TORQUE SPECIFICATIONS - METRIC HARDWARE

Use the following torques when special torques are not given.

These values apply to fasteners with coarse threads as received from supplier, plated or unplated, or when lubricated with engine oil. These values do not apply if graphite or moly-disulfide grease or oil is used.

Grade 8.8 Bolts, Nuts, and Studs

8.8

Size	Pound-Feet	Newton metres	Kilogram metres
M4 0.15 in	2-3	3-4	0.3-0.4
M5 0.19 in	5-6	6.5-8	0.7-0.8
M6 0.23 in	8-9	10.5-12	1.1-1.2
M8 0.31 in	19-23	26-31	2.6-3.2
M10 0.39 in	38-45	52-61	5.3-6.2
M12 0.46 in	66-79	90-107	9.1-10.9
M14 0.55 in	106-127	144-172	14.7-17.6
M16 0.62 in	160-200	217-271	22.1-27.7
M20 0.78 in	320-380	434-515	44.2-52.5
M24 0.94 in	500-600	675-815	69.1-83.0
M30 1.17 in	920-1100	1250-1500	127-152
M36 1.40 in	1600-1950	2175-2600	221-270

Grade 10.9 Bolts, Nuts, and Studs

10.9

Size	Pound-Feet	Newton metres	Kilogram metres
M4 0.15 in	3-4	4-5	0.4-0.5
M5 0.19 in	7-8	9.5-11	1.0-1.1
M6 0.23 in	11-13	15-17.5	1.5-1.8
M8 0.31 in	27-32	37-43	3.7-4.4
M10 0.39 in	54-64	73-87	7.5-8.8
M12 0.46 in	93-112	125-150	12.9-15.5
M14 0.55 in	149-179	200-245	20.6-24.7
M16 0.62 in	230-280	310-380	31.8-38.7
M20 0.78 in	450-540	610-730	62.2-74.7
M24 0.94 in	780-940	1050-1275	108-130
M30 1.17 in	1470-1770	2000-2400	203-245
M36 1.40 in	2580-3090	3500-4200	357-427

Grade 12.9 Bolts, Nuts, and Studs

12.9

Usually the torque values specified for grade 10.9 fasteners can be used satisfactorily on grade 12.9 fasteners.

811359

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MAINTENANCE SCHEDULE

The items in this maintenance schedule are at maximum intervals. If you are operating the machine under severe conditions (high temperatures, mud, dust, water, etc.), shorten the intervals.

AS REQUIRED

Check track tension ..... See Section 5503

Service air cleaner if restriction indicator lamp illuminates ..... See Section 2001

Replace hydraulic filter elements if warning lamp illuminates ..... See Section 8201

Every 10 Hours of Operation or Each Day, Whichever Occurs First

Check the engine oil level ..... See Operators Manual

Check hydraulic reservoir fluid level ..... See Section 8201

Clean air cleaner dust valve ..... See Section 2001

Check the condition of the drive belts ..... See Operators Manual

Check and clean safety decals ..... See Operators Manual

Lubricate turntable ring gear ..... See Operators Manual

Lubricate boom, arm, and tool pivot points ..... See Operators Manual

Drain water and sediment from fuel tank ..... See Operators Manual

Fill fuel tank ..... See Operators Manual

Every 50 Hours of Operation

Lubricate turntable bearing race (4 fittings) ..... See Operators Manual

Lubricate starter ring gear and pinion ..... See Operators Manual

Every 100 Hours of Operation

Systemgard™ testing schedule ..... See Page 1002-2

Clean sediment bowl screen ..... See Operators Manual

Clean hydraulic cooler ..... See Section 8201

Check track tension ..... See Section 5503

Check alternator drive belt tension ..... See Operators Manual

Clean swing system ring gear ..... See Operators Manual

Clean engine, oil cooler, and cooling fins ..... See Operators Manual

Change engine oil ..... See Operators Manual

Check fluid level for batteries ..... See Section 4005

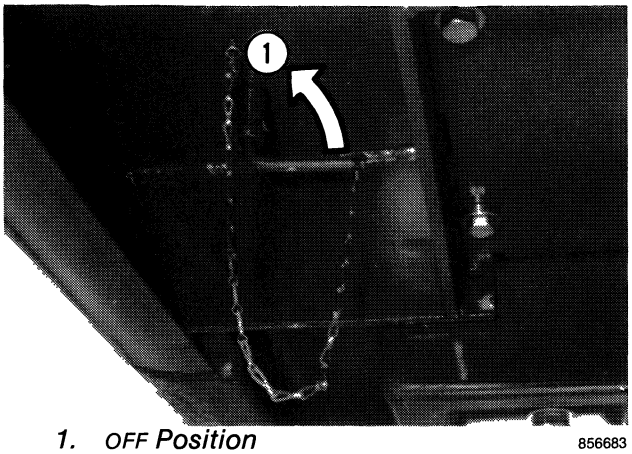
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ENGINE REMOVAL

Before you disconnect any hoses, put identification tags on the hoses. Install plugs and caps in the hoses and fittings to keep dirt out of the engine.

1. Put the battery disconnect switch in the OFF position.



1. OFF Position 856683

2. Loosen and remove the cap screws, flat washers, and spacers that fasten the cowling to the upper structure.

3. Close the doors on the cowling.

4. Connect lifting equipment to the cowling.

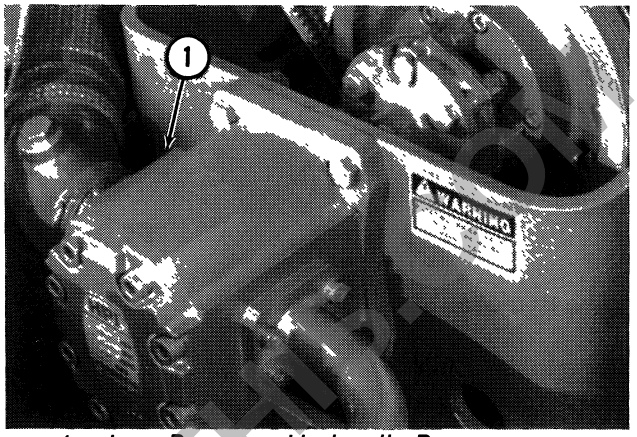
5. Remove the cowling from the machine.



A855026

6. Loosen the two screws that fasten the coupling to the low pressure hydraulic pump.

7. Loosen and remove the self-locking nuts, washers, and bolts that fasten the low pressure hydraulic pump to the mounting plate.



1. Low Pressure Hydraulic Pump 856696

8. Pull the low pressure hydraulic pump away from the mounting plate until the shaft is clear of the mounting plate.

9. Disconnect the air cleaner hose from the turbocharger.

10. Loosen and remove the cap screws and flat washers from the rear engine mounts.

11. Put identification tags on all the electrical wires connected to the engine.

12. Disconnect the wires from all the switches and senders on the engine.

13. Cut the tie straps that fasten the wires to the engine. Move the wires out of the way.

14. Disconnect the battery cable and ground strap from the starter.

15. Disconnect the fuel lines from the engine.

16. Disconnect the hoses for the cab heater from the housing for the engine oil filter.

17. Disconnect the throttle cable and fuel shutoff cable from the fuel injection pump.

18. Disconnect the throttle cable and fuel shutoff cable from the bracket on the engine.

19. Disconnect the heater control cable from the housing for the engine oil filter.

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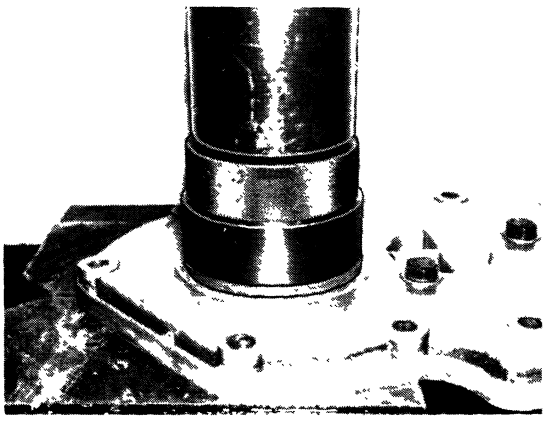
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General engine data

