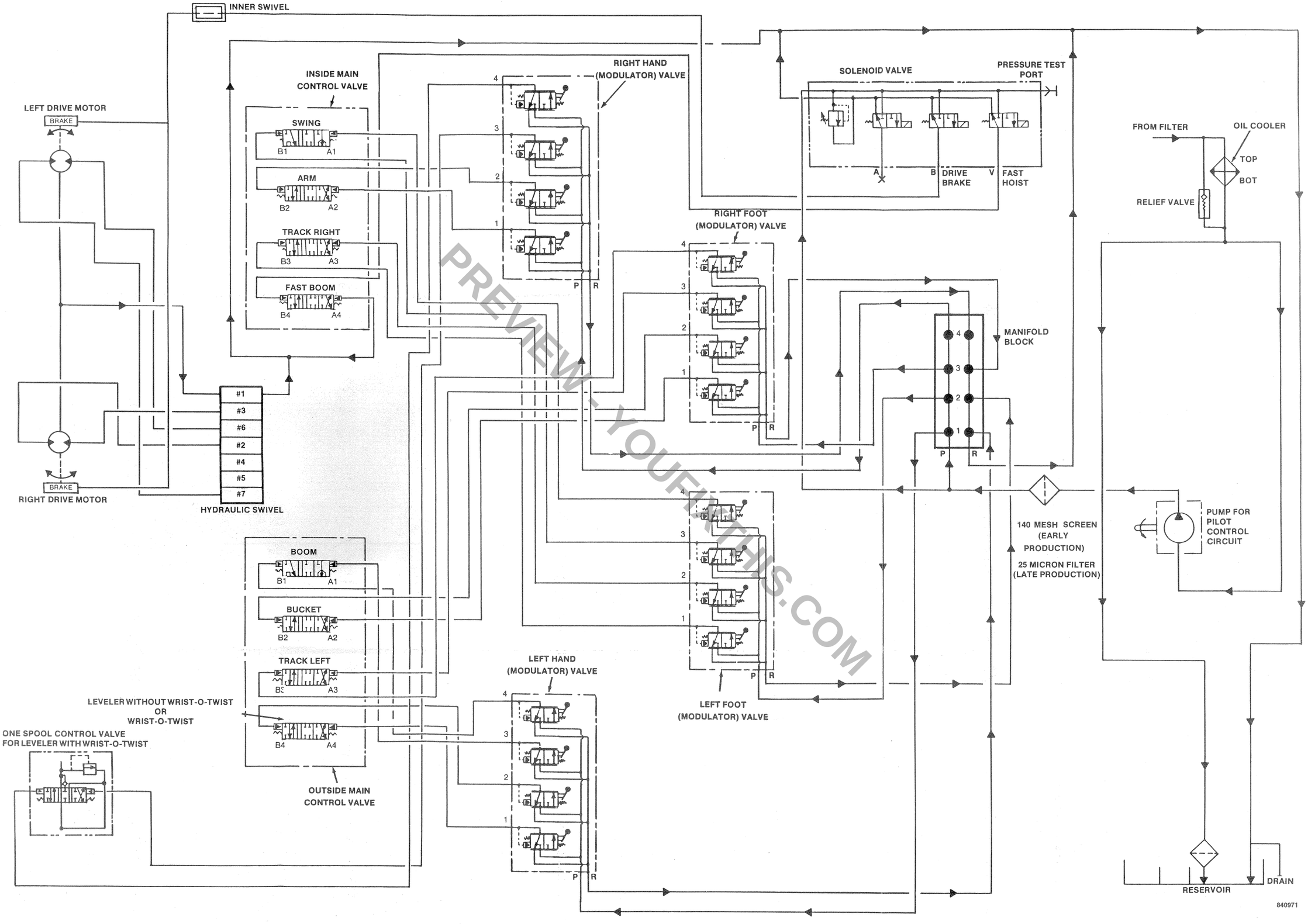
ENGINE TEMP. GAUGE LAMP
VOLTMETER LAMP
49
ENGINE OIL PRESSURE LAMP
HYD. FILTER BYPASS LAMP
VOLTMETER
ENGINE TEMP. GAUGE
OIL PRESS. ALARM
PANEL LAMP
HORN SWITCH
COLD START SWITCH
POWER MAGNETIC SWITCH
STARTER MAGNETIC SWITCH
150 OHM RESISTOR
ALTERNATOR
FUEL SOLENOID
DRIVE BRAKE LAMP
44
0
19A
19A
0
49
0
64
19B
28
19B
12A
12
21C
1K
0
21P
14
19A
1R
1K
1A
BATTERY (2)
150 OHM RESISTOR
37P
36T
DEFROSTER SWITCH
M
OFF
HI
LO
RIGHT CONSOLE HARNESS
CAB HARNESS
RIGHT CONSOLE HARNESS
CAB HARNESS
CAB HARNESS
19A T
1K R
Plug U
21P S
Plug W
37P Z
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35H X
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ENGINE HARNESS
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BL
GR
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OFF
LOW
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CAB HARNESS
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LEFT CONSOLE HARNESS
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0
35H
61H
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WASHER SWITCH
WORK LAMP SWITCH
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SWITCH SHOWN IN LO POSITION
37H
Mounting Bolt of Solenoid Valve
ENGINE OIL PRESSURE SENDING UNIT

**1080/1080B (Late)** 860505

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## WORK SAFELY

A serviceman can be severely injured if caught in the pulleys, belts or fan of an engine that is accidentally started. To avoid such a misfortune, take these precautions before starting to work on an engine:

1. Disconnect the battery from the starting system by removing one or both of the battery cables. With the electrical circuit disrupted, accidental contact with the starter button will not produce an engine start.

2. Make sure the mechanism provided at the governor for stopping the engine is in the stop position. This will mean the governor is in the no-fuel position. The possibility of the engine firing by accidentally turning the fan or by being bumped by another vehicle is minimized.

### Some Safety Precautions To Observe When Working On The Engine

1. Consider the hazards of the job and wear protective gear such as safety glasses, safety shoes, hard hat, etc. to provide adequate protection.

2. When lifting an engine, make sure the lifting device is fastened securely. Be sure the item to be lifted does not exceed the capacity of the lifting device.

3. Always use caution when using power tools.

4. When using compressed air to clean a component, such as flushing a radiator or cleaning an air cleaner element, use a safe amount of air. Recommendations regarding the use of air are indicated throughout the manual. Too much air can rupture or in some other way damage a component and create a hazardous situation that can lead to personal injury.

5. Avoid the use of carbon tetrachloride as a cleaning agent because of the harmful vapors that it releases. Use perchlorethylene or trichlorethylene. However, while less toxic than other chlorinated solvents, use these cleaning agents with caution. Be sure the work area is adequately ventilated and use protective gloves, goggles or face shield and an apron.

Exercise caution against burns when using oxalic acid to clean the cooling passages of the engine.

6. Use caution when welding on or near the fuel tank. Possible explosion could result if heat build-up inside the tank is sufficient.

7. Avoid excessive injection of ether into the engine during start attempts. Follow the instructions on the container or by the manufacturer of the starting aid.

8. When working on an engine that is running, accidental contact with the hot exhaust manifold can cause severe burns. Remain alert to the location of the rotating fan, pulleys and belts. Avoid making contact across the two terminals of a battery which can result in severe arcing.

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b. If the voltmeter does not indicate system voltage, repair or replace the wires between the harness plug and the alternator.

9. Connect the two halves of the harness plug.

10. Disconnect the wiring plug from the key switch.

11. Check for system voltage at test point E.

a. If the voltmeter indicates system voltage, do step 12.

b. If the voltmeter does not indicate system voltage, repair or replace the wires between the harness plug and the wiring plug for the key switch.

12. Put the key switch on the ON position. Use an ohmmeter to check for continuity between test points E and F.

a. If the ohmmeter indicates continuity, do step 13.

b. If the ohmmeter does not indicate continuity, replace the key switch.

13. Connect the wiring plug to the key switch. Make sure that the key switch is in the ON position.

14. Disconnect the left console harness plug.

15. Use the voltmeter to check for system voltage at test point G.

a. If the voltmeter indicates system voltage, do step 16.

b. If the voltmeter does not indicate system voltage, repair or replace the wire between the harness plug and the wiring plug for the key switch.

16. Connect the two halves of the harness plug.

17. Use the voltmeter to check for system voltage at test point H.

a. If the voltmeter indicates system voltage, do step 18.

b. If the voltmeter does not indicate system voltage, repair or replace the wire between the harness plug and the circuit breaker.

18. Check for system voltage at test point I.

a. If the voltmeter indicates system voltage, do step 19.

b. If the voltmeter does not indicate system voltage, replace the circuit breaker.

19. Disconnect the right console harness plug.

20. Use the voltmeter to check for system voltage at test point J.

a. If the voltmeter indicates system voltage, do step 21.

b. If the voltmeter does not indicate system voltage, repair or replace the wire between the circuit breaker and the harness plug.

21. Connect the two halves of the harness plug.

22. Disconnect the cab to engine harness plug.

23. Use the voltmeter to check for system voltage at test point K.

a. If the voltmeter indicates system voltage, do step 24.

b. If the voltmeter does not indicate system voltage, repair or replace the wire between the harness plugs.

24. Connect the two halves of the harness plug.

25. Use a voltmeter to check for system voltage at test point L.

a. If the voltmeter indicates system voltage, do step 26.

b. If the voltmeter does not indicate system voltage at test point L, check the 150 ohm resistor. If the resistor is good, repair or replace the wire between the harness plug and the resistor.

26. Check the voltage at test point M.

a. If the voltmeter indicates system voltage, do step 27.

b. If the voltmeter does not indicate system voltage, repair or replace the wire between the resistor and the connector on the alternator.

