A267 ENGINE SPECIFICATIONS

NOTE ALL DIMENSIONS GIVEN IN INCHES

Type ---------- CASE Full Diesel, 4 Cylinder 4 Stroke Cycle Valve-in-Head Engine.
Cylinder Heads -------- Multiple Cylinder Heads can be removed individually for Servicing (2 cylinders per head).
Firing Order ---------- 1-3-4-2
Bore ---------- 4-1/8 Inches
Stroke ---------- 5 Inches
Piston Displacement ---------- 267 Cubic Inches
Compression Ratio ---------- 15 to 1
Full Load Rated Engine Speed ---------- 2000 RPM
No Load Governed Engine Speed ---------- 2150 RPM
Engine Idle Speed ---------- 750 RPM
Oil Filter, Crankcase ---------- Replaceable Full Flow Element
Method of Starting Diesel Engine -------- Engine Starts on Diesel Fuel (Electric Starting Motor).

MAXIMUM COMPRESSION PRESSURES

(At Cranking Speed of 200 RPM -- Injectors Removed from Engine)

Altitude	Sea Level	1000 ft.	2000 ft.	3000 ft.	4000 ft.	5000 ft.
Compression Pressure	480 to 510 PSI	455 to 485 PSI	435 to 465 PSI	415 to 445 PSI	395 to 425 PSI	375 to 405 PSI

Allowable Variance Between Cylinders ---------- 25 Pounds Pressure

CYLINDER SLEEVES

Type ---------- Replaceable Wet Type: Two Rubber O-ring Seals carried on each sleeve.
Inside Diameter of Sleeve Bore ------- 4.125 to 4.126 Inches. Replace Sleeve when inside Diameter below Top Ring Ridge Exceeds 4.133 Inches.
Piston Clearance in Sleeve (At Skirt) ---------- .0045 to .0055 Inch
Cylinder Sleeve Out-of-Round ---------- Max. .002 Inch

PISTON AND PISTON PINS

Piston Material ---------- Aluminum
Piston Weight (Less Pin) ---------- 54.4 oz. Pounds
Diameter of Piston at Top of Skirt (Below Oil Ring) ---------- 4.1144 to 4.1154 Inches
Diameter of Piston at Bottom of Skirt ---------- 4.1195 to 4.1205 Inches
Piston Pins ---------- Full Floating Type: Held in Position with Snap Rings in Piston. Replaceable Bronze Bushing in Connecting Rod.
Piston Pin Length ---------- 3.485 to 3.490 Inches
Piston Pin Diameter ---------- 1.4994 to 1.4995 Inches
Piston Pin Fit in Piston ---------- .0003 to .0008 Inch
Piston Pin bore in piston ---------- 1.4997 to 1.4999 Inches
Piston Pin Fit in Connecting Rod Bushing ---------- .0004 to .0011 Inch

PISTON RINGS

Rings Per Piston ---------- 4-(3 Compression and 1 oil).
Compression Rings
- Width of Ring (All 3) ---------- .0930 to .0935 Inch
- Ring End Gap (All 3) when Compressed in 4.125 Inch Cylinder ---------- .013 to .023 Inch
- Side Clearance in Groove of 1st (Top) Ring ---- .0035 to .0050 Inch
- Side Clearance in Groove of 2nd and 3rd Ring -- .0025 to .0040 Inch

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SPECIAL TORQUES

	Torque in Ft. Lbs.
Camshaft Nut	95 to 105
Connecting Rod Bolts	95 to 105
Crankshaft Pulley Bolt	100 to 110
(Valve Cover) Stud Nuts	5 to 6
Cylinder Head Bolts (Grade 8)	145 to 155
Flywheel to Crankshaft Bolts 5/8 inch	180 to 190
9/16 inch	100 to 110
Fuel Injector Clamp Stud Nut	18 to 22
Injector Cap Nut	50 to 55
Manifold Clamp Stud Nuts	25 to 30
Oil Pan Bolts	15 to 20
Powrcel Clamp Screws	100 to 110
Water Pump Fan Shaft Nut	60 to 70
Oil Pump Suction Tube Nut	95 to 105

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RUN-IN PERIOD

Items listed in this section are supplementary to the normal maintenance and lubrication during the run-in period only.

Component	Type of Service	Capacity or Measurement	Type of Lubricant
Check Every 2 Hours Until Torque Remains Stable			
Wheel Bolt Torque	Front 170 ft. lbs. Rear 250 ft. lbs.	———— ————	———— ————
After First 20 Hours Of Operation			
Engine Oil	Drain and Refill	9 Quarts With Filter Change	See Page 3
Engine Oil Filter	Replace Element	————	A21475 Element
Hydraulic Suction Screen	Clean	————	————
Hydraulic Return Line Filter	Replace Element	————	D35995 Element

MAINTENANCE AND LUBRICATION

Every 10 Hours Or Daily			
1. Front Axle Pivot and King Pins	Grease	5 Fittings	Lithium "Soap Base" Grease
2. Steering Cylinders	Grease	2 Fittings	Lithium "Soap Base" Grease
3. Air Cleaner	Clean Dust Cup	————	————
4. Engine Oil	Check Level	————	See Page 3
5. Power Shuttle Transmission Oil	Check Level	————	Case Hi-Lo TCH Oil
6. 4 Speed Transmission and Final Drive Oil	Check Level	————	See Page 3
7. Hydraulic Reservoir Oil	Check Level	————	Case Hi-Lo TCH Oil
8. Air Intake Weather Cap	Clean	————	————
9. Fuel Water Trap.	Drain Water	————	————
10. Radiator	Check Level	————	————
11. Loader Pivot Points	Grease	18 Fittings	Lithium "Soap Base" Grease
12. Loader Pivot Points - With Drott Bucket	Grease	22 Fittings	Lithium "Soap Base" Grease
13. Backhoe Pivot Points	Grease	19 Fittings	Lithium "Soap Base" Grease
Every 60 Hours Or Weekly			
14. Power Shuttle Transmission Shift Lever	Oil	Few Drops	Engine Oil (SAE 30)
15. Brake Pedals	Grease	2 Fittings	Lithium "Soap Base" Grease
16. Brake Bellcrank (Right Side)	Grease	1 Fitting	Lithium "Soap Base" Grease
17. Brake Cross Shaft	Grease	2 Fittings	Lithium "Soap Base" Grease
18.			
19. Throttle Linkage Shaft Pivot	Grease	1 Fitting	Lithium "Soap Base" Grease
20. Power Steering Reservoir Oil	Check Level	————	————
21. Batteries	Check Liquid Level	————	————
22. Fan Belts	Check Tension	————	————
23. Steering Pump Drive Belt	Check Tension	————	————
Every 120 Hours Of Operation			
24. Starting Motor	Oil	Few Drops	Engine Oil (SAE 30)
25. Engine Oil	Drain and Refill	8 Quarts without Filter Change	See Page 3
26. Water Pump	Grease	1 Fitting	Lithium "Soap Base" Grease