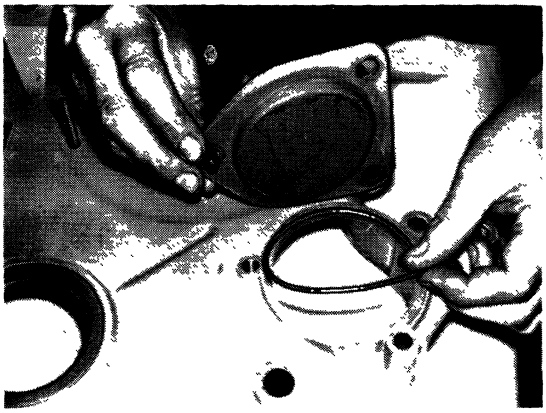
English	NOTE! For comparison purposes only, we have included decimal equivalents in the brackets near the metric figures. We recommend you use the metric figures when working on DEUTZ engines.					
Engine type	F2/3/4/5/6L 912	F2/3/4/5/6L 912 W	F3/4/6L 911	BF6L 912	F4/6L 913	BF6L 913/C
Total piston displacement cm^3	F2L = 1885 F3L = 2827 F4L = 3770 F5L = 4712 F6L = 5655		F3L 2473 F4L = 3297 F6L 4946	5652	F4L 913 = 4086 B/F6L 913 = 6128 **B/F6L 913 — (374 Cu. In.)**	
Working cycle	Fourstroke diesel					
Combustion system	1)	2)	1)			
Bore mm	100 **(3.937 in.)**				102 **(4.015 in.)**	
Stroke mm	120 **(4.724 in.)**		105 **(4.134 in.)**	120	125 **(4.921 in.)**	
Weight of engine according to VDMA kg	**(518 lbs.)** F2L = 235 F3L = 270 **(595 lbs.)** **(662 lbs.)** F4L = 300 F5L = 380 **(838 lbs.)** F6L = 410 **(905 lbs.)**		F3L = 300 F4L = 315 F6L = 410	410	F4L = 307 F6L = 420	**(1069 lbs.)** 485 BF6L913C = 510
Direction of rotation	when facing flywheel, counter-clockwise					
Rated speed max. (RPM) 1/min	F2L 912/W = 2500 BF6L 912 = 3000 FL 911/912/W = 3000 B/FL 913 = 2800 BF6L913C = 2500					
Minimum idle speed 1/min (RPM)	650 - 700 F2L = 750 - 800		850 - 900	650 - 700	650 - 700	
Compression ratio	17 : 1	19 : 1	17 : 1	15,5 : 1	17 : 1	15,5 : 1
Compression pressure bar	**(290-406 PSI)** 20 - 28	**(362 - 435)** 25 - 30	**(290 - 406)** 20 - 28	**(319 - 362)** 22 - 25	26 - 30	**(348 - 406)** 24 - 28
Valve clearance Inlet Exhaust mm	**(0.006 in.)** 0, 15					

1) Direct injection 2) 2-stage combustion system

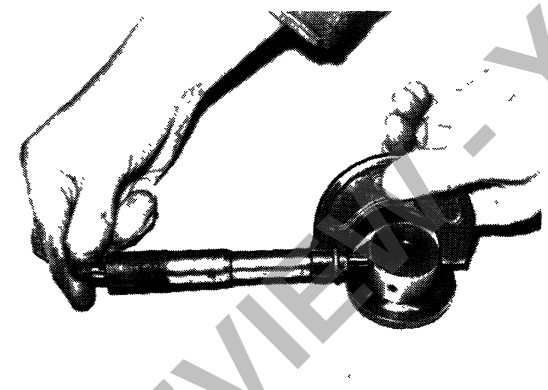
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5-21



5-22



5-23



5-24

REPLACING THE SEALING RINGS IN THE FRONT AND REAR COVERS

1. The sealing surfaces must be flat and free from score-marks.

2. Drive out the radial sealing ring and renew.

3. Press in the radial sealing ring with the lip facing inwards so that the outside is a flush fit.

See Fig. 5-21

4. As from 3 cylinder engine: dismantle the cover plate on the drive of the hydraulic pump and remove the rubber O-seal

5. Fit a new rubber O-seal. Fix the cover plate with the internally located screw.

See Fig. 5-22

CHECKING IDLER GEAR AND MOUNTING

1. Check the idler gear. If it is damaged fit a new one.

2. Check the journal for the idler gear. If it is damaged, renew it

3. Measure the diameter of the journal. See Fig. 5-23

4. With a micrometer set the internal dial indicator set to the diameter of the journal.

5. Measure the bearing bore of the idler gear.

See Fig. 5-24

6. The dial gauge will indicate the vertical clearance. This must not exceed the permissible maximum given in the specifications. If necessary, renew the bearing bushing in the idler gear and the journal.

7. Press out of the idler gear the bearing bushing that is to be renewed.

8. Renew bearing bushing and see that it is squarely seated.

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After-tightening angles studs

English						
Engine type	F2/3/4/5/6L 912	F2/3/4/5/6L 912 W	F3/4/6L 911	BF6L 912	F4/6L 913	BF6L 913/C
After-tightening angles studs in degrees	Initial tightening; (a = 22 ft. lbs.) a) 30 Nm b) 50 Nm (b = 36 ft. lbs.)					
Cylinder head bolts	a) 45° + 45° + 45°					
Big-end bolts	a) 60° + 30°					
Main bearing bolts	a) 60° + 45°					
Flywheel bolts	a) 30° + 30°		a) 60° + 30° 1)			
Counter-weight bolts	a) 30° + 30°					
Anti-fatigue bolt for cooling blower	a) 90°					
Flywheel nuts	F2L 912/912 W = b) 180°					
Bolt for securing vee-belt pulley	b) 210°		b) 120° F3/4L tractor			
Nut for vee-belt pulley	F2L 912/912 W = b) 60°					
Hex. nut on delivery valve anti-fatigue stud	25 - 30 Nm					
Bolt for idler gear bearing	a) 60°					
Nut on fuel-injection pump drive	2) M 12 2) M 14 x 1,5 = 60 - 70 Nm 3) M 14 x 1,5 = 80 - 90 Nm					

2) Slotted nut

3) Clamping nut

1) Old design (e.g. 223 0281 UE 0150-05)

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170B EXCAVATOR
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	Engine Accessories	2001	8-44600
	Deutz Engine Service Manual		291-1842
3	**FUEL SYSTEM**		
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SAFETY RULES

This symbol means ATTENTION! BECOME ALERT! YOUR SAFETY IS INVOLVED. The message that follows the symbol contains important information about safety. Carefully read the message. Make sure you fully understand the causes of possible injury or death. 1-1-C

NOTE: *To prevent injury on job, follow the Warning, Caution, and Danger notes in this section and other sections throughout this manual. Follow the instructions carefully.*

The procedures recommended and shown in this manual are good, effective service methods. However, all possible procedures and service hazards may not be covered. Therefore, if you use a tool or procedure not recommended, you must make sure that the method you select is a safe method.

Put the warning tag shown below on the key for the key switch when you are servicing or repairing this machine. One warning tag is on every new machine. You can buy additional warning tags, part number 331-4614, from Service Parts Supply.



780449

WARNING: *Read operator's manual to familiarize yourself with control lever functions.* 46-27

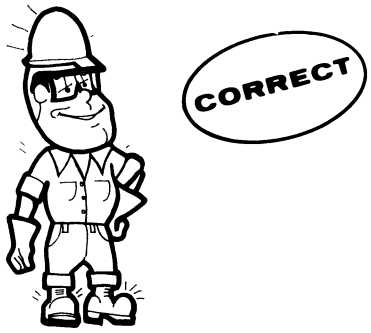
WARNING: *Operate tractor and equipment controls from the seat position only. Any other method could result in serious injury.* 48-55

WARNING: *This is a one man machine, no riders allowed.* 35-8

WARNING: *Before starting engine, study operator's manual safety messages. Read all safety signs on machine. Clear the area of other persons. Learn and practice safe use of controls before operating.*

It is your responsibility to understand and follow manufacturer's instructions on machine operation, service, and to observe pertinent laws and regulations. Operator's and service manuals may be obtained from your J I Case dealer. 45-2

WARNING: *If you wear clothing that is too loose or do not use the correct safety equipment for your job, you can be injured. Always wear clothing that will not catch on objects. Extra safety equipment that can be required includes hard hat, safety shoes, ear protection, eye or face protection, heavy gloves and reflector clothing.* 45-3-A



WARNING: *When working in the area of the fan belt with the engine running, avoid loose clothing if possible, and use extreme caution.* 35-4

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1001

SAFETY RULES, SERVICE MANUAL INTRODUCTION, AND TORQUE SPECIFICATIONS

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Written In *Clear And Simple English*

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Case

8-43910

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Issued August 1985
Reprinted November 1985 (220B)
Reprinted February 1986 (170B)

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Fuel injection system

English

Engine type	F2/3/4/5/6L 912	F2/3/4/5/6L 912 W	F3/4/6L 911	BF6L 912	F4/6L 913	BF6L 913/C
Commencement of del. bef. TDC in °cranksh. rota. 1)						
Engines without advance unit deg/1/min	F 2 L 912 = 32/1500 - 1800 32/1801 - 2300 38/2301 - 2500 F2L 912 W = 25/1500 - 2500 2) F2L 912 = 26/1500 - 1800 30/1801 - 2300 32/2301 - 2800 2) F2L 912 W = 20/1500 - 1800 22/1801 - 2300 23/2301 - 2800 F3/4L 912 W = 20/1500 - 1800 22/1801 - 2300 23/2301 - 2800	F3/4L 912 = 26/1500 - 1800 30/1801 - 2300 32/2301 - 3000 F5/6L 912 = 29/1500 - 1800 32/1801 - 2300 35/2301 - 3000 F5/6L 912 W = 22/1500 - 1800 24/1801 - 2300 25/2301 - 2800 BF6L 912 - 32/1800 - 2500	F4L 913 = 25/1500-1800 29/1801-2300 31/2301-2500 33/2501-2800 F6L 913 = 28/1500-1800 32/1801-2300 34/2301-2500 36/2501-2800 BF6L 913 = 28/ -1800 = 32/1801-2300 = 34/2301-2500 = 36/2501-2800 BF6L 913C = 28/1800-2300			
Engines with advance unit deg / 1/min	2) F2L 912 = 22 2) F2L 912 W = 18	over 2500: F3/4L 912 = 22/2301 - 3000; F5/6L 912 = 25/2301 - 3000; F3/4L 912 W = 18/2301 - 3000; F5/6L 912 W = 20/2301 - 3000	BF6L 912 = 24/2500 - 2800 F3/4L 911 - 24/2650 - 3000 F6L 911 - 27/2650 - 3000	F4L 913 - 21/2500 - 2800 F6L 913 - 24/2500 - 2800 BF6L 913 = 24/2301 - 2800 BF6L 913 C = 26/2300 - 2650		
Advance unit degree	12 ± 1	6 ± 1	12 ± 1			