27. Put the key switch in the OFF position.

28. If no problems have been found or if all problems have been repaired but the charging system still does not work correctly, do the Alternator Output Test.

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# 6312

# DRIVE MOTORS

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Assembly ..... 6312-34


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7. Install the bypass valve in a new element.

8. Carefully install the element in the housing. Do not damage the bypass valve.

9. Install the housing against the filter head.

10. Install the seal washer and cap screw.

11. Tighten the cap screw to 75 pound-feet (100 N m, 10 kg/m).

12. Repeat steps 1 through 11 for the other hydraulic filter.

## Oil Change

Change the hydraulic oil and clean the diffuser and filler screens after every 2000 hours of operation. If possible, drain the hydraulic oil when the hydraulic oil is warm.

1. Start and run the engine at 1/4 throttle.

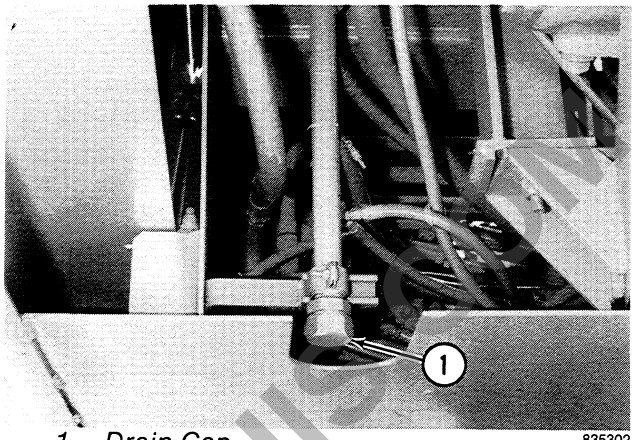
2. Park the machine on a level surface.

3. If space permits, roll the bucket toward the machine and extend the dipper. Lower the boom until the bucket is on the ground.



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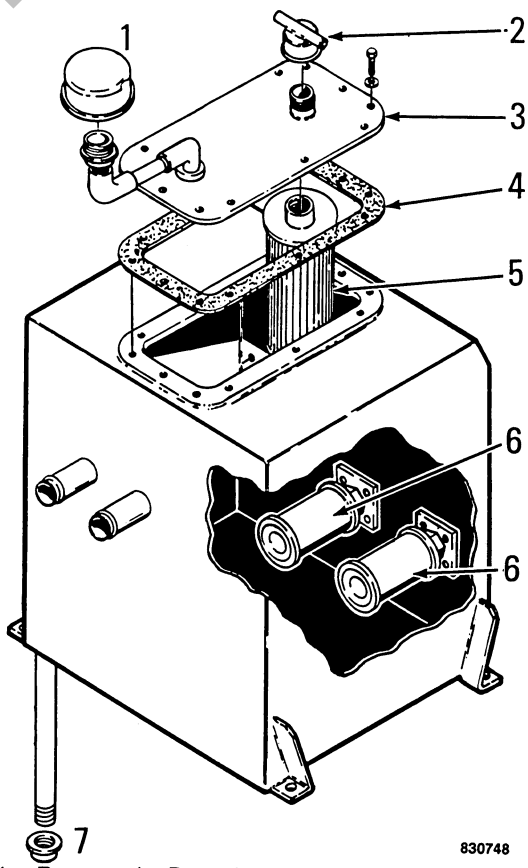
4. Remove the drain cap and drain the hydraulic oil from the reservoir. The reservoir holds approximately 25 U.S. gallons (95 litres) of hydraulic oil.



*1. Drain Cap*
835302

5. See page 8201-5 and replace the hydraulic filters.

6. See page 8201-7 and clean the 140 micron screen.



830748

*1. Reservoir Breather*
*2. Filler Cap*
*3. Access Cover*
*4. Gasket*
*5. Filler Screen*
*6. Diffuser Screen*
*7. Drain Cap*

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# 5503

# TRACK CHAIN AND SHOES

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# 1001

# SAFETY RULES, SERVICE MANUAL INTRODUCTION, AND TORQUE SPECIFICATIONS

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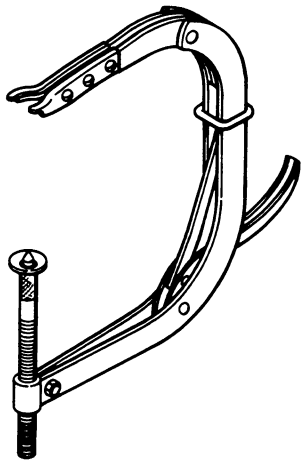
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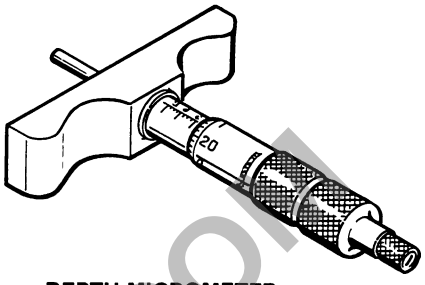
# SPECIAL TOOLS



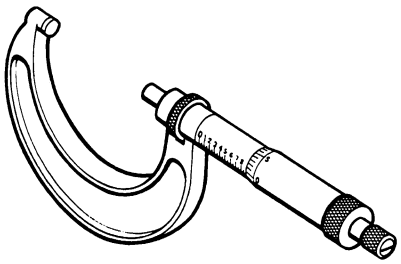
CAS-1086
VALVE GUIDE
CLEANER



CAS-10240
VALVE SPRING COMPRESSOR



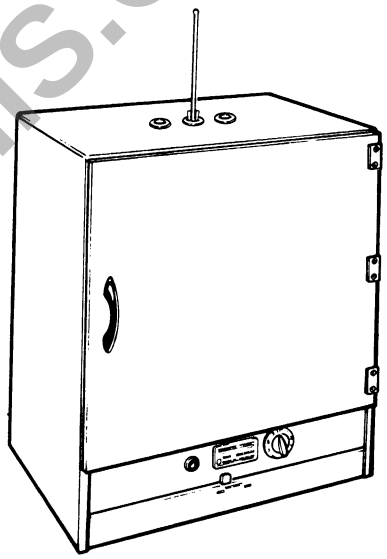
DEPTH MICROMETER



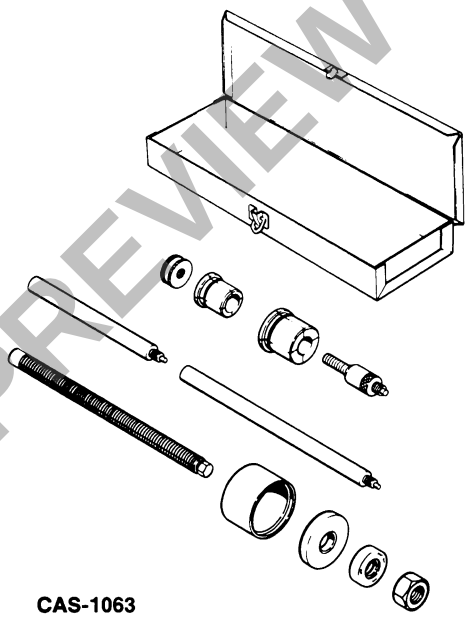
0″ TO 5″ MICROMETER



CAS-1109
CRANKSHAFT FRONT
OIL SEAL TOOL



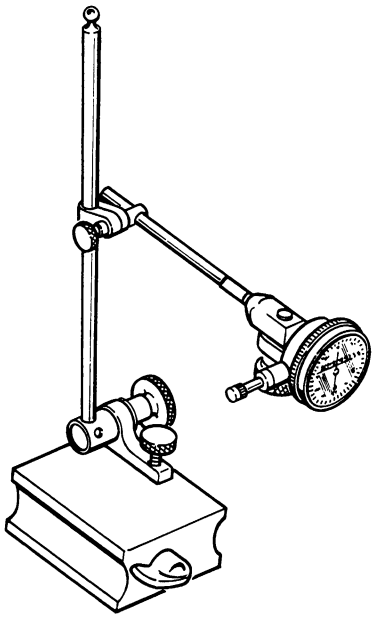
CAS-10133
BEARING HEATER/OVEN



CAS-1063
CAMSHAFT BUSHING
TOOL KIT



CAS-1411
INJECTOR
BORE CLEANER



DIAL INDICATOR

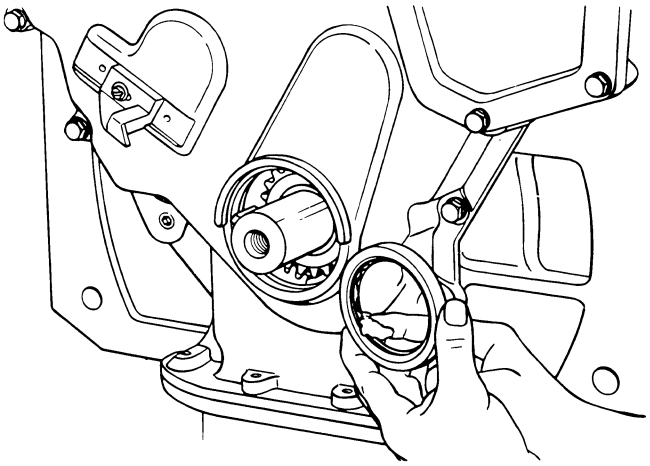
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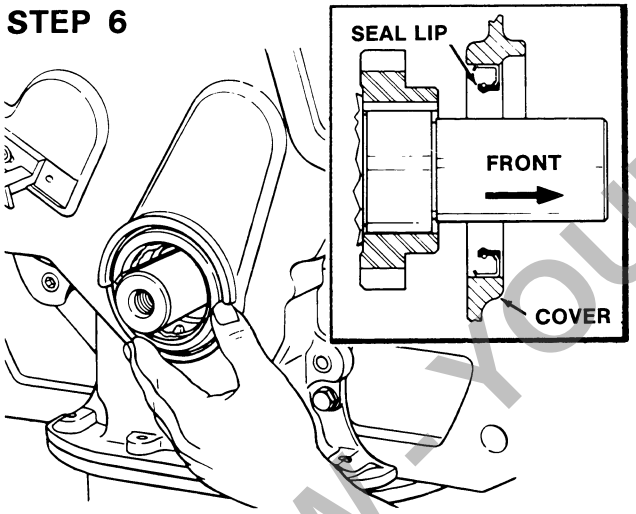
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## STEP 5