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EXPLODED VIEW

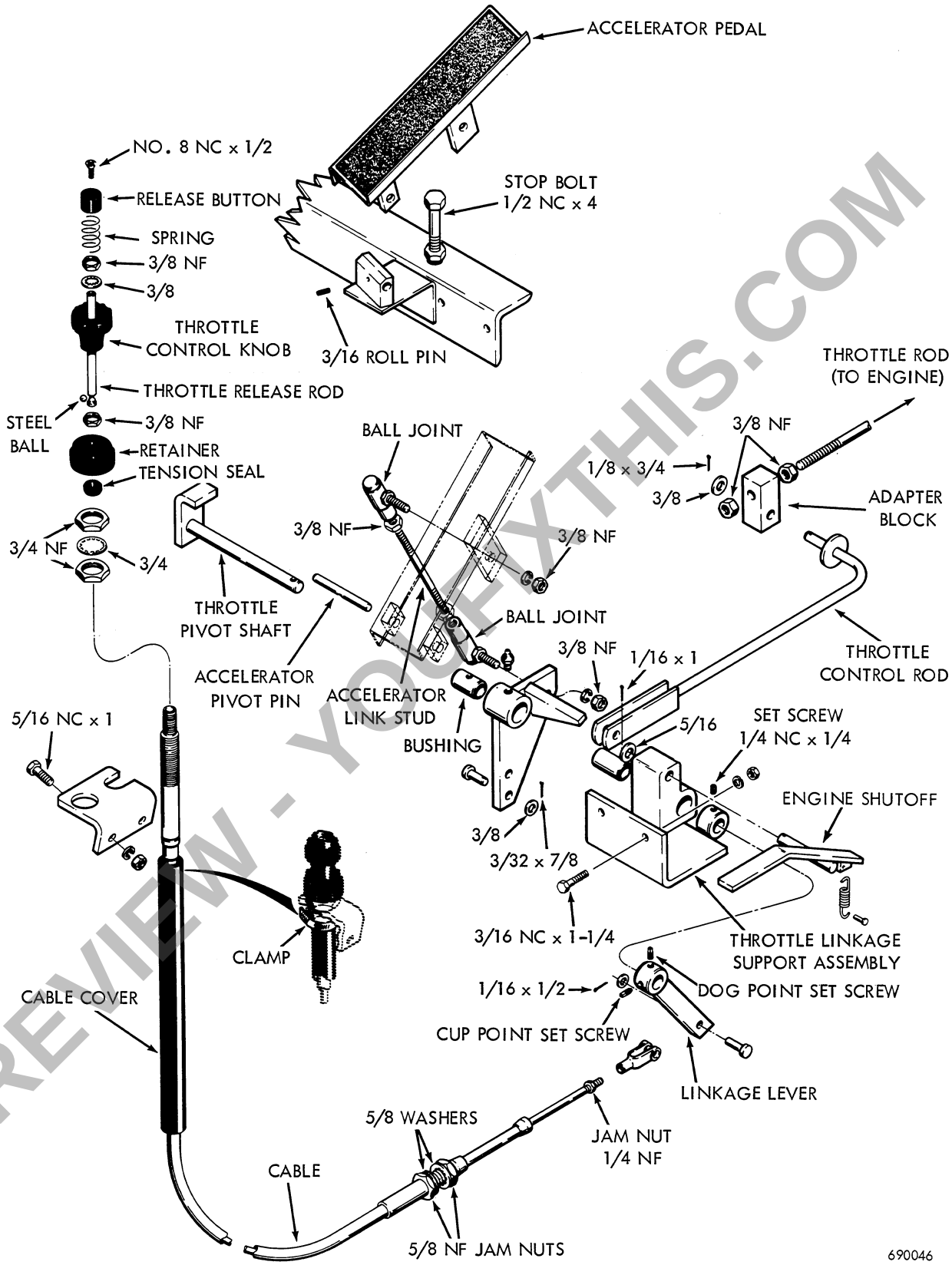


Figure 2 - Backhoe and Accelerator Throttle Linkage

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Trouble Shooting Chart

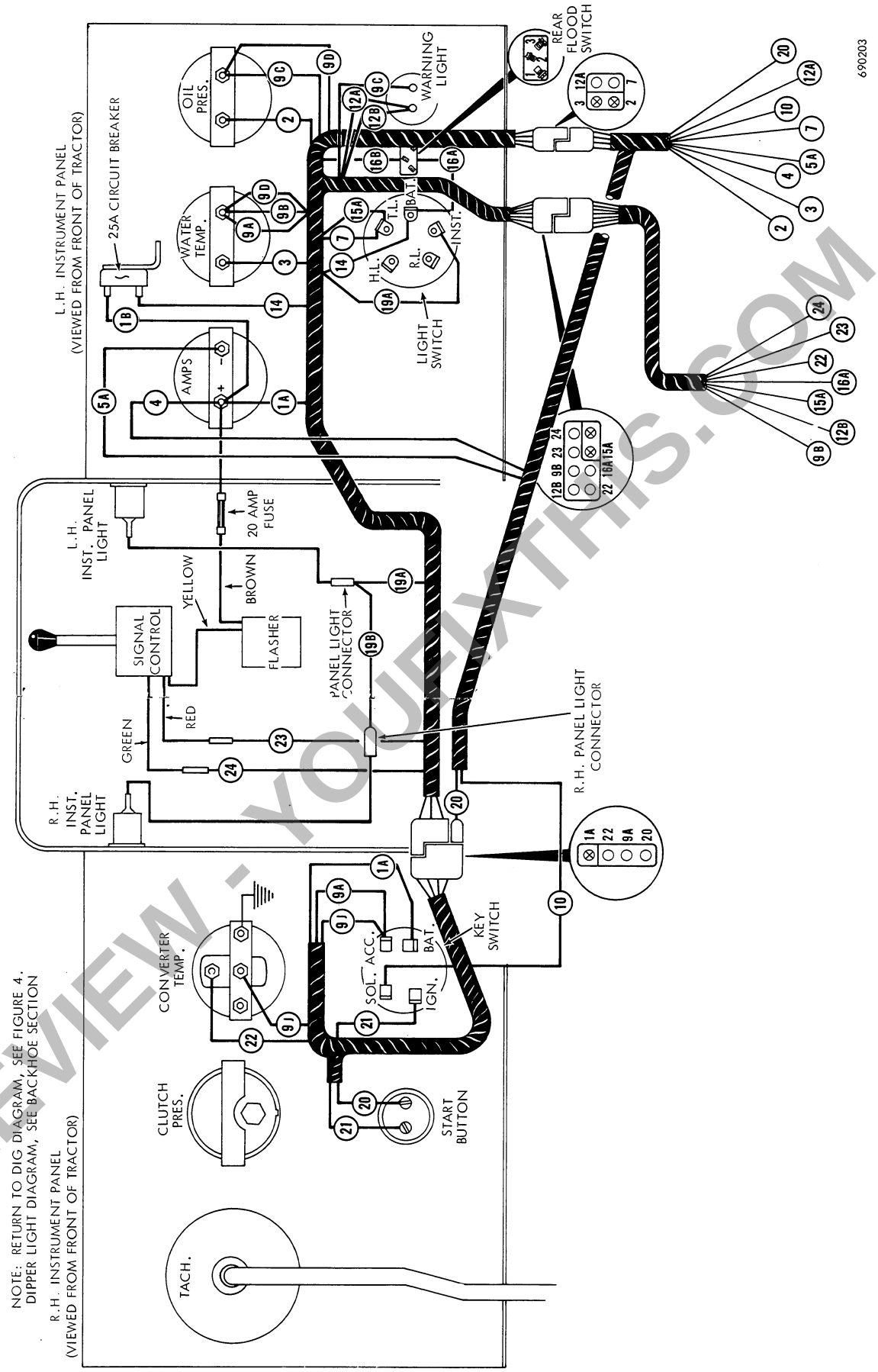
Refer to Figure 2 for parts identification.

Problem	Possible Cause	Remedy
Engine Speed Cannot Be Maintained	1. Worn tension seal. 2. Tension seal not squeezed against inner sleeve.	1. Replace tension seal. 2. Move jam nuts down on outer sleeve so retainer can be screwed down farther.
No Detent	1. Steel ball not replaced. 2. Steel ball improperly assembled.	1. Disassemble control and replace steel ball. 2. Disassemble control and assemble as shown in Figure 3.
Release Button Not Working	Same as "No Detent" above.	
Control Pulled Out, Engine Speed Slow	1. Throttle linkage improperly adjusted.	1. Adjust throttle linkage.

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WIRING DIAGRAM



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HYDRAULIC DIAGRAM

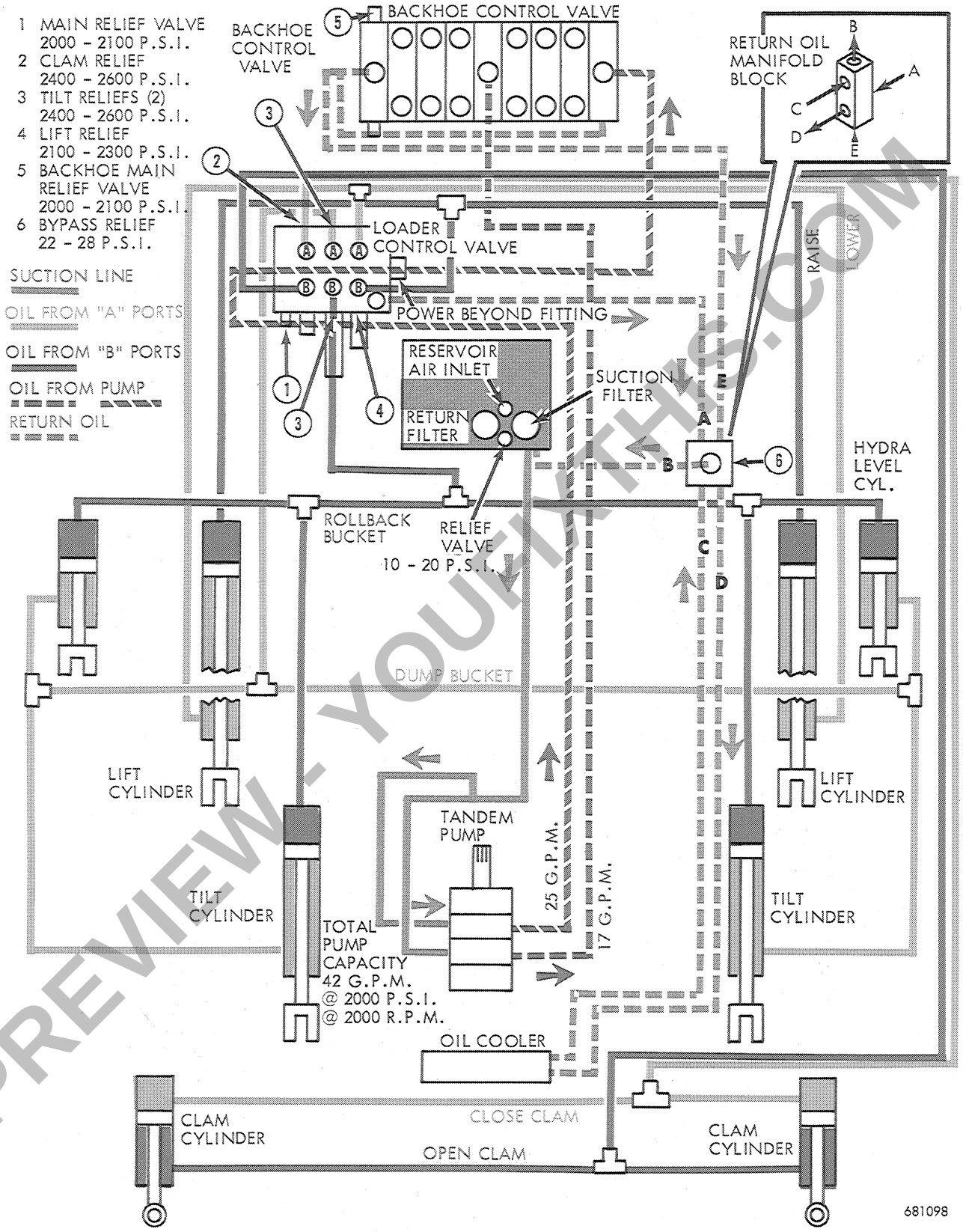


Figure 5 - Hydraulic Diagram of Model 680, Series B Loader With Drott Bucket

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3. Remove the air cleaner cap, air cleaner pipe, and exhaust stack.