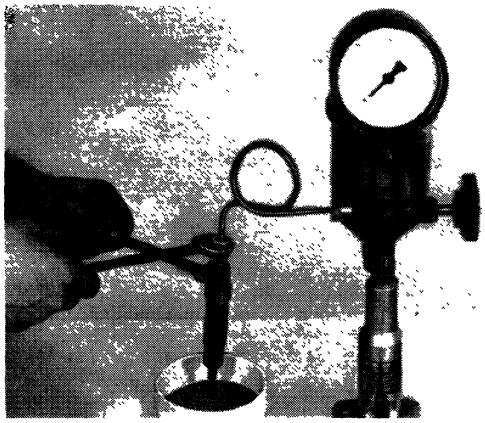
1) The commencement of injection expressed in degrees of crank angle (°KW) can be translated into a length "L" in mm marked on the V-belt pulley (flywheel) as follows:

$$L = \frac{d \cdot 3{,}14 \cdot {}^{\circ}KW}{360^{\circ}}$$

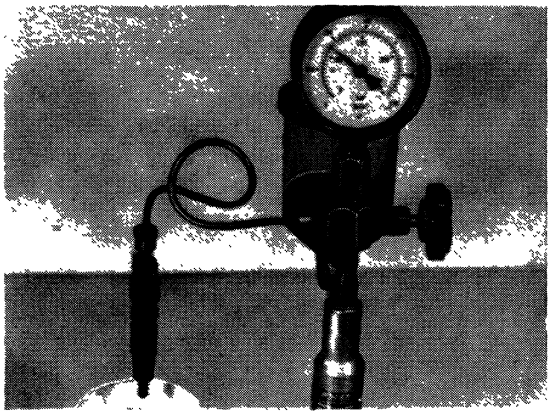
2) Fuel injection pump : Bosch

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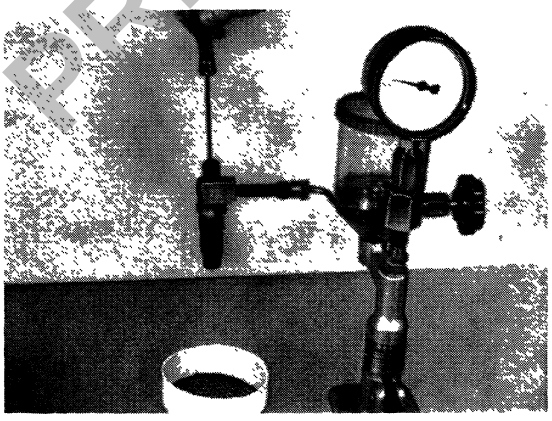
2-34



2-35



2-36



2-37

TESTING THE INJECTION NOZZLE
(by testing outfit)

Injector is removed.

1. Connect injector to outfit.

Fig. 2-34

2. With pressure gauge cut in, press outfit pump lever several times. Read opening pressure (Fig. 2-35) and inspect spray pattern. Compare readings with Specification Data.

Important:

At 25 - 30 bar below specified opening pressure, check that no fuel will dribble from nozzle.

3. Adjust nozzle opening pressure by shims below the spring (adding shims increases pressure and vice versa).

Fig. 2-36

Note for Refitment:

By adding shims the pressure will be increased; by removing them the pressure will be decreased.

For FL912W, adjust release pressure by means of set-screw. By turning in screw, release pressure is increased; by turning it out, pressure is decreased.

Fig. 2-37

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CHECKING AND GAUGING THE CRANKSHAFT

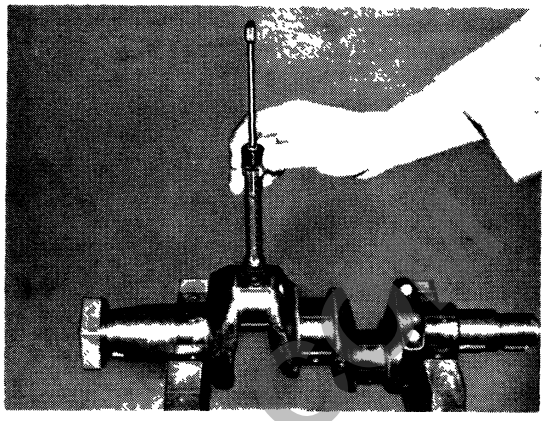
1. Inspect crankshaft for cracks (by magnaflux method).

2. Remove the gearwheel from the crankshaft.

3. Support crankshaft at outer main journals on prismshaped blocks.

4. Determine the hardness of the journal surfaces with a scleroscope. Conversions of the readings to Rockwell "C" hardness values, for comparison with the specifications, can be effected with the table included with the instrument.

Fig. 4-1

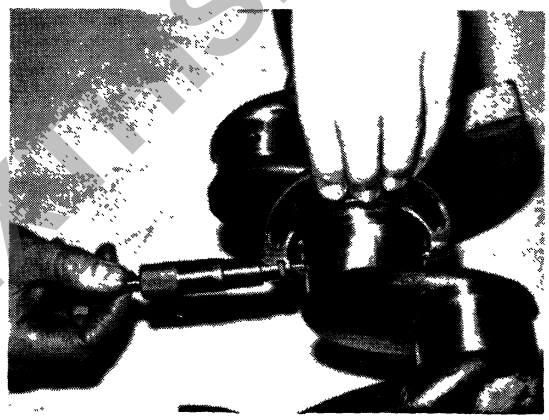


4-1

5. Compare the readings with the specifications.

6. Measure all journals at points "1" and "2", in the vertical and horizontal, as indicated by "a" and "b".

Fig. 4-2 and 4-3

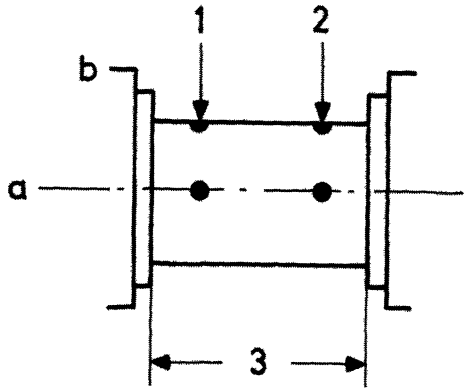


4-2

Note:

Width "3" should also be measured of the journal for a locating bearing.

Fig. 4-3



4-3

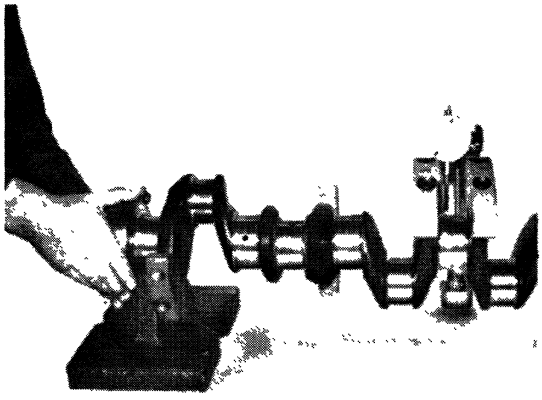
7. Note the measurements on the inspection record sheets and compare with the specifications.

Note:

Maximum permissible deviations from roundness, straightness, true run and parallelism of all shaft journals and crankpins, also adjacent ones, see drawings. Wear limit for ovality is 0.02 mm.