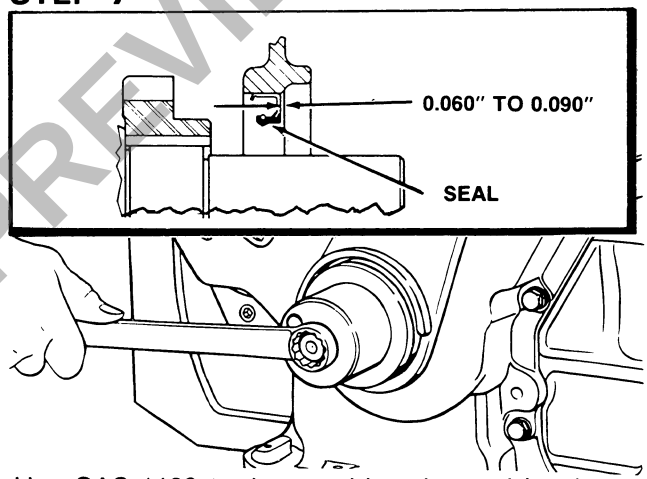
COAT THE SEAL LIP WITH PETROLEUM JELLY.

## STEP 6



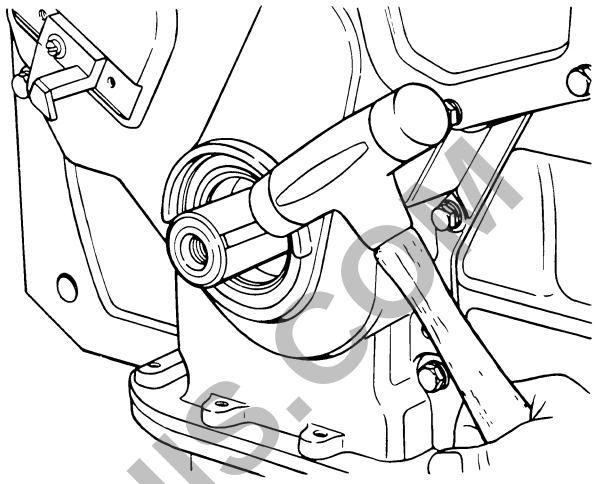

PLACE THE SEAL WITH LIP INWARD INTO TIMING GEAR COVER.

## STEP 7



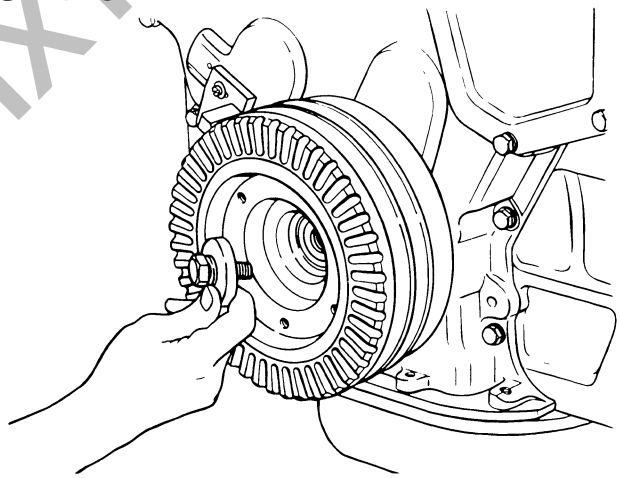

Use CAS-1109 tool to position the seal in place. Push the seal in until the seal is 0.060 to 0.090" (1.52 to 2.29 mm) from the front edge of the cover seal retaining rim.

## STEP 8



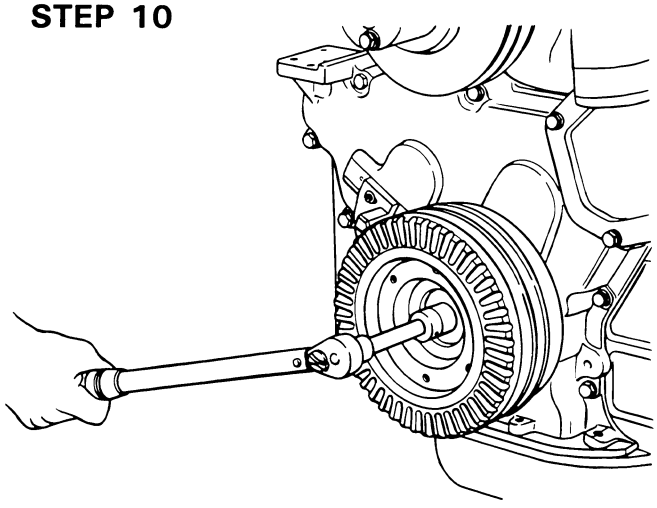
INSTALL PULLEY POSITIONING KEY IN CRANKSHAFT.

## STEP 9



INSTALL THE CRANKSHAFT PULLEY.

## STEP 10



TORQUE PULLEY RETAINING BOLT 100 TO 110 FT. LBS.



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# ENGINE DOES NOT HAVE POWER

**1. Engine Stop Control Lever Not Completely Open.**

Check the engine stop control lever to see if the lever is opening completely. A lever that does not open completely limits the amount of fuel to the injection pump and results in low engine horsepower.

The following conditions can cause the engine stop control lever not to open completely:
A. a cable that is not adjusted correctly.
B. damage to the cable.
C. a cable sliding in the clamps.

**2. Low Engine RPM.**

Check the engine for the correct RPM.

**3. Mechanical Drag On The Tractor.**

A mechanical drag on the tractor can cause the engine to run at low horsepower and the engine to run at temperatures above normal. A mechanical drag can be caused by:
A. brakes that do not work correctly.
B. bad bearings.
C. bad gears in the transmission.

**4. Dirty Air Filters.**

A dirty air filter will cause the fuel and the air not to mix correctly and will result in low engine power. Check the filter restriction indicator and give service to the air filters, if required.

**5. Not Using The Correct Type Of Fuel Or Using Dirty Fuel.**

The engine will not operate correctly if the correct fuel is not used or if dirty fuel is used. The fuel will not burn efficiently and will cause a loss in engine power and serious damage to the engine. Drain the fuel tank and fill the tank with the correct fuel.

**6. Low Operating Temperature.**

The engine will run at full horsepower if the engine is operating in the correct temperature range. Low operating temperature can result from a thermostat that is not working correctly. Never run the engine without the thermostat.

**7. Engine Timing Not Correct.**

Combustion will not occur in the cylinder at the correct moment (degrees BTDC) if the engine timing is not correct. This can cause the fuel not to burn efficiently and will cause a loss in engine power and serious damage to the engine. Check for correct engine timing.

**8. Low Compression.**

Low compression in several cylinders makes the engine difficult to start and does not make enough heat to cause combustion in the cylinders. It will be difficult for the engine to continue running. Make a compression check on the engine.

**9. Turbocharger Does Not Work Correctly.**

A bad turbocharger will not supply the required compressed air to the intake manifold. The engine will smoke from the bad mixture. There will be a loss of power in the engine. Inspect the turbocharger for wear of parts and for correct lubrication. Make sure that the compressor wheel turns freely.

**10. Fuel Injection Nozzles Not Working Correctly.**

Combustion in the engine cylinders will not be correct if the following conditions are present:
A. low cracking pressure.
B. spray pattern that is not correct.
C. a spray orifice that is not open.

Remove and test the fuel injection nozzles.

**11. Obstructions In The Fuel Filters.**

Check and give service to the fuel filters.

**12. Air In The Fuel System.**

Remove the air from the fuel system until the fuel flows without any air bubbles. Check for air leaks at the fittings between the fuel tank and the fuel pump.

**13. Camshaft Timing Not Correct.**

A camshaft can be installed one tooth out of time, making all the valves operate out of the normal timing sequence, in relation to the crankshaft. The engine will not run smoothly or at full power. Valves can hit the piston and cause internal damage.



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galleries) in the corners of the block to be sure they are flush with or below the top surface of the block.

14. Check the remaining cylinder block surfaces and threaded holes. Check all of the mating surfaces, or mounting pads, for flatness, nicks and burrs. The flatness of the blower mounting pad must not vary more than .004". Clean-up damaged threads in tapped holes with a tap or install helical thread inserts, if necessary.

15. After inspection, if the cylinder block is not to be used immediately, spray the machined surfaces with engine oil. If the block is to be stored for an extended period of time, spray or dip it in a polar type rust preventive such as Valvoline Oil Company's "Tectyl 502-C", or equivalent. Castings free of grease or oil will rust when exposed to the atmosphere.

**Assemble and Install Engine**

After the cylinder block has been cleaned and inspected, assemble the engine as follows:

> **NOTE:** Before a reconditioned or new service replacement cylinder block is used, steam clean it to remove the rust preventive and blow out the oil galleries with compressed air.