4. Disconnect the hoses:

   a. Disconnect the lift cylinder lines at the tube-to-hose connection on each side of the loader. Close all openings with clean caplugs.

   b. Disconnect the tilt cylinders at the tube-to-hose connection on each side of the loader. Close openings with clean caplugs. Move tubes and hoses remaining on the tractor out of the way or remove them so the lift arms can be hoisted up.

   c. Disconnect the Hydra-Level (slave) cylinder hoses on both sides of the loader. Close openings with clean caplugs.

   d. If the loader is equipped with a Drott 4-in-1 bucket, disconnect the hoses at the loader crossmember. Unclamp and remove the tubes and hoses from the left hand lift arm. Figure 8.

5. Disconnect the wires used for the return-to-dig mechanism from the limit switch on the right hand lift arm. Figure 15.

6. Remove the leveling rod assembly from the right hand lift arm.

7. To remove the lift cylinders and Hydra-Level cylinders:

   a. Remove the pin retainer from the mounting bracket at the closed end of the cylinders.

   b. Remove snap ring at rod end, then pull or drive out pins. Protect cylinders from falling and becoming damaged when the pins are removed.

   c. Remove the pins from the closed ends of the cylinders.

8. Attach the hoist to the lift arms near the lift frame pivot pins.

9. Remove the pivot pins:

   a. Take up slack in the chain hoist to take the weight of the lift frame off the pins.

   b. Each pin is retained by a 1/2" x 4 bolt and lockwasher. This bolt is threaded into a boss inside the chassis upright. Figure 10. Raise the hood and remove this bolt and lockwasher on both sides.

   c. Pull out the pins.

10. Raise and lift frame to free it from the tractor. Start the tractor engine and carefully back it away from under the lift frame. Lower the lift frame gently to the floor.

RETURN-TO-DIG

General Information

Refer to Figures 13, 14 and 15.

The electrically controlled return-to-dig mechanism is standard equipment on the Model 680 CK Loader. After a bucket is raised and dumped, the return-to-dig mechanism automatically levels the bucket for digging as it is being lowered for the next pass.

It consists of an electrical circuit and mechanical linkage tied into the tilt spool by a solenoid coil. Its function is to return the tilt spool from "rollback" to "neutral" position at the instant the bucket becomes level as it lowers.

Operation

Assume that the operator has the bucket raised and his load dumped. Now he pulls the control lever into "rollback"—it will be held by a detent mechanism. The movement of the lever also closes the actuator switch, one of two switches which must be closed to energize the electrical

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DISASSEMBLY OF THE CYLINDER HEAD AND VALVES (Refer to Figure K-9)

Using a valve spring compressor (Refer to Inset A) compress the spring (1). Remove the valve retainer locks (2) and the spring retainers (3) or valve rotators (4). Remove the valve springs (1), valve stem oil seal (5) and the valve spring seat. Remove any carbon from the valve stems before they are moved from the head.

Remove the intake valves (7) and the exhaust valves (8) from the head and store them in a rack or holder. Remove the intake valve guide (9) exhaust valve guide (10) down through head using an Arbor (See Inset B). Refer to "Specification" Section for dimension of valve guides. The exhaust valve seats (11) can be removed with a special seat removing tool (See Inset C).

NOTE Never attempt to remove a valve seat with a center punch, cold chisel or pry bar.

To remove the expansion plug (12) it must be drilled and then pryed out.

ASSEMBLY (Refer to Figure K-9)

Clean head completely and check for cracks. Remove all carbon from the bore of the valve guides with a wire brush and blow out with compressed air.

Install new valve guides (9 and 10) using an Arbor (See Inset B) and press the guides into the head from the top of the head. The distance the guides must protrude above the head is given in the "Specification" Section.

To install new exhaust valve seats (11) clean the recess in the cylinder head. Place the valve seats in dry ice to shrink them for easy installation. Insert the valve seats in the head and drive them in place using suitable driver. Lubricate the valves (7 and 8) with engine oil and install them in the original location.

Install the valve spring seats (6), valve springs (1) and intake valve stem oil seal (5). Install the exhaust valve rotators (4) and the intake valve spring retainers (3). Compress the valve springs so the valve retainer locks (2) can be installed.

Install new expansion plug (12). Refer to Page K-2 for reinstalling the cylinder head.

EXHAUST VALVE ROTATOR (Refer to Figure K-9)

When re-installing the rocker arm assembly, check the operation of the exhaust valve rotators. To check the operation of the rotators, place a dab of white paint on the rotator - note its position; -- then start the engine and observe whether or not the rotator is turning. Replace any rotators that will not turn. Do not attempt repairs on rotators.

It is impossible to determine whether or not the rotator is turning without an identifying mark.

There is no set speed at which the rotators should turn; some rotators will turn faster than others. As long as the rotator is turning the valve, it is functioning properly.

NOTE

An excessive accumulation of deposits on the exhaust valve face and stem is also an indication that the rotators may not be functioning properly.

IMPORTANT

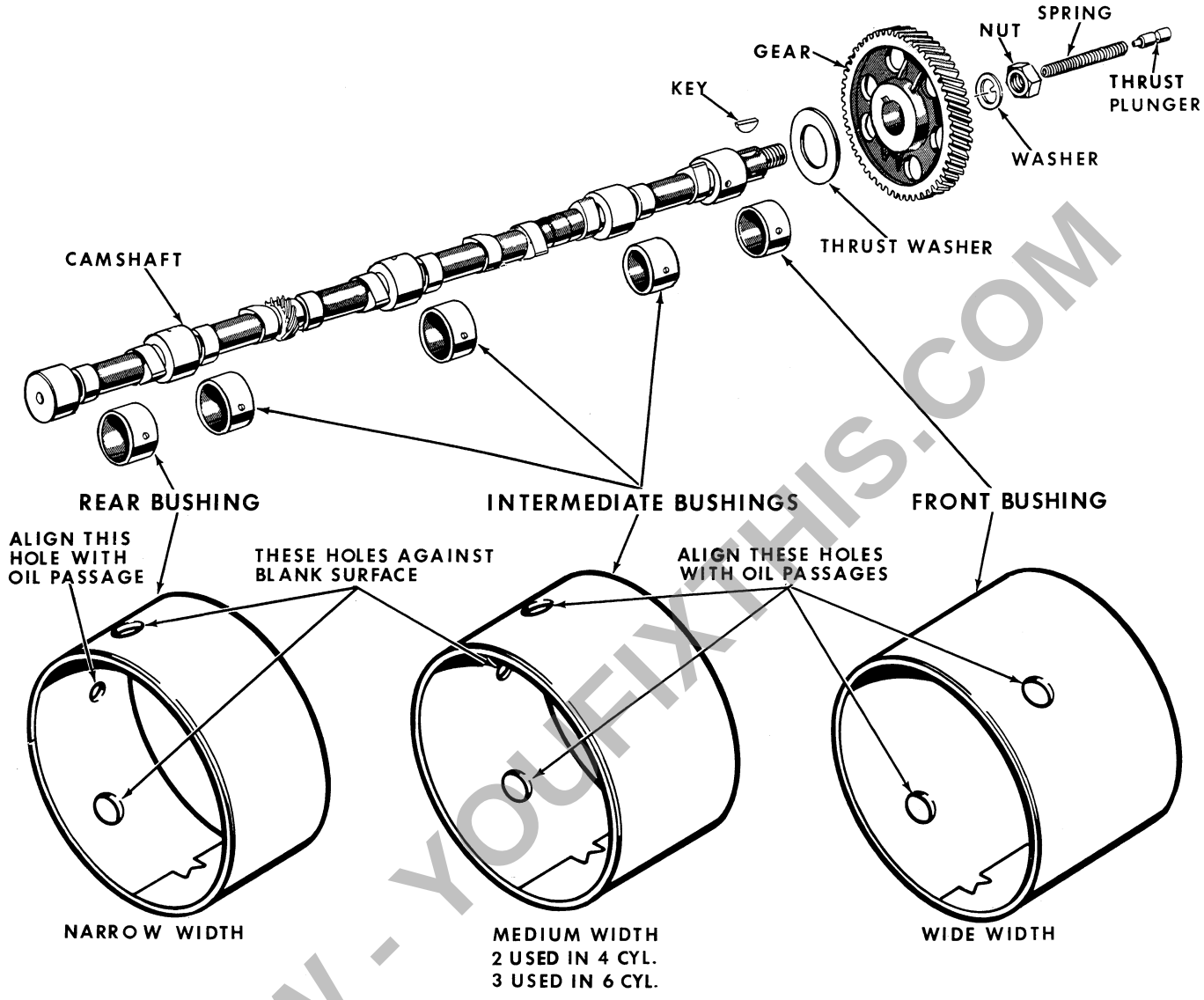
When installing valve rotators:

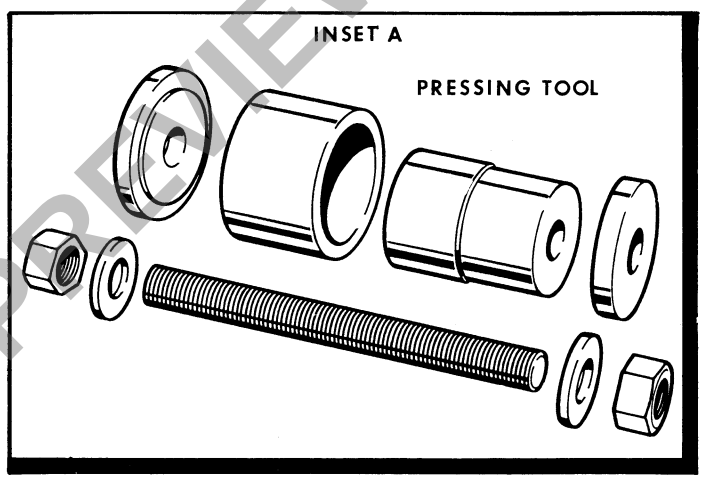
Reassemble the rotator with original valve as they tend to become matched parts when they wear in.