8. With a dial indicator, check the other journals for out-of-truth.

Fig. 4-4



4-4

9. Check the working surface of the radial packing ring on the flywheel flange.

10. Recondition or renew the crankshaft if it is defective.

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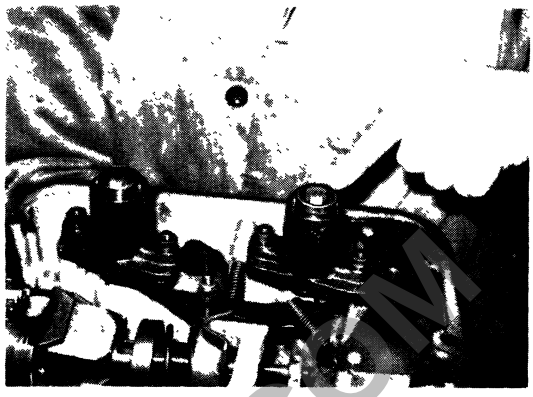
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DISMANTLING AND MOUNTING THE FUEL-INJECTION PUMP COVER OF AN F2L

DISMANTLING:

1. Dismantle the fuel-injection lines and the breather pipe attached to the crankcase. Remove the oil dipstick.

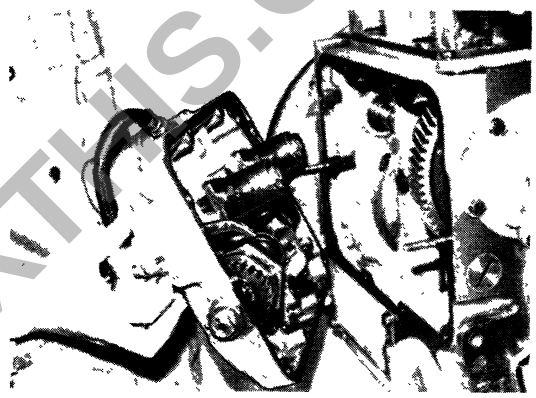
2. Slacken uniformly in diagonal sequence and remove the screws securing the injection pump cover. Dismantle the injection pump cover and gasket.
See Fig. 7-1



7-1

INSTALLING:

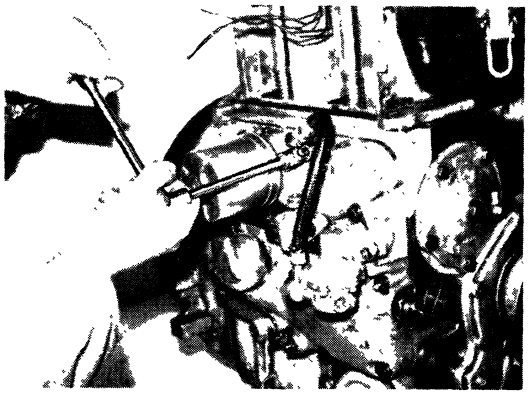
1. Apply grease to a new gasket and stick it in position on the injection pump cover. Turn the crankshaft so that the fuel cams face in the direction of the crankcase. Mount the fuel-injection pump cover so that the gears are in mesh.
See Fig. 7-2



7-2

2. Tighten uniformly, in diagonal sequence, the screws securing the injection pump cover.
See Fig. 7-3

3. Connect the breather pipe and install with jointing compound in the injection pump cover. Install the oil dipstick fitted with a new rubber O-seal.



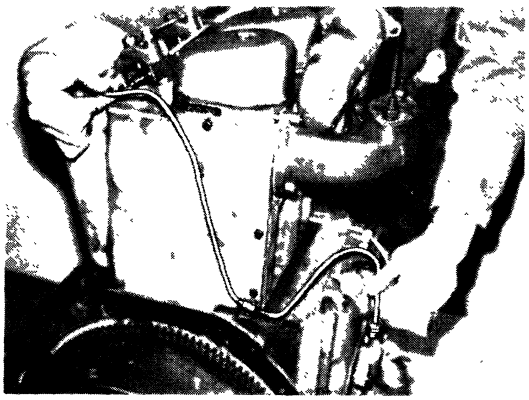
7-3

4. Connect the fuel injection lines.
See Fig. 7-4

Note :

Install and secure with clips the fuel injection line to cylinder 1 to the crankcase and that to cylinder 2 to the front vertical plate. Insert a rubber sleeve between each clip and the fuel delivery line.

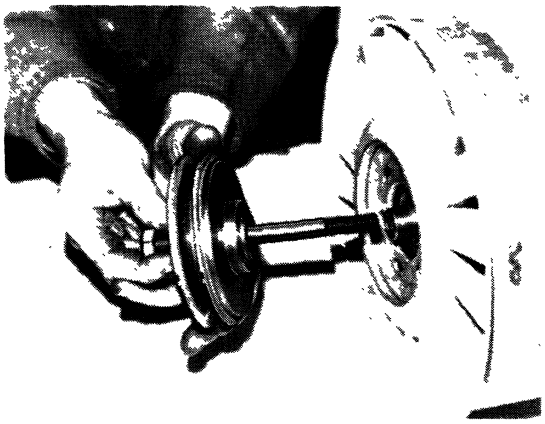
5. Adjust the fuel-injection point in accordance with the instructions contained in this manual. (see Section 2)



7-4

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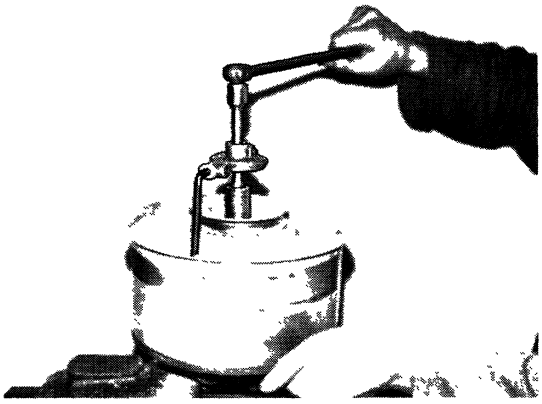


8-29

9. Mount the vee-belt pulley on the opposite side of the impeller and insert the securing bolt.

See Fig. 8-29

10. Place the washer on the impeller side and assemble the nut finger-tight.



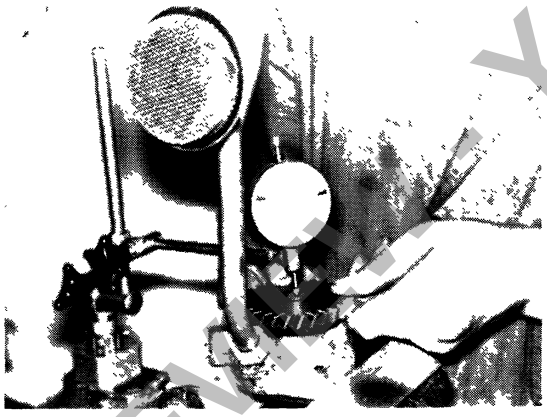
8-30

11. Grip the nut in a vice and tighten and lock down the bolt in accordance with the instructions for tightening bolts and studs.
(Use angle-of-turn indicator No. 101910)
See Fig. 8-30

CHECKING THE OIL PUMP (F2L)

1. If the engine is an F2L, dismantle the oil pump from the front cover plate.

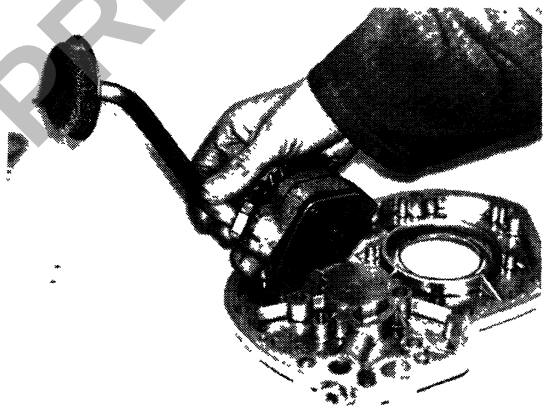
2. Check the end clearance of the pump gear on the driving shaft.



8-31

See Fig. 8-31

3. The end clearance must be within the limits stated in the specifications. If necessary, fit a new oil pump.

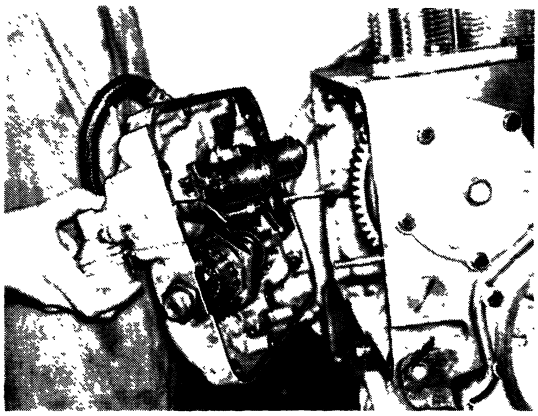


8-32

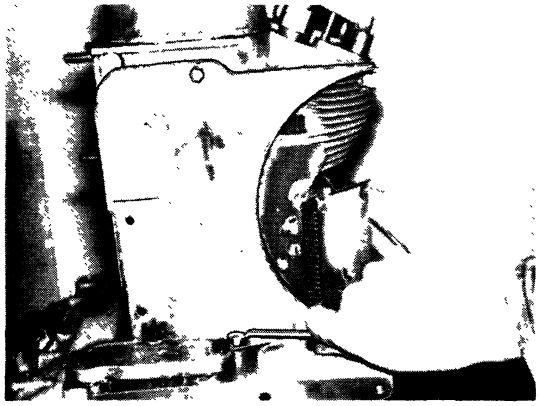
4. Mount the oil pump on the front cover plate.

See Fig. 8-32

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9-121



9-122



9-123



9-124

ASSEMBLING AN F2L ENGINE COMPLETE

1. Coat a new gasket with grease and stick it in position on the injection pump cover. Rotate the camshaft so that the cams which operate the pumping elements face towards the casing. Mount the injection pump cover, making sure that the gears are in mesh.