1. Mount the cylinder block on the overhaul stand.

2. If a new service replacement block is used, stamp the engine serial number and model number on the pad located in the upper right-hand corner on the blower side of the block. Also stamp the position numbers on the main bearing caps (Fig. 19) and the position of the No. 1 bearing on the oil pan mounting flange of the block.

3. Install all of the required cylinder block plugs and drain cocks. Use a good grade of non-hardening sealant on the threads of the plugs and drain cocks. Install the plugs flush with or below the surface of the block.

4. Clean and inspect all engine parts and subassemblies and, using new parts as required, install them on the cylinder block by reversing the sequence of disassembly. The procedures for inspecting and installing the various parts and subassemblies are outlined in the following sections of this manual.

5. Use a chain hoist and suitable sling to transfer the engine to a dynamometer test stand.

6. Complete the engine build-up by installing all remaining accessories, fuel lines, electrical connections, controls etc.

7. Operate the engine on a dynamometer, following the *run-in* procedure outlined in Section 13.2.1.

8. Reinstall the engine in the vehicle.

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| ENGINE PARTS (Standard Size, New) | MINIMUM | MAXIMUM | LIMITS |
|---|---|---|---|
| **Camshaft and Balance Shaft Bearings** | | | |
| Inside diameter: | | | |
| Front and rear | 1.5000" | 1.5010" | |
| Center and intermediate | 1.5010" | 1.5030" | |
| Clearance--bearing-to-shaft: | | | |
| Front and rear | .0025" | .0040" | .0060" |
| Center and intermediate | .0025" | .0050" | .0090" |
| Outside diameter: | | | |
| Front and rear | 2.1875" | 2.1880" | |
| Center and intermediate | 2.1840" | 2.1860" | |
| Diameter of cylinder block bore | 2.1875" | 2.1885" | |
| Clearance--bearings-to-block: | | | |
| Front and rear | .001" press. | .0005" loose | |
| Intermediate (extruded) | .0015" | .0065" | |
| Intermediate (die cast) | .0015" | .0105" | |
| **Camshaft and Balance Shaft Gears** | | | |
| Inside diameter | 1.1865" | 1.1875" | |
| Clearance--gear-to-shaft | .0015" press. | .0000" | |
| Backlash | .0030" | .0080" | .0100" |
| **Idler Gear** | | | |
| Backlash | .0030" | .0080" | .0100" |
| Pre-load--Variation on pull 2 lbs. 11 oz. | 1/2 lb. | 4 lbs. | |
| **Crankshaft Timing Gear** | | | |
| Inside diameter | 4.7490" | 4.7500" | |
| Clearance--gear-to-shaft | .001" press. | .001" loose | |
| Backlash | .0030" | .0080" | .0100" |
| **Blower Drive Gear** | | | |
| Backlash | .0030" | .0080" | .0100" |
| Gear-to-hub fit | .0005" press. | .001" loose | |
| Support-to-end plate | .0005" press. | .0025" loose | |
| Inside diameter (support bushing) | 1.6260" | 1.6265" | |
| Hub diameter (at bearing) | 1.6240" | 1.6250" | |
| Hub-to-support bushing clearance | .0010" | .0025" | .0050" |
| Hub-to-cam clearance | .0020" | .0070" | |
| End thrust (current bearing) | .0060" | .0140" | |
| End thrust (former flanged bearing) | .0050" | .0080" | .0100" |
| **Cylinder Head** | | | |
| Flatness--transverse (3, 4 and 6 cyl.) | | | .0040" |
| Flatness--longitudinal (3 cyl.) | | | .0055" |
| Flatness--longitudinal (4 cyl.) | | | .0080" |
| Flatness--longitudinal (6 cyl.) | | | .0100" |
| Distance between top deck and fire deck | 3.5560" | 3.5680" | 3.5360" |
| Water nozzles | .0312" recess | Flush | |
| Cam follower bores | 1.0620" | 1.0630" | 1.0650" |
| **Exhaust Valve Seat Inserts** | | | |
| Seat width--30° (2-valve) | .0625" | .0937" | .0937" |
| Seat width--30° (4-valve) | .0468" | .0937" | .0937" |
| Valve seat runout | | .0020" | .0020" |

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# FUEL INJECTOR (Crown Valve)

The fuel injector (Fig. 1) is a lightweight compact unit which enables quick, easy starting directly on diesel fuel and permits the use of a simple open type combustion chamber. The simplicity of design and operation provides for simplified controls and easy adjustment. No high pressure fuel lines or complicated air-fuel mixing or vaporizing devices are required.

The fuel injector performs four functions:

1. Creates the high fuel pressure required for efficient injection.

2. Meters and injects the exact amount of fuel required to handle the load.

3. Atomizes the fuel for mixing with the air in the combustion chamber.

4. Permits continuous fuel flow.

Combustion required for satisfactory engine operation is obtained by injecting, under pressure, a small quantity of accurately metered and finely atomized fuel oil into the cylinder.

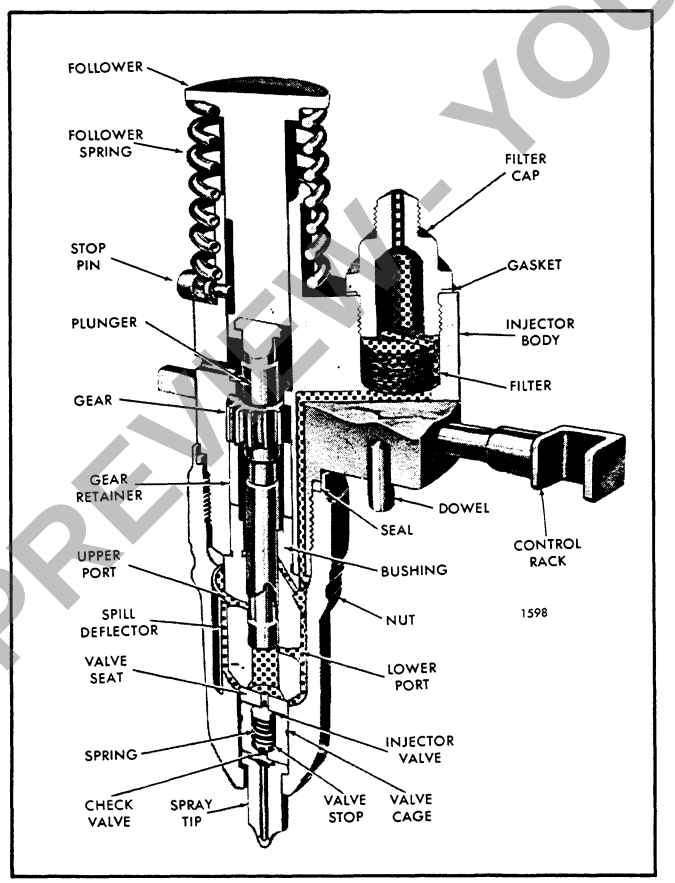



Fig. 1 - Fuel Injector Assembly

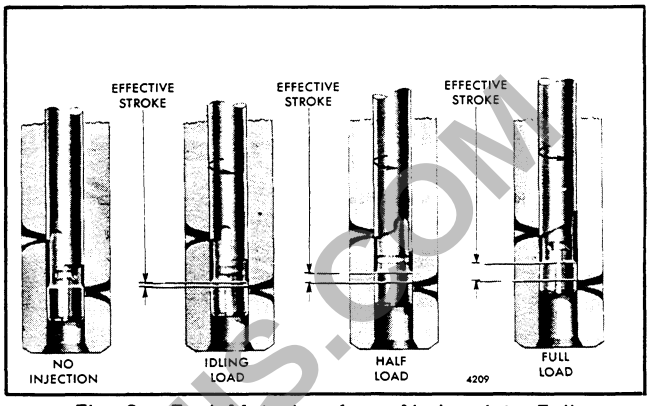



Fig. 2 - Fuel Metering from No-Load to Full-Load

Metering of the fuel is accomplished by an upper and lower helix machined in the lower end of the injector plunger. Figure 2 illustrates the fuel metering from no-load to full-load by rotation of the plunger in the bushing.

Figure 3 illustrates the phases of injector operation by the vertical travel of the injector plunger.

The continuous fuel flow through the injector serves, in addition to preventing air pockets in the fuel system, as a coolant for those injector parts subjected to high combustion temperatures.

To vary the power output of the engine, injectors having different fuel output capacities are used. The fuel output of the various injectors is governed by the helix angle of the plunger and the type of spray tip used. Refer to Fig. 4 for the identification of the injectors and their respective plungers and spray tips.

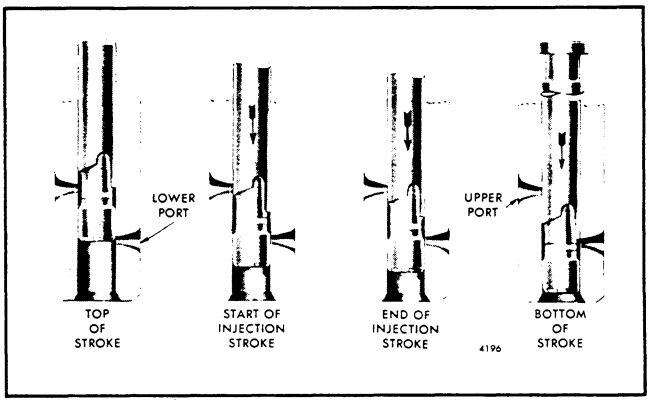



Fig. 3 - Phases of Injector Operation Through Vertical Travel of Plunger

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Examine the riser thrust bearings for excessive wear, flat spots, or corrosion. If any of these conditions exist, install a new riser and bearing assembly.

Inspect the weight carriers, weights and retaining pins for wear.

Inspect the bushings in the current weights and replace them if they are worn excessively. In the former weights inspect the needle bearings for wear and replace them, if necessary.