If it is necessary to install a new valve always install a new rotator and retaining lock.

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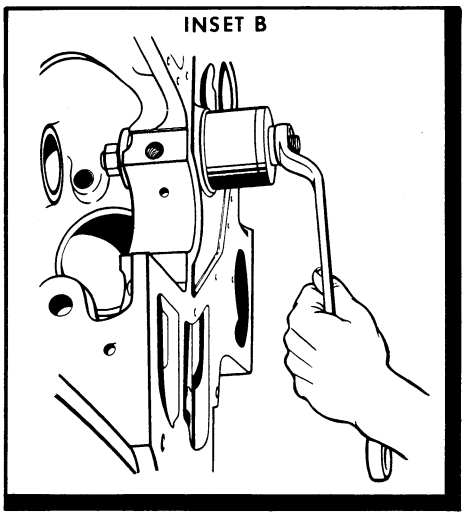


Figure M-51

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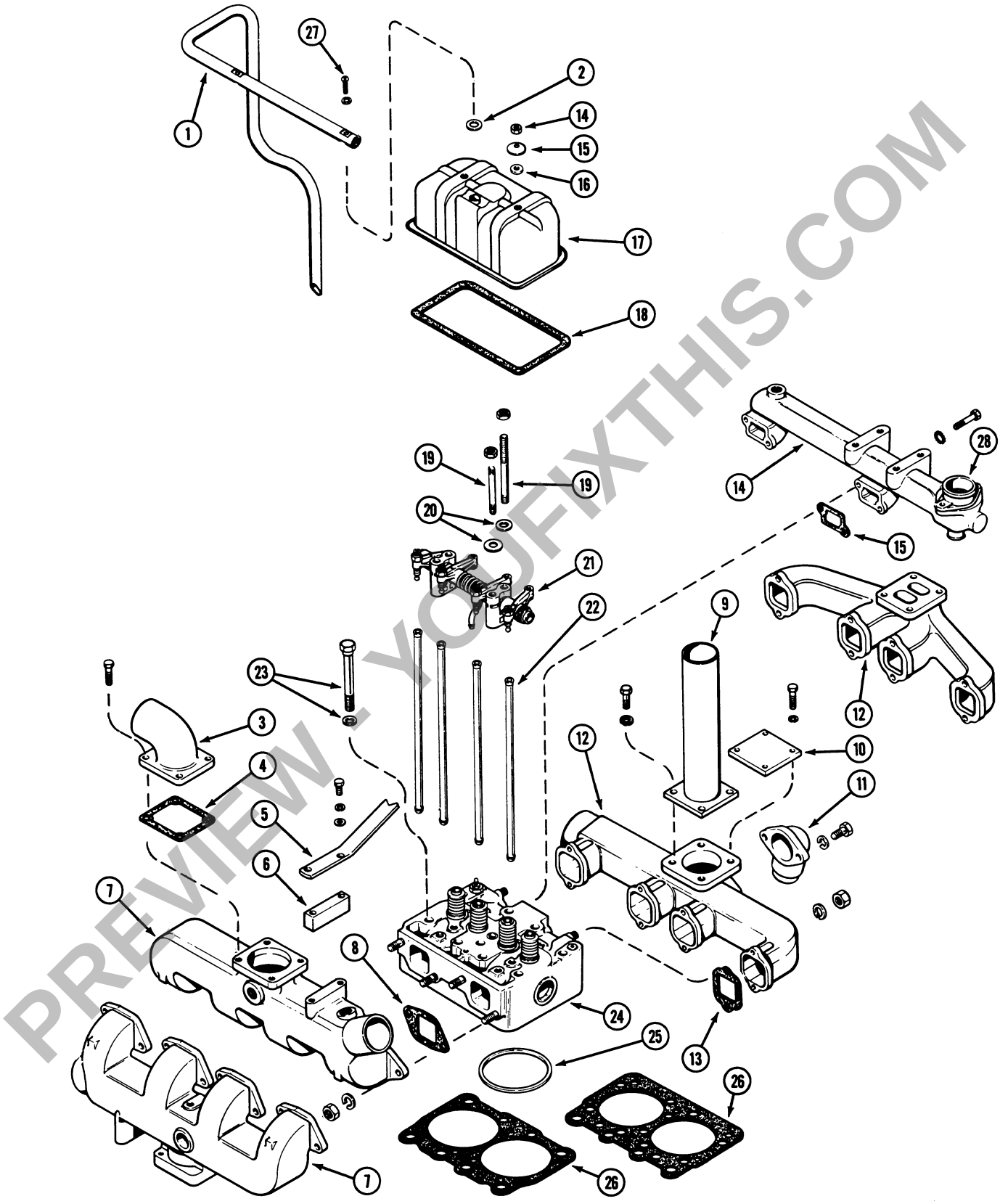


Figure 5

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CRANKSHAFT, PISTONS, SLEEVES AND CONNECTING RODS
(Refer to Figure 12)
Removal and Disassembly

NOTE When the pistons and rods are to be removed, check for a ridge formed in the piston sleeve at the top of the ring travel, Inset A. If a ridge is present, use a ridge reamer to remove the ridge or damage to the piston rings and lands will result.

1. Check to be sure that the rods and caps are numbered as to their location in the block. If not, they must be numbered for reinstallation in their same location.

2. Using a feeler gauge, check each connecting rod for excessive side clearance, Inset C. If it exceeds .016", the rods must be replaced.

3. Remove the connecting rod bearing cap (1) and push the connecting rod and piston assembly up and out through the top of the block. Reinstall rod cap (1) to avoid mixing of the caps.

4. Remove the two piston pin retainer rings (5) from each piston (7) and remove the pin (6) from the rod (3) and piston (7).

5. To avoid damage to the pistons, remove the piston rings (8), with a ring expander.

6. Remove the rod cap (1) and bearing liners (2) from the connecting rod (3).

7. The piston pin bushing (4) must be re-replaced when the inside diameter exceeds the maximum wear limit, refer to inspection below, when checked at a number of points. Press the piston pin bushing (4) from the rods (3) using the proper size arbor.

8. If the cylinder sleeves (11) are to be removed, mark them with paint in relation to the block. Use a sleeve puller and adapter as illustrated in Inset B, to remove sleeves.

IMPORTANT To prevent sediment from the block from damaging the crankshaft and main bearings, cover them with clean cloths before the sleeves are removed.

9. Remove and discard the sleeve "O" rings (12). **NOTE** Never attempt to re-use them.

10. Remove the three wide main bearing caps (15) and two narrow main bearing caps (14) with bolts (13) and the crankshaft (19) or (22) from the block.

11. Remove the thrust bearings (16) from the third main bearing cap and remove the bearing liners (17 and 18).

12. Use a gear type puller to remove the crankshaft gear (20).

Inspection

Thoroughly clean and inspect all parts for nicks, burrs, scratches, grooves and excessive wear. All parts that are worn or damaged must be replaced.

Check the connecting rods and caps for cracks and any noticeable twist, bowed or bent condition. Replace if any one or more of these conditions exist.

Remove all carbon deposits from the piston. Be careful not to scratch the piston skirt. Remove all the carbon from the ring groves with a ring groove cleaning tool.

Inspect the piston pins for cracks, score marks or pitting. Discard the piston pins if the polished surfaces are dull, rough or checked by acid corrosion. If the pin bore in the pistons exceeds 1.8012" (336BD), 1.5007" (301BD), 1.5009" (267BD) or 1.3598" (251BG and 301BG) replace pistons. If the bushing in the rod exceeds 1.8018" (336BD), 1.5018" (267-BD and 301BD) or 1.3604" (251BG and 301BG) replace the bushings.

Check the crankshaft thrust bearings for wear. If their thickness is .178" (251BG, 267-BD, 301BG and 301BD), or .157" (336BD or 336BDT) or less, they must be replaced.

Clean the oil holes in the crankshaft and block. Pipe plugs at the end of each oil gallery in the block will have to be removed. Coat the threads of the pipe plugs with Permatex #2 before installation.

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PREPARING TEST STAND

1. After filling the test stand fuel tank, loosen the bleeder screw, Figure I-14.
2. When the oil flowing from the bleeder screw opening is free of air bubbles, retighten the screw.
3. Wash the connector tube in clean diesel fuel, blow it clean with filtered compressed air, and connect it securely to the test stand, as shown in Figure I-14. Operate the hand lever slowly until clean fuel flows from the tubing. Flush the tubing out thoroughly in this manner.
4. The test stand is now ready for use. ***NOTE*** Complete maintenance instructions are furnished with the test stand. Follow the directions carefully.