See Fig. 9-121

Note:

Fitment of Bosch injection pump see Section 7.

2. Connect the breather pipe and install in the injection pump cover with jointing compound. Assemble the oil dipstick fitted with a new rubber O-seal.

3. Assemble the front vertical plate.

Fig. 9-122

4. Mount the cooling air blower and check the two vee-belt pulleys for alignment.

Fig. 9-123

5. If the vee-belt pulleys are out of alignment, correct by varying the number of shims under the cooling air blower.

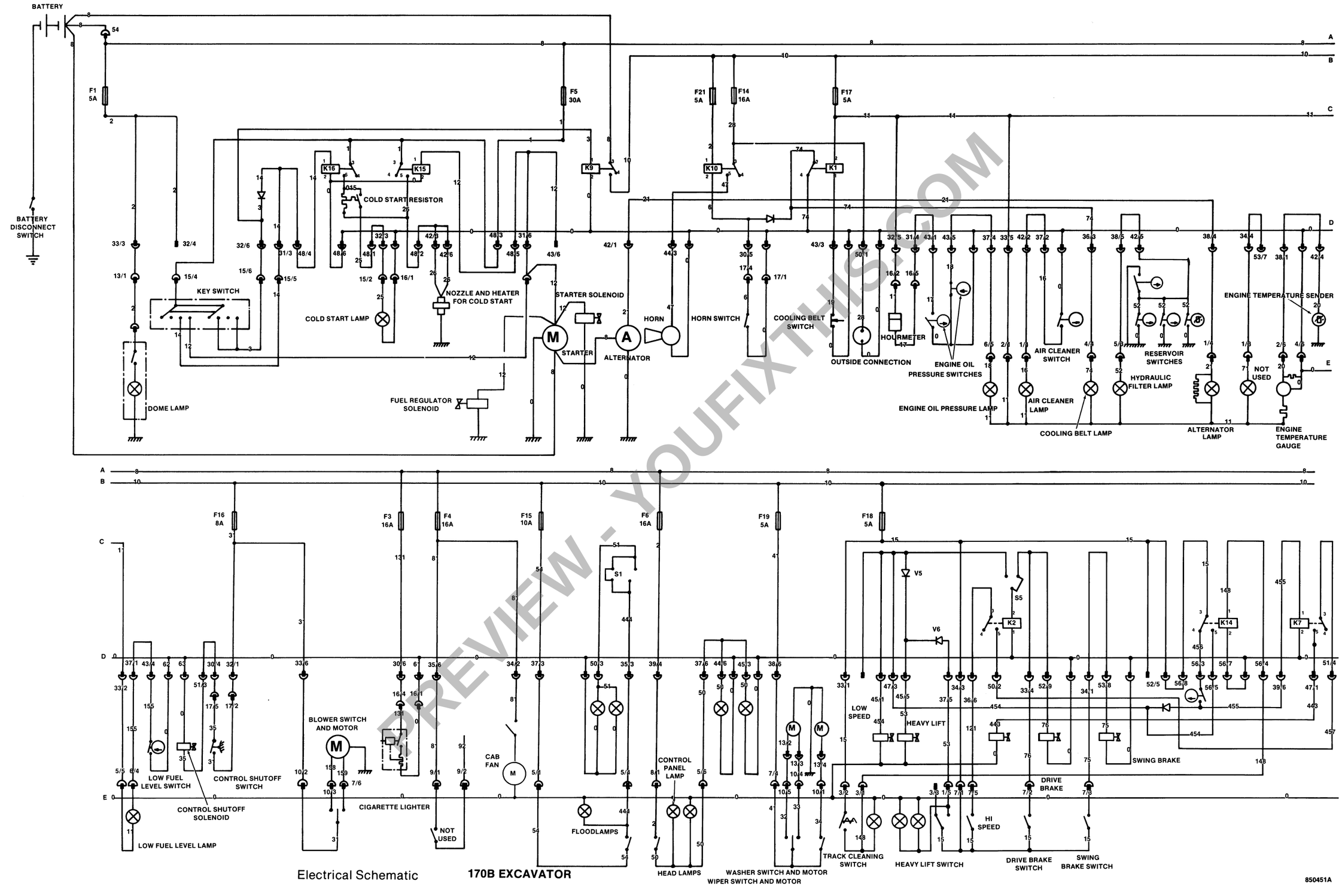
Fig. 9-124

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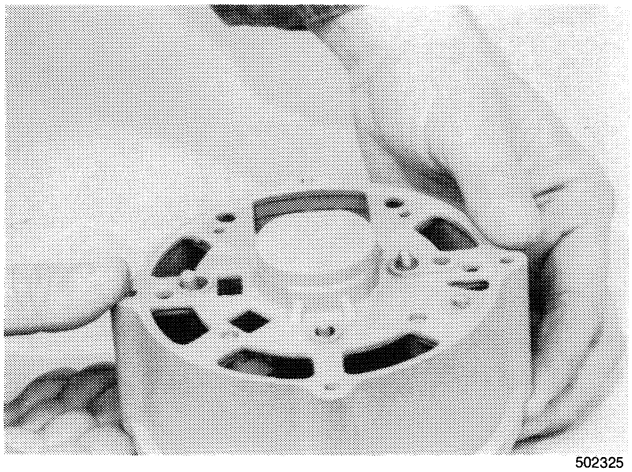
Electrical Schematic **170B EXCAVATOR**

850451A

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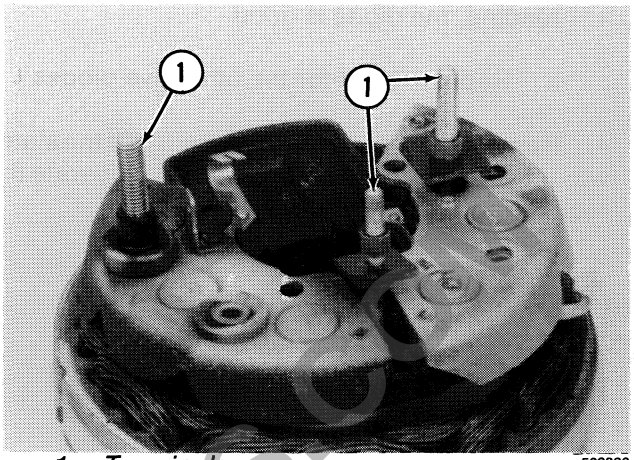
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18. Remove the housing.



502325

19. Remove the insulators from the terminals.



1. Terminals

502326

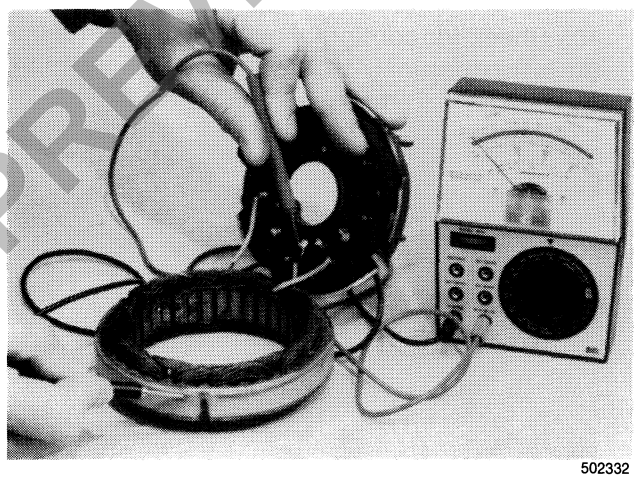
INSPECTION

1. Check the stator resistance. The resistance in the stator winding must be 0.4 ohms.



502330

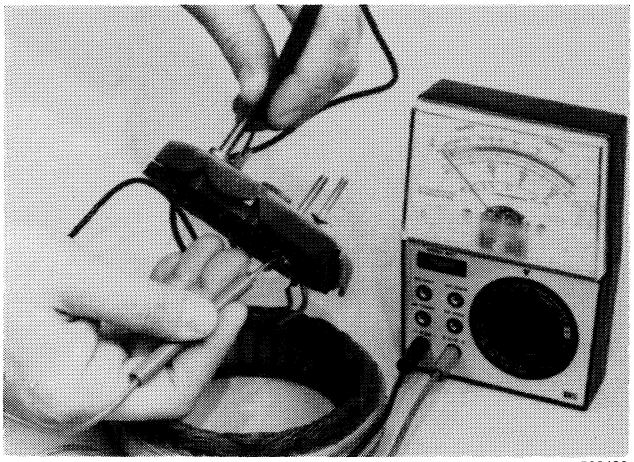
2. Check the stator winding for a short circuit.



502332

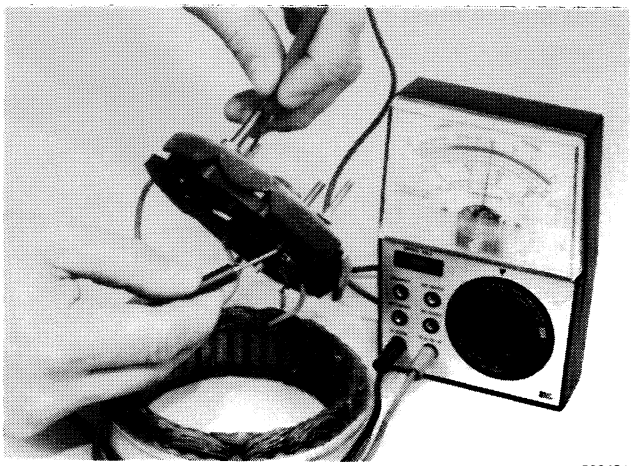
3. Check the diodes in the rectifier bridge.

a. Connect the black lead of the ohmmeter to the output (+B) terminal. Connect the red lead of the ohmmeter to one of the diode leads. Read the ohmmeter.