Inspect the operating shaft and bushing for excessive wear. If excessive wear is noted, install a new bushing and shaft.

**Assemble Governor Cover**

1. If the needle bearings were removed from the governor cover, place the governor cover on the bed of an arbor press with the inner face of the cover down. Start the upper bearing straight into the bearing bore of the cover with the number on the bearing up. Insert bearing installer J 21068 in the bearing and press the bearing in until the shoulder on the tool contacts the cover (Fig. 7).

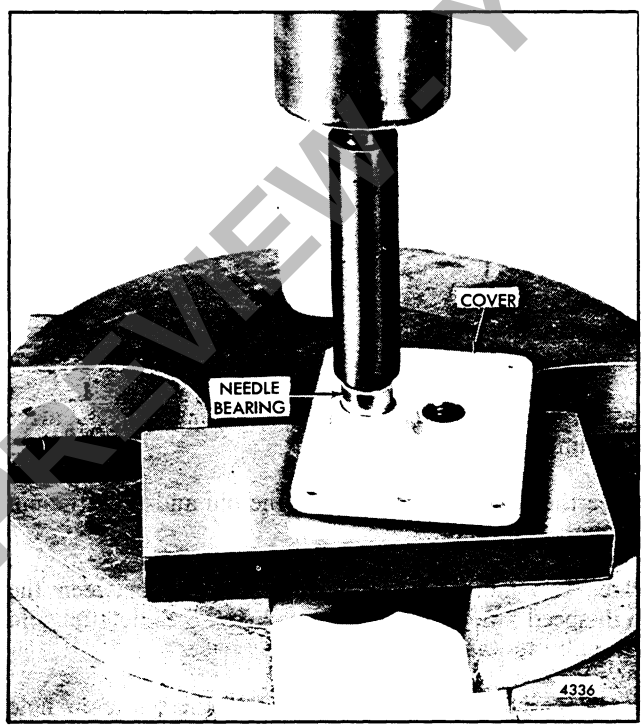



Fig. 7 - Installing Needle Bearings in Governor Cover using Tool J 21068

2. Turn the cover over and start the second bearing, number side up, in the bearing bore. Press the bearing in flush with the cover with tool J 21068.

**NOTE:** Do not use impact tools to install needle bearings.

3. Install the plug in the throttle shaft.

4. Pack the needle bearings with grease. Then, slide the throttle shaft assembly through the bearings.

5. Install two retaining washers and retaining ring on the throttle shaft.

6. Install the spacer on the shaft (slip fit) against the retainer washers and over the snap ring.

**NOTE:** Prior to September 1970 a spacer was not used. When assembling a governor cover on an engine built prior to September 1970 include a .440" thick spacer.

7. Lubricate the stop lever shaft with engine oil and slide the shaft through the cover.

8. Install a new seal ring over the shaft and in the cover, then install two seal retaining washers and a retaining ring.

9. Install the stop lever and speed control lever and tighten the clamping bolts.

**Assemble Governor Control Housing**

1. Place the washer over the short finished end of the operating shaft (Fig. 5). Start the bearing over the end of the shaft. Support the opposite end of the shaft on the bed of a press. Press the bearing on the shaft tight against the washer with a sleeve which has the same diameter as the bearing inner race.

2. With the pivot pin in the operating lever up, start the lever over the end of the shaft with the flat on the shaft registering with the flat surface in the lever. Press the lever on the shaft tight against the bearing.

3. Lubricate the bearing and operating shaft bushing in the housing with clean engine oil. Insert the lever and operating shaft assembly in the control housing.

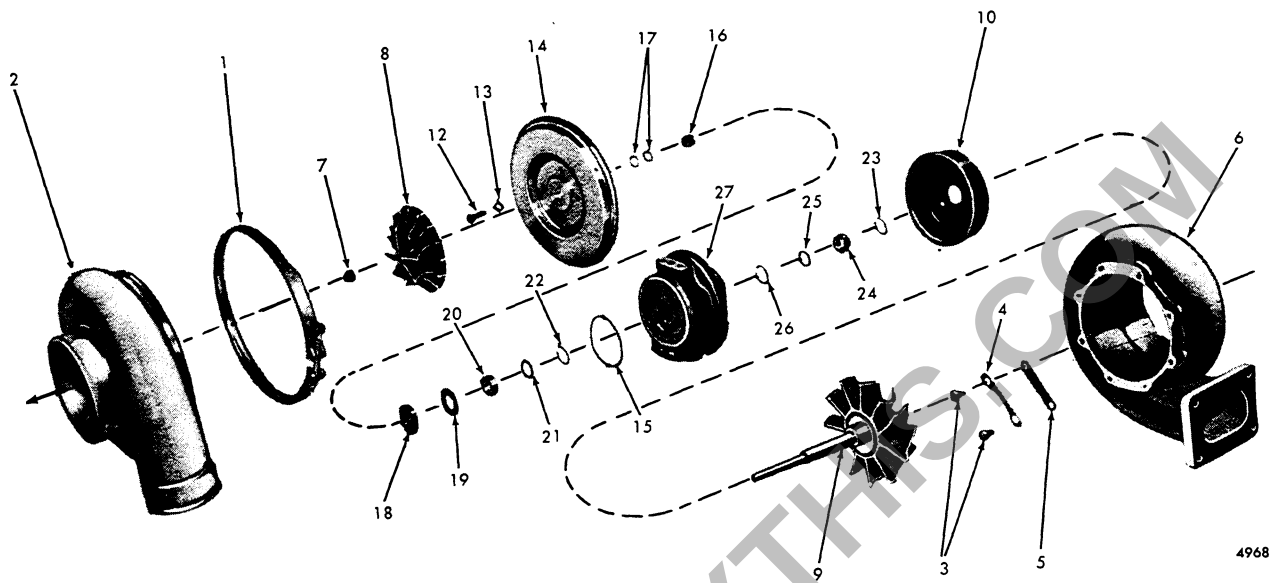
4. Position the operating fork over the lower end of the operating shaft (Fig. 5) so the finished side of the fork finger will rest against the thrust bearing when assembled (see Section 2.7.1).

5. Support the operating shaft and control housing in an arbor press with the upper end of the operating shaft resting on a steel block. Align the flat in the operating

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| | | | |
|---|---|---|---|
| 1. Coupling--"V" Band | 8. Wheel--Compressor | 15. Ring--Seal | 22. Ring--Snap |
| 2. Housing--Compressor | 9. Shaft--Turbine Wheel Assembly | 16. Spacer--Thrust | 23. Ring--Snap |
| 3. Bolt | 10. Shroud--Turbine Wheel | 17. Ring--Piston | 24. Bearing |
| 4. Lockplate | 12. Screw | 18. Collar--Thrust | 25. Washer--Bearing |
| 5. Clamp--Turbine Housing | 13. Lockplate | 19. Washer--Inboard Thrust | 26. Ring--Snap |
| 6. Housing--Turbine | 14. Backplate Assembly | 20. Bearing | 27. Housing--Center |
| 7. Nut--Self-Locking | | 21. Washer--Bearing | |

Fig. 7 - T18A40 Turbocharger Details and Relative Location of Parts

brush and remove all dirt particles. Dry all of the parts thoroughly.

> **CAUTION:** Never use a caustic cleaning solution for cleaning as this will damage certain parts. Use the cleaning solution in an open or well ventilated area. Avoid breathing the fumes. Keep away from open flames. Do not use a wire brush or a steel blade scraper to clean the parts.

Make sure that both wheel blades are thoroughly clean. Deposits left on the blades will affect the balance of the rotating assembly.

Clean all of the internal cavities and oil passages in the center housing thoroughly with dry compressed air.

Clean the oil passage in the center housing thrust plate with dry compressed air.

Remove the oil inlet and outlet lines from the engine and thoroughly clean the oil lines inside and out. An oil line that is dented or crimped enough to restrict the flow of oil must be replaced.

**Inspection**

Inspect all of the parts for signs of damage, corrosion or deterioration. Check for nicked, crossed or stripped threads.

Visually check the turbine wheel for signs of rubbing or wear. For shaft bearing journal dimensions and wear limits, refer to Section 3.0.

Inspect the shaft for signs of scoring, scratches or bearing seizure.

Check the compressor wheel for signs of rubbing or damage from foreign material. Check to see that the wheel bore is not galled. The wheel must be free of dirt and other foreign material.

Inspect the seal parts for signs of rubbing or scoring of the running faces.

Inspect the backplate for wear or damaged bore (piston ring groove).

Inspect the housing for contact with the rotating parts.

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The proper selection of a generator or alternator which will meet the needs of the battery-charging circuit on the particular engine is mandatory. This, together with adherence to the recommended maintenance procedures will reduce generator or alternator troubles to a minimum. Since most generators or alternators adhere to the same basic design, the maintenance, removal and installation procedures for all are similar.

#### Generator or Alternator Maintenance

1. Maintain the proper drive belt tension. Replace worn or frayed belts. Belts should be replaced as a set when there is more than one belt on the generator or alternator drive.

> **NOTE:** When installing or adjusting the drive belt, be sure the bolt at the pivot point is properly tightened, as well as the bolt in the adjusting slot.

2. Lubricate the generator bearings as outlined in the *Lubrication and Preventive Maintenance Chart* in Section 15.1.

3. Alternator bearings are permanently lubricated. There are no external oiler fittings.

#### Remove Generator or Alternator

1. Disconnect the cables at the battery supply. If the generator or alternator has a separately mounted regulator and field relay, disconnect all other leads from the generator or alternator and tag each one to ensure correct re-installation.