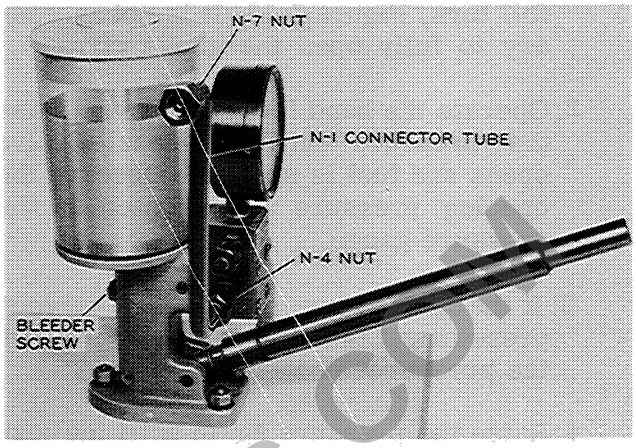


Figure I-14. Preparing Test Stand for Operation

TESTING INJECTOR

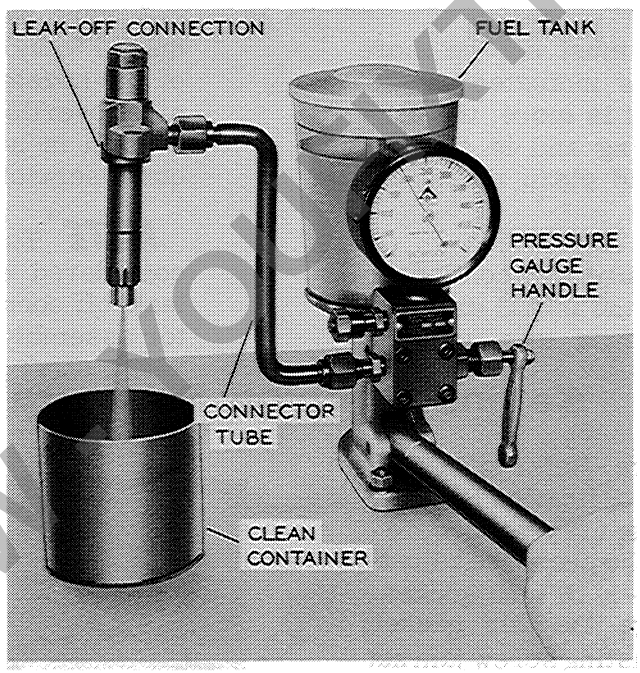


Figure I-15. Testing the Injector on a Bacharach Test Stand

CAUTION Do not place your hands or arms in front of the nozzle when testing an injector on the test stand. The fuel spray has sufficient penetrating power to puncture the flesh and destroy tissue. Refer to the "Warning" on Page I-3.

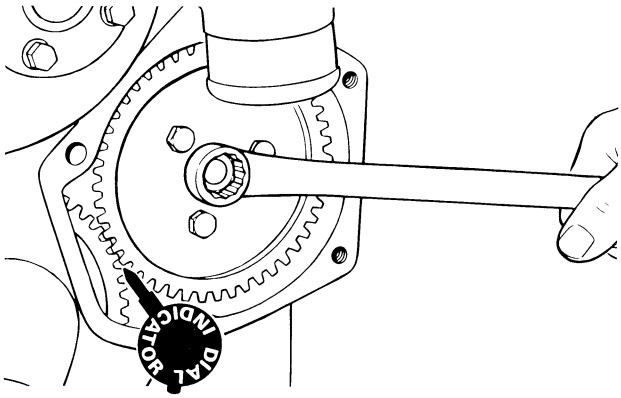
1. Remove the protective cap from the high pressure connection on the nozzle holder and from the nozzle end. Connect the injector to the test stand connector tube as shown in Figure I-15.

Aim the injector into a clean container. It is also advisable to place a clean lint-free rag over the container to prevent fuel bouncing back out of the container and making it difficult to determine the spray pattern. (Do not use laundered shop rags as they may contain tiny steel particles.)

2. Close the pressure gauge valve (turn it fully in) Figure I-15, and operate the hand lever reapidly for a few strokes to clear all air from the injector.

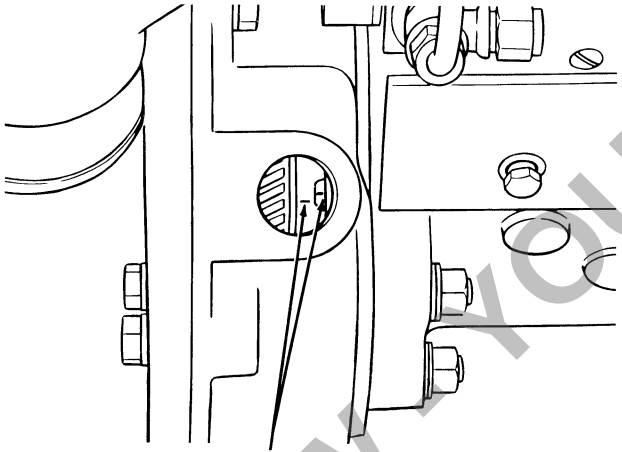
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STEP 28



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

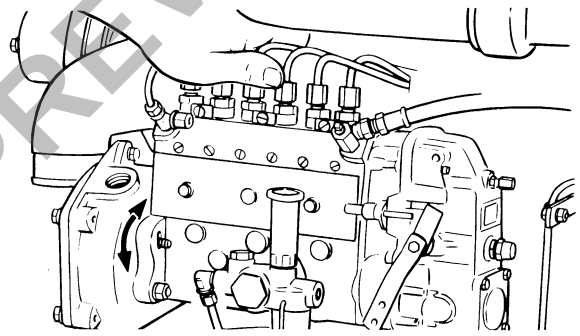
STEP 29



TIMING MARKS NOT ALIGNED

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

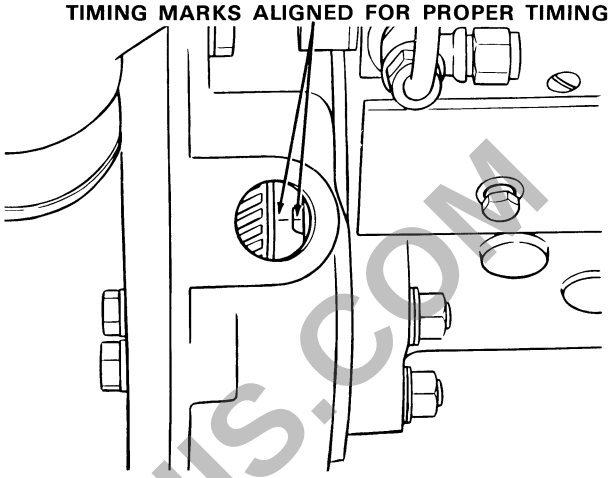
STEP 30



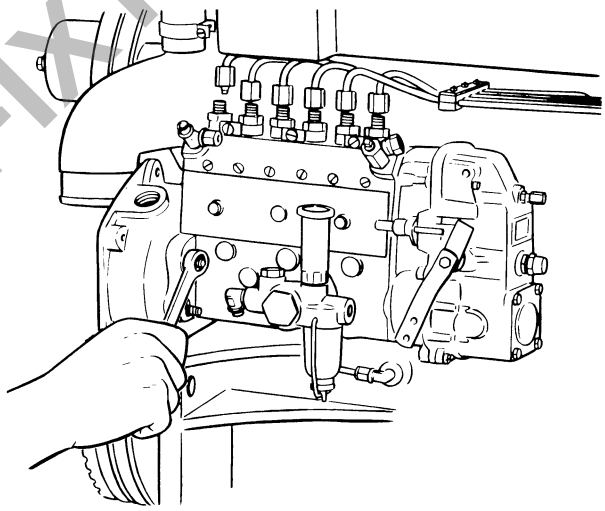
LOOSEN PUMP MOUNTING NUTS. MOVE PUMP TOWARD OR AWAY FROM ENGINE UNTIL TIMING MARKS ARE ALIGNED.

STEP 31

TIMING MARKS ALIGNED FOR PROPER TIMING.

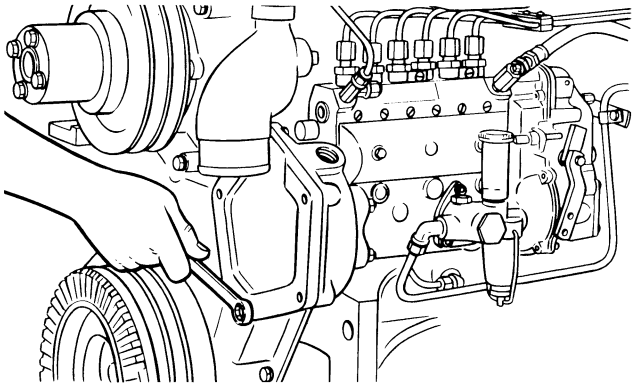


STEP 32



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.

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10. a. The recorded GPM readings for each cylinder tested at 1800 PSI should compare closely with the previously recorded pump GPM at 1800 PSI.

b. If the GPM readings for ONE pair of cylinders are below pump GPM readings in both the extended and retracted positions, it indicates leakage past the cylinder packing in either or both of the cylinders. If the GPM reading is low in just one position, spool leakage is probable.

c. If ALL cylinder GPM readings are low, it indicates that oil is leaking before it reaches the cylinders. Check the main relief valve seals and parts for damage. Also check the "O"ring nearest the check poppet on check valve cartridges.

TESTING SWING AND STABILIZER CIRCUITS

11. a. Test the R.H. stabilizer cylinder. Raise the stabilizer as far as it will go. Partially close the load valve until 1800 PSI is reached on the flowmeter pressure gauge. Take the GPM reading and record it.

b. Lower the stabilizer to full depth and take the GPM reading at 1800 PSI.

c. Test the swing cylinders by recording the GPM readings at 1800 PSI when the boom is swung completely to the right and to the left.

INTERPRETING TEST RESULTS

12. a. The recorded GPM readings for each cylinder tested at 1800 PSI should compare closely with the previously recorded pump GPM at 1800 PSI.

b. If the GPM readings for either stabilizer cylinder or the pair of swing cylinders are below pump GPM readings in both the extended and retracted positions, it indicates leakage past the cylinder packing. If the GPM reading is low in just one position, spool leakage is probable.

c. If ALL three sets of GPM readings are low, it indicates that oil is leaking out before it reaches the cylinders. Check the loader main relief valve seals and parts for damage. Check the "O"ring on the power beyond fitting at the outlet to the loader control valve.