502420

b. Reverse the ohmmeter leads. Read the ohmmeter.



502421

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6301

REMOVAL AND INSTALLATION OF POWER TRAIN COMPONENTS

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Removal 6301-3

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Removal 6301-7

Installation 6301-7

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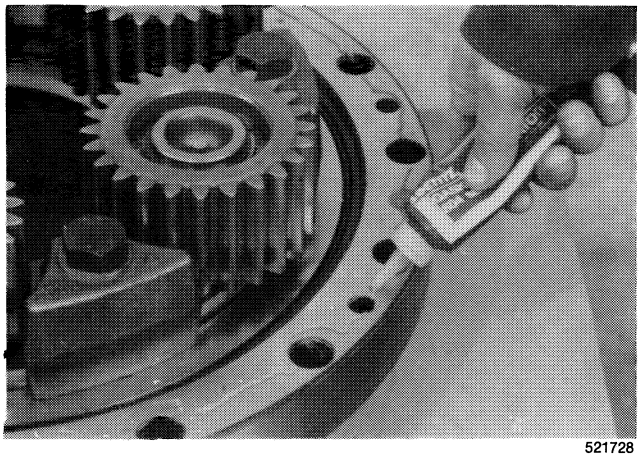
Case

8-44600

Printed in U.S.A.
Issued February 1986

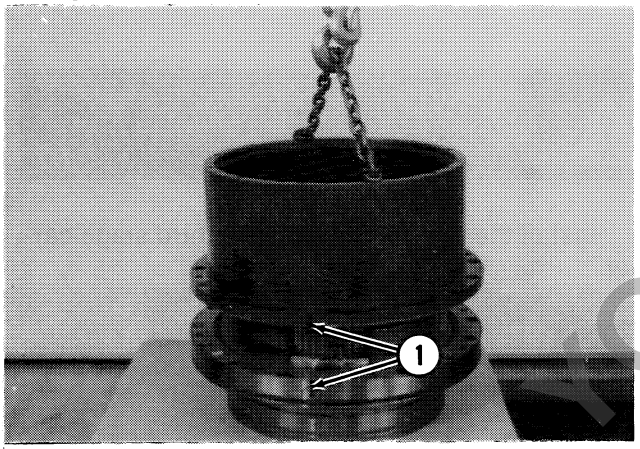
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7. Install gasket eliminator on the bearing.



521728

8. Lower the hub onto the bearing with the marks in alignment.



1. Mark

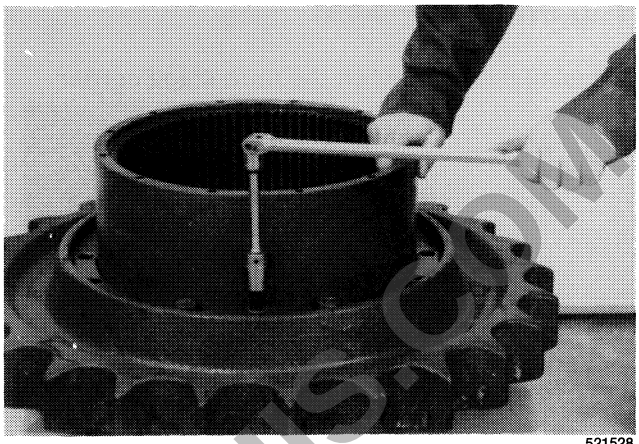
521538

9. Lower the sprocket onto the hub.



521531

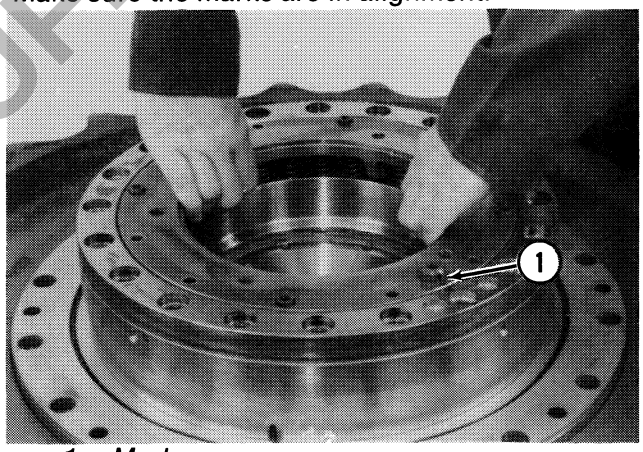
10. Align the holes for the Allen screws in the bearing hub, and sprocket. Install the Allen screws. The Allen screws will be tightened after the final drive is installed on the machine.



521528

11. If the brake assembly was disassembled, do steps 1 through 14 under Brake Assembly on page 6317-18.

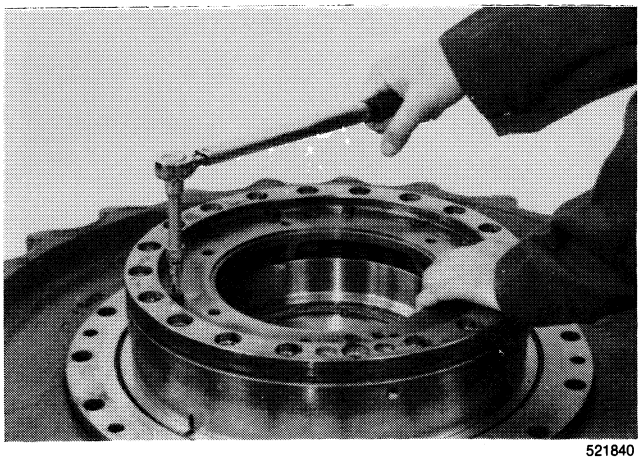
12. Install the brake assembly into the final drive. Make sure the marks are in alignment.



1. Marks

521708

13. Install the Allen screws and washers to fasten the brake assembly to the final drive. Tighten the Allen screws to 218 pound-inches (24.6 N m, 2.5 kg/m).



521840

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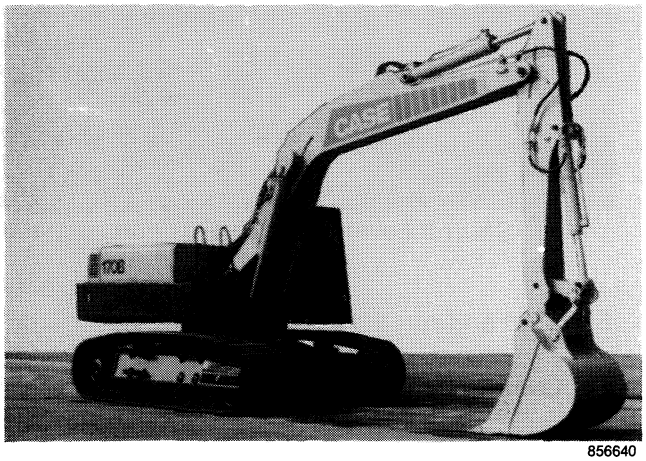
CYLINDERS

Boom Cylinder

Removal

1. Park the machine on a level surface.

2. Put the machine in the position shown below.



856640

3. Stop the engine.

4. Use the foot pump and move the boom control lever in both directions to release the pressure in the boom circuit.

5. Remove the retainer that fastens the pivot pin at the rod end of the boom cylinder.



504123

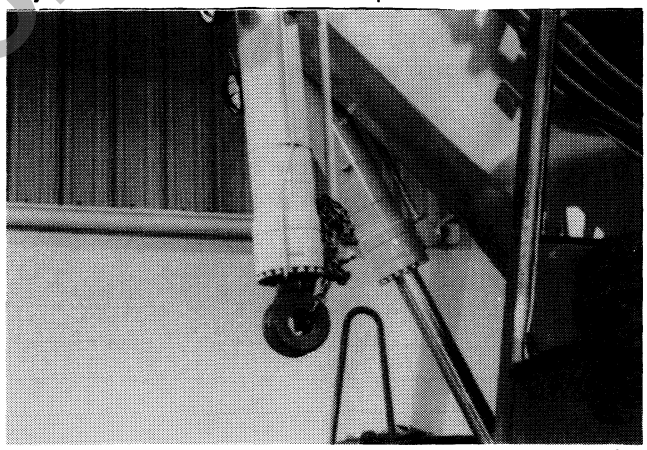
6. Hold the boom cylinder rod in position and remove the pivot pin.