2. Loosen the mounting bolts and the adjusting strap bolt. Then remove the drive belts.

3. While supporting the generator or alternator, remove the adjusting strap bolt and washers. Then remove the mounting bolts, washers and nuts. Remove the generator or alternator carefully and protect it from costly physical damage.

4. Remove the pulley assembly if the generator or alternator is to be replaced.

#### Generator or Alternator Service

Repairs and overhaul work on generators and alternators should be referred to an authorized repair station of the manufacturer of this equipment. Replacement parts for generators and alternators should be ordered through the equipment manufacturer's outlets. For generators and alternators manufactured by Delco-Remy Division, repair service and parts are available through AC Delco branches and repair stations.

#### Install Generator or Alternator

1. Install the drive pulley, if it was removed. Tighten the pulley retaining nut to 50-60 lb-ft (68-81 Nm) torque (Fig. 3).

> **NOTE:** If the pulley was not removed, check the retaining nut for proper torque.

2. Position the generator or alternator on the mounting brackets and start the bolts, with washers in place, through the bolt holes in the end frames. If nuts are used, insert the bolts through the bolt holes in the mounting bracket and end frame. Make sure that the washers and nuts are in their proper locations.

3. Align the threaded hole in the adjusting lug of the drive end frame with the slot in the adjusting strap. Start the bolt, with the washers, through the slot of the adjusting strap and into the threaded hole in the end frame.

4. Place the drive belts in the grooves of the pulleys.

5. Adjust the belt tension as outlined in Section 15.1. Tighten all of the bolts after the belt tightening is completed.

6. Attach the wires and cables. Be sure that each one is correctly installed in accordance with its previous location on the generator or alternator. Keep all connections clean and tight.

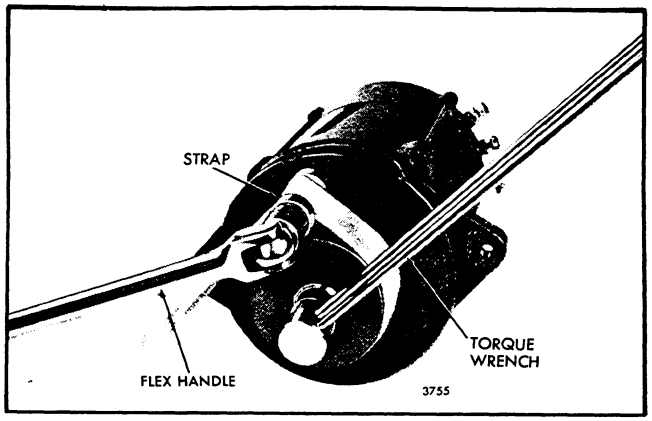



Fig. 3 - Tighten Generator or Alternator Pulley Retaining Nut


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**Adjust Governor Gap**
**(Double-Weight Governor)**

With the engine stopped and at normal operating temperature, adjust the governor gap as follows:

**NOTE:** If the governor gap adjustment is to be made with the engine in the vehicle, it is suggested that the fan assembly be removed due to the closeness of the fan blades to the engine governor.

1. Remove the governor high-speed spring retainer cover.

2. Back out the buffer screw until it extends approximately 5/8" from the locknut (Fig. 8).

3. Start the engine and loosen the idle speed adjusting screw locknut and adjust the idle screw to obtain the desired engine idle speed (Fig. 8). Hold the screw and tighten the locknut to hold the adjustment.

EPA certified minimum idle speeds are 500 rpm for trucks and highway coaches and 400 rpm for city coaches.

**NOTE:** Current limiting speed governors used in turbocharged engines include a starting aid screw threaded into a boss on the governor housing.

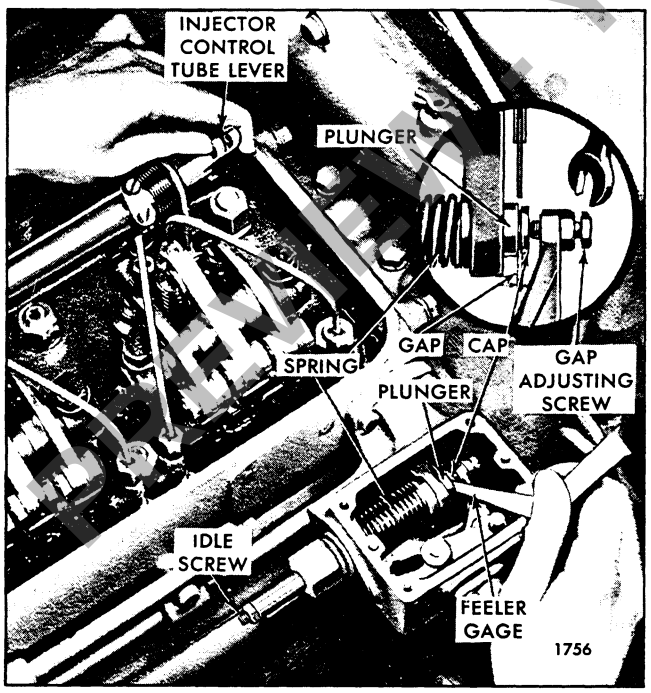



Fig. 2 - Adjusting Gap (Double-Weight Governor) using Tool J 3172

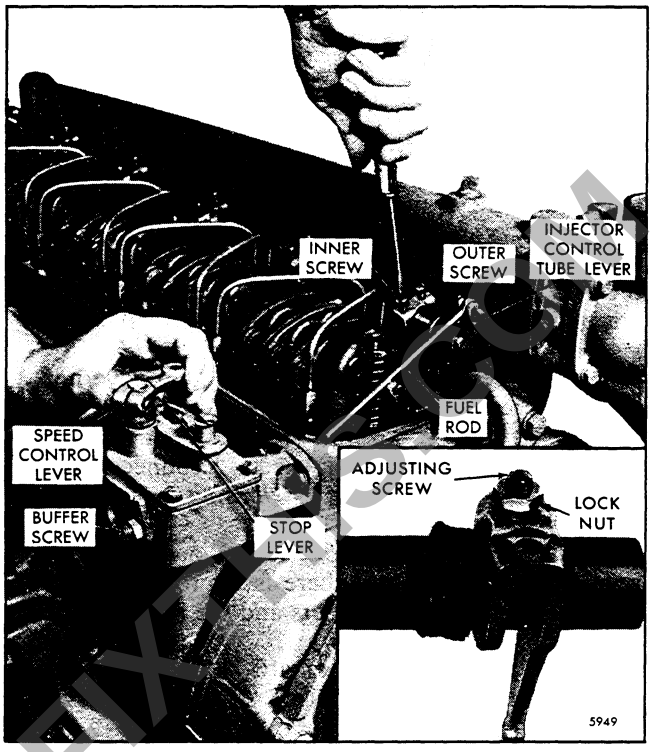



Fig. 3 - Positioning No. 1 Injector Rack Control Lever

4. Stop the engine. Clean and remove the valve rocker cover, the governor cover and lever assembly. Discard the gaskets.

5. Remove the fuel rod from the differential lever and the injector control tube lever (Fig. 3).

6. Start and run the engine between 1100 and 1300 rpm by manual operation of the differential lever.

**NOTE:** Do not overspeed the engine.

7. Check the gap between the low-speed spring cap and the high-speed spring plunger with a feeler gage (Fig. 2). The gap should be .002"-.004". If the gap setting is incorrect, reset the gap adjusting screw.

8. On governors without the starting aid screw, hold the gap adjusting screw and tighten the locknut.

9. Recheck the gap with the engine operating between 1100 and 1300 rpm. Readjust, if necessary.

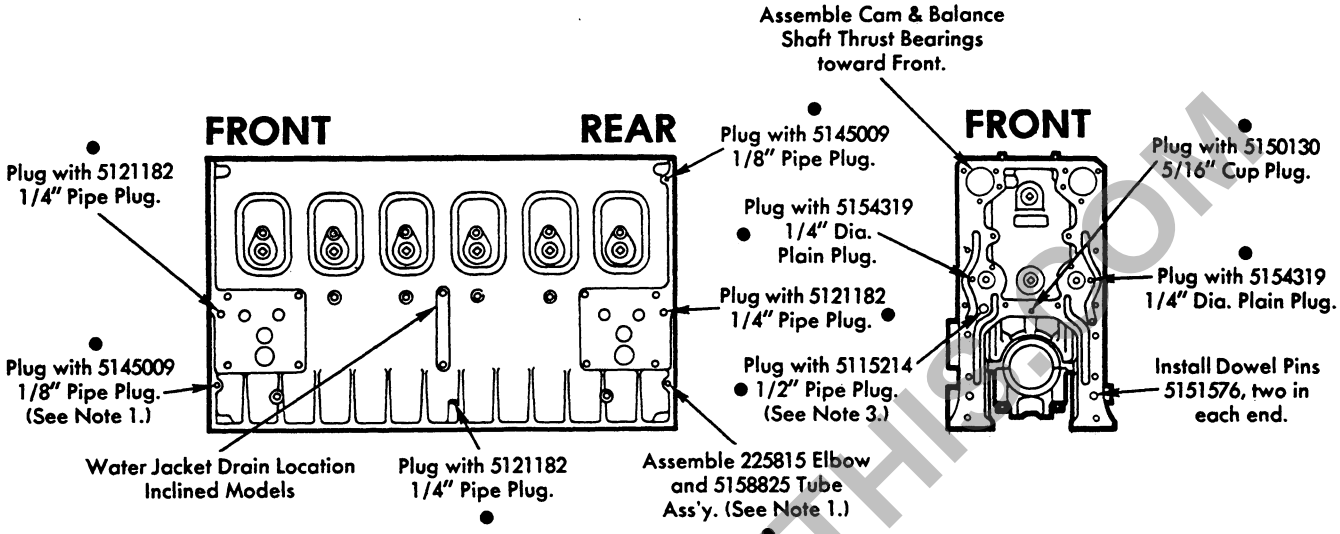
10. Stop the engine and install the fuel rod between the differential lever and the control tube lever.