TESTING BUCKET, DIPPER, AND BOOM CIRCUITS

13. Test the bucket cylinder. Curl the bucket under as far as it will go. Raise one of the stabilizers and hold the lever in power position. This will prevent oil from the 25 GPM side of the pump from reaching the bucket cylinder. Gradually close the load valve until 1800 PSI is reached on the flowmeter pressure gauge. Take the GPM reading and record it.

b. Repeat this test with the bucket extended.

c. Test the dipper cylinder in the same manner in both the extended and retracted positions.

d. Raise the boom and test the boom cylinder in the same manner.

e. Lower the boom and test the boom cylinder in the same manner. Close the load valve only until 1000 PSI is reached. There is a secondary relief valve at the top port in the boom section of the control valve which is set at 1150 PSI.

INTERPRETING TEST RESULTS

14. a. The recorded GPM readings for each cylinder tested at 1800 PSI should compare closely with the previously recorded pump GPM at 1800 PSI. Compare it with the 17 GPM side of the pump.

b. The recorded GPM reading for the boom in the extended position

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TROUBLE SHOOTING CHART

PROBLEM	POSSIBLE CAUSES	REMEDY
Backhoe Operation Slow, Jerky, or Lacking Power	1. Backhoe regeneration check valve not closing because of chips, etc.	1. Remove regeneration check valve cartridge - inspect check poppet and "O" ring.
	2. Backhoe regeneration spool not closing.	2. Remove regeneration cap and check the spring. Check spool for burrs.
	3. Reservoir oil level too low.	3. Fill to proper level and check for leaks.
	4. Incorrect main relief valve setting.	4. Check relief valve pressure at loader and backhoe.
	5. Relief valve leaking internally.	5. Check seat, poppet, and "O" rings for cracks, pits, wear, etc.
	6. Broken relief valve spring.	6. Replace spring and check pressure.
	7. Relief valve action sluggish.	7. Thoroughly clean relief valve with solvent.
	8. Defective secondary relief valve in circuit being actuated.	8. Check secondary relief valve with hand pump.
	9. Oil leaking from system.	9. Check for external leaks.
	10. Undetermined leakage.	10. Check backhoe hydraulic system with flowmeter.
	11. Worn pump.	11. Check pump with flowmeter.
	12. Inlet section cracked internally	12. Remove and inspect section.
Control Lever Feathered - Cylinder Falls In Opposite Direction	1. Check poppet not seated and sealing.	1. Check the poppet in valve section being actuated.
	2. Lands in valve spool not properly aligning with valve body.	2. Check for equal spool travel in both directions. If unequal, section is improperly assembled. Correct spool travel is 15/32" from neutral.
Spools Bind	1. Tie rods unevenly tightened or too tight.	1. Torque to 30 ft. lbs. maximum evenly in increments of 5 ft. lbs.
	2. Bent spool.	2. Replace spool and valve section.
Spools Do Not Return To Neutral	1. Broken spool centering spring.	1. Replace spring.
Cylinder Operates Incorrectly	1. Insufficient power.	1. Check relief valve pressures.
	2. Defective cylinder.	2. Rebuild or replace cylinders.
	3. Defective "O" rings on secondary relief valves.	3. Service relief valves.
	4. Broken springs in secondary relief valves.	4. Replace springs in secondary relief valves.
	5. Hoses connected to wrong ports.	5. Check Hydraulic Diagram. Switch hoses.

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EXPLODED VIEWS

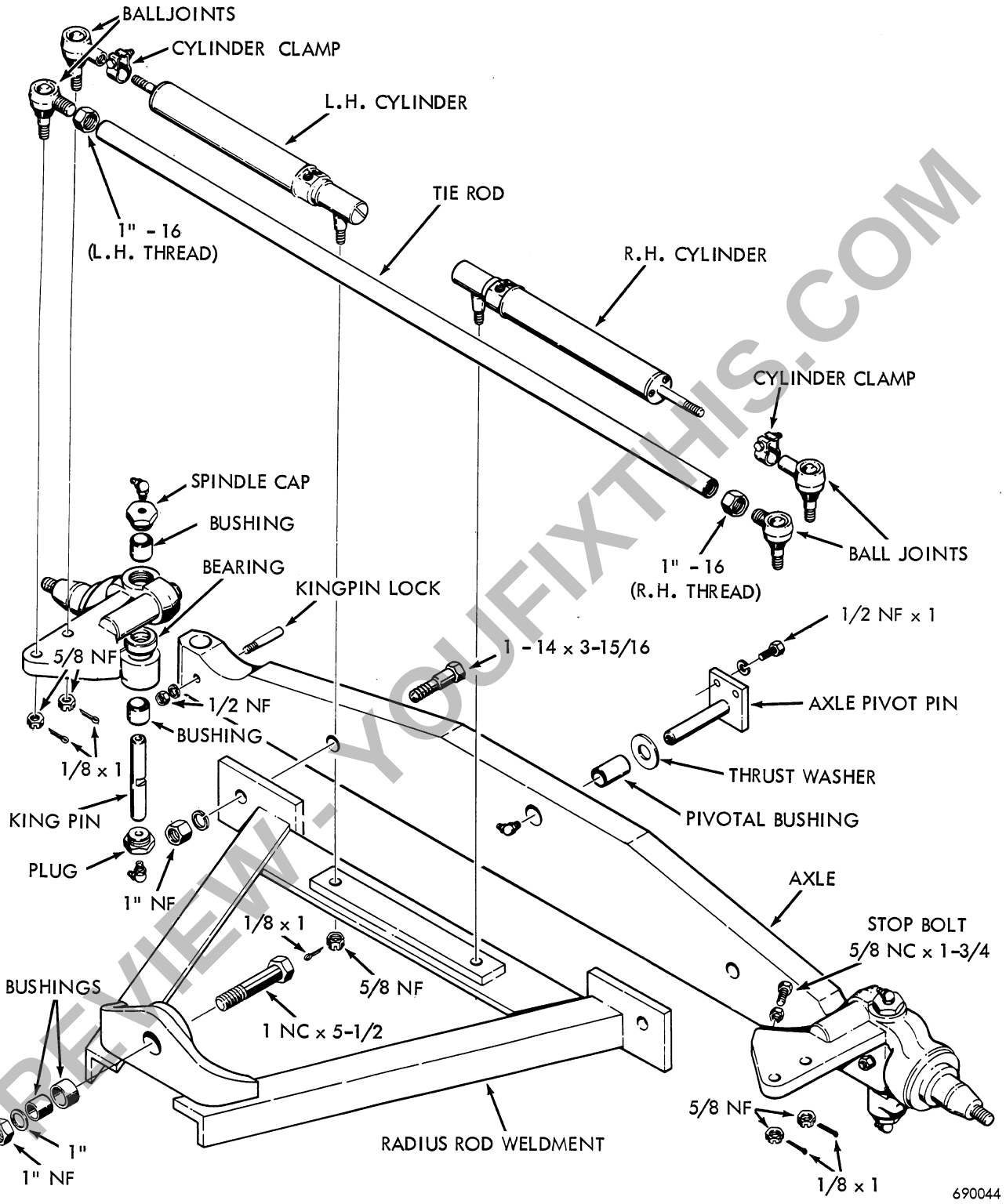


Figure 5 - Exploded View of Front Axle and Suspension

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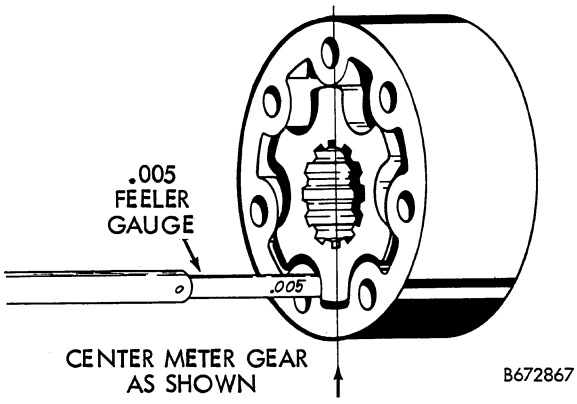


Figure 17 - Checking For Side Clearance

ness with a micrometer or dial indicator. If the meter gear thickness is .002 inch less than the gear ring, replace the meter gear and meter gear ring. See Figure 18.

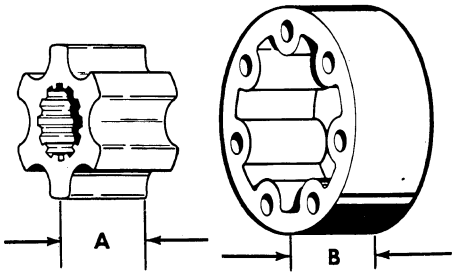


Figure 18 - Checking Thickness

Slightly scored or burred surfaces can be dressed by using 600 grit abrasive paper on a flat surface. Proceed as follows:

1. Place a piece of 600 grit abrasive paper face up on extremely flat, clean surface, at least as flat as plate glass. If the 600 grit paper is new, it should be first rubbed down with a piece of scrap steel to remove any sharp grit which would produce scratches. The ends of the gear can be used for this purpose.

2. Both sides of the ring and gear in the metering set, both sides of the spacer plate, flat side of the end cap and the 14 hole end of the housing should be cleaned by rubbing lightly over the grit paper. See Figure 19.