504126

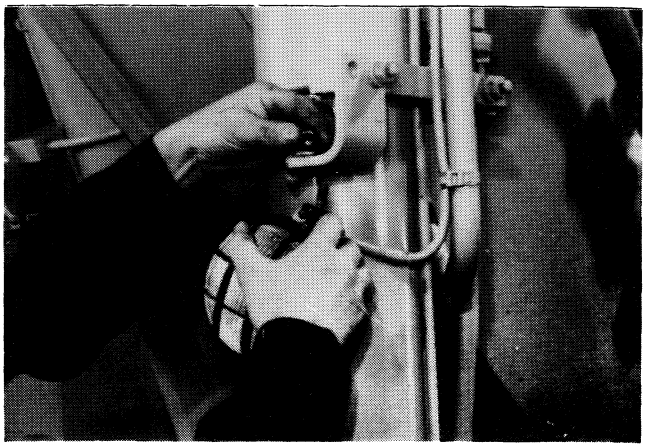
7. Let the boom cylinder rod move forward out of alignment with the turntable.

8. Start and run the engine at idle. Operate the boom control to retract the cylinder rod completely. Stop the engine. Use a chain to hold the boom cylinder rod in the retracted position.



504228

9. Hold the flood lamp in place and remove the nut and washer.



504230

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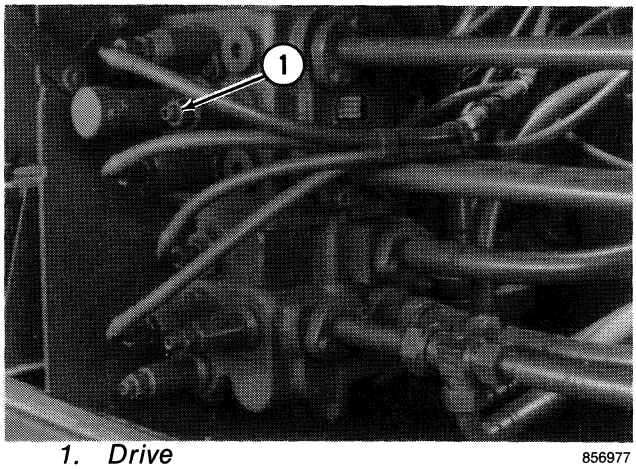
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12. Push down and hold the left pedal in the FORWARD position. Read the pressure gauge.

13. The pressure must be 4550 psi (31 372 kPa, 320 bar). If the pressure is correct, do step 15.

14. If the pressure is still not correct, adjust the pressure by doing the following steps:

a. Find the circuit relief valve for the drive circuits at the right side of the swing and drive control valve.



1. Drive 856977

b. Loosen the lock nut.

c. Turn the adjusting screw clockwise to increase the pressure and counterclockwise to decrease the pressure.

d. Repeat steps 12 through 14 until the pressure is correct.

e. Tighten the lock nut.

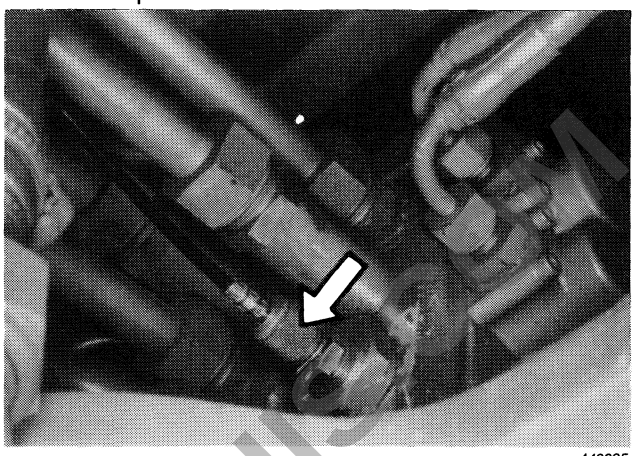
15. If the pressure was correct in step 12 while the pressure was too low in step 8, there is a problem in the drive circuit for the right drive motor. Check the swivel and drive motor.

Control Valve for Options

1. Heat the hydraulic oil. See page 8202-17.

2. Stop the engine.

3. Connect the pressure gauge, 8500 psi (58 820 kPa, 600 bar), to the test port (M8) in the control valve for options.



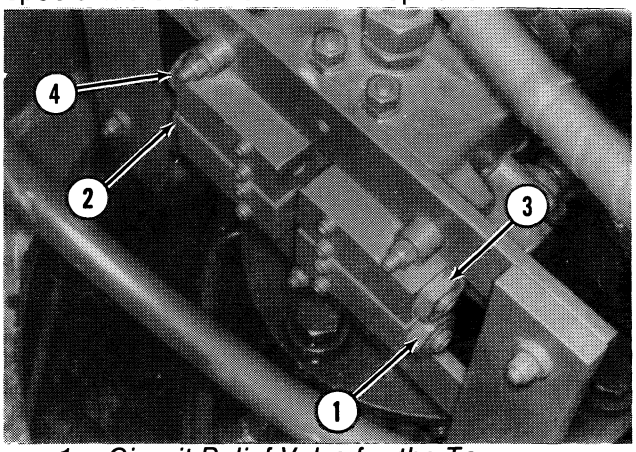
440005

4. Move the drive brake and swing brake switches to the ON position.

5. Make sure that the heavy lift switch is OFF.

6. Start and run the engine at full throttle.

7. The left pedal and right pedal actuate the spools in the control valve for options.



1. Circuit Relief Valve for the Top of the Right Pedal
2. Circuit Relief Valve for the Bottom of the Right Pedal
3. Circuit Relief Valve for the Top of the Left Pedal
4. Circuit Relief Valve for the Bottom of the Left Pedal

440010

8. Push down and hold the pedal. Read the pressure gauge.

9. The pressure must be 1565 psi (10 790 kPa, 110 bar) for the lower circuit relief valves.

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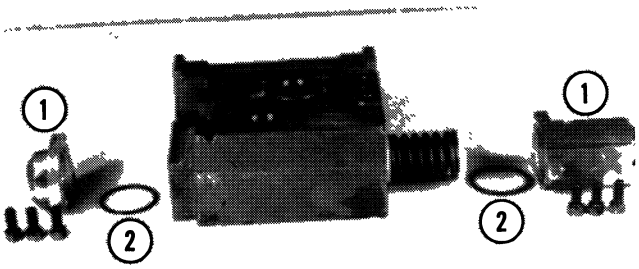
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PARALLEL ARM SECTION

Disassembly

1. Make a mark on the end of the parallel arm section that has the long end cap.

2. Remove the end caps and O-rings.



503411

1. *End Caps*
2. *O-rings*

3. Remove the spool from the parallel arm section.



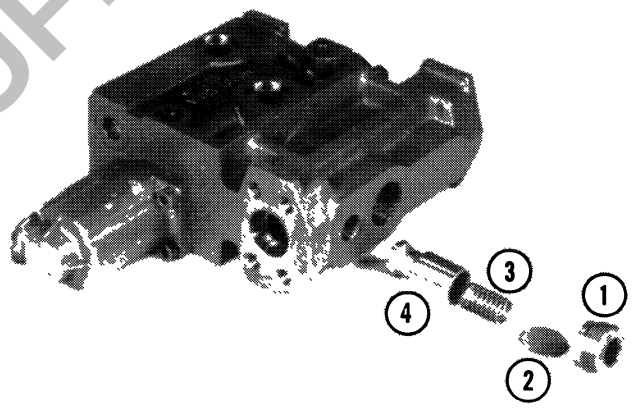
503425

4. Loosen and remove the cap screw from the spring end of the spool. Separate the spring seats, springs, and washer.



503424

5. Loosen and remove the plug, spacer, spring, and poppet.



503423

1. *Plug*
2. *Spacer*
3. *Spring*
4. *Poppet*

6. Remove and discard all O-rings. See Inspection on page 8206-14.

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3. Lubricate the O-ring with clean hydraulic oil.

4. Install the adjusting screw assembly in the circuit relief valve.

5. Repeat steps 1 through 4 for each circuit relief valve.

6. Install new O-rings on the circuit relief valve.

7. Lubricate the O-rings with clean hydraulic oil.

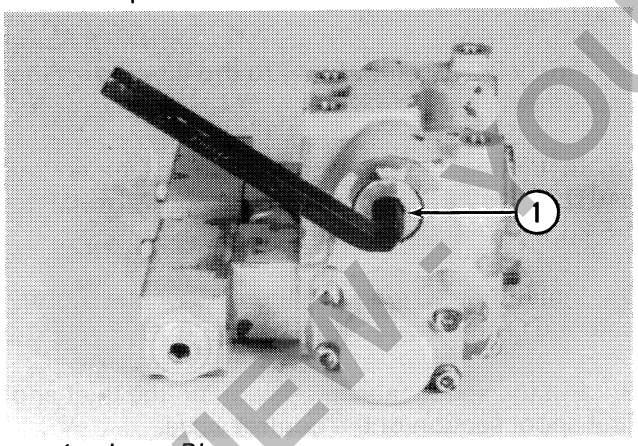
8. Hold the circuit relief valve in position on the control valve section and install the Allen head screws that fasten the circuit relief valve to the control valve.