11. Use a new gasket and install the governor cover and lever assembly.

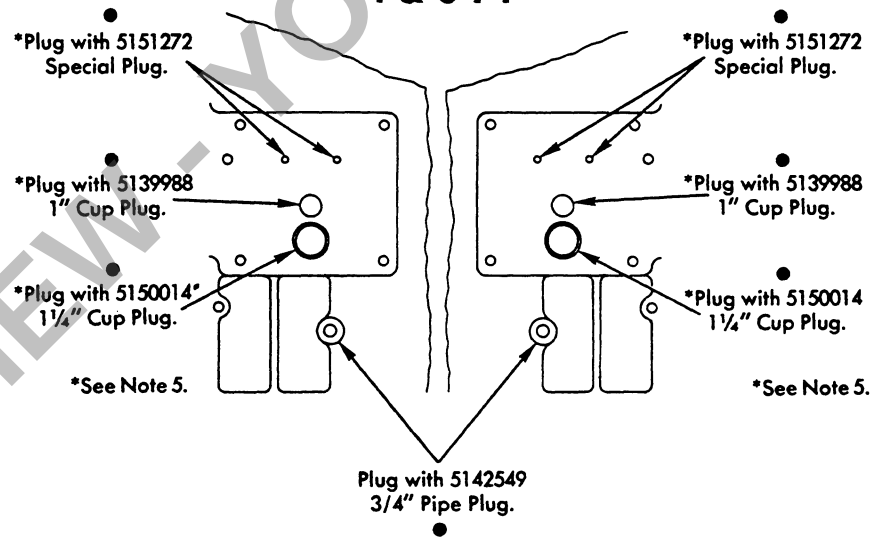

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# LC and RC ENGINES (Cont'd)




## Accessory Pads 4 & 6-71




## — NOTES —

(2) Apply Loctite J-26558-92 pipe sealer or equivalent with teflon ● prior to installation.

(3) Replace Oil Cooler Pad and Oil Gallery End Plugs 5115214 by Plug 5173334 and Plug 5145014 in bottom of block by 5173333 when assembling an aluminum cylinder block.

(4) Do not install plugs when crankcase breather is to be installed on accessory pad.

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**NOTE:** *See the list of electrical symbols in Section 4003.*

Use the following procedure for all machines.

1. Do the Troubleshooting for a Short Circuit.

2. Make sure the key switch is in the ON position.

3. Move the drive brake switch to the ON position.

4. Have another person operate the fast hoist switch while you listen to the solenoid.

   a. If you can hear the solenoid operate, the problem is not in the electrical system. See Section 8202 for troubleshooting the hydraulic system.

   b. If you cannot hear the solenoid operate, do step 5.

5. Have another person operate the drive range switch while you listen to the solenoid.

   a. If you can hear the solenoid operate, do step 6.

   b. If you cannot hear the solenoid operate, do step 17.

6. Make sure the drive range switch is in the LO position.

7. Disconnect the harness plug at test point A.

8. Check for system voltage at test point A.

   a. If the voltmeter indicates system voltage, do step 9.

   b. If the voltmeter does not indicate system voltage, repair to replace the wire between the drive range switch and the harness plug.

9. Connect the two halves of the harness plug.

10. Check for system voltage at test point B.

   a. If the voltmeter indicates system voltage, do step 11.

   b. If the voltmeter does not indicate system voltage, repair or replace the wire between the harness plug and the fast hoist switch.

11. Have another person hold the fast hoist switch all the way down while you check for system voltage at test point C.

   a. If the voltmeter indicates system voltage, do step 12.

   b. If the voltmeter does not indicate system voltage, replace the fast hoist switch.

12. Disconnect the connector at test point D.

13. Have another person hold the fast hoist switch all the way down while you test for system voltage at test point D.

   a. If the voltmeter indicates system voltage, do step 14.

   b. If the voltmeter does not indicate system voltage, repair or replace the wire between the fast hoist switch and the connector.

14. Connect the connector.

15. Remove the bolt at test point E and disconnect the wire from the bolt. Have another person hold the fast hoist switch all the way down while you check for system voltage at the terminal on the wire.

   a. If the voltmeter indicates system voltage, clean and tighen the connection and check the operation of the fast hoist circuit. If the fast hoist circuit still does not operate correctly, check the solenoid for damage.

   b. If the voltmeter does not indicate system voltage, repair or replace the solenoid or the wires for the solenoid.

16. Install the wire on the bolt and install the bolt. Make sure the connection is clean and tight.

17. Have another person operate the drive brake switch while you listen to the solenoid.

   a. If you can hear the solenoid operate, repair or replace the wire between the circuit breaker and the drive range switch. Repeat step 4.

   b. If you cannot hear the solenoid operate, do step 18.

18. Make sure the key switch is in the ON position.

19. Use the voltmeter to check for system voltage at both terminals of the circuit breaker.

   a. If the voltmeter indicates system voltage at only one terminal of the circuit breaker, replace the circuit breaker.

   b. If the voltmeter does not indicate system voltage at either terminal of the circuit breaker, check the circuit between the battery and the circuit breaker. See Circuit Breaker Circuit on page 4002-32 or 4002-33.

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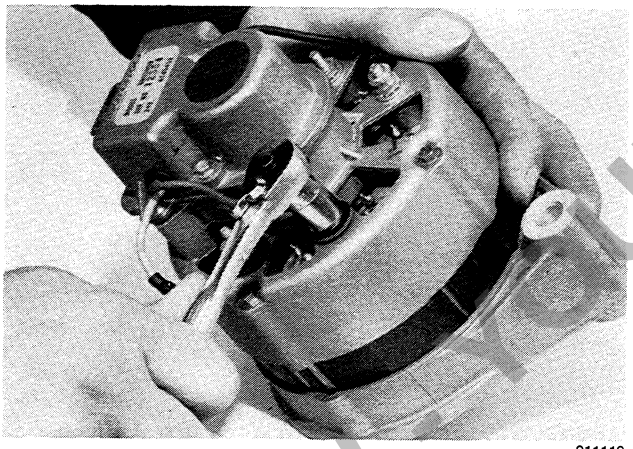
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19. Put the voltage regulator lead on the POS OUTPUT stud.



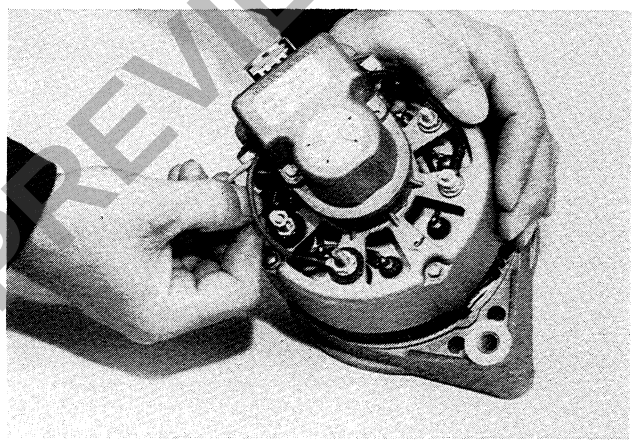
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20. Install a lock washer and nut on the POS OUTPUT stud. Tighten the nut.



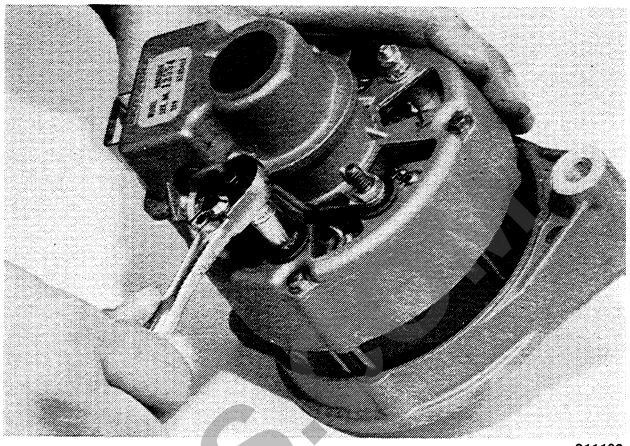
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21. Put the voltage regulator lead on the REG TERM stud.



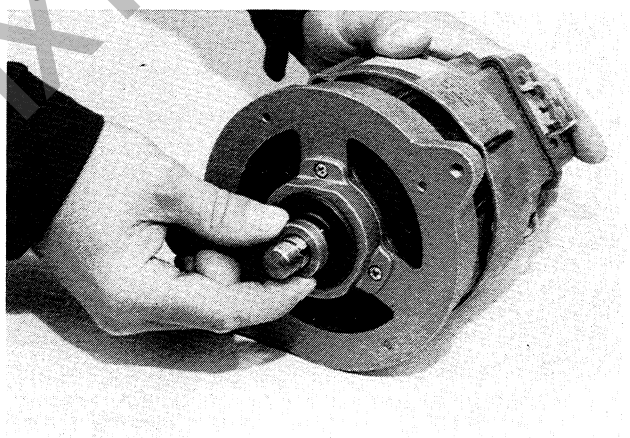
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22. Install a lock washer and nut on the REG TERM stud. Tighten the nut.