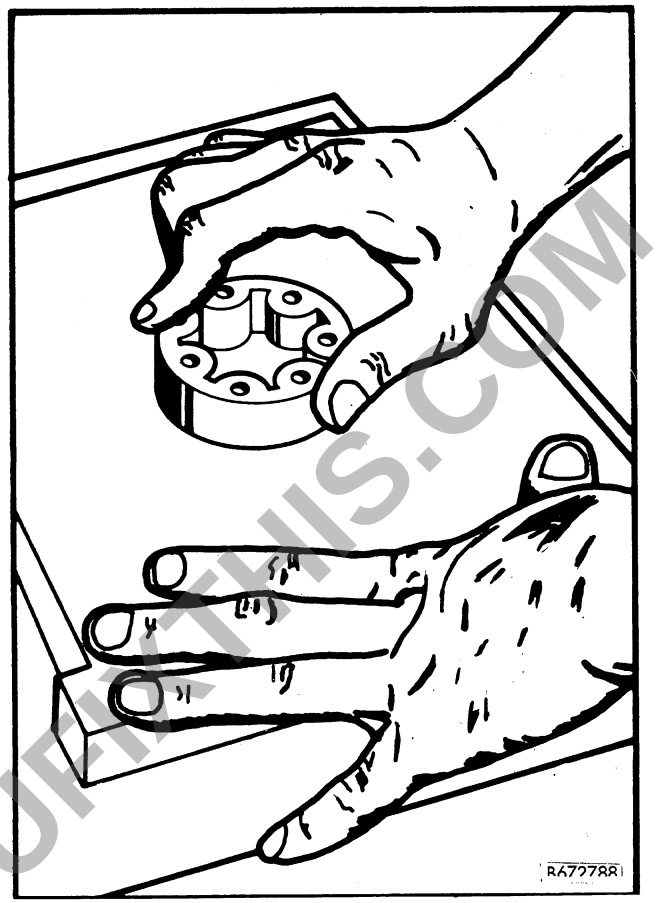


Figure 19 - Removing Burrs

3. Stroke each surface across the abrasive several times, then check the part. Any small bright area near an edge indicates a burr which must be removed. Hold the part so that contact with the abrasive is as flat as possible. Do not push one edge down hard or the flatness will become rounded.

4. Check each part after 6 to 10 strokes across the abrasive. After polishing each part, rinse clean in solvent and blow dry.

Assembly

Lubricate all parts with Case TCH Fluid before assembly.

1. Replace check valve assembly (6) into housing. Make sure that the ball rests on top of the small end of the spring and the machined counterbore of the

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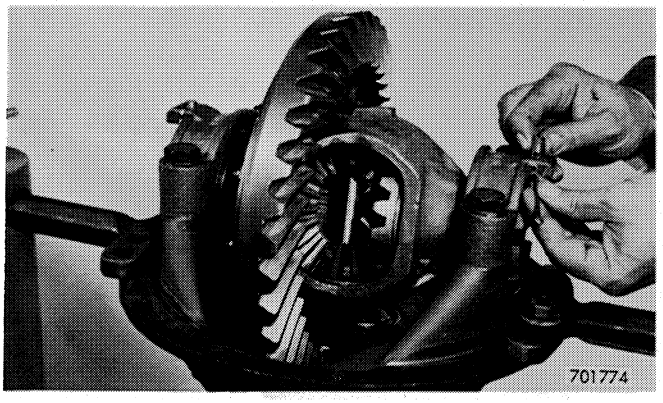


Figure 59
Installing Adjusting Nut Lock Pins



Figure 60 - Installing Lockwire

Adjusting Differential Bearings

CAUTION: Before adjusting the bearings make sure there is a slight amount of backlash between the ring gear and pinion to assure proper bearing adjustment.

1. Install dial indicator as shown in Figure 62 and tighten adjusting nut to obtain zero backlash.

2. Check for proper bearing adjustment by trying to move the bearing rollers sideways with screwdriver as shown in Figure 62. If bearing rollers can be moved, the bearings are not properly adjusted and end play must be readjusted.

3. With dial indicator positioned as shown in Figure 61, rotate the ring gear several times and check ring gear runout. Runout must not exceed .005 inch. If runout is excessive, remove and disassemble differential and check for cause (burrs or dirt under ring gear, improperly torqued ring gear nuts or improperly installed bearing adjusting nuts).

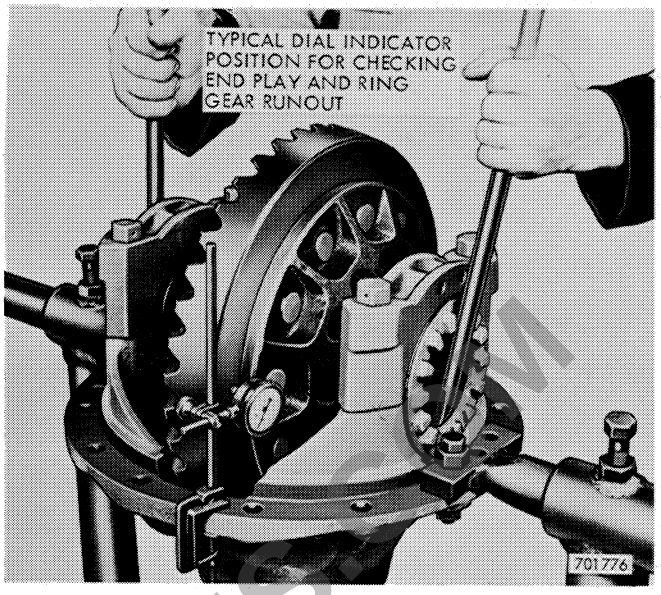


Figure 61 - Adjusting End Play



Figure 62 - Checking Bearing Adjustment

Adjusting Ring Gear And Pinion Backlash

1. The backlash must be checked with a dial indicator. Position the dial indicator as shown in Figure 63.

2. When using old gears, adjust backlash to reading obtained prior to disassembly.

   NOTE: Adjust backlash for new gears between .008" and .011".

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Also see Figure 9, next page.

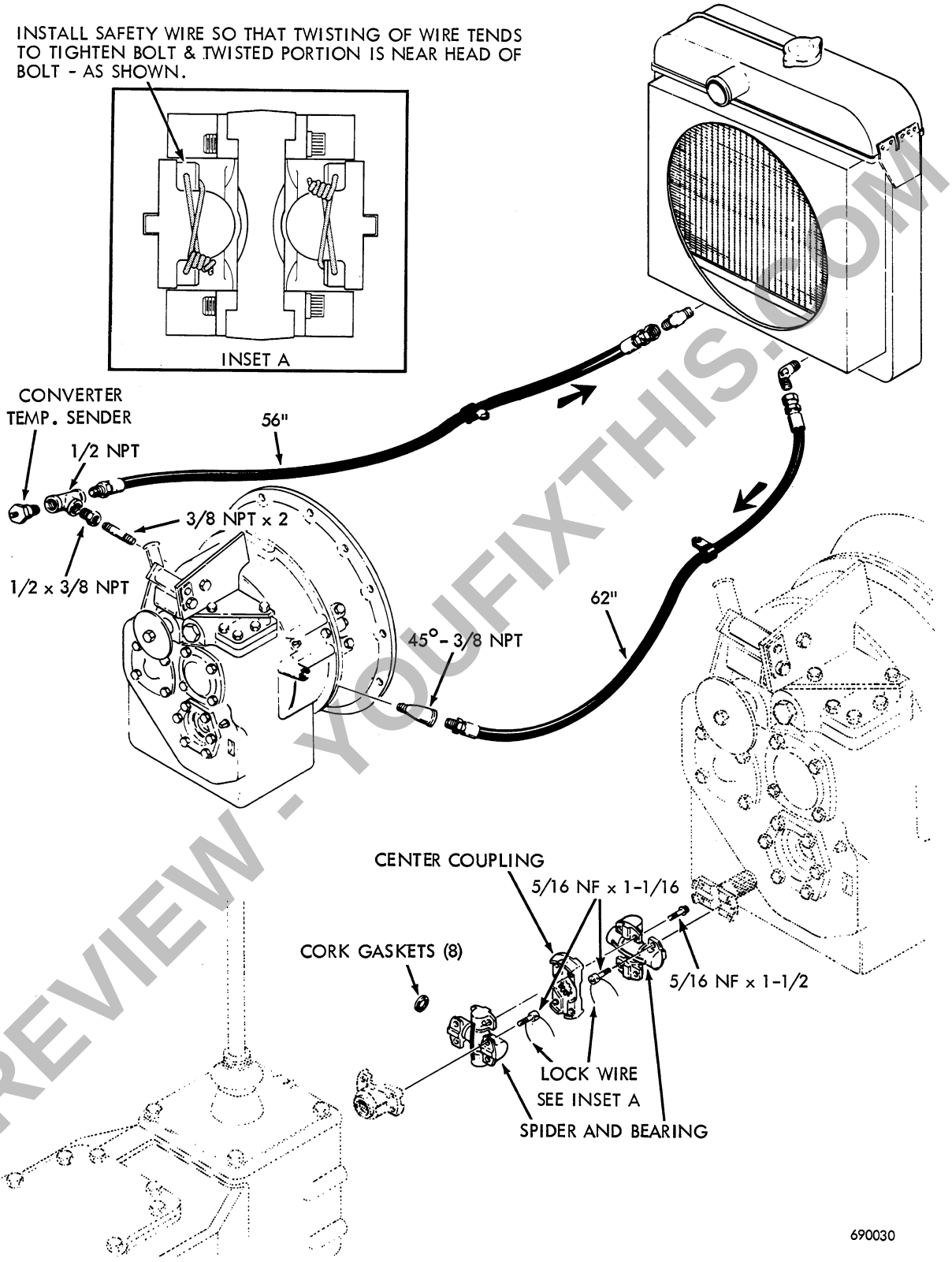


Figure 8 - Removal–Installation of Cooler Hoses and Universal Coupling

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VACUUM PUMP

General

The vacuum pump is a rotary, sliding vane type pump. The rotor is eccentrically located in respect to the housing. The pump is engine lubricated; the lubricant also providing an internal seal. The pump is engine driven and operates whenever the engine is running, drawing air from the vacuum reservoir and Hydrovac cylinders.