9. Tighten the Allen head screws to 12 to 15 pound-feet (16 to 20 N m, 1.7 to 2.1 kg/m).

Valve Sections

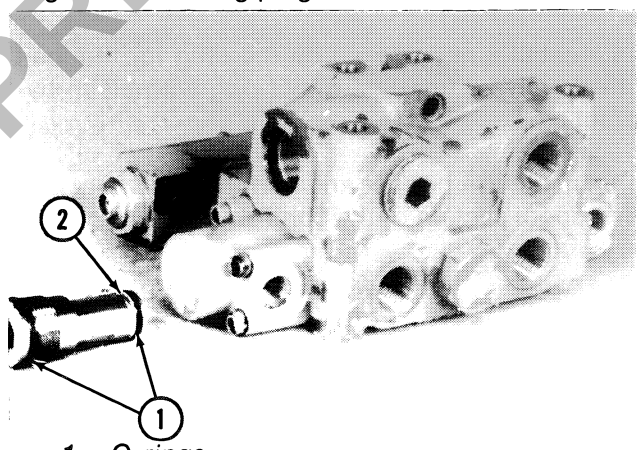
Disassembly

1. Loosen and remove the long plug from the inlet and first spool section of the control valve.



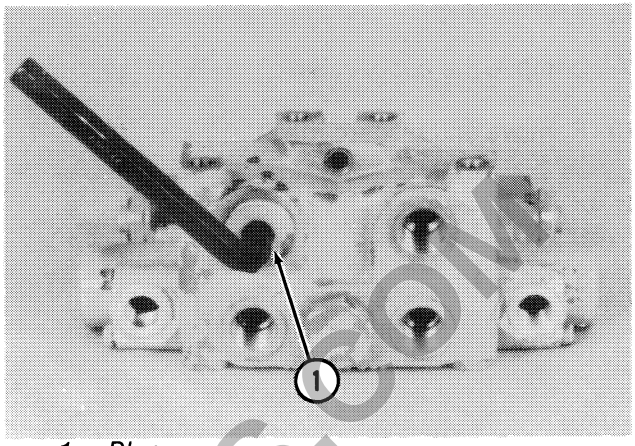
1. Long Plug 503219

2. Remove and discard the O-rings and backup rings from the long plug.



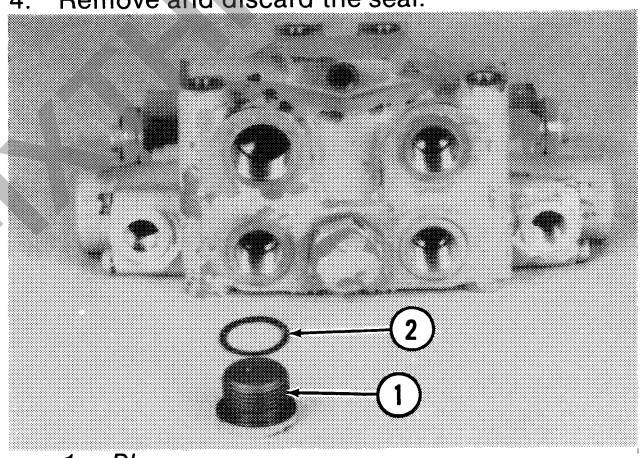
1. O-rings
2. Backup Ring 503218

3. Remove the plug from the inlet and first spool section of the control valve.



1. Plug 503217

4. Remove and discard the seal.

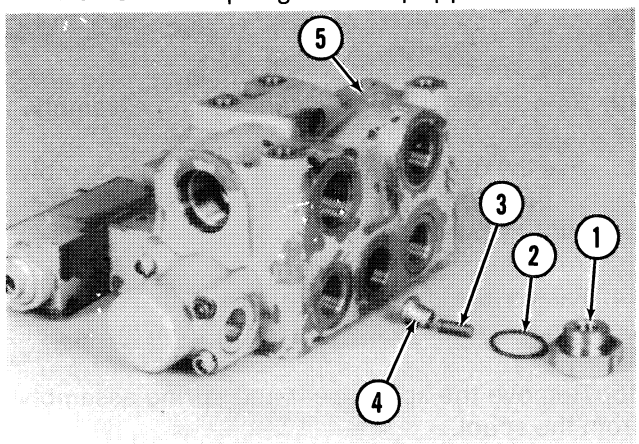


1. Plug
2. Seal 503216

5. Loosen and remove the load check valve from the first spool section of the control valve.

6. Remove and discard the O-ring from the plug.

7. Remove the spring and the poppet.



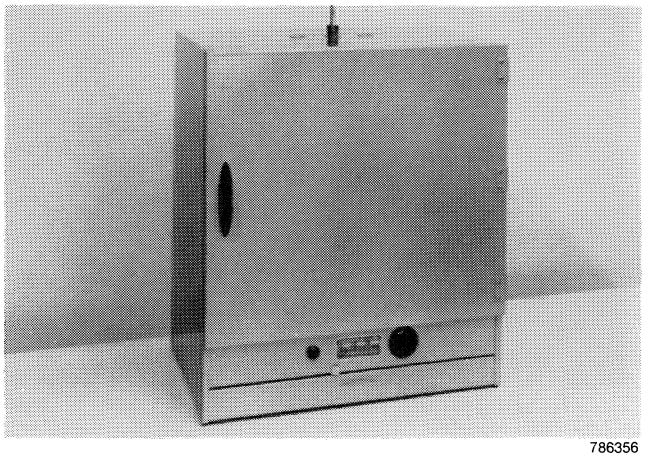
1. Plug
2. O-ring
3. Spring
4. Poppet
5. Inlet and First Spool Section 503215

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ASSEMBLY

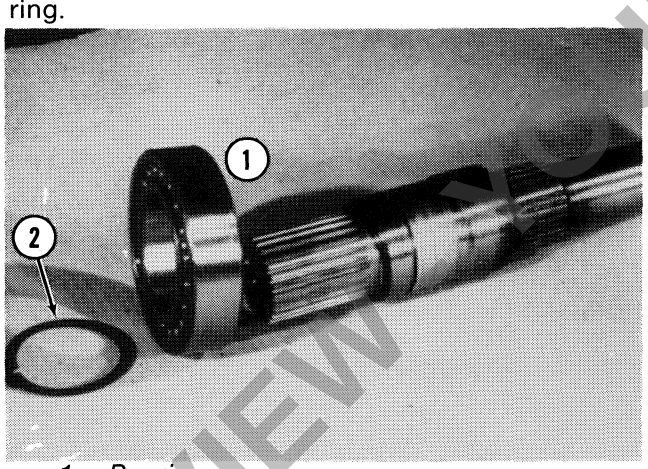
1. If the bearing was removed from the shaft, put the bearing in an oven. Heat the bearing to 175° F (80° C).



786356

WARNING: *Use insulated gloves or mittens when working with hot parts.* *47-41A*

2. Install the bearing on the shaft. Install the snap ring.



1. Bearing
2. Snap Ring

501416

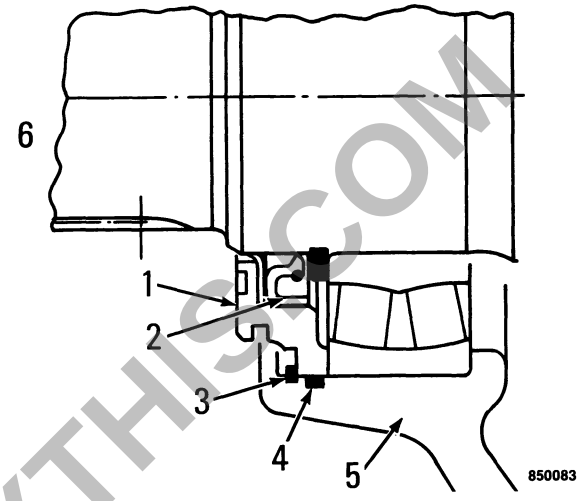
3. Install shaft and bearing in the bearing support.



501436

4. Hit the end of the shaft lightly with a soft hammer to install the shaft and bearing.

5. Install the seal in the seal retainer.

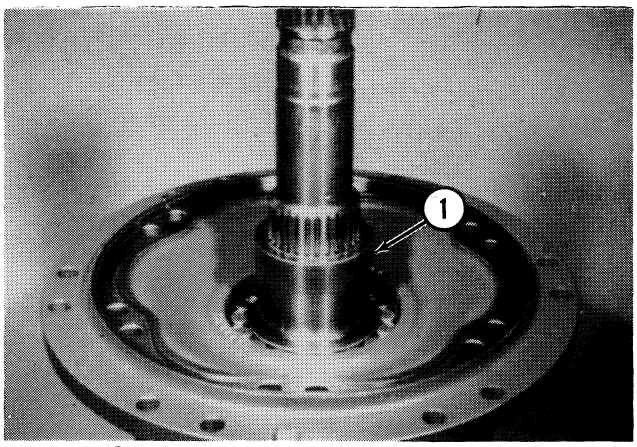


850083

1. Seal Retainer
2. Seal
3. Snap Ring
4. O-ring
5. Bearing Support
6. Shaft

6. Install the O-ring in the bearing support. Install seal retainer in bearing support. Install the snap ring.

7. Turn the bearing support and shaft over. Apply petroleum jelly to both ends of the spacer. Install the spacer on the shaft.



1. Spacer

501438

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