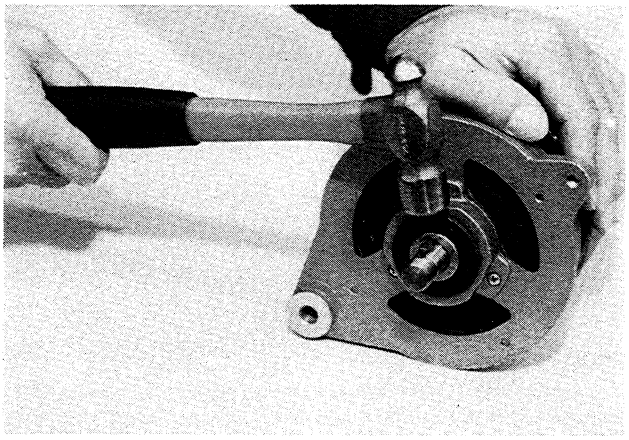
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23. Put the spacer on the rotor shaft. Then push the spacer into the seal until the spacer stops moving.



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24. Use a hammer to install the Woodruff key in the rotor shaft.



911540

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# Identification of Causes of Drive Motor Failure

| SYMPTOM(S) | POSSIBLE CAUSE(S) | REMEDY |
|---|---|---|
| Worn areas have a smooth dull surface<br><br>Edges are round instead of square. | Contaminated oil. Particles are too small to see or feel (microscopic contamination). | Filter the hydraulic oil according to instructions for Cleaning the Hydraulic System in Section 8201.<br><br>When the system is clean, service the hydraulic system at the specified intervals. |
| Many scratches or grooves. Surfaces can be rough. | Metal particles in oil. Particles are large enough to see or feel (visible contamination). | Clean the entire hydraulic system according to instructions for Cleaning the Hydraulic System in Section 8201. |
| Pitting<br><br>Noisy operation, as if the motor is full of glass balls.<br><br>Wear on ends of gears and thrust plates | Air bubbles (cavitation) in oil caused by a restriction or leak in the inlet line to the pump.<br><br>Low oil level in the reservoir. | Inspect and repair the inlet line as required.<br><br>Check oil level. Add oil if the level is low. |
| Broken parts or cracks | Relief valve does not work correctly or is set too high. | Check the pressure setting of the main relief valve and circuit relief valve(s), if equipped. Adjust or repair as required. |
| Burned areas<br><br>Oil has a burned odor | Control valve spool not returning to Neutral.<br><br>Relief valve is set too low. | Check spool travel and control linkage. Repair as required.<br><br>Check the pressure setting of the main relief valve and circuit relief valve(s). if equipped. Adjust or repair as required. |

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## PROBLEM IN THE CONTROL VALVES

| PROBLEM | POSSIBLE CAUSE | CORRECTION |
|---|---|---|
| Spool does not return to neutral | Modulator valve linkage does not move freely. | See Section 8220 and adjust the linkage. |
| | Broken centering spring in control valve. | Make repairs as necessary. |
| | Damaged spool or spool bore. | Replace the control valve. |
| | Contaminated hydraulic oil. | See Cleaning the Hydraulic System in Section 8201. |
| Load falls when you begin to actuate a spool | Damaged load check valves in the main control valves. | See Section 8207. Inspect and clean the load check valve. Repair or replace the parts as necessary. |
| Bad performance of hydraulic circuits. | Main relief valve. | See page 8202-23. Check and adjust the main relief valve. |
| | Circuit relief valve. | See page 8202-25. Check and adjust the circuit relief valve. |
| | Internal leakage in control valve. | Disassemble control valve and check for too much clearance between spool and spool bore. |

## PROBLEM IN THE CYLINDERS

| PROBLEM | POSSIBLE CAUSE | CORRECTION |
|---|---|---|
| Slow or no movement | Damaged piston packing. | See page 8202-29 and check the piston packing. |
| | Loose piston bolt. | Remove the cylinder and repair as necessary. |
| | Hoses not connected correctly. | See the hydraulic schematics on page 8202-5 to 8202-7 to find the hoses. Check the routing of the hoses to make sure the connections are correct. |
| | Spools in the control valves are not moving into the correct position. | See page 8202-23 and check the spool travel. If the spool travel is not correct, check the pressure in the pilot control circuit. |
| Damaged cylinder bushings or pivot pins. | Not enough lubrication. | Repair the bushings and pivot pins. See Section 1002 for the correct intervals and lubricant. |

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# 8212

# DIPPER HYDRAULIC CIRCUIT

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**Illustration of E Boom - Dipper Hydraulic Circuit 1080B** ..... 8212-4


Written In *Clear And Simple English*

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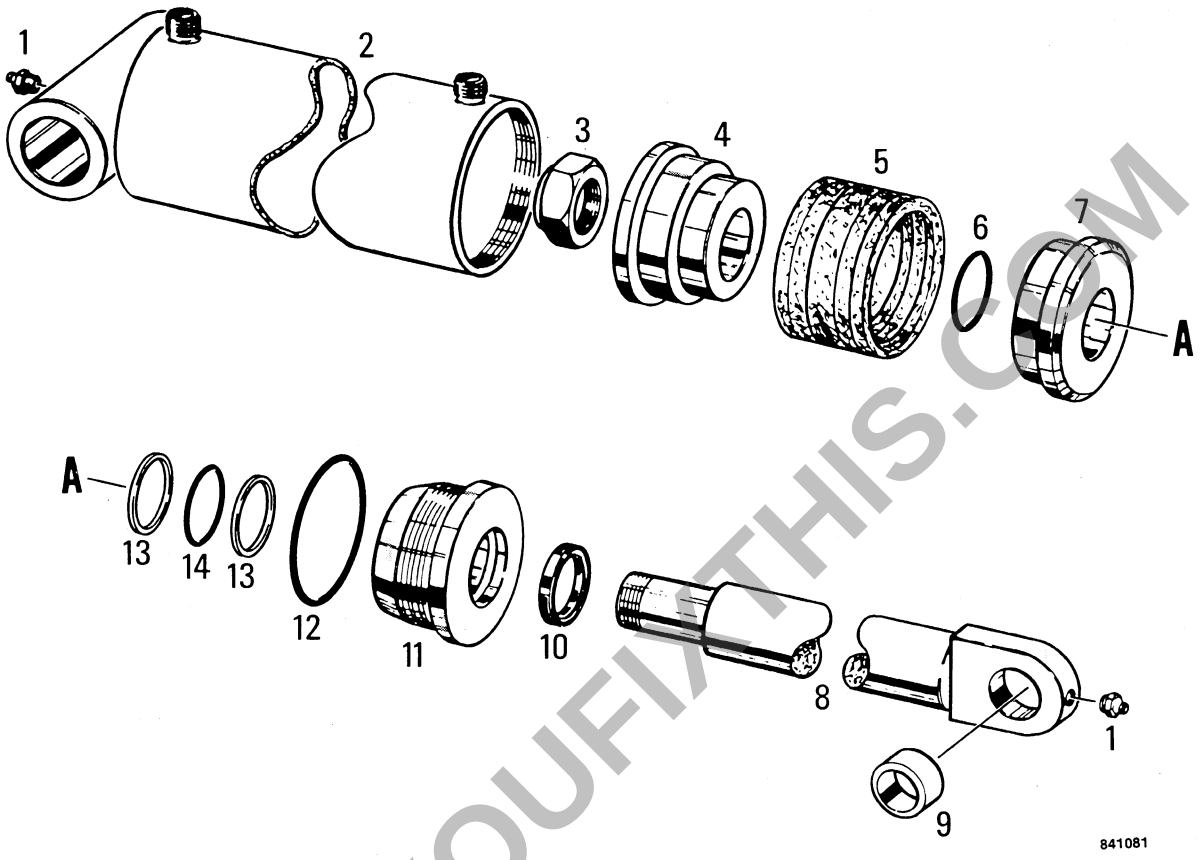
CASE CORPORATION

8-42681

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Issued February 1985
Rev./Rpt. July 1986

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# WRIST-O-TWIST CYLINDER, 1080




1. *Grease Fitting*
2. *Tube*
3. *Nut*
4. *Piston, Outer Half*
5. *V-ring Assembly*
6. *O-ring*
7. *Piston, Inner Half*
8. *Rod*
9. *Bushing*
10. *Wiper*
11. *Gland*
12. *O-ring*
13. *Backup Ring*
14. *O-ring*

## Disassembly

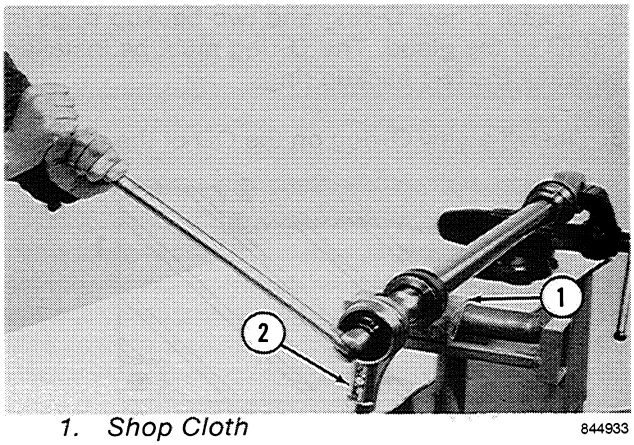
1. Fasten the cylinder in the vise. Tighten the vise carefully to prevent damage to the cylinder tube.

2. Use the gland wrench shown on page 8290-3 to loosen the gland.

3. Pull the rod straight out of the cylinder tube.

4. Fasten the rod eye in the vise and put a support stand under the rod. Put the support stand near the piston end of the rod. Use a shop cloth between the support stand and the rod to prevent damage to the rod.

5. Loosen and remove the piston nut from the rod. The torque on the piston nut is 1700 pound- feet (2303 N m, 235 kg/m). Use a torque multiplier to loosen the piston nut.




1. *Shop Cloth*
2. *Torque Multiplier*

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