Removal

1. Disconnect the oil supply and return lines and the vacuum line. Then loosen the mounting plate capscrews and remove drive belt.

2. Remove the four nuts, lockwashers and bolts that secure the pump to the mounting plate and remove pump.

Disassembly

Refer to Figures 25 and 26.

1. Remove cotter pin and nut from shaft. Attach a suitable puller (OTC No. 1002) to pulley and remove pulley. Do not use a hammer to aid in pulley removal. Then remove Woodruff key from shaft.

2. Scribe a mark across the housing and end plates to assure proper parts positioning during reassembly. Remove the nuts and lockwashers from the tie bolts and remove bolts. If necessary, the bolts may be driven out using 3/16" brass rod as a driver.

3. If necessary, use a soft hammer to break the seal between the end covers and the housing. Remove the rear end plate and the front end plate and rotor assembly from the housing.

4. Remove the vanes from the rotor. Place the threaded end of rotor shaft on a block of wood and drive front end plate off shaft using a soft hammer.

5. Place the outer edge of the machined surface of the front end plate on wood blocks and drive out the baffle plate and ball bearing. Use a length of 3/8" diameter rod through the opening on the pulley side of the end plate.

6. Remove the felt washer from the pulley side of the end plate.

7. Using the special tool shown in Figure 24, drive out the oil seal and gasket from the end plate.

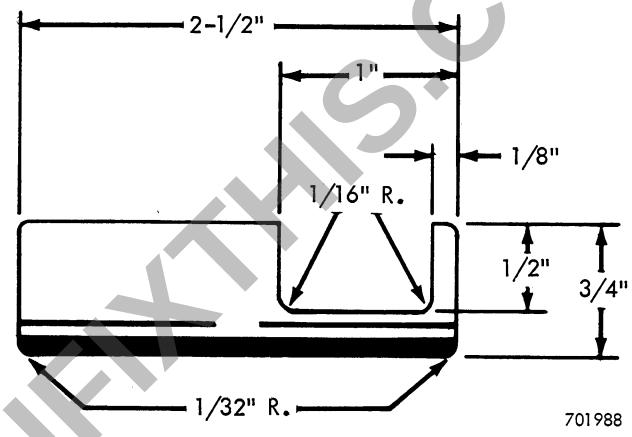


Figure 24 - Seal Removal Tool

Inspection

With the pump completely disassembled, the component parts can easily be cleaned and inspected for wear, cracks, score marks and burrs. All parts that are worn or damaged must be replaced. All o-rings and seals must be replaced.

Front And Rear End Plates

Inspect the finished surface of both the front and rear end plates by placing a scale or straight edge across the surface, Figure 27. Using a feeler gauge, the wear must not exceed .003 inches. If the surface of either end plate is worn excessively or scored, replace the end plate. Inspect the bronze bushing in the rear end plate for looseness, wear and scoring. If the bushing is defective, replace the complete rear end plate assembly.

The clearance of the rotor shaft (at the rear end plate) to the rear end plate bushing should not exceed .007 inch. The outside dia-

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ALTERNATOR AND REGULATOR

Test Specifications

Case numbers	
Alternator	A41340
Regulator	L11351
Motorola numbers	
Alternator	MH12N-601
Regulator	R2JC2
Alternator test	
Output amperes	45-55
Specified voltage	14.4
Engine R.P.M.	2150
Alternator R.P.M.	4730
Field current	1.65 - 2.25 amps at 10 volts at 80°F.
Regulator test	
At 25°F.	14.2-15.2 volts
At 50°F.	13.9-14.9 volts
At 75°F.	13.6-14.6 volts
At 100°F.	13.3-14.3 volts
At 125°F.	13.0-14.0 volts

CAUTION

The following precautions must be followed when performing the tests described in this section:

The battery must be in good condition and fully charged so that the alternator output current can be completely controlled with an external load.

DO NOT under any circumstances, short FIELD terminal of alternator to ground.

DO NOT disconnect voltage regulator while alternator is operating.

DO NOT disconnect load (alternator output lead) from alternator while the alternator is operating.

DO NOT remove alternator from tractor without first disconnecting the negative (-) battery cable. If battery must be removed, disconnect negative cable first.

CAUTION

IF A BATTERY IS BEING INSTALLED, MAKE CERTAIN THAT THE NEGATIVE TERMINAL IS CONNECTED TO GROUND. REVERSE POLARITY WILL DESTROY RECTIFIER DIODES IN THE ALTERNATOR.

Testing Alternator Output On Engine

The following tests can be performed without removing the alternator from the engine. The test equipment shown in the hookup, Figure 20 must be available.

1. Refer to Figure 20. Disconnect regulator at plug.
   a. Disconnect the orange wire from the alternator "Output" terminal.
   b. Hook one ammeter lead to the orange wire and the other lead to the "output" terminal of the alternator. Attach positive and negative leads as shown in Figure 20.
   c. Connect a voltmeter to the "output" terminal and to ground.
   d. Disconnect the green wire from the alternator "field" terminal. Connect a field rheostat between the "field" and output terminals.
   e. Hook a carbon pile (variable load) across the battery terminals in the manner shown.

TEST PROCEDURE

2. Run the engine at high idle. Turn the carbon pile knob to "load" position. Turn the field rheostat to "direct" position. Use the carbon pile to regulate voltage to 14.4. Read the ammeter. It should read 45-55 amps.
3. If the output is low, it could mean loose or defective drive belts. Tighten or replace belts as required, then repeat step 2.
4. If the output is still low, remove field rheostat and connect a low reading ammeter between the field and output terminals. With the engine off, the reading should be within specifications for "Field Current" above.

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SERVICING THE ALTERNATOR

Disassembly

1. Secure the alternator in a vise with the rear housing facing you.

2. Remove the brush cover retaining screws. Hold the cover away from the rear housing and remove the brush assembly mounting screws. Then remove the cover and brush assembly from the rear housing. See Figure 42.

3. Remove the four thru bolts. Then separate the rear housing from the front housing. Carefully insert screwdriver blades into opposite openings between the stator and front housing and pry them apart.

   CAUTION: Do not insert blade of screwdriver more than 1/16".

4. Remove the stator from the rear housing.

   a. Place the open end of the stator on a clean work surface, free of metal chips that could cause damage to the stator windings.

   b. Remove nuts and insulators from the diode terminal studs.

   c. Carefully and evenly, tap the diode terminal studs out of the rear housing. Lift the housing off the studs and remove any insulating sleeves remaining in the terminal stud holes.

5. Remove pulley retaining nut and lockwasher. Then remove pulley, pulley spacer, fan, fan spacer and Woodruff key from the rotor shaft.

6. Remove the three bearing retainer mounting screws from the front housing. Then press rotor assembly out of housing.

7. Using a universal bearing puller, remove the front bearing and bearing sleeve from the rotor shaft.

   NOTE: Remove the slip ring hub only when necessary.

8. To remove the slip ring hub proceed as follows:

   a. Unsolder rotor leads from slip ring terminals.

      CAUTION: Do not overheat when unsoldering the leads. Then unwind rotor leads from the slip ring terminals.

   b. Remove the ALLEN head screw from end of rotor shaft. Then thread a 1/4" - 28 x 1-1/2" cap screw into the slip ring hub. This will back the slip ring hub off the rotor shaft.

Inspection

1. Inspect the front and rear housing for cracks and other defects.

2. Inspect the rotor and stator windings for defective and discolored insulation. Discolored insulation may result from shorted windings.

3. Inspect brushes for wear and oil contamination.

4. Check brush spring tension.

5. Clean brush contacting surface on slip ring with crocus cloth.

6. Check bearings for free rotation and flat spots.

7. Discard any cracked insulator (sleeve, washer and square).

8. Check for loose diodes in each heat sink.

Assembly

1. If the rear rotor bearing was removed install at this time. Make sure the bearing inner race is seated against shoulder.

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RETURN-TO-DIG

Trouble Shooting

TROUBLE	POSSIBLE CAUSE	REMEDY
Too Much Or Too Little Rollback	1. Limit switch improperly positioned.	1. Place bucket on ground in level (digging) position. Slide limit switch back to point where it "snaps". Tighten clamps.
	2. Engine speed too low.	2. Increase engine speed so that bucket can be rolled back level during time it lowers to ground.
Return-To-Dig Fails To Oper-Operate	1. Faulty switch, diode, solenoid, or wiring.	1. Use voltmeter to check system as described below.
	2. Actuator switch not closed by tang on tilt lever.	2. Position actuator switch so rearward movement of tilt cylinder closes actuator switch.
	3. Solenoid improperly adjusted.	3. Adjust solenoid as described under "Adjustments" below.

Electrical Checkout

Refer to Figure 8 and make the following checks with a voltmeter:

1. With KEY Switch on, tilt lever in neutral and bucket in a dumped position. A 12 volt reading at points 1, 2 and 3 to ground, indicates that the circuit to the actuator switch is good.

2. Follow procedure in Step 1, then move the tilt lever to the retained position. A 12 volt reading at points 4 and 5 to ground, indicates that the actuator switch and the circuit to the limit switch is good. If no reading is indicated check wiring and actuator switch adjustment.

3. Point 6 is a ground potential. This can be checked by disconnecting the ground wire from the limit switch and connect a voltmeter from this terminal to ground. A 12 volt reading should result if the engine is started and the bucket rolled back until the leveling rod actuates the limit switch. If the voltmeter does not show 12 volts, adjust or replace the limit switch.

4. Check diode using an ohmmeter or 12 volt test lamp. Connect the test lamp and diode in series with a 12 volt battery. If the lamp lights in both directions the diode is shorted. If the test lamp does not light in either direction, the diode is open. A shorted or open diode must be replaced.

If above steps indicate that the switches and diode are good then the tilt solenoid must be replaced.

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